CDM-570

70/140 MHz Satellite Modem

CDM-570L

L-Band Satellite Modem

CDMR-570L

Reduced Chassis Depth L-Band Satellite Modem

Satellite Modem with Optional IP Module
Installation and Operation Manual

For Firmware Version 1.7.0 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.

Part Number MN/CDM570L.IOM Revision 10

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Revision 10
August 8, 2011

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

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CDM-570 or CDM-570L/CDMR-570L Satellite Modems (collectively referred to throughout the remainder of this manual as the CDM-570/570L). These modems are essentially identical in their operation, with the following differences:

- The CDM-570 operates in the 70/140MHz IF band and includes support for externally connected Comtech EF Data Transceivers (CSAT-5060, KST-2000A/B);
- The CDM-570L and CDMR-570L operate at L-band and include support for externally connected Block Upconverters (BUCs) and Low-Noise Block Downcoverters (LNBs).

This is a technical document intended for the persons responsible for the operation and maintenance of the Comtech EF Data CDM-570/570L.

Reporting Comments or Suggestions Concerning this Manual

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

TechnicalPublications@comtechefdata.com.

Conventions and References

Metric Conversion

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

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations may be shown when depicting actual text displayed on the Web or Telnet (i.e., remote control) interface pages for the unit (e.g., RS-232). All other references in the manual will be shown with the EIA designations.

Trademarks

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

The user should carefully observe the following information:

Warnings, Cautions, and Notes

A <u>WARNING</u> gives information about a possible hazard that MAY CAUSE DEATH or SERIOUS INJURY.

A <u>CAUTION</u> gives information about a possible hazard that MAY CAUSE INJURY or PROPERTY DAMAGE.

A <u>NOTE</u> gives important information about a task or the equipment.

A <u>REFERENCE</u> directs the user to additional information about a task or the equipment.

Electrical Safety

The CDM-570/570L has been shown to comply with the **EN 60950 Safety of Information Technology Equipment (Including Electrical Business Machines)** safety standard.

The equipment is rated for operation over the range 100 to 240 volts AC. It has a maximum power consumption of 250 Watts (when equipped with a 150W BUC power supply), and draws a maximum of 2.5 Amps.

Fuses

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

The 230 or 115 volt AC-powered CDM-570L or CDM-570 is fitted with two 20mm Slow-Blow fuses – one each for line and neutral connections. They are contained within a fuse holder that is press-fit into the body of the IEC power module.

- For 230 volt AC operation, use T2.5A fuses.
- For 115 volt AC operation, use T5.0A (P/N 5ASB-IEC) fuses.

CDM-570/570L Optional 48V DC Units: The 48 volt DC-powered CDM-570L or CDM-570 is fitted with two 20mm Slow-Blow fuses – one each for positive and negative connections. They are contained within a fuse holder that is press-fit into the body of the IEC power module.

- For 42 to 60 volt DC operation, use T5.0A fuses if the modem has no BUC power supply.
- For 42 to 60 volt DC operation, use T8.0A fuses if the modem is fitted with an internal BUC power supply.

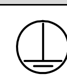
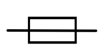
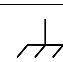
CDMR-570L 48V DC Units: The 48 volt DC-powered CDMR-570L is fitted with one Type TR5 Slow-Blow fuse contained within a screw-in receptacle located to the left of the terminal block.

- For 42 to 60 volt DC operation, use TR5 6.3A fuses if the modem has no BUC power supply.

CDM-570/570L Optional 24V DC Units: The 24 volt DC-powered CDM-570L or CDM-570 is fitted with two 20mm Slow-Blow fuses – one each for positive and negative connections. They are contained within a fuse holder that is press-fit into the body of the IEC power module.

- For 20 to 36 volt DC operation, use a T5.0A fuse if the modem has no BUC power supply.
- For 20 to 36 volt DC operation, use a T10.0A fuse if the modem is fitted with an internal BUC power supply.

International Symbols

Symbol	Definition	Symbol	Definition
	Alternating Current		Protective Earth
	Fuse		Chassis Ground

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

Installation

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.
The CDM-570/570L is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to a power system that has no direct connection to ground.

The CDM-570/570L is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

Environmental

Do not operate the CDM-570/570L in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C, precipitation, condensation, or humid atmospheres above 95% RH, altitudes (non-pressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

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

Telecommunications Terminal Equipment Directive

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

CE Mark

Comtech EF Data declares that the CDM-570/570L meets the necessary requirements for the CE Mark.

RoHS Compliance

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

EMC (Electromagnetic Compatibility) Compliance

In accordance with European Directive 2004/108/EEC, the CDM-570/570L has been shown, by independent testing, to comply with the following standards:

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

(Also tested to FCC Part 15 Subpart B.)

Immunity: EN 55024 – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.

Additionally, the CDM-570/570L has been shown to comply with the following standards:

EN 61000-3-2 – Harmonic Currents Emission;
EN 61000-3-3 – Voltage Fluctuations and Flicker.

To ensure that the CDM-570/570L continues to comply with these standards, observe the following instructions:

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

Warranty Policy

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

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

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

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

Limitations of Warranty

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

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

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

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

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

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

Exclusive Remedies

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

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

Customer Support

Refer to p. xxviii in this Preface for information regarding this product's Warranty Policy.

Contact the Comtech EF Data Customer Support Department for:

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

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department

2114 West 7th Street
Tempe, Arizona 85281 USA

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

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

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

Online Customer Support

An **RMA number** can be requested electronically by accessing Comtech EF Data's online **Support** page (**www.comtechefdata.com/support.asp**). From this page:

- **Click** the **Service** hyperlink, and then read the **Return Material Authorization** section for detailed instructions on Comtech EF Data's return procedures.
- **Click [Send RMA Request]** on the **Support** page or the **RMA Request** hyperlink provided in the **Service | Return Material Authorization** section; fill out the *Billing Information*, *Return Information*, and *Unit to be Returned* sections completely, then click **[Send email]**

  – or –

- **Send an e-mail** providing this same detailed information to the Customer Support Department at service@comtechefdata.com.

Chapter 1. INTRODUCTION

1.1 Overview

Figure 1-1. CDM-570/570L Satellite Modem
(CDM-570L shown)

The CDM-570L and CDMR-570L Satellite Modems (**Figure 1-1**, referred to collectively as the 570L) are intended for closed network L-band applications. The CDM-570 Satellite Modem is the 70/140 MHz IF version of the same modem. Apart from the IF frequency band, the three modems are essentially identical.

Note the following:

- The CDM-570/570L offers variable data rates from 2.4 kbps to 9.98 Mbps, in BPSK, QPSK, Offset QPSK, 8-PSK, 8-QAM, and 16-QAM modes.
- The CDM-570/570L provides, as Forward Error Correction (FEC) options, Viterbi, concatenated Reed-Solomon (R-S), Trellis Coded Modulation (TCM), and Turbo Product Coding (TPC, IESS-315 compliant).
- The CDM-570/570L provides a full range of built-in interface types, including G.703 T1 and E1 (note that G.703 operation is optional after 10/2009).
- The CDM-570 IF frequency range covers 50 to 90 and 100 to 180 MHz.
- The CDM-570L IF frequency range covers 950 to 2000 MHz. and supports external Block Upconverters (BUCs) and Low-Noise Block Downconverters (LNBs). An optional BUC power supply, up to 150 Watts @ 50°C and 180 Watts @ 30°C, may be installed internally. 10 MHz reference signals are available to drive both BUC and LNB. LNB power and FSK for 'smart' BUCs is standard.

- The CDM-570L and CDMR-570L are compact – 1RU high and 16 inches deep or 1RU high and 11 inches deep, respectively – and consume only 29 Watts (typical, not including BUC power supply or IP Module).
- The CDM-570 is 1RU high and 13 inches deep, and consumes 29 Watts (typical, not including IP Module).
- The CDM-570/570L features a front panel VFD display and six-button keypad for local configuration and control, although both modems can be fully remote-controlled.
- An optional integrated 10/100 BaseT Ethernet interface offers a wide range of network-based management options, such as SNMP, HTTP (non-secure Web server), and Telnet.
- An optional E1 RAN Optimization / WAN Adaptation Processor Board allows provision of GSM backhaul transport services via E1 framing over the G.703 interface.

1.2 Functional Description

The CDM-570/570L has two fundamentally different types of interface – IF and data:

- The IF interface provides a bidirectional link with the satellite via the uplink and downlink equipment.
- The data interface is a bidirectional path, which connects with the customer's equipment (assumed to be the DTE) and the modem (assumed to be the DCE).

Transmit data is received by the terrestrial interface where line receivers convert the clock and data signals to CMOS levels for further processing. A small FIFO follows the terrestrial interface to facilitate the various clocking and framing options. If framing is enabled, the transmit clock and data output from the FIFO pass through the framer, where the EDMAC overhead data is added to the main data; otherwise, the clock and data are passed directly to the Forward Error Correction encoder.

In the FEC encoder, the data is differentially encoded, scrambled, and then convolutionally encoded. Following the encoder, the data is fed to the transmit digital filters, which perform spectral shaping on the data signals. The resultant I and Q signals are then fed to the BPSK, QPSK/OQPSK, 8-PSK, or 16-QAM modulator. The carrier is generated by a frequency synthesizer, and the I and Q signals directly modulate this carrier to produce an IF output signal.

In the CDM-570L, the Rx IF signal in the range 950 to 2000 MHz is translated to an intermediate frequency at around 465 MHz, and from there further translated to baseband using the carrier recovery VCO.

In the CDM-570, the conversion of signals in the range 50 to 180 MHz is directly to baseband. This is a complex mix, resulting in the signal once more being split into an in-phase (I) and a quadrature (Q) component. An AGC circuit maintains the desired signal level constant over a broad range. Following this, the I and Q signals are sampled by high-speed (flash) A/D converters. All processing beyond this conversion is purely digital, performing the functions of Nyquist filtering, carrier recovery, and symbol timing recovery. The resultant demodulated signal is fed, in soft decision form, to the selected FEC decoder (which can be Viterbi, TCM, Reed-Solomon, or Turbo if installed).

After decoding, the recovered clock and data pass to the de-framer (if EDMAC framing is enabled) where the overhead information is removed. Following this, the data passes to the Plesiochronous/Doppler buffer, which has a programmable size, or may be bypassed. From here, the receive clock and data signals are routed to the terrestrial interface, and are passed to the externally connected DTE equipment.

The CDM-570/570L signal processing functions are performed in a single, large **F**ield-**P**rogrammable **G**ate **A**rray (**FPGA**), which permits rapid implementation of changes, additions and enhancements in the field. These signal processing functions are controlled and monitored by a 32-bit RISC microprocessor, which also controls all front panel, serial and Ethernet interfaces.

1.3 Features

1.3.1 Physical Description

The CDM-570/570L is constructed as a 1RU-high rack-mounting chassis, which can be free-standing if desired. Rack handles at the front facilitate removal from and placement into a rack. Physically, the modem is comprised of a single PCB assembly with two expansion slots for FEC codecs and other option cards.

1.3.2 Compatibility

The CDM-570/570L is fully backwards-compatible with the Comtech EF Data CDM-500, CDM-550, and CDM-550T modems, in addition to the CDM-600, CDM-600L, SDM-300 and SDM-300L in selected modes.

For CDM-570/570L with IP Module Ethernet Interface Option:
The CDM-570/570L is fully backward-compatible with the Comtech EF Data CDM-IP 550 and CDM-IP 300L in selected modes.

1.3.3 Major Assemblies

Assembly	Description
PL/10047-1	Chassis
AS/10901	Modem Card - CDM-570
AS/9979	Modem Card - CDM-570L
AS/10554	Turbo Codec
AS/10551	Reed-Solomon Codec
PL/10235	IP Module 10/100 BaseT Ethernet Interface (optional)
PL-0000599	E1 RAN Optimization / WAN Adaptation Processing Board (optional, used in place of the AS/10551 Reed-Solomon Codec assembly)

1.3.4 Dimensional Envelope

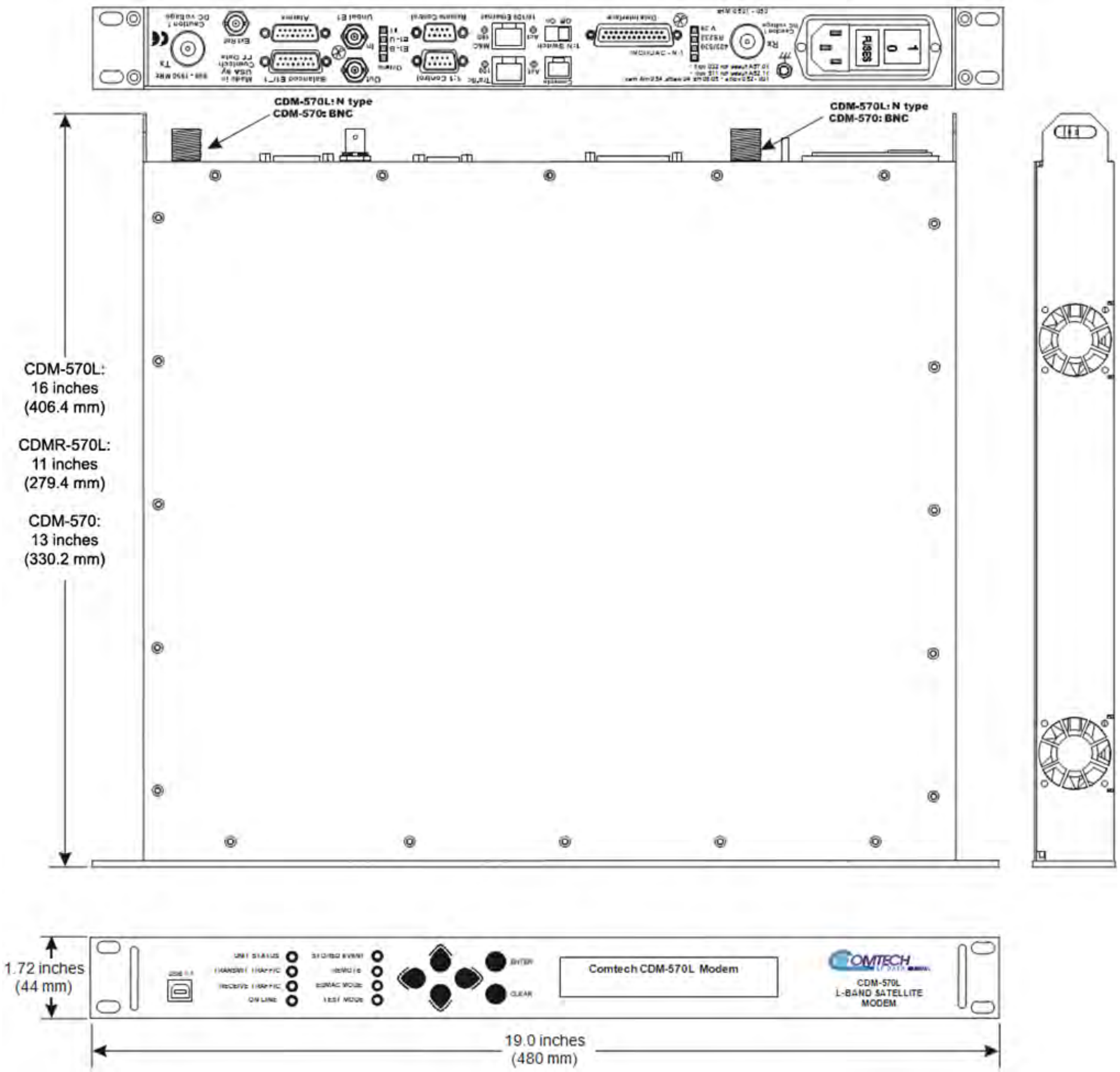


Figure 1-2. CDM-570/570L Dimensional Envelope

1.3.5 Physical Features

1.3.5.1 Front Panel

***The function and behavior of the LED indicators, keypad, and VFD are described in detail in* Chapter 5. FRONT PANEL OPERATION.**

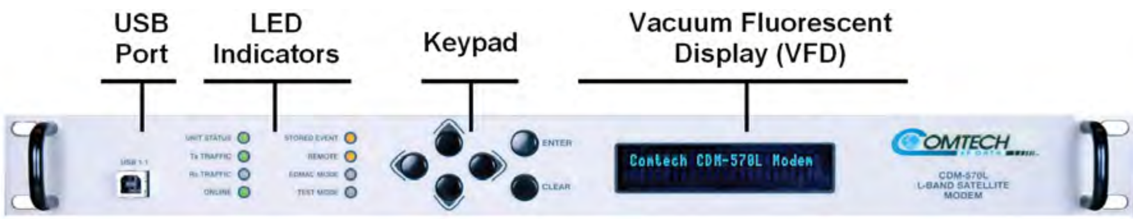


Figure 1-3. Front Panel View
(CDM-570L shown)

Figure 1-3 shows the front panel of the CDM-570/570L. The front panel features (from left) a Type 'B' USB connector (reserved for future use with a PC for reflashing the modem firmware); eight **L**ight-**E**mitting-**D**iode (LED) indicators; a keypad; and a **V**acuum **F**luorescent **D**isplay (VFD):

- The LEDs indicate, in a summary fashion, the status of the unit.
- The keypad comprises six individual keyswitches. The switches provide a positive 'click' action for tactile feedback. The user enters data via the keypad, and messages are displayed on the VFD.
- The VFD is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Compared to a **L**iquid **C**rystal **D**isplay (LCD), the VFD offers superior viewing characteristics and does not suffer problems of viewing angle or contrast.

1.3.5.2 Rear Panel

All connectors are described in detail in Chapter 3. REAR PANEL CONNECTORS AND PINOUTS.

Figure 1-4. Rear Panel View
(CDM-570L shown with optional IP Module Ethernet Interface installed)

Figure 1-4 shows the rear panel of the CDM-570/570L. External cables are attached to connectors provided on the modem rear panel. Refer to **Table 1-1** on the next page for a summary of the available rear panel connectors.

Table 1-1. Summary of CDM-570/570L Rear Panel Connectors

Connector Group (Chapter 3 Sect. Ref.)	Name		Connector Type	Function
IF (Sect. 3.2)	Rx		CDM-570L: Type 'N' female (L-band)	IF Input
			CDM-570: BNC female (70/140MHz band)	
	Tx		CDM-570L: Type 'N' female (L-band)	IF Output
			CDM-570: BNC female (70/140MHz band)	
Terrestrial Data (Sect. 3.3)	Data Interface		25-pin Type 'D' female	Serial synchronous data Input/Output
	G.703 Data	Balanced	15-pin Type 'D' female	G.703 T1 (1544 kbps) / E1 (2048 kbps)
		Unbalanced Out	BNC 75Ω female	Receive G.703 E1 (2048 kbps)
		Unbalanced In	BNC 75Ω female	Transmit G.703 E1 (2048 kbps)
	10/100 Ethernet M&C		RJ-45 female	10/100 BaseT management and data
	10/100 Ethernet Traffic		RJ-45 female	*(w/optional IP Module)* Ethernet Traffic
Utility (Sect. 3.4)	Remote Control		9-pin Type 'D' male	Serial Remote Interface (EIA-232/-485)
	Alarms		15-pin Type 'D' male	Form C Alarms (relay closures)
	1:1 Control		9-pin Type 'D' female	Connection to External 1:1 Controller
	External Reference		BNC female	Input/Output
	Serial Console		RJ-11 female	*(w/optional IP Module)* EIA-232 Serial Console for CDM-570L/IP Module management
Power/Ground (Sect 3.5)	AC		See Sect. 3.5.1	Chassis power
	DC (optional)		See Sect. 3.5.2	
	Ground		#10-32 stud	Common Chassis Ground

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.

In addition to the connectors listed in **Table 1-1**, eight LEDs are provided on the rear panel:

- Six of the LEDs, all *orange*, indicate the interface type currently selected: **V.35**, **RS232**, **RS422/EIA530**, **T1**, **E1-U**, or **E1-B**.
- For systems in a redundant configuration, a *green* LED labeled "**Online**" indicates the Online/Offline status of the unit.
- When the unit is connected to a 1:N switch, a *red* LED labeled "**1:N CAUTION!**" indicates that caution is required, as there may be DC voltages and other control signals present on certain pins on the 25-pin Data Interface connector.

Also associated with redundancy mode, a slide switch is provided that selects the 1:N mode.

1.3.6 Hardware Options

There are four hardware options available: Reed-Solomon Codec, Turbo Product Codec, the IP Module Ethernet Interface, and the E1 RAN Optimization / WAN Adaptation Processor Board. Three of these cards fit into expansion slots on the main circuit board; when the E1 RAN Optimization / WAN Adaptation Processor Board is used, it takes the place of the Reed-Solomon Codec card.

1.3.7 Data Interfaces

The CDM-570/570L includes, as standard, a universal data interface that eliminates the need to exchange interface cards for different applications. The interfaces offered include:

- EIA-422 (EIA530) DCE (at rates up to 9.98 Mbps)
- X.21 DTE and DCE (at rates up to 9.98 Mbps)
- V.35 DCE (at rates up to 9.98 Mbps)
- Synchronous EIA-232 DCE (at rates up to 300 kbps)
- G.703 E1 (2048 kbps), balanced and unbalanced (optional for units after 10/2009)
- G.703 T1 (1544 kbps), balanced
- Optional – integrated 10/100 BaseT Ethernet Interface.

1.3.8 Verification

The CDM-570/570L includes many test modes and loopbacks for rapid verification of the correct function of the unit. The IF loopback, in particular, permits the user to perform a quick diagnostic test without disturbing external cabling. During the loopback, all the receive configuration parameters are temporarily changed to match the transmit side, and an internal RF switch connects the modulator output to the demodulator input. When normal operation is again selected, all of the previous values are restored.

1.3.9 AUPC

See* Chapter 7. Automatic Uplink Power Control (AUPC) *for detailed information about this feature.

Automatic **U**plink **P**ower **C**ontrol (**AUPC)** is an important feature that enables the CDM-570/570L to automatically adjust its output power to maintain the Eb/No of the remote end of the satellite link as constant. This provides protection against rain fading, a particularly severe problem with Ku-band links.

To accomplish AUPC, the framed **EDMAC** mode of operation must be used. The distant end modem constantly sends back information about the demodulator Eb/No using reserved bytes in the overhead structure. The local modem uses the Eb/No to adjust its output power and create a closed-loop feedback system over the satellite link.

A benefit of AUPC is that, whenever **EDMAC**/**AUPC** operation is selected, the remote demodulator's Eb/No can be viewed from the front panel display of the local modem. Note that both **EDMAC** and **AUPC** can be used simultaneously.

1.3.10 EDMAC

See* Chapter 9. EDMAC CHANNEL *for detailed information about this feature.

The CDM-570/570L incorporates **E**mbedded **D**istant-end **M**onitor **A**nd **C**ontrol (**EDMAC**) to facilitate network management for small networks. In this mode, an additional 5% overhead is combined with the traffic data, (1.6% in Turbo BPSK modes, Turbo Rate 21/44 QPSK/OQPSK, and all data rates greater than 2 Mbps). M&C information (transparent to the user) is added, allowing access to the distant-end modem.

Additionally, **EDMAC-2** uses 1.6% overhead in all modes for those applications where the 5% overhead is excessive. The **EDMAC** and **EDMAC-2** modes do not require any additional cabling at either the local or distant-end Modems. Access to **EDMAC** is via the standard M&C control port. Full monitor and control is possible, and the on/off status at the distant-end carrier can be controlled.

1.3.11 Updating Modem Firmware

See* Chapter 4. UPDATING FIRMWARE *for detailed information about this feature.

The modem uses 'flash memory' technology internally. This simplifies firmware updating – the update can be performed without opening the unit simply by connecting the modem to any 10/100BaseT Ethernet port on an external user PC once Ethernet connectivity has been established. Firmware updates can be received via the Internet (from Comtech EF Data's Web site), through e-mail, or on CD.

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

1.3.12 Fully Accessible System Topology (FAST)

See* Appendix C. FAST ACTIVATION PROCEDURE *for detailed information about this feature.

The CDM-570/570L Satellite Modem incorporates a number of optional features. In order to permit a lower initial cost, the unit may be purchased with only the desired features enabled.

If, at a later date, the user wishes to upgrade the functionality of a unit, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), a technology which permits the purchase and installation of options through special authorization codes. These unique Fast Access Codes may be purchased from Comtech EF Data during normal business hours, and then loaded into the unit using the front panel keypad.

FAST System Theory

FAST allows an operator to order a unit precisely tailored for the initial application. When service requirements change, FAST allows the operator to upgrade the topology of the unit on-location, within minutes, and without having to remove the unit from the setup. This accelerated upgrade is possible due to FAST's extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the modem. All **FAST** options are available through the basic platform unit at the time of order. **FAST** allows immediate activation of available options – first, upon entry of the FAST Access Code through the front panel keypad, and then by setting the desired operational parameters via the front panel, remote control, or Web Server interfaces.

FAST and FAST-Accessible Hardware Options

Option	Description and Comments	Option Installation Method
Low Rate Variable	Data rate 2.4 kbps to 512 kbps	BASE UNIT
Mid-Rate Variable	Data rate 2.4 kbps to 2.048 Mbps	FAST
Full Rate Variable	Data rate 2.4 kbps to 5.0 Mbps	
Extended Rate Variable	Data rate 2.4 kbps to 9.98 Mbps	
8-PSK/8-QAM	Modulation Type	
16-QAM	Modulation Type	
R-S Codec	Closed-network Reed-Solomon Codec	HARDWARE
TPC Codec	5 Mbps Turbo Product Codec (IESS-315 compliant)	
RAN Optimization	E1 RAN Optimization / WAN Adaptation Processor Card	
100W BPSU *(CDM-570L only)*	100 Watt@30°C, 90 Watt@50°C, Internal 24V BUC PSU	
150W BPSU *(CDM-570L only)*	150 Watt@50°C, 180 Watt@30°C, Internal 48V BUC PSU	

IP Module Ethernet Interface and IP Options		
Option	Description and Comments	Option Installation Method
3xDES Data Encryption	Uses NIST certified 3x core Software Version 1.4.0 and later	FAST
IP Header Compression	Software Version 1.4.0 and later	
Payload Compression	Software Version 1.4.0 and later	
Quality of Service (QoS)	Software Version 1.4.0 and later	
IP Module Ethernet Interface	10/100 BaseT Ethernet interface	HARDWARE

Hardware options for basic modems can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the modem. A unique FAST Access Code is purchased that enables configuration of the specific hardware upgrade.

1.3.13 Supporting Hardware and Software

CDM-570L Redundancy

For 1:1 applications the modem is supported by the low-cost external CRS-170A L-band 1:1 Redundancy Switch.

For Hub applications, the CDM-570L is supported by the low-cost external CRS-300 1:N Redundancy Switch coupled with the CRS-280L Redundancy Switch.

CDM-570 Redundancy

For 1:1 applications the modem is supported by the low-cost external CRS-180 70/140MHz 1:1 Redundancy Switch.

For Hub applications, the CDM-570 is supported by the low-cost external CRS-300 1:N Redundancy Switch coupled with the CRS-280 IF (70/140 MHz) Switch.

Support Software

The CDM-570/570L is supported by Comtech EF Data's SatMac (**Sat**ellite system **M**onitor **a**nd **C**ontrol) Version 4.7 software, a Windows™-based application that provides a 'point and click' interface for the complete system of Comtech EF Data equipment (comprising Modems, Transceivers, and Redundancy Switches).

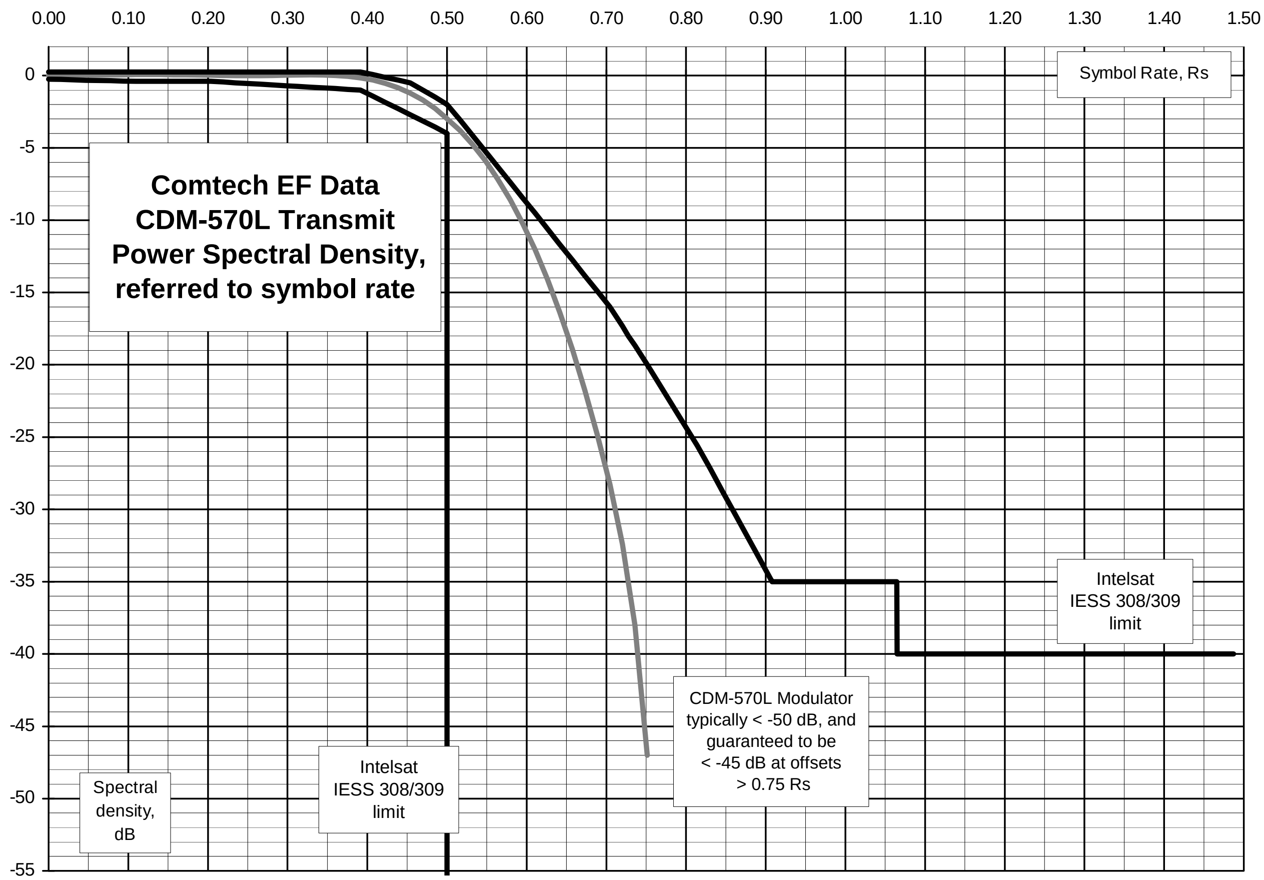
For more information or to order a free demo disk, please contact Comtech EF Data Customer Support during normal business hours. SatMac is also available for download from the M&C Utilities link on Comtech EF Data's Web site (http://www.comtechefdata.com/pcutils.asp).

1.4 Summary of Specifications

1.4.1 Modulator

Modulation	BPSK, QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
Symbol Rate Range	4.8 ksps to 3.0 Msps
Data Rate Range	See Section 1.7.5
Operating Modes	Transparent, Closed Network, IESS-315 (VSAT Turbo) Proprietary EDMAC framed mode: • 5% overhead – EDMAC (All modes except BPSK Turbo, Rate 21/44 OQPSK Turbo, and data rates < 2.048 Mbps) • 1.6% overhead - EDMAC-2 (Rate 21/44, 5/16 Turbo, Rate 21/44 OQPSK Turbo, and all other rates >2.048 Mbps) Automatic Uplink Power Control (AUPC) mode R-S Outer Codec (optional) • 220,200 outer code (transparent mode) • 200,180 outer code (EDMAC modes) Turbo Product Codec (optional): • Rate 21/44 BPSK • Rate 5/16 BPSK • Rate 21/44 QPSK/OQPSK • Rate 3/4 QPSK/OQPSK/8-PSK/8-QAM/16-QAM • Rate 7/8 QPSK/OQPSK/8-PSK/8-QAM/16-QAM • Rate 0.95 QPSK/OQPSK/8-PSK/8-QAM (exact Code Rate is actually 0.944)
Transmit Filtering	Per INTELSAT IESS-308 (FIR digital filter implementation)
Scrambling	Transparent Closed Network mode, no R-S or Turbo coding - per ITU V.35 (Intelsat variant) EDMAC mode, no R-S coding - externally frame synchronized - proprietary Turbo Product Code mode - externally frame synchronized - proprietary All R-S modes - externally frame synchronized per IESS-308/309/310
FEC	None: Uncoded BPSK/QPSK/OQPSK Viterbi: k=7, per IESS-308/309 BPSK: Rate 1/2 QPSK/OQPSK: Rate 1/2, Rate 3/4 and Rate 7/8 16-QAM: Rate 3/4 and Rate 7/8 (requires Reed-Solomon) Reed-Solomon (Closed Network): 220,200 outer code (transparent mode) 200,180 outer code (EDMAC modes) Interleaver depth = 4 8-PSK/TCM Rate 2/3 (Trellis) with concatenated Reed-Solomon CLOSED NETWORK - NOT IESS-310 COMPATIBLE Turbo Product Codec (optional plug-in card): Rate 5/16 BPSK - 2 dimensional Rate 21/44 BPSK - 3 dimensional Rate 21/44 QPSK/OQPSK - 3 dimensional Rate 3/4 QPSK/OQPSK/8-PSK/8-QAM/16-QAM - 2 dimensional Rate 7/8 QPSK/OQPSK/8-PSK/8-QAM/16-QAM - 2 dimensional Rate 0.95 QPSK/OQPSK/8-QAM/8-PSK - 2 dimensional eTPC (exact Code Rate is actually 17/18, or 0.944)

Output Frequency	CDM-570L: 950 - 2000 MHz, 100 Hz resolution Stability ±0.06 ppm (±6 x 10^{-8}) 0 to 50°C (32 to 122°F), when using internal reference CDM-570: 50 - 90 MHz, and 100 – 180 MHz, 100 Hz resolution Stability ±1.0 ppm (±1 x 10^{-6}) 0 to 50°C (32 to 122°F), when using internal reference
Harmonics and Spurious	Better than -55 dBC/4 kHz (typically <-60 dBC/4 kHz) – measured from 25 MHz to 2 GHz
Transmit On/Off Ratio	55 dB minimum
Output Phase Noise	<0.75° RMS double-sided, 100 Hz to 1 MHz for CDM-570 and CDM-570 IP
	<1.2° RMS double-sided, 100 Hz to 1 MHz for CDM-570L and CDM-570L IP
Output Power	CDM-570L: 0 to -40 dBm, 0.1 dB steps - manual mode. See Automatic Uplink Power Control section CDM-570: 0 to -25 dBm, 0.1 dB steps - manual mode. See Automatic Uplink Power Control section also.
Power Accuracy	CDM-570L: ±1.0 dB over frequency, data rate, modulation type and temperature CDM-570: ±0.5 dB over frequency, data rate, modulation type and temperature
Output Impedance	CDM-570L: 50Ω, 19 dB minimum return loss CDM-570: Compatible with 50Ω or 75Ω,17 dB minimum return loss
Output Connector	CDM-570L: Type N female CDM-570: BNC female
Clocking Options	CDM-570L: Internal, ±0.06 ppm (SCT) CDM-570: Internal, ±1.0 ppm (SCT) External, locking over a ±100 ppm range (TT) Loop timing (Rx satellite clock) - supports asymmetric operation - Rx and Tx data rates do not need to be identical
External TX Carrier Off	By TTL 'low' signal or external contact closure - hardware function automatically over-rides processor, or by RTS signal on main data interface
BUC Reference (10 MHz)	On center conductor of L-band output connector; 10.0 MHz ± 0.06 ppm* (Optional 1 ppm) -1.0 dBm, ± 4 dBm; programmable ON/OFF *Source: Selected as Internal
Phase Noise	<u>dB/Hz</u> — <u>Frequency Offset</u> -110 — 10 Hz -135 — 100 Hz -1407 — 1 kHz



1.4.2 Demodulator

Note: Data Rate Range, Operating modes, Descrambling, Input Impedance/Return Loss etc., are as specified in **Sect. 1.4.1 Modulator.**

Input Power Range	CDM-570 Desired Carrier: -30 to -60 dBm. +35 dBc maximum composite, up to -5 dBm, absolute max. CDM-570L Desired Carrier: -130 + 10 log (Symbol Rate) to -90 + 10 log (Symbol Rate). +40 dBc maximum composite, up to –10 dBm, absolute max.
FEC	Viterbi: 3 bit soft decision Trellis: Pragmatic TCM/8-PSK with closed network concatenated Reed-Solomon Reed-Solomon (Closed Network): Proprietary Turbo Product Codec: 4 bit soft decision, proprietary
Acquisition Range	±1 to ±32 kHz, programmable in 1 kHz increments, for symbol rates below 625 ksymbols/sec ±1 to ±200 kHz, 1 kHz increments, for symbol rates above 625 ksymbols/sec, CDM-570L only
Acquisition Time	Highly dependent on data rate, FEC rate, and demodulator acquisition range. Examples: 120 ms average at 64 kbps, R1/2 QPSK, ±10 kHz acquisition sweep range, 6dB Eb/No 3.5 s average at 9.6 kbps, R1/2 QPSK, ±10 kHz, 6dB Eb/No Note: Reed-Solomon and TPC increases acquisition time, due to the additional time taken for the R-S/TPC decoder to declare synchronization.
Clock Tracking Range	± 100 ppm min

IMPORTANT NOTE: Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum symbol rate has been increased from 2.5 to 3.0 Msymbols/sec. This has been done without modification to the hardware, and as a consequence, there may be a small degradation in BER versus Eb/No performance for rates above 2.5 Msymbols/sec. The degradation is as follows:

Rates from 2.5 to 2.65 Msps: degradation < 0.1 dB

Rates from 2.65 to 2.80 Msps: degradation < 0.2 dB

Rates from 2.80 to 3.00 Msps: degradation < 0.3 dB

VITERBI BER performance (met in the presence of two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-5} BER=10^{-6} BER=10^{-7}	Rate 1/2 (B, Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 5.4 dB (4.9 dB) 6.0 dB (5.5 dB) 6.7 dB (6.2 dB)	Rate 3/4 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 6.8 dB (6.3 dB) 7.4 dB (6.9 dB) 8.2 dB (7.7 dB)	Rate 7/8 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 7.7 dB (7.2 dB) 8.4 dB (7.9 dB) 9.0 dB (8.6 dB)
VITERBI and R-S 220,200 or 200,180 Outer Code BER (with two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-5} BER=10^{-6} BER=10^{-7}	Rate 1/2 (B, Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 4.3 dB (4.0 dB) 4.4 dB (4.1 dB) 4.5 dB (4.2 dB)	Rate 3/4 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 5.6 dB (4.7 dB) 5.8 dB (4.8 dB) 6.0 dB (5.2 dB)	Rate 7/8 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 6.5 dB (6.0 dB) 6.7 dB (6.2 dB) 6.9 dB (6.5 dB)
8-PSK/TCM/R-S CODEC BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-5} BER=10^{-7} BER=10^{-8}	R 2/3 8-PSK/TCM/R-S Guaranteed Eb/No: (typical value in parentheses) 6.3 dB (5.4 dB) 6.7 dB (5.8 dB) 6.9 dB (6.0 dB)		
TURBO PRODUCT CODEC Rate 21/44 QPSK Rate 21/44 BPSK Rate 5/16 BPSK BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 21/44 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 2.9 dB (2.6 dB) 3.1 dB (2.7 dB) 3.3 dB (2.8 dB)	Rate 21/44 (B) Guaranteed Eb/No: (typical value in parentheses) 2.8 dB (2.5dB) 3.1 dB (2.8 dB) 3.3 dB (2.90dB)	Rate 5/16 (B) Guaranteed Eb/No: (typical value in parentheses) 2.4 dB (2.1dB) 2.6 dB (2.3dB) 2.7 dB (2.4dB)
TURBO PRODUCT CODEC Rate 3/4 QPSK Rate 3/4 8-PSK Rate 3/4 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 3/4 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 3.8dB (3.4dB) 4.1dB (3.7dB) 4.4dB (4.0dB)	Rate 3/4 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 6.2 dB (5.8 dB) 6.4 dB (6.0 dB) 6.8 dB (6.3 dB)	Rate 3/4 (16-QAM) Guaranteed Eb/No: (typical value in parentheses) 7.4dB (7.0 dB) 7.8 dB (7.3 dB) 8.2 dB (7.7 dB)

TURBO PRODUCT CODEC Rate 7/8 QPSK Rate 7/8 8-PSK Rate 7/8 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 7/8 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 4.3 dB (4.0 dB) 4.4 dB (4.1 dB) 4.5 dB (4.2 dB)	Rate 7/8 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 7.0 dB (6.6 dB) 7.1 dB (6.7 dB) 7.2 dB (6.8 dB)	Rate 7/8 (16-QAM) Guaranteed Eb/No: (typical value in parentheses) 8.1 dB (7.7 dB) 8.2 dB (7.8 dB) 8.3 dB (7.9 dB)
TURBO PRODUCT CODEC Rate 0.95 QPSK Rate 0.95 8-PSK BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 0.95 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses) 6.4 dB (6.0 dB) 6.7 dB (6.3 dB) 6.9 dB (6.5 dB)	Rate 0.95 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 9.3 dB (8.9 dB) 9.8 dB (9.4 dB) 10.3 dB (9.9 dB)	
TURBO PRODUCT CODEC Rate 3/4 8-QAM Rate 7/8 8-QAM Rate 0.95 8-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 3/4 (8-QAM) Guaranteed Eb/No: (typical value in parentheses) 6.5 dB (6.1 dB) 6.8 dB (6.4 dB) 7.2 dB (6.8 dB)	Rate 7/8 (8-QAM) Guaranteed Eb/No: (typical value in parentheses) 6.6 dB (6.2 dB) 6.7 dB (6.3 dB) 6.8 dB (6.4 dB)	Rate 0.95 (8-QAM) Guaranteed Eb/No: (typical value in parentheses) 9.6 dB (9.2 dB) 10.1 dB (9.7 dB) 10.6 dB (10.2 dB)
16-QAM VITERBI/R-S (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-8}	16-QAM Rate 3/4 Viterbi/R-S Guaranteed Eb/No: (typical value in parentheses) 8.1 dB (7.5 dB) 8.6 dB (8.0 dB)	16-QAM Rate 7/8 Viterbi/R-S Guaranteed Eb/No: (typical value in parentheses) 9.5 dB (9.0 dB) 10.1 dB (9.5 dB)	
Plesiochronous/ Doppler Buffer	Selectable size of ± 128, 256, 512, 1024, 2048, 4096, 8192, 16384 and 32768 bits Size selection is displayed in bits and milliseconds. Supports asymmetric operation - when buffer is clocked from Tx clock, Rx and Tx rates do not need to be identical.			
Monitor Functions	Eb/No estimate, 2 to 16 dB (± 0.25 dB accuracy) Corrected Bit Error Rate, 1E-3 to 1E-9 Frequency offset, ± 200 kHz range, 100 Hz resolution Buffer fill state, in percent Receive signal level monitor accuracy: ± 5 dB for CDM-570L, ± 3 dB for CDM–570 over specified min to max signal range			

1.4.3 Automatic Uplink Power Control

Operating Mode	Requires Closed Network Framed mode for transport of Eb/No information from remote modem (EDMAC can be enabled or disabled)
Target Eb/No Range	0 to 14.9 dB at remote demod (default is 4.0 dB)
Max AUPC Range	0 to 9 dB (default is 3 dB)
Monitor Functions	Remote demod Eb/No and Tx power level increase (front panel or via remote control interface)

1.4.4 Data and Miscellaneous Interfaces

Primary Data (3 selectable modes)	RS-422/EIA-530 DCE (Rates up to 10 Mbps) (also supports X.21 DCE & DTE) V.35 DCE (Rates up to 10 Mbps) Synchronous EIA-232 (Rates up to 300 kbps)	25-pin D-sub (female)
G.703 (Optional for units as of 10/2009)	1.544 Mbps T1 (Balanced 100Ω) 2.048 Mbps E1 (unbalanced 75Ω or balanced 120Ω)	15-pin D-sub (female) or BNC (female)
External Reference In	1, 2, 5, 10 or 20 MHz, -6dBm to +10dBm (The Ext. ref. locks Tx and Rx synthesizers, and all baseband clock generation)	BNC (female)
Modem Alarms	Relay outputs (Tx, Rx & unit faults) Demodulator I & Q test outputs (constellation) Demodulator Rx Signal Level output (0 to 10 volts) External carrier off input	15-pin D-sub (male)
1:1 Control	Async serials link to other modem, and switching signals in 1:1 pair, via CRS-170A	9-pin D-sub (female)
Alarm Relay	Type: Form C Contacts. Rating: 125V AC/30V DC, 0.3A AC/1A DC	15-pin D-sub (male)
Remote Control	EIA-232 or EIA-485 modem control and monitoring	9-pin D-sub (male)
Ethernet	10/100 Base Tx for http, SNMP and Telnet interfaces	RJ-45

1.4.5 Data Rate Ranges

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – see note below
	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	
	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
Viterbi + R-S	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	
	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	
		Rate 3/4	6.5 kbps to 4.091 Mbps	
		Rate 7/8	7.5 kbps to 4.666 Mbps	
	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	
		Rate 7/8	16.8 kbps to 4.666 Mbps	
TCM + R-S	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	
		Rate 21/44	2.4 kbps to 1.430 Mbps	
	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
		Rate 0.95	9.1 kbps to 5.666 Mbps	
	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
		Rate 7/8	13.6 kbps to 7.875 Mbps	
		Rate 0.95	15.3 kbps to 8.500 Mbps	
	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	
		Rate 7/8	16.8 kbps to 9.980 Mbps	

Important Note: Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.

1.4.6 Miscellaneous

Front Panel	Tactile keypad, 6 keys (Up/Down, Left/Right, Enter/Clear) Vacuum Fluorescent Display (blue) - 2 lines of 24 characters
Loopbacks	Internal IF loopback, RF loopback, digital loopback, and inward/outward loopback
Fault Relays	Hardware fault, Rx and Tx Traffic Alarms
M&C Interface	EIA-232 and EIA-485 (addressable multidrop, 2-wire or 4-wire)
Ethernet	10/100 Base Tx for http:, SNMP and Telnet interfaces
M&C Software	SatMac Ver. 4.7
Dimensions	CDM-570L: 1RU high x 19 inches (482.6 mm) wide x 16 inches (406 mm) deep CDMR-570L: 1RU high x 19 inches (482.6 mm) wide x 11 inches (279 mm) deep CDM-570: 1RU high x 19 inches (482.6 mm) wide x 13 inches (330 mm) deep
Weight	CDM-570L: 7 lbs (3.2 kg) max (not including BUC Power Supply) CDMR-570L: 6.4 lbs (2.9 kg) max (not including BUC Power Supply) CDM-570: 5 lbs (2.3 kg) max
AC Consumption	CDM-570L (without BUC Power Supply or IP Module): 29 Watts (typical) 32 Watts (maximum) CDM-570L when fitted with 150 Watt@50°C, 180 Watt@30°C BUC power supply: 250 Watts (maximum) CDM-570: (without IP Module): 29 Watts (typical) 32 Watts (maximum) <u>Typical measured VA, Power Factor and power data:</u> CDM-570L – no IP Module installed: 240V 50 Hz Power Factor = 0.44, 65VA, 29 Watts 110V 60 Hz Power Factor = 0.55, 50VA, 28 Watts CDM-570L – with IP Module installed: 240V 50 Hz Power Factor = 0.46, 80VA, 37 Watts 110V 60 Hz Power Factor = 0.56, 63VA, 35 Watts CDM-570 – no IP Module installed: 240V 50 Hz Power Factor = 0.33, 87VA, 29 Watts 110V 60 Hz Power Factor = 0.53, 51VA, 28 Watts CDM-570 – with IP Module installed: 240V 50 Hz Power Factor = 0.36, 99VA, 37 Watts 110V 60 Hz Power Factor = 0.54, 64VA, 35 Watts
Operating Voltage	• Standard AC operation (CDM-570 or CDM-570L only): 100 - 240 volts AC, +6%/-10% – autosensing (total absolute max. range is 90 - 254 volts AC) • Optional DC Power Supplies available : 48 volt DC (modular for CDM-570 or CDM-570L, terminal block for CDMR-570L) 24 volt DC power supply available (modular, CDM-570 or CDM-570L only)
Operating Temperature	0 to 50ºC (32 to 122ºF)

1.4.7 Approvals

"CE" as follows:	EN 55022 Class B (Emissions) EN 50082-1 (Immunity) EN 60950 (Safety)	EN 61000-3-2 EN 61000-3-3 EN 61000-4-2 EN 61000-4-4 EN 61000-4-5	EN 61000-4-6 EN 61000-4-8 EN 61000-4-9 EN 61000-4-11 EN 61000-4-13
FCC	FCC Part 15 Class B		

Chapter 2. INSTALLATION and STARTUP

2.1 Unpacking and Inspecting the Shipment

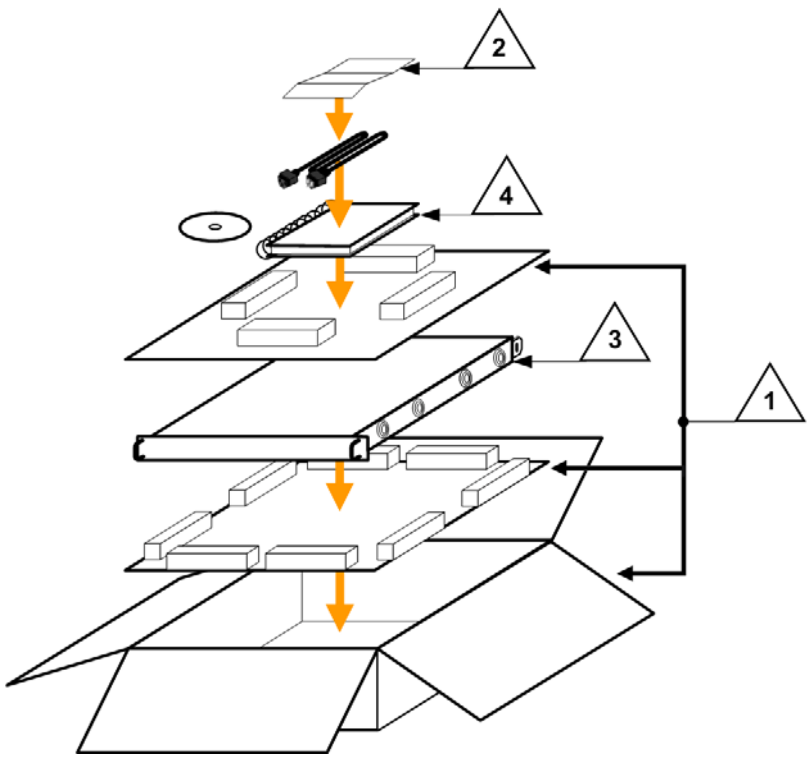


Figure 2-1. Unpacking and Inspecting the Shipment

The CDM-570/570L Satellite Modem, its Installation and Operation Manual, and its power cord were packaged and shipped in a reusable cardboard carton containing protective foam spacing.

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when handling the equipment.

Once opened, inspect the shipment:

Step	Task
1	Keep all shipping materials for storage or reshipment.
2	Check the packing list to ensure the shipment is complete.
3	Inspect the equipment for any possible damage incurred during shipment. Contact the carrier and Comtech EF Data immediately to submit a damage report if damage is evident.
4	Review the Installation and Operation Manual carefully to become familiar with operation.
5	Proceed to Section 2.2 Rack-mounting the CDM-570/570L.

2.2 Rack-mounting the CDM-570/570L

When mounting the CDM-570/570L into a rack enclosure:

- ***PROPER GROUNDING PROTECTION IS REQUIRED. The equipment must be connected to the protective earth connection at all times. It is therefore imperative that the unit is properly grounded, using the ground stud provided on the unit rear panel, during installation, configuration, and operation.***

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

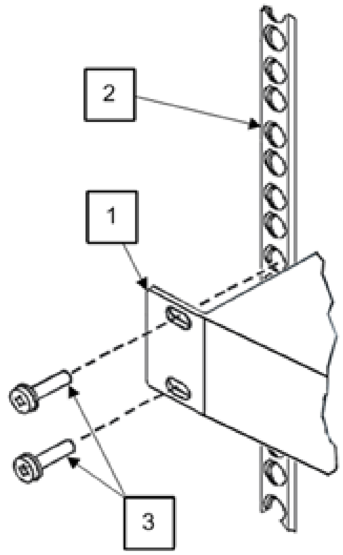
  - ***Make sure there is adequate clearance inside the enclosure, especially at the side for air ventilation.***

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

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

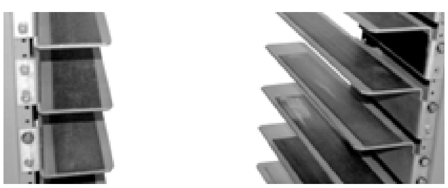
  The CDM-570/570L CANNOT have rack slides mounted to the sides of the chassis. Cooling fans and exhaust vents are provided here – air flow must not be impeded.

Comtech EF Data recommends that an alternate method of support is provided within the rack, such as standard rack shelves (Figure 2-2) or the optional Rear-Mounting Support Brackets Kit (Figure 2-3). If there is any doubt, contact Comtech EF Data Customer Support during normal business hours.

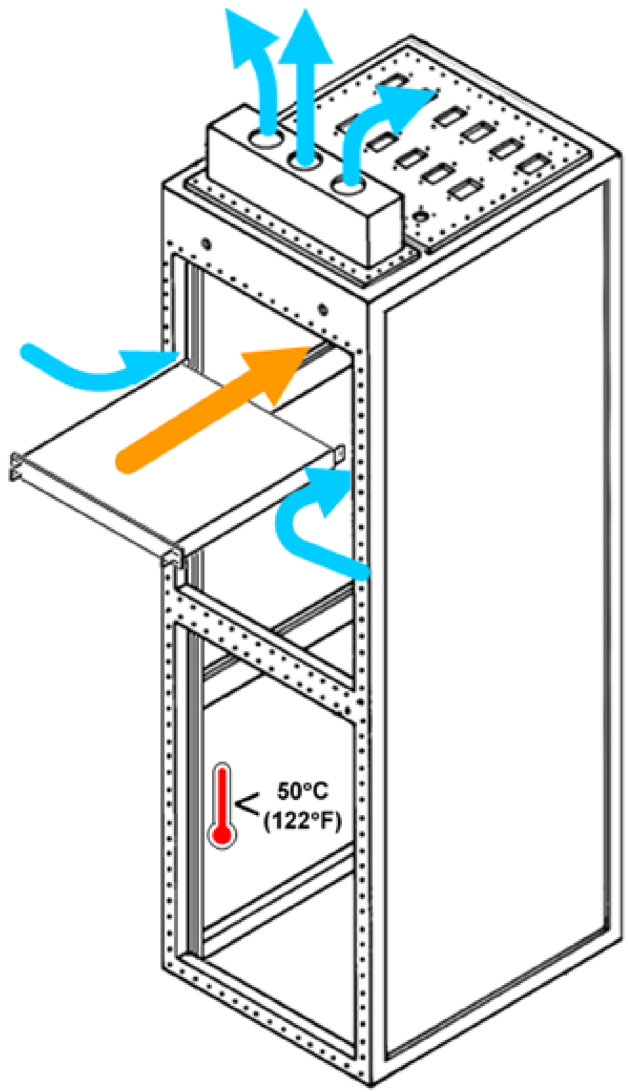


Item	Description
1	Unit Front Panel
2	Rack Enclosure Threaded Front Mounting Rail (typical)
3	User-supplied screws

Front Panel Installation



Standard Rack Shelving



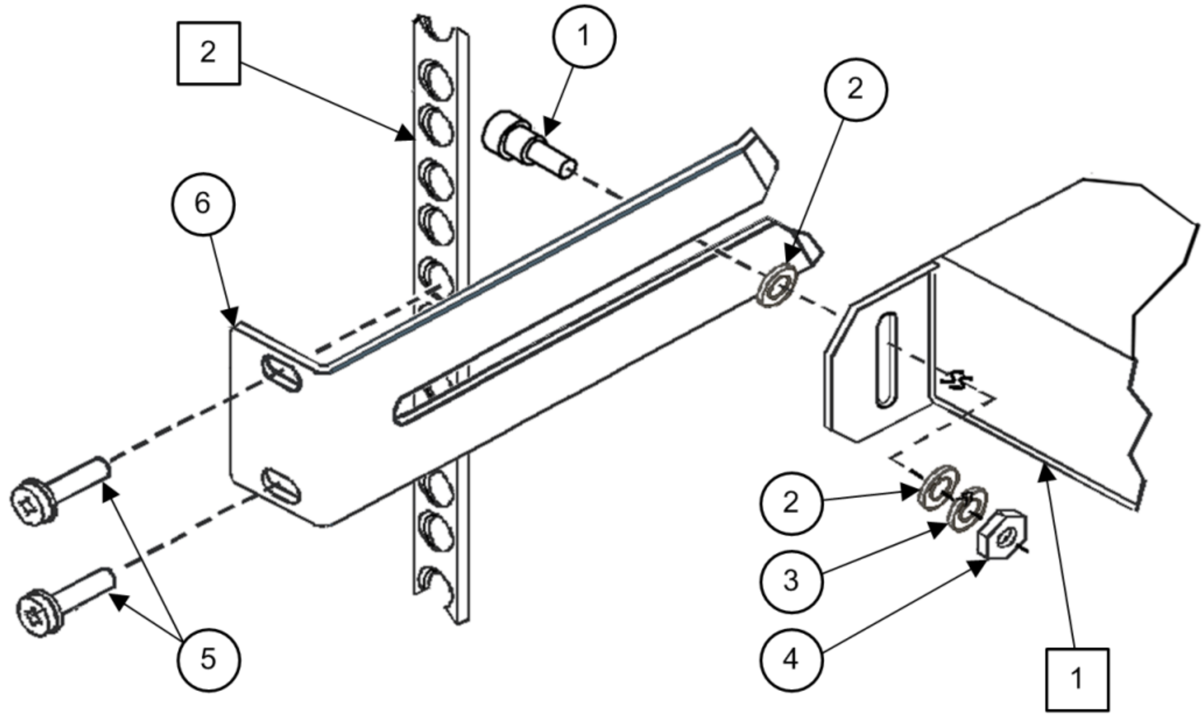
Custom Rack Enclosure

Figure 2-2. Installation into a Rack Enclosure

Mount the CDM-570/570L in its assigned position in the rack enclosure. Use, as required:

- 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-Mounting Support Brackets Kit.

2.2.1 Installing the Optional Rear-Mounting Support Brackets Kit



Detail	Description
1	Back of Unit
2	Rack Enclosure Threaded Rear Mounting Rail (typical)

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

Figure 2-3. Optional Rear-Mounting Support Brackets Kit Installation

The tools needed to install the KT/6228-2 (4”) or KT/6228-3 (10”) Rear-Mounting Support Brackets Kit are as follows:

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

To install the kit (**Figure 2-3**):

Step	Task
1	Use the #10 flat washers, #10 split washers, and #10 hex nuts to secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots.
2	Use the #10 rack bracket bolts to install the rear support brackets onto the rack enclosure threaded rear mounting rails.
3	Mount the unit into the rack enclosure. Ensure that the shoulders of the #10 shoulder screws properly engage into the rear support bracket slots.

2.3 Initial Configuration

The CDM-570/570L ships with a default 64 kbps, QPSK, Rate 1/2 configuration. There are no internal jumpers to configure, no interface cards to install, and no other options to install: all configurations are carried out entirely via software.

The unit should first be configured locally using the front panel keypad and display. See **Chapter 5. FRONT PANEL OPERATION** for details on how to fully configure the unit for the desired operating parameters.

Note: The auto-sensing AC power supply does not require any adjustment. Simply plug in the supplied line cord, and then turn on the switch on the rear panel.

2.4 Verifying Operation (IF Loopback Test)

The user may quickly verify proper operation of the CDM-570/570L, without the need for externally connected equipment, by using the front panel keypad and display:

- From the top-level **SELECT:** menu: Use the ◄ ► arrow keys to first select the **TEST** menu branch, and then press **ENTER**.
- From the **TEST** menu, use the ◄ ► arrow keys to select **IF**> (IF Loopback), and then press **ENTER** to execute the test. (See **Chapter 5. FRONT PANEL OPERATION** for detailed information on using Test modes.)

The demod should synchronize, and the Rx TRAFFIC LED indicator on the front panel should illuminate green.

If the unit does not pass this test, call Comtech EF Data Customer Support for further assistance.

2.5 Connecting External Cables

Once the desired configuration settings have been made, and proper operation has been verified using the IF Loopback test mode, proceed to connect all external cables to the connectors outlined in the next chapter (**Chapter 3. REAR PANEL CONNECTORS AND PINOUTS**). Should difficulties occur, call Comtech EF Data Customer Support for assistance.

Chapter 3. REAR PANEL CONNECTORS and PINOUTS

3.1 Connector Overview

Figure 3-1. CDM-570/570L Rear Panel
(CDM-570L shown with optional IP Module Ethernet Interface installed)

The CDM-570/570L Satellite Modem rear panel connectors, shown here in **Figure 3-1**, provide all necessary external connections between the modem and other equipment. On the next page, **Table 3-1** summarizes the connectors provided on the rear panel interface, grouped according to service function.

Table 3-1. Rear Panel External Connections

<table>
<tr><th>Connector Group (Sect. Ref.)</th><th colspan="2">Name</th><th>Connector Type</th><th>Function</th></tr>
<tr><td rowspan="4">IF
(Sect. 3.2)</td><td colspan="2" rowspan="2">Rx</td><td>CDM-570L: Type ’N’ female (L-Band)</td><td rowspan="2">IF Input</td></tr>
<tr><td>CDM-570: BNC female (70/140MHz band)</td></tr>
<tr><td colspan="2" rowspan="2">Tx</td><td>CDM-570L: Type ’N’ female (L-Band)</td><td rowspan="2">IF Output</td></tr>
<tr><td>CDM-570: BNC female (70/140MHz band)</td></tr>
<tr><td rowspan="6">Terrestrial Data
(Sect. 3.3)</td><td colspan="2">Data Interface</td><td>25-pin Type ‘D’ female</td><td>Serial synchronous data Input/Output</td></tr>
<tr><td rowspan="3">G.703 Data</td><td>Balanced</td><td>15-pin Type ‘D’ female</td><td>G.703
T1 (1544 kbps) / E1 (2048 kbps)</td></tr>
<tr><td>Unbalanced Out</td><td>BNC 75Ω female</td><td>Receive G.703 E1 (2048 kbps)</td></tr>
<tr><td>Unbalanced In</td><td>BNC 75Ω female</td><td>Transmit G.703 E1 (2048 kbps)</td></tr>
<tr><td colspan="2">10/100 Ethernet M&C</td><td>RJ-45 female</td><td>10/100 BaseT management and data</td></tr>
<tr><td colspan="2">10/100 Ethernet Traffic</td><td>RJ-45 female</td><td>(w/optional IP Module) Ethernet Traffic</td></tr>
<tr><td rowspan="5">Utility
(Sect. 3.4)</td><td colspan="2">Remote Control</td><td>9-pin Type ‘D’ male</td><td>Serial Remote Interface (EIA-232/-485)</td></tr>
<tr><td colspan="2">Alarms</td><td>15-pin Type ‘D’ male</td><td>Form C Alarms (relay closures)</td></tr>
<tr><td colspan="2">1:1 Control</td><td>9-pin Type ‘D’ female</td><td>Connection to External 1:1 Controller</td></tr>
<tr><td colspan="2">External Reference</td><td>BNC female</td><td>Input/Output</td></tr>
<tr><td colspan="2">Serial Console</td><td>RJ-11 female</td><td>(w/optional IP Module) EIA-232 Serial Console for CDM-570L/IP Module management</td></tr>
<tr><td rowspan="3">Power/Ground
(Sect 3.5)</td><td colspan="2">AC</td><td>See Sect. 3.5.1</td><td rowspan="2">Chassis power</td></tr>
<tr><td colspan="2">DC (Optional)</td><td>See Sect. 3.5.2</td></tr>
<tr><td colspan="2">Ground</td><td>#10-32 stud</td><td>Common Chassis Ground</td></tr>
</table>

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.

3.2 IF Connections

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

CDM-570L: The IF port connectors are both 50Ω 'N' female types. The return loss on these ports is greater than 19 dB (typically better than 21 dB), and if the user wishes to connect to a 75Ω system, an inexpensive 'N' to 'F' type adapter can be used. While there will be a reduction in return loss when doing this, the effect in most systems will be imperceptible.

CDM-570: The IF port connectors are both BNC female types. The return loss on these ports is greater than 17 dB (typically better than 19 dB) in *BOTH* 50Ω and 75Ω systems.

3.2.1 Rx IF Connectors

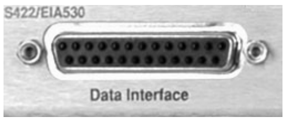
Connector Type	Description	Direction
CDM-570L: Type 'N' (Shown at left)	Rx IF signal, L- band	In
CDM-570: BNC (Shown at right)	Rx IF signal, 70/140 MHz band	

3.2.2 Tx IF Connectors

Connector Type	Description	Direction
CDM-570L: Type 'N' (Shown at left)	Tx IF signal, L- band	Out
CDM-570: BNC (Shown at right)	Tx IF signal, 70/140 MHz band	

3.3 Terrestrial Data Connections

3.3.1 Data Interface Connector, DB-25F



The 25-pin 'D' type female (DB-25F) Data Interface connector conducts data input and output breakout panel, or protection switch. This connector conforms to the EIA-530 pinout, which allows for connection of different electrical standards, including EIA-422, V.35, and EIA-232. A shielded DB-25F connector provides a very solid solution to EMC problems, unlike the sometimes-used V.35 Winchester connector.

THE MODEM IS *ALWAYS* ASSUMED TO BE DCE

Table 3-2. Data Interface Connector Pin Assignments

Pin #	Generic Signal Description	Direction	EIA-422 EIA-530	V.35	EIA-232	Circuit #
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
15	Internal Tx Clock A	Modem to DTE	ST A	SCT A	DB	114
12	Internal Tx Clock B	Modem to DTE	ST B	SCT B	-	114
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
8	Receiver Ready A	Modem to DTE	RR A	RLSD	CF	109
10	Receiver Ready B	Modem to DTE	RR B	-	-	109
5	Clear to Send A *	Modem to DTE	CS A	CTS	CB	106
13	Clear to Send B *	Modem to DTE	CS B	-	-	106
4	Request to Send A *	DTE to Modem	RS A	RTS	CA	105
19	Request to Send B *	DTE to Modem	RS B	-	-	105
6	Data Set Ready A *	Modem to DTE	DM A	DSR	CC	107
22	Data Set Ready B *	Modem to DTE	DM B	-	-	107
7	Signal Ground	-	SG	SG	AB	102
1	Shield	-	Shield	FG	AN	101

1. When the rear-panel switch marked "1:N Switch" is in the OFF position, all of the signals shown above are available and functional. In addition, pins not shown are not connected, and therefore no damage will occur if other signals are connected to the additional pins.
2. When the rear-panel switch marked "1:N Switch" is in the ON position, the highlighted signals, plus pins 18, 20, 21, 22, 23 and 25 are reserved for use by the 1:N system. DO NOT connect signals to any of these pins in this mode. Certain pins have DC voltages present that may damage equipment other than a Comtech EF Data redundancy switch.
3. For X.21 operation, use the EIA-422 pins, but ignore Receive Clock if the Modem is DTE, and ignore Transmit Clocks if the Modem is DCE.

3.3.2 G.703 Connections

3.3.2.1 G.703 Balanced E1/T1 Interface Connector, DB-15F

The G.703 Balanced E1/T1 connection is a 15-pin 'D' type female (DB-15F) connector used for balanced operation at the G.703 data rates of E1 (2.048 Mbps) or T1 (1.544 Mbps).

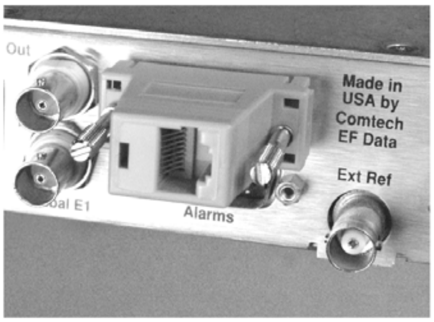
Table 3-3. Balanced G.703 Interface Connector Pin Assignments

Pin #	Signal Function	Name	Direction
1	Tx G.703 -	Tx G.703 In	In
9	Tx G.703 +	Tx G.703 In	In
2	Ground	GND	
3	Rx G.703 -	Rx G.703 Out	Out
11	Rx G.703 +	Rx G.703 Out	Out
4	Ground	GND	

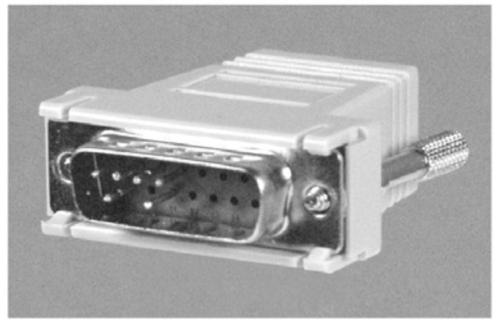
Pins 5, 6, 7, 8, 10, 12, 13, 14 and 15 are not used.

3.3.2.2 G.703 E1/T1 RJ-48 Connection via G.703 Balanced Interface Connector

The optional CN-0000268 Adapter, shown in **Figure 3-2**, may be purchased from Comtech EF Data to adapt the G.703 Balanced E1/T1 DB-15F connector for E1/T1 operation via an RJ-48 female user interface.



User Interface Side (RJ-48 F)



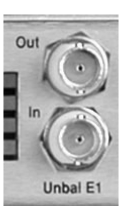
Modem Interface Side (DB-15M)

CN-0000268 Adapter Pin Assignments		
Pin #		Signal Name
RJ-48 (User Side)	DB-15M (Modem Side)	
1	9	Tx+
2	1	Tx-
3	2	GND
4	11	Rx+
5	3	Rx-
6	4	GND

Pins 7 and 8 on the RJ-48 side, and pins 5-8, 10, and 12-15 on the DB-15 side, are not used.

Figure 3-2. CN-0000268 DB-15M → RJ-48F Adapter for E1/T1 Operation

3.3.2.3 G.703 Unbalanced Interface Connectors (Tx/Rx), 75Ω BNC



Two female 75Ω BNC connectors are provided for unbalanced operation at the G.703 data rates of E1 (2.048 Mbps):

BNC Connector	Description	Direction
Unbal E1 Out	Rx G.703 (Unbalanced E1)	Out
Unbal E1 In	Tx G.703 (Unbalanced E1)	In

3.3.3 10/100 BaseT Ethernet Connections

3.3.3.1 10/100 BaseT Ethernet Management (M&C) Port, RJ-45 (Standard)

The 10/100 BaseT Ethernet connection is a standard 8-pin RJ-45 modular port. This connector is present on the base modem assembly and is used for M&C purposes. It is used to connect a UTP cable to an Ethernet hub, router, switch, PC, etc., and to upgrade CDM-570L base modem firmware.

See **Table 3-4** for the typical port pinouts.

3.3.3.2 10/100 BaseT Ethernet Traffic Port, RJ-45 (with Optional IP Module only)

This second 8-pin RJ-45 modular port is present only if the optional IP Module is installed. It is used to connect a UTP cable to an Ethernet hub, router, switch, PC, etc., and for Ethernet traffic, management of CDM-570L and IP Module functions via Telnet/HTTP/ SNMP, and to upgrade CDM-570L IP Module firmware.

Table 3-4. Typical Ethernet Interface Port Pin Assignments

Pin #	Function
1	Tx+
2	Tx-
3	Rx+
4	N/C
5	N/C
6	Rx-
7	N/C
8	N/C

3.4 Utility Connections

3.4.1 Remote Control Interface Connector, DB-9M

The Remote Control interface connection is a 9-pin type 'D' male (DB-9M) connector. This port is intended for connection to an M&C computer, or terminal device. This interface is user selectable for either EIA-232 or EIA-485.

Table 3-5. Remote Control Interface Connector Pin Assignments

Pin #	Description	Direction
1	Ground	
2	EIA-232 Transmit Data	Out
3	EIA-232 Receive Data	In
4	Reserved - do not connect to this pin	
5	Ground	
6	EIA-485 Receive Data B *	In
7	EIA-485 Receive Data A *	In
8	EIA-485 Transmit Data B	Out
9	EIA-485 Transmit Data A	Out

** Use for 2-wire EIA-485 operation*

3.4.2 Form-C Traffic Alarms Connector, DB-15M

The Alarms connector is a 15-pin type 'D' male (DB-15M) connector. Unit alarms are provided on this connector, affording the user access to the Form-C relay contacts which indicate the fault status of the unit. These contacts are typically connected to an external fault monitoring system often found in satellite earth stations. Additionally, the receive I and Q demodulator samples are provided on this connector. Connecting these signals to an oscilloscope in X,Y mode will provide the receive signal constellation diagram, which is a useful diagnostic aid. A pin is also provided which can mute the transmit carrier; this requires that the pin be shorted to ground or a TTL 'low', or that an EIA-232 'high' signal be applied.

As an aid to antenna pointing or for driving step-track equipment, an analog AGC signal is provided on Pin 2 of this connector.

See **Table 3-6** on the next page for the Alarms connector pinouts.

Table 3-6. Alarm Interface Connector Pin Assignments

Pin #	Signal Function	Name
8 15 7	Rx Traffic (De-energized, Faulted) Rx Traffic (Energized, No Fault) Rx Traffic	RX-NC RX-NO RX-COM
14 6 13	Tx Traffic (De-energized, Faulted) Tx Traffic (Energized, No Fault) Tx Traffic	TX-NC TX-NO TX-COM
5 12 4	Unit Fault (De-energized, Faulted) Unit Fault (Energized, No Fault) Unit Fault	UNIT-NC UNIT-NO UNIT-COM
11 3	Rx I Channel (Constellation monitor) Rx Q Channel (Constellation monitor)	RX-I RX-Q
10	No Connection	N/C
2	AGC Voltage (Rx signal level, 0 to 10 volts)	AGC
9	EXT Carrier OFF	EXT-OFF
1	Ground	GND

3.4.3 1:1 Control Interface Connector, DB-9F

The 1:1 Control connection is a 9-pin type 'D' female connector (DB-9F). This connector is used to connect the modem ***only*** to a CRS-170 switch in 1:1 redundancy configurations.

Table 3-7. 1:1 Control Interface Connector Pin Assignments

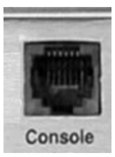
Pin #	Description	Direction
1	Ground	
2	Receive Serial Data – auxiliary channel	In
3	Redundancy In 1	In
4	Redundancy In 2	In
5	Ground	
6	Transmit Serial Data – auxiliary channel	Out
7	Redundancy Out 1	Out
8	Redundancy Out 2	Out
9	Fused +12 volt	Out

3.4.4 Ext Ref Connector, BNC

The Ext Ref connector is a BNC female connector. The signal supplied here by the user is used for phase-locking the internal 10MHz reference oscillator, and can be 1, 2, 5, 10 or 20 MHz. The impedance is matched for 50/75Ω, and requires a level in the range –6 to +10 dBm.

Connector Type	Description	Direction
BNC	External Reference	In/Out

3.4.5 Async-Serial Console, RJ-11 (with Optional IP Module only)



The Serial Console Connector is a standard 6-pin RJ-11 modular jack. The Async-Serial Console interfaces the IP Module Command Line Interface (CLI) and is used for management of CDM-570L and IP Module functions using a terminal emulator connected (with the supplied adapter cable) to the Console port. This is an EIA-232 DCE interface.

Table 3-8. ASYNC-Serial Console Connector Pin Assignments

Pin #	Function
1	Ground
2	Rx
3	Tx
4	Ground
5	Not used
6	Not used

3.5 Power / Ground Connections

3.5.1 Alternating Current (AC) Power Connector (Standard)

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the CDM-570 or CDM-570L units.

Note the following:

AC Power Specifications	
Input Power	40W maximum, 20W typical
Input Voltage	100 - 240 volts AC, +6%/-10% - autosensing (total absolute max. range is 90 - 254 volts AC)
Connector Type	IEC
Fuse Protection	Use two (2X) 20 mm Slow-Blow fuses for line and neutral fusing – fuses are contained within a fuse holder that is press-fit into the body of the IEC power module: • Use 5.0A fuses for 115 volt AC operation • Use 2.5A fuses for 230 volt AC operation

3.5.2 Optional Direct Current (DC) Power Connector

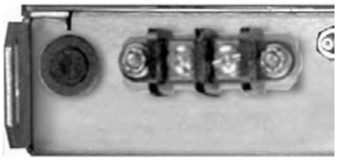
3.5.2.1 24V or 48V DC Units – CDM-570 or CDM-570L Units

This optional connector supplies the 24V or 48V Direct Current (DC) power to the CDM-570 or CDM-570L units.

Note the following:

DC Power Specifications		
Input Power	48V	48 watts typical, 55 watts maximum
	24V	TBD
Input Voltage	48V	48 volts DC nominal (43 volts to 60 volts)
	24V	24 volts DC nominal (20 volts to 36 volts)
Connector Type		Corcom PS series
Mating Connector		Corcom GA210 or Molex 03-12-1026
Fuse Protection		Use two (2X) 20 mm Slow-Blow fuses for positive and return fusing – fuses are contained within a fuse holder that is press-fit into the body of the IEC power module: • Use T5A fuses for units without a BUC • Use T8A fuses for units with a BUC

3.5.2.2 48V DC Units – CDMR-570L Unit Only



This optional connection supplies the 48V Direct Current (DC) power to the CDMR-570L modem.

Note the following:

DC Power Specifications	
Input Power	48 watts typical, 55 watts maximum
Input Voltage	48 volts DC nominal (43 volts to 60 volts)
Connector Type	Terminal Block
Fuse Protection	Use one (1X) Slow-Blow TR5 type fuse – fuse is contained within a screw-in receptacle located to the left of the terminal block: • Use a TR5 6.3A fuse for all CDMR-570L units (with **or** without BUC)

3.5.3 Ground Connector

PROPER GROUNDING PROTECTION REQUIRED: The installation instructions require that the integrity of the protective earth must be ensured and that the equipment shall be connected to the protective earth connection at all times. Therefore, it is imperative during installation, configuration, and operation that the user ensures that the unit has been properly grounded using the ground stud provided on the rear panel of the unit.

A #10-32 stud provided on the rear panel of the modem is used for connecting a common chassis ground among equipment.

Note: The AC power connector provides the safety ground.

Chapter 4. UPDATING FIRMWARE

4.1 Updating Firmware via Internet

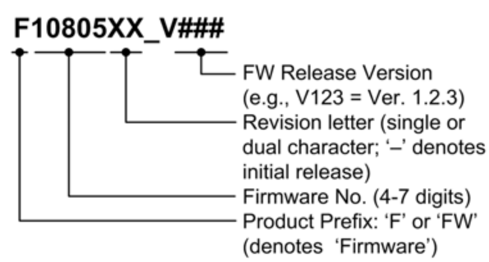
The modem uses Flash memory technology internally, which eliminates the need for updating firmware by physically replacing EPROMs.. This simplifies firmware updating – the update can be performed without opening the unit simply by connecting the modem to any 10/100BaseT Ethernet port on an external user PC once Ethernet connectivity has been established. Firmware updates can be received via the Internet (from Comtech EF Data's Web site), through e-mail, or or obtained on CD from Comtech EF Data Customer Support.

This chapter outlines the complete upgrading process as follows:

- New firmware can be downloaded from Comtech EF Data's Web site to a user PC.
- The update can be performed without opening the CDM-570/570L by connecting the unit to the serial or Ethernet port of the user PC.
- The firmware update is then transferred, via File Transfer Protocol (FTP), from the user PC to the CDM-570/570L.

4.2 About Firmware Files, Naming, Versions and Formats

All CEFD products are shipped configured with the current version firmware release. Comtech EF Data's Web site catalogues its firmware update files by product type (e.g., modem, converter, etc.) and specific model/optional configuration. The hyperlinks appear as per the example to the right. In this example, the **F10805XX_V###** firmware download hyperlink is depicted (the linked file applies to the base modem firmware), where 'XX' denotes the revision letter, and ### represents the firmware version.



In addition to the download for the base modem bulk firmware, downloads are available for the Ethernet IP Module which, with or without 3xDES Encryption, is an option for the CDM-570/570L Satellite Modem. It requires separate firmware update (the update procedure for the optional IP Module interface is also provided in this document). Firmware updates are available from Comtech EF Data per the following table:

Web Hyperlink	EXE/ZIP Filename	Contains Image File (* denotes revision letter)
F10805XX_V###	FW10805XX	FW10805*.bin – Base modem firmware.
F0000120X_V###	FW0000120XX	FW-0000120*.bin – IP Module Ver. 1.6.3 (and earlier) with HDLC Encapsulation, *without* 3xDES option.
N/A	Contact CEFD	FW10875*.bin – IP Module Ver. 1.6.3 (and earlier) with HDLC Encapsulation, *with* 3xDES option.
F0000358X_v###	FW0000358X	FW-0000358*.bin – IP Module Ver. 1.7.0 (and later) with Streamline Encapsulation, *without* 3xDES option.
F0000355X_v###	Contact CEFD	FW-0000355*.bin – IP Module Ver. 1.7.0 (and later) with Streamline Encapsulation, *with* 3xDES option.

1. ***Ver. 1.7.0 firmware (featuring Streamline Encapsulation) is*** not ***compatible with Ver. 1.6.x firmware (featuring HDLC Encapsulation).***
2. ***Only firmware for the CDM-570/570L base modem and IP Module without 3xDES is available for download from the CEFD Web site. To obtain the firmware update for the CDM-570/570L IP Module with the 3xDES option, contact Network Product Customer Support:***

   Phone: 480.333.2433

   E-mail: cdmipsupport@comtechefdata.com.

The firmware download files are available from Comtech EF Data in two archive file formats: ***.exe** (self extracting) and ***.zip** (compressed). Some firewalls will not allow downloading of *.exe files; in this case, download the *.zip file instead. If applicable, one version prior to the current release is also available for download.

(**Note:** For additional help with "zipped" file types, refer to the help files provided with the "PKZIP for Windows", "WinZip", or "ZipCentral" file archiving programs. “PKZIP for DOS” is not supported due to file naming conventions.)

To verify the correct firmware number, see **Step 1** in the next section of this guide, **Sect. 4.3 Preparation for the Base Modem Ethernet FTP Upload Procedure**.

4.3 Preparation for the Base Modem Ethernet FTP Upload Procedure

Step	Task
1	**Identify** the product in use, its firmware number for download, and its version number. The current modem M&C version and/or firmware number can be viewed as follows: • **Via the front panel:** The firmware version is available from the VFD's top-level screen. To view this screen, press the **[CLEAR]** key several times. The firmware number can also be found within the **SELECT: UTIL → Firmware → Info → Image#1** *or* **Image#2** menu trees. • **Via serial remote control:** The firmware number, versions, and revision level can be queried as follows: *Abbreviated:* **<0/SWR?** **or:** *Detailed:* **<0/FRW?** • **Via the Base Modem Web Server Interface:** The Bootrom, Bulk1 and Bulk2 firmware loads may be viewed after selecting the **Unit Info** hyperlink (available under the **Maint** [Maintenance] page tab). For more information, refer to **Chapter 7. BASE MODEM WEB SERVER INTERFACE**.
2	**Create** a temporary directory (folder) on the PC: **Windows**: Select **File → New → Folder** and rename the "New Folder" to "temp" or another unused name. A "***c:\temp***" folder should now exist. **Note:** The **c:** is the drive letter used in this example. Any valid, writable drive letter can be used. ***CMD*** *prompt:* At the command prompt (c:\>) type "**MD temp**" or "**mkdir temp**" without quotes (**MD** and **mkdir** stand for ***make directory***). A "***c:\temp***" subdirectory should now exist, where **c:** is the drive letter used in the example.
3	**Download** the correct firmware file to this temporary folder: a) Go online to **www.comtechefdata.com**. b) On the *Main* page – select the *Support* tab and then the ***Software Downloads*** hyperlink – <u>*or*</u> – under ***Support Information***, click ***Software Downloads***. c) On the ***Software Downloads*** page – click ***Download Flash and Software Update Files***. d) On the ***Flash Updates Index*** page – select the ***(Select a Product Line) Modems*** hyperlink. e) On the ***Modems*** product page – select the ***CDM-570 and CDM-570L*** product hyperlink; f) Select the appropriate firmware EXE or ZIP download hyperlink. Refer to the table in **Sect. 4.2 About Firmware Numbers, File Versions, and Formats** in this chapter for the naming and availability of the firmware download hyperlinks, archive files, and downloaded image files.
4	**Extract** the files to the temporary folder on the PC. A minimum of three files should be extracted: • **FW10805*x*.bin:** The bulk image file (where 'x' is the revision letter); • **CDM570_570L Release Notes.pdf** (or a variation of this filename); • **Readme_vx.txt:** Firmware installation notes (where 'x' is the revision letter); • **FLG-CDM570L_r*x*.pdf:** The Firmware Update Guide (where 'x' is the document revision number).

Step	Task
5	**Confirm** that the files have been extracted to the specified temporary folder on the PC. In DOS, use “**cd c:\temp**” to change to the temporary directory created in **Step 2**, then use the “**dir**” command to list the files extracted from the downloaded archive file.

4.4 Base Modem Bulk Firmware Update – Ethernet FTP Upload Procedure

Step	Task
6	**Connect** the external PC to the CDM-570/570L modem 10/100 Ethernet M&C port via a hub or a switch, or directly to a PC with a crossover cable. ***BASE MODEM firmware can be loaded via the Ethernet M&C port; when the optional IP Module is installed, via the Ethernet Traffic port; or over the satellite link when the modem data interface is set to IP.*** ***Note that the command used to load the BASE MODEM firmware is as follows (where ‘x’ is the firmware revision letter):*** • ***Via Ethernet Port:*** Type "**put FW10805x.bin bulk:**" • ***Via Traffic Port or over satellite using IP Module:*** Type "**put FW10805x.bin**”
7	**Send a “ping” command** to the modem to verify the connection and communication. **First,** determine the IP address of the modem as follows: • **Via the front panel** – use the **SELECT: CONFIG → Remote → Remote → Ethernet** menu. • **Via serial remote control:** Use the **<0/IPA?** query. **Then,** use DOS to “ping” the modem: From Windows, click “**Start**” on the Windows toolbar, then select the “**Run...**” option (as an alternative, use the “**DOS Prompt**” or “**Command Prompt**” icons in the **Start Menu**): • **Using Win95 or Win98** – Type “**command**”. • **Using WinNT, Win2K or WinXP** – Type “**cmd**”. At the DOS prompt, type “**ping *xxx.xxx.xxx.xxx***” (where "*xxx.xxx.xxx.xxx*" is the modem IP address). The results should confirm whether or not the modem is connected and communicating.
8	**Initiate** an FTP session with the modem (this example uses a DOS window): a) From the PC, type "**ftp *xxx.xxx.xxx.xxx***" where "*xxx.xxx.xxx.xxx*" is the IP address of the CDM-570/570L. b) Enter the **Admin User Name** and **Password** to complete login. c) Verify the FTP transfer is binary by typing "**bin**". d) Type "**prompt**", then type "**hash**" to facilitate the file transfers.

Step	Task
9	**Transfer** the files from the temporary folder on the PC: • **Update via Ethernet M&C port:** Type "**put FW10805x.bin bulk**:" to begin the file transfers transfers (where '*x*' is the revision letter). The destination "**bulk:**" must be all lower case. It will take approximately one minute to transfer the file. • **Update via Traffic Ethernet port or over satellite using IP module:** Type "**put FW10805x.bin**" to begin the file transfers (where '*x*' is the revision letter). It will take approximately one minute to transfer the file when done locally and several minutes when done over the satellite.

10	**Verify** the file transfer:
	a) The PC should report that the file transfer has occurred, and the display on the modem will report:
	`Programming flash sector #xx`
	`Please wait…`
	b) The process sequences through several blocks – this will take several minutes. When it has finished, the modem front panel will display:
	`Bulk FTP done. Press CLEAR.`
	c) **Terminate** the FTP session by typing "**bye**" and close the DOS window.
	d) **Confirm** that the new file was loaded by using the procedure in **Step 1**.

11	**Change** the desired image to boot from the modem front panel menu: **SELECT: UTIL → Firmware → Select** (*use ◄ ► arrows to change to the other image),* then cycle power to **reboot** the modem.

12	**Verify** the new firmware versions are booting by observing the following messages on the modem front panel display:
	`Comtech CDM-570/570L Modem`
	`Ver 1.x.x`
	Note: To load the second image, repeat **Steps 8** through **11**.

4.5 Ethernet IP Module FTP Upload Procedure

Step	Task
1	**Identify** the product in use, its firmware number for download, and its version number. The current modem M&C version and/or firmware number can be viewed as follows: • **Via the front panel:** The firmware version is available from the VFD's top-level screen. To view this screen, press the **[CLEAR]** key several times. The firmware information can also be found within the **SELECT: UTIL → Firmware → Info → MP550** menu trees. • **From the Serial Console port**: View the IP Module information by selecting **Operations** and **Maintenance → Unit Information**. • **From Telnet via the 10/100 Ethernet Traffic port**: View the IP Module information by selecting **Operations** and **Maintenance → Unit Information**. • **From HTTP via the 10/100 Ethernet Traffic port:** View the IP Module information by selecting **Operations** and **Maintenance → Unit Information**.
2	**Create** a temporary directory (folder) on the PC: **Windows**: Select **File → New → Folder** and rename the "New Folder" to "temp" or another unused name. A "***c:\temp***" folder should now exist. **Note:** The **c:** is the drive letter used in this example. Any valid, writable drive letter can be used. ***CMD*** *prompt:* At the command prompt (c:\>) type "**MD temp**" or "**mkdir temp**" without quotes (**MD** and **mkdir** stand for ***make directory***). A "***c:\temp***" subdirectory should now exist, where **c:** is the drive letter used in the example.
3	**Download** the correct firmware file to this temporary folder: a) Go online to **www.comtechefdata.com**. b) On the ***Main*** page – select the ***Support*** tab and then the ***Software Downloads*** hyperlink – *or* – under ***Support Information***, click ***Software Downloads***. c) On the ***Software Downloads*** page – click ***Download Flash and Software Update Files***. d) On the ***Flash Updates Index*** page – select the ***(Select a Product Line) Modems*** hyperlink. e) On the ***Modems*** product page – select the Comtech EF Data **CDM-570 and CDM-5570L** product hyperlink; f) Select the appropriate firmware hyperlink (i.e., CDM-570/570L with IP Module *without* 3xDES) or contact CEFD Customer Support to obtain the download *with* 3xDES. Refer to the table in **Sect. 4.2 About Firmware Numbers, File Versions, and Formats** in this chapter for the naming and availability of the firmware download hyperlinks, archive files, and downloaded image files.

Step	Task
4	**Extract the files to the temporary folder** on the PC. A minimum of three files should be extracted: • *<u>Without</u> 3xDES* – **FW-0000120x.bin** (Ver. 1.6.3 and earlier) *–or–* **FW-0000355x.bin** (Ver. 1.7.0 or later). Note that 'x' denotes the revision letter of the image file. ***–or–*** • *<u>With</u> 3xDES* – **FW10875x.bin** (Ver. 1.6.3 and earlier) *–or–* **FW-0000355x.bin** (Ver. 1.7.0 or later). Note that 'x' denotes the revision letter of the image file. • **CDM570_570L Release Notes.pdf** (or a variation of this filename); • **FLG-CDM570L_r*x*.pdf:** The Firmware Update Guide (where 'x' is the document revision number).
5	**Confirm** that the files have been extracted to the specified temporary folder on the PC. In DOS, use "**cd c:\temp**" to change to the temporary directory created in **Step 2**, then use the "**dir**" command to list the files extracted from the downloaded archive file.
6	**Connect** the external PC to the CDM-570/570L modem 10/100 Ethernet M&C port via a hub or a switch, or directly to a PC with a crossover cable. ***IP MODULE firmware can only be loaded via the EthernetTraffic port; do not use the Ethernet M&C port. Also, IP MODULE firmware can be loaded to a remote modem over the satellite link when the modem data interface is set to IP.*** • ***<u>For updates to a local CDM-570/570L IP Module:</u>*** *It is recommended that this update be performed with a PC that is locally attached to the IP Module CLI via the RS-232 Serial Console Port to monitor the progress of the update.* • ***<u>For updates to a remote CDM-570/570L IP Module over a satellite link:</u>*** *It is recommended that this update be performed with a PC that has a Telnet session connection (in addition to the FTP session) to the IP Module via satellite to monitor the progress of the update.*
7	**Send a "ping" command** to the modem to verify the connection and communication. **First,** determine the IP address of the modem by using either the CDM-570/570L front panel or serial remote control: • **Via the front panel:** Use the **SELECT: CONFIG → Remote → Remote → Ethernet** menu. • **Via serial remote control:** Use the **<0/IPA?** query. **Then,** use DOS to "ping" the modem: From Windows, click "**Start**" on the Windows toolbar, then select the "**Run...**" option (as an alternative, use the "**DOS Prompt**" or "**Command Prompt**" icons in the **Start Menu**): • **Using Win95 or Win98** – Type "**command**". • **Using WinNT, Win2K or WinXP** – Type "**cmd**". At the DOS prompt, type "**ping *xxx.xxx.xxx.xxx***" (where "*xxx.xxx.xxx.xxx*" is the modem IP address). The results should confirm whether or not the modem is connected and communicating.

Step	Task
8	**Initiate** an FTP session with the modem (this example uses a DOS window): a) From the PC, type "**ftp *xxx.xxx.xxx.xxx***" where "*xxx.xxx.xxx.xxx*" is the IP address of the CDM-570/570L. b) Enter the **Admin User Name** and **Password** to complete login. c) Verify the FTP transfer is binary by typing "**bin**". d) Type "**prompt**", then type "**hash**" to facilitate the file transfers.
9	**Transfer the files** from the temporary folder on the PC: Type "**put FW#######x.bin**" (where '#######' is the designated image file number, and 'x' is the revision letter) to begin the file transfers. It will take several minutes to transfer and write the files to flash memory.
10	**Verify the file transfer:** a) **The PC should report that the file transfer has occurred**, and the display on the CLI or Telnet will indicate that the image is being written to flash memory. b) **Terminate the FTP session** by typing "**bye**" and close the DOS window. c) **Confirm that the new file was loaded** by using the procedure in **Step 1**.
11	**Change the desired image to boot.** By default, the IP Module will boot to the version with the *latest date* (**Boot to – Latest**). "Boot to" can also be set to force the modem to boot up using either **Image #1** or **Image #2**. The IP Module will then need to be reset (i.e., rebooted or power cycled) from the serial console, Web Server Interface, or CLI/Telnet for the firmware update selection to become active: • To reset from the serial console, use serial remote command '**FRB='** (Force Reboot). • To reset from the IP Module Web Server Interface, select the **Maint | Reboot** page, then click **[Yes, Reboot]**. • To reset from the CLI/Telnet Main Menu, select **Operations and Maintenance [O]**, then **Reset [R]**. ***If the file transfer is not successful for any reason, do not reset or power down the CDM-570/570L. Restart the FTP session and repeat Steps 7 through 9.*** ***If the file transfer is still not successful, contact* Comtech EF Data Network Product Support:** **Telephone: 480.333.2433** **Email: *cdmipsupport@comtechefdata.com***

4.6 USB Procedure

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

Chapter 5. FRONT PANEL OPERATION

5.1 Introduction

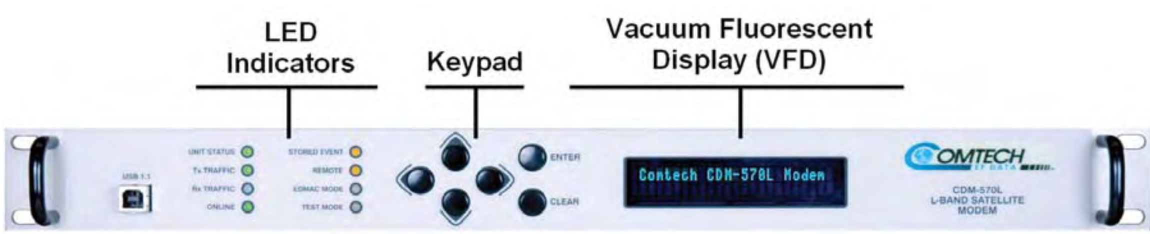


Figure 5-1. Front Panel View (CDM-570L shown)

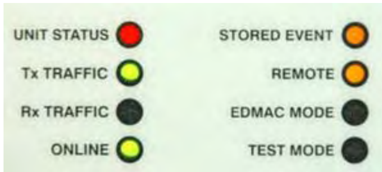
Figure 5-1 identifies the key features of the CDM-570/570L Satellite Modem's front panel. The front panel is used to fully control and monitor the CDM-570/570L's operation.

The front panel features (from left) eight **L**ight-**E**mitting **D**iode (LED) Indicators, a six-button keypad, and a **V**acuum **F**luorescent **D**isplay (VFD). The user enters data via the keypad – nested menus display all available options and prompt the user to carry out a required action – and messages are displayed on the VFD. The LEDs indicate, in a summary fashion, the status of the modem.

The USB 1.1 Type 'B' connector is reserved for future use with a user PC to update the modem firmware.

The function and behavior of the LED indicators, keypad, and VFD are described in detail in this chapter.

5.1.1 LED Indicators



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

The behavior of the eight front panel LED Indicators is as follows:

LED	Condition	Description
UNIT STATUS	Red	A Unit Fault exists (Example: PSU fault)
	Orange	No Unit Faults, but a Traffic Fault, or ODU (BUC or LNB) fault exists
	Green	No Unit Faults, or Traffic Faults
Tx TRAFFIC	Green	No Tx Traffic Faults
	Off	A Tx Traffic fault exists OR the Tx Carrier is in OFF state
Rx TRAFFIC	Green	No Rx Traffic Faults (demod and Viterbi decoder are locked, everything is OK)
	Off	An Rx Traffic fault exists (the demod may still be OK – check the fault status of the modem from the **Monitor** menu).
ONLINE	Green	The modem is On Line, and carrying traffic
	Off	The modem is Off Line (standby) - forced by externally connected 1:1 or 1:N redundancy system
STORED EVENT	Orange	There is a Stored Event in the log, which can be viewed from the front panel, or retrieved via the remote control interface
	Off	There are no Stored Events
REMOTE	Orange	The modem is in Remote Mode - local monitoring is possible, but no local control
	Off	The modem is in Local Mode - remote monitoring is possible, but no remote control
	Flashing	ODU FSK control has been enabled, and there is a communications fault
EDMAC MODE	Orange	Framing on, EDMAC on, and unit defined as Slave - local monitoring is possible, but no local control
	Off	Either the modem is in Transparent mode (no framing), or the framing has been selected, but in AUPC-only mode, or EDMAC Master configuration
TEST MODE	Orange	A Test Mode is selected (Example: IF Loopback)
	Off	There is no Test Mode currently selected

5.1.2 Keypad

As the manufacturing process of the CDM-570/570L has evolved, there have been three different keypad layouts, as shown in **Figure 5-2**:

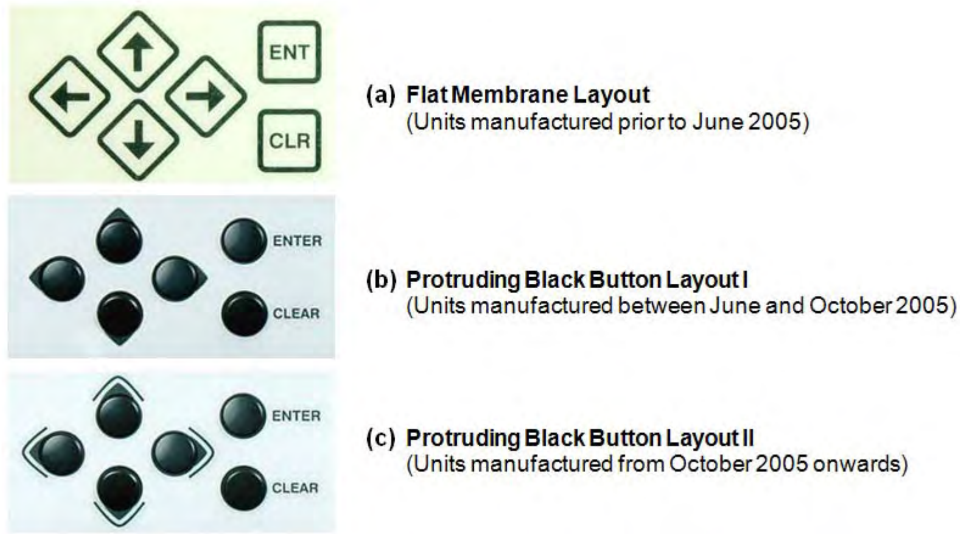


Figure 5-2. CDM-570/570L – Front Panel Keypad

The function of the keypad is as follows:

Key	Function
ENTER (ENT)	This key is used to select a displayed function or to execute a modem configuration change. From the opening screen, pressing ENTER *once* takes the user to the SELECT: (Main) menu.
CLEAR (CLR)	This key is used to back out of a selection or to cancel a configuration change which has not been executed by pressing ENTER. Pressing CLEAR generally returns the display to the *previous selection* or, if pressed *repeatedly*, to the opening screen. From the opening screen, pressing CLEAR *once* takes the user to the SELECT: (Main) menu.
◄ ► (Left, Right)	These arrow keys are used primarily to move to the next menu screen section. At times, they may also be used to move the cursor position (e.g., when editing a parameter value or label character).
▲ ▼ (Up, Down)	These arrow keys are used primarily used to move from one menu screen parameter selection to another. At times, they may also be used to edit configuration value digits (numbers) or label characters (e.g., letters).

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.

5.1.3 Vacuum Fluorescent Display (VFD)

The CDM-570/570L features a **V**acuum **F**luorescent **D**isplay (VFD). The VFD is an active display showing two lines of 24 characters each. It produces a blue light, the brightness of which can be controlled by the user. Compared to a **L**iquid **C**rystal **D**isplay (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

On most menu screens, a flashing solid block cursor blinks at a once-per-second rate. This indicates the currently selected item, digit, or field. Where it might obscure the item being edited (e.g., a numeric field), the solid block cursor automatically changes to an underline cursor.

If the operating unit is left displaying the same screen for weeks at a time, the VFD could become 'burnt' with this image. To prevent such 'burn-in' a 'screen saver' feature activates after 1 hour. The screen saver message moves from right to left across the screen, then wraps around. The user-configurable Circuit ID displays on the VFD top line, while the bottom line displays the demod lock state (i.e., '**`Demod not locked.`**' or the circuit Eb/No value if the demod is locked) followed by '**`Press any key...`**'. Press any key to return to the previous screen.

5.2 CDM-570/570L Front Panel Menus

5.2.1 Opening Screen

The opening screen displays whenever power is first applied to the modem; from any other nested menu, it is accessible by repeatedly pressing **CLEAR**. Otherwise, press any other key to advance to the **Select:** (Main) menu screen.

If the Internal Reference warm-up delay feature is *disabled* (refer to **SELECT:UTIL→ REFERENCE→ Warm-up Delay** later in this chapter), depending on the modem type, one of the following screens displays:

```
Comtech CDM-570L Modem
Firmware Version:1.x.x
```

```
Comtech CDM-570 Modem
Firmware Version:1.x.x
```

If, however, the Internal Reference warm-up delay feature is *enabled*, one of the following screens displays:

```
Comtech CDM-570L Modem
Ref Warming-up: 045
```

```
Comtech CDM-570 Modem
Ref Warming-up: 045
```

The bottom line counts down, in seconds, the time remaining for the warm-up period. ***During this period, the Tx Carrier is deliberately muted***. At the end of the warm-up period, the bottom line reverts to the 'normal' opening screen display (i.e., it displays the modem Firmware version), and the modem enters into its normal operational state.

The user may bypass (override) the warm-up period at any time by pressing the CLEAR ***key.***

5.2.2 SELECT: (Main) Menu

CDM-570L:

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

CDM-570:

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

The **Select:** (Main) menu provides user access to all modem configuration, monitor and control menu branches.

On the next page, **Figure 5-3** illustrates the hierarchal structure of the front panel principle menu tree, from the **SELECT:** menu on down.

The table that follows identifies the functional description/overview for each menu branch. Refer to the chapter section for detailed information about the operations provided therein.

Menu Branch	Sect.	Description
Config	5.2.2.1	Used to fully configure the modem.
Monitor	5.2.2.2	Used to monitor the alarm status of the modem, to view the log of stored events, and to display the Receive Parameters screen.
Test	5.2.2.3	Used to invoke one of several test modes (loopbacks, for example).
Info	5.2.2.4	(Information) Used to view information on the modem, without having to go into configuration screens.
Save/Ld	5.2.2.5	(Save/Load) Used to save and to retrieve up to 10 different modem configurations.
Util	5.2.2.6	(Utility) Used to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.
ODU (*summary only*)	5.2.2.7	(Outdoor Unit) On the CDM-570 only: Used to monitor and control a Comtech EF Data RF Transceiver (CSAT-5060 or KST-2000A/B), if connected. *See* Appendix K. CDM570 ODU (CSAT-5060 OR KST-2000A/B) OPERATION *for full details.*

The actual choices displayed in the submenus may vary according to which FAST options have been enabled. Where a FAST option affects a menu, this is identified in the descriptive text.

Use the ◄ ► arrow keys to select a menu branch from the choices available for either the CDM-570L or CDM-570, and then press **ENTER**.

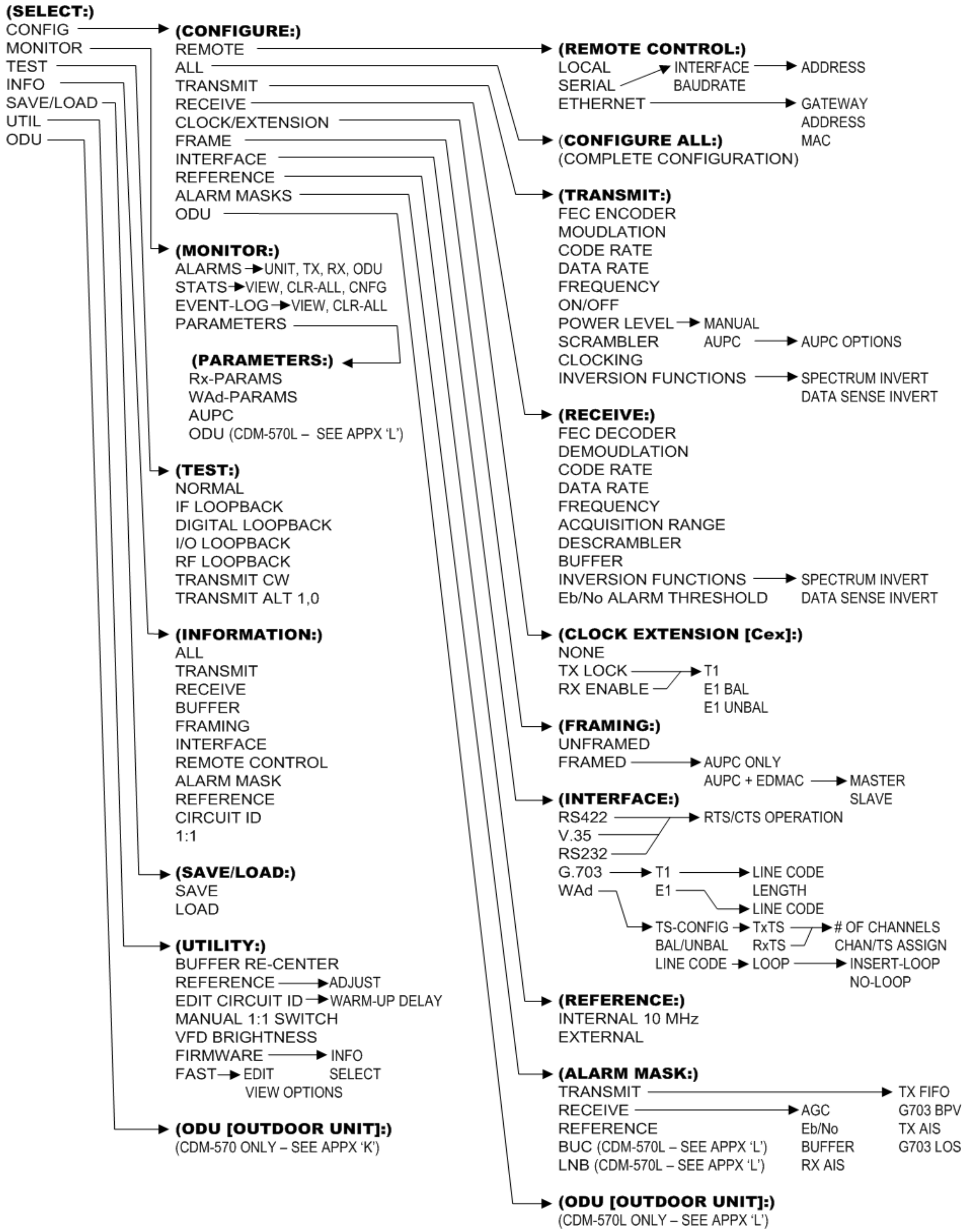


Figure 5-3. CDM-570/570L – Principle Menu Tree

5.2.2.1 (SELECT:) Config (Configuration) Menus

```
CONFIG: Rem All Tx Rx CEx
Frame Intfc Ref Mask  ODU
```

Use the ◄ ► arrow keys to select from the submenu choices shown, and then press **ENTER**. The following table identifies each submenu available from the Configuration menu branch, its content section in this chapter, and each submenu's functional description:

Submenu	Sect.	Functional Description
Rem	5.2.2.1.1	(Remote Control) Used to define whether the modem is being controlled locally, or remotely.
All	5.2.2.1.2	Used to completely configure the modem. The user is prompted, step by step, to make choices or edit data. This is highly recommended for new users, as it serves to clearly lead the user through all the configuration parameters.
Tx	5.2.2.1.3	(Transmit) Used to define, on a parameter-by-parameter basis, the transmit configuration of the modem. The available submenus should be used if the user wishes to change, for example, just the Transmit IF Frequency.
Rx	5.2.2.1.4	(Receive) Used to define, on a parameter-by-parameter basis, the receive configuration of the modem. The available submenus should be used if the user wishes to change, for example, just the Receive Data Rate.
CEx	5.2.2.1.5	(Clock Extension) Used to define the G.703 Clock Extension interface.
Frame	5.2.2.1.6	Used to define operation in a transparent mode (no framing) or in a framed mode. In the framed mode, an overhead of 5% or 1.6% is added to the rate transmitted over the satellite so that M&C and AUPC information may be passed to the distant end.
Intfc	5.2.2.1.7	(Interface) Used to define which electrical interface type is active at the data connectors (either the EIA-530 port, or the G.703 ports).
Ref	5.2.2.1.8	(Reference) Used to define whether the modem should use its own internal 10MHz reference, or phase lock to an externally applied reference and, if so, at what frequency.
Mask	5.2.2.1.9	Used to mask certain traffic alarms, which may cause problems to the user. For example, certain multiplexers use 'all ones' as an idle pattern. However, by convention, the 'all ones' condition is taken to be the Alarm Indication Signal (AIS). If desired, this alarm may be masked.
ODU (*Summary only*)	5.2.2.1.10	On the CDM-570L only: Used to configure a BUC (Block Up Converter) or LNB (Low-Noise Block Down Converter), if connected. *See* Appendix L. CDM-570L ODU (BUC,LNB) OPERATION *for full details.*

5.2.2.1.1 CONFIG: Rem (Remote Control)

```
Remote Control: Local
Serial Ethernet(◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Local, Serial**, or **Ethernet**, and then press **ENTER**.

If **Local** mode is selected, then remote control will be disabled. Remote monitoring is still possible.

5.2.2.1.1.1 (CONFIG: Remote Control) Serial

NOTE: In **Serial** mode, in addition to Serial M&C being enabled, Telnet connection (which enables Telnet M&C for modems configured for redundant operation) is also allowed.

If **Serial** is selected from the **Remote Control** submenu and the modem has **not** been defined as an EDMAC SLAVE, then the following menu is displayed:

```
Serial Config: Interface
Baudrate      (◄ ►,ENTER)
```

(CONFIG: Remote Control) Serial: Interface

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

Use the ◄ ► arrow keys to select **RS232**, **RS485-2W** (2-wire), or **RS485-4W** (4-wire), and then press **ENTER**. At this point the user is further prompted to enter the bus address.

(CONFIG: Remote Control) Serial: Interface → RS232

If **RS232** is selected, the following menu is displayed:

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

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

If either **RS485** mode is selected, the user is further prompted:

```
RS485 Bus Address: 0245
          (◄ ►,▲ ▼,ENTER)
```

To edit the RS485 bus address of this unit: First, use the ◄ ► arrow keys to select a digit to edit, then the ▲ ▼ arrow keys to edit the value of that digit. The valid range of addresses is from **1** to **9999**. Press **ENTER** when done.

(CONFIG: Remote Control) Serial: Baudrate

```
Local M&C Bus Baud Rate:
19200 Baud   (▲ ▼,ENTER)
```

Edit the baud rate of the remote control bus that is connected locally to the M&C computer. Use the ▲ ▼ arrow keys to change the value. Values of 2400, 4800, 9600,19200, 38400 and 57600 baud are available. Press **ENTER** when done.

Note: The asynchronous character format is **FIXED** at 8 data bits, 1 stop bit, no parity (8-N-1).

5.2.2.1.1.2 (CONFIG:) Remote Control: Ethernet

NOTE: In **Ethernet** mode, Serial monitoring is allowed; however, Serial control is not allowed except for use of the LRS (Local/Remote Status) and FPL (Front Panel Lockout) commands/queries.

```
Ethernet Config: Gateway
Address MAC SNMP   (◄ ►)
```

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

(CONFIG: Remote Control) Ethernet: Gateway

```
Ethernet IP Gateway:
192.168.001.002  (◄ ►,▲ ▼)
```

To edit the modem Ethernet M&C port's IP Gateway Address: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

(CONFIG: Remote Control) Ethernet: Address

```
Ether IP Address/Range:
192.168.001.002/24(◄ ►,▲ ▼)
```

To edit the modem Ethernet M&C port's IP Address and Range: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

(CONFIG: Remote Control) Ethernet: MAC

```
M&C Port MAC Address:
00-06-B0-00-01-06 (ENTER)
```

This ***read-only*** screen displays the unit MAC Address. Once the MAC Address has been noted, press **ENTER** or **CLEAR** to exit this menu.

(CONFIG: Remote Control) Ethernet: SNMP

```
SNMP: Communities  Traps
                (◄ ►, ENT)
```

Use the ◄ ► arrow keys to select the **Communities** or **Traps** configuration menu.

(CONFIG: Remote Control) Ethernet: SNMP → Communities

```
SNMP Communities:
Read  Write     (◄ ►, ENT)
```

Use the ◄ ► arrow keys to select the SNMP Communities **Read** or **Write** configuration submenu.

(CONFIG: Remote Control) Ethernet: SNMP → Communities → Read

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

(CONFIG: Remote Control) Ethernet: SNMP → Communities → Write

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

To edit the SNMP **Read** or **Write** Community strings: First, use the ◄ ► arrow keys to select a character to edit, and then use the ▲ ▼ arrow keys to edit that character.

Note that only the first 20 characters on the bottom line are available.

All printable ASCII characters are available with the exception of the backslash '/' (ASCII code 92) and tilde '~' (ASCII code 126).

Press **ENTER** once the string is composed **–** all trailing spaces are removed from the string upon entry.

(CONFIG: Remote Control) Ethernet: SNMP → Traps

```
Traps: Community Version
IP Addr#1 IP Addr#2  (◄ ►)
```

Use the ◄ ► arrow keys to select **Community**, **Version**, **IP Addr#1**, or **IP Addr#2**, and then press **ENTER**.

(CONFIG: Remote Control) Ethernet: SNMP → Traps → Community

```
Trap Community: (◄ ►,▲ ▼)
comtech
```

To edit the SNMP Trap **Read** or **Write** Community strings: First, use the ◄ ► arrow keys to select a character to edit, and then use the ▲ ▼ arrow keys to edit that character. Note that only the first 20 characters on the bottom line are available.

All printable ASCII characters are available with the exception of the backslash '/' (ASCII code 92) and tilde '~' (ASCII code 126).

Press **ENTER** once the string is composed **–** all trailing spaces are removed from the string upon entry.

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

```
Trap Version:
SNMPv1  SNMPv2  (◄ ►,ENT)
```

Use the arrow keys to select the SNMP Trap Version (**SNMPv1** or **SNMPv2**), and then press **ENTER**.

(CONFIG: Remote Control) Ethernet: SNMP → Traps → IP Addr#1 *or* Addr#2

```
Trap IP #X:    (◄ ►,▲ ▼)
 000.000.000.000
```

*(Where '**X**' indicates Trap IP #**1** or Trap IP #**2**)* To edit the Trap Destination IP Address: First, use the ◄ ► arrow keys to select a digit to edit, then use the ▲ ▼ arrow keys to edit the value of that digit.

Note: If both Trap IP Addresses are **000.000.000.000**, this designates the Traps as *disabled*.

5.2.2.1.2 CONFIG: All

```
All = Stop
(Stop, Start)    (◄ ►,▲ ▼)
```

Use of this menu branch is highly recommended for new users, as it serves to clearly lead the user through the modem's configuration *in its entirety*. Use the ▲ ▼ arrow keys to select between **Stop** and **Start** – the menu then presents **every** individual configuration option screen in sequential fashion. For each successive menu, use the ◄ ► arrow keys to first select, and then the ▲ ▼ arrow keys to edit, the various parameters.

Press **ENTER** to continue through all configurations. Press **CLEAR** to discontinue.

5.2.2.1.3 CONFIG: Tx (Transmit)

```
Tx:FEC Mod Code Data Frq
On/Off Pwr Scram Clk Inv
```

Use the ◄ ► arrow keys to select **FEC**, **Mod**, **Code**, **Data**, **Frq**, **On/Off**, **Pwr**, **Scram**, **Clk**, or **Inv**, and then press **ENTER.** A summary of the submenu selections is as follows:

Selection	Sect.	Description
FEC	5.2.2.1.3.1	(Forward Error Correction) Used to select the method of FEC used for transmission (Viterbi, TPC, etc). FEC type takes the highest configuration priority.
Mod	5.2.2.1.3.2	(Modulation) Used to select the modulation type used for transmission (BPSK, QPSK, 8-PSK, etc.). The choice of modulation will depend on the FEC type chosen.
Code	5.2.2.1.3.3	(FEC Code Rate) Used to select the FEC Code Rate used for transmission (Rate 1/2, Rate 3/4, etc.). The choice of Code Rate will depend on both the FEC type and Modulation selected.
Data	5.2.2.1.3.4	(Data Rate) Used to select the transmit data rate, in steps of 1 bps. The choice of data rate will depend on the FEC type, Modulation, and Code Rate selected.
Frq	5.2.2.1.3.5	(Frequency) Used to select the transmit frequency, in steps of 100Hz. CDM-570L range: 950 MHz to 2000 MHz CDM-570 range: 50 to 90 MHz and 100 to 180 MHz
On/Off	5.2.2.1.3.6	Used to control the output state of the transmit carrier.
Pwr	5.2.2.1.3.7	(Output Power level) Used to control the output level of transmit carrier, either manually, or using the AUPC (Automatic Uplink Power Control) feature.
Scram	5.2.2.1.3.8	(Scrambler) Used to select whether or not data scrambling is used.
Clk	5.2.2.1.3.9	(Clock Source) Used to select the clock source for transmission. This can be from the CDM-570L's high stability internal source, from an external source, or from the distant-end of the satellite link (loop timed).
Inv	5.2.2.1.3.10	(Inversion) Used to invert the sense of the transmitted spectrum, or to invert the sense of the transmitted baseband data.

VERY IMPORTANT NOTE: ***The FEC type takes the highest configuration priority, and the selection here depends on what, if any, optional plug-in codecs are installed. The choice of FEC type then determines what modulation types, code rates, and data rates are available. The order of hierarchy is therefore:***

FEC type (Highest) ► Modulation type ► Code Rate ► Data Rate (Lowest)

If the user changes a parameter within this hierarchy, the other parameters may become invalid. In this case, the software will change those other parameters, in order that the configuration remains valid at all times.

Example: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the modulation type from QPSK to 16-QAM. In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4).

5.2.2.1.3.1 (CONFIG: Tx) FEC (FEC Type)

```
Tx FEC: Viterbi Vit+RS
TCM+RS TPC Uncoded
```

IMPORTANT NOTE: All available choices are presented at all times. ***If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.***

CASE	RULES	COMMENT
Viterbi	ALWAYS VALID	
Vit+RS (Viterbi +Concatenated Reed-Solomon)	If the RS codec is installed	
TCM+RS (Trellis Coded Modulation + Concatenated Reed-Solomon)	If the RS codec is installed AND 8-PSK FAST is enabled	Fixed at 8-PSK and Rate 2/3
TPC (Turbo Product Codec)	If the TPC codec is installed	
Uncoded	Always valid - BPSK, QPSK and OQPSK only.	Forces Code Rate to 1:1 (uncoded)

5.2.2.1.3.2 (CONFIG: Tx) Mod (Modulation)

```
Modulation: BPSK QPSK
OQPSK 8-PSK 16-QAM 8-QAM
```

IMPORTANT NOTE: All available choices are presented at all times. ***If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.***

CASE	RULES
BPSK	Valid for all FEC types *except* TCM+RS
QPSK	Valid for all FEC types *except* TCM+RS
OQPSK	Valid for all FEC types *except* TCM+RS
8-PSK	Requires TCM+RS *OR* Turbo codec *AND* requires 8-PSK/ 8-QAM FAST option
8-QAM	Requires Turbo codec *AND* requires 8-PSK/8-QAM FAST option
16-QAM	Requires Viterbi+RS *OR* Turbo codec *AND* requires 16-QAM FAST option

5.2.2.1.3.3 (CONFIG: Tx) Code (Code Rate)

```
Tx Code Rate: 5/16 21/44
1/2 2/3 3/4 7/8 0.95 Unc
```

IMPORTANT NOTE: All available choices are presented at all times. ***If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.***

CASE	RULES
5/16	Requires BPSK *AND* Turbo
21/44	Requires BPSK or QPSK/OQPSK *AND* Turbo
1/2	Valid for BPSK, QPSK and OQPSK
2/3	Requires TCM *AND* 8-PSK *AND* RS codec installed
3/4	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
7/8	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
0.95	Valid for QPSK, OQPSK, 8-PSK and 8-QAM
Unc (uncoded)	Valid *only* for 'Uncoded' in FEC choice

5.2.2.1.3.4 (CONFIG: Tx) Data (Data Rate)

```
Tx Dat Rate: 5000.000kbps
3000.000ksym (◄ ►,▲ ▼,ENT)
```

The overall range of data rates is from 2.4 to 9980 kbps. The overall range of symbol rates is from 4.8 to 3000 ksymbols/second. The minimum and maximum data rates are dependent on modulation type and FEC encoder rate. If user changes the modulation or FEC, and the currently selected data rate can no longer be supported, then the data rate will be adjusted automatically, up or down, *keeping the symbol rate constant*. ***The bottom line of the display shows the symbol rate, based on FEC type, modulation, FEC Code Rate, and Data Rate. The valid ranges of data rate are shown in the table below.***

If the current interface type is selected to be G.703, the data rate will be automatically set to either 1544 kbps (T1) or 2048 kbps (E1).

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – See IMPORTANT note below
	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	
	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
Viterbi + RS	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	
	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	
		Rate 3/4	6.5 kbps to 4.091 Mbps	
		Rate 7/8	7.5 kbps to 4.666 Mbps	
	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	
		Rate 7/8	16.8 kbps to 4.666 Mbps	
TCM + RS	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	
		Rate 21/44	2.4 kbps to 1.430 Mbps	
	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
		Rate 0.95	9.1 kbps to 5.666 Mbps	
	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
		Rate 7/8	13.6 kbps to 7.875 Mbps	
		Rate 0.95	15.3 kbps to 8.500 Mbps	
	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	
		Rate 7/8	16.8 kbps to 9.980 Mbps	

IMPORTANT NOTE: Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.

(CONFIG: Tx) Data Rate (with WAN Adaptation)

If the interface has been selected as WAN Adaptation, the **Data** submenu appears as follows:

```
TxDataRate: 1024.000kbps
1096.000ksym AR=1.000
```

The initial (default) data displayed in this menu will be the uncompressed data rate, as displayed in the WAN Adaptation. **AR** is the Adaptation Ratio, and will initially show 1.00. Subsequent editing of the data rate downwards from the default value will result in AR being modified (for example, to 0.865).

Note: Editing of the number of WAN Adaptation Tx channels will reset the Tx Data Rate to the uncompressed value.

5.2.2.1.3.5 (CONFIG: Tx) Frq (Frequency)

```
Tx IF Freq:1156.3456 MHz
            (◄ ►,▲ ▼,ENT)
```

To edit the Transmit IF Frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

For the **CDM-570L**, the range of frequencies is from **950** to **2000** MHz, with a resolution of 100 Hz. Furthermore, if using the **CONFIG: ODU→BUC** menus and the user selects a **BUC LO** frequency other than zero, and defines whether the mix is high-side or low-side, the display changes to include the calculated Transmit RF frequency of the modem/ BUC combination, as per the following example:

```
Tx IF Freq:1156.3456 MHz
RF=14156.3456(◄ ►,▲ ▼,ENT)
```

As the **Tx IF** frequency is edited, the RF frequency is automatically updated. However, for the **CDM-570**, the range of frequencies permitted is from **50** to **90** MHz and from **100** to **180** MHz, with a resolution of 100 Hz, as per the following example:

```
Tx IF Freq:0085.1234 MHz
             (◄ ►,▲ ▼,ENT)
```

Note the leading zeros, which are included to maintain compatibility with the CDM-570L firmware.

5.2.2.1.3.6 (CONFIG: Tx) On/Off

```
Tx Output State: Off On
Rx-Tx Inhibit(◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select **On**, **Off**, or **Rx-Tx Inhibit**, and then press **ENTER**.

(CONFIG:Tx) On/Off: Rx-Tx Inhibit

```
RTI-Timeout Value: 10s
7s 4s 2s 1s (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select the RTI Timeout value (in seconds) as **10s**, **7s**, **4s**, **2s**, or **1s**, and then press **ENTER**.

RTI means RECEIVE/TRANSMIT INHIBIT. When selected, it will prevent the Tx carrier from being transmitted until the demodulator is locked. To avoid the Tx Carrier from being turned off when the demodulator loses lock for a very short period of time, the demodulator must be unlocked continuously for the selected time period (10, 7, 4, 2, or 1 seconds) before the transmit carrier is inhibited.

Having this feature enabled does not affect the internal IF loopback feature. Be aware, however, that if an external IF loopback is attempted (connecting an external cable from the Tx IF output to the Rx IF input), then **this will not work!** ***(The Tx carrier cannot turn on until the demod is locked, and the demod cannot lock because the Tx output is off. The net result is that the demod will not lock and the Tx carrier will not turn on.***

USE THE Rx-Tx INHIBIT FEATURE WITH EXTREME CARE!

5.2.2.1.3.7 (CONFIG: Tx) Pwr (Power)

```
Output Power Level Mode:
Manual  AUPC (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to set the output power level mode as **Manual** or **AUPC**, and then press **ENTER**.

(CONFIG: Tx) Output Power Level Mode: Manual

```
Tx Output Power Level:
-03.9 dBm (◄ ►,▲ ▼ ENT)
```

To edit the Tx Output Power Level: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow to edit the value of that digit. Note the following:

- **For the CDM-570L**, the range of output power is from **0** dBm to **–40** dBm.
- **For the CDM-570**, the range of output power is from **0** dBm to **–25** dBm.

Press **ENTER** when done.

(CONFIG: Tx) Output Power Level Mode: AUPC

If selecting **AUPC** and ‘Framed’ mode **is not** selected, the submenu displays as follows:

```
Warning! AUPC needs
Framed Mode (ENT or CLR)
```

Press **ENTER** or **CLEAR** to return to the previous menu, with **Manual** selected.

Otherwise, if selecting **AUPC** and 'Framed' mode ***is*** selected, the menu displays as follows:

```
Target-Eb/No  Max-Range
Alarm DemodUnlock (◄ ►)
```

Use the ◄ ► arrow keys to select **Target EbNo**, **Max-Range**, **Alarm**, or **Demod-Unlock**, and then press **ENTER**.

(CONFIG: Tx) Output Power Level Mode: AUPC → Target-Eb/No

```
Remote Demod - Target
Min Eb/No:14.9dB (◄ ►,▲ ▼)
```

To edit the Remote Demod Target Eb/No: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow to edit the value of that digit. The default value is 3.0 dB, and the upper limit is 14.9 dB. Press **ENTER** when done.

(CONFIG: Tx) Output Power Level Mode: AUPC → Max-Range

```
Maximum-permitted Power
increase: 1dB  (▲ ▼,ENT)
```

Use the ▲ ▼ arrow keys to edit the value of maximum permitted increase in power level (when in **AUPC** mode), and then press **ENTER**. The default value is 1dB, and the upper limit is 9 dB.

(CONFIG: Tx) Output Power Level Mode: AUPC → Alarm

```
Action when max Tx Power
reached: None TxAlarm ◄ ►
```

Use the ◄ ► arrow keys to set the action that occurs – **None** or **TxAlarm** – if the AUPC causes the maximum output power level to be reached. Press **ENTER** when done.

(CONFIG: Tx) Output Power Level Mode: AUPC → DemodUnlock

```
Action when Remote Demod
unlocks: Nom-Pwr Max-Pwr
```

Use the ◄ ► arrow keys to set the action that occurs if the remote demod is unlocked, and then press **ENTER**. Note the following:

Selection	Description
Nom-Pwr	(Nominal Power) The output level reverts to the nominal power level set under Manual.
Max-Pwr	(Maximum Power) The output level changes to the maximum permitted.

5.2.2.1.3.8 (CONFIG: Tx) Scram (Scrambling)

```
Tx Scrambling:Default-On
IESS-315-On Off (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Default-On**, **IESS-315-On**, or **Off**, and then press **ENTER**. **Note:** While this submenu always displays the available options, the cursor will skip past an unavailable choice. Note the following:

Selection	Description
Default-On	The appropriate scrambler type is automatically selected
IESS-315-On	This applies only when Turbo is installed and has been selected as the FEC type
Off	No scrambling

The default scrambler types are:

Uncoded:	ITU V.35 (Intelsat variant)
Viterbi, no framing:	ITU V.35 (Intelsat variant)
Viterbi, EDMAC frame:	Comtech proprietary, frame synchronized
Viterbi + RS or TCM/RS:	Per IESS-308, frame synchronized
TPC:	Comtech proprietary, frame synchronized
8-QAM TPC:	ITU V.35 (Intelsat variant)

5.2.2.1.3.9 (CONFIG: Tx) Clk (Clock Source)

```
Tx Clocking Mode:  Int
Ext Loop-Timed (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Int**, **Ext**, or **Loop-Timed**, and then press **ENTER**. Note the following:

Selection	Description
Int	(Internal) Indicates that the CDM-570/570L will supply a clock to the DTE, which is derived from its internal frequency reference. If the IP Module is installed and the selected Data Interface is IP, then Internal is the only valid selection.
Ext	(External) Indicates that the CDM-570/570L expects to receive a clock from the DTE, to which the modem can phase-lock its internal circuits. (If G.703 is selected as the Interface type, the software will force the clock mode to External.)
Loop-Timed	Indicates that the transmit timing source should be the receive clock, from the direction of the satellite. This is a useful mode, in that no external connection needs to be made in this mode. If the demodulator loses lock, or if there is no receive signal present, the internal clock is substituted. Note also that this mode will work even with asymmetric Rx and Tx data rates.

5.2.2.1.3.10 (CONFIG: Tx) Inv (Inversion Functions)

```
Tx Inversion functions:
Spectrum  Data (◄ ►,ENT)
```

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

(CONFIG: Tx) Tx Inversion functions: Spectrum

```
Tx Spectrum:  Normal
Inverted    (◄ ►,ENTER)
```

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

(CONFIG: Tx) Tx Inversion functions: Data

```
Tx Data Sense:  Normal
Inverted    (◄ ►,ENTER)
```

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

5.2.2.1.4 CONFIG: Rx (Receive)

```
Rx:FEC Dem Code Data Frq
Acq Descram Buf Inv EbNo
```

Use the ◄ ► arrow keys to select **FEC**, **Dem**, **Code**, **Data**, **Frq**, **Acq**, **Descram**, **Buf**, **Inv**, or **EbNo**, and then press **ENTER.** A summary of the submenu selections is as follows:

Selection	Sect.	Description
FEC	5.2.2.1.4.1	(Forward Error Correction) Used to select the method of FEC used for reception (Viterbi, TPC, etc.). FEC type takes the highest configuration priority.
Dem	5.2.2.1.4.2	(Demodulation) Used to select the modulation type used for reception (BPSK, QPSK, 8-PSK, etc.). The choice of demodulation will depend on the FEC type chosen.
Code	5.2.2.1.4.3	(FEC Code Rate) Used to select the FEC Code Rate used for reception (Rate 1/2, Rate 3/4, etc.). The choice of Code Rate will depend on both the FEC type and Demodulation selected.
Data	5.2.2.1.4.4	(Data Rate) Used to select the receive data rate, in steps of 1 bps. The choice of data rate will depend on the FEC type, Demodulation, and Code Rate selected.
Frq	5.2.2.1.4.5	(Frequency) Used to select the transmit frequency, in steps of 100Hz. • CDM-570L range: 950 MHz to 2000 MHz • CDM-570 range: 50 to 90 MHz and 100 to 180 MHz
Acq	5.2.2.1.4.6	(Acquisition) Used to determine the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier.
Descram	5.2.2.1.4.7	(Descrambler) Used to select whether or not data descrambling is used.
Buf	5.2.2.1.4.8	(Buffer) Used to select whether or not the Plesiochronous/Doppler buffer is used, and if so, the size of that buffer.
Inv	5.2.2.1.4.9	(Inversion) Used to invert the sense of the received spectrum, or to invert the sense of the received baseband data.
EbNo	5.2.2.1.4.10	(Eb/No Alarm threshold) Used to determine the Eb/No alarm threshold.

VERY IMPORTANT NOTE: ***The FEC type takes the highest configuration priority, and the selection here depends on what, if any, optional plug-in codecs are installed. The choice of FEC type then determines what demodulation types, code rates, and data rates are available.***

The order of hierarchy is therefore:

FEC type (Highest) ► Demodulation type ► Code Rate ► Data Rate (Lowest)

If the user changes a parameter within this hierarchy, the other parameters may become invalid. In this case, the software will change those other parameters, in order that the configuration remains valid at all times.

Example: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the demodulation type from QPSK to 16-QAM. In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4).

5.2.2.1.4.1 (CONFIG: Rx) FEC (FEC Type)

```
Rx FEC: Viterbi Vit+RS
TCM+RS TPC Uncoded
```

IMPORTANT NOTE: All available choices are presented at all times. **If an option is not installed (Hardware or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.**

CASE	RULES	COMMENT
Viterbi	Always valid	
Vit+RS (Viterbi +Concatenated Reed-Solomon)	If the RS codec is installed	
TCM+RS (Trellis Coded Modulation + Concatenated Reed-Solomon)	If the RS codec is installed AND 8-PSK FAST is enabled	Fixed at 8-PSK and Rate 2/3
TPC (Turbo Product Codec)	If the TPC codec is installed	
Uncoded	Always valid - BPSK, QPSK and OQPSK only.	Forces Code Rate to 1:1 (uncoded)

5.2.2.1.4.2 (CONFIG: Rx) Dem (Demodulation)

```
Demodulation: BPSK QPSK
OQPSK 8-PSK 8-QAM 16-QAM
```

IMPORTANT NOTE: All available choices are presented at all times. **If an option is not installed (Hardware or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.**

CASE	RULES
BPSK	Valid for all FEC types *except* TCM+RS
QPSK	Valid for all FEC types *except* TCM+RS
OQPSK	Valid for all FEC types *except* TCM+RS
8-PSK	Requires TCM+RS *OR* Turbo codec *AND* requires 8-PSK/8-QAM FAST option
8-QAM	Requires Turbo codec *AND* requires 8-PSK/8-QAM FAST option
16-QAM	Requires Viterbi+RS *OR* Turbo codec *AND* requires 16-QAM FAST option

5.2.2.1.4.3 (CONFIG: Rx) Code (Code Rate)

```
Rx Code Rate: 5/16 21/44
1/2 2/3 3/4 7/8 0.95 Unc
```

IMPORTANT NOTE: All available choices are presented at all times. **If an option is not installed (Hardware or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.**

CASE	RULES
5/16	Requires BPSK *AND* Turbo
21/44	Requires BPSK or QPSK/OQPSK *AND* Turbo
1/2	Valid for BPSK, QPSK and OQPSK
2/3	Requires TCM *AND* 8-PSK *AND* RS codec installed
3/4	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
7/8	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
0.95	Valid for QPSK, OQPSK, 8-PSK and 8-QAM
Unc (uncoded)	Valid *only* for 'Uncoded' in FEC choice

5.2.2.1.4.4 (CONFIG: Rx) Data (Data Rate)

```
Rx Dat Rate:5000.000kbps
2500.000ksym (◄ ►,▲ ▼,ENT)
```

Overall range of data rates is from 2.4 to 9980 kbps. Overall range of symbol rates is 4.8 to 2500 ksymbols/second. Minimum and maximum data rates are dependent on modulation type and FEC encoder rate. If the user changes modulation or FEC, and the currently selected data rate can no longer be supported, then the data rate will be adjusted automatically, up or down, keeping the symbol rate constant***. The bottom line of the display shows symbol rate, based on FEC type, modulation, FEC Code Rate, and Data Rate.***

If the current interface type is selected to be G.703, the data rate will be set either to 1544 (T1) or 2048 kbps (E1) as follows:

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – See IMPORTANT Note 1 (below)
	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	
	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
Viterbi + RS	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	
	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	
		Rate 3/4	6.5 kbps to 4.091 Mbps	
		Rate 7/8	7.5 kbps to 4.666 Mbps	
	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	
		Rate 7/8	16.8 kbps to 4.666 Mbps	
TCM + RS	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	
		Rate 21/44	2.4 kbps to 1.430 Mbps	
	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	
		Rate 3/4	7.2 kbps to 4.500 Mbps	
		Rate 7/8	8.4 kbps to 5.250 Mbps	
		Rate 0.95	9.1 kbps to 5.666 Mbps	
	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
		Rate 7/8	13.6 kbps to 7.875 Mbps	
		Rate 0.95	15.3 kbps to 8.500 Mbps	
	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	
		Rate 7/8	16.8 kbps to 9.980 Mbps	

IMPORTANT NOTES:

1. ***Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.***
2. ***When configured for WAN Adaptation, the Rx Data Rate should match the distant-end data rate.***

5.2.2.1.4.5 (CONFIG: Rx) Frq (Frequency)

```
Rx IF Freq:1156.3456 MHz
            (◄ ►,▲ ▼,ENT)
```

To edit the Receive IF Frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

For the **CDM-570L**, the range of frequencies is from **950** to **2000** MHz, with a resolution of 100 Hz. Furthermore, if using the **CONFIG: ODU→LNB** menus and the user selects an **LNB** frequency other than zero, and defines whether the mix is high-side or low-side, the display changes to include the calculated Transmit RF frequency of the modem/ LNB combination, as per the following example:

```
Rx IF Freq:1156.3456 MHz
RF=14156.3456(◄ ►,▲ ▼,ENT)
```

As the **Rx IF** frequency is edited, the RF frequency is automatically updated. However, for the **CDM-570**, the range of frequencies permitted is from **50** to **90** MHz and from **100** to **180** MHz, with a resolution of 100 Hz, as per the following example:

```
Rx IF Freq:0075.9876 MHz
             (◄ ►,▲ ▼,ENT)
```

Note the leading zeros, which are included to maintain compatibility with the CDM-570L firmware.

5.2.2.1.4.6 (CONFIG: Rx) Acq (Acquisition Range)

```
Demod Acquisition Range:
 +/- 010 kHz  (▲ ▼,ENTER)
```

The Demod Acquisition Range determines the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier. To edit the search range value, first use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done. Note the following:

- **In the CDM-570L**, the range varies according to symbol rate:
    - ±1 kHz to ±32 kHz for rates less than or equal to 625 ksymbols/sec
    - ±1 kHz to ±200 kHz for rates greater than 625 ksymbols/sec
- **In the CDM-570**, the range is ±1 kHz to ±32 kHz.

CAUTION MUST BE EXCERCISED ***at low data rates where the acquisition range is greater than the symbol rate of the desired carrier. In this circumstance it may be possible to acquire lock on an adjacent (and hence undesired) carrier, if that carrier has identical characteristics (modulation, FEC, code rate, data rate, etc.) to the carrier of interest.***

5.2.2.1.4.7 (CONFIG: Rx) Descram (Descrambling)

```
Descrambling: Default-On
 IESS-315-On Off (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Default-On**, **IESS-315-On**, or **Off**, and then press **ENTER**.
Note: While this submenu always displays the available options, the cursor will skip past an unavailable choice.

Note the following:

Selection	Description
Default-On	The appropriate descrambler type is automatically selected
IESS-315-On	This applies only when Turbo is installed and has been selected as the FEC type
Off	No descrambling

The default descrambler types are:

Uncoded:	ITU V.35 (Intelsat variant)
Viterbi, no framing:	ITU V.35 (Intelsat variant)
Viterbi, EDMAC frame:	Comtech proprietary, frame synchronized
Viterbi + RS or TCM/RS:	Per IESS-308, frame synchronized
TPC:	Comtech proprietary, frame synchronized

5.2.2.1.4.8 (CONFIG: Rx) Buf (Buffer)

To edit the size, in bits, of the Plesiochronous/Doppler Buffer, use the ▲ ▼ arrow keys to select **+/- 128**, **256**, **512**, **1024**, **2048**, **4096**, **8192**, **16384**, or **32768** bits. Press **ENTER** when done.

Select **Disabled** to disable the Plesiochronous/Doppler Buffer. The receive clock is then derived from the satellite signal, and is therefore subject to clock offsets relative to the local transmit clock. This is due, in part, to the originating clock being slightly different from the local clock (a so-called ***plesiochronous*** offset), and to the motion of the satellite (a ***Doppler*** offset). Note the following:

```
Rx Buffer: Disabled (Loop
Timing Mode)(▲ ▼, ENTER)
```

If the IP Module is installed and the selected Data Interface is IP, the buffer is *disabled by default* and this is the only valid selection.

When a value other than **Disabled** is selected, the Plesiochronous/Doppler buffer is *enabled*, and set to the selected size as follows:

```
Rx Buffer: +/-32768 Bits
(13.1ms)     (▲ ▼, ENTER)
```

The buffer's input is the signal from the satellite, with any clock offsets and jitter. The buffer's output is derived from the local TRANSMIT clock. In this way, the receive data will be perfectly synchronous with this local clock. The CDM-570/570L can be operated with independent receive and transmit data rates. Even in this configuration, where Rx data rate < > Tx data rate, the buffer's output clock will be phase locked to the transmit clock.

While it is only possible to select the size in bits, the corresponding total buffer size is displayed in ms (which will vary in inverse proportion to the data rate).

(CONFIG: Rx) Buf (Buffer) (with WAN Adaptation)

If the interface has been selected as WAN Adaptation, the menu appears as follows:

```
Rx Buffer: 00064 Bytes
(0.25ms)     (▲ ▼, ENTER)
```

On the top line, use the ▲ ▼ arrow keys to edit the number of Bytes, which are then also displayed in milliseconds on the second line.

5.2.2.1.4.9 (CONFIG: Rx) Inv (Inversion Functions)

```
Rx Inversion functions:
Spectrum  Data (◄ ►,ENT)
```

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

(CONFIG: Rx) Rx Inversion functions: Spectrum

```
Rx Spectrum:  Normal
Inverted    (◄ ►,ENTER)
```

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

(CONFIG: Rx) Rx Inversion functions: Data

```
Rx Data Sense:  Normal
Inverted    (◄ ►,ENTER)
```

Use the arrow keys to select **Normal** or **Inverted**, and then press **ENTER**.

5.2.2.1.4.10 (CONFIG: Rx) Eb/No

```
Eb/No Alarm Point:
02.0 dB (◄ ►,▲ ▼,ENTER)
```

The user may define an alarm point value where, if the Eb/No falls below this value, a receive traffic fault is generated.

To edit the Eb/No Alarm Point: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. The range of values is from **0.1** to **16.0** dB. Press **ENTER** when done.

5.2.2.1.5 CONFIG: CEx (G.703 Clock Extension)

```
G703 Clock Extend: None
TxLock RxEnable (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **None**, **TxLock** or **RxEnable,** and then press **ENTER**. Selecting **TxLock** or **RxEnable** displays the following submenu:

```
Clk Extend Interface: T1
E1Bal E1Unbal (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select the appropriate G.703 Clock Extension interface – **T1**, **E1Bal**, or **E1Unbal** – and then press **ENTER**.

5.2.2.1.6 CONFIG: Frame (Framing Mode)

```
Framing Mode:  Unframed
EDMAC EDMAC-2  (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Unframed, EDMAC,** or **EDMAC-2**, and then press **ENTER**. Note the following:

Selection	Description
Unframed	No framing is selected, no overhead is added, and the modem is with other manufacturers' equipment when operating in a 'standard' configuration.
EDMAC EDMAC-2	Comtech EF Data's proprietary framing is added. The framing permits the bi-directional passing of M&C and AUPC data between local and distant-end units.

5.2.2.1.6.1 (CONFIG: Framing Mode) EDMAC *or* EDMAC-2

EDMAC is backward compatible with the CDM-500, CDM-550, CDM-550T, CDM-600 and CDM-600L. **EDMAC-2** is a reduced overhead version of EDMAC, and while it is not *completely* backward compatible with the modems mentioned here, it is backward compatible in *some* modes (for example, in Turbo BPSK modes and at rates above 2.048 Mbps).

Selecting **EDMAC or EDMAC-2** displays the following submenu:

```
Framing mix: AUPC-Only
AUPC+EDMAC  (◄ ►,ENTER)
```

Note: When **EDMAC** or **EDMAC-2** framing is enabled, **AUPC** is automatically enabled but the specific EDMAC feature (passing M&C data from a local to a distant-end unit) requires further configuration.

Use the ◄ ► arrow keys to select **AUPC-Only** (default) or **AUPC+EDMAC**, and then press **ENTER**.
Note the following:

- When **AUPC-Only** is selected, none of the EDMAC features are available, *even though framing is still enabled*.
- When **AUPC+EDMAC** is selected, the user is further prompted to select whether the modem is an EDMAC ***Master***, or an EDMAC ***Slave***:

(CONFIG: Framing Mode) EDMAC or EDMAC-2: AUPC+EDMAC

```
EDMAC Mode:
Master  Slave (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select **Master** or **Slave,** and then press **ENTER**. Note the following:

- An **EDMAC Master** is a unit that is local to the M&C computer, and which passes messages, via the overhead, to a distant-end modem.
- An **EDMAC Slave** is a unit that is not local to the M&C computer; it is located at the distant-end of a satellite link.

(CONFIG: Framing Mode) EDMAC or EDMAC-2: AUPC+EDMAC → Master

```
Distant-end Base Address
0240     (◄ ►,▲ ▼,ENTER)
```

To edit the address of the distant-end modem to which this unit will pass messages: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. The valid range of addresses is from **10** to **9990**, in increments of 10 *only*.

Note: The the last digit of the address may not be edited; this has been implemented so that a single **Master** may pass messages for up to 10 devices at the distant end.

Press **ENTER** when done.

(CONFIG: Framing Mode) EDMAC or EDMAC-2: AUPC+EDMAC → Slave

```
Address of this Slave
Unit: 0241  (◄ ►,▲ ▼,ENT)
```

To edit the address of this **Slave** unit: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. The valid range of addresses is from **1** to **9999**, although ‘base 10' values will be automatically skipped.

Note: The Slave EDMAC address always ends in ‘**1**’. Keep in mind that this is a unit that is intended for location at the distant-end of a link, and is therefore under the control of a **Master** at the other end. This is the equivalent of putting the modem into Remote Control mode; *no local control is possible*.

Press **ENTER** when done.

5.2.2.1.7 CONFIG: Intfc (Interface)

```
Interface: RS422 IP V.35
RS232 G.703 WAd (◄ ► ENT)
```

Use the ◄ ► arrow keys to select **RS422** (EIA-530), **IP**, **V.35**, **RS232** (EIA-232), **G.703** , or **Wad**, and then press **ENTER.**

Note: The WAd (E1 RAN Optimization / WAN Adaptation) option will be available only if the E1 RAN / WAN Adaptation (WAd) Processor Board is installed.

5.2.2.1.7.1 (CONFIG: Interface) RS422 *or* V.35 *or* RS232

```
RTS/CTS Operation: (▲ ▼)
Loop,RTS Controls Tx Out
```

Selecting **RS422**, **V.35**, or **RS232** displays this typical submenu. Use the ▲ ▼ arrows keys to select an option, and then press **ENTER**. Note the following:

Selection	Description
RTS/CTS Loop, No Action	RTS and CTS are looped, so that CTS echoes the state of RTS, but RTS does not control the ON/OFF state of the carrier.
Loop, RTS Controls Tx Out	RTS and CTS are looped, so that CTS echoes the state of RTS, and RTS controls the ON/OFF state of the carrier (in other words, the modem will not bring up its TX carrier until RTS is asserted).
Ignore RTS, Assert CTS	RTS is ignored, and CTS is asserted unconditionally.
N/A - 1:N system in use	If the 1:N switch on the rear panel is active, then RTS/CTS are not supported; the pins are assigned to redundancy functions.

5.2.2.1.7.2 (CONFIG: Interface) IP

If the optional IP Module is installed, and **IP** is selected, all of the CDM-570/570L rear panel electrical interfaces are disabled, and all data for Tx and Rx is routed to and from the modem board to the optional IP Module. The user is returned to the previous menu.

5.2.2.1.7.3 (CONFIG: Interface) G.703

```
G.703 Type:  T1
E1-Bal E1-Unbal(◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **T1**, **E1-Bal**, or **E1-Unbal**, and then press **ENTER.**

(CONFIG: Interface) G.703: T1

```
T1 Configuration: Length
Line-Code     (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select **Length** or **Line Code**, and then press **ENTER.**

(CONFIG: Interface) G.703: T1 → Length

```
T1 Line Length:
000-133 feet (▲ ▼,ENTER)
```

Use the ▲ ▼ arrow keys to select the line length (in feet) – **0-133**, **133-266**, **266-399**, **399-533**, and **533-655** – and then press **ENTER**.

(CONFIG: Interface) G.703: T1 → Line-Code

```
T1 Line Code (B8ZS):
On  Off(AMI) (◄ ►,ENTER)
```

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

(CONFIG: Interface) G.703: T1 → E1-Bal or E1-Unbal

```
E1 Line Code (HDB3):
On   Off      (◄ ►,ENTER)
```

Selecting **E1-Bal** or **E1-Unbal** displays this typical submenu.. Use the ◄ ► arrow keys to select **On** or **Off**, and then press **ENTER.**

5.2.2.1.7.4 (CONFIG: Interface) WAd (E1 RAN Optimization / WAN Adaptation)

Note: The WAd (E1 RAN Optimization / WAN Adaptation) menus are available only when the E1 RAN / WAN Adaptation (WAd) Processor Board is installed.

```
WanAdaptation: TS-Config
Bal/Unb LineCode   (◄ ►)
```

Use the ◄ ► arrow keys to select **TS-Config**, **Bal/Unb**, or **LineCode**, and then press **ENTER.**

(CONFIG: Interface) WanAdaptation: TS-Config

```
WanAdaptation TS-Config:
TxTS  RxTS  Loop   (◄ ►)
```

Use the ◄ ► arrow keys to select **TxTS, RxTS**, or **Loop**, and then press **ENTER.**

(CONFIG: Interface) WanAdaptation: TS-Config → TxTS *or* RxTS

```
Tx: Number Of Channels
Channel/TS-Assign  (◄ ►)
```

```
Rx: Number Of Channels
Channel/TS-Assign  (◄ ►)
```

For either submenu, use the ◄ ► arrow keys to select **NumberOfChannels** or **Channel/TS-Assign**, and then press **ENTER.**

(CONFIG: Interface) WanAdaptation: TS-Config → TxTS *or* RxTS → NumberOfChannels

```
Tx Channels:    05 (▲ ▼)
Nominal D.R.=0320.0 kbps
```

```
Rx Channels:    05  (▲ ▼)
Nominal D.R.=0320.0 kbps
```

Typical for either submenu: **On the top line**, use the ▲▼ arrow keys to edit the number of channels (which dictate the data rate). The permitted number of channels is **1–16**, corresponding to data rates of xx–1024 kbps.

The nominal data rate, shown on the **bottom line**, is provided for reference only.

Press **ENTER** when done.

(CONFIG: Interface) WanAdaptation: TS-Config → TxTS *or* RxTS → Channel/TS-Assign

```
Ch/TS: 1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16(◄ ►)
```

Typical for TxTS or RxTS, use the ◄ ► arrow keys to select the Channel for assigning a timeslot – the cursor may only be positioned on valid channel numbers – and then press **ENTER**. Once a valid channel is selected, the display changes to allow the user to edit the timeslot:

```
Select Timeslot for
Channel 02 TS=00(▲ ▼,ENT)
```

Use the ▲▼ arrow keys to edit the timeslot – the permitted timeslot settings are **0** through **31** – and then press **ENTER.**

(CONFIG: Interface) WanAdaptation: TS-Config → Loop

```
WAd E1 Loop:
No-Loop Insert-Loop  (◄ ►)
```

Use the ◄ ► arrow keys to select **No-Loop** or **Insert-Loop**, and then press **ENTER.**

When **Insert-loop** is selected, the Insert demultiplexer uses Tx Terrestrial data/clock (E1) as the source for inserts. Received satellite data is inserted into the Tx Terrestrial data stream, which is then output to the Rx Terrestrial data interface. Also, Tx Terrestrial clock is used as the buffer reference source.

(CONFIG: Interface) WanAdaptation: Bal/Unb (Balanced/Unbalanced)

```
WAd E1 Bal/Unbal:
Balanced Unbalanced   (◄ ►)
```

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

(CONFIG: Interface) WanAdaptation: LineCode

```
WAd E1 Line Code:
On (HDB3)  Off (AMI)   (◄ ►)
```

Use the ◄ ► arrow keys to select **On (HDB3)** or **Off (AMI)**, and then press **ENTER.**

5.2.2.1.8 CONFIG: Ref (Reference)

IMPORTANT NOTE: ***The CDM-570/570L can accept an externally supplied frequency reference, using the BNC connector on the rear panel. However, rather than bypassing the internal reference, and substituting the external signal, the internal reference is used in a low-bandwidth (~ 2Hz) phase-locked loop (PLL), so the CDM-570/570L actually phase locks to the reference external signal. There are two distinct advantages to this scheme:***

1. ***This scheme permits hitless switching between the operation of internal and external reference. There are no sudden discontinuities of frequency and phase in the transmitted carrier.***
2. ***Due to the very low bandwidth of the PLL, this scheme permits the external reference to have an inferior phase noise characteristic than the internal reference of the CDM-570/570L. The narrow loop essentially 'cleans up' the external signal. This is particularly important if the CDM-570L is being used to supply a 10MHz reference to a BUC or LNB.***

Use the ▲▼arrow keys to edit the configuration and value of the frequency reference – values of **Internal 10 MHz**, **External 01 MHz**, **External 02 MHz**, **External 05 MHz**, **External 10 MHz,** and **External 20 MHz** are available **–** and then press **ENTER** when done. For example:

```
Frequency Reference:
Internal 10 MHz(▲ ▼,ENT)
```

```
Frequency Reference:
Internal 05 MHz(▲ ▼,ENT)
```

5.2.2.1.9 CONFIG: Mask

```
Alarm Mask: Transmit
Receive Ref BUC LNB (◄ ►)
```

Use the ◄ ► arrow keys to select **Transmit**, **Receive**, **Reference**, **BUC** (CDM-570L only), or **LNB** (CDM-570L only), and then press **ENTER**.

5.2.2.1.9.1 (CONFIG: Alarm Mask) Transmit

```
Tx Alarm Mask: Tx-FIFO
G703BPV TxAIS G703LOS ◄ ►
```

Use the ◄ ► arrow keys to select **Tx-FIFO**, **G703BPV, Tx-AIS**, or **G703LOS**, and then press **ENTER**.

Each choice displays a submenu similar to the **TX-FIFO** submenu:

```
Tx-FIFO Alarm:
Active  Masked (◄ ►,ENT)
```

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

For the TX-FIFO Tx Alarm Mask submenu example: When **Active** is selected, a Transmit Traffic fault is generated whenever the transmitter sees that the transmit FIFO has slipped.

When **Masked** is selected, no alarm is generated.

Similarly, the **G.703 BPV, TxAIS**, and **G703LOS** Tx Alarm Masks may be set as **Active** or **Masked**.

5.2.2.1.9.2 (CONFIG: Alarm Mask) Receive

```
Rx Alarm Mask: AGC Eb/No
Rx-AIS Buf  WAd  (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **AGC**, **Eb/No**, **Rx-AIS, Buf (Buffer)**, or **WAd**, and then press **ENTER**.

Each choice displays a submenu similar to the **AGC** submenu:

```
AGC Alarm:
Active  Masked (◄ ►,ENT)
```

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

For the AGC Rx Alarm Mask submenu example: When the user selects **Active**, a Receive Traffic fault is generated whenever the demodulator sees that the composite input level being applied causes compression in the IF stages, and consequently degrades the performance of the demodulator.

When **Masked** is selected, no alarm is generated.

Similarly, the **Eb/No**, **Rx-AIS**, **Buf (Buffer)**, or **WAd** Rx Alarm Masks may be set as **Active** or **Masked**.

5.2.2.1.9.3 (CONFIG: Alarm Mask) Ref

```
Reference Alarm:
Active  Masked (◄ ►,ENT)
```

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

When **Active** is selected, a Transmit Traffic fault is generated whenever the modem sees that:

a) External Reference is selected, and

b) There is no signal activity at the External Reference port.

When **Masked** is selected, no alarm is generated.

5.2.2.1.9.4 (CONFIG: Alarm Mask) BUC (CDM-570L ONLY)

```
BUC Alarm:
Active  Masked (◄ ►,ENT)
```

For the CDM-570L only: Use the ◄ ► arrow keys to set the alarm for the BUC (Block Up Converter), if connected, as **Active or Masked**.

See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details about using this modem-specific menu branch.

5.2.2.1.9.5 (CONFIG: Alarm Mask) LNB (CDM-570L ONLY)

```
LNB Alarm:
Active  Masked (◄ ►,ENT)
```

For the CDM-570L only: Use the ◄ ► arrow keys to set the alarm for the LNB (Low-Noise Block Down Converter), if connected, as **Active or Masked**.

See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details about using this modem-specific menu branch.

5.2.2.1.10 CONFIG: ODU (CDM-570L ONLY)

```
ODU (Outdoor Unit):
BUC  LNB      (◄ ►,ENTER)
```

For the CDM-570L only: Use the ◄ ► arrow keys to configure a **BUC** (Block Up Converter) or **LNB** (Low-Noise Block Down Converter), if connected.

See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details about using this modem-specific menu branch.

5.2.2.2 SELECT: Monitor

```
MONITOR:Alarms Stats
Event-Log Parameters
```

Use the ◄ ► arrow keys to select **Alarms**, **Stats**, **Event-Log**, or **Parameters**, and then press **ENTER**.

5.2.2.2.1 MONITOR: Alarms

```
Live Alarms:Unit Receive
Transmit ODU (◄ ►,ENTER)
```

IMPORTANT NOTE: ***The CDM-570L uses a system of Fault Prioritization. In each category of fault, only the highest priority fault is displayed. For instance, if the demodulator is unlocked, it is irrelevant if there are other receive faults present. If the demodulator then locks, but there is a fault of a lower priority present, this will then be displayed. This also holds true for the faults reported via the remote control. This system cuts down significantly on unwanted and irrelevant fault reporting.***

For CDM-570 modems, or CDM-570L modems *without* ODUs, use the ◄ ► arrow keys to select **Unit**, **Receive**, or **Transmit**, and then press **ENTER**.

For CDM-570L modems* with *ODUs, see* Appendix L: CDM-570L ODU (BUC, LNB) OPERATION *for details on selecting this submenu.

The comprehensive list of prioritized faults for Unit, Receive, and Transmit is as follows (refer to **Appendix L** for the listing of prioritized ODU faults):

LISTING OF PRIORITIZED FAULTS		
Unit Faults	Rx Traffic Status	Tx Traffic Status
1) Power supply fault, +5 volts	1) Demodulator unlocked	1) No clock from terrestrial interface
2) Power supply fault, +12 volts	2) AGC Alarm - signal out of range	2) Tx FIFO slip
3) Power supply fault, –5 volts	3) RS Frame sync alarm	3) Loss of External Reference
4) Power supply fault, +23 volts	4) EDMAC Frame sync alarm	4) AUPC upper limit reached
5) Power supply fault, –12 volts	5) Buffer Underflow	5) AIS detected on incoming data (from terrestrial direction)
6) Tx synthesizer lock	6) Buffer Overflow	6) WAd E1 Sync loss
7) Rx 1st LO synthesizer lock	7) Eb/No alarm	7) Bipolar violation on G.703 interface
8) Rx 2nd LO synthesizer lock	8) WAd Idle Detected	
9) Reference PLL lock	9) WAd DFFL Overflow	
10) WAd HW fault	10) WAd Rx Sync Loss	
11) IP Module fault	11) WAd Buffer Syn Error	
12) EEPROM checksum error	12) AIS detected on incoming data (from satellite direction)	

5.2.2.2.1.1 (MONITOR: Live Alarms) Unit

```
Unit Fault: -12 Volt PSU
is Under-Voltage   (ENT)
```

This screen indicates if there are any Unit Faults. If not, it displays '**None**'. Press **ENTER** to return to the previous menu.

5.2.2.2.1.2 (MONITOR: Live Alarms) Receive (Receive Traffic Status)

```
Rx Traffic: AGC Alarm -
Reduce Input level (ENT)
```

This screen indicates if there are any Receive Traffic Faults. If not, it displays '**None**'. Press **ENTER** to return to the previous menu.

5.2.2.2.1.3 (MONITOR: Live Alarms) Transmit (Transmit Traffic Status)

```
Tx Traffic: No Tx Clock
from Terrestrial (ENT)
```

This screen indicates if there are any Transmit Traffic Faults. If not, it displays '**None**'. Press **ENTER** to return to the previous menu.

5.2.2.2.2 MONITOR: Stats (Link Statistics)

```
Link Statistics:   View
Clear-All Config(◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **View**, **Clear-All**, or **Config**, and then press **ENTER**.

5.2.2.2.2.1 (MONITOR: Link Statistics) View

```
Sta198:02/11/02 10:37:32
16.0, 16.0, 9.0, 9.0(▲ ▼)
```

The statistics log can store up to 255 events. The **top line** indicates the log entry number, and the time and date of the entry.

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

The **bottom line** shows the measured and recorded statistics data. The meaning and format of the numbers is as follows:

- Minimum Eb/No, Average Eb/No, Maximum TPLI, Average TPLI (where TPLI means **T**ransmit **P**ower **L**evel **I**ncrease, if AUPC is enabled).

- The user defines a measurement interval (see **MONITOR: Stats → Config**) and during this interval, Eb/No and TPLI are observed, at a one second rate. At the end of this period, the average Eb/No is calculated and recorded, and the minimum value seen in the interval. Similarly, the average TPLI is calculated, along with the highest value seen in the interval.

  Note: If the demod has lost lock during the measurement interval, the minimum Eb/No will show 'Loss' rather than indicate a value. However, the average value (while the demod was locked) will still be calculated and shown. If, on the other hand, the demodulator has been unlocked for the entire measurement interval, the average Eb/No will also show 'Loss'. (The display will show 'Loss, Loss'.)

- If the measured values are greater than, or equal to 16.0 dB, the display will show 16.0 dB.

- If AUPC is not enabled, the values of maximum and average TPLI will both show 'Off'.

Examples: ***08.0, 13.5, 2.5, 1.8 means:***
Minimum Eb/No observed in the measurement interval = 8.0 dB
Average Eb/No observed in the measurement interval = 13.5 dB
Maximum TPLI observed in the measurement interval = 2.5 dB
Average TPLI observed in the measurement interval = 1.8 dB

Loss, 04.5, Off, Off means:
There was a loss of demod lock during the measurement interval
Average Eb/No observed in the measurement interval = 4.5 dB
Maximum TPLI observed in the measurement interval = AUPC disabled
Average TPLI observed in the measurement interval = AUPC disabled

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

5.2.2.2.2.2 (MONITOR: Link Statistics) Clear-All

```
Clear all Stored Stats?
No  Yes     (▲ ▼, ENTER)
```

Use the ▲ ▼ arrow keys to choose **No** or **Yes**, and then press **ENTER**. If **Yes** is selected, the Link Statistics log is cleared, and the user is returned to the previous menu.

5.2.2.2.2.3 (MONITOR: Link Statistics) Config (Configure)

```
Stats Logging Interval:
Disabled    (▲ ▼,ENTER)
```

Use the ▲ ▼ arrow keys to select a logging interval (the period of time over which the statistics is measured) – valid selections are **Disabled**, **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, or **90 minutes** – and then press **ENTER** when done.

Once set, the display reflects the chosen logging interval:

```
Stats Logging Interval:
30 minutes   (▲ ▼,ENTER)
```

5.2.2.2.3 MONITOR: Event-Log (Stored Events)

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

Use the ◄ ► arrow keys to select **View** or **Clear-All**, and then press **ENTER**.

5.2.2.2.3.1 (MONITOR: Stored Events) View

```
Log23: 30/11/02 10:37:32
Fault - Demod Lock (▲ ▼)
```

When a fault condition occurs, it is time-stamped and put into the Stored Events Log. This log can store up to 255 events. Similarly, when the fault condition clears, this is also recorded, as shown per the following example:

```
Log240:30/11/97 10:37:35
Clear - Demod Lock (▲ ▼)
```

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

5.2.2.2.3.2 (MONITOR: Stored Events) Clear-All

```
Clear all Stored Events?
No  Yes     (▲ ▼, ENTER)
```

Use the ▲ ▼ arrow to choose **No** or **Yes**, and then press **ENTER**. If **Yes** is selected, the event log is cleared and the user is returned to the previous menu. However, if faults are present on the modem at this time, they are re-time-stamped and new log entries are generated.

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

5.2.2.2.4 MONITOR: Parameters

```
PARAMETERS: Rx-Params
WAd-Params AUPC ODU
```

For CDM-570 modems or CDM-570L modems *without* ODUs, use the ◄ ► arrow keys to select **Rx-Params**, **WAd-Params,** or **AUPC**, and then press **ENTER**.

For CDM-570L modems with ODUs, see* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details on selecting the ODU submenu.

5.2.2.2.4.1 (MONITOR: PARAMETERS) Rx-Params (Receive Parameters)

```
EbNo=05.7dB  BER=3.4E-9
∆F=+11.7k Buf=50 RSL=-64
```

If the demodulator is **locked**, information displays as shown here. Note the following:

Item	Description
EbNo=	This shows the value of Eb/No calculated by the demodulator. The value referred to here is the energy per information bit (Ebi), divided by the noise spectral density (No).
BER=	This is an estimate of the corrected BER.
∆F=	The frequency offset of the received carrier, in kHz, with a displayed resolution of 100 Hz.
Buf=	(**Buffer fill state**) This shows the fill state (in percent), of the receive Buffer. After a reset, it will read 50. A value <50 indicates that the buffer is emptying, and >50 indicates that it is filling.
RSL=	(**Receive Signal Level**) A value in dBm, indicating the input power of the desired carrier, as seen by the demodulator. If the signal level is below the AGC range of the demod, this will display **RSL <-99**.

Otherwise, if the demodulator is **not locked**, the message **'Demod: Not Locked'** appears, but the screen continues to display the receive signal level, as per the example that follows. Press **ENTER** or **CLEAR** to return to the previous menu.

```
  Demod: Not Locked
               RSL=-64
```

5.2.2.2.4.2 (MONITOR: PARAMETERS) WAd-Params (WAN Adapation Parameters)

```
WAd: AdaptRate=X.XXX
```

This screen displays the transmit channel adaptation ratio (where *X.XXX* = data out / data in). Press **ENTER** or **CLEAR** to return to the previous menu.

5.2.2.2.4.3 (MONITOR: PARAMETERS) AUPC

```
Framing is required for
AUPC Monitor (ENT or CLR)
```

If selecting **AUPC,** and the modem ***is not*** in 'Framed' mode**,** the menu displays as shown here. Otherwise, if the user selects **AUPC** and the modem ***is*** in Framed mode**,** the menu displays as follows:

```
AUPC:Remote EbNo =14.0dB
TX Power Increase =2.2dB
```

Note the following:

- The **top line** displays the value of Eb/No of the demodulator at the distant end of the satellite link. The Eb/No will display **Unlock** if the remote demod is unlocked.

- The **bottom line** shows how much the AUPC system has increased the output power. If AUPC is not enabled, the value of **Tx Power Increase** will show as 0.0 dB.

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

5.2.2.2.4.4 (MONITOR: PARAMETERS) ODU (CDM-570L ONLY)

```
Outdoor Unit Monitor:
BUC  LNB     (▲ ▼,ENTER)
```

For the CDM-570L only: This menu branch is used to monitor a BUC (Block Up Converter) or LNB (Low-Noise Block Down Converter), if connected. Use the ▲ ▼ arrow keys to select **BUC** or **LNB**. Press **ENTER** to continue or **CLEAR** to return to the previous menu.

See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details about this modem-specific menu branch.

5.2.2.3 SELECT: TEST

```
TEST: Norm IF> Dig> I/O>
RF> Tx-CW Tx-1,0(◄ ►,ENT)
```

This menu branch is used to execute a variety of test modes. Use the ◄ ► arrow keys to select **Norm**, **IF** >, **Dig> I/O>**, **RF>**, **Tx-CW**, or **Tx-1,0**, and then press **ENTER**. Note the following:

Selection	Description
Norm	(Normal) This clears any test modes or loopbacks, and places the modem back into an operational state.
IF>	(IF Loopback) This test mode invokes an internal IF loop. This is a particularly useful feature, as it is used to perform a quick diagnostic test without having to disturb external cabling. Furthermore, all of the receive configuration parameters are temporarily changed to match those of the transmit side. During an IF Loop, the Tx carrier continues to be transmitted. See Figure 5-4. When Norm is again selected, all previous values are restored.
Dig>	(Digital Loopback) This test mode invokes a digital loopback, which loops data at the output of the framer/scrambler on the transmit side and back into the deframer/descrambler on the receive side. If concatenated Reed-Solomon FEC is being used, this is also included in the digital loop. See Figure 5-4.
I/O>	(Inward/Outward loopback) This test mode invokes two distinct loopbacks: • The Inward Loop 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 transmit data interface is routed directly back out of the receive data interface. See Figure 5-4.
RF>	(RF Loopback) Useful for performing a satellite loopback, this test mode is almost identical to the IF loop mode: All receive configuration parameters are temporarily changed to match those of the transmit side; however, no internal connection is made. When Norm is again selected, all previous values are restored.
TX-CW	(Transmit CW) Used for measuring phase noise, this test mode forces the modulator to transmit a pure carrier (unmodulated).
TX-1,0	(Transmit an alternating 1,0,1,0 pattern) Used to check the carrier suppression of the Modulator. This 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 two discrete spectral lines to appear, spaced at +/- half the symbol rate, about the carrier frequency. If OQPSK is selected as the modulation type, the test produces a spectral pattern suitable for the measurement of SSB rejection – useful in determining the phase and amplitude accuracy of the modulator.

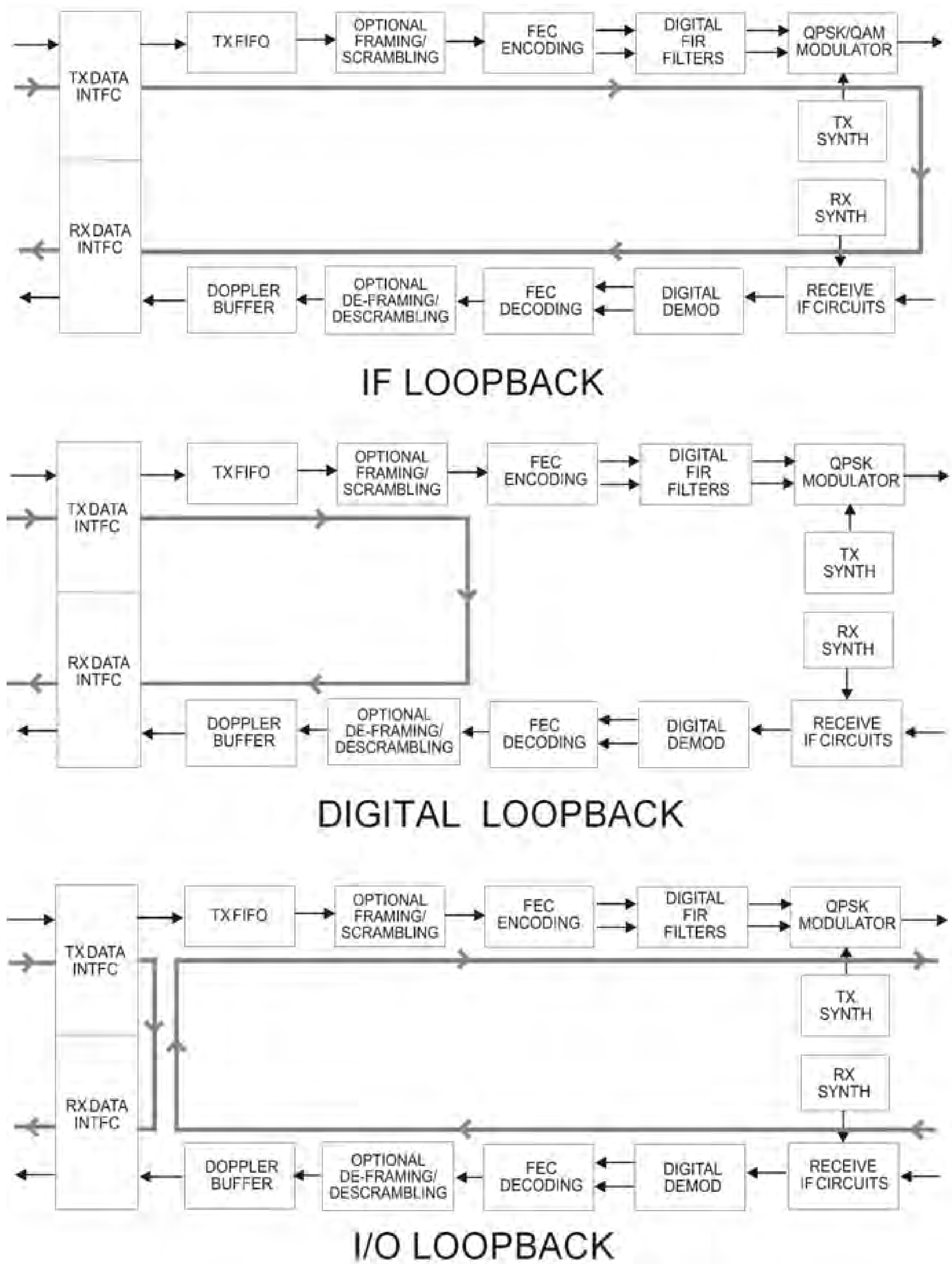


Figure 5-4. Loopback Modes

5.2.2.4 SELECT: Info

```
INFO:All Tx Rx Buf Frame
Intfc Rem Msk Ref ID 1:1
```

The Info menu branch provides access to screens that display information on the modem's current configuration. All screens provide information on a ***read-only*** basis – that is, the user may only *view* the information provided on these screens – *no editing is possible.*

Use the ◄ ► arrow keys to select **All, Tx, Rx, Buf, Frame, Intfc, Rem, Mask, Red, ID**, or **1:1**, and then press **ENTER**. Typical for all nested Info screens, press **ENTER** or **CLEAR** to return to the **SELECT: Info** menu.

5.2.2.4.1 INFO: All

```
 All = Start
(Stop, Start) (▲ ▼,ENTER)
```

This screen set allows the user to review the modem configuration *in its entirety*. Use the ▲ ▼ arrow keys to select between **Stop** and **Start**, and then press **ENTER.** Once a specific configuration displays, press **ENTER** to continue through the remaining configuration displays.

To discontinue: Press **CLEAR**, use the ▲ ▼ arrow keys to select **Stop**, and then press **ENTER**.

5.2.2.4.2 INFO: Tx (Transmit)

```
Tx:1140.000 5000.000 TUR
8P 0.95 S EXT -20.0 ON I
```

This screen displays the Transmit information. Note the following:

Display Line	Description
Top Line	• Transmit Frequency and Data Rate (NOTE: Due to space limitations, the resolution of displayed frequency is limited to 1 kHz, and data rate to 10 bps) • FEC Encoder type (VIT = Viterbi, VRS=Viterbi + Reed-Solomon, TCM = Trellis Coded + Reed-Solomon, TUR = Turbo, UNC = uncoded)
Bottom Line	• Modulation type (Q = QPSK, OQ= OQPSK, B = BPSK, 8P = 8-PSK, 8Q = 8QAM, 16=16-QAM) • Code Rate (Unc = Uncoded, 2144 = 21/44, then 5/16, 1/2, 2/3, 3/4, 7/8, 0.95) • Scrambler state (S = Scrambler on, N = Scrambler off, I = IESS-315 On) • Clocking Mode (INT = internal, EXT = external, LOP = loop, CXE = internal & Clock Extend TxLock E1 mode, CXT = internal & Clock Extend TxLock T1 mode) • Output power level • Transmit output state (ON = on, OF = off, EO= external off, RT= Rx-Tx Inhibit) • TSI state (I = Transmit Spectral Inversion on, N = off)

5.2.2.4.3 INFO: Rx (Receive)

```
Rx:1140.000 5000.000 TUR
8P 0.95 D BUF +/-32k   I
```

This screen displays the Receive information. Note the following:

Display Line	Description
Top Line	• Receive Frequency and Data Rate (NOTE: Due to space limitations, the resolution of displayed frequency is limited to 1 kHz, and data rate to 10Hz,) • FEC Decoder type (VIT = Viterbi, VRS=Viterbi + Reed-Solomon, TCM = Trellis Coded + Reed-Solomon, TUR = Turbo, UNC = uncoded)
Bottom Line	• Demodulation type (Q = QPSK, OQ= OQPSK, B = BPSK, 8P = 8-PSK, 8Q = 8QAM, 16=16-QAM). • Code Rate (Unc = Uncoded, 2144 = 21/44, then 5/16, 1/2, 2/3, 3/4, 7/8, 0.95) • Descrambler state (D = Descrambler on, N = Descrambler off, I = IESS-315 On) • Clocking Mode (SAT = buffer disabled, BUF = buffer enabled, CXE = internal & Clock Extend RxEnable E1 mode, CXT = internal & Clock Extend RxEnable T1 mode) • Demod Sweep Acquisition range • RSI state (I = Receive Spectral Inversion on, N = off)

5.2.2.4.4 INFO: Buf (Buffer)

```
Buffer: Enabled  (Tx=Rx)
Size:+/-04096 bits (ENT)
```

This screen displays if the buffer is enabled or disabled; shows the exact clocking mode (**Tx=Rx**, or **Tx**< > **Rx**); and the buffer size.

5.2.2.4.5 INFO: Frame (Framing and EDMAC)

This screen displays the framing mode and whether the modem is **EDMAC Master** or **Slave**, with the appropriate address. Examples are as follows:

```
Framing: Disabled
        (ENTER or CLEAR)
```

```
Framing:AUPC-Only,EDMAC2
        (ENTER or CLEAR)
```

```
Framing: AUPC+EDMAC2
Master,0240 (ENT or CLR)
```

```
Framing: AUPC+EDMAC
Slave, 0241 (ENT or CLR)
```

5.2.2.4.6 INFO: Intfc (Interface)

This screen displays details for the of the main data port's electrical interface type. If **RS422**, **V.35**, or **RS232** is selected, the menu also indicates the operation of RTS/CTS. Examples are as follows:

```
Interface: RS422  (ENT)
RTS/CTS Loop, No Action
```

```
Interface:G.703 E1-Unbal
HDB3    (ENTER or CLEAR)
```

```
Interface: G.703 T1 B8ZS
533-655 feet(ENT or CLR)
```

```
Interface: IP      (ENT)
  IEEE 802.3 Ethernet
```

5.2.2.4.7 INFO: Rem (Remote Control)

This screen displays whether the modem is in **Local** or **Remote** mode; gives details of the electrical interface type selected; the unit's address; and the baud rate selected, etc. Examples are as follows:

```
Remote M&C: Monitor Only
(Local Control only)
```

```
Remote M&C: RS485-4Wire
Address: 0001 19200 Baud
```

```
Remote M&C: 100BaseTx
IP Addr: 255.255.255.255
```

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

5.2.2.4.8 INFO: Msk (Alarm Mask)

```
Mask: FIFO BPV TAIS RAIS
AGC EbNo BUF Ref BUC LNB
```

This screen displays, in the same format as the **CONFIG: Mask** submenu, which alarms are currently masked. If an alarm is not masked, the relevant screen position is replaced with a blank space.

Note: When in G.703 Clock Extended Mode (CEx), **BPV** is replaced with **LOS** to indicate the alarm mask of *G703 Loss of Signal*.

5.2.2.4.9 INFO: Ref (Frequency Reference)

```
Frequency Reference:
Internal 10 MHz (ENTER)
```

This screen displays the source of the frequency reference for the CDM-570/570L.

5.2.2.4.10 INFO: ID (Circuit ID)

```
Circuit ID:      (ENTER)
24 CHARACTER TST MESSAGE
```

This screen displays the user-defined Circuit ID string that is composed via the **UTIL: ID** submenu.

5.2.2.4.11 INFO: 1:1 (1:1 Redundancy)

```
Redundancy State:Standby
Serial 1:1 Link: Active
```

- **On the top line:** This screen displays the **Redundancy State** as **Online** or **Standby** (1:1 or 1:N)
- **On the bottom line:** The status of the serial link between the two units is indicated as **Active** or **Idle**.

5.2.2.5 SELECT: Save/Load

```
Save/Load Configuration:
Save  Load   (◄ ►,ENTER)
```

This menu branch allows the user to store or load up to 10 different modem configurations (**0** through **9**) in the non-volatile memory of the modem**.** Use the ◄ ► arrow keys to select **Save** or **Load**, and then press **ENTER**.

5.2.2.5.1 Save/Load Configuration: Save

Use the ▲ ▼ arrow keys to select the location where the current configuration is to be **stored**, and then press **ENTER**. Locations **0** through **9** are available.

Using Location 9 for this example:

If **Save** is selected and the chosen location is empty, the screen appears as follows:

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

If, however, the selected location already contains data, the time and date stamp of the previously stored configuration displays for identification purposes, as per the following example:

```
Save Config to Loc: 9
11:10:29 23/12/03 (▲ ▼)
```

If the selected location does *not* contain a previously stored configuration, the screen appears as follows:

```
Your Configuration has
been Saved to Loc 9 (ENT)
```

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

If, however, the selected location *does* contain a previously stored configuration, the user is first prompted to overwrite the location. The screen appears as follows:

```
Loc 9 Contains Data!
Overwrite? NO YES  (◄ ►)
```

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

Once a modem configuration has been properly **saved**, press **ENTER** or **CLEAR** to return to the previous menu.

5.2.2.5.2 Save/Load Configuration: Load

Use the ▲ ▼ arrow keys to select the location from where the current configuration is to be **loaded**, and then press **ENTER**. Locations **0** through **9** are available.

Using Location 9 for this example:

If **Load** is selected and a configuration is stored at the chosen location, the time and date stamp of the previously stored configuration displays for identification purposes, as per the following example:

```
Load Config from Loc: 9
11:10:29 23/12/03 (▲ ▼)
```

If, however, the selected location contains no configuration data, the screen appears as follows:

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

Use the ▲ ▼ arrow keys to select another location from which to load a configuration (e.g., Location 8), and then press **ENTER**. If the newly selected location contains valid data, the display appears as follows:

```
New Config has been
Loaded from Loc 8 (ENT)
```

Once a modem configuration has been properly **loaded**, press **ENTER** or **CLEAR** to return to the previous menu.

5.2.2.6 SELECT: Utility

```
UTIL: Buffer Clock Ref
ID  1:1 VFD Firmware FAST
```

Use the ◄ ► arrow keys to select **Buffer**, **Clock**, **Ref**, **ID**, **1:1**, **VFD**, **Firmware,** or **FAST**, and then press **ENTER**.

5.2.2.6.1 UTIL: Buffer (Buffer Re-center)

```
Press ENTER to Re-Center
the Receive Buffer
```

Press **ENTER** to force re-centering of the Plesiochronous/Doppler buffer.

5.2.2.6.2 UTIL: Clock (Set Real-time Clock)

```
Edit Real-Time Clock:
12:00:00 24/04/03(◄ ►,▲ ▼)
```

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

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

5.2.2.6.3 UTIL: Ref (Reference)

```
Internal Freq Ref:Adjust
Warm-up delay (◄ ►,ENTER)
```

Use the ◄ ► arrow keys to select **Adjust** or **Warm-up delay**, and then press **ENTER**.

5.2.2.6.4 UTIL: Ref → Adjust

```
Internal 10 MHz Freq Ref
Fine Adjust:+017(◄ ►,▲ ▼)
```

This menu permits fine adjustment of the Internal 10 MHz reference oscillator. Use the ▲ ▼ arrow keys to edit the value. The range of values is from **–999** to **+999**.

Note: In order to facilitate adjustment, the value updates in real time as the digits are incremented/decremented. The user does ***not*** need to press the **ENTER** key.

Note: The numbers displayed here do not correspond to an exact frequency increment. A user should perform this fine adjustment while using an external frequency counter, connected either tor:

a) the internal 10 MHz reference, if the user has internal access to the equipment, *or*

b) the Tx Output, set for CW, 0 dBm output level, and an exact center frequency (e.g., 1000 MHz).

5.2.2.6.5 UTIL: Ref → Warm-up Delay

```
Warm-up delay:  Disable
Enable       (◄ ►,ENTER)
```

Because the CDM-570/570L uses a high-stability oven-controlled 10 MHz reference oscillator (OCXO), a finite time period is required for the oven to reach operating temperature. Consequently, when the modem first powers up a frequency error as great as 2×10^{-6} will occur, and it may take up to 2 minutes before the frequency has settled to its correct value. This will affect the Tx synthesizer (and hence the Tx output frequency), the Rx synthesizers, and the generation of the Internal Tx baseband clock.

For a modem operating on its own, this may not be a problem, but if the 10 MHz reference signal is being used to drive an externally-connected BUC, the frequency error at the RF output may be large, particularly at Ku- or Ka-Band.

In order to avoid this problem, the user may choose to enable a warm-up delay, which will suspend normal operation of the modem until the operating temperature of the OCXO has stabilized.

Warm-up delay is not fixed. Instead, the modem uses an intelligent algorithm to minimize this delay, under all circumstances. The modem uses its internal temperature sensor, and knowledge of how long the modem has been powered down, to determine the duration of the warm-up delay period.

For example: The worst case occurs when the modem has been powered down sufficiently long that the modem has reached thermal equilibrium with its surroundings, and the external temperature is at the lowest value possible. In this circumstance the modem will take 2 minutes to warm-up.

If the external temperature is hot, and the modem was powered down and then powered up again a short time later, the warm-up period will be very short, perhaps only several seconds.

Use the ◄ ► arrow keys to **Disable** or **Enable** the warm-up delay feature, and then press **ENTER**.

If **Disable** is selected, the modem powers up and goes into normal operational service ***without delay***.

If **Enable** is selected, when the modem powers up, one of the following screens displays:

```
Comtech CDM-570L Modem
Ref Warming-up: 045
```

```
Comtech CDM-570 Modem
Ref Warming-up: 045
```

The bottom line counts down, in seconds, the time remaining for the warm-up period. ***During this period, the Tx Carrier is deliberately muted***. At the end of the warm-up period, the bottom line reverts to the 'normal' opening screen display (i.e., it displays the Firmware version), and the modem enters into its normal operational state.

The user may bypass (override) the warm-up period at any time by pressing the CLEAR ***key.***

5.2.2.6.6 UTIL: ID (Circuit ID)

```
Edit Circuit ID:(◄ ►,▲ ▼)
24 CHARACTER TST MESSAGE
```

A 24-character Circuit ID string may be composed on the bottom line only. To compose the Circuit ID string, first use the ◄ ► arrow keys to select a character to edit, and then use the ▲ ▼ arrow keys to edit that character.

The following characters are available (a maximum length of 24 characters of allowed**)**:

[Space] **( ) * + - . / 0** *through* **9 and A** *through* **Z.**

Press **ENTER** when done.

5.2.2.6.7 UTIL: 1:1 (Manual 1:1 Switchover)

```
Press ENT to force modem
to Standby (1:1 ONLY)
```

If this modem is the *online* unit in a 1:1 redundant configuration, press **ENTER** to force the unit into **Standby mode.** Otherwise, press **CLEAR** to exit this menu and return to the previous menu *without* causing the switchover.

5.2.2.6.8 UTIL: VFD (Video Fluorescent Display Brightness)

```
Edit Display Brightness:
100%          (▲ ▼,ENTER)
```

Use the ▲ ▼ arrow keys to edit the display brightness. The available brightness values are **25%**, **50%**, **75%**, or **100%.** Press **ENTER** when the brightness is suitable.

5.2.2.6.9 UTIL: Firmware

```
Firmware Image:
Info Select    (◄ ►,ENTER)
```

This series of submenus is used to view information about the CDM-570/570L internal firmware. The modem can store two complete firmware images, and the image to be loaded upon the next unit re-boot may be selected here.

THESE MENUS ARE INTENDED FOR DIAGNOSTIC PURPOSES ONLY. DO NOT CHANGE AN IMAGE UNLESS OTHERWISE INSTRUCTED BY COMTECH EF DATA CUSTOMER SUPPORT.

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

5.2.2.6.9.1 (UTIL: Firmware Image) Info

```
Firmware Info: Bootrom
Image#1   Image#2   MPP50
```

Use the ◄ ► arrow keys to select **Bootrom**, **Image#1**, **Image#2**, or **MPP50** (only when the optional IP Module is installed), and then press **ENTER**.

Each image is further broken down to display component-level firmware information – the available component choices will differ, dependant on whether the optional E1 RAN Optimization / WAN Adaptation (WAd) Processor Board is installed or not. Where **Image#X** denotes **Image#1** or **Image#2**:

No WAd board present:

```
Image#X: Bulk  Main-FPGA
App Turbo-FPGA  RS-FPGA
```

WAd board present:

```
Image#X: Bulk  Main-FPGA
App Turbo-FPGA  WAd-FPGA
```

Use the ◄ ► arrow keys to select a component, and then press **ENTER** to display that firmware component's information.

If, for example, **Bulk** is selected, a screen similar to the following example displays:

```
Bulk#X:        08/14/09
FW/10805AH        1.7.0
```

5.2.2.6.9.2 (UTIL: Firmware Image) Select

```
Current Active Image: #1
Next Reboot Image: #1 #2
```

The top line displays the current active image. On the bottom line, use the ◄ ► arrow keys to select the image to be loaded and active upon the next unit re-boot.

5.2.2.6.10 UTIL: FAST (FAST Code Options)

***For more information about enabling FAST options, see* Appendix C. FAST ACTIVATION PROCEDURE.**

FAST (**F**ully **A**ccessible **S**ystem **T**opology) provides the means to enable new options in the modem. Contact Comtech EF Data during normal business hours to obtain the **FAST Access Code** for the desired option.

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

The **FAST** menu allows the user to ***configure*** (enter) a new FAST Access Code into the modem, ***view*** which options are currently installed, and ***enable*** Demo Mode. Additionally, this display provides the Hardware Revision Number on the top line, and the Main Board Serial Number on the bottom line.

Note: The Main Board Serial Number is a unique identifier for the FAST upgrade process and is different from the Chassis Serial Number. This number is required in order to obtain a new FAST Access Code from Comtech EF Data Customer Support.

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

5.2.2.6.10.1 (UTIL: FAST) Cnfg (FAST Configuration)

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

Use the ◄ ► arrow keys to select **Edit Code** or **Demo Mode**, and then press **ENTER**.

(UTIL: FAST) FAST Configuration: Edit Code

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

To enable new FAST options in the modem, the user must first obtain the **FAST Access Code** for the new option from Comtech EF Data Customer Support. Once obtained, the FAST Access Code must be entered *carefully*. First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to edit that digit. Press **ENTER** when the FAST Access Code has been fully entered.

If the FAST Access Code is entered correctly, the modem **accepts** the code and displays the message "`Configured correctly.`" as follows:

```
Configured Successfully
        (ENTER or CLEAR)
```

If the FAST Access Code is *not* entered correctly, or an invalid code is entered, the modem **rejects** the code and displays the message "`Fast Code Rejected!`" as follows:

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

Re-enter the FAST Access Code. Should the code entry error persist after repeating the procedure, contact Comtech EF Data Customer Support for further assistance.

(UTIL: FAST) FAST Configuration: Demo Mode

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

Use the ◄ ► arrow keys to select FAST Demo Mode as **Off** or **On**, and then press **ENTER**.

When **On**, the bottom line displays the number of available seconds remaining for the free Demo Mode. During this time, Demo Mode allows access to *ALL* CDM-570/570L FAST options for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of times until the 604800 seconds have expired. The available time decrements only when Demo Mode is **On**.

When the Demo period expires, the following message displays:

```
 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.

5.2.2.6.10.2 (UTIL: FAST) View

```
View Options: 03    (▲ ▼)
150W BPSU   Not Installed
```

Use the ▲ ▼ arrow keys to view which **FAST** options are currently installed or available.

The ***top line*** displays the Option Number. The ***bottom line*** provides a description for that option, along with its current operational status (i.e., "**`Installed`**" or "**`Not Installed`**"). Options listed as "**`Not Installed`**" are available for purchase from Comtech EF Data.

The available options are as follows:

Option Number	Option Type	Displayed Code	Description
01		150WBPSU	150 Watt, 48 volt BUC PSU
02		100W BPSU	100 Watt, 24 volt BUC PSU
03		RS Codec	Reed-Solomon Codec
04		TPC Codec	Turbo Product Codec
05	Hardware	Reserved	Reserved
06		IP Module	IP Traffic Module
07		WAd Card	E1 RAN Optimization / WAN Adaptation Processor Board
08		H/W Exp-2	Future Hardware Expansion 2
09		2048 kbps	2048 kbps max data rate
10		5000 kbps	5000 kbps max data rate
11		8PSK/8QAM	8-PSK and 8-QAM modulation
12		16-QAM	16-QAM modulation
13		9980 kbps	9980 kbps max data rate
14		Hdr Comp	IP Header Compression
15	FAST	Data Comp	IP Datagram Compression
16		IP QoS	IP Quality of Service
17		3xDES	IP 3xDES Encryption
18		Vipersat	Management by VMS
19		VFS	Vipersat File Streamer
20		G703 CEx	Clock Extension

5.2.2.7 SELECT: ODU Menus (CDM-570 ONLY)

```
Transceiver Control:
Disable Enable(◄ ►,ENTER)
```

For the CDM-570 only: This menu branch is used to monitor and control a Comtech EF Data RF Transceiver (CSAT-5060 or KST-2000A/B), if connected.

See* Appendix K. CDM-570 ODU (CSAT-5060 OR KST-2000A/B) OPERATION *for complete details about this modem-specific menu branch.

Notes:

Chapter 6. ETHERNET MANAGEMENT

6.1 Introduction

The CDM-570/570L base modem is equipped with an RJ-45 10/100 BaseT Ethernet management interface, used for monitor and control purposes. This section provides a high-level overview of the functionality provided by this interface and references other chapters for further details.

6.2 Ethernet Management Interface Protocols

The modem 10/100 BaseT Ethernet Management Interface supports three (3) different management protocols:

- HTTP (Web Server) interface for complete product management
- SNMP with public and private MIB
- Telnet interface for remote product M&C

In general, the operation of each of these interfaces is essentially identical to the management interfaces that are available when the optional IP Module is installed.

1. ***In* Remote → Ethernet *mode, Serial monitoring is allowed; however, Serial control is not allowed except for use of the LRS (Local/Remote Status) and FPL (Front Panel Lockout) commands/queries.***
2. ***The Ethernet M&C port is designed to be used on a CDM-570/570L modem that does NOT have the optional IP Module installed. With the IP Module installed, the IP Module Traffic port and base modem M&C port will share the same IP address and can cause an IP conflict on the local network if both ports are used. Therefore, when the IP Module is installed, only the IP Module Traffic port should be used for IP traffic, base modem and IP Module FW upgrades, and Ethernet Management.***

   The Traffic port supports Ethernet Management of all IP Module functions as well as all base modem functions via Web, Telnet and SNMP.

6.3 HTTP (Web Server) Interface

This embedded application provides the user with an easy to use interface to configure and monitor all aspects of the Base Modem. These web pages have been designed for optimal performance when using Microsoft's Internet Explorer 5.5 or higher.

Currently, Comtech EF Data offers two independent HTTP Interfaces with the CDM-570/570L modem:

- **Base Modem HTTP Interface** – For details, see **Chapter 7. BASE MODEM HTTP INTERFACE.**
- **IP Module HTTP Interface** – Available when the optional IP Module Interface is installed. For details on this optional feature, see **Chapter 13. IP MODULE HTTP INTERFACE.**

The optional IP Module does NOT need to be installed for base modem operations.

All HTTP Interfaces are accessible using a Web browser by typing (depending on the interface) "*http://www.xxx.yyy.zzz*" or "*https://www.xxx.yyy.zzz*" in the browser's **Address** box, where "*www.xxx.yyy.zzz*" is the IP address of the modem (as configured from the CDM-570/570L front panel menu: **SELECT: CONFIG → REM → ETHERNET → ADDRESS**. Refer to **Chapter 5. FRONT PANEL OPERATION** for further details).

To access the HTTP Interface via the Ethernet M&C port, the CDM-570/570L must be configured via* SELECT: CONFIG → REM → ETHERNET. *If modem Remote is set to* LOCAL *or* SERIAL*, the HTTP Interface will display "Modem Remote Control is not in Ethernet mode".

For base modems as well as modems equipped with the optional IP Module, the user is prompted to type in a valid User Name and Password, similar to the dialogue box shown to the right.

(Note that the site IP address shown in this example is for display purposes only. Contact your network administrator to determine the appropriate IP address assignment for your modem.)

Typical HTTP Login Access Levels, User Names, and Passwords are defined as follows:

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
Web	Full Access to all Web Pages	No Access to Admin pages	No Access to Admin pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

CDM-570/570L Satellite Modem HTTP Interface Default Name/Passwords		
Admin User	Read/Write User	Read Only User
comtech/comtech	opcenter/1234	monitor/1234

Type the appropriate User Name and Password, and then click **OK**. For detailed information on navigating the specific CDM-570/570L HTTP Interface, refer to the pertinent chapter or section in this manual, as previously listed.

6.4 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an Internet-standard protocol for managing devices on IP networks. An SNMP-managed network consists of three key components:

- The managed device – this includes the CDM-570/570L.
- The SNMP Agent — the software (i.e., MIB file) that runs on the CDM-570/570L. The CDM-570/570L SNMP Agent supports both **SNMPv1** and **SNMPv2c**.
- The user-supplied Network Management System (NMS) — the software that runs on the manager.

1. ***For proper SNMP operation, the CDM-570/570L MIB files must be used with the associated version of the CDM-570/570L modem M&C and the IP Module SW. Please refer to the CDM-570/570L FW Release Notes for information on the required FW/SW compatibility.***
2. ***For SNMP access via the Ethernet M&C port, the CDM-570/570L must be configured via* SELECT: CONFIG → REM → ETHERNET*.***

6.4.1 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.

The following MIB files are associated with the CDM-570/570L:

MIB File/Name (where '*X*' indicates the revision letter)	Description
FW10874-2*X*.mib ComtechEFData MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
FW10874-3*X*.mib IP Module MIB file	MIB file for the optional IP Module consists of all of the OIDs for management of the IP functions
FW10874-4*X*.mib CDM-570/570L MIB file	MIB file consists of all of the OIDs for management of the CDM-570/570L modem functions
FW10874-5*X*.mib CDM-570/570L Traps MIB file	Trap MIB file is provided for SNMPv1 traps common for base modems.

MIB File/Name (where '*X*' indicates the revision letter)	Description
FW10874-6*X*.mib CDM-570L BUC/LNB MIB file	CDM-570L MIB file consists of all of the OIDs for management of the BUC and LNB.
FW10874-7*X*..mib CDM-570L L-Band BUC/LNB Traps MIB file	CDM-570L Trap MIB file is provided for BUC and LNB SNMPv1 traps
FW10874-8*X*..mib CSAT-5060 MIB file	MIB file consists of all the OIDs for management of the CSAT-5060 Transceiver connected to the CDM-570 modem through FSK.
FW10874-9*X*..mib KST-2000A/B MIB file	MIB file consists of all the OIDs for management of the KST-2000A/B Transceiver connected to the CDM-570 modem through FSK.

The SNMP agent supports both "SNMPv1" and "SNMPv2c". The "Traps" file only needs to be compiled if "SNMPv1" traps are to be used.

6.4.2 SNMP Community Strings

In SNMP v1/SNMPv2c, 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. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The CDM-570/570L 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.

Type the SNMP Community String into the user-supplied MIB Browser or Network Node Management software. The user defines three Community Strings for SNMP access:

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

Note: Maximum number of characters for community strings shall not exceed 20. All printable ASCII characters, except '\' and '~' are allowed. No trailing spaces are permitted for community strings.

6.4.3 SNMP Traps

The CDM-570/570L has the ability to send out SNMP traps when certain events occur in the modem. For example, when the CDM-570/570L boots it sends out a coldstart trap and three linkup traps, one for each interface that is brought up. The CDM-570/570L also sends out traps when an alarm or a fault occurs in the modem. These include unit faults, TX faults, and RX faults. A trap is sent both when a fault occurs and is cleared.

The CDM-570/570L supports both SNMPv1 traps and SNMPv2 notifications. The style of traps that is sent by the CDM-570/570L sends can be configured by the user using the cdmipSnmpTrapVersion OID.

The following tables list the MIB-II v1traps/v2 notifications that the modem supports:

CDM-570/570L MIB-II SNMPv1 traps:	
Cold Start	1
Link Up	4
Authentication Failure	5

CDM-570/570L MIB-II SNMPv2 notifications:	
Cold Start	1.3.6.1.6.3.1.1.5.1
Link Up	1.3.6.1.6.3.1.1.5.4
Authentication Failure	1.3.6.1.6.3.1.1.5.5

The following tables list the Alarms and Faults v1 traps / v2 notifications that the modem supports.

CDM-570/570L Alarms and Faults SNMPv1 traps:	
cdm570LUnitAlarm	6247241
cdm570LTxTrafficAlarm	6247242
cdm570LRxTrafficAlarm	6247243
cdm570LODUAlarm	6247244

CDM-570/570L Alarms and Faults SNMPv2 notifications:	
cdm570LUnitAlarm	1.3.6.1.4.1.6247.24.2.0.1
cdm570LTxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.2
cdm570LRxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.3
cdm570LODUAlarm	1.3.6.1.4.1.6247.24.2.0.4

6.4.4 MIB-II

The CDM-570/570L agent implements RFC 1213, Management Information Base for Network Management of TCP/IP-based Internets. This is known as “MIB-II” or “Public MIB support.” The agent implements the following groups:

Group	Comments
System Group	Mandatory for RFC1213
Interface	Mandatory for RFC1213
IP	Mandatory for RFC1213
ICMP	Mandatory for RFC1213

Group	Comments
TCP	Mandatory for RFC1213
UDP	Mandatory for RFC1213
SNMP	Mandatory for RFC1213
Address Translation Group	Implemented but depreciated in MIB-II
EGP	Not applicable

For detailed OID information please refer to the actual MIB file.

6.4.5 Private MIB

The CDM-570/570L SNMP implements common modem MIBs that contain all the modem specific parameters common to the CDM-570/570L. In addition, the CDM-570L SNMP also implements a BUC and LNB MIB for RF parameters.

Whenever modifying the Modulator or Demodulator parameters by SNMP, it is important that the variables must be executed in the following:

1. **FEC (Forward Error Correction)**
2. **Modulation or Demodulation**
3. **Code Rate**
4. **Data Rate**

For detailed OID information please refer to the actual MIB file.

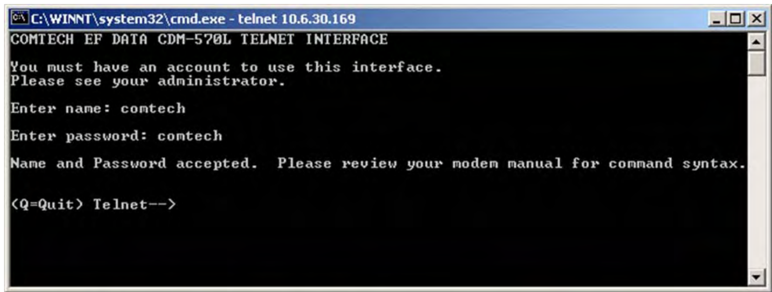
6.5 Telnet Interface

The modem provides a Telnet interface for two primary functions:

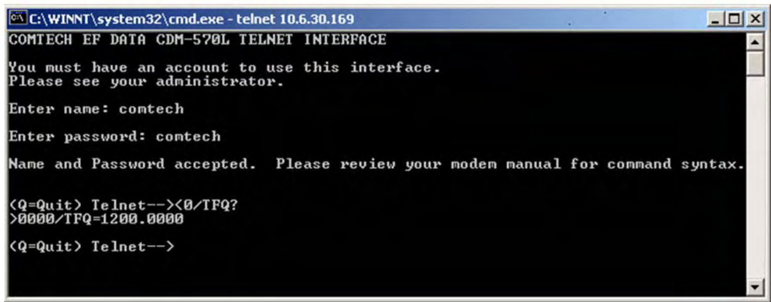
- Equipment M&C via the standard equipment Remote Control protocol
- Equipment M&C via Comtech Monitor and Control System (CMCS) application

Telnet connection is allowed in both Serial remote mode and Ethernet remote mode.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level. The login process appears as follows:



Once logged into the Telnet interface as the Administrator, the user can access the standard remote control interface defined in **Appendix D. REMOTE CONTROL** as shown in this example:

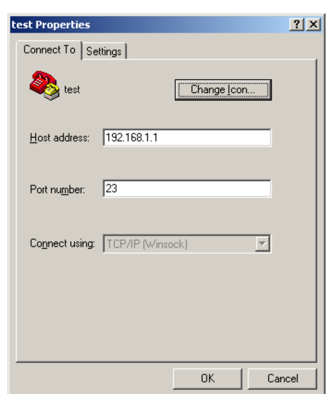


6.5.1 HyperTerminal as Telnet Client

There is a disadvantage when using Windows Command-line as Telnet Client. Since Command-line cannot translate a '\r' to a '\r\n' for the messages coming from Telnet Server, the multi-line command/query response (for example, the **FRW?** query response) will be displayed as one line, with the latter lines overwriting the previous lines.

In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client. To do so, configure the HyperTerminal as follows:

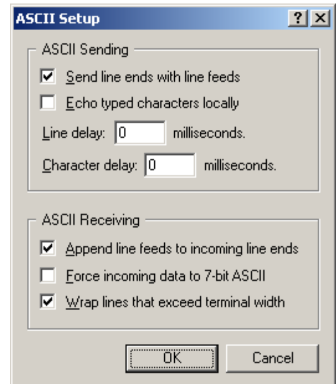
1. From the HyperTerminal **Properties** | **Connect To** tab: Connect using TCP/IP instead of COM1 or COM2.



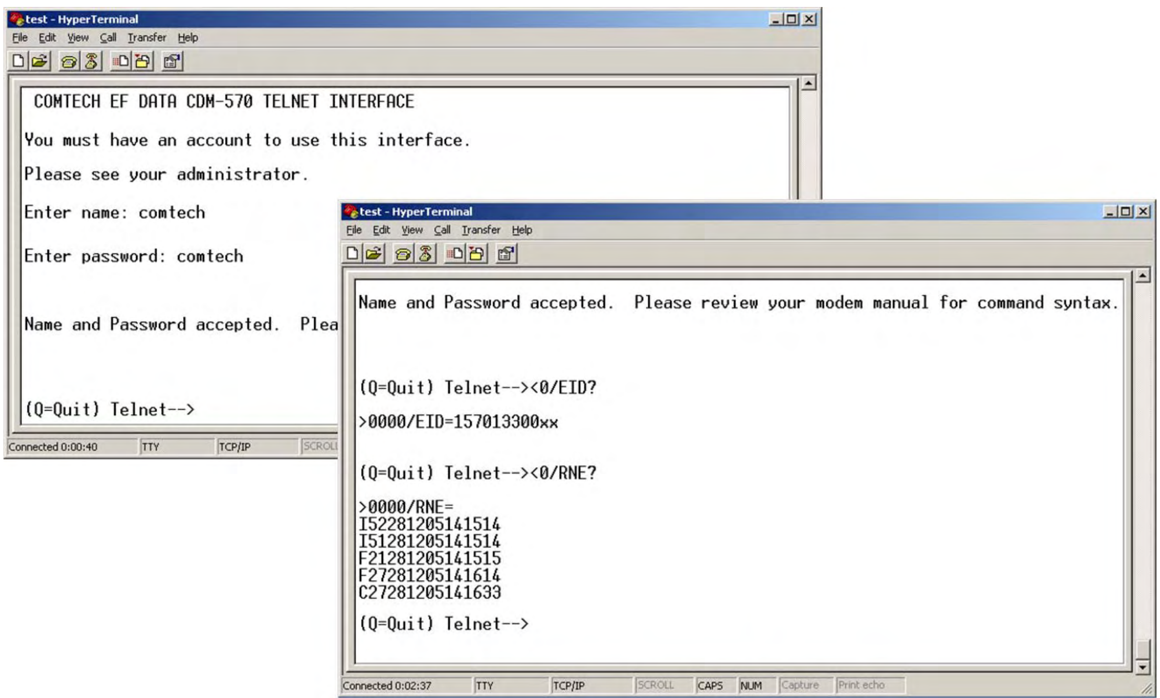
2. From the HyperTerminal **Properties** | **Settings** tab, using the **ASCII Setup...** window:

   - For **ASCII Sending**, check "**Send line ends with line feeds**"

   - For **ASCII Receiving**, check "**Append line feeds to in-coming line ends**"



Examples of HyperTerminal configured as Telnet Client are as follows:



Chapter 7. BASE MODEM HTTP INTERFACE

7.1 Overview

This chapter describes the functionality of the CDM-570/570L Base Modem HTTP Interface (i.e., for use with the base modem as well as the optional IP Module). The operational parameters available on the Web pages for this non-secure interface complement operation of the CDM-570/570L front panel menus (see **Chapter 5. FRONT PANEL OPERATION**) and the use of remote control command and queries via the serial-based network management interface (see **Appendix D. REMOTE CONTROL**).

Information about the functionality of the CDM-570/570L Satellite Modem HTTP Interface for use with the optional IP Module is provided in **Chapter 13. IP MODULE HTTP INTERFACE*.***

The Ethernet M&C port is designed to be used on a CDM-570/570L modem that does NOT have the optional IP Module installed. With the IP Module installed, the IP Module Traffic port and base modem M&C port will share the same IP address and can cause an IP conflict on the local network if both ports are used. Therefore, when the IP Module is installed, only the IP Module Traffic port should be used for IP traffic, base modem and IP Module FW upgrades, and Ethernet Management.

The Traffic port supports Ethernet Management of all IP Module functions as well as all base modem functions via Web, Telnet and SNMP.

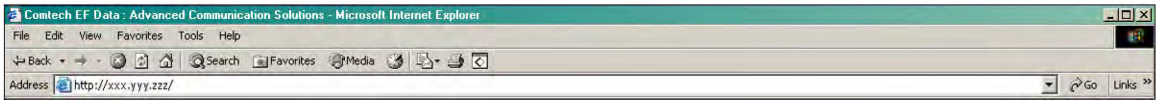
7.2 Base Modem HTTP Interface Introduction

The embedded HTTP Interface application provides the user with an easy to use interface to configure and monitor all aspects of the CDM-570/570L. These Web pages have been designed for optimal performance when using Microsoft's Internet Explorer Version 5.5 or higher (the examples shown use Internet Explorer Version 7.0).

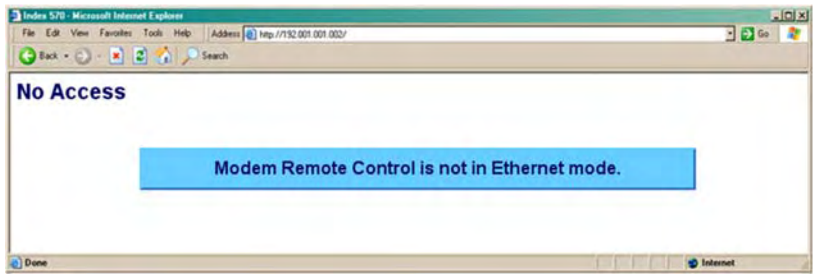
The user can fully control and monitor base operations of the CDM-570/570L from the HTTP Interface. By rolling the cursor over the navigation tabs located at the top of each page (shown at right), the user can select from the available nested hyperlinks.

7.2.1 User Login

To initiate a Web session with the CDM-570/570L Modem, from the PC type *http:/www.xxx.yyy.zzzz* (where *"www.xxx.yyy.zzz"* represents the IP address of the CDM-570/570L) into the **Address** area of the Web browser:



If the user attempts to access the Base Modem HTTP Interface and the modem Remote Control is set to Local or Serial mode, the following message appears:



The user will need to set the CDM-570/570L to Ethernet mode. Use the ◄ ► arrow keys from the CDM-570/570L front panel main (**SELECT:**) menu: Select **CONFIG → Rem → Ethernet**, and then press **[ENTER]**. Type in the modem's IP address in the browser window once more.

The user is then prompted to type in a valid **User name** and **Password**, similar to the dialog box shown to the right. For all interfaces, the default for both is **comtech**.

(Note that the site IP address shown in this example is for display purposes only. Contact your network administrator to determine the appropriate IP address assignment for your modem.)

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

HTTP Login Access Levels, User Names, and Passwords are defined as follows:

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
Web	Full Access to all Web Pages	No Access to Admin pages	No Access to Admin pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

CDM-570/570L Satellite Modem HTTP Interface Default Name/Passwords		
Admin User	Read/Write User	Read Only User
comtech/comtech	opcenter/1234	monitor/1234

Once the valid IP address has been entered, the CDM-570/570L Satellite Modem HTTP Interface "splash" page is displayed. As shown in **Figure 7-1** and **Figure 7-2**, depending on the unit in use and the equipment configured for use with that unit, from this top level menu the user has access to five or six navigation tabs.

7.2.1.1 CDM-570 Base Modem HTTP Interface "Splash" Page

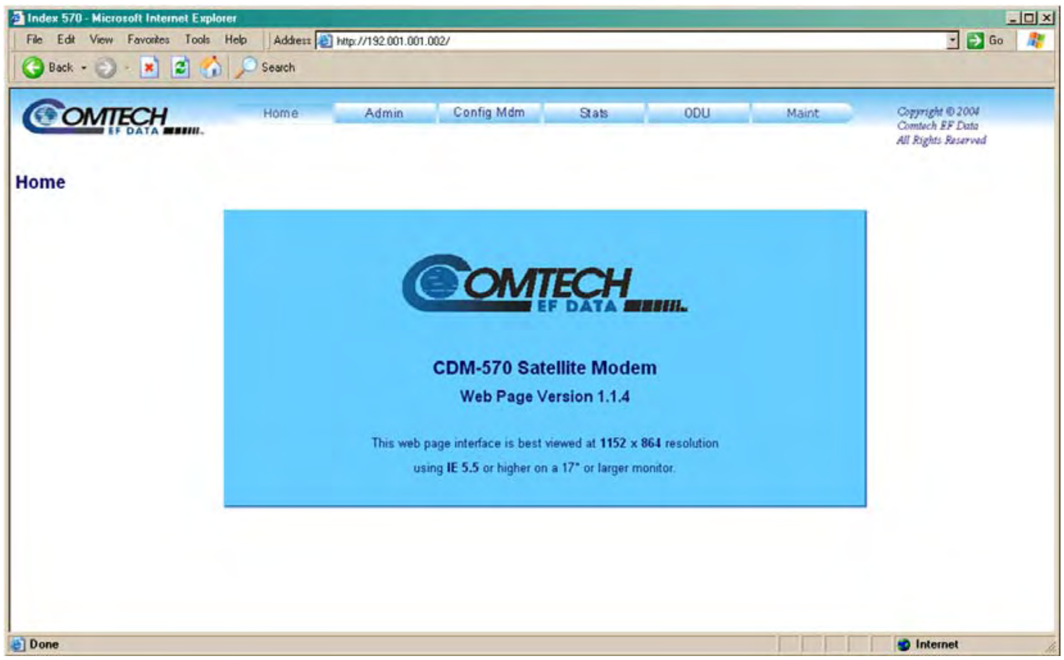


Figure 7-1. CDM-570 "Splash" page

The options available through the CDM-570 Base Modem HTTP Interface are illustrated via the following menu tree:

Home	Admin	Config Mdm	Stats	ODU*	Maint
Home	Access	Modem	Modem Status	Config	Unit Info
Contact	Remote	Modem Utilities	Modem Logs	Status	
Support		AUPC	Graphs (Minute Hour Day)	Utilities	
		Timeslot Selection			

Beyond the top-level row of navigation tabs (shown in blue), the diagram illustrates the available nested hyperlinks (shown in grey) that afford the user more specific functionality.

**** The 'ODU' tab and its related hyperlinks are accessible to the user only when a CSAT-5060 or KST-2000A/B Outdoor Unit is connected via FSK to the CDM-570. These pages are fully defined in Appendix K. CDM-570 ODU (CSAT-5060 OR KST-2000A/B) OPERATION.***

For either modem interface, click any tab to continue.

7.2.1.2 CDM-570L Base Modem HTTP Interface “Splash” Page

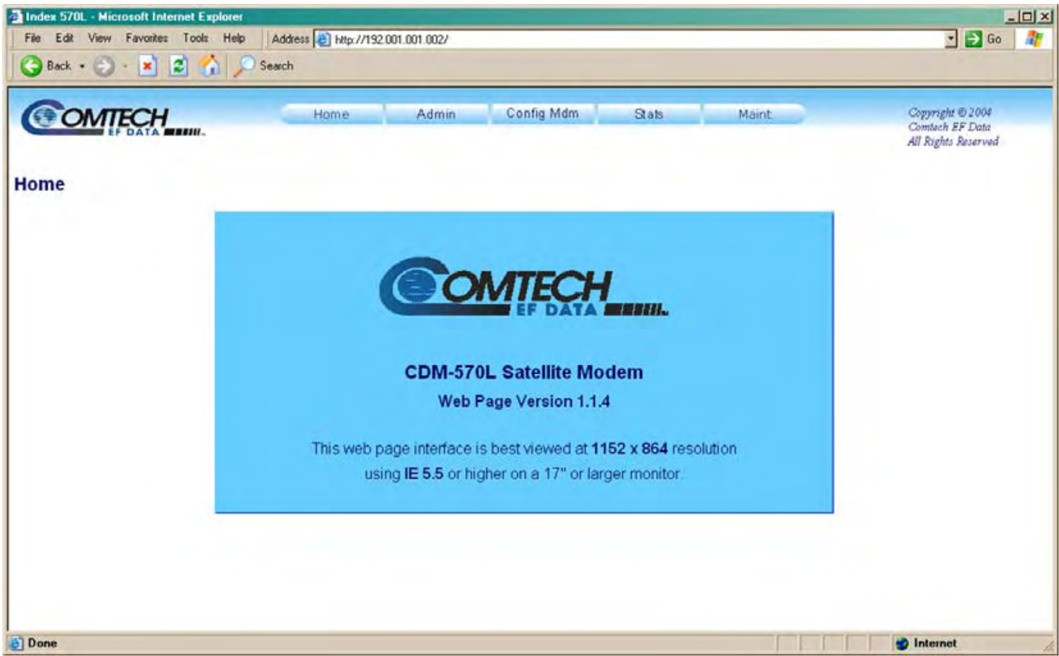


Figure 7-2. CDM-570L “Splash” page

The options available through the CDM-570L Base Modem HTTP Interface are illustrated via the following menu tree:

Home	Admin	Config Mdm	Stats	Maint
Home	Access	Modem	Modem Status	Unit Info
Contact	Remote	Modem Utilities	Modem Logs	
Support		AUPC	Graphs (Minute Hour Day)	
		Timeslot Selection		
		BUC*		
		LNB*		

Beyond the top-level row of navigation tabs (shown in blue), the diagram illustrates the available nested hyperlinks (shown in grey) that afford the user more specific functionality.

**** The ‘BUC’ and ‘LNB’ hyperlinks found under the ‘Config Mdm’ tab are accessible only when a BUC (Block Upconverter) or LNB (Low-Noise Block Downconverter) is connected to the CDM-570L. These pages are fully defined in Appendix L. CDM-570L ODU (BUC OR LNB) OPERATION.***

For either modem interface, click any tab to continue.

7.3 HTTP Interface Page Descriptions

The sections that follow detail the Web pages accessible via hyperlink from the navigation tabs illustrated by the splash pages shown in **Sect. 7.2.1.1** and **7.2.1.2**.

Each section subsequently defines features common to either the CDM-570 or the CDM-570L Base Modem HTTP Interfaces (content unique to either the CDM-570 or CDM-570L interface is noted accordingly):

For:	***See:***
Home Pages	**Sect. 7.3.1**
Admin (Administration) Pages	**Sect. 7.3.2**
Config Mdm (Configure Modem) Pages	**Sect. 7.3.3**
Stats Pages	**Sect. 7.3.4**
ODU (Outdoor Unit) Page	**Sect. 7.3.5** ***(CDM-570 only) – summary only***
Maint (Maintenance) Page	**Sect. 7.3.6**

7.3.1 Home Pages

Click the **Home**, **Contact**, or **Support** hyperlink to continue.

7.3.1.1 Home | Home

Figure 7-3. Satellite Modem Home page (CDM-570L shown)

From any location within the Base Modem HTTP Interface, the user can select the **Home** tab and/or hyperlink to return back to this top-level page.

7.3.1.2 Home | Contact

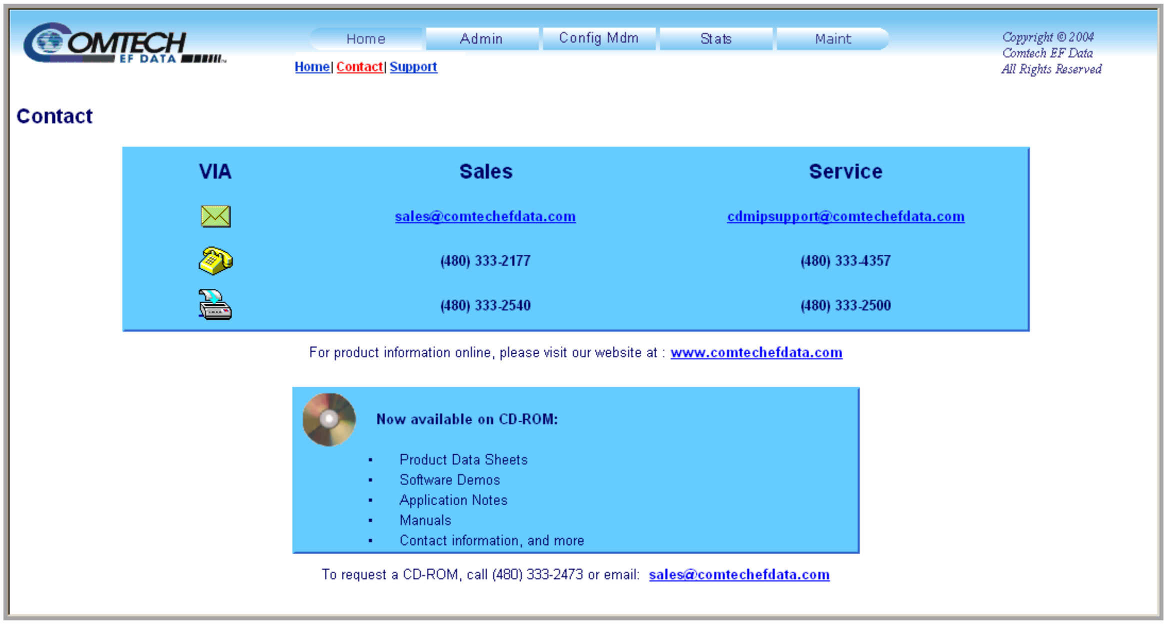


Figure 7-4. Home | Contact page

The ***read-only*** **'Home | Contact'** page (**Figure 7-4**) provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone, fax, or e-mail hyperlinks.

7.3.1.3 Home | Support

For this page to operate correctly, the modem's administrator is required to specify the SMTP server, domain name, and destination on the* Admin | Access *page (see Sect. 7.3.2.1).

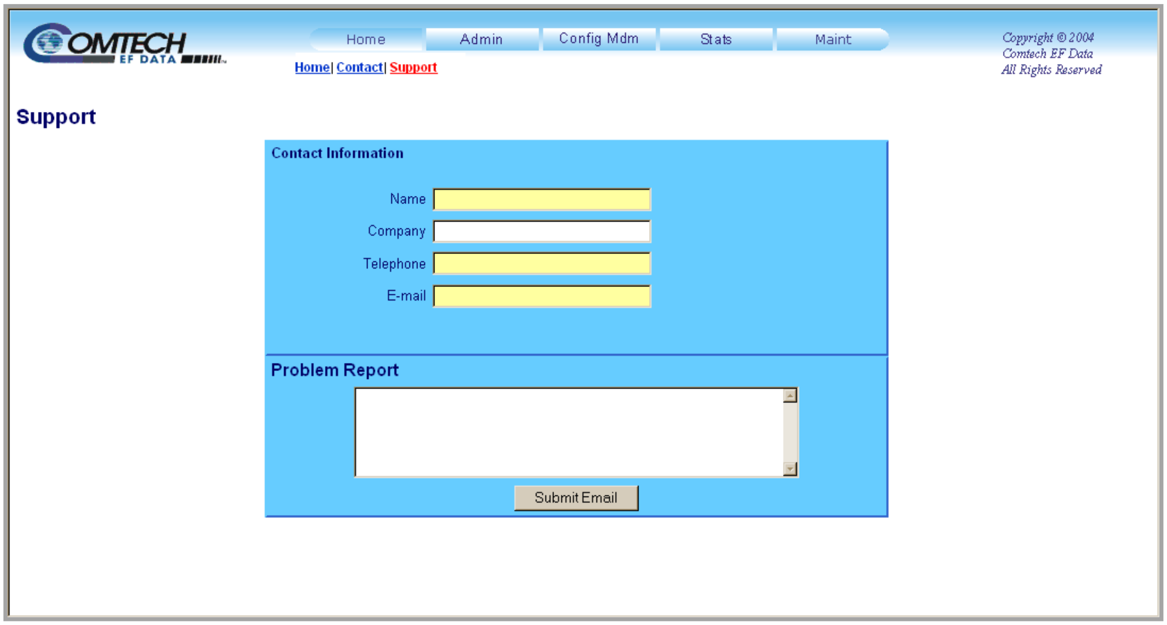


Figure 7-5. Home | Customer Support page

The **'Home | Support'** page (**Figure 7-5**) uses SMTP (Simple Mail Transport Protocol) to submit questions about or report problems with the CDM-570/570L to Comtech EF Data Modem Support (cdmipsupport@comtechefdata.com).

Type the pertinent contact information into the **Contact Information** fields – **Name**, **Company**, **Telephone**, and **E-mail** address – and then use the **Problem Report** section to compose a message consisting of up to a maximum 256 characters.

Click [**Submit Email]** to send the message.

7.3.2 Admin Pages

Only users who have logged in using the Administrator Name and Password have access to the nested Admin pages.

The nested '**Admin'** pages enable setup of the parameters required for proper user communication with the CDM-570/570L HTTP Interface.

Click the **Access** or **Remote** hyperlink to continue.

7.3.2.1 Admin | Access

Use of this page is restricted to users with Administrator login privileges.

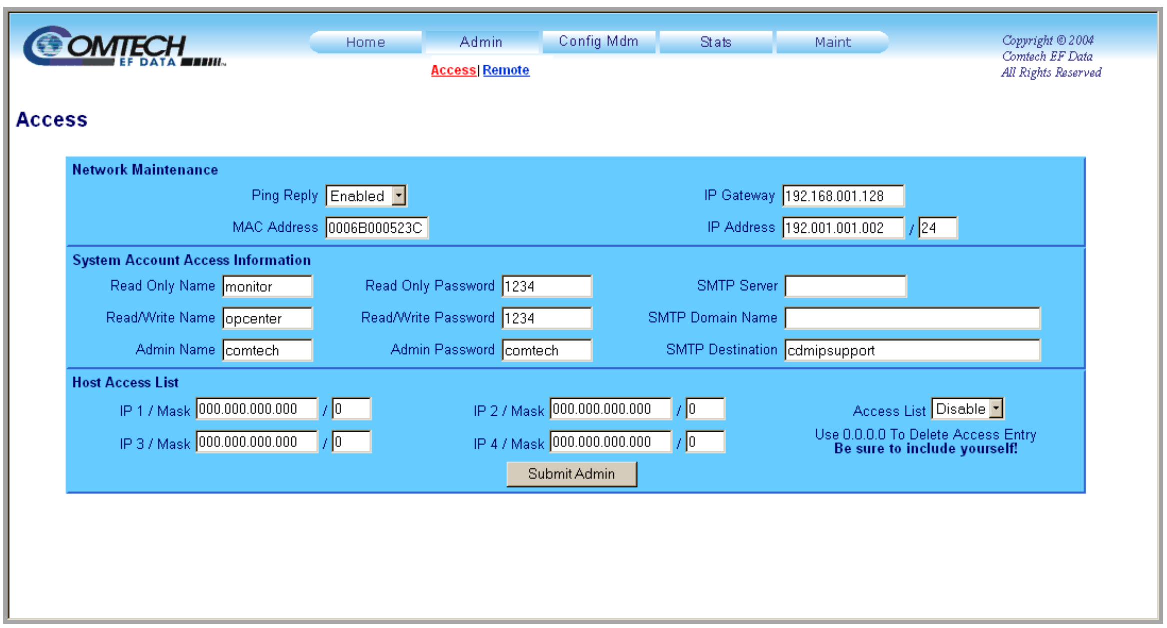


Figure 7-6. Admin | Access page

Use the '**Admin | Access'** page (**Figure 7-6)** to set up and maintain the user names, passwords, e-mail server, and the host IP addresses required for communication with the CDM-570/570L HTTP Interface.

Network Maintenance

- **Ping reply –** Use the drop-down to set ping reply as **Enabled** or **Disabled**.
- **MAC address –** This is ***read-only*** and cannot be edited.

- **IP Gateway / IP Address –** Specify an IP address and a subnet mask for the modem in use.

System Account Access Information

- **Admin, Read/Write, and Read Only Names and Passwords –** The factory defaults for these names/passwords are as follows:

Admin	comtech/comtech
Read/Write	opcenter/1234
Read Only	monitor/1234

Note: The **Name** and **Password** fields can each accept any alphanumeric combination with a maximum length of 10 characters.

- **SMTP Server –** Specify the mail server IP address from where to send the e-mail.

- **SMTP Domain Name / Destination –** The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the Support Page (**Sect. 7.3.1.3** in this chapter) is to be used. Note the following:

SMTP Domain Name	Specify the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
SMTP Domain Destination	Specify the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Host Access List

- **IP** *(#)* **/ Mask –** Use the Host Access List to define which remote clients can connect when the Access List is **Enabled**. Each entry allows a user to specify an IP address and a subnet mask to define a unique class of machines that are allowed access.

  For example, if a user wants to grant access to a PC with an IP Address of 10.10.10.1, and any PC on a subnet of 192.168.10.xxx, then the Access List would be defined as:

  IP 1 / Mask: 10.10.10.1/32
  IP 2 / Mask: 192.168.10.0/24

  For **IP 3 / Mask** and **IP 4 / Mask**, make sure they are not 0.0.0.0/0. An entry with 0.0.0.0/0 simply means any machine is allowed access.

- **Access List –** Use the Access List to grant access via HTTP and SNMP to a well-defined list of client machines. From the drop-down, select **Enable** or **Disable**. If **Disabled**, then any client machine will be able to connect via HTTP and SNMP.

Click [**Submit Admin]** to save any changes made to this page.

7.3.2.2 Admin | Remote

***Use of this page is restricted to users with Administrator login privileges*.**

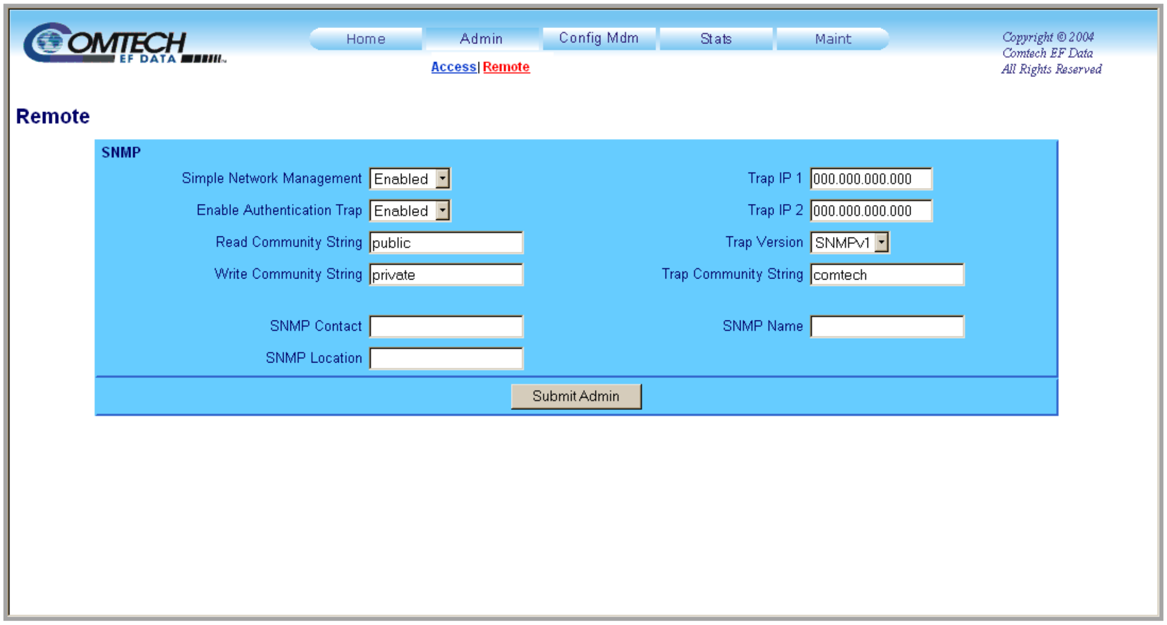


Figure 7-7. Admin | Remote page

Use the '**Admin | Remote'** page (**Figure 7-7**) to set and return administration information for the CDM-570/570L Simple Network Management Protocol (SNMP) feature.

The Administrator may:

- Use the drop-down menus to set **Simple Network Management** and **Enable Authentication Trap** as **Enabled** or **Disabled**
- Assign up to two SNMP **Trap IP** addresses (**Trap IP 1** and **Trap IP 2**)
- Use the drop-down menu to set the **Trap Version** as **SNMPv1** or **SNMPv2**
- Assign SNMP **Read**, **Write**, and **Trap Community Strings**. The factory defaults for these parameters are as follows:

Read Community String	public
Write Community String	private
Trap Community String	comtech

  Each Community String field can be any combination of characters and a length of 0 - 20 characters.

- Assign an **SNMP Contact**, **SNMP Name**, and **SNMP Location**

Click [**Submit Admin]** to save any changes made to this page.

***For details pertaining to the configuration parameters available on this page, see* Chapter 5. FRONT PANEL OPERATION *and* Sect. 6.3 SNMP INTERFACE.**

7.3.3 Config Mdm (Configure Modem) Pages

The nested **Config Mdm** (Configure Modem) pages provide the means to configure all modem parameters. Click the **Modem**, **Modem Utilities**, **AUPC**, **Timeslot Selection**, **BUC***, or **LNB*** hyperlink to continue.

**** The 'BUC' and 'LNB' hyperlinks shown in Figure 7-8 are available only on the CDM-570L Base Modem HTTP Interface. They provide the means to control and monitor a Block Upconverter or Low-Noise Block Downconverter connected to the CDM-570L. See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details on ODU operations via the CDM-570L Base Modem HTTP Interface.***

7.3.3.1 Config Mdm | Modem

***For detailed information about the configuration parameters available on this page, see* Chapter 5. FRONT PANEL OPERATION.**

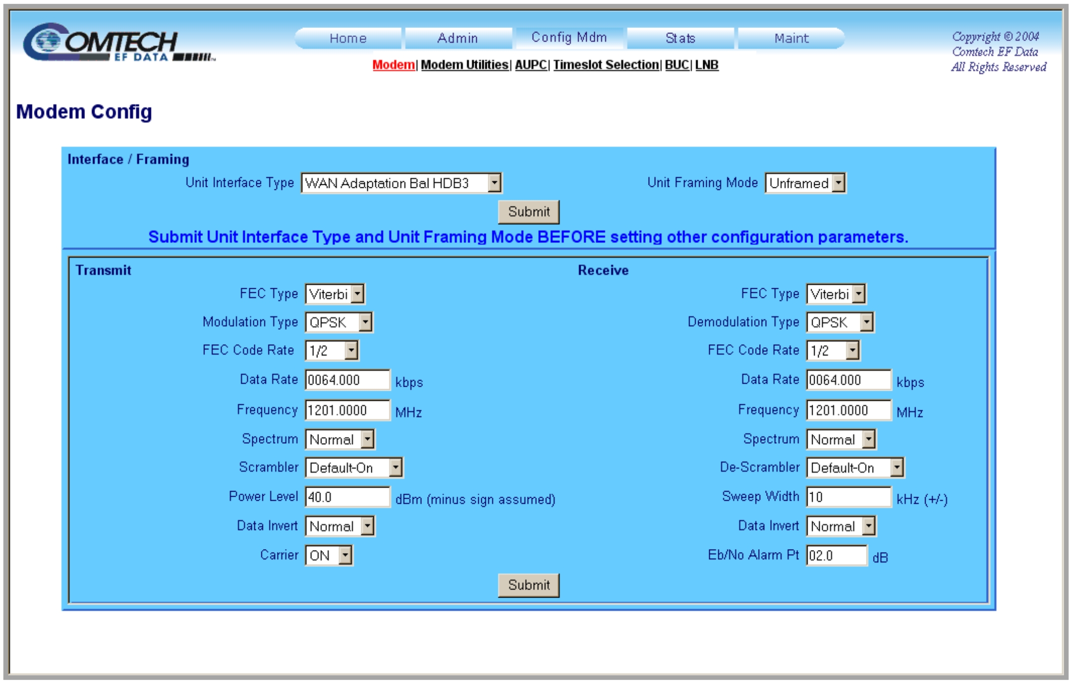


Figure 7-8. Config Mdm | Modem page

Use the '**Config Mdm | Modem'** page (**Figure 7-8**) to configure modem operating (Tx / Rx) parameters, including the Tx / Rx Interfaces and Framing.

The Tx / Rx Interface Types and Framing Modes have higher priority than other parameters, and should be configured before setting other parameters.

Click **[Submit]** to save any changes made to this page.

7.3.3.2 Config Mdm | Modem Utilities

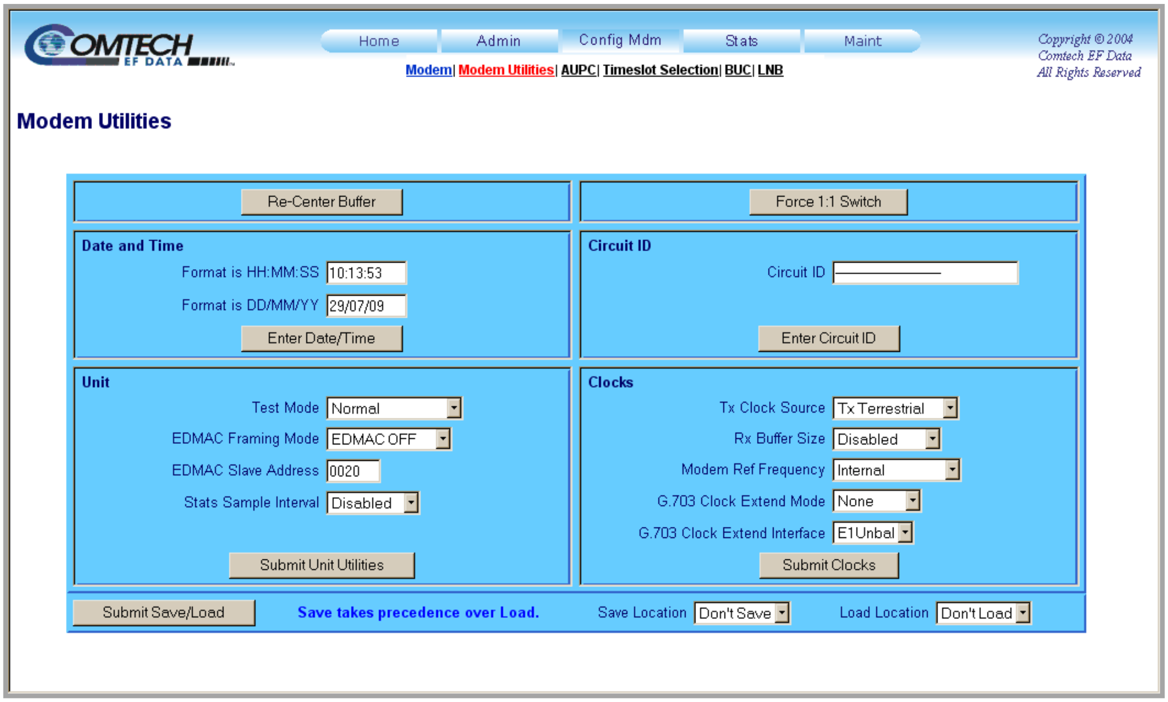


Figure 7-9. Config Mdm | Modem Utilities page

Use the '**Config Mdm | Modem Utilities**' page (**Figure 7-9**) to configure CDM-570/570L utility functions. From left to right, and from top to bottom, note the following:

Re-Center Buffer

- Click **[Re-Center Buffer]** to force recentering of the Plesiochronous/Doppler buffer.

Force 1:1 Switch

- Click **[Force 1:1 Switch]** to toggle the Unit Fail relay to the "fail" state for approx 500ms. If the unit is one in a 1:1 redundant pair and it is currently the ***online*** unit, this forces a switchover so the unit is then placed in ***standby*** mode. The command is always executed by the unit, regardless of whether it is standalone, in a 1:1 pair, or part of a 1:N system.

Date and Time

- Use the European continental format DD/MM/YY to enter the date (where DD = day [01 to 31], MM = month [01 to 12], and YY = year [00 to 99]).

- Use the international format HH:MM:SS to enter the time (where HH = hour [00 to 23], MM = minutes [00 to 59], and SS = seconds [00 to 59]).

  Click **[Enter Date/Time]** to save any changes made to this section.

Circuit ID

- Create a Circuit ID string of up to 24 alphanumeric characters. Click **[Enter Circuit ID]** when done.

Unit

- Configure **Test Mode**, **EDMAC Framing Mode**, **EDMAC Slave Address**, and **Stats Sample Interval**.

  Click **[Submit Unit Utilities]** to save any changes made to this section.

Clocks

- Configure **Tx Clock Sources**, **Rx Buffer Size**, **Modem Frequency Reference**, **G.703 Clock Extended Mode**, and **G.703 Clock Extend Interface**.

  Click **[Submit Clocks]** to save any changes made to this section.

Submit Save and Load

- Use **[Submit Save and Load]** to save and/or load (recall) up to 10 configuration sets numbered **0** through **9**.

  - ***To save a configuration set:*** Adjust all utilities parameters to suit, and then select **0** through **9** from the **Save Location** drop-down. Then, click **[Submit Save and Load]** to store the configuration setting. The setting is then bookmarked with a time and date stamp.

    The default **Save Location** setting is **Don’t Save**.

  - ***To load (recall) a configuration set:*** Select **0** through **9** from the **Load Location** drop-down, and then click **[Submit Save and Load]** to load the configuration setting.

    The default **Load Location** setting is **Don’t Load**.

7.3.3.3 Config Mdm | AUPC

***For details pertaining to AUPC configuration and operation, see* Chapter 9. AUTOMATIC UPLINK POWER CONTROL (AUPC).**

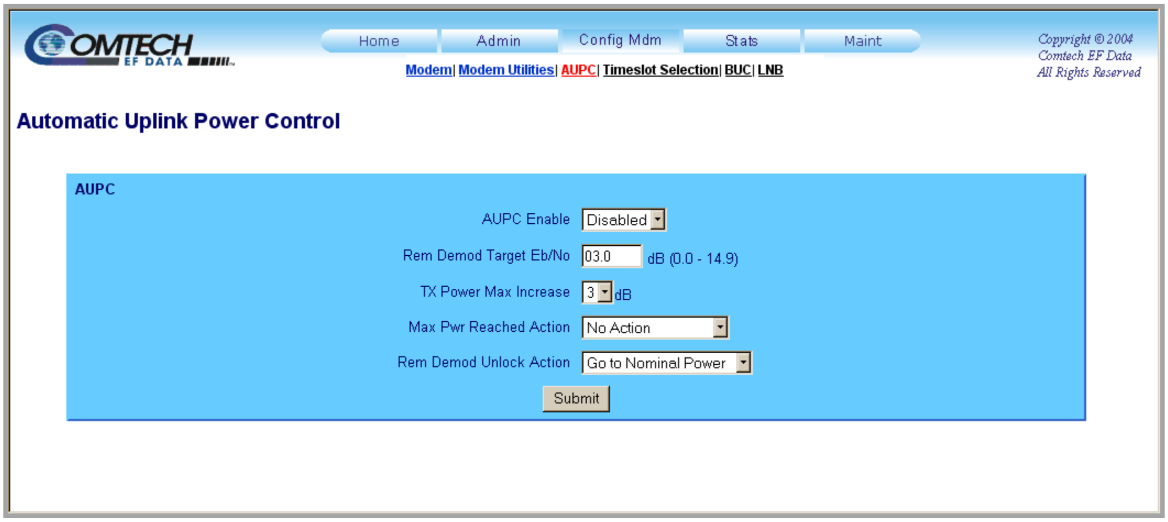


Figure 7-10. Config Mdm | AUPC page

Use the '**Config Mdm | AUPC'** page (**Figure 7-10**) to configure **A**utomatic **U**plink **P**ower **C**ontrol (AUPC). With AUPC, a local modem is permitted to adjust its own output power level in order to attempt to maintain the Eb/N0 at the remote modem.

Observe the following:

- **AUPC Enable:** Use the drop-down to select AUPC operation as either **Enabled** or **Disabled**.
- **Rem Demod Target Eb/No:** Type in a value, in dB, from **0.0** to **14.9**.
- **Tx Power Max Increase:** Use the drop-down to select a value, in dB, from **0** to **9**.
- **Max Pwr Reached Action:** Use the drop-down to set the action as **No Action** or **Generate Tx Alarm**.
- **Rem Demod Unlock Action:** Use the drop-down to set the action as **Go to Nominal Powe**r or **Go to Maximum Power**.

Click **[Submit]** to save any changes made to this page.

7.3.3.4 Config Mdm | Timeslot Selection

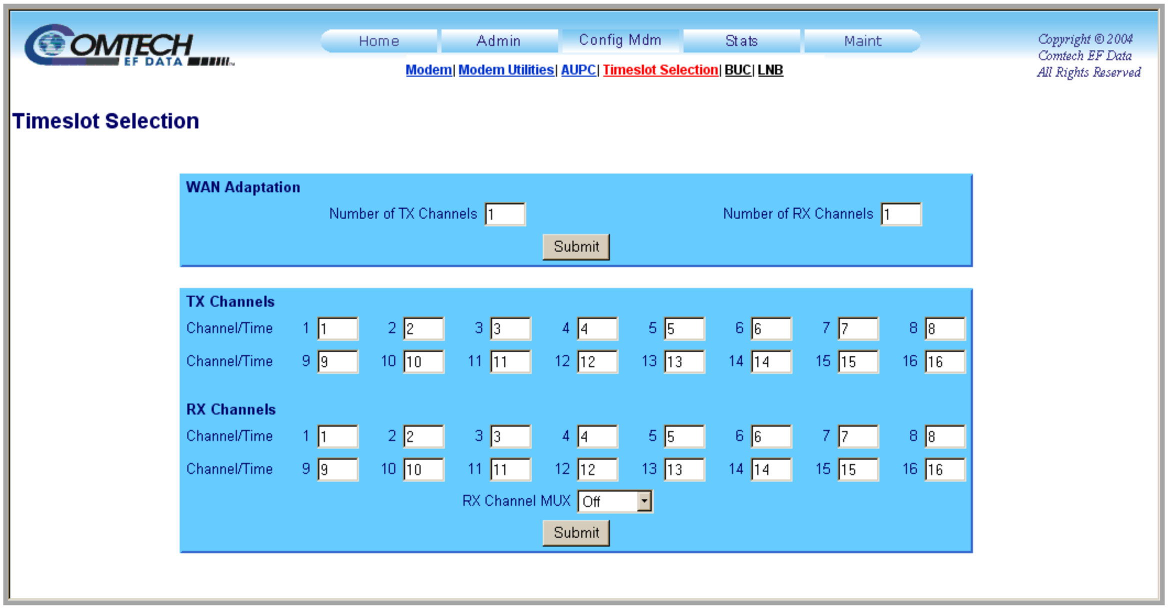


Figure 7-11. Config Mdm | Timeslot Selection page

The '**Config Mdm | Timeslot Selection**' page (**Figure 7-11**) operations are available from the CDM-570/570L Base Modem HTTP Interface *only* when the presence of the optional E1 RAN Optimization / WAN Adaptation Processor Board is detected. Use this page to configure the timeslots, channels, and D&I loop functionality associated with RAN Optimization / WAN Adaptation (RAN / WAd).

If the user attempts to access this page when there is no E1 RAN Optimization / WAN Adaptation Processor Board is installed, then the following message appears:

This modem does not have a WAN Adaptation Processor card.

For details pertaining to RAN / WAd functionality, see **Chapter 15. RAN OPTIMIZATION / WAN ADAPTATION.**

For detailed information about the monitoring parameters available on this pages, see **Chapter 5. FRONT PANEL OPERATION.**

7.3.4 Stats Pages

The nested '**Stats**' pages provide user access to status, operational statistics, and event logging windows.

Click the **Modem Status**, **Modem Logs**, or the **Graphs Minute** / **Hour** / **Day** hyperlink to continue.

7.3.4.1 Stats | Modem Status

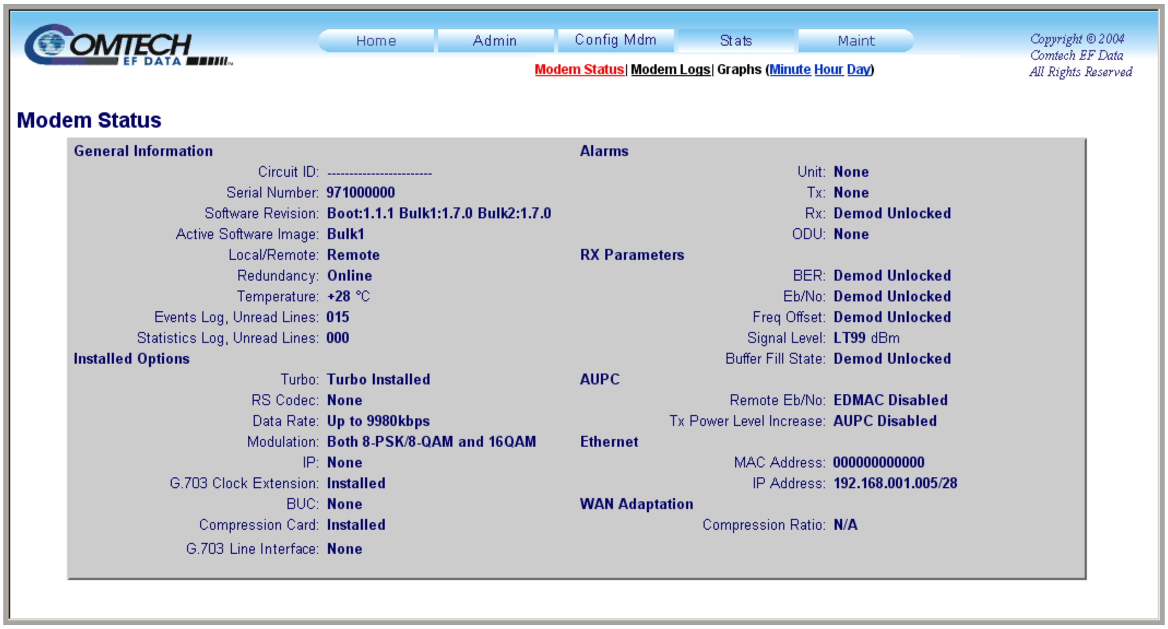


Figure 7-12. Stats | Modem Status page

Use the '**Stats | Modem Status'** page (**Figure 7-12)** to review ***read-only*** status information pertaining to:

- General modem operating and configuration information
- Installed options
- Alarms
- Rx Parameters
- AUPC
- Ethernet
- RAN / WAd

7.3.4.2 Stats | Modem Logs

***For details on the configuration parameters available for this page, see* Chapter 5. FRONT PANEL OPERATION.**

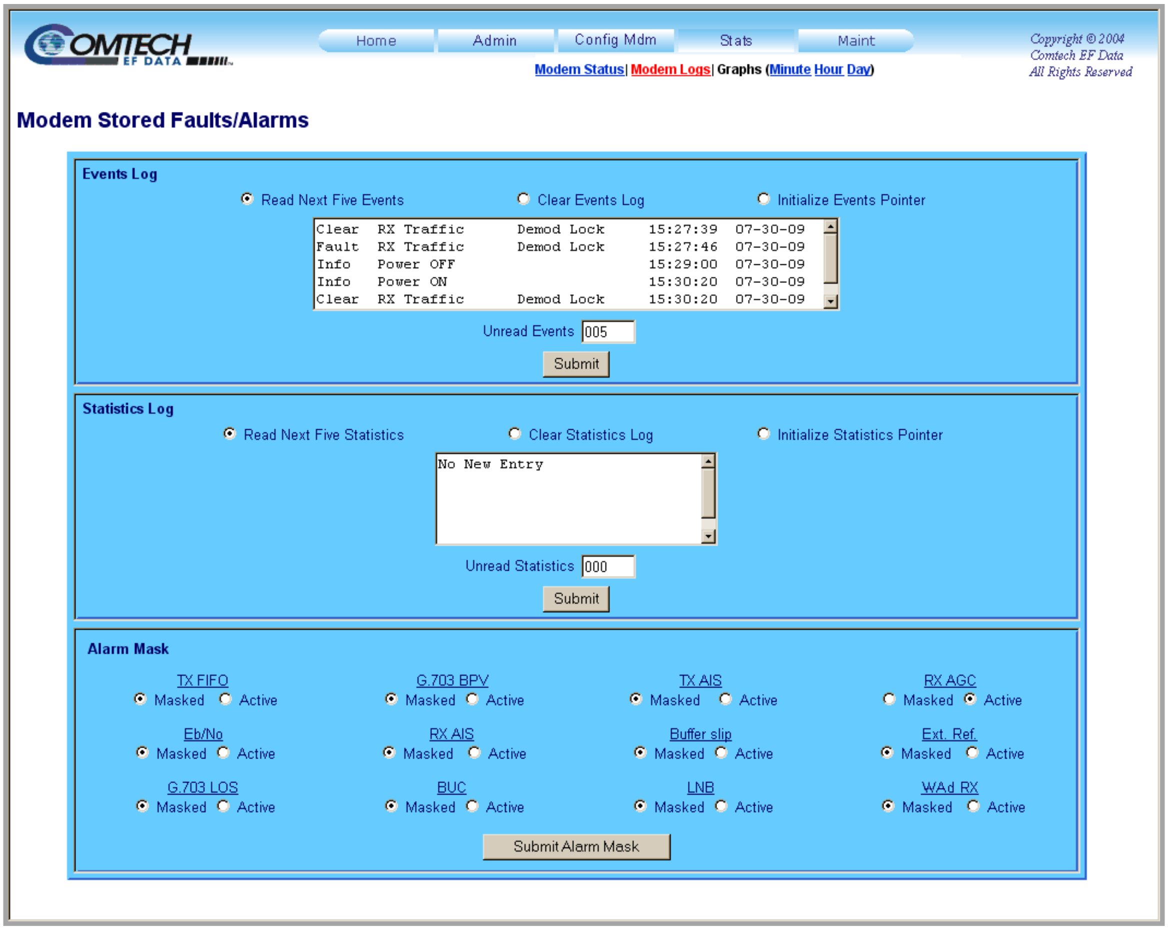


Figure 7-13. Stats | Modem Logs page

Use the '**Stats | Modem Logs'** page (**Figure 7-13)** to control how the following parameters are processed by the unit:

- **Events**
- **Stored Statistics**
- **Alarm Masks**

Once the desired settings have been selected in either the **Events Log** or **Statistics Log** sections, click **[Submit]** as needed to save those changes.

Note: The **Unread Events** and **Unread Statistics** windows provide ***read-only*** counters of available unread information as tallied since the last time the associated log file was cleared.

Each available Alarm Mask may be selected as **Masked** or **Active**. Once the desired Alarm Mask settings have been selected, click **[Submit Alarm Mask]** as needed to save those changes.

7.3.4.3 Stats | Graphs (Minute Hour Day)

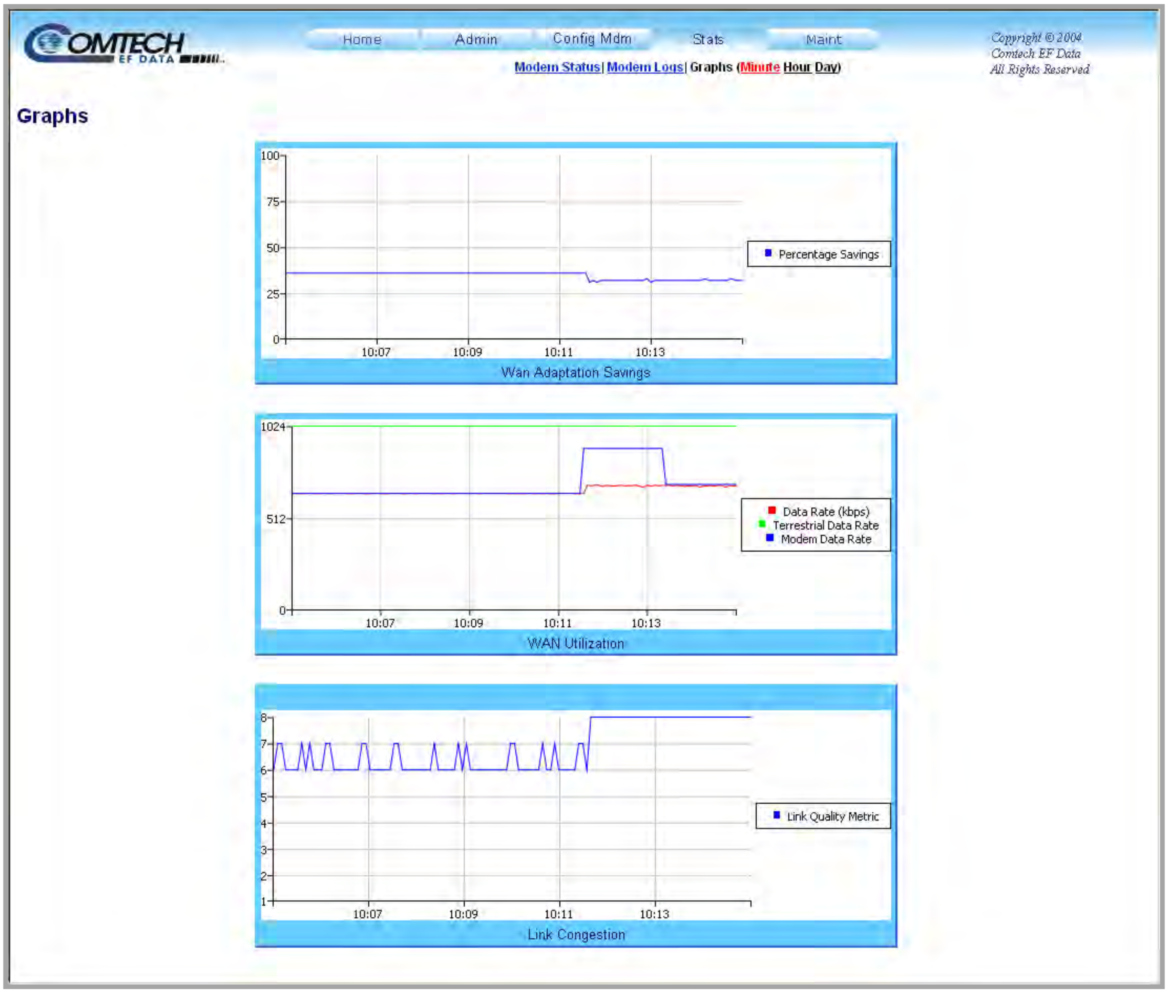


Figure 7-14. Stats | Graphs pages (Minute page shown)

When the presence of the optional E1 RAN Optimization / WAN Adaptation Processor Board is detected, the '**Stats | Graphs'** pages (**Figure 7-14)** provide a live graphical representation of the trending characteristics provided while using this feature.

Click the **Stats** tab, then select performance graph sets by the **Minute**, by the **Hour**, or by the **Day**.

Once selected, allow some time for the performance statistics to be compiled and then graphed. If the browser window is resized, allow approximately 5 to 10 seconds for the graph set to regenerate, and then recenter in the browser window.

Each page provides three trending graphs – **Wan Adaptation Settings**, **WAN Utilization**, and **Link Congestion**.

Aside from the self-explanatory time duration afforded each page, the information presented on each page is identical as follows:

- **WAN Adaptation Settings:** This graph is a simple representation of the percentage of bandwidth saved by using the RAN / WAd feature.

- **WAN Utilization:** This graph allows the user to fine-tune the amount of satellite bandwidth allocated for the link. **Figure 7-14** depicts an example where the user has allocated too little bandwidth to the link at first, and has then changed the bandwidth to 900 kbps, which is too much.

- **Link Congestion:** This graph displays the link quality metric, which is a qualitative measure of the quality of the voice calls as measured by the amount of adaptation required to fit the user data into the available satellite bandwidth. A dip indicates link quality degradation.

  The Link Quality Metric, as it is graphed in relation to its Level of Quality, is defined as follows:

<table>
<tr><th>Link Quality Metric</th><th>Link Quality</th></tr>
<tr><td>8</td><td>Excellent</td></tr>
<tr><td>7</td><td>Very Good</td></tr>
<tr><td>6</td><td>Good</td></tr>
<tr><td>5</td><td>Fair</td></tr>
<tr><td>4</td><td>Average</td></tr>
<tr><td>3</td><td>Poor</td></tr>
<tr><td>2</td><td rowspan="2">Very Poor</td></tr>
<tr><td>1</td></tr>
</table>

If the user attempts to access any of the three Graphs page hyperlinks when there is no E1 RAN Optimization / WAN Adaptation Processor Board installed, the following message appears:

This modem does not have a WAN Adaptation Processor card.

- ***For details pertaining to RAN / WAd functionality, see*** **Chapter 15. RAN OPTIMIZATION / WAN ADAPTATION.**

- ***For detailed information about the monitoring parameters available on this pages, see*** **Chapter 5. FRONT PANEL OPERATION*.***

7.3.5 ODU (Outdoor Unit) Pages

The '**ODU'** (Outdoor Unit) tab and its related hyperlinks are available only on the CDM-570 Base Modem HTTP Interface. They are accessible only when a CSAT-5060 or KST-2000A/B ODU is configured for operation via FSK for the CDM-570.

See* Appendix K. CDM-570 ODU (CSAT-5060, KST-2000A/B) OPERATION *for complete details on ODU operations via this interface.

7.3.6 Maint (Maintenance) | Unit Info Page

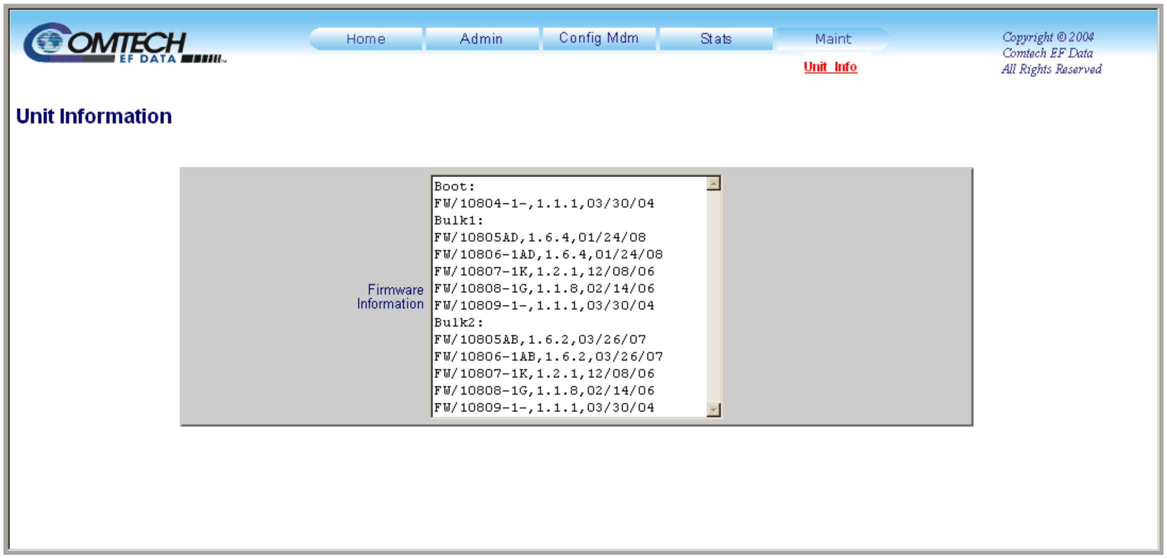


Figure 7-15. Maint (Maintenance) page

Use the **'Maint | Unit Info'** page (**Figure 7-15**) to review a scrollable, ***read-only*** status window that provides information about the currently loaded Bootrom. For Bulk1 and Bulk2, the user is provided with information about all the constituent firmware blocks that make up the bulk.

Chapter 8. FORWARD ERROR CORRECTION OPTIONS

8.1 Introduction

As standard, the CDM-570/570L Modem is equipped with an industry-standard Viterbi **F**orward **E**rror **C**orrection (FEC) encoder/decoder. The constraint lengths and encoding polynomials are compatible with the vast majority of existing modems from other manufacturers.

Comtech EF Data has performed compatibility testing to ensure interoperability. In addition, there are two plug-in daughter cards (SIMM modules), both field upgradeable, for adding other FEC functionality. The first of these is a Concatenated Reed-Solomon Codec, which is combined with Viterbi coding, to significantly improve BER versus E_b/N_o performance. It is required for running 8-PSK/TCM, and for the 16-QAM Viterbi modes.

The second optional plug-in card is the Turbo Product Codec. Turbo Coding represents a very significant development in the area of FEC, and Comtech EF Data's Turbo Product Codec offers Rate 5/16 and Rate 21/44 for BPSK, Rate 21/44 QPSK, Rate 3/4 and Rate 7/8 for QPSK, OQPSK, 8-QAM, 8-PSK and 16-QAM, and Rate 0.95 for QPSK, 8-QAM and 8-PSK. Turbo Product Coding provides the best Forward Error Correction technology currently available, and is now offered with a sufficiently broad range of code rates and modulation types that link performance can be optimized under any conditions.

8.2 Viterbi

The combination of convolutional coding and Viterbi decoding has become an almost universal standard for satellite communications. The CDM-570/570L complies with the Intelsat IESS 308/309 standards for Viterbi decoding with a constraint length of seven. This is a *de facto* standard, even in a closed network environment, which means almost guaranteed inter-operability with other manufacturer's equipment. It provides very useful levels of coding gain, and its short decoding delay and error-burst characteristics make it particularly suitable for low data rate coded voice applications. It has a short constraint length, fixed at 7, for all code rates. (The constraint length is defined as the number of output symbols from the encoder that are affected by a single input bit.)

By choosing various coding rates (Rate 1/2, 3/4 or 7/8) the user can trade off coding gain for bandwidth expansion. Rate 1/2 coding gives the best improvement in error rate, but doubles the transmitted data rate, and doubles the occupied bandwidth of the signal. Rate 7/8 coding, at the other extreme, provides the most modest improvement in performance, but only expands the transmitted bandwidth by 14%. A major advantage of the Viterbi decoding method is that the performance is independent of data rate, and does not display a pronounced threshold effect (i.e., does not fail rapidly below a certain value of E_b/N_o). Note that in BPSK mode, the CDM-570/570L only permits a coding rate of 1/2. Because the method of convolutional coding used with Viterbi, the encoder does not preserve the original data intact, and is called *non-systematic*.

Table 8-1. Viterbi Decoding Summary

FOR	AGAINST
• Good BER performance - very useful coding gain. • Almost universally used, with *de facto* standards for constraint length and coding polynomials. • Shortest decoding delay (~100 bits) of any FEC scheme - good for coded voice, VOIP, etc. • Short constraint length produces small error bursts - good for coded voice. • No pronounced threshold effect - fails gracefully. • Coding gain independent of data rate.	Higher coding gain possible with other methods

8.3 Reed-Solomon Outer Codec (Hardware Option)

It cannot be emphasized strongly enough that the purpose of the concatenated Reed-Solomon is to dramatically improve the BER performance of a link under given noise conditions. It should NOT be considered as a method to reduce the link EIRP to the point where rain-fade margin, particularly at Ku-band, is no longer required.

The concatenation of an outer Reed-Solomon Codec with Viterbi decoder first became popular when Intelsat introduced it in the early 1990s. It permits significant improvements in error performance without significant bandwidth expansion. The coding overhead added by the RS outer Codec is typically around 10%, which translates to a 0.4 dB power penalty for a given link. Reed-Solomon codes are block codes (as opposed to Viterbi which is convolutional), and in order to be processed correctly the data must be framed and de-framed.

Additionally, Reed-Solomon codes are limited in how well they can correct errors that occur in bursts. This, unfortunately, is the nature of the uncorrected errors from a Viterbi decoder, which produce clusters of errors that are multiples of half the constraint length. For this reason, the data must be interleaved following RS encoding, and is then de-interleaved prior to decoding. This ensures that a single burst of errors leaving the Viterbi decoder is spread out over a number of interleaving frames, so errors entering the RS decoder do not exceed its capacity to correct those errors. In the case of the CDM-570/570L, two different RS code rates are used, according to the mode of operation.

A 220,200 code is used in transparent closed network modes, and a 200,180 code is used in framed (EDMAC) modes. (220,200 means that data is put into blocks of 220 bytes, of which 200 bytes are data, and 20 bytes are FEC overhead.) These two codes were chosen because they fit well into Comtech EF Data's clock generation scheme, and they have almost identical coding gain. When Viterbi decoding is used as the primary FEC, an interleaver depth of four is used. The increase in coding gain is at the expense of delay. The interleaving/de-interleaving delay and the delay through the decoder itself can be as high as 25 kbits. At very low data rates, this equates to several seconds, making it highly unsuitable for voice applications. Additionally, the de-interleaver frame synchronization method can add significantly to the time taken for the demodulator to declare acquisition.

A characteristic of concatenated RS coding is the very pronounced threshold effect. For any given modem design, there will be a threshold value of E_b/N_o below which the demodulator cannot stay synchronized. This may be due to the carrier-recovery circuits, or the synchronization threshold of the primary FEC device, or both. In the CDM-570/570L, and Rate 1/2 operation, this threshold is around 4 dB E_b/N_o. Below this value, operation is not possible, but above this value, the error performance of the concatenated RS system produces exceptionally low error rates for a very small increase in E_b/N_o.

Care should be taken not to operate the demodulator near its sync threshold. Small fluctuations in E_b/N_o may cause total loss of the link, with the subsequent need for the demodulator to re-acquire the signal.

Table 8-2. Concatenated RS Coding Summary

FOR	AGAINST
• Exceptionally good BER performance - several orders of magnitude improvement in link BER under given link conditions. • Very small additional bandwidth expansion.	• Very pronounced threshold effect - does not fail gracefully in poor Eb/No conditions. Additional coding overhead actually degrades sync threshold, and reduces link fade margin. • Significant processing delay (~25 kbits) - not good for voice, or IP applications. • Adds to demod acquisition time.

8.4 Trellis Coding (requires 8-PSK/8-QAM FAST Option)

In the other FEC methods described here, the processes of coding and modulation are independent. The FEC codec has no knowledge of, or interaction with, the modulator. However, there are schemes in which the coding and modulation are combined together, where the encoder places FEC symbols in a precise manner into the signal constellation. This can yield an overall improvement in performance, and is used in higher-order modulation schemes, such as 8-PSK, 16-PSK, 16-QAM, etc. When convolution coding is used, the overall *coded modulation* approach is referred to as Trellis Coded Modulation (TCM). Ungerboeck was an early pioneer, and developed optimum mapping and decoding schemes. However, the decoding scheme was seen as complex, and expensive, and Qualcomm Inc. developed a variation on the theme, which uses a Viterbi decoder at the core, surrounded by adjunct processing. The scheme is able to achieve performance very close to the optimum Ungerboeck method, but with far less complexity, and is called *pragmatic Trellis Coded Modulation*.

Now, Intelsat recognized that, as more and more high power transponders are put into service, the transponders are no longer *power limited*, but *bandwidth limited.* In order to maximize transponder capacity, they looked at 8-PSK as a method of reducing the occupied bandwidth of a carrier, and adopted Qualcomm's pragmatic TCM, at Rate 2/3.

A Rate 2/3 8-PSK/TCM carrier occupies only 50% of the bandwidth of a Rate 1/2 QPSK carrier. However, the overall coding gain of the scheme is not adequate by itself, and so it is required that the scheme be concatenated with an outer RS codec. When combined, there is a threshold value of E_b/N_o of around 6 dB, and above approximately 7 dB, the bit error rate is better than 1×10^{-8}. The detractions of the concatenated RS approach apply here also, along with more stringent requirements for phase noise and group delay distortion – the natural consequences of the higher-order modulation.

The CDM-570/570L implements a Closed Network version of Rate 2/3 8-PSK/TCM/RS, using either the 220, 200 or 200,180 Reed-Solomon outer codes. Although not compatible, it provides identical performance to the Open Network IESS-310 standard.

Table 8-3. 8-PSK/TCM Coding Summary

FOR	AGAINST
Exceptionally bandwidth efficient compared to QPSK.	• Needs concatenated RS outer codec to give acceptable coding gain performance. • Demod acquisition threshold much higher than for QPSK. • 8-PSK is more sensitive to phase noise and group delay distortion than QPSK.

8.5 Turbo Product Codec (Hardware Option)

8.5.1 Introduction

Turbo coding is an FEC technique developed within the last few years, which delivers significant performance improvements compared to more traditional techniques. Two general classes of Turbo Codes have been developed: **T**urbo **C**onvolutional **C**odes (TCC), and **T**urbo **P**roduct **C**odes (TPC), a block coding technique. Comtech EF Data has chosen to implement an FEC codec based on TPC. A Turbo Product Code is a 2- or 3-dimensional array of block codes. Encoding is relatively straightforward, but decoding is a very complex process requiring multiple iterations of processing for maximum performance to be achieved.

Unlike the popular method of concatenating a Reed-Solomon codec with a primary FEC codec, Turbo Product Coding is an entirely stand-alone method. It does not require the complex interleaving/de-interleaving of the RS approach, and consequently, decoding delays are significantly reduced. Furthermore, the traditional concatenated RS schemes exhibit a very pronounced threshold effect. A small reduction in E_b/N_o can result in total loss of demod and decoder synchronization. TPC does not suffer from this problem. The demod and decoder remain synchronized down to the point where output error rate becomes unusable. This is considered to be an advantageous characteristic in fading environment. Typically, in QPSK, 8-PSK and 16-QAM TPC modes the demod and decoder can remain synchronized ***2 – 3 dB below*** the Viterbi/R-S or TCM cases.

With this release of the CDM-570/570L, Comtech EF Data now provides the best Forward Error Correction technology currently available, offering a very broad range of TPC code rates, combined with the entire range of modulation types, from BPSK to 16-QAM.

8.5.2 TPC modes available in the CDM-570/570L

Table 8-4. Available TPC Modes

Code Rate/Modulation	Data Rate Range
Rate 5/16 BPSK	2.4 kbps to 0.937 Mbps
Rate 21/44 BPSK	2.4 kbps to 1.430 Mbps
Rate 21/44 QPSK, OQPSK	4.8 kbps to 2.860 Mbps
Rate 3/4 QPSK, OQPSK	7.2 kbps to 4.500 Mbps
Rate 3/4 8-PSK, 8-QAM	10.8 kbps to 6.750 Mbps
Rate 3/4 16-QAM	14.4 kbps to 9.000 Mbps
Rate 7/8 QPSK, OQPSK	8.4 kbps to 5.250 Mbps
Rate 7/8 8-PSK, 8-QAM	13.6 kbps to 7.875 Mbps
Rate 7/8 16-QAM	16.8 kbps to 9.980 Mbps
Rate 0.95 QPSK, OQPSK	9.1 kbps to 5.666 Mbps
Rate 0.95 8-PSK, 8-QAM	15.3 kbps to 8.500 Mbps
Maximum rates are subject to the appropriate FAST codes being installed	

8.5.3 8-QAM Modulation

What is 8-QAM, and why is it important? Unlike 8-PSK, which comprises 8 equally spaced constellation points around a unit-circle, 8-QAM is comprised of exactly half of a 16-QAM signal. Fortuitously, the 8-QAM constellation possesses some unique properties that can be exploited to permit acquisition and tracking of signals at noise levels 2 - 3 dB worse than is possible with 8-PSK. This is, then, a perfect match for the expected E_b/N_o values that TPC demands. Naturally, it has exactly the same spectral efficiency as 8-PSK.

While the 8-QAM constellation itself is not new, Comtech has performed much original work related to the choice of optimum mapping and soft decision decoding, and, of course, on the techniques for acquiring and tracking 8-QAM signals. This work is the subject of a pending patent application filed by Comtech EF Data.

The basic performance of uncoded 8-QAM is broadly similar to uncoded 8-PSK, but has a slightly higher peak-to-average power ratio than 8-PSK (about 0.8 dB). In most linear transponders, this should not be considered a problem.

A major benefit of Comtech's implementation of 8-QAM is that it is inherently more immune to the effects of phase noise than 8-PSK. In L-band applications that use low-cost BUCs and LNBs this is considered particularly advantageous for lower bit rates, where phase noise can be very problematic.

8.5.4 End-to-End Processing Delay

In many cases, FEC methods that provide increased coding gain do so at the expense of increased processing delay. However, with TPC, this increase in delay is very modest. The table below shows, for the CDM-570/570L, the processing delays for the major FEC types, including the three TPC modes:

Table 8-5. Turbo Product Coding Processing Delay Comparison

FEC Mode (64 kbps data rate)	End-to-end delay, ms
Viterbi, Rate 1/2	12
Viterbi Rate 1/2 + Reed Solomon	266
Turbo Product Coding, Rate 3/4	**47**
Turbo Product Coding, Rate 21/44, BPSK	**64**
Turbo Product Coding, Rate 5/16, BPSK	**48**
Turbo Product Coding, Rate 7/8	**245 ***
Turbo Product Coding, Rate 0.95	**69**
* A larger block is used for the Rate 7/8 code, which increases decoding delay.	

Note that in all cases, the delay is inversely proportional to data rate, so for 128 kbps the delay values would be half of those shown above. It can be seen that the concatenated Reed-Solomon cases increase the delay significantly, due mainly to interleaving/de-interleaving.

8.5.5 Comparison of all TPC Modes

Mode	E_b/N_o at BER = 10^{-6} Guaranteed (Typical in parentheses)	E_b/N_o at BER = 10^{-8} Guaranteed (Typical in parentheses)	Spectral Efficiency	Symbol Rate	Occupied * Bandwidth for 1 Mbps Carrier
QPSK Rate 1/2 Viterbi *	6.0 dB (5.5 dB)	7.3 dB (6.8 dB)	1.00 bits/Hz	1.0 x bit rate	1190 kHz
BPSK Rate 21/44 Turbo	2.9 dB (2.6 dB)	3.3 dB (3.0 dB)	0.48 bits/Hz	2.1 x bit rate	2493 kHz
BPSK Rate 5/16 Turbo	2.4 dB (2.1 dB)	2.8 dB (2.5 dB)	0.31 bits/Hz	3.2 x bit rate	3808 kHz
QPSK/ OQPSK Rate 21/44 Turbo	2.9 dB (2.6 dB)	3.2 dB (2.8 dB)	0.96 bits/Hz	1.05 x bit rate	1246 kHz
QPSK/ OQPSK Rate 3/4 Turbo	3.8 dB (3.3 dB)	4.4 dB (4.0 dB)	1.50 bits/Hz	0.67 x bit rate	793 kHz
QPSK/ OQPSK Rate 7/8 Turbo	4.3 dB (4.0 dB)	4.5 dB (4.2 dB)	1.75 bits/Hz	0.57 x bit rate	678 kHz
QPSK/ OQPSK Rate 0.95 Turbo	6.4 dB (6.0 dB)	6.9 dB (6.5 dB)	1.90 bits/Hz	0.53 x bit rate	626 kHz
*8-PSK Rate 2/3 TCM ** and RS (IESS-310)*	6.5 dB (5.6 dB)	6.9 dB (6.0 dB)	1.82 bits/Hz	0.56 x bit rate	666 kHz
8-PSK Rate 3/4 Turbo	6.2 dB (5.7 dB)	6.8 dB (6.3 dB)	2.25 bits/Hz	0.44 x bit rate	529 kHz
8-PSK Rate 7/8 Turbo	7.0 dB (6.6 dB)	7.2 dB (6.8 dB)	2.62 bits/Hz	0.38 x bit rate	453 kHz
8-PSK Rate 0.95 Turbo	9.3 dB (8.9 dB)	10.3dB (9.9 dB)	2.85 bits/Hz	0.35 x bit rate	377 kHz
8-QAM Rate 3/4 Turbo	6.5 dB (6.1 dB)	7.2 dB (6.8 dB)	2.25 bits/Hz	0.44 x bit rate	529 kHz
8-QAM Rate 7/8 Turbo	6.6 dB (6.2 dB)	6.8 dB (6.4 dB)	2.62 bits/Hz	0.38 x bit rate	453 kHz
8-QAM Rate 0.95 Turbo	9.6 dB (9.2 dB)	10.6 dB (10.2 dB)	2.85 bits/Hz	0.35 x bit rate	377 kHz
16-QAM Rate 3/4 Turbo	7.4 dB (7.0 dB)	8.2 dB (7.7 dB)	3.00 bits/Hz	0.33 x bit rate	396 kHz
16-QAM Rate 7/8 Turbo	8.1 dB (7.7 dB)	8.3 dB (7.9 dB)	3.50 bits/Hz	0.28 x bit rate	340 kHz
*16-QAM Rate 3/4 ** Viterbi/Reed-Solomon*	8.1 dB (7.5 dB)	8.6 dB (8.0 dB)	2.73 bits/Hz	0.37 x bit rate	435 kHz
*16-QAM Rate 7/8 ** Viterbi/Reed-Solomon*	9.5 dB (9.0 dB)	10.1 dB (9.5 dB)	3.18 bits/Hz	0.31 x bit rate	374 kHz

* The occupied bandwidth is defined at the width of the transmitted spectrum taken at the –10 dB points on the plot of power spectral density. This equates to 1.19 x symbol rate for the CDM-570/570L transmit filtering.

** Included for comparative purposes

It can be seen that the 8-PSK Rate 3/4 Turbo performance closely approaches that of the Rate 2/3 TCM/Reed-Solomon case – the BER performance is within approximately 0.4 dB. However, it should be noted that the Rate 3/4 Turbo mode is ***20% more bandwidth efficient*** than the TCM case. The additional advantages of Turbo (lower delay, performance during fades, etc.) should also be considered.

Table 8-6. Turbo Product Coding Summary

FOR	AGAINST
• Exceptionally good BER performance - significant improvement compared with every other FEC method in use today. • No pronounced threshold effect - fails gracefully. • Exceptional bandwidth efficiency. • Coding gain independent of data rate (in this implementation). • Low decoding delay. • Easy field upgrade in CDM-570/570L.	Nothing!

8.6 Uncoded Operation (No FEC)

There are occasions when a user may wish to operate a satellite link with no forward error correction of any kind. For this reason, the CDM-570/570L offers this uncoded mode for three modulation types - BPSK, QPSK, and OQPSK. However, the user should be aware of some of the implications of using this approach.

PSK demodulators have two inherent undesirable features. The first of these is known as 'phase ambiguity', and is due to the fact the demodulator does not have any absolute phase reference, and in the process of carrier recovery, the demodulator can lock up in any of K phase states, where K = 2 for BPSK, K = 4 for QPSK. Without the ability to resolve these ambiguous states there would be a 1-in-2 chance that the data at the output of the demodulator would be wrong, in the case of BPSK. For QPSK, the probability would be 3 in 4.

The problem is solved in the case of BPSK by differentially encoding the data prior to transmission, and then performing the inverse decoding process. This is a very simple process, but has the disadvantage that it doubles the receive BER. For every bit error the demodulator produces, the differential decoder produces two.

The problem for QPSK is more complex, as there are 4 possible lock states, leading to 4 ambiguities. When FEC is employed, the lock state of the FEC decoder can be used to resolve two of the four ambiguities, and the remaining two can be resolved using serial differential encoding/decoding. However, when no FEC is being used, an entirely different scheme must be used. Therefore, in QPSK, a parallel differential encoding/decoding technique is used, but has the disadvantage that it again doubles the receive BER.

OQPSK is a different situation again, where the ambiguities result not only from not having an absolute phase reference, but also not knowing which of the two parallel paths in the demod, I or Q, contains the half-symbol delay. Another type of differential encoding is used, but yet again the error rate is doubled, compared to ideal.

The second problem inherent in PSK demodulators is that of ‘data false locking’. In order to accomplish the task of carrier recovery, the demodulator must use a non-linear process. A second-order non-linearity is used for BPSK, and a fourth-order non-linearity is used for QPSK. When data at a certain symbol rate is used to modulate the carrier, the demodulator can lock at incorrect frequencies, spaced at intervals of one-quarter of the symbol rate away from the carrier. Fortunately, when FEC decoding is used, the decoder synchronization state can be used to verify the correct lock point has been achieved, and to reject the false locks.

However, if uncoded operation is used, there is no way to recognize a data false lock. The demodulator will indicate that it is correctly locked, but the data out will not be correct.This problem has been almost entirely eliminated in the CDM-570/570L with the fast acquisition algorithm which includes Fast Fourier Transform (FFT) techniques. However, there is a very small probability that a data false lock could still occur in uncoded mode, and in this circumstance Comtech EF Data cannot be held responsible for incorrect operation.

8.7 Rates above 2.5 Msymbols/sec

Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum symbol rate has been increased from 2.5 to 3.0 Msymbols/sec. This has been done without modification to the hardware, and as a consequence, there may be a small degradation in BER versus E_b/N_o performance for rates above 2.5 Msymbols/sec. The degradation is as follows:

Rates from 2.5 to 2.65 Msps: degradation < 0.1 dB

Rates from 2.65 to 2.80 Msps: degradation < 0.2 dB

Rates from 2.80 to 3.00 Msps: degradation < 0.3 dB

Users should take this into account when considering the BER versus E_b/N_o graphs that follow.

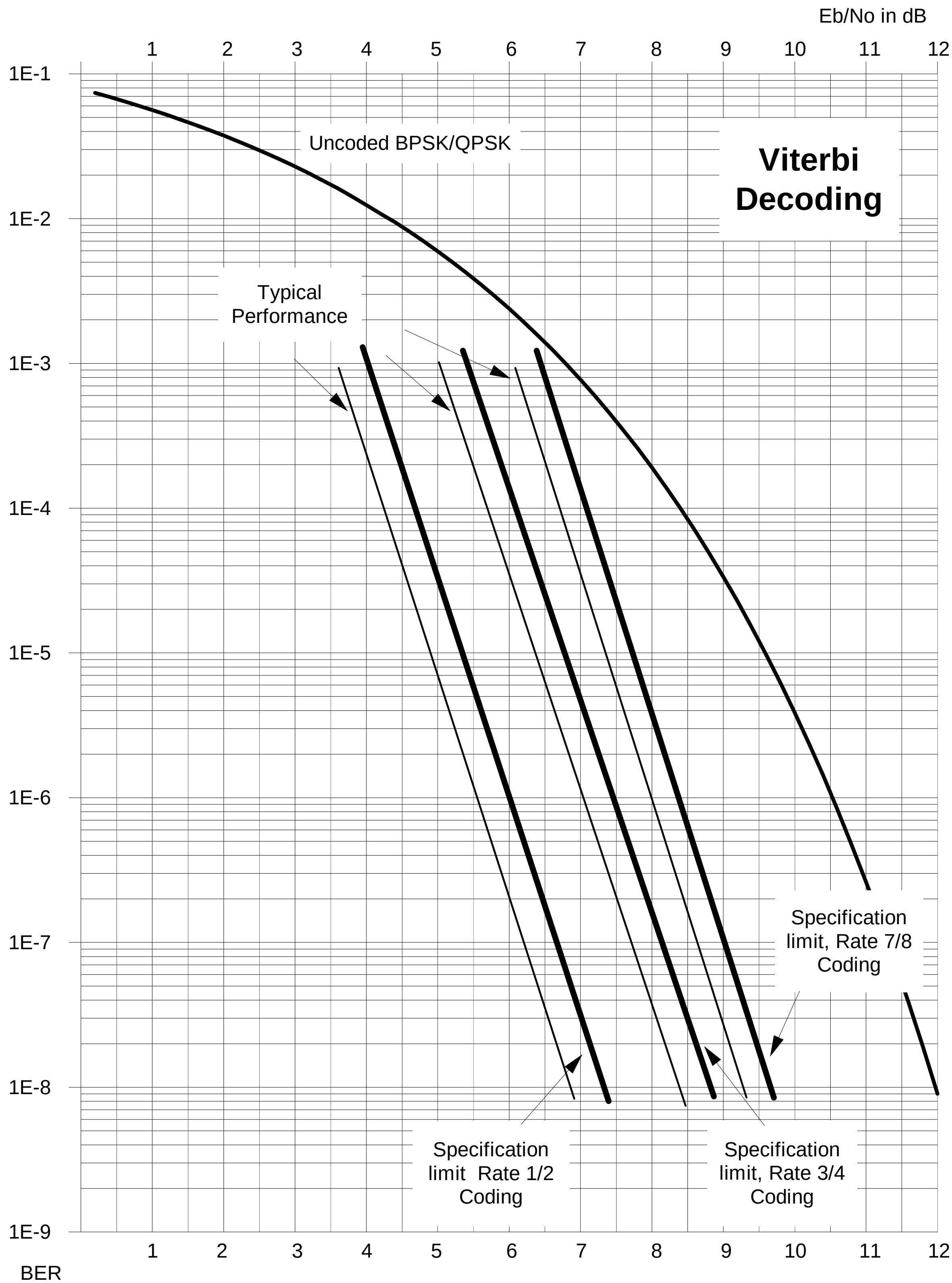


Figure 8-1. Viterbi Decoding

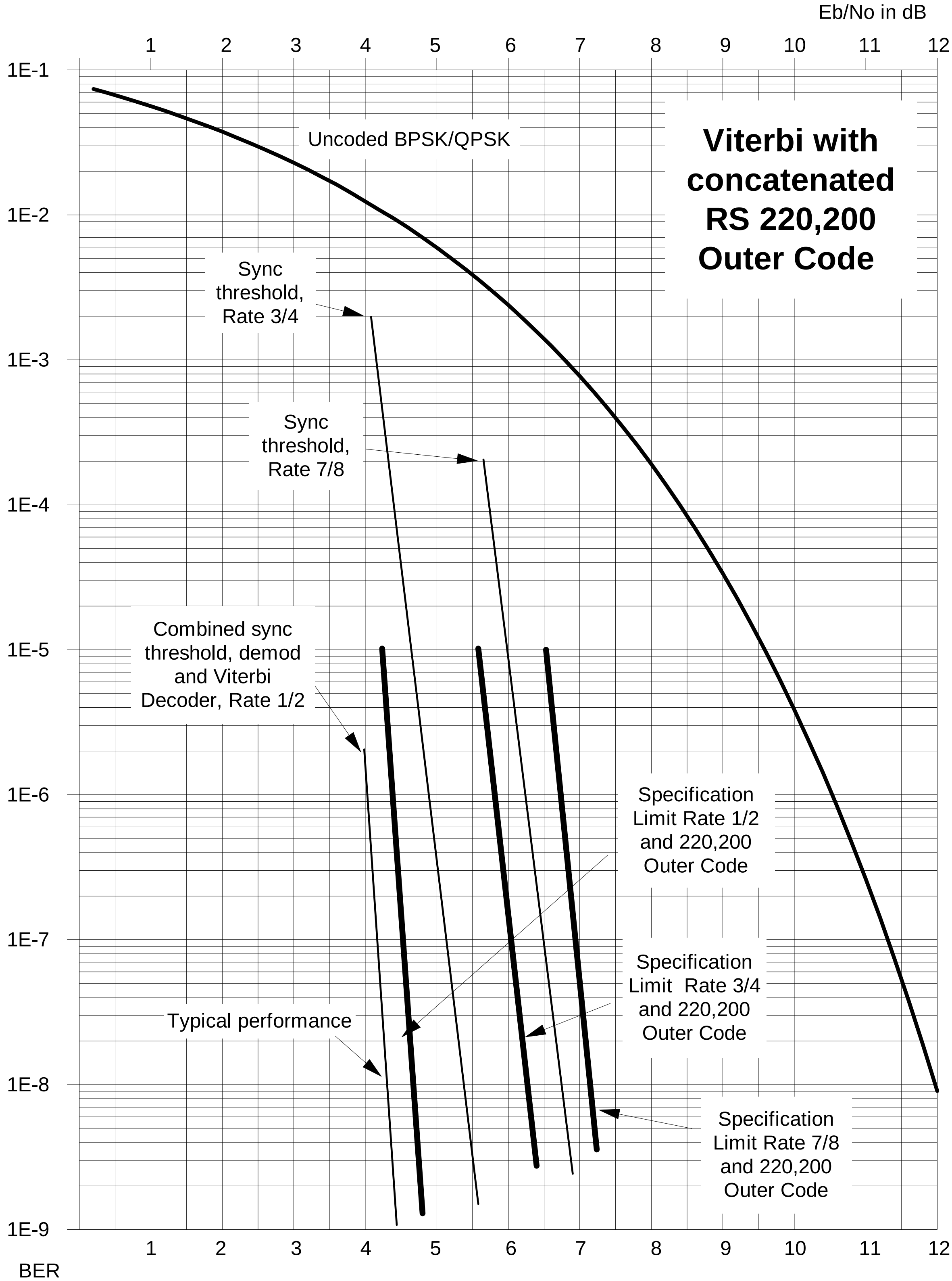


Figure 8-2. Viterbi with Concatenated RS Outer Code

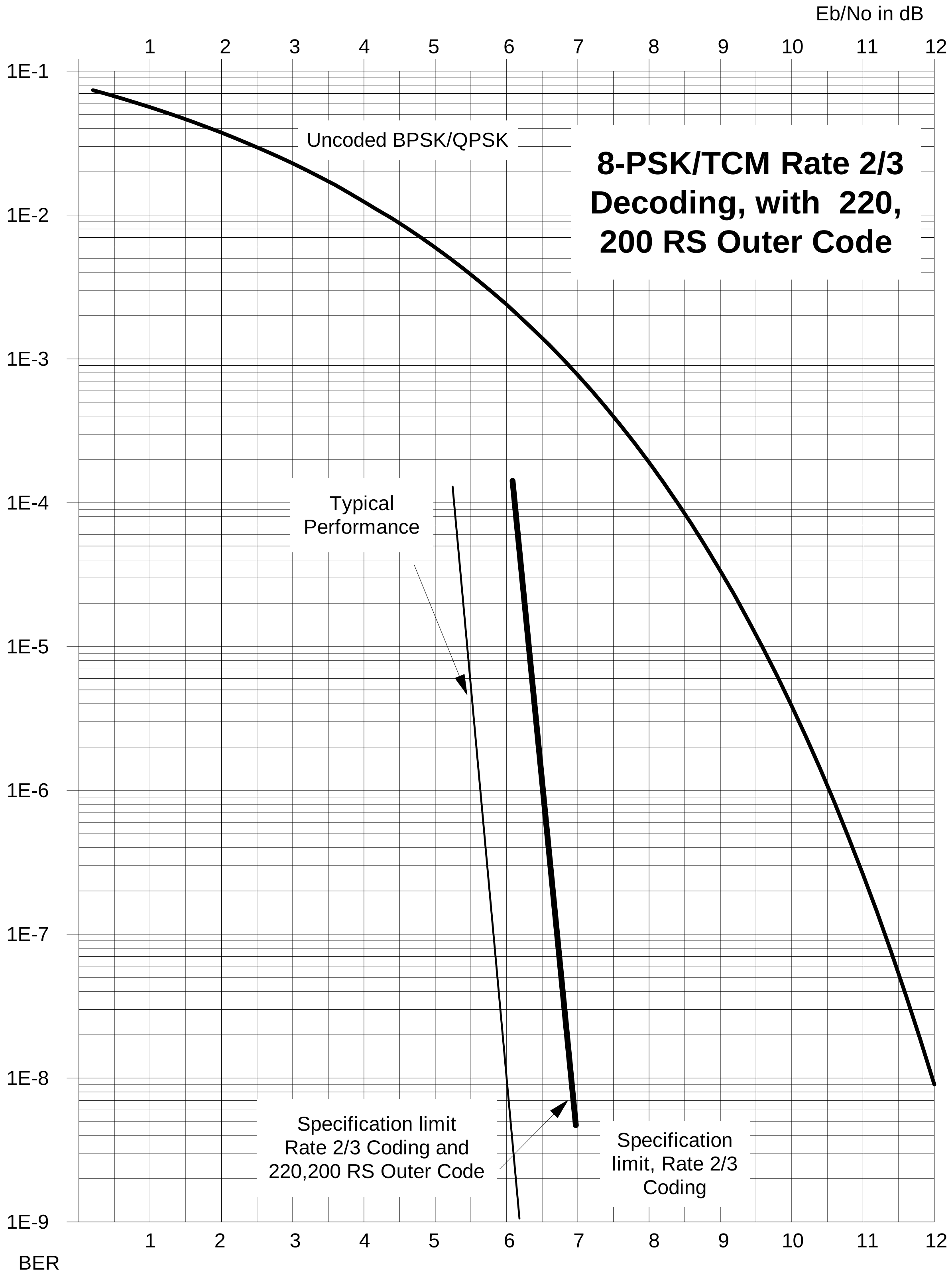


Figure 8-3. 8-PSK/TCM Rate 2/3 with Concatenated RS Outer Code

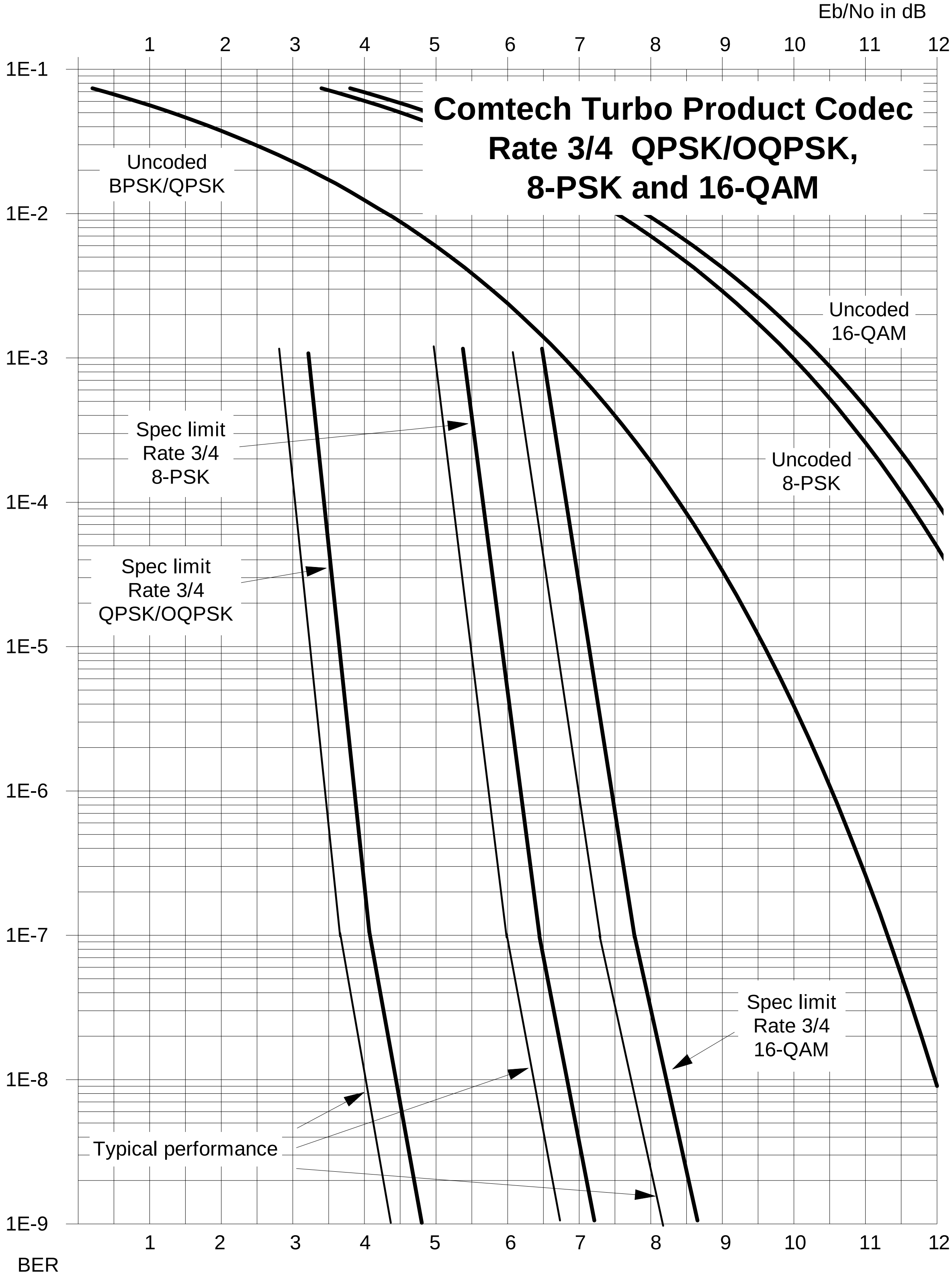


Figure 8-4. Rate 3/4 QPSK/OQPSK, 8-PSK AND 16-QAM Turbo

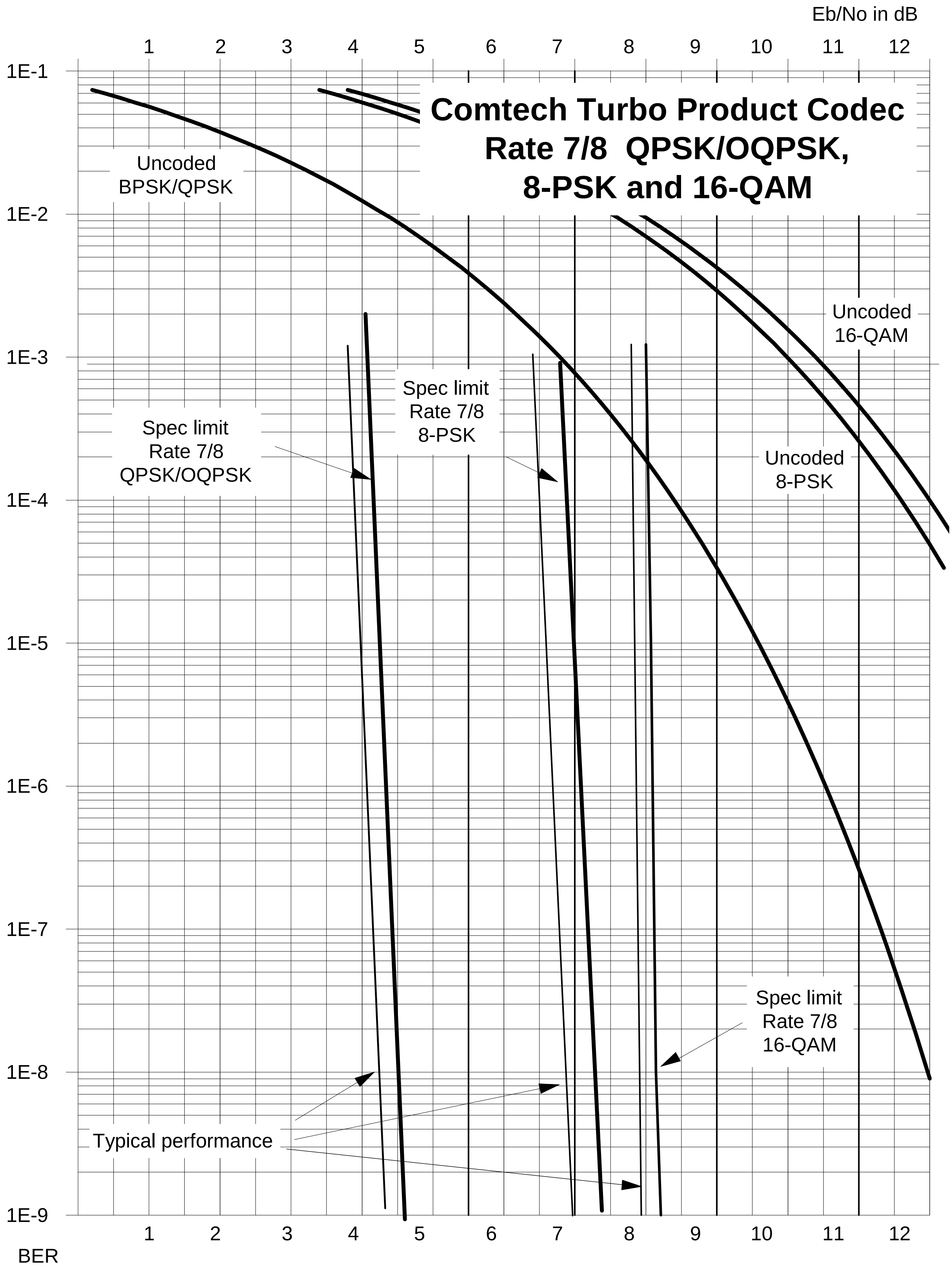


Figure 8-5. Rate 7/8 QPSK/OQPSK, 8-PSK AND 16-QAM Turbo

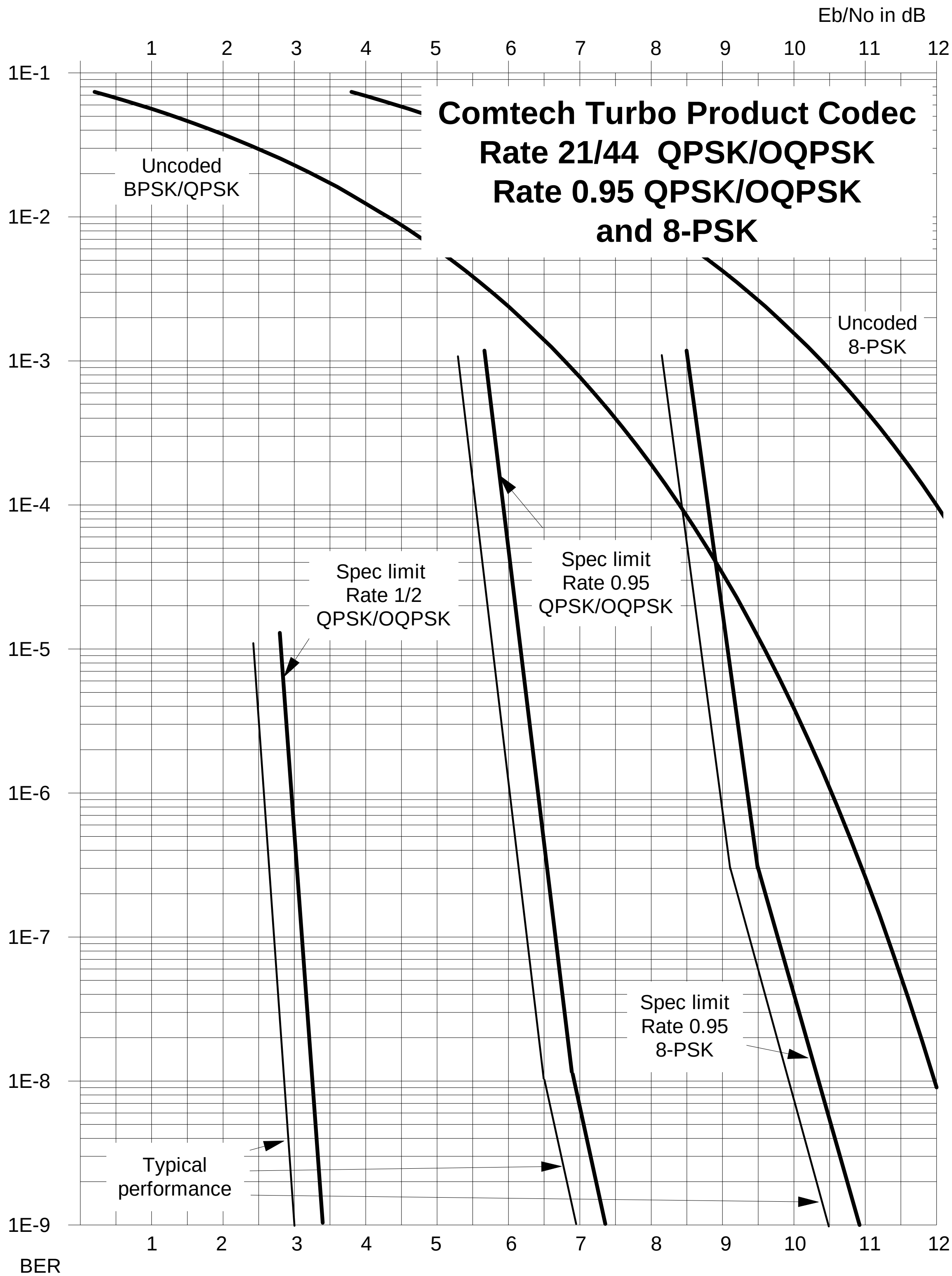


Figure 8-6. Rate 21/44 QPSK, Rate 0.95 QPSK and Rate 0.95 8-PSK Turbo

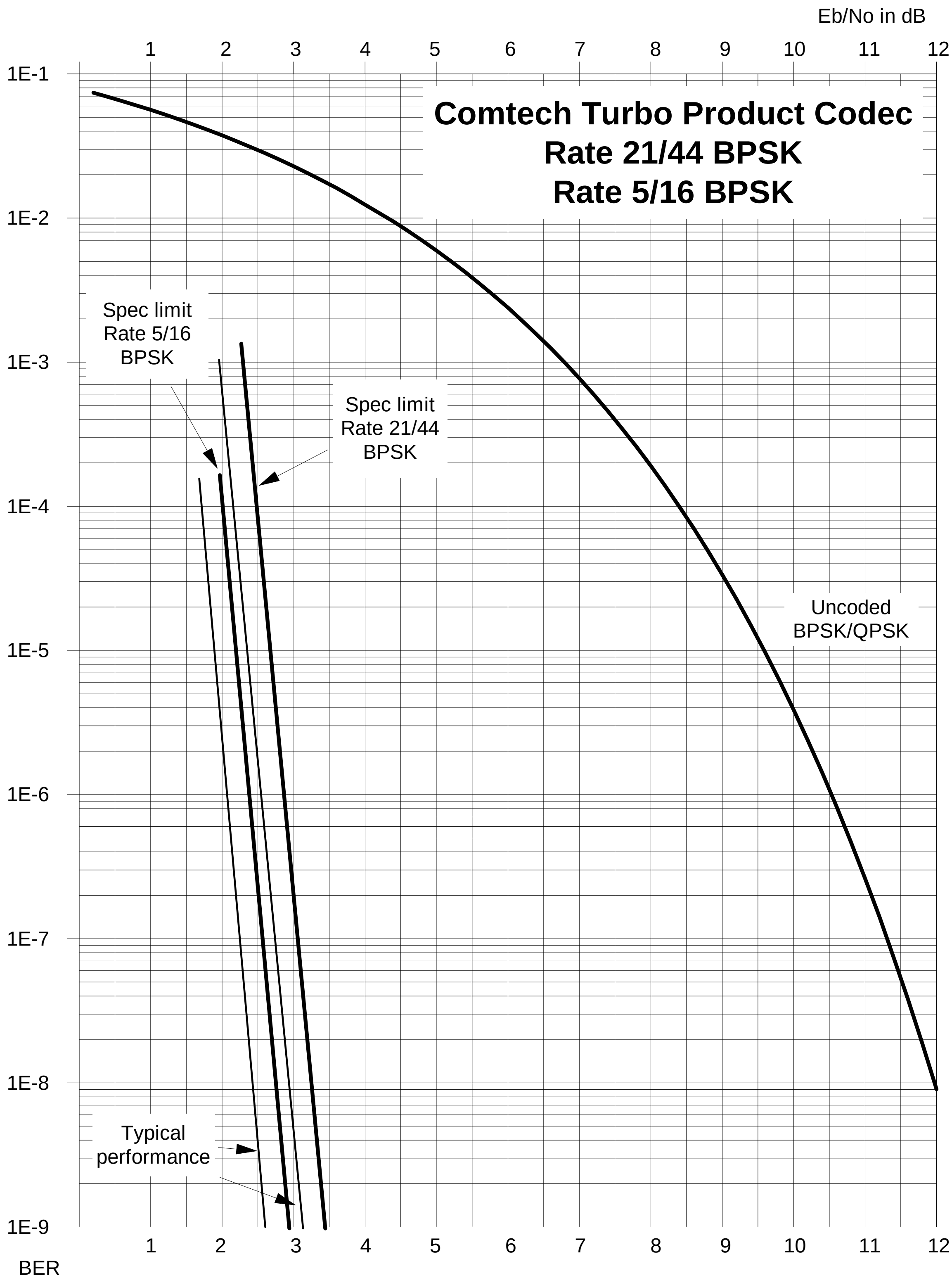


Figure 8-7. Rate 21/44 BPSK and Rate 5/16 BPSK Turbo

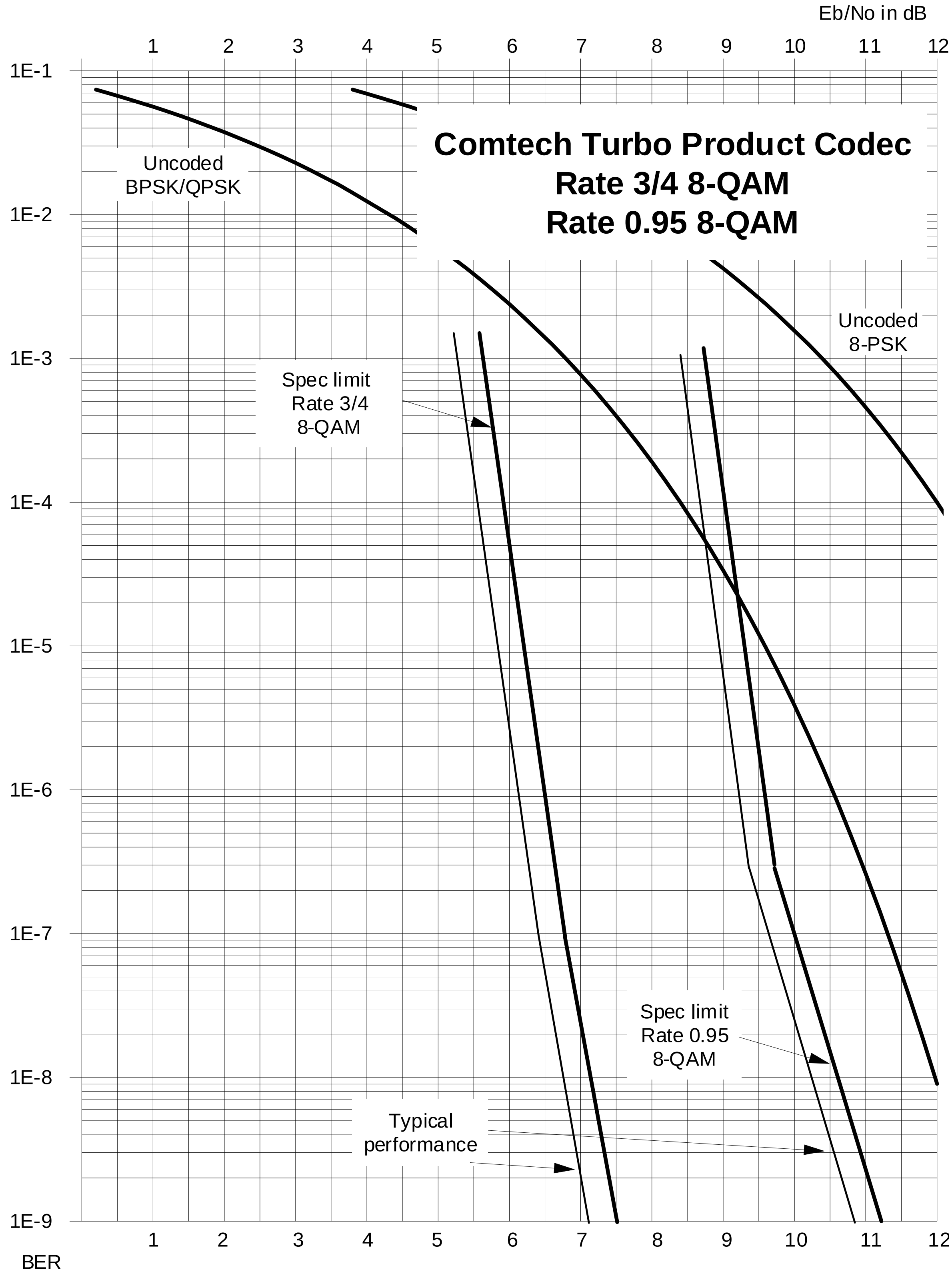


Figure 8-8. Rate 3/4 and Rate 0.95 8-QAM Turbo

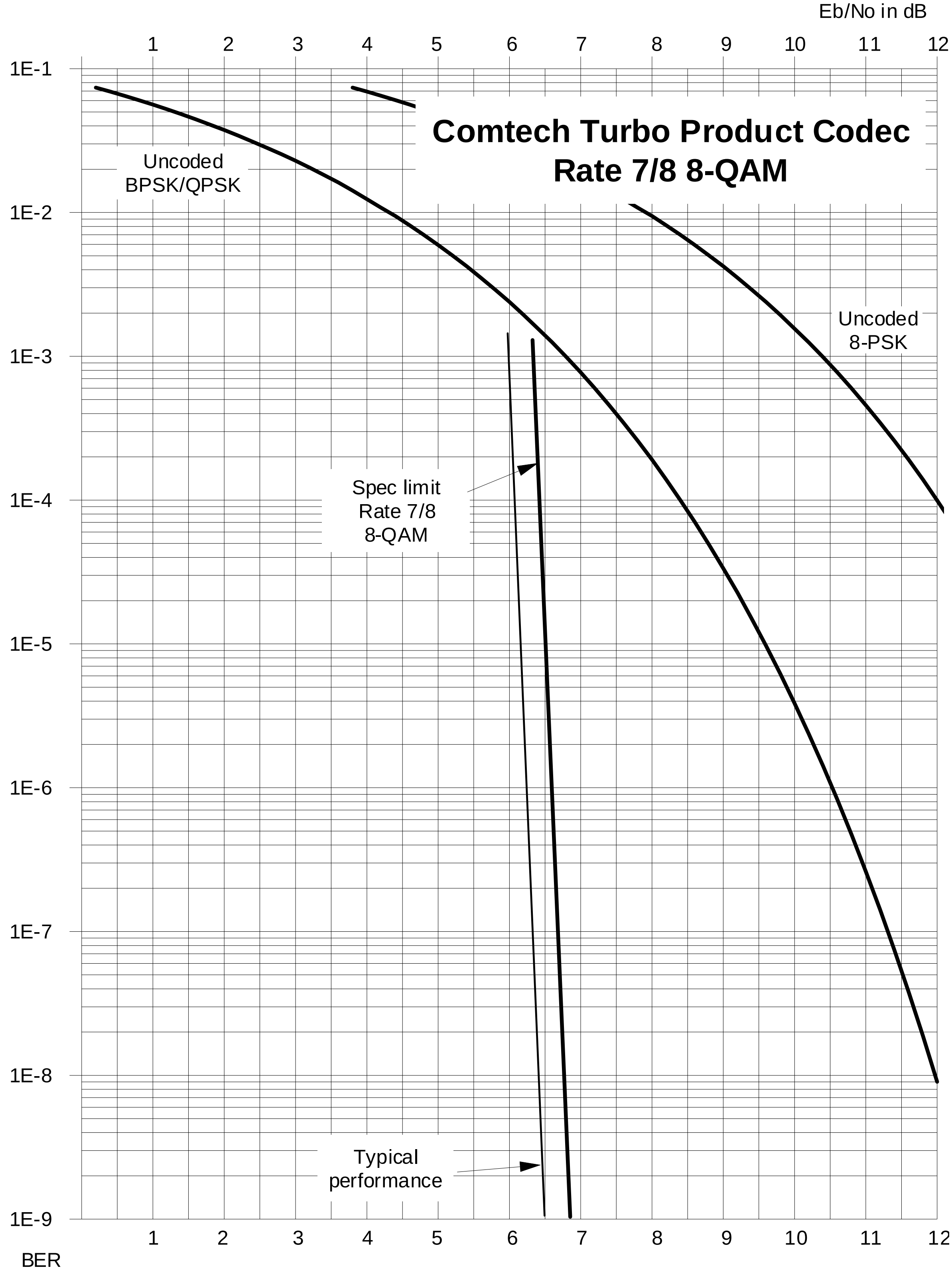


Figure 8-9. Rate 7/8 8-QAM Turbo

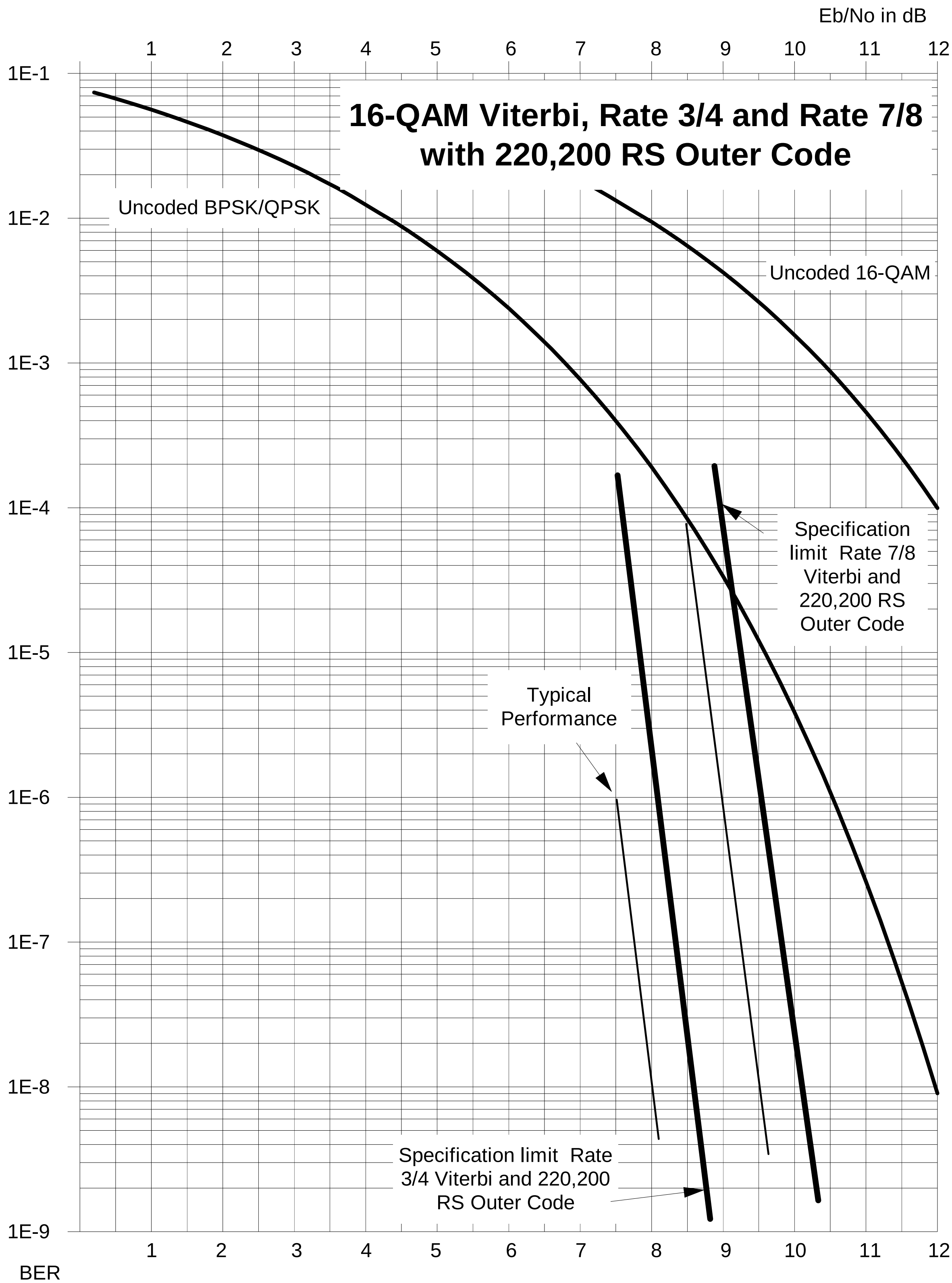


Figure 8-10. 16-QAM Viterbi, Rate 3/4 and Rate 7/8 with 220,200 RS Outer Code

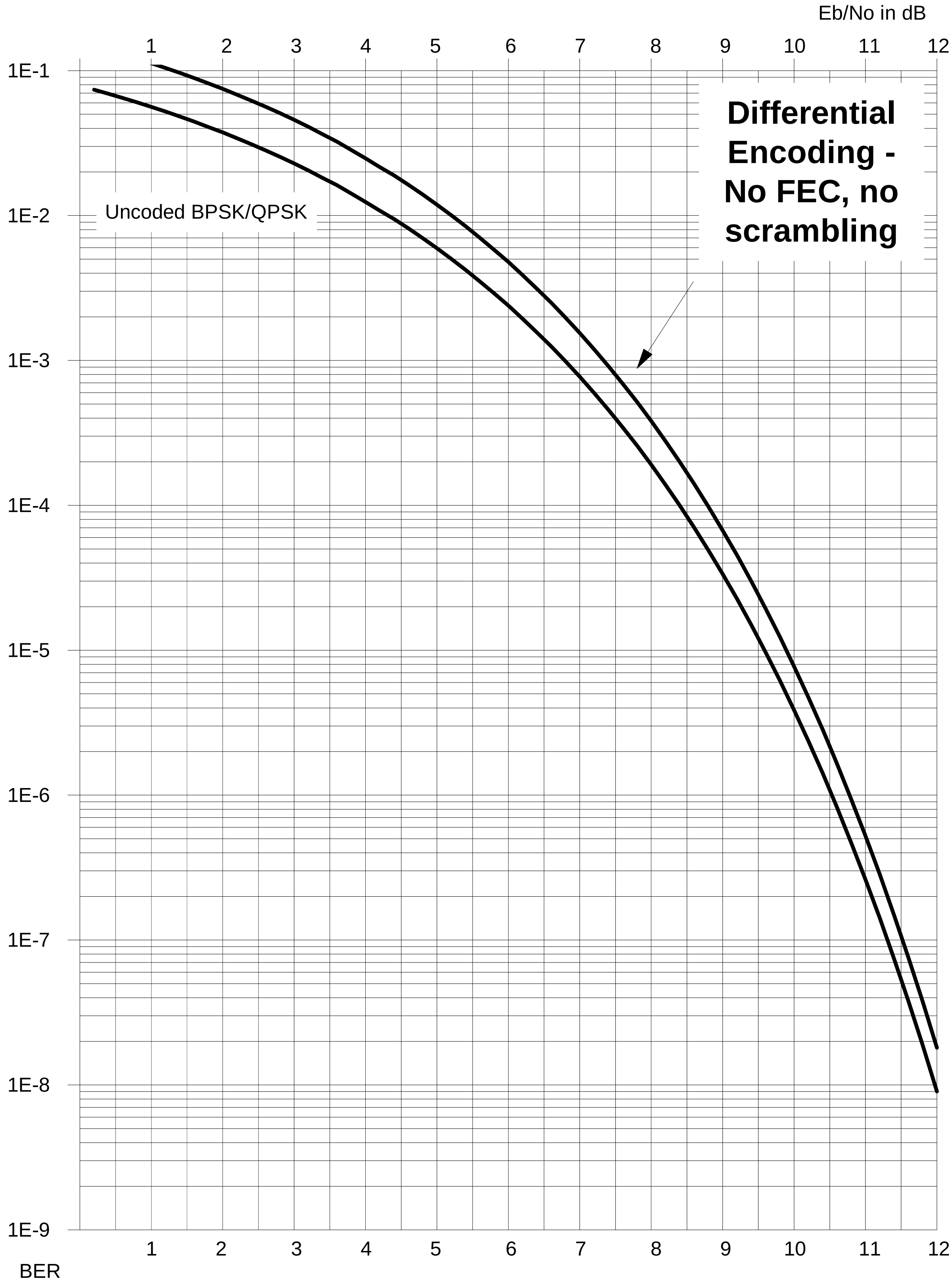


Figure 8-11. Differential Encoding – No FEC, No Scrambling

Chapter 9. AUTOMATIC UPLINK POWER CONTROL (AUPC)

9.1 Introduction

The user MUST obtain permission from the Satellite Operator to use this feature.

Improper use of this feature could result in a transmitting terminal seriously exceeding its allocated flux density on the Operator's satellite. This could produce interference to other carriers, and could cause transponder saturation problems.

Automatic **U**plink **P**ower **C**ontrol (AUPC) is a feature whereby a local modem is permitted to adjust its own output power level as a means to maintain the E_b/N_0 at the remote modem.

To accomplish this, the framed mode of operation (EDMAC, or EDMAC-2) must be used. The remote modem constantly sends back information about the demodulator E_b/N_0 using reserved bytes in the overhead structure. The local modem then compares this value of E_b/N_0 with a pre-defined target value. If the Remote E_b/N_0 is below the target, the local modem will increase its output power, and hence, a closed-loop feedback system is created over the satellite link. A particularly attractive benefit of this feature is that whenever framed operation is selected, the remote demodulator's E_b/N_0 can be viewed from the front panel display of the local modem. Note also that AUPC can be used simultaneously with EDMAC.

There are several important parameters associated with this mode of operation, and the user needs to understand how the AUPC feature works, and the implications of setting these parameters.

9.2 Setting AUPC Parameters

Step	Task
1	Under the menu (**CONFIG→Frame**), first ensure that Framing is selected. **EDMAC** or **EDMAC-2** may be selected, then the Framing mix – either **AUPC-Only** or **AUPC +EDMAC**. The important consideration is that EDMAC framing should be enabled.
2	Verify that the remote modem also has EDMAC framing enabled.
3	Under the menu (**CONFIG→Tx→Power**), set the nominal output power of the modem by selecting the **Manual** mode, then editing the Tx output power level displayed.
4	Select **AUPC** as the operating mode.

At this point, the user will be prompted to define four key parameters: **Target E_b/N_0**, **Max Range**, **Alarm**, and **Demod Unlock**.

9.2.1 Target E_b/N_0

Target E_b/N_0 is value of E_b/N_0 that the user desires to keep constant at the remote modem.
If the E_b/N_0 exceeds this value, the AUPC control will reduce the Tx output power, but will never drop below the nominal value set.

If the E_b/N_0 falls below this value, the AUPC control will increase the Tx output power, but will never exceed the value determined by the parameter **Max-Range**.

- The minimum value the user can enter is 0.0 dB
- The maximum value the user can enter is 14.9 dB
- The default value is 3.0 dB
- The resolution is 0.1 dB

9.2.2 Max Range

Max-Range defines how much the modem is permitted to increase the output level, under AUPC control.

- The minimum value the user can enter is 0 dB
- The maximum value the user can enter is 9 dB
- The default value is 1 dB
- The resolution is 1 dB

9.2.3 Alarm

The **Alarm** parameter defines how the user wants the modem to act if, under AUPC control, the maximum power limit is reached. The two choices are:

- **None** (no action)
- **Tx-Alarm** (generate a TX alarm)

The default setting is **None**.

9.2.4 Demod Unlock

Demod Unlock defines the action the modem will take if the remote demodulator loses lock. The two choices are:

- **Nom-Pwr** (reduce the Tx Output Power to the nominal value)
- **Max-Pwr** (increase the Tx Output Power to the maximum value permitted by the parameter **Max-Range**)

The default setting is **Nom-Pwr**.

If the local demod loses lock, the modem will automatically move its output power to the nominal value.

9.3 Compensation Rate

As with any closed-loop control system, the loop parameters must be chosen to ensure stability at all times. Several features have been incorporated to ensure that the AUPC system does overshoot, or oscillate.

- First, the rate at which corrections to the output power can be made is fixed at once every 4 seconds. This takes into account the round trip delay over the satellite link, the time taken for a power change to be reflected in the remote demodulator's value of E_b/N_0, and other processing delays in the modems.
- Second, if the comparison of actual and target E_b/N_0 yields a result that requires a change in output power, the first correction made will be 80% of the calculated step. This avoids the possibility of overshoot. Subsequent corrections are made until the difference is less than 0.5 dB. At this point, the output power is only changed in increments of 0.1 dB, to avoid 'hunting' around the correct set point.

9.4 Monitoring

The remote demodulator's value of E_b/N_0 can be monitored at all times, either from the front panel (**Monitor → AUPC**) or via the remote control interface. The resolution of the reading is 0.2 dB. For all values greater than or equal to 16 dB, the value 16.0 dB will be displayed. As long as framing is enabled, the value will still be available, regardless of the AUPC mode, or framing mix.

Also displayed is the current value of Tx power increase. If EDMAC framing is enabled, but AUPC is disabled, this will indicate 0.0 dB. This value is also available via the remote control interface.

Comtech EF Data strongly cautions against the use of large values of permitted power level increase under AUPC control. Users should consider using the absolute minimum range necessary to improve rain-fade margin.

Notes:

Chapter 10. CLOCKING MODES

10.1 Introduction

When dealing with satellite modems, the subject of clocking can be a complex issue. This chapter describes the various clocking options that are available with the CDM-570/570L. There are two fundamentally different interfaces provided by the modem, plus the optional IP Module Ethernet Interface:

- Synchronous clock and data interfaces (EIA-422, V.35, etc.) that permit great flexibility concerning the source and direction of clocks. These are complex.
- G.703 interfaces combine clock and data into a single signal (and are referred to as *self-clocking*). In their basic form these are less flexible and easier to understand. Additionally, a G.703 Clock extension mode is available in order to provide the transport of a high–stability G.703 (T1 or E1) timing reference to the distant end of a satellite link, regardless of the actual data rate of that link. See Section 10.5 for detailed information.
- For the optional IP Module Ethernet interface, clocking is internally controlled and clock selection is not available. The G.703 Clock extension mode is also available when using the IP interface.

10.2 Transmit Clocking

There are four transmit clocking modes in the CDM-570/570L. EIA-422/449 signal mnemonics will be used for illustration, but the description applies equally to V.35 and synchronous EIA-232.

10.2.1 Internal Clock

In this mode the modem, assumed always to be the DCE, supplies the clock to the DTE. (The EIA-422/449 name for this signal is **S**end **T**iming, or **ST**.) The DTE then clocks from this source and gives the modem transmit data (**S**end **D**ata, or **SD**), synchronous with this clock. It is optional whether the DTE also returns the clock (**T**erminal **T**iming, or **TT**). The modem can accept it if it is present, but uses ST if it is not. At rates above 2 Mbps, Comtech EF Data highly recommends that the user return TT to ensure the correct clock/data relationship.

G.703: The internal clock mode does not apply; the clock is always recovered from the incoming signal, and the modem locks its modulator clocks to this.

G.703 Clock extension: This is a special case of Internal Tx Clock, where the internal clock generator is perfectly locked to an externally applied G.703 (T1 or E1) signal. See Section 10.5 for detailed information.

10.2.2 Tx Terrestrial

In this mode, the modem expects to see the DTE provide the clock, so that it can phase-lock its internal circuits. In this case, the modem does not provide any signal on ST, but instead requires a clock signal on TT, synchronous with the data. If no clock is present, an alarm will be generated and the modem will substitute its internal clock.

G.703: This is the 'natural' clock mode.

10.2.3 Rx Loop-Timed, Rx=Tx

In certain circumstances, a terminal at the distant-end of a satellite link may be required to provide a clock to the DTE equipment which is locked to the receive satellite signal. This is similar to Internal Clock mode, in that the modem will source ST to the DTE, but now the timing is derived from the demodulator. The DTE then clocks from this source, and gives the modem transmit data (SD), synchronous with this clock. It is optional whether the DTE also returns the clock (TT); the modem can accept it, if it is present, but uses ST if it is not. If the demodulator loses lock, the modem's internal clock will be substituted, so an accurate and stable clock is present on ST, rather than a clock that may jitter and wander in a random fashion.

G.703: Does not apply.

10.2.4 Rx Loop-Timed, Rx<>Tx (Asymmetric Loop Timing)

The CDM-570/570L incorporates circuitry which permits loop timing when the Tx and Rx data rates are not the same. In this case the clock frequency appearing at ST will be whatever the TX data rate is programmed to, but phase-locked to the demodulator's receive symbol clock. In all other respects the operation is the same as for 'standard' loop timing.

G.703: Does not apply.

10.3 Receive Clocking

There are three receive clocking modes in the CDM-570/570L, plus an additional setting used for Drop and Insert only – refer to **Figure 10-1** for details.

10.3.1 Buffer Disabled (Rx Satellite)

When the buffer is disabled, the receive clock (RT) is derived directly from the demodulator, and hence will be subject to plesiochronous and Doppler offsets. In certain instances, this may be acceptable. There is still a minimum buffer in use to de-jitter the effects of removing overhead framing.

G.703: Applicable.

10.3.2 Buffer Enabled, Tx=Rx

In this instance, it is required that the buffer be enabled, so that the clock and data appearing on RT and RD are synchronous with the transmit clock. This is a relatively simple case, as the output clock for the buffer is derived directly from ST, TT or the external source.

G.703: Applicable.

10.3.3 Buffer Enabled, Rx<>Tx

This is an uncommon case, where the receive data rate does not equal the transmit clock. The modem will generate a phase-locked buffer output clock which uses the selected reference, regardless of its frequency in relation to the receive data rate.

G.703: Applicable.

10.4 X.21 Notes

For X.21 operation, use the RS-422 pins, but ignore Receive Clock if the Modem is DTE, and ignore Transmit clocks if the Modem is DCE.

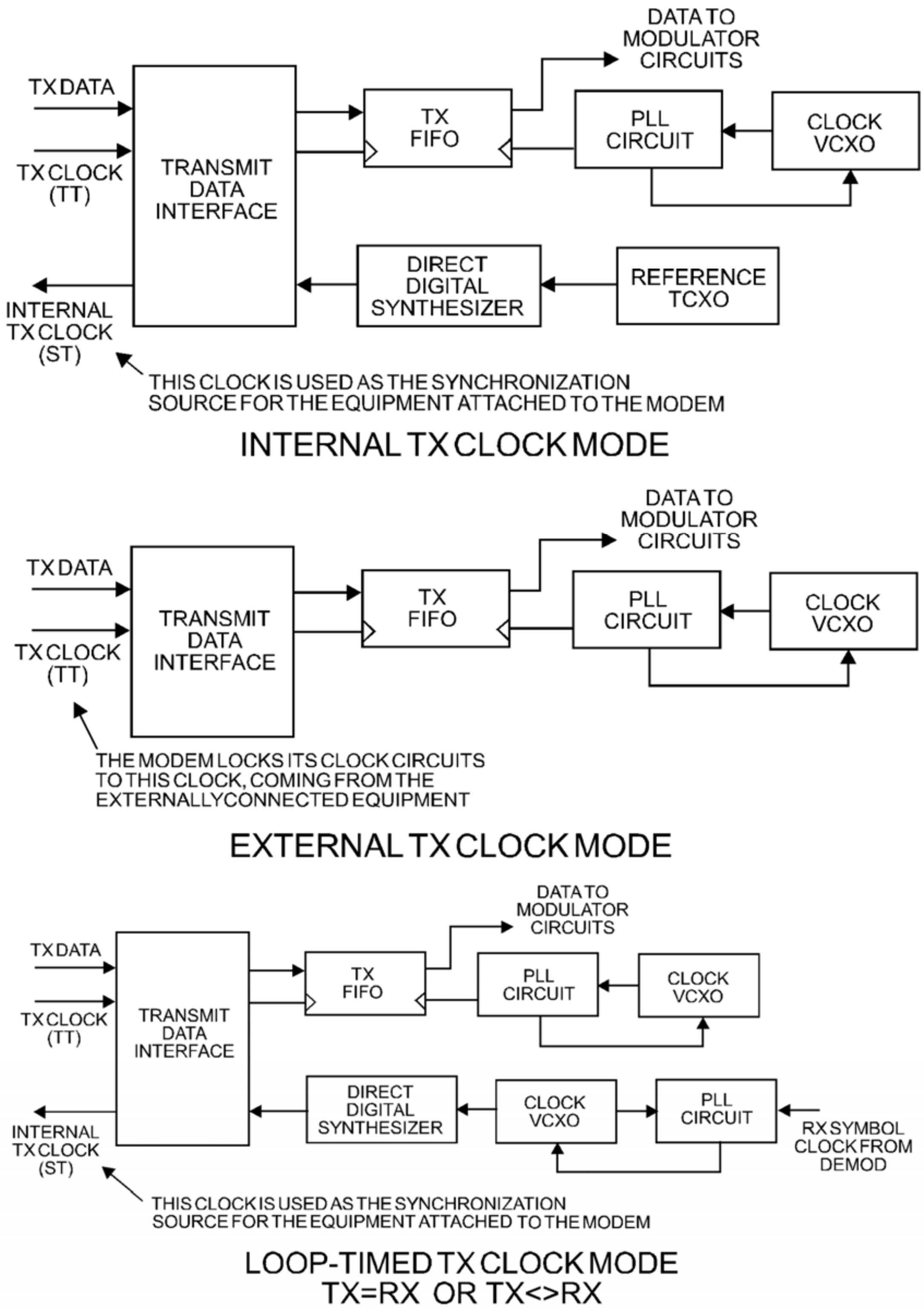


Figure 10-1. Tx Clock Modes

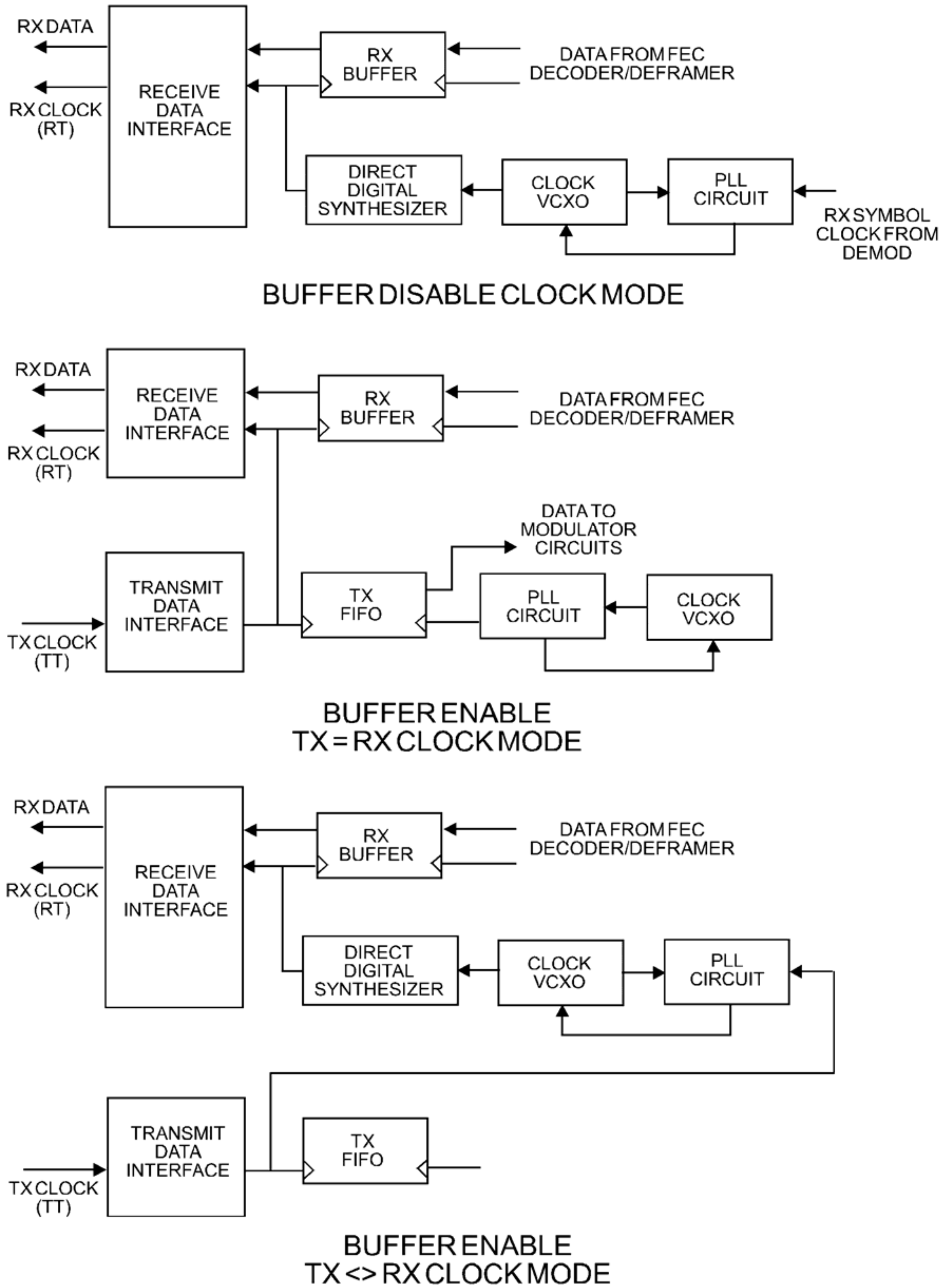


Figure 10-2. Rx Clock Modes

10.5 G.703 Clock Extension

There are some applications where it becomes necessary, at the distant end of a satellite link, to provide a high-stability G.703 timing reference for timing equipment connected to the modem. For instance, in cellular backhaul applications the BTS equipment may require such a reference, ***even though the satellite link itself may be operating at a data rate other than 1.544 Mbps or 2.048 Mbps***. Sometimes this is accomplished by adding a specialized GPS receiver at the distant end, which then provides the G.703 synchronizing signal; however, with the G.703 clock extension mode, this may become unnecessary, as the CDM-570/570L – operating at either end of the link, where the local modem has access to a high-stability G.703 signal – can provide an almost perfect copy of this signal at the distant end. The presence of Doppler shift on the link is the only factor affecting the overall accuracy. If Doppler shift were not present, the copy of the clock would be perfect.

This feature of the CDM570/570L is accomplished by the use of a novel frequency synthesis and phase locking scheme. This permits the distant end to generate a G.703 synchronizing signal that, depending on a sufficiently accurate local reference, has short term accuracy to within parts in 10^{-8}, and is solely dependent on link Doppler shift.

The subsections and figures that follow illustrate three possible G.703 clock extension modes. Details of how to set up the modems for these various operating modes are given in **Chapter 5. FRONT PANEL OPERATION.**

10.5.1 Clock Extension Mode 1

Figure 10-3 shows Clock Extension Mode 1. The local modem is assumed to be operating on INTERNAL clock. A T1 or E1 G.703 signal is applied to the rear panel connector of the modem, where the clock is recovered.

The G.703 signal is not intended to convey data – its function is only to provide a synchronizing clock. The data is transferred using the EIA-530/V.35 serial interface.

The internal clock reference generator locks, in both frequency and phase to this recovered clock, and a special synthesizer generates an ST clock of ANY ARBITRARY FREQUENCY, over the range 2.4 kHz to 9.98 MHz, with a resolution of 1 Hz. The synthesis is exact – there is no approximation or residual error. For example, if the user selects 168.231 kbps as the transmit data rate, and an E1 reference, there will be *exactly* 168,231 clock cycles generated for every 2,048,000 cycles of the E1 reference.

The internal ST clock is now used, as in the standard Internal Clock mode, to provide the timing reference for the externally-connected equipment. The data is then transmitted, at the desired data rate, to the distant end (or distant ends – this works for broadcast applications as well).

Now, at the distant end modem (timing mode: Rx Satellite), the Rx signal is received, demodulated, and the clock is recovered. A second synthesizer, very similar to the one used at the local modem, is now used to generate an E1 or T1 timing signal. Again, it should be emphasized that the synthesis is *exact.*

The net result is that the E1 or T1 timing signal used at the local end is reproduced at the distant end, *regardless of the link data rate.*

The only thing that affects the overall accuracy and stability of the copy of the clock is the Doppler shift of the link itself. This will be very dependent on the particular satellite used, and the accuracy of the orbital station keeping (often referred to as *orbital inclination*). Typically the Doppler variations are in the order of parts in 10^{-8}, but more importantly it should be recognized that over a 24 hour period the net error will be zero, due to a fundamental characteristics of geostationary orbits.

The T1 or E1 signal, available on the rear panel of the modem on the G.703 connectors, is now used to provide a synchronizing source for equipment connected to the modem. The form of this is an ‘all ones’ signal, which provides the maximum transition density in the AMI signal.

This scheme is sufficiently flexible to permit an E1 signal to be used at the local end, and a T1 signal to be reproduced at the distant end, or vice versa.

10.5.2 Clock Extension Mode 2

Figure 10-4 shows Clock Extension Mode 2. This is for situations where clock extension needs to be performed, but there is no local G.703 reference. In this case the local modem now operates in an EXTERNAL clock mode, and the accuracy of the Tx Clock is determined solely by the accuracy of the equipment connected to the modem.

At the distant end, an E1 or T1 synchronizing signal is generated *regardless of the link data rate*, as in Mode 1.

10.5.3 Clock Extension Mode 3

Figure 10-5 shows Clock Extension Mode 3. This is very similar to Mode 1, but now, instead of the EIA-530/V.35 serial interface being used, the modems are equipped with the optional IP module, and for the user, everything is based around the 10/100 Base T Ethernet interface.

At the distant end, an E1 or T1 synchronizing signal is generated *regardless of the link data rate*, as in Mode 1.

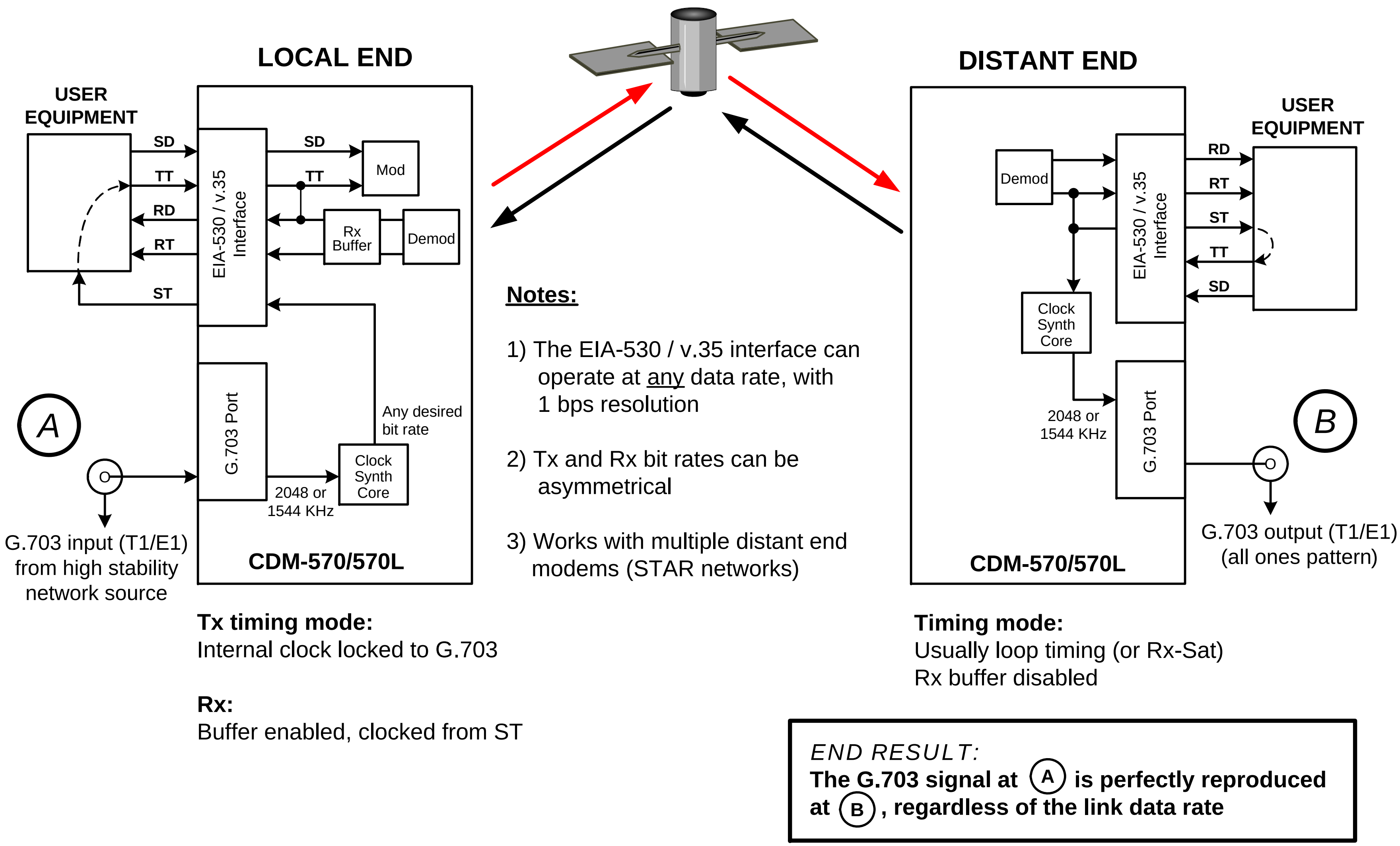


Figure 10-3. G.703 Clock Extension Mode 1

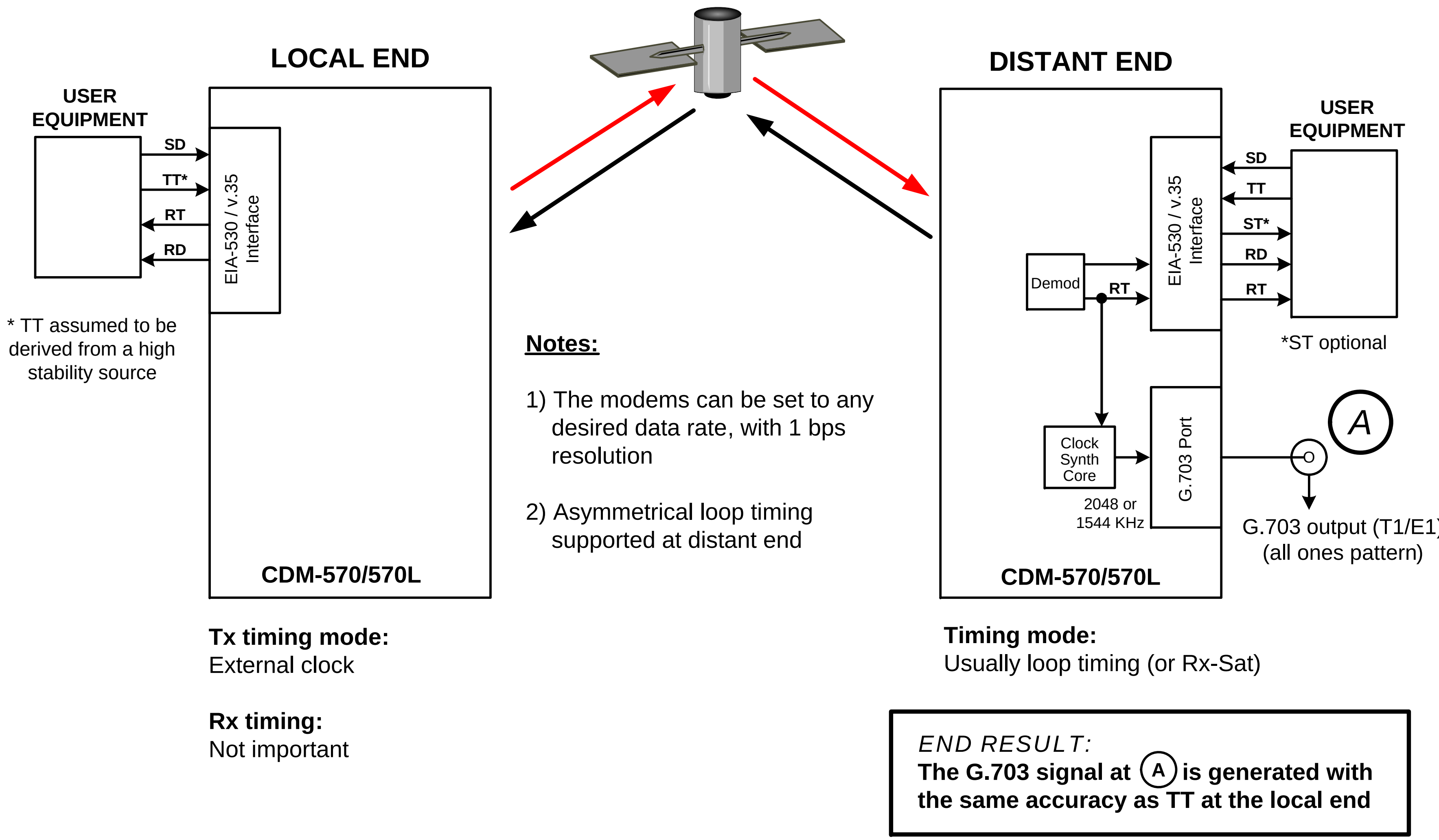


Figure 10-4. G.703 Clock Extension Mode 2

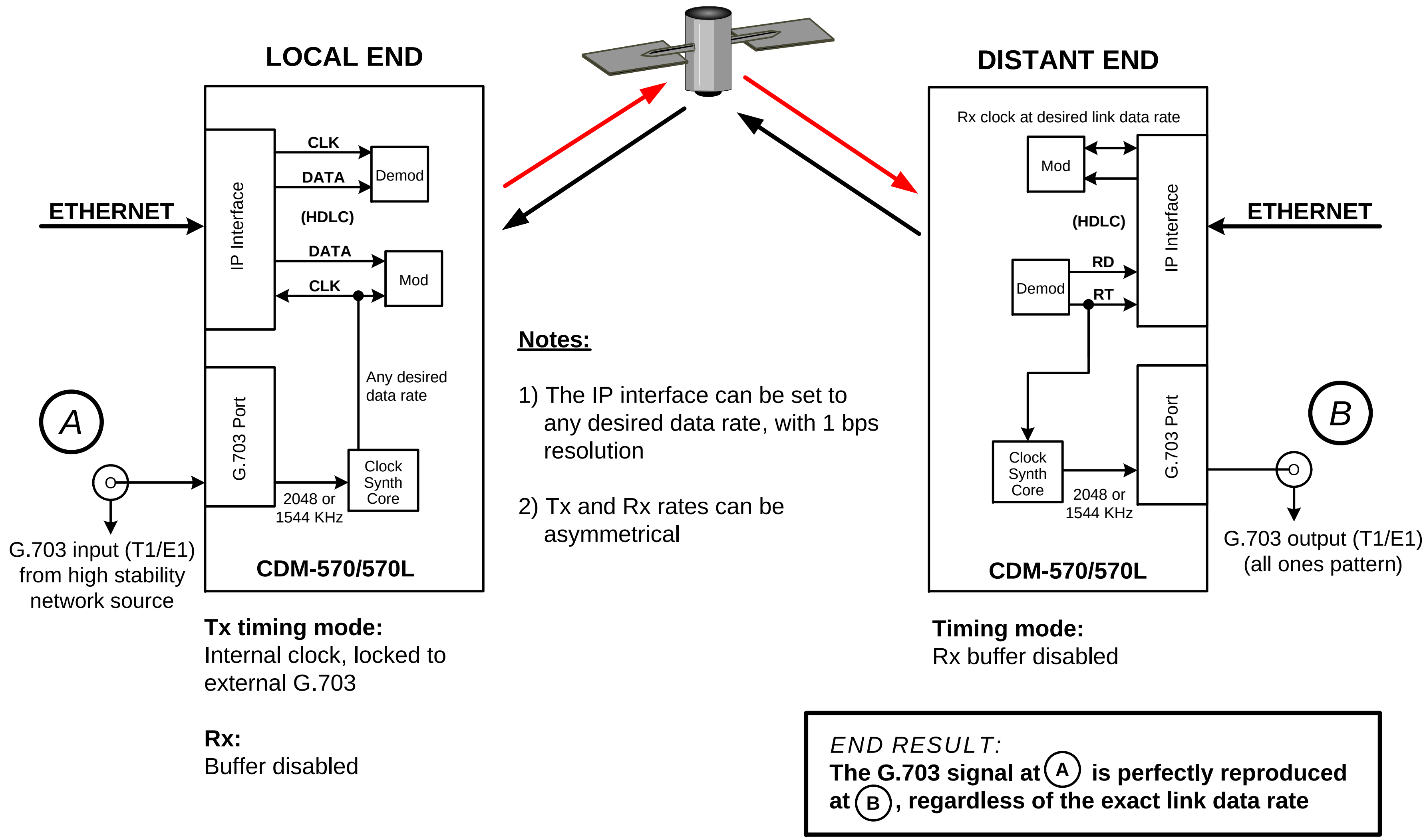


Figure 10-5. G.703 Clock Extension Mode 3

Chapter 11. EDMAC CHANNEL

11.1 Theory Of Operation

Embedded **D**istant-end **M**onitor **A**nd **C**ontrol (EDMAC) is a feature that permits the user to access the M&C features of modems that are at the distant-end of a satellite link. This is accomplished by adding extra information to the user's data in a manner that is completely transparent to the user.

On the transmit side: The data is split into frames – each frame containing 1008 bits (except Rate 21/44 BPSK Turbo or when the data rates exceed 2048 kbps – where the frame length is 2928 bits; and Rate 5/16 BPSK Turbo – where the frame length is 3072 bits). 48 bits in each frame are overhead, and the rest of these bits are the user's data. This increases the rate of transmission by 5% (approximately 1.6% for the Turbo BPSK cases, and for all data rates greater than 2.048 Mbps). ***For example***, if the user's data rate is 64 kbps, the actual transmission rate will now be at 67.2 kbps. Note that the user may also select EDMAC-2 framing, which uses a 2928 bit frame, and yields a 1.6% overhead for all modulation types and data rates.

At the start of each frame, a 12-bit synchronization word is added. This allows the demodulator to find and lock to the start of frame. At regular intervals throughout the frame, additional data bytes and flag bits are added (a further 36 bits in total). It is these additional bytes which convey the M&C data.

When framing is used, the normal V.35 scrambler is no longer used. This V.35 approach is called 'self synchronizing' because, in the receiver, no external information is required in order for the descrambling process to recover the original data. The disadvantage of this method is that it multiplies errors.

On average, if one bit error is present at the input of the descrambler, three output errors are generated. However, there is an alternative when the data is in a framed format; in this case, a different class of scrambler may be used – one which uses the start of frame information to start the scrambling process at an exact known state. In the receiver, having synchronized to the frame, the descrambler can begin its processing at exactly the right time. This method does not multiply errors, and therefore has a clear advantage over V.35 scrambling.

This is fortunate, as there is a penalty to be paid for adding the framing. By adding the extra 5% to the transmitted data rate, the effective Eb/No seen by the user will degrade by a factor of 10log(1.05), or 0.21 dB (0.07 dB in the case of the two BPSK Turbo rates). The use of an externally synchronized scrambler and descrambler almost exactly compensates for this degradation. The net effect is that the user will see effectively identical BER performance whether framing is used or not.

On the receive side: When the demodulator locks to the incoming carrier, it must go through the additional step of searching for, and locking to, the synchronization word. This uniquely identifies the start of frame, and permits the extraction of the overhead bytes and flag bits at the correct position within the frame. In addition, the start of frame permits the descrambler to correctly recover the data. The user's data is extracted, and sent through additional processing, in the normal manner. The extracted overhead bytes are examined to determine if they contain valid M&C bytes.

11.2 M&C Connection

Data to be transmitted to the distant-end is sent to a local unit via the remote control port. A message for the distant-end is indistinguishable from a 'local' message – it has the same structure and content, only the address will identify it as being for a distant-end unit.

Before the M&C data can be successfully transmitted and received, pairs of units must be split into EDMAC Masters and EDMAC Slaves. Masters are local to the M&C Computer, and Slaves are distant-end.

Now, a unit which has been designated an EDMAC master not only responds to its own unique bus address, but it will also be configured to listen for the address which corresponds to its EDMAC Slave. When a complete message packet has been received by the EDMAC Master, it will begin to transmit this packet over the satellite channel, using the overhead bytes which become available.

The 'normal' protocol for the message packet is not used over the satellite path, as it is subject to errors. For this reason, a much more robust protocol is used which incorporates extensive error checking.

At the distant-end, the EDMAC slave, configured for the correct address, receives these bytes, and when a complete packet has been received, it will take the action requested, and then send the appropriate response to the EDMAC Master, using the return overhead path on the satellite link. The EDMAC Master assembles the complete packet, and transmits the response back to the M&C Computer.

Apart from the round-trip satellite delay, the M&C Computer does not see any difference between local and distant-end units – it sends out a packet, addressed to a particular unit, and gets back a response. It can be seen that the EDMAC Master simply acts as forwarding service, in a manner which is completely transparent.

This approach does not require any additional cabling – connection is made using the normal M&C remote port. Furthermore, the user does not have to worry about configuring the baud rate of the M&C connection to match the lowest data rate modem in the system. The M&C system can have mixed data-rate modems, from 2.4 kbps to 2048 kbps, and still run at speeds in excess of 19,200 baud. It should be pointed out that at 2.4 kbps, the effective throughput of the overhead channel is only 11 async characters/second. For a message of 24 bytes, the time between sending a poll request and receiving a response will be around 5 seconds. (Note that when either of the

BPSK Turbo rates are in use, the overhead rate is reduced by a factor of three, and therefore the response time will be around 15 seconds.)

11.3 Setup Summary

To access a distant-end unit:

Step	Task
1	Designate a Master/Slave pair: Master at the local-end, Slave at the distant-end.
2	On the local-end unit, enable framing, and EDMAC, define the unit as MASTER, then enter the bus address. This is constrained to be 'base 10' meaning that only addresses such as 10, 20, 30, 40, etc, are allowed.
3	Choose a unique bus address for the distant-end. This should normally be set to the 'base 10' address + 1. For example, if the MASTER unit is set to 30, choose 31 for the distant-end unit.
4	On the distant-end unit, enable framing, and EDMAC, define the unit as SLAVE, then enter the bus address. The orange EDMAC Mode LED should be illuminated.
5	Set the local-end unit to RS485 remote control, and set the bus address of this local unit. The orange Remote Mode LED should be illuminated.
6	Once the satellite link has been established, connect the M&C Computer, and begin communications, with both the local and distant end units.

EDMAC modes are fully compatible with AUPC modes.

Notes:

Chapter 12. OFFSET QPSK OPERATION

Offset QPSK modulation is a variation of normal QPSK, which is offered in the CDM-570/570L. Normal, bandlimited QPSK produces an RF signal envelope that necessarily goes through a point of zero amplitude when the modulator transitions through non-adjacent phase states. This is not considered to be a problem in most communication systems, as long as the entire signal processing chain is linear.

However, when bandlimited QPSK is passed through a non-linearity (for instance, a saturated power amplifier), there is a tendency for the carefully-filtered spectrum to degrade. This phenomenon is termed ‘spectral re-growth’, and at the extreme (hard limiting) the original, unfiltered sin(x)/x spectrum would result. In most systems, this would cause an unacceptable level of interference to adjacent carriers, and would cause degradation of the BER performance of the corresponding demodulator.

To overcome the problem of the envelope collapsing to a point of zero amplitude, Offset QPSK places a delay between I and Q channels of exactly 1/2 symbol. Now the modulator cannot transition through zero when faced with non-adjacent phase states. The result is that there is far less variation in the envelope of the signal, and non-linearities do not cause the same level of degradation.

The demodulator must re-align the I and Q symbol streams before the process of carrier recovery can take place. For various reasons this makes the process of acquisition more difficult, and acquisition times may be longer, especially at low data rates.

Notes:

Chapter 13. IP MODULE ETHERNET INTERFACE

13.1 Introduction

The CDM-570/570L's optional IP Module Ethernet Interface makes the CDM-570/570L a high-performance, low-cost, IP-centric satellite modem that is well-suited for closed network **S**ingle **C**hannel **P**er **C**arrier (SCPC) links. It is also ideal for many VSAT applications.

The CDM-570/570L, when equipped with the optional IP Module, can also be utilized in a ViperSat satellite bandwidth management system (VMS). For specific information on the CDM-570/570L IP Module operation when deployed in a ViperSat system, see adjunct Comtech EF Data publication **MN/22125 – *Vipersat CDM-570/570L Satellite Network Modem Router User Guide***.

13.2 Major Assemblies

Assembly	Description
PL/10235-1	IP Ethernet Module MPP-50

13.3 IP Module Standard Features

- 10/100BaseT Ethernet Interface;
- Powerful Network Management:
  - Front Panel operation for complete product management;
  - HTTP Interface for complete product management;
  - SNMP with public and private MIB;
  - Console Port interface for local network management;
  - Telnet interface for remote product M&C;
  - Remote software/firmware upgrade via FTP.
- Configuration Backup and Restore via FTP;
- Event Logging to Capture all IP Module Activity;
- Detailed Statistics of IP traffic;

- IGMP Support for Multicast;
- Static IP Routing for Unicast and Multicast;
- Managed Switch Mode with VLAN Support (added in Firmware Ver. 1.5.4);
- Streamline Encapsulation (added in Firmware Ver. 1.7.0).

13.3.1 10/100BaseT Ethernet Interface

In Router Mode operation, the 10/100BaseT Ethernet Interface is used for routing IP traffic to be transmitted over the satellite or routed to another device on the local LAN. In Managed Switch Mode, the Ethernet Interface is used to forward IP and non-IP traffic over the satellite. Local or remote management of all CDM-570/570L and IP Module functions is also available via Telnet, HTTP, or SNMP.

13.3.2 Network-Based Management

Use any of the following methods to configure, operate, and monitor the CDM-570/570L Satellite Modem with Optional IP Module:

User Interface	Connection	Modem Functions	IP Module Functions	Manual Reference
Front Panel	Local - Keypad	ALL	IP Address/Subnet Mask only	Chapter 5
SNMP	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 6.4
HTTP (Web Server)	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 13.6
Serial Command Line Interface (CLI)	Local - Serial RS-232 via Console Port	ALL	ALL	Chapter 14
Telnet	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 14
Serial Remote Control	Local - Serial RS-232/RS-485 via Remote Control Port	ALL	IP Address/Subnet Mask only	Appendix D

13.3.3 Remote Software/Firmware Upgrade via FTP

The IP Module uses ‘flash memory’ technology internally, and new firmware can be uploaded to or from an external user PC by FTP. This simplifies firmware updating, and updates can be received via the Internet, through e--mail, or on CD. The firmware update can be performed without opening the unit or having to be in the same physical location.

13.3.4 Configuration Backup and Restore via FTP

All Base Modem and IP Module configuration parameters are stored in a simple text file. The parameter file can easily be retrieved locally or remotely by FTP. The file can then be used to quickly configure a replacement modem if needed.

13.3.5 Event Logging to Capture all IP Module Activity

All IP Module activity can be stored into an easy-to-read Event Log. This file can also be retrieved locally or remotely by FTP.

13.3.6 Detailed Statistics of IP Traffic

IP traffic statistics are continuously updated and allow detailed performance analysis or can be used to identify traffic problems. The statistics are available through the Serial Console locally, or can be gathered remotely by Telnet, HTTP, or SNMP.

13.3.7 IGMP Support for Multicast

IGMP is a standard feature in the IP Module. If enabled, it responds to IGMP queries for the configured multicast routes on the transmit side and generates IGMP queries on the receive side. If there are no active IGMP receivers on the LAN, it will stop forwarding the multicast traffic (received from the satellite) to the LAN.

13.3.8 Static IP Routing for Unicast and Multicast

Up to 256 static routes can be entered into the IP Module to direct IP traffic over the satellite or to another device on the local LAN. These 256 routes could be in any combination of unicast and multicast.

13.3.9 Managed Switch Mode

Managed Switch Mode is the Comtech EF Data IP modem intelligent networking solution that allows a link to be setup with minimal configuration (no specific routes need to be configured). The IP Module also supports non-IP traffic with Managed Switch Mode. All IP traffic will be subject to user configured QoS restrictions.

13.3.9.1 Managed Switch Mode Operation

1. ***Managed Switch Mode will automatically use Header Compression for compressing Layer 2 (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted. For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite, then it will time out until the full Header packet is sent. The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both IP modems will be able to receive all traffic, unless one IP modem is power cycled or reset. Header Compression feature should be enabled for compressing Layer 3, Layer 4 and Layer 5.***

2. ***Do not enable IF Loopback (or link the TX to RX by a BNC cable or satellite) on a IP modem operating in Managed Switch Mode when***

connected to a LAN. In this configuration, Managed Switch Mode will resend all Layer 2 broadcast packets and cause a "broadcast storm" on the LAN. To perform a loop test to verify the modem or satellite link, do one of the following:

a) ***Reconfigure the CDM-570/570L interface selection: From the front panel, select*** **Config→ Intfc*****, then select*** **RS422, V.35*****, or*** **RS232*****.***

- OR -

b) ***Set the IP Module to Router Mode.***

Information about how Managed Switch Mode functions, as well as a detailed description for how a Managed Switch Mode pair should be set up and configured, is as follows:

- Because Managed Switch Mode is a "smart wire," the devices attached to it on either side of the satellite should be on the same subnet and should not configure a next hop address to be the CDM-570/570L IP address (as should be done with router mode). For purposes of configuration, Managed Switch Mode should be viewed to function in much the same way as a bridge (however, without spanning tree protocol).
- All of the features that groom and optimize the satellite link in router mode are also available in Managed Switch Mode.
- Managed Switch Mode Multicast Option – Multicast packets in Managed Switch Mode are identified using multicast MAC address. These identified multicast packets are either routed or dropped based on the Managed Switch Mode multicast option.
- Managed Switch Mode uses Layer 2 (MAC) addresses to learn where to send packets. In comparison, router mode uses the destination IP address in the packet in conjunction with the route table to determine where to forward the packets.
- The IP Module Ethernet Interface in Managed Switch Mode is configured to be in promiscuous mode with a data rate of 10/100BaseT Half Duplex/Full Duplex. The IP Module needs to be in promiscuous mode in order to learn the attached networking devices.
- Since Managed Switch Mode does not use a routing table, the determination of where to send a packet is made by a learning process. When the system is powered-up, all packets from each subnet (local and remote) will be sent over the satellite interface. However, as each IP Module learns which devices are attached to their local Ethernet interfaces, the IP Module begins to filter packets which it has learned are locally attached to its Ethernet interface.
- The Managed Switch Mode learning/forwarding algorithm is as follows:
  - If the packet is destined for the IP Module, then process it locally.
  - If the packet is from the Ethernet interface, then send it to the Satellite interface; OR if the destination Layer 2 (MAC) address of the packets matches the source Layer 2 address for a packet we have already seen, then the destination MAC address of this packet is on our local subnet; so why send it over the satellite interface. In this case, the IP Module will drop the packet.
  - If the packet is from the satellite interface, then send it out the Ethernet interface.

- Managed Switch Mode also supports VLAN's and when VLAN Mode is enabled, will forward traffic as follows:
  - If an untagged packet arrives at the IP Module, it will egress as a tagged packet with the defined Native VLAN ID.
  - VLAN entries can be added into the VLAN Table and to forward VLAN's over the satellite. A VLAN entry is also needed on the receiving CDM-570 to receive the VLAN traffic and they will egress as tagged VLAN's.
  - If a tagged packet arrives at the Ethernet port, it will only be forwarded if there is a matching VLAN entry in the VLAN Table and it will egress as tagged. If there is no matching VLAN in the VLAN Table, the tagged packet will be dropped.
- VLAN operation in the CDM-570 also includes full 802.1Q VLAN QoS support. With the QoS Option enabled, the IP Module will read the 802.1Q VLAN Priority (7 through 0) that is in the VLAN Header in each VLAN frame received and will prioritize traffic accordingly.

13.3.10 Streamline Encapsulation (Version 1.7.x and later)

Numerous encapsulation techniques exist for transporting packetized data including HDLC and GSM. Many of them perform well on large packet sizes, but produce excessive overhead on smaller packet sizes such as those found in VoIP or when Header and / or Payload compression techniques are utilized. Some, such as HDLC, are data dependent making it impossible to specify the amount of user bandwidth available and giving a lower bound of 3% in purely random data regardless of how large the packets are.

The Comtech Streamline Encapsulation method was developed to provide a low overhead method of transporting any size packetized data. It provides superior performance on small packets and performs well on large packets, with overhead performance approaching 1%.

As shown in **Table 13-1**, the three basic encapsulation methodologies are compared and, as this table illustrates, the large performance gain of over GSM and HDLC encapsulation on smaller packets far outweighs the 1% disadvantage on large packets. With respect to HDLC, Comtech Streamline Encapsulation outperforms the longtime industry standard on all packet sizes.

Table 13-1. Streamlined Encapsulation

Packet Size	GSM (%)	HDLC (%)	Comtech Streamline (%)
32	15.6	18.8	7.4
64	7.8	10.9	4.3
128	3.9	7.0	2.7
256	2.0	5.1	2.0
512	1.0	4.1	1.6
1024	0.5	3.6	1.4
2048	0.2	3.4	1.3

Additional advantages of Streamline Encapsulation include:

- HDLC addresses are removed to reduce overhead and deployment configuration complexity;
- HDLC addressing modes have been removed;

- Receive Header Compression is now automatically determine from the Streamline encapsulation information. This removes the need to configure the Rx Header Decompression feature (these options have been removed);
- The Vipersat STDMA ACK packet (one per burst) is much smaller (42 to 14 bytes).

13.3.10.1 Combined Working Mode

In order greatly simply the configuration complexity, the working modes operation of modem have been centralized in the single Working Mode configuration parameter, which in turn offer the following functional parameters:

Mode Selection	Function
Managed Switch	Managed switch with support for VLAN as well as advanced features such as QoS, Header Compression and Payload Compression. Primarily intended for operation in a point-to-point topology.
Router-Hub	Hub side router in a Point-to-Multipoint network. Allows Sat-to-sat
Router-Remote	Remote Router in a Point-to-Multipoint network. Packets from the WAN are not allowed to be sent to the WAN. No longer requires HDLC receive addresses to be configured.
Router-Point to Point	Point-to-Point router in Point-to-Point configurations.
Vipersat Router-Hub	Hub router in a Vipersat Network
Vipersat Router-Hub Expansion	Hub Expansion router in a Vipersat Network
Vipersat Router-Remote	Remote router in a Vipersat Network
Vipersat Router-Remote Expansion	Remote Expansion Router in a Vipersat Network.

The Vipersat "Unit Role" and "Expansion Role" parameters are not read-only.

13.4 IP Module Optional Features

Enhancing the IP Module performance is simple. Additional features can be quickly added on site by using the CDM-570/570L front panel controls to enter a FAST Access Code purchased from Comtech EF Data. See **Appendix C. FAST ACTIVATION PROCEDURE** for more information.

- 3xDES Data Encryption;
- IP Header Compression;
- Payload Compression;
- Quality of Service (QoS) – supports three different modes of QoS:
  - Minimum/Maximum Bandwidth;
  - Maximum Bandwidth/Priority;
  - DiffServ.

- Vipersat (Management by VMS);
- VFS (Vipersat File Streaming).

13.4.1 CDM-570/570L IP Module Demo Mode

Demo Mode temporarily enables the following IP optional features:

- IP Header Compression
- Payload Compression
- Quality of Service (QoS)
- Vipersat
- VFS

The Demo Mode is a cumulative counter that can be stopped and started at any time, for a total time duration of up to seven (7) days, or 168 hours.

To enable Demo Mode: From the CDM-570/570L front panel, select **UTIL: DEMO → ON**. The seven day Demo Mode Timer will start but can be stopped at any time by setting Demo Mode to **OFF**.

All IP FAST Options except 3xDES Encryption may be temporarily enabled using the 7-day Demo Mode.

13.4.2 3xDES Encryption with Ability to Change Keys

The IP Module optionally supports 3xDES-128 (using NIST certified 3x core) encryption and decryption, for the highest level security for link encryption. Each unit supports eight encryption keys and eight decryption keys. The keys are user configurable. Each route can be assigned to be encrypted by any of the eight available keys, random key method, or transmitted in clear.

13.4.3 IP Header Compression

Header Compression is an optional feature of the IP Module. The IP Module supports Header Compression for the following Ethernet and Layer 3, 4 & 5 Headers:

Supported Ethernet Headers
Ethernet 2.0
Ethernet 2.0 + VLAN-tag
Ethernet 2.0 + MPLS
802.3-raw
802.3-raw + VLAN-tag
802.3 + 802.2
802.3 + 802.2 + VLAN-tag
802.3 + 802.2 + SNAP
802.3 + 802.2 + SNAP + VLAN-tag
802.3 + 802.2 + SNAP + MPLS

Supported Layer 3 & 4 Headers
IP
TCP
UDP
RTP (Codec Independent)

Header Compression reduces the required VoIP bandwidth by 60 percent. Example: A G.729a voice codec, operating at 8 kbps, will occupy 32 kbps once encapsulated into IP framing on a LAN. Using IP/UDP/RTP Header Compression, the same traffic only needs 10.8 kbps total WAN satellite bandwidth to cross the link. A total maximum of 64 simultaneous VoIP calls can be compressed. Normal HTTP (Web) traffic can be reduced an additional 10% via IP/TCP header compression. Note the following:

- **Header Compression Configuration** is completely independent from QoS, and there is no configuration required except enabling the Header Compression feature on both the sending and receiving Comtech EF Data IP modem. Packets with a Header Compression supported header will automatically be identified for compression. The only configuration consideration is the Header Compression Refresh Rate. This is how many compressed header packets will be sent before a single full header packet is sent. Some compressed header traffic could be lost during deteriorated satellite link conditions. Sending a full header packet will allow the return of the traffic stream. The Refresh Rate can be increased for poor satellite link conditions or decreased to further reduce overhead.
- **Header Compression Statistics** will display the total bytes of the pre-compressed and post-compressed traffic and effective compression ratio.

13.4.4 Payload Compression

Traffic optimization through Payload Compression is an optional feature of the IP Module. Note the following::

- FAST feature to upgrade;
- Uses AHA chip;
- Compression algorithm applied to all data (HDLC header excluded);
- Compression statistics are fed back to QoS in order to maximize WAN utilization while maintaining priority, jitter and latency;
- 1024 simultaneous compression sessions to maximize compression across multiple distinct traffic flows;
- Compression algorithm not applied to RTP streams because this traffic is already compressed and would only INCREASE the sat bandwidth if compressed again;
- Additional statistics have been added to the compression statistics menu in order to provide feedback on the compression efficiency that has been achieved;
- Payload Compression is selectable on a per route basis.

13.4.4.1 ADLC vs. LZS Compression Comparison

These numbers have been generated by using an internally created test program. This program takes the target benchmark files and splits the files into payload size chunks and compresses each chunk in a separate invocation of the compression algorithm. This is important to note because most compression algorithms are applied to the entire file data set as a single invocation of the compression algorithm which is easier for other types of compression algorithms (LZS, GZIP in specific). This, of course, does not apply to streamed packet data across an IP network (FTP transfer, for example).

Algorithm	Payload size	File Set	Ratio
ADLC	1472	Calgary	1.76
	1000		1.76
	500		1.77
	100		2.09
	1472	Canterbury	1.71
	1000		1.72
	500		1.74
	100		2.04
LZS	1472	Calgary	1.66
	1000		1.66
	500		1.68
	100		1.97
	1472	Canterbury	1.61
	1000		1.62
	500		1.63
	100		1.91

13.4.5 Quality of Service

Quality of Service (QoS) is an optional feature of the IP Module. The user may select one of three modes of QoS operation:

- Mode 1 – QoS Rules based on Maximum Bandwidth and Priority;
- Mode 2 – QoS Rules based on Minimum and Maximum Bandwidth;
- Mode 3 – DiffServ.

QoS Segmentation and Reassembly (SAR): Packet Segmentation and Reassembly (SAR) is enabled automatically while QoS is enabled. However, SAR is an adaptive process; it will trigger only if the packet latency exceeds the threshold value (default to 20 msec). Latency value is calculated based on the satellite transmission bandwidth. There is no minimum segment size. However if the last segment is less than 16 bytes, then it will be appended to the previous segment excluding satellite HDLC header in order to avoid satellite overhead and consumption of CPU cycles.

Weighted Random Early Detection (WRED): The MIN-MAX and MAX-Priority QoS modes allow the user to enable or disable the WRED option. In Diffserv mode, WRED is applicable to Asure forwarding only; however, the user can change the WRED option. WRED allows for more graceful dropping of packets as QoS queues get full. Typically, without WRED, packets are dropped based upon a simple tail drop algorithm that is applied to packets as they are being added to the QoS queues. This can result in large numbers of contiguous packets being dropped, which causes many protocols such as RTP and TCP to ungracefully degrade performance in an over-consumed or bursty scenario. WRED applies a randomization, which means that the percentage change to drop packets increases as the queue becomes full, and minimizes the chances of global synchronization. Thus, WRED allows the transmission line to be used fully at all times.

System Latency: System latency is used to define the maximum duration that a packet will stay in a QoS queue. Rather than waste satellite bandwidth on invalid packets, this mechanism serves to ensure that old packets are "aged" out of the system.

13.4.5.1 Maximum Bandwidth/Priority QoS Mode

QoS Rules can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

Priority – A Priority level from 1 to 8 is assigned for each flow:

- The IP Module classifies each packet that is to be forwarded over the satellite; the packet then has a Priority assigned according to the defined QoS Rules;
- Any latency critical traffic such as VoIP/RTP should always be assigned Priority 1.;
- Priority 1 packets are forwarded immediately; Priority 2 packets are forwarded as soon as there are no Priority 1 packets in the Queue; and so on;
- Any packet that does not meet a QoS Rule is assigned to the Default Rule and is assigned a Priority of 9.

Maximum Bandwidth – This can also be assigned to a flow to restrict the Maximum Bandwidth that any particular flow will utilize; otherwise, the default of no bandwidth restriction can be selected.

Filtering – QoS also allows specific flows to be designated as "filtered," so the IP Module will discard traffic that the user does not want to forward over a satellite link.

QoS Rule Hierarchy – It is quite possible to have traffic that meets the definitions of several QoS Rules. All traffic will be classified into the first QoS Rule that is a match, or fall into the Default Rule. The most specific QoS Rule will always be first. For example, a QoS Rule that identified a Source and Destination IP Address would be assigned ahead of a rule that just defined RTP protocol. QoS Rules that have the same amount of variables defined are sorted as follows:

1. Having a Protocol defined:

Protocol Priority	
CTRX	CITRIX Protocol
FTP	File Transfer Protocol
HTTP	Hypertext Transfer Protocol
ICMP	Internet Control Message Protocol
IP	All Internet Protocol
N-IP	All Non-Internet Protocol
ORCL	ORACLE Protocol
RTP	All Real Time Protocol
RTPS	Real Time Protocol Signaling
SAP	Service Announcement Protocol
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SQL	Structured Query Language Protocol
TCP	Transmission Control Protocol

TELN	Telnet Protocol
UDP	User Datagram Protocol
VDEO	Video Real Time Protocol
+	Voice Real Time Protocol

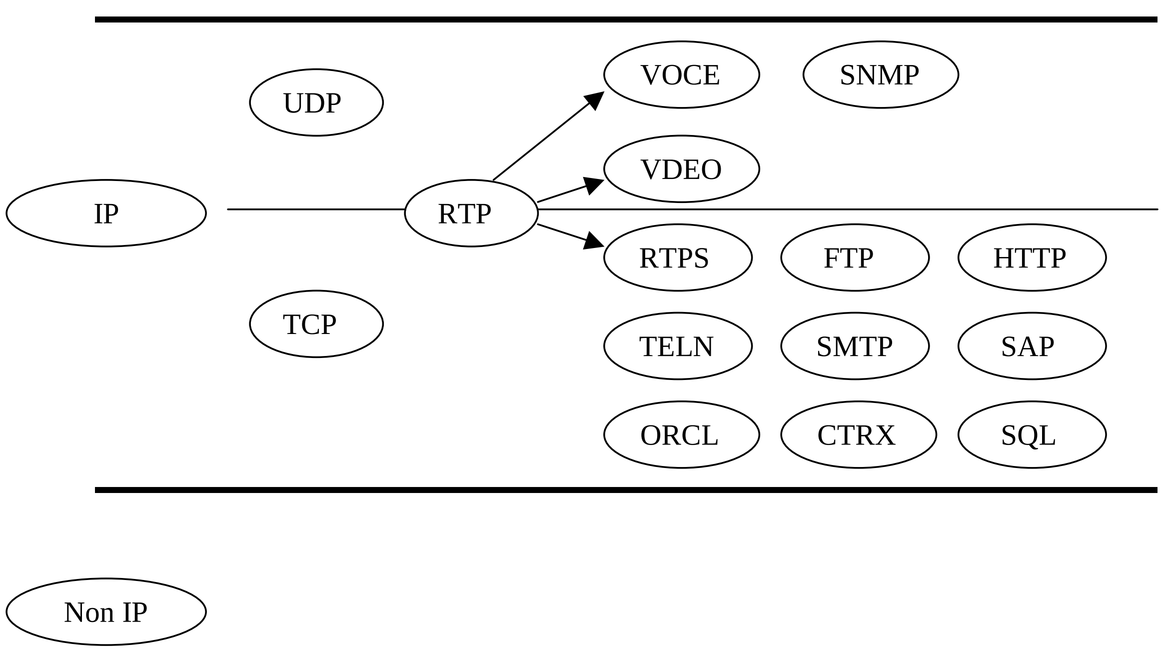
2. Source IP Address or subnet defined.
3. Destination IP Address or subnet defined.
4. Source Port defined (lowest Port number first).
5. Destination Port defined (lowest Port number first).

The IP Module will sort each QoS rule as they are added and the QoS Configuration display will be updated to reflect the order with which rules are matched.

QoS Statistics – Every QoS Rule defined can be monitored to see the traffic flow for each Queue. These statistics will display the traffic sent in each Queue, the amount of dropped traffic, and the number of Active Flows.

Protocol and Port Number Considerations – When defining QoS Rules, it is important to be aware of specifics of the traffic for which the rule is intended. When selecting a protocol for a QoS Rule, be aware that the IP Module allows for a very broad selection (such as IP) or a very specific protocol. For example, RTP traffic can consist of UDP portion (for voice or video) and a TCP portion (for RTP signaling). These could have separate QoS Rules created or all be included in a single Rule by selecting RTP as the protocol.

The following diagram illustrates where each protocol selection resides:



Selection of Source/Destination Ports should only be done if the user is aware of the port usage of the desired protocol or application. There are well known ports for various protocols, but often only the 'command' messaging is transacted on these ports and the 'data' is transferred through a negotiated port.

The following table can be used as a reference for some well known Port numbers:

Port	Description	Port	Description
1	TCP Port Service Multiplexer (TCPMUX)	118	SQL Services
7	ECHO	119	Newsgroup (NNTP)
20	FTP - Data	137	NetBIOS Name Service
21	FTP - Control	139	NetBIOS Datagram Service
22	SSH Remote Login Protocol	150	NetBIOS Session Service
23	Telnet	156	SQL Server
25	Simple Mail Transfer Protocol (SMTP)	161	SNMP
42	Host Name Server (Nameserv)	179	Border Gateway Protocol (BGP)
53	Domain Name System (DNS)	190	Gateway Access Control Protocol (GACP)
69	Trivial File Transfer Protocol (TFTP)	197	Directory Location Service (DLS)
70	Gopher Services	396	Novell Netware over IP
80	HTTP	443	HTTPS
108	SNA Gateway Access Server	444	Simple Network Paging Protocol (SNPP)
109	POP2	546	DHCP Client
110	POP3	547	DHCP Server
115	Simple File Transfer Protocol (SFTP)	1080	Socks

Once the QoS Rules are defined, each type of traffic flow should be isolated and sent to verify that it is being sent in the intended QoS Rule.

13.4.5.2 Minimum/Maximum Bandwidth QoS Mode

QoS Rules can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

Weighted Random Early Detection (WRED) – The Min/Max BW QoS mode allows the user to select Weighted Random Early Detection (WRED).

WRED allows for more graceful dropping of packets as QoS queues get full. Typically, without WRED, packets are dropped based upon a simple tail drop algorithm that is applied to packets as they are being added to the QoS queues. This can result in large numbers of contiguous packets being dropped, which causes many protocols such as RTP and TCP to ungracefully degrade performance in a over-consumed or bursty scenario. WRED applies a randomization, which means that the percentage change to drop packets increases as the queue becomes full, and minimizes the chances of global synchronization. Thus, WRED allows the transmission line to be used fully at all times.

Maximum Bandwidth – This can be assigned to a flow to restrict the Maximum Bandwidth that any particular flow will utilize; otherwise, the default of no bandwidth restriction can be selected.

Minimum Bandwidth – Minimum specification that allows a committed information rate (CIR) to be applied to user defined classes of traffic; otherwise, the default of no minimum bandwidth can be selected.

Filtering – Any specific flow can be designated as filtered (see Maximum Bandwidth/Priority QoS).

QoS Rule Hierarchy – The QoS Rule Hierarchy is the same as Maximum Bandwidth/Priority QoS.

QoS Statistics – QoS Statistics are displayed as Maximum Bandwidth/Priority QoS.

13.4.5.3 DiffServ QoS Mode

The IP Module QoS can also be set to DiffServ Mode to make it fully compliant to the Differential Services QoS RFC standards.

Class Selector DiffServ Code Points (DSCP) – Some implementations of DiffServ will prioritize traffic by Class Selector assignment. This is defined in the DiffServ Code Points (DSCP) within the IP header. The first three bits of the DSCP define the Class Selector Precedence (or Priority):

Class Selector	DSCP	IP Module Priority
Precedence 1	001 000	7
Precedence 2	010 000	6
Precedence 3	011 000	5
Precedence 4	100 000	4
Precedence 5	101 000	3
Precedence 6	110 000	2
Precedence 7	111 000	1
Default	000 000	9

The IP Module will prioritize the traffic based upon the DSCP Class Selector Precedence.

All traffic that does not have the DSCP Class Selector Precedence defined (000 000) will be placed in the Default Queue and have a Precedence of 9.

Expedited Forwarding and Assured Forwarding DSCP – Another implementation of DiffServ uses all six bits of the DSCP to define Expedited and Assured Forwarding:

DiffServ Type	Class Selector	DSCP	IP Module Priority
Expedited Forwarding	Precedence 1	101 110	3
Assured Forwarding – Class 1	Precedence 8	001 xx0	7
Assured Forwarding – Class 2	Precedence 8	010 xx0	7
Assured Forwarding – Class 3	Precedence 8	011 xx0	7
Assured Forwarding – Class 4	Precedence 8	100 xx0	7

Expedited Forwarding (EF) DSCP – This defines premium service and is recommended for real time traffic applications such as VoIP and video conferencing.

Assured Forwarding (AF) DSCP – This defines four service levels and also uses the last three bits of the DSCP to define the Drop Precedence (Low, Medium, or High). The Drop Precedence determines which packets will most likely be dropped during periods of over congestion, similar to Weighted Random Early Detection (WRED). As a result, each of the four AF service levels also have three Drop Precedence levels for which the IP Module provides 12 separate queues.

Minimum Bandwidth (AF only) – Minimum specification that allows a committed information rate (CIR) to be applied to user defined classes of traffic, or the default of no minimum bandwidth can be selected.

Maximum Bandwidth (AF only) – This can be assigned to a flow to restrict the maximum bandwidth that any particular flow will utilize, or the default of no bandwidth restriction can be selected.

1. ***Minimum and maximum bandwidth is only configurable for each of the four Assured Forwarding classes.***

2. ***Typically, DiffServ is implemented using exclusively Class Selector DSCP or exclusively Expedited and Assured Forwarding DSCP. The IP Module is fully DiffServ compliant and will work with either DiffServ implementation, or with a combination of both.***

13.5 IP Module Specifications – Supported RFCs and Protocols

Supported RFC	Protocol
RFC 768 User Datagram Protocol	RFC 791 Internet Protoco7l
RFC 792 Internet Control Message Protocol	RFC 793 Transmission Control Protocol
RFC 826 An Ethernet Address Resolution Protocol	RFC 856 Telnet Binary Transmission
RFC 862 Echo Protocol	RFC 894 A Standard for the Transmission of IP Datagrams over Ethernet Networks
RFC 959 File Transfer Protocol	RFC 1112 Host Extensions for IP Multicasting
RFC 1213 Management Information Base for Network Management of TCP/IP-based internet: MIB-II	RFC 1812 Requirements for IP Version 4 Routers
RFC 2045 Multipurpose Internet Mail Extensions (MIME)	RFC 2236 Internet Group Management Protocol, Version 2
RFC 2474 Definition of the Differentiated Services Field (DS Field) in the Ipv4 and Ipv6 Headers	RFC 2475 An Architecture for Differentiated Services
RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 2597 Assured Forwarding PHB Group
RFC 2598 An Expedited Forwarding PHB	RFC 2616 Hypertext Transfer Protocol – HTTP/1.1
RFC 2821 Simple Mail Transfer Protocol	RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3416 Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)	RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)

13.6 IP Module HTTP Interface

The embedded IP Module HTTP Interface enables configuration and monitoring of features unique to the IP Module Interface. It also integrates much of the CDM-570/570L Base Modem HTTP Interface functionality (see **Chapter 7. BASE MODEM HTTP INTERFACE** for more information). The IP Module HTTP Interface provides an easy-to-use interface for configuring and monitoring most aspects of the CDM-570/570L modem and all IP Module parameters.

The user can fully control and monitor operation of the IP Module from the IP Module HTTP Interface. By rolling the cursor over the tabs located at the top of each page, the user can select from the available nested hyperlinks (as shown to the right).

The pages in the IP Module HTTP Interface have been designed to work using either Microsoft's Internet Explorer Version 6.0 or higher, or Mozilla Firefox Version 2.0 or higher (the examples shown use Internet Explorer Version 6.0).

1. ***The Ethernet M&C port is designed to be used on a CDM-570/570L modem that does NOT have the optional IP Module installed. With the IP Module installed the IP Module Traffic port and base modem M&C port will share the same IP address and can cause an IP conflict on the local network if both ports are used. Therefore, when the IP Module is installed, only the IP Module Traffic port should be used for IP traffic, base modem and IP Module FW upgrades, and Ethernet Management. The Traffic port supports Ethernet Management of all IP Module functions as well as all base modem functions via Web, Telnet and SNMP.***
2. ***In order to make any IP Module modifications permanent, the unit configuration must be saved before rebooting the unit (select Maint/Save).***

13.6.1 User Login

To initiate a Web session with the CDM-570/570L IP Module, from a Web browser type *http://www.xxx.yyy.zzzz* (where "*www.xxx.yyy.zzz*" represents the IP address of the IP Module) into the browser's **Address** area:

The user is then prompted to type in a valid **User name** and **Password**, similar to the dialog box shown to the right. For all interfaces, the default for both is **comtech**.

(**Note:** The site IP address shown in this example is for display purposes only. Contact your network administrator to determine the appropriate IP address assignment for your modem.)

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

HTTP Login Access Levels, User Names, and Passwords are defined as follows:

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
HTTP (Web Server)	Full Access to all Web Pages	No Access to Admin pages	No Access to Admin pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

CDM-570/570L Satellite Modem HTTP Interface Default Name/Passwords		
Admin User	Read/Write User	Read Only User
comtech/comtech	opcenter/1234	monitor/1234

13.6.1.1 IP Module HTTP Interface "Splash" Page

Once the valid User Name and Password is accepted, the user will see the CDM-570/570L IP Module HTTP Interface "splash" page, shown in **Figure 13-1**.

Figure 13-1. CDM-570/570L IP Module HTTP Interface "Splash" page

13.6.1.2 IP Module HTTP Interface Menu Tree

The options available through the CDM-570/570L IP Module HTTP Interface are illustrated via the following menu tree:

Home	Admin	Modem	IP	Stats	Maint
Home	Summary	Modem	Interface	Ethernet	Unit Info
Contact	Mode	Utilities	Routes	Routes	Operations
Support	Access	Status	Multicast	QoS*[1]	Save
Logoff	Features	Logs	QoS Mode*[1]	WAN	Reboot
	Remote	BUC[2]	QoS*[1]	Compression*[1]	
	Encryption*[1]	LNB[2]	ARP		
			VLAN		
			IGMP		
			Redundancy		

Beyond the top-level row of navigation tabs (shown in blue), the diagram illustrates the available nested hyperlinks (shown in grey) that afford the user more specific functionality

1. **** indicates a FAST Feature that is accessible from the interface only after that option has been purchased and activated via the CDM-570/570L front panel.***

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

2. ***The 'BUC' and 'LNB' hyperlinks are available only on the CDM-570L Base Modem and IP Module HTTP Interfaces. They provide the user with the means to control and monitor a Block Upconverter or Low-Noise Block Down Converter connected to the CDM-570L.***

   See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details on ODU operations via the CDM-570L Base Modem and IP Module HTTP Interfaces.

Click any tab or hyperlink to continue.

13.6.2 HTTP Interface Page Descriptions

13.6.2.1 Home Pages

Click the **Home**, **Contact**, **Support**, or **Logoff** hyperlink to continue.

13.6.2.1.1 Home | Home

Figure 13-2. Home | Home Page

From any location within the IP Module HTTP Interface, the user can select the **Home** tab and/or hyperlink to return back to this top-level page.

13.6.2.1.2 Home | Contact

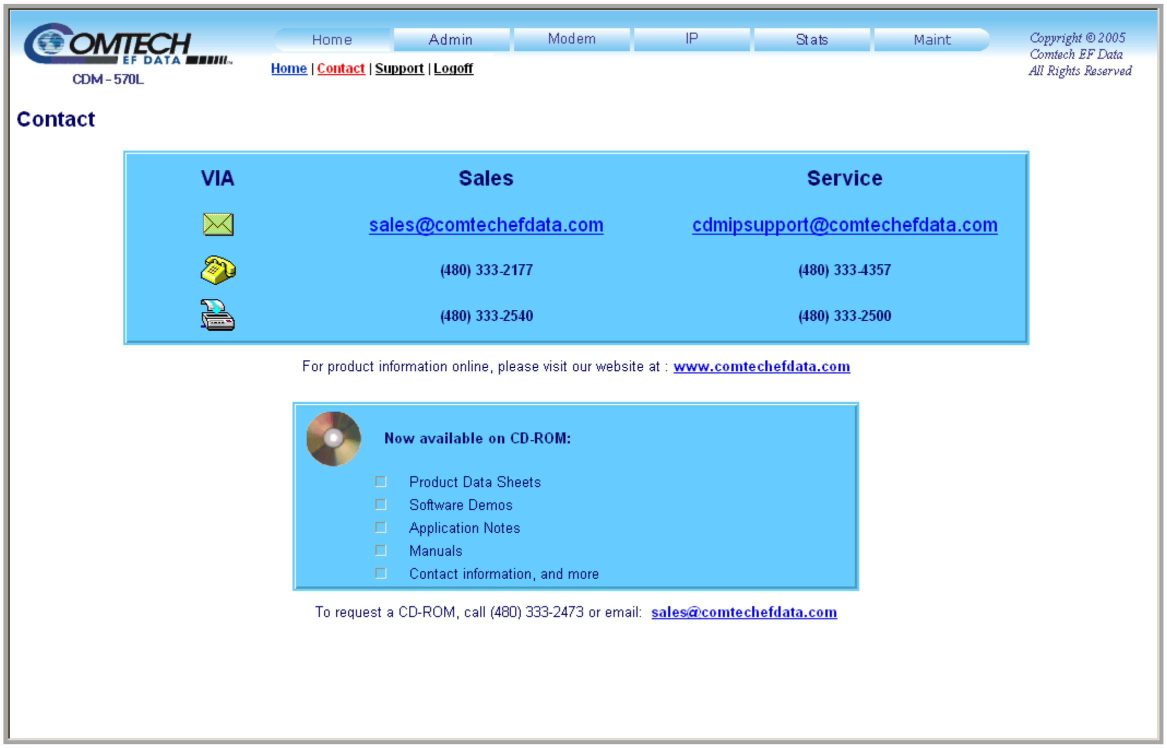


Figure 13-3. Home | Contact page

The ***read-only*** '**Home | Contact'** page (**Figure 13-3**) provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone, fax, or e-mail hyperlinks.

13.6.2.1.3 Home | Support

For this page to operate correctly, the modem's administrator is required to specify the SMTP server, domain name, and destination on the* Admin | Access *page (See Sect. 7.3.2.1).

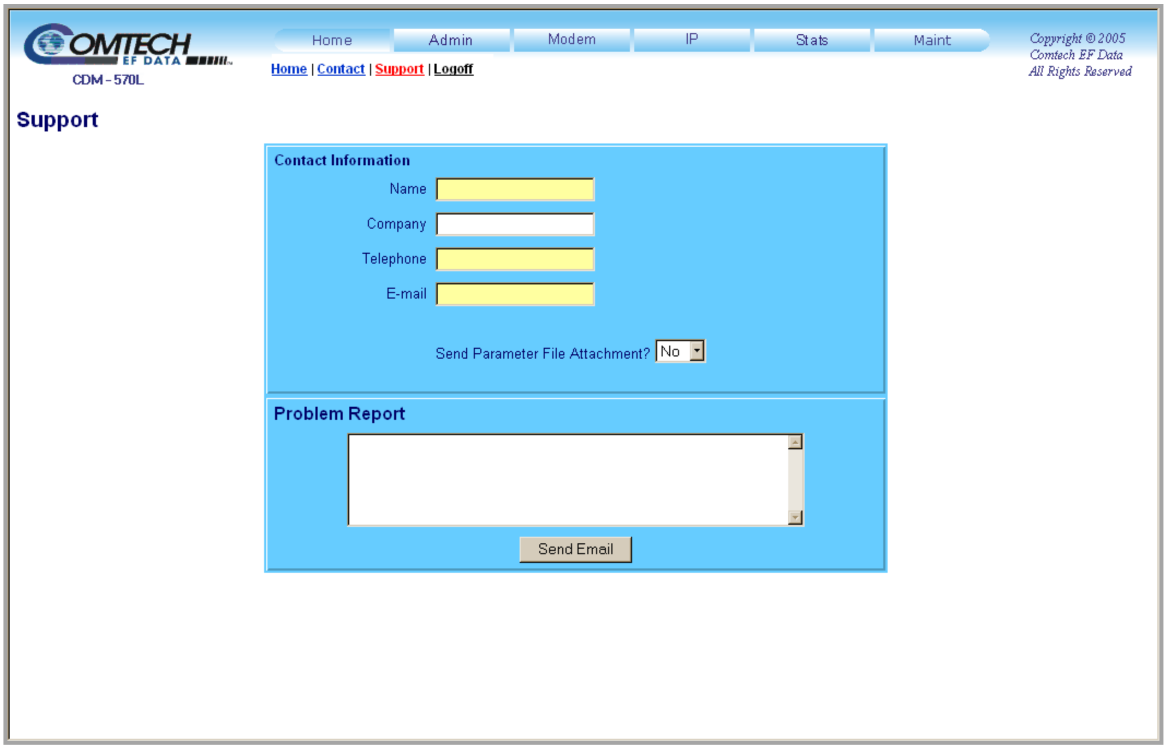


Figure 13-4. Home | Customer Support page

The **'Home | Support'** page (**Figure 13-4**) uses SMTP (Simple Mail Transport Protocol) to submit questions about or report problems with the CDM-570/570L to Comtech EF Data Modem Support (cdmipsupport@comtechefdata.com).

Type the pertinent contact information into the **Contact Information** fields – **Name**, **Company**, **Telephone**, and **E-mail** address – and then use the **Problem Report** section to compose a message consisting of up to a maximum 256 characters.

Click [**Submit Email]** to send the message.

13.6.2.1.4 Home | Log Off

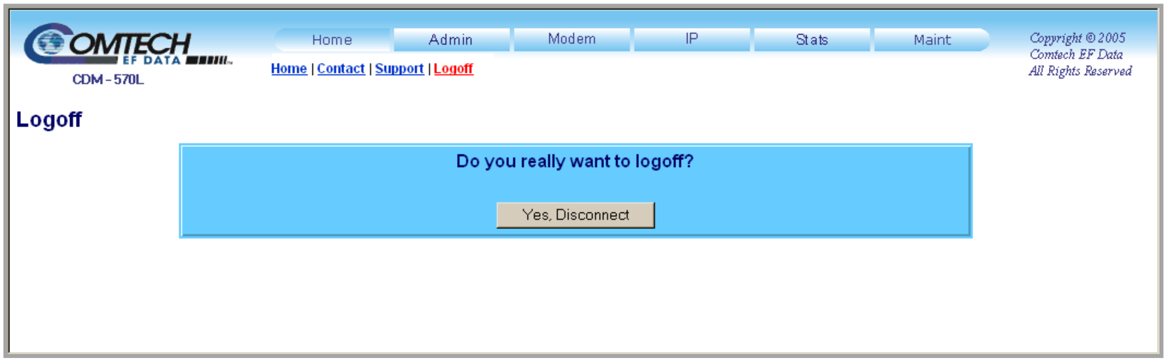


Figure 13-5. Info | Logoff page

The IP Module currently allows only one connection to the IP Module HTTP Interface. Use the '**Home | Logoff'** page (**Figure 13-5**) to formally disconnect from the interface. At the prompt, click **[Yes, Disconnect]** to complete the logoff process.

It is required to close the Web browser upon logoff/disconnection, so as to delete the IP Module's security cookie.

13.6.2.2 Admin Pages

Click the **Summary**, **Mode**, **Access**, **Features**, **Remote**, or **Encryption** hyperlink to continue.

13.6.2.2.1 Admin | Summary

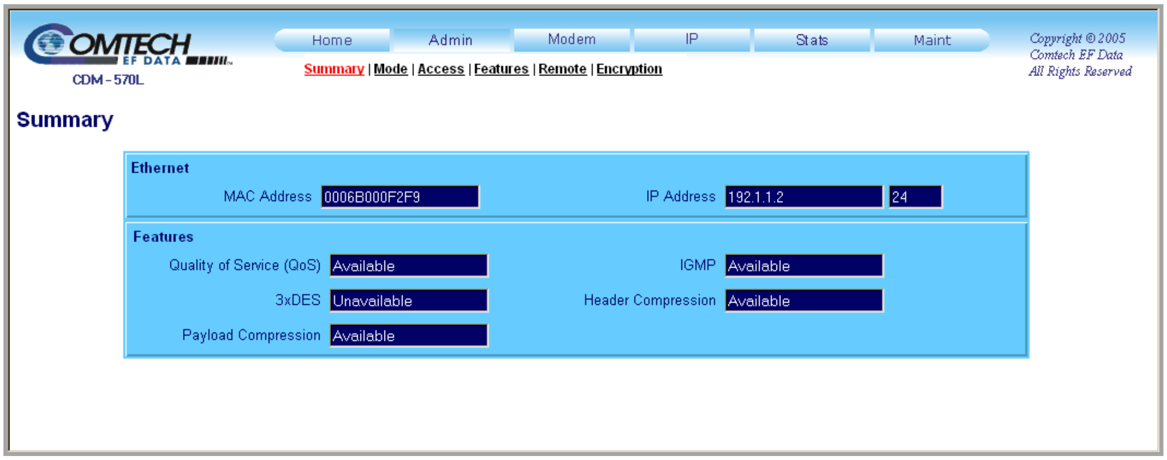


Figure 13-6. Admin |Summary page

The ***read-only*** '**Admin | Summary'** page (**Figure 13-6**) provides information for the assigned MAC and IP Addresses and the currently available standard and optional operational features.

13.6.2.2.2 Admin | Mode

The '**Admin | Mode'** page allows the user to specify how the modem/IP Module is to behave in Vipersat or non-Vipersat working modes. Once the role of a particular modem in the network is determined, this single point of configuration is intended to simplify deployment.

Note that the appearance of and selections available on this page depend on the currently active firmware version. **Figure 13-7** illustrates the page as it appears under Firmware Ver. **1.6.x** and *earlier*.

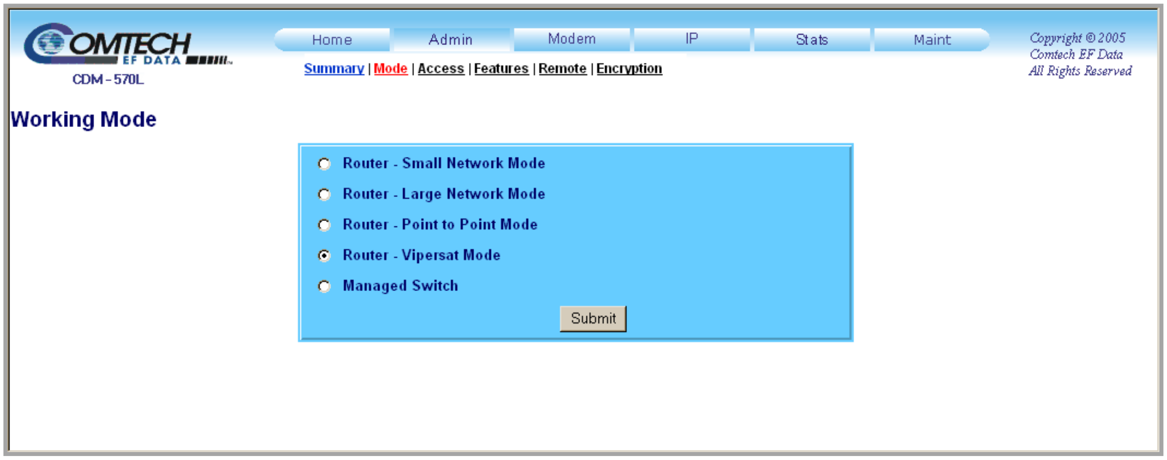


Figure 13-7. Admin | Mode page (Firmware Ver. 1.6.x and earlier)

Router – Small Network Mode

The Small Network Mode supports up to 255 remotes, as allowed using HDLC addressing. Select this mode to set the modem to be on independent IP subnets; this mode requires adding static routes to pass traffic between them.

Router – Large Network Mode

This mode is similar to Small Network Mode, the exception being that a maximum of 32,766 remotes are allowed on a single shared satellite outbound carrier.

Router – Point-to-Point Mode

Select for use in a Point-to-Point SCPC link where there are different IP subnets on either side of the link.

Router – Vipersat Mode

See adjunct Comtech EF Data publication* MN/22125 – Vipersat CDM-570/570L Satellite Network Modem Router User Guide *for details on use of the Router – Vipersat Mode selection.

Managed Switch

Managed Switch Mode functions as a learning bridge with VLAN support. Optional supported features include QoS, Header Comp, Payload Comp, and 3xDES. No routes are required in this mode.

Figure 13-8 illustrates the page as it appears under Firmware Ver. **1.7.x** and *later*.

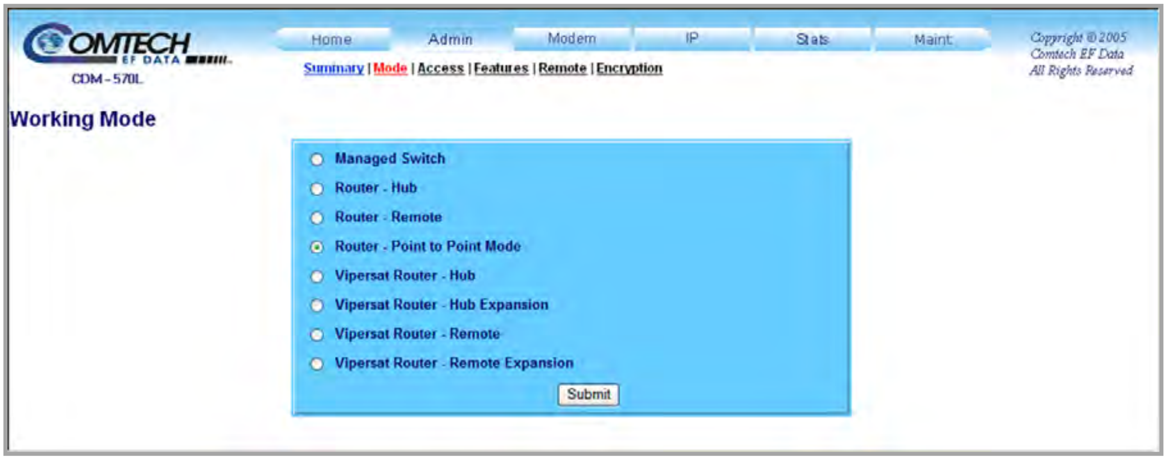


Figure 13-8. Admin | Mode page (Firmware Ver. 1.7.x and later)

Managed Switch

Managed Switch mode functions as a managed switch with support for VLAN as well as advanced features such as QoS, Header Compression and Payload Compression. It is primarily intended for operation in a point-to-point topology.

Router – Hub

Router-Hub mode functions as the Hub side router in a Point-to-Multipoint network. It allows Sat-to-Sat packets to pass. It no longer requires configuration of per-route HDLC addresses.

Router – Remote

Router-Remote mode functions as a Remote Router in a Point-to-Multipoint network. Packets from the WAN are not allowed to be sent to the WAN. It no longer requires configuration of HDLC receive addresses.

Router – Point-to-Point Mode

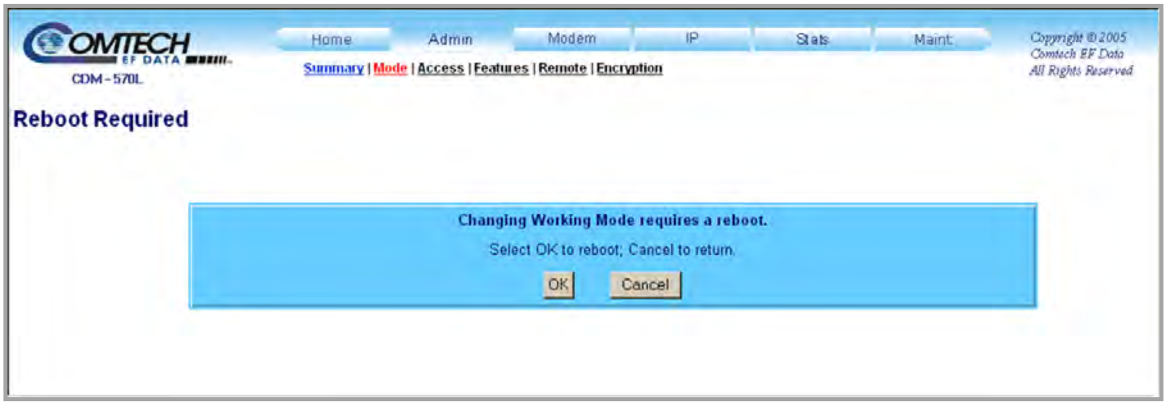
Select for use in a Point-to-Point SCPC link where there are different IP subnets on either side of the link.

Vipersat Router Mode selections

See adjunct Comtech EF Data publication* MN/22125 – Vipersat CDM-570/570L Satellite Network Modem Router User Guide *for details on use of the following Vipersat Router Mode selections:

- **Vipersat Router – Hub**
- **Vipersat Router – Hub Expansion**
- **Vipersat Router – Remote**
- **Vipersat Router – Remote Expansion**

For either Admin | Mode page version, click **[Submit]** once the appropriate selection is made. If a working mode different from the currently active mode is selected, the user is prompted to reboot the modem:



Click **[OK]** to reboot the modem, or **[Cancel]** to return to the **Admin | Mode** page.

13.6.2.2.3 Admin | Access

***For details pertaining to the configuration parameters available on this page, see* Chapter 5. FRONT PANEL OPERATION.**

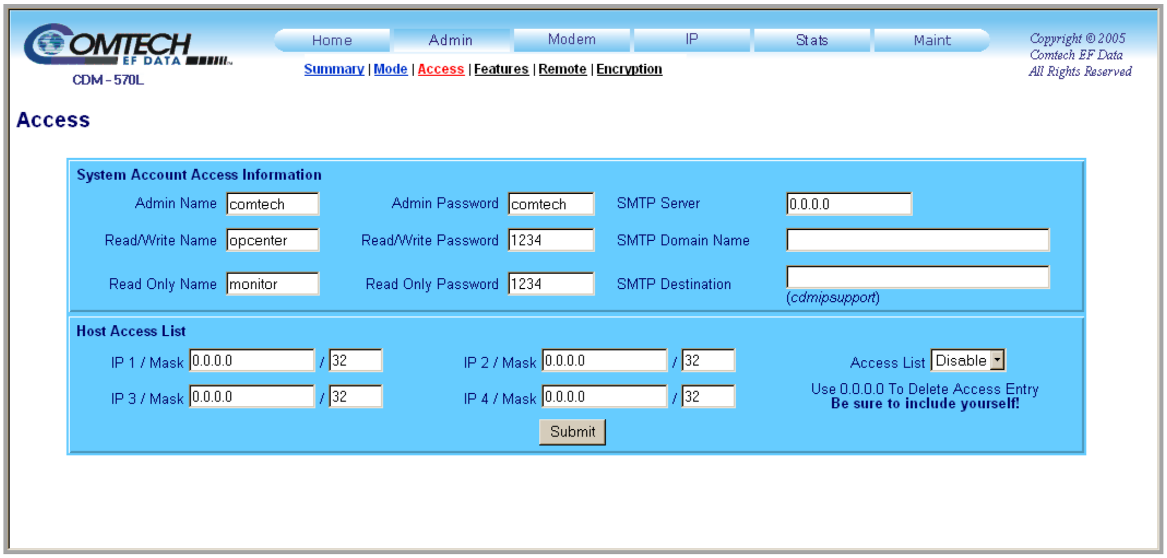


Figure 13-9. Admin | Access page

The '**Admin | Access'** page (**Figure 13-9**) provides the means to set up User names, passwords, the e-mail server, and the host IP addresses to facilitate communication with the CDM-570/570L IP Module HTTP Interface.

Click [**Submit]** to save any changes made to this page.

13.6.2.2.4

Admin | Features

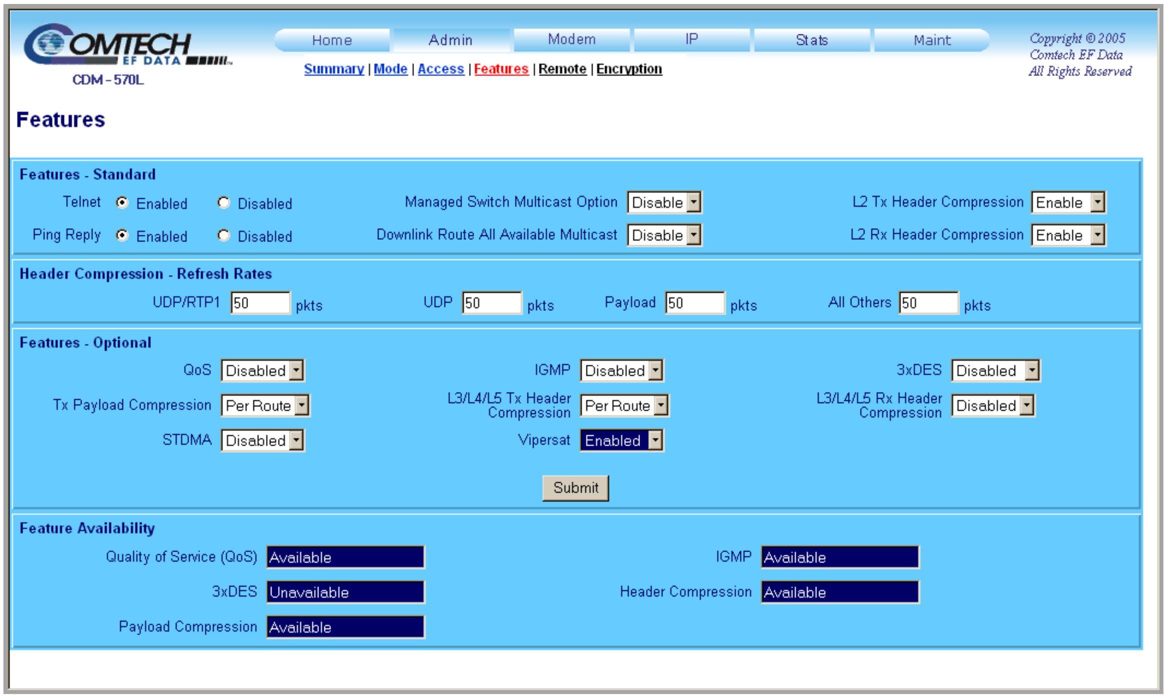


Figure 13-10. Admin | Features page

The '**Admin | Features'** page (**Figure 13-10**) provides a read-only status summary of operational features.

Features – Standard

Permits the user to set as **Enabled** or **Disabled** (via option button or drop-down menu) the following standard features:

- Telnet
- Ping Reply
- Managed Switch Multicast Option
- Downlink Route All Available Multicast
- L2 Tx Header Compression
- L2 Rx Header Compression

Header Compression – Refresh Rates

In association with **enabled** L2 Header Compression, this section permits the user to enter, via number of packets, the refresh rates for **UPD/RTP1**, **UDP**, **Payload**, and **All Others**.

***L2 Header Compression** applies only when in **Managed Switch Mode**.*

Features – Optional

Permits the user to set, via drop-down menu, the following optional features (as available) as **Enabled** or **Disabled**:

- QoS (Quality of Service)
- STDMA
- IGMP
- L3/L4/L5 Rx Header Compression
- ViperSat

The following optional features have the additional capability to be assigned, from its respective drop-down menu, on a **Per Route** basis:

- Tx Payload Compression
- L3/L4/l5 Tx Header Compression
- 3xDES

Once the desired configuration settings have been configured from any of the above sections, click [**Submit]** to save those changes.

Feature Availability

As per the '**Admin | Summary'** page, this ***read-only*** section provides information for the operational features (standard or optional) currently available.

13.6.2.2.5 Admin | Remote

***For details pertaining to the configuration parameters available on this page, see* Chapter 5. FRONT PANEL OPERATION *and* Sect. 6.4 SNMP INTERFACE.**

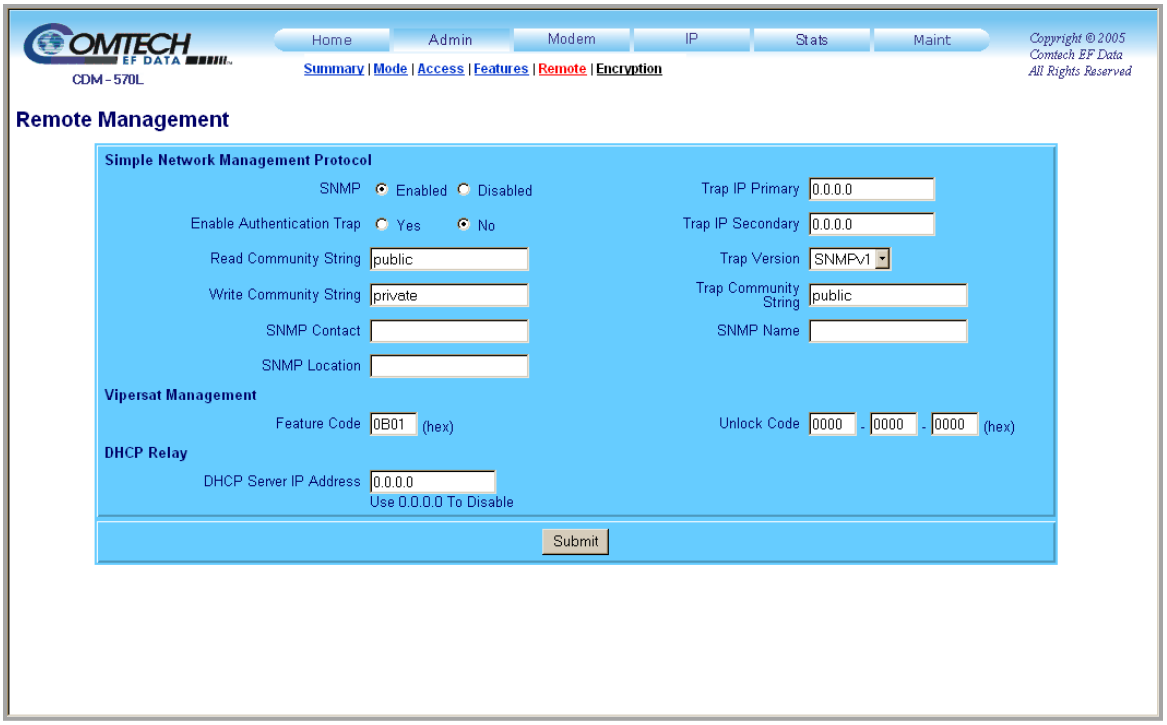


Figure 13-11. Admin | Remote page

The '**Admin | Remote'** page (**Figure 13-11)** sets and returns administration information for:

- The Simple Network Management Protocol (SNMP) feature
- The Feature and Unlock codes for ViperSat Management
- The IP address of the DHCP Server

Click [**Submit]** to save any changes made to this page.

13.6.2.2.6 Admin | Encryption

The CDM-570/570L IP Module optionally supports 3xDES-128 (using NIST certified 3x core) encryption and decryption, for the highest level security for link encryption.

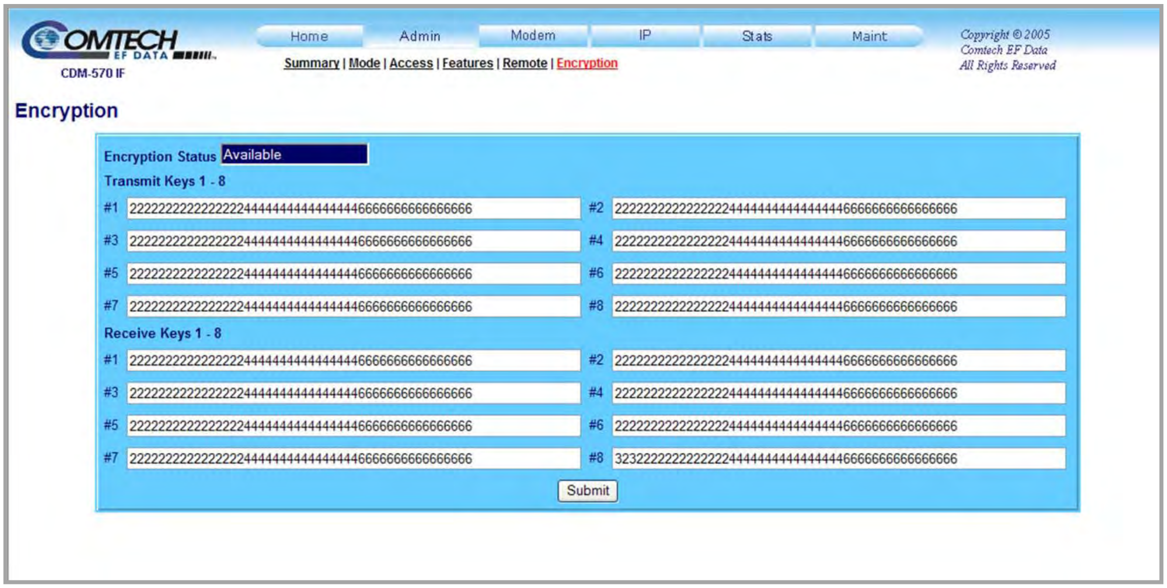
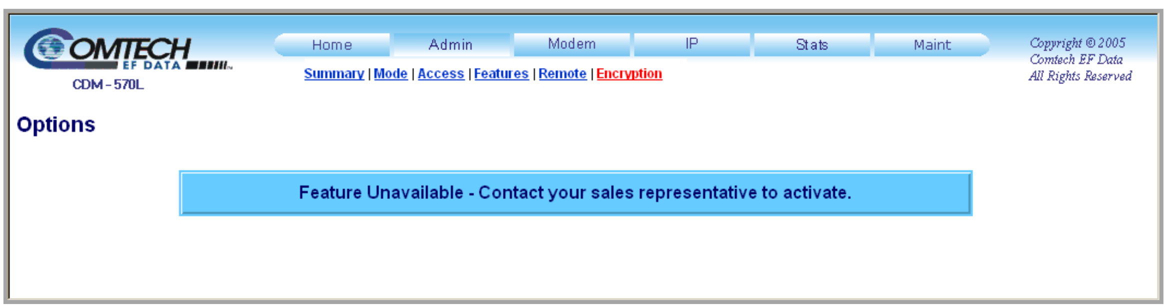


Figure 13-12. Admin | Encryption page

The '**Admin | Encryption'** page (**Figure 13-12**) is accessible only when the optional 3xDES Encryption FAST feature has been purchased from Comtech EF Data and activated via the front panel. Otherwise, when the Encryption hyperlink is selected, the following page is displayed:



***For further information, see* Sect. 13.4.1 3xDES Encryption with Ability to Change Keys *or* Chapter 14. IP MODULE - CLI AND TELNET OPERATION.**

13.6.2.3 Modem Pages

Click the **Modem**, **Utilities**, **Status**, **Logs**, **BUC*** or **LNB*** hyperlink to continue.

***** The 'BUC' and 'LNB' hyperlinks shown in* **Figure 13-13** *are available only on the CDM-570L Base Modem and IP Module HTTP Interfaces. They provide the user with the means to control and monitor a Block Upconverter or Low-Noise Block Downconverter connected to the CDM-570L.***

See* Appendix L. CDM-570L ODU (BUC, LNB) OPERATION *for complete details on ODU operations via these HTTP Interfaces.

13.6.2.3.1 Modem | Modem

For detailed information about the configuration parameters available on this page, see Chapter 5. FRONT PANEL OPERATION.

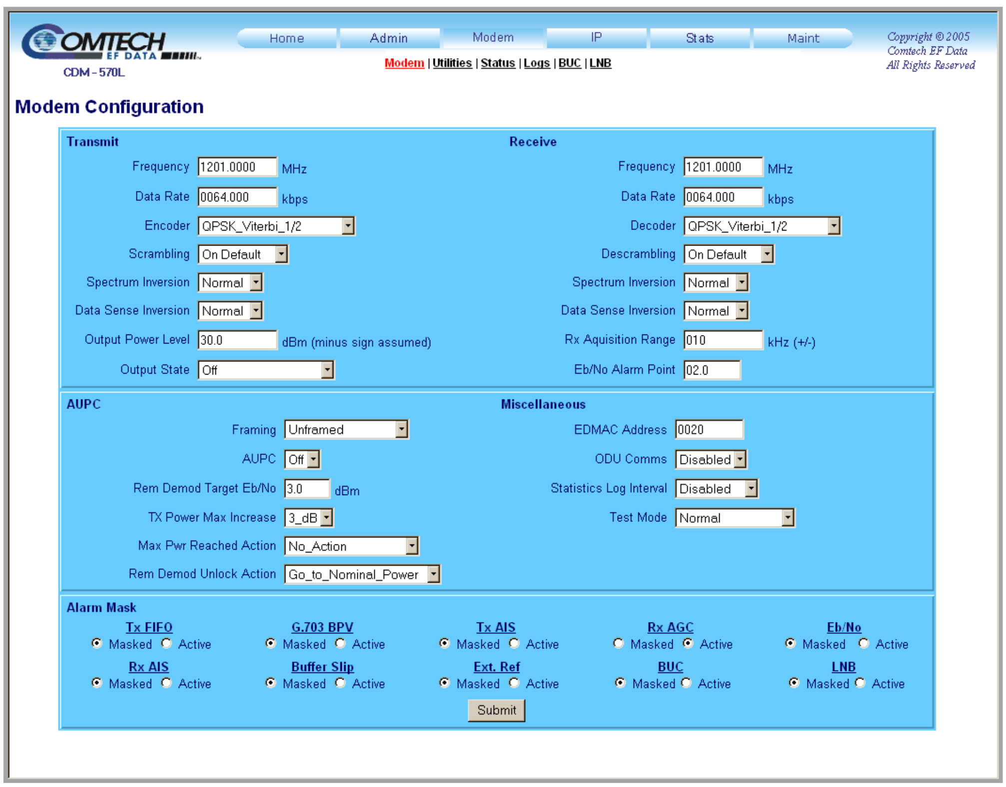


Figure 13-13. Modem | Modem page

The '**Modem | Modem' (Configuration)** page (**Figure 13-13**) provides the means to configure the modem operating parameters. The user may enter a preferred value into a text box, select a predefined parameter from a drop-down menu, or, for the **Alarm Mask** section, use the option button provided to define a designated alarm as **Masked** or **Active**.

Click [**Submit]** to save any changes made to this page.

13.6.2.3.2 Modem | Utilities

For detailed information about the configuration parameters available on this page, see Chapter 5. FRONT PANEL OPERATION.

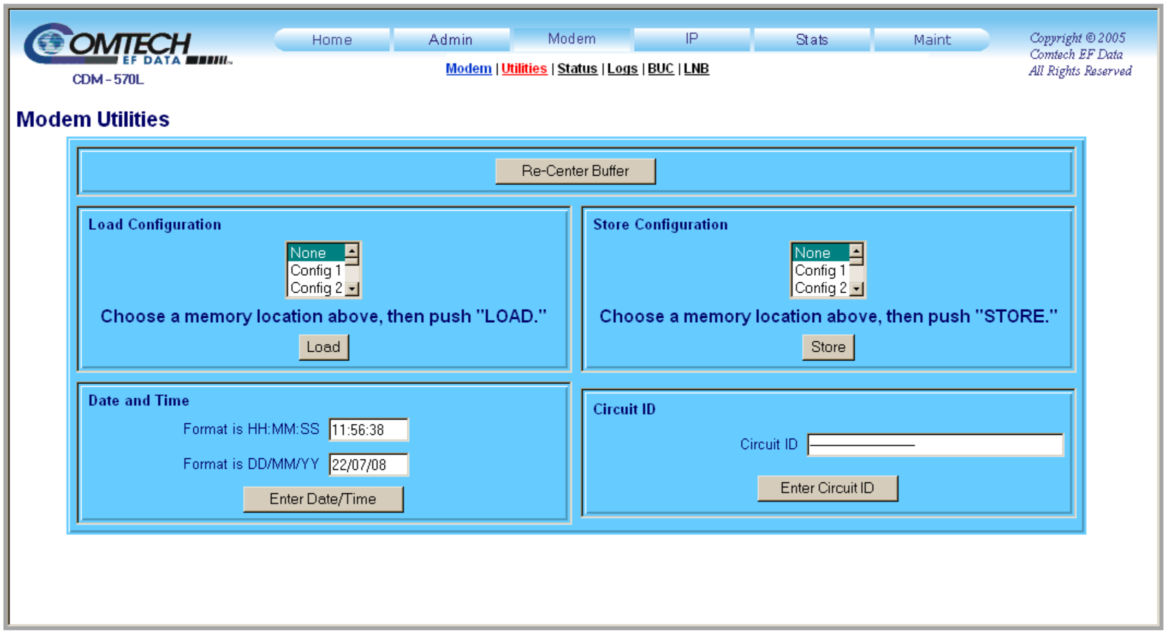


Figure 13-14. Modem | Utilities page

The '**Modem | Utilities'** page (**Figure 13-14**) is used to set utilities such as Date and Time; Circuit ID; and Load and Store Configurations.

Click **[Re-Center Buffer]** to force the recentering of the Plesiochronous/Doppler buffer.

13.6.2.3.3 Modem | Status

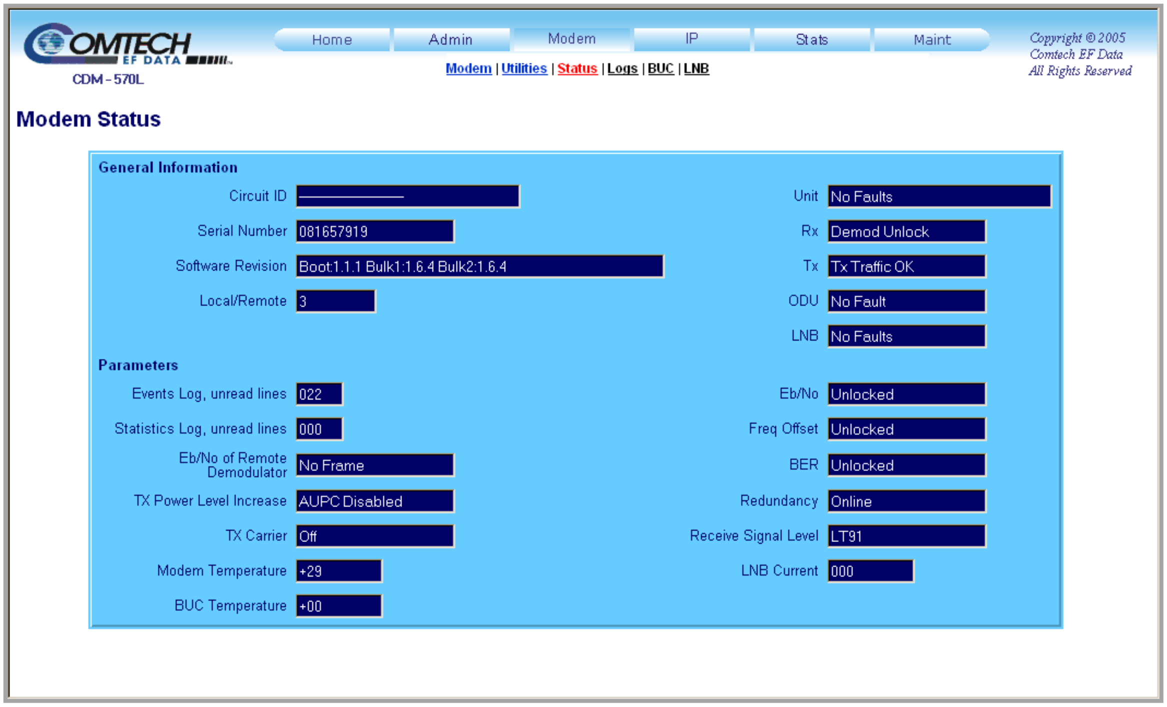


Figure 13-15. Modem | Status page

The ***read-only*** '**Modem | Status'** page (**Figure 13-15**) provides information about the modem's general operating status and configuration parameters.

13.6.2.3.4 Modem | Logs

For detailed information about the configuration parameters available on this page, see Chapter 5. FRONT PANEL OPERATION.

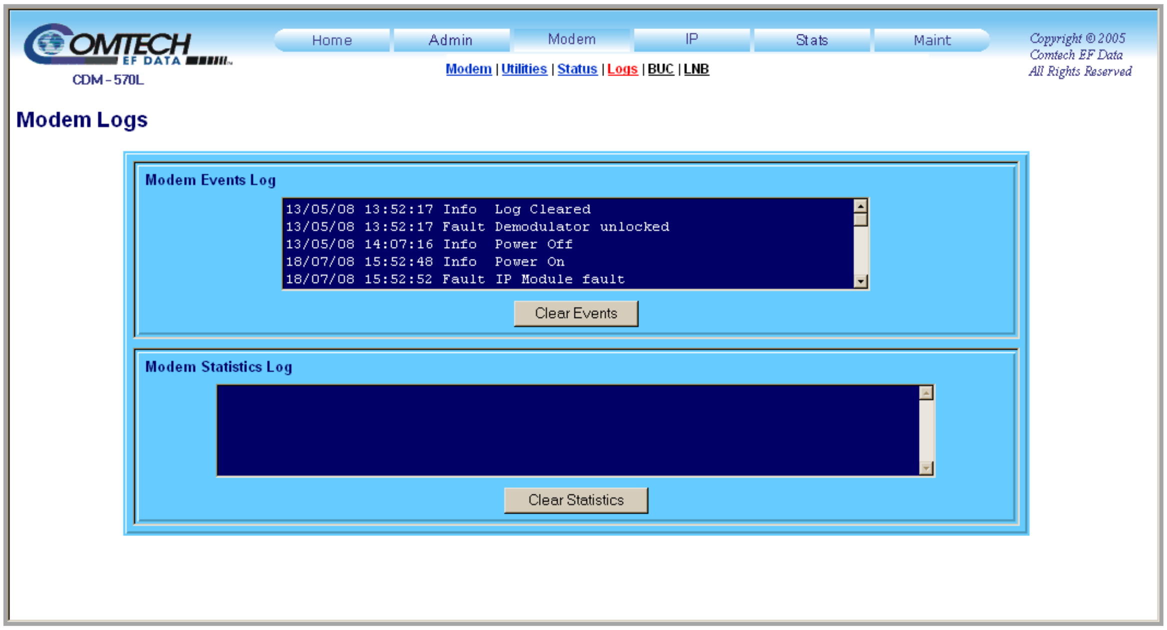


Figure 13-16. Modem | Logs page

The ***read-only*** '**Modem | Logs**' page (**Figure 13-15**) provides a window that displays Faults and Alarms (i.e., Modem Events) as logged by the unit, and a modem operating statistics window.

Click **[Clear Events]** to delete all existing log entries from the Modem Events Log. The log is then reset to one (1) entry: "**Info: Log Cleared**".

Click **[Clear Statistics]** to delete all existing entries from the Modem Statistics Log.

13.6.2.4 IP Pages

Click the **Interface**, **Routes**, **Multicast**, **QoS Mode**, **QoS**, **ARP**, **VLAN**, **IGMP**, or **Redundancy** hyperlink to continue.

13.6.2.4.1 IP | Interface

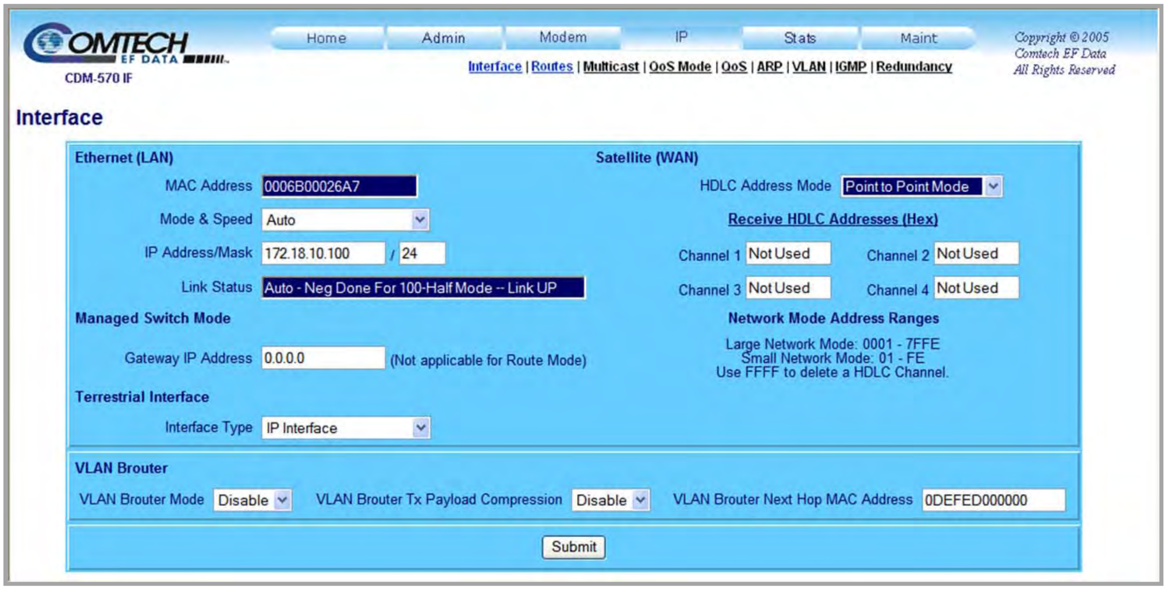


Figure 13-17. IP | Interface page

The **'IP | Interface'** page (**Figure 13-17**) allows the user to view the MAC address and set the IP address and mask of the IP Module:

Ethernet (LAN)

- **MAC Address (*read-only*)** – This is set at the factory to a guaranteed unique address that cannot be modified by the user.
- **Mode & Speed** – Use the drop-down menu to select **Auto**, **10 Mbps Half Duplex**, **100 Mbps Half Duplex**, **10 Mbps Full Duplex**, or **100 Mbps Full Duplex**.
- **IP Address/Mask** – The user may enter the IP Address/Mask for the IP Module Ethernet Interface.
- **Link Status (*read-only*)** – The is the actual negotiated Link Status of the Ethernet Port; this includes whether the link is **UP** or **DOWN**.

Managed Switch Mode

The Gateway IP Address may be entered when Managed Switch Mode is active.

Terrestrial Interface

Use the **Interface Type** drop-down menu to select the operating terrestrial interface:

- EIA-422/EIA530 DEC
- V.35 DCE
- EIA-232 (sync)
- G.703 T1 AMI
- G.703 T1 B8ZS
- G.703 E1 Unbal AMI
- G.703 E1 Unbal HDB3
- G.703 E1 Bal AMI
- G.703 E1 Bal HDB3

Satellite (WAN)

HDLC addressing only applies with IP Firmware Versions 1.6.x and* earlier*.* *Firmware Version 1.7.x and* later *uses Streamline Encapsulation; HDLC addresses are not used.

- **HDLC Address Mode** – Select **Small Network Mode**, **Large Network Mode**, or **Point-to-Point Mode.**
- **Receive HDLC Addresses (Hex) (*read-only*)** – Indicates the HDLC Address that the WAN Interface will listen to (i.e., pass traffic). This should match the HDLC Address specified for traffic to pass from the sending modem.
- **Network Mode Address Ranges (*read-only*)** – The Hex address ranges for Large and Small Network Modes are provided here for reference purposes.

VLAN Brouter

- **VLAN Brouter Mode** – Use the drop-down menu to **Enable** or **Disable** this mode. If *enabled*, any packet arriving at the Ethernet interface with a VLAN header will be automatically forwarded to the WAN interface. In this mode, *ALL* VLAN packets are sent; there is no filtering of any kind.
- **VLAN Brouter Tx Payload Compression** – Use the drop-down menu to **Enable** or **Disable** payload compression for all "Brouted" packets. Because the modem is really in router mode, all non-VLAN traffic would check the associated router to turn on/off payload compression.
- **VLAN Brouter Next Hop MAC Address** – On the downlink side, this attribute allows the operator to define the next hop router to which all of the Brouted packets must be sent. This allows the Brouter feature to bypass the need to send an ARP packet for packets that could potentially have the same IP address.

Click [**Submit]** to save any changes made to this page.

13.6.2.4.2 IP | Routes

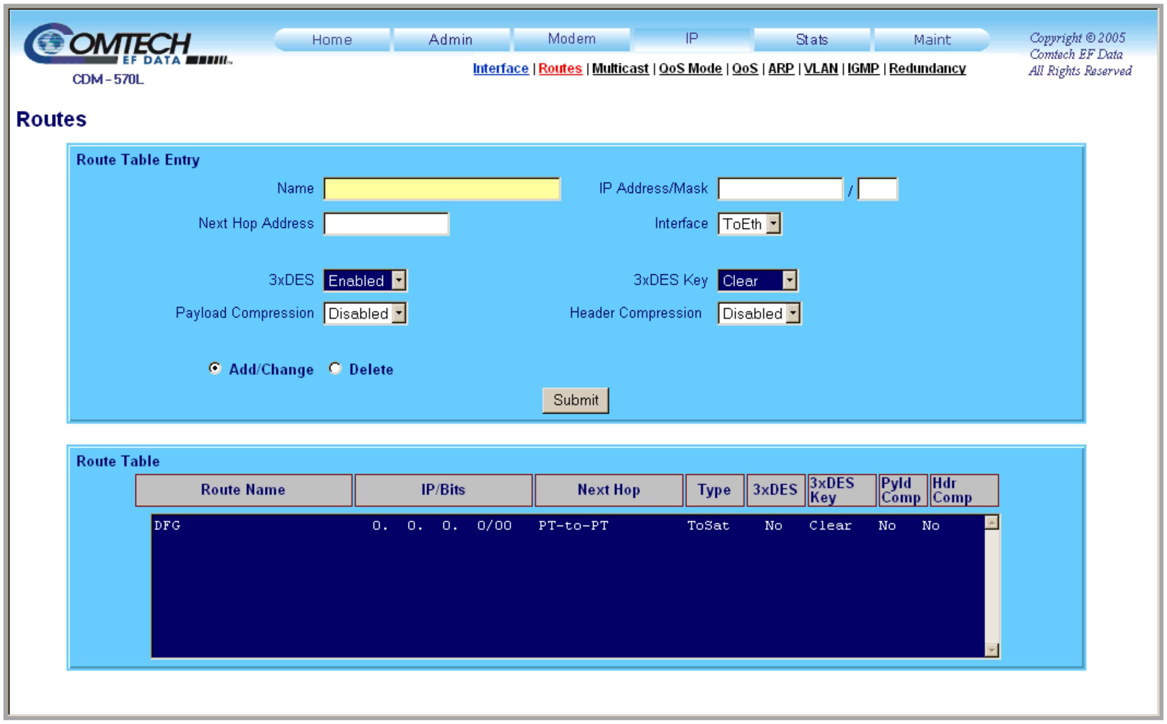


Figure 13-18. IP | Routes page

Use the '**IP | Routes**' page **(Figure 13-18**) to enter static routes into the IP Module for routing IP traffic over the satellite or to another device on the local LAN.

Route Table Entry

- **Name** – String label provided to help users maintain their network. The assigned name cannot contain any whitespace and must be unique.
- **IP Address/Mask** – Parameters used to define the route to the destination network.
- **Next Hop Address** – When the route is of type **ToEth**, the **Next Hop Address** is used to define the locally attached router's IP address. which can be used to route to the destination network. This is the case when there is another subnet addressed to the modem on the LAN side.
- **Interface** – There are two valid values for routing to a destination network: **ToSat** and **ToEth**:
  - o **ToSat** should be selected when the route to the destination network is over the satellite link. The **ToSat** routes do not need a Next Hop IP address.
  - o **ToEth** should be used when the route to the destination network is attached to the Ethernet interface.
- **3xDES** – When this optional feature is available, the user may set encryption as **Enabled** or **Disabled**.

- **3xDES Key** – When this optional feature is available and encryption has been **Enabled**, the 3xDES keys are used to encrypt traffic being sent over the Satellite Interface:
    - Select **1** through **8** to use the key specified in the 3xDES Encrypt/Decrypt Configuration Page to encrypt the traffic destined for the route.
    - Select **Clear** to force the IP Module to not encrypt any traffic destined for the route.
    - Select **Random** to cause the IP Module to randomly use any of the eight Tx Keys to encrypt the traffic destined for the route.
- **Payload Compression** – When this optional feature is available, the user may set Payload Compression as **Enabled** or **Disabled**.
- **Header Compression** – When this optional feature is available, the user may set Header Compression as **Enabled** or **Disabled**.
- **Add/Change** – Click to add a route entry to the route table or modify an existing route table entry. The route entry will be added to the route table (or the existing entry modified) for processing once the user clicks **[Submit]**.
- **Delete** – Click to flag a route entry for removal from the route table. The route entry will be deleted from the route table once the user clicks **[Submit]**.

Click [**Submit]** to save any changes made to this section of the page.

Route Table

This ***read-only*** window displays the currently active Route Table Entries.

13.6.2.4.3 IP | Multicast

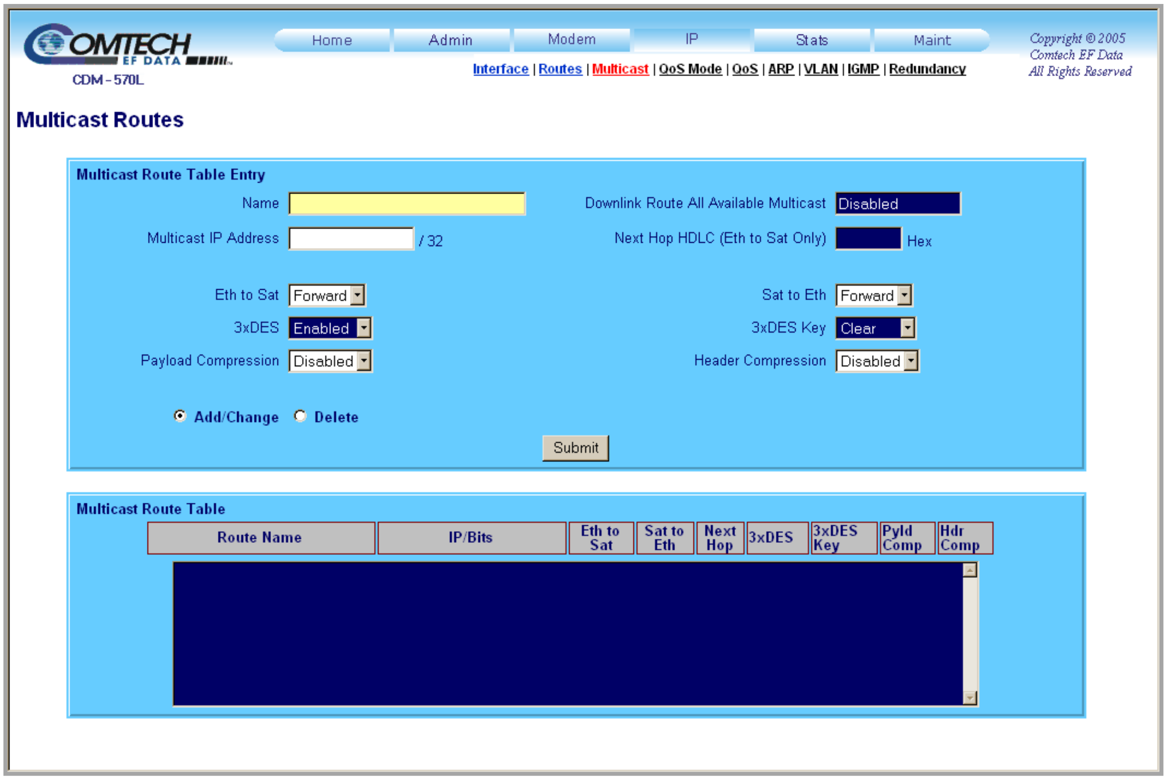


Figure 13-19. IP | Multicast page

Use the '**IP | Multicast'** page (**Figure 13-19**) to enter multicast routes into the IP Module for routing multicast IP traffic over the satellite or to another device on the local LAN.

Multicast Route Table Entry

- **Name** – String label provided to help users maintain their network. The assigned name cannot contain any whitespace and must be unique.
- **Downlink Route All Available Multicast** (***read-only***) – Displays if this feature is **Enabled** or **Disabled**.
- **Multicast IP Address –** Parameters used to define the route to the destination network.
- **Next Hop HDLC (Eth to Sat Only) (*read-only*)** – Displays the desired Next Hop HDLC IP Address for traffic to be sent over the satellite, within the following ranges:
  - o Point-to-Point: No HDLC address
  - o Small Network: 0x1 – 0xFE
  - o Large Network: 0x1 – 0xFFFE
- **Eth to Sat / Sat to Eth** – Use the drop-down menu to select the valid packet handling value for routing to a destination network:
  - o **Forward –** When unit is running in Managed Switch Mode, multicast is only forwarded across link if both units have this feature enabled.

  - **Filter –** A multicast packet is received but there is no application associated with it.

- **3xDES** – When this optional feature is available, encryption may be set as **Enabled** or **Disabled**.
- **3xDES Key** – When this optional feature is available and encryption has been **Enabled**, the 3xDES keys are used to encrypt traffic being sent over the Satellite Interface:
  - Select **1** through **8** to use the key specified in the 3xDES Encrypt/Decrypt Configuration Page to encrypt the traffic destined for the route.
  - Select **Clear** to force the IP Module to not encrypt any traffic destined for the route.
  - Select **Random** to cause the IP Module to randomly use any of the eight Tx Keys to encrypt the traffic destined for the route.
- **Payload Compression –** When this optional feature is available, Payload Compression may be set as **Enabled** or **Disabled**.
- **Header Compression** – When this optional feature is available, Header Compression may be set as **Enabled** or **Disabled**.
- **Add/Change:** Click to allow the multicast route entry to be added to the multicast route table, or to modify an existing multicast route table entry.
- **Delete:** Click to flag a multicast route entry for removal from the multicast route table.

Click [**Submit]** to save or execute any changes made to this page.

Multicast Route Table

This ***read-only*** window displays the currently active Multicast Route Table Entries.

13.6.2.4.4 IP | QoS Mode

This section depicts the CDM-570/570L IP Module HTTP Interface with Quality of Service (QoS) installed on the CDM-570/570L. QoS is a FAST Feature option which must be purchased from Comtech EF Data.

To access these QoS pages, this optional feature must first be **installed** by entering the appropriate FAST Access Code from the CDM-570/570L front panel; QoS functionality must then be **enabled** using the '**Admin | Features'** page.

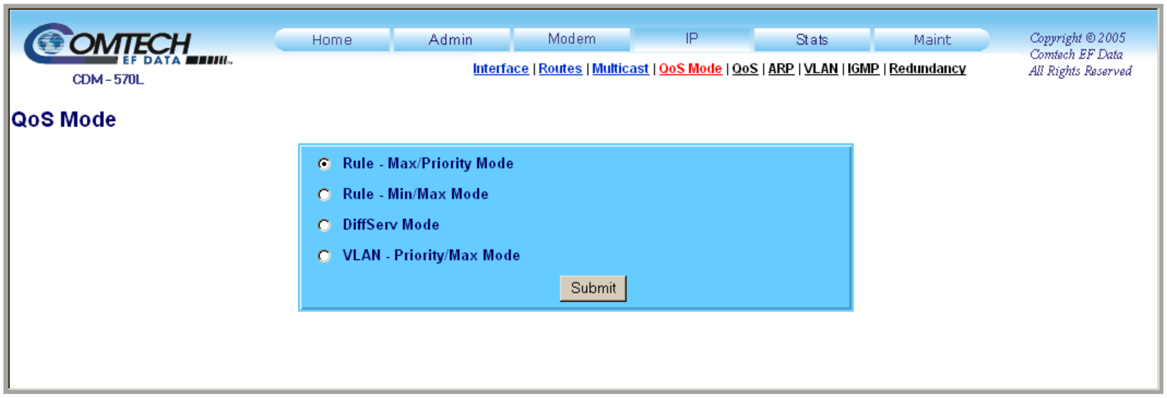


Figure 13-20. IP | QoS Mode page

Use the '**IP | QoS Mode'** page (**Figure 13-20**) to define the operational rules for the QoS configuration. Select the option button for one of the following operational rules/modes:

- Rule – Max/Priority Mode
- Rule – Min/Max Mode
- DiffServ Mode
- VLAN – Priority/Max Mode

Click [**Submit]** to save any changes made to this page.

For detailed QoS operational overview and rule configuration information, refer to the following sections in this manual:

QoS Rule/Mode	Overview	Configuration Info
Max/Priority Mode	See Sect. 13.4.5.1	See Sect. 14.2.3.1
Min/Max Mode	See Sect. 13.4.5.2	See Sect. 14.2.3.2
DiffServ	See Sect. 13.4.5.3	See Sect. 14.2.3.3

13.6.2.4.5 IP | QoS (Quality of Service) Pages

This section depicts the CDM-570/570L IP Module HTTP Interface with Quality of Service (QoS) installed on the CDM-570/570L. QoS is a FAST Feature option which must be purchased from Comtech EF Data.

To access this QoS page, this optional feature must first be **installed** by entering the appropriate FAST Access Code from the CDM-570/570L front panel; use the '**Admin | Features'** page to then **enable** QoS functionality.

Use the **'IP | QoS Mode'** page to select the QoS operating rule that drives the appearance of the **'IP | QoS**' page.

13.6.2.4.5.1 IP | QoS (Maximum Bandwidth/Priority Mode)

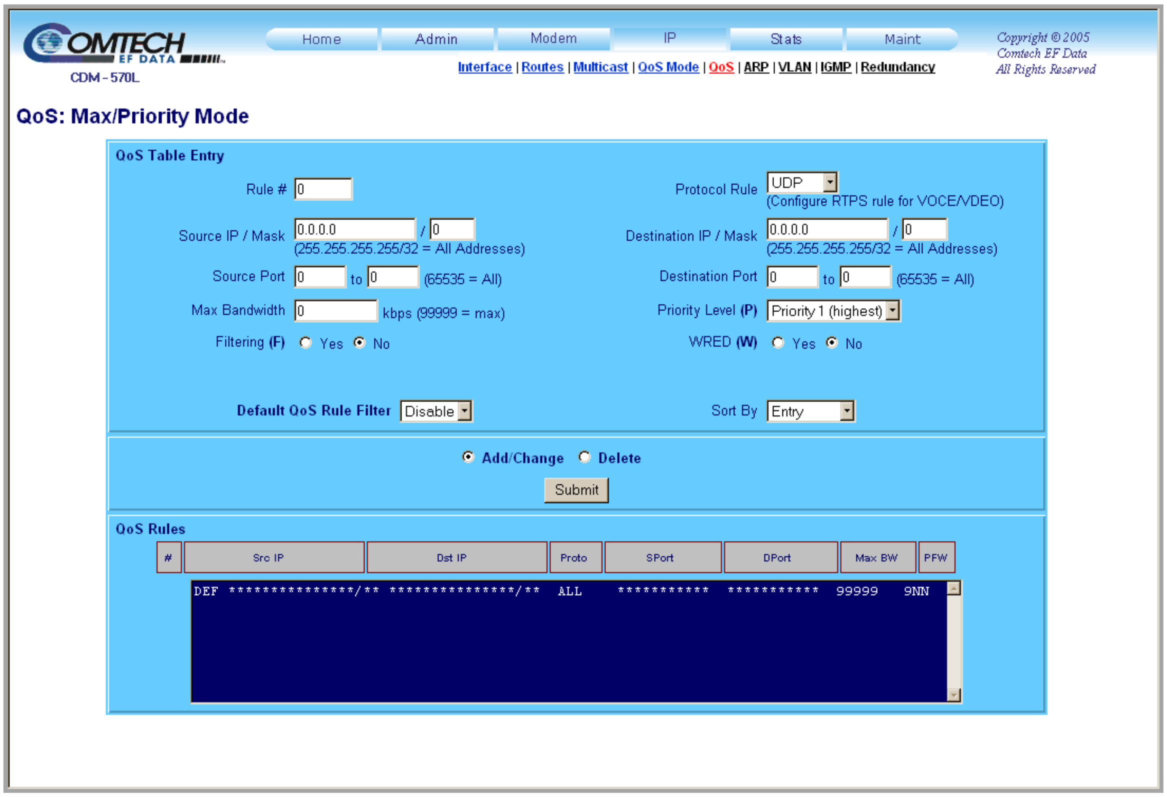


Figure 13-21. IP | QoS page (Max/Priority Mode)

The '**IP | QoS**' page, as it appears when Maximum Bandwidth/Priority Mode is *active* (**Figure 13-21**), is used by the user to establish up to 32 different types of flows. See **Sect. 13.4.5.1** for full information on this page's functionality.

QoS Table Entry

Use the text boxes to enter the following information:

- Rule #
- Source IP / Mask
- Destination IP / Mask
- Source Port *(range)*
- Destination Port *(range)*
- Max Bandwidth (in kbps)

Use the option buttons to select the following:

- **Filter (F)** – Click **Yes** to allow or **No** to disallow flow filtering.
- **WRED (W)** – Click **Yes** to allow or **No** to disallow **W**eighted **R**andom **E**arly **D**etection.
- **Add/Change** – Click to add a QoS flow rule or modify an existing QoS flow rule. The entry will be added to the QoS Rules table for processing once the user clicks **[Submit]**.
- **Delete** – Click to flag a flow rule for removal from the QoS Rules table. The flow rule will be deleted from the QoS Rules table once the user clicks **[Submit]**.

Use the drop-down menus to select the following:

- **Protocol Rule** – Select the desired protocol rule as per the *QoS Hierarchy Rule Protocol* table featured in **Sect. 13.4.5.1**.
- **Priority Level (P)** – Select the desired packet forwarding priority – **Priority 1 (Highest)** through **Priority 8 (Lowest).**
- **Default QoS Rule Filter** – Select **Enable** or **Disable**.
- **Sort By** – Select the QoS Rules table column by which to re-order as needed.

Click [**Submit]** to save the rules settings changes made on this page.

QoS Rules

This ***read-only*** window displays the currently active QoS flow rules. The table sorts each QoS rule as it has been added, and the display is updated to reflect the order with which rules are matched; the columns for the rules are additionally sorted by the user via the **Sort By** drop-down menu explained previously.

13.6.2.4.5.2 IP | QoS (Minimum/Maximum Bandwidth Mode)

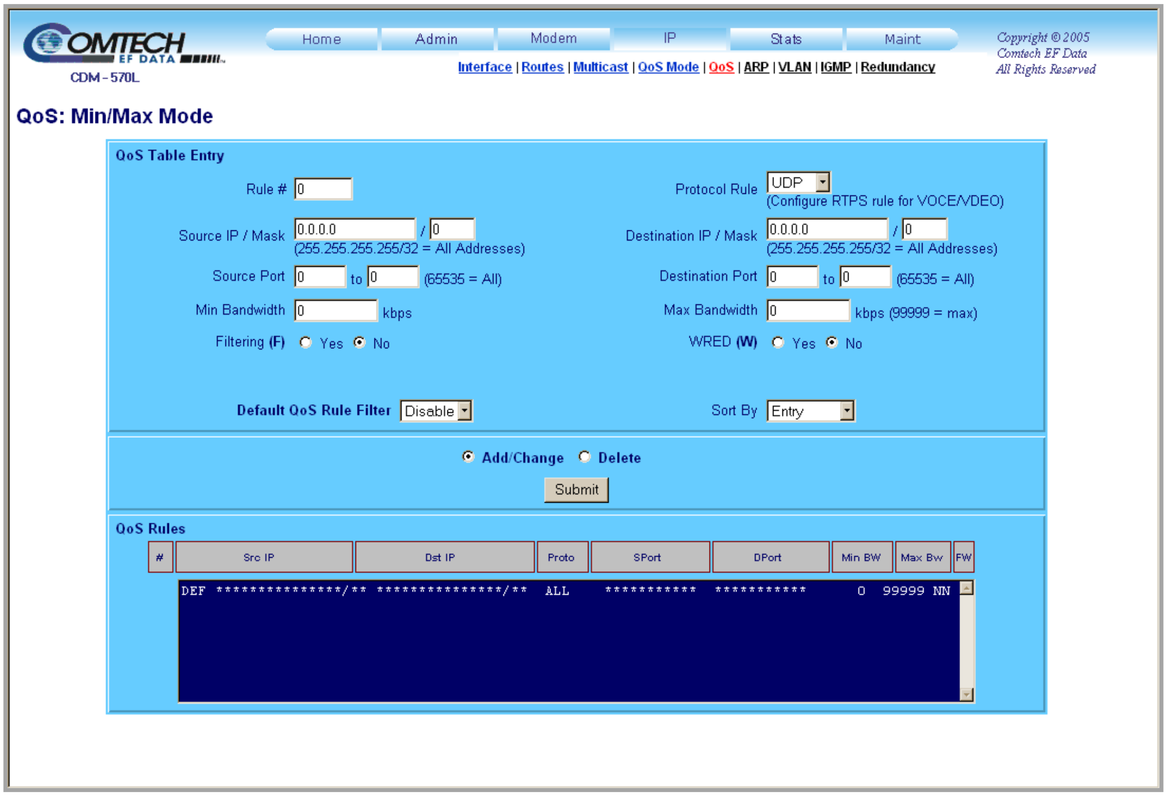


Figure 13-22. IP | QoS Mode page (Min/Max Mode)

The '**IP | QoS**' page, as it appears when Minimum/Maximum Bandwidth Mode is active (**Figure 13-22**), is used by the user to establish up to 32 different types of flows. See **Sect. 13.4.5.2** for full information on this page's functionality.

QoS Table Entry

Use the text boxes to enter the following information:

- Rule #
- Source IP / Mask
- Destination IP / Mask
- Source Port *(range)*
- Destination Port *(range)*
- Min Bandwidth (in kbps)
- Max Bandwidth (in kbps)

Use the option buttons to select the following:

- **Filter (F)** – Click **Yes** or **No** to allow/disallow flow filtering.
- **WRED (W)** – Click **Yes** or **No** to allow/disallow **W**eighted **R**andom **E**arly **D**etection.
- **Add/Change** – Click to add a QoS flow rule or modify an existing QoS flow rule. The entry will be added to the QoS Rules table for processing once the user clicks **[Submit]**.
- **Delete** – Click to flag a flow rule for removal from the QoS Rules table. The flow rule will be deleted from the QoS Rules table once the user clicks **[Submit]**.

Use the drop-down menus to select the following:

- **Protocol Rule** – Select the desired protocol rule as per the *QoS Hierarchy Rule Protocol* table featured in **Sect. 13.4.5.1**.
- **Priority Level (P)** – Select the desired packet forwarding priority – **Priority 1 (Highest)** through **Priority 8 (Lowest).**
- **Default QoS Rule Filter** – Select **Enable** or **Disable**.
- **Sort By –** Select the QoS Rules table column by which to re-order as needed.

Click [**Submit]** to save the rules settings changes made on this page.

QoS Rules

This ***read-only*** window displays the currently active QoS flow rules. The table sorts each QoS rule as it has been added, and the display is updated to reflect the order with which rules are matched; the columns for the rules are additionally sorted by the user via the **Sort By** drop-down menu explained previously.

13.6.2.4.5.3 IP | QoS (DiffServ Mode)

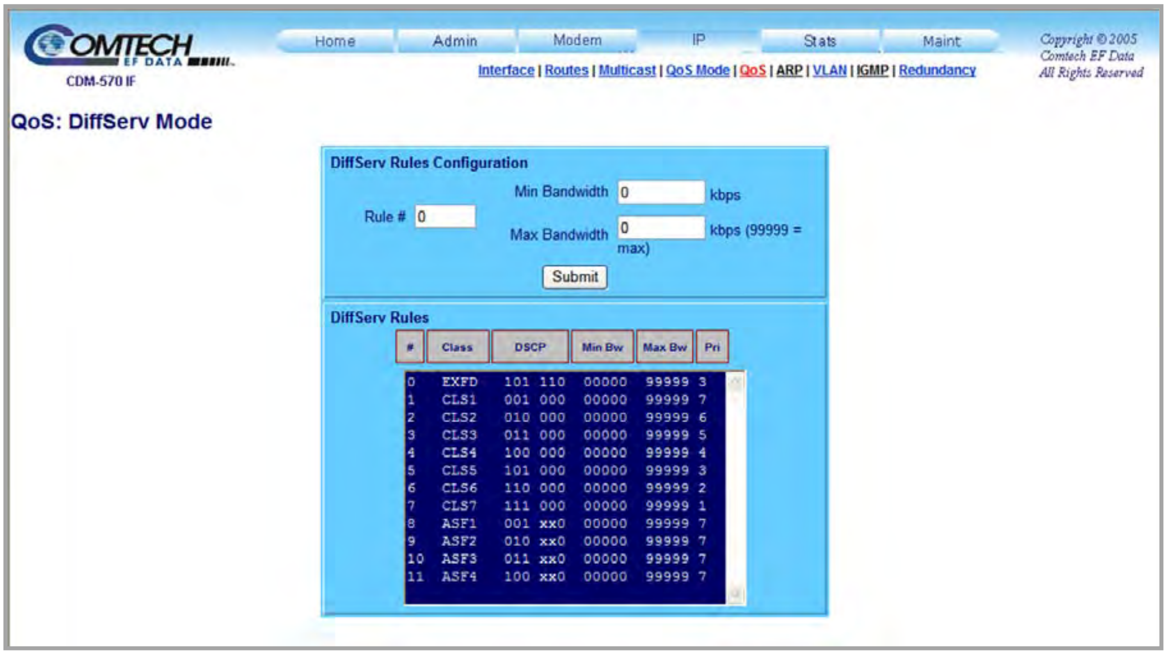


Figure 13-23. IP | QoS Mode page (DiffServ Mode)

The '**IP | QoS**' page, as it appears when DiffServ Mode is active (**Figure 13-23**), is used by the IP Module QoS to make it fully compliant to the Differential Services QoS RFC standards. See **Sect. 13.4.5.3** for full information on this page's functionality.

DiffServ Rules Configuration

Use the text boxes to enter the following information:

- Rule #
- Min Bandwidth (kpbs)
- Max Bandwidth (kbps)

Click [**Submit]** to save the rules settings changes made on this page.

DiffServ Rules

This ***read-only*** window displays the currently active DiffServ Rules.

13.6.2.4.5.4 IP | QoS (VLAN – Priority/Maximum Bandwidth Mode)

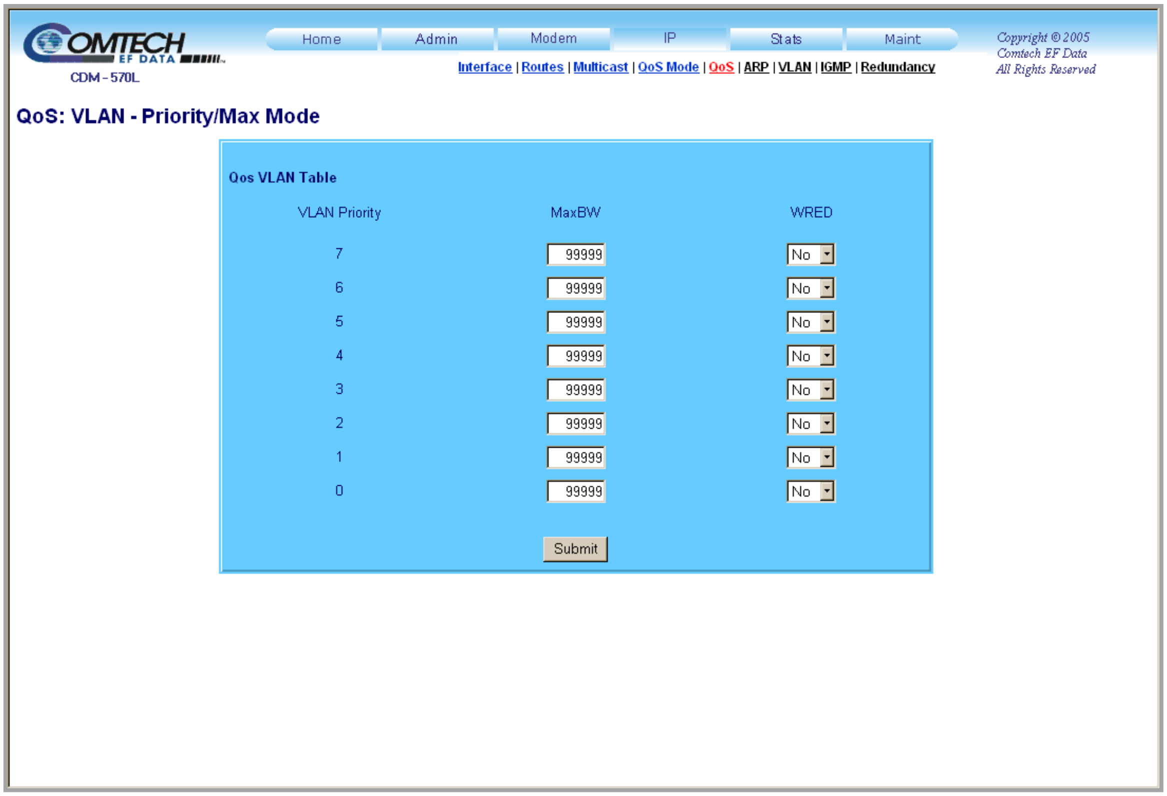


Figure 13-24. IP | QoS Mode page (VLAN – Priority/Max Mode)

Figure 13-24 shows the '**IP | QoS**' page as it appears when **Working Mode** has been set to **Managed Switch** (see '**Admin | Mode**') and **VLAN – Max/Priority Mode** is active (see '**QoS | Modes**').

This page is used by the IP Module QoS to allow the user to specify the maximum bandwidth for each VLAN Priority. Additionally, the user can turn **W**eighted **R**andom **E**arly **D**etection (WRED) **on** or **off** on a per-queue basis.

QoS VLAN Table

The prioritized maximum bandwidth is entered, in kbps, in text box column **MaxBW** for **VLAN Priority** Rules 0 through 7.

Use the drop-down menu to select **Yes** to allow or **No** to disallow **WRED Priority** Rules 0 through 7.

Click [**Submit]** to save the rules settings changes made on this page.

13.6.2.4.6 IP | ARP

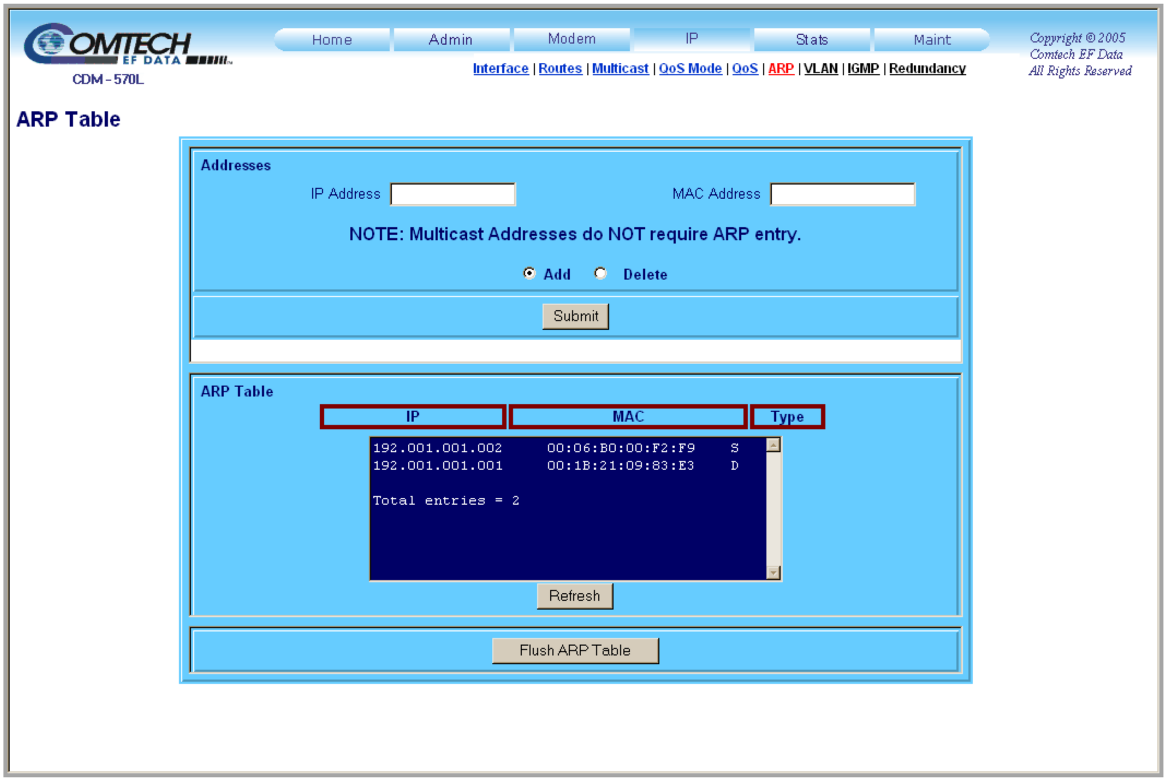


Figure 13-25. IP | ARP page

The '**IP | ARP**' page (**Figure 13-25**) displays all current ARP entries (both Static and Dynamic). The user is able to directly edit any of the current static ARP entries.

Addresses

- **IP Address** – Enter the IP Address (format XXX.XXX.XXX.XXX).
- **MAC Address** – Enter the MAC Address (format YY:YY:YY:YY:YY:YY).
- **Add** – Click to directly add a Static ARP entry. The entry will be added to the ARP Table for processing once the user clicks **[Submit]**.
- **Delete** – Click to flag a Static ARP entry for removal from the ARP Table. The ARP entry will be deleted from the ARP Table once the user clicks **[Submit]**.

Click **[Submit]** to save the ARP values entered on this page.

ARP Table

This *read-only* table list the ARP entries by IP address, MAC address, and entry Type (S=Static; D=Dynamic).

Click **[Refresh]** to update the table (note that the index total will automatically increment to the next available number).

13.6.2.4.7 IP | VLAN

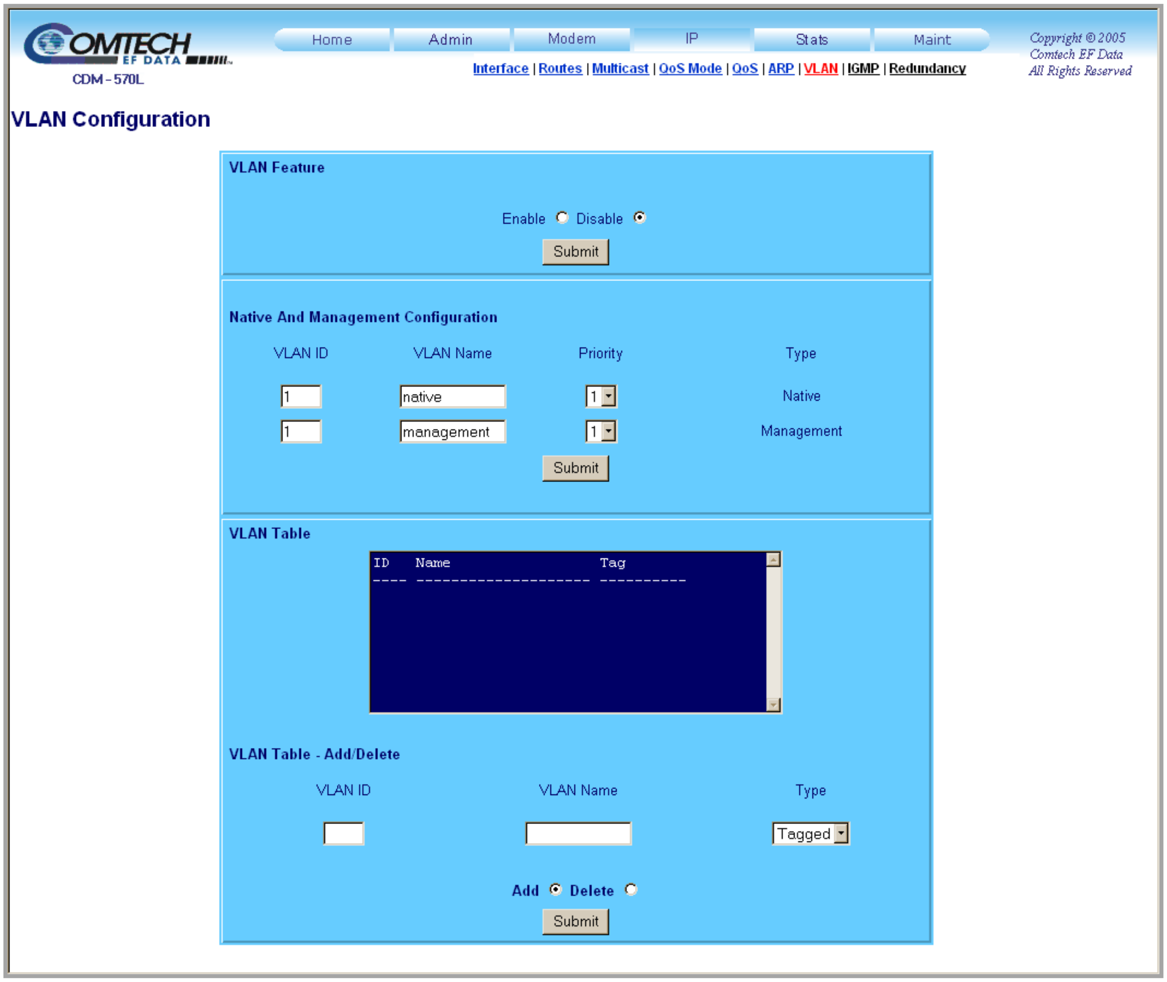


Figure 13-26. IP | VLAN page

Figure 13-26 shows the '**IP | VLAN**' page, which is accessible when **Working Mode** has been set to **Managed Switch** (see '**Admin | Mode**').

VLAN Feature

Use the option buttons to **Enable** or **Disable** VLAN operation. Click **[Submit]** once the selection has been made.

Native and Management Configuration

This section is used to configure the *Native* and *Management* VLAN IDs:

- The *Native* VLAN ID is used to tag arriving packets that have no VLAN tag. Likewise, when packets arrive from the WAN with the same VLAN tag as the Native VLAN ID, then the VLAN header is removed and passed to the LAN interface.
- The *Management* VLAN ID us used to specify a dedicated management VLAN used to access and control the modems.

For either Native or Management VLAN ID configuration, enter the following information:

- **VLAN ID** – Specifiy a value from **1** to **4095**.
- **VLAN Name** – Assign a string to label the VLAN ID as needed for user convenience.
- **Priority** – Use the drop-down menu to select prioritize rules from **0** to **7**.

Click [**Submit]** to save the changes made in this section.

VLAN Table

This ***read-only*** table lists the VLAN rules by ID, Name, and Tag.

VLAN Table – Add/Delete

- **VLAN ID** – Enter an ID for the rule. Specifiy a value from **1** to **4095**.
- **VLAN Name** – Enter a name for the rule (a maximum of 20 characters is allowed).
- **Type** – ***Tagged*** is the only rule option available at this time.
- **Add –** Click to add a VLAN priority rule. The entry will be added to the VLAN Table for processing once the user clicks **[Submit]**.
- **Delete** – Click to flag a VLAN priority rule for removal from the VLAN Table. The VLAN rule will be deleted from the VLAN Table once the user clicks **[Submit]**.

Click [**Submit]** to save the changes made in this section.

13.6.2.4.8 IP | IGMP

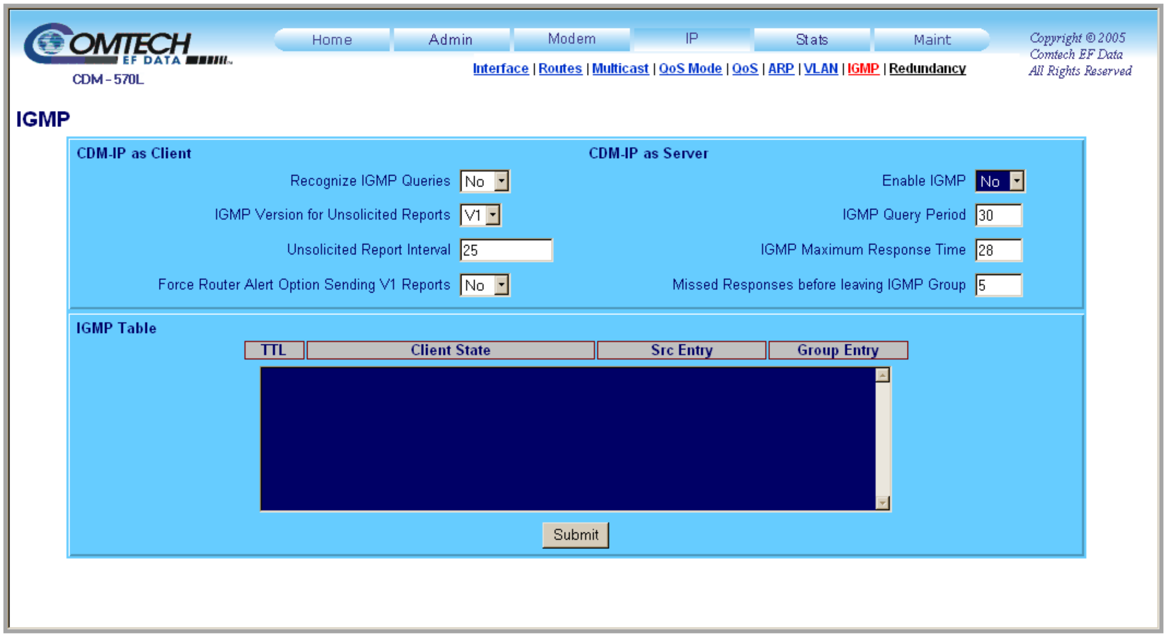


Figure 13-27. IP | IGMP

The '**IP | IGMP'** page (**Figure 13-27**) facilitates the use of Internet Group Management Protocol (IGMP) with configured multicast routes.

CDM-IP as Client

- **Recognize IGMP Queries** – Use the drop-down menu to select **Yes** or **No**.
- **IGMP Version for Unsolicited Reports** – Use the drop-down menu to select **V1** or **V2**.
- **Unsolicited Report Interval** – Enter an interval value from 1 to 25 seconds into the text box.
- **Force Router Alert Option Sending V1 Reports** – Use the drop-down menu to select **Yes** or **No**.

CDM-IP as Server

- **Enable IGMP** – Use the drop-down menu to select **Yes** or **No**. If enabled, the IP Module responds to IGMP queries for the configured multicast routes on the transmit side and generates IGMP queries on the receive side.
- **IGMP Query Period** – Enter a query period value from 1 to 600 seconds into the text box.
- **IGMP Maximum Response Time** – Enter a response time value that is *less than the IPGM Query Period* ***minus one*** – from 1 to 598 seconds – into the text box.
- **Missed Responses before leaving IGMP Group** – Enter the number of desired missed responses – from 1 to 30 – into the text box.

Click [**Submit]** to save the changes made on this page.

IGMP Table

This ***read-only*** table lists the IGMP Groups that are active on the modem. This includes the Time to Live for the entry; the State (Idle, Active, or Closing); and the Multicast IP Address.

13.6.2.4.9 IP | Redundancy

See* Appendix H. IP REDUNDANCY *for detailed information on the use of the CDM-570/570L Satellite Modem in redundant operations.

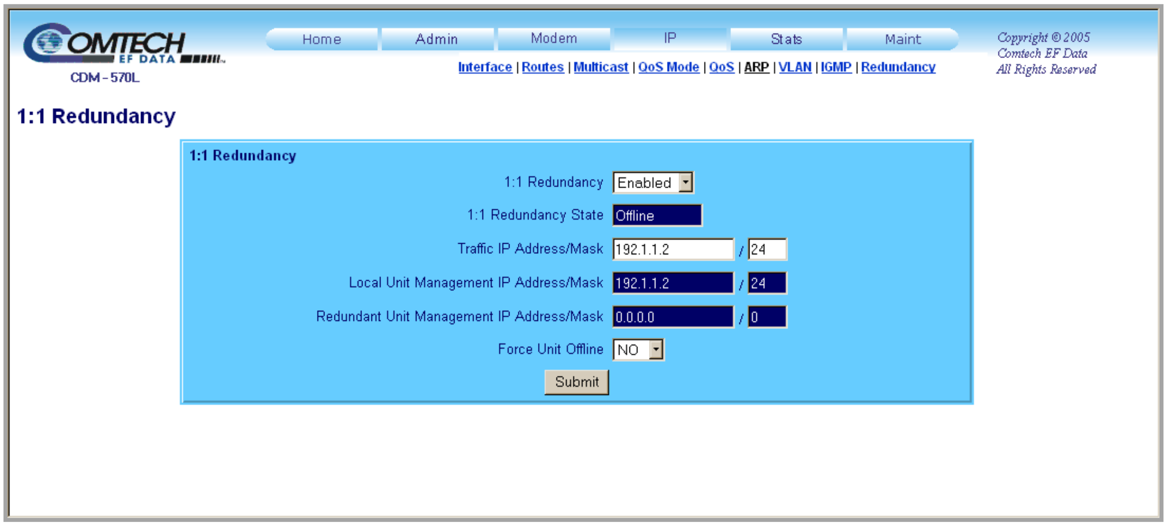


Figure 13-28. IP | Redundancy page

The '**IP | Redundancy'** page (**Figure 13-28**) provides the user with redundant configuration control and monitoring capabilities. The CDM-570/570L Satellite Modem, when connected to a Comtech EF Data redundancy switch, provides fully-automatic protection of IP packet traffic in the case of equipment failure.

With this page, the user may adjust the following redundancy operating parameters:

- **1:1 Redundancy** – Use the drop-down menu to select **Enabled** or **Disabled**.
- **Traffic IP Address/Mask** – Enter in format: xxx.xxx.xxx.xxx / xx
- **Force Unit Offline** – Use the drop-down menu to select **Yes** or **No**.

Additionally, ***read-only*** information is provided on the redundant configuration as follows:

- **1:1 Redundancy State** – Displays the status as **Online** or **Offline**.
- **Local Unit Management IP Address/Mask**
- **Redundant Unit Management IP Address/Mask**

Click [**Submit]** to save the changes made on this page.

13.6.2.5 Stats (Statistics) Pages

Click the **Ethernet**, **Routes**, **QoS**, **WAN**, or **Compression** hyperlink to continue.

13.6.2.5.1 Stats | Ethernet

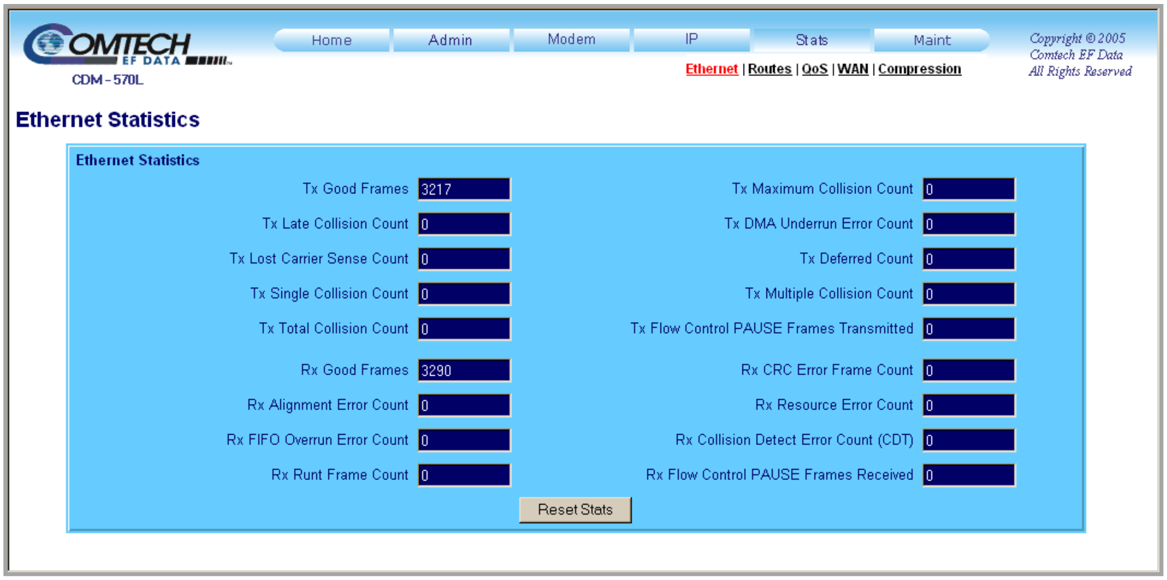


Figure 13-29. Stats | Ethernet page

The *read-only* **'Stats | Ethernet'** page (**Figure 13-29**) provides current operating statistics for Ethernet Tx and Rx.

Click **[Reset Stats]** to allow display of the most recent Ethernet operating statistics.

13.6.2.5.2 Stats | Routes

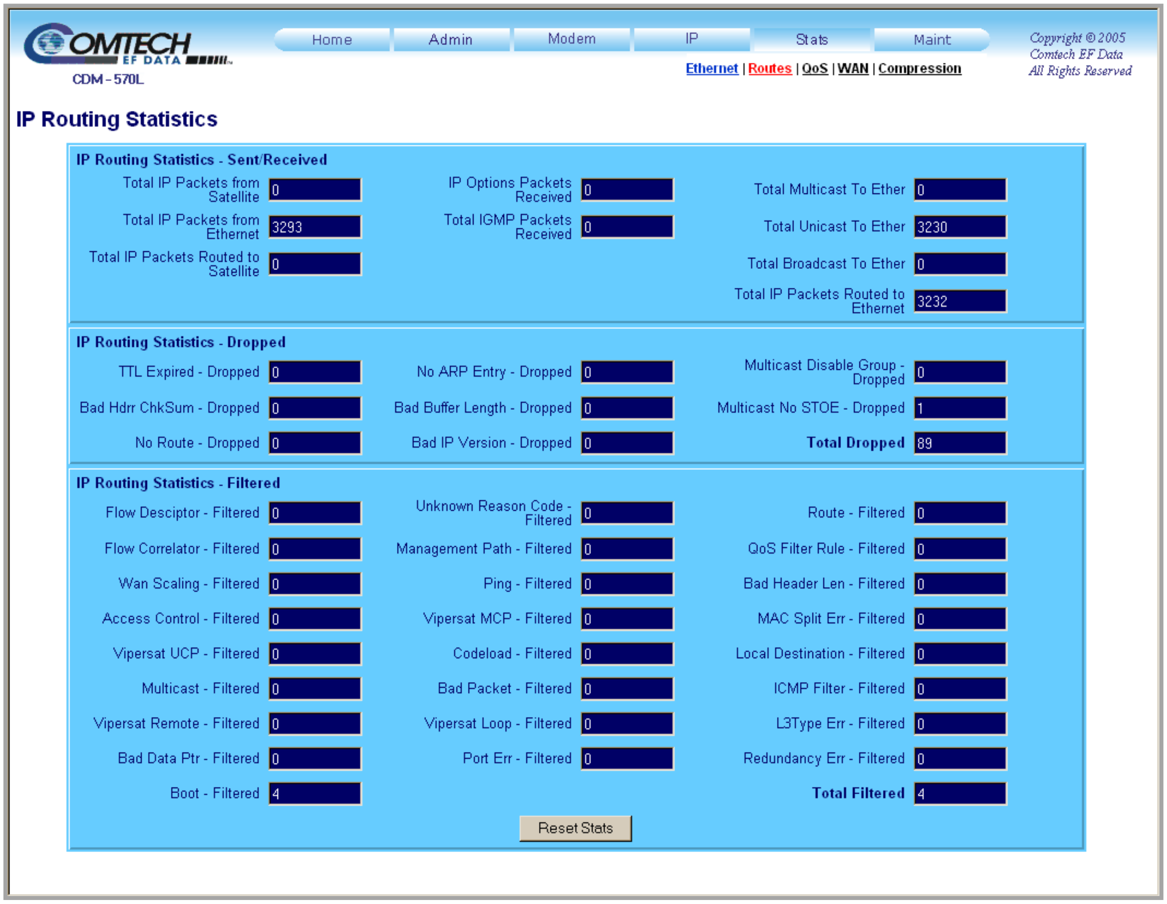


Figure 13-30. Stats | Routes page

The *read-only* **'Stats | Routes'** page (**Figure 13-30**) provides current operating statistics for IP packet routing on a **Sent/Received**, **Dropped**, and **Filtered** basis.

Click **[Reset Stats]** to allow display of the most recent IP Routing statistics.

13.6.2.5.3 Stats | QoS

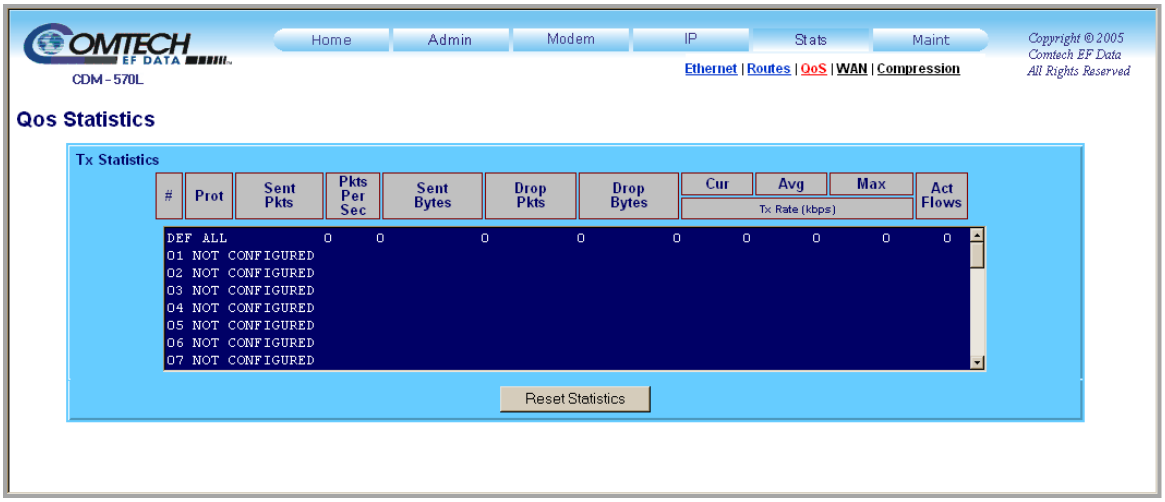


Figure 13-31. Stats | QoS page

The *read-only* **'Stats | QoS'** page (**Figure 13-31**) provides current operating statistics for the optional QoS feature, if installed.

Click **[Reset Statistics]** to allow display of the most recent QoS Statistics.

13.6.2.5.4 Stats | WAN

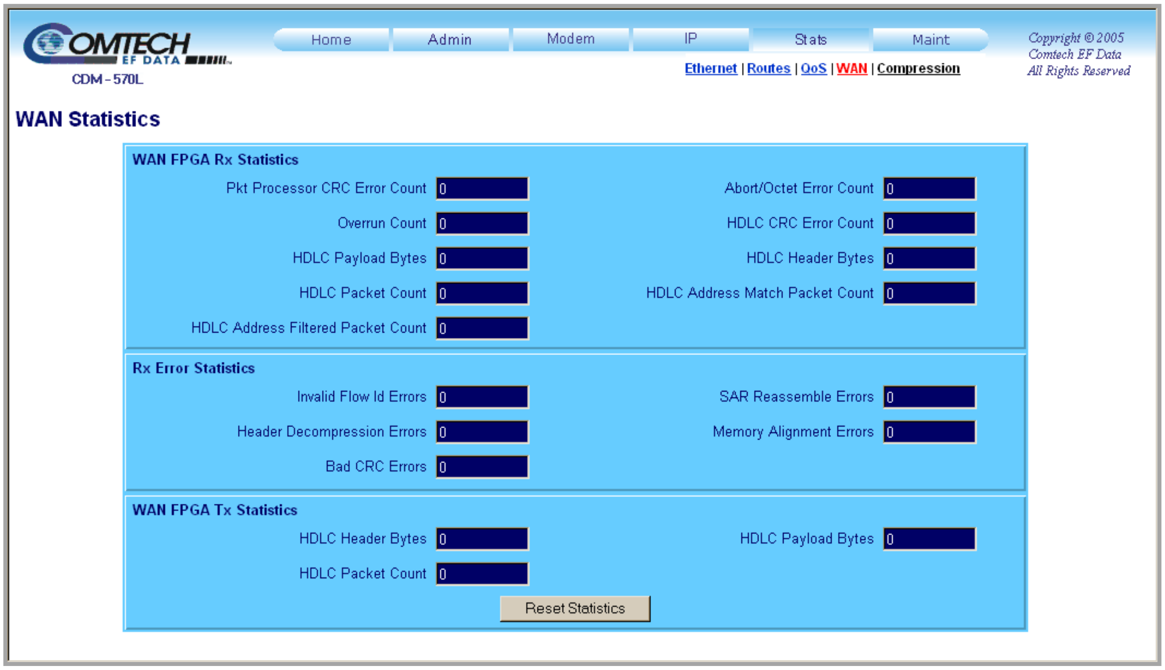


Figure 13-32. Stats | WAN page

The *read-only* **'Stats | WAN'** page (**Figure 13-32**) provides current operating statistics for the WAN FPGA Tx and Rx, as well as logged Rx Errors.

Click **[Reset Statistics]** to allow display of the most recent WAN statistics.

13.6.2.5.5 Stats | Compression

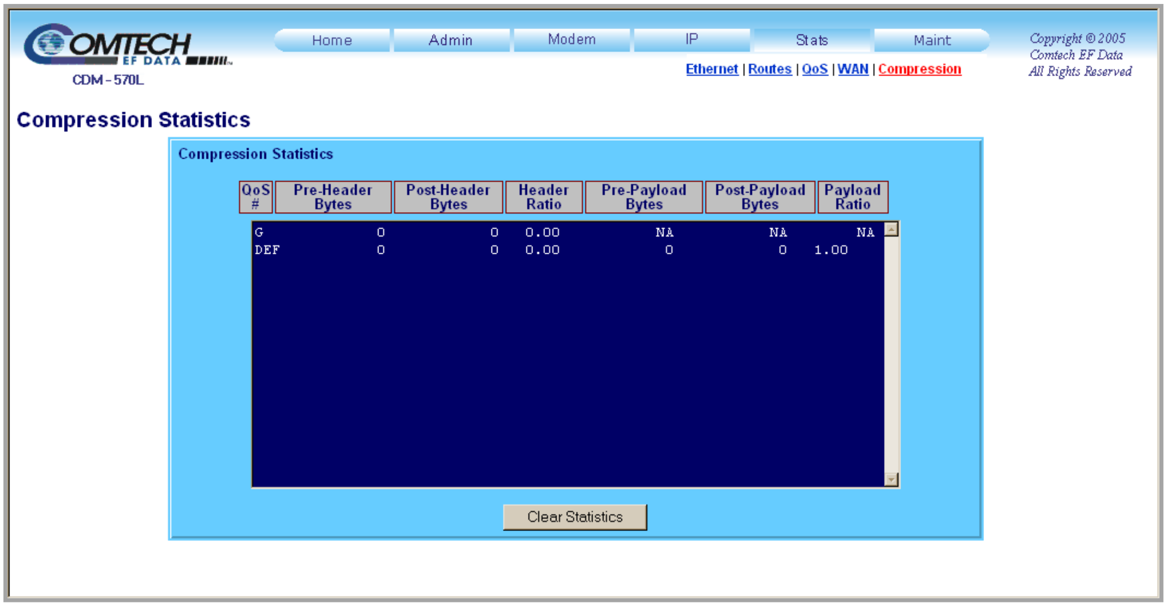


Figure 13-33. Stats | Compression page

The *read-only* **'Stats | Compression'** page (**Figure 13-33**) provides current operating statistics for the optional Payload and Header Compression feature, if installed.

Click **[Clear Statistics]** to allow display of the most recent Compression statistics.

13.6.2.6 Maint (Maintenance) Pages

Select the **Unit Info**, **Operations**, **Save**, or **Reboot** hyperlink to continue.

13.6.2.6.1 Maint | Unit Info

For details about the information provided on this page, see* Chapter 5. FRONT PANEL OPERATION*.

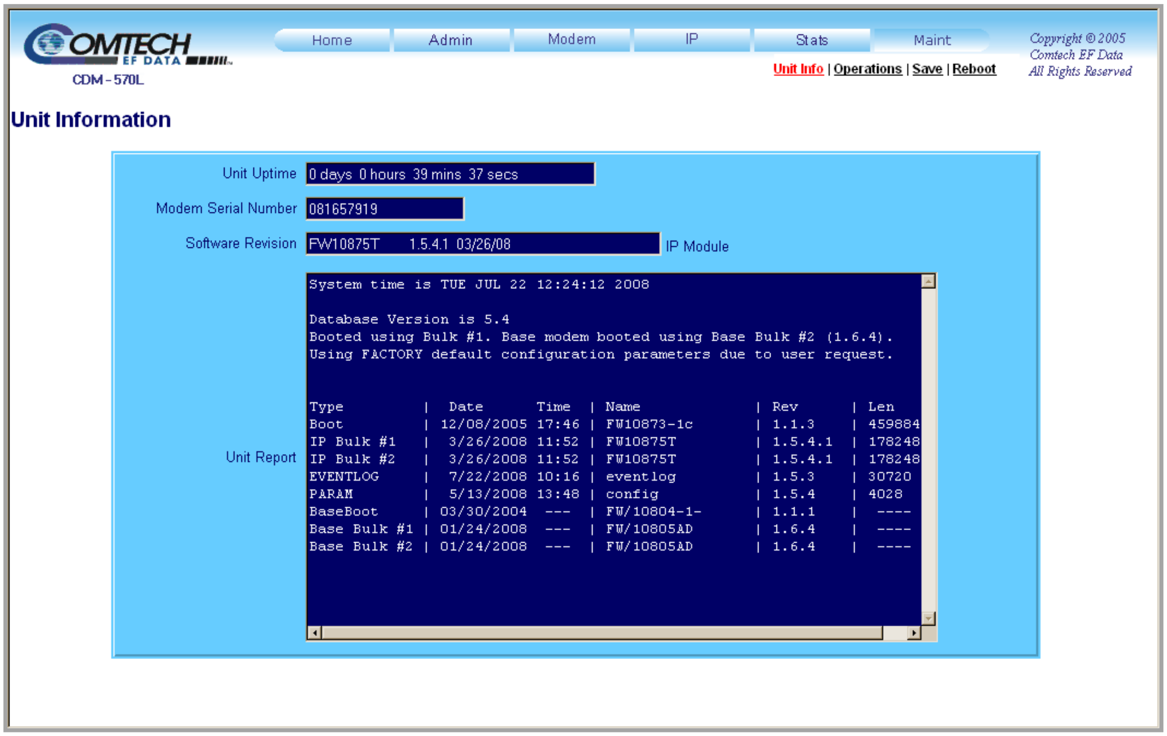


Figure 13-34. Maint | Unit Info page

The *read-only* '**Maint | Unit Info'** page (**Figure 13-34)** provides information about the base modem and IP Module's firmware information for Boot, Active and Inactive Bulks. The Unit Uptime, Modem Serial number, and IP Module Software Revision information is also provided here.

13.6.2.6.2 Maint | Operations

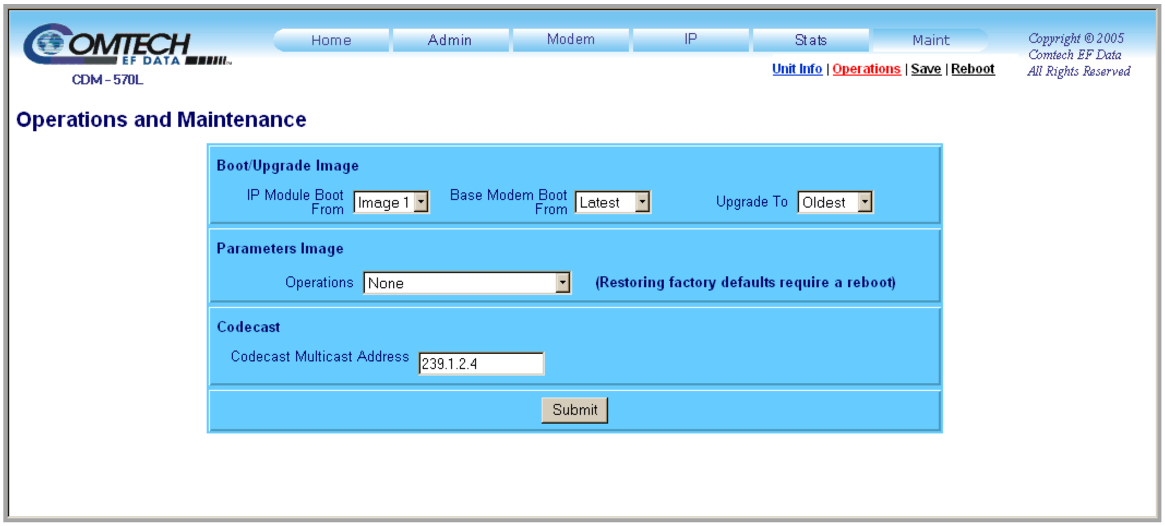


Figure 13-35. Maint | Operations page

The '**Maint | Operations**' page (**Figure 13-35**) is used for the following operations:

Boot/Upgrade Image

Use the drop-down menus in this section to specify how to control the firmware on the IP Module and in the base modem:

- **IP Module Boot From** – Select **Latest**, **Image 1**, or **Image 2**.
- **Base Modem Boot From** – Select **Latest**, **Image 1**, or **Image 2**.
- **Upgrade To** – Select **Oldest**, **Image 1**, or **Image 2**.

Parameters Image

Use the drop-down menu in this section to control how the parameters file is managed:

- **Operations** – Select **None**, **Save Parameters to Flash**, **Load Parameters from Flash**, or **Restore Factory Defaults**. Note that restoring from factory default requires reboot of the modem.

Codecast

The **Codecast** feature allows multiple modems to be upgraded at the same time. The Codecast Multicast Address is configured to match the Multicast Address in the VLOAD application.

Click [**Submit]** to save any changes made on this page.

13.6.2.6.3 Maint | Save

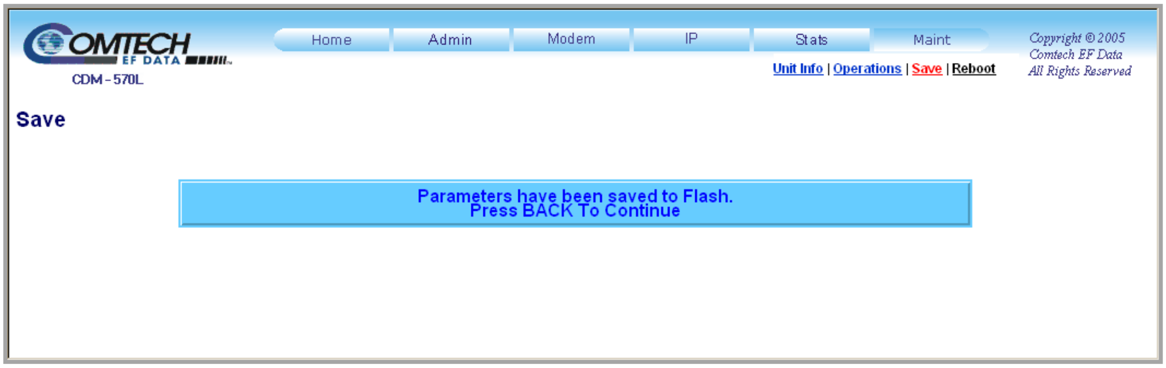


Figure 13-36. Maint | Save page

The **'Maint | Save'** page (**Figure 13-36**) appears once the **Save** hyperlink is selected. The current unit configurations are then saved to Flash memory. All configuration changes made via the IP Module HTTP Interface are permanently stored until the user either initiates and saves a new round of settings updates, or restores all settings to the original factory defaults via the **'Maint | Operations'** page.

The message window appears as shown in **Figure 13-36.** The user is prompted to click [**Back]** in the browser window. The user may alternately press [**Backspace]** on the keyboard, or select any one of the HTTP Interface navigation tabs/hyperlinks to return to the previously active HTTP Interface page or to select other modem functions.

In order to make any IP Module modifications permanent, the unit configuration* must *be saved before rebooting the unit.

13.6.2.6.4 Maint | Reboot

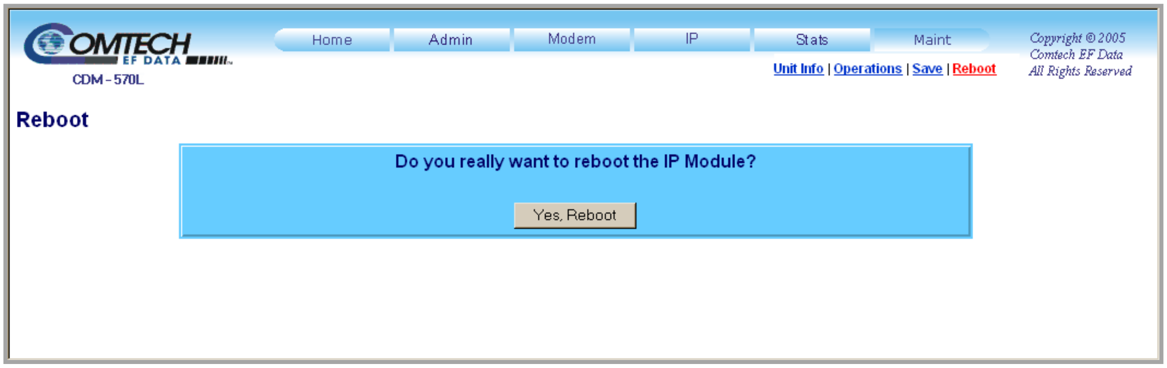
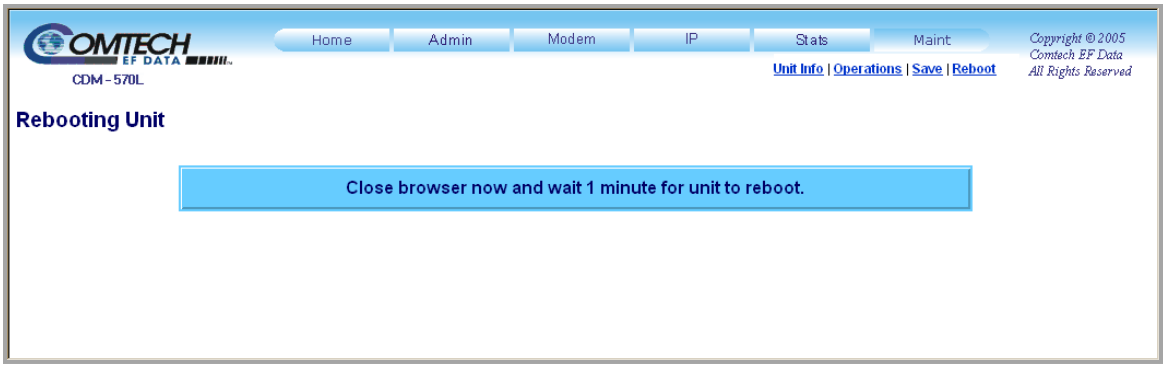


Figure 13-37. Maint | Reboot page

The '**Maint | Reboot'** page (**Figure 13-37)** is used to initiate the unit reboot process. After clicking the **Reboot** hyperlink, the page with the message window as shown opens**.**

To continue the process, click **[Yes, Reboot]**. The page then updates as follows:



From this point forward, while the reboot process is underway the page is no longer accessible. Additionally, while this process ensues, the CDM-570/570L front panel displays the following messages in succession:

```
IP OPTION CARD BOOTING.
...PLEASE WAIT
```

```
PROCESSOR BOOTING.
...PLEASE WAIT
```

The reboot process has been completed once the opening screen displays on the modem front panel:

```
Comtech CDM-570L Modem
Firmware Version:1.x.x
```

A new HTTP Interface session may now be initiated as per the procedure outlined in **Sect. 13.6.2**.

Notes:

Chapter 14. IP MODULE – CLI AND TELNET OPERATION

14.1 Overview

This chapter defines the user menu system connected to the IP Module via a Terminal Emulator or Telnet. In the process of configuring each parameter, an overview of the parameter and its impact on the configuration of the IP Module is provided.

For connection via a Terminal Emulator: The user should be physically attached to the Console port of the IP Module. The terminal emulator should be configured to match the Console port setting. The default Console port setting is 38,400 bps, 8 data bits, no parity, 1 stop bit and no flow control.

For connection via Telnet: The user must have network connectivity to the Traffic Ethernet Port of the IP Module. This connectivity can be via a local LAN, a remote LAN, or via a satellite link from another IP modem. The Ethernet Speed Mode is a configurable parameter of the IP Module and thus its exact setting can vary between specific installations.

1. ***The IP MODULE does not allow concurrent access to the menu via Telnet and the Console port. If a user connects via Telnet, IP MODULE automatically disables the Console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP MODULE automatically ends a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).***
2. ***Any changes made to the base modem and IP Module will be lost if the IP Module is reset or loses power unless the changes are saved to permanent storage. This applies to all of the IP Module and base modem parameters. The parameters can be saved by selecting "S", available on any CLI/Telnet Menu page.***
3. ***As of CDM-IP Firmware Ver. 1.5.3, all parameters for the modem are stored in the IP Module parameter file. This provides a single file to store the entire contents of the modem.***
4. ***As of CDM-IP Firmware Ver. 1.5.3.1, all parameter changes made for the modem or IP settings will automatically be saved by default. This applies to any changes made from the front panel or any other user interface (Web/CLI/SNMP, etc.) This feature can be disabled in Maintenance/Database Operations.***

The CLI and Telnet Access Levels are defined as follows:

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
Telnet	Full Access – all Menus	No Access to Admin Menu Full Access all other Menus	No Access
CLI (direct to Console port)	Full Access – no Login		

The factory defaults for names/passwords are as follows:

Admin	comtech/comtech
Read/Write	opcenter/1234
Read Only	monitor/1234

14.1.1 Common Operational Features

Interface Appearance: The appearance of the HyperTerminal-based Telnet interface may vary across individual user configurations. Therefore, a complete interface window is depicted in **Figure 14-1** only.

Common Interface Options/Fields: Menu functions that are deemed typical for all primary and nested screens are as follows:

Selection	Entry	Description
Save Parameters to Flash	S	Allows the user to save the current configuration of the NP Module to permanent storage. This configuration is restored on each successive power cycle.
Exit Menu	X	Allows the user to exit the current menu and return to the parent menu. Alternately, the user may press the Esc key to perform the same action.

Elsewhere, where the **Entry** column for a tabulated menu feature is designated as ***[RO]***, this means that the pertinent menu option or field is a *read-only* feature.

14.2 Main Menu Page

Menu pages are followed by a table listing the Selection, required Entry, and Descriptions.

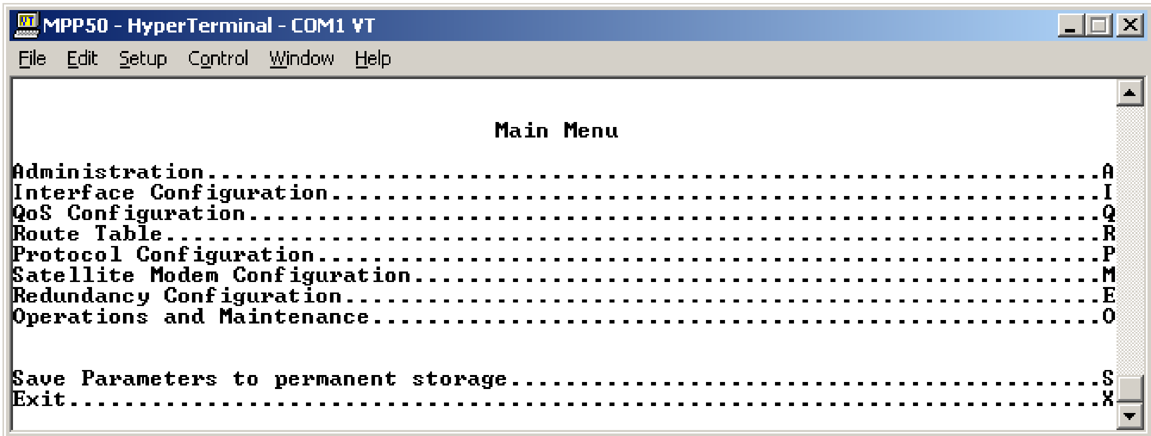


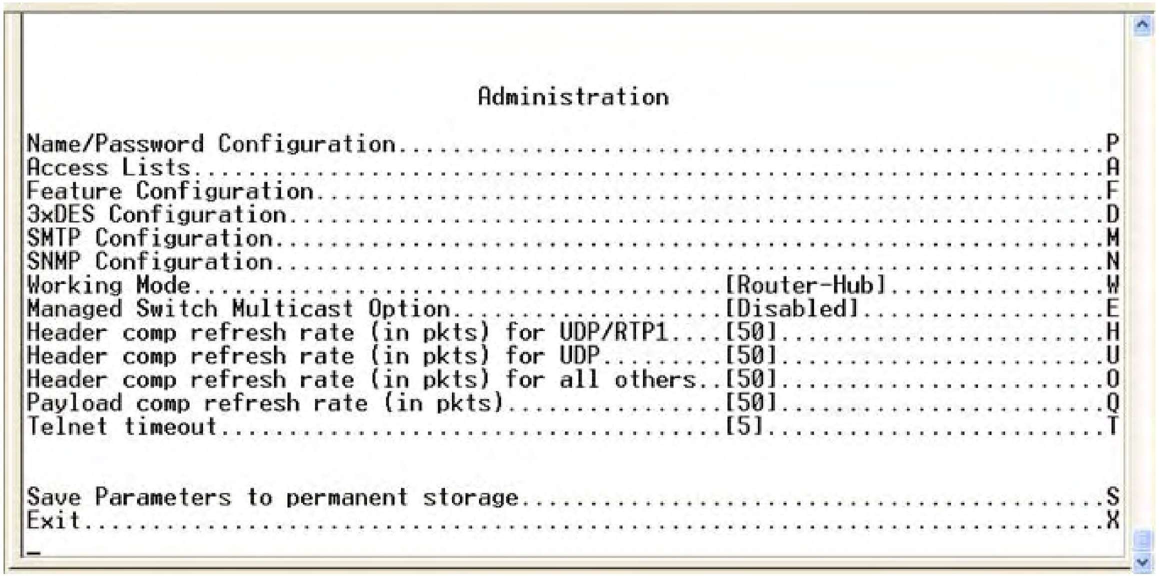
Figure 14-1. Main Menu page

The *Main Menu* page has the following options/fields:

Selection	Entry	Description
Administration	A	The Administration menu provides a basic set of standard admin functions to the IP Module. When connected via Telnet, navigation to this menu is restricted to the admin user.
Interface Configuration	I	Allows the user to configure the Ethernet and Satellite interfaces.
QoS Configuration	Q	Allows the user to define QoS rules for up to 32 different types of flows.
Route Table	R	Allows the user to define how the IP Module will route packets that it receives on its Ethernet and Satellite interfaces.
Protocol Configuration	P	The Protocol Settings option allows the user to configure various protocols used by the IP Module. These protocols currently include ARP and IGMP.
Satellite Modem Configuration	M	The Modem Parameters option displays a set of menus that allows the user to configure and monitor the satellite base modem.
Redundancy Configuration	E	The Redundancy Configuration Menu allows the user to configure 1:1 IP redundancy.
Operations and Maintenance	O	The Operations & Maintenance Menu allows the user to configure various options used to control and maintain the system. Also has diagnostic tools for troubleshooting and Statistics.

14.2.1 Administration Page

The *Administration* page is activated from the *Main Menu* page.



```
                              Administration

Name/Password Configuration.............................................P
Access Lists............................................................A
Feature Configuration...................................................F
3xDES Configuration.....................................................D
SMTP Configuration......................................................M
SNMP Configuration......................................................N
Working Mode.........................................[Router-Hub]........W
Managed Switch Multicast Option......................[Disabled].........E
Header comp refresh rate (in pkts) for UDP/RTP1....[50]...................H
Header comp refresh rate (in pkts) for UDP.........[50]...................U
Header comp refresh rate (in pkts) for all others..[50]...................O
Payload comp refresh rate (in pkts)................[50]...................Q
Telnet timeout.....................................[5]....................T

Save Parameters to permanent storage....................................S
Exit....................................................................X
_
```

Figure 14-2. Administration page

Access to the Administration page is restricted to the Admin user when connecting via the Telnet, or HTTP interface. The Administration page is available when connected via the Terminal Emulator (serial) connection because there is no log in.

The *Administration* page contains the following options/fields:

Selection	Entry	Description
Name/Password Configuration	P	Activates the *Name/Password Configuration* page. Allows the user to define the user name and passwords that are required in order to access the management interfaces.
Access Lists	A	Activates the *Access Lists* page. Allows the user to restrict access to the management interfaces based upon the requester's IP address.
Feature Configuration	F	Activates the *Feature Configuration* page.
3xDES Configuration	D	The 3xDES Configuration Page allows the user to determine if 3xDES encryption is enabled on a device and if so, the 3xDES keys that are used to decrypt traffic. The keys specified for the transmit function are completely independent for the 3xDES keys specified for the receiver function.
SMTP Configuration	M	The SMTP configuration page allows the user to specify appropriate settings for SMTP email server.
SNMP Configuration	N	The SNMP configuration page allows the user to specify management parameters for SNMP.

Selection	Entry	Description
Working Mode	W* -or- C**	Sets the Working Mode. *For CDM-IP Firmware Ver. 1.7.Xand later: • Managed Switch • Router – Hub • Router – Remote • Router – Point to Point ** For CDM-IP Firmware Ver. 1.6.X and earlier: • Router – Small Network • Router – Large Network • Router – Point to Point • Managed Switch See Chapter 13 for additional information.
Managed Switch Multicast Option *(For CDM-IP Firmware Ver. 1.5.4 and later; was "Easyconnect Multicast Option" for CDM-IP Firmware Ver. 1.5.3.6 and earlier)*	E	When unit is running in Managed Switch mode, Multicast is only forwarded across link if both units have this feature enabled.
Header comp refresh rate (in pkts) for UDP/RTP1	H	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Header comp refresh rate (in pkts) for UDP	U	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Header comp refresh rate (in pkts) for all others	O	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Payload comp refresh rate (in pkts)	Q	This setting allows for the adjustment of how often to send a full payload when Payload Compression is enabled.
Telnet Timeout	T	The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated.

14.2.1.1 Name/Password Configuration Page

The *Name/Password Configuration* page is activated from the *Administration* page. It allows the user to define the passwords required to access via HTTP, FTP, and Telnet.

```
                         Name/Password Configuration

Admin User/Password.......[comtech/comtech]....................................A
Read/Write User/Password..[opcenter/1234]......................................W
Read Only User/Password...[monitor/1234].......................................R


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
```

Figure 14-3. Name/Password Configuration page

- ***All Usernames and Passwords are case sensitive.***
- ***There is a minimum of 1 and maximum of 11 characters.***
- ***Any or all of the Usernames and Passwords can be removed by entering*** "NONE NONE" ***from the CLI or Telnet.***
- ***Removing all Usernames and Passwords would only allow access to the IP functions when connected via the Terminal Emulator (serial) connection (because there is no log in).***
- ***FTP access is restricted to Admin Username/Password only. FTP is only used to upgrade the IP SOFTWARE or to load or retrieve the IP Parameter or IP Event log files.***

The *Name/Password Configuration* page contains the following options/fields:

Selection	Entry	Description
Admin User/Password	A	Enter the user name and password with a space delimiter. **Example:** <user> <passwd> Enter NONE NONE to erase
Read/Write User/Password	W	Enter the user name and password with a space delimiter. **Example:** <user> <passwd> Enter NONE NONE to erase
Read Only User/Password	R	Enter the user name and password with a space delimiter. **Example:** <user> <passwd> Enter NONE NONE to erase

14.2.1.2 Access Lists Page

The *Access Lists* page is activated from the *Administration* page. This page allows the user to limit monitor and control access to the unit from a specified list of authorized clients.

```
                              Access Lists

AccessClient1............[172.018.010.024/29]..................................1
AccessClient2............[010.006.000.000/16]..................................2
AccessClient3............[NOT-DEFINED/NA]......................................3
AccessClient4............[NOT-DEFINED/NA]......................................4
Access List Enforcement..[Disabled]............................................E


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
```

Figure 14-4. Access Lists page

If connecting to the IP modem remotely, the IP address of the machine used to manage the IP modem should be included in the Access List.

The *Access Lists* page contains the following options/fields:

Selection	Entry	Description
AccessClient1 – 4	1 – 4	The Access Client list allows the user to define which remote clients can connect when the Access List Enforcement is enabled. Each entry allows the user to specify an IP Address or a subnet mask to define a unique class of machines that are allowed access. For example, if a user wanted to grant access to a PC with an IP Address of 10.10.10.1 and any PC on a subnet of 192.168.10.xxx, then the Access List would be defined as: AccessClient1 …[10.10.10.1/32] AccessClient2…. [192.168.10.0/24]
Access List Enforcement	E	The Access List Enforcement allows the user to grant access via ping, Telnet, HTTP, FTP, and SNMP to a well-defined list of client machines. Access List Enforcement toggles between [Enabled] and [Disabled]. If disabled, then any client machine is able to connect via ping, Telnet, HTTP, FTP, and SNMP. If enabled, then only those machines specified in the Access Client List are allowed to connect via ping, Telnet, HTTP, and SNMP.

14.2.1.3 Feature Configuration Page

The *Feature Configuration* page is activated from the *Administration* page.

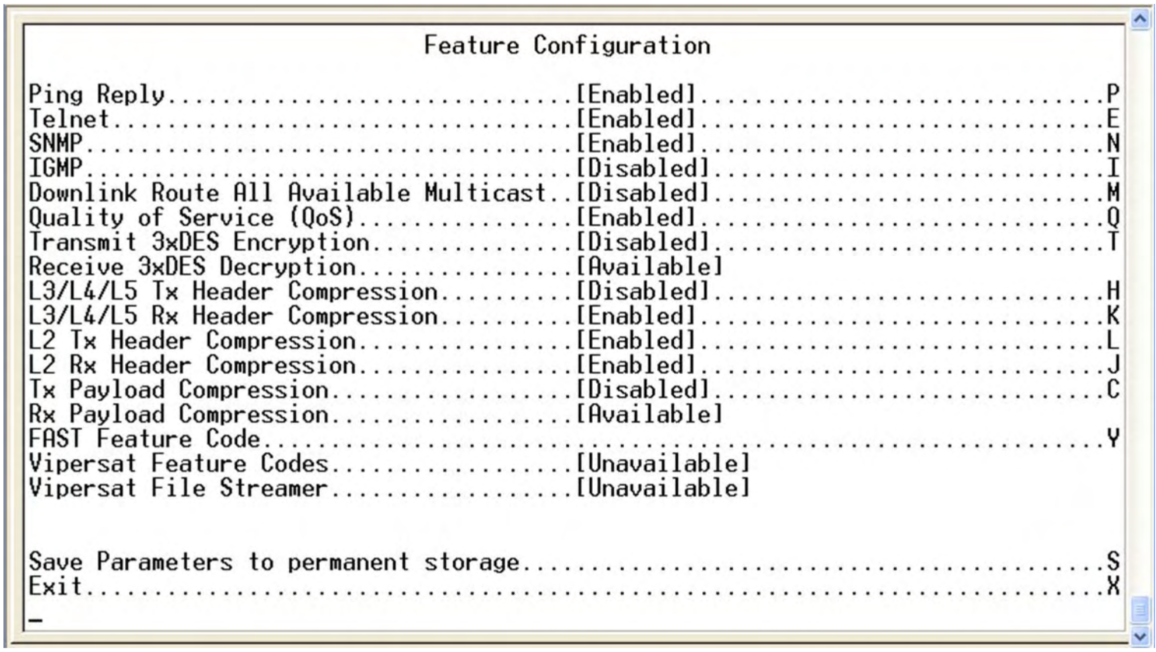


Figure 14-5. Feature Configuration page

The *Feature Configuration* page communicates to the user the current availability for each of the features. If a feature is marked “Unavailable” then the feature is a FAST feature. FAST features must be purchased from Comtech EF Data.

The *Feature Configuration* page contains the following options/fields:

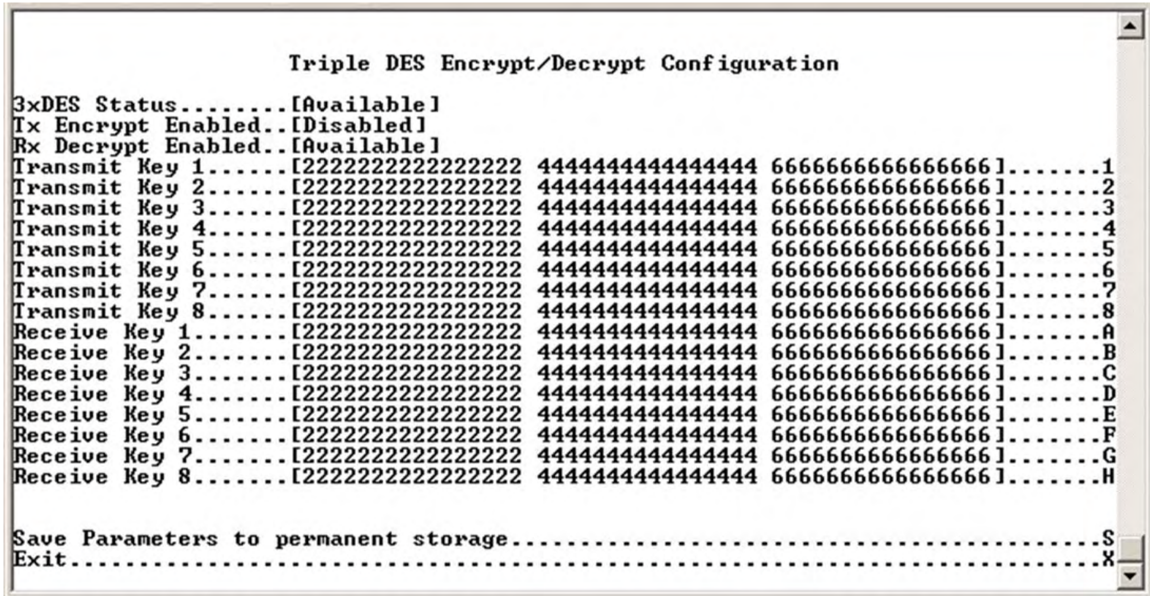
Selection	Entry	Description
Ping Reply	P	Toggles [Enabled] and [Disabled]: • **Enabled** tells the IP Module to respond to ping requests directed to the IP Module Ethernet Interface. • **Disabled** tells the IP Module not to respond to ping requests. This is used as a security feature to prevent unauthorized parities from determining if a device exists via the ping utility.
Telnet	E	Toggles [Enabled] and [Disabled]: • **Enabled** allows access via Telnet. • **Disabled** denies access via Telnet.
SNMP	N	Toggles [Enabled] and [Disabled]: • **Enabled** tells the IP Module to respond to SNMP requests against the private and public MIB. • **Disabled** tells the IP Module not to respond to SNMP requests against the private and public MIB.

Selection	Entry	Description
IGMP	I	Toggles [Enabled] and [Disabled]. The receive portion of an IP Module will utilize the IP Module as an IGMP server. The transmit portion of a IP Module will utilize the IP Module as an IGMP client. The *IGMP Information* Page configures the IP Module to report an interest to join a Multicast group on an IGMP server. The IGMP protocol is used to regulate Multicast traffic on a LAN segment to prevent information of no interest from consuming bandwidth on the LAN.
Downlink Route All Available Multicast	M	Toggles [Enabled] and [Disabled]. Enabled tells the IP Module to route all Multicast packets coming from the Satellite interface to the Ethernet LAN regardless of the Route Table entries. Disabled tells the IP Module not to automatically forward all Multicast packets. This IP Module will only forward multicast traffic received from the satellite to the Ethernet port if the multicast route exists in the Route Table.
Quality of Service (QoS)	Q	This feature must be purchased. Toggles [Enabled] and [Disabled]. Enabled tells the IP Module to apply configured QoS rules on all packets going out the Satellite Interface. When Disabled, the IP Module does not apply QoS rules for outgoing packets.
Transmit 3xDES Encryption	T	This feature must be purchased. Toggles [Enabled] and [Disabled]. Enabled allows the IP Module to assign a TX key to encrypt packets for a specific route being sent over the Satellite Interface. When Disabled, the IP Module cannot encrypt packets being sent over the Satellite interface.
Receive 3XDES Decryption	*[RO]*	This feature must be purchased. Available allows the IP Module to decrypt packets being received from the Satellite Interface. When Unavailable the IP Module cannot decrypt packets received from the Satellite Interface. This option is auto-sensed by a bit carried in packet headers. This option is always available if the option is purchased.
L3/L4/L5 Tx Header Compression	H	This option compresses L3/L4/L5 headers. Headers available for compression can be referenced in the IP Header Compression section. Note that, in Managed Switch mode, all L2 Ethernet Headers are compressed whether or not this feature is enabled. In Router mode, this screen shows compression as Available, and the option must be *enabled* per route in Route table.

Selection	Entry	Description
L3/L4/L5 Rx Header Compression	K	This option tells the system to expect received streams to be Header compressed. **Important Note for CDM-IP Firmware Ver. 1.6.x and earlier**: A CDM-IP modem must receive all streams Header compressed or not Header compressed. The modem has no way to distinguish between compressed or not compressed. If a CDM-IP modem has TX Header Compression enabled, the receiving CDM-IP will not be able to receive any data unless RX Header Compression is also Enabled. For this reason, when enabling Header Compression on a live satellite link, the user must always first enable the option on the remote CDM-IP modem. **For example:** **Step1.** Enable remote CDM-IP TX Header Comp (data link will be lost). **Step 2.** Enable local CDM-IP RX Header Compression (data link will be restored). **Step 3.** Enable remote CDM-IP RX Header Comp (data link will be lost). **Step 4.** Enable local CDM-IP TX Header Compression (data link will be restored). **Important Note for Streamline (Firmware Ver. 1.7.x and later)**: The modem will detect if packets received were Header Compressed on a packet by packet basis. Therefore there is no need to enable or disable L3/L4/L5 RX Header Compression and this is a *read-only* selection as either **Available** or **Unavailable**.
L2 Tx Header Compression	L	This option will compress L2 headers when set to **Enabled** and only applies in Managed Switch Mode. **Note for Streamline (Firmware Ver. 1.7.x and later)**: This option is only displayed when in Managed Switch Mode.
L2 Rx Header Compression	J	This option will decompress L2 headers when set to **Enabled** and only applies in Managed Switch Mode. **Note for Streamline (Firmware Ver. 1.7.x and later)**: This option is not displayed when in Managed Switch Mode. The modem will detect if packets received were L2 Header Compressed on a packet by packet basis.
Tx Payload Compression	C	This option allows a stream of traffic to be payload compressed. Payload is considered everything inside the HDLC satellite frame. Therefore, IP headers could be compressed as well. Note that in Managed Switch Mode, the option is **Enabled** or **Disabled** for all traffic. In Router mode, Payload compression will show **Available**, and one must set the option Per Route in Routing table.
Rx Payload Compression	*[RO]*	Receive payload compression option allows a unit receiving a stream of data that has been payload compressed to be correctly uncompressed. This option is auto-sensed by a bit carried in packet headers. This option is always available if the option is purchased.
FAST Feature Code	Y	If a FAST option is purchased, the FAST Access Code is entered here to enable that option.
Vipersat Feature Codes		Allows the user to review the Vipersat features enable code that has been provided by Comtech Vipersat for modem configured to operate under VMS control.
Vipersat File Streamer		Refer to the Vipersat User Manual for complete information.

14.2.1.4 3xDES Encrypt/Decrypt Configuration Page

The *3xDES Encrypt/Decrypt Configuration* page is activated from the *Administration* page.



```
                    Triple DES Encrypt/Decrypt Configuration

3xDES Status........[Available]
Tx Encrypt Enabled..[Disabled]
Rx Decrypt Enabled..[Available]
Transmit Key 1......[2222222222222222 4444444444444444 6666666666666666].......1
Transmit Key 2......[2222222222222222 4444444444444444 6666666666666666].......2
Transmit Key 3......[2222222222222222 4444444444444444 6666666666666666].......3
Transmit Key 4......[2222222222222222 4444444444444444 6666666666666666].......4
Transmit Key 5......[2222222222222222 4444444444444444 6666666666666666].......5
Transmit Key 6......[2222222222222222 4444444444444444 6666666666666666].......6
Transmit Key 7......[2222222222222222 4444444444444444 6666666666666666].......7
Transmit Key 8......[2222222222222222 4444444444444444 6666666666666666].......8
Receive Key 1.......[2222222222222222 4444444444444444 6666666666666666].......A
Receive Key 2.......[2222222222222222 4444444444444444 6666666666666666].......B
Receive Key 3.......[2222222222222222 4444444444444444 6666666666666666].......C
Receive Key 4.......[2222222222222222 4444444444444444 6666666666666666].......D
Receive Key 5.......[2222222222222222 4444444444444444 6666666666666666].......E
Receive Key 6.......[2222222222222222 4444444444444444 6666666666666666].......F
Receive Key 7.......[2222222222222222 4444444444444444 6666666666666666].......G
Receive Key 8.......[2222222222222222 4444444444444444 6666666666666666].......H

Save Parameters to permanent storage..........................................S
Exit..........................................................................X
```

Figure 14-6. 3xDES Encrypt Configuration page

The *3xDES Encrypt/Decrypt Configuration* page contains the following options/fields:

This menu will only be accessible if the 3xDES FAST feature has been purchased and the license key has been entered through the modem front panel.

Selection	Entry	Description
3xDES Status	*[RO]*	Displays status, [Available] or [Unavailable]: • **Available** is displayed when the 3xDES feature has been installed. • **Unavailable** is displayed when the 3xDES feature has not been installed.
Transmit Encrypt Enabled	*[RO]*	Displays feature status. This field updates via the *Features Configuration* menu. If Transmit Encrypt is *disabled*, then all traffic processed by the IP Module is transmitted in the clear regardless of the 3xDES encryption key specified in the Route table.
Receive Decrypt Enabled	*[RO]*	Displays feature status. This field updates via the *Features Configuration* menu.
Transmit Key 1 – 8	1 – 8	Use these 3xDES keys to encrypt traffic being sent over the Satellite Interface. The key is entered in HEX (48 digits max)
Receive Key 1 – 8	A – H	Use these 3xDES keys to decrypt traffic being received from the Satellite Interface. The key is entered in HEX (48 digits max)

A 24 Byte [192-bit] 3xDES key is actually a combination of 3 single DES keys of 8 Bytes [64-bits]. The CLI will display the Key with a space separating the Key into 3 sections. In the screen capture above, Transmit Key 1 is displayed as:

2222222222222222 4444444444444444 6666666666666666

Consider the first section as Key1A, the second as Key1B, and the third as Key1C.

Data is first encrypted with Key1A and then decrypted with Key1B and again encrypted with Key1C. So if a user specifies all the three Keys the same, (like 48 '1's OR all the characters in DES key the same) the cumulative effect of 3xDES is just a single DES. When data is first encrypted with Key1A and decrypted with Key1B we get back the original data and then when encrypted with Key1C results in a total effect of single DES key.

Because of this, the user is required to enter unique 64-bit keys. ***If any 2 sections of the Key match, the IP Module will respond***

```
Invalid Key – Please Re-enter.
```

Also, the Least Significant bit of each byte in a 24-byte [192-bit] 3xDES key is reserved for the DES Algorithm for parity. Entries of 1, 3, 5, 7, 9, B, D, or F will have all the corresponding bit positions masked. So a Key entry of:

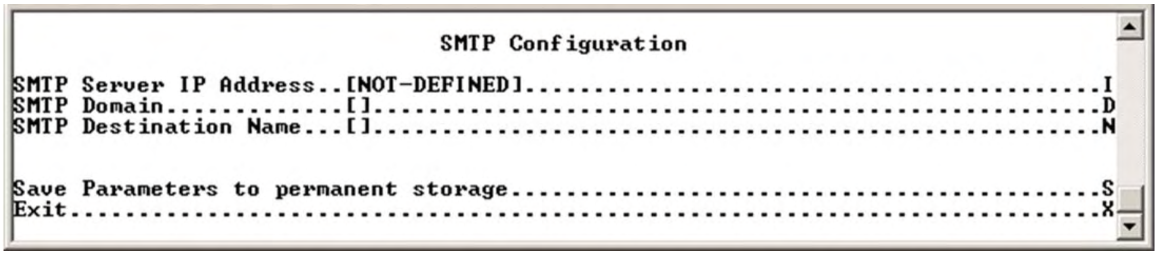
1111111133333333 5555555577777777 99999999BBBBBBBB

becomes

1010101032323232 5454545476767676 98989898BABABABA

14.2.1.5 SMTP Configuration Page

The *SMTP Configuration* page is activated from the *Administration* page.



```
                          SMTP Configuration

SMTP Server IP Address..[NOT-DEFINED]...................................I
SMTP Domain.............[]..............................................D
SMTP Destination Name...[]..............................................N


Save Parameters to permanent storage....................................S
Exit....................................................................X
```

Figure 14-7. SMTP Configuration page

The *SMTP Configuration* page contains the following options/fields:

Selection	Entry	Description
SMTP Server IP Address	I	The mail server address from where the user will want to send the email.
SMTP Domain	D	Set to the domain of the email server (usually found to the right of the @ symbol in an email address).
SMTP Destination Name	N	Set the email recipient names (usually found to the left of the @ symbol in an email address).

SMTP can be used to send an email to Comtech EF Data IP Modem Support cdmipsupport@comtechefdata.com using the Support Web Page by connecting to the IP Module with a Web Browser. The Support Web Page allows the user to compose an email message for questions or problems with the IP Module. The user can also select to automatically attach the IP Module parameter file in order to facilitate troubleshooting or to resolve configuration issues.

14.2.1.6 SNMP Configuration Page

The *SNMP Configuration* page is activated from the *Administration* page.

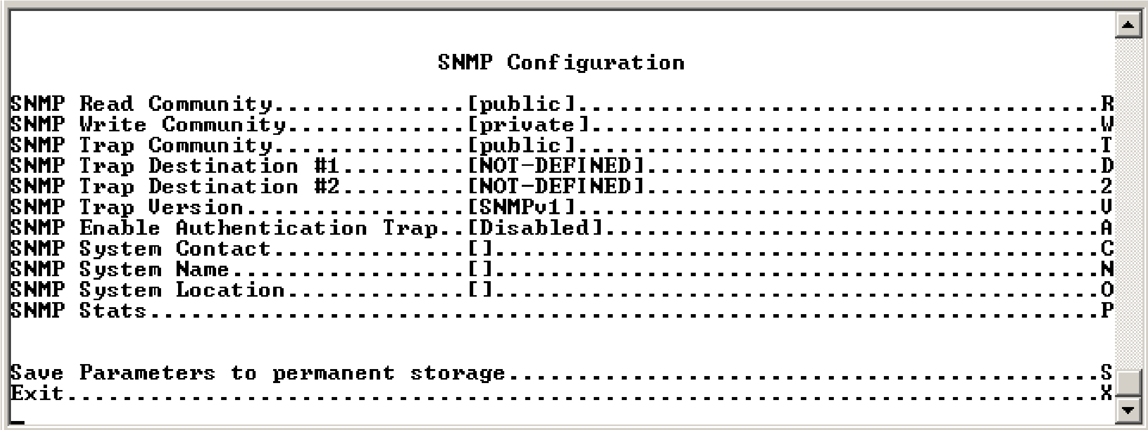


Figure 14-8. SNMP Configuration page

The *SNMP Configuration* page contains the following options/fields:

Selection	Entry	Description
SNMP Read Community	R	GET community – allows GET operations to all portions of the IP Module Controller and CDM-570/570L modem MIBs.
SNMP Write Community	W	SET community string – allows SET operations to all portions of the IP Module Controller and CDM-570/570L modem MIBs.
SNMP Trap Community	T	Community String that is set in the Community field of all outgoing traps. the The network manager application checks this field on the trap PDU to determine if the trap comes from a “trusted” agent.
SNMP Trap Destination #1	D	First IP address where all traps/notifications are sent. If a network management application is running in the network, configure it to receive traps and enter its IP address here.
SNMP Trap Destination #2	2	Second IP address where all traps/notifications are sent. If a network management application is running in the network, configure it to receive traps and enter its IP address here.
SNMP Trap Version	V	Determines whether an SNMPv1 trap or SNMPv2 notification is sent.
SNMP Enable Authentication Trap	A	Determines whether a MIB2 authentication trap is sent when a PDU with an invalid community string is encountered. A community string is invalid when it does not match the Admin, the Read Write, or the Read Only community strings.
SNMP System Contact	C	User-defined SNMP Contact information.
SNMP System Name	N	User-defined SNMP Name information.
SNMP System Location	O	User-defined SNMP Location information.

Selection	Entry	Description
SNMP Stats	P	Displays statistics concerning the operation of the SNMP agent (number of IN SNMP packets, number of OUT SNMP packets, number of OUT Traps, etc.)

14.2.1.7 Working Mode

The *Working Mode* page is activated from the *Administration* page.

Changing the Working Mode will require a system reboot. The user is prompted [Y] or [N] to continue to this section and may press [ESC] to abort this process at any time.

The *Working Mode* contains the following option/field:

Selection	Entry	Description
IP Module Working Mode	C* *-or-* W**	Select the Working mode. * For CDM-IP Firmware Ver. 1.6.x and earlier: • **For all Router Modes –** IP packets are routed based on the Route table information input by the user. Non-IP packets are discarded. Operates at 10/100BaseT. • **Router – Small Network:** Router uses 1 byte HDLC addresses. • **Router – Large Network:** Router mode using 2 byte HDLC addresses. • **Router – Point to Point:** Router mode uses 0 HDLC addresses to save satellite bandwidth • **Router – Vipersat:** Router mode when running in a Vipersat Network. • **Managed Switch:** default operating mode, and operates at 10/100BaseT. In this mode the IP Module will forward both IP and non-IP datagrams over satellite without any defined routes. **For Streamline, CDM-IP Firmware Ver. 1.7.x and later: • Managed Switch • Router – Hub • Router – Remote • Router – Point to Point See Chapter 13 for additional information.

14.2.1.8 Managed Switch Multicast Option

The *Managed Switch Multicast Option* (Firmware Ver. 1.5.4 or later; this feature was titled *easyConnect Multicast Option* in CDM-IP Firmware Ver. 1.5.3.6 or earlier) page is activated from the *Administration* page. It allows multicast to be either transmitted or received through the modem. This applies to **Managed Switch Mode** only. Managed Switch Mode will normally filter multicast traffic.

If the Working Mode is Managed Switch and multicast traffic is intended to pass across a pair of modems, this option must be enabled on both modems.

14.2.1.9 Header/Payload Compression Refresh Rate

The *Header Compression Refresh Rates* are configured from the *Administration* page.

Selection	Entry	Description
Header comp refresh rate (in pkts) for UDP/RTP1	H	Selects how often a single, full header UDP/RTP1 packet is transmitted with Header Compression enabled.
Header comp refresh rate (in pkts) for UDP	U	Selects how often a single, full header UDP packet is transmitted with Header Compression enabled.
Header comp refresh rate (in pkts) for all others	O	Selects how often a single, full header packet is transmitted with Header Compression enabled (for all other types of IP headers).

The *Header Compression Refresh Rates* determines how many compressed header packets are sent before a single full header packet is sent. Some compressed header traffic could be lost during deteriorated satellite link conditions. Sending a full header packet will allow the return of the traffic stream. Refresh rates from 1 to 600 can be individually selected for UDP/RTP1, UDP and all other IP headers. The Refresh Rate can be decreased for poor satellite link conditions or increased to further reduce overhead. The default Refresh Rate of 50 has been found to provide the best performance and efficiency in typical satellite link

Managed Switch Mode will automatically use L2 Header Compression (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted. For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite it will time out until the full Header packet is sent. The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both CDM-IP modems are able to receive all traffic, unless one CDM-IP is power cycled or reset.

14.2.1.10 Payload Compression Refresh Rate

The Payload Compression *Refresh Rates* determines how many compressed payload packets are sent before a single full payload packet is sent. Some compressed payload traffic could be lost during deteriorated satellite link conditions. Sending a full payload packet will allow the return of the traffic stream. Refresh rates from 1 to 600 can be individually selected. The Refresh Rate can be decreased for poor satellite link conditions or increased to further reduce overhead.

14.2.1.11 Telnet Timeout

The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated by the IP Module.

The IP Module does not allow concurrent access to the menu via Telnet and the Console port. If a user connects via Telnet, IP Module automatically disables the Console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP Module will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

14.2.2 Interface Configuration Page

The *Interface Configuration* page is activated from the *Main Menu* page.

```
                              Interface Configuration

Ethernet Interface.......................................................E
Satellite/HDLC Interface.................................................H


Save Parameters to permanent storage.....................................S
Exit.....................................................................X
_
```

Figure 14-9. Interface Configuration page

The *Interface Configuration* page contains the following options/fields:

Selection	Entry	Description
Ethernet Interface	E	Activates the *Ethernet Interface* page.
Satellite/HDLC Interface	H	Activates the *Satellite/HDLC Interface* page.

14.2.2.1 Ethernet Interface Page

The *Ethernet Interface* page is activated from the *Interface Configuration* page.

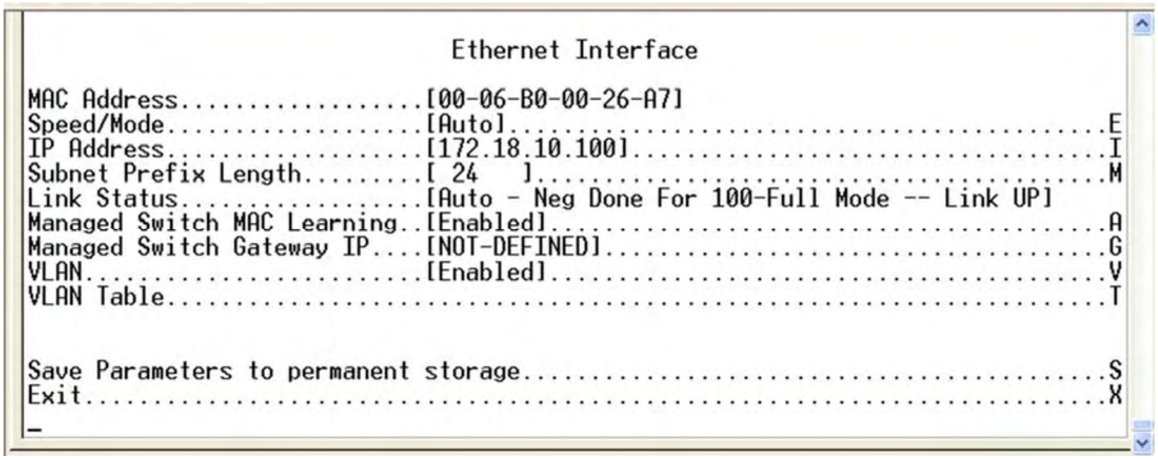


Figure 14-10. Ethernet Interface page

The Ethernet IP Speed/Mode must be set to match the Ethernet port settings of the connected device port or there will be a significant performance degradation. For example, if the connected device port is set for auto negotiate then the IP Module must also be set to auto negotiate. It is recommended to use auto negotiate mode unless the connected device port does not support auto negotiate. In that case, both Ethernet ports must be set to the same Manual settings (i.e. 100 Mbps Full Duplex).

The *Ethernet Interface* page contains the following options/fields

Selection	Entry	Description
MAC Address	*[RO]*	The MAC Address defines the hardware destination MAC Address that is used when an Ethernet packet is destined for the IP Module Traffic Ethernet Interface. This address is unique and has been assigned permanently at the factory.
Speed/Mode	E	The Ethernet Speed Mode is a configurable parameter and thus its exact setting can vary between specific installations. The default setting allows the Ethernet port to auto negotiate its link speed on power-up. Selections are: 1 – Auto 2 – 10 MB/sec Half Duplex 3 – 100 MB/sec Half Duplex 4 – 10 MB/sec Full Duplex 5 – 100 MB/sec Full Duplex
IP Address	I	This is the IP Address assigned the Ethernet Traffic Interface. Enter the IP address in aaa.bbb.ccc.ddd format
Subnet Prefix Length	M	Specifies the Subnet Mask assigned to the Ethernet Traffic Interface. Enter the subnet mask prefix length (8...30)

Selection	Entry	Description
Link Status	*[RO]*	Displays current Link Status of the IP Module Traffic port
Managed Switch MAC Learning	A	(Displayed only when in Managed Switch Mode) Allows the user to disable MAC Learning on packets received on the Ethernet Interface so that all packets are sent to the satellite.
Managed Switch Gateway IP	G	(Displayed only when in Managed Switch Mode) Allows the user to define a Gateway so that the IP Module is accessible from an outside network when in Managed Switch Mode
VLAN	V	(Displayed only when in Managed Switch Mode) Allows the user to enable VLAN support functions
VLAN Table	T	(Displayed only when in Managed Switch Mode) Select VLAN Table to make VLAN Table entries

14.2.2.1.1 VLAN Table

The *VLAN Table* is activated from the *Ethernet Interface* page.

```
                              VLAN Table
                  ID   Name                Tag        Priority

VLAN01.............[    1 native           native           1].............1
VLAN02.............[    1 management       management       1].............2
VLAN03.............[1794 Web               tagged         N/A].............3
VLAN04.............[1818 Data              tagged         N/A].............4
VLAN05.............[2105 Voice             tagged         N/A].............5
VLAN06.............[UNKNOWN]...................................................6
VLAN07.............[UNKNOWN]...................................................7
VLAN08.............[UNKNOWN]...................................................8
Delete VLAN Entry..............................................................D
Base...............[1].........................................................B
```

Figure 14-11. VLAN Table

In the VLAN Table, there is a **Native VLAN** and **Management VLAN** (default VLAN ID 1). These can be changed to other VLAN ID's, but they cannot be deleted.

If an untagged packet arrives at the IP Module, it will egress as a tagged packet with the defined Native VLAN ID.

VLAN entries can be added into the VLAN Table and to forward VLAN's over the satellite. A VLAN entry is also needed on the receiving CDM-570 to receive the VLAN traffic and they will egress as tagged VLAN's.

If a tagged packet arrives at the Ethernet port, it will only be forwarded if there is a matching VLAN entry in the VLAN Table and it will egress as tagged. If there is no matching VLAN in the VLAN Table, then the tagged packet is dropped.

14.2.2.2 Satellite/HDLC Interface Page

The *Satellite/HDLC Interface* page is activated from the *Interface Configuration* page.

Satellite HDLC addressing only applies to CDM-IP Firmware Ver. 1.6.x and earlier.

Firmware Ver. 1.7.x and later uses Streamline, and HDLC addresses are not used. The Satellite Interface menu is* read-only *and for firmware Ver. 1.7.x there is no selection for Receive HDLC Channel Addresses.

```
                         Satellite/HDLC Interface
HDLC Addr Mode..................[Point-To-Point Mode]
Receive HDLC Channel Addresses.................................................H


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
_
```

Figure 14-12. Satellite/HDLC Interface page

The *Satellite/HDLC Interface* page contains the following options/fields:

Selection	Entry	Description
HDLC Addr Mode	*[RO]*	HDLC Address Mode – This mode is configured via the Working Mode, which is found on the *Administration* page. Point-To-Point Mode – In this mode of operation, no HDLC address is transmitted over the satellite link. The restrictions on using this mode are that it can only be used for pure Point-to-Point configurations. Small Network Mode (up to 254 addresses) – In this mode of operation a single byte HDLC address is transmitted over the satellite link (0x1 – 0xFE). Large Network Mode (up to 32766 addresses) – In this mode of operation a two byte HDLC address is transmitted over the satellite link (0x1 – 0xFFFE).
Receive HDLC Channel Addresses	H	Activates the *Receiver HDLC Channel Addresses* page.

14.2.2.3 Receive HDLC Channel Addresses Page

The *Receive HDLC Channel Addresses* page is activated from the *Satellite/HDLC Interface* page. This page allows the user to define up to four HDLC addresses that can carry user information on the Satellite Interface. It is displayed only when using CDM-IP Firmware Ver. 1.7.x or earlier.

```
                   Receive HDLC Channel Addresses

HDLC Addr 1.......[NOT-USED]................................................1
HDLC Addr 2.......[NOT-USED]................................................2
HDLC Addr 3.......[NOT-USED]................................................3
HDLC Addr 4.......[NOT-USED]................................................4
Delete HDLC Addr............................................................D


Save Parameters to permanent storage........................................S
Exit........................................................................X
_
```

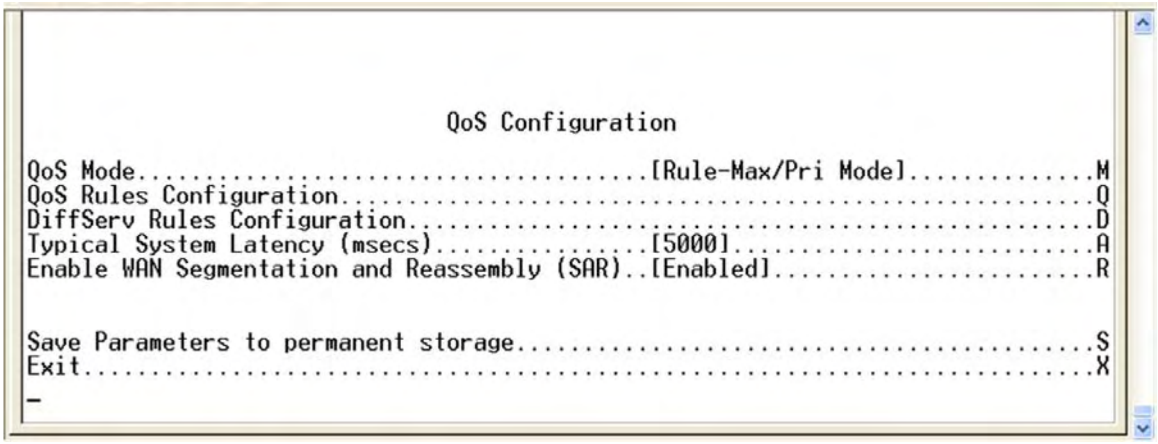
Figure 14-13. Receive HDLC Channel Addresses page

The *Receive HDLC Channel Addresses* page contains the following options/fields:

Selection	Entry	Description
HDLC Addr 1 – 4	1 – 4	HDLC address in hex <1 – FFFE, enter = 0001> **Note:** HDLC addresses are not used in Point-To-Point Mode. **Small Network Mode (up to 254 addresses) –** The user is limited to valid addresses between the values of 0x01 and 0xFE. **Large Network Mode (up to 32766 addresses) –** The user is limited to valid addresses between the values of 0x0001 and 0x7FFF.
Delete HDLC Addr	D	Enter the HDLC entry to delete <1...4>

14.2.3 QoS (Quality of Service) Configuration Page

The *QoS Configuration* page is activated from the *Main Menu* page.



```
                          QoS Configuration
QoS Mode.....................................[Rule-Max/Pri Mode].............M
QoS Rules Configuration.......................................................Q
DiffServ Rules Configuration..................................................D
Typical System Latency (msecs)...............[5000]...........................A
Enable WAN Segmentation and Reassembly (SAR)..[Enabled]........................R

Save Parameters to permanent storage..........................................S
Exit..........................................................................X
_
```

Figure 14-14. QoS Configuration page

The *QoS Configuration* page contains the following options/fields:

Selection	Entry	Description
QoS Mode	M	Select; 1 – Rule-Max/Pri Mode 2 – Rule-Min/Max Mode 3 – DiffServ Mode
QoS Rules Configuration	Q	Select to define QoS rules for Max/Pri Mode or Min/Max Mode
DiffServ Rules Configuration	D	Select to define QoS rules for DiffServ Mode
Maximum System Latency (msecs)	A	Defines the maximum duration that a packet will sit in a QoS queue before being aged out and dropped. This allows the user to specify the overall depth of the QoS queues in milliseconds of traffic that is destined to go over the satellite. Lower priority packets are dropped first until there is enough room to send the higher priority packets. Valid range is from 200 to 5000 milliseconds.
Enable WAN Segmentation and Reassembly (SAR)	R	Packet Segmentation and Reassembly (SAR) is enabled automatically while QoS is enabled. However, SAR is an adaptive process; it will trigger only if the packet latency exceeds the threshold value (default to 20 msec). Latency value is calculated based on the satellite transmission bandwidth. There is no minimum segment size. However if the last segment is less than 16 bytes, then it is appended to the previous segment excluding satellite HDLC header in order to avoid satellite overhead and consumption of CPU cycles.

14.2.3.1 QoS Rules Configuration Page – Max/Priority Mode

The *QoS Rules Configuration* page is activated from the *QoS Configuration* page.

```
                               QoS Rules Configuration
       SrcIP                DestIP              Prot SPort  DPort MaxBW PWF
RL01..[10.6.20.32/30          ***/*             RTP  1155   1155  512   1YN
                                                    ~1180  ~1180              ].1
RL02..[  ***/*              12.6.50.2/32        pFTP  ***    ***  256   2YN   ].2
RL03..[10.6.20.0/24           ***/*             HTTP  ***    ***  384   3YN   ].3
RL04..[10.6.20.0/24         12.6.50.0/24        SMTP  ***    ***  32    5YN   ].4
RL05..[10.6.20.5/32         12.6.50.0/24        UDP   ***   161   32    2YN
                                                      ***  ~161               ].5
RL06..[  ***/*              239.240.65.8/32     UDP   ***    ***  512   2YN   ].6
RL07..[10.6.20.128/29         ***/*             IP    ***    ***  99999 8YY   ].7
RL08..[UNKNOWN]...........................................................  ..8
Def...[  ***/*                ***/*             ALL   ***    ***  99999 9NN   ].R

      [ P-Priority            W-WRED(Yes/No)        F-Filter(Yes/No)          ]
Del.......................................................................  ..D
Base..[1].................................................................  ..B
QoS...[                     QoS Enabled                      ]

Save Parameters to permanent storage......................................S
Exit......................................................................X
_
```

Figure 14-15. QoS Rules Configuration page (Max/Priority mode)

The *QoS Rules Configuration* page contains the following options/fields when in **Max/Pri Mode**:

Selection	Entry	Description
Rule 01 – 08 (32) (The 8 currently displayed QoS Rules; up to 32 can be defined).	1 – 08	Max/Pri QoS can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.
By selecting a QoS Rule, the user is asked to define the following:		
Specify Protocol for the rule	1	UDP – *User Datagram Protocol*
	2	TCP – *Transmission Control Protocol*
	3	ICMP – *Internet Control Message Protocol*
	4	RTP – *Real Time Protocol (includes all RTP – VOCE, VDEO, and RTPS)*
	5	VOCE – *Voice RTP*
	6	VDEO – *Video RTP*
	7	RTPS – *RTP Signaling*
	8	FTP – *File Transfer Protocol only*
	9	HTTP – *Hypertext Transfer Protocol*
	10	TELN – *Telnet*
	11	SMTP – *Simple Mail Transfer Protocol*
	12	SNMP – *Simple Network Management Protocol*
	13	SAP – *Service Announcement Protocol*
	14	ORCL – *Oracle application traffic*
	15	CTRX – *Citrix application traffic*
	16	SQL – *Structured Query Language*
	17	IP – *Internet Protocol (all inclusive)*
	18	N-IP – *Non-Internet Protocol (all inclusive)*

Selection	Entry	Description
Specify priority for the rule	1 – 8	Priority 1 – Highest, Priority 8 – Lowest: 1 for QoS Priority-1 2 for QoS Priority-2 3 for QoS Priority-3 4 for QoS Priority-4 5 for QoS Priority-5 6 for QoS Priority-6 7 for QoS Priority-7 8 for QoS Priority-8
Maximum bandwidth in kbps <0 – 99999, enter = *99999>:*	0 – 99999	Enter desired Maximum Bandwidth in kbps. If no Maximum is desired, select enter, Bandwidth is displayed as '99999'
Source IP address <enter = 0.0.0.0>:	x.x.x.x	Enter desired Source IP Address or subnet. If no Source IP is desired, select enter, Source IP is displayed as '***'
Number of source subnet bits <0,8-32, enter = 0>:	0, 8 – 32	Enter desired Source subnet bits. If no Source subnet is desired, select enter, Source subnet is displayed as '/*'
Destination IP address <enter = 0.0.0.0>:	x.x.x.x	Enter desired Destination IP Address or subnet. If no Destination IP is desired, select enter, Destination IP is displayed as '***'
Number of Destination subnet bits <0,8-32, enter = 0>:	0, 8 – 32	Enter desired Destination subnet bits. If no Destination subnet is desired, select enter, Destination subnet is displayed as '/*'
Specify TCP/UDP source port [MIN] (1 – 65535) <Enter: ***>	1 – 65535	Enter desired TCP/UDP source port (or Min port of a range). If no TCP/UDP source port is desired, select enter, Source port is displayed as '***'
Specify TCP/UDP source port [MAX] (1 – 65535) <Enter: ***>	1 – 65535	Enter desired TCP/UDP source port (or Max port of a range). Will not display if no MIN TCP/UDP source port was selected.
Specify TCP/UDP destination port [MIN] (1 – 65535) <Enter: ***>	1 – 65535	Enter desired TCP/UDP destination port (or Min port of a range). If no TCP/UDP destination port is desired, select enter, Destination port is displayed as '***'.
Specify TCP/UDP destination port [MAX] (1 – 65535) <Enter: ***>	1 – 65535	Enter desired TCP/UDP destination port (or Max port of a range). Will not display if no MIN TCP/UDP destination port was selected.
Set WRED (Weighted Random Early Discard) <Y or N> <Enter : Y>	Y or N	Select to enable Weighted Random Early Detect.
Specify Filtering for the rule <Y or N> <Enter : N>	Y or N	Select to prevent traffic defined in rule to be forwarded. Default N = not filtered
Delete	D	Enter the QoS Rule to delete <1..32>
Base [1]	B	Select Base to view, edit, or display a different set of 8 QoS Rules. For example, if 8 QoS Rules have been defined, add a new rule by selecting B 9. The QoS Configuration page will refresh and now display QoS Rules 9 – 16.
QoS [ ]	*[RO]*	Displays state of QoS option – Unavailable, Enabled Disabled. If available, QoS is Enabled or Disabled from the *Administrator Features* page.

14.2.3.2 QoS Rules Configuration Page – Min/Max Mode

The *QoS Rules Configuration* page is activated from the *QoS Configuration* page.

```
                               QoS Rules Configuration
       SrcIP               DestIP             Prot SPort  DPort MaxBW MinBW WF
RL01..[10.6.20.32/30         ***/*            RTP  1155   1155  512   0     YN
                                                  ~1180  ~1180              ].1
RL02..[  ***/*            12.6.50.2/32        pFTP  ***    ***  256   0     YN].2
RL03..[10.6.20.0/24          ***/*            HTTP  ***    ***  384   0     YN].3
RL04..[10.6.20.0/24       12.6.50.0/24        SMTP  ***    ***  32    0     YN].4
RL05..[10.6.20.5/32       12.6.50.0/24        UDP   ***   161   32    0     YN
                                                    ***  ~161               ].5
RL06..[  ***/*            239.240.65.8/32     UDP   ***    ***  512   0     YN].6
RL07..[10.6.20.128/29        ***/*            IP    ***    ***  99999 0     YY].7
RL08..[UNKNOWN]...................................................................8
Def...[  ***/*               ***/*            ALL   ***    ***  99999 0     NN].R

      [ P-Priority          W-WRED(Yes/No)       F-Filter(Yes/No)           ]
Del...............................................................................D
Base..[1].........................................................................B
QoS...[                    QoS Enabled                    ]

Save Parameters to permanent storage..............................................S
Exit..............................................................................X
_
```

Figure 14-16. QoS Rules Configuration page (Min/Max mode)

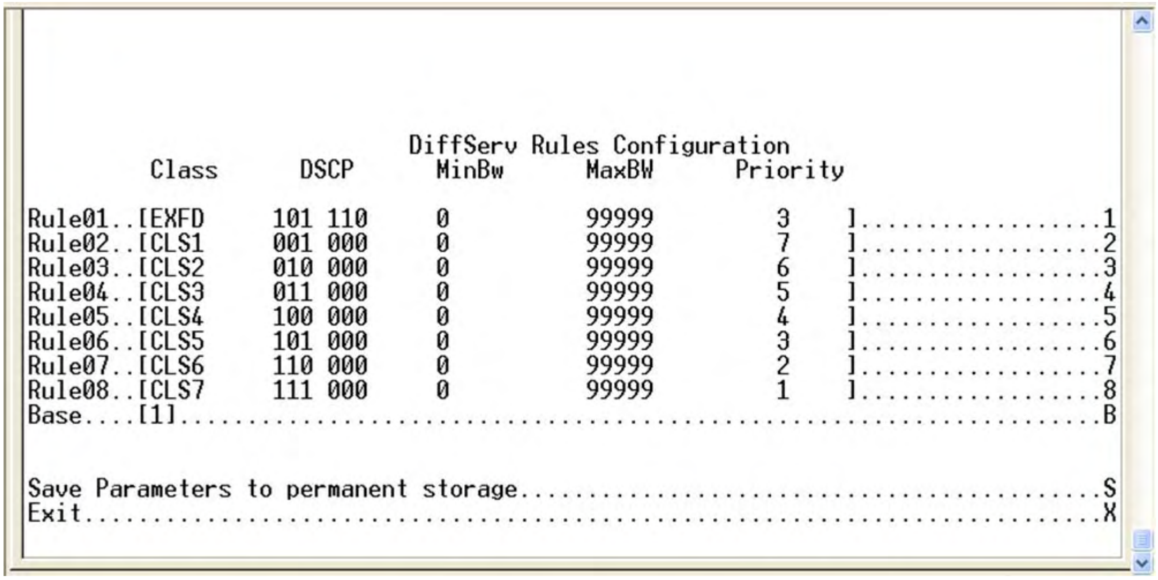
In **Minimum/Maximum Mode,** the *QoS Rules Configuration* page contains the same options/fields as in Max/Pri Mode with the following exceptions:

- Priority is not assigned.
- A Minimum Bandwidth can be assigned, or select enter to assign no Min Bandwidth (displayed as ‘0’).

See section **14.2.3 Quality of Service** for a more detailed description of this QoS option.

14.2.3.3 DiffServ Rules Configuration Page

The *DiffServ Rules Configuration* page is activated from the *QoS Configuration* page.



```
                                 DiffServ Rules Configuration
         Class       DSCP       MinBw       MaxBW       Priority

Rule01..[EXFD     101 110     0          99999          3     ]..................1
Rule02..[CLS1     001 000     0          99999          7     ]..................2
Rule03..[CLS2     010 000     0          99999          6     ]..................3
Rule04..[CLS3     011 000     0          99999          5     ]..................4
Rule05..[CLS4     100 000     0          99999          4     ]..................5
Rule06..[CLS5     101 000     0          99999          3     ]..................6
Rule07..[CLS6     110 000     0          99999          2     ]..................7
Rule08..[CLS7     111 000     0          99999          1     ]..................8
Base....[1]......................................................................B

Save Parameters to permanent storage.............................................S
Exit.............................................................................X
```

Figure 14-17. DiffServ Rules Configuration page

In **DiffServ Mode**, the IP Module will prioritize all traffic by the DSCP value contained within the IP header of each packet. All packets that do not have a DSCP value are placed in the Default Queue and have a Priority of 9.

Configuration of DiffServ Rules is only allowed for Assured Forwarding Classes 1-4 (Rule 9-12), where a Minimum and Maximum Bandwidth can be assigned.

See **14.2.3 Quality of Service** section for a more detailed description of this QoS option.

14.2.4 Route Table Configuration Page

Satellite HDLC addressing only applies to CDM-IP Firmware Ver. 1.6.x and earlier.

CDM-IP Firmware Ver. 1.7.x and later uses Streamline, and HDLC addresses are not used.

The *Configuring the Route Table* page is activated from the *Main Menu* page.

```
                          Configuring the Route Table
            Route Name    Dest IP/SNet Bits   Next Hop        MultiCast  State

Route001...[TestLab        172.18.0.0/16       10.6.30.50      N/A        toEth]..1
Route002...[Multicast1     239.240.50.15/32    0x5A            LAN->SAT   toSat]..2
Route003...[FTPServ        192.168.14.22/32    0x10            N/A        toSat]..3
Route004...[UNKNOWN]...............................................................4
Route005...[UNKNOWN]...............................................................5
Route006...[UNKNOWN]...............................................................6
Route007...[UNKNOWN]...............................................................7
Route008...[UNKNOWN]...............................................................8
Base.......[1].....................................................................B
Delete.............................................................................D
Display............................................................................P
PerRoute...........................................................................E
DL Mcast...[Disabled]
AddFilter..........................................................................A
DelFilter..........................................................................R


Save Parameters to permanent storage...............................................S
Exit...............................................................................X
_
```

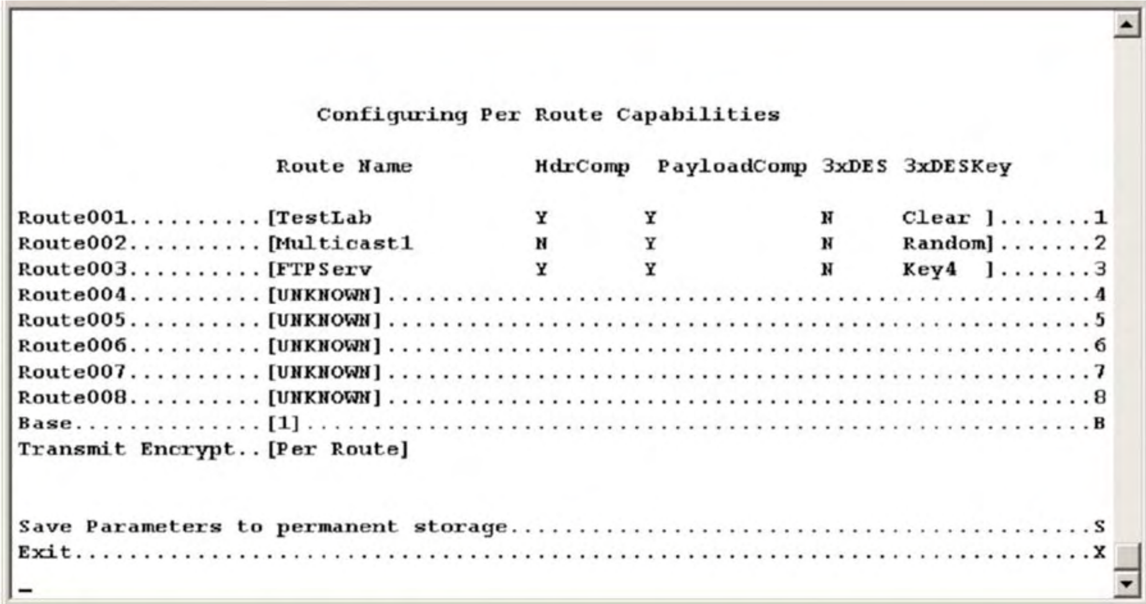
Figure 14-18. Route Table Configuration page

The *Configuring the Route Table* page contains the following options/fields:

Selection	Entry	Description
Route001-Route008 (256) (The 8 currently displayed routes, up to 256 can be defined)	1 – 8	Route Table Allows the user to define how packets the IP Module receives are routed. Defining an entry in this table is similar to using 'route add' command of machines that support that command. For each route, the user must define: 1. A name assigned by the user to reference the route. The assigned name cannot contain any whitespace and must be unique. 2. The destination address of an IP packet of interest. The number of network addresses that are governed by the selected destination entry, i.e., subnet mask. The Next Hop IP address: This is the IP where the packet is routed for further processing. The Next Hop IP Address for traffic to be sent over the satellite will be the desired HDLC address (version 1.6.x and earlier only). Point-to-Point – no HDLC address Small Network – 0x1 – 0xFE Large Network – 0x1 – 0xFFFE Also, a route can be defined to have IP Module send traffic to another IP address on the same subnet as the Ethernet interface.

Selection	Entry	Description
		Optionally: If the user enters a multicast address (224.0.0.0-239.255.255.255) as the destination IP address, then the following parameters will be requested: **Route Multicast packets from Ethernet to Satellite? [y/n]** The option allows the user to specify if multicast packets that match the provided IP address are routed from the Ethernet to Satellite. “No” means that the packets are discarded. **Route Multicast packets from Satellite to Ethernet? [y/n]** The option allows the user to specify if multicast packets that match the provided IP address are routed from the Satellite to Ethernet. “No” means that the packets are discarded. Multicast Routes always have a subnet length of 32 and the next hop is 0.0.0.0 because it is not applicable. **Note:** The IP Module does allow the specification of one and only one default route. Destination IP = 0.0.0.0 Subnet Length = 0. The default route can be defined to send traffic to either the Satellite or Ethernet interface. This will cause all packets that do not match any other route to be sent to the destination the user will have defined for further processing.
Base	B	The Route Table menu allows the user to view up to 8 different routes per screen. To allow editing on any of the 256 entries that can be defined, the user can select a base address to control which 8 routes are displayed. For example, if the user wants to edit Routes 32-40, then a Base value of 32 should be defined.
Delete Route	D	Specify Route Name to delete.
Display	P	Displays all of the routes that are currently defined in the system. This will include automatically generated routes that are provided to simplify provisioning of the system. The information displayed is: Route Name, DestIP/SnetBits, Next Hop, HDLC, and Flags.
PerRoute	E	Enter to enable Header Compression, Payload Compression or 3xDES Encryption on a Per Route basis.
Downlink Mcast	*[RO]*	*Read-only* status of Downlink Multicast (Enabled or Disabled). This feature is enabled or disabled on the Administrator Feature page.

Selecting **Per Route** displays the following submenu page:



```
                    Configuring Per Route Capabilities

                 Route Name        HdrComp  PayloadComp 3xDES 3xDESKey

Route001..........[TestLab           Y        Y           N     Clear ].......1
Route002..........[Multicast1        N        Y           N     Random].......2
Route003..........[FTPServ           Y        Y           N     Key4  ].......3
Route004..........[UNKNOWN]...................................................4
Route005..........[UNKNOWN]...................................................5
Route006..........[UNKNOWN]...................................................6
Route007..........[UNKNOWN]...................................................7
Route008..........[UNKNOWN]...................................................8
Base..............[1].........................................................B
Transmit Encrypt..[Per Route]


Save Parameters to permanent storage..........................................S
Exit..........................................................................X
_
```

Header Compression, Payload Compression or 3xDES Encryption can be configured on a per Route basis by selecting the route number.

DES key select <Choose [1-8] for [key1-key8] 0=Clear 9=Random Enter= Clear>:

The value of **0 [CLEAR]** will force the IP Module to not encrypt any traffic destined for the route.

The value of **Key[1-8]** will use the key specified in the 3xDES Encrypt/Decrypt Configuration Page to encrypt the traffic destined for the route.

The value of Random will cause the IP Module to randomly use any of the 8 TX Keys to encrypt the traffic destined for the route.

3xDES Encryption:

Managed Switch Mode – By definition, there are no routes in Managed Switch operation, so there is no way to assign different keys to traffic. When TX 3xDES encryption is enabled in Managed Switch Mode, all traffic (IP and non-IP) is encrypted and TX Key1 is always used.

Router Mode – Different TX keys can be assigned to different routes and some routes can be sent unencrypted [Clear]. If Random is selected, then <u>all</u> <u>TX</u> <u>Keys</u> must be configured with different keys and the receiving IP modem must have identical corresponding RX Keys. The IP Module will randomly utilize all 8 Keys for encryption.

14.2.5 Protocol Configuration Page

The *Protocol Configuration Page* is activated from the *Main Menu* page.

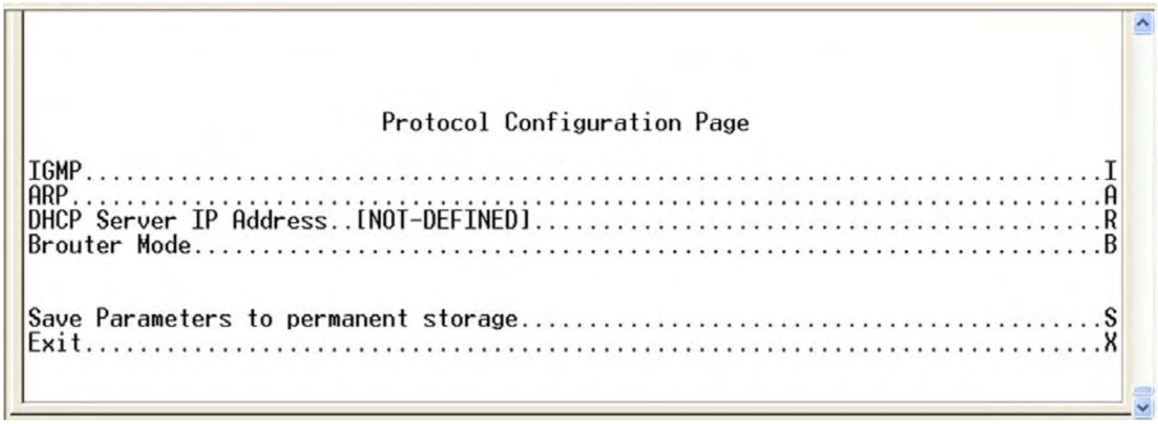


Figure 14-19. Protocol Configuration Page

The *Protocol Configuration Page* contains the following options/fields:

Selection	Entry	Description
IGMP	I	Activates the *IGMP* page.
ARP	A	Activates the *ARP Table Utilities* page.
DHCP Server IP Address	R	Allows the user to enter the IP address of a DHCP server. This allows hosts on a remote LAN to send DHCP request packets to the DHCP server so that the DHCP server can dynamically assign IP addresses to remote hosts.
Brouter Mode	B	Activates the *Brouter Configuration* page.

14.2.5.1 IGMP Information Page

The *IGMP Information* page is activated from the *Protocol Configuration* page. The *IGMP Information* page allows the user to view the IGMP clients that are actively listening to content being provided by the IP Module. It also allows the user to determine how the Ethernet Interface is configured either to receive requests to join IGMP groups or announce groups for others to join.

```
                                IGMP Information

IGMP..............................................................[Disabled]
View IGMP Table..................................................................V
Modem as Server: IGMP query period................................[30].........Q
Modem as Server: IGMP max. response time..........................[28].........R
Modem as Server: Num. missed responses before leaving IGMP group..[5]..........M
Modem as Client: Recognize IGMP Queries...........................[No].........C
Modem as Client: Router Alert Option for V1 report................[No].........A
Modem as Client: IGMP Version used for Unsolicited Reports........[V1].........U
Modem as Client: Unsolicited Report Interval, sec.................[25].........I


Save Parameters to permanent storage.............................................S
Exit.............................................................................X
```

Figure 14-20. IGMP Information page

The *IGMP Information* page contains the following options/fields:

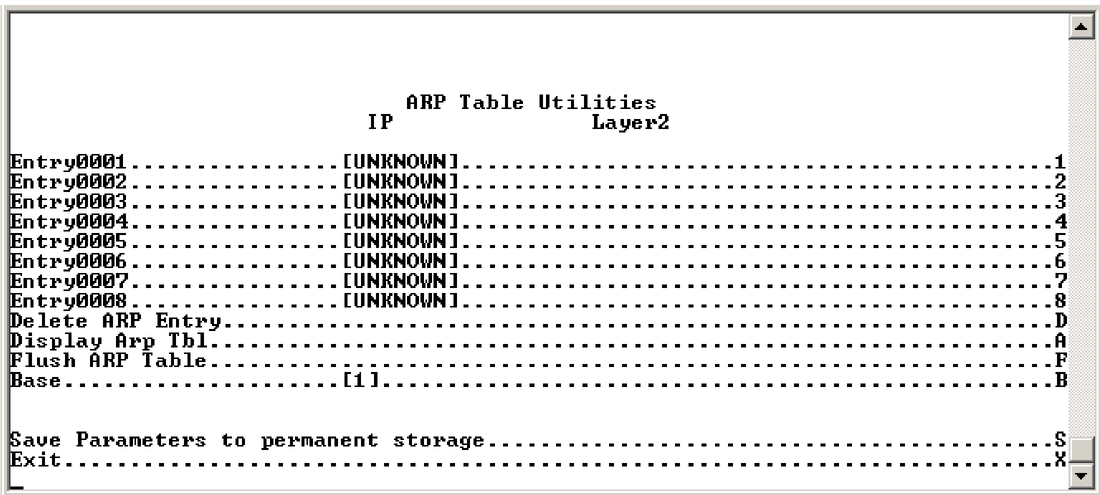
Selection	Entry	Description
IGMP	*[RO]*	*Read-only* showing IGMP status (Enabled or Disabled).
View IGMP Table	V	This table reports the content that clients have subscribed to the IP Module using the IGMP protocol. This allows the user to determine which services are being used and the minimum time before a service is terminated.
Modem as Server: IGMP query period	Q	The IGMP protocol requests that a server periodically publish to users on the LAN the Multicast IP Addresses that it can service. The IGMP query period defines the time interval (in seconds) between each of these queries for membership.
Modem as Server: IGMP max. response time	R	The IGMP max response time defines the time interval (in seconds) that the IP Module should wait before it assumes that no parties are interested in the content published via an IGMP query. This option is expressed in seconds, and the max response time that is accepted by the IP Module is 25 seconds.
Modem as Server: Number of missed responses before leaving IGMP group	M	Defines the number of membership queries that go unanswered from LAN clients before the Ethernet Interface will no longer forward data for that IGMP group. Consider a IP Module that has the IGMP query period set to 60 seconds and the number of missed responses set to 3. If a client joins an IGMP group, then the service to that group will not be discontinued until no clients respond to a query from the IP Module for a period of 60*3 = 180 seconds.

Selection	Entry	Description
Modem as Client: Recognized IGMP queries	C	The Recognize IGMP Queries parameters determines if the IP Module should respond to periodic queries from an IGMP server that publishes a request to join a specified multicast group. This parameter will assume either of the following values: 1. YES 2. NO If set to YES, the IP Module will respond to an IGMP query by requesting to join a Multicast Group published by the server that is defined in the IP Module's route table. If set to NO, the IP Module will not respond to IGMP queries from a server. In this type of configuration, the IP Module may be configured to unconditionally request to join an IGMP group at an interval specified by the "Unsolicited Report Interval" option in the Transmitter IGMP Client Configuration Page.
Modem as Client: IGMP Version used for Unsolicited Reports	U	This parameter defines which version of the IGMP protocol should be followed when attempting to join a group on a Multicast Server via an unsolicited report. When the IP Module is configured to Recognize IGMP Queries, the IP Module will respond to a query in the same version that the server used to initiate the query. This parameter will assume either of the following values: 1. V1 2. V2 The value of V1 will configure the IP Module to use the IGMP Version 1 protocol to join a Multicast Group available on an IGMP Server in response to an IGMP Query. The value of V2 will configure the IP Module to use the IGMP Version 2 protocol to join a Multicast Group available on an IGMP Server in response to an IGMP Query. The user can toggle the value of the IGMP Version used for Unsolicited Reports from 'V1' and 'V2' with each selection.
Modem as Client: Force Cisco Router Alert Option sending V1 reports	A	Some Cisco Routers may require the definition of a Router Alert Option to recognize a report from a Client to join a Multicast group. The IP Router Alert Option is defined in RFC2113 and was introduced by Cisco. While this option is not part of the IGMP standard, most IGMP V2 implementations contain this option. However, most implementations of IGMP V1 do not contain this option. This parameter is defined to prevent possible conflicts in networks in which a Cisco Router is configured as an IGMP V1 server. This parameter can assume either of the following values: 1. YES 2. NO If set to YES, the IP Module will generate IGMP reports to join Multicast groups as specifically required by some Cisco Router configurations. If set to NO, the IP Module will generate IGMP reports to join Multicast groups as defined and implemented by most IGMP servers.

Selection	Entry	Description
Modem as Client: Unsolicited Report Interval, sec	I	The Unsolicited Report Interval configures the IP Module to generate unsolicited reports to join a Multicast Group at specified time intervals. Each unsolicited report to join a Multicast group will use the version of the IGMP protocol as specified by the IGMP Version used for Unsolicited Reports option. The value of the Unsolicited Report Interval specifies the number of seconds between unsolicited reports. A value of zero implies that no unsolicited reports to join a Multicast group should be generated by the IP Module.

14.2.5.2 ARP Table Utilities Page

The *ARP Table Utilities* page is activated from the *Protocol Configuration Page*.



```
                          ARP Table Utilities
                       IP                Layer2

Entry0001................[UNKNOWN]...........................................1
Entry0002................[UNKNOWN]...........................................2
Entry0003................[UNKNOWN]...........................................3
Entry0004................[UNKNOWN]...........................................4
Entry0005................[UNKNOWN]...........................................5
Entry0006................[UNKNOWN]...........................................6
Entry0007................[UNKNOWN]...........................................7
Entry0008................[UNKNOWN]...........................................8
Delete ARP Entry.............................................................D
Display Arp Tbl..............................................................A
Flush ARP Table..............................................................F
Base.....................[1]...................................................B


Save Parameters to permanent storage.........................................S
Exit.........................................................................X
_
```

Figure 14-21. ARP Table Utilities page

The *ARP Table Utilities* page allows the user to view and edit the ARP table defined by the IP Module. It allows up to 256 static IP->MAC ARP entries.

The *ARP Table Utilities* page contains the following options/fields:

Selection	Entry	Description
Entry0001 – 0008	1 – 8	The user can define up to 256 static ARP definitions on the IP Module. This table allows the user to operate/view up to 8 of these definitions. An ARP definition is defined as: 1. Unicast IP Address This IP Address is used as a lookup into the ARP table when the IP Module needs to resolve a MAC or HDLC Address. Restrictions: IP Address must be on the same subnet as the Ethernet Interface. IP Address must be a valid Unicast address (Not Multicast, broadcast, etc.) 2. MAC Address The MAC Address defines the hardware destination MAC Address that is used when an Ethernet packet is destined for an IP machine from the IP Module.

Selection	Entry	Description
Add IP to MAC ARP entry	M	Adds an IP to MAC ARP entry.
Delete ARP Entry	D	Allows the user to delete a Static ARP entry. Queries the user for the IP address of the ARP entry to delete.
Display ARP Tbl	A	Displays the entire IP to MAC ARP table. Includes the Static as well as dynamic ARP entries. Displays blocks of 10 ARP entries. Hit 'Enter' key to display next 10 entries or 'Escape' to return to ARP Table Utilities page.
Flush ARP Table	F	This option allows the entire ARP table to be removed. This is equivalent to performing the standard UNIX command "arp –d" on each address reported in an "arp –a" command. The command only flushes the dynamic ARP entries. The static ARP entries will not be removed.
Base	B	The ARP Table menu allows the user to view up to 8 different ARP definitions per screen. To allow editing on any of the 256 entries that can be defined, the user can select a base address to control which 8 ARP entries are displayed. For example, if the user wants to edit static ARP Entries 32-40, then a Base value of 32 should be defined.

14.2.5.3 Brouter Configuration Page

The *Brouter Configuration* page is activated from the *Protocol Configuration Page*.

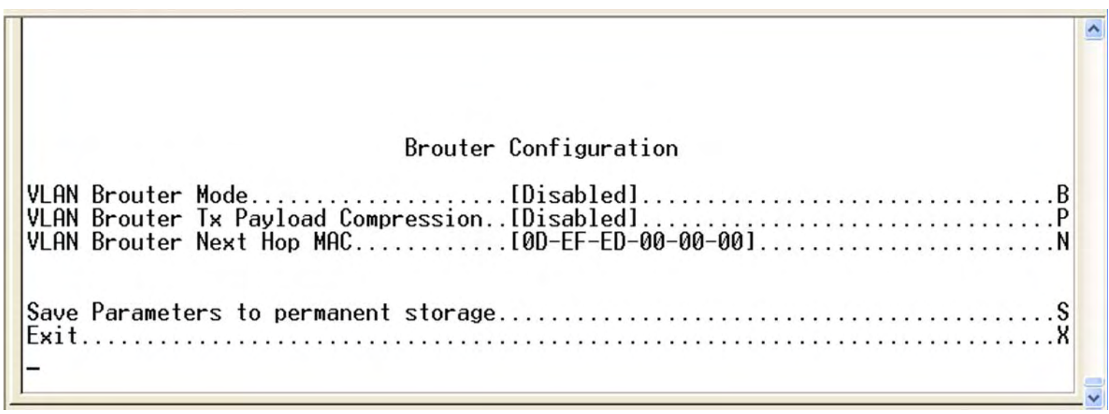


Figure 14-22. Brouter Configuration page

The *Brouter Configuration Page* contains the following options/fields:

Selection	Entry	Description
VLAN Brouter Mode	B	If enabled, any packet arriving at the Ethernet interface with a VLAN header is automatically forwarded to the WAN interface. In this mode ALL VLAN packets are sent – no filtering of any kind.
VLAN Brouter Tx Payload Compression	P	Allows the user to enable/disable Payload Compression for all "Brouted" VLAN packets.
VLAN Brouter Next Hop Address	N	On the downlink side, this selection allows the operator to define the MAC of the next hop router to which all of the Brouted packets must be sent. This allows the Brouter feature to bypass the need send an ARP packet for packets that could potentially have the same IP address.

14.2.6 Vipersat Configuration Page

This page is displayed only if the optional Vipersat feature is enabled.

The *Vipersat Configuration* page is activated from the *Main Menu* page.

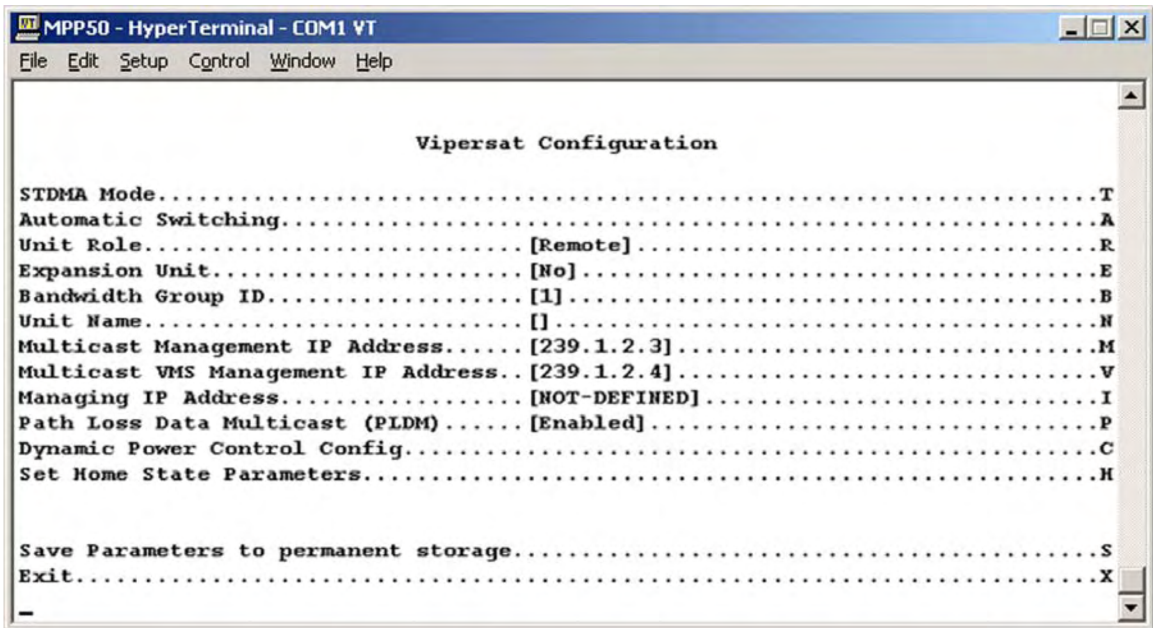


Figure 14-23. Vipersat Configuration page

The *Vipersat Configuration* page contains the following options/fields:

Selection	Entry	Description
STDMA Mode	T	Used only when CDM-570/570L is used in a Vipersat system. Refer to the Vipersat User Manual for complete information.
Automatic Switching	A	
Unit Role	R	
Expansion Unit	E	
Bandwidth Group ID	B	
Unit Name	N	
Multicast Management IP Address	M	
Multicast VMS Management IP Address	V	
Managing IP Address	I	
Path Loss Data Multicast (PLDM)	P	
Dynamic Power Control Config	C	
Set Home State Parameters	H	

14.2.7 Satellite Modem Page

The *Satellite Modem* page is activated by selecting *Satellite Modem Configuration* from the *Main Menu* page.

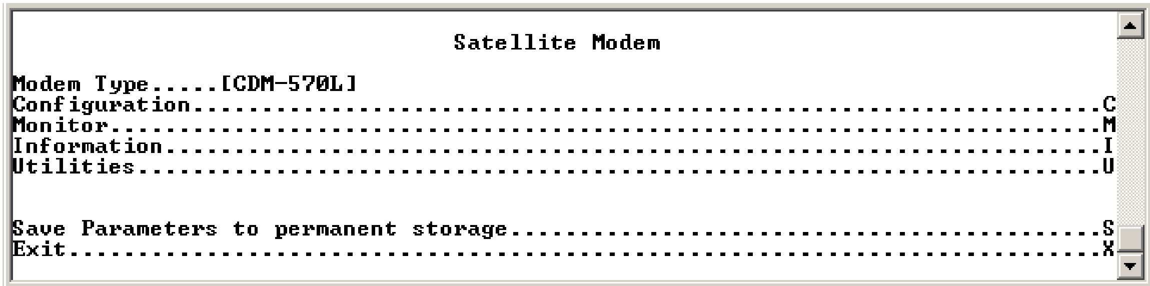


Figure 14-24. Modem Parameters Page

The *Satellite Modem* page contains the following options/fields:

Selection	Entry	Description
Modem Type	*[RO]*	Identifies the Modem type – CDM-570 or CDM-570L.
Configuration	C	Activates the the Modem *Configuration* page.
Monitor	M	Activates the the Modem *Monitor* page.
Information	I	Activates the the Modem *Information* page.
Utilities	U	Activates the the Modem *Utilities* page.

14.2.8 Configuration Page

The Modem *Configuration* page is activated by selecting *Configuration* from the *Satellite Modem* page.

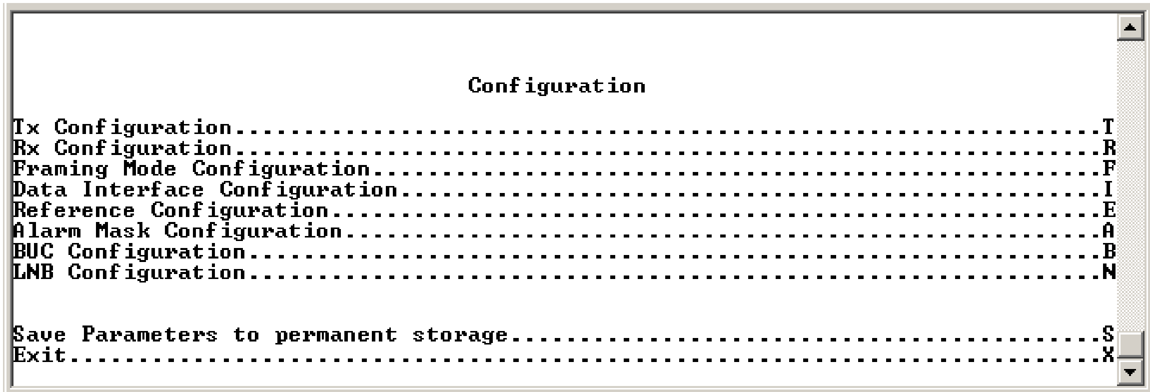


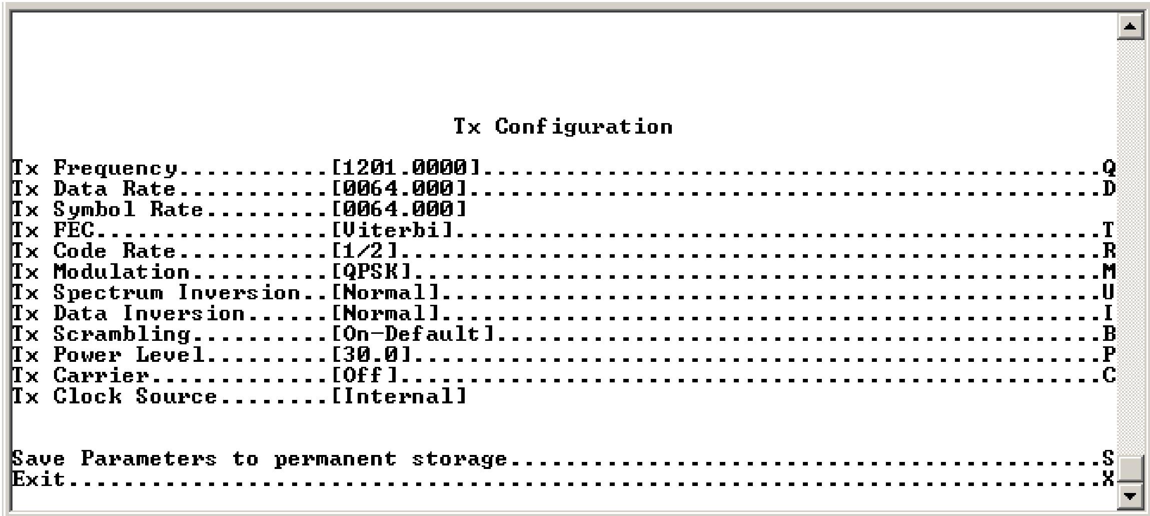
Figure 14-25. Modem Configuration page

The Modem *Configuration* page contains the following options/fields:

Selection	Entry	Description
Modem Type	*[RO]*	Identifies the Modem type – CDM-570 or CDM-570L .
Tx Configuration	T	Activates the *Tx Configuration* page.
Rx Configuration	R	Activates the *Rx Configuration* page.
Framing Mode Configuration	F	Activates the *Framing Mode Configuration* page.
Data Interface Configuration	I	Activates the *Data Interface Configuration* page.
Reference Configuration	E	Activates the *Reference Configuration* page.
Alarm Mask Configuration	A	Activates the *Alarm Mask Configuration* page.
BUC Configuration	B	Activates the *Block Up Converter (BUC) Configuration* page.
LNB Configuration	N	Activates the *Low Noise Block Converter (LNB) Configuration* page.

14.2.8.1 Tx Configuration Page

The *Tx (Transmit Modem) Configuration* page is activated from the *Configuration* page.



```
                              Tx Configuration

Tx Frequency...........[1201.0000]............................................Q
Tx Data Rate...........[0064.000].............................................D
Tx Symbol Rate.........[0064.000]
Tx FEC.................[Viterbi]..............................................T
Tx Code Rate...........[1/2]..................................................R
Tx Modulation..........[QPSK].................................................M
Tx Spectrum Inversion..[Normal]...............................................U
Tx Data Inversion......[Normal]...............................................I
Tx Scrambling..........[On-Default]...........................................B
Tx Power Level.........[30.0].................................................P
Tx Carrier.............[Off]..................................................C
Tx Clock Source........[Internal]


Save Parameters to permanent storage..........................................S
Exit..........................................................................X
```

Figure 14-26. Tx (Transmit Modem) Configuration Page

The *Tx (Transmit Modem) Configuration* page contains the following options/fields:

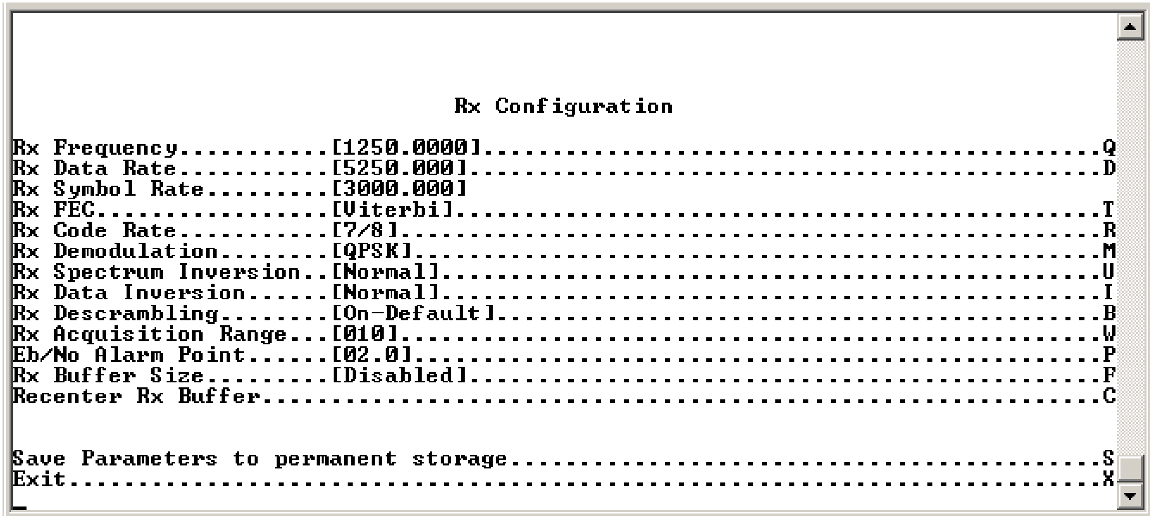
Turbo FEC selections are displayed only if the optional Turbo card is installed.

Selection	Entry	Description
Tx Frequency	Q	Valid ranges are from 50 to 180 MHz (IF); 950 to 1950 MHz (L-Band)
Tx Data Rate	D	The rate at which the Modem will send traffic over the Satellite Interface. Valid ranges are from 2.4 to 9980 kbps. Up to 5000 kbps and 9980kbps are options that must be purchased.
Tx Symbol Rate	*[RO]*	Corresponding Symbol Rate for the currently selected data rate, encoder, rate and modulation scheme.
Tx FEC	T	1 – VIT 2 – TURBO 3 – VIT+RS 4 – TCM-RS
Tx Code Rate	R	1 – 5/16 2 – 21/44 3 – 1/2 4 – 2/3 5 – 3/4 6 – 7/8 7 – 0.95 9 – 1/1

Selection	Entry	Description
Tx Modulation	M	Sets transmit modulation type 1 – BPSK 2 – QPSK 3 – OQPSK 4 – 8-PSK 5 – 16-QAM 6 – 8-QAM
Tx Spectrum Inversion	U	1 – Normal 2 – Inverted
Tx Data Inversion	I	1 – Normal 2 – Inverted
Tx Scrambling	B	1 – Off 2 – On-Default 3 – On-IESS-315
Tx Output Power	P	Valid ranges are from 0.0 to 40.0 dBm (minus sign assumed)
Tx Carrier	C	1 – OFF 2 – ON 3 – Rx-Tx Inhibit – Turn off the transmitter if the Rx is not locked NOTE: In a 1:1 Redundant system, the standby modem will display **[External Control]**.
Tx Clock Source		[Internal]

14.2.8.2 Rx Configuration Page

The *Rx (Receive Modem) Configuration* page is activated from the Configuration page.



```
                         Rx Configuration

Rx Frequency...........[1250.0000]...........................................Q
Rx Data Rate...........[5250.000]............................................D
Rx Symbol Rate.........[3000.000]
Rx FEC.................[Viterbi].............................................T
Rx Code Rate...........[7/8].................................................R
Rx Demodulation........[QPSK]................................................M
Rx Spectrum Inversion..[Normal]..............................................U
Rx Data Inversion......[Normal]..............................................I
Rx Descrambling........[On-Default]..........................................B
Rx Acquisition Range...[010].................................................W
Eb/No Alarm Point......[02.0]................................................P
Rx Buffer Size.........[Disabled]............................................F
Recenter Rx Buffer...........................................................C


Save Parameters to permanent storage.........................................S
Exit.........................................................................X
_
```

Figure 14-27. Rx (Receive Modem) Configuration Page

The *Rx (Receive Modem) Configuration Page* contains the following options/fields:

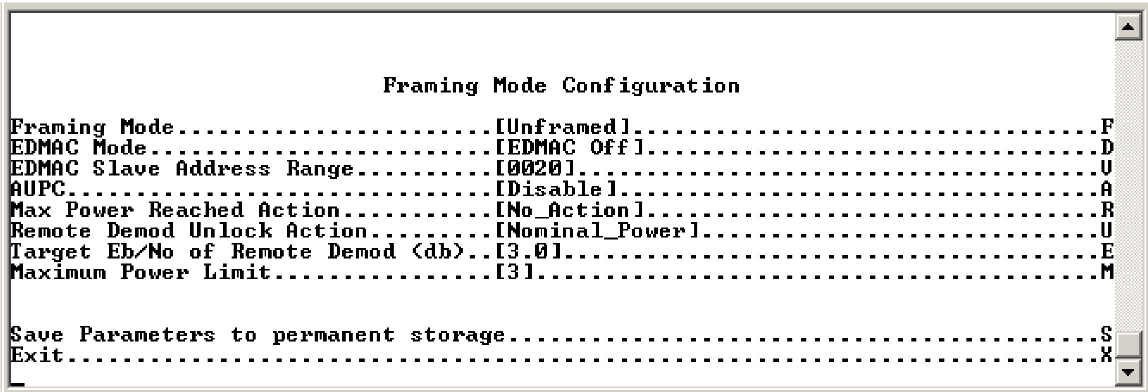
Turbo FEC selections are displayed only if the optional Turbo card is installed.

Selection	Entry	Description
Rx Frequency	Q	Valid ranges are from 50 to 180 MHz (IF), 950 to 1950 MHz (L-Band)
Rx Data Rate	D	Valid ranges are from 2.4 to 9980 kbps. Up to 5000 kbps and 9980kbps are options that must be purchased.
Rx Symbol Rate	*[RO]*	Corresponding Symbol Rate for the currently selected data rate, encoder, rate and modulation scheme.
Rx FEC	T	1 – VIT 2 – TURBO 3 – VIT+RS 4 – TCM-RS
Rx Code Rate	R	1 – 5/16 2 – 21/44 3 – 1/2 4 – 2/3 5 – 3/4 6 – 7/8 7 – 0.95 9 – 1/1

Selection	Entry	Description
Rx Demodulation	M	Sets receive demodulation type 1 – BPSK 2 – QPSK 3 – OQPSK 4 – 8-PSK 5 – 16-QAM 6 – 8-QAM
Rx Spectrum Inversion	U	1 – Normal 2 – Inverted
Rx Data Inversion	I	1 – Normal 2 – Inverted
Rx Descrambling	B	1 – Off 2 – On-Default 3 – On-IESS-315
Rx Acquisition Range (Sweep Width)	W	Valid ranges are from 0 to 200 kHz (1 to 32HKz if symbol rate < 625Ksymbol)
Eb/No Alarm Point	P	Valid ranges are from 0.1 to 16.0
Rx Buffer Size	F	1 – Disabled 2 – +/-_1024_bits 3 – +/-_2048_bits 4 – +/-_4096_bits 5 – +/-_8192_bits 6 – +/-_16384_bits 7 – +/-_32768_bits
Recenter Rx Buffer	C	Recenters the Plesiochronous/Doppler Buffer.

14.2.8.3 Framing Mode Configuration

The *Framing Mode Configuration* page is activated from the *Configuration* page.



```
                     Framing Mode Configuration

Framing Mode.......................[Unframed]..................................F
EDMAC Mode.........................[EDMAC Off]..................................D
EDMAC Slave Address Range..........[0020]........................................V
AUPC...............................[Disable]....................................A
Max Power Reached Action...........[No_Action]..................................R
Remote Demod Unlock Action.........[Nominal_Power]..............................U
Target Eb/No of Remote Demod (db)..[3.0].........................................E
Maximum Power Limit................[3]...........................................M


Save Parameters to permanent storage.............................................S
Exit.............................................................................X
_
```

Figure 14-28. Framing Mode Configuration Page

The *Framing Mode Configuration* page contains the following options/fields:

Selection	Entry	Description
Framing Mode	F	1 – Unframed 2 – EDMAC Framing 3 – EDMAC-2 Framing
EDMAC Mode	D	1 – Unframed 2 – EDMAC Framing 3 – EDMAC-2 Framing
EDMAC Slave Address Range	V	Enter a value from 10 to 9990 in multiples of ten.
AUPC	A	1 – Enable 2 – Disable
Max Power Reached Action	R	1 – No_Action 2 – Generate_TX_Alarm
Remote Demod Unlock Action	U	1 – Nominal_Power 2 – Maximum_Power
Target Eb/No of Remote Demod (db)	E	Enter a value from 0.0 to 9.9
Maximum Power Limit	M	Enter a value from 0 to 9

14.2.8.4 Data Interface Configuration

The *Data Interface Configuration* page is activated from the *Configuration* page.

```
                         Data Interface Configuration

Data Interface..[IP Interface]...............................................I


Save Parameters to permanent storage.........................................S
Exit.........................................................................X
```

Figure 14-29. Data Interface Configuration Page

The *Data Interface Configuration* page contains the following options/fields:

Selection	Entry	Description
Data Interface	I	1 – EAI-422/EAI-530 DCE 2 – V.35 DCE 3 – EAI-232(sync) 4 – G.703 T1 AMI 5 – G.703 T1 B8ZS 6 – G.703 E1 Unbal AMI 7 – G.703 E1 Unbal HDB3 8 – G.703 E1 Bal AMI 9 – G.703 E1 Bal HDB3 10 – IP Interface NOTE: The data interface must be set to IP Interface for IP traffic to pass over the satellite.

14.2.8.5 Reference Configuration Page

The *Reference Configuration* page is activated from the *Configuration* page.

```
                              Reference Configuration

Frequency Reference..[Internal 10 MHz]........................................R
Test Mode............[Normal].................................................T


Save Parameters to permanent storage..........................................S
Exit..........................................................................X
```

Figure 14-30. Reference Configuration Page

The *Reference Configuration* page contains the following options/fields:

Selection	Entry	Description
Frequency Reference	R	1 – Internal 10 MHz 2 – External 1 MHz 3 – External 2 MHz 4 – External 5 MHz 5 – External 10 MHz 6 – External 20 MHz
Test Mode	T	1 – Normal 2 – IF_loopback 3 – Digital_loopback 4 – I/O_Loopback 5 – RF Loopback 6 – Tx_CW 7 – TX_alt_101010

14.2.8.6 Alarm Mask Configuration

The *Alarm Mask Configuration* page is activated from the *Configuration* page.

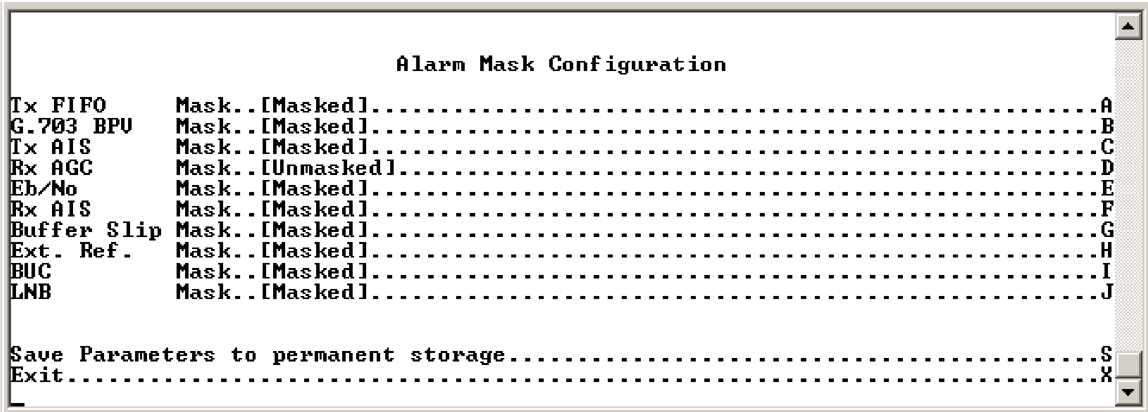


Figure 14-31. Alarm Mask Configuration Page

The *Alarm Mask Configuration* page contains the following options/fields:

Selection	Entry	Description
Tx FIFO	A	Select as Masked or Unmasked. NOTE: This setting should always be set as Masked with IP as data interface.
G.703 BPV	B	
Tx AIS	C	
RX AGC	D	
Eb/No	E	Select as Masked or Unmasked.
Rx AIS	F	
Buffer Slip	G	Select as Masked or Unmasked. NOTE: This setting should always be set as Masked with IP as data interface.
External Reference	H	Select as Masked or Unmasked.
BUC	I	
LNB	J	

14.2.8.7 Block Up Converter (BUC) Configuration

The *Block Up Converter (BUC) Configuration* page is activated from the *Configuration* page.

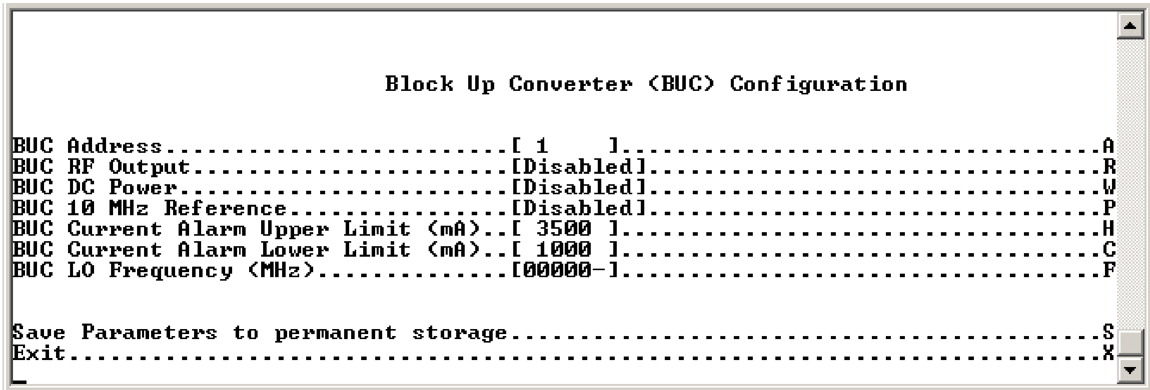


Figure 14-32. Block Up Converter (BUC) Configuration Page

The *Block Up Converter (BUC) Configuration* page contains the following options/fields:

Selection	Entry	Description
BUC Address	A	Select a value from 1 to 15
BUC RF Output	R	Select as Enabled or Disabled.
BUC DC Power	W	
BUC 10 MHz Reference	P	
BUC Current Alarm Upper Limit (mA)	H	Enter a value from 500 to 4000
BUC Current Alarm Lower Limit (mA)	C	Enter a value from 0 to 3000
BUC LO Frequency (MHz)	F	Enter a value from 3000 to 65000, 0 to disable

14.2.8.8 Low Noise Block Converter (LNB) Configuration

The *Low Noise Block Converter (LNB) Configuration* page is activated from the *Configuration* page.

```
                        Low Noise Block Converter(LNB) Configuration

LNB DC Supply Voltage................[Off]..........................................P
LNB 10MHz Reference..................[Off    ].....................................R
LNB Current Alarm Upper Limit (mA)..[ 600   ].....................................H
LNB Current Alarm Lower Limit (mA)..[ 10    ].....................................C
LNB LO Frequency (MHz)...............[00000+].....................................F


Save Parameters to permanent storage..............................................S
Exit..............................................................................X
```

Figure 14-33. Low Noise Block Converter (LNB) Configuration Page

The *Low Noise Block Converter (LNB) Configuration* page contains the following options/fields:

Selection	Entry	Description
LNB DC Supply Voltage	P	1 – Off 2 – 13 Volts 3 – 18 Volts 4 – 24 Volts
LNB 10MHz Reference	R	Select as On or Off
LNB Current Alarm Upper Limit (mA)	H	Enter a value in mA
LNB Current Alarm Lower Limit (mA)	C	
LNB LO Frequency (MHz)	F	Enter a value from 3000 to 65000, 0 to disable

14.2.9 1:1 Redundancy Configuration Page

The *1:1 Redundancy Configuration* page is activated from the *Main Menu* page. Refer to **Appendix H. IP REDUNDANCY** for detailed information on the use of the CDM-570/570L Satellite Modem in redundant operations.

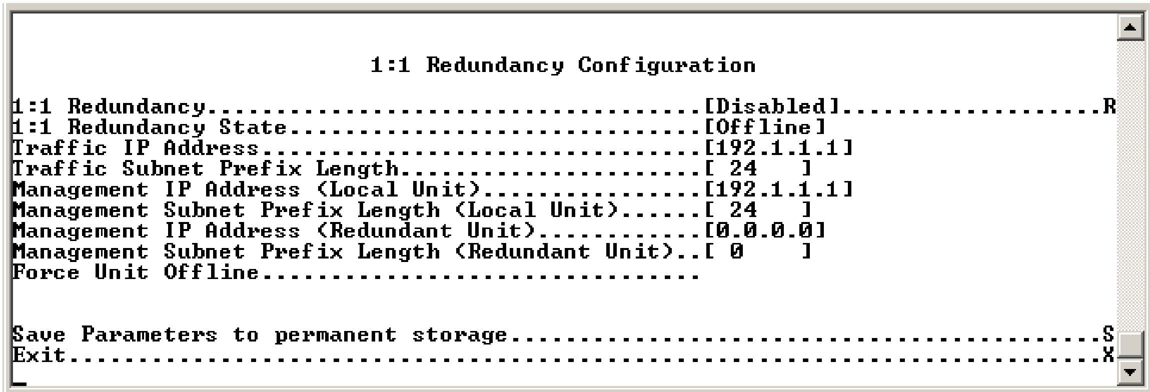

```
                    1:1 Redundancy Configuration

1:1 Redundancy.....................................[Disabled]....................R
1:1 Redundancy State...............................[Offline]
Traffic IP Address.................................[192.1.1.1]
Traffic Subnet Prefix Length.......................[ 24    ]
Management IP Address (Local Unit).................[192.1.1.1]
Management Subnet Prefix Length (Local Unit).......[ 24    ]
Management IP Address (Redundant Unit).............[0.0.0.0]
Management Subnet Prefix Length (Redundant Unit)..[ 0     ]
Force Unit Offline.................................


Save Parameters to permanent storage..........................................S
Exit..........................................................................X
_
```

Figure 14-34. 1:1 Redundancy Configuration page

The *1:1 Redundancy Configuration* page contains the following options/fields:

Selection	Entry	Description
1:1 Redundancy	R	Toggles Redundancy state. NOTE: Only enable Redundancy when connected to a CRS redundancy switch with another CDM-570/570L.
1:1 Redundancy State	*[RO]*	• If standalone CDM-570/570L – displays state as *Online*. • If Redundant CDM-570/570L – displays state as *Online* or *Offline*
Traffic IP Address		• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – sets Traffic IP (read/write). • If Offline Redundant CDM-570/570L – displays Traffic IP (read-only).
Traffic Subnet Prefix Length		• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – sets Traffic Subnet (read/write). • If Offline Redundant CDM-570/570L – displays Traffic Traffic Subnet (*read-only*).
Management IP Address (Local Unit)	*[RO]*	• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – displays Local Management IP • If Offline Redundant CDM-570/570L – displays Local Management IP
Management Subnet Prefix Length (Local Unit)	*[RO]*	• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – displays Local Management Subnet • If Offline Redundant CDM-570/570L – displays Local Management Subnet
Management IP Address (Redundant Unit)	*[RO]*	• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – displays Redundant Management IP • If Offline Redundant CDM-570/570L – displays Redundant Management IP

Selection	Entry	Description
Management Subnet Prefix Length (Redundant Unit)	*[RO]*	• If standalone CDM-570/570L – not used. • If Online Redundant CDM-570/570L – displays Redundant Management Subnet • If Offline Redundant CDM-570/570L – displays Redundant Management Subnet

14.2.10 Operations and Maintenance Page

The *Operations and Maintenance* page is activated from the *Main Menu* page.

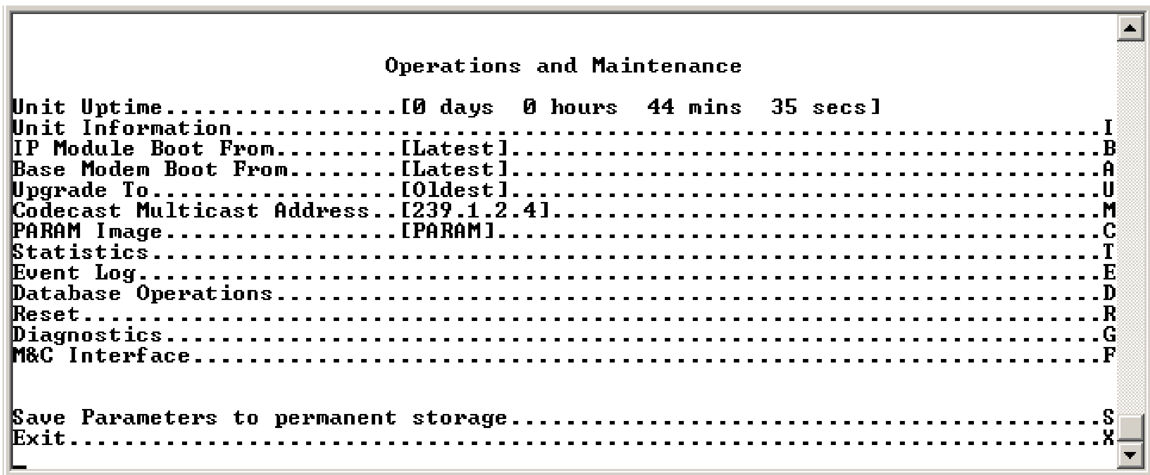


Figure 14-35. Operations and Maintenance page

The *Operations and Maintenance* page contains the following options/fields:

Selection	Entry	Description
Unit Uptime	*[RO]*	Time in days, hours, mins and secs since the last time the IP Module was rebooted.
Unit Information	I	Displays unit current operational Software information.
IP Module Boot From	B	Determines which version of the IP Module software package (includes Application, FPGA, and FFPGA) is loaded upon bootup. The possible options are: 0 – Latest: Boot the newest software package based upon date. 1 – Image1: Boot the software package loaded into the first slot in permanent storage. 2 – Image2: Boot the software package loaded into the second slot in permanent storage.

Selection	Entry	Description
Base Modem Boot From	A	Determines which version of the Base modem firmware is loaded upon boot-up. The possible options are: 0 – Latest: Boot the newest software package based upon date. 1- Image1: Boot the software package loaded into the first slot in permanent storage. 2 – Image2: Boot the software package loaded into the second slot in permanent storage.
Upgrade To	U	Determines which installed software package that the IP Module or base modem firmware will overwrite when upgrading with a new software package. The possible options are: 0 – Oldest : Overwrite the oldest software package based upon date. 1 – Image1: Overwrite the software package loaded into the first slot in permanent storage. 2 – Image2: Overwrite the software package loaded into the second slot in permanent storage.
Codecast Multicast Address	M	Multicast address used by Vload to upgrade the modem firmware and param file via streaming multicast. Must match the address specified in Vload.
PARAM Image	C	Identifies the PARAM file that is loaded on bootup. The options are: 1 – Last saved Parameter file 2 -Factory – uses the internal, hard-coded factory default parameters.
Statistics	T	Activates the *Statistics Menu* page.
Event Log	E	Activates the *Event Log* page.
Database Operations	D	Activates the *Database Operations* page.
Reset	R	Allows the user to reboot the modem (includes the IP modem and base modem). It has the same logical effect of power-cycling the unit.
Diagnostics	G	Activates the *Diagnostics* page.
M&C Interface	F	Used for base modem communications debugging

14.2.10.1 Unit Information Page

The *Unit Information* page is activated from the *Operations and Maintenance* page.

```
System time is WED MAY 30 15:32:08 2007

Booted using Bulk #1. Base modem booted using Base Bulk #1 (1.6.2d).
Using configuration parameters from PARAM file on flash.


Type           |  Date       Time  | Name              | Rev       | Len
Boot           | 12/08/2005 17:46 | FW10873-1c        | 1.1.3     | 459884
IP Bulk #1     |  3/08/2007 14:08 | FW10875P          | 1.5.3.5   | 1731256
IP Bulk #2     |  3/08/2007 14:08 | FW10875P          | 1.5.3.5   | 1731256
EVENTLOG       | 12/10/2005 09:44 | eventlog          | 1.5.3     | 419840
PARAM          |  5/30/2007 13:58 | config            | 1.5.3     | 3912
BaseBoot       | 03/30/2004  ---  | FW/10804-1-       | 1.1.1     |  ----
Base Bulk #1   | 03/09/2007  ---  | FW/10805AB        | 1.6.2d    |  ----
Base Bulk #2   | 01/30/2007  ---  | FW/10805AA        | 1.6.1     |  ----

                          Press Any Key to Continue
_
```

Figure 14-36. Unit Information page

The *Unit Information* page displays the following information:

Info Set	Item	Description
1	Current System time	DAY MONTH DATE hh:mm:ss YEAR
2	Image # that the IP Module is currently booted from	By default displays the Latest, unless “IP Module Boot From” is set to Image #1 or Image #2
	Image # that the base modem is currently booted from.	By default displays Latest, unless “Base Modem Boot From” is set to Image #1 or Image #2
	PARAM file that the IP Module is currently configured from	Displays PARAM file from Flash or Factory Default if no parameter file is found in flash memory.
3	Currently Loaded IP Module and Base Modem SW: • Boot • IP Bulk #1 • IP Bulk #2 • BaseBoot • Base Bulk #1 • Base Bulk #2	Displays Build Date, CEFD FW#, Revision #, and size of each IP Module and Base Modem SW file: • Boot file for the IP Module and the Base Modem. • Bulk file contains all of the SW files for the IP Module and Base Modem and there are two slots available.
	EVENTLOG	Displays the date/time that the EVENTLOG file was last updated.
	PARAM	Displays the date/time that the PARAM1 file was last updated. Also shows what user interface was used to last update the PARAM file. • From CLI, displays ‘console’ • From Web, displays ‘http’ • From Telnet, displays the Telnet user login name • From SNMP, displays ‘snmp’

14.2.10.2 Statistics Page

The *Statistics Menu* page is activated from the *Operations and Maintenance* page.

```
                          Statistics Menu

IP Statistics..............................................................R
QoS Statistics.............................................................Q
Ethernet Statistics........................................................E
WAN Statistics.............................................................W
Compression Statistics.....................................................H
CPU Statistics.............................................................U
VLAN Statistics............................................................V
Clear all statistics.......................................................C


Save Parameters to permanent storage.......................................S
Exit.......................................................................X
_
```

Figure 14-37. Statistics Menu

The *Statistics Menu* page contains the following options/fields:

Selection	Entry	Description
IP Statistics	R	Displays the statistics for IP Routing and allows counters to be reset.
QoS Statistics	Q	Displays the statistics for QoS and allows counters to be reset.
Ethernet Statistics	E	Displays the statistics for the Ethernet Port and allows counters to be reset.
WAN Statistics	W	Displays the statistics for the WAN (HDLC) Port and allows counters to be reset.
Compression Statistics	H	Displays the statistics for Header & Payload Compression and allows counters to be reset.
CPU Statistics	U	Displays CPU Usage % (percentage)
VLAN Statistics	V	Displays the statistics for the VLAN entries and allows counters to be reset.
Clear all statistics	C	Globally resets all statistics counters.

All updates for Statistics information will occur once every 6 seconds.

14.2.10.2.1 IP Routing Statistics Page

The *Statistics for IP Routing/EasyConnect* page is activated from the *Statistics Menu* page. The *Statistics for IP Routing/EasyConnect* page displays counts of the number of packets routed in the IP Module.

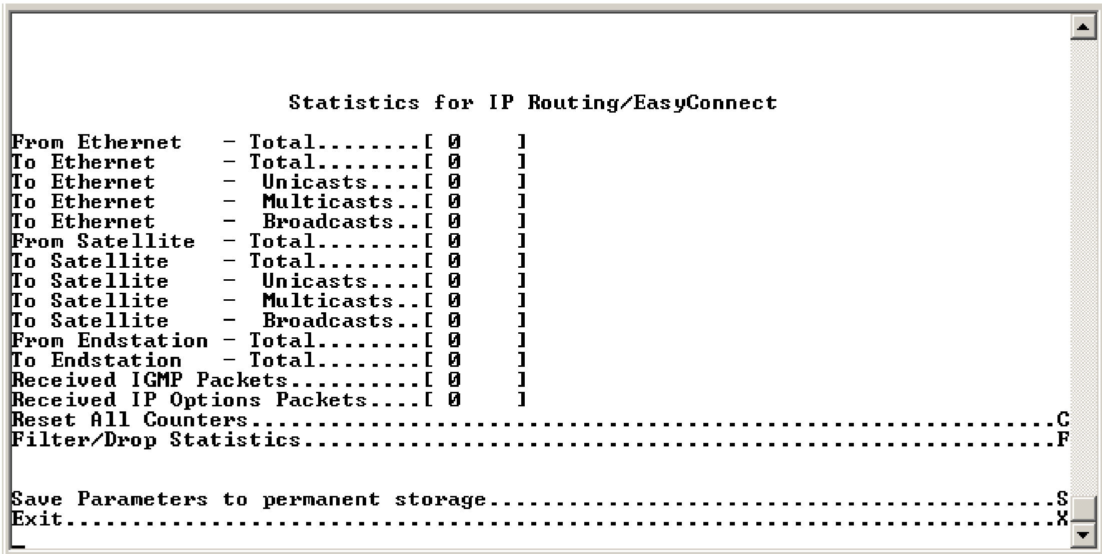


Figure 14-38. IP Statistics page

The *Statistics for IP Routing/EasyConnect* page contains the following options/fields:

Selection	Entry	Description
From Ethernet – Total	*[RO]*	Ethernet Statistics Page, Rx Good Frames
To Ethernet – Total		Ethernet Statistics Page, Tx Good Frames
To Ethernet – Unicasts		Unicast packets to LAN
To Ethernet – Multicasts		Multicast packets to LAN
To Ethernet – Broadcasts		Broadcast packets to LAN
From Satellite – Total		WAN Statistics Page, Rx HDLC Packet Count
To Sat – Total		WAN Statistics Page, Tx HDLC Packet Count
To Sat – Unicasts		Unicast packets to WAN
To Sat – Multicasts		Multicast packets to WAN
To Sat – Broadcasts		Broadcast packets to WAN
From Endstation – Total		Packets sent from IP Module
To Endstation – Total		Packets directed to IP Module
Received IGMP Packets		Internet Group Management Packets received (used for management of multicast traffic).
Received IP Options Packets		Number of IP Options packets received.
Reset All Counters	C	Executing this menu option resets all gathered WAN, Ethernet and IP Routing statistics to zero.
Filter/Drop Statistics	F	Activates the *Filter Statistics* page.

14.2.10.2.1.1 Filter/Drop Statistics Page

The *Filter/Drop Statistics* page is activated from the *Statistics for IP Routing/EasyConnect* page. The *Filter/Drop Statistics* page displays counts of the number of packets filtered or dropped in the IP Module.

```
                               Filter Statistics

Filtered -  Boot..........................[ 0     ]
Filtered -  Flow Descriptor...............[ 0     ]
Filtered -  Unknown Reason Code...........[ 0     ]
Filtered -  Flow Correlator...............[ 0     ]
Filtered -  Management Path...............[ 0     ]
Filtered -  Wan Scaling...................[ 0     ]
Filtered -  Ping..........................[ 0     ]
Filtered -  Access Control................[ 0     ]
Filtered -  Vipersat MCP..................[ 0     ]
Filtered -  Vipersat UCP..................[ 0     ]
Filtered -  Codeload......................[ 0     ]
Filtered -  Multicast.....................[ 0     ]
Filtered -  Bad Packet....................[ 0     ]
Filtered -  Route.........................[ 0     ]
Filtered -  Vipersat Remote...............[ 0     ]
Filtered -  QoS Rule......................[ 0     ]
Filtered -  Vipersat Loop.................[ 0     ]
Filtered -  Bad Header Len................[ 0     ]
Filtered -  Bad Data Ptr..................[ 0     ]
Filtered -  MAC Split Err.................[ 0     ]
Filtered -  L3Type Err....................[ 0     ]
Filtered -  Local Destination.............[ 0     ]
Filtered -  Redundancy Err................[ 0     ]
Filtered -  ICMP Filter...................[ 0     ]
Filtered -  Port Err......................[ 0     ]
Filtered -  Per port route rule...........[ 0     ]
Filtered - Total..........................[ 0     ]
Dropped  -  Bad IP Header Checksum........[ 0     ]
Dropped  -  Bad Buffer Length.............[ 0     ]
Dropped  -  Bad IP Version................[ 0     ]
Dropped  -  TTL Expired...................[ 0     ]
Dropped  -  No Route......................[ 0     ]
Dropped  -  No ARP Entry..................[ 0     ]
Dropped  -  Filtered Multicast............[ 0     ]
Dropped  -  Multicast Disable Group.......[ 0     ]
Dropped  -  EasyConnect Multicast Option..[ 0     ]
Dropped  -  Router Queue Full.............[ 0     ]
Dropped  - Total..........................[ 0     ]
Reset All Counters.............................................................C


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
_
```

Figure 14-39. Filter/Drop Statistics page

The Filter/Drop Statistics page contains the following options/fields:

Selection	Entry	Description
Filtered – Boot	*[RO]*	Packets are filtered while booting.
Filtered – Flow Descriptor		1. Packet are Filtered due to a Multicast packet classified as UNICAST packet. 2. Packets are filtered due to Off-line modem is receiving packet from WAN port.

Selection	Entry	Description
Filtered – Unknown Reason Code	*[RO]*	Packets dropping due to reasons were not listed here.
Filtered – Flow Correlator		Packet are filtered due to improper establishing SAT-to-SAT traffic (This counter generally is seen on out bounding Hub modem in point-to-multipoint setup)
Filtered – Management Path		Not used currently.
Filtered – WAN Scaling		Internal Error occurred during WAN scaling sub process in processing packet.
Filtered – Ping		Ping packets were received but PING feature was disabled.
Filtered – Access Control		Packets are received while “Access List” control is enabled but IP address does not match the access list database.
Filtered – Vipersat MCP		Internal Error occurred while processing Vipersat Multi-command messages.
Filtered – Vipersat UCP		Internal Error occurred while processing Vipersat Uni-command messages.
Filtered – Codeload		Internal error occurred while processing Codeload messages.
Filtered – Multicast		A multicast packet is received but there is no application associated with it.
Filtered – Bad Packet		Malformed packet is received. This may be due to internal or external error.
Filtered – Route		Applies to Vipersat Remote only – when a packet is received from the WAN and the Route Table contains a route to transmit that packet to the WAN, the packet is filtered to prevent a routing loop.
Filtered – Vipersat Remote		Packet filtered due to QoS Rule configured to filter.
Filtered – QoS Rule		Packet filtered due to QoS Rule configured to filter.
Filtered – Vipersat Loop		Packet are filtered due to Vipersat loop (a modem configured as a Vipersat Remote Expansion unit and default route set to 0.0.0.0/0).
Filtered – Bad Header Len		Filtered due to packets received with less than 14 bytes of L2 header.
Filtered – Bad Data Ptr		Internal error occurred while accessing the packet data.
Filtered – MAC Split Err		Not currently used.
Filtered – L3Type Err		Not currently used.
Filtered – Local Destination		Packet received with destination MAC as modem MAC and destination IP is not modem IP while modem is operating in bridge mode (Managed Switch)
Filtered – Redundancy Err		Applies to Offline modem in 1:1 Redundancy Packets are received on the WAN port by the both Offline unit and Online unit, only Online unit is allowed to forward the packets. Indicates packets received by Offline unit from WAN port that were filtered because unit is Offline.
Filtered – ICMP Filter		This is the same as “Filtered Ping”, except this will update in Managed Switch mode.
Filtered – Port Err		Non-IP or ARP packets are targeted to End-station. (End-station will not allow any non-IP packets).

Selection	Entry	Description
Filtered – Per port route rule	*[RO]*	In 1:1 Redundancy Managed Switch mode – a packet received with modem destination MAC, but the IP does not match the traffic IP or management IP. In Router mode – per port WAN filtered mode is ON.
Filtered – Total		Total Filtered Packets
Dropped – Bad IP Header Checksum		Total Dropped Packets due to incorrect IP Header Checksum.
Dropped – Bad Buffer Length		IP length (as specified in packet header) was greater than payload received in the Ethernet packet. This would indicate the packet was truncated before arriving.
Dropped – Bad IP Version		Total Dropped IP Version 6 Packets (IP Module only supports IP Version 4).
Dropped – TTL Expired		Total Dropped Packets due to Time To Live counter expired (TTL limits the number of hops, or seconds, before a packet reaches its destination).
Dropped – No Route		Total Dropped Packets due to no Route for the destination in the IP Module Route Table. These are packets that are directed to the IP Module's MAC address and the IP Module will reply to the sender with a ICMP 'Destination net unreachable' message.
Dropped – No ARP Entry		Total Dropped Packets due to no ARP entry in IP Module ARP Table. For example, if a IP Module receives packets from the satellite for a host that is not in the ARP table, the IP Module will send an ARP request. If there is no response, the packets are dropped.
Dropped – Filtered Multicast		Total Dropped Multicast Packets received from the satellite due to no SAT→LAN or
Dropped – Multicast Disable Group		Multicast packet was dropped because, although route existed, IGMP is being used, and there is no client requesting forwarding of this traffic or due to a IGMP "leave group" message.
Dropped – Managed Switch Multicast Option		Total Dropped Multicast Packets received from the satellite due to the 'Managed Switch Multicast Option' feature not being enabled in Managed Switch Mode.
Dropped – Router Queue Full		Indicates that the router task is dropping packets due to being full. Represents a graceful drop process when the processor performance is being overdriven.
Dropped – Total		Total Dropped Packets
Reset All Counters	C	Executing this menu option resets all gathered WAN, Ethernet and IP Routing statistics gathered to zero.

14.2.10.2.2 QoS Statistics Page

The *QoS Statistics* page is activated from the *Statistics Menu* page. The *QoS Statistics* page displays the statistics for the number of IP packets routed, based upon the defined QoS Rules, by the IP Module.

```
                                   QoS Queue Statistics

                                                        CurTx   AvgTx   MaxTx
                Sent         Pkts/  Drop    Drop       Rate    Rate    Rate    Act
          Prot  Pkts         Second Pkts    Bytes      (kbps)  (kbps)  (kbps)  Flows

RL01....[EXFD  0            0      0       0          0       0       0       0   ]
RL02....[CLS1  0            0      0       0          0       0       0       0   ]
RL03....[CLS2  0            0      0       0          0       0       0       0   ]
RL04....[CLS3  0            0      0       0          0       0       0       0   ]
RL05....[CLS4  0            0      0       0          0       0       0       0   ]
RL06....[CLS5  0            0      0       0          0       0       0       0   ]
RL07....[CLS6  0            0      0       0          0       0       0       0   ]
RL08....[CLS7  0            0      0       0          0       0       0       0   ]
DefQu...[XXXX  0            0      0       0          0       0       0       0   ].....
ClrAll...............................................................................A
Clear................................................................................C
Base....[1]..........................................................................B


Save Parameters to permanent storage.................................................S
Exit.................................................................................X
_
```

Figure 14-40. QoS Statistics Page

NOTE: In DiffServ QoS Mode, statistics for the various DiffServ DSCP Classes are in the following Queues:

Queue01	Expedited Forwarding
Queue02	Class 1 Precedence
Queue03	Class 2 Precedence
Queue04	Class 3 Precedence
Queue05	Class 4 Precedence
Queue06	Class 5 Precedence
Queue07	Class 6 Precedence
Queue08	Class 7 Precedence
Queue09	Assured Forwarding Class 1
Queue10	Assured Forwarding Class 2
Queue11	Assured Forwarding Class 3
Queue12	Assured Forwarding Class 4

14.2.10.2.3 Ethernet Statistics Page

The *Ethernet Statistics* page is activated from the *Statistics Menu* page. The *Ethernet Statistics* page presents the total packets transmitted and received for the Ethernet Port of the IP Module.

```
                              Ethernet Statistics
Tx Bytes.................................................[         0]
Tx Good Frames...........................................[         0]
Tx Maximum Collision Count...............................[         0]
Tx Late Collision Count..................................[         0]
Tx DMA Underrun Error Count..............................[         0]
Tx Lost Carrier Sense Count..............................[         0]
Tx Deferred Count........................................[         0]
Tx Single Collision Count................................[         0]
Tx Multiple Collision Count..............................[         0]
Tx Total Collision Count.................................[         0]
Rx Bytes.................................................[         0]
Rx Good Frames...........................................[         0]
Rx CRC Error Frame Count.................................[         0]
Rx Allignment Error Count................................[         0]
Rx Resource Error Count..................................[         0]
Rx Collision Detect Error Count (CDT)....................[         0]
Rx Runt Frames Count.....................................[         0]
Tx Flow Control Pause Frames Transmitted.................[         0]
Rx Flow Control Pause Frames Received....................[         0]
CLEAR...............................................................C


Save Parameters to permanent storage................................S
Exit................................................................X
_
```

Figure 14-41. Ethernet Statistics page

The *Ethernet Statistics* page contains the following options/fields:

Selection	Entry	Description
Tx Bytes	*[RO]*	Number of bytes transmitted by this Ethernet interface.
Tx Good Frames		Number of good frames transmitted by this Ethernet interface.
Tx Maximum Collision Count		Number of frames that are not transmitted because they encountered configured max collisions.
Tx Late Collision Count		Number of frames dropped due to a late collision on the Ethernet.
Tx DMA Underrun Error Count		Number of frames not transmitted or re-transmitted due to transmit DMA underrun.
Tx Lost Carrier Sense Count		Number of frames transmitted by device despite the fact that it detected a de-assertion of carrier sense.
Tx Deferred Count		Number of frames deferred before transmission due to activity on link.
Tx Single Collision Count		Number of transmitted frames that encountered only one collision.
Tx Multiple Collision Count		Number of transmitted frames that encountered more than one collision.
Tx Total Collision Count		Total number of collisions encountered while attempting to transmit.
Rx Bytes		Number of bytes received by this Ethernet interface.

Selection	Entry	Description
Rx Good Frames	*[RO]*	Count of good frames received by the Ethernet device.
Rx CRC Error Frame Count		Number of aligned frames discarded due to a CRC error.
Rx Alignment Error Count		Number of frames that are both misaligned and contain a CRC error.
Rx Resource Error Count		Count of good frames discarded due to unavailable resources.
Rx Collision Detect Error Count (CDT)		Number of frames encountered collisions during frame reception.
Rx Runt Frames Count		Count of undersize frames received by the Ethernet device.
Tx Flow Control Pause Frames Transmitted		Number of Flow Control frames transmitted by the device.
Rx Flow Control Pause Frames Received		Number of Flow Control frames received by the device.
CLEAR	C	Resets all Ethernet Statistics

14.2.10.2.4 WAN Statistics

The *WAN Statistics* page is activated from the *Statistics Menu* page. The *WAN Statistics* page displays counts of the number of packets routed or dropped in the IP Module Satellite interface.

```
                              WAN Statistics

WAN Rx Pkt Proc CRC Error Count.................................[0         ]
WAN Rx Abort/Octet Error Count..................................[0         ]
WAN Rx Overrun Count............................................[0         ]
WAN Rx HDLC CRC Error Count.....................................[215       ]
WAN Rx HDLC Payload Bytes.......................................[7764041   ]
WAN Rx HDLC Header Bytes........................................[780474    ]
WAN Rx HDLC Packet Count........................................[130079    ]
WAN Rx HDLC Address Match Packet Count..........................[102423    ]
WAN Rx HDLC Address Filtered Packet Count.......................[27656     ]
WAN Rx Err Invalid Flow Id......................................[0         ]
WAN Rx Err SAR Reassemble.......................................[0         ]
WAN Rx Err Hdr Decomp...........................................[0         ]
WAN Rx Err Mem Alignment........................................[0         ]
WAN Rx Err Bad Crc..............................................[0         ]

WAN TX Err - No Route...........................................[0         ]
WAN TX Err - Pkt Start..........................................[0         ]
WAN TX Err - Pkt Front Length...................................[0         ]
WAN TX Err - Pkt End Length.....................................[0         ]
WAN TX Err - Pkt Invalid Length.................................[0         ]
WAN TX Err - Pkt Dropped - Sat overdriven.......................[0         ]
WAN Tx HDLC Header Bytes........................................[484368    ]
WAN Tx HDLC Payload Bytes.......................................[1900631   ]
WAN Tx HDLC Packet Count........................................[72787     ]
WAN Utilization.................................................[0         ]
Ethernet traffic destined to go over WAN (kbps).................[0         ]
Actual Satellite traffic (kbps).................................[0         ]
Percentage of WAN Bandwidth saved...............................[0         ]
CLEAR..................................................................C


Save Parameters to permanent storage...................................S
Exit...................................................................X
```

Figure 14-42. WAN Statistics page

The *WAN Statistics* page contains the following options/fields:

Selection	Entry	Description
WAN Rx Pkt Proc CRC Error Count	*[RO]*	Count of received frames that failed packet processor CRC check. Indicates that a Payload Compressed Packet was received that could not be decompressed.
WAN Rx Abort/Octet Error Count		Count of aborted frames and octet error frames.
WAN Rx Overrun Count		Count of received frames that exceeded max frame length of 2K bytes in length (Or) overflowed the HDLC buffer.
WAN HDLC CRC Error Count		Number of received frames that failed HDLC CRC check. Indicates that a corrupted packet was received and is usually due to a marginal satellite link.
WAN Rx HDLC Payload Bytes		The count of payload bytes that were received over satellite link excluding any frame overhead.
WAN Rx HDLC Header Bytes		The count of HDLC header bytes received over satellite link including control, HDLC address, Flow ID, and CRC.
WAN Rx HDLC Packet Count		Number of packets received over satellite link.
WAN Rx HDLC Address Match Packet Count		Number of packets received that matched any of the 4 RX HDLC Addresses defined in the Satellite interface (not used with version 1.7.x and later).
WAN Rx HDLC Address Filtered Packet Count		Number of packets received that did not match any of the 4 RX HDLC Addresses defined in the Satellite interface (not used with version 1.7.x and later).
WAN Rx Err Invalid Flow ID		Number of packets which the flow identifier has been corrupted, does not fall into the range of acceptable values.
WAN Rx Err SAR Reassemble		Number of packets unable to correctly reassemble a segmented packet.
WAN Rx Err Hdr Decomp		Number of packets unable to correctly decompress the header information.
WAN Rx Err Mem Alignment		Number of packets discarded (caused by memory corruption).
WAN Rx Err bad CRC		Number of corrupted packets indicated by CRC check.
WAN TX Err – No Route		*Internal Traffic Statistics used for Factory Troubleshooting*
WAN TX Err – Pkt Start		
WAN TX Err – Pkt Front Length		
WAN TX Err – Pkt End Length		
WAN TX Err – Pkt Invalid Length		
WAN TX Err – Pkt Dropped – Sat overdriven		
WAN Tx HDLC Header Bytes		This counter keeps track of number of HDLC header bytes transmitted over satellite link.
WAN Tx HDLC Payload Bytes		Number of payload bytes transmitted over satellite link.
WAN Tx HDLC Packet Count		Count of packets transmitted over satellite link.
WAN Utilization		Percentage of current TX data rate being used for IP traffic (after compression and framing)
Ethernet traffic destined to go over WAN (kbps)		Bandwidth required to forward Ethernet traffic before compression.
Actual Satellite traffic (kbps)		Current satellite bandwidth being used.
Percentage of WAN Bandwidth saved		Displays percent of bandwidth being saved as a result of Header and/or Payload Compression, and optimized satellite framing.
Clear	C	Resets all WAN statistics.

14.2.10.2.5 Compression Statistics

The *Compression Statistics* page is activated from the *Statistics Menu* page. The *Compression Statistics* page displays counts of the number of bytes before and after for both Header and Payload Compression. For Header Compression, the percentage of bandwidth savings is displayed. For Payload Compression, the effective compression ratio is displayed.

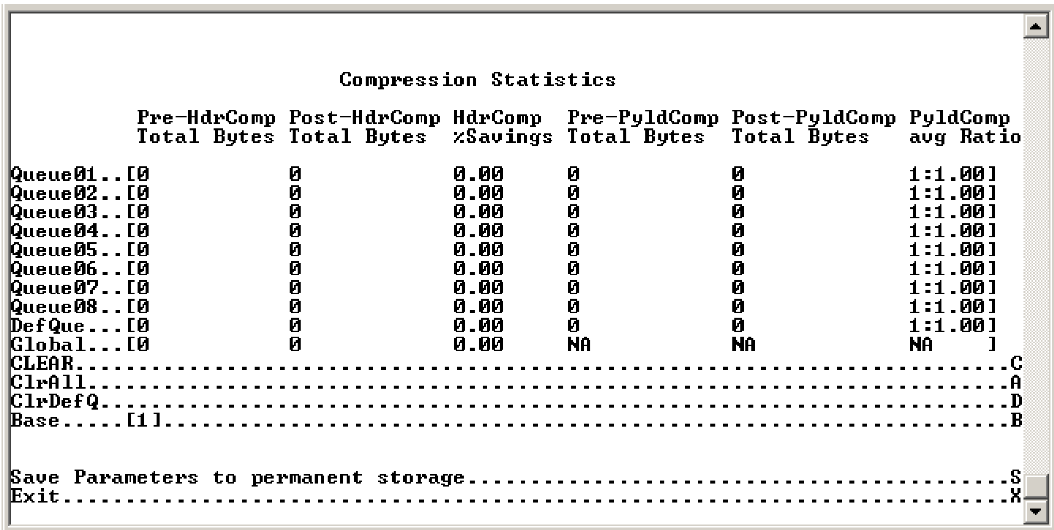


Figure 14-43. Compression Statistics page

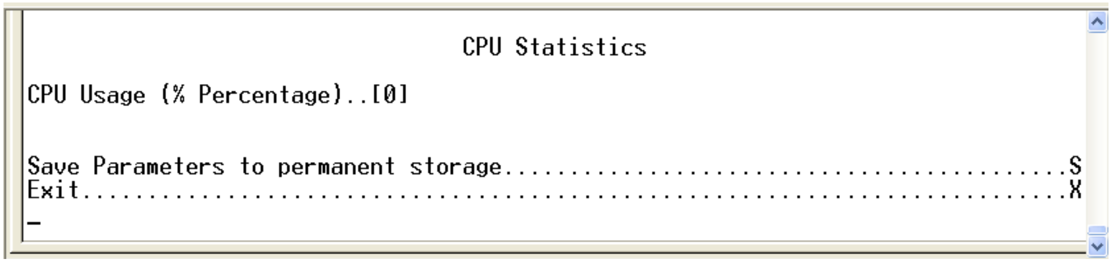
The *Compression Statistics* page contains the following options/fields:

Selection	Entry	Description
Queue01…08	*[RO]*	Statistics are displayed in a table format showing: Pre-Header Comp Bytes Post-Header Comp Bytes Header Comp % Savings Pre-Payload Comp Bytes Post-Payload Comp Bytes Payload Compression Ratio
DefQue		
Global		All traffic that does not fall within a defined QoS Rule is indicated in the 'Global' (Default Rule Queue).
CLEAR	C	Allows a reset of the Statistics of a specific Queue.
ClrAll	A	Resets all Compression Statistics.
ClrDefQ	D	
Base [1]	B	Allows the user to view up to 8 different Queues per screen. To allow editing on any of the 32 entries that can be defined, the user can select a base address to control which 8 QoS Queues are displayed. For example, if the user wants to view QoS Queues 16-24, then a Base value of 16 should be defined.

***Note:** Although the QoS option is not required to use Header or Payload Compression, the Compression Statistics are displayed by QoS Rule flow Queues. If QoS is not enabled, all the Compression Statistics will fall within the Global Queue.*

14.2.10.2.6 CPU Statistics

The *CPU Statistics* page is activated from the *Statistics Menu* page. The *CPU Statistics* page displays IP Module CPU Utilization as a percentage(%).

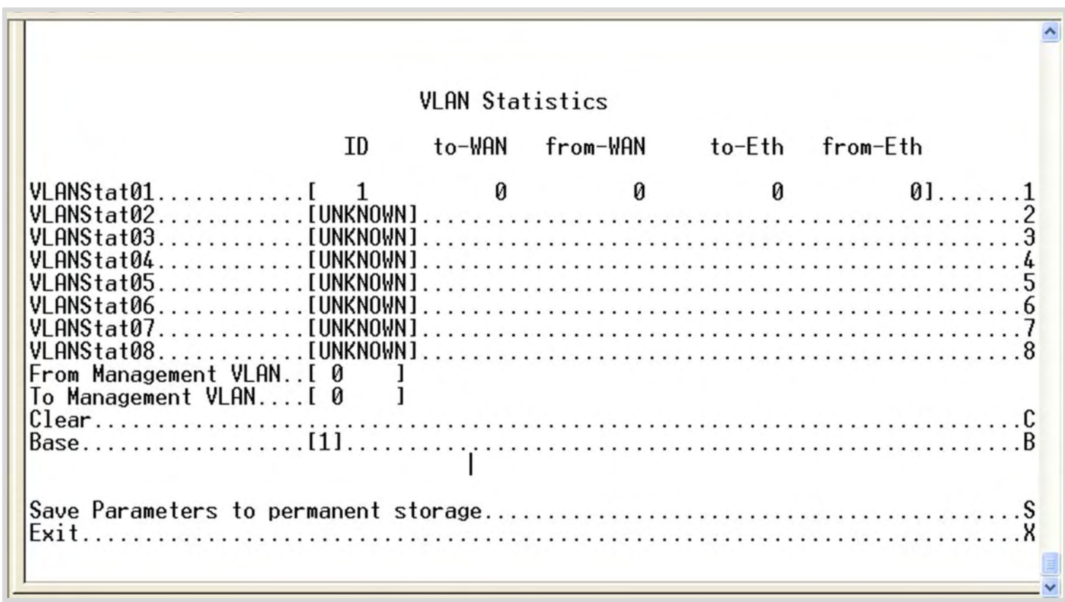


```
                              CPU Statistics

CPU Usage (% Percentage)..[0]


Save Parameters to permanent storage........................................S
Exit........................................................................X
_
```

Figure 14-44. CPU Statistics page

14.2.10.2.7 VLAN Statistics

The *VLAN Statistics* page is activated from the *Statistics Menu* page. The *VLAN Statistics* page displays VLAN packets to and from the WAN (satellite) and to and from Ethernet (LAN) by VLAN ID. It also displays VLAN packets to and from the Management VLAN of the IP Module.



```
                              VLAN Statistics

                        ID     to-WAN   from-WAN    to-Eth   from-Eth

VLANStat01............[   1        0         0         0         0]......1
VLANStat02............[UNKNOWN]........................................2
VLANStat03............[UNKNOWN]........................................3
VLANStat04............[UNKNOWN]........................................4
VLANStat05............[UNKNOWN]........................................5
VLANStat06............[UNKNOWN]........................................6
VLANStat07............[UNKNOWN]........................................7
VLANStat08............[UNKNOWN]........................................8
From Management VLAN..[ 0    ]
To Management VLAN....[ 0    ]
Clear..................................................................C
Base..................[1]..............................................B

Save Parameters to permanent storage...................................S
Exit...................................................................X
```

Figure 14-45. VLAN Statistics page

14.2.10.3 Event Log Page

The *Event Log* page is activated from the *Operations and Maintenance* page.

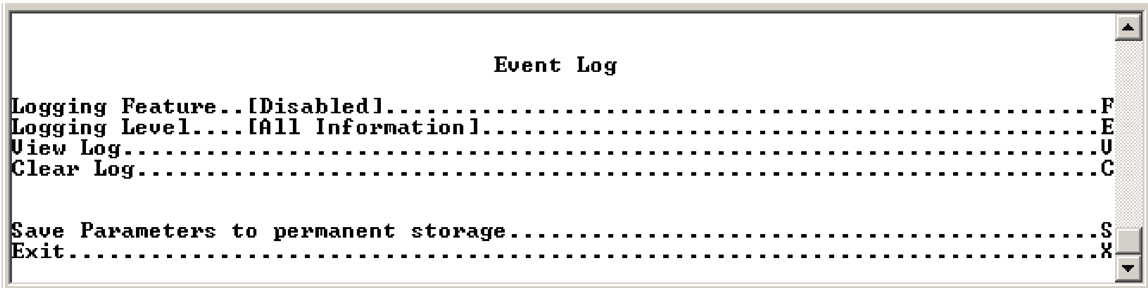


Figure 14-46. Event Log page

The *Event Log* page allows the user to capture all IP Module events to a log. The *Event Log* page contains the following options/fields:

Selection	Entry	Description
Logging Feature	F	Select to Enable/Disable Logging
Logging Level	E	Select 1 – Errors Only 2 – Errors and Warnings 3 – All Information
View log	V	Select to view log. Will display most recent events. Press any key to scroll through events or Escape to exit. All events will display Type – Error, Warning, or Information Date/Time – NOTE: During bootup, multiple Boot Events are created, but a Date/Time will only be seen when the bootup has completed. Category – Boot, Database, FTP logins, upgrade file transfers, Ethernet Link status change. Description – Event details
Clear log	C	Select to clear log contents.

NOTE: The full Event log file can be retrieved by FTP. Use Admin login, then type the command ‘get eventlog’.

The entire Event log can then be viewed with a text viewer, as per the following example:

```
54        Information    05/21/2004 10:12:04 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected – 'User: comtech' logged in

53        Information    05/21/2004 09:07:40 C:/Comtech/cimmib/cimMib.c
520       Database            Set system clock to FRI MAY 21 09:07:40 2004

52        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
534       Boot                Configuring router using PARAM file

51        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
364       Boot                Detected Framer Module II.

50        Information    05/21/2004 08:57:42 C:/Comtech/cimmib/cimMib.c
520       Database            Set system clock to FRI MAY 21 08:57:42 2004

49        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
534       Boot                Configuring router using PARAM file

48        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
364       Boot                Detected Framer Module II.

47        Information    05/21/2004 08:13:02 C:/Comtech/ftp/ftpCallbacks.c
180       FTP                 Disconnected FTP

46        Information    05/21/2004 07:58:06 C:/Comtech/ftp/ftpCallbacks.c
540       FTP                 FTP Transfer complete

45        Information    05/21/2004 07:58:04 C:/Comtech/ftp/ftpCallbacks.c
863       FTP                 Image has been saved to FLASH

44        Information    05/21/2004 07:57:40 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected – 'User: comtech' logged in

43        Information    05/21/2004 06:55:14 C:/Comtech/Telnetd/Telnetd.c
421       Telnet              Telnet disconnected

42        Information    05/21/2004 06:54:26 C:/Comtech/Telnetd/Telnetd.c
385       Telnet              Connected host 10.6.6.94

41        Information    05/21/2004 06:38:02 C:/Comtech/ftp/ftpCallbacks.c
180       FTP                 Disconnected FTP

40        Information    05/21/2004 06:23:07 C:/Comtech/ftp/ftpCallbacks.c
540       FTP                 FTP Transfer complete

39        Information    05/21/2004 06:23:06 C:/Comtech/ftp/ftpCallbacks.c
863       FTP                 Image has been saved to FLASH

38        Information    05/21/2004 06:22:43 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected – 'User: comtech' logged in
```

14.2.10.4 Database Operations Page

The *Database Operations* page is activated from *Operations and Maintenance* Page.

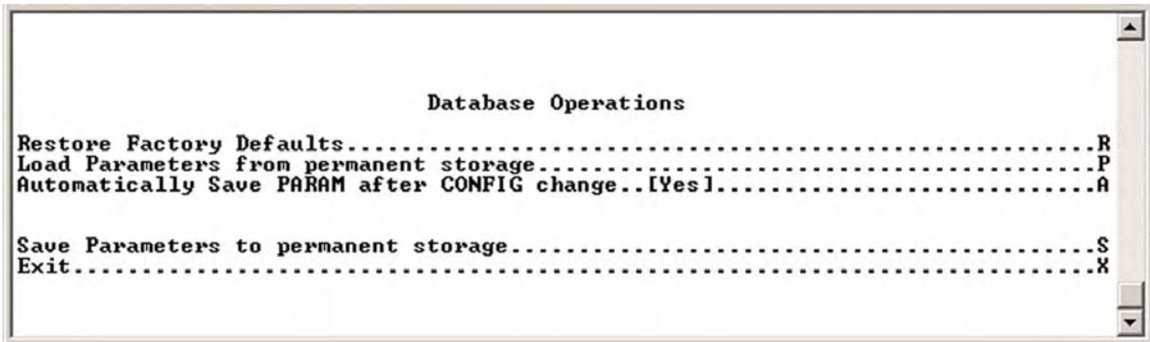


Figure 14-47. Database Operations page

The *Database Operations* option allows the user to view, save, or erase an existing user configuration of the IP Module. An IP Module uses these types of configuration files to initialize itself on power-up.

The User Configuration File allows the user to over-write the values defined in the Factory Configuration file. This allows full customization of a IP Module without erasing a set of parameters defined from the factory. The User configuration file can also be retrieved or overwritten via FTP by specifying the filename 'param1'.

The *Database Operations* page contains the following options/fields:

Selection	Entry	Description
Restore Factory Default	R	Restores the IP Module settings to "safe" values as defined by the factory.
Load Parameters from permanent storage	P	This option overwrites the current configuration of the IP Module with the configuration last saved to permanent storage. It allows the user to perform an "Undo" type operation if the IP Module is put into an undesirable state by the user.
Automatically Save PARAM after CONFIG change	A	When enabled, this feature automatically will save any configuration changes, including changes made from the front panel.

14.2.10.5 Diagnostics Page

The *Diagnostics Page* is activated from the *Operations and Maintenance* page.

```
                              Diagnostics Page

Dump Packets transmitted to Satellite Interface..[No]..........................T
Dump Packets received from Satellite Interface...[No]..........................R
Dump Packets transmitted to Ethernet Interface...[No]..........................U
Dump Packets received from Ethernet Interface....[No]..........................V
Dump Packets received by Router..................[No]..........................B
Dump Packets sent to EndStation..................[No]..........................G
Dump Packets received from EndStation............[No]..........................H
Ping...........................................................................P
Traceroute.....................................................................A
Command Line Debug Prompt......................................................D


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
_
```

Figure 14-48. Diagnostics Page

Using Dump Packets Diagnostics Utilities

1. ***The Dump Packet Utilities will display a hexadecimal representation of each packet and <u>should</u> <u>not</u> be used when the IP Module is on a "live" network.***
2. ***Selecting the menu option a second time terminates the dump operation. Each selection toggles the value of the dump engine.***

The *Diagnostics Page* contains the following options/fields:

Selection	Entry	Description
Dump Packets transmitted to Satellite Interface	T	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet transmitted over the Satellite Interface.
Dump Packets received from Satellite Interface	R	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet received from the Satellite Interface.
Dump Packets transmitted to Ethernet Interface	U	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet transmitted to the Ethernet Interface.
Dump Packets received from Ethernet Interface	V	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet received from the Ethernet Interface.
Dump Packets received by Router	B	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet received by the routing engine. **Note:** Does not apply when in Managed Switch Mode.
Dump Packets sent to EndStation	G	Toggles [Yes] or [No]. Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet received by and destined for this modem. This traffic includes Pings, SNMP, Telnet, HTTP, and FTP traffic types.

Selection	Entry	Description
Dump Packets received from EndStation	H	Toggles [Yes] or [No]. Forces the IP Module to dump a hexadecimal representation of each packet sourced from this modem and destined for some other device. Allows the user to see what type of packets this modem is generating internally.
Ping	P	Enter the IP address in aaa.bbb.ccc.ddd format, enter the number of pings to be sent. Reports percentage of packet loss and round trip time (RTT) in msec (min/avg/max).
Traceroute	A	Enter the IP address in aaa.bbb.ccc.ddd format. Reports min/avg/max RTT for each hop in path.
Command Line Debug Prompt	D	Enter the password to access the debug command line. **Note:** This is reserved for Customer Service and engineering use.

14.3 Telnet Session – Logout Option

When connecting to the IP Module through a Telnet session, the menus present another option to logout of the Telnet session. This logout option is in all the menus and, when selected, logs the user out of the Telnet session, returning control of the CLI to the serial interface.

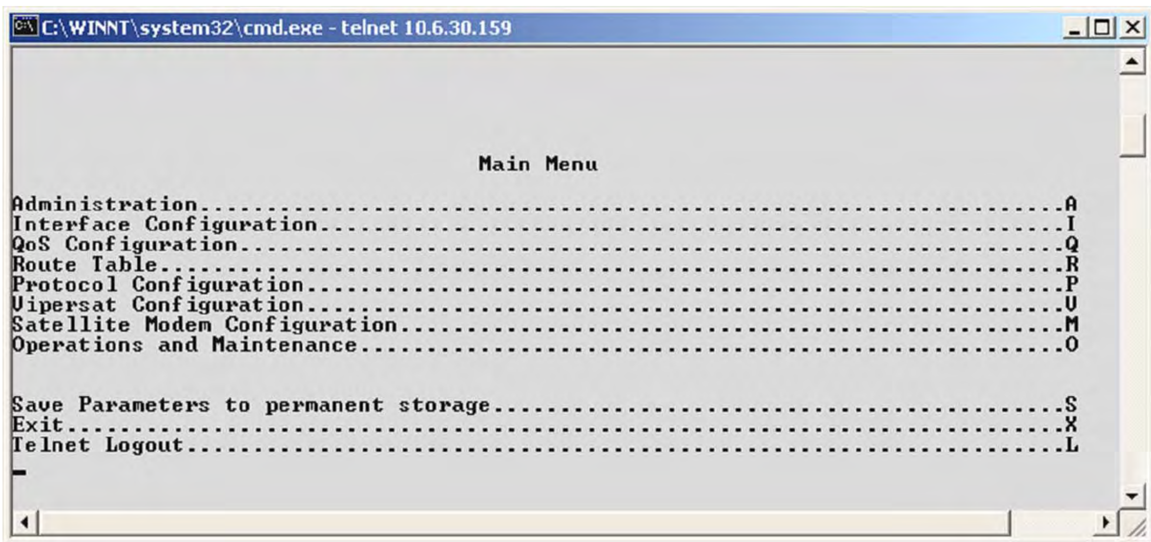


Figure 14-49. Logout via Telnet Session

The IP Module does not allow concurrent access to the menu via Telnet and the Console port. If a user connects via Telnet, IP Module automatically disables the Console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP Module will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

Notes:

Chapter 15. RAN OPTIMIZATION / WAN ADAPTATION

15.1 Overview

The CDM-570/570L supports E1 RAN (**R**adio **A**ccess **N**etwork) Optimization for Point-to-Point circuits. This chapter provides detailed information about this patent-pending technology, which is designed to provide maximum savings while maintaining superior voice quality.

15.1.1 E1 RAN Optimization Components

Use of the E1 RAN Optimization feature requires the following components:

- ***E1 RAN Optimization / WAN Adaptation Processor Board (CEFD P/N PL-0000599).***

  Note that equipping the CDM-570/570L with the E1 RAN Optimization / WAN Adaptation Processor Board precludes equipping the CDM-570/570L with the Reed-Solomon Board (CEFD P/N AS/10551). Accordingly, Reed-Solomon coding is not available when the E1 RAN Optimization / WAN Adaptation Processor Board is installed.

- ***CDM-570/570L Firmware Version 1.7.0****, which supports the E1 RAN Optimization / WAN Adaptation feature.*

- ***GSM backhaul traffic*** *consisting of a combination of 8k & 16K voice TCH (traffic channels) and 16 kbps, 32 kbps and 64kbps HDLC channels. Operation of the voice channels is codec independent. The interface supports the E1 framing format.*

Note that, while the IP Module Ethernet Interface and the RAN Optimization capability can coexist in a modem, the IP Module Ethernet Interface and RAN Optimization ***cannot*** *be operated concurrently.*

15.1.2 Radio Access Network (RAN)

In the cellular network, the RAN connects cell-site nodes with central-site nodes:

- For **G**lobal System for **M**obile Communications (GSM) / 2G, the **B**ase **T**ransceiver **S**tations (BTS) connect to the **B**ase **S**tation **C**ontrollers (BSC) via the Abis interface. Voice, data and signaling are transported over one or more E1s.
- For **U**niversal **M**obile **T**elecommunications **S**ystems (UMTS) / 3G, the NodeB connects to the **R**adio **N**etwork **C**ontroller (RNC) via the "lub" interface. Voice, data and signaling are transported over one or more E1s using Asynchronous Transfer Mode (ATM).

Figure 15-1 illustrates the typical RAN for 2G and 3G networks.

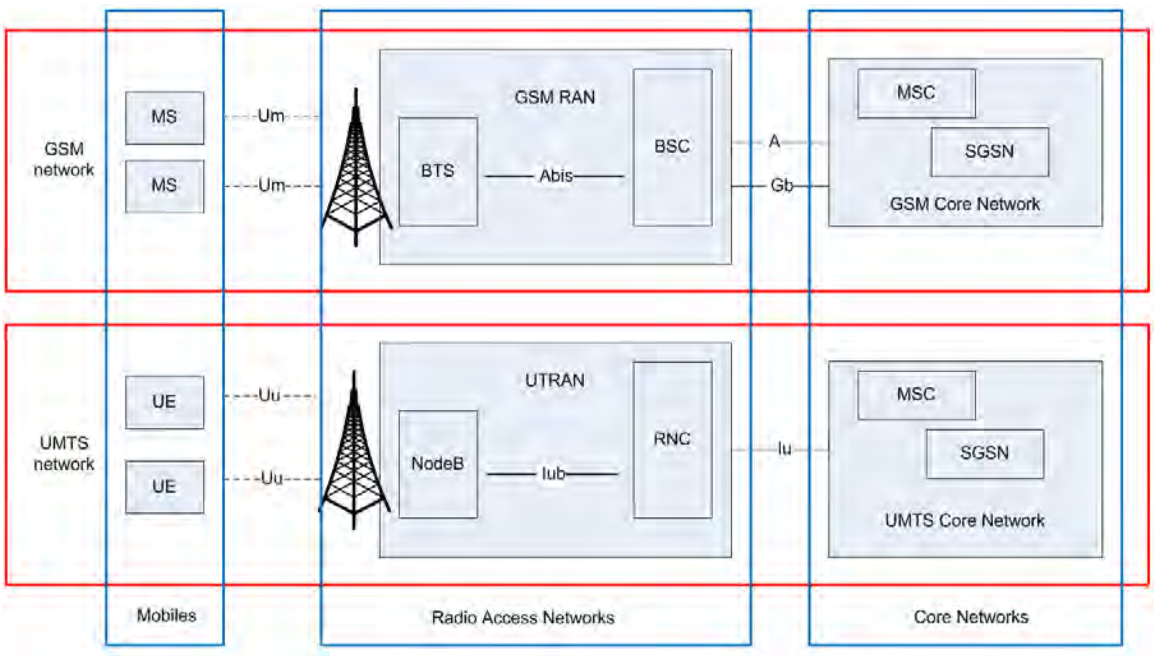


Figure 15-1. 2G / 3G Radio Access Network (RAN)

15.1.3 RAN Inefficiency

The 2G/3G RAN design is not efficient for satellite backhaul. For example, in the GSM Abis interface shown in **Figure 15-2**, the resource allocation is on a fixed basis (one or more E1s per BTS), irrespective of the actual traffic. Within the E1, the **T**ime **S**lots (TS) are dedicated to signaling, voice and data per Transceiver (TRX).

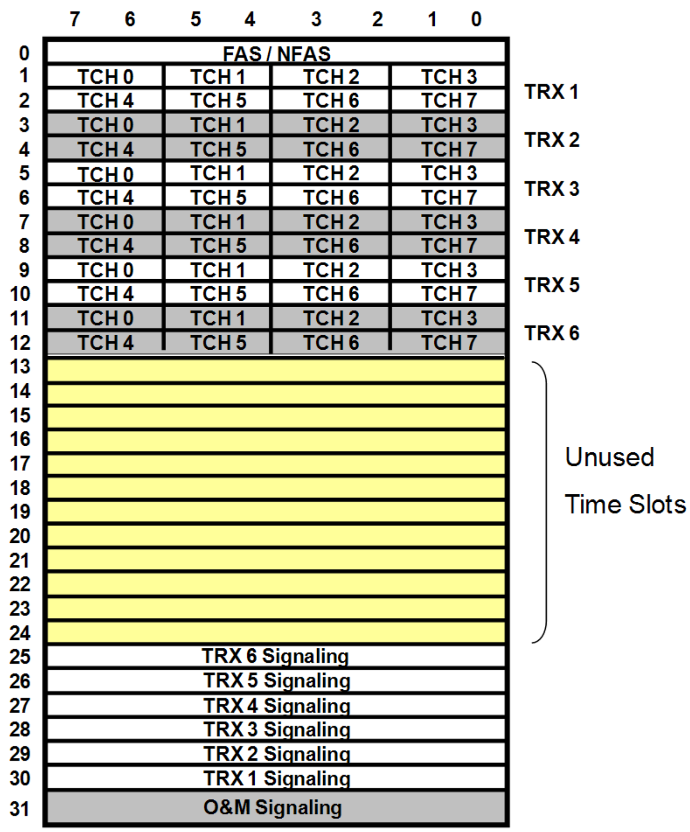


Figure 15-2. Typical Abis Map

15.2 E1 RAN Optimization

Jointly developed by Comtech EF Data, CEFD sister division Comtech AHA Corp., and CEFD subsidiary Memotec Inc., the RAN Optimization technology significantly reduces the **W**ide **A**rea Network (WAN) / satellite bandwidth required to carry an E1 bearer used for cellular backhaul. RAN Optimization allows the transmit modem data rate to be reduced relative to the input terrestrial data rate, thus allowing the transport of a user-selectable channel subset of bearer E1 using less bandwidth. In the receive direction, the data is restored to the E1 format for transport over the G.703 E1 interface.

The process is designed to allow varying levels of optimization to accommodate the incoming terrestrial data in the reduced modem data rate. Optimization performance depends on the traffic profile and the difference between the terrestrial data rate (based on input timeslot selection) and the transmit modem data rate. The optimization is performed in hardware for optimal performance.

The user has complete control over the desired level of optimization by selecting the time slots to be optimized, and the transmit modem data rate. Depending on the traffic profile, typical bandwidth reduction of 30-35% can be achieved with little or no impact to the voice quality.

Users have the option to reduce the WAN bandwidth by as much as 60% relative to the ingress data rate – this allows the users to achieve desired bandwidth savings while maintaining desired voice quality.

15.2.1 Process Overview

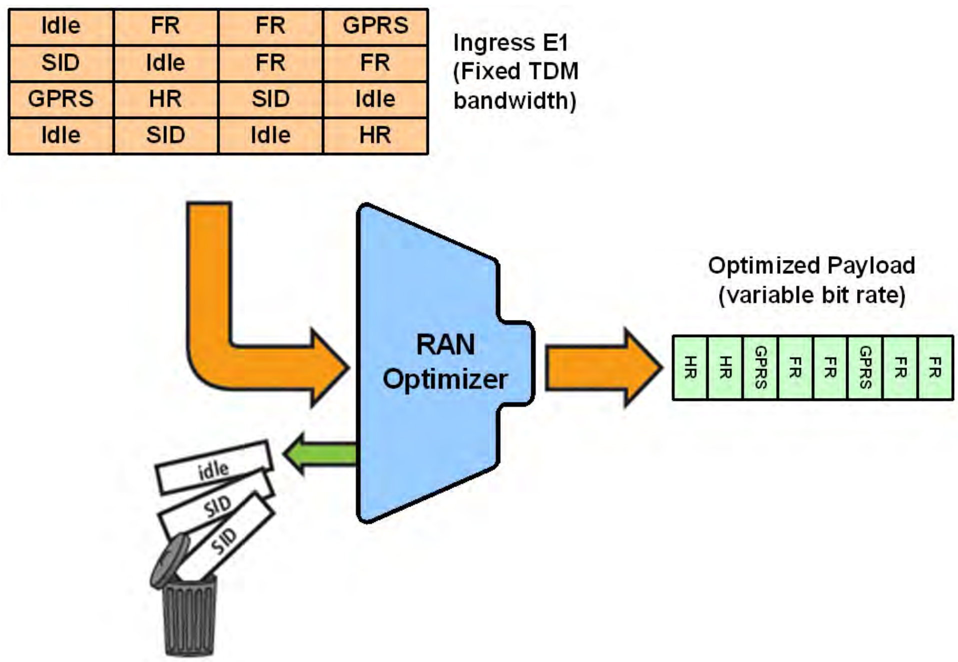


Figure 15-3. RAN Optimization (GSM Abis Interface)

On the transmit side, the RAN optimization process can be summarized as follows:

- The incoming 64 kbps Time Slots are de-multiplexed into Traffic Channels (TCH) ;
- TCH are inspected in real-time to identify Signaling, Voice, Data, and Idle;
- Idle TCH are removed;
- Silence frames are removed from the Voice channel;
- Signaling and Data TCH are compressed using lossless compression;
- O&M frames are compressed using lossless compression;
- Voice frames are compressed using lossless compression;
- Pre-emptive Bandwidth Management to maintain service quality;
- The optimized payload is sent to the modem for transmission.

On the receive side, this process is reversed, re-creating the E1 for transmission over the G.703 E1 interface.

15.2.2 WAN Link Dimensioning and Pre-emptive Bandwidth Management

The RAN traffic varies over time – variations during the day that peak at certain time(s), and longer term variation as user density/profile(s) changes. The WAN link can be dimensioned to accommodate the peak traffic, or it can be dimensioned to meet a statistically derived value (e.g. average traffic).

Dimensioning the WAN link for peak traffic may not be economically viable. However, dimensioning the WAN link for average traffic has its challenges. Specifically: What happens when the optimized traffic exceeds WAN capacity?

Typical of most other vendors' RAN optimization solutions, **Figure 15-4** shows the optimized Abis traffic as a function of time, depending on the BTS traffic load. The red line is the pre-defined WAN link capacity (assuming 35% target optimization). Each time the optimized Abis traffic exceeds WAN capacity, packets are dropped and the voice quality degrades dramatically – even leading to dropped calls or in the worst case, causing BTS drop.

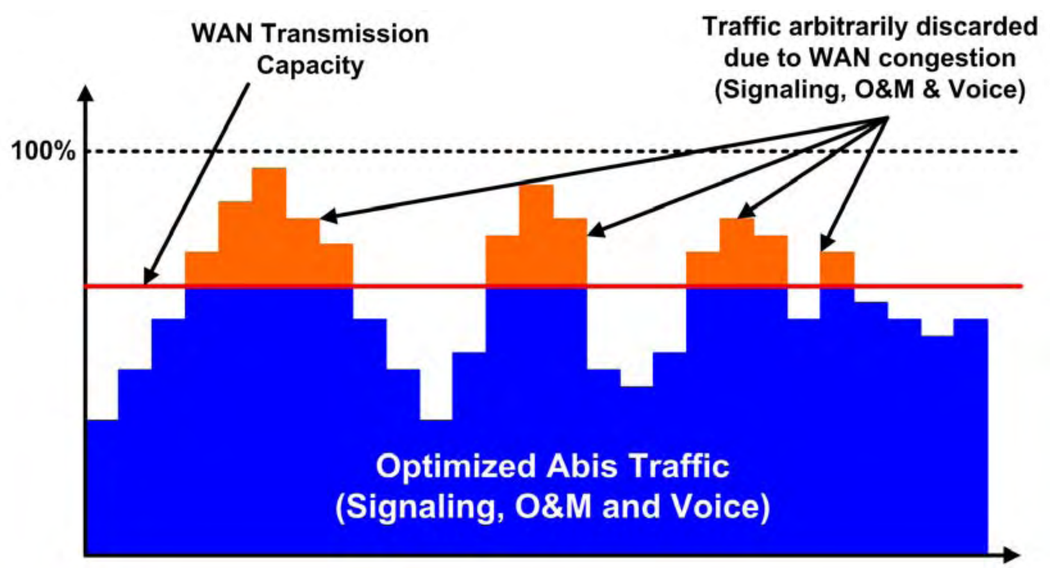


Figure 15-4. Optimized Abis Traffic *without* Pre-emptive BW Management

The simplistic packet drop employed by most vendors in case of WAN congestion has potentially disastrous effects on voice quality and call handling – the results can include clicks, blank calls, and eventually call drops, especially if the BCCH channel of the TRX is impacted. In the worst case, it may even lead to BTS drop.

To compensate, most other vendor solutions are forced to over-dimension the WAN link, which leads to significant inefficiencies. *This methodology should not be acceptable to mobile operators.* A good RAN optimization solution should be nearly transparent, and should provide the same level of service to the mobile customers as when there is no RAN Optimization *while* providing a significant reduction in the RAN transmission bandwidth.

As implemented by Comtech EF Data, the superior method of handling WAN congestion is to perform pre-emptive and selective voice packet discard. Comtech EF Data's RAN Optimization solution employs a sophisticated bandwidth management capability to maintain *Service Quality*. The signaling and O&M traffic is always protected from being dropped in case of WAN congestion – this ensures that the BTS/NodeB stays connected and synchronized. The bandwidth manager smoothes peak traffic variation before the optimized RAN traffic reaches the available WAN capacity – this mechanism maintains good voice quality while effectively reaching the optimal target optimization rate.

Comtech EF Data's patent pending algorithm on voice packet discard is designed to minimize the impact on the voice quality. This results in superior voice quality and improved *Service Quality* even at peak hour traffic load. Implementing a RAN optimization solution without such capability serves little purpose.

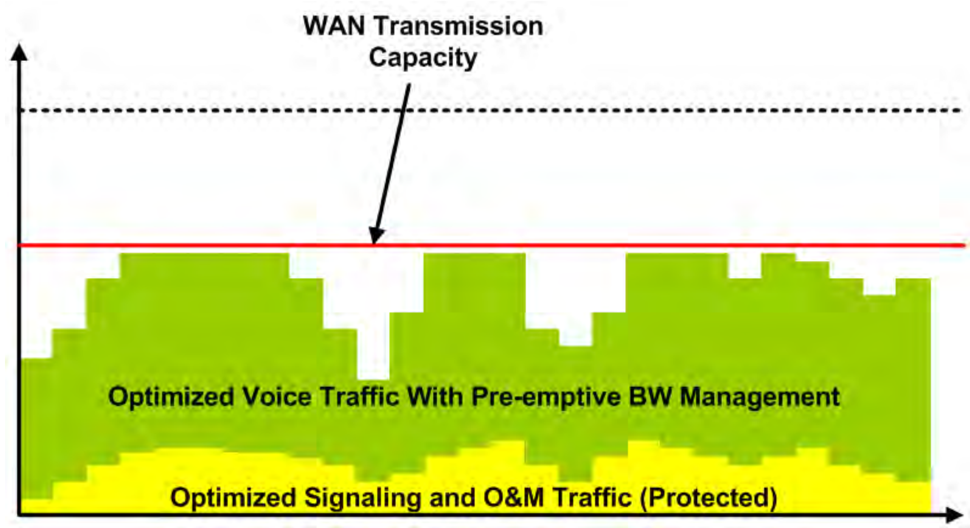


Figure 15-5. Optimized Abis Traffic *with* Pre-emptive BW Management

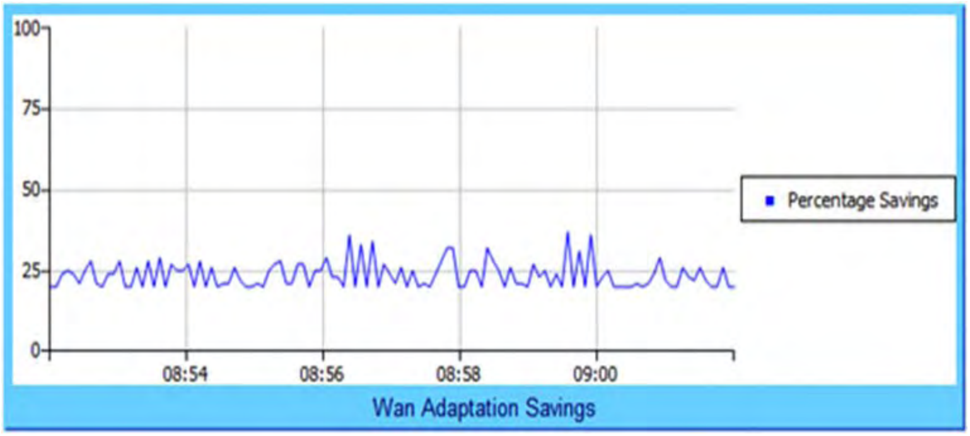
15.2.3 Performance Monitoring

The RAN Optimizer collects detailed usage and performance statistics that can be accessed via the CDM-570/570L Web Server Interface's **Stats | Graphs** page. Viewable by the minute, the hour, or the day, these graphs provide the user with the information needed to monitor the link performance, and to take appropriate action as needed.

See* Chapter 7. BASE MODEM HTTP INTERFACE *for complete details on the graph pages shown here, and for more information about the modem's HTTP (Web Server) Interface.

15.2.3.1 RAN Optimization (WAN Adaptation) Savings

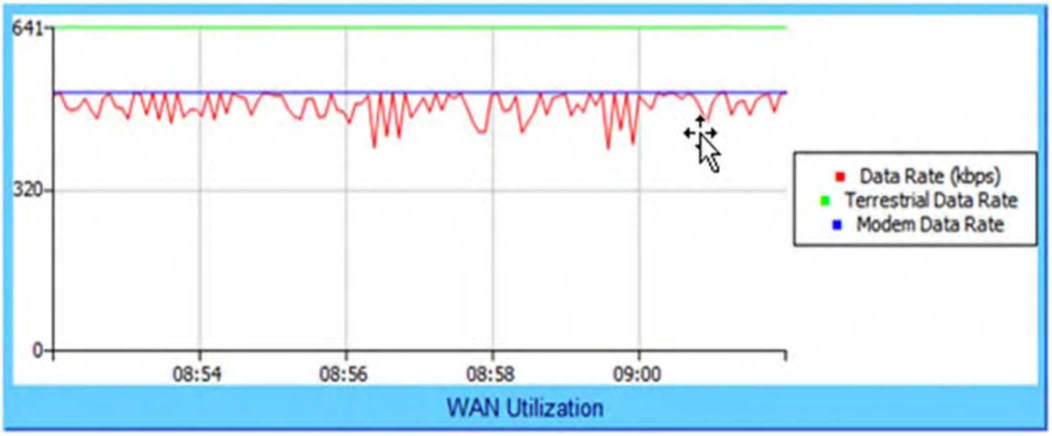
The following graph shows the actual percentage of RAN Optimization (WAN Adaptation) savings:



15.2.3.2 WAN Utilization

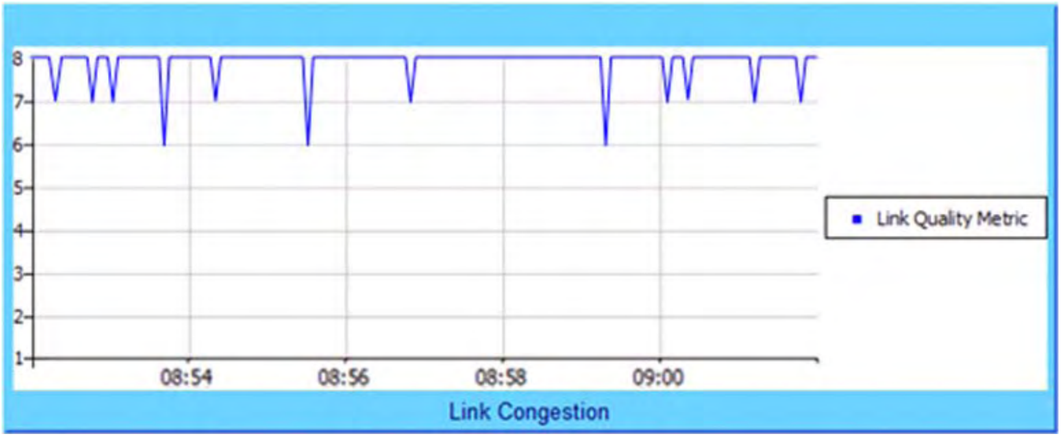
The following graph displays:

- The ingress data rate (Terrestrial Data Rate) based on selected number of Time Slots;
- WAN or the Modem Data Rate (egress); and
- The instantaneous optimized RAN traffic rate.



15.2.3.3 Link Congestion/Quality

The following graph displays the Link Quality Metric, a qualitative measure of the voice quality predicted by a) the level of the compression and b) voice packet discard required to accommodate the incoming traffic into the available WAN (satellite) bandwidth:



Note that '**8**' on this graph indicates the highest quality, with no voice traffic discard.

Appendix A. CABLE DRAWINGS

A.1 Overview

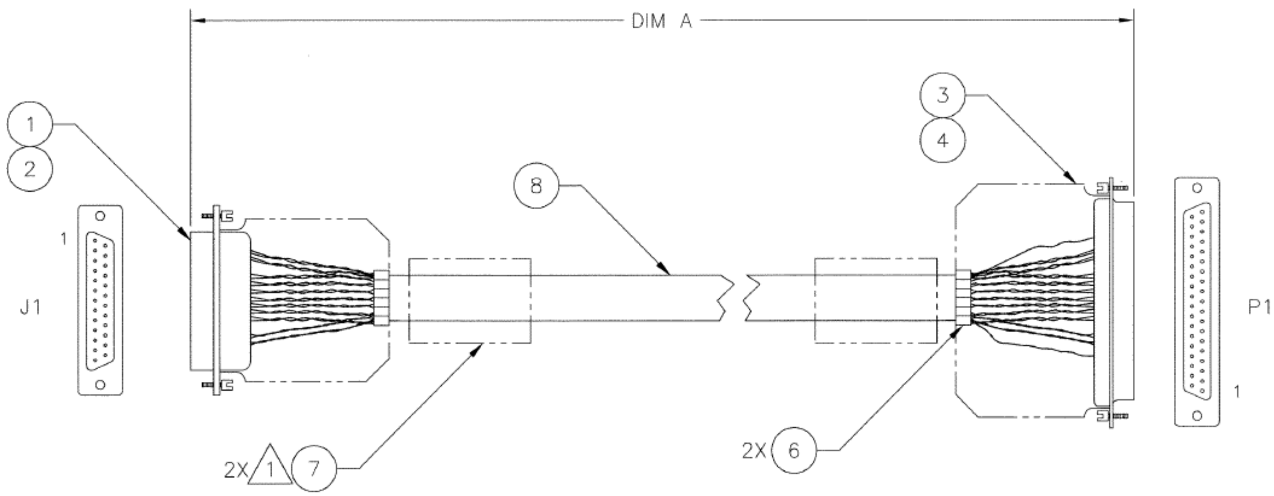
The EIA-530 standard pinout that is provided on the CDM-570/570L is becoming popular in many applications. However, there are still many occasions – especially for existing EIA-422/449 and V.35 users – when a conversion must be made.

For these situations:

- **Figure A-1** shows the line detail for a EIA-530 to EIA-422/449 DCE conversion cable (Comtech EF Data part number CA/WR12753-x)

- **Figure A-2** shows the line detail for a EIA-530 to V.35 DCE conversion cable (Comtech EF Data part number CA/WR12685-x)

A.1.1 EIA-530 to EIA-422/449 Data Cable



WIRE LIST			TWISTED PAIR
FROM	TO	SIGNAL	
J1-3	P1-6	RD-A	X
J1-16	P1-24	RD-B	
J1-2	P1-4	SD-A	X
J1-14	P1-22	SD-B	
J1-24	P1-17	TT-A	X
J1-11	P1-35	TT-B	
J1-15	P1-5	ST-A	X
J1-12	P1-23	ST-B	
J1-17	P1-8	RT-A	X
J1-9	P1-26	RT-B	
J1-4	P1-7	RS-A	X
J1-19	P1-25	RS-B	
J1-5	P1-9	CS-A	X
J1-13	P1-27	CS-B	
J1-8	P1-13	RR-A	X
J1-10	P1-31	RR-B	
J1-6	P1-11	DM-A	X
J1-22	P1-29	DM-B	
J1-20	N/C	SPARE	
J1-23	N/C	SPARE	
J1-18	N/C	SPARE	
J1-21	N/C	SPARE	
J1-25	N/C	SPARE	
J1-7	P1-20	SIGGND	X
J1-1	P1-1	SHLD	

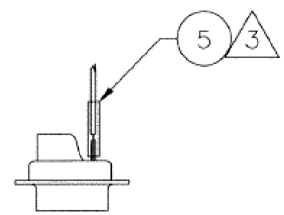
PART NO.	DIM A
CA/WR12753-1	8.00 ±.50

3\. ALL WIRE TERMINATIONS SHALL HAVE A MINIMUM OF .25 INCH OF HEAT SHRINK, ITEM 5, OVER EACH SOLDER JOINT. SEE DETAIL A.

2\. ASSEMBLE CABLE AS PER MANUFACTURING PROCEDURE MN/5360.

1\. APPLY PART NUMBER AND REVISION TO LABEL, IN .12 HIGH CHARACTERS, USING PERMANENT INK, COLOR BLACK, LOCATE APPROXIMATELY WHERE SHOWN.

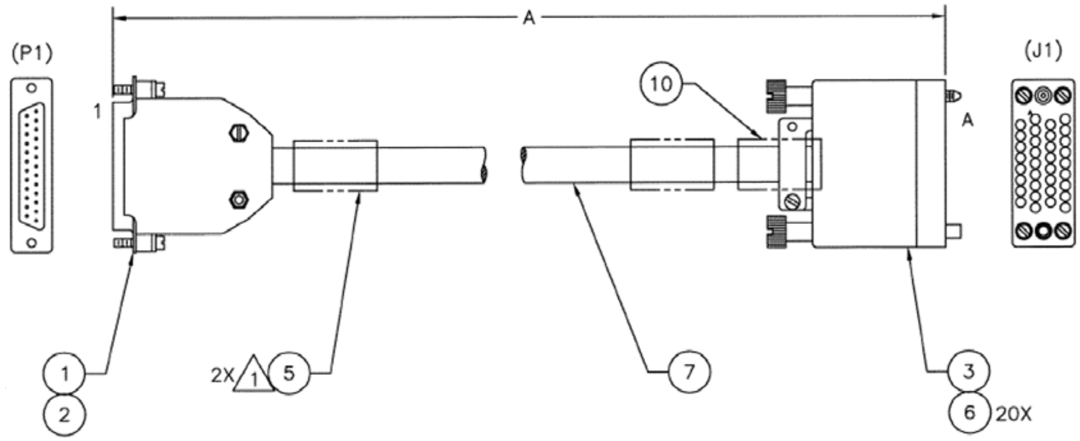
NOTES: UNLESS OTHERWISE SPECIFIED



DETAIL A
"D" CONNECTOR TERMINATIONS

Figure A-1. CDM-570/570L EIA-530 to EIA-422/449 DCE Conversion Cable (CEFD Dwg. No. CA/WR12753)

A.1.2 EIA-530 to V.35 DCE Conversion Cable



WIRE LIST

FROM	TO	SIGNAL NAME	TWISTED PR.
P1–1	J1–A	SHIELD GND	
P1–7	J1–B	SIGNAL GND	
P1–2	J1–P	SD–A	X
P1–14	J1–S	SD–B	
P1–24	J1–U	SCTE–A	X
P1–11	J1–W	SCTE–B	
P1–15	J1–Y	SCT–A	X
P1–12	J1–AA	SCT–B	
P1–3	J1–R	RD–A	X
P1–16	J1–T	RD–B	
P1–17	J1–V	SCRA	X
P1–9	J1–X	SCRB	
P1–4	J1–C	RTS	X
P1–5	J1–D	CTS	
P1–6	J1–E	DSR	X
P1–8	J1–F	RLSD	

4

CABLE LENGTH

PART NO.	DIM A
CA/12685–1	8.00 ± 1.50

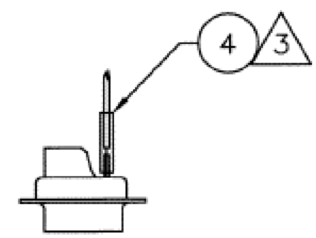
4 TWIST ALL SHIELD WIRES FROM INDIVIDUAL PARTS TOGETHER AND SOLDER WIRE, ITEM 8, TO THEM TO MAKE SHIELD CONNECTION BETWEEN P1-1 AND J1-A. COVER WITH HEAT SHRINK, ITEM 9.

3 ALL WIRE TERMINATIONS SHALL HAVE A MINIMUM OF .25 INCH OF HEAT SHRINK, ITEM 4, OVER EACH SOLDER JOINT. SEE DETAIL A. HEAT SHRINK UNUSED PAIRS.

2. STRIP AND/OR TIN WIRES AS REQUIRED FOR INSTALLING TERMINALS OR CONNECTORS USING MANUFACTURER'S INSTALLATION PROCEDURE.

1 APPLY CABLE PART NUMBER AND THE BOM REVISION LETTER TO LABEL IN .12 HIGH CHARACTERS, USING PERMANENT MARKING, COLOR: BLACK. LOCATE APPROXIMATELY WHERE SHOWN.

NOTES, UNLESS OTHERWISE SPECIFIED:



DETAIL A
"D" CONNECTOR TERMINATIONS

Figure A-2. CDM-570/570LL EIA-530 to V.35 DCE Conversion Cable (CEFD Dwg. No. CA/WR12685)

Notes:

Appendix B. E_b/N_0 MEASUREMENT

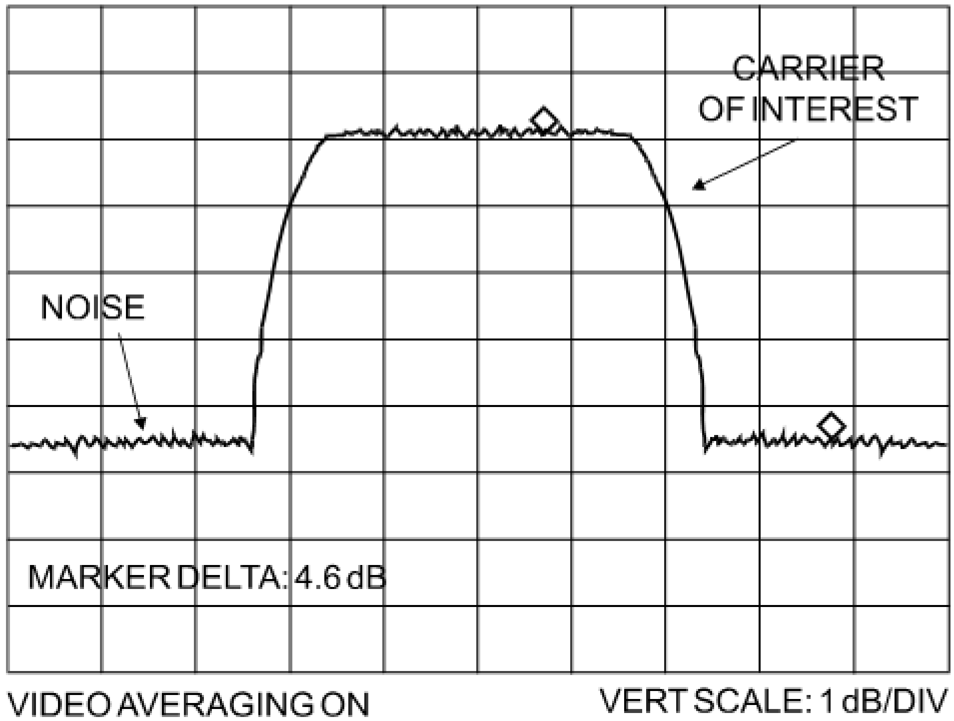
Although the CDM-570/570L calculates and displays the value of receive E_b/N_0 on the front panel of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.

The idea is to accurately measure the value of (Co+No)/No, (Carrier density + Noise density/Noise density). This is accomplished by tuning the center frequency of the Spectrum analyzer to the signal of interest, and measuring the difference between the peak spectral density of the signal (the flat part of the spectrum shown) and the noise density.

To make this measurement:

- Use a vertical scale of 1 or 2 dB/division.
- Set the Resolution Bandwidth of the Spectrum Analyzer to < 20% of the symbol rate.
- Use video filtering and/or video averaging to reduce the variance in the displayed trace to a low enough level that the difference can be measured to within 0.2 dB.
- 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 above diagram, the (Co+No)/No measured is 4.6 dB. If Rate 1/2 QPSK is being used, this would correspond to an Eb/No of approximately 2.6 dB.

The exact relationship used to derive the table values is as follows:

$$\mathbf{E_b/N_0 = 10\ log_{10}(10^{(Co+No/No\ )/10)}\ -1)\ \ -\ 10\ log_{10}\ (FEC\ Code\ Rate)\ -\ 10\ log_{10}(bits/symbol)}$$

Where:

- E_b/N_0 and (Co+No)/No are expressed in dB
- Bits/symbol = 1 for BPSK
- Bits/symbol = 2 for QPSK
- Bits/symbol = 3 for 8-PSK/8-QAM
- Bits/symbol = 4 for 16-QAM
- Code Rate for ‘uncoded’ = 1

Note: Pay close attention to the sign of the middle term

(Co+No)/No	Eb/No Uncoded BPSK	Eb/No Rate 1/2 BPSK	Eb/No Rate 21/44 BPSK	Eb/No Rate 5/16 BPSK	Eb/No Uncoded QPSK	Eb/No Rate 1/2 QPSK	Eb/No Rate 3/4 QPSK	Eb/No Rate 7/8 QPSK	Eb/No Rate 0.95 QPSK	Eb/No Rate 2/3 8-PSK	Eb/No Rate 3/4 8-PSK	Eb/No Rate 7/8 8-PSK	Eb/No Rate 0.95 8-PSK	Eb/No Rate 3/4 16-QAM	Eb/No Rate 7/8 16-QAM
1.4	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-
1.6	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
1.8	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-
2.0	-	0.7	0.9	2.7	-	-	-	-	-	-	-	-	-	-	-
2.2	-	1.2	1.4	3.2		-	-	-	-	-	-	-	-	-	-
2.4	-	1.7	1.9	3.7	-	-	-	-	-	-	-	-	-	-	-
2.6	-	2.1	2.3	4.2	-	-	-	-	-	-	-	-	-	-	-
2.8	-	2.6	2.8	4.6	-	-	-	-	-	-	-	-	-	-	-
3.0	0.0	3.0	3.2	5.0	-	-	-	-	-	-	-	-	-	-	-
3.5	0.9	3.9	4.1	5.9	-	0.9	-	-	-	-	-	-	-	-	-
4.0	1.8	4.8	5.0	6.8	-	1.8	-	-	-	-	-	-	-	-	-
4.5	2.6	5.6	5.8	7.6	-	2.6	0.8	-	-	-	-	-	-	-	-
5.0	3.3	6.3	6.5	8.4	-	3.3	1.5	0.9	-	-	-	-	-	-	-
5.5	4.1	7.1	7.3	9.1	1.1	4.1	2.3	1.7	1.3	-	-	-	-	-	-
6.0	4.7	7.7	7.9	9.8	1.7	4.7	2.9	2.3	1.9	-	-	-	-	-	-
6.5	5.4	8.4	8.6	10.4	2.4	5.4	3.6	3.0	2.6	-	-	-	-	-	-
7.0	6.0	9.0	9.2	11.1	3.0	6.0	4.2	3.6	3.2	-	-	-	-	-	-
7.5	6.6	9.6	9.8	11.7	3.6	6.6	4.8	4.2	3.8	-	-	-	-	-	-
8.0	7.3	10.3	10.5	12.3	4.3	7.3	5.5	4.9	4.5	-	-	-	-	-	-
8.5	7.8	10.8	11.0	12.9	4.8	7.8	6.0	5.4	5.0	4.8	-	-	-	-	-
9.0	8.4	11.4	11.6	13.4	5.4	8.4	6.6	6.0	5.6	5.4	4.9	-	-	-	-
9.5	9.0	12.0	12.2	14.0	6.0	9.0	7.2	6.6	6.2	6.0	5.5	4.8	4.5	-	-
10.0	9.5	12.5	12.7	14.6	6.5	9.5	7.7	7.1	6.7	6.5	6.0	5.3	5.0	-	-
10.5	10.1	13.1	13.3	15.1	7.1	10.1	8.3	7.7	7.3	7.1	6.6	5.9	5.6	5.3	-
11.0	10.6	13.6	13.8	15.7	7.6	10.6	8.8	8.2	7.8	7.6	7.1	6.4	6.1	5.8	5.2
11.5	11.2	14.2	14.4	16.2	8.2	11.2	9.4	8.8	8.4	8.2	7.7	7.0	6.7	6.4	5.8
12.0	11.7	14.7	14.9	16.7	8.7	11.7	9.9	9.3	8.9	8.7	8.2	7.5	7.2	6.9	6.3
12.5	12.2	15.2	15.4	17.3	9.2	12.2	10.4	9.8	9.4	9.2	8.7	8.0	7.7	7.4	6.8
13.0	12.8	15.8	16.0	17.8	9.8	12.8	11.0	10.4	10.0	9.8	9.3	8.6	8.3	8.0	7.4
13.5	13.3	16.3	16.5	18.3	10.3	13.3	11.5	10.9	10.5	10.3	9.8	9.1	8.8	8.5	7.9
14.0	13.8	16.8	17.0	18.8	10.8	13.8	12.0	11.4	11.0	10.8	10.3	9.6	9.3	9.0	8.4
14.5	14.3	17.3	17.5	19.4	11.3	14.3	12.5	11.9	11.5	11.3	10.8	10.1	9.8	9.5	8.9
15.0	14.9	17.9	18.1	19.9	11.9	14.9	13.1	12.5	12.1	11.9	11.4	10.7	10.4	10.1	9.5
15.5	15.4	18.4	18.6	20.4	12.4	15.4	13.6	13.0	12.6	12.4	11.9	11.2	10.9	10.6	10.0
16.0	15.9	18.9	19.1	20.9	12.9	15.9	14.1	13.5	13.1	12.9	12.4	11.7	11.4	11.1	10.5
16.5	16.4	19.4	19.6	21.4	13.4	16.4	14.6	14.0	13.6	13.4	12.9	12.2	11.9	11.6	11.0
17.0	16.9	19.9	20.1	21.9	13.9	16.9	15.1	14.5	14.1	13.9	13.4	12.7	12.4	12.1	11.5
17.5	17.4	20.4	20.6	22.4	14.4	17.4	15.6	15.0	14.6	14.4	13.9	13.2	12.9	12.6	12.0
18.0	17.9	20.9	21.1	23.0	14.9	17.9	16.1	15.5	15.1	14.9	14.4	13.7	13.4	13.1	12.5
18.5	18.4	21.4	21.6	23.5	15.4	18.4	16.6	16.0	15.6	15.4	14.9	14.2	13.9	13.6	13.0
19.0	18.9	21.9	22.1	24.0	15.9	18.9	17.1	16.5	16.1	15.9	15.4	14.7	14.4	14.1	13.5
19.5	19.5	22.5	22.7	24.5	16.5	19.5	17.7	17.1	16.7	16.5	16.0	15.3	15.0	14.7	14.1
20.0	20.0	23.0	23.2	25.0	17.0	20.0	18.2	17.6	17.2	17.0	16.5	15.8	15.5	15.2	14.6

Notes: IBS Framing: add 0.2 dB EDMAC Framing: rates below 2048 kbps add 0.2 dB, otherwise 0 Reed-Solomon: add an *additional* 0.4 dB to the values shown

Notes:

Appendix C. FAST ACTIVATION PROCEDURE

C.1 FAST System Overview

The CDM-570/570L Satellite Modem incorporates a number of optional features. In order to permit a lower initial cost, the unit may be purchased with only the desired features enabled.

If, at a later date, the user wishes to upgrade the functionality of a unit, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), a technology which permits the purchase and installation of options through special authorization codes. These unique Fast Access Codes may be purchased from Comtech EF Data during normal business hours, and then loaded into the unit using the front panel keypad.

FAST System Theory

FAST allows an operator to order a unit precisely tailored for the initial application. When service requirements change, **FAST** allows the operator to upgrade the topology of the unit on-location, within minutes, and without having to remove the unit from the setup. This accelerated upgrade is possible due to **FAST**'s extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the modem. All **FAST** options are available through the basic platform unit at the time of order. **FAST** allows immediate activation of available options – first, upon entry of the FAST Access Code through the front panel keypad, and then by setting the desired operational parameters via the front panel, remote control, or Web Server interfaces.

FAST Accessible Options

Hardware options can be ordered and installed either at the factory or in the field. In the field, the operator can select options that can be easily activated, depending on the current hardware configuration of the unit. The unique FAST Access Code that is purchased from Comtech EF Data enables configuration of the available hardware.

See **Sect 1.3.12** in **Chapter 1. INTRODUCTION** for the lists of FAST and FAST-accessible hardware options that are available for the CDM-570/570L.

C.2 FAST Activation Procedure

C.2.1 Record Modem Serial Number

Obtain the modem serial number as follows:

a) From the front panel main **SELECT:** menu, use the ◄ ► arrow keys to select **UTIL→ FAST**, and then press **ENTER**.

b) The **UTIL: FAST** menu branch screen displays the modem's motherboard serial number on the bottom line as per the following example:

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

c) Record the serial number: ______________________________

C.2.2 View Currently Installed Features

To view the currently installed features, proceed as follows:

a) From the front panel main **SELECT:** menu, use the ◄ ► arrow keys to select **UTIL: FAST → View**, and then press **ENTER**.

b) Use the ▲▼ arrow keys to scroll through the modem's available FAST options. Note which options are "**`Installed`**" or "**`Not Installed`**" as per the following example:

```
View Options: 09    (▲ ▼)
5000 kbps  Not Installed
```

Any option identified as '**`Not Installed`**' may be purchased as a FAST upgrade.

C.2.3 Order FAST Options

Contact a Comtech EF Data sales representative during normal business hours to order features. You will be asked to provide the modem serial number. Comtech EF Data Customer Support personnel will then verify the order and provide an invoice and instructions, including the 20-digit FAST Access Code required for configuration.

C.2.4 Enter FAST Access Code

Enter the FAST Access Code as follows:

a) Press **CLEAR** to return to the **UTIL: FAST** submenu.

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

b) From the **UTIL: FAST** submenu, use the ◄ ► arrow keys to select **Cnfg**, and then press **ENTER**.

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

c) From the **FAST Configuration** screen, use the ◄ ► arrow keys to select to select **Edit Code**, and then press **ENTER**.

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

d) ***Carefully*** enter the 20-digit Fast Access Code. On the bottom line, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲▼ arrow keys to edit the value of that digit. Confirm that the FAST Access Code string has been accurately composed, and then press **ENTER**.

The modem responds with "**`Configured Successfully`**" if the new FAST Access Code is accepted:

```
Configured Successfully
       (ENTER or CLEAR)
```

On the other hand, the modem responds with "**`FAST Code Rejected!`**" if the new FAST Access Code is invalid:

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

Press **ENTER** or **CLEAR** to return to the **EDIT CODE** screen, and then re-enter the FAST Access Code as needed. Should the error persist after repeating the code entry procedure, contact Comtech EF Data Customer Support for further assistance.

C.2.5 Enable / Disable Demo Mode

Demo Mode allows access to *ALL* CDM-570/570L FAST options for 604800 seconds (7 full days).

Control FAST Demo Mode as follows:

a) Press **CLEAR** to return to the **UTIL: FAST** submenu:

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

b) From the **UTIL: FAST** submenu, use the ◄ ► arrow keys to select **Cnfg**, and then press **ENTER**.

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

c) From the **FAST Configuration** screen, use the ◄ ► arrow keys to select to select **Demo Mode**, and then press **ENTER**.

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

d) Use the ◄ ► arrow keys to select FAST Demo Mode as **Off** or **On**, and then press **ENTER**.

When **On**, the bottom line displays the number of available seconds remaining for the free Demo Mode. During this time, Demo Mode may be turned on and off an unlimited number of times until the 604800 seconds have expired. The available time decrements only when Demo Mode is **On**.

When the Demo period expires, the following message displays:

```
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.

Appendix D. SERIAL REMOTE CONTROL

D.1 Overview

This appendix describes the protocol and message command set for remote monitor and control of the CDM-570/570L Satellite Modem with Optional IP Module.

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

D.2 EIA-485

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

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

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

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

EIA-485 (full duplex) Summary:

Two differential pairs	One pair for Controller-to-Target, one pair for Target-to-Controller.
Controller-to-Target pair	One line driver (Controller), and all Targets have line receivers.
Target-to-Controller Pair	One line receiver (Controller), and all Targets have Tri-State drivers.

D.3 EIA-232

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

D.4 Basic Protocol

Whether in EIA-232 or EIA-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. In this case, the asynchronous character formats include 7O2, 7E2, and 8N1. The baud rate may vary between 1200 and 38400 baud.

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

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

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

D.5 Packet Structure

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

Example: <0135/TFQ=1949.2345{CR}

Target-to-Controller						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	=, ?, !, *or* * ASCII codes 61, 63, 33, or 42 (1 character)	(From 0 to n characters)	Carriage Return, Line Feed ASCII codes 13,10 (2 characters)

Example: >0654/RSW=32{CR}{LF}

D.5.1 Start of Packet

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

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

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

D.5.2 Target Address

Up to 9999 devices can be uniquely addressed. In EIA-232 applications this value is set to 0. In EIA-485 applications, the permissible range of values is 1 to 9999. It is programmed into a Target unit using the front panel keypad.

The Controller sends a packet with the address of a Target – the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

D.5.3 Address Delimiter

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

D.5.4 Instruction Code

This is a three-character alphabetic sequence, which identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance – e.g., **TFQ** for **T**ransmit **F**re**Q**uency, **RMD** for **R**eceive **M**o**D**ulation type, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 to 90).

D.5.5 Instruction Code Qualifier

This is a single character, which further qualifies the preceding Instruction Code. Code Qualifiers obey the following rules:

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

Symbol	Function
= (ASCII code 61)	The '=' code is used as the Assignment Operator (AO) and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument (s) which follow it. For example: In a message from Controller-to-Target, TFQ=0950.0000 would mean "set the transmit frequency to 950 MHz."
? (ASCII code 63)	The '?' code is used as the Query Operator (QO) and is used to indicate that the Target should return the current value of the parameters defined by the preceding byte. For example: In a message from Controller-to-Target, TFQ? would mean "return the current value of the transmit frequency."

2. ***From Target-to-Controller***, the only permitted values are:

Symbol	Function
= (ASCII code 61)	The '=' code is used in two ways: First, if the Controller has sent a query code to a Target (for Example: TFQ? meaning 'what is the Transmit frequency?'), the Target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question. Second, if the Controller sends an instruction to set a parameter to a particular value, then, providing the value sent is valid, the Target will acknowledge the message by replying with TFQ= (with no message arguments).
? (ASCII code 63)	If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent is not valid, the Target will acknowledge the message by replying (for example) with TFQ? (with no message arguments). This indicates that there was an error in the message sent by the Controller.
! (ASCII code 33)	If the Controller sends an instruction code which the Target does not recognize, the Target will acknowledge the message by echoing the invalid instruction, followed by the ! character. Example: XYZ!
* (ASCII code 42)	If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent is valid BUT the modulator will not permit that particular parameter to be changed at this time, the Target will acknowledge the message by replying, for example, with TFQ* (with message arguments).
# (ASCI code 35)	If the Controller sends a correctly formatted command BUT the modem is in local mode, it will not allow reconfiguration and will respond with TFQ#
~ (ASCI code 126)	If a message was sent via a local modem to a distant end device or ODU, the message was transmitted transparently through the local modem. In the event of the distant-end device not responding, the local modem would generate a response. Example: 0001/RET~ (indicating that it had finished waiting for a response and was now ready for further comms).
+ (ASCII Code 43)	This is similar to the = code (acknowledgement). However, the + code is used to indicate that a command has been accepted and processed, but additionally indicates that some other configuration parameter has also been modified. Example: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the modulation type from QPSK to 16-QAM by sending TMD=4. In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4). The Target will therefore respond with TMD+.
^ (ASCI code 94)	The ^ code indicates that the modem is in Remote mode, so serial remote control is not possible. There are two exceptions to this: • The LRS (Local/Remote Status) command is still active, and may be used to change the operating mode to local or to serial remote control. • For the CDM-570L, the FPL (Front Panel Lockout) command is active, and may be used to configure the Front Panel Lockout to be "No lockout" or "Active."

D.5.6 Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters 0 to 9 (ASCII codes 48 to 57), period (ASCII code 46) and comma (ASCII code 44), plus miscellaneous printable characters.

D.5.7 End Of Packet

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

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

Both indicate the valid termination of a packet.

D.6 Remote Commands / Queries

Index Notes:

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

Instruction Code column (Column "CODE") notes:

Where Instruction Code is bold/shaded (e.g., **XXX**): Indicates a **PRIORITY** parameter that overrides any lower priority parameters.

Where Instruction Code reads XXX^{L} = **CDM-570L only.**

Where Instruction Code reads XXX^{W} = **WAN Adaptation Option only.**

CODE	C	Q	PAGE
ABA	X	X	D-17
ACR^{W}		X	D-36
ADJ	X	X	D-18
ALA	X	X	D-34
APP	X	X	D-18
AUP	X	X	D-18
BAD^{L}	X	X	D-31
BCE^{L}	X	X	D-31
BCH^{L}	X	X	D-31
BCL^{L}	X	X	D-32
BDC^{L}		X	D-32
BDV^{L}		X	D-32
BER		X	D-15
BFR^{L}	X	X	D-32
BFS		X	D-18
BLO^{L}	X	X	D-32
BOE^{L}	X	X	D-32
BOL^{L}		X	D-32
BPA^{L}		X	D-33
BPC^{L}	X	X	D-33
BSV^{L}		X	D-33
BUT^{L}		X	D-33

CODE	C	Q	PAGE
CAE	X		D-18
CAS	X		D-19
CEX	X	X	D-19
CID	X	X	D-19
CLD	X		D-19
CST	X		D-19
CTD	X	X	D-20
DAY	X	X	D-20
DCH^{W}	X	X	D-36
DNI^{W}	X	X	D-36
EBA	X	X	D-20
EBN		X	D-15
EFM	X	X	D-20
EID		X	D-21
ERF	X	X	D-20
ESA	X	X	D-22
FLT		X	D-22
FPL	X	X	D-11
FRB	X		D-23
FRM	X	X	D-9
FRW		X	D-24
FSW	X		D-23

CODE	C	Q	PAGE
ICH^{W}	X	X	D-36
IEP	X		D-24
IMG	X	X	D-24
IPA	X	X	D-24
ISP	X		D-24
ITF	X	X	D-9
LBO	X	X	D-25
LCH^{L}	X	X	D-34
LCL^{L}	X	X	D-34
LDC^{L}		X	D-34
LDV^{L}		X	D-34
LFR^{L}	X	X	D-34
LLO^{L}	X	X	D-35
LPC^{L}	X	X	D-35
LRS	X	X	D-25
MGC	X	X	D-30
MSK	X	X	D-25
NUE		X	D-25
NUS		X	D-26

CODE	C	Q	PAGE
ODU	X	X	D-26
OGC^{L}	X	X	D-29
PLI		X	D-11
RBS	X	X	D-16
RCB	X		D-26
RCR	X	X	D-15
RDI	X	X	D-14
RDR	X	X	D-15
RDS	X	X	D-16
REB		X	D-24
RED		X	D-24
RFO		X	D-24
RFQ	X	X	D-16
RFT	X	X	D-14
RMD	X	X	D-14
RNE		X	D-26
RNS		X	D-27
RSI	X	X	D-16
RSL		X	D-17
RSR		X	D-17
RSW	X	X	D-17
RTS	X	X	D-27

CODE	C	Q	PAGE
SNO		X	D-26
SSI	X	X	D-27
SWR		X	D-28
TCK	X	X	D-11
TCR	X	X	D-10
TDI	X	X	D-11
TDR	X	X	D-10
TFQ	X	X	D-11
TFT	X	X	D-10
TIM	X	X	D-28
TMD	X	X	D-10
TMP		X	D-28
TPL	X	X	D-12
TRF^{L}		X	D-12
TSC	X	X	D-12
TSI	X	X	D-12
TSR		X	D-12
TST	X	X	D-28
TTF^{L}		X	D-12
TXO	X	X	D-13
VFW		X	D-28
WUD	X	X	D-29

Section D.6.X Notes:

1. The remote commands and queries are arranged as subsections of this chapter as follows:
   - Sect. D.6.1 Transmit (Tx) Commands and Queries
   - Sect. D.6.2 Receive (Rx) Commands and Queries
   - Sect. D.6.3 Unit Commands and Queries
   - Sect. D.6.4 Bulk Commands and Queries
   - Sect. D.6.5 BUC Commands and Queries (CDM-570L ONLY)
   - Sect. D.6.6 LNB Commands and Queries (CDM-570L ONLY)
   - Sect. D.6.7 WAN Adaptation Option Commands and Queries

2. A command/query that is unique to the CDM-570L is noted in the **'Parameter Type'** column as **(CDM-570L ONLY)**.

   Similarly, a command/query that is unique to the CDM-570 is noted in the **'Parameter Type'** column as **(CDM-570 ONLY)**.

   For commands and queries common to both the CDM-570/570L, any operational difference is noted accordingly in the **'Description of Arguments'** column.

3. The following codes are used in the 'Response to Command' column (see **Sect. D.5.5** for further details):

=	Message ok
?	Received ok, but invalid arguments found
*	Message ok, but not permitted in current mode
#	Message ok, but unit is not in **Remote** mode
~	Time out of an EDMAC pass-through message
+	Warning. Command accepted, but other parameters were additionally changed

D.6.1 Transmit (Tx) Commands and Queries

Tx Priority System = ITF (Highest priority), FRM, TFT, TMD, TCR, and TDR (Lowest Priority), indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Interface Type	ITF=	1 byte, value of 0 thru 8	Command or Query. Terrestrial interface type, where: 0=EIA-422/EIA530 DCE 1=V.35 DCE 2=EIA-232 (sync). 3= G.703 T1 AMI (forces Rx and Tx data rates to 1544 kbps) 4= G.703 T1 B8ZS (forces Rx and Tx data rates to 1544 kbps) 5= G.703 E1 Unbal AMI (forces Rx and Tx rates to 2048 kbps) 6= G.703 E1 Unbal HDB3 (forces Rx and Tx rates to 2048 kbps) 7= G.703 E1 Bal AMI (forces Rx and Tx rates to 2048 kbps) 8= G.703 E1 Bal HDB3 (forces Rx and Tx rates to 2048 kbps) 9 = IP Interface A= WAN Adaptation Unbal AMI * B= WAN Adaptation Unbal HDB3 * C= WAN Adaptation Bal AMI * D= WAN Adaptation Bal HDB3 * * A-D require the compression coprocessor card to be installed in the expansion slot. Data rates are limited to 1024kbps All other codes invalid. Example: ITF=2 (V.35) Note: When ITF is set to be G.703, Clock Extension Mode is automatically set to be 0=None. Reply: ITF+	ITF= ITF? ITF* ITF# ITF+	ITF?	ITF =x (see Description of Arguments)
Unit Framing Mode	FRM=	1 byte, value of 0 or 1	Command or Query. Unit operating mode, where: 0=Unframed 1= EDMAC Framing 2= EDMAC-2 Framing Example: FRM=1 (which is framed)	FRM= FRM? FRM* FRM# FRM+	FRM?	FRM=x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx FEC Type	TFT=	1 byte, value of 0 thru 6	Command or Query. Tx FEC coding type, where: 0=None (uncoded - no FEC) (Forces TCR=7 1/1) with differential encoding ON 1=Viterbi 2=Viterbi + Reed-Solomon 3=Reserved – do not use 4= Reserved – do not use 5=TCM + Reed-Solomon (Forces TCR=3 2/3) 6=Turbo Example: TFT=1 (which is Viterbi coding)	TFT= TFT? TFT* TFT# TFT+	TFT?	TFT=x (see Description of Arguments)
Tx Modulation Type	TMD=	1 byte, value of 0 thru 5	Command or Query. Tx Modulation type, where: 0=BPSK 1=QPSK 2=OQPSK 3=8PSK 4=16-QAM (Turbo or Viterbi + RS only) 5=8-QAM (Future option) Depending on FEC type, not all of these selections will be valid. Example: TMD=2 (which is OQPSK)	TMD= TMD? TMD* TMD# TMD+	TMD?	TMD=x (see Description of Arguments)
Tx FEC Code Rate	TCR=	1 byte, value of 0 thru 7	Command or Query. Tx Code Rate, where: 0 = Rate 5/16 (Turbo Only) 1 = Rate 21/44 (Turbo Only) 2 = Rate 1/2 3 = Rate 2/3 (8-PSK TCM or 8-QAM only) 4 = Rate 3/4 5 = Rate 7/8 6 = Rate 0.95 (Turbo Only) 7 = Rate 1/1 (Uncoded or No FEC) Depending on FEC and Modulation type, not all of these selections will be valid. Example: TCR=4 (which is Rate 3/4)	TCR= TCR? TCR* TCR# TCR+	TCR?	TCR=x (see Description of Arguments)
Tx Data Rate	TDR=	8 bytes	Command or Query. Tx Data rate, in kbps, between 2.4 kbps and 9.98 Mbps Resolution=1 bps. Example: TDR=2047.999 (which is 2047.999 kbps)	TDR= TDR? TDR* TDR#	TDR?	TDR=xxxx.xxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Front Panel Lockout	FPL=	1 byte, value of 0 or 1	Command or Query. Control the state of front panel lockout, where: 0=no lockout 1=front panel lockout active Disable the lockout by either FPL=0, or by setting into local mode using LRS=0 (response is LRS+ meaning FPL is disabled at the same time) **Note:** When using the Optional IP Module Command Line Interface (CLI), to verify CLI lockout: <0/FPL? >0000/FPL=0 (Lockout disabled) *or* >0000/FPL=1 (Lockout enabled)	FPL= FPL? FPL* FPL#	FPL?	FPL=x (see Description of Arguments)
Tx Power Level Increase	N/A	3 bytes	Query only. Returns the increase in Tx power level, in dB (from the nominal setting) due to the action of AUPC. Range is 0.0 to 9.9 dB Responds x.x if AUPC is disabled. **Example:** PLI=2.3	N/A	PLI?	PLI=x.x (see Description of Arguments)
Tx Clock Source	TCK=	1 byte, value of 0 thru 2	Command or Query. Tx Clock Source, where: 0=Internal 1=Tx Terrestrial 2= Loop-Timed **Note:** When TCK is changed from Internal to Non-Internal, Clock Extension Mode will be automatically changed to 0=None if it was 1=TxLock. Reply: TCK+ **Example:** TCK=0 (selects Internal)	TCK= TCK? TCK* TCK#	TCK?	TCK=x (see Description of Arguments)
Tx Data Invert	TDI=	1 byte, value 0 or 1	Command or Query. Invert Transmit Data, where: 0=Normal 1=Inverted **Example:** TDI=1 (selects Inverted TX Data)	TDI= TDI? TDI* TDI#	TDI?	TDI=x (see Description of Arguments)
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency, where: **CDM-570L:** 950 to 1950 MHz **CDM-570:** 50 to 90 and 100 - 180 MHz Resolution=100 Hz **Example:** TFQ=0950.9872 **Example:** TFQ=0073.4528	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Power Level	TPL=	4 bytes	Command or Query. (Command not valid in AUPC mode) Tx Output power level, where: CDM-570L: 0 to -40 dBm (minus sign assumed). CDM-570: 0 to -25 dBm (minus sign assumed). **Example:** TPL=13.4	TPL= TPL? TPL* TPL#	TPL?	TPL=xx.x (see Description of Arguments)
Terminal Rx Frequency	N/A	10 bytes	Query only – CDM-570L only. Terminal Rx Frequency, where frequency = LNB LO ± RFQ Resolution=100 Hz Returns 00000.0000 if LNB LO is zero **Example:** TRF=11650.2249	N/A	TRF?	TRF=xxxxx.xxxx (see Description of Arguments)
Tx Scrambler	TSC=	1 byte, value of 0, 1 or 2	Command or Query. Tx Scrambler state, where: 0=Off 1=On (default scrambler type) 2 = On - IESS-315 (Turbo only) **Example:** TSC=1 (Scrambler On)	TSC= TSC? TSC* TSC#	TSC?	TSC=x (see Description of Arguments)
Tx Spectrum Invert	TSI=	1 byte, value of 0 or 1	Command or Query. Tx Spectrum Invert selection, where: 0=Normal, 1=Tx Spectrum Inverted **Example:** TSI=0 (which is normal)	TSI= TSI? TSI* TSI#	TSI?	TSI=x (see Description of Arguments)
Tx Symbol Rate	N/A	8 bytes	Query only. Tx Symbol rate, in ksymbols/sec, between 4.8 ksps and 3.00 Msps Resolution = 1 sps. **Example:** TSR=2047.999 (which is 2047.999 ksymbols/sec)	N/A	TSR?	TSR=xxxx.xxx (see Description of Arguments)
Terminal Tx Frequency	N/A	10 bytes	Query only – CDM-570L only. Terminal Tx Frequency, where frequency = BUC LO ± TFQ Resolution=100 Hz Returns 00000.0000 if LNB LO is zero **Example:** TTF=14250.9872	N/A	TTF?	TTF=xxxxx.xxxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Carrier State	TXO=	1 byte, value 0 thru 4	Command or Query. Tx Carrier State, where: 0=OFF due to front panel or remote control command 1=ON 2=RTI (receive/transmit inhibit) 3=OFF due to ext H/W Tx Carrier Off command (not a valid argument when used as a command) 4=OFF due to BUC warm up delay (not a valid argument in a command format.) 5=RTI (receive/transmit inhibit), timeout = 1 second 6=RTI (receive/transmit inhibit), timeout = 2 seconds 7=RTI (receive/transmit inhibit), timeout = 4 seconds 8=RTI (receive/transmit inhibit), timeout = 7 seconds Example: TXO=1 (Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO?	TXO=x (see Description of Arguments)

D.6.2 Receive (Rx) Commands and Queries

Rx Priority System = RFT (Highest priority), RMD, RCR, and RDR (Lowest Priority), indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx FEC Type	RFT=	1 byte, value of 0 thru 6	Command or Query. Rx FEC Type, where: 0=None (uncoded – no FEC) with differential encoding ON 1=Viterbi 2=Viterbi + Reed-Solomon 3= Reserved – do not use 4= Reserved – do not use 5=TCM + Reed-Solomon 6=Turbo Example: RFT=1 (which is Viterbi only)	RFT= RFT? RFT* RFT# RFT+	RFT?	RFT=x (same format as command argument)
Rx Demod type	RMD=	1 byte, value of 0 thru 5	Command or Query. Rx Demodulation, where: 0=BPSK 1=QPSK 2=OQPSK 3=8PSK 4=16QAM (Turbo or Viterbi + RS only) 5=8-QAM (Future option) Depending on FEC type, not all of these selections will be valid. All other codes are invalid. Example: RMD=2 (selects OQPSK)	RMD= RMD? RMD* RMD# RMD+	RMD?	RMD=x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx FEC Code Rate	RCR=	1 byte, value of 0 thru 7	Command or Query. Rx FEC Code Rate, where: 0 = Rate 5/16 (Turbo Only) 1 = Rate 21/44 (Turbo Only) 2 = Rate 1/2 3 = Rate 2/3 (8-PSK TCM or 8-QAM only) 4 = Rate 3/4 5 = Rate 7/8 6 = Rate 0.95 (Turbo Only) 7 = Rate 1/1 (Uncoded or No FEC) Depending on FEC and demodulation type, not all of these selections will be valid. Example: RCR=1 (selects Rate 3/4)	RCR= RCR? RCR* RCR# RCR+	RCR?	RCR=x (see Description of Arguments)
Rx Data Rate	RDR=	8 bytes	Command or Query. Rx Data Rate, in kbps, between 2.4 kbps to 9.98 Mbps. Resolution=1 bps Example: RDR=2047.999	RDR= RDR? RDR* RDR#	RDR?	RDR=xxxx.xxx (see Description of Arguments)
Rx BER	N/A	5 bytes	Query only. Value of the estimated corrected BER is returned in the form a.b x 10^{-c} where: a.b = value, $^{-c}$ L= exponent. Returns 99999 if the demodulator is unlocked. Example: BER=4.8E3 (which is BER = 4.8 x 10^{-3})	N/A	BER?	BER=a.bEc (see description of arguments)
Rx Eb/No	N/A	4 bytes	Query only. The value of Eb/No, between 0 and 16 dB, is returned. Resolution 0.1 dB. Returns 99.9 if demod is unlocked. For values greater than 16.0 dB, the reply will be: EBN=+016 Example: EBN=12.3 (Eb/No = 12.3 dB)	N/A	EBN?	EBN=xxxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Buffer Size	RBS=	1 byte, value of 0 thru 9	Command or Query. Rx buffer size, where: 0 = Buffer disabled (Clock mode = Rx satellite) 1 = +/- 1024 bits 2 = +/- 2048 bits 3 = +/- 4096 bits 4 = +/- 8192 bits 5 = +/- 16384 bits 6 = +/- 32768 bits 7 = +/- 128 bits 8 = +/- 256 bits 9 = +/- 512 bits Example: RBS=0	RBS= RBS? RBS* RBS#	RBS?	RBS=x (same format as command argument)
Rx Descrambler	RDS=	1 byte, value of 0, 1 or 2	Command or Query. Rx Descrambler state, where: 0=Off 1=On (default descrambler type) 2 = On - IESS-315 (Turbo only) Example: RDS=1 (Scrambler On)	RDS= RDS? RDS* RDS#	RDS?	RDS=x (see Description of Arguments)
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency, where: CDM-570L: 950 to 1950 MHz CDM-570: 50 to 90 and 100 - 180 MHz Resolution=100 Hz Example: RFQ=0950.9872 Example: RFQ=0073.4528	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx (see Description of Arguments)
Rx Spectrum Invert	RSI=	1 byte, value of 0 or 1	Command or Query. Rx Spectrum Invert, where: 0=Normal 1=Rx Spectrum Invert Example: RSI=0 (selects Normal)	RSI= RSI? RSI* RSI#	RSI?	RSI=x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Signal Level	N/A	4 bytes	Query Only. Unit returns the value of the Rx signal level, in dBm, between –5 and –99 dBm, in the form ccxx, where: cc = code (GT=Greater Than; LT=Less Than, == is 'equal to') xx = value (the '-' sign is implied) Examples: RSL=LT99 (Rx signal level is less than -99 dBm) RSL===41 (Rx signal level is equal to -41 dBm)	N/A	RSL?	RSL=ccxx (see description of arguments)
Rx Symbol Rate	N/A	8 bytes	Query only. Rx Symbol rate, in ksymbols/sec, between 4.8 ksps and 3.00 Msps Resolution = 1 sps. Example: RSR=2047.999 (2047.999 ksymbols/sec)	N/A	RSR?	RSR=xxxx.xxx (see Description of Arguments)
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 32 kHz (rates < 625 ksym/second) or ± 1 to ± 200 kHz (rates >= 625 ksym/second) CDM-570L only Example: RSW=009 (selects ± 9 kHz)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (see Description of Arguments)

D.6.3 Unit Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Internal 10MHz Reference Adjustment	ADJ=	4 bytes, numeric	Command or Query. This command provides fine adjustment of the Internal 10MHz Reference on the modem, in the form sddd, where: s = sign (+ or –) ddd = value, 0-999	ADJ= ADJ? ADJ* ADJ#	ADJ?	ADJ=sddd (see Description of Arguments)
AUPC Parameters	APP=	6 bytes	Command or Query. (Command not valid in Manual mode). Defines AUPC operating parameters, in the form abc.cd, where: a=Defines action on max. power condition. (0=do nothing, 1=generate Tx alarm) b=Defines action on remote demod unlock. (0=go to nominal power, 1=go to max power) c.c=Target Eb/No value, for remote demod, from 0.0 to 14.9 dB, where numbers above 9.9 use hex representation for the 1 st character, ie 14.9 is coded as E.9. d =Max increase in Tx Power permitted, from 0 to 9 dB Example: APP=015.67 (Sets no alarm, max power, 5.6 dB Target and 7 dB power increase.)	APP= APP? APP* APP#	APP?	APP=abc.cd (see Description of Arguments)
AUPC Enable	AUP=	1 byte, value of 0 or 1	Command or Query. AUPC mode enable/disable, where: 0=Disabled 1=Enabled Note: EDMAC framing must be selected for the AUPC feature to work. Example: AUP=1	AUP= AUP? AUP* AUP#	AUP?	AUP=x (see Description of Arguments)
Buffer Fill State	N/A	2 bytes	Query only. Value of the buffer fill state is returned, between 1 to 99%. Returns 00 if demodulator is unlocked. Example: BFS=33 (33%)	N/A	BFS?	BFS=xx (see description of arguments)
Clear All Stored Events	CAE=	None	Command only. Forces the software to clear the software events log. Note: This command takes no arguments. Example: CAE=	CAE= CAE? CAE* CAE#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Clear All Stored Statistics	CAS=	None	Command only. Forces the software to clear the software statistics log. **Note:** This command takes no arguments. **Example:** CAS=	CAS= CAS? CAS* CAS#	N/A	N/A
G.703 Clock Extension	CEX	2 byte	Command or Query. G.703 Clock Extension in the form ab, where: a=G.703 Clock Extension Mode (0=None; 1=TxLock; 2=RxEnable) b=G.703 Clock Extension Interface (0=T1; 1=E1Bal; 2=E1Unbal) **Example:** CEX=12 (Sets Tx Lock to E1 Unbalanced) **Notes:** 1. Not all CEX modes are valid all the time. 2. For argument a: When Data Interface (ITF) is set to be G.703, Clock Extension Mode is automatically set to be 0=None. Reply: ITF+ When Tx Clock (TCK) is changed from Internal to Non-Internal, Clock Extension Mode will be automatically changed to 0=None if it was 1=TxLock. Reply: TCK+	CEX= CEX? CEX* CEX#	CEX?	CEX=ab (see Description of Arguments)
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: [Space] ( ) * + – , . / 0 thru 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxxx (see Description of Arguments)
Configuration Load	CLD=	1 byte	Command only. Causes the CDM570L to retrieve a previously stored modem configuration from Configuration Memory location defined by the one-byte argument (0-9). **Example:** CLD=4 (retrieve modem configuration from location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
Configuration Save	CST=	1 byte	Command only. Causes the CDM570L to store the current modem configuration in Configuration Memory location defined by the one-byte argument (0- 9). **Example:** CST=4 (store the current configuration in location 4)	CST= CST? CST* CST#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Countdown	CTD=	3 bytes	Command or Query. As a **command**, only takes the argument 000. Used to truncate the Warm-up delay period to zero, forcing the unit into 'instant-on' mode. As a **query**, returns the Warm-up Delay countdown, in seconds remaining. Range is from 000 to 200 seconds. CTD=000 terminates the warm-up delay. **Example:** CTD? responds with CTD=067, meaning the unit will wait another 67 seconds before it will enter an operational state.	CTD= CTD? CTD* CTD#	CTD?	CTD=xxx (see Description of Arguments)
RTC Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy (see Description of Arguments)
Eb/No Alarm Point	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB **Example:** EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (see Description of Arguments)
EDMAC Framing Mode	EFM=	1 byte, value of 0, 1 or 2	Command or Query. EDMAC mode, where: 0 = EDMAC OFF (Framing is on, AUPC active) 1 = EDMAC MASTER 2 = EDMAC SLAVE (Query Only) **Example:** EFM=1 (EDMAC Enabled as Master)	EFM= EFM? EFM* EFM#	EFM?	EFM=x (see Description of Arguments)
External Reference Frequency	ERF=	1 byte, value of 0 thru 5	Command or Query. External Reference Frequency, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (External reference not used - uses internal)	ERF= ERF? ERF * ERF #	ERF?	ERF =x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Equipment ID	N/A	11 bytes	Query only. Unit returns information concerning the equipment identification, and the option field, in the form abbbcdefghi; where: a = Turbo option: 0 = None, 1 = Turbo bbb defines the modem model number: CDM-570 = 570, CDM-570L = 571 c = Expansion slot: 0 = None 1 = Reed-Solomon codec installed 2 = WAd card installed d = Data Rate Option: 0 = Base (512 kbps) 1 = up to 2048 kbps 2 = up to 5000 kbps 3 = up to 9980 kbps e = Higher-order modulation: 0 = None 1 = 8-PSK/8-QAM 2 = 16QAM 3 = 8-PSK/8-QAM and 16QAM f = IP Module: 0 = None 1 = Installed g = BUC option: 0 = None 1 = 100 Watt 2 = 150 Watt h = G.703 Clock Extension: 0 = None 1 = Installed i = G.703 Line Interface 0 = None 1 = Installed Example: EID=1571013111x means Turbo, CDM-570L, no RS codec, no WAd card installed, up to 2048bps, 8-PSK/8-QAM and 16-QAM, IP Module installed, 100 Watt BUC supply installed, G.703 Clock Extension option installed	N/A	EID?	EID= abbbcdefghi (see Description of Arguments) 570 is the CDM-570 571 is the CDM-570L

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
EDMAC Slave Address Range	ESA=	4 bytes	Command or Query. **This command is only valid for an EDMAC master.** When used as a Query, it may be sent to an EDMAC slave, which will respond with the appropriate address. EDMAC Slave Address Range - sets the range of addresses of distant-end units (modems or transceivers) for which this unit, as the Master, will forward messages. Only values which are integer multiples of ten are permitted. (0010, 0020, 0030, 0040, etc.). Example: ESA=0090	ESA= ESA? ESA* ESA#	ESA?	ESA=xxxx (see Description of Arguments)
Faults and Status	N/A	6 bytes	Query only. Unit returns the current *highest-priority* fault and status codes for the Unit (hardware), Tx Traffic, Rx Traffic and ODU in the form abcdef, where: a = Unit faults: 0 = No faults 1 = Power supply fault, +5 volts 2 = Power supply fault , +12 volts 3 = Power supply fault, –5 volts 4 = Power supply fault, +23 volts 5 = Power supply fault, –12 volts 6 = Tx synthesizer lock 7 = Rx 1st LO synthesizer lock 8 = Rx 2nd LO synthesizer Lock 9 = Ref PLL lock D = WAd HW Fault E = IP Module F = EEPROM checksum error A, B, and C are TBD (for future expansion) b = Tx Traffic status: 0 = Tx traffic OK 1 = No clock from terrestrial interface 3 = Tx FIFO slip 4 = G.703 Loss of Signal (only valid in Clock Extend Mode) 5 = Loss of External Reference 7 = AUPC upper limit reached 9 = AIS detected on incoming data A = WAd E1 sync loss B = Bipolar violation on G.703 interface C = BUC Alarm (if attached)	N/A	FLT?	FLT=abcdef (see Description of Arguments for details) e=Change in fault status since last poll. f=Change in unit configuration since last poll (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status (cont.)			2, 6, and 8 are TBD (for future expansion) c = Rx Traffic status: 0 = Rx Traffic OK 1 = Demodulator unlocked 3 = AGC Alarm - signal out of range 5 = RS Frame sync alarm 6 = WAd Idle detected 7 = EDMAC Frame sync alarm 8 = WAd DFFL Overflow 9 = WAd Rx sync loss A = Buffer Underflow B = Buffer Overflow C = WAd Buffer sync error D = Eb/No alarm E = LNB Alarm (if attached) F = AIS detected on incoming data 2 and 4 are TBD (for future expansion) d = ODU status: 0=No ODU faults 1=BUC PLL 3=BUC current 5=BUC voltage 7=LNB current 9=LNB voltage B=BUC temperature D=BUC checksum 2, 4, 6, 8, A, and C are TBD (for future expansion)			
Force Reboot	FRB=	None	Command only. Force a hard reset of the unit in 5 seconds.	FRB= FRB? FRB* FRB#	N/A	N/A
Force 1:1 Switch	FSW=	None	Command only. This command takes no arguments. Forces the unit to toggle the Unit Fail relay to the 'fail' state for approx 500ms. If the unit is a 1:1 pair, and it is currently the 'On Line' unit, this will force a switchover, so the unit will then be in 'Standby' mode. The command is always executed by the unit, regardless of whether it is stand-alone, in a 1:1 pair, or part of a 1:N system.	FSW= (message ok)	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Software Information	N/A	variable	Query only. Complete unit software information. ****Note:** If the WAd card is installed, this will show information specific to the WAd FPGA load. If the WAd card is **not** installed, Reed-Solomon FPGA information is provided here. **Example:** FRW= Boot: FW/10804-1-,1.1.1,03/30/04 Bulk1: FW/10805AH,1.7.0,08/14/09 FW/10806-1AH,1.7.0,08/14/09 FW/10807-1L,1.7.0,08/14/09 FW/10808-1G,1.1.8,02/14/06 FW-0000270-,1.1.1,08/14/09 ****see Note** Bulk2: FW/10805AH,1.7.0,08/14/09 FW/10806-1AH,1.7.0,08/14/09 FW/10807-1L,1.7.0,08/14/09 FW/10808-1G,1.1.8,02/14/06 FW-0000270-,1.1.1,08/14/09 ****see Note**	N/A	FRW?	FRW=x….x (see Description of Arguments)
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP#	N/A	N/A
Software Image	IMG=	1 byte, value of 1 or 2	Command or Query. Current Active software image, where: 1=Bulk Image # 1 currently active 2=Bulk Image # 2 currently active **Example:** IMG=1 (Image #1 active)	IMG= IMG? IMG* IMG#	IMG?	IMG=x (see Description of Arguments)
IP Address	IPA=	18 bytes, numerical	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseT Ethernet management port, in the form xx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address yy is the network prefix (8-30) **Example:** 010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xx.xxx.xxx.xxx.yy (see Description of Arguments)
Initialize Statistics Pointer	ISP=	None	Command only. Resets internal pointer to allow RNS? queries to start at the beginning of the statistics log.	ISP= ISP#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
T1 Line Build-Out	LBO=	1 byte, value of 0 thru 4	Command or Query. Valid only for T1 interface, where 0 = 0-133 feet 1 = 133-266 feet 2 = 266-399 feet 3 = 399-533 feet 4 = 533-655 feet Example: LBO=2 (In all other modes other thanT1, this is a don't care.)	LBO= LBO? LBO * LBO #	LBO?	LBO=x (see Description of Arguments)
Local/Remote Status	LRS=	1 byte, value of 0, 1 or 3	Command or Query. Local/Remote status, where: 0=Local 1=Serial Remote 3 = Ethernet Remote Example: LRS=1 (Serial Remote)	LRS= LRS? LRS* LRS# LRS+	LRS?	LRS=x (see Description of Arguments)
Unit Alarm Mask	MSK=	12 bytes	Command or Query. Alarm mask conditions, provides response of 0 (unmasked/active) or 1 (masked) for each parameter, in form abcdefghijkl, where: a =Tx FIFO b=G.703 BPV c=Tx-AIS d=Rx AGC Alarm e=Eb/No Alarm f=Rx-AIS g=Buffer slip h=Ext Reference alarm i=BUC alarm j=LNB alarm k=G.703 Loss of Signal alarm (0 = unmasked, 1 = masked) l= WAd Rx Alarms Note: For argument k, if G703 CEx FAST option is not installed or Tx clock is not Internal, only 1=masked is allowed. Example: MSK=1110011100	MSK= MSK? MSK* MSK#	MSK?	MSK=abcdefghijkl (see Description of Arguments)
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the number of stored events that remain unread, in the form xxx. Note: This means unread over the remote control. Example: NUE=126	N/A	NUE?	NUE=xxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Number of Unread stored Statistics	N/A	3 bytes	Query only. Unit returns the number of stored statistics that remain Unread, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUS=247	N/A	NUS?	NUS=xxx (see Description of Arguments)
Outdoor Unit Comms Enable	ODU=	1 byte, value of 0 or 1	Command or Query – **CDM-570 Only.** Enables or disables communications, via the FSK link, with a Comtech EF Data transceiver (ODU), where: 0=Disabled 1=Enabled **Example:** ODU=0 (selects Disabled)	ODU= ODU? ODU* ODU#	ODU?	ODU=x (see Description of Arguments)
ReCenter Buffer	RCB=	None	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer. **Note:** This command takes no arguments. **Example:** RCB=	RCB= RCB? RCB* RCB#	N/A	N/A
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss, A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=ODU 5= Power on/off, or log cleared C is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	N/A	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss (see description for details of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Retrieve next 5 unread Stored Statistics	N/A	130 bytes	Query only. Unit returns the oldest 5 Stored Statistics, which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= AA.ABB.BC.CD.Dddmmyyhhmmss, AA.A=Minimum Eb/No during sample period. BB.B=Average Eb/No during sample period. C.C=Max. Tx Power Level Increase during sample period. D.D=Average Tx Power Level Increase during sample period. ddmmyyhhmmss = date/time stamp. If there are no new events, the unit replies with RNS*. If there are less than 5 statistics to be retrieved, the remaining positions are padded with zeros.	N/A	RNS?	RNS={CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss (see description for details of arguments)
Request to Send	RTS=	1 byte, value of 0 thru 3	Command or Query. Defines how RTS/CTS will operate at the main data interface 0 = RTS/CTS Loop, No Action RTS and CTS are looped, so that CTS echoes the state of RTS, but RTS does not control the ON/OFF state of the carrier 1 = Loop, RTS Controls Tx O/P RTS and CTS are looped, so that CTS echoes the state of RTS, and RTS controls the ON/OFF state of the carrier (in other words, the modem will not bring up its TX carrier until RTS is asserted.) 2 = Ignore RTS, Assert CTS 3 = 1:N system in use. RTS/CTS ignored (Query only) RTS is ignored, and CTS is asserted unconditionally. **Example:** RTS=0 (RTS/CTS Loop, No Action).	RTS= RTS? RTS* RTS#	RTS?	RTS=x (see Description of Arguments)
Statistics Sample Interval	SSI=	1 byte, numerical	Command or Query. Sets sample interval for the Statistics Logging Function in the form x, where: x= 0 to 9 in 10 minute steps. **Note:** Setting this parameter to 0 disables the statistics logging function. **Example:** SSI=3 (30 minutes)	SSI= SSI? SSI* SSI#	SSI?	SSI=x (see description for details of argument)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Software Revision	N/A	34-37 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form : Boot:x.y.z Bulk1:x.y.z Bulk2:x.y.z or Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz	N/A	SWR?	SWR=Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz (see description of arguments)
RTC Time	TIM=	6 bytes	Command or Query. A time in the form hhmmss, indicating the time from midnight, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) Example: TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss (see Description of Arguments)
Temperature	N/A	3 bytes	Query only. Returns value of the unit internal temperature, in degrees C, in the form sxx, where: s = sign (+ or - character) xx = value Example: TMP=+26	N/A	TMP?	TMP=sxx (see Description of Arguments)
Unit Test Mode	TST=	1 byte, value of 0 thru 6	Command or Query. CDM-570L Test Mode, where: 0= Normal Mode (no test) 1=IF Loopback 2=Digital Loopback 3=I/O Loopback 4=RF Loopback 5=Tx CW 6=Tx Alternating 1,0 Pattern Example: TST=1 (IF Loopback)	TST= TST? TST* TST#	TST?	TST=x (see Description of Arguments)
Viterbi Firmware Version	VFW=	6 bytes	Query only. Used to query Viterbi chips firmware version. Response format: VFW=Q1900 for modem with Qual Comm. Q1900 Viterbi chip VFW=aa.b.c for modem with Alteva Viterbi chip, where: aa.b.c = the chip's FPGA firmware version aa=major version b=minor version c=revision Example: VFW=01.0.1	VFW= VFW? VFW * VFW #	VFW?	VFW=xxxxxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Warm-up Delay	WUD=	1 byte, value 0 or 1	Command or Query. Warm-up Delay for internal frequency reference (OCXO) 0=Disabled (instant on – no delay for OCXO to reach temperature) 1=Enabled (unit waits until OCXO reaches correct temperature) Example: WUD=1 (selects Warm-up Delay)	WUD= WUD? WUD* WUD#	WUD?	WUD=x (see Description of Arguments)

D.6.4 Bulk Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
OGC Outdoor Unit Global Configuration	OGC=	50 Bytes	Command or Query – CDM-570L only. ODU Global Configuration of CDM-570L in the form aabcdexxxxhhhhiiiijjjjjkxxxxxxlmnnnooopppppqxxxxxx, where: aa = BUC Address same as BAD b = BUC FSK comms enable same as BCE c = BUC Power Control same as BPC d = BUC 10MHz Frequency Reference enable same as BFR e = BUC Tx Output Enable same as BOE xxxx = expansion bytes hhhh = BUC Low Alarm Limit same as BCL iiii = BUC High Alarm Limit same as BCH jjjjjk = BUC LO frequency, mix sign same as BLO xxxxxx = expansion bytes l = LNB Power Control m = LNB 10MHz Frequency Reference enable same as LPC nnn = LNB Low Alarm Limit same as LFR ooo = LNB High Alarm Limit same as LCL pppppq = LNB LO Frequency, mix sign same as LCH xxxxxx = expansion bytes same as LLO Any unavailable parameters will be filled with xxx.	OGC= OGC? OGC* OGC#	OGC? OGC?n	OGC=aabcdfxxxhhh hiiiijjjjjkxxxxxxlmnnn ooopppppqxxxxxx (see Description of Arguments) Where n=0 to 9 returns the OGC portion of 1 of 10 stored configurations (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Global Configuration	MGC=	115 bytes, with numerical entries, fixed values and delimiters	Command or Query. Global Configuration of CDM570L, in the form shown in the Response to Query column, where: a = Unit Interface Type — same as ITF b = T1 Line build-out — same as LBO c = Unit Framing mode — same as FRM dddd.dddd = Tx Frequency — same as TFQ e = Tx FEC Type — same as TFT f = Tx Modulation type — same as TMD g = Tx FEC Rate — same as TCR hhhh.hhh = Tx Data Rate — same as TDR i = Tx Spectrum Inversion — same as TSI j = Tx Scrambler State — same as TSC kk.k = Tx Power Level — same as TPL l = Tx Clock Source — same as TCK m = Tx Data Invert — same as TDI n = Tx Carrier State — same as TXO o = AUPC Enable — same as AUP ppp.pp = AUPC parameter setup — same as APP q = Warm-up delay — same as WUD rr = G.703 Clock Extension — same as CEX sssss = expansion bytes AAAA.AAAA = Rx Frequency — same as RFQ B = Rx FEC Type — same as RFT C = Rx Modulation Type — same as RMD D= Rx FEC Rate — same as RCR EEEE.EEE = Rx Data Rate — same as RDR F = Rx Spectrum Inversion — same as RSI G = Rx Descrambler state — same as RDS H = Rx Data Invert — same as RDI III = Rx Sweep Width — same as RSW JJ.J = Eb/No Alarm Point — same as EBA K = Rx Buffer Size — same as RBS LLLLLLLL = expansion bytes M = External Reference Frequency — same as ERF N = EDMAC Framing Mode — same as EFM OOOO = EDMAC Slave Address — same as ESA P = Unit test Mode (Read only) — same as TST QQQQQQQQQQQQ = Unit Alarm Mask — same as MSK	MGC= MGC? MGC* MGC#	MGC? MGC?n	MGC=abcdddd.ddddefghhhh.hhhijkk.klmnoppp.ppqqqqqqqqAAAA.AAAABCDEEEE.EEEFGHIIIJJ.JKLLLLLLLLMNOOOOPQQQQQQQQQQQQQRSTTTTTTTT (see Description of Arguments) Where n=0 to 9 Returns the MGC portion of 1 of 10 stored configurations (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Global Configuration (cont.)			R=RTS/CTS Control S = Statistics Sampling Interval T = Attach BUC Alarm to Tx Alarm U = Attach LNB Alarm to Rx Alarm VVVVVV = expansion bytes V = number of Tx channels for WAd W = number of Rx channels for WAd YYYY = expansion bytes Fill unused expansion bytes with 'x'	same as RTS same as SSI same as ABA same as ALA			

D.6.5 BUC Commands and Queries (CDM-570L ONLY)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC Address	BAD=	2 byte, value of 01 to 15	Command or Query. Indicates the BUC Address, in the form xx, where: xx = between 01 and 15. **Example:** BAD=03	BAD = BAD? BAD * BAD #	BAD?	BAD=xx (see Description of Arguments)
BUC Comms enable	BCE=	1 byte, value of 0 or 1	Command or Query. Enables or disables communications, via the FSK link, with an externally connected Block Up Converter (BUC), where: 0=Disabled 1=Enabled **Example:** BCE=0 (Disabled)	BCE= BCE? BCE* BCE#	BCE?	BCE=x (see Description of Arguments)
BUC High Current Limit	BCH=	4 bytes	Command or Query. BUC High Current Limit, in mA, the form xxxx, where: xxxx = between 500 and 4000 **Example:** BCH=3100	BCH= BCH? BCH* BCH#	BCH?	BCH=xxxx (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC Low Current Limit	BCL=	4 bytes	Command or Query. BUC Low Current Limit, in mA, the form xxxx, where: xxxx = between 0 and 3000 **Example:** BCL=0600	BCL= BCL? BCL* BCL#	BCL?	BCL=xxxx (see Description of Arguments)
BUC Current	N/A	4 bytes	Query only. BUC Current, in mA, in the form xxxx, where: xxxx = between 0 and 9999 If not available, response is 0000. **Example:** BDC=3100	N/A	BDC?	BDC=xxxx (see Description of Arguments)
BUC Voltage	N/A	4 bytes	Query only. BUC Voltage, in the form xx.x, where: xx.x = between 0 and 64.0 If not available, response is 00.0. **Example:** BDV=43.6 (BUC DC voltage is 43.6 volts)	N/A	BDV?	BDV=xx.x (see Description of Arguments)
BUC 10 MHz Reference	BFR=	1 byte, value of 0 or 1	Command or Query. BUC 10 MHz frequency reference, where: 0 = Disabled 1 = Enabled **Example:** BFR=0 (BUC 10MHz reference disabled)	BFR= BFR? BFR* BFR#	BFR?	BFR=x (see Description of Arguments)
BUC LO Frequency	BLO=	6 bytes	Command or Query. BUC Tx LO frequency information in the form xxxxxs, where: xxxxx = LO frequency, in the range of 3000 to 65000 MHz. All 0's (000000) disables the feature. s = sign for the mix (+ or - character) Terminal Frequency = BUC LO ± TFQ **Example:** BLO = 12000+ (BUC LO is 12 GHz, low-side mix)	BLO= BLO? BLO* BLO#	BLO?	BLO=xxxxxs (see Description of Arguments)
BUC Output Enable	BOE=	1 byte, value of 0 or 1	Command or Query. BUC Output, where: 0 = Off (output disabled) 1 = On (output enabled) **Example:** BOE=1 (BUC output is enabled)	BOE= BOE? BOE* BOE#	BOE?	BOE=x (see Description of Arguments)
BUC Output Power Level	N/A	4 bytes	Query only. BUC Output Power Level, in Watts, in the form xx.x. Returns 00.0 when FSK and BUC power are not enabled. **Example:** BOL=08.3 (BUC reports output power is 8.3 Watts)	N/A	BOL?	BOL=xx.x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC PLL Alarm	N/A	1 byte, value of 0 or 1	Query only. BUC PLL lock state, where: 1=Unlocked 0=Locked If not available, response is 9. **Note:** This command is only valid when the FSK and BUC power are turned On. **Example:** BPA=0 (BUC PLL is locked)	N/A	BPA?	BPA=x (see Description of Arguments)
BUC Power Control	BPC=	1 byte, value of 0 or 1	Command or Query – **CDM-570L only.** 0=Disable BUC DC Power 1=Enable BUC DC Power **Example:** BPC=0 (BUC DC power disabled)	BPC= BPC? BPC* BPC#	BPC?	BPC=x (see Description of Arguments)
BUC Software Version	N/A	2 bytes	Query only. Indicates the BUC software version, in the form xx. If not available, response is 00 **Note:** This command is only valid when the FSK and BUC power are turned On. **Example:** BSV=05 (Software version 05)	N/A	BSV?	BSV=xx (see Description of Arguments)
BUC Temperature	N/A	3 bytes	Query only. BUC temperature is returned, in the form sxx, where: s = sign (+ or - character) xx = value If not available, response is –99 **Note:** This query is only valid when the FSK and BUC power are turned On. **Example:** BUT=-13 (BUC temperature is -13 degrees C)	N/A	BUT?	BUT=sxx (see Description of Arguments)

D.6.6 LNB Commands and Queries (CDM-570L ONLY)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Attach LNB Alarm to Rx Alarm	ALA=	1 byte, value of 0 or 1	Command or Query. Attach LNB Alarm to Rx Alarm, where: 0 = No 1 = Yes **Example:** ALA=1 (Attach LNB Alarm to Rx Alarm)	ALA= ALA? ALA#	ALA?	ALA=x (see Description of Arguments)
LNB High current limit	LCH=	3 bytes	Command or Query. LNB upper alarm limit for current, in mA, in the form xxx, where: xxx = current value between 50 and 600 **Example:** LCH=450	LCH= LCH? LCH* LCH#	LCH?	LCH=xxx (see Description of Arguments)
LNB Low current limit	LCL=	3 bytes	Command or Query. LNB lower alarm limit for current, in mA, in the form xxx, where: xxx = current value between 10 and 400 **Example:** LCL=050	LCL= LCL? LCL* LCL#	LCL?	LCL=xxx (see Description of Arguments)
LNB Current	N/A	3 bytes	Query only. Indicates the value of the LNB Current, in mA, in the form xxx, where: xxx = current value between 0 and 999 If not available, response is 000. **Example:** LDC=210 (LNB DC current is 210 mA)	N/A	LDC?	LDC=xxx (see Description of Arguments)
LNB Voltage	N/A	4 bytes	Query only. Value of LNB Voltage is returned, in the form xx.x, where: xx.x = voltage value between 0 and 30.0 If not available, response is 00.0. **Example:** LDV=24.2 (LNB DC voltage is 24.2 volts)	N/A	LDV?	LDV=xx.x (see Description of Arguments)
LNB Frequency Reference enable	LFR=	1 byte, value of 0 or 1	Command or Query. 0=Disable LNB Reference 1=Enable LNB Reference **Example:** LFR=0 (LNB 10 MHz reference off)	LFR= LFR? LFR* LFR#	LFR?	LFR=x (see Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
LNB LO Frequency	LLO=	6 bytes	Command or Query. LNB Receive LO frequency information in the form xxxxxs, where: xxxxx = LO frequency, in the range of 3000 to 65000 MHz All 0's (000000) disables the feature. s is the sign for the mix (+ or - character) Terminal Frequency = LNB LO ± RFQ Example: LLO=06000- (LO is 6 GHz, high-side mix)	LLO= LLO? LLO* LLO#	LLO?	LLO=xxxxxs (see Description of Arguments)
LNB Power Control	LPC=	1 byte, value of 0 thru 3	Command or Query. LNB Power Control, where 0=Off 1=On, 13V LNB Voltage 2=On, 18V LNB Voltage 3=On, 24V LNB Voltage Example: LPC=1 (LNB power is On, 13 volts)	LPC= LPC? LPC* LPC#	LPC?	LPC=x (see Description of Arguments)

D.6.7 WAN Adaptation Option Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
WAN Adaptation ratio	N/A	5 bytes	Query only. Uncompressed the ratio will be 1.000. If compressed the value will be less than 1. If the interface is not configured for WAN Adaptation, the value returned will be xxxxx.	N/A	ACR?	ACR=x.xxx (see Description of Arguments)
WAN Adaptation Tx Channels	DCH=	1 byte	Command or Query. Set the number of Tx Channels, where: X=0 thru G for 0 to 16 channels.	DCH= DCH? DCH* DCH#	DCH?	DCH=x (see Description of Arguments)
WAN Adaptation Tx and Rx channel allocations	DNI=	33 bytes, each value may be 0 thru 9, A thru V or z	Command or Query. Format: DDDDDDDDDDDDDDDDJJJJJJJJJJJJJJJJL, where D is the timeslot of each of the 16 Tx channels J is the timeslot of each of the 16 Rx channels L= Insert loop: 0=off, 1=looped The channel is determined by position in the string. Each timeslot value may be: 0=timeslot 0 1=timeslot 1, etc… A=timeslot 10, B=timeslot 11, … V=timeslot 31 Example: DNI=123000000000000000123456789ABCDEFG0	DNI= DNI? DNI* DNI# DNI+	DNI? DNI?n	DNI=DDDDDDDDDDDDDDDDJJJJJJJJJJJJJJJJL (see Description of Arguments) Where n=0 to 9 Returns the DNI portion of 1 of 10 stored configurations (see Description of Arguments)
WAN Adaptation Rx Channels	ICH=	1 byte	Command or Query. Set the number of Rx Channels, where: X=0 thru G for 0 to 16 channels.	ICH= ICH? ICH* ICH#	ICH?	ICH=x (see Description of Arguments)

Appendix E. CDM/CDD NMCS PROTOCOL – REV 1.0

E.1 Revision History

Date	Rev	Author	Comments
10/4/2004	Draft 1.0	Wallace Davis	Created for Internal Distribution
3/1/2005	Draft 1.1	Bryan Wilcutt	Modifications for implementation
6/27/2005	Rev 1.0	Bryan Wilcutt	Released revision
11/10/2005	Rev 1.0	Harish Talanki	Modifications

E.2 Introduction

This appendix defines the Remote Control-based interface used for the CDM/CDD family of Comtech EF Data products. The primary interface is to be Telnet; however, other interfaces may adapt to the **CiM** implementation, programmatically, via specific **API** calls.

E.3 Architecture

As illustrated in **Figure E-1**, the Remote **NMCS** attaches to an external interface such as Telnet, and processes basic text based commands to the **CiM** database manager. The database manager is responsible for resolving **GET** and **SET** actions to **Local** and **Remote** objects.

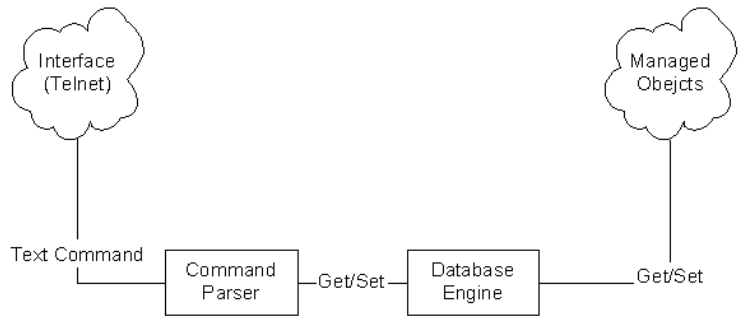


Figure E-1. Basic Architecture Layout

E.4 Command Set Introduction

The following sections outline the basic command set supported in this version of the **CIM NMCS** protocol.

E.4.1 Telnet Interface

Telnet interface into the **NMCS** system must be on port 7023, which has been reserved for this protocol by the **IANA**.

The login process requires a name and password, which are defined by the systems administrator of the controlling equipment. This name and password is usually associated to the name and password of an administrator account.

E.4.2 Basic Protocol

All bytes within a command are printable ASCII characters, less than ASCII code 127. In this context, the **C**arriage **R**eturn (cr) and **L**ine **F**eed (lf) characters are considered printable.

All messages from Controller-to-Target require a response as indicated. This will be either to return data that has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target.

E.4.3 Command Structure

Controller-to-Target							
Start of Packet	Target Address	Address De-limiter	Instruction Code	Row Index (Optional)	Code Qualifier	Optional Arguments	End of Packet
< ASCII code 60 (1 character)	(1 to 4 characters)	/ ASCII code 47 (1 character)	(3 characters)	1 to 3 characters contained within [and] brackets.	= or ? ASCII codes 61 or 63 (1 character)	(n characters)	Carriage Return and Line Feed ASCII code 13 and code 10 [0x0D 0x0A] (2 characters)

Example: <0135/TFQ=1949.2345{CR}
Example: <1/rte[1]=rt1|239.022.033.044.32|1|***************|0011|0|0|0|0|3

Target-to-Controller						
Start of Packet	Target Address	Address De-limiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	=, ?, !, *, # or ~ ASCII code 61, 63, 33, 42, 35, 126 (1 character)	(n characters)	Carriage Return, Line Feed ASCII code 13,10 (2 characters)

Example: >0654/RSW=32{CR}{LF}

Example: <RTE[4]?>0001/rte[4]=rt4|239.022.033.044.32|1|***************|0011|0|0|0|0|3

E.4.3.1 Start Of Packet

Controller-to-Target: This is the character ‘<’ (ASCII code 60)

Target-to-Controller: This is the character ‘>’ (ASCII code 62)

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message. For multi line text message, each line should end with a new line character ‘\n’. The carriage return & new line [\r\n] combination should present only at the end of the message.

E.4.3.2 Target Address

Up to 9,999 devices can be uniquely addressed. Even though the any number of devices can be addressed, but they all should be associated with single IP Address.

- For a CDM-570, address of ‘1’ is being used to address both modulator and demodulator.
- For CDD-564, each demodulator is identified by unique address from 1 to 4 respectively for all the four demodulators.

The address is not significant for commands Targeted system wide. But, it does has significance when associated with demod specific commands like Frequency, Data Rate, etc.

The Controller sends a packet with the address of a Target - the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

E.4.3.3 Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. For example, **TFQ** stands for Transmit Frequency, **RMD** is for Receive Modulation type, etc.This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 - 90).

E.4.3.4 Instruction Code Qualifier

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

1. From **Controller to Target**, the only permitted values are:

= (ASCII code 61	The = code is used as the assignment operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example, in a message from Controller to Target, TFQ=0950.0000 would mean 'set the Transmit Frequency to 950 MHz.'
? (ASCII code 63)	The ? code is used as the query operator, and is used to indicate that the Target should return the current value of the parameter defined by the preceding byte. For example, TFQ? means 'what is the current value of the Transmit Frequency?'

2. From **Target-to-Controller**, the only permitted values are:

= (ASCII code 61)	The = code is used in two ways: First, if the Controller has sent a query code to a Target (for example TFQ?, meaning 'what's the Transmit frequency?'), the Target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question. Second, if the Controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the Target will acknowledge the message by replying with TFQ= (with no message arguments).
! (ASCII code 33)	The ! code is only used as follows: If the Controller sends an instruction code that the Target does not recognize, the Target will acknowledge the message by echoing the invalid instruction, followed by the ! character with. Example: XYZ!

If the Controller sends an instruction to set a parameter to a particular value, and, if the value sent in the argument is valid, BUT the modem will not permit that particular parameter to be changed at that time, then the Target will acknowledge the message by replying, for example, with **TFQ!** (with no message arguments).

If the Controller sends an instruction code which the Target does not recognize, then the Target will acknowledge the message by echoing the invalid instruction, followed by the ! character. **Example: XYZ!**

Right now the CDM software is not organized to categorize various error codes, so it combines various errors into a single code (!).

E.4.3.5 Optional Message Arguments

Arguments are not required for all messages. Arguments include ASCII codes for the characters 0 to 9 (ASCII 48 to 57), period (ASCII 46), and | (ASCII 124), plus miscellaneous printable characters.

E.4.3.6 Table Support Qualifier

In order to support accessing information that is represented in a table, the following syntax is supported.

E.4.3.6.1 Row Index

The desired row shall be encapsulated within '[' and ']' brackets. This option is only applicable for data that is represented as table.

For example:

Get a route table entry (will return the contents of the four route table entry):

<1/RTE[4]?

Get a the entry route table (will return the contents of the four route table entry):

```
$NumEntries = <0/RTN?

for($I=1, $I<$NumEntries, $I++)
{
  entryInfo[$I] = <0/RTE[$I]?
}
```

To add a new route table entry:

```
$NumEntries = <0/RTN?
$NewRouteEntry = $NumEntries + 1

<1/RTE[$NewRouteEntry]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

To modify an existing route table entry:

```
<1/rte[1]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

E.4.3.7 Optional Argument lists

In order to enforce atomic reads and writes and well as allow for checking related parameter for validity, multi-argument lists will have the following format:

- Arguments are positioned in fixed length format (see specification for each argument)
- **‘|’** Is used to separate different argument values from each other.

E.4.3.8 End Of Packet

Controller-to-Target: This is the ‘Carriage Return’ character (ASCII code 13).

Target-to-Controller: This is the two-character sequence ‘Carriage Return’, ‘Line Feed’ (ASCII code 13, and code 10).

Both indicate the valid termination of a command.

E.5 Remote Commands and Queries

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

CODE	C	Q	PAGE
ACD	X		E-11
ACE	X	X	E-11
ACL	X	X	E-11
ADP	X	X	E-10
ADU	X	X	E-10
ARD	X		E-20
ARN		X	E-20
ARP	X	X	E-20
B			
BBI	X	X	E-23
BLI	X	X	E-23
C			
CCA	X	X	E-24
D			
DDK	X	X	E-13
DEK	X	X	E-13
DRA	X	X	E-20
DRM	X	X	E-12
DSR	X	X	E-17
DTG		X	E-18
E			
EMO	X	X	E-9
ERT		X	E-30

CODE	C	Q	PAGE
ESC	X		E-30
ESM	X	X	E-16
ETM		X	E-16
ETT		X	E-30
F			
G			
H			
HAD	X	X	E-16
HRA	X	X	E-10
HRR	X	X	E-9
HRU	X	X	E-9
I			
ICV	X	X	E-21
IDT		X	E-29
IFT		X	E-28
IFW		X	E-22
IGE	X	X	E-11
IGQ	X	X	E-20
IGT		X	E-21
IMR	X	X	E-20
INM	X	X	E-21
IPA	X	X	E-16
IPM	X	X	E-16
IPS		X	E-28
IRI	X	X	E-21
IRO	X	X	E-21
IRQ	X	X	E-21

CODE	C	Q	PAGE
J			
K			
L			
LPS	X		E-23
M			
N			
O			
P			
PFI	X	X	E-23
PRA	X	X	E-10
PRE	X	X	E-11
Q			
QSA	X		E-31
QSC	X		E-31
QSD	X		E-19
QSE	X	X	E-15
QSM	X	X	E-17
QSN		X	E-19
QSR	X	X	E-18
QST		X	E-31
QTL	X	X	E-19

CODE	C	Q	PAGE
R			
RCG		X	E-26
RED		X	E-24
RFD	X		E-23
RHE	X	X	E-12
ROP	X	X	E-11
ROU	X	X	E-11
RSC	X	X	E-29
RST	X		E-23
RTD	X		E-26
RTE	X	X	E-25
RTN		X	E-26
RWP	X	X	E-10
RWU	X	X	E-10
S			
SAT	X	X	E-14
SCG		X	E-15
SCS	X		E-23
SDM	X	X	E-13
SDN	X	X	E-13
SIA	X	X	E-13
SPE	X	X	E-12
SRC	X	X	E-13
SRT		X	E-27
SSC	X	X	E-13
SSL	X	X	E-15
SSN	X	X	E-14
STA	X	X	E-14
STB	X	X	E-14
STC	X	X	E-14
STT		X	E-27

CODE	C	Q	PAGE
STV	X	X	E-14
SWC	X	X	E-14
SWM	X	X	E-9
SWR		X	E-22
T			
TDE	X	X	E-12
TET	X	X	E-10
THE	X	X	E-12
TLE	X	X	E-12
TPE	X	X	E-13
U			
USI	X	X	E-22
UUT		X	E-24
V			
W			
WSC	X	X	E-27
X			
Y			
Z			

Unless otherwise specifically called out in the **IP Commands and Queries** section, the remaining commands are provided as part of the base modem command set and are defined in **Appendix D. SERIAL REMOTE CONTROL**.

E.5.1 IP Commands and Queries

E.5.1.1 Admin Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
System Working Mode	SWM=	1 byte, value of 0 through 1	Command or Query, where: 1=Router-Small Network 2=Router-Large Network 3=Router-Point to Point 4=Router-Vipersat 5=Managed Switch Router-Vipersat mode needs the ViperSat option to be available on the modem. Changing the address/working mode may reboot the modem.	SWM= SWM!	SWM?	SWM =x (see description of arguments)
Managed Switch Multicast Option	EMO=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disabled forwarding of multicast traffic while in Managed Switch mode. Valid only when in Managed Switch mode on 570.	EMO = EMO!	EMO?	EMO =x (see description of arguments)
Header Compression Refresh rate – UDP/RTP1	HRR=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for UDP/RTP1 streams. **Example:** HRR=50 **Restrictions:** 570 only	HRR = HRR!	HRR?	HRR =xxx (see description of arguments)
Header Compression Refresh rate –UDP	HRU=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for UDP only stream. **Example:** HRU =50 **Restrictions:** 570 only	HRU = HRU!	HRU?	HRU =xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Header Compression Refresh rate – All Others	HRA=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for all other streams. **Example:** HRU =50 **Restrictions:** 570 only	HRA = HRA!	HRA?	HRA =xxx (see description of arguments)
Payload Compression Refresh rate	PRA=	3 bytes	Command or Query. Payload compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for all other streams. **Example:** PRU =50 **Restrictions:** 570 only	PRA = PRA!	PRA?	PRA =xxx (see description of arguments)
Telnet timeout	TET=	2 bytes	Command or Query. Telnet log in timeout, 1 to 60 Resolution=1 minute Inactivity timeout on CLI menu screen. **Example:** <1/TET=50	TET = TET!	TET?	TET =xx (see description of arguments)
Administrator UserName	ADU=	11 bytes No spaces allowed.	Command or Query. Change the administrator username, where: **Example:** ADU=comtech To get the new user name effective, ADP must be issued Immediately after ADU. Then query ADU? to see the new.	ADU = ADU!	ADU?	ADU =xxxxxxxxxxx (see description of arguments)
Administrator Password	ADP=	11 bytes No spaces allowed.	Command or Query. Change the administrator password, where: **Example:** ADP=comtech	ADP = ADP!	ADP?	ADP =xxxxxxxxxxx (see description of arguments)
ReadWrite UserName	RWU=	11 bytes No spaces allowed.	Command or Query. Change the ReadWrite username, where: **Example:** RWU =comtech To get the new user name effective, RWP must be issued Immediately after RWU.	RWU = RWU!	RWU?	RWU =xxxxxxxxxxx (see description of arguments)
ReadWrite Password	RWP=	11 bytes No spaces allowed.	Command or Query. Change the ReadWrite password, where: **Example:** RWP =comtech	RWP = RWP!	RWP?	RWP =xxxxxxxxxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
ReadOnly UserName	ROU=	11 bytes No spaces allowed.	Command or Query. Change the ReadOnly username, where: Example: ROU =comtech To get the new user name effective, ROP must be issued Immediately after ROU.	ROU = ROU!	ROU?	ROU =xxxxxxxxxx (see description of arguments)
ReadOnly Password	ROP=	11 bytes No spaces allowed.	Command or Query. Change the ReadOnly password, where: Example: ROP =comtech	ROP = ROP!	ROP?	ROP =xxxxxxxxxxx (see description of arguments)
Access Client List	ACL=	18 bytes, numerical	Command or Query. Used to set the Access list entry, which contains a subnet and mask. Once the access list is enabled, only devices from the allowed ranges are allowed to communicate with the modem.: xxx.xxx.xxx.xxx/yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (0-31) Returns 000.000.000.000/32 when a particular Access Client is not configured. Example: <1/ACL[1]=010.006.030.001.24	ACL = ACL!	ACL?	ACL= xxx.xxx.xxx.xxx.yy (see description of arguments)
Access List Delete	ACD=x	1-byte numerical 1…4	Command only. Delete the specified access list entry from the access list table. <1/ACD=x, where x is value of 1…4	ACD= ACD!	N/A	ACD=x [1..4] (see description of arguments)
IGMP enable/disable	IGE=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disables the IGMP feature.	IGE = IGE!	IGE?	IGE =x (see description of arguments)
Access List Enforcement	ACE=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disabled access list enforcement.	ACE = ACE!	ACE?	ACE =x (see description of arguments)
Ping Reply Enabled	PRE=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disables ping reply. When disabled, the modem will not respond to pings (network security feature)	PRE = PRE!	PRE?	PRE =x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Telnet Enabled	TLE=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disables the telnet interface. When disabled, the user will not be able to log in to the telnet interface.	TLE = TLE!	TLE?	TLE =x (see description of arguments)
SNMP Enabled	SPE=	1 byte, value of 0 or 1	Command or Query, where: 0=Disabled 1= Enabled Enables or disables the SNMP interface. When disabled, the user will not be able to use the SNMP interface.	SPE = SPE!	SPE?	SPE =x (see description of arguments)
Downlink Route All Multicast	DRM=	1 byte, 0 or 1	Command or Query, where: 0=Disabled 1=Enabled Enable/Disable Downlink Route All Multicast option.	DRM= DRM!	DRM?	DRM=x x – 0 or 1.
Transmit DES enable/disable	TDE=	1 byte, value of 0, 1, 2 or 3	Command or Query, where: 0=Disabled 1= Enabled (Managed Switch Only mode) 2= PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in Managed Switch mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. Restriction: Cannot enable if the 3xDES FAST feature has not been purchased	TDE = TDE!	TDE?	TDE =x (see description of arguments)
TX Header Compression enable/disable	THE=	1 byte, value of 0, 1, 2 or 3	Command or Query, where: 0=Disabled 1= Enabled (Managed Switch Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in Managed Switch mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. Restriction: Cannot enable if the 3xDES FAST feature has not been purchased	THE = THE!	THE?	THE =x (see description of arguments)
RX Header Compression enable/disable	RHE=	1 byte, value of 0, 1, 2 or 3	Command or Query, where: 0=Disabled 1= Enabled Enables or disables the Transmit 3xDES feature. Restriction: Cannot enable if the 3xDES FAST feature has not been purchased	RHE = RHE!	RHE?	RHE =x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
TX Payload Compression enable/disable	TPE=	1 byte, value of 0, 1, 2 or 3	Command or Query, where: 0=Disabled 1= Enabled (Managed Switch Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in Managed Switch mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. **Restriction:** Cannot enable if the 3xDES FAST feature has not been purchased	TPE = TPE!	TPE?	TPE =x (see description of arguments)
3xDES Encrypt Key	DEK[1..8]=	48 bytes, numerical	Command or Query. 3xDES encrypt key [192-Bit], where all are Hexadecimal digits. [0…F], a total of 48 Hex digits. **Example:** DEK[1]= 222222222222222244444444444444446666666666666666	DEK = DEK!	DEK[1..8]?	DEK= x [1..48] (see description of arguments)
3xDES Decrypt Key	DDK[1..8]=	48 bytes, numerical	Command or Query. 3xDES decrypt key, where all are Hexadecimal digits. [0…F], a total of 48 Hex digits. **Example:** DDK:0= 222222222222222244444444444444446666666666666666	DDK = DDK!	DDK[1..8]?	DDK =x [1..48] (see description of arguments)
SMTP Server IP Address	SIA=	15 bytes, numerical	Command or Query. Used to set the IP address of the SMTP server where mail should be sent, in the format: xxx.xxx.xxx.xxx is the IP address **Example:** <1/SIA=010.006.030.001. When not configured, it returns >0001/SIA=0.0.0.0	SIA = SIA!	SIA?	SIA = xx.xxx.xxx.xxx (see description of arguments)
SMTP Domain Name	SDM=	128 bytes, characters, no spaces	Command or Query. SMTP Domain name of up to 128 characters. To delete the domain name, issue <1/SDM= Empty string will delete the domain name. **Example:** SMTP=somedomainname	SDM = SDM!	SDM?	SDM =x [1..128] (see description of arguments)
SMTP Destination Name	SDN=	128 bytes, characters,	Command or Query. SMTP Destination name of up to 128 characters. To delete the destination name, issue <1/SDN= Empty string will delete the domain name. **Example:** <1/SMTP=somedestinationname	SDN = SDN!	SDN?	SDN =x [1..128] (see description of arguments)
SNMP Read Community	SRC=	255 bytes, characters, no spaces	Command or Query. SNMP read community string. Empty string is not allowed **Example:** <1/SRC=public	SRC = SRC!	SRC?	SRC =x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SNMP Write Community	SWC=	255 bytes, characters, no spaces	Command or Query. SNMP write community string. Empty string is not allowed **Example:** <1/SWC =public	SWC = SWC!	SWC?	SWC =x (see description of arguments)
SNMP Trap Community	STC=	255 bytes, characters, no spaces	Command or Query. SNMP Trap community string. Empty string is not allowed **Example:** <1/STC =trapcomm	STC = STC!	STC?	STC =x (see description of arguments)
SNMP Trap Destination IP Address	STA=	15 bytes, Numerical	Command or Query. Used to set the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format: xxx.xxx.xxx.xxx is the IP address **Example:** <1/STA=010.006.030.001 Returns >0001/STA=0.0.0.0 When not configured.	STA = STA!	STA?	STA = xx.xxx.xxx.xxx (see description of arguments)
SNMP Trap Destination IP Address-2	STB=	15 bytes, Numerical	Command or Query. Used to set the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format: xxx.xxx.xxx.xxx is the IP address **Example:** 010.006.030.001 Returns >0001/STB=0.0.0.0 When not configured.	STB = STB!	STB?	STB = xx.xxx.xxx.xxx (see description of arguments)
SNMP Trap Version	STV=	1 byte, value of 0 or 1	Command or Query. 1=Snmpv1 2=Snmpv2 Specifies the version of SNMP traps that should be sent.	STV = STV!	STV?	STV = x (see description of arguments)
SNMP Trap Enable Authentication Traps	SAT=	1 byte, value of 1 or 2	Command or Query, where: 2=Disabled 1= Enabled Enables or disables sending SNMP authentication traps.	SAT = SAT!	SAT?	SAT =x (see description of arguments)
SNMP System Contact	SSC=	128 bytes, characters,	Command or Query. SNMP System Contact string **Example:** <1/SSC=Joe Net Admin. If not configured it returns empty string. <1/SSC=	SSC = SSC!	STC?	STC =x [1..128] (see description of arguments)
SNMP System Name	SSN=	128 bytes, characters,	Command or Query. SNMP System Name string **Example:** <1/SSN=Remote1. If not configured it returns empty string. <1/SSC=	SSN = SSN!	SSN?	SSN =x [1..128] (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SNMP System Location	SSL=	128 bytes, characters,	Command or Query. SNMP System Location string **Example:** <1/SSL=Upstairs back right. If not configured it returns empty string. <1/SSL=	SSL = SSL!	SSL?	SSL =x [1..128] (see description of arguments)
Enable/Disable QoS Feature	QSE=	1 byte, value of 0 or 1	Command or Query. Setting this to '1' enables the Quality of Service feature. Setting to '0' disables it.	QSE= QSE!	QSE?	QSE=x
System Configuration Get	N/A	String of Variable byte size	Query only. Querying the SCG? dumps the system configuration. This can be used for updating the GUI parameters. See the Appendix section for more information on individual field.	SCG= SCG!	SCG?	SCG= string of variable byte size.

E.5.2 Interface Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet MAC	N/A	12 bytes	Query only. Returns the Ethernet MAC address, format: Example: ETM=0006B0000178	ETM!	ETM?	ETM=xxxxxxxxxxxx (see description of arguments)
Ether speed mode	ESM=	1 byte, value of 1..5	Command or Query. 1=Auto 2=10 MB/sec Half Duplex 3=100 MB/sec Half Duplex 4=10 MB/sec Full Duplex 5=100 MB/sec Full Duplex Specifies the speed and mode of Ethernet interface.	ESM = ESM!	ESM?	ESM = x (see description of arguments)
IP Address of Ethernet interface	IPA=	15 bytes length.	Command or Query. Used to set the IP address and mask of the Ethernet interface, in the format: xxx.xxx.xxx.xxx where xxx.xxx.xxx.xxx is the IP address Example: 010.006.030.001 Note: To make the IPA= command effective, one needs to issue the IPM command immediately following IPA command. IPM should be issued even if there is no change in the subnet mask. Changing the IP address will cause the telnet/socket connection to break. So, the telnet/application should reconnect to the new IP address after timeout. For Reading also, IPA? is followed by IPM?	IPA = IPA!	IPA?	IPA= xxx.xxx.xxx.xxx (see description of arguments)
IP Address Mask of Ethernet Interface	IPM=	Value of 8 – 32	Command or Query. Sets the IP Subnet mask for the interface IP address. yy is the subnet mask in bits [8..32] See the NOTE above for IPA.	IPM= IPM!	IPM?	IPM=yy
HDLC Address	HAD	4 bytes, Numerical	Command or Query. Sets the one of four HDLC address, where: In small network mode value is 0x01-0xFE In large network value is 0x0001-0x7FFE To delete, set the value to 0xFFFF. Example: <1/HAD[3]=AB will set the HDLC address to 0xAB <1/HAD[2]=FFFF will Clear/Delete the HDLC Address. In Point-to-Point or ViperSat mode the values are not used.	HAD= HAD!	HAD?	HAD= xxxx (see description of arguments)

E.5.3 QoS Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
QoS mode	QSM=	1 byte, value of 1, 2 or 3.	Command or Query. QoS operating mode, where: 1=Priority/Max 2=Min/Max 3=DiffServ Example: <1/QSM=2	QSM = QSM!	QSM?	QSM =x (see description of arguments)
DiffServ Rule	DSR=	48 bytes, numerical	Command or Query. The value in this is broken into separate values: Read/Get Format: cccc|ddd ddd|mmmmm|MMMMM|p where: cccc – DiffServ class name ddd ddd – DiffServ Code Point. The code point has 0, 1, X mmmmm – Minimum bandwidth in kbps. Range = 0..99999 (kbps) MMMMM – Maximum bandwidth in kbps. Range = 0..99999 (kbps) p – priority is fixed and assigned by system. User is allowed to modify Assured Class Rules 9, 10, 11, 12 ONLY, while the QoS [QSM=3] is in DiffServ mode. Write/Set Format: Example: DSR[9]=00100|00400 Sets min bw to 100, max bw to 400. To set DSR, the system has to be set in DiffServ mode by issuing <1/QSM=3.	DSR= DSR!	DSR?	DSR =x [1..48] (m = Min value, M = Max Value)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
DiffServ Table Get	N/A	String of DiffServ Table	Query only. Displays the complete Diffserv rules. Can be issued when QoS mode is set in Diff Serv. There are 12-rows/rules. Each rule is separated by chr(13). >0001/DTG=chr(13) EXFD|101 110|00000|99999|1chr(13) CLS1|001 000|00000|99999|1chr(13) CLS2|010 000|00000|99999|2chr(13) CLS3|011 000|00000|99999|3chr(13) CLS4|100 000|00000|99999|4chr(13) CLS5|101 000|00000|99999|5chr(13) CLS6|110 000|00000|99999|6chr(13) CLS7|111 000|00000|99999|7chr(13) ASF1|001 xx0|00011|01111|8chr(13) ASF2|010 xx0|00022|02222|8chr(13) ASF3|011 xx0|00000|99999|8chr(13) ASF4|100 xx0|00000|99999|8chr(13)chr(10)	DTG= DTG!	DTG?	DTG=sssss…..ss Display all 12 Diffserv rules.
QoS Rule	QSR=	QSR[0..32]= Index-0 is the default rule	Command or Query. QSR=tt|p|sss.sss.sss.sss/ss|ddd.ddd.ddd.ddd/dd|AAAAA|BBBBB|CCCCC|DDDDD|mmmmm|MMMMM|w|f Where t = Protocol Type: 01 - UDP 02 - TCP 03-ICMP 04-RTP 05-VOCE 06-VDEO 07-RTPS 08-FTP 09-HTTP 10-TELN 11-SMTP 12-SNMP 13-SAP 14-ORCL 15-CTRX 16-SQL 17-IP 18 for N-IP 19-ALL [Valid only for default rule] Where p = PRI=1..8 (only applies in max/priority mode). In Min/Max mode priority for all rules is fixed at 8. User should not be allowed to change priority in Min/Max mode. Priority-9 is being used for default rule, and obtained from PARAM file. Pri-9 cannot be used for configuring other rules. Where s = Source IP SIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range[***.***.***.***/**]. Where d = Destination IP DIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range, like [***.***.***.***/**] All '*' signifies all port range of 00000 – 65535 for TCP/UDP. All port numbers should in fixed length of 5-chars	QSR = QSR!	QSR[0..32]? Index-0 is the default rule	QSR[0..32] = See description. Index-0 is the default rule

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
QoS Rule (cont.)			Where A = TCP/UDP Source Port range SPS=aaaaa [Source Port range Start] Where B = [Source Port range Finish] SPF=bbbbb Where C = [Dest Port range Start] DPS=ccccc Where D = [Dest Port range Finish] DPF=ddddd Where m = MINBW = mmmmm (meaningful in min.max mode). This is 0 in Max Priority mode. The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. Where M = MXB=MMMMM (meaningful in max/pri and min./max modes only). The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. W = WRED = 0-No 1-Yes F = FILTER = 0-No 1-Yes Example: >0001/qsr[1]=05|5|***.***.***.***/**|***.***.***.***/**|*****|*****|*****|*****|00000|22222|0|1 Example: [Default rule] Note: All QoS related commands can only be issued only when the system is in QoS-Max/Priority or QoS-Min/Max mode. It may return QSR! while not in any of these modes.			
Number of QoS Rule entries	N/A	QSN=2 bytes numerical	Query only. Returns the number of active QoS rules. Does not count default rule. Note: This command should be issued whenever a new rule is added/deleted.	QSN = QSN?	QSN?	QSN = xxx (see description of arguments)
Delete a QoS Rule entry	QSD=	QSD =2bytes, numerical	Command only. Deletes the QoS rule entry at the specified index number Example: QSD=3 (deletes the 3rd QoS rule)	QSD = QSD!	N/A	QSD = xx (see description of arguments)
QoS Typical System Latency	QTL=	1-Byte value 0 – 5 Seconds.	Command or Query. Sets/Gets the QoS typical system latency At low datarates of up to 1Mbps this value can range from 0 – 5 Seconds.. At datarates above 1Mbps, the value range from 0 – 2 Seconds.	QTL = QTL!	QTL?	QTL=x X – A value of 0-5 Seconds.

E.5.4 Protocol Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
DHCP Relay IP Address	DRA=	15 bytes, numerical	Command or Query. Used to set the IP address of the DHCP Server, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address Example: <1/DRA=010.006.030.001 Returns >0001/DRA=0.0.0.0 when not configured.	DRA = DRA!	DRA?	DRA = xxx.xxx.xxx.xxx (see description of arguments)
Static Arp table	ARP=	256 bytes characters	Command or Query. ARP Entry in format xxx.xxx.xxx.xxx|mm:mm:mm:mm:mm:mm Where xxx.xxx.xxx.xxx = IP address. mm:mm:mm:mm:mm:mm. = MAC Address. Note: Duplicate IP addresses are not allowed. They must also be locally attached (on the same subnet as the Ethernet interface). Using a different index with existing IP address may modify the existing ARP entry, rather than creating new one. Example: <1/arp[1]=010.020.030.040|00:11:ab:33:44:66 Returns >0001/ARP! When there is no ARP entry.	ARP = ARP!	ARP[1..256]?	ARP=x [1..256] (see description of arguments)
Number of ARP entries	N/A	4 bytes, numerical	Query only. Returns the number of static arp entries. Note: This command should be issued whenever a new ARP Entry is added/deleted.	ARN = ARN!	ARN?	ARN=nnnn (see description of arguments)
Delete an ARP entry	ARD=	ARD=xxx.xxx.xxx.xxx	Command only. Delete the ARP entry associated with the specified IP Address. xxx.xxx.xxx.xxx IP address of ARP entry to delete. Example: <1/ARD=192.168.001.100	ARD = ARD!	N/A	ARD=xxx.xxx.xxx.xxx (see description of arguments)
IGMP Server: IGMP Query Period	IGQ=	IGQ=xxx Where xxx is 1 to 600	Command or Query. Set the IGMP Query period in seconds while modem acting as IGMP Server.	IGQ= IGQ!	IGQ?	IGQ=xxx xxx – value of 1 to 600.
IGMP Server: IGMP Max Resp. Time	IMR=	IMR=xxx Where xxx is value of 1 to 598	Command or Query. Set the Maximum response time for the IGMP Query in seconds. Should always be 2 less than query period. The range is 1 to (IGQ – 2). If IGQ is at 30, then IMR can be set from 1 through 28.	IMR= IMR!	IMR?	IMR=xxx xxx - value of 1 to 598.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IGMP Server: Number of Missed Responses	INM=	2 bytes, Numerical 1..30	Command or Query. Number of missed responses before leaving the IGMP Group. Configured from 1…30 Example: INM=15	INM = INM!	INM?	INM =xxx (see description of arguments)
IGMP Client Recognize Queries	IRQ=	1 byte, 0 or 1	Command or Query, where: 0=No 1= Yes Enable/Disable Recognizing IGMP Queries. Example: IRQ=0	IRQ = IRQ!	IRQ?	IRQ =xxx (see description of arguments)
IGMP Client Router Alert Option for V1	IRO=	1 byte, 0 or 1	Command or Query, where: 0=No 1= Yes Enable/Disable Router Alert option for V1 Reports. Example: IRO =0	IRO = IRO!	IRO?	IRO =xxx (see description of arguments)
IGMP Client: Version	ICV	1 byte, 0 or 1	Command or Query, where: Set the IGMP Version for Unsolicited Reports. 0=V1 1= V2 Recognize IGMP Queries Example: ICV =0	ICV = ICV!	ICV?	ICV =xxx (see description of arguments)
IGMP Client: Unsolicited Report Interval	IRI=	2 bytes 0..25	Command or Query, where: Set the unsolicited Report Interval [Modem as Client] Range = 1..25 Example: <1/IRI =14	IRI = IRI!	IRI?	IRI =xxx (see description of arguments)
IGMP View Table	N/A	String value	Query only. Display the IGMP table with different states. To see the entries, the system should have the IGMP feature enabled, and should be properly configured to forward IGMP packets. See WEB interface for proper table format.	IGT= IGT!	IGT?	IGT=sssssss Table of IP Addresses and their state information.

E.5.5 Operations and Maintenance Commands and Queries

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>Upgrade Slot</td><td>USI=</td><td>1 bytes, value of 0,1 or 2</td><td>Command or Query.
Slot to upgrade new IP firmware where,
0= Oldest
1=Image 1
2=Image 2
Example: UPS=0</td><td>USI =
USI!</td><td>USI?</td><td>USI=x
(see description of arguments)</td></tr>
<tr><td>Software Revision</td><td>N/A</td><td>34-37 bytes</td><td>Query only.
Unit returns the value of the internal software revision installed in the unit, in the form :
Example: >0001/SWR=Boot:1.1.1 Bulk1:1.5.1u Bulk2:1.5.1P</td><td>SWR!</td><td>SWR?</td><td>SWR=Boot:x.y.zz
Bulk1:x.y.zz
Bulk2:x.y.zz
(see description of arguments)</td></tr>
<tr><td>IP Software Information</td><td>N/A</td><td>String</td><td>Query only.
Complete IP software information:
Example: FRW=
System time is THU DEC 22 14:53:50 2005
Booted using image #1
Using configuration parameters from PARAM #1
<table>
<tr><th>Type</th><th>Date</th><th>Time</th><th>Name</th><th>Rev</th><th>Len</th></tr>
<tr><td>Boot</td><td>1/24/2006</td><td>15:26</td><td>FW/10873-1c</td><td>1.1.3</td><td>460804
chr(13)</td></tr>
<tr><td>IP Bulk#1</td><td>12/27/2005</td><td>17:27</td><td>5.3 Pre</td><td>1.5.3</td><td>2607240
chr(13)</td></tr>
<tr><td>IP Bulk #2</td><td>12/14/2005</td><td>14:19</td><td>5.3 Pre</td><td>1.5.3</td><td>2604308
chr(13)</td></tr>
<tr><td>EVENT LOG</td><td>02/01/2006</td><td>14:10</td><td>Eventlog</td><td>1.5.3</td><td>128000
chr(13)</td></tr>
<tr><td>PARAM</td><td>1/26/2006</td><td>18:29</td><td>Console</td><td>1.5.3</td><td>5160
chr(13)</td></tr>
<tr><td>BaseBoot</td><td>03/30/2004</td><td>-- --</td><td>FW/10804-1-</td><td>1.1.1</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk #1</td><td>01/26/2006</td><td>-- --</td><td>FW/10805T</td><td>1.5.1N</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk #2</td><td>01/04/2006</td><td>-- --</td><td>FW/10805R</td><td>1.5.1g</td><td>----
chr(13)
chr(10)</td></tr>
</table></td><td>IFW!</td><td>IFW?</td><td>IFW =x….x
(see description of arguments)</td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Boot From Software Image	BLI=	1 byte, value of 0,1,2	Command or Query. Image which will be used the next time the system is booted, where: 0=Latest 1=Bulk Image # 1 2=Bulk Image # 2 Example: BLI=1 (which is Image #1 active)	BLI = BLI!	BLI?	BLI =x (see description of arguments)
Base Modem Boot From	BBI=	1 byte value 0,1,2	Command or Query. The binary image, which will be used by the base modem, to boot with. Where 0 – Latest 1 – Image in Slot# 1 2 – Image in Slot#2. Example: <1/BBI=0	BBI= BBI!	BBI?	BBI=x (see description of arguments)
Param file image to use	PFI=	1 byte, value of 1 or 3	Command or Query. Image which will be updated the next time firmware is uploaded to the system: 1=Param1 3=Factory Default To restore the Factory Defaults, set PFI=3 and issue RST to reset the box. This would bring up the box with factory default configuration. Example: PFI =1 (using param image on flash)	PFI = PFI!	PFI?	PFI =x (see description of arguments)
Save System Configuration Parameters	SCS=	1 byte value 1 – Save config	Command only Setting SCS to ‘1’, will save all the active system configuration on to the Flash.	SCS= SCS!	N/A	SCS=x (see description of arguments)
Reset Unit	RST	1 byte value. 1 - reset the system.	Command only. Setting the parameter to 1 resets the system. Telnet2 connection needs to be re-established.	RST= RST!	N/A	RST=x (see description of arguments)
Restore Factory Defaults	RFD	1-Byte value 1 - restore	Command only. Setting this to ‘1’ will bring the modem back to factory defaults. This may force unit reboot, depending on the mode of operation.	RFD= RFD!	N/A	RFD=x (see description of arguments)
Load Params from permanent storage	LPS=	1-Byte value 1 – load parameters	Command only. Setting this to ‘1’ loads the system with parameters from permanent storage/flash. This may force unit reboot, depending on the mode of operation.	LPS= LPS!	N/A	LPS=x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Codecast Multicast Address	CCA=	Multicast IP Address in xxx.xxx.xxx.xxx format	Command or Query. Set the Code cast multicast address, through which the modem can receive the software updates via vLoad application. Only Multicast address in the range 224.xxx.xxx.xxx To 239.xxx.xxx.xxx are allowed. There are some reserved multicast addresses which cannot be used. This cannot be deleted.	CCA= CCA!	CCA?	CCA=xxx.xxx.xxx.xxx (see description of arguments)
Unit Up Time	N/A	String value	Query only. Displays the unit up time in days, hours, minutes & seconds. Example: >0001/uut=0 days 0 hours 13 mins 15 secs	N/A	UUT?	UUT=sssssss String. (see description of arguments)

E.5.6 Redundancy Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	N/A	1 byte, value of 0 or 1	Query only. Unit returns the redundancy state of the unit, where 0=Offline 1=Online Example: RED=1 (which is Online)	N/A	RED?	RED=x (see description of arguments)

E.5.7 Routing Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Route Table	RTE	RTE[1..256]= variable	Command or Query. sssssssssssss|ddd.ddd.ddd.ddd/DD|i|nnn.nnn.nnn.nnn|hhhh|t|p|c|k|S s = Route Name up to 13 characters. It should be unique. Reusing of route names with different index, will end up modifying the existing route. d = Destination IP Address in xxx.xxx.xxx.xxx/yy where xxx.xxx.xxx.xxx is IP address and yy – Subnet mask bits. To mean 'Any IP Address' indicate it by ***.***.***.***/** format. D = Destination Subnet Mask Bits. i = Interface 1 – Sat and 0 – Ethernet n = Next Hop IP Address in xxx.xxx.xxx.xxx format. To be valid the next hop should be on the same subnet as the router IP Address. This field will be all '*' for a 'SAT' directed route. It means, for a route with valid HDLC address this field will be '***************'. h = HDLC Addr in 4-digit hexadecimal number. Valid range is 0x00 to 0xFE in Router-Small Network mode. And 0x0000 to 0x7FFE for Router-Large Network mode. This field will be all '*' for 'ETH' directed route. It means, if the route has a valid next-hop, then this field is '****' [meaning HDLC Address is not Used.]. HDLC Address is not used in point-to-point mode, may default to '1'. t = Header Compression 0 – No 1 – Yes. p = Payload Compression 0 – No 1 – Yes. c = DES Encryption 0 – No 1 – Yes. k = DES Key to use 0 – Don't use any key 1 – 8 use as mentioned and 9 – Use Random key. S = Multicast state 0-None 1=Eth-to-Sat 2=Sat-to-Eth 3=toBoth When called using an existing index, the command is treated as a "modify". Only new routes can be added at the END of the list: Example: RTN? RTN=3 <1/rte[3]= rt3|239.111.102.222.32|0|192.168.001.022|00AB|0|0|1|5|3 Sat Directed Route: >0001/RTE[1]=rt1|011.012.013.014/32|1|***.***.***.***|1111|0|0|0|0|0 Eth Directed Route: >0001/RTE[4]=rt4|012.013.014.015/32|0|192.168.001.111|****|0|0|0|0|0	RTE = RTE!	RTE[1..256]?	RTE[1..256] = xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Route Table (cont.)			**Note:** To be able to set/get the route entries, the system should be in the routing. It may return RTE!, if system is in Managed Switch mode.			
Number of route entries	N/A	RTN=3 bytes, numerical	Query only. Returns the number of route entries in the route table. **Note:** This command should be issued whenever a new route is added/deleted.	RTN = RTN!	RTN?	RTN = xxxx (see description of arguments)
Delete route entry	RTD=	RTD=4 bytes, numerical	Command only. Deletes the route entry at the specified index number, if configured. Returns RTD!, if there is no route at the index.	RTD =	RTD!	RTD = xx.xx (see description of arguments)
Route Table Get	N/A	N/A	Query only. Get the whole Routing Table of the modem. Each route entry is separated by '\r' [chr(13)] The route table will be displayed only if system's working mode is "Router – Small, Router-Large, Router-PtP. If the system is in Managed Switch mode, it may return RCG!	RCG!	RCG?	RCG= xxxxxxxxxxxxxx xxxxxxxxxxxxxx

E.5.8 Statistics Commands and Queries

E.5.8.1 WAN Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
WAN TX: Statistics	N/A	10 bytes, Numerical	Query only. Display all WAN Transmit Statistics. WAN Tx Error – No Route [0]chr(13) WAN Tx Error – Packet Start [0]chr(13) WAN Tx Error – Packet Front Length [0]chr(13) WAN Tx Error – Packet End Length [0]chr(13) WAN Tx Packet Invalid Length [0]chr(13) WAN Tx Packet Dropped – Sat Overdriven [0]chr(13) WAN Tx HDLC Header Byte Count [0]chr(13) WAN Tx HDLC Payload Count [0]chr(13) WAN Tx HDLC Packet Count [0]chr(13) WAN Tx Utilization [0]chr(13) Ethernet Traffic Destined to WAN [0]chr(13) Actual Satellite Traffic (kbps) [0]chr(13) Percentage of WAN Bandwidth Saved [0]chr(13)chr(10)	STT!	STT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
WAN RX: Statistics	N/A	10 bytes, Numerical	Query only. Display all WAN Receive Statistics. WAN Rx Bad Address Count [0]chr(13) WAN Rx Pkt Proc CRC Errors [0]chr(13) WAN Rx Abort/Octet Errors [0]chr(13) WAN Rx Overrun Errors [0]chr(13) WAN Rx HDLC CRC Errors [0]chr(13) WAN Rx HDLC Payload Byte Count [0]chr(13) WAN Rx HDLC Header Byte Count [0]chr(13) WAN Rx HDLC Packet Count [0]chr(13) WAN Rx Invalid FlowID Errors [0]chr(13) WAN Rx SAR Re-Assemble Errors [0]chr(13) WAN Rx Header Decomp errors [0]chr(13) WAN Rx Memory Alignment Errors [0]chr(13) WAN Rx Bad CRC Errors [0]chr(13)chr(10)	SRT!	SRT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
WAN Stats Clear	WSC=	1Byte Numerical	Command only. Setting to '1' clears all the WAN Statistics. Clears both Transmit & Receive Stats.	WSC=	N/A	WSC= Clear WAN Stats.

E.5.8.2 IP Statistics Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Route Stats	N/A	10 bytes, Numericals	Query only. Display all IP Route packet statistics in text. Total Packets From Ethernet [58]chr(13) Total Packets To Ethernet [56]chr(13) Unicast Packets To Ethernet [56]chr(13) Multicast Packets To Ethernet [0]chr(13) Broadcast Packets To Ethernet [0]chr(13) Total Packets From Satellite [0]chr(13) Total Packets From Endstation [61]chr(13) Total Packets To Endstation [58]chr(13) IGMP Packets Received [0]chr(13) IP Option Packets Received [0]chr(13)chr(10)	IPS!	IPS?	Text display of all IP Route Stats. \r =CR = 0x0D \n = Newline = 0x0A
IP Filtered Stats	N/A	10 bytes, Numerical	Query only. Display all IP Route Filtered packet statistics in text Filtered – Boot [8]chr(13) Filtered – Flow Descriptor [0]chr(13) Filtered – Unknown Reason Code [0]chr(13) Filtered – Flow Correlator [0]chr(13) Filtered – Management Path [0]chr(13) Filtered – WAN Scaling [0]chr(13) Filtered – Ping [0]chr(13) Filtered – Access Control [0]chr(13) Filtered – Vipersat MCP [0]chr(13) Filtered – Vipersat UCP [0]chr(13) Filtered – Vipersat Remote [0]chr(13) Filtered – Codeload [0]chr(13) Filtered – Multicast [0]chr(13) Filtered – Bad Packet [0]chr(13) Filtered – Route [0]chr(13) Filtered – QoS Rule [0]chr(13) Filtered – Vipersat Loop [0]chr(13) Filtered – Bad Header Loop [0]chr(13) Filtered – Bad Data Ptr [0]chr(13) Filtered – MAC Split error [0]chr(13) Filtered – L3 Type Error [0]chr(13) Filtered – Local Destination [0]chr(13) Filtered – Redundancy Error [0]chr(13) Filter – ICMP Filter [0]chr(13) Filter – Port Error [0]chr(13) Filter - Total [8]chr(13)chr(10)	IFT!	IFT?	Text display of all IP Filtered stats. \r =CR = 0x0D \n = Newline = 0x0A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Dropped Statistics	N/A	10bytes numerical values	Query only. Display all the IP Route Dropped Packet Statistics in text. Dropped – Bad IP Header Checksum [0]chr(13) Dropped – Bad Buffer Length [0]chr(13) Dropped – Bad IP Version [0]chr(13) Dropped – TTL Expired [0]chr(13) Dropped – No Route [0]chr(13) Dropped – No ARP Entry [0]chr(13) Dropped – Multicast [0]chr(13) Dropped – Multicast Disabled Group [0]chr(13) Dropped – Total [0]chr(13	IDT!	IDT?	Text display of all IP Dropped stats. \r =CR = 0x0D \n = Newline = 0x0A
Clear IP Route Statistics	RSC=	1Byte number 1 – Clear stats	Set only. Setting this value to '1' would clear all IP Route statistics. Clears IP Route Stats, IP Filtered Stats, IP Dropped Stats.	RSC= RSC!	RSC?	RSC!

E.5.8.3 Ethernet Statistics Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet Rx Statistics	N/A	10 bytes, Numericals	Query only. Display all the Ethernet Receive statistics in text. Ethernet Tx Bytes [0994]chr(13) Ethernet Tx Good Frames [112]chr(13) Ethernet Tx Max Collision Count [0]chr(13) Ethernet Tx Late Collision Count [0]chr(13) Ethernet Tx DMA Underrun Errors [0]chr(13) Ethernet Tx Lost Carrier Sense Count [0]chr(13) Ethernet Tx Deferred Count [0]chr(13) Ethernet Tx Single Collision Count [0]chr(13) Ethernet Tx Multicast Collision Count [0]chr(13) Ethernet Tx Total Collision Count [0]chr(13)chr(10)	ERT!	ERT?	Text display of all Ethernet Receive statistics. \r =CR = 0x0D \n = Newline = 0x0A
Ethernet Rx Statistics	N/A	10 bytes, Numericals	Query only. Display all the Ethernet Transmit statistics in text. Ethernet Rx Bytes [6786]chr(13) Ethernet Rx Good Frames [91]chr(13) Ethernet Rx CRC Error Frames [0]chr(13) Ethernet Rx Alignment Errors [0]chr(13) Ethernet Rx Resource Errors [0]chr(13) Ethernet Rx Collision Detect Errors [0]chr(13) Ethernet Rx Runt Frames [0]chr(13) Ethernet Rx Flow Control Pause Frames [0]chr(13)chr(10)	ETT!	ETT?	Text display of all Ethernet Transmit statistics. \r =CR = 0x0D \n = Newline = 0x0A
Clear Ethernet Stats	ESC=1	1byte number. 1 – Clear stats	Set only. Setting this value to '1' clears all the Ethernet Receive & Transmit statistics.	ESC= ESC!	ESC?	ESC!

E.5.8.4 Quality of Service (QoS) Statistics Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Quality of Service Statistics Get	N/A	String of QoS Stats	Query only. Displays the QoS queue statistics of all active queues. nnn|pp|aaaaaaaaaa|bbbbb|cccccccccc|dddddddddd|eeeeeeeeee|fffff|ggggg|hhhhh|iiii n – QoS Rule Number p – Protocol number [Refer to QSR] a – Sent Packets b – Pkts per Second c – Sent Bytes d – Dropped Packets e – Dropped Bytes f – Current Transmit Rate [Kbps] g – Average Transmit Rate [Kbps] h – Maximum Transmit Rate [Kbps] I – Active Flow count associated with this QoS Queue. >0001/QST= 0|19| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13) 1| 0| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13)	QST!	QST?	QST=sssssssss… String displaying QoS stats of all active queues. \r – CR – 0x0D \n – Newline – 0x0A
Quality of Service Stats Clear	QSC=xx xx = QoS rule index	xx – QoS rule index for which to clear stats.	Command only. Clears the QoS statistics for a specified queue. The command can be issued only on active/configured queue. To clear default queue stats use '0'. <1/QSC=0 will clear default queue stats <1/QSC=5 will clear stats of rule-5.	QSC= QSC!	N/A	QSC=xx (see description of argument)
Clear All QoS Queue Statistics	QSA=	QSA=x 1 – Clear all stats	Command only. Setting QSA=1 will clear all QoS queue statistics. Also clears the default queue stats.	QSA= QSA!	N/A	QSA=x (see description of argument)

E.6 PARAM Files

This section gives more detail about the possible values of various parameters in the PARAM file.

Parameter File Tag	Values Associated with Parameter
SYS_WORKING_MODE	Possible values are: Router Mode Managed Switch Mode
EASYCON_MCAST_MODE	Enabled Disabled
HDR_REFRESH_UDP_RTP1	Decimal Value of 1…600
HDR_REFRESH_UDP	Decimal Value of 1…600
HDR_REFRESH_ALL_OTHERS	Decimal Value of 1…600
PAYLOAD_REFRESH	Decimal Value of 1…600
TELNET_TIMEOUT	Decimal Value of 1…60 Minutes
QOSMODE	Possible values are: Rule-Max/Pri Mode Rule-Min/Max Mode DiffServ Mode
DYNBUF_LATENCY	Decimal value of 200 to 5000 mSec.
Rt#0 …. Rt#nnn	Route table entries Rt#0 is the first entry and can go up to 256 entries. [No need to read this from param file, use RTG]
ROUTE_HDLC_ADDR_SAVE	Corresponding HDLC Addresses for Ethernet→Sat entries. [No need to read this from param file, use RTG]

Parameter File Tag	Values Associated with Parameter
DHCP_RELAY_IP_ADDR	DHCP Server IP Address. Possible values are NOT-DEFINED – When the parameter not set. 10.20.30.40 – When a DHCP Server IP Address is set.
REDUNDANCY_ACTIVE	Enabled Disabled
BASE_BOOT_IMAGE	Possible values are: Latest Image 1 Image 2
UPGRADE_SLOT	Oldest Image 1 Image 2
BLINDLOAD_MCAST_ADDR	NOT-DEFINED when ip_addr is 0 Valid multicast IP address like 239.4.5.6
ADMIN_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READWRITE_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READONLY_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
ACCESS_CLIENT	NOT-DEFINED/NA – When not set Valid IP address like 192.168.001.001/32

Parameter File Tag	Values Associated with Parameter
ACCESS_ENFORCEMENT_ENABLE	Enabled Disabled
PING_REPLY_ENABLE	Enabled Disabled
TELNETD_ENABLE	Enabled Disabled
SNMP_ENABLE	Enabled Disabled
IGMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
GENERIC_DOWNLINK_MCAST	Enabled Disabled
QOS_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
TRANS_DES_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is Managed Switch Disabled – If system working mode is Managed Switch

Parameter File Tag	Values Associated with Parameter
TX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is Managed Switch Disabled – If system working mode is Managed Switch
RX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
TX_PYLDCOMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is Managed Switch Disabled – If system working mode is Managed Switch
ENCRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
DECRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
SMTP_SERVER_IP_ADDRESS	NOT-DEFINED – If the parameter is not set. Otherwise, IP address in the form 192.168.1.1
SMTP_DOMAIN	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character. Generally in domain name format.
SMTP_DESTNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_READ_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “public”
SNMP_WRITE_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “private”

Parameter File Tag	Values Associated with Parameter
SNMP_TRAP_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “public”
SNMP_TRAP_DEST	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_DEST_2	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_VERSION	SNMPv1 – When SNMP version-1 trap generation is selected. SNMPv2 – When SNMP version-2 trap generation is selected.
SNMP_TRAP_ENABLE_AUTHEN_TRAP	UNKNOWN – When invalid value is set. Enabled – When set to send the Authentication Trap. Disabled
SNMP_SYSCONTACT	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSLOCATION	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
ETHER_MAC	Ethernet MAC Address in the format 00-06-B0-xx-xx-xx. All are hexadecimal digits.
ETHER_SPEED_MODE	Possible Values are: Auto 10 MB/sec Half Duplex 100 MB/sec Half Duplex 10 MB/sec Full Duplex 100 MB/sec Full Duplex

Parameter File Tag	Values Associated with Parameter
ETHER_IP_SNET	IP Address in the format 192.168.1.50/24
HDLC_ADDR_MODE	Small Network Mode Large Network Mode Point-To-Point Mode
QOSC	If there are no QoS rules configured, (or) system is not in Max-Pri (or) Min-Max mode, then param file will not have an entry for QoSC. Otherwise, the rules will be in the following format. QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSC#1 = ***/* ***/* RTP *** *** *** *** 22222 0 4 N Y QOSC#2 = 11.12.13.14/32 22.22.33.44/32 UDP 11111 22222 33333 44444 99999 0 0 Y N Where spm – source port min; spM – source port Max; dpm – Destination port min; dpM – Destination port Max mxB – Max bandwidth in kbps; mb – minimum bandwidth in kbps [Total aggregate min bandwidth of all the QoS rules should be less than the Tx-Data rate of the system.] P – Priority; W – WRED; F – Filter; [Y – Yes, N – No]
QOSCDEFR	The default rule always exists in the system and in param file, but not meaningful if QoS mode is DiffServ. The format is QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSCDEFR#0 = ***/* ***/* ALL *** *** *** *** 99999 0 9 N N
DIFFSSV#0 … DIFFSSV#11	The DiffServ rules are meaningful only when QoS mode is DiffServ. Otherwise, these parameters can be discarded. The format is as follows. The first column is DIFFSSV#0 = 0 99999 NOTE: Donor use this from PARAM file, instead use DTG? Command.
IGMP_QRYP	A decimal value of 1…600

Parameter File Tag	Values Associated with Parameter
IGMP_MXRT	A decimal value of 1…598
IGMP_MRP	A decimal value of 1…30
IGMP_QUERIES	Possible string values are Yes No
IGMP_ROUTERALERT_OPT	Possible string values are Yes No
IGMP_VERSION2	Possible string values are V1 V2
IGMP_URI	A decimal value of 0…25
SARP#0 …. SARP#255	Static ARP entry if there are any, in the format IP Addr Layer2 MAC Address [Hexadecimal digits] 10.20.30.40 00:11:33:AA:BB:CC
MGC_SAVE	MGC Command response from the base modem. See the base modem document for more detail.
OGC_SAVE	OGC Command response from the base modem. See the base modem document for more detail.
LOGGING FEATURE	Enabled Disabled

Parameter File Tag	Values Associated with Parameter
LOGGING LEVEL	Possible string values are: Errors Only Errors and Warnings All Information
HDLCADDR_SAVE	HDLC addresses in hexadecimal format aaaa bbbb cccc dddd where aaaa – First HDLC Address bbbb – Second HDLC Address…etc

Notes:

Appendix F. IP QUICK-START GUIDE

F.1 Quick-Start Guide Introduction

This appendix guides the user through the steps needed to configure a pair of CDM-570/570L modems equipped with the optional IP Module Ethernet Interface (generically referred to through the remainder of this appendix as the **CDM-IP**) as needed in order to pass traffic within minutes of initial installation and setup (i.e., starting from factory default settings). This appendix assumes user familiarity with configuration of the base modem.

F.2 Getting Started

F.2.1 Equipment List

The following equipment is required:

Description	Qty	Comments
CDM-IP Modem	2	CDM-570/570L w/ IP Module, CDM-IP 550, and CDM-IP 300L. **Note:** User may need to provide equipment to convert 70 MHz IF to L-Band for a duplex connection depending upon modems.
Layer 2 Ethernet Switch	2	Provided by User. RJ-45 crossover Ethernet cables can be substituted to directly connect PC to CDM-IP modem without the use of a hub.
PC with network interface card (NIC) and a terminal emulation program	2	Provided by User.
Console cable (DB-9 to RJ-11)	1	Supplied by Comtech EF Data.
Ethernet cables (CAT5)	4	Provided by User.
IF cables	2	Provided by User (to interconnect Tx-Rx between both CDM-IP modems).

F.2.2 Equipment Setup

Step	Task
1	Connect each CDM-IP to the PC via the Ethernet Hub.
2	Connect the TX IF on CDM-IP 1 to RX IF of CDM-IP 2 and vice-versa.
3	Connect the DB-9 end of the console cable to the COM1 or COM2 port of the PC and the RJ-11 end to the console port at the back of CDM-IP 1.
4	Connect CDM-IP 1 and CDM-IP 2 to suitable power supply and turn them ON.

F.2.3 Transmit and Receive IF Configuration

Step	Task
1	Configure the transmit and receive IF parameters on CDM-IP 1 and CDM-IP 2 via the front panel. **Note:** The IF parameters can also be set via console menu, Telnet, Web interface and SNMP, but for this exercise, it is recommended that the front panel be used.
2	Set the **TxPower** to minimum level.
3	Before proceeding to next step, make sure that each CDM-IP is appropriately carrier-locked to the other CDM-IP.

F.2.4 Serial Console Port Command Line Interface (CLI) Configuration

Step	Task
1	Launch the user terminal emulation program (e.g., HyperTerminal on Microsoft Windows).
2	Select the appropriate COM port to which the DB-9 end of the console cable is connected, and configure the port as follows: • 38,400 bps • 8 data bits • No parity • 1 stop bit • No hardware flow control
3	Press **Enter** to bring up the **Main Menu**.

F.2.5 CLI Main Menu

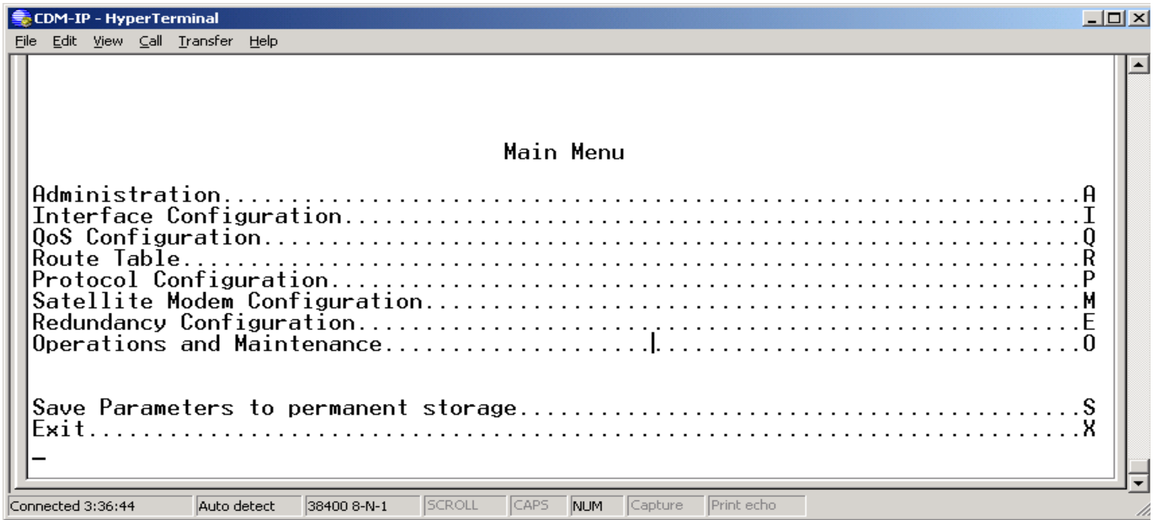


Figure F-1. CLI Main Menu

To use the **C**ommand **L**ine **I**nterface (CLI) (**Figure F-1**), select the appropriate submenu or the entry by typing the character indicated at the right. Type **[X]** to return to the previous menu.

Note: Any CDM-IP configuration changes need to be saved to permanent storage by typing **[S]** at any menu screen, then typing **[y]** to save.

F.2.6 Restoring Factory Default Configuration

The configuration procedures provided in this guide assume that the CDM-IP is still in factory default configuration for IP. If this is not the case, the factory default configuration can be restored from the menu:

Step	Task
1	From the Main Menu, select Operations and Maintenance submenu [O].
2	From the Operations and Maintenance menu, select Database Operations submenu [D].
3	From the Database Operations menu, select Restore Factory Default option [R].
4	Confirm when prompted by typing 'yes' when the following prompt is displayed: **Are you sure you want to restore factory default settings?** **WARNING: Choosing Yes will restore factory defaults and then reboot..** This will erase any user configuration and restore the CDM-IP to factory default configuration. Proceed to Section F.2 to perform the Managed Switch Mode configuration, or to Section F.3 to perform the Router Mode configuration.

F.3 Managed Switch Point-to-Point System Configuration

The procedures outlined in this section will lead to the configuration illustrated in **Figure F-2**.

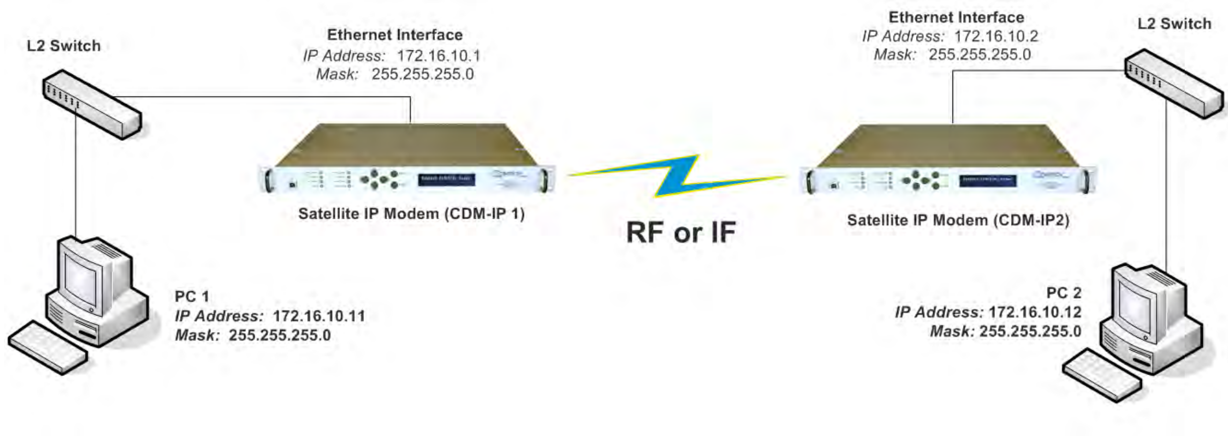


Figure F-2. Managed Switch Point-to-Point System Configuration

F.3.1 PC Configuration

Step	Task
1	PC 1: Set the IP address to 172.16.10.11; Set mask to 255.255.255.0.
2	PC 2: Set the IP address to 172.16.10.12; Set mask to 255.255.255.0.
3	Reboot the PCs (if required).

F.3.2 CDM-IP Configuration – Setting IP Address(es)

Step	Task
1	From the Main Menu select Network Interface Configuration submenu [I].
2	From the Interface Configuration Menu select Ethernet Interface (fei0) submenu [E].
3	Set Ethernet IP Address [I]: Set CDM-IP 1 to 172.16.10.1 Set CDM-IP 2 to 172.16.10.2
4	Set Subnet Prefix Length [M] to 24 The other parameters can be left to their factory default settings.

At this point the basic configuration is over and you should be able to:

Step	Task
5	From PC 1: Ping 172.16.10.1 (CDM-IP 1); Ping 172.16.10.2 (CDM-IP 2); Ping 172.16.10.12 (PC 2).
6	From PC 2: Ping 172.16.10.2 (CDM-IP 2); Ping 172.16.10.1 (CDM-IP 1); Ping 172.16.10.11 (PC 1).

Do not enable IF Loopback (or link the TX to RX by a BNC cable or satellite link) on a CDM-IP modem operating in Managed Switch Mode when connected to a LAN. In this configuration, Managed Switch Mode will resend all layer 2 broadcast packets and cause a "broadcast storm" on the LAN.

F.4 Router Mode Point-to-Point System Configuration

The procedures outlined in this section will lead to the configuration illustrated in **Figure F-3**

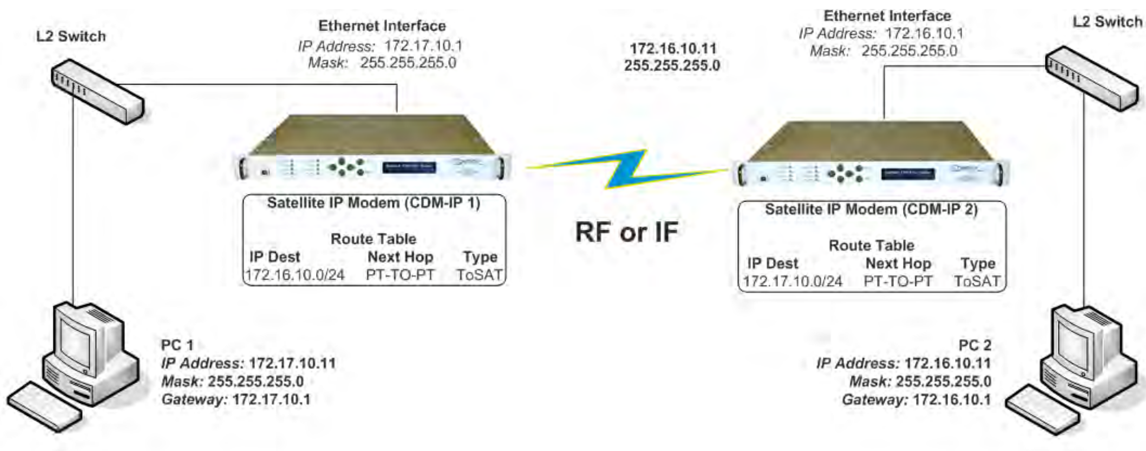


Figure F-3. Router Mode Point-to-Point System Configuration

F.4.1 PC Configuration

Step	Task
1	PC 1: Set the IP address to 172.17.10.11; Set mask to 255.255.255.0; Set PC Gateway to 172.17.10.1.
2	PC 2: Set the IP address to 172.16.10.11; Set mask to 255.255.255.0; Set PC Gateway to 172.16.10.1.
3	Reboot the PCs (if required).

F.4.2 Setting CDM-IP Modems to Router Mode Operation

Perform the following steps on **CDM-IP 1:**

Step	Task
1	From the Main Menu, select Administration [A] submenu.
2	From the Administration menu, select CDM-IP Working Mode [C].
3	Confirm when prompted by typing 'y' when the following prompt is displayed: **`Changing Modem working mode requires system Reboot.`** **`Do you want to continue(Y/N)[Enter :No]`** Select **[3] Router-Point to Point** for IP SW version 1.6.x or earlier . Select **[4] Router-Point to Point** for IP SW version 1.7.x or later.
4	Allow CDM-IP to reboot.

Both CDM-IP modems are now in Router-Point to Point Mode, which means that the CDM-IP modems will be on independent IP subnets and will require adding static routes to pass traffic between them.

F.4.3 Setting IP Address(es)

Step	Task
1	From the Main Menu select Network Interface Configuration submenu [I].
2	From the Interface Configuration Menu select Ethernet Interface (fei0) submenu [E].
3	Set Ethernet IP Address [I]. CDM-IP 1 to 172.17.10.1 CDM-IP 2 to 172.16.10.1
4	Set Ethernet Subnet MaskSubnet Prefix Length [M] to 24.

F.4.4 Set Route Table entries

First, perform the following steps on **CDM-IP 1:**

Step	Task
1	Select Route Table [R] submenu.
2	Enter 1 to configure the first route.
3	Enter a suitable name.
4	Set IP Address to 172.16.10.0
5	Set Number of Subnet Bits to 24.
6	For Interface to which route is destined to <E-Ethernet S-Satellite Enter : S> select S.

Step	Task
7	CDM-IP 1 Route Table should display the following:

```
              Route Name  Dest IP/SNet Bits  Next Hop       MultiCast  State
Route001...[test       172.16.10.0/24     POINT-TO-POINT N/A        toSat]
```

Next, perform the following steps on **CDM-IP 2:**

Step	Task
8	From **Transmitter Configuration Main Menu** submenu select **Route Table [R]** submenu.
9	Enter **1** to configure the first route.
10	Enter a suitable name
11	Set **IP Address** to 172.17.10.0
12	Set **Number of Subnet Bits** to 24
13	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select S
14	CDM-IP 2 Route Table should display the following:

```
              Route Name  Dest IP/SNet Bits  Next Hop       MultiCast  State
Route001...[test       172.17.10.0/24     POINT-TO-POINT N/A        toSat]
```

At this point the basic configuration is over and you should be able to:

- Ping PC 1 from PC 2 and vice versa
- Ping **CDM-IP** 2 from PC 1 and vice versa
- Pass any other data between the 2 PCs

Step	Task
15	From PC1: Ping 172.17.10.1 (CDM-IP 1) Ping 172.16.10.1 (CDM-IP 2) Ping 172.16.10.11 (PC 2)
16	From PC2: Ping 172.16.10.1 (CDM-IP 2) Ping 172.17.10.1 (CDM-IP 1) Ping 172.17.10.11 (PC 1)

F.5 Troubleshooting IP Module

The CDM-IP comes with a variety of diagnostic tools to aid in identifying the traffic path going into and out of the CDM-IP modem. This troubleshooting section shows how to use some of these tools and also identifies several problem scenarios commonly encountered when first setting up two CDM-IP modems. If following these troubleshooting steps fails to resolve the problem, contact a Customer Support representative at:

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

480.333.2200 (Main Comtech EF Data Number)
480.333.2433 (Network Product Customer Support Desk)
480.333.2161 FAX

Or, e-mail can be sent to the Customer Support Department at cdmipsupport@comtechefdata.com.

F.5.1 Managed Switch Mode Troubleshooting

Use the following troubleshooting steps if unable to successfully send traffic in Managed Switch Mode:

Managed Switch Mode Troubleshooting		
Scenario	Problem	Action
1	No Ping response from the locally connected PC to the CDM-IP Ethernet port. ICMP response is 'Request timed out'.	a) Verify correct IP address/subnet on PC and CDM-IP. b) Verify Ethernet connection – cables, L2 switch, PC, and CDM-IP should have Ethernet activity LED lit. Note: A PC must be connected to the CDM-IP using a hub, L2 switch or a RJ45 crossover cable. When the CDM-IP Ethernet port senses an Ethernet connection, the CLI will display: **`Ethernet Interface UP`** If the connection is broken, the CLI will display: **`Ethernet Interface DOWN`**

Scenario	Problem	Action
2	No Ping response from the locally connected PC to the remote CDM-IP or remote PC. ICMP response is ‘Request timed out’.	**a)** Verify both CDM-IP’s are in Managed Switch Mode. **b)** Verify IF link between modems for proper settings and carrier quality (RX signal level, E_b/N_0, etc.). It is possible that there is a spectrum inversion, particularly if you are using the CDM-IP with RF converter equipment. If this is the case, the signal level & E_b/N_0 may be OK, but no data will be received. To correct this, invert the TX and RX Spectrum on one of the CDM-IPs. **c)** Send a constant ping from the PC 1 ‘ping 172.16.10.2 –t’ to PC 2. In the CDM-IP1, go to Operations and Maintenance/ Diagnostics. Enable ‘Dump Packets transmitted to Satellite Interface’. Verify that the Pings are being transmitted by observing 1 packet on CLI every second. If not displayed, re-verify PC 1 and CDM-IP 1 settings. Disable ‘Dump Packets transmitted to Satellite Interface’ by entering ‘T’. **d)** Continue sending constant ping from the PC 1 to PC 2. In the CDM-IP 2, go to Operations Maintenance/Diagnostics. Enable ‘Dump Packets received from Satellite Interface’. Verify that the Pings are being received by observing 1 packet on CLI every second. If not displayed, re-verify PC 2 and CDM-IP 2 settings. Disable ‘Dump Packets received from Satellite Interface’ by entering ‘R’. Note: All pings transmitted will require a reply to be transmitted from the target host. Use the Diagnostics ‘Dump Packets’ tools to isolate where packets are lost in the CDM-IP duplex paths. Also, always disable ‘Dump Packets’ before sending live traffic.

F.5.2 Router Mode Troubleshooting

Use the following troubleshooting steps if unable to successfully send traffic in Router Mode.

Router Mode Troubleshooting		
Scenario	Problem	Action

1	No Ping response from the locally connected PC to the CDM-IP Ethernet port.
	
	ICMP response is '**Request timed out**'.
		a) Verify correct IP address/subnet on PC and CDM-IP.
		b) Verify Ethernet connection – cables, hub, etc. PC, hub, and CDM-IP should have Ethernet activity LED lit.
		
		Note: A PC must be connected to the CDM-IP using a hub, switch or a RJ45 crossover cable.
		
		When the CDM-IP Ethernet port senses an Ethernet connection, the CLI will display:
		`Ethernet Interface UP`
		If the connection is broken, the CLI will display:
		`Ethernet Interface DOWN`

2	No Ping response from the locally connected PC to the remote CDM-IP or remote PC. ICMP response is '**Request timed out**'.	a) Verify both CDM-IP's are in Router-Point to Point Mode. b) Verify PC's Gateways are set to local CDM-IP address. c) Verify IF link between modems for proper settings and carrier quality (RX signal level, E_b/N_0, etc.). It is possible that there is a spectrum inversion, particularly if you are using the CDM-IP with RF converter equipment. If this is the case, the signal level & E_b/N_0 may be OK, but no data will be received. To correct this, invert the TX and RX Spectrum on one of the CDM-IPs.
3	No Ping response from PC 1 to PC 2 or vice versa. ICMP response is '**Reply from 172.XXX.10.1 - Destination net unreachable**'.	Verify CDM-IP Route Tables are correct.

Appendix G. TYPICAL IP MODULE OPERATIONAL SETUPS

G.1 Overview

The CDM-570/570L Satellite Modem with Optional IP Module (referred to throughout the remainder of this appendix as the **CDM-570/L IP**) has several modes of operation. To assist the user in determining the best mode of operation for the appropriate network topology and Ethernet traffic environment, this appendix illustrates typical operational setup examples for the CDM-570/L IP.

G.2 Modem Compatibility

The CDM-570/L IP is compatible with other Comtech EF Data IP modems (generically referred to as **CDM-IPs**), provided the modems have similar operating modes and IP options.

The following is a list of compatible Comtech EF Data IP products for <u>CDM-570/570L Firmware Ver. 1.6.X or earlier ONLY</u>:

Comtech EF Data IP Product	IP Module Version	Additional Notes
CDM-IP 550 Satellite Modem	Version 1.3.3 or later	Must have Framer II Module (PL/9956-1) and Version 1.3.3 or later to support Data Compression IP option
CDM-IP 300L Satellite Modem	Version 1.3.3 or later	Must have Framer II Module (PL/9956-1) and Version 1.3.3 or later to support Data Compression IP option
CDD-564/L Demodulator with IP Module	Version 1.6.X or later	No restrictions
CDD-562L Demodulator with IP Module	Version 1.6.X or later	No restrictions

CDM-570/L IP Firmware Ver. 1.7.X and later is NOT compatible with CDM-IP 550 or CDM-IP 300L IP Firmware.

CDM-IP Firmware Ver. 1.7.X is compatible ONLY with CDM-570/L IP modems or CDD-564/L and CDM-562L demodulators that also have Firmware Ver. 1.7.X.

G.3 IP Module Working Modes

Two IP Module Working Modes are available: **Managed Switch** (formerly easyConnect™) and **Router Mode**. Operation differs based on the current operating firmware version. Examples of the available working modes are provided later in this section.

G.3.1 Working Modes (CDM-IP Firmware Ver. 1.6.X and earlier)

Three HDLC Addressing Modes are available:

- Point-to-Point
- Small Network
- Large Network

This section describes the functionality of these separate HDLC Modes in order to optimize Comtech EF Data IP modems in the network, based upon Network Topology and Ethernet Traffic requirements.

These modes allow the user to minimize the HDLC overhead transmitted over the satellite based upon the size of their network:

- In **Router/Point-to-Point Mode**, no HDLC address is transmitted
- **Router/Small Network Mode** transmits 1 byte
- **Router/Large Network Mode** transmits 2 bytes as part of the HDLC header for each packet; non-IP traffic is not supported in Router Mode

The Working Mode and HDLC Address Mode of the Comtech EF Data IP modems must be identical to pass traffic between modems.

Changing the Working Mode or HDLC address Mode of the IP modem requires the IP Module to be rebooted. Before the user can select a different mode, the IP Module will notify the user that changing the mode will require a reboot.

Working Mode HDLC Address Mode	Network Topology	Ethernet Traffic
Managed Switch Mode Point-to-Point	Point-to-Point only Both sites on same LAN subnet	IP v4 and/or non-IP
Router Mode Point-to-Point	Point-to-Point only Both sites on different LAN subnet	IP v4 only
Router Mode	Point-to-Point or Point-to-Multipoint (up to 254 sites)	IP v4 only
Small Network	All sites on different LAN subnet	
Router Mode	Point-to-Point or Point-to-Multipoint (up to 32766 sites)	IP v4 only
Large Network	All sites on different LAN subnet	

Feature Support – The optional IP Module also has several standard and optional features to further optimize security, performance and efficiency. How these features are supported in the two working modes is as follows:

Feature	Managed Switch Mode	Router Mode
HDLC Address Mode	Point-to-Point Only	Point-to-Point, Small Network, Large Network (can be Point-to-Multipoint)
10/100 BaseT Operation	10 or 100BaseT Half or Full Duplex	10 or 100 BaseT Half or Full Duplex
Access Lists	None	4 Clients by IP or IP Subnet
3xDES Encryption	1 Encrypt Decrypt All traffic encrypted when enabled	Up to 8 Encrypt Decrypt Keys or random Traffic encrypted on a per route basis
Quality of Service	Min/Max; Max/Priority; DiffServ	Min/Max; Max/Priority; DiffServ
Header Compression	Yes – Layer 2 is always compression. Applied to all Layers 3, 4, and 5 traffic when enabled	Yes – applied on a per route basis
Payload Compression	Yes - applied to all traffic when enabled	Yes – applied on a per route basis
Multicast	Select either all or no Multicast, Uplink or Downlink	All or specific Multicast streams, Uplink or Downlink
IGMP	No	Yes
Remote upgrade by FTP	Yes	Yes

G.3.2 Working Modes (CDM-570/570L Firmware Ver. 1.7.X and later)

The Comtech Streamline Encapsulation method was developed to provide a low overhead method of transporting any size packetized data. It provides superior performance on small packets and performs well on large packets, with overhead performance approaching 1%. With respect to HDLC, Comtech Streamline Encapsulation outperforms the longtime industry standard on all packet sizes.

The incorporation of Comtech Streamline Encapsulation results in the following operational changes from Firmware Ver. 1.6.X and earlier:

- HDLC addressing modes have been removed
- HDLC addresses have been removed to reduce overhead and deployment configuration complexity
- Rx Header Compression is now automatically determined from the Streamline Encapsulation information – this removes the need to configure the Rx Header Decompression feature (these options have been removed)

With Firmware Ver. 1.7.X and later, the Streamline Encapsulation working modes' operation, which has been centralized in the single Working Mode configuration parameter, is as follows:

- **Managed Switch** – Functions a managed switch with support for VLAN as well as advanced features such as QoS, Header Compression and Payload Compression. Primarily intended for operation in a point-to-point topology.

- **Router-Hub** – Functions as the Hub side router in a Point-to-Multipoint network. Allows Sat-to-sat packets to pass. No longer requires per-route HDLC addresses to be configured.
- **Router-Remote** – Functions as a Remote Router in a Point-to-Multipoint network. Packets from the WAN are not allowed to be sent to the WAN. No longer requires HDLC receive addresses to be configured.
- **Router-Point to Point** – Functions a point to point router in point to point configurations.
- **Vipersat Router** – Hub-Hub router in a Vipersat Network
- **Vipersat Router** – Hub Expansion-Hub Expansion router in a Vipersat Network.
- **Vipersat Router** – Remote-Remote router in a Vipersat Network
- **Vipersat Router** – Remote Expansion-Remote Expansion Router in a Vipersat Network.

Note: The Vipersat “Unit Role” and “Expansion Role” parameters are not read-only.

G.3.3 Managed Switch Working Mode

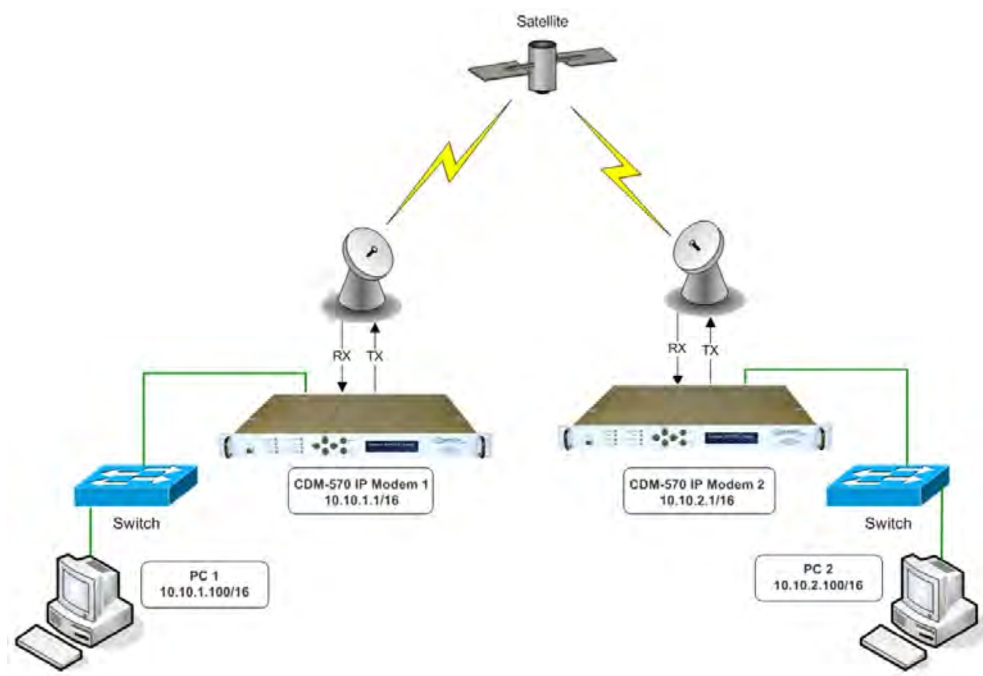


Figure G-1. Managed Switch Mode Diagram

Managed Switch Working Mode is the default Working Mode for the optional IP Module. This mode allows the modem to be set up with minimal configuration (no specific routes need to be configured). Managed Switch only operates in Point-to-Point Mode, meaning that it is communicating with only one other CDM-IP modem. In this mode, the IP Module is acting as a “smart wire” over a satellite link between two CDM-IP modems. This allows the optional IP Module to simultaneously forward IP traffic, and non-IP traffic such as IPX.

Figure G-1 shows a 256 kbps Point-to-Point duplex link in Managed Switch Mode. Note that both sides of the link are on the same IP subnet – 10.10.0.0/16. There are no routes or HDLC addresses to configure. When the system is powered-up, all packets from each subnet (local and remote) will be sent over the satellite interface. Each CDM-IP Modem learns which devices are attached to their local Ethernet interfaces and will only send packets over the satellite that are not destined for the locally attached devices.

Managed Switch mode will automatically use Layer 2 Header Compression (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted.

For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite, then it will time out until the full Header packet is sent.

The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both CDM-IPmodems will be able to receive all traffic, unless one CDM-IP is power-cycled or reset.

G.3.4 Router Working Mode – Point-to-Point

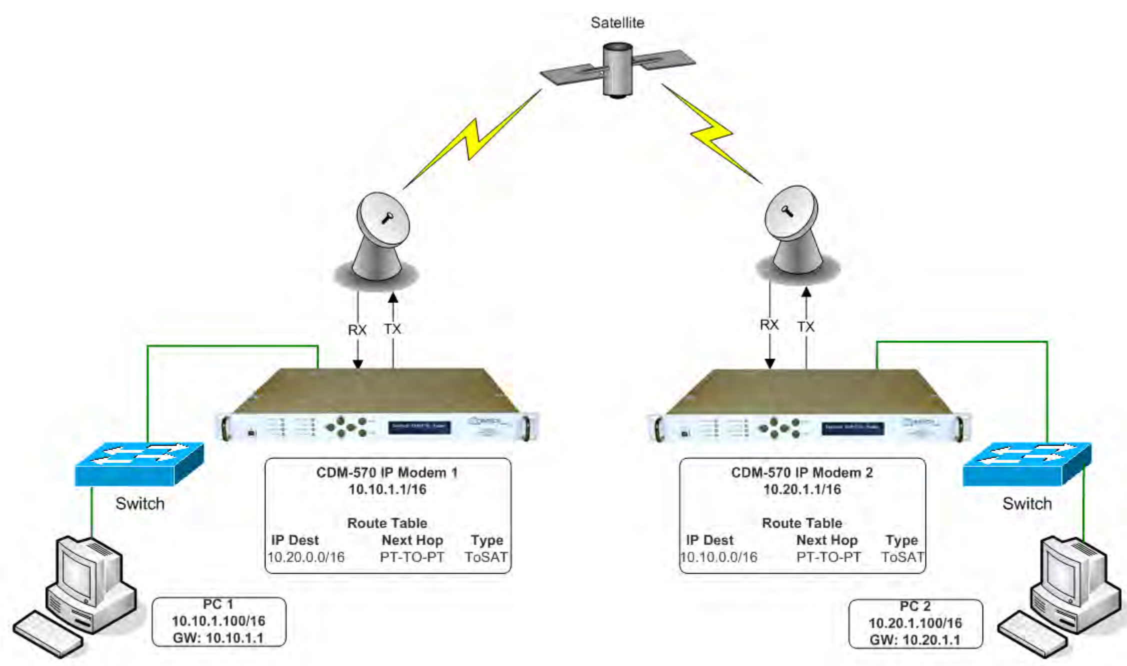


Figure G-2. Router Mode, Point-to-Point Diagram

Figure G-2 shows a 256 kbps Point-to-Point duplex link in Router Mode. Note that each side of the link has different IP subnets – 10.10.0.0/16 and 10.20.0.0/16. Each CDM-IP modem has a static route defined for the distant CDM-IP modem subnet. The Next Hop is automatically defined as Point-to-Point, and there are no HDLC addresses to configure; all that is required to send traffic between the PCs on each subnet is to define the local CDM-IP modem as the PC default gateway. The CDM-IP modems will only pass traffic over the satellite link by the ToSat routes configured in the Route Table.

G.3.5 Router Working Mode – Point-to-MultiPoint

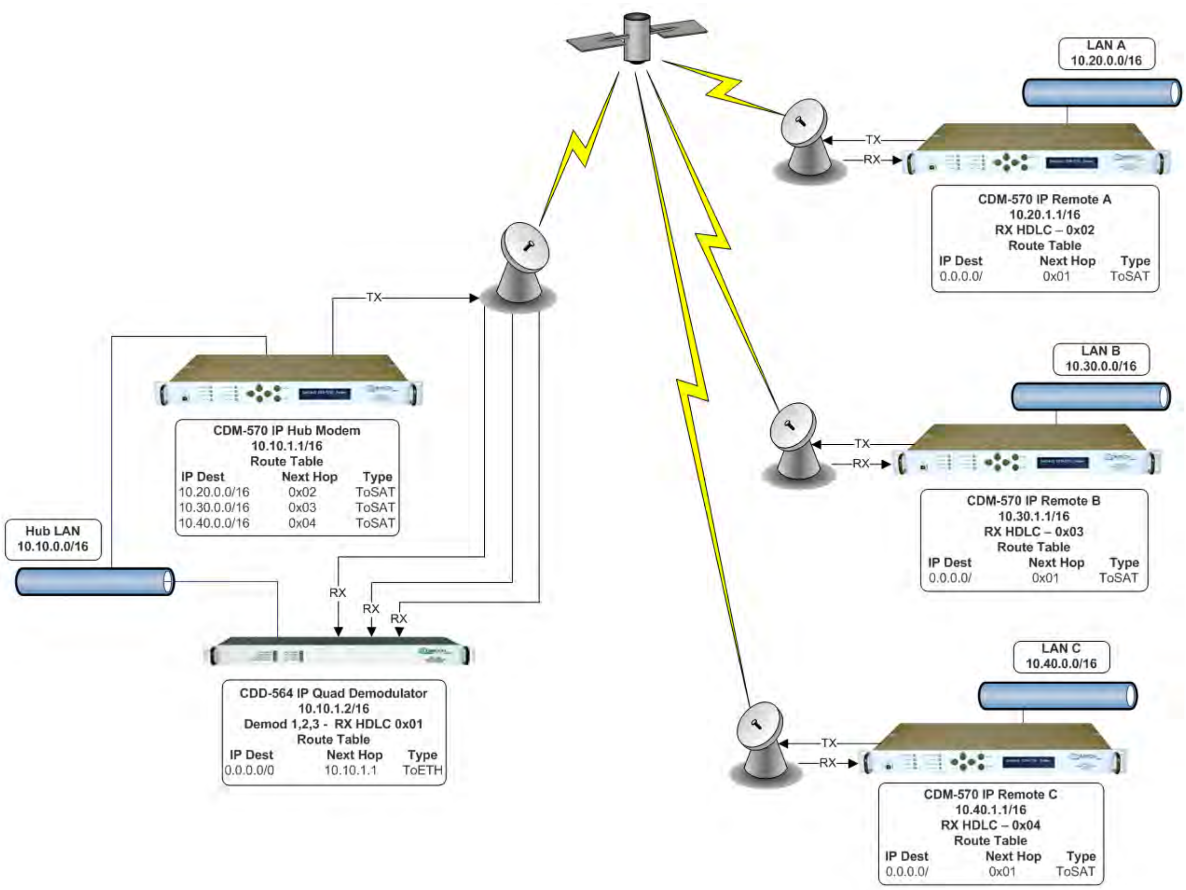


Figure G-3. Router Mode, Point-to-Multipoint HDLC Diagram

This Router Point-to-Multipoint Mode with HDLC Addressing only applies to CDM-570's and CDD-564's operating with CDM-570/570L FW version 1.6.7 or earlier.

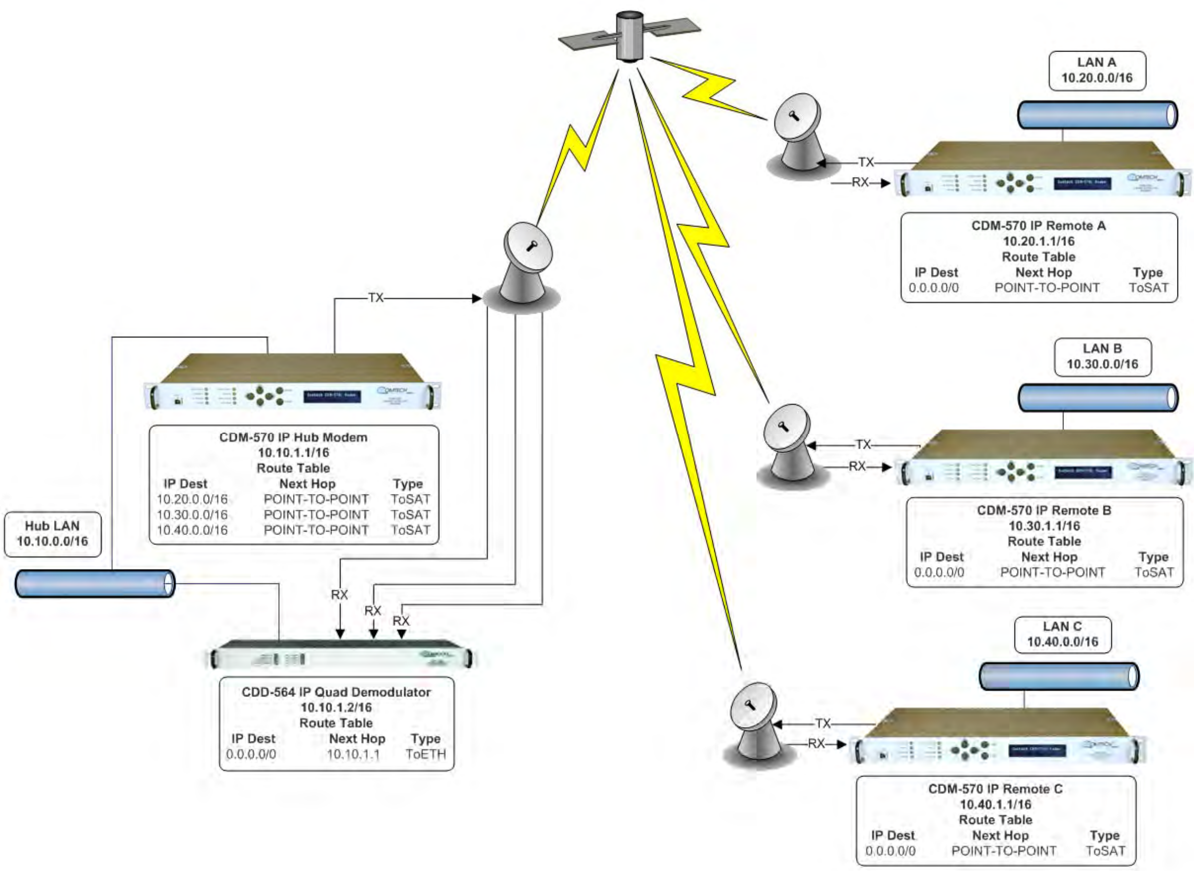
Figure G-3 shows a Point-to-MultiPoint Configuration (also referred to as a "STAR Network"). The Hub CDM-570/L IP Modem is transmitting a common 2.048 Mbps link to THREE remote CDM-570/L IP modems. All three Remote CDM-570/L IP modems are transmitting a 256 kbps link back to the Hub CDD-564/L IP Quad Demodulator.

Since this is a Point-to-MultiPoint configuration, HDLC addressing is used so that the traffic not intended for a particular destination can be filtered. For Unicast traffic, it is best to associate a unique HDLC address for each site in the network. For this case, the Hub Site is HDLC 0x01;

Remote A is HDLC 0x02; Remote B is 0x03; and Remote C is 0x04. Each CDM-IP Modem would select the HDLC address associated with its site as a RX HDLC Address, so Hub CDD-564/L Demodulator 1, 2, and 3 would have 0x01 as the first RX HDLC Address; Remote A CDM-570/L IPwould have 0x02; Remote B CDM-570/L IP would have 0x03; and Remote C CDM-570/L IP would have 0x04.

The Hub CDM-IP 1 has static routes defined for each of the remote CDM-570/L IP subnets with the Next Hop HDLC address being the HDLC address associated with the remote site. All three remote CDM-570/L IP modems have default routes to the satellite with the Next Hop HDLC address being 0x01. The Hub CDD-564/L Demodulator has a default route (ToEth) to the Hub CDM-570/L IP modem because all outbound traffic will go through the CDM-570/L IP modem.

Additional remote sites can be added through a dedicated demodulator at the hub for each remote.



This Router Point-to-Multipoint Mode with Streamline Encapsulation only applies to CDM-570/Ls and CDD-564/Ls operating with CDM-IP Firmware Ver. 1.7.X or later.

Figure G-4. Router Mode, Point-to-Multipoint Streamline Diagram

Figure G 4 shows a Router Mode, Point-To-Multipoint network using Streamline encapsulation. This is functionally identical to the Point-To-Multipoint network using HDLC without having to configure HDLC addressing on the CDM-570/570L modems.
The Working Mode of each modem needs to be set as follows:

- **Hub CDM-570/L IP Modem – Router-Hub**
- **Hub CDD-564/L IP Quad Demodulator – Router**
- **Remote CDM-570/L IP Modem – Router-Remote**

The Route Table entries are as follows:

- **Hub CDM-570/L IP Modem –** One Route entry for each IP subnet at each remote site
- **Hub CDD-564/L Demodulator –** An Ethernet default route with a Next Hop being the IP of the **Hub CDM-570/L**
- **Remote CDM-570/L IP Modem –** A Satellite default route

Appendix H. P REDUNDANCY

H.1 Introduction

All CDM-570/570L modems can be configured for 1:1 IP Redundancy as a standard feature when used with a Comtech EF Data CRS-180 (70/140 MHz IF) or CRS-170A (L-Band) 1:1 Redundancy Switch:

CDM-570 Modem Type	CRS Switch Model
CDM-570 (70-140 MHz IF)	CRS-180
CDM-570L (L-Band)	CRS-170A

This appendix describes CDM-570/570L IP 1:1 Redundancy configuration and operation using either of these switches.

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting Printed Circuit Boards (PCBs).

H.2 CRS-XXX 1:1 Redundancy Switch Functional Description

H.2.1 CRS-180 70/140 MHz 1:1 Redundancy Switch

See the* CRS-180 70/140 MHz 1:1 Redundancy Switch Installation and Operation Manual *for more detailed information on the CRS-180 operation.

The CRS-180 70/140 MHz 1:1 Redundancy Switch performs the transmit and receive coaxial switching required for redundant modem operation. It switches both the Tx and Rx coaxial cables simultaneously.

The user can select **Unit Faults** only, **Unit Faults** or **Receive Traffic Faults**, **Unit Faults** or **Transmit Traffic Faults**, or all three for the switchover criteria with the two switches on top of the unit. This selection provides a great deal of flexibility in the operation of the switch. Green LEDs on the antenna side of the CRS-180 indicate which modem is online.

The control cable from each modem to the CRS-180 also includes +12V power to operate the CRS-180. Power from both modems is diode OR'ed so that the switch remains active if power is lost from one of the modems.

The CRS-180 provides IF redundancy. On the Tx side, it switches the Tx IF signal. The Rx IF signal from the RF equipment is split in a power divider to continuously drive both the online and offline demodulator. The offline demodulator can then maintain lock so that it is ready to quickly assume online status for receive traffic when a switchover is required.

H.2.2 CRS-170A L-Band 1:1 Redundancy Switch

See the* CRS-170A L-Band 1:1 Redundancy Switch Installation and Operation Manual *for more detailed information on the CRS-170A operation.

The CRS-170A L-Band 1:1 Redundancy Switch performs the transmit and receive coaxial switching required for redundant modem operation with an outdoor BUC and LNB. It switches all of the BUC and LNB interface signals that are multiplexed onto the transmit and receive coaxial cables:

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

The user can select **Unit Faults** only, **Unit Faults or Receive Traffic Faults**, **Unit Faults** or **Transmit Traffic Faults**, or all three for the switchover criteria. This selection provides a great deal of flexibility in the operation of the switch. Green LEDs on the antenna side of the CRS-170A indicate which modem is online.

The control cable from each CDM-570L modem to the CRS-170A also includes +12V power to operate the CRS-170A. Power from both modems is diode OR'd so that the switch remains active if power is lost from one of the modems.

The CRS-170A provides L-Band redundancy, but when switching occurs, it accommodates more than just the L-Band signals. On the Tx side, it switches the Tx L-Band signal, the 10 MHz reference to the BUC, DC power to the BUC, and FSK signaling to the BUC. On the Rx side, it switches the 10 MHz reference to the LNB, and DC power to the LNB. The Rx L-Band signal from the LNB is split in a power divider to continuously drive both the online and offline demodulator. The offline demodulator can then maintain lock so that it is ready to quickly assume online status for receive traffic when a switchover is required.

H.3 CDM-570/570L 1:1 IP Data Switching Functional Description

When the CDM-570/570L modem is using a serial data interface (for example, RS.422 or V.35), the CRS-180 (or CRS-170A) 1:1 Redundancy Switch is used in conjunction with a Comtech 1:1 Data Switch module. When the CDM-570/570L modem is using the IP Module as the data interface, there is no need for a 1:1 Data Switch module. As shown in **Figure H-1**, a standard Ethernet Hub or Layer 2 Switch can be used (it is recommended to use a Layer 2 Switch).

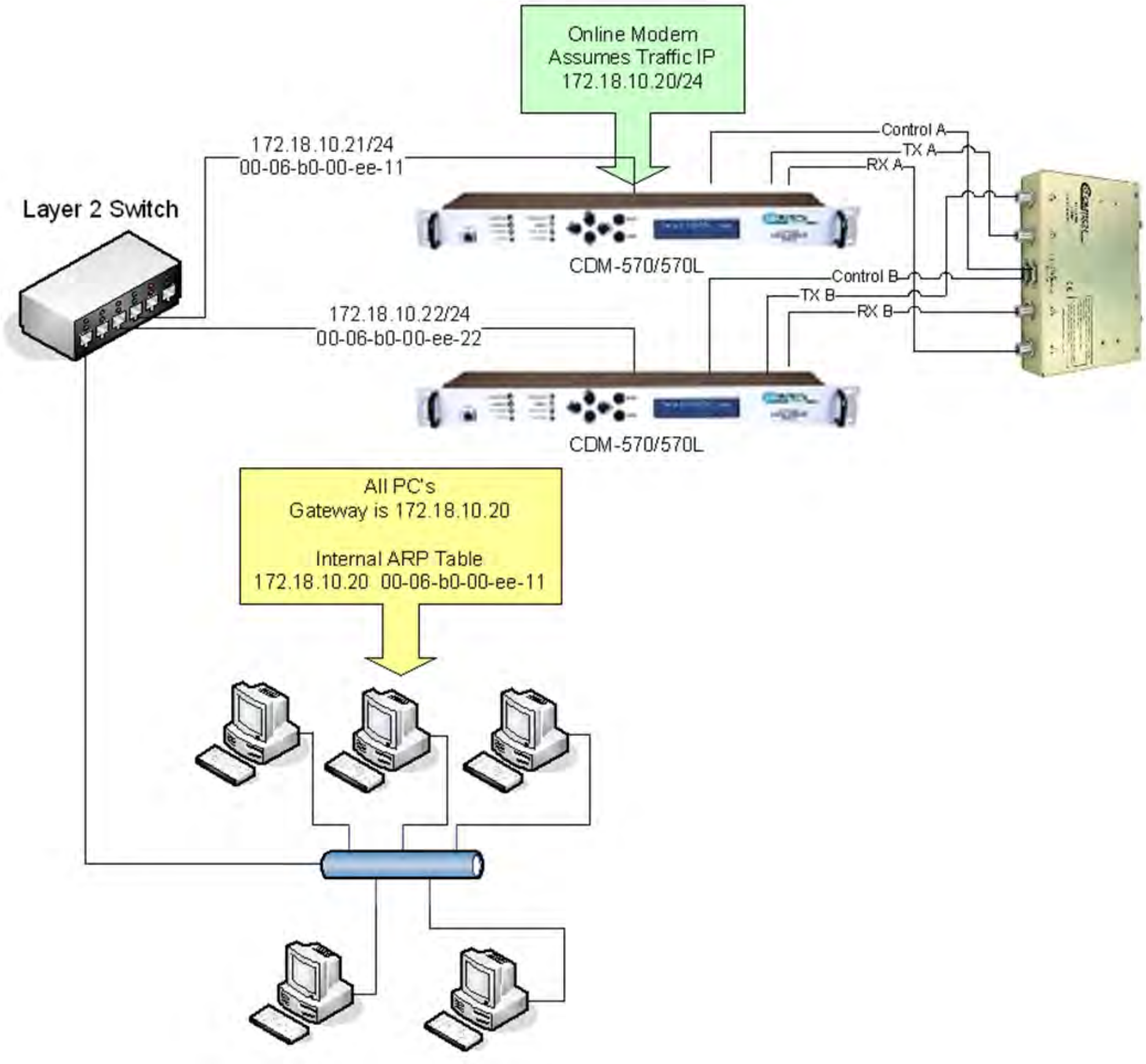


Figure H-1. CDM-570 1:1 IP Redundancy

For CDM-570/570L IP 1:1 redundancy operation, both CDM-570/570L modems are assigned a unique M&C IP address on the same subnet (in the diagram above, 172,18.10.21/24 and 172.18.10.22/24). A Traffic IP address on the subnet is also assigned (172.18.10.20/24). Whichever modem is online, it will also assume the Traffic IP.

When there is a switchover to the backup modem, this modem will now assume the Traffic IP. It will also broadcast a "gratuitous ARP" which will tell all local devices to now associate a new MAC address for the Traffic IP 172.18.10.20. Each device will update their ARP tables and traffic will resume virtually instantaneously.

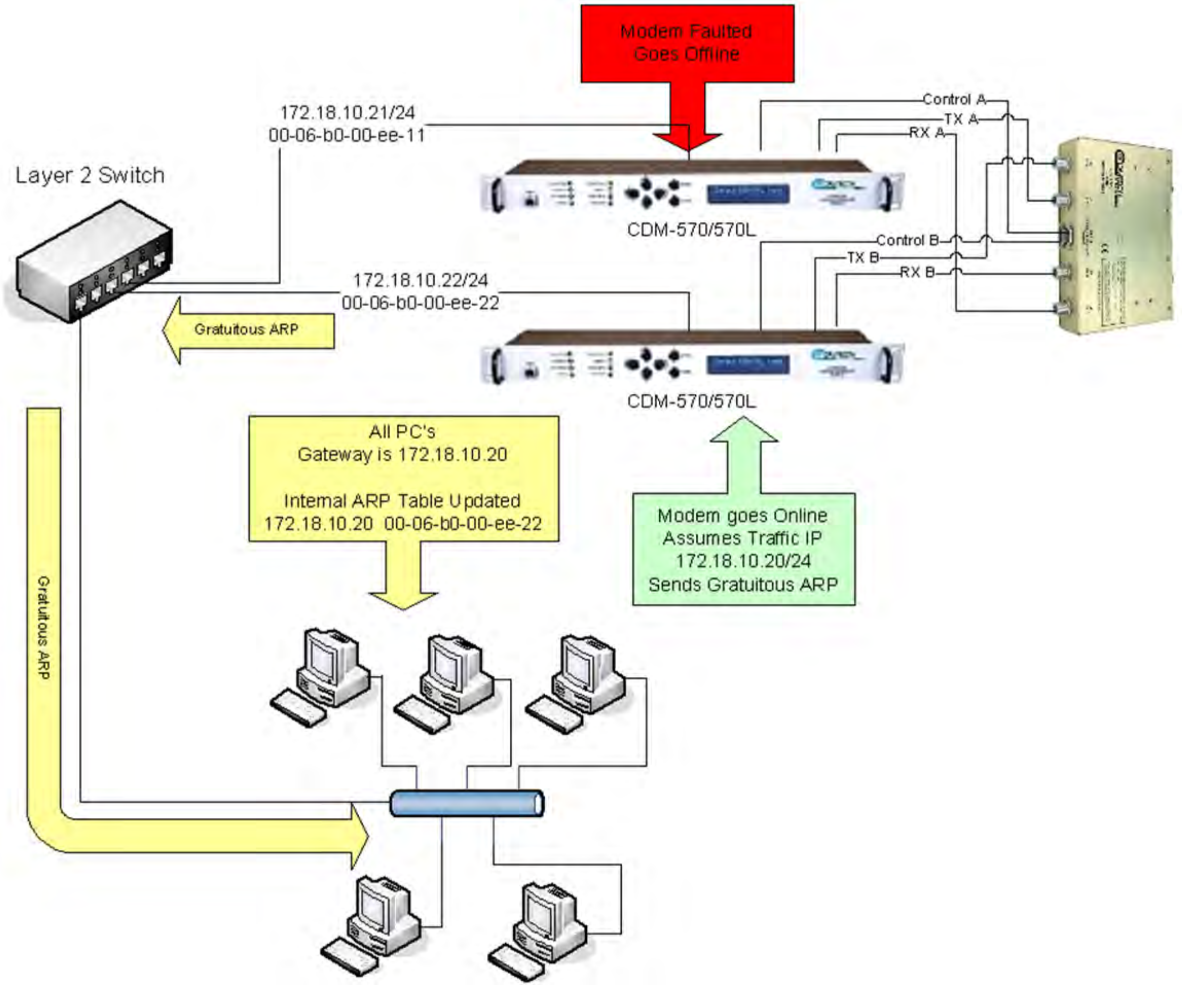


Figure H-2. CDM-570 1:1 IP Redundancy Switchover

All configuration changes can only be made to the Online CDM-570/570L and will require the user to do a "Save Parameters to permanent storage" so that the configuration change is also applied to the Backup CDM-570/570L.

H.4 CDM-570/570L 1:1 IP Redundancy Configuration

The following steps are required for setting up a CDM-570 IP 1:1 redundant system using either a CRS-170A (for the CDM-570L) or a CRS-180 (for the CDM-570) 1:1 Redundancy Switch:

1. First, the two CDM-570/570Ls will need an Ethernet connection to each other through a Layer 2 switch or hub (preferably an L2 switch).
2. Before connecting the CDM-570/570Ls to the 1:1 switch, you will first need to configure the following on the CDM-570/570L IP Module settings:
    - **Administration → Redundancy Configuration → 1:1 Redundancy** set to **`DISABLED;`**
    - **Administration → Working Mode**: Both modems need to be set to the same Working Mode;
    - **Administration → Features**: Both modems need to have the same IP Option Feature set.
3. On both modems, enter a unique IP Address that is on the same subnet (**Interface → Ethernet Interface → IP Address**). Verify that you can ping from one CDM-570/570L to the other (**Ops and Maintenance → Diagnostics → Ping**).
4. On both modems, set **Administration → Redundancy Configuration → 1:1 Redundancy** set to **`ENABLED`**. Save Parameters to Permanent Storage and power down both modems.
5. Connect the CDM-570/570Ls to the1:1 switch:
    - Refer to **Sect. H.4** for cabling with the CDM-570 IF → CRS-180;
    - Refer to **Sect. H.5** for cabling with the CDM-570L → CRS-170A.
6. While monitoring the Serial console CLI on both modems, observe the following after powering on both modems at the same time (also observe the switch Online LEDs to see which modem is the Online modem).
    - Online modem CLI will display:

      ```
      1:1 Redundancy (Auto Detected)
      Redundancy: PARAM File Connection Established.
      Redundancy: Sending PARAM File...
      ```

    - Offline modem will display:

      ```
      1:1 Redundancy (Auto Detected)
      Redundancy: Received PARAM File...
      Writing 5447 bytes to PARAM file on Flash
      ```

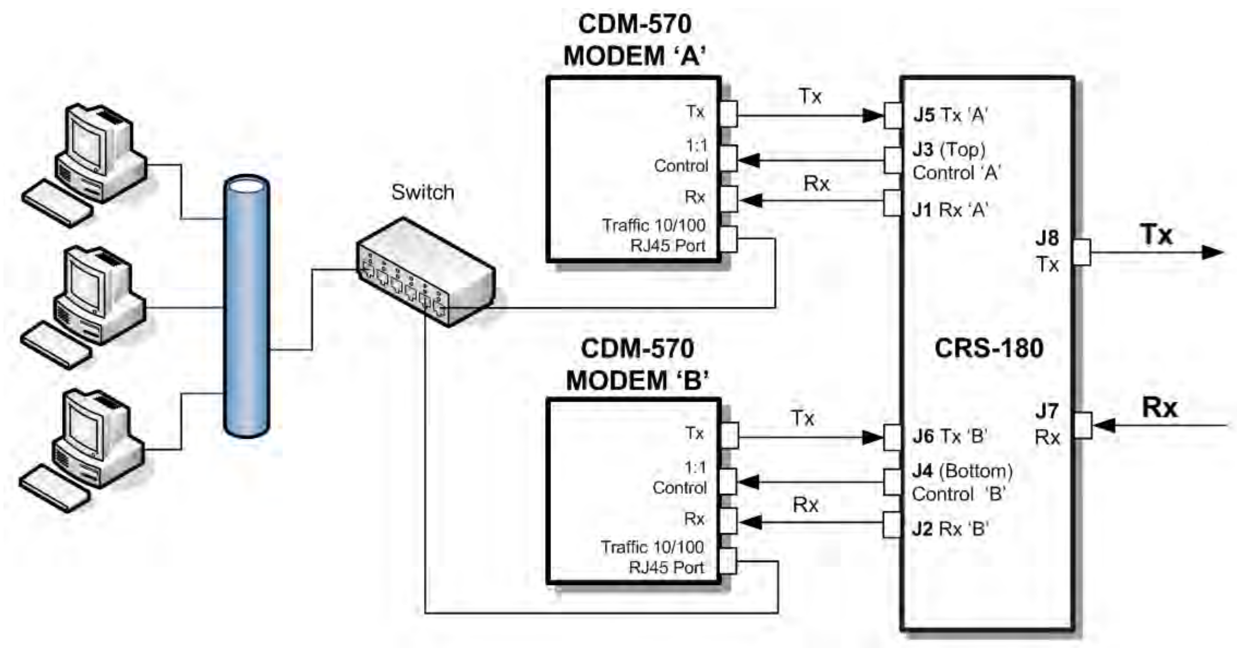
7. On the Online modem, select the Redundancy Configuration menu. Observe that the correct IP Address/Mask is displayed for the Local and Redundant Unit. Then you will need to set the Traffic IP Address/Mask (this also needs to be in the same subnet as the Management IP addresses):

```
                        1:1 Redundancy Configuration


1:1 Redundancy...........................[Enabled]...................R

1:1 Redundancy State.....................[Online]

Traffic IP Address.......................[172.18.10.20]..............T

Traffic Subnet Prefix Length.............[ 24   ]....................M

Management IP Address (Local Unit).......................[172.18.10.21]

Management Subnet Prefix Length (Local Unit)..................[ 24   ]

Management IP Address (Redundant Unit)...................[172.18.10.22]

Management Subnet Prefix Length (Redundant Unit) .............[ 24   ]

Force Unit Offline....................................................F


Save Parameters to permanent storage. ................................S

Exit..................................................................X
```

All configuration changes can only be made to the Online CDM-570/570L and will require the user to do a "Save Parameters to permanent storage" so that the configuration change is also applied to the Backup CDM-570/570L.

H.5 Cabling With CDM-570 IF

Figure H-3 shows how to connect a pair of CDM-570 modems together with the CRS-180 70/140 MHz 1:1 Redundancy Switch. The table that is included here lists cable assemblies that may be supplied with the CRS-180.



Quantity	Part #	Description
2	CA/WR9378-4	Control Cable, Universal, DB9 Male to Male, 4'
4	PL/0946-1	IF (Tx/Rx) Coax Cable, 50Ω Type 'BNC', 4'

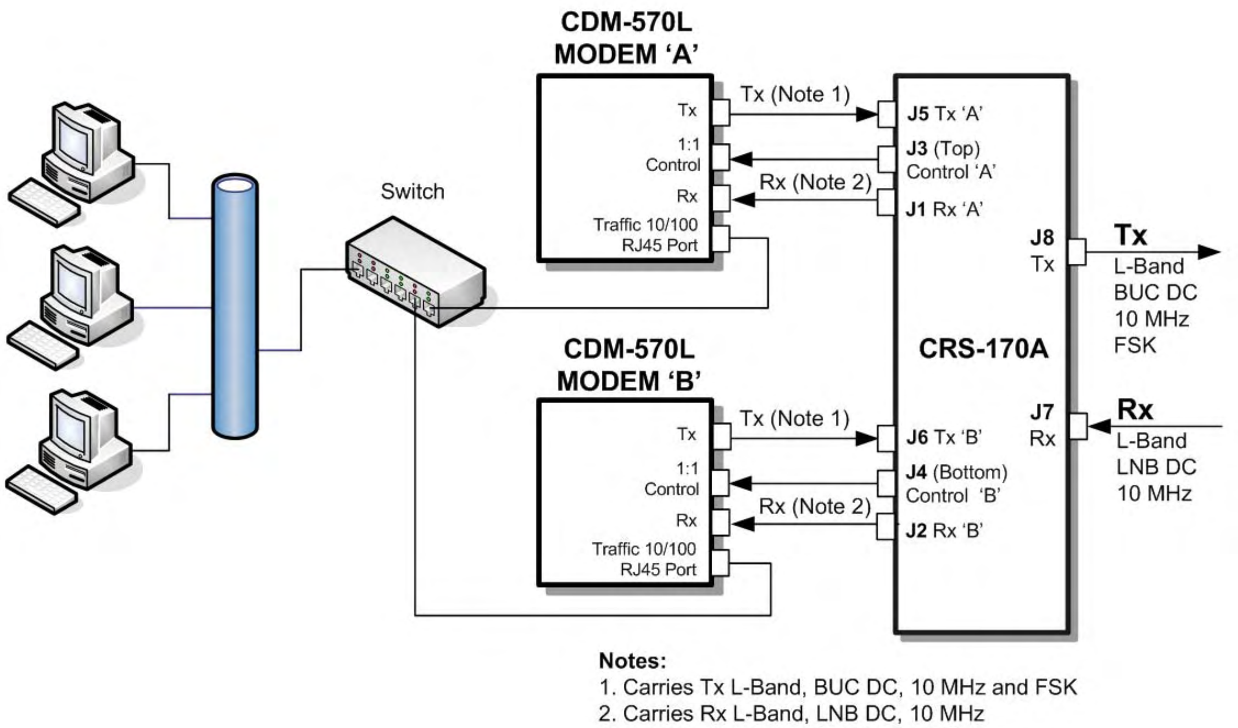
Figure H-3. CDM-570 and CRS-180 Interconnect

It is essential to ensure that the control and IF connections, both Rx and Tx, are made correctly. For example, the Tx IF from Unit 'A' connects to the Tx IF port 'A' on the CRS-180, and Unit 'B' connects to the Tx IF Port 'B', and the same for the Rx IF connections. Failure to observe this requirement will result in system malfunction.

When connecting the Control cable between the CRS-180 and the modems, ensure that screw locks on the 'D' type connectors are securely fastened. This will prevent the accidental un-mating of the cable, particularly when a standby unit is being removed or replaced.

H.6 Cabling With CDM-570L

Figure H-4 shows how to connect a pair of CDM-570L modems together with the CRS-170A L-Band 1:1 Redundancy Switch. The table that is included here lists cable assemblies that may be supplied with the CRS-170A.



Quantity	Part #	Description
2	CA/WR9378-4	Control Cable, Universal, DB9 Male to Male, 4'
4	CA/RF10453-4	RoHS-Compliant Cable – IF (Tx/Rx), 50Ω Type 'N', 4'

Figure H-4. CDM-570L and CRS-170A Interconnect

When connecting the Control cable between the CRS-170A and the modems, ensure that screw locks on the 'D' type connectors are securely fastened. This will prevent the accidental unmating of the cable, particularly when a standby unit is being removed or replaced.

Appendix J. GPS MODE

J.1 Overview

This appendix summarizes the CDM-570/570L software feature that permits a Furuno GP-320B GPS receiver to be connected to a distant-end modem, and for the local end to query – via the EDMAC channel – the output from the GPS receiver.

In order to do this, the local modem is set as MASTER, and the distant-end is set as SLAVE. The Furuno GP-320B GPS receiver is then connected to the remote control serial port of the distant end modem.

If 'standard' EDMAC framing is used, the MASTER can be a CDM-550, CDM-600/600L, or CDM-570/570L. However, if EDMAC-2 framing is used, both ends of the link need to be CDM-570/570L.

Remote commands sent to the SLAVE modem are used to retrieve GPS data sentences. The modem has a circular buffer to contain the most recent 1000 characters received from the GPS receiver – about 2 to 3 seconds of data. The method of searching for the correct sentence is to simply look for the first match in the buffer. This gives about two seconds' delay time in the worst case at the SLAVE end, plus any delay added by the EDMAC channel. When a query is actively taking place, placing of new GPS data into the buffer is temporarily suspended.

J.2 Hardware Setup

Step	Task
1	Ensure that the serial remote control type of the SLAVE modem is set to RS232.
2	Follow the Setup sequence of EDMAC described in **Chapter 11. EDMAC CHANNEL**. The SLAVE Modem must be a CDM-570 or CDM-570L, and the MASTER modem can be any modem compatible with the SLAVE modem.
3	Connect the GP-320B GPS receiver to the SLAVE modem's serial port. The **YELLOW** wire in the Furuno GPS cable (RDA) should be connected to pin 3 of the CDM-570L serial remote control port (9-pin Type 'D' male – see **Chapter 3. REAR PANEL CONNECTORS**). Connect the ground wire from the GPS to Pin 1.
4	Establish an RF link between the SLAVE and MASTER modems, and once satisfied that both demods are locked, set up a serial communications session via the serial port of the MASTER modem, and begin sending EDMAC messages to the distant-end SLAVE.

J.3 Remote Commands

For more information about using remote commands and queries, see* Appendix D. REMOTE CONTROL*).

Several remote commands are available to enable the GPS Mode and retrieve GPS information. These commands are for the SLAVE modem ONLY, which means the address field must be the address of the Slave unit (e.g., 0021).

- **GPS – GPS Mode, Query and Command**
  0 = Disabled
  1 = Enabled

Note: When the GPS mode is enabled, the SLAVE modem's serial's Baud Rate is changed to 4800 to receive data from GP-320B. To go back to normal serial operation mode, disable the GPS Mode.

- **DTM? – Retrieve GPDTM data sentence**
- **GGA? – Retrieve GPGGA data sentence**
- **ZDA? – Retrieve GPZDA data sentence**
- **GLL? – Retrieve GPGLL data sentence**
- **VTG? – Retrieve GPVTG data sentence**
- **RMC? – Retrieve GPRMC data sentence**

Example capture of the remote commands:

<0021/GPS?	***queries current GPS status***
>0021/GPS=0[cr][lf]	***SLAVE responds that GPS is disabled***
<0021/GPS=1	***SLAVE is commanded to enable GPS***
>0021/GPS=[cr][lf]	***SLAVE confirms that GPS is enabled***

<0021/DTM?	***SLAVE is commanded to return GPDTM data sentence***

>0021/DTM=$GPDTM,W84,,00.0000,N,00.0000,W,,W84*53[cr][lf]
<0021/GGA?
>0021/GGA=$GPGGA,222830,3325.4268,N,11158.2640,W,0,01,00.00,000293.6,M,-026.2,M,,*7F[cr][lf]
<0021/ZDA?
>0021/ZDA=$GPZDA,223145,14,10,2005,+00,00*63[cr][lf]
<0021/GLL?
>0021/GLL=$GPGLL,3325.4268,N,11158.2640,W,222830,V,N*47[cr][lf]
<0021/VTG?
>0021/VTG=$GPVTG,,T,,M,,N,,K,N*2C[cr][lf]
<0021/RMC?
>0021/RMC=$GPRMC,222830,V,3325.4268,N,11158.2640,W,,,141005,011.8,E,N*12[cr][lf]

<0021/GPS=0	***SLAVE is commanded to disable GPS***
>0021/GPS=[cr][lf]	***SLAVE confirms that GPS is disabled***
<0021/RMC?	***SLAVE is commanded to return GPRMC data sentence***
>0021/RMC*[cr][lf]	***SLAVE responds that data is not available***

Appendix K. CDM-570 ODU (CSAT-5060 OR KST-2000A/B) OPERATION

K.1 Introduction

The CDM-570 Satellite Modem permits the user to configure, monitor, and control a Comtech EF Data RF Transceiver (referred to throughout this appendix as an ODU, or Outdoor Unit).

The following ODUs are compatible for operation with the CDM-570:

- CSAT-5060 series (5 to 25, 50 & 100 Watts) C-Band Transceivers
- KST-2000A (LNA) Ku-Band Satellite Transceiver
- KST-2000B (LNB) Ku-Band Satellite Transceiver

The user can fully control and monitor the operation of an ODU in the following ways:

- By using ODU remote commands through Serial Remote or Telnet
- By using the keypad and display via the front panel of a CDM-570 Modem
- By using the CDM-570 Base Modem HTTP (Web Server) Interface
- By using the SNMP Interface with CSAT-5060 or KST-2000A/B Transceiver MIB

K.2 ODU Remote Control Address Setup

The Outdoor Unit (ODU) connected to a CDM-570 through FSK can be remotely monitored and controlled by using ODU remote commands through Serial Remote or Telnet. The address of the ODU is set up as follows:

- **For local-end ODUs:**
    - Use Modem's RC address + 1 for Standalone unit or Online unit in a 1:1 Redundancy System
    - Use Modem's RC address + 2 for Offline unit in a 1:1 Redundancy System

- **For distant-end ODUs in an EDMAC setup:**
  - o Use EDMAC Slave Address (ESA) Range +4 for Standalone unit or Online unit in a 1:1 Redundancy System
  - o Use EDMAC Slave Address (ESA) Range +5 for Offline unit in a 1:1 Redundancy System

K.3 ODU Operations via the CDM-570 Front Panel

K.3.1 CDM-570 Front Panel Operation Overview

***For in-depth explanations of the function and operation of the front panel features, see* Chapter 5. FRONT PANEL OPERATION.**

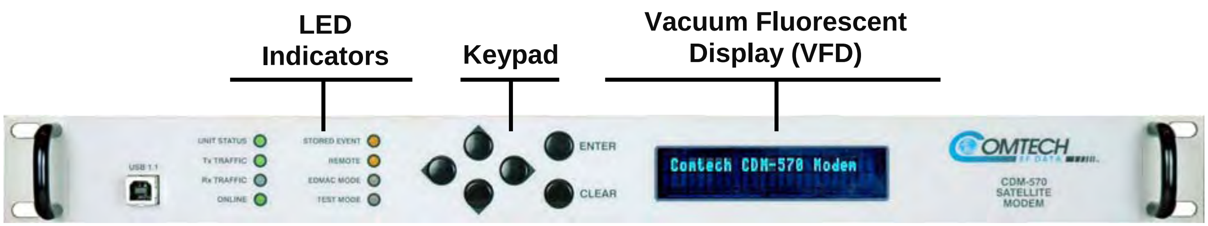
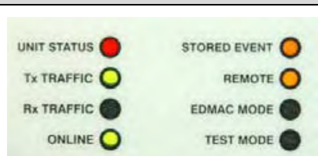


Figure K-1. CDM-570 Front Panel View

Figure K-1 identifies the key features of the CDM-570 front panel; their purpose is summarized as follows:

Feature		Description
	LED Indicators	This array of eight LEDs indicates the operational status of the CDM-570.
	Keypad	Use the keypad to select and navigate the available CDM-570 menu functions as displayed on the Vacuum Fluorescent Display (VFD).
	Vacuum Fluorescent Display (VFD)	Consisting of two lines with a width of 24 characters each, the VFD displays all available options and prompts the user to carry out a required action (using the keypad and nested menus) for monitor and control of the CDM-570.

The user can configure, monitor, and control ODU operation via the CDM-570 front panel, using the keypad and display. Nested menus are used, which display all available options, and prompt the user to carry out a required action.

K.3.2 CDM-570 Front Panel Operation – ODU Menu Hierarchy

Figure K-2 identifies the basic CDM-570 front panel menu hierarchy that pertains specifically to the operation of a CSAT-5060, KST-2000A or KST-2000B ODU. In this particular figure, the menu branch dedicated to ODU operations is shown in bold.

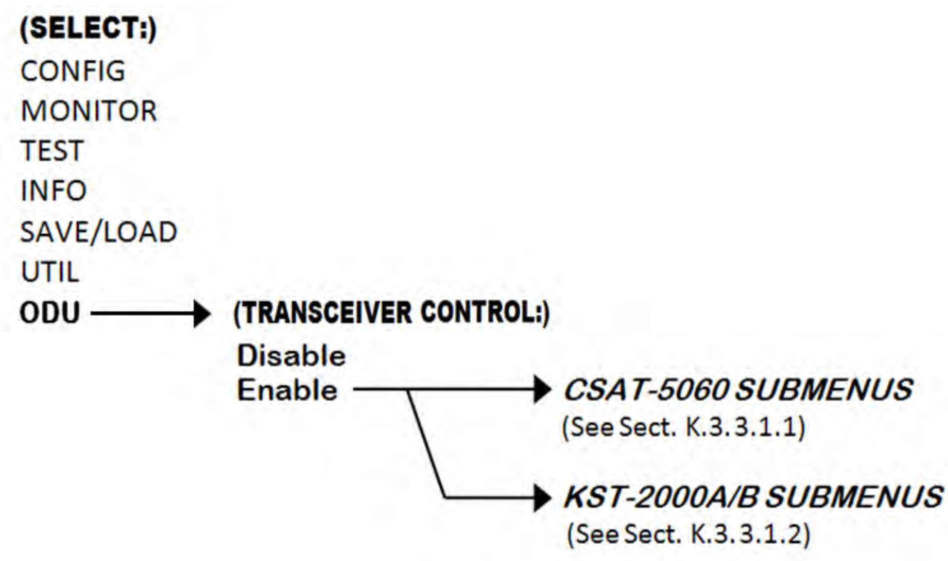


Figure K-2. CDM-570 ODU Operation Principal Menu Tree

The ODU menu branch is accessible from the CDM-570 front panel menu only when the presence of an ODU is detected. Also note that, as this appendix deals with strictly with ODU operations, **Chapter 5. FRONT PANEL OPERATION** ***provides a complete overview for any CDM-570 menu operations or selections not defined in this appendix.***

Where menu operations differ based on the ODU product recognized by the CDM-570 (i.e., menu function tailored to the CSAT-5060 or KST-2000A/B ODUs), refer to the appropriate appendix subsection specified in this figure for the remainder of the complete principal menu tree.

K.3.3 SELECT: (Main) Menu

```
SELECT: Config Test Info
Monitor Save/Ld Util ODU
```

The table that follows identifies the commands comprising the CDM-570 main menu, and the content section in this manual where explicit information may be referenced, either in this appendix or in **Chapter 5. FRONT PANEL OPERATION**:

Menu Branch *(For more info, see...)*	Description
Config *(Chapter Sect. 5.2.2.1)*	Used to fully configure the modem.
Monitor *(Chapter Sect. 5.2.2.2)*	Used to monitor the alarm status of the modem, to view the log of stored events, and to display the Receive Parameters screen.
Test *(Chapter Sect. 5.2.2.3)*	Used to invoke one of several test modes (loopbacks, for example).
Info *(Chapter Sect. 5.2.2.4)*	(Information) Used to view information on the modem, without having to go into configuration screens.
Save/Load *(Chapter Sect. 5.2.2.5)*	(Save/Load) Used to save and to retrieve up to 10 different modem configurations.
Util *(Chapter Sect. 5.2.2.6)*	(Utility) Used to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.
ODU *(Appendix K.3.2: K.3.2.1 for CSAT-5060 K.3.2.2 for KST-2000A/B)*	(Outdoor Unit) Used to monitor and control a Comtech EF Data RF Transceiver (CSAT-5060 or KST-2000A/B), if connected.

For ODU operation, use the ◄ ► arrow keys to select **ODU**, and then press **ENTER**.

K.3.3.1 (SELECT:) ODU

```
Transceiver Control:
Disable Enable (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Disable** or **Enable**, and then press **ENTER**. Note the following:

Disable	This menu item turns OFF the FSK link to the ODU
Enable	This menu item turns ON the FSK link to the ODU

Once the FSK link to the ODU is **enabled**, the CDM-570 senses the active ODU model and automatically adjusts the front panel menu selections specific to that product. **Sections K.3.3.1.1** and **K.3.3.1.2** address front panel operation functionality as it is adapts to CSAT-5060 or

KST2000A/B Transceiver operation. **Figure K-3** and **Figure K-4** illustrate those ODU-specific CDM-570 menu hierarchies.

K.3.3.1.1 (SELECT:) ODU – CSAT-5060 Transceiver Front Panel Operation

Figure K-3 identifies the basic CDM-570 front panel menu hierarchy as it pertains specifically to operation of the CSAT-5060 ODU.

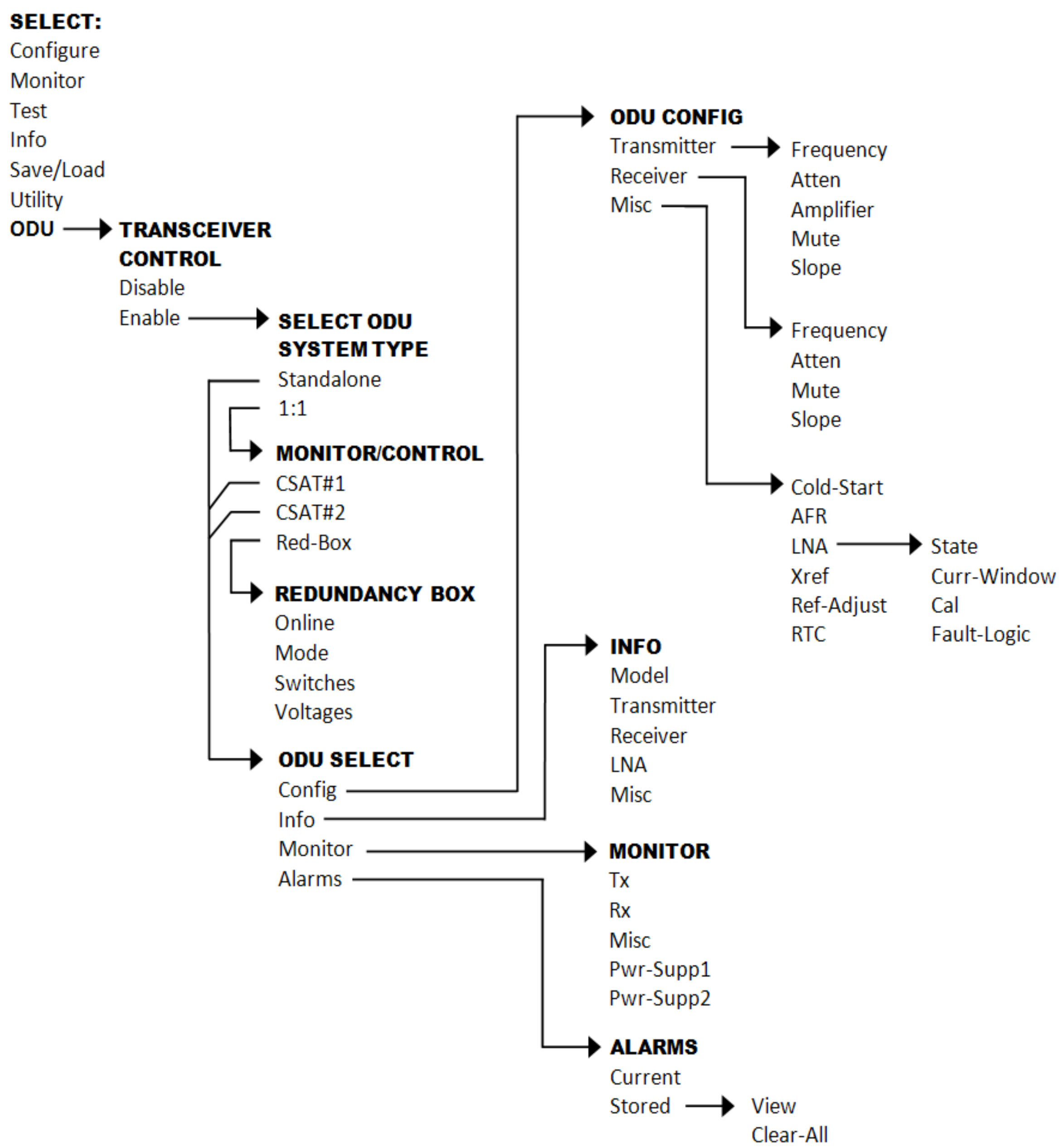


Figure K-3. ODU: CSAT-5060 Transceiver Menu Tree

K.3.3.1.1.1 ODU (Transceiver Control): Enable

```
Select ODU System Type:
Standalone 1:1 (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Standalone** or **1:1**, and then press **ENTER**. Note the following:

- Select **Standalone** when the modem is linked via the Rx IF cable to a single Comtech EF Data CSAT-5060 ODU.
- Select **1:1** when the modem is linked to a redundant CSAT-5060 system via connection between the Rx IF and the ODU Redundancy Controller Box.

When the following menu selections are made:

ODU Transceiver Control: Enable → Standalone
ODU Transceiver Control: Enable → 1:1 → CSAT#1
ODU Transceiver Control: Enable → 1:1 → CSAT#2

*The user is directed to a common **ODU SELECT** submenu branch:*

```
ODU SELECT: Config  Info
Monitor  Alarms (◄ ►,ENT)
```

*For clarity, this common submenu branch is defined in detail in **Sect. K.3.3.1.1.1.1.***

(ODU: Enable) Standalone

```
ODU SELECT: Config  Info
Monitor  Alarms (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Config**, **Info, Monitor**, or **Alarms**, and then press **ENTER**. The selections for this common submenu branch are defined in detail in **Section K.3.3.1.1.1.1.**

(ODU: Enable) 1:1

```
Monitor/Control:  CSAT#1
CSAT#2  Red-Box (◄ ►,ENT)
```

For monitor/control of a redundant CSAT-5060 system: Use the ◄ ► arrow keys to select **CSAT#1**, **CSAT#2**, or **Red-Box**, and then press **ENTER**.

(ODU: Enable) 1:1 → CSAT#1 or CSAT#2

```
ODU SELECT: Config  Info
Monitor  Alarms (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Config**, **Info, Monitor**, or **Alarms**, and then press **ENTER**. The selections for this common submenu branch are defined in detail in **Sect. K.3.3.1.1.1.1.**

(ODU: Enable) 1:1 → Red-Box

```
Redundancy Box:  Online
Mode  Switches  Voltages
```

Use the ◄ ► arrow keys to select **Online**, **Mode**, **Switches**, or **Voltages**, and then press **ENTER**.

(ODU: Enable) 1:1 → Redundancy Box → Online

```
Online Unit:
CSAT#1  CSAT#2  (◄ ►,ENT)
```

This display indicates the ODU **currently online**. The cursor will be flashing under **CSAT#1** or **CSAT#2**. If the user desires to change the **Online** unit, use the ◄ ► arrow keys to move the cursor position to the desired unit, and then press **ENTER**.

If the ODU Redundancy system is in AUTO mode, a 'forced switch-over' can only occurs if the currently Offline unit is fault-free.

(ODU: Enable) 1:1 → Redundancy Box → Mode

```
Operating Mode:
Manual  Auto    (◄ ►,ENT)
```

This display indicates the **current operating mode** of the 1:1 ODU system. The cursor will be flashing under **Manual** or **Auto**. If the user desires to change the operating mode of the 1:1 system, use the ◄ ► arrow keys to move the cursor position to the desired operating mode, and then press **ENTER**.

(ODU: Enable) 1:1 → Redundancy Box → Switches

```
Waveguide Switch Status:
Tx=OK Rx=OK (ENT or CLR)
```

This *read-only* screen shows status for both the Tx and Rx Waveguide Transfer Switches. If either Switch reports an ambiguity from the commanded position, "**OK**" will change to "**FT**" to indicate a switch fault.

(ODU: Enable) 1:1 → Redundancy Box → Voltages

```
Redundancy Box Voltages:
5V= 5.0  12V=12.0  (ENT)
```

Provided to assist in troubleshooting system problems, this *read-only* display monitors the voltages inside the Redundancy Controller Box.

K.3.3.1.1.1.1 COMMON 'ODU SELECT' SUBMENU

(ODU: Enable) Standalone →

(ODU: Enable) 1:1 → CSAT#1 →

(ODU: Enable) 1:1 → CSAT#2 →

```
ODU SELECT: Config  Info
Monitor  Alarms (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Config**, **Info, Monitor**, or **Alarms**, and then press **ENTER**.

K.3.3.1.1.1.1.1 ODU SELECT: Config

```
ODU CONFIG: Transmitter
Receiver  Misc  (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Transmitter (**Transmitter configuration submenu), **Receiver** (Receiver configuration submenu), or **Misc** (Miscellaneous configuration submenu), and then press **ENTER**.

(ODU SELECT) ODU CONFIG: Transmitter

```
ODU TX: Frequency Atten
Amplifier Mute Slope  ◄ ►
```

Use the ◄ ► arrow keys to select **Frequency**, **Atten**, **Amplifier**, **Mute**, or **Slope,** and then press **ENTER**.

(ODU SELECT) ODU CONFIG: ODU TX → Frequency

```
ODU Tx Frequency:
5912.5 MHz (◄ ►,▲ ▼,ENT)
```

To edit the transmit frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU SELECT) ODU CONFIG: ODU TX → Atten (Attenuation)

```
ODU Tx Attenuation:
15.00 dB    (◄ ►,▲ ▼,ENT)
```

To edit the transmit attenuation: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU SELECT) ODU CONFIG: ODU TX → Amplifier

```
ODU Tx Amp State:
On   Off          (◄ ►,ENT)
```

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

(ODU SELECT) ODU CONFIG: ODU TX →Mute

```
ODU Tx Mute State:
Muted  Unmuted  (◄ ►,ENT)
```

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

(ODU SELECT) ODU CONFIG: ODU TX →Slope

```
ODU Tx Slope Mode:
Manual  Calibrated  (◄ ►)
```

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

(ODU SELECT) ODU CONFIG: ODU TX →Slope → Manual

```
ODU Tx Slope:
0.0            (▲ ▼,ENT)
```

Use the ▲ ▼ arrow keys to edit the transmit slope setting, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: Receiver

```
ODU RX: Frequency Atten
Mute Slope      (◄ ►,ENT)
```

Use the ◄ ► the arrow keys to select **Frequency**, **Atten**, **Mute**, or **Slope,** and then press **ENTER**.

(ODU SELECT) ODU CONFIG: ODU RX → Frequency

```
ODU Rx Frequency:
5912.5 MHz (◄ ►,▲ ▼,ENT)
```

To edit the receiver frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU SELECT) ODU CONFIG: ODU RX → Atten (Attenuation)

```
ODU Rx Attenuation:
15.00 dB    (◄ ►,▲ ▼,ENT)
```

To edit the receiver attenuation: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU SELECT) ODU CONFIG: ODU RX → Mute

```
ODU Rx Mute State:
Muted  Unmuted  (◄ ►,ENT)
```

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

(ODU SELECT) ODU CONFIG: ODU RX → Slope

```
ODU Rx Slope Mode:
Manual  Calibrated  (◄ ►)
```

Use the ◄ ► arrow keys select **Manual** or **Calibrated**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: ODU RX →Slope → Manual

```
ODU Rx Slope:
0.0             (▲ ▼,ENT)
```

Use the ▲ ▼ arrow keys to edit the ODU Rx Slope setting, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: Misc

```
MISC: Cold-Start AFR LNA
XRef Ref-Adjust RTC (◄ ►)
```

Use the ◄ ► arrow keys to select **Cold-Start**, **AFR**, **LNA**, **XRef**, **Ref-Adjust**, or **RTC**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: MISC → Cold-Start

```
Cold-Start State:
Enabled  Disabled  (◄ ►)
```

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

(ODU SELECT) ODU CONFIG: MISC → AFR (Auto Fault Recovery)

```
Auto Fault Recovery:
Enabled  Disabled  (◄ ►)
```

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

(ODU SELECT) ODU CONFIG: MISC → LNA

```
LNA: State  Curr-Window
Cal Fault-Logic (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **State**, **Curr-Window**, **Cal,** or **Fault-Logic**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: MISC → LNA → State

```
ODU LNA State:
On   Off          (◄ ►,ENT)
```

To control whether or not the CSAT provides LNA POWER via the Receive RF Cable: Use the ◄ ► arrow keys to select **On** or **Off**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: MISC → LNA → Curr-Window

```
LNA Current Window:
99 %              (▲ ▼,ENT)
```

To define the allowable LNA current change before declaring a fault, edit the LNA Current Window setting as follows:

- Use the ▲ ▼ arrow keys to select a value – the value scrolls from **20%** to **50%**.
- Select **99%** to disable the LNA Current Window function.
- Press **ENTER** when done.

(ODU SELECT) ODU CONFIG: MISC → LNA → Cal (Calibrate)

```
Calibrate LNA Current?
Cal  Exit         (◄ ►,ENT)
```

To calibrate the LNA current for use with the LNA Current-Window function (described previously). Use the ◄ ► arrow keys to select **Cal** or **Exit**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: MISC → LNA → Fault-Logic

```
LNA: State  Curr-Window
Cal Fault-Logic (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **State**, **Curr-Window**, **Cal**, or **Fault-Logic**, and then press **ENTER**.

(ODU SELECT) ODU CONFIG: MISC → XRef (External Reference)

```
ExternalRef Fault Logic:
Summary No-Summary  (◄ ►)
```

Use the ◄ ► arrow keys to select **Summary** or **No-Summary**, and then press **ENTER.**

The CSAT will automatically lock to an external 5 or 10 MHz reference independent of the state of this selection. This selection determines whether or not the Summary Fault Relay is activated if the CSAT loses lock with the external reference.

(ODU SELECT) ODU CONFIG: MISC → Ref-Adjust

```
Internal Ref Adjustment:
087                (▲ ▼,ENT)
```

To edit the Internal 10MHz Reference setting: Use the ▲ ▼ arrow keys to select a value – the value will scroll from **000** to **255** – and then press **ENTER.**

***The Internal Reference is adjusted in the factory to be very accurate with the default setting of* 087*. This parameter is made available to compensate for the long-term frequency drift of the oscillator*.**

(ODU SELECT) ODU CONFIG: MISC → RTC (Real-Time Clock)

```
Sync ODU RTC to Lcl RTC:
Yes  No          (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Yes** or **No**, and then press **ENTER**. By selecting **Yes,** this causes the CSAT RTC (Real Time Clock) to synchronize with the modem RTC.

K.3.3.1.1.1.1.2 ODU SELECT: Info

```
INFO: Model Transmitter
Receiver LNA Misc  (◄ ►)
```

For *read-only* information on the ODU *as currently configured for operation*: Use the ◄ ► arrow keys to select **Model**, **Transmitter**, **Receiver**, **LNA**, or **Misc**, and then press **ENTER**.

The screen shots that follow depict sample configurations – the actual values and settings will vary and they are dependant on the ODU configuration in use. Typical for all nested screens, press* ENTER *or* CLEAR *to return to the ODU* SELECT: Info *menu.

(ODU SELECT) INFO: Model

```
CSAT-5060/010  V2.09
SERIAL # 00225     (ENT)
```

This *read-only* screen shows the model and serial number for the ODU in use.

(ODU SELECT) INFO: Transmitter

```
Tx: ON  5845.0MHz 10.00dB
AMP:ON   Unmuted   Sl:0.0
```

This *read-only* screen shows information on the CSAT transmitter status: Tx operating state (**ON** or **OFF**); Tx Frequency; Tx Attenuation; Amplifier state (**ON** or **OFF**); Tx Mute state (**Muted** or **Unmuted**); and Tx Slope adjustment.

(ODU SELECT) INFO: Receiver

```
Rx: ON  3570.0MHz 10.00dB
          Unmuted   Sl:0.0
```

This *read-only* screen shows information on the CSAT receiver status: Rx operating state (**ON** or **OFF**); Rx Frequency; Rx Attenuation; Rx Mute state (**Muted** or **Unmuted**); and Rx Slope adjustment.

(ODU SELECT) INFO: LNA

```
LNA: On      Window: 99%
Fault Logic: No-Summary
```

This *read-only* screen shows the current state of the LNA functions: the LNA operating status (**ON** or **OFF**); the Current Window; and Fault-Logic settings (**Summary** or **No-Summary**).

(ODU SELECT) INFO: Misc

```
Cold Start: Off
Auto Fault Recovery: On
```

This *read-only* screen shows the current state of the Cold Start and Auto Fault Recovery functions as **ON** or **OFF**.

K.3.3.1.1.1.1.3 ODU SELECT: Monitor

```
ODU MONITOR: Tx Rx Misc
Pwr-Supp1 Pwr-Supp2 (◄ ►)
```

For access to real-time, *read-only* information displays on the ODU *currently in operation*: Use the ◄ ► arrow keys to select **Tx**, **Rx**, **Misc**, **Pwr-Supp1**, or **Pwr-Supp2**, and then press **ENTER**.

The screen shots that follow depict sample configurations – the actual values and settings will vary and they are dependant on the ODU configuration in use. Typical for all nested screens, press* ENTER *or* CLEAR *to return to the ODU* SELECT: Monitor *menu.

(ODU SELECT) ODU MONITOR: Tx

```
TX: SynTune=04.8 Pwr=040
IFLO = 10.7  Temp = 27 oC
```

This *read-only* screen shows the Tx Synthesizer and IFLO tuning voltages, the RF Output Power in dBm and the Transmitter temperature.

(ODU SELECT) ODU MONITOR: Rx

```
RX: Synth Tune = 03.1
IFLO = 10.9  Temp = 28 oC
```

This *read-only* screen shows the Rx Synthesizer and IFLO tuning voltages and the Receiver temperature.

(ODU SELECT) ODU MONITOR: Misc

```
MISC: Ref Tune = 03.0
LNA=000.0mA FAN=568.0mA
```

This *read-only* screen shows the Internal Reference Oscillator tuning voltages, the LNA Current in milliamps and the Fan Current in milliamps.

(ODU SELECT) ODU MONITOR: Pwr-Supp1

```
PS: 24V=23.8  20V=22.6
    12V=13.0  10V=10.1
```

This *read-only* screen shows a monitor for four of the six internal power supplies.

(ODU SELECT) ODU MONITOR: Pwr-Supp2

```
PS: +5V=5.5   -5V=-4.9
```

This *read-only* screen shows a monitor for the remaining two internal power supplies.

K.3.3.1.1.1.1.4 ODU SELECT: Alarms

```
ALARMS:  Current  Stored
               (◄ ►,ENT)
```

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

(ODU SELECT) ALARMS: Current

```
TX = OK       RX = OK
PWR SUP = OK   MISC = OK
```

This *read-only* screen summarizes the CSAT's current status. If any of the items display "**FT**" instead of "**OK**" then that feature is faulted – view the **Stored Events Log** for further details.

(ODU SELECT) ALARMS: Stored

```
Stored Events:  View
Clear All      (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **View** or **Clear All**, and then press **ENTER**.

(ODU SELECT) ALARMS: Stored → View

```
LOG 02:11/13/99 10:42:47
OK- REF  LOCK      (▲ ▼)
```

Per the example shown, use the ▲ ▼ arrow keys to sequentially view the individual entries in the **Stored Events Log**, and then press **CLEAR** to return to the previous menu.

(ODU SELECT) ALARMS: Stored → Clear All

```
PRESS ENT TO
CLEAR THE EVENTS LOG
```

Press **ENTER** to clear the **Stored Events Log.** Otherwise, press **CLEAR** to exit and return to the previous menu.

K.3.3.1.2 (SELECT:) ODU – KST-2000A/B Transceiver Front Panel Operation

Figure K-4 identifies the basic CDM-570 front panel menu hierarchy as it pertains specifically to operation of the KST-2000A or KST-2000B ODU.

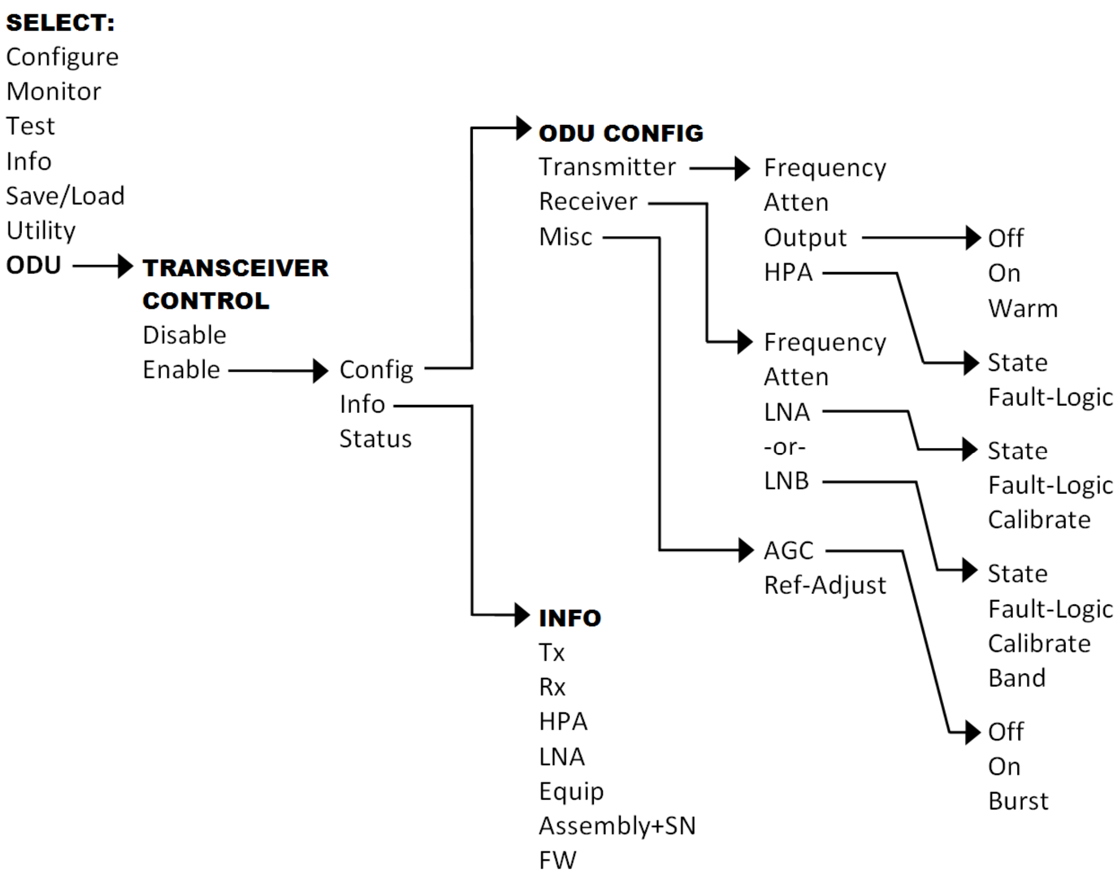


Figure K-4. ODU: KST-2000A/B Transceiver Menu Tree

K.3.3.1.2.1 ODU (Transceiver Control): Enable

```
KST SELECT: Config  Info
Status         (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Config**, **Info**, or **Status**, and then press **ENTER**.

K.3.3.1.2.1.1 (ODU) Enable: Config (KST Configuration)

```
KST CONFIG: Transmitter
Receiver Misc  (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Transmitter** (Transmitter configuration submenu), **Receiver** (Receiver configuration submenu), or **Misc** (Miscellaneous configuration submenu), and then press **ENTER**.

(ODU: Enable) KST CONFIG: Transmitter

```
KST TX: Frequency  Atten
Output  HPA    (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Frequency**, **Atten**, **Output**, or **HPA**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST TX → Frequency

```
ODU Tx Frequency:
14500.0 MHz (◄ ►,▲ ▼,ENT)
```

To edit the transmit frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The frequency limits of the **KST-2000A** are known and the frequency values are constrained accordingly. Press **ENTER** when done.

(ODU: Enable) KST CONFIG: KST TX → Atten (Attenuation)

```
ODU Tx Attenuation:
15 dB       (◄ ►,▲ ▼,ENT)
```

To edit the transmit attenuation: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU: Enable) KST CONFIG: KST TX → Output

```
KST Tx Output:
Off  On  Warm  (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **OFF**, **ON**, or **WARM**, and then press **ENTER**. Note the following:

- WARM is OFF, if COLD.
- WARM is ON, if warm and NO FAULTS.
- If FAULTS are present, stays WARM and OFF indefinitely.

(ODU: Enable) KST CONFIG: KST TX → HPA

```
HPA:  State  Fault-Logic
                (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **State** or F**ault-Logic**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST TX → HPA → State

```
KST HPA State:
 On  Off        (◄ ►,ENT)
```

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

If the HPA power is Off, it cannot report errors, answer messages, provide serial numbers, etc.

(ODU: Enable) KST CONFIG: KST TX → HPA → Fault-Logic

```
 HPA Fault Logic: Summary
 No-Summary     (◄ ►,ENT)
```

To control whether or not HPA fault will activate the SUMMARY FAULT RELAY: Use the ◄ ► arrow keys to select **Summary** or **No-Summary**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: Receiver

```
KST RX: Frequency  Atten
LNA             (◄ ►,ENT)
```

*(Displayed when the ODU is a **KST-2000A** unit)*

```
KST RX: Frequency  Atten
LNB             (◄ ►,ENT)
```

*(Displayed when the ODU is a **KST-2000B** unit)*

Use the ◄ ► arrow keys to select **Frequency**, **Atten**, or **LNA/LNB**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST RX → Frequency

```
ODU Rx Frequency:
10950.0 MHz (◄ ►,▲ ▼,ENT)
```

To edit the receive frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU: Enable) KST CONFIG: KST RX → Atten (Attenuation)

```
ODU Rx Attenuation:
15 dB       (◄ ►,▲ ▼,ENT)
```

To edit the receive attenuation: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(ODU: Enable) KST CONFIG: KST RX → LNA

```
LNA:  State  Fault-Logic
Calibrate       (◄ ►,ENT)
```

*Displayed when the ODU is a **KST-2000A** unit*. Use the ◄ ► arrow keys to select **State**, **Fault-Logic**, or **Calibrate,** and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST RX → LNA → State

```
ODU LNA State:
On  Off         (◄ ►,ENT)
```

To control whether or not the ODU provides LNA POWER via the Receive RF Cable: Use the ◄ ► arrow keys to select **ON** or **OFF**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST RX → LNA → Fault-Logic

```
LNA Fault Logic: Summary
No-Summary      (◄ ►,ENT)
```

To control whether or not an LNA fault will activate the SUMMARY FAULT RELAY: Use the ◄ ► arrow keys to select **Summary** or **No-Summary**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST RX → LNA → Calibrate

```
Calibrate LNA Current?
Cal  Exit       (◄ ►,ENT)
```

Calibration allows the system to determine nominal LNA power consumption. This need only be performed at initial installation.

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

(ODU: Enable) KST CONFIG: KST RX → LNB

```
LNB:  State  Fault-Logic
Calibrate Band  (◄ ►,ENT)
```

*Displayed when the ODU is a **KST-2000B** unit*. Use the ◄ ► arrow keys to select **State**, **Fault-Logic**, **Calibrate**, or **Band**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST RX → LNB → State

(ODU: Enable) KST CONFIG: KST RX → LNB → Fault-Logic

(ODU: Enable) KST CONFIG: KST RX → LNB →Calibrate

The **State**, **Fault-Logic**, and **Calibrate** commands operate identically to those used for the LNA (KST-2000A) unit. Additionally:

(ODU: Enable) KST CONFIG: KST RX → LNB → Band

```
LNB Rx Band:
A   B   C       (◄ ►,ENT)
```

*Displayed when the ODU is a **KST-2000B** unit*. Use the ◄ ► arrow keys to select **A**, **B**, or **C**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: Misc (Miscellaneous)

```
KST MISC: AGC Ref-Adjust
               (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **AGC** or **Ref-Adjust**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST MISC → AGC

```
AGC MODE:
Off  On  Burst (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **OFF**, **ON** or **BURST**, and then press **ENTER**.

(ODU: Enable) KST CONFIG: KST MISC → Ref-Adjust

```
Internal Ref Adjustment:
087             (▲ ▼,ENT)
```

To edit the INT 10MHz REF setting: Use the ▲ ▼ arrow keys to select a value – the values scroll from **000** to **255** – then press **ENTER**.

The INT REF is adjusted in the factory to be very accurate with the default setting of 028. This parameter is made available to compensate for the long-term frequency drift of the oscillator.

K.3.3.1.2.1.2 (ODU) Enable: INFO (Information)

```
INFO:TX RX HPA LNA Equip
Assembly+SN FW (◄ ►,ENT)
```

For access to real-time, *read-only* information displays on the ODU *currently in operation*: Use the ◄ ► arrow keys to select **TX**, **RX**, **HPA**, **LNA**, **Equip**, **Assembly+SN**, or **FW**, and then press **ENTER**.

The screen shots that follow depict sample configurations – the actual values and settings will vary and they are dependant on the ODU configuration in use. Typical for all nested screens, press **ENTER** ***or*** **CLEAR** ***to return to the*** **ODU: Enable → INFO** ***menu.***

(ODU: Enable) INFO: TX (TRANSMITTER)

```
TX: ON  14500.0MHz  19dB
AGC: OFF
```

This screen displays *read-only* information on the **KST-2000A** transmitter status: Tx operating state (**ON** or **OFF**); Tx Frequency; Tx Attenuation; and AGC state (**ON** or **OFF**).

(ODU: Enable) INFO: RX (RECEIVER)

```
RX: ON  10950.0MHz  15dB
Ref-Adjust: 228
```

This screen displays *read-only* information on the **KST-2000A** receiver status: Rx operating state (**ON** or **OFF**); Rx Frequency; Rx Attenuation; and Internal Reference adjustment.

(ODU: Enable) INFO: HPA

```
HPA: On
Fault Logic: No Summary
```

This screen displays *read-only* information on the current configuration of the HPA functions: HPA (**ON** or **OFF**) and Fault Logic (**Summary** or **No Summary**).

(ODU: Enable) INFO: LNA

```
LNA: On
Fault Logic: No Summary
```

This screen displays *read-only* information on the current configuration of the LNA functions: LNA (**ON** or **OFF**) and Fault Logic (**Summary** or **No Summary**).

(ODU: Enable) INFO: Equip (Equipment)

```
EQUIP-TYPE: KST-2000A
HPA-TYPE: CEFD-SSPA
```

This screen displays *read-only* information on the about the currently installed ODU.

(ODU: Enable) INFO: Assembly+SN

```
ASSEMBLY INFO:   M&C
AS:11565-4  SN:001370891
```

The blinking cursor is on the M&C. Use the ▲ ▼ arrow keys to view additional assembly and S/N information for the Up Converter, Down Converter, and HPA.

(ODU: Enable) INFO: FW (Firmware)

```
FIRMWARE INFO:   M&C
FW:10303-1D  VER:01.01.05
```

The blinking cursor is on the M&C. Use the ▲ ▼ arrow keys to view additional assembly and S/N information for the Up Converter, Down Converter, and HPA.

K.3.3.1.2.1.3 (ODU: Enable) Status

```
STATUS:PS:OK RF:OK UC:OK
LNA:OK AG:OK HP:OK DC:OK
```

Use the ◄ ► arrow keys to select a feature, and then press **ENTER** to view more detailed status information. The nested screens provide continually-updated, *read-only* operational summary information, as follows:

Feature (Selection)	Designates	Detailed Status Display Example
PS	Power Supplies	`P/Supplies: 7V:OK 17V:OK` `-7V:OK 12V:OK`
RF	Reference	`REF:WARM 72M:OK RANGE:NA` `SRC:INT  XLK:NA PHASE:NA`
UC	Up Converter	`UPCONV STATUS: OVRTMP:OK` `SSYN:OK  KSYN:OK  PRG:OK`
LNA	Low Noise Amplifier	A detailed status display screen is not available for this selection.
AG	AGC Status	`AGC STATUS:  EIP:OK` `LOOP:OK      IIP:OK`
HP	HPA Status	`HPA: OVERTMP:OK 9.75V:OK` `-5V:OK  BIAS:OK   PRG:OK`
DC	Down Converter	`DNCONV STATUS: OVRTMP:OK` `LSYN:OK  KSYN:OK  PRG:OK`

For each detailed status display, the item status indicator abbreviations are as follows:

Summary Status	Designates
OK	OK – No Fault
FT	Fault
NA	Not Applicable

Typical for all nested screens, press **ENTER** or **CLEAR** to return to the **ODU: Enable → Status** submenu.

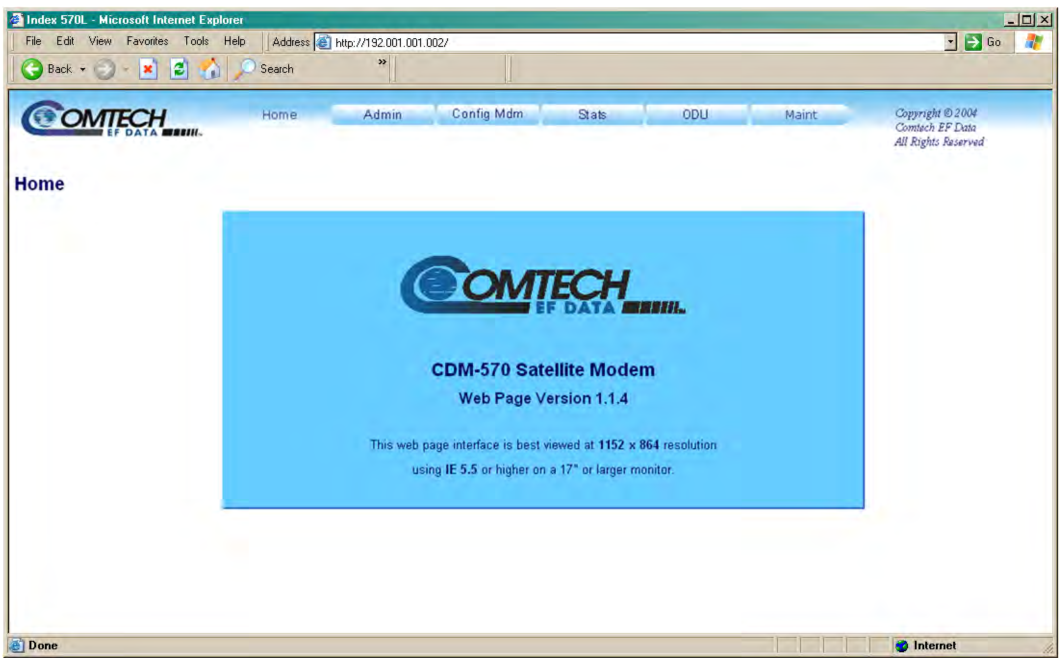
K.4 ODU Operations via the CDM-570 Base Modem HTTP Interface

K.4.1 Base Modem HTTP Interface Overview

***The CDM-570 Satellite Modem's embedded HTTP application provides an easy to use interface to configure and monitor all aspects of the CSAT-5060 or KST12000A/B Transceivers (ODUs). For a complete overview of the features for this interface, see* Chapter 7. BASE MODEM HTTP INTERFACE.**

K.4.1.1 ODU-Accessible HTTP Interface Home Page

Once a Web browser is opened and a valid IP address has been entered, the CDM-570 Satellite Modem HTTP Interface "splash" page is displayed:



The options available through the CDM-570 Base Modem HTTP Interface are illustrated via the following menu tree. Operations not specific to the ODU appear dimmed in this diagram and are explicitly defined in **Chapter 7. BASE MODEM HTTP INTERFACE**:

Home	Admin	Config Mdm	Stats	ODU	Maint
Home	Access	Modem	Modem Status	**Config**	Unit Info
Contact	Remote	Modem Utilities	Modem Logs	**Status**	
Support		AUPC	Graphs (Minute Hour Day)	**Utilities**	
		Timeslot Selection			

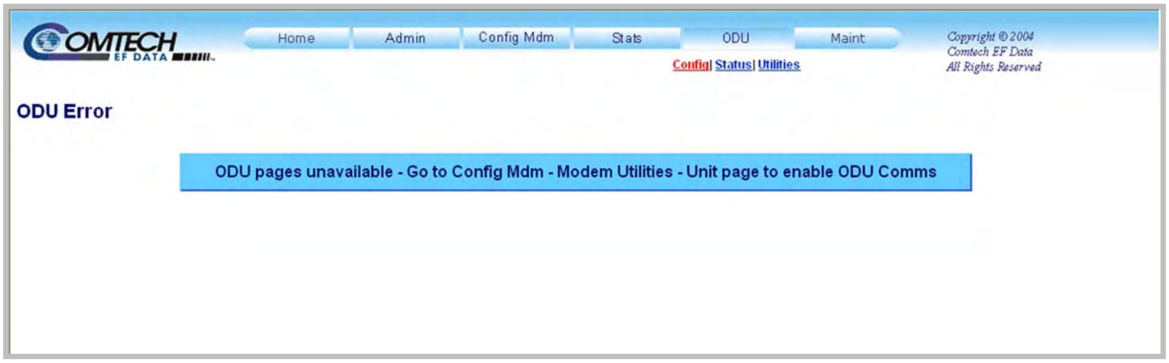
K.4.1.2 ODU (Outdoor Unit) pages

Monitor and control of the CSAT-5060 or KST-2000A/B Outdoor Unit that is connected via FSK to the CDM-570 is possible using the hyperlinked pages nested under the '**ODU (Outdoor Unit)'** tab. These pages are accessible only when an ODU is configured for operation with the CDM-570.

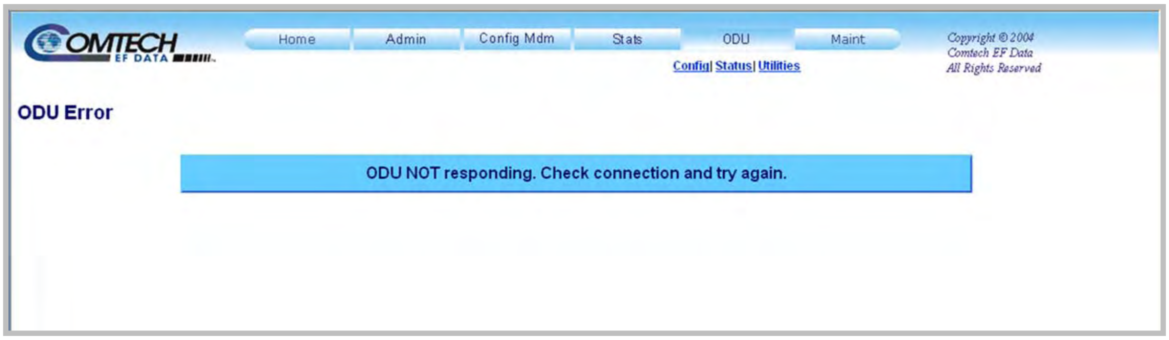
All ODU pages can be viewed by all three levels of user login. However, only a user with Administrative or Read/Write privileges can submit changes to the '**ODU | Config**' and '**ODU | Utilities**' pages.

ODU Comms must be enabled in order for the user to be able to fully access the* '**ODU | Config**'*,* '**ODU | Status**'*, and* '**ODU | Utilities**' *pages.

If access to the ODU pages is attempted and communications parameters have not been properly established on the CDM-570 end, the following error page is displayed:



As indicated, the user must first enable ODU Comms via the '**Config Mdm | Modem Utilities** page (see **Sect. 7.3.3.2**). For situations where other communications issues arise, e.g., a problem exists with communication between the installed ODU and the CDM-570, the following error message is displayed:



Refer to the pertinent ODU *Installation and Operation Manual* to troubleshoot the issue, or contact Comtech EF Data Sales and Customer Support via the means outlined on the '**Home | Support**' page (see **Sect 7.3.1.3**).

Click the **Config**, **Status**, or **Utilities** hyperlink to continue.

K.4.1.2.1 ODU | Config Pages

When properly configured to operate with either the CSAT-5060 or the KST-2000A/B ODU, the '**ODU | Config'** page displays allows the user to configure the operating parameters specific to the active unit.

K.4.1.2.1.1 ODU | Config (CSAT-5060)

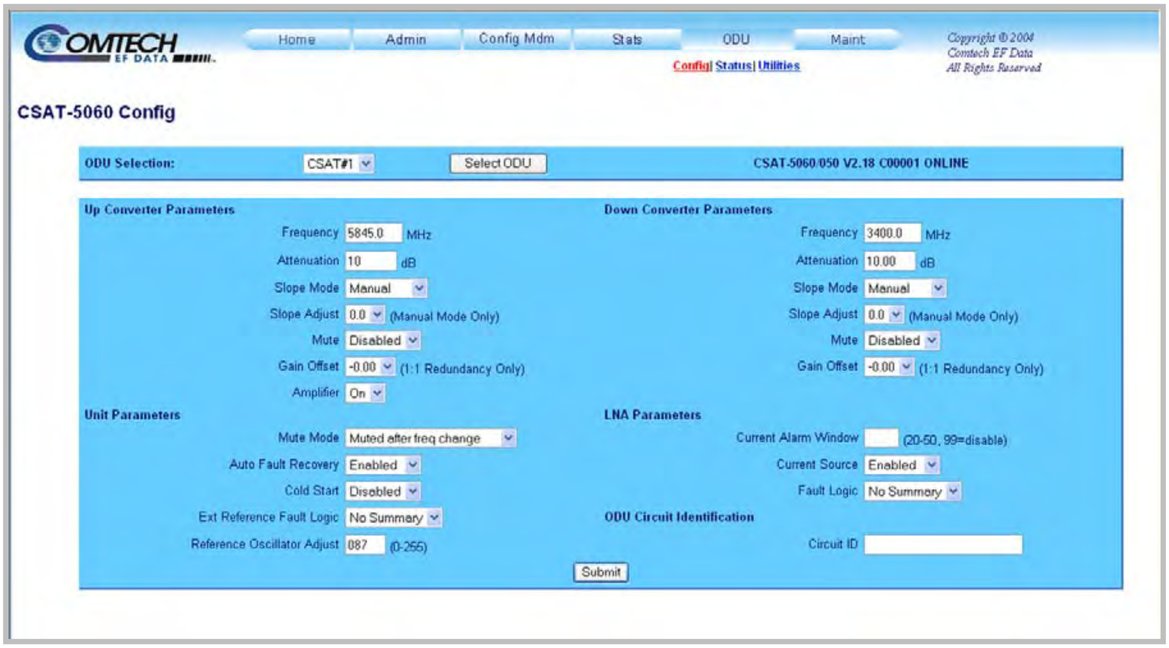


Figure K-5. ODU | Config page (CSAT-5060)

Figure K-5 shows the '**ODU | Config'** page as it appears with the CSAT-5060 configured as the ODU. Use this page to configure the primary Transmit and Receive Parameters of a CSAT-5060 ODU.

ODU Selection

If redundant ODUs are used, the page can be toggled between the Online and Offline units by selecting **CSAT #1** or **CSAT #2**, and then clicking **Select ODU**. A message identifies the active unit as '**ONLINE**' in the right-hand side of the box.

Up Converter Parameters

- **Frequency:** Enter a value in MHz
- **Attenuation:** Enter a value in dB
- **Slope Mode:** Select **Manual** or **Calibrated** from the drop-down menu
- **Slope Adjust (Manual Mode Only):** Select the desired setting from the drop-down menu
- **Mute:** Select **Enabled** or **Disabled** from the drop-down menu

- **Gain Offset (1:1 Redundancy Only):** Select the desired setting from the drop-down menu
- **Amplifier:** Select **On** or **Off** from the drop-down menu

Down Converter Parameters

- **Frequency:** Enter a value in MHz
- **Attenuation:** Enter a value in dB
- **Slope Mode:** Select **Manual** or **Calibrated** from the drop-down menu
- **Slope Adjust (Manual Mode Only):** Select the desired setting from the drop-down menu
- **Mute:** Select **Enabled** or **Disabled** from the drop-down menu
- **Gain Offset (1:1 Redundancy Only):** Select the desired setting from the drop-down menu

Unit Parameters

- **Mute Mode:** Select **Muted after freq change** or **Unmuted after freq change** from the drop-down menu
- **Auto Fault Recovery** or **Cold Start:** Select **Enabled** or **Disabled** from the drop-down menus
- **Ext Reference Fault Logic:** Select **Summary** or **No Summary** from the drop-down menu
- **Reference Oscillator Adjust:** Enter a value from **0** to **255**

LNA Parameters

- **Current Alarm Window:** Enter a value of **20** to **50**, or **99** to disable this feature
- **Current Source:** Select **Enabled** or **Disabled** from the drop-down menu
- **Fault Logic:** Select **Summary** or **No Summary** from the drop-down menu

ODU Circuit Identification

Enter an ODU Circuit Identification name of up to 24 alphanumeric characters.

Click **[Submit]** to save any changes made to this page.

K.4.1.2.1.2 ODU | Config (KST-2000A/B)

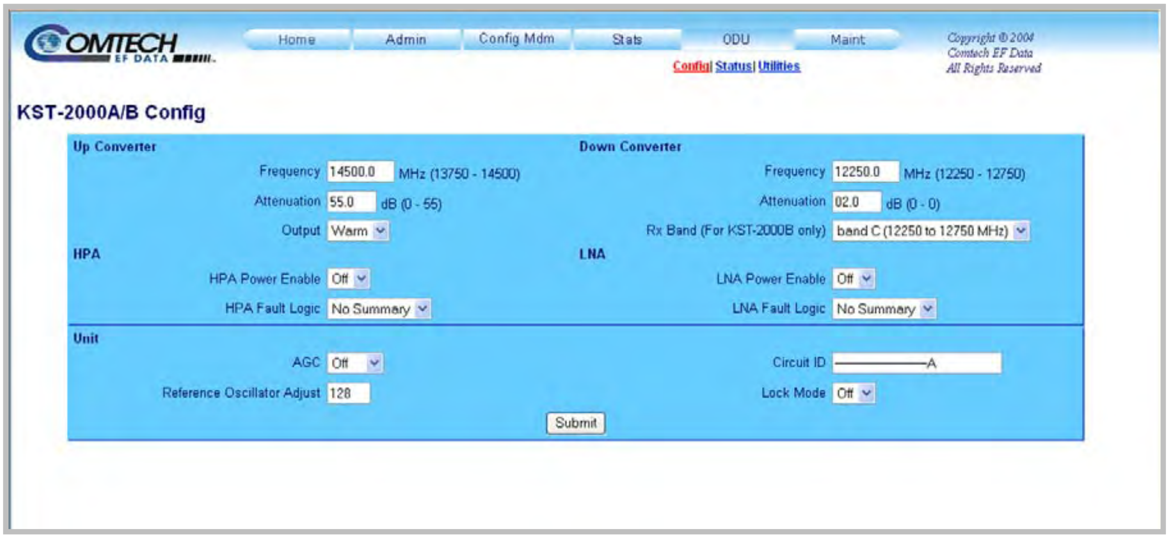


Figure K-6. ODU | Config page (KST-2000A/B)

Figure K-6 shows the '**ODU | Config'** page with the KST-2000A/B configured as the ODU. Use this page to configure the primary Transmit and Receive Parameters of a KST-2000A/B ODU.

Up Converter Parameters

- **Frequency:** Enter a value in MHz
- **Attenuation:** Enter a value in dB
- **Output:** Select **On** or **Off** from the drop-down menu

Down Converter Parameters

- **Frequency:** Enter a value in MHz
- **Attenuation:** Enter a value in dB
- **Rx Band (For KST-2000B Only):** Select **band A (10950 to 11700 MHz)**, **band B (11700 to 12200 MHz)**, or **band C (12250 to 12750 MHz)** from the drop-down menu

HPA Parameters

- **HPA Power Enable:** Select **On** or **Off** from the drop-down menu
- **HPA Fault Logic:** Select **Summary** or **No Summary** from the drop-down menu

LNA Parameters

- **LNA Power Enable:** Select **On** or **Off** from the drop-down menu
- **LNA Fault Logic:** Select **Summary** or **No Summary** from the drop-down menu

Unit Parameters

- **AGC (Automatic Gain Control):** Select **On** or **Off** from the drop-down menu
- **Reference Oscillator Adjust:** Enter a value from **0** to **255**
- **Circuit ID:** Enter a Circuit Identification name of up to 24 alphanumeric characters
- **Lock Mode:** Select **On** or **Off** from the drop-down menu

Click **[Submit]** to save any changes made to this page.

K.4.1.2.2 ODU | Status Pages

The appearance of the 'ODU | Status' page changes depending on which type of ODU had been configured for operation with the CDM-570. These pages provide the user with read-only status windows pertaining to the current operating condition for either the CSAT-5060 or the KST-2000A/B ODUs.

K.4.1.2.2.1 ODU | Status (CSAT-5060)

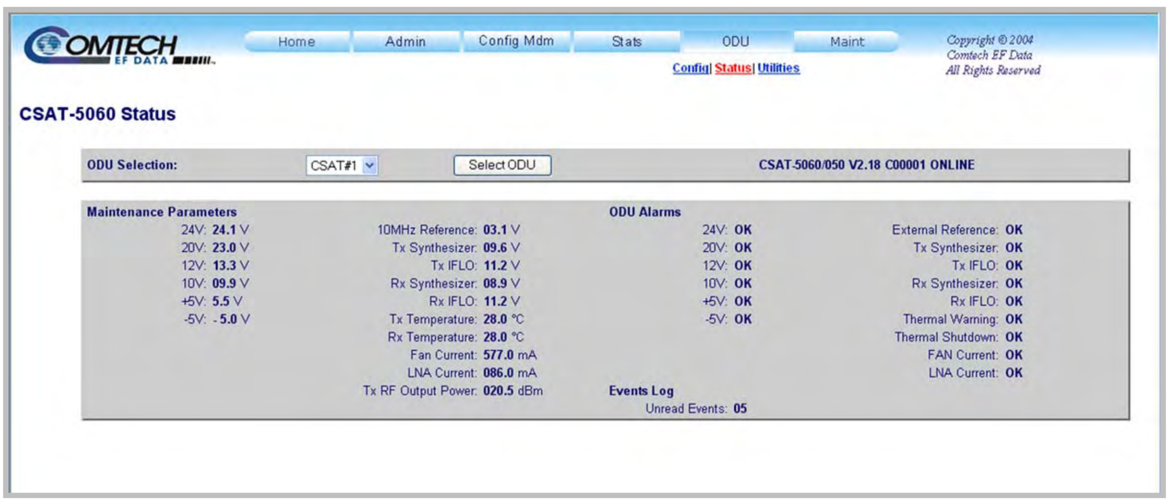


Figure K-7. ODU | Status page (CSAT-5060)

Figure K-7 shows the '**ODU | Status'** page as it appears with the CSAT-5060 configured as the ODU.

This page provides a ***read-only*** status window pertaining to the ODU's **Maintenance Parameters**; **ODU Alarms**; and the number of **Unread Events** in the **Events Log**.

ODU Selection

If redundant ODUs are used, the CSAT-5060 '**ODU | Status'** page can toggle between the Online and Offline units. Select **CSAT #1** or **CSAT #2** from the **ODU Selection:** drop-down menu, and then click **[Select ODU]**. A message identifies the currently active unit as '**ONLINE**' in the right-hand side of the box.

K.4.1.2.2.2 ODU | Status (KST-2000A/B)

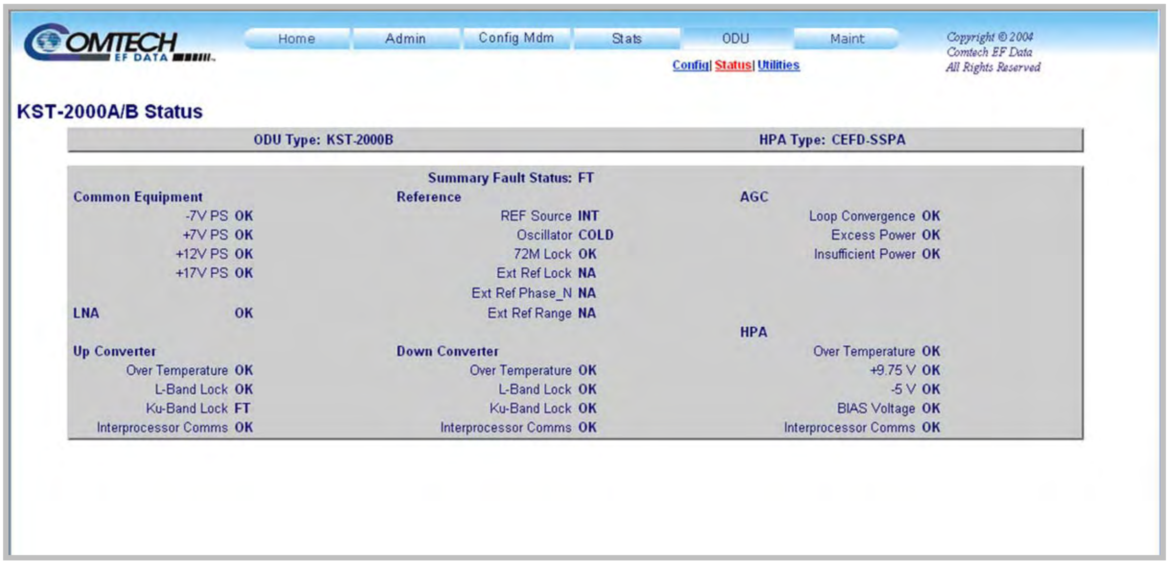


Figure K-8. ODU | Status page (KST-2000A/B)

Figure K-8 shows the '**ODU | Status'** page as it appears with the KST-2000A/B configured as the ODU. The message bar at top identifies the **ODU Type** and **HPA Type** (in this example, *KST-2000B* and *CEFD-SSPA*, respectively).

The KST-2000A/B '**ODU | Status**' page provides a ***read-only*** status window that summarizes the fault status of the configuration:

- **Common Equipment**
- **Reference**
- **AGC**
- **LNA**
- **HPA**
- **Up Converter**
- **Down Converter**

K.4.1.2.3 ODU | Utilities Pages

The appearance of the 'ODU | Utilities' page changes depending on which type of ODU had been configured for operation with the CDM-570. Use this page to configure various ODU utility functions.

K.4.1.2.3.1 ODU | Utilities (CSAT-5060)

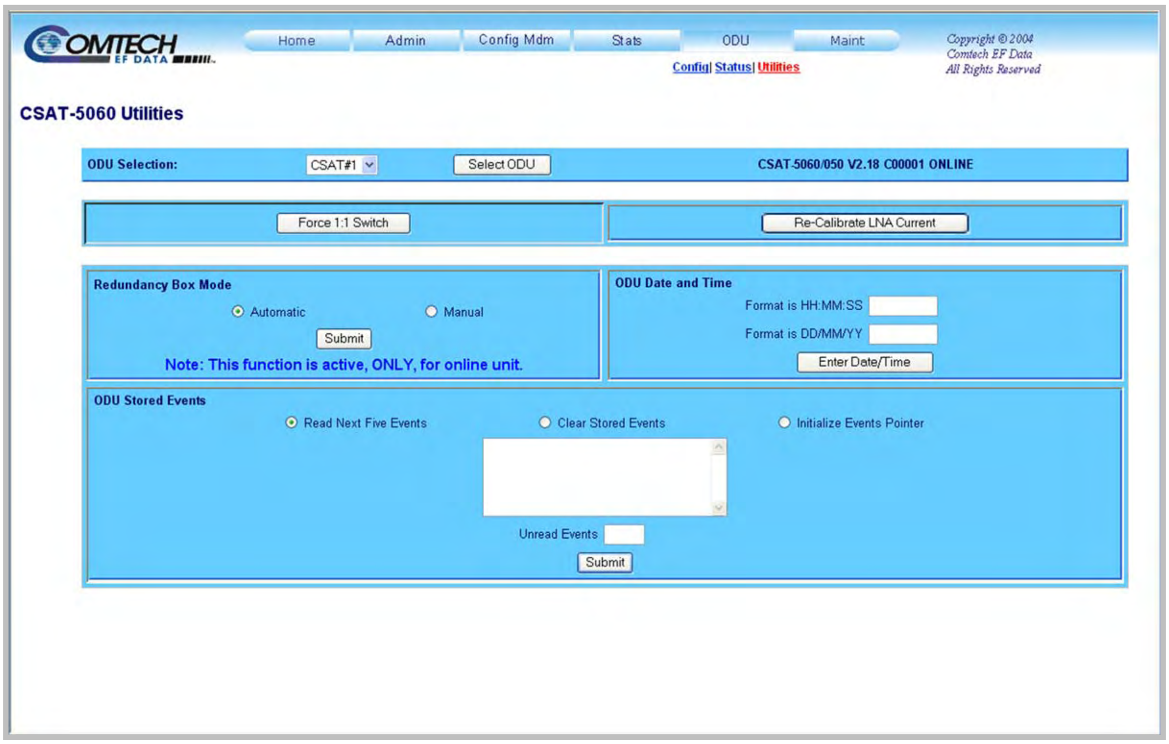


Figure K-9. ODU | Utilities page (CSAT-5060)

Figure K-9 shows the '**ODU | Utilities'** page as it appears with the CSAT-5060 configured as the ODU.

ODU Selection

If redundant ODUs are used, the CSAT-5060 '**ODU | Status'** page can toggle between the Online and Offline units. Select **CSAT #1** or **CSAT #2** from the **ODU Selection:** drop-down menu, and then click **[Select ODU]**. A message identifies the currently active unit as '**ONLINE**' in the right-hand side of the box.

Force 1:1 Switch

If redundant ODUs are used and the selected unit is currently the 'ONLINE' unit, click **[Force 1:1 Switch]** to force the switchover of the 'ONLINE' unit into 'STANDBY' mode. **This command is only valid for the 'ONLINE' unit in a 1:1 pair.**

Re-Calibrate LNA Current

Click to recalibrate the LNA Current.

Redundancy Box Mode

Select **Automatic** or **Manual**, and then click **[Submit]** to save this setting.

ODU Date and Time

- Use the international format HH:MM:SS to enter the time (where HH = hour [00 to 23], MM = minutes [00 to 59], and SS = seconds [00 to 59])
- Use the European continental format DD/MM/YY to enter the date (where DD = day [01 to 31], MM = month [01 to 12], and YY = year [00 to 99])

Click **[Enter Date/Time]** to save any changes made to this section.

ODU Stored Events

This window provides a visual record of the ODU stored events in a scrollable window.

- **Read Next Five Events:** Click to buffer the next group of five stored events into the **Events** window
- **Clear Stored Events:** Click to wipe clean the stored events log
- **Initialize Events Pointer:** Click to reset the log's internal pointer
- **Unread Events:** Displays the total number of *unread* stored events in the Events window. As stored event groups are displayed, this number decrements accordingly

Click **[Submit]** to save any changes made to this section.

K.4.1.2.3.2 ODU | Utilities (KST-2000A/B)

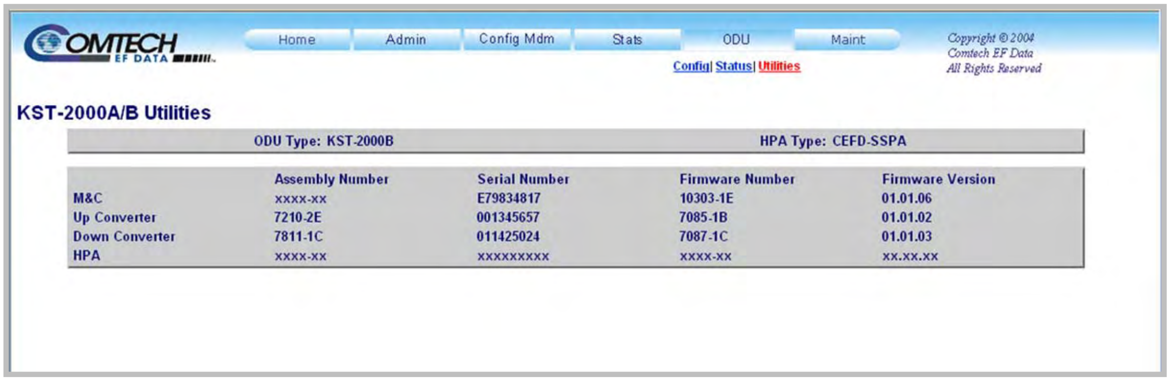


Figure K-10. ODU | Utilities page (KST-2000A/B)

Figure K-10 shows the '**ODU | Utilities'** page, as it appears with the KST-2000A/B configured as the ODU. The message bar at top identifies the **ODU Type** and **HPA Type** (in this example, *KST-2000B* and *CEFD-SSPA*, respectively).

The KST-2000A/B '**ODU | Utilities**' page provides a ***read-only*** status window that identifies the configured ODU chassis' installed component assembly numbers and serial numbers, and firmware numbers and versions.

Notes:

Appendix L. CDM-570L ODU (BUC, LNB) OPERATION

L.1 Introduction

The CDM-570L and CDMR-570LSatellite Modems (referred to collectively as the CDM-570L) permit the user to fully configure, monitor, and control a Comtech EF Data ODU (Outdoor Unit) – the mnemonic for a BUC (Block Up Converter) or LNB (Low-Noise Block Down Converter) – in the following ways:

- By using ODU remote commands through Serial Remote or Telnet
- By using the keypad and display via the front panel of a CDM-570L Modem
- By using the CDM-570L Base Modem HTTP (Web Server) Interface
- By using the SNMP Interface with the CDM-570L BUC or LNB MIB

L.2 ODU Remote Control Address Setup

The ODU connected to a CDM-570L through FSK can be remotely monitored and controlled by using ODU remote commands through Serial Remote or Telnet. The address of the ODU is set up as follows:

- **For local-end ODUs:**
    - Use Modem’s RC address + 1 for Standalone unit or Online unit in a 1:1 Redundancy System
    - Use Modem’s RC address + 2 for Offline unit in a 1:1 Redundancy System
- **For distant-end ODUs in an EDMAC setup:**
    - Use EDMAC Slave Address (ESA) Range + 4 for Standalone unit or Online unit in a 1:1 Redundancy System
    - Use EDMAC Slave Address (ESA) Range + 5 for Offline unit in a 1:1 Redundancy System

L.3 ODU Operations via the CDM-570L Front Panel

L.3.1 CDM-570L Front Panel Operation Overview

***For in-depth explanations of the function and operation of the front panel features, see* Chapter 5. FRONT PANEL OPERATION.**

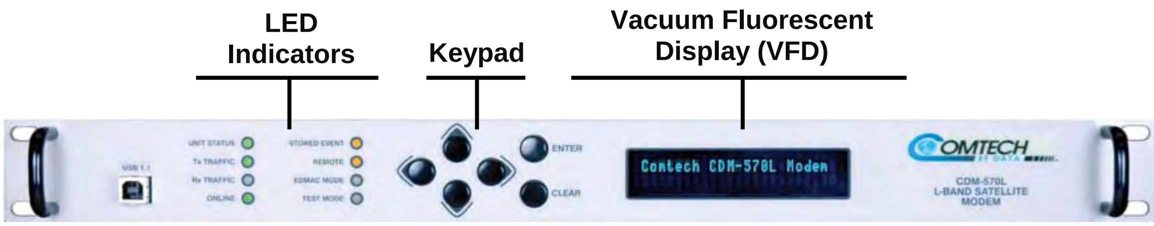
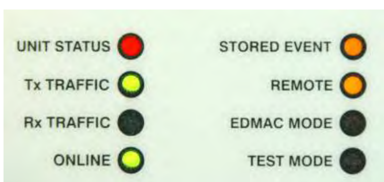


Figure L-1. CDM-570L Front Panel View

Figure L-1 identifies the key features of the CDM-570L front panel; their purpose is summarized as follows:

Feature		Description
	LED Indicators	This array of eight LEDs indicates the operational status of the CDM-570L.
	Keypad	Use the keypad to select and navigate the available CDM-570L menu functions as displayed on the Vacuum Fluorescent Display (VFD).
	Vacuum Fluorescent Display (VFD)	Consisting of two lines with a width of 24 characters each, the VFD displays all available options and prompts the user to carry out a required action (using the keypad and nested menus) for monitor and control of the CDM-570L.

The user can configure, monitor and control BUC/LNB operation via the CDM-570L front panel, using the keypad and display. Nested menus are used, which display all available options, and prompt the user to carry out a required action.

L.3.2 CDM-570L Front Panel Operation – ODU Menu Hierarchy

Figure L-2 identifies the CDM-570L front panel menu hierarchies that pertain specifically to the configuration, monitor and control of a BUC or LNB. In this particular figure, menu branches that incorporate ODU operations are shown in **bold**; menu content that is dedicated to ODU operations is additionally ***italicized***.

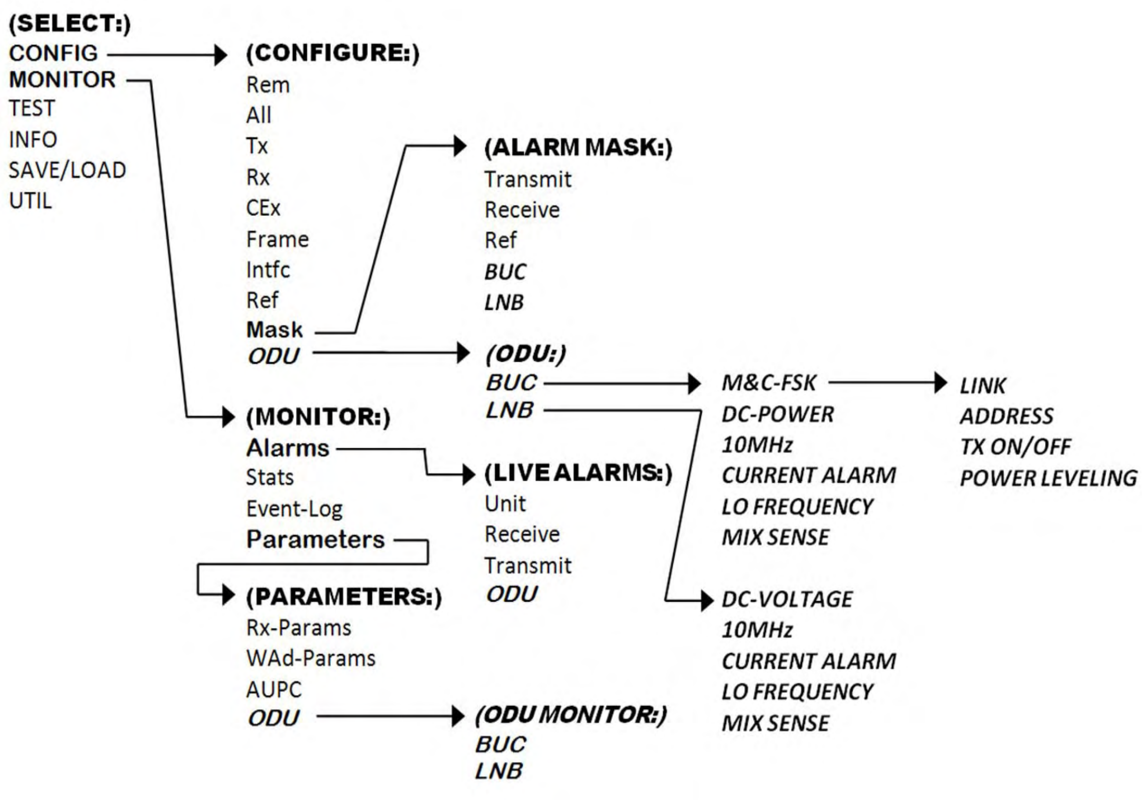


Figure L-2. CDM-570L ODU Operation Principal Menu Tree

The ODU menu branch is accessible from the CDM-570L front panel menu only when the presence of an ODU is detected. Also note that, as this appendix deals with strictly with ODU operations, Chapter 5. FRONT PANEL OPERATION provides a complete overview for any CDM-570 menu operations or selections not defined in this appendix.

L.3.3 SELECT: (Main) Menu

```
SELECT: Config Test Info
Monitor Save/Ld Util ODU
```

The table that follows identifies the commands comprising the CDM-570L main menu, and the content section in this manual where explicit information may be referenced, either in this appendix or in **Chapter 5. FRONT PANEL OPERATION**:

Menu Branch *(For more info, see...)*	Description
Config *(Chapter Sect. 5.2.2.1)* *(Appendix Sect. L.3.3.1)*	Used to fully configure the modem and the ODU.
Monitor *(Chapter Sect. 5.2.2.2)* *(Appendix Sect. L.3.1.3)*	Used to monitor the alarm status of the modem and the ODU, to display the Receive Parameters screen, and to view the log of stored events for the modem and the ODU.
Test *(Chapter Sect. 5.2.2.3)*	Used to invoke one of several test modes (loopbacks, for example).
Info *(Chapter Sect. 5.2.2.4)*	(Information) Used to view information on the modem, without having to go into configuration screens.
Save/Load *(Chapter Sect. 5.2.2.5)*	(Save/Load) Used to save and to retrieve up to 10 different modem configurations.
Util *(Chapter Sect. 5.2.2.6)*	(Utility) Used to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.

For ODU operation, use the ◄ ► arrow keys to select **Config**, **Monitor**, or **ODU**, and then press **ENTER**.

L.3.3.1 (SELECT:) Config (Configuration)

```
CONFIG: Rem All Tx Rx CEx
Frame Intfc Ref Mask ODU
```

For ODU operations, use the ◄ ► arrow keys to select **Mask** or **ODU**, and then press **ENTER**.

L.3.3.1.1 CONFIG: Mask

```
Alarm Mask: Transmit
Receive Ref BUC LNB (◄►)
```

For ODU operations, use the ◄ ► arrow keys to select **BUC** or **LNB**, and then press **ENTER**.

L.3.3.1.1.1 (CONFIG: Mask) Alarm Mask: BUC

```
BUC Alarm:
Active  Masked (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Active or Masked**, and then press **ENTER**. If the user selects **Masked**, no alarm will be generated.

L.3.3.1.1.2 (CONFIG: Mask) Alarm Mask: LNB

```
LNB Alarm:
Active  Masked (◄ ►,ENT)
```

Use the ◄ ► arrow keys to select **Active or Masked**, and then press **ENTER**. If the user selects **Masked**, no alarm will be generated.

L.3.3.1.2 CONFIG: ODU (Outdoor Unit)

```
ODU (Outdoor Unit):
BUC  LNB     (◄ ►,ENTER)
```

To choose between controlling and monitoring a **BUC** (Block Up Converter) or an **LNB** (Low-Noise Block Down Converter): Use the ◄ ► arrow keys to select **BUC** or **LNB**, and then press **ENTER**.

L.3.3.1.2.1 (CONFIG: ODU) BUC

```
BUC: M&C-FSK  DC-Power
10MHz Alarm LO Mix (◄ ►)
```

Use the ◄ ► arrow keys to select **M&C-FSK**, **DC-Power**, **10MHz**, **Alarm**, **LO**, or **Mix**, and then press **ENTER**. Note the following:

Item	Description
M&C-FSK	If an FSK-capable BUC is employed, provides access to a further set of menus that define the FSK setup, and use it for control and monitor.
DC-Power	If a BUC supply is installed, permits the user to turn DC power ON or OFF.
10MHz	Permits the user to turn the 10MHz frequency reference for the BUC ON or OFF.
Alarm	Permits the user to define the upper and lower limits for a current 'window'. If the measured BUC current falls outside this window, an alarm is generated.
LO	Permits the user to define the LO frequency used in the BUC. This is then used in the display of RF frequency in the CONFIG: Tx → Freq menu.
Mix	Permits the user to define the sense of the frequency translation – either high-side mix or low-side mix.

(CONFIG: ODU) BUC: M&C-FSK

```
BUC M&C(FSK): FSK-Comms
Address Tx-On/Off  (◄ ►)
```

Use the ◄ ► arrow keys to select **Comms, Address,** or **Tx-On/Off**, and then press **ENTER**.

(CONFIG: ODU) BUC: BUC M&C (FSK) →Comms

```
BUC M&C FSK Comms:
On  Off      (◄ ►,ENTER)
```

When an FSK-capable BUC is employed, to turn the FSK between the modem and BUC on or off, use the ◄ ► arrow keys to select **On or Off**, and then press **ENTER**.

(CONFIG: ODU) BUC: BUC M&C (FSK) →Address

```
BUC FSK Address: 01
             (▲ ▼,ENTER)
```

To enter the logical address of the BUC: Use the ▲ ▼ arrow keys to edit the value of the address – the valid range is from **01** to **15** – and then press **ENTER**.

(CONFIG: ODU) BUC: BUC M&C (FSK) →TX-On/Off

```
BUC RF Output:
On  Off      (◄ ►,ENTER)
```

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

(CONFIG: ODU) BUC: DC-Power

```
BUC DC Power:
On Off         (◄ ►,ENTER)
```

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

(CONFIG: ODU) BUC: 10MHz

```
BUC 10MHz Reference:
On  Off        (◄ ►,ENTER)
```

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

(CONFIG: ODU) BUC: Alarm

```
Set BUC Current Alarm:
Upper  Lower  (◄ ►,ENTER)
```

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

(CONFIG: ODU) BUC: Set BUC Current Alarm → Upper

```
BUC Current Alarm Upper
Limit:1200mA (◄ ►,▲ ▼,ENT)
```

To edit the BUC Current Alarm Upper Limit: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range of current is from **500** to **4000** mA. Press **ENTER** when done.

(CONFIG: ODU) BUC: Set BUC Current Alarm → Lower

```
BUC Current Alarm Lower
Limit:1200mA (◄ ►,▲ ▼,ENT)
```

To edit the BUC Current Alarm Lower Limit: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range of current is from **0** to **3000** mA. Press **ENTER** when done.

(CONFIG: ODU) BUC: LO

```
BUC LO Frequency:
12000 MHz (◄ ►,▲ ▼,ENTER)
```

To edit the value of the BUC LO Frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range is from **3000** to **65000** MHz. Press **ENTER** when done.

This value is used to display the RF frequency of the modem/BUC combination. If the default value of* 00000 *is entered here, then no RF frequency will be displayed on the* CONFIG: Tx → Freq *menu.

(CONFIG: ODU) BUC: Mix

```
BUC Frequency Mix:
High-Side Low-Side (◄ ►)
```

Use the ◄ ► arrow keys to select **High-Side** or **Low-Side**, and then press **ENTER**.

L.3.3.1.2.2 (CONFIG: ODU) LNB

```
LNB: DC-Voltage 10MHz
Alarm LO Mix (◄ ►, ENT)
```

Use the ◄ ► arrow keys to select **DC-Voltage**, **10MHz**, **Alarm**, **LO**, or **Mix**, and then press **ENTER**. Note the following:

Item	Description
DC-Voltage	Selects Power OFF, 13, 18, or 24 volts as the LNB power supply output voltage.
10MHz	Permits the user to turn the 10MHz frequency reference for the BUC ON or OFF.
Alarm	Permits the user to define the upper and lower limits for a current 'window'. If the measured LNB current falls outside this window, an alarm is generated.
LO	Permits the user to define the LO frequency used in the LNB. This is then used in the display of RF frequency in the CONFIG RX, RX FREQUENCY menu.
Mix	Permits the user to define the sense of the frequency translation – either high-side mix or low-side mix.

(CONFIG: ODU) LNB: DC-Voltage

```
LNB DC Supply Voltage:
13 volts       (◄ ►,ENTER)
```

Use the ▲ ▼ arrow keys to edit the value of the LNB DC Supply Voltage – **13 volts**, **18 volts**, **24 volts**, or **Power OFF –** and then press **ENTER**.

(CONFIG: ODU) LNB: 10MHz

```
LNB 10MHz Reference:
On  Off      (◄ ►,ENTER)
```

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

(CONFIG: ODU) LNB: Alarm

```
Set LNB Current Alarm:
Upper  Lower  (◄ ►,ENTER)
```

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

(CONFIG: ODU) LNB: Set LNB Current Alarm → Upper

```
LNB Current Alarm Upper
Limit: 200mA (◄ ►,▲ ▼,ENT)
```

To edit the LNB Current Alarm Upper Limit: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range of current is from **50** to **600** mA. Press **ENTER** when done.

(CONFIG: ODU) LNB: Set LNB Current Alarm → Lower

```
LNB Current Alarm Lower
Limit: 050mA (◄ ►,▲ ▼,ENT)
```

To edit the LNB Current Alarm Lower Limit: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range of current is from **10** to **400** mA. Press **ENTER** when done.

(CONFIG: ODU) LNB: LO

```
BUC LO Frequency:
12000 MHz (◄ ►,▲ ▼,ENTER)
```

To edit the value of the LNB LO Frequency: First, use the ◄ ► arrow keys to select a digit to edit, and then use the ▲ ▼ arrow keys to change the value of that digit. The valid range is from **3000** to **65000** MHz. Press **ENTER** when done.

This value is used to display the RF frequency of the modem/BUC combination. If the default value of* 00000 *is entered here, then no RF frequency will be displayed on the* CONFIG: Tx → Freq *menu.

(CONFIG: ODU) LNB: Mix

```
LNB Frequency Mix:
High-Side Low-Side (◄ ►)
```

Use the ◄ ► arrow keys to select **High-Side** or **Low-Side**, and then press **ENTER**.

L.3.3.2 (SELECT:) Monitor

```
MONITOR:Alarms Stats
Event-Log Parameters
```

For ODU operation, use the ◄ ► arrow keys to select **Alarms** or **Parameters**, and then press **ENTER**.

L.3.3.2.1 MONITOR: Alarms

```
Live Alarms:Unit Receive
Transmit ODU (◄ ►,ENTER)
```

The CDM-570L uses a system of Fault Prioritization. This system cuts down significantly on unwanted and irrelevant fault reporting. In each category of fault, only the highest priority fault is displayed. For example, if the demodulator is unlocked, it is irrelevant if there are other receive faults present. If the demodulator then locks, but there is a fault of a lower priority present, this will then be displayed. This also holds true for the faults reported via the remote control.

SUMMARY OF PRIORITIZED ODU FAULTS	
ODU Status	1) BUC PLL lock fault 2) BUC Current Out of Limits 3) BUC Voltage Out of Limits 4) LNB Current Out of Limits 5) LNB Voltage Out of Limits 6) BUC Temperature Alarm 7) BUC Software Checksum Error

For ODU Live Alarms, use the ◄ ► arrow keys to select **ODU**, and then press **ENTER**.

L.3.3.2.1.1 (MONITOR: Live Alarms) ODU

```
ODU Alarms: BUC Current
Out of Limits      (ENT)
```

```
ODU Alarms: None
                   (ENT)
```

This *read-only* screen indicates if there are any ODU Alarms present. If a prioritized fault is present it is displayed here (as per the **SUMMARY OF PRIORITIZED ODU FAULTS** table). If not, the screen displays ‘**None**’.

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

L.3.3.2.2 MONITOR: Parameters

```
PARAMETERS: Rx-Params
WAd-Params AUPC ODU
```

For ODU operation, use the ◄ ► arrow keys to select **ODU**, and then press **ENTER**.

L.3.3.2.2.1 (MONITOR: Parameters) ODU

```
Outdoor Unit Monitor:
BUC  LNB     (◄ ►,ENTER)
```

The screen shots that follow depict sample configurations – the actual values and settings will vary and they are dependant on the ODU configuration in use. Typical for all nested screens, press* ENTER *or* CLEAR *to return to the Outdoor Unit Monitor submenu.

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

(MONITOR: Parameters) Outdoor Unit Monitor: BUC

```
BUC:DC=47.8V,3.25A SW=05
T=+38C PLL=Flt Pwr=02.1W
```

This *read-only* screen displays the following parameters:

Item	Description
DC	(DC Power) If a BUC supply is installed, menu displays measured BUC supply voltage and load current, measured at the Tx-IF connector.
T	(Temperature) If BUC FSK is enabled, menu displays BUC ambient temperature in °C.
SW	If BUC FSK is enabled, menu displays the M&C software version of the BUC.
PLL	If BUC FSK is enabled, menu displays the fault status of the BUC PLL synthesizers.
Pwr	(Output Power) If BUC FSK is enabled, menu displays the output power as measured by the BUC power monitor.

(MONITOR: Parameters) Outdoor Unit Monitor: LNB

```
LNB Voltage: 13.1 volts
LNB Current: 235 mA(ENT)
```

This *read-only* screen displays the LNB Voltage and LNB Current parameters.

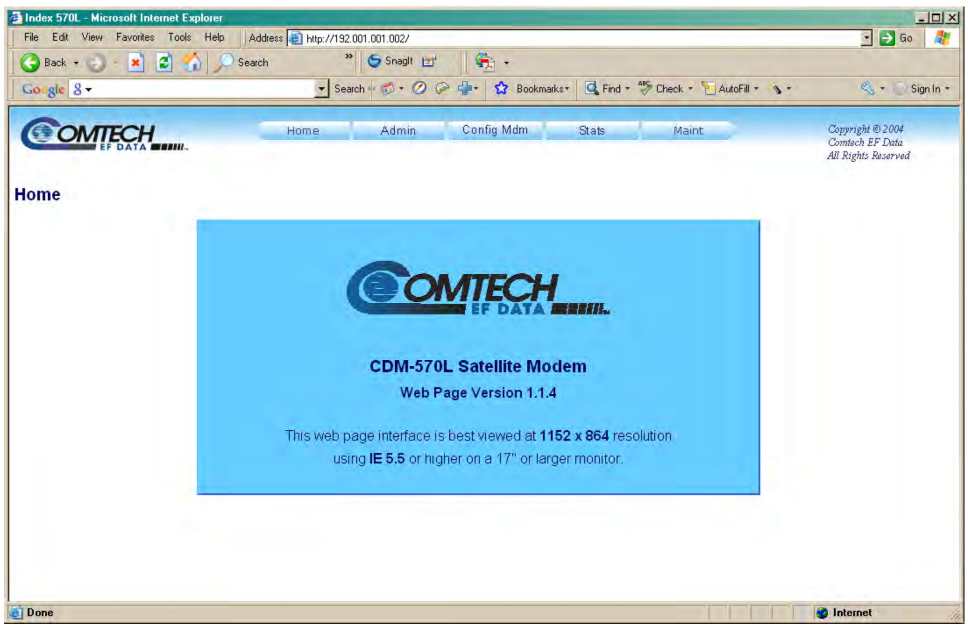
L.4 ODU Operations via the CDM-570L Base Modem HTTP Interface

L.4.1 Base Modem HTTP Interface Overview

***The CDM-570L Satellite Modem's embedded HTTP Interface provides an easy to use application to configure and monitor all aspects of a BUC or LNB. For a complete overview of the features for this interface, see* Chapter 7. BASE MODEM HTTP INTERFACE.**

L.4.1.1 ODU-Accessible Base Modem HTTP Home Page

Once a Web browser is opened and a valid IP address has been entered, the CDM-570L Satellite Base Modem HTTP Interface "splash" page is displayed:



The options available through the CDM-570L Base Modem HTTP Interface are illustrated via the following menu tree – operations not specific to ODU operations appear dimmed and are explicitly defined in **Chapter 7. BASE MODEM HTTP INTERFACE**:

Home	Admin	Config Mdm	Stats	Maint
Home	Access	Modem	Modem Status	Unit Info
Contact	Remote	Modem Utilities	Modem Logs	
Support		AUPC	Graphs (Minute Hour Day)	
		Timeslot Selection		
		BUC		
		LNB		

L.4.2 ODU (BUC, LNB) Pages

L.4.2.1 Config Mdm | BUC (Block Up Converter)

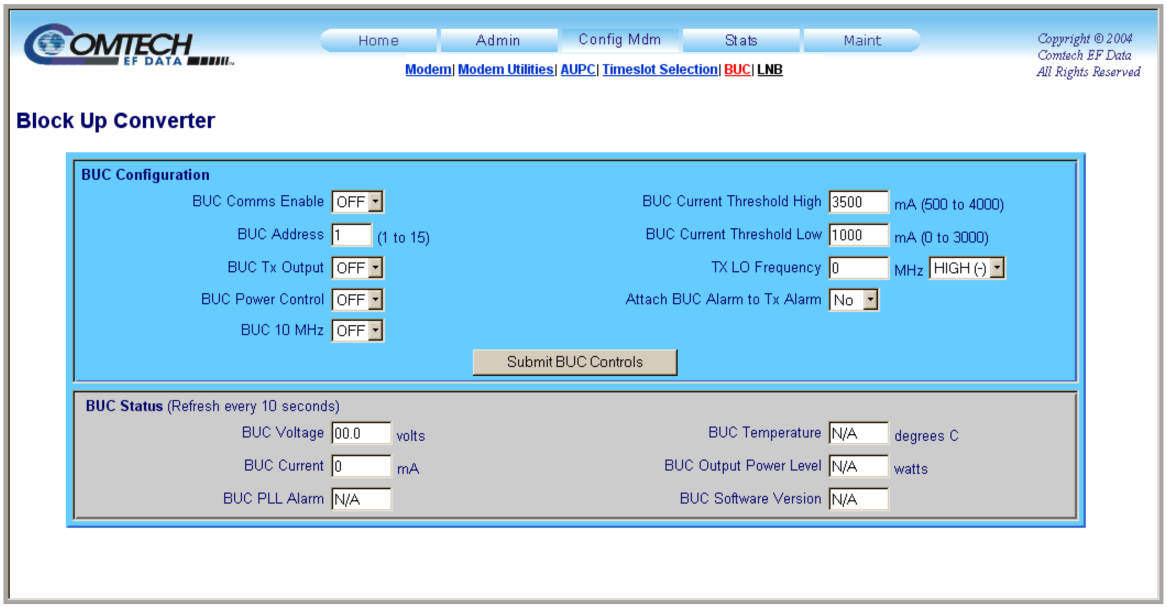


Figure L-3. Config Mdm | BUC page

Use the '**Config Mdm | BUC**' page (**Figure L-3**) to configure Block Up Converter parameters, and to display the BUC status for L-Band operation.

BUC Configuration

- Use the provided drop-down menus to turn **BUC Power Enable**, **10 MHz Ref Enable**, and **Output Power Enable ON** or **OFF**.
- Assign a **BUC Low** and **High Current Limit** value ranging from **0** to **4000** mA.
- Assign a **Tx Lockout Frequency** and designate the value as a **HIGH (+)** or **LOW (-)** limit.
- Assign a **BUC Address** from **0** to **15**.

Click **[Submit BUC Controls]** to save any changes made to this section.

BUC Status

The values displayed in this section are ***read-only*** and cannot be changed. This information automatically updates every 10 seconds.

L.4.2.2 Config Mdm | LNB (Low-Noise Block Down Converter)

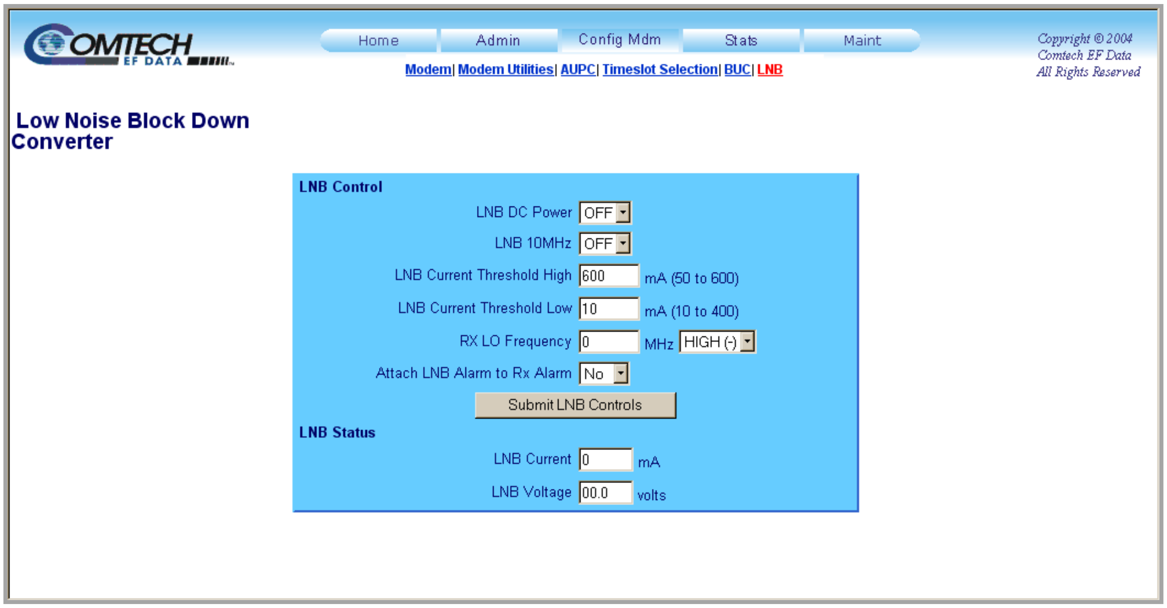


Figure L-4. Config Mdm | LNB page

Use the '**Config Mdm | LNB**' page (**Figure L-4)** to configure Low-Noise Block Down Converter parameters, and to display the LNB status for L-Band operation.

LNB Control

- Use the provided drop-down menus to turn **BUC LNB DC Power** and **LNB Reference Enable** operations **ON** or **OFF**.
- Assign **LNB Low** and **High Current Threshold** values ranging from **0** to **500** mA.
- Assign an **Rx Lockout Frequency** and designate the value as a **HIGH (+)** or **LOW (–)** limit.

Click **[Submit LNB Controls]** to save any changes made to this section.

LNB Status

The **LNB Current** and **LNB Voltage** values displayed in this section are ***read-only*** and cannot be changed.

L.5 ODU Operations via the CDM-570L IP Module HTTP Interface

L.5.1 IP Module HTTP Interface Overview

***As with the CDM-570L Base Modem HTTP Interface, the optional IP Module's embedded HTTP Interface provides an easy to use application to configure and monitor all aspects of a BUC or LNB. For a complete overview of the features for this interface, see* Sect 13.6. IP Module HTTP Interface.**

L.5.1.1 ODU-Accessible IP Module HTTP Home Page

Once a Web browser is opened and a valid IP address has been entered, the CDM-570L IP Module HTTP Interface "splash" page is displayed:

The options available through the CDM-570L IP Module HTTP Interface are illustrated via the following menu tree – operations not specific to ODU operations appear dimmed and are explicitly defined in **Section 13.6. IP Module HTTP Interface**:

Home	Admin	Modem	IP	Stats	Maint
Home	Summary	Modem	Interface	Ethernet	Unit Info
Contact	Mode	Utilities	Routes	Routes	Operations
Support	Access	Status	Multicast	QoS*1	Save
Logoff	Features	Logs	QoS Mode	WAN	Reboot
	Remote	**BUC**	QoS	Compression	
	Encryption	**LNB**	ARP		
			VLAN		
			IGMP		
			Redundancy		

L.5.2 ODU (BUC, LNB) Pages

L.5.2.1 Modem | BUC (Block Up Converter)

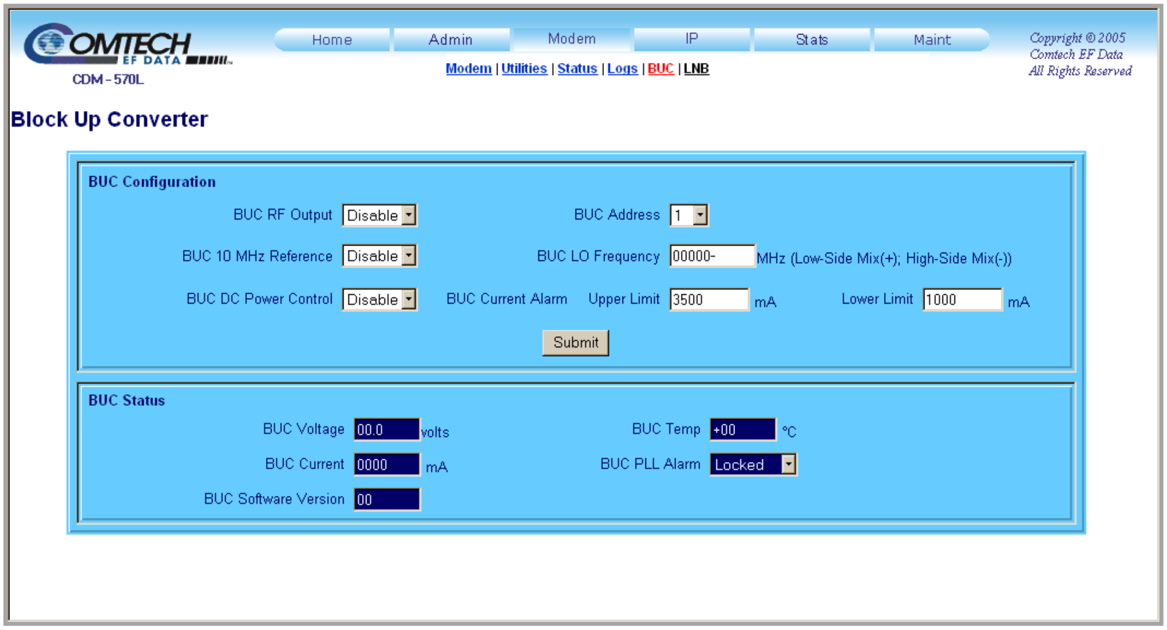


Figure L-5. Modem | BUC page

Use the '**Modem | BUC**' page (**Figure L-5**) to configure Block Up Converter parameters, and display the BUC status for L-Band operation:

BUC Configuration

- Use the drop-down menus to set **BUC RF Output, 10 MHz Reference**, or **DC Power Control** operations to **Enable** or **Disable**.
- Use the drop-down menu to select a **BUC Address** of **1** to **15**.
- Assign the **LO (Lockout) Frequency** and designate the value as a **HIGH (+)** or **LOW (–)** limit.
- Assign **BUC Current Alarm Upper** and **Lower Limit** values ranging from **0** to **4000** mA.

BUC Status

Use the drop-down menu to set the **BUC PLL Alarm** as **Locked**, **Unlocked**, or **N/A**. The remaining values displayed in this section are ***read-only*** and cannot be changed.

Click **[Submit]** to save any changes made to this page.

L.5.2.2 Modem | LNB (Low-Noise Block Down Converter)

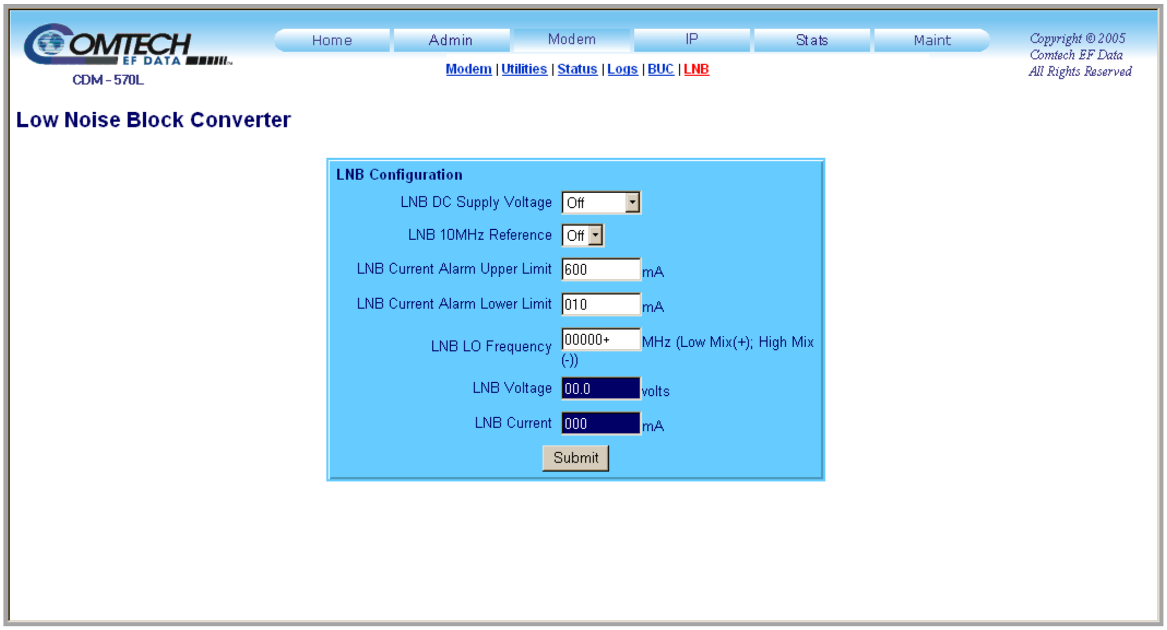


Figure L-6. Modem | LNB page

Use the '**Modem | LNB**' page (**Figure L-6)** to configure Low-Noise Block Down Converter parameters, and display the LNB status for L-Band operation:

- Use the drop-down menus to set the **LNB DC Supply Voltage** to **Off**, **13_Volts**, **18_Volts**, or **24_Volts**.
- Use the drop-down menus to set the **LNB 10 MHz Reference** to **On** or **Off**.
- Assign **LNB Current Alarm Upper** and **Lower Limit** values ranging from **0** to **600** mA.
- Assign **LNB LO (Lockout) Frequency** and designate the value as a **HIGH (+)** or **LOW (–)** limit.

The **LNB Voltage** and **LNB Current** values displayed in this section are ***read-only*** and cannot be changed.

Click **[Submit]** to save any changes made to this page.

Notes:

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
° C = (F - 32) * 0.555
° F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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