

# CDM-570 & CDM-570L Satellite Modems



## INTRODUCTION

The CDM-570 and the CDM-570L are Comtech EF Data's entry-level satellite modems that provide industry leading performance and flexibility in a 1 RU package at a very competitive price. It is the platform of choice for Network Operators, Enterprise users, Service Providers, Broadcasters and Government users for a wide range of applications – Cellular Backhaul over IP, Voice-over-IP (VoIP), LAN/WAN connectivity, Satellite News Gathering (SNG), Communication-on-the-Move, Maritime, Off-shore applications etc.

Designed to address the market for low-cost terminals, the modems are available with 70/140 MHz or L-band IF and EIA-530/-422, V.35, EIA-232 and G.703 data interfaces. An optional Internet Protocol (IP) Module with 10/100BaseT Ethernet port is available for IP centric applications.

The advanced FPGA-based architecture along with the internal Flash memory allows for easy field upgrades via the Ethernet port.

## KEY FEATURES

- Data rate range from 2.4 kbps to 9.98 Mbps
- CDM-570: 50 to 90 or 100 to 180 MHz IF range  
CDM-570L: 950 to 1950 MHz IF range
- Fast acquisition demodulator ( $\pm 32$  kHz acquisition range, 64 kbps, Rate 1/2 QPSK: 150 ms average)
- Modulation types: BPSK, QPSK, OQPSK, 8-PSK, 8-QAM, 16-QAM
- Forward Error Correction (FEC) choices include Turbo Product Code (TPC), Viterbi, Reed-Solomon, and Trellis Coded Modulation (TCM)
- Automatic Uplink Power Control (AUPC)
- Embedded Distant-end Monitor and Control (EDMAC)
- Asymmetric Loop Timing
- Built-in 1:1 redundancy controller (Y-cables for data, simple and inexpensive external module for IF and RF)
- 1:1 and 1:10 redundancy switches available
- CDM-570: FSK communications to CSAT-5060 or KST-2000A
- CDM-570L: 10 MHz reference for BUC, FSK communications and optional BUC power supply
- CDM-570L: 10 MHz reference and power supply for LNB
- Backwards compatible with the CDM-500/CDM-550, CDM-550T, CDM-600, and CDM-600L
- Interoperable with SDM-300A and SDM-300L3
- 10/100BaseT Ethernet port for M&C with Web browser, SNMP and Telnet support
- IP Module with 10/100BaseT Ethernet port
- Vipersat Management System (VMS) integration
- G.703 Clock Extension for IP backhaul

## TURBO PRODUCT CODING

The optional Turbo Product Codec delivers significant performance improvement when compared to Viterbi with concatenated Reed-Solomon. It offers increased coding gain, lower decoding delay, and significant bandwidth savings compared to traditional FEC.

## EDMAC & AUPC OPERATION

CDM-570/L has the ability to monitor and control the distant end of a satellite link using EDMAC. User data is framed and bits are added to pass control, status, and AUPC information. This is transparent to the user.

## MANAGEMENT

The modem can be configured and monitored from the front panel, or through the remote M&C port. Ten complete configurations may be stored in the modem. An Event log stores alarm and status information in non-volatile RAM, while the Link Statistics log stores link performance (Eb/No and AUPC performance) for monitoring and reporting purposes.

The CDM-570/L also offers a 10/100BaseT Ethernet port for management with an embedded Web Server (HTTP), SNMP agent, and Telnet capability.

## IP MODULE AND VIPERSAT NETWORKS VMS

With the optional IP Module, the CDM-570/L provides advanced features for IP networking including Quality of Service (QoS), Header and Payload Compression.

Optionally, it can also be integrated with the Vipersat Management System (VMS) to provide fully automated network and capacity management.

## G.703 CLOCK EXTENSION

Cellular networks require precise synchronization of base stations, which is a challenge when using IP backhaul. Most operators are forced to use GPS based external equipment for site synchronization.

CDM-570/L offers a G.703 Clock Extension option that propagates a high stability reference from Hub to the Remote. A high stability E1/T1 reference signal is fed to the Hub modem. The Remote modem generates a T1/E1 signal synchronized to the reference signal that is then used for synchronizing the Remote site. G.703 Clock Extension can be used with the IP Module or when using serial synchronous data interfaces. This process does not require additional bandwidth.

## FAST FEATURE ENHANCEMENTS

The FAST codes make it easy to upgrade the modem capability in the field. New features can be added on site, using FAST access codes purchased from Comtech EF Data that can be entered via the Front Panel.

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## SYSTEM SPECIFICATIONS

Frequency Range	CDM-570: 50 to 90 or 100 to 180 MHz, CDM-570L: 950 to 1950 MHz, 100 Hz frequency resolution
Data Interfaces	EIA-422/-530, V.35, Sync EIA-232, G.703 T1, G.703 E1 balanced or unbalanced
Data Rate Range	Programmable in 1 bps step with fully independent Tx and Rx rates
<u>Modulation &amp; FEC</u>	<u>Data Rate Range</u>
5/16 BPSK TPC	2.4 kbps to 0.937 Mbps
1/2 BPSK	2.4 kbps to 1.50 Mbps
1/2 QPSK/OQPSK	4.8 kbps to 3.00 Mbps
3/4 QPSK/OQPSK	7.2 kbps to 4.50 Mbps
7/8 QPSK/OQPSK	8.4 kbps to 5.25 Mbps
2/3 8-PSK TCM	8.7 kbps to 4.40 Mbps
21/44 QPSK/OQPSK TPC	4.8 kbps to 2.86 Mbps
3/4 QPSK/OQPSK TPC	7.2 kbps to 4.50 Mbps
7/8 QPSK/OQPSK TPC	8.4 kbps to 5.25 Mbps
0.95 QPSK/OQPSK TPC	9.1 kbps to 5.66 Mbps
3/4 8-PSK/8-QAM TPC	10.8 kbps to 6.75 Mbps
7/8 8-PSK/8-QAM TPC	13.6 kbps to 7.875 Mbps
0.95 8-PSK/8-QAM TPC	15.3 kbps to 8.50 Mbps
3/4 16-QAM TPC	14.4 kbps to 9.00 Mbps
7/8 16-QAM TPC	16.8 kbps to 9.98 Mbps
Uncoded	4.8 kbps to 5.00 Mbps
Scrambling	Mode dependent - ITU V.35, or proprietary externally synchronized
FEC Options	
Viterbi	Rate 1/2 BPSK, QPSK/OQPSK Rate 3/4 and 7/8 QPSK/OQPSK and 16-QAM w/RS
Pragmatic TCM	8-PSK 2/3 (Closed Network – Not IESS-310)
Turbo Product Coding	Rate 21/44 BPSK, 5/16 BPSK, Rate 21/44 QPSK/OQPSK Rate 3/4 and Rate 7/8 QPSK/OQPSK, 8-PSK and 16-QAM Rate 0.95 QPSK/OQPSK and 8-PSK Proprietary 220/200 and 200/180 modes available
Reed-Solomon	BPSK, QPSK/OQPSK EIA-232, EIA-485 (2- or 4-wire), Ethernet 10/100BaseT
Uncoded	BPSK, QPSK/OQPSK
M&C Interface	EIA-232, EIA-485 (2- or 4-wire), Ethernet 10/100BaseT
Input/Output Impedance	CDM-570: Matched for 50/75Ω, BNC connector CDM-570L: Transmit and Receive 50Ω, female Type N connector
External Reference Input	1, 2, 5, 10 or 20 MHz, BNC connector
Form C Relays	Tx, Rx traffic alarms and Unit faults

## MODULATOR

	<u>CDM-570</u>	<u>CDM-570L</u>
Frequency Stability	±1 ppm, 0° to 50°C (32° to 122°F)	±0.06 ppm, 0° to 50°C (32° to 122°F)
Output Power	0 to -25 dBm, 0.1 dB steps	0 to -40 dBm, 0.1 dB steps
Accuracy	± 0.5 dB over frequency and temperature	± 1.0 dB over frequency and temperature
Phase Noise	< 0.75 degrees RMS double-sided, 100 Hz to 1 MHz	< 1.2 degrees RMS double-sided, 100 Hz to 1 MHz
Output Spectrum/ Filtering	Meets IESS-308/-309 power spectral mask	

Harmonics and Spurious	< -55 dBc/4 kHz (Typically < -60 dBc/4 kHz)
Transmit On/Off Ratio	55 dB minimum
External Tx Carrier	By TTL LOW signal, or RTS
Off	
Tx Clock Options	Internal (SCT), External (TT), Loop timing with Symmetric or Asymmetric operation

## DEMODULATOR

	<u>CDM-570</u>	<u>CDM-570L</u>
Input Power Range	-30 to -60 dBm	-130 + 10 Log Symbol Rate, dBm (minimum) -90 + 10 Log Symbol Rate, dBm (maximum)
Max Composite Level	+35 dBc, up to -5 dBm	+35 dBc, up to -5 dBm
Acquisition Range	± 1 to ± 32 kHz, 1 kHz step	± 1 to ± 32 kHz, 1 kHz step, Symbol Rate ≤ 625 ksps ± 1 to ± 200 kHz, 1 kHz step, Symbol Rate > 625 ksps
Acquisition Time	Example: 150 ms average at 64 kbps, Rate 1/2 QPSK, and ± 32 kHz acquisition range	
Receive Buffer	512, 1024, 2048, 4096, 8192, or 16384 bits	
Receive Clock	Rx Satellite, Tx Terrestrial,	
Options	Internal Reference	
Clock Tracking	± 100 ppm minimum	
Monitor Functions	E <sub>b</sub> /N <sub>0</sub> , Frequency Offset, BER, Buffer fill status, Rx signal level	

## Example BER Performance

Met with two adjacent carriers 7 dB higher  
Guaranteed E<sub>b</sub>/N<sub>0</sub>, in dB (Typical values in parentheses)  
(See the CDM-570/L manual for a complete listing of the performance  
of all FEC types, Code Rates, and Modulation types.)

### Viterbi

(B, QPSK/OQPSK)	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>
10 <sup>-5</sup>	5.4 (4.9)	6.8 (6.3)	7.7 (7.2)
10 <sup>-7</sup>	6.7 (6.2)	8.2 (7.7)	9.0 (8.6)

### Viterbi & Concatenated Reed-Solomon 220/200 or 200/180

(B, QPSK/OQPSK)	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>
10 <sup>-5</sup>	4.3 (4.0)	5.6 (4.7)	6.5 (6.0)
10 <sup>-7</sup>	4.5 (4.2)	6.0 (5.2)	6.9 (6.5)

### Turbo Product Codec (QPSK/OQPSK)

	<u>21/44</u>	<u>3/4</u>	<u>7/8</u>	<u>0.95</u>
10 <sup>-6</sup>	2.9 (2.6)	3.8 (3.4)	4.3 (4.0)	6.4 (6.0)
10 <sup>-8</sup>	3.3 (2.8)	4.4 (4.0)	4.5 (4.2)	6.9 (6.5)
(8-PSK)	<u>3/4</u>	<u>7/8</u>	<u>0.95</u>	
10 <sup>-6</sup>	6.2 (5.8)	7.0 (6.6)	9.3 (8.9)	
10 <sup>-8</sup>	6.8 (6.3)	7.2 (6.8)	10.3 (9.9)	
(8-QAM)	<u>3/4</u>	<u>7/8</u>	<u>0.95</u>	
10 <sup>-6</sup>	6.5 (6.1)	6.6 (6.2)	9.6 (9.2)	
10 <sup>-8</sup>	7.2 (6.8)	6.8 (6.4)	10.6(10.2)	

*Note: Data Rate and Range specifications on this page reflect  
CDM-570/L modem operating in non-Vipersat mode. For information  
on modulation and FEC combinations and data rate ranges in  
conjunction with STDMA operation in Vipersat mode, please refer to  
page 4.*

### LOW-NOISE BLOCK CONVERTER (LNB) SUPPORT (CDM-570L Only)

LNB Voltage +13, +18, and +24 VDC @ 500 mA maximum  
 LNB Reference 10 MHz via Rx center conductor, -3 dBm ± 3 dB

### BLOCK UP CONVERTER (BUC) SUPPORT (CDM-570L Only)

BUC Voltage 24 VDC, 80W @ 50°C, 100W @ 30°C (internally fitted option)  
 48 VDC, 150W @ 50°C, 180W @ 30°C (internally fitted option)  
 BUC Reference 10 MHz via Tx center conductor, 0 dBm ± 3 dB  
 FSK Support Via Tx center conductor with FSK BUCs

### ENVIRONMENTAL AND PHYSICAL

Temperature Operating: 0 to 50°C (32 to 122°F)  
 Storage: -25 to 85°C (-13 to 185°F)  
 Power Supply 100 to 240 VAC, 50/60 Hz  
 Power Consumption (See Manual) CDM-570: 29W typical (32W max) w/o IP Module  
 CDM-570L: 29W typical (32W max) w/o BUC or IP Module  
 Physical Dimensions CDM-570: 1RU high, 12 inches deep (30.5cm)  
 CDM-570L: 1RU High, 16 inches deep (40.6 cm)  
 Weight CDM-570: 7 lbs (3.2 kg)  
 CDM-570L: 16 lbs (7.2 kg) including 180W BUC supply

### OPERATIONS & MAINTENANCE

Configuration and management  
 Front Panel  
 Remote Port – EIA-232 or EIA-485 (2- or 4-wire)  
 SNMP with MIB II and private, modem-specific MIB  
 Telnet  
 Web Browser (http)  
 Console interface (EIA-232, RJ-12 connector) (with IP Module)  
 Software/firmware upgrade via FTP  
 Traffic statistics (with IP Module)  
 Faults and alarms  
 Configuration backup and Restoral (with IP Module)

### SECURITY (IP Module)

Password Protection  
 Access List

### REGULATORY

CE Mark EMC, Safety (CDM-570)  
 EN55022 Class B (Emissions)  
 EN50082-1 Part 1 (Immunity)  
 EN60950 (Safety) (CDM-570L)  
 FCC Approval FCC Part 15 Class B (CDM-570L)

### AVAILABLE OPTIONS

How Enabled	Option
FAST	Variable Rate to 2.048 Mbps
FAST	Variable Rate to 5 Mbps
FAST	Variable Rate to 9.98 Mbps
FAST	8-PSK, 8-QAM modulation (8-QAM is TPC only)
FAST	16-QAM modulation
FAST	G.703 Clock Extension
Hardware	Reed-Solomon Codec Board
Hardware	Turbo Codec Board
Hardware	CDM-570: Power Supply, AC Input
Hardware	CDM-570: Power Supply, -48 DC Input
Hardware	CDM-570L: 24 VDC, 100W BUC Power Supply
Hardware	AC Input or 48 VDC Input
Hardware	CDM-570L: 48 VDC, 180W BUC power supply
Hardware	AC Input or 48 VDC Input
Hardware	IP Module
<b>IP Module Options:</b>	
FAST	Header Compression
FAST	Payload Compression
FAST	Quality of Service (QoS) – 3 modes
FAST	3x DES Data Encryption
FAST	Vipersat Management System Integration

### ACCESSORIES

CRS-170A CDM-570L: 1:1 Modem Redundancy IF Switch  
 CRS-180 CDM-570: 1:1 Modem Redundancy IF Switch  
 CRS-280 CDM-570: IF Switch Module  
 CRS-300 1:N Modem Redundancy Switch



CDM-570 Satellite Modem Back Panel



CDM-570L Satellite Modem Back Panel with optional IP Module installed

# IP Module & VMS Integration



## INTRODUCTION

With its innovative architecture and support for advanced capabilities, an IP-Module equipped CDM-570/L allows for efficient IP networking and transport over satellite links. It supports a wide range of applications and network topologies.

## KEY FEATURES

- easyConnect® for set up with minimal configuration
- Static IP routing for unicast and multicast
- Standards based management via SNMP, Web, or Telnet
- IGMP v1 and v2
- Symmetric as well as asymmetric operation for maximum bandwidth efficiency
- Support for Mesh, STAR and hybrid network topologies

## HEADER COMPRESSION OPTION

Configurable on a per route basis, Header compression reduces the bandwidth required for Voice over Internet Protocol (VoIP) by as much as 60%. Example: A G.729 voice codec, operating at 8 kbps, requires 32 kbps bandwidth once encapsulated into an IP/UDP/RTP frame. With IP/UDP/RTP header compression, the same voice call needs only 10.8 kbps total WAN satellite bandwidth. Typical Web/HTTP traffic can also be reduced by 10% via IP/TCP header compression.

## PAYLOAD COMPRESSION OPTION

Configurable on a per route basis, Payload compression can reduce the required satellite bandwidth by up to 40%.

## DATA ENCRYPTION OPTION

Configurable on a per route basis, the IP Module supports 3xDES data encryption to prevent unauthorized access to data transmitted over the satellite link.

## QUALITY OF SERVICE (QoS) OPTION

The IP Module supports multi-level QoS to reduce jitter and latency for real time traffic, provides priority treatment to mission critical applications and allows non-critical traffic to use the remaining bandwidth. Supported modes are:

- DiffServ – Industry-standard method of providing QoS enabling seamless co-existence in networks that implement DiffServ.
- Max/Priority – Provides 8 levels of traffic prioritization with the ability to limit maximum traffic per priority class
- Min/Max – Provides a Committed Information Rate (CIR) to each user defined class of traffic with the ability to allow a higher burstable rate depending on availability

## NETWORKING PROTOCOLS

RFC 768 – UDP	RFC 2045 – MIME
RFC 791 – IP	RFC 2236 – IGMP v2
RFC 792 – ICMP	RFC 2474 – Diffserv
RFC 793 – TCP	RFC 2475 – Diffserv
RFC 826 – ARP	RFC 2578 – SMI
RFC 856 – Telnet	RFC 2597 – AF PHB
RFC 862 – Ping	RFC 2598 – Expedite Forwarding
RFC 894 – IP	RFC 2616 – HTTP
RFC 959 – FTP	RFC 2821 – SMTP
RFC 1112 – IP Multicast	RFC 3412 – SNMP
RFC 1213 – SNMP MIB II	RFC 3416 – SNMPv2
RFC 1812 – IPv4 Routers	RFC 3418 – SNMP MIB

## VMS NETWORK & BANDWIDTH MANAGEMENT

A Vipersat powered network integrates this advanced modem with a powerful network management tool, the Vipersat Management System (VMS). In addition to the traditional Monitoring and Control of the CDM-570/L modems, CDD-564/L and CDD-562L demodulators, the VMS allows these devices to share bandwidth, and when needed, switch automatically to a dedicated SCPC channel.

In a Vipersat powered network, the CDM-570/L modem takes advantage of its fast acquisition demodulation to allow it to operate in a shared mode. Inbound transmissions (from remote to hub) can be switched from a shared Selective Time Division Multiple Access (STDMA) mode to a dedicated Single Carrier Per Channel (SCPC) connection via a variety of user defined policies or triggers. This enables the network to more effectively handle real-time connection-oriented applications and reduces both latency and network congestion. Through VMS, dynamic point-to-point mesh connections can also be established between remotes.

- Dynamic SCPC carrier allocation & true bandwidth-on-demand
- User-defined policies for upstream carrier switching
- Star and full mesh capabilities using Single Hop On Demand
- Advanced Switching takes advantage of using other modulation/forward error correction combinations

## UPSTREAM SWITCHING

Through protocol classification in the remote terminals, the modem initiates automatic switching. VMS establishes *dSCPC* bandwidth based on policies that can be individually enabled on a per-remote basis, or globally enabled. Policies can be configured for a variety of applications such as VoIP, video (VTC), or based on a load, or via a schedule, Type of Service (ToS), or QoS rules such as IP port or IP address and protocol type. Operators are able to set minimum and maximum data rates for each remote as well as excess data rates for an initial upstream switch.

## VIPERSAT OPERATION MODE

Vipersat operation is enabled via a FAST feature code. Networks can easily start off in point-to-point or point-to-multipoint configurations. As the network grows and users wish to take advantage of the bandwidth on demand savings by implementing a Vipersat network, modems can easily be upgraded to Vipersat mode. Vipersat mode provides for the ability to operate in the following modulation/FEC rates:

STDMA	QPSK, Rate 3/4 Turbo FEC – all STDMA modes. Data Rate Range: 64 kbps – 4.5 Mbps BPSK, Rate 5/16 Turbo FEC – Entry Channel Mode only. Data Rate Range: 32 kbps to 937 kbps.
SCPC	All Turbo Product Code FEC rates as detailed on page 2