CDM-570-IP & CDM-570L-IP Satellite Modems

INTRODUCTION

The CDM-570-IP and the CDM-570L-IP are Comtech EF Data's IP-centric satellite modems that provide industry leading performance and flexibility in a 1 RU package at a very competitive price.

With their innovative architecture and support for advanced capabilities, CDM-570-IP and CDM-570L-IP allow for efficient IP networking and transport over satellite links while supporting a wide range of applications and network topologies. In addition to the 10/100BaseT Ethernet interface, a wide range of data interfaces are available to support legacy applications and assist in migrating from legacy to IP transport.

They are 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, offshore applications, etc.

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-IP: 50 to 90 or 100 to 180 MHz IF range
  CDM-570L-IP: 950 to 1950 MHz IF range
- Integrated IP Module with 10/100BaseT Ethernet port
- Static IP routing for unicast and multicast
- Multi-level Quality of Service (QoS)
- Header and payload compression for maximum efficiency
- 3xDES Encryption for transport security
- Standards based management via SNMP, Web, or Telnet
- IGMP v1 and v2
- VLAN capability with 802.1Q compliant QoS
- Symmetric as well as asymmetric operation for maximum bandwidth efficiency
- Support for mesh, Star and hybrid network topologies
- Vipersat Management System (VMS) integration
- G.703 clock extension for IP backhaul
- Fast acquisition demodulator (± 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)
- 1:1 Redundancy available
- CDM-570-IP: FSK communications to CSAT-5060 or KST-2000A
- CDM-570L-IP: 10 MHz reference for BUC, FSK communications and optional BUC power supply
- CDM-570L-IP: 10 MHz reference and power supply for LNB

HEADER COMPRESSION OPTION

Configurable on a per route basis, header compression reduces the bandwidth required for 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 modem supports 3xDES data encryption to prevent unauthorized access to data transmitted over the satellite link

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-IP 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.

Modems

CDM-570-IP & CDM-570L-IP Satellite Modems

QUALITY OF SERVICE (QoS) OPTION

The modem 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

MANAGEMENT

The modem supports SNMP, web-based and command line interfaces for management.

The modem can also be configured and monitored from the front panel, or through the remote M&C port (for non-IP mode of operation). Ten complete RF 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.

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-IP 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.

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-IP 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-IP 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 in the following specifications

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.

SYSTEM SPECIFICATIONS

Frequency Range	CDM-570-IP: 50 to 90 or 100 to 180 MHz, CDM-570L-IP: 950 to 1950 MHz, 100 Hz frequency resolution
Data Interfaces	10/100Base T Ethernet, EIA-422/-530, V.35, Sync EIA-232, G.703 T1 balanced, G.703 E1 balanced or unbalanced
Data Rate Range	Programmable in 1 bps step with fully independent Tx and Rx rates
Modulation & FEC	Data Rate Range
5/16 BPSK TPC	2.4 kbps to 0.937 Mbps
21/44 BPSK TPC	2.4 kbps to 1.430 Mbps
1/2 BPSK	2.4 kbps to 1.500 Mbps
1/2 QPSK/OQPSK	4.8 kbps to 3.000 Mbps
3/4 QPSK/OQPSK	7.2 kbps to 4.500 Mbps
7/8 QPSK/OQPSK	8.4 kbps to 5.250 Mbps
2/3 8-PSK TCM	8.7 kbps to 4.400 Mbps
21/44 QPSK/OQPSK TPC	4.8 kbps to 2.860 Mbps
3/4 QPSK/OQPSK TPC	7.2 kbps to 4.500 Mbps
7/8 QPSK/OQPSK TPC	8.4 kbps to 5.250 Mbps

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0.95 QPSK/OQPSK TPC	9.1 kbps to 5.666 Mbps
3/4 8-PSK/8-QAM TPC	10.8 kbps to 6.750 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 8.500 Mbps
3/4 16-QAM TPC	14.4 kbps to 9.000 Mbps
7/8 16-QAM TPC	16.8 kbps to 9.980 Mbps
Uncoded	4.8 kbps to 5.000 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
Reed-Solomon	Proprietary 220/200 and 200/180 modes available
Uncoded	BPSK, QPSK/OQPSK
M&C Interface	EIA-232, EIA-485 (2- or 4-wire), Ethernet 10/100BaseT (Dependent on operational mode)
Input/Output Impedance	CDM-570-IP: Matched for 50/75Ω, BNC connector CDM-570L-IP: 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

	CDM-570-IP	CDM-570L-IP
Frequency Stability	±1 ppm, 0º to 50ºC (32º to 122ºF)	±0.06 ppm, 0º to 50ºC (32º to 122ºF)
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 Off	By TTL LOW signal, or RTS	
Tx Clock Options	Internal (SCT), External (TT), Loop timing with Symmetric or Asymmetric operation (Data interface dependent)	

DEMODULATOR

	CDM-570-IP	CDM-570L-IP
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 absolute max.	+40 dBc, up to -10 dBm absolute max.
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, 8182, or 16384 bits	
Receive Clock Options	Buffer Disabled (Rx Satellite), Buffer Enabled (Symmetric or Asymmetric Operation) (data interface dependent)	
Clock Tracking	± 100 ppm minimum	
Monitor Functions	E_b/N_o, Frequency Offset, BER, Buffer fill status, Rx signal level	

Example BER Performance

For symbol rates up to 2.5 Msps (See CDM-570/L User Manual for higher symbol rates).
Guaranteed E_b/N_o, in dB (typical values in parentheses) with two adjacent carriers 7 dB higher
(See the CDM-570/L User Manual for a complete listing of the performance of all FEC types, code rates, and modulation types.)

Viterbi

(BPSK, QPSK/OQPSK)	1/2	3/4	7/8
10^{-5}	5.4 (4.9)	6.8 (6.3)	7.7 (7.2)
10^{-7}	6.7 (6.2)	8.2 (7.7)	9.0 (8.6)

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

(BPSK, QPSK/OQPSK)	1/2	3/4	7/8
10^{-5}	4.3 (4.0)	5.6 (4.7)	6.5 (6.0)
10^{-7}	4.5 (4.2)	6.0 (5.2)	6.9 (6.5)

Turbo Product Codec

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

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

BUC Voltage	24 VDC, 90 W @ 50°C, 100 W @ 30°C (internally fitted option) 48 VDC, 150 W @ 50°C, 180 W @ 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 50ºC (32 to 122ºF)
	Storage: -25 to 85ºC (-13 to 185ºF)
Power Supply	100 to 240 VAC, 50/60 Hz
Power Consumption (See Manual)	CDM-570-IP: 37 W typical CDM-570L-IP: 37 W typical w/o BUC
Physical Dimensions	CDM-570-IP: 1RU high, 12 inches deep (30.5cm) CDM-570L-IP: 1RU High, 16 inches deep (40.6 cm)
Weight	CDM-570-IP: 6 lbs (2.7 kg) CDM-570L-IP: 16 lbs (7.2 kg) including 150 W BUC power 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)

Software/firmware upgrade via FTP
IP Traffic statistics
Faults and alarms
Configuration backup and Restoral

SECURITY

Password Protection
Access List

ACCESSORIES

CRS-170A	CDM-570L-IP: 1:1 Modem Redundancy IF Switch
CRS-180	CDM-570-IP: 1:1 Modem Redundancy IF Switch

REGULATORY

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

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 with TPC only)
FAST	16-QAM modulation
FAST	G.703 Clock Extension
Hardware	Reed-Solomon Codec Board
Hardware	Turbo Codec Board
Hardware	CDM-570-IP: Power Supply, AC Input
Hardware	CDM-570-IP: Power Supply, -48 DC Input
Hardware	CDM-570L-IP: 24 VDC, 100 W (@ 30°C) BUC power supply AC Input or 48 VDC Input
Hardware	CDM-570L-IP: 48 VDC, 180 W (@ 30°C) BUC power supply AC Input or 48 VDC Input
	IP Module Options:
FAST	Header Compression
FAST	Payload Compression
FAST	Quality of Service (QoS) – 3 modes
FAST	3x DES Data Encryption
FAST	Vipersat Management System Integration

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

CDM-570L-IP Satellite Modem Back Panel

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