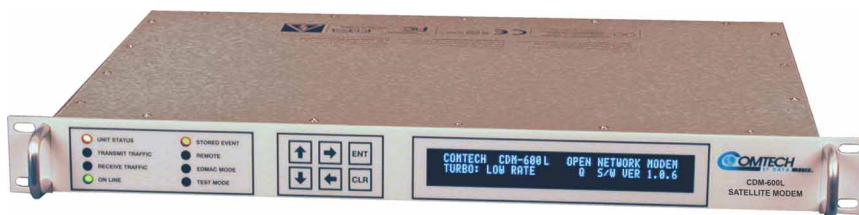


- Open Network L-Band Modem
- Fast Acquisition Demod
- Turbo Product Coding
- BPSK, QPSK, 8-PSK, 16-QAM



INTRODUCTION

The CDM-600L is an L-Band version of the industry-leading CDM-600 modem. The unit operates:

- Open Network: fully compliant with Intelsat IESS-308, -309, -310, -314, and -315 from 64 kbps through T2 and E2.
- Closed Network: from 2.4 kbps to 20 Mbps

The architecture is firmware and FPGA-based, and the internal Flash memory allows easy updating via the serial port. The modem offers exceptional flexibility and performance in a 1RU enclosure.

FEATURES

- Fast acquisition demod (± 32 kHz acquisition range, 64 kbps, Rate 1/2 QPSK: 1 sec average)
- Forward Error Correction choices include Turbo Product Coding, Viterbi, Sequential, Reed-Solomon, and TCM
- Open Network compatible, and backwards compatible with the CDM-500/CDM-550, CDM-550T and CDM-600
- Interoperable with SDM-300A, SDM-300L3
- INTELSAT Intermediate Data Rate (IDR)
- INTELSAT Business Services (IBS)
- L-Band 950 to 1950 MHz frequency range
- Data rate range from 2.4 kbps to 20 Mbps
- Automatic Uplink Power Control (AUPC)
- BPSK, QPSK, OQPSK, 8-PSK, 16-QAM modulation types
- Asymmetric Loop Timing
- 1:1 and 1:10 redundancy switches available

FEATURE ENHANCEMENTS

Enhancing the CDM-600L's performance is easy. Additional features are added quickly on site, using FAST access codes purchased from Comtech EF Data. To enable these features, simply enter the code at the front panel.

APPLICATION

The CDM-600L provides a cost-effective solution for a complete range of low and data rate satellite circuits, and will replace many older modems currently reaching the end of their life cycle.

TURBO PRODUCT CODING

The CDM-600L offers all traditional FEC methods and incorporates an optional Turbo Product Codec (TPC). TPC simultaneously offers increased coding gain, lower decoding delay, and significant bandwidth savings. The Low Rate TPC codec operates up to 5 Mbps. The High Rate TPC codec operates up to 20 Mbps. The advanced capabilities of High Rate TPC codec also provide a full range of code rates (from 5/16 through 7/8 and 0.95) with all modulation types from BPSK to 16-QAM.

Comtech EF Data's TPC solution is compliant with Intelsat IESS-315.

DROP & INSERT (D&I++)

The CDM-600L offers two variants of Drop and Insert (D&I). The first is an Intelsat Open Network-compliant mode, using the IBS framing (6.7%). The second is CEFD's Proprietary Enhanced mode, called D&I++. This "n" x 64 kbps mode offers any value of "n" up to 24, and permits the simultaneous use of EDMAC, AUPC (see below) and an ESC circuit at 1/576th of the user data rate. This is achieved with the addition of only 2.2% overhead.

EDMAC OPERATION

A special feature of the CDM-600L is its ability to monitor and control the distant end of a satellite link using a Comtech EF Data proprietary overhead channel. This framed mode is called EDMAC (Embedded Distant-end Monitor and Control). User data is framed and extra bits are added to pass control, status, and Automatic Uplink Power Control information. This process is completely transparent to the user. Status and Control of FSK-capable Block Up Converters at the far end is also provided via the EDMAC channel.

REMOTE CONTROL

The operator may configure and monitor the modem 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 QoS reporting purposes. SatMac, a Windows-based monitor and control program, is available for configuring the local and distant end modems, transceivers, and redundancy switches.



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SYSTEM SPECIFICATIONS

Frequency Range	950 to 1950 MHz in 100 Hz steps
Input/Output Impedance	50 Tx and 50 or 75Ω Rx
IF Connectors	Tx Type N, female, Rx Type F (75Ω) or N (50Ω), female
Data Rate (See Manual)	2.4 kbps to 20 Mbps in 1 bps steps within symbol rate range
Symbol Rate	4.8 ksp/s to 10 Msp/s
Turbo Product Coding	4.8 kbps to 5 Mbps (Low Rate Option) 4.8 kbps to 20 Mbps (High Rate Option)
Scrambling	Intelsat IESS-308, -309, -310 or proprietary
FEC Options	
Viterbi	BPSK, QPSK and OQPSK 1/2 QPSK, OQPSK and 16-QAM w/RS 3/4 and 7/8
Sequential	BPSK 1/2, O/QPSK 3/4, and 7/8
Pragmatic TCM	8-PSK 2/3
Low Rate TPC	BPSK 21/44, 5/16 QPSK/OQPSK/8-PSK/16-QAM 3/4
High Rate TPC	BPSK 21/44, 5/16 QPSK/OQPSK 1/2, 3/4, 7/8, 0.95 8-PSK 3/4, 7/8, 0.95 16-QAM 3/4, 7/8
Reed-Solomon	Intelsat compliant, and proprietary modes available
Uncoded	BPSK, QPSK and OQPSK
M&C Interface	EIA-232, EIA-485 (2- or 4-wire)
Form C Relays	Tx, Rx traffic alarms and Unit faults Backward alarms for IDR and IBS

DATA INTERFACE

Data Interfaces	EIA-422/530, V.35, Sync EIA-232, G.703 balanced or unbalanced, Low Voltage Differential Signal (LVDS), HSSI (using CIC-20 HSSI/LVDS interface converter)
Drop And Insert	G.703 (T1 or E1)
Frame formats supported	D4 or ESF for T1, CCS or CAS for E1
N x 64 kbps Data Rates	N = 1 to 6, 8, 10, 12, 15, 16, 20, 24 or 30 for Open Network 1 to 24 for D&I++ Enhanced Proprietary

ESC Interfaces

IDR	96 kbps overhead
Voice Orderwire	2 ADPCM (input: 4-wire VF), or 64 kbps data
Data Orderwire	8 kbps (EIA-422 interface)
Backward Alarms	Form C contacts, hardware or software mapped
IBS	1/15 x data rate overhead
ASYNCR Data Orderwire	1/2000 x data rate
Backward Alarm	Form C contacts
Receive Buffer	64 to 262144 bits, in 16 bit increments
Receive Clock Options	Rx Satellite, Tx Terrestrial, External Reference, Insert
Clock Tracking	± 100 ppm minimum
External Clock Input	BNC connector, 2.4 kHz to 20 MHz

10 MHZ REFERENCE

Stability	1.0 ppm standard (not with BUCs), 0.02 ppm optional																
Power Level	BUC: 0 dBm ± 3dB via Tx center conductor LNB -3 dBm ± 3dB via Rx center conductor																
Phase Noise	<table border="1"> <thead> <tr> <th>dB/Hz</th> <th>Offset</th> <th>dB/Hz</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>-80</td> <td>1 Hz</td> <td>-140</td> <td>1 kHz</td> </tr> <tr> <td>-110</td> <td>10 Hz</td> <td>-150</td> <td>10 kHz</td> </tr> <tr> <td>-135</td> <td>100 Hz</td> <td>-150</td> <td>100 kHz</td> </tr> </tbody> </table>	dB/Hz	Offset	dB/Hz	Offset	-80	1 Hz	-140	1 kHz	-110	10 Hz	-150	10 kHz	-135	100 Hz	-150	100 kHz
dB/Hz	Offset	dB/Hz	Offset														
-80	1 Hz	-140	1 kHz														
-110	10 Hz	-150	10 kHz														
-135	100 Hz	-150	100 kHz														

MODULATOR

Output Spectrum/filtering	Meets IESS-308/309 power spectral mask
Frequency Stability	± 1 ppm (standard) or ± 0.02 ppm (optional), 0 to 50°C
Output Power	0 to -40 dBm, 0.1 dB steps
Accuracy	± 1.5 dB over frequency and temperature
BUC FSK Communications	Via Tx center conductor with FSK BUCs
ODU / BUC Voltage	24 VDC, 4 amps, 100W
(Optional)	48 VDC, 3 amps, 180W

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 volts AC, 50/60 Hz (38-60 VDC Optional)
Power Consumption	40 W typical (46 W maximum) with no BUC PS 160W maximum with 100W BUC PS 290W maximum with 180W BUC PS
Physical Dimensions (1RU) approx.	1.75H x 19.0W x 19 D inch (4.4H x 48W x 48D cm)
Weight	15 lbs (7.0 kg), approx
Agency Approvals	CE: EN55022 Class B (Emissions), EN50082-1 Part 1 (Immunity), EN60950 (Safety). FCC: Part 15 Class B

DEMODULATOR

Input Power, Minimum	-130 dBm + 10 Log (Symbol Rate)
AGC	50 dB above minimum
Max Composite Level	+30 dBc, up to -5 dBm
Acquisition Range	± 32 KHz, programmable in 1 kHz steps
Acquisition Time	Example: 1 sec average at 64 kbps Rate 1/2 QPSK, and ± 32 kHz acquisition range

Example BER performance

Met with two adjacent carriers 7 dB higher

Viterbi (B, Q and OQPSK)	Guaranteed E_s/N₀, in dB (Typical values in parentheses)		
	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>
	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)		

Sequential

(See the CDM-600L manual for details.)

Viterbi and concatenated Reed-Solomon 220/200 or 200/180

(B, Q and OQPSK)	Guaranteed E_s/N₀, in dB (Typical values in parentheses)		
	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>
	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)		

8-PSK TCM/RS (IESS-310)

(See the CDM-600L manual for details.)

Turbo Product Codec (Q/OQPSK)	Guaranteed E_s/N₀, in dB (Typical values in parentheses)			
	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>	<u>0.95</u>
	10 ⁻⁶	3.5 (3.2) 3.8 (3.4) 4.3 (4.0) 6.8 (6.4)		
10 ⁻⁸	3.6 (3.3) 4.4 (4.0) 4.5 (4.2) 7.4 (7.0)			

(See the CDM-600L manual for a comprehensive listing of the performance of all FEC types, Code Rates, and Modulation types.)

Monitor Functions E_s/N₀, Frequency Offset, BER, Buffer fill status, Rx signal level

LNB Voltage +13, +18, or +24 VDC at 500 mA max

AVAILABLE OPTIONS

How Enabled	Option
N/A	Variable data rate to 5 Mbps (standard)
FAST	Variable data rate to 10 Mbps
FAST	Variable data rate to 20 Mbps
FAST	8-PSK modulation
FAST	16-QAM modulation
FAST	IBS Operation
FAST	IDR Operation
FAST	IBS with High Rate IBS ESC Operation
FAST	Drop & Insert Operation (Open Network and D&I++)
FAST	2 Audio IBS Operation
Hardware	HSSI, CIC-20 plug-in
Hardware	Internal Reference, 1.0 ppm (standard, not with BUCs) or 0.02 ppm (optional)
Hardware	Rx Type F or Type N connector
Hardware	Turbo Codec – Low Rate 5 Mbps (21/44, 5/16, 1/2, 3/4)
Hardware	Turbo Codec – High Rate 20 Mbps (21/44, 5/16, 1/2, 3/4, 7/8, 0.95)
Hardware	ODU PS 24 VDC, 100W, AC or DC input
Hardware	ODU PS 48 VDC, 180W, AC or DC input

ACCESSORIES

- CRS-150 1:1 Modem Redundancy Switch with CRS-170A L-Band IF Switch
- CRS-300 1:N Modem Redundancy Switch

