

# CDM-550 Satellite Modem



## INTRODUCTION

The CDM-550 is a low-cost, high performance satellite modem designed for closed network Single Channel Per Carrier (SCPC) links. It is ideal for many VSAT applications.

The CDM-550 offers a range of data rates from 2.4 kbps to 2048 kbps in 1 bit per second steps. The modem includes Viterbi or Sequential forward error correction as standard. A Reed-Solomon Codec and Turbo Product Codec are available as extra-cost options.

## FEATURES

Turbo Product Coding (TPC) is a recent development in FEC techniques that delivers significant performance improvement when compared to Viterbi with concatenated Reed-Solomon. TPC simultaneously offers increased coding gain, lower decoding delay, and bandwidth savings of up to 40%. Two modes are included that permit operation from exceptionally small antennas, where flux density issues are of concern.

## INTERFACES

Another special feature of the CDM-550 is the universal data interface. The user data can be EIA-422/EIA-530, V.35, X.21, or synchronous/asynchronous EIA-232. The interface is selectable from the front panel or via remote control. Any asynchronous EIA-232 data protocol is automatically recognized by the modem, thus alleviating extensive operator setup. The modem is capable of G.703, T1, or E1 rates by attaching the CIC-50 Interface Converter to the data port.

## TEST MODES

The modem includes several Loopback modes, which facilitate troubleshooting and diagnosis. An internal IF loopback permits testing of the entire modem without the need for external cables and attenuators. Digital loopback permits testing of the digital baseband, and the I/O loopback permits testing of the data interface chip set. The I/O loop is bi-directional.

## EDMAC

A special feature of the CDM-550 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.

Comtech EF Data RF transceivers may be controlled from the front panel of the modem using a low data rate FSK signal on the Rx IF cable. An RF transceiver at the distant end of a satellite link may also be controlled and monitored through the EDMAC channel.

## DESIGN

The CDM-550 is an extremely compact 1 rack-unit (1RU) high and 12 inches deep. It is equipped with a universal power supply (100 to 240 volts AC) and consumes a maximum of 25 Watts. The modem meets current CE and FCC Part 15 requirements for safety, emissions, and immunity.

## ASSOCIATED EQUIPMENT

SatMac, a Windows-based monitor and control program, is available for configuring the local and distant end modems, transceivers, and redundancy switches.

Modem redundancy switches include the CRS-100 1:1 switch module and the CRS-200 1:10 switch. Both provide significantly enhanced link availability.

# CDM-550 Satellite Modem

## SYSTEM

Frequency Range	52 to 88 MHz 104 to 176 MHz (option)
Input/Output Impedance	50 and 75Ω (Front panel selectable)
IF Connector	BNC, female
Digital Interface	DB25 female, providing: EIA-422/EIA-530 DCE V.35 DCE X.21 DCE and DTE SYNC/ASYN C EIA-232
Data Rate Range:	
Rate 1/2 BPSK	2.4 to 1024 kbps
Rate 1/2 QPSK/OQPSK	4.8 to 2048 kbps
Rate 3/4 QPSK/OQPSK	7.2 to 2048 kbps
Rate 7/8 QPSK/OQPSK	8.4 to 2048 kbps
Rate 21/44 BPSK Turbo	2.4 to 1145 kbps
Rate 5/16 BPSK Turbo	2.4 to 750 kbps
Rate 3/4 QPSK/OQPSK Turbo	7.2 to 2048 kbps
Rate 1/2 QPSK Turbo	4.8 to 2048 kbps
(Fully Independent Tx and Rx rates)	
Scrambler	ITU V.35 self synchronizing Externally synchronized (synchronous) per IESS-308
FEC:	
Viterbi or Sequential	Rate 1/2, 3/4, or 7/8
Turbo	Rate 1/2 or 3/4 QPSK
Turbo	Rate 21/44 or 5/16 BPSK
Overhead	
Framed EDMA C/AUPC	5% overhead (Except Turbo BPSK modes, which add 1.5%)
AUPC	
Target $E_b/N_0$ Range	0 to 9.9 dB
Max AUPC Range	0 to 9 dB
Monitor Functions	Distant end $E_b/N_0$ Tx power level increase

## MODULATOR

Transmit Filtering	6 <sup>th</sup> order Butterworth, per IESS 308
Frequency Stability	± 1.5 ppm, 0 to 50°C (32 to 122°F)
Harmonics and Spurious	< -55 dBc/4 kHz
Transmit On/Off Ratio	55 dB minimum
Phase Noise	< 0.24° rms double-sided (100 Hz to 1 MHz)
Output Power	0 to -20 dBm, 0.1dB steps
Accuracy	± 0.5 dB over frequency and temperature
Clocking Options	Internal (± 1.5 ppm) External (± 100 ppm tracking range) Loop timing (Rx sat clock) Master / Slave clock relationships Tx ≠ Rx data rate No step size limitation
Asymmetric Loop Timing	

## DEMODULATOR

Input Range	-30 to -60 dBm
Max Composite Level	+35 dBc up to a max of -5 dBm
Acquisition Range	± 1 to ± 30 kHz (1 kHz steps)
Acquisition Time	Depends on data rate, FEC rate and acquisition range

### Example:

At 512 kbps, R1/2 QPSK, ± 30 kHz sweep, acquisition time = 0.25 seconds, average

## BER PERFORMANCE

(Met with two adjacent carriers 7 dB higher)  
Guaranteed  $E_b/N_0$ , in dB

(Typical values in parentheses)

Viterbi	<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>-6</sup>	6.0 (5.5)	7.4 (6.9)	8.4 (7.9)	
10 <sup>-7</sup>	6.7 (6.2)	8.2 (7.7)	9.0 (8.6)	
Sequential (64 kbps)	<u>1/2</u>	<u>3/4</u>	<u>7/8</u>	
10 <sup>-5</sup>	4.8 (4.2)	5.8 (5.3)	7.0 (6.6)	
10 <sup>-6</sup>	5.2 (4.5)	6.4 (5.8)	7.5 (7.2)	
10 <sup>-7</sup>	5.6 (4.8)	6.9 (6.3)	8.0 (7.7)	
Viterbi and concatenated Reed-Solomon 220, 200 or 200, 180	<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>-6</sup>	4.4 (4.1)	5.8 (4.8)	6.7 (6.2)	
10 <sup>-7</sup>	4.5 (4.2)	6.0 (5.2)	6.9 (6.5)	
Turbo Product Codec	<u>1/2 (Q)</u>	<u>3/4 (Q)</u>	<u>21/44 (B)</u>	<u>5/16 (B)</u>
10 <sup>-6</sup>	2.9 (2.6)	3.9 (3.5)	2.8 (2.5)	2.3 (2.0)
10 <sup>-7</sup>	3.1 (2.7)	4.1 (3.7)	3.1 (2.8)	2.6 (2.3)
10 <sup>-8</sup>	3.3 (2.8)	4.3 (4.0)	3.3 (3.0)	2.8 (2.5)

Receive Buffer	Selectable up to 8192 bits
Monitor Functions	$E_b/N_0$ , Frequency Offset, BER, Buffer fill status, coarse AGC value

## 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
Power Consumption	18 W typical, 25 W maximum
Physical Dimensions	1RU high, 12" (305 mm) deep
Weight	7 lbs (3.2 kg)
CE Approvals	EN55022 Class B (Emissions) EN50082-1 Part 1 (Immunity) EN60950 (Safety)
FCC Approval	FCC Part 15 Class B

