SDM-8000

Satellite Modem

- IDR/IBS
- Closed Network
- 9.6 Kbps to 9.312 Mbps
- Concatenated Reed-Solomon Coding (Optional)
- 8-PSK and 16-QAM Modulation (Optional)

MODEMS

SDM-8000

INTRODUCTION

The Comtech EF Data SDM-8000 Satellite Modem is designed to meet the requirements of Intermediate Data Rate (IDR), INTELSAT Business Specifications (IBS) and other specifications encountered in the satellite digital communications industry.

The SDM-8000 is a complete, self-contained unit in a standard 2-unit (2U) 19-inch (48 cm) rack-mountable enclosure weighing approximately 19 lbs (8.6 kg). Using modular design, the unit consists of five Printed Circuit Board (PCB) assemblies, including the front and rear panels. The backplane PCB is mounted on the chassis, and contains receptacles for plug-in PCBs.

APPLICATIONS

The single-chassis SDM-8000 meets all requirements of the IESS-308 and 309 specifications for the IDR, IBS, and EUTELSAT SMS requirements. Switching from one Open Network application to another is very simple and is accomplished from the front panel, in most cases. The SDM-8000 also can be used for any Closed Network application. An optional sequential decoder is available. Multiple filter masks, selected at the front panel, ensure end-to-end compatibility with other manufacturer's modems in closed network environments.

MAXIMUM FLEXIBILITY

The SDM-8000 can be configured to any data rate ranging from 9.6 kbps to 9.312 Mbps, in 1 bit/s steps. Each rate meets standard FEC code rates. Selection of data rates can be done from the front panel. The modem contains an internal channel unit that includes both IDR and IBS overhead framing units. The framing unit, with D&I option installed, is fully functional at all specified rates for IDR (64 to 8448 Kbps) and IBS (64 to 2048 kbps) data rates.

INTERFACES

A full range of industry standard digital interfaces (G.703, V.35, or MIL-188/EIA-422) is built into the modem. Interface selection is a simple matter of moving jumpers. Optional breakout panels provide convenient access to all components of the IDR and IBS Engineering Service Channels (ESC) via built-in standard connectors and terminal blocks. Access to the D&I signals is available also.

MONITOR AND CONTROL

The SDM-8000 has been equipped with an improved, more extensive M&C system than its predecessors. Each modem subsystem has its own M&C microprocessor controlled by the host processor located on the M&C board. The microprocessor/host processor greatly enhances the flexibility of the SDM-8000. The M&C is compatible with the software versions of other Comtech EF Data modems currently in the field. All M&C functions controlled and monitored at the front panel keyboard also are programmable through the remote EIA-232 or EIA-485 serial interface. Modems can be individually addressed from 1 to 255. Address 0 is reserved for global addressing. Modem configuration is stored in non-volatile memory that is maintained for at least one year without external power.

ENERGY AND BANDWIDTH EFFICIENT

Forward error correction, utilizing convolutional encoding and soft decision Viterbi K=7 decoding, yields high performance at low E_b/N_0 levels while occupying minimal bandwidth. Options available for the SDM-8000 include 8-PSK and 16-QAM modulation methods. These modulation techniques provide maximum bandwidth efficiency, particularly when used in conjunction with the concatenated Reed-Solomon Codec.

BACKUP SWITCHING

Different types of protection switches are available to satisfy all installation configurations. Fully automatic 1:1 redundancy and M:N protection (M = 1 or 2, N = 1 to 8) are available. These systems are capable of backing up to eight modems operating on different transponders. Switches and modems also are available in completely assembled and tested racks. The SDM-8000 also will interoperate in a redundant system with other models of Comtech EF Data modems.

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SDM-8000 Satellite Modem

SYSTEM SPECIFICATIONS

Operating Frequency Range	50 to 180 MHz, in 2.5 kHz steps
Digital Interface	G.703, MIL-188/EIA-422, and V.35 selectable
Digital Data Rate	9.6 kbps to 9.312 Mbps, in 1 bps steps
Symbol Rate	19 ks/s to 6.3 Ms/s
Modulation Type	BPSK, QPSK, 8-PSK, and 16-QAM
Stability	5, 10, or 20 MHz at +5 dBm external reference, $\pm$ 1 x 10^{-5} internal reference
Energy Dispersal	CCITT, V.35, and others

MODULATION SPECIFICATIONS

Output Power	-5 to -30 dBm, adjustable in 0.1 dB steps (+5 to -20 dBm optional)
Output Return Loss	20 dB
Output Impedance	75 Ω (50 Ω optional)
Spurious	-55 dBc, measured in a 3 kHz bandwidth
Output Connector	BNC

DEMODULATION SPECIFICATIONS

Input Power:	
Desired Carrier	-30 to -55 dBm ($\leq$ 2 Mbps) -30 to -45 dBm (> 2 Mbps)
Maximum Composite	-5 dBm or +40 dBc
Input Impedance	75 Ω (50 Ω optional)
Input Connector	BNC
Carrier Acquisition Range	$\pm$ 30 kHz, selectable
Input Return Loss	20 dB
Elastic Buffer	32 to 262,144 bits, selectable

ENVIRONMENTAL AND PHYSICAL

Prime Power	90 to 264 VAC, 47 to 63 Hz, 130W 38 to 64 VDC, 80W typical, 130W maximum
Mounting	19-inch (48 cm) rack
Size	19W x 20D x 3.5H inches (2RU) (48W x 51D x 9H cm)
Weight	< 19 lbs. (8.6kg)
Temperature Operating	0 to 50°C (32 to 122°F)
Storage	-40 to 70°C (-40 to 158°F)
Humidity	Up to 95%, non-condensing

ESC SPECIFICATIONS

IDR:	
Voice/Orderwire Data	2 ADPCM (4-wire) or 64 kbps data channel
Data Orderwire	8 kbps (EIA-422 Interface)
Backward Alarms	Form C contacts (4)
Total Overhead	96 kbps
IBS:	
ASYNC Data	1/2000 x customer data rate
Orderwire	
Backward Alarm	Form C contact (1)
Total Orderwire	1/15 x customer data rate

AVAILABLE OPTIONS

- Sequential Soft Decision Decoder
- Concatenated Reed-Solomon Codec
- Viterbi
- Trellis
- DVB compatibility
- High Output Power (+5 to –20 dBm)
- $\pm 2 \times 10^{-7}$ internal clock
- Closed Network Overhead:
  - Asynchronous Channel Unit
- Drop and Insert (D&I)
  - T1 (1.544 Mbps) or E1 (2.048 Mbps)
  - nx64 Kbps, n=1-6, 8, 10, 12, 15, 16, 20, 24, 30

BER PERFORMANCE

Viterbi Decoder, QPSK

BER	1/2	3/4	7/8
10^{-3}	3.8 dB	4.9 dB	6.1 dB
10^{-4}	4.6 dB	5.7 dB	6.9 dB
10^{-5}	5.3 dB	6.4 dB	7.6 dB
10^{-6}	6.0 dB	7.5 dB	8.3 dB
10^{-7}	6.6 dB	7.9 dB	8.9 dB
10^{-8}	7.2 dB	8.5 dB	9.6 dB

Sequential Decoder, 56 kbps

1/2	3/4	7/8
	4.6 dB	5.5 dB
4.1 dB	5.1 dB	6.1 dB
4.5 dB	5.5 dB	6.6 dB
5.0 dB	5.9 dB	7.3 dB
5.4 dB	6.4 dB	7.9 dB
5.8 dB	6.8 dB	8.4 dB

Sequential Decoder, 1544 kbps

BER	1/2	3/4	7/8
10^{-3}	4.8 dB	5.2 dB	6.0 dB
10^{-4}	5.2 dB	5.7 dB	6.4 dB
10^{-5}	5.6 dB	6.1 dB	6.9 dB
10^{-6}	5.9 dB	6.5 dB	7.4 dB
10^{-7}	6.3 dB	7.0 dB	7.9 dB
10^{-8}	6.7 dB	7.4 dB	8.4 dB

Viterbi + Reed-Solomon, QPSK

BER	1/2	3/4
10^{-6}	4.1 dB	5.6 dB
10^{-7}	4.2 dB	5.8 dB
10^{-8}	4.4 dB	6.0 dB
10^{-10}	5.0 dB	6.3 dB

High Order Modulation

	8-PSK			16-QAM			
BER	2/3 w RS	2/3	BER	3/4 w RS	3/4	7/8 w RS	7/8
10^{-4}	5.5 dB	7.0	10^{-4}	7.9	9.1	9.3	10.4
10^{-5}	5.8 dB	7.8	10^{-5}	8.1	10.0	9.6	11.2
10^{-6}	6.2 dB	8.7	10^{-6}	8.4	10.8	9.8	12.0
10^{-7}	6.5 dB	9.5	10^{-7}	8.6	11.7	10.0	12.8
10^{-8}	6.7 dB	10.2	10^{-8}	8.8	12.6	10.3	13.6
10^{-9}	6.9 dB		10^{-9}	9.0		10.5	

Viterbi Decoder, 8-PSK 5/6

Reed-Solomon		Without Reed-Solomon	
BER	Eb/No	BER	Eb/No
10^{-4}	7.5	10^{-4}	9.0
10^{-5}	7.8	10^{-5}	10.0
10^{-6}	8.2	10^{-6}	10.8.
10^{-7}	8.6	10^{-7}	11.5
10^{-8}	8.8	10^{-8}	12.3
10^{-9}	9.3	10^{-9}	13.1

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