



INTRODUCTION

The SDM-2020 Satellite Modulator is a programmable, variable-rate satellite modulator used for digital video and high-speed data applications. The SDM-2020 supports open network modes compliant with the EN 300 421/EN 301 210 specification for Digital Video Broadcasting (DVB) by satellite. The SDM-2020 has a plug-in data interface module installed in the rear of the chassis. This module provides flexible adaptation to the various physical and electrical interfaces found in the communications industry.

FEATURES

- DVB or Transparent Data Transmission
- Programmable 1.5 to 100 Mbps
- QPSK
- 8PSK and 16QAM (Optional)

APPLICATIONS

The SDM-2020 Satellite Modulator is ideal for:

- Digital Video Broadcast (DVB)
- Digital Satellite News Gathering (DSNG)
- Primary and backhaul transmission for:
 - Contribution
 - Distribution
 - ATSC (HDTV)
 - Direct To Home (DTH)

The SDM-2020 Satellite Modulator also excels in:

- High-speed data distribution
- Fiber and cable restoration
- Internet

INTERFACES

Field-changeable interfaces for the SDM-2020 Satellite Modulator include:

- EIA-422 Serial/Parallel Data Interface
- LVDS Low Voltage Differential Signal Interface
- ASI / 422 ASYNC/Serial Data Interface
- ECL-HSSI Serial Data Interface
- G.703 Data Interface
- SMPTE 310M (SSI-DVB) Serial Data Interface
- DVB ASI / LVDS

DIGITAL VIDEO BROADCAST (DVB)

The SDM-2020 Satellite Modulator supports satellite channel adaptation for DVB applications. It translates the data stream from an MPEG-2 multiplexer to an RF satellite channel as defined by EN 300 421(QPSK) and EN 301 210 (8PSK and 16QAM):



- Randomization for energy dispersal (scrambling)
- Outer coding, Reed-Solomon EIA (204, 188, T=8)
- Convolutional interleaving (depth I=12)
- Inner coding QPSK, 1/2, 2/3, 3/4, 5/6, and 7/8 rates
- Inner coding 8PSK, 2/3, 5/6, 8/9
- Inner coding 16QAM, 3/4 and 7/8
- Spectral masks for DVB and 99% within 1.2 x symbol rate

DATA RATE FLEXIBILITY

The SDM-2020 Satellite Modulator is a data rate programmable unit. Desired data or symbol rates are easily programmed.

MAXIMUM DATA THROUGHPUT

8PSK and 16QAM increase the data rate through a satellite transponder compared to QPSK. The examples below are for a 36 MHz transponder:

- 8PSK 5/6: 1 carrier at 68 Mbit/s (1 modem)
- 16QAM 7/8: 2 carriers at 34.36 Mbit/s (2 modems)

Similar results are available using transponders with different bandwidths. The advanced higher order modulation of the SDM-2020 optimizes video or data applications.

POWERFUL CONCATENATED CODING

The powerful industry standard concatenated coding used by the SDM-2020 product family reduces the Eb/No needed to produce low bit error rates (BER). This combination of inner coding (Viterbi/trellis) combined with outer Reed-Solomon coding yields unparalleled performance.

CONFIGURATION RETENTION

The SDM-2020 modulator maintains its configuration in non-volatile memory. Once power is restored, the unit returns to the configuration in use before the power loss.



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SYSTEM

Digital Data Rate	1.5 to 100 Mbps, in 1 bit/s steps depending on symbol rate, data interface and frame type
Symbol Rate	37.5 Msys/s maximum
DVB Compliant Modulation	QPSK at 1/2, 2/3, 5/6, 3/4, and 7/8 rate 8PSK at 2/3, 5/6 and 8/9 (optional) 16QAM at 3/4 and 7/8 (optional)
EN 300 421 / EN 301 210 Compatibility/Compliance	Inner Coding (Viterbi, K=7, Pragmatic Trellis), Reed-Solomon, Data Scrambling, Interleaving, Sync Word, QPSK, 8PSK
Frame Types Supported	188 and 204 byte MPEG2 TS, None

ENVIRONMENTAL AND PHYSICAL

Prime Power, AC	100 to 240 VAC, 50 to 60 Hz, 60 W typical, 100 W maximum
Size	19W x 16D x 1.75H inch (1 RU) (48.2 cm x 40.6 cm x 4.44 cm)
Weight	< 15 lbs. (6.8 kg)
Temperature:	
Operating	0 to 50°C (32 to 122°F)
Storage	-40° to +70°C (-40° to +158°F)
Humidity: Operational	< 95%, non-condensing
IF Output Connector	BNC, female

MODULATOR

Operating Frequency Range	50 to 90, 100 to 180 MHz
Step Size	2.5 kHz
Output Power	-20.0 to +5.0 dBm, in 0.1 dB steps
Transmit Frequency Stability	± 10 PPM
Output Spurious/Harmonics	-55 dBc measured in a 4 kHz bandwidth
Output Return Loss	18 dB minimum
Output Impedance	75Ω
Internal Data Clock Stability	± 10 PPM
Min Data Rate	1.5 Mbit/s QPSK, 8PSK, 16QAM, All Code Rates
Max Data Rate, Mbit/s	1/2 2/3 3/4 5/6 7/8 8/9
QPSK (188 Frame)	34.56 46.08 51.84 57.60 60.48
8PSK (188 Frame)	69.12 86.39 92.15
16QAM (188 Frame)	92.15 92.15

DATA INTERFACE

ECL_HSSI	Serial: Bit Clock (TT), Data (SD), Send Timing (ST), DCE Ready (DM), CA and TA
EIA-422	Serial / Parallel: Same as LVDS Serial to 18 Mbit/s: Serial: Bit Clock (TT), Data (SD), Send Timing (ST), DCE Ready (DM)
LVDS	Serial / Parallel: Parallel: Byte Clock, 8 bits data, Sync, Data Valid Serial to 32 Mbit/s: Serial: Bit Clock (TT), Data (SD), Send Timing (ST) ASI / 422: Asynchronous Serial Interface (ASI) and 422 (EIA-530) Serial Serial: Bit Clock (TT), Data (SD), Send Timing (ST), DCE Ready (DM)
ASI / LVDS	DVB Asynchronous Serial Interface (ASI) DVB LVDS Parallel: Byte Clock, 8 bits data, Sync, Data Valid
G.703 Includes	1.544, 2.048, 6.312, 8.448, 32.064, 34.368, 44.736, or 51.84 Mbit/s (per Bellcore SONET STS-1) 2 - 32 ms Rx Buffer
SMPTE 310M	19.392 658 Mbps, ATSC 8VSB

MONITOR AND CONTROL

Local User Keypad Interface	6 button
LCD Display	2 lines, 16 characters per line
Status LEDs	Power On Transmit Fault Sync Stored Fault Transmitter On Transmit Alarm Test Mode
Remote User Interface:	
Async Serial I/O	EIA-485 (2-/4-wire) or EIA-232
Baud Rate	300 through 19200 bps programmable
Serial Format	ASCII
Data Bits	7 bit with parity, or 8 bit with no parity
Stop Bits	2
Parity	Odd, Even, or None
Status/Control	Data Rate Select, Code Rate Select, Modulation Type, Transmit Frequency, Tx Power Level, Tx IF ON/OFF

OPTIONS

8PSK	DVB Modulation per EN 301 210
8PSK and 16QAM	DVB Modulation per EN 301 210
Prime Power	DC: -48 (-42 to -56) VDC, 60W typical

SDM-2020 Application

Digital Distribution via Satellite
Higher Quality
Lower Cost

