



## 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.

## 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 to 70 Mbit/s
Serial / Parallel	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
ASI / LVDS	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

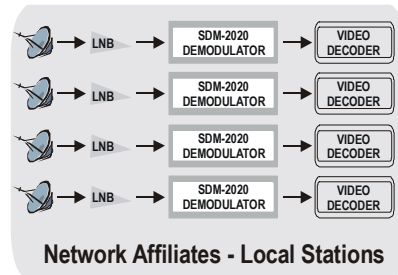
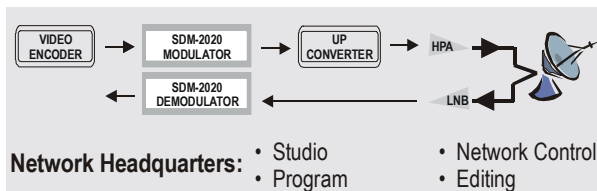
Local User Keypad	6 button
Interface	
LCD Display	2 lines, 16 characters per line
Status LEDs	Power On            Transmit Fault Sync                Stored Fault Transmitter On    Transmit Alarm Test Mode
Remote User Interface:	
Async Serial I/O	EIA-485 (2-/4-wire) or EIA-232
Baud Rate	300 through 19200 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



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