



### Overview

The DMD20 Satellite Modem breaks new ground in flexibility, operation and cost. With standards including IDR, IBS and DVB, and covering data rates up to 20 Mbps, this 1RU duplex modem covers virtually all your Satellite IP, Telecom, Video and Internet applications. Switch between spur-free 70/140 MHz operation and L-Band without any configuration changes. It's all in the same box!

DMD20 now offers DoubleTalk<sup>®</sup> Carrier-in-Carrier<sup>®</sup> bandwidth compression. DoubleTalk Carrier-in-Carrier, based on patented "Adaptive Cancellation" technology, allows transmit and receive carriers of a duplex link to share the same transponder space. DoubleTalk Carrier-in-Carrier is complementary to all advances in modem technology, including advanced FEC and modulation techniques. As these technologies approach theoretical limits of power and bandwidth efficiency, DoubleTalk Carrier-in-Carrier utilizing advanced signal processing techniques provides a new dimension in bandwidth and power efficiency.

The extensive list of software options allows for budgeting the modem for today's needs while covering tomorrow's plans. These options can be purchased and then activated in seconds via the front panel.

Additional hardware options like Turbo Product Code (TPC), Low Density Parity Check Code (LDPC), interface expansion, high-stability and DC operation complete the modem's dynamic feature coverage. Stock this modem at its minimum configuration (and cost) locally for immediate distribution. Then configure on-site, allowing huge savings in time and dollars with just-in-time feature installation.

The DMD20's impressive remote accessibility surpasses all others in the field. Remote control via the RLLP (Radyne Link Level Protocol), Ethernet 10Base-T (SNMP and Web browser) includes control of all the modem's features plus software maintenance. Additionally, the two-line backlit LCD can be supplemented with terminal software running on a PC or laptop. The modem now presents its entire monitor and control functions on the big screen.

Supported by an extensive line of redundancy switches, converters, encoders and decoders, the DMD20 can be built into any satellite requirement. The DMD20 is compatible with DMD15, DMD50, CM701, MD2401 and CDM-600.

Carrier-in-Carrier<sup>®</sup> is a Registered Trademark of Comtech EF Data  
DoubleTalk<sup>®</sup> is a Registered Trademark of Raytheon Applied Signal Technology

### Features

- DoubleTalk Carrier-in-Carrier bandwidth compression
- BPSK/QPSK/OQPSK/8PSK/8-QAM/16-QAM operation
- 2.4 kbps to 20 Mbps, 1 bps steps
- FEC - Viterbi, Reed-Solomon, Sequential, Trellis, TPC, LDPC
- Configuration, monitor and control features fully user-programmable
- Excellent spurious performance
- Fully compliant with IESS-308/309/310/314/315
- Optional DVB to EN301-210 and EN300-421
- Industry-standard universal interface module
- Fast acquisition
- 50 to 90 MHz and 100 to 180 MHz IF, and 950 to 2050 MHz L-Band in 1 Hz steps
- Standard features include: Reed-Solomon, asynchronous overhead, satellite control channel and automatic uplink power control
- SCPC / MCPC Links

### Typical Users

- Mobile Network Operators
- Government & Military

### Common Applications

- Satellite Mobile Backhaul
- G.703 Trunking
- IP Trunking





### Hardware Options

- DoubleTalk Carrier-in-Carrier
- Turbo FEC
- LDPC FEC
- Sequential FEC
- DC input power 48 VDC
- High-stability reference

### Software Options

- Data rate upgrades
- L-Band operation
- IDR, IBS
- 8PSK/8-QAM
- 16-QAM
- Drop and insert
- DVB-S

### Interface Options

- Ethernet 10/100
- HSSI interface
- HSSI/Ethernet
- HSSI/G703 interface
- DVB ASI/SPI interface
- G703/IDR/ESC

### Specifications

#### DMD20 BER Performance Guaranteed (Typical) at BERs shown:

Modulation/FEC	Code Rate	1 x 10 <sup>-5</sup>	1 x 10 <sup>-6</sup>	1 x 10 <sup>-7</sup>	1 x 10 <sup>-8</sup>	Data Rate Range
BPSK VIT	1/2	5.5 (5.1)	6.1 (5.7)	6.7 (6.2)	7.4 (6.8)	2.4 kbps - 5.0 Mbps
QPSK VIT	1/2	5.5 (5.1)	6.1 (5.7)	6.7 (6.2)	7.4 (6.8)	4.8 kbps - 10.0 Mbps
QPSK VIT	3/4	6.8 (6.3)	7.6 (7.0)	8.3 (7.7)	8.9 (8.4)	7.2 kbps - 15.0 Mbps
QPSK VIT	7/8	7.9 (7.2)	8.6 (7.9)	9.3 (8.6)	10.2 (9.4)	8.4 kbps - 17.5 Mbps
QPSK VIT RS	1/2	3.8 (3.4)	4.1 (3.6)	4.2 (3.8)	4.4 (4.0)	4.8 kbps - 8.88 Mbps
QPSK VIT RS	3/4	5.4 (4.7)	5.6 (4.9)	5.8 (5.1)	6.0 (5.3)	7.2 kbps - 13.33 Mbps
QPSK VIT RS	7/8	6.5 (6.0)	6.7 (6.4)	6.9 (6.7)	7.2 (7.1)	7.8 kbps - 15.55 Mbps
QPSK SEQ	1/2	5.6 (5.1)	5.9 (5.4)	6.3 (5.8)	6.7 (6.2)	4.8 kbps - 2.048 Mbps
QPSK SEQ	3/4	6.1 (5.6)	6.5 (6.1)	7.0 (6.5)	7.4 (6.9)	7.2 kbps - 2.048 Mbps
QPSK SEQ	7/8	6.9 (6.4)	7.4 (6.9)	7.9 (7.4)	8.4 (7.9)	8.4 kbps - 2.048 Mbps
QPSK TPC	1/2	2.7 (2.4)	2.9 (2.6)	3.1 (2.8)	3.3 (3.0)	4.8 kbps - 9.54 Mbps
QPSK TPC	3/4	3.6 (3.2)	3.8 (3.4)	4.1 (3.7)	4.4 (4.0)	7.2 kbps - 15.0 Mbps
QPSK TPC	7/8	4.2 (3.9)	4.3 (4.0)	4.4 (4.1)	4.5 (4.2)	8.4 kbps - 17.5 Mbps
8PSK TRE	2/3	7.8 (6.4)	8.7 (7.2)	9.5 (8.1)	10.2 (8.9)	9.6 kbps - 20.0 Mbps
8PSK TRE RS	2/3	5.8 (5.4)	6.2 (5.6)	6.5 (5.8)	6.7 (6.1)	8.9 kbps - 18.3 Mbps
8PSK TPC	3/4	6.0 (5.6)	6.2 (5.8)	6.4 (6.0)	6.8 (6.3)	10.8 kbps - 20.0 Mbps
8PSK TPC	7/8	6.9 (6.5)	7.0 (6.6)	7.1 (6.7)	7.2 (6.8)	12.6 kbps - 20.0 Mbps
16-QAM VIT	3/4	10.7 (9.9)	11.5 (10.7)	12.4 (11.6)	13.3 (12.5)	14.4 kbps - 20.0 Mbps
16-QAM VIT	7/8	11.9 (11.1)	12.7 (11.9)	13.5 (12.7)	14.3 (13.5)	16.8 kbps - 20.0 Mbps
16-QAM VIT RS	3/4	8.9 (8.3)	9.1 (8.6)	9.3 (8.8)	9.5 (9.1)	13.3 kbps - 20.0 Mbps
16-QAM VIT RS	7/8	10.3 (9.9)	10.5 (10.2)	10.8 (10.4)	11.0 (10.7)	15.5 kbps - 20.0 Mbps
16-QAM TPC	3/4	7.0 (6.7)	7.4 (7.1)	7.8 (7.5)	8.2 (7.9)	14.4 kbps - 20.0 Mbps
16-QAM TPC	7/8	8.0 (7.6)	8.1 (7.7)	8.2 (7.8)	8.3 (7.9)	16.84 kbps - 20.0 Mbps

### Modulator

Modulation	BPSK, QPSK, and OQPSK (8PSK, 8-QAM & 16-QAM optional)
IF Tuning Range	50 to 90 and 100 to 180 MHz in 1 Hz steps
L-Band Tuning Range	950 to 2050 MHz in 1 Hz steps
Impedance	IF: 75 Ohm (50 Ohm optional) L-Band: 50 Ohm
Connector	BNC: 75 Ohm SMA: 50 Ohm, L-Band
Return Loss	IF: 20 dB minimum L-Band: 14 dB minimum
Output Power	0 to -25 dBm
Output Stability	IF: ±0.5 dB Over frequency and temperature L-Band: ±1.0 dB Over frequency and temperature
Output Spectrum	Meets IESS-308/309/310/DVB-S Power spectral mask
Spurious	-55 dBc In-band (50 to 90 MHz, 100 to 180 MHz, 950 to 2050 MHz) -45 dBc Out-of-band
On/Off Power Ratio	>60 dB
Scrambler	CCITT V.35 or IBS (Others optional)
FEC	Viterbi, K=7 at 1/2, 3/4 and 7/8 Sequential 1/2, 3/4 and 7/8 (optional) Trellis 2/3 Turbo Product Code (optional) BPSK: 21/44 QPSK/OQPSK: 1/2 (21/44), 3/4, 7/8 8PSK/8-QAM, 16-QAM: 3/4, 7/8 Legacy Turbo Rates: 0.495, 0.793 (optional) LDPC (optional) BPSK: 1/2 QPSK/OQPSK: 1/2, 2/3, 3/4 8PSK/8-QAM: 2/3, 3/4

	16-QAM: 3/4
Outer Encoder Options	Reed-Solomon Intelsat (DVB-S optional) Custom (N, K) Reed-Solomon (optional)
Data Clock Source	Internal, external, RX recovered
Internal Stability	1 x 10 <sup>-6</sup> Typical (optional to 5 x 10 <sup>-8</sup> )

### Plesiochronous Buffer

Size	0 msec to 64 msec
Centering	Automatic on overflow/Underflow
Centering Modes	IBS: Integral number of frames IDR: Integral number of multi-frames
Clock	Transmit, external, RX recovered or SCT (internal)

### Monitor & Control

Ethernet 10Base-T/Remote RS-485/Terminal RS-232, Web browser

### DMD20 Drop and Insert (Optional)

Terrestrial Data	1.544 Mbps or 2.048 Mbps, G.732/733
Line Coding	AMI or B8ZS for T1 and HDB3 for E1
Framing	D4, ESF and PCM30 (PCM 30C) or PCM31 (PCM 31C) for E1
Time Slot Selection	n x 64 contiguous or arbitrary blocks for drop or insert
D&I open network satellite overhead 6.6%	
Time Slots	TS1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 31
Efficient D&I closed network, satellite overhead 0.4%	
Time Slots	1-31 Any combination

### Terrestrial Interfaces

- DVB
- ASI/SPI
- HSSI
- Ethernet 4 Port 10/100Base-T
- HSSI/Ethernet 4 Port 10/100Base-T
- HSSI/G703 T1/E1/T2/E2

### Demodulator

Demodulation	BPSK, QPSK, and OQPSK (8PSK, 8-QAM & 16-QAM optional)
IF Tuning Range	50 to 90 and 100 to 180 MHz in 1 Hz steps
L-Band Tuning Range	950 to 2050 MHz in 1 Hz steps
Impedance	IF: 75 Ohm (50 Ohm optional) L-Band: 50 Ohm
Connector	BNC: 75 Ohm SMA: 50 Ohm (L-Band)
Return Loss	IF: 20 dB minimum L-Band: 14 dB minimum
Spectrum	Intelsat IESS-308/309/310/DVB-S compliant
Input Level	10 x log (symbol rate) – 100, ±12 dB
Total Input Power	-10 dBm or +40 dBc (the lesser) @ 256 kbps Viterbi, K=7 at 1/2, 3/4 and 7/8, Sequential 1/2, 3/4 and 7/8 (optional) Trellis 2/3 Turbo Product Code (optional)
FEC	BPSK: 21/44 QPSK/OQPSK: 1/2 (21/44), 3/4, 7/8 8PSK/8-QAM, 16-QAM: 3/4, 7/8 Legacy Turbo Rates: 0.495, 0.793 (optional) LDPC (optional) BPSK: 1/2 Q-PSK/OQPSK: 1/2, 2/3, 3/4 8PSK/8-QAM: 2/3, 3/4 16-QAM: 3/4
Decoder Options	Reed-Solomon Intelsat (DVB-S optional) Custom (N, K) Reed-Solomon (optional)
Descrambler	CCITT V.35 or IBS (Others optional)
Acquisition Range	Programmable ±1 kHz to ± 255 kHz
Sweep Delay Value	100 msec to 6000 seconds in 100 msec steps

### IBS/Synchronous Interface (Standard)

RS-422/530	All Rates, differential, clock/data, DCE
ITU V.35	All Rates, differential, clock/data, DCE
RS-232	(DCE up to 200 kbps)

### Physical & Environmental

Dimensions (height x width x depth)	1.75" x 19" x 16" (4.45 x 48.26 x 40.64 cm)
Weight	6.5 lbs (3.0 kg)
Prime Power	100 to 240 VAC, 50 to 60 Hz, 40 W max. 48 VDC (optional)
Operating Temperature	0 to 50°C
Storage Temperature	-40 to 85°C
Humidity	95% maximum, non-condensing

### DoubleTalk Carrier-in-Carrier

Delay Range	0 to 300 ms
Power Spectral Density Ratio (Interferer to Desired)	BSPK/OQPSK/QPSK/8PSK/8-QAM: -7 dB to +10 dB 16-QAM: -7 dB to +7 dB
Maximum Symbol Rate Ratio	3:1 (TX:RX or RX:TX)
Eb/No Degradation	0 dB Power spectral density ratio BPSK/QPSK/OQPSK: 0.6 dB 8-QAM: 0.7 dB 8PSK: 0.8 dB 16-QAM: 0.9 dB
Satellite Restrictions	Satellite in "loop-back" mode (i.e., the transmit station can receive itself) "Non-processing" satellite (i.e., does not demodulate or remodulate the signal)

### IDR/ESC Interface (Optional)

G.703 T1 (DSX1)	1.544 Mbps, 100 Ohm balanced, AML and B8ZS line codes
G.703 E1	2.048 Mbps, 75 Ohm unbalanced and 120 Ohm balanced, HDB3
G.703 T2 (DSX2)	6.312 Mbps, 75 Ohm unbalanced, B8ZS line code and 110 Ohm balanced, B6ZS line code
G.703 E2	8.448 Mbps, 75 Ohm BNC, unbalanced, HDB3 line code



DMD20 Rear Panel