



# DMD20 LBST L-BAND SATELLITE MODEM AND ODU DRIVER

SATELLITE MODEMS



## Overview

The DMD20 LBST L-Band 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.

DMD20 LBST now offers DoubleTalk® Carrier-in-Carrier® 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 configuring 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), interface expansion, high-stability and DC operation complete the modem's dynamic feature coverage.

This modem can be stocked 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 LBST's remote control via the RLLP (Radyne Link Level Protocol) 10Base-T SNMP Ethernet or web browser interfaces, include control of all the modem's features plus software maintenance. Additionally, the two-line backlit LCD can be supplemented with terminal software or a standard web browser running on a PC or laptop. The modem 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 LBST can be built into any satellite requirement. Compatibility with current modems, such as the DMD2401 and DMD15, are maintained for seamless substitution and addition to your existing systems.

The DMD20 LBST FSK Communications Link allows the full use of all supported smart BUCs monitor and control parameters. From the front panel, a quick status will be displayed, and the most commonly used control parameters can be modified.

Additionally, the FSK Communications Link will be accessed by the DMD20 LBST terminal port, remote port, and the Ethernet port (Web browser/SNMP). From any of these connections, the operator can issue any valid ASCII command or request to the smart BUC. Multiple ports can be used simultaneously without affecting the performance of the system.

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

## Features

- DoubleTalk Carrier-in-Carrier bandwidth compression
- Web browser interface
- FSK M&C channel for smart BUCs
- Integrated 10 MHz high-stability reference
- Programmable 13, 15, 18, or 20 VDC for LNB
- Optional 24 or 48 VDC for up to 10 W BUC
- 950 to 2050 MHz L-Band TX/RX operation
- BPSK/QPSK/OQPSK/8PSK/8-QAM/16-QAM operation
- 2.4 kbps to 20 Mbps, 1 bps steps
- Configuration, monitor and control features full user-programmable
- FEC - Viterbi, Reed-Solomon, Sequential, Trellis, TPC, Low Density Parity Check Code (LDPC)
- 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
- Standard features include: Reed-Solomon, Asynchronous Overhead, automatic uplink power control and CM701 compatible satellite control channel
- SCPC / MCPC Links

## Typical Users

- Mobile Network Operators
- Government & Military

## Common Applications

- Satellite Mobile Backhaul
- G.703
- IP Trunking





### Hardware Options

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

### Software Options

- Data rate upgrades
- 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

Published specifications reflect the maximum DMD20 LBST performance. Each DMD20 LBST can be configured to customer requirements via hardware / software options applied at the factory or in the field.

#### DMD20 LBST Performance

| 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 – 10.0 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 R-S   | 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 R-S   | 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 R-S   | 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 R-S   | 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 R-S | 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 R-S | 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)   |
| L-Band Tuning Range   | 950 to 2050 MHz in 1 Hz steps   |
| Impedance             | 50 Ohm  |
| Connector             | Type N female   |
| Return Loss           | 10 dB minimum   |
| Output Power          | 0 to -25 dBm  |
| Output Accuracy       | ±1.0 dB over frequency and temperature  |
| Output Spectrum       | Meets IESS-308/309/310 power spectral mask (DVB-S optional)   |
| Spurious              | -55 dBc In-band<br>-45 dBc Out-of-band  |
| Harmonics             | -45 dBc   |
| 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<br>Trellis 2/3<br>Sequential 1/2, 3/4 and 7/8 (optional)<br>Turbo Product Code (optional)<br>BPSK: 21/44<br>QPSK/OQPSK: 1/2 (21/44), 3/4, 7/8<br>8PSK/8-QAM, 16-QAM: 3/4, 7/8<br>Legacy Turbo Rates: 0.495, 0.793 (optional)<br>LDPC (optional)<br>BPSK: 1/2<br>QPSK/OQPSK: 1/2, 2/3, 3/4<br>8PSK/8-QAM: 2/3, 3/4<br>16-QAM: 3/4 |
| Outer Encoder Options | Reed-Solomon Intelsat (DVB-S optional)<br>Custom (N, K) Reed-Solomon (optional)   |

|                    |   |
|--------------------|---|
| Data Clock Source  | Internal, external, RX recovered              |
| Internal Stability | 5 x 10 <sup>-8</sup>                          |
| BUC DC Voltage     | BUC 24 V @ 4 A maximum<br>BUC 48 V (optional) |
| BUC Reference      | 10 MHz, 3 dBm ± 3 dB                          |
| BUC FSK            | 710/590 KHz Nominal (optional)                |

#### Demodulator

|                     |   |
|---------------------|---|
| Demodulation        | BPSK, QPSK, and OQPSK (8PSK, 8-QAM & 16-QAM optional)   |
| L-Band Tuning Range | 950 to 2050 MHz in 1 Hz steps   |
| Impedance           | 50 Ohm  |
| Connector           | Type N female   |
| Return Loss         | 10 dB minimum   |
| Spectrum            | Intelsat IESS-308/309/310 compliant (DVB-S optional)  |
| Input Level         | 10 x log (symbol rate) – 100, ± 12 dBm  |
| FEC                 | Viterbi, K=7 at 1/2, 3/4 and 7/8<br>Trellis 2/3<br>Sequential 1/2, 3/4 and 7/8 (optional)<br>Turbo Product Code (optional)<br>BPSK: 21/44<br>QPSK/OQPSK: 1/2 (21/44), 3/4, 7/8<br>8PSK/8-QAM, 16-QAM: 3/4, 7/8<br>Legacy Turbo Rates: 0.495, 0.793 (optional)<br>LDPC (optional)<br>BPSK: 1/2<br>QPSK/OQPSK: 1/2, 2/3, 3/4<br>8PSK/8-QAM: 2/3, 3/4<br>16-QAM: 3/4 |
| Total Input Power:  | -10 dBm or +40 dBc (the lesser) @ 64 kbps, symbol rate dependent  |



# DMD20 LBST L-BAND SATELLITE MODEM AND ODU DRIVER

## SATELLITE MODEMS

|                   |   |
|-------------------|---|
| Decoder Options   | Reed-Solomon Intelsat (DVB-S optional)<br>Custom (N, K) Reed-Solomon (optional) |
| Descrambler       | CCITT V.35 or IBS (others optional)   |
| Acquisition Range | Programmable $\pm 1$ kHz to $\pm 255$ kHz                                       |
| Sweep Delay Value | 100 msec to 6000 seconds in 100 msec steps                                      |
| LNB Reference     | 10 MHz, 3 dBm $\pm$ 3 dB  |
| LNB DC Voltage    | 13, 15, 18, 20 VDC (750 mA maximum), programmable                               |

### 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<br>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<br>BPSK/QPSK/OQPSK: 0.6 dB<br>8-QAM: 0.7 dB<br>8PSK: 0.8 dB<br>16-QAM: 0.9 dB  |
| Satellite Restrictions                               | Satellite in "loop-back" mode (i.e., the transmit station can receive itself)<br>"Non-processing" satellite (i.e., does not demodulate or remodulate the signal) |

### Plesiochronous Buffer

|                 |  |
|-----------------|--|
| Size            | 0 msec to 64 msec  |
| Centering       | Automatic on underflow or overflow                                     |
| Centering Modes | IBS: integral number of frames<br>IDR: integral number of multi-frames |
| Clock           | Transmit, external, RX recovered or SCT (internal)                     |

### 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

### IDR/ESC Interface (Optional)

|                 |  |
|-----------------|--|
| G.703 T1 (DSX1) | 1.544 Mbps, 100 Ohm balanced, AMI 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                                 |

### 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)                     |

### Environmental & Physical

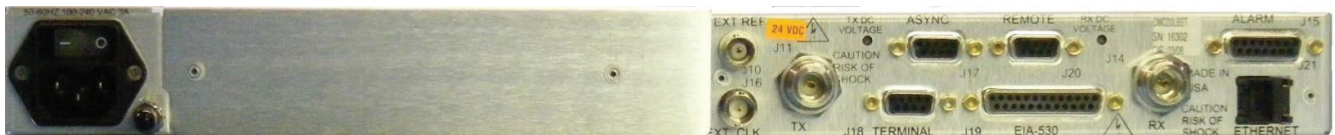
|                                     |  |
|-------------------------------------|--|
| Prime Power                         | 100 to 240 VAC, 50 to 60 Hz, 150 W maximum with 10 W BUC |
| Operating Temperature               | 0 to 50°C  |
| Storage Temperature                 | -40 to 85°C  |
| Humidity                            | 95% maximum, non-condensing                              |
| Dimensions (height x width x depth) | 1.75" x 19" x 19.5"<br>(4.45 x 48.26 x 48.89 cm)         |
| Weight                              | 8.5 lbs (3.83 kg)  |

### Monitor and Control

|  |                           |
|--|---------------------------|
| Remote RS-485/Terminal RS-232/Ethernet 10Base-T, Web browser |                           |
| FSK  | CODAN/TERRASAT smart BUCs |

### DMD20 LBST 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                                     |



DMD20 LBST Rear Panel

