Overview

The CDM-760 Advanced High-Speed Trunking Modem builds on our award-winning family of high-speed, ultra efficient trunking modems. The CDM-760 further enhances our offerings to include ultra wide band symbol rates, near theoretical performance with minimal implementation loss, our proprietary DVB-S2 Efficiency Boost technology, Super Jumbo Frame (SJF) Ethernet support and many other value-added features.

The CDM-760 Advanced High-Speed Trunking Modem was designed to be the most efficient, highest throughput, point-to-point trunking modem available. The CDM-760 accommodates the most demanding Internet Service Provider (ISP) and telco backhaul links by offering users the most advanced combination of space segment saving capabilities while minimizing the need for unnecessary overhead.

The CDM-760 offers an expansive range of symbol rates (100 ksps to 150 Msps) and data rates (100 kbps to 314 Mbps). Run in a duplex setting, this is a staggering 628 Mbps or 300 Msps. Coupling these speeds with the native Super Jumbo Frame Ethernet interfaces supporting Ethernet frames from 64 Bytes to >10,000 Bytes and the CDM-760 will process Ethernet frames at a blazing (> 1.2 Million packets / second).

Expanding on the efficient DVB-S2 EN 302 307 standard, the CDM-760 again furthers spectral efficiency with its DVB-S2-EB1 (Efficiency Boost) waveforms. DVB-S2 is widely accepted as the most spectrally efficient standards-based waveforms. With our Efficiency Boost technology (DVB-S2-EB1), you can achieve a 10% – 35% increase in efficiency over the DVB-S2 standard without an increase in power or occupied bandwidth. The CDM-760 accomplishes this task by virtually doubling the number of available MODCODs, introducing three new ROF figures (5%, 10% and 15%) and minimizing implementation loss to near theoretical operation. The CDM-760 is software upgradeable to support future standards including DVB-S2 Efficiency Boost, DVB-Sx and DVB-S3.

Implementing Adaptive Coding and Modulation (ACM) operation allows link margin to be converted to user capacity during non-faded conditions by taking advantage of the actual signal to noise ratio rather than calculated worst case signal to noise.

By using the best encapsulation methods, the CDM-760 further increases throughput by using minimal overhead. In G.703 synchronous mode, users can implement monitor and control over the satellite with no additional overhead. When using Ethernet bridge mode, less than 1% overhead is used for encapsulation.

The optional K4 GZIP lossless compression engine performs real-time compression of Ethernet traffic and is capable of running at the full rate of the modem. Offering 52% to 59% compression rates at random packet sizes using the Calgary Corpos bitstream, K4 GZIP can greatly increase the throughput of the satellite link, or reduce required bandwidth.

Additionally, the CDM-760 leverages our powerful DoubleTalk® Carrier-in-Carrier® "Adaptive Cancellation" technology. With the ability to overlay TX and RX carriers, Carrier-in-Carrier enables the operator to establish the perfect balance between bandwidth and power, enabling the best possible use of the satellite resource and reducing operating expenses (OPEX).

These technologies alone offer enormous savings to the ISP and telco operator. When used in combination, however, the savings are astronomical. The innovative high-performance architecture of the CDM-760 allows efficient networking and transport over satellite links while supporting a wide range of applications and network topologies.

Typical Users
- Mobile Operators
- Telecom Operators
- ISPs
- Government & Military

Common Applications
- IP Trunking
- G.703 Trunking
- High-Speed Content Delivery
- Disaster Recovery & Emergency Communications

Features

- Symbol Rate: 0.1 to 150 Msps
- Data Rate: 0.1 to 314 Mbps
- DVB-S2 ETSI EN 302 307 compliant
- DVB-S2-EB1 Efficiency Boost technology
- DoubleTalk Carrier-in-Carrier bandwidth compression
- ACM and CCM
- GSE – low overhead <1% encapsulation
- K4 GZIP lossless compression
- Super Jumbo Frame 10,240 Byte Support
- Modulation: QPSK, 8PSK, 16APSK, 32APSK
- Dual IF: 70/140 MHz, L-Band and L-Band monitor (standard)
- Data Interfaces
    - 2 Gigabit 10/100/1000Base-T interfaces (standard)
    - 1 Optical Gigabit interface (optional)
    - Processes > 600,000 pps simplex, 1.2M pps duplex
    - PIIC optional interface cards
    - G.703 E3/T3/STS-1 (34.368, 44.736, 51.84 Mbps)
    - STM-1 Copper SDH (155.52 Mbps)
    - OC-3 SONET single mode or multi-mode 1300 nm (155.52 Mbps)
- Multistream capable (Multi-Interface mux)
- Management: HTTP, SNMP, Telnet, RS-232/485
- In-band (over satellite) M&C control
- 1:1 and 1:N redundancy switching available

Doubletalk Carrier-in-Carrier

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.

Figure 1 shows the typical full duplex satellite link, where the two carriers are adjacent to each other. Figure 2 shows the typical DoubleTalk Carrier-in-Carrier operation, where the two carriers are overlapping, thus sharing the same spectrum.
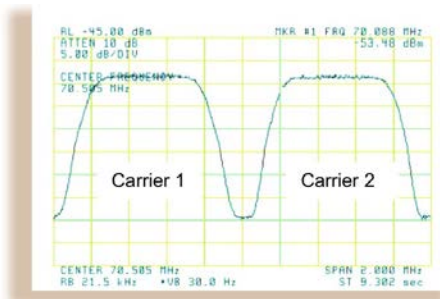

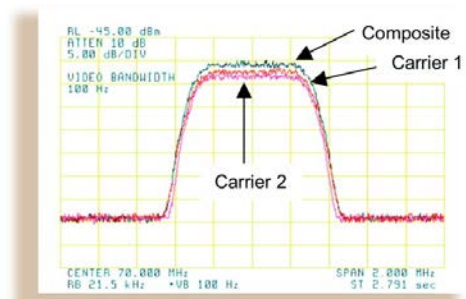**Figure 1: Traditional Full Duplex Link**

Figure 2: Duplex Link with DoubleTalk Carrier-in-Carrier

When observed on a spectrum analyzer, only the Composite is visible. Carrier 1 and Carrier 2 are shown in Figure 2 for reference only.

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

CDM-760 Back Panel

Specifications

Symbol Rate Range	DVB-S2: 100 Ksps to 150 Msps in 1 sps steps (modulation dependent) DVB-S2-EB1: 100 Ksps to 150 Msps in 1 sps steps (modulation dependent)
Modulation Type	DVB-S2: ETSI EN 302 307 compliant DVB-S2-EB1: DVB-S2 with Efficiency Boost technology
FECFrame	Normal (64,800 bits) or Short (16,200 bits)
Pilots	On or off
Alpha (Rolloff)	DVB Compliant: 20%, 25% or 35% Comtech Efficiency Boost DVB-S2-EB1: 5%, 10%, 15%, 20%, 25%, 35%
Management	Front panel keypad / display RS-232 /485, or 10/100Base-T with SNMP, Telnet, HTTP
Reflash	Ethernet management port
Frequency Stability	Internal, stability ± 0.06 ppm
External Reference Input / Output (BNC Female)	Internal, 1, 2, 5 or 10 MHz for IF and data, internally phase locked. Output: off or internal 10 MHz
Form C	Modulator, demodulator and unit fault
Spectral Sense	Normal and inverted
Configuration Retention	Non-volatile memory; Returns upon power up

Options

Type	Option
FAST	DVB-S2, DVB-S2-EB1 TX / RX: 8PSK, 16APSK, 32APSK
FAST	Symbol rate options
FAST & Hardware	Carrier-in-Carrier options
FAST & Hardware	K4 GZIP lossless compression
FAST	ACM point to point client / controller
FAST	Optical Gigbit Ethernet enable
Hardware	PIIC optional interface cards G.703 E3/T3/STS-1 (34.368, 44.736, 51.84 Mbps) STM-1 Copper SDH (155.52 Mbps) OC-3 SONET single mode or multi-mode 1300 nm (155.52 Mbps)
Hardware	Rack slides

Modulator (Dual IF)

70/140 MHz	50 to 180 MHz in 100 Hz steps
Impedance / Connector	75 Ω, BNC female. Return loss ≥ 18 dB
Output Power	0 to -25 dBm, 0.1 dB steps (70/140 MHz)
Power Accuracy	± 0.5 dB of nominal at 25°C; Within ± 0.5 dB from 25°C value at same frequency
L-Band	950 to 2150 MHz in 100 Hz steps
Impedance / Connector	50 Ω, Type N female. Return loss ≥ 15 dB
Output Power	0 to -40 dBm, 0.1 dB steps
Power Accuracy	± 0.5 dB of nominal at 25°C ± 0.5 dB from 25°C value at same frequency
L-Band Monitor	Same as L-Band or 900 + 70/140 MHz IF at -27 dBm ± 3 dB
Harmonics and Spurs	< 60 dBc/4kHz, modulated carrier; Excludes spectral mask area
External TX Carrier Off	TTL low signal
Quadrature Phase Error and Amplitude Imbalance	Sideband 35 dB below unmodulated carrier

Demodulator (Dual IF)

70/140 MHz	50 to 180 MHz in 100 Hz steps
Impedance / Connector	75 Ω, BNC female. Return loss 15 dB min.
Input Power	Desired carrier: Min. = -58 + 10Log (SR$_{MSPS}$) dBm Max. = -23 + 10Log (SR$_{MSPS}$) dBm or +10 dBm whichever is less.
Max. Composite Power	+20 dBm or = 14 + 10Log (180 / SR$_{MSPS}$) dBc (whichever is less)
L-Band	950 to 2150 in 100 Hz steps

Impedance / Connector	50 Ω, Type N female. Return loss 10 dB min.
Input Power	Desired carrier: Min. = -70 + 10Log (SR$_{MSPS}$) dBm Max. = -20 + 10Log (SR$_{MSPS}$) dBm or +20 dBm whichever is less.
Maximum Composite	+20 dBm or = 43 – 10Log (SR$_{MSPS}$) dBc (whichever is less)

Doubletalk Carrier-In-Carrier

Symbol Rate Range	1 Msps to 63 Msps in 1sps steps
Delay Range	0 to 400 ms (factory default 230 – 290 ms)
CnC Ratio	+7 dB to -7 dB interferer to desired
Es/No degradation (dB) measured at 0.0 dB CnC Ratio	QPSK: 0.3 dB 8PSK: 0.3 dB 16APSK: 0.6 dB 32APSK: 1.0 dB
Symbol Rate Ratio	Max 3:1 TX/RX or RX/TX
Satellite Configuration	Transmit station sees own carrier. Non-processing satellite.

Base Unit Connectors

Alarm Connector (DB-15 Male)	Form C: TX, RX and unit faults External TX carrier off IQ test point
Unit Management	DB-9 male with RS-232 and RS-485 2-wire / 4-wire RJ-45 Ethernet (maximum Ethernet packet size 1536 bytes including Ethernet header & CRC)
TX & RX IF Connectors	BNC female (70/140 MHz) Type-N female (L-Band)
L-Band Monitor	SMA female
Ethernet Data Interfaces	2 x RJ-45 10/100/1000Base-T Ethernet 1 x Optical Gibabit Ethernet (optional) Note: All Data GigE interfaces support super jumbo frames with a maximum Ethernet frame size of 10,240 bytes including Ethernet header & CRC

Test Functions

Data Test Pattern	$2^{10}-1$, $2^{15}-1$, $2^{23}-1$ compatible with BERT on TX data on applicable interfaces
CW	Modulation disabled and CW signal is transmitted
SSB Carrier	Provides suppressed carrier and suppressed sideband
Loopback	Full-duplex only

Environmental and Physical

Temperature		
Operating	0 to 50°C (32 to 122°F)	
Storage	-40 to 70°C (-40 to 158°F)	
Humidity	95% maximum, non-condensing	
Power Supply Input	100-240 VAC 50/60 Hz 43-60 VDC (48 VDC option)	
Power Consumption		
120 VAC at 60 Hz	88 W, 93 VA typical	
230 VAC at 50 Hz	88 W, 133 VA typical	
48 VDC	85 W typical	
Dimensions (1RU) (height x width x depth)	1.75" x 19" x 18.65" (48 x 47.4 x 4.4 cm)	
Weight	15 lbs (6.8 kg)	
AC Receptacles	Includes restraint for standard IEC-320 inlet	
Agency Compliance	CE Mark and FCC part 15	

Accessories

Type	Option
1:1 Modem Redundancy	CRS-170A (L-Band), CRS-180 (70/140 MHz)
1:N Modem Redundancy	CRS-500 70/140 MHz or L-Band (Only for use with 10/100/1000Base-T or G.703 T3/E3/STS-1 interfaces)

DVB-S2, Normal Block, Pilot ON, QEF (PER 10e-7)

MOD	FEC	Min SR (Msps)	Max SR (Msps)	Min DR (Mbps)	Max DR (Mbps)	Spec Eff (Bits / Hz)	QEF Eb/No	QEF Es/No
QPSK	1/2	0.1	150	0.10	144.80	0.97	1.4	1.2
QPSK	3/5	0.1	150	0.12	174.00	1.16	1.9	2.5
QPSK	2/3	0.1	150	0.13	193.70	1.29	2.2	3.3
QPSK	3/4	0.1	150	0.15	217.80	1.45	2.7	4.3
QPSK	4/5	0.1	150	0.15	232.40	1.55	3.0	4.9
QPSK	5/6	0.1	150	0.16	242.30	1.62	3.3	5.4
QPSK	8/9	0.1	150	0.17	258.60	1.72	4.0	6.4
QPSK	9/10	0.1	150	0.17	261.90	1.75	4.2	6.6
8PSK	3/5	0.1	120	0.17	208.80	1.74	3.4	5.8
8PSK	2/3	0.1	120	0.19	232.30	1.94	4.0	6.9
8PSK	3/4	0.1	120	0.22	261.40	2.18	4.7	8.1
8PSK	5/6	0.1	120	0.24	290.60	2.42	5.7	9.6
8PSK	8/9	0.1	120	0.26	310.30	2.59	6.9	11.0
8PSK	9/10	0.1	120	0.26	314.20	2.62	11.2	11.2
16APSK	2/3	0.1	90	0.26	231.80	2.58	5.3	9.4
16APSK	3/4	0.1	90	0.29	260.60	2.90	6.0	10.6
16APSK	4/5	0.1	90	0.31	278.10	3.09	6.5	11.4
16APSK	5/6	0.1	90	0.32	290.00	3.22	6.9	12.0
16APSK	8/9	0.1	90	0.34	309.60	3.44	7.8	13.2
16APSK	9/10	0.1	90	0.35	313.50	3.48	8.1	13.5
32APSK	3/4	0.1	72	0.36	260.90	3.62	7.5	13.1
32APSK	4/5	0.1	72	0.39	278.40	3.87	8.2	14.1
32APSK	5/6	0.1	72	0.40	290.20	4.03	8.6	14.7
32APSK	8/9	0.1	72	0.43	309.80	4.30	9.9	16.2
32APSK	9/10	0.1	72	0.44	313.70	4.36	10.1	16.5

DVB-S2-EB1, Normal Block, Pilot ON, QEF (PER 10e-7)

MOD	FEC	Min SR (Msps)	Max SR (Msps)	Min DR (Mbps)	Max DR (Mbps)	Spec Eff (Bits / Hz)	QEF Eb/No	QEF Es/No
QPSK	1/2	0.1	150	0.10	144.75	0.97	1.4	1.2
QPSK	8/15	0.1	150	0.10	154.50	1.03	1.5	1.6
QPSK	17/30	0.1	150	0.11	164.25	1.10	1.6	2.0
QPSK	3/5	0.1	150	0.12	174.00	1.16	1.9	2.5
QPSK	19/30	0.1	150	0.12	183.75	1.23	1.8	2.7
QPSK	2/3	0.1	150	0.13	193.65	1.29	2.2	3.3
QPSK	127/180	0.1	150	0.14	204.90	1.37	2.3	3.7
QPSK	3/4	0.1	150	0.15	217.80	1.45	2.7	4.3
QPSK	4/5	0.1	150	0.15	232.35	1.55	3.0	4.9
QPSK	5/6	0.1	150	0.16	242.25	1.62	3.3	5.4
QPSK	31/36	0.1	150	0.17	250.20	1.67	3.6	5.9
QPSK	8/9	0.1	150	0.17	258.60	1.72	4.0	6.4
QPSK	9/10	0.1	150	0.17	261.90	1.75	4.2	6.6
8PSK	17/30	0.1	120	0.16	197.04	1.64	3.3	5.5
8PSK	3/5	0.1	120	0.17	208.80	1.74	3.4	5.8
8PSK	19/30	0.1	120	0.18	220.44	1.84	3.8	6.4
8PSK	2/3	0.1	120	0.19	232.32	1.94	4.0	6.9
8PSK	127/180	0.1	120	0.20	245.76	2.05	4.7	7.8
8PSK	3/4	0.1	120	0.22	261.36	2.18	4.7	8.1
8PSK	4/5	0.1	120	0.23	278.88	2.32	5.3	9.0
8PSK	5/6	0.1	120	0.24	290.64	2.42	5.7	9.6
8PSK	31/36	0.1	120	0.25	300.24	2.50	6.3	10.3
8PSK	8/9	0.1	120	0.26	310.32	2.59	6.9	11.0
8PSK	9/10	0.1	120	0.26	314.16	2.62	7.0	11.2
16APSK	19/30	0.1	90	0.24	219.87	2.44	5.1	9.0
16APSK	2/3	0.1	90	0.26	231.75	2.58	5.3	9.4
16APSK	127/180	0.1	90	0.27	245.16	2.72	5.8	10.2
16APSK	3/4	0.1	90	0.29	260.64	2.90	6.0	10.6
16APSK	4/5	0.1	90	0.31	278.10	3.09	6.5	11.4
16APSK	5/6	0.1	90	0.32	289.98	3.22	6.9	12.0
16APSK	31/36	0.1	90	0.33	299.52	3.33	7.5	12.7
16APSK	8/9	0.1	90	0.34	309.60	3.44	7.8	13.2
16APSK	9/10	0.1	90	0.35	313.47	3.48	8.1	13.5
32APSK	127/180	0.1	72	0.34	245.30	3.41	7.5	12.8
32APSK	3/4	0.1	72	0.36	260.86	3.62	7.5	13.1
32APSK	4/5	0.1	72	0.39	278.35	3.87	8.2	14.1
32APSK	5/6	0.1	72	0.40	290.23	4.03	8.6	14.7
32APSK	31/36	0.1	72	0.42	299.74	4.16	9.2	15.4
32APSK	8/9	0.1	72	0.43	309.82	4.30	9.9	16.2
32APSK	9/10	0.1	72	0.44	313.70	4.36	10.1	16.5