The O3b product suite is supported by the most advanced modulation technologies in the industry. O3b Networks supports applications such as high-speed Internet service, VoIP, video conferencing, mobile backhaul and private corporate data network applications.

Overview
The CDM-625-EN Advanced Satellite Modem builds on Comtech EF Data’s legacy of providing the most efficient satellite modems for IP-centric applications that require data encryption. It is the first modem to combine advanced Forward Error Correction (FEC) such as VersaFEC® and Low Density Parity Check (LDPC) codes, allowing for maximum savings under all conditions. This combination of advanced technologies enables multi-dimensional optimization, allowing satellite communications users to:
- Minimize operating expenses (OPEX)
- Maximize throughput without using additional transponder resources
- Maximize availability (margin) without using additional transponder resources
- Minimize capital expenses (CAPEX) by allowing a smaller BUC/HPA and/or antenna
- Or, a combination to meet specific business needs

Features
- Adaptive Coding and Modulation (ACM)
- Packet Processor with header compression, payload compression, advanced Quality of Service (QoS) and Managed Switch Mode
- AES Data Encryption for IP traffic (Packet Processor)
- Dual Band Capability: 70/140 MHz and L-Band in same unit
- Data Rate: 18 kbps to 25 Mbps
- Symbol Rate: 18 kbps to 12.5 Msps
- Modulation: BPSK, QPSK/OQPSK, 8PSK/8-QAM, 16 QAM
- FEC: Viterbi, Sequential, Concatenated Reed Solomon, TCM, Turbo Product Code (TPC) (IEC 315 Compliant), LDPC Code and VersaFEC (low-latency LDPC)
- Widest Range of Data Interfaces: 4-port 10/100Base-T Ethernet, EIA 422/530, V.35, G.703 T1, G.703 E1, G.703 T2, G.703 E2, Quad G.703 E1, ASI, LVDS, HSSI
- 4-port Managed Ethernet Switch with VLAN and QoS
- Sub Mux to multiplex IP/Ethernet traffic with serial or G.703 traffic
- Drop & Insert for T1/E1
- Enhanced DBi++ for Single T1/E1 & Quad E1
- Management: 10/100Base-T Ethernet with SNMP, Distinct End SNMP Proxy, HTTP, Telnet and EIA 232/EIA 485
- Embedded Distinct end Monitor and Control (EDMAC)
- Automatic Uplink Power Control (AUPC)

Typical users
- Mobile Operators
- Telecom Operators
- Satellite Service Providers
- Government & Military
- Enterprise
- Offshore

Common applications
- Mobile Backhaul
- G.703 Trunking
- IP Trunking
- Offshore & Maritime Communications
- Enterprise
- Communications on-the-Move
- Satellite News Gathering
VersaFEC Forward Error Correction
CDM-625-EN offers VersaFEC, a patented system of high performance short-block low-latency LDPC codes designed to support latency-sensitive applications, such as cellular backhaul over satellite. VersaFEC provides excellent coding gain with lowest possible latency. VersaFEC’s Eb/No performance is similar to that of DVB-S2 (short block) or LDPC (16k block) with 70-90% lower latency. Compared to TPC, VersaFEC can provide coding gain of 1.0 dB or more.
The new Ultra Low Latency (ULL) codes provide even lower latency compared to standard VersaFEC codes.

Adaptive Coding & Modulation (ACM)
Satellite users have traditionally relied on worst case link margin to overcome rain fade which leads to significant inefficiencies. ACM converts the fade margin into increased throughput – gain of 100% or more is possible. ACM maximizes throughput under all conditions – rain fade, inclined orbit satellite operation, antenna mis-pointing, noise, interference and other impairments.

Low Density Parity Check Codes (LDPC) & Turbo Product Codes (TPC)
CDM-625-EN offers an integrated LDPC and 2nd Generation TPC codec. LDPC is an advanced Forward Error Correction technique capable of providing performance much closer to Shannon limit. The current LDPC implementation can provide 0.7 to 1.2 dB additional coding gain compared to an equivalent TPC code.

In order to take full advantage of the increased coding gain provided by LDPC, Comtech EF Data has developed a patented 8-QAM modulation that allows for acquisition and tracking at much lower Eb/No compared to 8PSK.

Dual Band Capability
CDM-625-EN supports 70/140 MHz and L-Band capability in the same unit with independently selectable transmit and receive IF. This simplifies sparing and stocking in networks requiring 70/140 MHz and L-Band units.

4-Port Managed Ethernet Switch with VLAN & QoS
CDM-625-EN incorporates a 4-port 10/100Base-T managed Ethernet switch with VLAN capability and priority-based Quality of Service. Access (Native) Mode and Trunk Mode are supported. Traffic can be prioritized using port-based priority or VLAN priority. The maximum Ethernet frame size with Rev 2 HW is 2048 bytes.

Packet Processor
The Packet Processor enables efficient IP networking and transport over satellite by adding routing capability with very low overhead encapsulation, header compression, payload compression and Quality of Service to the CDM-625-EN. The advanced QoS combined with header and payload compression ensures the highest quality of service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency.

Packet processor also supports AES data encryption.

Header Compression
The Packet Processor incorporates industry-leading header compression for IP traffic. Header compression can reduce the 40 byte IP/UDP/RTP header to as little as 1 byte. For TCP/IP, the 40 byte header is reduced to as little as 3 bytes. For applications such as VoIP, header compression can provide bandwidth savings exceeding 60%. E.g. the 8 kbps G.729 voice codec requires 24 kbps of IP bandwidth once encapsulated into an IP/UDP/RTP datagram. With header compression, the same voice call needs about 8.5 kbps – a saving of almost 65%. And, bandwidth requirements for typical Web/HTTP traffic can be reduced by 10% or more with TCP/IP header compression.

Payload Compression
The Packet Processor incorporates industry-leading payload compression for IP traffic. Implemented in the hardware for maximum throughput and efficiency, payload compression can reduce the required satellite bandwidth by as much as 40-50%.
Streamline Encapsulation (SLE)
The Packet Processor incorporates Comtech EF Data’s patent-pending very low overhead Streamline Encapsulation (SLE). SLE can reduce the encapsulation overhead by as much as 65% compared to industry standard HDLC.

Advanced Quality of Service (QoS)
The Packet Processor incorporates multi-level QoS to ensure the highest quality service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency. Supported modes are:
- DiffServ – Industry-standard method of providing QoS enabling seamless co-existence in networks that implement DiffServ
- Max/Priority – Provides multi-level traffic prioritization with the ability to limit maximum traffic per priority class
- Min/Max – Provides a Committed Information Rate (CIR) to each user defined class of traffic with the ability to allow a higher burstable rate depending on availability

Managed Switch Mode
Managed switch modem enables layer 2 operation with the Packet Processor. This provides significant bandwidth savings for layer 2 operation with very low overhead Streamline Encapsulation, header compression and payload compression.

AES Data Encryption
Configurable on a per route basis, the modem supports AES data encryption for transmission security to prevent unauthorized access to data transmitted over the satellite link. AES data encryption is only available for IP traffic processed by the Packet Processor.

Quad E1 Interface (QDI) with Enhanced D&I++
The CDM-625-EN supports a Quad E1 interface that can aggregate up to four full or fractional E1s into a single carrier, with very low overhead. This provides significant CAPEX savings by reducing the number of modems and could possibly reduce the BUC/HPA size by eliminating the multi-carrier backoff. A proprietary, closed network drop & insert (D&I++) allows for dropping or inserting any combination of 1 to 31 time slots on each E1. D&I++ is supported for E1-CCS only.

IP Sub Multiplexer
The IP sub mux allows multiplexing IP/Ethernet traffic with serial or G.703 traffic into a single carrier. This is particularly useful for cellular backhaul when both E1 and IP backhaul is required. This reduces the number of modems and could possibly reduce the BUC/HPA size by eliminating the multi-carrier backoff. The IP sub mux ratio ranges from 9:1 (IP data rate is 9 times that of the serial or G.703 data rate) to as low as 1:59.

EDMAC & AUPC
The CDM-625-EN supports EDMAC, EDMAC 2, EDMAC-3 and AUPC. EDMAC/EDMAC-2/EDMAC-3 can be used to monitor and control the distant end of a satellite link using a proprietary overhead channel. EDMAC-3 is also used for SNMP management of the distant end modem. AUPC enables automatic uplink power control for a duplex link.

Management & SNMP Proxy
The modem can be managed via the front panel, the remote M&C port (EIA 232/EIA 485), or the 10/100Base-T Ethernet port. With support for SNMP, HTTP and Telnet, the modem can be easily integrated into an IP-based management system. The CDM-625-EN can also act as SNMP proxy for the distant end modem. This allows distant end modem management using SNMP without requiring an end-to-end IP link.

Advanced FSK for LPOD Monitoring & Control
The Advanced FSK allows for monitoring and control of LPOD through modem front panel menus, serial remote control and Telnet.

Feature Enhancements
Enhancing the capability of the CDM-625-EN in the field is easy. Features that do not require additional hardware can be added on site, using FAST access codes purchased from Comtech EF Data.
Specifications

Data Rate
18 kbps to 25 Mbps, in 1 bps steps (modulation, FEC & data interface dependant)

Symbol Rate
18 kbps to 12.5 Mbps

Operating Frequency
50 – 180 MHz (standard) and 950 – 2000 MHz (Option), 100 Hz resolution, independent TX and RX operation

Major Operating Modes
(See User Manual For Details)
- Open network, per IESS-308 / 309 / 310 / 314 transparent, closed network per IESS-315
- LDPC / TPC Codec (optional plug-in module) with ACM or Constant Coding & Modulation (CCM)
- EDMAC Framed with/without AUPC
- RS Outer Codec
- High rate ESC / Enhanced ESC (ESC++)
- Drop & insert (DII) / Enhanced DII++
- Quad E1 drop & insert (QDI)

SCRAMBLING
- Rate 2/3 BPSK/QPSK/8PSK
- Rate 3/4 BPSK/QPSK/8PSK
- Rate 5/6 BPSK

VersaFEC Codec
- VersaFEC Codec (optional plug-in module) with IESS-308-310

FEC Options
- None
- Uncoded BPSK/QPSK/8PSK
- Rate 1/2 BPSK/QPSK/8PSK/QPSK
- Rate 3/4 BPSK/QPSK/8PSK/QPSK

Viterbi with Reed Solomon
- Rate 3/4 16-QAM
- Rate 7/8 16-QAM

Reed Solomon
- Open network and closed network modes

Modem Alarms
- 15-pin D-sub (male)
- 9-pin D-sub (female)
- 4 x RJ-45

Modulator
- Frequency Stability
- ± 0.06 ppm (± 6 x 10^-9) @ 50°C (32° to 122°F)
- Transmit Filtering
- Per IESS-308
- Transmit Filter RollOff
- 25%, 35%

Harmonics and Spurious
- Better than -60 dBc/4 kHz
- Measured from 1 to 500 MHz (50-180 MHz band)
- Measured from 1 to 500 MHz (950-2000 MHz band)

Output Phase Noise
- ≤ +30 dBc
- ≤ +30 dBc
- ≤ +30 dBc

Output Power
- 50-180 MHz
- 0 to -25 dBm, 0.1 dB steps
- 950-2000 MHz
- 0 to -40 dBm, 0.1 dB steps

Demodulator
- Input Power Range, Desired Carrier
- 50-180 MHz
- -105 to +10 dBm (symbol rate) dBm
- 950-2000 MHz
- -130 to +10 dBm (symbol rate) dBm

Max Composite Operating Level
- 94 – 10 log (symbol rate, desired carrier) dBm, +10 dBm max., with the additional requirement that within ± 10 MHz of the desired carrier the composite power is ≤ +30 dBc
- 950-2000 MHz
- 102 – 10 log (symbol rate, desired carrier) dBm, +10 dBm max., with the additional requirement that within ± 10 MHz of the desired carrier the composite power is ≤ +30 dBc

Absoute Maximum
- +20 dBm

Adaptive Equalizer
- 5× tap design, selectable on/off

Input OR Output
- BNC connector
- Input: 1, 2, 5, or 10 MHz , -6 dBm to +10 dBm, 50 Ω, 1/275 Ω (nominal)
- Output: 10 MHz, 2.7 V peak-to-peak ± 0.4 V, low impedance output

Data Interfaces
- EIA-422/S-30 DCE, Up to 14 Mbps
- 25-pin D-sub (female)

V.35 DCE
- Up to 14 Mbps
- 25-pin D-sub (female)

LVDS Serial
- Up to 25 Mbps
- 25-pin D-sub (female)

HSSI Serial
- Up to 25 Mbps
- 25-pin D-sub (female)

G.703 T1, 1.544 Mbps
- (Balanced 100 Ohm)
- 9-pin D-sub (female) or BNC (female)

G.703 T2, 2.048 Mbps
- (Balanced 75 Ohm or 120 Ohm)
- 9-pin D-sub (female) or BNC (female)

G.703 E2, 3.448 Mbps
- (Balanced 75 Ohm or 120 Ohm)
- 9-pin D-sub (female) or BNC (female)

ASI
- Up to 25 Mbps
- BNC (female)

Additional 2.048 Mbps E1
- Ports for Quad-E1
- (Balanced 120 Ohm)

Overhead Data
- 44-pin High-density D-sub (male)

Managed Ethernet Switch
- 4-port 10/100Base-T
- Managed Switch

4x RJ-45

Specifications

Continued
**Acquisition Range**

<table>
<thead>
<tr>
<th>Below 64 kysymbols/sec</th>
<th>Programmable in 1kHz increments</th>
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<tbody>
<tr>
<td>Between 64 and 389 kysymbols/sec</td>
<td>± 1 kHz to ± 32 kHz</td>
</tr>
<tr>
<td>Above 389 kysymbols/sec</td>
<td>± 1 kHz to ± (0.1 * Rs) kHz, up to a maximum of ± 200 kHz</td>
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**Acquisition Time**

Highly dependent on data rate, FEC rate, and demodulator acquisition range. E.g.: 120 ms average at 64 kbps, R1/2 QPSK, ± 10 kHz acquisition sweep range, 6 dB Eb/No.

**Plesiochronous/Doppler Buffer**

Selectable from 64 to 262,144 bits, in 16-bit steps (Additional limitations for G.704 frame boundaries)

**Receive Clock**

RX satellite, TX terrestrial, external reference

**Clock Tracking**

± 100 ppm minimum

**LNB Reference (10 MHz)**

Via RX IF center conductor, 10.0 MHz ± 0.06 ppm (with internal reference), selectable on/off, 3.0 dBm ± 3 dB

**LNB Voltage**

Selectable on/off, 13 VDC, 18 VDC per DiSEq 4.2 and 24 VDC at 500 mA maximum

**Monitor Functions**

Eb/N0 estimate, corrected BER, frequency offset, buffer fill state, receive signal level

**Available Options**

**Hardware**

- 100 – 240 VAC, 175 W AC primary power supply
- -48 VDC, 125 W primary power supply
- 24 VDC, 90 W @ 50°C BUC power supply, AC or DC primary power supply
- 48 VDC, 150 W @ 50°C (180 W @ 30°C) BUC power supply, AC or DC primary power supply
- Integrated TPC (2nd generation) and LDPC Codec module
- VersaFEC Codec module
- T-L Band IF (in addition to 70/140 MHz)
- Modern data rate – 10 Mbps, 15 Mbps, 20 Mbps or 25 Mbps
- QPSK and 8-QAM modulation (8-QAM requires TPC/LDPC or VersaFEC Codec)
- 16-QAM modulation
- TPC/LDPC Codec data rate – 10 Mbps, 15 Mbps, 20 Mbps or 25 Mbps
- VersaFEC Codec data rate (GCM) – 2.5 Mbps, 5 Mbps or 16 Mbps
- VersaFEC Codec symbol rate (ACM) – 300 kbps, 1.2 Mbps or 4.1 Mbps
- Open network – IBS with high rate IBS ESC, IDR and audio
- Dbi / Dhi++ for single Port T1/E1
- Dhi++ For Quad E1 Port 2, 3 and 4
- Quality of Service
- Header Compression
- Payload Compression

**Accessories**

- CRS-170A: 1:1 Modern Redundancy Switch (L-Band)
- CRS-180: 1:1 Modern Redundancy Switch (70/140 MHz)
- CRS-280: 1:10 IF Redundancy Switch (70/140 MHz)
- CRS-280L: 1:10 IF Redundancy Switch (L-Band)
- CRS-500: 1:4 Modern Redundancy System (For use with Packet Processor Only)
- CRS-282XXX: 1:10 IF Redundancy Switch (For use with CRS-500)

**Environmental And Physical**

**Temperature**

Operating: 0 to 50°C (32 to 122°F)  
Storage: 25 to 85°C (13 to 185°F)

**Power Supply**

100 – 240 VAC, ±6%/-10%, 50/60 Hz, auto sensing 48 VDC (HW option)

**Power Consumption**

48 W (typical with TPC/LDPC Codec), 55 W (max.)  
60 W (typical with TPC/LDPC Codec, Packet Processor installed), 67 W max.  
280 W (typical with TPC/LDPC Codec, and 48 VDC BUC power supply installed), 300 W (max.)

**Dimensions (1RU)**

(Height x width x depth) 1.75” x 19.0” x 17.65” (4.4 x 48 x 44.8 cm) approximate

**Weight**

10.8 lbs (4.9 kg) maximum, with all option modules and 48 VDC BUC power supply installed

**CE Mark**

EN 301 489-1 (ERM)  
EN55022 (Emissions)  
EN55024 (Immunity)  
EN 61000-3-2  
EN 61000-3-3  
EN60950 (Safety)

**FCC**

FCC Part 15, Subpart B