# DATUM SYSTEMS

PRECISION SATELLITE MODEMS

## M7 Modular MODEM SERIES

## Modem M7 IF or M7L L-Band

### Modular Satellite Modems


**Datum Systems innovation** is transforming the SCPC and MCPC modem industry with a new generation modular modem product, the M7 Series, that is versatile, compact, highly efficient and costs less to own and operate. Flexible M7 configurations include a full modem, mod-only, demod-only or multi-demod capability, all using common integrated assembly modules.

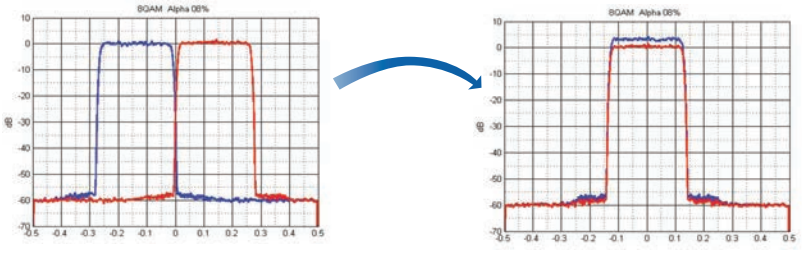
**Compact Modular Design -** The completely new M7 modem hardware platform fits within a single half-rack 1 RU space, or two modems mounted side-by-side, saving expensive rackspace at the hub. The M7 design uses individual card assemblies for mod, demod, controller and interface for versatile configurations and simple cost effective inventory.

Two Modems in 1 Rack Space
"Side x Side"

**Advanced *FlexLDPC* Onboard –** With unparalleled configuration flexibility and superior coding gain, *FlexLDPC* takes FEC technology innovation to the next level, bringing strong economic advantages to satellite service providers and their customers. Granular code rates and block sizes get you the most out of your available satellite bandwidth and spectral power, while keeping processing latency at the desired level.

**Sharp Carrier Filter Roll-Off –** The M7 Series supportsadvanced filter shaping for optimizied carrier spacing as a standard feature. Datum currently offers down to an 5% Alpha, which means that carriers can be spaced at 1.05 times the symbol rate instead of the historical factor of 1.35. This allows an immediate spectral efficiency increase and significant bandwidth savings, at no additional hardware or software cost.

**Smart Carrier Canceller –** Smart Carrier is a patented advanced second generation carrier canceller which allows 2 similar carriers to occupy the same transponder spectrum, but is different from other cancellers in that it is a baseband canceller instead of an IF canceller. It allows excellent performance with easy setup and no additional cabling. Smart Carrier is compatible with all Datum modulation types and FECs, and is well suited to be used with Sharp Roll-Off factors all the way down to 5%. Datum's technique provides improvement in the Shannon Capacity of ~ 2 dB, which is ~50 % increase in the fundamental channel capacity.



Example Smart Carries Bandwidth Savings of 50%

**System Architectures Supported**

- Point-to-Point
- Point-to-Multipoint
- Mesh
- Multicasting

**Key Highlights**

- Compact and Modular Modem Design
- Smart Carrier Cancelling (Patented)
- *FlexLDPC* Multi Block Sizes & Code Rates
- 1.2 kbps to 59.4 Mbps, 1 bps steps
- BPSK/QPSK/OQPSK/8PSK/8QAM/16QAM
- Widest Range of Carrier Roll-Off Factors
- G.703/E1 (D&I), Full & Fractional (N x 64)
- Advanced IP Interface
  - 200,000 Packets Per Second Throughput
  - Bridge and Router Modes
  - 3rd Party Platform for IP Optimization
- Express Ethernet Interface
  - Layer 2 Bridge, Switch Based
  - 4-Port with additional SFP Port
  - QoS and VLAN Support
- Lowest Latency, <15 ms at 64 kbps ¾ QPSK
- Fast Carrier acquisition time
- Perfect for Managed BW Systems
- Multi-Flo Async Channel, AUPC
- State-of-the-Art Web Browser GUI

**Applications**

- Cellular Backhaul
- Enterprise
- IP Networks
- E1 Trunking
- On-the-Move
- Bandwidth on Demand

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| Specifications | |
|---|---|
| Operating Modes | TX and RX Continuous (SCPC)<br>*Flex*LDPC, Flexible Block and Code Rates, Low Latency<br>Advanced TPC and Industry Compatible<br>Std and Custom Async Low Overhead Channels, AUPC<br>Remote Modem Control Channel<br>IP, Ethernet, Dual G.703/E1 (D&I), Serial, HSSI<br>Opt Plug-in I/O Selections (Up to 2 per M7 Unit) |
| Data Rate Range | 1.2 kbps to 59.04 Mbps, (1 bps steps) |
| Symbol Rate Range | 2400 sps to 14.76 Msps (1 sps steps) |
| FrequencyTuning Range | M7 50-180 MHz, M7L 950-2150 MHz (1 Hz steps) |
| Modulation Types | BPSK,QPSK,OQPSK,8PSK/QAM,16QAM |
| FEC Options | None, Viterbi, TCM, Reed-Solomon, *Flex*LDPC<br>TPC 4k and TPC 16k (Opt Plug-in HW) |
| Advanced *Flex*LDPC | Block Sizes 256,512,1k,2k,4k,8k,16k<br>Rates 1/2,2/3,3/4,14/17,7/8,10/11,16/17 |
| Turbo Product Code | TPC-4k 21/44, 1/2, 3/4, 7/8, 0.950<br>TPC-16k 1/2, 3/4, 7/8, 0.453, 0.922 |
| Viterbi | 1/2, 3/4, 7/8 (k=7), Trellis 2/3 |
| Reed Solomon | Selectable N & K, IESS 308/309/310 |
| Scrambler/Descrambler | IBS, V.35, IESS, TPC, RS, LDPC, EFD |

| *FlexLDPC*™ | Typical Eb/No for 1E-8 BER | | | | Delay @ 64kbps |
|---|---|---|---|---|---|
| | QPSK | 8PSK | 8QAM | 16QAM | |
| LDPC-1/2 - 2k | 2.04 dB | n/a | 3.80 dB | 4.48 dB | 49.6 ms |
| LDPC-1/2-4k | 1.73 dB | n/a | 3.44 dB | 4.16 dB | 98.0 ms |
| LDPC-1/2-8k | 1.52 dB | n/a | 3.19 dB | 3.92 dB | 195.0 ms |
| LDPC-1/2-16k | 1.38 dB | n/a | 3.04 dB | 3.76 dB | 388.6 ms |
| LDPC-2/3-2k | 2.77 dB | 4.88 dB | 4.68 dB | 5.85 dB | 44.4 ms |
| LDPC-2/3-4k | 2.46 dB | 4.53 dB | 4.36 dB | 5.46 dB | 87.5 ms |
| LDPC-2/3-8k | 2.23 dB | 4.28 dB | 4.09 dB | 5.19 dB | 173.7 ms |
| LDPC-2/3-16k | 2.09 dB | 4.14 dB | 3.91 dB | 5.01 dB | 346.1 ms |
| LDPC-3/4-2k | 3.52 dB | 5.97 dB | 5.51 dB | 6.78 dB | 41.9 ms |
| LDPC-3/4-4k | 3.14 dB | 5.56 dB | 5.11 dB | 6.37 dB | 82.4 ms |
| LDPC-3/4-8k | 2.89 dB | 5.27 dB | 4.83 dB | 6.07 dB | 163.1 ms |
| LDPC-3/4-16k | 2.72 dB | 5.07 dB | 4.63 dB | 5.87 dB | 325.0 ms |
| LDPC-7/8-2k | 4.96 dB | 7.89 dB | 6.98 dB | 8.48 dB | 38.1 ms |
| LDPC-7/8-4k | 4.32 dB | 7.21 dB | 6.40 dB | 7.84 dB | 74.6 ms |
| LDPC-7/8-8k | 4.00 dB | 6.86 dB | 6.05 dB | 7.51 dB | 147.3 ms |
| LDPC-7/8-16k | 3.90 dB | 6.66 dB | 5.87 dB | 7.32 dB | 293.6 ms |
| LDPC-10/11-2k | 5.63 dB | 8.73 dB | 7.68 dB | 9.37 dB | 37.0 ms |
| LDPC-10/11-4k | 5.00 dB | 7.99 dB | 7.02 dB | 8.63 dB | 72.3 ms |
| LDPC-10/11-8k | 4.58 dB | 7.51 dB | 6.60 dB | 8.18 dB | 143.0 ms |
| LDPC-10/11-16k | 4.40 dB | 7.33 dB | 6.35 dB | 7.95 dB | 284.5 ms |

Guaranteed Eb/No is 0.2 dB > Typical

| Modulator | |
|---|---|
| Output Level | IF 0 to -40.00, L-Band +5 to -35.00 (dBm) |
| Output Level Accuracy | ±0.5 dB Over Freq, Level and Temp |
| Output Impedance | IF 50 or 75 Ohms BNC (User Selectable)<br>L-Band 50 Ohms SMA |
| Output Return Loss | IF > 20 dB, L-Band > 16dB |
| Output Off Isolation | > 60 dB |
| Output Spurious | < -60 dBc / 4 kHz BW |
| Phase Noise Offset = 10 Hz | < -78 dBc/Hz |
| Offset = 100 Hz | < -95 dBc/Hz |
| Offset = 1.0 kHz | < -110 dBc/Hz |
| Offset = 10 kHz | < -110 dBc/Hz |
| Offset = 100 kHz | < -115 dBc/Hz |
| Offset = 1.0 MHz | < -130 dBc/Hz |
| Mod Roll-Off Factor % | 5, 8, 10, 15, 20, 25, 30, 35, 40 (%) |
| Ext Reference Frequency | 1, 1.544, 2.048, 5, 10, 20 (in MHz) |
| External Ref Level | -10 dBm to +10 dBm |

- Specifications subject to chance without notice

| Demodulator | |
|---|---|
| Input Acquisition Range | ±100 Hz to ±3 MHz, 1 Hz Steps |
| Minimum Input Level | 10 × Log(Symbol Rate) - 125 = Lvl (dBm) |
| Maximum Input Level | 10 × Log(Symbol Rate) - 80 = Lvl (dBm) |
| Maximum IF Input Power Density | +20 dBc/Hz |
| Maximum Total Power | +10 dBm |
| Receive Acquisition Time | Typical 71 ms at 64 kbps, QPSK |
| Input Impedance | IF 50 or 75 Ohms BNC (User Selectable)<br>L-Band 50 Ohms SMA |
| Input Return Loss | IF > 20 dB, L-Band > 16dB |
| Input Phase Noise | > Intelsat by 6 dB typical, 4 dB min |
| Demod Roll-Off Factor % | 5, 8, 10, 15, 20, 25, 30, 35, 40 (%) |

| Smart Carrier Cancelling | |
|---|---|
| Delay Range | 0 to 320 msec |
| Acquisition Time | < 30 Sec for Full Delay Sweep |
| Power Spectral Density | Ratio: +/- 10 dB:<br>Symbol Rate Ratio: +/- 30% of Symbol Rate<br>Frequency Offset: +/- 12.5% of Symbol Rate |
| Eb/No Degradation | PSD Ratio 0 dB<br>BPSK/QPSK/OQPSK: 0.2 dB<br>8PSK/8QAM: 0.3 dB<br>16QAM: 0.5 dB |

## Interface Options: (Choose Up to Two Per Modem)

| Serial Data Interface (S7) | |
|---|---|
| Main Interface Modes | Sync RS-232,449,V.35,EIA-530 (DB-25) |
| Internal Clock (ST) Accuracy | ±1E-12, (±1 part per Trillion) |
| Doppler Buffer Depth | 4 Bits to 524,284 Bits, 1 Bit Steps |
| ESC Overhead I/O Modes | Async RS-232,RS-485 (DB-25) |
| Adv Mux ESC OH Data Rate | Disabled, 300 bps to 3.5 Mbps, 1 bps Steps |
| Adv Mux (MCC) OH Data Rate | Disabled, 300 to 29.52 Mbps, 1 bps Steps |
| ESC Remote Signaling I/O's | Form C (Qty 2) |

| Advanced IP Interface (I7) | |
|---|---|
| Adv Ethernet IP Interface | 10/100 BaseT, Gigabit Ethernet (RJ-45) |
| Operating System | Debian Linux Operating System |
| Operating Modes | Bridge and Vyatta Router |
| Packets Per Second | 70,000 PPS |
| Network Protocols: | See Specification |

| Express Ethernet Interface (E7) | |
|---|---|
| Express Ethernet Ports | 4Ports (RJ-45), 1 Port SFP |
| 4 Port Interface | 10/100 BaseT, Gigabit Ethernet (RJ-45) |
| SFP Port | Optional Gigabit or Optiuc Fiber |
| Ethernet Protocol | Layer 2 Swtched Bridge Only |
| Features | QoS and VLAN Selectable |

| Dual G.703/E1 Interface (G7) | |
|---|---|
| G.703 E1 Physical Inputs | Dual Bal Inputs on (RJ-48), UnBal Opt |
| Formats Supported | Full E1, D&I / PCM-30 (CAS), PCM-31 (CCS) |
| D&I Time Slots Supported | N x 64, N = 1 to 31 Time Slots |

| HSSI Interface (H7) | |
|---|---|

| Monitor and Control | |
|---|---|
| Remote Control Interfaces | RS-232, RS-485, SNMP, Web Browser |
| Alarm Outputs | Qty 2 Form C |

| Certification and Compliance | |
|---|---|
| CE Certified for: CE | EN55022 Emmissions/EN55024 Immunity<br>ETSI EN301 489-1 V1.9.2 (Emissions/Immunity)<br>EN60950 (Safety) |
| RoHS | Meets RoHS lead-free standards |

| Environment and Physical | |
|---|---|
| AC to DC Adapter (Std) | Input 100-240 VAC, Output 24 V 65 W max |
| DC Input (Rear of Unit) | 8 to 36 VDC, -48 VDC Optional |
| Operating Temperature Range | 0°C to 50°C, 99% humidity, non-cond |
| Storage Temperature | -20°C to +70°C, 99% humidity, non-con |
| Size | 8.5" (W) x 11" (D) x 1.75" (H), (2 Units in 1 RU) |
| Weight | < 5 lbs, fully configured |

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