

# DATUM SYSTEMS

PRECISION SATELLITE MODEMS

## M7 MODULAR MODEM SERIES M7D IF & M7LD L-BAND COMPACT SATELLITE DUAL-DEMODS

### System Architectures Supported

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

### Key Highlights

- Modular Dual-Demod Design
- *FlexLDPC* Multi Block Sizes & Code Rates
- 1.2 kbps to 59.4 Mbps, 1 bps steps
- BPSK/QPSK/OQPSK/8PSK/8QAM/16QAM
- Independent Demods, IF or L-Band
- Serial Interface Optional
- Advanced IP Interface
  - 70,000 Packet Per Seconds Throughput
  - Bridge and Router Modes
  - Integrated Linux and Vyatta Routing
- Express Ethernet Interface
  - Layer 2 Bridge, Switch Based
  - 4-Port with additional SFP Port
  - QoS and VLAN Support
- Lowest Latency Solution
- Typical acquisition time, 71 ms at 64 kbps
  - Perfect for Managed BW Systems
- Front Panel Optional
- State-of-the-Art Web Browser GUI

### Applications

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



M7 Dual Demod



M7 Quad Demod

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. Standard hardware houses our optional *FlexLDPC* FEC and many other advanced upgradable features to create the industry's most spectral and space efficient low cost modem.

**Compact Modular Design** - The completely new M7D and M7LD Dual-Demod platform fits within a half-rack 1 RU space, saving expensive rackspace at hub or remote locations. Demods can be mounted and operated side-by-side or used in a simple and clean 1:1 redundant configuration. The M7 Series Dual-Demod uses fully independent demod assemblies, which are not restricted by bandwidth allocation or single transponder requirements. The M7D and M7LD also supports multiple interface options, making it a true flexible and multipurpose demod-only platform.

**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 Roll-Off Technology** – The M7 Series supports advanced filter shaping for optimized 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. Filter Roll-Off options in the new M7 modems Series include 5%, 8%, 10%, 15%, 20%, 25%, 30%, 35% and 40%. See Advanced Filter Shaping White Paper for more information.



Half-Rack M7D  
(with Serial Interface)



Half-Rack M7D  
(with Express Ethernet Interface)



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| Specifications           |                                                                                                                                                                                                                                                                                                                         |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Modes          | RX Continuous (SCPC)<br><i>FlexLDPC</i> , 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)                                                                                                                                                                                                                                                                                    |
| Frequency Tuning Range   | M7D 50-180 MHz, M7LD 950-2150 MHz (1 Hz)                                                                                                                                                                                                                                                                                |
| Demodulation Types       | BPSK, QPSK, OQPSK, 8PSK/QAM, 16QAM                                                                                                                                                                                                                                                                                      |
| FEC Options              | None, Viterbi, TCM, Reed-Solomon, <i>FlexLDPC</i><br>TPC 4k and TPC 16k (Opt Plug-in HW)                                                                                                                                                                                                                                |
| Advanced <i>FlexLDPC</i> | 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                                                                                                                                                                                                                                                                                      |
| Viterbi                  | 1/2, 3/4, 7/8 (k=7), Trellis 2/3                                                                                                                                                                                                                                                                                        |
| Reed Solomon             | Selectable N & K, IESS 308/309/310                                                                                                                                                                                                                                                                                      |
| Descrambler              | IBS, V.35, IESS, TPC, RS, LDPC, EFD                                                                                                                                                                                                                                                                                     |



| Demodulator                    |                                                                     |
|--------------------------------|---------------------------------------------------------------------|
| Input Acquisition Range        | $\pm 100$ Hz to $\pm 3$ MHz, 1 Hz Steps                             |
| Minimum Input Level            | $10 \times \text{Log}(\text{Symbol Rate}) - 125 = \text{Lvl (dBm)}$ |
| Maximum Input Level            | $10 \times \text{Log}(\text{Symbol Rate}) - 80 = \text{Lvl (dBm)}$  |
| 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 (%)                                |

| <i>FlexLDPC</i> <sup>TM</sup> | 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 &gt; Typical

## 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 | $\pm 1\text{E}-12$ , ( $\pm 1$ 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          | 4 Ports (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 Switched 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) |  |
|---------------------|--|
|---------------------|--|



POINT-TO-MULTIPOINT EXAMPLE

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

| 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                         |

| Certification and Compliance |                                                                     |
|------------------------------|---------------------------------------------------------------------|
| CE Certified for:            | ETSI EN 301 489-1 V1.9.2 (Emissions & Immunity)<br>EN60950 (Safety) |
| RoHS                         | Meets RoHS lead-free standards                                      |

- Specifications subject to change without notice