Precision Satellite Modems

Modem M7 IF or M7L L-Band
Modular Satellite Modems

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

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.

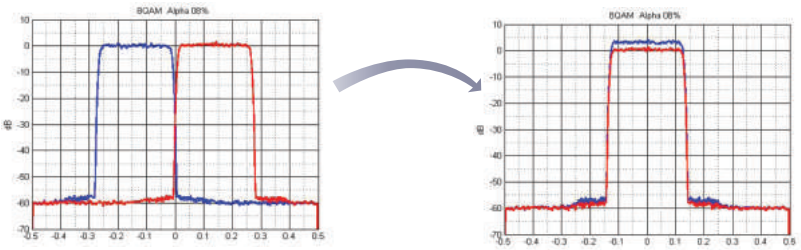
Compact Modular Design - The completely new M7 modem hardware platform fits within a single half-rack 1 RU space, or two modems mounted side-by-side, saving expensive rackspace at the hub. The M7 design uses individual card assemblies for mod, demod, controller and interface for versatile configurations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

Specifications	
Operating Modes	TX and RX Continuous (SCPC) *Flex*LDPC, Flexible Block and Code Rates, Low Latency Advanced TPC and Industry Compatible Std and Custom Async Low Overhead Channels, AUPC Remote Modem Control Channel IP, Ethernet, Dual G.703/E1 (D&I), Serial, HSSI 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 TPC 4k and TPC 16k (Opt Plug-in HW)
Advanced *Flex*LDPC	Block Sizes 256,512,1k,2k,4k,8k,16k 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 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) 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) 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: Symbol Rate Ratio: +/- 30% of Symbol Rate Frequency Offset: +/- 12.5% of Symbol Rate
Eb/No Degradation	PSD Ratio 0 dB BPSK/QPSK/OQPSK: 0.2 dB 8PSK/8QAM: 0.3 dB 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 ETSI EN301 489-1 V1.9.2 (Emissions/Immunity) 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