M7XC

Extra Compact Software Defined Modem

Waveform Selections

Multi-Mission Waveforms

- DVB-S2X TX
- DVB-S2X RX
- DVB-S2X Dual RX
- ACM FlexLDPC TX
- ACM FlexLDPC RX
- ACM FlexLDPC 16 RX Channels
- Segmented 16 TX Channels
- Segmented 16 RX Channels
- Spread Spectrum (DSSS)
- TRANSEC (AES-128/256)

Other Datum Capabilities

- Turbo Product Code (TPC)
- Viterbi-Reed Solomon
- Smart Carrier Cancelling
- Smart Hub-Cancelling

Applications

- Air, Land and Sea
- On-the-Move
- Fly-Away / Micro-Terminals
- Manpack
- Cellular Backhaul
- Oil & Gas
- Emergency Response
- Government / Defense
- Enterprise

M7XC Description

The M7XC "COMMON HARDWARE PLATFORM: Modem is the most *VIRTUALIZED* compact design in the industry for use at both Hub and Remote.

At only 3 x 5 inches, the M7XC's Common SD Hardware Platform supports multiple waveforms, is compliant with many industry standards, making it the smallest common hardware modem available today.

Waveforms can be quickly and easily selected using one of the most advanced Web Browsers.

The M7XC is a major reduction in form factor and a giant increase in our software defined extensions. Our innovative concepts have been proven and refined in over twenty years of design and manufacturing experience. The extreme compact design uses the latest in FPGA Technology for on the fly selectable waveforms.

The M7XC supports both HUB or REMOTE systems for Point to Point, Point to Multipoint, Mesh and Hybrid Networks.

The housing is designed for embedded integration into terminals.

The M7XC can also be integrated with other compact units into a master hub station for operation in different network types. Operating modes may be dedicated or shared. Dedicated modems are set for continuous operation and shared modems are usually controlled by Network Managers.

M7XC Software Defined Modem

The **M7XC** offers key features such as DVB-S2X, FlexLDPC, ACM, Smart Carrier Cancelling, Sharp Carrier Roll-Off, Modulation up to 256APSK, Encryption and support for Point-to-Point, Point-to-Multipoint and Mesh Networks.

DVB-S2X – DVB-S2X and Extensions.

ACM FlexLDPC – Bolsters substantially strong economic advantages for satellite service providers. Granular code rates and block sizes get the most out of available satellite bandwidth and spectral power, while keeping process latency low.

Smart Carrier Canceller – Smart Carrier Canceller is a patented carrier canceller that allows 2 similar carriers to occupy common transponder bandwidth. This allows for a Shannon Capacity improvement of up to 2 dB, and ~50 % decrease in channel occupancy.

Sharp Carrier Filter Roll-Off – Roll-Off capability that makes an immediate increase in spectral efficiency and significant bandwidth savings. Filter Roll-Off options start at 2%.

Adaptive Coding Modulation – ACM offers an increase in throughput by utilizing link margin provided for worst case scenarios and increasing link availability by seamlessly adjusting available ModCods.

Direct Sequence Spread Spectrum – (DSSS) Spread Spectrum waveforms spread the modulated carrier across a larger occupied bandwidth in order to lower the power spectral density of the transmitted signal. This is used to reduce the impact on other signals and lower the signals ability to be detected and intercepted (LPD, LPI)

Network Interface – The modem provides the user an embedded Gbe Layer 2 Bridge Interface that supports VLAN PcP, DSCP, MPLS, QoS with 8 independent Queues for Strict, WRED or Custom priorities. Also supports Line-Speeds >100M PPS and Jumbo Frames up to 10K Bytes.

AES-256 Encryption – Helion based AES-256 Core and FIPS140-3 Level 2 Certifiable TRANSEC with Random Key Generation and Very Short Rollover periods for added protection.

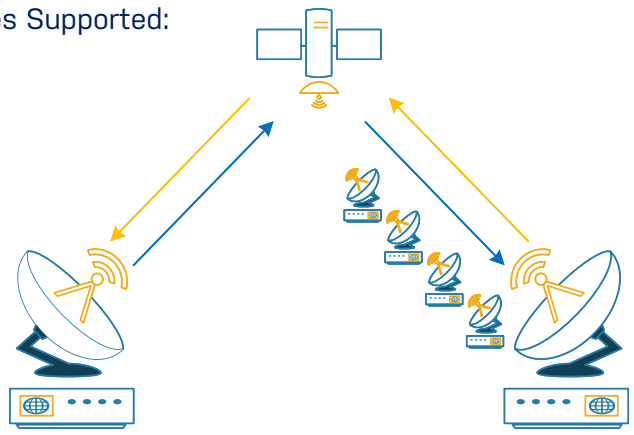
OpenAMIP (TM) Support – Open-Source standard for interfacing modems to satellite antennas, VSAT terminals and antenna controllers for use in satellite mobility environments ground & aviation (ARINC 791).

Carrier Segmentation – Bond up to 16 Independent Transmit and Receive LDPC channels with ACM.

Redundancy – Built in control allows for low cost implementation.

Major Network Architectures Supported:

- Point-to-Multipoint
- Point-to-Point
- Mesh
- Hybrid



M7XC

Extra Compact Software Defined Modem

Key Operational Features

- Compact and Lightweight at only 3" x 5" x 1.3" and ~ 1 lbs
- DVB-S2X and FlexLDPC FEC Types
- L-Band IFL 950 to 2250 MHz
- Data Rates up to 565.84 Mbps DVBS2X 85Mbps FLEX
- 16 ksps to 98 Msps DVB-S2X, 72Msps FLEX Symbol Rates
- MCC / ACM / AUPC
- +10 to +36 VDC Input
- Mil-Std-165B Compliant TX Spurious and Phase Noise
- Wide Temp Range of -40oC to +70oC
- BPSK-QPSK/OQPSK-8PSK/8QAM/8APSK-16QAM/16APSK-32APSK-64APSK-128APSK-256APSK
- Carrier Roll-Off Factors starting at 2%
- 13/45, 9/20,1/2, 11/20, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10, 23/36, 25/36, 13/18, 5/9, 26/45, 28/45, 7/9, 8/15, 77/90, 32/45, 11/15, 29/45, 31/45, 32/45
- Smart Carrier and Hub Carrier Cancelling
- ACM-LDPC Multi-Demod (16 RX Channels)
- DVBS2X Dual-Demod (2 RX Channels)
- GigE Layer 2 Data Interface, M&C: SNMP v2, HTTPS: Web Browser
- TRANSEC AES-256 Encryption
- GEO/MEO/LEO Doppler Tracking Modes, Max Symbol shift +/-3MHz, rate change up to +/-160kHz
- OpenAMIP Antenna Controller interface
- DSSS Direct Sequence Spread Spectrum waveforms with Spread Factors 2-256

Environmental and Physical

Unit Power	Input 10-36 VDC, < 30 Watts
Power Connector Type	Phoenix
Operating Temp Range	-40o C to +70o C, 99% Humidity
Storage Temperature	-40o C to +80o C, 99% Humidity
Vibration	Mil-Std 810H, 461
Size (inch) Fan Version	3" (W) x 5" (D) x 1.3" (H)
Non-Fan Version	3" (W) x 5" (D) x 1.0" (H)
Weight (lbs.)	~ 1
In/Out Reference	Int 10 or 50 MHz @ Nom -3 dBm 1x10-8 OCXO, 2x10-7 aging (BUC and LNB 10 MHz Reference)
LNB Output Power	Off, +13 or +18 VDC

Specifications

Unit

Data Services	Flex LDPC DVBS2 per ETSI EN 302 307 DVBS2X per ETSI EN 302 307
Data Rate Range	16 kbps to 565.84 Mbps
Symbol Rate Range	16 ksps to 98 Msps (1 bit steps)
DSSS Chip Rate Range DSSS Spread Factor (with LDPC BPSK 1/2 Rate)	64 kcps to 72 Mcps 2-256 (Integer & Steps)
L-Band Tuning Range	950 to 2250 MHz (1 Hz steps)
Modulation Types	B/QPSK, 8PSK/QAM, 16APSK/QAM, 32APSK, 64APSK, 128APSK, 256APSK
FEC	FlexLDPC DVBS2 Inner Code BCH Outer Code
Filter Roll-Off Factor (%)	2, 5, 10, 15, 20, 25, 30, 35, 40
DVB-S2 Frame Length	64800 bits (Long) 16200 bits (Short)
LDPC Block Size (k) DVB-S2 Short and Long Frames	2, 4, 8, 16 ModCods
QPSK	½ to 9/10
8PSK	3/5 to 9/10
16APSK	2/3 to 9/10
32APSK	¾ to 9/10
DVB-S2X Short and Long Frames	ModCods
QPSK	13/45 to 9/10
8PSK	5/9 to 9/10
16APSK	1/2 to 9/10
32APSK	2/3 to 9/10
64 APSK	32/45 to 5/6
ACM	Supported
Es/No Range (QEF)	-2 to +30 dB
Bits/Hz Range	0.6 to 4.95
ModCod Selection	Automatic Preferred Table
Smart Carrier Canceling	Supported See Details
AUPC	Supported
Data Interface	GBe Layer 2 Bridge

Network Interface

WAN Encapsulation – DVBS2	GSE per ETSI TS 102 606
WAN Encapsulation	GSE-Low Overhead HDLC
Protocols	IPv4, IPv6, VLAN, MPLS
QoS Priority	WRED, Strict
Jumbo Frames	≤10k bytes
LAN Ports	2 ports, Auto-Neg, RJ-45

Modulator

Available Waveforms (TX/RX Independent)	Flex LDPC, DVB-S2X
Output Level (dBm)	+5 to -35
Output Level Accuracy (dB)	±0.5 over Freq and Temp
Output Impedance (ohm)	50
Output Ret Loss (dB) / VSWR	> 14 / 1.5:1
Output Off Isolation (dBc/4KHz)	< -60
Phase Noise	> Intelsat by 6 dB typical or MIL-STD-165B
Int/Ext Ref Frequency (MHz)	10 or 50
Ext Ref Level Output (dBm)	+5
SMA Type (F) Connector [N Type (F) Adapter Optional]	

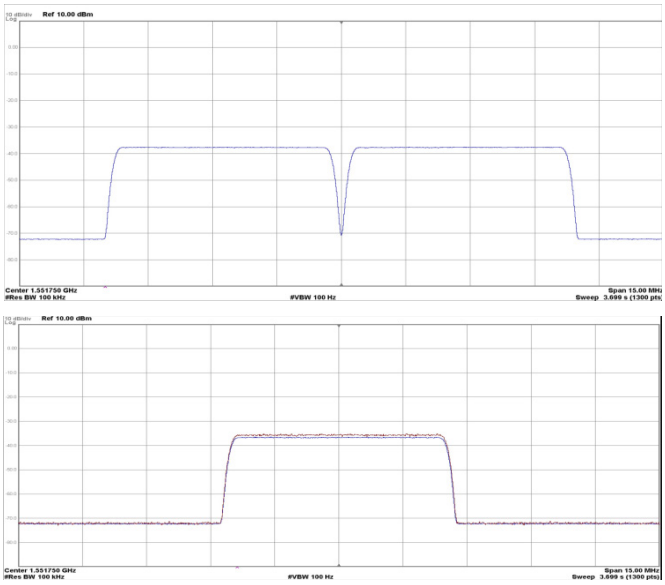
Demodulator

Available Waveforms	Flex LDPC, Flex LDPC Multi-Demod (16 RX) DVB-S2X, DVB-S2X Dual-Demod (2 RX)
Input Acquisition Range	±100 Hz to ±3 MHz (1 Hz Steps)
Min Input Level (dBm)	10 Log(SymRate) – 130 = Lvl
Max Input Level (dBm)	10 Log(SymRate) – 80 = Lvl
Max IF Input Power Density (dBc/Hz)	+20
Max Total Power (dBm)	+10
Input Impedance (ohm)	50
Input Ret Loss (dB) / VSWR	> 14 / 1.5:1
Input Phase Noise	> Intelsat by 6 dB typical, 4 dB min
Acquisition & Doppler Tracking Range	±10% of SymRate
Max Freq Shift Rate (Hz): QPSK ½ ≥16APSK 9/10	 SR*SR/12.5E6 SR*SR/10.0E6
SMA Type (F) Connector [N Type (F) Adapter Optional]	

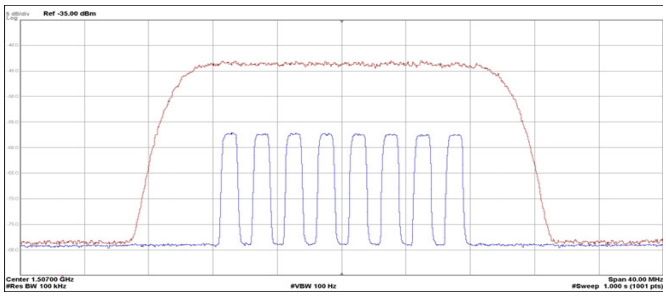
Specifications

Smart Carrier Canceling

Delay Range (msec)	0 to 320
Acquisition Time (Sec)	< 45 for Full Delay Sweep < 2 for 10 ms range
Power Spectral (dB)	±10
Density Ratio (dB)	
Symbol Rate Ratio (%)	±30
SR Frequency Offset (%)	±12.5
Eb/No Degradation (dB)	0
QPSK	0.2
8PSK/QAM	0.3
16APSK	0.5
32APSK	0.7
64APSK	0.8



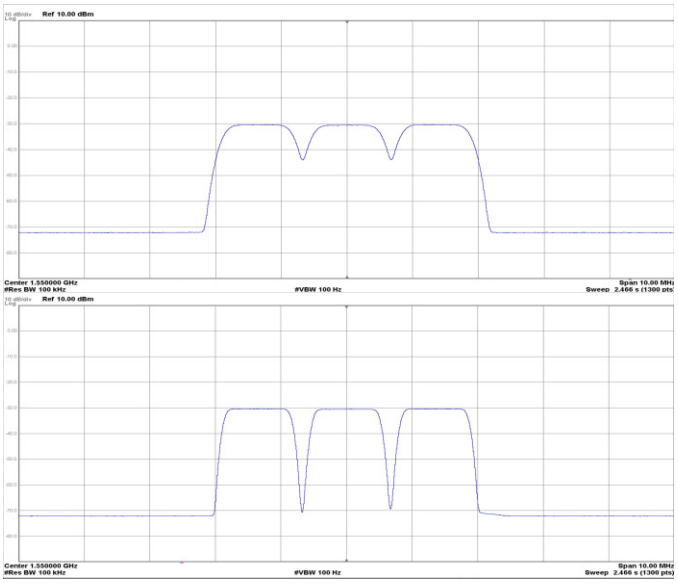
P2P Smart Carrier Bandwidth Savings of 50%



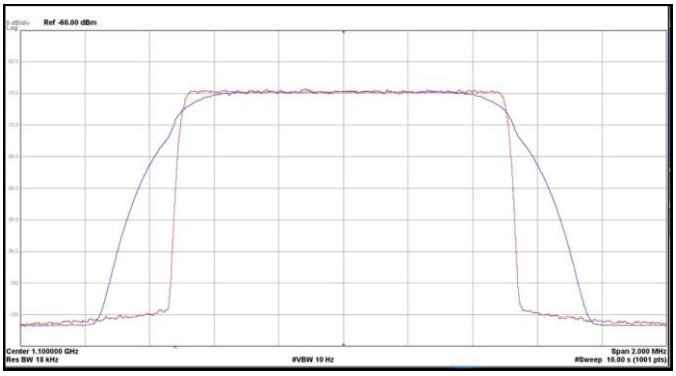
P2MP Hub Carrier Cancelling Bandwidth Savings

Sharp Carrier Technology

Roll-Off Filters .40, .35, .30, .20, .10, .05, .02



Carrier Alpha = 0.35 vs Carrier Alpha = 0.05 Carrier Spacing



Spectrum Analyzer Plot of 0.35 verses 0.02 Roll-off factors

Monitor and Control

IP Control Port	10/100/Gbe Ethernet, RJ-45 Http/Https Web Server SNMP
Serial Control Port	RS-232
Alarm Port	Form C Contact

Certification and Compliance

CE Certified	EN50022 Emissions EN50024 Immunity EN60950 Safety
RoHS	Meets

Configuration Options

- ✓ Simplex DVB-S2X
- ✓ Duplex DVB-S2X
- ✓ Dual DVB-S2X Demods
- ✓ ACM *FlexLDPC*
- ✓ 16 Channel TX LDPC
- ✓ 16 RX Channel LDPC
- ✓ 16 TX Segmented LDPC
- ✓ 16 RX Segmented LDPC
- ✓ TPC, Viterbi, OM-73
- ✓ TRANSEC (AES-256)
- ✓ Spread Spectrum
- ✓ Carrier Canceling
- ✓ Hub Canceling
- ✓ Modulator or Demodulator Only
- ✓ Modulator and Demodulator
- ✓ Hub or Remote

STAX-4 Chassis

Full M7XC System HUB and REMOTE Advantages

Common Hardware Platform
Major SWAP Reduction
Shipping and Logistics Savings
Common Sparing, Training and Support
Single Hardware Platform can Support multiple Network Missions
Highly Robust and Reliable Hardware Package

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