

## Description

The MDM6000 Satellite IP Modem is a versatile next generation modem optimized for a wide range of applications such as cellular backhauling, IP trunking and fiber restoration. The MDM6000 modem is typically installed at both ends of a point-to-point satellite link or at the remote sites of a star network. The unit can work as a modulator, demodulator or modem depending on the network configuration and integrates seamlessly with terrestrial networks and equipment. The modem is in full compliance with the DVB-S2 and DVB-S2X standards, achieving the highest possible efficiency at maximum service availability.

## Efficiency at the Core

The Newtec MDM6000 Satellite Modem combines a number of innovative elements to improve current market available efficiencies, thereby lowering the overall Total Cost of Ownership.

New modulation and Forward Error Correction (FEC) codes up to 256APSK in the DVB-S2X standard in combination with innovative technologies such as 133 Mbaud, Clean Channel Technology®, Bandwidth Cancellation (BWC), Automatic Uplink Power Control (AUPC), FlexACM®, QoS, Shaping and Equalink® 3 are embedded in the modem and bring the satellite link to full efficiency.

Depending on the application, the Newtec MDM6000 Satellite Modem can be used in conjunction with the Newtec HUB6000 Satellite Hub. The performance can be increased even more by adding Newtec's network optimization technologies, such as acceleration, compression and bandwidth management.

## Optimal Availability

Newtec's auto-adaptive technology FlexACM is incorporated in the MDM6000 modem and deals with fading conditions (rain, dust, interference) and inclined orbit satellites. Thanks to FlexACM, fading will no longer interrupt the transmission between the hub and remote sites nor result in loss of data. The maximum possible throughput can be achieved at all times. Additionally, the Automatic Uplink Power Control mechanism ensures maximum use of the link budget at all times.

## Flexibility and Scalability Matching Market's Business Models

The MDM6000 Satellite Modem provides a scalable and flexible platform which allows customers to grow their business depending on their application and investment plan. The modem comes with all features that can be unlocked by means of a very granular licensing scheme depending on the needs as the business grows.

All modulation modes and maximum symbol rate are always available, the capability of the modem is determined by its IP throughput license with rates as low as 1 Mbps up to 425 Mbps in very granular steps. This makes the MDM6000 suitable for either low, medium or high speed links.

The built-in bandwidth canceller completely operates in the digital domain providing unsurpassed performance with the lowest possible residual cancellation noise resulting in the highest spectral efficiency. Non-linear post compensation (NLPC) performs real-time analysis of the complete received spectrum and reduces intermodulation interference that affects the demodulated carrier. Fractional licensing of the bandwidth cancellation option allows for cost-effective redundant setups.

To facilitate ordering, the modem comes with IF and L-band for both TX and RX by default.

The MDM6000 Satellite Modem can be easily monitored and controlled via a comprehensive front panel menu, CLI, advanced web GUI and via SNMP protocol. This enables easy integration into any industry-standard EMS/NMS system.

The Newtec MDM6000 Satellite Modem is a versatile modem which allows service providers and government operations to increase the amount of services or the customer base within the same bandwidth. At the same time it introduces ways to reduce OPEX costs and increase the profitability of their business at maximum efficiency and optimum availability.

# SPECIFICATIONS

## Key Features

- Very granular rate licensing scheme with rates from 1 Mbps up to 425 Mbps bidirectional
- Suitable for low, medium and high speed applications, baudrates up to 133 Mbaud to handle all common transponder sizes
- Clean Channel Technology for additional bandwidth efficiency gains by allowing optimal carrier spacing
- DVB-S2, DVB-S2X (QPSK up to 256APSK)
- Newtec S2 Extensions (up to 64APSK) for closed network operation
- Default IF and L-band on TX and RX for ease of operation
- Optional Equalink 3 for linear and non-linear pre-distortion
- Reduce impact of RF Interferences (RFI) by enabling DVB RF Carrier ID (DVB-CID)
- All MODCODs and baudrates default enabled for flexible and optimal operation of the network
- Intelligent Uplink Power Control
- NLPC (non-linear post compensation) for intermod removal
- FlexACM for adaptive environments like variable interferences from rain and dust or for inclined orbit operation
- Standard GSE encapsulation for minimal overhead
- Support for MPE, ULE and XPE for working with legacy equipment
- Adaptive traffic shaping and bandwidth management allowing maximal SLA adherence even in case of ACM
- Advanced Quality of Service (QoS) for better customer experience
- Easy integration with terrestrial data networks
- Easy operation through secure front panel, SNMP, HTTP and CLI interfaces
- Modified OpenAMIP support to interwork with stabilized antennas from different vendors

## Support Services for your Professional Equipment

Care Pack Basic and Care Pack Enhanced are the Newtec service and support packages protecting your Newtec equipment over a three-year period.

## Architecture

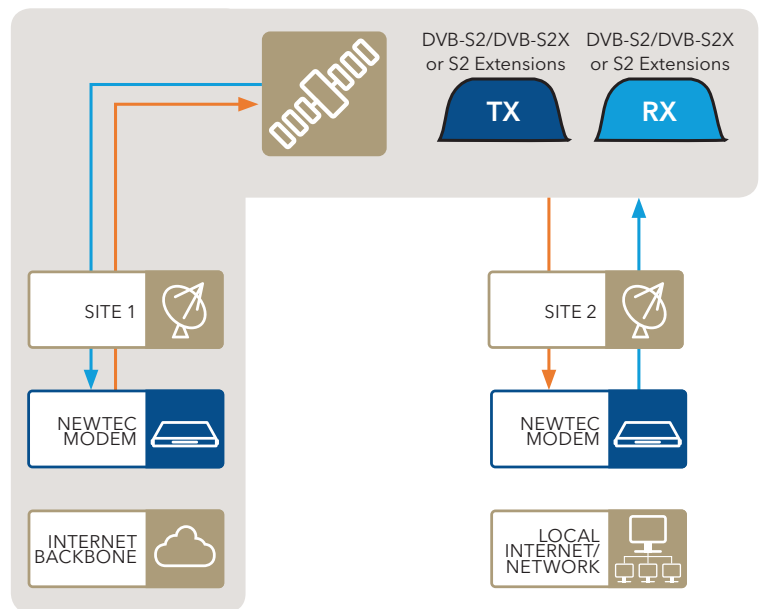
The MDM6000 Satellite Modem can be used at both ends of a point-to-point network or at the remote site of a star network. Depending on the configuration, the unit can be used as a modulator, demodulator or modem.

## Related Products

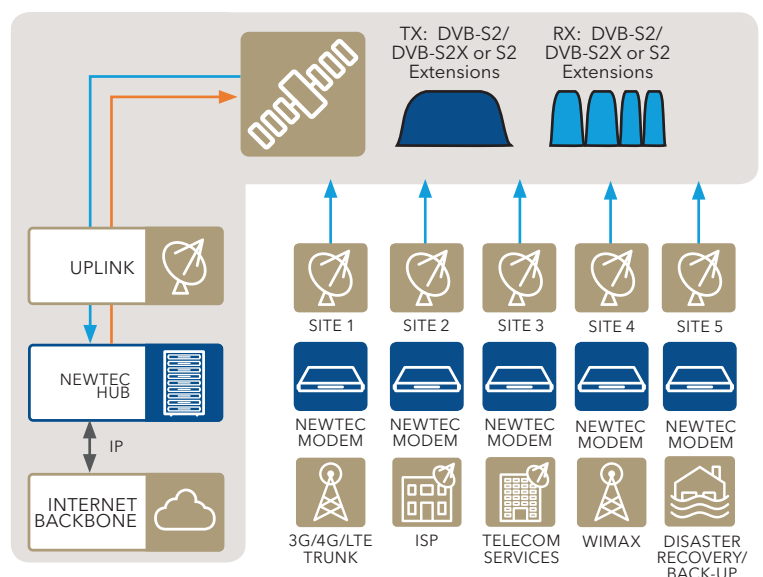
- HUB6000 Satellite Hub
- MDM6100 Broadcast Satellite Modem
- NOP183x PEP Gateways
- NOP184x PEP Servers
- USS02x2 Redundancy Switch
- FRC07x0 Frequency Converters Portfolio

## Related Bandwidth Efficiency Technologies

- Clean Channel Technology
- Equalink 3
- DVB-S2X
- FlexACM
- Bandwidth Cancellation

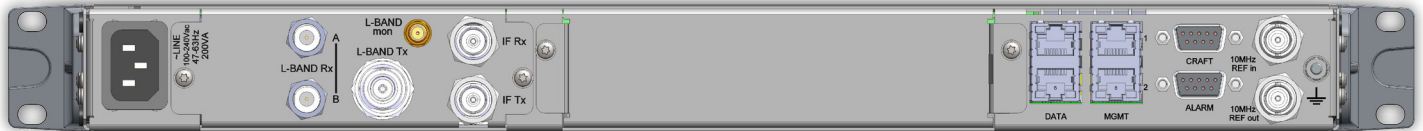


Point-to-point



Point-to-multipoint





## Input Interfaces

- Auto switching 10/100/1000 Base-T Ethernet interfaces
- GSE Encap/Decap performance  

<u>lmax (avg 340 byte)</u>	<u>1500 byte</u>
TX only: 300 Mbps	TX only: 425 Mbps
RX only: 360 Mbps	RX only: 425 Mbps
RX + TX: 523 Mbps	RX + TX: 850 Mbps
- Max PPS (46 byte)  

TX only: 120 kpps
RX only: 150 kpps
RX + TX: 220 kpps
- Maximum Data Rate  
425 Mbps simplex, 850 Mbps duplex
- Layer 2 bridge function: Ethernet over satellite (IPv6/VLAN/MPLS compatible)
- Layer 3 static router function: IPv4 packets over satellite
- Supports Jumbo frames (9216 bytes)
- Up to 100 routes
- Advanced QoS features  
Adaptive Traffic Shaping on bitrate or symbolrate according to PIR/CIR  
Flexible traffic classification on VLAN/MPLS/IPv4/IPv6
- GSE, MPE, XPE or ULE Encapsulation/  
Decapsulation of IP/Ethernet frames in DVB-S2, DVB-S2X and S2 Extensions
- Data filtering (downlink):  
Up to 64 receive filters

## Modulation and Demodulation

### SUPPORTED MODULATION SCHEMES AND FEC

- DVB-S2 (acc. ETSI EN 302 307 v1.2.1 for DVB-S2)
  - Outer/Inner FEC: BCH/LDPC
  - 52 MODCODs (short & normal frames):
    - QPSK: from 1/4 to 9/10
    - 8PSK: from 3/5 to 9/10
    - 16APSK: from 2/3 to 9/10
    - 32APSK: from 3/4 to 9/10
- Newtec S2 Extensions
  - Outer/Inner FEC: BCH/LDPC
  - 54 MODCODs:
    - QPSK: from 45/180 to 144/180
    - 8PSK: from 80/180 to 150/180
    - 16APSK: from 80/180 to 162/180
    - 32APSK: from 100/180 to 162/180
    - 64APSK: from 90/180 to 162/180
  - 29 Linear MODCODs:
    - 8PSK-L: from 80/180 to 120/180
    - 16APSK-L: from 80/180 to 162/180
    - 64APSK-L: from 90/180 to 162/180
- DVB-S2X standard
  - Outer/Inner FEC: BCH/LDPC
  - 53 MODCODs (normal frames):
    - QPSK: from 1/4 to 9/10
    - 8PSK: from 3/5 to 9/10
    - 16APSK: from 26/45 to 9/10
    - 32APSK: from 32/45 to 9/10
    - 64APSK: from 11/15 to 5/6
    - 128APSK: 3/4; 7/9
    - 256APSK: 32/45; 3/4
  - 13 Linear MODCODs (normal frames):
    - 8APSK-L: 5/9; 26/45
    - 16APSK-L: from 1/2 to 2/3
    - 32APSK-L: 2/3
    - 64APSK-L: 32/45
    - 256APSK-L: from 29/45 to 11/15
  - 41 MODCODs (short frames):
    - QPSK: from 11/45 to 8/9
    - 8PSK: from 7/15 to 8/9
    - 16APSK: from 7/15 to 8/9
    - 32APSK: from 2/3 to 8/9
- FlexACM controller (optional)
- FlexACM client (optional)
- Automatic Uplink Power Control

### BAUD RATE RANGE

- SCPC use: 0.256 Mbaud - 133 Mbaud
- BWC use: 0.256 Mbaud - 72 Mbaud

### FRAME LENGTH

- Short frames of 16200 bits for DVB-S2 and DVB-S2X
- Normal frames of 64800 bits for DVB-S2, DVB-S2X and Newtec's S2 Extensions

### CLEAN CHANNEL TECHNOLOGY

- Roll-off: 5% -10% -15% -20% -25% -35%

### EQUALINK 3

- Linear pre-distortion
- Non-linear pre-distortion for all MODCODs

### CARRIER INTERFERENCE REDUCTION

- DVB RF Carrier ID (CID according ETSI TS 103 129 v1.1.1)
- Spread Spectrum Modulator (BPSK)
- Supports User Data
- Compliant to DVB Standard

### BANDWIDTH CANCELLATION (BWC)

- Max symbolrate: 72 Mbaud
- Delay range 0 to 500 ms
- Cancellation range: -10 to +10 dB local to remote carrier
- Cancellation ratio: > 30 dB
- Es/No degradation (dB) at 0 dB cancellation ratio
  - QPSK: 0.1 dB
  - 8PSK: 0.2 dB
  - 16APSK: 0.4 dB
  - 32APSK: 0.6 dB
  - 64APSK: 1.0 dB
  - 128APSK: 1.2 dB
  - 256APSK: 1.5 dB
- Monitoring: delay, frequency offset, local/remote power, local/total power, phase noise
- Fractional license for redundant modem

## Modulation Interfaces

### L-BAND

- Connector N(F), 50 Ohm (optional SMA adapter)
- Frequency 950 - 2150 MHz (10 Hz steps)
- Level -35/+7 dBm (+/- 2 dB)
- Return loss > 14 dB
- Switchable 10 MHz Reference
- Spurious performance  
Better than -65 dBc/4kHz @ +5 dBm output level and > 256 kbaud  
Non-signal related: < -80 dBc @ +5 dBm output

### IF-BAND

- Connector BNC (F) - 75 Ohm (intermateable with 50 Ohm)
- Frequency 50 - 180 MHz (10 Hz steps)
- Level -35/+10 dBm ( $\pm 2$  dB)
- Return loss 50 Ohm : > 14 dB  
75 Ohm : > 20 dB
- Spurious performance  
Better than -65 dBc/4 kHz @ +5 dBm output level and > 256 kbaud  
Non-signal related: < -80 dBc @ +5 dBm output

### L-BAND MONITORING

- Connector SMA (F), 50 Ohm
- Frequency Same as L-Band output frequency or 1050 MHz in case of IF output option only
- Level -45 dBm
- Return loss > 10 dB

### 10 MHZ REFERENCE OUTPUT (OPTIONAL)

- Connector BNC (F), 50 Ohm
- Output level +3 dBm (+/- 2dB)

### BUC POWER (OPTIONAL)

- Max. current: 3.8 A
- Voltage: 24 V, 48 V (Software controlled)

## Demodulation Interfaces

### DUAL L-BAND INPUT

- Connector 2 x F-type (F), 75 Ohm
- Return loss > 7 dB (75 Ohm - F(F))
- Maximum total input power: -10 dBm
- Maximum input signal power:  $(-30 + 10\log(f))$  dBm where f=baud rate in Mbaud
- Minimum input signal power:  $(-80 + Es/No(thr) + 10\log(f))$  dBm where f=baud rate in Mbaud and  $Es/No(thr) = Es/No$  value in dB for QEF reception
- Frequency 950 - 2150 MHz
- Adjacent signal <  $(Co+7)$  dBm/Hz with  $Co =$  signal level density

### IF-BAND INPUT

- Connector BNC (F) - 75 Ohm
- Return loss > 15 dB
- Level See L-band input level spec above +10 dBm
- Frequency 50 - 180 MHz
- Adjacent signal <  $(Co+7)$  dBm/Hz with  $Co =$  signal level density

### LNB POWER AND CONTROL

- Max. current 350 mA (on selected IFL input)
- DiSEqC control

## Internal 10 MHz Reference Frequency

### STANDARD STABILITY

- Stability: +/- 2000 ppb over 0 to 70° C
- Ageing: +/- 1000 ppb/year

### VERY HIGH STABILITY (OPTIONAL)

- Stability: +/- 2 ppb over 0 to 65°C
- Ageing: +/- 500 ppb/10 year

## Generic

### MONITOR AND CONTROL INTERFACES

- M&C connectivity via separate Ethernet links
- Web server GUI (HTTP) via web browser
- Diagnostics report, alarm log (HTTP)
- SNMP v2c
- Modified OpenAMIP protocol to control stabilized antenna from modem

### ALARM INTERFACE

- Electrical dual contact closure alarm contacts
- Connector 9-pin sub-D (F)
- Logical interface and general device alarm

## Physical

- Height 1RU, width: 19", depth 51 cm, 5.8 kg
- Power supply: 90-130 & 180-260 Vac, 125 VA, 47-63 Hz or 36-76 VDC, 160 W
- Temperature:  
Operational: 0°C to +50°C / +32°F to +122°F  
Storage: -40° to +70°C / -40°F to +158°F
- Humidity: 5% to 85% non-condensing
- CE label and UL

Newtec MDM6000 Satellite Modem Release 3.1		Ordering n°
<b>Configuration Options Category</b>		<b>MDM6000</b>
Hardware Platform	Chassis Version 03 (Modem)	CH-03
Operating Software	MDM6000 Major Software version R3*	MS-30
Efficiency Optimization Package	DVB-S2, DVB-S2X and S2 Ext, CCT and AUPC	OP-04
Demodulator Hardware	Class 3 (wide band up to 133 Mbaud)	DH-03
Modulator Output Interface	IF+ L-band with switchable 10 MHz out* IF+L-band + 10 MHz output + 24/48 V BUC**	OU-02 OU-06
Internal Reference Clock	Standard 10 MHz Very High Stability 10 MHz	IR-00 IR-02
Reference Clock Output	10 MHz Reference Output (BNC)	RO-01
Mains Power Supply Unit	PSU Single AC 110/240 V PSU Dual Redundant AC 110/240 V PSU Single DC 48 V** PSU Dual DC 48 V**	PS-00 PS-01 PS-10 PS-11
Outbound Rates	Outbound Rate*	1 - 425 Mbit/s
Inbound rates	Inbound Rate*	1 - 425 Mbit/s
<b>Additional Options Category</b>		
Outbound ACM	TX FlexACM point-to-point *	1-425 Mbit/s
Inbound ACM	RX FlexACM Client*	1-425 Mbit/s
Bandwidth cancellation	Full license or fractional license*	1-425 Mbit/s
BBF output	Transparent BBF over IP output*	TB-01
Pre-Distortion	Equalink 3*	AE-01
Modulator Output Connector	L-Band output N to SMA output adapter	OU-10
<b>Services Category</b>		
Support	Care Pack 3 Basic Care Pack 3 Enhanced	GA-08 GA-09

(\*) Selectable via license key

(\*\*) Option PS-10 and PS-11 are mutually exclusive with option OU-06  
Contact your sales representative for details (sales@newtec.eu).

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