The EL178 is a state-of-the-art satellite modulator optimized for high speed IP applications over satellite in compliance with the DVB-S2 standard. As a real IP product, this modulator performs IP processing functions such as packet filtering, routing and encapsulation. In order to achieve speeds up to 160 Mbit/s, only the fastest and most bandwidth-efficient encapsulation and modulation parameters are supported.

For point-to-point backbone links, the EL178 can be used in conjunction with the high speed IP satellite demodulator EL978. In star networks, such as the configuration used in IP trunking and government, the EL178 can be used in conjunction with the high speed modem EL478 in each of the remote sites.

The EL178 offers a dual auto-switching Gigabit Ethernet interface and integrates seamlessly with terrestrial IP networks and equipment. The incoming IP packets can be filtered using e.g. VLAN or MAC addresses, transmitted transparently (bridging) or routed to several destination addresses using Newtec’s Extended Performance (XPE) Encapsulation.

The EL178 supports the DVB-S2 Multistream mode, allowing the IP traffic to be divided in several streams, each stream being transmitted with its own identifier. When the Variable Coding and Modulation (VCM) mode is activated, each stream can be transmitted with its own set of modulation parameters, further optimizing the transmission efficiency when different streams are intended to different receiving sites.

To protect the satellite transmission, the AES encryption option can be activated. AES allows to scramble the content of DVB-S2 streams with a high security level. The AES technology ensures the continuity of service without transmission outages or data losses when encryption keys are changed.

At the output of the modulator, the signal is available on an L-band interface. Extended L-band, IF-band as well as BUC power supply and reference frequency are available as configuration options, providing a compact and cost effective solution.

When activated, the unique linear and non-linear predistortion option Equalink™ provides an additional link margin improvement of up to 2dB, truly unleashing the full efficiency of higher modulation schemes such as 16 and 32 APSK.

Clean Channel Technology™ is available on the EL178 High Speed IP modulator as an option. Clean Channel Technology™ further improves satellite efficiency by up to 15% compared to the current DVB-S2 standard. Newtec’s customers will be able to immediately benefit from Clean Channel Technology™ as it is available as a software field upgrade for existing Newtec equipment.

**Key features**
- DVB-S2 compliant
- QPSK, 8PSK, 16APSK and 32APSK
- Data rates up to 160 Mbit/s
- XPE encapsulation
- L-band monitoring output
- Programmable amplitude slope equalizer
- Optional extended L-band
- Optional 10 MHz reference input/output
- Optional switchable BUC power supply on L-band output
- Optional Linear and non-linear predistortion (Equalink™)
- DVB-S2 Multistream
- Optional VCM and ACM operation (FlexACM)
- Optional AES encryption
- Optional Clean Channel Technology™

**Main advantages**
- Enables high speed IP links over satellite
- Lower operational costs thanks to highest bandwidth efficiency
- Easy integration with terrestrial IP networks and routers
- High versatility and flexibility
- Secure and encrypted satellite transmissions
- Fit for operations over Inclined Orbit Satellites

**Applications**
- Backbone / Leased line in the sky
- IP trunking for ISPs
- IP Backhauling & WiMax
- Disaster recovery
- Government and Defence networks

**Related products**
- EL170 IP satellite modulator
- EL470 IP satellite modem
- EL478 High speed IP satellite modem
- EL940 IP satellite receiver
- EL970 IP satellite demodulator
- EL978 High speed IP satellite demodulator
- EL501 Elevation IP Hub
- ELBxx Protocol Enhancement Proxy IP appliances
- AZ7x0 Frequency converters
- AZ210 1+1 Modulator Redundancy Switch
- AZ2xx Universal Switching System

**Related Documents**
- White paper Equalink™
- White paper optimization of satellite capacity
- Care Pack Brochure
- Reference cases
- Application notes
Specifications - EL178 (R9)

Input interface
- Auto switching 10/100/1000 Base-T Ethernet interface
- Maximum rate: 160 Mbit/s or 78,000 packets per second
- Layer 2 bridge mode: Ethernet frames over satellite
- Layer 3 bridge or router mode: IP packets over satellite
- Encapsulation: Extended Performance Encapsulation (XPE) - Newtec's highly efficient encapsulation protocol for the encapsulation of Ethernet/IP frames in DVB-S2 Base-Band frames
- Filtering and routing capabilities:
  - Up to 32 VLAN filters
  - Up to 255 MAC filters
  - Up to 255 IP routes/air-router addresses
  - Up to 16 DVB-S2 streams
- Proxy ARP support
- DVB-S2 Multistream
- AES 64 bit encryption

Modulation
Supported modulation schemes and FEC
- DVB-S2
  - Outer/inner FEC: BCH/ LDPC
  - MODCODS:
    - QPSK: 1/2, 3/4, 5/6, 3/4, 5/6, 6/8, 9/10
    - 8PSK: 3/4, 3/5, 4/5, 6/8, 9/10
    - 16APSK: 3/4, 3/5, 4/5, 6/8, 9/10
    - 32APSK: 3/4, 3/5, 4/5, 6/8, 9/10
  - VCM support (optional)
  - Embedded point-to-point FlexACM controller (optional)

Baud rate range
- DVB-S2
  - QPSK/8PSK: 1/2, 3/4, 5/6, 6/8, 9/10
  - 8PSK: 3/4, 3/5, 4/5, 6/8, 9/10

Frame length
- DVB-S2 Normal Frames 64800 bits

Roll-off factor
- 20 % - 25 % - 35 %

Clean Channel Technology™
- Roll-Off: 5% - 10% - 15% - 20% - 25% - 35%
- Advanced filter technology

Output interfaces
L-band output (default):
- Connector: SMA (F), 50 ohms
- Return loss: > 14 dB
- Level: -35/-5 dBm (+/- 2 dB)
- Frequency: 950 - 1750 MHz (50 Hz steps)
- Spurious: better than -65 dBc/4 kHz @ +5 dBm level and > 256 kbaud

Extended L-band output (optional):
- Connector: SMA (F), 50 ohms
- Return loss: > 14 dB
- Level: -35/-5 dBm (+/- 2 dB)
- Frequency: 950 - 2150 MHz (50 Hz steps)
- Spurious: better than -65 dBc/4 kHz @ +5 dBm level and > 256 kbaud

IF-band (optional):
- Connector: BNC (F), 50 ohms
- Return loss: > 14 dB
- Level: -30/-5 dBm (+/- 3 dB)
- Frequency: 50 - 180 MHz (50 Hz steps)
- Spurious: better than -65 dBc/4 kHz @ -10 dBm level and > 256 kbaud

BUC power and reference frequency (optional):
- Max. current: 3 A
- Voltage: 24V, 48V
- Frequency: 10 MHz
- Stability: ±5x10^-8 over 0°C to 65°C

With this option installed, the L-band output connectors become N(F), 50 ohms

10 MHz reference input / output (optional):
- Connector: BNC (F), 50 ohms
- Input level: -3dBm up to 7dBm
- Output level: +7dBm

Internal Reference frequency
High Stability (optional)
- Stability: ±5x10^-8 over 0°C to 70°C
- Ageing: ± 0.5 ppm/year

Very High Stability (optional)
- ±2x10^-9 over 0°C to 65°C
- Ageing: ± 500 ppm/10 year

Generic

Monitor and control interfaces
- Web based GUI
- Diagnostics report, alarm log
- RMCP over TCP/IP/UDP and RS232/RS485
- SNMP v2c

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

Physical
- 1RU width, 19", depth 51 cm, 6 kg
- Power supply: 90-130 & 180-260 Vac, 105 VA, 47-63 Hz
- Temperature:
  - Operation: 0°C to 40°C
  - Storage: -40 to +70°C
- Humidity: 5% to 85% non-condensing
- CE label

Cleaning Interface Technology™
- Spurious: better than -65 dBc/4 kHz @ +5 dBm level and > 256 kbaud
- Frequency: 50 - 180 MHz (50 Hz steps)
- Return loss: 50 ohms: > 14 dB, 75 ohms: > 20 dB

Ordering information

EL178 HIGH SPEED IP SATELLITE MODULATOR

Ordering Information

Default Configuration
DVB-S2 IP modulator with QAM interface, QPSK, BPSK, 16APSK 45 Mbaud, 32APSK 33 Mbaud, XPL Advanced Multistream, SNMP
Output interface: L-band 950-1750 MHz

Configuration options

<table>
<thead>
<tr>
<th>Category</th>
<th>Max. 1 option per category</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-band (950-1750 MHz)</td>
<td>Default</td>
</tr>
<tr>
<td>IF (10-180 MHz)</td>
<td>AA-02</td>
</tr>
<tr>
<td>L-band + 10 MHz for BUC</td>
<td>AA-03</td>
</tr>
<tr>
<td>Output interface</td>
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</tr>
<tr>
<td>L-band + 10 MHz + 24Vdc for BUC</td>
<td>AA-12</td>
</tr>
<tr>
<td>Extended L-band (950 - 2150 MHz)</td>
<td>AA-18</td>
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<tr>
<td>IF + L-band</td>
<td>AA-06</td>
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Additional options

<table>
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<tbody>
<tr>
<td>10MHz reference In/Out</td>
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<tr>
<td>High stability: 1ppm</td>
<td>GR-01</td>
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<tr>
<td>Very high stability: 0.01 ppm</td>
<td>GR-02</td>
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<tr>
<td>Encryption</td>
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<tr>
<td>AES 64 bit encryption</td>
<td>AG-01</td>
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<tr>
<td>Clean Channel Technology™</td>
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<tr>
<td>Clean Channel Technology for 45 Mbaud*</td>
<td>AI-04</td>
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<td>Predistortion</td>
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<td>Equalink®</td>
<td>AC-01</td>
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<tr>
<td>VCM/ACM</td>
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<tr>
<td>VCM*</td>
<td>AN-01</td>
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<tr>
<td>VCM + Point-to-Point ACM controller</td>
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Services

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<tr>
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<tr>
<td>Assistance</td>
<td>Care Pack Basic</td>
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<tr>
<td></td>
<td>Care Pack Extended</td>
</tr>
</tbody>
</table>

(*): Upgradeable via license key

Other configurations and options such as RF output interfaces, are available on request. Contact your sales representative for details (sales@newtec.eu).

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