**DESCRIPTION**

Being fully compliant to the second standard for Digital Video Broadcasting over Satellite (DVB-S2, EN 302307), the Newtec satellite modulator NTC/2277/xF is one of the first modulators to offer the advantages of DVB-S2:

1. Much better spectral efficiency than DVB-S thanks to the use of new advanced high-level coding techniques: BCH replaces Reed Solomon and LDPC replaces Viterbi
2. New modulation schemes: 16 APSK & 32 APSK
3. More roll-off factors (20, 25 & 35 %)

Implementing all these new techniques, DVB-S2 results in a bandwidth saving of up to 30 % in CCM (or 2.5 dB gain margin) and up to 65% in VCM mode compared to DVB-S. The NTC/2277/xF is also capable of working in DVB-S and DVB-DSNG mode.

Like its predecessor, the NTC/2177 DVB-S modulator, the NTC/2277/xF is a member of the field-proven modular Azimuth series and is designed to packetize, encode and modulate one or more digital signals such as IP traffic or MPEG Transport Streams. At the output, the signal is converted to an IF band signal (50-180 MHz).

The NTC/2277/xF has been designed for the broadcasting, contribution or distribution of digital television signals as well as the transmission of high-speed TELCO data in backbone infrastructures and data content distribution networks.

The NTC/2277/xF has two physical input interface positions that can be fitted with a range of interface modules: A DVB (ASI, SPI, LVDS) and a TELCO (HSSI/G703) interface module provide a standard data input to the modulator. The NTC/2277/xF can be fitted with any combinations of these cards. An IP GbE interface is also available. This module has an RJ-45 input and 2 ASI inputs/outputs. In combination with the GbE module (NTC/7015/xx) VCM/ACM applications become reality. For an overview see “Versions & Options” on page 2.

The DVB-S2 modulator NTC/2277/xF handles symbol rates from 0.05 up to 68 Mbaud, using a QPSK, 8PSK, 16APSK or 32APSK modulation scheme. The roll-off factor is selectable between 0.2, 0.25 or 0.35 in both DVB-S and DVB-S2 mode.

The NTC/2277/xF is standard equipped with an IF-band output. An L-band monitoring output is provided for connection of e.g. an IRD or spectrum analyzer. Optionally, the NTC/2277/xF can be equipped with an additional L-band output. A programmable digital equalizer is provided to compensate for external amplitude slopes.

The optional Equalink™ concept provides for pre-compensation of linear and non-linear satellite link distortions resulting in optimization of transponder data throughput.

All Control and Monitoring parameters are available locally on the front panel (LCD display & keyboard) and remotely through a web interface (Http) or through the RS-485/232 port or through the 10/100 Base-T Ethernet port. The last two use the RMCPv2 protocol. There is optionally an SNMP + MIB agent.

A dual contact closure output is available for 2 types of summary alarms: one contact is operated in case of device alarms, while the other contact opens (or closes) in case of input or output interface alarms.

Inherent to its modular design, the modulator can be SW-upgraded to a higher capability (data rate, modulation schemes, functionalities, etc.) after ordering the corresponding password, which is simply keyed-in by the customer.

**APPLICATIONS**

Up to 68 Mbaud data rate transmission of satellite services such as broadcast, distribution or contribution of Digital TV (HDTV / SDTV) signals, Digital Satellite News Gathering, data content distribution, trunking and other professional applications.

**FEATURES**

- DVB-S2 compliant (EN 302307)
- DVB-S compliant (EN 300421)
- DVB-DSNG compliant (EN 301210)
- Data rates & modulation schemes are coupled on the available DVB-S2 data rates and modulation schemes.
- Two optional DVB, TELCO input interface
- CCM (Constant Coding and Modulation)
- VCM/ACM (Variable Coding and Modulation / Adaptive Coding and Modulation) mode, requires the GbE interface card
- Insertion of MPEG Transport Stream framing
- Independent error coding and modulation scheme for each physical or logical input
- 50 kbit/s up to 216 Mbps interface rate (FEC- & interface dependent)
- QPSK, 8PSK, 16APSK and 32APSK for optimal bandwidth efficiency in DVB-S2
- Automatic (redundancy switching) or manual ASI data input switching
- Ovenised 10.0 MHz reference frequency (option)
- External 10.0 MHz reference input/output (option)
- L-band monitoring output (fixed frequency)
- Programmable external LO frequency
- Level indication offset
- Programmable amplitude slope equalizer
- The Equalink™ option for compensation of linear amplitude and group-delay distortions and nonlinear distortions over the satellite link.
- Local & remote M&C access to all menus through a web interface (Http protocol)
- * RS-485/RS-232 (RMCP v2 protocol)
- * 10/100 Base-T Ethernet port (RMCP v2 protocol)
- 50 or 75 Ohm IF output selectable
- User-programmable menu structure
- Action Keys (group of commands under single button)
- Real-time clock for alarm occurrence logging
## AZIMUTH SERIES

### VARIABLE RATE IF-BAND DVB-S2

#### SATellite Modulator

<table>
<thead>
<tr>
<th>NTC/2277/xF</th>
<th>QPSK+8PSK+16 QAM when working in DVB-S/DSNG mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTC/7020/BBDx</td>
<td>QPSK+8PSK+16APSK+32APSK modulation (DVB-S2 mode)</td>
</tr>
<tr>
<td>NTC/7020/BBx</td>
<td>QPSK+8PSK+16 QAM when working in DVB-S/DSNG mode</td>
</tr>
<tr>
<td>NTC/7020/BBxB</td>
<td>max 5 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/BBxC</td>
<td>max 15 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/BBxD</td>
<td>max 25 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/BBxE</td>
<td>max 30 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/BBx</td>
<td>max 45 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/BBx</td>
<td>max 68 Mbaud (60 Mbaud when working in DVB-S/DSNG mode)</td>
</tr>
</tbody>
</table>

For example, if the modulator has to work (DVB-S2, CCM mode) in QPSK+8PSK+16APSK at a max baud rate of 45 Mbaud, the NTC/7020/BBCD has to be ordered. This modulator NTC/7020/BBCD will also work in DVB-S/DSNG mode (QPSK+8PSK+16 QAM at 45 Mbaud).

For the Equalink™ option, order NTC/2030/AA (in combination with DVB-S2 modulation only).

**For customers who want to work in DVB-S/DSNG only** (as replacement of the NTC/2177), the following types are available:

<table>
<thead>
<tr>
<th>NTC/7020/ACxx</th>
<th>DVB-S/DSNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTC/7020/ACAx</td>
<td>QPSK modulation scheme</td>
</tr>
<tr>
<td>NTC/7020/ACBx</td>
<td>QPSK+8PSK modulation scheme</td>
</tr>
<tr>
<td>NTC/7020/ACAx</td>
<td>QPSK+8PSK+16QAM modulation scheme</td>
</tr>
<tr>
<td>NTC/7020/ACx</td>
<td>max 5 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/ACB</td>
<td>max 10 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/AC</td>
<td>max 15 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/AC</td>
<td>max 20 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/AC</td>
<td>max 30 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/AC</td>
<td>max 45 Mbaud</td>
</tr>
<tr>
<td>NTC/7020/ACx</td>
<td>max 60 Mbaud</td>
</tr>
</tbody>
</table>

### 2nd Tx outgoing L-band (optional):

The NTC/2277/xF modulator can be fitted with the NTC/3474/AA L-band (950-1750 MHz) agile frequency converter.

With this option installed, the NTC/2277/xF can be used in two different modes of operations:

1) **as IF modulator with an agile IF output:** In this mode, the L-band output is disregarded, and the IF band is fully agile (the output frequency can be ranging between 52 and 88 or 104 and 176 MHz).

2) **as L-band modulator with an agile L-band output and fixed IF band output:** The L-band output frequency can be any value between 950 and 1750 MHz, while the IF output is selectable between 70 MHz or 140 MHz.

In both cases a fixed L-band monitoring (1080 MHz) output is available.

### 10 MHz Reference Board:

One of the following 10 MHz ref. boards is always required whenever an external 10 MHz reference input and/or output is required.

- NTC/3462.A.A : 10 MHz OCXO reference Oscillator (normal use)  
  Temperature stability: 0.05 ppm
- NTC/3462.A.A : 10 MHz OCXO High Stability Ref. Oscillator  
  (recommended only with carriers < 1MHz)  
  Temperature stability: 0.002 ppm)

### SNMP agent and MIB library

Needed whenever the unit needs to be controlled over Ethernet via proprietary NMS.

- NTC/2277.xx.xB.
**DATA SUMMARY**

**DATA INTERFACE**
- ASI/SP/serial-LVDS (see data sheet NTC/3453.x.xx) and/or
- Single rate G703 w. Ext. clock + HSSI (see data sheet NTC/3458.Ax.x), or
- IP Gigabit Ethernet card (see datasheet NTC/7015/P).

**IF-BAND OUTPUT**
Operational output
- Level : -30/+5 dBm (± 3 dB)
- Frequency : 50 - 180 MHz (adjustable in steps of 50 Hz)
- Connector : BNC (F) - 75 Ohm (intermateable with 50 Ohm or 75 Ohm BNC)
- Return loss : 50 Ohm : > 14 dB
  75 Ohm : > 20 dB

with the L-band output installed, the IF output becomes fixed (70 or 140 MHz) and output level range is -34/+1 dBm (+/- 3 dB).

**L-BAND MONITORING OUTPUT**
level : -45 dBm
frequency : 1080 MHz (fixed frequency)
connector : SMA (F) - 50 Ohm
return loss (50): > 7 dB

**L-BAND OUTPUT (option)**
Output connector : SMA (F)
L-band output impedance : 50 Ohm
L-band output level : -30 to + 0 dBm (+/- 3dBm)
L-band 1 dB compres. outp : +10 dBm
Programmable L-band gain : -20 to +20 dB
(750MHz @-10dBm => L-band)
L-band gain stepsize : 0.1 dB
IF-BAND ONLY (frequency agile) OUTPUT mode is selectable and is enabled after a power reset.

**PHASE NOISE**
10 Hz : <-50 dBcHz
100 Hz : <-70 dBcHz
1 kHz : <-80 dBcHz
10 kHz : <-85 dBcHz
100 kHz : <-95 dBcHz

**SPURIOUS**
better than 65 dBc @ -10 dBm

**INNER FEC CODING (LDPC)**
1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4
4/5, 5/6, 8/9, 9/10
16200 and 64800 bit blocks

**BIT MAPPING**
- QPSK, 8PSK, 16APSK, 32APSK

**DVB-S2 COMPLIANT (EN 302307)**
- Single or multiple Transport Stream/Data Input interface
- Null-packet deletion
- CRC-8 Encoding
- Base Band Signalling
- Base Band Scrambling
- Outer FEC coding (BCH)
- Bit Interleaving
- Physical Layer Framing
- Physical Layer Dummy Frame insertion
- Physical Layer Scrambling
- Base Band Shaping (roll-off 0.2, 0.25, 0.35)

in DVB-S mode only : 300421 and EN 301210 compliant :
- MPEG-2 interface synchronisation
- MPEG-2 transport adaptation
- Energy dispersal (synchronous)
- RS-coding : 188/204
- Convolutional interleaving i = 12
- FEC-coding : 1/2, 2/3, 3/4, 5/6, 7/8 with QPSK modul.
  2/3, 5/6, 8/9 with 8PSK modulation
  3/4, 7/8 with 16QAM modulation
- Base Band Shaping (roll-off 0.2, 0.25, 0.35)

**INTERNAL REFERENCE FREQUENCY**
- Standard : ± 5 ppm
- Ageing : ± 5 ppm/10 years
- Optional 10 MHz reference board :
  see datasheet NTC/3462.Ax.A
  AA.A version: +/- 0.002 ppm
  AB.A version: +/- 0.005 ppm

**EXTERNAL 10.0 MHz REFERENCE** (option):
- Input level : -3 dBm up to +7 dBm
- Output level : +7 dBm

**MONITOR & CONTROL INTERFACES**
- a) protocol : Http (via web-browser)
  connector : RJ-45
  electrical : Ethernet 10 base-T
- b) protocol : RMCP version 2 only
  connector : 9 pin sub-D female
  electrical : RS-485 / RS-232
- c) protocol : RMCP version 2 only over TCP-IP or UDP, SNMP
  connector : RJ-45
  electrical : Ethernet 10 base-T

**ALARM INTERFACE**
- Connector : 9 pin sub-D (F)
- Electrical : interface + device alarms

**MECHANICAL**
- 19" sub rack, height: 1RU, weight 6 kg, depth 51 cm

**POWER SUPPLY**
- 90-130/180-260V, 105VA, 47–63 Hz

**TEMPERATURE**
- Operational : 0° up to +40°C
- Storage : -40° up to +70°C

**Control**
- Physical input selection, logical input selection (VLAN tag or MAC address), interface rate (1 bit/s resol.) and symbol rate (1 baud resol.), data framing (MPEG TS internal/external, generic mode, Data Piping), rate adaptation, input buffer size, FEC-rate, Modulation scheme, IF frequency (95 Hz resol.), 10.0 MHz source (internal or external), internal PRBS generator/detector
**Performance**

Interface bit rate vs satellite baud rate in DVB-S mode:

Satellite baud rate: 50 kbaud to 68 Mbaud

**Interface Rate** - 188 byte

<table>
<thead>
<tr>
<th>Modul.</th>
<th>FEC</th>
<th>50 kbaud</th>
<th>1 MBaud</th>
<th>60 Mbaud</th>
<th>-3dB</th>
<th>-26dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSK</td>
<td>1/2</td>
<td>0.046</td>
<td>0.922</td>
<td>55.294</td>
<td>1.085</td>
<td>1.465</td>
</tr>
<tr>
<td>QPSK</td>
<td>2/3</td>
<td>0.061</td>
<td>1.229</td>
<td>73.725</td>
<td>0.814</td>
<td>1.099</td>
</tr>
<tr>
<td>QPSK</td>
<td>3/4</td>
<td>0.069</td>
<td>1.383</td>
<td>82.941</td>
<td>0.723</td>
<td>0.977</td>
</tr>
<tr>
<td>QPSK</td>
<td>5/6</td>
<td>0.077</td>
<td>1.536</td>
<td>92.156</td>
<td>0.651</td>
<td>0.879</td>
</tr>
<tr>
<td>QPSK</td>
<td>6/7</td>
<td>0.079</td>
<td>1.580</td>
<td>94.789</td>
<td>0.633</td>
<td>0.855</td>
</tr>
<tr>
<td>QPSK</td>
<td>7/8</td>
<td>0.081</td>
<td>1.613</td>
<td>96.764</td>
<td>0.620</td>
<td>0.837</td>
</tr>
<tr>
<td>QPSK</td>
<td>N.A.</td>
<td>0.092</td>
<td>1.844</td>
<td>110.568</td>
<td>0.543</td>
<td>0.732</td>
</tr>
<tr>
<td>8PSK</td>
<td>2/3</td>
<td>0.092</td>
<td>1.844</td>
<td>82.941</td>
<td>0.543</td>
<td>0.678</td>
</tr>
<tr>
<td>8PSK</td>
<td>5/6</td>
<td>0.115</td>
<td>2.304</td>
<td>103.676</td>
<td>0.434</td>
<td>0.509</td>
</tr>
<tr>
<td>16QAM</td>
<td>3/4</td>
<td>0.138</td>
<td>2.765</td>
<td>124.412</td>
<td>0.362</td>
<td>0.452</td>
</tr>
<tr>
<td>16QAM</td>
<td>7/8</td>
<td>0.161</td>
<td>3.226</td>
<td>145.147</td>
<td>0.310</td>
<td>0.388</td>
</tr>
</tbody>
</table>

This table indicates for a certain modulation scheme the input bit stream needed to obtain an output symbol rate of 1Mbaud (also shown for an output symbol rate of 0.05 and 68 Mbaud).

For example: modulation is in 8PSK 2/3, to obtain an output stream of 1Mbaud, the input stream has to be 1,844 Mbit/s. This means a spectral efficiency of 1,844 bits/Hz. For your convenience the table also mentions the input stream to obtain output streams of resp 0.05 Mbaud and 60 Mbaud (these symbol rate limits of the modulator).

Interface bit rate vs satellite baud rate in DVB-S2 mode

<table>
<thead>
<tr>
<th>Modul.</th>
<th>Interface Rate (Mbps)</th>
<th>Bandwidth/Interf. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSK</td>
<td>50k baud</td>
<td>1 MBaud</td>
</tr>
<tr>
<td>QPSK</td>
<td>1/4</td>
<td>0.025</td>
</tr>
<tr>
<td>QPSK</td>
<td>1/3</td>
<td>0.033</td>
</tr>
<tr>
<td>QPSK</td>
<td>2/5</td>
<td>0.039</td>
</tr>
<tr>
<td>QPSK</td>
<td>1/2</td>
<td>0.049</td>
</tr>
<tr>
<td>QPSK</td>
<td>3/5</td>
<td>0.059</td>
</tr>
<tr>
<td>QPSK</td>
<td>2/3</td>
<td>0.066</td>
</tr>
<tr>
<td>QPSK</td>
<td>3/4</td>
<td>0.074</td>
</tr>
<tr>
<td>QPSK</td>
<td>5/6</td>
<td>0.083</td>
</tr>
<tr>
<td>QPSK</td>
<td>8/9</td>
<td>0.098</td>
</tr>
<tr>
<td>QPSK</td>
<td>9/10</td>
<td>0.098</td>
</tr>
<tr>
<td>8PSK</td>
<td>3/5</td>
<td>0.089</td>
</tr>
<tr>
<td>8PSK</td>
<td>2/3</td>
<td>0.069</td>
</tr>
<tr>
<td>8PSK</td>
<td>3/4</td>
<td>0.111</td>
</tr>
<tr>
<td>8PSK</td>
<td>5/6</td>
<td>0.124</td>
</tr>
<tr>
<td>8PSK</td>
<td>8/9</td>
<td>0.132</td>
</tr>
<tr>
<td>8PSK</td>
<td>9/10</td>
<td>0.134</td>
</tr>
<tr>
<td>16QPSK</td>
<td>2/3</td>
<td>0.132</td>
</tr>
<tr>
<td>16QPSK</td>
<td>3/4</td>
<td>0.148</td>
</tr>
<tr>
<td>16QPSK</td>
<td>5/6</td>
<td>0.158</td>
</tr>
<tr>
<td>16QPSK</td>
<td>8/9</td>
<td>0.176</td>
</tr>
<tr>
<td>16QPSK</td>
<td>9/10</td>
<td>0.178</td>
</tr>
</tbody>
</table>

+ = no verification possible above 45 Mbaud

Formulas: see ETSI EN 302 307 v1.1.1 (2004-01) table 5 & 11

Efficiency taken into account the BB header (80 bits) and the PL frame header (1 slot per PLFRAME) without pilots.
• **BLOCK DIAGRAM**

![Block Diagram](image)

• **TECHNICAL LITERATURE & REFERENCES (ALSO AVAILABLE ON OUR WEBSITE)**

**Other related products**

- NTC/2137  Transport stream ASI concentrator-deconcentrator
- NTC/2263/xU  DVB-S2 L-band satellite demodulator
- NTC/2280/xF  DVB-S2 L-band satellite modulator
- NTC/3453  SI/SPI/serial LVDS DVB interface board
- NTC/3458  Dual rate G.703/HSSI data interface board
- NTC/3462  10 MHz reference frequency module
- NTC/3474/AA  IF to L-band agile frequency converter
- NTC/7015/xx  Combined GbE/ASI input/output card
- NTC/7020  DVB-S2 IF-band modulator board
- NTC/7030  DVB-S2 L-band modulator board

**Application notes and technical publications**

- NTC/2280/APN01  Comparison between DVB-S2 (ACM) and DVB-S