• DESCRIPTION

Being fully compliant to the second standard for Digital Video Broadcasting over Satellite (DVB-S2, EN 302307), the Newtec satellite modulator NTC/2280/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 mode (or 2,5 dB gain margin) and up to 65% in VCM mode compared to DVB-S.

The NTC/2280/xF is also capable of working in DVB-S and DVB-DSNG mode.

Like its predecessor, the NTC/2180 DVB-S modulator, the NTC/2280/xF is a member of the field-proven modular Azimuth series and is designed to packetize, encode and modulate one MPEG Transport Stream. At the output, the signal is converted to an L- band signal (950-1750 MHz). The integration of an RF converter is optional.

The NTC/2280/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/2280/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. An IP GbE interface module 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/2280/xF handles symbol rates from 0.05 up to 68 Mbaud, using a QPSK, 8PSK, 16APSK or 32 APSK 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/2280/xF is standard equipped with an L-band output. An L-band monitoring output is provided for connection of e.g. an IRD or spectrum analyzer. A programmable digital equalizer is provided to compensate for external amplitude slopes.

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 alarm 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 is SW- upgradeable 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-DSNG, DVB-S compliant (EN 301210), (EN 300421)
- 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
- 50 kbit/s up to 216 Mbit/s interface rate (FEC- & interface dependent)
- QPSK, 8PSK, 16APSK and 32APSK for optimal bandwidth efficiency in DVB-S2 mode
- Automatic (redundancy switching) or manual ASI data input switching
- Ovenized 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
- Local & remote M&C access to all menus through a
     * web interface (Http protocol)
     * RS-485/RS-232 (RMCPv2 protocol)
     * 10/100Base-T Ethernet port (RMCPv2 + SNMP/MIB)
- User-programmable menu structure
- Real-time clock for alarm occurrence logging
- Internal test-generator and detector (PRBS counter)
- Very compact: 1Ru (height: 4.4 cm !)
- highly reliable Newtec design
- CE label
- Dynamic build-up of alarm menu
- Diagnostics generator
- Action Keys (group of commands under single button)
- The NTC/2280/-NCR can also be ordered to operate in DVB-S mode only as replacement of the NTC/2180-NCR

AZIMUTH SERIES

NTC/2280/xF

• VERSIONS & OPTIONS

The modular architecture opens various possibilities and application fields: Firmware-packages will determine the usage and capabilities of the unit.

1. Base band Data Interface Module :

The interchangeable Base Band data interface modules provide a wide range of input interfaces via coaxial and/or sub-D connectors. Optical inputs and outputs are also available.

- NTC/3453.BA.Ax: DVB ASI/SPI/Serial-LVDS interface card
  Hardware option: optical ASI in/out plug-in NTC/3453.x.x.A
  Firmware options:
    * Automatic rate adapter NTC/3453.x.xB
    * BISS 0,1 & E scrambler NTC/3453.x.xC
    * Automatic rate adapter + BISS scrambler NTC/3453.x.xD

- NTC/3458.Ax.x: TELCO HSSI+2x single rate G703 interface card
    * NTC/3458.AA.A: HSSI-G.703 input 2 to 52 Mbps
    * NTC/3458.AA.B: HSSI-G.703 input 2 to 110 Mbps
    * NTC/3343/AA: G.703 at 8.448 Mb/s submodule used on NTC/3458
    * NTC/3343/AB: G.703 at 6.312 Mb/s submodule used on NTC/3458
    * NTC/3344/AA: G.703 at 16.896 Mb/s submodule used on NTC/3458
    * NTC/3344/AB: G.703 at 34.368 Mb/s submodule used on NTC/3458
    * NTC/3348/AA: G.703 at 44.736 Mb/s submodule used on NTC/3458
    * NTC/3349/AA: G.703 at 2.048 Mb/s submodule used on NTC/3458

- NTC/7015/xx: IP GbE & ASI in/out interface

2. Modulator Board:

The Variable Rate L-band DVB-S2 Modulator is fitted with a modulator board of the NTC/7030 series. The available modulation schemes and maximum baud-rates are part of the firmware capabilities, which are password upgradeable:

Available symbol rates:
5, 15, 30, 45 (both in DVB-S2 & DVB-S/DSNG mode), 60(DVB-S) and 68 (DVB-S2)

Available Modulation schemes:
DVB-S2 QPSK
DVB-S2 QPSK / 8PSK
DVB-S2 QPSK / 8PSK / 16APSK
DVB-S2 QPSK / 8PSK / 16APSK / 32APSK

DVB-S/DSNG QPSK
DVB-S/DSNG QPSK / 8PSK
DVB-S/DSNG QPSK / 8PSK / 16QAM

Types to be specified for the modulator when ordering:

NTC/7030/B**B**xx: CCM mode
NTC/7030/B**V**xx: CCM/VCM/ACM mode

NTC/7030/BB**A**x: QPSK modulation scheme (DVB-S2 mode)
        Works also in QPSK in DVB-S/DSNG mode
NTC/7030/BB**B**x: QPSK+8PSK modulation scheme (DVB-S2-mode)
        QPSK+8PSK when working in DVB-S/DSNG mode
NTC/7030/BB**C**x: QPSK+8PSK+16APSK modulation scheme (DVB-S2 mode)
        QPSK+8PSK+16 QAM when working in DVB-S/DSNG mode
NTC/7030/BB**D**x: QPSK+8PSK+16APSK+32APSK modulation (DVB-S2 mode)
        QPSK+8PSK+16 QAM when working in DVB-S/DSNG mode

NTC/7030/BBx**A**: max   5 Mbaud
NTC/7030/BBx**B**: max 15 Mbaud
NTC/7030/BBx**C**: max 30 Mbaud
NTC/7030/BBx**D**: max 45 Mbaud
NTC/7030/BBx**E**: max 68 Mbaud (60 Mbaud in DVB-S mode)

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/7030/BBCD has to be ordered.
This modulator NTC/7030/BBCD will also work in DVB-S/DSNG mode (QPSK+8PSK+ 16QAM at 45 Mbaud)

For customers who want to work in DVB-S/DSNG only (as replacement of the NTC/2180), the following types are available:

NTC/7030/**AC**xx: DVB-S/DSNG

NTC/7030/AC**A**x: QPSK modulation scheme
NTC/7030/AC**B**x: QPSK+8PSK modulation scheme
NTC/7030/AC**C**x: QPSK+8PSK+16QAM modulation scheme

NTC/7030/ACx**A**: max   5 Mbaud
NTC/7030/ACx**B**: max 15 Mbaud
NTC/7030/ACx**C**: max 30 Mbaud
NTC/7030/ACx**D**: max 45 Mbaud
NTC/7030/ACx**E**: max 60 Mbaud

3. Frequency Converter Modules NTC/3736 and NTC/3750 Series :

The field replaceable converter modules convert the standard L-band output to the required RF-band. They can be installed either within the same chassis, or in the outdoor unit NTC/2505/ZL.
This band ranges from 950 MHz up to 18 GHz :

- None installed   single L-band output only 950 - 1750 MHz.
- NTC/3736.DEx.A L-band to 5850-6650 MHz Conv. mod,
- NTC/3736.EEx.A L-band to 12750-13250 MHz Conv. mod
- NTC/3736.EZx.A L-band to 12890-13250 MHz Conv. mod,
- NTC/3736.HCx.A L-band to 17300-17800 MHz Conv. mod,
- NTC/3736.IZx.A L-band to 17700-18100 MHz Conv. mod,
- NTC/3736.KZx.A L-band to 18100-18400 MHz Conv. mod,
- NTC/3750.GE   L-band to 13750-14500 MHz Conv. mod

- NTC/3736.TBx.A L-band to 3 x active L-band outputs, G=0 dB
- NTC/3750.AA.A Outdoor Unit/LNB L-band conditioner & active 2/4 L-band splitter module
- NTC/3750.AB.A L-band conditioner module for LNB & transceiver (L-band + 10 MHz ref. on same cable)
- NTC/3750.AC.A L-band conditioner module for ODU NTC/2505/ZL (L-band + 100 MHz + DC + M&C)
- NTC/3750.AD.A L-band conditioner module for LNB & transceiver (L-band + 10 MHz ref. on same cable) + active 2/4 L-band splitter module

In special cases where a higher output level is required, line amplifiers are optionally available:
- NTC/3736.xxA: +20 dB L-band line amplifier
- NTC/3750.xxB: +20 dB Ku-band line amplifier
- NTC/3736.xxC: +20 dB C-band line amplifier
- NTC/3736.xxE: +18 dB line amplifier (17.3-18.4 GHz)

4. 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.AB.A : 10 MHz OCXO reference Oscillator (normal use)
        Temperature stability: 0,05 ppm
- NTC/3462.AA.A : 10 MHz OCXO High Stability Ref. Oscillator (recommended only with carriers < 1MHz)
        Temperature stability:0,002 ppm

5. SNMP agent and MIB library

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

- NTC/2280.xx.xB.

• DATA SUMMARY

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

L-BAND OPERATIONAL OUTPUT
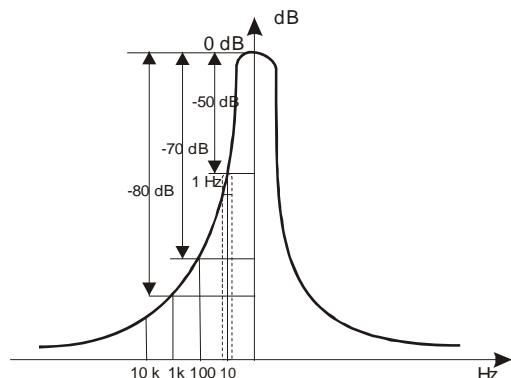|	
Level	: -7/-50 dBm (+/- 2dB)
frequency	: 950 - 1750 MHz (adjustable in steps of 1 Hz)
connector	: SMA (F) - 50 Ohm
return loss	: > 10 dB

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

RF-OUTPUT : see datasheets NTC/3736.xxx.x and NTC/3750.xx.x

PHASE NOISE
10 Hz	: < -50 dBc/Hz
100 Hz	: < -70 dBc/Hz
1 kHz	: < -80 dBc/Hz
10 kHz	: < -85 dBc/Hz
100 kHz	: < -95 dBc/Hz

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 Transport Stream/data Input interface

Null-packet deletion
CRC-8 Encoding
Base Band Signaling
Base Band Scrambling
Outer FEC coding (BCH)
Bit Interleaving
Physical Layer Framing
Physical Layer Signaling
Physical Layer Dummy Frame insertion
Physical Layer Scrambling
Base Band Shaping (roll-off 0.2, 0.25, 0.35)

in DVB-S mode only : EN 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

EXTERNAL 10.0 MHz REFERENCE (option):
Input level	: -3 dBm up to +7 dBm
Output level	: +7 dBm
connector	: BNC (F) - 50 Ohm

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 (F)
electrical	: RS-485 / RS-232
c) protocol	: RMCP **version 2** 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

Modul.	FEC	50 kbaud	1 Mbaud	60 Mbaud	-3dB	-26 dB
		MPEG frames (Mbps)			Bandw./interf.R 35% roll-off	
QPSK	1/2	0.046	**0.922**	55.294	1.085	1.465
QPSK	2/3	0.061	**1.229**	73.725	0.814	1.099
QPSK	3/4	0.069	**1.383**	82.941	0.723	0.977
QPSK	5/6	0.077	**1.536**	92.156	0.651	0.879
QPSK	6/7	0.079	**1.580**	94.789	0.633	0.855
QPSK	7/8	0.081	**1.613**	96.764	0.620	0.837
QPSK	N.A.	0.092	**1.844**	110.588	0.543	0.732
8PSK	2/3	0.092	**1.844**	82.941	0.543	0.678
8PSK	5/6	0.115	**2.304**	103.676	0.434	0.509
16QAM	3/4	0.138	**2.765**	124.412	0.362	0.452
16QAM	7/8	0.161	**3.226**	145.147	0.310	0.388

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).

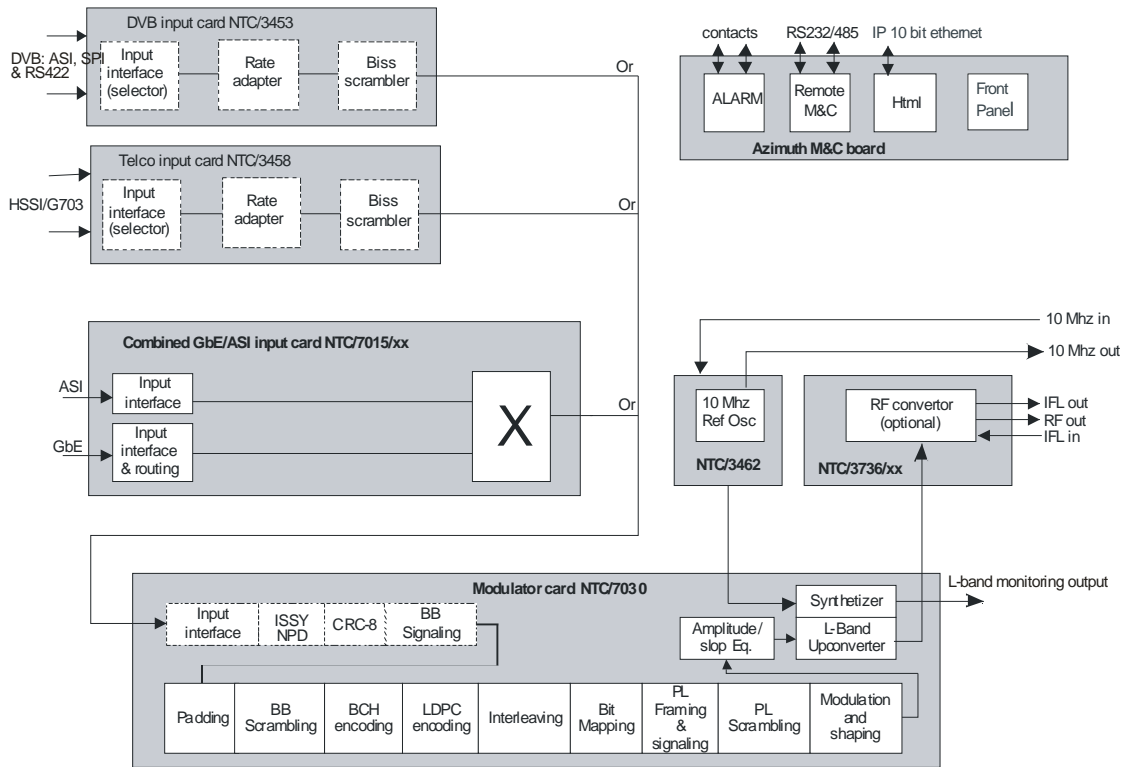**interface bit rate vs satellite baud rate in DVB-S2 mode**

Modul.	FEC	Interface Rate (Mbps) (64800 bit FEC frames)			Bandw./Interf.R. (35% Roll-off)	
		50kBaud	1MBaud	65MBaud	-3dB	-26dB
QPSK	1/4	0,025	0,490	31,866	2,040	2,754*
QPSK	1/3	0,033	0,656	42,669	1,523	2,057*
QPSK	2/5	0,039	0,789	51,312	1,267	1,710
QPSK	1/2	0,049	0,989	64,276	1,011	1,365
QPSK	3/5	0,059	1,188	77,240	0,842	1,136
QPSK	2/3	0,066	1,322	85,946	0,756	1,021
QPSK	3/4	0,074	1,487	96,686	0,672	0,908
QPSK	4/5	0,079	1,587	103,168	0,630	0,851
QPSK	5/6	0,083	1,655	107,553	0,604	0,816
QPSK	8/9	0,088	1,766	114,819	0,566	0,764
QPSK	9/10	0,089	1,789	116,260	0,559	0,755
8PSK	3/5	0,089	1,780	115,699	0,562	0,758
8PSK	2/3	0,099	1,981	128,741	0,505	0,682
8PSK	3/4	0,111	2,228	144,828	0,449	0,606
8PSK	5/6	0,124	2,479	161,107	0,403	0,545
8PSK	8/9	0,132	2,646	171,991	0,378	0,510
8PSK	9/10	0,134	2,679	174,148	0,373	0,504
16APSK	2/3	0,132	2,637	171,418	0,379	0,512+
16APSK	3/4	0,148	2,967	192,837	0,337	0,455+
16APSK	4/5	0,158	3,166	205,765	0,316	0,426+
16APSK	5/6	0,165	3,300	214,512	0,303	0,409+
16APSK	8/9	0,176	3,523	229,004	0,284	0,383+
16APSK	9/10	0,178	3,567	231,877	0,280	0,378+

Designed-in, no verification
+ = 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

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

Other related products

NTC/2137	Transport stream ASI concentrator-deconcentrator
NTC/2210/xT	Variable rate DVB-S2 IF-band Modem
NTC/2215/xT	Variable rate DVB-S2 L-band Modem
NTC/2263/xT	DVB-S2 L-band satellite demodulator
NTC/2277/xF	DVB-S2 IF-band satellite modulator
NTC/3453	ASI/SPI/serial LVDS DVB interface board
NTC/3458	Dual rate G.703/HSSI data interface board
NTC/3462	10 MHz reference frequency module
NTC/7015/xx	GbE + ASI interface board
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