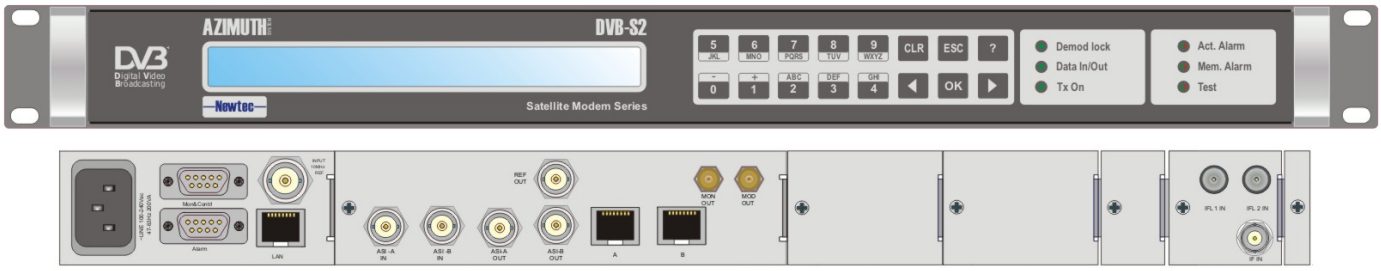


DESCRIPTION

The NTC/2215/xU is a high speed L-band modem designed to operate in DVB-S2 - CCM and VCM/ACM mode - as well as in DVB-S and DSNG. Its exceptional performances provide reliable solutions for the implementation and upgrade of broadcast and IP backbone networks.

The flexibility of the 2215/xU modem provides a simple upgrade path matching your traffic growth requirements. You have the possibility to access the full potential of the DVB-S2 standard by means of a simple license key.

The L-band modulator output can transmit data up to 68 Mbaud covering all SCPC and MCPC applications in DVB-S/DSNG and DVB-S2.

The demodulator handles satellite traffic from 0,256 Mbaud to 45 Mbaud in DVB-S2 and from 1 to 45 Mbaud in DVB-S/DSNG. In the basic version, the 2 L-band inputs (950 MHz to 2150 MHz) are compatible with commercial LNBs.

Interfaces

Two types of interchangeable interface boards are available:

- Gigabit Ethernet (GbE) + ASI interface card
- G.703/HSSI interface card

Following data can be received and transmitted over satellite:

GbE interface
- Ethernet frames, IP packets
- MPEG2 TS (input is TS over IP)

ASI interface
- single ASI transport stream
- dual ASI transport stream

Combined GbE + ASI interface
- Ethernet frames, IP packets
- single/dual ASI transport stream

HSSI interface
- HSSI (Cisco ™) specification

G.703 interface
- dual rate G.703 framed data

Monitoring and Control

All monitoring and control parameters are available locally via the front panel and remotely via a web interface, via the RS-485/232 port or via the 10/100BASE-T Ethernet port. The last two use the RMCPv2 protocol. As an option, an SNMP + MIB agent can be provided.

The dual contact closure output for general device and interface alarms allows for easy integration in redundancy switching systems like the NTC/2185 series.

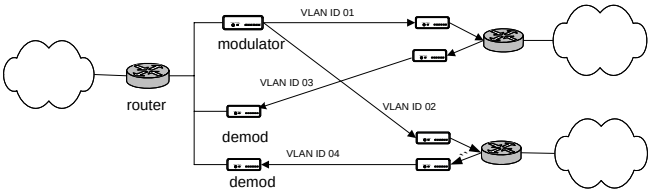
APPLICATIONS

The NTC/2215/xU modem is used when data has to be transmitted and received in a transparent and efficient way over a satellite link.

1. Ethernet interface – data applications

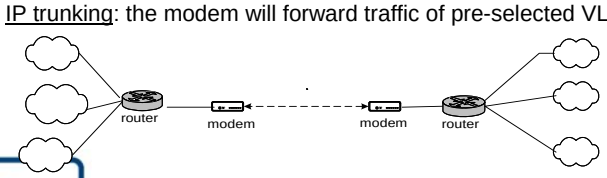
Ethernet bridge – LAN extension:
All received Ethernet frames will be forwarded over satellite.
Layer 2 filtering on VLAN tag/MAC header will be supported.

VLAN switch: the modem will forward traffic of pre-selected VLANs

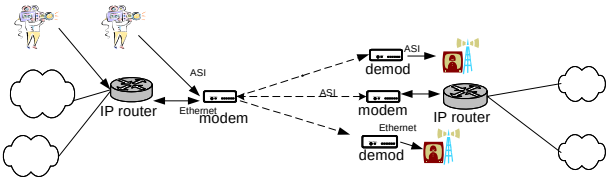


IP gateway: Received IP packets will be forwarded over satellite.

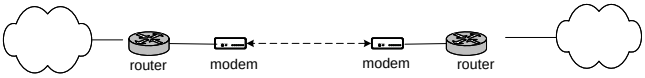
IP trunking: the modem will forward traffic of pre-selected VLANs



2. Combined use of ASI + Ethernet interfaces
When Ethernet (or IP) based signals and ASI based signals need to be transported (and received) in a transparent way over a DVB-S2 satellite link.



3. HSSI interface
Providing a symmetrical bi-directional bridge between routers with an HSSI interface.



4. G.703 interface
Providing a symmetrical bi-directional bridge between G.703 terminated equipment. Selection between 2 rates or slaving to an external G.703 clock rate is possible by addition of a second G.703 sub module.

FEATURES

Control part of the modem:

- Web based graphical user interface
- Serial M&C, using high level instructions on asynchronous serial link via RS485/RS232 and 10/100BASE-T Ethernet management interface
- SNMP v.2/MIB support

Ethernet interface (data applications) of the modem:

- Two 1000BASE-T Ethernet interfaces
- Auto switching 10/100/1000BASE-T Ethernet interface on UTP (RJ45) connector
- Supported data encapsulation protocols
  - **Data piping**: for data transport - compatible with the DVB specifications. (EN 301 192 V1.2.1).
  - **Ultra Lightweight Encapsulation** (ULE) for transmission of IP datagram's over MPEG-2/DVB systems Compatible with draft-ietf-ipdvb-ule-04.txt
  - **Multi Protocol Encapsulation (MPE):** for data transport compatible with the DVB specifications (EN 301 192 V1.2.1).
  - **eXtended Performance Encapsulation (XPE)**: encapsulation of IP frames in DVB-S2 Baseband frames – Newtec's proprietary implementation.
- Ethernet receive data filtering based on:
  - VLAN and/or
  - MAC address and/or
  - Single IP address or IP network
- Layer 2 bridge mode – Ethernet frames over satellite
- Layer 3 IP bridge mode – IP packets over satellite
- DVB-S2 multi stream support:
  - 16 simultaneous DVB-S2 streams
  - CCM + VCM/ACM support
- Supported bit rates (transmit and receive values aggregated)

IP packet size	Packets/s	IP rate
Data piping		
64	36.000	18.3 Mbit/s
512	22.000	90 Mbit/s
1500	12.000	144 Mbit/s
ULE (Ultra Lightweight Encapsulation)		
64	30.000	15,4 Mbit/s
512	19.500	80 Mbit/s
1500	9.750	117 Mbit/s
MPE (Multi Protocol Encapsulation)		
64	35.000	17,9 Mbit/s
512	19.500	80 Mbit/s
1500	9.750	117 Mbit/s
XPE (EXtended Performance Encapsulation)		
64	40.000	20,5 Mbit/s
512	20.000	82.0 Mbit/s
1500	10.500	126 Mbit/s

Ethernet interface (MPEG-2 TS streaming over IP) of the modem:

- Two 1000BASE-T Ethernet interfaces
- Auto switching 10/100/1000BASE-T Ethernet interface on UTP (RJ45) connector
- Supported protocols to encapsulate TS over IP:
  - TS/UDP/IP
  - TS/RTP/UDP/IP
- IP features:
  - Unicast support
  - Multicast support
  - IGMP V2 support (for modulator side)
- Number of supported MPEG-2 TS streams: 1
- Modulator can slave on the received TS stream via IP; supported jitter of IP network:
  - < 50 Mbit/sec: 50 ms
  - > 50 Mbit/sec: 25 ms
- Data rate: < 120 Mbit/s (in total for both directions)

ASI interface of the modem:

- Complies to MPEG (ISO/IEC 13818-1) system specs
- Rate adapter for modulator side
- PRBS generator and detector
- DVS-2 specific features:
  - Multi-stream support (2 ASI inputs/outputs interfaces are active simultaneously with different data streams)
  - Input Stream synchronization (ISCR)
  - Transport stream regeneration using ISCR
  - Null Packet deletion at modulator side
  - Null packet insertion at demodulator side
  - CCM/VCM and ACM support
- Data rate: > 150 Mbit/s for each direction

Combined use of ASI + GbE interface

- GbE interface functionality:
  - **EXtended Performance Encapsulation (XPE)**: encapsulation of IP frames in DVB-S2 Baseband frames – Newtec's proprietary implementation.
  - Ethernet receive data filtering based on VLAN and/or MAC address and/or single IP address or IP network
  - Layer 2 bridge mode – Ethernet frames over satellite
  - Layer 3 bridge mode – IP packets over satellite
- ASI interface functionality:
  - Multi-stream support (2 ASI inputs/outputs interfaces are active simultaneously with different data streams)
  - Input Stream synchronization (ISCR)
  - Transport stream regeneration using ISCR
  - Null Packet deletion at modulator side
  - Null packet insertion at demodulator side
  - Null packet insertion at demodulator side
- DVB-S2 Multi-stream support:
  - 18 simultaneous DVB-S2 streams: 16 streams reserved for IP data and 2 streams reserved for 2 ASI inputs/outputs
- Supported rates (ASI rates apply for each direction)

IP packet size	Packets/s	IP rate Total for Tx/Rx
XPE (EXtended Performance Encapsulation)		
64	40.000	20,5 Mbit/s
512	20.000	82.0 Mbit/s
1500	10.500	126 Mbit/s

Interface port	Rate (Mbit/s)
ASI-A	120
ASI-B	60

HSSI interface:

- Compliant to HSSI (Cisco ™) specification
- Data rates from 0,917 to 52 Mbps

G.703 interface:

- Compliant to G.703 specifications
- Selection out of 2 possible rates in the 2 to 45 Mbps range
- Slaving to external G.703 clock

Common parts for the modem

- Optional ovenized 10.0 MHz reference with External 10.0 MHz reference input/output

Modulator part of the modem:

- DVB-S2 compliant (EN 302307)
- DVB-DSNG/S compliant (EN 301210 & EN 300421)
- L-band monitoring output (fixed frequency and level)
- QPSK, 8PSK, 16APSK/QAM, 32APSK modulation
- 35%, 25%, 20% roll-off factor
- Pilot insertion
- 55 kbit/s up to 68Mbaud interface rate (FEC- and modulation - dependent)
- L-band frequency in the range of 950 to 1750 MHz
- Automatic interference rejection filter for low symbol rates
- Programmable amplitude equalizer
- **Equalink™** option for compensation of linear amplitude and group-delay distortions (in all DVB-S/DSNG/S2 modes) and non-linear distortions (DVB-S2 mode only) over the satellite link.

Demodulator part of the modem:

- DVB-S2 compliant (EN302307), DVB-DSNG/S compliant (EN 301210 & EN 300421)
- Dual L-band input: 950 -2150 MHz
- Baud rate in DVB-S2:
  - QPSK: 0,256 Mbaud to 45 Mbaud (*)
  - 8PSK, 16APSK: 0,256 Mbaud to 40 Mbaud (*)
  - 32APSK: 1 Mbaud to 30 Mbaud (Normal Frames only)
- Baud rate in DVB-DSNG/S:
  - QPSK/8PSK/16 QAM: 1-45 Mbaud
- 35%, 25%, 20% roll-off factor
- LNB power control

(*)data rates below 1 Mbaud require the use of pilots

VERSIONS & OPTIONS

Baseband data interface modules
Select one of the following data interfaces

- HSSI only interface:
  - NTC/3458.AC.C: HSSI input/output interface
- HSSI + G.703 interface, select a 1 or 2 sub module(s):
  - NTC/3458.AC.C: HSSI+G.703 interface +
    - NTC/3349/AA: G.703 at 2.048 Mb/s
    - NTC/3343/AB: G.703 at 6.312 Mb/s
    - NTC/3343/AA: G.703 at 8.448 Mb/s
    - NTC/3344/AA: G.703 at 16.896 Mb/s
    - NTC/3344/AB: G.703 at 34.368 Mb/s
    - NTC/3348/AA: G.703 at 44.736 Mb/s
- NTC/7015 GbE + ASI interface, select a software capability:
  - NTC/7015/CAA: Eth or ASI, CCM
  - NTC/7015/CAC: Eth or ASI, CCM + VCM/ACM
  - NTC/7015/CCA: Eth and ASI, CCM
  - NTC/7015/CCC: Eth and ASI, CCM + VCM/ACM

Modulator board software capability
The modem is fitted with the NTC/7030 modulator board. The available modulation schemes, maximum baud rates and the **Equalink™** predistortion are part of the software capabilities.

Select for each the needed software capabilities:

- Coding and modulation mode
  - NTC/7030/ACxx: DVB-S - CCM
  - NTC/7030/BBxx: DVB-S/S2 - CCM
  - NTC/7030/BAxx: DVB-S/S2 - CCM + VCM/ACM
- Highest modulation type
  - NTC/7030/xxAx: QPSK
  - NTC/7030/xxBx: QPSK+8PSK
  - NTC/7030/xxCx: QPSK+8PSK+16APSK(16QAM)
  - NTC/7030/xxDx: QPSK+8PSK+16APSK(16QAM)+32APSK
- Maximum symbolrate
  - NTC/7030/xxxA: 5 Mbaud
  - NTC/7030/xxxB: 15 Mbaud
  - NTC/7030/xxxC: 30 Mbaud
  - NTC/7030/xxxD: 45 Mbaud
  - NTC/7030/xxxE: 68 Mbaud
- For the **Equalink™** option, order NTC/2030/AA.

Demodulator board software capability
The modem is fitted with the NTC/7044 demodulator board. The available modulation schemes and maximum baud rates are part of the software capabilities. The NTC/7044 is always capable of handling CCM, VCM and ACM.

Select for each the needed software capabilities:

- Highest modulation type
  - NTC/7044/BCBx: QPSK+8PSK
  - NTC/7044/BCCx: QPSK+8PSK+16APSK(16QAM)
  - NTC/7044/BCDx: QPSK+8PSK+16APSK(16QAM)+32APSK
- Maximum symbolrate
  - NTC/7044/BCxA: 5 Mbaud
  - NTC/7044/BCxB: 15 Mbaud
  - NTC/7044/BCxC: 30 Mbaud
  - NTC/7044/BCxD: 45 Mbaud

10 MHz reference board
Optionally a 10 MHz reference input and output can be provided that can be used to slave the modem to an external 10 MHz reference by installing the optional 10 MHz reference board. For low data rate carriers (< 1 Mbaud) it is advised to fit the very high stability 10 MHz reference board.

- 10 MHz OCXO reference oscillator board
  - NTC/3462.AB.A high stability
  - NTC/3462.AA.A very high stability

DATA SUMMARY

Modulator part

- L-band operational output
  - level -50/-7 dBm (+/- 2dB)
  - frequency 950 - 1750 MHz (adjustable in steps of 95 Hz)
  - connector SMA (F), 50 Ohm
  - return loss > 10 dB
  - group delay over +/- 27 MHz band
    - Linear <0.02 ns/MHz
    - Parabolic <0.002 ns/MHz²
    - Residual <1ns peak-to-peak
- L-band monitoring output
  - level -45 dBm (fixed)
  - frequency 1080 MHz (fixed)
  - connector SMA (F) - 50 Ohm
  - return loss 50 Ohm > 7 dB
- Phase noise performance
  - 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 performance
  - better than - 65 dBc @ -10 dBm
- Inner FEC coding (LDPC) - DVB-S2
  - QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
  - 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - 32APSK 3/4, 4/5, 5/6, 8/9, 9/10
- Inner FEC coding - DVB-S/DSNG
  - QPSK 1/2, 2/3, 3/4, 5/6, 7/8
  - 8PSK 2/3, 5/6, 8/9
  - 16QAM 3/4, 7/8
- Framing
  - DVB-S/DSNG
  - DVB-S2 short and normal frames
- Null packet deletion and insertion
- Multi stream DVB-S2: CCM and VCM/ACM

Demodulator part

- L-band input: dual input
  - frequency range 950-2150 MHz
  - return loss > 7 dB (75 Ohm-F(F))
  - level signal -25 to -65dBm
  - adjacent signal <(C_o+7) dBm/Hz, C_o=signal level density

- LNB power and control
  - max. current 350 mA (on selected L-band input)
  - voltage 11.5-14 V (vertical polarization), 16-19 V (horizontal polarization) & additional 22 KHz ± 4 kHz (band selection according to universal LNB for ASTRA satellites)

- Inner FEC coding (LDPC) - DVB-S2
  - QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
  - 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - 32APSK (normal frames only): 3/4, 4/5, 5/6, 8/9, 9/10

- Inner FEC coding - DVB-S/DSNG
  - QPSK 1/2, 2/3, 3/4, 5/6, 7/8
  - 8PSK 2/3, 5/6, 8/9
  - 16QAM 3/4, 7/8

- Framing
  - DVB-S/DSNG
  - DVB-S2 short and normal frames
  - Mixing of normal / short frames only possible below 10 MBaud.

Common modem parts

- External 10 MHz reference (optional)
  - input level -3 to +7 dBm
  - output level +7 dBm
  - connector BNC (F) - 50

- Monitor and control interfaces
  - Web server GUI (HTTP) via web browser
  - Diagnostics report, alarm log (HTTP)
  - RMCP via serial port (RS232/485)
  - RMCP over TCP-IP/UDP
  - SNMP (optional license)

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

- Mechanical
  - Width 19” sub rack
  - Height 1 RU
  - Weight 6 kg

- Power supply
  - Voltage 90-130 and 180-260 Vac
  - Frequency 47-63 Hz
  - Power 105 VA

- Temperature
  - Operation 0° to +40°C
  - Storage -40° to +70°C

PERFORMANCE

Demodulator part

- Satellite baud rate
  - DVB-S2
    - QPSK 0,256 to 45 Mbaud
    - 8PSK/16APSK 0,256 to 40 Mbaud
    - 32APSK 1 to 30 Mbaud (Normal Frames only)
  - DVB-S/DSNG
    - QPSK/8PSK/16QAM 1 to 45 Mbaud

- DVB-S2 performance at PER 1E-5 (BER ~ 5E-8)

Frame length	Short	Normal	
Modulation and coding	Es/No (dB)	Es/No (dB)	Es/No (dB)
	1-15 Mbaud	1-40Mbaud	>40 Mbaud
QPSK- 1/3	-0.6	-0.7	-0.5
QPSK- 2/5	0.4	0.2	0.3
QPSK- 1/2	1	1.4	1.4
QPSK- 3/5	3.1	2.8	2.7
QPSK- 2/3	3.8	3.6	3.5
QPSK- 3/4	4.5	4.3	4.4
QPSK- 4/5	5.1	5.1	5.1
QPSK- 5/6	5.8	5.5	5.6
QPSK- 8/9	6.7	6.6	6.6
QPSK- 9/10	-	6.7	6.8
		1-35 Mbaud	>35Mbaud
8PSK- 3/5	6.5	6.3	6.9
8PSK- 2/3	7.4	7.1	7.1
8PSK- 3/4	8.6	8.4	8.4
8PSK- 5/6	10.2	9.7	9.9
8PSK- 8/9	11.4	11.1	11.2
8PSK- 9/10	-	11.3	11.3
		1-35 Mbaud	>35 Mbaud
16APSK- 2/3	9.6	9.6	9.7
16APSK- 3/4	10.9	10.5	10.9
16APSK- 4/5	11.6	11.5	11.7
16APSK- 5/6	12.4	12.1	12.2
16APSK- 8/9	13.6	13.3	13.3
16APSK- 9/10	-	13.6	13.6
		1-25 Mbaud	>25 Mbaud
32APSK- 3/4	-	13.5	13.6
32APSK- 4/5	-	14.3	14.5
32APSK- 5/6	-	14.8	14.9
32APSK- 8/9	-	16.1	16.1
32APSK- 9/10	-	16.5	16.5

- Remarks
  - Values for QPSK 1/3, 8PSK 3/5, 2/3 and 16APSK 2/3, 3/4 or values below 3Mbaud are measured with pilots on.
  - When using VCM/ACM multi-stream it is advised to use pilots on the higher modulation mode streams
  - Performance was measured using Ku-band test translator and LNB (type : SMW PLL) in a linear channel
  - In order to calculate Eb/No (for CCM applications) use following formula: Eb/No = Es/No – 10log(η) with η = spectral efficiency.

- DVB-S/DSNG performance at BER 1E-7 after RS (IF loopback)

Modulation and coding	Eb/No (dB)	Eb/No (dB)
	<20 Mbaud	>20 Mbaud
QPSK- 1/2	3.9	3.9
QPSK- 2/3	4.4	4.5
QPSK- 3/4	4.9	5.1
QPSK- 5/6	5.4	5.8
QPSK- 7/8	5.8	6.4
8PSK- 2/3	6.3	6.5
8PSK- 5/6	8.3	8.8
8PSK- 8/9	8.8	9.8
16QAM- 3/4	8.4	8.6
16QAM- 7/8	10.1	11.1

- LNB phase noise requirements
  - equiv. input noise -178 dBm/Hz
  - equiv. input temperature 100K (typical)
  - LNB gain 55 to 70 dB
  - phase noise SSB

    type A : for all baud rates

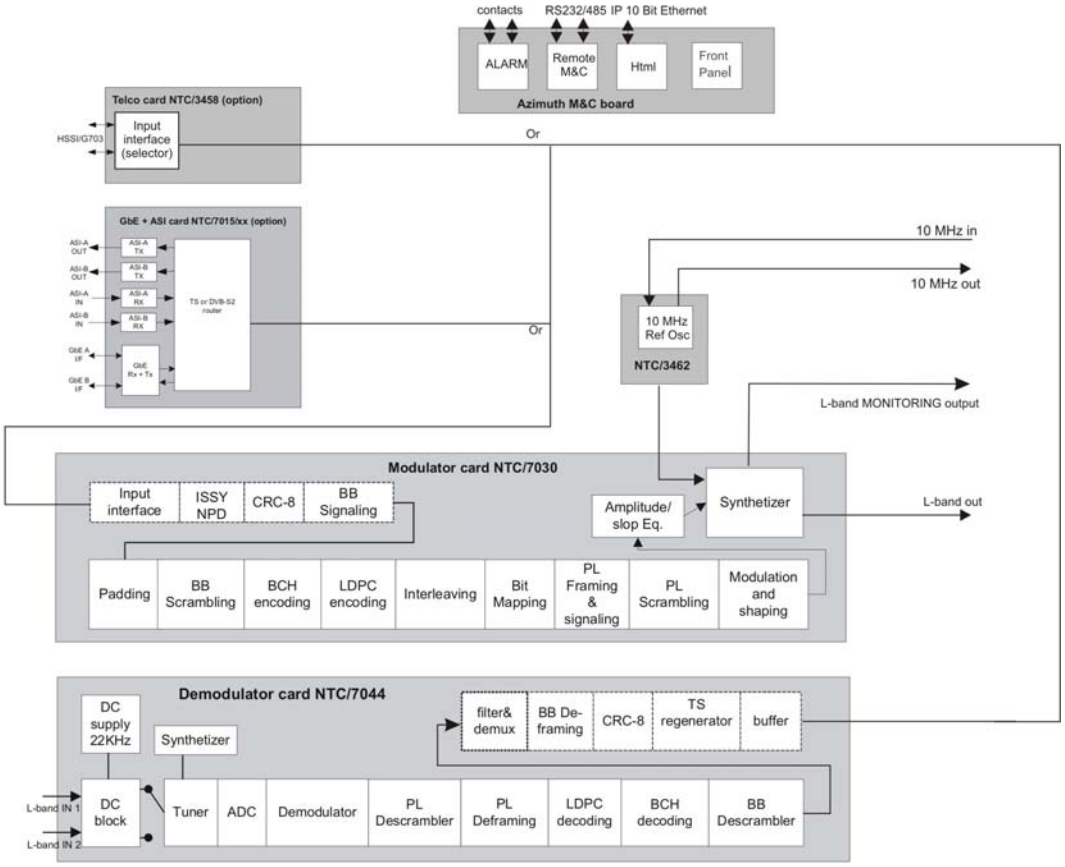
    type B :

    DVB-S2 (with pilots on only)
    for QPSK > 10-30 Mbaud
    for 8PSK > 10-30 Mbaud

    DVB-DSNG/S:
    for QPSK > 5 Mbaud
    for 8PSK > 22 Mbaud
    for 16 QAM > 6Mbaud

Type A PL-DRO	Type B Free running	at
-	< -35dBc/Hz	10 Hz
< -70dBc/Hz	< -63dBc/Hz	100 Hz
< -75dBc/Hz	< -73dBc/Hz	1 kHz
< -80dBc/Hz	< -85dBc/Hz	10 kHz
< -85dBc/Hz	< -90dBc/Hz	100 kHz
-	< -96dBc/Hz	1 MHz
-	< -108dBc/Hz	>10 MHz

BLOCK DIAGRAM



• TECHNICAL LITERATURE & REFERENCES

Other related products

- NTC/2263/xU DVB-S2 L-band satellite demodulator
- NTC/2277/xF DVB-S2 IF-band satellite modulator
- NTC/3458 TELCO HSSI + Single rate G.703 w. external Data Clock input
- NTC/3462 10 MHz reference frequency module
- NTC/7015/xx IP GbE + ASI input/output card
-

Application notes and technical publications

- NTC/2263/xU.apn01 performances comparison between NTC DVB-S and S2 demodulators
- NTC/2263/xU.apn02 Satmaster inputs for DVB-S
- NTC/7015/APN04 Processing modes for GbE + ASI interface board
- NTC/7015/APN05 Using the ASI Interface of the GbE interface board
- NTC/7015/APN06 Setup guide for GbE interface
- NTC/7015/APN07 CCM, VCM and ACM implementation

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