TANDBERG television
Part of the Ericsson Group

SM6620

Satellite Modulator with PREKOR™

The rapid rise of bitrate intensive high definition television and the continuing need for cost-effective transmission over satellite is accelerating the change to more efficient transmission technology. The new DVB-S2 standard is at the forefront of providing the means to fulfilling this requirement.

The SM6620 is a feature-rich, compact, IF output satellite modulator. This future-proof product gives DVB-S, DVB-DSNG and now DVB-S2 modulations. Integrated into the unit is TANDBERG Television's award winning PREKOR™ technology that further enhances system performance making this modulator the class leader in its field.

BASE UNIT FEATURES

SM6620 Satellite Modulator (SM6620/BAS)

- Operation to ETSI standard EN 300 421 (DVB-S: BPSK and QPSK)
- Variable symbol rate operation: 1 to 48 Msymbol/s
- User selectable spectrum roll-off factor: 20%, 25%, 30%, 35%
- IF Output: 50 – 180 MHz, tunable in 1 kHz steps with low spurious output levels
- Digitally generated cable tilt correction
- 2 x DVB ASI inputs
- Input data rate adaptation mode – including PCR correction
- PREKOR™ dynamic pre-correction technology
- Corrects for phase/magnitude distortions introduced by uplink HPA equipment
- Corrects for phase/magnitude distortions introduced by the satellite
- Corrects for group delay distortions introduced by the satellite transponder
- Easy software upgrades for extra features
- Web browser control and via easy-to-use front panel, SNMP, RS-232 or RS-485 remote control or Telnet

OPTIONS

DVB-DSNG Higher Order Modulation Option (SM66XX/SWO/HOM)

- 8PSK and 16QAM option to EN 301 210 standard in addition to BPSK and QPSK

Extended Symbol Rate Option (SM66XX/SWO/HS)

- Extends the symbol rate from 1 – 48 Msymbol/s to 0.2 – 66 Msymbol/s

PREKOR™ License (SM66XX/SWO/PREKOR)

- PREKOR™ license key and PC control software

Additional Transport Stream Inputs (SM66XX/HWO/ASI-SPI)

- Additional 2 x DVB ASI and 1 x DVB SPI input option

DVB-S2 QPSK Modulation Option (SM66XX/SWO/S2)

- DVB-S2 Broadcast mode QPSK modulation to EN 302 307

DVB-S2 8PSK Modulation Option (SM66XX/SWO/S2-8PSK)

- DVB-S2 Broadcast mode 8PSK modulation to EN 302 307
- SM66XX/SWO/S2 also required

DVB-S2 16APSK Modulation Option (SM66XX/SWO/S2-16APSK)

- DVB-S2 Broadcast mode 8PSK, 16APSK and 32APSK modulations to EN 302 307
- SM66XX/SWO/S2 also required

PRODUCT OVERVIEW

All Modulation Modes

The SM6620 supports all DVB standard modulation modes (DVB-S, DVB-DSNG, DVB-S2) making this well specified product extremely flexible and capable of performing in all types of system architectures.

Variable Symbol Rate

The SM6620's wide symbol rate range from 0.2 to 66Msymbol/s makes it suitable for all applications from low bitrate DSNG transmissions to high data rate IP backbone applications.

High Quality IF Output

The SM6620 follows the high spec design philosophy through to its IF output stage by offering the highest possible transmission quality. The SM6620 offers a number of signal quality improvement tools such as group delay correction through PREKORÔ and digitally generated cable tilt correction to ensure that the received satellite signal is free from distortions.

Full Set of Control Methods

The SM6620 incorporates an easy to use web browser control interface as well as full control through SNMP, RS232, RS485 and Telnet sessions. For local control the SM6620 also has a simple to operate front panel control.

About DVB-S2

DVB-S2 is the next generation standard for satellite broadcasting offering up to a 30% increase in throughput or a 1.5 to 2dB increase in link margin bringing 8PSK within the reach of consumer sized dishes. The combination of savings in bitrate from Advanced Video Coding and the increased efficiency of DVB-S2 makes the transmission of HD video a real and financially attractive reality.

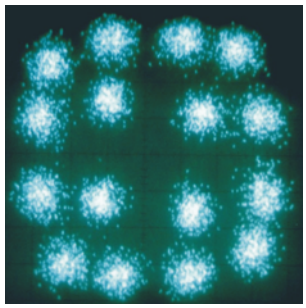
Example DVB-S2 Configuration for Equivalent Failure Point to DVB-S

Standard	Modulation	FEC	Symbol Rate	Bit Rate	PREKOR	% Bit Rate Increase
DVB-S	QPSK	2/3	27.5	33.8	Off	N/A
DVB-S2	QPSK	3/4	29.5	43.9	On	**30%**

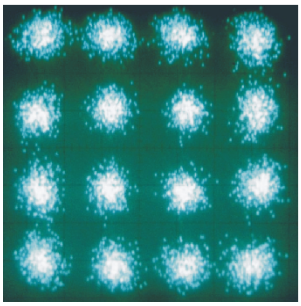
About PREKOR™

TANDBERG Television's unique PREKOR™ option ensures optimum performance from the satellite link for those who wish to get the most from their system.

Applications such as satellite distribution of TV to multiple headends and Internet backbone applications are particularly suited to the implementation of PREKOR™. In these applications cost per bit is of primary consideration. The improvement in the satellite link margin that PREKOR™ gives can result in an increase in data capacity of up to 7% for QPSK, 22% for a DVB-DSNG 8PSK system and up to 55% for a 16QAM system.



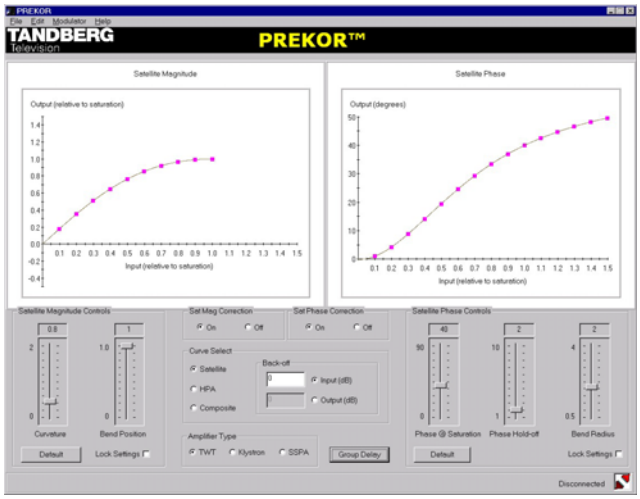
16QAM Without Prekor



16QAM With Prekor

PREKOR™ is of benefit to users employing satellite modulation in a single carrier per transponder mode. In this mode maximum power efficiency of the satellite link is achieved by operating the satellite transponder at saturation. The dynamic pre-correction technology of PREKOR™ corrects for group delay and removes the phase and magnitude non-linear distortions introduced by operating the transponder at saturation. The higher order modulations of 8PSK, 16QAM and 16APSK are particularly sensitive to these distortions and so PREKOR™ can yield large improvements in the satellite link margin.

PRODUCT OVERVIEW



Integrating PREKOR™ into an earth station generally has little effect on the system architecture. PREKOR™ is housed in the SM6625 satellite modulator, which provides industry standard interfaces. When required to operate with transponders having no AGC, a beacon receiver may be required in order to adjust the correction process automatically during rain fades. PREKOR™ is configured on installation for use with a particular path. There is no need to be able to see the downlink during operation, and during installation it is possible to extend control of the modulator to the receive site via the Internet. The ability to store numerous configurations allows its use in complex redundancy systems.

PREKOR™ requires no special equipment at the receive station. Any receiver compliant with EN 300 421, EN 301 210 or EN 302 307 such as the TT1260, may be used.

PREKOR™ SPECIFICATIONS

Satellite channel normalised small signal gain:	4.0 dB maximum
Phase correction range:	0 - 90°
Phase polarity:	Lag or lead with increasing amplitude
Group delay correction range:	0 – 200 ns at the transponder band edge
Group delay correction shape:	Parabolic + n^{th} order term, n = 2-7
Symbol rate range:	1 – 48 Msymbol/s 0.2 – 66 Msymbol/s (option)
Transmit/receive roll-off factor:	25%

Note: Some DVB receivers operate with 0.35 roll-off. Such a mismatch does not introduce significant degradation.

EARTH STATION REQUIREMENTS

In order to ensure that PREKOR™ can deliver the best possible performance, it is important that the overall performance of both uplink and downlink earth stations meet certain minimum requirements. These requirements will depend upon individual circumstances. Please contact TANDBERG Television for further information.

IMPROVEMENTS DUE TO PREKOR™

Pre-correction gain may be specified in two ways:

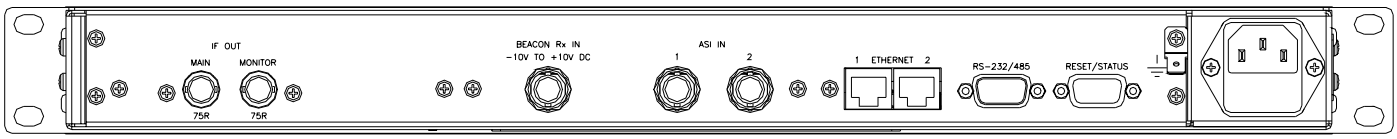
- As a system threshold improvement in dB for a fixed user bitrate.
- As a percentage increase in the user bit-rate for a fixed system threshold. This assumes that an appropriate code-rate is available.

The total gain in system performance is not achieved from any single feature of the system. A large system gain is normally the result of the combination of the individual improvements to the system. The table below gives a maximum expectation of system gain for a TWT based transponder in conjunction with a TWT based HPA driven at 3 dB OBO and a typical level of uplink noise.

Ni = Non-linear improvement, Gi = Group delay improvement

Modulation	Ni	Gi	Ni + Gi
DSNG 8PSK 5/6	1.0 dB 10%	1.0 dB 10%	2.0 dB 20%
DSNG 8PSK 8/9	1.2 dB 12%	1.8 dB 10%	3.0 dB 22%
DSNG 16QAM 3/4	4.0 dB 40%	2.0 dB 15%	6.0 dB 55%
DSNG 16QAM 7/8	>4.0 dB >40%	>2.0 dB >15%	>6.0 dB >55%

SAMPLE CONFIGURATION



SPECIFICATIONS

Inputs

Transport Stream Inputs

2 x DVB ASI Copper

Rear panel connector: BNC (F), 75 Ohm

+2 x DVB ASI Copper (option)

Rear panel connector: BNC (F), 75 Ohm

+1 x DVB SPI (option)

Rear panel connector: 25-way D-type (F)

Transport Stream Data Specification

ASI

Data Rate: 213 Mbit/s maximum

ASI Format: Byte and single packet burst mode

Packet Size: 188-byte, 204-byte, unframed

SPI

Data Rate: 108 Mbit/s maximum

Packet Size: 188-byte, 204-byte, unframed

Data Clocking Modes

Input data rate adaptation mode including PCR correction

Input data rate derived mode

Analog Inputs

1 x Beacon Rx Input

Rear panel connector: BNC (F)

-10 V to +10 V range for Uplink Fade Control

Outputs

IF Output

Main IF Output

IF Frequency: 50 – 180 MHz (tunable)

IF Frequency Step Size: 1 kHz

IF Frequency Error: ±1 kHz maximum

Output Power: -20 to +5 dBm (0.1 dB steps)

Output Power Stability: ±0.5 dB

Impedance: 75 Ohm

Connector: BNC (F)

Spurious Outputs

< -60 dBc/4 kHz over 0-500 MHz (modulated carrier

< -55 dBc over 0-500 MHz (unmodulated carrier)

Phase Noise: > 6 dB below IESS-308 limits

IF Monitor Output

Output Power
-20 dB nominal relative to Main IF output power

Impedance: 75 Ohm

Connector: BNC (F)

Distortion Correction

Cable Tilt Correction: ±0.04 dB/MHz maximum (digitally generated)

Satellite AM-AM, AM-PM and group delay correction PREKOR™ option

Modulation Features

DVB-S and DVB-DSNG

Signal Conditioning: EN 300 421 (DVB-S) AND EN 301 210 (DVB-DSNG)

Modulation: BPSK, QPSK, 8PSK (option) and 16QAM (option)

FEC BPSK/QPSK: 1/2, 2/3, 3/4, 5/6, 7/8

FEC 8PSK: 2/3, 5/6, 8/9

FEC 16QAM: 3/4, 7/8

Symbol Rate

1 to 48 Msymbol/s

0.2 to 66 Msymbol/s (option)

Variable in 1 symbol/s increments

Spectrum Roll-off Factor α

20%, 25%, 30%, 35% user selectable

DVB-S2: Signal Conditioning: EN 302 421 for Broadcast Services

Modulation Mode: Constant Coding and Modulation

Modulation: QPSK, 8PSK (option), 16APSK (option), 32APSK (option)

FEC QPSK

1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10

FEC 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10

FEC 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10

FEC 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10

PL Scrambling Sequence: User selectable

FEC Frame Size: Normal and Short

Symbol Rate: 1 to 48 Msymbols/s

0.2 to 66 Msymbols/s (option)

Variable in 1 symbol/s increments

Pilot Insertion: Switchable On/Off

Spectrum Roll-off Factor a

20%, 25%, 30%, 35% user selectable

Control

Front Panel: 2 line x 40 character LCD display

Navigation: 4 cursor keys, 2 function keys

RS-232 / RS-485

Via RS-232/485 control port using VT100 emulator or PC control software

Connector: 9-way D-type (M)

Ethernet

Dual-redundant 10BaseT Ethernet

Web browser control interface

Telnet/FTP

SNMP

Connectors: 2 x RJ45

Reset/Status Port

Relay contacts for signalling equipment and input signal failure

Connector: 9-way D-type (F)

Physical and Power

1RU, 19” rack mounting

Approximate Mass
7.2 kg

Supply Voltage
100-120 Vac and 220-240 Vac, wide-ranging

Power Consumption
Approx. 60W (dependent upon options fitted)

Environmental Conditions

Temperature Range

0°C to +50°C (32°F to 122°F) operational
-20°C to +70°C (-4°F to 158°F) storage

Relative Humidity

0% - 90% (non-condensing)

Compliance

CE marked in accordance with EU low voltage and EMC directives. Standards applied: EN55022, EN55024, EN61000-3-2, EN61000-3-3 for EMC and EN60950 for Safety, as a minimum where applicable. Also meets other relevant requirements and national standards derived from international requirements on which the above European Standards are based and FCC Pt 15B. Designed to meet UL 1950.

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