

Challenge Series Satellite High Speed DVB-S2 Modulator

70/140 MHz IF Output
L-Band Output



CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 modulator with 70 MHz/140 MHz IF or L-Band output provides high flexibility for the station design. The modulator can be integrated in most standard station configurations and can be used in fixed satellite ground stations as well as in satellite news gathering (SNG) vehicles, Fly-Aways or any other mobile or portable applications

MPEG Transport Stream Input – L-Band or IF output

The modulator accepts an MPEG transport stream on an ASI or SPI input from a video encoder or MPEG multiplexer and provides a DVB-S or DVB-S2 modulated carrier anywhere between 50...180 MHz or L-Band.

Baseband Frame Data Input

For DVB-S2 VCM and ACM applications the modulator accepts on its input a baseband frame plus an additional header, which defines the modulation and FEC to be applied to each specific baseband frame. Also here the ASI or SPI input is used as interface. A hardware flow control signal can be used for synchronization purposes between the modulator and the multiplexer or encapsulator.

High signal integrity

Low spurious emissions allow using the modulator also in environments with demanding requirements, like high power video uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

Flexibility, backward compatibility

Mode adaptation, FEC Encoding, and Modulation is compliant with the DVB-S2 Standard EN 302307. QPSK / 8PSK / 16APSK and 32APSK modulation is available. For backward compatibility also framing, scrambling, FEC encoding as well as QPSK / 8PSK / 16QAM modulation according to the DVB-S Standards EN 300421 and EN 301210 is supported. BPSK modulation is also possible. Carriers with symbol rates from very low rates (8 kbps) up to 60 Msps can be transmitted.

Operating and control – easy integration into your system

The modulator can be operated via the push buttons on the front panel using self-explanatory display menus or via remote control (RS232, RS422/485, TCP/IP over Ethernet). Detailed monitoring of the system status and a summary alarm output (dual change over switch contacts) are provided. For the remote control addressable, packet based commands are used.

Remote monitoring and control through SNMP and a Web browser interface is now also available.

Specials and OEM Products

WORK Microwave is specialized to offer custom tailored products. We offer specials as follows:

- Combination with complete 70/140 MHz upconverter in one housing.
- Customized M&C interface and control syntax
- Military versions for hostile environment (shock, vibration, humidity, temperature)

Key features

- DVB Satellite modulator for digital TV satellite uplinks and digital SNG applications
- DVB-S2 compliant (EN 302 307)
DVB-DSNG compliant (EN 301 210)
DVB-S compliant (EN 300 421)
- QPSK / 8PSK / 16 QAM modulation (DVB-S, DVB-DSNG)
- QPSK / 8PSK / 16APSK / 32 APSK modulation (DVB-S2)
- Normal and short FEC frames, Pilots on or off (DVB-S2)
- BISS-E encryption (option), supports multi program transport stream
- Physical layer framing (PL scrambling with codes 0..262141) according to DVB-S2 standard
- Roll-Off: 35%, 25%, 20%
- Adjustable digital slope equalizer
- Low spurious output
- ASI and SPI (except opt. BI) electrical interfaces
- ASI optical interface (option)
- Null packet insertion and deletion with PCR correction
- Still picture playout (customized picture content can be loaded to the modulator unit, option)
- Symbol rates from 8 ksps to 60 Msps
- Data rate max appr. 213 Mbps with ASI Interface (depending on modulation type and FEC)
- Data rate max 267 Mbps with SPI Interface (depending on modulation type and FEC)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided).
- Summary alarm output (dual change over switch contacts)
- Transmit mute input
- Oven controlled 10 MHz reference oscillator.
- L-Band Monitor Output

- An output signal multiplexer integrated within the L-Band version allows to combine the modulated signal, the 10 MHz reference signal and DC power to drive an external block upconverter.
- Operating temperature range -30°C to 60°C (-22°F to 140°F) (option)
- CE compliant
- **3 years warranty**

Order Information

Customer Field selectable Firmware Option

In order to meet your requirements different maximum symbol rates and different sets of modulation types are supported depending on the selected firmware option. The firmware option is password upgradeable in the field, which allows easy enhancement of the modulators if requirements change.

Summary of firmware options:

Firmware Option	Max Symbol Rate, Supported Modulation Types 1) DVB-S / DVB-DSNG 2) DVB-S2
- QL	20 Msps, BPSK / QPSK 1)
- QH	60 Msps, BPSK / QPSK 1)
- PL	20 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- PH	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- P2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK 2)
- P2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK 2)
- P2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK 2)
- P2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK 2)
- A2L	15 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 15 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2N	30 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 30 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2M	45 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 45 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2H	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 60 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)

OPEN QUESTIONS, DEMO UNITS

If you need more information about WORK Microwave's new satellite modulator or if you would like to have demo a unit, please contact us via e-mail: sales@work-microwave.de or call us. We are glad to assist you.

Challenge Series

Satellite High Speed DVB-S2 Modulator

Indoor Unit

70 MHz / 140 MHz or L-Band Output
S-Type (standard version), H-Type (extended temperature range)

Modulator Type:	HDM2-V / SDM2-V		HDM2-L / SDM2-L
IF-Output Frequency:	50...180 MHz		950...2150 MHz
Phase Noise:	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	- 70 dBc/Hz - 80 dBc/Hz - 88 dBc/Hz - 90 dBc/Hz - 100 dBc/Hz - 115 dBc/Hz	- 65 dBc/Hz - 75 dBc/Hz - 88 dBc/Hz - 90 dBc/Hz - 100 dBc/Hz - 115 dBc/Hz
Frequency Resolution:	1 Hz		
IF-Output Characteristics:	Impedance: Return Loss: Output Power: Accuracy: Stability: Output Power muted: Connector: DC-output on IF-Output: 10 MHz reference output on IF-Output:	75 Ω (option 50 Ω) (SDM2-V / HDM2-V) 50 Ω (option 75 Ω) (SDM2-L / HDM2-L) >20 dB - 25 dBm to +5 dBm, 0.1 dB steps (SDM2-V / HDM2-V) - 30 dBm to 0 dBm, 0.1 dB steps (SDM2-L / HDM2-L) ± 0.5 dB ± 0.5 dB < -85 dBm BNC female (SDM2-V / HDM2-V) SMA female (SDM2-L / HDM2-L) 24 V DC, max 800 mA (can be switched on/off) (SDM-L / HDM-L) 1.5 ±1.5 dBm (can be switched on/off) (SDM-L / HDM-L)	
IF-Monitoring Output (on front panel):	Output Power: Impedance: Return Loss: Connector:	- 20 dB of IF Output 50 Ω >20 dB SMA female	
L-Band Monitoring (on rear panel):	Output Frequency: Output Power: Impedance: Return Loss: Connector:	1.4 GHz - 45 dBm 75 Ω >15 dB BNC female	available only on SDM2-V / HDM2-V
Spurious Outputs:	Signal related:	< - 70 dBc (unmodulated carrier, 50...90 MHz or 100...180 MHz for SDM2-V / HDM2-V) < - 70 dBc (unmodulated carrier, 950...1900 MHz (for SDM2-L/HDM2-L) < - 55 dBc (unmodulated carrier, 1900...2150 MHz (for SDM2-L/HDM2-L) < - 45 dBc (unmodulated carrier, out of band)	
Frequency Stability:	± 5 x 10 ⁻⁸ (-30 °C to 60 °C), aging: ± 1.5 x 10 ⁻⁹ per day, ± 1 x 10 ⁻⁷ per year		
Symbol Rate:	Max Range: Step size:	8 kspss ... 60 Mspss (depending on Firmware Option) 1 sps	
Clock Stability:	± 5 x 10 ⁻⁸ (-30 °C to 60 °C), aging: ± 1.5 x 10 ⁻⁹ per day, ± 1 x 10 ⁻⁷ per year		
Data Rate:	3 kbps - 267 Mbps (depending on firmware option, modulation, coding) (SPI interface) 3 kbps - 213 Mbps (depending on firmware option, modulation, coding) (ASI interface) *) *) 3 kbps ...170 Mbps (option BI, when BISS-1/E active)		
Transport Stream Adaption DVB-S2:	CRC-8 Encoder: Merger/Slicer: Base-Band Header Insertion: Stream Adaption: Base-Band Scrambling: (according EN 302307)	yes yes yes yes yes	
Transport Stream Adaption DVB-S / DVB-DSNG:	Transport Stream Adaption Randomization (according EN 300421)	yes yes	
Modulation / Encoding DVB-S2:	Outer BCH Coding: Inner LDPC Coding, depending on Firmware Option: Physical Layer Framing: Physical Layer Signalling: Pilots Insertion: Physical Layer Scrambling: (according EN 302307)	FEC-Frames n _{ldpc} = 64800 (normal FEC Frame) or n _{ldpc} = 16200 (short FEC frame) QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n _{ldpc} =64800) 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (only n _{ldpc} =64800) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n _{ldpc} =64800) 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (only n _{ldpc} =64800) yes yes on / off N=0...262141	
Modulation / Encoding DVB-S / DVB-DSNG:	Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding depending on Firmware Option: (according EN300421, EN 301210)	188/204, T=8 Depth I =12 BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)	

Specifications continued next page

Challenge Series

Satellite High Speed DVB-S2 Modulator

Indoor Unit

70 MHz / 140 MHz or L-Band Output

Specifications continued:

Signal Spectrum Mask:	$\alpha = 0,35$ (according EN 300421) $\alpha = 0,25$ (according EN 301210, EN 302307) $\alpha = 0,20$ (according EN 302307)
Transport Stream Input Interface:	DVB-SPI (DSUB25 female, not available for option BI) DVB-ASI-electrical (Connector BNC female, Impedance 75 Ohm) DVB-ASI-optical (Connector ST female, Multimode, 1300 nm) (Option) Pre product information (available Q1/2009): RTP/UDP/IP over Ethernet (RJ-45, 10/100/1000 Mbit/s auto sensing)
Transport Stream Security (Option BI):	BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports 1 single or 1 multi program transport stream in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session Word BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier Max. input rate for Clear Session Word and Encrypted Session Word: - 10 times per 5 minutes - 1 time per 10 seconds
Transport Stream Frames Size:	188 or 204 bytes
Packet Stuffing:	Null packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at the data input. Null packet deletion when the encoder sends to many null packets PCR (program clock reference) correction (with Null packet insertion) for max 250 PID streams with PCRs included.
Still Picture Playback	As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).
Compliant with Standards:	EN 300421, EN 301210, EN 302307 EN 50083-9 (ASI electrical, SPI Interface)
Monitoring:	Faults, stored faults with time stamps
Monitoring and Control Interface:	Protocol: SNMP Connection: UDP over Ethernet (10 or 100 Mbit/s, auto sensing), connector RJ-45 Protocol: HTTP (web browser interface) Connection: TCP/IP over Ethernet (10 or 100 Mbit/s, auto sensing), connector RJ-45 Protocol: Multipoint Connection: RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10 or 100 Mbit/s, auto sensing), connector RJ-45
Alarm Interface: Mute Input:	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female
Temperature Range:	HDM2: -30°C to 60°C operating (10 minutes warm up at -30°C) SDM2: 0°C to 50°C operating -30°C to 80°C storage
Relative Humidity:	< 95% non condensing
User Interface:	SDM2: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys HDM2: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys
Power Input:	85...264 V AC, 40...70 Hz, appr. 23 W / 31 VA
Mains Fuse:	2 x 3.15 A time-lag fuse
Dimension and Weight:	483 x 44 x 310 mm ³ , 1 RU (19") approx. 6 kg

Specifications are subject to change

Order Information:

**HDM2-[Output Band]-[IF Imp]-[Firmware Option]-[Options] or
SDM2-[Output Band]-[IF Imp]-[Firmware Option]-[Options]**

Possible Options are: FAN (internal Fan)
BI (BISS scrambling)

Examples:

SDM2-V-75-PL

HDM2-L-50-A2H

HDM2-V-75-PL-FAN (Modulator with Fan)



Trade Mark of the DVB Digital Video Broadcasting Project