Challenge Series
Satellite High Speed DVB-S2
Modulator-Block Upconverter

C-, X-, Ku-Band

DV3®
Digital Video Broadcasting

CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 modulator with Block Upconverter constitutes a very cost effective solution of a modulator including an upconverter. The modulator is ideally suited for satellite news gathering (SNG) or similar portable applications. Due to the immediate RF output an SSPA or HPA can be directly connected. No interference susceptible IF cabling is used within the transmit chain.

MPEG Transport Stream Input – RF 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 in the C-, X- or Ku-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.

VideoACM

An integrated VideoACM controller provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint Transport Stream transmissions.

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 ETSI 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 ETSI EN 300421 and 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 and 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 also available.

Specials and OEM Products

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

- 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 (ETSI EN 302 307)
  DVB-DSNG compliant (ETSI EN 301 210)
  DVB-S compliant (ETSI 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 to 262141) according to DVB-S2 standard

- Roll-Off: 35%,25%,20%

- Roll-Off: 15%, 10%, 5% with Firmware Option …S

- Adjustable digital slope equalizer

- Low spurious output

- Dual ASI (with auto-switchover) and SPI electrical interfaces

- ASI optical interface (option)

- Hex ASI Multistream-Interface (with additional auto-switchover) (option)

- DVB-S2 Multistream support (option), capacity calculator, capacity limitation per TS input can be activated.

- Transport Stream over IP input (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 approx. 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

- 10 MHz Reference OCXO included

- C-, X-, or Ku-Band output by using an integrated block converter.

- L-Band Monitor Output on Frontpanel

- Small housing.

- Operating temperature range -30°C to 60°C (-22°F to140°F) (option)

- CE compliant

- **3 years warranty**

Customer Field selectable Firmware Option

Different maximum requirements 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)
- …S	Support of Roll-Off-Filters down to 5%

Open questions, demo units

If you need more information about WORK Microwave's satellite modulators or if you would like to have demo a unit, please contact us via e-mail: info@drawcom.com.au   or call us. We are glad to assist you.

Challenge Series
Satellite High Speed DVB-S2 Modulator-Block Upconverter
Indoor Unit

C-, X-, Ku-Band
S-Type (standard version), H-Type (extended temperature range)

Modulator Type:		HM2BU-C / SM2BU-C	HM2BU-X / SM2BU-X	HM2BU-Ku1 / SM2BU-Ku1 HM2BU-Ku3 / SM2BU-Ku3
RF-Output Frequency:		C-Band 5.850 … 6.450 GHz	X-Band 7.9 … 8.4 GHz	Ku-Band Ku1: 13.75 … 14.50 GHz Ku3: 12.75 … 13.50 GHz
Phase Noise:	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-58 -70 -80 -85 -94 -112	-58 -70 -80 -85 -94 -112	-53 -65 -75 -83 -91 -112
		max values in dBc/Hz		
Frequency Resolution:		1 Hz		
RF-Output Characteristics:		Impedance: Return Loss: Output Power: Accuracy: Stability: Output Power muted: Connector:	$50 \, \Omega$ >18 dB -25 dBm ... 5 dBm, 0.1 dB steps ±0.5 dB ±1 dB <-85 dBm SMA female	
L-Band Monitoring Output (on front panel):		Output Frequency: Output Power: Impedance: Return Loss: Connector:	950 … 1700 MHz (max) -40 … -50 dBm $50 \, \Omega$ >15 dB SMA female	
Spurious Outputs:		Signal related:	<-70 dBc (Pout > 0 dBm) <-65 dBc (-20 dBm < Pout ≤ 0 dBm) <-60 dBc (Pout ≤ -20 dBm) -	
Frequency Stability:		$\pm 2 \times 10^{-8}$ (-30°C ... 60°C, after warm up), aging: $\pm 1 \times 10^{-9}$ per day, $\pm 1 \times 10^{-7}$ per year		
Symbol Rate:		Max Range, depending on Firmware Option: Step size:	8 ksps … 60 Msps 1 sps	
Clock Stability:		$\pm 2 \times 10^{-8}$ (-30°C ... 60°C, after warm up), aging: $\pm 1 \times 10^{-9}$ per day, $\pm 1 \times 10^{-7}$ 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) *) 10 kbps … 213 Mbps (depending on firmware option, modulation, coding) (TS over IP interface) *) *) max 170 Mbps (option BI, when BISS-1/E active)		
Transport Stream Adaption DVB-S2:		CRC-8 Encoder Merger/Slicer Baseband Header Insertion Stream Adaption Baseband Scrambling	yes yes yes yes yes according ETSI EN 302307	
Transport Stream Adaption DVB-S / DVB-DSNG:		Transport Stream Adaption Randomization	yes yes according ETSI EN 300421	
Modulation / Encoding DVB-S2:		Outer BCH Coding: Inner LDPC Coding, depending on Firmware Option: Physical Layer Framing: Physical Layer Signaling: Pilots Insertion: Physical Layer Scrambling:	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 according ETSI EN 302307	
Modulation / Encoding DVB-S / DVB-DSNG:		Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding depending on Firmware Option:	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) according ETSI EN 300421, 301210	
Signal Spectrum Mask:		α = 0.35, 0.25, 0.20 (according ETSI EN 300421, 301210, 302307) α = 0.15, 0.10, 0.05 (with Firmware Option …S, other values on request))		

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C-, X-, Ku-Band

Specifications continued:

Transport Stream Input Interface:	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω) auto switching (can be enabled) between input 1 and 2 in case of ASI signal interruption, ASI data missing DVB-ASI-optical (Connector ST female, Multimode, 1300 nm) (option, ask factory) With option MT2 additionally support of 2 TS multiple input streams. Alternatively with option MT6, 6 DVB ASI electrical interfaces (6 x Connector BNC female, Impedance 75 Ω) 3 pairs of auto switching inputs or 6 individual inputs for TS multiple input stream support Additionally with option TI1 or TI2 up to two individual Transport Stream over IP Inputs (Connector RJ-45, 100/1000 Mbps, auto sensing), IPv4, UDP and RTP support, FEC according SMPTE 2022 1/2, Jitter tolerance 1 … 500 ms, Conversion TS over IP to TS
Multiple TS Input Streams:	Individual modulation and FEC (MODCOD) configuration per TS input, capacity calculator, capacity limitation per TS input can be activated. Input stream synchronization and Null-Packet deletion according to ETSI EN 302307, Annex D.2, D.3. (Option MT2, MT6 only)
Baseband Frame Input:	Through DVB-ASI inputs or DVB-SPI input (can be used alternatively to Transport stream input, configurable) , Flow control signal available as LVDS Output signal on DVB-SPI connector or RS232 Signal on DVB-SPI connector (Option BBR)
Transport Stream Security (Option BI):	BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or 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:	TS 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 can be enabled to remove incoming null packets. PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included. Not supported in case of DVB-S2 multiple input stream operation.
Still Picture Playout	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:	ETSI EN 300421, 301210, 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 (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Protocol: HTTP (web browser interface) Connection: TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Protocol: Multipoint Connection: RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, 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 ... 60°C operating (10 minutes warm up at -30°C) SDM2: 0°C ... 50°C operating -30°C ... 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
Mains Power Input:	100 … 240 V AC nominal, 90 … 264 V AC max, 50 … 60 Hz
Mains Power Consumption:	Typ: 31 VA / 23 W
Mains Power Input Connector:	IEC C14
Mains Fuse:	2 x 2 A time-lag fuse
Dimension and Weight:	483 x 44 x 470 mm³ (WxHxD), 1 RU (19") approx. 8 kg

Specifications are subject to change

Order Information: **HM2BU-[Output Band]-[Options] [Firmware Option] or**
SM2BU-[Output Band]-[Options] [Firmware Option]

Possible Options are:

		Cannot be combined with:	**Requires:**
FAN	internal Fan	-	-
BBR	Baseband Frame flow control as RS232 signal	MT6	-
BI	BISS scrambling	MT2, MT6	-
TI1	one TS over IP input interface	TI2	-
TI2	two TS over IP input interfaces	TI1	-
MT2	Support of 2 Multiple TS input streams	MT6, BI	-
MT6	Support of 6 Multiple TS Input streams	MT2, BI	-

Examples:

SM2BU-Ku1-PL	Ku1-Band Modulator-Block-Upconverter
HM2BU-C-A2H	C-Band Modulator-Block-Upconverter
HM2BU-C-A2HS	C-Band Modulator-Block-Upconverter, Roll-Off-Filters down to 5 %
HM2BU-Ku1-FAN PL	Ku1-Band Modulator-Block-Upconverter with Fan

Trade Mark of the DVB Digital Video Broadcasting Project