Unique Broadband Systems Ltd.

OEM Universal Modulator

Models: DVM 2000D (Board version)
DVM 2010D (Enclosed version)

Product Features

- *50 MHz to 1.5 GHz RF Output Frequency range*
- *Upconverter provides superior MER and Shoulders*
- *SFN and MFN support*
- *Linear and Non-linear Pre-correction*
- *GbE Transport Stream Input based on Pro-MPEG CoP #3*
- *WEB GUI, SNMP, Telnet remote control and software upgrade*
- *Available in both enclosed and board version*

Waveforms Supported

- *ATSC compliant with A/53, A/54, A/64 and SMPTE-310M*
- *ISDB-T/T_B compliant with ARB STB-B31 and TR-B14*
- *DVB-T/H compliant with ETSI DVB standards*
- *DVB-SH compliant with ETSI DVB standards*
- *DAB, DAB+ and T-DMB compliant with ETSI DAB standards and EU147*
- *CMMB compliant with GY/T 220.1-2006 and 220.2-2006*
- *DTMB compliant with GB20600-2006 and GY/T 229.1-2008 (SIP)*

Description and Application

Overview

The UBS Universal Modulator Series utilizes the innovative UBS Universal Waveform engine, supporting all world standards for mobile and terrestrial digital broadcasts.

The Universal Modulator can be factory configured to support one, two or all the waveforms listed above. The user can easily switch from one waveform to another through software selection. UBS' modulators can also be field upgraded as standards evolve.

This open architecture design enables carriers to take advantage of a proven, robust platform, while designing networks to meet current and future broadcast standards.

This series incorporates all of UBS' high performance signal processing stages including integrated linear and non-linear pre-correctors. Full remote management and control as well as remote firmware and waveform upgrades are provided.

Application

The core function of the Universal Modulator is to modulate an input stream, in accordance with the rules for channel coding and modulation defined in the specific standards for each waveform.

Signal Inputs

The OEM modulator is provided with two serial DVB-ASI inputs and two serial G.703/G.704 inputs. The DVB-ASI inputs accept a MPEG-2 transport stream or a CMMB multiplex stream. The G.703/G.704 inputs are used in DAB mode and accept either NA or NI signals. Optionally, two serial SMPTE-310M inputs can be installed. The OEM modulator can also be equipped with a GbE Transport Stream input (based on Pro-MPEG CoP #3) only when a DVB-T/H waveform is selected.

The DVB-ASI, G.703/G.704 and SMPTE-310M inputs can be automatically selected, or assigned by the user. The automatic switching provides near seamless switching to a secondary transport stream in case the primary transport stream source fails (a truly valuable feature for broadcast applications.)

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Description and Application

RF Output

The RF output covers a frequency range of 50 MHz to 1.5 GHz, in steps of just 1 Hz with an output level that is adjustable from –10 dBm to 0 dBm, in 0.1 dB steps. The user can set the polarity of the spectrum to Inverted or Non-inverted as required.

The upconversion process offers superior performance with Shoulder Levels ≤ -58 dBc and MER ≥ 50 dB.

Web Interface

This feature allows remote control of the OEM Modulator via Ethernet (TCP/IP). The system is based on a Web server mounted inside the modulator. The Web pages stored on the Web server are designed as a complete graphical user interface (GUI) for testing the status and setting the parameters of the modulator. The Web Interface concept is popular because remote control with this system only requires a standard PC with a network interface card (NIC) and a Web browser (Microsoft Explorer 6.0+).

SNMP Client

This feature allows remote control of the OEM modulator in accordance with the SNMP protocol (Get, Set and SNMP traps). This remote control feature is intended for systems solutions where it is desired to integrate the control of a range of SNMP compliant equipment in a common management system.

Digital Linear and Non-linear Pre-corrector

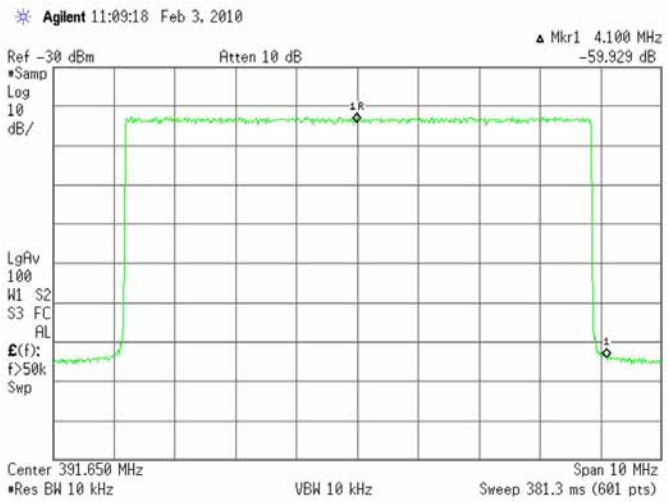
The digital linear and non-linear pre-correctors are used to maximize the performance of the transmitter in which the modulator is installed.

- The Non-linear pre-corrector balances out gain and phase non-linearity in the transmitter RF power amplifier, thereby significantly reducing the in-band and out of band intermodulation products. Optimizing the transmitter's performance will extend the coverage area. The performance requirement of the transmitter output filter, which is used to suppress radiation in adjacent channels below a maximum allowed level, will also be eased.

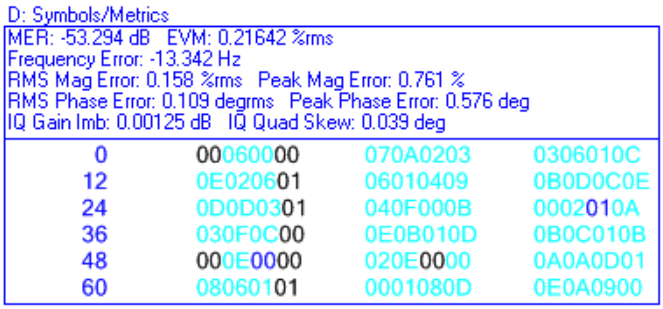
- The Linear pre-corrector balances out level and group delay variations that are seen across the channel bandwidth and caused by the transmitter mask filter and/or channel combiner filters. The linear optimization of the transmitter's radiated signal allows the receiver's channel equalizer to focus all of its correction capacity on level and group delay errors originating from the actual transmission path.

The characteristics of the linear and non-linear pre-correction curves are set by means of an easy to use and highly intuitive graphical user interface, the UBS Corrector GUI software package (Windows compatible).

RF Output Performance (specifications are subject to change without notice)



Shoulder Level



MER

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Product Specifications | Signal Processing (specifications are subject to change without notice)

DVB-T/H Mode

Supported Modes	IFFT: 2k, 4k, 8k
Guard Intervals	1/4, 1/8, 1/16,1/32
Code Rates	1/2, 2/3, 3/4, 5/6, 7/8
Constellations	QPSK, 16-QAM, 64-QAM
Hierarchical Modes	Alpha - 1, 2 and 4 for 16-QAM and 64-QAM
Network Mode	SFN and MFN
Bandwidth	8 MHz, 7 MHz, 6 MHz, 5 MHz
Input	MPEG-2 Transport Stream

DVB-SH Mode

Supported Modes	IFFT: 1k, 2k, 4k, 8k
Guard Intervals	1/4, 1/8, 1/16,1/32
Code Rates	1/2, 1/3, 1/4, 1/5, 2/3, 2/5, 2/7, 2/9
Constellations	QPSK, 16-QAM
Network Mode	SFN and MFN
Bandwidth	8 MHz, 7 MHz, 6 MHz, 5 MHz, 1.7 MHz
Time Interleaver	From 100 ms to several seconds
Input	MPEG-2 Transport Stream

ATSC Mode

Supported Mode	8VSB
Network Mode	SFN and MFN
Bandwidth	6 MHz
Input	MPEG-2 Transport Stream

DAB Mode

Transmission Modes	I, II, III, IV Automatically selected from the ETI stream or set via any control interface
Processing Delay	Mode I: 156000 usec, Mode II: 84000 usec Mode III: 84000 usec, Mode IV: 108000 usec
Transmitter Delay	Up to 2.4 sec, step 1 usec
Transmitter Offset Delay	0 to 2047 usec, step 1 usec
Network Padding Delay	0 to 1.5 second
MNSC Control	Transmitter Identification Information (TII)
Input Signal	ETI (NI) 2.048 MHz short haul or ETI (NA) for E1 interface - ETSI 300 799
Input Selection	Dual NA with seamless switchover NI or NA with automatic detection Manual lock to input 1 or 2
Input Error Condition	Input CRC violations (User selectable)
Test Modes	DAB mode I, II, III, IV CW mode, two tone, 24-tone, 48 tone, 96 tone comb

CMMB Mode

Supported Modes	4K
Guard Intervals	1/8
Code Rates	1/2, 3/4 LDPC
Constellations	BPSK, QPSK, 16-QAM
Byte Interleave	Mode 1, Mode 2, Mode 3
Reed Solomon Coding	RS(240,240); RS(240, 224); RS(240,192); RS(240,176)
Scrambling Modes	1, 2, 3, 4, 5, 6, 7, 8
Number of Time Slots	40
Number of simultaneous multiplexed frames	40
Network Mode	SFN and MFN
Bandwidth	8 MHz
Transmission Time delay	Adjustable, range: ±500 ms, step 100 ns
Input	CMMB Multiplex Stream
Time Information Input	RS232 serial port for GPS TOD Information Connector: 9-pin SUB-D Female

DTMB Mode

Supported Modes	IFFT: 3780, Single Carrier
Guard Intervals	945, 595, 420 symbols
Code Rates	0.4, 0.6, 0.8
Constellations	QPSK, 4QAM-NR, 16-QAM, 32-QAM, 64-QAM
Frame Duration	500 us, 666.67 us or 571.43 us
Sub-carrier Spacing	1.5 kHz, 1.75 kHz, 2 kHz
Time Interleaver	240, 720 symbols
Network Mode	SFN and MFN
Bandwidth	8 MHz
Input	MPEG-2 Transport Stream

ISDB-T/Tb Mode

Supported Modes	IFFT: 2k, 4k, 8k
Guard Intervals	1/4, 1/8, 1/16,1/32
Code Rates	1/2, 2/3, 3/4, 5/6, 7/8
Constellations	QPSK, 16-QAM, 64-QAM, DQPSK
Hierarchical Modes	up to 3 layers
Carrier Spacing	1 kHz, 2 kHz, 4 kHz
Time Interleaver	0 to 16
Network Mode	MFN and SFN (IIP packets)
Bandwidth	5.6 MHz
Input	MPEG-2 Transport Stream

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Product Specifications (specifications are subject to change without notice)

Inputs

DVB-ASI	**IN-A, IN-B**	2 Inputs: BNC (F), 75 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D)
G.703/G.704	**IN-A, IN-B**	2 Inputs: BNC (F), 50 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D)
GbE Transport Stream (DVB-T/H mode only)		Protocol: Pro-MPEG CoP #3 Connector: RJ45
Clock Reference - 10 MHz		Connector: BNC (F), 50 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D) Frequency: 10 MHz Level: 100 mV to 3 Vpp
Time Reference - 1 PPS		Connector: BNC (F), 50 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D) Frequency: 1 PPS Level: TTL Trigger: Positive transition

RF Output

Connector	BNC (F), 50 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D)
Operating Frequency Range	50 MHz to 1.5 GHz, in 1 Hz step
Frequency Stability	Internal ref 1ppm / or in accordance with external ref accuracy
Spectrum Polarity	Inverted or Non-inverted, user selectable
Level	-10 dBm to 0 dBm in 0.1 dB steps
Level Stability	±0.2 dB
Return Loss	> 26 dB
Shoulder Level	≤ -58 dBc (Note 1)
Harmonics and Spurious	< 60 dB relative to the total output power
MER	≥ 50 dB (Note 2)
Phase Noise SSB	10 Hz: < -60 dBc/Hz 100Hz: < -86 dBc/Hz 1kHz: < -100 dBc/Hz 10kHz: < -105 dBc/Hz 100kHz: < -110 dBc/Hz 1MHz: < -120 dBc/Hz

Monitoring Outputs

DVB-ASI	**OUT-A, OUT-B**	2 Outputs: BNC (F), 75 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D)
G.703/G.704	**OUT-A, OUT-B**	2 Outputs: BNC (F), 50 Ω (DVM 2000D) SMA (F), 50 Ω (DVM 2010D)

Control Interfaces

USB	Interactive CLI commands
Alarm Relays	2 Dry Contact Alarm relays Triggered by any major alarm Contacts available on the RS232 and RS485 connectors
RS232 Interface	Connector: 9-pin SUB-D Male Command protocol: Interactive CLI commands (All except CMMB)
RS485 Interface	Connector: 9-pin SUB-D Female (DVM 2000D only) Command protocol: Interactive CLI commands (CMMB only)
Web Interface	Internet Explorer 6.0+ 2 Connector: RJ45 Ethernet 10/100/1000 Base-T
SNMP Control Interface	2 Connector: RJ45 Ethernet 10/100/1000 Base-T MIBs are provided

Pre-Correction

Non-Linear Pre-Correction	
Curve Formats	S 21 and VO/VI
Amplitude Scale	Linear and Logarithmic
Correction Points	Max. 256, user-defined position
Gain Correction	Max. 12 dB, subject to available headroom
Phase Correction	-6 to +30 degrees, subject to available headroom
Linear Pre-Correction	
Correction Points	61
Point Spacing	1/60 of nominal spectrum BW
Amplitude Correction	±10 dB
Amplitude Resolution	0.01 dB
Group Delay Correction	±2000 ns
Group Delay Resolution	1 ns
Peak Power Clip Level	+17 dB to +7 dB (peak power relative to average RMS level)

Note 1: Shoulder measurements were performed with Agilent E4443A PSA Series Spectrum Analyzer.

Note 2: MER measurements were performed with Agilent E4443A PSA Series Spectrum Analyzer in conjunction with Agilent E9285B Digital Video Analysis Modulation software.

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Power Supply

Voltage	12 Vdc: 6 Pin Header (DVM 2000D) DC Jack, 2.1mm ID, 5.3mm OD (DVM 2010D)
Power Consumption	max. 27 VA

Mechanical

DVM 2000D Dimensions (W x H x D)	234mm x 38mm x 163mm (9.2" x 1.5" x 6.4")
DVM 2000D Weight	0.25kg (0.5 lbs.)
DVM 2010D Dimensions (W x H x D)	247mm x 30.5mm x 203mm (9.7" x 1.2" x 8.0")
DVM 2010D Weight	1 kg (2.2 lbs.)

Environmental

Operating Temperature	0°C to +50°C (+32°F to +122°F)
Storage Temperature	-30°C to +70°C (-22°F to +158°F)
Relative Humidity (operating/storage)	max. 95%
Cooling	Temperature controlled fan to assist natural convection (DVM 2010D only)

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