

### Product Features

- Direct RF output from 47 MHz to 960 MHz in 1 Hz steps
- Superior Shoulders and MER
- Single and multiple PLP(s)
- MFN and SFN (with full T2-MI support) operation
- SISO/MISO transmission
- Adaptive Non-linear Pre-corrector
- Manual Linear and Non-linear Digital Pre-correctors
- Interfaces for Web GUI, SNMP and Telnet remote control, machine to machine interface and software upgrades
- DVB-T2 compliant with EN 302 755 and TS 102 773



### Optional Features

- Internal GPS Receiver
- 0 dBm to 10 dBm output

### Description and Application

#### Overview

The DVU 5000 DVB-T2 modulator utilizes the innovative UBS Universal Waveform engine, supporting all world standards for mobile and terrestrial digital broadcasts.

The modular, state of the art design allows transmitter manufacturers and network operators to integrate the DVU 5000 into their system/network with relative ease.

The DVU 5000 supports all DVB-T2 modulation features including T2-MI interface support, single and multiple Physical Layer Pipes (PLPs), MFN/SFN operation, and SISO/MISO transmission.

Using the latest technology, UBS has developed a direct conversion process that allows the OEM Universal Modulator to provide an RF output from 47 MHz to 960 MHz with superior shoulders and MER.

This DVU 5000 also incorporates UBS' Adaptive Non-linear Pre-corrector and Manual Linear and Non-linear Digital pre-correctors. Full remote management and control as well as remote firmware upgrades are provided.

#### Signal Inputs

The DVU 5000 is provided with two serial DVB-ASI inputs, which 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.

#### RF Output

The RF output covers a frequency range of 47 MHz to 960 MHz in 1 Hz steps. The output level is adjustable from -10 dBm to 0 dBm (0 dBm to 10 dBm optional), in 0.1 dB steps.

The direct conversion process offers superior performance with Shoulder Levels  $\leq -57$  dBc and MER  $\geq 50$  dB (note 3).

# PRELIMINARY DATA

## DVB-T2 Modulator

Model: DVU 5000



### Description and Application

#### Adaptive Non-linear Pre-corrector

The Adaptive Non-linear Pre-corrector is a superior pre-distortion solution that compensates for RF Power Amplifier non-linearities including AM/AM and AM/PM distortion and protects against IMD and spectral regrowth while maximizing EVM performance.

The complex signal processing is done in the RF domain and supports a fully adaptive operation: the feedback signal (HPA output) is compared to the modulator's RF output signal (HPA input) in order to optimize the correction which will improve the shoulders of the RF output.

Note: The Adaptive Non-linear Pre-corrector is a standard feature on the DVU 5000. The customer has the option to have this feature removed if desired.

#### Web Interface

This feature allows remote control of the DVU 5000 via Ethernet (TCP/IP). The system is based on a Web server mounted inside the DVU 5000. 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 DVU 5000 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.

Optionally, the DVU 5000 RS232 interface can be dedicated for communication with a 3rd party UPS. In this case, the modulator is configured with an extra set of SNMP parameters and will actively monitor the UPS.

#### Machine to Machine Interface

Depending on the waveform selected, the DVB-T2 Modulator RS232, RS485 or Ethernet port can be used for as a machine to machine interface. This is a valuable feature when control of an external power amplifier is required.

#### Manual Linear and Non-linear Digital Pre-correctors

The manual linear and non-linear digital 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.

#### Internal GPS Receiver (optional)

The DVU 5000 can be equipped with an internal GPS unit. In this case, the frequency references for the modulator and upconverter are derived from the internal GPS receiver.

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## DVB-T2 Modulator

Model: DVU 5000



Front Panel

## Product Specifications

### DVB-T2 Modulation and Signal Processing

<b>FFT Modes</b>	1k, 2k, 4k, 8k, Extended 8k, 16k, Extended 16k, 32k, Extended 32k
<b>Guard Intervals</b>	1/128, 1/32, 1/16, 19/256, 1/8, 19/128, 1/4
<b>Code Rates</b>	1/2, 3/5, 2/3, 3/4, 4/5, 5/6
<b>PLP Constellations</b>	QPSK, 16-QAM, 64-QAM, 256-QAM (normal or rotated)
<b>L1 Post Constellations</b>	BPSK, QPSK, 16-QAM, 64-QAM
<b>FEC</b>	Short (16k), Normal (64k)
<b>Network Modes</b>	MFN, SFN-SISO, SFN-MISO
<b>Bandwidth</b>	1.7 MHz, 5 MHz, 6 MHz, 7 MHz, 8 MHz, 10 MHz
<b>Time Interleaving</b>	Adjustable
<b>Pilot Pattern</b>	PP1 to PP8
<b>Test Modes</b>	Single Carrier (CW) Carrier Removal (100 to 800 carriers)
<b>Input</b>	T2-MI control Input steam monitoring PCR restamping TS Bit Rate Adaptation

### Control Interfaces

<b>Front Panel</b>	LCD display and cursor/ execute keys
<b>Ethernet Interface</b>	Connector: 2x RJ45 Speed: 10/100/1000 Base-T
<b>USB Interface</b>	Connector: USB Type B
<b>RS232 Interface</b>	Connector: 9-pin SUB-D Male
<b>RS485 Interface</b>	Connector: 9-pin SUB-D Female
<b>CLI (Command Line Interface)</b>	Connector: USB (HyperTerminal) or Ethernet (HyperTerminal and Telnet)
<b>Web GUI</b>	Internet Explorer, Firefox, etc. Connector: Ethernet
<b>SNMP Control Interface</b>	Connector: Ethernet Note: MIBs can be provided
<b>Alarm Relays</b>	Connector: RS232 and RS485 2 Dry Contact Alarm relays, triggered by any major alarm.
<b>Machine to Machine Interface</b>	Connector: Ethernet or RS232

### Inputs

<b>DVB-ASI</b>	<b>IN-A, IN-B</b>	2 DVB-ASI inputs: BNC (F), 75 Ω
<b>HPA FB</b>		SMA (F), 50 Ω
<b>Clock Reference - 10 MHz (Note 1)</b>		Connector: BNC (F) Frequency: 10 MHz Level: 100 mV - 3 Vpp Impedance: 50 Ω
<b>Time Reference - 1 PPS (Note 1)</b>		Connector: BNC (F) Frequency: 1 PPS Level: TTL Trigger: Positive transition Impedance: 50 Ω

### Monitoring Outputs

<b>DVB-ASI</b>	<b>OUT-A, OUT-B</b>	2 DVB-ASI outputs: BNC (F) 75 Ω
<b>RF Monitor</b>		Connector: SMA (F) Impedance: 50 Ω Level: 30 dB below RF output
<b>Reference Monitor</b>		Connector: BNC (F) Frequency: 10 MHz Level: 2 Vpp Impedance: 50 Ω
<b>Clock Reference - 10 MHz (Note 1)</b>		Connector: BNC (F), High Impedance Frequency: 10 MHz Level: 10 dBm, ± 2.5 dB sinewave
<b>Time Reference - 1 PPS (Note 1)</b>		Connector: BNC (F), High Impedance Frequency: 1 PPS Level: TTL Trigger: Positive transition

**Note 1:** The "10MHz" and "1pps" are inputs, except when the modulator is equipped with an internal GPS receivers, where they become Monitoring Outputs (high impedance).

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# DVB-T2 Modulator

Model: DVU 5000

# UBS

Unique Broadband Systems Ltd.



Rear Panel

## Product Specifications

### RF Output

<b>Connector</b>	N-type (F), 50 $\Omega$
<b>Frequency Range</b>	47 MHz to 960 MHz
<b>Frequency Step Size</b>	1 Hz
<b>Frequency Stability</b>	Internal reference 0.02ppm / or in accordance with external ref. accuracy
<b>Spectrum Polarity</b>	Inverted or non-inverted, selectable
<b>Level</b>	-10 dBm to 0 dBm in 0.1 dB step (optional 0 dBm to 10 dBm)
<b>Level Stability</b>	$\pm 0.3$ dB
<b>Return Loss</b>	> 20 dB
<b>Shoulder Level</b>	$\leq -57$ dBc (Note 2)
<b>Spurious Level Outside Channel</b>	< -60 dBm
<b>MER</b>	$\geq 50$ dB (Note 3)
<b>Amplitude Flatness</b>	Center frequency $\pm 3.8$ MHz: $\pm 0.3$ dB (Note 4)
<b>Group Delay response:</b>	Center frequency $\pm 3.8$ MHz: $\pm 10$ ns (Note 4)
<b>Phase Noise SSB</b> (measured @ 474 MHz)	10 Hz: < -60dBc/Hz 100 Hz: < -90 dBc/Hz 1 kHz: < -100 dBc/Hz 10 kHz: < -105 dBc/Hz 100 kHz: < -120dBc/Hz 1 MHz: < -135 dBc/Hz

**Note 2:** Shoulder measurements were performed with Agilent E4443A PSA Series Spectrum Analyzer.

**Note 3:** MER measurements were performed on a DVB-T2 waveform with an Agilent E4443A PSA Series Spectrum Analyzer in conjunction with Agilent E9285B Digital Video Analysis Modulation software.

**Note 4:** Levels are measured in 10 kHz bandwidth, where 0 dB is the level of the carriers at the edge of the spectrum. Harmonics and spurious are not included.

### Adaptive Non-linear Pre-correction

<b>HPA FB Connector</b>	To be connected to the HPA output when the Adaptive Pre-corrector is used
<b>Level</b>	-15 dBm to 0 dBm
<b>Frequency</b>	470 MHz to 860 MHz
<b>Spectral Regrowth Reduction</b>	7 dB $\pm 2$ dB (Note 5)

### Manual Digital Pre-Correction

#### Non-Linear Pre-Correction

<b>Curve Formats</b>	S 21 and VOMI
<b>Amplitude Scale</b>	Linear and Logarithmic
<b>Correction Points</b>	Max. 256, user-defined position
<b>Spectral Regrowth Reduction</b>	Max. 12 dB, subject to available headroom
<b>Phase Correction</b>	-6 to +30 degrees, subject to available headroom

#### Linear Pre-Correction

<b>Correction Points</b>	61
<b>Point Spacing</b>	1/60 of nominal spectrum BW
<b>Amplitude Correction</b>	$\pm 10$ dB
<b>Amplitude Resolution</b>	0.01 dB
<b>Group Delay Correction</b>	$\pm 2000$ ns
<b>Group Delay Resolution</b>	1 ns
<b>Peak Power Clip Level</b>	+17 dB to +7 dB (peak power relative to average RMS level)

**Note 5:** Greater improvement is possible under particular applications. Performance depends upon power level and waveform.

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## DVB-T2 Modulator

Model: DVU 5000

### Product Specifications

#### Power Supply

<b>Voltage</b>	100 - 240 VAC
<b>Frequency</b>	50 - 60 Hz
<b>Power Consumption</b>	max. 45 VA (70 VA with +10 dBm RF amplifier and GPS receiver installed)
<b>Harmonic Correction</b>	EN61000-3-2

#### Environmental

<b>Operating Temperature</b>	0°C to +50°C (+32°F to +122°F)
<b>Storage Temperature</b>	-30°C to +70°C (-22°F to +158°F)
<b>Relative Humidity (operating/storage)</b>	max. 95%
<b>Cooling</b>	Fan to assist natural convection

#### Mechanical

<b>Size</b>	1 U of 19" wide cabinet
<b>Dimension (W x H x D)</b>	483mm x 44mm x 521mm (19" x 1.75" x 20.5")
<b>Weight</b>	6 kg (13 lbs)
<b>Transport and Storage</b>	Vibration acc. to IEC Publ.68

#### ETSI Compliance

Essential Requirement R&TTE Directive 1995/5/EC	Standard / Specification
<b>Safety</b>	EN 60950-1: 2001, A11: 2004 First Edition
<b>Health</b>	Not Applicable. No Antenna
<b>EMC</b>	EN 301 489-1 V1.8.1
<b>Radio</b>	EN 302 296 V1.1.1 (The technical requirement of Clause 4.3 was substituted for Clause 8.2 of EN 301 489-1 using the Class A limits specified in Table 4.)

#### CE Compliance

This equipment is CE Compliant.

CE 06780

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