OTM 1000

Advanced Waveform Monitor and Signal Generator
3Gb/s * Dual-Link * HD * SD * Standard case
Introducing the OmniTek OTM 1000 waveform monitor and signal generator: a unique combination of high-precision video/audio analysis tools partnered with a comprehensive full-motion signal generator system. The OTM 1000 is compatible with all single- and dual-link SDI formats at 270Mb/s, 1.5Gb/s, and 3Gb/s. The system also contains an optional physical layer analysis package, providing jitter measurements and the industry’s first production eye diagram display for 3Gb/s signals.

**System Overview**

The OTM 1000 is supplied in an industry-standard half-width 3RU enclosure with a familiar, easy-to-use control panel interface and high-resolution built-in colour LCD display. There are two SDI inputs and two SDI outputs, plus a reference sync input loop-thru (bi-level or tri-level) and an analog RGB/YPbPr component monitoring output. There is an internal loudspeaker and a headphone socket for audio monitoring. External data interfaces include dual gigabit ethernet ports, three USB ports, and an RS-232 serial interface.

The capabilities of the system are defined by a wide range of performance options, to allow users to configure the system to meet their exact needs. Most options are software-programmable, to allow new features to be installed simply via a download. The physical layer analysis package and digital audio I/O interfaces are in the form of additional plug-in circuit cards. A range of mechanical options are also available, including a 19” rack-mount kit, rugged flight case, and mounting sleeve with carrying handle and angled feet.

The OTM 1000 contains a unique flexible display manager, which allows the user to configure the screen displays to best suit their needs. Each window tile can be positioned and sized individually, and stored as a preset. There is an external VGA port for connection to an external display screen of up to 1920 x 1200 pixel resolution.

All functions of the system can be remote controlled, either via SNMP or a network-based client-server model which supports the control of multiple systems.

**Signal Analysis Functions**

**Input Signal Status**

Input signals are checked for errors and the presence of various kinds of metadata. Checks include SDI formatting, TRS and CRC/EDH validity; Picture freeze/mono/black detect; SMPTE 352M “payload ID” display; AFD, Video Index, and WSS aspect ratio controls; VITC, LTC, and ATC timecode monitoring; Range and gamut checks in RGB & YCbCr colour spaces; and subtitle display for EIA-608, 708, teletext and OP47 data.

**Picture Monitor**

The OTM 1000 includes a high quality full frame-rate picture monitor display, which can be configured to show either the active picture or the entire raster with horizontal and vertical “pulse-cross” modes. Gamut and range errors can be highlighted on the picture, and there is a unique zoom view mode for high magnification of a user-selectable area of the picture.

**Waveform Displays**

The OTM 1000 contains OmniTek’s award-winning high resolution, user-adjustable waveform displays in YCbCr, RGB, Composite, and XYZ colour spaces. Multi-line, single-line, two-line, and frame-scan modes are available, and the colour components may be displayed as a horizontal parade, overlay, or vertical stack. There is a full range of H & V magnification functions, plus our unique region of interest control. There are also timebase and amplitude cursors available. The internal signal processing is performed to 12-bit precision, to maximize waveform accuracy. Arbitrary combinations of colour components may be displayed simultaneously. Gain, gamma, and persistence controls are available, and the waveforms may be individually colour-coded on the screen.

**Colour Analysis Functions**

The OTM 1000 provides up to four separate colour monitoring and analysis displays, to support users working in broadcast, QC, post-production, or digital cinema environments. There is a high resolution vectorscope with 75% and 100% graticules, including region-of-interest, gain control, and luma-level qualification modes. The system also provides a colour gamut indicator display, which gives a real-time indication of the percentage of pixels which are outside gamut in any of the monitored colour spaces (for example as specified in EBU Recommendation 103). For post-production users, the VIEW_XR_DCI software option provides histogram displays in RGB, YCbCr, XYZ, and Composite colour spaces, and our new real-time CIE colour chart display provides a unique method for showing which source pixels fall inside or outside the colour gamut of a range of different display types and formats.
When equipped with the VIEW_2 option, The OTM 1000 can simultaneously monitor two independent SDI inputs. The full range of analysis functions are provided on each input, and the two inputs can be in different formats (SD, HD single-link or 3Gb/s type A).

There is also a two-channel option GEN_2 for the test signal generator. This provides two independent output channels which may be in different video formats.

Pixel Data Display

The VIEW_DATA option adds a detailed pixel data display, showing the exact values present on the SDI inputs in decimal, hex, or binary numbers. The colour-coded display indicates different types of data, while a user-programmable ANC data packet reader decodes metadata for easy analysis. The display is compatible with dual-link inputs, and provides decoding of 12-bit pixel values or 4:4:4:4 data with alpha channel in YCbCr, RGB, and XYZ formats.

Audio Monitoring Capabilities

The OTM 1000 provides a comprehensive range of audio monitoring functions. The basic AUDIO option supports 16 channels of PCM embedded audio input and provides detailed channel status, a wide range of PPM meter ballistics and graticules, loudness analysis to ITU-R BT.1770, surround-sound display and Lissajous figures. The options AUDIO_DOLBY_D and AUDIO_DOLBY_E provide full decoding of compressed audio inputs, including metadata analysis and A/V delay measurements. A decoded analog stereo pair is available at the system loudspeaker, headphone and line-out sockets. The AUDIO_AES option is a separate hardware card providing 16 channels of digital audio I/O. Digital input signals are routed to the various analysis displays, and the digital outputs may be selected from the Dolby decoder options or PCM embedded audio input.

Physical Layer Analysis

The EYE option on the OTM 1000 system provides a full range of physical layer analysis tools for the SDI inputs. Note that an additional hardware plug-in card is required, which is available in SD-only, SD/HD, and SD/HD/3G versions.

The EYE option provides accurate measurement of the amplitude of the incoming SDI signal, the bitstream rise and fall times, the overshoot/undershoot levels, and the calibrated input cable length. The option also gives a detailed analysis of the bitstream jitter characteristic over various frequency bands, including the SMPTE specification timing and alignment filters.

Two display windows are available with the EYE option: Firstly the Eye Diagram display itself, showing the waveform of the input SDI bitstream calculated with an input bandwidth in excess of 10GHz. 2-, 4-, and 8-Eye displays are available, in both equalised and non-equalised modes. Secondly a Jitter Waveform display is available, showing the jitter amplitude with respect to time with a variety of different horizontal timebases.

Error Logging & Alarms

Comprehensive error detection and logging is a standard feature on the OTM 1000. All the video, audio, and metadata parameters monitored by the system may be entered into an XML-format event log file, with time-stamping from input timecode or the system internal clock.

In addition, events may be configured to trigger alarms or SNMP network traps. Thresholds and timeouts for each monitored parameter are fully adjustable in the configuration menus. The OTM 1000 also uses a ‘traffic light’ colour-coded indicator system on the input status display, to indicate whether errors have been detected.

Multi-Channel Generation & Analysis

When equipped with the VIEW_2 option, The OTM 1000 can simultaneously monitor two independent SDI inputs. The full range of analysis functions are provided on each input, and the two inputs can be in different formats (SD, HD single-link or 3Gb/s type A).

There is also a two-channel option GEN_2 for the test signal generator. This provides two independent output channels which may be in different video formats.
Test Signal Generator

The **OTM 1000** provides several different test signal generator options. **GEN_BASIC** simply provides colour bars and pathological matrix in the selected output video format.

The more comprehensive **GEN** option provides a wide range of capabilities including many standard test patterns, fully programmable zone plate generator, still image play-out from a variety of different file formats, embedded audio tone generator, and user-selectable levels of gain, noise and bounce. There are also several metadata generation functions as listed below.

The **GEN_MOTION** option allows the **OTM 1000** to play out full-motion uncompressed video sequences. These may be in any standard file format, including AVI and WMV.

Finally the **GEN_ADVANCED** option contains our unique RVF file editor, enabling users to create and edit video frames comprising the entire raster with H & V blanking. User-defined ANC packets may be inserted onto the output.

**Standard Line Patterns**
The standard patterns include a range of colour bars (including SMPTE RP219), frequency sweeps, multiburst, luma and chroma steps & ramps, pathological, and pulse & bar. Patterns are available in all video formats.

**Zone Plates**
The zone plate generator provides a complete set of X, Y, and T adjustments. The basic waveform is selectable as sine, square, or triangular, and may be applied to luma and chroma channels independently. User settings can be saved in custom setup files.

**Still Image Play-out**
The **OTM 1000** can play out images stored in any standard PC file format (.bmp, .jpg, .tif, .yuv etc.). When the images are loaded into the system they may be re-sized to fit the current video output format, and the colour space is automatically converted using Rec. 601 or Rec. 709 matrices.

**Ancillary Data**
The **GEN** option provides the capability to insert VITC/ATC timecode, wide screen signalling, RP186/ARD format video index, and SMPTE 352 payload ID to the video output.

**Full-Motion Play-Out**
The **OTM 1000** can play out full-motion uncompressed video sequences in any format. The sequence length is approximately 76 secs at SD rates, 13 secs for single-link HD, or 6.5 secs of 1080p60.

**Embedded Audio Generator**
The system provides a user-programmable 16-channel embedded audio tone generator, with 20- or 24-bits per sample at 48 kHz. Output frequency and waveform is user-selectable per channel.

**Input Capture Functions**
The standard **OTM 1000** system can freeze & capture still frames from the SDI inputs. With the **CAP_MOTION** option, full motion sequences of frames may be captured directly into system memory for subsequent analysis. Sequence length limits are the same as for the generator option listed above.

There is also a **CAP_ADVANCED** option, to enable users to capture frames or sequences as full-raster RVF files with blanking data. This includes user-defined ANC packet extraction & logging capabilities.

Note that to play out any captured images or sequences, the appropriate generator option must also be installed.

**System Options & Configurations**
The **OTM 1000** has many different configuration options, as explained above and listed on the back page of this brochure. To make choosing the correct system for your needs easier, these options have been collected into price discounted “bundles” designed to meet typical user requirements in broadcast, post-production, and R&D.

For a complete list of all the available options and prices, or to arrange a system demonstration, please consult your local dealer.
Eye diagram / Input status / Picture monitor / Overlay waveforms

Pixel data display / Picture monitor / Stacked waveforms (single line)

CIE chart / Vectorscope / RGB histograms / Gamut display / Picture monitor

Eye diagram / Picture monitor / Stacked waveforms

Audio PPMs / Surround & Loudness display / Surround Lissajous / Picture monitor

XYZ waveforms / Picture monitor / CIE colour chart

Eye diagram / Timing & Alignment jitter waveforms / Input status

Audio PPMs & phase / Picture monitor / Parade waveforms
**TECHNICAL SPECIFICATION**

**Serial Digital Inputs**
- **Connection**: 2 x BNC with 75ohm termination
- **Return Loss**: >15dB to 1.5GHz, >10dB to 3GHz
- **Bit Rates**: 270Mb/s, 1.485Gb/s, 2.97Gb/s (SMPTPE 259M, 292M, 424M)

**Serial Digital Outputs**
- **Connection**: 2 x BNC with 75ohm termination
- **Bit Rates**: 270Mb/s, 1.485Gb/s, 2.97Gb/s (SMPTPE 259M, 292M, 424M)
- **Jitter**: Timing Jitter: < 0.2UI (SD), < 1.0UI (HD), < 2.0UI (3Gb/s)
  Alignment Jitter: < 0.2UI (SD), < 2.0UI (HD), < 3.3UI (3Gb/s)

**Monitor Out Connector**
- **Video Output**: RGB with bi- or tri-level sync on green, 0.7Vpk-pk video; or YYPbPr with bi- or tri-level sync on Y, 0.7Vpk-pk video
- **Sync Input**: Black with bi-level (0.3 Vpk-pk) or tri-level (0.6 Vpk-pk) composite sync.
- **Return Loss**: >30dB up to 30MHz

**Reference Loop**
- **Connection**: 2 x BNC, high impedance loop-through
- **Sync Input**: Black with bi-level (0.3 Vpk-pk) or tri-level (0.6 Vpk-pk) composite sync.
- **Return Loss**: >30dB up to 30MHz, with suitable termination on one BNC

**Physical Layer Measurements**
- **Note**: Video standard support must match system video standard support (see above)
  - **EYE_SD_HD_3G**: SD / HD / 3G eye height, eye diagram and jitter

**Other Options**
- **LTC**: LTC timecode reader
- **OTM_COVER**: Carrying sleeve with handle & feet, plus protective display cover
- **OTM_CASE**: Custom-designed flight case, also with USB keyboard
- **OTM_DUAL_RACK**: 19" rack mounting kit
- **OTM_FILLER**: 19" rack blanking plate

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**SYSTEM OPTIONS**

The OTM 1000 is supplied with basic monitoring functions in standard-definition only. A wide range of additional options are available, see below. Options may be purchased at any time, and the system upgraded by the customer via software downloads. Please consult your OmniTek dealer for a full list of options and price/delivery information.

**View Standard Support**
- **VIDEO_HD**: Adds HD support
- **VIDEO_DL**: Adds support for Dual-Link formats (requires VIDEO_HD)
- **VIDEO_3G**: Adds support for 3Gb/s A & B formats (requires VIDEO_HD)

**Video Monitoring Options**
- **VIEW_DATA**: Enhanced pixel data digital analysis display
- **VIEW_2**: Adds support for simultaneous SDI monitoring. Note: 3Gb/s type B and Dual Link formats not supported
- **VIEW_XR_DCI**: Adds XYZ monitoring, histograms, 12-bit, CIE colour chart

**Audio Monitoring Options**
- **AUDIO**: Adds audio monitoring: PPMs, phase, clip, over, silence, mute, play-out audio status, surround sound, loudness, Lissajous figures
- **AUDIO_AES**: Adds AES digital I/O support on separate card (requires AUDIO)
- **AUDIO_DOLBY_D**: Full Dolby Digital decode (requires AUDIO)
- **AUDIO_DOLBY_E**: Adds DOLBY E full decode + metadata (requires AUDIO)

**Video Pattern Generator Options**
- **GEN_Basic**: Basic static test pattern generator
- **GEN**: Standard test patterns, zone plates, active video stills; gain, noise, bounce, audio tone generation, VITC, ATC, WSS, VINDEX, SMPTE 352 insert
- **GEN_2**: Adds support for simultaneous 2-channel SD/HD/3G-A signals
- **GEN_MOTION**: Uncompressed sequence play-out from system RAM
- **GEN_ADV**: Closed caption, RFV and ANC generation, custom ANC streaming

**Video Capture Options**
- **CAP_MOTION**: Full motion capture, recorded uncompressed to RAM
- **CAP_ADV**: ANC capture, RFV still or sequence capture

**Performance**
- **System**: OTM 1000 Rear Panel Layout
- **WARRANTY**
  OmniTek systems are warranted for one year from date of purchase. This includes all feature upgrades and bug fixes to the application software, plus repair or replacement of the hardware (at the discretion of OmniTek). Extended warranty agreements are also available, please consult your local dealer.

**ABOUT OmniTek**
OmniTek is the product division of Image Processing Techniques Ltd., a leading independent consultancy company specializing in the design of products for the broadcast, post-production, and digital film industries. Over the past 10 years, IPT has completed many successful design projects for major equipment manufacturers in Europe, Asia, and the United States. For more information, please see www.omnitek.tv

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