

# 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 or composite monitoring output. 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.

The system is fully remote-controllable, 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

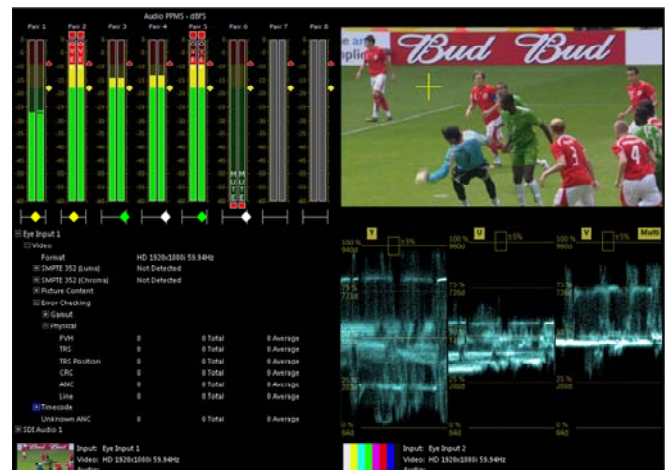
The **OTM 1000** includes a high quality full frame-rate picture monitor display, which can be configured to show either the active picture or the entire raster with horizontal and vertical "pulse-cross" modes. Gamut and range errors can be highlighted on the picture, and the user can select an arbitrary "region-of-interest" for feeding the waveform display and colour analyzer functions.

### 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 **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.



OTM 1000 default analysis configuration

### 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 embedded audio and provides detailed input status, a wide range of PPM meter ballistics and graticules, loudness, surround-sound display and Lissajous figures. The **AUDIO\_AES** option is a separate hardware card, providing 16 channels of digital audio I/O independent of the SDI embedded audio. Options **DOLBY\_D** and **DOLBY\_E** provide full decode & analysis of compressed audio inputs, with analog output to a stereo mixdown pair. The **DOLBY\_OUT** option, when used in conjunction with the **AUDIO\_AES** and either the **DOLBY\_D** or **DOLBY\_E** options, provides decoded output from all the encoded channels.

## Physical Layer Analysis

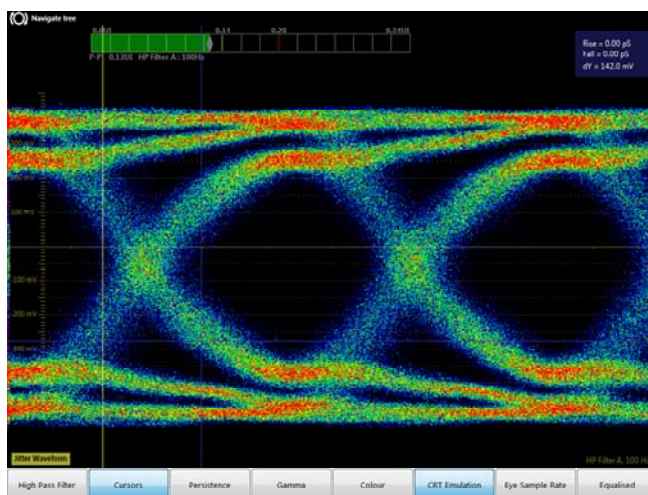
The **OTM 1000** provides two levels of physical layer analysis for the SDI inputs, as described below. Note: Additional hardware plug-in cards are required for these options. Specify SD, HD, or 3Gb/s capability when ordering.

### PHY Option

This option provides accurate measurement of the amplitude of the incoming SDI signal, plus detailed analysis of the bitstream jitter characteristic. The option includes SMPTE specification jitter timing and alignment filters, and displays of jitter amplitude with respect to time plus a jitter frequency spectrum display.

### EYE Option

In addition to the measurements provided by the PHY option, the EYE module generates a real-time display of the SDI input bitstream eye pattern. The display is available as 3- or 10-eye, on the equalized or non-equalized SDI input signal.

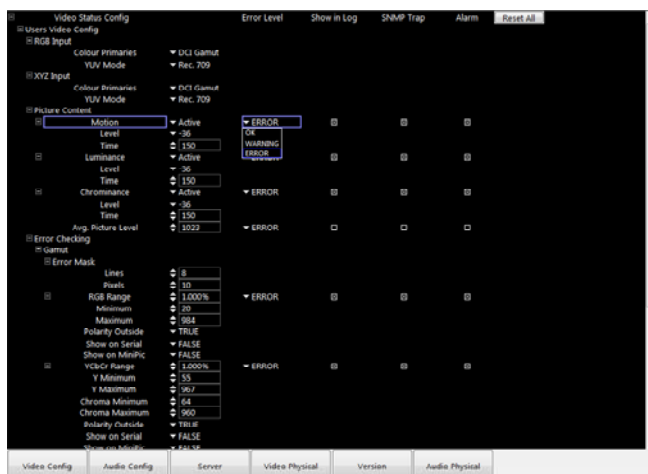


3Gb/s eye pattern with jitter meter & cursors

## 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.



Main configuration menu for setting log parameters

## Multi-Channel Generation & Analysis

The **OTM 1000** can simultaneously monitor two independent SDI inputs, when equipped with the **VIEW\_2** option. 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.

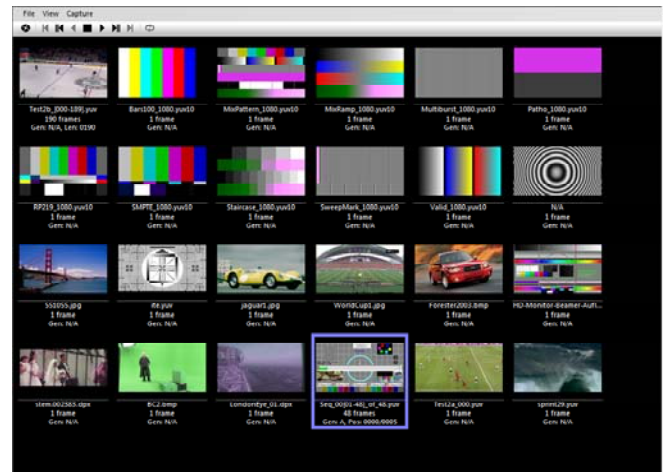
## Test Signal Generator

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.



Signal generator control window

### 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.

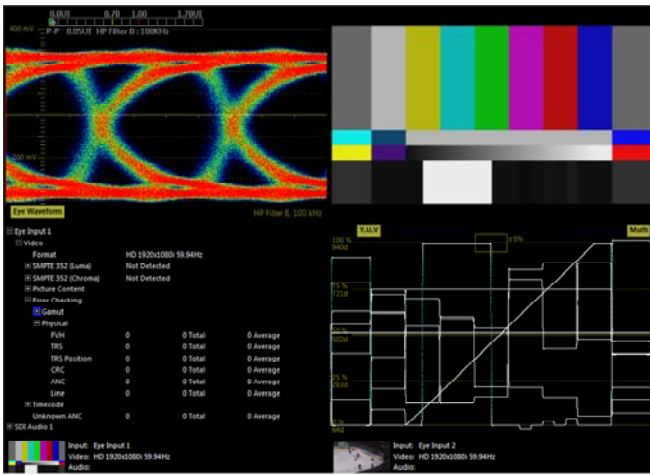
There is also a **CAP\_ADVANCED** option, to enable users to capture frames or sequences as full-raster RVF files with blanking data. This includes user-defined ANC packet extraction & logging capabilities.

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.

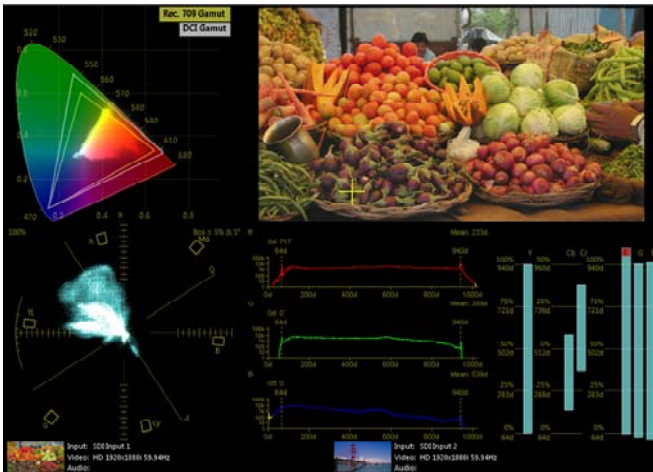
For a complete list of all the available options and prices, or to arrange a system demonstration, please consult your local dealer.



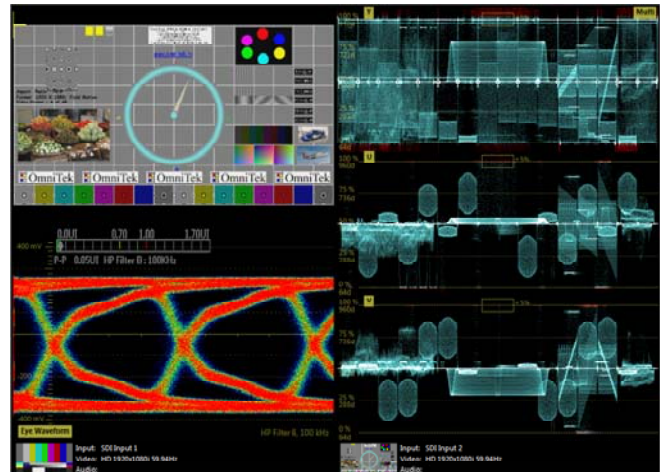
Eye diagram / Video status / Picture monitor / Overlay waveforms



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



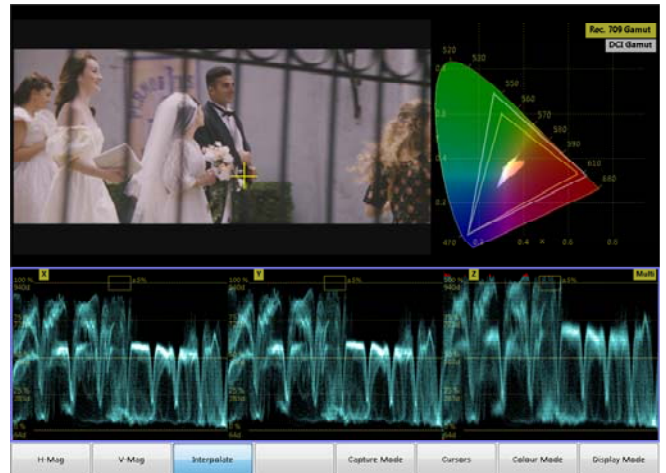
CIE colour chart / Vectorscope / RGB histograms / Gamut display / Picture monitor



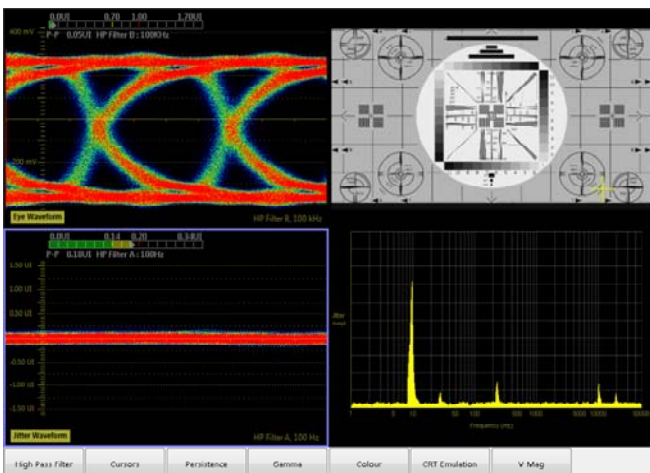
Eye diagram / Picture monitor / Stacked waveforms



Picture monitor / Parade waveforms



XYZ waveforms / Picture monitor / CIE colour chart



Eye diagram / Jitter waveform / Jitter spectrum / Picture monitor



Audio PPMs & phase / Picture monitor / Parade waveforms

## TECHNICAL SPECIFICATION

### Serial Digital Inputs

**Connection** 2 x BNC with 75ohm termination  
**Return Loss** >15dB up to 2.97GHz  
**Bit Rates** 270Mbit, 1.485Gbit, 2.97Gbit (SMPTE 259M, 292M, 424M)

### Serial Digital Outputs

**Connection** 2 x BNC with 75ohm termination  
**Bit Rates** 270Mbit, 1.485Gbit, 2.97Gbit (SMPTE 259M, 292M, 424M)  
**Jitter** < 0.2UI, 10Hz to 100kHz

### Analog I/O Connector

**Connection** 8-pin Lemo  
**Video Output** RGB with bi- or tri-level sync on green, 0.7Vpk-pk video; or YPrPb with bi- or tri-level sync on Y, 0.7Vpk-pk video; or Composite & S-Video (in PAL or NTSC modes) 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** >20dB up to 30MHz

All specifications are subject to change without notice.  
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### Performance

**Raster Formats** 486i / 59.94, 576i / 50 (ITU-R BT.601)  
 720p / 23.98, 24, 25, 29.97, 30, 50, 59.94, 60Hz (SMPTE 296M)  
 1080sF / 23.98, 24, 25, 29.97, 30Hz (SMPTE 274M, RP211)  
 1080i / 50, 59.94, 60Hz (SMPTE 274M)  
 1080p / 23.98, 24, 25, 29.97, 30, 50, 59.94, 60Hz (SMPTE 274M, 425M)  
**Sampling** 4:2:2, 4:4:4, and 4:4:4 + Alpha (SMPTE 372M)  
**Resolution** 8-, 10-, or 12-bits per pixel (SMPTE 372M)  
**Error Control** EDH checking in SDTV modes; Line CRCs in HDTV  
**Generators** Total storage capacity 2GBYTES (RAM)  
 (Sequence play-out length depends on video format & sampling structure.)  
**Genlock** Output timing adjustable (with respect to sync input) in clock increments from 0 to 1 video frame.

### Environmental

**Power** 90...250Vac 47...63Hz autodetect. 150W maximum  
**Size/Weight** Standard case: 430mm x 200mm x 120mm, 9Kg  
**Temperature** Operational: +5...+35C, humidity <95% non-condensing  
 Storage: -20...+50C, humidity <95% non-condensing

## SYSTEM OPTIONS

The **OTM 1000** is supplied with basic monitoring functions in standard-definition only. A number 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.

### Video Standard Support

**VIDEO\_HD** Adds HD support  
**VIDEO\_DL** Adds Dual Link – requires VIDEO\_HD  
**VIDEO\_3G** Adds 3G – requires VIDEO\_HD

### Video Monitoring Options

**VIEW\_DATA** Enhanced pixel data display  
**VIEW\_2** Adds support for dual simultaneous monitoring for SD, HD and 3GA.  
*Note: 3GB and Dual Link simultaneous monitoring 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 support (card) – requires AUDIO  
**AUDIO\_DOLBY\_E** Adds DOLBY E full decode + metadata – requires AUDIO  
**AUDIO\_DOLBY\_OUT** Dolby output – requires AUDIO + AUDIO\_AES + AUDIO\_DOLBY\_E  
**AUDIO\_DOLBY\_D** Full Dolby Digital decode – 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, VINDEK, 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, RVF and ANC generation; custom ANC streaming

### Video Capture Options

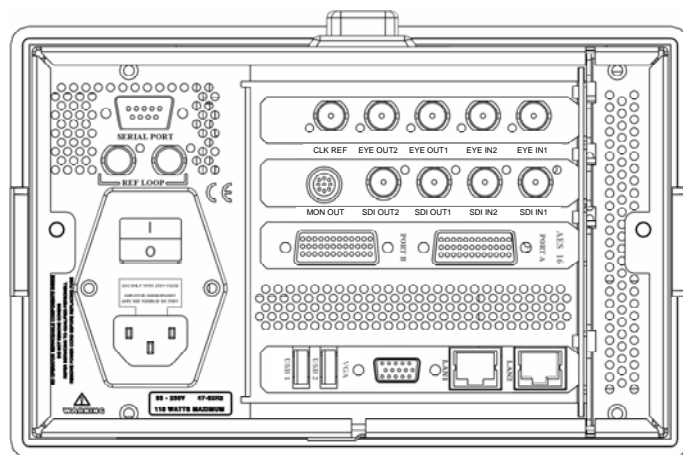
**CAP\_MOTION** Full motion capture, recorded uncompressed to RAM  
**CAP\_ADV** ANC capture; RVF still or sequence capture

### Physical Layer Measurements

*Note: Video standard support must match system video standard support (see above).*  
**PHY\_SD/\_HD/\_3G** SD / HD / 3G eye height and jitter  
**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



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](http://www.omnitek.tv)



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