OTR 1003

Advanced Signal Generator and Data Analyzer
3Gb/s * Dual-Link * HD * SD * 3RU chassis
Introducing the OmniTek OTR 1003 signal generator and data analyzer: A unique combination of high-precision video & audio analysis tools partnered with a comprehensive full-motion signal generator system. The OTR 1003 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 OTR 1003 is supplied in an industry-standard 3RU rackmount enclosure. System control is via mouse and keyboard, with an easy-to-use graphical user interface. There are two SDI inputs and two SDI outputs, plus a reference analog sync input (bi-level or tri-level) and an analog RGB/YPbPr component or composite monitoring output. The system has two DVI/VGA graphics outputs, capable of driving an external display panel at up to 2560 x 1600 pixels resolution. System data interfaces include dual gigabit ethernet interfaces and multiple USB ports.

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. However the physical layer analysis package and digital audio I/O interfaces are in the form of additional plug-in circuit cards, and the real-time disk recorder option requires the installation of multiple disk drives.

The OTR 1003 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. When used with a high resolution graphics monitor, the system can display 1080p60 images with all the blanking areas at 1:1 size and full frame rate. The OTR 1003 is also 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 OTR 1003 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 OTR 1003 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 OTR 1003 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.
**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 **OTR 1003** 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 **OTR 1003** 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.

**Error Logging & Alarms**

Comprehensive error detection and logging is a standard feature on the **OTR 1003**. 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 **OTR 1003** 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**

The **OTR 1003** 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.
The OTR 1003 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 OTR 1003 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 OTR 1003 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 OTR 1003 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 OTR 1003 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: In order to play out any captured images or sequences, the appropriate generator option must also be installed.

Real-Time Disk Recorder
The OTR 1003 system supports 6 high-speed hot-swap internal disk drives, which provide the capability for real-time capture and playback of long-form video and audio data in any of the supported video formats (including 3Gb/s). Captured data can be converted to DPX files, AVI, or Quicktime movie formats.
Real-time picture display at 1:1 size with H & V blanking areas

Picture monitor, eye pattern and jitter display, and video/audio status window

Generator window showing loaded images; picture display, YPbPr waveforms, & video status

Audio PPMs, picture monitor, gamut display, waveforms & vectorscope

Real-time picture display at 1:1 size with H & V blanking areas
**SYSTEM OPTIONS**

The OTR 1003 is supplied set up either for basic monitoring (OTR-VIEW) or test signal generation (OTR-GEN) at standard-definition only. A number of additional options are available, see below. Please consult your OmniTek dealer for option availability and price 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**: Video proxy; comprehensive video status; video and GUI freeze/capture; Safe area, Safe Action graphics on picture and SDI output; logging, alarms
- **VIEW_WFM**: YUV, RGB, YRGB, Composite waveforms; Vectorscope; Gamut display
- **VIEW_DATA**: Enhanced pixel data display
- **VIEW_2**: Adds support for dual simultaneous monitoring for SD, HD and 3GA.
- **VIEW_XR_DCI**: Adds XYZ monitoring, histograms, 12-bit, CIE colour chart

### Audio Monitoring Options

- **AUDIO**: Adds audio monitoring: PMMs, phase, clip, over, silence, mute, play-out audio status, surround sound, loudness, Lucidus 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**: SD / HD zonelists, line patterns, active video stills; gain, noise, bounce, jitter insertion; audio tone generation, VITC, ATC, WSS, VINDEX, SMPTE 352 generation
- **GEN_2**: Adds support for simultaneous generation of SD and HD signals
- **GEN_MOTION**: Sequence play-out from PC RAM, live streaming from disk of MPEG and other compressed files; Uncompressed play from fast disk array.
- **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

### Physical Layer Measurements

- **PHY**: Video standard support must match system video standard support (see above).
  - **SD**: HD, 3G
  - **HD**: HD, 3G eye-height and jitter
- **EYE**: SD, HD, 3G eye-height, eye diagram and jitter

### Real-Time Disk Recorder

- **RTDISK**: 1.57abyte 6-disk array for uncompressed recording/playback

* Included in OTR-VIEW package
† Included in OTR-GEN package

### OPTION BUNDLES

To make the choice of system options easier, the OTR 1003 is available pre-configured with various option bundles targeted at specific user applications. Note that these bundles assume the basic system begins with OTR-VIEW.

#### 3G/HD Broadcast Monitoring

- **HD_BCAST**: Options VIDEO_3G, VIDEO_HD, VIEW_2, AUDIO

#### 3G/HD Broadcast Monitoring

- **3G_BCAST**: Options VIDEO_3G, VIDEO_HD, VIEW_2, AUDIO

#### HD/SD Post-Production

- **HD_POST**: Options VIDEO_HD, VIDEO_DL, VIEW_XR_DCI

#### HD/SD Broadcast Monitoring

- **3G_BCAST**: Options VIDEO_3G, VIDEO_HD, VIEW_2, AUDIO

#### HD/SD Broadcasting Lab

- **HD_LAB**: Options VIDEO_HD, VIDEO_DL, VIEW_DATA, AUDIO, GEN_MOTION, GEN_ADV, CAP_MOTION, CAP_ADV
- **3G_LAB**: Options VIDEO_3G, VIDEO_HD, VIDEO_DL, VIEW_DATA, AUDIO, GEN_MOTION, GEN_ADV, CAP_MOTION, CAP_ADV

#### Complete System “The Full Monty”

- **FM_FULL**: Options VIDEO_3G, VIDEO_HD, VIDEO_DL, VIEW_DATA, VIEW_2, VIEW_XR_DCI, AUDIO, AUDIO_DOLBY_E, AUDIO_DOLBY_OUT, AUDIO_DOLBY_D, GEN_MOTION, GEN_ADV, CAP_MOTION, CAP_ADV

### WARRANTY

OmniTek systems are warranted for one year from date of purchase. This includes all future 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.