OmniTek

www.omnitek.tv

Advanced Measurement Technology

PQA

Full Reference Picture Quality Analyzer and Broadcast Status Monitor

In today's multi-media digital broadcast environment, a wide variety of different image compression techniques are being used in order to maximise the payload capacity of the chosen transmission path. Picture quality assessment on the resulting broadcast images is an essential task, to ensure that the best use is being made of the available channel bandwidth. Traditional test and measurement equipment is wholly inadequate for this task: What is needed is an integrated quality assessment system, capable of establishing objective picture quality in addition to measurement of gross technical characteristics of the input video signal.

Introducing the revolutionary **OmniTek *PQA***. A full-reference picture quality analysis system that provides all the tools necessary for R&D laboratories, broadcasters, and transmission engineers to make deterministic measurements of picture quality. Main features of the system include:

Flexible Signal Processing Architecture

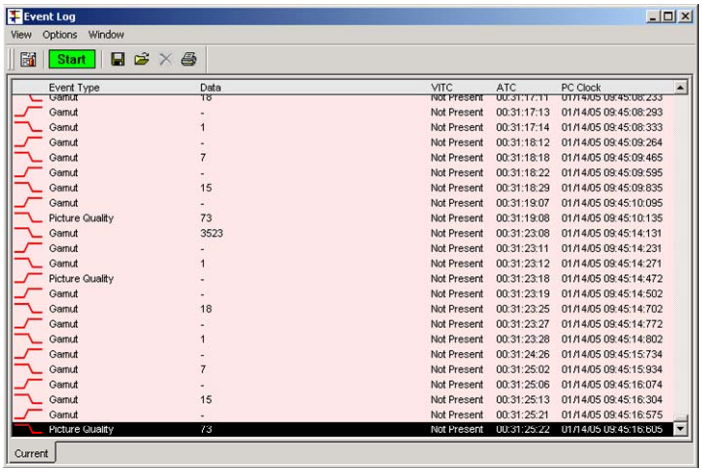
- Compare 2 live HD or SD video inputs in real-time
- Compare 1 live video input with a stored video sequence
- Compare 2 stored video sequences
- Automatic input signal timing delay compensation
- All standard-definition and HDTV formats supported
- Full remote control via SNMP protocols

Picture Quality Measurements

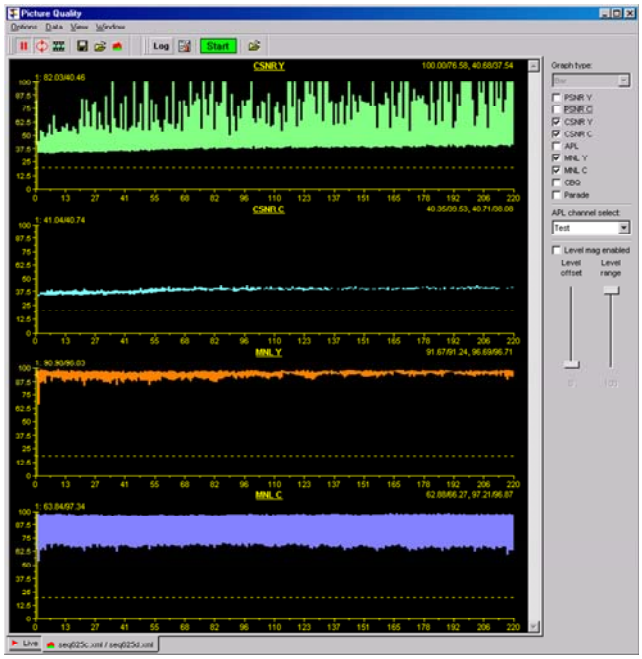
- Real-time PSNR calculations on luma & chroma
- Edge-compensated picture difference analysis
- Macroblock artifact detection
- Average picture level calculations
- User-configurable combined quality assessment

General Signal Integrity Tests

- SDI transport errors (EDH, CRC, TRS, ANC)
- YCbCr and RGB gamut & range checks
- Picture freeze, black, & monochrome detection
- Blanking width measurement
- 16-channel embedded audio PPMs and level alarms
- VITC and ATC timecode reading & checking



Full time-stamped data logging to XML files



Picture difference graph, comparing two sets of stored results

Audio / Video Delay Measurements

- Loop delay measurements on audio and video
- Relative A/V (lipsync) delay measurement

Comprehensive Result Analysis

- Graphical presentation of all measurement data
- Compare results from different tests
- User-selectable error trigger thresholds
- Configurable SNMP network alarms
- All data stored in XML format time-stamped data files

PC-Based System

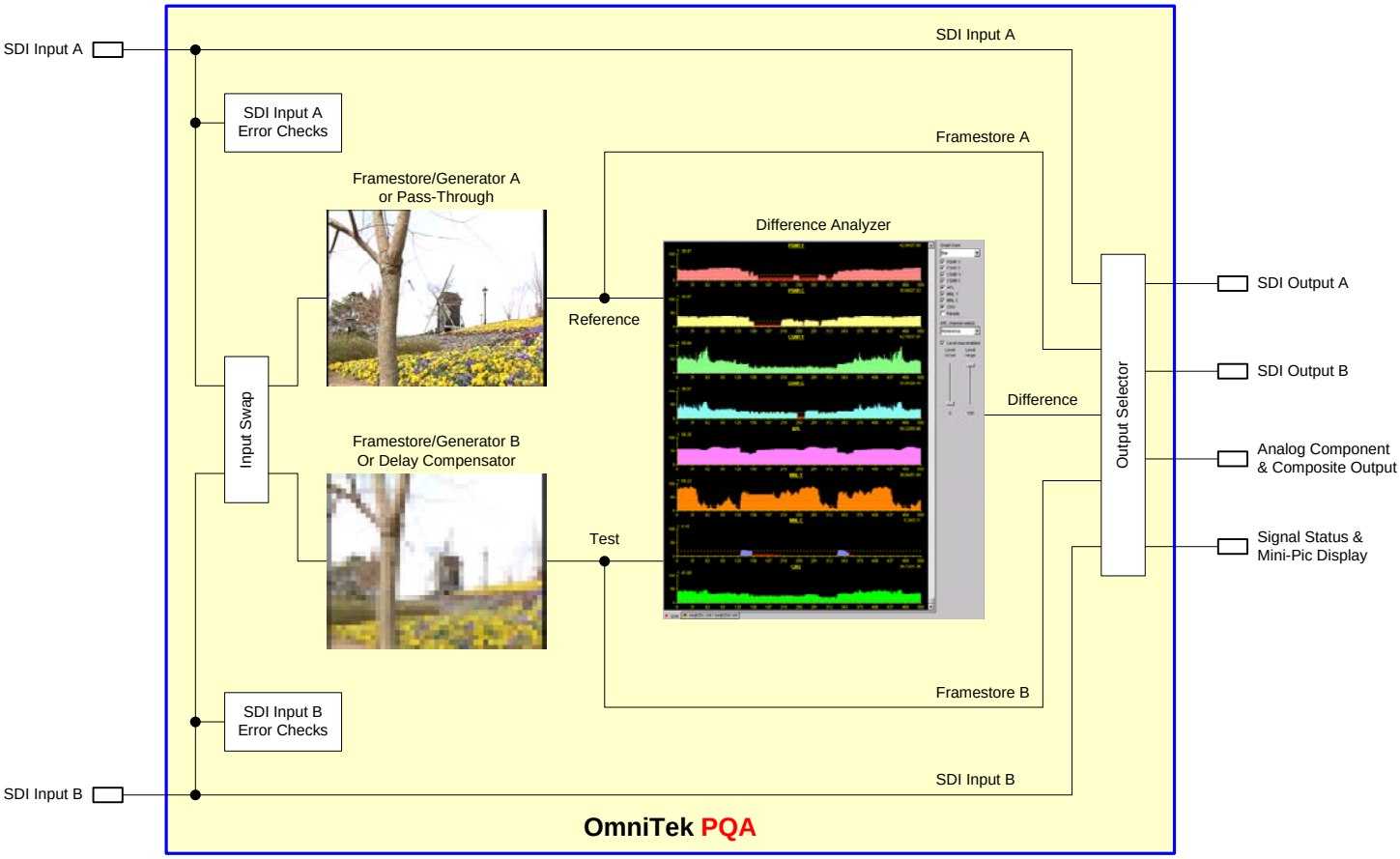
- Advanced PCI signal processing plug-in card
- Application software running under Windows® XP
- Cost-effective, flexible, programmable architecture
- Available as card-and-software only, in 1RU chassis, laptop expander, or "luggable" PC.

Using the OmniTek *PQA*

The PQA system can be used in a variety of different application areas for assessing picture quality and signal integrity:

* R & D engineers can evaluate the relative performance of different image compression codecs, in order to optimize the processing algorithms.
* Broadcasters can compare the quality of different tape & file server formats, to achieve best performance for acquisition, storage, playout.
* Multi-channel playout centres can use the PQA for remote monitoring of picture quality, with alarms fed to station automation software.
* Transmission engineers can measure end-to-end quality degradation through an entire process path.

Real-time picture difference display



PQA Internal Signal Processing Architecture (simplified)

Overview of Picture Quality Measurements

There are two principal methods of video quality assessment used by broadcasters. **Subjective** measurements are the result of human observers providing their opinion of the video quality. **Objective** measurements are performed with the aid of instruments, either manually or automatically using a mathematical algorithm.

Subjective testing suffers from several major disadvantages including the selection, screening and payment of observers; variability of test results; and overall time taken for performing the tests. In general, subjective test techniques do not lend themselves to operational monitoring or transmission system troubleshooting, and the need for an objective testing method of picture quality is clear. However, since it is the observers' opinion of picture quality that counts, the main goal of any objective measurement system is to provide good correlation with subjective results for the same video system and test scenes.

As with subjective testing, most **objective** testing methods do not claim to measure picture quality directly. Instead, they provide an indication of how much degradation of a picture there is **compared to** a reference picture. Such “full-reference” comparisons help to eliminate faults or artefacts which are already present in the original source material.

There are a variety of methods available for objective testing of picture quality in video systems. Some of these techniques are described in the documents ITU-T J.144 and the final report of the Video Quality Experts Group (VQEG). Probably the best known technique is the PSNR (peak signal-to-noise ratio) calculation, which is a measurement of the mean-square-error difference in pixel values between reference and test frames, expressed as a ratio in dB. This technique has the advantage of being repeatable, uses a public-domain algorithm, and is supported by several different equipment manufacturers. The disadvantage of PSNR is that the results do not correlate particularly well with the results of subjective picture tests.

To improve on the accuracy of the PSNR, OmniTek have developed an algorithm which combines the picture-difference calculation with compensation factors based on the overall brightness of the image (because errors in dark parts of an image are not visible) and an edge-enhancement facility which localizes ‘mosquito noise’ around sharp edge transitions. The result is the **compensated signal-to-noise ratio** measurement, or CSNR. This technique aims to provide a more accurate real-world assessment of picture degradation.

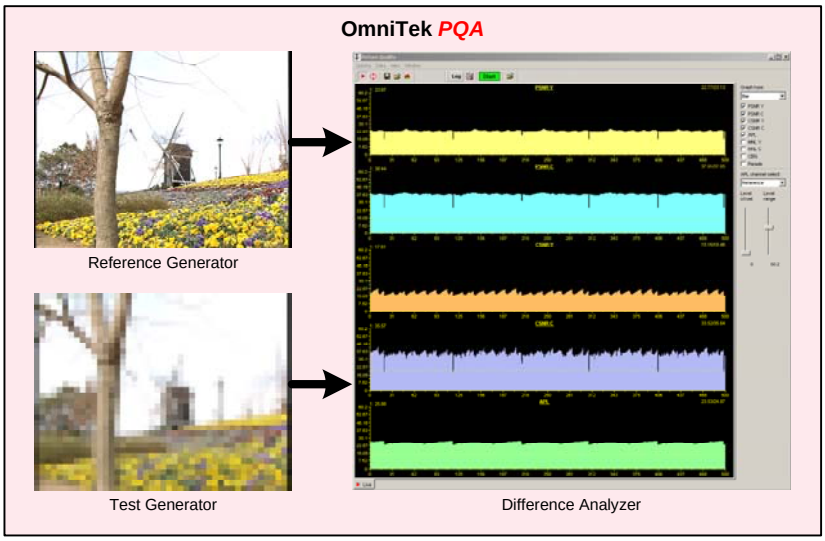
The **OmniTek *PQA*** provides real-time picture quality measurements using both PSNR and CSNR algorithms, plus several other assessment methods including DCT macroblock counting, picture YCbCr range and RGB gamut excursion checks, plus gross transport errors in the input SDI streams. All these errors may be saved in time-stamped XML format log files for later analysis.

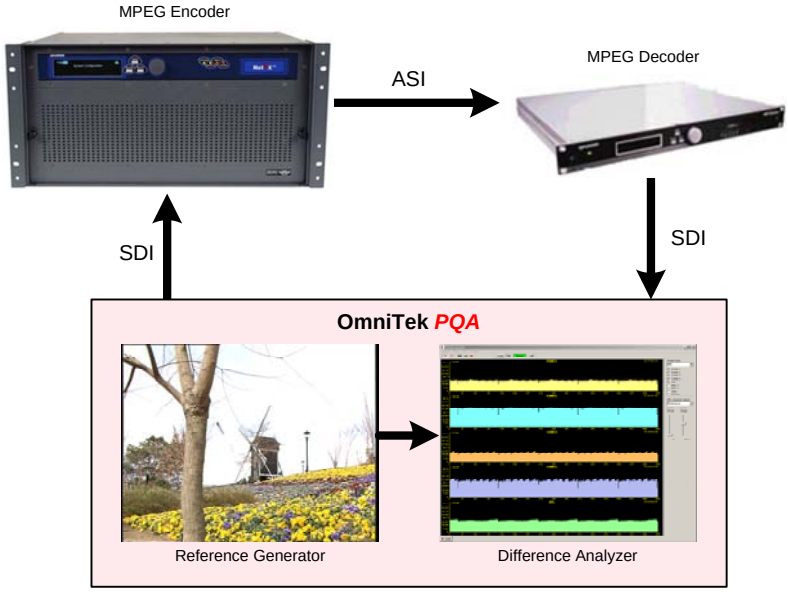
Internal Test Mode

In this mode, the PQA is used completely stand-alone, comparing the outputs of the two internal full-motion signal generators.

One generator plays out a reference video sequence, and the other plays out a test sequence (which can either be loaded over data network, or captured from the live SDI input).

This mode is very useful for R&D engineers developing new codec algorithms, some of which may involve non-real-time rendered images.



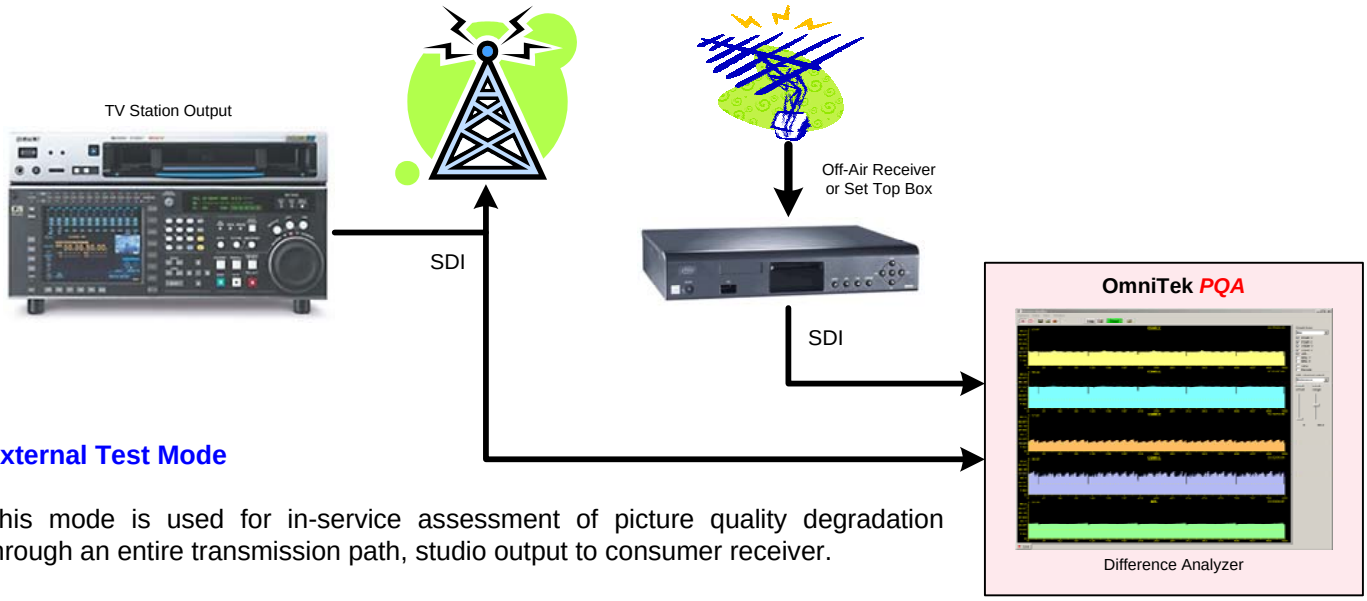


Internal / External Mode

In this mode, one of the PQA internal signal generators is used to source a reference video sequence. This signal is taken to the analyzer module and an SDI output connection to external equipment.

After external processing, the signal is returned to the PQA where it is compared with the original reference generator. Horizontal, vertical, and temporal delays due to the external equipment are automatically compensated inside the PQA.

Broadcast engineers can use the PQA in this mode to obtain quantitative measurements of the picture degradation related to a specific compression bit-rate, when using a variety of different reference source materials.

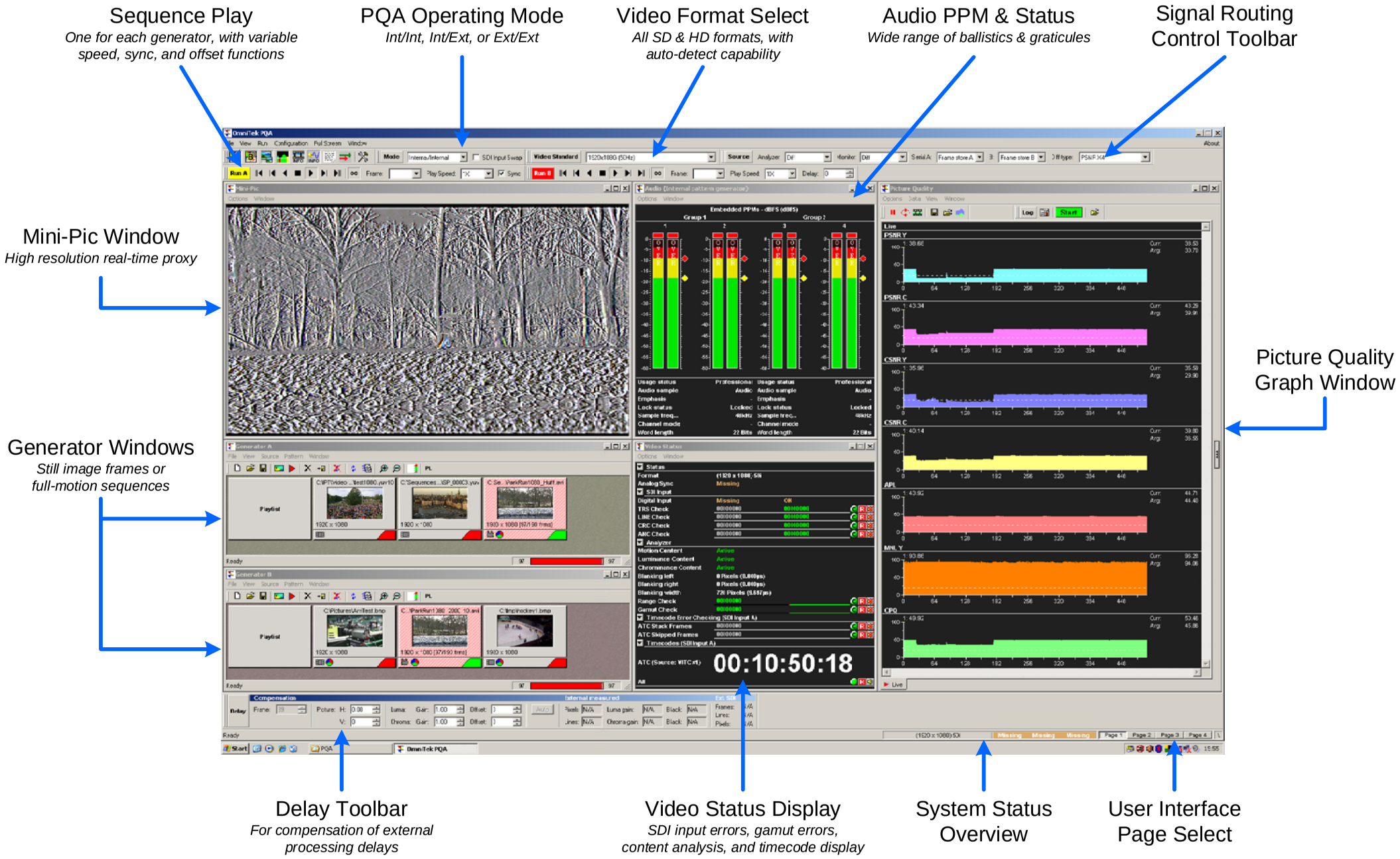


External Test Mode

This mode is used for in-service assessment of picture quality degradation through an entire transmission path, studio output to consumer receiver.

The PQA accepts two live external inputs: A reference signal from the studio output, and an input from an off-air receiver or consumer set-top box. Time delays between the two signals can be manually compensated inside the PQA.

This mode of operation may be used by broadcast engineers to ensure the integrity of the transmission path, and the network-based SNMP alarm mechanism inside the PQA may be used to automatically trigger a warning at the station automation system if a minimum quality threshold has been violated.


Sequence Play
One for each generator, with variable speed, sync, and offset functions
PQA Operating Mode
Int/Int, Int/Ext, or Ext/Ext
Video Format Select
All SD & HD formats, with auto-detect capability
Audio PPM & Status
Wide range of ballistics & graticules
Signal Routing Control Toolbar
Mini-Pic Window
High resolution real-time proxy
Generator Windows
Still image frames or full-motion sequences
Picture Quality Graph Window
Delay Toolbar
For compensation of external processing delays
Video Status Display
SDI input errors, gamut errors, content analysis, and timecode display
System Status Overview
User Interface Page Select
00:10:50:18

TECHNICAL SPECIFICATIONS

OmniTek PCI Card

Specification	PCI revision 2.2
Type	32-bit, 33 or 66 MHz bus speed
Size	Full length (33cm long)
Power	25W max. (±12V, +5V and +3.3V supplies required)
Bracket	Industry-standard size

Analog Sync Input

Connection	BNC with 75ohm termination
Return Loss	>20dB up to 30MHz
Signal	Black with bi-level sync (0.3V pk-pk) or tri-level sync (0.6V pk-pk)

Serial Digital Inputs

Connection	BNC with 75ohm termination
Return Loss	>15dB up to 1.5GHz
Bit Rates	270Mbit, 540Mbit & 1.485Gbit (SMPTE 259M, 344M, 292M)

Serial Digital Outputs

Connection	BNC with 75ohm termination
Bit Rates	270Mbit, 540Mbit & 1.485Gbit (SMPTE 259M, 344M, 292M)
Jitter	< 0.2UI, 10Hz to 100kHz

Analog Monitor Output

Connection	9-pin mini-DIN
Video	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.
Syncs	H & V separate syncs, TTL level, positive-going pulses.

Environmental (Complete systems only)

Power	90...250Vac 47...63Hz autodetect. 300W maximum	
Size/Weight	Rack chassis:	440mm x 430mm x 40mm, 8Kg
	Portable:	400mm x 220mm x 340mm, 12Kg
Temperature	Operational:	+5...+35C, humidity <95% non-condensing
	Storage:	-20...+50C, humidity <95% non-condensing

Performance

Formats	486i / 59.94 (ITU-R BT.601)		
	576i / 50 (ITU-R BT601)		
	483p / 59.94 (ITU-R BT.1358)		
	576p / 50 (ITU-R BT1358)		
	720p / 23.98, 24, 25, 29.97, 30, 50, 59.94, 60Hz (SMPTE 296M)		
	1035i / 59.94, 60Hz (SMPTE 260M)		
	1080sF / 23.98, 24Hz (SMPTE 274M, RP211)		
	1080i / 50, 59.94, 60Hz (SMPTE 274M)		
	1080p / 23.98, 24, 25, 29.97, 30Hz (SMPTE 274M)		
Resolution	10 bits per pixel		
Error Control	EDH checking in SDTV modes; Line CRCs in HDTV		
Generators	Storage capacity	525-line:	1150 frames
		625-line:	970 frames
		720p modes:	436 frames
		1080 modes:	194 frames
Genlock	Output timing adjustable (with respect to sync input) in clock increments from 0 to 1 video frame.		

Computer System

Processor	Intel Pentium-M or Core 2 Duo, >1.8GHz
Main RAM	512Mbyte
Hard Disk	80Gbyte minimum
CDROM	48x read only
Software	Microsoft Windows® XP
Ethernet	100Base-T on RJ45 connector
SNMP	Protocols conform to SNMP version 1.
USB	Type A connector, USB 2.0
Serial Port	RS232 on 9-pin 'D' plug
Video Out	SXGA (1280x1024) minimum, 15-pin high density 'D'
Keyboard	USB or PS-2 compatible
Mouse	USB or PS-2 compatible

Please consult your dealer for specifications on the laptop/PCI-expansion product.

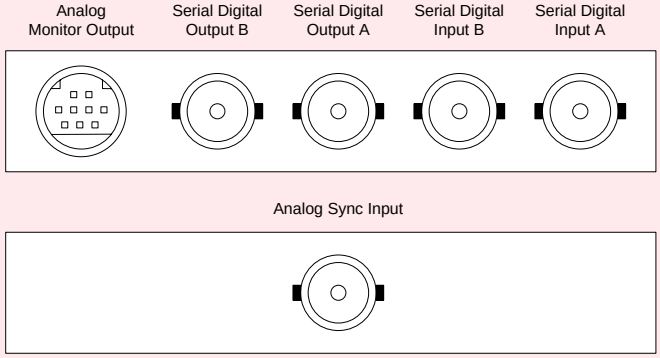
WARRANTY

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.

SYSTEM CONFIGURATIONS

OmniTek products use an advanced PCI signal processing engine plus application software running under the Microsoft Windows® XP operating system. The OmniTek PQA can be supplied in a 1RU rackmount chassis, laptop cardbus expander, or portable PC configurations. Alternatively, the system can be supplied as PCI card + software only, for customer installation into the PC of choice.

PCI CARD CONNECTIONS



DEALER INFORMATION

All specifications are subject to change without notice.

OmniTek

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