ClearView™
Video Quality Analyzers
8K • 4K • HD • SD • IP

VideoClarity
Tools for Video Analysis
ClearView is a highly advanced test & measurement analyzer providing source and processed video recording, file importing, automatic alignment, and a variety of quality metric assessments for any content resolution or frame rate. Comparative playback modes are a unique feature applied up to 8K ultra high definition uncompressed sequences*. This combination of quality analysis features allows users to effectively quantify the human subjective experience.

With the convergence of voice, TV, and data there is a need for multiple resolutions and processing methods to all screens - TV, PC and mobile. Therefore, the requirements of digital content distribution have increased dramatically. Evolving compression schemes from MPEG-2 to MPEG-4 and now HEVC, JPEG 2000, and AV1 have increased the need for tools that can properly analyze and track results.

Today’s digital media can be produced and delivered at very high resolutions and frame rates assuming that one has the storage space and the required throughput via the chosen delivery network such as satellite, internet, cable, cellular, or over-the-air broadcast. Each method presents unique characteristics and limitations. Therefore, the most challenging task for product developers, content originators, and media delivery networks is to create a product or service that can fit as many programs as possible into the available bandwidth at the highest quality and to avoid low quality.

To this end, human perceptual video and audio quality analysis must be done. Two ways exist to do this:
- Perform in-depth analysis on problematic/difficult streams and judge the perceived video or audio quality
- Perform long-duration tests searching for drops/degredation in quality over hours, days or even weeks long test runs

In depth video quality analysis is a subjective notion. The most precise way to measure quality is to collect human observers and to ask them to judge the quality. This is an expensive and potentially inconsistent approach as human observers need to be judged to make sure that they can be trusted - i.e. their sight is good, they are not too tired or they are not color blind, etc. In the end, a mean opinion score (MOS) is computed for each test. Details for setting up a subjective test can be found in recommendation ITU-R BT.500-13 - methodology for the subjective assessment of the quality of television pictures.

*Sequences in ClearView are video, audio, VANC, and timecode of any duration.

A number of algorithms have also been developed to estimate perceived quality in a precise way. The results of these algorithms are then correlated against correctly produced subjective data under ITU-R BT.500.13. The result is a perceptual measure of subjective quality.

The algorithms are divided into three general types:
- Full-reference algorithms compare the processed and reference sequences
- No-reference algorithms analyze only the processed
- Reduced-reference algorithms extract specific information from the reference stream and use it when analyzing the processed stream

The ClearView Analyzer product line features five full-reference scoring methods or scales:
- VMAF: Video Multimethod Assessment Fusion is tailored for quality assessment of streaming video services
- MS-SSIM/DMOS: Multi-Scale Structural Similarity Image Quality Assessment on both MS-SSIM and DMOS scales, where DMOS is the difference between the mean opinion scores of the reference and processed video
- JND: The number of human observers that must be gathered to end up with at least one person who believes that the processed video is at least as good as the reference (just noticeable differences)
- PSNR: Peak Signal-to-Noise Ratio, the ratio between the maximum possible power of a signal and the power of disturbing noise affecting the fidelity of its representation
- aFREQ: Audio performance metric for finding gross errors versus each reference audio channel. aFREQ includes an audio-video offset measurement or lip sync value for a selected channel in program

The ClearView Analyzer product line includes five no-reference scoring methods:
- NIQE: Natural Image Quality Evaluator, a completely blind, distortion free, no reference, image quality assessment index
- aPEAK: True-peak audio measurement per channel according to ITU-R BS.1770-3
- LKFS: Audio loudness measurement per program according to ITU-R BS.1770-3
- Spatial: Calculates the activity power of a video frame, a higher number indicates more changes in the frame
- Temporal: Calculates the changes between successive video frames, a zero indicates a frozen frame
The best way to subjectively analyze an original source versus its processed version is to look at them on one video display. Using two different displays, even of the same type, requires vigilant calibration.

- Therefore, ClearView has multiple viewing modes that play two uncompressed sequences to one display. These modes can also be played to a window on the desktop.
- In side-by-side and split-mirror modes the sequences can be panned as only half of the image is showing.
- In seamless split mode part of the image is from the reference and the rest of the image is from a processed version of the video content.
- All the view mode’s split points can be moved interactively.

ClearView can also output the two sequences to two different displays. This is done using the multiple output viewing mode command.

Side-By-Side Viewing

Video sequences can be further analyzed as follows:
- Zooming into any picture area up to 16x
- Panning within the picture during zoom or split screen
- Identifying luma and chroma pixel values via mouse click
- Playing individual fields at a time to easily find processor cadence differences to original video

Using the included command line interface play lists can be created to allow any view mode to be executed in a series.

ClearView A minus B: An easy way to view pixel intensity differences between two images.
- Below, a straight subtraction shows one pixel level intensity which may not be possible with some displays.
- Therefore, ClearView systems include A minus B with a Threshold and Addback command allowing users to see differences that are greater or less than a specific pixel intensity threshold as a selectable color.
- This also allows edge differences to stand out.

A minus B with Threshold = 20 View Mode

Colors green A>B; yellow B>A

These views are all completely interactive for play, jog, pause, zoom or picture scroll and are simultaneously fed to the ClearView system’s full resolution video output or, selectably, to a separate desktop window.
ClearView Objective & Performance Metrics

PSNR: One of the most widely used metrics is PSNR (Peak Signal-to-Noise Ratio). It measures the mean error between input and output expressed as a ratio of the peak signal in dB. PSNR, while not performing a human perceptual video quality prediction, does serve an important role as one of the objective metrics included in all ClearView systems. PSNR provides the absolute difference between two signals and is important for device performance or network path testing where a PASS/FAIL indicator is needed.

NIQE: Natural Image Quality Evaluator is a completely blind, distortion free, no reference, image quality assessment index. This quality evaluator by University of Texas LIVE is of a natural scene statistic (NSS) based modeling framework for an opinion unaware (OU) and distortion unaware (DU) no-reference (NR) image quality assessment (IQA). The result is a first of a kind NSS-driven blind OU-DU IQA model which does not require exposure to distorted images a priori, nor any training on human opinion scores. The new NR OU-DU IQA quality index performs better than peak signal-to-noise-ratio (PSNR) and the non-multi-scale structural similarity (SSIM) index delivering equal performance to top performing NR OA-DA IQA approaches.

VMAF: This full-reference metric is designed by Netflix and implemented on its native scale in ClearView according to the latest published VMAF version. VMAF closely approximates human perception of video quality and is consistent across content types whether for natural videos or animated content. VMAF is particularly tuned to assess quality of video streaming by taking various source content characteristics into account and by focusing on compression and picture scaling artifacts as the dominant degradation components in delivered versions of streamed content.

MS-SSIM, SSIM and DMOS: In Multi-Scale Structural Similarity Image Metric (MS-SSIM), the picture is evaluated at various resolutions and the result is an average of these calibrated steps. MS-SSIM out-performs simple SSIM even when the SSIM is correctly calibrated to the environment and data set. ClearView includes MS-SSIM and SSIM, developed by the University of Texas, and provides both on their native scales with MS-SSIM also mapped to a linear DMOS (Differential Mean Opinion Score). The measurements may be performed on luma and a combined score is provided for color channels.

ClearView System Option - Sarnoff JND: A well accepted perceptual video quality index method which simulates the functionality of the human visual system (HVS) components. The method involves video/audio alignment, low pass filtering (to simulate the eye – video only), calculating the differences that affect the human eye/ear, blockiness, blurriness, noise, lack of dynamic range, loss of high frequencies, classifying the types of distortions, and generating a perceived quality number per frame. ClearView analyzers are optionally licensed with the algorithm developed by Sarnoff Corporation known as Picture Quality Ratio (PQR) and place it on the JND (Just Noticeable Differences) scale.

Audio Performance Measurements - Included In All ClearView Models
aFREQ - Audio Frequency Metric - Gives a comparison of audio versus a reference to find gross audio errors and provide a general performance comparison of source audio channels to processed audio channels.
- Audio/Video Alignment (lip-sync) is a millisecond accurate measurement included in aFREQ.
aPEAK - Audio Peak Metric and Loudness Measurement - Measures the true-peak amplitude, providing a value for each frame and a separate value for each channel. Within the aPEAK measurement there is a selection for LKFS, Loudness Quoted relative to Full Scale. LKFS provides a measurement that will take the peak loudness over a one second period over all audio channels in a given program and respond with one value over that period. The values returned are based on a logarithmic scale with 0 being the maximum value and -60 being close to silence. The LKFS measurement follows recommendation ITU-R BS.1770-3 exactly.
Equipment Manufacturers want to accelerate the development of their processing algorithms, network path along with transmission and receiving products. ClearView allows developers to measure the performance of the network and resulting quality with their devices to quantitatively or subjectively judge them, get detailed test results and instantly reviewable video recordings.

ClearView
- Imports many compressed or uncompressed file formats (video and audio file types listed on page 9)
- Records video and audio using standard baseband inputs such as SMPTE ST 2110, ST 2022-6, HD/SD/3G SDI, HDMI, Component, Composite or S-Video as well as digital audio embedded on SDI
- From an MPEG IP stream it demultiplexes, decodes and records the targeted stream for testing

Whether the sequence is imported as a file or recorded, content is stored as uncompressed YUV 4:2:2 or RGB 4:4:4.

ClearView can then:
- Automatically align the two sequences spatially and temporally using a choice of methods
- Provide a subjective comparison of the two sequences using any of the viewing modes previously shown
- Score the video quality using perceptual and objective methods VMAF, MS-SSIM/DMOS, NIQE, JND or PSNR
- Apply the aFreq audio performance metric on up to sixteen audio channels

The perceptual scores and objective measurements are saved to a text log file. The log file can be automatically combined and graphed with other score data using the included Metric Log Grapher tool and it can be dropped onto the ClearView GUI (shown on page 7) to restore the test session.

Ways to use ClearView:
1) Capture a sequence via HDSDI, 10 Gig IP or Gig IP to ClearView or output from ClearView to the processing unit. Simultaneously record the transmitted output from a hardware decoder or from an IP network directly.

2) Send a repeatable sequence to the network or processing unit, record the output from an IP network or a hardware decoder via SDI or HDMI and compare this to a pre-recorded or a simultaneously recorded live reference video. After recording and automatic alignment, ClearView generates pass/fail to a log file or command-line script. This can then be followed by instantly recallable playback review of network or device under test failures shown compared to the source video in various view modes as described on page 3.

Reference video - pre-recorded or live feed

Processed sequence from network and/or device under test
**Content originators and entertainment service providers** want to determine the optimal parameters to fit as many channels or streams into the delivery network as possible and reach an acceptable quality level. They also want to check the quality of the material after it has been compressed and packaged in a transport or program stream. To do this the ClearView analyzer will play a reference sequence to the processing unit and simultaneously record the decoder output or take a direct IP feed and decode internally for its uncompressed measurement operation.

ClearView then provides automatic source video versus processed video alignment methods, multiple comparison measurements and viewing modes.

**ClearView**
- Plays an uncompressed sequence through SD/HD/3G/Quad 4K SDI, HDMI or 10 Gig IP outputs to the processing unit
- Records, simultaneously, from the IP network or from a decoder via SD/HD/3G/ Quad 4K SDI, HDMI or 10 Gig IP inputs
- Aligns spatially & temporally via single or multi-frame method or a frame for frame Exhaustive Alignment routine
- Judges the video quality using VMAF, MS-SSIM/DMOS, JND, NIQE, PSNR, or audio quality with the aFreq metric
- Produces log files with the results (text logs can be examined as is or graphed automatically with Metric Log Grapher)
- Drag and drop the log file for recalling any test along with its synchronized side by side audio/video comparison

[Diagram of encoder/processor to transmission to decoder]

Another application for manufacturers, broadcasters or any entertainment service provider is using RTM to monitor quality and record performance faults in on-air or IP network quality of service from a long duration test. The RTM system can detect content specific, continuous or intermittent effects on audio or video quality.

**RTM and RTM 4K - full reference audio/video quality monitor with error segment recording**
- Inputs source “reference” and downstream “processed” A/V through HDSDI up to 4K or via IP up to 1080p
- Measures the audio and video quality as PSNR or MS-SSIM/DMOS in real-time on live sources
- Measures the audio and video delay (lip-sync) in real-time down to the millisecond
- Measures the audio loudness according to ITU-R BS.1770-3
- Measures each VANC line’s data line integrity with each line individually selectable
- Continuously reports min, max and average A/V quality and A/V offset to text logs and the RTM Manager
- Records the failed portions of the A/V sequences, and alarms via audio beep tone if any of the above have fallen below a user set degradation threshold
- RTM is optionally combined with ClearView in the same system to provide both test applications

[Diagram of source to processing unit to transmission to decoding unit to processed]

*See RTM and RTM Manager product brochures for full feature descriptions*
ClearView Functional Highlights

ClearView Graphical User Interface

Automatic Alignment of Source and Processed Videos
- ClearView systems have the unique ability to apply several alignment methods
- Either “single frame”, “intelligent” multi-frame, or “exhaustive” alignment are selectable
- Exhaustive alignment is applied when unpredictable amounts of dropped or frozen frames occur in the processed video for which ClearView will provide a count and then eliminate from a test score by providing a newly matched source to the processed video

Subjective Viewing Modes Now On Desktop or Broadcast Output
- In addition to playback on HDMI & HDSDI outputs, a separate desktop function is here
- Play sequences to a separate window on the desktop or as usual to a video monitor
- Apply side-by-side and all subjective viewing modes to assess quality in either selection

Quality Metrics and Performance Measurements
- VMAF: High accuracy quality assessment optimized for streaming with 0-100 scale
- MS-SSIM: Emmy winning metric provided on linear DMOS and native MS-SSIM scales
- NIQE: Natural Image Quality Evaluator, a blind image quality assessment index
- Sarnoff JND: PQR metric on the Just Noticeable Differences scale (optional item)
- PSNR: Peak signal-to-noise ratio, in decibels, between two video images
- Spatial: Calculates the activity power of a frame within the frame
- Temporal: Calculates the changes between successive frames
- aFREQ: Audio Frequency conformance measurement to find gross errors in audio performance versus a reference, provides lip-sync measurement in milliseconds
- aPEAK: True-peak audio measurement per channel according to ITU-R BS.1770-3
- LKFS: Audio loudness measurement per program according to ITU-R BS.1770-3

Test Score Analysis
Log files contain the quality scores and information about each test’s setup
- Metric Log Grapher creates multiple test comparisons
- Drag & drop log files back to ClearView to recall previous tests and comparison views
There are several ways to record live A/V sequences into ClearView. All ClearView systems provide a combination of broadcast video/audio inputs as well as IP input capabilities. Broadcast video input interfaces are HDSDI, HDMI or new 10 Gigabit Ethernet, all with embedded audio. IP inputs are Gigabit Ethernet with automatic decoding of compressed video streams. All interfaces provide several options for capturing one or two live inputs as outlined below.

**Broadcast Inputs**

ClearView systems hold several options for uncompressed video with audio source recording. The Broadcast record tab allows a selection of single input, dual input or input/output modes and the configuration menu options are tailored to the input interfaces installed in your ClearView model.

The Broadcast record tab controls the 10 Gig IP transport, HDSDI, or HDMI inputs.

ClearView systems automatically detect the input format for record operations. Sequences are stored as unmodified, fully uncompressed video and audio with support for Dolby audio then saved for instant recall and playback operations from a user created ClearView library showing a thumbnail view of recorded sequences.

**IP Input - Ethernet Stream Decoding and Recording**

Record 1 IP Input - A single input mode that records a video sequence as sensed at the IP multicast address and port specified within the IP configuration menu as pictured to the right. *IP Input, if MPEG, decodes up to 1080i video formats.*

Record 2 Inputs - Dual IP or IP with Broadcast input records sequences from two separate inputs or mix of inputs. Each input selection is provided with individual menus to set up Broadcast or IP input parameters. Each IP menu contains transformation settings for scale, crop, de-interlace, rate change and position for matching of source content to the IP network delivered video sequence format for testing.

Record While Playing - In this mode the Broadcast output selection will play a sequence loaded into Viewport A for input to an IP network processor or device under test with an IP output. The ClearView IP input can then simultaneously decode and capture the processed IP stream as uncompressed video with up to sixteen channels of audio.

**From ClearView**

The ClearView Output tab has a new set of features which provide an ability to internally copy sequences with burned in frame numbers to facilitate frame tracking. Sequences containing Dolby audio can now be automatically trimmed to correct packet boundaries in order to eliminate the potential for audio artifacts or discontinuities while playing sequences in a loop. The ClearView Output tab also continues to provide the unique ability to copy a sequence to a new length or a combination of two sequences set into any View Mode so that selected picture comparisons can then be exported as a single sequence in YUV, AVI or QuickTime formats for external review by most of today’s computer desktop players.
ClearView Importer is a comprehensive tool for importing many media file types. The application is provided with ClearView systems or software allowing identification of source file types and full control of file importing parameters to store uncompressed sequences that are automatically inserted into a ClearView library for use within a ClearView test routine.

ClearView Importer GUI

![ClearView Importer GUI](image)

ClearView Importer Highlights

- Wide range of supported video and audio formats
- Fast audio and video decoding speed
- Detailed file import source information with video window
- MPTS import with program stream selector-decoder
- Easy source length import modification
- Detailed per pixel source cropping
- Image quality, size and positioning adjustment
- Up to 16 channels of audio decoding
- Command Line and GUI user interface

User confirmable file adjustments:

- Import HDR video in BT.2020 (PQ) or BT.2100 (HLG)
- Import lctCp native color format or record it from HDSDI
- Decoded or imported frame size, rate
- First/last frames to import
- 3:2 pull down insertion or removal
- Native bit depth import of 8, 10 or 12 bit video
- Crop source with input values
- Scale video resolution up or down to x, y / w, h
- Variable image and canvas resolution
- Truncate to legal broadcast values (yes/no)
- Import audio and closed caption data

Imported File Formats (partial list):
- Accom YUV CCIR 601 8-bit
- ARI Raw Bayer Pattern
- Avid AVR, DS HD/SD, DV (*.gen), DNxHD
- Avid Meridian, Y’CbCr, OMFI (*.omf, *.omfii)
- AV1, AVC, AVC-HD, AVR, AVS
- Cineon (*.cin), CineWave
- DPX RGB 8, RGB 10, Y’CbCr 4:2:2
- DV (*.dv, *.dfl), Digital Negative (*.dng)
- DVS Direct File Format (*.dvs)
- DVSD, DV25, DV50, MPEG-I, mJPEG, DigiSuite
- GXF Format/SMPT-E-360 (*.gxf)
- H.261, H.263, H.264, H.265, HDV
- Headerless/Raw (*.hdr, *.yuv, *.rgb, *.raw)
- HiCon SLB32 RFB format (*.slb)
- Image (*.gif, *.jpg, *.png), Jaleo (*.js), JFIF, JPEG
- JPEG, JPEG2000, LXF, Meridian, Media 100 JPEG
- Microsoft AVI (*.avi), BMP, DIB Files (*.dps)
- MPEG, MPEG 1 4:2:0 (*.mppg, *.mpeg)
- MPEG-2 Elem. Stream, (4:2:0/4:2:2), MPEG2 (*.m2v)
- MPEG-2 Program Stream, (4:2:0/4:2:2)
- MPEG-2/4 in Transport Stream, (4:2:0/4:2:2)
- MPEG-2/4 in MPTS (4:2:0, 4:2:2), MPEG-4 (*.m4v)
- MPEG-4 AVC Elementary Stream 4:2:0/4:2:2, (*.h264)
- MPEG-H HEVC/H.265 4:2:0 Main Profile (*.h265)
- MXF Format (DCP, DV, DVCPro50, MPEG, IMX, OP1a)
- Newtek Video Toaster (*.rtv)
- Phantom Support (*.cine), PhotoShop FilmStrip (*.flm)
- Photo CD PCD, Photoshop PSD, Portable anymap PNM
- Portable Bitmap Format PBMP DPS
- Portable graymap PGM
- Portable pixmap PPM
- QuickTime Movies (*.mov)
- QuickTime formats w/proper codec, ProRes, etc...
- RealVideo (*.ra, *.rm, *.ram), Red Camera Stream (*.r3d)
- Run-Length encoding (rle)
- Sony XDCam, SGI Movie Format (*.mv), SGI RGB
- Silicon Image Bayer (*.siv), Sun Raster (*.ras)
- Targa TGA, ICB, VDA, VST, Targa 3000, TIFF, TIF
- v210 Y’Cbr 10 Bit, VC-1 Pro, VP8, VP9, Viewstore (*.vcr)
- vcap, vcap10, Windows Media (*.asf, *.wmf, *.wmv)
- Y’Cbr 8/10, Y’Cbr, RGB, YCrCb 8/10GB

Audio Import Formats:
- Dolby Digital Plus Professional Input Decoder
- MPEG-2 Layer 1 (*.mp1)
- MPEG-2 Layer 3 (*.mp3)
- Waveform Audio (*.wav)
- Adaptive Multi-rate (*.amr)
- Audio Interchange File Format (*.aiFF)
- Windows Media Audio (*.wma)
- Advanced Audio Coding (*.aac)

Exported File Formats:
- BMP, Headerless/Raw (*.yuv, *.rgb, *.raw)
- Microsoft AVI (*.avi), MXF (v210)
- QuickTime with up to 16 audio channels

*ClearView Importer is an option in ClearView QA models.
## Product and Feature Matrix

<table>
<thead>
<tr>
<th>Features</th>
<th>ClearView Extreme 8K</th>
<th>ClearView Extreme 4K</th>
<th>CV-Extreme w/RTM 4K</th>
<th>CV-Extreme IP + SDI 4K</th>
<th>ClearView Shuttle 4K</th>
<th>ClearView QA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSNR, NIQE, aFreq, aPeak Metrics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Full Ref. Perceptual Video Metrics</td>
<td>JND optional</td>
<td>JND optional</td>
<td>JND optional</td>
<td>JND optional</td>
<td>JND optional</td>
<td>All optional</td>
</tr>
<tr>
<td>Subjective Viewing Modes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Subjective Side-By-Side Max Play Rate</td>
<td>7680x4320p30</td>
<td>3840x2016p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>1920x1080p60</td>
</tr>
<tr>
<td>Max Video Rec. Rate w-16 Audio chs.</td>
<td>7680x4320p60</td>
<td>3840x2016p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>1920x1080p60</td>
</tr>
<tr>
<td>Max Video Play Rate w-16 Audio chs.</td>
<td>7680x4320p60</td>
<td>3840x2016p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>1920x1080p60</td>
</tr>
<tr>
<td>Max Simultaneous Play &amp; Record Rate</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>3840x2160p60</td>
<td>1920x1080p60</td>
<td>1920x1080p60</td>
</tr>
<tr>
<td>Real-Time Measurement Input Rate</td>
<td>Option</td>
<td>Option</td>
<td>2160p 50/60</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>Disk Storage Capacity Examples - In Minutes</td>
<td>54 or 108 of 7680x4320p 60Hz YUV10</td>
<td>67,162, 323</td>
<td>3840x2160p60</td>
<td>67,162, 323</td>
<td>3840x2160p60</td>
<td>67,162, 323</td>
</tr>
<tr>
<td>Automatic Metric Log Graphing Tools</td>
<td>X</td>
<td>X</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>Waveform Monitor/Vectorscope - WFM</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>CV-Importer - with Dolby Decoder</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Option</td>
</tr>
<tr>
<td>HDSDI Input, including 8, 10, or 12 bit</td>
<td>Ext. Option</td>
<td>Ext. Option</td>
<td>Ext. Option</td>
<td>Ext. Option</td>
<td>Ext. Option</td>
<td>Ext. Option</td>
</tr>
<tr>
<td>Y’PbPr, S-Video, Composite Input</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8 or 10 bit</td>
</tr>
<tr>
<td>HDSDI Output, incl. 8, 10, or 12 bit</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8 or 10 bit</td>
</tr>
<tr>
<td>IP on GNC Max Decode Input Rate</td>
<td>1080i60 (2)</td>
<td>1080i60 (2)</td>
<td>1080i60 (2)</td>
<td>1080i60 (2)</td>
<td>1080i60 (2)</td>
<td>Option</td>
</tr>
<tr>
<td>Timecode record and play</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>USB Ports - 3.0, 2.0</td>
<td>10, 2</td>
<td>10, 2</td>
<td>10, 2</td>
<td>10, 2</td>
<td>4 - 3.0</td>
<td>4 - 3.0</td>
</tr>
<tr>
<td>Gigabit Ethernet Ports</td>
<td>2</td>
<td>2</td>
<td>3 (1 via USB)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chassis and Rack Mount Type</td>
<td>3RU Kit</td>
<td>3RU Kit</td>
<td>3RU Kit</td>
<td>3RU Kit</td>
<td>2RU Ears</td>
<td>2RU Ears</td>
</tr>
</tbody>
</table>

**WFM - Waveform Monitor / Vectorscope**

ClearView systems may include WFM, a comprehensive signal tool for input and playback specification display.

- **Waveform Monitor** - Displays the levels of the Y, Cb and Cr from the left of the picture to the right of the picture with all the lines summed into one graph.
- **Vectorscope** - Depicts a traditional Cb by Cr X-Y display with overlaid reference graticule. Color accurate graticules automatically switch between SD, HD and UHD color spaces.
- **Chromaticity Scope** - Provides a visual representation of the color in a video across all the colors of visible light. For a particular Y’CbCr range (BT.2020, Rec.709, CICIR-601) a triangle can be super imposed.
- **Histogram** - Provides an overview of the tonal range of each color in the picture.
- **Picture View** - Shows the video signal, to confirm the source is correct and to display time code location.
- **Data View** - Allows access to the raw pixel values being monitored on the HDMI or SDI input.

**Signal Compare** - Used to freeze a complete frame of video (two fields in interlaced), every second line (field) or at a 50/50 dissolve to compare two signals or cameras.

**Time Code** - Reads multiple timecode types simultaneously and displays them in the lower third data area.

**Audio** - Up to 16 channels of audio are supported for metering.

*WFM is an option in all ClearView system configurations.*
ClearView Systems Specifications

ClearView Extreme 4K and 8K Systems

ClearView Extreme 4K: Model #s CV-S8084-4K-5 or -12 or -24

- A/V Interfaces: CV-SDI-IO-4K2 (2)
- Accessories: 3RU rack kit, keyboard, mouse, mirror boot drive, printed system guide, A/V cable kits (2)
  
  Physical Specifications:
  - Physical Specifications: 2.56 x 1.72 in x 3.64 x 1 in
  - Power: 100 - 240V, 50/60Hz
  - Weight: 11.5 lbs

ClearView Extreme 8K: Model #s CV-S8088-8K-16 or -32

- A/V Interfaces: CV-SDIHO-8 (2)
- Accessories: 3RU rack kit, keyboard, mouse, mirror boot drive, printed system guide, sync generator w/BNC cables
  
  Physical Specifications:
  - Physical Specifications: 22.0 x 11.5 x 4.2 in
  - Weight: 11.5 lbs

ClearView Extreme IP: Model #s CV-S8084-IP-4 or -12 or -24

- A/V Interfaces: CV-IP-IOD-HD (1)
  - CV-IP-IOD-HD (1)
  - See A/V Interface descriptions below

  Accessories: 3RU rack rail kit, keyboard, mouse, mirror boot drive, printed system guide, A/V cable kits for CV-SDI-4K2.

  Note: SFPs not included.

ClearView Shuttle 4K and IP Systems

ClearView Shuttle 4K: Model #s CV-S2044 or CV-S2044-5

- A/V Interface: CV-SDIHO-4K2 (1)
- Accessories: Hard travel case, keyboard, mouse, OS recovery disk, printed guide, cable kit, rack ears
  
  Physical Specifications:
  - Dimensions: 22.0 x 11.5 x 4.2 in
  - Weight: 11.5 lbs

ClearView Shuttle IP: Model #s CV-S2043-IP or CV-S2043-IP-5

- A/V Interface: CV-IP-IOD-HD (1)
  - Hard travel case
  - Keyboard, mouse
  - OS recovery disk
  - Printed guide
  - Rack kit
  - Accessories: SFPs not included.

ClearView QA: HD and SD Test Systems

ClearView QA: Model # CV-S2041-QA

- A/V Interface: CV-SDIHO-LHD (1)
- Accessories: Hard travel case, keyboard, mouse, OS recovery disk, printed guide, cable kit, rack ears
  
  Physical Specifications:
  - Dimensions: 12 x 20 x 2 in
  - Weight: 11.5 lbs

ClearView QA with Dual HDSDI: Model # CV-S2042-QA

- A/V Interface: CV-SDIHO-CV2D2 (1)
- Accessories: Hard travel case, keyboard, mouse, OS recovery disk, printed guide, cable kit, rack ears
  
  Physical Specifications:
  - Dimensions: 12 x 20 x 2 in
  - Weight: 11.5 lbs

ClearView Product A/V Interface Specifications

CV-SDI-I0-8:

- The two interfaces applied on all CV-S8088-8K models include:
  - 16 BNC video connections
  - 1 sync generator, with cables
  - Analog breakout cable
  - Mini HDMI to HDMI cable

Digital Video: 8 BNC output/input (16 per system) - 3G-SDI or SD-SDI compliant
  - Supports 8, 10 or 12 bits - SMPTE 259, 292, 296, 424, 425a/b, two 4K Quad or 2SI
  - Digital Audio: 16 channels - SD embedded input/output per input

Digital AES/EBU Audio: 8 channels on 4 BNC input, 8 channels on 4 BNC output

Timecode: SMPTE-12M on HDSDI

Digital Audio Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz, 4096x2160p @ 60, 59.94, 50Hz, 24, 23.93Hz

CV-SDI-I0-4K2:

- CV-Extreme-4K applies two, CV-Shuttle4-4K applies one with:
  - Quad SMB to BNC cable
  - Analog breakout cable
  - Mini HDMI to HDMI cable

Digital Video: 4 BNC input/output programmable - 3G-SDI or SD-SDI compliant
  - Supports 8, 10 or 12 bits - SMPTE 259, 292, 296, 424, 425a/b, 4K Quad or 2SI
  - Embedded Audio: 16 channels - SD embedded input/output
  - HDMI 2.0b: 1 output, up to 4096x2160p60Hz 4:2:0 (Mini HDMI to HDMI cable supplied)

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

Digital Video Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

Digital Audio Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

Digital Audio Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

CV-I0-PD:

- Requires one or two SFPs to be purchased separately and applied for I/O function

Digital Video: 1* BNC or 2 SFP input, 1* BNC or 2 SFP output - 3G-SDI compliant
  - Supports 8 or 10 bits as SMPTE 259, 292, 296, 424, 425 (Level A or B)
  - Digital Audio: 16 channels - SDI embedded or 2 channels AES/EBU on 1 XLR
  - HDMI 1.4a:

  Video VOD: 10 Gigabit Ethernet applying SMPTE ST 2110, 2022-6/7 media transport
  - Up to 2 HD or SD video/audio programs output with ClearView playback function
  - Up to 2 HD or SD video/audio programs output or simultaneous one in one out
  - HDMI 1.4 programmable - 1 output, standard size HDMI connector

  Media Transport Interface: 2 x SFP+ Cables - SFPs not included

  Reference Input: ST 2110-10 PTP slave or composite sync on BNC

Digital Video Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

Digital Video Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout

Digital Video Formats: 252 @ 59.94Hz, 625 @ 50Hz, 720p @ 60, 59.94, 50Hz, 1080p @ 60, 59.94, 50Hz, 24, 23.93Hz, 2160p @ 60, 59.94, 50Hz, 25, 23.93Hz

Digital Audio Formats: 24bit, 48KHz PCM, or DD+

Timecode: SMPTE-12M on HDSI, LTC on analog breakout
ClearView Systems Back Panels

ClearView Extreme IP/4K - Shown with 10G IP - Dual 4K Model Applies Second QUAD 4K/HDMI in Place of 10G IP Interface

ClearView Extreme 8K System Back Panel with 16 HDSDI BNC Connections - Externally Convertible to Four 4K HDMI Outputs

ClearView Shuttle 4K System with Quad-HDSDI & HDMI Out

ClearView Shuttle IP System with 10G IP Cages & HDMI Out

ClearView QA HD/SD System with Dual HDSDI In & Out

ClearView QA HD/SD System with HDSDI/HDMI In & Out

All product design and specifications are subject to change without notice or obligation, Video Clarity, Inc. Dolby and the double-D symbol are registered trademarks of Dolby Laboratories.

Video Clarity, Inc. • Telephone: +1-408-379-6952 • sales@videoclarity.com • www.videoclarity.com • v9.1 page 12