Video Clarity

Tools for Video Analysis

ClearView™

Video Quality Analyzers

System Guide

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ClearView A/V Analyzer Systems

Video Clarity created ClearView AV Analyzer Systems (ClearView) to provide video researchers, codec developers, hardware designers, TV Network operators and QA/QC engineers with the unique ability to play, view, record, and objectively analyze audio and video.

ClearView allows the capture of video content from virtually any source -- file, SDI, HDMI, and IP directly or from other interfaces through external converters. Regardless of the input, the video is, based on user choice, either recorded as is in uncompressed 4:2:2 Y'CbCr, 4:4:4 RGB, ARGB, or RGBA or decoded to one of these image types from a compressed file format or IP stream.

ClearView applies various objective and perceptual metrics to each frame of the video sequences, generates graphs, detects anomalies outside of the threshold range, and logs the results.

ClearView has both No Reference and Full Reference Metrics. When there is no comparable video, no reference metrics can be used to determine anomalies like loss of video, frozen video, loss of audio, etc. With a source video comparison, highly accurate quantitative scoring can occur. ClearView is constantly growing in functionality, and currently supports:

Full Reference Objective Metrics
- PSNR
- aFreq – the Video Clarity audio performance metric

Full Reference Perceptual Metrics
- VMAF by Netflix
- MS-SSIM on DMOS and MS-SSIM scales from University of Texas
- ΔEitp which follows ITU Recommendation BT.2124
- Sarnoff's JND (option)

No Reference Metrics
- CAMBI – Contrast Aware Multiscale Banding Index
- University of Texas' NIQE - Natural Image Quality Estimator
- Number of Edges - Spatial / Sobel Filter
- Frame-to-Frame Differences - Temporal
- Loudness - aPeak and LKFS

(Please refer to Select Objective Measurements section for definitions)

To aid in subjective video analysis, ClearView displays the video sequences at any rate in side-by-side, seamless split, split mirror, A minus B, and applies additional variations to playback parameters.

- **Please note that throughout this manual in most instances where a feature is described as "Video", it will apply to Audio, Video, and ancillary data.**

Playback Features:

Output rates are independent from input rates; so, any video sequence can be output at rates up to 120Hz depending on installed and external interfaces. The user has control over shuttle rates, jog, color look-up tables, zoom/pan, and field display. The video sequences are previewed within the ClearView Interface and output to 25G IP, 12G-SDI, 3G-SDI, or HDMI.

Normally the video sequences are shown in comparison modes on the same display, or ClearView systems may apply a dual output of two video sequences all containing video, audio, and ancillary data, via SDI or ST 2110 network and apply redundancy via ST 2022-7 at the same time.

Compete Video Sequence, or partial selection of the video sequence from selected in and out points, can also be exported as uncompressed BMP, RAW, AIFF, MOV, or AVI files.

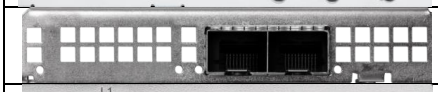
Hardware Quick Start Guide

ClearView Analyzers come in three model categories. Each system is geared to help in a certain segment of the market, while all run the same software to maintain compatibility throughout the family.
-Apply the included keyboard, mouse, power cable and then a user supplied desktop display, video output display, and the appropriate video inputs and outputs for feeding test sequences to and from ClearView will need to be connected.
-Power up the system by pushing the green center button on the front ClearView panel which will launch the ClearView desktop.

Figure 1: Product Family

-The **ClearView Extreme** (left) has several options for all video hardware modules listed below. In general, the pattern of input on SDI modules is 1in, 2in, 3out, 4out. Primary recording is input #1. 8K requires all four 12G inputs used in tandem on CV-SDI-IO-UHD modules for input or output. Utilize the included high-density BNC to standard BNC adapter cables supplied. HDMI output is a standard connector and is mirroring the output SDI connector #3.
-The **ClearView Shuttle** 4K (middle) A portable solution with two model options applying the CV-SDI-IO-12G or CV-IP-IO-UHD for 25G IP media networking.
-The **ClearView QA** (right) is specifically focused on HD and SD formats and generally includes one CV-SDI-IO-3G video module. The same input pattern applies to this module as 1in, 2in, 3out, 4out. The HDMI output is with a supplied cable for HDMI mini to standard Type A HDMI connector. 3G SDI connections are mini-SMB. Connect to standard BNC cables via supplied SMB to BNC adapter cables.

Table 1: Hardware Modules

	CV-SDI-IO-12G with 4 12G-SDI and 1 HDMI out
	CV-IP-IO-UHD right or lower side SFP is primary
	CV-SDI-IO-3G for single or dual interface models
	CV-HDMI-I-4 inputs for HDMI 2.0 and 1.4

ClearView supports high-speed disk access using Raid 0. The captured video sequences are stored on the array in fully uncompressed format in any of the following user-selectable image formats:

Y'CbCr 8-bit Y'CbCr 10-bit RGB DX 10-bit YUV 12-bit RGB 12-bit	ARGB 8-bit RGB 8 or 10-bit RGBA or BGR 8-bit RGB 12 PK Dolby Vision

Software Quick Start Guide

Double-click on the **ClearView** icon on the desktop. The following screen will launch.

Figure 2: Initial Screen

You have several options when starting to use ClearView.
If you do not have any video sequences loaded, then you must load one or more:

- You can import a file.
- You can capture/record from hardware I/O:
  - SDI, HDMI, ST 2110, or MPEG IP

Now you can

- Play one (1) video sequence at any rate, change the color parameters, etc.
- Compare two (2) video sequences to visually inspect differences.
- Run the objective metrics on one (1) or two (2) video sequences.

The following three figures outline the general steps to implement each of the above actions. Each box in the figures is described under "Operations".

You can click on any hyperlinked box to review the actions needed unless the box is double-lined. In the double outlined box, this is an informative result.

Figure 3: Import a File

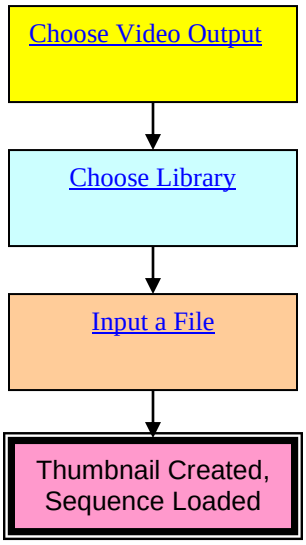


Figure 4: Record from Hardware Input

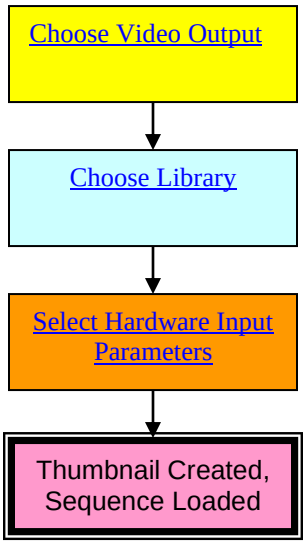


Figure 5: Play 2 Video Sequences

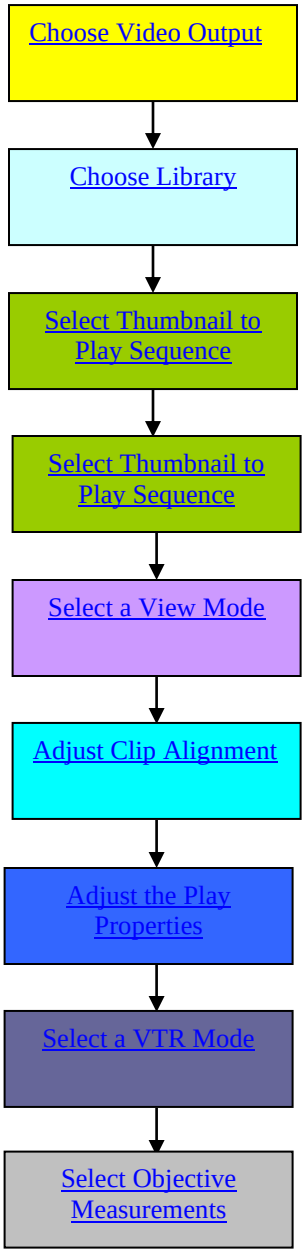
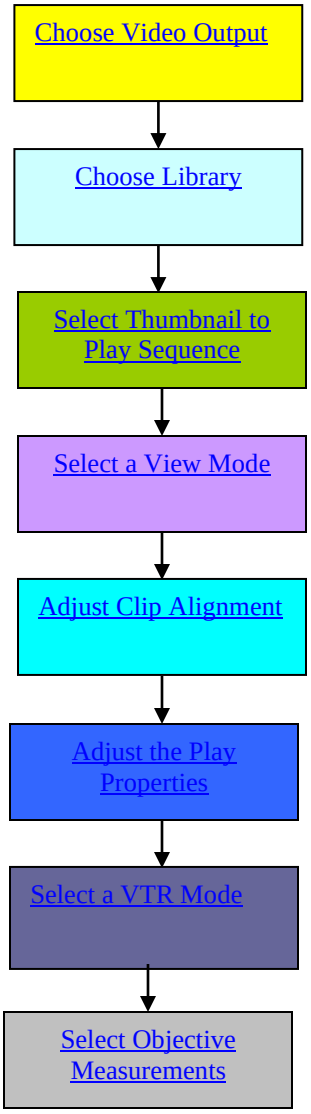


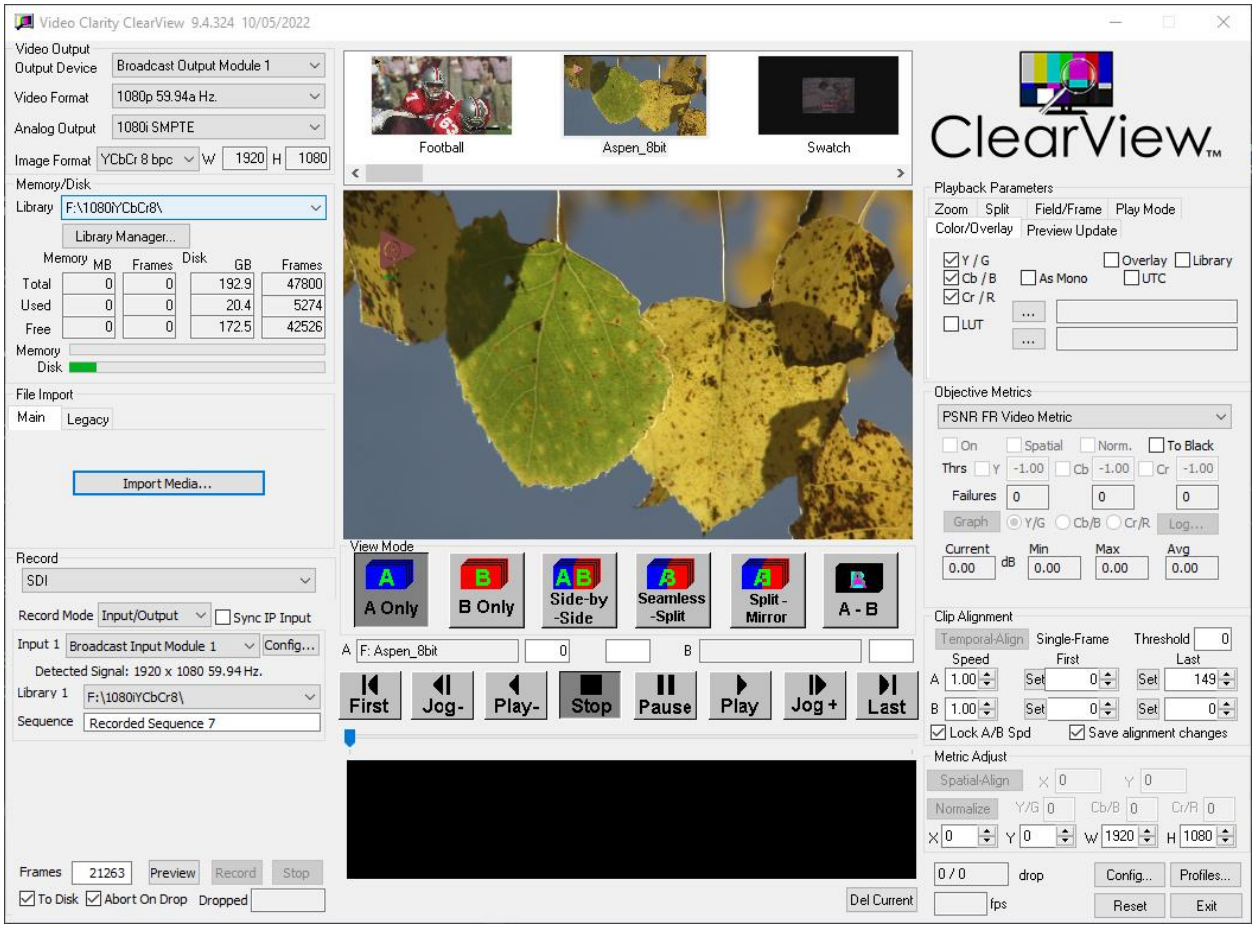
Figure 6: Play a Video Sequence



Operations

The ClearView GUI screen consists of a number of panes dedicated to specific functions. In the GUI, these panes appear generally in the order of use from top left to bottom right during a typical video quality analysis session.

Figure 7: ClearView GUI



ClearView allows full control over all of the engineering parameters, which can be selected in any order. (The preferred sequence is shown under "Software Quick Start Guide".)

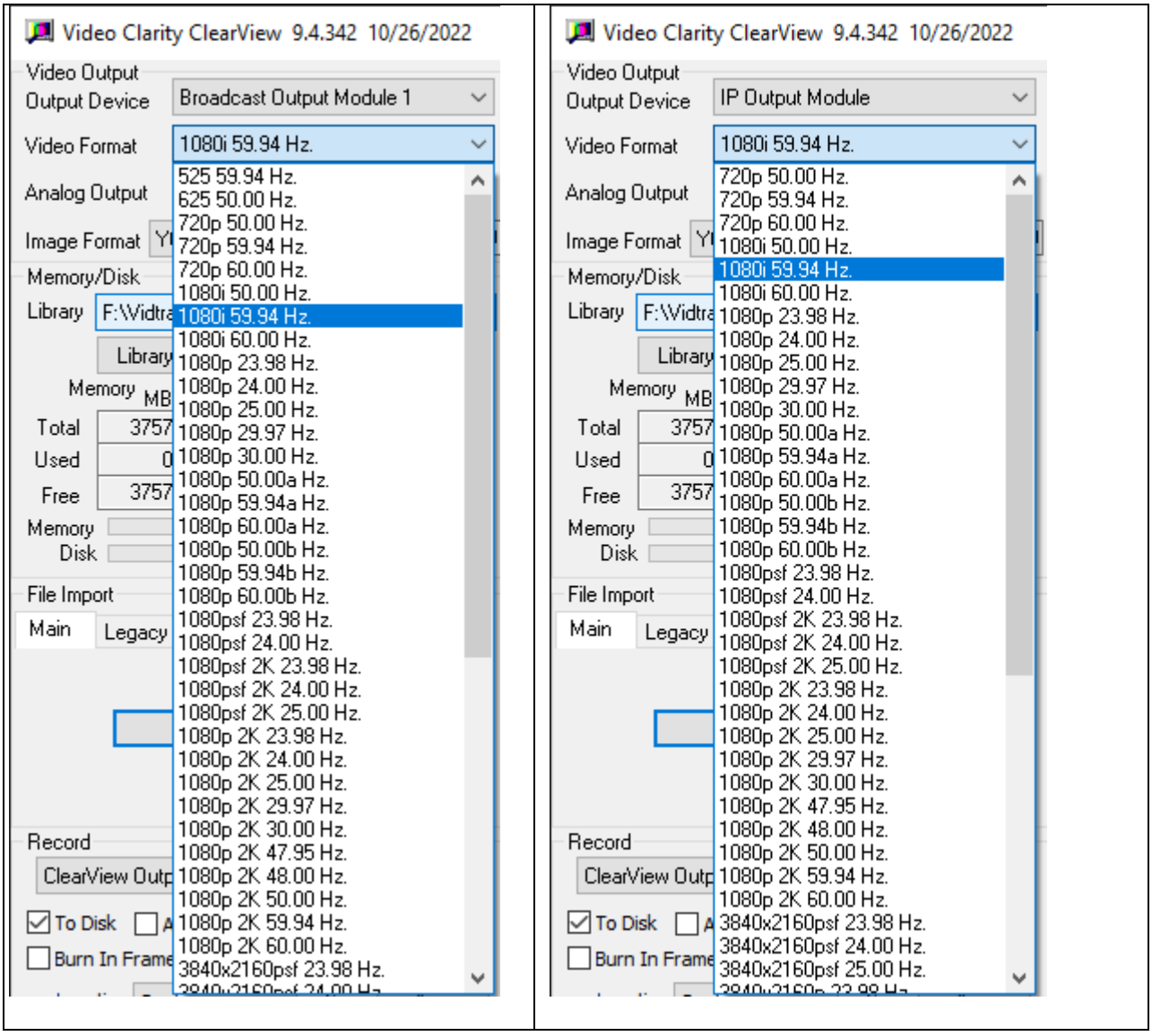
- Choose Video Output using the Video Output pane (in the top left corner of the GUI)
- Choose Library using the Memory/Disk pane
- Input a File using the ClearView Importer application
- Select Hardware Input Parameters using the Record pane
- Select Thumbnail to Play using the Sequence Manager pane
- Select a View Mode using the View Mode pane
- Adjust Clip Alignment using the Clip Alignment pane
- Adjust the Play Properties using the Color Space, Split, Play Mode, and Field/Frame panes
- Select a VTR Mode using the VTR buttons under the View Mode pane
- Select Objective Measurements using the Objective Metrics pane

The video clip being played and analyzed is shown as a sequence name in Viewport A or B, above the VTR buttons.

Choose a Video Output

The Video Output Device selection controls ClearView's uncompressed video format to be displayed on external monitors and affects the input format during recording.

Figure 8: Video Formats for Broadcast Output (SDI, HDMI) and IP Output (25G or 10G Networks)



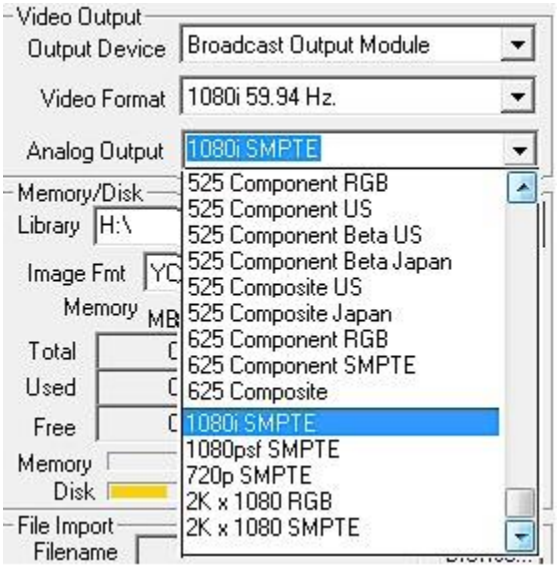
Note: Output formats depend on module selected and system configuration. 4K formats are up to 4096x2160p 60Hz and 8K formats are up to 8192x4320p 60Hz. Higher frame rates for 4K video are available by applying external HDMI 2.1 converter. IP Output module supports up to 4096x2160p 60Hz.

Table 2: Video Output Pane Descriptions

Output Device	The list of Output Devices depends on the optional ClearView Output Modules installed. Output Devices are selected from a pull-down menu: • **No Video Output Module** – used for testing of non-broadcast formats potentially with custom resolutions and frame rates. Allows image view in ClearView's application Viewport only. • **Desktop Output Module** – provides separate video output window at full resolution on the system desktop. Note: Desktop output requires the connected desktop monitor to support the resolution of the sequence selection, or the image output will be scaled to fit a lower resolution. • **Broadcast Output Module** – output of SDI and HDMI up to the specification of the video module installed. Up to three Broadcast Output Modules are supported in ClearView Extreme 4K models. • **IP Output Module** – ST 2110 media networking interface output.

Video Format	The list of available **input and output** resolutions/frame rates depends upon the Output module user selections. • **No Video Output Module** has no restrictions and has the *Create New* feature providing the ability enter any resolution and frame rate, allowing for a file import of the created video format for quality testing. • The **Broadcast Output Module** conforms to broadcast specifications provided by SMPTE and as specified by the installed video module. • **IP Output Module** conforms to the current ST 2110 media networking interface format specifications for the installed video module.
Analog Output	Defines the type of analog output only when using a Broadcast Output Module with analog output connections (i.e., Composite, S-Video, or Y, Pb, and Pr Component Outputs). The Output is sent out the selected analog output simultaneously to 3G-SDI and HDMI. The CV-SDI-IO-3G is the only module currently supporting analog outputs.

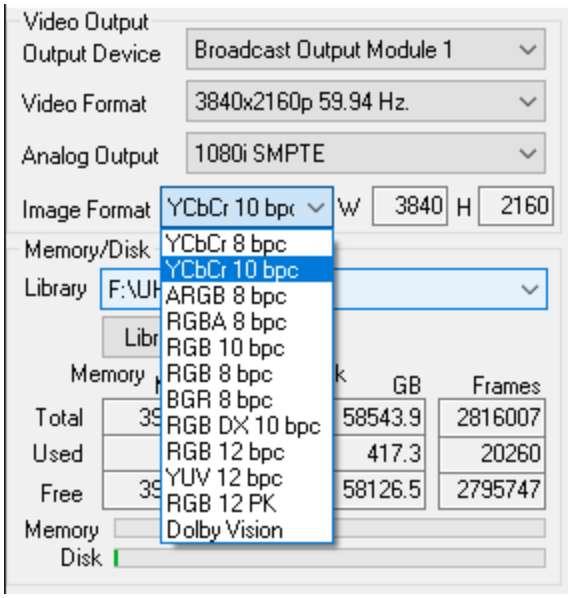
Figure 9: Analog Output Formats



By either choosing the Broadcast Output Module or IP Output Module Device, VANC data can be captured and played. VANC applies a larger vertical raster size in SDI or HDMI and applies as ancillary data in ST 2110 media. The audio & VANC controls are turned on/off via the configuration menu's Playback tab.

After a Video Format has been selected, the ClearView memory is tied to the resolution of the selected format unless a video is loaded having a different format.

The image format must be chosen next. This item is shown at the bottom of the Video Output pane. The choices are as follows:



Generally, video sequences that are either file imported or recorded will apply the correct native image format for the chosen video sequence. Any video sequence, regardless of its actual input image format, can be converted to another image format using the ClearView Importer. After it is input to a specific image format it can only be output to a compatible display. Any format will work in No Video Output mode.

Note: video sequences already loaded will not play if the Output Format does not match the clip's output format when it was originally loaded. If you want to view a video sequence that was previously loaded in a different output format, then you will need to reload it. To view the properties of any video sequence, hover the cursor over the thumbnail or view the video sequences in detail mode.

Figure 10: Memory/Disk

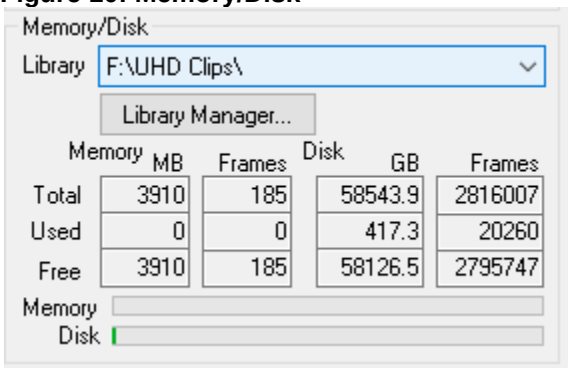


Table 3: Memory/Disk Descriptions

Library	The Library button allows storage location and organization of the video sequences. You can change libraries by pulling down on the tab or by selecting the "Library" button. The library button also accesses the library manager controls like delete, move, copy, etc., explained in the next section of this guide.
Image Format	Select the Image format. Choices include: Y'CbCr, RGBA, RGB, BGR, ARGB, 8-bit, 10-bit and more as shown in the Image Format dropdown above.
W & H	Width and Height are informational shown next to the image format chosen.
Memory & Disk Statistics	These fields display the System Memory and Disk capacity statistics for informational purposes (Total, Used, Free, megabytes, number of frames available in the chosen Video and Image Formats). Note: Memory is generally

	used as diagnostic tool today, so Disk capacity provides an understanding of storage used and free capacity for recording and playback.
Y'CbCr 8 bpc	8 Bit Y'CbCr, 4:2:2 Sampling, format for Broadcast and IP Output Modules
Y’CbCr 10 bpc	10 Bit Y'CbCr, 4:2:2 Sampling, format for Broadcast and IP Output Modules
RGB 8 bpc	8 Bit RGB, 4:4:4 Sampling, format for the Legacy DVI or DP Output Module
BGR 8 bpc	8 Bit RGB, 4:4:4 Sampling, format for Dolby Vision and Legacy DVI, DP Output
ARGB 8 bpc	8 Bit RGB, 4:4:4 Sampling, format for the Legacy DVI or DP Output Module
RGBA 8 bpc	8 Bit RGB, 4:4:4 Sampling, format for the Broadcast Output Module
RGB 10 bpc	10 Bit RGB, 4:4:4 Sampling for the Broadcast Output Module and Dual-link SDI.
RGB DX10bpc	10 Bit RGB, 4:4:4 Sampling, format for the Legacy DVI or DP Output Module
RGB 12 bpc	12 Bit RGB, 4:4:4 Sampling for the Broadcast Output Module and Dual link.
YUV 12 bpc	12 Bit Y'CbCr, 4:2:2 Sampling, applied only for ICtCp using Legacy file importer.
RGB 12 PK	12 Bit RGB – 8 pixels in 36 bytes – used only for testing 6P format.
Dolby Vision	Dolby Vision format - may be imported with proper metadata and played via HDMI 2.0 output only. This format requires an optional software license.

Choose a Library

The Memory-Disk Pane displays the Memory and Disk properties, allows the selection of image format, and lets the user control the library file system. A library acts like a Windows directory, with a few differences.

Similarities:

- Much like Windows directories, you should organize your video sequences together in a meaningful way. For example, all the 1080i, 59.94, 8-bit video sequences could be placed in a folder with name about the format, like “1080i_60Hz_8bit”, or a naming convention that makes sense for the content or device under test.
- You can copy, move, remove (delete), and sort video sequences by selecting a **complete library folder**. However, only do this under the Library Manager control window in ClearView, and not via Windows Explorer or other Windows based file access methods.

Differences:

- Libraries have an index file which catalogs metadata information about the video in a file called **“sequences.xxx”**. This index file holds information like the sequence name, resolution, thumbnail to display, looped playback frequency and mark-in/mark-out points, etc.
- Each video sequence in a Library folder has 3 files associated with it – the uncompressed video sequence with a large file size, the uncompressed audio sequence, and a text overlay file. The text overlay file contains the text to be displayed when overlay is checked under Playback Parameters in the Color/Overlay tab. The default names should be the same as the sequence name. Since this is a text file, it can be easily changed using any text editor.

  NOTE: ***Do not delete*** *these files called* ***“sequences.xxx”*** *as it will result in a loss of the video loaded in the entire library file system.*

  The ClearView file system is configured as ***Raid 0****.* ***Please back up the ClearView Library folders in an external storage system****. This is to guard against a disk failure.*

ClearView uses its own file system to ensure playback and record integrity.

To change libraries, you can simply choose a different one by selecting the pull-down menu display of recently used, or you can select the “Library” button. If you choose the Library button, the following will be displayed.

Figure 11: Library Manager Controls

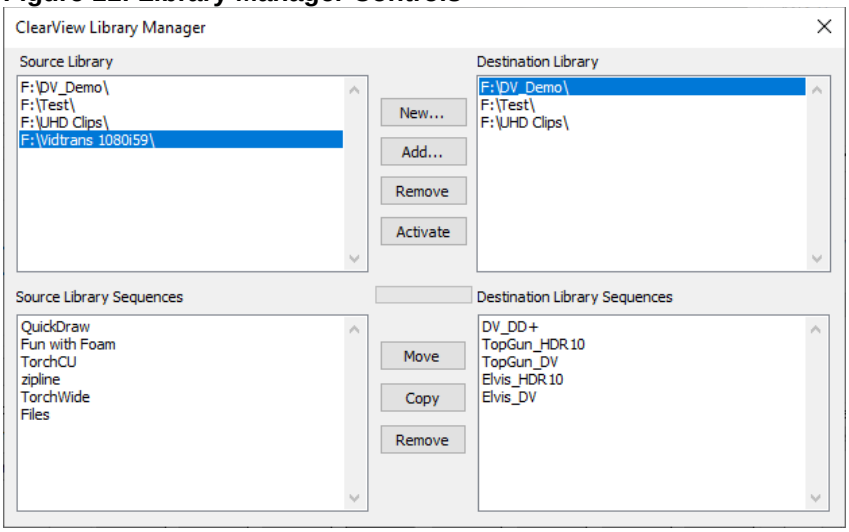


Table 4: Library Manager Descriptions

New	Creates a new library. • Select **New folder Icon** to create a directory within Windows • Name a new file located in the F: media array and select **Save**. • *This saves the sequences file in the created folder that will index the contents, track additions, and allow access within ClearView.*
Add	This allows ClearView to recognize a library imported from outside ClearView. For example: restoring a library from tape backup or copying a library from another ClearView system. *ClearView needs to reference the sequences file in each library. This command activates a selected sequence's file system.* • Select the Source Library "**sequences.xxx**" • Press the **Add** button
Remove	This removes the sequences file from an existing directory. • Select the Source Library • Press the **Remove** button
Activate	This reads the sequences file and places the thumbnails and details in the Select Thumbnail to Play pane. • Select the Source Library folder • Press the **Activate** button
Move	This allows you to move a video sequence from one Library to another Library. • Select the Source Library • Select the Destination Library • Select the video sequence to Move • Press the **Move** button
Copy	This allows you to copy (duplicate) a video sequence to another Library. • Select the Source Library • Select the Destination Library • Select the video sequence to Copy • Press the **Copy** button
Remove	This allows you to delete a video sequence. • Select the Source Library • Select the video sequence to Remove • Press the **Remove** button
X	Closes the dialog window. *Note: all changes are accepted as they are entered.*

Import a File

See ClearView Importer Manual

Importing media files into ClearView is done via the ClearView Importer application that can be accessed either via system desktop icon or via Import Media selection on the left center ClearView GUI File Import section as shown in Figure 13 below. Please refer to the ClearView Importer Manual for further information after reading the ClearView Dependencies section below.

ClearView File Import Dependencies

Library

Libraries are the maintenance folders, used in both the Importer and ClearView applications. Importer destination folders may be used as ClearView input source. Basically, Libraries may be considered as shared locations for the Importer and ClearView.

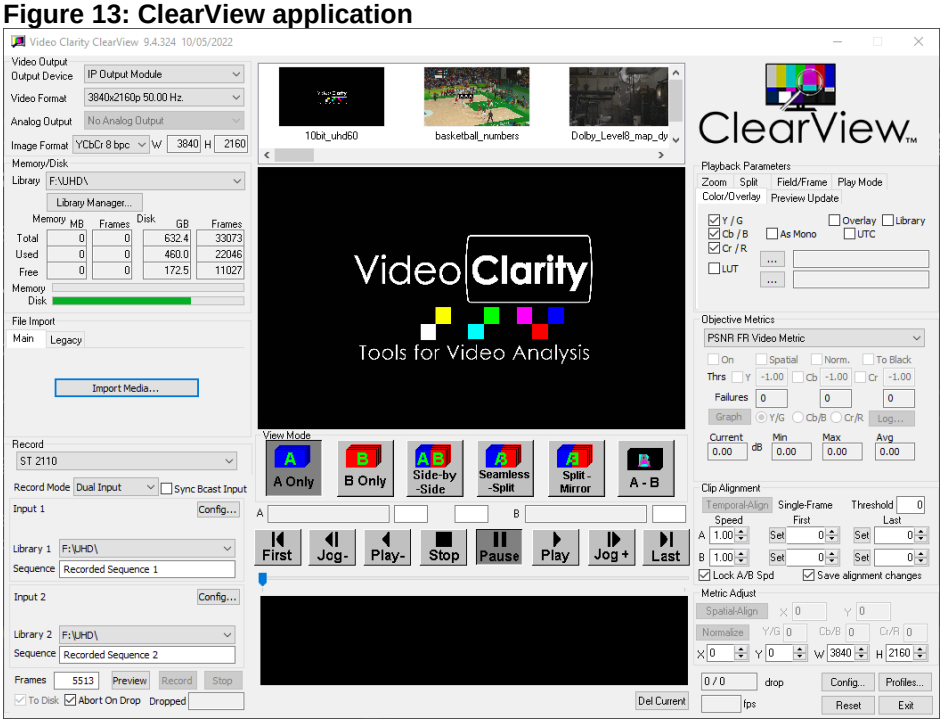
ClearView Library folder specification

Libraries have an index file which catalogs information about the video sequences. This index file holds information like the sequence name, the resolution, the thumbnail to display, the playing frequency, the mark-in/mark-out points, etc. The file name for this catalog is “sequences”. Please do not delete this file as it will result in a loss of the video sequences in the entire library. Each video sequence has 3 files associated with it – the uncompressed video sequence, the uncompressed audio sequence, and a text overlay file. The text overlay file contains the text to be displayed when Overlay is checked. The default name is the sequence name. Since this is a text file, it can be easily changed using any text editor.

Additionally, Libraries, created in ClearView will be accessible as Output Sequence Libraries in File Importer applications.

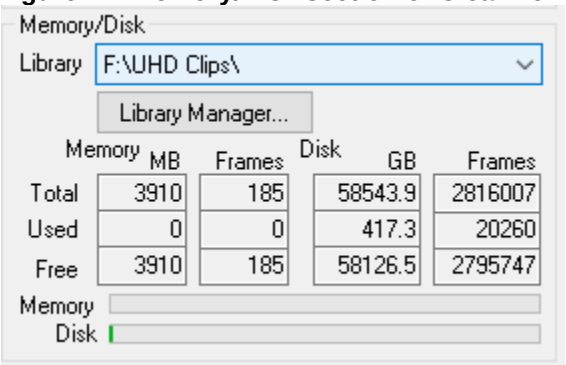
Launch ClearView application icon from the desktop.

Figure 13: ClearView application



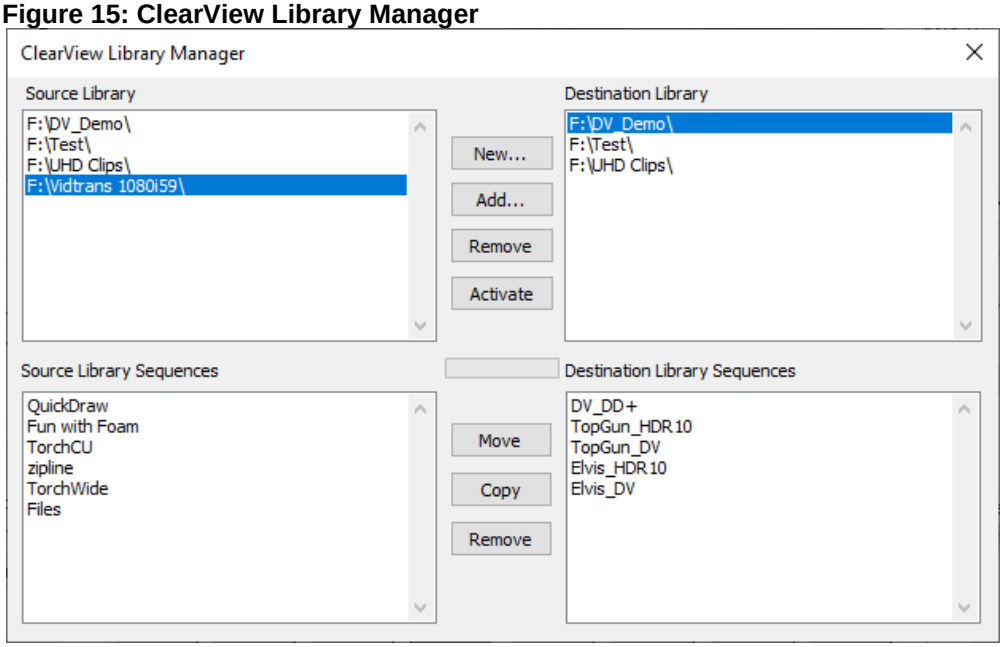
1. Click on ‘Library’ folder of ‘Memory/Disk’ section:

Figure 14: Memory/Disk section of ClearView



2. Click ‘New’ button in the ‘ClearView Library Manager’ to create a new Library. Using the Windows Explorer, navigate to the folder that will be used as the destination for File Importer output, for example *‘H:\1080i50 YCbCr 8bit\’* path.

Figure 15: ClearView Library Manager

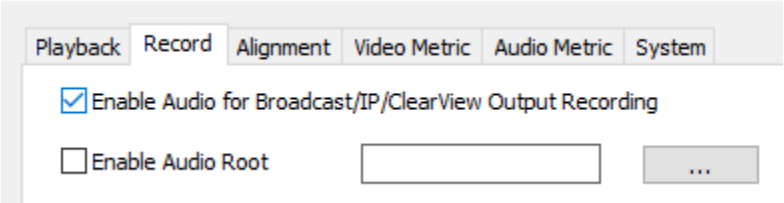


The ClearView system has no restrictions on the number of libraries that may be created. All new Libraries will be accessible in the ‘Library’ drop down list of Output Sequence section in ClearView Importer.

Audio Root Usage (Legacy only)

Utilization of audio root file location is not necessary in today’s system configurations. Decoded Video and Audio files are automatically stored in the named library. However, audio files may be recorded in a specified destination, based on the ‘Use Audio Root’ option in **‘Config’** screen. By having the option checked all Audio files from the decoded videos will be kept in the selected location, separate from the video files.

Figure 17: Record section



1. Within ClearView application, press on '**Config'** button, see the '**Record section'**.
2. Check the **'Enable Audio Root'** checkbox.
3. Fill in the path for Audio files to be stored manually or press on the browse button with three dots. Select Audio root location folder using Windows Explorer.
4. Click **'Save'** button to apply the selection.

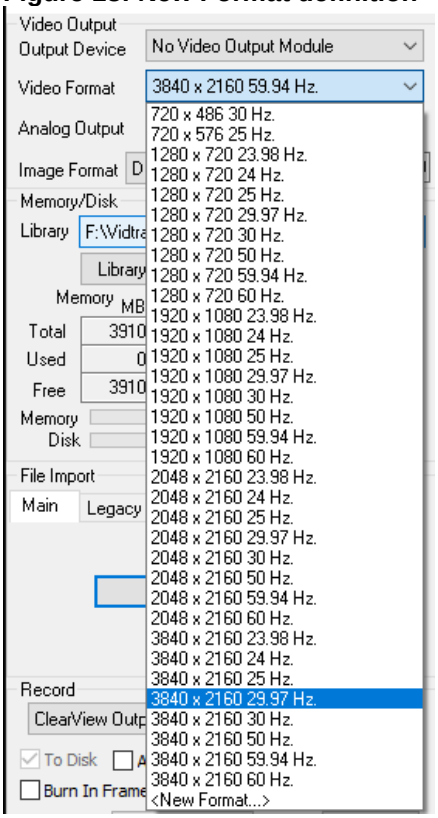
Again, use of audio root is a legacy application for older configurations of systems with lower throughput functions that needed to have audio in a root location. This is not necessary in today's recording settings.

Specify Resolution to Store

The ClearView application allows creating a custom set of resolutions and refresh rates that may be used in the '**Video Format'** drop-down list of File Importer, when the **'Output Module'** is set as **'No Video Output Module'.**

Imported video may be decoded in any of the user-defined **'Video Format'** applying any desired **'Source Modification'** and **'Output Sequence'** configurations. To define a new resolution and refresh rate in the ClearView application, please follow the steps below:

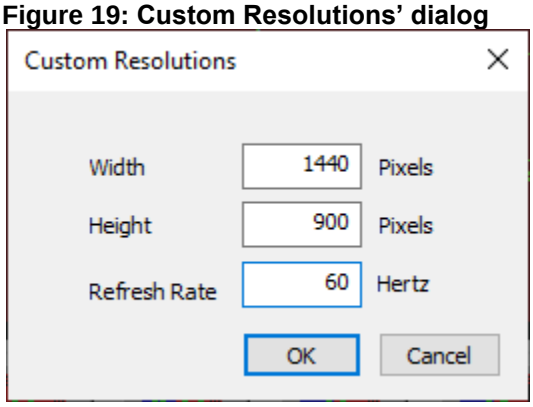
Figure 18: New Format definition



1. Launch ClearView application.
2. Expand **'Video Format'** drop down list of **'Video Output'** section.
3. Click on **'<New Format…>'** in the bottom of the expandable list.
4. In the 'Custom Resolution' displayed dialog specify the following:

- ***Width (Pixels)*** – Horizontal amount of pixels
- ***Height (Pixels)*** – Vertical amount of pixels
- ***Refresh Rate (Hertz)*** – Frames per second

Figure 19: Custom Resolutions' dialog



5. Click **'OK'** button to save custom resolution. Click **'Cancel'** button to discard the changes made in the **'Custom Resolution'** screen.

After the new resolution is added in ClearView, it may be used in the ClearView Importer application for video decoding purposes.

Note: It may be needed to restart the Importer application to get a user-defined resolution to appear in the **'Video Format'** drop-down list.

Output File Allocation

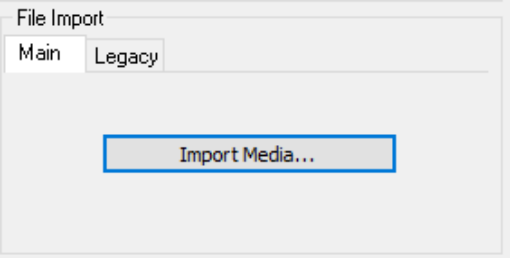
Once the video is decoded using ClearView Importer application, the following files are created, according to the Sequence Name provided in the Output Sequence section.

Decoded Files:

- **<Sequence Name> (with no extension)** – Decoded Video raw data.
- **<SequenceName>.aud** – Decoded Audio raw data, may be stored either in Output Library folder, configured in Importer application, or in a custom location, according to **'Use Audio Root'** option in the ClearView Config menu of the application.
- **<FileName>.grf** - Stored graph that performs decoding.
- **<SequenceName>.cvo** - This text file contains just the name of the sequence for overlay.

Launching ClearView Importer

Figure 44: Launching ClearView Importer



The Import Media button on the Main tab under File Import launches the ClearView Importer application described in the ClearView Importer Manual PDF document. This is the current method for file import and decoding to import media files of all types and may be used for MPEG IP stream capture to separate IP input/decoding action from ClearView operations.

The Legacy Selection

The Legacy Selection in the File Import section is no longer used unless a format from the legacy importer is needed. Please contact Video Clarity Support before attempting to use this feature.

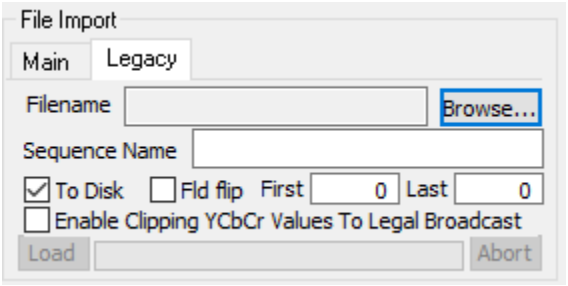


Table 8: Legacy File Import Descriptions

Filename	This is the name of the file to be input.
Frames	Total number of still files found in folder or the total number of frames found in a streaming media file. This is automatically filled in after reading the header of the selected file. *Note: if the header does not state the number of frames, then ClearView will calculate this number based on the size of the file and the bitrate.*
Sequence Name	This is the name of the video sequence that will appear in Play Mode and if a .CVO (ClearView Overlay) file does not already exist, it will be created with this text.
To Disk	When checked, import to the File System. When unchecked, import to Memory. *Note: Audio is not currently written to Memory.*
Fld Flip	Reverse (flip) the top and bottom fields during import.
First	The first frame to be loaded from a sequence of files. You can use this to import part of the video sequence.
Last	The last frame to be loaded from a sequence of files. You can use this to import part of the video sequence.
Load	Initiates the load process. This converts the video sequence and loads it to the file system or memory.
Abort	Aborts a load in process. You must re-browse after an abort. You cannot change parameters and then click Load again.

Play a List of Video Sequences

When ClearView sees the .CVP, it knows that this is a tab-delimitated file, which tells it how to playback many files.

Note: Please remember that to play files you must already have loaded the video sequences into ClearView.

The fields in the .CVP file are as follows.

Table 10: Play List Descriptions (.cvp file)

Sequence Name	This is the name of the sequence that will appear in Play Mode
First	The first frame to be loaded from a sequence of files or the first frame to be loaded from a streaming media file. (-1: means first)
Last	The last frame to be loaded from a sequence of files or the last frame to be loaded from a streaming media file. (-1: means last)
Repeat	Play this sequence X number of times.

Load Tested Sequences via Objective Metric Log File Drag-n-Drop

The objective metric log file includes:

- Objective Metrics – ΔEITP, AFREQ, APEAK, CAMBI, DMOS, JND, NIQE, PEAQ, PSNR, SPATIAL, TEMPORAL, or VMAF
- Clip Alignment Parameters
- Image and Video formats
- Video Sequence names and Library locations
- Default parameters used when calculating the metrics

By dragging and dropping a metric log file onto the ClearView application, then

- the video sequences will be loaded
- the clip alignment will be set
- the objective metrics will be restored (no need to recalculate)
- the library and video sequences, etc. must exist and be part of a Library in ClearView

Note: The different metric's log data are stored in separate log files and some logs may have different sections that others do not contain.

The fields in log files are as follows.

Table 11: Objective Metric Log File Description

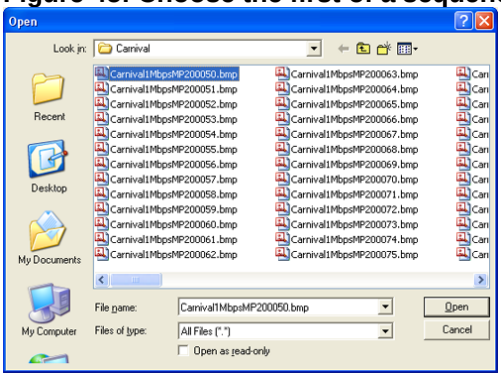
Log File Type	Denoted by the file extension. Examples file has .dmos, .psnr, .spatial, .temporal, .vmaf, etc.
Library A Library B	These are the locations where the Video Sequences are stored *Note: if the Library does not exist, then an error message will be posted*
Sequence A Sequence B	These are the Video Sequences to load. *Note: if they are not in the Library, then an error message will be posted*
First Frame A, Last Frame A, Speed A, First Frame B, Last Frame B, Speed B	These are the Clip Alignment Parameters for each sequence. *Note: if the first and last frame are not within the range, then an error message will be posted*
Frame, Luma, Chroma, Fail Y, Fail C	This is the header for the DMOS, JND, and VMAF data. The data for each frame is recorded as Y values and the Chroma (CbCr combined) values. The last 2 columns are pass/fail against the user set threshold.

Frame, Y/G, Cb/B, Cr/R, Y/G, Cb/B, Cr/R, Y/G, Cb/B, Cr/R, Fail Y, Fail Cb, Fail Cr	This is the header for PSNR. It consists of the frame number and 12 more columns. The first set of 3 values are for Viewport A (if the data is No Reference), the second set of 3 values are for Viewport B (if the data is No Reference), the third set of 3 values are for the results (in No Reference this would be the subtraction; in PSNR, this would be the data), the fourth set of 3 values are pass/fail against a threshold.
Frame, Score, pnan, Fail, Fail	NIQE applies this header. It consists of frame numbers and NIQE metric score. Pnan is the confidence level of the accuracy for the NIQE score value presented by the metric. The last two columns binary entries for failed frame according to user set thresholds for the metric score and pnan.

Load a Series of Files with The Same Extension

File Importer will search the folder for all files with sequential file names. The file names must have at least 4 digits and must be sequential. An example is listed below that has 5 digits.

Figure 45: Choose the first of a sequence of BMP files



Note: the File Import pane will display information about the file or files that have been selected. In this example, .bmp files are imported. However, this behavior is the same for any file type.

Load Headerless files

File Importer needs to know more about these files to load them correctly. Header files have been defined to help ClearView to understand this data the description of the file is defined in File Import Descriptions below

- .hdr – this is used when all of the headerless data is in 1 file
- In the case of 1 frame per file no header file is needed

Note 1: Many YUV formats can be loaded directly by ClearView. If File Importer cannot load the file properly, then you will need to create a .hdr

Note 2: You can either double click (or drag & drop the headerless file to load.

The .hdr file contains the following data. Some of the data is marked as Optional, and can be omitted. Regardless, you must start with % and the name.
Note: There are many examples under www.videoclarity.com/Support (Miscellaneous Support Files).

Table 12: Raw File Import Descriptions

Color Format	YUV420 – Planar YCbCr in IYUV/I420 order (ST/Thompson/MPEG Groups) YV12 – Planar YCbCr in YV12 order YUV422P – Planar YCbCr with 4:2:2 sub sampling (Sony) YVU422P – Planar YCbCr with 4:2:2 sub sampling (chroma inverted)

	YUV422_10 – Interleaved 10 Bit YCbCr v210 format (standard Quick Clip 10 Bit YCbCr) YUV4224_10 – Interleaved 10 Bit YCbCr v210 format with alpha/key channel YUV4224 – Interleaved 8 Bit YCbCr yuv2/UYVY format with alpha/key channel YUV422_fields – Separate fields of 4:2:2 YCbCr (Crescent) YUV422 – Interleaved 8 Bit YCbCr UYVY format (standard Quick Clip 8 Bit YCbCr) UYVY422 - YUV 4:2:2 interleaved 8-bit packed as U Y V Y U Y V Y ... YUY2 - YUV 4:2:2 interleaved 8-bit packed as Y U Y V Y U Y V ... DPXRGBLEFILL - DPX 10-bit RGB, little endian, filled DPXRGBLE - DPX 10-bit RGB, little endian, padded DPXRGBFILL - DPX 10-bit RGB, big endian, filled DPXRGB - DPX 10-bit RGB, big endian, padded DPXABGRLEFILL - DPX 10-bit ABGR, little endian, filled DPXABGRLE - DPX 10-bit ABGR, little endian, padded DPXABGRFILL - DPX 10-bit ABGR, big endian, filled DPXABGR - DPX 10-bit ABGR, big endian, padded RGBA – 32 Bit Interleaved RGB (TIFF) ARGB – 32 Bit Interleaved RGB (Mac) BGRA – 32 Bit Interleaved RGB (Windows BMP/TGA) BGR – 24 Bit Interleaved RGB (Windows BMP/TGA) TIFF24 - 24 Bit Interleaved RGB TIFF ordering TIFF32 - 32 Bit TIFF (same as RGBA) PRGB - 8-bit x 3 Planar RGB PRGBA - 8-bit x 4 Planar RGBA PBGR - 8-bit x 3 Planar BGR PABGR - 8-bit x 4 Planar ABGR PBGRA - 8-bit x 4 Planar BGRA PARGB - 8-bit x 4 Planar ARGB FULLDUAL - 10-bit dual frame YCbCr (stereo) STEREO8 - Dual 8-bit YCbCr interleaved streams (one after another) STEREO10 - Dual 10-bit YCbCr interleaved streams (one after another) DV25 - DV25 'dv/dif' stream 4:2:0 or 4:1:1 8-bit SD DV50 - DVCPro 50 stream 4:2:2 8-bit SD DV100 - DVCPro HD/DV-100 stream 4:2:2 8-bit HD IMX30 - Sony IMX MPEG 30 Mbit stream 4:2:2 8 bit IMX40 - Sony IMX MPEG 40 Mbit stream 4:2:2 8 bit IMX50 - Sony IMX MPEG 50 Mbit stream 4:2:2 8 bit ARRIBAYERDLRAW12 - ARRI dual link raw 12-bit layer packed into YCbCr 10 Grey - 8 bit grey/gray plane of video data
Image Size	"Number of Rows" "Number of Columns" (ex: 486 720; note the 'x' cannot be used)
Number of Fields per Image	This should be ‘1’ unless you want us to take 2 images and interlace them together.
Number of Images	This number is calculated based on the number of video sequences within the folder. If you use a small number, then less will be read into memory, so set this number high. (Optional).
Frames per second	23 (23.98), 24 (Standard film), 25 (PAL/25p/50i), 29 (29.97 -NTSC/29.97p/59.94i), 30 (NTSC NDF/30p/60i), 50 (50p), 59 (59.94p - for 720p), 60 (60p - for 720p)
Header Offset	If there is a header on the file, then place the number of bytes into the file

	where the video starts/size of the header (Optional)
Video Offset	If there is an additional offset before the start of the video that is not a header, then place the size of it in bytes here. (Optional)
Video Alignment	To speed up disk access, the files are padded to the nearest block size. This is normally set to 512 for Windows. (Optional)
Video Name	This is the name of the first still image. The 000 must be present. If an extension is not named, then it will search for .raw, .yuv, and .bin, in that order, before returning an error. (Optional) Note: The name of the first frame must contain “000” (e.g., VideoSequence000) and the second frame “001” (e.g., VideoSequence001), etc. This is because the software sorts the frames before loading them, and in Windows, the ordering would be 000, 001, 002, 003, 004, 005, 006, 007, 008, 009, 010 (in other words “1” would actually be loaded as frame 100). Of course, you could use 0000 (4 zeros) if you have more than 999 frames.
Audio Name	This is the name of the .wav or .aiff file associated with the video.
Timecode	This is the time code for the first video frame. It will run continuously from here. Given as hrs:min:sec:frames (Optional)
Userbits	A query of the value of the user bits will return this value for all frames. (Optional; ClearView does not currently extract the user bits.)
Start Frame	This indicates the frame number of the first frame in the video file. It is normally 0, unless you are using some type of circular file as input. (Optional) CAUTION: If you were writing the file when you asked ClearView to start importing it, then you may create a situation where the pointers formed a circle (used the same disk space over and over). This is very dangerous, as ClearView may read too fast or too slow, and it is asynchronous.

Record From Various Inputs

The Record pane allows you to record from the SDI, 2110, HDMI, MPEG IP Inputs, or record ClearView sequences being played in any mode. The list of Input Sources (input devices) is dependent on the ClearView input modules installed. While recording from the video source, ClearView will do the following:

- Capture based on the sensed video format. *Note: during MPEG network IP Input, the format that is used for import is selected by the video format selection under Video Output.*
- Store the uncompressed video sequence on the file system.
- Create the required file and image thumbnail information.

Below is a table explaining the fields in the record pane tabs.

Table 13: Record Pane Description

Input	ClearView supports the following Inputs if the Modules have been purchased • Broadcast Input: records the video sequence from the Broadcast I/O Module (i.e., SDI – for 12G and 3G-SDI, with HDMI output), one Broadcast Module is generally included in base system configurations. • IP Input for ST 2110 media streams • MPEG IP Input from system GNIC: decodes and records an uncompressed video sequence from the multicast address and port number specified in the configuration menu • ClearView Output: records the video sequences currently playing in the preview window as a new Video Sequence. *Note: This is useful if you want to export a Split AB image or re-record after spatial alignment/normalization.*
Config	Configure is different depending on the Input Source • SDI Input: Select the Input and configure items in Table 14 • HDMI input: Select the Input and configure items in Table 15 • ST 2110: Configure IP Settings and SFP input section.

	• ClearView Output: No meaning; thus, it is disabled. • IP Input: configure the IP stream input
Record Mode	This can be applied to selected modules installed in your system • Single Input – this allows you to record 1 channel • Dual Input – this allows you to record up to 2 channels • Input/Output – this allows you to simultaneously record and play
Library	This lets you set the library for recording so that you can change it from the library used for playing
To Disk	This should remain checked to record the input to the file system. Unchecking is a legacy application for recording the input to Memory *Note: Audio is not currently written to Memory.*
AOI	If you have zoomed and panned to a particular area. You can record the video sequence in 1 of 2 ways: • AOI checked: Record the video sequence with pixel replication turned off, but only record the pixels shown on the preview window. (i.e., with zoom 2x and a 1920x1080 video sequence, this will record a video sequence with the size 960x540. • AOI unchecked: Record the video sequence as it is displayed in the preview window. Possibly with pixels replicated. *Note: to play a reduced size video sequence, you can use no video output mode.*
Use Metric Adjust	Checking this box will start the process of re-recording the 2 video sequences associated with Viewport A and Viewport B. The video sequences are re-recorded after applying spatial alignment, normalization, and windowing. *Note 1: for spatial alignment, the alignment must be an even number to avoid color shifts in Y'CbCr space and/or flipped fields in interlaced modes.* *Note 2: for spatial alignment, both sequences are moved and centered while performing the adjustment.*
Sequence	This is the name that is displayed in the thumbnail. *Note: this can be renamed later.*
Frames	Select the number of frames to record in the Record Pane. The number of frames defaults to the maximum number of frames available in memory or on the disk.
Abort on Drop	Checking this aborts the recording on the first dropped frame. Unchecking this allows the system to keep recording albeit with the error frame.
Status	This simply says previewing, recording, or nothing.
Drop	This increments the number of frames that have been dropped.
Preview	Press this button to preview the record selected input(s) and activate the Record selection, make sure that a valid input(s) is applied to the interface.
Record	Starts the recording process. It will automatically end when the frame count is reached
Snapshot	Press this button to export the current frame in the preview screen as a BMP to the Library that is selected in the ClearView Output Tab. This can now be done with a single click – no need to do a record/export sequence.
Stop	Stop recording
Burn in Frame Numbers	This feature allows you to create a new sequence with frame numbers burned in. Enable this before creating your CV Output recording. Designate the size, and location prior to pressing record.
Trim Dolby Digital Audio	If you have a clip saved with compressed audio, then this feature allows you to create a new sequence that will loop perfectly on Dolby packet boundaries. It will reduce the sequence down to the highest frame multiple allowed according to the frame rate.

Record 1 SDI Input

Under the Record section, select SDI from the top drop-down menu, make sure the source is connected and ClearView will auto sense detected video format.

In ClearView Record Section, Figure 47:

- After selecting SDI for recording, select Single input for Record Mode
- Input 1, select Broadcast Input Module 1 will be the default selection for systems with one video interface module. Select Broadcast Module 2 if recording single input from another SDI interface
- Select Config button (shown in Figure 48) to decide target input connector, either SDI Input 1 or 2
- See Table 14 below for Configure SDI Input Pane Descriptions
- Decide the Library for recording location
- Name the Sequence or apply the system default name that automatically appears
- Set a number of Frames for recording or leave the capacity number shown to allow a free run record
- Select Preview, you should see video in the Viewport, select Record
- Recording will stop automatically for set number of frames, otherwise select Stop to halt recording
- To Disk and Abort on Drop selections should be left as default settings

Figure 47: Record 1 SDI Input

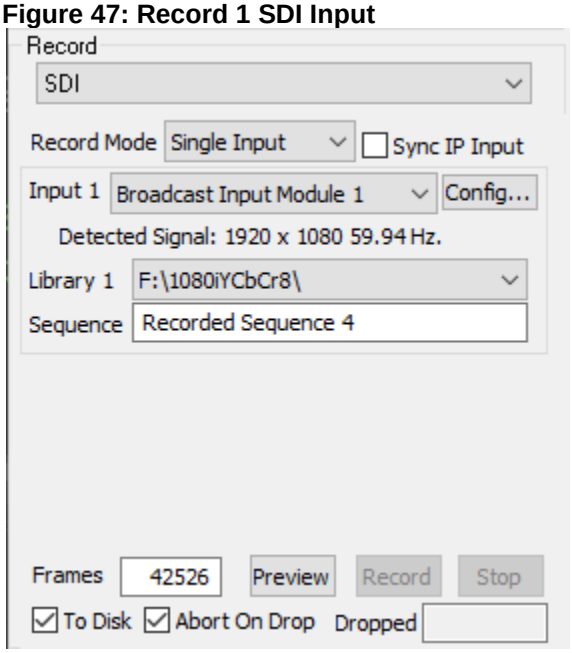


Figure 48: Configure SDI Input

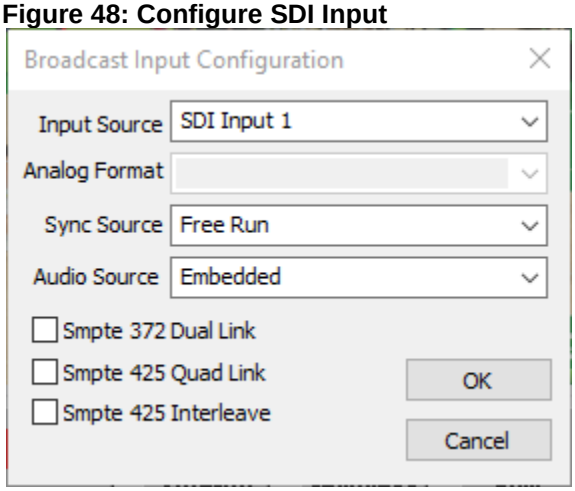


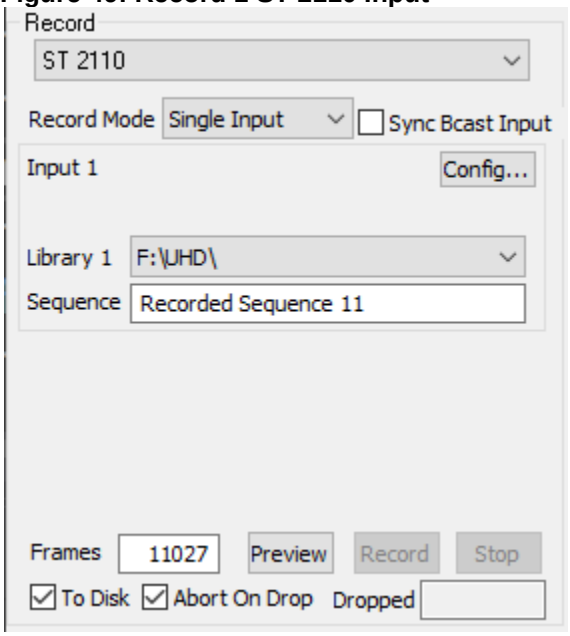
Table 14: Configure SDI Input Pane Description

Input Source	Choose among SDI Input 1 or Input 2, these are generally the connectors labeled #1 and #2 on today's SDI interface modules
Analog Format	This field is only available if you have a CV-SDI-IO-LHI legacy module installed. Choose among 525 (486i), 625 (576i), 720P, and 1080i analog input standards,
Sync Source	Choose among SDI#1, SDI#2, External if external reference is being fed to the Ref In connector on the SDI interface, or Free Run (no external sync source)
Audio Source	Choose Embedded if recording audio channels from the SDI input. AES or Analog audio selections are only available via an optional multi-connector input applied to the interface in your system.
SMPTE 372 Dual Link	If you are using both inputs in Dual Link mode, then check this box. Many times, this check box will be required if 3G-SDI or 12G-SDI signals are Level B.
SMPTE 425 Quad Link	Select if you want to record from all four 3G-SDI ports on a CV-SDI-IO-4K2, or CV-SDI-IO-3G interface module.
SMPTE 425 Interleave	Select in addition to SMPTE 425 Quad Link if the incoming four 3G-SDI feeds are 2SI and not Quad 3G-SDI

Record 1 ST 2110 Input

ClearView Extreme 4K systems equipped with ST 2110 interface modules can record one or two uncompressed video inputs with audio and ancillary data up to 4Kp60Hz 4:2:2 10-bit video formats. The image on the next page shows how the input will appear when selecting ST 2110 from the initial drop-down menu under Record.

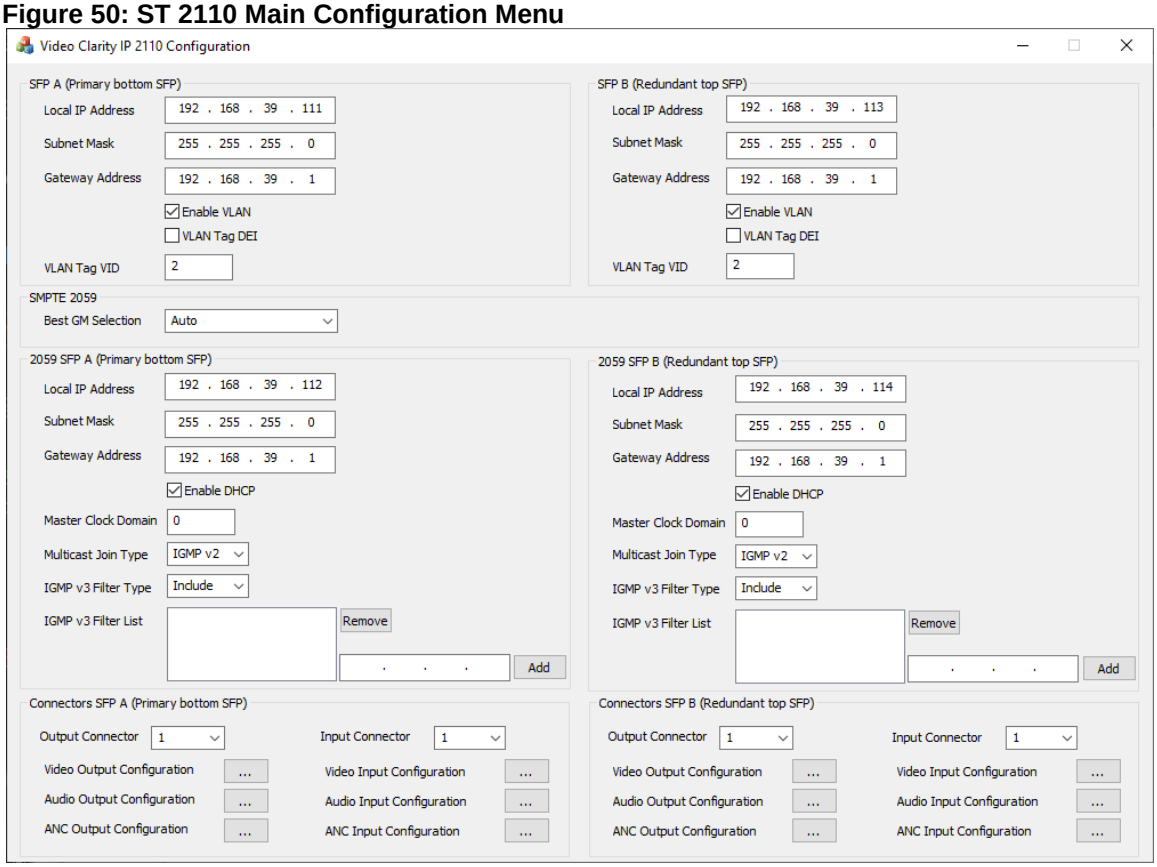
Figure 49: Record 1 ST 2110 Input



In ClearView Record Section, Figure 49:

- After selecting ST 2110 for recording, select Single input for Record Mode
- Input 1 shown will default to the installed CV-IP-IO-UHD module for ST 2110
- Select Config button to apply input stream network address and media stream input parameters

Figure 50: ST 2110 Main Configuration Menu

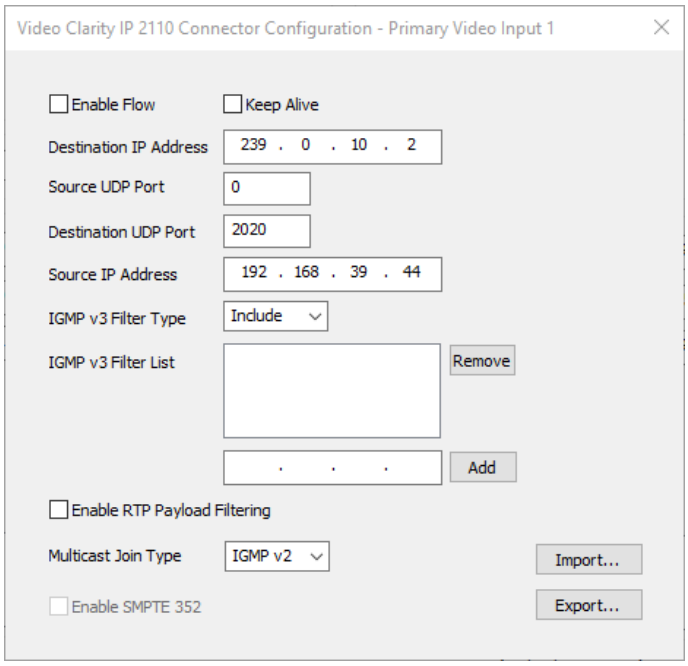


ClearView Main Configuration Menu Set up:

- For SFP A (Primary is the bottom SFP in 3RU systems and the right side SFP in 1RU and 2RU systems) - Enter Local IP address, Subnet Mask, and Gateway Address
- Enable VLAN or VLAN Tag DEI and enter VLAN Tag VID
- SMPTE 2059 apply Best Grand Master Selection for PTP as Auto, SFPA, or SFPB
- 2059 SFP A settings for PTP are Local IP Address, Subnet Mask and Gateway Address and either enable DHCP or leave unchecked
- Master Clock Domain number range = 0 - 127
- Multicast Join Type which can be None, IGMPv2, or IGMPv3
- IGMPv3 Filter Type can set to be Include or Exclude the Filter List
- IGMP v3 Filter List allows up to four Destination IP addresses to be only ones used if Included or ignored if Exclude command is applied in Filter Type

Set up for Connectors SFP A (Primary bottom SFP) to record one stream input:

- Select Input Connector 1 for single input recording
- Select Video Input Configuration box to reveal menu as shown in Figure 50a below

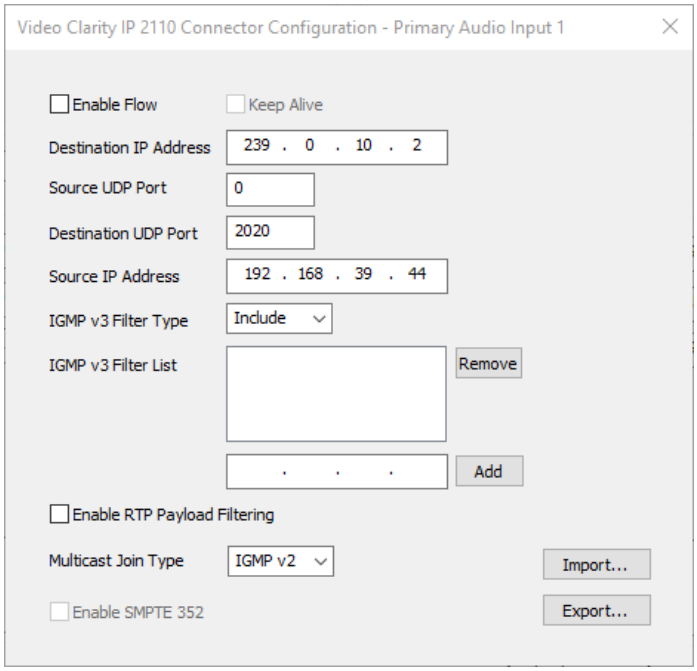


- Select Enable Flow at the top of the configuration window
- Enter the Destination IP Address as the multicast or unicast address of the stream
- Enter the Source UDP Port if required for matching
- Name the Destination UDP Port for the stream
- Enter Source IP Address of the source device if required for matching
- Decide IGMP v3 Filter type and list filtered address in the Filter List using the Add window
- If listed addresses need to be deleted select them and use the Remove button
- Enable or leave blank the Enable RTP Payload Filtering – Normally Video is Payload ID 97, Audio is 96, and Anc is 100, filtering the input using these values can be applied as well.
- Apply Multicast Join Type which can be None, IGMPv2, or IGMPv3
- Enable SMPTE 352 for an SDI payload identifier if required
- Close dialog window

Note: Generally, the Keep Alive is left unchecked since receivers and senders will be dynamically enabled with commands such as record, stop, and play when flow is enabled within this dialog.

Set up Connectors SFP A (Primary bottom SFP) for recording one stream input continued:

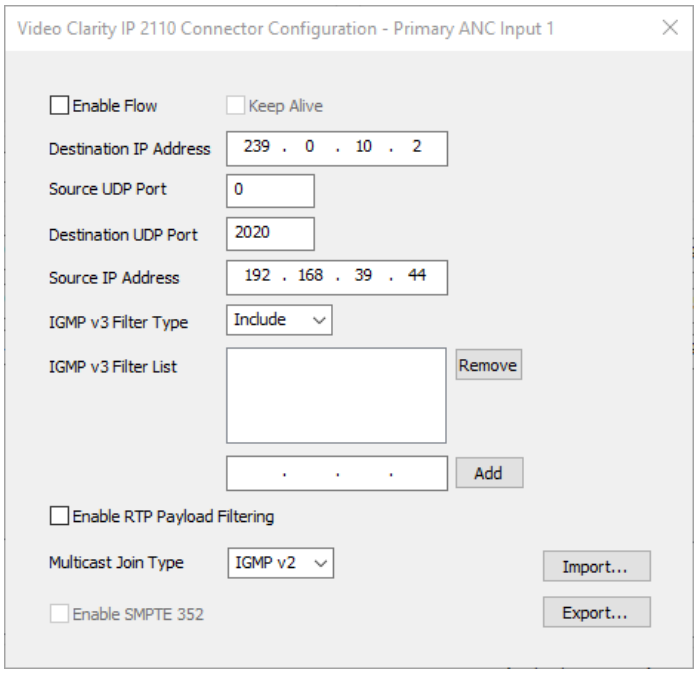
- Select Primary Audio Input Configuration box to reveal menu as shown in Figure 50b below



- Select Enable Flow at the top of the configuration window
- Enter the Destination IP Address as the multicast or unicast address of the stream
- Enter the Source UDP Port if required for matching
- Name the Destination UDP Port for the stream
- Enter Source IP Address of the source device if required for matching
- Decide IGMP v3 Filter type and list filtered address in the Filter List using the Add window
- If Listed addresses need to be deleted select them and use the Remove button
- Enable or leave blank the Enable RTP Payload Filtering – Normally Video is Payload ID 97, Audio is 96, and Anc is 100, filtering the input using these values can be applied as well.
- Apply Multicast Join Type which can be None, IGMPv2, or IGMPv3
- Enable SMPTE 352 for an SDI payload identifier if required
- Close dialog window

Set up Connectors SFP A (Primary bottom SFP) for recording one stream input continued:

- Select Primary ANC Input Configuration box to reveal menu as shown in Figure 50c below

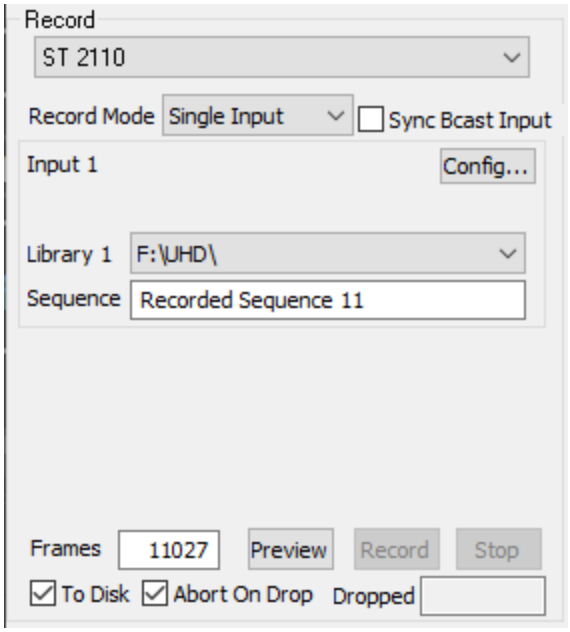


- Select Enable Flow at the top of the configuration window
- Enter the Destination IP Address as the multicast or unicast address of the stream
- Enter the Source UDP Port if required for matching
- Name the Destination UDP Port for the stream
- Enter Source IP Address of the source device if required for matching
- Decide IGMP v3 Filter type and list filtered address in the Filter List using the Add window
- If Listed addresses need to be deleted select them and use the Remove button
- Enable or leave blank the Enable RTP Payload Filtering – Normally Video is Payload ID 97, Audio is 96, and Anc is 100, filtering the input using these values can be applied as well.
- Apply Multicast Join Type which can be None, IGMPv2, or IGMPv3
- Enable SMPTE 352 for an SDI payload identifier if required
- Close dialog window

After closing the above dialog window recheck the Main Configuration menu to see that every entry is correct. You may now close the ST 2110 Configuration Window.

Now back on the ClearView Record section (see repeat of Figure 49) on next page:

- Name the destination library in F: (or, if you have renamed F:, utilize a correct path to a currently set up Library folder destination in the ClearView system's fast disk array.
- Name the Sequence. A default name is populated there with incrementing numbers that can be replaced with your preferred name choice.
- Apply either the number of frames to record or leave the current frame capacity to free run.
- Select Preview. This will provide a preview of the incoming media stream in the Viewport.
- Select Record. If a number below the frame capacity number was entered the system will stop automatically.
- If free running, select Stop when desired.
- "To Disk" and "Abort on Drop" are selected by default. Frames Dropped, if any, will be reported.



After recording has been stopped you should see the video sequence with the name chosen in the upper ClearView thumbnail section. If several sequences are already recorded in this library, you may need to move the scroll bar to the right in order to see the last recorded sequence thumbnail.

At that point you may either start a new recording or select this thumbnail for playback and further analysis.

Record 2 Inputs

When selecting Dual Input for Record Mode the video sequences are sensed on SDI inputs. For ST 2110 inputs the system will record the stream in the address and Configuration set up parameters.

Each video can be set up to go to the same library or may go to different libraries.

Dual Input configuration set up procedures are similar for Single Input recording as shown starting on page 27.

SDI systems that have two modules may record to the same Broadcast Input Module 1 or apply Broadcast Input Module 2 for Input 2 where the layout of inputs is generally the same. The #1 connector is input 1 and #2 connector is input 2. Select the video input with signal applied in the configuration for each module selected using Config… button, select other input parameters shown (page 28) then select OK to close the SDI configuration window. Proceed with recording by selecting existing Libraries for Input 1 and Input 2, enter Sequence names, number of frames or leave capacity number shown for free run recording, select Preview then Record. Select the Stop button at chosen record end point when free run recording, as shown on Figure 51 on page 34.

Systems with ST 2110 interface are set up similarly to “Record 1 ST 2110 Input” starting on page 29. However, when applying set up parameters for Connectors SFP A (Primary bottom SFP) apply input configuration settings for Input Connector #2 in the Main Configuration Window in addition to configuration setting for Input Connector #1. As in the above example, after setting up IP network configurations on both Input Connector 1 and 2 for ST 2110, apply existing Library folder on F:, apply both Sequence names or use the default name shown, apply number of frames to record or leave the default capacity number shown for a free run recording, select Preview, then Record. Stop recording at the desired point when free run recording to create an end to the recording procedure.

Note: For some legacy HD systems configured with separate G and H libraries (which are two separate disc arrays), HD formats must be recorded to separate libraries, one to a library in G and one to a library in H. This is to maintain real-time capabilities and designated frame rates.

For those systems configured with only one disc array, “F” for instance. These systems can record two, play two and play while record two sequences to one or two libraries on the single “F” array up to the format capacity of the IO subsystem.
Examples:
-Extreme 4K systems with dual interface, up to two 2160p60 (Post May2014 or upgraded systems)
-Extreme X2 systems with dual interface, up to two 1080p60
-Shuttle 4K or HD interface systems, up to two 1080p60

Figure 51: Record 2 SDI Inputs

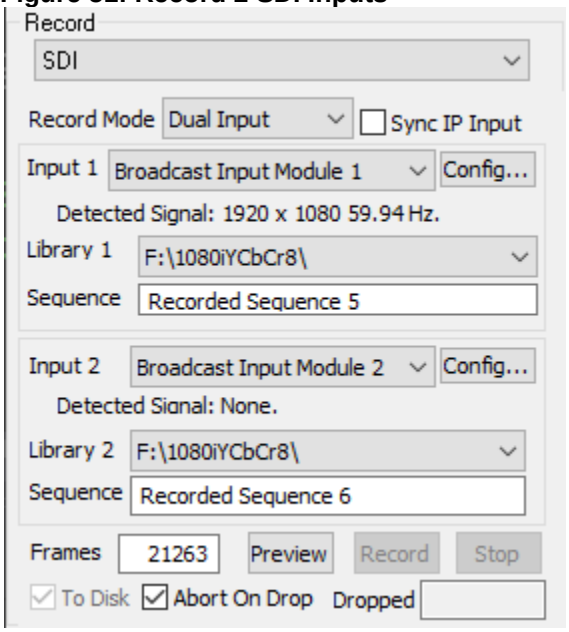
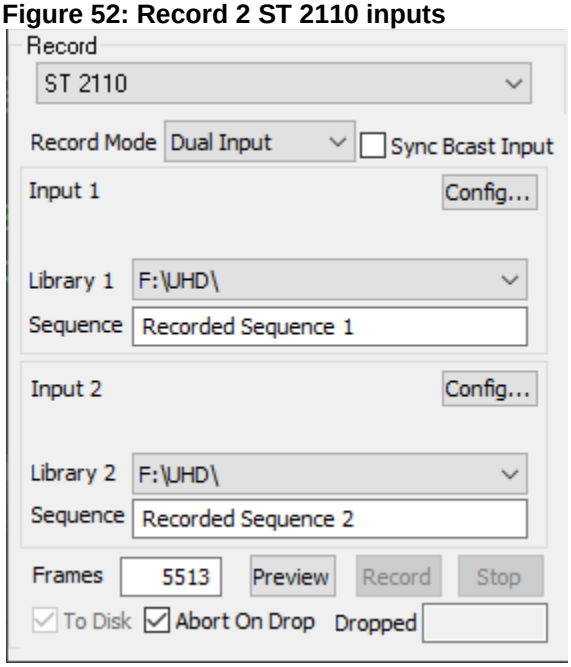


Figure 52: Record 2 ST 2110 inputs

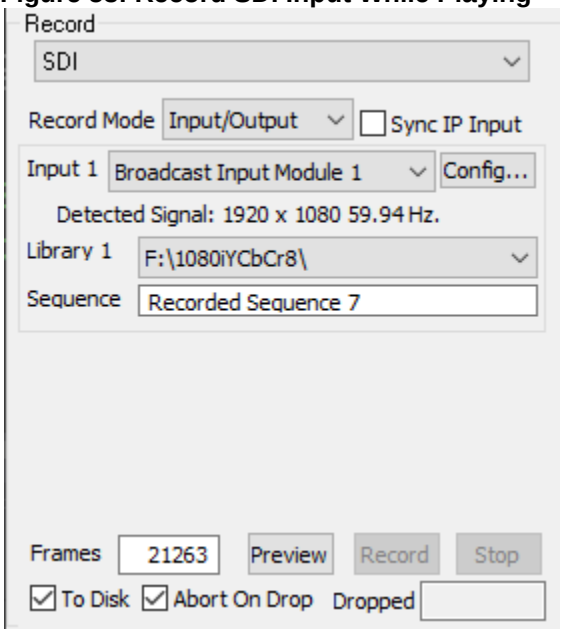


Record Input While Playing

For each interface module installed on a ClearView system the Record Mode Input/Output records the video sequences as sensed on the Input selected. The outputs on the selected Output Module in the upper left section of the ClearView UI will play out the video that is currently in the Viewport. This allows the user to play through a processing chain such as an encoder or an encoder and a decoder allowing the selected Record Input module to be recorded into the system. Once the preview has started and displays the video, the recording can start by pressing the Record button. The video format must be the same (i.e., both 1080i).

Note: If you want to play into a video encoder while recording from a video decoder. Then set the sync source to SDI #1 (the source) under Config.

Figure 53: Record SDI Input While Playing



ClearView Extreme 4K legacy models support "Dual Input" or "Input/Output" to record while playing using Quad/HD 4K formats in systems utilizing two Quad 3G-SDI interfaces. These interfaces had previously been specified as module model CV-SDI-IO-4K2 which now is described in module model CV-SDI-IO-3G on page 71 of this system guide.

ClearView Extreme-4K Legacy Two-Board Input/Output –
Playing or recording 4K in a system which applies two Quad 3G-SDI interfaces is provided up to 4K 60Hz rate by using one of the two video interface modules on the system back panel. The Formats displayed in the GUI pulldown as "4x1920x1080" are used. To record video, select "Broadcast Module 1" which and to playback video select "Broadcast Input Module 2". Each tile of the 4K image is carried by one 3G HDSDI for input or output on either the left (output) or right (input) interface boards.

For a Quad HD 3840X2160 (4K) sequence output or input are HDSDI (1) is Upper Left, (2) Upper Right, (3) Bottom Left, (4) Bottom Right.

Record 1 MPEG IP Input

In IP input mode, a configuration option will pop up as shown below. The video format needs to be set in the main ClearView window under Video Output.

Figure 54: Record 1 IP Input

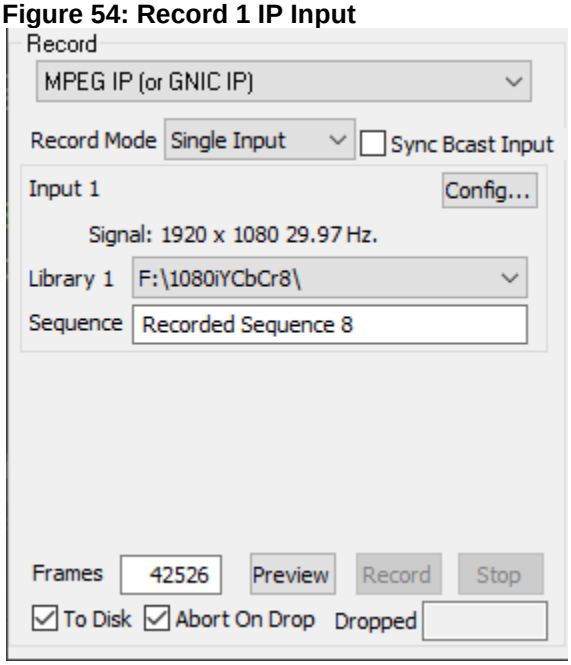


Figure 55: Configure IP Input

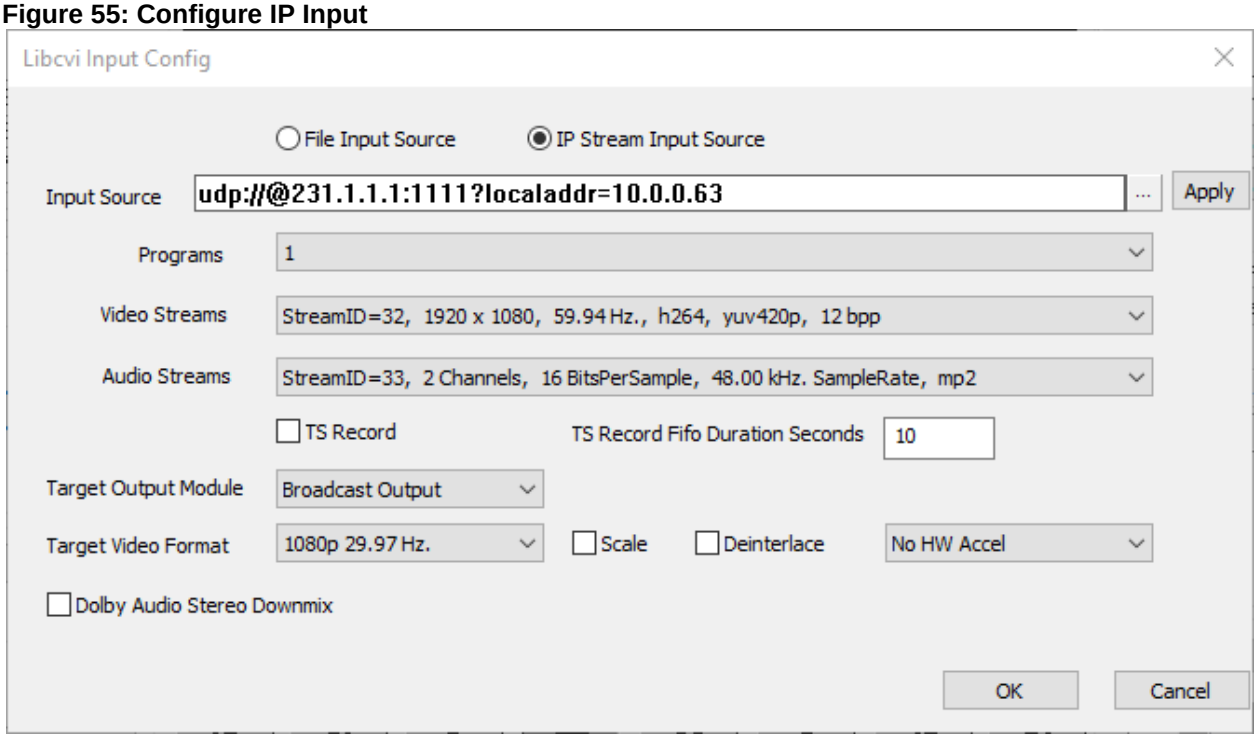


Table 15: Configure IP Input Description

Protocol	Choose among the three protocols of the incoming stream: • RTP • UDP • RTSP
Address	The address that the stream is located
Port	The port number to find the stream
Stream Name	When using RTSP Protocol, specify the stream name
Transport Type	The transport type of the stream: • Mpeg2 TS AVP/UDP Unicast • Mpeg2 TS AVP/UDP Multicast • Mpeg2 TS AVP/TCP Unicast • Unicast RTP over UDP • Multicast RTP over UDP • Multicast Raw over UDP • Interleaving • Unicast Raw over UDP • Unicast Raw over TCP
Timeout	The timeout value for the current stream
Program	Choose the MPTS to Import
V. Decoder	Chose the video decoder to use
A. Decoder	Chose the audio decoder to use
Announcement	Display SAP announcement on the network
Output Sequence Pane	*See FileImporter Description* • **Error! Reference source not found.** • **Error! Reference source not found.**
Transformation	In order to modify the Transformation values, check the use transform box *See FileImporter Description* • **Error! Reference source not found.** • **Error! Reference source not found.** • **Error! Reference source not found.** • **Error! Reference source not found.** • **Error! Reference source not found.** • **Error! Reference source not found.**

Note: In order for the stream setting to appear, first input the settings for the stream and click ok then Preview in the ClearView GUI. Stop the preview and reopen the configuration menu to have the setting appear.

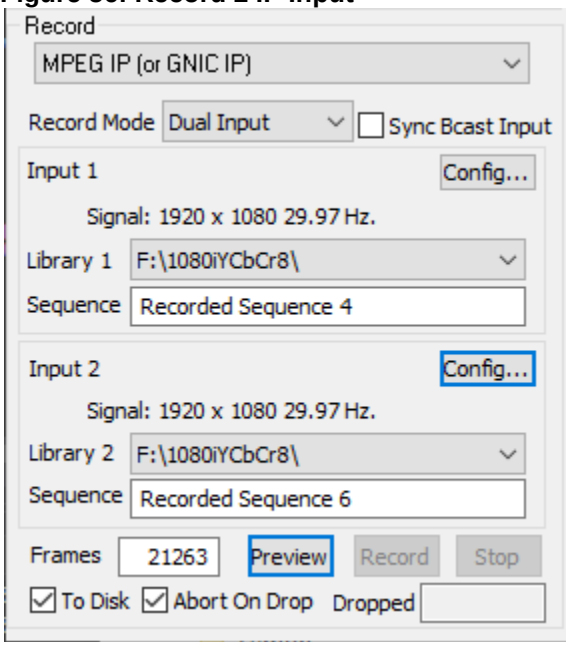
The IP Input tab – Record Mode Single Input records the video sequence as sensed at the multicast address and port specified from within the configuration menu.

Note: IP input will only work on ClearView Extreme systems with Windows 7 or machines built after and including May 2012.

Record 2 IP Inputs

The IP Input tab – Record Mode Dual Input records the video sequences as sensed on two separate multicast addresses and ports specified from within the configuration menus. Each video must go to a different Library, and both may have the same or different sequence names.

Figure 56: Record 2 IP Input



Record 1 IP Input and 1 SDI input

Set the Record drop down menu selection to MPEG IP, set the Record Mode to Single Input, select Sync Bcast Input check box. Apply configuration as described in Record 1 IP Input section above. Apply Library path and name. Then set the Record menu to SDI and Record Mode to Single Input and select Sync Bcast Input check box (this command allows Preview and Record commands to be applied to both inputs at the same time). Each video must go to a different Library and both sequences may have the same name or different names.

Figure 57: Record 1 IP Input

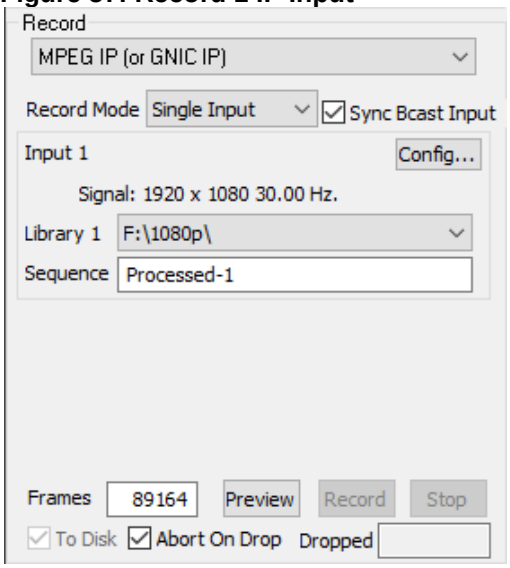
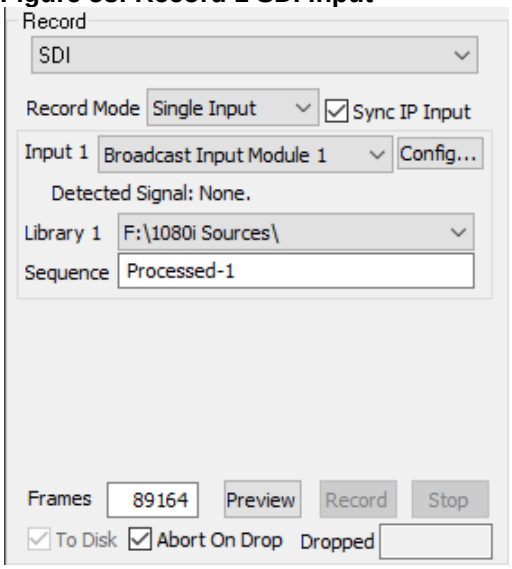


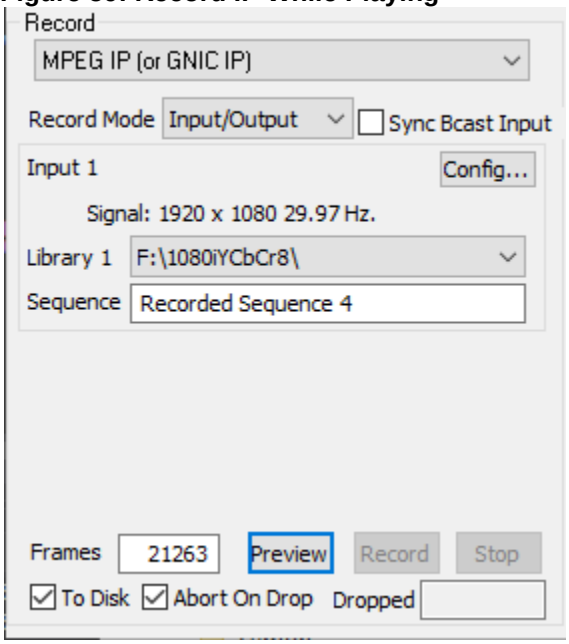
Figure 58: Record 1 SDI Input



Record IP While Playing from Broadcast Output

The IP Input tab – Record Mode Input/Output records the video sequences as sensed by the multicast address and port. The outputs on the broadcast board will play out the video that is in the viewport. This allows the user to play through SDI and encode the signal into an IP stream to record from the IP input. Once the preview has started and displays the video, the recording can start by pressing the record button. The video format must be the same (i.e., both 1080i).

Figure 59: Record IP While Playing

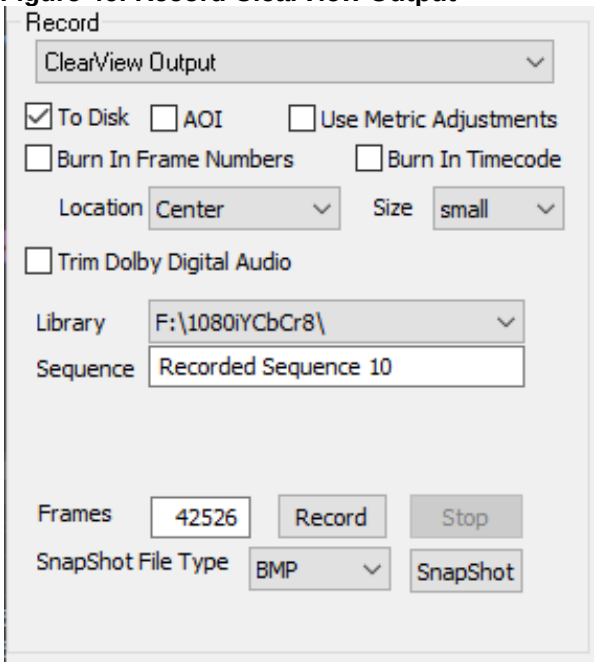


Record ClearView Output

The ClearView Output selection allows the user to record the video sequences currently playing in Viewport A and Viewport B. Three reasons exist to do this

- Record split screen video sequences as a single video sequence so that they can be exported later for offline analysis/viewing
- Record a portion of the video sequence (or split screen video sequences) as a single video sequence so that they can be exported later for offline analysis/viewing. ClearView records the video area with the zoom box, when AOI is checked.
- Record both video sequences as new video sequences after applying spatial alignment, normalization, and window commands. ClearView records the new video sequences to show the user the effect of the adjustments when the Use Metric Adjustments is checked.

Figure 46: Record ClearView Output



To record the current ClearView sequence, jog to the desired frame. In the Clip Alignment pane, set the first frame. To record a number of frames, you can either set the last frame in the Clip Alignment pane or you can select a number of frames in the Record pane.

You would want to record the output of ClearView if you intended to:

- Export the video sequences as they are playing side-by-side to an AVI file (or BMP, Raw, etc.)
- Export the video sequence with frame numbers burned into the new sequence
- Export the video sequence to a trimmed length that will loop perfectly on Dolby packet boundaries
- Export the video sequence as a smaller version (just looking at the spokes of the wheel as opposed to the whole car).
- Create 2 new video sequences after the spatial alignment and normalization has adjusted the 2 video sequences relative to each other.

Note 1: that if you simply want to hit play and then record, you do not need to set the Clip Alignment. If you want to record just from frame n to frame m, and give it a new name, etc., you need to use a combination of the clip alignment and the record function.

Note 2: Please be in Stop mode before starting the recording or you will record more than 1 first frame. (Of course, you can edit these out, using the Clip Alignment pane.) This is because in pause mode, ClearView displays the same frame over and over. If you hit record while ClearView is doing this, then it will record that same frame over and over. In Stop mode, ClearView is not displaying, but the last frame that was played stays on the screen. The confusing part is that when you hit play, it will not start at this frame. It starts at the frame number given by the "clip alignment first frame" (probably frame 0).

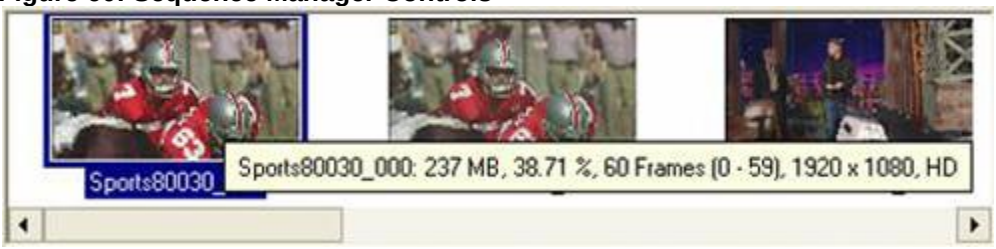
Select Thumbnail to Play or Export

The Sequence Manager pane displays thumbnails (or details) of the video sequences currently loaded into the current ClearView library. Two video sequences can be loaded at any time. Each video sequence is assigned a Viewport. After a file is imported or a video sequence is recorded via hardware inputs, the first video sequence is mapped to Viewport A. The second sequence loaded is mapped to Viewport B.

Note 1: If you are trying to achieve ultra-high frame rates, then it is preferable to load only one Viewport or to run from memory.

Note 2: Please remember that the sequence to be displayed must have the same bit depth (8, 10-bit), color space (4:4:4, 4:2:2), and resolution (1080i, PAL, NTSC) as the current video output format (specified in the Video Output pane). Hovering the mouse over a sequence thumbnail will display the property information about the selected sequence.

Figure 60: Sequence Manager Controls



This figure shows the pop-up display of video clip properties when the mouse cursor hovers over the thumbnail.

- You can drop a video sequence onto the Viewport.
- In A-only mode, the video sequence will be assigned to Viewport A
- In B-only mode, the video sequence will be assigned to Viewport B
- In A-B mode, the first video will be assigned to Viewport A. Every subsequent video sequence will be assigned to Viewport B.
- In the other modes, moving the video sequence to the left side of the Viewport (or top in Horizontal Split) will assign it to Viewport A. Moving the video sequence to the right side of the Viewport (or bottom in Horizontal Split) will assign it to Viewport B.

As the following figure shows, right-clicking on a sequence thumbnail allows you to change the Viewport assignment, to unload video sequences from memory or disk, to see the details, or to export the video sequence to a file.

Renaming the video sequence can be done by left clicking on the sequence name in Details or Thumbnails modes.

The default Thumbnail of any sequence is the first frame of that sequence. There is the ability to change the Thumbnail frame.

- One can change the Current Thumbnail image for a frame by placing the sequence in a Viewport, moving the sequence to the desired frame and right clicking the Thumbnail in the top portion of the GUI and choosing “New Thumbnail”.

Sorting the Sequence Manager Pane can be done in Details or Thumbnails modes.
In Thumbnails mode:

- Grab a sequence with the mouse and drop it where you would like to move it. *Note: you cannot move the sequence to the first position. To move it to the first position, you need to move the sequence to the second position, and then move the first sequence to the second position.*

In Details mode:

- Sort based on any of the file type headers: Name, File Size, etc.

Figure 61: Sequence Manager Drop Down Menu

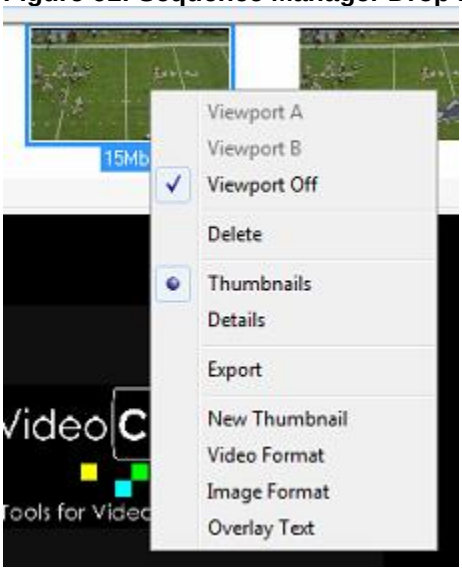


Table 16: Sequence Manager Descriptions

Viewport A	Assigns the video sequence to Viewport A (left or top window).
Viewport B	Assigns the video sequence to Viewport B (right or bottom window).
Viewport Off	De-Assigns the video sequence from both Viewport A and Viewport B
Delete	Removes the video sequence from ClearView (unloads memory or erases from disk)
Thumbnails	Sets the video sequence viewing mode to Thumbnails
Details	Sets the video sequence viewing mode to Details
Export	Exports the video sequence to disk.

Choosing Export opens the following dialog box:

Figure 62: Sequence Manager Export Controls

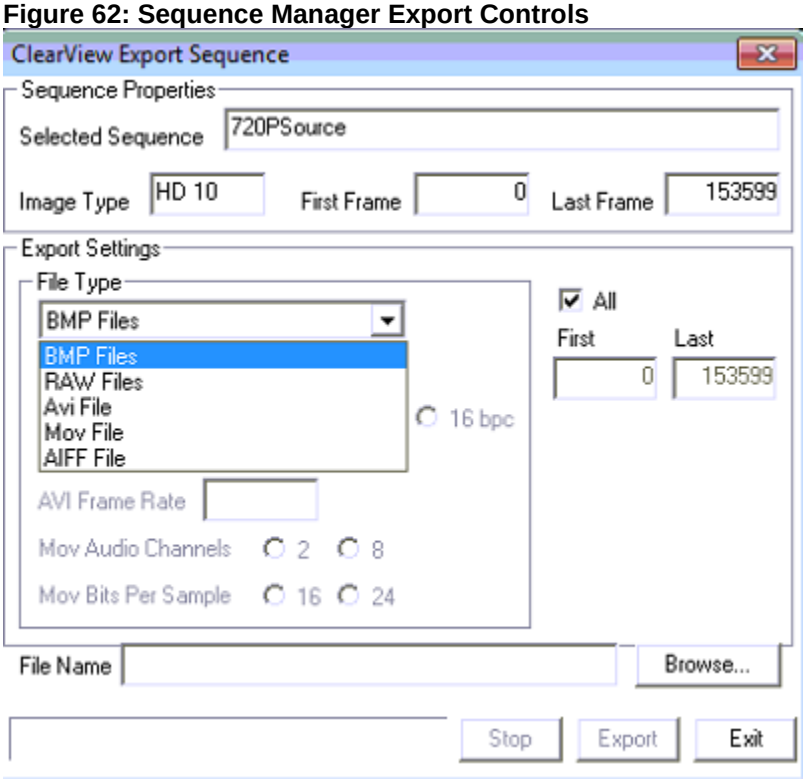


Table 17: Sequence Manager Export Descriptions

Sequence Properties	Selected Sequence, Image Type, First Frame, Last Frame are informational only. They cannot be changed
File Type	The video sequence can be exported as a BMP, RAW, MOV, AIFF or AVI file
All	Checking this box exports all of the frames. Unchecking this box allows you to set the first and last frame to output.
File Name	You can type in the full path and filename or select Browse to find the file
First	First frame to be exported.
Last	Last frame to be exported
Browse	Navigate to the filename
Stop	Stop exporting
Export	Start exporting
Exit	Close this window

Note 1: You can output one video sequence to multiple files by exporting a list of frames (first frame/last frame) to multiple files (i.e., choose a File Name and press Export; then change the first frame/last frame and choose the next File Name and press Export).

Note 2: When exporting an AVI file, it cannot be larger than 2 GB.

Note 3: When exporting BMP files, it will be converted to RGB format.

Select a View Mode

The View Mode pane allows you to select the current viewing mode.

Figure 63: View Mode Controls

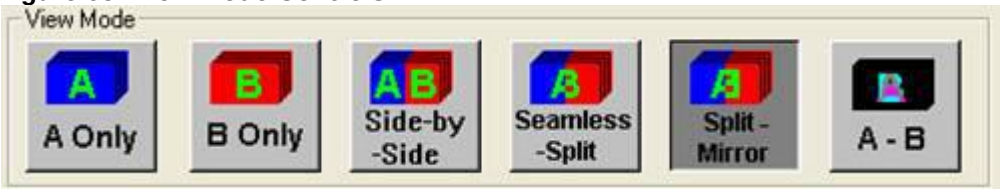


Table 18: View Mode Descriptions

A Only	Display only Viewport A; i.e., the video sequences associated with A. (Note: Viewport B may be playing).
B Only	Display only Viewport B. (Note: Viewport A may be playing).
Side-by-Side	Display Viewports A and B side –by side.
Seamless-Split	Display Viewports A and B flowing as if they were 1 video sequence. The left side of the display is Viewport A, the right side is B.
Split-Mirror	Display Viewports A and B, with B inverted right to left as if in a mirror.

A-B	Three types of A-B exist:
	• A display of the pixel differences,
	• A display of the absolute value of the pixel differences over a threshold for just the Y or Chroma values, and
	• A display that the pixels are different beyond a threshold for just the Y or Chroma values. If the pixels are not different, then the original video sequence is shown.
	The Color Space Pane controls which mode is active.
	
	If (A-B difference threshold in the Color Space pane) is unchecked, then each pixel in video sequence B is subtracted from video sequence A. The result is displayed. If the resultant is less than absolute black, then absolute black is displayed.
	
	If (A-B difference threshold) is checked and (A-B Add Back) is unchecked, the luma (Chroma unchecked) or chroma (Chroma checked) pixels in video sequence B are subtracted from video sequence A. If the absolute value of the subtraction is greater than the threshold, the result is displayed.
	
	Note: In either of the above, the value is probably a small number. Using the Color Space pane, the user can load a LUT (look-up table) to enhance small differences. There are many LUT examples under www.videoclarity.com/Support (Miscellaneous Support Files).
	
	If (A-B difference threshold) is checked and (A-B Add Back) is checked, the luma (Chroma unchecked) or chroma (Chroma checked) pixels in video sequence B are subtracted from video sequence A.
	• If (A-B) >= Threshold, a Green pixel is displayed
	• If (B-A) >= Threshold, a Yellow pixel is displayed
	• If (((A-B) < Threshold) && ((B-A) < Threshold)), the original video sequence is displayed
	
	Note: B-A can be achieved using the Play Control Pane's Swap A/B.

In a typical operation, the original uncompressed clip (the original source file) and the corresponding decompressed clip (a compressed version of the source file, decompressed by ClearView) are shown as successive thumbnails.

Note, however, that there is no restriction on the assignment of clips to Viewports. You are free to assign any still or clip to either Viewport, whether that makes any sense or not. Thus, you could do an A-B of a still and a clip, or A-B of two totally unrelated clips, and get visually entertaining but totally meaningless results.

Select VTR Mode

The VTR Control pane functions similar to a VCR allowing full temporal control of the sequence(s) being viewed. For each clip, the currently mapped sequence and currently displayed frame number are displayed in the two fields next to the labels Viewport A and Viewport B.

Figure 64: VTR Controls

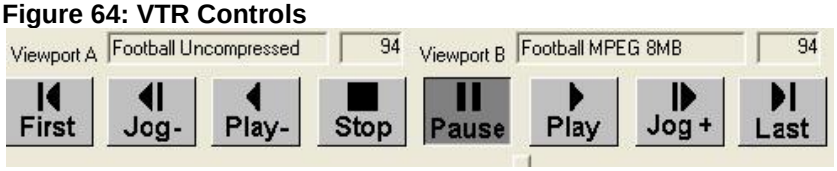


Table20: VTR Control Descriptions

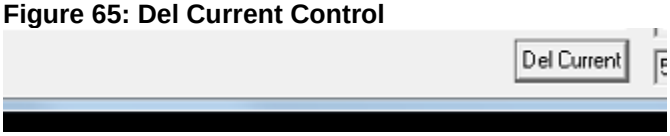
Viewport A, Viewport B	This is an information message. It is the name of the sequence(s) playing and the current frame number. *Note 1: The frame number does not increment smoothly while playing. This is because GUI updates (refreshes) are a low priority to keep the video playing well.* *Note 2: The disk array drive letter is displayed to help when multiple disk arrays are present in 1 system.*
First	Move to the first frame.
Jog-	Jog backwards one frame.
Play-	Play backwards at the chosen rate. Rate is chosen in the Clip Alignment pane
Stop	Do not process any more data. Stop.
Pause	Continue to process the current frame at the displayed rate.
Play+	Play forwards at the chosen rate. Rate is chosen in the Clip Alignment pane.
Jog+	Jog forward one frame.
Last	Move to the last frame.
Slider Bar	Move to a specific frame. The frame number is displayed above the VTR controls; next to the Viewport video sequence name. *Note: the slide bar does not move when the file is playing*

Delete Current Sequences

The Delete Current control will delete the sequences that are currently in viewport A and viewport B from the hard disk space. If there is a log file associated with the current view that will also be deleted.

Note: There is a setting in the ClearView configuration menu to ask to confirm the deletion.

Figure 65: Del Current Control



Select Objective Measurements

The Objective Measurement Graph pane displays the graph of the DMOS/ MS-SSIM, NIQE, JND, PSNR, PSNR No Ref, Spatial, or Temporal over time. The actual value, minimum, maximum and average values are displayed in the Objective Metric Controls pane. Examples, using the various objective measurements are on our website under www.videoclarity.com/videoqualityanalysiscasestudies/.

The Objective Metrics can be used to calculate the perceived video quality (Sarnoff JND, DMOS/MS-SSIM, NIQE), perceived audio quality (PEAQ), QC a product when there are expected results (PSNR with threshold), looking for artifacts when no reference is present (PSNR No Ref, Spatial and Temporal). In all cases, the metrics are displayed and written to a LOG file for off-line analysis.

AFREQ

The Audio algorithm measures the peak amplitude of an envelope of audio data. It is a full reference as it measures the differences between the original and processed video in absolute terms. This is termed an objective metric, as it does not talk about perceived quality to the human ear. It measures absolute differences.

APEAK

A-Peak measures the true peak amplitude of the channels chosen and gives a value for each frame and a separate value for each channel. A-Peak is a no-reference metric. The value of the metric corresponds to the highest absolute value of a sample for a single audio channel in a single frame. Measured in dB (decibels) the maximum value is 0 dB and the value closest to silence is -60 dB. ClearView supports the standards ATSC A/85, EBU R 128, ARIB TR-B32, and NAB T032 that control parameters and Momentary, Short Term, and Integrated that determine the timescale variable. The true peak(A-Peak) is based on the ITU-R BS. 1770.

CAMBI

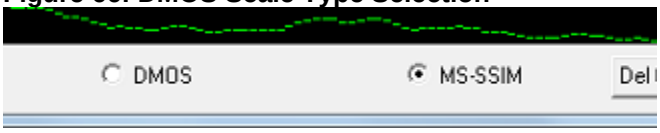
CAMBI (Contrast-aware Multiscale Banding Index) operates as a no-reference banding detector in ClearView and is a metric that operates similarly to other included no-reference quality indices. It takes a ClearView video sequence applied to the A or B Viewports and produces a banding visibility score per frame with text-based log file. CAMBI may also be applied to a full-reference workflow which creates a score for each aligned sequence in the Viewports along with a difference value between each sequence's CAMBI score. CAMBI has a scale of 0 to 100. Zero being an indicator of no banding and banding's visibility generally will start to be noticeable at a score of 5 and will indicate that banding has become more noticeable as the score value per frame increases.

DMOS

The MS-SSIM algorithm from the University of Texas is used as a basis for a top-down way of predicting the video quality. This is a full reference algorithm as it measures the perceived structural similarity between the original and processed videos. It then correlated this data to the DMOS scale using the LIVE database at the University. The DMOS scale is between 0 and DMOS Max Value (4, 7, or 10 based in the ClearView Configuration Menu); where 0 is perfect. The MS-SSIM scale is between 0 and 1, with 1 being perfect. For more information about MS-SSIM or the DMOS scale, please refer to our website at www.videoclarity.com/videoqualityanalysiscasestudies/.

The selection dial at the bottom of the objective measurement graph for DMOS is used to choose which scale to display.

Figure 66: DMOS Scale Type Selection



JND

The Sarnoff JND model is a method of predicting the subjective rating of a group of human testers using a bottom-up approach. It looks for macroblocks, blur, luminous variations, etc. and predicts a score. It then correlates this score to the JND scale using the VQEG database. The JND is theoretically between 0 and 100; where 0 is perfect. In practice, the number should never exceed about 13 or 14. For more information about the Sarnoff algorithm or the JND scale, please refer to our website at www.videoclarity.com/videoqualityanalysiscasestudies/.

LKFS

LKFS, Loudness K-weighted relative to Full Scale, can be run by checking the box within the a-Peak tab. LKFS is a no-reference metric. This metric gives a measurement that will take the peak loudness (amplitude) over a variable timescale over all audio channels and respond with one value for all channels that corresponds to that one second time period. The values that are returned are based on a logarithmic scale with 0 being the maximum value and -60 being close to silence. The LKFS is based on the ITU-R BS. 1770.ClearView supports the standards ATSC A/85, EBU R 128, ARIB TR-B32, and NAB T032 that control parameters and Momentary, Short Term, and Integrated that determine the timescale variable.

VMAF

VMAF is an objective full-reference video quality metric developed by Netflix in cooperation with the University of Southern California and the Laboratory for Image and Video Engineering (LIVE) at The University of Texas at Austin. It predicts subjective video quality based on a reference and distorted video sequence. The metric can be used to evaluate the quality of different video codecs, encoders, encoding settings, or transmission variants.

ΔEITP

Following ITU Recommendation BT.2124, ΔEITP is useful to assess the potential visibility of color differences in HDR television images and signals. Applications include camera output characterization and objective assessment of differences introduced by signal processing techniques.

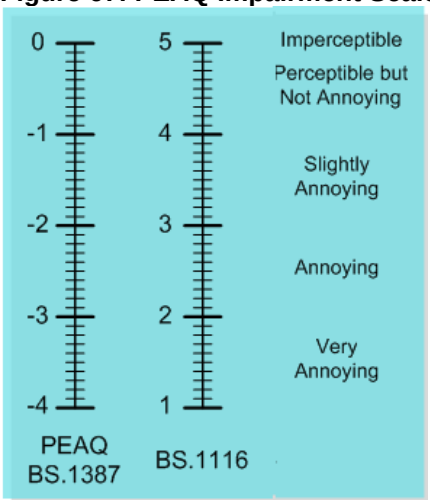
NIQE

NIQE is a single ended metric that does not require a reference. NIQE is based on the construction of a ‘quality aware’ collection of statistical features based on a simple and successful space domain natural scene statistic (NSS) model. These features are derived from a corpus of natural, undistorted images.

PEAQ

The PEAQ audio objective perceptual quality measurement model processes two audio signals to be compared (original reference signal and the test version to be evaluated) and calculates a quality score similar to the mean opinion score that would be obtained for a formal subjective test. The average used is the quadratic average. The perceptual rating generated by the PEAQ model represents the overall severity of the impairments in the test signal as compared to the reference.

Figure 67: PEAQ Impairment Scales



PSNR

The PSNR algorithm measures the video differences between the original and the processed video in absolute terms. This is termed an objective metric as it does not talk about perceived quality to the human eyes. It measures the absolute differences using the following algorithm.

$$PSNR = 20 \log \left(\frac{P}{\sqrt{\frac{1}{m*n} \sum \sum (x(i,j) - y(i,j))^2}} \right)$$

- P = the peak pixel value. Normally, 235 for broadcast video or 255 for 8-bit PC data. This is set in the ClearView Configuration Menu.
- m,n = horizontal and vertical pixel count (e.g., 1920, 1080)

The PSNR is given in decibel units (dB), which measure the ratio of the peak signal and the difference between two images. An increase of 20 dB corresponds to a ten-fold decrease in the RMS (root mean squared) difference between two images. For simplicity, we display 100 when the images are identical. The actual value is infinite.

PSNR measures all of the differences between the original and processed videos. It does not try to weight these. The calculation is very fast and is used to perform QA/QC when the perceived video quality is already known.

Spatial

Spatial measures the activity within a video sequence. Spatial is a no-reference metric. Large values indicate a substantial change within an image - for example: panning stadium crowds would generate a large Spatial Index. A solid color would produce a low Spatial Index. For more information about the Spatial metric, please refer to ITU-T P.910 (a link is on our website at www.videoclarity.com/videoqualityanalysiscasestudies/).

$$H_v = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}, H_h = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

$$SI_v(i,j,n) = Y(i,j,n) \otimes H_v$$

$$SI_h(i,j,n) = Y(i,j,n) \otimes H_h$$

$$SI_r(i,j,n) = \sqrt{SI_v(i,j,n)^2 + SI_h(i,j,n)^2}$$

$$SI_{var}(n) = \frac{1}{P} \sum_i \sum_j (SI_r(i,j,n) - SI_{mean}(n))^2$$

$$SI_{stdv}(n) = \sqrt{SI_{var}(n)}$$

The Spatial Index is the STD deviation, and presented in Pixel Value units, which measure the value difference from one pixel to its neighbors across the image. If two sequences are being played, then the Spatial Index is calculated for both video sequences, and the differences are displayed and graphed. The Log file holds the actual values for both video sequences and the differences.

Temporal

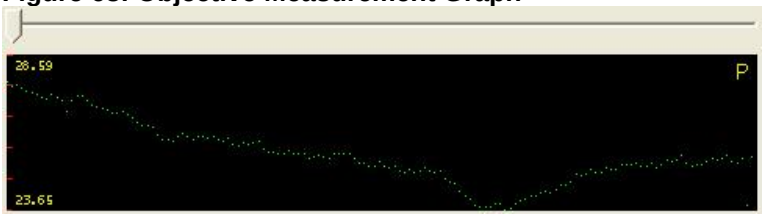
Temporal measures the activity frame-to-frame within a video sequence. Temporal is a no-reference metric. Large values indicate a substantial change occurred during the video sequence - for example: a scene change would generate a large Temporal Index. A frozen frame would generate a Temporal Index of 0. For more information about the Temporal metric, please refer to ITU-T P.910 (a link is on our website at www.videoclarity.com/videoqualityanalysiscasestudies/).

$$TI(i,j,n) = Y(i,j,n) - Y(i,j,n-1)$$
$$TI_{mean}n = 1/P \sum_i \sum_j TI(i,j,n)$$

- $Y(i,j,n)$represents the luminous value of a pixel in frame(n) at location (i, j).
- The sum of differences is divided by P (the number of pixels in the frame).

The Temporal Index is the STD deviation, and presented in Pixel Value units, which measure the value difference from one pixel across many frames. If two sequences are being played, then the Temporal Index is calculated for both video sequences, and the differences are displayed and graphed. The Log file holds the actual values for both video sequences and the differences.

Figure 68: Objective Measurement Graph



The Objective measurement graph is enabled by pressing the Graph button in the Objective Metric Controls pane. If all of the data has already been collected (which it does by playing through the 2 video sequences the first time after the Objective Metric is turned on), the graph will be displayed as shown above. If the data has not been collected, the Graph button will switch to Graphing mode, and a horizontal line will be drawn across the center of the screen. The video sequences are played from the start through the end points. To change the start and end points, use Clip Alignment to adjust the first and last positions for both Viewports. Once the video sequences have been played, the graph is scaled and the minimum, maximum, and average Objective Metrics are displayed along with the graph. Using the shuttle bar (slide bar), the user can display any frame to visually assess the 2 video sequences.
Note: The frame is associated with the right side of the slide bar.

Pixel Values

To display individual pixel values, press the right mouse button.

Note: the left mouse button will still control panning.

Scrolling to any X,Y location will show the pixel values for the same location for both video sequences. Holding the right button while moving the cursor will allow moving the cursor in increments of 4 pixels at a time.

Note 2: to get finer control of the X,Y location, use the Pixel Value Hotkeys, which increment in 1-pixel increments, or type in an X,Y location in the Pixel Value Controls.
Note 3: you can also type in an X,Y location directly.

Objective Metric Controls

The Objective Metric Control Pane controls the behavior of the AFREQ, APEAK, JND, PEAQ, PSNR, Spatial, and Temporal objective metrics, displays the Pixel Values at a chosen location, and sets the A-B parameters.

Figure 69: PSNR Objective Metrics Controls

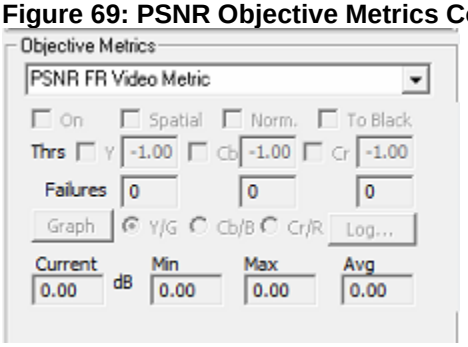


Figure 70: JND Objective Metric

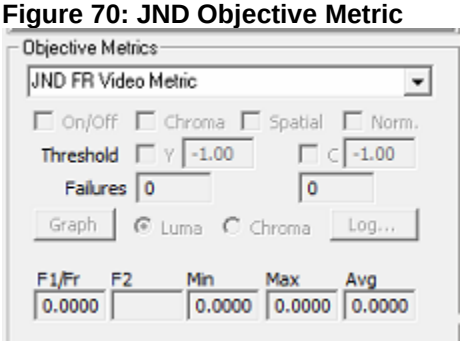


Figure 71: Pixel Value Controls

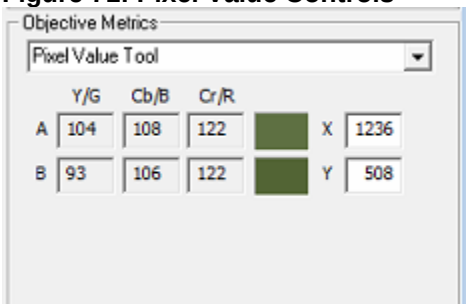


Figure 72: DMOS Objective Metric

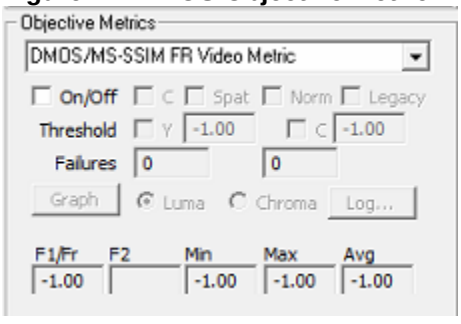


Figure 73: aFreq Objective Metric

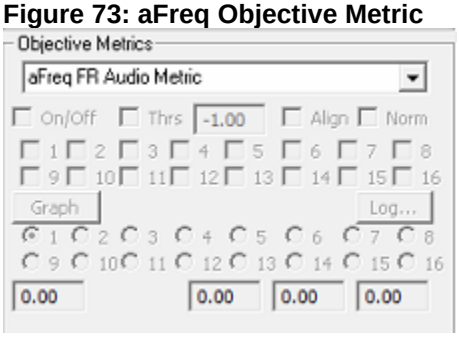


Figure 74: Spatial Objective Metric

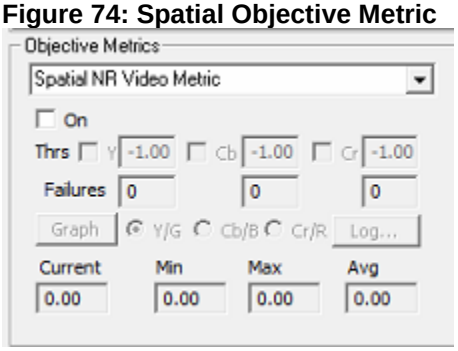


Figure 75: Temporal Objective Metric

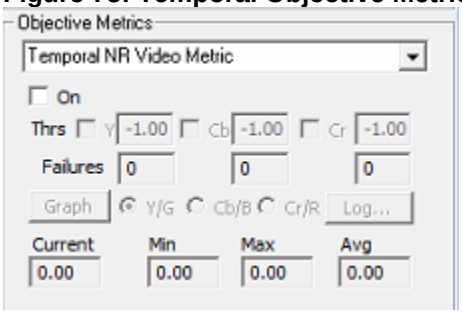


Figure76: PEAQ Objective Metric

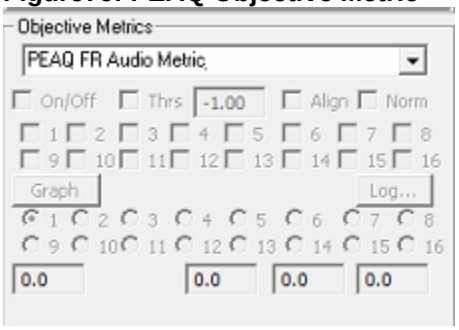


Figure 77: a-Peak Objective Metric

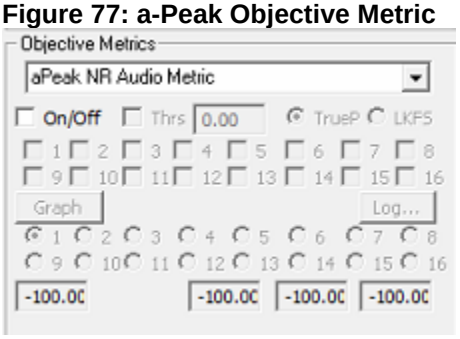


Figure 78: NIQE Objective Metric

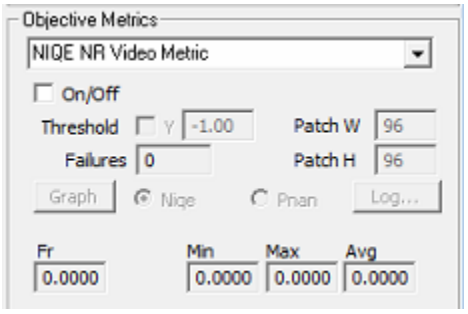


Figure 79: A Minus B Visual Assist

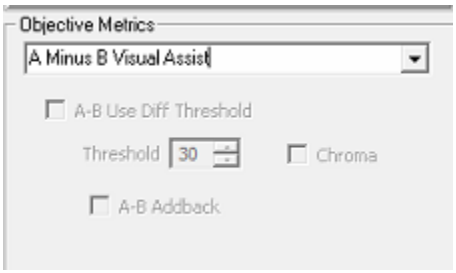


Figure 80: Delta ICtCp FR Video Metric

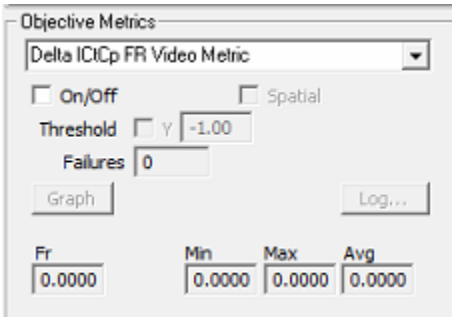


Figure 81: VMAF FR Video Metric

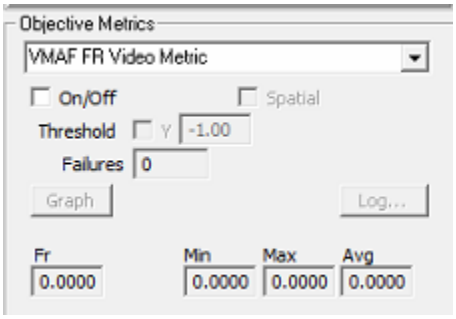


Table 21: Objective Metrics Description

Note: Moving among the Objective Metrics does not turn on or off the metric calculations. This simply displays the collected data.

DMOS	This tab selects the DMOS Metric settings *Note 1: DMOS takes a considerable amount of time, so we do not allow moving to another pane while this calculation is processing.* *Note 2: Chroma now enabled for DMOS.*
JND	This tab selects the JND Metric settings *Note 1: JND takes a considerable amount of time, so we do not allow moving to another pane while this calculation is processing.*
PSNR	This tab selects the PSNR Metric settings
PEAQ	This tab selects the PEAQ Metric settings *Note 1: Sequence must have audio turned on by clicking on/off box under PEAQ tab. Then click Threshold if desired and enter Threshold value. Align box may be checked if aligning the audio separately from the video before running the metric. A positive offset means audio is lagging behind video. Negative offset means audio running ahead of video. Normal checkbox will normalize channels before running PEAQ metric.* *Note 2: Choose the channel you want to run PEAQ metric. Multiple channels may be chosen to run metric test simultaneously. Graph shows metric data in graph window. The button below log creates log file. Channel output data can be selected to view results. Config Button sets parameters for PEAQ: Current Frame, Min Seq, Max Seq & Avg. Seq. are options.* *Note 3: Audio Frequency/PEAQ Metric Silence Threshold should be set to the default value of 0.0020. Audio PEAQ metric scale has dropdown with 2 options – 1387 and 1116. See the PEAQ application note here…* *http://videoclarity.com/wp-content/uploads/2013/05/PEAQ_Audio-Objective-Testing-in-ClearView.pdf . For PEAQ reference location matters – if B desired, check REF B box. Viewport B is the default.*
Delta ICtCp	This tab selects the Delta ICtCp Metric settings
VMAF	This tab selects the VMAF Metric settings The HDTV model is trained to predict the quality of videos displayed on a 1080p HDTV in a living room-like environment. The phone model is trained to predict the quality of videos displayed on a phone screen. Invoking the phone model will generate VMAF scores higher than in the HDTV model. The UHD-TV model is trained to predict the quality of video displayed on a 4K TV video from the distance of 1.5 times picture height.
aFreq	This tab selects the aFreq Metric settings. *Note 1: Sequence must have audio. Turn it on by clicking on/off box under aFreq tab. Then click Threshold if desired and enter Threshold value. Align box may be checked if aligning the audio separately from the video before running the metric. A positive offset means audio is lagging behind video. Negative offset means audio running ahead of video. Normal checkbox will normalize channels before running aFreq metric.* *Note 2: Choose the channel you want to run aFreq metric. Multiple channels may be chosen to run metric test simultaneously. Graph shows metric data in graph*

	window. The button below log creates log file. Channel output data can be selected to view results. Config Button has two settings: • *Audio Frequency Metric Batch Milliseconds: Default setting is 334* • *Audio Frequency Metric Low Pass Threshold: Default setting is 0* *Note 3: Audio alignment can be done with aFreq: this is a simple audio alignment that can be done much faster than PEAQ.*
aPeak	*This tab selects the aPeak settings.* *Note 1: Sequence must have audio. Turn it on by clicking on/off box under aPeak tab. Then click Threshold if desired and enter Threshold value. By default, tPeak is run.* *Note 2: Choose the channel you want to run aPeak metric. Multiple channels may be chosen to run metric test simultaneously. Graph shows metric data in graph window. The button below log creates log file.* *Note 3: To run LKFS instead of aPeak click the LKFS box on. This will run on all audio channels whether they are checked or not. The resulting log file will have .LKFS as the extension.* *Note 4: Within the config window, the parameters Audio Loudness Standard and Timescale will affect the parameters and timescale of this metric for LKFS and True Peak.*
Spatial	This tab selects the Spatial Metric settings *Note 1: If you have 2 video sequences loaded, it will calculate the Spatial for both sequences independently and subtract the difference. The Log file will have 3 sets of data. The Graph will display the subtracted difference.*
Temporal	This tab selects the Temporal Metric settings *Note 1: If you have 2 video sequences loaded, it will calculate the Temporal for both sequences independently and subtract the difference. The Log file will have 3 sets of data. The Graph will display the subtracted difference.*
NIQE	This tab selects the NIQE Metric settings A threshold can be set prior to running the metric. Frames that score above the threshold will be flagged as a failure. The measurement patch size can be adjusted by entering values for width, and height. The measurement will also generate a Pnan score which is a confidence score.
PixVal	This tab enables you to view individual Pixel Values. Please refer to the Pixel Value Controls for more information.
A Minus B	This tab enables you to set the A-B parameters. Please refer to the A-B Controls for more information
On	This enables/disables calculating the Objective Metrics. When checked, the Metric calculation is enabled. Data is collected while the sequence is playing. To play the sequence, please press the Play, Graph, or Log buttons. When Unchecked, the calculated data is removed from memory.
Spatial	Selecting this applies the spatial alignment calculated in the Metric Adjust pane.
Norm.	Selecting this applies the color hue/luminance intensity offset calculated in the Metric Adjust pane.
Field	Selecting this tells DMOS to process each field separately as opposed to processing the data as 1 frame.
Thrs	This allows a threshold to be set of Y, Cb and Cr. Each component can be turned on/off. PSNR values under this threshold are returned as failures (including Luminance and Chrominance). JND, Spatial, and Temporal values over this

	threshold are returned as failures. *Note 1: JND, DMOS combine Cb& Cr together so there is only 1 threshold for color.*
Failures	These are informational messages and cannot be changed. It displays the number of frames that are outside the threshold (see not above).
Y/G	Show the Objective Metric data for the Y/G value
Cb/B	Show the Objective Metric data for the Cb/B value
Cr/R	Show the Objective Metric data for the Cr/R value
F1/Fr, F2, Current, min, max, avg	These are informational messages and cannot be changed. Current – the current metric value F1/Fr – the current Sarnoff JND or DMOS metric value for Field #1 or Frame F2 – the current Sarnoff JND or DMOS metric value for Field#2 Min – the minimum metric value Max – the maximum metric value Avg – the average as defined in the appropriate ANSI spec. For PSNR the average is based on T1.TR.74-2001; for DMOS and JND, average is a 4th squared, 4th root minkowski average; for Spatial, Temporal it is a straight average.
Graph	Display the Y/G, Cb/B, or Cr/R values over time on the Objective Metric Graph. If the data has not been calculated, then pushing this button will play the video sequences, calculate the Objective Metrics, and display them. *Note 1: Y/G data will be printed in Green. Cb/B data will be printed in Blue. Cr/R data will be printed in Red.* *Note 2: In the upper, right corner, the graph will display A for both PEAQ and AFREQ, D for DMOS, J for JND, P for PSNR, S for SPATIAL, and T for TEMPORAL.*

Log	This creates a log file which includes:
	• Video Sequence Library
	• Video Sequence Name
	• Clip Alignment Parameters
	• Objective Metrics
	  ○ AFREQ
	  ○ DMOS
	  ○ JND
	  ○ PEAQ
	  ○ PSNR
	  ○ SPATIAL
	  ○ TEMPORAL
	  ○ NIQE
	
	If the data has not been calculated, then pushing this button will play the video sequences, calculate the Objective Metrics, and write them to the appropriate file. When you press log, you will be prompted to enter a location to save the file along with a filename.
	
	Note 1: You can restore these files using File Import, and ClearView will automatically load the clips, restore the image format, video format, alignment, and read in the Objective Metrics.
	Note 2: Files are written as a 12 column, space-delimitated file.
	• *The first 3 columns are Viewport A's data.*
	• *The second 3 columns are Viewport B's data.*
	• *The third 3 columns are Viewport B's data subtracted from Viewport A's data*
	• *The fourth 3 columns are the results against the threshold (aka pass/fail)*

Table 22: Pixel Value Descriptions

Y/G Cb/B Cr/R A B	These are the pixel values in decimal at the same X,Y location for video sequence A & B. The color is also displayed for reference. *Note 1: if you zoom the original image, then you can see the cursor more clearly.* *Note 2: to get finer control of the X,Y location, use the Pixel Value Hotkeys, which increment in 1-pixel increments, or type in an X,Y location in the Pixel Value Controls.*
X, Y	This is the X, Y location of the current pixel. Pressing the right mouse button enables this mode. *Note: This is referenced within the original image – not the location after the video sequences have been rendered.*

Figure 79: A Minus B Controls

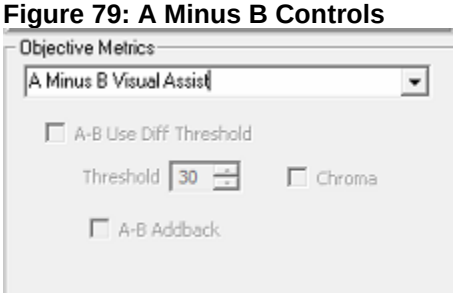


Table 23: A Minus B Descriptions

A-B Use Diff Threshold	Checking this box performs a |A-B| > Threshold on either the Chroma or Y pixels Unchecking this box, performs an A-B > 0 on all pixel values If true, it displays the difference. If false, it displays black
Threshold	This is the threshold value for the A-B Use Diff Threshold above
Chroma	Check means that the A-B calculation will be performed only on the chroma values (Cr &Cb) Uncheck means that the A-B calculation will be performed only on the luminance value (Y)
A-B Addback	Checking this box performs a |A-B| > Threshold calculation. • If (A-B) >= Threshold, a Green pixel is displayed • If (B-A) >= Threshold, a Yellow pixel is displayed • If (((A-B) < Threshold) && ((B-A) < Threshold)), the original video sequence is displayed Unchecking this box displays the results of |A-B| if it is greater than the threshold.

Figure 80: Metric Adjust Controls

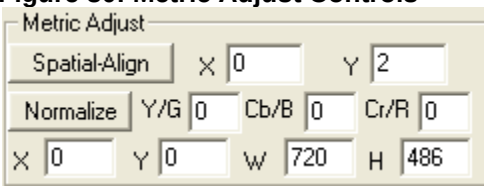


Table 24: Metric Adjust Descriptions

Spatial-Align	Checking this box performs a Spatial Alignment in both the horizontal and vertical direction. The current video frame in Viewport B is compared to the current frame in Viewport A. The results are shown in X, Y. *Note: The video sequence is not adjusted. This offset only applies to the objective metrics.*
X, Y	These are the X,Y offset values after the Spatial-Alignment. They can be overridden. *Note 1: the offsets are restricted to being +/- 8 (X) and +/- 16 (Y).* *Note 2: The values must be even. An odd offset in the Y direction will result in a flipped field in Interlace mode. An odd offset in the X direction will result in a flipped color component in Y'CbCr.* *Note 3: The video sequences are centered after the alignment. To view the results, re-record the video sequences using the Record Pane.*
Normalize	Checking this box performs a Luminance Intensity and Chrominance Hue calculation. The current video frame in Viewport B is compared to the current frame in Viewport A. The results are shown in Y/G, Cb/B, Cr/R. *Note: The video sequence is not adjusted. This offset only applies to the objective metrics.* *Note2: The offset is a linear offset per frame and is used to adjust the brightness or color hue.*
Y/G, Cb/B, Cr/R	These are the Y/G, Cb/B, and Cr/R luminance/chrominance offsets after the Normalization.
X, Y, W, H	This allows you to set a window size for the objective metrics. By default, it is full screen, but the size can be adjusted. *Note: to remove borders with noise, this tool can be used to exclude the noise.*

Align the Video Sequences

The Clip Alignment Pane allows user control of display speed and defines the first and last frame to be played on either Viewport. This is used to line up similar clips captured at different times, at different frames rates.

For example, ClearView acts as a video server to a compression engine. It then reads the results from the compression engine as a file. The compression engine takes 1-2 seconds to process the first frame and may reduce the frame rate from 30fps to 3fps. ClearView can manually or automatically align the clips, and then play them so that they appear to be playing at the same rate.

Figure 81: Clip Alignment Controls

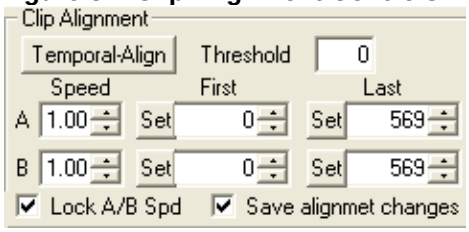


Table 25: Clip Alignment Pane Descriptions

Clip Alignment Speed	This can be set to any value. If you would like to play the sequence at 3fps, and you are outputting at 30fps (or 60 fields per second), then set the speed to 3fps/30fps = 0.1. The thumb wheel moves 1/10th increments, but you can enter a more precise fractional number using the keyboard. We recognize fractional numbers in the Y.XX format. In other words, 1 digit before the decimal point,

	and 2 digits after the decimal point. *Note: Viewport A and B will run at the same speed as long as Lock A/B Spd is checked.*
First	This is the first frame that will play. *Note 1: Viewport A and B are set independently to allow manual alignment of clips* *Note 2: 0 (zero) is the first frame*
Last	This is the last frame that will play. *Note 1: Viewport A and B are set independently to allow manual alignment clips* *Note 2: If you need to reset the Last Frame, set it to 99999 or press backspace/delete, and the software will automatically reset it to the last frame.*
Lock A/B Spd	Checking this sets Viewport B to play at the same rate as Viewport A. Unchecking this allows Viewport A and B to operate at different rates. *Note: Viewport A has a video sequence originally compressed at 3fps. Viewport B has the uncompressed video sequence. To play these at the same rate, set Viewport A's Speed to 0.1 and Viewport B's Speed to 1.0, and Uncheck this box.*
Save alignment changes	Checking this saves the changes that you have made to first and last. Next time you use the video associated with Viewport A or B, it will use these first and last frame numbers. *Note: This is normally a good thing, but if you are comparing a reference video to many different encoded video sequences, the first/last frame of the reference may be different for each encoded video sequence. In this case, you should uncheck this box.*
Temporal Align	There are three different temporal alignment options that can be selected in the configuration menu SingleFrame: Most basic method. User shuttles to a frame in sequence B, clicks "Temporal-Align" button and ClearView searches for the best matching frame in sequence A. This method requires operator interaction because the frame displayed in B when the process begins needs to have some temporal motion between itself and neighboring frames or there is a chance that the alignment calculation will be incorrect. If the selected frame is part of many static frames, the alignment calculation will likely be incorrect. Pressing align while in this mode performs a PSNR on every frame for the Video Sequence associated with Viewport A with respect to the currently displayed frame in Viewport B. If successful, the First frames are set based on the frame numbers of the aligned frames. The Last frames are set to First frame + min (Frames remaining in Viewport A, Frames remaining in Viewport B). *Note 1: While it is performing the auto alignment, this box will change status from Auto Align to Aligning.* *Note 2: To ensure a successful auto alignment, go to the first non-repeated frame in Viewport B. If there are repeated frames, ClearView will find the first frame.* *Note 3: The dominant sequence can be changed in the alignment config menu*

	Intelligent: It's designed to temporally align two video sequences with no human intervention. This method searches through sequence A for frames with good temporal activity. It then searches through sequence B for a best match. It then repeats this process on 2 other high-motion frames in the sequence to make sure it is correct. All three checkpoints must agree with each other. It starts by searching through only a few seconds of video (user configurable) and if a good match is not found, the process is repeated after increasing the search range by 15%. This method of alignment is most useful when ClearView is being used in a scripted/automated environment. Exhaustive: The previous two alignment methods only work if neither video sequence has any dropped or repeated frames. If the sequences have dropped or repeated frames, the alignment will be correct at alignment point but will be incorrect after a frame is dropped or repeated in either sequence, which means all full-reference VQ metrics will have inaccurate results. Exhaustive alignment actually creates a third sequence by removing frames or repeating frames from one sequence to best match the other. A text file list of the missing and repeated frames is also generated. Now, even though some frames were repeated or removed, one can still run full-reference VQ metrics as desired.
Threshold	After the auto alignment is complete, the PSNR between the two aligned frames is checked against this value. If the PSNR is lower than this value, then auto alignment is declared to be unsuccessful, and the first and last frames are not set. *Note 1: This is a safety check just in case no frames are in common between the 2 sequences. If you set this to 0 (zero), then the system will align to the greatest PSNR.* *Note 2: This is only used in RGB mode. In Y'CbCr modes, the Y threshold under the PSNR tab should be used. By using this threshold, you can also apply spatial, normalization, and windowing parameters.*

Note: Please remember to have the same number of frames if you are going to Play the clips in a loop (see the Play Mode pane). Also note that you can deliberately cause errors in the analysis if you play the same clip in both Viewports, but the clips are off by as little as 1 frame, especially if there is rapid motion in the clip.

Adjust the Play Properties

Color Space Pane

The Color Space Pane controls how the A-B measurements are calculated and how the color components are displayed.

Figure 82: Color Space Controls

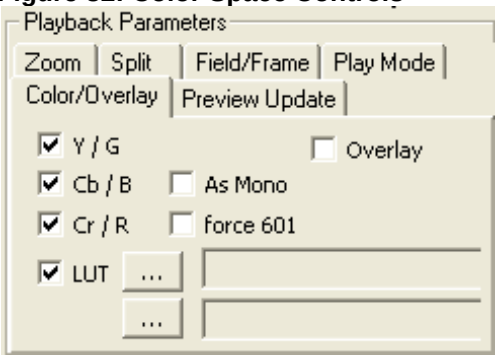


Table 26: Color Space Description

Y/ G **Cr / R** **Cb / B**	Check displays the Y or G. Uncheck turns this color space off Check displays the Cr or R. Uncheck turns this color space off Check displays the Cb or B. Uncheck turns this color space off. Y'CbCr is in Broadcast space; RGB is in Broadcast RGBA or DVI ARGB space.
Overlay	This puts the overlay text over the video sequence. The overlay is a text file which has the same name as the sequence name with a .cvo extension. An overlay file is automatically created with the sequence name inside when you import or record a video sequence. The maximum length of the overlay is 35 characters.
Force 601	Checking this box tells ClearView that the video sequence was encoded using 601 regardless of resolution Unchecking this box, SD uses 601; HD uses 709.
As Mono	Check shows the image in B/W mode. Uncheck: shows all colors.
Gamma / Lookup Table	Check lets you define your own Gamma/Look up table which redefines the values for Y'CbCr or RGB. The file where your own definition exists must be in the format as shown in the LUT example below. 2nd LUT for dual output (when doing output, one can set a separate LUT for each output)
Filename	You can type in the full path and filename or select Browse to find the file *Note: There are many examples under www.videoclarity.com/Support (Miscellaneous Support Files).*

The user can choose to display only the Red (R) in RGB space or the Luminance (Y) in YUV space.

The user can also define a more complex LUT (look-up table). The LUT is a tab delimited file ending in .lut. Several LUT files are provided with the installation. The columns are ordered as R-G-B or Cr-Y-Cb. As an example, a LUT in RGB 8-bit &Y'CbCr 8-bit, which only displays Red would look like the following (*Note: that 0x10 is black for Y and 0x80 is black for Cr and Cb*):

Figure 75: Example of RGB/CrYCb LUT

R	G	B	Cr	Y	Cb
0	0	0	0	16	128
1	0	0	1	16	128
.	.	.	.	.	.
254	0	0	254	16	128
255	0	0	255	16	128

A 10-bit color space would have 1024 entries and values up to 1024. When using an A-B mode without Addback it is advised to use a LUT that spreads the small pixel values over a larger range.

To enable a LUT filter:

1. Map your sequence
2. Enable LUT on the Color/Overlay tab
3. Open your LUT filter using the '…' selection button

Preview Update Pane

The Preview Update pane (at the top right corner of the GUI screen) controls the refresh of the preview displayed in the center of the ClearView GUI.

Note 1: This preview display is never updated faster than 30Hz so you should never rely on it as your only output.
Note 2: The preview is also decimated both horizontally and vertically. You cannot trust the image quality in this window.

Figure 83: Preview Update Controls

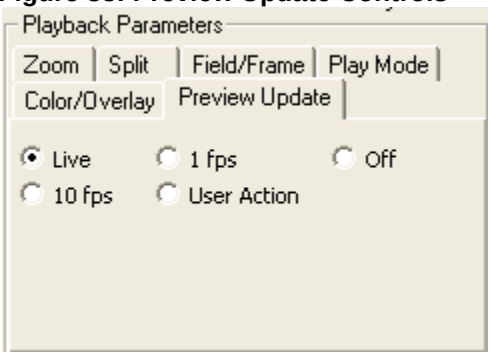


Table 27: Preview Update Descriptions

Live	Updates the Preview Window at up to 30fps *Note: all of these modes only affect the Preview Window. They have no effect on the hardware output. The Preview Window is decimated as we are only showing 1 in 4 pixels horizontally and vertically.*
1 fps	Updates the Preview Window at 1fps
10 fps	Updates the Preview Window at 10fps
User Action	Updates the Preview Window when the user clicks the mouse hits enter, etc.
Off	Does not update the Preview Window

Split Pane

The Split pane controls the way that Viewports A and B are displayed.

Figure 84: Split Controls

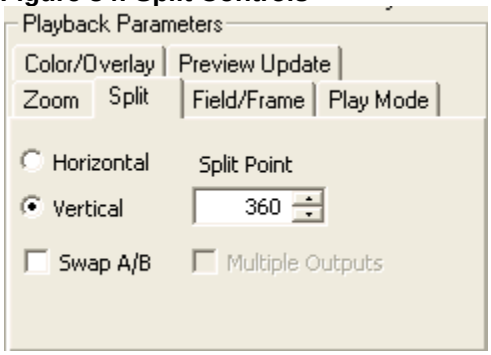


Table 28: Split Pane Descriptions

Horizontal	Viewport A is displayed on top, Viewport B on the bottom
Vertical	Viewport A is displayed on the left, Viewport B on the right
Split Point	This changes the pixel number where Viewport A ends and Viewport B begins
Swap A/B	Show the video sequence assigned to A on Viewport B and vice versa (for example, show clip A on the right and clip B on the left). The effect in A-B modes is that the math turns into B-A. *Note: This gets very confusing. It is better to simply reload the sequences.*
Multiple Outputs	Checking this sends Viewport A to one SDI output and Viewport B to the other. Note 1: This mode works only with the CV-SDI-IO-DL module or with the ClearView Extreme with 2 Broadcast I/O modules Note2: This only works if the View mode is A-only or B-only.

Zoom Pane

The Zoom Pane allows integer-based, pixel replication zoom in both X and Y.

Figure 85: Zoom Controls

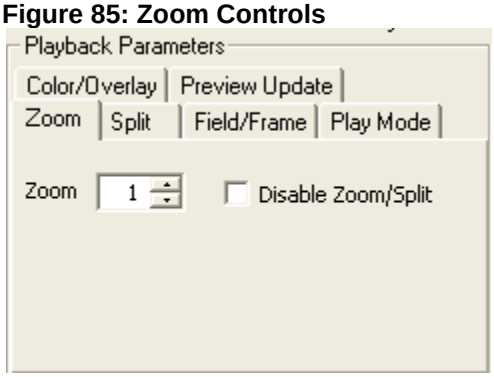


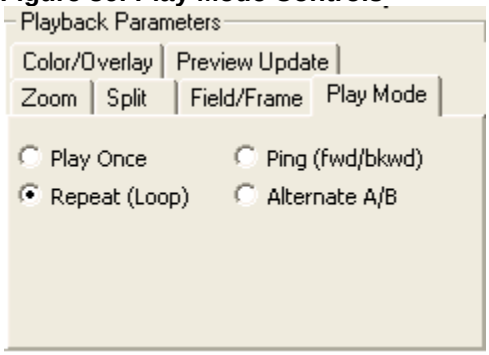
Table 29: Zoom Pane Descriptions

Zoom	Zoom is a global parameter and affects both Viewport A and Viewport B. This is an integer-based zoom. No pre-processing is done as ClearView does not affect the video quality. *Note: Zooming in/out can also be done with the mouse wheel. Move the mouse to the center-point for the zoom and roll the mouse roller in/out. Use the left mouse button to pan and the roller to zoom +/-.*
Disable Zoom/Split	Disable Zoom/Split returns the system to single stream mode. *Note 1: This mode is used to run in ultra-high frame rate/resolution mode as it directly connects the file system (or memory) to the input buffer of the output module (DVI or Broadcast I/O).* *Note 2: This effectively removes zoom, split, color space, PSNR, (i.e., everything). It should only be used if told to by a Video Clarity Sales/Support Engineer.*

Play Mode Pane

The Play Mode pane controls whether the clip is played 1x, forever in a loop, or forward then backward repeatedly. The Alternate A/B plays sequence A, then sequence B repeatedly.

Figure 86: Play Mode Controls



Field/Frame Mode Pane

The Field/Frame Mode pane allows various options for viewing fields and frames. This is mainly used for interlaced material. These options are independent for Viewport A and Viewport B.

Figure 87: Field/Frame Mode Pane

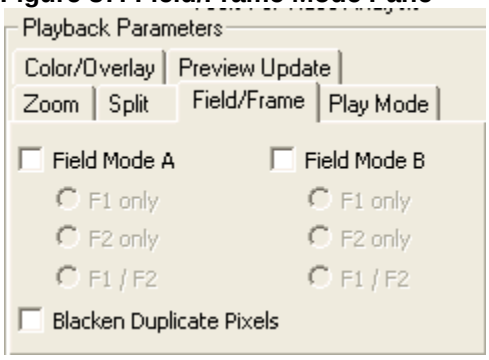


Table 29: Zoom Pane Descriptions

Field Mode A	This has 3 radial button choices: • F1 only: This plays field 1 when displaying field 1 and field 1 when displaying field 2. In other words, it plays field 1 for both fields. • F2 only: This plays field 2 when displaying field 1 and field 2 when displaying field 2. In other words, it plays field 2 for both fields. • F1/F2: This plays field 1 when displaying field 1 and field 2 of frame 1. Then plays field 2 when displaying field 1 and field 2 of frame 2. *Note: Blacken Duplicate Pixels turns off the other field so F1 only means field 1 when displaying field 1 and black when displaying field 2. F2 only means black when displaying field 1 and field 2 when displaying field 2.*
Field Mode B	This has 3 radial button choices: • F1 only: This plays field 1 when displaying field 1 and field 1 when displaying field 2. In other words, it plays field 1 for both fields. • F2 only: This plays field 2 when displaying field 1 and field 2 when

	displaying field 2. In other words, it plays field 2 for both fields. • F1/F2: This plays field 1 when displaying field 1 and field 2 of frame 1. Then plays field 2 when displaying field 1 and field 2 of frame 2. *Note: Blacken Duplicate Pixels turns off the other field so F1 only means field 1 when displaying field 1 and black when displaying field 2. F2 only means black when displaying field 1 and field 2 when displaying field 2.*
Blacken Duplicate Pixels	This displays black for the field that is being duplicated above. Please read the note sections above.

HotKeys Pane

The HotKeys pane allows the user to set various parameters and to see some attributes about the system.

Figure 88: HotKeys Controls

Table31: HotKeys Control Descriptions

Drop	This indicates if any frames have been dropped. There are 2 numbers, and they relate to where the frame was dropped.
Config	This lets you set various general configuration parameters for ClearView. These settings are saved globally.
Hotkeys	This lets you set various keystrokes to do repetitive actions. These settings are saved globally.
fps	This is the measured frame rate.
Reset	This restores ClearView to the startup state
Exit	This exits ClearView (as does the X at the top of the screen and the ESC key)

Figure 89: Configuration Settings

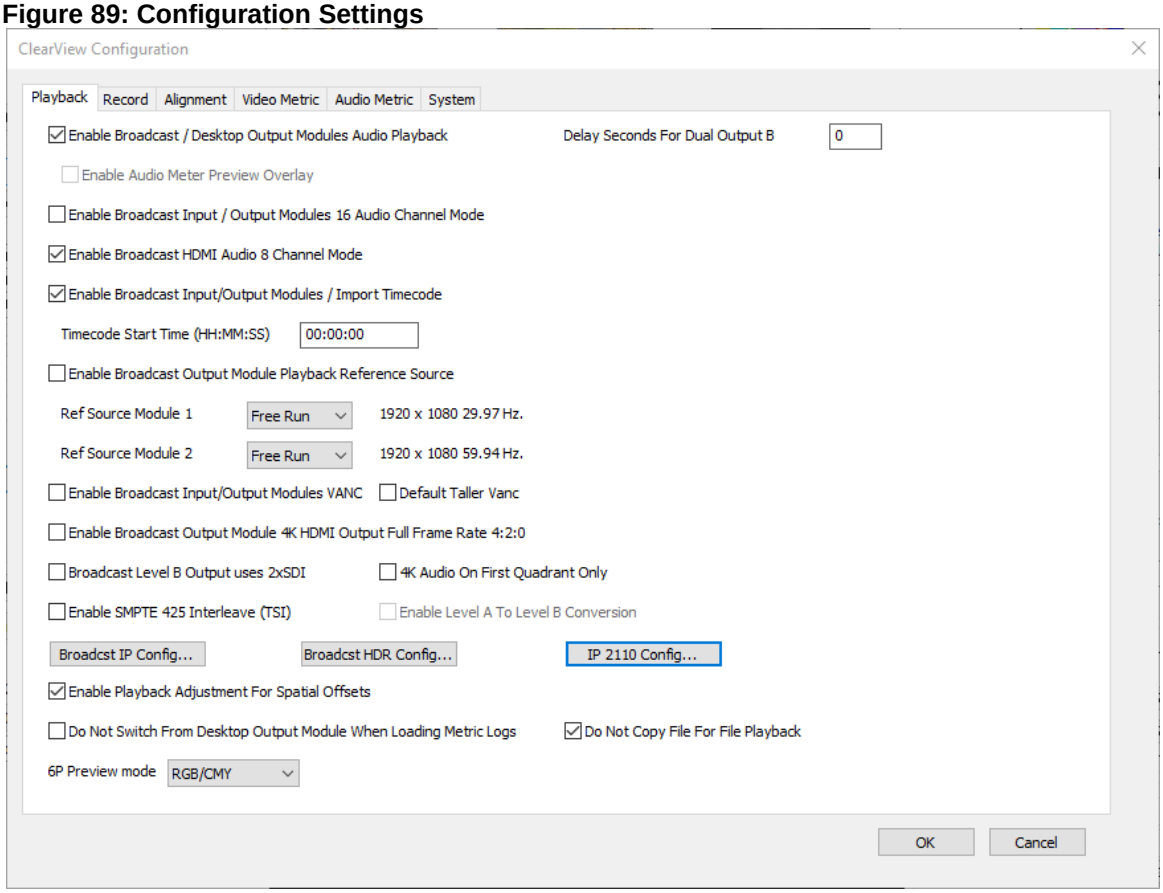


Table 32: Configuration Setting Descriptions

Playback	• Enable Broadcast/Desktop Output Modules Audio Playback – This enables audio on playback • With that, Audio Meter Preview Overlay provides audio level meters to overlay in the Viewport for the number of channels in each sequence. • Enable Broadcast Input/Output Modules 16 Audio Channel Mode – This enables ClearView to record, analyze, and playback 16 channels of audio. The default is 8. • Default is 2 • Enable Broadcast Input/Output Modules/Import Timecode – Enables timecode playback • Timecode Start Time – Time code will start at time entered; default is 00:00:00 • Enable Broadcast Output Module Playback Ref Source – Enables broadcast boards to lock to external reference • Enable Broadcast Input/Output Modules VANC – Enables access to VANC lines. Note that ClearView treats VANC as active video at the top of the video raster. • Enable Broadcast Output Module 4K HDMI Output Full Frame Rate 4:2:0. The HDMI output on 4K units is HDMI 2.0b. When outputting 4KP60 video over the quad HDSDI you can output half frame rate over the HDMI, or full frame rate but it is decimated to from 4:2:2 to 4:2:0 • Broadcast Level B Output uses 2 x SDI – Enables level B over two physical wires instead of virtual level B over a single SDI wire • Enable SMPTE 425 Interleave – Enables two sample interleave for 4K

	output. The default is quad. • Enable Playback Adjustment For Spatial Offset – The spatial offsets set in the GUI will be displayed in the viewport. • Do Not Switch From Desktop Output Module When Loading Metric Logs – ClearView Output Device will not change from Desktop Output Module mode when loading metric log files.
Broadcast IP Config	Currently only 2022-6 is supported. All inputs and outputs go through the top SFP. The bottom SFP is reserved for -7 which will be released soon. The inputs and outputs are not enabled until this config menu is brought up.
Broadcast HDR Config	The Broadcast HDR Config button will bring up the HDR settings for the mini-HDMI output. The metadata signaling can be turned on, or off. Colorimetry, EOTF, and Gamut can be adjusted, or custom values can be set.
Record	• Record Broadcast/IP/ClearView Output Audio - Default selection is checked for on. If there is no audio with video while recording it will be best to uncheck this box so that nulls are not recorded in place of audio. • Use Audio Root - Not required to be checked however it allows placement of the audio channels being input with video in a different directory than the default library where the audio is normally placed if required.(F:\AudoRoot\ is the default) • In/Out Recording Stop Playback - When activated sequence will re-set to start at beginning when hitting record • Dolby Digital and Digital Plus - select input 1 or 2 to enable input decoding of Dolby's range from Dolby Digital to Dolby Digital Plus 7.1 • Note: Dolby Audio Decoding is an option; please contact sales@videoclarity.comif interested in this feature.
Import	• Import Audio –This check box allows import audio with file import operations. It should be on by default. • Clip YCrCb Values–Color values will be clipped to legal broadcast values • Import Clipping Strategy -Changes where CV places the video sequence if the raster size is larger than the video sequence. • Import Add Lines - Will add lines equally to top & bottom if Center is chosen for Import Clipping Strategy window and to "top" top or "bottom" for those selections in the same drop down. • Import Use Media Read – This is the default method for importing files with Clearview File Import Pane. This box should generally be checked. • Enable 3:2 Pull Up/Down - Converts film cadence 24pfs to video cadence and vice versa. This is generally done from 23.98 to 29.97 or 24 to 30 fps or down from higher frame rates to the lower of these two for interlaced content.
System	• Delete Files To Recycle Bin – Deleted files are permanently deleted. Check this box to have deleted items recoverable from the recycle bin on the desktop. Keep in mind that emptying the recycle bin manually will clear up disk space.
Objective Metrics	• Threshold Failure Overlay – Places the text *Failure* in an overlay on the video when the threshold is passed. • Metric Window Excludes VANC –Will effectively ignore VANC lines and CV will not report VANC metrics. • Addback Negative Color – When B-A > Threshold in Addback mode, we show the pixel in a color. The default color is Yellow. You can change this. • Addback Positive Color – When A-B > Threshold in Addback mode, we show the pixel in a color. The default color is Green. You can change this .JND Field Mode – This should be set to Auto which allows the system to do the right thing. For interlaced video sequences, the field mode should be field. For progressive video sequences, the field mode should be frame. If you override this, then you may want to set the De-interlace flag below.

	• JND De-interlace Flag – If you are calculating interlaced data in frame mode, then you need to choose a de-interlace method. In general, you should use JND Field Mode = Auto.
	  ○ Average - averages to the top field and bottom field
	  ○ Duplicate - duplicates the top field when active or the bottom field when active
	  ○ Hybrid Average - Creates a new line that is 1/4 of the summation of the top and bottom fields
	  ○ Median - calculates the median average as opposed to the arithmetic average above
	• JND Color Modeling Flag – This is automatically set based on whether we are in HD or SD. This is an override.
	  ○ SMPTE274M - HD Color Mode (default)
	  ○ SMPTE240M - SD Color Mode
	  ○ EBU-625/50 - European Color Mode
	• JND Viewing Modes in Picture Heights – This is how far the human tester was standing away from the display. JND has two defined distances based on the ANSI specification 2x (Expert) and 5x (Normal). Measure the height of the display and stand either 2x or 5x the height from the display. Video Clarity interpolated the results to achieve 3, 4, and 6x
	• JND Max Display Luminance – This is the luminance of the viewed display.
	• Output JND Maps – This check box enables JND display maps to be written to disk. The maps give an indication of what the algorithm “saw” when calculating the metrics. It is useful for figuring out why the score is the score for video processing vendors.
	• JND Map Location – This is where the map files are stored on the hard disk array. The files are viewed using a command line program called vpseqw32.exe.
	• DMOS Field Mode – This should be set to Auto which allows the system to do the right thing. For interlaced video sequences, the field mode should be field. For progressive video sequences, the field mode should be frame. You can override this.
	• DMOS Max Value – DMOS is a scale from 0 (perfect) to X (very poor). The X is normally 4, but it can be 7 or 10. This sets the value to 4, 7, or 10. The numbers are linearly equivalent as we are using 4 digits of accuracy after the decimal place.
	• PSNR Numerator Limited to Legal Broadcast Values – The PSNR numerator is the maximum legal value. Normally, this is set to 255 for 8-bit and 1023 for 10-bit. ANSI suggests using 235 for 8-bit and 940 for 10-bit, which is the setting used if you select this option.
	• PSNR Linear Average – Setting this feature changes the average from a quadratic average to a linear average.
	• Save Spatial Alignment – Setting this feature saves the temporal/spatial alignment with respect to the sequence in Viewport B. So, if you change the sequence in Viewport A the spatial changes are saved. Previously if changed Viewport A the spatial offsets would be lost. This would be used if the reference was always the same, but the processed clip changed, say at different bit rates or different encoders.
	• Intelligent Alignment – Setting this feature instructs system to look through every frame in Viewport B and finds any frame that has high temporal change and looks for a match for that frame in Viewport A. Do this for two frames to calculate offset to make sure alignment is the same. In addition, spatial align during temporal align checkbox may be used and set x and y parameters desired.
	• Audio Freq Metric Batch – sets how many milliseconds we process at a given time

	• Audio Freq metric Low Pass – you can skip over higher Hertz frequencies by setting what frequencies to test • Audio Freq/PEAQ Metric Silence – Set an audio floor, silence threshold. The threshold is at zero, measuring all, set above 0 for any point between 0 and that number to be considered silence. • Audio PEAQ Metric – sets scale perceived – audio quality • Ref on B–check if you are using B as your reference so scores reflect correctly. • Audio Spike Detection – have notices when audio spikes, notifying you when score may be low because of spikes. • Audio Gap Detection – have notices when audio gaps, alerting that score may be low because of gaps. • Audio Gap Min – set the number of milliseconds that count as a gap. Ignoring smaller gaps so they do not affect the score. • Audio Loudness Standard - Setting the audio loudness standard for a-Peak o ATSC A/85 o EBU R 128 o ARIB TR-B32 o NAB T032 • Audio Loudness Timescale - Setting the timescale for a-Peak o Momentary Loudness - 125 ms timescale for ATSC A/85 and 400 ms for the other standards. o Short Term Loudness - 10 second timescale for ATSC A/85 and 3 seconds for the other standards. o Integrated Loudness - a variable timescale from 1 to 60 seconds for all standards.
Alignment Config	• Maximize Aligned Length – uncheck this box for alignment frame to be start frame in sequence. • Save Spatial Alignment – allows to auto save so the special alignment is on beat for future test. Saves special align offsets with the sequence. • Alignment drop-down– --Single Frame: in this setting, pick a frame on viewport B then CV will find exact frame on viewport A for alignment. --Intelligent: finds best temporal and spatial match. When spatial alignment is checked then you can set spatial range as well. --Exhaustive: Looks for frozen or dropped frames. Doesn't modify reference, creates a new file with dropped and duplicate frames so that testing doesn't fall out of temporal alignment through. • Dominant Sequence is on Viewport A – ClearView will cycle through the passive sequence's frames and match to the current frame of the dominant sequence • Spatial Align During Intelligent Alignment – Enables spatial alignment while running the temporal alignment • Max X – Spatial search range in the X direction • Max Y – Spatial search range in the Y direction • Intelligent Alignment Range – The initial search range to find an alignment. The application will increase this by 15% with each pass if it cannot find a successful alignment. The search will stop once it hits the max value. • Intelligent Alignment PSNR Threshold – Minimum PSNR score to be considered a valid alignment • Exhaustive Alignment Search Range – Exhaustive alignment attempts to match every A and B frame together one at a time. The search range is how far forward and backwards the application will search through the passive sequence. Exhaustive alignment will create a new passive sequence that matches the dominant sequence. A log is created telling the user which frames were dropped and which were repeated.

	• Audio Alignment Search Range – The number of seconds to view when looking to align audio. • Audio Alignment Preferred – Use this drop down to set which channel to start with.

Maximize Align Length

Maximize Align Length – Setting this should be done with caution. After calculating the temporal alignment with this set, the first and last frames will be adjusted to the maximum number of frames in the video sequences. For example, if the video sequence in Viewport A has 10 frames and the video sequence in Viewport B has 20 frames. If the Alignment is sequence A's frame 5 is the same as sequence B's frame 10. The Viewport A's first will be set to 0 and last to 9. Viewport B's first will be set to 5 and last to 14.

Note: If the videos do not match before the alignment point, there is a possibility that the sequences will be misaligned at the start after the alignment.

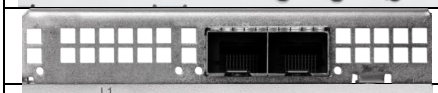
ClearView Hardware Configurations

Each ClearView product model has a specific IO configuration based on model configuration and specifications available at the time of purchase. There are several potential IO configurations that have been developed which are supported for the life of your product.

The following section is dedicated to describing the function and format support for each currently available interface module and module combinations. Versions of this guide with descriptions of legacy interfaces are available upon request.

Hardware Modules

Table 33: Hardware Modules

	CV-SDI-IO-12G
	CV-IP-IO-UHD
	CV-SDI-IO-3G
	CV-HDMI-1-4

CV-SDI-IO-12G

Video Inputs
12G-SDI, SMPTE-2082, 12-bit*, 10-bit and 8-bit
6G-SDI, SMPTE-2081, 10-bit and 8-bit
3G-SDI, SMPTE-259/292/296/424/425, 12-bit*, 10-bit and 8-bit
4K/UltraHD 4:4:4 (4x BNC)
1.5G-SDI, SMPTE 372M, Dual Link HD 4:4:4 (2x BNC), 12-bit*, 10-bit and

8-bit
1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1x BNC), 10-bit and 8-bit

Video Outputs
12G-SDI*, SMPTE-2082, 12-bit*, 10-bit and 8-bit
6G-SDI*, SMPTE-2081, 10-bit and 8-bit
3G-SDI, SMPTE-259/292/296/424, 12-bit*, 10-bit and 8-bit
4K/UltraHD 4:4:4 (4x BNC)
1.5G-SDI, SMPTE 372M, Dual Link HD 4:4:4 (2x BNC), 12-bit*, 10-bit and 8-bit
1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1x BNC), 10-bit and 8-bit
HDMI v2.0
30/36-bits/pixel, RGB or YUV, 6 Gbps per color component
4K, UltraHD, 2K, HD and SD with HFR support up to 60p (4:2:2), 10-bit and 8-bit
HDR10 Support** - HDR Infoframe metadata, compatible with HDMI 2.0a/CTA-861.3
HLG Support** - compatible with HDMI 2.0b/CTA-861-G

Video Formats
(8K) 8192 x 4320p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
(UltraHD2) 7680 x 4320p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(4K) 4096 x 2160p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
(UltraHD) 3840 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
(2K) 2048 x 1080PsF 23.98, 24, 25
(HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(HD) 1080PsF 23.98, 24, 25, 29.97, 30
(HD) 1080i 50, 59.94, 60
(HD) 720p 50, 59.94, 60
(SD) 625i 50
(SD) 525i 59.94
NOTE: 8K/UltraHD2 video formats are only available on 8K capable systems.

CV-IP-IO-UHD

IP Media Transport Interfaces
SMPTE ST 2110 (-10, -20, -21, -23, -30, -31, -40), with or without 2022-7 redundancy. Inputs are asynchronous receivers (Type A). Outputs are narrow transmitters (Type N)

- 2x SFP28 Cages - SFPs not included
- 10 GbE IEEE 802.3ae (10GBASE-SR/LR)
- 25 GbE IEEE 802.3by (25GBASE-SR/CR/CR-S)
- 25 GbE IEEE 802.3cc (25GBASE-LR)
- Seamless protection (redundancy) according to SMPTE ST 2022-7

Support JT-NM TR-1001-1 for system environment and device behavior including:

- NMOS IS-04
- NMOS IS-05

Video Inputs and Outputs
Each Flow is SMPTE ST 2110-20 compliant

- Each SFP28 is paired to offer primary and redundancy flows (SMPTE ST 2022-7)

Dual SFP28 in 25 GbE offers primary flows with ClearView:

- 4K or UHDp50/60: 2 inputs or 2 outputs, or 1 output while recording 1 input of same video format
- HD: 2 inputs or 2 outputs, or 1 output while recording 1 input of same video format
- Redundancy flows that mirror above channel input and output capability

Standard broadcast resolutions and frame rates supported:

- 1280x720p at 50, 59.94, and 60 fps
- 1920x1080i at 25, 29.97
- 1920x1080p at 25, 29.97, 50, 59.94 and 60 fps
- 3840x2160p at 25, 29.97, 50, 59.94 and 60 fps
- 4096x2160p at 25, 29.97, 50, 59.94 and 60 fps
- 8- and 10-bit YCbCr 422
- Dual* or single channel output available when using ST 2110 to transmit 4K/UHD/2K/HD
- 2-Channels output available when using ST 2110-23 to transmit 4K/UHD/2K/HD
- ANC support
- Tx support for Narrow Receivers**

Audio inputs and outputs with ClearView
• Each flow is SMPTE ST 2110-30/ST 2110-31 compliant conforming with Levels A, B, and C
• Up to 16 flows may be input per video program of inputs or outputs
• Dual SFP28 in 25 GbE offers:
- Primary flows: 16 audio input or output flows per video channel
- Redundancy flows that mirror above throughput
• 48KHz sampling

Ancillary data inputs and outputs
• Each flow is SMPTE ST 2110-40 compliant
• ANC data is packaged into a separate flow equal to the number of video flows
• Dual SFP28 in 25 GbE offers:
- Primary flows: ANC flows equal the number of video flows being input and output
- Redundancy flows that mirror above throughput

Validated 25GBASE-SR transceivers:
InnoLight TR-PY85S-N00
Optech OPAX-MX-85-CB
10Gtek AZS85-S28-M1-XYS
10Gtek AZS85-S28-M1-XYS
FiberStore SFP28-25GSR-85
Finisar FTLF8536P4BCL
Empowerfiber E25GSF28SR
Mellanox MMAA2P00-AS
Gigalight GSS-MPO250-SRC
Eoptolink EOLP-8525G-02-R
Formerica TAS-A1EH1-834
Formerica TAS-A1EH1-8AQ
Intel E25GSFP28SR

Validated 25GBASE-LR transceivers
FiberStore SFP-28-25GLR-31
10Gtek AZS13-S28-10
InnoLight TR-PYI3L-N00
Eoptolink EOLP_1325G-02-R

CV-SDI-IO-3G

Figure 91: CV-SDI-IO-3G Broadcast I/O Module.

The CV-SDI-IO-3G is currently only applied in model CV-S2043-QA model and two interfaces are applied in legacy models of ClearView Extreme 4K. CV-SDI-IO-3G is also available as an optional interface for current ClearView Extreme 4K systems if required. This product module is specified to record and play SD and HD formats from 525i 59.94Hz up to 1080p60 and is capable of supporting UHD formats using all four 3G-SDI interfaces and its HDMI output as specified below.

Input and output of HD and SD formats with CV-SDI-IO-3G is mapped in ClearView as follows:

- Connector #1 is the primary recording input, selectable for recording in ClearView's Record section
- Connector #2 is the secondary recording input, selectable for recording in ClearView's Record section
- Connector #3 is the primary SDI output that will generally play what is selected to play in ClearView's Viewport with single video or comparison modes using A and B Viewport selections
- Connector #4 is the secondary SDI output that may be used when selecting multiple outputs and generally will be playing the Viewport B selected video sequence if Multiple Outputs is selected under the Split tab in ClearView's Playback Parameters

HDMI Output: From mini connector with supplied cable which provides standard Type A connection

- HDMI mini connector is an output which will play the primary selection from ClearView's Viewport
- The HDMI output will support formats up to 4Kp60 4:2:2 10-bit at 30Hz or 4:2:0 8-bit at 60Hz
- 4Kp60 4:2:2 10-bit video is only available via Quad 3G-SDI using CV-SDI-IO-3G.

With legacy ClearView Extreme 4K models, this interface was formerly named CV-SDI-IO-4K2 and will record and play UHD and 4K video resolutions with embedded audio as follows.

Tiled sections for a Quad HD 2160p (UHD and 4K) sequence output or input are 3G-SDI (1) is Upper Left, (2) Upper Right, (3) Bottom Left, (4) Bottom Right. Quad connections are automatically synchronized for playback to a Quad/HD monitor with four 3G HDSDI inputs or for recording from a source input and do not require a reference input.

CV-SDI-IO-3G Capture & Playback Standards

Digital Video Inputs & Outputs

- 4 BNC Input/Output programmable for 259/292/296/424/425a/425b and 4K/Quad HD
- 8 or 10 bits per component
- 1-channel v-1.4 HDMI output (1080p60Hz limited)
- 3G, HD-SDI, SD-SDI I/O

Analog Video Inputs & Outputs (on supplied breakout cable)

- 12-bit HD Analog Component I/O
- 12-bit SD Analog Component/Composite/S-Video I/O

Digital Audio Inputs & Outputs

- 8-ch SDI Embedded Audio I/O, 20-bit 48KHz
- 8-ch HDMI Embedded Audio Output, 20-bit 48KHz

I/O Format

Standard Definition (SD)

- 525i 59.94Hz
- 625i 50Hz

High Definition (HD)
- 720p 50Hz, 59.94Hz, 60Hz
- 1080i 50Hz, 59.94Hz, 60Hz
- 1080psf 23.98Hz, 24Hz
- 1080p 23.98Hz, 24Hz, 25Hz, 29.97Hz, 30Hz, 50Hz, 59.94Hz, 60Hz

Ultra High Definition (UHD)
- 3840X2160p 23.98Hz, 24Hz, 25Hz, 29.97Hz, 30Hz, 50Hz, 59.94Hz, 60Hz
- 4096 x 2160p 23.98Hz, 24Hz, 25Hz, 29.97Hz, 30Hz, 50Hz, 59.94Hz, 60Hz

CV-HDMI-I-4

Figure 96: CV-HDMI-I-4 - Four Input Module

The CV-HDMI-I-4 module records one or two input videos within ClearView. It can record up to 4096x2160p 60Hz on two inputs. ClearView stores the video data as 100% uncompressed 8,10, or 12-bit* video as described below.2160p 60Hz on two inputs. ClearView stores the video data as 100% uncompressed 8,10, or 12-bit* video as described below.

CV-HDMI-I-4 Capture Features

Digital Video, Audio, and Ancillary Data Input Support:
Port 1 and Port 2: Up to 4K/UltraHD 60p, 4:2:2, 4:2:2, 8 or 10-bit, or 30-bits/pixel 4:4:4 RGB at 10-bits per color component
Single input or simultaneous dual input operation with ClearView record tab
Port 3 and Port 4: Up to 2K/HD 60p, 4:2:2, 8 or 10-bit, or 30-bits/pixel 4:4:4 RGB at 10-bits per color component

- Single input or simultaneous dual input operation with ClearView record tab

8-channel, 16 and 24-bit HDMI embedded audio, 48 kHz sample rate, synchronous per HDMI Input

PQ, HLG, HDR10 and Dolby Vision Support with HDR Metadata Capture
*12-bit support is applied in Dolby Vision format.

Video Input Formats

(4K) 4096 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(UltraHD) 3840 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(2K) 2048 x 1080PsF 23.98, 24, 25
(HD) 1080i 50, 59.94, 60
(HD) 1080PsF 23.98, 24, 25, 29.97, 30
(HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
(HD) 720p 50, 59.94, 60
(SD) 625i 50
(SD) 525i 59.94