

Video Clarity



Tools for Video Analysis

Real-Time Monitor (RTM) Operation Manual



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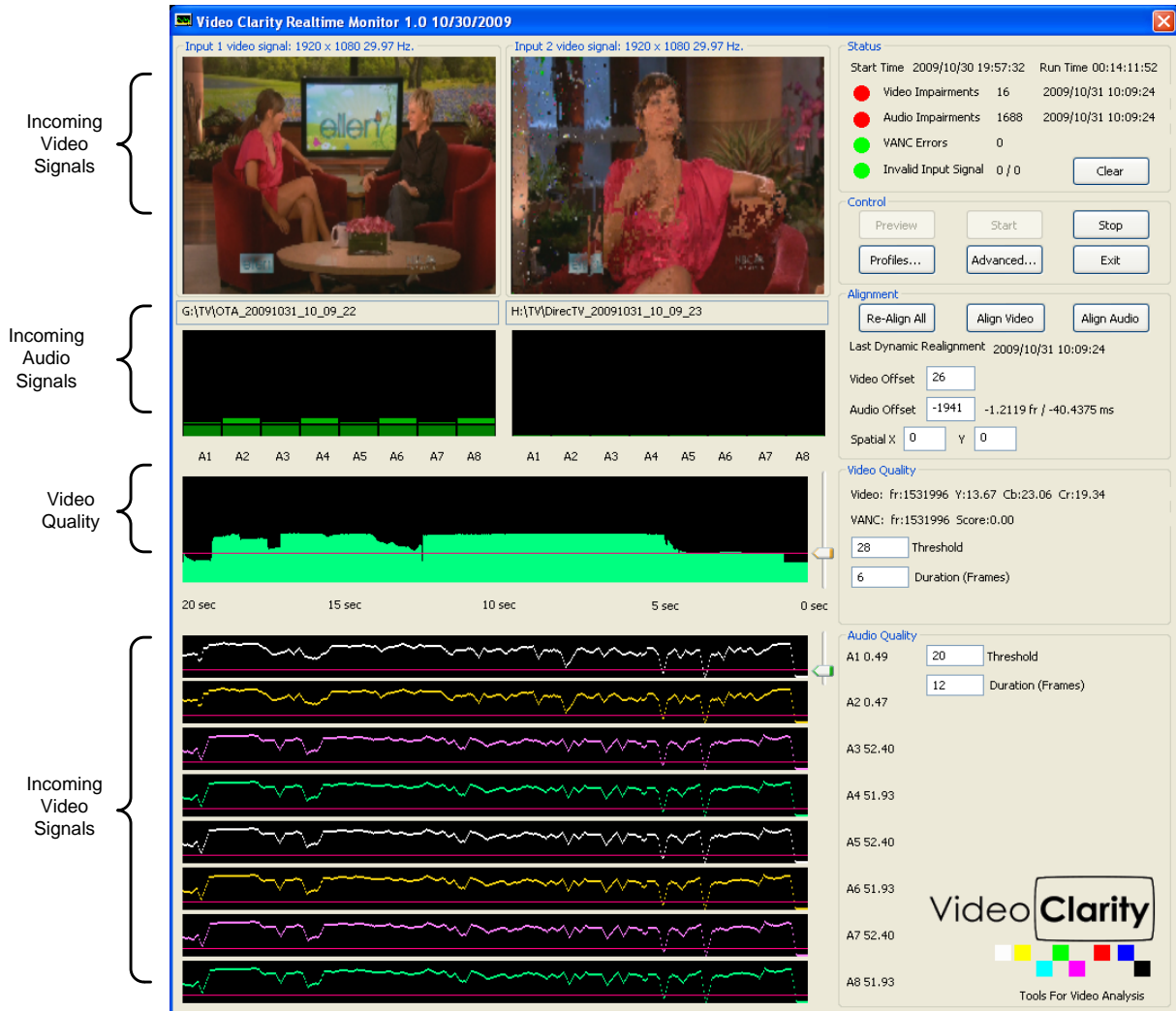
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1. Real Time Monitoring (RTM) System

RTM is a full-reference, real-time video and audio quality-of-Experience (QoE) monitoring system. RTM is designed to detect and log differences between the two incoming signals. RTM compensates for the delays between the two signals, and measures the quality of both the audio and video, as well as monitoring for any additional audio delays (lip-sync).



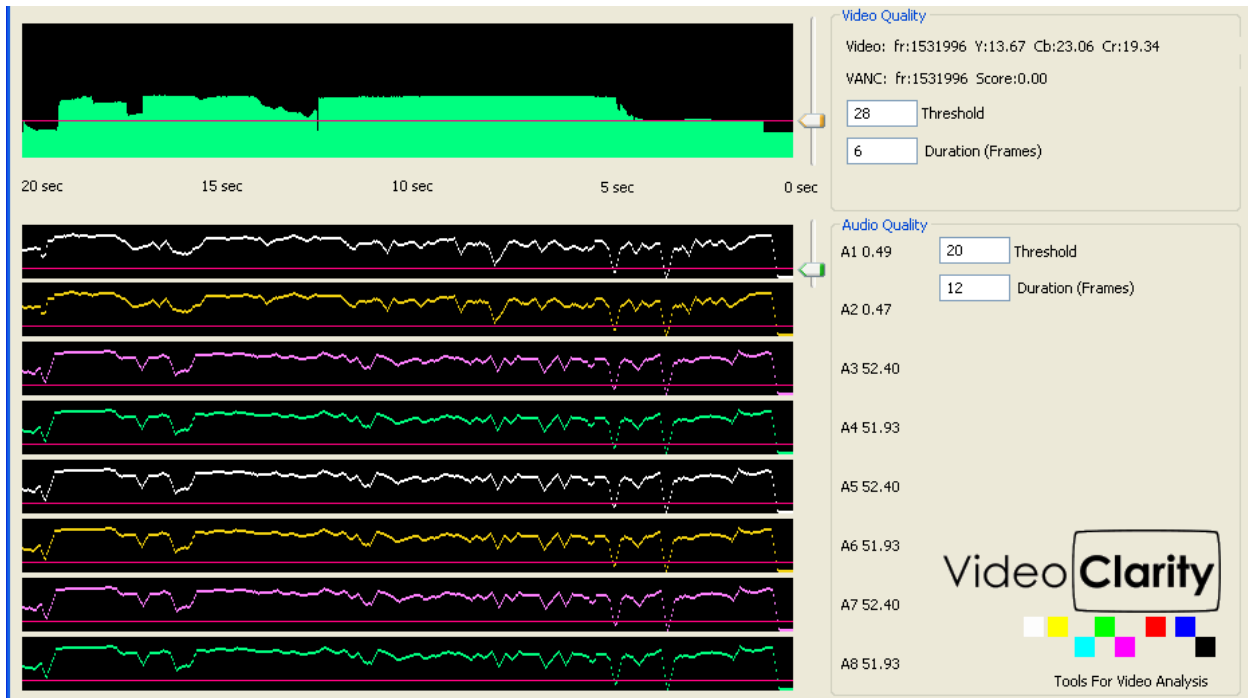
When a difference between the two inputs exceeds a defined threshold (level and duration), a recording is started of both incoming signals, and a log file (.psnr or .audio) is created which contains the difference values for the created recordings. This log file can be dragged/dropped onto ClearView for easy setup and post-analysis.

It is expected that the incoming signals will drift from each other over time. For example, the delay between the signals may be 344 frames for a day, 343, for a day, and back to 344 the next. This is due to the fact that the two source are not gen-locked. RTM is aware of this and compensates for it using dynamic re-alignment.

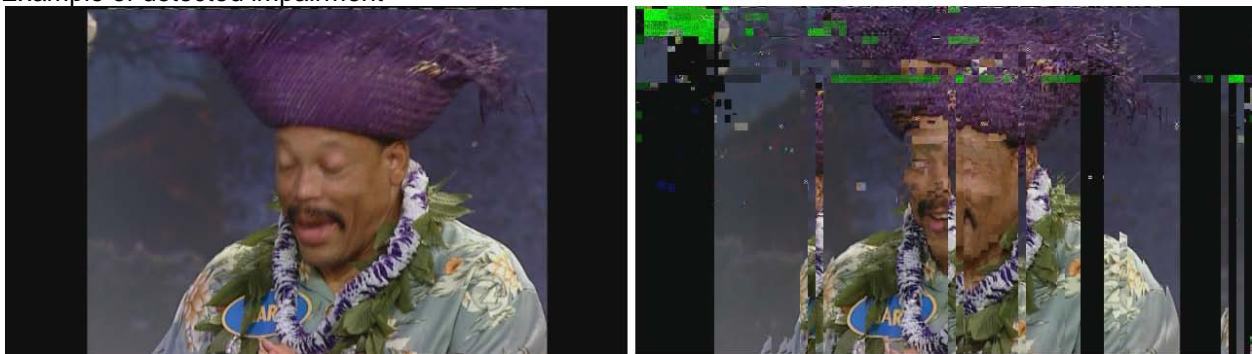
2. What RTM Does

RTM is designed to catch objectionable impairments. Applications requiring the measurement of slight/subtle differences between two signals require ClearView. Contact Video Clarity for further information on ClearView.

RTM reliably detects MPEG breakups, frozen video, lost audio, most typical causes of impairments found in broadcasts today. The picture below shows how the quality graph reacts to a video impairment. The impairment took place 12 seconds ago where the video quality graph has dipped.



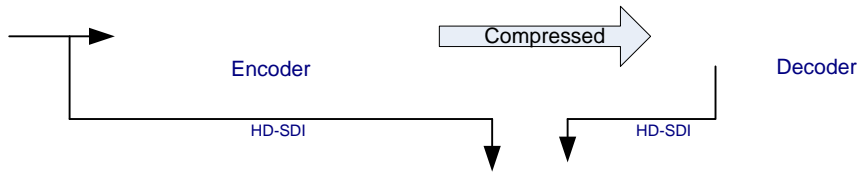
Example of detected impairment



3. Typical Applications

RTM can be used for nearly any extended duration quality monitoring applications of both broadcasters and equipment manufacturers:

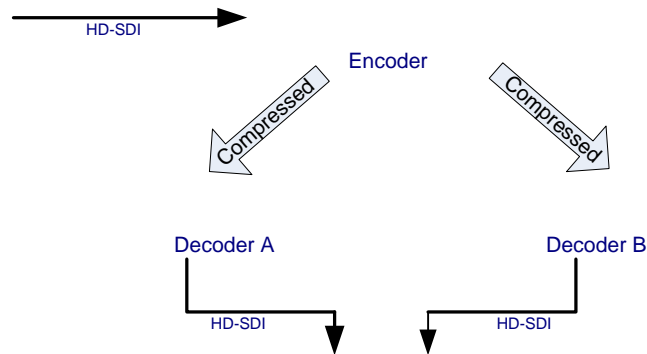
Extended Duration Testing – Encoder/Decoder



RTM

RTM monitors the SDI source to the encoder compared to the SDI output from the reference decoder.

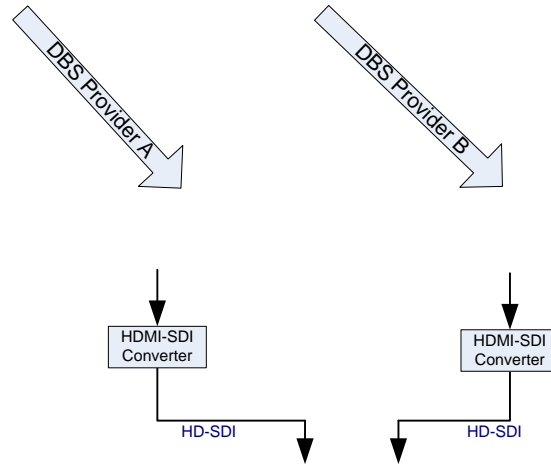
Extended Duration Testing - Decoders



RTM

By monitoring the outputs from two decoders, errors will be detected whenever the two decoder outputs differ.

Monitor customers experience from a consumer STBs



RTM

Comparing outputs from two independent provider's STBs, three things are actually tested. If either STB has errors, they will be logged. Also, if the originator has compression or decompression errors, both DBS providers will react with additional errors. However the errors will be different (since the encoders/decoders are), and will trigger a record. Any recordings with impairments on both signals indicate the originator was at fault.

Monitoring two mirrored broadcast signals

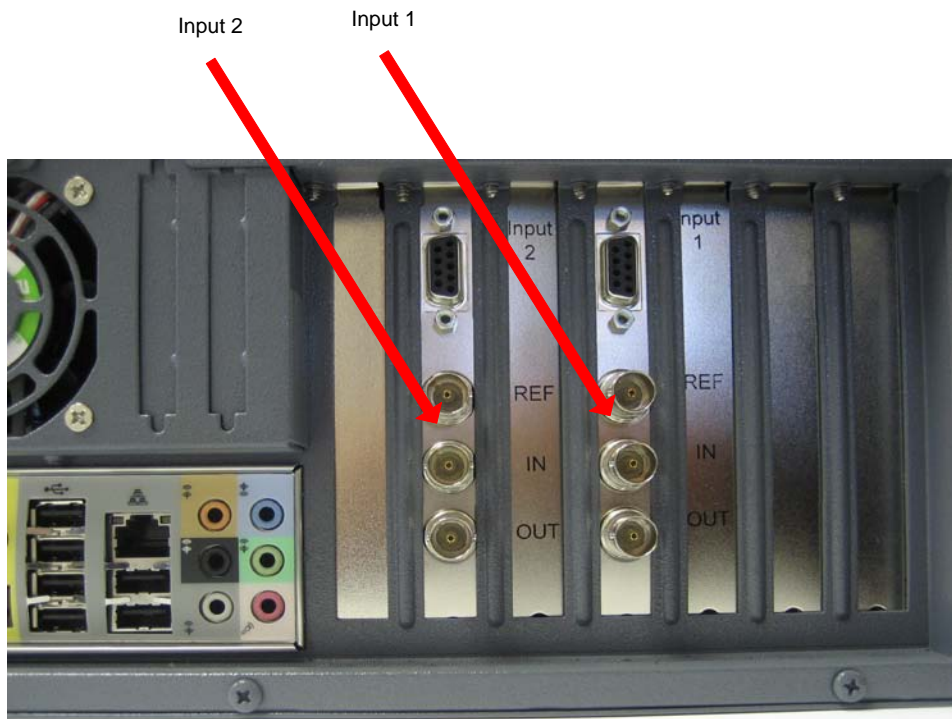
4. Getting Started

Hardware Connections

Connect the included USB Keyboard and Mouse

Connect a VGA monitor to the VGA output connector

Connect signals to Input 1 and Input 2



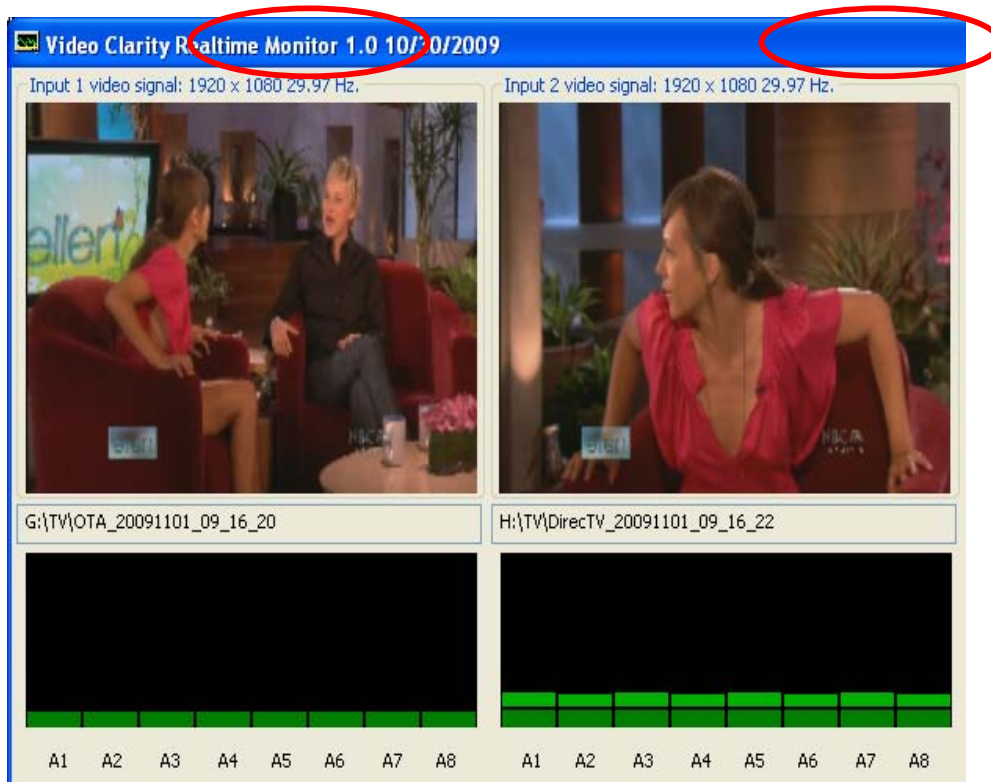
It is not necessary to connect a house reference into the REF connector.

The OUT connector is an EE output of the Input.

Either OUT connector may be used for viewing captured sequences within the ClearView Player Application.

Power on the PC and launch RTMonitor by double-clicking the RTMonitor Icon on the desktop.

Ensure both incoming signals are present



After clicking **start**, RTM will capture frames from both inputs, process the frames, and determine the temporal and spatial offsets. RTM requires motion in the two videos in order to calculate the temporal delay. If not enough motion is found, RTM will retry the operation.

Once the offsets have been found, RTM begins to measure the video quality. A few seconds later, RTM begins monitoring the audio quality and the audio-from-video delay (Lip-Sync).

Now the user must define thresholds. This done by watching the quality graphs to see what the quality level is during normal video. Now, set the threshold slightly lower than that. Or, if you are only interested in major impairments, set it even lower.

The graphs and slider bars define the level threshold. To change the number of frames below threshold causes a record, use the configuration window, Sequence Creation pane.

The following is an example of a normally running RTM system (2 channel Audio)



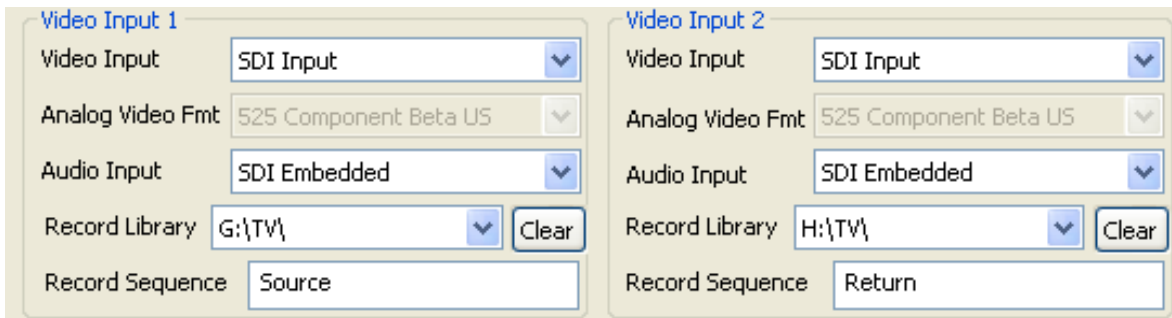
In the Video Quality section of the GUI, you can adjust the quality threshold and duration for impairment logging. This is the same for audio in the Audio section of the main GUI.

5. Detailed Setup – Advanced Window

Below is a detailed description of all settings. Each component of the Configure dialog is broken down with default settings given. These settings have been pre-configured to operate in most monitoring environments. Depending on your environment, you may need to modify some of these settings.

Video Input Panes

Configures Video/Audio Inputs, record folders and record file names



The screenshot shows two side-by-side configuration panes for video inputs. Each pane has five rows of controls:

- Video Input 1:**
 - Video Input: SDI Input (dropdown)
 - Analog Video Fmt: 525 Component Beta U5 (dropdown)
 - Audio Input: SDI Embedded (dropdown)
 - Record Library: G:\TV\ (dropdown) with a Clear button
 - Record Sequence: Source (text field)
- Video Input 2:**
 - Video Input: SDI Input (dropdown)
 - Analog Video Fmt: 525 Component Beta U5 (dropdown)
 - Audio Input: SDI Embedded (dropdown)
 - Record Library: H:\TV\ (dropdown) with a Clear button
 - Record Sequence: Return (text field)

Figure 2.1

Video Input

- For RTM – Must be SDI

Audio Input

- For RTM – Must be SDI Embedded
- For ClearView Extreme + RTM – Can be SDI, HDMI, AES or Analog

Record Library

This library is where the recorded impairments are stored. The recordings will later be played back in ClearView for post-analysis.

NOTE: One library **must** be located the “G: array” and the other must be on the “H: array”. To create new libraries, use the ClearView Library Manager. RTM does not have the ability to create new libraries.

Clear

This button clears the contents of the currently selected record library. Be aware that it removes all recordings (sequences), even from prior sessions.

Record Sequence

This field defines the base name of all recordings. The text that is automatically concatenated is the following:YYYYMMDD_HH_MM_SS. Note that the entire sequence name cannot exceed 35 characters.

Alignment Pane

Alignment

Maximize Alignment Range (requires Input 1 to be ahead of Input 2) Field Mode

Max Alignment Frames Spatial Align Max X Max Y Align Previews

Full alignment upon threshold failures within seconds.

Full alignment threshold Audio Alignment Period (seconds) Batch Frames

Figure 2.2

Maximize Alignment Range (requires Input 1 to be ahead of Input 2)

When RTM starts it must first determine the temporal and possible spatial offsets between two signals. This is done by capturing a number of frames from both inputs and then finding a best match between the two and determining the temporal and spatial offsets. In situations where delay is greater than 100 frames, this box should be checked.

If delay is short or unknown, this box should not be checked. When checked, RTM assumes input 1 is ahead of input 2.

Field Mode

When monitoring interlaced video, it is possible that the two incoming signals are off by a field rather than a frame. This flag allows RTM to align and monitor on a field by field bases, instead of frame by frame.

Max Alignment Frames

For the initial full alignment, RTM will record from both inputs for as many frames as are defined in this field. The example above uses 700. This means that 700 frames will be recorded from each input before the initial full alignment begins. Time is saved by properly setting this value. If you know your delay is < 100 frames, 400 frames would most often be sufficient for *Max Alignment Frames*. A value of 0 uses the maximum available in the 8 GB of onboard RAM.

Spatial Align

This flag enables a spatial test between the two incoming signals. Often times in broadcasts to consumer devices, a horizontal or vertical shift will take place. RTM needs to detect and compensate for this shift before the monitoring begins.

Max X

Horizontal search range. Values may be 0 to 8

Max Y

Vertical search range. Values may be 0 to 8

Align Previews

The preview displays in RTM's GUI will be aligned according to the delay so the previews are synced.

Full Alignment Upon

These two parameters provide the option to have RTM completely restart if too many failures have occurred. In the example above, if 7,000 of 7,200 in the two minute period (720P/60), RTM will stop monitoring and start over with a full alignment.

Audio Alignment Period

Defines how often RTM will check for audio drift. This is also how often the file AudioAlign.log is updated. AudioAlign.log records the value of the audio offset for long-term monitoring.

Batch Frames

Defines the number of frames of audio that will be used to perform the alignment (lip-sync) check. Should be the number of frames the selected video format will play in one second.

Dynamic Re-Alignment Pane

Dynamic Realignment

Enable Dynamic Re-Alignment Video Alignment Period (seconds)

Use Threshold

Use % of Avg. % of avg over frames

Dynamically Re-Align upon or less consecutive threshold failures.

Check for maximum alignment offset change of frames. Verify Percentage

Figure 2.3

Enable Dynamic Re-Alignment

Enabling this flag tells RTM to disregard single or double-frame drops in video quality. This typically happens with video signals are mis-aligned by one or two frames. This will occur infrequently with signals which are not genlocked. If your signals are genlocked and you are testing for drift, disable this flag.

Video Alignment Period

If a non-zero value is present, RTM will perform a dynamic re-alignment every x seconds.

Use Threshold or % of Average

Defines what triggers a dynamic re-alignment. This can be set to either a constant value or a percentage of current quality average over x frames.

Dynamically Re-Align upon

This defines how many frames (or less) with a quality measurement meeting the threshold criteria will cause a dynamic re-alignment.

Check for maximum alignment offset

When a dynamic re-alignment happens, this value determines how many frame will be searched in each direction for the best new-match for video offset.

Verify Percentage

Defines how well the new offset found in a dynamic re-alignment must compare to the current running average which will cause an actual adjustment to the current video offset.

PSNR Metric Pane

Psnr Metric - Full Reference - Input Channels 1 and 2

Psnr Y Cb Cr Averaging Period (seconds)

Psnr Metric Window X Y W H

Spatial Offset X Y Border clip value

Figure 2.4

PSNR Y/Cb/Cr

Enable/disable the measurement of each video component

Averaging Period

Defines how often the file *psnrAvg.Log* will be updated. This logfile contains the Min, Max, Average, and Mean values for this many seconds of video.

PSNR Metric Window

These values define the video measurement window.

Reset

Reset will reset the window size to the largest size possible minus the *board clip value*.

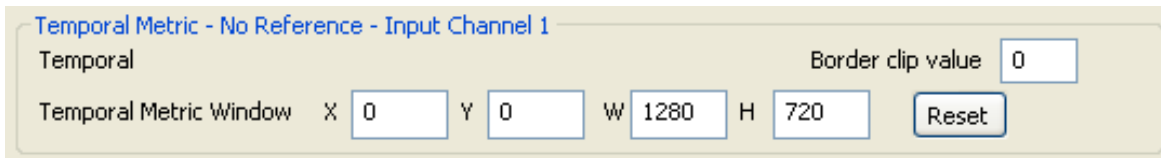
Border Clip Value

This allows the user to quickly crop the measurement window. Useful when known noise is present on top/bottom lines left/right pixels of a video signal. Enter a value and click *Reset*.

Spatial Offset

If *Spatial Align* is checked in the [Alignment](#) pane of the Advanced window, these X and Y values are updated/overwritten automatically when a full alignment is performed. If *Spatial Align* is not checked above, users can manually type values in here and they will be used by RTM.

Temporal Metric Pane



Temporal Metric - No Reference - Input Channel 1

Temporal

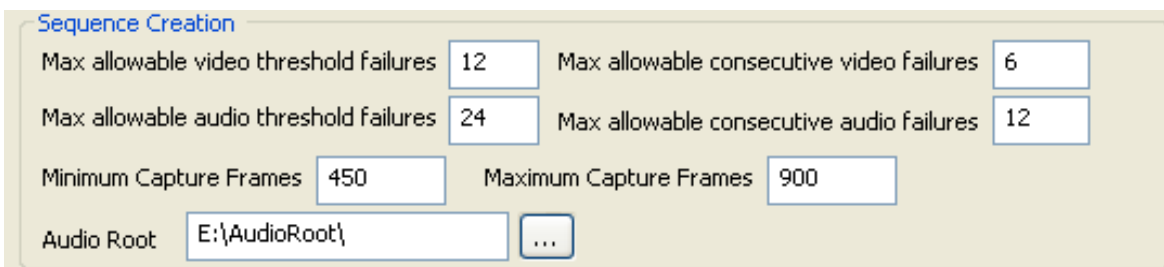
Border clip value

Temporal Metric Window X Y W H

Temporal Metric Window

These for values define the video measurement window. Temporal is used for finding motion in the sequence for better results in temporal alignment.

Sequence Creation Pane



Sequence Creation

Max allowable video threshold failures Max allowable consecutive video failures

Max allowable audio threshold failures Max allowable consecutive audio failures

Minimum Capture Frames Maximum Capture Frames

Audio Root

Figure 2.5

Max allowable video threshold failures

This value defines how many video quality failures are needed to trigger a recording within the *Minimum Capture Frames*.

Max allowable consecutive video failures

This value defines how many consecutive video quality failures are needed to trigger a recording within the *Minimum Capture Frames*.

Max allowable audio threshold failures

This value defines how many audio quality failures are needed to trigger a recording within the *Minimum Capture Frames*.

Max allowable consecutive audio failures

This value defines how many consecutive audio quality failures are needed to trigger a recording within the *Minimum Capture Frames*.

Minimum Capture Frames

This value defines the minimum number of frames that will be captured once a recording is triggered.

Maximum Capture Frames

This value defines the maximum number of frames that will be captured once a recording is triggered. If failures are still occurring and *Minimum Capture Frames* has

been met, RTM will continue to record until the failures stop or until this value is reached.

Audio Root

Audio files are stored on the E drive instead of the G or H drive. This defines the location of audio files.

LogFile Pane

Defines the location of all log files created by RTM.

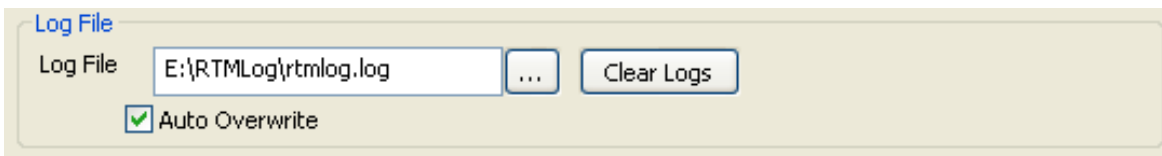


Figure 2.6

Clear Logs

Clears all log files.

System Pane

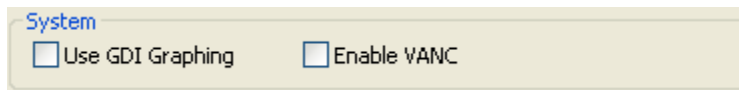


Figure 2.7

Use GDI Graphing

Some system environments require this box to be checked. Contact Video Clarity for more information.

Enable VANC

Enables RTM to add VANC in the total PSNR value (NOT CURRENTLY SUPPORTED).

6. Log Files

RTM creates five types of log files which are useful for a variety of things.

RTMLog.log

This is the main status log for RTM. It stores all relevant information required for tracking historical data such as frequency of impairments, detected video delay, loss of signal time, etc.

```
2009/08/08 14:17:07 Preview Started
2009/08/08 14:17:39 Psnr Threshold: 20
2009/08/08 14:17:39 Audio Psnr Threshold: 10
2009/08/08 14:17:39 Temporal Threshold: 0.0000
2009/08/08 14:17:39 Temporal Period: 0
2009/08/08 14:17:39 Sequence Creation Criteria Max Failures: 12 Max Consecutive Failures: 6
2009/08/08 14:17:39 Sequence Creation Audio Criteria Max Failures: 24 Max Consecutive Failures: 12
2009/08/08 14:17:39 Video Offset: 0
2009/08/08 14:17:38 Preview Started
2009/08/08 14:17:39 Monitor Started
2009/08/08 14:17:39 Video Input 1: SDI In 1
2009/08/08 14:17:39 Video Input 2: SDI In 2
2009/08/08 14:17:39 Audio Input 1: SDI Embedded
2009/08/08 14:17:39 Audio Input 2: SDI Embedded
2009/08/08 14:17:39 Library 1: G:\TV\
2009/08/08 14:17:39 Library 2: H:\TV\
2009/08/08 14:17:39 Sequence 1: OTA_08_14_16_00
2009/08/08 14:17:39 Sequence 2: DirecTV_08_14_16_00
2009/08/08 14:17:39 Frames To Record: 450
2009/08/08 14:17:39 Max Frames To Record: 900
2009/08/08 14:17:39 Log File: E:\RTMLog\rtmlog.log
2009/08/08 14:17:39 Enable Log File Overwrite: 1
2009/08/08 14:17:39 Psnr Components Y: 1 Cb: 1 Cr: 1
2009/08/08 14:17:39 Psnr Window X: 8 Y: 8 W: 1264 H: 704
2009/08/08 14:17:39 Spatial Offset X: 0 Y: 0
2009/08/08 14:17:39 Temporal Components Y: 1 Cb: 0 Cr: 0
2009/08/08 14:17:39 Temporal Window X: 8 Y: 8 W: 1264 H: 704
2009/08/08 14:17:39 Dynamic Realignment Enabled Threshold: 70 Consecutive Failures: 2 Max Frame Offset: 3
2009/08/08 14:20:19 Full Alignment Video Offset: 343 Value: 38.6243
2009/08/08 14:20:19 Monitor Started
```

psnrAvg.log

This is a tab-delimited text file containing the Average, Min, Max, and Standard Deviation for the defined period. The frequency of update to this file is controlled by the parameter called *Averaging Period* in the [PSNR Metric](#) tab of the Advanced window.

```
2009/08/08 14:21:25 Psnr Periodic Avg 041.0208 Min 034.8861 Max 045.1394 Std Dev 001.8884
2009/08/08 14:22:25 Psnr Periodic Avg 039.6175 Min 035.4877 Max 044.0881 Std Dev 001.6635
2009/08/08 14:23:25 Psnr Periodic Avg 039.2722 Min 036.9902 Max 042.4495 Std Dev 000.9413
2009/08/08 14:24:25 Psnr Periodic Avg 038.1622 Min 034.1089 Max 042.9992 Std Dev 001.8374
2009/08/08 14:25:25 Psnr Periodic Avg 039.1499 Min 037.3366 Max 044.5121 Std Dev 001.3079
```

AudioAlign.log

This is a tab-delimited text file containing the Average, Min, Max, and Standard deviation for the defined period. The frequency of update to this file is controlled by the parameter called *Audio Alignment Period* in the [Alignment](#) tab of the Advanced window.

2009/08/08 14:30:44	Audio Alignment	Audio Offset: 772
2009/08/08 14:31:04	Audio Alignment	Audio Offset: 771
2009/08/08 14:31:24	Audio Alignment	Audio Offset: 741
2009/08/08 14:31:44	Audio Alignment	Audio Offset: 707
2009/08/08 14:32:04	Audio Alignment	Audio Offset: 700

.psnr and .audio Files.

Whenever a threshold is reached and a recording is started, either a .psnr or .audio file is also created in the RTMLog folder. These files contain the measured quality values for the associated recording. These files can also be dragged/dropped onto ClearView for easy synchronized playback and post analysis.

```

ClearView PSNR Log File (V5.1)      08/07/09 10:04:44
Video Output Format: 720p 59.94 Hz.
Image Format: YCbCr 8 bpc
Spatial X: 0
Spatial Y: 0
Metric Window X: 8
Metric Window Y: 8
Metric Window W: 1264
Metric Window H: 704
Psnr Limit Numerator: 1
Library A: G:\TV\
Sequence A: OTA_07_10_04_36
Library B: H:\TV\
Sequence B: DirecTV_07_10_04_36
Sequence Metric Y Min: 8.73
Sequence Metric Y Max: 37.29
Sequence Metric Y Avg: 18.82
Sequence Metric Cb Min: 19.18
Sequence Metric Cb Max: 45.69
Sequence Metric Cb Avg: 36.24
Sequence Metric Cr Min: 19.63
Sequence Metric Cr Max: 45.96
Sequence Metric Cr Avg: 35.28

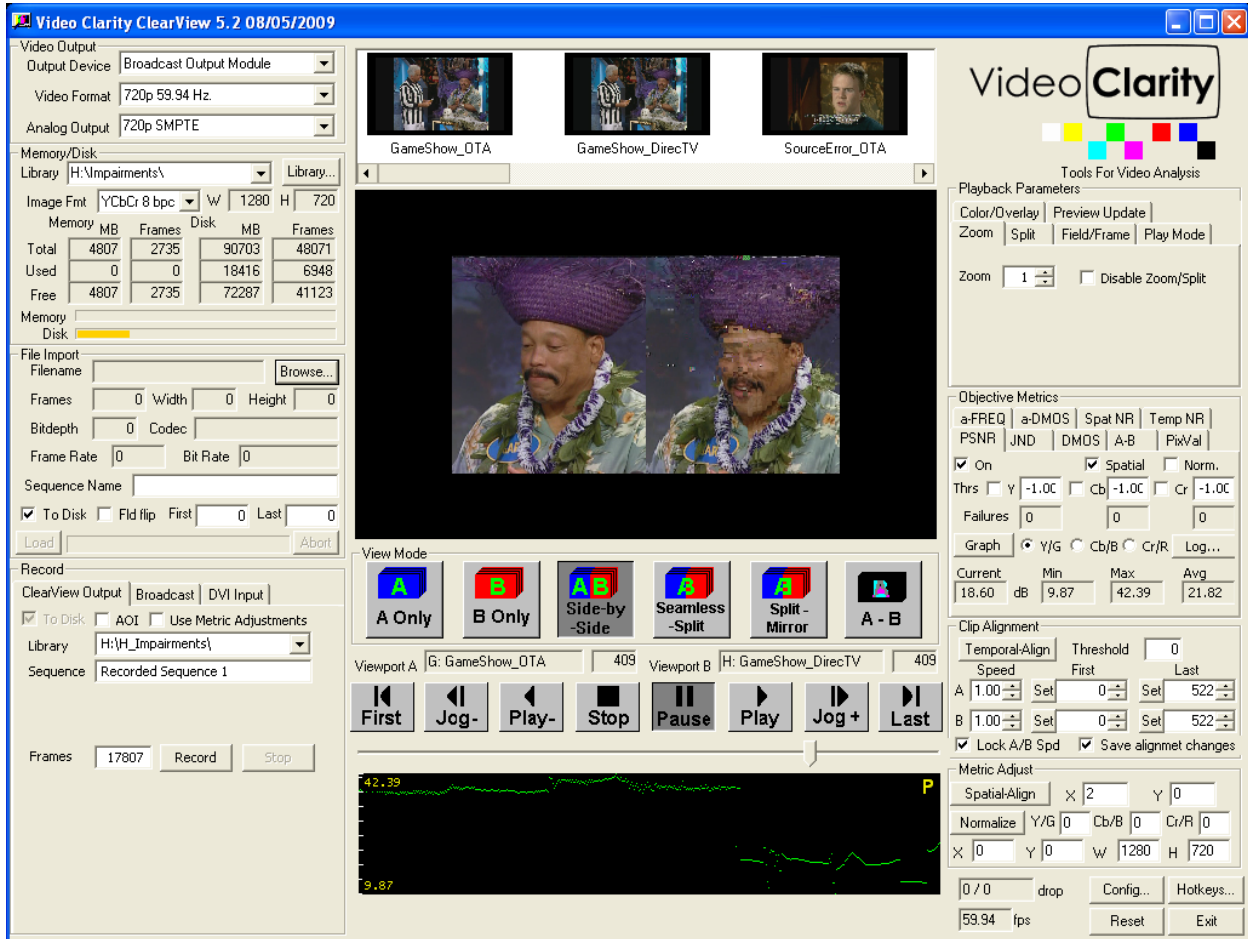
```

```

Frame Y/G  Cb/B  Cr/R  Y/G  Cb/B  Cr/R  Y/G  Cb/B  Cr/R  Fail Y  FailCb  FailCr
000000 000.00 000.00 000.00 000.00 000.00 000.00 016.79 038.39 033.11 000000 000000 000000
000001 000.00 000.00 000.00 000.00 000.00 000.00 015.92 037.63 032.12 000000 000000 000000
000002 000.00 000.00 000.00 000.00 000.00 000.00 016.49 038.14 032.63 000000 000000 000000
000003 000.00 000.00 000.00 000.00 000.00 000.00 016.32 038.02 032.47 000000 000000 000000
000004 000.00 000.00 000.00 000.00 000.00 000.00 016.32 038.26 032.66 000000 000000 000000

```

Any .psnr or .audio file can be dragged onto the ClearView application for detailed post analysis. Dragging the files onto ClearView looks as follows



7. Command-Line Interface

The monitoring process can also be programmatically controlled via scripting by using RTMServer.exe and rtm.exe

RTMServer.exe

Once started, RTMServer.exe will receive commands from rtm.exe (the client) and allow scriptable control of the RTM system. This allows the ability for multiple units to be controlled from a single controller application. Commands can also be sent from other machines which have access to the RTM system via a network.

RTM ships with a desktop shortcut to start RTMServer. Double-Click to start and then open a DOS command window to send commands to RTMServer using the client rtm.exe.

rtm.exe

This is the client executable which acts as the command-line interface. This program must either be in the folder where commands are sent from or it the “path” environment variable. rtm.exe supports the following commands:

rtm Start

Initially Starts RTM after launching. Same as clicking the Start button in the main GUI.

rtm Stop

Stops RTM from monitoring. Same as clicking the Stop button in the main GUI.

rtm Realign

Initiates a full re-Alignment. Same as clicking the Re-Align button in the main GUI.

rtm saveConfig

Syntax: rtm saveConfig filename [bOverwrite]

rtm restoreConfig

Syntax: rtm restoreConfig filename

rtm ?

Displays available rtm commands

rtm ? <command name>

Displays syntax for requested command