Video **Clarity**

Tools for Video Analysis

Set Top Box Testing

The set top box testing suite checks a system under test for errors in playing out at any resolution, system info for newest updates (firmware, etc.), display timing info for zap time (time between changing channels), and boot time. These tests combine to allow a system under test to receive a pass or fail based on a threshold set by the user, such as the set top box takes over 2 minutes to boot up or the quality scores of the video and audio are below a set value. The test is able to build a report that will show if any system drivers or firmware is out of date and which tests the system has failed. Each test will need to have a recording of the idea system should show, i.e. the initial screen when booting up, or the correct system info page, which is used for full reference testing. Each test is run from a Perl script that will communicate with ClearView and read results from log files. Each script can be customized to fit any cases the set top box may have.

The current scripts communicate with set top boxes through a device called IRTrans, http://www.irtrans.com/en/shop/usb.php. The script could also communicate with the set top boxes through RS232 or any other programmable interface that can be managed through command line. Most of the video tests use the PSNR , a pixel to pixel root mean squared comparison metric, to test for similarities in the frames of the video. The descriptions of each test follows.

Zap Time

Zap Time tests the time it takes for the video for a specified channel to return after the inputting the channel. This is done by using a frame of what the video returning should look like in the case of a menu appearing. This could also take into account the time it takes from when the screen goes black until any color video returns. The test uses PSNR to find when the channel returns. This test also is able to test a measurement for the loudness of the channel, the metric is called Apeak.

In order to run the script, there needs to be a frame of a channel change recorded with the name "ZapFrame" which displays what the channel should look like when the timing should stop. In the case of only testing when video returns, it is only necessary to test against a black screen.
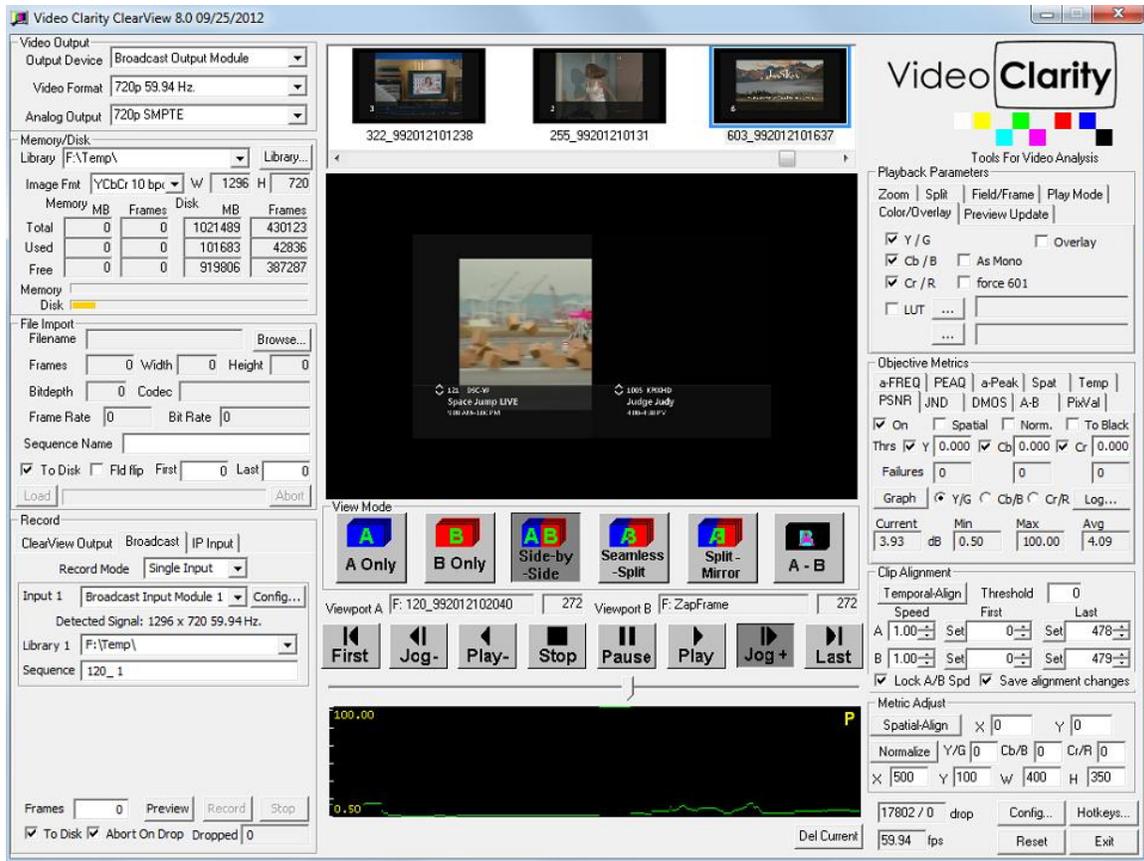
There are some other files that allow a user to customize how the script is run. ChannelChange.txt (can be named differently) will need to be created and specified the location of in the GUI. This file is the list of channels that the test will run, in the sequence listed.

There is also a configurable GUI for zap time testing.
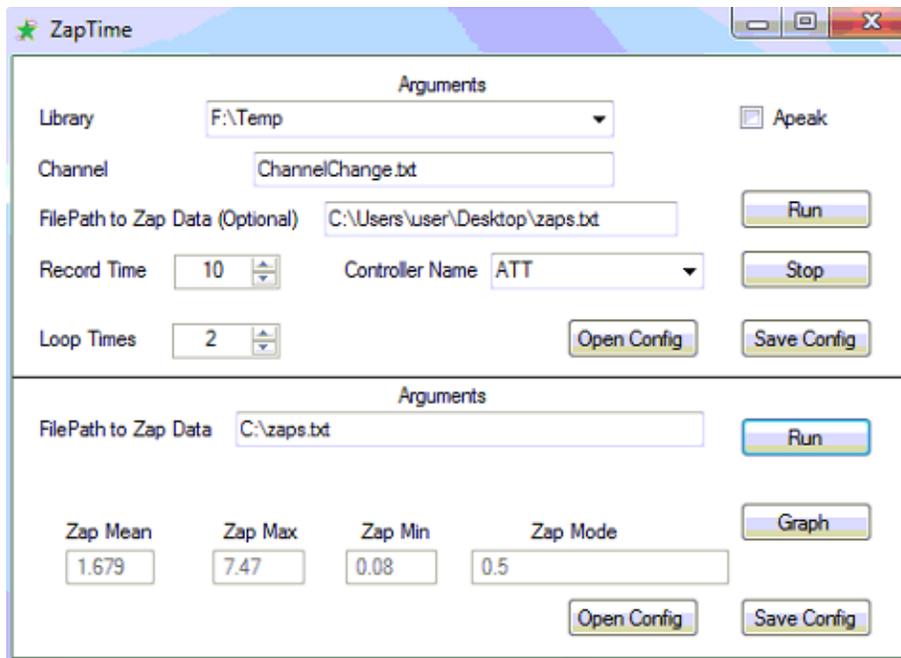
-Library value is a drop down that gives the choice of where to record the sequences to; this needs to be the same library as where the ZapFrame sequence was recorded.

-Channel is the file path to the channelchange.txt.

-Record time is the time in seconds to look for a channel change, needs to be long enough to record the video coming back.

-Controller Name is the name used when recording a controller for IRTrans

-Loop Times is the number of times to loop through ChannelChange.txt.

-The checkbox with Apeak next to it is to run loudness test.

- File Path to Zap Data is the file path to the data created from the first step.

-The graph button creates an excel file of the data with a graph.

-The Save Config buttons save the current textbox states of all the inputs.

-The Open Config buttons allows you to choose the GUI's config file to open.

When these values are all entered, hitting run will start the script. The resulting files, text and excel files, will be located in the same directory as specified.

Boot Time

Boot time testing is done by finding recording from the set top box until the boot up screen is shown or video has started to play from the system. This can be testing by both either using the power button on the remote or doing a hard reboot by using a

web power switch, whose use is integrated into the script, to turn off power to the machine.

The time produced in the output file is the time in seconds that the system takes to boot up to the point specified. This test can also be used to give a pass or fail rating by using a threshold value for seconds it takes to boot up.

System Info

The system info of a system can be checked for differences from the most up to date version of the machine. A recording of what the correct settings and firmware needs to be saved to a ClearView library in order to test. This is done by setting a metric window and running a PSNR over the set area to test whether the version number or settings match with the most up to date system.

This can be customized to output which settings and/or firmware are out of date or set incorrectly.

Quality Test

The quality test checks a known and available source video coming from the set top box and into the ClearView. The source is played out of the set top box through the interface under test (HDMI, component, composite) and recorded into ClearView as the perfect or golden source that contains no errors. All output interfaces and video formats can be tested at once, as long as there is a golden reference recording corresponding to that format and output interface saved prior to the test run in ClearView. When the test is run any number of testing metrics can be used for audio and video (PSNR, DMOS, JND, AFREQ with Lip sync, APEAK   with True Peak and Loudness, or A-PEAQ perceptual audio quality), since the script is highly configurable to the user's needs. Please see the ClearView data sheet for further explanation of these measurements here …

ClearView Datasheet

This script can be customized to output either the results from the log files as scores per frames, or a failure based on a threshold for the entire sequence or per frame.

Example of set top box connected to ClearView QA.
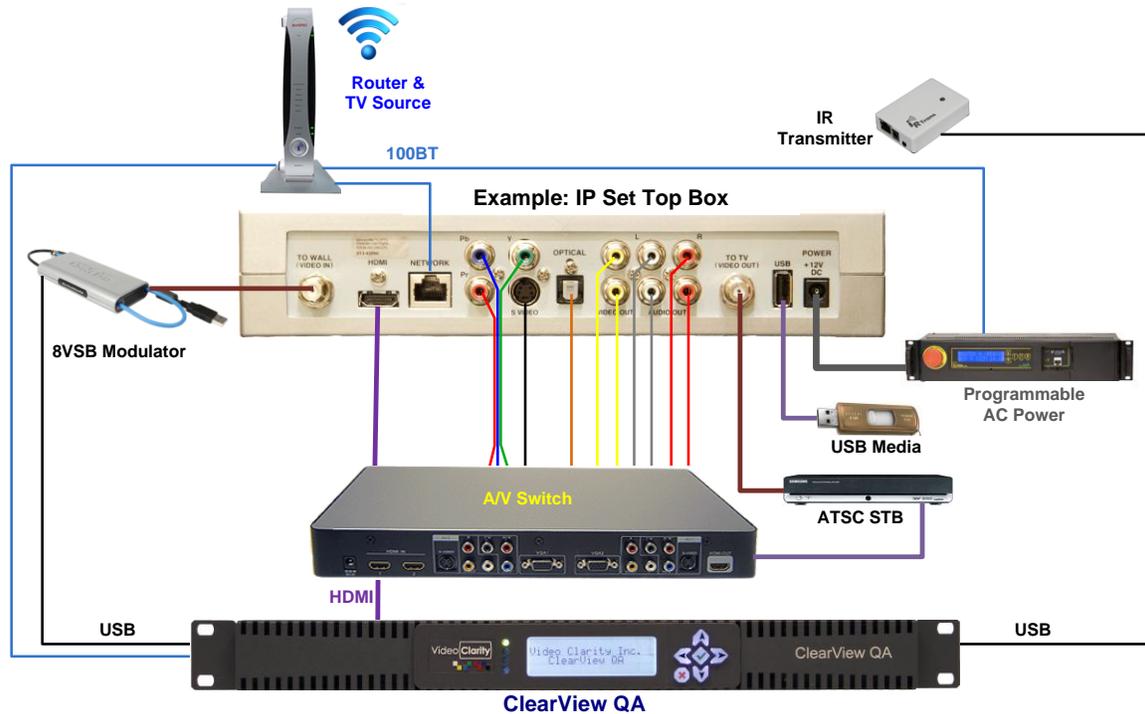
Note that the interface to ClearView QA can be individually addressed with direct input from a device and is pictured and detailed below.

ClearView QA and Shuttle Model Inputs & Outputs

The CV-SDI-IO-LHi module on ClearView Shuttle and QA models records and plays HD/SD video and audio. It is capable of up to 1080P/60Hz record and/or playback. ClearView stores the video data as 100% uncompressed 8/10-bit 4:2:2 Y'CbCr. The inputs and outputs are any of HDMI, HD-SDI and Component, Composite, S-Video along with digital and analog audio.

Analog audio and video are carried on a supplied break out cable.

Capture & Playout Standards

Video Standards	
Digital Inputs & Outputs	Analog Inputs & Outputs

SMPTE 259/292/296/424/425a/425b
  - 8 or 10 bits per component
2-channel v-1.3a HDMI
  - 1 input and 1 output
3G, HD-SDI, SD-SDI
  - 1 input and 1 output
	12-bit HD Analog Component I/O
	12-bit SD Analog
	Component/Composite/S-Video on
	shared three wire BNC
	  - 3 BNC for input
	  - 3 BNC for output

Audio Standards:	
Digital Inputs & Outputs	Analog Inputs & Outputs

2-ch Balanced XLR AES /EBU
  - 24-bit 48KHz
  - 1 XLR with 2 mono channel in
  - 1 XLR with 2 mono channel out
8-ch SDI Embedded Audio I/O
  - 20-bit 48KHz in each SDI in/out
2-ch HDMI Embedded Audio
  - 1 in, 1 out - 20-bit 48KHz
	2-ch Balanced Analog Audio
	  - 2 XLR input, 24-bit 48KHz
	  - 2 XLR output, 24-bit 48KHz

I/O Format
Standard Definition (SD)
525i 59.94 Hz
625i 50 Hz

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

CV-SDI-IO-LHi Module's Breakout Cable