



## White Paper: Video Testing for STB Manufacturers

By Bill Reckwerdt, CTO  
Video Clarity



This paper explores the challenges Video Equipment Manufacturers face when assessing video quality. Assessing video quality ultimately depends on the customer's reaction on their new display (PC, POD, TV, etc.).

Set-top box (STB) functions are continually advancing, but the customers' reactions are usually centered on the quality of the picture. So testing is increasing important. The test setup simply stated is

- Start with a known video sequence.
- Decode the processed video sequence.
- Capture the processed video sequence.
- Display a "gold standard" and processed video sequences.
- Bring in experts to subjectively vote.

Complexity arises as

- New Video Processing systems may need new equipment to playback the video sequences.
- The original and processed video sequences should be displayed in random orders.
- Expert viewers are expensive and do not produce repeatable results.

So a need arises to perform quantitative, repeatable objective scoring of the video.

### Previous Options

Each vendor builds unique test equipment to verify their new algorithms. So the first job is to debug the test equipment before it can be used to verify a new design. Debugging the test equipment can take as long if not longer than debugging the display equipment.

### Easier Solution

To streamline the process, equipment for video quality testing needs to be defined, which can capture, play, and analyze any two video sequences. Further, as new input/output modules are continuously under development, the test equipment should use an open-architecture approach to ease upgradeability.

The following are the key attributes of a robust video quality testing tools.

- Allow a way to import video sequences regardless of their file type – i.e. AVI, QuickTime, Raw, Video Editor, MPEG, etc.

- Serve video sequences to the decoder using DVB-ASI or an IP connection
- Capture the output of the decoder.
- Convert all video sequences to user-selectable resolution, bit depth, and color format so that they can be displayed multiple viewing modes on the same display.
- Support 8 and 10-bit data paths with upgradeability to future 16-bit modes.
- Store the video sequences as frames (fields) so that they can be played at any rate.
- Allow multiple playing modes such as play, shuttle, jog, pause, zoom and pan.
- Apply objective metrics to the video sequences to score the video frame-by-frame, and log/graph the results for easy analysis.
- Export pieces of video sequences to further analyze off-line.

### Case Examples

In all of the following examples, the tests can be performed using software mockups of the actual hardware.

A Set-top Box (STB) or Decoder manufacture needs to

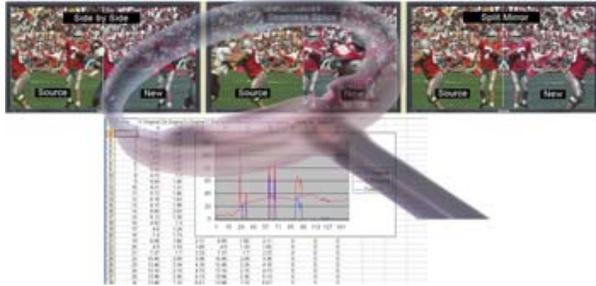
- Serve a video sequence to the decoder(s).
- Capture a "Golden" video stream or the results of one of their competitors.
- Capture the output of their unit.
- Visually inspect the "Golden" stream compared to their decoded stream.
- Generate a Score for pass/fail.

**Figure 1: Video Testing for STB Manufacturers**





**Figure 2: Multiple Display Modes with Objective Scoring**



Using this setup, the decoder manufacturer, can test their video quality with respect to their golden sequence, one of their competitors algorithms, or a previous generation algorithm.

The objective metrics are logged for archiving, and the entire process can be fully automated.

### The Author

Bill Reckwerdt has been involved in digital video since the early 90's from digital compression, video on demand, to streaming servers. He received his MS specializing in Behavioral Modeling and Design Automation from the University of Illinois Urbana-Champaign.

He is currently the VP of Marketing and the CTO for Video Clarity, which makes quantitative, repeatable video quality testing tools. For more information about Video Clarity, please visit their website at <http://www.videoclarity.com>.