

Video Preservation Project: No Setup vs. Setup

When doing transfers of analog video materials, there are a variety of choices available to the preservation specialist. Each tape is different depending on certain factors including the quality of stock, the quality of the transfer, the setup of the system that the video was produced with, and others. It is important that all of the elements of the transfer system in the deck are calibrated and properly setup so that the best transfer is possible. This paper will tackle the setup procedure important to getting the best transfer possible from an analog videotape. The paper will first explore the components necessary in the setup of the equipment so that the best transfer occurs and the optimal circumstances are available for the person doing the transfer. The setup of a video transfer involves calibrating the playback monitor, calibrating the monitoring equipment and utilizing the TBC and video processor. The paper will then explore a few case studies in comparing various videos depending on the setup of the equipment.

Defining the Project

The project for this paper is defined as follows. Four tapes were chosen to transfer to digital files through a Mac using Final Cut Pro. Two Umatic tapes and two VHS tapes, with differing production quality, were chosen. The two Umatic tapes included a Sonic Youth tape in color with very basic titles and a black and white tape by Jen Cohen. The VHS tapes included a production titled *Demon Lover* and a Hitchcock film, *Dial M for Murder*. Three transfers were conducted for each tape, and two to three minutes of each transfer was migrated to digital for further analysis. The first transfer was a straight migration from video to digital, without patching the signal through the monitoring equipment or the deck. The second transfer was patched through the Time Based Corrector (TBC) and video processing unit, calibrated to the SMPTE color bars. The third transfer was patched through the TBC unit calibrated optimally to the tape's own signal. These three will be explained in more depth later in the paper. All results were analyzed using the readings from the scopes and the scopes in Final Cut. Before any transfers were conducted, first the monitoring equipment and the entire system was checked for optimal performance. The first step in this process was to transfer the tapes without any setup.

Step 1: Calibrating the Monitor¹

The first step in the project was in calibrating the video monitor on the deck. This is necessary so that the system performs at optimal level. It is important to have a monitor built specifically for monitoring video signals. Two elements that separate monitors built for this purpose and those

¹ Works consulted and photos from

Bob Currier. *Calibrating Video Monitors* Synthetic Aperture. Accessed 12/2011 at www.synthetic-ap.com.

Using Color Bars to Calibrate an NTSC CRT Monitor. Accessed 12/2011 at http://spareroommedia.com/video/monitor_setup.html.

Hal Landen. *Color Bars and How To Use 'em*. Video University. Accessed 12/2011 at www.videouniversity.com/articles/color-bars-and-how-to-use-em.

that are made for watching television are the color temperature and phosphors differences. The monitor was calibrated by checking the blue portion of the image and the brightness of the monitor. The signal or sync generator was first patched to the monitor, allowing for the SMTE standard color bars to be displayed on the monitor. It is from this point that the monitor's hue, Chroma, and brightness levels to be adjusted so that it can be properly calibrated.

Color bars with labels:



The blue color signal was checked using the monitor's Blue Only button located along the bottom of the monitor's controls. This button allows for the blue color signal to be shown through all three CRT guns, and thus, the blue portion of the image is only shown on the monitor. The blue portion of the image is the most unstable, or noisiest, and thus, stabilizing the blue signal allows for the technician to gage how noisy the video signal is. The Blue Only button was pressed on the monitor. The color bars are then displayed solely in blue hues. Hue and Chroma levels can now be adjusted. The four vertical bars were adjusted so their blues matched the horizontal bars directly below them. When all of these bars are the same, the hue and Chroma levels on the monitor are calibrated properly.

Properly calibrated Hue and Chroma:



The brightness levels were then calibrated utilizing the color bars by pressing the button on the monitor's controls to display the color bars in gray scale. If this is not possible, the Chroma can be adjusted to its lowest point so no color is visible, only the gray scale. The three small vertical bars under the large vertical bar second from the right (or the red) are called the PLUGE bars or Picture Line-Up Generating Equipment bars. The brightness button should be used to adjust brightness until all three bars are visible, and then adjusted down until the two left bars do not

deviate in gray scale (one more adjustment will make them separate grays). Then the Contrast is adjusted up until the bar on the right is very bright, and then it is adjusted down just to the point that the white bar, or the second from the right bar at the bottom, begins to change. The middle PLUGE bar and the horizontal Black bar above it should be the same shade, and make a T shape.

Correctly calibrated brightness and contrast:



The monitor is now calibrated correctly and can be used properly in monitoring video images.

Step 2: No Setup

The first transfer for each of the four tapes patched the video deck directly to the computer. Two to three minutes of each of the tapes was transferred from the deck into Final Cut on the Mac computer in the lab. The tapes and files will be defined as follows:

1. Umatic Sonic Youth Video, color with minimal titles and no color bars
2. Umatic tape by Jen Cohen, black and white, color bars
3. VHS tape titled Demon Lover, low production, no color bars
4. VHS tape, Universal's Dial M for Murder directed by Alfred Hitchcock, no color bars

The videos were monitored visually while transferring and a few observations were made. The first tape, Sonic Youth video, displayed a flickering of the image. The image was very blue, which could be because of the production lighting or a consequence of the quality of production. The whites were very low and the signal was very unstable. The Jen Cohen video demonstrated heavy dropout. The Demon Lover video showed high white levels leading to a washed out image. Dial M for Murder visually displayed high levels of saturation in its colors. All these observations were made visually with the use of a calibrated monitor and by looking at the scopes in the deck. These observations will be compared in the last section.

Step 3: Calibrating the Monitoring Scopes against a Test Signal

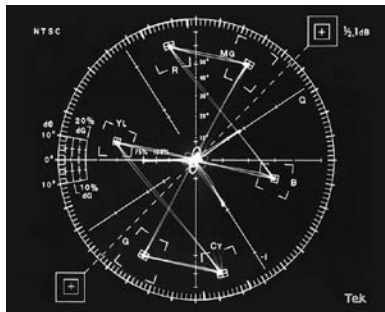
Setup for a video system occurs by patching the signal to be tested through the scopes, or waveform monitor and vectorscope, so that the input path can be tested, observed, and measured and so that the output signal is best captured. The waveform monitor and vectorscope are used to measure the video signal itself. The waveform monitor measures the luminance of the signal, while the vectorscope measures the chrominance. The time based corrector and video processing unit adjust the signal according to the readings on the scopes to capture the best signal.

As a reference, the first transfer utilizing the TBC and monitoring equipment was done by

calibrating the machines to a test signal. This is also known as a null transfer. The null transfer is used as a reference for the third test. To do this, the test signal was generated from the sync generator and patched to the monitor and scopes. This produces SMPTE color bars (NTSC). The TBC levels were adjusted so that the scopes were properly calibrated. The signals are now properly articulated so that monitoring is accurate. The TBC has the capacity to change four levels including the waveform luminance, waveform black level, hue, and saturation. Patching the color bars from the synch generator through the TBC and into the monitor provided a reference signal, and the levels were adjusted utilizing knowledge of how the waveform monitor and the vectorscope should be processing the signal visually.

Checking the display and adjusting the TBC involves a few things. On the vectorscope, a bright dot should be in the center of the display, and the color burst signal is used as the control. It should be on the horizontal line and the vector should extend to the left of the center dot, or at 9 o'clock. The vectors illustrate certain aspects of the color signal; the placement of the vector indicates hue, while the length of the vector indicates saturation. The display from the test signal, or color bars in general, should show vectors that fit neatly into the color boxes on the vectorscope.²

The color bars as seen on the vectorscope: ³



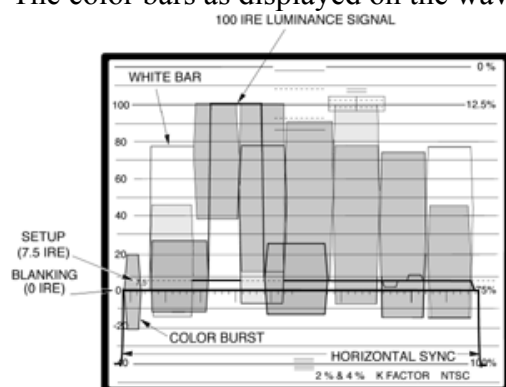
The waveform monitor reflects the signal's luminance, or white and black levels. The luminance and black levels can be monitored. First, the image is adjusted so the horizontal sync pulse is at the -40 line, aligning the 0 line and the color burst from -20 to 20 IRE units. The luminance of the active signal should then be displayed between the 7.5 line and the 100 line, or the blacks at 7.5 units and the whites no higher than 100 units.

² Weise and Weynard. How Video Works. Page 97.

³ Vectorscope photo from

http://www.tek.com/Measurement/App_Notes/NTSC_Video_Msmt/vectorscope.html

The color bars as displayed on the waveform monitor with detail:⁴



TBC levels were adjusted so that the scopes displayed the correct visuals as described above. Black levels were adjusted first, then luminance, hue, and saturation. All four tapes were patched through the TBC and into the computer.

TBC levels for null transfers were:

Luminance: -5

Black: 4

Hue: 35

Saturation: 4

Step 4: Calibrating the TBC to each tape signal

The third set of transfers was done by calibrating the video signal to each tape. The black levels, luminance levels, hue levels, and saturation levels were adjusted for each tape. Only one tape had color bars at the start of the tape, so the other tapes were adjusted visually using the calibrated monitor and taking into account the signal levels as displayed on the vectorscope and waveform monitor. The TBC was adjusted accordingly and recordings were made. The following values reflect the levels as adjusted on the TBC by viewing the signal on the vectorscope and waveform monitors.

1. Umatic Sonic Youth Video, color with minimal titles and no color bars.

Luminance: 6

Black: 10

Hue: 35

Saturation: 34

The major change in the Sonic Youth video was that the saturation was increased significantly in accordance with lifelike flesh tones. Minor changes occurred in the other readings. Below is a shot of the scopes for the first transfer without the use of the TBC. This transfer showed significant signal loss throughout the video, with a loss of some of the footage in real time. The use of the TBC stabilized the video so there was no more signal loss. The third transfer allowed for an adjustment of the levels so flesh tones were more in accordance with their acceptable levels. The last photo shows a comparison of the three

⁴ Waveform monitor photo from

http://www.tek.com/Measurement/App_Notes/NTSC_Video_Msmt/wfmmonitor.html#Color

transfers. The top left is the transfer without the TBC, the top right is the null transfer, and the bottom center is the saturation adjusted for acceptable flesh tones on the third transfer. Saturation change is noticeable.



2. Umatic tape by Jen Cohen, black and white, color bars

Luminance: 6

Black: -2

Hue: 34

Saturation: 12

The Jen Cohen tape was in black and white but the luminance values were adjusted so they were not as bright. The white values are significantly lower in both TBC transfers. The saturation was adjusted to the color bars value at the start of the film even though the film was in black and white. Below are images in order from the straight transfer, the null transfer, and the TBC calibrated to the tape transfer.



3. VHS tape titled Demon Lover, low production, no color bars

Luminance: -8

Black: 20

Hue: 34

Saturation: 34

The Demon Lover tape shows very high white values, way too high for broadcast standards, on the straight transfer. Calibrated to the TBC on the second transfer decreased the luminance with a loss of some of the color. The third transfer allowed for a combination of lower brightness levels but without the loss of saturation. Below are screenshots from left to right of the transfer with no setup, null transfer, and transfer calibrated to the tape.



4. VHS tape, Universal's Dial M for Murder directed by Alfred Hitchcock, color bars

Luminance: -26

Black: 24

Hue: 34

Saturation: 24

The following photos show from top to bottom, no setup transfer, transfer through the TBC calibrated to the sync generator, and transfer through the TBC calibrated to the tape. It is difficult to discern the first two images visually but the saturation is increased on the third one, and the visual does not look as washed out.



Conclusions

All of the transfers showed a remarkable improvement when using the TBC. The null transfer, while effective, produced a lower quality visual in all of the tapes against calibrating the TBC levels to the tape itself, even when there are no color bars present. This of course comes with its own risk, as the technician doing the transfers must make subjective quality judgments that may not be the same as others would make, so they should be done by qualified trained technicians.