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Analog Vectorscopes and Direct Current Restoration (DC Restore)

A vectorscope is a visual tool used to monitor color in an analog video signal. Like other oscilloscopes, a vectorscope is a type of “free-running” or programmable CRT (Lee, Dana M). Instead of the zig-zagging, left-to-right pattern we are accustomed from a video monitor, the cathode ray tube inside of a vectorscope is designed to respond to the video’s color signals. In the days of analog video production, a vectorscope, waveform monitor, and test signal generator were the key apparatuses used to assess the fidelity of a video signal (VintageTEK Museum). Today, this tool has been appropriated as a built-in feature on digital cameras or in editing software that form part of modern production environments. For video digitization, it is important to know the basic functions of a vectorscope in order to attain color accuracy during capture.

Unlike a waveform monitor, which is dedicated to measuring the luminance, or the intensity of white light, the vectorscope compliments our understanding of the video signal by breaking down color as a combined measurement of chrominance and luminance, also known as saturation, and color pigment, also known as as hue (Weynand et al. 63). The vectorscope accomplishes this color reading by decoding the chrominance subcarrier, or color portion of the video signal, through vectors on a graticule. The trace or length of a vector represents the saturation, and direction or position of the vector is representative of its hue (Weynand et al. 93).

The graticule is an overlaid set of lines on a circle that act as a guide. The graticule is designed to mark target specific color values within boxes when calibrating a color bar signal (Weynand et al. 92-3). In other words, each color in a color bar signal is assigned its own box. The graticule circle is divided like a pie by primary colors (red, green, blue) as well as secondary colors (cyan, magenta, yellow). When calibrating, the goal is to make sure each graticule box is marked by a vector point. Prior to making adjustments, it is important to ensure that the sync pulse, seen as a small dot in the center, is aligned with the center of the graticule circle (VintageTEK Museum). The burst of a color subcarrier, seen as a short line along the X axis of the graticule, should align at the nine o’clock position of the circle (Weynand et al. 93). To adjust

values to achieve these target areas, one simply needs to adjust the gain (amplitude of chrominance) and phase (hue) in the vectorscope control settings.

In a waveform monitor control panel, you will often find a button called “DC REST” or “DC Restore.” This is another way to describe the “clamp capacitor” installed in the machine, and more generally points to the electrical current running through a waveform monitor (“AC/DC Coupling on an Oscilloscope”). Because a video signal is a high frequency alternating current (AC), the current must then be “coupled” in order to limit the scale of the waveform measurements. Otherwise, readings on the graticule scale would skew outside of parameters. However, when this happens, the AC coupling causes the waveforms to oscillate back-and-forth between the high and low frequencies, cancelling out the ability to get an accurate reading on the scope. To remedy this, the DC or direct current restorer is made to stabilize the waveforms in order to get an accurate reading. It does this by locating the sync portion of the signal and fixes itself to it (Lee, Dana M). In a video capture setting, it is recommended to leave the DC restore on to attain an accurate reading of the color signal (Lee, Dana M).

Sources

“AC / DC Coupling on an Oscilloscope” June 27, 2011. Youtube. Video, 9 min 25 sec. https://www.youtube.com/watch?v=Hkq-fvb5-NI. (Accessed October 14, 2018).

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Weynand, Diana, et al. How Video Works: From Broadcast to the Cloud. Third Edition. Focal Press, 2016.