SENCORE®

Means Success In Electronic Servicing

tech tips

Understanding The NTSC FULL FIELD And SPLIT FIELD Patterns

The NTSC FULL FIELD and SPLIT FIELD patterns supplied by the NT64 NTSC PATTERN GENERATOR were designed by the Electronic Industries Association (EIA) and are listed in their RS189A standards. The NTSC color bar patterns are required by some VCR manufacturers for warranty work, and match many of the schematic waveforms for testing and calibrating VCRs. Together, the VA62A UNIVERSAL VIDEO ANALYZER and the NT64 combine to form the only complete video troubleshooting system with integrated phase locked signals. This Tech Tip gives an in depth explanation of the patterns provided by the NT64, and discusses some applications of the patterns.

The NT64's Patterns Give You Precise Vector Colors For Testing And Aligning Color Circuits

The NT64's patterns contain seven vertical color bars. Three bars are the primary colors; red, blue, and green. Three bars are the secondary colors; yellow, cyan, and magenta. The seventh bar is grey (75% of peak white). A secondary color is made of equal amounts of two of the primary colors; yellow = red and green, cyan = green and blue, and magenta = red and blue. Grey is made of equal amounts of all three colors. The FULL FIELD pattern consists only of these bars extending from the top to the bottom of the screen. The SPLIT FIELD pattern contains the same seven color bars with an additional four bars at the bottom of the screen.

Full Field

Each color bar is said to be 75% saturated. This means that if all three colors were mixed to make white, the resulting white level would be only 75% the amplitude of a true (100%) white signal. This is, in practice, the largest amplitude combination of color signals that can be applied to a TV transmitter without over-modulating it. Here's why:

Fig. 1: The NT64 NTSC PATTERN GENERATOR provides the EIA RS189A standard FULL FIELD and SPLIT FIELD patterns required by manufacturers for VCR servicing.

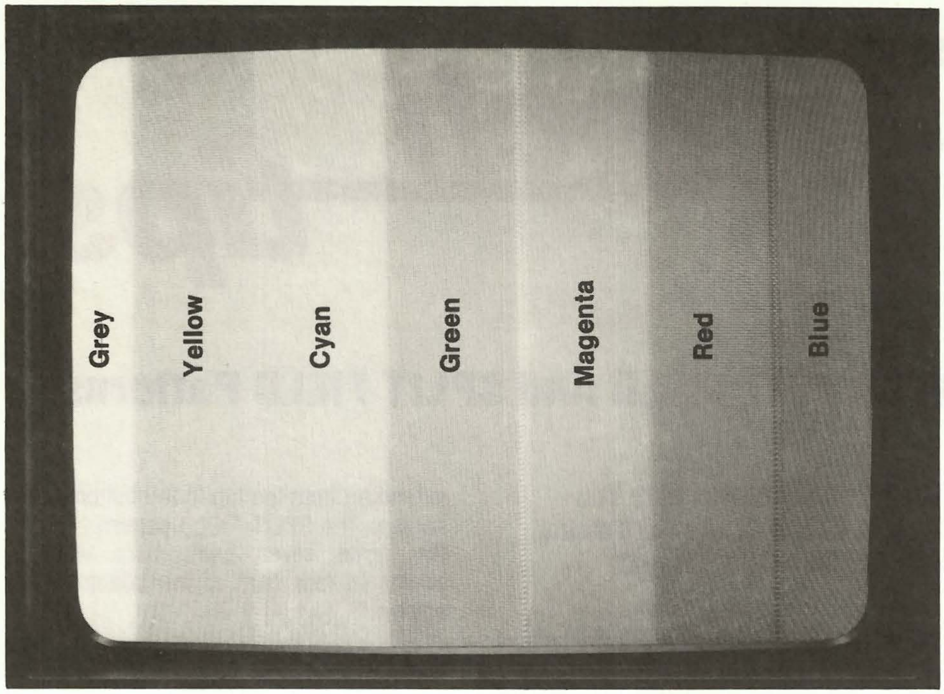

Fig. 2: The above photo shows seven bars that make up the FULL FIELD color pattern.

Each pure color contains two separate signal amplitudes; one representing the luminance (brightness) and one representing the color level (saturation). The luminance level is the average level of the two signals or the midpoint of the 3.58 MHz color information for each bar. The luminance channel of a receiver simply filters out the color signal to recover the luminance signal. The EIA color patterns line up to form a seven-level staircase in the luminance channel (*NOTE: Unlike the VA62A's 10 Bar Staircase signal, these steps are not evenly spaced).*

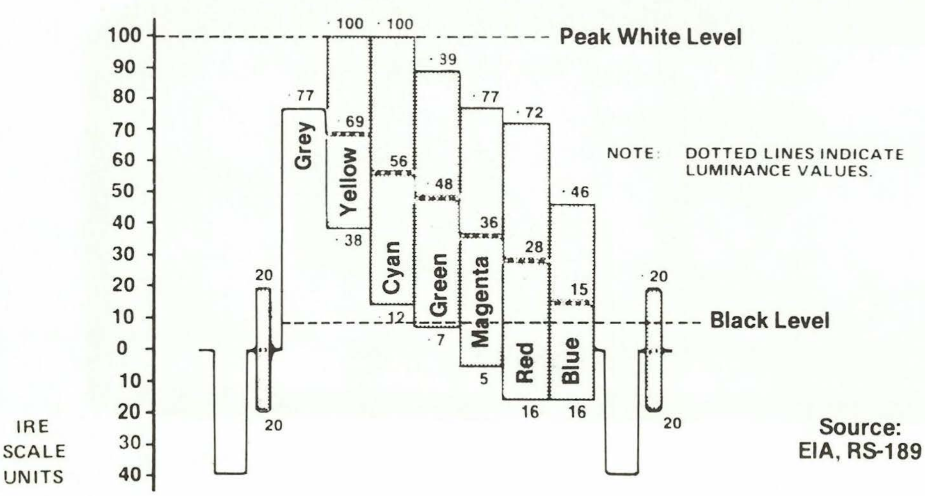

Fig. 3: Each color bar has a specific luminance level plus a specific chroma level. The luminance level is the midpoint of the chroma level. The peaks must not extend higher than a peak white bar.

The 75% saturated bars are the highest amplitude that can be applied to a transmitter because the combination of the luminance signal plus the chroma signal brings the top of the yellow bar and of the cyan bar to be the same as the 100% white bar. Any higher amplitude would cause the transmitter to be over-modulated.

Split Field

The SPLIT FIELD pattern is identical to the FULL FIELD pattern for the top 75% of the screen. The bottom quarter of the screen has a different combination of signals for special tests. The left half of the added split-field information is divided into three areas; -I, white, and Q. The right half of this area is pure black. The white bar is 100% white, as opposed to the 75% white bar on the left-hand side of the color bars. The black area is slightly lower in amplitude than the smallest step of the staircase pattern formed by the luminance content of the color bars.

Two of these signals are samples of the I and Q subcarriers used to develop the different colors. The I signal is 180 degrees phase shifted from true I (minus I) which gives it the same amount of blue content as the Q bar for special applications in setting up color studio monitors.

The top part and the bottom part of the SPLIT FIELD pattern overlap when viewed with an oscilloscope (as shown in Fig.5) allowing all the bars to be viewed simultaneously for comparison. Notice how the 100% white bar (from the lower part of the SPLIT FIELD pattern) lines up half way between the yellow and cyan bars (in the top part of the SPLIT FIELD pattern) for direct comparison of the two color bars that should be the same amplitude as 100% white.

Use With A Vectorscope For Setting The Saturation And The Color Tint

The NT64 color patterns are generally used with an NTSC vectorscope. These are special instruments that separate the chroma from the composite video signal and then graphically represent the color saturation (amplitude modulation) and the color tint (phase modulation) of the chroma signal.

The vectorscope screen has markings (small boxes) for each part of the SPLIT FIELD color bar pattern. The boxes show the correct position of the vectors for the

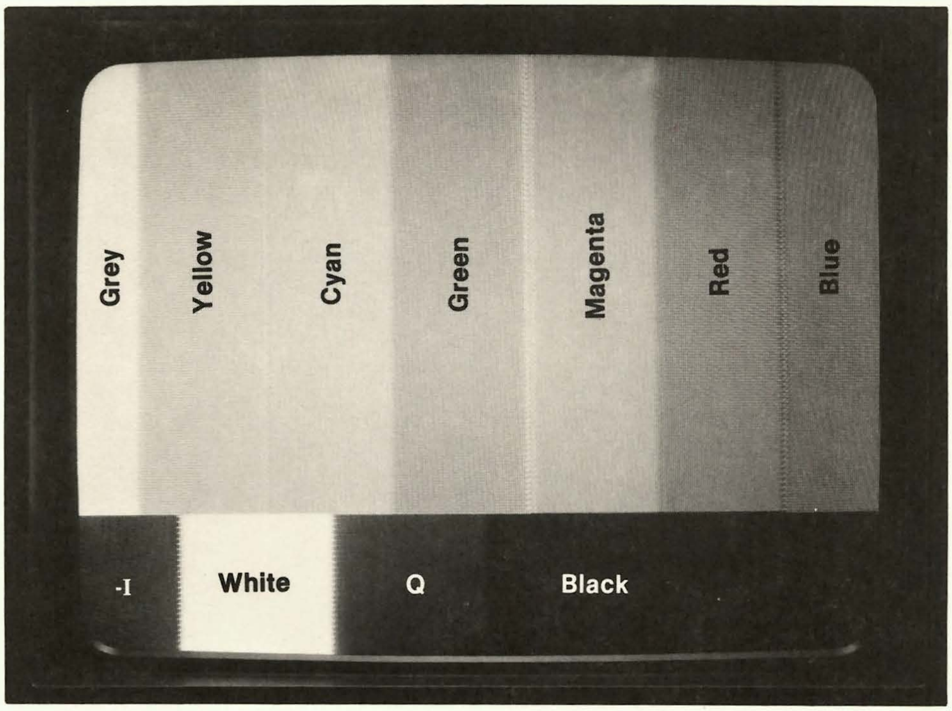

Fig. 4: The top 3/4 of the SPLIT FIELD pattern is the same as the FULL FIELD pattern. The bottom quarter has a bar for -I, one for white, one for Q, and the remaining half of the bar is black.

color burst, all six of the primary and secondary color bars, and the -I and Q bars. The color saturation and tint are correct if the vectors fall inside the correct boxes on the vectorscope graticule.

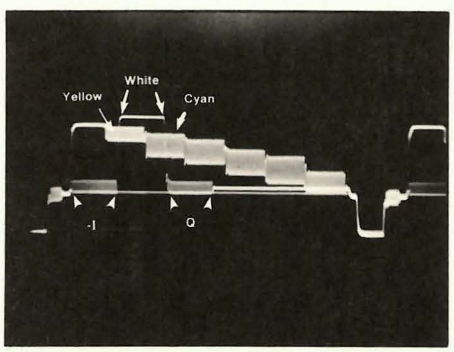

Fig. 5: The top and bottom parts of the SPLIT FIELD pattern overlap when viewed on an oscilloscope. Notice how the yellow and cyan bars both have the same peak amplitude as the white bar from the bottom part of the screen.

Most applications needing a vectorscope involve video devices (such as cameras or tape recorders) that have controls that affect color phase and amplitude. Most broadcast equipment, for example, have controls that affect one or both parts of the color signal. These controls are adjusted until the dots representing the color signals on the vectorscope fall inside the corresponding boxes.

Other vectorscope applications involve recording a signal and then playing it back to see if the color signals are distorted in the recording/playback process. The applications of an NTSC generator, here, are only in the recording circuits, as any playback adjustments should be made using the color bar pattern from a reference tape recorded on a perfectly adjusted recorder.

After the playback circuits are properly adjusted, it will be necessary to record a segment of tape, and then play it back. The color phase or amplitude control in the recording circuit is then turned a small amount, and a new test is recorded and played back. The results on the vectorscope indicate whether the adjustment made the signal better or worse. This is repeated until the control is within the correct tolerance.

Testing The Chroma Frequency Response With The NTSC Patterns

The -I and Q signals do not fully test the chroma frequency response of a TV. The frequency response typically is in the range of 500 kHz either side of 3.58 MHz. The smaller the object to be reproduced by the TV the greater the response must be in order to see color in that object.

The -I, Q, and the other color bars have far less bandwidth ranging from 57.2 kHz for the -I and Q signals to 66.7 kHz for the FULL FIELD color bars. To fully test the frequency response of the chroma bandpass circuits, you should use the CHROMA BAR SWEEP pattern of the VA62A. A full 1 MHz bandpass is needed to pass the 3.08 and 4.08 MHz bars.

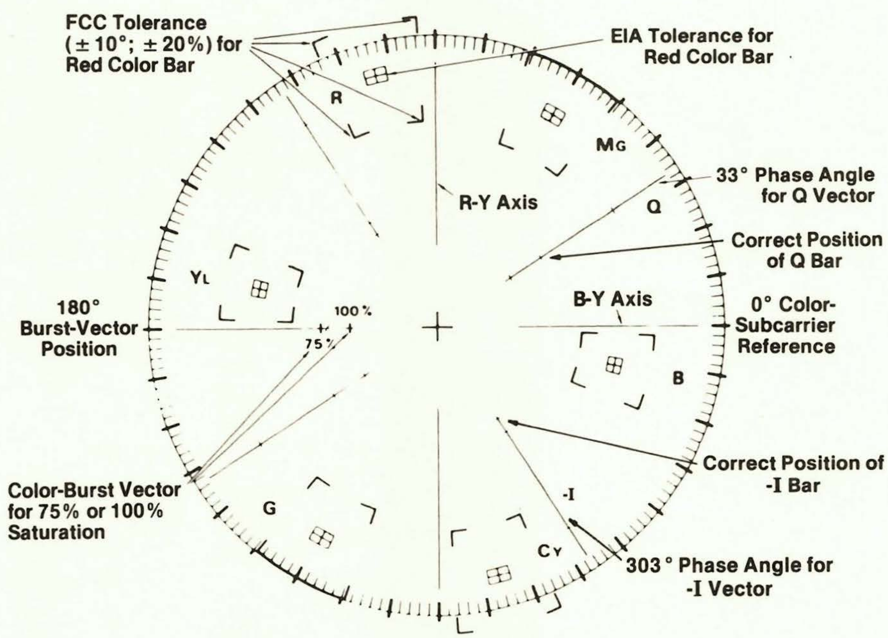

Fig. 6: The graticule of an NTSC vectorscope has a box for each part of the SPLIT FIELD pattern. Each vector is within FCC tolerances if it falls in the large outside box, and within EIA tolerance (RS189-A) if it falls into the smaller box. The cross in the center of the small box represents "zero" error.

Form 4158 Printed in U.S.A.