

## 4KScope Software Waveform, Vectorscope, Histogram and Monitor

### 4KScope - a 4K/2K/HD/SD Video Measurement Tool

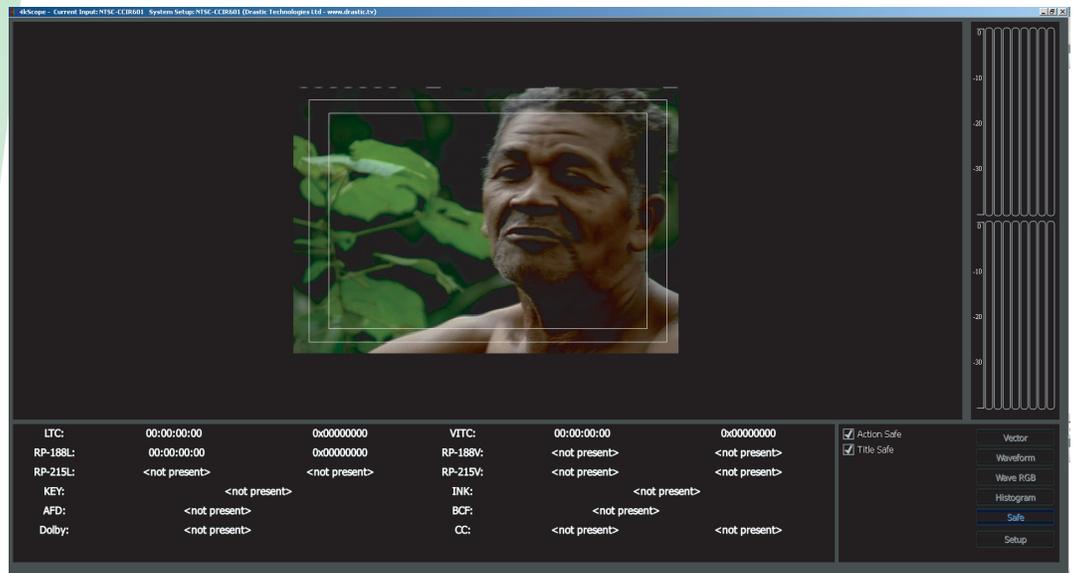
View your color bars, test patterns, live camera or telecine signal for device or facility installation, setup, commissioning/certification and other operational reference. Confirm that the color gamut and analog transmission limits are not violated and that the color phase is accurate. Multiple inputs may be compared when viewing the output of a switcher, to coordinate a multi-device setup

There are five main views: Vectorscope, Waveform (YCbCr), Waveform (RGB), Histogram and the Picture view.

To the right of each of these views either 8 or 16 audio meters are displayed.

Below each view the real time metadata is displayed. Metadata fields include: LTC (longitudinal time code) from the SMPTE/LTC input, VITC (vertical interval time code) as encoded in the vertical blank, RP-188L (LTC marked HANC time code), RP-188V (VITC marked HANC time code), RP-215L (audio time code from KLV vertical blank), RP-215V (video time code from KLV vertical blank), also RP-215 keycode, R-215 Ink code, AFD (active format description), and BCF (broadcast flag).

All closed captioning is decoded from SD 608 and HD 708 signals, and will soon be optionally displayed over the picture..



### Input and Output Modes

#### Video/Audio Inputs (hardware dependent)

- Single Link SDI/HD-SDI
- Dual Link HD-SDI
- Quad Link HD-SDI (Quad HD and 4K)
- 3G Dual Link
- 3G Dual Rate
- HDMI
- Analog inputs (with an alternate video board)
- Embedded audio, up to 16 channels (hardware dependent)
- AES/EBU audio, up to 16 channels (hardware dependent)
- Analog audio (with an alternate video board)

#### Metadata

- LTC/SMPTE analog time code and user bits
- VITC/D-VITC vertical blank time code and user bits
- RP-188 HANC time code and user bits
- RP-215 VANC time code, user bits, key code and ink code
- Active Format Description detection

#### Output

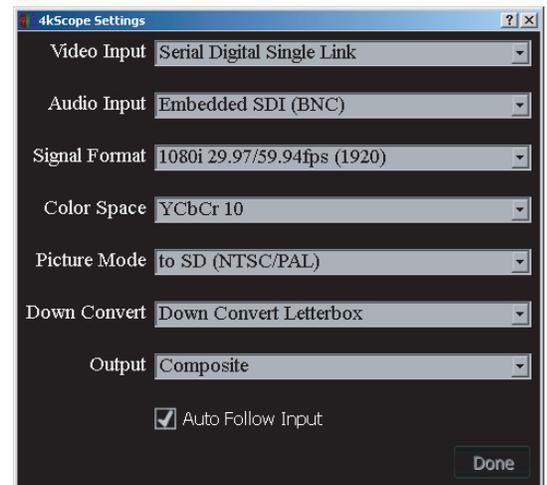
- Main output designed for a standard DVI 1920x1080
- Secondary down converted output available
- SD/HD/2K down conversion to HDMI and analog
- HDMI 4K quadrant output

#### Multiple Format Support (hardware dependent)

- SD - PAL/NTSC
- 720p - 23 / 24 / 25 / 29 / 30 / 50 / 59 / 60
- 1080i - 23 / 24 / 25 / 29 / 30
- 1080psf - 23 / 24 / 25 / 29 / 30
- 1080p - 23 / 24 / 25 / 29 / 30 / 50 / 59 / 60
- 2K Digital Cinema (2048 x 1080) - 23 / 24 / 25
- 2K Film (2048 x 1556) - 14 / 15 / 23 / 24
- Quad HD (3840 x 2160) - 23 / 24 (requires Kona 3G)
- 4K (4096 x 2160) - 23 / 24 (requires Kona 3G)

#### Processing Modes

- YCbCr 8 bit 4:2:2
- YCbCr 10 bit 4:2:2 (standard single link)
- RGB 8 bit 4:4:4
- RGB 10 bit 4:4:4 (standard dual link)
- Full active picture
- Up to 32 lines of vertical blank
- HANC processing for audio and time code



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## Vectorscope display

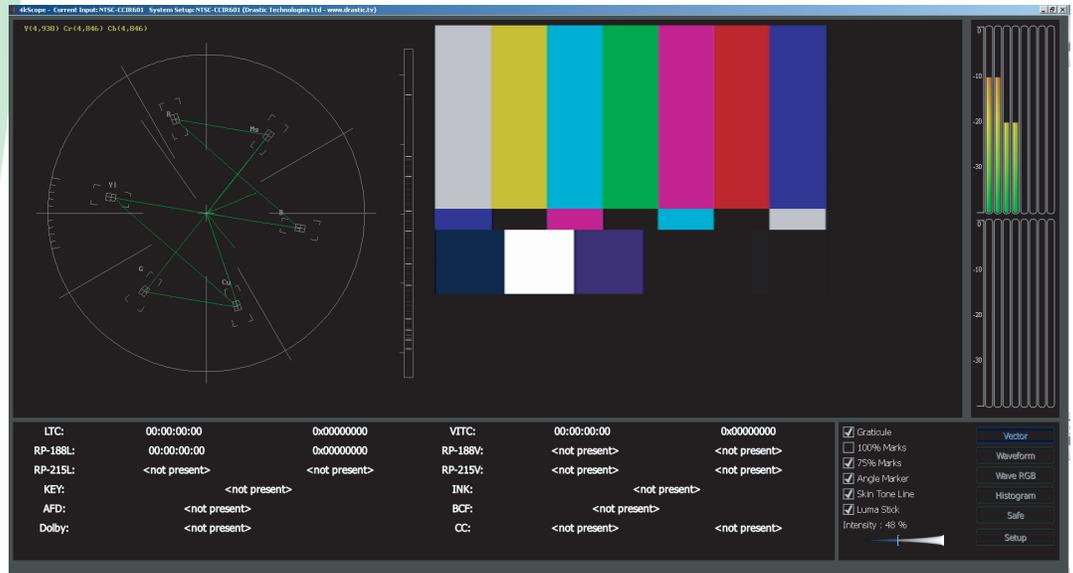
The vectorscope displays a traditional Cb by Cr X-Y display with overlaid reference graticule. Color accurate graticules automatically switch between SD and HD colorspace. The markers include color points (for standard bar checks) at 75% and 100% saturation. All the standard points are boxed; red, magenta, blue, cyan, green and yellow. A skin tone/flesh line is provided to allow for easy hue adjustment as well as standard diagonals.

The exclusive Drastic Luma Stick (patent pending) displays luminance distribution and strength in a space saving and intuitive graphic format.

At all times a minimum and maximum value for each of the channels (Y, Cr and Cb) is displayed in 10 bit mode (0-1023). The color of the text for each channel indicates the following: in range (green), out of range but legal (yellow) and illegal/sync values (red).

Finally, a mini pic is always available as a confidence monitor.

For single link 8 and 10 bit YCbCr signals, there is no color processing involved. For dual link 4:4:4 RGB signals, the equivalent Cb and Cr are calculated to create the display.



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## Waveform YCbCr Display

The YCbCr waveform monitor displays the levels of the Y, Cb and Cr from the left of the picture to the right of the picture with all the lines summed into one graph. The Y, or luma/luminance, graph provides accurate white and black level information, as well as the range in between. The Cb and Cr display the +/- 512 levels of chroma of both types. This provides a visual representation of the chroma range of the signal.

Critical for downstream color correction is the need to ensure proper luminance levels at the stage of initial capture, so any corrections will not muddy or wash out the signal information.

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For single link 8 and 10 bit YCbCr signals, there is no color processing involved. For dual link 4:4:4 RGB signals, the equivalent Cb and Cr are calculated to create the display.



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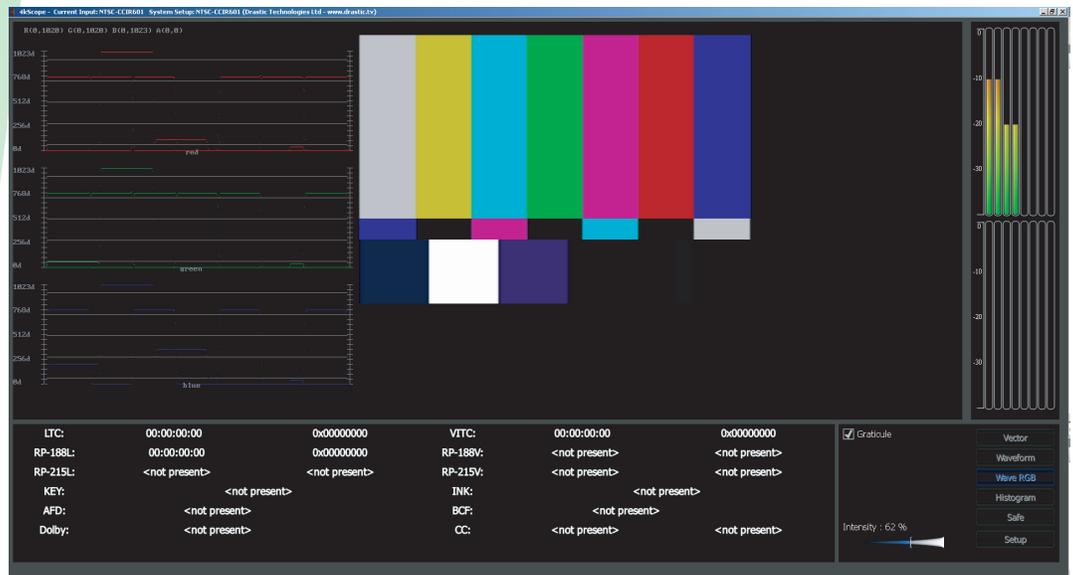
## Waveform RGB Display

The RGB waveform monitor shows each of the red, green and blue signals as independent graphs, displaying the RGB, or chrominance/color values associated with the signal.

At all times a minimum and maximum value for each of the channels (R, G and B) is displayed in 10 bit mode (0-1023).

Finally, a mini pic is always available as a confidence monitor.

For dual link RGB signals, the original RGB 10 bit values are used unprocessed. For single link YCbCr signals, they are first converted to RGB before being analyzed and displayed.

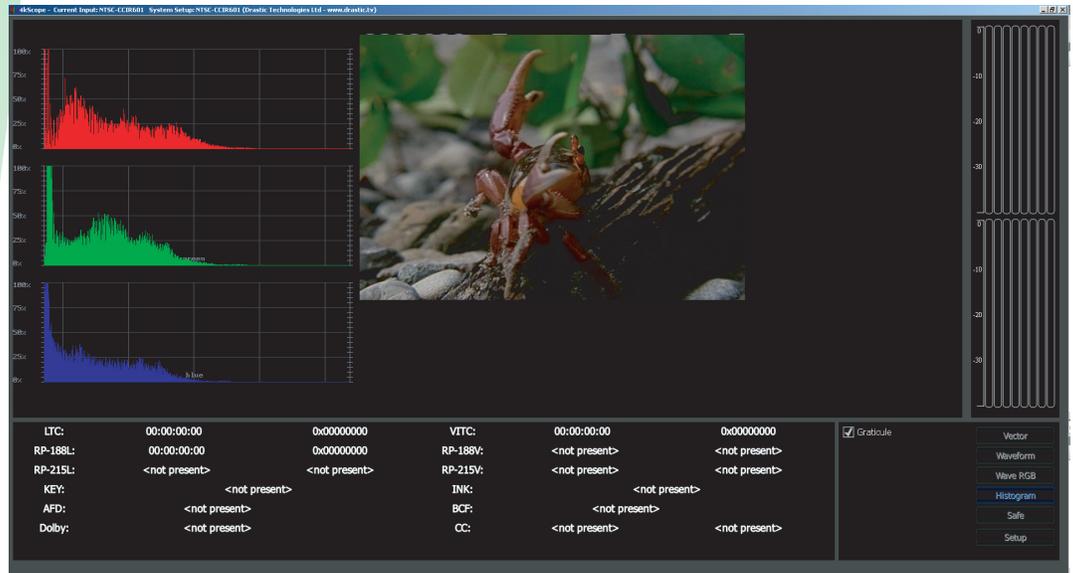


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## Histogram Display

The histogram view shows the distribution of red, green and blue within the signal as a series of discrete bars that make a continuous graph for each color. This display provides an overview of the tonal range of each color in the picture. Each bar is the count of the number of pixels for one of the 1024 possible colors. These totals are then auto ranged to fit within the graticule and represent the relationship between the shades of each color and between each other.

Each color has its own graph. The color's levels are represented from left to right, with the absolute left being 0 and the absolute right being 1024. The scale is presented as a percentage to allow for extremely bright or dark pictures to be analyzed without truncating.



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### Picture Display

The Picture view shows the video signal, to confirm the source is correct and to display time code location. Both picture safe and title safe graticules are optionally available.

There is a scaled down version of the signal input on the right of each of the vectorscope, waveform monitors and histogram views. They are a useful reference but smaller than the Picture view. This view exists to provide the fullest display of the signal for optimum quality viewing.

