4kScope
Signal Analysis Software
Version 6

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About 4kScope

4kScope Drastic 4kScope Version 6 is the world's most powerful 4K through SD software signal monitoring tool. It includes waveform (luma, YCbCr, RGB), vectorscope, histogram, chromaticity, and data/picture monitor for video. It also includes audio histogram, phase, RMS, peak and loudness monitoring for up to 16 channels. Raw hex views of the video and OP-47/CEA-708/CEA-608 closed caption decoding, with support for CCIR-601, Rec.709 and BT.2020 color spaces and HDR10/ST-2084 luma processing.

Designed to take advantage of BlueFish444, AJA, Matrox or Blackmagic's Quad HD, 2SI and 4K capture modes in both Rec.709 or BT.2020, 4kScope provides the most cost effective SD/HD/4K signal monitoring solution available. Available for Windows XP through 10, and Apple OS-X 10.8 or greater. Blackmagic DeckLink/Intensity/UltraStudio cards are also supported. It provides the following signal analysis tools:

- Picture, with zoom and pan
- Closed caption detection, decode and displayed
- Multiple timecode displayed
- Data View
- Vectorscope
- YCbCr Waveform Monitor
- Luma Waveform Monitor
- RGB Waveform Monitor
- RGB Histogram
- Luma Histogram
- Chromaticity
- Status, including MaxCLL and MaxFALL
- Audio Vectorscope
- Audio Phase

- Audio Histogram
- Audio Waveform Monitor
- Audio Metering (Loudness, RMS and Peak)
- Freeze and compare
- Save signal and scopes to image
- Standard desktop software with remote access

Reference

The reference section provides a detailed look at each of the elements in the **4kScope** graphical user interface.

Main Interface Overview
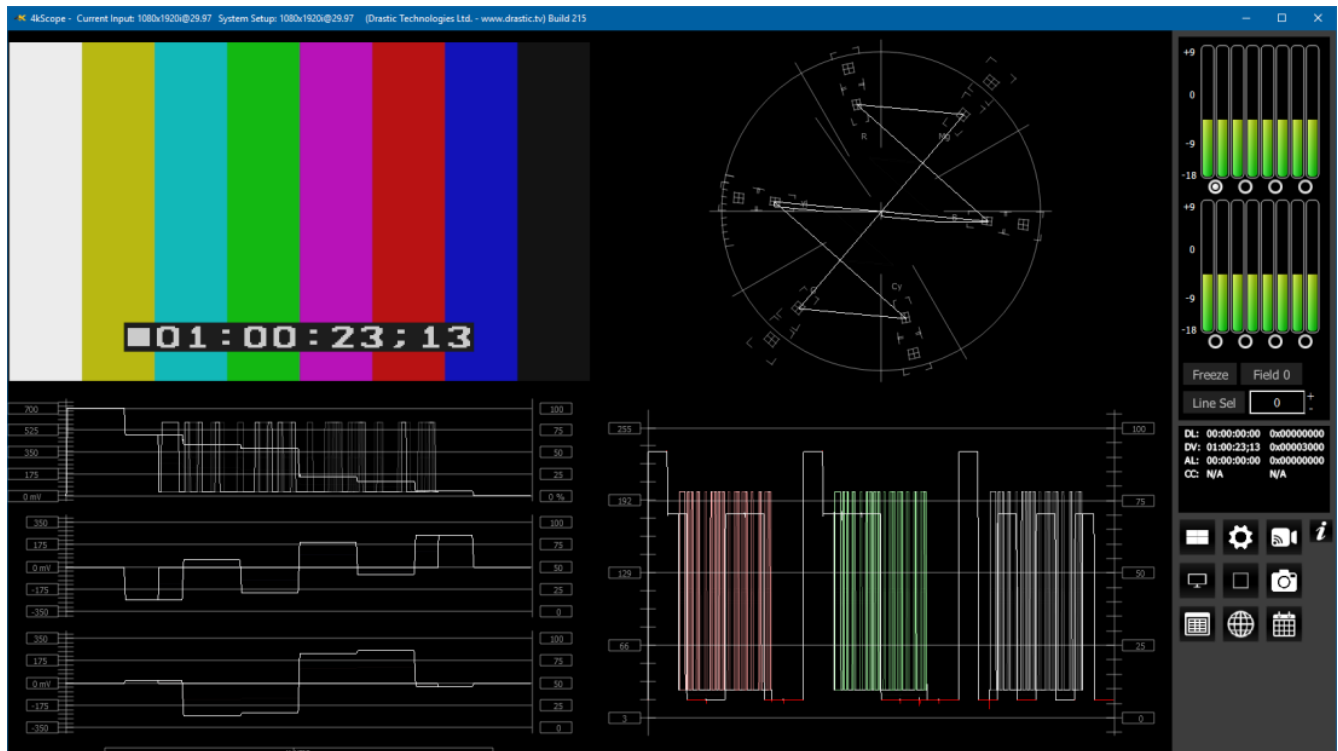
Display Area – this is where the various scopes, meters, or data will be displayed. The scopes, monitors and displays can be laid out using four different layouts: single, side by side, four quadrants, and six up (three across, two down). These can be selected in the Scope Config window. The Data View can be selected by clicking the Data View button.
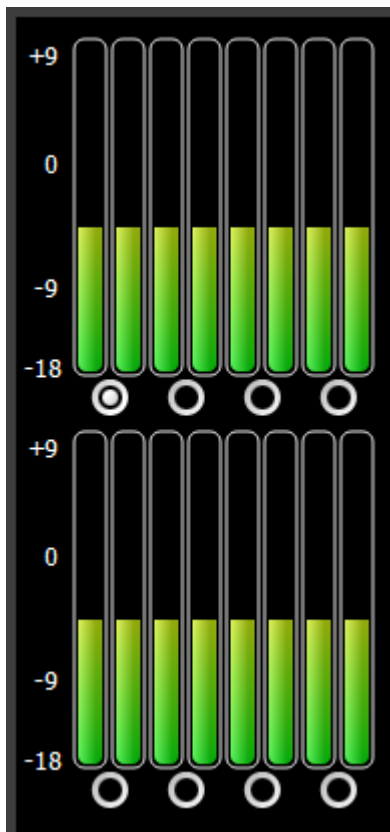
Audio meters - To the right of the scopes either 8 or 16 audio meters are displayed for loudness or peak/rms.
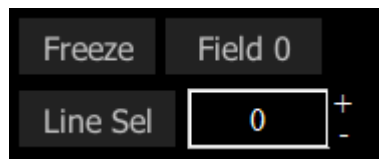
Freeze button – saves the current frame of video for closer inspection or comparison

Field/Frame/Live drop down – selects how a frozen frame will be displayed against the live video

> Field 0 – show field 0 frozen, field 1 live
> Field 1 – show field 1 frozen, field 0 live
> Frame – show the frozen frame
> Frame 50 – show 50% of the frozen frame and 50% of the live frame
> Live – show the live video (frozen frame is still saved)

Line Sel – when clicked, all the video scopes will analyze only the video line in the line selection box next to the button. This line will be highlighted on the in app video display.

```
DL:  00:00:00:00   0x00000000
DV:  01:00:23;13   0x00003000
AL:  00:00:00:00   0x00000000
CC:  N/A           N/A
```
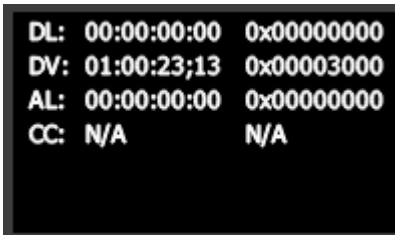
Status Display - displays time code and user bits for the RP-188 V and RP-188 L SDI inputs and the analog SMPTE time code input if available. If closed captions are detected, their presence and type are also displayed.

Scope Config button **–** opens a window which allows the user to configure the layout of the scopes, and the setup of each selected scope.

Settings button – Opens the Settings window, which allows the user to adjust settings for the video and audio type.

IP Setup button – opens a dialog to set up IP Sources and Targets.

About button – displays the 4KScope logo, along with version information.

Monitor Settings button – opens a dialog to set up the monitor to properly display the type of video being viewed.
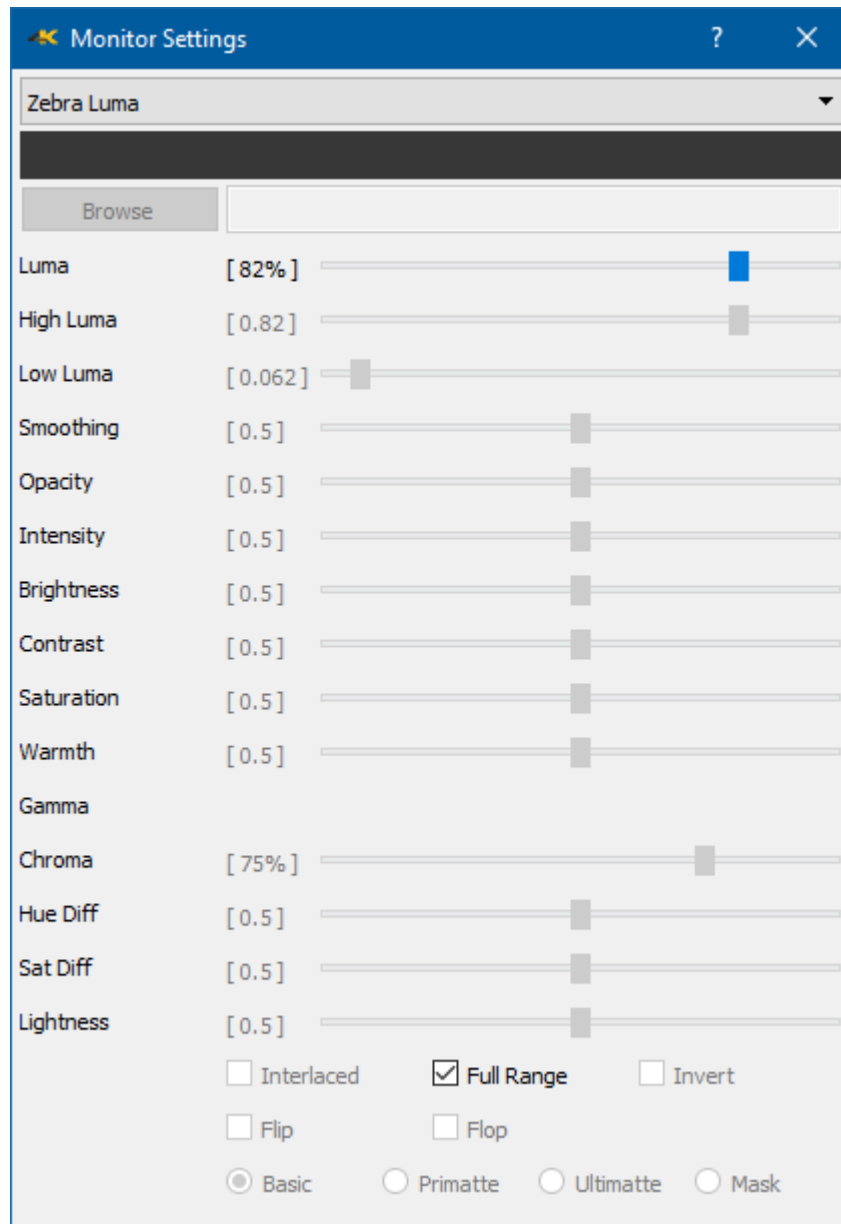
Monitor Settings window

Depending on the hardware, the following settings may be adjusted.

Pulldown menu at top
Browse button
Luma slider
High Luma slider
Low Luma slider
Smoothing slider
Opacity slider

Intensity slider
Brightness slider
Contrast slider
Saturation slider
Warmth slider
Gamma
Chroma slider
Hue Diff slider
Sat Diff slider
Lightness slider
Interlaced checkbox
Full Range checkbox
Invert checkbox
Flip checkbox
Flop checkbox
Basic checkbox
Primatte checkbox
Ultimatte checkbox
Mask checkbox

Manual button – opens up this manual for quick reference.

Frame Grab button – provides options for capturing a frame of video for reference. Opens the following dialog:
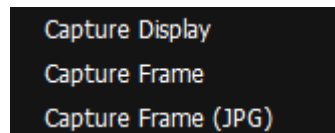
Capture Display – Capture the interface with the current video and scopes to an image
Capture Frame - The incoming image can be captured as a raw (YUV, V210, RGB10) image in full, bit perfect images to your Pictures/4kScope/ directory by selecting this option or by pressing <CTRL>-0. These can be read with videoQC or converted with MediaReactor.
Capture Frame JPG - by selecting this option or using <CTRL>-1, a JPG image can be captured in 8 bit YCbCr mode for easy reading and documentation. 10% and 50% JPG scaled versions can also be captured with <CTR>-5 and <CTRL>-9.

Data View button – opens the Data View window.

Globe button – opens up the web page for 4KScope.
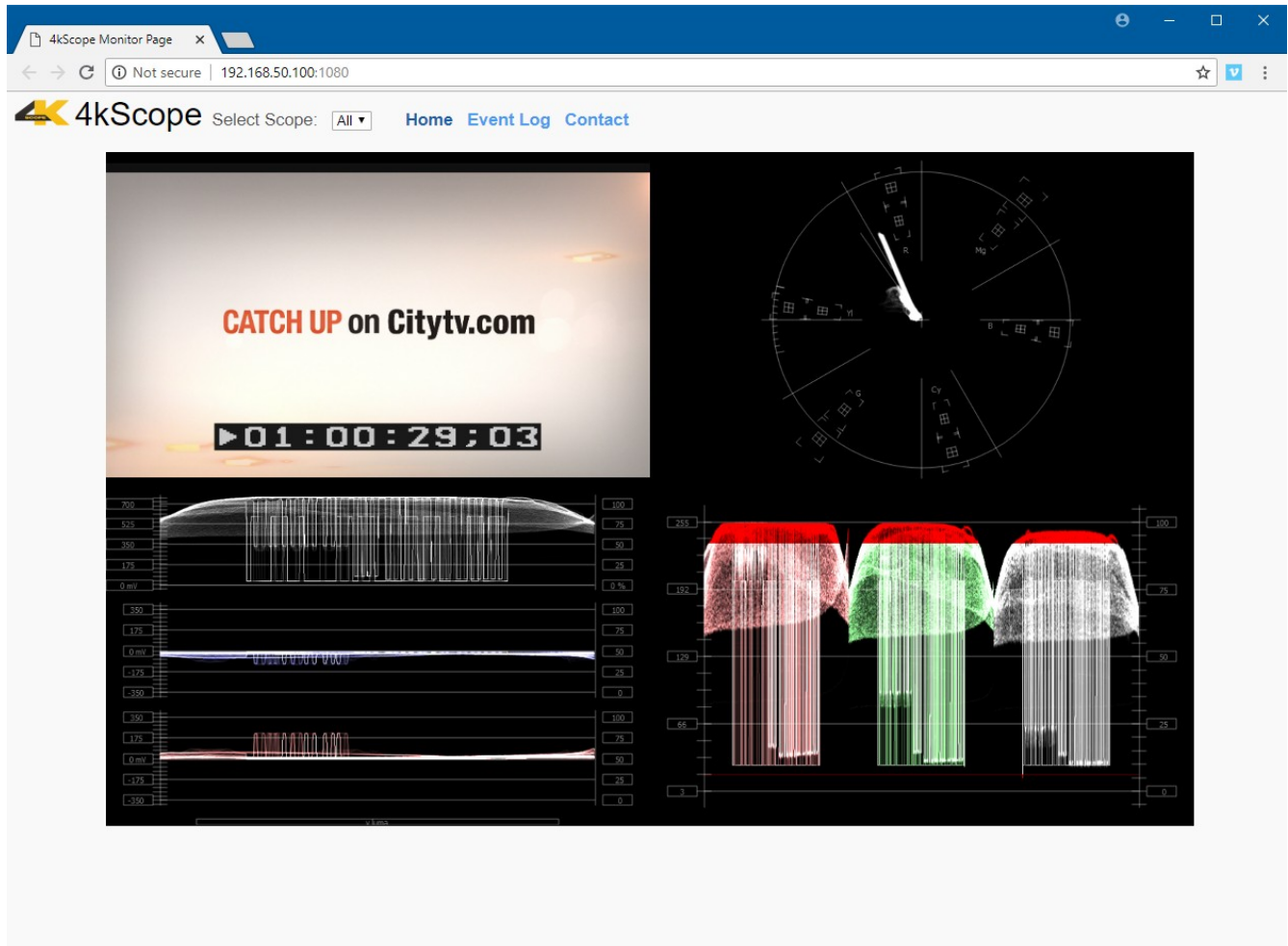
The web page lets the user set up and view scopes remotely.

Log button – opens up the events log, which allows the user to review specific types of events, useful for troubleshooting errors or other issues.

☐ Show info events ☑ Auto scroll

Show Logs

	Date-Time	Code	SubCode	Event	Description	Details
127	2018_6_18-15_5...	Hardware	0x00000002	0x0000000B	Closing video board	
128	2018_6_18-15_5...	Hardware	0x00000002	0x0000000A	Found and opened AJA video board	
129	2018_6_18-15_5...	Hardware	0x00000002	0x0000000A	Found and opened VGA board	
130	2018_6_18-15_5...	Hardware	0x00000002	0x0000000B	Closing video board	
131	2018_6_18-15_5...	Hardware	0x00000002	0x0000000B	Closing video board	
132	2018_6_18-16_0...	Hardware	0x00000002	0x0000000A	Found and opened AJA video board	
133	2018_6_18-16_0...	Hardware	0x00000002	0x0000000A	Found and opened VGA board	
134	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
135	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
136	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
137	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
138	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
139	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels
140	2018_6_18-16_0...	BroadcastIllegal	0x00000013	0x00000013	Video many broadcast illegal	Video has too many broadcast illegal pixels

IP Setup Window

Tabs - in SMPTE 2110 there are separate Video, Audio and Ancillary sets
Type pulldown menu - select the type of network video stream, SMPTE 2110 or SMPTE 2022.
Receive pulldown menu - select between network transport IP version 4 or version 6 for incoming
        streams
  Source Address checkbox and field - the address of the device sending the video
  Source Port checkbox and field - the port on the source device sending the video
  Destination Address checkbox and field - the address the video is going to
  Destination Port checkbox and field - the port the video is going to
  Interface checkbox and field - the IP address of the NIC that is connected to the source device
Send pulldown menu- select between network transport IP version 4 or version 6 for outgoing
        streams
  Source Address checkbox and field - the address of the device sending the video
  Source Port checkbox and field - the port on the source device sending the video
  Destination Address checkbox and field - the address the video is going to

Destination Port checkbox and field - the port the video is going to

Interface checkbox and field - the IP address of the NIC that is connected to the source device

Clock Source pulldown menu - select between Free run, internal or PTP 1588 Grandmaster

Clock Master pulldown menu - select a master clock source, or auto select

Data Rate field – set the data rate

Accept button - set any changes that have been made and close the setup dialog

Cancel button - close the setup dialog without making any changes

Settings Window

Video Input pulldown menu - allows the user to select between the HD-SDI, HDMI or analog inputs. In the case of dual link, 2 inputs are used. In the case of quad HD (3840 x 2160) and 4K (4096 x 2160), all four I/O ports of the 3D are in use, so the downconvert is HDMI and analog only.

Signal Format pulldown menu - displays the current setting, and allows the user to select between the formats supported by the I/O hardware.

Color Format pulldown menu - allows the user to select the processing mode. In the case of single link, this can be 8 or 10 bit YCbCr or RGBA 8. For dual link it is normally YCbCr 10 or RGB 10.

Primaries – select between the following primaries:

       601 - SD Color Primaries
       709 - HD Color Primaries
       2020 - HDR WCG Primaries
       Auto - Select the correct value based on the signal format

Transfer – adjust the Transfer Gamma setting

Picture Mode pulldown menu - allows the user to select how the conversion is done. All standard modes for up and down conversion are supported

Down Convert pulldown menu - allows the user to select the output signal type. The output can match the input or be converted to another up or down signal format.

Output pulldown menu - allows the user to select between available analog output formats. In SD this can be Composite, S-video or Component. For HD only component is supported.

Closed Caption pulldown menu - allows the user to select which closed caption format is to be displayed, or to not display closed captions.

Audio Input pulldown menu - allows the user to select between the embedded audio tracks (HD-SDI or HDMI depending on input), or the AES/EBU audio inputs. On some hardware, analog audio inputs are also available.

Audio Scale – change the audio meter modes between RMS, Loudness 9 and Loudness 18 modes

Preferred Scan – Select between the following scan settings:

   Interlaced
   Progressive
   Segmented Frame
   Auto - Select the correct value based on the signal format

Active Region fields – allows the user to set the active region of the video signal. X1 sets the upper left pixel location, Y1 sets the lower left pixel location, X2 sets the upper right pixel location, Y2 sets the lower right pixel location.

Auto Follow Input checkbox is selected, whenever the input type is changed, the settings for 4kScope are changed as well. If not checked, switching the input signal will not switch the settings.

Scope Vblank – by default, the waveform/vectorscopes do not use the vertical blanking area. If this is set, the vertical blank lines will be treated as active picture

Audio Channels - In systems that support 16 channel audio, the user would be able to select between 8 and 16 channel audio. Otherwise, only the 8 channel button would appear.

Audio Pairs - buttons allow the user to select the audio pair that will be monitored.

Training Mode checkbox - 4kScope version 6 and greater includes a training mode for use at educational institutions that purchase 4kScope. It is also available free for personal use. In this mode, the various scopes can be accessed using internal multi pattern video to practice or learn how to use waveform monitors/vectorscopes. All of the video scopes are enabled in this mode, and it does not require any hardware. The multi patterns will generate most of the standard patterns used in video testing, in the correct color space and transfer mode, from CCIR-601, Rec.709, BT.2020 and even HDR10.

If there is no AJA, BlueFish444, Blackmagic, Matrox or DirectShow video board in the system 4kScope is installed on, it will go into 'Training Mode' automatically. If you have one of these boards, you can enable training mode by clicking on the Setup (the button with a gear icon) and clicking the training mode checkbox at the bottom of the settings window. The software will have to be restarted for it to enter training mode.

Using 4kScope in training mode is essentially the same as using it in live mode, except that when you select a signal format, color space and transfer mode, an appropriate test multi pattern will be generated and used to feed the scope. The available patterns include:

NTSC Pattern


```
00:00:02:11 ABS
00:00:02:11 A0A0A0A0 LTC
00:59:58:23 A5A5A5A5 VITC
```
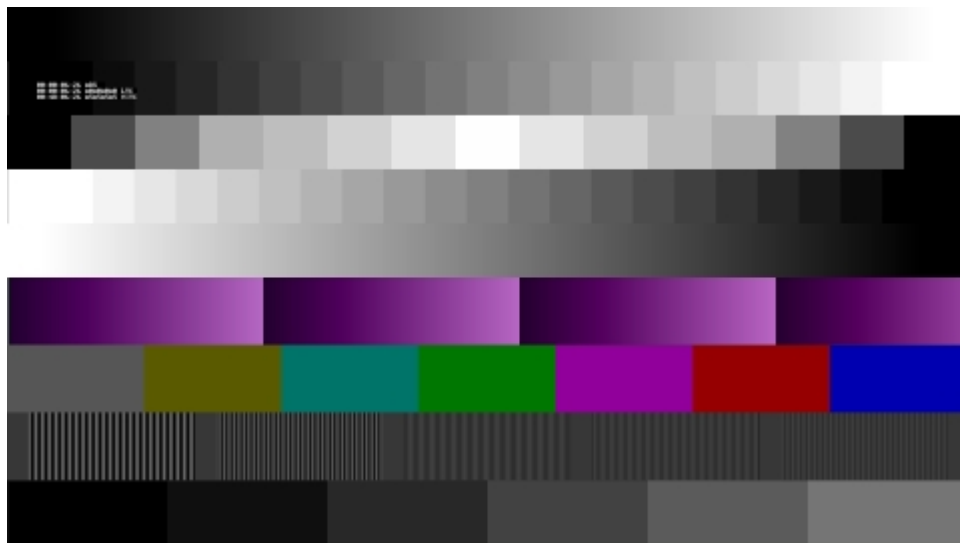
PAL Pattern


```
00:00:01:09 ABS
00:00:01:09 A0A0A0A0 LTC
00:50:01:09 A5A5A5A5 VITC
```

HD Rec 709 Pattern

QHD Rec 709 + HDR10 Pattern

QHD BT 2020 +HDR10 Pattern

License button - Press the **License** button to open the licensing dialog.

The top field displays the current status of the license.

The **User Name** field allows the user to type in a first and last name during the licensing process.

The **Email Address** field allows the user to type in the email at which they would like to receive the site key for their license.

Once the name and address fields have been filled out, pressing the **Generate** button populates the **Site Code** field with a string of alphanumeric characters. This string is the Site Code.

The **Site Code** field is where the site code displayed during the licensing process. Ths user may select the site code and use Ctrl+C to copy it to the clipboard, or use the **Copy** button. The user will need to send the site code to Drastic Authorization to get a Site Key to enable the license.

If the system has been set up with email, pressing the **Send** button will open a new email to Drastic Authorization, with the site code in the body of the email.

Once a reply email containing the **Site Key** has been returned by Drastic Authorization, copy it, then paste it into the Site Key field either using the **Paste** button or Ctrl+V.

Once the Site Key has been pasted into the **Site Key** field, pressing the **Register** button registers the license. The system may need to be restarted for the change in license status to be updated. Pressing the x in the upper right corner will close the **License** window.

Press the **Done** button to enable any changes, and close the **Settings** window.

Data View

To display the Picture view, press the **Data View** button.
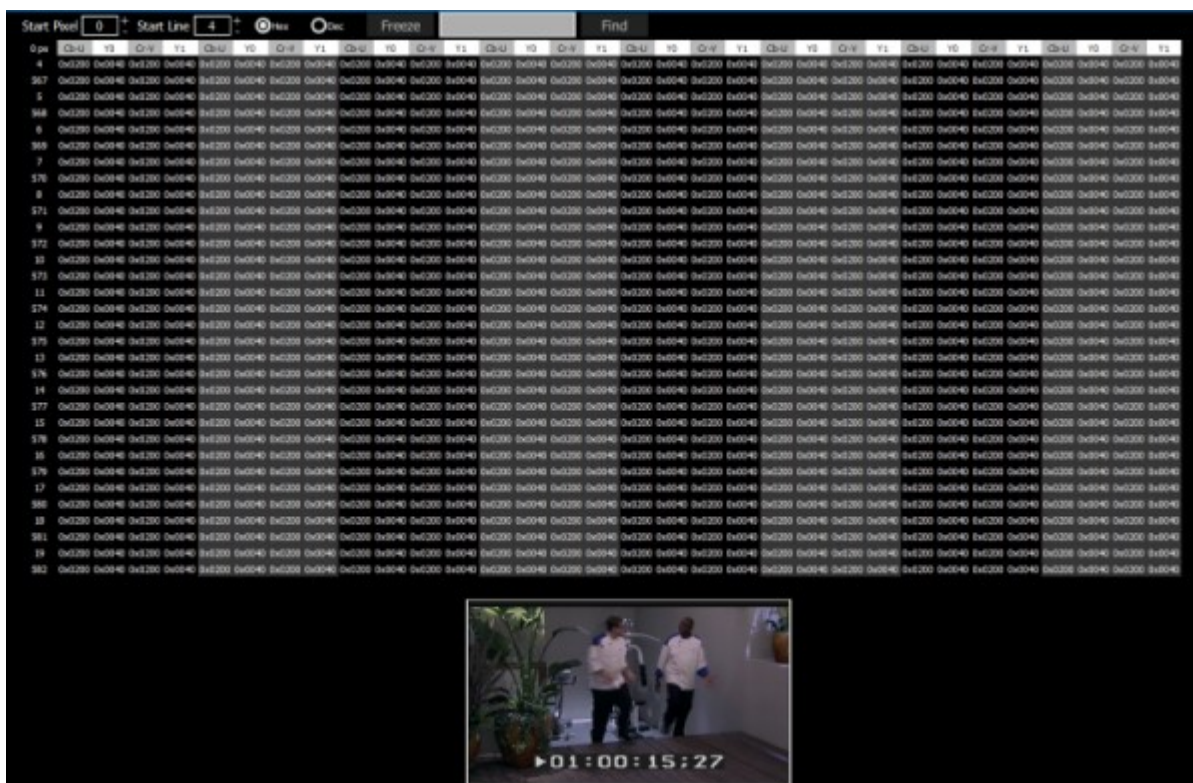
The Data view allows access to the raw pixel values being monitored on the HDMI or SDI input. Values are captured and displayed in their raw values, with no manipulation by the software. Capture card ranging is maintained, supporting both 0..255 and 0..1023 (inclusive).

For YCbCr signals, the Y/Cb and Y/Cr pairs are displayed next to each other with no interpolation. For dual link RGB, the 0..1023 components are also displayed directly. This mode is perfect for checking vertical blank signaling and metadata, as well as picture issues like inner line sync markers or out of range colors.

Pixel starts can be selected, along with lines, in the edit boxes above the data area. Pixels can also be 'picked' by clicking on the video image to set both pixel and line start. Hanging the mouse over the picture, will pop up a tool tip with the R, G and B percentage as well as the pixel X and Y position.

Picture

To display the Picture view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Picture** button on the right. This opens the Picture Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Picture displayed.
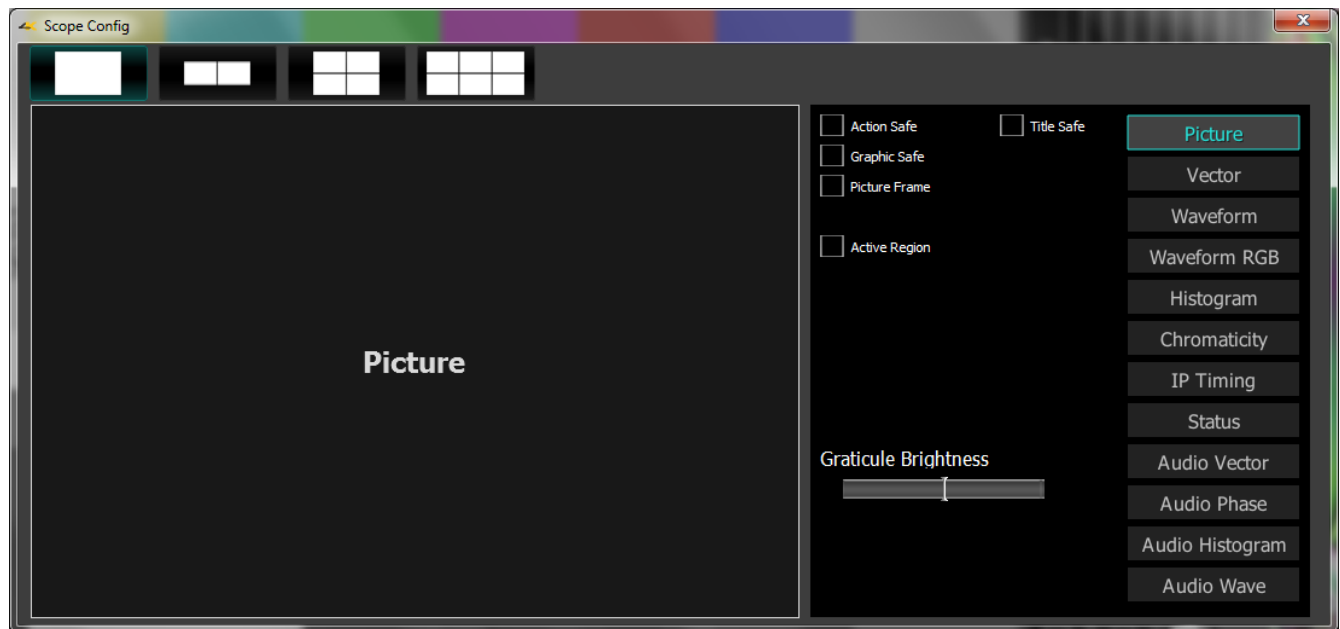
Action Safe checkbox - when selected, the Action Safe graticule is displayed over the video output.

Title Safe checkbox - when selected, the Title Safe graticule is displayed over the video output.

Graphic Safe checkbox - when selected, the Graphic Safe graticule is displayed over the video output.

Picture Frame checkbox - when selected, the Picture Frame graticule is displayed over the video output.

Active Region checkbox - when selected, the Active region graticule is displayed over the video output.

Graticule Brightness slider - Moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Here is the Picture view.

The Picture view shows the video signal, to confirm the source is correct and to display time code location. Action Safe, Title Safe, Graphic Safe, Picture Safe, and Active Region graticules may be optionally overlaid.
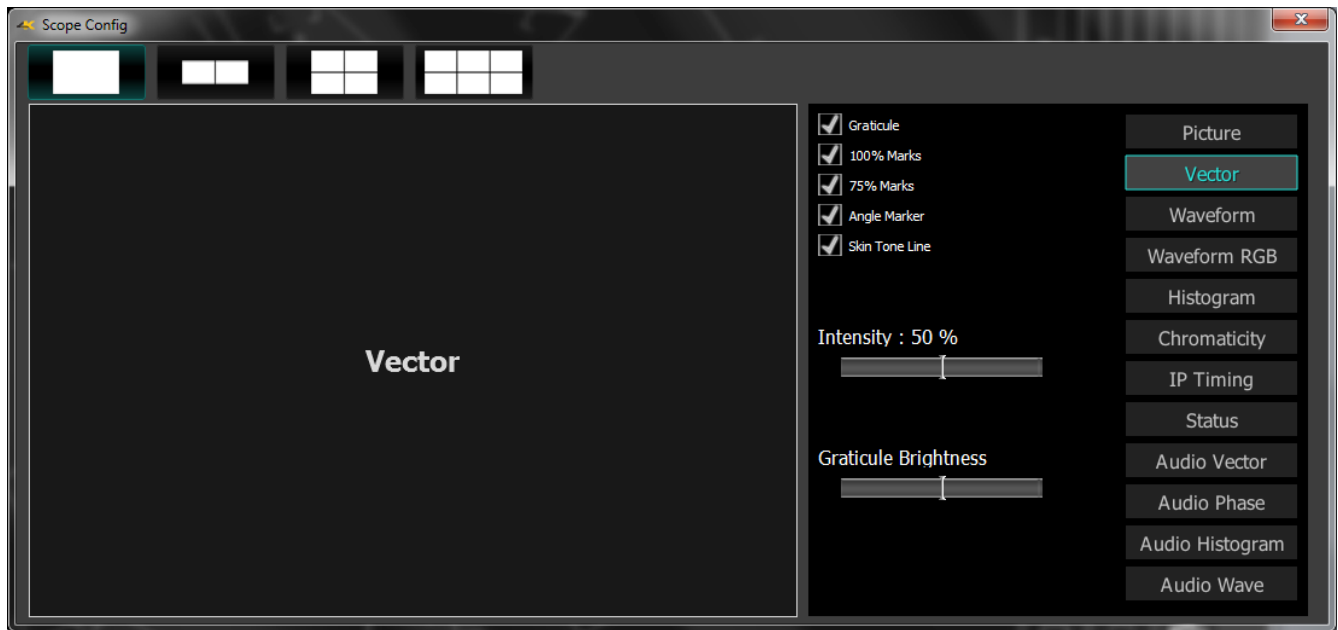
Vectorscope

Vectorscope Setup

To display the Vectorscope view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Vectorscope** button on the right. This opens the Vectorscope Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Vectorscope displayed.

Graticule checkbox – when selected, the graticule is laid over the Vectorscope. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.
100% Marks checkbox – when selected, the 100% Marks are displayed over the Vectorscope
75% Marks checkbox - when selected, the 75% Marks are displayed over the Vectorscope
Angle Marker checkbox - when selected, the Angle Marker is displayed over the Vectorscope
**Skin Tone Line** checkbox - when selected, the Skin Tone Line is displayed over the Vectorscope
Intensity slider – Moving the Intensity slider brightens or dims the display of the video signal through the Vectorscope. The current setting is displayed above the slider, as a percentage, 0% providing no display and 100% being maximum intensity.
Graticule Brightness slider - Moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Vectorscope Window

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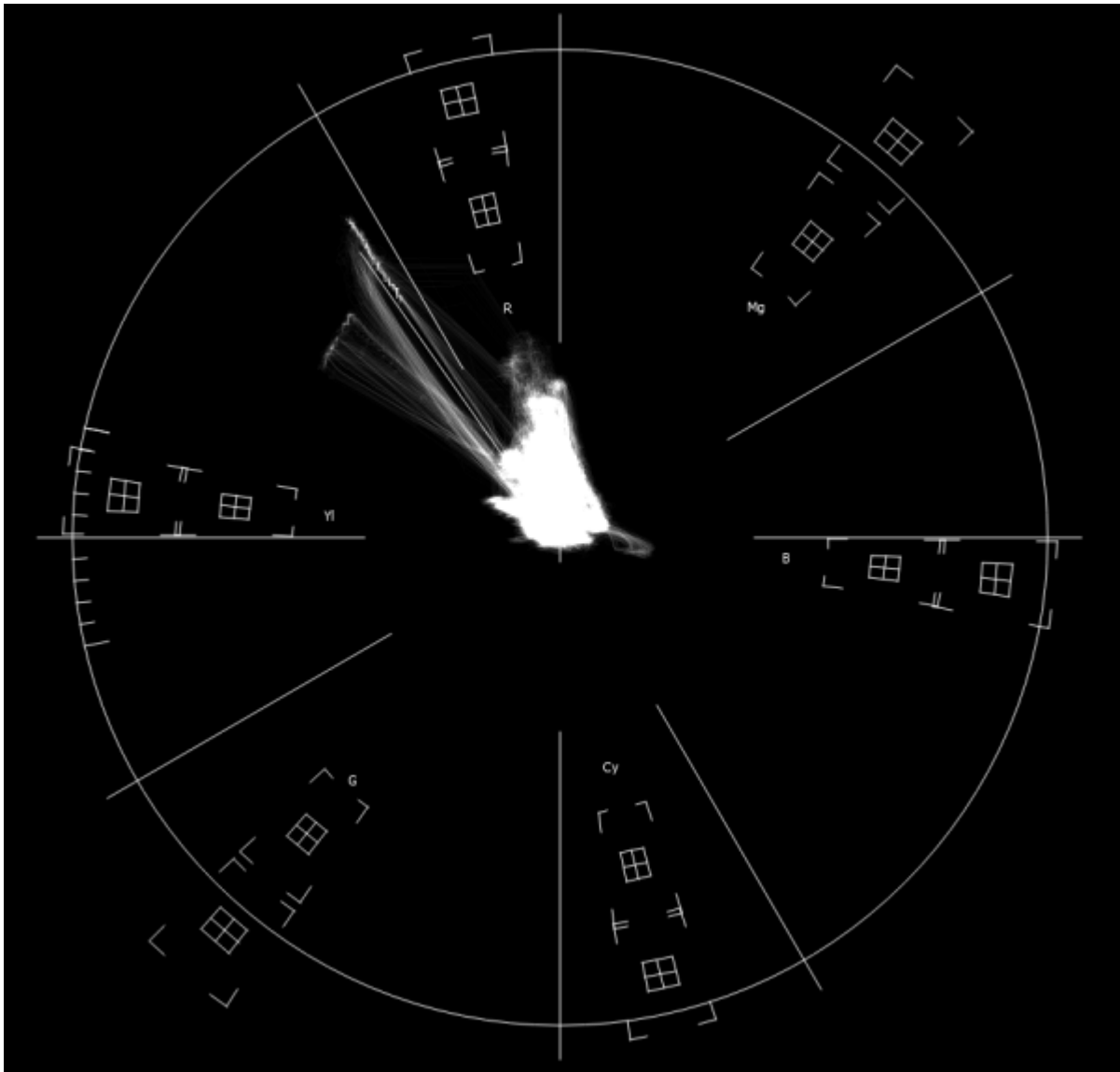
The **Vectorscope** displays a traditional Cb by Cr X-Y display with overlaid reference graticule. Color accurate graticules automatically switch between SD and HD color spaces. The markers include color points (for standard bar checks) at 75% and 100% saturation. All the standard points are boxed; red,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

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).

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.
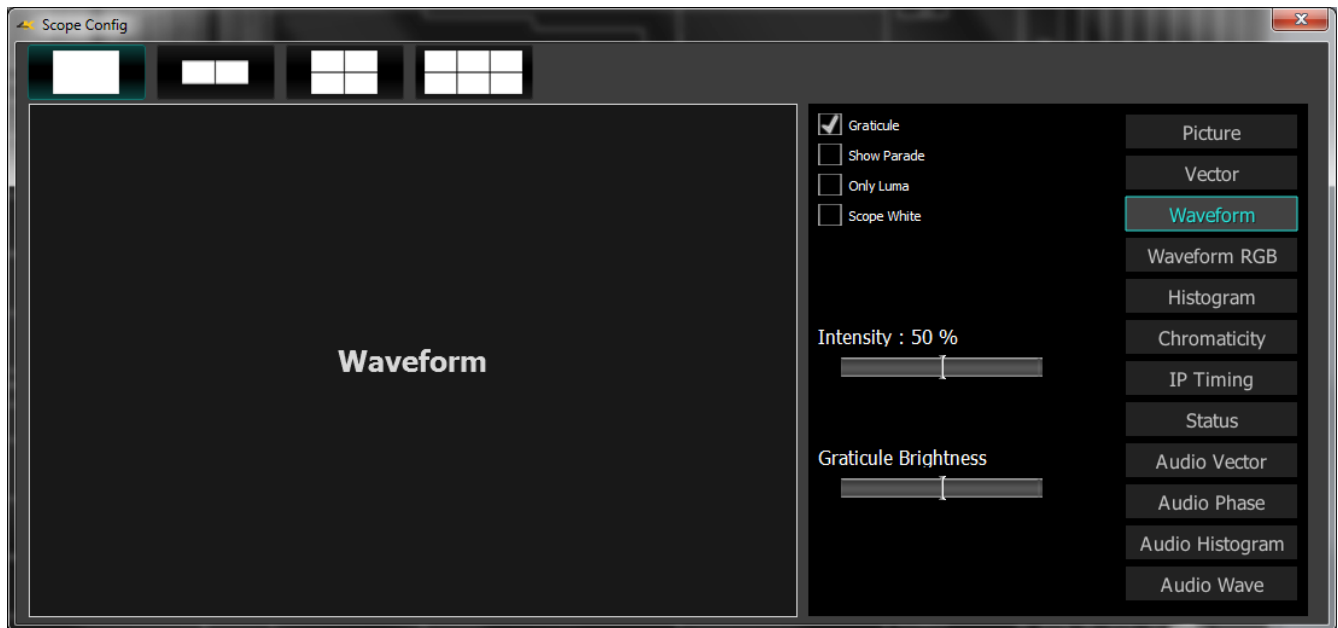
Waveform YCbCr

Waveform YCbCr Setup

To display the Waveform YCbCr view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Waveform YCbCr** button on the right. This opens the Waveform YCbCr Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Waveform YCbCr displayed.


Graticule checkbox – when selected, the graticule is laid over the Waveform YCbCr display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Show Parade checkbox – when selected, the display is from left to right. When not selected, the display is stacked top to bottom.

Stacked   Parade
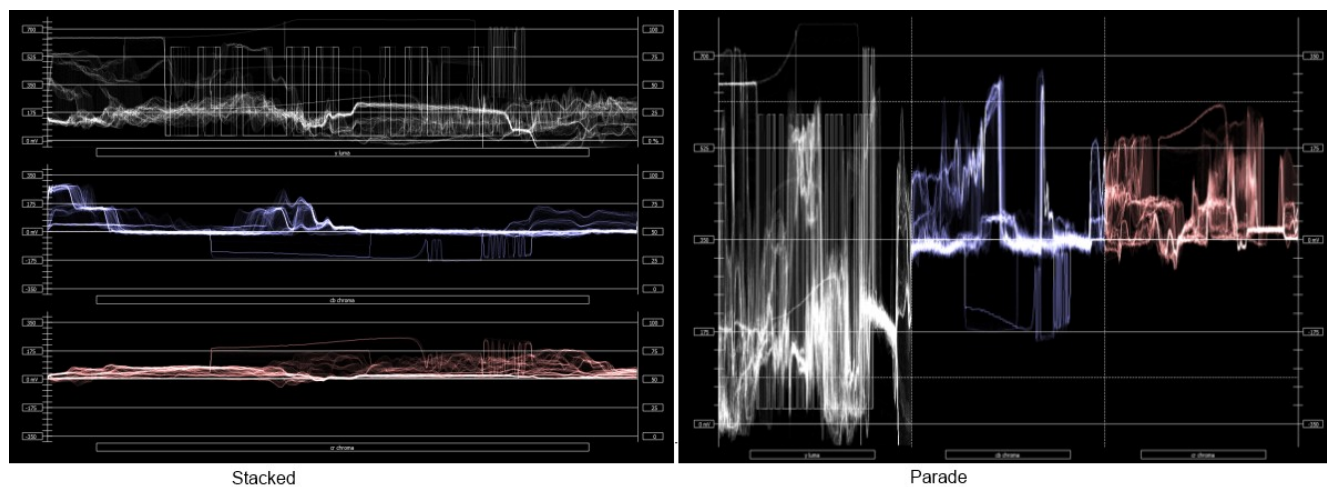
Only Luma checkbox – when selected, displays only the luminance of the signal.
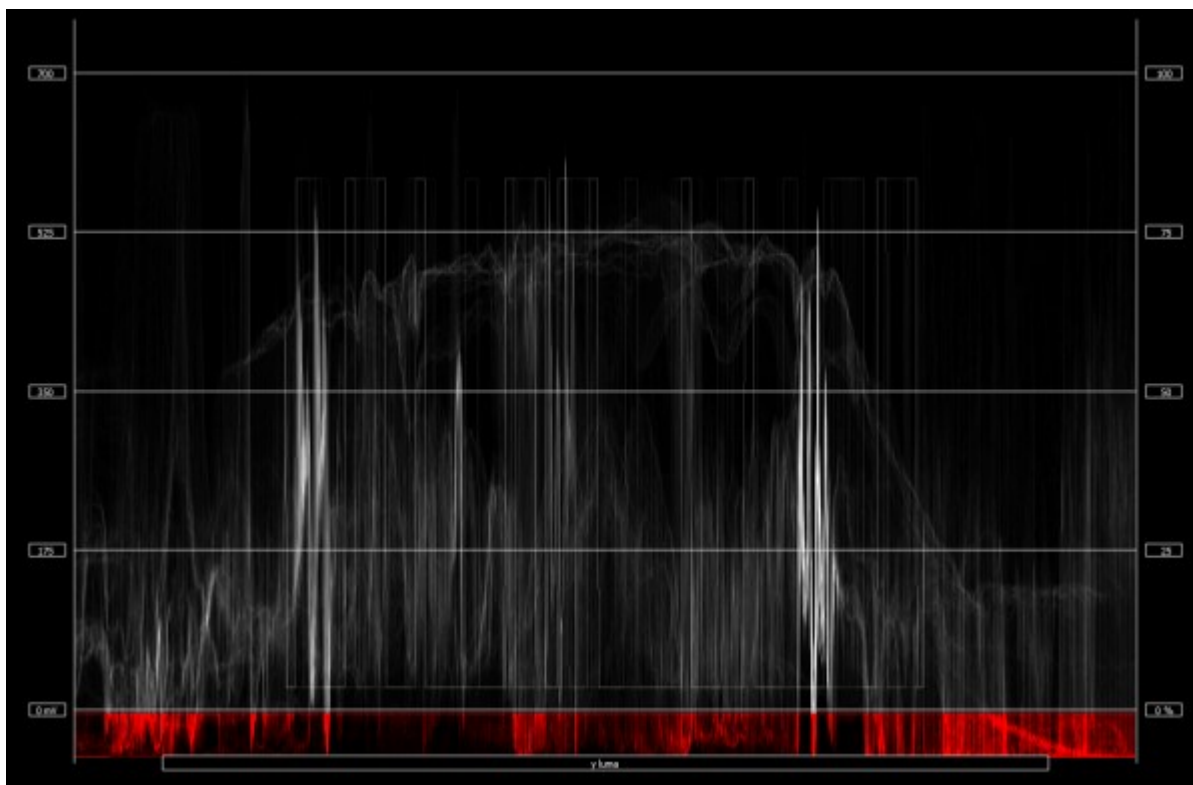
Scope White checkbox – turns the display white.

Intensity slider – Moving the Intensity slider brightens or dims the display of the video signal through the Vectorscope. The current setting is displayed above the slider, as a percentage, 0% providing no display and 100% being maximum intensity.

Graticule Brightness slider - Moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Waveform YCbCr Window

Here is the Waveform YCbCr.
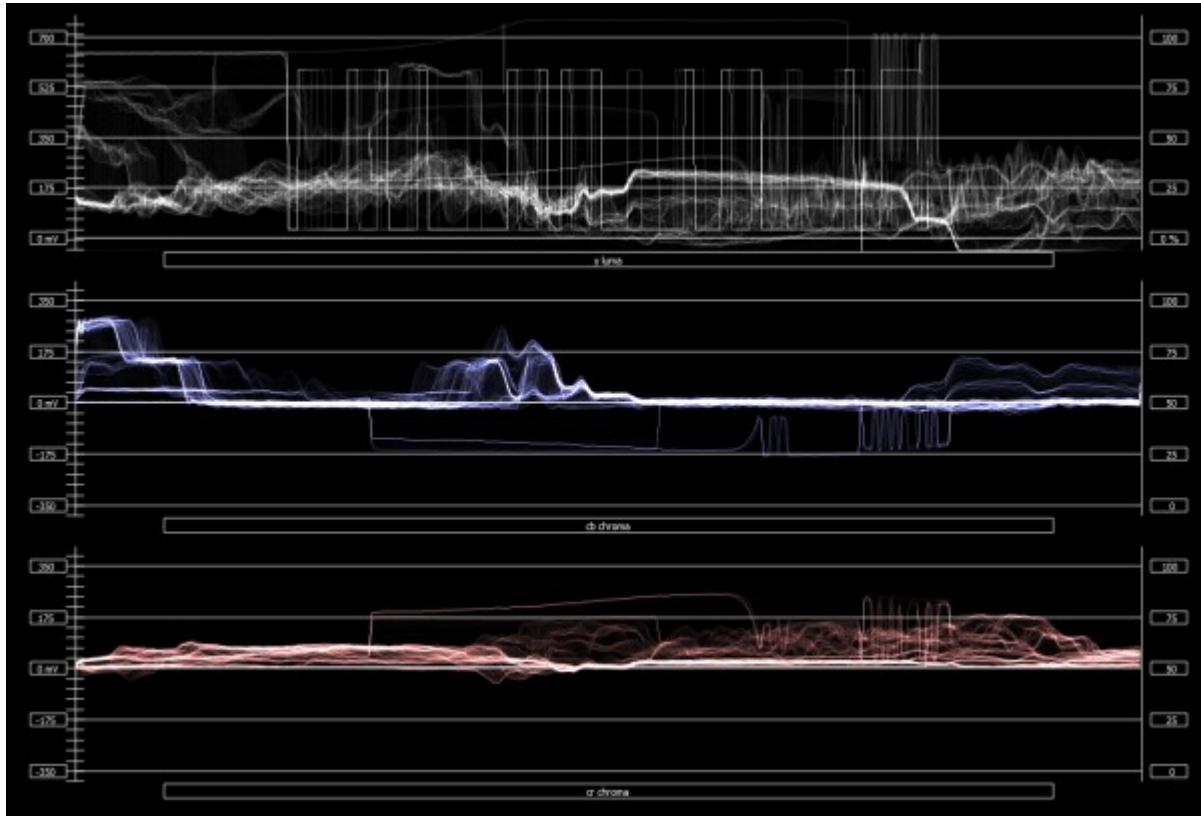
The YCbCr Waveform Monitor displays the levels of the Y, Cb and Cr from the left of the picture to the right of the picture with all the lines summed into one graph. The Y, or luma/luminance, graph provides accurate white and black level information, as well as the range in between. The Cb and Cr display 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.

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).
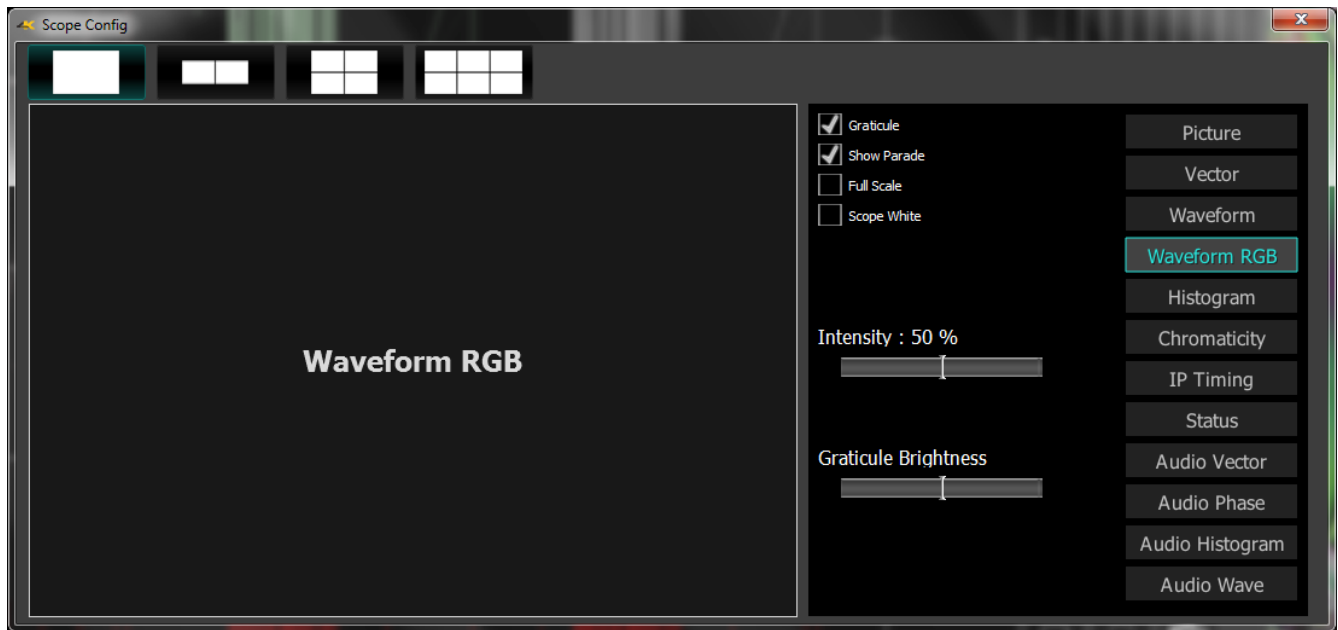
Waveform RGB

Waveform RGB Setup

To display the Waveform RGB view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Waveform RGB** button on the right. This opens the Waveform RGB Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Waveform RGB displayed.

Graticule checkbox – when selected, the graticule is laid over the Waveform RGB display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Show Parade checkbox – when selected, the display is from left to right. When not selected, the display is stacked top to bottom.

Stacked   Parade
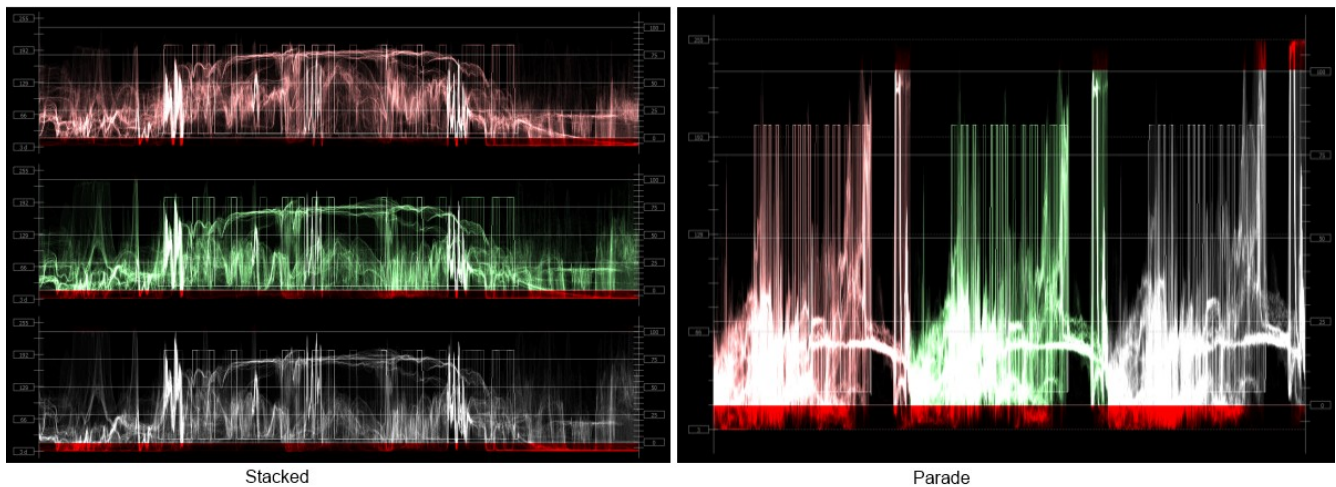
Full Scale checkbox – RGB, by default, will be sRGB. The range of each color will be from 16 to 240 (in 8 bit), so the scale will place white at 240 and black at 16 in normal scale. If in full scale, white will be placed at 255 and black at 0.

Intensity slider – Moving the Intensity slider brightens or dims the display of the video signal. The current setting is displayed above the slider, as a percentage, 0% providing no display and 100% being maximum intensity.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Waveform RGB Window

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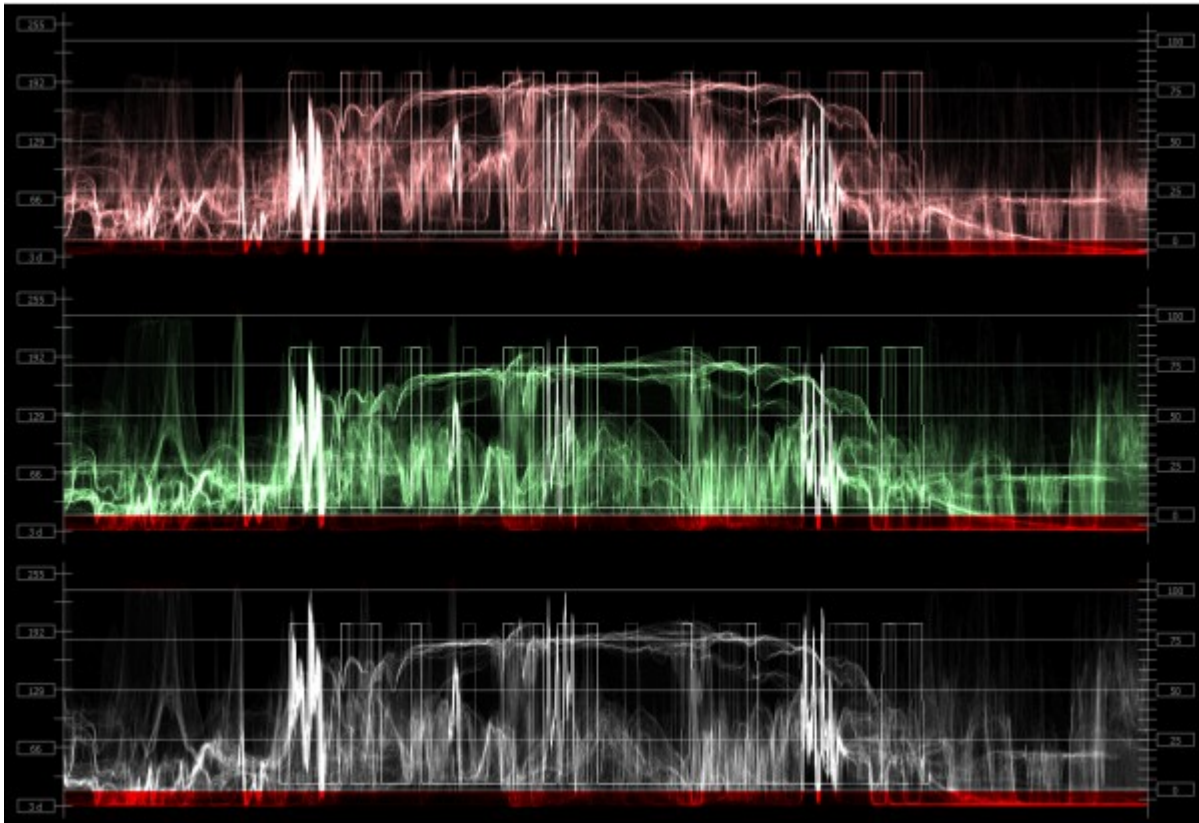
The RGB Waveform Monitor shows each of the red, green and blue signals as independent graphs, displaying the RGB, or chrominance/color values associated with the signal.

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

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.
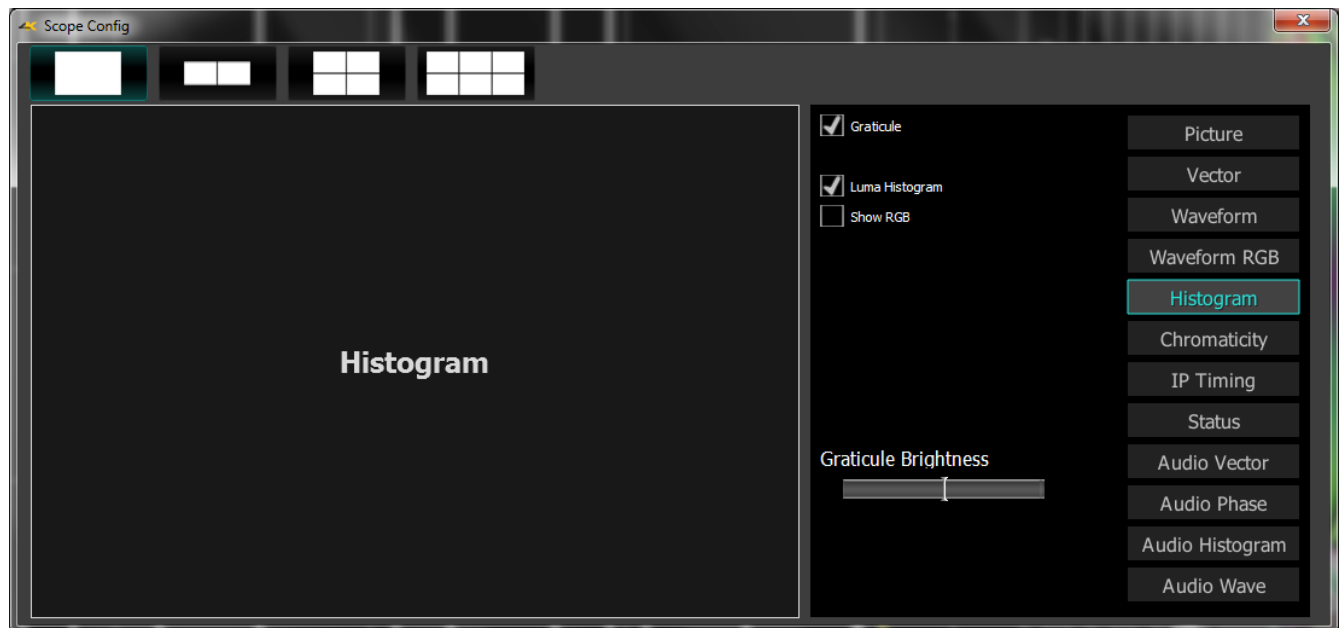
Histogram

Histogram Setup

To display the Histogram view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Histogram** button on the right. This opens the Histogram Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Histogram displayed.

Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.
Luma Histogram checkbox – when selected, displays the luminance of the signal.
**Show RGB** checkbox – when selected, displays the RGB portion of the signal.
Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Histogram Window

Here is the Histogram window in RGB mode.
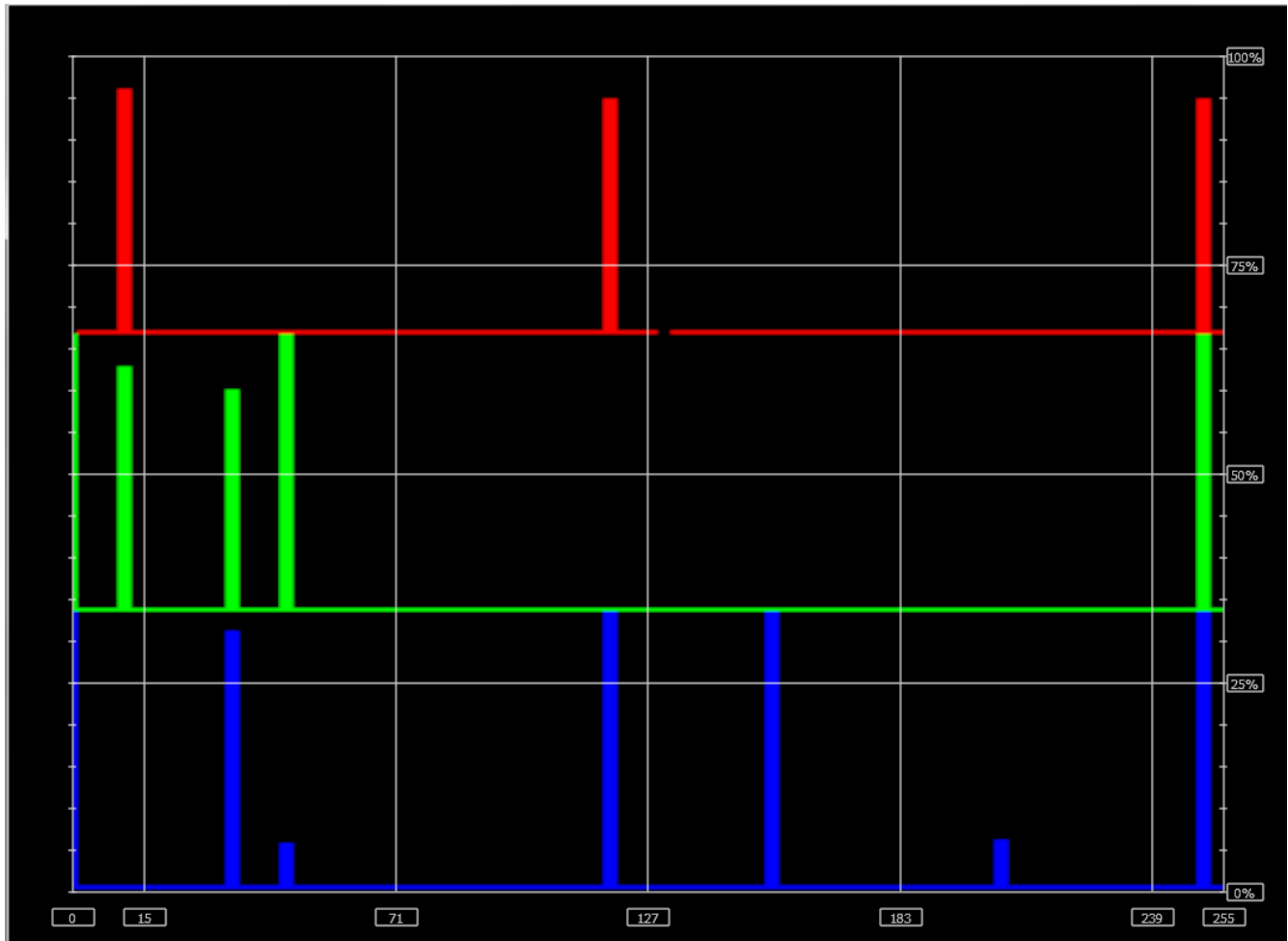
The Histogram view shows the distribution of red, green and blue within the signal as a series of discrete bars that make a continuous graph for each color. This display provides an overview of the tonal range of each color in the picture. Each bar is the count of the number of pixels for one of the 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.

Here is the Histogram with Luma Histogram selected, displaying only luminance information.
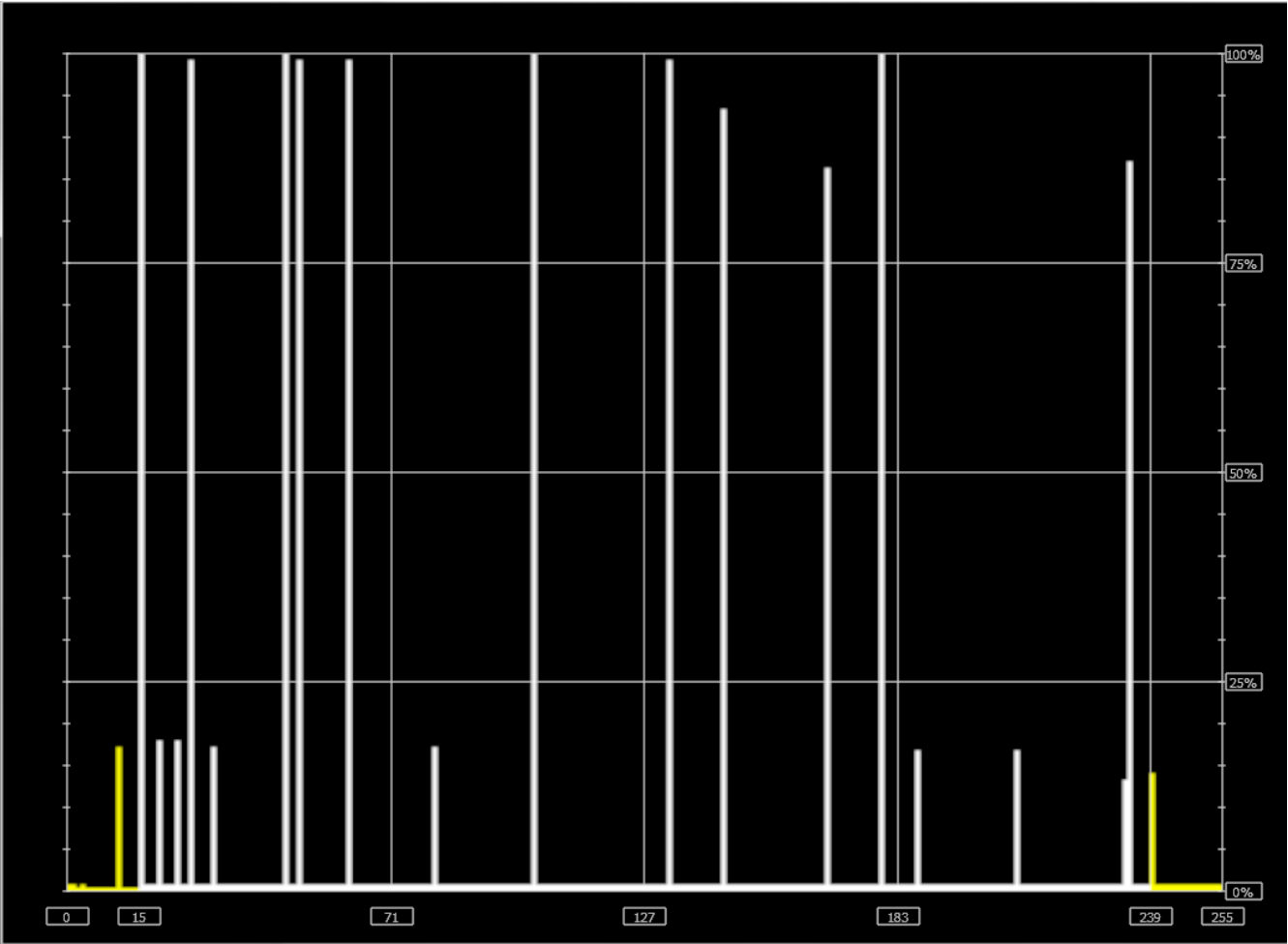
Chromaticity

Chromaticity Setup

To display the Chromaticity view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Chromaticity** button on the right. This opens the Chromaticity Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Chromaticity displayed.
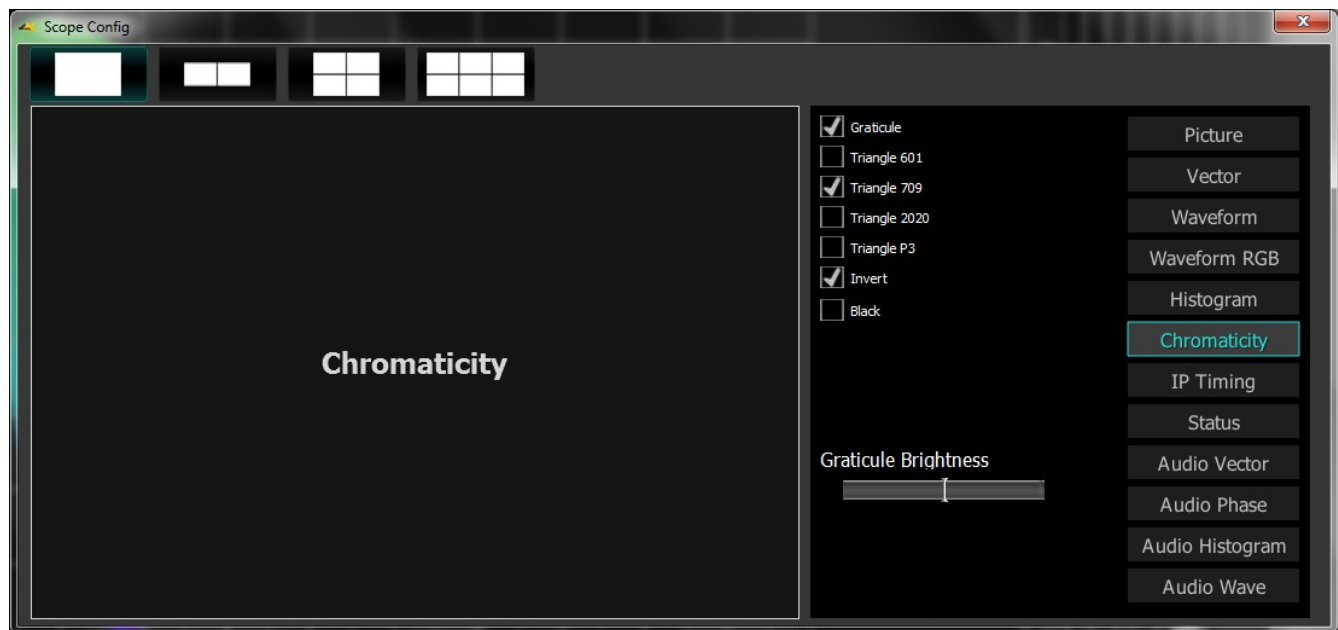
Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Triangle 601 checkbox – when selected, displays the CCIR-601 triangle.

Triangle 709 checkbox – when selected, displays the Rec.709 triangle.

Triangle 2020 checkbox – when selected, displays the BT.2020 triangle.

Triangle P3 checkbox – when selected, displays the P3 triangle.

Invert checkbox – when selected, displays the video signal over a black background instead of the Chromaticity hued background.

Black checkbox – when selected, displays the video as black. If unselected, the video will be displayed as white.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Chromaticity Window

Here is the Chromaticity window.
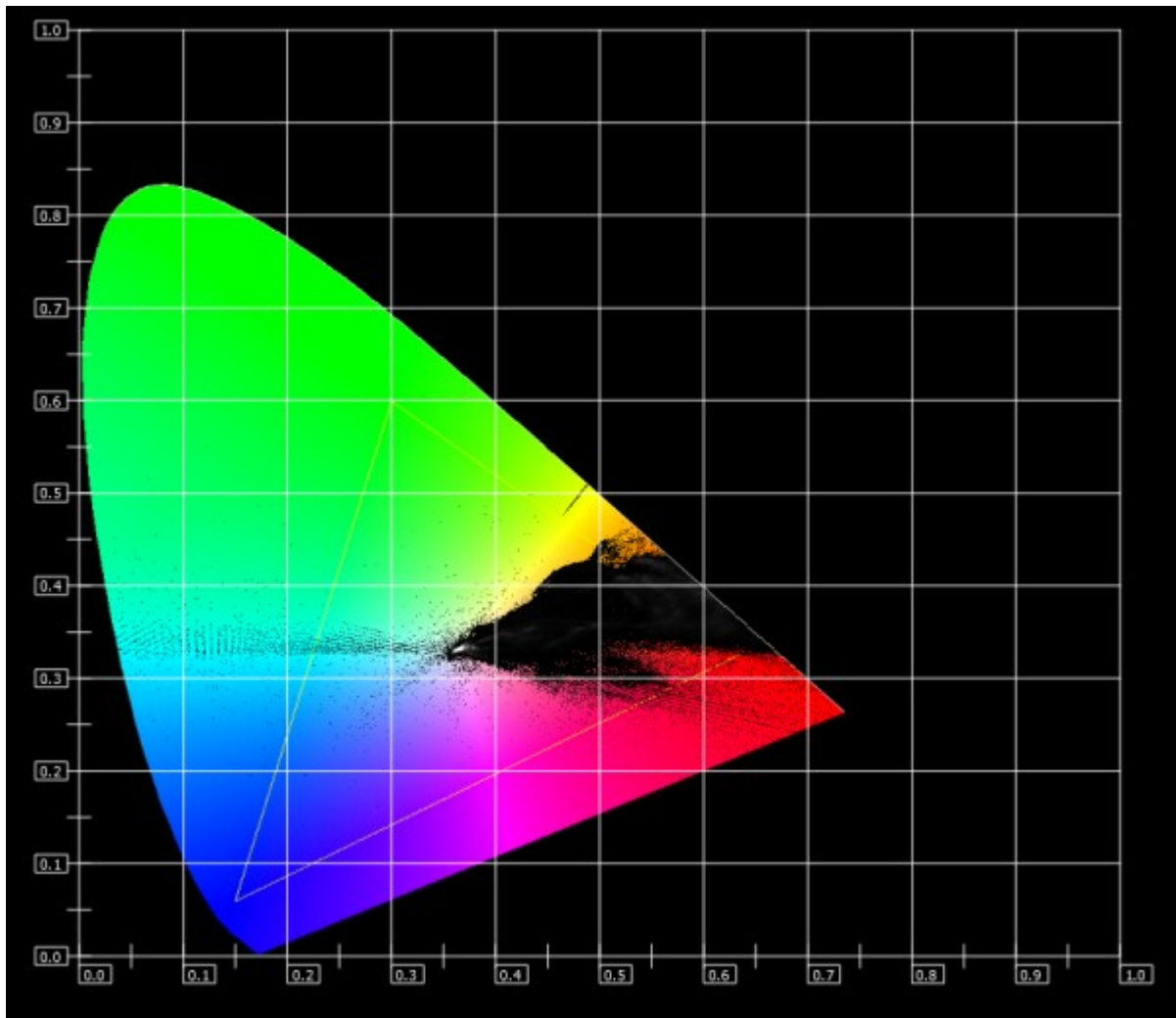
The Chromaticity scope provides a visual representation of the color in a video across all the colors of visible light. For a particular YCbCr range (BT.2020, P3, Rec.709, CCIR-601) a triangle can be superimposed. This will delineate the colors that fall within the acceptable range and those that are outside it. The color of the video within the CIE 1931 color display can be white over black, or black over white. The amount of a color will cause that dot to be scaled from the second color to the first.

IP Timing Window

IP Timing Setup

To display the IP Timing view, press the **Scope Config** button. This opens the Scope Config window. Click on the **IP Timing** button on the right. This opens the IP Timing Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the IP Timing displayed.
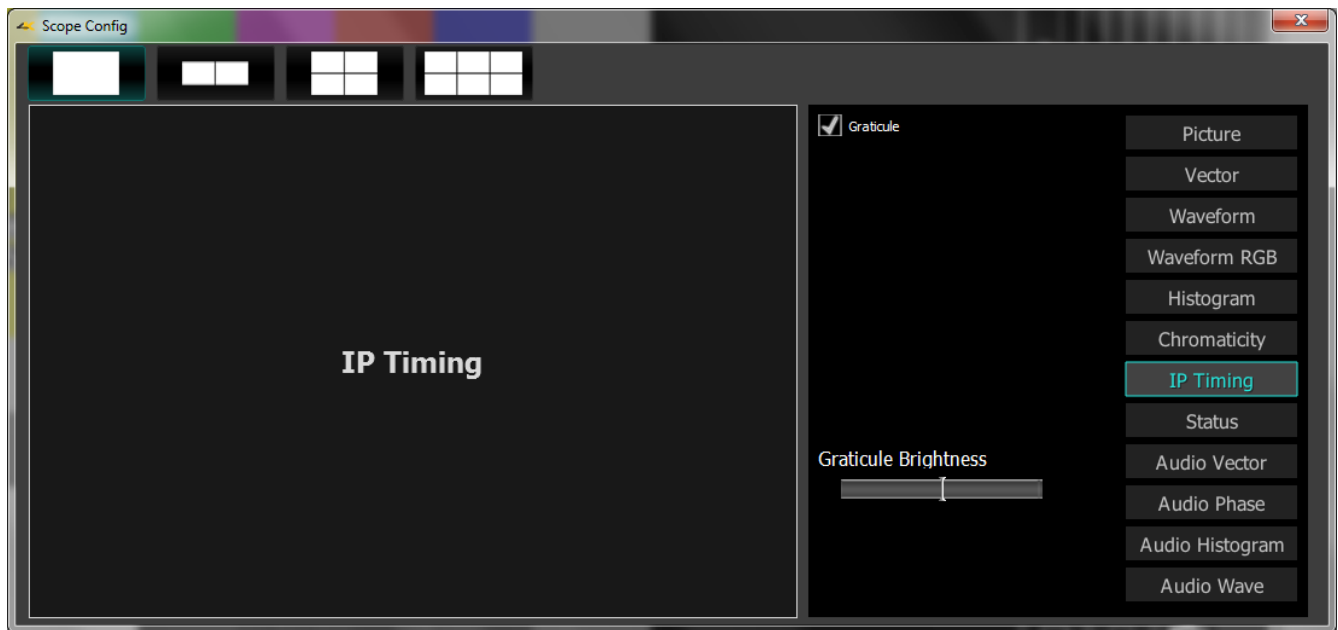
Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

IP Timing Window

Here is the IP Timing window.
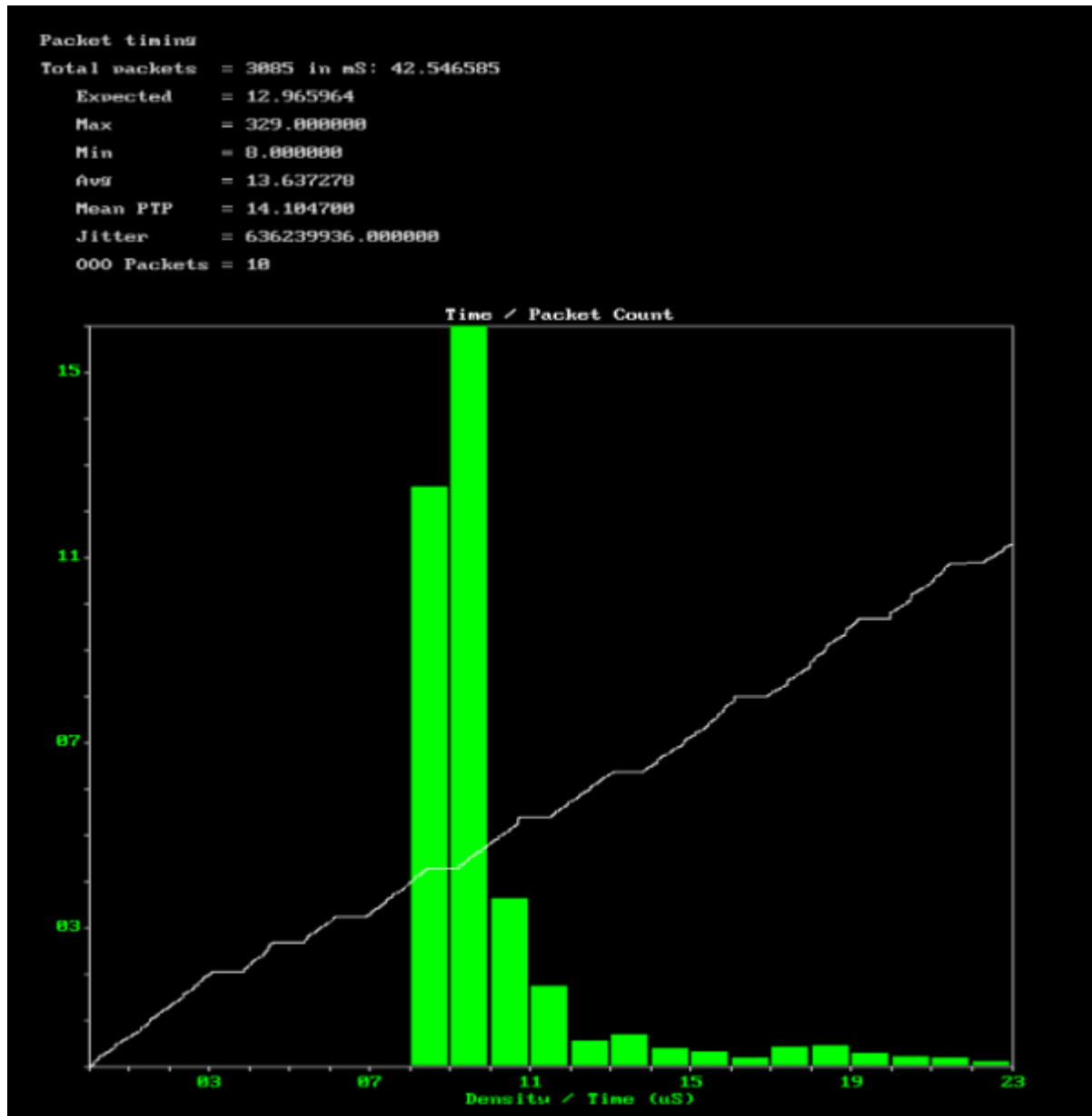
4KScope records the timing of each incoming packet of SMPTE 2110 or SMPTE 2022. These timing records can then be analyzed for expected packet time, min/max/average packet time, packet jitter and out of order or missing packets. There is also a chart that shows a histogram of what the inter-packet timing was, and a line graph that displays how far off the expected time each packet was.

Status Window

Status Setup

To display the Status view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Status** button on the right. This opens the Status Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

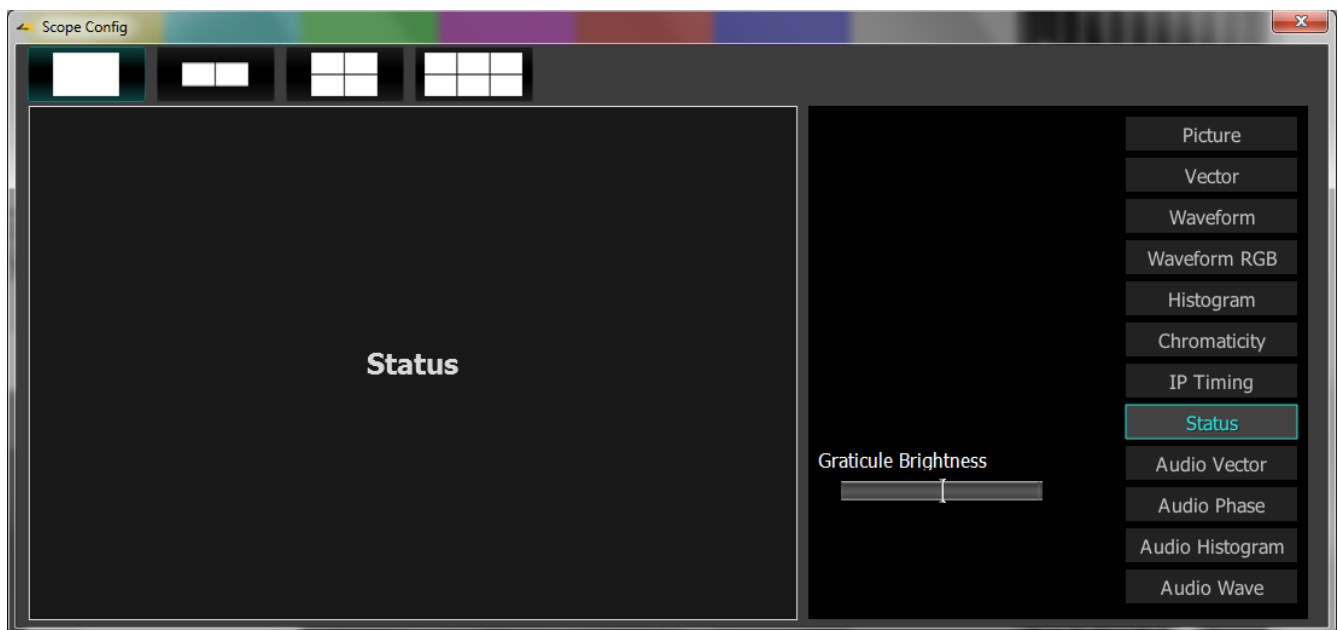For a multiple scope layout, click on the window in which you would like the Status displayed.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Status Window

Here is the Status window.

```
Y Min    0 Low     49% Avg   600
   Max 1020 High   12%
Y-Gamut Under      8%
Y-Gamut Over       5%
U Min    0 Low     18% Avg   466
   Max  832 High   18%
U-Gamut Under     10%
U-Gamut Over       4%
V Min    0 Low     17% Avg   474
   Max 1020 High   11%
V-Gamut Under      5%
V-Gamut Over       1%
S Min    0 Low    100% Avg     0
   Max  141 High    0%
MaxCLL                0
MaxFALL               0
Line repitition   0 of 1080
Broadcast Illegal  12%
Audio Peak  A12 0000 0000
            A34 0000 0000
Audio RMS   A12 0000 0000
            A34 0000 0000
Audio Ebu   A12 100 100
            A34 100 100
```

The Status window displays:

   Y: Minimum and Maximum, Low and High, Average, Gamut Under, and Gamut Over values
   U: Minimum and Maximum, Low and High, Average, Gamut Under, and Gamut Over values
   V: Minimum and Maximum, Low and High, Average, Gamut Under, and Gamut Over values
   S: Minimum and Maximum, Low and High, Average, Gamut Under, and Gamut Over values
   MaxCLL – In HDR10 mode, Maximum Content Light Level
   MaxFALL – In HDR10 mode, Maximum Frame – Average Light Level
   Line repetition in number of lines over total possible lines
   Broadcast illegal in percentage
   Audio Peak per channel pair
   Audio RMS per channel pair
   Audio Ebu Loudness per channel pair

Audio Vector

Audio Vector Setup

To display the Audio Vectorscope view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Audio Vectorscope** button on the right. This opens the Audio Vectorscope Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Audio Vectorscope displayed.
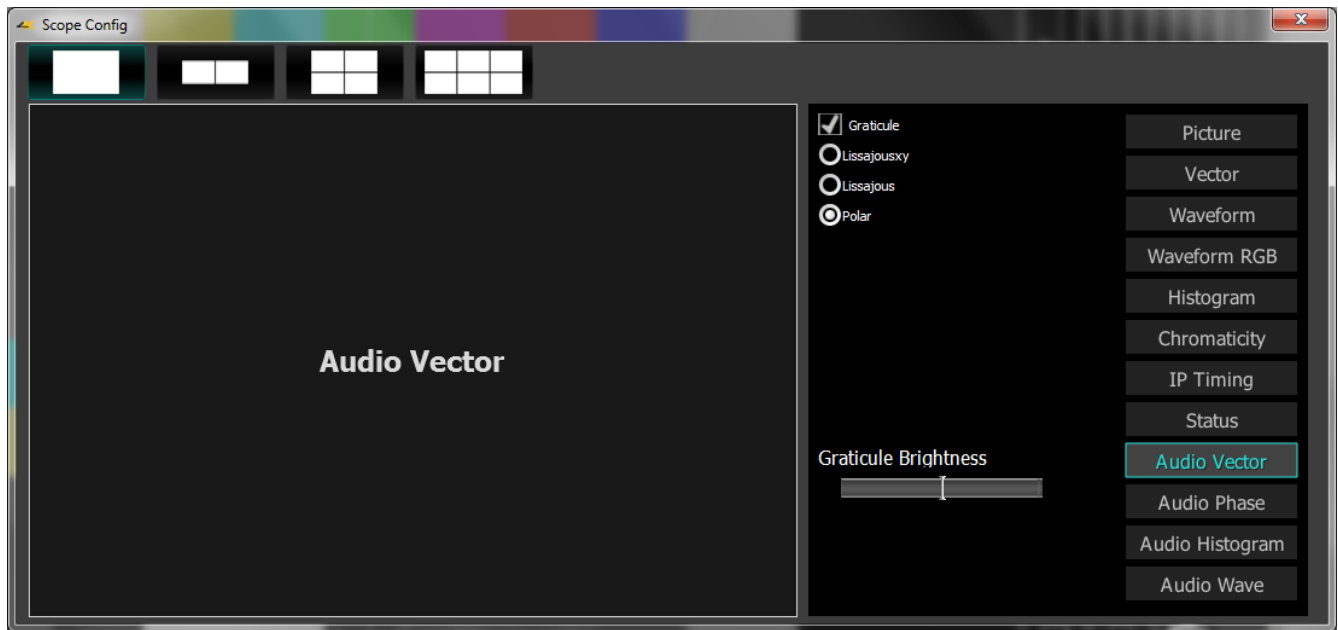
Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Lissajousxy checkbox – when selected, displays the relative phase of the selected audio pair in Lissajous XY mode.

Lissajous checkbox – when selected, displays the relative phase of the selected audio pair in Lissajous mode.

Polar checkbox – when selected, displays the relative phase of the selected audio pair in Polar mode.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Pressing the x in the upper right corner will close the Scope Config window.

Audio Vector Window

Here is the Audio Vectorscope window.
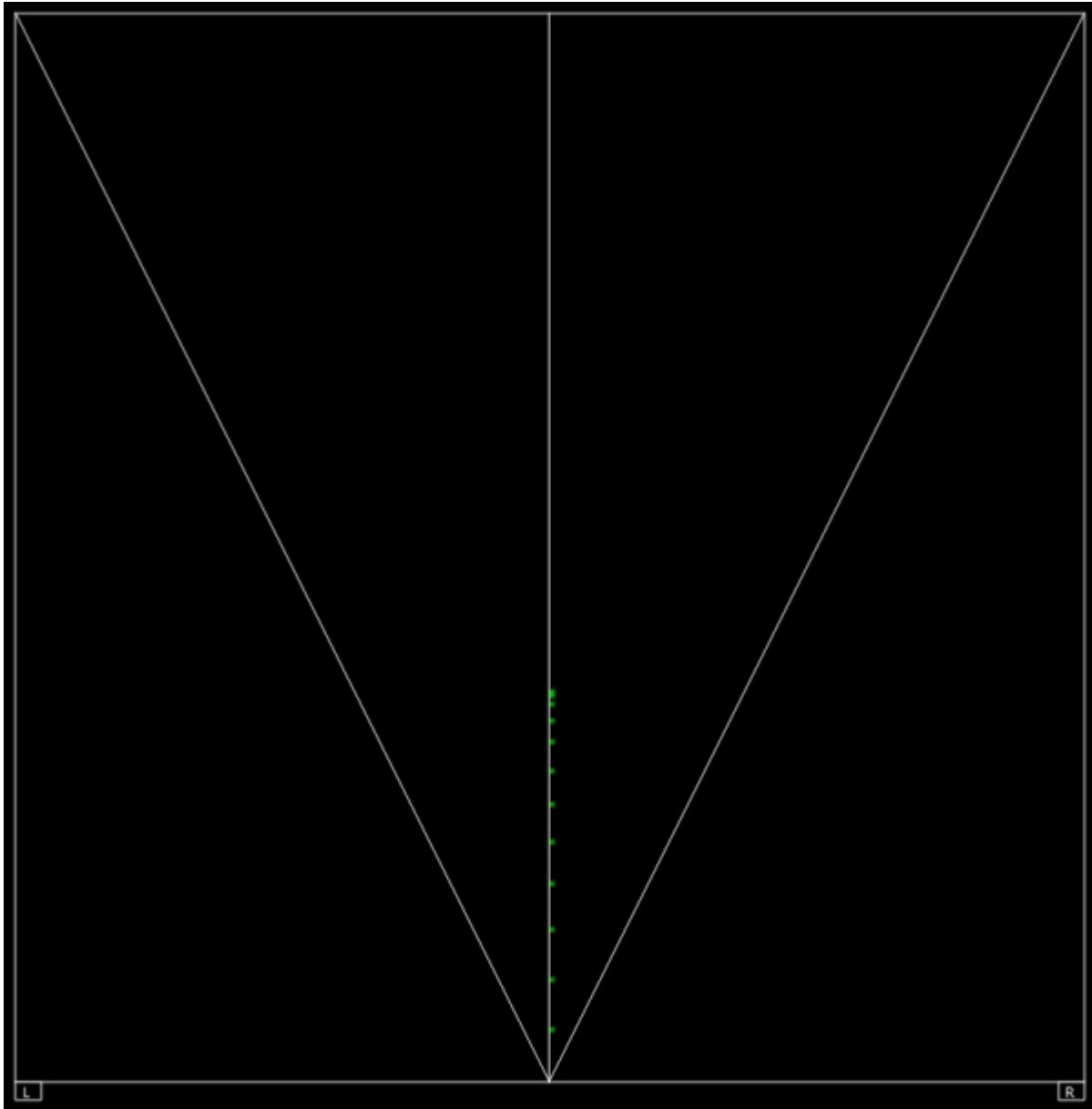
The audio vectorscope measures the difference between channels of a stereo pair. One channel drives the horizontal and the other the vertical deflection. This will show the relative phase of the two channels. This can be shown in Lissajous XY, Lissajous or Polar modes. Any pair may be selected in the setup.

Audio Phase

Audio Phase Setup

To display the Audio Phase view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Audio Phase** button on the right. This opens the Audio Phase Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Audio Phase displayed.
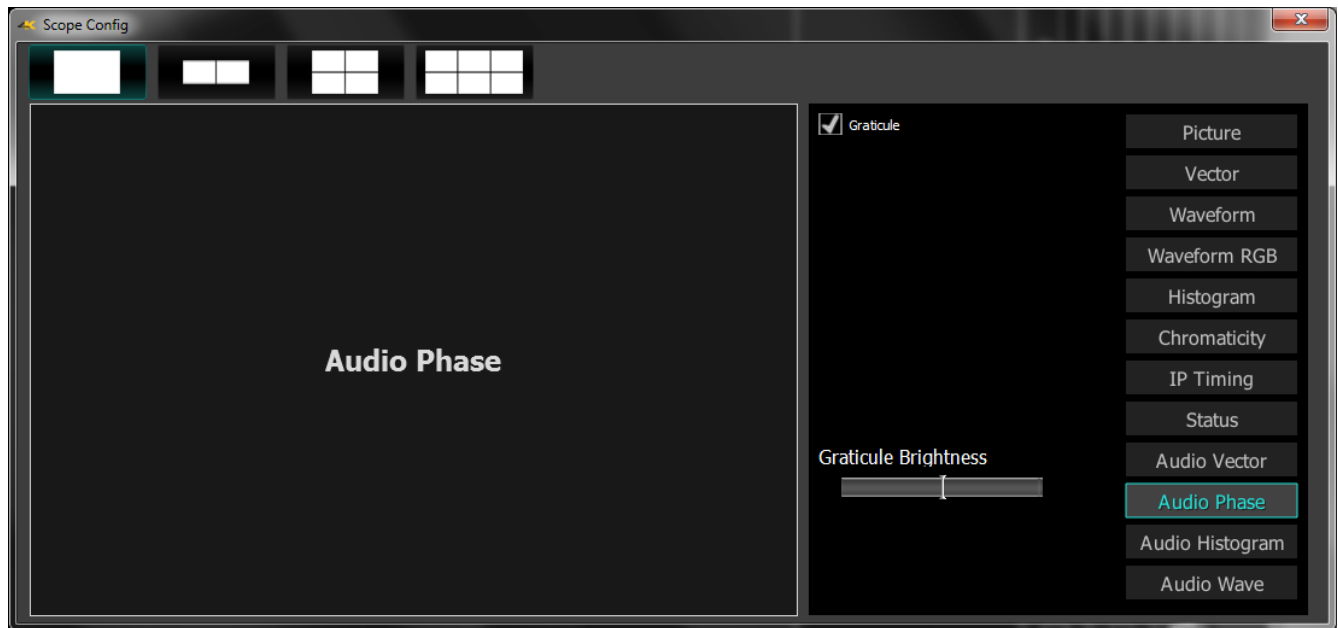

Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Audio Phase Window

Here is the Audio Phase window.
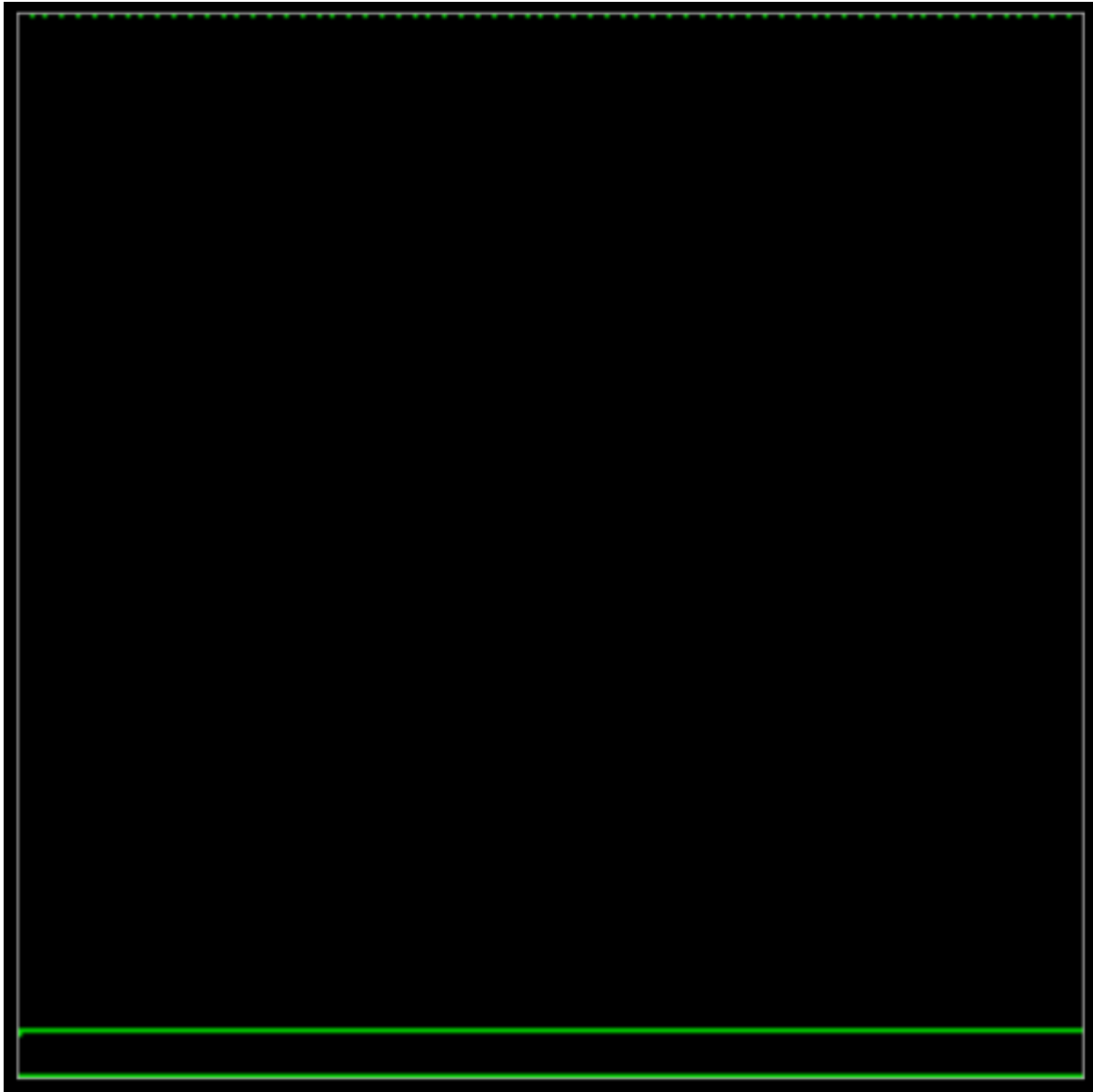
The audio phase meter shows the relative density of two audio channels and the relative loudness as a line moving towards the louder channel.

Audio Histogram

Audio Histogram Setup

To display the Audio Histogram view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Audio Phase** button on the right. This opens the Audio Histogram Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Audio Histogram displayed.
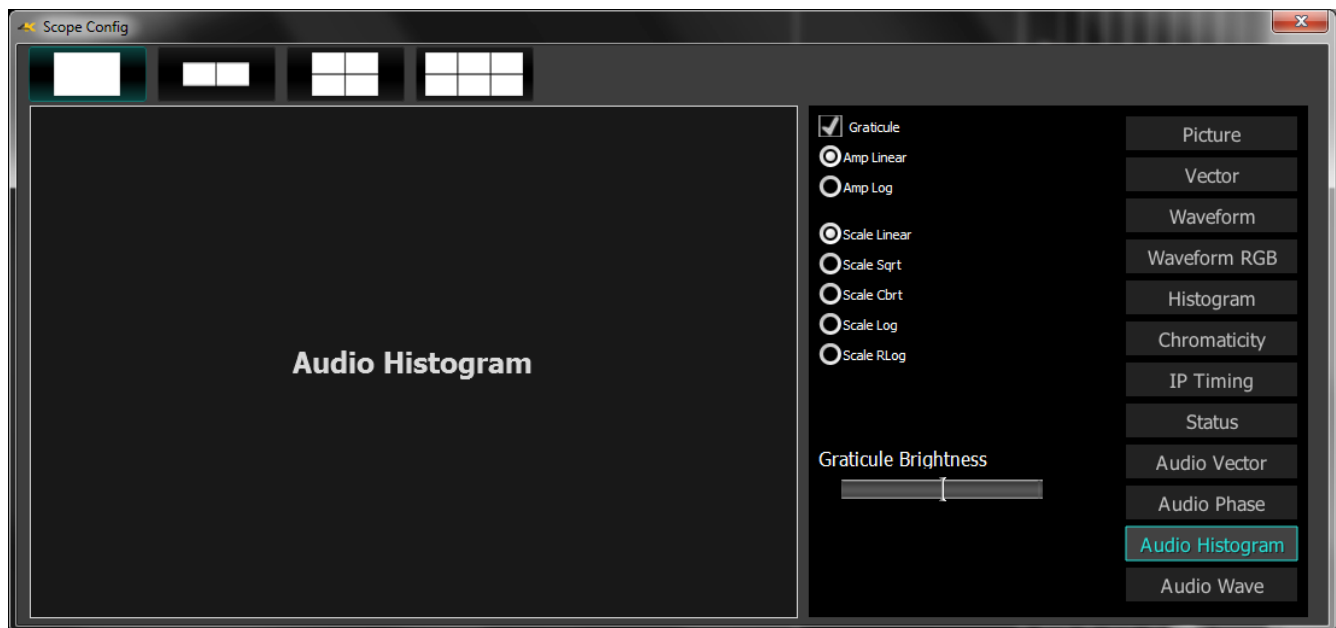
Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Amp Linear selector – clicking in the Amp Linear checkbox sets the Amp to linear

Amp Log selector – clicking in the Amp Log checkbox sets the Amp to linear

Scale Linear – clicking in the Scale Linear checkbox sets the scale to linear.

Scale Sqrt – clicking in the Scale Sqrt checkbox sets the scale to sqrt.

**Scale Cbrt** – clicking in the Scale Cbrt checkbox sets the scale to cbrt.

Scale Log – clicking in the Scale Log checkbox sets the scale to logarithmic.

Scale RLog – clicking in the Scale Rlog checkbox sets the scale to R logarithmic.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Audio Histogram Window

Here is the Audio Histogram window.
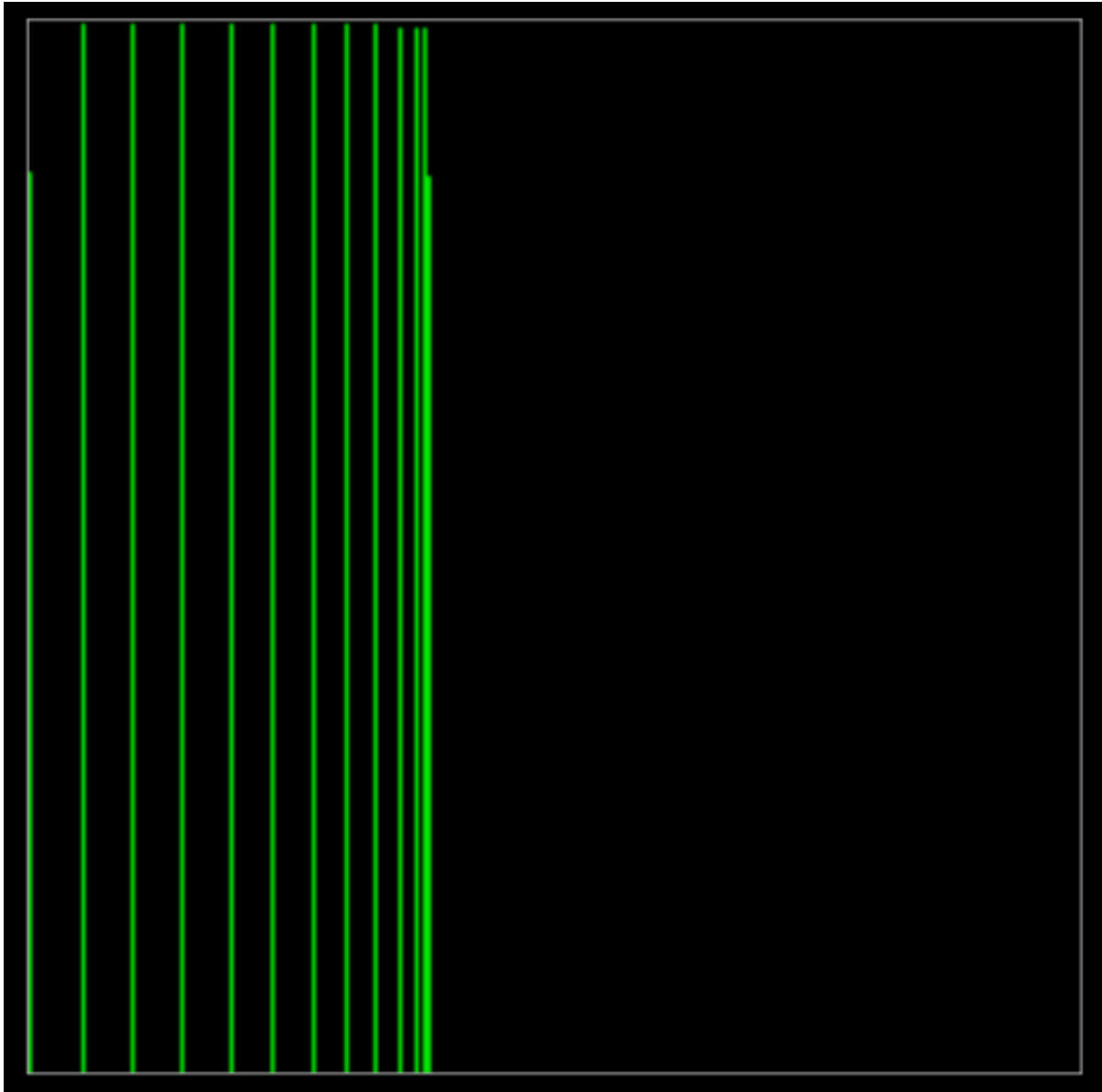
The audio histogram displays a bar chart of the levels of the components of an audio signal. This can be displayed as linear or logarithmic. The scale can be set as linear, square root, cubed root, log or reverse log.

Audio Wave

Audio Wave Setup

To display the Audio Wave view, press the **Scope Config** button. This opens the Scope Config window. Click on the **Audio Wave** button on the right. This opens the Audio Wave Setup section of the Scope Config.

Select a layout. The choices are: 1 scope (single), 2 scopes (side by side), 4 scopes (2 x 2 grid), or 6 scopes (two rows of three scopes).

For a multiple scope layout, click on the window in which you would like the Audio Wave displayed.
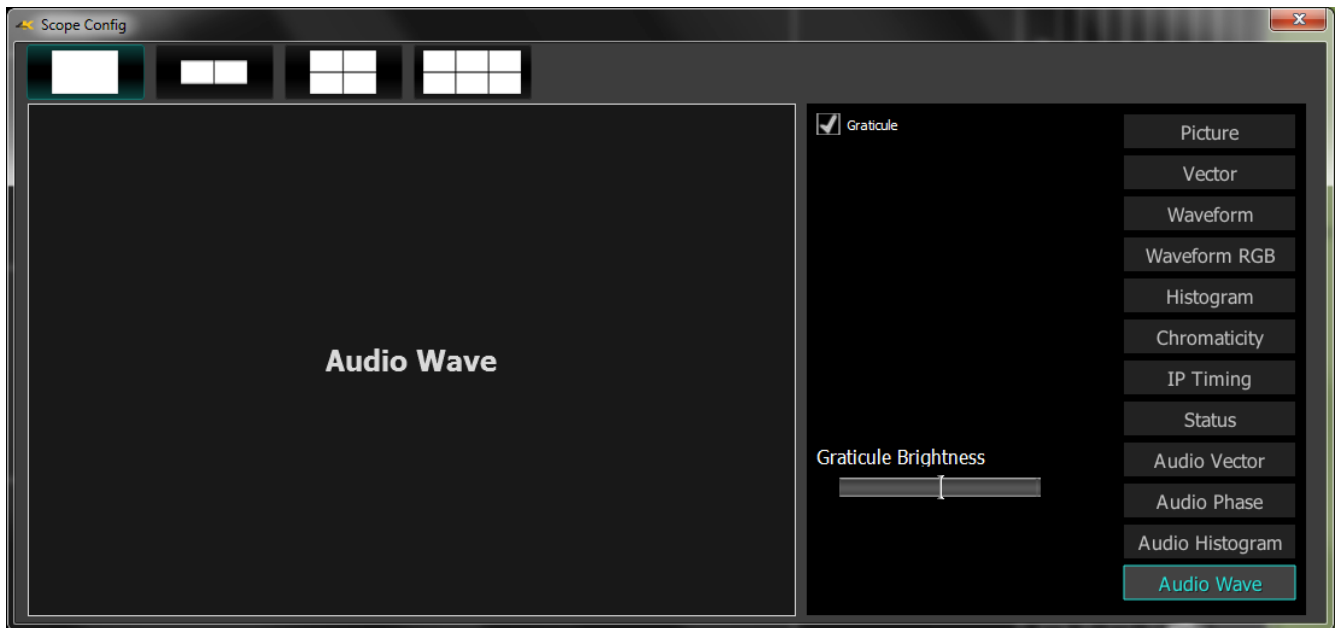
Graticule checkbox – when selected, the graticule is laid over the Histogram display. The brightness of the Graticule may be adjusted using the **Graticule Brightness** slider described below.

Graticule Brightness slider – moving the Graticule Brightness slider adjusts the brightness of the graticule overlay, 0% providing no display and 100% being maximum brightness.

Audio Wave Window

Here is the Audio Wave window.
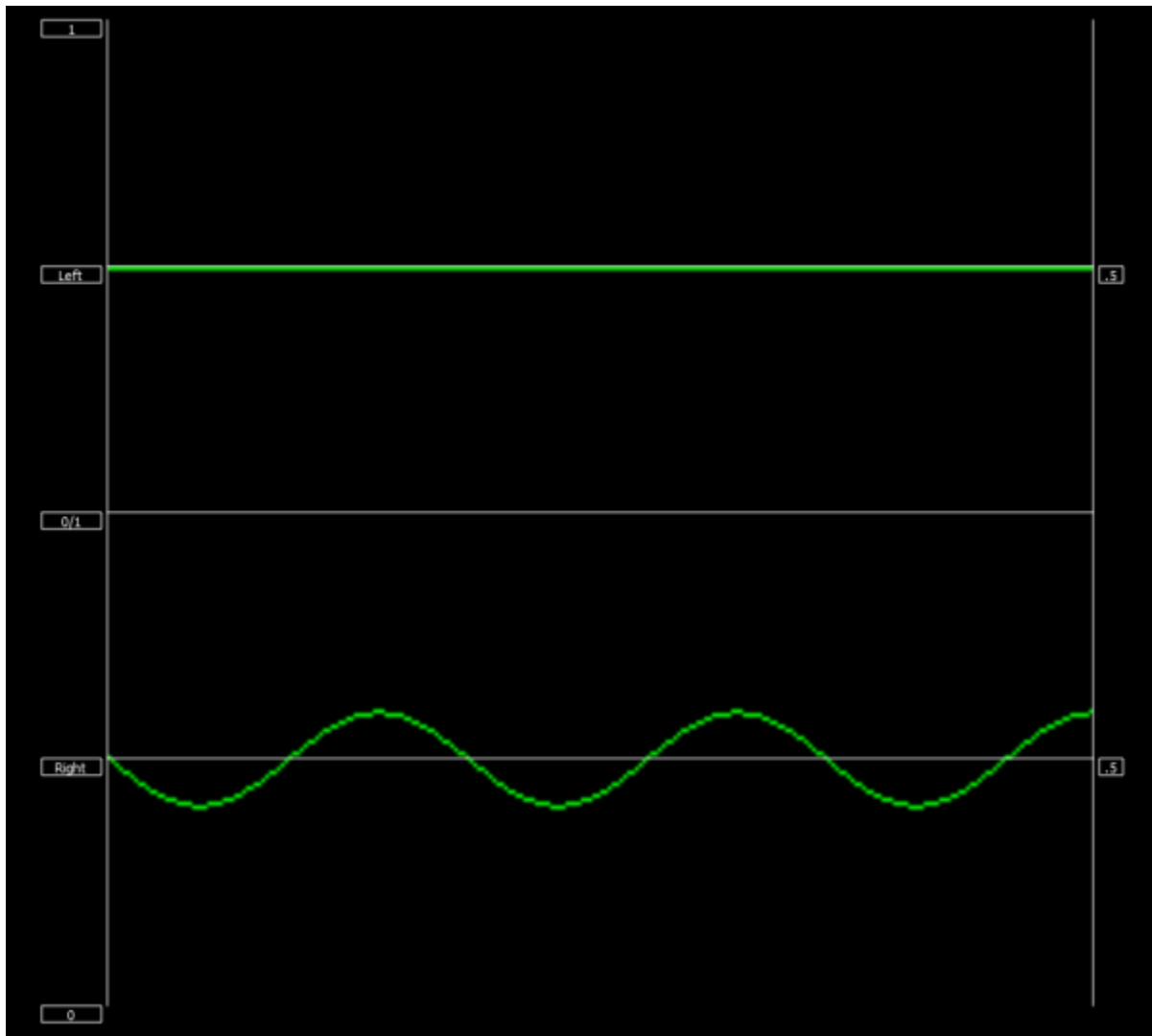
The audio waveform of any pair of channels can be displayed.

Scope Layout

Scope Config

To set up the layout of the various scopes, press the **Scope Config** button.

Along the top of the Scope Config window, there are four available layouts for the interface.

Layout 1 – clicking on layout 1 sets the display to use a single scope. Once this selection has been made, clicking on one of the scope selectors to the right will set the display to that scope.

Layout 2 – clicking on layout 2 sets the display to show two scopes of equal size side by side.

Layout 3 – clicking on layout 3 sets the display to show four scopes of equal size stacked in a two by two grid.

Layout 4 – clicking on layout 4 sets the display to show six scopes of equal size, configured in 2 rows of 3 screens each.

An Example - 4 Scopes in a 2x2 Grid

In the **Scope Config** window, pressing the 3rd icon from the left (displayed with blue highlight to indicate selected) sets the window to use four scopes arrayed in a 2x2 grid. Clicking on the window at top left (outlined, in gray to indicate selected), and then pressing the **Picture** selector sets this window to display the Video signal.
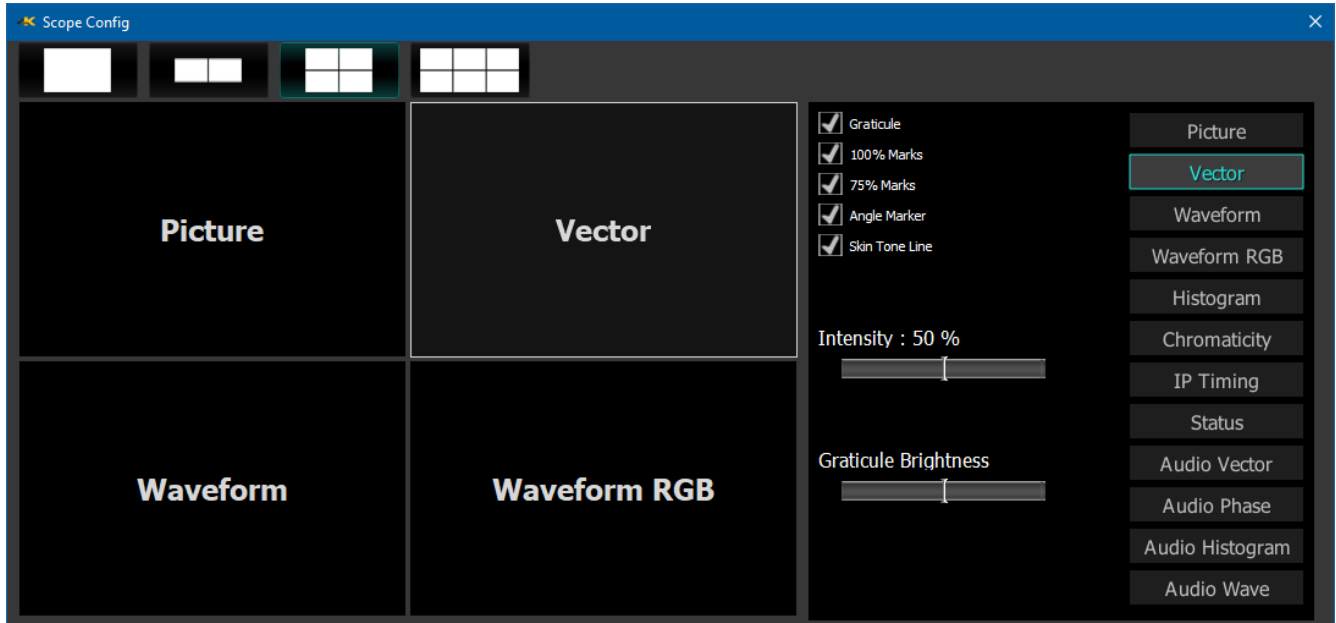
To set each screen:

Click on the screen.

Click on the desired scope's button from the selection on the right. Currently this selection includes Picture, Vector, Waveform, Waveform RGB, Histogram, Chromaticity, IP Timing, Status, Audio Vector, Audio Phase, Audio Histogram, and Audio Wave.

Selecting the scope as per the previous step sets the selected screen to that scope, and displays the scope's available settings. Adjust these settings as required for the application.

Once the layout has been set up, press the red x in the corner to close the **Scope Config** window.

Advanced

Zoom and Pan

4kScope supports zooming the waveform monitors and vectorscope for a closer look at low
saturation signals, or the luma elements of the waveform. The live picture can also be
zoomed in or out, and panned with the mouse.
To zoom, place the mouse over the picture or scope, and roll the mouse wheel.
To pan the picture, click on it and drag it until the area of interest is visible.
To reset to normal zoom, right click the mouse.

Frame Compare

4kScope includes a signal compare feature that can be used to freeze a complete frame of video
(two fields in interlaced), every second line (field) or at a 50/50 dissolve to compare two
signals or cameras.
Once frozen, all the standard scopes are still available for setup and comparison. While a frame is
frozen, the comparison mode and type of scope can be changed.

To access the frame compare features, press the **Frame Grab** button.

Setup

Install the Software

Install **4kScope** software on the system. Regardless of the delivery method, the software will be available at some level as an (executable) installable file. Double-click on the file, or right click and select **Open** from the context menu. Follow the prompts to set where the software should be installed and make other installation-specific decisions.

To take full advantage of the hardware based features of **4kScope**, the system should contain one of the supported AJA, Blackmagic, Matrox or Bluefish444 boards. The board's manufacturers will have up to date recommendations for system specifications.

License the Software

4kScope installs in demo mode, with various limitations. To remove these limitations, you will need a valid license.

In order to license 4KScope, open 4KScope and navigate to the Settings ("Gear" icon at the bottom right of the application). Next click on the "License" button at the bottom of the Settings menu box and then follow the steps at the following location: http://license.drastictech.com/

Run the Software

Run the software. If the default installation path is used, you can open it at: **Start|Programs| Drastic 4kScope|4kScope**. The software will then need to be set up.

Setup Window

Confirm that the signal you wish to monitor is connected to the correct input(s) of the video board. Click on the **Setup** button to confirm or adjust any settings for the type of signal format being used. Once the system is correctly set up, pressing the **Done** button closes the **Setup** window.

Operations

4kScope can be used to view an input signal through supported AJA, Bluefish444, Matrox or Blackmagic video hardware. Once a capable system has been equipped with an install of 4kScope, the user may connect a signal to the appropriate inputs and begin to use the software.

Multiple inputs may be connected to a switcher to compare and adjust any mismatched parameters of setup.

Use the **Setup** Window to confirm or adjust any settings for your video signal.

Use the **Scope Config** window to set the layout (number and arrangement of windows), and which window uses which scope.

At this point if all has been properly set up, the user should be able to view their signal through the appropriate scopes and other signal analysis tools.

This manual has been compiled to assist the user in their experience using **4kScope** software. It is believed to be correct at the time of writing, and every effort has been made to provide accurate and useful information. Any errors that may have crept in are unintentional and will hopefully be purged in a future revision of this document. We welcome your feedback.

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