

# Monitoring

has a whole new look... yours.



## FlexVu™ Technology: The information you need, displayed the way you want it.



A unique method for configuring a variety of different views of the video signal within four tiles. This display technology is called FlexVu™ and allows the user to customize their measurement



requirements to a specific task. Configuring each of the four tiles with different displays is like having four instruments within one unit. These configurations can be saved as a preset within the unit and quickly recalled.

The independent tiles are selected using the Display Select buttons. The measurement function can then be selected by the user for each individual tile.

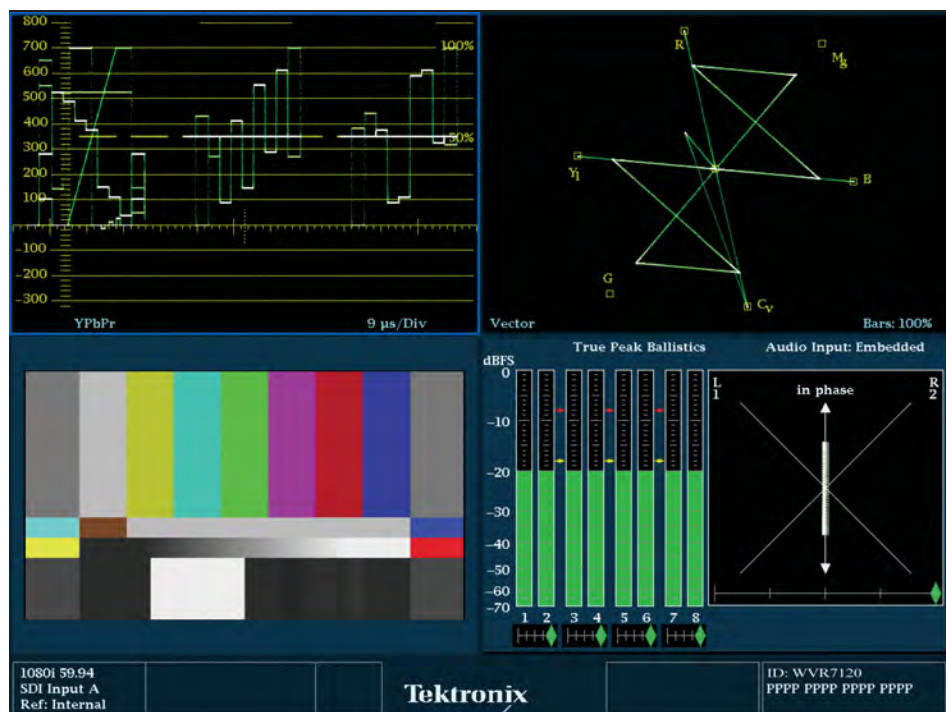
The measurements are selected from the following available Measure Select functions. Pressing and holding either the Measurement Select button or Display button will display the menu selections available for that measurement. A standard instrument FlexVu™ four tile display allows only one Audio Measurement to be selected at a time and only one waveform tile to be in Line Select mode. With Option SIM it is possible to have two Audio tiles or two line select displays.

### Factory Defaults

The factory default preset recalls the instrument to the standard configuration.

#### Waveform

A paraded display of the digital component signal is shown as YPbPr. This allows each component of the signal to be displayed separately. The luma signal Y is displayed on the left side of the screen with a typical amplitude ranging between 0-700 mv. The color difference signals Pb and Pr are offset so that the zero point is at the 50% point of the waveform display. The typical range of Pb and Pr is +/-350 mv. Therefore, by applying the offset, the maximum excursion of the color difference signal and luma signals can be easily compared. When 100% color bar components are applied, these signals extend to the maximum legal limits of the signal components.



#### Vector

A vector display is an X-Y plot of the color difference signals Pb and Pr. No information from the luma component is present within the vector display. The display can be scaled by the user for 100% or 75% targets. The components should then fit within the appropriate boxes for each Pb/Pr component when a color bar signal is applied. In this example, the ARIS-SMPTE high definition color bar pattern has been applied to the input. This pattern contains both 75% and 100% color bar saturations.



#### Picture

Picture mode renders the video display into a tile of the XGA output of the WVR Series. This allows the user to observe the currently applied video input program content. Additionally, the waveform monitor can provide visual indication within the picture of where gamut alarms are exceeded within the image. If the user selects this option within the configuration menu, if the instrument is in line select mode, a bright up line within the picture display provides an on-screen indication of the line which is currently selected.



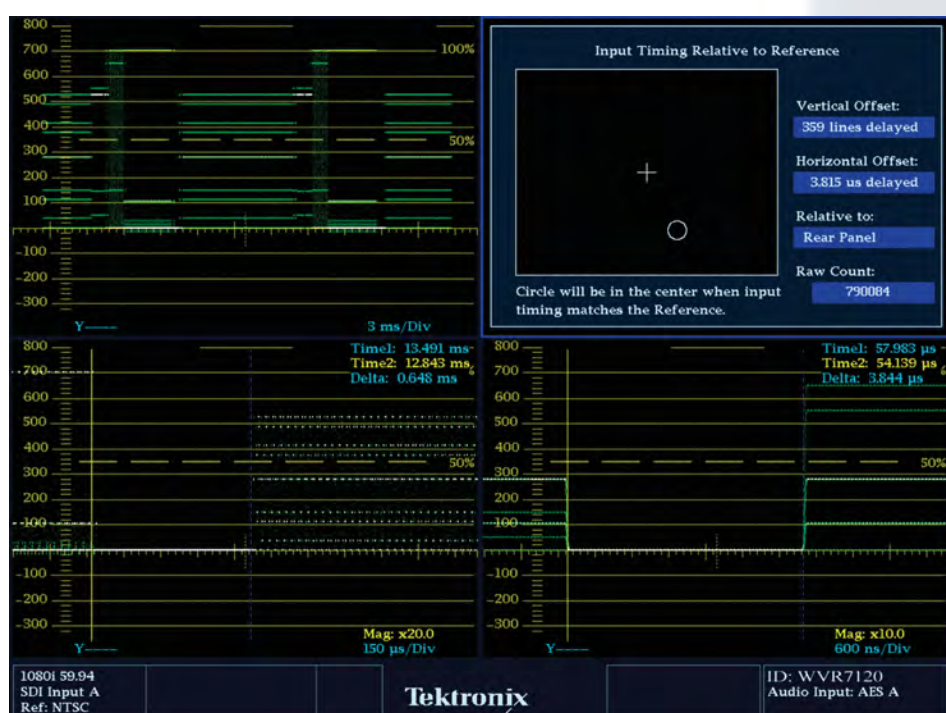
#### Audio

If the audio option is installed within the WVR Series, Tile 4 will display audio level bars of 8 audio channels and a lissajous display of one of the selected audio pairs. The audio input can be analog or AES/EBU digital or de-embedded from the SDI signal, depending on which type of option is installed within the unit. Only one audio tile can be selected to display audio. The user can configure the test tone level and peak level for the audio bar displays for particular facilities standards. The ballistics of the meter can also be configured between VU, Peak, True Peak and PPM. If the audio option is not installed this display is replaced with the Lightning display.

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#### Timing Display

The timing display shows a full color frame time within the black rectangle. The center crosshair shows the reference point. When the circle is in the same location as the crosshair, the input signal and the external reference are correctly timed together. In this example, the circle's vertical position represents a number of lines offset from the reference. Advance time conditions are represented in the upper part of the display and delayed time conditions are represented in the lower half of the display, as in this example. The horizontal position of the circle provides information about the us offset from reference time. When the circle cursor moves toward the left-hand side, this indicates an advanced time condition. In a similar manner, when the circle moves toward the right-hand side, this indicates a delayed time condition, as in this case. Fine timing adjustments can be made by referring to the numerical readout in the display.

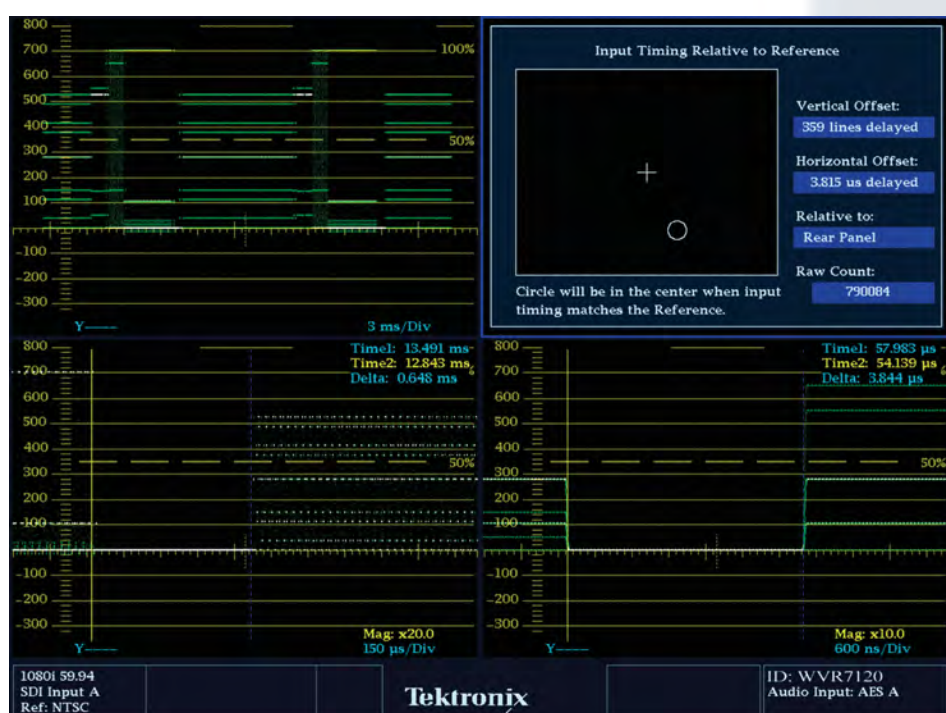


### HD and SD Video Timing

The wide variety of HD video standards and external sync references has made it challenging to ensure correct timing. This FlexVu configuration includes a video timing display with an intuitive interface to help ensure correct timing between the varieties of different signal standard combinations.

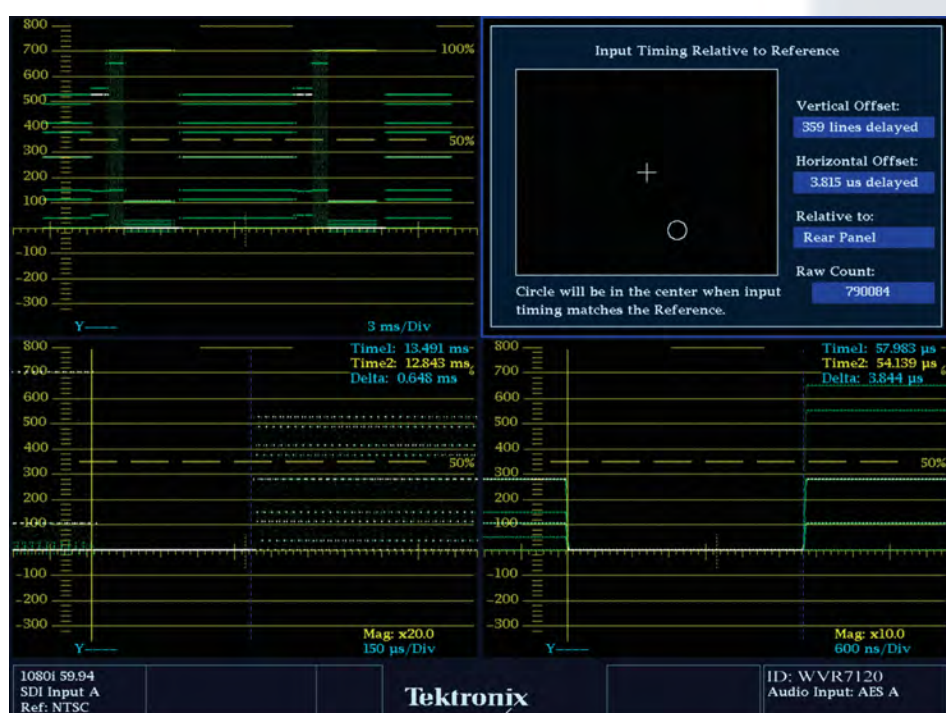
#### Two Field Waveform

This waveform display shows the Y signal in a two field display mode. This shows the relative position of the fields related to the reference signal.



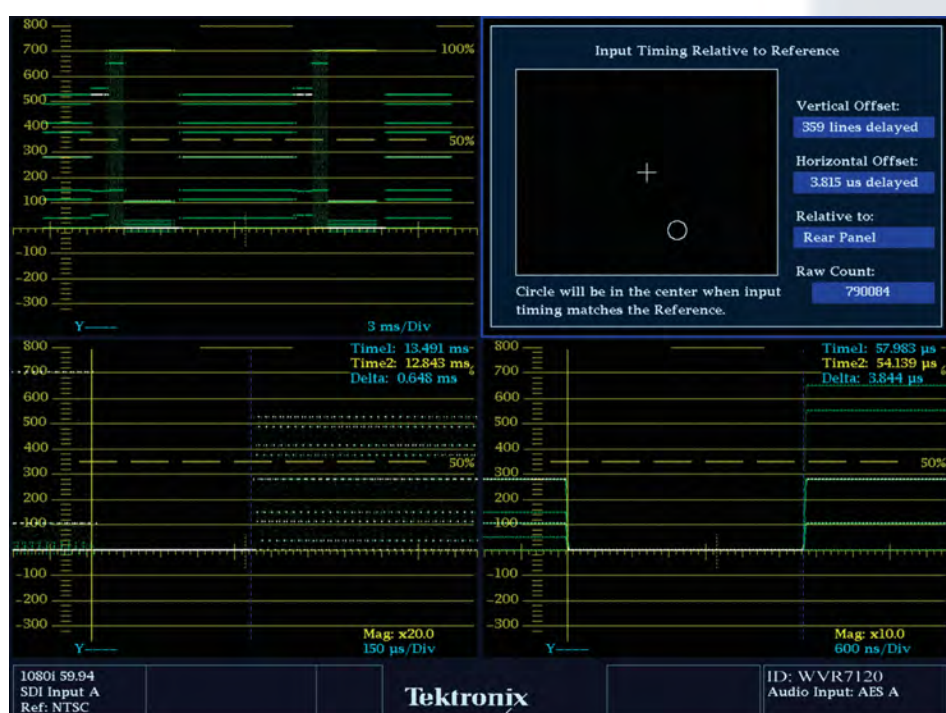
#### Two Field MAG of V Blanking

This waveform display is a magnification of the two field display centered around the vertical blanking interval. Cursors have been placed at the beginning and end of blanking to measure the duration of field blanking.



#### Two Line MAG of H Blanking

This waveform display is a magnification of the two line display centered around the horizontal blanking interval. Cursors have been placed at the beginning and end of blanking to measure the duration of the line blanking interval.

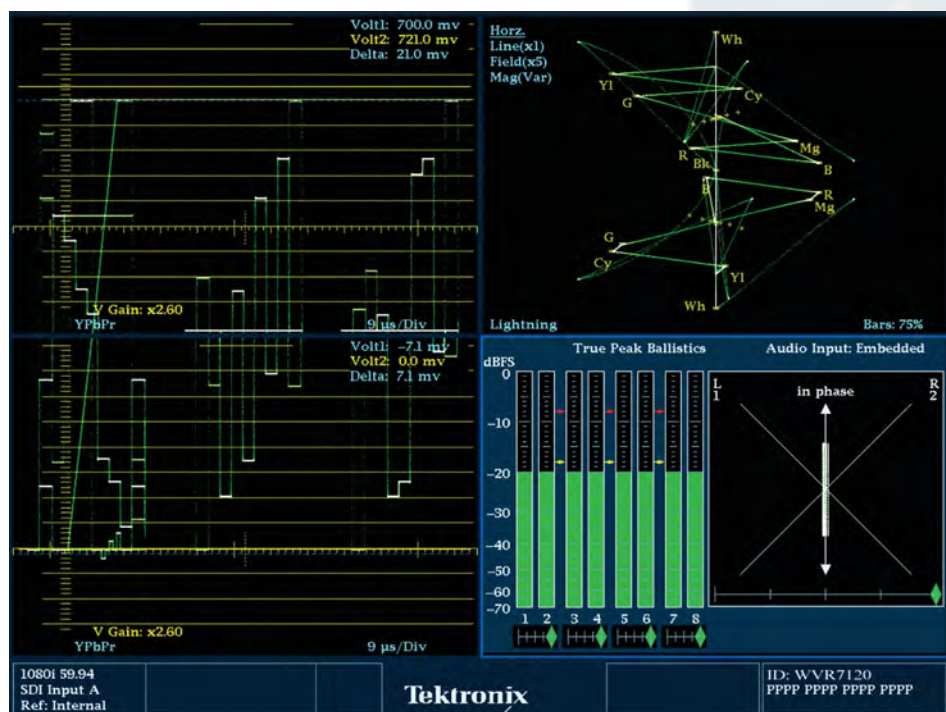


### Tape Quality Assurance and Line-up Setup

In setting up material to be recorded to disk or tape, a leader of color bars and test tones is normally used. This configuration of the FlexVu™ display allows easy monitoring and adjustment of the signal levels.

#### Upper WFM MAG

When aligning video levels of the tape leader or test signal, it is important to ensure that the upper and lower amplitudes of the signal are correctly set up. To easily view the waveform with increased precision, the variable gain function of the WVR Series can be maximized to show the upper portion of the YPbPr paraded waveform display in the upper half of the tile. This allows the operator to easily make adjustments to the proc-amp controls of the recording device and ensure the 700 mv level is obtained for the upper part of the signal. Cursors are placed on the screen to indicate the 700 mv amplitude of the signal and to allow accurate alignment of the color bar levels.



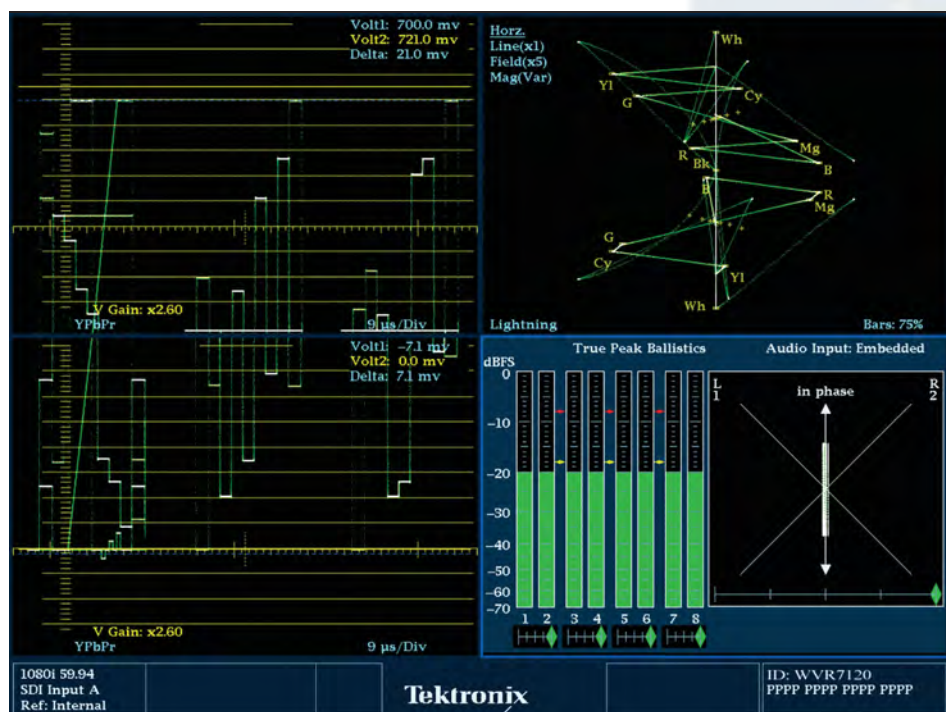
#### Tektronix Lightning

The Lightning display is similar to a vector display except that it incorporates the luma channel into the display. An X-Y plot of luma versus Pb is plotted in the upper part of the display and an X-Y plot of luma versus Pr is plotted in the lower part of the display. By ensuring that the color components fall with the graticule boxes, quick and easy adjustment of the proc-amp controls can be made. If this signal is stretched or compressed in the horizontal direction, adjustment of the chroma signal is required. If the signal is stretched or compressed in the vertical direction, then adjustment of the luma or setup controls is required. Once the signal is correctly aligned within each of the boxes, the green-magenta transition should pass through the center of the crosshairs on the upper and lower graticule to marks. If this does not happen, there is a timing error between the components of the signal and a bending of the signal will occur. The amount of this bending represents the relative signal delay between luma and color-difference signals. The upper half of the display measures the Pb to Y timing, while the bottom half measures the Pr to Y timing. If the transition bends in toward black, the color-difference signal is delayed with respect to luma. If the transition bends out toward white, the color difference signal is leading the luma signal.

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#### Lower WFM MAG

By clever adjustment of the variable gain function, horizontal, and vertical position controls of the waveform monitor, the lower portion of the waveform graticule is displayed in Tile 3. Cursors are placed on the display to show the 0 mv amplitude of the signal. This allows easy and accurate alignment of the color bar black proc-amp levels.



#### Audio

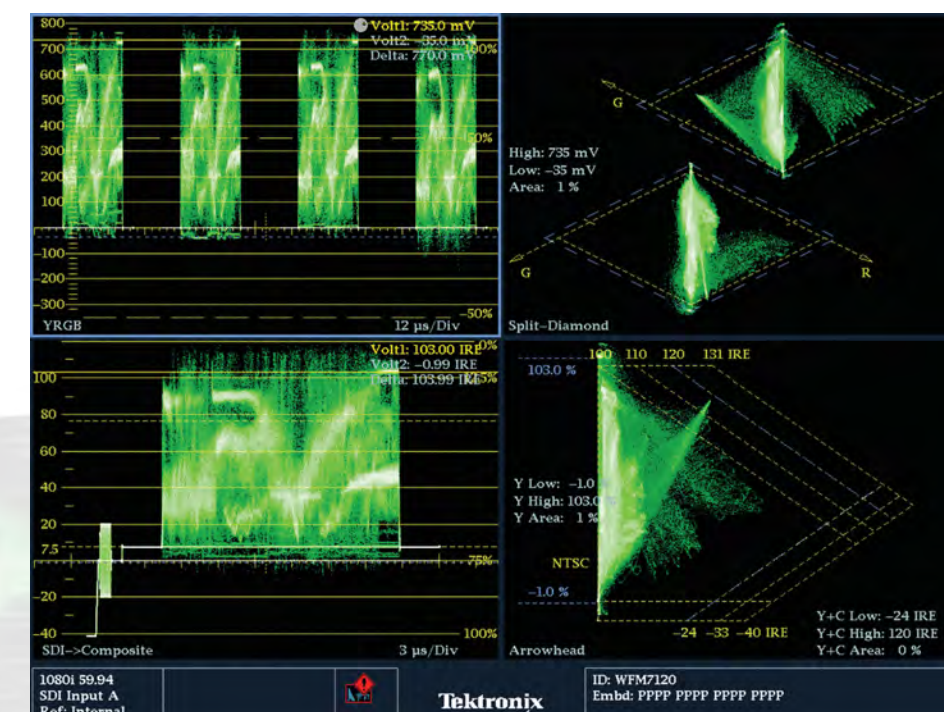
The audio display shows the level bars and lissajous display. The user can independently select each channel pair to be displayed on the lissajous display. The lissajous display is an X-Y plot of the selected channels. In the soundstage mode as shown, when the audio channels have the same frequency and amplitude and are in-phase they produce a vertical line on the lissajous display. A correlation meter below the lissajous display and each channel pair quickly will show channel to channel correlation. In this example, the green diamonds within the display indicate that the correlation is at +1 and the signals are in-phase. In this case, the True Peak ballistic was selected, the test level has been set at -18 dBFS, and the peak level is set to -8 dBFS in the configuration menu.

### Gamut Monitoring

This display configuration is used with telecine color correction, camera balancing, graphics production and editing areas to ensure that the video levels are within format limits when transformed between formats RGB, YPbPr and Composite.

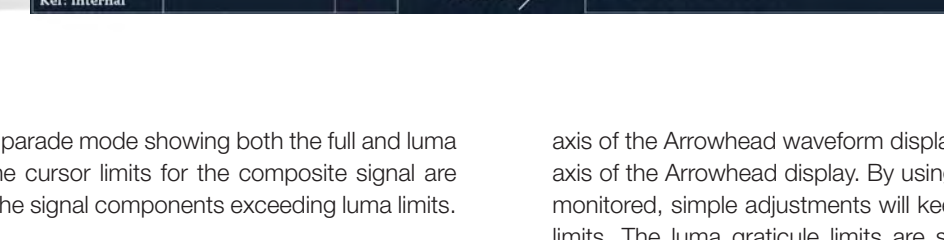
#### YRGB Parade WFM

In color correction or camera balancing of the RGB components, it is useful to be able to see the effect that these adjustments have on the luma Y signal. This waveform display shows a parade display of the YRGB components. Cursors have been placed at the EBU-R103 RGB gamut limits of +/-5% so that excursions of the signal can be noted. If the gamut limits are exceeded, a warning appears at the bottom of the display.



#### Pseudo Composite Flat/Low Pass

To assist in ensuring composite gamut limits of the signal, the WVR Series digitally creates a pseudo composite mode from the digital input signal. This allows the user to visualize the encoded composite output of the final signal without the need for an encoder. In this example, a filter parade mode showing both the full and luma only signals is shown. In this case the cursor limits for the composite signal are applied to allow easy identification of the signal components exceeding luma limits.



#### Tektronix Split Diamond

The Split Diamond display is a simple method to easily view RGB gamut compliance and quickly identify the component in error. When the signal falls within the graticule limits of the display, the signal is within RGB gamut compliance. If a portion of the signal falls outside of the limits, the component in error can be quickly identified. Errors in green amplitude affect both diamonds equally, while blue errors affect only the top diamond and red errors affect only the bottom. The center of the display represents the lower black region of the signal and the upper and lower points of the diamond represent the white limits for the signal. A straight line from the center to the outer point of the diamond indicates a correctly balanced luma only signal. The gamut limits are adjustable within the configuration menu. In this case the EBU-R103 limits were applied.

#### Tektronix Arrowhead

The Arrowhead display provides a simple method to view composite gamut compliance. If the signal elements fall within the graticule limits of the display, the signal is compliant. If a signal element falls outside these limits, it can be quickly identified. Luma adjustments affect the vertical axis of the Arrowhead waveform display. Chroma adjustments affect the horizontal axis of the Arrowhead display. By using the proc-amp controls of the device being monitored, simple adjustments will keep the signal within the Arrowhead graticule limits. The luma graticule limits are shown on the left-hand vertical side of the Arrowhead display and luma-chroma limits are shown on the right-hand diagonals of the display.

### Session Display for Quality Assurance Application

While ingesting / recording content the video should not exceed the allowed gamut range and the audio levels should not exceed limits, or create pops, mutes or clicks. A variety of these parameters can be continually monitored and the event log used to review a list of errors following the session.

#### YPbPr Parade

The YPbPr parade display allows the user to monitor the signal while it is being recorded and to visually observe any errors within the content. Indicators of gamut errors for RGB and Composite are shown in the lower status title bar as alarms.



#### Video Session

The video session screen provides a current view of format parameters such as SAV Placement, Field Length, Line Length and Line Number Error. Statistics are gathered on CRC/EDH errors, RGB, Composite and Luma gamut. If a capitalized letter is shown, this indicates that the gamut limit has exceeded the upper threshold. If a non-capitalized letter is shown, this indicates that the lower gamut limit has been exceeded. For example, R\_g indicates that the upper Red component has exceeded the gamut threshold and that the lower Green component has also exceeded its lower threshold limit.

#### Audio with Lissajous

The audio display shows the level bars of up to 8 channels of audio. In this case, channels 2 and 3 have exceeded the peak threshold since the bars have gone above the red peak value. The True Peak values are also shown within the audio bar displays. The yellow diamond beneath channels 3/4 & 5/6 indicates a correlation value of 0 between the channels. This indicates there is little correlation.

#### Audio Session

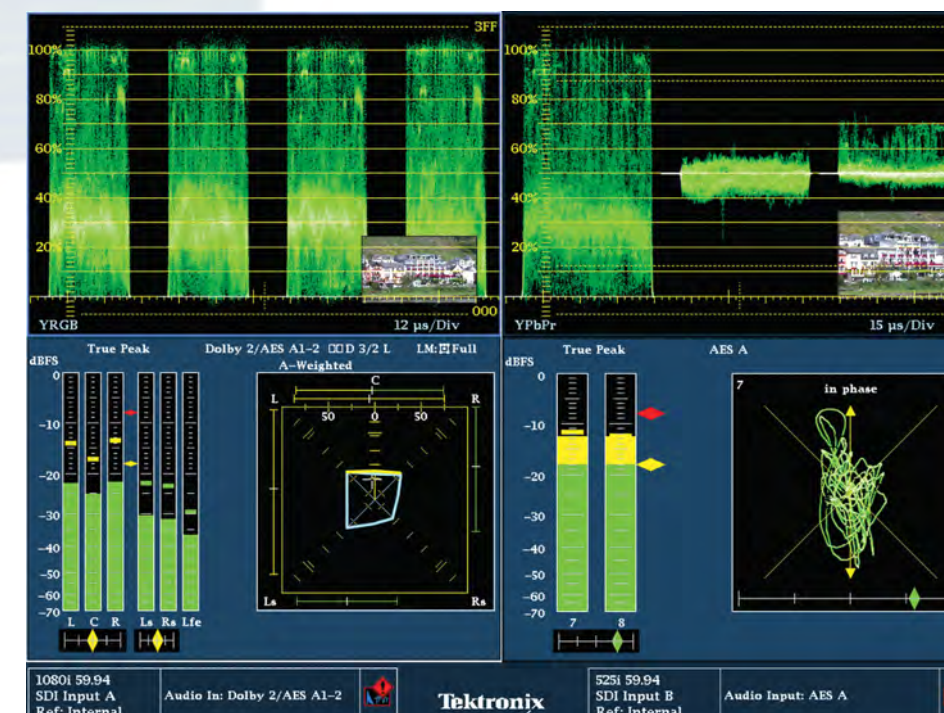
The audio sessions provide information on the Clips, Over ranges, Mutes and Silence that have occurred during the running of the monitored statistics. The overall peak and high audio level is also noted for each of the channels. By selecting the Error interface, the user can view the log and determine when these errors occurred relative to internal clock or timecode (if available).

### Simultaneous Input

The SIM option allows for two input channels to be displayed simultaneously. The four tiles are split vertically into two channels.

#### Waveform Mode

The display has been configured to show a paraded YRGB of the HD input. This allows the user to monitor the luma channel at the same time as viewing the transcoded RGB traces of the input signal. To aid the user in identifying the image a thumbnail picture can be enabled within the instrument.



#### Audio Display

The SIM option allows for two audio displays to be viewed simultaneously. A maximum of 8 discrete audio bars can be displayed for the analog and digital inputs. However using a Dolby configuration it is possible to display a maximum of ten audio bars when the user enables the downmix function. In this case the HD signal that is transmitted contains a Dolby Digital stream. The user can configure Channel 1 to display six audio bars and select a Dolby preset to decode the data stream. The audio display automatically configures the audio bars based upon the metadata to show L, C, R, Ls, Rs and Lfe. The surround sound display is selected to show the interaction of the L, C, R, Ls and Rs channels.

#### Waveform Mode

The YPbPr paraded display has been selected for the SD input. This shows the luma signal along with the color difference signals Pb and Pr. The thumbnail display allows the user to easily identify the current selected signal.

#### Audio Display

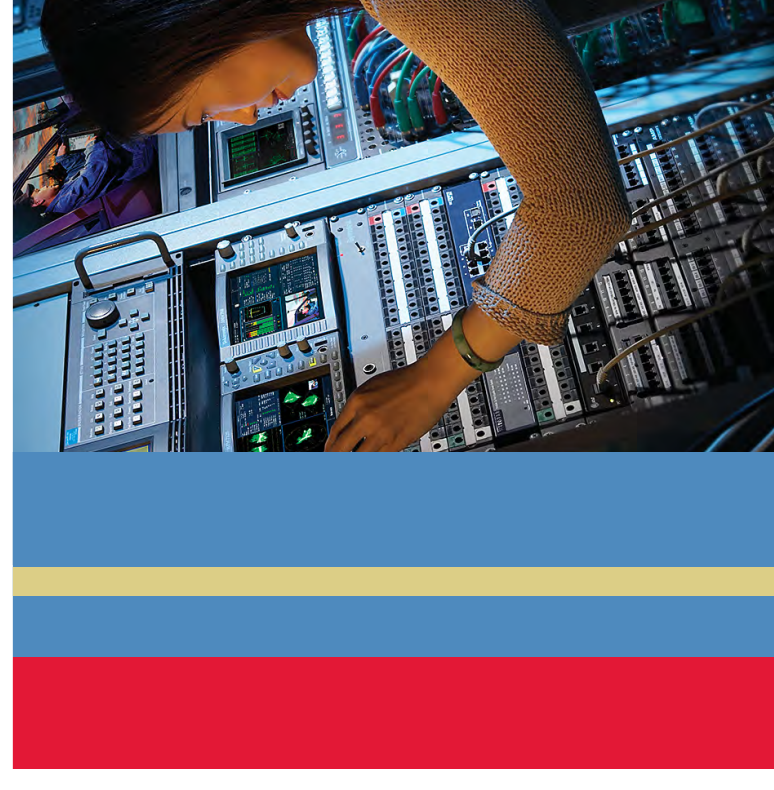
The SD signal typically has a stereo L and R audio signal associated with video. In this case two audio bars were configured for Channel 2. Since a maximum of eight audio bars can be displayed within the instrument. The AES input was used or as the source, but embedded analog inputs could also have been selected. For the two audio inputs a Lissajous display was selected to show the interaction of the phase of the two channels.

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 Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com)

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