

User Manual



WFMNLE Software Waveform Monitor for Non-Linear Editing Systems

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This document applies to software version 1.0.

www.tektronix.com

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Getting Started

This section describes the features of the WFMNLE Software Waveform Monitor and lists which Avid non-linear editing applications are supported.

Product Description

The Tektronix, Inc. WFMNLE Software Waveform Monitor is a software plug-in that seamlessly integrates into Avid, Inc. Non-Linear Editing (NLE) applications. The WFMNLE software enables you to monitor the video signal levels using a variety of displays to ensure that the video you are editing is compliant with industry or customer standards.

NOTE. *The WFMNLE software monitors the video signal from the Record window in the Avid software (not the ingest signal).*

The waveform monitor is a necessary tool used during the creation and development of video material in an NLE environment. The WFMNLE software provides the following advantages when using a hardware waveform monitor is not desirable:

- **Ease of Use.** Hardware waveform monitor solutions are perceived to be difficult to use for NLE environment tasks. The WFMNLE software is easy to use since it provides only the functions that are essential for editing in the NLE environment. Menu structures are simple, intuitive, and easy to navigate. The traditional Waveform and Vector displays are provided along with the Tektronix, Inc. patented Diamond and Arrowhead displays, which are used to identify component and composite gamut errors.
- **Space Savings.** Many video editing suites cannot provide space for a hardware waveform monitor. The WFMNLE is a software-only application and requires no external hardware.
- **Cost Effective.** Since many facilities cannot afford a dedicated hardware waveform monitor for every NLE suite, they resort to sharing a hardware waveform monitor between suites or even taking the risk of not monitoring their video. Since the price of the WFMNLE software is a fraction of a comparable hardware waveform monitor, many facilities can now afford a waveform monitor for all of their NLE suites.

Features and Benefits

The WFMNLE software provides the following features and benefits:

- The AlarmVu display provides a summary view of any component or composite limit violations that might jeopardize your content and lead to rejection of video material intended for broadcast
- The Tektronix, Inc. patented Diamond and Arrowhead displays enable you to quickly identify what needs to be done to correct problem areas in the video
- The Error log display provides proof of compliant video material
- The various displays enable you to monitor color correction changes and to match scenes between video clips
- The Properties dialog box provides easy set up of custom limits to trigger alarm violations
- The advanced features serve both video editors and engineers

Supported Avid NLE Applications

You can use the WFMNLE software on the Avid NLE applications listed in Table 1.

Table 1: Supported Avid NLE applications

Avid NLE application	Operating systems
Media Composer Adrenaline Xpress Pro	Windows XP; Mac OS X (up to 10.3)
NewsCutter Adrenaline FX and NewsCutter XP	Windows XP
Symphony Media Composer 9000XL and 1000XL Film Composer XL and Media Station XL	Windows 2000 or NT; Mac OS X (up to 10.3)
NewsCutter Effects	Windows 2000 or NT

Installing the WFMNLE Software

You can install the WFMNLE software using the CD-ROM or by downloading the software from the Tektronix, Inc. Web site. Perform the following steps to install the WFMNLE software:

NOTE. *Since the WFMNLE software is a plug-in for the Avid NLE software application, the Avid NLE software must be already installed on your computer before you install the WFMNLE software.*

The WFMNLE software CD-ROM allows you to install the WFMNLE software for a free 60-day trial period. After the trial period, the software expires and you must purchase an authorization key from Tektronix, Inc. before the WFMNLE software will operate again on your computer.

Although the WFMNLE software is licensed only to individual computers, you can use this CD-ROM to install the WFMNLE software on multiple computers. Each computer that installs the software will be able to use it for the free 60-day trial period.

1. Perform the following steps if you are installing the WFMNLE software from the Tektronix, Inc. Web site:
 - a. Click on the appropriate download link for your Avid NLE system type (Windows OS or MAC OS).
 - b. Run the Install executable after the software downloads to your computer.
 - c. Proceed to step 3.
2. Perform the following steps if you are installing the WFMNLE software from the CD-ROM:
 - a. Install the WFMNLE CD-ROM into the CD-ROM drive on your computer.
 - b. For Windows OS computers, the WFMNLE install program should automatically start. If the install program does not start, use Windows Explorer to view the contents of the CD-ROM. Double-click on the following file to start the installation program: wfmnle_install_win.exe.
 - c. For MAC OS computers, open the CD-ROM icon on the desktop and click Install.

3. In the WFMNLE software installation window, read the Introduction page and then click **Next**.
4. Read the License Agreement. If you agree to the terms of the license, click the **I accept the terms of the License Agreement** button and then click **Next**.
5. Windows OS Only: The next page lets you select the install location for the WFMNLE software.

NOTE. *For Mac OS systems only, the WFMNLE software is automatically installed in the Applications directory.*

- a. Click **Next** if you want to use the default installation location.
 - b. Click **Choose...** if you want to select the directory where the WFMNLE software will be installed. After you select the custom directory, click **Next** to proceed with the installation.
6. Review the information in the Pre-Installation Summary. If the information is correct, click **Install** to start the installation process.
 7. After the WFMNLE software is installed, click **Done** on the Install Complete page to quit the installer program.

Verifying the Installation

Perform the following steps to verify that the Avid software can locate the installed WFMNLE software plug-in:

1. Start your Avid NLE application software.
2. If you can locate Tektronix in the left pane of the Avid Effects Palette, then the installation process is complete.
3. If you cannot not locate Tektronix in the left pane of the Avid Effects Palette, shut down the Avid application software, and then perform step 4 for Windows OS systems or perform step 5 for MAC OS systems.
4. For Windows OS systems only:
 - a. Find the Avx.dll file in the directory where you installed the Avid application software.
 - b. Select Product Version from the Item Name list in the Version tab of the Properties dialog box for the Avx.dll file. Note if the Avid product version is 1.0 or 1.5.
 - c. In the directory location where you installed the WFMNLE application, there is a Win_AVX1.0 directory and a Win_AVX1.5 directory. Open the directory matching the Avid version number you noted above.
 - d. Copy the WfmPlugin.avx file to the AVX_Plug-ins directory where your Avid NLE application is installed.
 - e. Repeat this verification procedure starting at step 1.
5. For MAC OS systems only:
 - a. Double-click on the Wfm.dmg file in the Volume/Applications/WFMNLE/Mac_AVX1.5 directory. This causes the WFMNLE icon to appear on the desktop.
 - b. Double-click the WFMNLE icon on the MAC desktop, and then copy the wfm.bundle file to the AVX-Plug-ins directory where your Avid NLE application is installed.
 - c. Repeat this verification procedure starting at step 1.

Refer to [Starting the WFMNLE Software](#) on page 9 for instructions on how to start the WFMNLE software from your Avid NLE application.

Licensing the WFMNLE Software

During the free 60-day trial period, the authorization window shown in Figure 1 appears when you start the WFMNLE application. This window lists the number of days remaining before the WFMNLE software expires.

If you are ready to purchase a license for your WFMNLE software, perform the following steps:

1. Write down the Unique ID number listed in the WFMNLE authorization window. You will be required to provide this number during the ordering process.



CAUTION. *The WFMNLE software is licensed only to an individual computer running the Avid NLE software. The Unique ID number is case sensitive and is unique to the hardware used by your Avid application. During the ordering process, be sure that the Unique ID number you enter is from the Avid NLE editing computer for which you intend to license the WFMNLE software.*

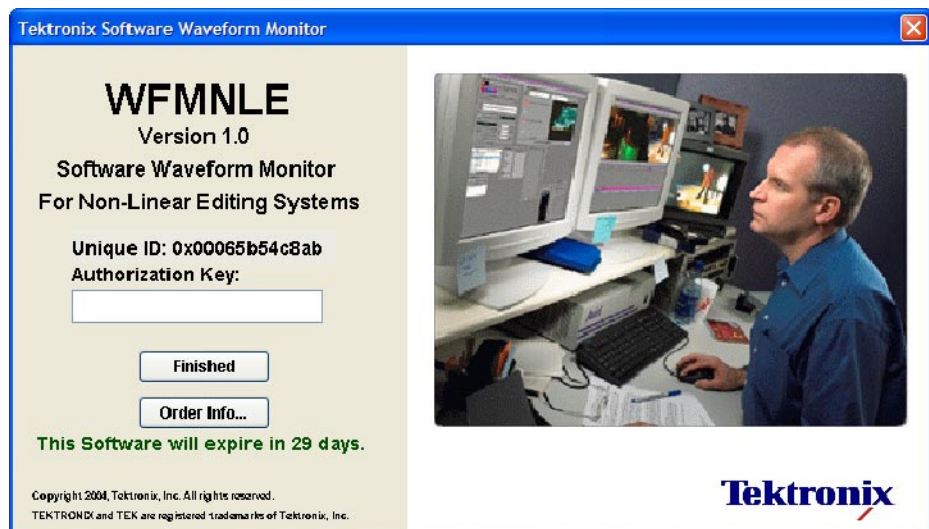


Figure 1: The WFMNLE software authorization window

2. Click the **Order Info...** button to open the Order Information window which lists two URLs you can use if your computer has a Web browser:
 - **Online.** Use this URL to open the WFMNLE purchase page at the Tektronix, Inc. Web site. The online ordering capabilities depend on your location and the payment method you select.
 - **By Phone.** Use this URL to open the Tektronix, Inc. home Web page where you can click on the Contact Us link to list the many ways to contact Tektronix by phone.

NOTE. *The standard method of delivering the WFMNLE authorization key is by regular mail. If your WFMNLE software is about to expire and you need to get your authorization key quickly, during the purchase process you can select to also have the key sent to you by email.*

3. After you receive the authorization key, enter the number into the entry box in the WFMNLE authorization window (see Figure 1). Be careful since the authorization key number is case sensitive. The authorization window will no longer appear after you license the WFMNLE software.
4. Click **Finished** to complete the licensing process and close the WFMNLE authorization window.

Uninstalling the WFMNLE Software

Perform the following procedure if you need to uninstall the WFMNLE software:

1. For Windows OS systems:
 - a. Open the Control Panel from the Start menu and select Add/Remove Programs.
 - b. Select WFMNLE from the list of programs and then select Remove.
2. For MAC OS systems:
 - a. Double-click on `uninstall_wfmnle` in the `Volume/Applications/WFMNLE` directory.
 - b. Select Uninstall and then click Done.

Operating Basics

This section provides instructions for starting the WFMNLE software on your Avid system and describes the basic methods for operating the software.

Starting the WFMNLE Software

NOTE. *This procedure assumes you have already installed the WFMNLE software on your Avid NLE system. Refer to [Installing the WFMNLE Software](#) on page 3 for installation instructions.*

Perform the following steps to start the WFMNLE software:

1. Start your Avid NLE application software.
2. Open a video timeline from an existing project or create a new timeline.
3. If your Avid timeline is a new project, or you have not previously applied the WFMNLE software to your timeline, perform the procedure described below. Otherwise, proceed to the step 4.
 - a. Apply any desired effects to the Avid video timeline.
 - b. Create a new global video track in the Avid Timeline window.
 - c. Activate the new video track by clicking on the right side of the associated Record Track button. Figure 2 shows an example using an Avid Xpress Pro system.
 - d. Insert an Add Edit marker at the head of the timeline for the new video track.
 - e. Select Tektronix in the left pane of the Avid Effects Palette, and then drag-and-drop the WFMNLE icon from the right pane of the Effects Palette onto the new video track you created.



Figure 2: Starting the WFMNLE Software Waveform Monitor in an Avid Timeline window

4. The WFMNLE icon appears in the top global video track on your timeline when you apply the WFMNLE software to the video track.

NOTE. When you save the project settings for a timeline that has the WFMNLE software applied, the next time you open the project, the WFMNLE software will already be applied to the timeline.

5. Start the WFMNLE software either by using the Avid Effects Editor or by double-clicking on the WFMNLE icon on your computer desktop.

NOTE. During the free 60-day trial period, click the *Finished* button in the WFMNLE authorization window to enable the application. This window does not appear in licensed WFMNLE software.

6. The WFMNLE application window appears on the Avid desktop. You may need to click on the video timeline to have the video signal appear in the WFMNLE window.
7. Position the WFMNLE application window to a convenient location on your Avid desktop. Refer to *Operating Characteristics* on page 26 for information about positioning the WFMNLE window on your desktop.

Understanding the Displays

The following pages describe the basic functions of the various WFMNLE software monitoring views.

Setting the Display Appearance

Figure 3 shows a typical WFMNLE display and identifies the major elements of the user interface.

Use the drop-down boxes located at the top of the WFMNLE window to select which monitor type will be displayed in the left and right tiles of the WFMNLE window. The left tile is the primary display. All of the monitor types can be viewed in the left tile. The right tile is the secondary display. Only some of the monitor types can be viewed in the right tile.

To save space on your Avid desktop, or if you want to view only one monitor, you can use the One or Two Displays button to hide or display the right tile.

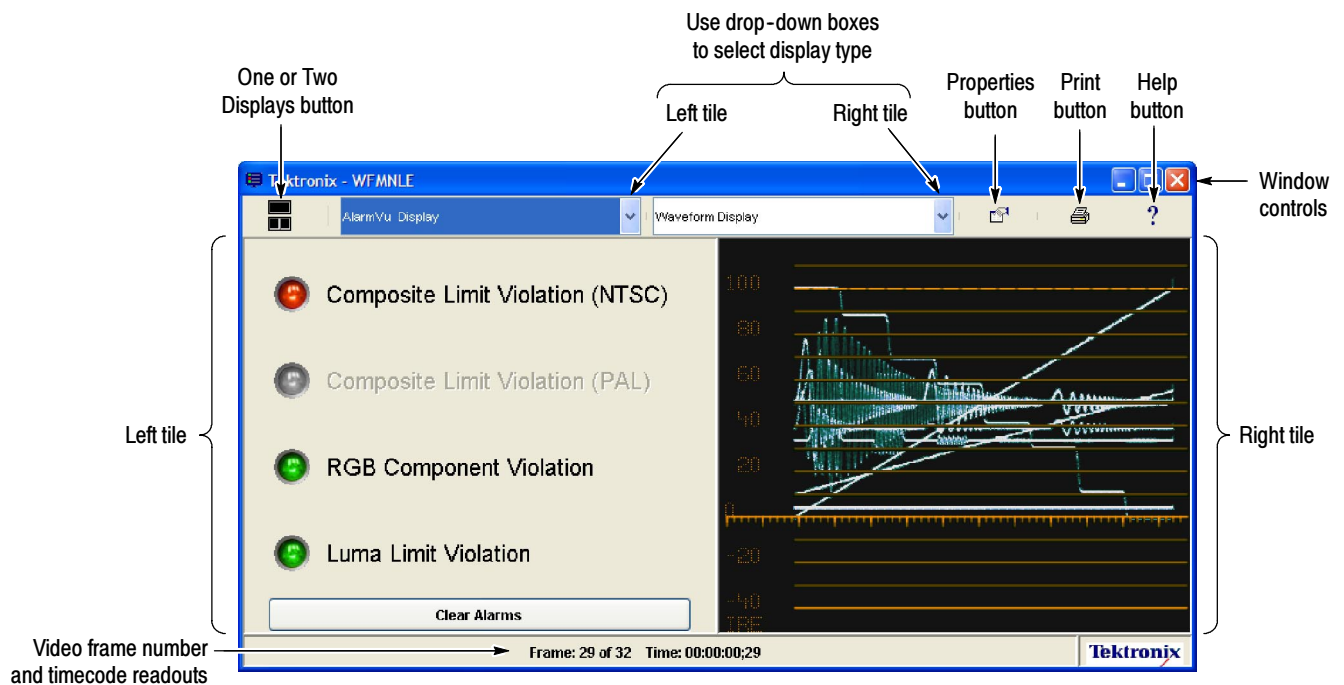


Figure 3: WFMNLE display elements

AlarmVu Display

The AlarmVu display, see Figure 4, provides an easy method to determine on a frame-by-frame basis whether your video material violates signal limits that may lead to your video being rejected by your customer for broadcast. Along the left side of the display, the status lights indicate which limits are being monitored and the current state of each limit test.

Use the Limits tab in the Properties dialog box to enable each of the limit tests and to set the signal levels at which limit errors will be reported. The color of the state lights in the AlarmVu display indicate the current state of the associated limit test as described below:

- Gray. Indicates that the associated limit test is not enabled.
- Green. Indicates that the associated limit test is enabled and that no limit violation has been detected since you last cleared the alarms.
- Yellow. Indicates that the associated limit test is enabled and that a limit violation was previously detected, but the current video frame does not contain a limit violation.
- Red. Indicates that the associated limit test is enabled and that the current video frame is in violation of one or more limits.

Click the Clear Alarms button to clear any reported limit violations from the AlarmVu display. The error log is not affected by this Clear Alarms function.

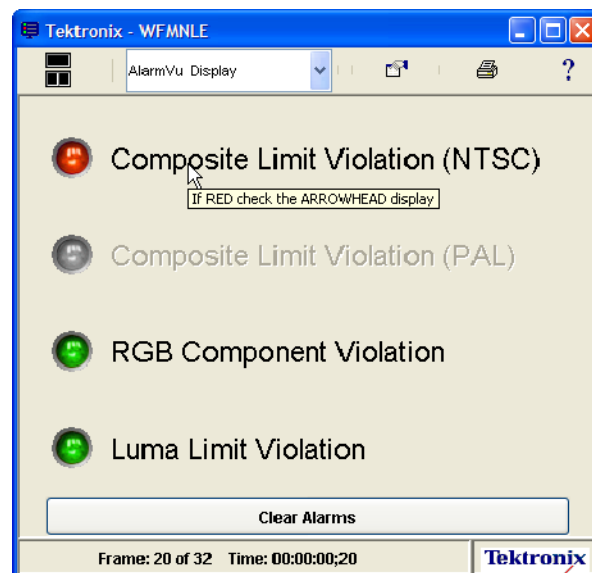


Figure 4: AlarmVu display

Waveform Display

The Waveform display (see Figure 5) shows the signal levels in the vertical axis with time progressing in the horizontal axis. Lower signal levels represent the darker portions of the image while higher signal levels represent the brighter portions of the image. Time progresses from left to right.

Refer to [How Do You Use the Waveform Display?](#) on page 28 for background information about using the display.

Refer to [Configuring the WFMNLE Displays and Alarm Limits](#) on page 21 for information about changing the following Waveform display settings:

- Waveform mode
- Line Select mode
- Trace and graticule intensity
- Analog Representation mode
- Out-of-Limits Tolerance Filter

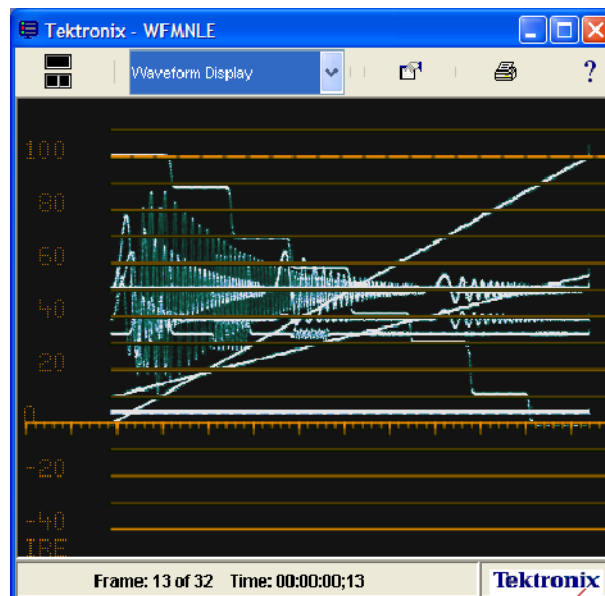


Figure 5: Waveform display

Vector Display

The Vector display enables you to monitor the overall signal chrominance level, which is useful for setup, for matching scenes, and for ensuring flesh tones are correctly aligned and color-corrected within the image.

The Vector display is an X-Y plot of the two color difference signals, with blue (Cb) along the horizontal axis and red (Cr) along the vertical axis (see Figure 6). The amount of color saturation is indicated by the distance of the waveform away from the center. Differences in color hue are indicated by the amount of circular rotation (angle) of any part of the signal away from a reference point.

When the signal being monitored is a 75% color bars signal, each of the colors should fall within the appropriate vector target boxes (see Figure 6).

Refer to [How Do You Use the Vector Display?](#) on page 32 for background information about using the display.

Refer to [Configuring the WFMNLE Displays and Alarm Limits](#) on page 21 for information about changing the following settings that affect the Vector display:

- Line Select mode
- Trace and graticule intensity
- Analog Representation mode
- Out-of-Limits Tolerance Filter

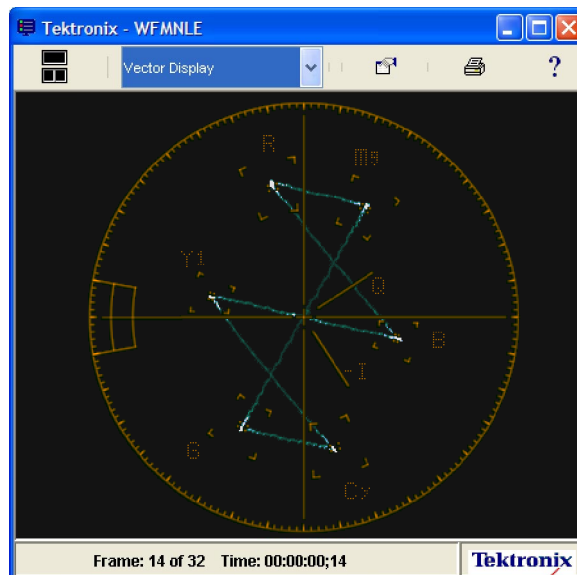


Figure 6: Vector display of a 75% color bars signal

Diamond Display

The Tektronix, Inc. patented Diamond display (see Figure 7) consists of two diamond-shaped graticules. The display shows the relationship between the Red, Green, and Blue color components in the RGB component domain. You can use the Diamond display to monitor whether any of the three color components are out of limits in your video since virtually all color displays are RGB displays.

When the displayed waveform extends outside of the diamond graticules, the video signal exceeds the RGB component gamut limits in that video frame. Conversely, if the waveform is within the graticule limit marks, then the video signal is within the gamut limits for the RGB component domain.

Refer to *How Do You Use the Diamond Display?* on page 34 for background information about using the display.

Refer to *Configuring the WFMNLE Displays and Alarm Limits* on page 21 for information about changing the following settings that affect the Diamond display:

- Line Select mode
- Trace and graticule intensity
- Analog Representation mode
- Out-of-Limits Tolerance Filter

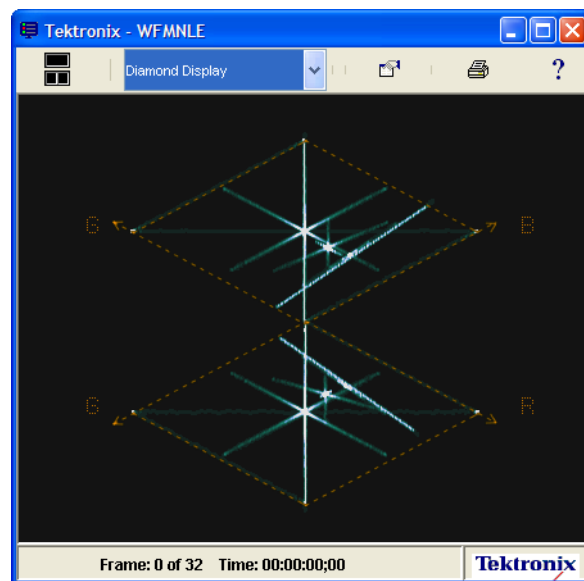


Figure 7: Diamond display of a matrix test signal

Arrowhead Display

The Tektronix, Inc. patented Arrowhead display (see Figure 8) shows limit errors in the composite color-space, without requiring the signal to first pass through a composite encoder. Use this display if your video material will be used for analog broadcast (terrestrial, CATV, satellite, NTSC, or PAL) or if the video will eventually be input to a TV as a single analog input (either baseband composite or Channel 3 or 4), whether via VHS, DVD, PC video, etc.

The Arrowhead display plots the luminance (brightness) portion of the video signal on the vertical axis, with the lower left corner of the arrow corresponding to setup level for NTSC signals and to blanking level for PAL signals. The chrominance (color) portion of the video signal is plotted on the horizontal axis, with no color at the left edge of the arrow. When the displayed waveform extends outside of the graticule limit marks, the video signal exceeds the Composite gamut limits in that video frame.

Refer to [How Do You Use the Arrowhead Display?](#) on page 36 for background information about using the display.

Refer to [Configuring the WFMNLE Displays and Alarm Limits](#) on page 21 for information about changing the following settings that affect the Arrowhead display:

- Line Select mode
- Trace and graticule intensity
- Analog Representation mode
- Out-of-Limits Tolerance Filter
- Composite limits

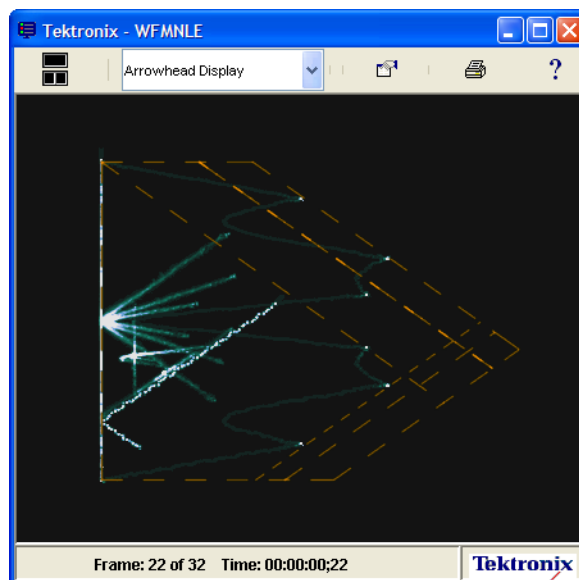


Figure 8: Arrowhead display of a matrix test signal with composite limit errors

Picture with Error Bright-ups Display

The Picture with Error Bright-ups display shows a monochrome display of the video image. When you enable any of the limit checks using the Limits tab in the Properties dialog box, the associated portions of the image that are in violation are highlighted in red. Figure 9 shows the AlarmVu display indicating a current Composite limit violation.

When you enable one of the Line Select modes, the selected lines are highlighted in the Picture with Error Bright-Ups display as shown in Figure 15 on page 31.

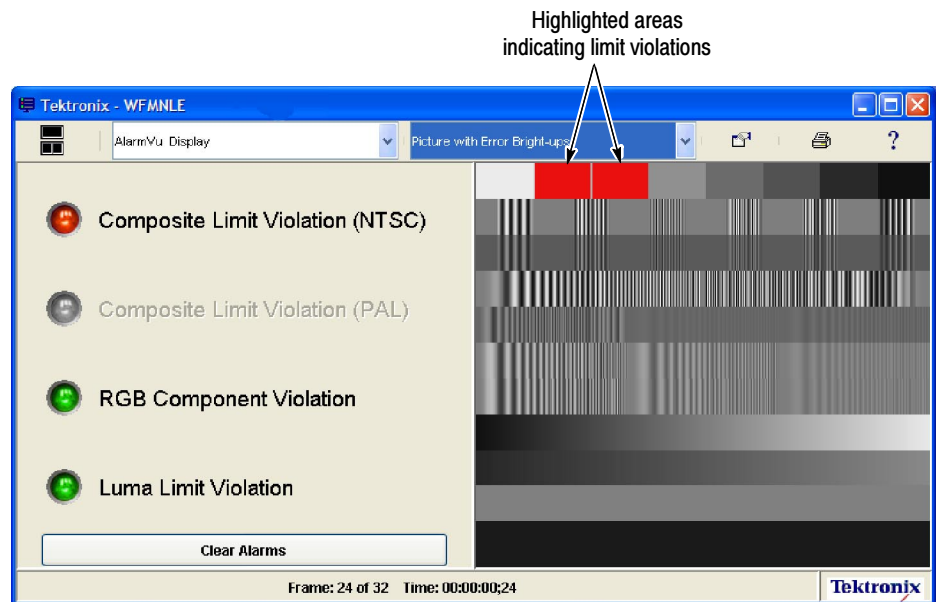


Figure 9: Picture with Error Bright-Ups display

Error Log Display

When you enable limit violation tests using the Limits tab of the Properties dialog box, the Error Log display (see Figure 10) lists the following information about any detected errors:

- Type of error event; if more than one type of error occurs in a frame, each type of error is reported as a separate log entry
- Starting frame number where the error was detected and the number of consecutive frames containing the error
- Timecode of when the error was detected; listed in hours, minutes, seconds, and the frame number within the second



CAUTION. *When you playback the Avid video timeline at real-time speed, the Avid software occasionally skips video frames to maintain the proper display rate. When the Avid system skips frames during playback, the WFMNLE software cannot test the skipped frames for limit violations.*

The Avid system does not skip frames when you playback the timeline using the Avid rendering mode. You must use the Avid rendering mode for playback to ensure that the WFMNLE software tests all of the video frames in your timeline.

The WFMNLE software assumes that you do not have any NTSC setup for a Component video signal output. If you turn on setup at the Avid video output, the signal levels that the WFMNLE software uses to determine limit violations will not match the signal output from your Avid system. Turn off NTSC setup at the Avid video output to use the Error Log as proof of compliant video.

The three buttons at the bottom of the Error Log provide the following functions:

- Clear Log. Use this button to clear the log entries. Once you clear the log, you cannot recover the contents.
- Save Log. Use this button to save the log as a comma-delimited text file that you can import into other applications for further analysis. A Save window appears allowing you to save the file to any location on your PC or network.
- Print Log. Use this button to print a copy of the log.

Event	Start	Duration	Time
RGB Component Violation	448	12	00:00:13;13
Luma Limit Violation	447	1	00:00:13;12
Luma Limit Violation	437	2	00:00:13;02
Luma Limit Violation	431	4	00:00:12;30
Luma Limit Violation	429	1	00:00:12;28
Luma Limit Violation	425	3	00:00:12;24
Luma Limit Violation	422	2	00:00:12;21
Luma Limit Violation	418	3	00:00:12;17
Luma Limit Violation	411	4	00:00:12;10
Luma Limit Violation	409	1	00:00:12;08
Luma Limit Violation	371	4	00:00:11;03
Luma Limit Violation	363	1	00:00:10;28
RGB Component Violation	330	117	00:00:09;29
Luma Limit Violation	326	2	00:00:09;25
RGB Component Violation	324	4	00:00:09;23
Luma Limit Violation	318	4	00:00:09;17
Luma Limit Violation	308	9	00:00:09;07
Luma Limit Violation	304	3	00:00:09;03
Luma Limit Violation	290	13	00:00:08;22

Clear Log Save Log Print Log

Frame: 468 of 597 Time: 00:00:14:01 Tektronix

Figure 10: Error Log display

Correlating the WFMNLE Timecode with the Avid Timecode. The WFMNLE Error Log display reports limit errors using the Absolute timecode as defined by your Avid system, rather than the Avid Master timecode. To enable the WFMNLE Error Log to report errors that correlate with the Avid Master timecode, enter the appropriate time offset in the Preferences tab of the Properties dialog box.

Locating Reported Limit Violations. The method you use to locate reported limit violations depends on whether you have correlated the WFMNLE timecode with the Avid Master timecode.

- If the WFMNLE timecode correlates with the Avid Master timecode because you entered the appropriate time offset in the Preferences tab of the Properties dialog box, then you can use the Master timecode readout at the bottom of the Avid Timeline window to locate reported limit violations as you move through the timeline.
- If the WFMNLE timecode is not correlated with the Avid Master timecode, any limit violations are reported using the Avid Absolute timecode. To locate reported violations, first set the Avid Record window to display the Absolute (abs) timecode. You can then use the timecode readout at the top of the Avid Record window to locate reported limit violations as you move through the timeline.

Color Picture Display The Color Picture display shows the video picture without any error highlights.

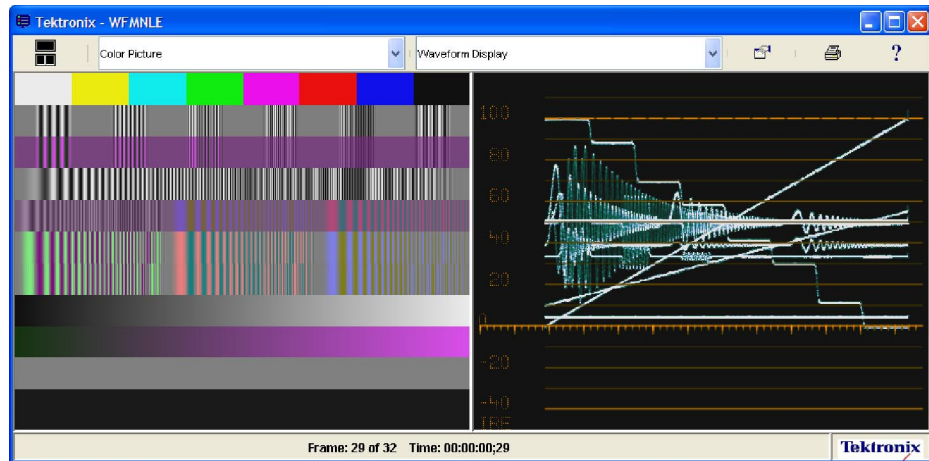



Figure 11: Color Picture display of a matrix test signal

Configuring the WFMNLE Displays and Alarm Limits

Click the Properties button  to open the Properties dialog box (see Figure 12) which provides the following three tabs to configure monitoring parameters:

- **Settings.** Use this tab to select the mode for the Waveform display, to configure the Line Select mode, to adjust the trace and graticule brightness, and to enable the Analog Representation mode.
- **Limits.** Use this tab to enable or disable the limit tests, to configure the levels that will trigger limit violations, and to set how the WFMNLE monitor responds to short duration limit excursions.
- **Preferences.** Use this tab to set whether or not the WFMNLE application window is always on top (Windows applications only), to enable or disable the Fast QC mode, and to enter the time offset that will be used to match the WFMNLE timecode with the Avid Master timecode.

Refer to *How Do You Use the Properties Dialog Box?* on page 39 for descriptions of the various settings.

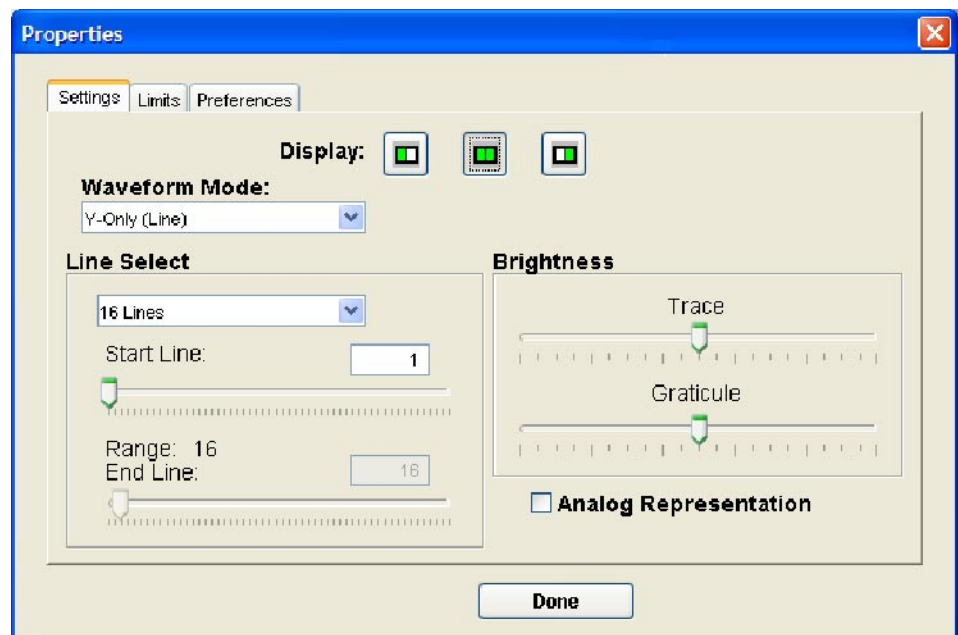


Figure 12: Settings tab of the Properties dialog box

Monitoring Methods

The following procedure describes methods for using the WFMNLE software to ensure that the video you are editing is compliant with industry or customer standards.

1. Perform the procedure *Starting the WFMNLE Software* on page 9 to enable the WFMNLE software to monitor the timeline you are editing.
2. Use the Limits tab of the Properties dialog box to enable the desired limit test(s) and to set the alarm limit thresholds.
 - Typically, you will enable the RGB Component Violation test to monitor the color saturation, and you will enable the Luma Limit Violation test to monitor the black levels and image brightness.
 - If required, use the Low and High Limit slider controls to set the alarm limit thresholds to levels other than the default values. Since the default values comply with industry standards (EBU Tech Rec. R103-2000 and IEEE Standard 205 for SD signals), you typically will not need to adjust the limit values.
 - You can also enable both the NTSC and PAL composite limit tests. Even if all of your material is from a digital source, you can use these tests to verify that your video will comply as a composite output when you may need to output in that format.
 - Use the Out-of-Limits Tolerance Filter slider control to set how the WFMNLE software responds to an occasional signal spike outside of the defined limits. Although the default setting of 50 corresponds to industry standards, if your video contains many sharp video transitions, you may want to move the slider control to the left to decrease the WFMNLE sensitivity to short-duration limit violations.
3. After you enable limit testing and set the limit thresholds, go to the Error Log display and clear the log if necessary.
4. Select the AlarmVu display for the left tile of the WFMNLE application.
 - A green light appears next to enabled tests until a limit violation is detected. A red light appears next to the associated test when the current video frame contains a limit violation.
 - You do not have to leave the AlarmVu visible while you work. You can minimize the WFMNLE application in your workspace and just check it periodically as you edit. If you see a yellow light when you display the AlarmVu, this indicates that the WFMNLE software detected limit violations during your editing session.

5. If you observe a red or yellow light in the AlarmVu display, select the Error Log display for the left tile of the WFMNLE window. The Error Log lists the type of any detected limit violation(s), the starting frame number, the number of consecutive frames containing the error, and the time in the video timeline when the error was first detected.
6. Reselect the AlarmVu display for the left tile of the WFMNLE application and then go to the frame in the timeline where the WFMNLE reported the limit violation.
 - If you entered a time offset in the Preferences tab of the Properties dialog box so that the WFMNLE timecode correlates with the Avid Master timecode, use the Master timecode readout at the bottom of the Avid Timeline window to locate reported limit violations as you move through the timeline.
 - If you have not correlated the WFMNLE timecode with the Avid Master timecode, any limit violations are reported using the Avid Absolute timecode. To locate reported violations, first set the Avid Record window to display the Absolute (abs) time. Then use the timecode readout at the top of the Avid Record window to locate reported limit violations as you move through the timeline.
7. Select the appropriate display for the right tile of the WFMNLE window as described below.
 - For a luminance limit violation, select the Waveform display to monitor the signal levels. Use your Avid software to adjust the signal until the red light on the AlarmVu display changes to yellow.
 - For an RGB component violation, select the Diamond display or select the RGB Parade (Line) mode in the Waveform display to monitor signal levels. Use your Avid software to make signal adjustments until the signal stays within the limit marks on the Diamond graticule. The red light on the AlarmVu display will change to yellow when the signal level is properly adjusted. Refer to [How Do You Use the Diamond Display?](#) on page 34 for more information.
 - For an NTSC or PAL composite violation, select the Arrowhead display to monitor signal levels. Use your Avid software to make signal adjustments until the signal stays within the limit marks on the Arrowhead graticule. The red light on the AlarmVu display will change to yellow when the signal level is properly adjusted. Refer to [How Do You Use the Arrowhead Display?](#) on page 36 for more information.
 - To view limit violations in the video image, select the Picture with Error Bright-ups display, which superimposes red over the area(s) where limit violations are detected. These red areas disappear after you properly adjust the signal levels with your Avid software.

8. After you correct all reported violations, click the Clear Alarms button in the AlarmVu to clear the reported alarms so you can return to editing where you left off.
9. At the end of your editing session, go to the Error Log display to print of copy of the log or to save it to a file on your hard drive or network.

Troubleshooting Problems

Table 2 provides a list of questions and suggests possible solutions to help you solve suspected problems with the WFMNLE software.

Table 2: Troubleshooting WFMNLE software problems

Question	Suggestions
What do I do if I just installed the WFMNLE software, but the application will not start?	<ol style="list-style-type: none"> 1. Review the procedure in Installing the WFMNLE Software on page 3. 2. Review the procedure in Starting the WFMNLE Software on page 9.
What do I do if the Avid software or the WFMNLE software behaves strangely?	<ol style="list-style-type: none"> 1. Close the WFMNLE application window to see if the Avid system returns to normal operation. 2. If you suspect there is a problem with the WFMNLE software, first uninstall and then reinstall the WFMNLE software. If the problem persists, contact Tektronix, Inc. 3. If you suspect there is a problem with the Avid software, contact Avid, Inc.
What do I do when the WFMNLE displays do not update as I scroll through my timeline?	Create a global video track above your other video tracks in the Avid timeline, and then apply the WFMNLE plug-in to the global track. This method enables you to analyze your entire timeline without having to apply the WFMNLE plug-in to each individual video clip.
What do I do if the WFMNLE window keeps disappearing behind the Avid editing windows?	<p>Windows OS: Use the Preferences tab of the Properties dialog box to enable the WFMNLE always in foreground mode. This mode keeps the WFMNLE application window always on top of any other application window.</p> <p>MAC OS: If you have a second monitor for your Avid system, try positioning the WFMNLE application on the other monitor. You can also save desktop space by using the One or Two Displays button to toggle the WFMNLE application between displaying one or two monitor types.</p>

Table 2: Troubleshooting WFMNLE software problems (Cont.)

Question	Suggestions
What do I do if I cannot find an error in the video frame at the timecode shown in the Error Log?	<ol style="list-style-type: none"> 1. Review the information in Locating Reported Limit Violations on page 19. 2. Make sure you have placed the WFMNLE plug-in on a global video track. 3. Make sure you set the Master time in your Avid timeline.
What do I do if my Avid Record window is not updating?	<ol style="list-style-type: none"> 1. Make sure that the WFMNLE application does not cover any portion of the Avid Record window. 2. The Avid Record window or the timeline must be active to start a playback.
What do I do if changes to the Settings tab of the Properties dialog box are not taking affect?	Click on the appropriate Display icon in the Settings tab (left tile, both tiles, or right tile) so that the changes affect the desired tile.

Operating Characteristics

The following topics describes interactions between the WFMNLE software and the Avid NLE software.

Positioning the WFMNLE Application Window

The Avid software must be the active window (on top) before editing commands are accepted. Try to position the WFMNLE window to an unused location on your Avid desktop. If your Avid system has only one monitor, try to position the WFMNLE window to a location where you can still see the WFMNLE window when you click in the Avid Composer or Timeline windows. The Avid windows may appear to not update properly if the WFMNLE window is the active window and it covers part of the Avid NLE windows.

Skipped Video Frames During Real-Time Playback

When you playback the Avid video timeline at real-time speed, the Avid software occasionally skips video frames to maintain the display rate. When the Avid system skips frames, the WFMNLE software cannot test the skipped frames for limit violations. The Avid system does not skip frames when you playback the timeline using the Avid rendering mode. If you need the WFMNLE software to test all of the video frames in your timeline, be sure to playback the timeline using the Avid rendering mode.

Synchronization Between the Avid and WFMNLE Displays

When you playback the Avid video timeline, the WFMNLE software attempts to keep the WFMNLE displays synchronized with the Avid Playback display. Although you may notice that the WFMNLE displays and the Avid Playback display are not exactly synchronized during playback, this does not affect the measurement accuracy of the WFMNLE software.

When the WFMNLE software is set to Fast QC mode using the Preferences tab of the Properties dialog box, the WFMNLE software performs the limit violation tests on the Avid timeline at a faster rate than the actual video playback. In this case, the Avid and WFMNLE displays will not be synchronized.

Testing for Component Limit Violations

When you set the Avid system to output Component video, turn off NTSC setup at the Avid video output. The WFMNLE software assumes that you do not have any setup in a Component video signal. If you turn on setup at the Avid video output, the signal levels that the WFMNLE software uses to determine limit violations will not match the signal output from your Avid system. In this case, the Error Log report cannot be used as proof of compliant video material.

Correlating the WFMNLE Timecode with the Avid Master Timecode

The WFMNLE Error Log display reports limit errors using the Absolute timecode as defined by your Avid system rather than the Avid Master timecode. To enable the WFMNLE Error Log to report errors that correlate with the Avid Master timecode, you must enter the appropriate time offset in the Preferences tab of the Properties dialog box.

Reference

This section answers the following questions to provide basic information about using waveform monitors to measure video signals:

- [How Do You Use the Waveform Display?](#)
- [How Do You Use the Vector Display?](#)
- [How Do You Use the Diamond Display?](#)
- [How Do You Use the Arrowhead Display?](#)
- [How Do You Use the Properties Dialog Box?](#)

How Do You Use the Waveform Display?

The Waveform display shows the signal levels in the vertical axis (increasing from bottom to top) with time progressing in the horizontal axis (left to right). Lower signal levels represent darker portions of the image, while higher signal levels represent brighter portions of the signal.

Waveform Monitor Graticule Types

The WFMNLE software automatically selects from the following two graticules (see Figure 13) depending on the type of video signal you are monitoring and which Waveform mode setting is selected in the Settings tab of the Properties dialog box:

- IRE. This graticule is used for NTSC video signals that are displayed with the Y-Only (Line), Field, or YCbCr Parade (Line) waveform modes.
- Volts. This graticule is used for PAL video signals and for NTSC signals displayed with the RGB Parade (Line) waveform mode.

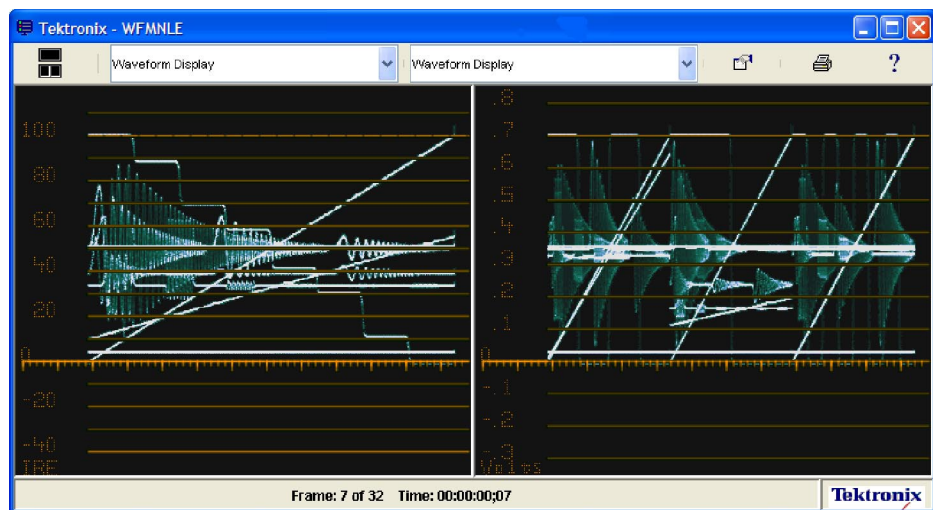


Figure 13: Waveform monitor graticules

NOTE. If you are editing Component video on your Avid system, and you are intending to output your video in NTSC Composite format, be aware that for the Waveform display the WFMNLE software removes the 7.5% setup level from the signal display and rescales the signal from 0 to 100%. This does not affect any of the limit violation tests.

Selecting the Waveform Mode

Use the Settings tab in the Properties dialog box to select from the following Waveform modes: Y-Only (Line), Field, YCbCr Parade (Line), or RGB Parade (Line). These modes are described below and are shown in Figure 14 on the following page.

NOTE. *The time per division on the Waveform graticule changes when you change the waveform mode.*

Y-Only (Line) Mode. The Y-Only (Line) mode is the most common way to view the waveform since it shows only the luminance (Y) portion of the video signal without any of the chrominance (color) portions of the signal. In Y-Only (Line) mode, each of the individual lines that make up the image will be overlaid on top of each other to make up the waveform display. This allows you to see the overall amplitudes of video signal. The intensity to which each amplitude level is displayed is dependent on how often that amplitude level is present within the image. Waveform intensities that are more intense and bright indicate that more portions of the signal are occurring at those amplitude levels.

YCbCr Parade (Line) and RGB Parade (Line) Modes. Since there are two types of component video systems, there are two types of parade modes. Each parade mode displays the three components of the video signal sequentially in line mode and allows you to see the individual contribution each of these components makes to the overall image.

The YCbCr parade mode displays the luminance component (Y) of the video signal followed by the two color components (Cb and Cr), which are derivatives of the B-Y and R-Y signal components. The RGB parade mode displays the Red, Green, and Blue signal components.

NOTE. *Further information on video component derivations can be found in application notes available on the Tektronix, Inc. Web site: www.tektronix.com.*

Field Mode. The Field mode displays each video line sequentially to show how the lines contribute to the overall image. The Field mode allows you to look for regions of the signal which contain the brighter parts of the image and therefore have the highest luminance values. You can then use the Line Select function to isolate these lines for further analysis.

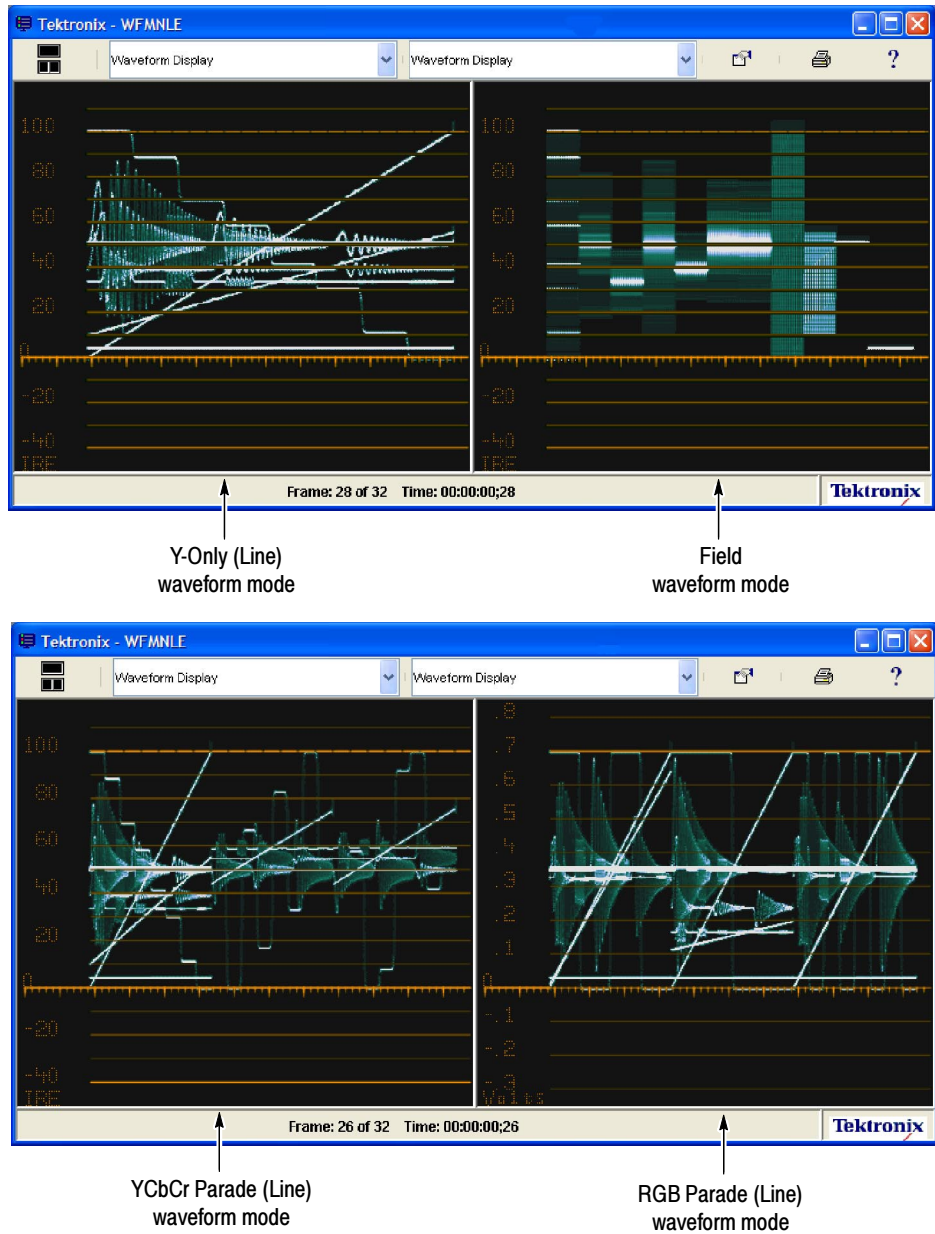


Figure 14: Waveform displays showing the different waveform display modes

Viewing Specific Video Lines

A video signal consists of a number of individual lines that make up the complete image. The Line Select function enables you to analyze specific video lines for suspected problems. Use the Settings tab of the Properties dialog box to select from the following Line Select modes:

- All Lines. This mode displays all of the video lines in the image for each of the display modes. This is the standard display mode.
- One Line. This mode displays only one line of the video image in the waveform displays (Waveform, Vector, Diamond, and Arrowhead). Use the Start Line entry box or slider control to select the line number.
- Sixteen Lines. This mode displays sixteen lines of the video image in the waveform displays (Waveform, Vector, Diamond, and Arrowhead). Use the Start Line entry box or slider control to select the starting line number.
- Variable. This mode displays the selected number of lines from the video image in the waveform displays (Waveform, Vector, Diamond, and Arrowhead). Use the Start Line and End Line entry boxes and/or slider controls to select the starting and ending line number.

NOTE. When you select the One Line, Sixteen Lines, or Variable line select mode, the Picture with Error Bright-Ups display highlights the area of the image associated with the selected line(s). Figure 15 shows the display being used to select 16 video lines in an area where Composite limit errors are indicated.

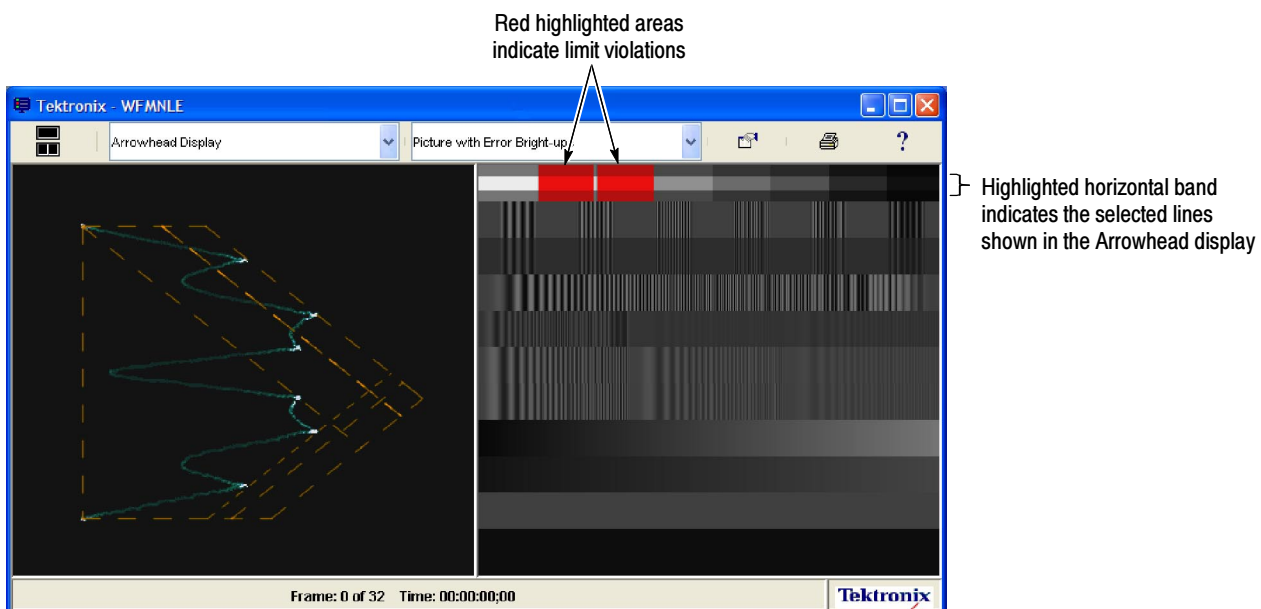


Figure 15: Using the Line Select mode to isolate a composite limit error

How Do You Use the Vector Display?

The Vector display enables you to view the video signal as an X-Y plot of the color difference signals Cb (B-Y) and Cr (R-Y), with no luminance information included. The amount of color saturation is indicated by the distance of the waveform away from the center. Differences in color hue are indicated by the amount of circular rotation (angle) of any part of the signal away from a reference point. 0 degrees is defined at the 3 o'clock position. Color burst (if displayed) is normally aligned at 180 degrees, or 9 o'clock.

For a correctly aligned video system, each of the color components falls within the target boxes on the Vector display when a 75% color bar signal is used (see Figure 16).

Each chrominance vector of a color bar signal terminates as a bright dot in a target. The distance from the center to the target box corresponds to the amplitude of the measured color. The dot brightness corresponds to the duration of the color bar. The dimension of each small target box represents a $\pm 2\%$ saturation range (moving in or out from the center), and a ± 2 degree hue range (moving clockwise or counterclockwise around the center). Each large target box represents a 20% saturation range and a 10 degree hue range.

The vector line labeled "I" is for evaluating flesh tones. Increasing radial amplitude along this axis indicates increasing flesh-tone saturation. Increasing angle change from this axis indicates increasing flesh-tone hue change.

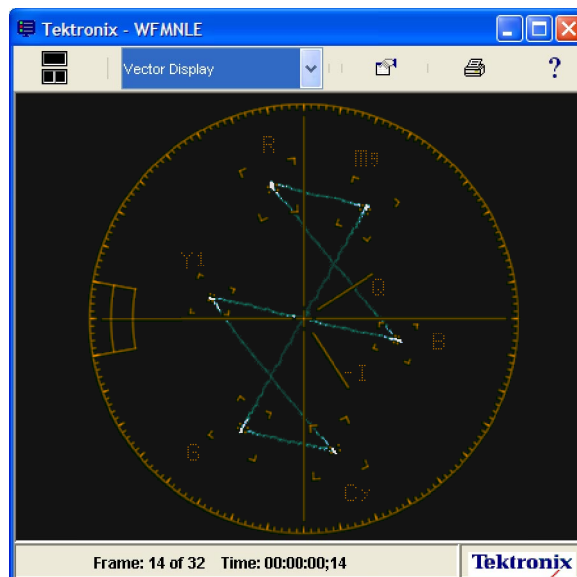


Figure 16: Vector display of a 75% color bars signal

Adjusting Saturation and Hue

The Vector display shows the overall chrominance level of the video signal. Adjust the chrominance level or hue with your Avid system controls until all of the individual colors are aligned within the graticule boxes when using a 75% color bar signal.

The display is also useful for ensuring flesh tones are correctly aligned and color-corrected within the image. Many graphics inserted in the video use highly saturated colors for a bright, vivid display. These highly saturated colors can be viewed on the vector display to monitor their overall affect on the image.

Matching Scene Colors

To use the Vector display to match colors between different video scenes, observe the first scene using the Vector display. Note the overall signal concentration in the display. When you view the second scene, adjust the color controls on the Avid system so that the overall signal concentration closely matches the first scene.

How Do You Use the Diamond Display?

When you see a red light in the AlarmVu display for the RGB Component Violation test, this indicates that the limit thresholds within the RGB domain have been exceeded in the current video frame. You can use the Diamond display to monitor whether any of the three color components are out of limits in your video, since virtually all color displays are RGB displays.

Use the Limits tab in the Properties dialog box to set the thresholds used for the RGB Component Violation test.

Identifying the Video Component in Violation

For a signal to be within the RGB domain limits, all of the waveform vectors must lie within the G-B and G-R diamond-shaped graticules. If a waveform vector extends outside the graticule, the direction of the excursion indicates which signal component is excessive (see Figure 17). Use the Avid color corrector to adjust the signal until the waveform falls within the graticule.

Since each of the video component signals (Y, Cb, and Cr) can contain small amounts of one or both of the other component signals, some interaction between components may be noted in the Diamond display when you are adjusting the color corrector controls. The following guidelines will help you decide which video component is in violation for your initial color correction adjustments:

- If the waveform exceeds only the upper-right Diamond graticule, this indicates a Blue component violation. If the error occurs towards the upper area of the graticule, this indicates the signal exceeds the 100% limit for the Blue component. If the waveform is offset from the center, this indicates a black offset for the Blue component.
- If the waveform exceeds only the lower-right Diamond graticule, this indicates a Red component violation. If the error occurs towards the lower area of the graticule, this indicates the signal exceeds the 100% limit for the Red component. If the waveform is offset from the center, this indicates a black offset for the Red component.
- If the waveform exceeds both the upper-left and lower-left Diamond graticules, this indicates a Green component violation. When limit violations affect only the Green component, the waveforms in both of the diamond graticules are affected equally.
- The intensity of the waveform indicates the signal duration. A momentary condition appears as a faint trace while a long duration condition appears as a bright trace.
- Bending of the transitions indicates timing delays. When a color bar signal is applied, the vertical axis becomes an indicator of delay errors.

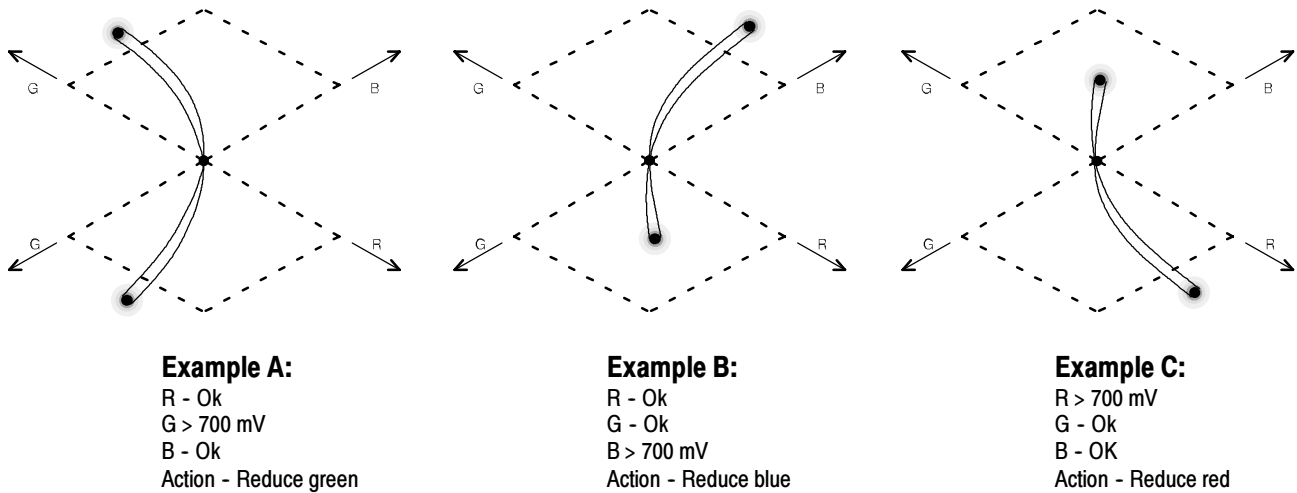


Figure 17: Examples of out-of-limit signals on a Diamond display

Correcting White Balance

Monochrome signals appear as vertical lines in the Diamond display. Nonlinear component processing, such as from a gamma corrector that alters white balance, can cause deviations along the vertical axis. Therefore, you can use the Diamond display to adjust the white balance in your video.

How Do You Use the Arrowhead Display?

Use this display if your video will be used for analog broadcast (terrestrial, CATV, satellite, NTSC, or PAL) or if the video will eventually be input to a TV as a single analog input (either baseband composite or Channel 3 or 4) whether via VHS, DVD, PC video, etc.

When you see a red light in the AlarmVu display for an NTSC or PAL Composite Limit Violation, this indicates that the limit thresholds (luma or chroma) within the Composite domain have been exceeded in the current video frame. Use the Limits tab in the Properties dialog box to set the NTSC and/or PAL Composite Limit Violation test threshold(s).

Understanding the Arrowhead Graticules

The Arrowhead display (see Figure 18 and Figure 19) plots the Luma (brightness) component on the vertical axis, with the lower left corner of the arrow corresponding to setup level for NTSC signals and to blanking level for PAL signals. The upper left corner corresponds to peak white. The magnitude of the Chroma (color) component is plotted at each Luma level on the horizontal axis, with zero color at the left edge of the arrowhead display.

The upper sloping graticule line indicates 100% color bar total Luma + Chroma amplitudes. The lower sloping graticule line indicates a Luma + Chroma extending toward sync tip (maximum transmitter power). The upper and lower Composite limits that you define using the Limits tab in the Properties dialog box are displayed by upper and lower sloped graticule lines.

On the NTSC Arrowhead graticule (see Figure 18), the 120 IRE line represents the level at which a transmitter starts clipping the signal while the -40 IRE line represents the sync tip level.

On the PAL Arrowhead graticule (see Figure 19), the 950 mV line represents the level at which a transmitter starts clipping the signal. The 930 mV line represents the upper limit of chrominance excursion, and the -230 mV line is the lower limit of chrominance excursion. The -300 mV line represents the sync tip level.

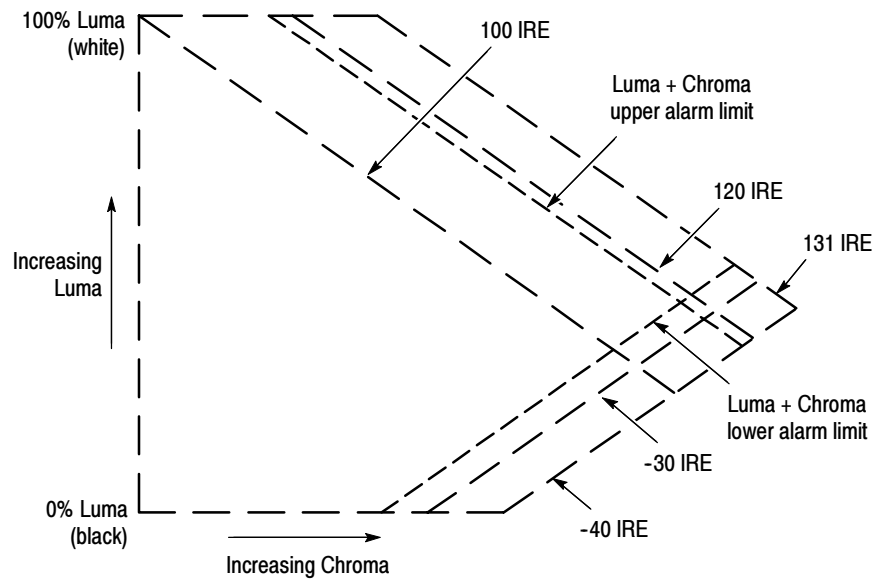


Figure 18: NTSC Arrowhead graticule

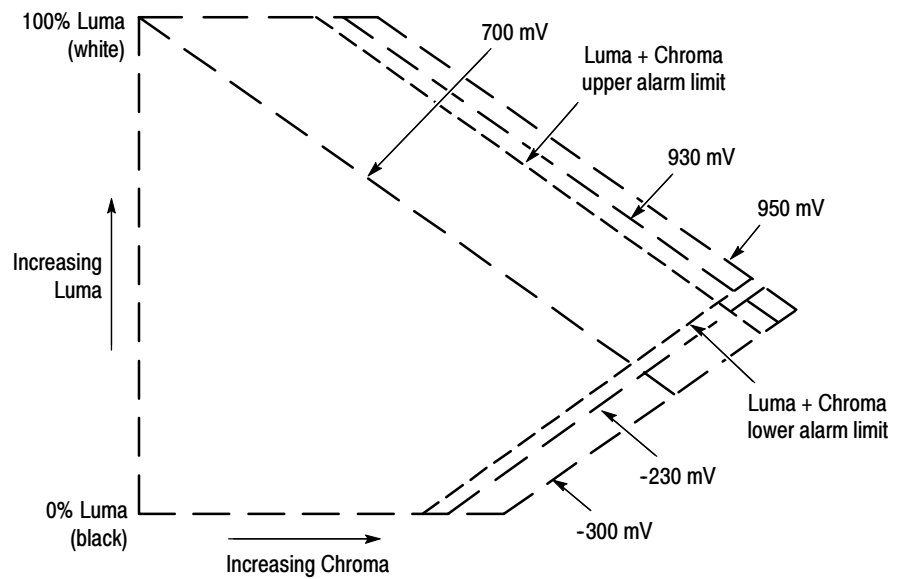


Figure 19: PAL Arrowhead graticule

Identifying the Video Component in Violation

For a signal to be within the Composite domain limits, all of the waveform must lie within the limit marks on the Arrowhead graticule. If the waveform extends outside the graticule limit marks, the direction of the excursion indicates which signal component is excessive. You can then use the Avid brightness and/or saturation controls to adjust the signal until the waveform falls within the graticule limit marks.

Signals that exceed the Luma component limit extend above the top graticule line. Signals that exceed the Luma + Chroma amplitude limits extend beyond the upper and/or lower sloping graticule lines.

To correct Luma component violations, adjust the brightness control on your Avid system. To correct Chroma component violations, adjust the saturation control on your Avid system. In some cases, you may need to adjust both the brightness and saturation controls.

How Do You Use the Properties Dialog Box?

The Properties dialog box provides three tabs (Settings, Limits, and Preferences) that enable you to configure various monitoring parameters. The following pages describe each of the configuration settings.

Changes that you make to the configuration settings are applied immediately and are saved when you close the Properties dialog box.

Using the Settings Tab

The Settings tab (see Figure 20) enables you to control how the signal waveform is displayed. The various controls are described below.

Display. Use the three Display icons to select which WFMNLE display tile to affect by setting changes: the left tile only, both tiles, or the right tile only. The selected Display icon is highlighted.

Waveform Mode. Use the Waveform Mode drop-down box to select which mode to use to display the signal in the Waveform display. Refer to [Selecting the Waveform Mode](#) on page 29 for a description of the available modes.

Line Select. Use the Line Select controls to select specific video lines for detailed analysis. Refer to [Viewing Specific Video Lines](#) on page 31 for more information.

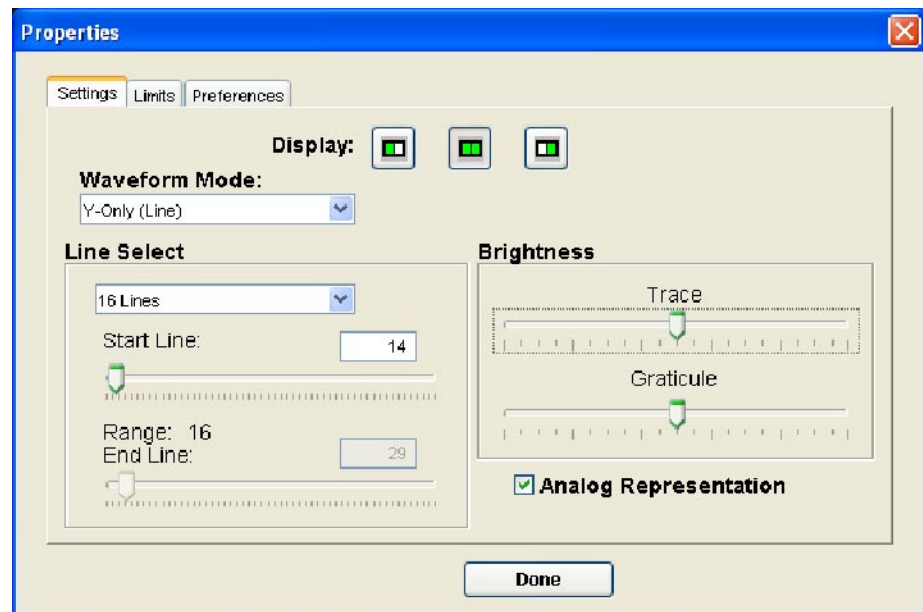


Figure 20: Settings tab of the Properties dialog box

Brightness. Use the Trace and Graticule slider controls to adjust the intensity of the signal waveform and the measurement graticule to suit your working conditions. The brightness controls affect the Waveform, Vector, Diamond, and Arrowhead displays.

Analog Representation. The WFMNLE software uses digital sampling of the video signal to determine signal characteristics. This can result in a waveform display that appears to be made up of small dots, which correspond to the actual sample locations in the signal. If you enable the Analog Representation mode, the WFMNLE software interpolates the sampled signal so that the waveform appears smoother like an analog waveform display. This mode complies with Rec. ITU BT. 601-5 (Appendix 2 to Part A: Specifications for a luminance or RGB signal filter used when sampling at 13.5 MHz).

NOTE. *The Analog Representation mode requires more computer processing in order to represent the digital signal as an analog waveform display. This may slow down your Avid system. This mode is intended to be used when you require detailed analysis of the signal waveform.*

Using the Limits Tab

The Limits tab (see Figure 21) enables you to configure how the WFMNLE software responds to limit violations.

Monitor For. Click on the associated check box to enable or disable each of the four limit tests. A check mark appears in the box when the test is enabled.

Low Limit and High Limit. The Low Limit and High Limit settings determine the signal levels at which limit violations will be reported for the limit tests that are enabled. The default limit settings listed in Table 3 comply with EBU Tech Rec. R103-2000 and IEEE Standard 205 for SD signals.

You can use the Low Limit and High Limit slider controls to set custom limits to meet specific signal level requirements at your facility. Click the Default button to return all of the limits back to the default values.

Table 3: Limit settings

Limit test	Min and max limits		Default limits	
Composite (NTSC)	Min: -29 IRE	Max: 140 IRE	Min: -24 IRE	Max: 120 IRE
Composite (PAL)	Min: -300 mV	Max: 1000 mV	Min: -230 mV	Max: 930 mV
RGB Component	Min: -56 mV	Max: 770 mV	Min: -35 mV	Max: 735 mV
Luma	Min: -8%	Max: 110%	Min: -1%	Max: 103%

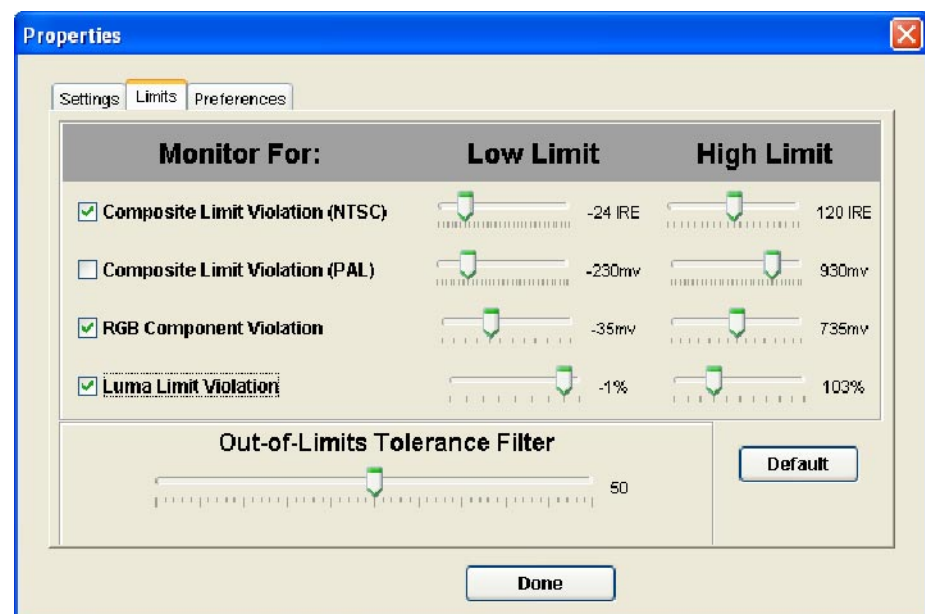


Figure 21: Limits tab of the Properties dialog box

Out-of-Limits Tolerance Filter. Use the Out-of-Limits Tolerance Filter setting to determine how the WFMNLE software responds to brief limit violations that are only a small amount over the limit.

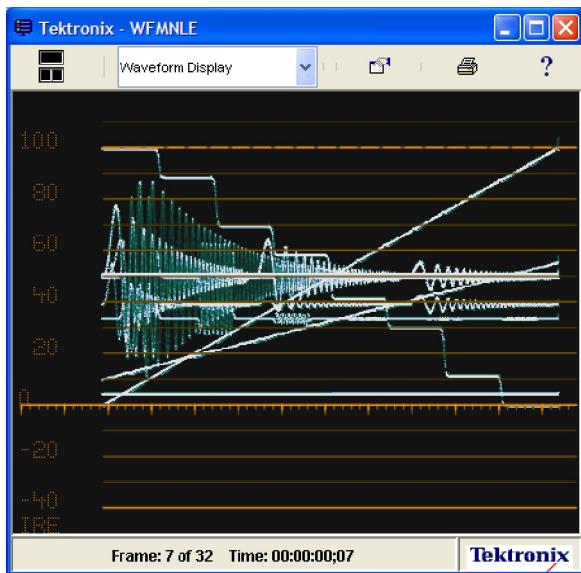
The default 50% filter setting complies with EBU Tech Rec. R103-2000 and IEEE Standard 205 for SD signals. This video standard recognizes that very brief violations, which cause small dots on the video image to be out-of-limit, are not a problem in practice. If the WFMNLE software is reporting that your video contains many brief limit violations, you can adjust the filter setting to reduce the sensitivity to these transitions.

A tolerance filter setting of 0% corresponds to the WFMNLE software placing minimum importance on detecting brief violations (maximum filtering), while a filter setting of 100% corresponds to maximum importance being placed on detecting brief violations (no filtering).

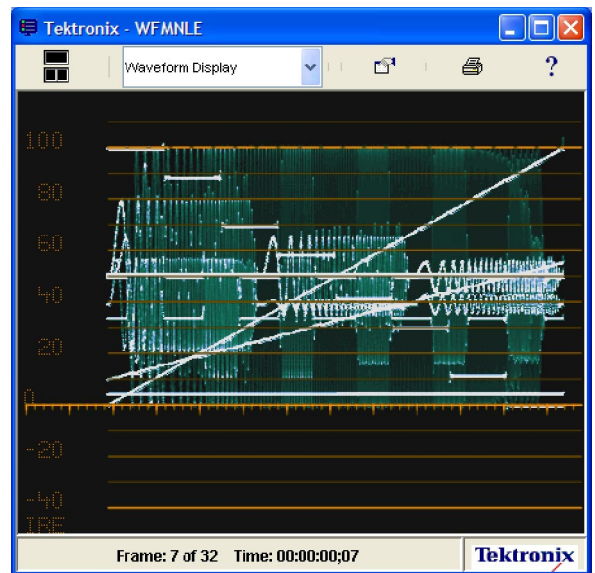
The tolerance filter setting affects the Waveform, Vector, Diamond, and Arrowhead displays since they show only the filtered video signal. The tolerance filter setting does not affect the Color Picture and Picture with Error Bright-ups displays since they show only the unfiltered video.

NOTE. *When the Out-of-Limits Tolerance Filter is set to 50% (the default setting), the WFMNLE low pass (transient) filter meets the specifications of the luminance filter used in the Waveform display, and the default filter used in the Vector, Diamond, and Arrowhead displays of Tektronix hardware waveform monitors. However, full bandwidth (luminance filter off) is typically used by Tektronix hardware waveform monitors when Component video is displayed in Waveform mode.*

Therefore, if you want the Y component of the WFMNLE Waveform display to match the display of Component hardware waveform monitors with the luminance filter turned off, you must set the WFMNLE Out-of-Limits Tolerance Filter setting to 100%. Figure 22 shows how the Waveform display changes when the filter setting is adjusted from 50% to 100%.



Y-Only (Line) mode
Filter setting - 50%



Y-Only (Line) mode
Filter setting - 100%

Figure 22: Waveform display comparison with the Out-of-Limits Tolerance filter set to 50% and to 100%

Using the Preferences Tab

The Preferences tab (see Figure 23) lets you enable or disable the monitoring parameters described below. A check mark in the associated box indicates that the function is enabled.

WFMNLE Always In Foreground (Windows Only). When this mode is enabled, the WFMNLE software window is always on top of other software windows on your desktop. This mode affects Avid Windows OS applications only.

This mode is especially useful if your Avid system does not have two monitors, which would allow you to position the WFMNLE software window to an unused portion of your desktop.

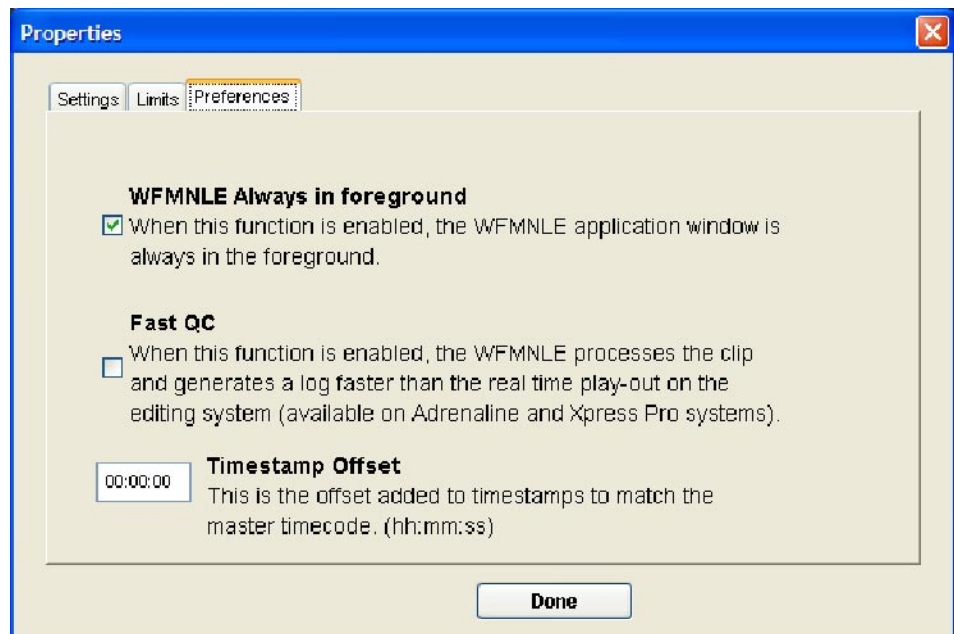


Figure 23: Preferences tab of the Properties dialog box

Fast QC. This mode affects only the Avid Adrenaline Media Composer and Xpress Pro NLE systems when you playback the video timeline at real-time speed (not the Avid rendering mode).

NOTE. *The Fast QC mode has no effect when you are playback the video timeline using the Avid rendering mode.*

Under normal operation, when the WFMNLE Fast QC mode is not enabled, the WFMNLE software attempts to keep the WFMNLE displays synchronized with the Avid real-time playback display. Although you may notice that the WFMNLE displays and the Avid real-time playback display are not exactly synchronized, this does not affect the measurement accuracy of the WFMNLE software.

When the Fast QC mode is enabled (indicated by a check mark in the box), the WFMNLE software performs the enabled limit violation tests on the timeline at a faster rate than the real-time playback on the Avid system. The Fast QC mode is most useful for short video sequences.

Timestamp Offset. Use the Timestamp Offset box to enter the amount of time in hours, minutes, and seconds that is required to align the Avid Absolute timecode with the Avid Master timecode. This enables you to use the WFMNLE Error Log as proof that your video material complies with customer standards.

The Error Log records limit errors using the Absolute timecode as defined by your Avid system rather than the Avid Master timecode. Usually, the difference between the Absolute timecode and the Master timecode in the Avid system is the amount of filler time you inserted in front of the video sequence. Typically, the filler time consists of blank video plus some video test signals.

