

Avid® Color Correction

User's Guide

for the Windows XP Operating System

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Using This Guide

This guide provides you with all the information you need to use the color correction features of your Avid® system, including complete explanations of all the color correction tools. The guide leads you through all color correction procedures with task-oriented instructions. Many examples of color correction techniques and typical color correction problems help you understand what to look for when you are correcting color in a sequence. Thorough cross-references to other parts of your Avid documentation make it easy for you to find additional information.

If your project workflow normally includes traditional color correction, your system's color correction tools can reduce or even eliminate the need for such procedures. If your workflow has not allowed for extensive color correction in the past, your system's color correction tools can make possible a new level of color-finishing quality.



The documentation describes the features and hardware of all models. Therefore, your system might not contain certain features and hardware that are covered in the documentation.

This guide is intended for all Avid Color Correction users, from beginning to advanced.



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Symbols and Conventions

Avid documentation uses the following symbols and conventions:

Symbol or Convention	Meaning or Action
	A note provides important related information, reminders, recommendations, and strong suggestions.
	A caution means that a specific action you take could cause harm to your computer or cause you to lose data.
	A warning describes an action that could cause you physical harm. Follow the guidelines in this document or on the unit itself when handling electrical equipment.
>	This symbol indicates menu commands (and subcommands) in the order you select them. For example, File > Import means to open the File menu and then select the Import command.
►	This symbol indicates a single-step procedure. Multiple arrows in a list indicate that you perform one of the actions listed.
Margin tips	In the margin, you will find tips that help you perform tasks more easily and efficiently.
<i>Italic font</i>	Italic font is used to emphasize certain words and to indicate variables.
Courier Bold font	Courier Bold font identifies text that you type.
Ctrl+key or mouse action	Press and hold the first key while you press the last key or perform the mouse action, for example, Ctrl+drag.

If You Need Help

If you are having trouble using Avid Color Correction:

1. Retry the action, carefully following the instructions given for that task in this guide. It is especially important to check each step of your workflow.
2. Check for the latest information that might have become available *after* the documentation was published in one of two locations:
 - If release notes are available, they ship with your application.
 - If ReadMe files are available, they are supplied in your Avid application folder. ReadMe files are also available from Help.



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Chapter 1

Introducing Avid Color Correction

Your Avid application includes Avid Color Correction, a comprehensive set of tools for correcting and adjusting colors. These tools have easy-to-use controls that can be mastered quickly by film and video editors.

This chapter provides a conceptual introduction to Avid Color Correction. This chapter also summarizes the other color adjustment features available in your Avid application and tells you where to find more information about them.

- [Understanding Avid Color Correction](#)
- [Other Color Adjustment Tools](#)



A more complete Color Correction tool is available for Avid Symphony™. If you have an Avid Symphony system, see the Avid Symphony Color Correction User's Guide.

Understanding Avid Color Correction

Avid Color Correction lets you perform color corrections on individual segments in a sequence or on multiple segments at the same time. You perform most color correction tasks in Color Correction mode, a distinct toolset that displays the Color Correction tool and a Composer window specially reconfigured for color correction work. The Color Correction tool includes several types of color correction controls, so you can select the ones that are best for your project and working methods.

When you use Color Correction mode, having a basic understanding of how your application applies color corrections is helpful. The following sections explain these basic concepts.

For an introduction to color correction techniques and illustrated examples of typical color corrections, see [Chapter 4](#).

Applying and Viewing Color Corrections

Avid Color Correction works with video material once it has been edited into a sequence. You make color adjustments in Color Correction mode by selecting segments within a sequence and then altering their color values. The system applies a Color Correction effect to each segment that you correct in a sequence and you can view the correction as you play back the sequence, within the normal limits for effects playback for your application.

Your ability to preview color correction effects in real-time in the Composer monitor or in a Client monitor depends on the model of your Avid application, your hardware configuration, and the complexity of the sequence to which you have applied the color correction effects. As with other effects, you might need to render at least some of your color correction effects before you can export your sequence or perform a digital cut. For more information, see the information on previewing, playing, and rendering in the Help.

The color corrections that you make with Avid Color Correction do not cause any permanent change to clips in bins or to their associated media files. If you make a color adjustment to a clip in one sequence, that adjustment does not apply to the same clip in a different sequence.

Automatic and Manual Color Corrections

Avid Color Correction lets you make corrections both automatically and manually. Automatic corrections are easy to learn, quick to implement, and can remove common color problems in the great majority of images. Manual corrections require more skill and practice but allow you more precise control over the final look of your images and give you a greater range of creative possibilities.

When you make automatic corrections, Avid Color Correction calculates and then makes the adjustments needed to improve a particular aspect of an image, for example its color balance. Some automatic corrections involve no input

from you beyond the click of a single button; others allow you to assist Avid Color Correction in its calculations by identifying targets in an image with an eyedropper, for example, an area that should be white. When you make manual corrections, you make the adjustments that change the look of the image yourself using controls such as sliders and color wheels.

The Color Correction Effect

The Color Correction effect appears in the Image category of the Effect Palette. Because your system automatically applies a Color Correction effect in the Timeline when you make a correction in Color Correction mode, you apply the Color Correction effect directly from the Effect Palette only for a small number of special purposes.

You apply the Color Correction effect from the Effect Palette if you want to apply a single color correction to multiple segments in a sequence. You also apply the Color Correction effect from the Effect Palette if you want to apply multiple automatic color corrections to one or more segments in a sequence in accordance with the settings you have established in the AutoCorrect tab of the Correction Mode Settings dialog box. For more information, see [“Using Color Correction Effects in the Effect Palette”](#) on page 96.

Once you render a Color Correction effect, you can move the sequence to a system without color correction and the rendered correction will play successfully. In a system without color correction capability, a Color Correction effect is an unknown effect. The effect icon appears blank in the Timeline, and you cannot make any adjustments to it.

Understanding Color Correction Groups

Avid Color Correction provides two groups of color correction controls, the HSL (Hue, Saturation, Luminance) group and the Curves group.

You can make both automatic and manual adjustments using one or both groups of controls. If you make adjustments in both groups, you can turn either group on or off independently to control which adjustments are active. When you view the sequence or render the Color Correction effect, your application applies the adjustments from the active groups to create the final appearance. For more information on the interaction between the two groups, see [“Understanding Interaction Between Color Correction Groups”](#) on page 31.

Each group uses a different kind of control for making adjustments. The HSL group provides controls for adjusting attributes such as hue, saturation, gain, and gamma. The Curves group allows you to manipulate points on a graph that control the relationship between input and output color.

For more information on the color correction groups, see [“Working with the Group and Subdividing Tabs” on page 30](#).

Other Color Adjustment Tools

In addition to the work you can do with Avid Color Correction, you can correct and adjust colors at various stages of your project using several other tools. Some of these tools are described in this guide; others are described in other parts of the documentation for your system. The following is a summary of these tools with the locations of detailed information about them.

- In some circumstances, when you capture your video input, you can make initial adjustments to the color of incoming video using the Video Input tool. For more information, see the chapter “Preparing to Capture Media” in the input and output guide or the user’s guide for your system or the Help.
- You can create keyframeable color effects on individual segments in a sequence using the Color Effect. For more information, see the chapter “2D Reference” in the effects reference guide for your system or the Help.
- You can make many adjustments to color within other 2D and 3D effects, including color control for keys and border colors. For more information, see the effects guide for your system or the Help.

You can set safe limits for the colors that appear in your project and ask the system to warn you when those limits are exceeded. For more information, see [Chapter 5](#).

Chapter 2

Understanding Color Correction Mode

As it does with other modes (such as Trim mode and Effect mode), your Avid system changes the screen display to provide a specialized interface for Color Correction mode. This interface includes the Color Correction tool itself (containing the controls for adjusting color), and a reconfigured Composer monitor that allows you to view several segments in your sequence side-by-side. This chapter describes the features of Color Correction mode and explains how to control and customize them.

- [Entering and Exiting Color Correction Mode](#)
- [Overview of the Color Correction Mode Toolset](#)
- [The Composer Window in Color Correction Mode](#)
- [The Client Monitor in Color Correction Mode](#)
- [The Color Correction Tool](#)
- [Working with Color Correction Effect Templates](#)

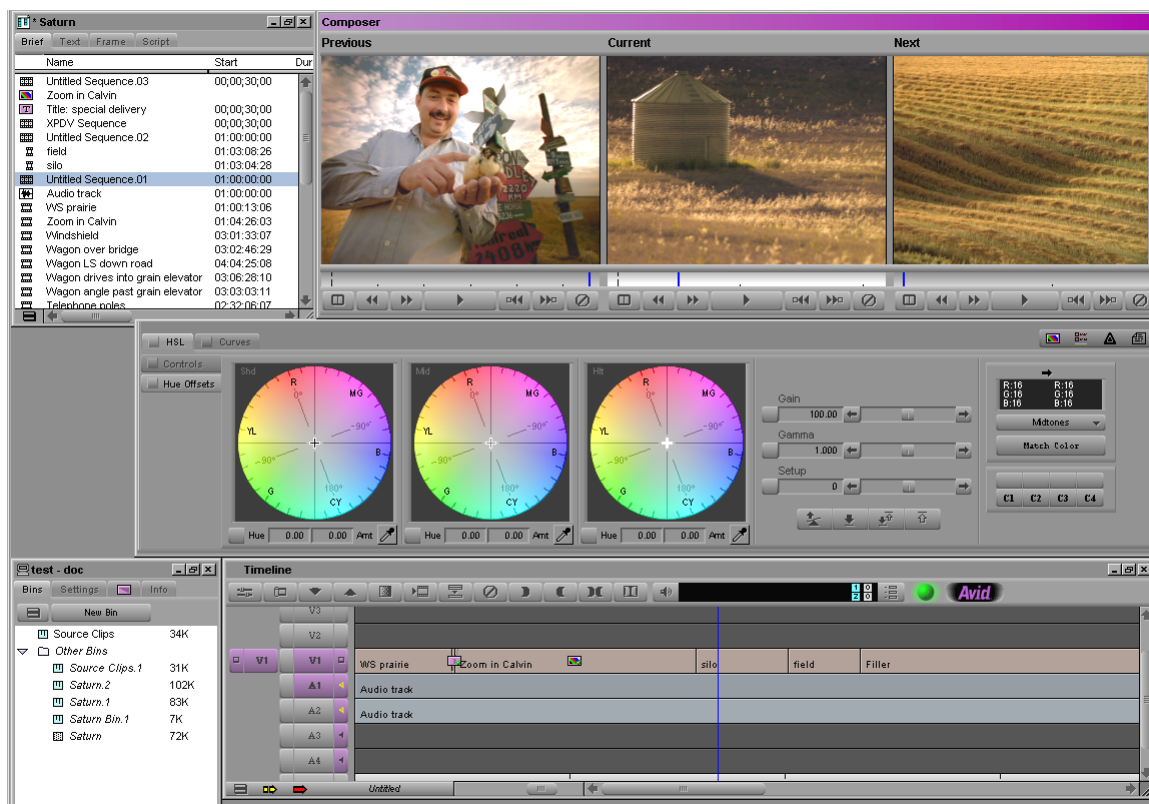
Entering and Exiting Color Correction Mode

To enter Color Correction mode, do one of the following:

- ▶ Select Toolset > Color Correction.
- ▶ Press Shift+F8.
- ▶ The Color Correction toolset appears.



Chapter 2 Understanding Color Correction Mode



If you are reading a black-and-white hardcopy printout of this document, you will find it useful to view the color images in the Help or in the online version of this document on the online publications CD-ROM.



In some Avid applications, the Color Correction button appears by default below the Timeline. In others it does not appear in the default button layout, but you can map it from the CC tab of the Command palette to the keyboard or to any button location that can be remapped. For more information, see “Using the Command Palette” in the chapter “Using Basic Tools” in the user’s guide or the editing guide for your system or the Help.

To exit Color Correction mode and return to another mode:

- Make a selection from the Toolset menu.

The system replaces the Color Correction toolset with the toolset for the mode you selected.

Overview of the Color Correction Mode Toolset

The toolset for Color Correction mode includes three windows in addition to Project and Bin windows:

- The Composer window, a three-monitor view
For more information, see [“The Composer Window in Color Correction Mode” on page 19](#).
- The Color Correction tool
For more information, see [“The Color Correction Tool” on page 30](#).
- The Timeline, resized to accommodate the other elements of the color correction toolset

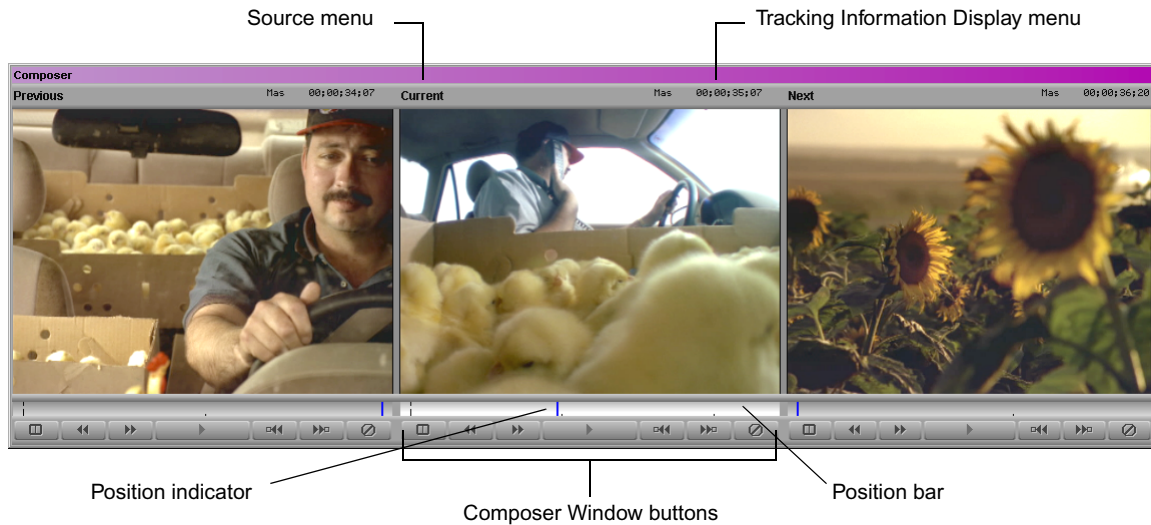
Avid Color Correction also allows you to display several kinds of image information in the Client monitor. For more information, see [“The Client Monitor in Color Correction Mode” on page 29](#).

The following sections describe the organization of these elements and explain how to navigate in them and how to customize them for your project needs.

The Composer Window in Color Correction Mode

The Composer window in Color Correction mode is a three-monitor view. This allows you to view material from three segments at once, making it easy to compare material on a shot-by-shot basis. This three-monitor view shares many of the features of the monitors in other modes but also includes several features specific to Color Correction mode.

The following illustration shows the features of the Composer window in Color Correction mode.



By default, the monitors show (from left to right) the first frame of the previous segment, the first frame of the current segment, and the first frame of the next segment.

Activating Monitors

Only one of the monitors is active at any one time. The position bar is highlighted in the active monitor, and the image from the active monitor is displayed in the Client monitor.

To activate a monitor:

- Click anywhere in the monitor's image area, in the position bar, or on the Tracking Information Display menu.



When you click one of the Composer Window buttons below a monitor, the system activates that monitor and performs the action associated with the button.

Displaying Tracking Information

The Composer Window monitors in Color Correction mode have the same options for displaying tracking information that are available in other modes.

To display tracking information in a Color Correction mode monitor:

- ▶ Select Tracking Information Display > *format*.

By default, the Tracking Information Display menu shows no information until you select a tracking format.

For more information on tracking information display, see the chapter “Viewing and Marking Footage” in the user’s guide or the editing guide for your system or the Help.

Displaying Images in Monitors

The default Composer window for Color Correction mode is a three-monitor view that shows images from three adjacent segments in the Timeline. You can customize the monitor view to show images from other parts of the sequence, to show specific images in a split-screen display, to hide the video, or to display wide-screen (16:9) video. You can also customize a monitor to show waveform or vectorscope information for the current segment.

Understanding Default Monitor Display

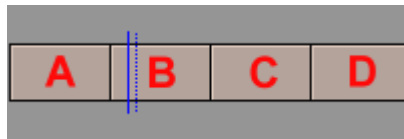
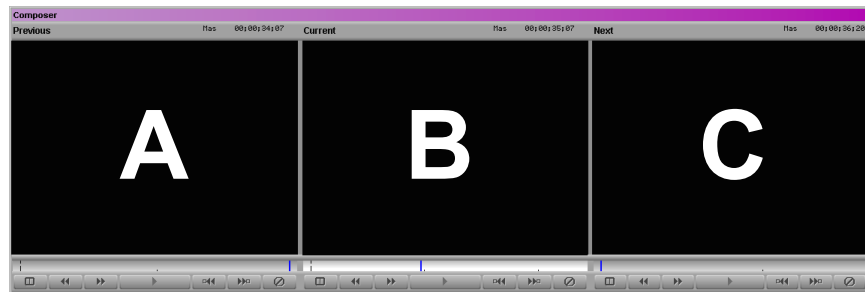
By default, the center monitor shows the current segment (the segment the position indicator is on in the Timeline). The left monitor shows the previous segment (the segment before the current segment), and the right monitor shows the next segment (the segment after the current segment).

When you move in the sequence by clicking a Composer Window button or by moving the position indicator to a new segment in the Timeline, all three monitors update to maintain the same relationship between displayed segments.

The following illustrations show the default monitor display behavior.

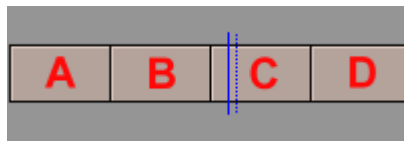
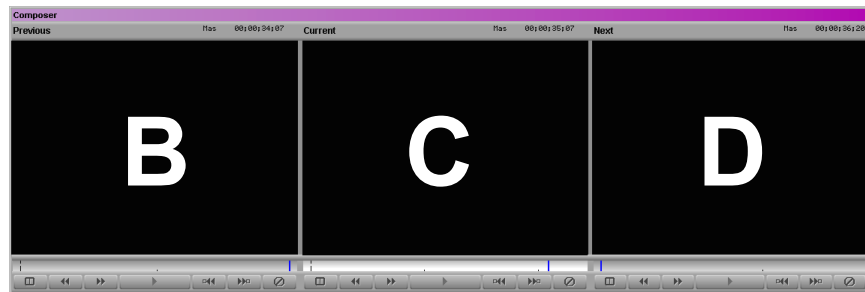
Example 1

The position indicator is on segment B in the Timeline. The three monitors display segments A, B, and C.



Example 2

The position indicator has moved to segment C. All three monitors have updated so they now display segments B, C, and D.



Configuring Image Display in Monitors

You can configure each monitor to display those segments that are most useful for making comparisons in your project.

To configure the display in a monitor:

- Click the monitor's Source menu, and select one of the commands described in the following table.

Source Menu Commands

Command	Description
Empty	Displays no image (black).
Entire Sequence	Makes the entire sequence available in the monitor. This is useful when you want to compare shots from many different places in a sequence. For example, you can display the current segment and the next segment in two monitors for immediate shot-to-shot comparison and display the entire sequence in the third monitor so that you can quickly navigate to any other part of the sequence you want to view. When you change the current segment, the entire sequence updates to that segment.  <i>You can use the Play Loop button in the Command palette to play the whole sequence in the active monitor even if the monitor is not set to Entire Sequence. For more information, see “Using the Play Loop Button in Color Correction Mode” on page 28.</i>
Reference	Locks the current frame (the frame the position indicator is on) in the monitor. When the other monitors update as you navigate in the Timeline, this frame continues to display as a reference. This is useful if you want to use a specific place in your sequence as a reference against which to compare all other shots, for example, a segment that contains optimal skin tones. To lock the current frame as a reference: ► Right-click in the Composer window or the Color Correction tool, and select Reference Current.
Current	Displays the current segment. This option is not available in the Source menu if another monitor is already set to Current.
Previous	Displays the segment immediately before the current segment.
Next	Displays the segment immediately after the current segment.
Second Previous	Displays the segment two segments before the current segment (the segment the position indicator is on in the Timeline).
Second Next	Displays the segment two segments after the current segment.

Source Menu Commands (Continued)

Command	Description
Waveform and Vectorscope commands	These commands configure the monitor as a Waveform monitor or Vectorscope monitor. The system displays the information for the currently active monitor. For more information, see “Working with the Waveform Monitors and Vectorscope Monitor” on page 85. These commands include: • Quad Display • RGB Histogram • RGB Parade • Vectorscope • Y Waveform • YC Waveform • YCbCr Histogram • YCbCr Parade

Splitting the Image Display in Monitors

You can configure a monitor so it splits the screen to show the image before and after the current color correction adjustments are applied.



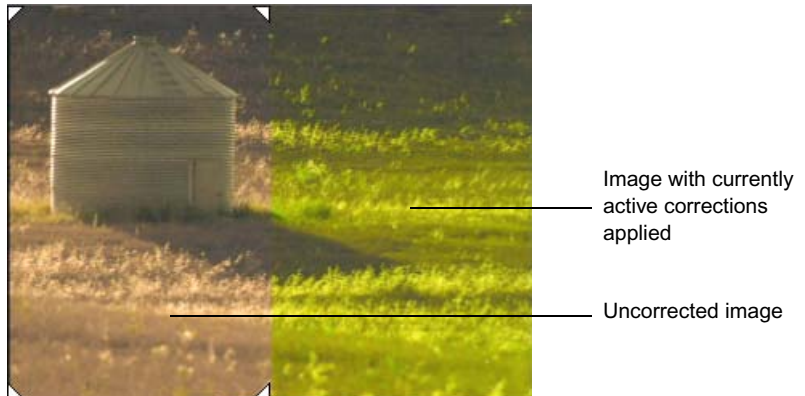
The Dual Split display does not appear on the Client monitor.

To display uncorrected and corrected images in a split screen (Dual Split):



- Click the Dual Split button for the monitor you want to display the split screen.

The split-screen display appears in the monitor.



If you are reading a black-and-white hardcopy printout of this document, you will find it useful to view the color images in the Help or in the online version of this document on the online publications CD-ROM.

The uncorrected image appears on the left and the image with currently active corrections applied appears on the right. You can resize the box that contains the split-screen image by dragging its triangular handles in the monitor.



You can map the Dual Split button from the Command palette to the keyboard. You can then switch Dual Split on and off with a single keystroke. For more information, see “Using the Command Palette” in the chapter “Using Basic Tools” in the user’s guide or the editing guide for your system or the Help.

To cancel the Dual Split display:



- ▶ Click the Dual Split button for the monitor that contains the Dual Split display.

The monitor returns to a single-image view.

Hiding the Video in Monitors

You can hide the video image area of the monitors at any time. When the video is hidden, you see only the Source and Tracking Information Display menus and the position bars for the monitors. The other parts of the Color Correction toolset expand to fill the remainder of your screen. This might be a preferable setting if you can perform your color correction tasks using only the Client monitor to view your image.

To hide the video in the monitors:

- ▶ Right-click in the Composer window, and select Hide Video.

When the video is hidden, a check mark appears beside the Hide Video command.

To display the video again:

- ▶ Right-click in the Composer window, and select Hide Video.

When the video is visible, there is no check mark beside the Hide Video command.

Displaying 16:9 Video in Monitors

You can display wide-screen 16:9 video as well as standard format 4:3 video in the monitors. However, you must switch to or from 16:9 display while in editing mode and then select Color Correction mode. The 16:9 Video option is unavailable in the shortcut menu when you are in Color Correction mode.

To display 16:9 video in the monitors:

- ▶ In editing mode, right-click in the Composer window, and select 16:9 Video.

When the monitors are set to display 16:9 video, a check mark appears beside the 16:9 Video command.

To display standard format 4:3 video again:

- ▶ In editing mode, right-click in the Composer window, and select 16:9 Video.

When the monitors are set to display 4:3 video, there is no check mark beside the 16:9 Video command.

Using the Composer Window Buttons

The buttons in the following illustration are available for each monitor in the Composer window when you are using Color Correction mode. You can use these buttons to play footage, move around in your sequence, display a split-screen view, and remove effects.



All these buttons are available in the Command palette and can be mapped from the Command palette to the keyboard using the procedure described in “Using the Command Palette” in the chapter “Using Basic Tools” in the user’s guide or the editing guide for your system or the Help.



You cannot map other buttons to the Composer Window button locations of the Color Correction toolset.

The following table describes these buttons in detail and indicates their location within the Command palette.

Composer Window Buttons

Button	Description	Command Palette Tab
	Dual Split Splits the screen in the monitor to show the image before and after the current Color Correction settings are applied. For more information, see “Splitting the Image Display in Monitors” on page 24 .  <i>The Dual Split display does not appear in the Client monitor.</i>	Other
	Go to Previous Shot Moves the position indicator to the first frame of the previous shot in the topmost selected video track.	Move

Composer Window Buttons (Continued)

Button	Description		Command Palette Tab
	Go to Next Shot	Moves the position indicator to the first frame of the next shot in the topmost selected video track.	Move
	Play	Plays the material in the monitor from the current position of the position indicator to the end of the segment. If Sequence is selected in the Source menu, clicking this button plays the material from the current position of the position bar to the end of the sequence. Clicking the button again stops play.	Play
	Go to Previous Uncorrected Shot	Moves the position indicator to the first frame of the last segment before the current segment in the topmost selected video track that has not been color corrected.	CC
	Go to Next Uncorrected Shot	Moves the position bar to the first frame of the first segment after the current segment in the topmost selected video track that has not been color corrected.	CC
	Remove Effect	Removes the color correction on the current segment.	FX

Using the Play Loop Button in Color Correction Mode



The Play Loop button has a specialized function in Color Correction mode. The Play Loop button does not appear in the Composer window but does control the playback of material in the Composer window. You can access the Play Loop button from the Play tab of the Command palette or from the keyboard if it has been mapped to a keyboard location.

When you click the Play Loop button, the system plays the whole sequence in the active monitor, starting from the current position of the position indicator. Playback is not limited to the current segment alone, regardless of the Source menu command selected for the monitor. This is useful whenever you want to view the whole sequence quickly without switching monitors or making a new Source menu choice.

The Client Monitor in Color Correction Mode

The Client monitor can be an important tool for color correction since it allows you to see your corrections as they will appear when output and displayed on a television screen. Your system's Edit monitor does not have exactly the same color and luminance display characteristics as a television monitor.



With some Avid systems, to use a Client monitor requires that you select the “High Performance (more simultaneous effects)” option in the Video Display Settings dialog box. For information about the Video Display Settings dialog box, see the effects guide for your system or the Help. For more information on connecting a Client monitor, see the Help.

When you are using Color Correction mode, the Client monitor displays the image that is in the currently active monitor in the Composer window. By switching from one monitor to another in the Composer window, you can quickly compare whichever three images are currently displayed in the monitors. For more information on switching between monitors, see [“Activating Monitors” on page 20](#).

Some systems support Dual Split display in the Client monitor. For those systems, when you select Dual Split for the active monitor, the split-screen display also appears in the Client monitor. This allows you to compare uncorrected and corrected versions of the same segment within the Client monitor. If you right-click the Color Correction tool, and select Dual Split with Reference, the split-screen display allows you to compare a shot with the current reference shot within the Client monitor. For more information on using dual-split options, see [“Splitting the Image Display in Monitors” on page 24](#).

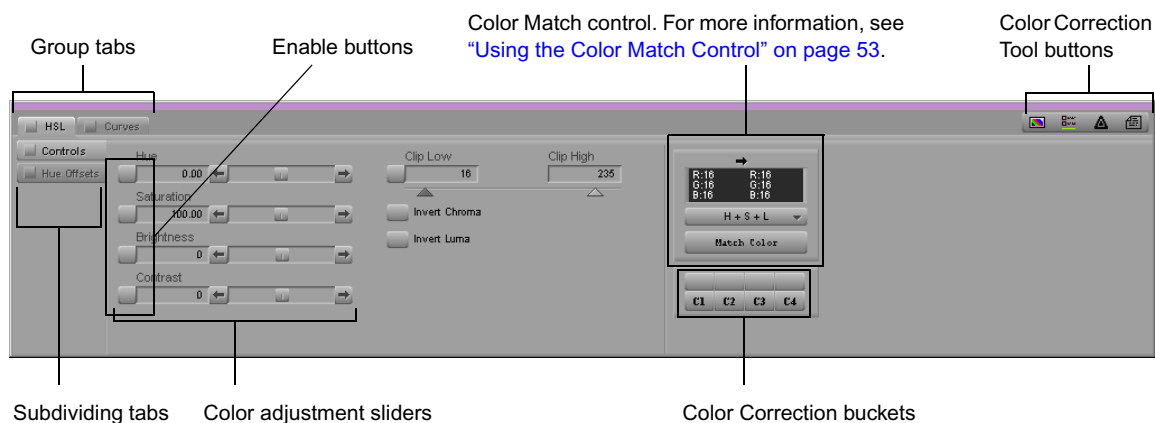


If the Dual Split display does not appear in the Client monitor, your system might not support this feature. If it does, make sure that Show Graphics on Client Display is selected in the Interface Settings dialog box. See the user's guide or the editing guide for your system or the Help.

The Color Correction Tool

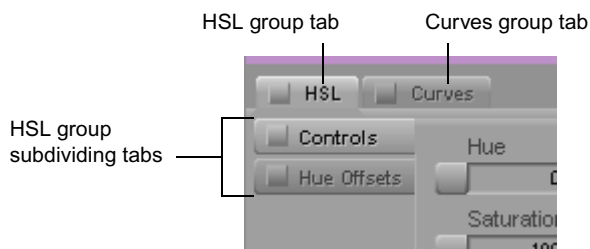
In Color Correction mode, you make adjustments in color using the Color Correction tool.

The following illustration shows the Color Correction tool in its default configuration.



Working with the Group and Subdividing Tabs

The Color Correction tool contains two group tabs, the HSL (Hue, Saturation, Luminance) group tab and the Curves group tab.



Within the HSL group are two tabs on the left side of the tool that subdivide the controls for that group. The Curves group has no subdividing tabs. For more information, see [“Understanding Color Correction Groups” on page 15](#).

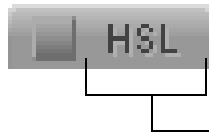
Displaying a Group Tab

To display a color correction group tab:

- Click the tab in the area containing the group name.



Do not click the Enable button when you want to display a color correction group tab.



Click in this area of a tab to display the tab.
Do not click the Enable button.

The tab is highlighted and moves to the front, and the specific controls for that tab appear.



You can switch between the group tabs using the Page Down key or the Page Up key.

For detailed information on adjusting color using the controls within the color correction groups, see [Chapter 3](#).

Displaying an HSL Subdividing Tab

To display an HSL subdividing tab:

1. Click the HSL group tab in the area containing the group name.
2. Click the subdividing tab in the area that contains the subdivision name.

The subdividing tab is highlighted and moves to the front, and the specific controls for that tab appear.

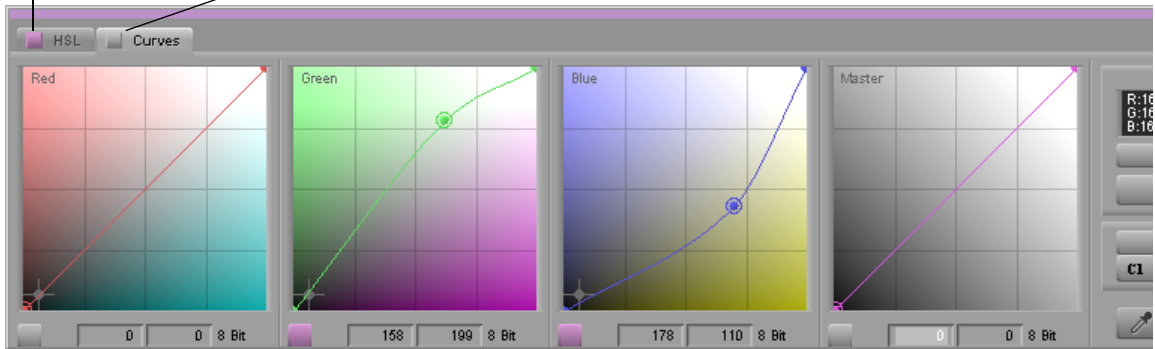
Understanding Interaction Between Color Correction Groups

Understanding how the color correction groups work together is important. Adjustments made in each group are applied cumulatively to the current segment and its related material. If you make an adjustment in one group and then go on to make another adjustment in a different group, the image will show the cumulative effect of both adjustments.

This behavior provides you with a great deal of flexibility. For example, if you are unhappy with some of your adjustments, you can disable the group that contains those adjustments or reset its controls to default settings without disrupting other adjustments. The following illustration shows an example of this kind of control over color correction groups.

Enable button for
HSL tab is turned on.

Enable button for Curves
tab is turned off.



The Green and Blue ChromaCurve graphs are adjusted, but the Curves tab is turned off. The Curves tab adjustments are not currently applied to the segment. Adjustments made in the HSL tab *are* applied to the segment because the HSL tab is turned on, even though the HSL controls are not currently visible.

For more information on enabling, disabling, and resetting the groups, see [“Working with the Enable Buttons” on page 32](#).



If you make adjustments in both groups, keep in mind how the cumulative adjustments will affect the final image. Adjustments might accumulate, or cancel each other out, in ways that you do not want. Keep each stage of your correction distinct, and do not duplicate the same adjustment in both groups.

Working with the Enable Buttons

In the Color Correction tool, each group tab, subdividing tab, and individual control has an Enable button. These buttons provide an immediate visual guide to the status of the controls while you are making corrections. They also allow you to turn controls on and off in various combinations and quickly reset controls to their default values.



Adjustments to the Gain, Gamma, and Setup controls in the Hue Offsets subtab of the HSL tab enable both the Hue Offsets and the Controls subtabs. This behavior is not consistent with the normal interaction between Enable buttons but is necessary to ensure that color corrections will conform correctly if you move your project to Avid Symphony. To turn off adjustments to the Gain, Gamma, and Setup controls you must disable the controls individually by clicking one or more of their Enable buttons, or you must disable the entire HSL tab by clicking the HSL tab Enable button.

To turn off adjustments to the Gain, Gamma, and Setup controls you must disable the entire HSL tab. However, you can reset the Gain, Gamma, and Setup controls

Turning Controls On or Off

To turn a control or tabbed group of controls on, do one of the following:

- ▶ Click the Enable button for the control or tabbed group of controls.
- ▶ Adjust any individual control that is linked to the Enable button.

The Enable button changes to pink, and the control or tabbed group of controls becomes active. The system includes the adjustments in that control or group of controls when calculating the corrected color.

To turn a control or tab off:

- ▶ Click the Enable button for the control or tab.

The Enable button changes to gray.

Resetting Controls

To reset a control or a tabbed group of controls to its default values:

1. Display the control or group of controls you want to reset.
2. Alt+click the Enable button for that control or group of controls.

The Enable button changes to gray, and all controls linked to that button return to their default values.



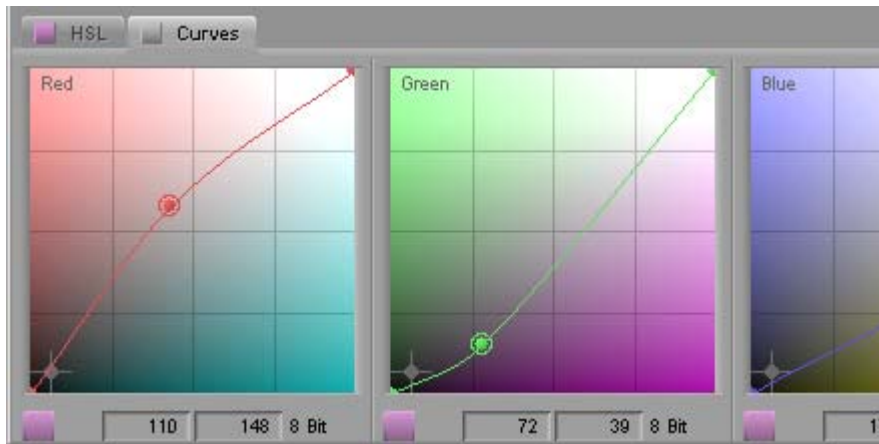
You cannot reset controls not currently displayed. If you Alt+click the Enable button for a tab whose controls are not currently displayed, you display the controls but do not reset them. Alt+click the button again to reset the controls.

Understanding Interaction Between Enable Buttons

The Enable buttons are linked in a hierarchical relationship that mirrors the relationship of the tabs themselves. When you change the status of an Enable button, the change can affect several levels of the hierarchy.

When you Alt+click an Enable button to reset controls, you automatically reset all controls at a lower level in the hierarchy. For example, if you Alt+click the Enable button for the Red ChromaCurve™ graph in the Curves tab, only that one control is reset to its default value. However, if you Alt+click the Enable button for the Curves tab, all the controls in the Curves tab will reset to their default values.

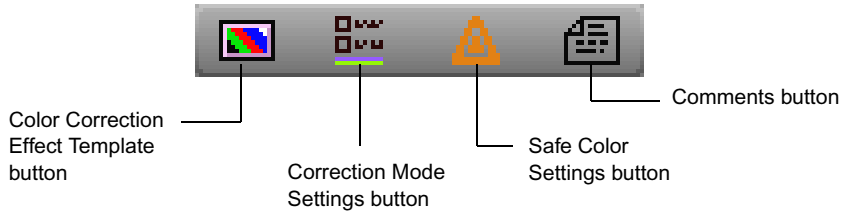
When you turn an Enable button off, the system stops including controls below that button in the hierarchy when it calculates the corrected color for the segment. Individual controls below that button retain their values and can be reactivated at any time. Their Enable buttons remain pink.



The Curves tab Enable button is turned off, so none of the adjustments in the Curves tab are applied to the correction. Individual controls inside the tab retain their values and can be reactivated by clicking the Curves tab Enable button again.

Using the Color Correction Tool Buttons

In addition to the Enable buttons, and specific control buttons within groups, the Color Correction tool has a group of buttons on the right side that control several important operations.



Use these buttons to:

- Create Color Correction effect templates.
For more information, see [“Working with Color Correction Effect Templates” on page 39](#).
- Customize the operation of Avid Color Correction.
For more information, see [“Customizing Color Correction Mode Settings” on page 35](#).
- Set Safe Color limits.
For more information, see [Chapter 5](#).
- Add comments to color-corrected segments.
For more information, see [“Adding Comments to Color Correction Effects” on page 37](#).

Customizing Color Correction Mode Settings

You can customize the appearance and behavior of Color Correction mode by selecting options in the Correction Mode Settings dialog box.

To customize Color Correction mode:

1. Do one of the following:



- In the Color Correction tool, click the Correction Mode Settings button.

- ▶ In the Project window, click the Settings tab, and then double-click Correction.

The Correction Mode Settings dialog box opens.

2. Click the tab that contains the options you want.
 - The **Features** tab controls several aspects of the appearance and behavior of Color Correction mode. The following table describes the options available in the Features tab of the Correction Mode Settings dialog box.
 - The **AutoCorrect** tab contains pop-up menus for defining which automatic color corrections are made when you apply the Color Correction effect from the Effect Palette. For information on the options available in the AutoCorrect tab of the Correction Mode Settings dialog box, see [“Selecting AutoCorrect Options” on page 96](#).
3. Select the options you want.
4. Click OK.

**Correction Mode Settings
Feature Tab Options**

Option	Description
Saved Color Labels	Select an item from the pop-up menu to control how custom colors are named in bins. For information on saving custom colors, see “Saving Custom Colors to a Bin” on page 60 . The menu options include: None. When selected, the system does not supply a name. RGB. When selected, the system uses the 8-bit values for the red, green, and blue components as the name. Name. When selected, the system uses the name from the standard HTML color scheme that most closely matches the color you are saving. Name and RGB. When selected, the system uses both the Name and the RGB information as the name. This is the default option.
Eyedropper 3 x 3 Averaging	When this option is selected, the system calculates the color value to pick by averaging the values of a 3 x 3 sample of pixels centered on the eyedropper’s position. This is often useful for picking up a color accurately by sight because it compensates for shifts in color value from one pixel to another. When this option is deselected, the system selects the color value of the exact pixel at the eyedropper’s position.

Correction Mode Settings Feature Tab Options (Continued)

Option	Description
Show Eyedropper Info	When this option is selected, the numerical RGB values appear on the color swatches in the Color Match controls.
Eyedropper Picks from Anywhere in Application	When this option is selected, the eyedropper can pick a color from anywhere within the Avid application, for example the swatch for a custom color in a bin.

Adding Comments to Color Correction Effects

You can add comments to color-corrected segments to assist you in your work. For example, you might want to briefly note the type of adjustment you made to a segment or to make notes during a preliminary correction pass of ideas for adjustments to be done later during a final pass.

The Comments button indicates whether a comment is present on a segment.



If the position indicator is on a segment that has a comment, the icon on the Comments button is yellow.



If the position indicator is on a segment that has no comment, the icon on the Comments button is not yellow.

To add a comment to a segment:

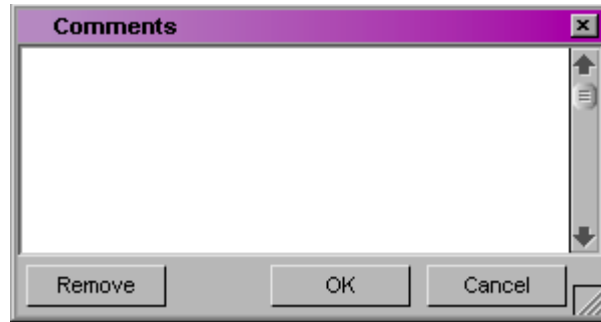
1. If you are not already in Color Correction mode, do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.

2. Move the position indicator to the segment to which you want to add a comment.



3. In the Color Correction tool, click the Comments button.

The Comments dialog box opens.



4. Type your comment in the text window, and click OK.

To remove a comment:

1. If you are not already in Color Correction mode, do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.
2. Move the position indicator to the segment from which you want to remove the comment.
3. In the Color Correction tool, click the Comments button.

The Comments dialog box opens.
4. Click Remove.

To view or edit a comment in the Comments dialog box:

1. If you are not already in Color Correction mode, do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.
2. Move the position indicator to the segment for which you want to view the comment.
3. In the Color Correction tool, click the Comments button.

The Comments dialog box opens and displays the text of the comment.

4. (Option) To edit the comment, click in the text window and make your edits using standard word processing procedures.

Working with Color Correction Effect Templates

Avid Color Correction offers the following versions of Color Correction effect templates:

- The Color Correction buckets provide an easily accessible location within the Color Correction tool for the short-term storage of Color Correction effect templates.
- The Color Correction Effect Template button allows you to create a template for any color correction and save it to a bin in the same way that you save other kinds of effect templates. The Save Correction button in the CC tab of the Command palette performs the same function.

Like templates for other effects, Color Correction effect templates save all the adjustment values for a color correction so you can apply those values quickly to another segment. You can apply all the values at once by dragging the template into the monitor containing the current segment, or you can apply the values for the controls in a single tab in the Color Correction tool by dragging the template onto the tab that contains the group of controls you want to change.

You can also apply a Color Correction effect template to multiple segments at once by selecting the segments and then double-clicking the effect template icon in the bin or in the Effect Palette. To do this, you must be in editing or Effects mode.



You can also save custom colors to bins. For more information, see “Using the Color Match Control” on page 53.

Understanding How Color Correction Effect Templates Save Settings

When you create a Color Correction effect template, the system saves all the Color Correction settings for the segment. The system remembers both the values set for each control and the status of each Enable button.

Templates saved to a bin or a bucket do not update when you make new adjustments to the segment. To save new adjustments, you must save a new template to a bin or a bucket.



You can specify which settings you apply in a template by dragging the template to the active tab in the Color Correction tool. This changes only those settings contained within that tab. Using this method, you can, for example, apply settings one tab at a time without applying any other settings that might also be saved in a template.

Saving a Color Correction Effect Template to a Bin

You can save a Color Correction effect template to a bin using either the Color Correction Effect Template button in the Color Correction tool or the Save Correction button in the CC tab of the Command palette.

Color correction templates saved to a bin are saved permanently, unlike templates saved to a bucket, which are not saved beyond the current working session.

To save a Color Correction effect template to a bin:

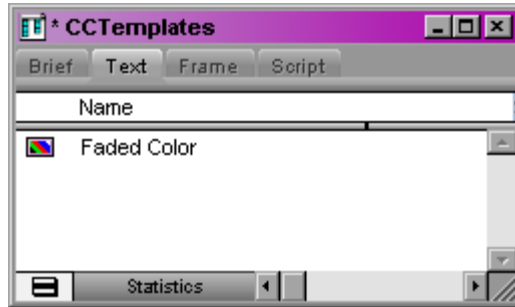
1. If you are not already in Color Correction mode, do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.
2. Make sure that the position indicator is in the segment that contains the settings you want to save.
3. Do one of the following:
 - ▶ Click the Color Correction Effect Template button, press and hold the mouse button, and then drag the effect icon to a bin.
 - ▶ With Active Palette selected in the Command palette, click the Save Correction button in the CC tab.
 - ▶ If the Save Correction button is mapped to a key, press that key.



Effect icons for open bins are also displayed in the Effect Palette.

A new effect template appears in the bin, containing all the color correction adjustment values for the segment. The new effect template is identified in the bin by its effect icon. By default, the system names the template using the clip name of the segment.

4. (Option) To rename the template, click the template name and type a new name.



Saving a Color Correction Effect Template to a Bucket

The Color Correction tool provides four *buckets*, located below the Color Match control, that you can use to save Color Correction effect templates for the duration of a working session. You can then apply the template quickly to any segment. The buckets are labeled C1 through C4.



You can map any of the Color Correction buckets from the CC tab in the Command palette to the keyboard, for example, to a function key, using the standard procedures for mapping buttons described in the chapter “Using Basic Tools” in the user’s guide or the editing guide for your system or the Help.

The following illustration shows the Color Correction buckets.



To save a Color Correction effect template in a bucket:

1. If you are not already in Color Correction mode, do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.

2. Make sure that the position indicator is in the segment that contains the adjustment values you want to save.
3. Alt+click the bucket in which you want to save the template.

Select a bucket from the range C1 to C4. Empty buckets have a blank icon holder above them. If you Alt+click a bucket that already contains a template, you overwrite the previous template with the new adjustment values.

The values are saved as a template and a Color Correction icon appears in the icon holder above the Color Correction bucket.



Color Correction effect templates saved to buckets do not remain from one session to another. When you end your session, the system deletes the templates. You can save an effect template in a bucket permanently by clicking the Color Correction icon in the icon holder, and dragging it to a bin.

Applying Color Correction Effect Templates

For help, see “Entering and Exiting Color Correction Mode” on page 17.

To apply all adjustment values in a Color Correction effect template to the current segment, do one of the following in Color Correction mode:

- ▶ Click the effect icon for the template in the bin, the Effect Palette, or the Color Correction bucket icon holder, and drag it to the monitor containing the current segment.



For tips on working with templates in the Effect Palette, see “Saving a Color Correction Effect Template to a Bin” on page 40.

- ▶ Select the template in the bin or the Effect Palette, and then press Enter.
- ▶ Click the appropriate Color Correction bucket (for example, C1).
- ▶ If you have mapped the Color Correction bucket to the keyboard, press the appropriate key.

The system applies all the Color Correction adjustments in the template to the segment that is the current location of the position indicator.

To apply adjustment values from a Color Correction effect template selectively to a single tab of color correction controls:

1. In the Color Correction tool, click the tab to which you want to apply the template.
2. Click the effect icon for the template in the bin, the Effect Palette, or the Color Correction bucket icon holder, drag it to the tab, and drop it anywhere in the tab.

The controls in that tab update to reflect the values in the template. Other color correction controls are not affected.



If you apply template settings to a subdividing tab in the HSL group, the image in the monitor does not reflect those settings until you enable the HSL group tab.



If you apply a saved Color Correction effect template to a segment that already has a color correction, you overwrite the existing correction. The existing Color Correction settings are lost. Make sure you want to replace the existing correction before you apply a saved Color Correction effect template to a clip that already has a correction. You can use the Undo command to undo the effect of a Color Correction effect template. However, once the Undo command is no longer available, you cannot recover the original Color Correction settings.

To apply all adjustment values in a Color Correction effect template to multiple segments:

1. In editing or Effect mode, select the segment to which you want to apply the Color Correction effect template.

For more information, see “Applying an Effect to Multiple Segments” in the chapter “Basics of Effects Editing” in the effects guide for your Avid application.

2. Open the bin that contains the Color Correction effect template.
3. Double-click the Color Correction effect template icon in the bin or in the Effect Palette.

The application applies the Color Correction effect template to each of the selected segments.

Working with Color Correction Effect Templates in the Effect Palette

The following list of reminders and suggestions can help you work quickly when you are using saved Color Correction effect templates in the Effect Palette.

- Press Ctrl+8 to open the Effect Palette or to make the Effect Palette active.

The Effect Palette becomes inactive whenever you perform an action in another area of the interface (for example, when you move the position indicator in the Timeline). Pressing Ctrl+8 is a quick keyboard method for reactivating the Effect Palette. The Effect Palette must be active before you can use it to apply a Color Correction effect template.

- Use the Tab key to make one side or the other of the Effect Palette active.

For example, if the effect categories list on the left side of the Effect Palette is active, press the Tab key to activate the list of templates on the right side. Press the Tab key again to activate the effect categories list. Clicking a specific item in either list also activates that side of the Effect Palette.

- To display a group of effect templates in the Effect Palette, select the bin or the color-corrected sequence that contains the templates in the effect categories list on the left side of the palette.

- Use the Up Arrow and Down Arrow keys to move through the active list.

For example, you can quickly move from the most recent correction to the third most recent in the list by pressing the Down Arrow key twice.

- The Effect Palette remembers the currently selected item in the list of corrections even when it becomes inactive or is closed.

For example, if you have the most recent correction in the list selected and then leave the Effect Palette to perform another operation or close the Effect Palette, that correction will be the selected correction when you reactivate or reopen the Effect Palette.

This makes it easy to apply the same template successively to a number of segments, especially if you have navigation buttons such as Fast Forward, Rewind, Go to Next Uncorrected Shot, and Go to Previous Uncorrected Shot mapped to the keyboard. Once you have the template you want selected in the Effect Palette, you simply navigate to another segment, press Ctrl+8 to activate the Effect Palette, and then press Enter to apply the template.

Chapter 3

Performing Color Corrections

This chapter describes procedures for making color corrections and provides a complete explanation of all the controls in the Color Correction tool.

- [General Workflow for Making Color Corrections](#)
- [Using Automatic Color Corrections](#)
- [Using the Color Match Control](#)
- [The HSL \(Hue, Saturation, Luminance\) Group](#)
- [The Curves Group](#)
- [Working with the Waveform Monitors and Vectorscope Monitor](#)
- [Applying Color Corrections to an Entire Sequence](#)
- [Using Color Correction Effects in the Effect Palette](#)

General Workflow for Making Color Corrections

Avid Color Correction gives you a great deal of flexibility when you make color corrections. The exact workflow that you employ will depend on your individual methods, your degree of familiarity with the color correction controls, and the requirements of your project. However, the basic steps to take when making a correction will be similar for all users.

The following procedure outlines a typical color correction operation. You can adapt the exact order in which steps are performed or repeated to conform to your particular needs.

To color correct a sequence:

1. In editing mode, load the sequence.
2. Do one of the following:
 - ▶ Select Toolset > Color Correction.
 - ▶ Press Shift+F8.

The Color Correction toolset appears.

3. (Option) If necessary, configure the toolset and adjust Correction Mode Settings to suit the requirements of your project and editing style. For more information, see [Chapter 2](#).

4. Preview the material in the sequence to develop a sense of the kinds of corrections that are needed and the approach you will use to make them.

For example, you might look for a shot that you would like to use as a reference for your adjustments and lock that shot in one of the monitors. For general guidance on what to look for when previewing material, see [Chapter 4](#).



You might prefer to preview extensively and plan your corrections in advance. If you have more color correcting experience, you might prefer to work by moving back and forth frequently between making corrections and assessing the material on which they are working.

5. Make sure that the Record Track button for the track on which you want to make corrections is the topmost selected button in the Track Selector panel in the Timeline.

You can color correct any number of tracks, including nested tracks by stepping into the nest. However, you can correct only one track at a time. Color correction is applied to the topmost selected track in a sequence.

6. Use the Composer Window buttons or the position indicator in the Timeline to move to a segment you want to correct.
7. Click the appropriate tabs in the Color Correction tool to display the controls you want to use to make the correction.

8. Use the automatic color correction features or adjust the color correction controls manually until you are satisfied with the correction.

Remember that you can repeat steps 7 and 8 to make successive adjustments using several different groups of controls and to selectively turn them on and off while you assess their effect on the segment. You can use the Dual Split button in the monitors to view corrected and uncorrected images side by side.

9. (Option) Add a comment for the correction.
10. Repeat steps 5 through 9 for each segment you want to correct.
11. When you are satisfied with the corrections throughout the sequence, make a selection from the Toolset menu to exit Color Correction mode and return to other editing operations.

Using Automatic Color Corrections

Both color correction groups include buttons that allow you to make automatic color corrections to correct contrast problems, balance color, or remove color casts by identifying areas of an image that should be color neutral.

You can also apply up to three automatic color corrections in a single operation by selecting options in the AutoCorrect tab of the Correction Mode Settings dialog box and applying the Color Correction effect from the Effect Palette to one or more segments in a sequence. For more information, see [“Using Color Correction Effects in the Effect Palette” on page 96](#).

The Color Match control also corrects automatically by adjusting an image so that a poor color value matches a better one. You select the colors on which you want Color Match to operate using an eyedropper. For more information, see [“Using the Color Match Control” on page 53](#).

Understanding Automatic Color Correction

Automatic color correction simplifies the work of correcting common color problems in video images. When you use one of the automatic color corrections, Avid Color Correction analyzes the existing color characteristics of an image and makes adjustments to color correction controls that usually eliminate or at least significantly reduce a specific color problem.

You will often want to begin your color correction work by using automatic color corrections, especially if you do not have time for detailed manual adjustments, if you only need to correct basic color problems such as color casts, or if you lack experience with the manual controls in the Color Correction tool.

Since automatic color correction adjusts controls in the Color Correction tool just as you would when making manual corrections, you are always free to make additional adjustments manually if you need to fine-tune the correction. Also, automatic color corrections can help you learn how to recognize color problems in images and what kinds of adjustments you might make to correct images manually. For example, if the Auto Balance automatic correction in the Hue Offsets subdividing tab adjusts an image by adding yellow in the ChromaWheels, then the analysis of that image revealed a blue color cast.

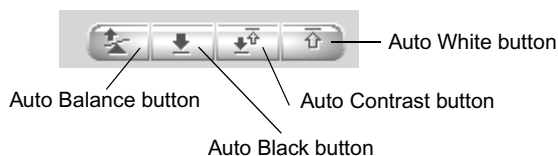
Automatic color corrections operate within normal limits for legal video levels. For example, an automatic color correction will not make an adjustment that takes a significant area of an image beyond legal luminance levels.

Adjusting Contrast and Balance Automatically

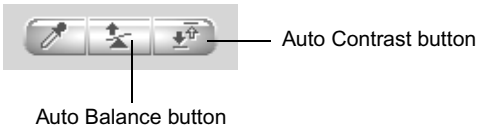
You can adjust the contrast and balance the color automatically for an image simply by clicking buttons. An automatic contrast adjustment expands the tonal range of the image, which usually improves sharpness and detail. An automatic balance adjustment evens out the influence of the different color channels in the image, which usually greatly reduces or even eliminates any color cast.

Automatic contrast and balance buttons appear in the Color Correction tool in the following locations:

- The Hue Offsets subdividing tab of the HSL tab, as shown in the following illustration:



- The Curves tab, as shown in the following illustration:



To make an automatic contrast or balance adjustment:

1. If you have not already done so:
 - a. Move the position indicator to the segment you want to correct.
 - b. Click the Color Correction group tab or subdividing tab that contains the automatic correction button you want to use.
2. Click the appropriate automatic correction button.

The system analyzes the currently selected frame in the segment and adjusts the appropriate color correction controls. The following table lists the available contrast and balance buttons and describes their function.

Automatic Contrast and Balance Buttons

Button	Location in Color Correction Tool	Description
Auto Balance 	HSL tab, Hue Offsets subdividing tab	Makes adjustments to the three ChromaWheels to balance the colors in the image. This eliminates any color cast for most images.
Auto Black 	HSL tab, Hue Offsets subdividing tab	Makes an adjustment to the Setup slider control that makes the darkest areas of the image as dark as possible.
Auto Contrast 	HSL tab, Hue Offsets subdividing tab	Makes adjustments to the Gain and Setup slider controls to maximize the tonal range in the image. The brightest areas of the image are made as bright as possible and the darkest areas of the image are made as dark as possible.
Auto White 	HSL tab, Hue Offsets subdividing tab	Makes an adjustment to the Gain slider control that makes the brightest areas of the image as bright as possible.
Auto Balance 	Curves tab	Makes adjustments to the Red, Green, and Blue curves to balance the colors in the image. This eliminates any color cast for most images.

Automatic Contrast and Balance Buttons (Continued)

Button	Location in Color Correction Tool	Description
Auto Contrast 	Curves tab	Makes an adjustment to the Master curve to maximize the tonal range in the image. The brightest areas of the image are made as bright as possible and the darkest areas of the image are made as dark as possible.

Using the Remove Color Cast Buttons

You can remove a color cast automatically by clicking a Remove Color Cast button and using an eyedropper to identify an area in your image that you want to be color neutral (white, black, or a shade of gray). Avid Color Correction analyzes the current color characteristics of the area you have selected and then adjusts color correction controls to make that area color neutral.

Remove Color Cast buttons provide more precise control over color cast removal than Auto Balance buttons because their adjustments are limited either by luminance range or by the impact that they have on existing curve graphs. However, Remove Color Cast buttons are only useful when you are working with an image that has areas that should be color neutral.

Remove Color Cast buttons appear in the Color Correction tool in the following locations:

- Below each of the three ChromaWheels in the Hue Offsets subdividing tab of the HSL tab, as shown in the following illustration:



- In the Curves tab, as shown in the following illustration:



Each ChromaWheel Remove Color Cast button is associated with the wheel above it. Adjustments are made only to that wheel; only the parts of the image that fall within the luminance range controlled by that wheel are changed. You choose which ChromaWheel to adjust based on the luminance level of the area you want to identify, as follows:

- To make white or light gray areas of an image color neutral and remove a cast throughout the lightest part of the image, use the Remove Color Cast button below the Highlights ChromaWheel.
- To make mid-gray areas of an image color neutral and remove a cast throughout the midtones of the image, use the Remove Color Cast button below the Midtones ChromaWheel.
- To make black or dark gray areas of an image color neutral and remove a cast throughout the darkest parts of the image, use the Remove Color Cast button below the Shadows ChromaWheel.

The Curves tab Remove Color Cast button works by adding a point to each of the Red, Green, and Blue curves that makes the area you identify with the eyedropper color neutral. You can use the Curves tab Remove Color Cast button repeatedly to identify multiple areas that you want to be color neutral. Each new use adds another point to each of the three curves. (You can add new points up to the 16 point limit, although once several points are distributed along the curve, further points are unlikely to improve the image significantly).

The effect of each added point on the image as a whole varies depending on the shape of the entire curve. In general, each new point affects the image most in areas with similar luminance values to the area you identify with the eyedropper, and affects the image least in areas with very different luminance values.

To use a Remove Color Cast button:

1. If you have not already done so, move the position indicator to the segment you want to correct.
2. Do one of the following:
 - ▶ Click the Remove Color Cast button below a ChromaWheel in the Hue Offsets subdividing tab of the HSL tab.
 - ▶ Click the Remove Color Cast button in the Curves tab.

The button appears highlighted.



3. Drag the pointer into the image.

The pointer changes to an eyedropper.

4. Continue to drag the eyedropper until it is over the part of the image you want to become color neutral, and then release the mouse button.

Avid Color Correction analyzes the part of the image you have identified and adjusts the controls to remove the color cast.

Considerations When Using Automatic Color Correction

Although automatic color corrections are much simpler to learn and perform than manual corrections, practice and experience will still improve your ability to correct a range of images with different color characteristics. If one set of automatic corrections does not produce good results, remove it and try a different combination. Remember also that some images with extreme color characteristics might require manual correction in addition to or instead of automatic correction.

The following tips and suggestions will help you to achieve the best possible results when using automatic color correction:

- The Auto Contrast correction is most useful for images that should have both areas of strong highlight (white or close to white) and areas of strong shadow (black or close to black). If you make an Auto Contrast correction on an image that should not have such a full tonal range (many close-ups fall into this category), the correction might introduce too much contrast. When an image requires strong highlights but not strong shadows (or the reverse), you can use the Auto White or the Auto Black button to set the white or black point without making the overall range of tones too extreme.
- When you perform both an Auto Contrast and an Auto Balance correction, the order in which you perform these two operations affects the final quality of the correction. In most cases, you will achieve the best results for most images by doing the following:
 - In the Hue Offsets subdividing tab of the HSL tab, use Auto Contrast first, and then use Auto Balance
 - In the Curves tab, use Auto Balance first, and then use Auto Contrast
- There is usually no gain in performing an automatic correction more than once on the same image, even if the second correction would be made in a different group from the first. For example, once you have performed an

Auto Balance in the Curves tab, you will not usually see any improvement in the color balance of the image if you perform a second Auto Balance either in the Curves tab or in the Hue Offsets subdividing tab of the HSL tab.

- If an Auto Contrast and Auto Balance combination has improved an image but some color cast remains, you can often fine-tune the correction using one or more of the Remove Color Cast buttons.
- Automatic corrections you make in the Hue Offsets subdividing tab of the HSL tab and those you make in the Curves tab do not produce identical results for most images (and might produce markedly different results for some images). This is because the methods for calculating the corrections are different and because the controls that are being adjusted operate differently. Automatic corrections in the Curves tab often work well for correcting basic problems caused by incorrect camera color balancing. Automatic corrections in the Hue Offsets subdividing tab of the HSL tab are often better for more extreme problems such as bad lighting conditions. However, there are no rules that cover all situations. If automatic correction in one color correction group does not yield good results, remove it and try a correction in the other group.

Using the Color Match Control

Both Color Correction groups include a Color Match control. This control allows you to quickly make a correction by selecting input and output colors from your images, or from the Windows Color dialog box. If you select the “Eyedropper Picks from Anywhere in Application” option in the Correction Mode Settings dialog box, you can also select colors from any other location within your Avid application, such as a custom color swatch saved in a bin.

When you use the Color Match control, the system replaces the input color value with the output color value and adjusts all the other color values in the image proportionally. The system also automatically adjusts the other controls in the group to reflect the change. You can set the combination of color channels or components the system uses to determine the match by making menu selections.

For example, if you want to replace the blue sky tone in one image with that in another to match the two shots, you can use the Color Match control to pick the two colors and automate the color adjustment.

When you are working in the Curves group, the Color Match control also includes the NaturalMatch™ feature. NaturalMatch allows you to replace the hue values in an image with new output values without distorting the saturation and luminance values in the image.

You can also Alt+drag colors to a bin and save them as custom colors. You can then click a custom color and drag it into the Color Match control at any time, or, if you have the “Eyedropper Picks from Anywhere in Application” option selected, you can select a custom color from its swatch in the bin using the eyedropper.

The following illustration shows the Color Match control.



Making a Correction with the Color Match Control

To make a correction using the Color Match control:

1. In the Color Correction tool, click the tab that includes the Color Match control with which you want to work.

For help, see [“Entering and Exiting Color Correction Mode” on page 17](#).

For complete information on the Correction Mode Settings dialog box, see [“Customizing Color Correction Mode Settings” on page 35](#).

2. (Option) If necessary, select either of the following options in the Correction Mode Settings dialog box:

- **Eyedropper 3 x 3 Averaging**

When you select “Eyedropper 3 x 3 Averaging,” the system calculates the color value to pick by averaging the values of a 3 x 3 sample of pixels centered on the eyedropper’s position. This is often useful for picking up a color accurately by sight because it compensates for shifts in color value from one pixel to another. When this option is deselected, the system selects the color value of the exact pixel at the eyedropper’s position.

- Eyedropper Picks from Anywhere in Application

When you select “Eyedropper Picks from Anywhere in Application,” you can pick colors from anywhere in the application using the Color Match eyedroppers. For example, you can pick a target color for a Color Match correction, such as a desirable skin tone, from the swatch that appears beside a custom color saved in a bin or from one of the ChromaWheels.

3. Select the input color (the color to be replaced):

- a. Move the pointer over the input color swatch.

The pointer changes to an eyedropper.

- b. Press and hold the mouse button, and then drag the eyedropper to the area of the image in the monitor from which you want to select an input value.

The input color swatch in the Color Match control updates as you move the pointer in the image.

- c. Release the mouse button to complete the selection.

The input color appears in the input color swatch.



If the “Eyedropper Picks from Anywhere in Application” option is selected in the Correction Mode Settings dialog box, you can select an input color from another location in your Avid application using the eyedropper. Also, you can pick from the Windows Color dialog box by double-clicking the input color swatch. However, you will usually want to select your input color from the current segment.

4. Select the output color:

- a. Move the pointer over the output color swatch.

The pointer changes to an eyedropper.

- b. Press and hold the mouse button, and then drag the eyedropper to the area of the image in the monitor from which you want to select an output value.

The output color swatch in the Color Match control updates as you move the pointer in the image.

- c. Release the mouse button to complete the selection.

The output color appears in the output color swatch.



Your output color will usually be selected from an image other than the current segment, such as the next segment or a reference frame. If the “Eyedropper Picks from Anywhere in Application” option is selected in the Correction Mode Settings dialog box, you can select an input color from another location in your Avid application, such as a custom color swatch in a bin, using the eyedropper. You can also double-click the output color swatch and select a color from the Windows Color dialog box. These alternatives are useful for selecting a saved “ideal” replacement color such as a completely neutral gray or an optimal skin tone. For more information on using the Windows Color dialog box, see “Using the Windows Color Dialog Box” in the chapter “Customizing Effects in Effect Mode” in the Help.

5. Click the Match Type button, and select a Match Type to determine the exact nature of the match the system makes.

The options available in the Match Type pop-up menu depend on the group in which you are working. For more information on Match Type options, see [“Selecting Match Type Options” on page 56](#).

6. Click the Match Color button to make the correction.

The system adjusts the current segment and resets the group controls to reflect the adjustment. The corrected image displays in the monitor that contains the current segment.

Selecting Match Type Options

The options available in the Match Type pop-up menu reflect the way in which color is handled in the group in which you are working. The following table describes the options available in the Match Type pop-up menu.

Match Type Options

Group	Description
HSL (Controls tab)	
• H + S + L	The system matches based on the hue, saturation, and luminance of the color selected in the output color swatch.
• Hue	The system matches based on only the hue of the color selected in the output color swatch.
• Saturation	The system matches based on only the saturation of the color selected in the output color swatch.

Match Type Options (Continued)

Group	Description
Luminance	The system matches based on only the luminance of the color selected in the output color swatch.
HSL (Hue Offsets tab)	
Highlights	The system matches based on both the hue and the saturation across the highlights portion of the tonal range.
Midtones	The system matches based on both the hue and the saturation across the midtones portion of the tonal range.
Shadows	The system matches based on both the hue and the saturation across the shadows portion of the tonal range.
Curves	
Master	The system matches based on the luminance of the color selected in the output color swatch.
R + G + B	The system matches based on the values of all three color channels of the color selected in the output color swatch.
NaturalMatch	Switches the NaturalMatch feature on and off. Choose NaturalMatch to select or deselect the NaturalMatch feature. When this command is selected, all the match types in the Curves group use the NaturalMatch feature when making a correction and match types appear in the Color Match control with the extension (Nat). For more information on NaturalMatch, see “Understanding NaturalMatch” on page 58.

Understanding NaturalMatch

In many situations when you are correcting on a shot-to-shot basis, color matching is complicated by differences in lighting between one shot and another. For example, you might want to match the skin tone in Shot A, which is in shadow, with that in Shot B, which is brightly lit. To achieve a natural-looking correction, you need to replace the hue of Shot A while preserving luminance and saturation characteristics that suggest shadow.

NaturalMatch solves this problem by making calculations that compensate for the luminance and saturation qualities of the original image when making the correction. The correction that is made when you use NaturalMatch adopts the new hue value, preserves the original luminance value, and adjusts the saturation value in relation to the other values. NaturalMatch allows you to use the quick correction method offered by the Color Match control even when images show significant differences in lighting.

Color Match Example Using NaturalMatch

The following illustrations show an example of the use of the Color Match control and the NaturalMatch feature to correct color from shot to shot.



If you are reading a black-and-white hardcopy printout of this document, you will find it useful to view the color images in the Help or in the online version of this document on the online publications CD-ROM.

Uncorrected Image

This original image is very gray and shows poor skin tones. The RGB values for a point in the center of the man's forehead are R:61, G:62, B:66 — an almost completely neutral gray.



Reference Image

This image shows much better color characteristics, including good skin tones and a better color for the canvas of the tent. If we want to present these two shots next to one another in a sequence, we will almost certainly want to make their color characteristics match better. One way to do this is with the Color Match control. If we use the center of the forehead in the first image as an input value and the center of the forehead in this reference image (R:110, G:70, B:56) as an output value, and then make a color match using NaturalMatch to automatically generate ChromaCurve graph adjustments for all three color channels, we can quickly match the skin tones in the weak image to those in the better one.



Corrected Image

Though this image would benefit from further correction (particularly to improve the contrast ratio), it is improved dramatically as a result of the color match. The skin tones and the color of the tent in the background now match the reference image well.



Saving Custom Colors to a Bin

You can save a color that you have selected in the Color Match control as an item in a bin. For example, you might want to save a skin tone that you want to match throughout your sequence. You can then load that color back into the Color Match control whenever you need to make a match based on that color.

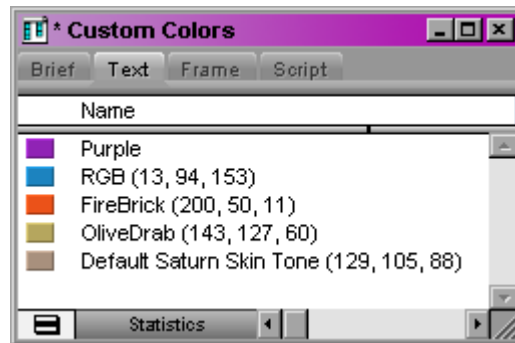
To save a color to a bin:

1. In the Color Match control, Alt+click the swatch that contains the color you want to save, and press and hold the mouse button.

The pointer changes to a hand, and a rectangular outline appears.

2. Drag the rectangular outline to a bin, and release the mouse button.

The color appears in the bin as a rectangular color swatch icon. The system assigns the color a name based on the current Saved Color Labels settings in the Correction Mode Settings dialog box. For more information, see [“Customizing Color Correction Mode Settings” on page 35](#).



3. (Option) If you want to rename the custom color, click the existing name in the bin and type a new name.

To load a custom color into the Color Match control, do one of the following:

- ▶ Click the color icon in the bin, and drag it to the appropriate color swatch in the Color Match control.
- ▶ If the “Eyedropper Picks from Anywhere in Application” option is selected in the Correction Mode Settings dialog box, select the saved color from its swatch in the bin using the Color Match eyedropper.

Getting RGB Information Using the Color Match Control

By default, the color swatches in the Color Match control display the RGB values for the selected color. This makes the Color Match control useful as an information palette to check the exact RGB value of a sample area in your image.

For example, if you have an area in your image that you know should appear white, you can sample that area using the Color Match eyedropper and check how far its RGB values depart from a true white. If the values are R:231, G:217, B:229, then you know that a little green needs to be added to achieve white. (In other words, the image has a magenta cast.) If you want this area in the image to be exactly reference white (R,G,B:235), you know that you also need to adjust the white point slightly to increase the RGB values.

The HSL (Hue, Saturation, Luminance) Group

The HSL (Hue, Saturation, Luminance) group provides controls that allow you to alter attributes such as hue, saturation, gain, and gamma. These controls resemble those found in the Video Input tool and in the Color Effect, and, therefore, HSL is the group in the Color Correction tool that will be most familiar to experienced Avid editors.

The HSL group also allows you to specify an offset for the hue of an image, a control that is especially useful for correcting a color cast. For example, when an object in an image that should be a neutral gray appears tinged with a color, you can use the offset adjustment to restore the correct gray color. You can make Hue Offset adjustments in three different luminance ranges — highlights, midtones, and shadows — allowing you more precise control over color cast corrections.

You can invert both the chrominance and luminance values in an image with a single click. You can also set clipping values for both the High and Low ends of the luminance range.

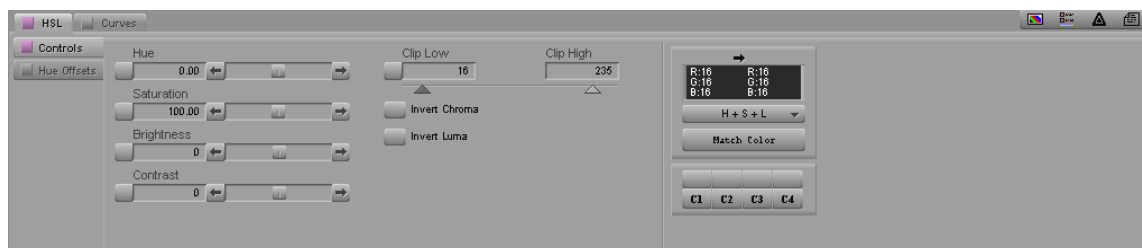
The HSL controls are capable of correcting a wide range of problems. If you are comfortable working with the HSL group and gain some experience using it, you might be able to make most of your common corrections without needing to use the Curves group. For some kinds of adjustments, however, you

might find the curve graph controls in the Curves group more suitable. In particular, remember that the Auto Contrast and Auto Balance automatic corrections buttons in the Curves group might

Working with the Controls Tab

The Controls tab of the HSL group includes sliders for making adjustments to hue, saturation, and luminance values. It also includes the Color Match control for making hue, saturation, and luminance adjustments automatically, based on selected input and output color values. For information on the Color Match control, see [“Using the Color Match Control” on page 53](#).

The following illustration shows the Controls tab.



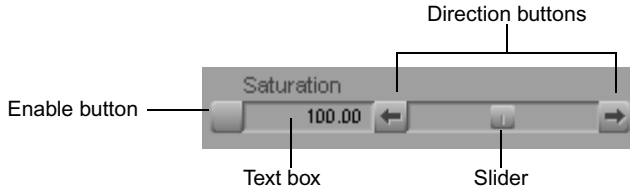
Making Corrections Using the Controls Tab

To make a correction using the Controls tab:

1. If you have not already done so:
 - a. Move the position indicator to the segment you want to correct.
 - b. Click the HSL tab.
 - c. On the left side of the Color Correction tool, click the Controls subdividing tab.
2. Make your adjustments by doing one of the following:
 - ▶ Adjust one or more of the individual sliders or buttons. For more information, see [“Using the HSL Sliders” on page 63](#) and [“Controls Tab Controls” on page 64](#).
 - ▶ Use the Color Match control to make a correction by selecting input and output colors. For more information, see [“Using the Color Match Control” on page 53](#).

Using the HSL Sliders

The following illustration shows the components of the HSL controls.



To adjust the HSL sliders, do one of the following:

- ▶ Type a value in the text box, and then press Enter.
- ▶ Click the slider, and drag it to a new value.
- ▶ Click one of the direction buttons to change the value in small increments.
- ▶ Click one of the direction buttons, and press and hold the mouse button to change the value quickly over a large range.



You can “nudge” the numerical value of a control up or down by small increments. To do this, click in the text box, and then press the Up Arrow key to increase the value or the Down Arrow key to decrease the value.

Each slider has an Enable button that you can click to turn that slider on or off or Alt+click to reset the slider to its default value. For more information, see [“Working with the Enable Buttons” on page 32](#).

Controls Tab Controls

The following table describes the individual controls available in the Controls tab of the HSL tab.

Controls Tab Controls

Control	Description
Hue	Shifts the hues in the image around the color wheel. Values range from –180 to 180, where 0 is the default and causes no change in the image. A value of 120 shifts red to blue, and a value of –120 shifts red to green.
Saturation	Specifies the amount or intensity of color. Values range from 0 to 200, where 100 represents no change to the image, 0 represents complete desaturation (monochrome image), and 200 represents maximum saturation.
Brightness	Adjusts the luminance of the image by shifting the luminance value of every pixel by the value set in the control. Values range from –100 to 100, where –100 subtracts 100 from the 8-bit luminance value of every pixel, and 100 adds 100 to the 8-bit luminance value of every pixel. The effect of the Brightness control is very similar to that of the Setup control (on the Hue Offsets tab). One important difference, however, is that the Brightness control interacts with the Contrast control, while the Setup control interacts with the Gain and Gamma controls. If you have made a Contrast adjustment, it is better to adjust luminance further using the Brightness slider. If you have made an adjustment using the Gain or Gamma controls, it is better to adjust luminance further using the Setup control.

Controls Tab Controls (Continued)

Control	Description
Contrast	Increases or decreases the amount of contrast in the image. Values range from –100 to 100, where –100 represents no contrast (all pixels mapped to neutral gray) and 100 represents maximum contrast.
Clip Low Clip High	Sets the Low clip and the High clip for the image. All pixels with the Low clip value or less are clipped to black; all pixels with the High clip value or more are clipped to white. The default settings for these controls are 16 and 235 on an 8-bit scale, representing the normal broadcast values for black and white.
Invert Chroma	Replaces the color value of every pixel in the image with the opposite color value on the color wheel. This is the equivalent of setting the Hue control to 180 or –180.
Invert Luma	Reverses the brightness level of every pixel in the image. Dark areas become light, and light areas become dark.

Working with the Hue Offsets Tab

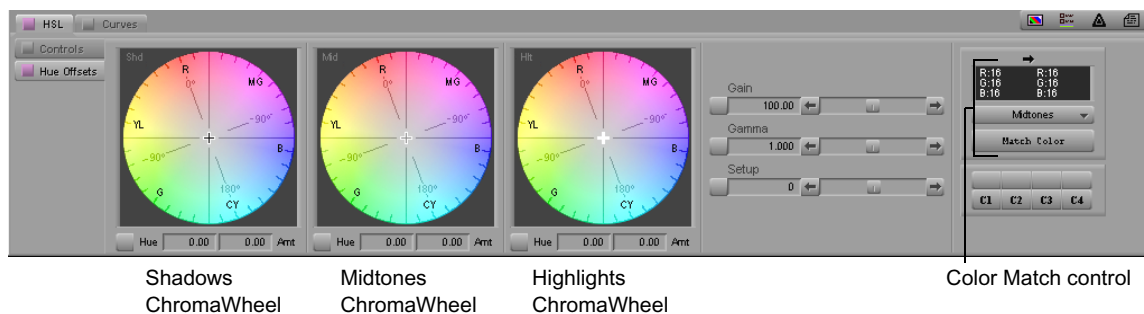
The Hue Offsets subdividing tab of the HSL group includes the following controls:

- Three ChromaWheel™ controls that allow you to adjust hue and saturation values at the same time by dragging in color wheels, by entering values in linked text boxes, or by using the Remove Color Cast buttons. Each ChromaWheel controls a distinct luminance range — Shadows, Midtones, and Highlights. These controls are especially well-suited for correcting color casts in images. For more information, see [“Understanding the ChromaWheel Controls” on page 66](#) and [“Using the Remove Color Cast Buttons” on page 50](#).
- Slider controls for adjusting Gain, Gamma, and Setup. These sliders offer one of the best ways to control the tonal range of your images. For more information, see [“Hue Offsets Tab Controls” on page 69](#).
- Four automatic color correction buttons that adjust the Gain and Setup sliders or the ChromaWheels automatically based on an analysis of the color characteristics of the active frame. For more information, see [“Adjusting Contrast and Balance Automatically” on page 48](#).
- The Color Match control, which you can use to automatically make a hue offset adjustment based on input and output colors. For information on the Color Match control, see [“Using the Color Match Control” on page 53](#).



Since the Hue Offsets ChromaWheel controls provide an adjustment method that is similar to the physical controllers on traditional color correction equipment, experienced colorists might choose to use them as their preferred controls for many color adjustments.

The following illustration shows the Hue Offsets tab.



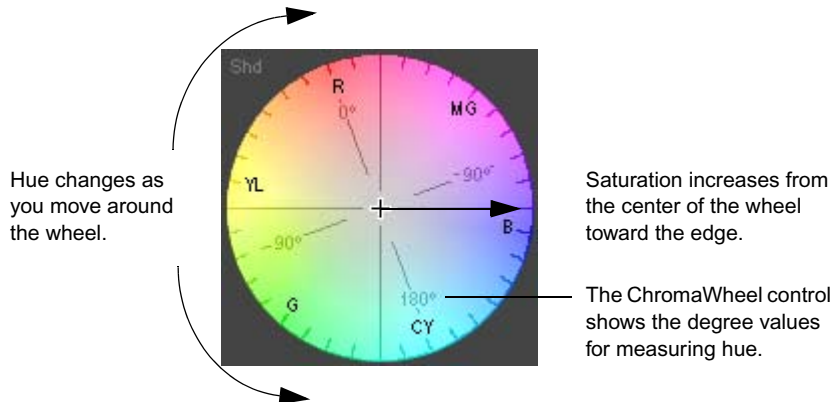
Understanding the ChromaWheel Controls

The ChromaWheel controls in the Hue Offsets tab show outlines that resemble the design of a vectorscope monitor, overlaid on full-color depictions that show the color represented by each area of the wheel. Each ChromaWheel is a circular graph that represents hue and saturation values. Hue values are mapped around the circumference of the wheel, with colors in the same positions that they occupy on a vectorscope. Red is at the 0° point on the wheel, and cyan is at the 180° point.

As you move around the wheel counterclockwise from red to cyan, you move through positive degree values. For example, green is at +120°. As you move around the wheel clockwise from red to cyan, you move through negative degree values. For example, blue is at -120°.

Saturation values are mapped along the radius of the wheel. The center point of the wheel represents zero saturation (neutral gray); the edge of the wheel represents maximum saturation. As you move out from the center of the wheel, you shift from less to more saturation. Saturation values are measured on a scale from 0 (zero saturation) to 100 (maximum saturation).

By picking a specific point on the wheel, you select an exact combination of hue and color intensity to add to your image. You can select a gray with a slight yellow tinge near the center of the wheel, for example, or an intensely saturated blue at the outer edge.



If you are reading a black-and-white hardcopy printout of this document, you will find it useful to view the color images in the Help or in the online version of this document on the online publications CD-ROM.

When you use the ChromaWheel controls to correct a color cast, you use a basic principle of color theory: you can cancel out one color in an image by adding an equal amount of the opposite color on the wheel. For example, to remove a red cast, add some cyan. To remove a yellow cast, add some blue. You do not even need to remember which colors are opposite when you have the ChromaWheel as a control. Simply add some color from the opposite side of the wheel from the color you want to remove, and then fine-tune your adjustment until you are satisfied with the result.



The Hue Offsets ChromaWheel controls are designed to create a familiar environment for users by duplicating the general appearance of a vectorscope monitor. Their representation of hue and saturation values, as described above, does not exactly match the calibration of a true vectorscope monitor.

Making Corrections Using the Hue Offsets Tab

To make a correction using the Hue Offsets tab:

1. If you have not already done so:
 - a. Move the position indicator to the segment you want to correct.
 - b. Click the HSL tab.
 - c. Click the Hue Offsets subdividing tab.
2. Make your adjustments by doing one or more of the following:
 - ▶ Click one or more of the automatic color correction buttons. For more information, see [“Adjusting Contrast and Balance Automatically” on page 48](#).
 - ▶ Use one or more of Remove Color Cast buttons below the ChromaWheels. For more information, see [“Using the Remove Color Cast Buttons” on page 50](#).
 - ▶ Use the Color Match control to calculate an offset automatically, based on input and output colors. For more information, see [“Using the Color Match Control” on page 53](#).
 - ▶ Move the crosshair pointer on the appropriate ChromaWheel control. For more information, see [“Using the ChromaWheel Crosshair Pointers” on page 69](#).

As you move the pointer in the wheel, the Hue and Amount text boxes update to display numerical values for the adjustment.

- ▶ Type values in the Hue and Amount text boxes for the appropriate ChromaWheel control to set the offset you want. You must press Enter after typing a value for it to take effect.

Hue values range from -180° to 180° where 0° is the position of red on the wheel. Amount values range from 0 to 100. When you change the Hue and Amount values, the pointer on the ChromaWheel control updates to represent the adjustment.



You can “nudge” the numerical value of a control up or down by small increments. To do this, click in the text box, and then press the Up Arrow key to increase the value or the Down Arrow key to decrease the value.

- ▶ Adjust one or more of the Gain, Gamma, and Setup controls. For more information, see [“Using the HSL Sliders” on page 63](#) and the following table.

3. Fine-tune your adjustments until you are satisfied with the result.

Remember that you can make adjustments on more than one ChromaWheel control and turn them on and off individually to assess their effect on the image.

Hue Offsets Tab Controls

Control	Description
Gain	Adjusts the gain or white point for the image. Values range from 0 to 200, where 100 represents the unchanged image. The main difference between Brightness (on the Controls tab) and Gain is that Brightness adjusts by adding to the 8-bit luminance value of every pixel, while Gain makes an adjustment based on a percentage of the original luminance.
Gamma	Adjusts the midpoint of the luminance range. Values range from 0.1 to 10, where 1 represents the unchanged image. Lowering the value darkens the midtones and brings the image closer to black. Raising the value lightens the midtones and brings the image closer to white.
Setup	Adjusts the setup or black point for the image. Values range from -255 to 255, where 0 represents the unchanged image (no offset). The effect of the Setup control is very similar to that of the Brightness control (on the Controls tab). One important difference, however, is that the Setup control interacts with the Gain and Gamma controls, while the Brightness control interacts with the Contrast control. If you have made an adjustment using the Gain or Gamma controls, it is better to adjust luminance further using the Setup control. If you have made a Contrast adjustment, it is better to adjust luminance further using the Brightness slider.

Using the ChromaWheel Crosshair Pointers

Each ChromaWheel control contains a crosshair pointer that identifies the currently selected point on the wheel. Each pointer has a distinctive appearance to help you distinguish them from one another. The following table shows the three pointers.

Hue Offsets ChromaWheel Crosshair Pointers

ChromaWheel Type	Pointer
Shadows	

Hue Offsets ChromaWheel Crosshair Pointers (Continued)

ChromaWheel Type	Pointer
Midtones	
Highlights	

To move the crosshair pointer in a ChromaWheel control:

1. Click anywhere in the wheel, and press and hold the mouse button.
The standard mouse pointer disappears, and the crosshair pointer is dynamically linked to the mouse.
2. Drag the crosshair pointer around in the wheel until you are satisfied with the adjustment, and then release the mouse button.



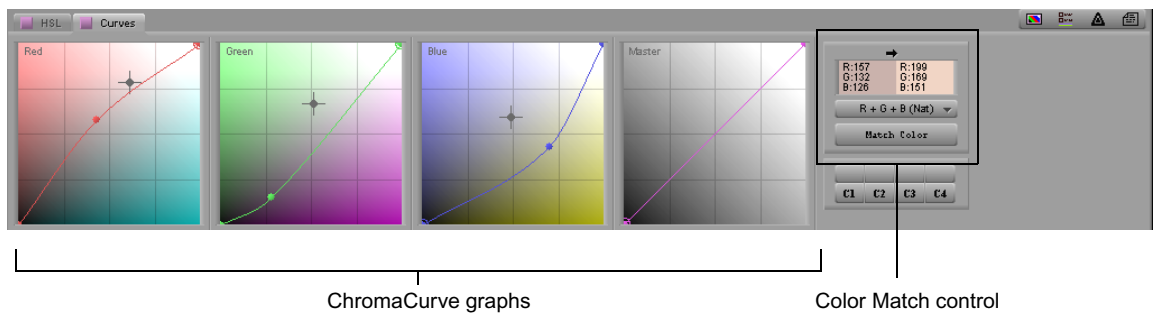
For more precise control over the movement of the crosshair pointer in the central area of the wheel, press and hold the Shift key while performing the actions in this procedure.

The Curves Group

The Curves group includes the following controls:

- Four ChromaCurve graphs, which allow you to control color and luminance by placing up to sixteen control points on a graph and then adjusting the points. For more information on ChromaCurve graphs and how they operate, see [“Understanding ChromaCurve Graphs” on page 71](#).
- Three automatic color correction buttons that adjust one or more of the ChromaCurve graphs automatically to correct problems of contrast or color balance. For more information, see [“Adjusting Contrast and Balance Automatically” on page 48](#) and [“Using the Remove Color Cast Buttons” on page 50](#).
- The Color Match control, which allows you to automatically add or modify a control point to the curves, based on selected input and output colors. For more information on the Color Match control, see [“Using the Color Match Control” on page 53](#) and [“ChromaCurve Graphs and the Color Match Control” on page 76](#).

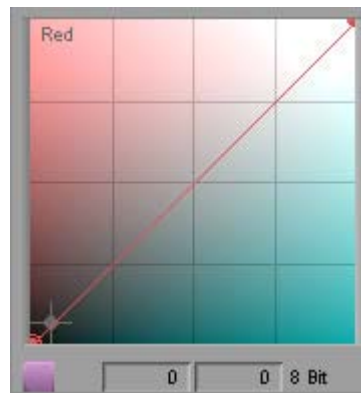
The following illustration shows the Curves tab.



Understanding ChromaCurve Graphs

A ChromaCurve graph shows the relationship of input values (on the horizontal axis) to output values (on the vertical axis). A background grid indicates the quartile points on each axis to assist you when you are reading the graph and making adjustments.

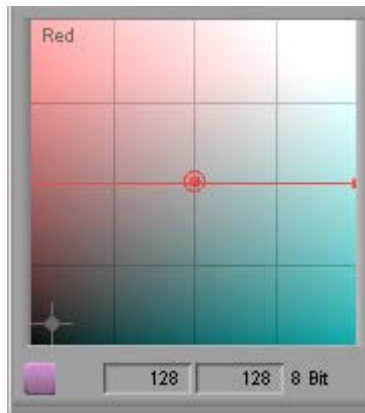
The following illustration shows the Red ChromaCurve graph.



The default curve (before you make any adjustments) is an ascending 45° straight line, since input and output values are the same across the entire range. The control points for the two ends of the curve are set by the system, but you can change their location.

If you make an adjustment that moves part of the line below the 45° angle, you make the output values for that part of the image lower than the input values. If you make an adjustment that moves part of the line above the 45° angle, you make the output values for that part of the image higher than the input values.

If you make an extreme adjustment to a curve so that it becomes a horizontal line, you are converting all input values to the same output value. For example, in the following illustration, all input values are mapped to an output value of 128. When this adjustment is made across all three color channels, the result is a uniform, midgray image.



When you make less extreme adjustments, the result is a true curve, since the graph updates by calculating a curve based on the values of the control points and their positions with respect to one another.

In each of the Red, Green, and Blue ChromaCurve graphs, the color of the background indicates what color in the image is adjusted if you created a curve through that part of the graph. The upper left corner of the graph is the color of the graph name (red, green, blue) and represents complete saturation in that color. The lower right corner of the graph is the complementary color (cyan, purple, yellow). The upper right corner is white and the lower left corner is black.

The Master ChromaCurve graph controls overall luminance in the image. The grayscale tone of its background indicates the luminance range that is affected by that part of the graph but does not directly indicate the result of an adjustment. Adjustments that result in parts of the graph being above the

default 45° angle make those areas of the image brighter. Adjustments that result in parts of the graph being below the default 45° angle make those areas of the image darker.

For examples showing how various curves affect an image, see [“Examples of ChromaCurve Graph Adjustments” on page 78](#).

Making Corrections Using the Curves Tab

To make corrections using the Curves tab:

1. If you have not already done so:
 - a. Move the position indicator to the segment you want to correct.
 - b. Click the Curves tab.
2. Do one of the following:
 - ▶ Use one or more of the automatic color correction buttons to adjust the ChromaCurve graphs. For more information, see [“Adjusting Contrast and Balance Automatically” on page 48](#) and [“Using the Remove Color Cast Buttons” on page 50](#).
 - ▶ Use the Color Match control to adjust the ChromaCurve graphs. For more information, see [“Using the Color Match Control” on page 53](#).
 - ▶ Adjust the ChromaCurve graphs manually, either by clicking and dragging to add and move control points or by entering values in the Input and Output text boxes, until you are satisfied with the results. For more information, see [“Adjusting ChromaCurve Graphs” on page 73](#).

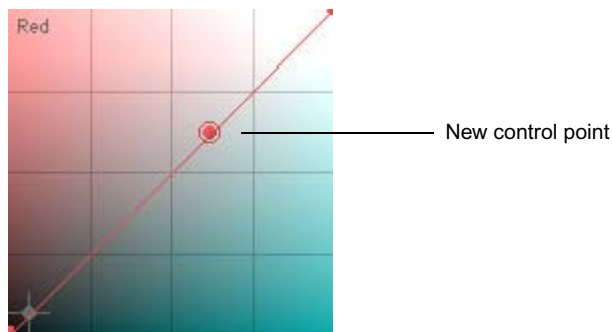
Adjusting ChromaCurve Graphs

You can have sixteen control points in a Curves tab ChromaCurve graph. Graphs must always have at least two control points. Avid Color Correction sets default control points such that input and output values are the same across the entire range of colors.

To add a control point:

- ▶ Click the curve line in the graph at the point where you want the new point to appear.

A new control point appears with a circle around it to indicate that it is the active control point.



To select a control point:

- Click the control point you want to select.

A circle appears around the control point to indicate that it is the active control point.



Active control point



Inactive control point

To move a control point, do one of the following:

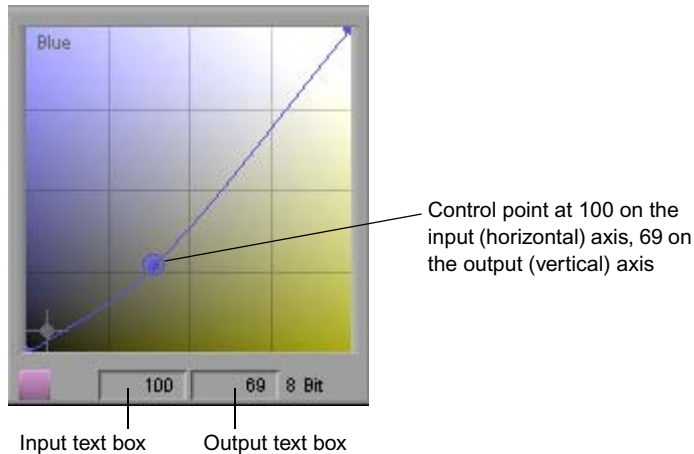
- Click the control point, press and hold the mouse button, and drag the control point to the location on the graph where you want to place the point.

The curve updates as you drag the control point.

- Type input and output values for the position of the control point in the Input and Output text boxes below the ChromaCurve graph. You must press Enter after typing a value for it to take effect.



You can “nudge” the numerical value of a control up or down by small increments. To do this, click in the text box, and then press the Up Arrow key to increase the value or the Down Arrow key to decrease the value.



To delete a control point:

1. Click the control point to activate it.
A circle appears around the control point.
2. Make sure the pointer is over the ChromaCurve graph that contains the control point you want to delete.
3. Press the Delete key.

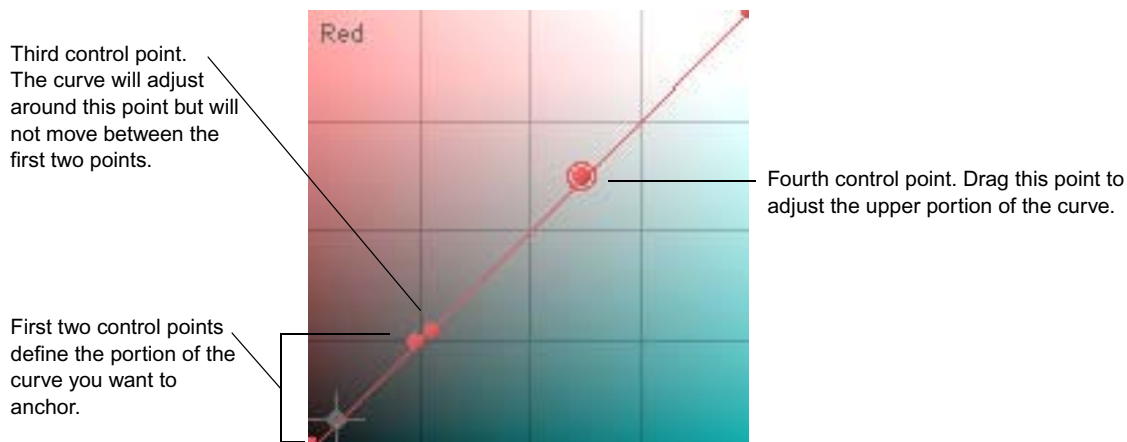


A curve is defined by at least two control points. If you have only two control points set in a ChromaCurve graph, you cannot delete one.

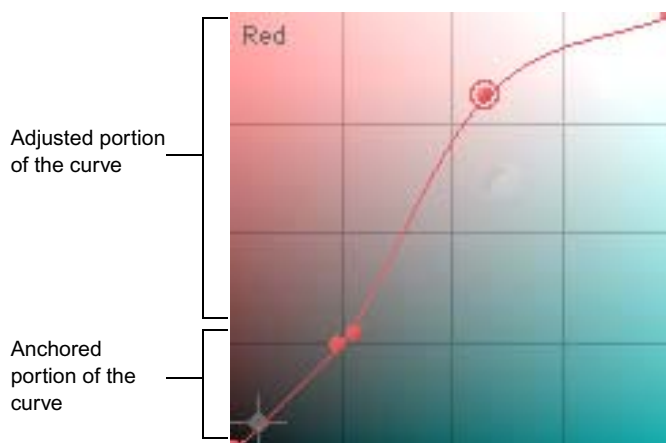
To anchor a portion of the curve so it does not move when you are making other adjustments:

1. Place two control points at either end of the portion of the curve you want to anchor.
2. Place a third control point very close to the point that separates the portion of the curve you want to anchor from the portion of the curve you want to adjust.

3. Place a fourth control point on the portion of the curve you want to adjust.



Now when you drag the new control point to adjust the curve, the portion of the curve between the first two control points will not move.

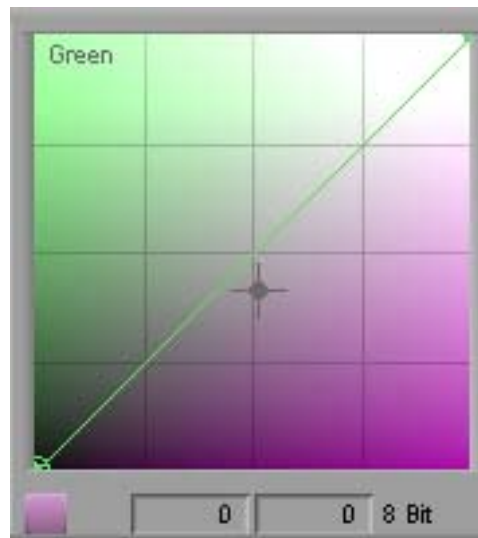


ChromaCurve Graphs and the Color Match Control

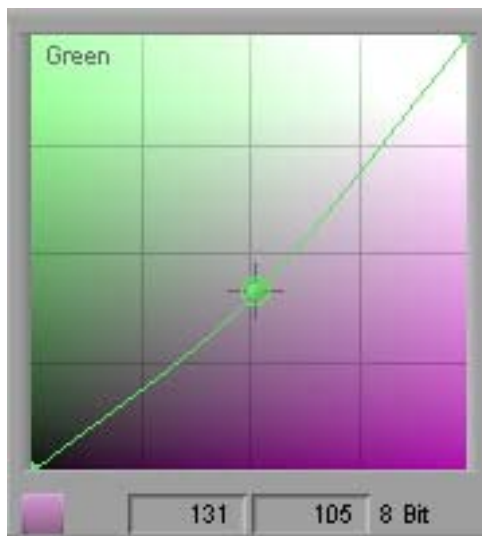
When you use the Color Match control in the Curves tab, a gray crosshair marker appears in each appropriate ChromaCurve graph to mark the intersection of the input value as defined by the input color swatch in the Color Match control and the output value as defined by the output color swatch in the Color Match control.

When you click the Match Color button, the system adds a new control point and updates the ChromaCurve graphs to reflect the color match. If you are not using NaturalMatch or if the ChromaCurve graphs have not received any previous adjustment, the new control point appears at the location of the crosshair marker. If you are using NaturalMatch or if the ChromaCurve graphs have already received some adjustment, the system makes a more complex calculation to reflect the input saturation and luminance values or to take earlier ChromaCurve graph adjustments into account. In these cases, the new control point does not appear at the location of the crosshair marker.

The following illustrations show this behavior both before and after you click the Match Color button.



The crosshair marker on the Green ChromaCurve graph represents the values for Green in the color swatches — Input 131, Output 105. Since R+G+B is selected as the Match Type, similar crosshair markers appear on the Red and Blue ChromaCurve graphs.



When you click the Match Color button, the system creates a new control point and updates the curve to reflect the color match. In this illustration, NaturalMatch is selected and the calculation is not complicated by other control points, so the new control point is created at the exact location of the crosshair marker. The Green input and output values as shown in the color swatches now appear in the Input and Output text boxes below the graph.

Examples of ChromaCurve Graph Adjustments

The following illustrations show a series of simple adjustments made to an image using the Red ChromaCurve graph in the Curves tab. By comparing the results of these adjustments, you will learn how curves can be used to control color across different parts of the brightness range.

In each adjustment example, the new corrected image and the curve used to produce it are shown together with one other image from the series for the purpose of comparison.



In each example, the color of the background behind the control point represents the color change to the image. In the first example, creating a curve through the darker cyan area causes reds to be reduced in the darker parts of the image. In the second example, creating a curve through the lighter cyan area causes reds to be reduced in the lighter areas of the image.

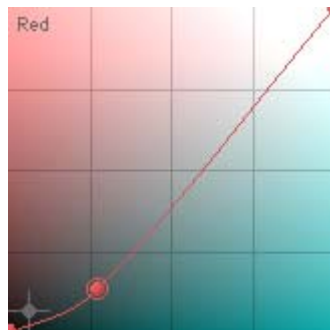


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Uncorrected Image



Adjustment 1

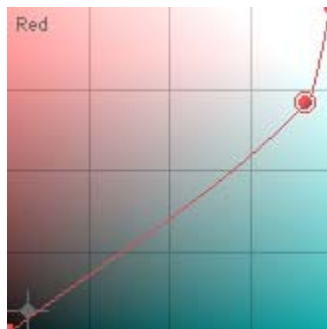


Adjustment 1. Red is reduced primarily in the shadows range (the lower part of the curve). Notice how much of the red tone is lost from the background grass, the shirt, and the lower red signpost, which loses much of its detail. The higher red signpost is relatively less desaturated, however, and some of the reddish tinge is retained in the cloud highlights in the top right.

Adjustment 1



Adjustment 2

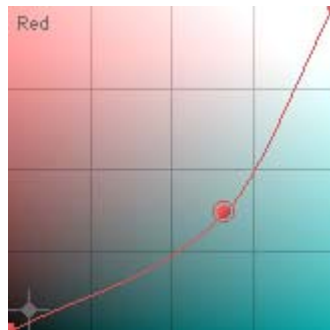


Adjustment 2. Red is reduced primarily in the highlights range (the upper part of the curve). The differences between this adjustment and adjustment 1 are most apparent in the lower signpost, which retains more redness and detail, and in the background, where the crop in the lower right retains more red tones, but the cloud highlights in the top right have lost their red tinge.

Adjustment 2



Adjustment 3



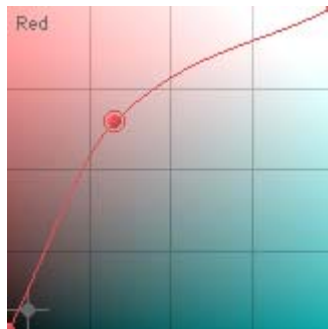
Adjustment 3. Red is reduced more evenly across the entire luminance range but with the largest change in the midtones. Though the differences between this adjustment and adjustment 2 are subtle, the strong midtone reduction in

red is most noticeable in the skin tones, which appear more gray than in either adjustment 1 or adjustment 2. However, adjustment 3 retains both some detail in the lower signpost and some of the reddish highlights in the clouds.

Adjustment 3



Adjustment 4

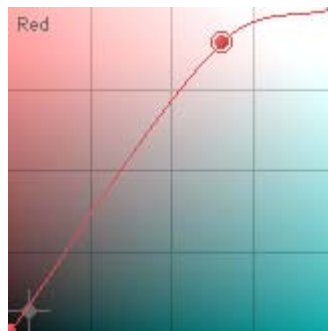


Adjustment 4. Red is boosted relatively evenly across the entire luminance range but with the largest change in the midtones. Here the difference from adjustment 3 is obvious throughout the image. The most extreme differences appear in the midtone range, for example, in the hands.

Adjustment 4



Adjustment 5

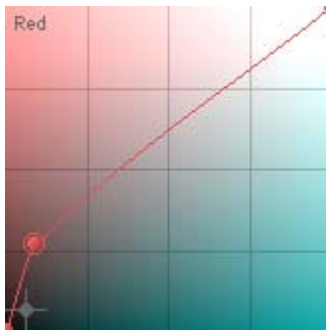


Adjustment 5. Red is boosted primarily in the highlights range. Here the most noticeable difference can be seen in the crop in the background. In adjustment 4, where red has been boosted more in the lower ranges, the crop looks more orange. In adjustment 5, where red has been boosted very little in the shadows range, the crop looks more yellow-green.

Adjustment 5



Adjustment 6



Adjustment 6. In the final adjustment, red is boosted primarily in the shadows range. In comparison with adjustment 5, there is much more of a red or orange tinge in the darker parts of the image (for example the crop in the lower right and the lower part of the shirt). Highlights in the clouds, however, have much less of a red tinge.

Working with the Waveform Monitors and Vectorscope Monitor

The waveform and vectorscope commands, found in the Source menu, configure the monitor to graphically display color information about your sequence. Avid Color Correction displays the information for the currently active monitor.

A waveform indicates the brightness of the image. The higher the green trace goes on the scale, the brighter that part of the image is.

Waveform monitors display all the information for the current field or frame overlaid in the waveform. That is, each left-to-right trace in the waveform represents one scan line. If you see a bright object on the left side of the image, you will see its peak on the left side of the waveform. A bright object in the top left of the image produces the same waveform if it is in the bottom left of the image.

Displaying a Waveform Monitor or Vectorscope Monitor

To display a Waveform monitor or Vectorscope monitor:

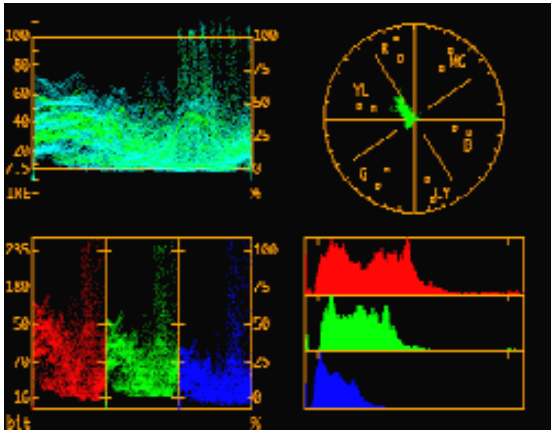
1. Click in the monitor for which you want to display color information.
The monitor becomes the active monitor.
2. In one of the other monitors, click the Source menu and select a waveform or vectorscope command.
The monitor displays the selected waveform or vectorscope information.

For more information, see [“Using the Waveform and Vectorscope Information” on page 93](#).

The following table describes each command.

Waveform and Vectorscope Commands

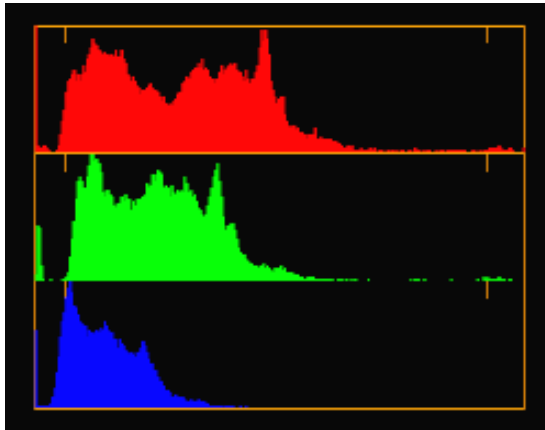
Command	Description
Quad Display	Displays the following waveform and vectorscope information in a single monitor (clockwise from the top left corner): • YC Waveform • Vectorscope • RGB Histogram • RGB Parade



For information on each display, see its individual entry in this table.

Waveform and Vectorscope Commands (Continued)

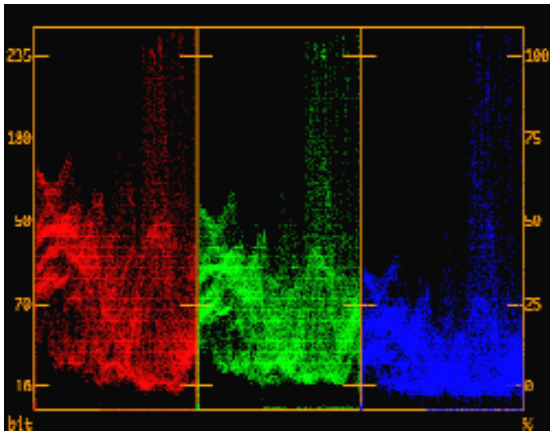
Command	Description
RGB Histogram	Displays a graph showing which RGB values in the image appear most frequently. The darkest values of red, green, and blue in the image appear as peaks on the left of the graph, and the brightest values appear as peaks on the right. The height of a peak indicates the number of pixels of that value. The width of a peak indicates how many pixels in the image have similar values. For example, if the blue histogram has many tall peaks at the left side, it shows that the image has many pixels with low blue values. However, those same pixels might appear in the image as many different colors, since they might have any red and green values.



For information on using the RGB Histogram display, see [“Using the Waveform and Vectorscope Information”](#) on page 93.

Waveform and Vectorscope Commands (Continued)

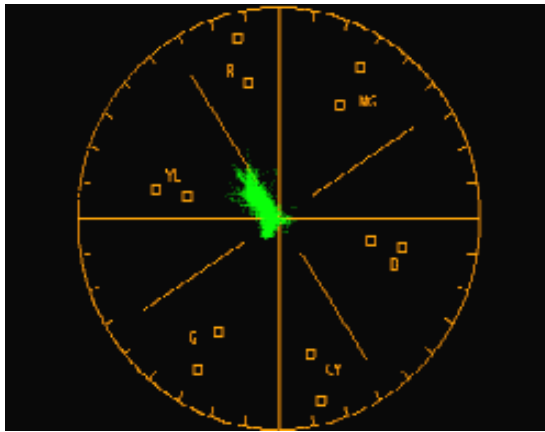
Command	Description
RGB Parade	Displays waveforms of the RGB (red, green, and blue) components side by side. Since video cameras capture in RGB, this display helps to show camera problems. It is also used for general reference to the three primary colors. RGB signals are used together to create all other colors. A white area in the image appears as peaks in all three waveforms at the same relative location. A high red level does not mean a red image, unless the green and blue levels are low. RGB Parade incorporates any safe color limits you have set. The system displays RGB values in white when the values fall outside the RGB Gamut limits. For more information on color limits, see “Safe Color Limits with Waveform and Vectorscope Information” on page 126.



For information on using the RGB Parade display, see [“Using the Waveform and Vectorscope Information” on page 93](#).

Waveform and Vectorscope Commands (Continued)

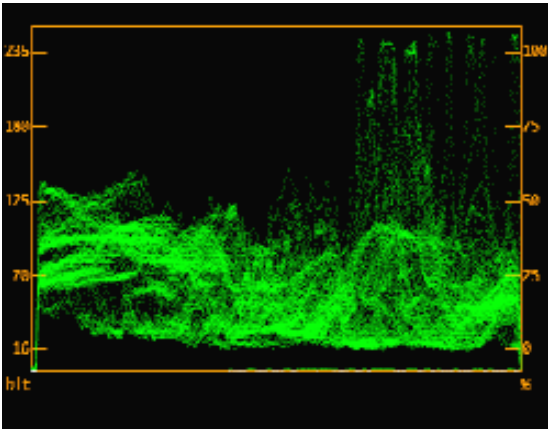
Command	Description
Vectorscope	Displays chroma information without luma information as a circular graph where the center represents no chroma and chroma increases as the trace moves away from the center. All white, black, and gray parts of the image appear at the center. Areas with more saturation appear further out from the center. Images with an overall color cast produce a vectorscope trace that is generally off-center. Colors created by various positive and negative combinations of Cb and Cr appear around the circle. Small squares mark the location of standard color bar vectors. Inner squares represent the proper values for 75% color bars, and outer squares represent 100% color bars.



For information on using the Vectorscope display, see [“Using the Waveform and Vectorscope Information”](#) on page 93.

Waveform and Vectorscope Commands (Continued)

Command	Description
Y Waveform	Displays a Waveform monitor with luma information. Luma is the brightness of an image without regard to color. The scale on the left is a digital level scale using a 256-step (eight-bit) range; 16 is the level for black, and 235 is the level for white. The scale on the right shows the amount of white in the image as a percentage; 0% represents black, and 100% represents white. Parts of an image can have values outside the 0% to 100% range. The digital video standard allows for <i>headroom</i> and <i>footroom</i> so you can correct a mistake in level in the postproduction process. The minimum is digital 0 or –8%, and the maximum is digital 255 or 108%.  <i>Some external software or hardware processing can clip a signal that is outside the 0% to 100% range.</i> Y Waveform incorporates any safe color limits you have set. The system displays Luma values in white when the values fall outside the Luminance limits. For more information on color limits, see “Safe Color Limits with Waveform and Vectorscope Information” on page 126.



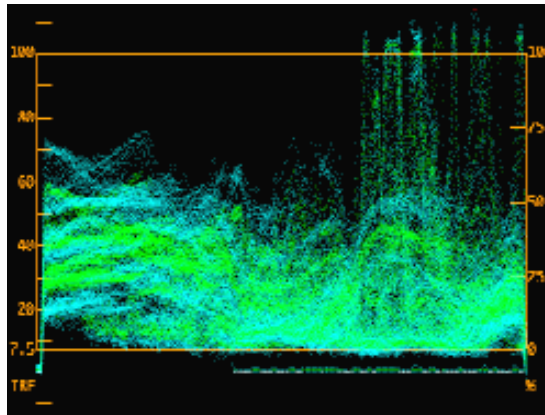
For information on using the Y Waveform display, see [“Using the Waveform and Vectorscope Information” on page 93](#).

Waveform and Vectorscope Commands (Continued)

Command	Description
YC Waveform	Displays composite video information. Composite video has the C (chroma) waveform, which is derived from Cb and Cr components, riding on the Y (luma) waveform. The Y trace is green and the C waveform is a cyan (blue-green) envelope around the green trace. Because the C signal of composite video has equal positive and negative energy, the cyan bands are at an equal distance above (Y+C) and below (Y-C) the green waveform. The left side of the YC Waveform shows a scale marked either for NTSC or PAL, depending on your project. NTSC black is 7.5 IRE (except in Japan), and NTSC white is 100 IRE. PAL black is 0 millivolts (mV), and PAL white is 700 mV.  <i>This tool does not display actual composite video output. It is an accurate software model of a perfect encoder. If you convert your material to composite form, you will see similar results.</i>

The scale on the right shows the amount of white in the image as a percentage; 0% represents black, and 100% represents white.

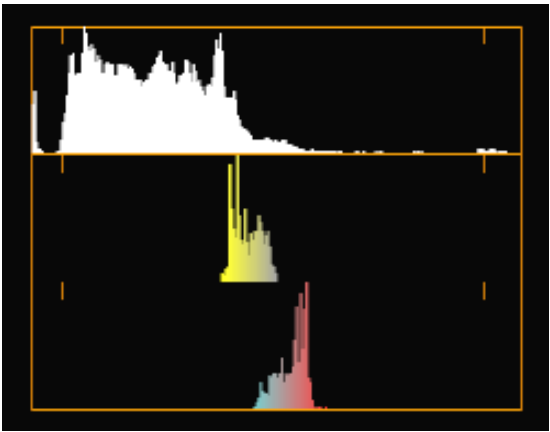
Composite video values above or below these limits are indicated by a red edge on the display. In addition, YC Waveform incorporates any safe color limits you have set. The system displays Composite values in yellow and Luma values in white when the values fall outside the safe color limits. For more information on color limits, see [“Safe Color Limits with Waveform and Vectorscope Information”](#) on page 126.



For information on using the YC Waveform display, see [“Using the Waveform and Vectorscope Information”](#) on page 93.

Waveform and Vectorscope Commands (Continued)

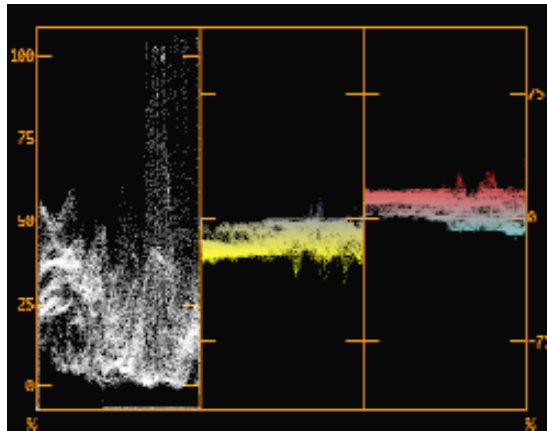
Command	Description
YCbCr Histogram	Displays a graph showing which YCbCr values in the image appear most frequently. The height of a peak indicates the number of pixels of that value. The width of a peak indicates how many pixels in the image have similar values. The upper bar of the histogram represents Y values. The darkest values are on the left and the brightest values on the right. An image with good contrast will show a good spread of values from darkest to lightest. An image with a great variety of colors appears as a wide spread in the Cb and Cr histograms. If they extend too far from the center, there is too much saturation.



For information on using the YCbCr Histogram display, see [“Using the Waveform and Vectorscope Information”](#) on page 93.

Waveform and Vectorscope Commands (Continued)

Command	Description
YCbCr Parade	Displays waveforms of Y, Cb, and Cr side by side. The Y in YCbCr is the same luma shown in the Y Waveform. In this display, the Y waveform is shown in white on the left side. Cb and Cr are color difference signals that represent just the color information of a signal with the luma removed. Cb and Cr values can be negative or positive. For images that are black and white, Cb and Cr are zero. You would see a flat white line halfway up the two right bands. As they increase, Cb and Cr are shown in the colors representing those vectors. The more the values increase, the more saturated the colors used to display them. Positive Cb is represented by blue hues, and negative Cb is represented by yellow hues. Positive Cr is represented by red hues, and negative Cr is represented by cyan hues. If the Cb or Cr waveforms are not centered, the cause might be a color cast to the image.



For information on using the YCbCr Parade display, see [“Using the Waveform and Vectorscope Information”](#) on page 93.

Using the Waveform and Vectorscope Information

Some of the ways you can use the waveform and vectorscope information include:

- Align levels of sources using test patterns. If you capture some color bars from your source footage, you can measure them and set the color correction needed to restore the video levels to the way the program was created. Import the Test Patterns from the SupportingFiles folder of your Avid system to become familiar with the proper Waveform, Parade, and

Vectorscope readings. Histograms are not as useful on test patterns. For example, with 75% color bars, the Y+C envelope for the yellow and cyan bars should match the 100% white level.

- Identify problems with source video. Typical problems include:
 - Color levels too high or too low. See [“Safe Color Limits with Waveform and Vectorscope Information”](#) on page 126.
 - Missing channels in YCbCr or RGB, indicating an equipment problem or a damaged cable.
 - Clipping in YCbCr, RGB, or YC channels. The trace appears chopped at a certain level. If this appears at a level below the maximum, it occurred before the footage was captured.
 - Images imported at the wrong level settings. If you import images at RGB levels of 0–255 that you should have imported at 601 levels of 16–235, the images will lack contrast. If the images have too much contrast, with levels exceeding the 0% and 100% markings, the opposite is likely.

With experience, you will learn how to read not only test patterns but actual content on the instruments. This facility will allow you to:

- Match scene brightness across a cut in Y Waveform.
- Put your flesh tones along a certain hue axis in the vectorscope.
- Watch the spread of the Y histogram to identify a good contrast range without clipping.
- Watch the top of the YC Waveform to make sure you do not have too much bright chroma.
- Fix white balance and black balance problems by identifying and centering those vectorscope traces.



These instruments are showing you the values of only one frame or field at a time. Move around in the clip to find the most extreme levels or those most representative of the scene.

You can also use the information in the Waveform monitors and Vectorscope monitor to monitor safe color limits. See [“Safe Color Limits with Waveform and Vectorscope Information”](#) on page 126.

Applying Color Corrections to an Entire Sequence

You can apply a single color correction to an entire sequence by adding a video track above all other video tracks and selecting the Record Track button for that track. This is a simple and flexible way to make a final color adjustment to an entire program. For example, you might want to brighten all of your material slightly, or increase saturation a little to create a warmer look, or tint your whole program.

Once you make a color adjustment, your application fills the entire length of the empty track with filler material and applies a Color Correction effect. The filler in this case is not opaque material but simply a container for the Color Correction effect. The result is that you see the color adjustment applied to whatever combination of images and effects exists in the lower video tracks.



In most situations, you should not use this technique to make automatic color corrections, since Avid Color Correction bases the color correction for the entire sequence on its analysis of the single frame that is active when you make the correction. This will not result in a good correction for the whole sequence unless all of the segments in it have very similar color characteristics. A better method for applying automatic color corrections to the entire sequence is to select every segment and then apply a Color Correction effect from the Effect Palette. For more information, see “Applying Automatic Color Corrections from the Effect Palette” on page 98.

To apply a color correction effect to an entire sequence:

1. In editing mode, add a new video track to the sequence.

For more information, see “Setting Up Tracks for the New Sequence” in the chapter “First Edits” in the user’s guide or editing guide for your application.

2. Enter Color Correction mode by doing one of the following:

- ▶ Select Toolsets > Color Correction.
- ▶ Press Shift+F8.
- ▶ Click the Color Correction button.

3. Make sure that the Record Track button for the topmost video track is selected.

4. Make one or more color adjustments in the Color Correction tool.

Filler material and a Color Correction effect appears in the topmost video track.

Using Color Correction Effects in the Effect Palette

The Color Correction effect appears in the Image category of the Effect Palette. Any Color Correction effect templates in open bins also appear in the Effect Palette. Because Avid Color Correction automatically applies a Color Correction effect in the Timeline when you make a correction, you apply Color Correction effects from the Effect Palette only for the following special purposes:

- To quickly apply one or more automatic color corrections to one or more segments in a sequence. For more information, see [“Performing Automatic Color Corrections from the Effect Palette” on page 96](#).
- To apply a Color Correction saved as an effect template to one or more segments in a sequence. For more information, see [“Working with Color Correction Effect Templates” on page 39](#).

Performing Automatic Color Corrections from the Effect Palette

You can instruct Avid Color Correction to make up to three automatic color corrections by default whenever you apply the Color Correction effect from the Image category in the Effect Palette. This allows you to easily and quickly apply multiple automatic corrections to a single segment or to multiple segments in a sequence. For example, you can perform Auto Contrast and Auto Balance corrections on every segment in your sequence in a single operation. This method also allows you to make automatic color corrections without entering Color Correction mode.

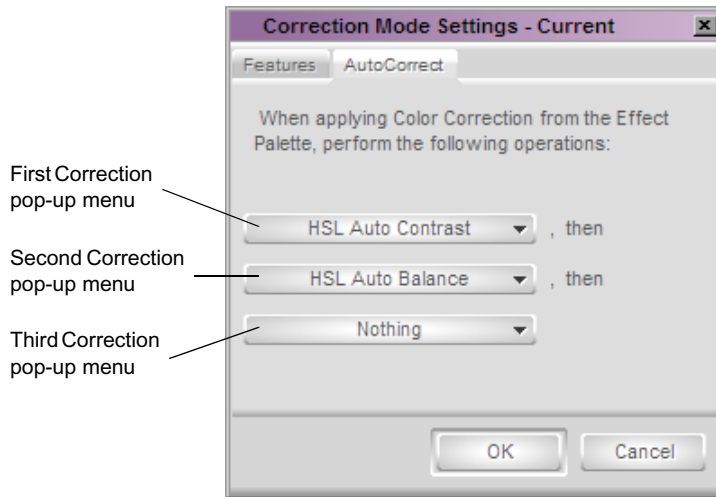
Selecting AutoCorrect Options

You control how Avid Color Correction makes automatic corrections when you apply the Color Correction effect from the Effect Palette by choosing options in the AutoCorrect tab of the Correction Mode Settings dialog box.

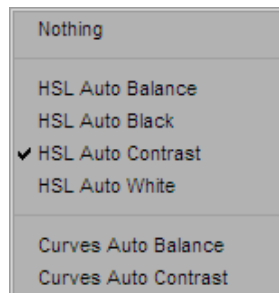
To set AutoCorrect options:

1. Do one of the following:
 - ▶ In the Settings tab of the Project window, double-click Correction.
 - ▶ In the Color Correction window, click the Correction Mode Settings button.

The Correction Mode Settings dialog box appears.



2. Click the AutoCorrect tab.
3. Select an option from each of the three pop-up menus to define the first, second, and third automatic color correction that Avid Color Correction makes when you apply the Color Correction effect from the Effect Palette.



The following table describes the available options in each of the pop-up menus.

For information that will help you to decide on the best order for these corrections, see [“Considerations When Using Automatic Color Correction” on page 52.](#)

AutoCorrect Options

Option	Description
Nothing	Makes no adjustment. For example, if you only want to make two automatic corrections when you drag the Color Correction effect from the Effect Palette, set the Third Correction pop-up menu in the AutoCorrect tab to Nothing.
HSL Auto Balance	Makes adjustments to the three ChromaWheels to balance the colors in the image. The equivalent of clicking the Auto Balance button in the Hue Offsets subdividing tab of the HSL tab.
HSL Auto Black	Adjusts the Setup slider in the Hue Offsets subdividing tab of the HSL tab to make the darkest areas of the image as dark as possible. The equivalent of clicking the Auto Black button in the Hue Offsets subdividing tab of the HSL tab.
HSL Auto Contrast	Adjusts the Gain and Setup sliders in the Hue Offsets subdividing tab of the HSL tab to maximize the tonal range in the image. The equivalent of clicking the Auto Contrast button in the Hue Offsets subdividing tab of the HSL tab.
HSL Auto White	Adjusts the Gain slider in the Hue Offsets subdividing tab of the HSL tab to make the brightest areas of the image as bright as possible. The equivalent of clicking the Auto White button in the Hue Offsets subdividing tab of the HSL tab.
Curves Auto Balance	Makes adjustments to the Red, Green, and Blue curves to balance the colors in the image. The equivalent of clicking the Auto Balance button in the Curves tab.
Curves Auto Contrast	Makes an adjustment to the Master curve to maximize the tonal range in the image. The equivalent of clicking the Auto Contrast button in the Curves tab.

Applying Automatic Color Corrections from the Effect Palette

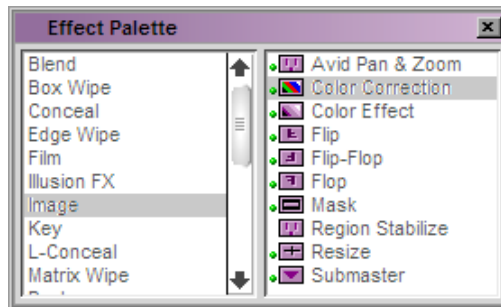
You can apply automatic color corrections from the Effect Palette to a single segment in editing, Effect, or Color Correction mode. Because you cannot select Timeline segments in Color Correction mode, you can only apply automatic color corrections from the Effect Palette to multiple segments in editing or Effect mode.

To apply automatic color corrections from the Effect Palette:

1. If you have not already done so, select options in the AutoCorrect tab of the Correction Mode Settings dialog box to control which automatic corrections are made when you apply the effect.

For more information, see [“Selecting AutoCorrect Options” on page 96](#).

2. In editing mode, Effect mode, or Color Correction mode, open the Effect Palette.
3. Click the Image category.



4. (Option) If you want to apply the automatic color corrections to multiple segments, select the segments in the Timeline.

For more information, see “Applying an Effect to Multiple Segments” in the chapter “Basics of Effects Editing” in the effects guide for your Avid application.

5. Do one of the following:
 - ▶ To apply automatic color corrections to a single segment, click the Color Correction Effect icon in the Effect Palette, and drag it to the segment in the Timeline to which you want to apply corrections.
 - ▶ To apply automatic color corrections to multiple selected segments, double-click the Color Correction Effect icon in the Effect Palette.

Avid Color Correction analyzes the middle frame of each of the segments to which you have applied the effect and makes automatic color corrections to those segments.

6. (Option) Enter Color Correction mode and make further adjustments to any of the corrections.

Working with the Color Correction Effect

Once you have created a Color Correction effect and have made color correction adjustments to it, you can work with that effect in the same way that you work with any other effect that is applied from the Effect Palette and that appears in the Timeline with an effect icon.

You can save the effect as a template by entering Effect mode, clicking the effect icon in the Effect Editor, and dragging it to a bin in the standard way described in the effects guide for your system. You can then apply the template to other segments in the sequence or to other sequences. This is useful for applying a Color Correction Effect template quickly to multiple segments.

You can also delete the effect in the standard way by selecting it in Effect mode and pressing the Delete key. For more information, see the effects guide for your system or the Help. If color corrections that were not applied from the Effect Palette are in the same segment — indicated by colored lines if Color Correction is selected in the Timeline Fast menu — those corrections cannot be deleted in Effect mode. To remove those color corrections, you must enter Color Correction mode and use the Remove Effect button.

Chapter 4

Color Correction Techniques

This chapter provides a basic introduction to color correction techniques. It suggests some general principles to keep in mind when you are assessing footage and making color corrections. The chapter then presents two examples of shots with typical color problems and detailed explanations of adjustments that improve those shots.

This information is intended primarily for users who are unfamiliar with the methods of color correction and who want some initial guidance on how to handle material that needs correction. However, since the chapter is built around specific examples of color corrections made with Avid Color Correction, it might also be useful for anyone learning to work with the tool and its controls, even an experienced colorist.

- [Guiding Principles for Color Correction](#)
- [Examples of Color Correction Problems](#)

Guiding Principles for Color Correction

One useful high-level way to think about the color correction process is to define what the overall goals of the process are. Another, slightly more practical and detailed, is to break down the typical color correction workflow into clearly defined stages of adjustment. This section uses these two approaches to provide you with a set of guiding principles for color correction.

Goals of Color Correction: Restoration and Adaptation

Color correction can be thought of as having two main goals. The first is restoring the original look of the scene. The second is adapting the look of the scene to meet the demands of the project.

In some cases, the task of color correction is complete when the first goal has been met. Often, however, there will be at least some departure from the restored look to achieve shot-to-shot consistency or to convey creative concepts. The color corrections applied to any particular shot must therefore respect (to varying degrees) two different contexts: the original scene at the time the camera captured it and the final situation of the shot within a program that has particular creative or communicative aims.

Restoring the Original Look

The first task in color correction is to restore the original look of the scene that has been filmed — in other words, to make the image match as closely as possible what an observer standing beside the camera would have perceived when the scene was shot.

This is important primarily because viewers have little tolerance for images that have unrealistic color values. For example, when a skin tone departs from our normal expectations of what skin should look like, we notice. Even when the final image is intentionally a distortion of reality, it is useful to restore the original look as a well-balanced foundation for subsequent alterations.

The color characteristics of a given shot can depart from the look of the original scene for a variety of reasons. At the time of shooting, the camera might not be correctly balanced or the scene might be imperfectly lit. During transfers (from film to tape, from one tape to another, or from tape to captured media), inconsistencies in materials, processing methods, or calibration might alter the colors.

When you are working on an uncorrected shot, you should make intelligent decisions about what the scene originally looked like and then bring the shot into line with those decisions as much as possible. Since it is unlikely that you were present when the scene was shot, this might seem to require a great deal of guesswork, but, in fact, it can be accomplished with sufficient accuracy using the following two basic guidelines.

- The human visual system generally maximizes the tonal range available in a scene. For example, in low light we adjust to perceive a greater range of dark tones.
- The human visual system generally perceives color accurately and compensates for color casts. For example, we perceive a white shirt as white even if it is being illuminated by slightly pink light.

Generally, you can restore the original look of a shot (or at least create a believable approximation of the original look) by opening up the tonal range as much as reasonably possible and by ensuring that colors look accurate. For more detailed information on how to achieve this with adjustments, see [“Correcting Tonal Range” on page 104](#) and [“Neutralizing Color” on page 105](#), and the examples later in this chapter.

Adapting the Original Look

An adaptive adjustment deliberately departs from the original look of the scene in some way. Such an adjustment might be relatively subtle, for example, lightening one shot to make it match another. In this case, you are departing from your commitment to the original look in order to achieve shot-to-shot consistency in your sequence. Other kinds of adaptive adjustment might be much more dramatic, for example, applying a gold tint to an entire sequence for an advertising spot or applying extreme adjustments such as posterization or chroma inversion for a music video.

Generally, it is a good idea to achieve an effective restorative adjustment before you begin adaptive adjustments. You will then be building on an image that has good color characteristics. Most viewers can probably perceive the difference between a restored, well-balanced image with a strong blue tint applied and an unrestored, poorly lit image with a strong blue tint applied (and prefer the former).

Stages of Color Correction

A typical color correction for a shot will probably include the following main stages of adjustment:

- Correcting the tonal range (or contrast ratio)
- Neutralizing color casts

- Achieving consistency between the shots in a sequence
- Achieving a final look

Different kinds of projects will lead to different emphases among these stages and might even make some of them unnecessary. Different working habits will also affect how these stages are handled. A more experienced colorist might work in a manner that blurs the distinctions between them. For a beginner, it might be better to keep them distinct and achieve an acceptable result for each one before moving on to the next.

The following sections provide some guidelines for each of the main stages.

Correcting Tonal Range

Correcting the tonal range usually requires two steps. In the first step, you reset the white and black points to make the range of values between the lightest part of the image and the darkest part of the image as large as possible. In the second step, you adjust the gray point to control how much of the total tonal range falls above and how much below the middle value.

Setting White and Black Points

Setting the white point and the black point is often relatively straightforward, since the shot will include an area that should obviously be very light and another area that should be very dark. You simply look for what should be the lightest area of the image and adjust controls until it becomes as light as possible, and then do the same for the area that needs to be black. You can dramatically improve the quality of shots taken using insufficient or excessive light just by making white and black point adjustments.

In some cases, however, the shot should have less range of brightness (for example, when the whole scene was originally in shadow or was shot at sunset). In such cases, you need to be careful to expand the range as much as possible without making parts of the image unrealistically light or dark.

Avoid clipping any significant part of the image. You want the range between your lightest value and your darkest value to be as large as possible, but in most circumstances you don't want to lose detail by reducing all your very light values to white or all your very dark values to black.

Do not use intense reflected spots of light (known as *speculars*) to judge where your white point should be. If you do so, you define white by an artificial standard that probably occurs in only a tiny fraction of the image. A true white object such as an item of clothing might appear dull and gray by this standard.

You have a number of choices for controls to use to make white point and black point adjustments, including the Gain and Offset sliders in the Hue Offsets subdividing tab of the HSL group and the Master curve in the Curves tab. All of these controls can be set automatically using the Auto Black, Auto Contrast, and Auto White buttons. If necessary, you can begin with an automatic correction and then fine-tune the adjustment manually.

Adjusting the Gray Point

Once you have established the range from the brightest part of the image to the darkest part, you can adjust the gray point if necessary. When you make a gray point adjustment, you define how much of the overall tonal range is between black and midgray, and how much is between midgray and white.

The most obvious effect of a gray point adjustment is that it either lightens or darkens the overall look of the image. Large adjustments of the gray point toward either the black point or the white point are almost always undesirable because they leave the whole image much too dark or too light.

Smaller, well-chosen gray point adjustments, however, can be useful for fine-tuning the overall brightness of the image. Also, since a gray point adjustment expands the tonal range on one side of the midpoint and contracts it on the other, it can be useful for improving contrast and detail overall. For example, some images look better if more contrast is available in the range between gray and white, even though the price paid for that extra contrast is a reduction in contrast between gray and black.

The main control for making gray point adjustments is the Gamma slider in the HSL group.

Neutralizing Color

Neutralizing color involves returning the colors in an image to the colors that a viewer would have perceived when standing beside the camera. Most film or video images depart from that ideal to some degree, and some depart from it dramatically.

One way to think about neutralizing color is to imagine working on a project where every shot includes a large card that we know is, when viewed in ideal lighting conditions, a perfectly neutral midgray color. If you can correct each image so the card appears midgray when your audience views the final program, all other colors in the images should be correct also.

Though you cannot normally have such a perfect measuring device in your images, it is useful to select an area of each image as a target for your color neutralizing adjustments. If you focus on getting the color in that area right, color in the rest of the image should fall into place. In some images, there might be an object or area that should be neutral gray, or nearly so, and you can use that area as your principal target as you make adjustments. In fact, this is exactly how you make corrections to remove color casts using the Remove Color Cast buttons. In other images, you might not have any gray color at all, but you will almost certainly have some other area where even a small departure from neutral color is noticeable. Human skin is probably the most common example. Or you might choose to focus on an area where you know the true color, such as a person's hair.

In addition to identifying parts of your image on which to concentrate your attention, it is useful to establish how the uncorrected image departs from neutral color before you attempt to correct it.

Sometimes this is obvious. You cannot mistake an image with an extreme pink or yellow cast. When the problem is more subtle, you can sample a few areas with the Color Match eyedropper to get information about the color characteristics of the image. Areas that should be white or black are particularly helpful, since these are easily identifiable colors that should have nearly identical values for red, green, and blue. If the red value is higher than the other two, the image has a red cast. If red and green are higher than blue, the image has a yellow cast.

You can neutralize color using different controls in the Color Correction tool. For example, you can use the Curves tab to adjust the proportions of each color. Or you can use the Hue Offsets ChromaWheel controls, which allow you to quickly locate the sector of the wheel that represents the color cast in the image, and then adjust in the opposite direction to that color. You can make either of these adjustments automatically using the Auto Balance buttons, and then fine-tune manually if necessary.

The more experienced you become as a colorist, the better you will get at judging even subtle color problems by eye and knowing intuitively what kinds of adjustments to make.

Achieving Shot-to-Shot Consistency

The most common reason for departing from the look of the original shot is to achieve simple shot-to-shot consistency in the finished program. If a scene in a drama that is supposed to take place at one time is shot over two days, and lighting conditions have changed from one day to the next, you clearly want to adjust all the shots so they appear to be taking place at the same time.

Adjustments for shot-to-shot consistency are relatively straightforward in most cases. You simply need to compare shots in the Composer window and then adjust them to match. If you have already adjusted tonal range and neutralized color well, a small change to relative brightness might be all that is needed.

The Dual Split with Reference option provides a particularly good way of comparing a reference shot with your correction to another shot to confirm that the two match. Small adjustments in relative brightness from one shot to another are also easily made with the Color Match control.

Achieving a Final Look

Some projects might require final adjustments to create a finished look. For example, you might slightly increase saturation across the whole sequence to create richer-looking colors or slightly darken all the shots to enhance a mood of tension or suspense. In certain circumstances, you might make substantial changes to the color values of the whole sequence or remove color entirely from some parts of it.

You can make final corrections of this kind by applying color correction to a filler track that is the topmost track in the Timeline. It is not possible to generalize about which controls to use to make such adjustments. You might be called upon to use any combination of color correction controls. The only effective preparation for such work is practice using the Color Correction tool and a good understanding of the more specific corrections discussed in the sections above.

Examples of Color Correction Problems

The remainder of this chapter presents two typical color correction problems. The original images are chosen as good illustrations of the kind of color correction work that needs to be done to restore a good approximation of what an observer at the scene would have perceived when the camera was shooting. They require corrections to improve tonal range and to neutralize color casts.

Each example provides the following information:

- An analysis of the original image
- Step-by-step descriptions of the corrections with illustrations (including split-screen displays in some instances)
- Sample RGB values that illustrate the results of the corrections
- Suggestions for alternative ways to achieve similar results with the Color Correction tool

Remember that these examples are presented as aids to learning, not as inflexible instructions for making corrections or models of what a perfect corrected image looks like. Each example shows only one possible way of making a correction and one possibility for a final corrected image. As you develop your own color correcting skill and judgment, you might prefer to use different combinations of controls and to aim for a slightly different final look.

Example 1

Uncorrected Image



Analysis of original image: This image has two obvious problems. First, it lacks contrast and detail because it does not have a full tonal range. A correction is required to improve sharpness and detail in areas such as the shirt and the man's hair. Second, the image has a strong yellow-green cast. This leads in particular to a very unnatural skin tone.

Step 1: Contrast Correction

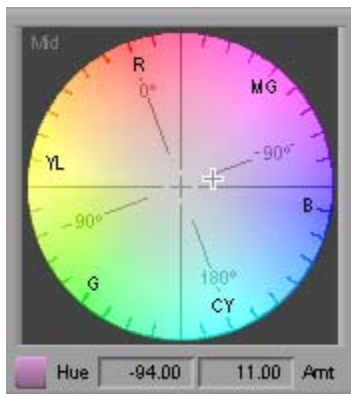


Split Screen:
Uncorrected Image
and Step 1
Correction



Step 1 of this correction is an adjustment to the Contrast slider in the Controls tab of the HSL group. This adjustment (which sets the Contrast slider value to 11) illustrates one of the simplest ways to affect the tonal range of an image. Despite its simplicity, the correction improves the image noticeably. Compare the look of the man's hair on either side of the split-screen dividing line.

Step 2: Correction to Neutralize Color



Split Screen:
Uncorrected Image
and Image After All
Corrections



Step 2 of this correction eliminates the color cast by making a single adjustment on the Midtones ChromaWheel control on the Hue Offsets tab of the HSL group. Since the image is obviously too green, the correction is made by moving the crosshair pointer away from green. The adjustment shown is

Hue:-94, Amount:11. (This places the crosshair between the magenta and blue parts of the wheel, opposite a point between green and yellow. The sample RGB values below confirm that we are reducing both yellow and green in the image.) This successfully restores a good skin tone and reveals the man's shirt to be blue.

Sample RGB values: A sampling of an area of the man's shirt before and after the corrections shows the following values:

Before: R:37, G:56, B:61

After: R:14, G:26, B:55

These numbers reinforce the nature of the corrections that have been made. The hue offset adjustment has reduced the red and green levels significantly while preserving the amount of blue in the image.

Alternative techniques: Several alternatives are available for making the tonal range adjustments to this image. You could use the Gain, Gamma, and Setup sliders as an alternative to the basic adjustment on the Contrast slider. Another alternative for making the contrast adjustment would be to use the Master ChromaCurve graph in the Curves tab.

Example 2

Uncorrected Image



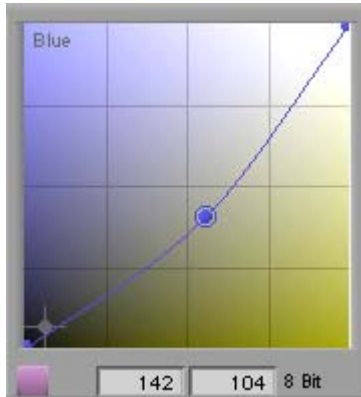
Reference Image



Analysis of original image: In this example, two different cameras have been used to shoot the rock climbers. The second camera is correctly balanced and shows good color characteristics. In comparison, the images from the first camera show a pronounced blue cast. Also, the image from the first camera is too dark. Because the images from the two cameras look so different from one another, and because the first image is intrinsically weak, corrections are needed to neutralize color and raise the brightness level in the first image. The image from the good camera can be used as a reference as these corrections

are made. In this example, the corrections are made in the Curves tab. One advantage of Curves tab adjustments, if you are practiced and comfortable with them, is that you can make quite complex changes without having to alter many controls. The corrections in this example are made by adding and moving a single control point in each of two ChromaCurve graphs.

Step 1: Correction to Neutralize Color



Split Screen:
Uncorrected Image and
Step 1 Correction



Step 1 of this correction removes the excess blue in the image by adjusting the Blue ChromaCurve graph in the Curves tab. A control point is placed near the center of the curve since the adjustment needs to apply relatively evenly across

the whole luminance range. The control point is then dragged down to reduce blue. The input and output values for this adjustment are 142 and 104 respectively.

Step 2: Correction to Match Brightness of Reference Image



Split Screen:
Uncorrected Image and
Step 2 Correction



Step 2 of this correction increases the brightness of the image by making an adjustment on the Master ChromaCurve graph in the Curves tab. The control point is placed three-quarters of the way up the curve and moved up and to the left. The input and output values for this adjustment are 178 and 213 respectively. The resulting curve increases brightness throughout the image

but increases it most in the highlights range. This creates more contrast in the lower three-quarters of the luminance range (in a ChromaCurve graph, contrast is greater where the curve is steeper).

The following illustration compares the corrected image to the reference image from the good camera. Some fine-tuning is still possible to match the shots more precisely, but the images from the two cameras are now much closer to one another and will look more acceptable when viewed in the sequence.

Reference Image and Corrected Image



Sample RGB values: A sample of one of the climber's white helmets before and after the correction and in the reference image shows the following values:

Before: R:113, G:139, B:211

After: R:142, G:152, B:174

Reference: R:146, G:174, B:185

Though these samples might not be from precisely the same part of the helmet in all three cases, they clearly confirm the nature of the correction. They indicate a relative gain in red and green levels, a reduction in blue levels, and a much closer match with the levels in the reference frame.

Alternative techniques: The Blue ChromaCurve graph correction could be made in the Hue Offsets tab or even with a series of adjustments to the HSL sliders in the Controls tab. The brightness and contrast adjustment could be made in the HSL tab (using similar techniques to those in examples 1 and 2).

Chapter 5

Safe Colors

This chapter describes the Safe Colors feature of your Avid system's color correction tools. Safe Colors allows you to set safe limits for the colors that display in your images — that is, limits beyond which the system issues a safe color warning.

- [Overview of Safe Color Limits](#)
- [Setting Safe Color Limits](#)
- [Understanding the Graphical View of Safe Color Settings](#)
- [Understanding Safe Color Warnings](#)
- [Safe Color Limits with Waveform and Vectorscope Information](#)

Overview of Safe Color Limits

Your system allows you to set three different types of safe color limits — limits beyond which the system issues a safe color warning. You can set warning limits for the composite signal range, the luminance range, and the RGB gamut.

Most broadcasting companies set specific limits for the composite signal and the luminance range. Programs that do not meet these limits are not normally accepted for broadcast. For example, a typical set of limits for broadcast in the United States might restrict the composite signal to a range from –20 IRE to 110 IRE and limit the maximum luminance to approximately 100 IRE. Some broadcast standards might be even stricter than these values, while others might be somewhat more permissive.



The composite signal for a program intended for broadcast should never exceed 120 IRE, which is the highest level that can be broadcast.

If you are working on a program intended for broadcast, you should determine what the safe limits for composite and luminance are and type them in the appropriate areas of the Safe Color Settings dialog box. You can then instruct the system to warn you when those limits are exceeded. For more information, see [“Setting Safe Color Limits” on page 118](#).

RGB gamut refers to the intensity of each individual color channel — red, green, and blue. This measure of a safe color is less likely to be subject to specific broadcast standards, but it is still an important limit type. Colors that have extremely low or high gamut values might not display well on television screens.

Setting Safe Color Limits

You set safe color limits and control how those limits are applied by selecting options in the Safe Color Settings dialog box.

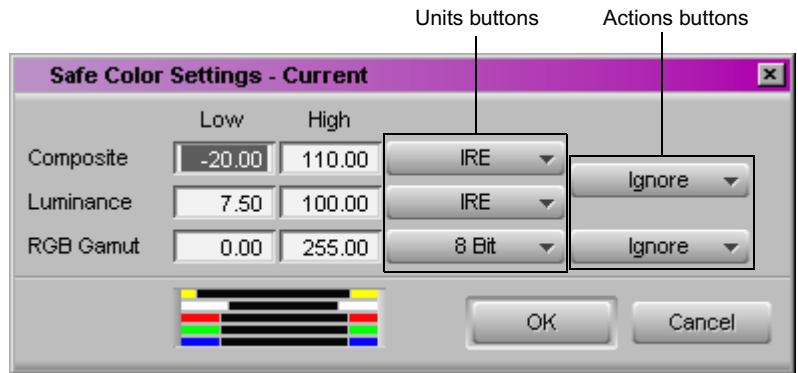
To select safe color options:

1. Open the Safe Color Settings dialog box by doing one of the following:
 - ▶ In the Settings scroll list of the Project window, double-click Safe Colors.
 - ▶ In the Color Correction tool, click the Safe Color Settings button.



The Safe Color Settings button in the Color Correction tool provides a visual indication of the status of the Safe Colors feature. If Warn is selected in one or more of the Actions pop-up menus, the icon on the Safe Color Settings button appears orange to indicate that at least some of the Safe Colors options are active. Otherwise, the icon on the Safe Color Settings button appears black.

The Safe Color Settings dialog box opens.



2. For each limit type, set the limits at which you want the system to issue a warning by doing the following:
 - a. Click the Units button, and select the unit of measurement you want to use.
 - b. Type the low and high safe color values you want in the Low and High text boxes.
 - c. Click the Actions button, and select the action that you want the system to take.

The following table provides more information on the options available in the Safe Color Settings dialog box. The graphical view at the bottom of the Safe Color Settings dialog box shows the current limits in relation to the default limits in an easy-to-read format. For more information, see [“Understanding the Graphical View of Safe Color Settings” on page 120](#).

3. Click OK.

Safe Color Settings Options

Option	Description
Composite	Sets safe color values for the composite video signal.
Luminance	Sets safe color values based on brightness.
RGB Gamut	Sets safe color values based on color range.

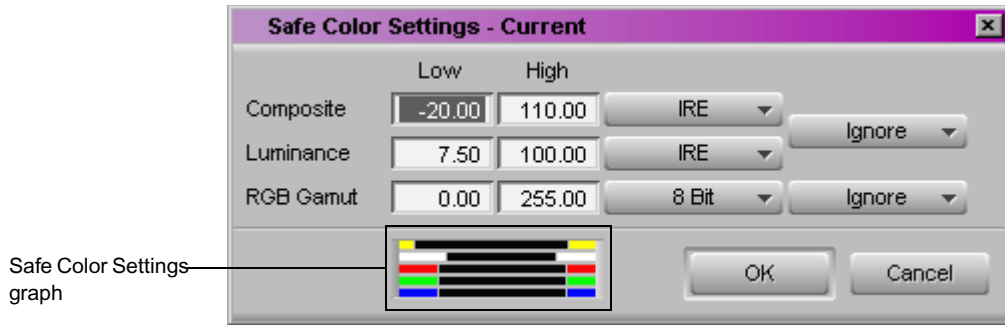
Safe Color Settings Options (Continued)

Option	Description
Units buttons	Define the units of measurement for the three types of safe color values. Click the Composite Units button and select either IRE or mVolts (millivolts). Click the Luminance and RGB Gamut buttons and select from the following options: 8 Bit — Measures the adjustment on a scale from 0 to 255.  <i>The RGB value for a color in the Color Correction tool will not be identical to the RGB value for the same color in a graphics application such as Adobe® Photoshop®. For example, the 8-bit RGB values for reference black and reference white are 16 and 235 respectively.</i> Percent — Measures the adjustment on a percentage scale from 0 to 100. IRE — Measures the adjustment in IRE units. mVolts — Measures the adjustment in millivolts.
Actions buttons	Define how the system implements the safe color settings. The top button controls both the Composite and the Luminance limit types; the bottom button controls the RGB Gamut limit type. Click an Actions button and select from the following options: Ignore — The system does not limit based on these settings. This is the default setting. Warn — The system provides warnings when these limits are exceeded. For more information on safe color warnings, see “Understanding Safe Color Warnings” on page 122.

Understanding the Graphical View of Safe Color Settings

The Safe Color Settings dialog box includes a graphical indication of the current limit values in relation to the default values. This allows you to quickly check that your limits are consistent with one another and within an acceptable range without having to read all the numerical limit values and remember the default values.

The following illustration shows the location of this graph within the Safe Color Settings dialog box. All settings in this illustration are at their default values.



The graph shows colored bars that represent the current low and high levels for each limit type. The colors are the same as those used to display safe color warnings in the monitors. It also displays gray vertical lines that represent the default high and low levels for each limit type.

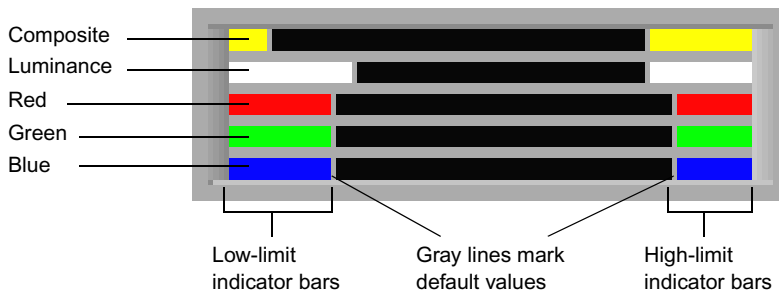
The following illustrations present two graphs in detail — the first showing default levels and the second showing adjusted levels — and explain how to interpret the graphs.

Default Safe Color Settings

On the default Safe Color Settings graph, all the color bars are aligned with the gray vertical lines that represent the default numerical values.

	Low	High
Composite	-20.00	100.00
Luminance	7.50	100.00
RGB Gamut	0.00	255.00

Default settings values



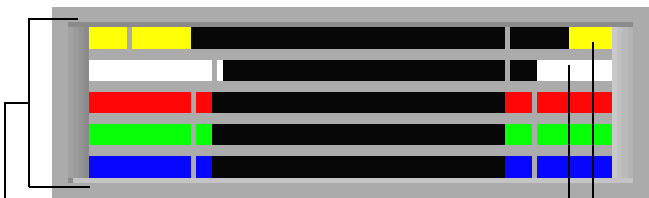
Default settings graph

Adjusted Safe Color Settings

On the adjusted Safe Color Settings graph, colored bars that extend beyond the gray lines toward the middle of the graph indicate more restrictive settings than the defaults. Bars that retreat from the gray lines toward the outside of the graph indicate more permissive settings than the defaults.

	Low	High
Composite	0.00	120.00
Luminance	10.00	110.00
RGB Gamut	16.00	235.00

Adjusted settings values



Adjusted settings graph

All low limit settings (and RGB high settings) are now more restrictive than the defaults represented by the gray lines.

High composite and luminance settings are now more permissive than the defaults represented by the gray lines.

Understanding Safe Color Warnings

Select the Warn option using the Actions button as described in “Setting Safe Color Limits” on page 118.

If you select the Warn option for one or more of the types of safe limit, the system displays warnings in the monitors when material exceeds the limits you have set. Warnings appear in the Color Match control for RGB Gamut limits only.



Warning indicators do not appear unless color levels exceed at least one of the limits currently set to Warn.

When your system displays safe color warnings, you have the following options:

- Leave your color correction adjustments at the current settings.
In this case, your program will continue to exceed some or all of the safe color levels you have set.

- Make manual color correction adjustments to bring levels within limits. For more information, see [“Making Adjustments to Achieve Safe Color Values” on page 125](#).
When all levels are within limits, the warning indicators no longer appear.

Safe Color Warnings in the Monitors

In Color Correction mode, the Safe Color Warning icon (an orange triangle) appears in the top corner of a monitor in the Composer window if the frame currently displayed in that monitor exceeds the safe limits you have set.



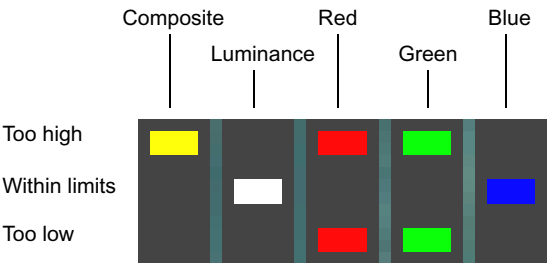
Safe color warnings appear when you exceed limits in either field of the frame if you are working with two-field media. To move through video material one field at a time and see histograms for every field, use the Step Forward One Field button or the Step Backward One Field button. In Color Correction mode, these buttons are available on the Move tab of the Command palette. You can also map these buttons to your keyboard to use them quickly while using Color Correction mode.

Alongside the Safe Color Warning icon, color-coded warning indicators provide a visual indication of the limits that are being exceeded. There are three rows for these indicators. An indicator appears in the top row if the limit is being exceeded at the high end and in the bottom row if the limit is being exceeded at the low end. If a limit type is within safe limits, an indicator appears in the center row. The following table lists the limit types and their associated colors as they appear left to right in each row.

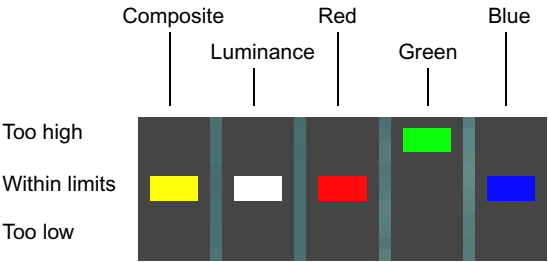
Safe Color Warning Indicators

Limit Type	Color Cast
Composite	Yellow
Luminance	White
RGB Gamut: Red	Red
RGB Gamut: Green	Green
RGB Gamut: Blue	Blue

The following illustrations show the layout of the Safe Color Warning display in the monitors, with examples of two typical presentations of Safe Color information.



In this example, the Red and Green levels exceed limits at both the high and low end, the Composite levels exceed limits at the high end, and the Luminance and Blue levels are within limits.

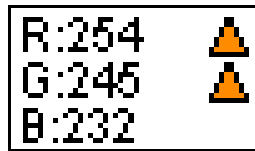


In this example, the Green level exceeds limits at the high end while all other levels are within limits.

Safe Color Warnings in the Color Match Control

Select the Warn option using the Actions button as described in “Setting Safe Color Limits” on page 118.

If you select the Warn option for the RGB Gamut limit type, the system displays warnings in the color swatches of the Color Match control when values exceed the limits you have set. If you use the eyedropper to select an input or output color that exceeds limits, a warning triangle appears beside the color information in the appropriate color swatch. The following illustration shows a swatch with typical Safe Color warnings.



In this example of a swatch for an intense white, both the Red and Green levels exceed the High RGB Gamut setting of 235 and warning triangles appear. The Blue value remains just within the limit.

Making Adjustments to Achieve Safe Color Values

If some of your color levels exceed limits, you can return them to safe color values by adjusting the color correction controls in any combination. The following procedures show how to make various adjustments using the Controls subdividing tab of the HSL group and the Curves group.

To bring luminance within safe limits:

1. Click the Controls subdividing tab in the HSL group.
The Controls tab opens.
2. Click the Enable button for the HSL group and the Controls subdividing tab.
3. Click the Enable button for Clip Low and Clip High controls to activate them.
4. Type 16 in the Clip Low text box, and press Enter.
5. Type 235 in the Clip High text box, and press Enter.

Luminance values are clipped to safe levels.

To bring RGB values within safe limits:

1. In the Master ChromaCurve graph of the Curves tab, click the lower left control point to select it.

A circle appears around the point.

2. Under the Master ChromaCurve graph, type **16** in both the input text box and the output text box.

The control point moves to 16, 16. The system adjusts RGB values under 16 up to 16.

3. In the Master ChromaCurve graph of the Curves tab, click the upper right control point to select it.

A circle appears around the point.

4. Under the Master ChromaCurve graph, type **235** in both the input text box and the output text box.

The control point moves to 235, 235. The system adjusts RGB values above 235 down to 235.

To bring composite levels within safe limits:

1. First adjust luminance and RGB levels using the previous procedures.
If composite levels do not fall within safe limits, continue with step 2.
2. Click the Curves tab.
3. If the composite high warning is on, do the following:
 - ▶ In the Master ChromaCurve graph, Shift+click the upper right control point, and drag it down the curve until the composite high warning turns off.
4. If the composite low warning is on, do the following:
 - ▶ In the Master ChromaCurve graph, Shift+click the lower left control point, and drag it up the curve until the composite low warning turns off.

Safe Color Limits with Waveform and Vectorscope Information

To stay well within the limits of television transmitters, cable systems, satellite links, DVD encoders, and so on, broadcasters or distributors often issue safe color limits for video levels. Video levels outside safe color limits are generally known as “illegal.” Of course, no law is broken if you exceed the specified limits, but the program might be rejected on technical grounds or the

image quality might suffer with further processing. If you know that your delivery master is a VHS tape that does not handle high chroma well, set some reasonable limits by yourself.

In Y (luma only) waveforms, reference white of 100% corresponds to a digital level of 235, an NTSC level of 100 IRE, and a PAL level of 700 mV. White excursions up to 108% are technically possible.

In Y (luma only) waveforms, reference black of 0% corresponds to a digital level of 16, an NTSC level of 7.5 IRE, and a PAL level of 0 mV. Black excursions down to -8% are technically possible.



With both white and black levels, further signal processing (down the line from your Avid system) might clip the peaks in your material. In addition, you might be required by delivery specifications to limit the white peaks to a lower level and the black peaks to a higher level.

Use Y Waveform to see the black and white levels of your image. Sometimes, particularly with white levels, keeping the white peaks within the 100% limit will not produce a pleasing level for the rest of the image. This is particularly common with backlit subjects, where the sky or a window is in the background and the lighting on the foreground is insufficient. In these cases, you might want to adjust for the foreground and leave the background too bright.

Chroma peaks are easiest to see on the vectorscope. The theoretical maximum is the circle around the outer edge, but to be safe you might like to keep vectors closer to the center than the 75% color bar squares.

Saturated bright or dark colors might have very low or high luma values, together with a lot of chroma. Even if neither luma nor chroma alone is excessive, the combination can be illegal. For example, vivid yellow and cyan in an image can produce composite levels that are too high, and those from vivid blue might be unacceptably low. The YC Waveform is a good way to see how far these levels extend. In general, avoid levels above approximately 120 IRE or 850 mV, and those below -20 IRE or -200 mV.



If you are producing a master for broadcast delivery, ask for delivery specifications. To ensure you meet particular standards, use a legalizer such as the Safe Color Limiting feature of Avid Symphony or a third-party AVX™ plug-in.



These instruments do not measure analog outputs. If your Avid system or other device uses analog connections, use an external Waveform monitor to verify levels.

The Y Waveform, YC Waveform, and RGB Parade displays incorporate any safe color limits you have set. The following table describes the colors used to represent various conditions. “Legal” means the value is within the safe color limits. “Illegal” means the value is outside (either above or below) the safe color limits.

Safe Color Limits in Waveform Displays

Display	Component	Value	Display Color
Y Waveform	Luma	Legal	Green
		Illegal	White
YC Waveform	Composite	Legal	Cyan
		Illegal	Yellow
	Luma	Legal	Green
		Illegal	White
	Composite or Luma	Outside display boundaries	Red
RGB Parade	Red	Legal	Red
		Illegal	White
	Green	Legal	Green
		Illegal	White
	Blue	Legal	Blue
		Illegal	White

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