
Chapter Eighteen: Processing Amplifier

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The Processing Amplifier lets you balance and refine the video signal from an input source. You can use the Proc Amp to polish good input and it may help you rescue bad footage—it's the video equivalent of an audio graphic equalizer. For example, you could take old tapes that you haven't worked with for ages and adjust them in the proc amp to produce cleaner, crisper video.

This chapter explains the Proc Amp controls. These controls work intimately with ToasterScope, which is explained in the preceding chapter. The explanations of the Proc Amp controls also include suggested situations when you need to adjust the control.

Figure 18.1. Processing Amplifier with Pro skin.

NOTE

Realize that some footage is just unrecoverable, and even adjustments from the Proc Amp will not restore it. In this case, a bad tape or video deck may need a time base corrector to stabilize the input.

Along with ToasterScope, the Proc Amp helps you repair problems like oversaturation of colors, faded colors, tinting problems, flesh tones that look red, low light scenes, blacks that look more like grays, and so on.

NOTE

You should be judicious with the Proc Amp. It's easy to overdo it, and while the Video Toaster can handle oversaturated colors, you're recording equipment may not be so kind when you duplicate your video tape.

Video Toaster [2] supports Proc Amp controls for all of your sources: you can use it on cameras for live switching, for VTR sources, and during video capture. For example, you can use the Proc Amp to balance two cameras to get the same tone from both. You compare color reference signals from the two cameras in ToasterScope so that you can match colors and luminance. When you adjust the signal during video capture, you record those changes.

UNDERSTANDING THE PROCESSING AMPLIFIER

When you use the Proc Amp, you change the actual signal as it feeds through Video Toaster, not just the display. If you use the Proc Amp in an edit session between a source VTR and a record VTR, you change the output signal to the tape in the record VTR. The Proc Amp is invaluable for correcting the color and luminance of a video signal. However, you should use it with a waveform monitor and vectorscope for precise results.

A processing amplifier works in a somewhat similar way to how a TV set works. On a television monitor, you adjust color, contrast, and the other controls, to change the appearance of the picture. But on a TV set you do not change the signal of that picture; you change only the display on the monitor. With a processing amplifier, you change the actual signal when you make adjustments. So when you record the signal, you record your changes as well.

INTERFACE

The video signal is composed of luminance and chrominance information, and the controls on the Proc Amp let you adjust that information. Luminance is the brightness level in the signal and chrominance refers to the colors in the signal.

A few skins are available. The **Normal** Proc Amp lets you adjust **Brightness**, **Contrast**, **Hue** and **Saturation**. The **Speed** Proc Amp offers the same options as **Normal**. The **Pro** Proc Amp lets you adjust those settings as well as **U** and **V Offset** and **U** and **V Gain**. You can choose a skin by clicking on the **S** at the top of the panel, or by right-clicking on the Proc Amp and choosing **Normal** or **Pro** from the menu that appears.

Figure 18.2. Processing Amplifier with Normal skin.

BRIGHTNESS

The **Brightness** control adjusts the lightness and darkness of the video signal, or luminance.

NOTE

If you want to experiment with the Proc Amp without losing your settings, use the **Hold** and **Restore** options in the context menu. **Hold** temporarily saves your current settings and **Restore** will recall the settings in Hold.

- Rotate counterclockwise to decrease **Brightness**, and darken the image.
- Rotate clockwise to increase **Brightness**, and lighten the image.

On the waveform monitor on the ToasterScope panel you can see the Y signal rise to 100 IRE when you increase the brightness control to maximum, and it sinks toward 0 IRE when you decrease the control.

TIDBIT

Luminance (brightness) values go back to the early days of TV, which was initially in black and white. The color signal piggy-backs on top of the black and white (luminance) signal so both can be broadcast simultaneously.

CONTRAST

The **Contrast** control adjusts the levels of gray in the signal. The levels of gray affect the brightness and saturation of an image. You create more contrast between image areas when you reduce the levels of gray; when you increase levels of gray, you see less contrast.

- Rotate counterclockwise to increase **Contrast**; the image appears brighter and more saturated.
- Rotate clockwise to decrease **Contrast**; the image appears darker and less saturated.

On the waveform monitor you can see the Y signal shrink to the bottom of the graph when you increase contrast (counterclockwise) and see the signal spread across the graph as you decrease contrast (clockwise).

An image with extreme areas of darkness and lightness might benefit from reduced **Contrast**. If your footage looks washed out, try increasing **Contrast**.

HUE

The **Hue** control adjusts the relative phase of color and is monitored using a vectorscope with a color bars signal. As you move the **Hue** control, the colors in your video rotate.

If you look at a colorwheel, you can determine which colors **Hue** cycles through. That's where the vectorscope comes in. On the vectorscope you can see the signal cycle around a color wheel as you rotate the Hue control.

You might use the **Hue** control when you have a video signal where a person looks too green. You would rotate the control to the right toward red.

SATURATION

Saturation is the intensity of color in the video signal. Low saturated pictures look grey, and overly saturated images show colors that bloom to the point of smearing.

- Rotate counterclockwise to decrease **Saturation**.
- Rotate clockwise to increase **Saturation**.

On the vectorscope, you can see the signal spread or shrink when you adjust saturation.

A video where colors seem too intense, especially where some colors bleed into others, would benefit from decreased **Saturation**. Red colors are particularly susceptible to bleeding in composite and Y/C signals.

If you turn **Saturation** all the way to the left, you remove all color and have black and white video.

U OFFSET

The U portion of the YUV signal carries the blue and green color information. Offset is similar to Hue, except when you adjust the **U Offset**, you rotate only in relation to the blue/yellow portion of the video signal.

- Rotate **U Offset** counterclockwise to shift the signal toward blue.
- Rotate **U Offset** clockwise to shift the signal toward yellow.

If you adjust **U Offset** and view a vectorscope, you will see the signal shift horizontally.

Figure 18.3. U and V Offset and U and V Gain are on the lower row on the Pro skin.

V OFFSET

The V portion of the YUV signal carries the red and green color information. Offset is similar to Hue, except when you adjust the **V Offset**, you rotate only in relation to the red/green portion of the video signal.

- Rotate **V Offset** counterclockwise to shift the signal toward red.
- Rotate **V Offset** clockwise to shift the signal toward green.

If you adjust **V Offset** and view a vectorscope, you will see the signal shift vertically.

U GAIN

The U portion of the YUV signal carries the blue and green color information. Gain is similar to Saturation, except when you adjust the **U Gain**, you increase or decrease the saturation of the blue/yellow portion of the video signal.

- Rotate counterclockwise to decrease **U Gain** and increase blue saturation.
- Rotate clockwise to increase **U Gain** and increase yellow saturation.

The **U Gain** control is used with a vectorscope and color bars to correct the white balance of a signal. In regular video, however, you can see the effect of **U Gain** on a vectorscope: the signal blooms over the blue segment or contracts away from it.

V GAIN

The V portion of the YUV signal carries the red and green color information. Gain is similar to Saturation, except when you adjust the **V Gain**, you increase or decrease the saturation of the red/green portion of the video signal.

- Rotate counterclockwise to decrease **V Gain** and increase green saturation.
- Rotate clockwise to increase **V Gain** and increase red saturation.

The **V Gain** control is also used with a vectorscope and color bars to correct the white balance of a signal. In regular video, however, you can see the effect of **V Gain** on a vectorscope: the signal blooms over the red segment or contracts away from it.

BYPASS

The **Bypass** button lets you toggle between your original input and the adjustments you made with the Proc Amp, so you can compare the two in ToasterVision. Basically, when you activate **Bypass** you temporarily turn off any adjustments you made.

Figure 18.4. The Bypass option is at the left of the Proc Amp panel.

ON/OFF

The **On/Off** switch closes the Proc Amp panel. The Proc Amp will automatically save the most recent settings for a particular input when you close the panel. If you save the configuration, you can save your settings.

The desktop saves all Proc Amp settings so that from one use of Video Toaster to the next you do not lose any Proc Amp configurations. However, you can save a proc amp setting, so that you load it for a channel later.

TRACK PREVIEW

With the **Track Preview** option, you can apply the Proc Amp to the source that sits on the Preview bus of the Switcher. You avoid opening a dozen proc amp panels and instead, you adjust the proc amp settings for the current Preview input. The adjustments that you make to the input remain with that input as long as it is on the Switcher. So if you move to a different preview source, you don't have to worry about losing your Proc Amp settings.

When you drop a tag from a Switcher source into the Proc Amp, it will turn off **Track Preview** automatically and lock the Proc Amp to that input.

NOTE
If you do not have the SX-8 breakout box, then the Proc Amp will not have the Track Preview button.

CONTEXT MENU

When you right-click over an empty area of the panel a context menu launches. From this menu, you can **Store** and **Recall** presets, and **Load** and **Save** configurations. The menu offers skins for the panel: Normal, Pro and Speed, which were discussed earlier.

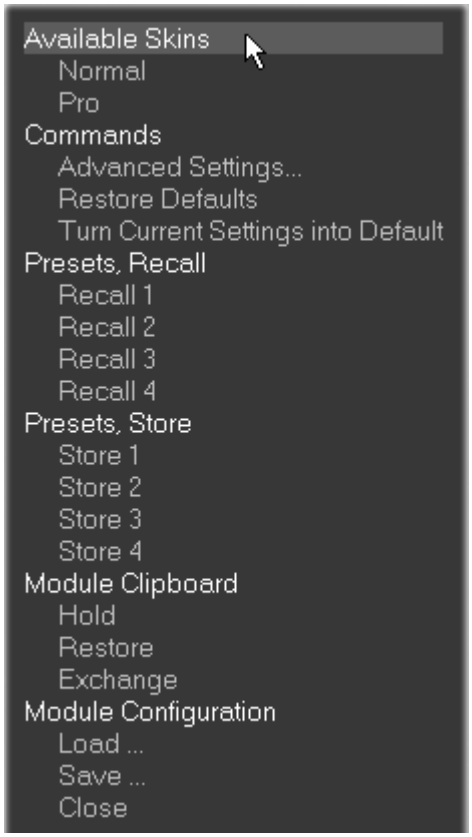

Figure 18.5. The Context menu for the Proc Amp panel.

Defaults

If you want to restore the default settings for the Proc Amp, that is to set them back to the settings shown when you first launched the panel, you can choose **Restore Factory Settings**.

Choose **Store as Bypass Settings** if you want to use your adjustments as the standard settings for the Proc Amp. Then you can choose **Restore Bypass Settings** and get back to your changes.

Presets

Like many panels, the Proc Amp offers user presets in the context menu. You can store and recall Proc Amp settings without actually saving the whole configuration. These presets remain until you replace them, so you can shutdown Video Toaster and access them at a later time.

To store a preset

1 Adjust the Proc Amp as necessary.

2 Right-click on the Proc Amp and choose **Store 1** from the menu.

If you return the Proc Amp to its default settings or make more adjustments, you can easily recall the preset that you stored.

To recall a preset

- Right-click on the Proc Amp and choose **Recall 1** from the menu.

Save Proc Amp Configuration

You can save also Proc Amp settings as panel configurations so that you can load it for a channel later. This is helpful after carefully matching two cameras for a live shoot, since you can save each configuration using the camera's name or type.

To save a Proc Amp setting

1 Make the adjustments for the input.

2 Right-click on the Proc Amp interface to launch the context menu.

3 Under Module Configuration, choose **Save...**

4 Enter a name in the dialog box that appears.

You access a saved setting by right-clicking on the Proc Amp and selecting the **Load...** option. Then you choose the configuration that you want, from the directory where you saved it.

Advanced Settings

In the context menu, you find a menu item for **Advanced Settings Panel**. This launches a panel with options for finer control over the Proc Amp. The first few options are identical to the buttons that you see in the Proc Amp panel, except you adjust them with sliders instead of knobs. The full specifications for the remaining parameters are available in a technical document from NewTek. This panel is meant for expert users. We do not advise that you change these parameters without guidance from NewTek technical support.

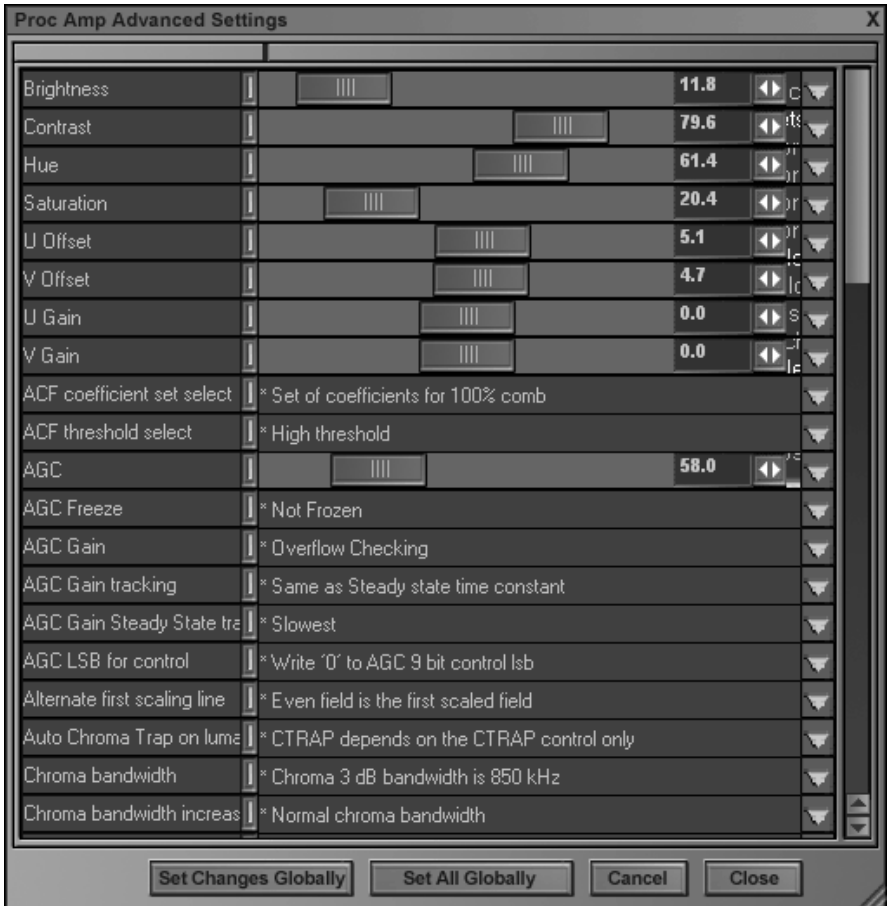

Figure 18.6. The Advanced panel accessed from the Proc Amp Context menu.

An asterisk beside a setting indicates the NewTek factory default, so that you know which setting was the original factory setting.

Tag Menu

The context menu that appears when you right-click over the Proc Amp tag lets you choose what input you want to adjust. You don't need to open a bunch of Proc Amp panels to work on different inputs, like different cameras. You just select the input that you want from the list that appears.

Figure 18.7. Menu accessed by right-clicking the Proc Amp tag.

The context menu also lets you specify commands related to the Switcher and output.

NOTE

You can right-click on a breakout box input and choose "Edit Proc Amp settings for this input." Video Toaster launches the Proc Amp. Video Toaster [2] stores 80 different settings for inputs, which is to say that you can store separate settings for every available input and for NTSC and PAL. Video Toaster also stores separate settings for different users.

PROCESSING AMPLIFIER AND TOASTERSCOPE

The Proc Amp and the ToasterScope work together to help you identify and correct signal problems. The ToasterScope measures the signal and the Proc Amp lets you make adjustments to the signal. Before you work with the procedures that follow you should read the ToasterScope section, which explains how to interpret the signals on a vectorscope and a waveform monitor.

COLOR BARS TEST SIGNAL

As stated in the previous chapter, you need a test signal generator or a professional video camera to create the Color Bars Test Signal. The colors in the color bars signal have different luminance levels, and the bars are arranged by level from highest to lowest: white, yellow, cyan, green, magenta, red, blue, and black.

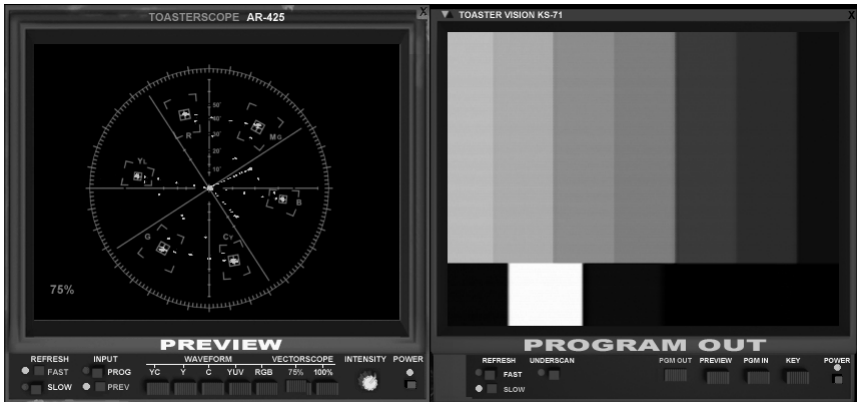

Figure 18.8. Vectorscope reading beside a color bars signal.

Color bars test signals fall into two categories: 100% bars (full amplitude) and 75% bars (reduced amplitude). You usually use 75% bars for basic testing because 100% bars contain signal levels that may be too high to pass through a system without distortion. At some point, however, you will need a 100% white reference level for checking overall signal amplitude. Many 75% color bar test signals have a 100% white level for this purpose.

When you look at the luminance of a signal, a correct test signal for color bars appears undistorted on a waveform monitor. It is therefore a perfect signal. You want the signals that you send through your equipment, like a VTR, to match this perfect signal, so you can recognize when the signal is distorted.

Amplitude (Waveform Monitor)

You measure amplitude against the horizontal axis on the waveform monitor at 0 IRE. The blanking level should align with the 0 IRE line and the 100% white reference level should align with the 100 IRE line. The black level, or setup, should be at 7.5 IRE (for North American NTSC). A special dashed line sits at 7.5 IRE so you can verify black level.

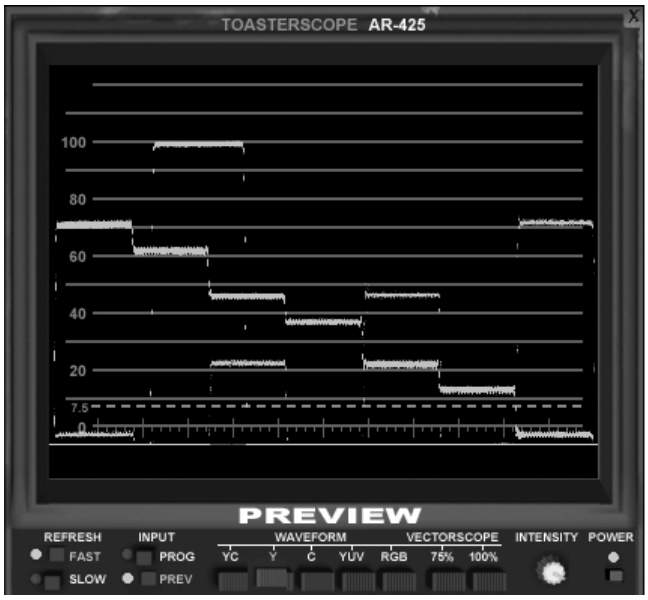

Figure 18.9. Waveform reading (Y option) for color bars signal.

- If the signal's 100% white level does not align with 100 IRE, you adjust the **Brightness** control on the Proc Amp, which should also bring the black level to 7.5 IRE.
- After you check amplitude, you need to check the sync pulse level. Sync pulse should sit at -40 IRE. If sync is off by more than a few IRE units, check your equipment for a sync amplitude adjustment and change it to -40 IRE. Luminance and sync must both be correct.
- If you cannot get the signal to align at all three points (white at 100 IRE, blanking at 0 IRE, and sync at -40 IRE) you should get your equipment serviced.

Chrominance Gain (Waveform Monitor)

After you check luminance gain you need to check chrominance gain. Incorrect chrominance amplitudes mean that the video saturation is affected. The color burst should range from -20 to +20 IRE and maximum chrominance levels of the first two color bars (yellow and cyan) should be at exactly 100 IRE. If they are not, adjust the chrominance gain (**U Gain** and **V Gain**) to correct the levels.

Chrominance Phase (Vectorscope)

To check the signal from a VTR with a reference signal, you must play back a videotape with the 75% color bars recorded. Select the VTR on the Switcher and look at the vectorscope display.

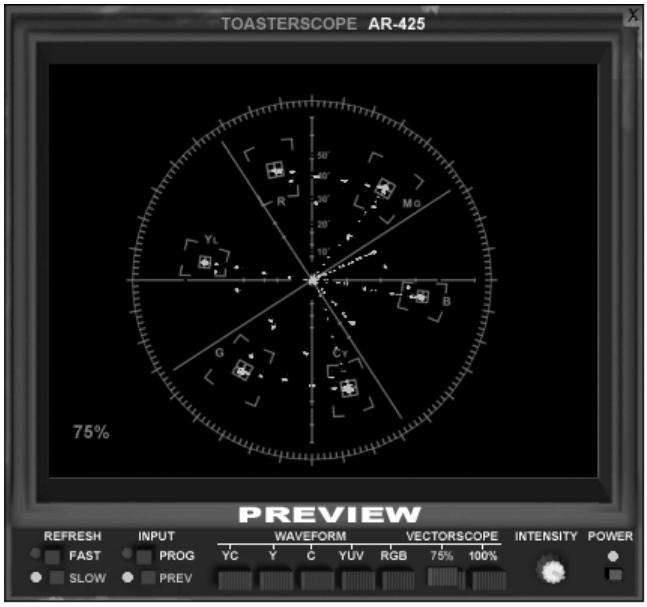

Figure 18.10. Vectorscope reading for a color bars signal.

The burst phase should align on the horizontal axis and the dots should sit within their targets, otherwise your signal has a problem with chroma phase. If the dots are rotated, then chrominance phase is incorrect relative to the color burst. Hues will look wrong—faces appear green or purple, for example. You must have correct chrominance phase, even if you don't see obvious hue errors on a picture monitor.

To correct chrominance phase

1 Align the vectorscope's burst display with the horizontal axis.

2 Adjust **Hue**, **U Offset**, and **V Offset** to get the dots as close to their targets as possible. They may be too near the center of the display or too far away, but they will lie in the proper direction from the center when phase is correct.

You may need to toggle between chrominance gain (discussed next) and phase adjustments to get the dots in their boxes. The dots rarely center exactly in the targets. They should fall somewhere within the small targets rather than the larger boxes.

Chrominance Gain (Waveform Monitor and Vectorscope)

Adjusting chroma phase alone may not put the dots in their boxes because they may fall short of, or extend too far outside the boxes. This means you need to adjust chroma gain.

To check chroma gain for a VTR, you use the color bars signal recorded at the head of the tape. You should check luminance levels on the waveform monitor, and correct any errors, before you make any measurements with the vectorscope.

To correct chrominance gain

1 Use **Brightness** to adjust the white level on the waveform monitor to 100 IRE. Then switch to the vectorscope.

2 While your tape plays the color bars, dots appear on the vectorscope. If the dots sit above their targets on the vectorscope, chroma amplitude is too high. If the dots fall short of the boxes, chroma is too low.

3 Adjust the **Saturation**, **U Gain**, and **V Gain** controls so that the dots fall into their targets.

If you adjust chroma gain and the dots do not fall into the targets, you may need to re-adjust hue or get the equipment serviced.

If the tape plays past the color bars signal into video, you'll see the vector change because video usually has no large areas of primary or secondary colors to create the bar dots. The display looks fuzzy or blurred because the vector shows the blend of hues within the picture.

TASK: PROCESSING AMPLIFIER

PROC AMP AND COLOR BARS

1 Add cameras to the breakout box

2 Open the Virtual BoB, the Switcher, ToasterScope and the Processing Amplifier.

3 Add the cameras to the Switcher.

4 In the Proc Amp, turn on **Track Preview**.

5 Place a camera on the Preview bus in the Switcher. Send a 75% Color Bars signal from the camera.

6 Adjust the signals in the Proc Amp as necessary.

Waveform:

- The white bar should fall below the 80 IRE line (at about 70). Use the **Brightness** control to correct.
- The tops of the first two color bars, yellow and cyan, should reach 70 IRE. Use the **Brightness** and **Contrast** controls to correct.
- The bottoms of the last two bars, red and blue, should be even with each other. Use the **Brightness** and **Contrast** controls to correct.

Vectorscope:

- The center dot of the trace should be at the center of the circle. Use the **Saturation** control, **U Offset** and **V Offset** controls and the **U Gain** and **V Gain** controls to correct.
- The burst vectors should fall into the small target boxes. Use the **Hue**, **U Offset** and **V Offset**, and **U Gain** and **V Gain** controls to correct.

7 Click on the **Bypass** button to see the changes that you've made.

8 Follow steps 5 and 6 for your remaining cameras.

PROC AMP AND TINTED PEOPLE

For these tasks, you will make someone look green, or blue, or warm. These tasks give you an idea of how the controls affect the tinting of human skin tones. Remember though, that the best way to balance video is to use the test signals with the ToasterScope. Also remember, that you should not use ToasterVision to monitor a signal because it is basically a computer monitor; you should use an external monitor to see exact results.

Part I. Green with Envy

Your assignment is to make a normal person look green and get familiar with the controls you need when a signal actually shows a green tint.

1. Add a camera to the SX-8 breakout box. Focus the camera on the face of a person.
2. Open the Virtual BoB, the Switcher, ToasterScope, and the Processing Amplifier.
3. Place the camera in the Switcher, on the **Preview** bus
4. In the Proc Amp, turn on **Track Preview**.
5. In the Proc Amp, turn the **Hue** control to the left and the face in the camera should turn green. In ToasterScope, the color burst rotates to the left also. Double-click the **Hue** control to return it to its original setting.
6. Turn the **V Offset** control all the way to -50. Notice that this increases green in the video as well.

Part II. Feeling Blue

In this section, you'll use the Proc Amp to create a stark video with sickly blue tones. It's kind of a bleak, I-work-in-a-basement-under-flouresent-lights look.

1. Use the camera and panels from Part I.
2. Right-click on the Proc Amp and choose **Restore Defaults**.
3. Increase **Contrast** to 70 and decrease **Saturation** to 20.
4. Set **U Offset** to 50, **V Offset** to -10, and set **U Gain** to 25.
5. Click **Bypass** to see the changes that you made.

Part IV. Through Rose-colored Lenses

Now that you've made a stark world, change it to a bubbly, bright world. This process can help make video that is undersaturated, with a blue cast look warmer—though you may need to tweak the settings a little.

1. Use the camera and panels from Part I.
2. Right-click on the Proc Amp and choose **Restore Defaults**.
3. Set **Saturation** to 75.
4. Set **U Offset** to -10 and **V Offset** to 15.
5. Set **U Gain** to 10 and **V Gain** to 5.
6. Click **Bypass** to see the changes that you made.