AVENUE

Avenue™ signal integration system

Model 5470 Digital Proc Amp and Legalizer and Model 5475 Video Noise Reducer Data Pack

ENSEMBLE DESIGNS

Revision 2.1 SW v1.1.2

This data pack provides detailed installation, configuration and operation information for the **5470 Digital Processing Amplifier and Legalizer** module and the **5475 Digital Video Noise Reducer** submodule as part of the Avenue Signal Integration System.

The module information in this data pack is organized into the following sections:

- Module Overview
- Applications
- Installation
- Cabling
- Module Configuration and Control
  - Front Panel Controls and Indicators
  - Avenue PC Remote Control
  - Avenue Touch Screen Remote Control
- Troubleshooting
- Software Updating
- Warranty and Factory Service
- Specifications

MODULE OVERVIEW

The 5470 module is a full-featured serial digital processing amplifier designed for adjusting and legalizing 601 sources. All processing is done in the digital domain, ensuring a pristine output. When set to unity, the 5470 is completely transparent. An optional 5475 Digital Noise Reducer submodule can be added to remove unwanted noise and artifacts.

Processing controls include level adjustment, NTSC style hue rotation, along with video, chroma and setup. Black and White clips can be set as desired. The Detail Enhancer recovers information that has been lost due to poor frequency response in upstream systems. A Split Screen mode allows comparing the processed output with the original non-processed input.

Several forms of noise reduction are employed with the 5475 DNR option to ensure the best possible performance. Horizontal filtering is used to remove high frequency and impulse noise and to limit bandwidth for MPEG encoding. Recursive Temporal Noise filtering includes Simple Recursive, Motion Adaptive and Motion Adaptive with impulse filter. Controls are provided for maximum signal to noise improvement and for noise threshold. These can be set manually or run in automatic mode.

As illustrated in the block diagram on the next page, the serial input signal enters the module and passes through receiver and serial decoder circuitry where the input stream is deserialized and EDH information is monitored. The serial output of the receiver is routed to the reclocked Loop Out BNC on the rear of the module. It is also directed by the user to either the processing circuitry for adjusting gains, pedestal, black levels and hue or, through the bypass path to the serial outputs if no processing is desired.

When the optional 5475 DNR (Digital Noise Reduction) submodule is installed, the processing continues through dynamic noise reduction and filtering circuitry based on controls set by the user.

The next processing stage is composed of detail enhancing filters which allow recovery of information lost due to poor frequency response in upstream systems. Controls are provided for setting luminance and chrominance sharpness values.

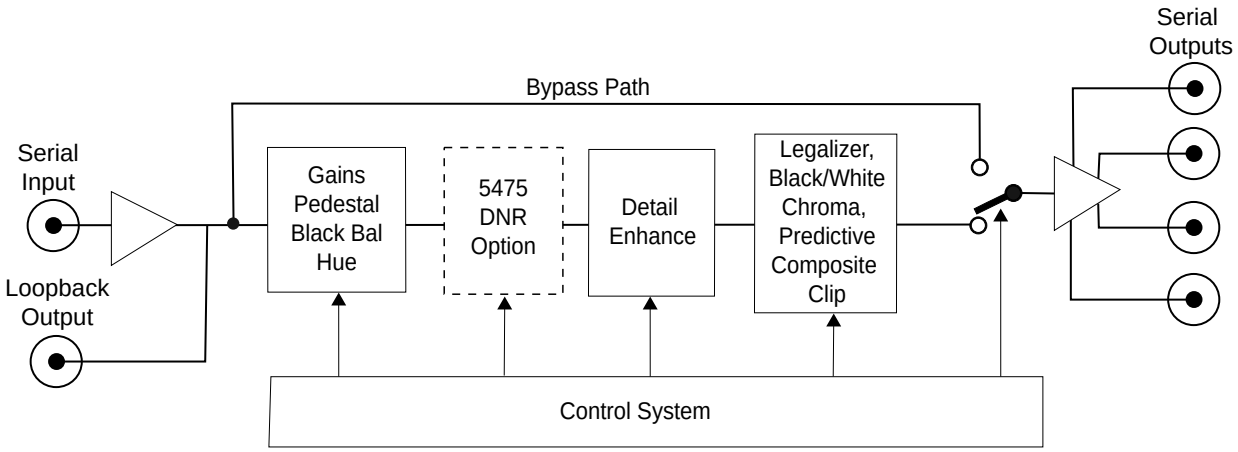
The final digital processing stage is the Legalizer and clip circuitry. Clip adjustments for black/white and chroma high/low levels are provided in the menus. Certain values represented in serial digital component may be illegal in the NTSC or PAL domains. The 5470's Predictive Composite Clipper mode looks for and alters those values that would be illegal in analog composite, ensuring the output can be used for transmission.

The output stage of the module inserts and updates EDH before the signal is distributed to the four Serial Output BNCs on the rear of the frame.

Embedded audio and ancillary data can be passed or stripped as directed by the user. If the video processing path has any delay, the embedded audio is delayed accordingly.

Five memory registers are provided on the module for storing module setups. Different setups can be created and stored for particular applications if needed or factory default setting can be recalled at any time.

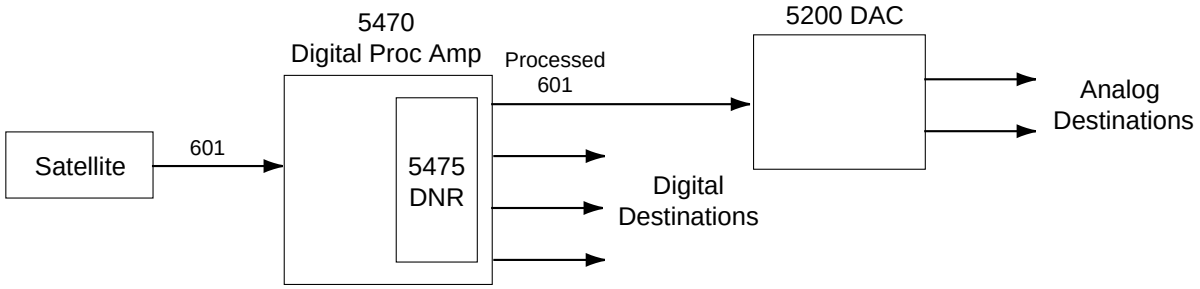
The on-board CPU can monitor and report module ID information (slot location, software version and board revision), and power status to the optional frame System Control module. This information can be accessed by the user or set to register an alarm if desired using the remote control options available.



5475/5470 Digital Processing Amplifier and Legalizer Block Diagram

APPLICATIONS

As shown in the example below, a typical use for the 5470 module would be for conditioning a potentially noisy 601 signal source, such as a satellite feed. After removing errors and legalizing the signal it can then be distributed to analog and digital sources within legal limits for all types of applications.



5470/5475 Digital Processing Amplifier and Legalizer Application

INSTALLATION

Plug the 5470 module into any one of the slots in the 1 RU or 3 RU frame and install the plastic overlay provided onto the corresponding group of rear BNC connectors associated with the module location. Note that the plastic overlay has an optional adhesive backing for securing it to the frame. Use of the adhesive backing is only necessary if you would like the location to be permanent and is not recommended if you need to change module locations. This module may be hot-swapped (inserted or removed) without powering down or disturbing performance of the other modules in the system.

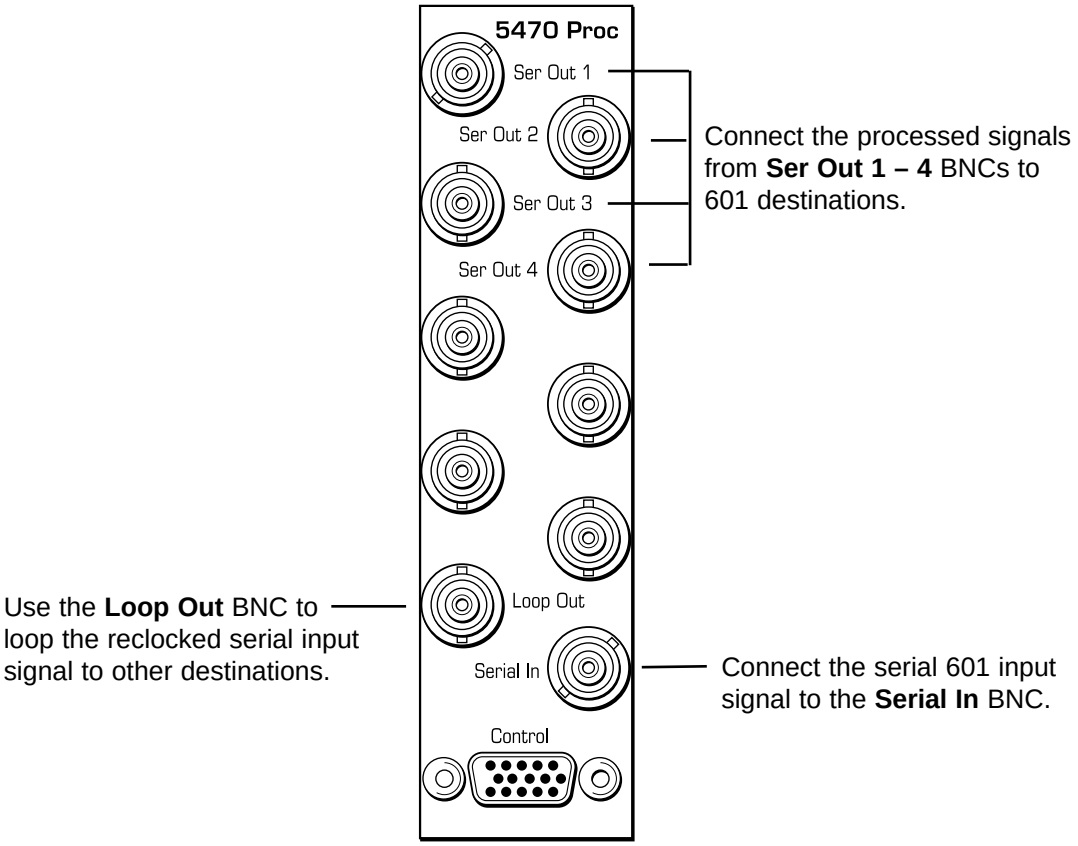
5475 SUBMODULE

Install the 5475 DNR submodule in the connector closest to the rear of the module labeled J6). The submodule is keyed for proper insertion. Match the connector on the submodule to the connectors on the top of the 5470 circuit board. Be sure to check pin alignment before seating the submodule.

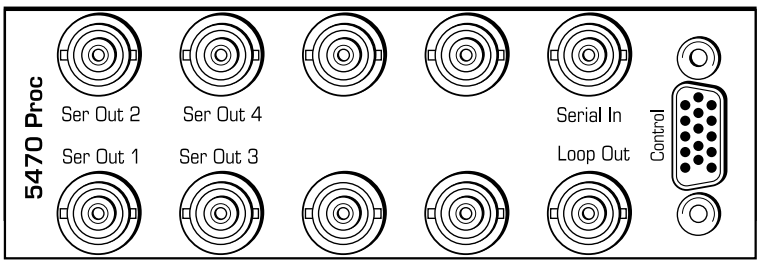
CABLING

Refer to the 3 RU and 1 RU backplane diagrams of the module below for cabling instructions. Note that unless stated otherwise, the 1 RU cabling explanations are identical to those given in the 3 RU diagram.

3 RU Backplane



1 RU Backplane



MODULE CONFIGURATION AND CONTROL

The configuration parameters for each Avenue module must be selected after installation. This can be done remotely using one of the Avenue remote control options or locally using the module front panel controls. Each module has a **REMOTE/LOCAL** switch on the front edge of the circuit board which must first be set to the desired control mode.

The configuration parameter choices for the module will differ between **Remote** and **Local** modes. In **Remote** mode, the choices are made through software and allow more selections. The **5470/5475 Parameter Table** on the following pages summarizes and compares the various configuration parameters that can be set remotely or locally and the default/factory settings.

If you are not using a remote control option, the module parameters must be configured from the front panel switches. Parameters that have no front panel control will be set to a default value. The **Local** switches are illustrated in the **Front Panel Controls and Indicators** section following the **5470/5475 Parameter Table**.

Avenue module parameters can be configured and controlled remotely from one or both of the remote control options, the Avenue Touch Screen or the Avenue PC Application. Once the module parameters have been set remotely, the information is stored on the module CPU. This allows the module be moved to a different cell in the frame at your discretion without losing the stored information. Remote configuration will override whatever the switch settings are on the front edge of the module.

For setting the parameters remotely using the Avenue PC option, refer to the **Avenue PC Remote Configuration** section of this document.

For setting the parameters remotely using the Avenue Touch Screen option, refer to the **Avenue Touch Screen Remote Configuration** section of this data pack following Avenue PC.

5470/5475 Parameter Table

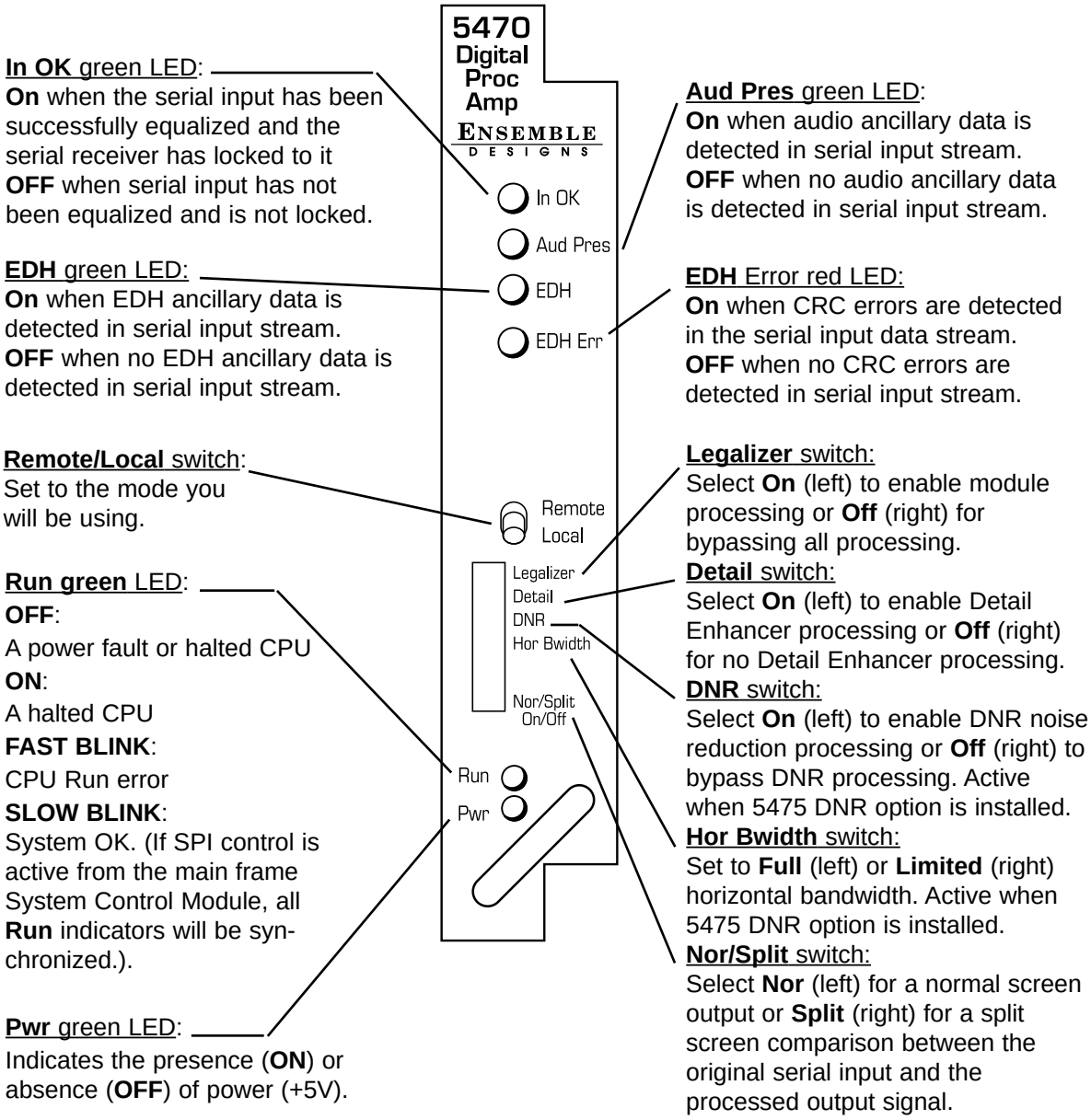
CONTROL	LOCAL	REMOTE	DEFAULT/FACTORY
Gain	N/A	0—150%	100%
Chroma	N/A	0—150%	100%
Pedestal	N/A	+/- 30 IRE	0
Hue	N/A	+/- 180 degrees	0
Black Clip	N/A	— 8 to + 6.2 IRE	— 8 IRE
White Clip	N/A	95 to 110 IRE	110 IRE
Legalizer	Switch 1: Legal Off	Off Legal Custom	Off
Chr Clip Mode	N/A	Off Chroma Cpst	Off
Chr Lo Clip	N/A	— 40 to +7.5 IRE	— 40 IRE
Chr Hi Clip	N/A	100 to 140 IRE	140 IRE
Lum Sharp	Switch 2: On Off	Off 1/4 1/2 Max	Max
Chr Sharp	Switch 2: On Off	Off 1/4 1/2 Max	Max
Cb Offset	N/A	+/- 300	0
Cr Offset	N/A	+/- 300	0
Cb Gain	N/A	+/- 20	0
Cr Gain	N/A	+/- 20	0
Output Bypass	Switch 7: Nor Split	Normal Bypass Split Split DNR	Normal
Blanking Mode	N/A	Narrow Wide	Wide
V Bit Pos	N/A	Line 10 Line 20 Line 23	Line 20

5470/5475 Parameter Table (Continued)

CONTROL	LOCAL	REMOTE	DEFAULT/FACTORY
When the 5475 DNR option is installed and enabled, the following parameters in the local controls and DNR menu will be active:			
Mode	Switch 3: On Off	Automatic Lo Automatic Hi Adaptive Adapt/Impulse1 Adapt/Impulse2 Non Adaptive	Adaptive
Bypass	N/A	Normal Bypass Show Noise	Normal
Luma	N/A	On Off	On
Luma NR Factor	N/A	0 — 20 dB	6 dB
Luma Threshold	N/A	0 — 250 IRE	25 IRE
Chroma	N/A	On Off Luma Tie	On
Chroma NR Factor	N/A	0 — 20 dB	6 dB
Chroma Threshold	N/A	0 — 250 IRE	25 IRE
Lum Bandwidth (Hor Bwidth)	Switch 4: On Off	Normal 3/4 Band 1/2 Band 1/4 Band	Normal
Chr Bandwidth	N/A	Normal 3/4 Band 1/2 Band	Normal
Y/C Delay	N/A	+/-148 ns	0 ns

Front Panel Controls and Indicators

Each front edge indicator and switch setting is shown in the diagram below:



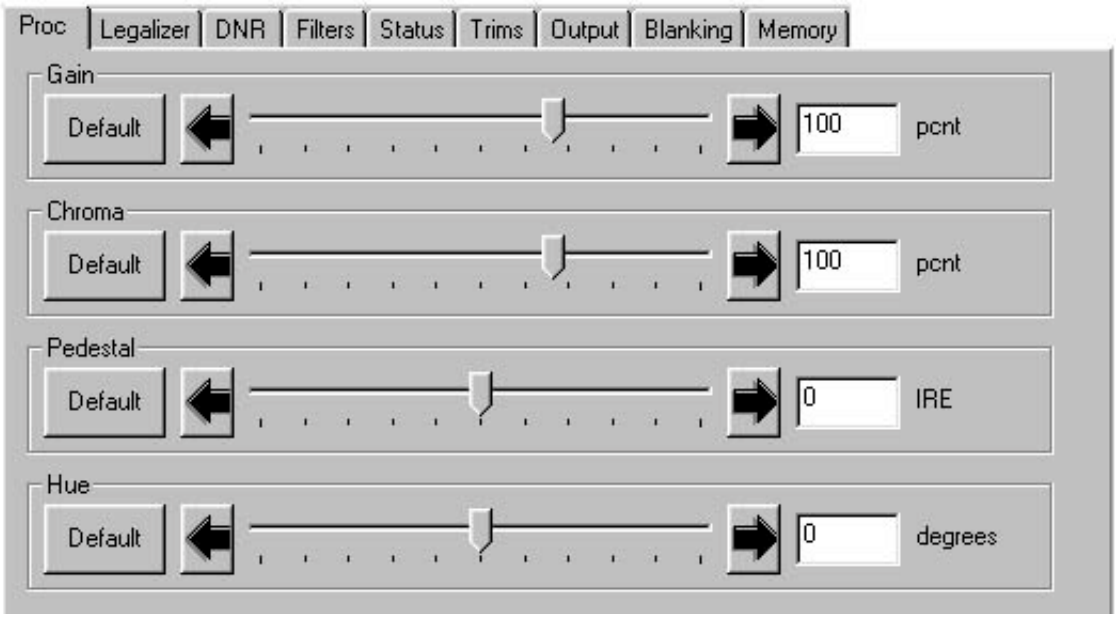
Avenue PC Remote Configuration

The Avenue PC remote control status menus for this module are illustrated and explained below. Refer to the **5470/5475 Parameter Table** for a summary of available parameters that can be set remotely through the menus illustrated. For more information on using Avenue PC, refer to the Avenue PC Control Application Software data pack that came with the option.

5470/5475 Avenue PC Menus

The **Proc** menu sets the following digital signal processing parameters for the signal:

- **Gain** – adjusts the percent of overall gain (luminance and chrominance).
- **Chroma Gain** – adjusts the percent of chroma amplitude.
- **Pedestal** – sets the pedestal (black) level ± 30 IRE.
- **Hue** – adjust the hue of the input signal ± 180 degrees.



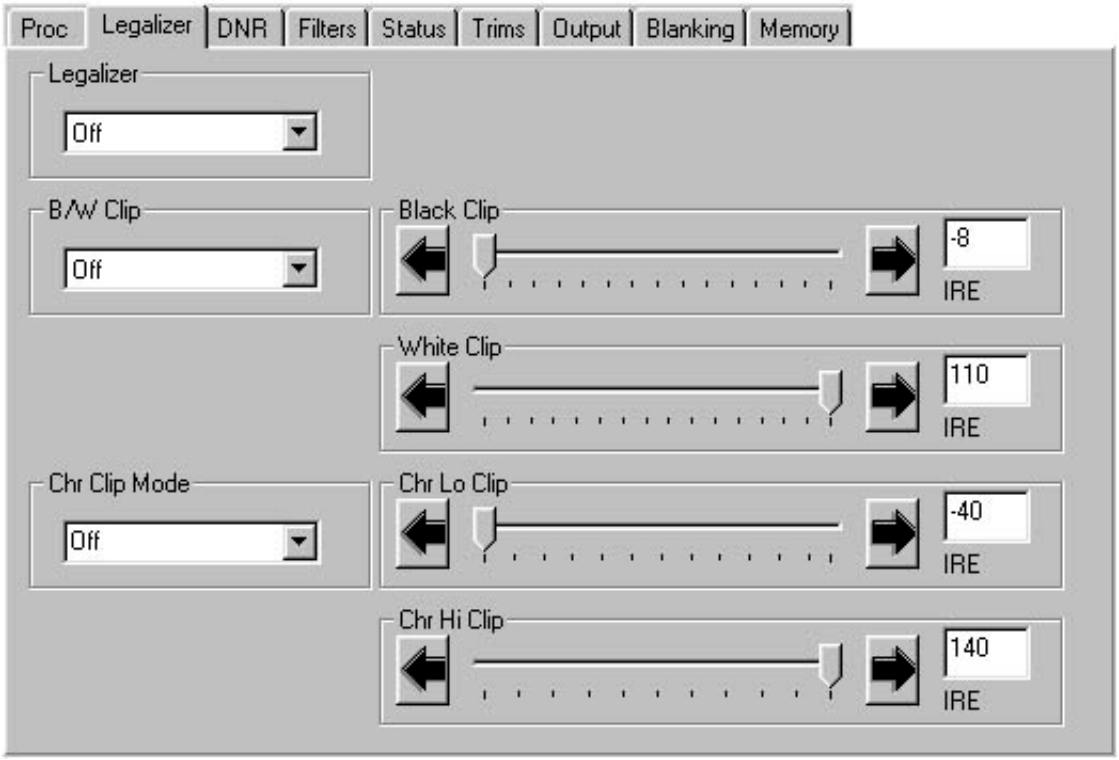
The **Legalizer** menu allows you to enable the Legalizer function to limit the input signal black and white clip levels and the chroma clip levels with the following controls:

- **Legalizer** – set the legalizer function to one of the following:

  Off – to disable it.

  Legal – to apply the following factory preset parameters:
  - **B/W Clip** is On.
  - **Black Clip** is set to – 2.5 IRE.
  - **White Clip** is set to + 105 IRE.
  - **Chr Clip Mode** is Predictive Composite.
  - **Chr Lo Clip** is set to – 20 IRE.
  - **Chr Hi Clip** is set to + 120 IRE.

  Custom to use the controls described below to set custom parameters.
  - **B/W Clip** – select **On** to enable **Black** and **White Clip** functions or **Off** to disable them.
  - **Black Clip** – set the threshold for the black clip level to between – 8 and + 6.2 IRE (no content will be allowed below the level set).
  - **White Clip** – sets the threshold for the white clip level to between 95 and 110 IRE (no content will be allowed above the level set).
  - **Chr Clip Mode** – select **Off** for no chroma clip functions. Select **Chroma** to use the **Chr Lo Clip** and **Chr Hi Clip** controls to clip the chroma content (irrespective of the luminance). Select **Cpst** to enable the Predictive Composite Clipper. This mode allows you to ensure that when the signal is encoded to PAL or NTSC the minimum and maximum chroma excursions do not exceed preset levels. Because in composite video, the chroma rides on the luminance, this clip mode is based on chroma and luminance values.



- **Chr Lo Clip** – set the low chroma clip level to between – 40 and 0 IRE (– 20 typical).
- **Chr Hi Clip** – set the high chroma clip level to between 100 and 140 IRE (+ 120 typical).

The **DNR** menu is active when the 5475 DNR (Digital Noise Reduction) submodule option is installed on the 5470 module.

The 5475 submodule removes unwanted noise and artifacts. It is motion and scene adaptive. Recursive Temporal Noise filtering includes Simple Recursive, Motion Adaptive and Motion Adaptive with impulse filter. Controls are provided for maximum signal to noise improvement and for noise threshold. These can be set manually or run in automatic mode.

Motion Adaptive Recursive Noise filtering works on a pixel by pixel basis, comparing the current frame to frames that have already been filtered. If the change detected is small, it is considered noise, if detected as large, it is considered motion or scene change. The detection process uses an LMMSE (Linear Minimum Mean Square Error) filtering algorithm to evaluate the presence of motion. Combining this algorithm with recursive temporal filters preserves fine detail while reducing noise in the presence of motion, including rapidly moving objects and scene changes. Motion trails are minimized while avoiding hard motion failures that some adaptive noise filters can exhibit.

User controls for the Motion Adaptive Recursive filter include a Noise Threshold, based on how much noise is present in the incoming signal, and Maximum Signal to Noise improvement, based on how much noise removal is desired. The threshold setting can be automatic or user adjustable.

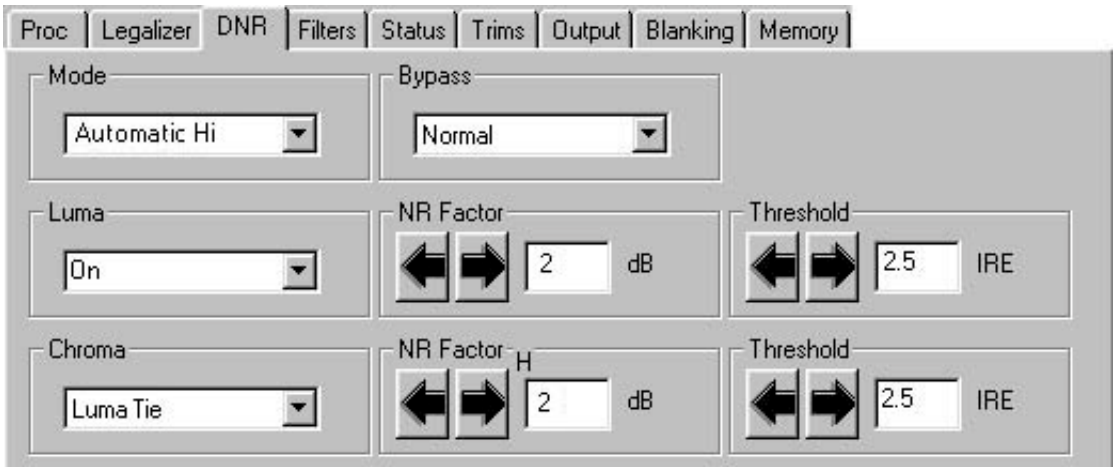
When set to Automatic, the noise level of the input signal is measured and the threshold is set accordingly. This simplifies the setup of the noise reducer and makes it responsive to varying input signal to noise levels. The need for operator intervention is minimized to accommodate feeds of differing quality. Two types of automatic noise reduction are offered, Automatic Lo or Automatic Hi.

When the combined Motion Adaptive Recursive and Impulse Noise filter is selected, temporal impulse noise filter removes high level, narrow noise impulses—without reducing fine stationary detail.

The output mode of the DNR can be set with the selections under the Bypass pulldown. This selection is used in conjunction with the module bypass setting in the Output menu. The Show Noise output mode displays which areas of the picture are being affected by the noise reducer. Noise is represented by white or black, while unaffected areas are represented in gray. This handy mode makes it easy to set optimum adjustments for the material being processed. The Split Screen mode lets you compare the processed output to the original signal.

In addition to the 5475 motion adaptive temporal filters, horizontal bandwidth filtering and luma-chroma delay filters are provided in the **Filters** menu. The luma delay path can be adjusted relative to the chroma path delay (**Y/C Delay** function in the **Trims** menu) in approximately 2 ns subpixel steps, providing the ability to correct luma-chroma delay errors in serial digital signals.

The **DNR** menu shown below sets the following parameters:



- **Mode** – set the mode of noise reduction based on the type of noise and the amount of motion in the signal. Set the **Mode** to one of the following:

  Automatic Lo – this setting is completely automatic and requires no user adjustments. The adjustments for Noise Reduction (NR) and Threshold change depending on the source material. Luma and Chroma filters and Chroma/Luma tie are on. This mode uses the Impulse 1 filter. This setting removes a moderate amount of noise and shows little motion artifacts. It is most useful for signals that vary a great deal and require less operator intervention.

  Automatic Hi – this setting is also completely automatic and requires no user adjustments. The adjustments for enhanced for noise reduction (NR) and Threshold. Luma and Chroma filters and Chroma/Luma tie are on. This mode uses the Impulse 2 filter (also temporal). All noise is removed in this mode and chances are higher for motion artifacts to appear.

  Adaptive – this mode requires manual settings of all parameters. With this mode, fine detail is preserved and motion is removed. Best used for signals with less motion and results viewed with the Show Noise function and a waveform monitor.

  Adaptive/Impulse 1 – this mode is similar to the Adaptive mode above but adds an Impulse 1 filter control. This allows removal of impulse noise — large, narrow amplitude noise with a very high bandwidth (narrow). This filter requires detail to be very fine before it will be removed. It is best for removing fine sparkles in the video. Some fine moving details, such as rain, can soften and blur with this filter enabled and so is not recommended for this type of scene.

  Adaptive/Impulse 2 – this mode is similar to the Adaptive/Impulse 1 mode above but adds an Impulse 2 filter control. This allows removal of a wider bandwidth of impulse noise. As a result, scenes with bigger detail will be affected. This is also an effective filter for removing sparkles but blurring and softening of detail will be more obvious than the Impulse 1 filter.

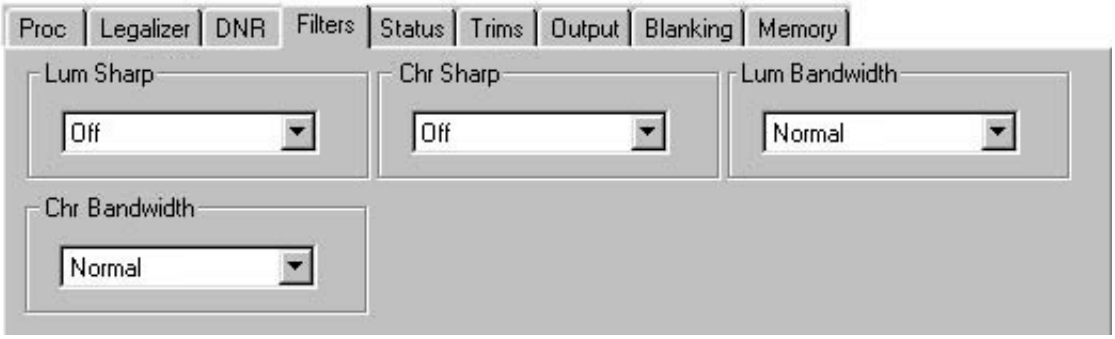
  Non Adaptive – this filter is the most effective for still pictures. Noise reduction can be set to the highest level with the luma and chroma NR and threshold controls to produce the best results. Not recommended for pictures with any motion.

- **Luma** – the luma channel can be adjusted independently of the chroma channel for noise reduction and motion threshold while in any of the Motion Adaptive Recursive modes. These controls are best set using a waveform monitor and setting the Show Noise function in the Bypass menu below.
- **Chroma** – the noise reduction and threshold of the chroma channel can be adjusted independently of the luma channel with these controls. A Luma Tie setting is provided that controls the chroma filter based on the motion estimation on the luma channel. Not only is noise more effectively reduced when this control is active, but it can also reduce the appearance of cross-color artifacts from poor upstream decoding of composite signals.
- **Bypass** – set the DNR output mode in conjunction with the **Output** menu Bypass function with this control. You may use this control to view the desired DNR output for comparing noise reduction or detail enhancement. Refer to the **Output** menu for details on setting this mode.

The **Filters** menu shown below allows setting the luminance and chroma sharpness and horizontal bandwidth (with DNR option) with the following detail enhancing controls:

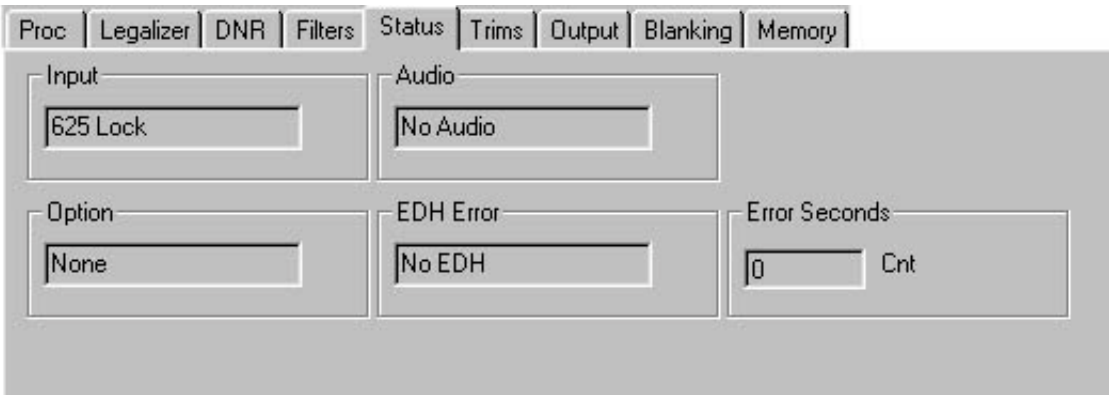
- **Lum Sharp** – set to **Off** to bypass detail enhancing filters. Set to **Off** , **1/4**, **1/2**, or **Max** to set the sharpness of the luminance portion of the signal.
- **Chr Sharp** – set to **Off** to bypass detail enhancing filters. Set to **Off**, **1/2, 1/4**, or **Max** to set the sharpness of the chrominance portion of the signal.
- **Lum Bandwidth** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Set to **Normal** to allow full bandwidth (no effect), or **3/4 Band**, **1/2 Band,** or **1/4 Band**.
- **Chr Bandwidth** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Set to **Normal** to allow full bandwidth (no effect), or **3/4 Band**, or **1/2 Band.**.

  These bandwidth functions utilize filtering applying a sharp cutoff low-pass filter to effectively remove high frequency and impulse noise. This is especially useful in applications such as an MPEG pre-processor to reduce bandwidth required to transmit an MPEG-encoded signal. The result can be a cost effective method of delivering video via satellite link.



The **Status** menu shown below gives the read-only status of the following:

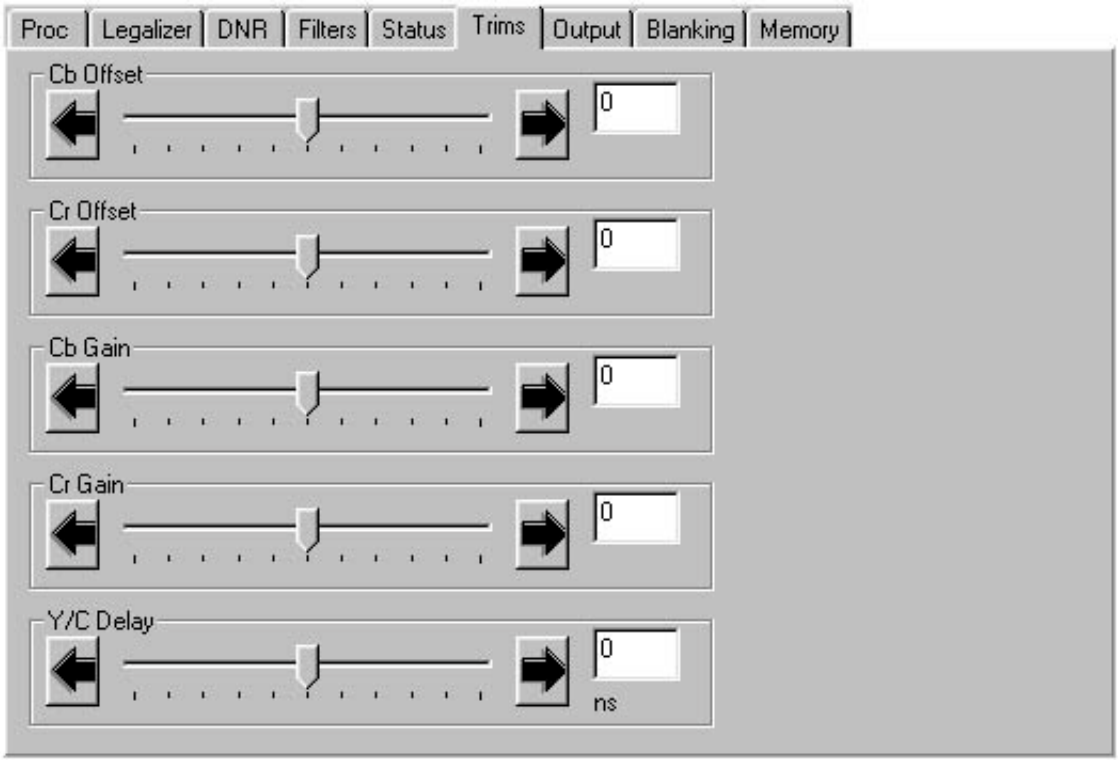
- **Input** – indicates if the serial input signal is being equalized and the serial receiver is locking to it.
- **Audio** – indicates if embedded audio is detected in the input data stream.
- **Option** – indicates whether the 5475 DNR submodule option is installed.
- **EDH Error** – indicates **No Error** if proper EDH is present, **No EDH** if EDH is not present, and **No Input** if there is no serial input present. When an EDH error is detected, it will be indicted by a specific EDH error code.
- **Error Seconds** – displays the number of seconds that a detected EDH error has been present in the serial data stream.



The **Trims** menu allows you to correct subtle issues in the individual color difference channels with offset and gain controls. The offset controls adjust the DC offsets above or below the nominal points. This can be used to correct black balance errors. The gain controls adjust the amplitude of each channel. It is helpful to set the output of the module to **Split Screen** (in the **Output** menu) to allow viewing a comparison of the processed signal to the input while adjusting the controls below.

Use the controls described below to make the offset and gain corrections:

- **Cb Offset** – adjust the DC offset of the Cb channel to between ± 300.
- **Cr Offset** – adjust the DC offset of the Cr channel to between ± 300.
- **Cb Gain** – adjust the amplitude of the Cb channel to between ± 20.
- **Cr Offset** – adjust the amplitude of the Cr channel to between ± 20.
- **Y/C Delay** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Adjust the amount of luminance to chrominance delay to between ± 148 ns.



The **Output** menu allows you to set the state of the output with the following:

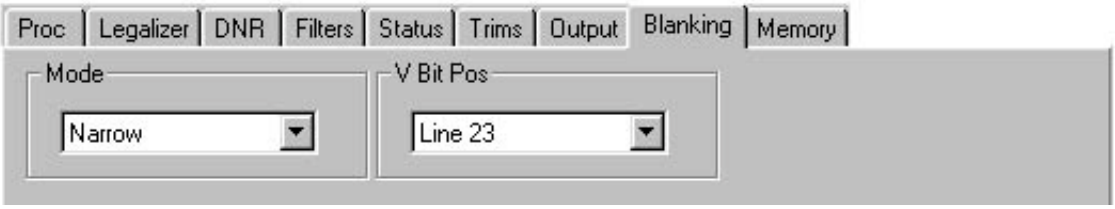
- **Bypass** – set to **Normal** for no split screen, **Bypass**, to completely bypass any digital processing, or **Split or Split DNR** to enable a split screen comparison between the original input signal (left) and the processed output (right). Use this control in conjunction with the **Bypass** control in the **DNR** menu as described in the summary table below.
- **Strip Audio** – select the box to strip embedded audio from the output. Leave the box unselected to pass embedded audio through to the output.

Output and DNR Menu Bypass Mode Table

Output Menu Bypass Setting	DNR Menu Bypass Setting	Output Condition
Normal	**Normal**	All processing on.
	Bypass	All DNR processing is off. DNR controls are grayed out.
	Show Noise	DNR processing is on. Show noise function is full screen with all DNR controls.
Bypass	**Any Setting**	All processing is bypassed. All controls grayed out.
Split	**Normal**	Left side of screen unprocessed, right side of screen processed with DNR. All controls active for DNR.
	Bypass	Left side of screen unprocessed, right side processed without DNR. DNR controls grayed out.
	Show Noise	Left side of screen unprocessed, right side of screen processed with DNR. All controls active.
Split DNR	**Normal**	Left side of screen processed without DNR, right side of screen processed with DNR. All controls active.
	Bypass	Left side of screen processed without DNR, right side of screen processed without DNR, All DNR controls grayed out.
	Show Noise	Left side of screen processed without DNR, right side processed with Show Noise, All DNR controls active.

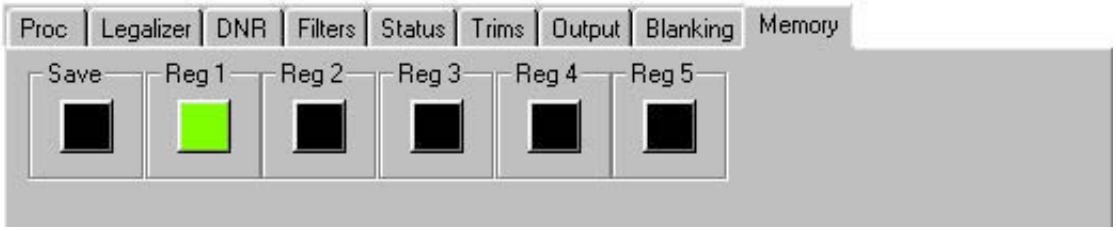
The **Blanking** menu allows you to select the blanking mode desired for the output with the following:

- **Mode** – set the blanking mode to either **Wide** (content in the vertical interval is blanked) or **Narrow** (content of the vertical interval is passed).
- **V Bit Pos** – in 525 mode only. Set the position of the vertical bit in the 601 output to **Line 10**, **Line 20** or **Line 23**.



The **Memory** menu allows you to save overall module setups into up to five memory registers as follows:

- Select **Save**, then one of the five memory registers **Reg 1 – 5**. The box will turn green. The entire module setup is now saved in the selected register.
- To recall a register, select the register box. If there is information saved, the box will turn green. The saved setup will now be loaded to the module. Up to five different module setups can be saved and recalled using the individual registers.



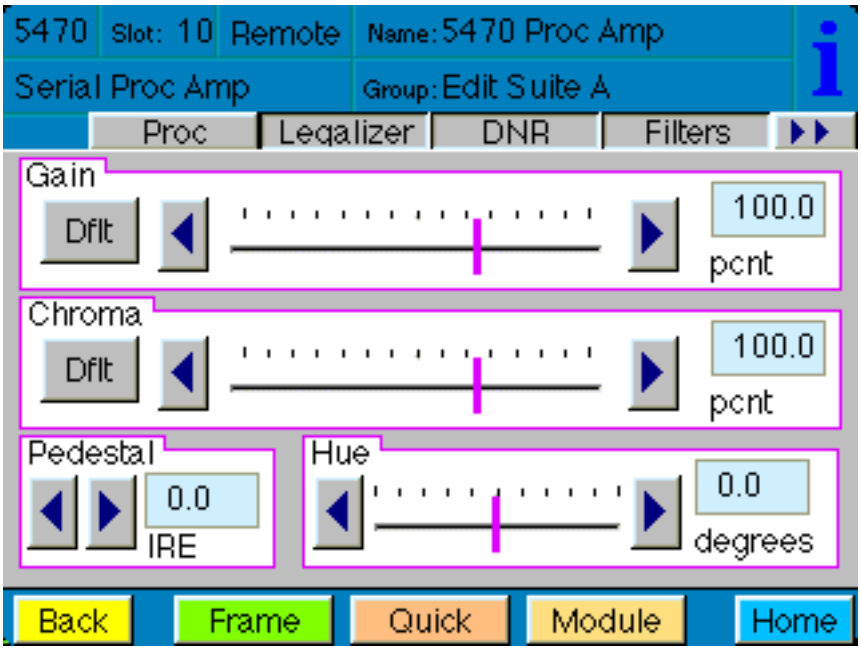
Avenue Touch Screen Remote Configuration

The Avenue Touch Screen remote control status menus for this module are illustrated and explained below. Refer to the **5470 Parameter Table** for a summary of available parameters that can be set remotely through the menus illustrated. For more information on using the Avenue Touch Screen, refer to the Avenue System Overview.

5470 Avenue Touch Screen Menus

The **Proc** menu sets the following digital signal processing parameters for the signal:

- **Gain** – adjusts the percent of overall gain (luminance and chrominance).
- **Chroma Gain** – adjusts the percent of chroma amplitude.
- **Pedestal** – sets the pedestal (black) level ± 30 IRE.
- **Hue** – adjust the hue of the input signal ± 180 degrees.



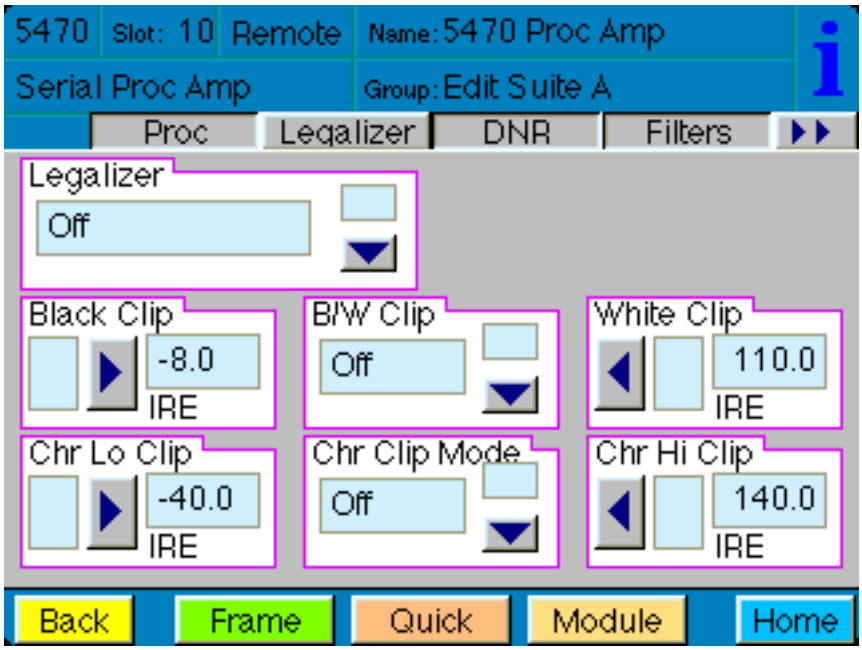
The **Legalizer** menu allows you to enable the Legalizer function to limit the input signal black and white clip levels and the chroma clip levels with the following controls:

- **Legalizer** – set the legalizer function to one of the following:

  Off – to disable it.

  Legal – to apply the following factory preset parameters:
  - **B/W Clip** is On.
  - **Black Clip** is set to – 2.5 IRE.
  - **White Clip** is set to + 105 IRE.
  - **Chr Clip Mode** is Predictive Composite.
  - **Chr Lo Clip** is set to – 20 IRE.
  - **Chr Hi Clip** is set to + 120 IRE.

  Custom to use the controls described below to set custom parameters.
  - **B/W Clip** – select **On** to enable **Black** and **White Clip** functions or **Off** to disable them.
  - **Black Clip** – set the threshold for the black clip level to between – 8 and + 6.2 IRE (no content will be allowed below the level set).
  - **White Clip** – sets the threshold for the white clip level to between 95 and 110 IRE (no content will be allowed above the level set).
  - **Chr Clip Mode** – select **Off** for no chroma clip functions. Select **Chroma** to use the **Chr Lo Clip** and **Chr Hi Clip** controls to clip the chroma content (irrespective of the luminance). Select **Cpst** to enable the Predictive Composite Clipper. This mode allows you to ensure that when the signal is encoded to PAL or NTSC the minimum and maximum chroma excursions do not exceed preset levels. Because in composite video, the chroma rides on the luminance, this clip mode is based on chroma and luminance values.
  - **Chr Lo Clip** – set the low chroma clip level to between – 40 and 0 IRE (– 20 typical).
  - **Chr Hi Clip** – set the high chroma clip level to between 100 and + 140 IRE (+ 120 typical).



The **DNR** menu is active when the 5475 DNR (Digital Noise Reduction) submodule option is installed on the 5470 module.

The 5475 submodule removes unwanted noise and artifacts. It is motion and scene adaptive. Recursive Temporal Noise filtering includes Simple Recursive, Motion Adaptive and Motion Adaptive with impulse filter. Controls are provided for maximum signal to noise improvement and for noise threshold. These can be set manually or run in automatic mode.

Motion Adaptive Recursive Noise filtering works on a pixel by pixel basis, comparing the current frame to frames that have already been filtered. If the change detected is small, it is considered noise, if detected as large, it is considered motion or scene change. The detection process uses an LMMSE (Linear Minimum Mean Square Error) filtering algorithm to evaluate the presence of motion. Combining this algorithm with recursive temporal filters preserves fine detail while reducing noise in the presence of motion, including rapidly moving objects and scene changes. Motion trails are minimized while avoiding hard motion failures that some adaptive noise filters can exhibit.

User controls for the Motion Adaptive Recursive filter include a Noise Threshold, based on how much noise is present in the incoming signal, and Maximum Signal to Noise improvement, based on how much noise removal is desired. The threshold setting can be automatic or user adjustable.

When set to Automatic, the noise level of the input signal is measured and the threshold is set accordingly. This simplifies the setup of the noise reducer and makes it responsive to varying input signal to noise levels. The need for operator intervention is minimized to accommodate feeds of differing quality. Two types of automatic noise reduction are offered, Automatic Lo or Automatic Hi.

When the combined Motion Adaptive Recursive and Impulse Noise filter is selected, temporal impulse noise filter removes high level, narrow noise impulses—without reducing fine stationary detail.

The output mode of the DNR can be set with the selections under the Bypass pulldown. This selection is used in conjunction with the setting in the Output menu. The Show Noise output mode displays what areas of the picture are being affected by the noise reducer. Noise is represented by white or black, while unaffected areas are represented in gray. This handy mode makes it easy to set optimum adjustments for the material being processed. The Split Screen mode lets you compare the processed output to the original signal.

In addition to the 5475 motion adaptive temporal filters, horizontal bandwidth filtering and luma-chroma delay filters are provided in the **Filters** menu. The luma delay path can be adjusted relative to the chroma path delay (**Y/C Delay** function in the **Trims** menu) in approximately 2 ns subpixel steps, providing the ability to correct luma-chroma delay errors in serial digital signals.

The **DNR** menu shown below sets the following parameters:

- **Mode** – set the mode of noise reduction based on the type of noise and the amount of motion in the signal. Set the **Mode** to one of the following:

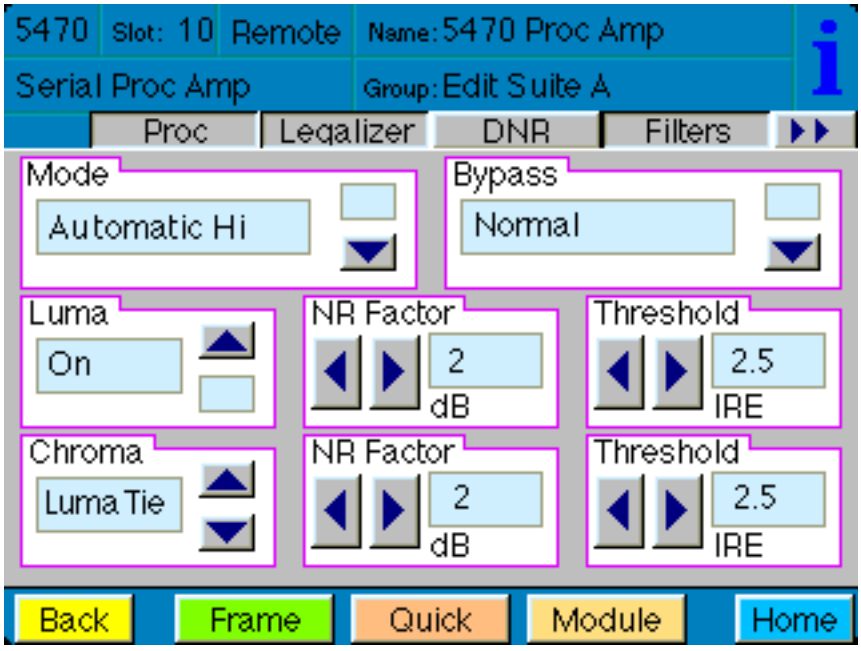
  Automatic Lo – this setting is completely automatic and requires no user adjustments. The adjustments for Noise Reduction (NR) and Threshold change depending on the source material. Luma and Chroma filters and Chroma/Luma tie are on. This mode uses the Impulse 1 filter. This setting removes a moderate amount of noise and shows little motion artifacts. It is most useful for signals that vary a great deal and require less operator intervention.

  Automatic Hi – this setting is also completely automatic and requires no user adjustments. The adjustments for enhanced for noise reduction (NR) and Threshold. Luma and Chroma filters and Chroma/Luma tie are on. This mode uses the Impulse 2 filter (also temporal). All noise is removed in this mode and chances are higher for motion artifacts to appear.

  Adaptive – this mode requires manual settings of all parameters. With this mode, fine detail is preserved and motion is removed. Best used for signals with less motion and results viewed with the Show Noise function and a waveform monitor.

  Adaptive/Impulse 1 – this mode is similar to the Adaptive mode above but adds an Impulse 1 filter control. This allows removal of impulse noise — large, narrow amplitude noise with a very high bandwidth (narrow). This filter requires detail to be very fine before it will be removed. It is best for removing fine sparkles in the video. Some fine moving details, such as rain, can soften and blur with this filter enabled and so is not recommended for this type of scene.

  Adaptive/Impulse 2 – this mode is similar to the Adaptive/Impulse 1 mode above but adds an Impulse 2 filter control. This allows removal of a wider bandwidth of impulse noise. As a result, scenes with bigger detail will be affected. This is also an effective filter for removing sparkles but blurring and softening of detail will be more obvious than the Impulse 1 filter.



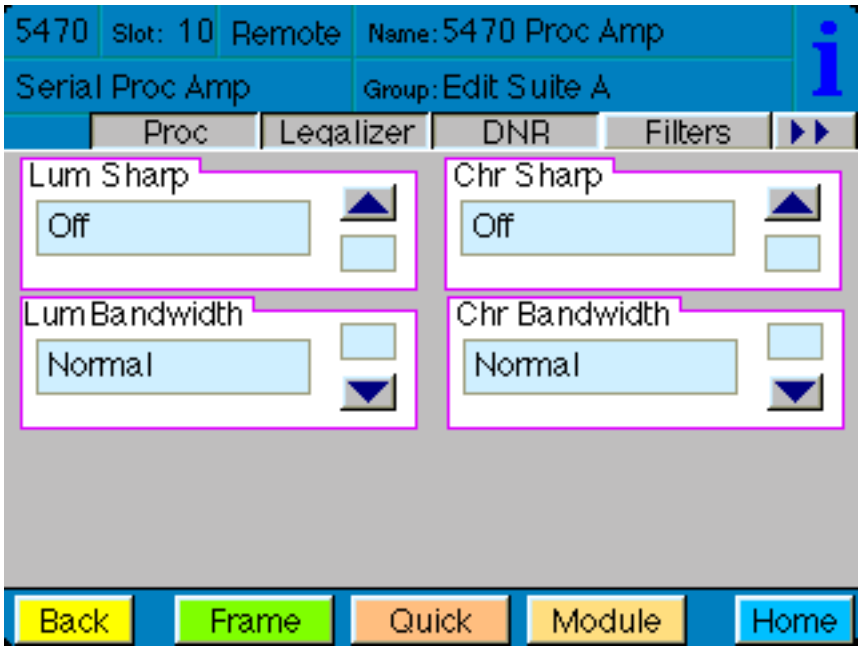
Non Adaptive – this filter is the most effective for still pictures. Noise reduction can be set to the highest level with the luma and chroma NR and threshold controls to produce the best results. Not recommended for pictures with any motion.

- **Luma** – the luma channel can be adjusted independently of the chroma channel for noise reduction and motion threshold while in any of the Motion Adaptive Recursive modes. These controls are best set using a waveform monitor and setting the Show Noise function in the Bypass menu below.
- **Chroma** – the noise reduction and threshold of the chroma channel can be adjusted independently of the luma channel with these controls. A Luma Tie setting is provided that controls the chroma filter based on the motion estimation on the luma channel. Not only is noise more effectively reduced when this control is active, but it can also reduce the appearance of cross-color artifacts from poor upstream decoding of composite signals.
- **Bypass** – set the DNR output mode with this control. You may use this control to split the screen for comparing noise reduction or detail enhancement. Refer to the **Output** menu for more details on setting this mode.

The **Filters** menu shown below allows setting the luminance and chroma sharpness and horizontal bandwidth (with DNR option) with the following detail enhancing controls:

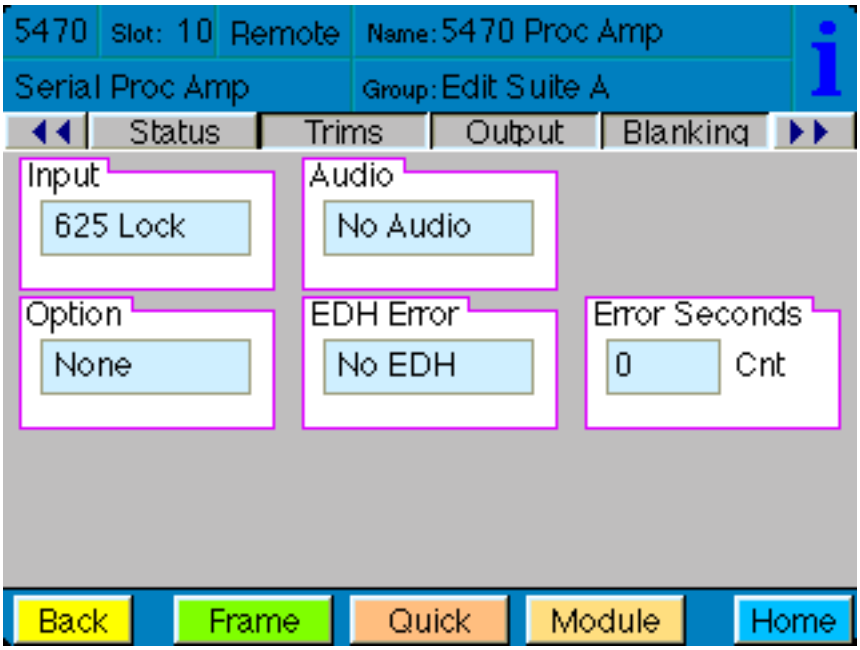
- **Lum Sharp** – set to **Off** to bypass detail enhancing filters. Set to **Off** , **1/4**, **1/2**, or **Max** to set the sharpness of the luminance portion of the signal.
- **Chr Sharp** – set to **Off** to bypass detail enhancing filters. Set to **Off**, **1/2, 1/4**, or **Max** to set the sharpness of the chrominance portion of the signal.
- **Lum Bandwidth** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Set to **Normal** to allow full bandwidth (no effect), or **3/4 Band**, **1/2 Band,** or **1/4 Band**.
- **Chr Bandwidth** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Set to **Normal** to allow full bandwidth (no effect), or **3/4 Band**, or **1/2 Band.**.

  These bandwidth functions utilize filtering applying a sharp cutoff low-pass filter to effectively remove high frequency and impulse noise. This is especially useful in applications such as an MPEG pre-processor to reduce bandwidth required to transmit an MPEG-encoded signal. The result can be a cost effective method of delivering video via satellite link.



The **Status** menu shown below gives the read-only status of the following:

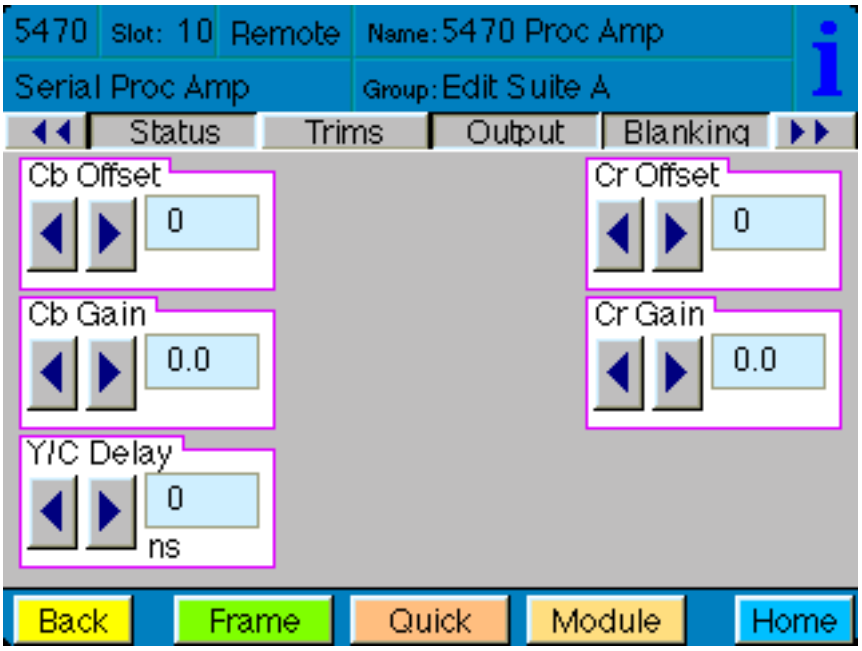
- **Input** – indicates if the serial input signal is being equalized and the serial receiver is locking to it.
- **Audio** – indicates if embedded audio is detected in the input data stream.
- **Option** – indicates whether the 5475 DNR submodule option is installed.
- **EDH Error** – indicates **No Error** if proper EDH is present, **No EDH** if EDH is not present, and **No Input** if there is no serial input present. When an EDH error is detected, it will be indicted by a specific EDH error code.
- **Error Seconds** – displays the number of seconds that a detected EDH error has been present in the serial data stream.



The **Trims** menu allows you to correct subtle issues in the individual color difference channels with offset and gain controls. The offset controls adjust the DC offsets above or below the nominal points. This can be used to correct black balance errors. The gain controls adjust the amplitude of each channel. It is helpful to set the output of the module to **Split Screen** (in the **Output** menu) to allow viewing a comparison of the processed signal to the input while adjusting the controls below.

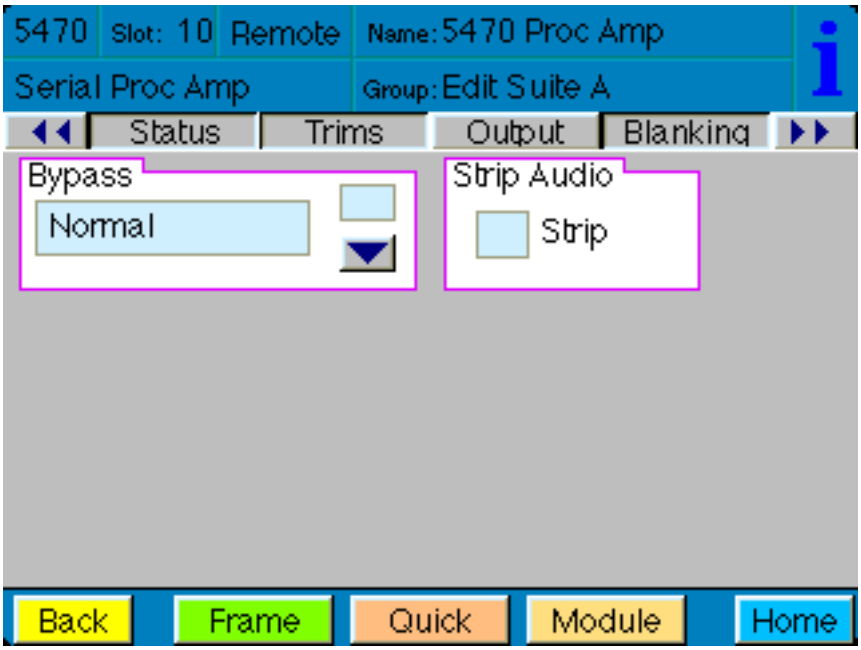
Use the controls described below to make the offset and gain corrections:

- **Cb Offset** – adjust the DC offset of the Cb channel to between ± 300.
- **Cr Offset** – adjust the DC offset of the Cr channel to between ± 300.
- **Cb Gain** – adjust the amplitude of the Cb channel to between ± 20.
- **Cr Offset** – adjust the amplitude of the Cr channel to between ± 20.
- **Y/C Delay** – used only when the 5475 DNR (Digital Noise Reduction) option is installed. Adjust the amount of luminance to chrominance delay to between ± 148 ns.



The **Output** menu allows you to set the state of the output with the following:

- **Bypass** – set to **Normal** for no split screen, **Bypass**, to completely bypass any digital processing, or **Split or Split DNR** to enable a split screen comparison between the original input signal (left) and the processed output (right). Use this control in conjunction with the **Bypass** control in the **DNR** menu as described in the summary table on the next page.
- **Strip Audio** – select the box to strip embedded audio from the output. Leave the box unselected to pass embedded audio through to the output.

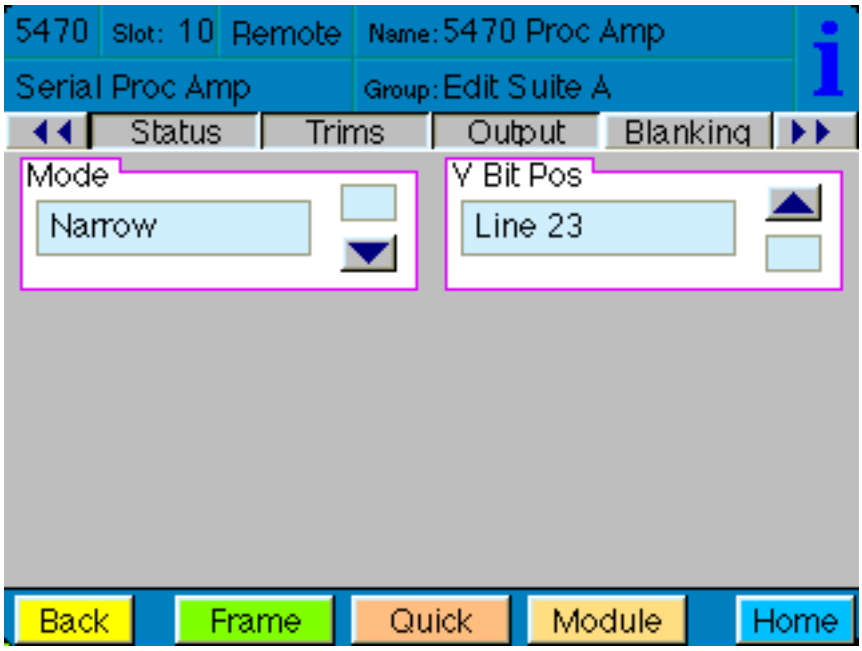


Output and DNR Menu Bypass Mode Table

Output Menu Bypass Setting	DNR Menu Bypass Setting	Output Condition
Normal	**Normal**	All processing on.
	Bypass	All DNR processing is off. DNR controls are grayed out.
	Show Noise	DNR processing is on. Show noise function is full screen with all DNR controls.
Bypass	**Any Setting**	All processing is bypassed. All controls grayed out.
Split	**Normal**	Left side of screen unprocessed, right side of screen processed with DNR. All controls active for DNR.
	Bypass	Left side of screen unprocessed, right side processed without DNR. DNR controls grayed out.
	Show Noise	Left side of screen unprocessed, right side of screen processed with DNR. All controls active.
Split DNR	**Normal**	Left side of screen processed without DNR, right side of screen processed with DNR. All controls active.
	Bypass	Left side of screen processed without DNR, right side of screen processed without DNR, All DNR controls grayed out.
	Show Noise	Left side of screen processed without DNR, right side processed with Show Noise, All DNR controls active.

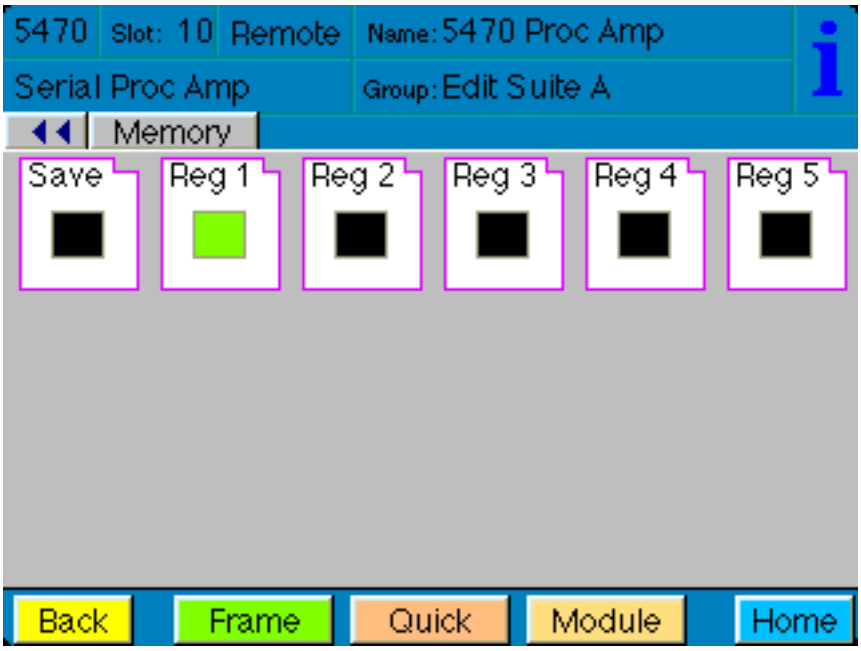
The **Blanking** menu allows you to select the blanking mode desired for the output with the following:

- **Mode** – set the blanking mode to either **Wide** (content in the vertical interval is blanked) or **Narrow** (content of the vertical interval is passed).
- **V Bit Pos** – in 525 mode only. Set the position of the vertical bit in the 601 output to **Line 10**, **Line 20** or **Line 23**.



The **Memory** menu allows you to save overall module setups into up to five memory registers as follows:

- Select **Save**, then one of the five memory registers **Reg 1 – 5**. The entire module setup is now saved in the selected register. The box will turn green indicating the setting have been saved and that it is the last recalled (current) register.
- To recall a register, select the register box. If there is information saved, the box will turn green. The saved setup will now be loaded to the module. Up to five different module setups can be saved and recalled using the individual registers.



TROUBLESHOOTING

As a troubleshooting aid, the input signal status and presence, power and CPU status can be easily monitored from the front panel of this module using the front panel indicators.

Refer to the overall troubleshooting tips given below for the module:

Can't control module:

- Check status of CPU **Run** green LED. Should be blinking slowly and in unison with other modules if System module is present. If not, try removing it and plugging it in again to be sure it is seated properly.
- System module may not be working properly if installed.

No signal out of module:

- Check status of **In OK** LED.
- Check **EDH Err** light is off.
- Check cabling to input of module.

You may also refer to the technical support section of the Ensemble Designs web site for the latest information on your equipment at the URL below:

http://www.ensembledesigns.com/support

SOFTWARE UPDATING

Software upgrades for each module can be downloaded remotely if the optional System Control module is installed. These can be downloaded onto your PC and then Avenue PC will distribute the update to the individual module. (Refer to the Avenue PC documentation for more information) Periodically updates will be posted on our web site. If you do not have the required System Control Module and Avenue PC, modules can be sent back to the factory for software upgrades.

WARRANTY AND FACTORY SERVICE

Warranty

This module is covered by a five year limited warranty, as stated in the main Preface of this manual. If you require service (under warranty or not), please contact Ensemble Designs and ask for customer service before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

Factory Service

If you return equipment for repair, please get a Return Material Authorization Number (RMA) from the factory first.

Ship the product and a written description of the problem to:

Ensemble Designs, Inc.

Attention: Customer Service RMA #####

870 Gold Flat Rd.

Nevada City, CA. 95959 USA

(530) 478-1830

Fax: (530) 478-1832

service@endes.com

http://www.ensembledesigns.com

Be sure to put your RMA number on the outside of the box.

SPECIFICATIONS

5470 Digital Proc Amp

Serial Input:

Number:	One
Signal Type:	Serial Digital (SMPTE 259M)
Impedance:	75 Ω
Return Loss:	> 15 dB
Maximum Cable Length	300 meters Belden 8281

Serial Output:

Number:	Four
Signal Type:	Serial Digital (SMPTE 259M)
Impedance:	75 Ω
Return Loss	> 15 dB
Output DC	None (AC coupled)
Delay	< 8 µsec (1/8 line)

Serial Loop Thru Output:

Number:	One, reclocked
Signal Type:	Serial Digital (SMPTE 259M)
Impedance:	75 Ω
Return Loss	> 15 dB
Output DC	None (AC coupled)
Delay	< 10 clocks

General Specifications:

Connectors:	BNC
Power Consumption:	< 7 Watts
Temperature Range:	0 to 40 degrees C ambient (all specs met)
Relative Humidity:	0 to 95% noncondensing
Altitude:	0 to 10,000 ft
Fusing:	1.5 Amp PTC resettable fuse

Due to ongoing product development, all specifications subject to change.