



VISTEK V1645 VIDEO NOISE REDUCER USER GUIDE

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VISTEK V1645 video noise reducer

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VISTEK V1645 video noise reducer

1. DESCRIPTION

The V1645 is a broadcast quality video noise reducer, which forms part of the Vistek V1600 range of interface products. It is a 3U high card which is fitted into either a V1601 or V1603 rack, from which it receives its power. A passive rear module, 130-1220 (V1601 rack) or 130-1100 (V1603 rack), is required for all signal interconnections.

It comprises a series of digital filters used to reduce noise and to spatially filter D1 component digital video signals.

Several filters are included. These include a recursive filter, an impulse noise filter, a Brickwall Filter, and a horizontal and vertical spatial filter.

The filters may be adjusted by the user to optimise for particular video material.

10 bit accuracy is maintained throughout.

The unit is capable of detecting 525 and 625 standard input material and will automatically switch to the required standard. Front panel LED's indicate the standard.

Control is through the card front panel or by PC via the DART bus or an RS485 interface. The RS485 interface can be used by a dedicated desktop control panel when it is available.

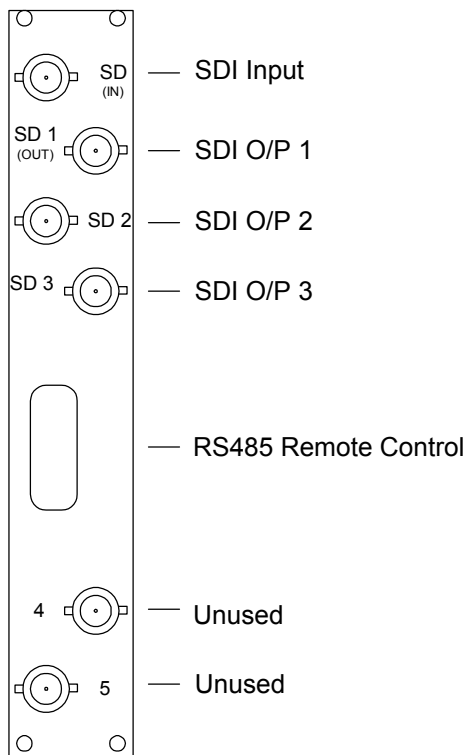
The unit is transparent to data or audio in the vertical and horizontal blanking intervals.

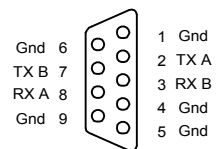
Error Detection and Handling (EDH) functions are provided.

2. INSTALLATION

2.1 Rear Panel Connections

The rear panel is shown below:



Signal	Source	Comments
SDI I/P	SD (IN)	Sourcing cable length up to 200m
SDI O/P 1	SD1 (OUT)	Driving cable length up to 200m
SDI O/P 2	SD2 (OUT)	Driving cable length up to 200m
SDI O/P 3	SD3 (OUT)	Driving cable length up to 200m
4 wire RS485	RS485 Connector	 <p>Connect to PC serial comms port via RS485/232 adapter</p>

2.2 Insertion Delay

The delay through the V1645 is two lines plus approximately 2 microseconds.



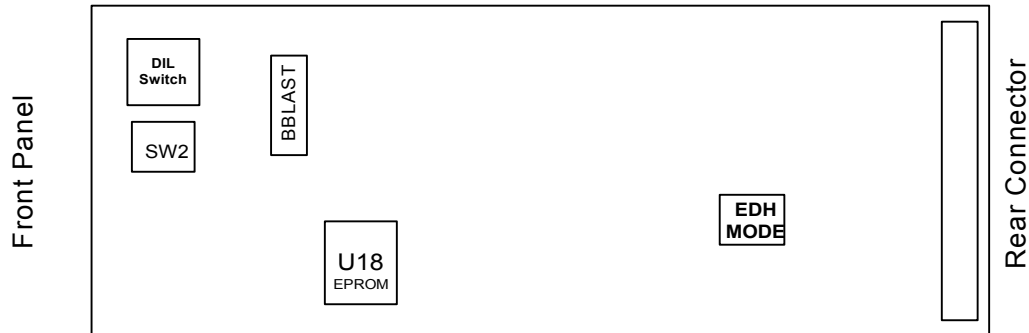
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2.3 Power Consumption

The power consumption of the V1645 is approximately 14.5 Watts.

2.4 Switches, Links and Programmable Devices

The figure below shows the main board along with certain components of interest:



2.4.1 Programmable Devices

The EPROM U18 is the component that would most likely need to be changed as a result of any in-field software upgrade. Also the In Circuit Programmable logic device might need to be reprogrammed via the BBLAST 10 way header.

2.4.2 RS485 Remote Control Address Selection

SW 2 is used to define the 4 least significant bits of the card address and Switches 1 and 2 of the DIL Switch define the 2 most significant bits of the card address. The card address is required for remote control via the RS485 interface.

2.4.3 Test Mode

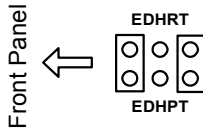
Switch 3 of the DIL Switch should be set to OFF and Switch 4 of the DIL Switch should be set to ON for normal operation.

Other positions of these switches will cause abnormal operation.

2.4.4 EDH (Error Detection & Handling) Function

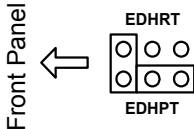
The set of links EDHRT and EDHPT may be set in four different ways to control the EDH mode.

1. Dart Bus Control.



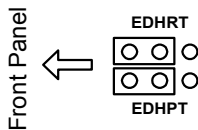
The EDH Mode can be controlled remotely via the DART bus.

2. EDH PassThrough.



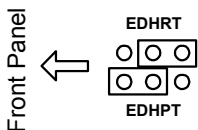
The EDH packet is not generated by the base board and any EDH packet on the input is passed through. This means that if there is any modification of the D1 data stream by the noise reducer (as is normally the case), an EDH error will be detected downstream. This mode is intended to aid in system diagnostics.

3. Transmit Mode.



CRC is calculated, inserted and error flags are cleared. Used when the V1645 is to be the originator of the EDH packet.

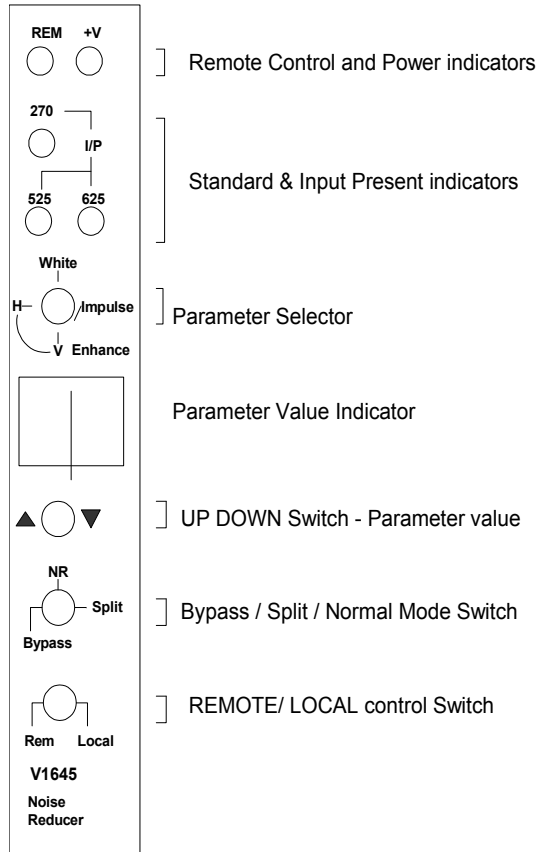
4. Receive Mode.



CRC is extracted, recalculated, compared, reinserted and error indication flags are set. Used when the EDH packet is sourced up stream.

3. OPERATION

3.1 Front Panel



The V1645 front panel is shown above.

3.2 Front Panel Switches and Indicators

REMOTE/LOCAL switch

- If the REM/LOCAL switch is in the REM position then the Noise Reducer is in Remote Mode and the settings will be those last sent from the remote controller (RS485 or DART bus). Otherwise the Noise Reducer is in Local Mode and the settings will be selectable from the front panel.

BYPASS/SPLIT/NR switch

- If the BYPASS /SPLIT/NR switch is in the BYPASS position then all the Noise Reducer filters will be turned off (the Noise Reducer will be transparent). N.B. BYPASS mode does not change the delay through the unit.
- If the BYPASS/SPLIT/NR switch is in the NR (Noise Reduction) position then all the Noise Reducer filters will be set according to the front panel settings.
- If the BYPASS/SPLIT/NR switch is in the SPLIT position then the picture will be split vertically so that the left half is transparent and right half is Noise Reduced.

UP/DOWN switch

- Use this switch to alter the selected parameter. The parameter will auto increment or decrement if the switch is held in the UP or DOWN position.

PARAMETER SELECTOR 4 WAY switch

- Use this switch to select the required parameter. The selected parameter can be adjusted by the UP/DOWN switch and it's value can be read on the Parameter Value Indicator. N.B. the Bypass setting for each parameter is 0.

PARAMETER VALUE INDICATOR

- When the unit is in Local Mode the value of the selected parameter is shown on the Parameter Value Indicator.
- When the unit is in Remote Mode the RS485 remote control address of the unit is shown on the Parameter Value Indicator.
- When the unit is downloading data into the configurable logic devices the most significant decimal point on the Parameter Value Indicator toggles.
- Each time a message is received on the RS485 remote control bus the least significant decimal point on the Parameter Value Indicator toggles (even when another unit is being addressed).

STANDARD & INPUT PRESENT INDICATORS

- If a 270Mbit per second serial input is connected to the rear panel input, the 270 LED will be lit. Otherwise it will be off.
- The unit will auto detect 525/625 standard and run in the appropriate mode. The 525 or 625 LED will be illuminated accordingly.

REMOTE CONTROL & POWER INDICATORS

- If the Unit is being controlled via the DART bus, the REMOTE indicator will flicker.
- The power LED indicates that power is available on the board.

3.3 RS485 Remote Control

The unit can be controlled from the RS485 9 way D type socket on the rear panel.

The protocol is designed to work with an RS232 serial comms port of a PC (typically COM2). The serial comms port of the Noise Reducer conforms to 4 wire RS485. Therefore an RS232 to 4 wire RS485 converter must be inserted between the PC and the Noise Reducer. These are available as small inexpensive inline units. Alternatively an RS485 interface card could be installed in the PC.

Using RS485 allows multidrop control (i.e. many Noise Reducers may be controlled by 1 PC). The Noise reducer to be controlled is selected by a unique address which is set up using switches on the Noise Reducer PCB. 64 addresses are available.

The number of Noise Reducers that may be controlled depends on the drive capabilities of the RS485 driver. With self powered inline units this may be as low as 10. Internal cards should be able to drive 32.

3.4 Non Volatile Memory

The unit stores both local and remote parameter settings in non volatile memory. This means that current settings are stored even when there is no power to the unit.

Parameters set up locally are stored separately from parameters set up remotely. The front panel Remote/Local switch selects which set of parameters are to be used.

The unit can be set up from a PC and disconnected. The last settings transmitted to the unit from the PC or control panel are stored in non volatile memory and the unit will continue to power up with these settings.



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3.5 Windows Graphical User Interface

A Windows program vnetbrow.exe is available to allow remote control of the unit from the Windows environment.

Using the Windows based control interface allows more parameters to be made available for adjustment than is possible with the small front panel.

3.5.1 Installation

Vnetbrow.exe will run on Windows 3.1 or Win95.

The vnetbrow.exe program must be copied into a working directory. Run it from the file manager or create a Win95 short cut.

The Working Directory ('Start In' Folder in Win95) should typically be set to the same directory that the program is in. An initialisation file vnetbrow.ini will be generated in the Working Directory when the program is first run. This may be edited to change some default settings. In particular the default com2: port may be changed.

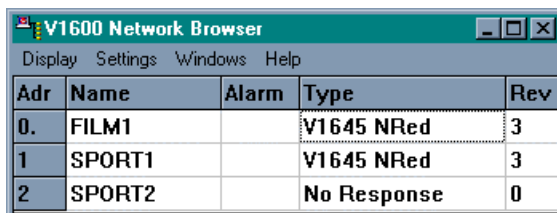
3.5.2 V1600 Net Browser

The window titled 'V1600 Network Browser' appears when the program is started. This controls the communications and continuously polls a series of addresses on the RS485 bus.

It detects if a unit replies, and if so what it's type and version number is. Finally any Alarm conditions may be displayed. The network status is displayed in tabular form.

To save continuously polling unused addresses, the user may specify a 'Top Address'. The address of all units on the RS485 bus should be below or equal to this 'Top Address'.

Names may be assigned by the user to each address. It is possible to 'freeze' the names to prevent inadvertent changes.



Adr	Name	Alarm	Type	Rev
0.	FILM1		V1645 NRed	3
1	SPORT1		V1645 NRed	3
2	SPORT2		No Response	0

3.5.3 V1645 Control Panel Window

The V1645 control panel window may be opened by clicking on the Windows selection on the main menu of the 'V1600 Network Browser' window.

Click on the address cell (in the left hand column) of the 'V1600 Net Browser' to select a unit. This will update the address of the V1645 control panel window.

The address shown on the V1645 control panel window corresponds to the address set up on switches on the Noise Reducer PCB. It also corresponds to the front panel Parameter Value Indicator when the unit is switched to Remote.

The selected V1645 may be controlled from the V1645 control panel window as described in section4.

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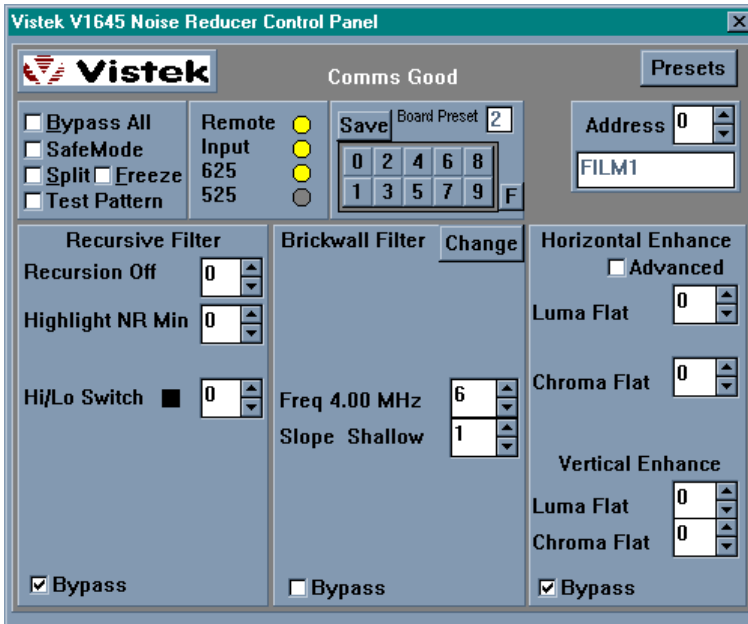


Fig 1 The Windows Control Panel with Brickwall Filter Selected

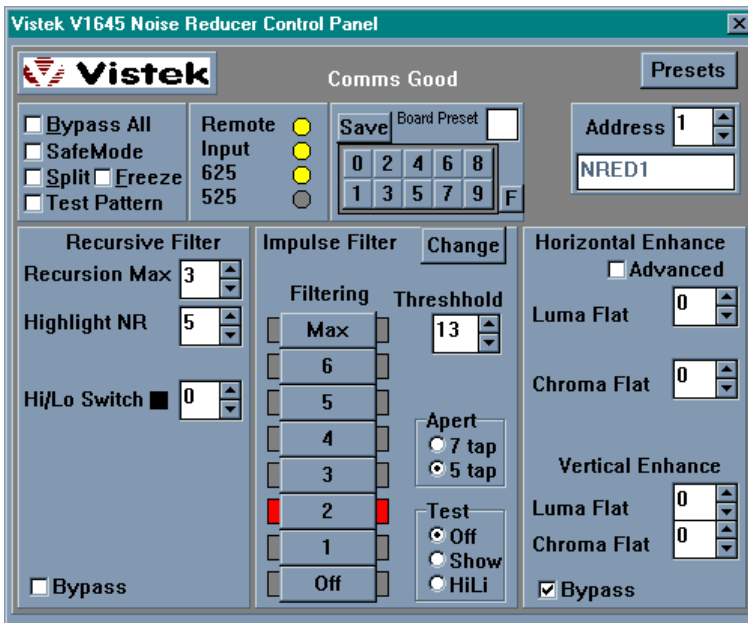


Fig 2 The Windows Control Panel with Impulse Filter Selected



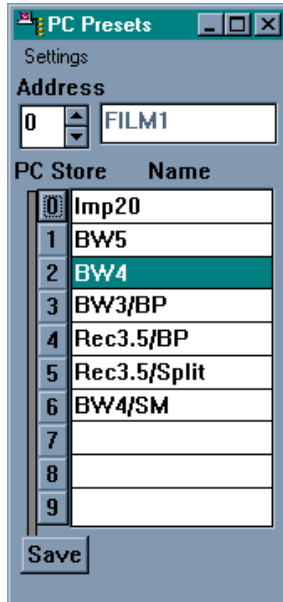
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3.5.4 V1645 PC Presets

Ten different V1645 Control Panel settings may be stored on the PC and recalled as required. A name may be assigned to each setting.

The settings of the selected unit are continuously monitored and whenever they correspond to a PC preset, the preset is highlighted. If there is more than one identical PC preset they will all be highlighted.

The PC presets should not be confused with the board presets which are individually stored in non volatile memory on each board.

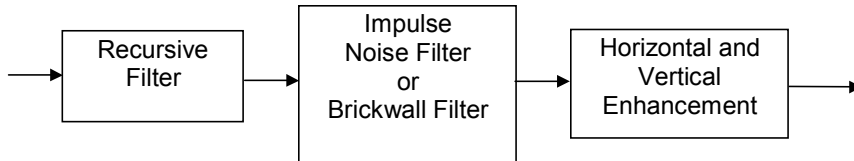


- To save the current settings in one of the PC preset stores, click on the “Save” button first. This will make the bar to the left of the store buttons turn red indicating that the unit is in “store mode”. Then click on the required store button. The current settings will be stored and the store button surround will revert to gray indicating that the unit is no longer in “store mode”.
- If “store mode” is inadvertently entered, it may be left without storing any settings by clicking on the “Save” button again.
- To recall a PC preset store, simply click on the required store button. This will download the settings to the selected unit.
- It is possible to ‘freeze’ the names and settings to prevent inadvertent changes by clicking on “settings”.

4. FILTER DESCRIPTIONS & CONTROLS

4.1 Architecture

A block diagram of the V1645 Noise Reducer appears below.



The V1645 uses Programmable logic to implement the various filters. This gives additional flexibility allowing completely different filters to be downloaded according to user requirement.

The Recursive filter and Horizontal and Vertical Enhancement filters are always in circuit.

Either the Impulse Noise filter or the Brickwall filter may be selected by the user. The programs for each are stored on the unit. When the unit is in Local Mode, only the Impulse Noise Filter is available.

When the unit is in Remote Mode, the Brickwall Filter or the Impulse Noise Filter can be selected from the remote control interface (e.g.Windows or separate control panel).

4.2 General Controls

4.2.1 Windows Control

The controls available in the general panel of the Windows graphical user interface are as follows:-

- Bypass All. Bypasses all filters.
- Safemode. Prevents Freeze, Split, Test Pattern, Median Test Mode and level 7 on the Highlight NR and Lowlight NR from being inadvertently selected.
- Freeze. Freezes the picture.
- Split. Produces a vertical split with a white line. All filters are enabled on the right hand side and disabled on the left hand side.
- Test Pattern. Produces a Ramp test pattern

4.2.2 Front Panel Control

Bypass All and Split can be selected using the BYPASS /SPLIT/NR switch.

Safemode, Freeze and Test Pattern are unavailable from the front panel.



4.3 Board Presets

10 presets may be stored in non volatile memory on each board.

4.3.1 Windows Control

The Presets are controlled from the Board Preset panel of the V1645 control panel window.

- To save the current settings in one of the preset stores, click on the “Save” button first. This will make the storebutton surround turn red indicating that the unit is in “store mode”. Then click on the required store button. The current settings will be stored and the storebutton surround will revert to gray indicating that the unit is no longer in “store mode”.
- If “store mode” is inadvertently entered, it may be left without storing any settings by clicking on the “Save” button again.
- To recall a preset store, simply click on the required store button.
- The small button marked “F” allows the user to disable the “Save” button to prevent inadvertent overwriting of board presets.

4.3.2 Front Panel Control

Board Presets are not available from the front panel.

4.4 Recursive Filter

The recursive filter works on both luma and chroma components and is very effective in removing low amplitude random temporal noise (white noise) typically seen in off air and VTR sourced signals and also film grain.

It is a frame based recursive filter that includes a variable proportion of the previous output frame and the present input frame to create the next output frame. The filter is movement adaptive. This means that as more movement is detected, less filtering is applied. The adaption varies on a pixel by pixel basis.

4.4.1 Windows Control

The controls available in the Recursive filter panel of the Windows graphical user interface are as follows:-

- Recursion. Bypass (0) , or 3 strengths (1 to 3) may be selected. The higher settings are for more noisy input material and lengthen trailing effects.
- Highlight NR. This controls the movement sensitivity of the adaption in light areas of the picture. Movement sensitivity decreases as the control setting increases from 0 to 7. Levels 0 to 5 are suitable for material with low levels of noise and will produce only subtle trailing effects in moving parts of the picture. Level 6 is for very noisy material and trailing effects will be more noticeable. Level 7 will produce pronounced trailing effects and is intended for maximum noise reduction for still pictures.
- Lowlight NR. As Highlight NR above but for dark areas of the picture.
- Hi/Lo Switch. This has 16 settings and selects the luminance level that defines highlight and lowlight areas. Level 0 is peak black and level 15 is just under peak white. The purpose of having separate controls for light and dark areas is that film grain noise is often greater in dark areas of the picture. Higher levels of noise reduction in these areas is therefore necessary.
- Bypass. This bypasses the recursive filter only by setting the recursion level to 0.

4.4.2 Front Panel Control

The Recursive filter is controlled from the front panel as follows:-

- Set the Parameter Selector to 'White' and the Remote/Local switch to local.
- The Up/Down switch now controls the Highlight NR as described above. Hi/Lo Switch is fixed as 0. Therefore Highlight NR controls the Noise Reduction at all luminance levels. Recursion is fixed as 3 (max.).

4.5 Impulse Noise Filter

The Impulse Noise Filter is intended to remove the black and white impulses typically seen on low gain satellite links.

4.5.1 Windows Control

The controls available in the Impulse filter panel of the Windows graphical user interface are as follows:-

- Threshold. This control selects the threshold where inter frame differences are deemed to be movement..
- Filtering. This control has 8 settings from 'off' through to 'max'.
- When set to 'off', this control disables the median filter in all parts of the picture and is effectively a bypass control.
- When set to 'max', the median filter is activated in all parts of the picture irrespective of motion.
- The intermediate settings (1 through 6) progressively enable the median filter in more parts of the picture by progressively decreasing the margin around changing parts of the picture.
- Fast moving material will require a lower setting on this control, whereas more impulses will be removed from slow moving material if high settings are used.
- Apert. A 5 tap or 7 tap median filter aperture may be selected. The 7 tap is more effective at removing very high impulse rates but will introduce slightly more distortion than the 5 tap.
- Test.
- When 'HiLi' is checked, this control shows the parts of the picture where the median filter will be disabled as magenta superimposed on the input picture.
- When 'Show' is checked, this control shows the parts of the picture where the median filter will be disabled as white on a black background.
- If the unit is in Safe Mode, this control is disabled.
- CHANGE. This control allows the Impulse Filter to be replaced by the Brickwall Filter. While the filter changeover takes place (taking about 5 seconds), the noise reducer is bypassed.

4.5.2 Front Panel Control

The Impulse filter is controlled from the front panel as follows:-

- Set the Parameter Selector to 'Impulse' and the Remote/Local switch to local.
- The Up/Down switch now controls the 'Filtering' setting of the Impulse Filter. All eight levels from 'off' to 'max' are selectable.
- The Motion Threshold is always set to 8 and the Aperture is always set to ' 7 tap ' for front panel control.



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4.6 Brickwall filter

The Brickwall filter works on Luminance only and has a wide aperture to allow sharp cut-off slopes.

A series of 15 cut-off frequencies from 1.75mhz to 5.25mhz in 0.25mhz steps may be selected. For each cut-off frequency, one of four slopes may be selected ranging from shallow to sharp.

4.6.1 Windows Control

The controls available in the Brickwall filter panel of the Windows graphical user interface are as follows:-

- Freq. This control selects the cut-off frequencies. It has 16 levels. 0 is flat (bypass) 1 is 5.25mhz and the cut off frequency decreases in 0.25mhz steps as the control is increased to 15.
- Slope. This control selects the filter slope. 4 levels are available, 1 being the shallowest and 4 being the steepest.
- Bypass. This bypasses the Brickwall filter only.
- CHANGE. This control allows the Brickwall Filter to be replaced by the Impulse Filter. While the filter changeover takes place (taking about 5 seconds), the noise reducer is bypassed.

4.6.2 Front Panel Control

The Brickwall filter is not available for control by the front panel.

4.7 Horizontal and Vertical Enhancement

Separate horizontal and vertical filters work on both luma and chroma components. Different settings for luma and chroma may be selected.

Both aperture correction (emphasising high frequencies) and some low pass shallow slope cut off filter shapes are selectable.

Luma Peak and Chroma Peak controls are available to give lift or droop around 3.375mhz and 1.7mhz for luma and chroma respectively. They can be used to aperture correct at lower frequencies in conjunction with the main horizontal luma and chroma controls or the brickwall filter.

4.7.1 Windows Control

The controls available in the Enhance panel of the Windows graphical user interface are as follows:-

For each of the controls below 0 is flat (bypass) positive numbers represent increasing lift at high frequencies and negative numbers represent increasing droop at high frequencies.

- Horizontal Luma. This control can be varied from -8 to +8.
- Horizontal Chroma. This control can be varied from -8 to +8.
- Vertical Luma. This control can be varied from -16 to +16.
- Vertical Chroma. This control can be varied from -16 to +16.
- Advance. This control makes the LumaPeak and ChromaPeak controls available and increases the range available on the Horizontal Luma and Chroma controls above.



- Luma Peak. This control can be varied from -8 to +8. 0 is flat (bypass) positive numbers represent increasing lift at middle frequencies (3.375MHz) and negative numbers represent increasing droop at middle frequencies.
- Chroma Peak. This control can be varied from -8 to +8. 0 is flat (bypass) positive numbers represent increasing lift at middle frequencies (1.7MHz) and negative numbers represent increasing droop at middle frequencies.
- Bypass. This bypasses the Enhancement filter only.

4.7.2 Front Panel Control

The Enhancement filter is controlled from the front panel as follows:-

- Set the Remote/Local switch to local.
- To control Horizontal Luma, set the Parameter Selector to 'H'.
- To control Vertical Luma, set the Parameter Selector to 'V'.
- Positive numbers represent increasing lift at high frequencies and negative numbers represent increasing droop at high frequencies.
- Horizontal and Vertical chrominance enhancement, Chroma and Luma Peak are set to flat (bypass) when in local mode.



5. RECOMMENDED SETTINGS

5.1 Introduction

This section gives a guide to the most appropriate settings to use for different types of picture material. To obtain optimum results it is strongly recommended that the RS485 control facility with its associated Windows Graphical User Interface is employed as this has much more extensive control capability than is possible on the module's front panel. (See Installation and Operation Manual Section 3.5.) The guidance given here assumes that this method of control is in use.

The settings quoted here are intended as a starting point that will give good results. It is possible that minor variations to the setting quoted will be necessary for optimum results with a given type of picture material.

5.2 General Guidance

In general, use only the minimum amount of correction necessary to achieve the desired amount of noise reduction, as excessive settings can cause unwanted picture degradation. For example, the impulse filter is very effective in removing satellite circuit "sparklies" but care is needed to optimise the filter settings where there is fast movement present in the picture. If the picture material does not suffer from impulse noise, then it is best to select the brickwall filter rather than the impulse filter so that this additional facility is available for the reduction of "normal" video noise.

5.3 Reducing Random Temporal ("White") Noise

5.3.1 Recursion

For material where the random noise is disturbing, set to **3**

To "clean up" material that has noise only visible on close examination, use setting **2**

5.3.2 Highlight Noise Reduction

Set to **4**

5.3.3 Lowlight Noise Reduction

Set to **5**

5.3.4 Hi/Lo Switch

Set to **8**

5.3.5 Brickwall Filter

If some reduction in high frequency luminance is acceptable, a further small improvement in noise may be achieved by using the brickwall filter with the frequency set to **4.0 or 4.25 MHz** and the slope set to **4**.



5.4 Improving Picture Sharpness

If the source picture material is “soft” as well as noisy, the following measures may be used in conjunction with the settings in 3 above. The settings create a mid-band peak in the luminance frequency response which improves subjective sharpness with little or no noise penalty.

5.4.1 Horizontal Enhance

Select **Advanced**.

Set **Luma Peak** to **12**. (All other Horizontal Enhance Settings at zero).

5.4.2 Vertical Enhance

Set **Luma Peak** to **12**. (All other Vertical Enhance settings at zero).

5.5 Reducing Impulse Noise

5.5.1 Filtering

Set to **2**.

5.5.2 Threshold

Set to **8**.

5.5.3 Aperture

Set to **5 tap**.



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6. TROUBLE SHOOTING

Trailing after moving objects. Excessive recursive filter settings. Reduce recursion level and/or highlight and lowlight NR settings.

Lowlight control not displayed on control screen. Hi/Low switch set to "0". Increase switch setting and Lowlight control will be displayed.

Break-up of white lines against dark background (or vice-versa). Too much impulse filter correction. Reduce filtering or threshold settings.

Grossly distorted black & white picture or magenta superimposed on picture. Impulse filter test mode selected (see Installation and Operation Manual Section 4.5.1). Select test mode to off.

Split, Freeze, Test Pattern not selectable. Safe mode selected. Deselect if these facilities are required.

Controls appear not to have expected effect. Check state of individual filter bypass and "bypass all" selections.