



OWNER'S OPERATING MANUAL

VIRTUALTM
HIGH DEFINITION

VHD-4404 ULTRA

Virtual High Definition Processor With Aspect Ratio Control



THE WORLD'S FINEST HOME THEATER PRODUCTSTM



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Warnings and Safety Precautions _____

CAUTION:

To turn off main power, be sure to remove the plug from power outlet. The power outlet socket should be installed as near to the equipment as possible, and should be easily accessible.

REMARQUE:

Pour mettre l'appareil hors circuit, s'assurer de retirer la fiche de la prise d'alimentation. La prise d'alimentation doit être installée aussi proche que possible de l'appareil et doit être facile d'accès.

 **WARNING**

TO PREVENT FIRE OR SHOCK HAZARDS, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE. ALSO DO NOT USE THIS UNIT'S POLARIZED PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLETS, UNLESS THE PRONGS CAN BE FULLY INSERTED. REFRAIN FROM OPENING THE CABINET AS THERE ARE HIGH-VOLTAGE COMPONENTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

 **AVERTISSEMENT**

POUR EVITER UN FEU OU UN RISQUE D'ELECTROCUTION NE PAS EXPOSER CET ENSEMBLE A LA PLUIE OU A L'HUMIDITE; DE MEME, NE PAS BRANCHER LA PRISE POLAIRE AVEC UNE RALLONGE A MOINS QUE LES DENTS DE LA PREMIERE NE S'Y INSERENT PLEINEMENT.

EVITER D'OUVRIR LE COFFRET CAR IL Y A, A L'INTERIEUR, DES COMPOSANTS SOUMIS A UNE HAUTE-TENSION; POUR LES REPARATIONS, S'ADRESSER A UN PERSONNEL QUALIFIE.

WARNING:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at his own expense.

DOC compliance Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

DOC avis de conformation

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le Matériel D'interférence du Canada.

Safety Tips

Please read and follow the safety precautions listed below to ensure the equipment is free from damage, and to ensure that no injury will occur as a result of improper use.

- Do not insert any object, especially metal or liquids, into the **VHD-4404 ULTRA**.
- Do not place any objects containing water or any other liquid on top of the **VHD-4404 ULTRA**
- Do not place the unit in direct sunlight, near heaters or in extremely dusty or humid locations
- Do not install this unit outdoors or otherwise exposed to the elements
- Do not place heavy objects on top of the unit
- If the power cord is damaged or frayed in any way, electrical shock and/or fire may result. Please do not place objects on the power cord, and keep the cord away from heat-emitting devices. Should the power cord become damaged in any way, please contact your Runco dealer for a replacement cord.
- Do not remove the cover of the unit for any reason. If any problems arise with the unit, please contact a Runco dealer or Runco International for service. Removing the cover will void the warranty.

INTRODUCTION

General Description

Welcome to the high-end world of Runco video processing! Your new **VHD-4404 ULTRA** has been designed to be flexible enough to be compatible with virtually any type of display device, from different types of CRT projectors to various types of fixed pixel displays. In addition, it will provide aspect ratio control for those displays that would otherwise not have that capability, whether on a standard 4:3 screen or a 16:9 (wide) screen.

In general, this processor will greatly improve the video quality and efficiency of the display device it will be used with. For CRT projectors, the scan rate output of the processor can be set so as to maximize the resolution AND light output of the projector it is to be used with. For example, projectors with smaller CRTs (i.e. 7") might be used with a scan rate of 540p or 600p; projectors with larger CRTs (i.e. 8" or 9") might use 840p, 960p or even 1080p. And for fixed-pixel displays, the various output resolutions will accommodate many different displays, including DLP™, LCD, D-ILA and even Plasma monitors. The most efficient way to process video for a fixed-pixel display is to feed the display with a resolution matched pixel-for-pixel to the display's native resolution.

Finally, many displays do not include any type of aspect ratio control, or have aspect ratio control limited to 4:3 screens. The **VHD-4404 ULTRA** can provide three geometrically correct aspect ratios whether the display is on a 4:3 screen OR a 16:9 screen. In a nutshell, your **VHD-4404 ULTRA** will expand the use of any compatible display device while providing top-notch video processing no other processor can match.

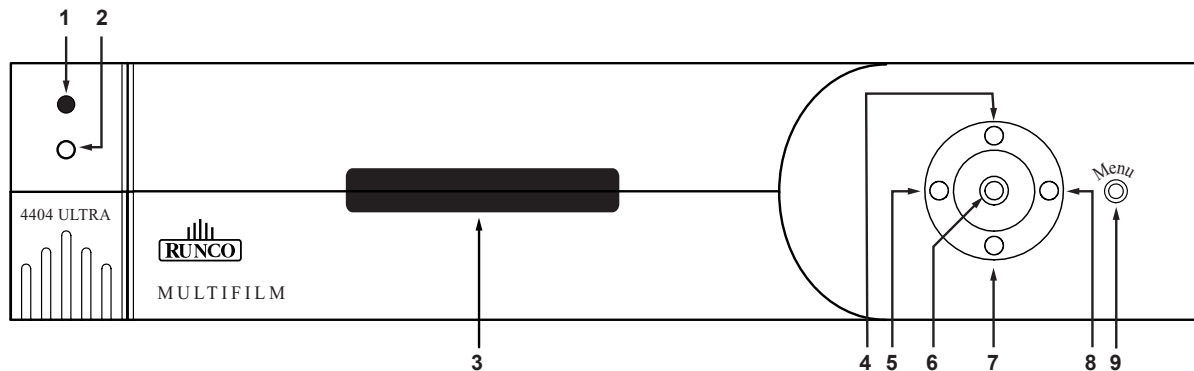
Features and Benefits

The **VHD-4404 ULTRA** has many great features and benefits that make it a flexible, high-quality processor. Its many benefits include:

- An adaptive 2-dimensional comb filter that greatly reduces artifacts when using a composite video signal as an input.
- A Luma edge enhancement circuit makes the edges of objects appear sharper without the ringing and noise increase associated with traditional sharpness circuits
- A Chroma edge enhancement circuit is included to compensate for lower chroma resolution found in composite and S-video.
- Inverse Telecine (3:2 pulldown) detection and processing allows the scaler to almost completely eliminate interlace artifacts associated with other scalers
- The controller can correctly scale anamorphic, letterbox and 4:3 formats to fit on a wide aspect-ratio screen, and scale anamorphic formats on a 4:3 screen
- A pass-through connector is supplied for routing HDTV or computer graphics directly to the display.
- An RS-232 input is provided for easy integration into the automated home theater environment
- A TBC (Time Base Corrector) circuit is provided for unstable sources such as VCR's.
- 12V outputs are provided for drop screens and screen masking.
- A simple 7-button remote controls all aspects of operation. One button source selection and aspect ratio control is also provided via the remote control.

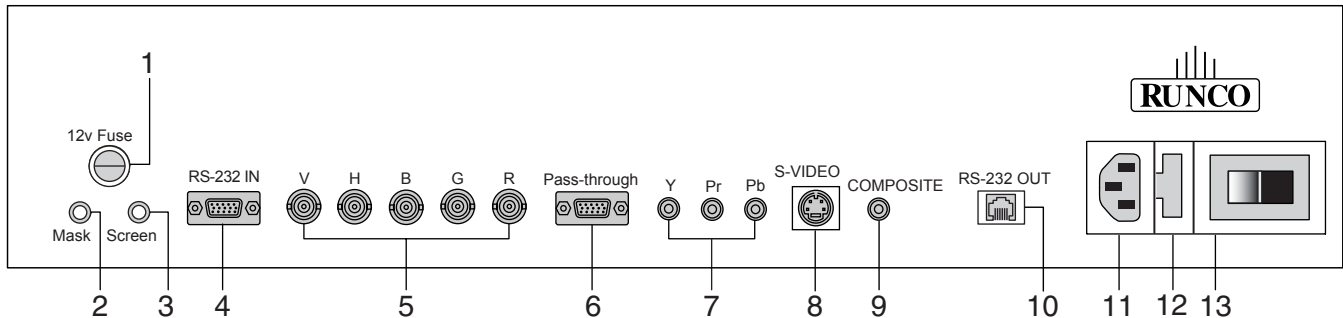
FRONT AND REAR PANEL DESCRIPTIONS

Front Panel



- 1. IR RECEIVER**
Receives the IR commands from the remote control.
- 2. POWER BUTTON**
Toggles the power on and off. For a discreet on or off command, you can use the direct access buttons.
NOTE: When the main AC power switch is first turned ON, the processor will go through an initiation cycle for approximately 15 seconds. The processor cannot be turned on or operated until the initialization is complete
- 3. LED DISPLAY**
Indicates the model#, current source, scan rate or resolution and aspect ratio.
- 4. UP BUTTON**
When no menus are present on-screen, the UP button will toggle you through aspect ratios in the following order:
Standard (4:3) → Letterbox → Anamorphic
When the menu is on-screen, the UP button will move the cursor up within the menu.
When an adjustment item has been selected (i.e. brightness), the UP button will increase the value of that function.
- 5. LEFT BUTTON**
When no menu is present on-screen, the LEFT button will toggle you through the four different sources, in the order of:
Pass-through → Component → S-Video → Composite
- 6. ENTER BUTTON**
When an item is highlighted on the On-Screen Display, the ENTER button will select the item.
- 7. DOWN BUTTON**
When no menu is present on-screen, this button will toggle you through the different aspect ratios.
When the menu is on-screen, the down button will move the cursor down within a menu. When an adjustment function has been selected (i.e. brightness), the DOWN button will decrease the value of that function.
- 8. RIGHT BUTTON**
When no menus are present on-screen, the RIGHT button will toggle you through the four different sources, in the order of:
Composite → S-Video → Component → Pass-through
- 9. MENU BUTTON**
Pressing the MENU button will bring up the main menu. If no action is taken within approximately 10 seconds, the menu will time-out (disappear). Also, if you are in an adjustment mode or function, pressing MENU will bring the menu back one level.

Rear Panel



1. 12v Fuse

This fuse protects the 12v outputs from the MASK and SCREEN jacks.
(Screen Fuse: 5mm x 25mm, AGC, 0.5A 250V Fast Acting, 250V, Fast Blow)

2. Mask

This is a 12V output that is used to trigger masking on screens that have that capability.
(For use on motorized screens only).

3. Screen

This is a 12V output that is used to trigger the screen to drop.
(For use on motorized screens only).

4. RS-232 In

This is for systems using serial (RS-232) to control the **VHD-4404 ULTRA**.

5. RGB OUTPUT

This is the main output of the **VHD-4404 ULTRA**. The RGB Signal goes directly to the projector; If component is used through the pass-through, then only the R (Pr), G(Y) and B(Pb) jacks will be active. Individually, the jacks are: V=vertical sync, H=horizontal sync, B=Blue, G=Green, R=Red.

NOTE: If setting the output for 'sync on green' or 'component' (see Installation Menu section); disconnect the sync cables (H & V) from the processor. If using composite sync, the sync output will be on the 'H' connector.

6. Pass-through

Anything input to this port will by-pass the processing of the **VHD-4404 ULTRA** and be sent straight to the display. This is useful for computer graphics and HDTV signals which do not require processing.

7. Component Input

This is the input for component video from sources such as DVD players.

Note:

The component output from a DTV decoder or a progressive-scan DVD cannot be used with this port; it must be input to the Pass-through port.

8. S-Video Input

This is the input for S-video from sources such as Satellite receivers, S-VHS VCR's and DVD players.

9. Composite Video Input

This is the input for Composite video from sources such as Laser disc players, VCRs and other miscellaneous video sources.

10. RS-232 OUT

Reserved for future use.

11. Power Input

Plug in main power here.

12. 115 VAC Fuse

This is the main AC input fuse.

(Main Fuse: 5mm x 20 mm, 500mA, 250v, Slow Blow)

13. Main Power Switch

Disconnects or applies main power to the processor.

REMOTE CONTROL DESCRIPTION

A. IR OUTPUT INDICATOR

Illuminates when a button is pressed, indicating that an IR signal is being transmitted.

B. POWER BUTTON

Toggles the power on and off. For a discreet on or off command, you can use the direct access buttons (see 'J'). **Note:** When the main AC power switch is first turned ON, the processor will go through an initiation cycle for approximately 15 seconds. The processor cannot be turned on or operated until the initialization is complete.

C. UP BUTTON

When no menus are present on-screen, the UP button will toggle you through aspect ratios in the following order:

Standard (4:3) → Letterbox → Anamorphic

When the menu is on-screen, the UP button will move the cursor up within the menu. When an adjustment item has been selected (i.e. brightness), the UP button will increase the value of that function.

D. LEFT BUTTON

When no menus are present on-screen, the LEFT button will toggle you through the four different sources in the following order:

Pass-through → Component → S-Video → Composite

E. DOWN BUTTON

When no menus are present on-screen, the DOWN button will toggle you through aspect ratios in the following order:

Anamorphic → Letterbox → Standard (4:3)

When the menu is on-screen, the DOWN button will move the cursor down within the menu. When an adjustment item has been selected (i.e. brightness), the DOWN button will decrease the value of that function.

F. RIGHT BUTTON

When no menus are present on-screen, the RIGHT button will toggle you through the four different sources in the following order:

Composite → S-Video → Component → Pass-through

G. MENU BUTTON

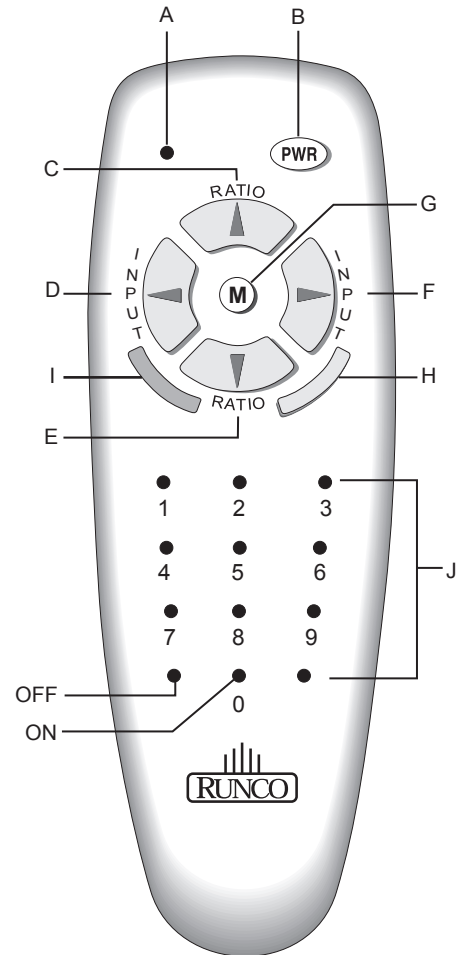
Pressing the MENU button will bring up the main menu. If no action is taken within approximately 10 seconds, the menu will time-out (disappear). Also, if you are in an adjustment mode or function, pressing MENU will bring the menu back one level.

H. ENTER BUTTON

When an item is highlighted on a menu, pressing ENTER will select that item.

I. PROGRAM BUTTON

If the remote control loses its 'memory' as a result of weak or dead batteries, it must be re-programmed for the **VHD-4404 ULTRA's** code set. To reprogram the remote, press the PROGRAM button followed by 0,1,3. **Note:** Pressing Enter after typing in the code is not necessary.



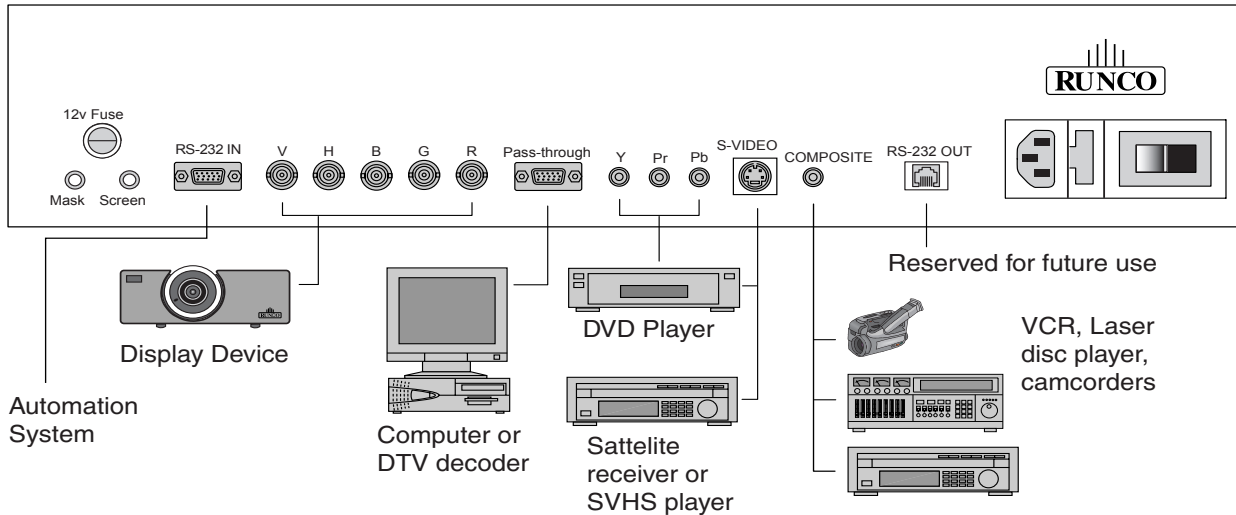
J. DIRECT ACCESS BUTTONS

These buttons will allow you to directly access an aspect ratio, source, or turn the unit on or off without having to go through any menus. These buttons are:

- 1: Selects COMPOSITE video
- 2: Selects S-video
- 3: Selects COMPONENT video
- 4: Not used
- 5: Selects PASS-THROUGH
- 6: Enables or Disables the Installation Menu (see page 18)
- 7: Selects the ANAMORPHIC aspect ratio
- 8: Selects the STANDARD (4:3) aspect ratio
- 9: Selects the LETTERBOX aspect ratio
- 0: Turns the processor ON.
- OFF: Also known as the button left of '0', this turns the processor OFF.

QUICK SET-UP GUIDE

Connection Examples



While there are many different ways to connect your source equipment to your **VHD-4404 ULTRA**, the examples shown above are the most common.

• COMPOSITE VIDEO INPUT:

Composite video is the most common type of signal used, but is also the lowest in picture quality. Many sources have outputs that are limited to composite video, such as some VCR's and camcorders; others such as Laser Disc players actually produce slightly better results when using composite video.

• S-VIDEO INPUT

S-video is the second-best type of signal that can be used, but is MUCH better than composite video. Using such sources as Satellite receivers, high-quality VCRs and DVD players (with no component output) will produce a MUCH cleaner and sharper signal.

• COMPONENT INPUT

Component video is the best type of signal that can be used. The most common sources that use component outputs are DVD players, and it is highly recommended that component be used when possible. Component video goes one step beyond S-video in picture quality; chroma (color) information is more resolved and the overall picture appears more well-defined.

• PASS-THROUGH

This input is used to 'pass-through' any high-definition or computer signals that do not require processing. The signal by-passes the **VHD-4404 ULTRA's** processing and is sent directly to the display. The pass-through may be used for COMPONENT outputs from a DTV decoder, a progressive-scan DVD player or RGB outputs from a computer or other high-resolution sources.

Getting Started

Now that your **VHD-4404 ULTRA** has been installed, it's time to get it configured for use in your system. Please follow the procedures and recommendations below:

1. First, connect all sources (DVD, VCR, Satellite receiver, etc.) to the **VHD-4404 ULTRA**, if this has not already been done. Also, ensure all sources are ON and functioning, if possible.
2. Connect the RGB (or component) output of the **VHD-4404 ULTRA** to the display device it is to be used with. NOTE: It may be necessary to set the 'output format' and 'scan rate' in the Installation menu to match the input type and scan rate of the display device it is to be used with (see page 19).
3. With everything properly connected, turn the **VHD-4404 ULTRA** on, followed by the display device itself.
4. If the output scan rate and output format have not been optimized for the display device the processor will be used with, set them now (see page 19 for recommendations).
5. Next, set the 'screen type' in the installation menu, either 16:9 screen (for installations using widescreens or other display devices with a 16:9 aspect ratio (i.e. a plasma display)) or 4:3 screen for those displays using a 4:3 screen only.

Once the initial settings have been completed, the 'front panel settings' (color, tint, sharpness, etc.) can be adjusted for each aspect ratio. The calibration procedures for these adjustments are outlined in 'picture quality adjustments', page 15.

Overall Functional Description

The **VHD-4404 ULTRA** has many useful purposes. It has many different scan rate outputs that can match most types of displays, including CRT projectors and fixed-pixel displays. Also, the sync polarity and output type (RGB, Component, Sync on green, etc.) can be changed to meet the requirements of the display device, ensuring that the **VHD-4404 ULTRA** will be fully compatible in all respects to just about every type of display.

In addition to being compatible with most displays, it also includes aspect-ratio control. This is extremely beneficial for those displays that do not have any type of aspect ratio control, as all movies can now be viewed in their native format instead of having to settle for 4:3.

So, how does the **VHD-4404 ULTRA** work, anyways? In a nutshell, the **VHD-4404 ULTRA** is an advanced processor known as a SCALER. A scaler takes the interlaced NTSC signal (such as that from a standard DVD player or VCR, for example), de-interlaces it, and then scales it to one of many selectable resolutions. It is the advanced Runco scaling algorithms that gives the **VHD-4404 ULTRA** the ability to change not only scan rates and resolutions, but aspect ratios as well.

Compatibility

As mentioned, the **VHD-4404 ULTRA** is compatible with many types of display devices. To ensure a display device is capable of working with the **VHD-4404 ULTRA**, it must have the following specifications:

- Capable of a horizontal scan rate of at least 31.5 KHz
- Capable of a resolution of at least 854 x 480
- Can accept RGB (separate or composite syncs, or sync on green), or component signals

In addition, the processor is designed to work properly on widescreens with an aspect ratio of either 1.78:1 (16:9) or 1.85:1, or any 4:3 screen. The processor is not designed to provide aspect ratio control for 2.35:1 screens.

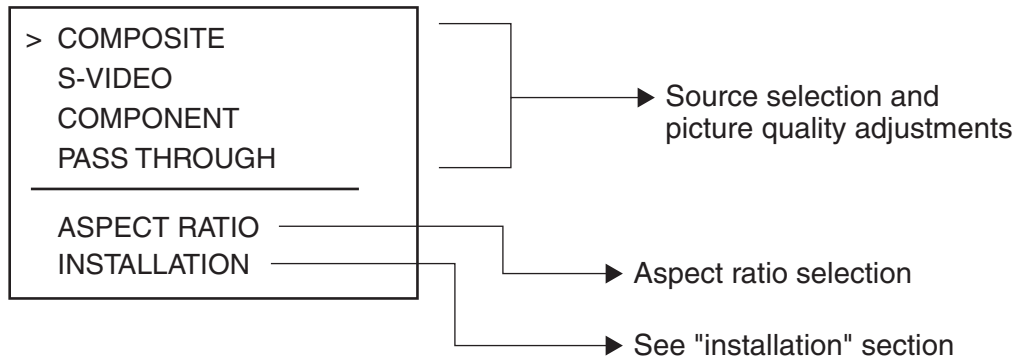
For input signals, the **VHD-4404 ULTRA** can accept NTSC or PAL signals from most typical sources. This includes interlaced signals from standard DVD players, Satellite receivers, VCRs, Laser Disc players, camcorders and other similar equipment. For higher-resolution signals such as a computer, high-definition decoder or progressive DVD players, these signals **MUST** be connected to the Pass-through port. *The VHD-4404 ULTRA will not accept progressive signals on its Component input port (i.e. progressive DVD players).*

Please ensure that your display device is compatible with any high-resolution signal you input to the pass-through port. NOTE: The **VHD-4404 ULTRA** will not process any signal on its pass-through port; it will simply loop the signal directly to its output. Also, the pass-through port will not convert component signals to RGB signals; component signals input to the pass-through port will be output as component signals.

MENU DESCRIPTION AND NAVIGATION

Main Menu

MAIN MENU



When the MENU button is pressed on either the remote control or the front panel, the main menu will appear on-screen. An example of the main menu is shown above.

The active source is indicated by an arrow to the left of the source; note that in the example above, Composite is the current source.

To select a source via the main menu, press either the up or down buttons on the remote or front panel and highlight the desired source, and press ENTER. Otherwise, you may select a source by pressing either the left or right arrow buttons (on the remote or front panel) when no menus are on-screen, or by pressing one of the direct access buttons on the remote control (recommended; see page 10).

If pass-through is selected, note that no on-screen menus will be displayed since the signal is simply being 'looped' directly to the RGB output. When pass-through is the selected source, pressing MENU will automatically select S-video as the source. If you wish to choose another source, Runco recommends using the direct access buttons to select the desired source as opposed to pressing MENU.

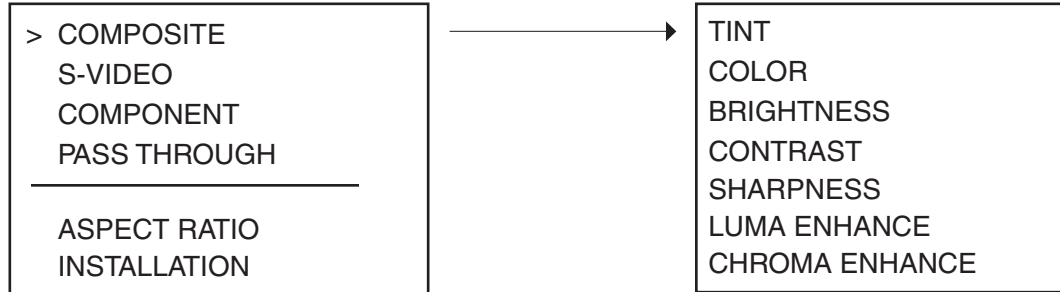
Aspect Ratio provides selection of one of three aspect ratios: Anamorphic, Letterbox or standard 4:3. To select an aspect ratio via the main menu, press either the up and down buttons on the remote or front panel, highlight ASPECT RATIO and press ENTER. The aspect ratio menu will then appear with the three choices; highlight the desired aspect ratio with the up or down buttons and press ENTER. Otherwise, you may select an aspect ratio by pressing either the up or down arrow buttons (on the remote or front panel) when no menus are on-screen (see page 10), or by pressing one of the direct access buttons on the remote control (recommended; see page 10).

Installation is where the scan rate and sync types can be adjusted, as well as screen types, 'side bar' levels, image shift and blanking controls. A full description of this menu is on page 18.

NOTE: If INSTALLATION does not appear on the main menu, see page 18 for an explanation on how to access the Installation menu.

Picture Quality Adjustments

MAIN MENU



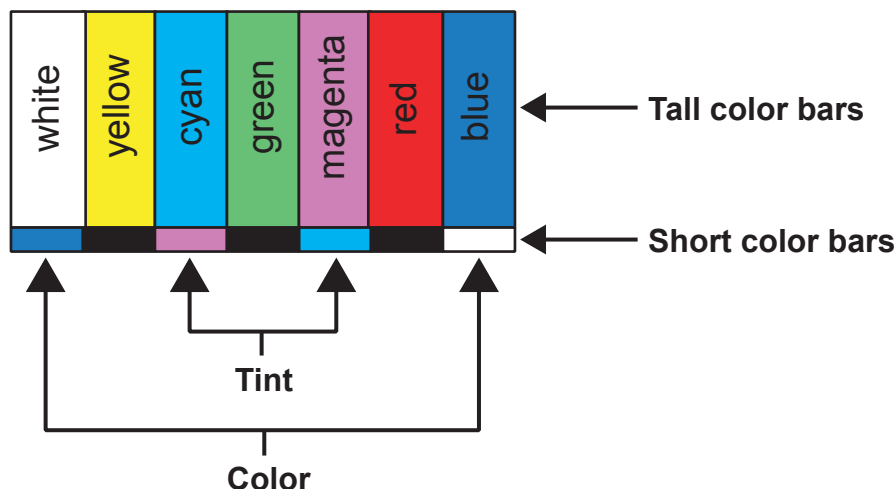
Picture quality adjustments (also known as "Front Panel Controls") are the controls that change different parameters of the image such as the amount of color, black level, etc. While these adjustments can be set to suit the needs of the user, there is a way to set these properly. This section will describe what each function does and how to adjust them properly.

To access the picture quality adjustments, press MENU, highlight the active source (indicated by the arrow) and press ENTER. The picture quality sub-menu will then appear (see above).

To make an adjustment to a particular function, highlight the function with the up or down arrow buttons and press ENTER. Once the function is on-screen (i.e. brightness), pressing the UP arrow button on the remote or front panel will increase the value of that function; pressing the DOWN arrow on the remote or front panel will decrease the value of that function.

While each of the picture quality adjustments can be set to suit the needs of the user, there is a 'proper' way to set the adjustments. For setting TINT and COLOR, please refer to the color bar test pattern below.

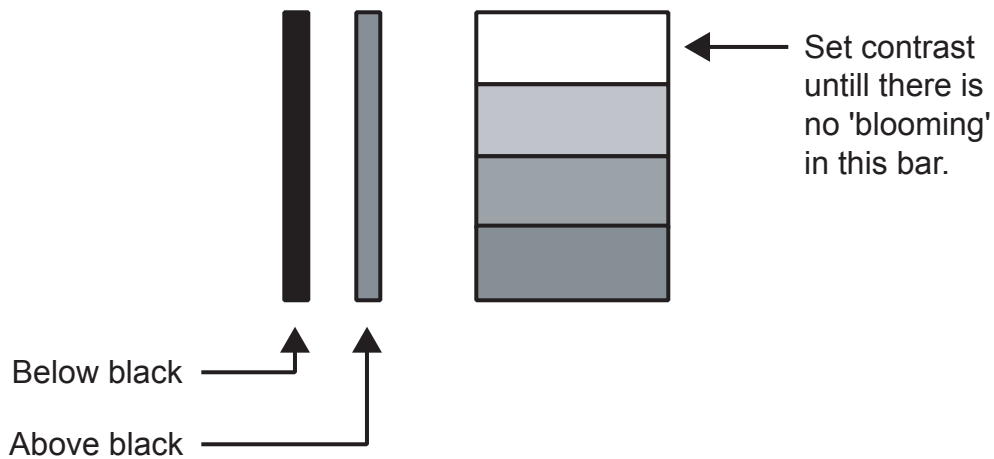
NOTE: For many display devices, a BLUE FILTER must be used so only the blue color bars can be seen; if no blue color filter is available, see if the display device has the ability to mute (turn off) the red and green colors via its menu structure (most CRT projectors have this feature). Blue filters are provided with the Video Essentials or AVIA test DVDs, or can be purchased from the Imaging Science Foundation (www.imaging-science.com).



TINT (also known as 'hue') is essentially the ratio of red to green in the color portion of the image. If TINT is decreased, the image will appear redder, and increasing it will cause the image to appear greener. To set TINT properly, look at the color bar pattern through a blue filter (or mute the red and green outputs). Adjust TINT until the middle two tall color bars match the middle short color bars (see color bar drawing).

COLOR (also known as 'saturation') increases or decreases the amount of color in the image. To set COLOR properly, look at the color bar pattern through a blue filter (or mute the red and green outputs). Adjust COLOR until the outer two tall color bars match the outer short color bars (see color bar drawing).

For setting **CONTRAST** and **BRIGHTNESS**, please refer to the PLUGE pattern below:



CONTRAST adjusts the white level of the image. To adjust this properly for CRT projectors, adjust CONTRAST until there is no blooming (or distortion) in the brightest bar in the PLUGE pattern (see above).

For Fixed-pixel displays, adjust contrast until there is a distinct definition between the two brightest bars.

NOTE: For best results, Runco recommends that CONTRAST be set to '0' or very close to it.

BRIGHTNESS adjusts the black level of the image. To adjust this properly, adjust BRIGHTNESS until the 'below black' bar JUST disappears, but the 'above black' bar is still barely visible.

NOTE: Some DVD players cannot pass the 'blacker than black' bar (they won't pass PLUGE), and that bar will never be visible. In a case like this, adjust the 'above black' bar until it is slightly brighter than the background that surrounds it.

SHARPNESS adjusts the amount of high-frequency detail in the image. This can be adjusted to the preference of the user. Keep in mind that when SHARPNESS is decreased, fine details in the image will become 'soft'; when it is increased, fine details will become sharper but will also make the picture appear 'noisy' if adjusted too high.

LUMA ENHANCE acts as an edge enhancement, especially around black to white transitions in the image. Essentially, this has the same characteristics as sharpness but affects the edges of objects far more than the rest of the image.

FREQUENCIES HIGH/LOW affect the overall range of the LUMA ENHANCE feature. For example, if using a lower-quality video source such as a VCR, the FREQUENCIES should be set to LOW. For a good quality source such as a DVD player, set FREQUENCIES to HIGH. To set FREQUENCIES, press ENTER while LUMA ENHANCE is on-screen.

CHROMA ENHANCE acts as an edge enhancement, especially around color transitions in the image. Essentially, this has the same characteristics as sharpness but affects the edges of objects far more than the rest of the image.

FREQUENCIES HIGH/LOW affect the overall range of the CHROMA ENHANCE feature. For example, if using a lower-quality video source such as a VCR, the FREQUENCIES should be set to LOW. For a good quality source such as a DVD player, set FREQUENCIES to HIGH. To set FREQUENCIES, press ENTER while CHROMA ENHANCE is on-screen.

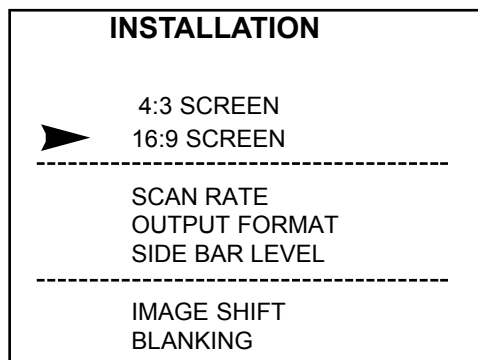
Installation Menu

The Installation menu is where you can adjust the scan rate and sync type, as well as set the type of screen (4:3 or 16:9), shift the image or set blanking, and even set the level of the 'sidebars'.

When the **VHD-4404 ULTRA** is turned on for the first time, the INSTALLATION item will not appear in the main menu. To enable the INSTALLATION menu, there are two options:

- With the processor *ON* and no menus on-screen, simultaneously press the *ENTER*, *UP* and *LEFT* buttons (you don't need to hold them down). Release the three buttons and press *MENU*, ensure INSTALLATION is now on the bottom of the main menu.
- With the remote control, press button 6 (with no menus on-screen). After pressing '6', press *MENU* and ensure INSTALLATION is now on the bottom of the main menu.

After INSTALLATION has been accessed, press *MENU*, highlight INSTALLATION and press *ENTER*. This will bring up the INSTALLATION MENU, shown below:



Screen Type

When you are installing the processor for the first time, the first order of business is to define what type of screen will be used with this system. If a 1.78:1 (16:9) or 1.85:1 screen is used, highlight 16:9 SCREEN and press ENTER. If a standard 4:3 screen is installed, highlight 4:3 SCREEN and press enter.

The purpose of defining the screen type is to tell the processor how to create aspect ratios (see page 27 for a definition of aspect ratios). For example, on a 16:9 screen, the letterbox and anamorphic aspect ratios will use the entire 16:9 screen, and the 4:3 aspect ratio will be displayed in the center of the 16:9 screen (you'd have 'black bars' on the left and right sides of the image).

On the other hand, on a 4:3 screen, the 4:3 aspect ratio would fill the screen, but the letterbox and anamorphic aspect ratios would be displayed in the center of the screen vertically (there would be 'black bars' on the top on bottom of the image).

Important note on aspect ratios for 4:3 screens: If 4:3 SCREEN is selected, the only way the processor will provide all three aspect ratios is if one of the FIXED PIXEL scan rates are selected (i.e. 1024 x 768). The processor will NOT provide three aspect ratios on a 4:3 screen if a CRT scan rate is selected (i.e. 600p). The reason for this is that CRT projectors will provide the best resolution if two separate memories are created by the projector itself, one for anamorphic, one for full 4:3. This way, the CRT projector can provide the maximum number of lines of resolution on either aspect ratio since it is simply compressing a 4:3 image to an anamorphic image. Therefore, Runco recommends that the CRT projector create the aspect ratios on 4:3 screens (if possible) for best results.

For fixed pixel displays, the number of pixels cannot be changed nor do many of the displays provide the ability to create aspect ratios. Therefore, the **VHD-4404 ULTRA** will provide three full aspect ratios for fixed pixel displays (WHEN a fixed-pixel scan rate is selected) for use on 4:3 screens.

In any event, if 16:9 SCREEN is selected, the **VHD-4404 ULTRA** will provide three aspect ratios regardless of the selection of the scan rate type or display device used.

Scan Rate

SCAN RATE is how many lines of resolution can be output in a single image. For example, 540p means that there are 540 visible lines of resolution, and 'p' means the signal is PROGRESSIVE. A Progressive output is where ALL lines of resolution will be displayed during each frame as opposed to an INTERLACED signal, which only displays half the lines of the frame during one field and the other half the next. Progressive outputs are far better than Interlaced outputs as all lines of resolution are always displayed, and fixed-pixel displays produce far better results when using a progressive signal.

The fixed-pixel outputs are also progressive, but are referred to in PIXELS (Picture Elements) as opposed to the actual number of lines of resolution. This is because fixed-pixel displays are referred to in their native resolution in pixels, i.e. 1024 x 768 (meaning 1024 vertical rows of pixels and 768 horizontal rows of pixels).

Selecting a scan rate for your display device is an extremely important task. The first thing that should be done is to determine what scan rate will provide the best results for your display. The following are some guidelines that will assist you in determining the best possible scan rate for your type of projector.

Selecting A Scan Rate

To select a scan rate, first determine which type of display will be used with the **VHD-4404 ULTRA** (see 'Fixed pixel displays' or 'CRT displays' below). If the display is a FIXED PIXEL display, you'll want to use one of the FIXED PIXEL scan rates. If using a CRT projector, you'll want to use one of the CRT scan rates.

To select a scan rate, follow this procedure:

- Press MENU and ensure 'INSTALLATION' is on the bottom of the menu. If it's not, enable the INSTALLATION menu using the procedures on page 18.
- Using the up or down arrow buttons, highlight INSTALLATION and press ENTER.
- Once the INSTALLATION menu is on-screen, use the up or down arrow buttons to highlight SCAN RATE and press ENTER.
- Note that at the top of the SCAN RATE menu that it will say either "SCAN RATE-CRT" or "SCAN RATE-FIXED PIXEL"; if it indicates the wrong mode for your system (i.e. you have a CRT projector but the menu says "FIXED PIXEL"), simply highlight the word "MORE..." on the bottom of the menu and press ENTER. This will toggle you to the appropriate scan rate type for your display.
- Next, highlight the desired SCAN RATE and press ENTER. The **VHD-4404 ULTRA** will immediately go to that scan rate. To confirm your scan rate selection, you must press MENU within ten seconds or the processor will revert to the scan rate it was at before you made the selection. Runco recommends that you ensure your display device produces an image before confirming the scan rate. If it does not, allow the processor to revert to its previous scan rate and consult the owner's manual of your display to see what its scan rate or resolution capabilities are.

SCAN RATE-CRT	SCAN RATE-FIXED PIXEL
540p	800 x 600
>600p	854 x 480
720p	1024 x 768
768p	1024 x 768 (A)
840p	1280 x 768
960p	1366 x 768
1080p	1280 x 1024
	1366 x 1024
MORE...	MORE...

SCAN RATE menus:

Note that the arrow indicates the currently selected scan rate (600p, in this example).

Fixed Pixel Displays

A fixed pixel display can be one of several types of displays, including Plasma (flat panel) displays, DLP™ projectors, LCD projectors and D-ILA projectors. Selecting a scan rate for these types of displays is actually quite easy since the display has a fixed resolution, commonly known as the display's native resolution.

To determine which scan rate output to use, first determine your display's native resolution. For example, if you have a DLP™ or an LCD projector with a native resolution of 1024 x 768, set the SCAN RATE for 1024 x 768. If the display has a native resolution of 1024 x 768 and is using an anamorphic lens, select 1024 x 768 (A).

Runco recommends that for fixed-pixel displays the output scan rate ALWAYS be set to match the native resolution of the display for best results. Selecting a resolution output higher or lower than that of the native resolution of the display will cause the display to scale the image, resulting in decreased resolution and performance.

If you have a fixed-pixel display and its native resolution does not match any of the resolution outputs of the **VHD-4404 ULTRA**, try different resolutions to see which one gives you the best picture quality.

CRT Projectors

Determining the best scan rate output for your CRT display is not quite as straightforward as choosing a resolution output for a fixed-pixel display, but following these guidelines will help you easily choose the best scan rate for your CRT display.

There are two factors with CRT projectors that directly affect which scan rate will work best with them- CRT size and type of electronic focus. It is important to note that while a particular CRT projector can handle a certain scan rate range, inputting a scan rate at the top end of its range may NOT be the best scan rate for the projector. In other words, just because a projector with 7" CRTs and electrostatic focus can display a signal with a scan rate between 15 and 65 KHz, using a quadrupler (63 KHz) would produce an extremely soft and dull picture. Inputting a signal around 38 KHz, however, will produce a bright, sharp image.

Ultimately, the goal with a CRT projector is to display as many scan lines as possible before the lines are so close together that they actually touch and 'write over' each other. If too many lines are displayed to the point where they're touching, the image will become very soft and unresolved. If too few lines are displayed, the image will be sharp but not nearly as bright, as not enough of the phosphor is being used. Therefore, the best scan rate is that which allows both maximum brightness AND resolution from the projector.

The size of the CRT makes a huge difference in a projector's resolution capability; the larger the CRT, the more resolution it can handle. Basically, a larger CRT has more physical surface area, so more resolution can be displayed without it 'running out of room to breathe'. This means, by definition, that a larger CRT demands a higher scan rate. Smaller CRTs will, of course, need a slower scan rate.

While there are many sizes of CRTs, the most common in use today are 7-inch, 8-inch and 9-inch CRTs. Some rear-screen projection televisions use even smaller (5-inch) CRTs, and one manufacturer actually produces a 12-inch CRT, but the 7-inch to 9-inch range is far more common.

The type of electronic focus that the projector uses also affects what scan rate work best with it. There are two types of electronic focus- Electrostatic and Electromagnetic. Electrostatic is a basic type of focus, where just turning a 'focus pot' is all the control of electronic focus you have. This work fine, but really only provides the best results in the center area of the image. The 'beam spot size' of the electrostatically focused projector is also larger; this means that the electron beam that creates the image in a CRT is larger. As a result, a projector using electrostatic focus will work better with a slower scan rate.

Electromagnetic focus, however, provides a much more accurate focus. This type of focus cannot only sharpen the center of the image, but each side and corner (in many cases) individually as well. The beam spot size is also smaller with this type of projector, meaning that it can perform better with a faster scan rate.

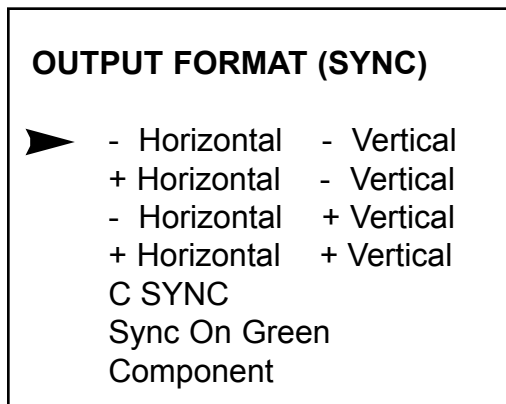
The following is a general guideline for determining the best scan rate for your type of CRT projector. This is only meant as a helpful guideline; the best results are ultimately determined by the condition of the projector and the quality of the projector's calibration. Use this as a 'starting point' for determining the best scan rate for your projector, and make changes based on the performance of YOUR projector.

Note: For the actual horizontal scan rate of each output (i.e. 540p=33.8 KHz), please refer to the SPECIFICATIONS page at the end of this manual.

CRT size	Type of focus	Recommended scan rates
7-inch	Electrostatic	540p, 600p
7-inch	Electromagnetic	600p, 720p, 768p
8-inch	Electrostatic	720p, 768p
8-inch	Electromagnetic	768p, 840p
9-inch	Electrostatic	768p, 840p
9-inch	Electromagnetic	960p, 1080p

Output Format (Sync)

This feature allows you to change the sync polarity or type of output of the **VHD-4404 ULTRA**. The default output is negative horizontal sync, negative vertical sync (- Horizontal - Vertical). However, some display devices work better with some sync polarities and some may not be compatible with others. There is not a 'best type of sync' to use (unlike the best scan rate), it's just that each display is designed differently and have their own requirements. Consult the owner's manual to see what type of sync or sync polarity is recommended for your display device.



OUTPUT FORMAT Menu

Note that the arrow indicates the currently selected sync output (Negative horizontal, Negative Vertical in this example).

Besides sync polarity options, you may also choose COMPOSITE SYNC, SYNC ON GREEN or COMPONENT.

COMPOSITE SYNC is the combination of horizontal and vertical syncs on one connector, which is output on the H sync connector on the rear of the processor (see page 8). Many projectors have a 'four-wire' RGB input (as opposed to the more common five-wire), meaning that they must have composite sync to function.

SYNC ON GREEN is where the horizontal and vertical syncs are actually combined with the green signal. Some older displays used sync on green as opposed to RGB and separate or composite syncs.

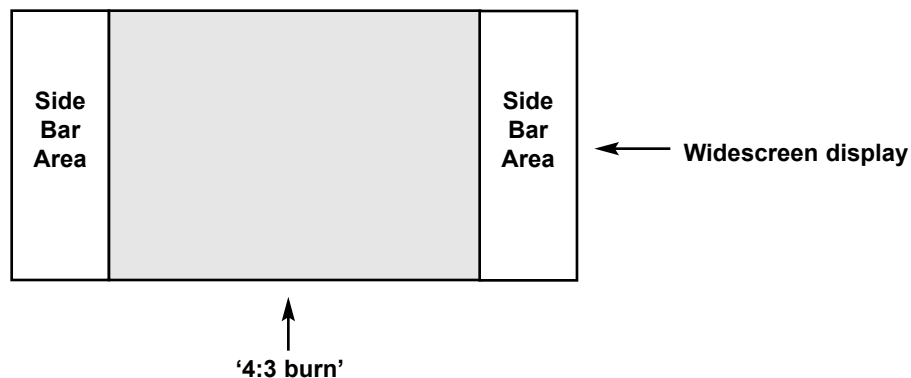
COMPONENT (Y, Pb, Pr) is a bit different from RGB; instead of the video and color information being combined on the Red, Green and Blue outputs and having the sync on separate cables (H and V), Component is actually the Luminance (the black and white part of the image) on the 'Y' output (which also includes the sync information), and the color information on the Pb (blue) and Pr (red) outputs. Many types of displays, especially rear-screen projection televisions (RPTV's), use Component inputs exclusively and do not have RGB inputs.

Side Bar Level

Some displays, especially phosphor-based displays such as CRT projectors and Plasma (flat panel) displays, can be 'burned' by still-images or otherwise not using the full display or raster. Examples of this include ATM's, where the bank logo is permanently burned into the display. This is also the reason why most projector manufacturers strongly recommend against the use of video games with projection televisions, as many video games have still images in them.

Some types of projectors are not susceptible to burns, like DLP™ projectors. Since a DLP™ projector uses tiny mirrors to create the image, burning the image is not a concern as the reflectivity of the mirrors does not decay like the phosphor in a CRT or Plasma.

Besides still images, using a 4:3 image on a widescreen display could cause a '4:3 burn' (see below):



The example above shows what would happen on a widescreen display if a small 4:3 image were used more often than widescreen images. This happens most frequently with CRT projectors or RPTV's, or Plasma displays.

To minimize this problem, the **VHD-4404 ULTRA** can provide SIDE BARS, which will put grey bars up on either side of a small 4:3 image (see 'side bar area' in the drawing above). This illuminates the otherwise unused portion of the display, minimizing a potential 4:3 burn.

SIDE BAR LEVEL is the amount of illumination in the side bars. The goal is not to make them so bright that they are much brighter than the 4:3 image itself (which could cause a reverse 4:3 burn), but not too dim where they cannot be effective. While there is not a recommended level, Runco recommends keeping the side bar level at a moderate level, approximately the same as the average light used on the 4:3 portion of the image.

NOTE: SIDE BAR LEVEL is only active on 16:9 screens. For 4:3 screens, side bar level is not active.

To use side bar level, it will be necessary to 'unblank' the left and right sides of the image. Please follow this procedure to set side bar level:

- Ensure an active source is displayed on the screen or display.
- Select the standard (4:3) aspect ratio. NOTE: Ensure 16:9 screen is selected in the INSTALLATION menu.
- Access the INSTALLATION menu, highlight BLANKING and press ENTER.
- Highlight LEFT with the up or down arrow buttons, then press and hold the left arrow button. You will begin to see the sidebar slowly appear on the left side. Continue holding down the left arrow button until the left sidebar fills the left side of the screen.
- When the left side is fully unblanked, perform the same procedure for the right side.
- Once both sides are fully unblanked, you can set the level of the sidebars. Highlight SIDE BAR LEVEL on the INSTALLATION menu and press ENTER. Use the up arrow button to increase the illumination of the side bars, or the down arrow to decrease their illumination. NOTE: It is recommended that an active image be displayed on-screen, and the level of the sidebars be set to match the average amount of illumination on the 4:3 portion of the image.

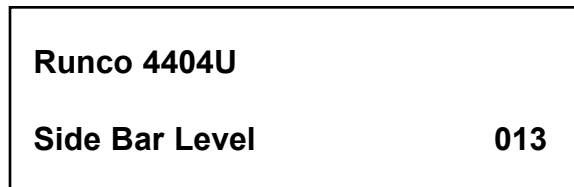
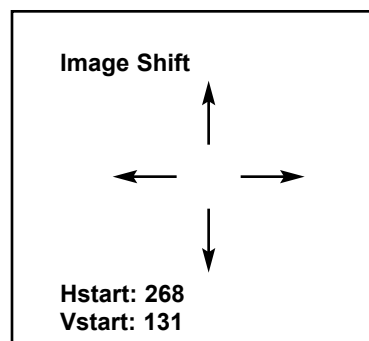


Image Shift

IMAGE SHIFT moves the entire image up, down, left or right. If the image is slightly off-center on-screen after installation, using IMAGE SHIFT can center the image on your screen or display.

While using IMAGE SHIFT will not cause any problems with your display, it is possible to use too much image shift, which could cause the image to shake or disappear. Therefore, Runco recommends that image shift be done with the display device itself whenever possible.



Blanking

The BLANKING function allows you to 'cut off' part of the image to fit the screen properly, or to eliminate anomalies on the extreme outsides (usually the top) of the image. This can be done to the top, bottom, left or right sides individually.

Blanking

Top	131
Bottom	707
Left	241
Right	1292

To adjust BLANKING, highlight the desired area you wish to blank (top, bottom, left or right), and use the left and right arrows to make the adjustment.

Most CRT projectors themselves have blanking controls, and it is recommended that you use the controls on the projector as opposed to the processor, if possible. In the event that your display device does not have blanking controls, however, use the blanking controls provided in the processor.

System Reset

In the event that your **VHD-4404 ULTRA** appears to have a software problem, or adjustments have been made so far out of range that the image is no longer on-screen or discernable, you can reset the processor back to factory values. This sets ALL settings back to factory values, so any adjustments made previously will be lost.

To reset your VHD-4404 ULTRA, follow this procedure:

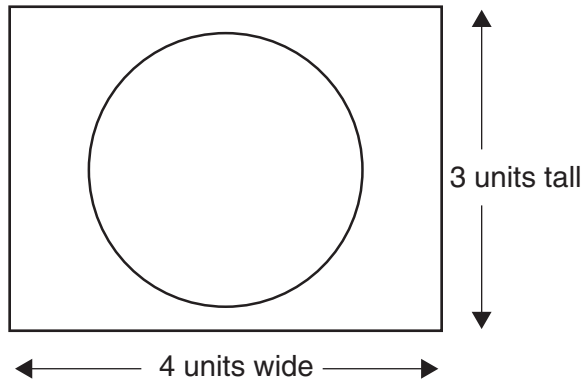
- Turn off the MAIN POWER switch on the back of the processor
- Hold down the DOWN ARROW button, and turn the MAIN POWER SWITCH back on. Continue holding the down arrow button until the LED on the front panel blinks, then release the down arrow button.

Once this is done, your processor has been completely reset to factory values. After resetting the unit, Composite video will be the active source.

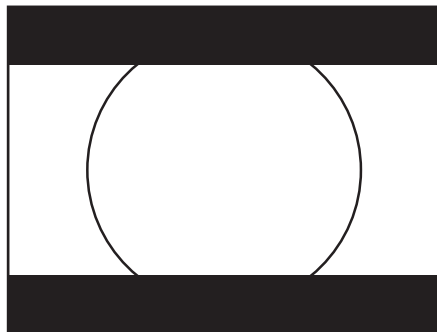
SYSTEM RESET is not on any of the menus; it must be performed using the instructions above.

ASPECT RATIOS

An 'aspect ratio' is simply the ratio of the width vs. the height of the screen. For example, the current aspect ratio standard is 4:3 (or 1.33:1), where the image is 4 units wide and 3 units tall.

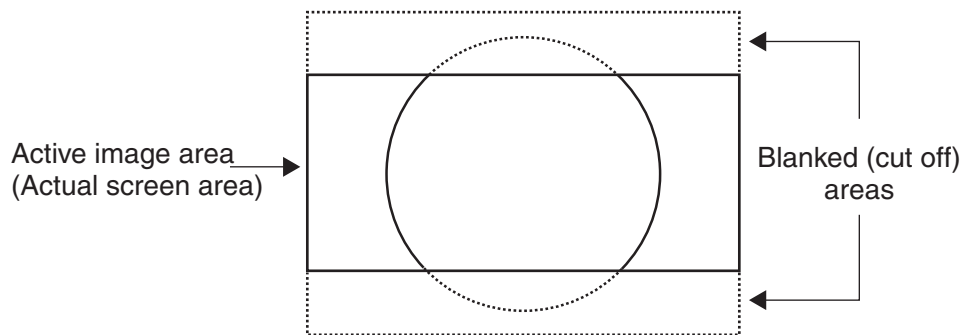


All of our 'regular' televisions are this aspect ratio. You have probably noticed that occasionally you'll watch a movie that does not fill the screen vertically. This is because the movie was filmed in WIDESCREEN (letterbox), and the result is 'black bars' above and below the image:



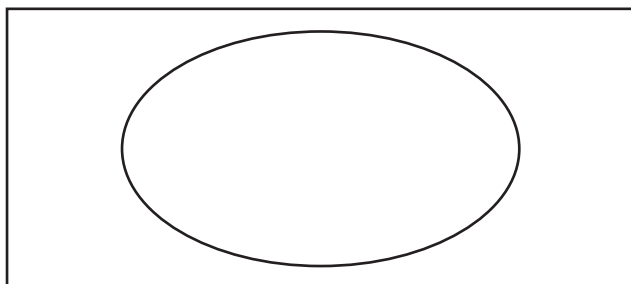
Obviously, watching a movie like this does not lend itself to a truly cinematic experience! This is why Runco invented the first-ever multiple aspect-ratio projection system back in 1991, so true movie-lovers can watch actual widescreen (letterbox) movies on a WIDESCREEN!

A WIDESCREEN can be a number of aspect ratios; many movies are either 1.85:1 or 2.35:1, and HDTV is always 1.78:1 (16:9). The way we create a widescreen (or LETTERBOX) aspect ratio is to take a full 4:3 image, then 'blank' (or cut off) the top and bottom so the displayed image is in a widescreen format. For movies recorded in 'letterbox', there would be no information above and below the screen anyways, so we're not losing any of the picture. However, if you were to watch standard television broadcast this way, you would lose some information (see next drawing).



As you can see, our screen in this example is a 1.85:1 ratio. The dashed lines show the area that we 'blanked'. If you recall, watching a letterbox movie on a 4:3 screen gave us black bars; therefore with letterbox movies, we're not losing any information!

The 'other' type of widescreen is called 'ANAMORPHIC'. The image is still a widescreen format, but instead of 'blanking' the top and bottom, we simply reduce the overall height of the image:

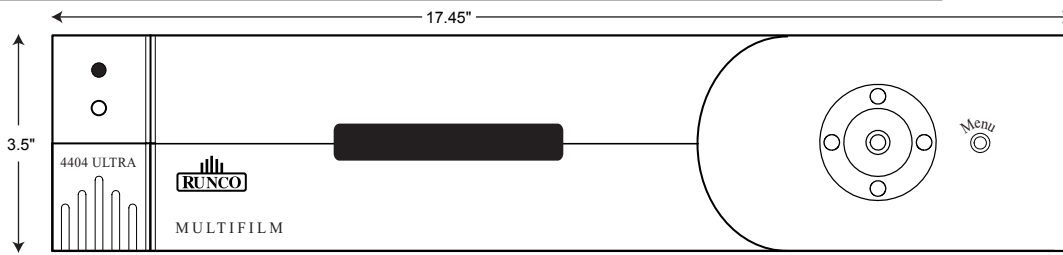


As a result, all objects will be 'short and fat' (like the circle above), right? Well, not if you're using software that is anamorphic. Most (but not all) DVD movies have an anamorphic option.

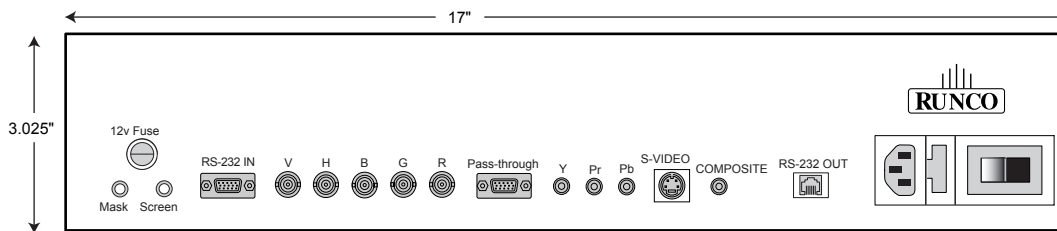
Anamorphic material will always produce a better image when using a high quality scaler such as the **VHD-4404 ULTRA**. The reason is that you will actually get more lines of resolution (and ultimately more detail) when using anamorphic titles. Basically, a TV image is made of 480 lines. When using LETTERBOX (the drawing at the top of the page), we're 'throwing away' information by blanking the top and bottom. The end result is that there will only be around 360 lines of information on the screen. With anamorphic, 480.

DIMENSIONS

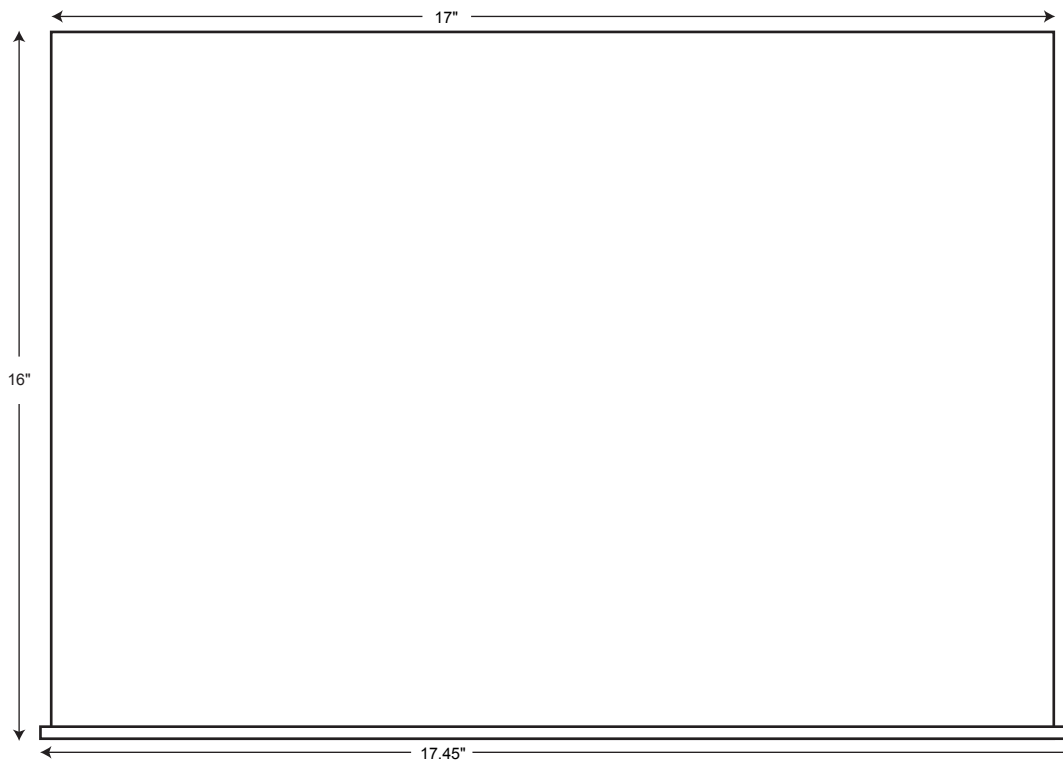
Front Panel



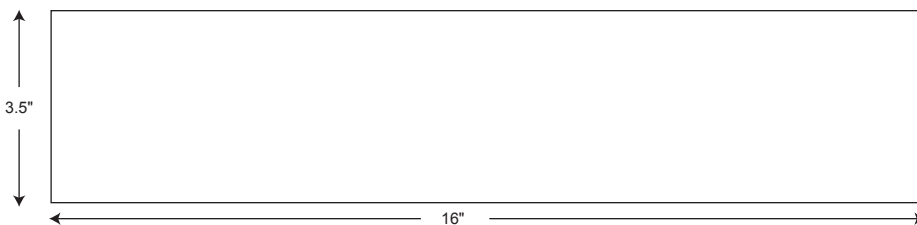
Rear Panel



Top



Side



RS-232 COMMUNICATIONS

General Information

Baud rate: 9600 (fixed)

Bits: 8

No Parity

All protocol in ASCII format

RS-232 input connector pin numbers: TxD= Pin# 2
 RxD= Pin# 3
 GnD= Pin# 5

Command format (single command): command value (i.e. brightness 30).

NOTE: A space (not an underscore) or comma may be used between the command and its value.

Command string format: command,command value, command etc.
(i.e. COMPOSITE,BRIGHTNESS 30,ANAMORPHIC)

NOTE: In between commands, a comma must be used; a comma or space may be used in between a command and its value.

Other notes:

- For command strings, a maximum of 255 characters can be used in a single string.
- If it is necessary to input multiple commands, they should all be together in a single string. Inputting commands one at a time requires a 15 second delay between commands, as the information is stored into non-volatile memory after each command.
- For values not automatically stored (see next paragraph), the command "!STORE" must be sent in order for the **VHD-4404 ULTRA** to keep the settings. Otherwise, the values will be considered temporary and will revert to their stored settings upon source change or power-up.
- The "Value stored" column refers to a command that is either automatically stored or if it must be manually stored with the "!STORE" command.
- PARAMETER min/max refers to a function's minimum and maximum value range. Inputting values above or below their range may cause unpredictable (but not fatal) results.

RS-232 COMMANDS

COMMAND	PARAMETER (min/max)	Value stored?	DESCRIPTION
ON	NA	NA	Turns 4404 on
OFF	NA	NA	Turns 4404 off
DISPLAY	0/4	YES	Adjusts the brightness of the front panel display
COMPOSITE	NA	YES	Selects the Composite Video input
SVIDEO	NA	YES	Selects the S-Video Input
COMPONENT	NA	YES	Selects the Component Video input
PASSTHRU	NA	YES	Selects the Pass-through input
ANAMORPHIC	NA	YES	Selects the anamorphic aspect ratio
STANDARD	NA	YES	Selects the standard (4:3) aspect ratio
LETTERBOX	NA	YES	Selects the letterbox aspect ratio
TINT	-127/127	NO	Sets a value for tint
COLOR	-127/127	NO	Sets a value for color
AGCCOLOR	0/1	NO	0=Disable Color AGC 1=Enable Color AGC
BRIGHTNESS	-127/127	NO	Sets a value for brightness
CONTRAST	-127/127	NO	Sets a value for contrast
AGCCONTRAST	0/1	NO	0=Disable Contrast AGC 1=Enable Contrast AGC
SHARPNESS	0/255	NO	Sets a value for sharpness
CHROMAHIGH	0/127	NO	Sets a value for high-frequency chroma edge enhancement
CHROMALOW	0/127	NO	Sets a value for low-frequency chroma edge enhancement
LUMAHIGH	0/127	NO	Sets a value for high-frequency luminance edge enhancement
LUMALOW	0/127	NO	Sets a value for low-frequency luminance edge enhancement
CSYNC	NA	YES	Selects the Composite Sync output
SYNCGREEN	NA	YES	Selects the Sync on Green output
SYNCCOMPONENT	NA	YES	Selects the Component output
+H+V	NA	YES	Selects positive horizontal and positive Vertical sync
+H-V	NA	YES	Selects positive horizontal and negative vertical sync output
-H+V	NA	YES	Selects negative horizontal and positive vertical sync output
-H-V	NA	YES	Selects negative horizontal and negative vertical sync output

COMMAND	PARAMETER (min/max)	Value stored?	DESCRIPTION
SR800X600	NA	YES	Selects the 800 x 600 scan rate
SR854x480	NA	YES	Selects the 854 x 480 scan rate
SR1024X768	NA	YES	Selects the 1024 x 768 scan rate
SR1024X768A	NA	YES	Selects the 1024 x 768 scan rate (for projectors with an anamorphic lens)
SR1280X768	NA	YES	Selects the 1280 x 768 scan rate
SR1280X1024	NA	YES	Selects the 1280 x 1024 scan rate
SR1366X768	NA	YES	Selects the 1366 x 768 scan rate
SR1366X1024	NA	YES	Selects the 1366 x 1024 scan rate
SR540P	NA	YES	Selects the 540p scan rate
SR600P	NA	YES	Selects the 600p scan rate
SR720P	NA	YES	Selects the 720p scan rate
SR768P	NA	YES	Selects the 768p scan rate
SR840P	NA	YES	Selects the 840p scan rate
SR960P	NA	YES	Selects the 960p scan rate
SR1080P	NA	YES	Selects the 1080p scan rate
!STORE	NA	YES	Stores the current set of values (all values) into non-volatile memory
!RESTORE	NA	YES	Restores the stored values
!FACTORY	NA	YES	Restores all values to factory default levels
!STATUS	NA	NA	Asks the 4404 to provide the hardware information, current values and system status to the automation system
!RESTART	NA	NO	Restarts the 4404 (same as turning it on and off)
!ECHO	NA	NO	Enables the 4404 to echo back commands and values to the automation system
!NOECHO	NA	NO	Disables the 4404's character echoing
!INSTALLMODEOFF	NA	NA	Disables the Installation menu (removes it from the main menu)
!INSTALLMODEON	NA	NA	Enables the Installation menu (enables it on the main menu)
!MODEL	NA	NA	Makes the front panel display the model number
!PANELTEST	NA	NA	Makes the front panel display a test sentence

SPECIFICATIONS

Inputs:	(1) Composite, (1) S-video, (1) Component, (1) Pass-through																
Input standards:	NTSC (all scan rates), PAL (all scan rates except 540p and 854 x 480)																
Scan Rate Outputs:	<table border="0"> <tr> <td>540p (33.8 KHz)</td> <td>800 x 600 (38.8 KHz)</td> </tr> <tr> <td>600p (38.8 KHz)</td> <td>854 x 480 (31.5 KHz)</td> </tr> <tr> <td>720p (45 KHz)</td> <td>1024 x 768 (48 KHz)</td> </tr> <tr> <td>768p (48 KHz)</td> <td>1024 x 768 (A), (48 KHz)</td> </tr> <tr> <td>840p (52 KHz)</td> <td>1280 x 768 (48 KHz)</td> </tr> <tr> <td>960p (60 KHz)</td> <td>1366 x 768 (48 KHz)</td> </tr> <tr> <td>1080p (67.6 KHz)</td> <td>1280 x 1024 (64 KHz)</td> </tr> <tr> <td></td> <td>1366 x 1024 (64 KHz)</td> </tr> </table>	540p (33.8 KHz)	800 x 600 (38.8 KHz)	600p (38.8 KHz)	854 x 480 (31.5 KHz)	720p (45 KHz)	1024 x 768 (48 KHz)	768p (48 KHz)	1024 x 768 (A), (48 KHz)	840p (52 KHz)	1280 x 768 (48 KHz)	960p (60 KHz)	1366 x 768 (48 KHz)	1080p (67.6 KHz)	1280 x 1024 (64 KHz)		1366 x 1024 (64 KHz)
540p (33.8 KHz)	800 x 600 (38.8 KHz)																
600p (38.8 KHz)	854 x 480 (31.5 KHz)																
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840p (52 KHz)	1280 x 768 (48 KHz)																
960p (60 KHz)	1366 x 768 (48 KHz)																
1080p (67.6 KHz)	1280 x 1024 (64 KHz)																
	1366 x 1024 (64 KHz)																
Bandwidth:	Composite, S-Video and Component inputs: 5.5 MHz, Pass-through: 100 MHz																
Power Requirements:	100-120 VAC, 50/60 Hz (200-240VAC, 50/60 Hz, export version)																
Power Consumption:	15W																
Control Options:	RS-232, IR, Front Panel																
Operating Environment:	41°-95°F (5°-35° C), 0-90% humidity, Non-condensing																
Dimensions:	Width: 17.45 in./(443 mm) Depth: 16 in./(406 mm) Height: 3.5 in./(89 mm)																
Weight:	16 Lbs (7.26 kg)																
Safety Regulations:	Complies with UL, FCC Class 'B', CE, C-tick																

Supplied Accessories

- Remote Control w/ 2 AAA Batteries
- Power Cord
- User's Manual

RUMA-004951 rev 1-01



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