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PROJECTOR OWNER'S MANUAL

Christie

MIRAGE S 2K

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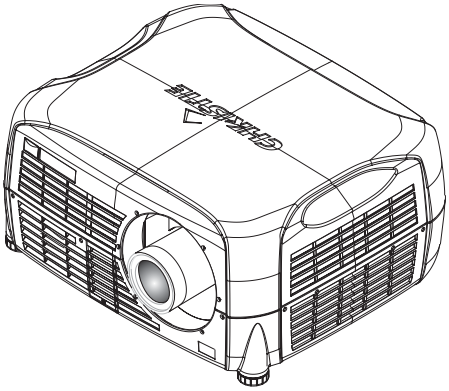
NOTE: Due to continuing research, all information in this manual is subject to change without notice.

Section 1

Introduction

1.1 Projector Overview

Christie DS+4K/8K and *Mirage S+2K/4K/8K* are professional 3-chip projectors based on next-generation Digital Light Processing™ (DLP™) technology by Texas Instruments™. These projectors are compatible with standard international video formats and can interface with IBM®-compatible PC, Macintosh® computers and workstations. All models deliver high-brightness, high-resolution, and high-quality images. *Christie DS+4K/8K*, projectors are an ideal choice in boardrooms, recreation facilities and auditoriums.



Mirage S+2K/4K/8K projectors provide a powerful combination of SXGA+ resolution, high brightness and high contrast ratios to produce flawless, realistic three-dimensional graphic images for simulation, virtual reality and other stereographic related applications.

The *DLV1400-DX* is designed for the demands of 24/7 control room applications and provides long term reliability and performance.

Key Features:

- Native SXGA+ resolution (1400 x 1050, fully scaleable)
- Internal scaling of stereo signals *(Mirage models)*
- 10-bit video processing
- Built-in multi-standard video decoder
- Display of NTSC, PAL and SECAM video input
- User replaceable Cermax® Xenon lamp
- LiteLOC™ for constant brightness
- Motorized lens mount for all models *except* DLV1400-DX
- Auto-setup feature
- Integrated ChristieNET™
- Networking ability through RS232 and RS422 connectors
- Status LED display on built-in keypad for easy projector status monitoring
- Control with IR, wired or built-in keypad

Refer to ***Section 6*** *for a complete list of Specifications including Brightness and Contrast.*

How the projector works ➤ The projector accepts data/graphics and video input signals for projection onto front or rear flat screens. High brightness light is generated by an internal Xenon lamp then modulated by three DMD (digital micromirror device) panels that provide digitized red, green or blue color information. Light from the "on" pixels of each panel is reflected, converged and then projected to the screen through a single front lens, where all pixels are perfectly superimposed as a sharp full-color image (*2D or 3D for Mirage models only*).

1.2 Components

The following listed items are shipped with your projector. Ensure you have received all these items before using your projector.

- User's Manual
- IR remote keypad (includes two, 1.5V AA batteries and a mini-stereo cable for conversion to wired)
- Line cord
- Stereo 3D Cable
- Warranty Card

1.3 Purchase Record and Servicing

Whether the projector is under warranty or the warranty has expired, Christie's highly trained and extensive factory and dealer service network is always available to quickly diagnose and correct projector malfunctions. Service manuals and updates are available to service technicians for all projectors.

If you encounter any problems with the projector and require assistance, contact your dealer or Christie Digital Systems. Fill out the information in the table below and keep with your records for future reference.

Purchase Record

Dealer:
Dealer Phone Number:
Projector Serial Number:
Purchase Date:
Installation Date, if applicable:

NOTE: The serial number can be found on the license label, which is located at the back of the projector.

You can also register your product on-line by visiting **www.christiedigital.com** ⇒ **Service and Support** ⇒ **Product Registration.** This will keep you in touch with all the latest product information, such as updates, technical bulletins, downloads and Christie newsletters.

Section 2

Installation & Setup

2.1 Quick Setup

The instructions provided here are for those that are familiar with the projector and wish to quickly set it up and use it temporarily. Refer to the remaining subsections of this manual for a more complete setup.

Step 1 ➤ Install a Projection Lens

The projection lens is shipped separately from the projector and must be installed prior to setting up the projector. Install the projection lens as described in *4.5 Replacing the Projection Lens.*

⚠ **Remove the lens plug** from the lens opening in the projector before installing the lens.

⚠ **Remove the lens when shipping** the projector and **reuse the lens plug** to prevent dust and debris from entering and settling on the projector's optical components.

Step 2 ➤ Position the Projector

Place the projector on a sturdy, level surface and position it so that it is perpendicular to the screen at a suitable distance. In general, the further back the projector is positioned from the screen, the larger the image will be.

If required, you can level the projector by adjusting its three feet. With the projector positioned perpendicular to the screen the image will appear rectangular instead of keystoned.

For more detailed instructions on positioning the projector refer to *Projector Position and Mounting* later in this section.

Step 3 ➤ Connect a Source

Located at the back of the projector is the input panel where all source connections are made. Each input is clearly labeled for easy identification.

Using the appropriate cable(s), connect your source. Connect RGB and YPbPr sources to **INPUT 1** located in the upper right corner of the input panel. Use the DVI-I connector at **INPUT 2** to connect analog or digital display signals. Connect composite video to **INPUT 3** and S-video to **INPUT 4**. *NOTE: One of the available optional input modules can be installed at* **INPUT 5** *or* **INPUT 6** *for additional connections.*

Refer to 2.3 Connecting Sources for more details on connecting a specific source.

Step 4 ➤ Connect the Line Cord

⚠The *North American rated line cord is provided with each projector.*

Plug the line cord to the AC receptacle located on the right hand side of the projector and the 3-pronged end into a grounded AC outlet. The input voltage to the projector must be capable of 100 – 240 VAC in *500W* and *1000W* models and 200-240VAC in *1200W* models. (*See also* ***Section 6 – Specifications*** *for complete details on all power requirements.*)

Use the approved North American-rated line cord supplied with the projector. If you are connecting to an area outside of North America make sure you are using an appropriately rated line cord.

Step 5 ➤ Turn the Projector ON

Press the ⏻ POWER button on either the remote or built-in keypad to turn the projector on. Wait a few minutes to allow the projector to warm up. The LED status window displays an active pattern of segments to indicate the projector is changing its state from powered down to powered up. The message “On” appears in the display when the projector has completed its initialization and is ready for use.

Step 6 ➤ Select a Source

Press one of the input keys on the remote or built-in keypad to select and display the image for the source you connected in Step 3.

Step 7 ➤ Adjust Image

Adjust the more common image settings, such as Brightness, Contrast, Gamma, Focus, Zoom etc. using the direct keys on the IR remote.

You can also access the menu system and adjust these and other image settings by pressing Menu on the remote.

2.2 Installation Considerations

Proper installation of your projector will ensure the quality of your display. Whether you are installing a projector temporarily or permanently you should take the following into account to ensure your projector performs optimally.

Installation type ➤ Choose the installation type that best suits your needs: front or rear screen, floor mount or inverted mount.

Front Screen, Floor Mount Installation

ADVANTAGES	CONSIDERATIONS
• Easy to set up • Can be moved or changed quickly • Easy to access	• Shares floor space with audience

Front Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
• Does not take up audience space • Projector is unobtrusive • Projector cannot be accidentally moved	• Installation is more permanent • It is more difficult to access the projector

Rear Screen, Floor Mount Installation

ADVANTAGES	CONSIDERATIONS
• Projector is completely hidden • Projector is easily accessed • Usually good ambient light rejection	• Requires separate room • Installation cost is usually higher

Rear Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
• Projector is completely hidden • Usually good ambient light rejection	• Requires separate room • Installation cost is usually higher

Rear Screen, Floor Mount with Mirror

ADVANTAGES	CONSIDERATIONS
• Projector is completely hidden • Usually good ambient light rejection • Requires less space behind screen than other rear screen installations	• Requires separate room • Installation cost is usually higher

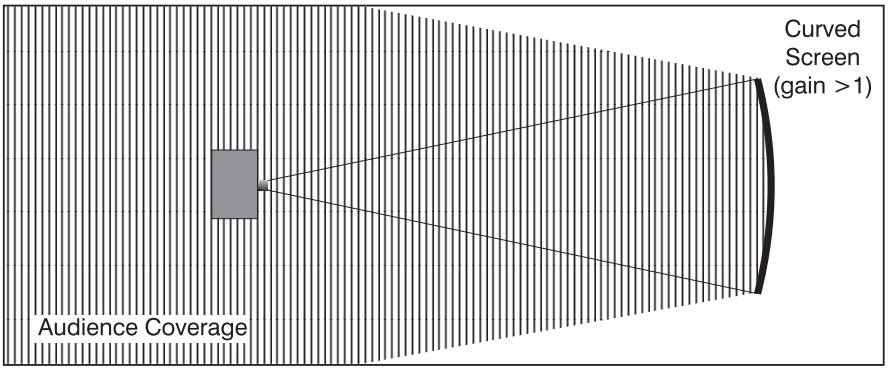
Screen Type ➤ ***Front Screen Installations***

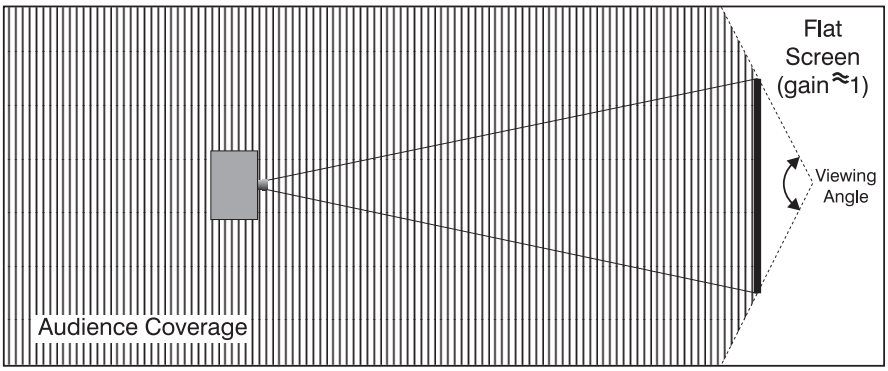
In front screen installations the projector and audience are positioned in front of the screen, which can be flat or curved.

Flat screens are most recommended with this projector. They offer a gain of about 1 with a viewing angle just less than 180°. This type of screen reflects incident light equally in all directions so the audience can see the display from various angles.

Curved screens have a gain greater than 1 with a viewing angle much less than 180°. This type of screen does not reflect incident light equally in all directions instead it is

concentrated in a viewing cone. The audience sitting within the viewing cone area will see a brighter image than those sitting just outside this area.





Rear screen installations

There are two basic types of rear screens: diffused and optical.

A diffused screen has a surface, which spreads the light striking it. Purely diffused screens have a gain of less than 1. The main advantage of the diffused screen is its wide viewing angle, similar to that of a flat screen for front screen projection. This type of screen is suitable when a wide viewing angle is required but there is low ambient room lighting.

Optical screens take light from the projector and redirect it to increase the light intensity at the front of the screen. This reduces it in other areas. A viewing cone, similar to that of a curved front screen installation is created. This type of screen is better suited for brightly lit rooms where the audience is situated within the viewing cone.

Screen size

Choose a screen size, which is appropriate for your lens and application. Keep in mind that if the projector will be used to display text information, the image size must allow the audience to recognize all text clearly. The eye usually sees a letter clearly if eye-to-text distance is less than 150 times the height of the letter. Small text located too far from the eye will likely be illegible at a distance no matter how sharply and clearly it is displayed.

To fill a screen with an image, the aspect ratio of the screen should be equal to the aspect ratio of the image (expressed as the ratio of its width to its height). Standard video from a VCR has a 4:3 or 1.33:1 aspect ratio. For example, to display a VCR

output with a 4:3 aspect ratio onto a 10-foot (3m) high screen, the width of the screen must be at least 13.3feet (4m).

Ambient Lighting ➤

The high brightness of this projector is well suited for locations where ambient lighting might be considered less than ideal for projection. A typical room with ceiling lights and windows rarely requires special attention. Contrast ratio in your images will be noticeably reduced only if light directly strikes the screen, such as when a shaft of light from a window or floodlight falls on the image. Images may then appear washed out and less vibrant.

In general, avoid or eliminate light sources directed at the screen.

Other Considerations ➤

Other considerations and tips that can help improve your installation:

- Keep the ambient temperature constant and below 35°C (95°F). Keep the projector away from heating and/or air conditioning vents. Changes in temperature may cause drifts in the projector circuitry, which may affect performance.
- Keep the projector away from devices, which radiate electromagnetic energy such as motors and transformers. Common sources of these include slide projectors, speakers, power amplifiers, elevators, etc.

Choose the best screen size for the application. Since more magnification reduces brightness, use a screen size appropriate for the venue but not larger than required. Installing a large screen in a small room is similar to watching television at a close range; too large a screen can overpower a room and interfere with the overall effect. A good rule of thumb is to be no closer than 1.5 times the width of the screen.

Projector Position and Mounting ➤

Throw distance

Throw distance is the distance measured from your projector's front feet to the screen. This is an important calculation in any projector installation as it determines whether or not you have enough room to install your projector with a desired screen size and if your image will be of the right size for your screen.

You can quickly estimate the throw distance by taking the horizontal width of the screen and multiplying it by the lens throw ratio. The result of this calculation tells you roughly how far back the projector should be positioned from the screen in order to project a focused image large enough to fill the screen. For example, using a 0.73:1 lens, throw distance would roughly be 0.73 x screen width.

IMPORTANT: Once you determine the type of lens and screen size you're going to use, calculate the precise throw distance using the formula or graphs located in Appendix D. *Due to lens manufacturing tolerances for lens focal length, actual throw distance can vary ±5% between lenses described as having the same throw ratio.*

Throw Distance (TD) = Screen Width (w) X Lens Throw Ratio

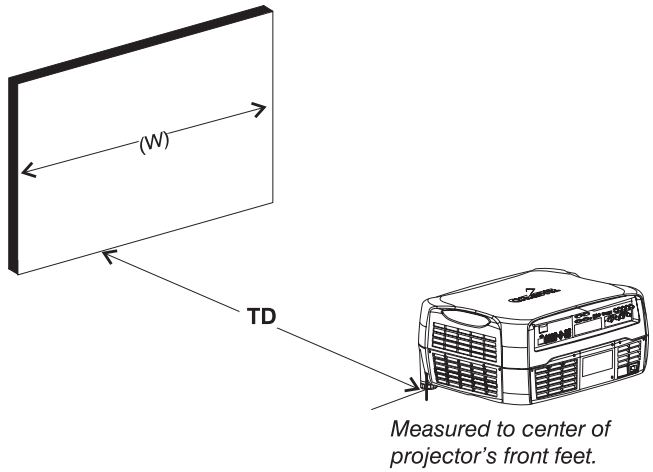


Figure 2.1. Estimating Throw Distance

Vertical and horizontal position

The correct vertical and horizontal position of the projector in relation to the screen depends on the lens type and the screen size. Ideally, the projector should be positioned perpendicular to the screen. This way, the image will appear rectangular instead of keystoned (trapezoidal).

The **vertical position** of the image can be offset – that is moved above or below the optical axis (lens center) by adjusting the fully motorized lens mount with the keypad. The amount of vertical offset available depends directly on the lens installed in the projector and can be slightly limited if horizontal offset has been applied. Vertical offset can also be expressed as the percent of half the image height OR the number of pixels of shift from lens center. Refer to Figure 2.2 for some illustrated examples of vertical offset.

Table 2.1 along with Figure 2.3 show the maximum vertical offset of a lens or alternatively, how much of your projected image will appear above or below lens center if the maximum vertical offset is applied using that lens.

Table 2.1. Lens Offsets

Lens Type	Vertical Offset (% of Half Height)		Maximum amount of projected image above or below lens center		Horizontal Offset (% of Half Width)		Maximum amount of projected image to one side of lens center	
	%	Pixels	%	Pixels	%	Pixels	%	Pixels
0.73:1 fixed	37%	+/-196	69%	+/-721	22%	+/-153	61%	+/-853
1.45-1.8:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
1.8-2.5:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
2.5-4.5:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
4.5-7.3:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050

% Offset = # pixels of offset / half panel resolution x 100.

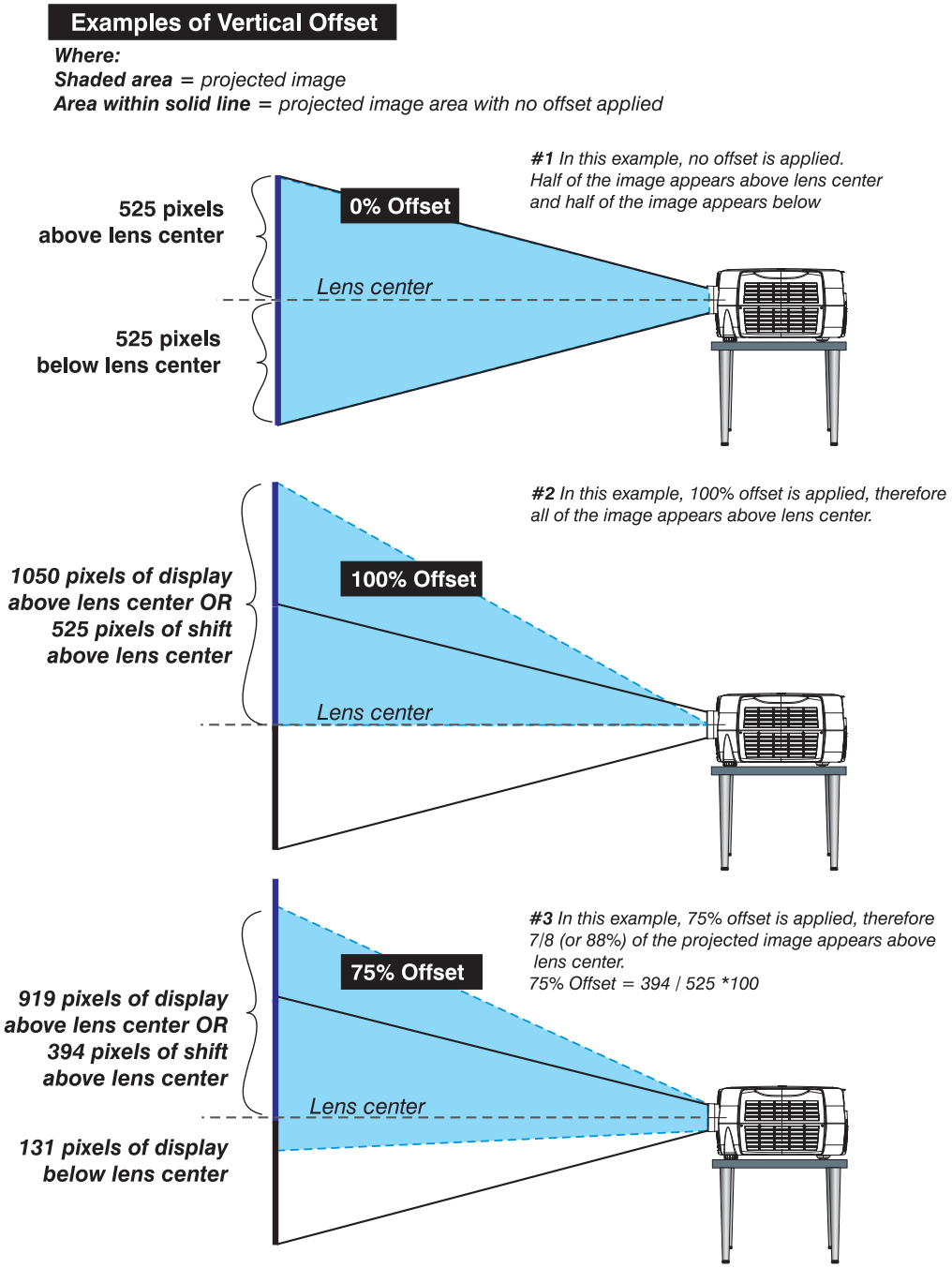


Figure 2.2. Vertical Offset Examples

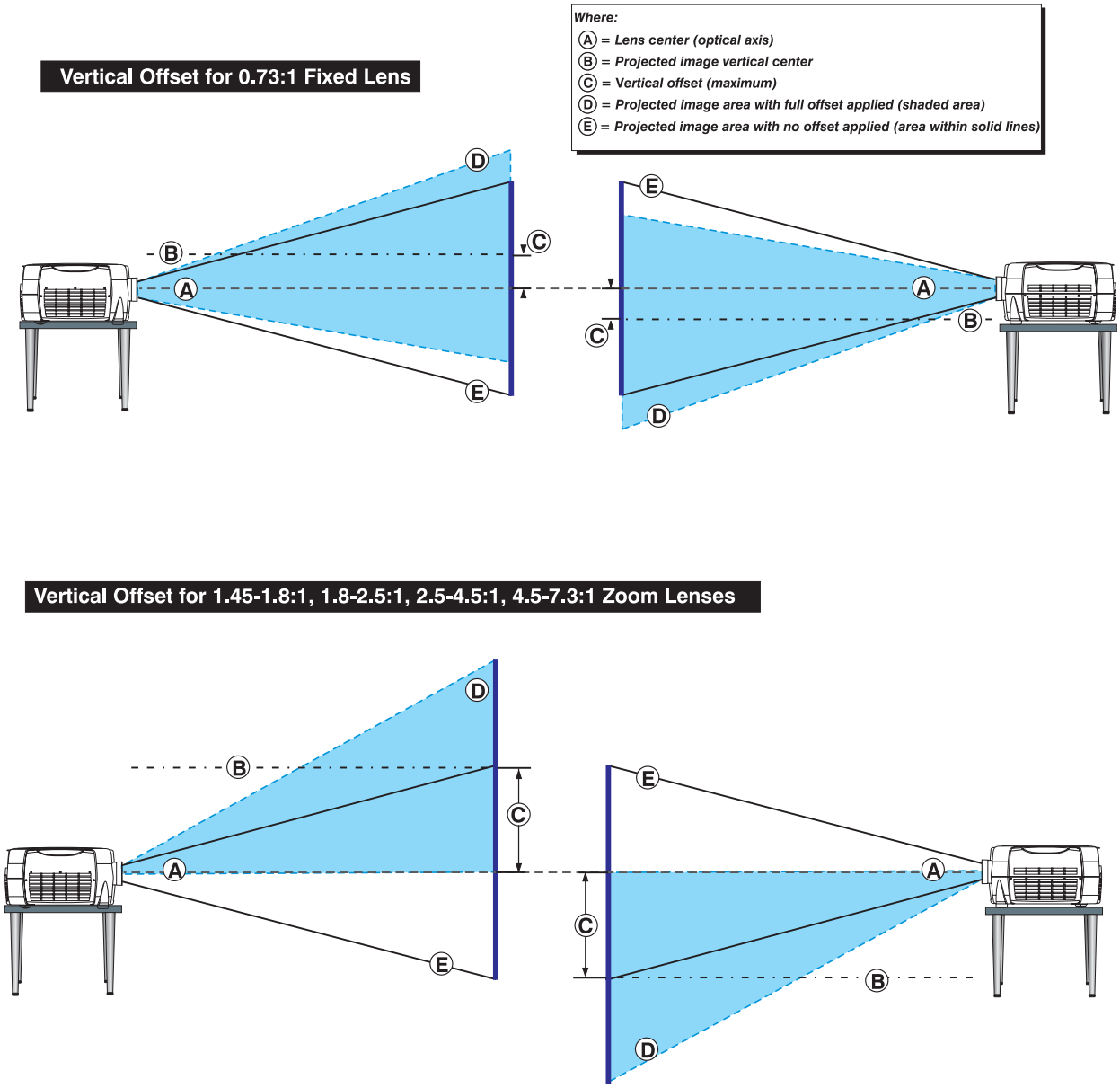


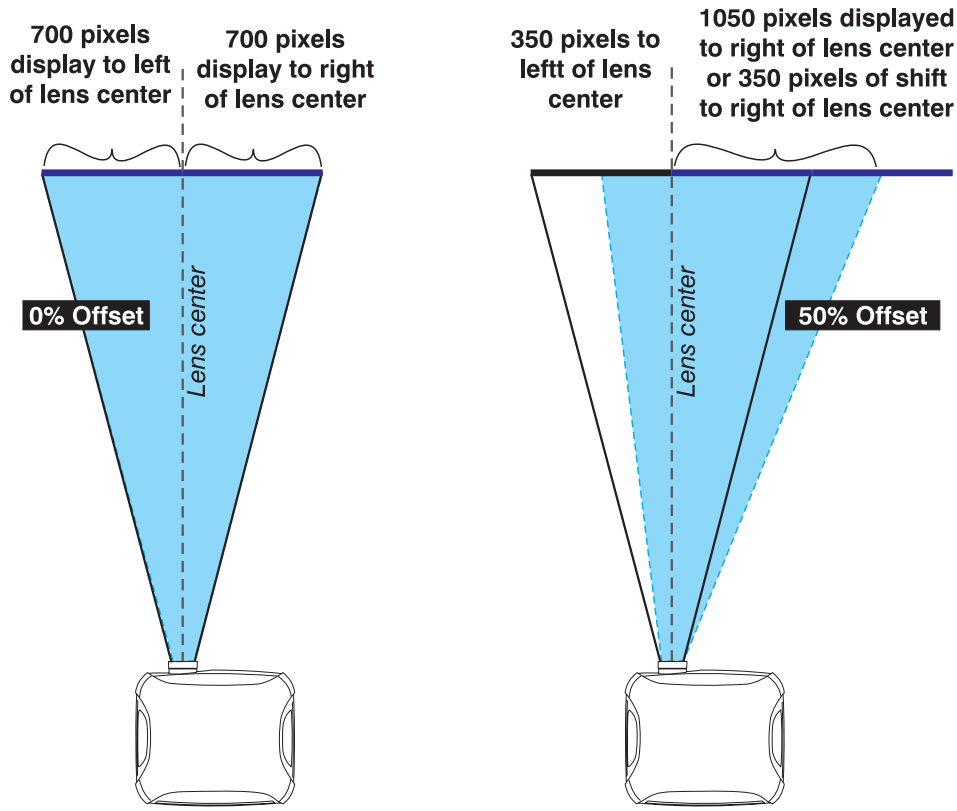
Figure 2.3. Lens Vertical Offsets

The **horizontal position** of the image can be offset – that is moved to the left or right of lens center, by adjusting the fully motorized lens mount through software. The amount of horizontal offset available depends on the lens installed and if the image has already been vertically offset. Horizontal offset can also be expressed as the percent of half the image width – the number of pixels of shift to one side of lens center. Refer to Figure 2.4 for some illustrated examples of horizontal offset.

See also **Table 2.1** along with Figure 2.5 which shows the maximum horizontal offset of a lens or alternatively, how much of your projected image will appear to one side of lens center if the maximum horizontal offset is applied using that lens.

Examples of Horizontal Offset

Where:
Shaded area *= projected image*
Area within solid line *= projected image area with no offset applied*



#1 *In this example, no offset is applied. Therefore half of the image appears to the left or lens center and half appears to the right.*

#2 *In this example, 50% offset is applied, therefore ¾ or 75% of the image appears to one side of lens center.*

Figure 2.4. Horizontal Offset Examples

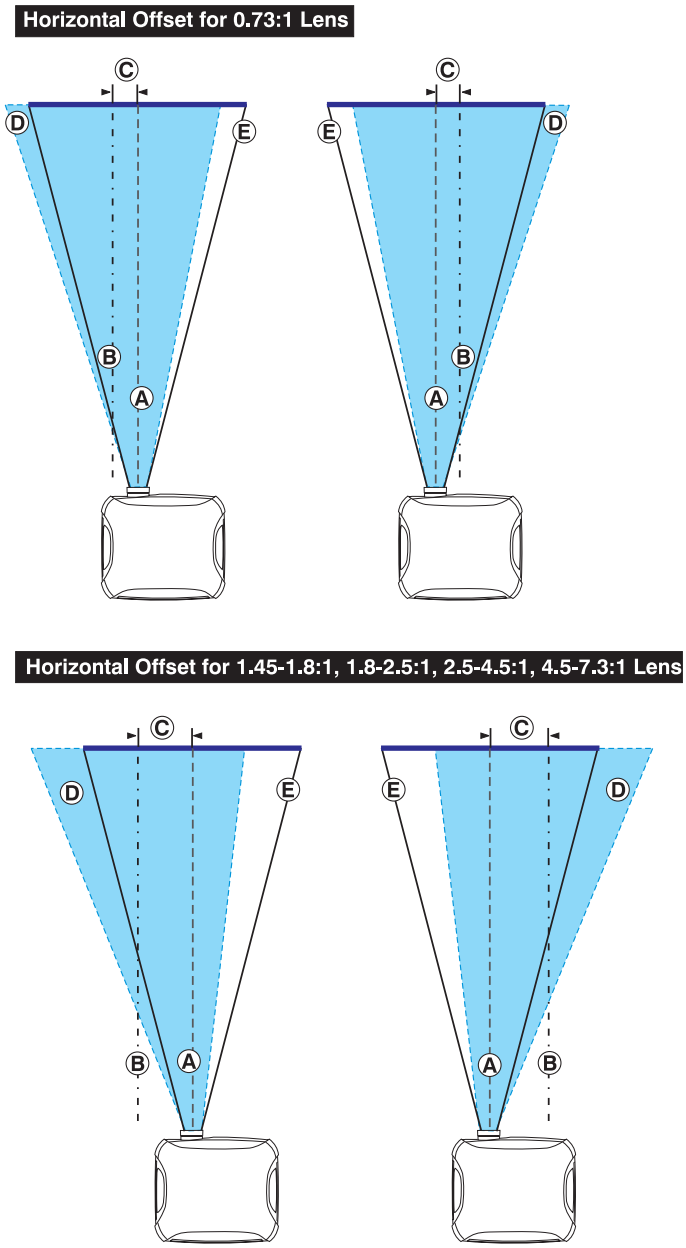


Figure 2.5. Lens Horizontal Offsets

Mounting

There are several methods for mounting the projector. Depending on your chosen installation, one method may be more suitable than another. In typical front and rear screen installations the projector can be mounted to a secure and level surface, such as a table or cart. Carts are useful when the projector has to be moved during a presentation or from site to site. It is recommended you lock the wheels on a cart, when it's in position, to prevent someone from accidentally moving it during a presentation.

CEILING MOUNT - The projector can also be inverted and suspended from the ceiling using a specially designed ceiling mount fixture. This type of mounting is recommended for fixed installations and for those that want the projector out of plain view or have a limited amount of space for projector and audience. *(Available 2005)*

⚠ ***Use only the CHRISTIE approved ceiling mount kit designed for your projector.***

SPECIAL MOUNTING – The projector can be rotated (front-to-back) up to 360 degrees and mounted without it affecting performance. However, the side-to-side tilt limit of the projector must not exceed ±15 degrees. This tilt limit is required to ensure optimal performance of the projector.

Adjusting projector height

You can modify the height of the projector to remedy a slightly unlevel mounting surface by adjusting the two feet threaded into the bottom chassis. Turn each foot clock-wise or counter-clockwise until the project is level on all sides.

Folded Optics

In rear screen applications where space behind the projector is limited, a mirror may be used to fold the optical path. See Figure 2.6. The position of the projector and mirror must be accurately set – if considering this type of installation call your dealer for assistance.

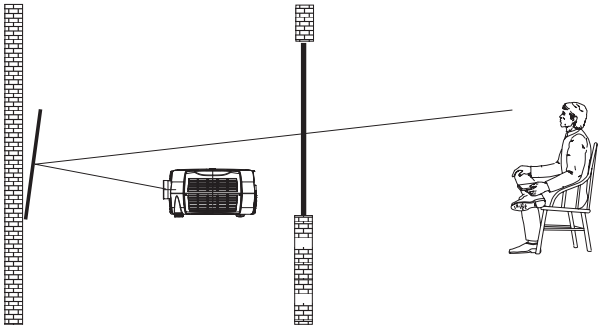


Figure 2.6.

2.3 Connecting Sources

Sources connect to the *Input Panel* located at the back of the projector. See Figure 2.7.

The upper right corner (**INPUT 1**) typically accepts an *RGB signal* from an external analog RGB source, or it can also be used for YPbPr signals or additional video sources. Just beside these BNCs, the DVI-I connector (**INPUT 2**) accepts digital or analog display signals from a computer. Connect analog *composite video* at **INPUT 3** or *S-video* at **INPUT 4** from devices such as VCRs, laser disc players or DVD players.

There are also several optional interfaces available for connecting other sources—these interfaces slide into the remaining unused option slot, and can be done while the projector is running.

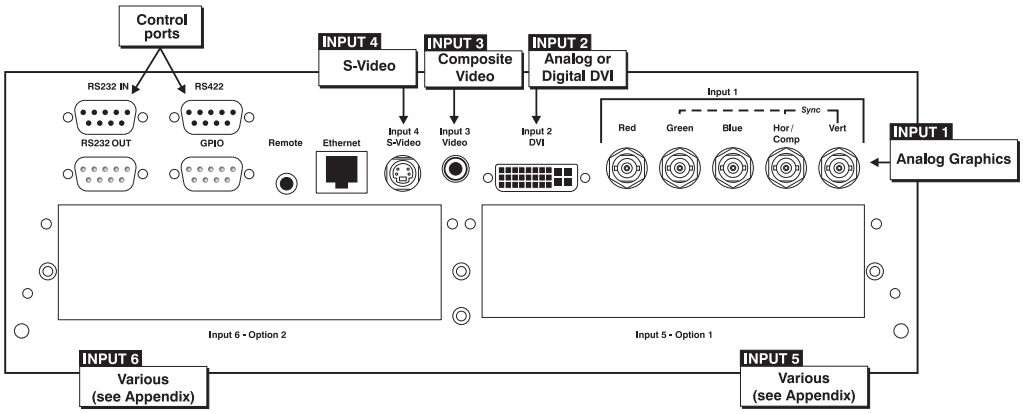


Figure 2.7. Input Panel

NOTES: ***1)*** *See* ***Section 6, Specifications*** *for details regarding compatible inputs.* ***2)*** *Use high quality shielded cables only for all connections.*

RGB Signals ➤ **INPUT 1** consists of 5 BNCs (connectors) for linking to a variety of sources. The typical connection would be to an RGB source such as a PC, Mac, DEC, Sun, SGI and others. This projector supports multiple sync types with RGB signals: sync-on-green, composite sync, and separate H & V syncs.

NOTE: Depending on your source, you may need a custom adapter cable with BNC connectors at the projector end and a different type of connector at the other (such as a 15-pin "D" connector for some computer sources). Contact your dealer for details.

Connect the **SYNC** BNC input(s) first. Then connect the red, green and blue source outputs to the **RED**, **GREEN**, and **BLUE** BNCs on the **INPUT 1** panel. If the source uses sync-on-green, only the red, green, and blue connections are required. If the source provides a composite sync output, connect it to the **SYNC** input labeled **HOR**/**COMP**. If the source provides separate horizontal and vertical sync outputs, connect horizontal sync to the **SYNC** input labeled **HOR**/**COMP** and connect vertical sync to **SYNC** input labeled **VERT.** See Figure 2.8.

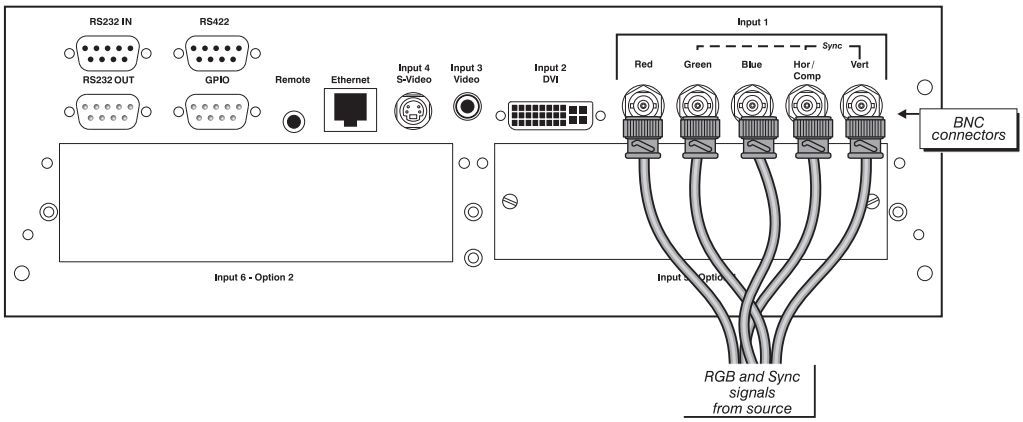


Figure 2.8. Connecting RGB and Sync

NOTES: ***1)*** *If for some reason the projector fails to recognize a signal as an RGB signal, specify this* ***Color Space*** *option within the* ***Image Settings*** *menu. See* ***3.5 Adjusting the Image. 2)*** *To connect YPbPr signals–such as from DVDs or analog HDTV sources–to* ***INPUT 1****, use the red, green and blue BNCs as described in* ***YPbPr Signals*** *(below).*

YPbPr Signals (COMPONENT VIDEO) ➤ Connect a YPbPr signal (*component video*) to **INPUT 1** or **INPUT 2** as shown in Figure 2.9.

NOTES: ***1)*** *If, for some reason, the projector fails to recognize a YPbPr signal, specify this* ***Color Space*** *option within the* ***Image Settings*** *menu. See* ***3.5, Adjusting the Image****.* ***2)*** *Do not connect digital component signals (known as YCbCr) to* **INPUT 1**. *Install an appropriate optional module in* ***INPUT 5*** *or* ***INPUT 6*** *for this.*

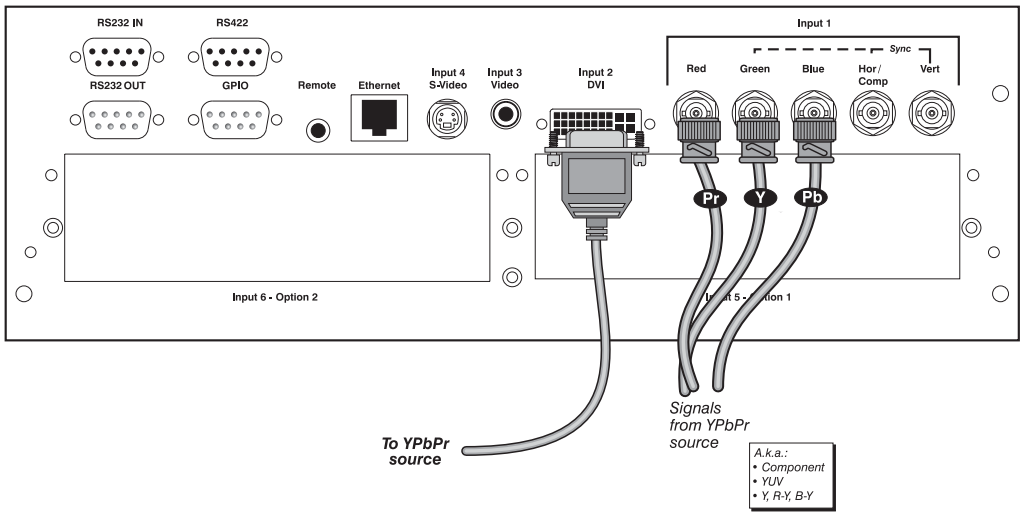


Figure 2.9. Connecting YPbPr sources

Composite and S-Video ➤ **INPUT 3** and **INPUT 4** provide simultaneous connection of both a composite video source (**INPUT 3**) and an S-Video source (**INPUT 4**). See Figure 2.10.

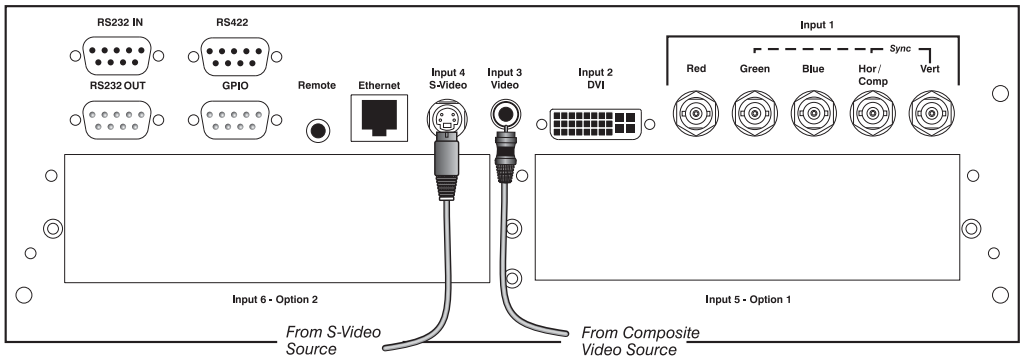


Figure 2.10.Connecting Composite or S-Video sources

DVI Digital Video ➤ Use the DVI-I connector at **INPUT 2** to connect either analog or digital video devices to the projector. When connecting devices that transmit an analog video signal such as VCRs, laptops, and PCs use the DVI cable provided with the projector. Plug the DVI-I (single link) connector end to the projector and the 15-pin VGA connector to the device.

Use a cable with DVI-I connectors at both ends to connect devices that transmit digital and analog video signals such as high-quality DVD players, satellite receiver and digital cable TVs.

*NOTE: **1)** To ensure true digital output from devices that transmit digital signals, connect to the DVI-I connector. **2)** DVI loop through is not available unless you have the optional **DVI Input Module** installed at* **INPUT 5** *or* **INPUT 6**.

Optional Inputs ➤ Optional modules allow you to increase your total number of inputs and/or accommodate different signal types, whether analog or digital. Install in the areas labeled **INPUT 5** or **INPUT 6.** Options include:

- RGB 500 Input Module
- RGB 400 Active Loop Thru Input Module
- RGB 400 Buffered Amplifier Input Module
- Composite/S-Video Input Module *(not supported in v1.0 software)*
- PC250 Analog Input Module
- Serial Digital Input Module
- DVI Input Module
- Dual SD/HD-SDI Module *(available 2005)*

NOTES: See ***Appendix F, Optional Input Modules*** for a brief description of each interface.

2.4 Connecting Communications

As an alternative to the projector's keypad or remote, you may wish to communicate with the projector using a PC or other controller. Such a device sends commands and receives feedback via serial links (RS232 and RS422), Ethernet or GPIO communications to the projector, all described below.

Remote Keypads ➤

As desired, direct the projector's IR remote keypad towards the display screen or the projector's IR sensors. Alternatively, connect a wired (tethered) version of the remote to the 3.5mm RCA jack labeled as **REMOTE** on the projector's input panel. Note that response to a wired keypad must also be enabled in the *Communications* menu—see *3.6, Adjusting System Parameters and Advanced Controls* for more information.

Serial Port Connections ➤

There are two types of serial ports available on the projector: RS232 and RS422. You can connect a device with a serial interface, such as a computer to either of these connectors (not both) and control the projector remotely by entering specific serial communication commands.

Connecting RS-232

The two 9-pin DIN connectors labeled RS232 IN and RS232 OUT on the input panel are dedicated to serial communication. Using the appropriate serial communication cables *(see Appendix C)* connect the controlling source, such as a personal computer to the RS232 IN connector. Then set the baud rate to match that of the computer. Refer to *Section 3* for details on changing the projector's baud rate.

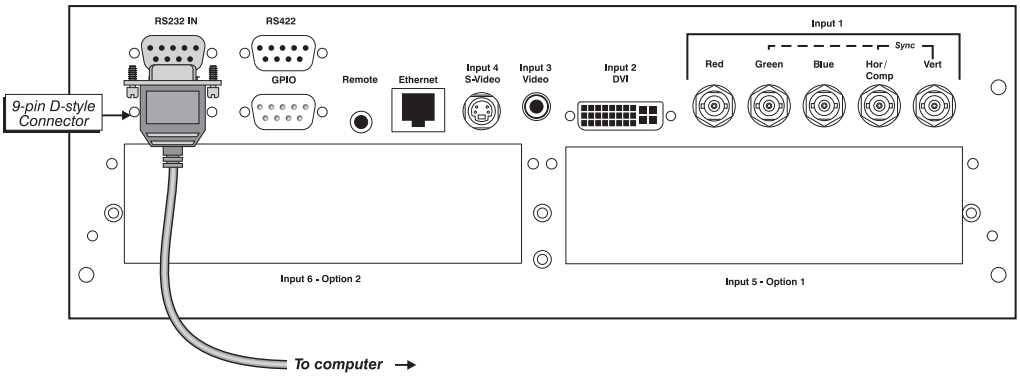


Figure 2.11. Connecting RS232

If you want to connect multiple projectors in a network with serial communication, connect the controlling source to the RS232 IN connector of the first projector in the network. Then take another serial communication cable and connect one end to the RS232 OUT connector and the other end to the RS232 IN connector of the next projector. Continue this pattern of connection with all projectors in the network. The last projector in the network will only have a connection to the RS232 IN connector.

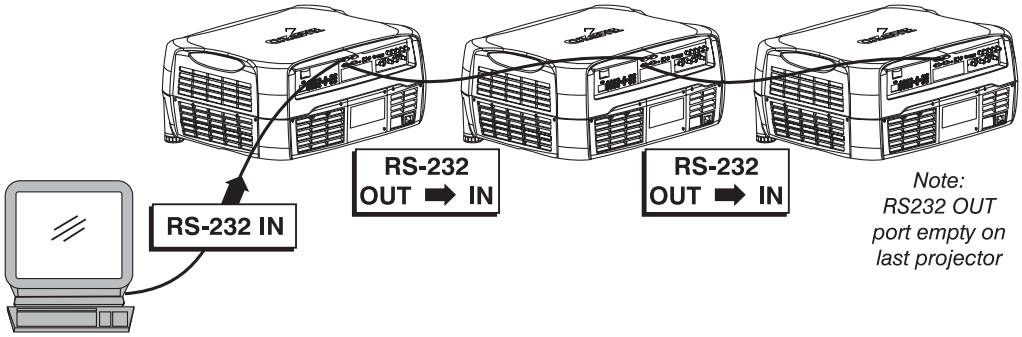


Figure 2.12. RS232 Network

Connecting RS-422

If you wish to control the projector with a computer and or other controlling device with RS-422 capability, connect a RS-422 serial communication cable between the computer and the RS-422 port on the projector. RS-422 is better suited for serial communication over long distances then is RS-232 communication.

⚠ Use the RS-422 port only if your device had RS-422 capability – always consult the literature provided with your equipment before connecting. Connecting to the RS-422 port with incompatible equipment could damage your projector.

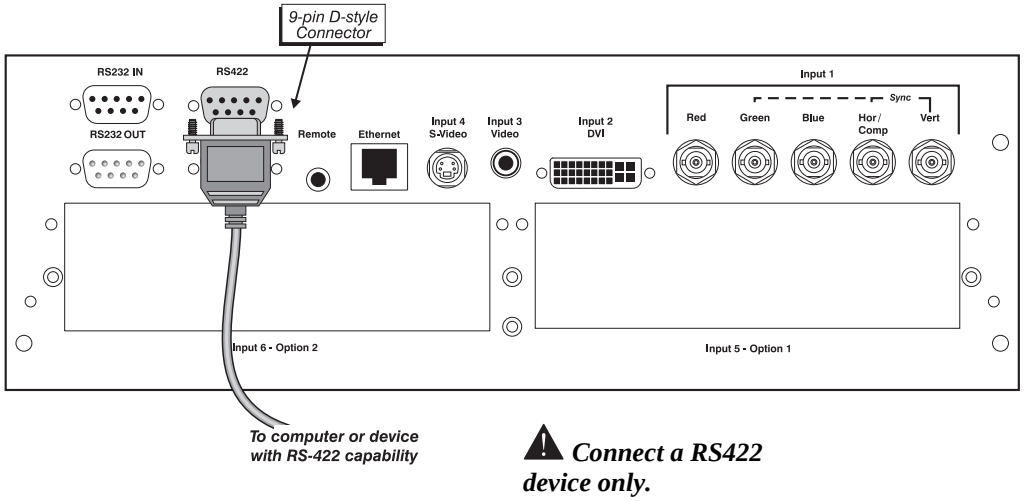


Figure 2.13. Connecting RS422

Ethernet Communications ➤

Ethernet Communications

To add the projector to an existing Ethernet network with other equipment such as controllers and other projectors, connect standard CAT5 Ethernet cable between your Ethernet controller (or hub) and the Ethernet port on the side of the projector.

Upon connection to an Ethernet network, the projector's factory default IP address of 0.0.0.0.0 will automatically enable the DHCP function (if available on the network) to assign a new IP address that is valid and unique for that network. Or, if there is no DHCP function available on the network (or if a specific static IP address for the projector is preferred or required), you can set the address in the *Ethernet Settings* menu or via an ASCII serial command.

Regardless of how it is assigned, once a projector has a valid and unique address it will respond to commands sent to this address. To determine the projector's current IP address, consult the *Status* or *Communications* menus.

Refer to *Section 3* for further information about setting up and using a projector connected via Ethernet.

Log on to www.christiedigital.com for detailed information on ChristieNET™.

2.5 System Integration - GPIO Connector

General Purpose Input Output

The GPIO connector on the input panel can be used to provide a method of interfacing a wide range of external I/O devices to the projector.

*Refer to **Appendix E: System Integration** for complete details on pin configuration and how to program the various pins on the connector.*

2.6 Power Connection

Plug the line cord to the AC receptacle located at the back of the projector, below the input panel, and the 3-pronged end into a grounded AC outlet. The input voltage to the projector must be capable of 100 – 240 VAC in *500W* and *1000W* models and 200-240VAC in *1200W* models. (*See also Section 6 – Specifications for complete details on all power requirements.*)

Use the approved North American-rated line cord supplied with the projector. If you are connecting to an area outside of North America make sure you are using an appropriately rated line cord.

Always power down the projector before unplugging the AC line cord. Wait 5-10 minutes for the main exhaust fan to turn off and for the lamp to cool sufficiently before unplugging the projector.

⚠ WARNINGS

Do not attempt operation if the AC supply and cord are not within the specified voltage and power range.

Wait for the cooling fans to turn off before unplugging the projector.

Section 3

Operation

This section explains how to effectively operate the projector once it has been installed. It is recommended that you read this section and familiarize yourself with the components and the available menu options before you begin using your projector for the first time.

3.1 About the Projector

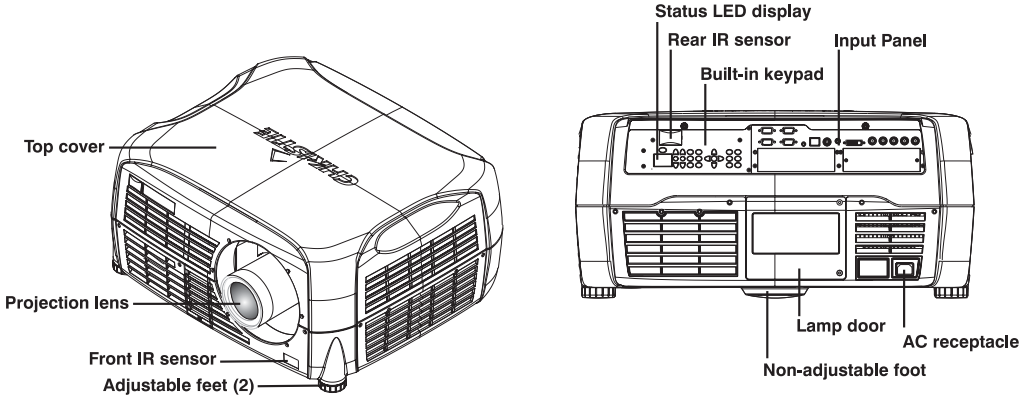


Figure 3.1. Projector Basics

Built-in Keypad ➤ The built-in keypad is located at the back of the projector, beside the input panel. Use it similarly to the IR remote to control the projector. A status LED display is also included on this keypad for monitoring projector status.

AC Receptacle ➤ The AC receptacle is located at the back of the projector just below the input panel. Use this outlet to plug in an appropriately rated line cord. Refer to *Section 6 – Specifications* for details.

Adjustable Feet ➤ Located on the underside of the projector are two fully adjustable feet. Raise or lower these feet when positioning the projector to ensure it is level on all sides so the displayed image will appear rectangular without any keystone. *NOTE: The third foot, located at the rear of the projector (underside) is not adjustable.*

Refer to *Section 2 - Projector Position and Mounting* for instructions on how to adjust the projector's feet.

Lens Mount & Projection Lenses ➤

The projector is built with a motorized lens mount that allows for easy lens control and adjustment. This includes such functions as adjusting vertical and horizontal offsets, zoom and focus. The lens mount can be fitted with any one of the available optional lenses – see *Section 6 - Specifications*.

- **Zoom and Focus** – There are two internal lens motors that allow for quick motorized adjustment of zoom and focus. Adjust zoom to fit the displayed image on the screen and adjust focus to improve the clarity of the image. *NOTE: You can manually override zoom and focus adjustments set with the remote. Turn the outer ring on the projection lens to adjust focus and the inner ring to adjust zoom.*

- **Lens Offset** – Vertical and horizontal offset is performed on the lens mount through the use of DC motors.

- **Shutter** – Standard on all models the shutter allows you to turn the screen absolutely black when in the "on" state.

- **Optical Aperture** – Enables adjustment of light output and contrast ratio.

*NOTES: **1)** The projection lens is shipped separately from the projector. **2)** Use the lens cap when transporting the projector to avoid scratching and damaging the lens, which could affect your displayed image.*

Input Panel ➤

All source connections are made to the input panel located at the back of the projector. Connect RGB or YPbPr sources to **INPUT 1**, analog or digital display signals to **INPUT 2**, composite video to **INPUT 3**, and S-video to **INPUT 4**. Any of the available optional modules can be installed in **INPUT 5** and/or **INPUT 6.**

There is no status display on the input panel. The only status display is part of the built-in keypad located at the rear of the projector.

Cooling and Air Vents ➤

There are numerous air vents located around the projector. It is important these vents remain unobstructed. Adequate airflow through the projector will prevent it from overheating.

Front & Rear IR Sensors ➤

The two IR sensors located on the projector receive transmissions from the IR remote from up to 100 feet away. It is important to keep the transmission path to these sensors unobstructed for uninterrupted communications with the projector. The front IR sensor is located next to the projector's nameplate and the rear IR sensor is located at the back of the projector just above the status LED display.

Lamp Door ➤

The lamp door is located at the back of the projector, which provides easy access to the lamp module for replacement. See *Section 4* for lamp replacement procedures.

3.2 Using the Remote or Built-In Keypad

⚠ Laser radiation is emitted from the laser diode in the remote. Do not look directly into the beam of the remote.

Keypad Commands ➤ The projector is typically controlled using one of the following keypads:

- ***Built-in Keypad*** located at the back of the projector
- ***Remote Keypad*** for tethered or tetherless control up to 100 feet away (includes cable for use as a wired remote)

While each of the keypads provides complete control of the projector, they differ slightly in their arrangement of keys and in what functions can be accessed directly with a key press rather than requiring use of the menu system. You may find one keypad more convenient than another for your specific installation and application.

NOTE: This keypad has a single IR protocol and can be converted to a wired remote by connecting the cable provided with the projector to the RCA jack labeled as **REMOTE** *on the input panel.*

Built-in ➤ To control the projector when signals from a remote keypad cannot reach the projector, use the projector's built-in keypad. The nearby LED display provides feedback indicating current status and activities of the projector. Because the built-in keypad has fewer keys than the remote keypad, certain projector functions are accessible only through the menu system rather than via a direct key.

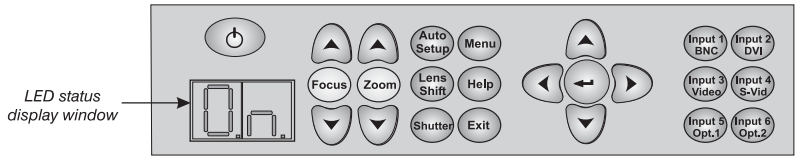
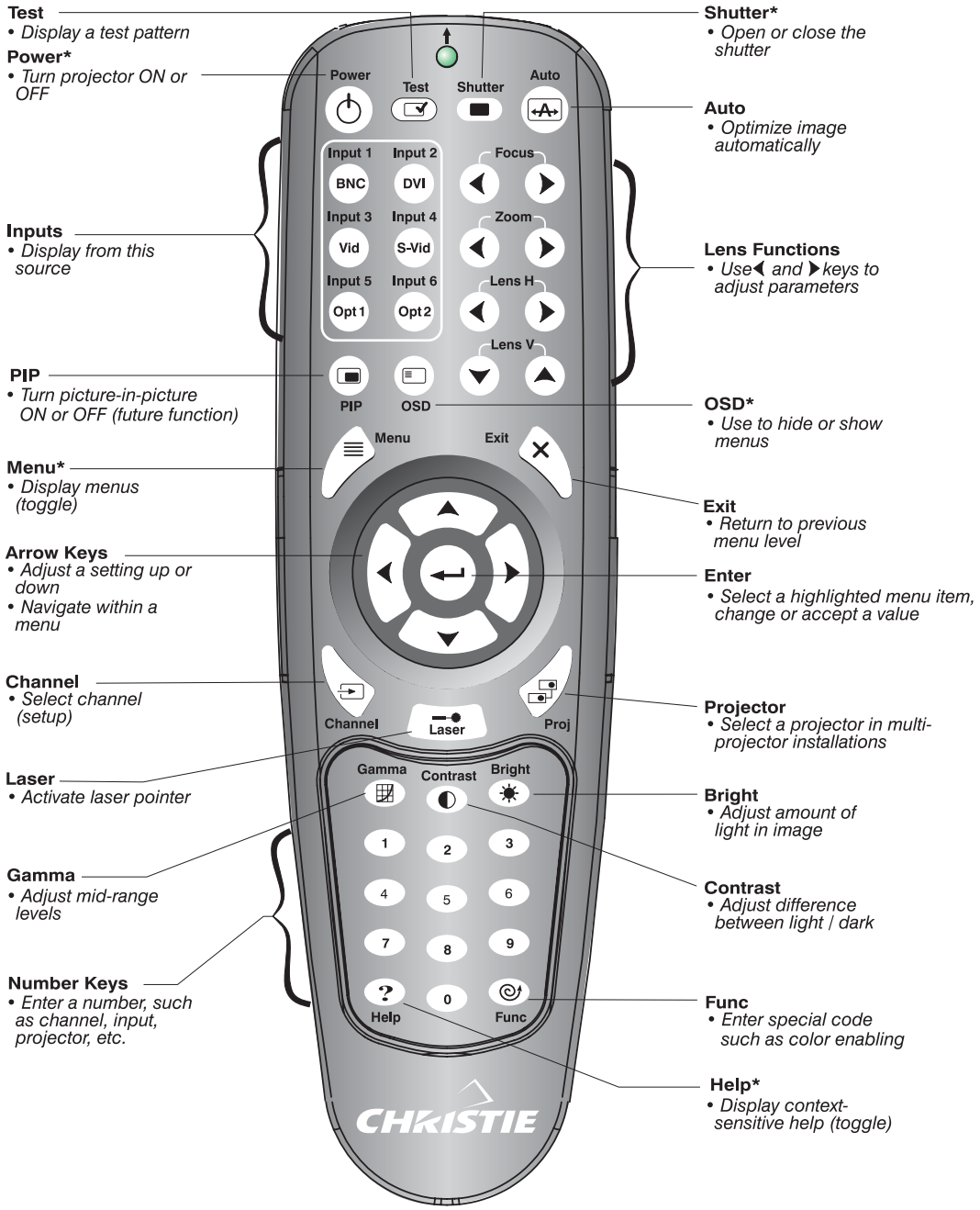


Figure 3.2. Built-in Keypad

Refer to the key descriptions provided for the IR remote – see Figure 3.3.

IR Remote ➤ The IR remote keypad controls the projector by way of wireless communications from a battery-powered infrared (IR) transmitter. Use the IR remote keypad the same way you would use a remote keypad supplied with a TV or VCR. When making key presses, direct the keypad either toward the screen or toward the front or rear of the projector. One of the two IR sensors on the projector will detect the signals and relay the commands for internal processing.



*** These are toggle keys, which require you to press and hold or press twice or press and use the up/down arrow keys. NOTE: To turn the OSD off you must press (OSD) and (▼).**

Figure 3.3. Remote Keypad

Wired Remote ➤ You can convert the IR remote into a wired remote keypad using the cable provided with the projector. Connect one end into the remote and the other to the mini stereo connector on the input panel labeled as **REMOTE**. The wired remote is recommended when:

- the built-in keypad is inaccessible
- the lighting conditions are unsuitable for proper IR transmission

NOTE: Leave the batteries in the wired remote for the laser key ( ) to work.

Guide to Keypads ➤ Keep in mind the following guidelines:

- Press keys one-at-a-time; there are no simultaneous key combinations required.
- Note that three keys—Power , Shutter Shutter and OSD OSD—are "press-and-hold" keys that do not function with a typical quick press-and-release key press.
- Hold arrow keys down for continuous adjustment/movement in one direction. In serial networks, pause briefly between adjustments to ensure that more distant projectors can "keep up" with the commands.
- If you press a key while the projector is still responding to the previous action, such as during power-up, the second key press may not take effect.

Keypad Commands ➤ Specific keypad commands are explained below:

Power ON/OFF

Press *and hold* for two seconds to toggle the projector on or off with a single keystroke. Or press and release followed immediately by (on) or (off) to guarantee the correct toggle (useful if you are unsure of the present state).

NOTES: ***1)*** *After powering down, the lamp cooling fan remains on for approximately 5 minutes to cool the lamp.* ***2)*** *It is a good idea to avoid turning a projector back on until it has been off for a few minutes. Hot re-strikes of the lamp may reduce lamp life.*

Test

Press Test to step forward through all internal test patterns and eventually the current input. If you press Test and then cycle by using the and right arrow keys, you'll be cycling in either direction through the test patterns only, no input.

Auto

Press Auto to initiate an automated process in which the projector optimizes critical display parameters such as size, position, pixel tracking, etc., for the current source. These parameters are listed in

Table 3.1. An *Auto Setup* can save time in perfecting a display and you can modify the adjustments as desired.

Table 3.1. Auto Setup

What an "Auto Setup" Does	
OPTIMIZES:	***SETS TO DEFAULT:***
Pixel Tracking	Contrast
Pixel Phase	Brightness
Size and Blanking	Auto Input Level (off)
Vertical Stretch	Detail *(if video source)*
Position	Filter
Input Levels	Luma Delay

NOTE: You must have an unlocked channel present to use Auto Setup.

Channel

Press Channel to select a specific source setup (*channel*) defined and stored in projector memory. Once you enter a 2-digit channel number (or, if there is a list displayed, highlight it and press ↵), the display will automatically change and update according to the numerous setup parameters defined for that channel. Note that a new channel is automatically created if you adjust an image from a new source.

NOTE: Channel (Channel) key behavior *during a presentation depends on whether or not the* ***Display Channel List*** *option is enabled in the* ***Menu Preferences*** *menu. You can choose to use a scrollable list of channels when you press* Channel*, or you may prefer to enter the desired channel number "blind", i.e., without on-screen feedback. See* ***Menu Preferences*** *later in this section.*

Input 1

Press Input 1 to display from the data input source connected to BNCs labeled **INPUT 1**.

Input 2

Press Input 2 to display from the DVI source connected to **INPUT 2**.

Input 3

Press Input 3 to display from the composite video source connected to **INPUT 3**.

Input 4

Press Input 4 to display from the S-video source connected to **INPUT 4**.

Input 5

Press Input 5 to display from the **INPUT 5** interface module installed in the Option 1 slot. NOTE: If you have the optional *Dual SD/HD-SDI Module* installed and there are two inputs connected here, the second input (B) is considered **INPUT 7.** If you are using the built-in keypad or the

remote keypad, press **INPUT 5** to access **INPUT 7** as follows:

- While displaying from **INPUT 5**, press Input 5 again. This switches to **INPUT 7**.
- While displaying from any input *other* than the *Dual SD/HD-SDI Module*, press Input 5. This switches to either **INPUT 5** or **INPUT 7**, depending on which of the *Dual SD/HD-SDI Module* inputs (A or B) was last used. Press Input 5 again to display from the other *Dual SD/HD-SDI Module* input.

Input 6

Press Input 6 to display from the **INPUT 6** interface module installed in the Option 2 slot. NOTE: If you have the optional *Dual SD/HD-SDI Module* installed and there are two inputs connected here, the second input (B) is considered **INPUT 8.** If you are using the built-in keypad or the remote keypad, press **INPUT 6** to access **INPUT 8** as follows:

- While displaying from **INPUT 6**, press Input 5 again. This switches to **INPUT 8**.
- While displaying from any input *other* than the *Dual SD/HD-SDI Module*, press Input 5. This switches to either **INPUT 5** or **INPUT 8**, depending on which of the *Dual SD/HD-SDI Module* inputs (A or B) was last used. Press Input 5 again to display from the other *Dual SD/HD-SDI Module* input.

Contrast

Press Contrast to change the amount of white in your images. Use ◀ ▶ keys until you reach the desired level of contrast—for best results, start low and increase so that whites remain bright but are not distorted or tinted and that light areas do not become white (i.e., "crushed"). Conversely, low contrast causes dim images. See *3.5, Adjusting the Image (Image Settings* subsection).

Brightness

Press Bright to increase or decrease the amount of black in the image. Use ◀ ▶ keys until you reach the desired level of contrast—for best results, start high and decrease so that dark areas do not become black (i.e., "crushed"). Conversely, overly high brightness changes black to dark gray, causing washed-out images. See *3.5, Adjusting the Image (Image Settings* subsection).

Gamma

"Gamma" determines how gray shades are displayed between minimum input (black) and maximum input (white) for a given amount of signal. The proper setting helps maintain optimized blacks and whites while ensuring a smooth transition for the "in-between" values utilized in grays. Unlike brightness and contrast controls, the overall tone of an image can be lightened or darkened without changing the two extremes and your images will be more vibrant yet with good detail in dark areas when using the Gamma control.

The normal gamma setting of 2.2 is correct for most signals and conditions. If excess ambient light washes out the image and it becomes difficult or impossible to see details in dark areas, lower the gamma setting to compensate. This will improve contrast ratio while maintaining good details for blacks and whites

Menu

Press Menu to enter or exit the projector's menu system.

OSD (On-screen display)

Press OSD ▼ to hide the projector's menu system during use. To see the menus again, do one of the following:

- Press *and hold* OSD for two seconds
- Press and release OSD followed immediately by ▲
- Press OSD OSD

Invisible menus are fully functional, enabling "hidden" access to numbered features and image adjustments by entering the corresponding sequence of keypresses on the keypad.

*NOTES: **1)** With OSD "on", you can still hide error messages and slidebars by disabling these options in the **Menu Preferences** menu.*

Shutter

Press *and hold* Shutter for two seconds to toggle the internal mechanical shutter blade closed or open with a single keystroke. Or press and release Shutter followed immediately by ▲ (closed) or ▼ (open) to guarantee the correct toggle (useful if you are unsure of the present state). Alternatively, press Shutter Shutter to toggle from the present on/off state. A closed shutter blanks the display (turns it to black). Close the shutter to mute all display while maintaining access to projector functions. Opening the shutter restores the image.
*NOTES: **1)** "Sh" appears in the LED display when the shutter is closed. **2)** The shutter is open upon power-up.*

Function Key

IF WITHIN A MENU: Using the Func for special tasks within the menu system is noted with the appropriate topic elsewhere in *Section 3*. For example, press Func in the *Channel Setup* menu to enable deletion or copying of a channel.

IF WITHIN A PRESENTATION: Press Func followed by a 2-digit number to enable a specific color or colors in the display (see right). For example, Func 6 4 will display only red and green data, Func 6 7 will display all color data. Eliminating one or more colors can help with certain diagnostics and setups, such as when accurately overlaying one image on top of another from stacked projectors.

Func 6 1 = Red
Func 6 2 = Green
Func 6 3 = Blue
Func 6 4 = Red & Green
Func 6 5 = Green & Blue
Func 6 6 = Red & Blue
Func 6 7 = All Colors

NOTE: Color enabling can also be implemented from numerous locations within the menu system.

Projector

Press Proj to access a specific projector within a group of projectors or to confirm if the local projector is listening. The number in the "Enter Number" window indicates which projector is currently listening to commands, and will match the projector number that has been defined in the *Menu Preferences* menu.

The "Projector" checkbox (read-only) shows whether or not the projector physically connected to a keypad is listening to commands from that keypad. A checkmark

means that connected projector is listening; if there is no checkmark, you are communicating with a different projector.

To control a specific projector with the keypad, press Proj and then enter the 3-digit number assigned to the projector you want to use. If you switch to a projector other than the one you are currently using, the checkmark will disappear.

To broadcast to multiple projectors, press Proj and then Proj again ***without*** entering a projector number. Keypad commands will then affect all projectors present. Note that there is no method of controlling a *group* of projectors within the same wired configuration using the wired keypad exclusively, since there is only one wired protocol available.

NOTES: 1) The "Broadcast Keys" option in the Communications menu must be selected for only ***one*** *(any) projector in a serial network. The keypad in use must be OFF (disabled) for the remaining projectors. See* ***3.6, Adjusting System Parameters and Advanced Controls.***

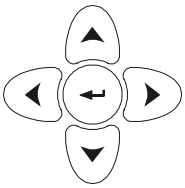
Enter

Press ↵ to select a highlighted item, to toggle a checkbox, or to accept a parameter adjustment and return to the previous menu or image.

Exit

Press Exit to return to the previous level, such as the previous menu.

NOTE: Exit does not save changes within text editing boxes (including number editing of a slidebar value) or within pull-down lists. It acts as a "cancel" in these cases.



Arrow Keys

Use the ◄ ► keys to change a slidebar value or to select a different option within a pull-down list without having to first scroll through options. See also *Editing Text* later in *Section 3*.

Use the ▲ ▼ keys to navigate within a menu, pull-down list or text box.

Focus, Zoom, Lens H, Lens V — Lens Focus, Zoom and Lens H, Lens V

When adjusting the image for focus, zoom, horizontal and vertical positioning, use the specific arrow keys (◄/► or ▲/▼) related to each function. A small window will appear to indicate the type of adjustment taking place. For example,

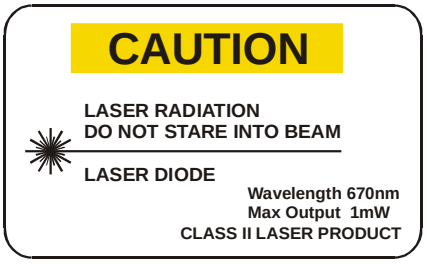
- Use the "Focus" ◄ or ► keys to improve image clarity as desired.
- Use the "Zoom" " ◄ or ► keys to achieve a desired image size.
- Use the "Lens H" " ◄ or ► keys to position the image horizontally while still keeping it rectangular.
- Use the "Lens V" ▲ or ▼ keys to position the image vertically while still keeping it rectangular.

Press Exit to return to presentation level.

NOTE: Use the (Lens Shift) key (built-in keypad) with the general (▲) (▼) keys to get the same effect as if using the arrow keys related to "Lens V" or "Lens H" on the IR remote.

Laser

Press (laser) to activate the laser pointer on the remote. This feature is useful when making presentations - just point the remote at the screen to highlight an area of your presentation. The closer you are to the screen the brighter the laser beam appears. The laser pointer works best in an environment where ambient lighting can be controlled.



NOTE: Leave batteries in the wired remote keypad for the (laser) key to work.

3.3 Navigating the Menus

Most of the controls for the projector are accessed from within the projector's menu system. There are several groups of related *functions*, with each group selectable from the *Main* menu as shown at right. Press (Menu) at any time to display this *Main* menu.

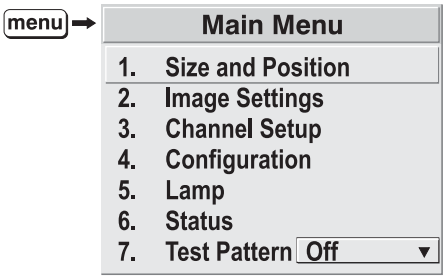


Figure 3.4. Entering the Menu System

On the remote keypad, either enter the number corresponding to the function menu you wish to access, such as (2) for the *Image Settings* menu, or use the (▲) (▼) keys on any keypad to highlight the desired option, then press (↵). The corresponding function menu or pull-down list of further options will then appear.

With a function menu displayed, navigate in a similar manner—enter a menu option number for any numbered option, or use the (▲) (▼) keys to highlight the desired option, then press (↵) (Enter). Extra long menus have a scroll bar on the right—use the arrow keys to access the remainder of the menu. Locked items or items that do not pertain to the current action or condition appear dimmed and cannot be selected.

NOTES: ***1)*** *If there is no signal present, all source-dependent adjustments are disabled.* ***2)*** *After 15 minutes of inactivity, the projector leaves the menu system and returns to the presentation.* ***3)*** *The* ***Status*** *menu is read-only.*

When finished with a function menu, do one of the following:

- Press (Exit) to return to the previous screen
- Press (Menu) to leave the menu system and return to the presentation

On-line Help ➤ If at any time you are uncertain what to do next, press (Help) to display summary information about the current menu or highlighted option. Press (Help) again to exit. In addition, a line of "hint" text is included at the bottom of some menus.

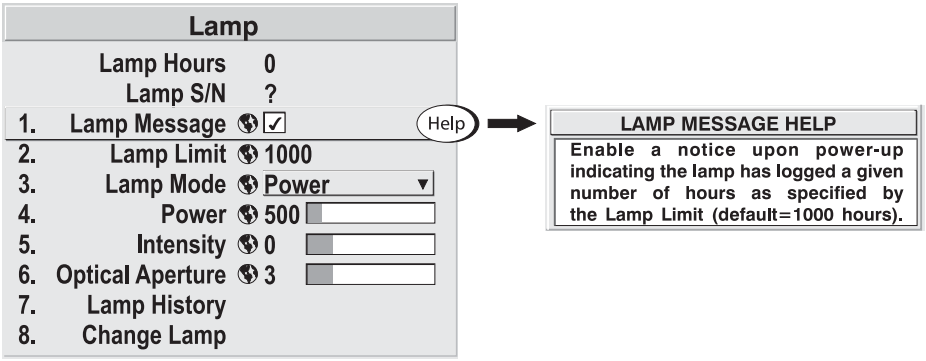


Figure 3.5. Context-sensitive Help

From presentation level, press Help to access general *Help Topics*. Scroll as necessary within a topic. Press Help or Exit to return to your presentation.

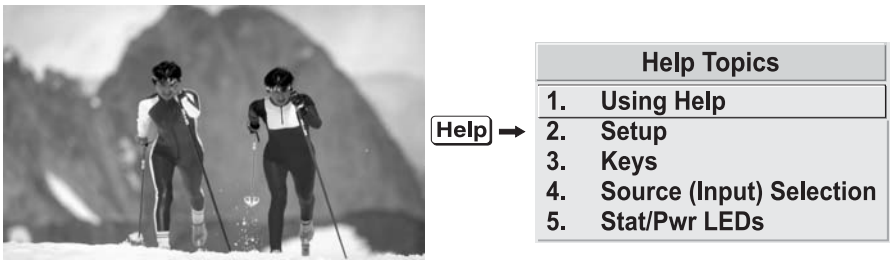


Figure 3.6. Accessing General Help Topics

Time-outs ➤ If a slidebar, menu, or message is displayed, you have limited time in which to make a keypad entry before the projector returns to presentation level Help and the graphic disappears. These time-outs may vary depending on what is displayed.

The Global Icon ➤ Menu options that include this icon apply universally to any incoming signal.

Using Slidebars and Other Controls ➤ Most of the function menus allow you to change settings by using slidebars, checkboxes, and pull-down lists. To select a slidebar, toggle a checkbox status, or view a pull-down list, do one of the following within the function menu:

- Enter the menu option number corresponding to the setting you wish to change (for example, press Menu 1 3 to select "Vertical Stretch" in the *Size & Position* menu).
- Or move the highlight to the option desired and press ↵ (Enter).
- Or move the highlight to the option desired and press ◄ ► to adjust immediately.
- Or bypass the menus entirely and use a single key to immediately access an adjustment during your presentation (*NOTE: applies only to options having their own key, such as Contrast, Brightness, Gamma, etc.*).
- For "blind" access, hide the entire menu system (see OSD key, above) and/or direct slidebars activated by their own key (such as Contrast, Brightness, etc.). Control by using the proper keypress or numerical sequence of key presses.

Once selected, change the setting as desired (see below) and press ↵ to save and return to the current function menu.

Slidebars in menus – The current value for a given parameter, such as size or vertical stretch, appears to the left of its slidebar icon (adjustment window). This number often expresses a percentage, or it may have units associated with it (such as pixels, degrees Kelvin, etc.), depending on the specific option. Press ◄ ► to gradually adjust the setting up or down—both the number and the length of the bar change accordingly. Hold for continuous adjustment. Or press ↵ to activate a slidebar text box for specific number entry via the keypad, then press ↵ to save (or press Exit to cancel).

"Direct" slidebars - For quick access, you can access Gamma, Brightness, and Contrast slidebars without traveling the menu system. For example, simply press Cont to immediately display the same contrast slidebar accessed with the Contrast option in the *Image Settings* menu.

Use the arrow keys to adjust a direct slidebar, or press ↵ and enter a specific number from the keypad , then ↵ or ◄ or ► to save (or Exit to cancel). When you are done, press Exit to save and return to your presentation.

NOTES: ***1)*** *You can still adjust a direct slidebar as usual if the display is turned off (see OSD or* ***Menu Preferences*** *menu) — the slidebar just won't be visible.* ***2)*** *A direct slidebar disappears if it is not used within 5 seconds.*

Checkboxes - Conditions are present if its adjacent checkbox contains a checkmark. To toggle the checkbox, simply highlight and press ↵, or highlight and use ► to check and ◄ to uncheck. If a checkbox is numbered, simply enter its number to immediately toggle the checkbox.

Pull-down lists – To see a pull-down list of options available for a given parameter labeled with a ▼, you can:

- Highlight it and press ↵ (Enter)
- Or enter the menu option number.

Use ▲ or ▼ keys to navigate up and down within the list (the current choice is noted with a small ➤). Press ↵ to choose an option from the list, if desired.

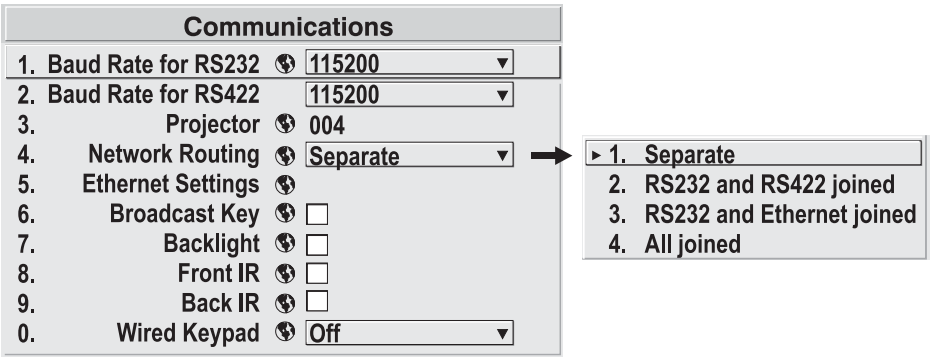


Figure 3.7. Example of Pull-Down List

If you prefer to quickly scroll through a list without first pulling it down, highlight the option and use ◄ *or* ► . Press ↵ when the desired choice appears.

NOTES: ***1)*** *Press* ◄ or ► *to jump between pages in an extra long pull-down list.* ***2)*** *Press* Exit *while in a pull-down list to* ***cancel*** *any change.*

Editing Text ➤

ACTIVATE THE EDIT WINDOW: To enter or edit text, highlight the desired parameter (such as a channel name) and press ↵ to activate its adjacent edit window. Any previously entered text is displayed with its first character highlighted in a square cursor, signifying that this character is ready for editing.

NAVIGATE WITHIN THE EDIT WINDOW: Press ► to move the cursor forward or ◄ to move the cursor backwards as desired.

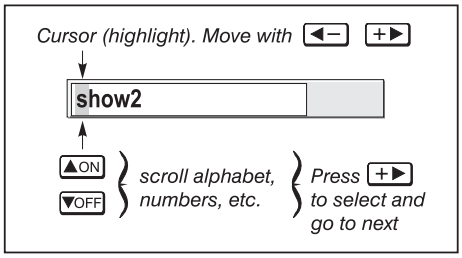
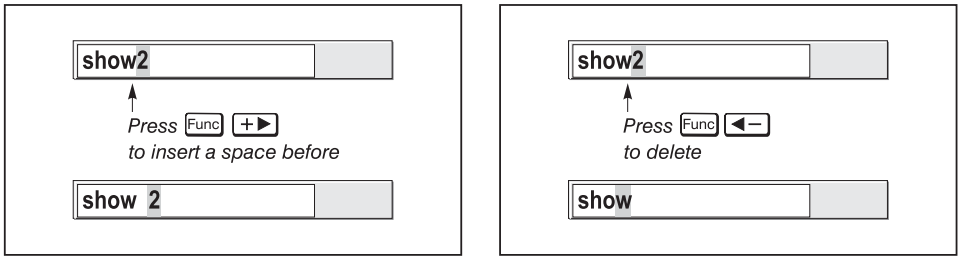


Figure 3.8. Entering Text

EDIT A CHARACTER: To edit a highlighted character, use ▲ and ▼ to scroll through the alphabet, numbers, spaces and punctuation available. When the character you need appears, press ► to select it—the cursor will move to the next character of current text, if present. Note that you can also enter a number directly from the keypad—it will be accepted and the cursor will move on.

ADD OR DELETE A CHARACTER OR SPACE: To insert a space at the cursor location, press Func ►. To delete a highlighted character (or space), press Func ◄.



PRESS ↵ (ENTER) WHEN FINISHED: To accept edits and leave the edit window, press ↵ (Enter).

NOTE: Press Exit *at any time to cancel changes and return to the previously-defined text.*

Editing Numerical Values ➤

Enter numbers directly from the keypad in order to specify numbers representing projectors, channels (source setups), or slots. As each digit is entered, it is displayed and the cursor moves on. Note that channel numbers are defined with 2 digits—for example, if you enter only a single digit (such as “7”) for a channel number, the channel will automatically be defined as “07”. Enter “07” to utilize this channel.

NOTES: ***1)*** *Once you enter the first digit, this digit replaces all old digits.* ***2)*** *If you press any non-numbered key, the number entered up to that point is accepted and updated as the new value.* ***3)*** *Press* Exit *to cancel editing of numerical values.*

3.4 Using Inputs and Channels

*NOTE: See **Section 2, Installation and Setup**, for a full explanation of how to connect sources to the projector.*

The projector stores and automatically recalls up to 50 different channels (source setups) for a variety of inputs. This memory feature allows you to define and conveniently use a wide variety of customized setups rather than having to repeatedly re-configure the projector for different presentations. Depending on what you have defined, each physical source connection (i.e., input at the projector) can have several different channels associated with it.

Do I Select an Input Or a Channel? ➤

INPUT – An input is a source physically connected at the projector. (Input) describes the source signal according to which *input slot* it is connected.

SWITCHING INPUTS – Press the appropriate direct key — (Input 1), (Input 2), (Input 3), (Input 4), (Input 5) or (Input 6) to quickly display from one of the six inputs connected to the projector. The image will be displayed according to the following:

If it is the first time you have used the source/input (or if you used the input but did not define a channel by adjusting anything), the projector will recognize the new input signal based on its frequencies and polarities, and will automatically display an image according to default settings for such a signal. In general, the image from the new source will be as large as possible without losing its aspect ratio. This and other default image settings depend on the incoming source.

If you used the source once before and changed a display parameter such as contrast, V-Position, etc., then a channel was automatically created and still exists in projector memory (see below). Using one of the (Input) keys will automatically recall this channel—and all its setup parameters—and update the display accordingly.

If more than one channel exists for the input, the image will be displayed according to the setup parameters for the first channel with matching characteristics.

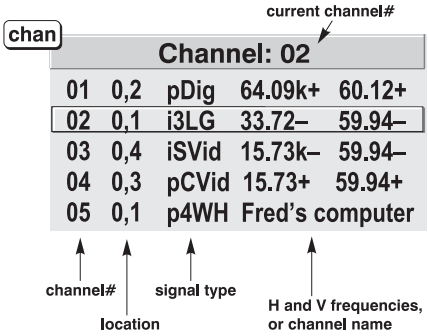
*NOTE: Inputs 7 and 8 require the **Dual SD/HD-SDI** module in either of the projector's option slots. For their selection, see also **3.2 Using the Remote or Built-In Keypad**.*

CHANNEL - A channel is a collection of measurements, locations and settings that tailor the display of a signal to your specific needs. Since source types and applications can vary greatly, you will likely want to adjust and define a wide variety of parameters, such as brightness, contrast, size, etc., in order to customize and optimize the display from or for a particular source. For example, the display settings you choose for a VCR source may be very different from those you choose for a high resolution computer source, or one signal may simply vary from another signal used previously through the same input location. Once you have adjusted a display parameter, such as pixel tracking or contrast, all current settings are collectively stored in the projector's memory as a unique 2-digit channel, such as (0)(9). You can have numerous distinct channels available for the same input, any of which can be selected by using the (Channel) key on the keypad followed by the 2-digit channel number.

Shown at right is a sample channel list as would be available from Channel. This is typically called the *channel list*.

NOTE: The Channel *key may display a channel list or not, depending on what you have defined for "Display Channel List" (see* ***Menu Preferences*** *later in this section).*

In order to access channels by using Channel on the keypad, you must first create the channels. See below.



Channel List

Creating a New Channel – AUTOMATIC –

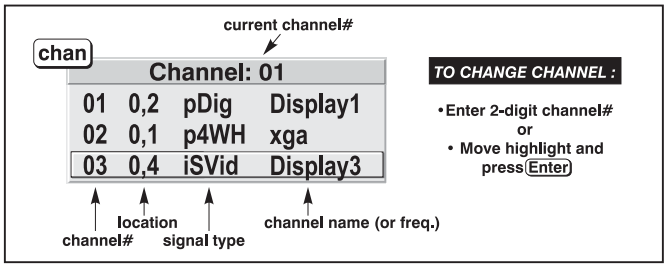
➤ To use a new source with the projector, a new channel must be added to projector memory so that the projector will respond properly to an input signal from that source in the future. A new channel can be created automatically, as described here, or it can be copied from an existing channel and then edited as necessary (see *Copying or Deleting Channels* later in this section).

When you select a direct input (Input 1, Input 2, Input 3, Input 4, Input 5 or Input 6), any existing channels in the projector are searched for matching input and signal parameters – this only occurs if Auto Source is enabled on these channels. If no match to the incoming input signal is found in currently-defined channels, a new channel is temporarily created based on factory-defined defaults for this type of signal. The *channel number* assigned is the lowest available number from 01-50.

NOTES: ***1)*** *An automatic channel will be discarded unless one or more of its parameters are changed and will not appear in the channel list (see below).* ***2)*** *If two channels have the same distinguishing source characteristics except for the reversal of sync connectors (i.e., H-sync and V-sync, are switched), they are still defined as distinct channels.* ***3)*** *You cannot define a new channel without an incoming signal.*

If the incoming signal *does* match an existing channel, the image will be set up and displayed as usual according to the parameters currently defined for that channel.

USING A CHANNEL: You can normally select a channel at any time by pressing Channel (see right). If you want to prevent a channel from appearing in this list, you must edit the channel as described in *Channel Edit* later in this section. Such a channel can still be selected by entering its number as shown at right.



NOTES: ***1)*** *The current channel is highlighted upon entering the channel list, or, if this channel is not displayed here, the first channel in the list is highlighted.* ***2)*** *Channels created automatically do not appear in the channel list unless a parameter for the channel has been changed.*

What Channels Are Defined So Far?

All available channels are listed in the *Channel Setup* menu, which describes how each channel can be accessed and which serves as the gateway for editing, copying and deleting channels.

From the presentation level press Menu to display the *Main* menu. To display the *Channel Setup* menu, press 3, or move the highlight to the *Channel Setup* option and press ↵. The *Channel Setup* menu will appear (see sample at right), with the active channel highlighted.

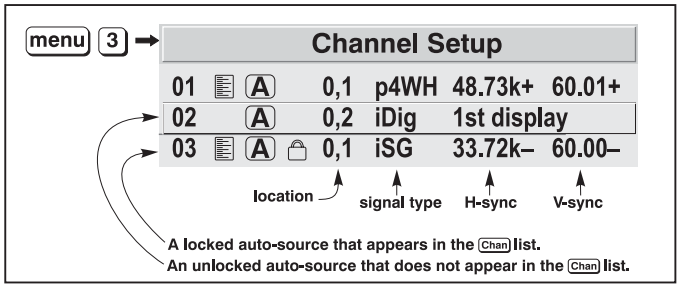
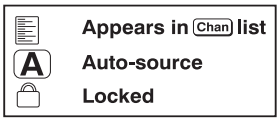


Figure 3.9. All Channels Appear in the Channel Setup Menu

WHAT APPEARS IN CHANNEL SETUP MENU? This menu lists all channels defined so far and indicates where they are connected on the input panel. The far left column lists channel numbers currently defined. The values in the far right columns indicate horizontal and vertical frequencies—if someone has defined a name for this channel, it appears here instead. Remaining columns contain details pertaining to each channel setup, such as its switcher number (always 0 = projector), slot location, a variety of icons indicating access to each channel, and an abbreviated description of each signal type. See *Editing a Channel Setup* for details.



NOTE: If you have more than a handful of channels, use ◄ and ► to see the remaining channels not visible in the initial display of channels.

SIGNAL TYPE — Either channel list, whether the Channel key list or the *Channel Setup* menu, identifies signal types in a shortened form as defined below. These descriptors indicate what signal information the projector uses to identify a match for a given channel, and are preceded by either an "i" (interlaced signals) or "p" (progressive signal"). See Table 3.2.

Table 3.2. Abbreviations for Signal Type

Abbrev.	Signal Type
4WH	Composite (4 wire) on HC input
4WV	Composite (4 wire) on V input
SG	Sync-on-green
5W	Separate H,V
5WR	Separate H,V swapped
SVid	S-Vid
CVid	Composite Video
Dig	Digital

FUNCTIONS WITHIN THE CHANNEL SETUP MENU —To copy, delete or edit a channel, highlight the desired channel in the *Channel Setup* menu and do one of two things:

- Press (Func) if you want to copy the selected channel or delete this or other channels. See *Copying or Deleting a Channel* below.
- Press (↵) if you want to edit channel setups (i.e., non-image related parameters) for the selected channel. See *Editing a Channel Setup*, below.

Copying or Deleting Channels

➤ **TO COPY A CHANNEL**, highlight the desired channel in the *Channel Setup* menu, then press (Func) to go to the *Channel Copy/Delete* submenu. Select "Copy" and press (↵)—a new channel will be created. It is identical to original, which still remains, but it is identified with the next available number from 01-50. If you change your mind and do *not* want to copy the current channel, press (Exit) to cancel and return to the previous menu. Copying channels is a quick method for creating numerous channels, each of which can then be edited and adjusted for a variety of presentations in the future.

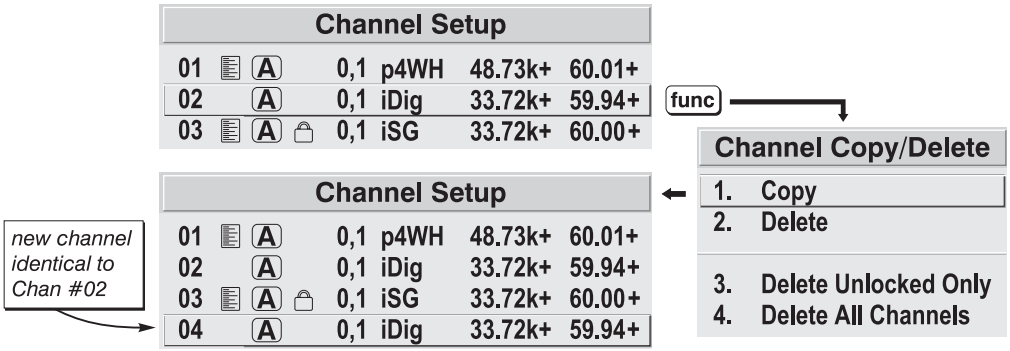


Figure 3.10. Copying A Channel

TO DELETE A CHANNEL, highlight the desired channel in the *Channel Setup* menu, then press (Func) to activate the *Channel Copy/Delete* submenu. Select "Delete" and press (↵)—a confirmation window will appear to make sure that you really want to delete this channel.

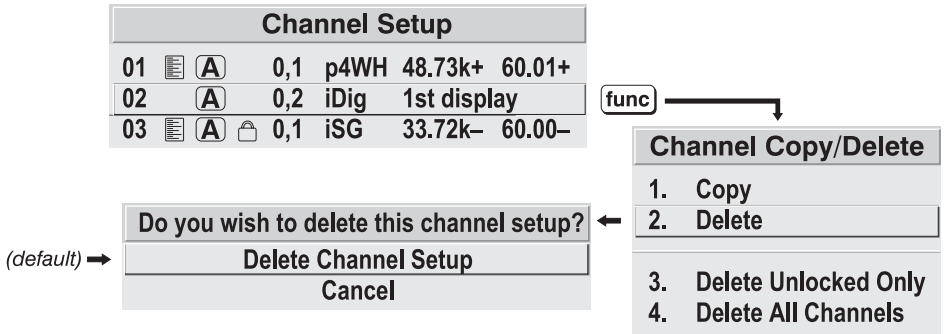


Figure 3.11. Deleting a Channel

TO DELETE MULTIPLE CHANNELS, highlight any channel in the *Channel Setup* menu and press (Func) to go to the *Channel Copy/Delete* submenu. Select "Delete Unlocked Only" and press (↵) to delete all unlocked channels. Or select "Delete All Channels" to delete all channels, even those that are locked. In either case, the current channel will remain but will be redefined from projector defaults.

NOTE: For any deletion, a confirmation box appears to make sure that you really want to delete. Select "Cancel" (default) if you don't want to delete after all.

Editing a Channel Setup ➤

The basic setups that describe how and where a channel can be accessed are listed in the *Channel Setup* menu. These channel setups can be edited at any time in the *Channel Edit* submenu.

CHANNEL EDIT — STEP 1

From the presentation level press (Menu) to display the main menu. To display the *Channel Setup* menu, press (3), or move the highlight to the *Channel Setup* option and press (↵). The *Channel Setup* menu will appear.

CHANNEL EDIT — STEP 2

To edit parameters shown in the *Channel Setup* menu, select the relevant channel and press (↵). The *Channel Edit* menu will appear similar to the sample shown in Figure 3.12.

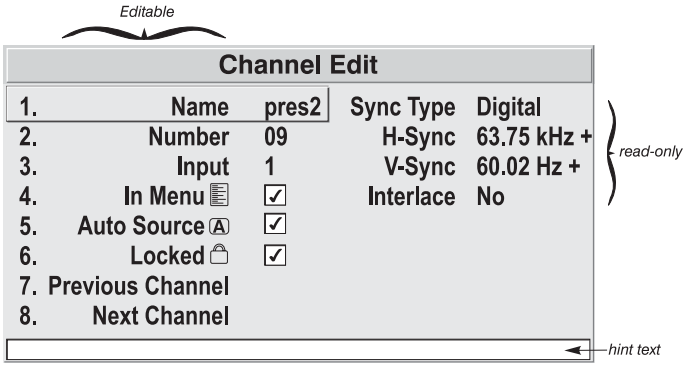


Figure 3.12. Channel Edit Menu (SAMPLE)

CHANNEL EDIT — STEP 3

If desired, review and/or edit the following channel setups in the *Channel Edit* menu:

- **CHANNEL NAME:** An alpha-numeric label can be defined and/or changed here. Channel names can be up to 12 characters in length.

- **CHANNEL NUMBER:** A 2-digit channel number can be changed here. NOTES: **1)** If you enter a channel number that already exists, a dialog message appears indicating that this number is already in use–assign a different channel number. **2)** You can define up to 50 channels.

- **INPUT:** 1-8, corresponding to where on the projector's input panel the source is connected.

- **IN MENU:** If checked (default, except for automatically defined channels with unchanged parameters), this defined channel will then appear in the list available when (Channel) key is pressed. If unchecked, the channel must be accessed via (Channel) on the keypad or via the Auto Source function. *NOTE: On-screen display of the channel list is an option that must be set in the* ***Menu Preferences*** *menu.*

- **AUTO SOURCE:** If checked, (default), the projector can automatically locate this channel when an incoming input signal matches. If not checked, the projector can locate the selected channel only when it is directly selected via (Channel) on the keypad—and a change in input signal will *not* result in a channel change.

- **LOCKED:** If checked, all of the image settings for this channel are disabled. If unchecked (default), all available image settings can be adjusted as desired. You cannot use Auto Setup with a locked channel.

- **PREVIOUS CHANNEL:** Select this option to see or change *Channel Edit* settings for the previous channel in the *Channel Setup* list.

- **NEXT CHANNEL:** Select this option to see or change *Channel Edit* settings for the next channel in the *Channel Setup* list.

3.5 Adjusting the Image

The most commonly used options for image adjustments are accessed through two menus: *Size and Position* ((Menu)(1))and *Image Settings* ((Menu)(2)), both of which appear in the *Main* menu. From either of these two menus, you can change settings affecting the image from the current channel by working with the appropriate slidebars, checkboxes and pull-down lists. (Exit) will return to the previous menu (or to the presentation, if from the *Main* menu) and accept any changes you may have entered. Settings are saved with the current channel.

From your presentation, you can access any of the individual options in these menus by pressing (Menu) followed by the appropriate two-digit number representing their location in the menu system. For example, press (Menu)(2)(3) to quickly access the "Gamma" option in the *Image Settings* menu.

Note that for certain options, you may prefer to use a "direct key" from presentation level to go directly to a particular option without traveling through the menu system (*note: available for certain display parameters only*). For example, press (Contrast) to access the "contrast" slidebar immediately. Press (Exit) to return to your presentation.

NOTES: ***1)*** *To hide these "direct" slidebars, disable the "Display Slidebars" checkbox in the* ***Menu Preferences*** *menu.* ***2)*** *To hide the entire menu system from view, toggle the on-screen display by pressing* (OSD) (▼).

Before You Begin ➤ ***Use Auto Setup ((Auto))***

For a good and efficient first step in perfecting the image, press (Auto). This initiates an automated process in which the projector quickly optimizes critical display parameters such as size, position, pixel tracking, etc., based on the type of incoming source data detected. An *Auto Setup* can save considerable setup time, and you can still modify the adjustments as desired using menu options described below.

Size and Position Menu ➤

In the *Size and Position* menu, you can increase or decrease the size of your image, change its proportion (aspect ratio), move the image to a specific area of the screen, and refine other related parameters. Use *Size and Position* controls to match the image precisely to the screen used at the site.

Size and Position		
1.	Resize Presets	No Resizing ▼
2.	Size	1000
3.	Vertical Stretch	1000
4.	Pixel Track	858
5.	Pixel Phase	0
6.	H-Position	360
7.	V-Position	262
8.	Reserved	
9.	Reserved	
0.	Advanced Size and Position	

Refer to *"Using Slidebars and Other Controls"* (earlier in this section) if you need help using any of the options and controls. Changes made in the *Size and Position* menu are applied immediately and are saved when you exit the menu (press Exit or Menu).

Resize Presets

Select a *Resize Presets* option to quickly display an image in its native resolution or to automatically resize an image to closely fill the projector's native resolution of 1400 x 1050, or to optimize the width or height of your display. *Size*, *Position* and *Blanking* parameters will automatically adjust accordingly, or if Blanking is set first, which defines an Active Input Area, *Resize Preset* scaling will occur in this region of interest only. Resizing options are explained in detail below.

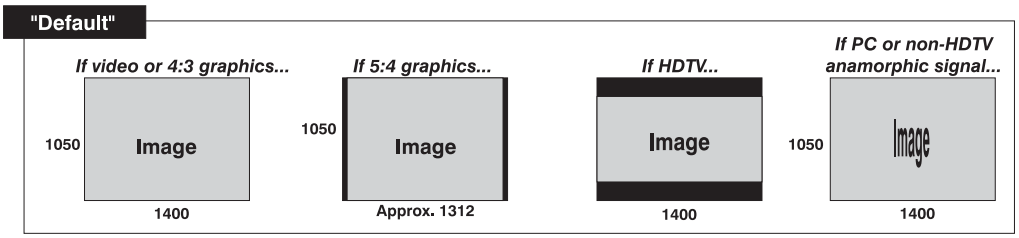
Resize Presets	
1. Default	= maximize for current source
2. No Resizing	= display in native resolution
3. Full Size	= fill the screen (regardless of source)
4. Full Width	= fill display width & keep aspect ratio
5. Full Height	= fill display height & keep aspect ratio
6. Anamorphic	= retain 16:9 aspect ratio
Custom (not selectable)	= non-preset values for *Size, Vertical Stretch, H-Position, V-Position and/or Blanking*

WHAT IS THE RESIZING DEFAULT? By default when displaying a new source, your image will utilize as much of the projector's display area (1400 x 1050) as possible for the type of incoming source data, but with minimal or no changes to aspect ratio. See *Select "Default"* below.

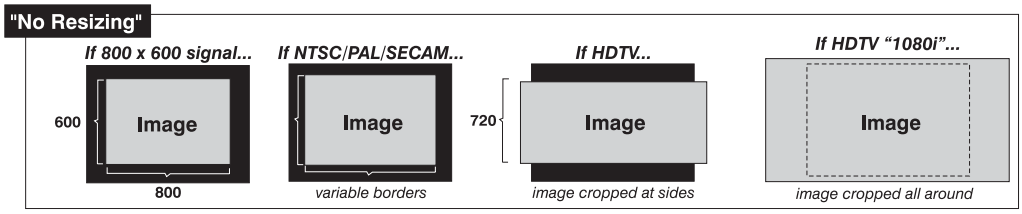
WHEN "CUSTOM" APPEARS: The "Custom" re-size descriptor automatically appears in the *Size and Position* menu when any of the values for *Size*, *Vertical Stretch*, *H-Position*, V-*Position* or *Blanking* do not correspond to those for a preset. This option is not offered in the *Resize Presets* pull-down list.

- Select "**DEFAULT**" for most sources (factory default). The image will be centered and displayed as large as possible *depending on the type of source*, as described below:

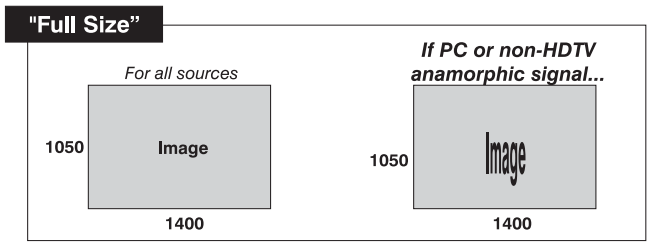
  ✓***A 5:4 graphic image*** will enlarge to fill the screen height, and be centered between narrow black side bars.
  ✓***A video image*** or 4:3 graphic image will enlarge to fill the screen.
  ✓***An anamorphic (16:9) image*** will fill the width and be centered between black bars on top and bottom.



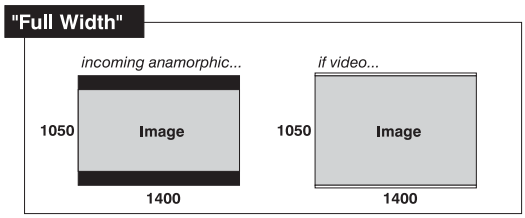
- Select "**NO RESIZING**" to display the image in its native resolution, which may or may not match the projector's 1400 x 1050 resolution. For example, for a source with a native resolution of 800 x 600, "No Resizing" will use the central 800 x 600 pixels and have a black border—the black border areas are unused areas. See below.



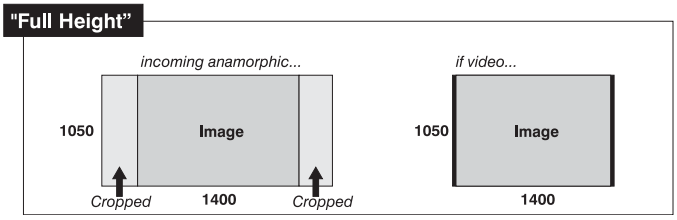
- Select "**FULL SIZE**" to use *all pixels* (1400 x 1050) for displaying the image, regardless of source or original aspect ratio. Incoming source material having a different aspect ratio than the projector will be stretched for display.



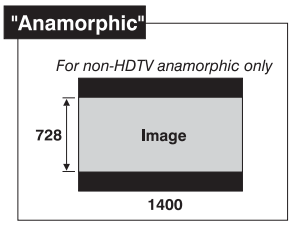
- Select "**FULL WIDTH**" to fill the projector's display from left-to-right without changing the original aspect ratio of the image. Depending on the source, data at the top and bottom may be discarded (cropped), or the display may have black borders at the top and bottom (called "letterboxed").



- Select "**FULL HEIGHT**" to fill the display from top-to-bottom. Depending on the source, this may create borders.



- Select "**ANAMORPHIC**" to display an anamorphic image in its native 16:9 aspect ratio. The image will fill the screen from side-to-side and be centered between black bars at top and bottom.



Size

"Size" controls both the image *width* and *height* in tandem, maintaining the current aspect ratio (proportion) of the displayed signal data.

Vertical Stretch

"Vertical Stretch" adjusts the *height* of the image while keeping the width constant. Use "*Vertical Stretch"* to change the aspect ratio of the display.

Pixel Track

Steady flickering or several soft vertical stripes or bands across the entire image indicates poor pixel tracking. Proper pixel tracking helps ensure that the image quality is consistent across the screen, that aspect ratio is maintained, and that pixel phase can be optimized (described below). Tracking determines the frequency of the pixel sampling clock, indicated by the number of incoming pixels per line, so that all pixels generated by a particular source are sampled.

NOTE: By default, the projector samples at the correct frequency for most sources.

For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar "half on, half off" graphic image, such as the *Windows* shutdown screen. Adjust the slidebar until the vertical stripes broaden to the point where one large stripe fills the image. If the image still exhibits some shimmer or noise, adjust *Pixel Phase* (below).

Pixel Phase

NOTE: Adjust "Pixel Phase" ***after*** *"Pixel Tracking".*

Adjust pixel phase when the image (usually from an RGB source) still shows shimmer or "noise" after pixel tracking is optimized. Pixel phase adjusts the phase of the pixel sampling clock relative to the incoming signal.

For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar "half on, half off" graphic image, such as the *Windows* shutdown screen. Adjust the slidebar until the image stabilizes and each pixel is clearly defined. You may notice that you can stabilize the image at more than one point—i.e., you may find that the image appearance at "11" is identical to the image appearance at "38", thus you can use either setting.

If some shimmer from a video or HDTV source persists, use the "Filter" control to remove high-frequency noise from the signal. See *Image Settings*.

H-Position

This option moves the image right or left within the area of available pixels.

NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available horizontally. This varies widely according to the signal—watch the image while adjusting.

V-Position

This option moves the image up or down within the area of available pixels.

NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available vertically. This varies widely according to the signal—watch the image while adjusting.

Swap PIP Images

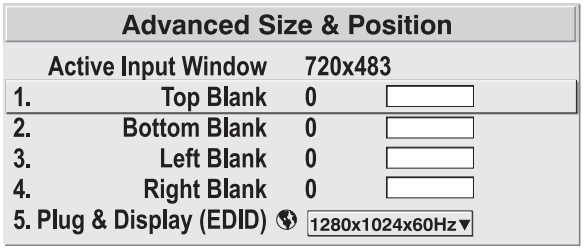
Toggle the current picture-in-picture relationship so that the primary image becomes secondary, and the secondary image becomes primary. Swapping is available only when PIP is enabled. *Note: Not available in v1.0 software. Shown as "Reserved".*

PIP Enable

Toggle to display from two sources at once (picture-in-picture) or the primary source only. This checkbox turns the secondary source on and off in the display. *Note: Not available in v1.0 software. Shown as "Reserved".*

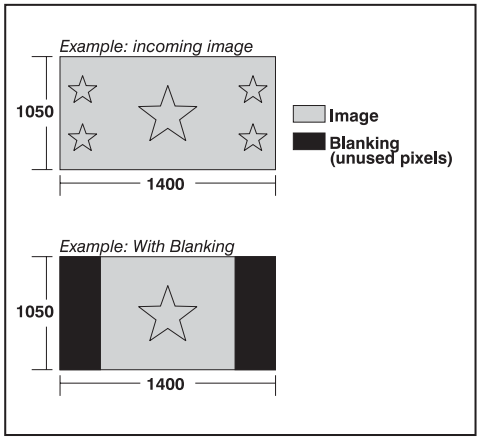
Advanced Size and Position — SUBMENU

This submenu consists of the following options:



ACTIVE INPUT WINDOW: This read-only value indicates the current size (i.e., area) of your displayed data or "region of interest" as defined by the blanking controls. By default, the projector automatically determines what portion of its full resolution to use, and pixels in the surrounding borders are turned off. You can also specify a specific active input window size by adjusting one or more "Blank" settings. For example, if you have blanked (cropped) 100 pixels from both the left and right edges of an incoming source of 1400 x 1050, the remaining active input window will be reduced to 1200 x 1050. When using SD or HD or a decoded video source at **INPUT 3** or **INPUT 4**, the default blanking of "0" defines an active input window of 720 x 483.

BLANKING (TOP, BOTTOM, LEFT, and RIGHT): Crop the image as desired so that unwanted edges are removed from the display (changed to black—see right). Blanking defines the size of the *Active Input Window*, or area of interest. Range of adjustment depends on the source resolution and other factors.



PLUG & DISPLAY (EDID): By default, a *Plug & Play (EDID)* source outputs a signal according to the EDID information provided by the projector. To override this information and display in a different format (for example, if your *Plug & Play [EDID]* device does not support the projector's resolution and/or frequency), select the desired *Plug & Play (EDID)* resolution from the list.

Any daisy-chained projectors will also display according to the chosen *Plug & Play (EDID)* format.

EDID = Extended Display Identification Data standard.

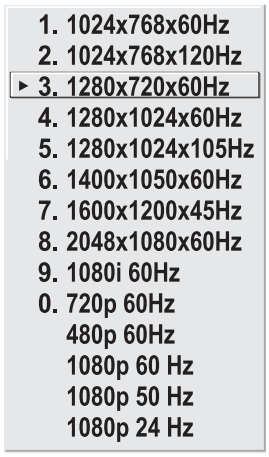
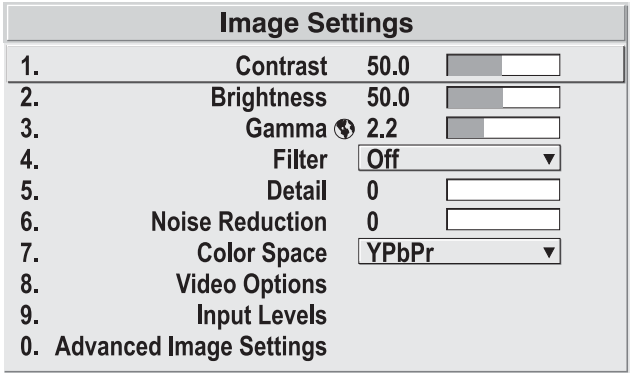


Image Settings Menu ➤

Use options in the *Image Settings* menu to alter your image without affecting its size or position. Changes made to the *Image Settings* menu are applied immediately and are saved when you exit the menu (press Exit or Menu). Options not available for the projector model or source are disabled and appear dim (gray).



Contrast

(***SHORT CUT:*** Press Contrast and adjust the slidebar.)

"Contrast" increases or decreases the perceived difference between light and dark areas of your image (0-100). For best results, keep close to 50. If contrast is set too high, the light parts of the image lose detail and clarity. If set too low, the light areas will not be as bright as they could be and the overall image will be dim. For best results, start with a low value and increase so that whites remain bright but are not distorted or tinted and that light areas do not become white (i.e., are "crushed").

NOTE: If the environment lighting changes, an adjustment of ***Gamma*** *is recommended (see below).*

Brightness

(***SHORT CUT:*** Press Bright and adjust the slidebar.)

"Brightness" increases or decreases the amount of black in the image (0-100). For best results, keep close to 50. Start with a high value and decrease so that dark areas do not become black (i.e., are "crushed"). Conversely, high brightness changes black to dark gray, causing washed-out images.

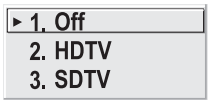
Gamma

(***SHORT CUT:*** Press Gamma and adjust the slidebar.)

"Gamma" is a global setting that determines how gray shades are displayed between minimum input (black) and maximum input (white) for all signals. A good gamma setting helps to optimize blacks and whites while ensuring smooth transitions for the "in-between" values utilized in other grays. Unlike "Brightness" and "Contrast" controls, the overall tone of your images can be lightened or darkened without changing the extremes and all images will be more vibrant while still showing good detail in dark areas when using the "Gamma" control.

The normal gamma setting of 2.2 is correct for virtually all signals and conditions. If excess ambient light washes out the image and it becomes difficult or impossible to see details in dark areas, lower the gamma setting to compensate. This will improve contrast while maintaining good details for blacks. Conversely, if the image is washed out and unnatural, with excessive detail in black areas, increase the setting. Again, good gamma improves contrast while maintaining good details for blacks and whites.

Filter



The proper filter setting is automatically set for virtually all signals, and rarely needs to be changed. It applies a low pass filter for noise reduction in the incoming input signal, particularly for HDTV or SDTV. Applied in the analog domain before sampling, this filtering removes high frequencies and thus reduces pixel phase noise (note this also reduces signal bandwidth). Override only if standard pixel tracking and phase adjustments do not adequately clear up a "noisy" video signal, or if a graphics signal appears overly "soft". Both instances indicate that "Filter" may be set to the wrong option.

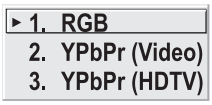
Detail

"Detail" adjusts the sharpness of a video image so that edges remain clearly defined. It can be particularly useful if a significant "Noise Reduction" adjustment has caused the image to appear too soft. Adjust until the display is as sharp as desired, keeping in mind that because "Detail" adds some high frequencies back into the image, it can also re-introduce a certain degree of noise.

Noise Reduction

"Noise Reduction" is similar to the "Filter" control, but operates in the post-sampling digital domain with a more subtle effect. Higher settings are most useful for clearing up noisy RGB images such as those from a PC. Adjust as desired, keeping in mind that reducing noise (which reduces high frequencies) may also soften the image.

Color Space



"Color Space" determines how the color components of an analog input signal are decoded for accurate color in the display. Selecting a color space option is useful only for analog signals connected to **INPUT 1, INPUT 2, INPUT 5** or **INPUT 6.** Although color space for these analog signals is automatically determined by the projector, in some circumstances you may wish to override this and manually set a specific color space.

NOTE: For digital signals or for signals connected to **INPUT 3** *or* **INPUT 4***, the color space function is entirely automatic and the pull-down list disabled.*

The current color space appears in the *Image Settings* menu. Press ↵ to select a different option:

- Select **RGB** *unless* you are using component video at **INPUT 1, 2, 5** or **6.**
- Select **YPbPr (Video)** with a standard definition televised signal (SDTV)
- Select **YPbPr (HDTV)** with a high definition televised signal (HDTV).

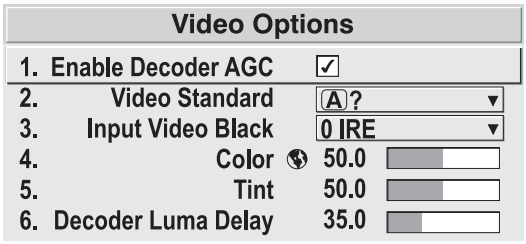
NOTE: When certain RGB signals are first connected, the projector may not initially recognize them as RGB and will incorrectly decode their color information as YPbPr (video). These signals, which appear magenta, can include:

- *RGB signals in NTSC, PAL, SECAM frequency ranges*
- *Scan-doubled sync-on-green*
- *Scan-quadrupled sync-on-green*

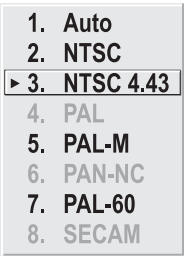
For these signals, change the Color Space to RGB.

Video Options — SUBMENU

This submenu is used with video sources only (**INPUTS 3** or **4**).



ENABLE DECODER AGC: Automatic Gain Control (AGC) affects decoded video images only. Enter a checkmark (default) in most instances—this activates the decoder's AGC circuit to ensure properly bright images. Delete the checkmark if a decoded video image exhibits strange color artifacts such as stripes in highly saturated colors, indicating an incompatibility between this source and the AGC.

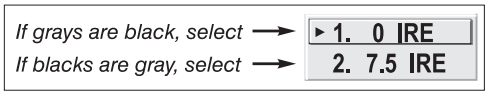


VIDEO STANDARD: For all but the more unusual video standards available in the world, the projector automatically detects the incoming horizontal and vertical frequencies and sets the projector's processing of this signal to the corresponding standard. The current video standard name appears in the *Video Options* submenu, and includes an "A" if it has been auto-detected. Press ↵ to view or select a different video standard from those available to the projector—any that are disabled have frequency characteristics that differ from those of the incoming signal. Selecting a specific standard forces the projector to process the signal according to this standard.

Table 3.3. Regions and Video Standards: Summary

Standard	Where Used (SUBJECT-TO-CHANGE)
NTSC	N. America and Japan
NTSC 4.43	A tape-only standard for partially-translated hybrid signals
PAL	Most of Europe, China, Australia, some of S. America, some of Africa
PAL-M	Brazil
PAL-NC	Argentina, Chile, other Latin American countries
PAL 60	
SECAM	France, Eastern Europe, most of Africa

NOTE: Generally, use "Auto" for all instances EXCEPT: ***1)*** *a poor quality input signal or* ***2)*** *a black-and-white video signal. In order to detect and display such signals, select the relevant standard from the list.*



INPUT VIDEO BLACK — This control compensates for incoming elevated black levels present in certain video signals, and ensures that blacks in the display are neither crushed (i.e., where dark grays appear black) nor excessively elevated (i.e., where blacks appear dark gray). By default, the projector automatically determines the best setting according to the type of incoming video signal:

- **0 IRE** – Used for DVD output with "enhanced black", SECAM, most PAL standards, and Japanese NTSC.
- **7.5 IRE** – Used for most NTSC video signals.

For some types of video, you can override the setting. The control is disabled for other types of video (and all graphics sources). Generally, if black appears crushed when brightness = 50, choose "0 IRE". If black appears excessively elevated, use "7.5 IRE".

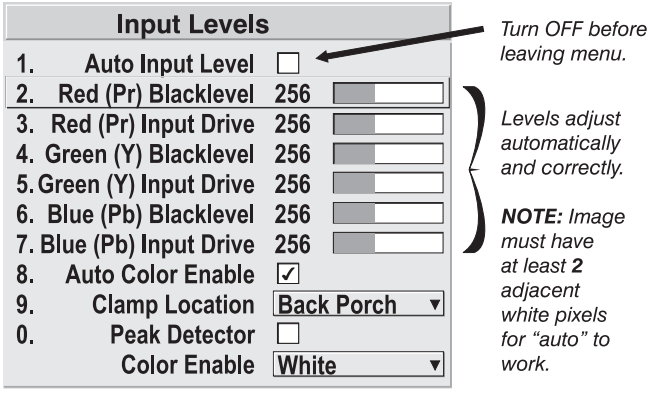
COLOR — This slidebar adjusts the color saturation level, i.e. the *amount* of color in a video image. Lower settings produce less saturated colors — for example a setting of "0" produces a black and white image. If the color level is too high, colors will be overpowering and unrealistic.

TINT — This slidebar adjusts the red/green color hue for true color reproduction of video signals connected to **INPUT 3** or **4**. For best results, adjust tint while displaying an external color bars test pattern—otherwise, it is recommended that tint remain at its default setting.

DECODER LUMA DELAY – This control affects any incoming composite or S-video signal, delaying the luma signal (intensity) in relation to the chroma (color). In the image, increasing the luma delay will move luma (seen as a shadow where colors overlap) to the right slightly, with colors remaining in place. Decreasing this delay will move the shadow slightly to the left. If necessary for your current source, adjust so that no shadows occur with adjacent colors.

Input Levels — SUBMENU

*NOTES: **1)** Because the projector automatically optimizes input levels for all but the most unusual of sources, it is recommended that only experienced users use the **Input Levels** submenu. **2)** Before beginning, check that overall contrast and brightness settings are near 50 **and** that color temperature is properly set up on an internal grayscale test pattern. **3)** There must be at least 2 consecutive white pixels present in the image for proper "Auto Input Level" function. Leave this control **off** after use.*



Good RGB or input levels—that is, the *drives* and *blacklevels* for each of the three colors, red, green and blue—ensure that images from analog sources other than decoded video have maximum contrast without crushing black or white. By default (and in an "Auto Setup"), the projector automatically determines the best input levels by monitoring image content and adjusting the controls appropriately—further adjustment is typically not required to obtain proper blacks or whites. *NOTE: This automatic adjustment requires at least **2 consecutive white pixels** in the image. Without these pixels, input levels may produce skewed colors, particularly in non-video images.*

However, for a very unusual source exhibiting one or more overly high blacklevels (typically caused by a noisy source causing blacklevel spikes), an experienced user may prefer to use the *Input Levels* menu (shown above). These adjustments, which together serve as a calibration process compensating for differences in sources and cabling, enable an experienced user to perfect the source image input levels and eliminate the "overshoot" and "undershoot". Note that *Input Levels* are of limited use with digital signals, but do offer some ability to tweak poorly mastered source materials.

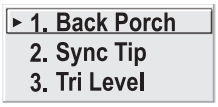
AUTO INPUT LEVEL – Keep off for virtually all sources (default). Temporarily enter a checkmark *only* if you are an experienced user and you have an unusual source that you feel needs further color temperature and/or input level adjustment. After entering a checkmark, wait for the six slidebar values to stabilize, then delete the checkmark and exit. This compensates for incoming out-of-range drives (white) and blacklevels (black) that would cause "crushing" of light and dark colors in the image.

BLACKLEVELS AND DRIVES - To check your image and adjust these controls:

1. Make sure overall "Contrast" and "Brightness" settings are both set to near 50. *NOTE: Not required for "Auto" adjustment.*
   - Contrast = 50 (approx.)
   - Bright = 50 (approx.)
2. Check the color temperature setup using an internal grayscale test pattern, making sure to obtain a neutral grayscale. *NOTE: Not required for "Auto" adjustment.*
3. Confirm that you are using an analog source ***not*** connected to **INPUT 3** or **INPUT 4**, as Input Levels are not applicable for digital sources or sources going through the decoder. A grayscale is recommended.
4. If the blacks and/or whites appear OK, input levels do not need adjustment. If black levels are too high (and/or whites are too low, which is rare), you likely have a noisy source that is producing skewed input levels. Continue with Step 5.
5. Temporarily enable "Auto" in the *Input Levels* submenu. Wait for all 6 values to stabilize. Alternatively, do *not* use "Auto"—reduce blacklevels manually instead. Judge by eye and change one or more of the six levels as necessary to obtain proper blacks and whites. You may want to see only a certain color while adjusting—use the "Color Enable" option (described below).
6. Delete the "Auto" checkmark and leave the *Input Levels* menu.

AUTO COLOR ENABLE – When a checkmark is present, selecting a specific blacklevel or drive to adjust will automatically enable the corresponding color in the display. Delete the checkmark to see all colors.

CLAMP LOCATION – This option (formerly known as *sync tip clamping*) can brighten the image produced from certain high-resolution high-frequency graphic sources. For almost all sources, the best clamp location is automatically selected by the projector. Use the normal *Back Porch* location if the image is either sufficiently bright or overly bright. Select *Sync Tip* if the image appears unusually dim, if there are horizontal streaks across the image, or if there is significant color drift. This moves the clamping pulse from the normal back porch location (which is likely too short) to the tip of the horizontal sync pulse. *Tri Level* is typically recommended for an HDTV source where the back porch is also short.



NOTE: Clamp Location is not used for video sources or any RGB source with sync information included on the video (e.g., sync-on-green). Use Tri Level instead.

COLOR ENABLE – Select which color or colors you want to see in the display, useful while working with color temperature white levels or input levels.

NOTES: ***1)*** *Input levels apply for the current source only, but for any color temperature used.* ***2)*** *Assuming that color temperature has been set up based on the internal test patterns, you can then set up input levels for a given source so that it matches the color temperature of the internal test patterns.*

PEAK DETECTOR – The Peak Detector is a fast method for defining individual input levels, and can improve the accuracy of input levels set by the Auto Input level function. Enabling the Peak Detector activates a special operating mode for detecting ***only*** pixels that are considered black or white—all other levels are displayed as a mid-level gray. When used with a smooth grayscale pattern in which black and white are known to be at opposite edges of the image, you can watch these isolated areas while adjusting individual blacklevels and input drives until both black and white edges are ***just*** visible and distinguished from neighboring pixels. Images from this source will then display correct blacks and whites without crushing.

See Figure 3.13. ***Adjusting Input Levels Using the Peak Detector***:

1. Display a 16 level grayscale test pattern from the desired external source, and enter a checkmark in the Peak Detector checkbox. *NOTE: The "Peak Detector" will initially render the grayscale as a uniform gray field before adjustment.*
2. Display one primary color (use *Color Enable* to select).
3. For the current color, adjust its corresponding "Blacklevel" slidebar ***just*** until a single band of black appears at one edge of the screen. This band represents the first band of the grayscale pattern, which should be 100% black. Do not adjust too far.
4. With the same color still active, adjust its corresponding "Input Drive" slidebar ***just*** until a single band of color appears at the opposite edge of the screen. This band represents the last band of the grayscale pattern, which should be 100% white (or the current color, if a certain color is enabled). Do not adjust too far.
5. Go back and check the black band—adjust the blacklevel slidebar if necessary. Blacklevel and Input Drive adjustments are related, so you may have to go back and forth until both bands are ***just*** optimized.
6. Repeat Steps 2-5 with the other two remaining primary colors. When each primary color shows ***one*** optimized black band and white (or colored) band, the input levels for this source are correctly set. Upon exiting the *Input Levels* menu, the Peak Detector checkbox will clear.

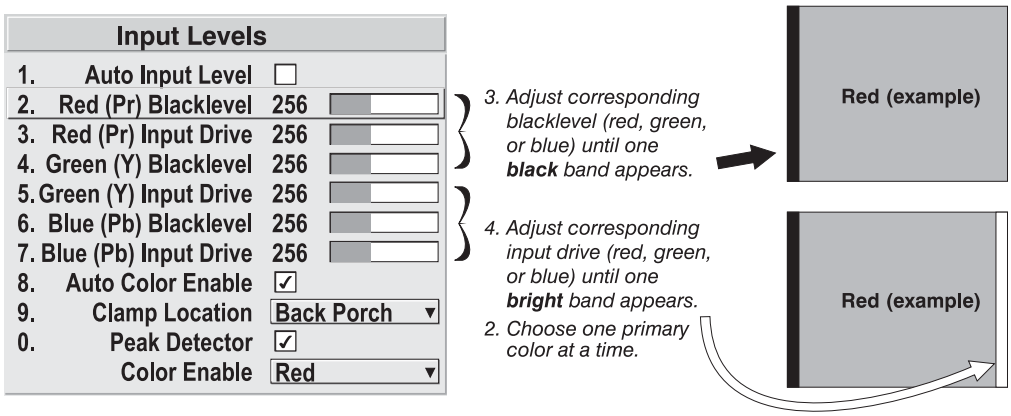


Figure 3.13. Adjusting Input Levels Using the Peak Detector
(RED EXAMPLE SHOWN)

Advanced Image Settings — SUBMENU

Advanced Image Settings		
1.	Gamma Table	2.2, Normal
2.	Select Color Adjustment	Color Temperature
3.	Color Temperature	7600
4.	Reserved	
5.	Reserved	
6.	Frame Delay	1000
7.	Reserved	
8.	Reserved	
9.	Reserved	
0.	Reserved	
	Motion Filter	Auto
	Film Mode Threshold	0
	Detail Threshold	0

GAMMA TABLE: This control selects and applies the normal 2.2 gamma setting or a user-defined "arbitrary" (custom) gamma table that has been previously downloaded to projector memory (these custom gamma tables—a.k.a. *curves*—are created in *Christie's Arbitrary Gamma* application for the PC, and are downloaded via a separate utility). Use of custom curves can improve performance for certain kinds of source input and applications. Generally the best gamma curve is one that produces maximum contrast, brightness and color performance for the current signal and ambient lighting conditions.

NOTE: If no such curves have been defined and downloaded to projector memory, only the "2.2, Normal" default gamma curve is available here—adjust as desired in the main ***Image Settings*** *menu.*

1. Max. Drives
2. Color Temperature
3. SD Video
4. HD Video
5. User 1
6. User 2
7. User 3
8. User 4

SELECT COLOR ADJUSTMENT: In "Select Color Adjustment", choose an overall color performance for all images. The "Max Drives" factory default simply drives all 3 colors at their maximum level so that they are fully on and cannot be changed. The two other pre-defined color adjustment choices—*SD Video* and *HD Video*—apply a color gamut optimized for video sources (standard or high-definition). Alternatively, you can specify a color temperature, which enables the nearby Color Temperature slidebar and applies its current setting (default = 6500K). If none of the pre-defined "Select Color Adjustment" options or color temperatures suit your application, select one of four color gamuts previously defined by a user (User 1, 2, 3, 4). A "User" option applies a customized color performance in which the user has precisely set the hue and intensity of each color component in the *Color Adjustment by X/Y* or *Color Saturation* submenus, and is most often needed with multiple-projector applications. Select the color adjustment producing the best color accuracy for your application and installation.

To configure a "User" color adjustment (gamut), use either the *Color Adjustment by X/Y* or *Color Saturation* submenu found in the *Configuration* menu under *Geometry and Color.*

NOTES: ***1)*** *"Color Temperature" defaults to 6500K until changed. All four "User" options default to SD Video unless they have been redefined by the user.* ***2)*** *Factory-defined color primaries, which ensure consistent color gamut from projector-to-projector, can be altered in the* ***Service*** *menu only. If you suspect alteration, the factory settings can be recovered with selection of* ***Factory Defaults*** *in the* ***Service*** *menu (password-protected).*

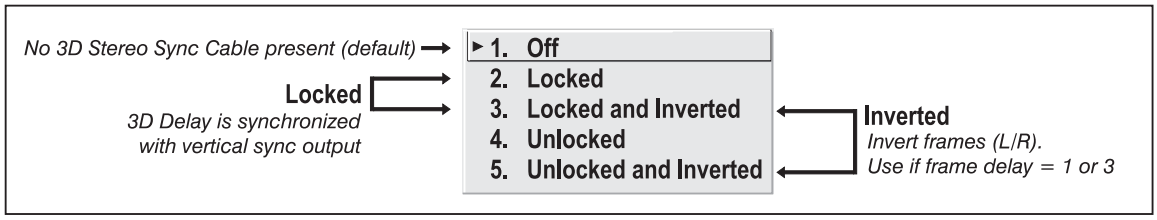
COLOR TEMPERATURE — Adjust to apply a specific and accurate color temperature to all displays. Color temperatures are expressed in degrees Kelvin (3200-9300K), and utilize different combinations of the projector's original native color primaries to produce a "coloration" or cast (reddish or bluish) in images—the lower the temperature, the more reddish the cast; the higher the temperature, the more bluish the cast. Note that the slidebar is enabled only if you have a source connected and have selected "Color Temperature" in the adjacent "Select Color Adjustment" pull-down list in the *Advanced Image Settings* menu.

FRAME DELAY — Set the interval of delay desired between the input signal and its appearance on screen. For applications such as simulation, where the feeling of "real time" image response is a priority, a minimum setting is usually preferable. For projectors capable of 3D (stereographic) applications where alternating left-right frames must be synchronized with the corresponding L/R shutters in 3D glasses, a frame delay setting of two (or multiple of two) may be more useful. Delay may vary between sources.

DARK INTERVAL — When displaying 3D (stereographic) images, adjust Dark Interval to artificially increase the amount of dark time between displayed frames. Higher settings provide more time for shutters in 3D glasses to open/close, ensuring that each eye sees the full display intended for it. Symptoms of cross-talk and/or color artifacts can indicate need for adjustment. The Dark Interval range of adjustment depends on the vertical frequency of your source—the higher the frequency, the smaller the range.

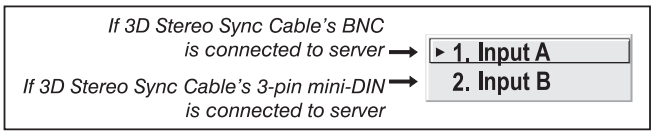
*NOTE: See **3.9, 3D Images** for a full explanation of Dark Interval use.*

3D STEREO SYNC — This option defines 1) whether or not the incoming 3D (stereographic) signal locks to the vertical sync output so that signals are synchronized, and 2) whether or not the 3D frames must be inverted, i.e. swapped left-with-right. The correct setting ensures that the projector's 3D display of left/right frames is synchronized with the rest of the 3D system components so that left/right image data is seen by the intended eye. Select the option corresponding to your 3D source connections and timing, and use only if the *Mirage 3D Stereo Sync Cable* is connected between the projector's GPIO port and a server (this cable replaces the need for a separate TTL inverter as described in ***3.9, 3D Images***). Keep this adjustment OFF (default) when you are not using the *Mirage 3D Stereo Sync Cable.*



With your sync cable, Z-screen and, if desired, emitter connected as described in *3.9, 3D Images*, select the option suited to your 3D configuration (see above). If frame delay is 2 (or 0), do not invert; if frame delay is 1 or 3, invert. Generally, an "Unlocked" setting is synchronized with the incoming L/R signal rather than the vertical sync output, and may be needed only with multi-projector installations in which the vertical sync outputs vary. NOTE: See **3.9, 3D Images** for a full explanation of 3D Stereo Sync use.

3D STEREO SYNC SELECT — Define which of the *Mirage 3D Stereo Sync Cable's* input connecters is routed to your server. Input A = BNC connector, Input B = 3-pin mini-DIN connector. Use only if the cable is present. *NOTE: Regardless of which input is connected, the output routes to both outputs.*



*NOTE: See **3.9, 3D Images** for a full explanation of 3D Stereo Sync Select use.*

3D STEREO SYNC DELAY — Set when the L/R frames begin, defining the best reference point for synchronizing the display with your glasses. Proper adjustment of this delay should eliminate cross-talk and odd colors caused by timing differences between the glasses and the projected display. Use this slidebar only if the *Mirage 3D Stereo Sync Cable* is connected between the projector's GPIO port and a server. Slidebar values indicate the number of lines that are delayed.

*NOTE: See **3.9, 3D Images** for a full explanation of 3D Stereo Sync Delay use.*

MOTION FILTER — This control is most useful for smoothing out moving images from interlaced sources. In most cases the proper Motion Filter setting is automatically determined according to the type of incoming source signal. However, if your source is jittery and/or tearing you may wish to "force" a setting to ensure stable processing for this source—if desired, override the default "Auto" setting by selecting the appropriate motion filter:

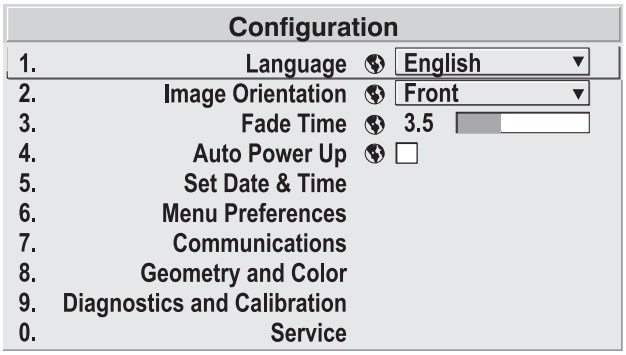
1. **AUTO:** The projector will automatically use the correct motion filter according to the incoming signal.
2. **STILL:** For static images with no motion, such as graphics from a CD.
3. **MOTION:** For video images that did not originate from film, or for moving computer-generated images.
4. **FILM:** For video images that originated from film. This will optimize image quality and stability.

FILM MODE THRESHOLD — This setting determines how sensitively the projector can detect if an incoming video signal originated from film or not.

DETAIL THRESHOLD — Use "Detail Threshold" to define at what frequency level the "Detail" control will begin to magnify high frequencies, which adds details back into the image. Raise the threshold to *ignore* more of these high frequencies, and lower the threshold to *magnify* more of these frequencies. A setting of "0", for example, means no noise will be ignored and all will be magnified. An ideal detail threshold is one in which high frequencies that are causing objectionable noise are *not* magnified when using "Detail", but frequencies which can help sharpen an overly-soft image *are* magnified when using "Detail".

3.6 Adjusting System Parameters and Advanced Controls

Use the *Configuration* menu to define general operating parameters and communications with other projectors and equipment, and to access other advanced processing and image adjustments affecting overall performance. In addition, the *Configuration* menu provides access to diagnostic and calibration tools, as well as the *Service* submenu (password protected).



Keep in mind that settings in the *Configuration* menu (and its submenus) are typically "global" settings applied regardless of the type of source your are using. This characteristic is identified with the (globe) icon alongside the option.

*NOTE: The **Configuration** menu is recommended for experienced users/technicians only.*

System Configuration ➤ — GENERAL —

The first six options in the *Configuration* menu are explained below:

Language

Choose from available languages to use in the projector's menus. The change will take effect immediately.

Image Orientation

Set the orientation of the image according to the orientation of your projector. If the setting is incorrect, projected images will be reversed and/or upside down.

Fade Time

Set how long (in seconds) it takes to gradually dissolve one image into another for a source switch.

Auto Power-up

Enter a checkmark to enable the projector to automatically power up after losing power due to a power failure or due to unplugging the projector during operation. Note that unsaved display adjustments may be lost.

Set Date & Time

Enter/read the current year-month-day and hour-minute-second. Changes here reset the projector's real-time clock.

Menu Preferences — SUBMENU

Use the options in this submenu to adjust the appearance, content and/or location of on-screen menus and messages.

Menu Preferences		
1.	Large Menu Font	☑
2.	Menu Location	4:3 Top/Left ▼
3.	Horizontal Shift	261
4.	Vertical Shift	204
5.	Display Channel List	☐
6.	Display Slidebars	☐
7.	Display Error Messages	All ▼

LARGE MENU FONT — Enter a checkmark to enlarge menus and their text. You may have to adjust "Menu Location" to accommodate the increased menu area.

MENU LOCATION — Use the pull-down list to choose a pre-defined default or customized location for the display of all on-screen menus.

To create a custom menu location quickly, choose a preset that is closest to the desired location. Then adjust "*Horizontal Shift*" and "*Vertical Shift*"slidebars to move the menu to the desired location. Avoid locations too close to a corner or edge to prevent cropping of larger menus.

HORIZONTAL SHIFT AND VERTICAL SHIFT — Shift your menus as desired, creating a customized menu location.

DISPLAY CHANNEL LIST — Enter a checkmark if you want to see a scrollable channel list whenever you press (Channel) from your presentation. Channels marked with a list icon in the *Channel Setup* menu will appear here. The "Display Channel List" option also enables on-screen feedback when using the (Input) key. If you prefer to hide the channel list and input dialog box while switching channels and sources during a presentation, clear the checkbox.

NOTE: The Channel List and input dialog box cannot be hidden during use of the menus.

DISPLAY SLIDEBARS — Enter a checkmark to superimpose a small slidebar over the current image whenever an adjustable parameter is selected directly with a key such as (Contrast) or (Bright). If "Display Slidebars" is unchecked, these slidebars can still be accessed, but will be hidden during adjustment. This option does not affect slidebars in menus.

DISPLAY ERROR MESSAGES — Choose in what way you want to be notified of errors detected in either the incoming signal or projector. Select "Screen" or "All" to see a brief on-screen message or select "RS232" to receive messages via RS232 (or RS422) serial communication only. Select "Off" to hide error message displays.

System Configuration ➤
— COMMUNICATIONS —

Settings in the *Communications* submenu define and control how single or multiple projectors are can link with each other and with a controlling device.

Communications		
1.	Baud Rate for RS232	115200
2.	Baud Rate for RS422	115200
3.	Projector	004
4.	Network Routing	All Joined
5.	Ethernet Settings	
6.	Broadcast Key	☐
7.	Backlight	☐
8.	Front IR	On
9.	Back IR	On
0.	Wired Keypad	Off

Figure 3.14. Communications

Baud Rates

The baud rate setting determines the speed of communication to and from the projector on the RS232 or RS422 links. The maximum rate for either standard is 115200. Set the baud rate to match that of your controlling device, such as your PC. If you are unsure about what baud rate to choose, refer to the documentation for the controlling device. In an existing network of projectors, if you discover that a projector has a different baud rate, make sure to use the pull-down list and select the correct baud rate using the ↵ key—do not just scroll this control with ◄ or ► keys. Serial communication is always 8 data bits, no parity.

Projector

Enter a three-digit number (such as "001") to assign or change a number to the projector currently in use. If the current projector already has a number assigned, that number will appear here (for example, “004” in Figure 3.14, above). Numerical identity for projectors enables you to communicate with a single projector within a multiple-projector application (see also Proj key in *3.2, Using the Keypads*). If you make a mistake in assigning or changing the projector number, press Exit to cancel.

Network Routing

NOTES: 1) Not applicable for stand-alone projectors or simple serial networks with only one type of controller and linking.

▸ 1. Separate	= Networks do not communicate with one another
2. RS232 and RS422 joined	= Serial networks are joined, but Ethernet is isolated
3. RS232 and Ethernet joined	= RS232 and Ethernet are joined but RS422 is isolated
4. All joined	= Network communications travel all networks

SEPARATE: Select “Separate” (factory default) to keep RS232, RS422 and Ethernet messages on their respective paths instead of being broadcast to the other types of ports. In Figure 3.15A, RS422 controls only the projector to which it is connected. In Figure 3.15B, either RS232 or RS422 will control the network.

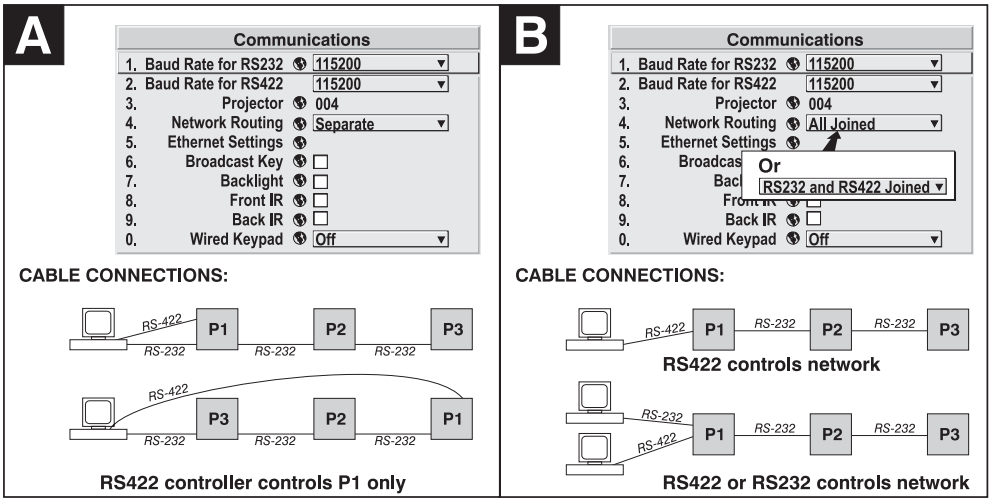


Figure 3.15. Using the "Network Routing" Option

RS232 AND RS422 JOINED: Messages originating from an RS232 or RS422 controller will be relayed to all RS232 ports. Any Ethernet communication, however, will not.

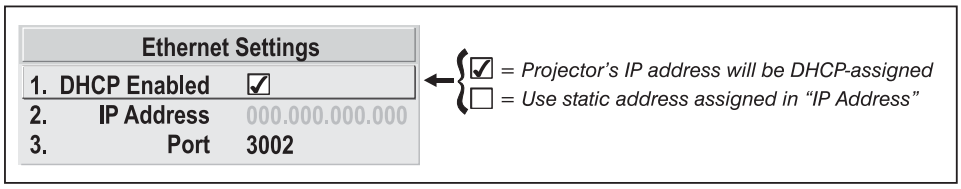
RS232 AND ETHERNET JOINED: Messages to and from the RS232 ports will also be relayed to the Ethernet port, and vice versa. Any RS422 communications will be isolated.

ALL JOINED: All messages reach all ports, regardless of type.

Ethernet Settings (SUBMENU)

NOTES: ***1)*** *Recommended for network administrators only.*

DHCP: Enable this checkbox if you want a DHCP server to automatically change the projector's default IP address (0.0.0.0) to one that is valid and unique for use on the current Ethernet network. On networks without a DHCP server, or to simply override the automatic DHCP server function, delete the checkmark and enter the new "IP Address" settings desired. Remember that only a 0.0.0.0 address will trigger the DHCP addressing service and only when the DHCP checkbox is enabled.



IP ADDRESS: Enter a valid and unique IP address for use on the network to which the projector is currently connected. This address will overwrite any previous IP address such as the projector's factory-defined default (0.0.0.0), or one that has been assigned by a DHCP server or other user. An IP address entered here remains in effect until it is changed again.

PORT: On some Ethernet networks, firewall restrictions may require that the port number of the projector be changed from its default of 3002. If so, enter a new valid port number here.

Broadcast Key

Enter a checkmark if you want keypad commands sent to any one projector to be relayed to all projectors in a serial network. Note that the (Proj) key will temporarily "override" the effect of a broadcast setting and allow you to control a specific projector when necessary. Make sure to remove the Broadcast Key checkmark when operating redundant networks.

Backlight

Toggle the built-in keypad lighting on/off.

Front IR / Back IR

As needed for your application, set to "on" so that the front and/or rear IR sensor locations on the projector responds to the IR keypad. Set to "off" to disable.

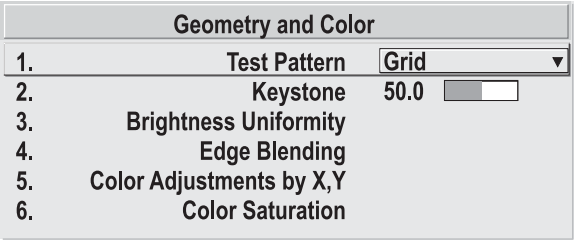
To disable *both* IR sensors, you cannot use the IR remote keypad to select the second **OFF** setting. This safeguard prevents accidentally disabling an IR keypad while you are using it. Instead, use either the built-in keypad or a wired remote (optional) to set the remaining active sensor to **OFF**. The projector will no longer respond to an IR remote keypad.

Wired Keypad

Select "On" to enable use of a wired remote keypad connected to the rear of the projector. The projector will then respond to incoming commands from either port. To disable the wired keypad, you must use a different keypad—the built-in or an IR remote keypad—to select "off". This safeguard prevents you from accidentally disabling the wired keypad during use.

System Configuration ➤
— GEOMETRY & COLOR —

In the *Configuration* menu, select the *Geometry and Color* submenu when you need to modify overall color performance and/or image geometry for all sources.



Test Pattern

Choose the desired internal test pattern or select OFF to turn off a test pattern. Alternatively, use the (Test) key for cycling through test patterns.

Vertical Keystone

Use to correct a keystoned image shape in which both sides of your image are inclined toward the top or bottom edge. Keystone is typically caused by tilting the projector in relation to the screen, so that the lens surface and screen are no longer parallel to each other.

Figure 3.16. Keystone Adjustment

Brightness Uniformity — SUBMENU

Brightness Uniformity provides further refinement of displays already matched for their primary colors and overall light output. Use Brightness Uniformity to create an exceptionally smooth image in which no area appears brighter and/or more red, green or blue than another. In the *Brightness Uniformity* menu, enable the "Uniformity Enable" checkbox (enter a checkmark) to access a multitude of adjustments for critical color light output control in specific areas throughout the image. Your settings apply as long as the "Uniformity Enable" checkbox is enabled and you are using a "User" color temperature defined by the Brightness Uniformity controls. Remove the checkmark from the "Uniformity Enable" checkbox to disable the Brightness Uniformity function.

NOTE: See also ***3.10, Using Multiple Projectors*** *for the complete step-by-step procedure for achieving uniform brightness in adjacent displays.*

Edge Blending — SUBMENU

The *Edge Blending* submenu provides a range of controls for smoothing together the overlapping bright edges of multiple adjacent projected images to create a single larger "seamless" image.

NOTE: See also ***3.10, Using Multiple Projectors****.*

Color Adjustments by X/Y, and Color Saturation — SUBMENUS

NOTES: ***1)*** *For defining or changing a User 1, 2, 3, or 4 color performance or "gamut". Sometimes known as Comprehensive Color Adjustment™.* ***2)*** *Factory-measured primary color levels, which ensure a specific color performance from projector-to-projector, can be altered in the* ***Service*** *menu only. If you suspect alteration of these defaults, the factory settings can be recovered with selection of "* ***Factory Defaults"*** *in the* ***Color Primary Settings*** *submenu accessed via the* ***Service*** *menu (password-protected).*

From the factory, the projector can utilize any of the 3 pre-defined color performance settings identified at right (default=Max Drives) or colors can be driven on the basis of color temperature. For most applications, one of these options will produce accurate and realistic colors from a variety of sources. They can be applied at any time in the *Advanced Image Settings* menu ("Select Color Adjustment") and are not adjustable.

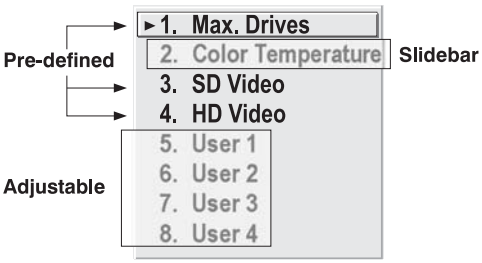


Figure 3.17. Color Performance Choices

DEFINING "USER" COLOR GAMUTS: In some cases, you may find that none of the pre-defined "Select Color Adjustment" options exactly suit your needs. For example, you may require a unique color gamut (range) for a single projector or application, or you may need to precisely match colors across multiple adjacent displays. In such cases, use either the *Color Adjustments by X,Y* or *Color Saturation* submenu to define the precise *hue* of each primary color component (red, green, blue, and white) used to generate the millions of colors produced in displays. You can create up to four custom color gamuts (User 1, 2, 3, or 4) defined by these adjustments.

Note that the two menus differ only in their user interface, so use whichever menu best suits your needs and application.

- *Color Adjustments by X,Y* — Enter known x/y coordinates from the chromaticity graph. For best results, use with a color meter.
- *Color Saturation* — Adjust color slidebars and judge image color by eye. A color meter can also be used.

A user-defined color "adjustment" can be applied by selecting it in the *Advanced Image Settings* menu ("Select Color Adjustment").

NOTE: Defining a "User" color gamut when a test pattern is displayed does not get saved in the current channel. Display the source first then select a color gamut (User) from Select Color Adjustment. Changes here are then saved for that source in channel memory.

COLOR ADJUSTMENT BY X,Y: Use this submenu if you want to alter, add or copy a color gamut (i.e., "color adjustment"). Controls in this menu define the precise hue of each primary color component (red, green, blue, and white) used to generate the millions of colors produced in displays. The x/y coordinates for each color define its location on the standard CIE chromaticity graph (see Figure 3.19)—changing either or both of these numbers will change the hue of the color, and relocate the "triangle" for possible colors. For example, changing the x/y coordinates for red will either move the color closer to orange or closer to violet, which will in turn affect all displayed colors having a red component. Adjust the slidebars or enter new specific coordinates as desired to define or change up to four "User" color gamuts needed for your environment and applications. Apply the new "User" color gamuts at any time in the *Advanced Image Settings* menu.

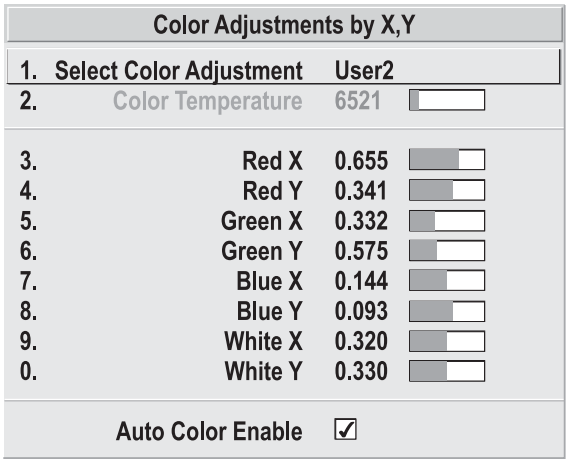


Figure 3.18. Customize Color Hue

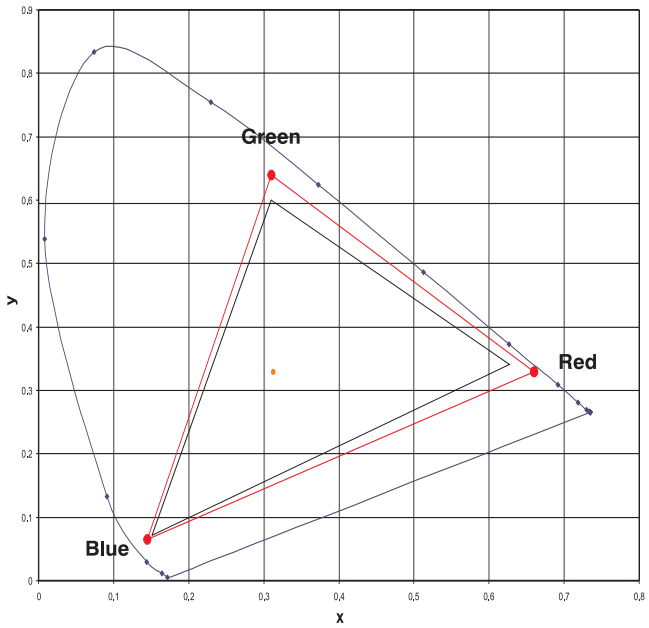


Figure 3.19. CIE 1931 Chromaticity Diagram

NOTE: Keep new x,y coordinates within the original color gamut triangle shown here. See Section 6 – Specification for color primaries.

PROCEDURE FOR X,Y ADJUSTMENTS: *See **3.10, Using Multiple Projectors**.*

COLOR SATURATION: Use this submenu if you do not have specific color coordinates in mind and will simply judge color performance by eye (or meter). Like the *Color Adjustment by X,Y* submenu, each color control actually defines new x/y coordinates for that color and changes its hue--it is just a different interface.

Adjust the hue of each primary color (red, green, blue, and white) by using more or less of it in relation to the other colors.

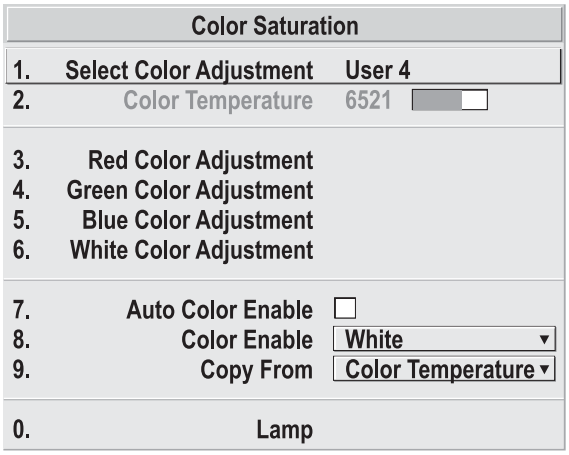


Figure 3.20. Customize Color

*NOTE: A **Color Saturation** adjustment sets the corresponding x/y coordinates shown in the **Color Adjustment by X,Y** submenu. These x/y coordinates will remain stable for this User gamut until they are changed again via either menu. Values displayed in the **Color Saturation** menu, however, will likely fluctuate as you use the projector, and will be different when you return to this menu at some point in the future. These floating changes do not affect the x/y coordinates or gamut.*

PROCEDURE FOR USING COLOR SATURATION: *See **3.10, Using Multiple Projectors**.*

System Configuration ➤
DIAGNOSTICS / CALIBRATION

Test Pattern

Choose the desired internal test pattern to display or select OFF to turn off a test pattern. Alternatively, use the (Test) key for cycling through test patterns.

Diagnostics and Calibration		
1.	Test Pattern	Grid ▼
2.	Grey Level	512
3.	Freeze Image	☐
4.	Color Enable	White ▼
5.	Odd Pixel Adjustment	
6.	Reserved	
7.	Peak Detector	☐
8.	Level Detector	☐
9.	Level Value	512

Test Pattern Grey Level

Set the desired level of gray for displaying in the full gray field test pattern.

Freeze Image

Enter a check mark to freeze (stop) an image on a single frame. This diagnostic tool is useful if you need to examine in detail a still version of an incoming image that cannot be “frozen” at the source. For example, in moving images it is sometimes difficult to observe artifacts such as external deinterlacing/resizing and signal noise. Remove the checkmark to return back to normal.

Color Enable

Select which color or colors you want to see. This is useful while working with color temperature, input levels or other special setup parameters. Colors can also be enabled/disabled by entering the corresponding function code listed on the back of the standard remote keypad.

Odd Pixel Adjustment

NOTES: ***1)*** *Factory-set and rarely required by user.* ***2)*** *Source must be >110 MHz.*

When using certain RGB sources, you may need to adjust the normal gain or offset of odd pixels in relation to even pixels. This will smooth out very narrow (1-pixel wide) “checks” or vertical stripes that indicate adjacent “on” and “off” pixels. Although offset and gain slidebars can be adjusted individually and manually, using the Level Detector simplifies this process (see Figure 3.21):

1. Use an external analog native-sized continuous grayscale test pattern with at least 256-levels.
2. Turn “Level Detector” on.
3. Set “Level Value” to ***~200***. The image should now be black-and-white (or black-and-one color, if you use “Color Enable” function).
4. Adjust ***offset***. Half of the pixels will move, the other half will not.
5. Adjust until the two transition regions overlap. The stripe of noise will be minimized, defined by the value in the slidebar.
6. Set “Level Value” to ***~800***. The image should now be black-and-white.
7. Repeat Steps 4 and 5, but adjusting ***gain***.
8. Repeat Steps 3-7 for all remaining colors. Your RGB source should now be OK.

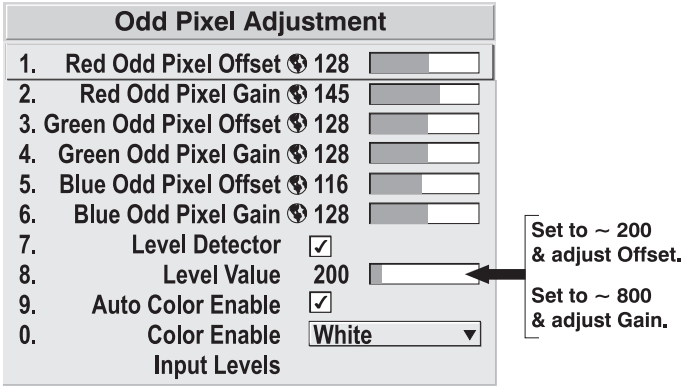


Figure 3.21. Using "Odd Pixel Adjustment"

NOTES: ***1)*** *Adjust offset before gain, since offset affects gain.* ***2)*** *A value of 128 represents no change in normal odd pixel offset or gain.* ***3)*** *Odd Pixel Adjustment eliminates "1 pixel on, 1 pixel off" patterns only, not any type of larger patterns.*

Reserved

No function.

Peak Detector

The "Peak Detector" is fast method of defining individual input levels, and can improve the accuracy of input levels set by the Auto Input Level function. Enabling the "Peak Detector" activates a special operating mode for detecting ***only*** pixels that are considered black or white—all other levels are displayed as a mid-level gray. When used with a 16-step grayscale pattern in which the two black and white bands are known to be at opposite edges of the image, you can watch these isolated areas while adjusting individual blacklevels and input drives until both bands are just visible. Images from this source will then display correct blacks and whites without crushing or washing out.

Level Detector

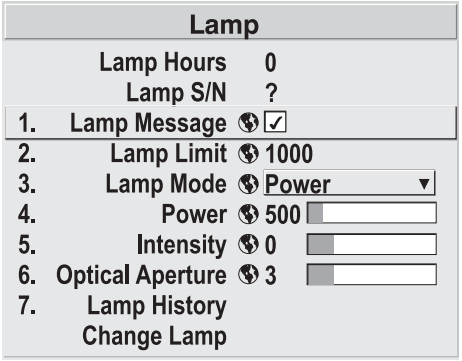
The "Level Detector" checkbox enables a specific thresholds for blacks and whites—input levels that fall below a specified *Level Value* (see below) are displayed as black, and all others are displayed as white. It aids in Odd Pixel Adjustment. To use:

1. Enable "Level Detector" and display a continuous grayscale.
2. Set "*Level Value"* to near black (such as 200).
3. Adjust Offsets to minimize area of black stripe.
4. Set "*Level Value"* to near white (such as 800).
5. Adjust Gains to minimize area of white stripe.

Level Value

The "*Level Value"* defines the value to be used by the Level Detector in recognizing blacks and whites. See *Level Detector*, above.

3.7 Working with the Lamp



Whenever you install a new lamp in the projector, access the *Lamp* menu to record the lamp serial number in the projector's memory. You can also choose a lamp mode for regulating power and light output, change optical aperture size, and access other read-only information pertaining to past and present lamps.

LAMP HOURS shows the number of hours logged on the current lamp. Whenever you record a new lamp serial number this value automatically resets to "0", where it begins to log time for the new lamp. *NOTE: Read-only*. This information also appears in the Status menu.

LAMP S/N is the serial number recorded for the current lamp. When you install a new lamp and enter its serial number, the number will appear here. *NOTE: Read-only.*

Enter a checkmark for **LAMP MESSAGE** to enable a warning message that will appear upon power-up when the lamp has reached the specified lamp limit and should be replaced. Delete the checkmark to prevent display of this message—instead, when your lamp expires, only the status display messages on the back of the projector will provide the visual warning to replace the lamp.

NOTES: ***1)*** *It is recommended that the Lamp Message checkbox remain enabled.* ***2)*** *When a lamp warning message appears, press* (Exit) *to temporarily cancel the message. The message will continue to appear upon power-up until you install a new lamp.*

Set **LAMP LIMIT** to the number of hours you expect to log on the current lamp before replacing it. This will trigger a lamp message on-screen (if enabled).

NOTES: ***1)*** *If you change modes over the life of a lamp, the lamp limit you originally expected may no longer be possible.* ***2)*** *Turning the lamp on and off reduces lamp life significantly, as do other factors.* ***3)*** *It is recommended that Lamp Limit not exceed the expected lamp life, otherwise a lamp could become dangerously fragile with overuse.*

Figure 3.22.

Set which **LAMP MODE** you want to use in order to control the light output. You can choose to run the lamp as bright as possible (i.e., always using maximum power—this is the default upon power up) or you can power the lamp with a specific wattage appropriate for the installed lamp or you can set a specific intensity (brightness) to maintain. Although there are exceptions, generally higher light output or higher power settings can shorten lamp life.

Use the lamp mode that best suits your brightness needs. For example, in a tiled application you may want to precisely match brightness levels between adjacent images—judge by eye and set each individual **Lamp Power** setting as necessary. Or if you want images to be as bright as possible—choose **Max Brightness**. Always keep in mind that higher lamp power settings can shorten lamp life.

Lamp modes are described below:

- **Max Brightness:** The lamp will always burn as brightly as possible, driven by 100% of the power level rating for the installed lamp (see *Section 6*,

Specifications). Keep in mind that the "maximum brightness" for any lamp gradually diminishes with age—images will become dimmer over time. Its current output level appears in the "**Intensity**" option (note: *not* in lumens).

- **Intensity:** Brightness will remain close to a specified level for as long as possible. Once you select this option, enter a number representing the intensity level (brightness) you wish to maintain—the projector will automatically adjust power as needed to maintain this intensity as closely as possible. Note that the intensity value is a correlation only and does not represent an actual lumens level. See "**Intensity**" below.
- **Power:** The power supplied to the lamp will remain at your specified wattage level. Once you select this option, enter the number of watts representing the power level you wish to maintain. See "**Power**" below.

POWER - This slidebar and number indicates how many watts are applied to the lamp. You can apply anywhere from approximately 60-65% of the maximum power intended for the installed lamp up to 100% of the lamp rating. Set for the number of watts as desired, keeping in mind that lower power levels produce dimmer images. When in either **Power** or **Max Brightness** modes, the power level remains constant. Specifying a maximum power level here is the same as operating in **Max Brightness** mode.

*NOTES: Power level can be set only if the lamp is in **Power** mode.*

INTENSITY – This value and slidebar represents the current brightness of your lamp, decreasing over time when you are operating in **Max Brightness** mode or at a specific **Power** level. When you are operating in "**Intensity**" mode this value remains at the original "**Intensity**" setting chosen and cannot be adjusted.

NOTE: The number shown for "intensity" is not the actual lumen output, but rather a correlated value only—1246 may represent 3500 lumens, for example.

To use "**Intensity**" mode, judge by eye (or use a meter) and set the level as desired for your application. Over time, the projector will automatically increase the power supplied to the lamp as needed to maintain the chosen intensity as closely as possible. This mode is known as "Brightness Tracking" or "LiteLOC™".

HOW LONG CAN I MAINTAIN BRIGHTNESS? Software can maintain your "**Intensity**" setting until the required power reaches the maximum rating for the lamp. The lower the setting, the longer it will take to reach this threshold and the longer you can maintain the desired brightness. Keep in mind that once the lamp power reaches its *maximum* wattage (see "**Power**", above), this tracking is no longer possible. At this point, the lamp will gradually begin to dim as usual, even though your original "**Intensity**" value will still appear in the menu. To resume accurate tracking, reduce the intensity setting so that the resulting "**Power**" value is less than its maximum—the lower the intensity, the longer it can be maintained.

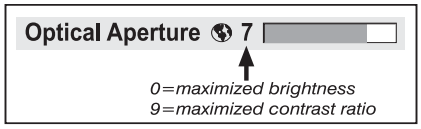
For example, a 1000 watt lamp can be driven at no more than 1000 watts. To produce desired brightness at the screen, a new lamp would likely need less than this maximum rating—perhaps 812 watts (example only). Over time, however, the lamp will require more and more current in order to generate the desired light, until eventually the lamp wattage reaches its 1000-watt maximum and the lamp power

automatically levels off. At this point, the tracking function terminates (i.e., the power level stabilizes) and the lamp will begin to dim normally. Either reduce your "**Intensity**" setting or replace the lamp.

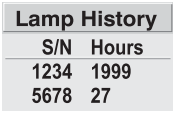
Do not lower the "**Intensity**" so much that the corresponding "**Power**" value reaches its *minimum*—the intensity setting will be inaccurate and cannot be maintained. For best results in achieving uniform intensity amongst tiled images, choose an "**Intensity**" setting that enables all lamps to operate at less than the maximum number of watts available in your projector but high enough to keep the corresponding lamp power above its minimum. See "**Power**", above.

NOTES: ***1)*** *Lamps become more stable over time, thus a specific intensity is more easily maintained as the lamp ages.* ***2)*** *Intensity can be set only if the lamp is in "Intensity" mode* ***3)*** *Intensity cannot exceed the output of Max Brightness mode.*

OPTICAL APERTURE - The optical aperture inside the projector controls the diameter of the light beam passing through the system. With a fully open aperture (slidebar default of "0"), the maximum amount of light passes through for maximum brightness in your images. Increase the slidebar setting to reduce the aperture diameter and maximize contrast ratio instead.



LAMP HISTORY - This read-only option lists the lamps most recently installed and recorded in the projector. *Lamp History* automatically updates whenever you record a new lamp serial number—the new lamp is added to the bottom of the list.



Use **CHANGE LAMP** to record the serial number for a newly installed lamp:

In the *Lamp S/N* window, use the number text entry keys to record the new lamp serial number and press ↵ again to accept the change. See *Using Slidebars and Other Controls* if you need help entering the number. Once entered, the new lamp serial number will be added to the *Lamp History* menu and the *Lamp Hours* timer will reset to "0". *Lamp Mode* and *Lamp Limit* remain as they were for the previous lamp and can be changed at any time.

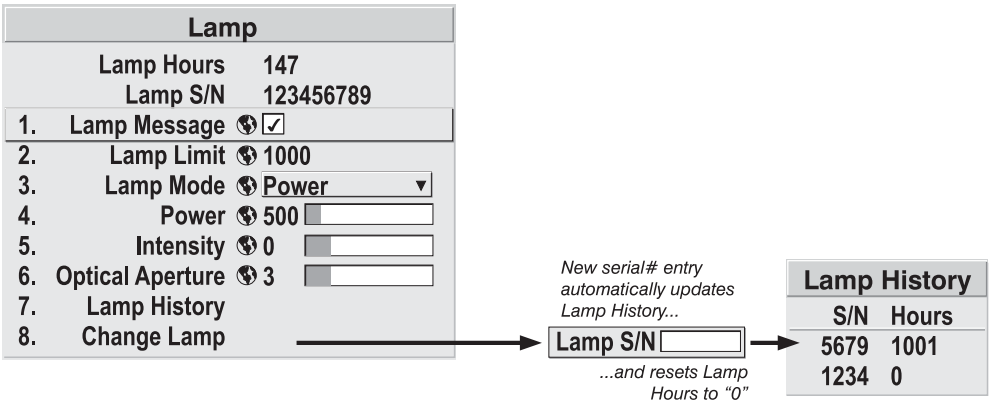


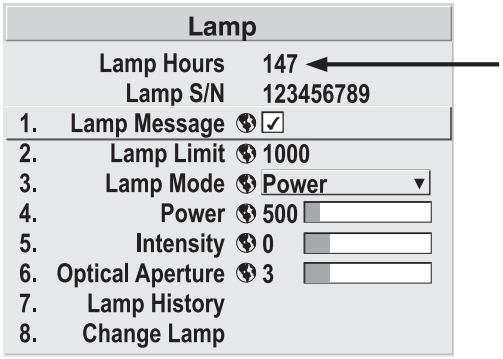
Figure 3.23. Recording the New Lamp Serial Number

NOTE: Enter a serial number ***only*** *if you have just installed a new lamp. This will help ensure that lamp timer is not reset on an old lamp and that the number of hours logged on the lamp will be accurate.*

⚠ IMPORTANT ⚠

Always record the serial number of a NEW lamp.

How Old is My Lamp? ➤ When a new lamp is installed and its serial number recorded by selecting “Change Lamp” in the *Lamp* menu, the lamp timer resets to “0” and begins logging time for the new lamp. This tally appears in both the *Lamp* menu (see right) and the *Status* menu.



To review the number of hours logged for previous lamps, consult the *Lamp History* menu.

When to Replace the Lamp ➤ If the “Lamp Message” checkbox has been enabled in the *Lamp* menu (recommended), an expiry message will appear upon power-up when the lamp has reached its defined “Lamp Limit”. The lamp should be replaced.

The “Lamp Limit” setting should not exceed the expected lamp life, as an old lamp becomes increasingly fragile and more prone to sudden failure. See also ***4.4, Lamp and Filter Replacement***.

3.8 *Status* Menu

The read-only *Status* menu lists a variety of details about the standard and optional components currently detected in the projector. Refer to the *Status* menu for versions of hardware and software installed, the type (size) of lamp, the hours logged in total and for a specific period (such as a rental period), and for your projector model name and serial number. In addition, the *Status* menu identifies the current channel, its location, its frequencies and other details.

Scroll the full *Status* menu using ▲ ▼. Use ◄ ► for page up/down.

3.9 3D Images
MIRAGE ONLY

A single *Mirage* projector can display 3D (stereographic) images as described below. Such images require a specialized source, as well as additional hardware and software in order to be displayed and interpreted correctly in a typical 3D active stereo viewing environment.

Description ➤ In simple terms, images generated from a 3D-video source consist of a series of images (*frames* or *fields*) that alternate quickly between two slightly different viewpoints corresponding to the separation of our left and right eyes. When these frames are displayed with enough speed and viewed with special glasses synchronized with the left/right frames, the resulting "single" perceived image appears with much the same depth and perspective we sense in the real world.

How to Activate 3D ➤ Once you have the necessary source and hardware/software setups described below, the *Mirage* projector will detect and process a 3D (stereographic) signal automatically.

In addition, if you are using Christie's *3D Stereo Sync Cable* (available early 2005), select the appropriate "3D Stereo Sync" setting in the *Advanced Image Settings* menu. See ***3.5, Adjusting the Image*** for more information.

NOTE: Christie's ***Stereo3D™ Interface Module*** *used with earlier Mirage 2000/4000/5000/6000 models is not compatible with Mirage S+ models.*

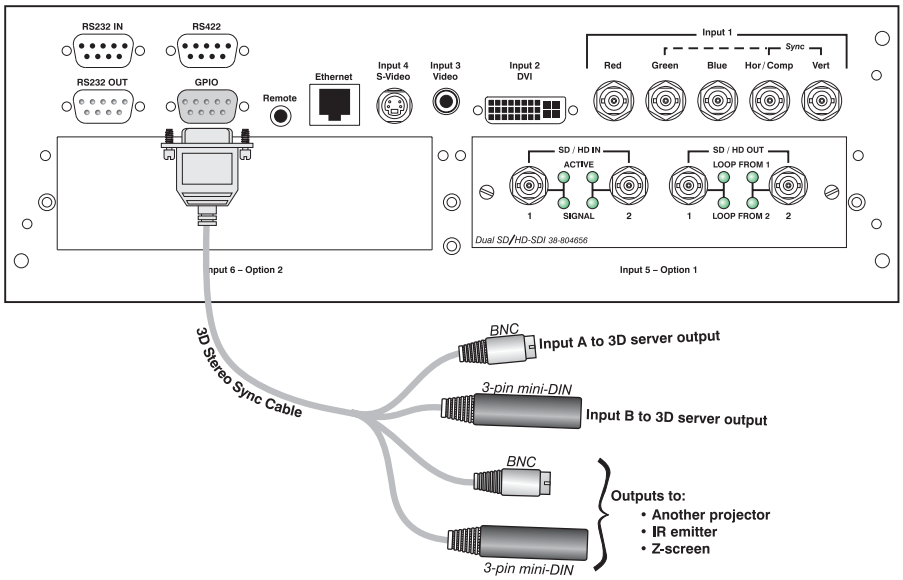


Figure 3.24. Connecting 3D Stereo Sync Cable

What 3D Sources Work? ➤ A 3D-video signal is sent to the projector via analog cables such as:

- 3-wire RGB sync-on-green
- 4-wire RGB with composite sync
- 5-wire RGB with separate H-sync and V-sync
- DVI

NOTE: Refer to ***2.3, Connecting Sources*** *for full details and illustrations.*

Most 3D (stereographic) signal formats currently available are optimized for display via CRT (cathode ray tube) technology, thus they have high pixel rates unsuitable for use in *Mirage.* However, by reducing the blanking in these signals, you can lower their pixel rate enough to be compatible with the projector (under 220 MHz).

Typically, a high-end graphics workstation that includes hardware and software tools for customizing video output timing parameters can produce the requisite 3D signals, as can a PC running Windows™ 98/2000 (use the “PowerStrip” utility)—consequently your 3D displays should originate from either of these sources, or one that is similar. *NOTE: Not all systems include the hardware/software necessary for reconfiguring the 3D video output timing parameters—these sources may not be compatible with* ***Mirage****.*

In addition, *Mirage* requires the following conditions for 3D work at these higher frame rates:

3D Source Requirements and Conditions

- Use a progressive RGB source with native resolution up to 1400 x 1050 (can be cropped if desired). Higher resolution can be used, but edge pixels will be cropped rather than the image resized to fit.
- 92-115 Hz input frame rate if SXGA+ resolution.
- Pixel rate must be less than 220 MHz
- Requires at least 14 lines of vertical blanking
- Use minimized line rates (horizontal frequency)
- 3D produces only a single frame of delay, limits some resizing (particularly vertical) and position ranges.

Hardware Requirements ➤

Typical hardware configurations for active and passive 3D systems are shown in Figure 3.25, Figure 3.26, Figure 3.27 and Figure 3.28. Hardware descriptions follow the illustrations.

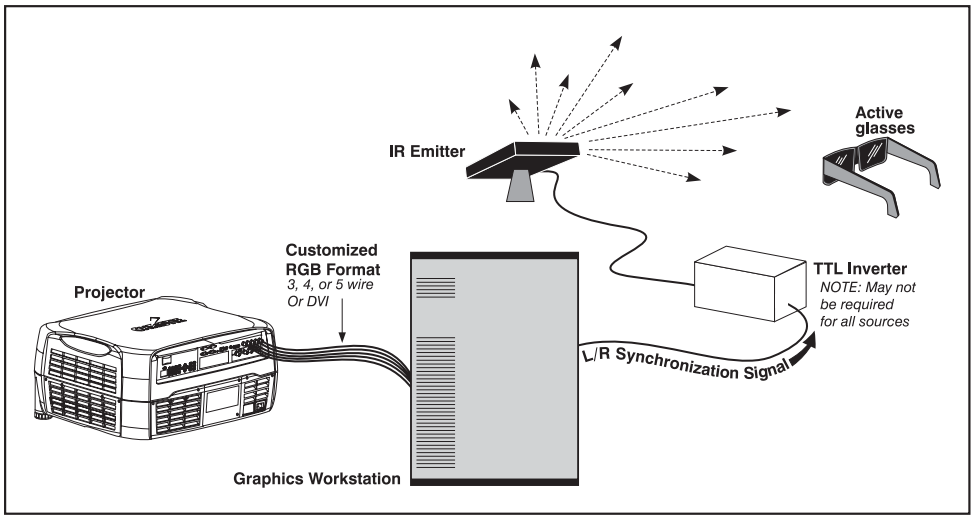


Figure 3.25. Typical 3D Configuration with Active Glasses & TTL Inverter

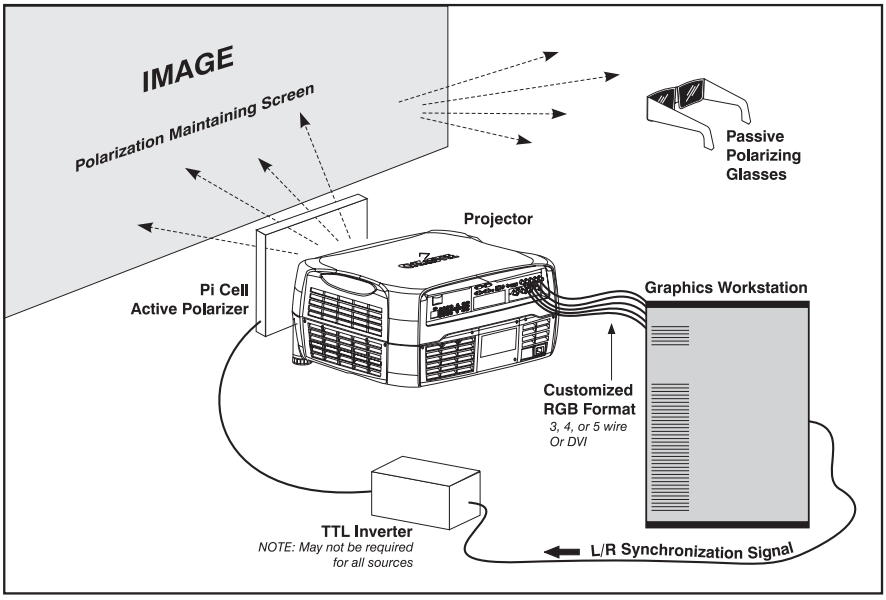


Figure 3.26. Typical 3D Configuration with Passive Glasses & TTL Inverter

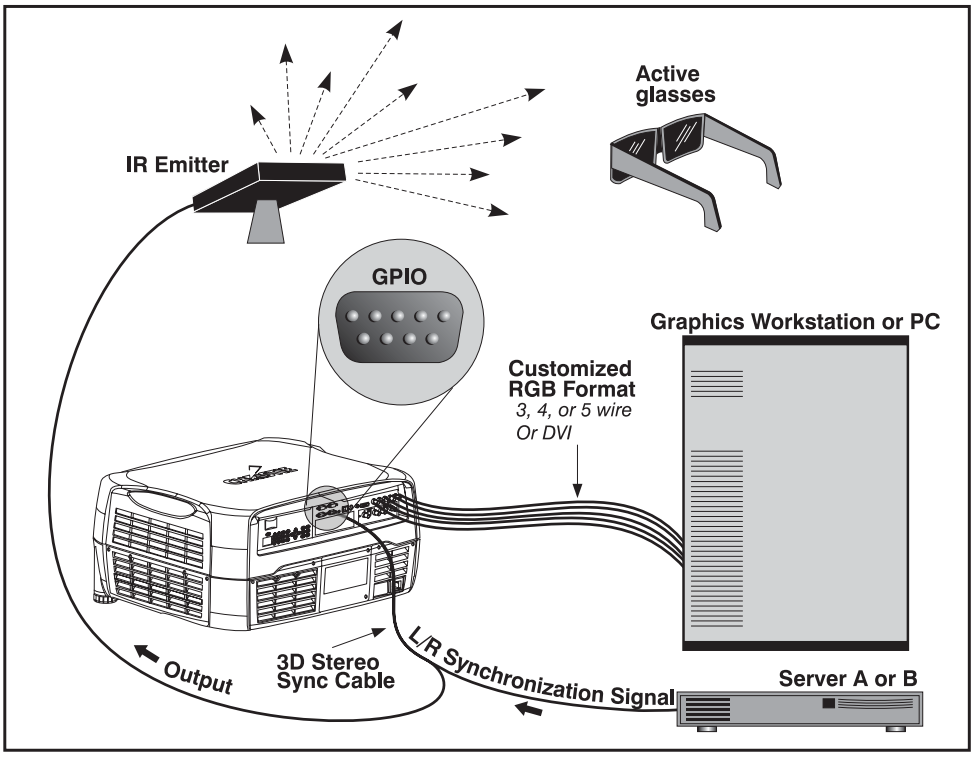


Figure 3.27. Typical 3D Configuration: Active Glasses & 3D Stereo Sync Cable

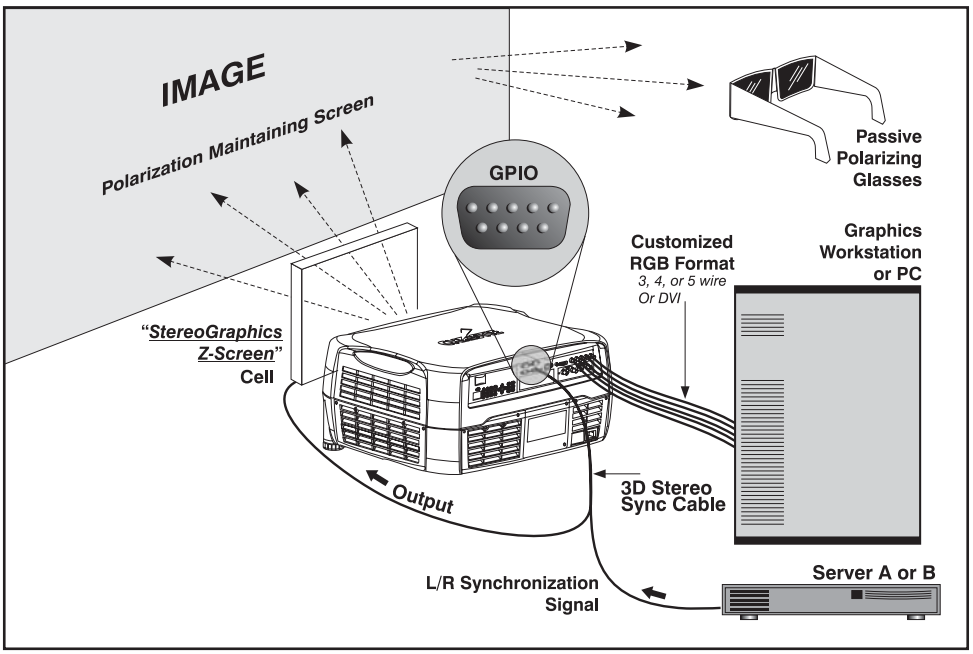


Figure 3.28. Typical 3D Configuration: Passive Glasses & 3D Stereo Sync Cable

- **APPROPRIATE 3D SOURCE**: Signals from your 3D source (workstation or PC) must be customized to precisely match the processing capabilities of the projector. In addition, the source must provide a separate synchronization signal that precisely controls when left/right fields are visible through the viewer's glasses.
- **INVERTER**: Your 3D displays will usually require adjustment of frame delay, which can be approximately 1-3 frames set in 1-line increments. If the delay is 1 frame or 3 frames it needs correction (i.e., reversal of frames), otherwise image data intended for one eye would be delayed and seen by the other—images would lose their 3D quality. If a 3D (stereographic) source cannot invert the signal, thereby synchronizing the left/right shutters in your 3D glasses with the corresponding images displayed by the projector, you can invert via a left/right TTL inverter or by using the *3D Stereo Sync Cable* and the proper *3D Stereo Sync* setting in the *Advanced Image Settin*gs menu. Either configuration ensures that shutter changes in the glasses allow each eye to receive the image data intended for it, regaining the 3D effect in the display. In addition, you can lock the R/L signal to *Mirage's* output frame sync.

  NOTE: Depending on your workstation, you may be able to reverse left/right frames through software only, eliminating the need for separate inverter hardware or the 3D Stereo Sync Cable.
- **IR EMITTER**: In response to an incoming sync signal, this small device emits left/right IR signals to a receiver in active 3D glasses, causing their left/right shutters to alternately open and close for active 3D (stereographic) applications. Connecting one of the *3D Stereo Sync Cable* outputs to an emitter also enables you to switch back-and-forth between active and passive systems, if desired.
- **GLASSES**: Active glasses differ in speed/performance—consult the documentation for your glasses and keep their specifications in mind when reconfiguring your source signal. The input signal must be optimized for the available shutter speed in order to prevent obvious "ghosting" of image content (known as

cross-talk in 3D (stereographic) applications) as well as other more subtle color artifacts. Such problems indicate that the eyes are detecting portions of the opposing frame due to an “out-of-sync” system, and can occur in either active or passive 3D configurations.

In the *Advanced Image Settings* menu, the correct “3D Stereo Sync Delay” setting helps to synchronize glasses with the displayed images. See also *Customizing the Input Signal*, below, for examples of well-synchronized systems.

NOTE: In a passive system, where glasses do not have shutters and instead depend on the speed and accuracy of the Pi Cell polarizer, the input signal must be synchronized with the polarizer.

Software Requirements

➤ To customize your 3D (stereographic) input signal for use with the projector, you will need access to software that controls video output timing from the graphics source.

Customizing the Input Signal

➤ The display must be synchronized with shutter control—called *gating*—so that each eye receives only the frames of data intended for it, otherwise you will detect opposing data frames (cross-talk) and see faulty images. This requirement means that timing parameters in your source should guarantee the following:

- ◊ Each new frame begins *after* the opposing shutter mechanism is closed
- ◊ Each frame completes its display *before* the opposing shutter mechanism begins to open.
- ◊ Each frame (mirror sequence) is displayed in its entirety to the correct eye.

What To Adjust

Since most current 3D-video sources (stereographic) do not have the necessary characteristics for use with *Mirage*, you must synchronize the projector’s display with your gating mechanism by adjusting the vertical sync width and/or vertical back porch of the input signal and, in many cases, by adjusting the projector’s “Dark Interval” control. These two parameters—input timing and dark interval—are described below. Note that because they interact with each other, you may have to go back and forth between them when optimizing the 3D display.

(1) ***Vertical sync width*** and/or ***vertical back porch blanking*** of your input source. Choose the vertical sync width and/or vertical back porch timing to determine when the next field begins displaying relative to the vertical sync signal. The degree of timing adjustment needed depends on the specific signal at hand as well as the performance of your glasses. An example of improvements to poor synchronization is shown in Figure 3.29. After adjustment, shutter changes occur during the dark interval between frames.

NOTE: The example in Figure 3.29 assumes that the first active line of your signal is displayed on the first line of the Mirage display panel rather than being repositioned higher or lower using the projector’s V-Position control.

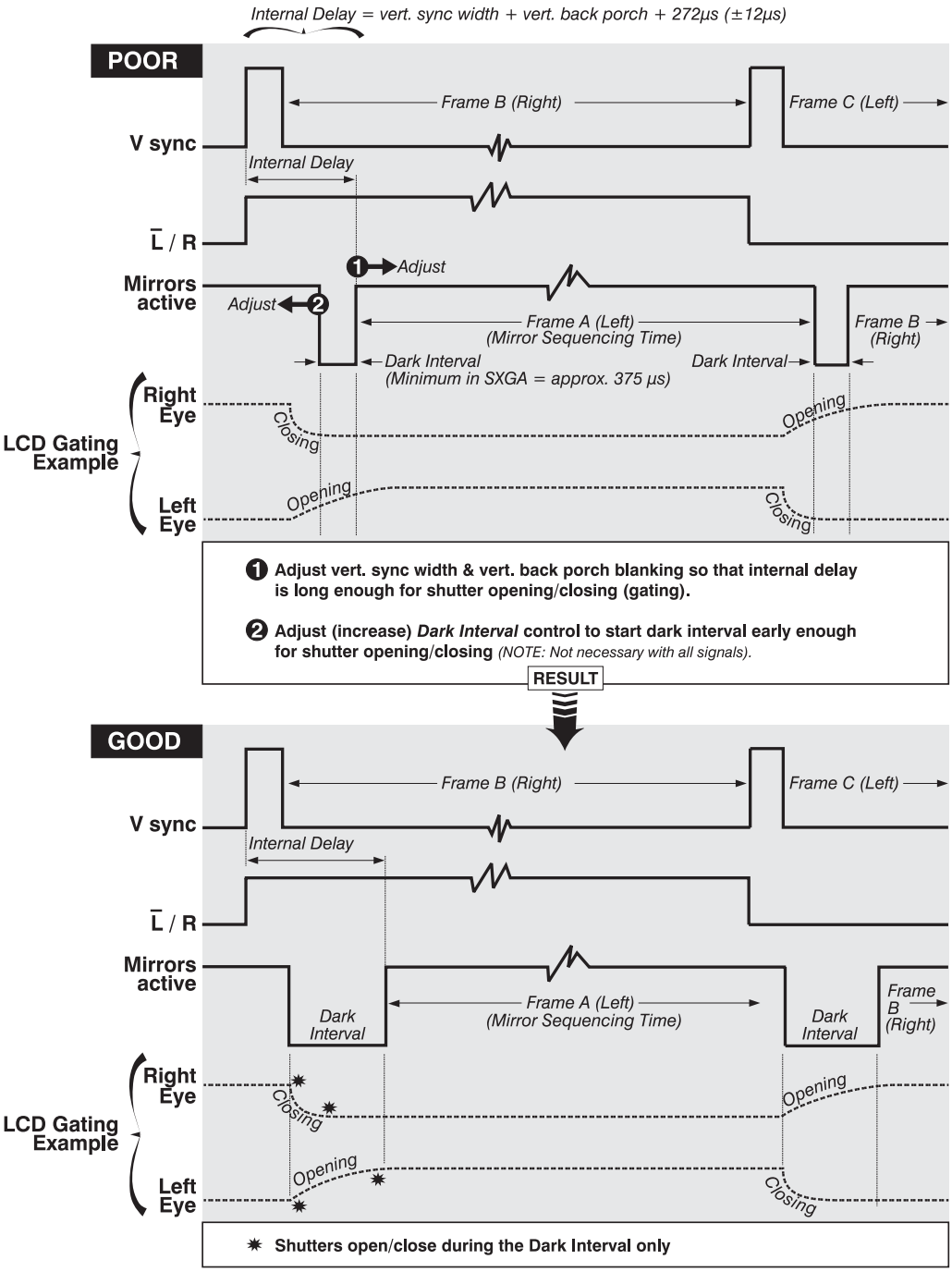


Figure 3.29. Customizing the Input Signal

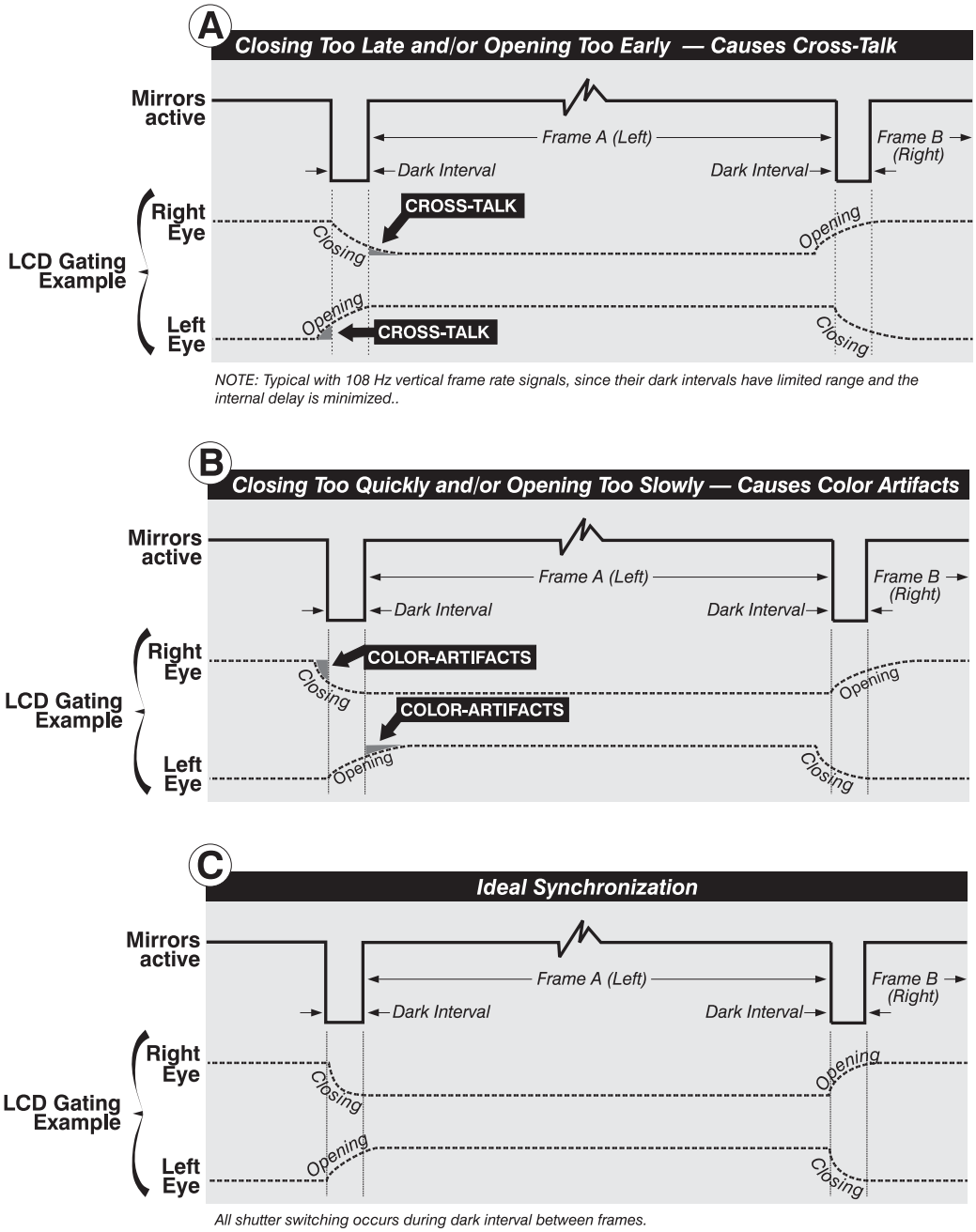
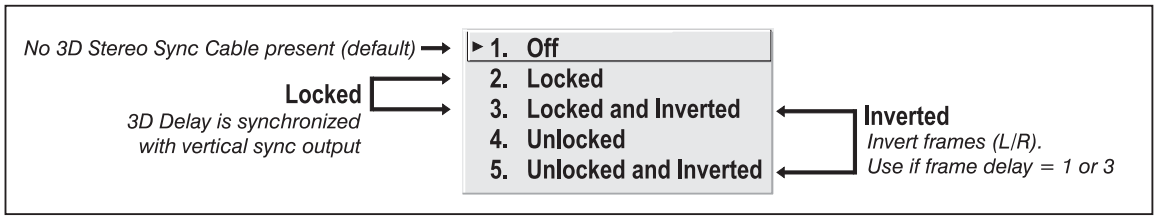


Figure 3.30. Examples of Poor and Ideal Synchronization

(2) **DARK INTERVAL** — *(note: not always required).* For slower gating technologies, you may also need to artificially increase the amount of dark time between displayed frames so that shutters have even more time to open/close and each eye sees the full display intended for it (Figure 3.30B). Symptoms are more subtle than cross-talk—if the dark interval is too brief for proper gating, you may notice an apparent color temperature problem, with some whites or grays appearing with a slight red, green or blue tint. This color artifact is particularly easy to diagnose in a grayscale test pattern displayed in 3D (stereographic) mode. In the *Advanced Image Settings* menu, increase the "Dark Interval" as necessary until the grayscale is correct—you may also have to increase the internal frame delay when using a longer Dark Interval. The Dark Interval range of adjustment depends on the vertical frequency of your source—the higher the frequency, the smaller the range.

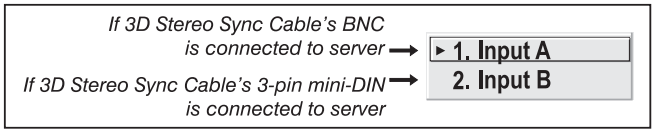
NOTES: ***1)*** *Increasing the Dark Interval decreases the peak brightness of the image. Use only if necessary—you may prefer some color artifacts rather than reduced brightness, or vice versa.* ***2)*** *Higher input frame rates limit the range of Dark Interval adjustment.* ***3)*** *Faster glasses allow a briefer dark interval.*

(3) **3D STEREO SYNC** — This option defines 1) whether or not the incoming 3D (stereographic) signal locks to the vertical sync output so that signals are synchronized, and 2) whether or not the frames must be inverted, i.e. swapped left-with-right. The correct setting ensures that the projector's 3D display of left/right frames is synchronized with other 3D system components so that left/right image data is seen by the intended eye. Select the option corresponding to your 3D source connections and timing, and use only if the *Mirage 3D Stereo Sync Cable* is connected between the projector's GPIO port and a server (this cable replaces the need for a separate TTL inverter as described in *3.9, 3D Images*). Keep this adjustment OFF (default) when you are not using the *3D Stereo Sync Cable.*



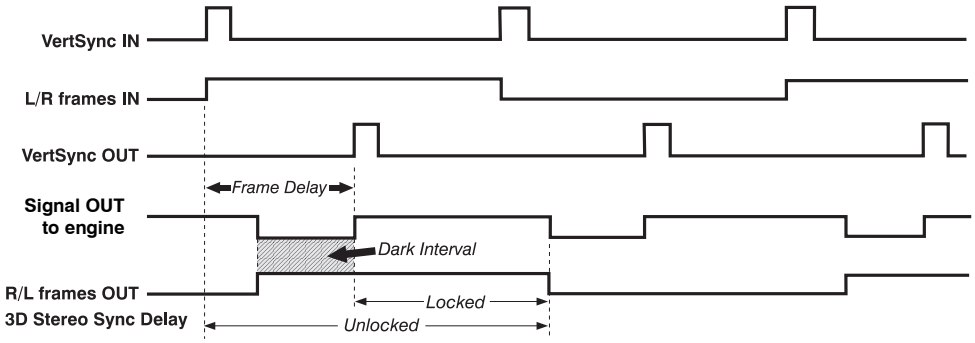
With your sync cable, Z-screen and, if desired, emitter connected as described in ***3.9, 3D Images***, select the option suited to your 3D configuration (see above). If frame delay is 2 or 0, do not invert; if frame delay is 1 or 3, invert. Generally, an "Unlocked" setting is synchronized with the incoming L/R signal rather than the vertical sync output, and may be needed only with multi-projector installations in which the vertical sync outputs vary slightly.

(4) **3D STEREO SYNC SELECT** — Define which of the *Mirage 3D Stereo Sync Cable's* input connecters is routed to your server. Input A = BNC connector, Input B = 3-pin mini-DIN connector. Use only if the cable is present.



(5) **3D STEREO SYNC DELAY** — Set when the L/R frames begin, defining the best reference point for synchronizing the display with your glasses. Proper adjustment should eliminate cross-talk and odd colors caused by timing differences between the glasses and the projected display. Use this slidebar only if the *Mirage 3D Stereo Sync Cable* is connected between the projector's GPIO port and a server. Slidebar values indicate the number of lines that are delayed.

The following illustration shows the various relationships between signals and *Mirage* software adjustments for 3D images.



When using a 3D Stereo Sync cable at the *Mirage* GPIO port, select which 3D Stereo Sync input (A or B) is connected, adjust the 3D delay, and choose the 3D Stereo Sync locking/inversion options applicable for your installation. See below.

Compatible 3D Sources ➤

The following sources are optimized for active 3D (stereographic) images using the projector and active glasses. Clamp Location is “Back Porch”. Keep in mind that formats beyond those shown below may also be compatible.

Table 3.4. Compatible 3D Sources

			Horizontal Timing Parameters (Pixels)			Vertical Timing Parameters (Lines)		
Glasses Speed	Vert. Rate	Pixel Rate	Front Porch	Sync Width	Back Porch	Front Porch	Sync Width	Back Porch
closed <600 µs	96 Hz ∗	146.127 MHz	144	80	188	2	4	30
closed <600 µs	96 Hz ∗∗	152.928 MHz	50	60	110	2	4	32
closed <600 µs	100 Hz ∗∗	159.300 MHz	50	60	110	2	4	32
closed <600 µs	105 Hz ∗∗	159.382 MHz	20	40	92	2	4	30
closed in 200 µs	108 Hz ∗∗	159.329 MHz	20	40	84	2	4	6
n/a	115 Hz∗∗∗	216 MHz	10	180	180	1	2	11

∗ *1024 x 1024* ∗∗ *1280 x 1024* ∗∗∗ *1400 x 1050*

3D Troubleshooting ➤

Refer to the following guide if 3D (stereographic) images displayed by your projector do not appear as you expect:

FLICKERING IMAGE: Increase the incoming frame rate as much as possible.

IMAGE IS COMPRESSED HORIZONTALLY: Increase pixel tracking. If already maximized, the pixel clock rate of the source is too high for the projector.

3D CROSS-TALK (GHOSTING): 1) Make sure the IR emitter is not blocked and that its signals can reach glasses. 2) If using a Pi Cell polarizer and passive glasses, make sure you are using a screen that maintains polarity. 3) Are depleted batteries slowing down the active glasses? 4) Fix timing parameters in your source. 5) Adjust Dark Interval setting.

NO IMAGE, JUMPY IMAGE, OR NOISE AT IMAGE TOP: Your video card’s minimum timings for blanking and pulse width are too slow for use with the projector.

WITHOUT GLASSES, I SEE ONLY A SINGLE IMAGE: You are not in 3D mode.

WITH GLASSES, PERSPECTIVE APPEARS “REVERSED”: If vanishing points of objects appear in the foreground rather than background, destroying perspective, the TTL inverter is likely missing or not working (you can confirm this by turning the glasses upside-down—3D perspective will return). Or, if you are using the *3D Stereo Sync Cable*, the *3D Stereo Sync* setting in the *Advanced Image Settings* menu needs to be needs to be toggled (inverted from its current setting).

IMAGE IS BREAKING UP: The horizontal back porch may be too small or too large. If you can lock to the signal by changing H-Position but have a black left edge in the image, *reduce* the source's horizontal back porch blanking. If the black edge is on the right, *increase* the source's horizontal back porch blanking.

HORIZONTAL STREAKS IN THE IMAGE: You may need to adjust the Clamp Location option in the *Input Levels* menu (accessed via *Image Settings* menu) with 4- or 5-wire signals.

COLORS ARE "OFF": If some grays in your grayscale appears tinted when viewed in 3D, your glasses may be slightly slow for the current signal setup. **1)** If possible, adjust the projector's Dark Interval control. **2)** Double-check timing adjustments to the source. **3)** Use faster glasses.

3.10 Using Multiple Projectors

When an installation requires multiple projectors, you can use the RS232 serial ports to daisy-chain the units together and control the group with a single keypad or a computer/controller connected to the first projector. In such a network, you can choose to broadcast commands to the entire group, or use the (Proj) key as desired to limit responses to an individual projector.

Alternatively, you may want to add projectors to a hub on an Ethernet network.

*NOTE: Refer back to **3.6, Adjusting System Parameters and Advanced Controls** for complete information about communicating with multiple projectors.*

Matching Colors In Multiple Screens ➤

In a multiple-projector wall, you will likely want to precisely match color and intensity from image-to-image so that the full wall is as uniform as possible. This matching is typically done in conjunction with Brightness Uniformity and Edge Blending.

Preliminary Calibration

As a final part of the manufacturing process, all primary colors in the projector are precisely set to pre-established values to ensure that overall color performance is optimized and is as accurate as possible (refer back to Figure 3.19). Upon installation at a site, however, lighting and other environmental factors may slightly change how these colors appear on your screen. While the change is negligible in most cases, you may prefer to recover the originally intended color performance before trying to match colors from several projectors. Or you may be renting a projector in which the colors were changed for use at its previous site, but are not ideal for yours.

The recommended first step in achieving such consistency is to use a color meter to measure the native primary colors—red, green, blue, and white—as they appear at the screen and record these as *Color Primary Settings* in the *Service* menu (password protected) for each projector. On the basis of these new values, which are stored in memory, each projector will then automatically calculate any necessary corrections to reproduce the original factory colors under the current environmental conditions. This essentially calibrates a projector to its surroundings, compensating for factors such as screen type, lamp and/or ambient lighting that can alter the final color characteristics on-screen, and will improve color accuracy and consistency in a group of projectors. It ensures a good starting point for further customizing and matching.

To return to the factory-set color primaries, such as when a projector is moved to different site, you must access the *Service* menu (password-protected). Select the

Factory Defaults option in the *Color Primaries* submenu. Then repeat the calibration process describe above, if desired, and continue with matching of colors.

Color Adjustment Procedure

Once the *Color Primary Settings* are calibrated for the site (see above), use the *Color Adjustments by X,Y* or *Color Saturation* menu to further refine each projector's fundamental colors so that the hue and intensity of each color appears the same from one display to another. Once matched, you will have created a single new shared range of colors or "color gamut" that all of your projectors can produce. This palette—named User 1, 2, 3 or 4—can be applied or disabled for a source at any time throughout a bank of adjacent displays, simplifying both the setup and maintenance of a "seamless" wall.

1. Set up and optimize all projector settings. You can ignore color temperature, since you will be redefining color performance in this procedure, but do optimize each projector in every other aspect. Closely align all screen edges.

2. Assign projector numbers to make communications easier. Use a wired keypad.

3. Use the same lamp mode for all projectors, and do the following:

   - Set *Select Color Adjustment* to "Max Drives"
   - Display a full white test pattern
   - Adjust lamp power and Optical Aperture until adjacent white fields appear the same brightness.

4. Display the *Color Adjustments by X,Y* menus for all projectors. Each menu shows the x/y coordinates defining the "Max Drives" color gamut for this projector. Jot down the values shown in one (any) of the displays. See Figure 3.31. Or use the "Copy From" function to copy them into a "User" gamut in one projector.

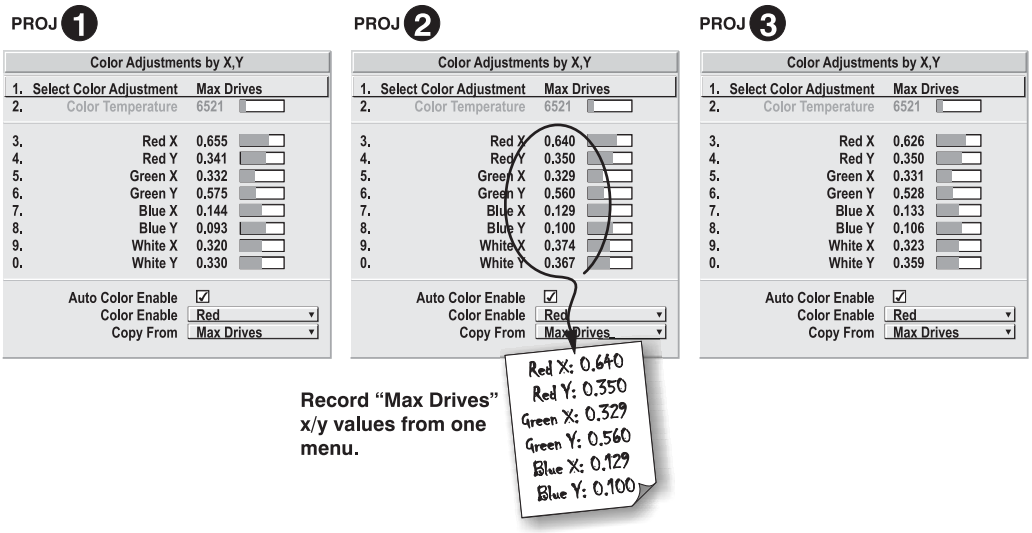


Figure 3.31. Jot Down a Set of "Max Drives" X/Y Values

5. In each projector, select a "User" color adjustment (1-4) to enable *Color Adjustments by X,Y* changes. Then enter your recorded x/y values into each menu (Figure 3.32).

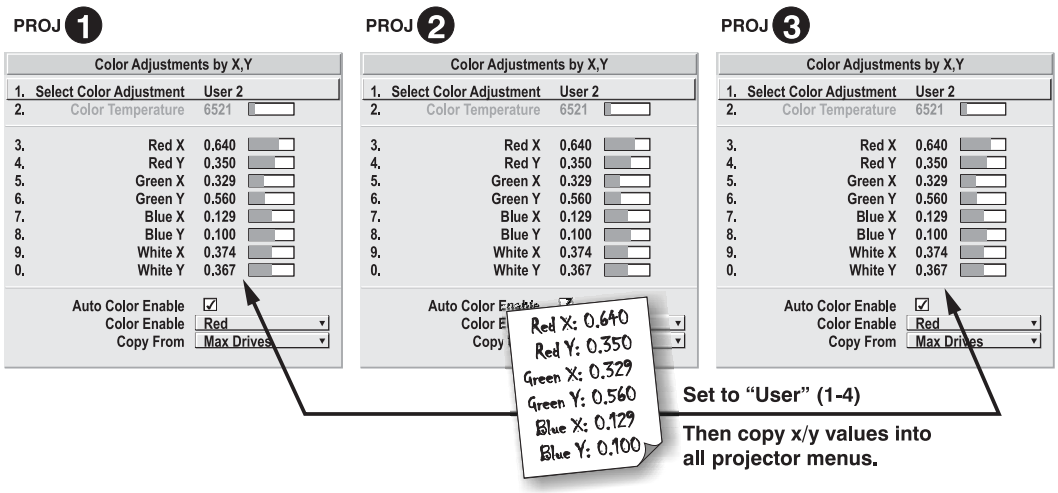
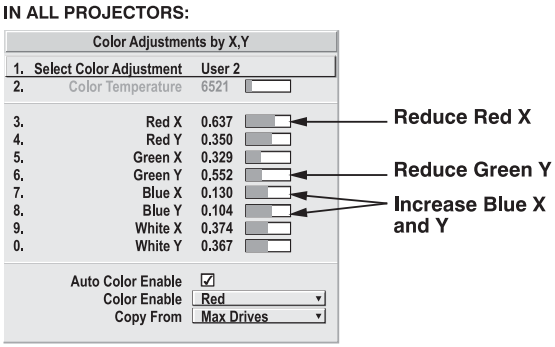


Figure 3.32. Copy X/Y Values into All Projectors

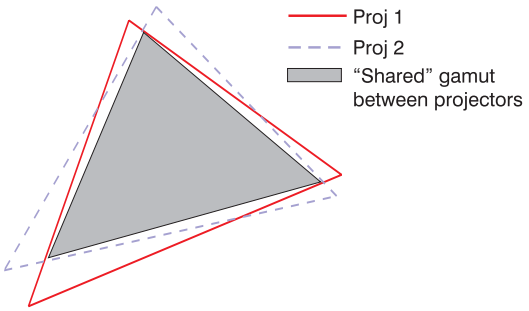
6. In each projector, judge by eye and adjust x/y coordinates slightly in the following manner:

   - To match reds, decrease " Red X" until full field red screens match.
   - To match greens, decrease "Green Y" until full field green screens match.
   - To match blues, increase both "Blue X" and "Blue Y" until full field blue screens match.



NOTE: For speed, enable the "Auto Color Enable" checkbox. Each color coordinate you select will then automatically trigger a full field display of the corresponding color.

These coordinate adjustments move the three color points closer together (see right) to establish a "shared" gamut attainable by all projectors in your group. Adjust only as necessary to ensure that the resulting color palette is as large as possible. When done, you may need to adjust lamp power slightly.



7. All screens should now be color-matched. Apply this new "User" gamut to a source at any time by selecting it in the "Select Color Adjustment" list accessed in the *Advanced Image Settings* menu.

Using the Color Saturation Menu for Color Matching

You may prefer to use the *Color Saturation* menu to match colors across multiple screens. In the three *Color Adjustment* submenus (Red, Green, Blue—see right), set all main values to 100 and the secondary values to 0. Then judge by eye and adjust the slidebars as needed. Note that adjustments here define new x/y coordinates in the *Color Adjustments by X,Y* menu.

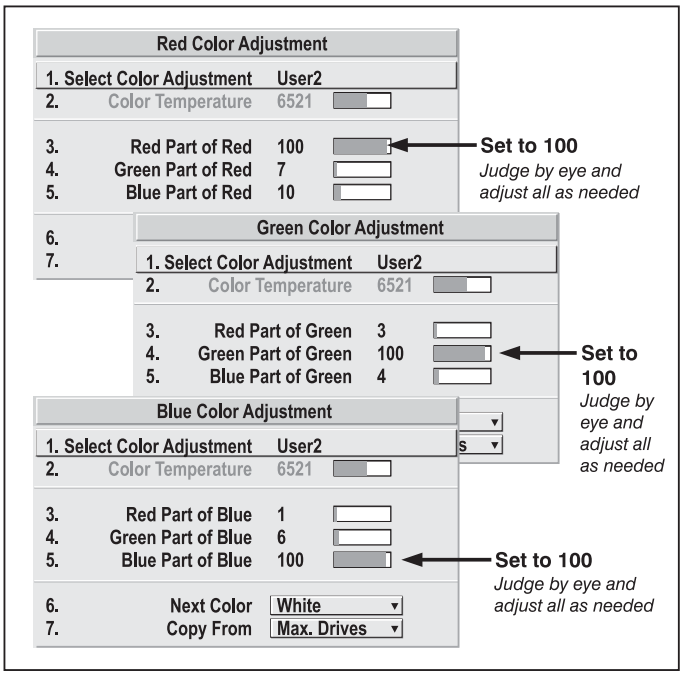


Figure 3.33. Color Matching Using Color Saturation Menu

Achieving Brightness Uniformity

➤ **WHAT IS BRIGHTNESS UNIFORMITY?** When used to refine screens already matched for their primary colors (see *Matching Colors in Multiple Screens*, above) and overall light output, proper adjustment of *Brightness Uniformity* can create an exceptionally smooth screen in which:

- no area of the screen appears more red, green or blue than another
- no area of the screen appears brighter than another
- color and light output from one screen closely matches adjacent screens

Although the *Brightness Uniformity* control can be used for a stand-alone projector, it is particularly useful for setting up and maintaining tiled images that form a cohesive display wall in which the color "cast" and light output appear uniform throughout each image as well as throughout the entire wall. The procedure provided here assumes a multiple-screen application.

⚠ ***Before You Begin***

Read through the entire procedure before attempting to adjust Brightness Uniformity controls, and keep in mind the following checklist of prerequisites and guidelines:

- ❑ **ADJUST COLORS FIRST—**Always adjust the primary colors as described in the "*Matching Colors in Multiple Screens*" procedure (above) before attempting to work with Brightness Uniformity. This ensures that primary colors, color temperature, and maximized light output are all well-matched from one screen to another. These matches are needed before you can achieve good Brightness Uniformity results.
- ❑ **RUN LAMP FOR 100 HOURS—**Light output and Brightness Uniformity can vary significantly during the first 100 hours of lamp use. For best results with new lamps, either set up Brightness Uniformity after this period, or do an initial setup and re-check at 100 hours.

- **SET LAMP POWER—**Make sure each “Lamp Power” setting is as high as possible for your application while still maintaining a good overall match of light output from screen-to-screen. By nature, achieving a *uniform* brightness will require a slightly reduced *overall* brightness—this reduction will help ensure that you have enough range of adjustment when examining brightness variables more closely from screen-to-screen, and will help prevent premature “maxing out” when trying to match to a certain color, zone or projector.
- **USE A “USER” COLOR TEMPERATURE—**Always adjust Brightness Uniformity for a *User* color temperature defined when you matched primary colors, and continue to use it for all sources displayed on the wall. Your other color temperatures will not necessarily be matched from screen-to-screen.
- **IGNORE THE COLOR OF MENUS—**Menu color will vary between screens that are otherwise well-matched.
- **WHITE UNIFORMITY SLIDEBARS—**White Uniformity slidebar values may not reduce to “0”. Each slidebar adjusts overall light output in a specific screen zone, but the value shown represents the current setting for *green* in this zone. When other “hidden” values (red or blue) are lower than green, during adjustment in the White Uniformity menu their values will reach “0” first, causing the slidebar to stop earlier than expected.
- **JUDGE BY EYE OR USE A METER—**Good brightness uniformity can be achieved with either.

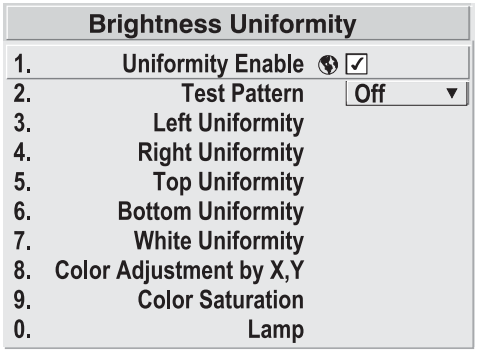
Step 1: General Setup

1a) Adjust primary colors (see *Matching Colors in Multiple Screens)* to ensure matched overall color temperatures and light output between screens.

⚠ IMPORTANT

Double-check that all WHITES and LIGHT OUTPUT are well-matched.

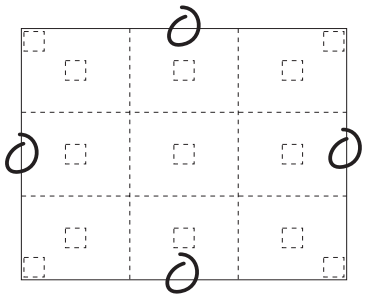
1b) Enable the *Brightness Uniformity* checkbox. This will enable access to the uniformity controls and will apply the settings to your image.



← *Enable adjustment of options #3-7*

1c) Select the 13 Point test pattern for display. This pattern provides 9 screen “zones” with 13 targets.

FOR BEST RESULTS: Rather than examining the CENTER of each zone when assessing Brightness Uniformity adjustments, focus on extreme EDGES as indicated in the illustration at right.



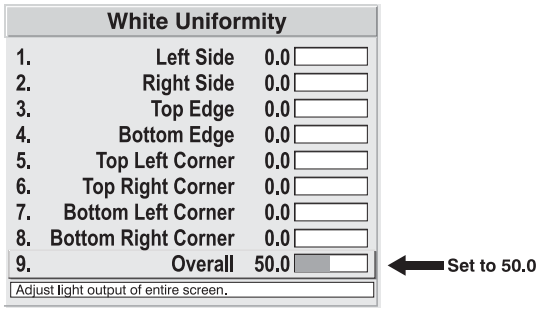
1d) In either *Color Adjustments* menu, select a “User” color. Then:

- ***If you have adjusted “User 1” Color Adjustment*** to create a well-matched wall (recommended), select “User 1” and then choose a color. Continue with Step **1e**.
- ***If you prefer maximum brightness*** rather than a particular color temperature, select “Max Drives”.

IMPORTANT

Do not change User 1 Color Adjustments in color-matched applications!

1e) In the *White Uniformity* menu, set “Overall” to **50.0** and set all others to **0**. This decreases the light output from each color *just enough* throughout the screen so that any color level can then be *increased* later as necessary for matching light output from zone-to-zone. Do not exceed **50.0** for “Overall”—a higher level will likely interfere with achieving brightness uniformity and is not recommended.



Ensure that overall light output remains well-matched from one screen center to the next. Where necessary, increase or decrease Lamp Power slightly to recover center matches.

Step 2: Adjust Color (level of red/green/blue) in 8 Zones

*NOTES: **1)** At this point, ignore the **brightness** of individual zones. **2)** Always ignore menu colors.*

2a) On each screen, compare the color temperatures in the 8 target zones (4 edges and 4 corners) to that of the color temperature of the center. Compare using a ***white*** field only, and take note of any areas that do not match the center. Also decide if any screen exhibits a more obvious color shift than other screens—begin with this screen in Step **2b**.

2b) Return to the *Brightness Uniformity* menu. Beginning with the screen that exhibits the most obvious color shift(s), for each edge that exhibits a noticeably different color temperature from the center, select the corresponding *Uniformity* adjustment menu—*Left*, *Right*, *Top* or *Bottom*. For example, if any part of the left side is too blue, too red or too green, go to the *Left Uniformity* menu and adjust the colors (i.e., change their light output) until all portions of the left side closely match the center color temperature. Adjust an edge first (focusing on its center), then adjust its corners. See Figure 3.34.

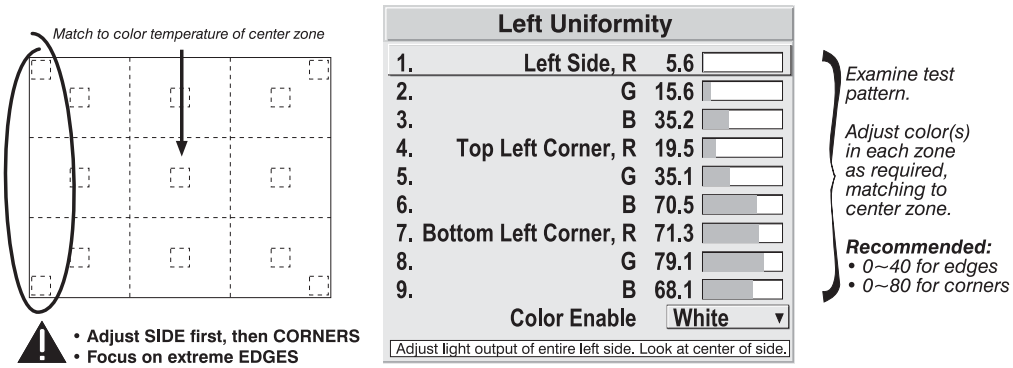


Figure 3.34. Match Zones to Center Color Temperature

Repeat the color adjustment of sides and corners for each edge of the screen that does not yet match the center (note that each corner is adjustable in either of its two adjacent "side" menus). When done, all areas of a given screen should match. Repeat Steps **2a** & **2b** for all remaining screens.

Step 3: Adjust Light Output in 8 Zones

3a) For each screen, compare the light output of each *edge* and *corner* to that of the *center*. If any of the areas differ, use the *White Uniformity* menu to match edges and corners to the center as described below (see Figure 3.35). Begin with the screen exhibiting the most obvious variations in light output.

- Adjust **edge** *White Uniformity* first—note that each edge adjustment also affects the rest of the screen slightly. Keep all edges just slightly *lower* than the center light output rather than matching light output precisely. Otherwise, it may not be possible to brighten the corners (typically the dimmest areas of the screen) enough. I.e., the best uniformity is a compromise between the brightest and darkest areas of the screen.
- Adjust **corner** *White Uniformity* last—each corner adjustment affects only this quadrant.
- Repeat for each screen.

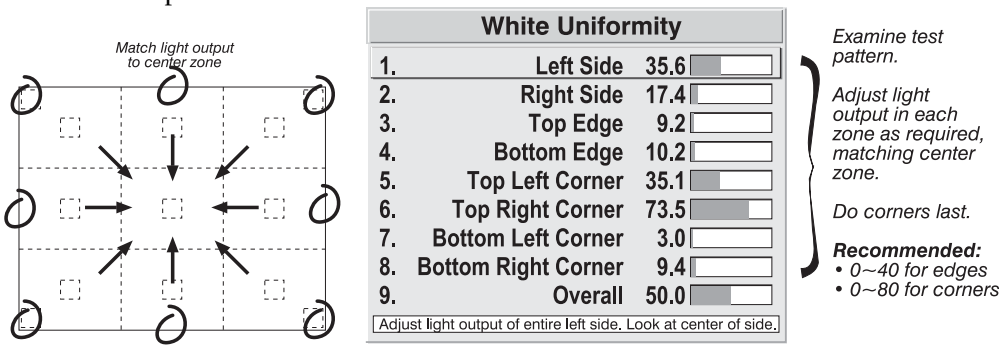


Figure 3.35. Match Zones to Center Light Output

Step 4: Readjust Color Temperature (level of red/green/blue) in 8 Zones

4a) Return to Steps **2a** & **2b** and, if necessary, fine-tune the zones so that they all still exhibit a single color temperature.

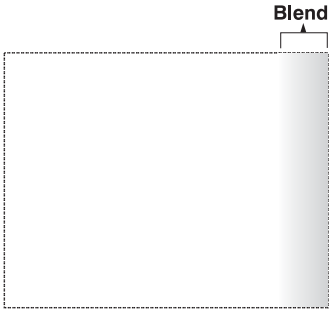
Canceling Brightness Uniformity

If you do not want to use or apply Brightness Uniformity settings, delete the checkmark from the “Uniformity Enable” checkbox at the top of the *Brightness Uniformity* menu.

Edge Blending ➤

Christie *Edge Blending* is an innovative set of software functions that can quickly and easily blend white levels along the edges of multiple adjacent projected images to create a single seamless larger image.

What is a Blend?



In simple terms, a blend appears as a gradient strip along an edge of a projected image. It is darkest along the extreme edge of the image, and lightens nearer to the rest of the image (see right).

How Are Blends Used?

In multiple-projector walls, complementary blends between neighboring images can compensate for the extra “brightness” or intensity where these edges overlap. By controlling blend width and other properties, you can achieve uniformity across the group of images. Visible overlaps will disappear:

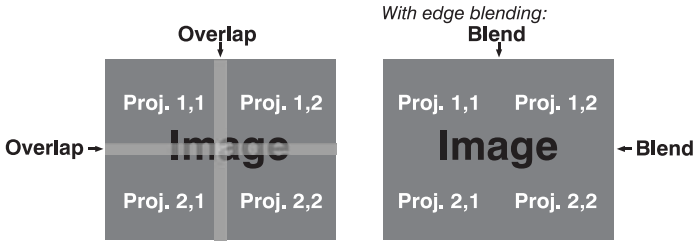


Figure 3. 36. Edge Blending Concept

For best results, use the same projector model and type throughout your display wall. In addition, avoid high-gain screens whenever possible—the optical performance of such screens demands minimal image offset, thus projectors must be located very close to one another.

Edge blending software controls are located in the 2-page *Edge Blending* submenu—access via *Configuration* menu, then go to the *Geometry and Color* menu and select *Edge Blending*. The *More* option opens the second page of the *Edge Blending* submenu.

Main Functions

Use Edge Blending controls to set the precise *width*, *shape* and *midpoint* you need to blend overlapping edges together smoothly.

- **Blend Width** determines how much area is used for blending along an overlapping edge. Slidebar values represent the number of 8-pixel steps used for the blend. For example, a setting of “3” creates a blended edge 24 pixels wide. A setting of “0” signifies no blending. For best results in most applications, use a blend width of 16-48 steps (128-384 pixels).

  Ranges: 0-80 horizontal, 0-60 vertical.

- **Blend Shape** determines the rate of roll-off across the blend width, i.e. how quickly the white levels across the blend change from light and dark. Increasing the *Blend Shape* setting accelerates the rate of change at both extremes so that *less* of the region appears mid-gray (see Figure 3.37). Decreasing the *Blend Shape* setting slows the rate of change so that *more* of the region appears mid-gray. For most applications, this subtle control is best left close to 50.

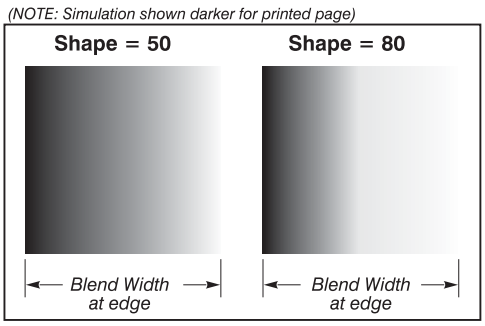


Figure 3.37. "Shape" Examples

- **Blend Midpoint** determines the white level at the blend midpoint (the point equidistant between the beginning and end of the blend). Increasing the *Blend Midpoint* setting creates a blend that appears brighter than the rest of the image. Decreasing the *Blend Midpoint* setting creates a blend that is darker than the rest of the image. A setting of 50 means the midpoint is approximately 50% black—for best results in most applications, keep fairly close to this default.

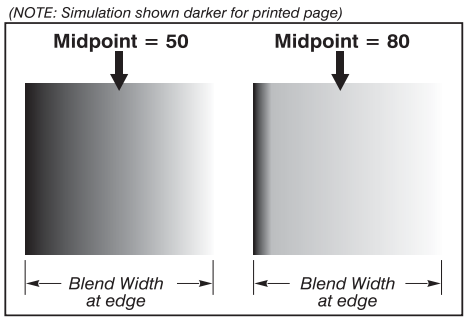


Figure 3.38. "Midpoint" Examples

Other Functions

For convenience, the *Edge Blending* submenu also includes related options for enabling a specific color and/or test pattern, or for working with colors or the lamp. Such functions duplicate those provided elsewhere in the menu system.

Edge Blending Procedure

*NOTE: Before attempting to work with edge blending software functions, you must **1)** physically align the projectors/images by correctly overlapping the displays from your intended external source, and **2)** Match colors and Brightness Uniformity.*

IMPORTANT

For a shared edge, all *Blend* procedures and settings should be identical on BOTH projectors.

1. Start with 2 projectors. Display full white field test pattern from both.
2. In the *Edge Blending* submenu, enable *Edge Blending* by entering a checkmark in the top checkbox.
3. **SET STARTING POINTS FOR ADJUSTMENT**:
   - Set all blend widths to 0.
   - Go to "More" and set everything in the *Edge Blending (2)* menu to 50.

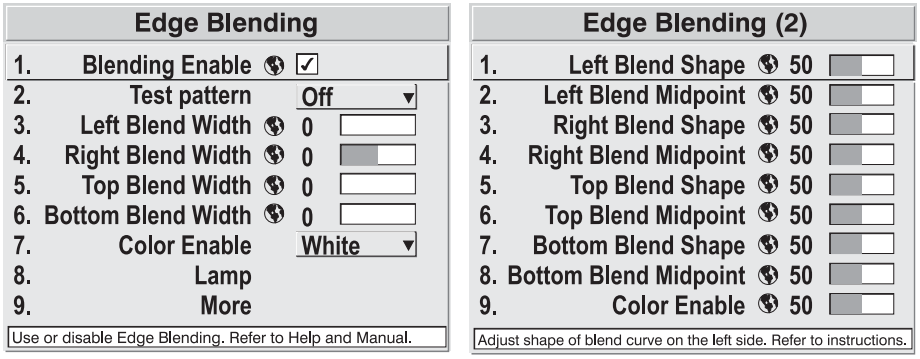


Figure 3.39. Set Starting Points for Each Projector

4. **SET BLEND WIDTH**: On one projector, increase the *Blend Width* for an overlapping edge (for example, if the projector's image is on the left, its right edge overlaps the adjacent image—adjust *Right Blend Width*). Use the same setting on the second projector for this shared edge.
5. Re-adjust width (both projectors) until the overly bright band at the midpoint of the overlapping blends disappears or *just* changes to very light gray. For the shared edge, use the same *Blend Width* setting on each projector. If the "best blend" appears to be between two settings, choose the wider setting for both projectors.
6. **CHECK BLEND:** If the blended region appears too dark or light in relation to the rest of the image:
   - Increase *Blend Midpoint* in both projectors to "lighten" the overall blend, decrease to "darken" the overall blend.
   - Adjust *Blend Shape* in both projectors to fine-tune the amount of mid-gray intensity (as opposed to black/white) in the blend.
7. Repeat with remaining projectors / overlaps.
8. Check completed display wall with the desired external signal.
9. Adjust mechanical alignment if necessary to maintain perfect pixel-on-pixel alignment over time.

In applications where you are projecting only white or light images, the *Blend Width* may be slightly higher—set according to how much overlap you have between images. Use the following as a guide (examples show overlapping width only—values for overlapping height will differ):

- If side overlap is **15%**, set *Blend Width* to **24**
- If side overlap is **20%**, set *Blend Width* to **32**
- If side overlap is **25%**, set *Blend Width* to **40**
- If side overlap is **30%**, set *Blend Width* to **48**

3.11 Remote Control of the Projector

As an alternative to using a keypad, most projector functions can be controlled remotely, typically at a controller such as a PC, via simple bi-directional ASCII messaging on an Ethernet or serial communication link.

WHAT SETUP IS NEEDED? To control these projector functions remotely via Ethernet and your own controller, either open an Ethernet socket between your controller and the valid projector address, or connect a serial link between your controller and any of the RS422 ports or the RS232 In port. Connect all ports, if desired.

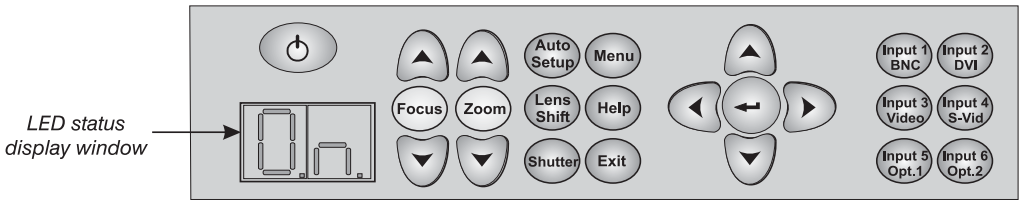
For complete information, including a list of valid ASCII messages and how to structure them for use, obtain the current *Christie Serial Communications* document.

3.12 Error Conditions

Occasionally the projector will encounter an error condition that can interrupt normal operation. Such a condition can be caused by a simple invalid keypad entry, an input signal error (most common) or a system error. The manner in which users are to be notified of error conditions is set in the *Menu Preferences* menu:

- To see error messages displayed on-screen, select the "**Screen**" or "**All**" option.
- To be notified via a serial communication only, select the "**RS232**" option.
- To receive both types of notifications, select "**All**".
- To disable error messages (except for "invalid user key entry", which can't be hidden), select "**Off**".

Note that a two-digit error code appears in the status LED display window located beside the built-in keypad at the rear of the projector. Normal operation is indicated by the "0n"status code.



User Errors ➤

Invalid User Entry

A keypad entry not recognized by the projector triggers a short on-screen error message identifying the problem. For example, if you specify a channel number that is not available, the message "*Invalid Channel* will appear. Or if you try to enter the wrong password, you'll see "*Invalid Password*". Press ↵ or Exit to clear the message and try again.

NOTE: On-screen display of "Invalid User Entry" messages cannot be disabled, even if ***Display Error Messages*** *has been set to "Off".*

Input Signal Errors ➤

An input signal error message occurs if you are in presentation level (i.e., there are no menus present) and have selected an input on which the projector detects a problem. While menus remain operational and any key press will temporarily remove any displayed error message, you must resolve the signal problem in order to permanently eliminate the message.

No Signal

The message *"No signal"* occurs when there is no source signal detected at the selected input—both HSYNC and VSYNC are inactive and the screen background is black. Connect or correct the signal, or try another input.

Bad Sync

The message *"Bad Sync"* occurs when HSYNC or VSYNC are active but the signal cannot be displayed. Such a condition occurs when only one of the two sync signals is present or when either sync signal is unstable or of the wrong frequency. Correct the signal or select another input.

Other Signal Error Messages

In addition to the common *"Bad Sync"* and "*No Signal*" errors, you may encounter a signal error message indicating that HSYNC and/or VSYNC are either too fast or too

slow. When such a message appears, check the frequencies shown in the *Status* menu. If they are correct, then the signal is not recognized by the projector. On some PCs you may be able to change the settings to generate a compatible signal. If the frequencies shown in the *Status* menu are incorrect, check the cabling to see where the problem might originate.

System Warnings / Errors ➤

When the projector encounters a system malfunction, either a *System Warning* message or a *System Error* message may appear. Both types of messages are accompanied by a numerical error code on the status LED display. A system malfunction can be cleared with Exit Exit from presentation level, but may indicate the need for service by a qualified service technician.

NOTE: System messages appear on-screen only if ***Display Error Messages*** *has been set to "Screen" or "All".*

System Warnings

A system *warning* indicates that a system malfunction has been detected (see *Status LED Codes*, below). A system warning message replaces any input signal message and disappears when the input signal status changes. While the projector will remain operational, the message indicates the presence of a potentially serious problem that should be investigated. You can press Exit Exit to remove the message, but for best results you should reset the projector—power the projector down and up again with the ⏻ (power) key.

System Errors

A system *error* message indicates that a serious malfunction has been detected and must be investigated as soon as possible (see *Status LED Codes*, below). The projector will no longer operate and must be reset—power the projector down and up again with the ⏻ (power) key.

The Status LED Codes

If the status code display on the back of the projector shows one of the following values, you have encountered a likely system error requiring the attention of a qualified service technician (see *System Warnings* and *System Errors*, above). Acknowledge and clear the error with Exit Exit from presentation level, or try resetting the projector by powering it off and on again, cooling when necessary. Consult ***Table 3.5*** and contact your dealer if the problem persists.

The specific code number identifies the source of the error detected, and is particularly useful in cases where the projector is far away. For example, the code "27" means the lamp could not be turned on. Error codes for this projector are listed in ***Table 3.5*** below.

Table 3.5 Error Codes

Code	Description
GENERAL	
12	Software bug. Contact dealer/factory.
13	CRC error in flash ROM. Download new software.
14	Engineering-only programming is complete. Call Christie, replace TIPM.
15	Attempting to download code without being in boot mode
16	Invalid interrupt. Power off/on. If it persists, contact dealer/factory.
17	User forced system to stay in boot mode
18	Jumper for programming boot not installed
LAMP FAILURES	
20	Lamp turned on unexpectedly (fault related to ballast)
21	Lamp airflow low, overheating imminent
23	Cannot read valid ballast ID
26	Lamp 1 Interlock: lamp door open, lamp not installed
27	Can't turn lamp on
28	Lamp turned off unexpectedly
29	Lamp ballast overheated
POWER AND COOLING	
46	Red DMD temperature probe overheated
4C	Projector shutdown due to critical error
C0	Lamp blower failure (lamp not turned on)
51	LVPS fan failed (Fan 1)
52	LVPS/ Red cooling fan failed (Fan 2)
53	DC lamp fan failed in 500W / 1kW models (Fan 3)
54	Red DMD heatsink fan failed on 1kW and 1.2kW models (Fan 4)
55	Green DMD heatsink fan failed on 1kW and 1.2kW models (Fan 5)
56	Blue DMD heatsink fan failed on 1kW and 1.2kW models (Fan 6)
57	TIPM fan failed (Fan 7)
58	TIPM fan failed (Fan 8)
TIPM (Image Processor)	
60	Boot code CRC failed
61	Unable to program DigMux PLD
62	Unable to program Control PLD
63	Unable to program Bubks PLD
64	Unrecognized ROM type
65	Write to flash ROM failed
66	TIPM failure
67	Downloaded code will not fit
68	Scaler communication problem
BUILT-IN KEYPAD	
70	Unable to access EEPROM on the built-in keypad
71	EEPROM memory re-initialization on the built-in keypad
PANEL DRIVER AND FORMATTER	
80	Unrecognized Panel Driver
81	Unable to program device on Panel Driver
82	TI flash download failure
83	TI flash download failure
84	TI flash download failure
85	TI-I2C write failure
86	One or more Formatters not responding — Probable Formatter s/w fault
87	Formatter reports RDRAM failure
88	Red modular Formatter communication failure
89	Green modular Formatter communication failure
8A	Blue modular Formatter communication failure
93	Modular formatter architecture error
94	Modular formatter DMD mismatch
95	Modular formatter sequence mismatch
MISCELLANEOUS	
A0	Unable to program the optional module
A1	Unable to power the optional module
A2	Unable to program the Dual Slot Backplane Module (DSBP)
A3	Unable to program the optional Post Processing Module (Warp module)

Clear system errors with (Exit) (Exit)*. If necessary, try resetting the projector by powering it off and on again (cooling if necessary). For detailed information, monitor the RS232 IN port. Contact dealer/factory if error persists. Codes omitted from this table should not appear in your projector.*

Section 4

Maintenance

4.1 Warnings and Safety Guidelines

The projector is an international regulatory agency approved product designed for safe and reliable operation. To assure complete safety at all times it is important to acknowledge the following precautions while operating the projector.

⚠ WARNING

Always remove the lens when shipping the projector.

⚠ WARNING

**NEVER look directly into the projector lens.
The high brightness of this projector
could cause permanent eye damage.**

⚠ WARNING

**For protection from ultraviolet radiation,
keep all projector shielding intact during operation.**

! CAUTION

**Installation should be performed by qualified
personnel.**

Labels and Markings ➤ Observe and follow all warnings and instructions marked on the projector.

The exclamation point within the equilateral triangle alerts the user to important operating and maintenance (servicing) instructions in the literature accompanying the projector.

The lightning flash and arrowhead symbol within the equilateral triangle alerts the user to uninsulated "dangerous voltage" within the projector's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

Instructions ➤ Read all operating instructions prior to using the projector.

Projector Location ➤ Operate the projector in an environment, which meets the operating range specified in *Section 6 – Specifications.*

◊ Do not operate the projector close to water, such as near a swimming pool. Do not operate in extremely humid environments.

◊ Do not place the projector on an unstable cart, stand or table. A projector and cart combination should be used with care. Sudden stops, excessive force and uneven surfaces may cause the projector and cart combination to overturn.

◊ Only use Christie-approved ceiling mount fixture, if the projector is to be ceiling mounted.

Lamp ➤ **Lamp:** The projector uses a Cermax® Xenon lamp to deliver its high brightness. A lamp should be replaced when it has reached its end of life (1000 hrs, typical) or if a noticeable change in brightness occurs. Keep track of the number of hours the lamp has been in use (*Lamp Menu*) and be aware of any changes to brightness. These indicators will help you effectively maintain operation of the projector.

⚠ WARNING ⚠

Wait approximately 5 minutes after powering down the projector to allow internal cooling fans to stop and for the lamp to cool sufficiently before removing.

The lamp is under great pressure when hot and may explode causing physical injury and/or property damage. Allow a lamp to cool before handling or unplugging the projector.

⚠ WARNING ⚠

Use lamps of the correct wattage for your projector model when replacing.

Use only lamps supplied by CHRISTIE.

Filter: Replace the filter when you replace the lamp or sooner if required. It is important the filter be replaced regularly to ensure sufficient airflow through the projector, otherwise it could cause the projector to overheat.

Refer to 4.4 Lamp and Filter Replacement for instructions.

Power Cord and Attachments ➤ Use only the attachments and/or accessories recommended by CHRISTIE. Use of others may result in the risk of fire, shock or personal injury.

⚠ WARNING

Use only the AC power cord supplied. Do not attempt operation if the AC supply is not within the specified voltage and power range. Refer to the Specifications in Section 6.

◊ Do not set or rest items on the power cord. Place the projector in an area where the projector cord cannot be abused or damaged by persons walking on it or by objects rolling over it.

◊ Operate the projector at the specified voltage only. Do not overload power outlets and extension cords as this can result in fire or shock hazards.

◊ The projector is equipped with a three-wire plug having a third grounding pin. This is a safety feature – if you are unable to insert the plug into an outlet contact an electrician to have the outlet replaced. Do not defeat the safety purpose of this grounding-type plug.

Ventilation ➤ Slots and vents in the projector provide ventilation. Never block or cover these openings. This ensures reliable operation of the projector and prevents overheating.

- ◊ Do not place the projector over a radiator or heat register. The projector should not be placed in an enclosure unless proper ventilation is provided.
- ◊ Do not insert objects into the ventilation openings of the projector. They may touch dangerous voltages or short-out components resulting in a fire or shock hazard. Do not spill liquids of any kind into the projector. Should an accidental spill occur, immediately unplug the projector and have it serviced by a qualified service technician.

Servicing ➤ If any of the following conditions exist, immediately unplug the projector from the power outlet and ask a qualified service technician to look at it.

- ◊ The power cord has been damaged.
- ◊ The internal cooling fans do not turn on within two minutes when the projector is first powered up.
- ◊ Liquid has been spilled into the projector.
- ◊ The projector has been exposed to excessive moisture.
- ◊ The projector is not operating normally or its performance has significantly deteriorated in a short period of time.
- ◊ The projector has been dropped or the shipping case (if applicable) has been badly damaged.

⚠ WARNING

Do not attempt to service the projector yourself. All servicing must be performed by CHRISTIE accredited service technicians.

Use replacement parts that are manufacturer-approved only. Use of any other part other than the ones specified by the manufacturer can result in fire, electric shock or risk of personal injury and irreparable equipment damage.

4.2 Cleaning and Maintenance Guide

⚠ WARNING

Always power down and unplug the projector before cleaning or servicing.

Table 4.1. Maintenance Guide

Part Description	Frequency	Action
Lens	*As required*	**CLEAN:** Clean if absolutely necessary. A small amount of dust on the lens has very little affect on picture quality. **To clean:** Apply a solvent such as acetone, alcohol or vinegar sparingly to clean, lint-free lens tissue. Wipe across the surface of the lens. Do not scrub or rub tissue in circular motion, this will scratch the lens. Do not reuse tissue. Do not use cleaning tools treated with Ether. If particles still appear on the lens, try using compressed air to remove.
Lamp	*As required*	**CLEAN:** Clean if absolutely necessary. Never touch the glass surface of the lamp. Fingerprints left on the glass will seriously degrade lamp performance or cause "hotspots" which can lead to an accumulation of intense heat in the touched area and cause the lamp to shatter. **To clean:** Wait until lamp is cool. Moisten a clean, lint-free cotton cloth with isopropyl alcohol and gently rub the surface of the glass in a circular motion until clean.
	1000 hrs or sooner if required	**REPLACE:** Refer to *4.4 Lamp and Filter Replacement* procedure later in this section.
Filters	*Whenever a lamp is replaced or sooner if required*	**REPLACE:** Do not reuse old filters. Use the filter provided in the Christie Lamp and Filter Kit.
Covers (External)	*As required*	**CLEAN:** Clean dust from external covers using a clean, lint free cotton cloth as required. *NOTE: Before cleaning the modules, it is recommended that you install the lens cap. This will keep dust particles from settling on the glass surface of the lens.*

4.3 Replacing Remote Batteries

The optional IR remote uses two AA size, 1.5V alkaline batteries. To replace the batteries simply turn the remote over and push out the cover using the finger groove, as shown in (1) Figure 4.1.

Remove and properly discard the old batteries. Insert new batteries in the proper positive/negative orientation as shown etched in the bottom of the compartment (2). Replace the cover by inserting the tabbed end into the opening and snapping the opposite end into place.

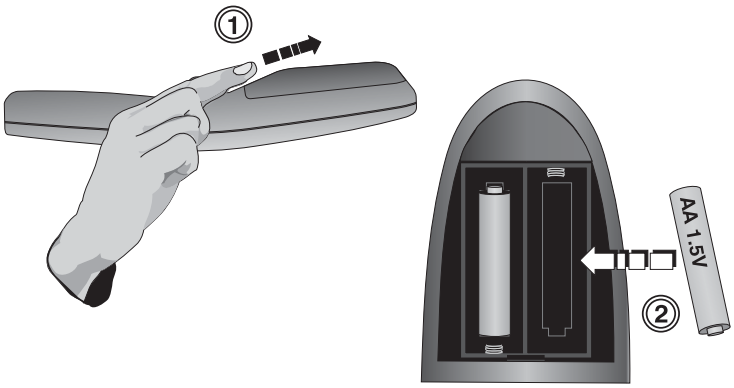


Figure 4.1. Replacing remote batteries ***(underside of keypad shown)***

4.4 Lamp and Filter Replacement

Use the following instructions when replacing the lamp. The lamp is located at the back of the projector (below the input panel) and can be accessed by removing the lamp access panel. Use only the Christie approved *Lamp and Filter Kit* for your specific projector model. See chart below.

Projector Model	Lamp (Watts)	Lamp/Filter Kit Required
Mirage S+2K (38-DSP102-02) DLV1400-DX (38-DSP102-01)	**500W**	**03-000832-01P**
Christie DS+4K (38-DSP104-02) Mirage S+4K (38-DSP104-03)	**1000W**	**03-000833-01P**
Christie DS+8K (38-DSP106-01) Mirage S+8K (38-DSP106-02)	**1200W**	**03-000834-01P**

A lamp should be replaced when it reaches its end of life (1000 hours, typical) or sooner if a noticeable degradation in brightness occurs (typical in aging lamps). You can set the number of hours you expect to log with the lamp before replacing it, by setting the **Lamp Limit** in the *Lamp* menu. You can also enable a warning message to appear upon powering up the projector that will indicate the lamp has reached the limit you set, by entering a checkmark beside the ***Lamp Message*** option. *NOTE: The lamp mode you choose to run the projector in may have an impact on the number of hours expected for the lamp.*

Tools required: #1 Phillips screwdriver

⚠ WARNING

Handle lamp with care. Lamp may explode if dropped. Wear protective clothing and safety goggles when handling lamps.

Use only Christie approved lamps provided in Lamp and Filter Service Kits for your projector.

1. Press ⏻ to power down the projector. Wait at least 5 minutes to allow the internal cooling fans to stop before unplugging the projector. This wait period is also required to allow the lamp to sufficiently cool before handling.

⚠ WARNING

Always power down and unplug the projector prior to servicing.
Allow the lamp to cool before handling.

2. Using a screwdriver, loosen the 2 screws from the lamp door located at the back of the projector, below the input panel. (Figure 4.2.)

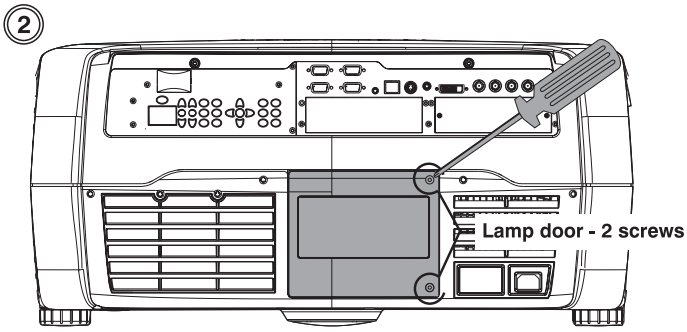


Figure 4.2.

3. Pull (out) and turn the lamp lock lever, which is located to the left of the lamp module, a quarter turn counter clockwise to the “unlock” position. (Figure 4.3.)

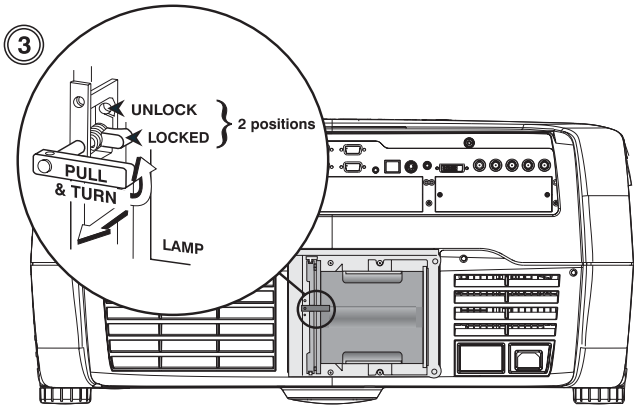


Figure 4.3.

4. Grasp the lamp by its housing only and pull it straight out (lamp slides along guides) until it’s free. (Figure 4.4.) Discard the lamp using safe disposal/recycling practices or contact CHRISTIE for a possible re-lamping program.

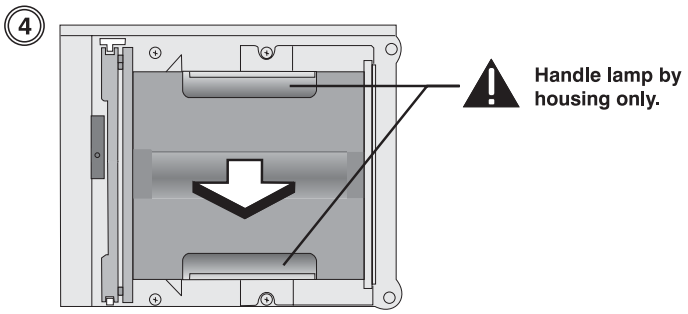


Figure 4.4.

5. Align the new lamp with the top and bottom guides on the left side of the lamp compartment. (Figure 4.5.) Slide the lamp all the way in – a slightly harder push may be required right at the end to make sure it is fully seated into the terminal block. *NOTE: The projector will not power up again if the lamp is not fully connected to the terminal block.*

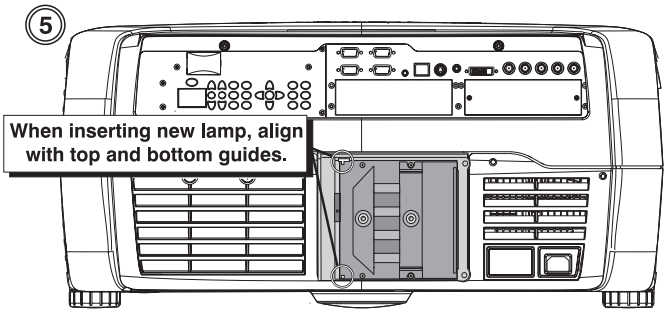


Figure 4.5.

6. Pull (out) and turn the lamp lock lever (turned up in Step 3) a quarter turn clockwise to “lock” the lamp in place. *NOTE: If you can’t turn the lamp lock into position it is likely the lamp is not fully inserted. In this case, partially remove the lamp and try pushing it back in again. Then, try switching the lock lever to the “lock” position.*

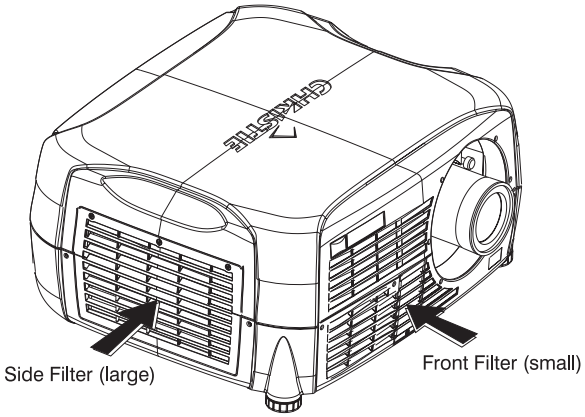
7. Replace the lamp door and tighten the 2 screws to secure.

8. The next time the projector is powered up, enter the new serial number of the newly installed lamp. Access the Lamp menu and select “Change Lamp”. Enter the serial number in the Lamp S/N text box using the number text entry keys.

Filter Replacement ➤

The two filters located at the front and left side of the projector should be replaced whenever the lamp is replaced. If you are working in an extremely dusty environment you may want to replace the filters sooner. Use the filters provided in the Christie approved *Lamp and Filter Kit* for your specific projector model (Table 1.)

Tools required: #1 Phillips screwdriver



1. Loosen the screw(s) from the filter access panels. The front access panel is located to the left of the projection lens – 1 screw. Left side access panel – 3 screws. See Figure 4.6.
2. Pull the filters out of the projector and discard. Do not reuse filters.
3. Insert the new filters with the wired side in. (Figure 4.7.)
4. Replace the filter access panels and tighten the screws to secure.

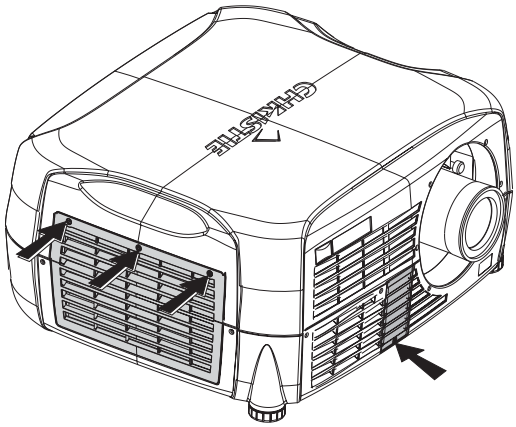


Figure 4.6.

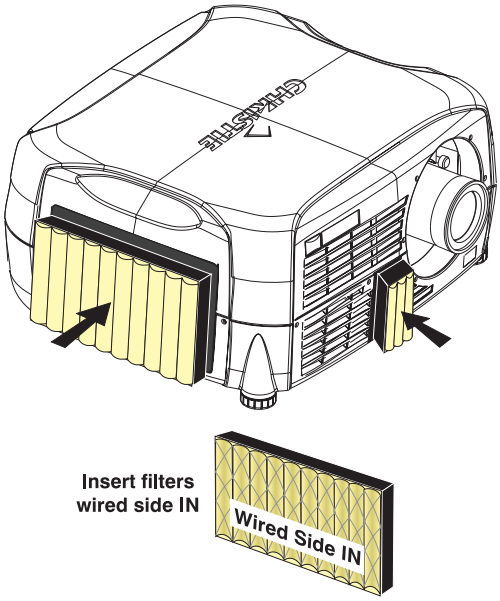


Figure 4.7.

4.5 Replacing the Projection Lens

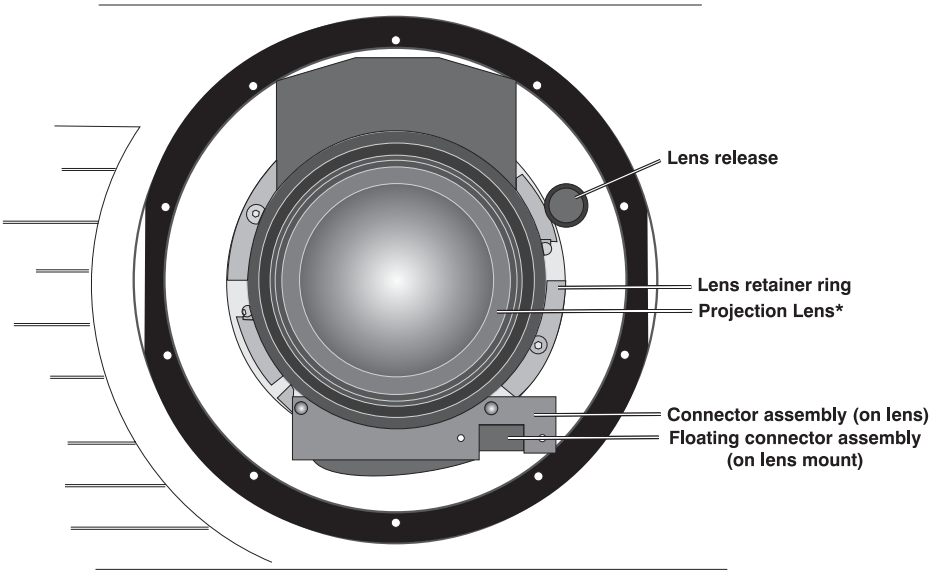
Use the following instructions when replacing a projection lens:

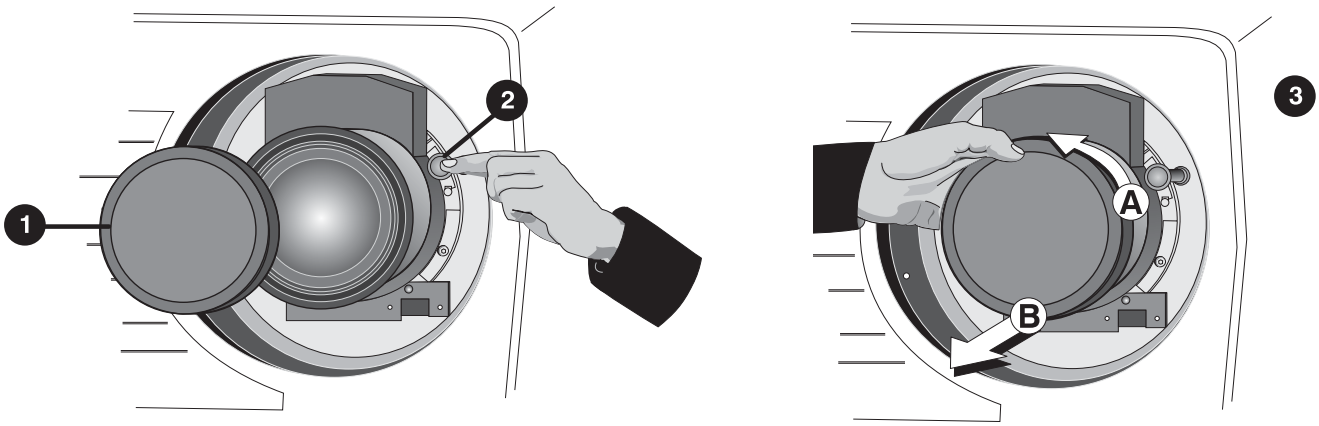
NOTE for first time use: *The projection lens is shipped separately from the projector. Before you install a lens it is important that you remove the lens plug from the lens opening in the projector.*

1. Power down the projector and wait 5 minutes to allow the lamp to cool before continuing with Step 2.
2. Place the lens cap on the projection lens to protect it from being damaged during the installation or removal process. For first time installations, remove the rear cap from the lens – this protective cap is only used during shipping to protect the lens from damage.
3. ***When removing the projection lens*** – Press and hold the "lens release" button located in the top right corner of the lens panel. Grasping the lens barrel, turn it in a counter-clockwise direction until it stops. Then pull it forward to remove it (disconnects from the connector assembly).

   OR

   When installing a projection lens, make sure Steps 1 and 2 are complete. Slide the new lens into the lens opening of the projector – make sure to align the connector that is located on the side of the lens with the connector assembly on the lens retaining ring. As you connect the lens, you may have to re-align it slightly until the tabs on the lens will fit into the slots in the lens retaining ring. With the lens fully inserted (and connected) turn it clockwise until the lens release button "pops" indicating the lens is fully inserted.





NOTE: Connector assembly will move as you turn the lens.

Figure 4.8.

Section 5

Troubleshooting

If the projector does not appear to be operating properly, note the symptoms present and use the following guide to assist you. If you cannot resolve the problems yourself, contact your dealer for assistance.

*NOTE: A **qualified service technician** is required when opening the projector to diagnose any "probable cause".*

5.1 Displays

Symptom ➤ The projector is on but there's no display...

CAUSE / REMEDY:

1. Was a lens cover accidentally left on? Remove lens cover.
2. Make sure the shutter is OPEN.
3. Is the lamp ignited? Check for interlock problems such as an open lamp door OR check for light spillage out the back.
4. Is the correct input selected? Check cable connections.
5. Check if menus appear on screen.
6. Can you access test patterns? Make sure there is not a full black test pattern selected for display—press Menu ▲ to access test patterns, then cycle patterns with ◀ ▶ keys. Check your source connections again.

Symptom ➤ Severe motion artifacts…

CAUSE / REMEDY:

1. Most likely there is a synchronization problem with reversed 3/2 pull-down in 60Hz-to-24Hz film-to-digital conversion in your source. Correct at the source.

Symptom ➤ Image appears "squeezed" or vertically stretched into center of screen

CAUSE / REMEDY:

1. Check your Resizing selection.

Symptom ➤ The display is jittery or unstable…

CAUSE / REMEDY:

1. If the display is jittery or blinking erratically, ensure that the source is properly connected and of adequate quality for detection. With a poor quality or improperly connected source, the projector will repeatedly attempt to display an image, however briefly.
2. The horizontal or vertical scan frequency of the input signal may be out of range for the projector. Refer to *Section 6, Specifications* for scan frequency ranges.
3. The sync signal may be inadequate. Correct the source problem.

Symptom ➤ The display is faint…

CAUSE / REMEDY:

1. Brightness and/or contrast and/or gamma may be set incorrectly.
2. The source may be double terminated. Ensure the source is terminated only once.
3. The source (if non-video) may need a different sync tip clamp location.

Symptom ➤ The upper portion of the display is waving, tearing or jittering…

CAUSE / REMEDY:

1. This can sometimes occur with video or VCR sources. Check your source.

Symptom ➤ Portions of the display are cut off or wrap to the opposite edge…

CAUSE / REMEDY:

1. Resizing and/or blanking may need adjustment.
2. The horizontal or vertical scan frequency of the input signal may be out of range for the projector. Refer to *Section 6, Specifications* for scan frequency ranges.

Symptom ➤ The display appears compressed …

CAUSE / REMEDY:

1. The frequency of the pixel sampling clock is incorrect for the current source.
2. Resizing, vertical stretch and positioning options may be improperly adjusted for the incoming source signal.

Symptom ➤ Data is cropped from edges

CAUSE / REMEDY:

1. Check settings for Blanking.
2. If incoming data is still missing from the image, reduce the image size to within the display area available in the projector.

Symptom ➤ Display quality appears to drift from good to bad, bad to good…

CAUSE / REMEDY:

1. The source input signal may be of low quality.
2. The H or V frequency of the input may have changed at the source end.

Symptom ➤ The display has suddenly frozen…

CAUSE / REMEDY:

1. It's possible that excessive voltage noise on the AC or ground input has interrupted the projector's ability to lock on to a signal. Power down the projector and disconnect from AC. Then plug in again and power up as usual.

Symptom ➤ Colors in the display are inaccurate…

CAUSE / REMEDY:

1. Try Auto Setup.
2. The color, tint, color space, color temperature and/or other settings may require adjustment.
3. Ensure signal connections are correct.
4. Make sure you are using the proper channel for this source.

Symptom ➤ Values in Color Saturation slidebars vary over time…

CAUSE / REMEDY:

1. Once defined, *Color Saturation* slidebar values fluctuate over time and will likely be different upon subsequent visits to this menu. This is normal and should be ignored, as these changes do not redefine the x/y coordinates or color gamut.

Symptom ➤ The display is not rectangular…

CAUSE / REMEDY:

1. Check leveling of the projector. Make sure that the lens surface and screen are as parallel to each other as possible.
2. Is the vertical offset correct? Adjust as necessary using the vertical offset knob.

Symptom ➤ The display is "noisy"…

CAUSE / REMEDY:

1. Display adjustment at your input source may be required. Adjust pixel tracking, phase and filter. Noise is particularly common on YPbPr signals from a DVD player. (If using a PC source, adjust using a high-frequency test pattern with one pixel on/off throughout.)
2. The video input may not be terminated. Make sure the video input is terminated (75Ω). If it is the last connection in a loop-through chain, the video input should be terminated at the *last* source input only.
3. The input signal and/or signal cables carrying the input signal may be of poor quality.
4. If the distance between the input source device and the projector is greater than 25 feet, signal amplification/conditioning may be required.
5. If the source is a VCR or off-air broadcast, detail may be set too high.

5.2 Lamp

Lamp Does Not Ignite ➤

1. If the lamp won't ignite, there may be an interlock failure such as an open lamp door, or failed lamp fan. An error code will display on the status LED display located on the built in keypad.
2. If a temperature is too high (e.g."DMD over critical temp limit"), the lamp will not ignite until the temperature is low enough. Cool the projector and try again.
3. For suspected communication failures, power-down the projector and try again.
4. If the lamp does not ignite after a second and third try, replace the lamp.

Lamp Suddenly Turns Off ➤

1. Try increasing the lamp power.
2. The DMDs may be overheated.
3. Replace the lamp.

Flicker, Shadows Or Dimness ➤

1. Increase lamp power, if possible.
2. Replace the lamp.

LiteLOC™ Does Not Seem To Work ➤

1. Make sure "Intensity" is selected in the *Lamp* menu. Other lamp modes disable LiteLOC™ .
2. If the lamp power has increased to its maximum in order to maintain a LiteLOC™ setting, LiteLOC™ is automatically terminated. If the values shown in the *Lamp* menu indicate that the lamp power has reached this "over-drive" state, either reduce your LiteLOC™ setting or install a new lamp.

5.3 Ethernet

1. Make sure the Ethernet settings are valid for your site—all network devices should have the *same* subnet mask and *unique* IP addresses.
2. Make sure to save any address change, and re-boot to implement.

   If you still have trouble establishing communications with a projector added to an existing Ethernet network, the projector's IP address is likely in conflict with another address already in use. Contact your network administrator.

Section 6

Specifications

6.1 Specifications

NOTES: 1) Due to continuing research, specifications are subject to change without notice. 2) Specifications apply to all models unless otherwise noted.

Display ➤ ***Resolution***

SXGA+ (1400 x 1050)

Achievable Brightness *(* all values +/-10%)*

Mirage S+2K (500W)	2000 ANSI lumens
Christie DS+4K, Mirage S+4K (1000W)	5000 ANSI lumens
Christie DS+8K, Mirage S+8K (1200W)	8000 ANSI lumens
DLV1400-DX (500W)	2000 ANSI lumens

Contrast Ratio (ANSI, full field)

450-600:1 ANSI, 1500-2000:1 full field *all models except DLV1400-DX*: up to 600:1 ANSI, 2000:1 full field

Color Primaries *(nominal)*

	X	Y
R	0.660	0.330
G	0.310	0.640
B	0.145	0.065

Colors and Gray Scale

Resolution	10 bits
Displayable colors	1.1billion

Color Temperature

Default	5800K +950K/-650K
Range of Adjustment (see Note 1)	3200K – 9300K

NOTE 1: Via electronic controls, with Comprehensive Color Adjustment™ turned off.

Lenses ➤ *(optional)*

Lens Type	Part No.	Vertical Offset (% of Half Height)		Maximum amount of projected image above or		Horizontal Offset (% of Half Width)		Maximum amount of projected image to one side	
		%	Pixels	%	Pixels	%	Pixels	%	Pixels
0.73:1 fixed	38-809088-01	37%	+/-196	69%	+/-721	22%	+/-153	61%	+/-853
1.45-1.8:1 zoom	38-809089-01	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
1.8-2.5:1 zoom	38-809090-01	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
2.5-4.5:1 zoom	38-809091-01	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
4.5-7.3:1 zoom	38-809092-01	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050

* 0% offset is equal to half the image above and below lens center (525 pixels) OR half the image to the left or right of lens center (700 pixels).

Inputs ➤ Standard Analog RGB or YPbPr *(Interlaced or Progressive Scan Format)*

Horizontal Frequency Range		31 – 120 kHz
Vertical Frequency Range (See Note 2)		23.97 – 150 Hz
Scan format		Interlaced or progressive
Pixel Clock Rate (max.)		220 MHz max
Signal Format		Analog RGB, YPbPr, Composite (on "G, PB" input and S-video (luma on "R/Pr/Y" input and chroma on "B/Pb/C" input)
Input Levels	R, G, B, - with sync:	$1.0V_{p-p} \pm 2$ dB
	R, G, B, - without sync:	$0.7V_{p-p} \pm 2$ dB
	Pb, Pr	$0.7_{p-p} \pm 2$ dB
Nominal Impedance		75 ohms

Note 2: Value specifies frame rate of non-interlaced sources and field rate for interlaced sources. Frame/field rates higher than the maximum refresh rate of the panels will be displayed at a lower rate (i.e., frames will be dropped).

Sync *(Interlaced or Progressive Scan Format)*

Horizontal Frequency Range	31 – 120 kHz
Vertical Frequency Range (See Note 1)	23.97 – 150 Hz
Sync Type	Separate H and V, direct or swapped Composite (bi-level, tri-level, XOR, OR) Sync-On-Green/luma (bi-level, tri-level) Serration and /or Equalization pulses MacroVision™ for standard & progressive video
Polarity (See Note 3)	Positive or Negative
Input Levels (See Note 3)	$0.5V_{pp} – 4.0V_{pp}$
DC Offset (See Note 3)	±3V
Nominal Impedance (See Note 3)	75 ohms
Horizontal Sync Duty Cycle	3% min, 20% max

Note 3: Does not apply to sync-on-green/luma.

Composite Video and S-Video

Signal Formats		Composite-video (CVBS), S-video Y/C)
Video Standards		NTSC, NTSC 4.43, PAL, PAL M, PAL N, PAL60, SECAM
Input Levels	Composite-video:	1.0 Vp-p ±3 db (including sync tip)
	S-video luma (Y):	1.0 Vp-p ±3 dB (including sync tip)
	S-video chroma (C):	630 mV nominal (burst)
DC Offset		±2 V
Nominal Impedance		75 ohms
Return Loss (VSWR)		20 dB min (1.2:1 max.) @ 6 MHz

DVI-I Input

Interface Standard	DDWG DVI 1.0
Color Space	RGB or YPbPr
Horizontal Frequency Range	31 – 120 kHz
Vertical Frequency Range	23.97 – 150 Hz
Pixel Clock Rate	25 – 165 MHz
Scan Format	interlaced or progressive
Active Pixels per scan line	640 min., 2048 max.
Active Lines per field / non-interlaced frame	200 min., 1536 max
Connector type	DVI-I

NOTE: HDCP compatible

RS-232 Serial Input

Connector Type	1 female 9-pin Dsub (RS232 IN) 1 male 9-pin Dsub (RS232 OUT)

RS-422 Serial Input

Connector Type	1 female 9-pin Dsub

GPIO

Connector Type	1 male 9-pin Dsub
Number of I/O lines	7 *(each individually assignable as input or output)*
Power Output	+12VDC @ 200mA max.
Output sink current (logic low)	100mA @ 1V

Ethernet

Connector Type	1 female RJ45
Maximum throughput	115.2kbps

Remote Control

Number of sensors	2
Type	IR with wired ability
Range (using std. keypad)	100 feet
Battery type (2 required)	AA, 1.5 V Alkaline

Laser Diode (laser pointer)	Wavelength	670nm
	Max. Output	1mW

Wired Control

Connector type		3.5mm RCA jack
Input levels	High:	2.2 V – 5.6 V (or open)
	Low:	-0.6 V – 0.9 V @ 1 mA

Power Requirements ➤

General

Voltage range	
500W models	100 – 240VAC
1000W models	100 – 240VAC
1200W models	200 – 240VAC
Line frequency	50 Hz – 60 Hz nominal
Max. Inrush current	60A max.
Current rating	
500W models	10A @ 100V, 5A @ 200V
1000W models	12A @ 100V, 8A @ 200V
1200W models	10A @ 200V
Power consumption	
500W models	1000 W max.
1000W models	1600 W max.
1200W models	2000 W max.
Current rating or AC input connector	15A
Type of Connector (back of projector)	IEC 320 C14

Line Cords

500W models	heavy duty 10’, 125VAC 15A
1000W models	heavy duty 10’, 125VAC 15A
1200W models	heavy duty 12’, 250VAC 15A

Plugs

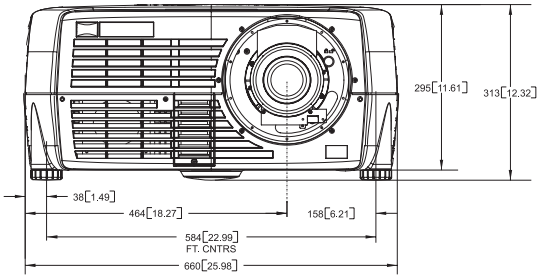
500W models	NEMA 5-15P
1000W models	NEMA 5-15P
1200W models	NEMA 6-15P

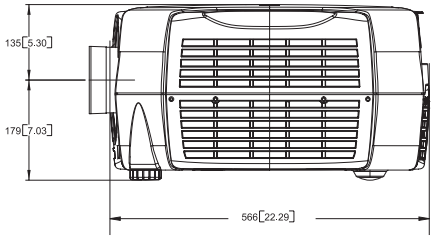
Lamps ➤

Type	CERMAX® Xenon
Power	
Mirage S+2K, DLV1400-DX	500W
Mirage S+4K, Christie DS+4K	1000W
Mirage S+8K, Christie DS+8K	1200W
Adjustment Ranges	
500W models	350 – 500W
1000W models	700 – 1000W
1200W models	800 – 1200W
Lamp Life (typical)	
Mirage S+2K, DLV1400-DX	1000 hrs at Max Brightness, 2000 hrs when continuous running (24 hours/day, 7 days a week) Lamp at 350W continuous power mode
Mirage S+4K, Christie DS+4K	1000 hrs
Mirage S+8K, Christie DS+8K	1000 hrs
Call for warranty information	
Operating position	Full rotation allowed about the lamp axis, ± 15 degrees minimum tilt of lamp axis from horizontal
Warm up to full brightness	10 minutes max.

Size and Weight ➤

Dimensions *(without lens, including feet at min. height position)*	26.0” x 22.3” x 12.3” 660mm x 566mm x 313mm





DIMENSIONS: Millimeters [Inches]

Weight *(without lens)*	
500W models	72 lb. max
1000W models	72 lb. max
1200W models	75 lb. max

Safety ➤ UL 60950 and CAN/CSA C22.2. No. 60950 (2000, 3rd edition bi-national)
IEC 60950 (1999, 3rd edition)
CCC (China Compulsory Certification)

EMC Emissions ➤ FCC CFR47, Part 15, Subpart B, Class A — Unintentional Radiation
CISPR 22: 1997 / EN55022: 1998 — Radio disturbance characteristics for ITE

EMC Immunity ➤ CISPR 24 / EN55024:1998 (all parts of immunity characteristics for ITE)

Operating Environment ➤

Temperature	5°C to 35°C (41°F to 95°F)
Humidity	20% to 80%, non-condensing
Altitude	0 – 3000 meters

Non-Operating Environment ➤

Temperature	-40°C to 70°C (-40°F to 149°F)
Humidity (non-condensing)	0% to 95%

Standard Components ➤ IR keypad *(includes two, 1.5V AA batteries and a mini-stereo cable for conversion to wired)*
Line Cord
User’s Manual
3D Stereo Sync Cable *(Mirage products only)*

Optional Accessories ➤ Wired remote keypad
Two-way remote controller
Remote IR sensor
Ethernet, RS-232 and RS-422 communication cables
KoRE Librarian for downloading new software
Ceiling Mount *(available Spring 2005)*
Service manual

Lenses

(SXGA+)

0.73:1 fixed (38-809088-01)
1.45-1.8:1 zoom (38-809089-01)
1.8-2.5:1 zoom (38-809090-01)
2.5-4.5:1 zoom (38-809091-01)
4.5-7.3:1 zoom (38-809092-01)

(SXGA)

1.2:1 fixed (38-809016-01) for ***DLV1400-DX models only***

Optional Input Modules

RGB500 Input Module
RGB400 Active Loop-Through Input Module
RGB400 Buffered Amplifier Input Module
PC250 Analog Input Module
Composite/S-Video Input Module
Serial Digital Input Module
DVI Input Module
Dual SD/HD-SDI Module

Appendix A

Glossary

This appendix defines the specific terms used in this manual as they apply to this projector. Also included are other general terms commonly used in the projection industry.

Active Line Time ➤ The time, inside one horizontal scan line, during which video is generated.

Ambient Light Rejection ➤ The ability of a screen to reflect ambient light in a direction away from the "line of best viewing". Curved screens usually have good ambient light rejection. Flat screens usually have less ambient light rejection.

Analog Video ➤ The video output of most computers and videotape machines. Analog video can generate a large number of colors.

Anamorphic ➤ Having or requiring a linear distortion, generally in the horizontal direction. Anamorphic lenses can restore a ‘scope’ (CinemaScope) or ‘flat’ format film frame to the correct wide-screen appearance by increasing its horizontal proportion.

ANSI ➤ The American National Standards Institute is the organization that denotes the measurement standard for lamp brightness.

Aspect Ratio ➤ The ratio of the width of an image to its height, such as the 4:3 aspect ratio common in video output. Can also be expressed as a decimal number, such as 1.77, 1.85 or 2.39. The larger the ratio or decimal, the wider and “less square” the image.

Auto Source ➤ The ability of the projector to automatically recognize and synchronize to the horizontal and vertical scan frequencies of an input signal for proper display.

Bandwidth ➤ The frequency range of the projector's video amplifier.

Baud Rate ➤ The speed (bits-per-second) at which serial communications travel from their origin.

Blanking Time ➤ The time inside one scan line during which video is not generated. The blanking time of the input signal must be equal to or greater than the retrace time of the projector.

Brightness ➤ In projection, brightness usually describes the amount of light emitted from a surface such as a screen. It is measured in foot-lamberts or candelas per square meter.

Candela or Candle ➤ Unit of measure for measuring intensity of light.

Channel ➤ A collection of measurements stored by the projector for a given input source, including frequencies, pulse width, polarity, syncs, channel number and location, user-adjustable display settings, etc. Use channels to switch between a variety of setups quickly, automatically recalling previously defined display parameters.

Channel List ➤ A list/menu of previously-defined channels available in projector memory.

Channel Number ➤ A number that uniquely identifies a specific channel retained in projector memory. The projector can retain up to 99 channels.

Checkbox ➤ A menu item that indicates whether an option is currently in effect (checked) or not (unchecked).

Chrominance ➤ The signal representing the color information (hue and saturation) when the image is represented as separate chrominance and *luminance*. Same as “chroma”.

Color Gamut ➤ The range of colors allowed in a specific system, as defined within a triangular area located on the CIE color locus diagram whose corners are the three primaries defined in the system. Also known as color space.

Color Shift ➤ A change in the tint of a white field across an image.

Color Temperature ➤ The coloration (reddish, white, bluish, greenish, etc.) of white in an image, measured using the Kelvin (degrees K) temperature scale. Higher temperatures output more light.

Component Video ➤ See *YCbCr* or *YPbPr*.

Composite Video ➤ The output of video tape players and some computers, characterized by synchronization, luminance and color signals combined on one output cable.

Contrast (ratio) ➤ The degree of difference between the lightest and darkest areas of the image.

Convergence ➤ The alignment of the red, green, and blue elements of a projected image so that they appear as a single element.

Curved Screen ➤ A projection screen which is slightly concave for improved screen gain. Curved screens usually have screen gains, which are greater than 1 but viewing angles much less than 180°. Curved screens are not recommended for use with this projector.

DDC ➤ The Display Data Channel VESA standard enables communication between PCs and monitors, and is based on E-EDID protocol.

DDI ➤ A “direct digital interface” signal can be supplied to the projector via an optional digital input module installed in **INPUT 5**. For example, you can input an SMPTE-259M signal using a *Serial Digital Input Module* or input an SMPTE-272M signal from a *Digital HDTV Serial Input Module*.

DMD™ ➤ Digital Micromirror Devices™ used in this projector for processing red, green, and blue color data.

Decoder ➤ Located at **INPUT 3** and **INPUT 4**, this device converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M, or SECAM to RGB video.

Detail ➤ The sharpness of a display from a video source.

Diffused Screen ➤ A type of rear-projection screen which spreads the light striking it. Screen gain is less than 1 but audience viewing angles are increased.

Display Setting ➤ An adjustment that affects the display of an image. Such display settings include contrast, brightness, tint, blanking, size, offsets, and others.

Dot Clock ➤ The maximum frequency of the pixel clock. Also known as pixel clock rate.

E-EDID ➤ The Enhanced Extended Display Identification Data standard, established by VESA, enables properties (such as resolution) of a display device to be detected by the display card in a controlling device such as a PC. The PC, in turn, can then output in a matching format to fill the display. Some sources used with the projector are VESA E-EDID reported.

Flicker ➤ A very rapid variation in image brightness caused by a frame rate that is too slow. (See *Interlace*) See also *Lamp Flicker*.

Foot-candle ➤ The intensity of visible light per square foot.

Foot-lambert ➤ The luminance (brightness) which results from one foot-candle of illumination falling on a perfectly diffuse surface.

Frame Rate ➤ The frequency at which complete images are generated. For non-interlaced signals, the frame rate is identical to the vertical frequency. For interlaced signals, the frame rate (also known as field rate) is one half of vertical frequency.

Gain or Screen Gain ➤ The ability of a screen to direct incident light to an audience. A flat matte white wall has a gain of approximately 1. Screens with gain less than 1 attenuate incident light; screens with gain more than 1 direct more incident light to the audience but have a narrow viewing angle. For example: An image reflecting off a 10 gain screen appears 10 times brighter than it would if reflected off a matte white wall. Curved screens usually have larger gain than flat screens.

GPIO ➤ General Purpose Input Output, used for remote control of a limited number of programmable functions by direct signal or dry-contact connection.

HDTV ➤ High-definition Television (1035, 1080 and 1125 lines interlace, and 720 and 1080 line progressive formats with a 16:9 (i.e. 1.77) aspect ratio.

Help Text ➤ A display of help information regarding the current task or presentation.

Horizontal Frequency ➤ The frequency at which scan lines are generated, which varies amongst sources. Also called horizontal scan rate or line rate.

Horizontal Offset ➤ The difference between the center of the projected image and the center of the projector lens. For clarity, offset is often expressed as the maximum amount of the image that can be projected to one side of the lens center without degrading the image quality. Horizontal offset ranges can be affected by the type of lens in use, and whether or not the image is offset vertically at the same time.

Hot Spot ➤ A circular area of a screen where the image appears brighter than elsewhere on the screen. A hot spot appears along the line of sight and "moves" with the line of sight. High gain screens and rear screens designed for slide or movie projection usually have a hot spot.

Input ➤ A physical connection route for a source signal, described by a 2-digit number representing 1) its switcher/projector location and 2) its slot in the switcher/projector.

Input Signal ➤ Signal sent from a source device to the projector.

Interface ➤ A device, such as the *Serial Digital Input Module*, that accepts an input signal for display by the projector.

Interlace ➤ A method used by video tape players and some computers to double the vertical resolution without increasing the horizontal line rate. If the resulting frame/field rate is too low, the image may flicker depending on the image content.

Keypad ➤ A small push-button device for controlling most projector settings and operation. For more information, refer to *3.3, Using the Keypad.*

Keystone ➤ A distortion of the image which occurs when the top and bottom borders of the image are unequal in length. Side borders both slant in or out, producing a “keyhole” shaped image. It is caused when the screen and lens surface are not parallel, or (in “X” models) by poor Keystone adjustment.

Lamp Flicker ➤ As the lamp ages, the shape of two anodes may changes from two points to a flattened state. When this occurs, the arc jumps across the gap from varying points. This is seen as image flicker. Turning the Lamp Conditioning feature ON will pulse the lamp and gradually “condition” the two anodes back to two points. Lamp Conditioning may take seconds, minutes or hours to reach full effectiveness. NOTE: Lamp flicker can occur at any time in the lamps life. The length of time, over which flicker may occur varies considerably and unpredictably. This behavior is inherent in UHP lamps.

Linearity ➤ The reproduction of the horizontal and vertical size of characters and/or shapes over the entire screen.

Line of Best Viewing ➤ When light from a projector is incident on a screen, the light reflects from the screen such that the angle of reflection equals the angle of incidence. The Line of Best Viewing is along the line of reflection.

LiteLOC™ ➤ A Christie software feature where samples of output light from a projector trigger automatic adjustments in the lamp ballast power in order to maintain a constant light output over time. Also known as brightness tracking.

Loopthrough (Loopthru) ➤ The method of feeding a series of high impedance inputs from a single video source with a coaxial transmission line in such a manner that the line is terminated with its characteristic impedance at the last input on the line.

Lumen ➤ The unit of measure for the amount of visible light emitted by a light source.

Luminance ➤ The signal representing the measurable intensity (comparable to brightness) of an electronic image when the image is represented as separate *chrominance* and *luminance*. Luminance also expresses the light intensity of a diffuse source as a function of its area; measured in lumens or candles per square foot (1 lumen per square foot = 1 *footlambert*). SMPTE RP 98 calls for a luminance of 12 to 22 footlamberts for theatre screens. See: *Footlambert*.

Lux ➤ The amount of visible light per square meter incident on a surface.
1 lux = 1 lumen/square meter = 0.093 foot-candles

Menu ➤ A list of selectable options displayed on the screen.

NTSC Video ➤ A video output format of some video tape and disk players. There are two types of NTSC (National Television Standards Committee) video: NTSC 3.58 and NTSC 4.43. NTSC 3.58 is used primarily in North America and Japan. NTSC 4.43 is less commonly used.

Optical Screen ➤ A type of rear-projection screen which re-directs light through the screen to increase image brightness in front of the screen. Screen gain is usually greater than 1 but audience viewing angles are reduced.

PAL Video ➤ PAL (Phase Alternating Line) video is a 50 Hz standard with 768 x 576 resolution. It is found on some video tape and disk players (used primarily in Europe, China and some South American and African countries).

Pixel ➤ The smallest discernible element of data from a computer-generated image.

Pixel Phase ➤ The phase of the pixel sampling clock relative to incoming data.

Pixel Tracking ➤ The frequency of the pixel sampling clock, indicated by the number of pixels per line.

Presentation Level ➤ The projector is at presentation level when an image from a source is displayed without the presence of a slidebar, menu, pull-down list, or error message.

Projector-to-Screen Distance ➤ The distance between the projector's front feet centers and the screen. Also called "Throw Distance".

Protocol ➤ The type of code format called “A” or “B” utilized by the remote keypad(s). The default protocol set at manufacture is Protocol “A”. By using two different keypad protocols, adjacent projectors can be controlled independently with their remote IR keypads.

Pull-down List ➤ A selectable menu item that unfolds into a list of options pertaining to it.

QuVis ➤ A manufacturer of a digital video recorder/player/server, QuBit, frequently used for providing digital cinema data. QuVis image compression uses a proprietary technology called Quality Priority Encoding, based on *wavelets*, in which the user selects a quality level based on *signal-to-noise ratio*. The data rate varies to efficiently maintain that quality level. Frames are coded individually.

Rear Screen ➤ A translucent panel for screen projection. Incident light travels through the incident surface of a rear screen and forms an image on the other surface.

Resizing ➤ The ability to manipulate through software commands the physical size, placement and/or aspect ratio of an image.

Resolution (lens) ➤ The maximum number of alternate white and black horizontal lines that can be distinguished on a screen when a photographic target is placed between the lens and a light source and illuminated by that source.

Resolution (projector) ➤ The maximum number of pixels that the projector can display horizontally and vertically across an image, such as 1024 x 768 (called XGA).

Retrace Time (Horizontal) ➤ The minimum time required for a CRT projector to move the position of the scanning spot from the right edge to the left edge.

Rise Time ➤ The time required by the video amplifier of the projector to increase its output from 10% to 90% of the maximum value.

RGB Video ➤ The video output (analog or digital) of most computers. Analog RGB video can have 3, 4, or 5 wires — one each for red, green, and blue, and either none, one or two for sync. For three-wire RGB, the green wire usually provides sync. (See TTL Video).

RS-232 ➤ A common asynchronous data transmission standard recommended by the Electronics Industries Association (EIA). Also called serial communication.

RS-422 ➤ A less common asynchronous data transmission standard in which balanced differential voltage is specified. RS-422 is especially suited to long distances.

S-Video ➤ The output from certain video tape players and video equipment. S-Video separates sync and luminance from color information, typically producing a higher quality display than composite video.

Scan Frequency ➤ The horizontal or vertical frequency at which images are generated. Also known as scan rate or refresh rate.

Scan Line ➤ One horizontal line on the display.

Scan Rate ➤ The horizontal or vertical frequency at which images are generated.

SECAM ➤ A video output format of some video tape and disk players (used primarily in France). SECAM (Sequential Couleur á Mémoire) signals are similar in resolution and frequency to PAL signals. The primary difference between the two standards is in the way color information is encoded.

Slidebar ➤ A slidebar is a graphical display of an adjustable setting. The numerical setting often represents a percentage but can be a specific unit such as degrees Kelvin.

Source ➤ The device, such as a computer or VCR, connected to the projector for display. A source may have numerous corresponding channels defined and recognized by the projector. See *Input*.

Source Setup ➤ See *Channel*.

Switcher ➤ A signal selector that can be connected to a projector for the purpose of adding more sources.

Sync ➤ This term refers to the part of the video signal that is used to stabilize the picture. Sync can occur in three forms:

1) "Composite sync": the horizontal and vertical components are together on one cable.
2) "Sync-on-green": the sync is part of the green video.
3) "Separate sync" or "H.SYNC and V.SYNC": the horizontal and vertical components of the sync are on two separate cables.

Sync Width ➤ The duration of each sync pulse generated by a computer. The sync width is part of the blanking time.

TTL Video ➤ A type of RGB video with digital characteristics.

Terminated ➤ A wire connecting a single video source to a display device, such as a projector, must be terminated by a resistance (usually 75Σ for video).

Throw Distance ➤ The distance between the front feet of the projector and the screen. Also called "Projector-to-Screen Distance". Always use the correct Christie throw distance formula to calculate the proper throw distance (±5%) required for your lens.

Throw Ratio ➤ Throw ratio = throw distance / screen width. Typically used to differentiate lenses.

Tint ➤ Balance of red-to-green necessary for realistic representation of NTSC signals.

Variable Scan ➤ The ability of a projector to synchronize to inputs with frequencies within a specified range.

Vertical Frequency ➤ The frequency at which images are generated. Vertical frequencies vary amongst sources. Also called vertical scan rate.

Vertical Offset ➤ The difference between the center of the projected image and the center of the projector lens. For clarity, offset is often expressed as the maximum amount of the image that can be projected above or below the lens center without degrading the image quality. Vertical offset ranges depend on the type of lens in use, and whether or not the image is offset horizontally at the same time.

Video ➤ The signal that is used by display devices (such as projectors) to generate an image. This term also refers to the output of video tape/disk players and computers.

Video Decoder ➤ An optional device that converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M or SECAM to RGB video.

Video Standard ➤ A specific type of video signal, such as NTSC, PAL, SECAM. This projector can automatically recognize and interpret the incoming standard and display accordingly.

Viewing Angle ➤ Screens do not reflect equally in all directions. Most light is reflected in a conical volume centered around the "line of best viewing". Maximum brightness is perceived if you are within the viewing cone defined by the horizontal and vertical viewing angles.

White Balance ➤ The color temperature of white used by the projector.

White Field ➤ The area of an image that is white only. For example, a full white field is an image that is white everywhere. A 10% white field is a white area (usually rectangular) that occupies 10% of the image; the remaining 90% is black.

YCbCr ➤ A high-end *digital* component video signal.

YPbPr ➤ A high-end *analog* component video signal. Sometimes called YUV, Component, or Y, R-Y, B-Y, the YPbPr signal by-passes the video decoder in this projector.

YUV ➤ See *YPbPr*.

Zoom ➤ The adjustment of image size by means of a zoom lens.

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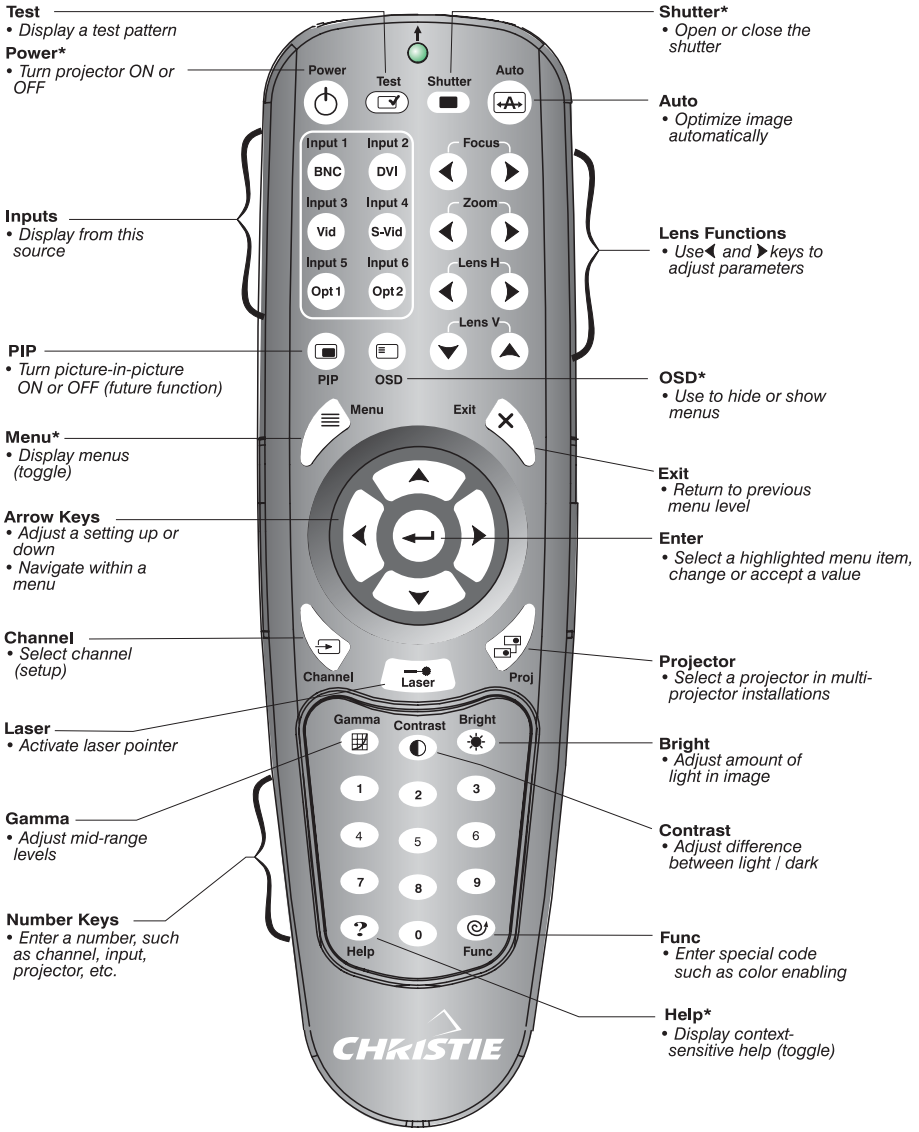
Appendix B

Keypad Reference

NOTE: The IR remote is a standard component provided with the projector. Use the extension cable also provided to convert the IR remote to a wired remote, if desired. Refer to Section 3 for a specific description of each key and how to use them correctly.



* Toggle keys, which require you to either, press and hold, or press twice or press and use the up/down arrow key.

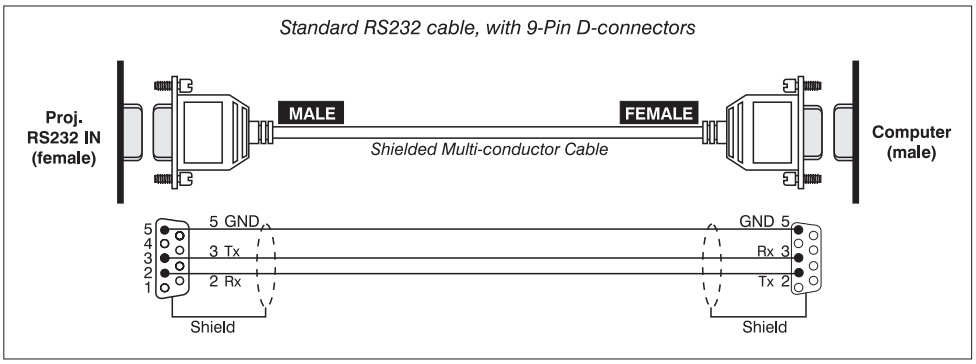
Appendix C

Serial Communication Cables

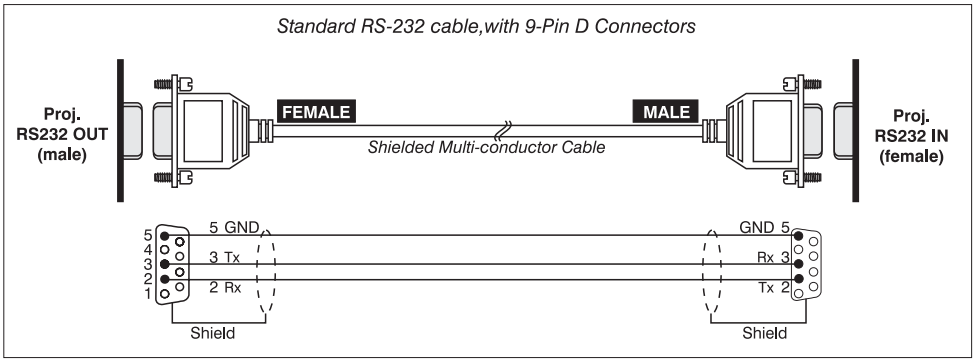
A serial link of RS232 or RS422 enables ASCII communication with the projector so that it can be controlled remotely from a PC or other controller. From a PC, connect a standard 9-wire RS232 serial cable to the **RS232 IN** port. Or, for long-distance (>100 ft.) links with an RS422-compatible PC or controller, connect RS422 cable to the **RS422** port.

❑ *From projector to computer (RS232)*

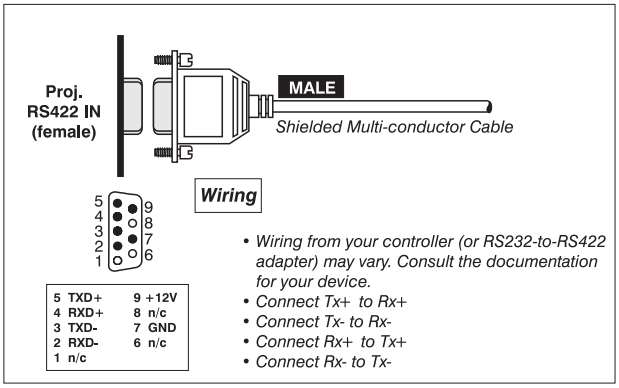
For computers having a 9-pin "AT" type serial port



❑ *From projector to projector*



❑ *From projector to RS422 compatible computer*



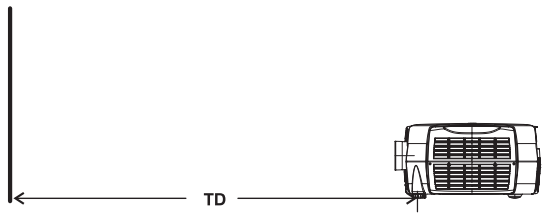
Appendix D

Throw Distance

Calculating Throw Distance

It is important throw distance be precisely calculated for your installation using the appropriate formula from the chart below. To calculate throw distance you must know the screen size and the lens type installed in the projector. In general, the larger you want the image to be the greater the distance you must allow between the lens and the screen.

NOTES: ***1)*** *Throw distance is measured from the screen to the center of the projector's front feet.* ***2)*** *This measurement is not necessarily parallel to the floor as the projector and screen may be inclined.* ***3)*** *Due to lens manufacturing, throw distance calculations have a tolerance of ±5%.*



Throw Distance (TD) is measured from the screen to the center of the projector's front feet.

Throw Distance (TD) = (Screen Width (w) X Lens Throw Ratio

Table A-1 Throw Distance Formulas

Lens Throw Ratio	Throw Distance Formula (cm)	Screen Widths (cm)	
		Min.	Max.
0.73	0.7618*W+6.7624	150	437
1.45-1.8	Min. 1.4789*W-3.6096 Max. 1.8655*W-8.1977	160 127	1102 889
1.8-2.5	Min. 2.0424*W-74.131 Max. 2.6076*W-16.638	160 117	1110 800
2.5-4.5	Min. 2.6347*W-11.428 Max. 4.783*W-29.602	244 137	1118 1110
4.5-7.3	Min. 4.5126*W-6.5502 Max. 7.423*W-25.184	267 165	1110 1095

Where:
TD = projector distance from the screen to the center of the projector's front feet.
W = screen (image) width (cm)

0.73:1 Fixed Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
73	186	59	149	47	120
96	244	77	195	61	155
103	263	83	210	66	167
111	281	89	225	70	178
118	300	94	240	75	190
125	319	100	255	79	201
133	338	106	270	84	212
140	356	112	285	88	224
148	375	118	300	93	235
155	394	124	315	97	247
162	413	130	330	102	258
170	431	136	345	106	270
177	450	142	360	111	281
185	469	148	375	115	292
192	488	154	390	120	304
199	506	159	405	124	315
207	525	165	420	129	327
214	544	171	435	133	338

Throw Distance Formula

TD = (0.7618 x W) + 6.7624

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

1.45-1.8:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
79	200	63	160	92	233
86	219	69	175	100	255
94	238	75	190	109	277
101	256	81	205	118	300
108	275	87	220	127	322
116	294	93	235	135	344
123	313	98	250	144	366
130	331	104	265	153	388
138	350	110	280	162	410
145	369	116	295	170	433
153	388	122	310	179	455
160	406	128	325	188	477
167	425	134	340	197	499
175	444	140	355	205	521
182	463	146	370	214	544
189	481	152	385	223	566
197	500	157	400	231	588
204	519	163	415	240	610
212	538	169	430	249	632
219	556	175	445	258	655
226	575	181	460	266	677
234	594	187	475	275	699
241	613	193	490	284	721
249	631	199	505	293	743
256	650	205	520	301	765
263	669	211	535	310	788
271	688	217	550	319	810
278	706	222	565	328	832
285	725	228	580	336	854
293	744	234	595	345	876
300	763	240	610	354	899
308	781	246	625	362	921
315	800	252	640	371	943
322	819	258	655	380	965
330	838	264	670	389	987
337	856	270	685	397	1009
344	875	276	700	406	1032
352	894	281	715	415	1054
359	913	287	730	424	1076
367	931	293	745	432	1098
374	950	299	760	441	1120
381	969	305	775	450	1143
389	988	311	790	459	1165
396	1006	317	805	467	1187
404	1025	323	820	476	1209
411	1044	329	835	485	1231
418	1063	335	850	493	1253
426	1081	341	865	502	1276
433	1100	346	880	511	1298
437	1111	350	889	516	1311
440	1119	352	895	520	1320
448	1138	358	910	528	1342
455	1156	364	925	537	1364
463	1175	370	940	546	1387
470	1194	376	955	555	1409
477	1213	382	970	563	1431
485	1231	388	985	572	1453
492	1250	394	1000	581	1475
500	1269	400	1015	590	1497
507	1288	406	1030	598	1520
514	1306	411	1045	607	1542
522	1325	417	1060	616	1564
529	1344	423	1075	624	1586
536	1363	429	1090	633	1608
541	1375	433	1100	639	1623

MINIMUM ZOOM

Throw Distance Formula

TD = (1.4789 x W) -03.6096

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

1.45-1.8:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
62	159	50	127	90	229
64	163	51	130	92	234
71	181	57	145	103	262
79	200	63	160	114	290
86	219	69	175	125	318
94	238	75	190	136	346
101	256	81	205	147	374
108	275	87	220	158	402
116	294	93	235	169	430
123	313	98	250	180	458
130	331	104	265	191	486
138	350	110	280	202	514
145	369	116	295	213	542
153	388	122	310	224	570
160	406	128	325	235	598
167	425	134	340	246	626
175	444	140	355	258	654
182	463	146	370	269	682
197	500	157	400	291	738
204	519	163	415	302	766
212	538	169	430	313	794
219	556	175	445	324	822
226	575	181	460	335	850
234	594	187	475	346	878
241	613	193	490	357	906
249	631	199	505	368	934
256	650	205	520	379	962
263	669	211	535	390	990
271	688	217	550	401	1018
278	706	222	565	412	1046
285	725	228	580	423	1074
293	744	234	595	434	1102
300	763	240	610	445	1130
308	781	246	625	456	1158
315	800	252	640	467	1186
322	819	258	655	478	1214
330	838	264	670	489	1242
337	856	270	685	500	1270
344	875	276	700	511	1298
352	894	281	715	522	1326
359	913	287	730	533	1354
367	931	293	745	544	1382
374	950	299	760	555	1410
381	969	305	775	566	1438
389	988	311	790	577	1466
396	1006	317	805	588	1494
404	1025	323	820	599	1522
411	1044	329	835	610	1549
418	1063	335	850	621	1577
426	1081	341	865	632	1605
433	1100	346	880	643	1633
437	1111	350	889	650	1650

MAXIMUM ZOOM

Throw Distance Formula

TD = (1.8655 x W) - 8.1977

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

1.8-2.5:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
79	200	63	160	99	253
86	219	69	175	112	283
94	238	75	190	124	314
101	256	81	205	136	345
108	275	87	220	148	375
116	294	93	235	160	406
123	313	98	250	172	436
130	331	104	265	184	467
138	350	110	280	196	498
145	369	116	295	208	528
153	388	122	310	220	559
160	406	128	325	232	590
167	425	134	340	244	620
175	444	140	355	256	651
182	463	146	370	268	682
189	481	152	385	280	712
197	500	157	400	292	743
204	519	163	415	305	773
212	538	169	430	317	804
219	556	175	445	329	835
226	575	181	460	341	865
234	594	187	475	353	896
241	613	193	490	365	927
249	631	199	505	377	957
256	650	205	520	389	988
263	669	211	535	401	1019
271	688	217	550	413	1049
278	706	222	565	425	1080
285	725	228	580	437	1110
293	744	234	595	449	1141
300	763	240	610	461	1172
308	781	246	625	473	1202
315	800	252	640	485	1233
322	819	258	655	497	1264
330	838	264	670	510	1294
337	856	270	685	522	1325
344	875	276	700	534	1356
352	894	281	715	546	1386
359	913	287	730	558	1417
367	931	293	745	570	1447
374	950	299	760	582	1478
381	969	305	775	594	1509
389	988	311	790	606	1539
396	1006	317	805	618	1570
404	1025	323	820	630	1601
411	1044	329	835	642	1631
418	1063	335	850	654	1662
426	1081	341	865	666	1693
433	1100	346	880	678	1723
437	1111	350	889	686	1742
440	1119	352	895	690	1754
448	1138	358	910	703	1784
455	1156	364	925	715	1815
463	1175	370	940	727	1846
470	1194	376	955	739	1876
477	1213	382	970	751	1907
485	1231	388	985	763	1938
492	1250	394	1000	775	1968
500	1269	400	1015	787	1999
507	1288	406	1030	799	2030
514	1306	411	1045	811	2060
522	1325	417	1060	823	2091
529	1344	423	1075	835	2121
536	1363	429	1090	847	2152

MINIMUM ZOOM

Throw Distance Formula

TD = (2.0424 x W) - 74.131

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

1.8-2.5:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
57	145	46	116	113	286
62	159	50	127	124	315
64	163	51	130	127	322
71	181	57	145	142	361
79	200	63	160	158	401
86	219	69	175	173	440
94	238	75	190	189	479
101	256	81	205	204	518
108	275	87	220	219	557
116	294	93	235	235	596
123	313	98	250	250	635
130	331	104	265	266	674
138	350	110	280	281	713
145	369	116	295	296	753
153	388	122	310	312	792
160	406	128	325	327	831
167	425	134	340	342	870
175	444	140	355	358	909
182	463	146	370	373	948
189	481	152	385	389	987
197	500	157	400	404	1026
204	519	163	415	419	1066
212	538	169	430	435	1105
219	556	175	445	450	1144
226	575	181	460	466	1183
234	594	187	475	481	1222
241	613	193	490	496	1261
249	631	199	505	512	1300
256	650	205	520	527	1339
263	669	211	535	543	1378
271	688	217	550	558	1418
278	706	222	565	573	1457
285	725	228	580	589	1496
293	744	234	595	604	1535
300	763	240	610	620	1574
308	781	246	625	635	1613
315	800	252	640	650	1652
322	819	258	655	666	1691
330	838	264	670	681	1730
337	856	270	685	697	1770
344	875	276	700	712	1809
352	894	281	715	727	1848
359	913	287	730	743	1887
367	931	293	745	758	1926
374	950	299	760	774	1965
381	969	305	775	789	2004
389	988	311	790	804	2043
396	1006	317	805	820	2082

MAXIMUM ZOOM

Throw Distance Formula

TD = (2.6076 x W) - 16.638

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

2.5-4.5:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
120	305	96	244	249	631
121	306	96	245	250	634
128	325	102	260	265	674
135	344	108	275	281	713
143	363	114	290	296	753
150	381	120	305	312	792
157	400	126	320	327	832
165	419	132	335	343	871
172	438	138	350	359	911
180	456	144	365	374	950
187	475	150	380	390	990
194	494	156	395	405	1029
202	513	161	410	421	1069
209	531	167	425	436	1108
217	550	173	440	452	1148
224	569	179	455	467	1187
231	588	185	470	483	1227
239	606	191	485	499	1266
246	625	197	500	514	1306
253	644	203	515	530	1345
261	663	209	530	545	1385
268	681	215	545	561	1424
276	700	220	560	576	1464
283	719	226	575	592	1504
290	738	232	590	607	1543
298	756	238	605	623	1583
305	775	244	620	639	1622
312	794	250	635	654	1662
320	813	256	650	670	1701
327	831	262	665	685	1741
335	850	268	680	701	1780
342	869	274	695	716	1820
349	888	280	710	732	1859
357	906	285	725	748	1899
364	925	291	740	763	1938
372	944	297	755	779	1978
379	963	303	770	794	2017
386	981	309	785	810	2057
394	1000	315	800	825	2096
401	1019	321	815	841	2136
408	1038	327	830	856	2175
416	1056	333	845	872	2215
423	1075	339	860	888	2254
431	1094	344	875	903	2294
438	1113	350	890	919	2333
445	1131	356	905	934	2373
453	1150	362	920	950	2412
460	1169	368	935	965	2452
468	1188	374	950	981	2492
475	1206	380	965	996	2531
482	1225	386	980	1012	2571
490	1244	392	995	1028	2610
497	1263	398	1010	1043	2650
504	1281	404	1025	1059	2689
512	1300	409	1040	1074	2729
519	1319	415	1055	1090	2768
527	1338	421	1070	1105	2808
534	1356	427	1085	1121	2847
541	1375	433	1100	1137	2887

MINIMUM ZOOM

Throw Distance Formula

TD = (2.6347 x W) - 11.428

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

2.5-4.5:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
67	170	54	136	244	621
69	175	55	140	252	640
76	194	61	155	280	712
84	213	67	170	308	784
91	231	73	185	337	855
98	250	79	200	365	927
106	269	85	215	393	999
113	288	91	230	421	1070
121	306	96	245	450	1142
128	325	102	260	478	1214
135	344	108	275	506	1286
143	363	114	290	534	1357
150	381	120	305	563	1429
157	400	126	320	591	1501
165	419	132	335	619	1573
172	438	138	350	647	1644
180	456	144	365	676	1716
187	475	150	380	704	1788
194	494	156	395	732	1860
202	513	161	410	760	1931
209	531	167	425	789	2003
217	550	173	440	817	2075
224	569	179	455	845	2147
231	588	185	470	873	2218
239	606	191	485	902	2290
246	625	197	500	930	2362
253	644	203	515	958	2434
261	663	209	530	986	2505
268	681	215	545	1015	2577
276	700	220	560	1043	2649
283	719	226	575	1071	2721
285	725	228	580	1081	2745
298	756	238	605	1128	2864
305	775	244	620	1156	2936
312	794	250	635	1184	3008
320	813	256	650	1212	3079
327	831	262	665	1241	3151
335	850	268	680	1269	3223
342	869	274	695	1297	3295
349	888	280	710	1325	3366
357	906	285	725	1354	3438
364	925	291	740	1382	3510
372	944	297	755	1410	3582
379	963	303	770	1438	3653
386	981	309	785	1467	3725
394	1000	315	800	1495	3797

MAXIMUM ZOOM

Throw Distance Formula

TD = (4.783 x W) - 29.602

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

4.5-7.3:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
131	334	105	267	472	1198
138	350	110	280	495	1257
145	369	116	295	522	1325
153	388	122	310	548	1392
160	406	128	325	575	1460
167	425	134	340	601	1528
175	444	140	355	628	1595
182	463	146	370	655	1663
189	481	152	385	681	1731
197	500	157	400	708	1798
204	519	163	415	735	1866
212	538	169	430	761	1934
219	556	175	445	788	2002
226	575	181	460	815	2069
234	594	187	475	841	2137
241	613	193	490	868	2205
249	631	199	505	895	2272
256	650	205	520	921	2340
263	669	211	535	948	2408
271	688	217	550	975	2475
278	706	222	565	1001	2543
285	725	228	580	1028	2611
293	744	234	595	1055	2678
300	763	240	610	1081	2746
308	781	246	625	1108	2814
315	800	252	640	1134	2882
322	819	258	655	1161	2949
330	838	264	670	1188	3017
337	856	270	685	1214	3085
344	875	276	700	1241	3152
352	894	281	715	1268	3220
359	913	287	730	1294	3288
367	931	293	745	1321	3355
374	950	299	760	1348	3423
381	969	305	775	1374	3491
389	988	311	790	1401	3558
396	1006	317	805	1428	3626
404	1025	323	820	1454	3694
411	1044	329	835	1481	3761
418	1063	335	850	1508	3829
426	1081	341	865	1534	3897
433	1100	346	880	1561	3965
437	1111	350	889	1577	4005
440	1119	352	895	1587	4032
448	1138	358	910	1614	4100
455	1156	364	925	1641	4168
463	1175	370	940	1667	4235
470	1194	376	955	1694	4303
477	1213	382	970	1721	4371
485	1231	388	985	1747	4438
492	1250	394	1000	1774	4506
500	1269	400	1015	1801	4574
507	1288	406	1030	1827	4641
514	1306	411	1045	1854	4709
522	1325	417	1060	1881	4777
529	1344	423	1075	1907	4844
536	1363	429	1090	1934	4912
541	1375	433	1100	1952	4957
546	1388	437	1110	1969	5002

MINIMUM ZOOM

Throw Distance Formula

TD = (4.5126 x W) - 6.5502

Where

W = image width (cm)

NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

4.5-7.3:1 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*	*Inches(in.)*	*Centimeters (cm)*
81	205	65	164	469	1192
86	219	69	175	502	1274
94	238	75	190	545	1385
101	256	81	205	589	1497
108	275	87	220	633	1608
116	294	93	235	677	1719
123	313	98	250	721	1831
130	331	104	265	765	1942
138	350	110	280	808	2053
145	369	116	295	852	2165
153	388	122	310	896	2276
160	406	128	325	940	2387
167	425	134	340	984	2499
175	444	140	355	1028	2610
182	463	146	370	1071	2721
189	481	152	385	1115	2833
197	500	157	400	1159	2944
204	519	163	415	1203	3055
212	538	169	430	1247	3167
219	556	175	445	1291	3278
226	575	181	460	1334	3389
234	594	187	475	1378	3501
241	613	193	490	1422	3612
249	631	199	505	1466	3723
256	650	205	520	1510	3835
263	669	211	535	1554	3946
271	688	217	550	1597	4057
278	706	222	565	1641	4169
285	725	228	580	1685	4280
293	744	234	595	1729	4392
300	763	240	610	1773	4503
308	781	246	625	1817	4614
315	800	252	640	1860	4726
322	819	258	655	1904	4837
330	838	264	670	1948	4948
337	856	270	685	1992	5060
344	875	276	700	2036	5171
352	894	281	715	2080	5282
359	913	287	730	2123	5394
367	931	293	745	2167	5505
374	950	299	760	2211	5616
381	969	305	775	2255	5728
389	988	311	790	2299	5839
396	1006	317	805	2343	5950
404	1025	323	820	2386	6062
411	1044	329	835	2430	6173
418	1063	335	850	2474	6284
426	1081	341	865	2518	6396
433	1100	346	880	2562	6507
437	1111	350	889	2588	6574
440	1119	352	895	2606	6618
448	1138	358	910	2650	6730
455	1156	364	925	2693	6841
463	1175	370	940	2737	6952
470	1194	376	955	2781	7064
477	1213	382	970	2825	7175
485	1231	388	985	2869	7286
492	1250	394	1000	2913	7398
500	1269	400	1015	2956	7509
507	1288	406	1030	3000	7621
514	1306	411	1045	3044	7732
522	1325	417	1060	3088	7843
529	1344	423	1075	3132	7955
536	1363	429	1090	3176	8066

MAXIMUM ZOOM

Throw Distance Formula

TD = (7.423 x W) - 25.184

Where

W = image width (cm)

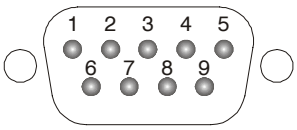
NOTE: The TD formula is provided in centimeters, but the chart shows values in cm and inches for easy reference. Make sure you are using the correct unit of measure when calculating throw distance.

Appendix E

System Integration

The GPIO (General Purpose Input Output) connector located on the input panel provides a flexible method of interfacing a wide range of external I/O devices to the projector. There are 7 GIO pins available on the 9pin D-Sub GPIO connector, which are configurable via RS232 commands. The other two pins are reserved for ground and power – see table below for pin identification.

GPIO



GPIO Pins	
Pin #	**Signal**
1	+ 12V (200mA)
2	GPIO 1
3	GPIO 2
4	GPIO 3
5	Ground
6	GPIO 4
7	GPIO 5
8	GPIO 6
9	GPIO 7

The serial cable required for connecting the external device to the projector's GPIO connector, whether it's a standard serial cable or a custom one, must be compatible with the external device.

Configuring the GPIO

The GPIO connector can be configured to automate any number of events using the serial command code **GIO**. Each pin is defined as either an ***input*** or ***output*** depending on the desired outcome. In general, configure the pin as an input if you want the projector to respond to something the external device does and as an output if you want the external device to respond to an action taken by the projector. For example, configure the pin as an output if you want the lighting in a room to automatically dim when the projector is turned on.

By using the GIO command, you can also set the state of each pin as ***high*** or ***low***. By default, the state of each pin is ***high.*** The voltage applied to pins in the *high* state is + 3.3V.

Example 1. Turn room lighting on when the projector is turned off. *(Assumes a control/automation unit is configured to turn the lights on when pin 2 of it's input goes high.)*

(GIO C2 O)	*Set pin #2 configuration to output*
(GIO 2 H)	*Set pin #2 to high (state)*

Query Command

(GIO?)	*Request the state and configuration of all pins*
(GIO! "HHLLHLH" "OOIOOOI")	*Reply of pin state and configuration*
(GIO? C2)	*Request configuration for pin #2*
(GIO! C2 O)	*Reply with pin #2 configuration as output*
(GIO? 2)	*Request the state of pin #2*
(GIO! H)	*Reply with pin #2 state as high*

Real Time Event

Use the serial command **RTE** to specify an action that is initiated at a particular time or based on an external stimulus.

For General Purpose IO "G"

Parameter	**Name**	**Value**
P1	RTE type	G (Real Time I/O Event)
P2	I/O bit	1-7
P3	Pin state (1 Character) (String)	H = High L = Low "LHXXXHL" Combine multiple inputs and trigger occurs when all conditions are met
P4	Commands	Any valid serial protocol command for the device

<u>Example 2.</u> Projector powers up when a switch on the external device is turned on.

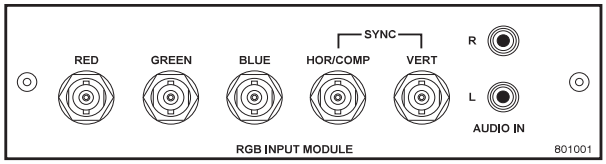
(GIO C2 I)	*Set pin #2 configuration as input*
(RTE G 2 H "(PWR 1)")	*Power on when pin #2 set to high*
(RTE G 2 L "(PWR 0)")	*Power off when pin #2 set to low*

Appendix F

Optional Input Modules

There are many optional input modules and accessories currently available for this projector. Contact your dealer for a complete and up-to-date listing.

RGB500 Input Module 38-804606-xx ➤ The *RGB500 Input Module* may be installed in this projector, a *Marquee Signal Switcher*, or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from computers or other RGB source devices.

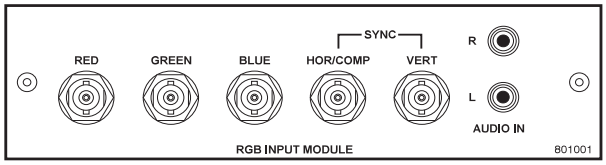


RGB500 Features

- ◊ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync), up to 500 MHz bandwidth
- ◊ accepts YPbPr, composite (on green) and Y/C (on red/blue)
- ◊ BNC connectors for RGB signal inputs

NOTE: The audio connectors are not functional.

RGB400BA Input Module 38-804610-xx ➤ The *RGB400 Buffered Amplifier Input Module* may be installed in this projector, in a *Marquee Signal Switcher* or in a *Marquee Case/Power Supply*. Connect three-, four-, or five-wire RGB video signals of up to 400 MHz bandwidth, signals typically produced by high-resolution computer or workstations. The buffering capability of the module enables the incoming signal to be sent to a remote destination. Inputs are 75Ω terminated.



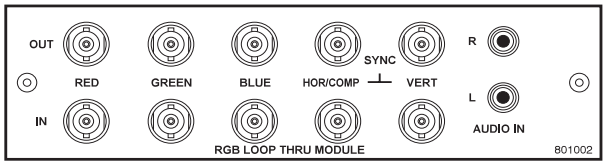
RGB400BA Features

- ◊ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- ◊ accepts YPbPr, composite (on green) and Y/C (on red/blue)
- ◊ BNC connectors for RGB signal inputs
- ◊ Buffered signals to a remote destination

NOTE: The audio connectors are not functional.

RGB400 Active Loop-Thru Input Module 38-804607-xx

➤ The *RGB400 ALT Input Module* may be installed in this projector, a *Marquee Signal Switcher*, or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from computers or other RGB source devices. Video inputs are 75Ω terminated. Video outputs provide buffered loop-through to another display device.



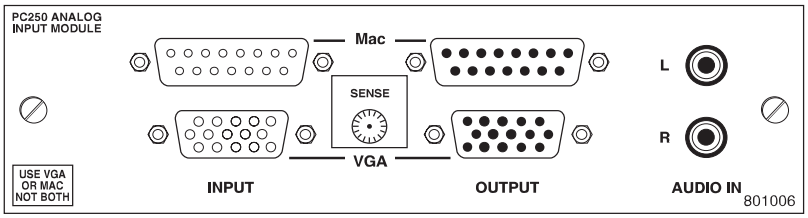
RGB400ALT Features

- ◊ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- ◊ accepts YPbPr, composite (on green) and Y/C (on red/blue)
- ◊ BNC connectors for RGB signal inputs
- ◊ buffered loop-through video outputs

NOTE: The audio connectors are not functional.

PC250 Analog Input Module 38-804609-xx

➤ The *PC250 Analog Input Module* may be installed in this projector, a *Marquee Signal Switcher* or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from IBM PC compatibles or Macintosh computers. Video inputs are 75Ω terminated. Video outputs are provided for buffered loop-through to another display device.



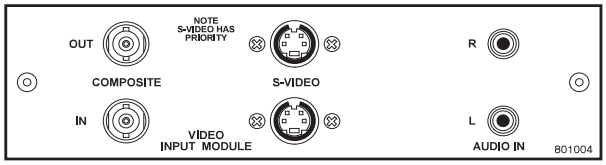
PC250 Analog Features

- ◊ accepts VGA or MAC RGB video
- ◊ 15 pin D connectors for video
- ◊ active loop-through video outputs

NOTES: ***1)*** *This interface does not accept VGA and MAC signals simultaneously.* ***2)*** *The audio connectors are not functional.* ***3)*** *Trademarks are the rights of their respective owners.*

Composite / S-Video Input Module 38-804608-xx

➤ The module receives either composite video or S-video input signals from tape or disk players (do not connect both types of signals simultaneously). Video inputs are 75Ω terminated. Video outputs are provided for buffered loop-through to another display device.



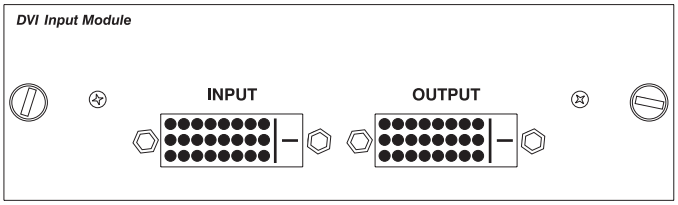
Composite/S-video Features

- ◊ BNC connectors for composite RGB signals
- ◊ 4-pin mini-DIN connectors for S-Video signals
- ◊ buffered loop-through video outputs

*NOTES: **1)** This interface is not a decoder. NTSC, PAL, or SECAM signals must connect to the video decoder installed at **INPUT 3** / **INPUT 4**. **2)** The audio connectors are not functional. **3)** For use with this projector, do not connect **both** composite video and S-video signals to the Composite / S-Video Input Module–connect one or the other, even when plugged into a switcher.*

DVI Input Module 38-804635-xx

➤ This module can display digital video input signals conforming to the DVI (Digital Visual Interface) single-channel standard.

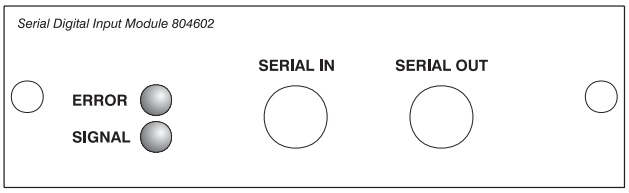


Features

- ◊ supports Digital Visual Interface (DVI) single-channel
- ◊ supports VESA® Extended Display Identification Data (EDID™)
- ◊ provides an active-loop-through using a DVI connector (conforming to the DVI Specification)

Serial Digital Input Module 38-804602-xx ➤

The module accepts a serial digital 4:2:2 component video signal (YCbCr) via a single **SERIAL IN** BNC connector. The signal can loop through the **SERIAL OUT** BNC out to another device (such as another projector). Inputs are 75Ω terminated.

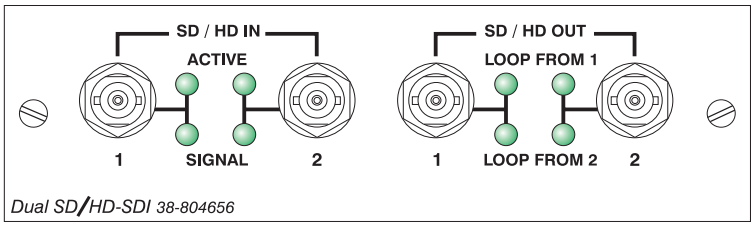


SDI Features

- ◊ accepts serial digital 4:2:2 component video (YCbCr)
- ◊ provides both a **SERIAL IN** and a **SERIAL OUT** BNC connector includes status LEDs for signal and error
- ◊ SMPTE 259M compatible

Dual SD/HD-SDI Module 38-804856-xx ➤

The *Dual SD/HD-SDI Module* enables incoming serial digital (SD or HD) data to be tiled across multiple screen displays, overlapped for extra-bright displays, or distributed to additional projectors for multiple, same-image screens.



Dual SD/HD-SDI Features

- ◊ Accepts and decodes up to two serial digital inputs
- ◊ Outputs up to two 10-bit YCbCr 4:2:2 video signals
- ◊ Provides input(s) to output(s) loop-through capability
- ◊ Supplies interchangeable inputs as part of the Picture-in Picture display
- ◊ SMPTE 259M compatible

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