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The following projector manual has not been modified or altered in any way.

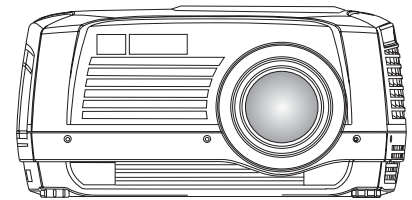
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Introduction

1.1 Projector Overview

Christie DS+60 projectors are professional quality single-chip projectors that use Digital Light Processing™ (DLP™) technology from Texas Instruments to achieve high brightness multimedia and video projection images. With a range of available lenses, input modules and built-in ChristieNET™ the *DS+60* is flexible and customizable. The brightness delivered by this projector makes it an ideal choice in venues where ambient lighting is typically higher, such as boardrooms, large conference rooms and small auditoriums.



Key features:

- 1-chip DLP™ technology
- Native SXGA+ 1400 x 1050 resolution
- Brightness – 6000 ANSI lumens (Dual Lamp with White Boost ON)
- 3050 ANSI lumens (Single Lamp with White Boost ON)
- Contrast – 1100:1 up to 5000:1 full field (with built-in shutter)
- Dual 300W P-VIP® lamp illumination (user replaceable lamps)
- Auto-switching or user selectable lamp operation mode (Single or Dual lamp)
- 24-bit RGB display
- Display of NTSC, PAL, and SECAM video inputs and HDTV/DTV formats
- 10-bit Image Processing Module
- Memory for up to 50 custom “channels” (source setups)
- Intuitive on-screen menu system
- Status LED display for projector monitoring
- Multiple control options including ChristieNET™, RS-232 and RS-422
- Remote controlled shutter
- Motorized lens mount for smooth lens control
- Field interchangeable projection lenses

See **Section 6** for a complete list of product specifications.

5 Things You Should Know About Your Projector

1 Powering ON

- (a) **Be patient when powering the projector ON** or switching lamp operation modes. As the lamps warm up, brightness will gradually increase. (No light appears on the wall during the first 25 seconds.) On the rare occurrence a lamp does not ignite, the projector will try again several times. *(For more information see 3.7 The Lamp Menu)*
- (b) **Wait for the projector to complete initialization before sending keypad commands** (“On” will appear on the LED display), otherwise it will be ignored.
- (c) **The projector enforces a 90 second wait from the time the projector is powered down and powered back up again.** This gives the lamps enough time to cool down to a point where they can be turned on again.
- (d) **Use the windows located on the lamp doors as indicators when trying to determine whether a lamp is on or off without accessing software menus.**

2 Lamp Operation Modes – Auto Switching

- (a) **The projector is designed to run in Dual Lamp mode (default), unless another mode is manually selected.** If a lamp fails while in Dual Lamp mode, the projector will try re-igniting the lamp – it will not switch to a single lamp mode.
- (b) **The projector will automatically switch from one single lamp operation mode to another to maintain light on the wall.**
- (c) **Check the status of a lamp in the Status menu, Lamp menu or by looking at the windows on the lamp doors.**
(For more information see 3.7 The Lamp Menu)

3 Lamp Operation Modes – Manual Switching

- (a) **One lamp will turn off only after the other lamp has successfully been turned on.** This allows you to view content without interruption when switching between lamp operation modes. It takes 25 seconds for a lamp that was just turned on to warm up and reach full brightness. When the original lamp turns off you will notice a slight dimming, which indicates the lamp switching operation is complete. At this point, you can perform any adjustment, such as Color Wheel Delay. *(For more information see 3.7 The Lamp Menu)*

4 Flexible Light Output Control

- (a) **Switching from Dual to Single Lamp operation modes** can reduce light output by approximately 50%.
- (b) **Adjusting lamp power** in the range of 300W to 250W can provide approximately 17% dimming capability.
- (c) **Adjusting the Optical Aperture** can significantly drive brightness down (approximately 78%) while increasing contrast from 1100-5000:1 increase contrast.
- (d) **Always check the optical aperture and lamp power levels** before troubleshooting brightness related problems.

5 White Boost

- (a) **White Boost automatically turns off when Edge Blending, adjusting Brightness Uniformity or making Color Adjustments.** A noticeable dimming of the display occurs. For best results, set White Boost to 10 for data content and 2 for video.

How the projector works ➤ The light generated by the lamp(s) is then sequentially filtered into the RGB color primaries by the spinning color wheel(s) and presented to the single chip DMD, located in the light engine, in sequence. The reflected light from the DMD chip then passes through the projection lens to the screen.

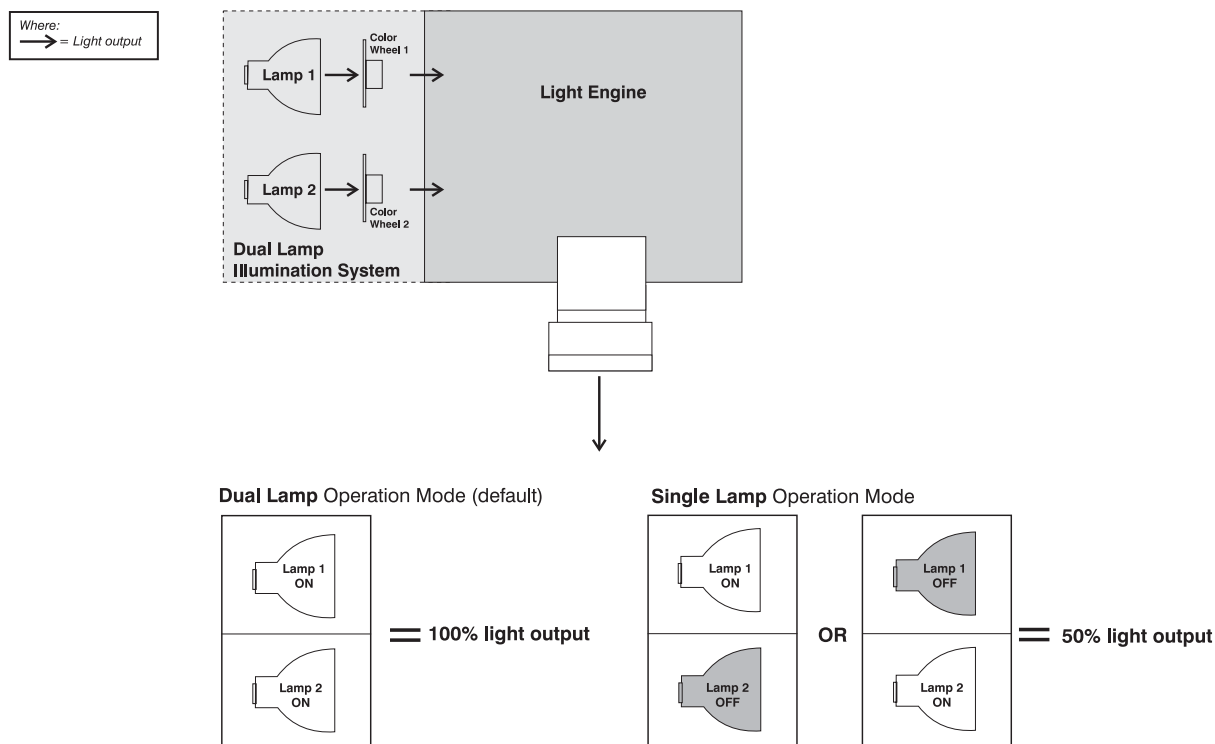


Figure 1. 1

1.2 Components

Ensure you have received all the following components before using your projector.

- Wireless IR Remote (with batteries)
- Wired Remote Cable (10 ft.)
- Line Cord (North American and European)
- Computer Cable (Dsub 15 to DVI-I)
- DVI-I Cable
- S-Video Cable
- User's Manual

NOTE: For a complete list of optional components that can be used with your projector, refer to Section 6 – Specifications. Call Christie or your dealer, if required.

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 located on the bottom 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.

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 critical 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 keystone.

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** for additional connections.*


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

Step 4 ➤ Connect the Line Cord

 *North American and European rated line cords are provided with each projector. Make sure you use the correct line cord for your area.*

Connect the appropriately rated line cord (supplied with the projector) to the AC receptacle located on the lower right side of the projector and the other end to an AC outlet (100-240V). Do not use a line cord or AC supply not in the specified voltage and power range. See *Section 6 – Specifications* for projector power requirements.

Step 5 ➤ Turn the Projector ON


Press  for two seconds to turn the projector on. As the projector begins initialization, an active pattern of segments appear in the LED status display window that is located with the built-in keypad. Do not enter a keypad command until “On” appears on the status display, otherwise the command will be ignored.

By default, the projector powers up in dual lamp mode. *Refer to Section 3 – The Lamp Menu for more information on lamp operation modes and lamp auto-switching.*

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 connected in Step 3.

Step 7 ➤ Perform Auto Setup on the current source

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

Additional modifications to image settings can be done afterward, if required.

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
<ul style="list-style-type: none"> • Easy to set up • Can be moved or changed quickly • Easy to access 	<ul style="list-style-type: none"> • Shares floor space with audience

Front Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
<ul style="list-style-type: none"> • Does not take up audience space • Projector is unobtrusive • Projector cannot be accidentally moved 	<ul style="list-style-type: none"> • Installation is more permanent • It is more difficult to access the projector

Rear Screen, Floor Mount Installation

ADVANTAGES	CONSIDERATIONS
<ul style="list-style-type: none"> • Projector is completely hidden • Projector is easily accessed • Usually good ambient light rejection 	<ul style="list-style-type: none"> • Requires separate room • Installation cost is usually higher

Rear Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
<ul style="list-style-type: none"> • Projector is completely hidden • Usually good ambient light rejection 	<ul style="list-style-type: none"> • Requires separate room • Installation cost is usually higher

Rear Screen, Floor Mount with Mirror

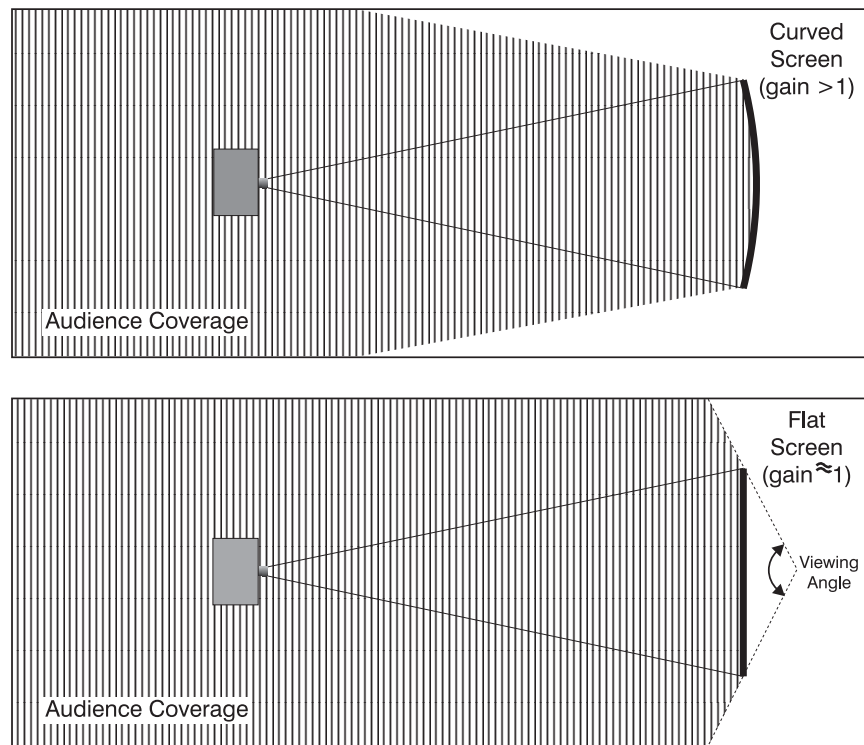
ADVANTAGES	CONSIDERATIONS
<ul style="list-style-type: none"> • Projector is completely hidden • Usually good ambient light rejection • Requires less space behind screen than other rear screen installations 	<ul style="list-style-type: none"> • Requires separate room • Installation cost is usually higher

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 that 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 (also known as projection 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, if you are going to use a 0.8:1 lens, throw distance would roughly be 0.8 X screen width.

▲ IMPORTANT: Always calculate the precise throw distance for the lens type and screen size you're going to use. Refer to Appendix D for actual throw distance formulas and quick reference charts.

Estimating Throw Distance

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

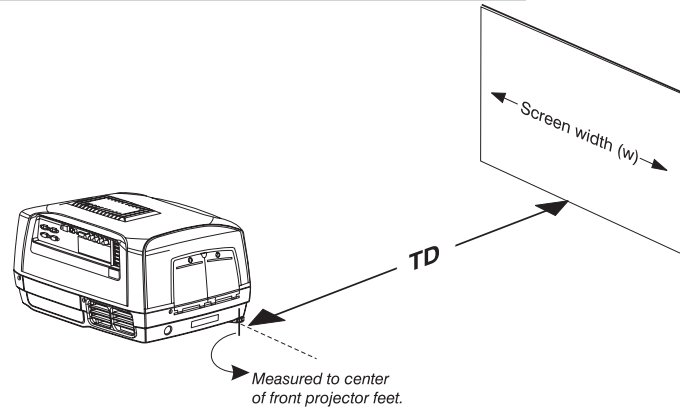


Figure 2.1. Estimating Throw Distance

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 keystone (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 using 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
0.8:1 fixed	12%	+/-63	56%	+/-588	7%	+/-48	53%	+/-748
1.2:1 fixed	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
1.3-1.7:1	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
1.7-2.5:1	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
2.5-4.0:1	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
4.0-7.0:1	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246

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

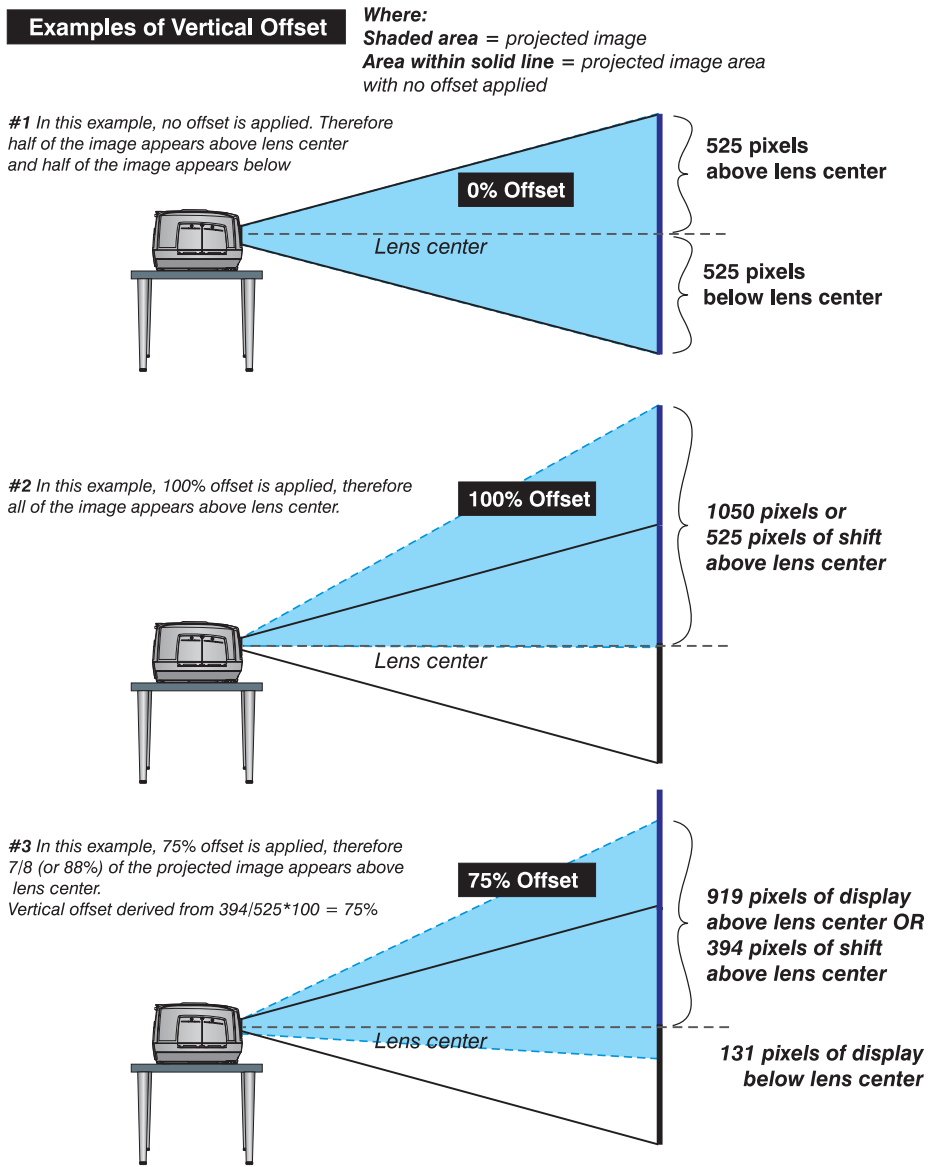


Figure 2.2. Examples of Vertical Offset

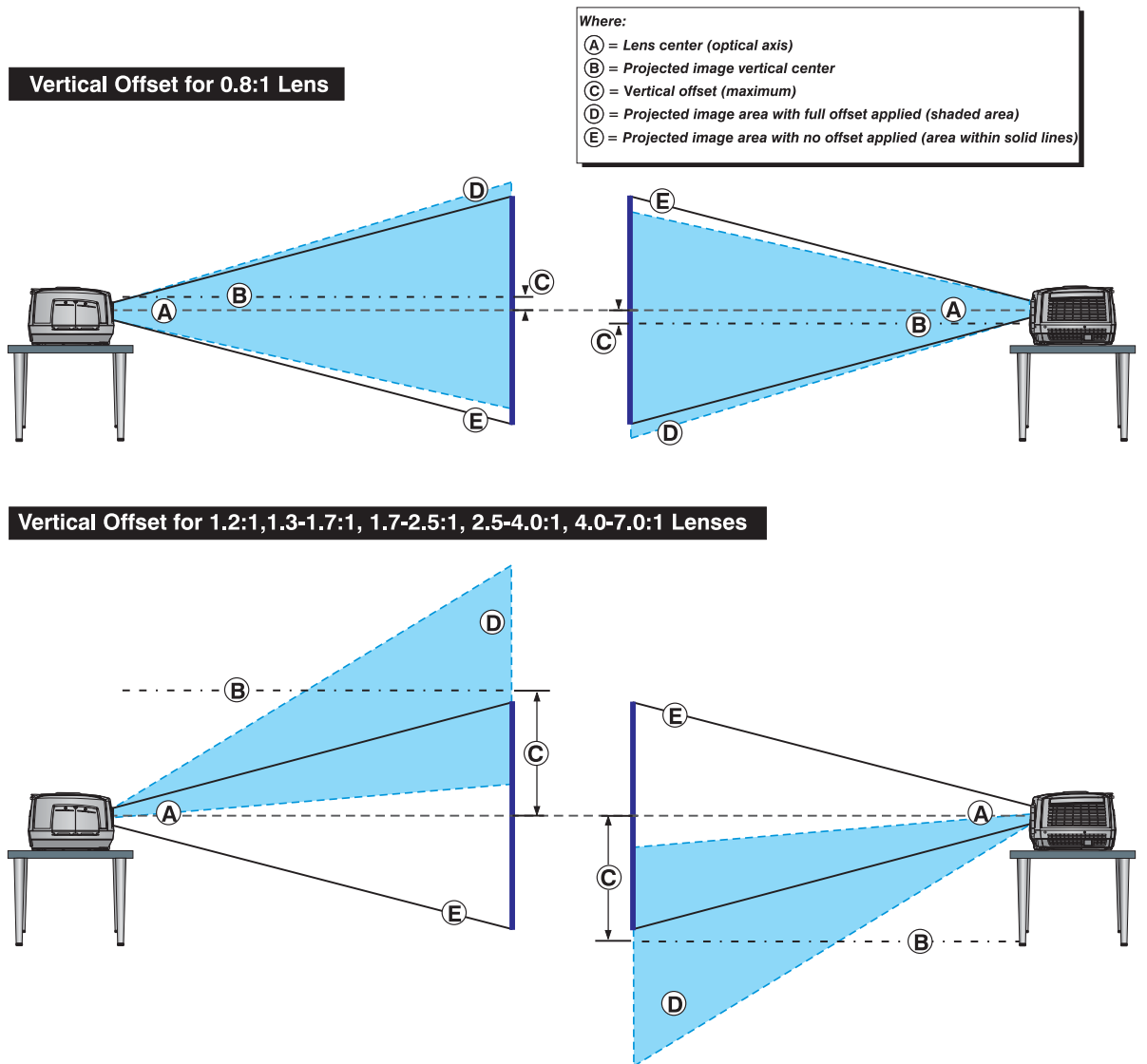


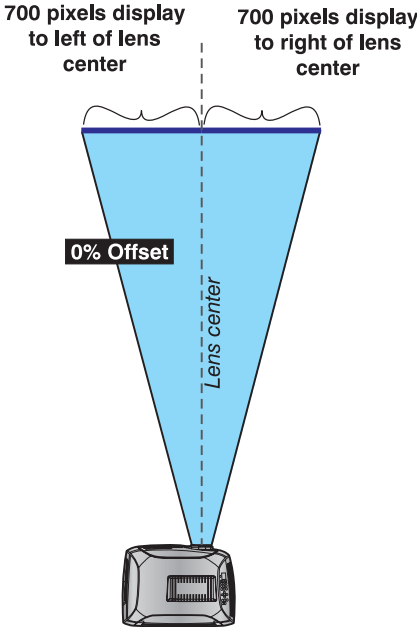
Figure 2.3. Lens Vertical Offsets

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.

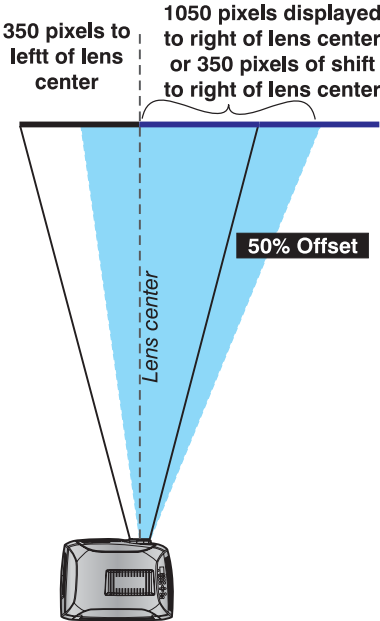
See also Table 2.1 along with Figure 2.5 which shows the maximum horizontal offset of a lens or alternatively, how much of your projected image will appear to one side of lens center if the maximum horizontal offset is applied using that lens.

Examples of Horizontal Offset

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 (or 50%) of the image appears to the left of lens center and half (50%) appears to the right.

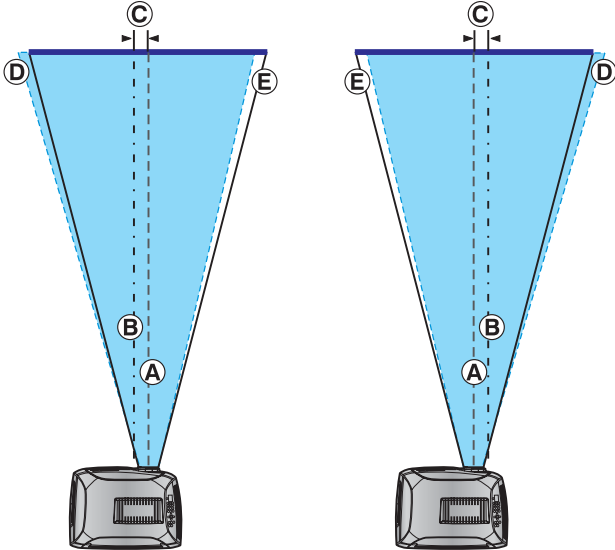


#2 In this example, 100% offset is applied, therefore 25% or 75% of the image appears to one side of lens center.

Figure 2.4. Examples of Horizontal Offset

Horizontal Offset for 0.8:1 Lens

- Where:
- (A) = Lens center (optical axis)
 - (B) = Projected image vertical center
 - (C) = Vertical offset (maximum)
 - (D) = Projected image area with full offset applied (shaded area)
 - (E) = Projected image area with no offset applied (area within solid lines)



Horizontal Offset for 1.3-1.7:1, 1.7-2.5:1, 2.5-4.0:1, 4.0-7.0:1 Lens

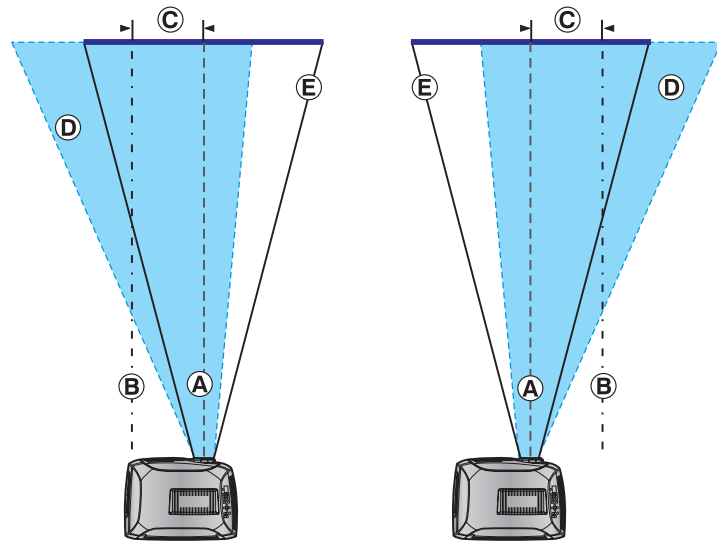


Figure 2.5. Lens Horizontal Offsets

Lifting and transporting the projector – The projector is light enough to lift and transport a short distance. Use the indentations on the bottom of the projector as a guide for hand placement, which makes carrying the projector easier.

When transporting the projector a long distance, use a stable cart or ask someone for help.

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 moving a projector during a presentation or from site to site. If possible, lock the wheels when it's in position to prevent it from being moved 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 sight or have a limited space for projector and audience.

⚠ Use only the CHRISTIE approved ceiling mount kit designed for your projector. Ceiling Mount Kit # 38-804951-01

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 +/-20 degrees. This limit is required to ensure optimal performance of the projector and its lamps. (Figure 2.6.)

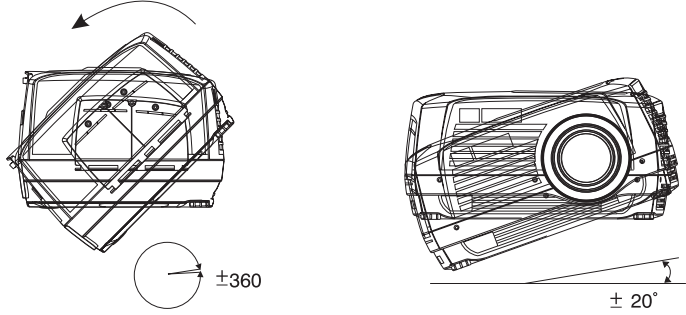


Figure 2.6.

Adjusting projector height

You can modify the height of the projector to remedy a slightly unlevel mounting surface by adjusting the three feet threaded into the bottom chassis. Turn each foot clock-wise or counter-clockwise until the project is level on all sides. (Figure 2.7.)

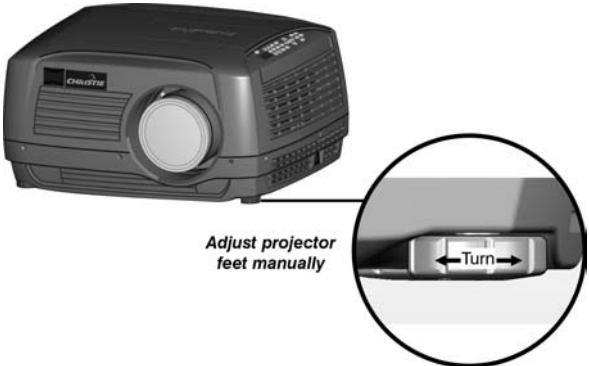


Figure 2.7.

NOTE: The front of the projector can be raised up to 10 degrees. (Figure 2.8.)

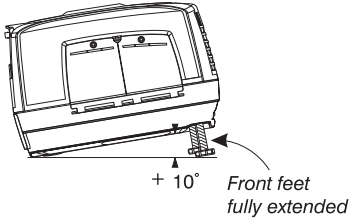


Figure 2.8.

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 2.9. The position of the projector and mirror must be accurately set – if considering this type of installation call your dealer for assistance.

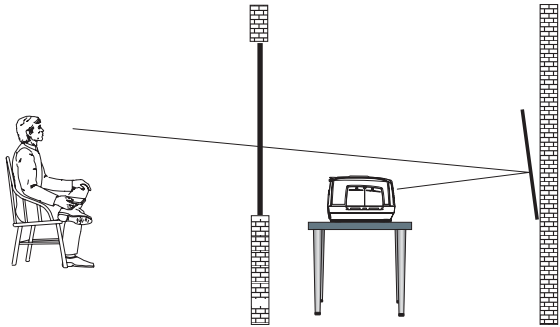


Figure 2.9.

2.3 Connecting Sources

Sources connect to the *Input Panel* located at the back of the projector. See Figure 2.10.

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. The DVI-I connector at **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 disk players or DVD players.

Christie offers optional input modules that can be installed into the projector at **INPUT 5** to connect other sources.

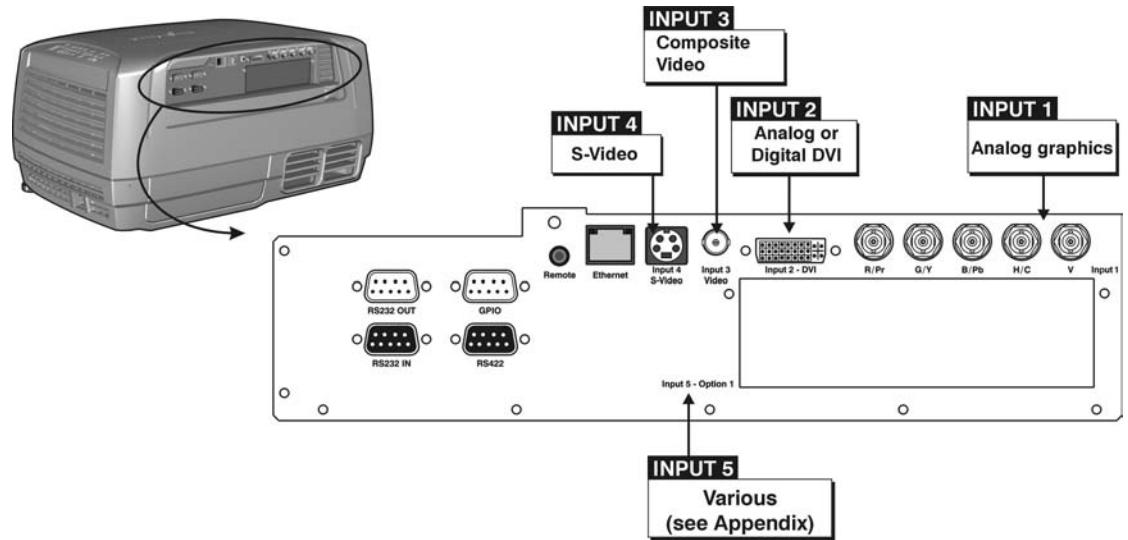


Figure 2.10. Input Panel

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

RGB signals (5 BNCs) ➤ **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, Sun, SGI and others. This projector supports multiple sync types with RGB signals: sync-on-green, composite sync, and separate H & V syncs.

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 2.11.

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.

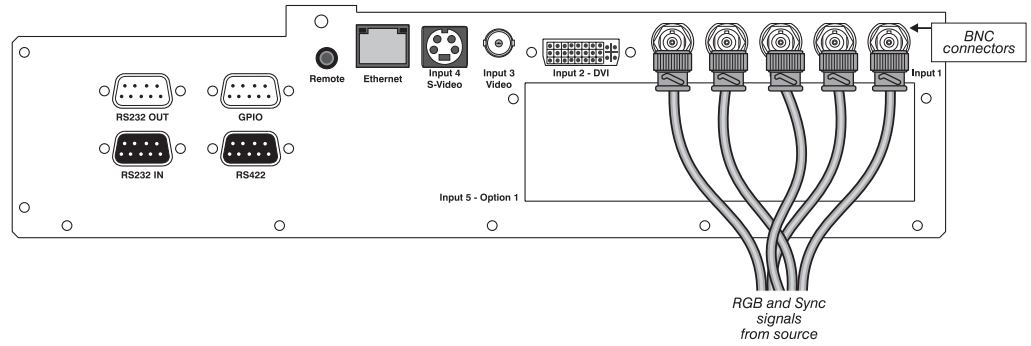


Figure 2.11. Connecting RGB and Sync

NOTES: 1) If for some reason the projector fails to recognize a signal as an RGB signal, specify the **Color Space** option within the **Image Settings** menu. See 3.7, **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). 3) Use the computer cable provided, to connect some devices to the DVI-I connector at **Input 2**.

YPbPr signals ➤ Connect a YPbPr signal (*component video*) to **INPUT 1** or **INPUT 2** as shown in Figure 2.12.

NOTES: 1) If, for some reason, the projector fails to recognize a YPbPr signal, specify the **Color Space** option within the **Image Settings** menu. See 3.7, **Adjusting the Image**. 2) Do not connect digital component signals (known as YCbCr) to **INPUT 1**. Install an appropriate optional module in **INPUT 5** for this.

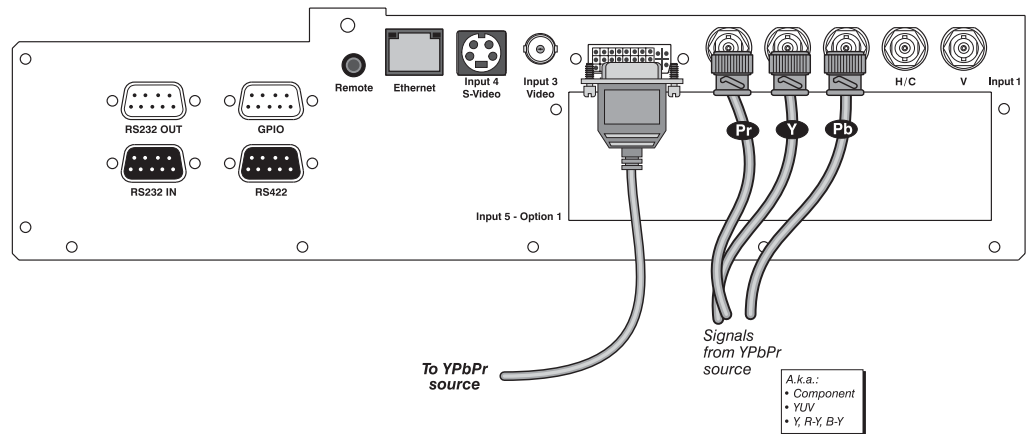


Figure 2.12. Connecting YPbPr sources

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 2.13.

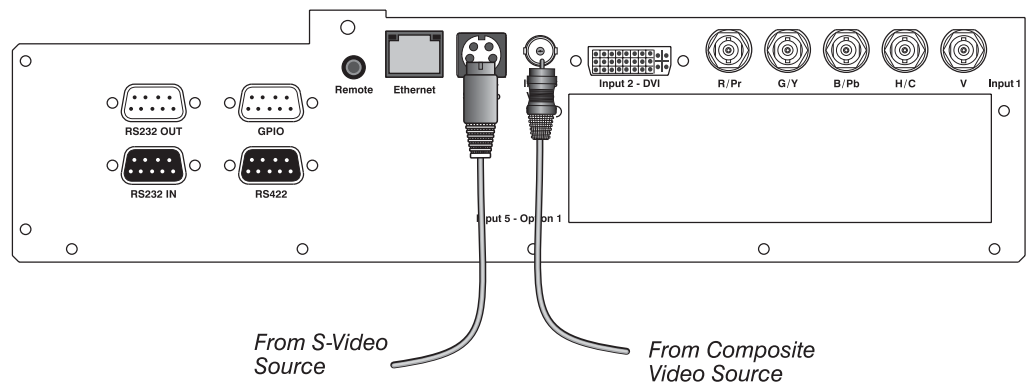


Figure 2.13. Connecting Composite or S-Video sources

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 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) The DVI connector is HDCP compliant. 3) DVI loop through is not available unless you have the optional **DVI Input Module** installed at **INPUT 5**.*

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

- RGB 500 Input Module
- RGB 400 Active Loop Thru Input Module
- RGB 400 Buffered Amplifier Input Module
- 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 RCA jack labeled **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.

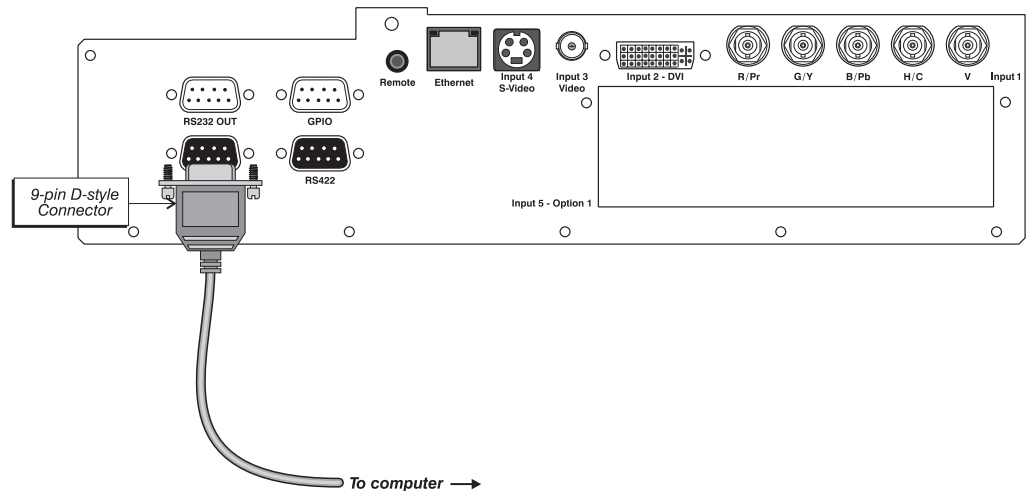


Figure 2.14. Connecting RS232

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.

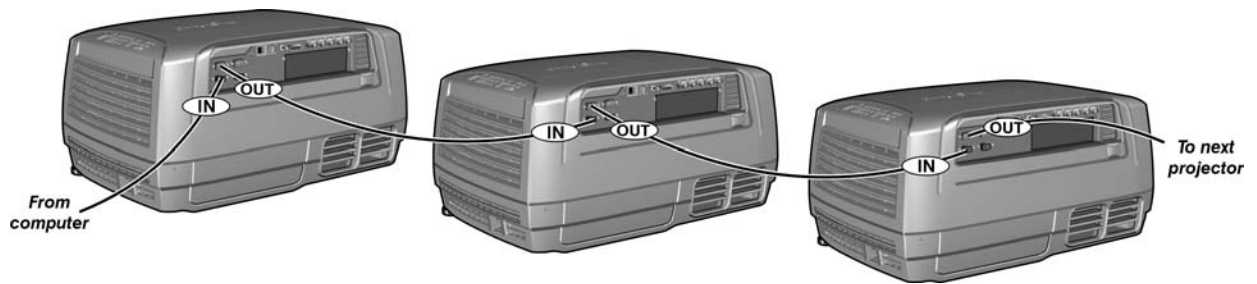


Figure 2.15. RS232 Network

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 than 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.

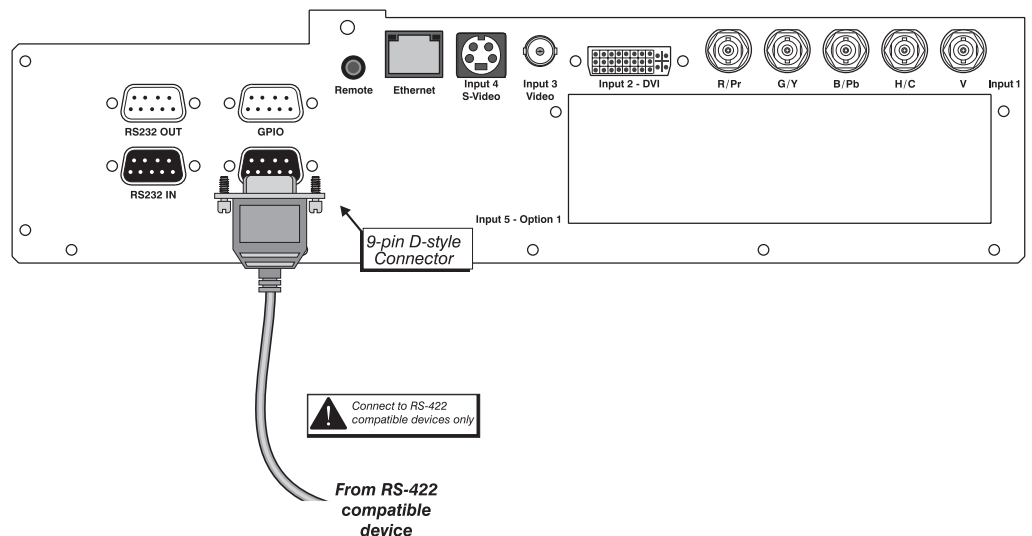


Figure 2.16. Connecting RS422

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 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

The GPIO (*General Purpose Input Output*) 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 on the right hand side of the projector and the 3-pronged end into a grounded AC outlet (Figure 2.17). The input voltage to the projector must be capable of 100 – 240 VAC. (*See also Section 6 – Specifications for complete details on all power requirements.*)

Each projector is provided with the North American and European rated line cords. Make sure you are using the appropriately rated line cord for your area.

Always power down the projector before unplugging the AC line cord – Once you power down, wait 2 minutes to allow the main exhaust fan to turn off and for the lamps to cool 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.

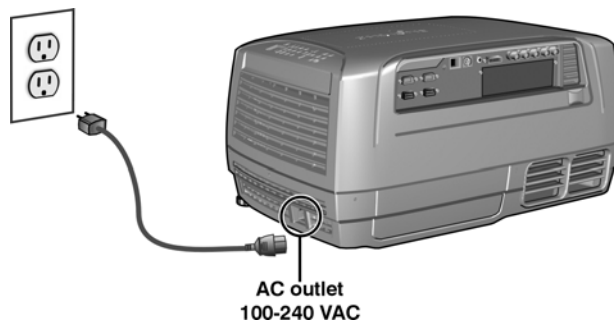
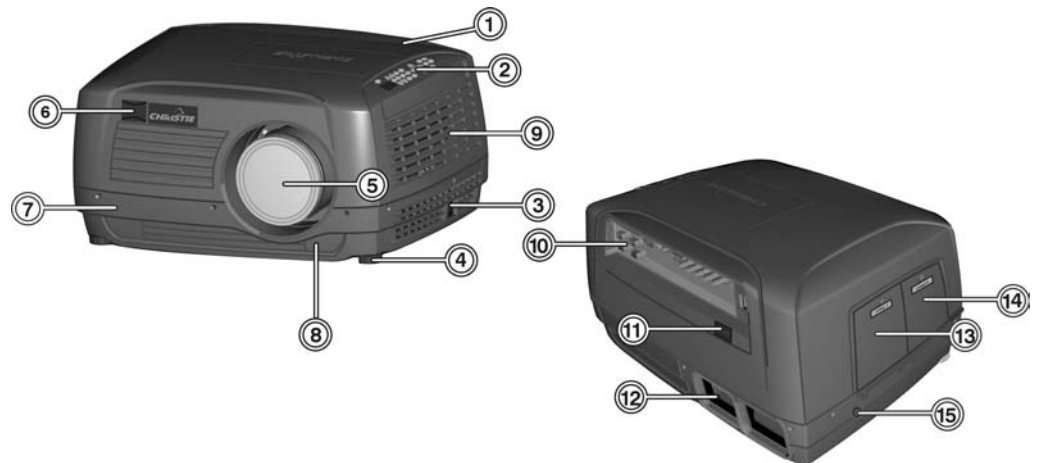


Figure 2.17.

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



1	Top cover	9	Air vents
2	Built-in keypad	10	Rear input panel
3	AC receptacle	11	Rear IR sensor
4	Adjustable feet (3)	12	Rear exhaust
5	Projection lens	13	Lamp 1 Access (Door)
6	Front IR sensor	14	Lamp 2 Access (Door)
7	Bottom chassis	15	Slot for Kensington Security Lock
8	Lens release button		

Figure 3.1. Projector Basics

Exterior ➤ (1) & (7) The projector's top cover and bottom chassis form the shell of the projector. All optical, electrical, and other miscellaneous components are housed between these two parts.

Built-in Keypad ➤ (2) The built-in keypad is located on the top, right side of the projector. It's an alternate method to using the IR remote for projector control. It has a few less direct keys than the IR remote, but includes an LED display, which continually displays the projector's status.

- AC receptacle** ➤ (3) The AC receptacle is located on the right side of the projector (opposite side of lamp doors). Use this outlet to plug in an appropriately rated line cord. See *2.6 Power Connection* for details.

The input voltage to the projector must be capable of 100 – 240 VAC. See also *Section 6 – Specifications* for complete details on all power requirements.

- Adjustable Feet** ➤ (4) Located on the bottom of the projector are 3 adjustable feet. You can raise or lower these feet to ensure the projector is level on all sides and the image displays rectangular without any keystone. See *Projector Position and Mounting (Section 2)* for instructions on adjusting these feet.

- Lens Mount & Projection Lenses** ➤ (5) 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.

- Lens Release Button** ➤ (8) The **LENS RELEASE** button, located just below the projection lens, allows for a quick “tool-free” lens changeover. For instructions on how to use this button during lens replacement refer to *Section 4 – 4.5 Replacing the Projection Lens*.

- Rear Input Panel** ➤ (10) 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**. **INPUT 5** is where you would install any of the available optional input modules.

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

- Cooling and Air Vents** ➤ (9) There are numerous air vents located around the projector. It is important these vents remain unobstructed. Allowing adequate airflow through the projector will prevent it from overheating.

NOTE: ▲ *Stand clear of the rear exhaust air path during operation. In the unlikely event of a lamp explosion, glass particles can be blown out of these vents.*

- Front & Rear IR Sensors** ➤ (6) & (11) 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 just below the input panel.
- Lamp Access Doors** ➤ (13) & (14) Located on the right hand side of the projector are two lamp doors that are labeled as Lamp #1 or Lamp #2. Each door is fitted with an amber window that makes it easy to identify which lamp because it will glow. *NOTE: It is important to always check the status of the lamp before opening the lamp door. Opening a lamp door while the lamp is still on will cause power to be cut to that lamp.*
- Kensington Security Slot** ➤ (15) Use the following slot to install a standard Kensington lock to keep your projector secure in some installations.

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 on the top, right edge of the projector
 - **IR Remote** 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 mini stereo connector on the input panel labeled as **REMOTE**.*

- Built-in Keypad** ➤ To control the projector when signals from a remote keypad cannot reach the projector, use the projector's built-in keypad. Two nearby status windows provide feedback indicating current status and activities of the projector.

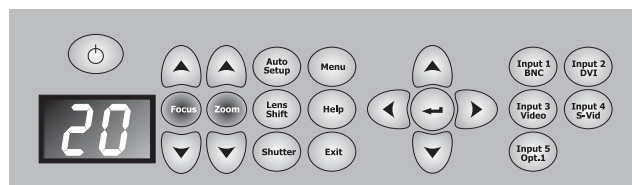
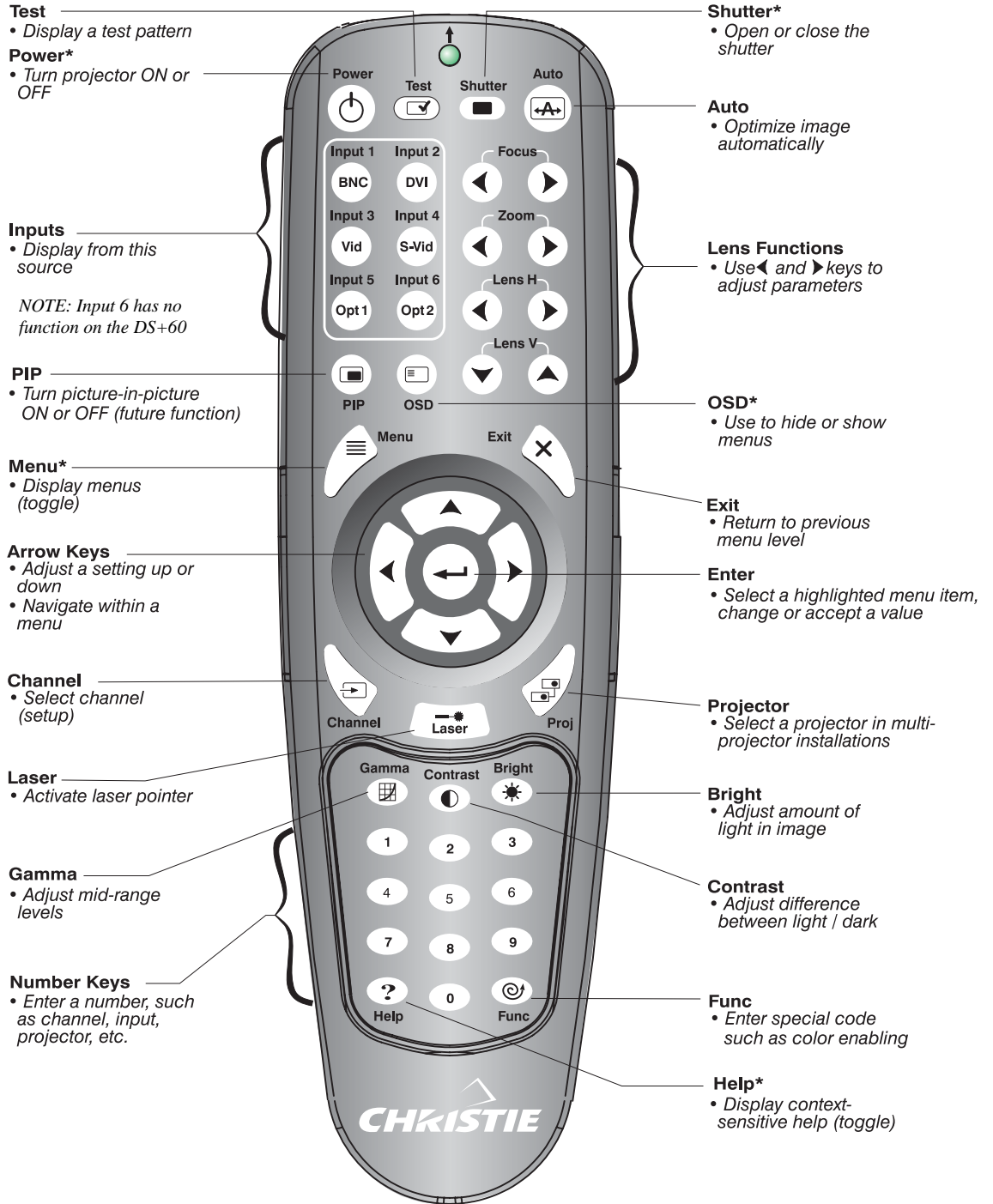


Figure 3.2. Built-in Keypad

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.

Refer to the key descriptions provided for the IR remote.

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  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 **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 when using the keypad:

- 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 ⏻ 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). Alternatively, press ⏻ ⏻ to toggle from the present on/off state.

NOTES: 1) After powering down, the lamp cooling fan remains on for approximately 2 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. 3) The projector enforces a 90 second wait between powering off and on again to allow the lamp to cool down. You will notice vertical scrolling bars across the status display during this wait period.

Test **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 ▶ arrow keys, you’ll be cycling in either direction through the test patterns only, no input.

Auto **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 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 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 , 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 to display from the data or video input source connected to BNCs labeled **INPUT 1**.



Input 2

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



Input 3

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



Input 4

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



Input 5

Press to display from the **INPUT 5** interface module installed in the Option 1 slot.




*NOTE: If you have the new optional **Dual SD/HD-SDI Module** installed at **INPUT 5** you can connect two inputs – A and B. Whether you are displaying from **INPUT 5** or from another input, press to display the input last used. Press again to toggle to the other input.*






Input 6

Note: This key is not available on the built-in keypad and has no function when pressed on the remote.

 **Contrast**

Press  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  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.






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.

 **Menu**

Press  to enter or exit the projector’s menu system.

 **OSD (On-screen display)**

Press  followed by  to hide the projector’s menu system during use. To see the menus again, do one of the following:

- Press *and hold*  for a second
- Press and release  followed immediately by 
- Press  

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 the display while maintaining access to projector functions. Opening the shutter restores the image.

*NOTES: 1) By default, the shutter is open upon powering up. 2) The LED status displays “Sh” when the shutter is closed. 3) Response time after pressing the **Shutter** key is 1-2 seconds.*

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, 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 also 3.6, **Adjusting System Parameters and Advanced Controls.**

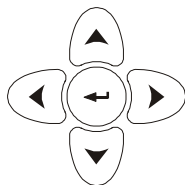
Enter

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

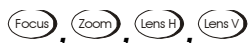
NOTE:  does not save changes within text editing boxes (including number editing of a slider value) or within pull-down lists. It acts as a "cancel" in these cases.







Arrow Keys









Use the   keys to change a slider 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.






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.

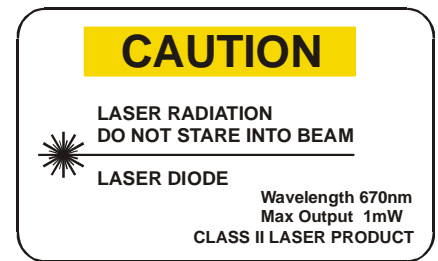
Press  to return to presentation level.

NOTE: Use the  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  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. Keep the  key depressed while you are pointing. Release it to turn it off. 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: The batteries must be in the wired remote keypad for the  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  at any time to display this *Main* menu.

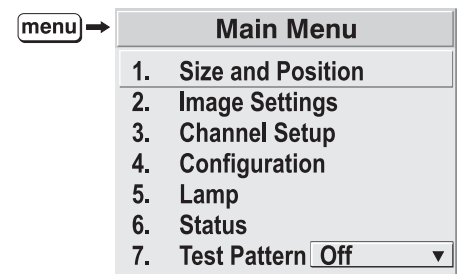











Figure 3.4. Entering the Menu System



On the remote keypad, either enter the number corresponding to the function menu you wish to access, such as  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  to return to the previous screen
- Press  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  to display summary information about the current menu or highlighted option. Press  again to exit. In addition, a line of “hint” text is included at the bottom of some menus.

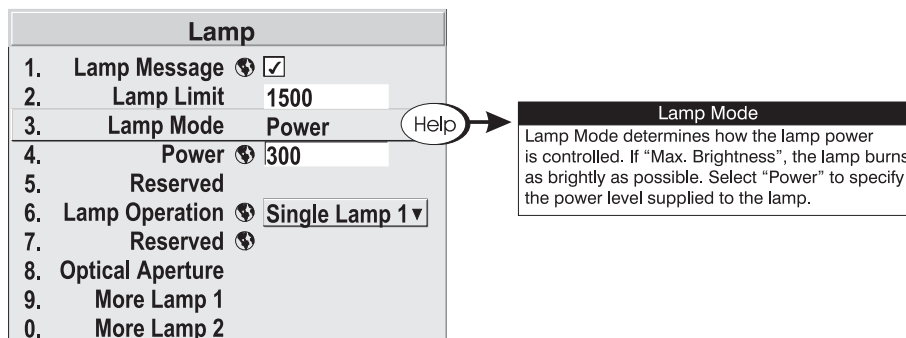


Figure 3.5. Context-sensitive Help

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

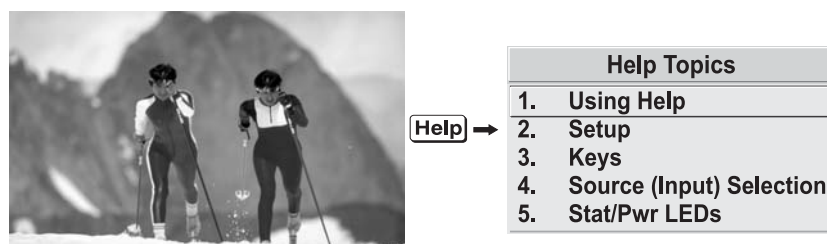


Figure 3.6. Accessing General Help Topics

Time-outs ➤ If a sidebar, menu or message is displayed you have limited time in which to make a keypad entry before the projector returns to presentation level 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 sidebar, 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 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 slider 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 slider 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 slider accessed with the Contrast option in the *Image Settings* menu.

Use the arrow keys to adjust a direct slider, 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 slider as usual if the display is turned off (see OSD or Menu Preferences menu) — the slider just won't be visible. 2) A direct slider 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 ▲ ▼ 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.

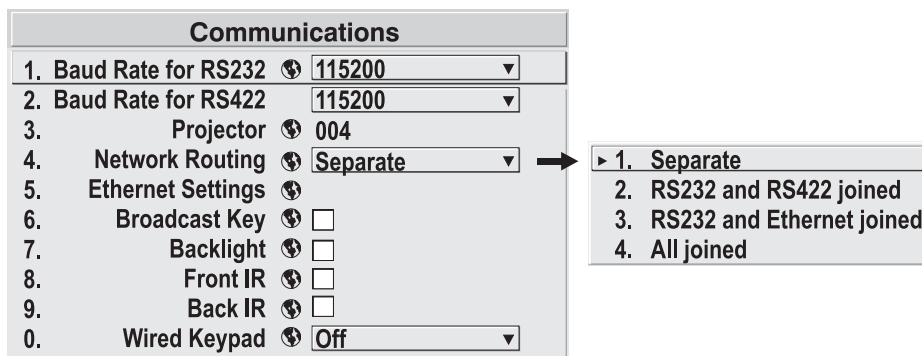








Figure 3.7. Example of Pull-Down List

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

NOTES: 1) Press  or  to jump between pages in an extra long pull-down list. 2) Press  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.

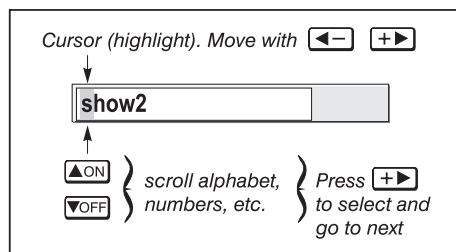





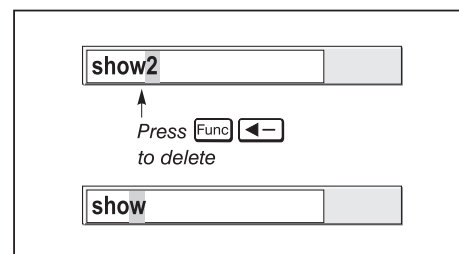
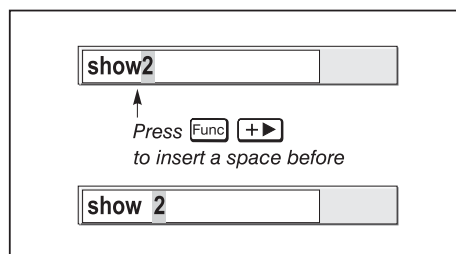





Figure 3.8. Entering Text

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 . To delete a highlighted character (or space), press .



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

NOTE: Press  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  to cancel editing of numerical values.






3.4 Using Inputs and Channels

NOTE: See Section 2, Installation and Setup, for details on connecting 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.  describes the source signal according to which *input slot* it is connected.


SWITCHING INPUTS – Press the appropriate “direct” key — , , , ,  to quickly display from one of the five inputs connected. 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  keys will automatically recall this channel—and all its setup parameters—and update the display accordingly.

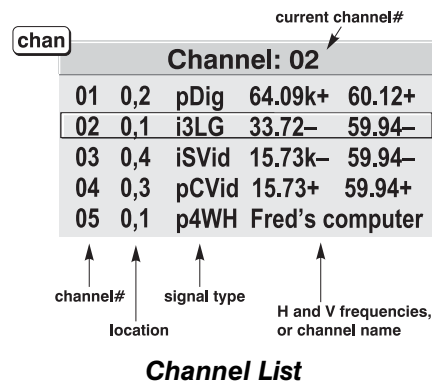
If more than one channel exists for the input, the image will be displayed according to the setup parameters for the first channel with matching characteristics.

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  . You can have numerous distinct channels available for the same input, any of which can be selected by using the  key on the keypad followed by the 2-digit channel number.

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

NOTE: The  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 on the keypad, you must first create the channels. See below.



Channel: 02				
01	0,2	pDig	64.09k+	60.12+
02	0,1	i3LG	33.72-	59.94-
03	0,4	iSVid	15.73k-	59.94-
04	0,3	pCVid	15.73+	59.94+
05	0,1	p4WH	Fred's computer	


Creating a New Channel
– AUTOMATIC –

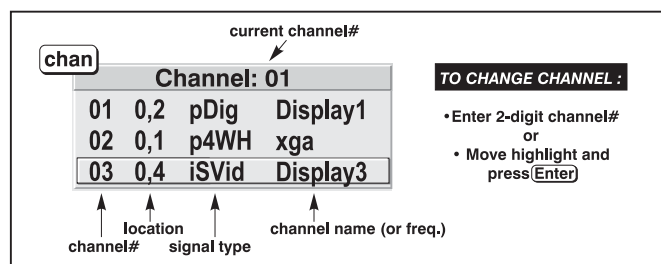
To use a new source with the projector, a new channel must be added to projector memory so that the projector will respond properly to an input signal from that source in the future. A new channel can be created automatically, as described here, or it can be copied from an existing channel and then edited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

When you select a direct input (, , , , ) , 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  (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.



Channel: 01				
01	0,2	pDig	Display1	
02	0,1	p4WH	xga	
03	0,4	iSVid	Display3	

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 **Left Arrow**. The *Channel Setup* menu will appear (see sample at right), with the active channel highlighted.

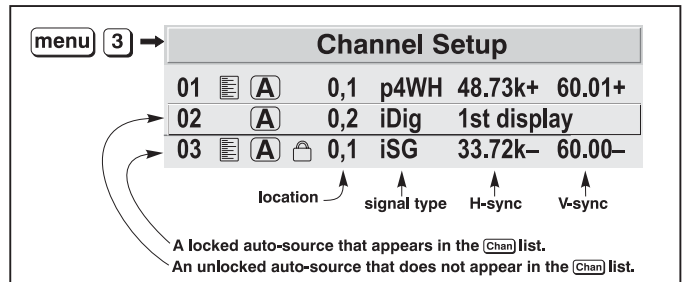


Figure 3.9. All Channels Appear in the Channel Setup Menu

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.

[List Icon]	Appears in Chan list
[A]	Auto-source
[Lock Icon]	Locked

*NOTE: If you have more than a handful of channels, use **Left Arrow** and **Right Arrow** 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.

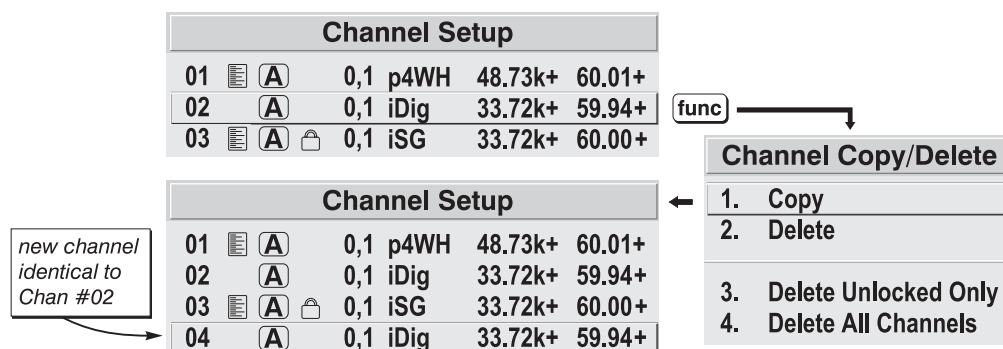


Figure 3.10. Copying A Channel

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.

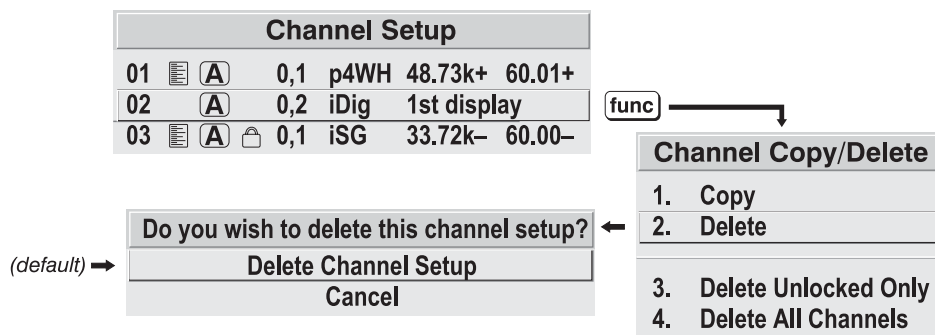


Figure 3.11. Deleting a Channel

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.

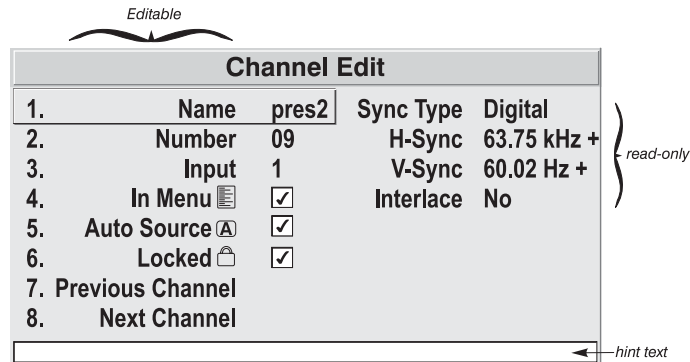


Figure 3.12. Channel Edit Menu (SAMPLE)

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:** 1-5, 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 sliders, 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” slider immediately. Press **Exit** to return to your presentation.

NOTES: 1) To hide these “direct” sliders, disable the “Display Sliders” checkbox in the **Menu Preferences** menu. 2) To hide the entire menu system from view, toggle the on-screen display by pressing the **OSD** **▼** keys.

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	<input type="text"/>
3.	Vertical Stretch	1000	<input type="text"/>
4.	Pixel Track	858	<input type="text"/>
5.	Pixel Phase	0	<input type="text"/>
6.	H-Position	360	<input type="text"/>
7.	V-Position	262	<input type="text"/>
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.

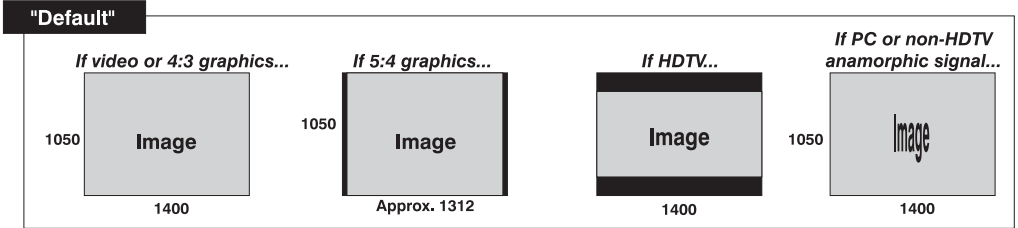
Resize Presets	
1. Default	= maximize for current source
2. No Resizing	= display in native resolution
3. Full Size	= fill the screen (regardless of source)
4. Full Width	= fill display width & keep aspect ratio
5. Full Height	= fill display height & keep aspect ratio
6. Anamorphic	= retain 16:9 aspect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

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.

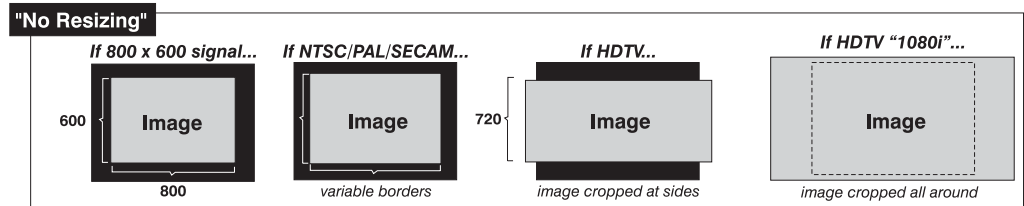
WHEN “CUSTOM” APPEARS: The “Custom” re-size descriptor automatically appears in the *Size and Position* menu when any of the values for *Size, Vertical Stretch, H-Position, V-Position* or *Blanking* do not correspond to those for a preset. This option is not offered in the *Resize Presets* pull-down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

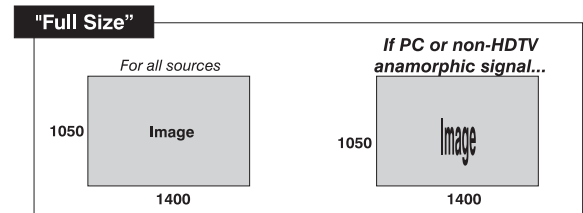
- ✓ *A 5:4 graphic image* will enlarge to fill the screen height, and be centered between narrow black side bars.
- ✓ *A video image* or 4:3 graphic image will enlarge to fill the screen.
- ✓ *An anamorphic (16:9) image* will fill the width and be centered between black bars on top and bottom.



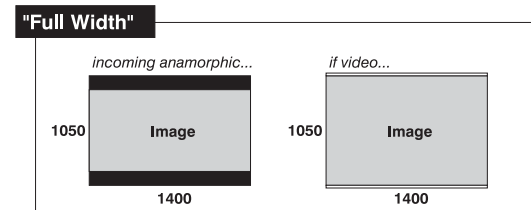
- Select **"NO RESIZING"** to display the image in its native resolution, which may or may not match the projector's 1400 x 1050 resolution. For example, for a source with a native resolution of 800 x 600, "No Resizing" will use the central 800 x 600 pixels and have a black border—the black border areas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



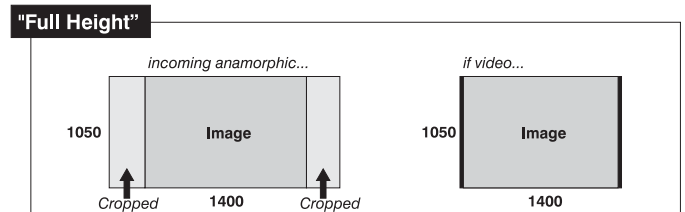
- Select **"FULL SIZE"** to use *all pixels* (1400 x 1050) for displaying the image, regardless of source or original aspect ratio. Incoming source material having a different aspect ratio than the projector will be stretched for display.



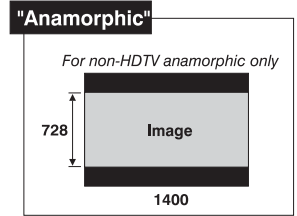
- Select **"FULL WIDTH"** to fill the projector's display from left-to-right without changing the original aspect ratio of the image. Depending on the source, data at the top and bottom may be discarded (cropped), or the display may have black borders at the top and bottom (called "letterboxed").



- 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 slider 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 slider 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.

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.

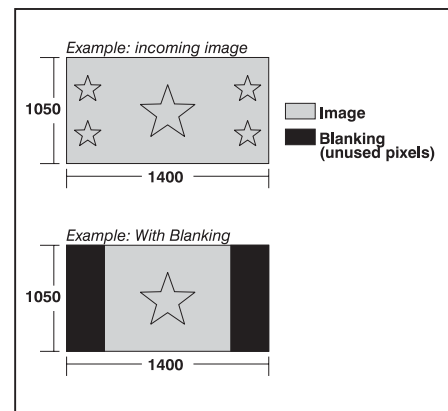
By default, the projector automatically determines what portion of its full resolution to use, and pixels in the surrounding borders are turned off. You can also specify a specific active input window size by adjusting one or more “Blank” settings. For example, if you have blanked (cropped) 100 pixels 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.

Advanced Size & Position			
Active Input Window		720x483	
1.	Top Blank	0	<input type="text"/>
2.	Bottom Blank	0	<input type="text"/>
3.	Left Blank	0	<input type="text"/>
4.	Right Blank	0	<input type="text"/>
5. Plug & Display (EDID) 		1280x1024x60Hz ▼	

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.

- 1. 1024x768x60Hz
- 2. 1024x768x120Hz
- ▶ 3. 1280x720x60Hz
- 4. 1280x1024x60Hz
- 5. 1280x1024x105Hz
- 6. 1400x1050x60Hz
- 7. 1600x1200x45Hz
- 8. 2048x1080x60Hz
- 9. 1080i 60Hz
- 0. 720p 60Hz
- 480p 60Hz
- 1080p 60 Hz
- 1080p 50 Hz
- 1080p 24 Hz

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).

Image Settings			
1.	Contrast	50.0	<input type="text"/>
2.	Brightness	50.0	<input type="text"/>
3.	Gamma	2.2	<input type="text"/>
4.	Filter	Off	<input type="text"/>
5.	Detail	0	<input type="text"/>
6.	Noise Reduction	0	<input type="text"/>
7.	Color Space	YPbPr	<input type="text"/>
8.	Video Options		
9.	Input Levels		
0.	Advanced Image Settings		

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  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  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 colors. 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.

- | |
|----------|
| ▶ 1. Off |
| 2. HDTV |
| 3. SDTV |

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, or INPUT 5**. 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.*

▶ 1. RGB
2. YPbPr (Video)
3. YPbPr (HDTV)

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, or 5**.
- 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 appear magenta and 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 Options	
1. Enable Decoder AGC	<input checked="" type="checkbox"/>
2. Video Standard	[A]? ▼
3. Input Video Black	0 IRE ▼
4. Color	50.0
5. Tint	50.0
6. Decoder Luma Delay	35.0

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.

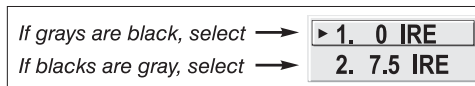
1. Auto
2. NTSC
▶ 3. NTSC 4.43
4. PAL
5. PAL-M
6. PAN-NC
7. PAL-60
8. SECAM

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 slider 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 slider 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

Input Levels		
1.	Auto Input Level	<input type="checkbox"/>
2.	Red (Pr) Blacklevel	256
3.	Red (Pr) Input Drive	256
4.	Green (Y) Blacklevel	256
5.	Green (Y) Input Drive	256
6.	Blue (Pb) Blacklevel	256
7.	Blue (Pb) Input Drive	256
8.	Auto Color Enable	<input checked="" type="checkbox"/>
9.	Clamp Location	Back Porch ▾
0.	Peak Detector	<input type="checkbox"/>
	Color Enable	White ▾

Turn OFF before leaving menu.

Levels adjust automatically and correctly.



NOTE: Image must have at least 2 adjacent white pixels for “auto” to work.

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.

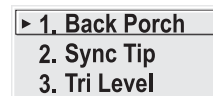
AUTO INPUT LEVEL – Keep off for virtually all sources (default). Temporarily enter a checkmark *only* if you are an experienced user and you have an unusual source that you feel needs further color temperature and/or input level adjustment. After entering a checkmark, wait for the six slider values to 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.*
 -  = 50 (approx.)
 -  = 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” sidebar *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” sidebar *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 sidebar 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.

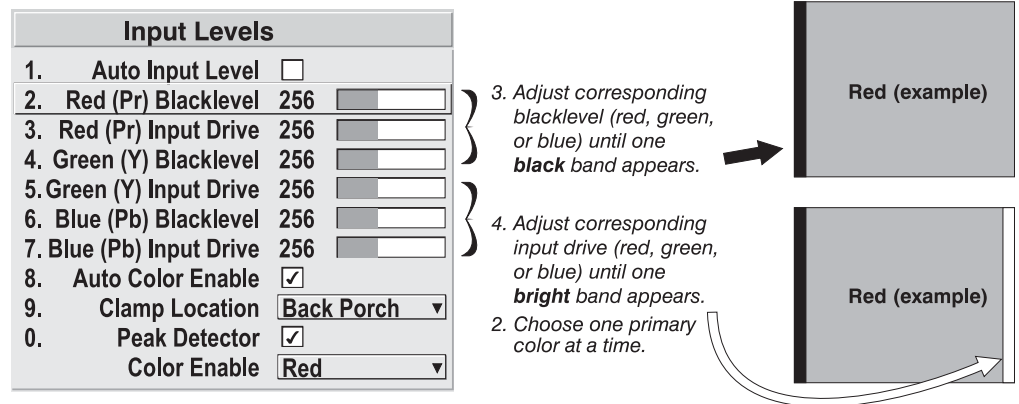


Figure 3.13. Adjusting Input Levels Using the Peak Detector (RED EXAMPLE SHOWN)

Advanced Image Settings — SUBMENU

GAMMA TABLE: This control selects and applies the normal 2.2 gamma setting. Adjust this setting as desired in the main *Image Settings* menu.

Advanced Image Settings		
1.	Gamma Table	2.2, Normal
2.	Select Color Adjustment	Max. Drives
3.	Color Temperature	7600 <input type="text"/>
4.	Optical Aperture	
5.	White Boost	10 <input type="text"/>
6.	Frame Delay	1000 <input type="text"/>
7.	Reserved	
8.	Reserved	
9.	Reserved	
0.	Reserved	
	Motion Filter	Auto
	Film Mode Threshold	0 <input type="text"/>
	Detail Threshold	0 <input type="text"/>



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.


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

To configure a “User” color adjustment (gamut), use either the *Color Adjustment by X/Y* or *Color Saturation* submenu located 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) White Boost automatically turns off when a setting other than Max Drives is selected – you will notice an immediate dimming of the display. 3) Factory-measured 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 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.

OPTICAL APERTURE — Use this control to adjust true contrast of an image. This is an optical adjustment where the two apertures in the projector are simultaneously adjusted; one aperture is located in the illumination system and the other in the projection lens. Adjust  to close the apertures, which minimizes contrast and maximizes brightness. Alternatively, adjust  to maximize true contrast and minimize brightness. By default, the apertures are closed.

NOTES: 1) Powering down the projector does not reset the apertures to their default position. 2) Adjusting contrast using the  key is an electronic adjustment, not an optical one.

WHITE BOOST — White boost is a source dependent setting that enables you to recapture some of the lost light from the transition between color wheel segments and the white segment as it's spinning. For NTSC, HDTV, PAL and SECAM signals the white boost defaults to “2” and for graphic signals it's “10”. When set to zero, white boost is off. As you increase the white boost setting you will notice that the image becomes increasingly brighter and a little less saturated.

NOTES: 1) White Boost is automatically disabled (grayed out in menu) when you enable Brightness Uniformity, Edge Blending or select a color adjustment (Select Color Adjustment) other than “Max Drives”. 2) White Boost can also be adjusted specifically for internal test patterns. However, once you switch back to a source, the White Boost settings will reset to the value set for that source.

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.

NOTE: If frame delay is set too low it can cause frame tears.

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:

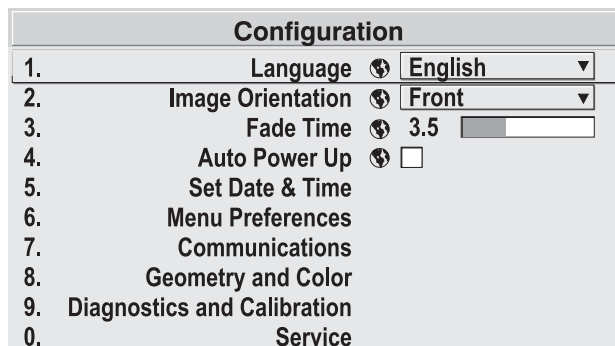
1. **AUTO:** The projector will automatically use the correct motion filter according to the incoming signal.
2. **STILL:** For static images with no motion, such as graphics from a CD.
3. **MOTION:** For video images that did not originate from film, or for moving computer-generated images.
4. **FILM:** 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 diagnostics-and-calibration tools and 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 you 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 <input checked="" type="checkbox"/>
2.	Menu Location 4:3 Top/Left
3.	Horizontal Shift 261
4.	Vertical Shift 204
5.	Display Channel List <input type="checkbox"/>
6.	Display Slidebars <input type="checkbox"/>
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 sidebar 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.

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.












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	 <input type="checkbox"/>
7.	Backlight	 <input type="checkbox"/>
8.	Front IR	 On ▼
9.	Back IR	 On ▼
0.	Wired Keypad	 Off ▼

Figure 3.14. Communications

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  key in 3.2, *Using the Keypads*). If you make a mistake in assigning or changing the projector number, press  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.

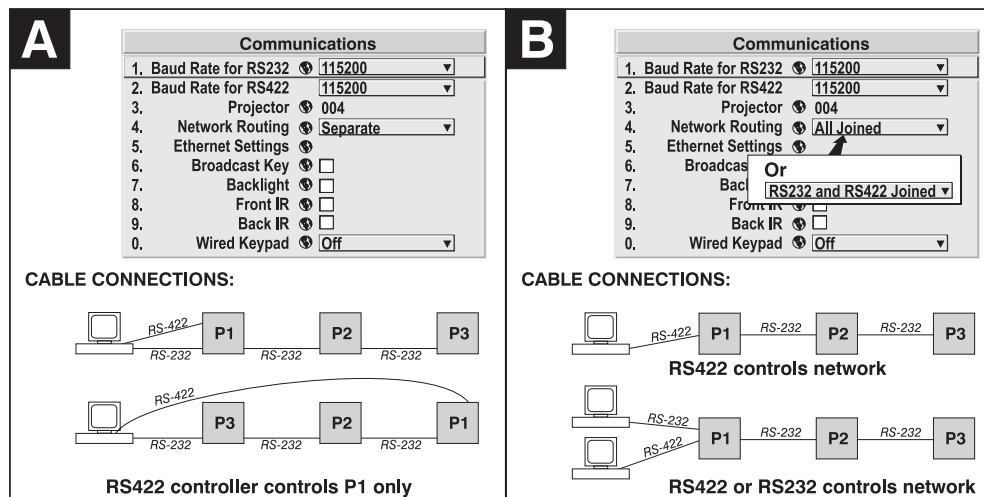


Figure 3.15. Using the “Network Routing” Option

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.

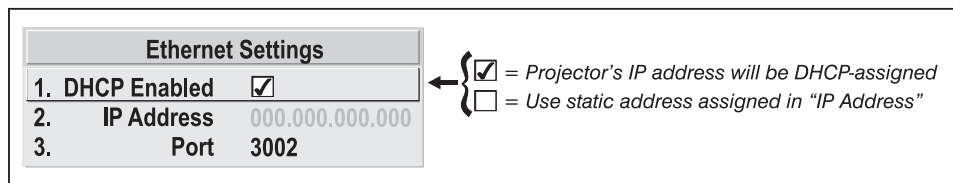
RS232 AND ETHERNET JOINED: Messages to and from the RS232 ports will also be relayed to the Ethernet port, and vice versa. Any RS422 communications will be isolated.

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  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.

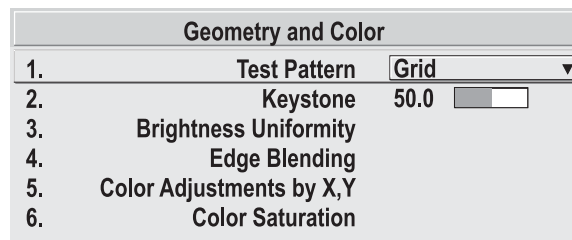
To disable *both* IR sensors, you cannot use the IR remote keypad to select the second **OFF** setting. This safeguard prevents accidentally disabling an IR keypad while you are using it. Instead, use either the built-in keypad or a wired remote (optional) to set the remaining active sensor to **OFF**. 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  key for cycling through test patterns.

Vertical Keystone

Use to correct a keystone 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.)



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 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 for instructions on adjustment.

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.

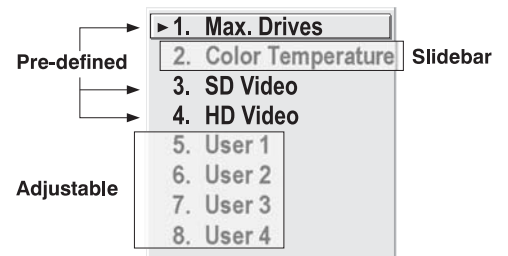


Figure 3.17. Color Performance Choices

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 gamut at any time in the *Advanced Image Settings* menu.

Color Adjustments by X,Y			
1.	Select Color Adjustment	User2	
2.	Color Temperature	6521	<input type="text"/>
3.	Red X	0.655	<input type="text"/>
4.	Red Y	0.341	<input type="text"/>
5.	Green X	0.332	<input type="text"/>
6.	Green Y	0.575	<input type="text"/>
7.	Blue X	0.144	<input type="text"/>
8.	Blue Y	0.093	<input type="text"/>
9.	White X	0.320	<input type="text"/>
0.	White Y	0.330	<input type="text"/>
Auto Color Enable		<input checked="" type="checkbox"/>	
Color Enable			<input type="text" value="White"/>
Copy From			<input type="text" value="Max Drives"/>

Figure 3.18. Customize Color Hue

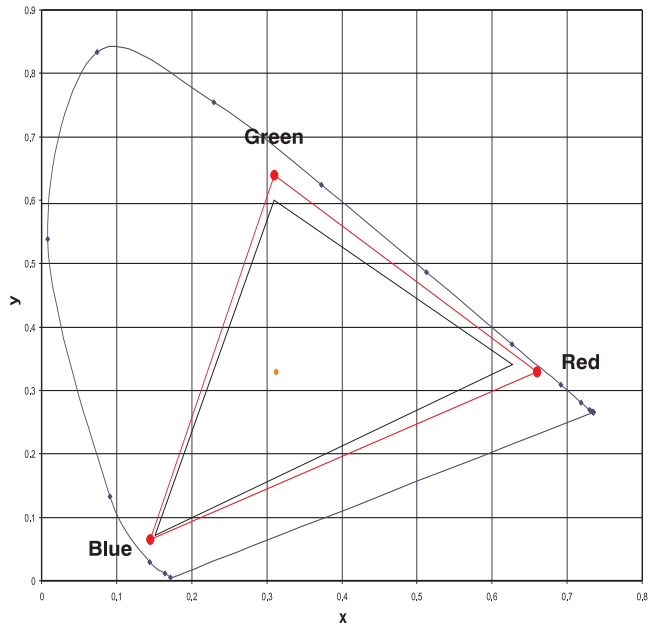


Figure 3.19. CIE 1931 Chromaticity Diagram

NOTE: Keep new x,y coordinates within the original color gamut triangle shown here.

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.

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.

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

Color Saturation	
1.	Select Color Adjustment User 4
2.	Color Temperature 6521 <input type="text"/>
3.	Red Color Adjustment
4.	Green Color Adjustment
5.	Blue Color Adjustment
6.	White Color Adjustment
7.	Auto Color Enable <input type="checkbox"/>
8.	Color Enable White <input type="text"/>
9.	Copy From Color Temperature <input type="text"/>
0.	Lamp


Figure 3.20. Customize Color

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  key for cycling through test patterns.

Test Pattern Gray 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 sidebar.
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.

Diagnostics and Calibration		
1.	Test Pattern	Grid 
2.	Grey Level	512 
3.	Freeze Image	<input type="checkbox"/>
4.	Color Enable	White 
5.	Odd Pixel Adjustment	
6.	Color Wheel Calibration	
7.	Peak Detector	<input type="checkbox"/>
8.	Level Detector	<input type="checkbox"/>
9.	Level Value	512 

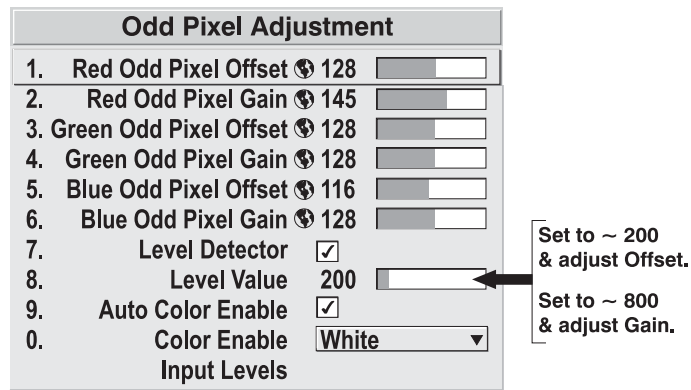
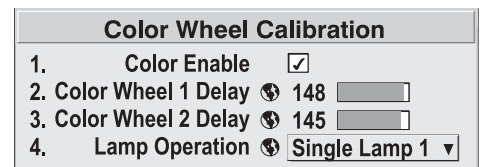


Figure 3.21. Using “Odd Pixel Adjustment”

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.

Color Wheel Calibration — SUBMENU

The *Color Wheel Calibration* submenu allows you to set the timing of the two color wheels in the projector. It is important the color wheels are correctly calibrated for the colors and shades in the displayed image to appear the same. Incorrectly calibrated, the colors will appear in various unmatched shades throughout the image. *This adjustment is typically only required when a color wheel is replaced.*



1. Select the single lamp operation mode that corresponds to the color wheel you want to calibrate. For example, select “Single Lamp 1” when calibrating color wheel 1 and “Single Lamp 2” when calibrating color wheel 2.
2. Enter the *Color Wheel Calibration* submenu – the *Color Ramp* test pattern will automatically display and the “Color Enable” option will automatically switch to **White**.
3. Adjust “Color Wheel 1 (or 2) Delay” so the transitions across each color bar appears smooth.
4. Repeat Step 1 – Step 3 for the other color wheel. *NOTE: Wait for 35 seconds when requesting a change in single lamp operation modes to allow for one lamp to warm up and the other to turn off.*
5. Verify adjustments by choosing different colors in “Color Enable”.

NOTES: 1) Upon entering the Color Wheel Calibration submenu, the “Color Enable” option automatically switches to white and the color ramp test pattern displays.

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 The Lamp Menu

The dual lamp illumination system used in this projector gives you the flexibility to choose an operation mode (single lamp or dual lamp) to suit the specific needs of your installation. The unique lamp auto-switching feature also provides the potential to operate the projector for extended periods without interruptions related to lamps or lamp replacement.

A complete understanding of how the projector works is critical in effectively maintaining its continuous operation. The *Lamp Menu* and the options provided, such as selecting a lamp operation or power mode and monitoring lamp status can help in achieving bright, uninterrupted projection.

About lamp operation, modes and auto-switching

The projector by default is set to power on in Dual lamp mode. No light appears on the wall during the first 25 seconds of power up, as this is the time it takes to ignite the lamps. Brightness gradually increases as the lamps warm up to their full potential. Before sending a keypad command, wait for the projector to complete its initialization (“ON” appears in the status LED display), otherwise the request will be ignored. After this time, you can switch to a single lamp operation mode or make any other requests through software.

On rare occasions, a lamp may not ignite on the first attempt.

- In dual lamp mode, only the light from the lamp that ignited successfully is seen on the wall. The projector will then continue to strike the second lamp (waiting 90 seconds in between each attempt) indefinitely – the lamp operation

mode will not automatically switch to the single lamp mode. It is strongly recommended if after 5 minutes the second lamp does not ignite, you manually switch to a single lamp operation mode and replace the lamp that won't strike.

- In single lamp mode, the projector will try to strike the lamp again in 90 seconds (considered re-strike #1). Only after the third attempt (re-strike #2) will the projector declare the lamp as “Failed to Strike” (in Lamp submenu) and automatically switch to the single lamp operation mode for the lamp that was not ignited. All lamp specific menu options will then change to reflect the true lamp operation mode of the projector.

NOTE: P-VIP lamps, by nature, do not successfully ignite when “hot” and therefore the 90 second wait period is taken by the projector before each strike attempt and between powering the projector down and up again.

Lamp operation modes will also automatically change if there is a failure of one of the lamp related components, such as the lamp driver, color wheel or fan. An error code or failure message will be displayed in the status LED or through the RS-232 serial communications log that indicates which component has failed. The lamp status will also show one of several messages that points to the failed component. The lamp in this instance is typically still okay and does not require replacement.

MANUALLY SWITCHING FROM DUAL TO SINGLE LAMP MODE – Switching from dual to single lamp operation mode occurs immediately. The result is an instant dimming of the displayed image. At this time, you can modify the lamp power or adjust other settings to increase desired brightness.

MANUALLY SWITCHING FROM SINGLE TO DUAL LAMP MODE – When you manually switch from a single lamp mode to the dual lamp mode, the projector immediately tries to ignite the second lamp. If the first attempt to ignite the lamp fails it will wait 90 seconds and try again. This process will continue indefinitely. It is recommended you switch the lamp operation mode back to single lamp mode if the second lamp does not ignite after 5 minutes.

MANUALLY SWITCHING BETWEEN SINGLE LAMP MODES – When manually switching between single lamp modes, there is a 35 second overlap when both lamps are on. This overlap allows the “new” lamp to warm up before the other lamp is turned off. The new lamp operation mode displays immediately in the menus. Only after the third attempt (re-strike #2), will an error message display to indicate the type of error that was detected. If no specific error is detected, then the error will be “Failed to Strike”. If this occurs, the first lamp will not turn off and the projector will continue to operate in the original lamp operation mode. In summary, it could potentially take the projector up to 4.5 minutes to successfully switch lamp modes. The projector will attempt to maintain light on the wall during this time. *NOTE: If a problem is fixed before the last strike attempt the lamp could turn on.*

If a lamp fails during operation, the projector will immediately attempt igniting the other lamp if it's not already on. Only in this case, will there be a brief interruption in the display.

NOTE: A lamp will naturally decrease in brightness as it ages. Lamp life can also be decreased further by a frequent change in lamp operation modes (number of times its ignited).

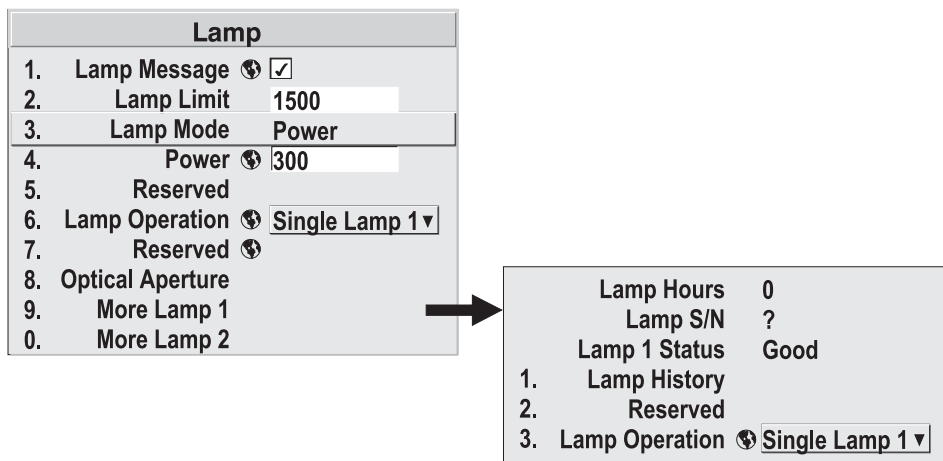


Figure 3.22. The Lamp Menu

LAMP MESSAGE - Enter a checkmark 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) If a lamp warning message appears during power-up, press **Exit** to temporarily cancel the message. The message will continue to appear upon power-up until you install a new lamp.*

LAMP LIMIT - Set the lamp limit to the number of hours you expect to log on the current lamp before replacing it. The limit by default is 1500 hours.

LAMP MODE - Select a lamp mode to control the light output of your projector — select “Max Brightness” to run the lamp as brightly as possible or “Power” (default) to continually run the lamp at the specific wattage set by adjusting the **POWER** sidebar.

POWER – Adjust the sidebar when **LAMP MODE** is set to “Power”, to indicate the number of watts (250-300) applied to the lamp. In general, a lower power level generates a dimmer image. Specifying a maximum power level is the same as operating in “Max Brightness” mode.

LAMP OPERATION – One of the key features of the projector is that it can be operated with one or two lamps on. From the pull down list, select the lamp operation mode you want to operate the projector in. “Dual Lamp” is the default.

- **DUAL LAMP** – Select “Dual Lamp” to operate the projector with both lamps on. In this mode, you can achieve maximum brightness output by the projector. If *one* lamp fails in this mode, an immediate dimming of the display occurs and the projector will continuously attempt to turn the second lamp back on – it will not switch to a single lamp operation mode. If the projector fails to turn the lamp back on after 5 minutes it is recommended you manually switch lamp operation to single lamp for the lamp that is working. If *both* lamps fail at the same time, an error is reported and the projector automatically powers down.

- **SINGLE, LAMP #1 OR SINGLE, LAMP #2** – Select “Single, Lamp 1” or “Single, Lamp 2” to specify which lamp to operate the projector with. The other lamp remains in “reserve” and will only turn on if the current lamp “fails” for some reason or if the mode is manually selected.

*NOTES: 1) The projector will automatically shutdown if it detects both lamps have “failed” (this includes lamps not installed). 2) The lamp operation mode will not automatically switch to a previous mode once a “failed” lamp is replaced. It must manually be selected. 3) It takes approximately 25 seconds for a cold lamp to reach full brightness when it is first turned on. 4) Power is cut to a lamp only when the lamp operation mode is switched to the other lamp. **IMPORTANT** - the original lamp stays on for 35 seconds to allow the new lamp to warm up before power is cut and lamp operation modes change.*

MORE LAMP 1 (MORE LAMP 2) - There are two separate lamp submenus that can be accessed from the *Lamp* menu. Each submenu is dedicated to one lamp – you can view specific lamp information, such as lamp hours, lamp history and the current status of the lamp. You can also change lamp operation modes.

LAMP HOURS - This read-only information shows the current number of hours logged on the current lamp. Whenever a new lamp serial number is detected it begins to log time for the new lamp. This information also appears in the *Status* menu.

LAMP S/N - This read-only information displays the serial number for the current lamp. *NOTE: When a lamp is installed, the projector automatically detects the serial number and displays it here. The serial number is not manually entered.*

LAMP 1 (OR 2) STATUS – This read-only information displays the current status of a lamp and can be viewed any time during operation. Refer to the list below for the possible lamp status messages and their meaning:

- **“Good”** – displays continually during operation until there is a failure with the lamp.
- **“Failed to Strike”** – displays when the projector cannot turn a lamp on. This may or may not be lamp related.
- **“Lamp Not Installed”** – displays when a lamp isn’t installed. If a lamp is present check that the lamp is fully connected to the terminal block.
- **“Turned Off Unexpectedly”** – displays when a lamp or lamp related component fails – may be caused by a hot lamp, failed lamp or a lamp driver problem. Check for error code on LED status display.
- **“Interlock Tripped”**- displays when the lamp door is opened for a lamp that is still on. The lamp is automatically turned off.
- **“Cooling Fan #8 (or #10) Failed”** – displays when a lamp fan fails (Cooling fan #8 associated with Lamp #1 and Cooling fan #10 with Lamp #2).
- **“Color Wheel Stopped”** – displays when a color wheel stops operating.
- **“Driver Vcc too Low”** – displays when a lamp driver fails.

LAMP HISTORY - This read-only option lists the lamp serial number and corresponding lamp hours of the lamp most recently installed. *Lamp History* is automatically updated when a new lamp is installed.


Lamp 1 History	
S/N	Hours
1234	1999
5679	23

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 defined in projector memory, its current, voltage and 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 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  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 a different site, you must access the *Service* menu (password-protected). Select the *Reset to 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 3.23. Or use the “Copy From” function to copy them into a “User” gamut in one projector.

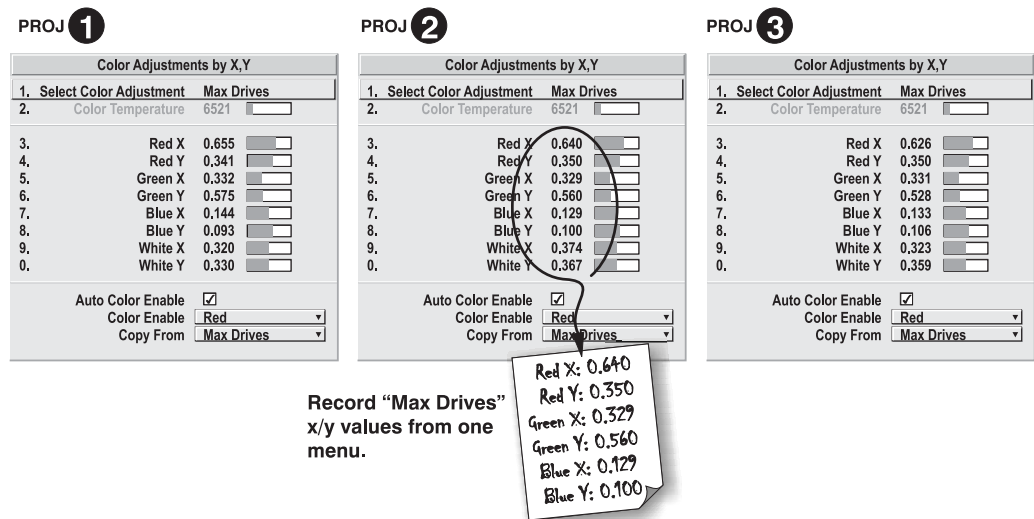


Figure 3.23. Jot Down a Set of “Max Drives” X/Y Values

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 3.24).

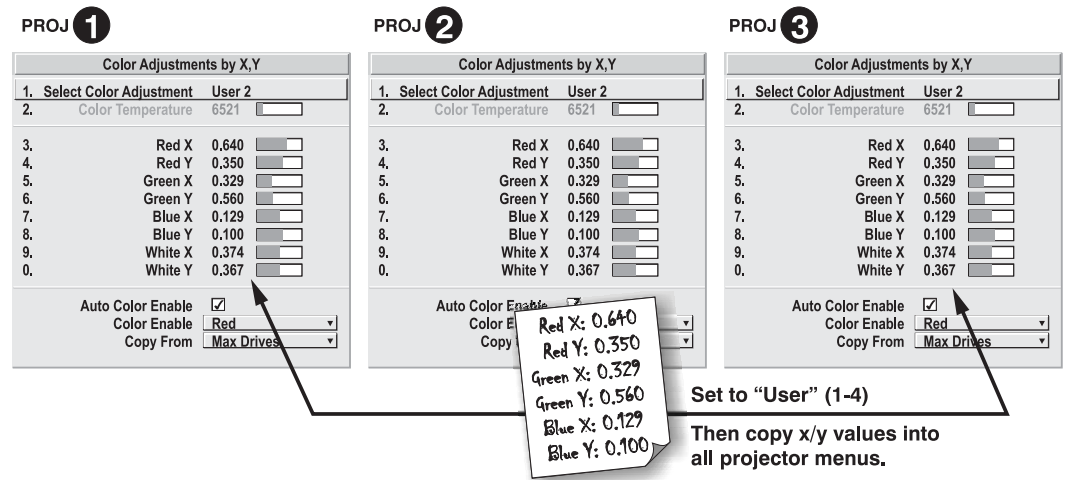
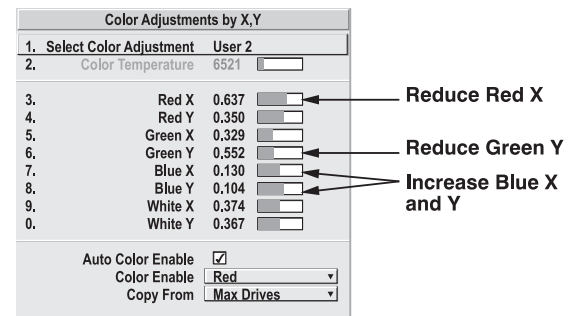


Figure 3.24. Copy X/Y Values into All Projectors

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

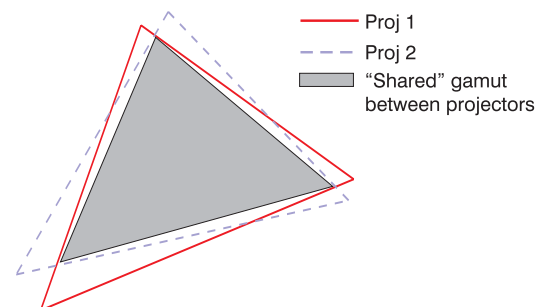
- ❑ To match reds, decrease “Red X” until full field red screens match.
- ❑ To match greens, decrease “Green Y” until full field green screens match.
- ❑ To match blues, increase both “Blue X” and “Blue Y” until full field blue screens match.

IN ALL PROJECTORS:



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.

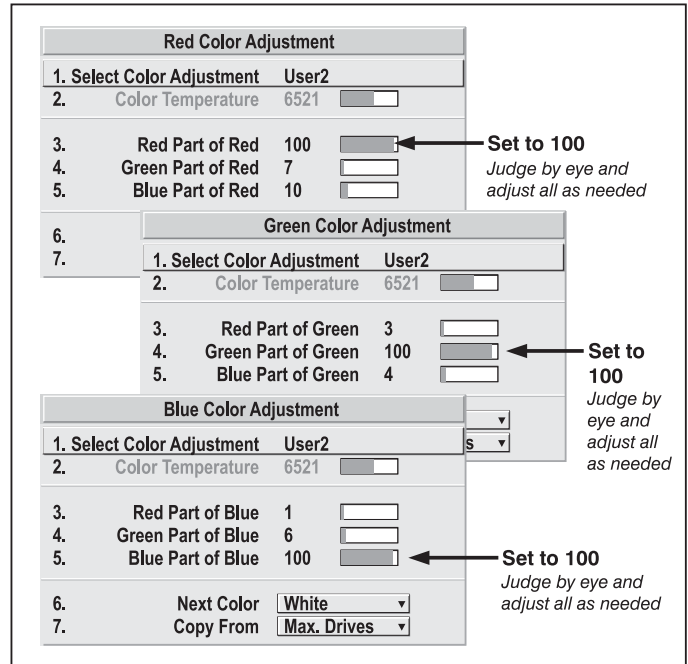


Figure 3.25. Color Matching Using Color Saturation Menu

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.
- ❑ **WHITE UNIFORMITY SLIDEBARS**—White Uniformity sidebar values may not reduce to “0”. Each sidebar 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 sidebar to stop earlier than expected.
- ❑ **JUDGE BY EYE OR USE A METER**—Good brightness uniformity can be achieved with either.

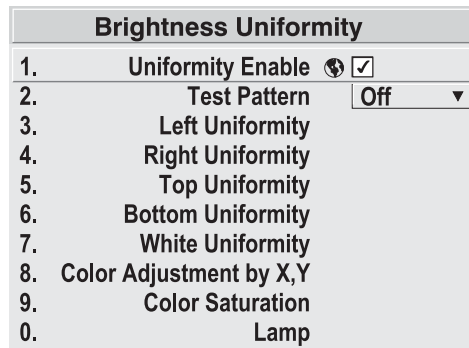
Step 1: General Setup

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



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

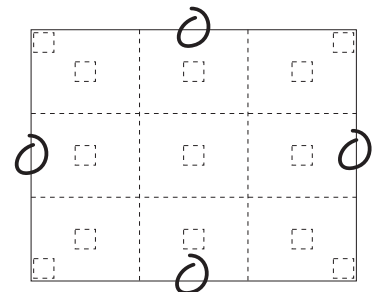
- 1b) Enable the *Brightness Uniformity* checkbox. This will enable access to the uniformity controls and will apply the settings to your image.



← 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 Adjustment* 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.

White Uniformity		
1.	Left Side	0.0 <input type="text"/>
2.	Right Side	0.0 <input type="text"/>
3.	Top Edge	0.0 <input type="text"/>
4.	Bottom Edge	0.0 <input type="text"/>
5.	Top Left Corner	0.0 <input type="text"/>
6.	Top Right Corner	0.0 <input type="text"/>
7.	Bottom Left Corner	0.0 <input type="text"/>
8.	Bottom Right Corner	0.0 <input type="text"/>
9.	Overall	50.0 <input type="text"/>
Adjust light output of entire screen.		

← Set to 50.0

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 3.26.

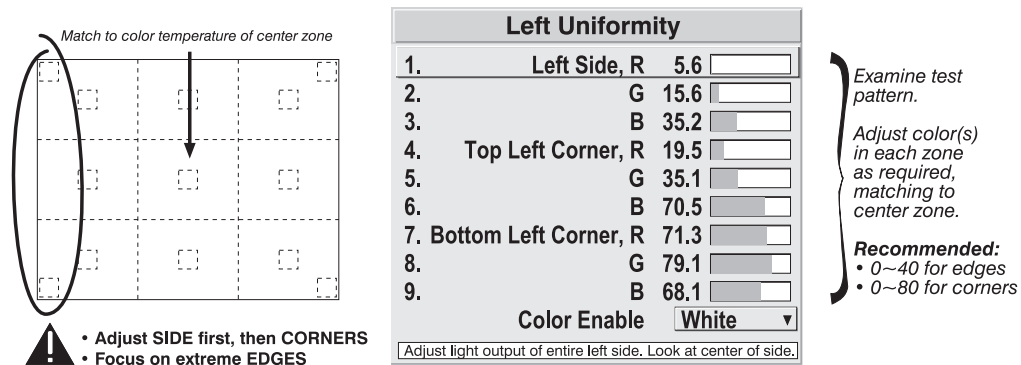


Figure 3.26. Match Zones to Center Color Temperature

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 3.27). 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.

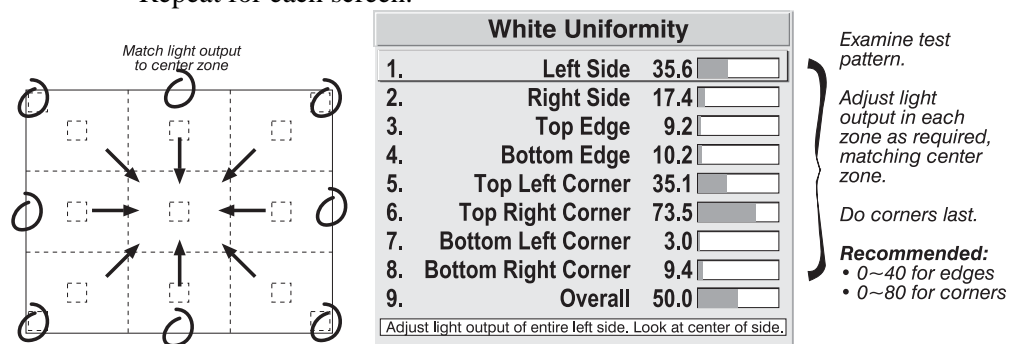


Figure 3.27. Match Zones to Center Light Output

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 whitelevels 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:

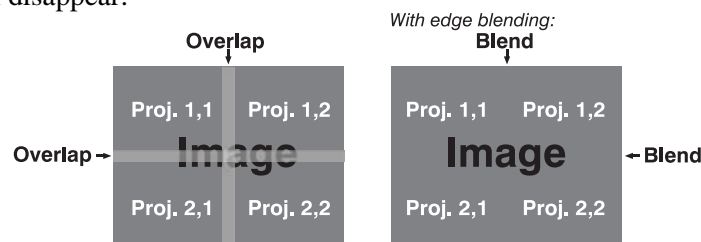


Figure 3.28. Edge Blending Concept

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. Slider 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 3.29.) 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.

(NOTE: Simulation shown darker for printed page)

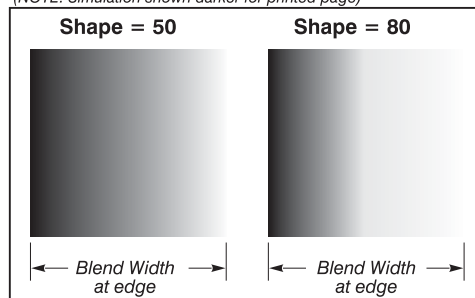


Figure 3.29. “Shape” Examples

- ❑ **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.

(NOTE: Simulation shown darker for printed page)

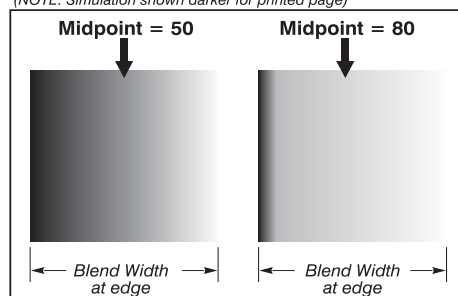


Figure 3.30. “Midpoint” Examples

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.

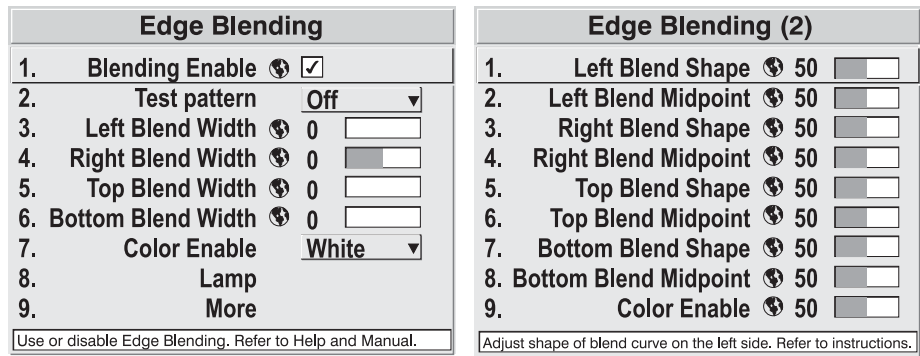


Figure 3.31. Set Starting Points for Each Projector

4. **SET BLEND WIDTH:** On one projector, increase the *Blend Width* for an overlapping edge (for example, if the projector’s image is on 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 change 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**

3.10 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.

3.11 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**” 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**”.

The 2-digit error code that corresponds to the message appears in the LED status display window located next to the built-in keypad (Figure 3.32.). *NOTE: During normal operation the status code “0n” appears.*

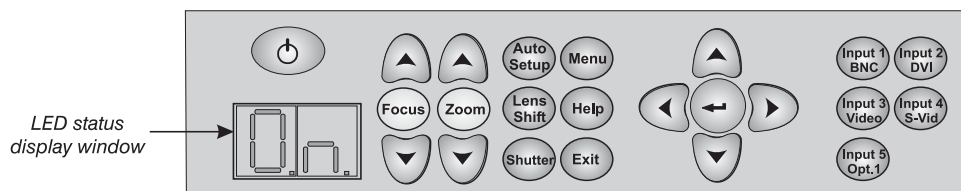




Figure 3.32. LED Status Display on Built-In

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  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 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 LED status display window next to the built-in keypad. A system malfunction can be cleared with   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 reported to the manufacturer. You can press   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 reported to the manufacturer 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   from presentation level, or try resetting the projector by powering it off and on again, cooling when necessary. Consult 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 too far away to read the accompanying text message in the LCD status display window. For example, the code "27" means "Lamp 1 could not be turned on". Error codes for this projector are listed in the table below.

Error Codes ➤

Code	Description
GENERAL	
12	Software bug. Contact dealer/factory.
13	Flash memory corrupted. 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.
18	Attempting to program boot mode without jumper
LAMP FAILURES	
21	Lamp compartment too hot
25	Lamp 1 not installed
26	Lamp 1 Interlock: door open, lamp not installed
27	Unable to turn lamp 1 ON
28	Lamp 1 shut off unexpectedly
29	Lamp 1 driver overheated
2A	Lamp 1 driver operation error (e.g. too hot can't start)
2C	Lamp 1 driver UART communications failure
30	Lamp 2 not installed
31	Lamp 2 door open
32	Unable to turn lamp 2 ON (unknown reason)
33	Lamp 2 shut off unexpectedly
34	Lamp 2 driver too hot
35	Lamp 2 driver reports operation error (e.g. too hot can't start)
36	Lamp 2 driver UART communications failure
POWER AND COOLING	
40	Lamp 1 shutdown due to corresponding fan failure
41	Lamp 1 driver Vcc to low
42	Color wheel 1 stopped for at least one second
43	Lamp 2 shutdown due to corresponding fan failure
44	Lamp driver Vcc too low
45	Color wheel 2 stopped for at least one second
4C	Projector shutdown due to critical error
51	TIPM fan failed
53	Main blower failed
56	Engine fan failed
57	Lamp 1 driver fan failed
58	Lamp 1 fan failed
59	Lamp 2 driver fan failed
5A	Lamp 2 fan failed
TIPM (image processor)	
60	Boot code CRC failed
61	Unable to program the DigMux PLD
62	Unable to program the Control PLD
63	Unable to program the BUBKS PLD
64	Unrecognized ROM type
65	Write to flash ROM failed
66	General image processor failure
67	Downloaded code will not fit in the ROMs
68	Communication problem with scaler on image processor
BUILT-IN or EEPROM	
70	Unable to access the EEPROM on the built-in keypad
71	EEPROM memory re-initialization (built-in keypad)
72	Unable to access the EEPROM on the lamp module
73	Unable to access the EEPROM on the Back End Board
BACK END BOARD	
80	Unable to detect Back End Board
81	Unable to program a device on the programming bus
82	TI flash download failure – not started
83	TI flash download failure – partial write
84	TI flash download failure – checksum read
85	TI – I2C write failure
86	Communications failure
BACKPLANE or OPTIONAL INTERFACE MODULE	
A0	Unable to program the Option Card
A1	Unable to power the Option Card
A2	Unable to program the Backplane module
A3	Unable to program the Warp Module

Clear system errors with  . If you encounter a system error, try resetting the projector by powering it off and on again (wait at least 90 seconds and allow for proper cooling). For detailed information, monitor the RS232 IN port. Contact dealer/factory if error persists and if a code appears that is not listed.

Maintenance

4.1 Warnings and Safety Guidelines

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

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 as 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.
- ◇ If the projector is to be ceiling mounted, use only the Christie-approved ceiling mount fixture.

Lamps ➤ The two 300W P-VIP lamps in the projector require replacement when they have reached their end of life (approximately 1500 hours), if they have failed during operation, or have a drastic change in brightness (typical of aging lamps). To effectively maintain operation of the projector it is best to be aware of any changes that occur in brightness and the number of hours each lamp is in use. Refer to *4.4. Lamp Replacement* for more details on lamp replacement.

NOTE: These are mercury-containing lamps. Handle appropriately. Refer to Appendix G for the lamp product safety data sheet.

Follow all safety and warning precautions regarding lamp replacement and handling.

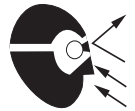


WARNING



Wait approximately 5 minutes to allow the lamp to cool before removing.

Do not stick hands into the lamp compartment during lamp replacement.



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 and/or powering down and unplugging the projector.

Use only the lamps supplied by CHRISTIE, in the *Lamp Replacement Kit*.

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. See *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 “poke” 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 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.

▲ WARNING

Never service the projector while it is still plugged in. There are exposed voltages that could cause severe physical injuries and possibly death. Always unplug the projector and wait 2 minutes to allow the capacitors on the power supply to discharge before removing the projector's covers.

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	How to clean
Lens	<i>As required</i>	<p>CLEAN: Clean if absolutely necessary. A small amount of dust on the lens has very little affect on picture quality.</p> <p>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.</p>
Lamp Module (300 W P-VIP)	<i>As required</i>	<p>CLEAN (front glass only): Clean if absolutely necessary. Never touch the glass surface of the lamp. Any oil (left by fingerprints) 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.</p> <p>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.</p>
	<i>1500 hours or sooner if required</i>	<p>REPLACE: Refer to 4.4 Lamp Replacement for instructions.</p>
Covers	<i>As required</i>	<p>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.</p>

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.

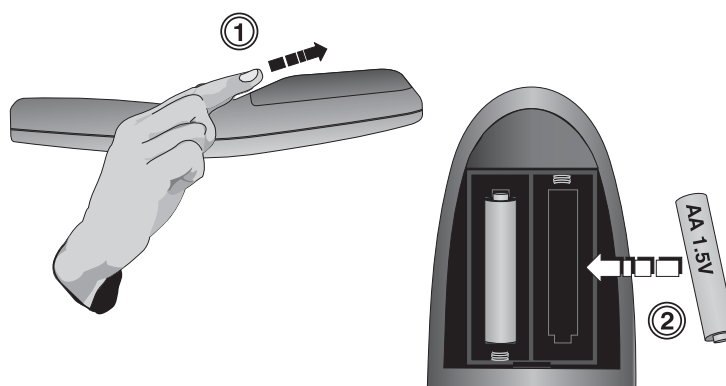


Figure 4.1. Replacing remote batteries

4.4 Lamp Replacement

The projector uses two 300W P-VIP lamps and can be operated with both lamps ON (Dual Lamp Operation mode) or with one lamp ON (Single Lamp Operation mode). The projector has the ability to automatically switch modes to maintain continuous operation.


When do I replace a lamp? Lamps that have shown a drastic reduction in brightness or have reached their end of life (approx 1500 hours) should be replaced immediately. You can check the number of hours each lamp has been in use by looking up the number of **LAMP HOURS** in individual lamp submenus or in the *Status* menu. From the *Lamp* menu, you can also set a **LAMP LIMIT** and enable the projector to send a warning message when it's powered on to indicate the lamps have reached their set limit.

At anytime during operation, you can check the status of a lamp by checking the lamp status in individual lamp submenus – *More, Lamp 1* or *More, Lamp 2*. You will see one of six states: “*Good*”, “*Cooling Fan #8 Failed*”, “*Cooling Fan #10 Failed*”, “*Interlock Tripped*”, “*Failed to Strike*”, “*Turned Off Unexpectedly*”, “*Color Wheel Stopped*”, “*Driver Vcc too Low*” or “*Lamp Not Installed*”. A status of “**Failed to Strike**” or “**Turned Off Unexpectedly**” indicates a failure that requires further investigation and may or may not be directly related to the lamp.

If you have ruled out the cause being an aged lamp or another component in the projector, it may indicate that your lamp has prematurely burned out or failed for some other reason (check status LEDs and/or error codes through RS-232, if possible). Burned out lamps or lamps that have failed due to some characteristic flaw should be replaced, as soon as possible.

In general, monitor the performance of your projector and replace lamps as needed.

To replace a lamp:

1. Press  to power down the projector and allow the lamp to cool for approximately 5 minutes after the fans have turned off before continuing with Step 2. If required, you can switch lamp modes and cut power to the lamp you want to replace without having to power down the projector and interrupt a presentation. Check the *Lamp* menu to ensure the lamp operation mode has been switched to the other lamp. Allow the lamp to cool sufficiently before continuing with Step 2.

NOTE: Opening a lamp door with a “live” lamp will cause the projector to automatically cut power to that lamp.

⚠ WARNING

Wait at least 5 minutes after powering down or switching lamp operation modes to allow the lamp to cool sufficiently before removing.

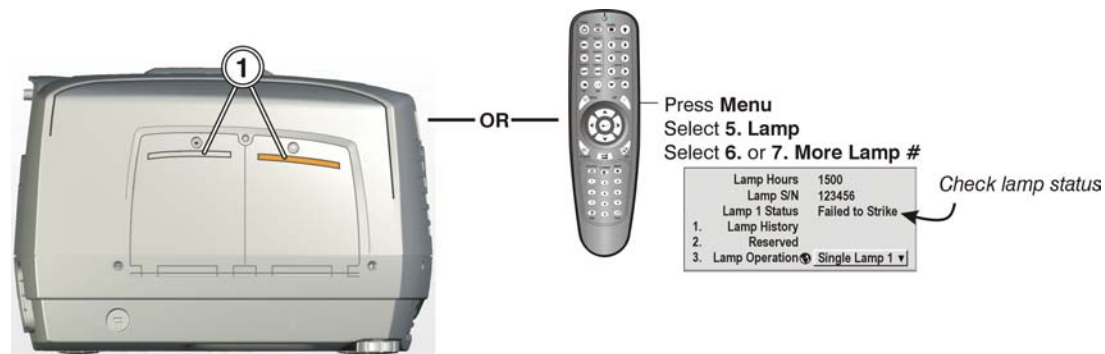


Figure 4.2.

2. Remove the single screw from the lamp door you want to open.
NOTE: The amber window on the door (Figure 4.2.) should be dim. If it “glows” then the lamp in this compartment is still on. Manually switch to the other single lamp operation mode to cut power to the lamp before replacing. (Figure 4.3)

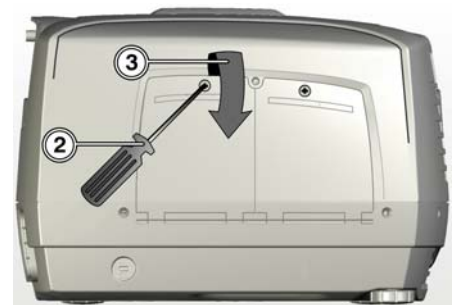


Figure 4.3.

3. Swing the lamp door open. (Figure 4.3.)
4. Using a screwdriver or fingers, turn the three lock screws on the lamp module counter-clockwise a quarter turn each to “unlock” it. (Figure 4.4.)
5. Using the two finger guides molded into the lamp housing, pull the lamp straight out of the projector. (Figure 4.4) The lamp module disconnects from the terminal block located at the back of the lamp compartment.

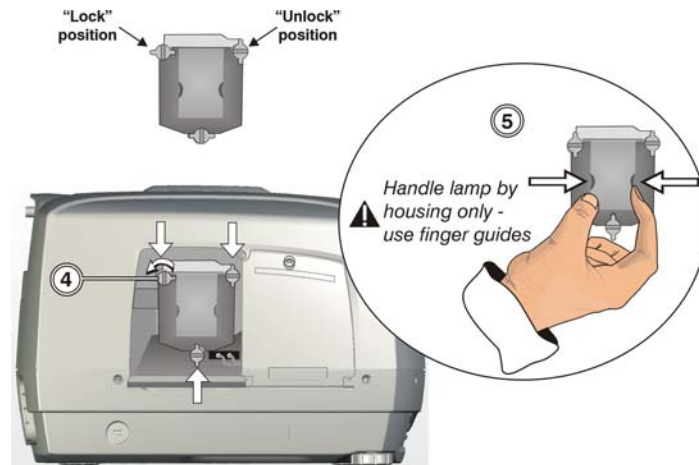


Figure 4.4.

6. Discard the lamp using approved disposal methods for your area. *NOTE: Lamps containing mercury must be treated as hazardous waste if discarded in large volumes.*

⚠ WARNING

Do not stick hands into an empty lamp compartment, especially if the other lamp is still on. The lamp compartment can become quite hot and cause physical injury.

7. On the new lamp module, turn the three lock screws to the “unlock” position before inserting it into the lamp compartment. Align the lamp with the three pins located at the back of the compartment. Insert the lamp all the way in until it is fully seated. (Figure 4.5)
8. Turn the three lock screws on the new lamp module clockwise a quarter turn to “lock” it in place. (See Figure 4.4 for lock screw position.)
9. Close the lamp door and tighten the screw to secure it in place.

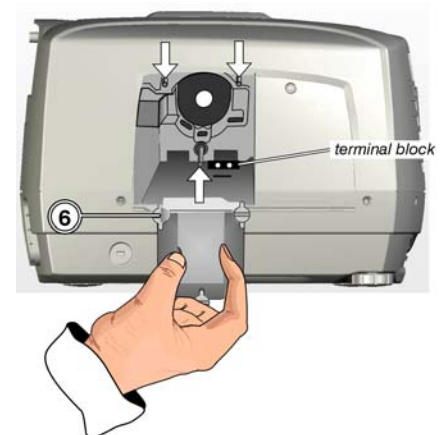


Figure 4.5.

NOTE: The projector automatically detects a new lamp and records the serial number in software the next time it's powered up. Manual entry of the serial number is not required.

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 to remove the lens plug from the lens opening in the projector and the protective end cap from the lens.*

1. Power down the projector and wait 5 minutes to allow the lamps 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.
3. **When removing the projection lens** - Press and hold the **LENS RELEASE** button located in the bottom right corner of the projector's front panel. Grasp the lens barrel with your free hand and turn it in a counter-clockwise direction until it can be removed from the projector. Release the **LENS RELEASE** button.

OR

When installing a projection lens, make sure Steps 1 and 2 are complete. Press the **LENS RELEASE** button with one hand and with the other hand slide the new lens into the lens opening in the projector – make sure you align the notch in the lens with the location of the alignment pin in the lens compartment. Turn the lens in a clockwise direction until it is fully installed. **NOTES:** 1) *There is a small alignment pin that is raised and lowered by the **LENS RELEASE** button. If this button is not fully depressed you will be unable to install or remove the lens.* 2) *Remove the protective end cap from any new lens before installing.*

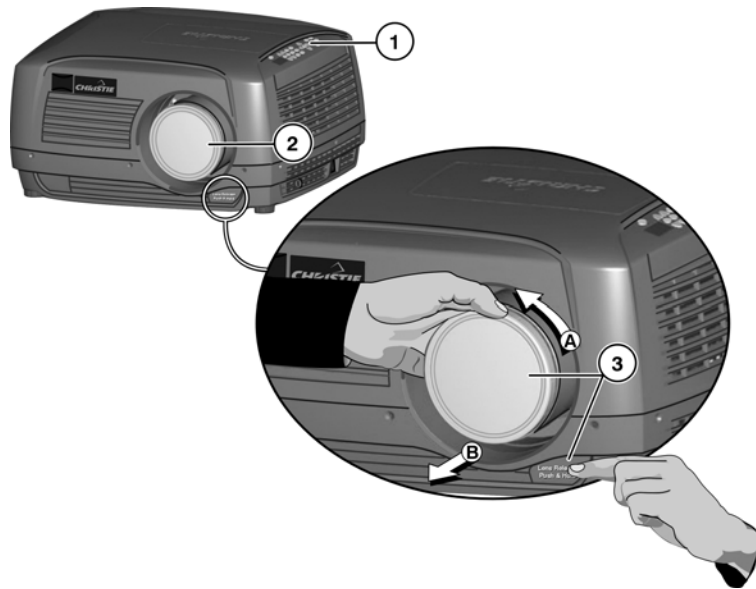


Figure 4.6.

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? It could take up to 3 attempts to strike a lamp. With a 90 second wait period in between each attempt it could take a total of 4.5 minutes to turn the lamp on. Check **LAMP STATUS**.
4. Is the correct input selected?
5. Is the source connected properly? Check the cable connections and make sure the correct source is selected.
6. Can you access test patterns? Make sure there is not a full black test pattern selected for display—press   to access test patterns, then cycle patterns with   keys.

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 may be set very low.
 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.

Symptom ➤ The display appears compressed (vertically stretched)...

- 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. If the screen blacks out inexplicably, it is 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. The color, tint, color space, color temperature and/or other settings may require adjustment.
 2. Make sure you are using the proper channel for this source.
 3. Check *Color Wheel Calibration*.

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.
 3. Check if Keystone is incorrectly set.

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 (75 Ω). 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 Lamps

For more information on lamp operation modes and auto-switching, refer to *Section 3 – 3.7 The Lamp Menu*.

Projector Delayed on Power Up

- 1. The projector enforces a 90 second delay between powering down and up again, because a hot lamp is more difficult to ignite. *NOTE: It can potentially take 2 minutes to cool a lamp sufficiently enough before re-striking it.*

Powered Up, But No Light On The Wall

- 1. It takes 25 seconds for the projector to power up and strike a lamp. One of the inherent properties of the lamp is that it may not strike with the first attempt. The projector will wait 90 seconds before trying to strike the lamp again. It will try a total of three times (4.5 minutes total) before it declares the lamp as “*Failed to Strike*” – check **LAMP STATUS**.
2. Make sure the shutter is OPEN.

Lamp Operation Mode Didn't Change

- 1. Did you request a lamp operation mode change during power up? The projector will ignore any commands sent during initialization. Wait for “ON” to appear in the LED status display window before entering a command.
2. The projector will not automatically switch to a single lamp operation mode if a lamp fails while in Dual Lamp mode. It will try to turn the lamp back on. It is recommended you switch to the single lamp mode for the lamp that is working if the projector fails to turn the second lamp on.
3. Check the status of the lamp. The lamp operation mode will not change if there is a lamp with an associated failure or lamp is not installed.
4. Make sure you have allowed enough time for the projector to turn a lamp on. This can take up to 4.5 minutes, as the projector will strike a lamp up to 3 times waiting 90 seconds in between each attempt. Only after a lamp is successfully turned on will the lamp operation mode change.

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.
3. 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.

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)

Brightness (typical)

Dual Lamp (White Boost ON)	6000 ANSI lumens
Dual Lamp (White Boost OFF)	3500 ANSI lumens
Single Lamp (White Boost ON)	3050 ANSI lumens
Single Lamp (White Boost OFF)	1800 ANSI lumens

Contrast Ratio

DS+60 (38-DSP006-xx) 1100:1 – 5000:1 full field *when using light shutter*

Brightness Uniformity

>90% across the screen

Colors and Gray Scale

Resolution 8 bits
Displayable Colors 64 million

Color Wheel

Type RGW80B

Color Temperature

Default 6300K±500K *with White Boost = 10*
6000K±500K *with White Boost = 0*
Range of Adjustment 3200K – 9600K

Lenses (optional) ➤

Lens Type	Part No.	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
0.8:1 fixed	38-809082-01	12%	+/-63	56%	+/-588	7%	+/-48	53%	+/-748
1.2:1 fixed	38-809083-01	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
1.3-1.7:1 zoom	38-809084-01	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
1.7-2.5:1 zoom	38-809085-01	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
2.5-4.0:1 zoom	38-809086-01	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246
4.0-7.0:1 zoom	38-809087-01	120%	+/-630	110%	+/-1155	78%	+/-546	89%	+/-1246

* 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 ➤ **Analog RGB or YPrPb (Interlaced or Progressive Scan Format)**

Horizontal Frequency Range	15 – 120 kHz
Vertical Frequency Range (See Note 1)	23.97 – 150 Hz
Pixel Clock Rate	13-210 MHz max
Signal Format	
Input Levels	R, G, B, - with sync: 1.0V _{p-p} ±2dB
	R, G, B, - without sync: 0.7V _{p-p} ±2dB
	Pb, Pr 0.7V _{p-p} ±2dB
DC Offset	±2V
Nominal Impedance	75 ohms

Note 1: 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.

Sync (Interlaced or Progressive Scan Format)

Horizontal Frequency Range	15 – 120 kHz
Vertical Frequency Range (See Note 1)	23.97 – 120 Hz
Sync Type	Separate H and V Composite (bi-level, tri-level, XOR) Sync-On-Green/luma (bi-level, tri-level) MarcoVision™ compatible
Polarity (See Note 2)	Positive or Negative
Input Levels (See Note 2)	0.5V _{pp} – 4.0V _{pp}
DC Offset (See Note 2)	±3V
Nominal Impedance (See Note 2)	75 ohms
Horizontal Sync Duty Cycle	3% min, 20% max

Note 2: 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: 1.0Vp-p ±3db (including sync tip)
	S-video luma (Y): 1.0Vp-p ±3dB (including sync tip)
	S-video chroma (C): 630mV nominal (burst)
DC Offset	±2V
Nominal Impedance	75 ohms
Return Loss (VSWR)	20dB min (1.2:1 max.) @ 6 MHz

DVI-I – Analog

Input Characteristics	Same as Analog RGB except as noted below.
Formats	RGB or YPbPr – video signal cannot be routed to the decoder.
Sync Types	Separate H and V (direct or swapped) Bi-level – TTL levels only Composite (XOR, OR) Sync-on-green Serrations and/or Equalization pulses MacroVision™ (standard & progressive)

DVI-I – Digital

Input Characteristics	meets DVI spec
DVI Cable Length	5m
EDID	Supported
HDCP (High Speed Digital Content Protection)	Supported

RS-232 Serial Input

Connector Type	1 male DB9 (RS-232 out) 1 female DB9 (RS-232 in)
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RS-422 Serial Input

Connector Type	1 female DB9 connector
----------------	------------------------

Network Control

Ethernet	1 RJ45 connector
Max. Baud Rate	115200

Remote Control

Type	IR with wired ability
Range	30 meters
Laser Pointer	Included
Battery Type (2 required)	AA, 1.5V Alkaline

Wired Control

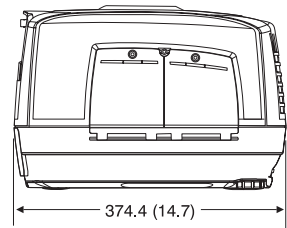
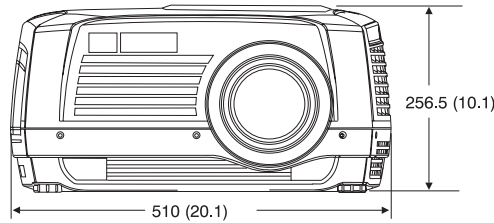
Connector Type	3.5mm plug
Input Levels	High: 2.2V min. Low: 0.9V max. Power: 500mA @ 5V

Power Requirements ➤ **▲ General**

Voltage Range	100 – 240 VAC nominal
Line Frequency	50 Hz – 60 Hz nominal
Max. Inrush Current	68 A
Current Rating	Both lamps on - 8.4A @ 100V (typical), 3.5A @ 240V (typical) One lamp on - 4.8A @ 100V (typical), 2.0A @ 240V (typical)
Power Consumption	Both lamps on - 840W nominal One lamp on - 480W nominal

Lamps ➤ Type	OSRAM 300W P-VIP®
Power	300 Watts
Operating Position	± 20 deg. tilt from horizontal plane
Warm up to full brightness	5 minutes
Lamp Life (typical)	1500 hours per lamp

Size and Weight ➤ Dimensions (L x W x H) 374mm x 510mm x 256mm
 14.7" x 20.1" x 10.1"
 Weight 36 lbs



Dimensions: mm (inches)

Safety ➤ CAN/CSA C22.2 No. 60950-00
 ANSI/UL 60950 3rd Edition
 EN60950, 2000 European Norm, Safety of Information Technology Equipment
 China Compulsory Certificate (CCC)
 FDA

EMI ➤ **Emissions**
 FCC Code of Federal Regulations, Title 47, Part 15, Conducted and Radiated Emissions, Class A
 EN55022 (CISPR 22) for Information Technology Equipment, Conducted and Radiated, Class A
 EN61000-3-2 Induced Harmonic Distortion
 EN61000-3-3 Induced Voltage Fluctuations (Flicker)
Immunity
 EN55024, specific to Information Technology Equipment (all parts), under which are:
 EN61000-4-2 ESD,
 EN61000-4-3 Radiated Immunity,
 EN61000-4-4 Fast Transient/Burst Immunity
 EN61000-4-5 Surge Immunity,
 EN61000-4-6 Immunity to Conducted Disturbances,
 EN61000-4-8 Magnetic Field Immunity,
 EN61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations Immunity

Operating Environment ➤ Temperature 10°C to 35°C
 Humidity 20% to 90%
 Altitude 0m to 3050m

Non-Operating Environment ➤ Temperature -20°C to 70°C
 Humidity 5% to 95%
 Altitude 0m to 9144 m

Standard Components ➤ IR remote keypad (with batteries)
Wired remote control cable
Line Cords (North American and European)
Computer cable (Dsub15 to DVI-I)
DVI-I cable
S-video cable
User's Manual

Optional Accessories ➤ Kore™ 10-bit Librarian for downloading new software
Ceiling Mount
Stacking Kit
Shipping Case
Service manual

Lenses (SXGA+)

0.8:1 fixed (38-809082-01)
1.2:1 fixed (38-809083-01)
1.3-1.7:1 zoom (38-809084-01)
1.7-2.5:1 zoom (38-809085-01)
2.5-4.0:1 zoom (38-809086-01)
4.0-7.0:1 zoom (38-809087-01)

Optional Input Modules

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

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.
- Color Wheel** ➤ An optical component, the color wheel is made up of red, green and blue and sometimes white segments. The light generated by the lamp is sequentially filtered by the color wheel (as it’s spinning) into R, G, B color primaries and passed to the DMD which then creates an image for each color.
- 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.

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- 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.
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- 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.
- 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.
- Loophrough (Loophru)** ➤ 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: *Foot-lambert*.
- 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 Aperture** ➤ Commonly called an iris, the optical aperture when adjusted affects true contrast.
- 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.

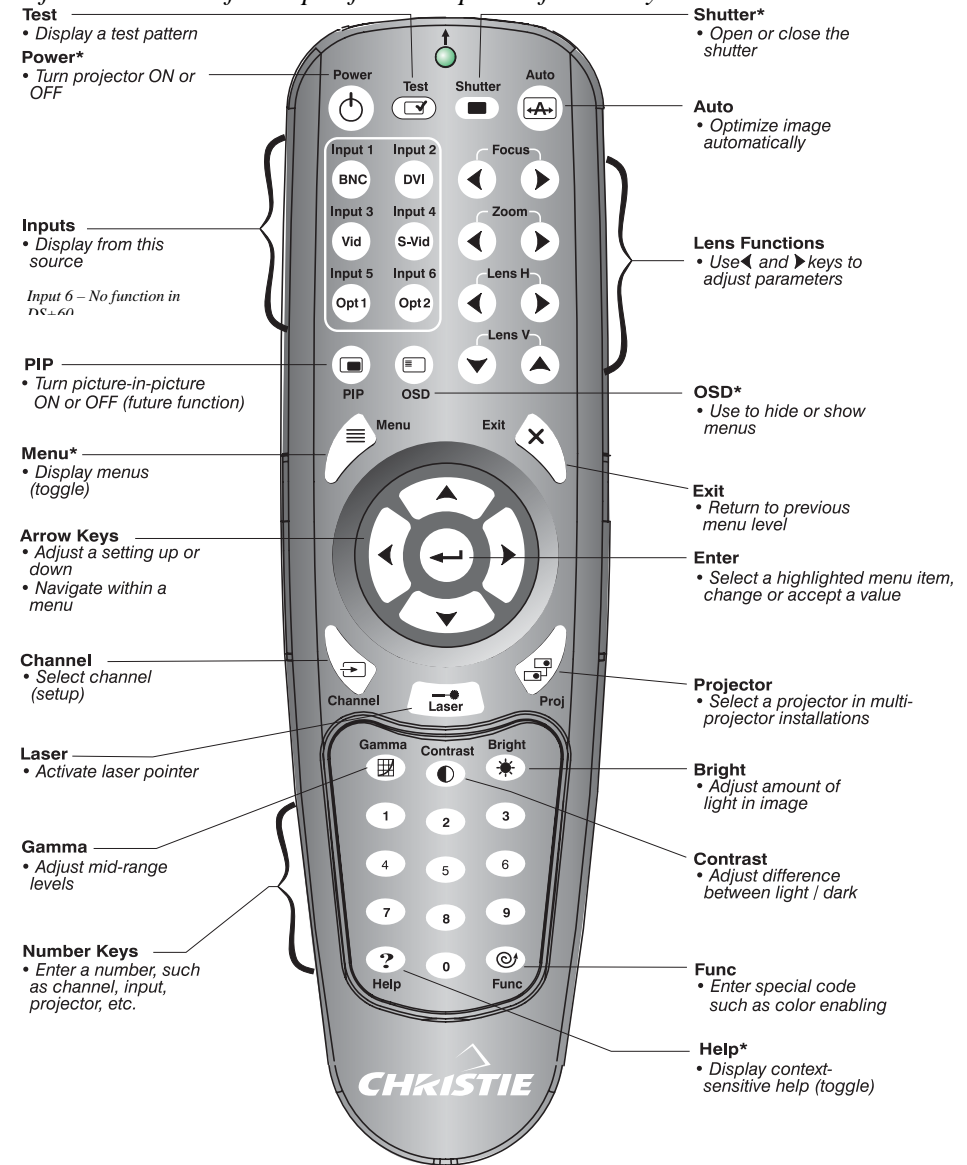
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- PAL Video** ➤ PAL (Phase Alternating Line) video is a 50 Hz standard with 768 x 576 resolution. It is found on some video tape and disk players (used primarily in Europe, China and some South American and African countries).
- Pixel** ➤ The smallest 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).
- 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 75Ω 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 Boost** ➤ White Boost is an option that enables the recapture of some of the lost light from the transition between each segment in the color wheel.
- 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.

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.



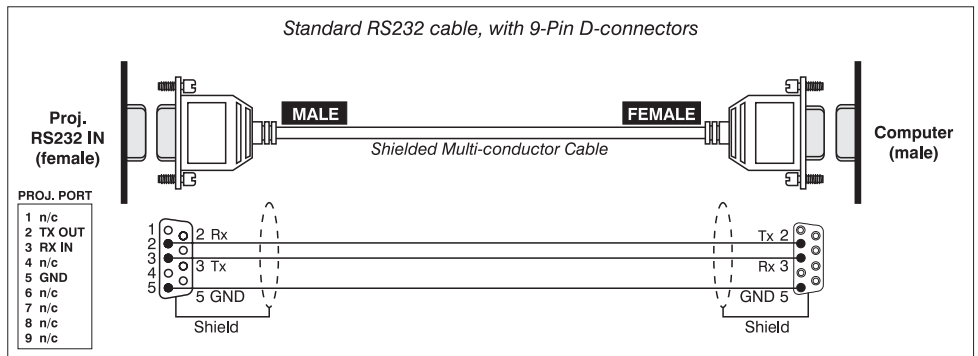
* These are toggle keys which require you to press and hold or press twice or use with the up/down arrow keys. Refer to the description of these keys and others in Section 3. **NOTE:** To turn the OSD off you must press  and .

Serial Communication Cables

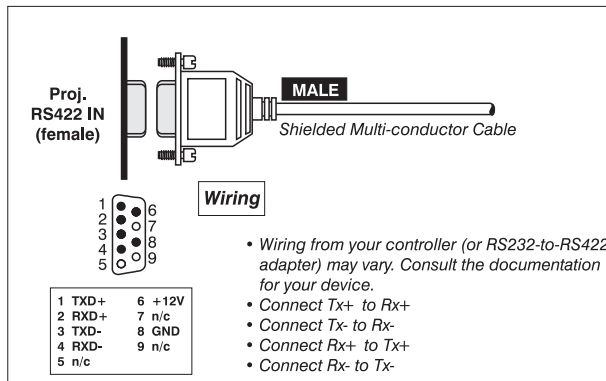
A serial link of RS232 or RS422 enables ASCII communication with the projector so that it can be controlled remotely from a PC or other controller. From a PC, connect a standard 9-wire RS232 serial cable to the **RS232 IN** port. Or, for long-distance (>100 ft.) links with an RS422-compatible PC or controller, connect RS422 cable to the **RS422** port.

□ **From projector to computer (RS232)**

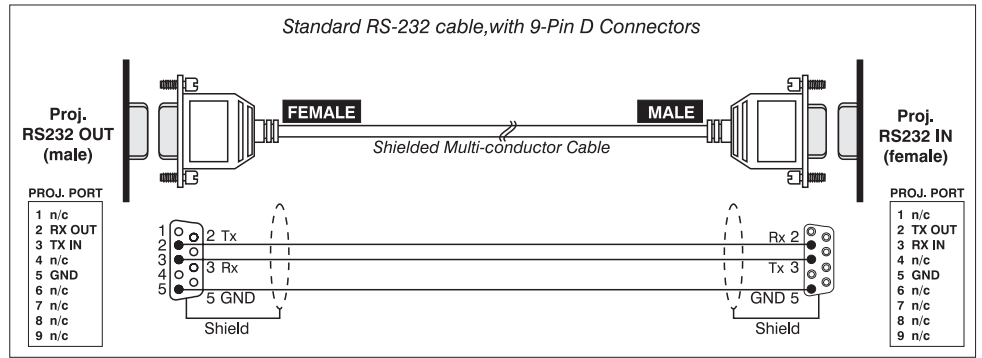
For computers having a 9-pin "AT" type serial port



□ **From projector to RS422 compatible computer**



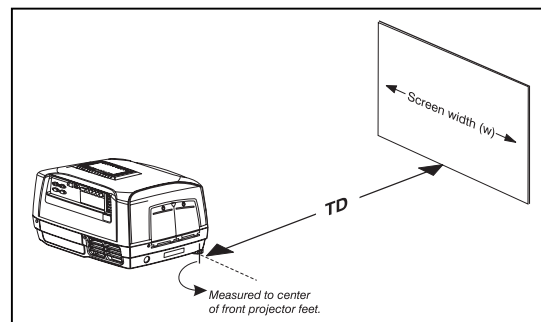
□ From projector to projector



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 the perpendicular distance from the screen to the place 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 $\pm 5\%$.

Table D-1 Throw Distance Formulas

Lens Throw Ratio	Throw Distance Formula (+/-5%) (cm)	Screen Widths ** (cm)	
		Min.	Max.
0.8 (fixed)	$.84*W+1.53$	51	289
1.2 (fixed)	$1.24*W+3.53$	79	1208
1.3-1.7 (zoom)	Min. $1.34*W-1.20$ Max. $1.75*W-1.07$	69	1114
1.7-2.5 (zoom)	Min. $1.73*W-3.21$ Max. $2.49*W-0.40$	110	862
2.5-4.0 (zoom)	TBD	73	1150
4.0-7.0 (zoom)	TBD	95	973

** data preliminary

Where:

TD = projector distance from the screen to the center of the projector's front feet.

W = screen (image) width (cm)

NOTE: Quick reference throw distance charts are provided on the following pages.

0.8:1 Fixed Lens					
Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
25	64	20	51	17	44
37	95	30	76	26	66
45	114	36	91	31	78
52	133	42	107	36	91
60	152	48	122	41	104
67	171	54	137	46	117
75	191	60	152	51	130
82	210	66	168	56	142
90	229	72	183	61	155
97	248	78	198	66	168
105	267	84	213	71	181
112	286	90	229	76	194
120	305	96	244	81	206
127	324	102	259	86	219
135	343	108	274	91	232
142	361	114	289	96	244

Throw Distance Formula

$$TD = (0.84 \times W) + 1.53$$

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.

1.2:1 Fixed Lens					
Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
39	99	31	79	40	101
45	114	36	91	46	117
52	133	42	107	53	136
60	152	48	122	61	155
67	171	54	137	68	174
75	191	60	152	76	193
82	210	66	168	83	211
90	229	72	183	91	230
97	248	78	198	98	249
105	267	84	213	106	268
112	286	90	229	113	287
120	305	96	244	120	306
127	324	102	259	128	325
135	343	108	274	135	344
142	362	114	290	143	363
150	381	120	305	150	381
157	400	126	320	158	400
165	419	132	335	165	419
172	438	138	351	173	438
180	457	144	366	180	457
187	476	150	381	187	476
195	495	156	396	195	495
202	514	162	411	202	514
210	533	168	427	210	533
217	552	174	442	217	552
225	572	180	457	225	570
232	591	186	472	232	589
240	610	192	488	239	608
247	629	198	503	247	627
255	648	204	518	254	646
262	667	210	533	262	665
270	686	216	549	269	684
277	705	222	564	277	703
285	724	228	579	284	722
292	743	234	594	292	741
300	762	240	610	299	759
307	781	246	625	306	778
315	800	252	640	314	797
322	819	258	655	321	816
330	838	164	671	329	835
337	857	270	686	336	854
345	876	276	701	344	873
352	895	282	716	351	892
360	914	288	732	359	911
367	933	294	747	366	930
375	953	300	762	373	948
382	972	306	777	381	967
390	991	312	792	388	986
397	1010	318	808	396	1005
405	1029	324	823	403	1024
412	1048	330	838	411	1043
427	1086	342	869	425	1081
435	1105	348	884	433	1100
592	1505	474	1204	589	1496
600	1524	480	1219	597	1515

Throw Distance Formula

$$TD = (1.24 \times W) + 3.53$$

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.

1.3-1.75 Zoom Lens					
Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
39	99	31	79	41	105
45	114	36	91	48	121
52	133	42	107	56	142
60	152	48	122	64	162
67	171	54	137	72	183
75	191	60	152	80	203
82	210	66	168	88	223
90	229	72	183	96	244
97	248	78	198	104	264
105	267	84	213	112	285
112	286	90	229	120	305
120	305	96	244	128	326
127	324	102	259	136	346
135	343	108	274	144	366
142	362	114	290	152	387
150	381	120	305	160	407
157	400	126	320	168	428
165	419	132	335	176	448
172	438	138	351	184	468
180	457	144	366	192	489
187	476	150	381	201	509
195	495	156	396	209	530
202	514	162	411	217	550
210	533	168	427	225	571
217	552	174	442	233	591
225	572	180	457	241	611
232	591	186	472	249	632
240	610	192	488	257	652
247	629	198	503	265	673
255	648	204	518	273	693
262	667	210	533	281	714
270	686	216	549	289	734
277	705	222	564	297	754
285	724	228	579	305	775
292	743	234	594	313	795
300	762	240	610	321	816
307	781	246	625	329	836
315	800	252	640	337	857
322	819	258	655	345	877
330	838	264	671	353	897
337	857	270	686	361	918
345	876	276	701	369	938
352	895	282	716	377	959
360	914	288	732	385	979
367	933	294	747	393	999
375	953	300	762	402	1020
382	972	306	777	410	1040
390	991	312	792	418	1061
397	1010	318	808	426	1081
405	1029	324	823	434	1102
412	1048	330	838	442	1122
424	1077	339	862	454	1154

MINIMUM ZOOM

Throw Distance Formula

$$TD = (1.34 \times W) - 1.20$$

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.

1.3-1.75 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
39	99	31	79	54	137
45	114	36	91	63	159
52	133	42	107	73	186
60	152	48	122	84	212
67	171	54	137	94	239
75	191	60	152	105	266
82	210	66	168	115	292
90	229	72	183	126	319
97	248	78	198	136	346
105	267	84	213	147	372
112	286	90	229	157	399
120	305	96	244	168	426
127	324	102	259	178	452
135	343	108	274	189	479
142	362	114	290	199	506
150	381	120	305	210	532
157	400	126	320	220	559
165	419	132	335	231	586
172	438	138	351	241	612
180	457	144	366	252	639
187	476	150	381	262	666
195	495	156	396	273	692
202	514	162	411	283	719
210	533	168	427	294	746
217	552	174	442	304	772
225	572	180	457	315	799
232	591	186	472	325	826
240	610	192	488	336	852
247	629	198	503	346	879
255	648	204	518	357	906
262	667	210	533	367	932
270	686	216	549	378	959
277	705	222	564	388	986
285	724	228	579	399	1012
292	743	234	594	409	1039
300	762	240	610	420	1066
307	781	246	625	430	1092
315	800	252	640	441	1119
322	819	258	655	451	1146
330	838	264	671	462	1172
337	857	270	686	472	1199
345	876	276	701	483	1226
352	895	282	716	493	1252
360	914	288	732	504	1279
367	933	294	747	514	1306
375	953	300	762	525	1332
382	972	306	777	535	1359
390	991	312	792	546	1386
397	1010	318	808	556	1412
405	1029	324	823	567	1439
412	1048	330	838	577	1466
424	1077	339	862	593	1507

MAXIMUM ZOOM

Throw Distance Formula

$$TD = (1.75 \times W) - 1.07$$

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.

1.7-2.5 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
54	54	43	110	74	187
60	60	48	122	82	208
67	67	54	137	92	234
75	75	60	152	103	260
82	82	66	168	113	287
90	90	72	183	123	313
97	97	78	198	134	340
105	105	84	213	144	366
112	112	90	229	154	392
120	120	96	244	165	419
127	127	102	259	175	445
135	135	108	274	186	471
142	142	114	290	196	498
150	150	120	305	206	524
157	157	126	320	217	550
165	165	132	335	227	577
172	172	138	351	237	603
180	180	144	366	248	630
187	187	150	381	258	656
195	195	156	396	269	682
202	202	162	411	279	709
210	210	168	427	289	735
217	217	174	442	300	761
225	225	180	457	310	788
232	232	186	472	321	814
240	240	192	488	331	840
247	247	198	503	341	867
255	255	204	518	352	893
262	262	210	533	362	920
270	270	216	549	372	946
277	277	222	564	383	972
285	285	228	579	393	999
292	292	234	594	404	1025
300	300	240	610	414	1051
307	307	246	625	424	1078
315	315	252	640	435	1104
322	322	258	655	445	1130
330	330	264	671	455	1157
337	337	270	686	466	1183
345	345	276	701	476	1210
352	352	282	716	487	1236
360	360	288	732	497	1262
367	367	294	747	507	1289
375	375	300	762	518	1315
382	382	306	777	528	1341
390	390	312	792	538	1368
397	397	318	808	549	1394
405	405	324	823	559	1421
412	412	330	838	570	1447
424	424	339	862	586	1488

MINIMUM ZOOM

Throw Distance Formula

$$TD = (1.73 \times W) - 3.21$$

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.

1.7-2.5 Zoom Lens

Image Diagonal		Image Width (W)		Throw Distance (TD)	
Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)	Inches(in.)	Centimeters (cm)
54	138	43	110	108	274
60	152	48	122	119	303
67	171	54	137	134	341
75	191	60	152	149	379
82	210	66	168	164	417
90	229	72	183	179	455
97	248	78	198	194	493
105	167	84	213	209	531
112	186	90	229	224	569
120	305	96	244	239	607
127	324	102	259	254	645
135	343	108	274	269	683
142	362	114	290	284	721
150	381	120	305	299	759
157	400	126	320	314	796
165	419	132	335	329	834
172	438	138	351	343	872
180	457	144	366	358	910
187	476	150	381	373	948
195	495	156	396	388	986
202	514	162	411	403	1024
210	533	168	427	418	1062
217	552	174	442	433	1100
225	572	180	457	448	1138
232	591	186	472	463	1176
240	610	192	488	478	1214
247	629	198	503	493	1252
255	648	204	518	508	1290
262	667	210	533	523	1328
270	686	216	549	538	1366
277	705	222	564	553	1404
285	724	228	579	568	1442
292	743	234	594	583	1480
300	762	240	610	597	1518
307	781	246	625	612	1555
315	800	252	640	627	1593
322	819	258	655	642	1631
330	838	264	671	657	1669
337	857	270	686	672	1707
345	876	276	701	687	1745
352	895	282	716	702	1783
360	914	288	732	717	1821
367	933	294	747	732	1859
375	953	300	762	747	1897
382	972	306	777	762	1935
390	991	312	792	777	1973
397	1010	318	808	792	2011
405	1029	324	823	807	2049
412	1048	330	838	822	2087
424	1077	339	862	845	2146

MAXIMUM ZOOM

Throw Distance Formula

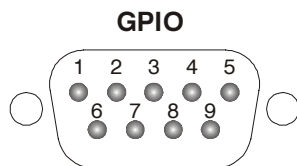
$$TD = (2.49 \times W) - 0.40$$

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.

System Integration

The GPIO 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 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 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! "HLLHLH" "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

Example 2. Projector powers up when a switch on the external device is turned on.

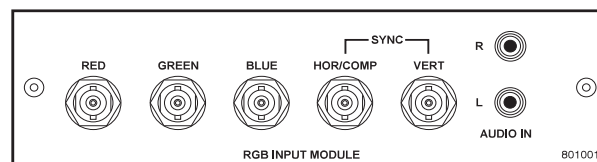
- (GIO C2 I) *Set pin #2 configuration as input*
- (RTE G 2 H "(PWR 1)") *Power on when pin #2 set to high*
- (RTE G 2 L "(PWR 0)") *Power off when pin #2 set to low*

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.

NOTE: Always unplug the projector or switcher before installing or removing any optional input module.

- RGB500 Input Module** ➤ 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.

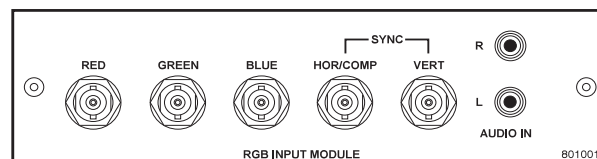


RGB500 Features

- ◇ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync), up to 500 MHz bandwidth
- ◇ BNC connectors for RGB signal inputs

NOTE: The audio connectors are not functional.

- RGB400BA Input Module** ➤ 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.



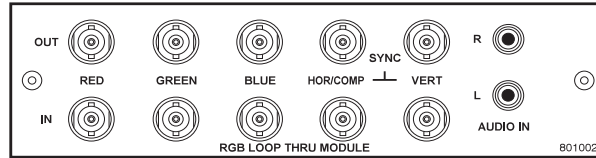
RGB400BA Features

- ◇ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- ◇ 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.



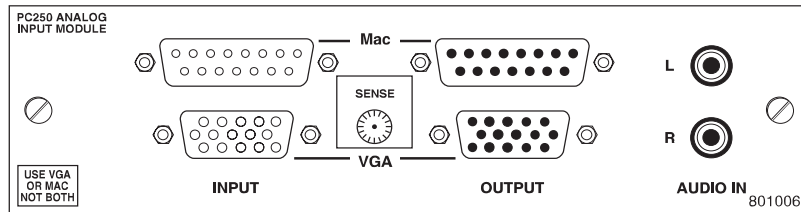
RGB400ALT Features

- ◇ accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- ◇ 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.

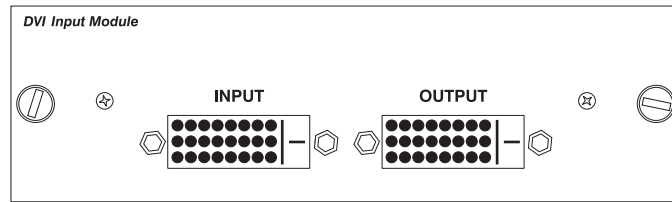


PC250 Analog Features

- ◇ 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.

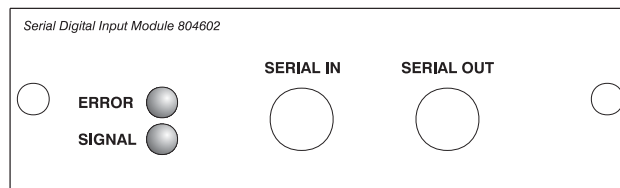
- **DVI Input Module 38-804635-xx** This module can display digital video input signals conforming to the DVI (Digital Visual Interface) single-channel standard.



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)

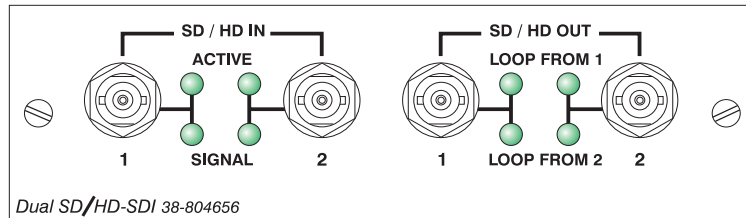
- **Serial Digital Input Module 38-804602-xx** This module accepts a serial digital 4:2:2 component video signal (YCbCr) via a single **SERIAL IN** BNC connector. The signal can loop through the **SERIAL OUT** BNC out to another device (such as another projector). Inputs are 75Ω terminated.



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

- **Dual SD/HD-SDI Module 38-804856-xx** The *Dual SD/HD-SDI Module* enables incoming serial digital 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

300W P-VIP® Product Safety Data Sheet

PRODUCT SAFETY DATA SHEET (PSDS) for VIP® Videoprojection lamps



OSRAM High Pressure Mercury Discharge Lamps, manufactured by OSRAM GmbH, are exempted from the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) because they are “articles.” The following information is provided by OSRAM GmbH as a courtesy to its customers.

I. PRODUCT IDENTIFICATION

Trade Name (as labeled): OSRAM VIP Super High Pressure Mercury Discharge Lamp

This data sheet covers the following models:

P-VIP 300/1.3 E21.8

Manufacturer:
OSRAM GmbH
Hellabrunner Strasse 1
81536 Munich
Germany

For General Information and for technical inquiries:
OSRAM GmbH
FOMS/KAM
13625 Berlin
Germany

II. HAZARDOUS INGREDIENTS

THERE ARE NO KNOWN HEALTH HAZARDS FROM EXPOSURE TO LAMPS THAT ARE INTACT.
The following information is for the arc-tube portion of the bulb only, and does not include materials used in the reflector or base. If the lamp is broken, the following materials may be released:

Chemical Name	CAS Number	% by wt.	Exposure Limits in Air (mg/cubic m)	
			ACGIH (TLV)	OSHA (PEL)
^(1,2) Mercury	7439-97-6	<0.125	0.025	0.1 Ceiling
Quartz, Fused	60676-86-0	<20	0.1 Resp. Dust	0.1
Tungsten	7440-33-7	1-2	---	---
(Insoluble compounds)			5	10
Molybdenum	7439-98-7	1-2	---	---
(Insoluble compounds)			10	15
⁽¹⁾ Nickel	7440-02-0	<0.2	0.05	1

(1) These chemicals are subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

(2) The mercury in this product is one of the substances known to the state of California to cause reproductive toxicity if ingested. [California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).]

III. PHYSICAL PROPERTIES

Not applicable to intact lamp.

Product Safety Data Sheet for OSRAM Videoprojection Lamps

IV. FIRE & EXPLOSION HAZARDS

Flammability: ignition temperature of front-cap material: 595°C

Fire Extinguishing Materials: Use extinguishing agents suitable for surrounding fire, such as water spray, foam, dry powder, or CO₂.

Special Firefighting Procedure: Use a self-contained breathing apparatus to prevent inhalation of dust and/or fumes that may be generated from broken lamps during firefighting activities.

Unusual Fire and Explosion Hazards: When exposed to high temperature, toxic fumes may be released from broken lamps.

Fire Fighting Protective Equipment: A self-contained breathing apparatus and suitable protective clothing should be worn in fire conditions.

Hazardous Decomposition Products: CO, CO₂

V. HEALTH HAZARDS

A. OPERATING LAMPS

Consult the OSRAM GmbH product catalog or technical data sheets for complete warnings, operating and installation guides for specific bulb types.

WARNING:

- This VIP lamp operates at high pressure and at high temperature and may unexpectedly shatter.
- This VIP lamp generates ultraviolet radiation which may cause skin and eye irritation with prolonged exposure.
- This VIP lamp must be operated only in suitably designed, enclosed fixtures which prevent direct observation of the arc and will prevent lamp fragments from exiting, in the unlikely event of a lamp rupture.

B. LAMP MATERIALS

THERE ARE NO KNOWN HEALTH HAZARDS FROM EXPOSURE TO LAMPS THAT ARE INTACT. No adverse effects are expected from occasional exposure to broken lamps. As a matter of good practice, avoid prolonged or frequent exposure to broken lamps unless there is adequate ventilation. The major hazard from broken lamps is the possibility of sustaining glass cuts.

NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards and/or NIOSH Pocket Guide to Chemical Hazards lists the following effects of overexposure to the chemicals/materials tabulated below when they are inhaled, ingested, or contacted with skin or eye:

Mercury - Exposure to high concentrations of vapors for brief periods can cause acute symptoms such as pneumonitis, chest pains, shortness of breath, coughing, gingivitis, salivation and possibly stomatitis. May cause redness and irritation as a result of contact with skin and/or eyes.

Quartz, Fused - Fibrosis of the lungs causing shortness of breath and coughing has been associated with silica exposure.

Tungsten - Inhalation of dust may cause mild irritation of nose and throat. Contact may cause mechanical irritation of skin and eyes.

Molybdenum - Oxides have caused irritation to the eyes, nose, and throat; weight loss and digestive disturbances in experimental animals.

Nickel - Skin contact may cause an allergic rash. Inhaled dust of nickel and its compounds have been reported to cause cancer of the lungs and sinuses. Nickel itself is not very toxic if swallowed, but its soluble salts are quite toxic and, if swallowed, may cause giddiness and nausea.

Product Safety Data Sheet for OSRAM Videoprojection Lamps

EMERGENCY AND FIRST AID PROCEDURES

Glass Cuts: Perform normal first aid procedures. Seek medical attention as required.

Inhalation: If discomfort, irritation or symptoms of pulmonary involvement develop, remove from exposure and seek medical attention.

Ingestion: Seek medical attention.

Contact, Skin: Thoroughly wash affected area with mild soap or detergent and water and prevent further contact. Seek medical attention if irritation occurs. The molten polymer of the front cap adheres to the skin and causes severe burns. Do not try to remove molten polymer from the skin. Cool with water immediately.

Contact, Eye: Wash eyes, including under eyelids, immediately with copious amounts of water for 15 minutes. Seek medical attention.

CARCINOGENIC ASSESSMENT (NTP ANNUAL REPORT, IARC MONOGRAPHS, OTHER):

Nickel was identified as a known or suspected carcinogen by NTP and/or IARC.

VI. REACTIVITY DATA

Stability: Stable, front cap material degrades at temperatures above 460°C.

Conditions to avoid: None for intact lamps.

Incompatibility (materials to avoid): None for intact lamps.

Hazardous Decomposition Products (including combustion products): CO, CO₂.

Hazardous Polymerization Products: Will not occur.

VII. PROCEDURES FOR DISPOSAL OF LAMPS

If lamps are broken, ventilate area where breakage occurred. Clean-up with mercury vacuum cleaner or other suitable means that avoids dust and mercury vapor generation. Take usual precautions for collection of broken glass. Place materials in closed containers to avoid generating dust and mercury vapor.

It is the responsibility of the waste generator to ensure proper classification of waste products. To that end, TCLP tests should be conducted on all waste products, including this one, to determine the ultimate disposition in accordance with applicable federal, state and local regulations.

VIII. SPECIAL HANDLING INFORMATION - FOR BROKEN LAMPS

Ventilation: Use adequate general and local exhaust ventilation to maintain exposure levels below the PEL or TLV limits. If such ventilation is unavailable, use respirators as specified below.

Respiratory Protection: Use appropriate NIOSH approved respirator if airborne dust concentrations exceed the pertinent PEL or TLV limits. All appropriate requirements set forth in 29 CFR 1910.134 should be met.

Eye Protection: OSHA specified safety glasses, goggles or face shield are recommended if lamps are being broken.

Protective Clothing: OSHA specified cut and puncture-resistant gloves are recommended for dealing with broken lamps.

Hygienic Practices: After handling broken lamps, wash thoroughly before eating, smoking or handling tobacco products, applying cosmetics or using toilet facilities.

Although OSRAM attempts to provide current and accurate information herein, it makes no representations regarding the accuracy or completeness of the information and assumes no liability for any loss, damage or injury of any kind which may result from, or arise out of, the use of/ or reliance on the information by any person.

Issue Date: March, 2004

Revision: 1.0

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