DIGITAL PROJECTION

E-Vision 6900 Series

High Brightness Digital Video Projector

- INSTALLATION AND QUICK-START GUIDE
- CONNECTION GUIDE
- OPERATING GUIDE
- REFERENCE GUIDE

Rev A February 2017
118-049A

About This Document

Please follow the instructions in this manual carefully to ensure safe and long-lasting use of the projector.

Keep this manual handy for future reference.

Symbols used in this manual

Many pages in this document have a dedicated area for notes. The information in that area is accompanied by the following symbols:

ELECTRICAL WARNING: this symbol indicates that there is a danger of electrical shock unless the instructions are closely followed.

WARNING: this symbol indicates that there is a danger of physical injury to yourself and/or damage to the equipment unless the instructions are closely followed.

NOTE: this symbol indicates that there is some important information that you should read.

Product revision

Because we at Digital Projection continually strive to improve our products, we may change specifications and designs, and add new features without prior notice.

Legal notice

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Notes

Introduction

Congratulations on your purchase of this Digital Projection product.

Your projector has the following key features:

- Support for Side by Side, Frame Packing, Frame Sequential and Top Bottom 3D formats.
- HDBaseT® for reception of uncompressed High Definition Video up to 100 m from the source.
- Swappable color wheels for high brightness and color critical applications.
- DynamicBlack™ for improved black levels in dark scenes.
- Independent control of hue, saturation and gain for primary and secondary colors.
- Vertical and horizontal keystone correction.
- Control via LAN and RS232.
- Motorized lens mount.

A serial number is located on the product label. Please record it here:

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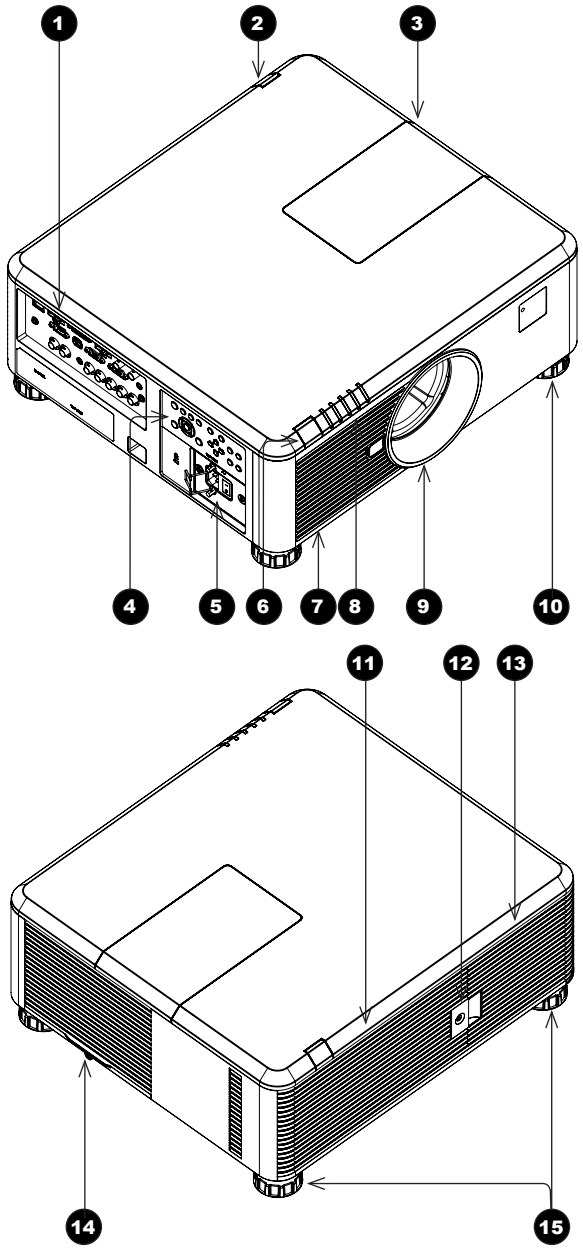
Projector Overview

Front and rear views

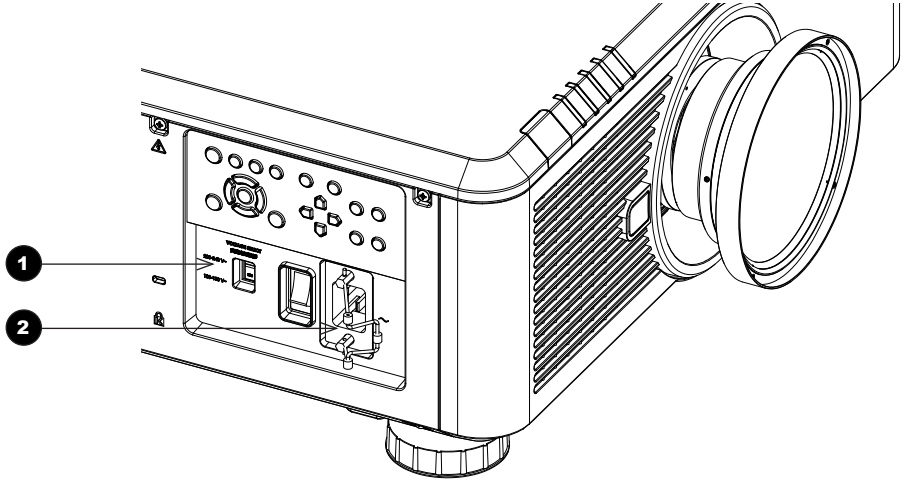


1. Connection panel
2. Rear infrared window
3. Color wheel door
4. Control panel
5. Power switch and power connection
6. Front infrared window
7. Air inlet
8. Indicators
9. Lens mount
10. Adjustable foot
11. Lamp compartment with air outlets
12. Lamp compartment door
13. Air outlet
14. Air inlet and filter
15. Adjustable feet

Notes

Connecting The Power Supply

Adjust the ***VOLTAGE SELECT switch*** 1 to the required voltage, then firmly push the mains connector into the ***socket*** 2.



Voltage selection

The VOLTAGE SELECT switch must be set to match the power supply you are using:

Voltage of power supply used	Position of VOLTAGE SELECT switch
AC 100 - 130 V outlet	200 240V~ 100 130V~
AC 200-240 V (single phase) outlet	200 240V~ 100 130V~

Notes

Use only the power cable provided.

Ensure that the power outlet includes a ground connection as this equipment MUST be earthed.

Handle the power cable carefully and avoid sharp bends. Do not use a damaged power cable.

Remote Control

1 **Power ON / OFF**
Turns power on and off.

2 **Pic Mute ON / OFF**
Shows and hides the projected image.
When OFF, the light source is completely switched off and the screen is black.

2 **OSD ON / OFF**
Enable and disable screen timeout messages and control whether to show the OSD during projection.

4 **MENU**
Access the OSD. If the OSD is open, press this button to go back to the previous menu.

5 **Navigation (arrows and OK)**
Navigate through the menus with the arrows, confirm your choice with **OK**.
In lens adjustment modes, the arrows are used to move, zoom or focus the lens. See ***11*** below.
In lens adjustment modes, or when the OSD is not showing, the **OK** button switches between modes: ***Shift Adjustment*** and ***Zoom / Focus Adjustment***.

6 **EXIT**
Go up one level in the OSD. When the top level is reached, press to close the OSD.

7 **FREEZE**
Freeze the current frame.

8 **DEFAULT**
When editing a parameter, press this button to restore the default value.

9 **INFO**
Access information about the projector.

10 **RE-SYNC**
Re-synchronise with the current input signal.

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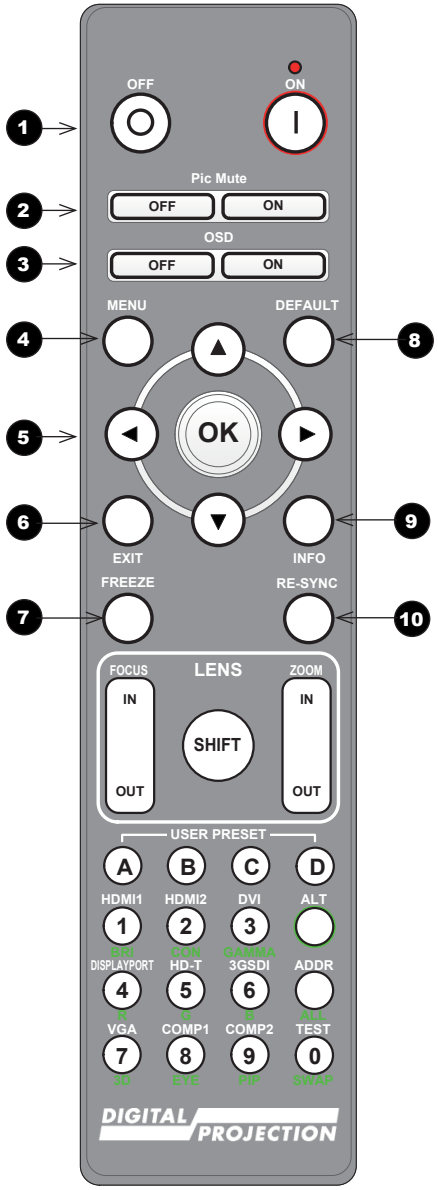

Notes

11 **LENS adjustment**
FOCUS IN / OUT: adjust focus.
SHIFT: press and hold this button, then use the Navigation arrow buttons to move the lens.
ZOOM IN / OUT: adjust zoom.

12 **USER PRESET A, B, C, D**
This featrure is not supported.

13 **ALT**
Press and hold this button to access alternative functions for all buttons with a green label.

14 **DVI / GAMMA / numeric input 3**
Select the DVI input.
Use with **ALT** to switch to the next **Gamma** value:
...1.0, 1.8, 2.0, 2.2, 2.35, 2.5...

15 **HDMI 2 / CON / numeric input 2**
Select the HDMI 1 input.
Use with **ALT** to bring up the **Contrast** control, then adjust the value with the **LEFT** and **RIGHT** arrow buttons.

16 **HDMI 1 / BRI / numeric input 1**
Select the HDMI 1 input.
Use with **ALT** to bring up the **Brightness** control, then adjust the value with the **LEFT** and **RIGHT** arrow buttons.

17 **TEST / SWAP / numeric input 0**
Show a test pattern. Press again to show the next test pattern:
...Off, White, Black, Red, Green, Blue, CheckerBoard, CrossHatch, V Burst, H Burst, ColorBar...
The **SWAP** function is not supported.

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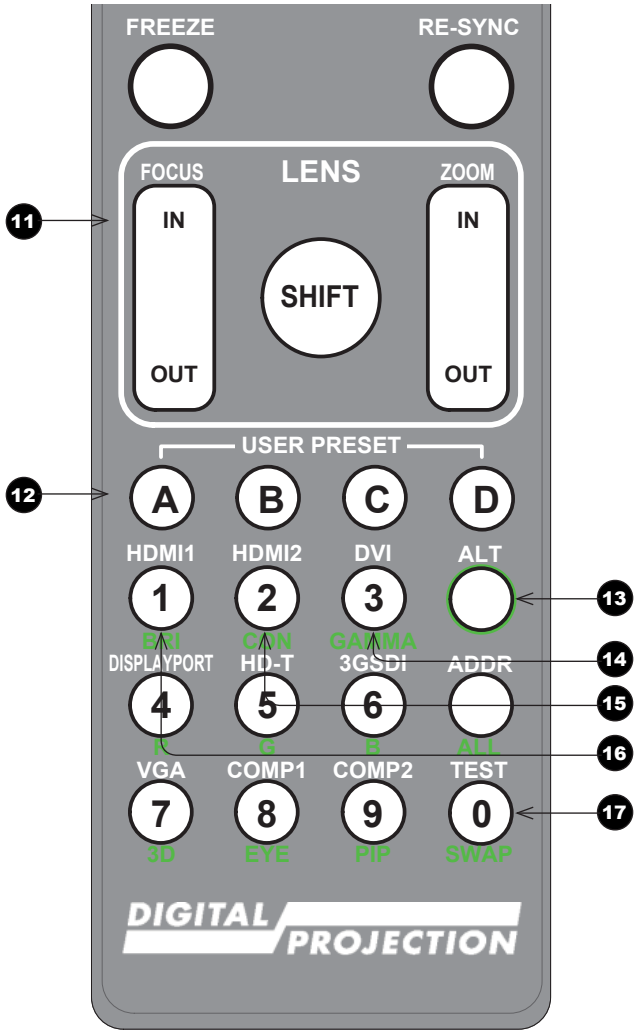


Remote control

Notes

17 **DISPLAYPORT / R / numeric input 4**
DisplayPort is not supported.

18 **HD-T / G / numeric input 5**
Select the HDBaseT input.

19 **3GSDI / B / numeric input 6**
3G-SDI is not supported.

20 **VGA / 3D / numeric input 7**
Select the VGA input.
Use with **ALT** to toggle the **3D Format** setting between **Off** and **Auto**.

21 **COMP1 / EYE / numeric input 8**
Select the Component 1 input.
Use with **ALT** to switch between left and right eye 3D dominance.

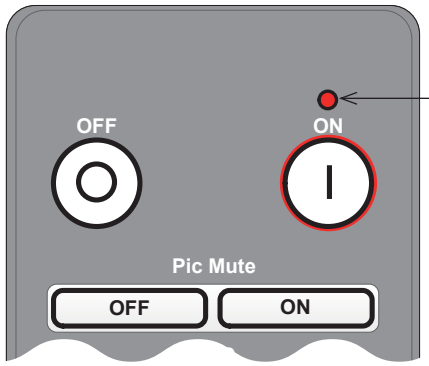
22 **COMP2 / PIP / numeric input 9**
Component 2 and PIP are not supported.

23 **ADDR / ALL (with red indicator at the top)**
Assign and unassign an IR remote address.
To assign an address:

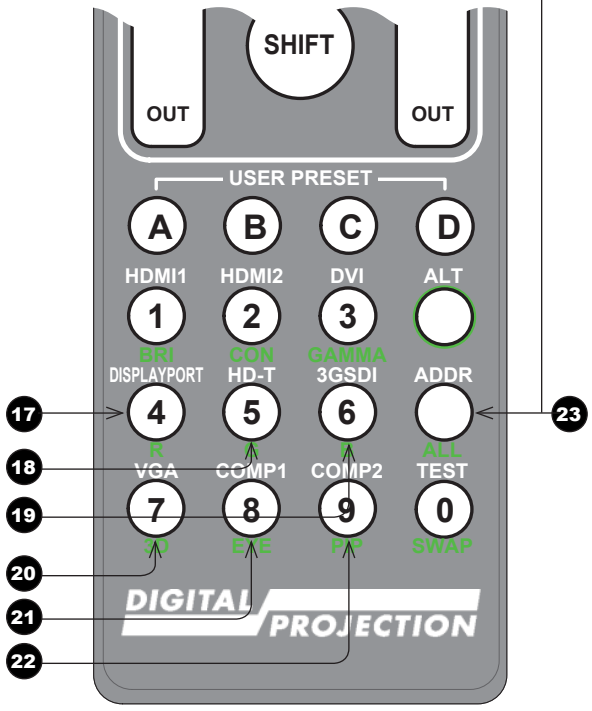
1. Press and hold this button until the indicator starts flashing.
2. Release this button and while the indicator is still flashing, enter a two-digit address using the numeric input buttons. The indicator will flash three times quickly to confirm the change.

To unassign an address and return to the default address 00,

- Press and hold **ALT** and this button simultaneously until the indicator flashes to confirm the change.



Remote control top



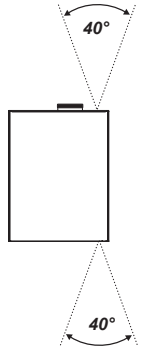
Remote control bottom

Notes

Infrared reception

The projector has infrared sensors at the front and back.

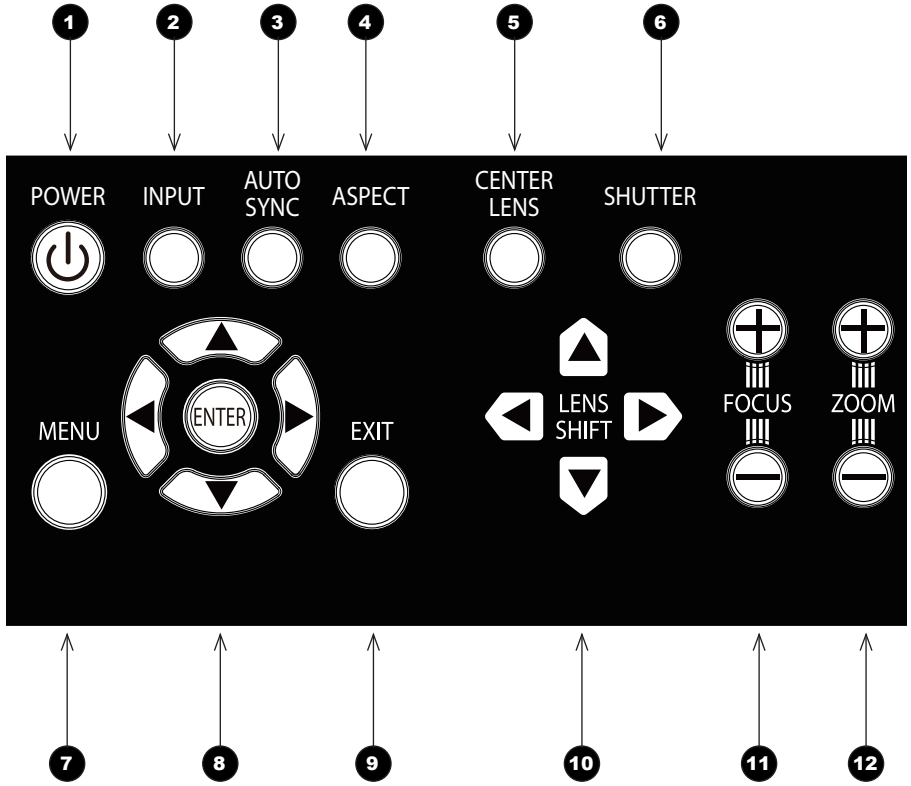
The angle of acceptance is 40°. Make sure that the remote control is within the angle of acceptance when trying to control the projector.



Infrared reception

Notes

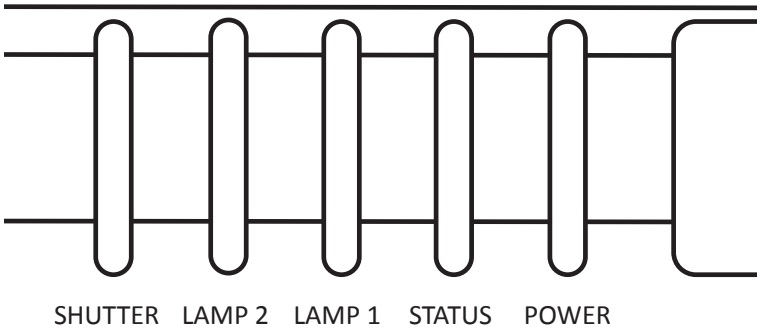
Control Panel



1. **POWER**
   Switches the projector on and off (STANDBY).
2. **INPUT**
   Switches to the next input source.
3. **AUTO SYNC**
   Re-synchronises with the current input signal.
4. **ASPECT**
   Changes the aspect ratio.
5. **CENTER LENS**
   Centers the lens.
6. **SHUTTER**
   Shows and hides the projected image. When OFF, the light source is completely switched off and the screen is black.
7. **MENU**
   Displays and exits the OSD.
8. **Arrow buttons & ENTER**
   Navigation buttons used to highlight menu entries in the OSD.
   Press **ENTER** to open or execute the highlighted menu entry.
9. **EXIT**
   Exits the current OSD page and enters the level above.
10. **LENS SHIFT arrow buttons**
    Each of these buttons moves the lens in the specified direction.
11. **FOCUS plus and minus buttons**
    Used to move the focus in and out.
12. **ZOOM plus and minus buttons**
    Used to zoom in and out.

Notes

Indicators



SHUTTER

Behavior	Meaning
Off	The shutter is open.
Steady green	The shutter is closed.

LAMP 2 / LAMP 1

Behavior	Meaning
Off	The lamp is switched off.
Flashing green	The lamp is preparing to switch on.
Steady green	The lamp is switched on.
One red flash, pause	No lamp.
Six red flashes, pause	The lamp failed to switch on.
Steady red	The lamp is end-of-life.

STATUS

Behavior	Meaning
Off	No error.
One red flash, pause	Cover error.
Two red flashes, pause	Temperature error.
Three red flashes, pause	System error.
Four red flashes, pause	Fan error.

POWER

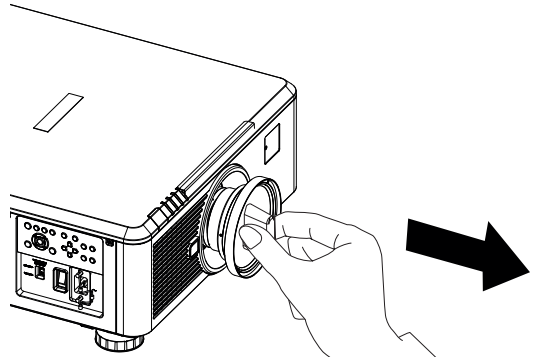
Behavior	Meaning
Off	The projector is switched off.
Flashing green	The projector is warming up.
Steady green	The projector is switched on.
Flashing amber	The projector is cooling down.
One amber flash, pause	Keypad Lock warning.
Steady amber	The projector is in Network STANDBY mode (<3W).
Steady red	The projector is in Eco STANDBY mode (<0.5W).

Notes

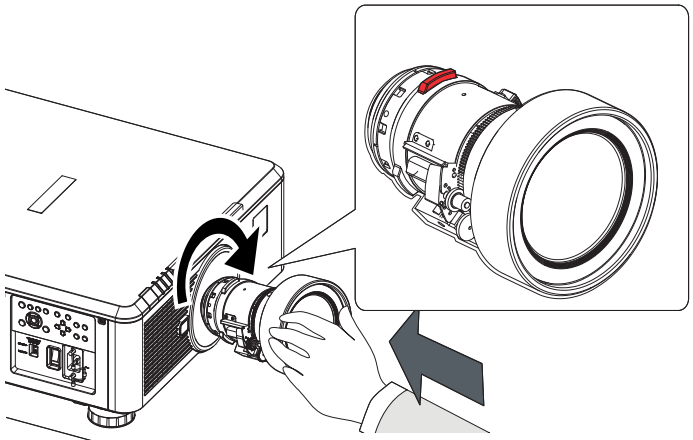
Changing The Lens, Lamps, Filter And Color Wheel

Inserting a new lens

1. Remove the front and rear lens caps.

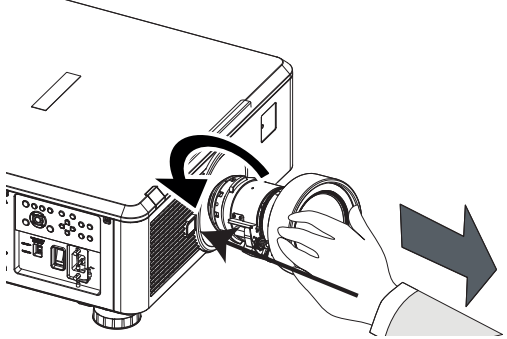


2. Position the lens so that the labels are at the top, and gently insert it all the way into the lens mount.
3. Push the lens in firmly and turn it clockwise until it clicks into place.



Removing the lens

1. Push in the lens release lever, and turn the lens anti-clockwise.
2. Remove the lens..



Notes

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector

Before changing the lens, always make sure the projector is switched off and fully disconnected from its power supply.

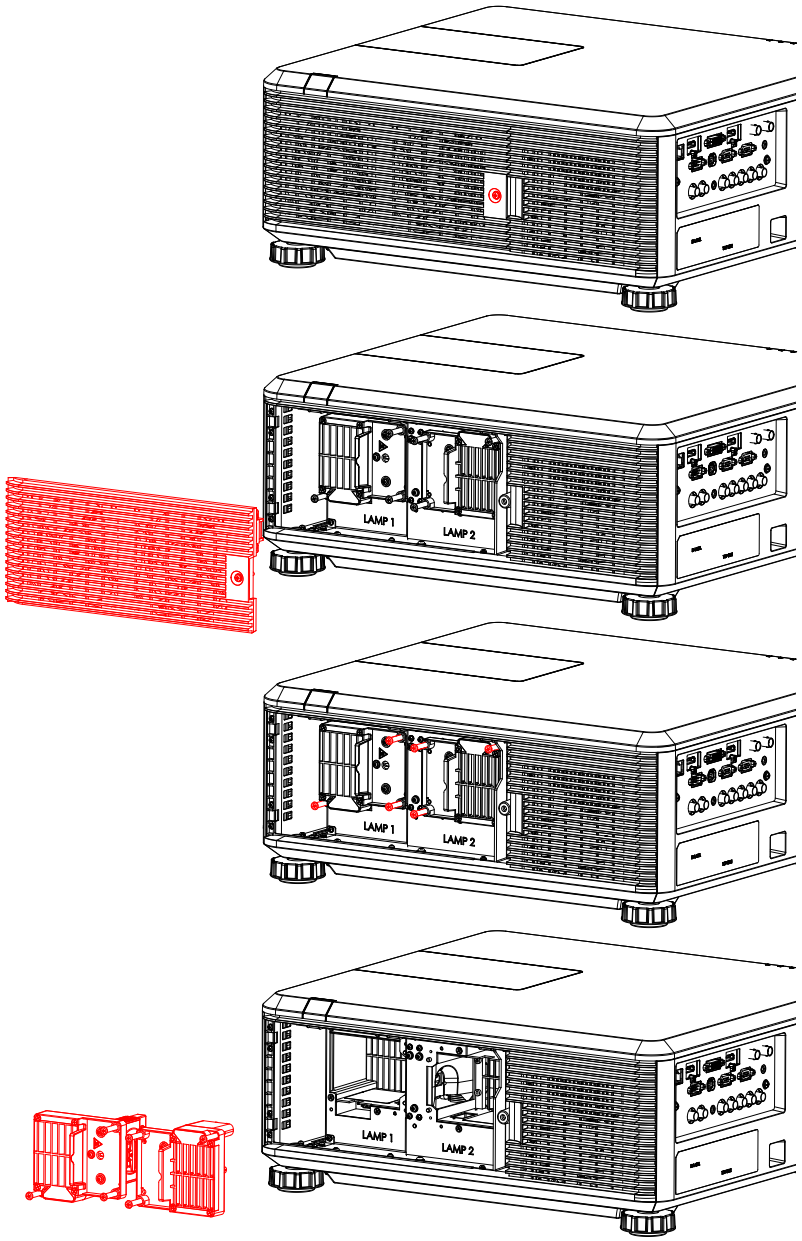
When changing the lens, avoid using excessive force as this may damage the equipment.

The lens is shipped separately.

Take care to preserve the original lens packaging and protective caps for future use.

Changing the lamps

1. Unscrew the captive screw holding the lamp compartment door.
2. Remove the door to reveal the lamp modules.
3. Unscrew the three captive screws holding each lamp module in its place.
4. Pull out the old lamp modules and insert the new ones.
5. Use the three captive screws on each module to hold it into position, then replace the lamp compartment cover and secure it with the screw.



Notes

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector

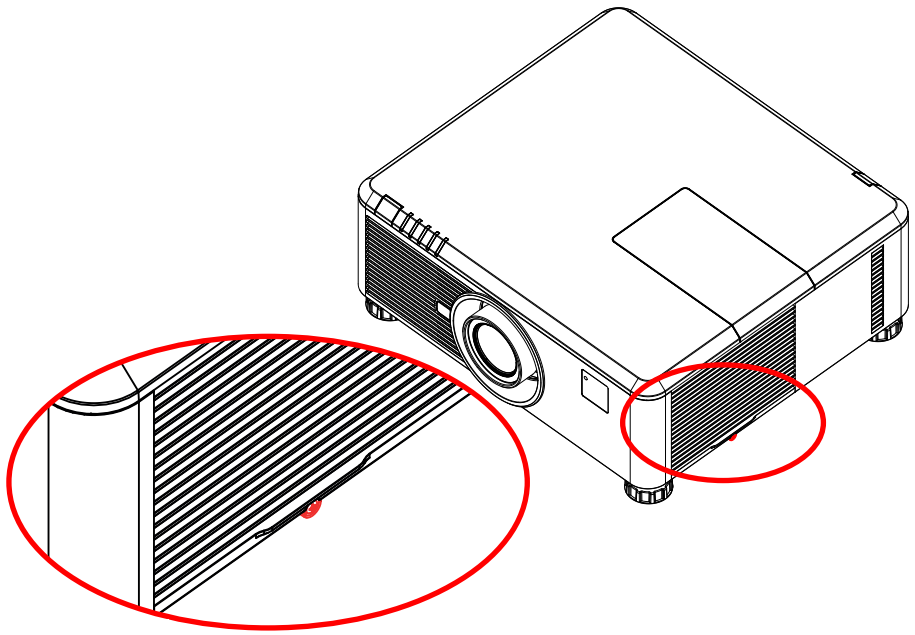
The lamp must be changed only by suitably qualified personnel.

The projector will shut down if the cover is opened whilst in operation.

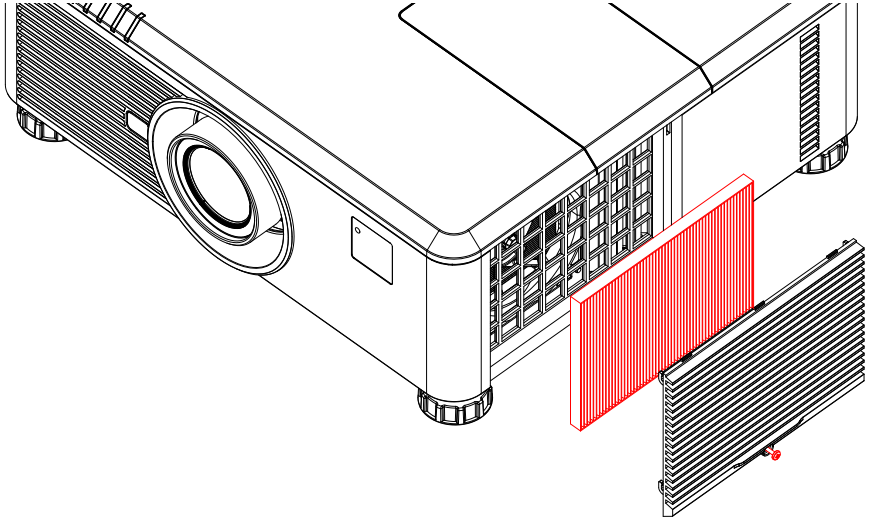
The filters should be changed at the same time as the lamp is changed.

Changing the filter

1. Loosen the captive screw at the bottom of the filter door.



2. Remove the door and the filter as shown in the illustration.
3. Replace the filter, then close the door and tighten the screw to secure it in place.



Notes

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector

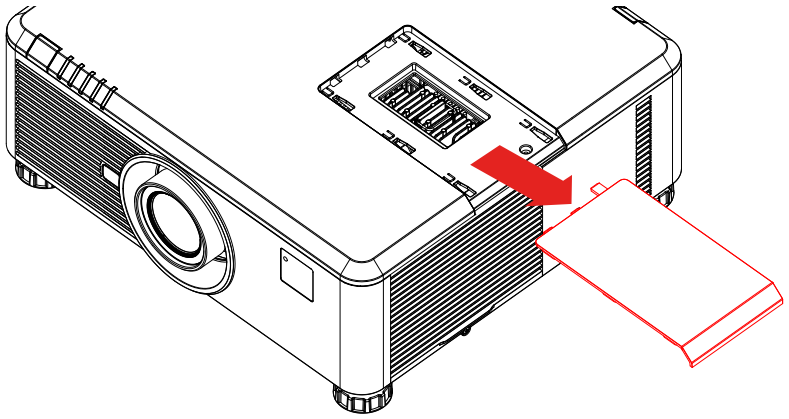
The lamp must be changed only by suitably qualified personnel.

The projector will shut down if the cover is opened whilst in operation.

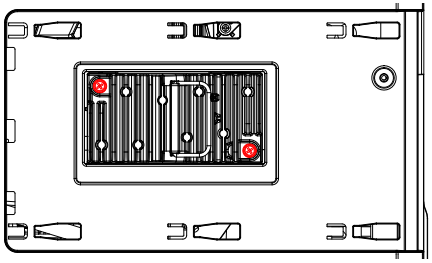
The filters should be changed at the same time as the lamp is changed.

Changing the color wheel

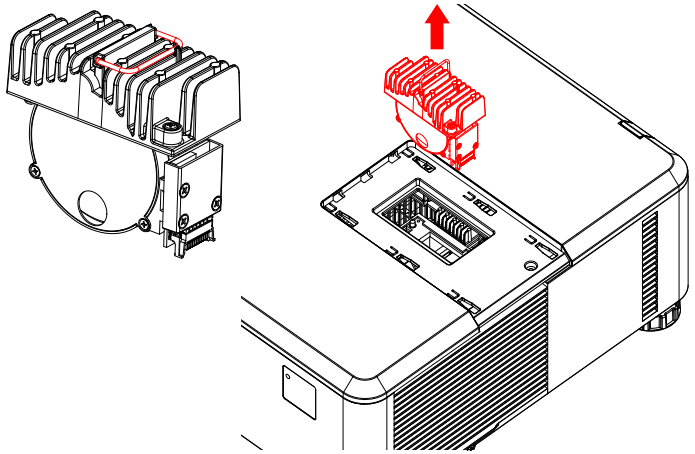
1. Slide open the lamp compartment cover as shown in the picture.



2. Unscrew the two captive screws securing the color wheel.



3. Lift and pull the color wheel handle to remove the color wheel.



4. Insert a new color wheel, lower the handle, fasten the screws and replace the lamp compartment cover.

Notes

Always allow the lamp to cool for 5 minutes before:

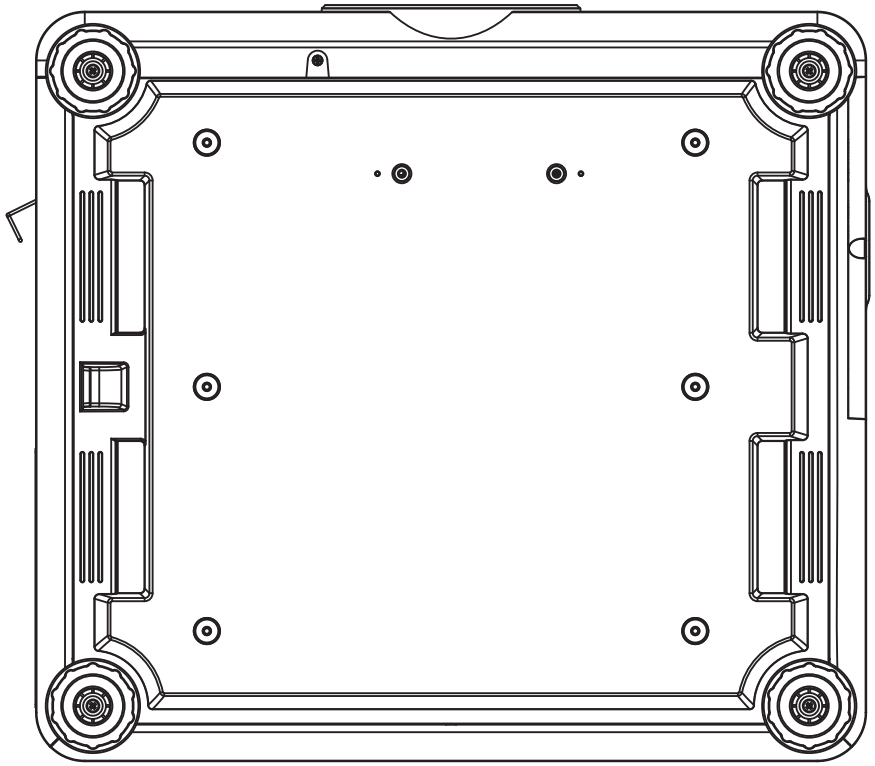
- disconnecting the power
- moving the projector

The color wheel must be changed only by suitably qualified personnel.

The projector will shut down if the cover is opened whilst in operation.

Positioning The Screen And Projector

1. Install the screen, ensuring that it is in the best position for viewing by your audience.
2. Mount the projector, ensuring that it is at a suitable distance from the screen for the image to fill the screen. Set the adjustable feet so that the projector is level, and perpendicular to the screen.
   Alternatively, six M4 bolts (max length 16 mm [0.6 in]) can be used to attach the projector to a ceiling mount (optional accessory,).



Location of the ceiling mount holes at the bottom of the projector

Notes

Always allow the lamp to cool for 5 minutes before:

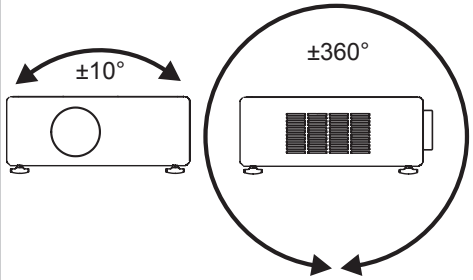
- disconnecting the power
- moving the projector

Ensure that there is at least 50cm (20in) of space between the ventilation outlets and any wall, and 10cm (4in) on all other sides.

If ceiling mounting, ensure there is 30cm (12in) of space between the projector and ceiling.

Do not stack the projectors.

Do not tilt the projector more than ±10° from side to side when in use, as this may cause serious lamp failure, damage the lamp module and cause extra cost on replacement.



Operating The Projector

Switching the projector on

- Connect the power cable between the mains supply and the projector. Switch on at the switch next to the power connector.
- Wait until the self-test has completed and the ***Power*** indicator on the projector control panel shows amber. The lamp will be off and the projector will be in ***STANDBY*** mode.
- Press ⏻ on the control panel or **POWER ON** on the remote control.

  The ***Power*** indicator on the control panel will flash green for a few seconds whilst the lamp comes up to full brightness. When the projector is ready for use, the ***Power*** indicator will show steady green.

Selecting an input signal or test pattern

Input signal

- Connect an image source to the projector. The signal should be automatically detected by the projector, and should be displayed within a two or three seconds.
- If more than one signal is connected, then select the image you want to display:
  - On the control panel, press **INPUT** to cycle through the inputs,

  or

  - on the remote control, press the button for the input of your choice,

  or

  - on any device, press **MENU** to show the OSD (On-screen DIsplay), then highlight **Input**, then press **OK/ENTER** to open the list of inputs.

Test pattern

To display a test pattern:

1. Press **MENU** to open the OSD. Use the **UP** and **DOWN** arrow buttons to highliught **Test Pattern**, then press **OK/ENTER** to open the list of test patterns. Alternatively, on the remote control press **TEST** to open the same list.
2. Use the **UP** and **DOWN** arrow buttons to highlight the test pattern you wish to display and press **OK/ENTER**.

Notes

Before switching on the projector for the first time, make sure the electric circuit is grounded. Poor grounding may damage the projector.

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector

*For full details of how to connect an image source to the projector, see the **Connection Guide**.*

*For full details of how to use the controls and the menu system, see the **Operating Guide**.*

Adjusting the lens

Zoom

- Use the **ZOOM +/–** buttons on the control panel or the **ZOOM IN/OUT** buttons on the remote control to adjust the lens so that the image fills the screen.

Focus

- Use the **FOCUS +/–** buttons on the control panel or the **FOCUS IN/OUT** buttons on the remote control to adjust the lens until the image is sharp.

Shift

- Use the **LENS SHIFT** arrow buttons on the control panel to adjust the position of the image,

  or press the **SHIFT** button on the remote control then use the arrow buttons to adjust the position of the image.

Adjusting the image

Orientation

- Use the **Orientation** settings in the **Setup** menu.

Aspect ratio

- Press the **ASPECT** button on the control panel to cycle through all the available settings.

  or

- use the **Aspect Ratio** setting in the **Geometry** menu.

Picture

- Open the **Image** menu, then use the sliders to adjust brightness, contract etc.

Notes

*For full details of how to use the controls and the menu system, see the **Operating Guide**.*

Switching the projector off

- Press ⏻ on the control panel or **POWER OFF** on the remote control, then press the button a second time within 5 seconds to confirm.

  The lamp will go off, and the ***Power*** indicator on the control panel will flash amber for a few seconds whilst the lamp cools. The ***Power*** indicator on the control panel will then show amber and the projector will be in ***Standby*** mode.

- Switch the projector off completely from the switch next to the power connector. Disconnect the power cable from the projector.

Notes

⚠ **Always allow the lamp to cool for 5 minutes before:**

- disconnecting the power
- moving the projector

DIGITAL PROJECTION

E-Vision 6900 Series

High Brightness Digital Video Projector

CONNECTION GUIDE

Rev A February 2017

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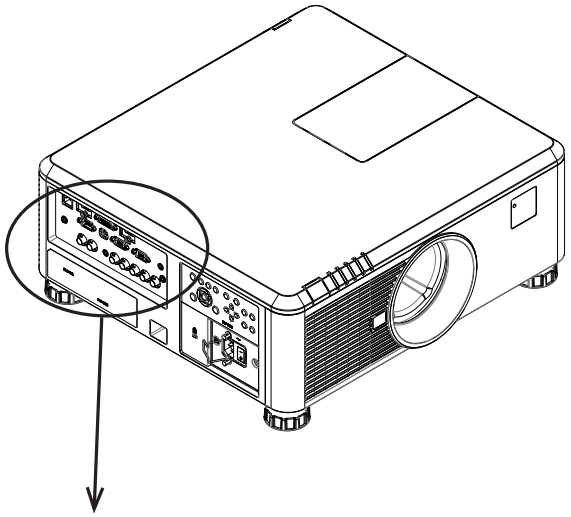
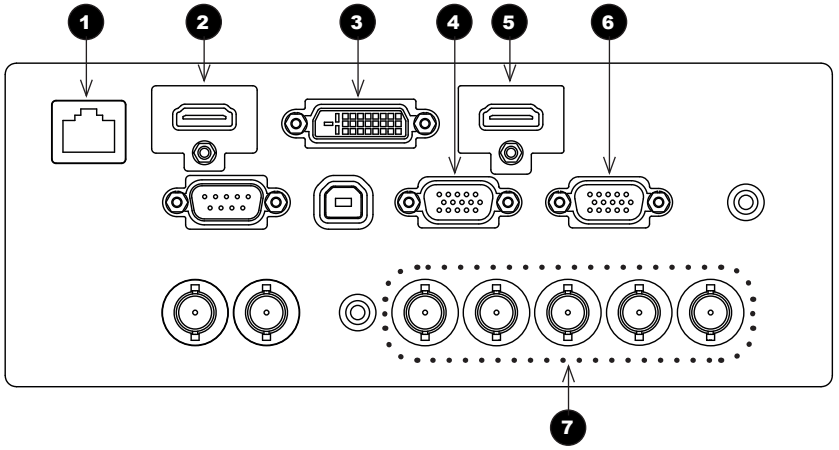
Signal Inputs And Outputs





1 HDBaseT/LAN
Receives digital signal from HDBaseT-compliant devices.

2 HDMI II
This HDMI 1.4 input supports HDCP 1.1 and DVI 1.0.

3 DVI-D
This input can receive digital (DVI-D) signal from a compatible source.
Supports HDCP.

4 Monitor Out
Connect an analog monitor cable (VGA) to the 15-pin D-type connector.
The connected monitor will display signal received via the VGA input.

5 HDMI I
This HDMI 1.4 input supports HDCP 1.1 and DVI 1.0.

6 VGA
This input receives analog signals from a computer.
When using this input, it is best to use a fully wired VGA cable to connect the source to the projector. This will allow the source to determine the projector's capabilities via DDC and show an optimized image. Such cables can be identified as they have a blue connector shell.

7 Component
Connect a set of RGsB, RGBHV or YCbCr cables to the BNC connectors.

Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** later in this Guide.*

Control Connections

1 **HDBaseT/LAN**

Receives digital signal from HDBaseT-compliant devices.
All of the projector's features can be controlled via a LAN connection, using commands described in the ***Remote Communications Guide***.

2 **Service**

The USB Service port is used for firmware updates only.

3 **Screen Trigger**

The Trigger output can be connected to an electrically operated screen, automatically deploying the screen when the projector is switched on, and retracting the screen when the projector is switched to standby.

4 **RS-232**

All of the projector's features can be controlled via a serial connection, using commands described in the ***Remote Communications Guide***.

5 **3D Sync Out**

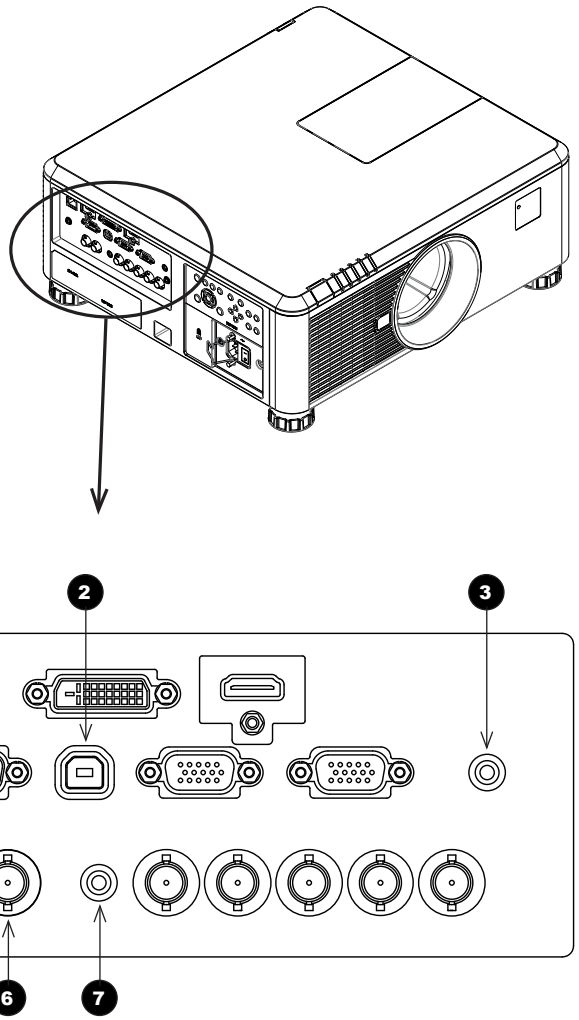
Connect to a Z Screen or 3D IR emitter as appropriate.

6 **3D Sync In**

Connect the 3D sync from your graphics card or server.

7 **Wired Remote**

The remote control can be connected using a standard 3.5 mm mini jack cable (tip-ring-sleeve, or TRS).



Notes

Plugging in the remote control cable will disable infrared transmission.

DIGITAL PROJECTION

E-Vision 6900 Series

High Brightness Digital Video Projector

OPERATING GUIDE

Rev A February 2017

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Using The Projector

Main menu

- **Input**
  Press **ENTER** to open the list of available inputs.

  Use the **UP** ▲ and **DOWN** ▼ arrow buttons to select an input from the list, then press **ENTER** to confirm your choice.

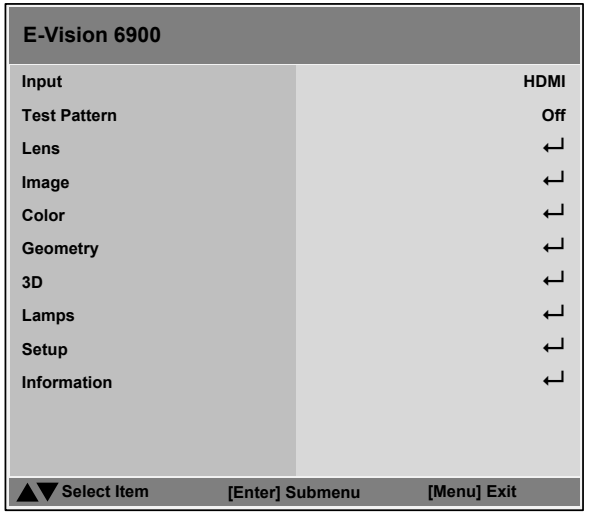
  Press **MENU** to return to the main menu.

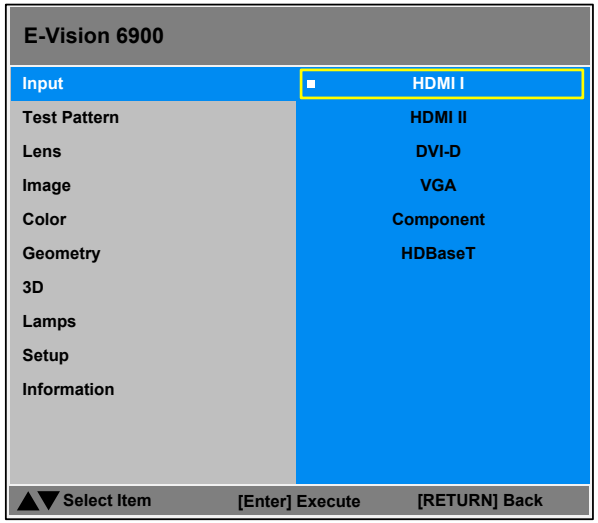
- **Test Pattern**
  Choose from:

  ...Off, White, Black, Red, Green, Blue, Checkerboard, Crosshatch, V Burst, H Burst, Color Bar, H Ramp...

  Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

- **Lens, Image**, **Color**, **Geometry**, **3D**, **Lamps**, **Setup** and **Information**
  Press **ENTER** to open these menus and access various settings.





Notes

If no input is connected, the **Image** *menu will be unavailable.*

Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in the* ***Menu Map*** *further in this guide.*

Lens menu

- **Lens Lock**
- **Lens Control**

  Lens Control operates in **Zoom/Focus** and **Shift** mode.

  When in **Zoom/Focus** mode:

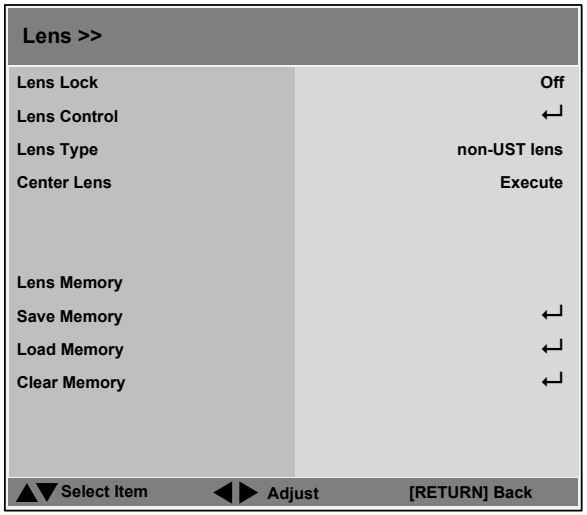
  - Use the **UP** and **DOWN** arrow buttons to adjust **Zoom**.
  - Use the **LEFT** and **RIGHT** arrow buttons to adjust **Focus**.

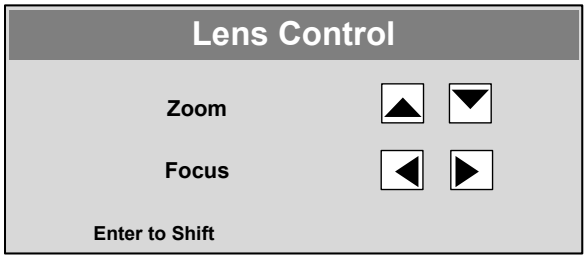
  When in **Shift** mode, use the arrow buttons to adjust **Shift**.

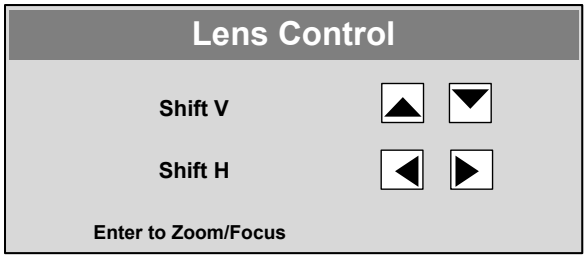
  Press **ENTER** to switch between Shift and Zoom/Focus mode.
- **Lens Type**

  Choose UST or non-UST lens.
- **Center Lens**
- **Lens Memory**

  Open a submenu to save, load or clear a lens preset.







Notes

*See **Lens Memory** further in this guide.*

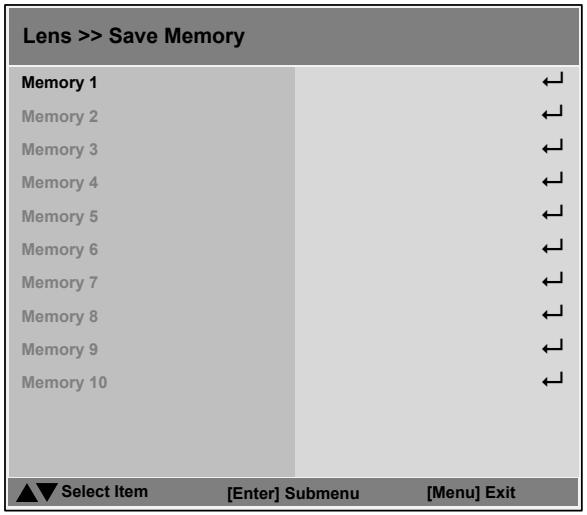
Lens menu continued from previous page

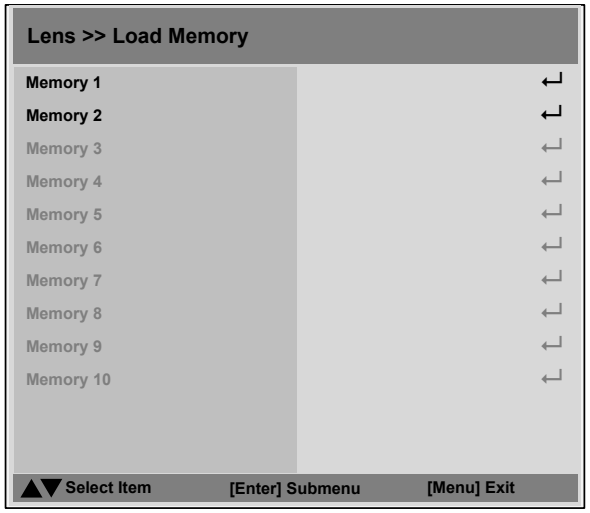
Lens Memory

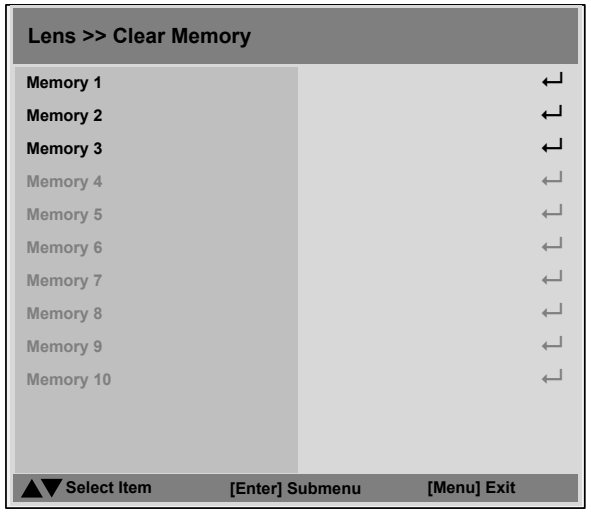
These menus allows you to load, save and delete up to ten lens presets, containing position, zoom, focus and shift adjustment information.

For example, if using different screen sizes and aspect ratios, you can save zoom, focus and positioning for each screen size and aspect ratio in a dedicated preset.

Use **Clear Memory** to delete a memory preset if you need to save a new combination of lens settings in its place. Overwriting a saved memory preset is not possible.







Notes

Image menu

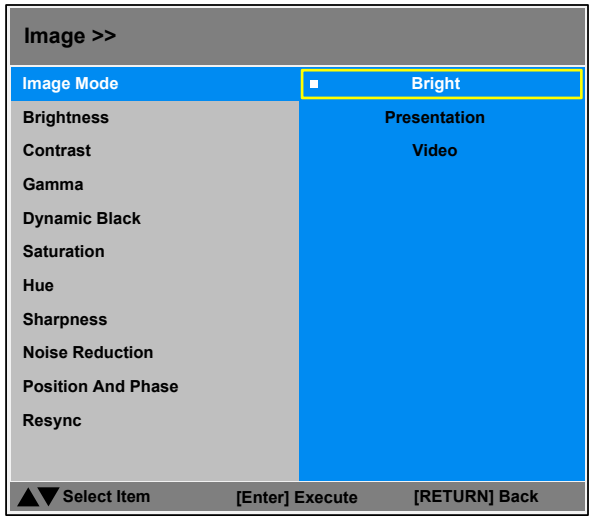
Image Mode

Choose from **Bright**, **Presentation** and **Video**.

Press **ENTER** to open the list.

Use the **UP** ▲ and **DOWN** ▼ arrow buttons to select an image mode from the list, then press **ENTER** to confirm your choice.

Press **MENU** to return to the main menu.

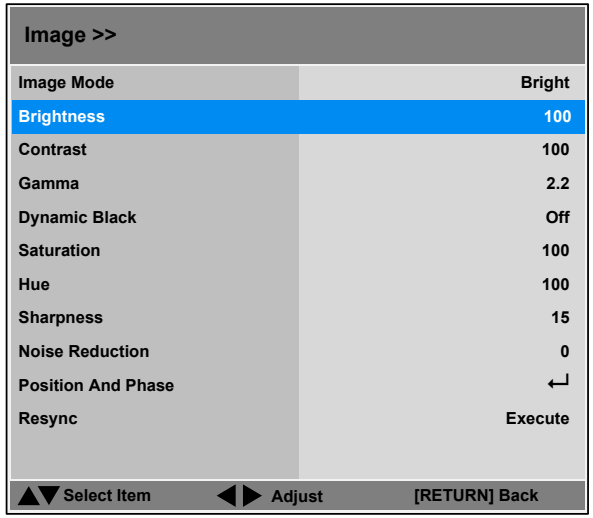


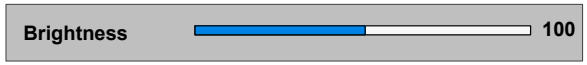
Brightness and Contrast

Highlight the setting you wish to edit, and then press the **LEFT** ◀ or **RIGHT** ▶ arrow button to open the slider.

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust the slider.

Press **MENU** to close the slider.





Notes

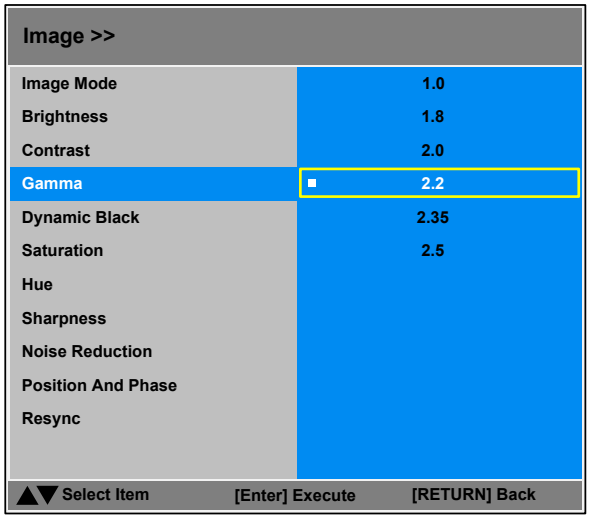
Image menu continued from previous page

Gamma

Choose a de-gamma curve from **1.0**, **1.8**, **2.0**, **2.2**, **2.35**, **2.5** and **S Curve**.

Used correctly, the **Gamma** setting can improve contrast while maintaining good details for blacks and whites.

If excess ambient light washes out the image and it is difficult to see details in dark areas, lower the **Gamma** setting to compensate. This improves 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.



Dynamic Black

Set to **On** to allow for increased contrast in darker scenes by modulating the light source.

Saturation, Hue, Sharpness and Noise Reduction

Highlight the setting you wish to edit, and then press **ENTER**, or the **LEFT** ◀ or **RIGHT** ▶ arrow button to open the slider.

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust the slider.

Press **MENU** to close the slider.

Notes

Saturation *and* **Hue** *are only accessible if the projector is connected to a* ***Component*** *input source.*

Image menu continued from previous page

Position and Phase

Press **ENTER** to open a submenu.

- **VGA Setup**

  H Total, **H Start**, **H Phase**, **V Start**
  Adjust these settings as required to suit the incoming image.

- **Digital Alignment**

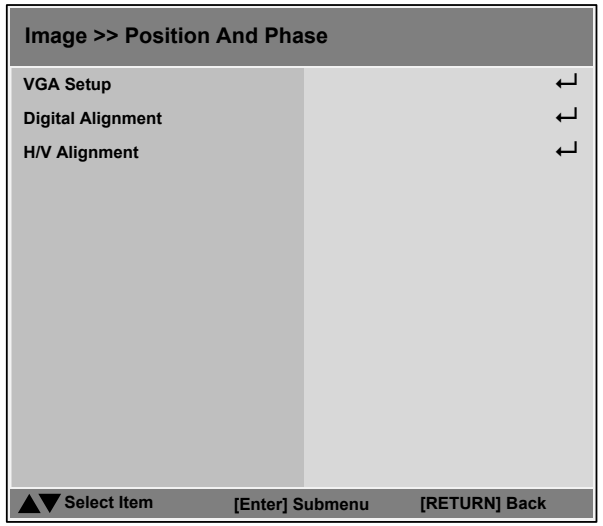
  Digital Zoom, **Digital Pan**, **Digital Scan**
  Select a digital alignment control.

  Reset
  Press **ENTER** to reset all **Digital Alignment** settings to zero.

- **H/V Alignment**

  H Zoom, **V Zoom**, **H Shift**, **V Shift**
  Select an alignment control.

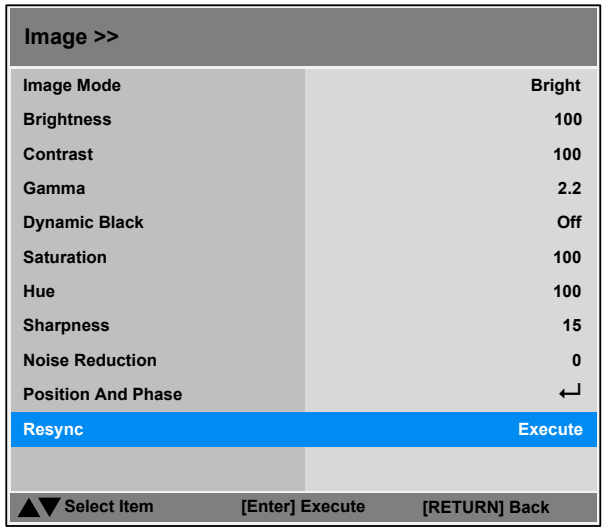
  Reset
  Press **ENTER** to reset all **H/V Alignment** settings to zero.



Highlight the setting you wish to edit, and then press **ENTER**, or the **LEFT** ◀ or **RIGHT** ▶ arrow button to open the slider.

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust the slider.

Press **MENU** to close the slider.



Resync

Press **ENTER** to force the projector to resynchronize with the current input.

Notes

VGA Setup *is only accessible if the projector is connected to a* ***VGA*** *or* ***Comnponent*** *input source.*

Digital Pan *and* **Digital Scan** *will only work if* **Digital Zoom** *is greater than zero.*

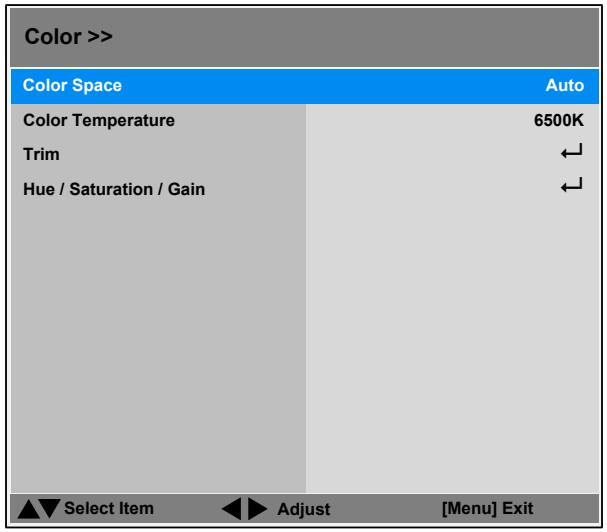
H Shift *will only work if the image has been reduced horizontally using* **H Zoom**. *Likewise,* **V Shift** *will only work once* **V Zoom** *has been applied.*

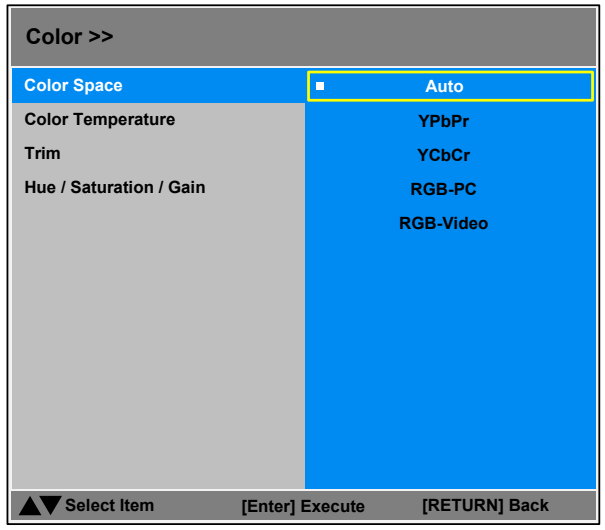
Color menu

Color Space

In most cases, the **Auto** setting determines the correct colorspace to use. If it does not, you can choose a specific colorspace:

Choose from **Auto**, **YPbPr**, **YCbCr**, **RGB-PC** and **RGB-Video**.



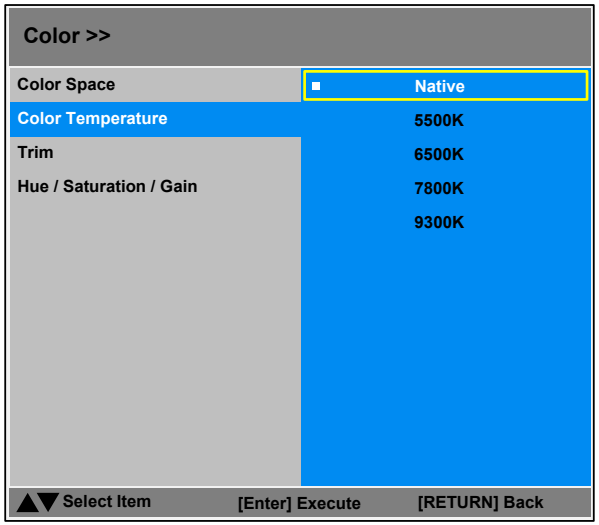


Notes

Color menu continued from previous page

Color Temperature

Choose a value from **5500K** (warmer) to **9300K** (cooler) or **Native** (no correction).



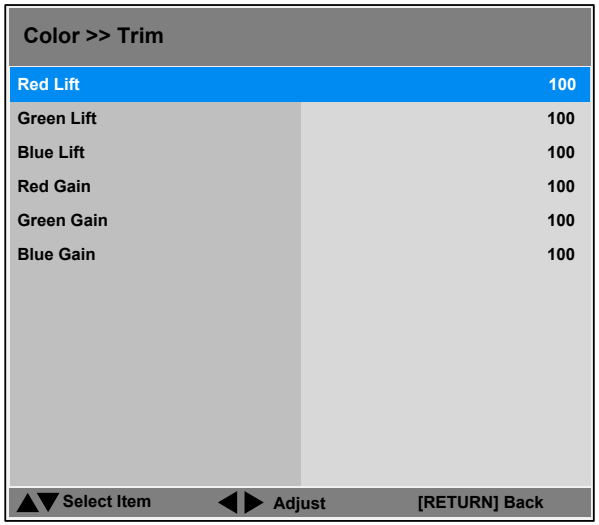
Notes

Color menu continued from previous page

Trim

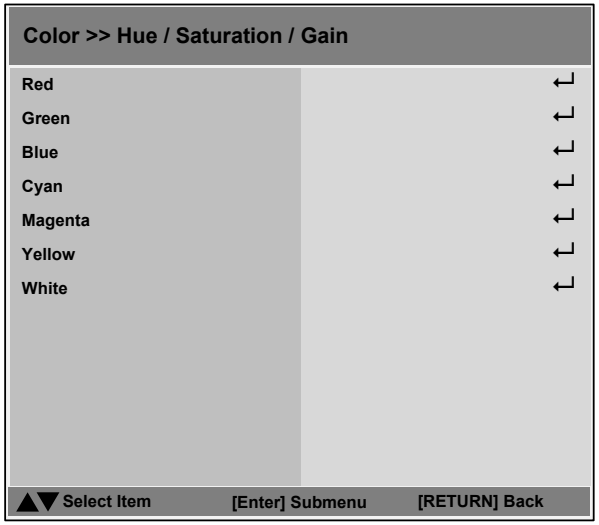
Adjust the RGB lift and gain settings to improve the color balance of the projected image.

Highlight the setting you wish to edit, and then either press **ENTER** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.



Hue / Saturation / Gain

Press **ENTER** to open a submenu, then use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to move the sliders.



Hue

Adjust hue of the main color as shown below:

Main color	Hue		
R	Magenta	◀ ▶	Yellow
G	Yellow	◀ ▶	Cyan
B	Cyan	◀ ▶	Magenta
C	Green	◀ ▶	Blue
M	Blue	◀ ▶	Red
Y	Red	◀ ▶	Green

Saturation

When you adjust the saturation of the main color, the selected color becomes lighter or thicker.

Gain

When you adjust the gain of the main color, the selected color becomes brighter or darker.

Notes

Color menu continued from previous page

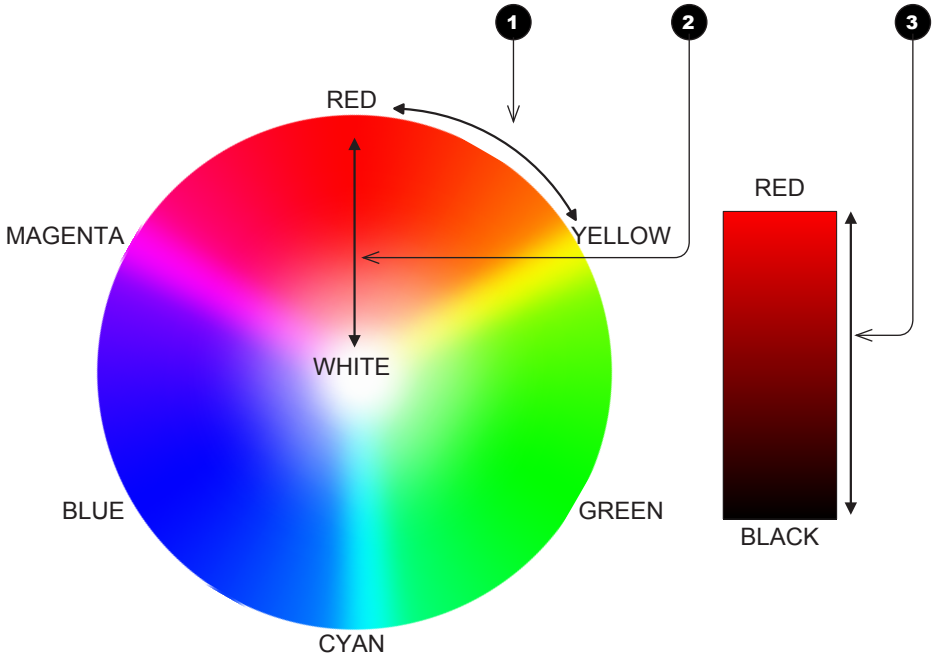
Hue, Saturation and Gain explained

The levels of hue, saturation and gain change the color values in the following ways:

1. **Hue**
   Specifies the position of each color (***red***, ***yellow***, ***green***, ***cyan***, ***blue*** and ***magenta***) relative to its neighboring colors.

2. **Saturation**
   Specifies the level of white in each color (i.e. how “pale” each color is).

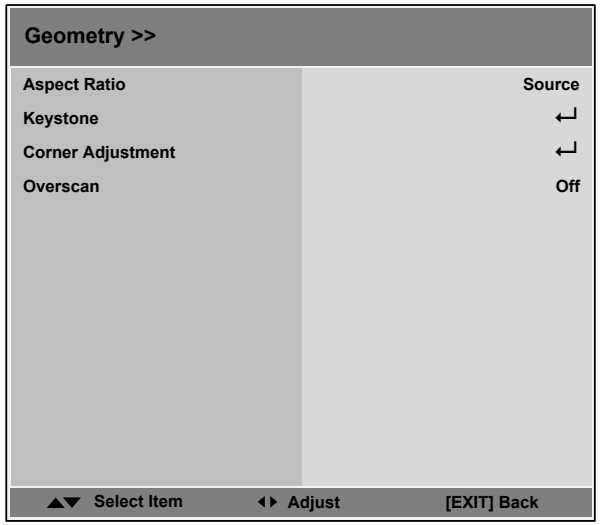
3. **Gain**
   Controls the amount of light that goes into each color, i.e. the lowest gain would produce black.



Notes

Geometry menu

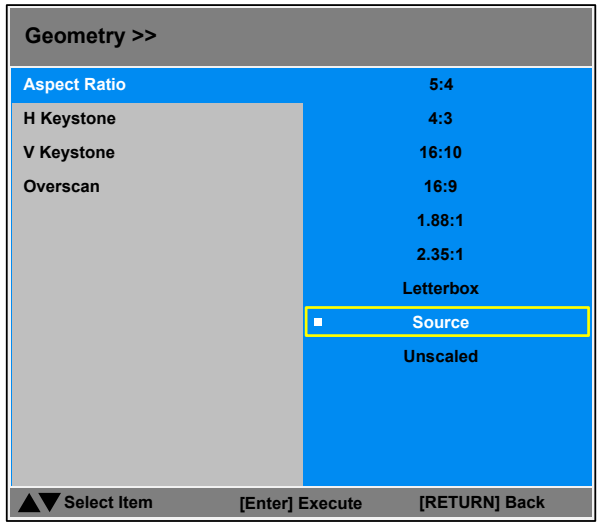
This menu allows you to compensate for image distortions caused by an unusual projection angle or irregular screen surface.



Aspect Ratio

Choose from:

- **5:4**
- **4:3**
- **16:10**
- **16:9**
- **1.88:1**
- **2.35:1**
- **TheaterScope**
- **Source**
- **Unscaled**



To change the aspect ratio:

1. From the **Main** menu, open **Aspect Ratio**.
2. From the list on the right, select a new aspect ratio and press **ENTER**.

Notes

Geometry menu continued from previous page

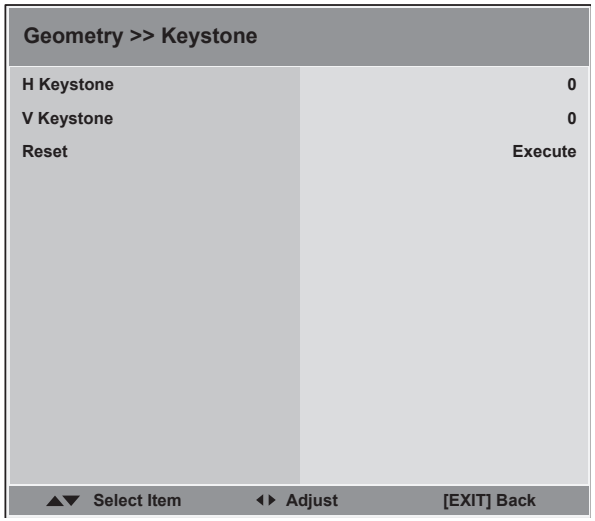
Keystone

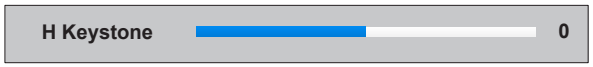
Use the **H Keystone** and **V Keystone** settings to compensate for any distortion caused by the projector being in a different horizontal or vertical plane to the screen.

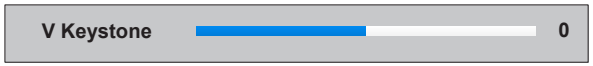
Highlight the setting you wish to edit, and then press the **LEFT** ◀ or **RIGHT** ▶ arrow button to open the slider.

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust the slider.

Press **MENU** to close the slider.

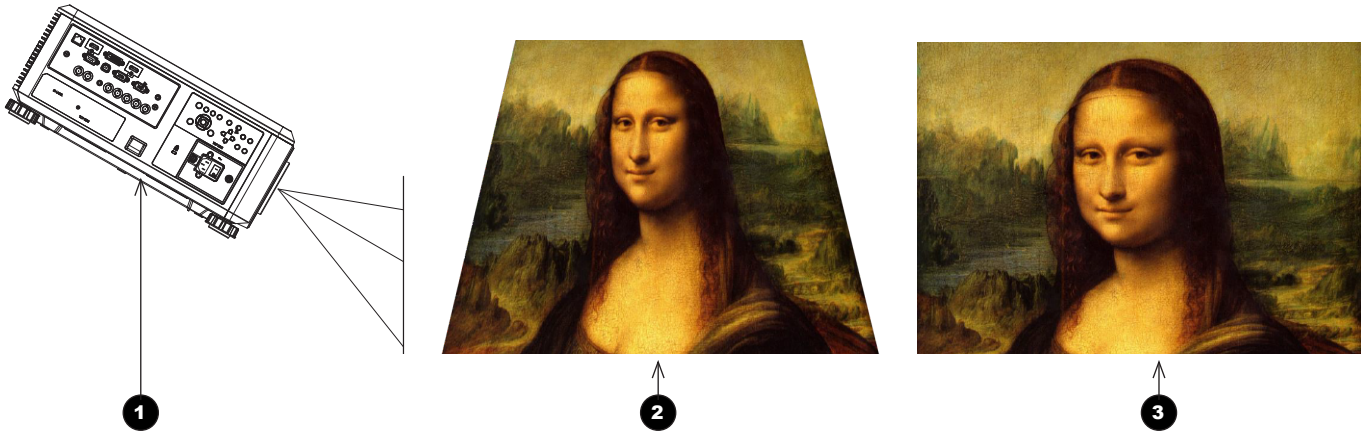






Keystone example

1. **The projector is positioned at an angle**
2. **The resulting image is distorted**
3. **The image is corrected when V Keystone is applied**



Notes

Geometry menu continued from previous page

Keystone settings

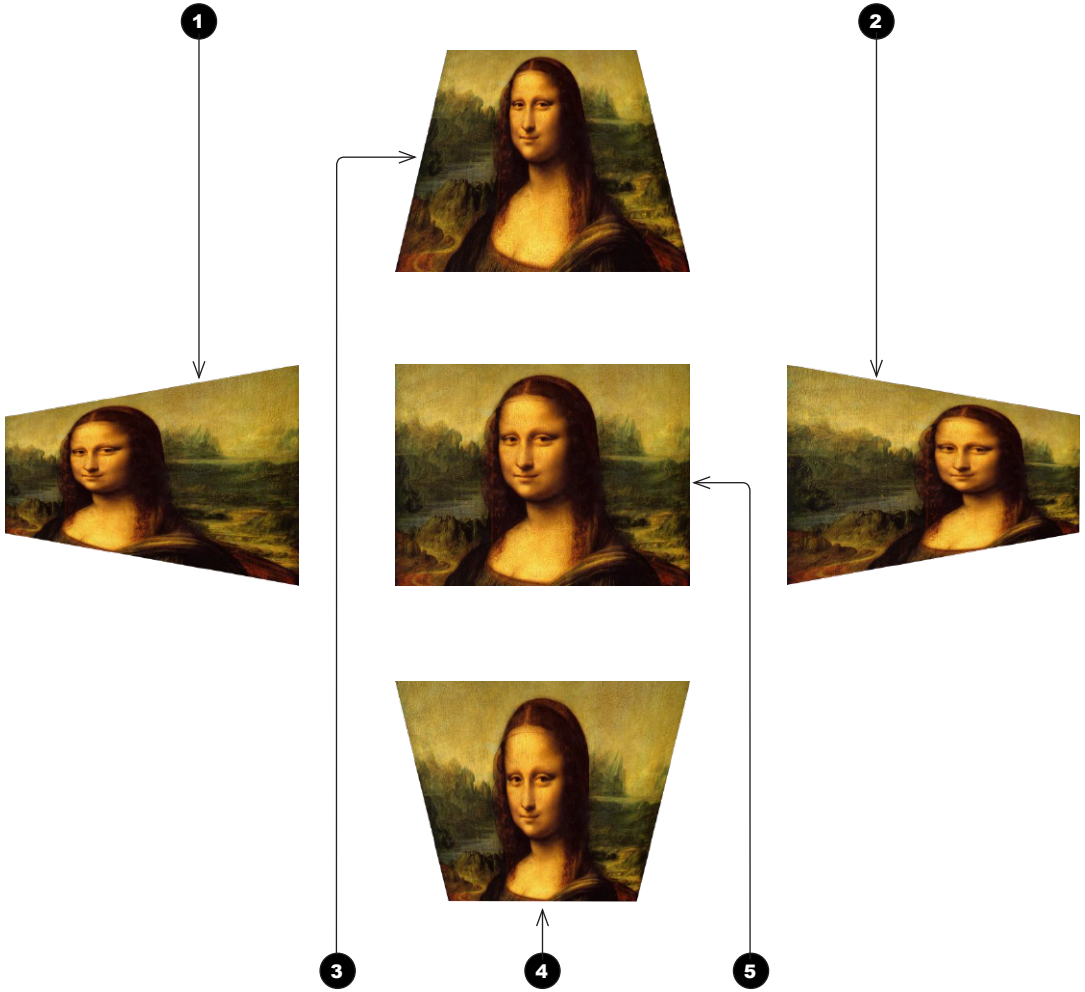
1 **Projector to the left**
The projector is positioned to the left of the screen.
To correct, apply a positive **H Keystone** value using the **RIGHT** arrow button.

2 **Projector to the right**
The projector is positioned to the right of the screen.
To correct, apply a negative **H Keystone** value using the **LEFT** arrow button.

3 **Projector high**
The projector is positioned above the screen at a downward angle.
To correct, apply a negative **V Keystone** value using the **LEFT** arrow button.

4 **Projector low**
The projector is positioned below the screen at an upward angle.
To correct, apply a positive **V Keystone** value using the **RIGHT** arrow button.

5 **Projector straight**
The projector is directly opposite the screen at a right angle both horizontally and vertically.
No correction is needed.



Horizontal and vertical keystone corrections

Notes

Geometry menu continued from previous page

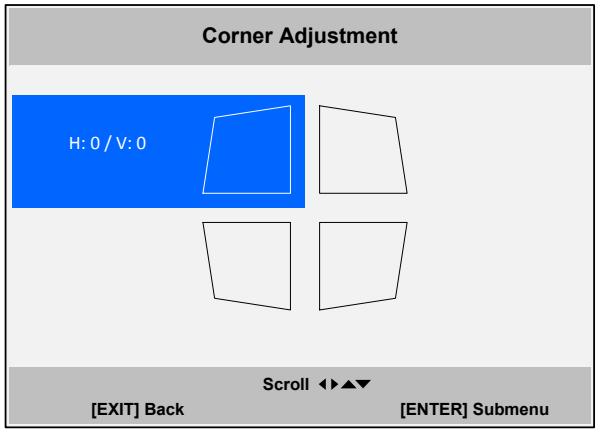
Corner Adjustment

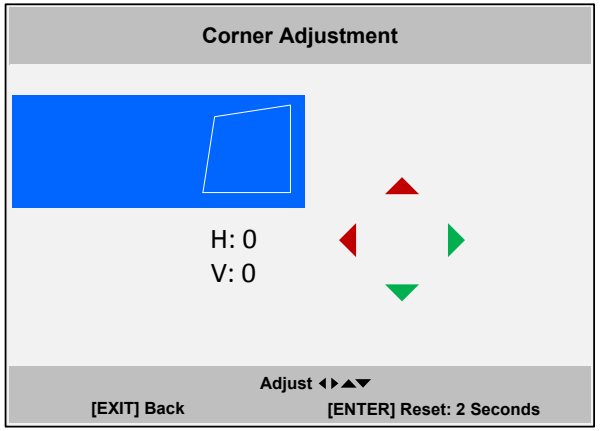
Use the arrow buttons to highlight the corner you wish to edit.

Press **ENTER** to enter edit mode, then use the arrows to change **H** and **V** values.

Reset the currently highlighted corner by oressing and holding **ENTER** for two seconds.

Exit edit mode with **EXIT**.



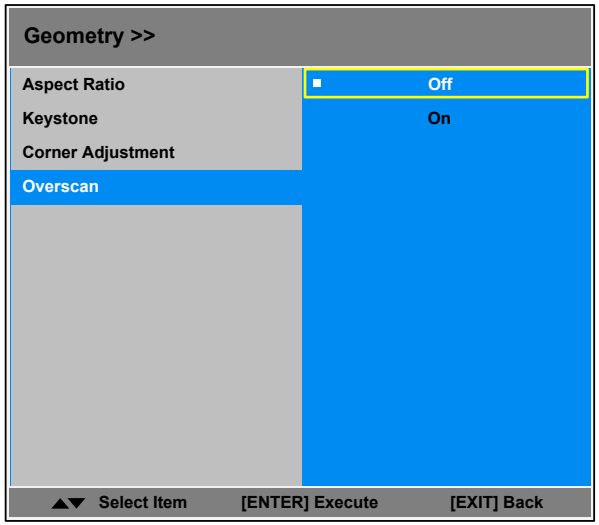


Notes

Geometry menu continued from previous page

Overscan

Set to **On** to compensate for noisy or badly defined image edges.



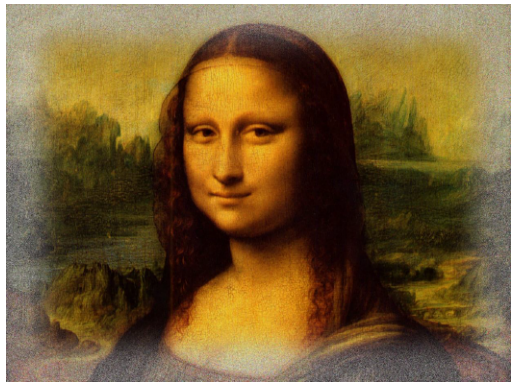
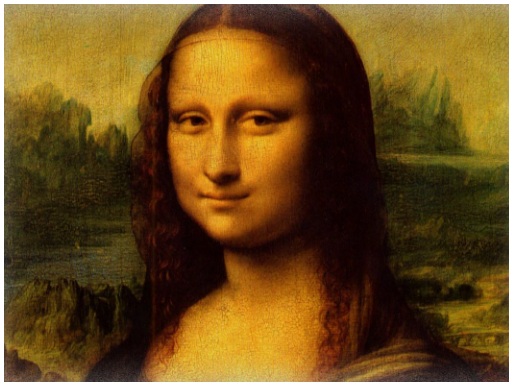


Image with noisy edges



Overscanned image

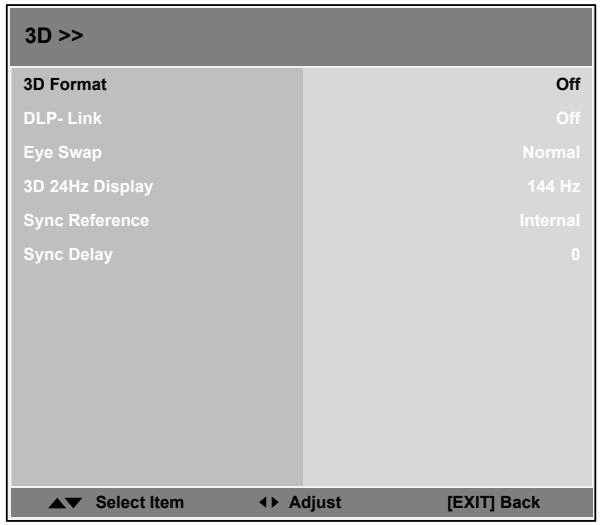
Notes

3D menu

Use this menu to enable, disable and set up 3D input, as follows:

- **3D Format** — **Off**, **Auto**, **Side by Side**, **Top and Bottom** and **Frame Sequential**.
- **DLP Link** — **On** (if you are using 3D glasses that can utilise the DLP Link® signal embedded in the image) and **Off**
- **Eye Swap** — **Normal** and **Reverse** (set to **Reverse** if the left- and right-eye images are displayed in the wrong order)
- **3D 24Hz Display** — set to 96Hz or 144Hz depending on the source. This setting is disabled unless a 24Hz 3D input is detected.
- **Sync Reference** — set to **Internal** or **External** as required.
- **Sync Delay** — this setting is only available if **Sync Reference** is set to **External**.

  Set a value between 0 and 100 ms.



The 3D Swap setting explained

The outgoing 3D frames are in pairs - the dominant frame being presented first. You can determine which frame should be the dominant one.

By convention the default setting is **Left**.

Dominance Left

LEFT 1	*RIGHT 1*	*LEFT 2*	*RIGHT 2*	*LEFT 3*	*RIGHT 3*

Dominance Right

RIGHT 1	*LEFT 1*	*RIGHT 2*	*LEFT 2*	*RIGHT 3*	*LEFT 3*

Notes

*If **3D Format** is set to **Off**, or if no 3D signal is detected in **Auto** mode, the other 3D settings will be unavailable.*

***Frame Sequential** is supported on the DVI input only.*

3D video is only possible on the HDMI, HDBaseT and DVI inputs.

*The **Frame Packing** format is automatically detected by the projector.*

*See also **3D types** further in this guide.*

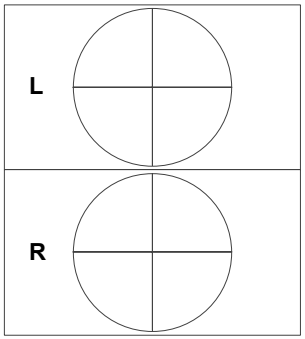
3D menu continued from previous page

3D types

In most situations you can use the **Auto** setting to have the projector automatically detect the format. Otherwise, consider the notes below to help you set up the 3D input manually.

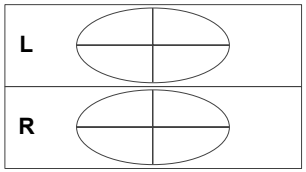
The following 3D formats are supported:

- **Frame Packing**
  This format will be detected, re-synchronised, frame-multiplied and displayed at 144 Hz with the left eye / right eye dominance automatically extracted from the video data.



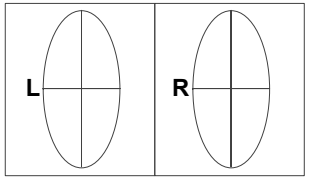
Frame Packing

- **Top and Bottom**
  Sets the projector to reformat the video frames and map them to the display with the left eye / right eye dominance automatically extracted from the video data.



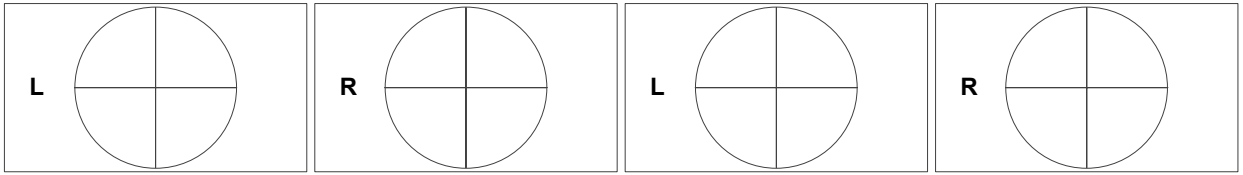
Top-and-Bottom

- **Side by Side (Half)**: interlaced and progressive, 50 and 60Hz
  The side-by-side image will be de-interlaced (if appropriate), resized and then sequentially displayed at 100 or 120 Hz. The left eye / right eye dominance will be automatically extracted from the video data.



Side-by-Side (Half)

- **Frame Sequential**
  An example of **Frame Sequential** would be 60Hz (30 frames per eye in Left-Right sequence (L1, R1, L2, R2…) with 2x Frame Rate Multiplication, resulting in a displayed sequence at 120 Hz (L1, R1, L1, R1, L2, R2, L2, R2…). For sequential 3D, the projector will generate an output sync, but it may then be necessary to manually reset the dominance each time the player is started.



Frame Sequential

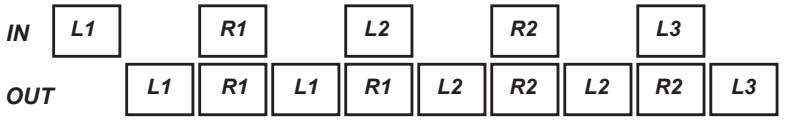
Notes

3D menu continued from previous page

Frame rate multiplication in 3D images

When displaying a low frame rate 3D video, the projector multiplies the frame rate to obtain a flicker-free image. For example, a 60Hz frame rate is doubled to 120 Hz, or a 48 Hz frame rate is tripled to 144 Hz.

Frame rate multiplication is an automatic process. It occurs in the background and cannot be modified by the user.



x2 example

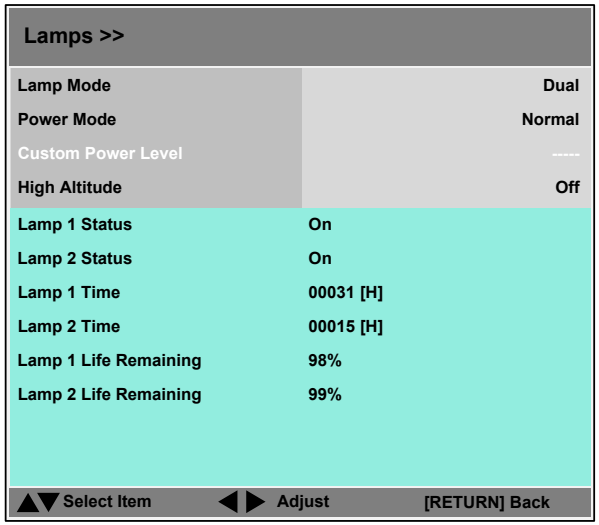
Notes

Lamps menu

- **Lamp Mode**
  Choose from **Auto 1**, **Dual**, **Lamp 1** and **Lamp 2**.
- **Power Mode**
  Eco will automatically set the lamp power to 80%. **Normal** will set the power to 92%.Set to **Custom** if you wish to adjust the power manually, from 80% to 100%.
- **Custom Power Level**
  Use the **LEFT** and **RIGHT** arrow buttons to set lamp power. This setting is only available if **Power Mode** is set to **Custom**.
- **High Altitude**
  On increases the fan speed to compensate for reduced air density at high altitude.

The following menu items show information only:

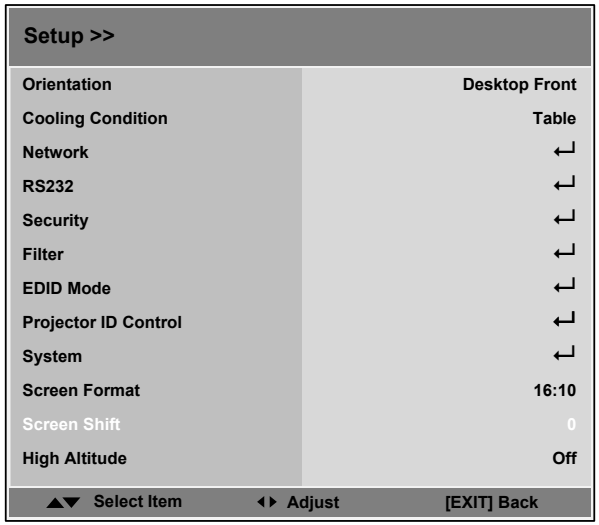
- **Lamp 1 Status**, **Lamp 2 Status**
- **Lamp 1 Time**, **Lamp 2 Time**
- **Lamp 1 Life Remaining**, **Lamp 2 Life Remaining**



Notes

Setup menu

- **Orientation**
  Choose from **Desktop Front**, **Desktop Rear**, **Ceiling Front** and **Ceiling Rear**.
- **Cooling Condition**
  Choose from **Table**, **Ceiling**, **Upward** and **Downward**.
- **Network**
  Set up a LAN network connection.
- **RS232**
  Set up a serial connection.
- **Security**
  Set up **Control Panel Lock** and **Security Lock**.
- **Filter**
  Set up filter exchange intervals and reset the filter timer.
- **EDID Mode**
  Configure EDID for each input.
- **Projector ID Control**
  Set up **ID Control Enable** and **Control ID Number**.
- **System**
  Adjust various system settings.
- **Screen Format**
  Set to **16:9**, **16:10** or **4:3**. Use this setting to adjust the projected image to your screen size.
- **Screen Shift**
  Set this to move the image within the unused area of the DMD depending on the **Screen Format** setting.
  For example, if the native resolution is WUXGA:
  - when **Screen Format** is set to **16:9**, **Screen Shift** will move the image up and down;
  - when **Screen Format** is **4:3**, **Screen Shift** will move the image left and right;
  - when **Screen Format** is **16:10**, **Screen Shift** will be disabled.
- **High Altitude**
  Set to **On** to increase fan speed if working at high altitudes, where air density is reduced.



Notes

Setup menu continued from previous page

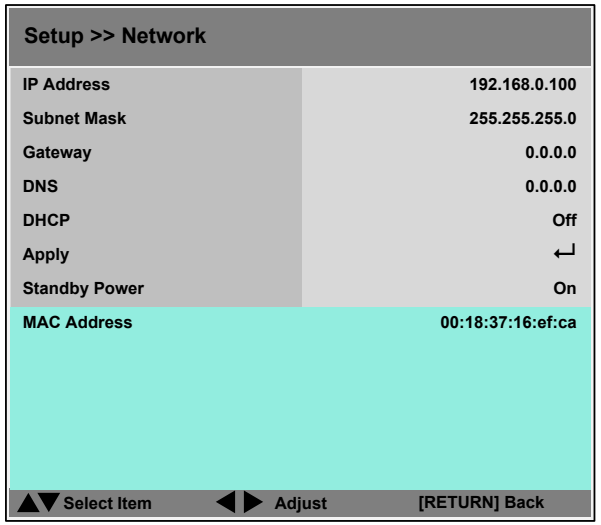
Network

Set **DHCP** to **On** if the IP address is to be assigned by a DHCP server, or **Off** if it is to be set here.

- If **DHCP** is set to **On**, it will not be possible to edit **IP Address**, **Subnet Mask**, **Gateway** or **DNS**.
- If **DHCP** is set to **Off**:
  1. Edit **IP Address**, **Subnet Mask**, **Gateway** and **DNS** as required.
  2. Select **Apply** and press **ENTER**.

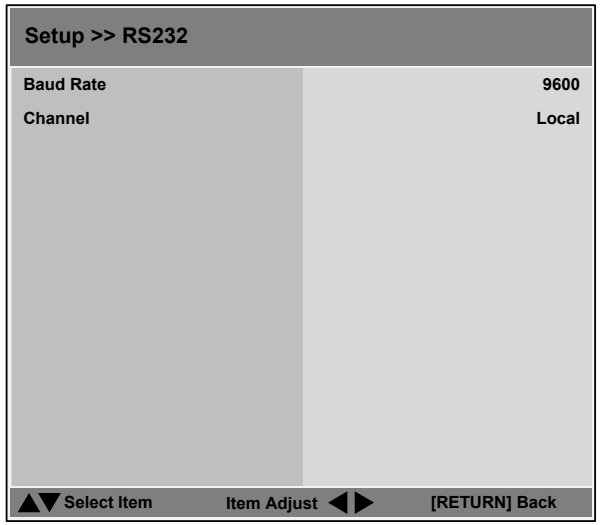
Standby Power

If this setting is **On**, the LAN socket remains active when the projector is in STANDBY mode. If the setting is **Off**, the LAN socket is disabled when the projector is in STANDBY mode.



RS232

- **Baud Rate**
  Choose between **38400**, **19200** and **9600**.
- **Channel**
  Choose between **Local** and **HDBaseT**.



Notes

Setup menu continued from previous page

Security

Control Panel Lock

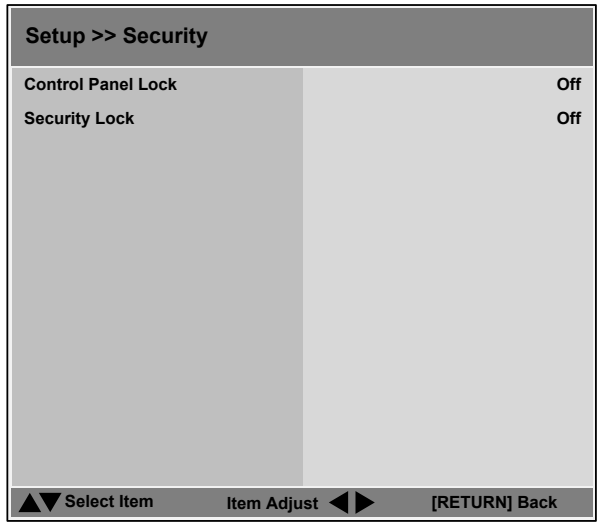
Use this setting to lock the control panel keys.

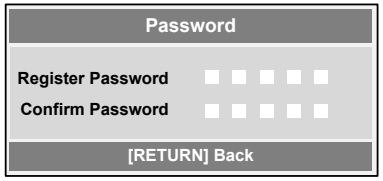
To unlock the keys, press the **DOWN** arrow button and hold for 5 seconds.

Security Lock

When the **Security Lock** is enabled, a security password will need to entered before the projector can be used, or before the lock can be disabled.

When setting the lock for the first time, the password will need to be entered twice, to ensure that it has been entered correctly.

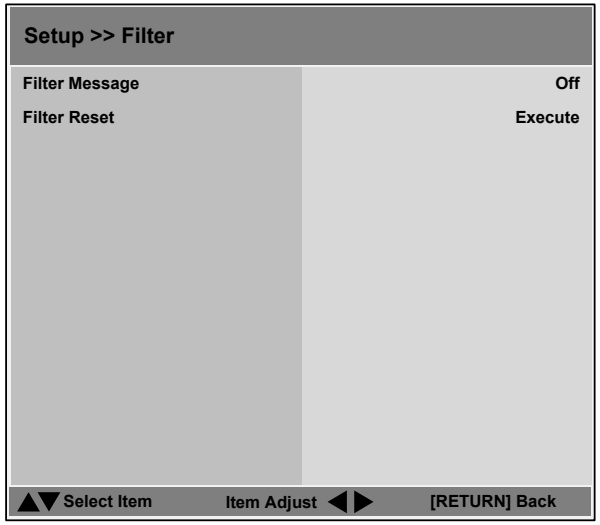




Filter

This menu allows you to set up a reminder that the filters are due for replacement and to reset the filter timer.

- **Filter Message**
  Choose from **Off**, **100 hours**, **200 hours**, **500 hours** and **1000 hours**.
- **Filter Reset**
  Press **ENTER** to reset the timer.



Notes

The password consists of a combination of five presses of the arrow keys.

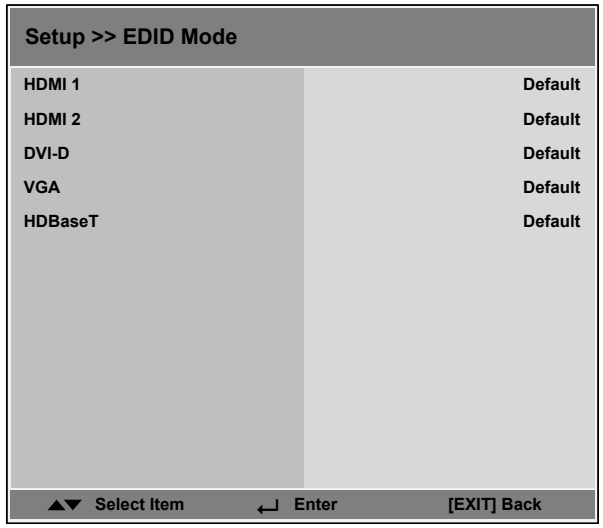
*Find details about changing filters in the **Installation and Quick-Start Guide**.*

Setup menu continued from previous page

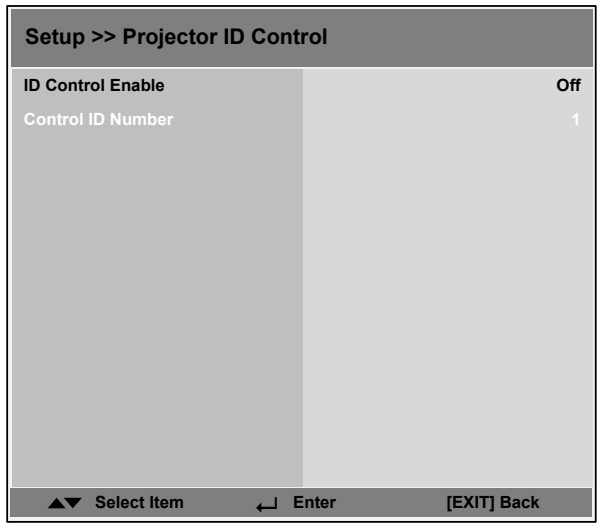
EDID Mode

For each input, choose from:

- **Default**
- **1024 x 768 @60**
- **1280 x 720 @60**
- **1280 x 800 @60**
- **1280 x 1024 @60**
- **1600 x 1200 @60**
- **1680 x 1050 @60**
- **1920 x 1080 @60**.



Projector ID Control

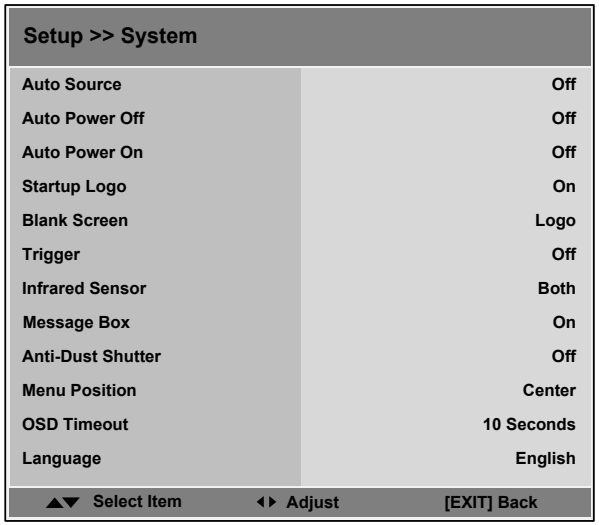


Notes

Setup menu continued from previous page

System

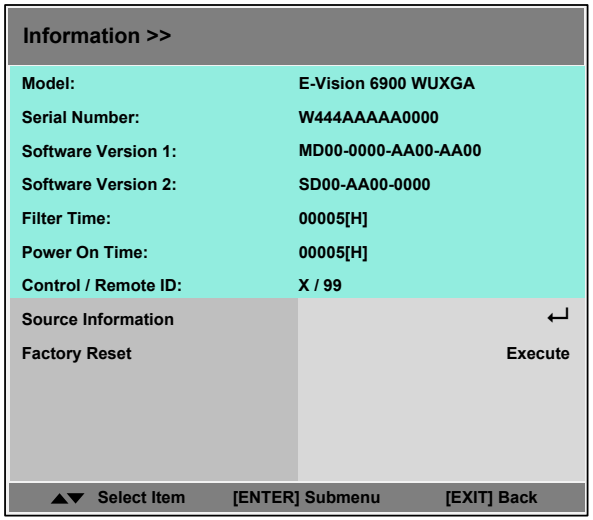
- **Auto-Source**
  If this setting is **On**, the projector will automatically search for an active input source.
- **Auto Power Off**
  Set this to **On** if you want the projector to go into STANDBY mode when no input source is detected for 20 minutes.
- **Auto Power On**
  - Set this to **On** if you want the projector to start up immediately when the mains is connected.
  - Set this to **Off** if you want the projector to go into STANDBY mode when the mains is connected. In this case, the projector will not start up until the **POWER** button is pressed on the control panel or the remote control.
- **Startup Logo**
  Set this to **On** to show the DP logo when the projector is first switched on.
- **Blank Screen**
  Choose from **Logo**, **Blue** and **Black**.
- **Trigger**
  Choose from **Screen**, **16:9**, **TheaterScope**, **4:3**, **4:3 Narrow** or **RS232** to determine what will cause the trigger output to activate.
- **Infrared Sensor**
  Choose from **Both**, **Front**, **Rear**, **HDBaseT** and **Off**.
- **Message Box**
  Switch this off if you wish to avoid system messages appearing on the screen during projection.
- Anti-Dust Shutter
- **Menu Position**
  Determine where the OSD should appear on the screen when activated. Choose from **Center**, **Top Left**, **Top Right**, **Bottom Left** and **Bottom Right**.
- **OSD Timeout**
  Determine how long the OSD should remain on the screen if no buttons are pressed. Choose **Always On** to disable this feature.
- **Language**
  Change the OSD language.



Notes

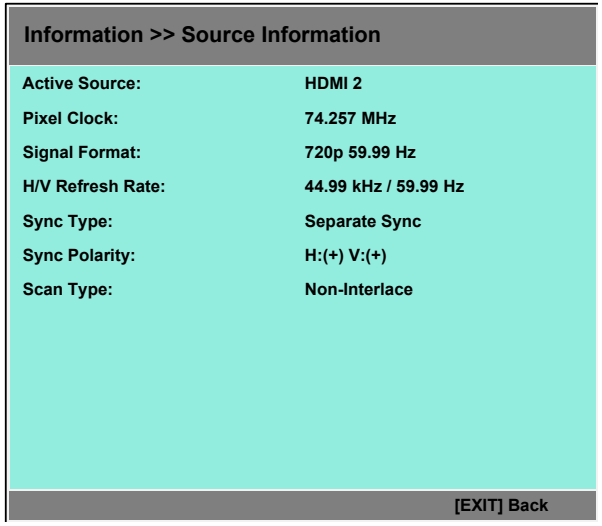
Information menu

This menu gives information about software and hardware configuration, input source and lamp operating times It also allows you to restore the factory default settings.



Source information

This page provides information about the currently selected input source.



Factory Reset

To restore the factory default settings:

1. Navigate to **Factory Reset** and press **ENTER**.
2. When prompted, use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to highlight the **OK** button and then press **ENTER** to confirm your choice.

Notes

Menu Map

Menu	*Submenus and controls*
INPUT	***HDMI 1*, HDMI 2, DVI-D, VGA, Component, HDBaseT**
TEST PATTERN	***Off*, White, Black, Red, Green, Blue, Checkerboard, Crosshatch, V Burst, H Burst, Color Bar, H Ramp**
LENS	***Lens Lock: On, Off*** ***Lens Control*** *Zoom / Focus* *Shift V / Shift H* ***Lens Type: non-UST Lens, UST Lens*** ***Center Lens (command)*** ***Lens Memory*** *Save Memory: Memory 1 to Memory 10* *Load Memory: Memory 1 to Memory 10* *Clear Memory: Memory 1 to Memory 10*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

Some menu options and controls may not be available due to settings in other menus. These will be lighter in color in the OSD.

Where it would be helpful, some menu options are described in more detail earlier in this operating guide.

Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in this section.*

Menu	*Submenus and controls*
IMAGE	

Image Mode: Bright, Presentation, Video
Brightness, Contrast: sliders, 0 to 200 (100)
Gamma: 1.0, 1.8, 2.0, 2.2, 2.35, 2.5, S Curve
Dynamic Black: On, Off
Saturation, Hue: sliders, 0 to 200 (100)
Sharpness: slider, 0 to 31
Noise Reduction: slider, 0 to 15
Position And Phase
VGA Setup: H Total, H Start, H Phase, V Start: sliders, 0 to 200 (100)
Digital Alignment
Digital Zoom: slider
Digital Pan: slider
Digital Scan: slider
Reset (command)
H/V Alignment
H Zoom: slider
V Zoom: slider
H Shift: slider
V Shift: slider
Reset (command)
Resync (command)

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

Some menu options and controls may not be available due to settings in other menus. These will be shaded grey on the actual menu.

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Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in this section.*

Menu	*Submenus and controls*
COLOR	
	Color Space: Auto, YPbPr, YCbCr, RGB-PC, RGB-Video
	Color Temperature: Native, 5400K, 6500K, 7500K, 9300K
	Trim: Red Lift, Green Lift, Blue Lift, Red Gain, Green Gain, Blue Gain: sliders, 0 to 200 (100)
	Hue / Saturation / Gain
	Red: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Green: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Blue: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Cyan: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Magenta: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Yellow: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	White: Hue, Saturation, Gain: sliders, 0 to 200 (100)
	Reset (command)
GEOMETRY	
	Aspect Ratio: 5:4, 4:3, 16:10, 16:9, 1.88:1, 2.35:1, TheaterScope, Source, Unscaled
	Keystone :
	H Keystone, V Keystone: sliders, -30 to 30 (0)
	Reset (command)
	Corner Adjustment: Selection and adjustment of each individual corner
	Overscan: On, Off
3D	
	3D Format: Off, Auto, Side by Side, Top and Bottom, Frame Sequential
	DLP Link: On, Off
	Eye Swap : Normal, Reverse
	3D 24Hz Display: 96Hz, 144Hz
	Sync Reference: Internal, External
	Sync Delay: slider, 0 to 100

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

Some menu options and controls may not be available due to settings in other menus. These will be shaded grey on the actual menu.

Where it would be helpful, some menu options are described in more detail earlier in this operating guide.

Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in this section.*

Menu	*Submenus and controls*

LAMPS

Lamp Mode: Auto 1, Dual, Lamp 1, Lamp 2
Power Mode: Eco, Normal, Custom
Custom Power Level: 80% to 100%
Information only: ***Lamp 1 Status, Lamp 2 Status***
Lamp 1 Time, Lamp 2 Time
Lamp 1 Life Remaining, Lamp 2 Life Remaining

SETUP

Orientation: Desktop Front, Desktop Rear, Ceiling Front, Ceiling Rear
Cooling Condition: Table, Ceiling, Upward, Downward
Network
IP Address: numeric input (default IP address is 192.168.0.100)
Subnet Mask, Gateway, DNS: numeric input
DHCP: On, Off
Apply (command)
Standby Power: On, Off
Information only: MAC Address
RS232
Baud Rate: 38400, 19200, 9600
Channel: Local, HDBaseT
Security
Control Panel Lock: On, Off
Security Lock: On, Off
Filter
Filter Message: Off, 100 hours, 200 hours, 500 hours, 1000 hours
Filter Reset (command)
EDID Mode
HDMI 1, HDMI 2, DVI-D, VGA, HDBaseT: Default, 1024 x 768 @60, 1280 x 720 @60, 1280 x 800 @60, 1280 x 1024 @60, 1600 x 1200 @60, 1680 x 1050 @60, 1920 x 1080 @60
Projector ID Control
ID Control Enable: On, Off
Control ID Number: slider, 1 to 99

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

Some menu options and controls may not be available due to settings in other menus. These will be shaded grey on the actual menu.

Where it would be helpful, some menu options are described in more detail earlier in this operating guide.

Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in this section.*

Menu	*Submenus and controls*
(SETUP menu continued)	
	System
	Auto Source: On, Off
	Auto Power Off: On, Off
	Auto Power On: On, Off
	Startup Logo: On, Off
	Blank Screen: Logo, Blue, Black
	Trigger: On, Off
	Infrared Sensor: Both, Front, Rear, HDBaseT, Off
	Message Box: On, Off
	Anti-Dust Shutter: On, Off
	Menu Position: Center, Top Left, Top Right, Bottom Left, Bottom Right
	OSD Timeout: Always On, 10 Seconds, 30 Seconds, 60 Seconds
	Language: English, Français, Español, Deutsch, Português, 简体中文, 繁體中文, 日本語, 한국어
	Screen Format: 16:10, 16:9, 4:3
	Screen Shift: slider, range depends on Screen Format value
	High Altitude: On, Off
INFORMATION	
	Model, Serial Number, Software Version 1, Software Version 2, Filter Time, Power On Time
	Source Information:
	Active Source, Pixel Clock, Signal Format, H/V Refresh Rate, Sync Type, Sync Polarity, Scan Type, Video Type
	Factory Reset (command)

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

Some menu options and controls may not be available due to settings in other menus. These will be shaded grey on the actual menu.

Where it would be helpful, some menu options are described in more detail earlier in this operating guide.

Some settings are associated with the current input and the value of the **Image Mode** *setting (***Bright***,* **Presentation** *or* **Video***). The projector automatically stores values of such settings to reuse when an* **Input** */* **Image Mode** *combination is selected again. For example, if you increase the* **Contrast** *value while on the DVI-D input with I***mage Mode** *set to* **Bright***, the next time you use the DVI-D input with* **Image Mode** *set to* **Bright***, the projector will automatically set the same* **Contrast** *value.*

Settings NOT associated with an **Input** */* **Image Mode** *combination are called* ***global settings*** *and are indicated with a globe icon in this section.*

DIGITAL PROJECTION

E-Vision 6900 Series

High Brightness Digital Video Projector

REFERENCE GUIDE

Rev A February 2017

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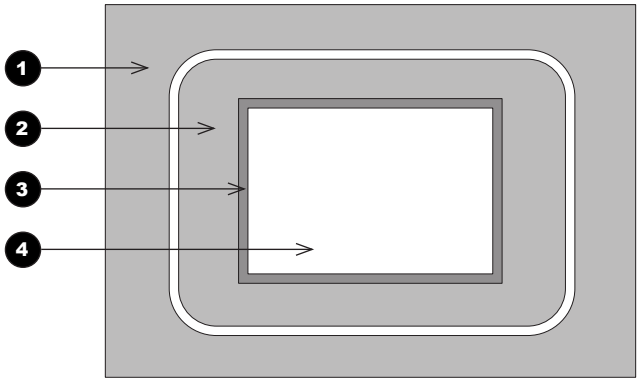
The DMD™

A DMD™ (Digital Micromirror Device™) is a true digital light modulator which utilises an array of up to 2.3 million moving aluminium mirrors, with each one representing a pixel in the final projected image. The outermost micromirrors in the array remain inactive (***pond of mirrors***) and are not used in constructing the image.

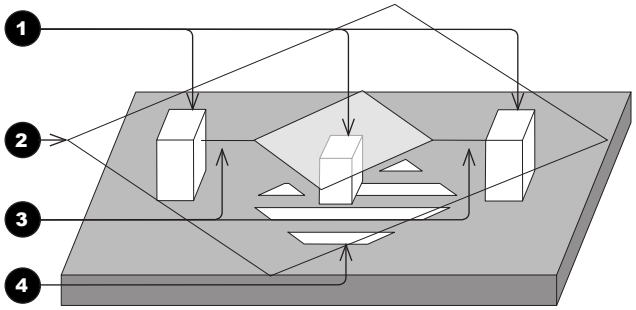
1. **Casing**
2. **Light shield**
3. **Pond of mirrors**
4. **Array**



DMD™

Each mirror element is suspended over address electrodes by a torsion hinge between two posts.

1. **Support posts**
2. **Mirror element**
3. **Torsion hinges**
4. **Offset address electrode**

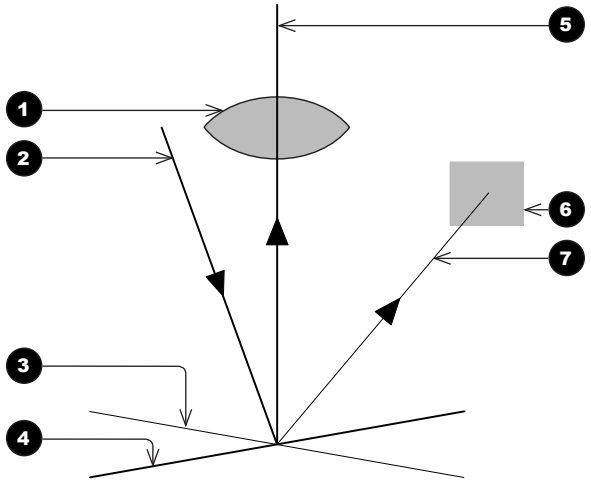


Mirror element with tilt mechanism

Notes

Depending on the voltage polarity applied, each mirror will either tilt to the left to produce a bright pixel or to the right for a dark pixel. When light is applied to the complete DMD™, only the light redirected from a mirror tilting to the left is projected.

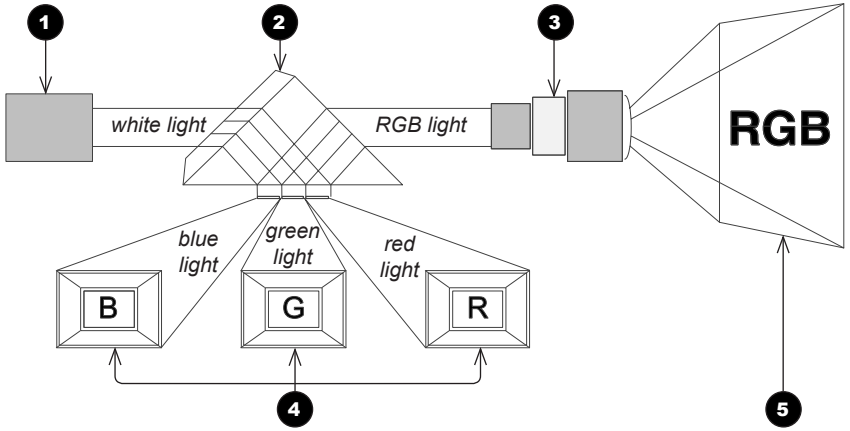
1. **Projection lens**
2. **Incoming light from the illumination module**
3. **Mirror element tilted to the right**
4. **Mirror element tilted to the left**
5. **Reflected light, left tilt**
6. **Light dump**
7. **Reflected light, right tilt**



Light flow

The projector optically filters white light from the illumination module into its constituent red, green and blue. Each color illuminates a separate DMD™ whose modulated output is then recombined with the other two to form the projected full color image.

1. **Illumination module**
2. **Optical filtering of light into red, green and blue**
3. **Projection lens**
4. **DMD™ devices**
5. **Full color image displayed on screen**



Filtering process

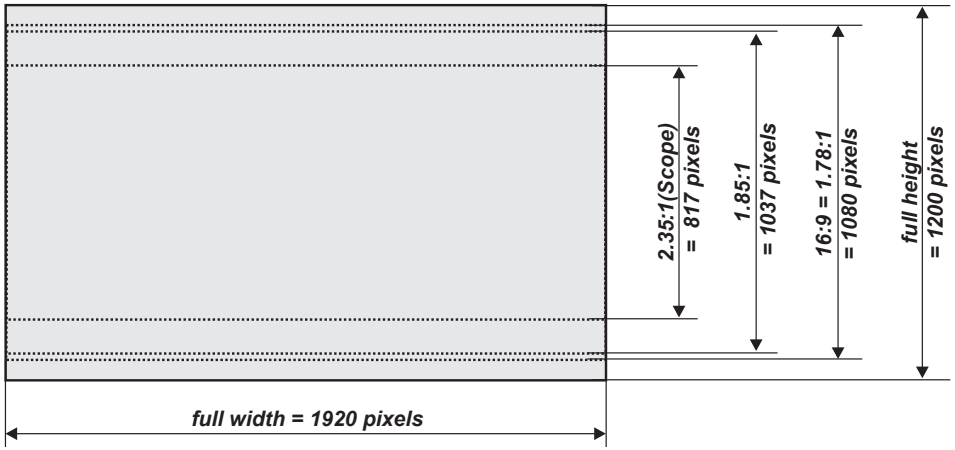
Notes

Screen Requirements

Fitting the image to the DMD™

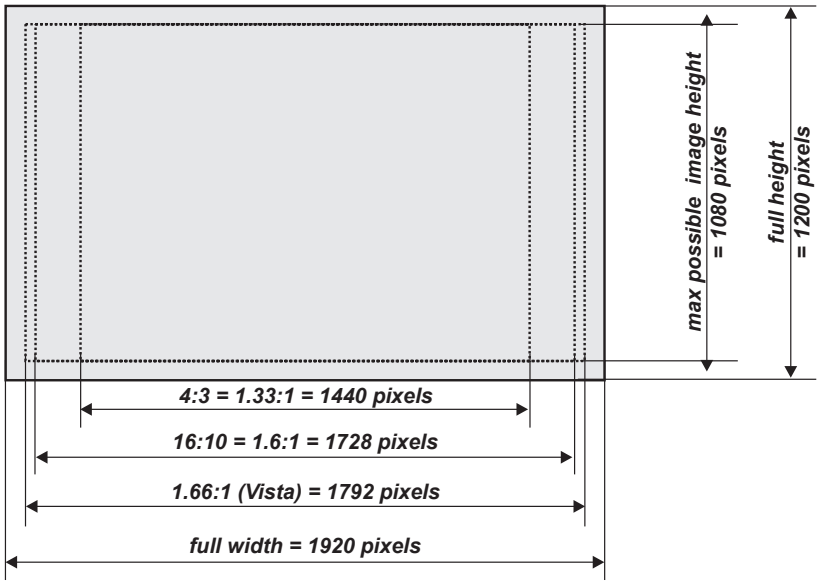
If the source image supplied to the projector is smaller than the DMD™ resolution, the image will not fill the DMD™. The following examples show how a number of common formats may be displayed, depending on your DMD™ resolution.

WUXGA images displayed full width



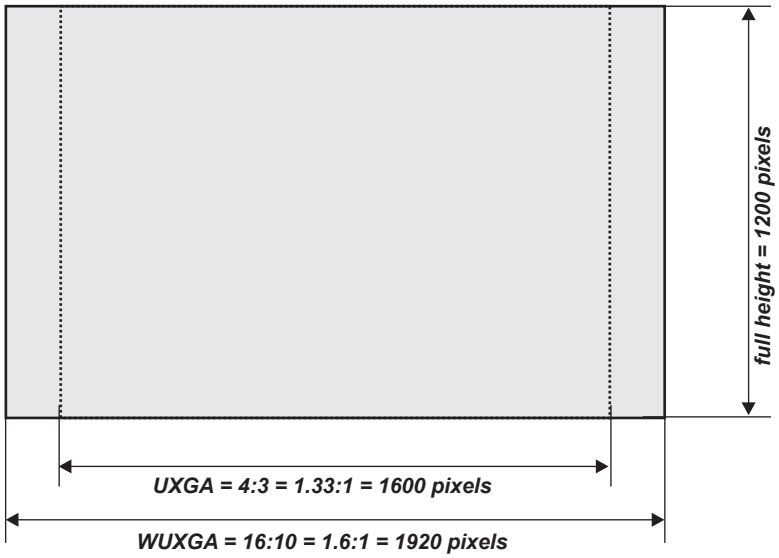
Notes

WUXGA images displayed with a height of 1080 pixels



Notes

WUXGA images displayed full height



Notes

Only WUXGA or UXGA images can fill the full height of the DMD™, using all 1200 pixels without scaling.

Diagonal screen sizes

Screen sizes are sometimes specified by their diagonal size (D). When dealing with large screens and projection distances at different aspect ratios, it is more convenient to measure screen width (W) and height (H).

The example calculations below show how to convert diagonal sizes into width and height, at various aspect ratios.

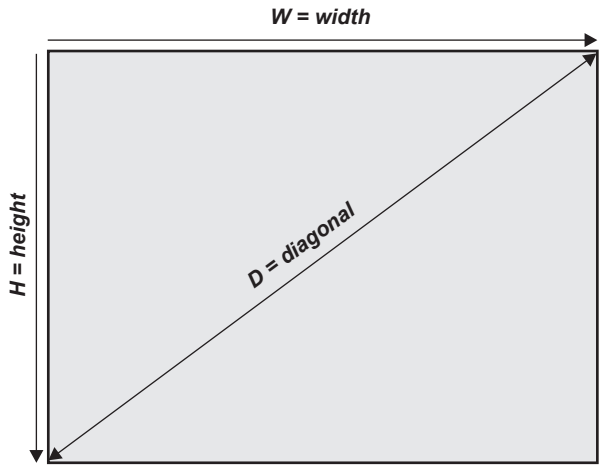
2.35:1 (Scope)
W = D x 0.92 ***H*** = D x 0.39

1.85:1
W = D x 0.88 ***H*** = D x 0.47

16:9 = 1.78:1
W = D x 0.87 ***H*** = D x 0.49

1.66:1 (Vista)
W = D x 0.86 ***H*** = D x 0.52

16:10 = 1.6:1 (native aspect ratio for WUXGA projectors)
W = D x 0.85 ***H*** = D x 0.53



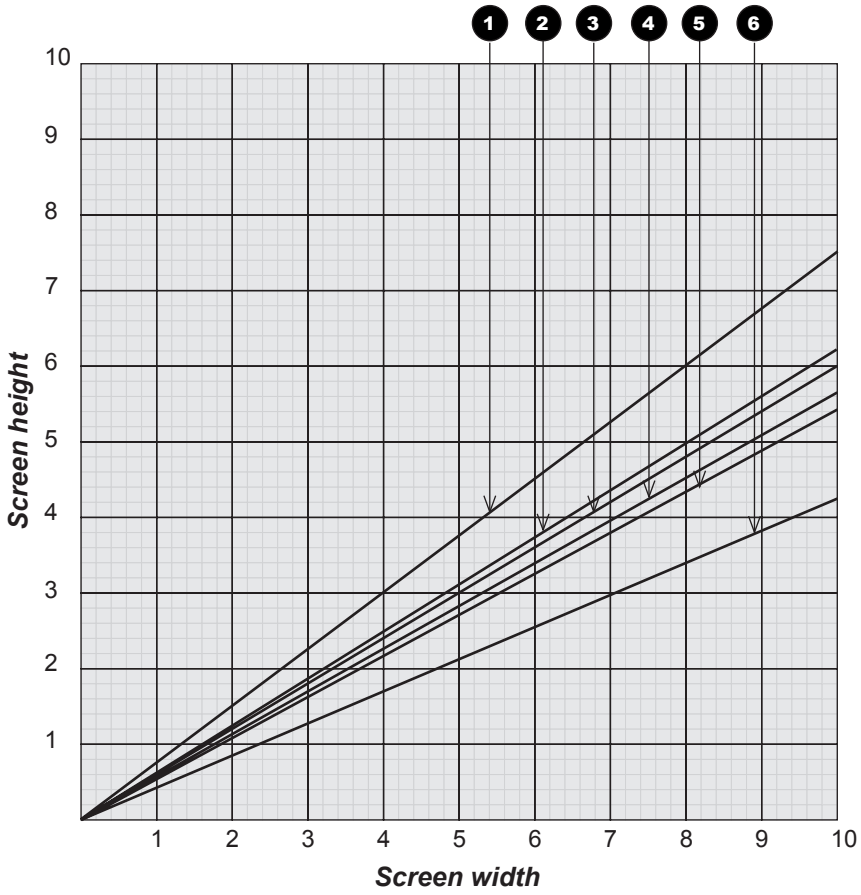
Notes

Fitting the image to the screen

It is important that your screen is of sufficient height and width to display images at all the aspect ratios you are planning to use.

Use the conversion chart to check that you are able to display the full image on your screen. If you have insufficient height or width, you will have to reduce the overall image size in order to display the full image on your screen.

1. **4:3 = 1.33:1**
   W = H x 1.33, H = W x 0.75
2. **16:10 = 1.6:1**
   (native aspect ratio for WUXGA projectors)
   W = H x 1.6, H = W x 0.625
3. **1.66:1 (Vista)**
   W = H x 1.66, H = W x 0.6
4. **16:9 = 1.78:1**
   W = H x 1.78, H = W x 0.56
5. **1.85:1 (Flat)**
   W = H x 1.85, H = W x 0.54
6. **2.35:1 (Scope)**
   W = H x 2.35, H = W x 0.426

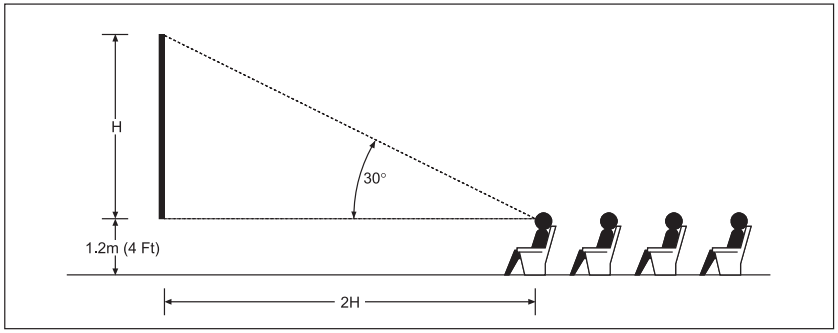


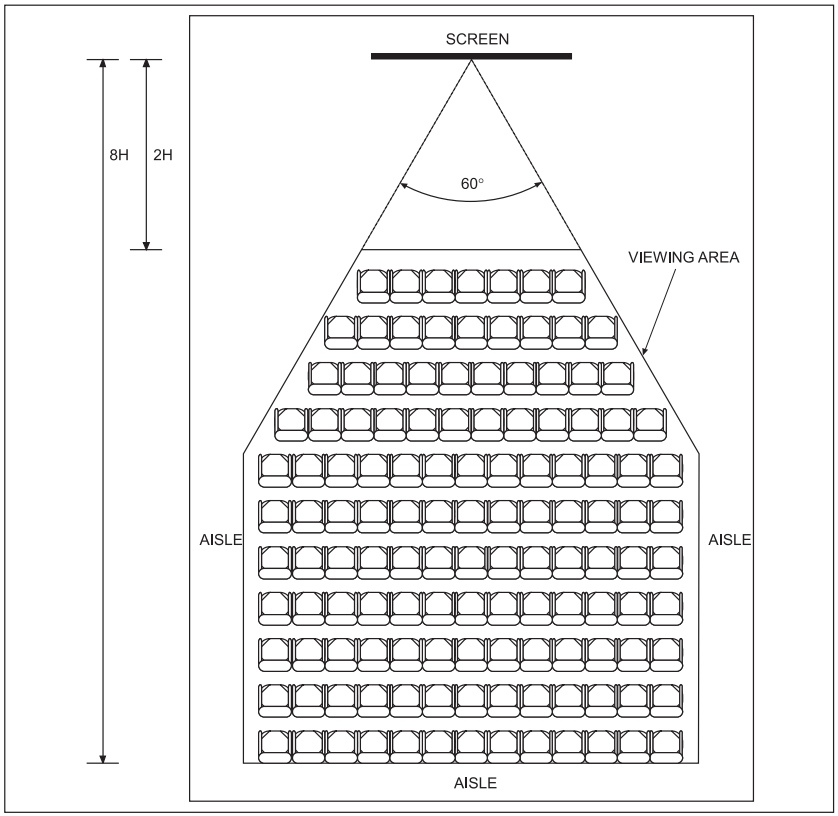
Notes

Positioning the screen and projector

For optimum viewing, the screen should be a flat surface perpendicular to the floor. The bottom of the screen should be 1.2 m (4 feet) above the floor and the front row of the audience should not have to look up more than 30° to see the top of the screen.

The distance between the front row of the audience and the screen should be at least twice the screen height and the distance between the back row and the screen should be a maximum of 8 times the screen height. The screen viewing area should be within a 60° range from the face of the screen.





Notes

The projector should be installed as close to the power outlet as possible.

The power connection should be easily accessible, so that it can be disconnected in an emergency.

Ensure that there is at least 30 cm (12 in) of space between the ventilation outlets and any wall, and 10 cm (4 in) on all other sides.

Do not install the projector close to anything that might be affected by its operational heat, for instance, polystyrene ceiling tiles, curtains etc.

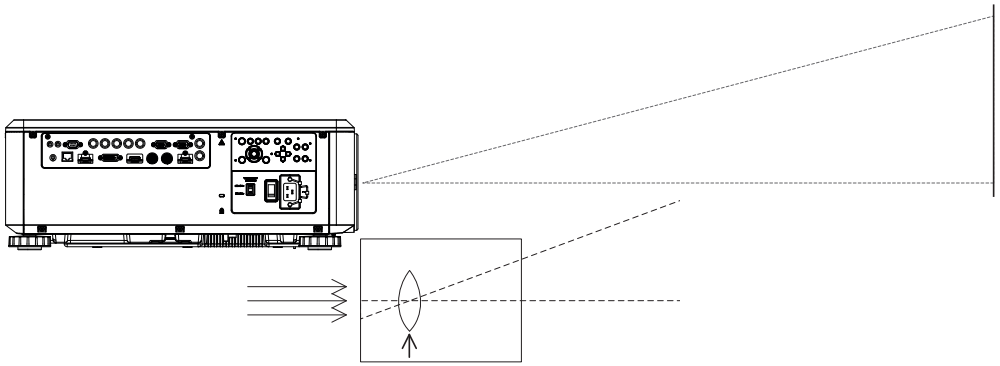
*The image can be flipped for rear projection (see **Setup menu** in the **Operating Guide**) and displayed without the need for extra mirrors or equipment.*

However, you must ensure that there is sufficient distance behind the screen for the projector to be correctly located.

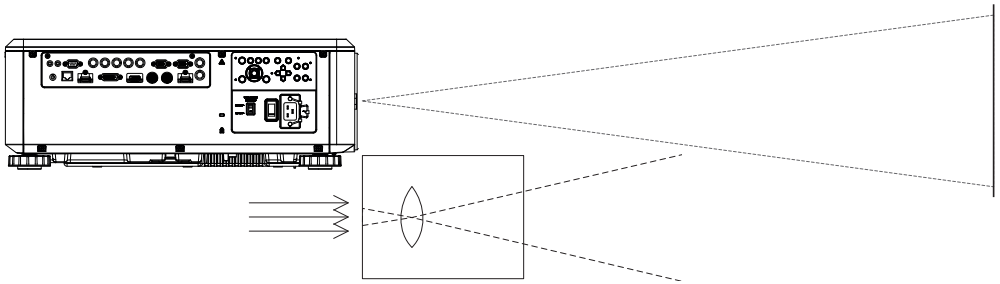
Rear installation is generally more complicated and advice should be sought from your local dealer before attempting it.

Positioning The Image

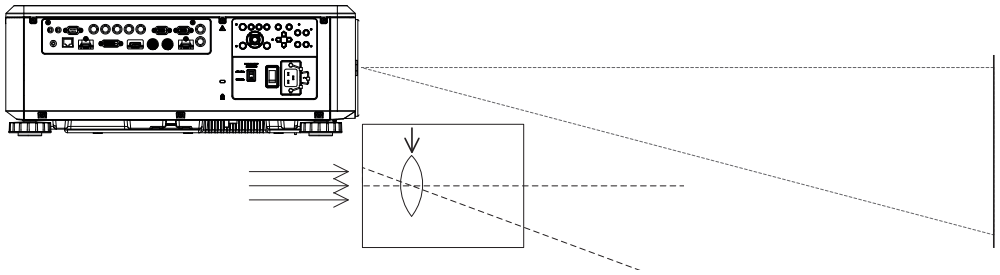
The normal position for the projector is at the centre of the screen. However, you can set the projector above or below the centre, or to one side, and adjust the image using the **Lens shift** feature (known as ***rising and falling front***) to maintain a geometrically correct image.



Shifting the lens up (rising front)



Centered lens

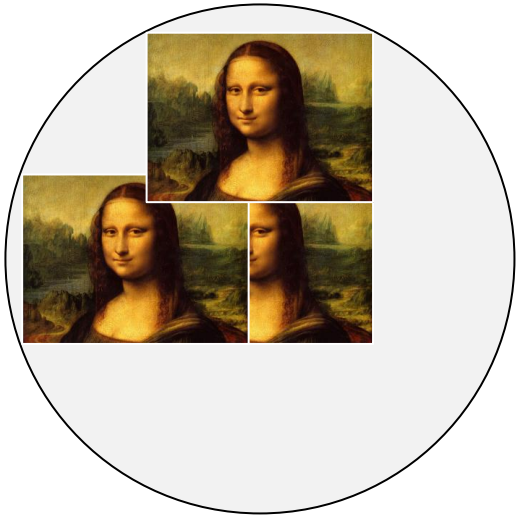


Shifting the lens down (falling front)

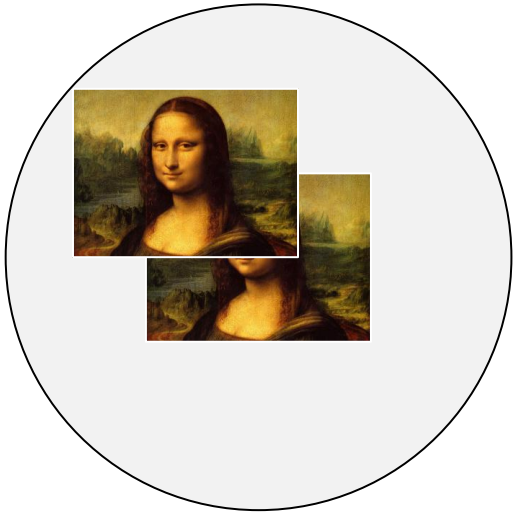
Notes

Any single adjustment outside the ranges specified on the following page may result in an unacceptable level of distortion, particularly at the corners of the image, due to the image passing through the periphery of the lens optics.

If the lens is to be shifted in two directions combined, the maximum range without distortion will be somewhat less, as can be seen in the illustrations below.



Full horizontal or vertical shift



Combined shift is reduced

Notes

Frame Rates And Pulldowns Explained

Interlaced and progressive scan

A ***progressive scan*** is a method of updating the image by drawing all the lines of each frame in a sequence. In contrast, ***interlaced video*** alternately scans odd and even lines. In old analog TV interlacing was commonly used as a way of doubling the refresh rate without consuming extra bandwidth.

The following artifacts are common with interlaced video:

- edge tear (combing)

  The image lands between two fields and blurs. This is commonly observed when viewing rapid lateral movement.

- aliasing (stair-stepping)

  The texture of the image becomes populated with unrealistic patterns. Aliasing occurs because of differences between the original frame rate and the destination format.

- twitter

  The image shimmers, for example when showing rolling credits. This happens when the image contains thin horizontal lines that only appear in one field.

Frame rates of image sources

Original analog films are made at 24 fps and the whole frame is projected at once. To eliminate flicker and create an impression of continuous movement, the projector blades divide the images so that the viewer sees 48 frames per second.

Interlaced video scans odd lines, then even. Two fields are blended into one image. NTSC video (60i) is 29.97 fps, or 59.94 fields per second.

24p video is progressive but without the benefit of projector blades dividing the images, so it looks jumpier on playback than film. 24p is the optimal format for projects that are finished on film.

30p is optimal for projects finished on video. It has fewer strobing issues than 24p in video playback.

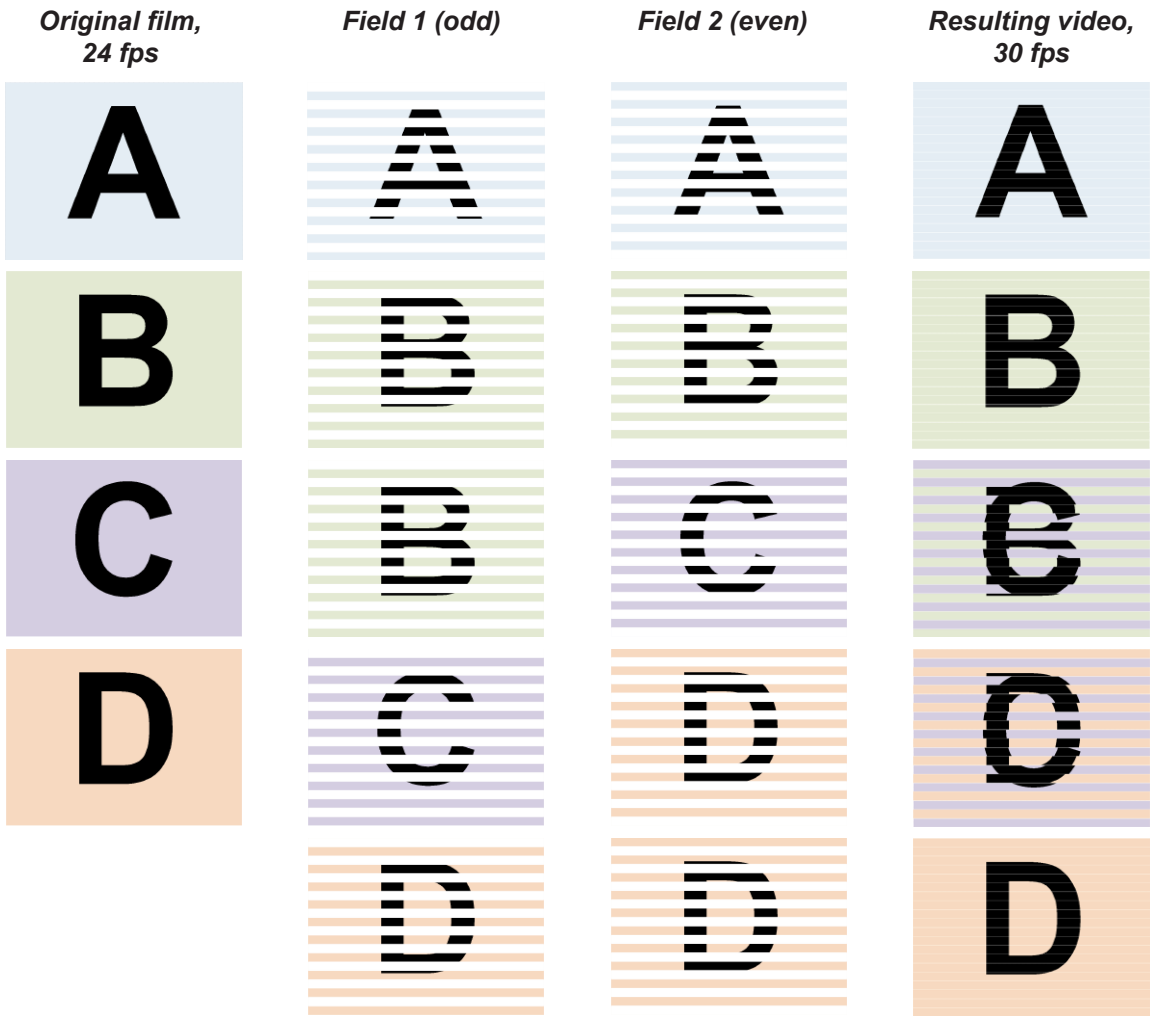
Notes

Pulldowns - conversion into destination formats

Pulldowns are a method of converting a 24p source into a different destination format by adding extra frames to the source.

2:3 (normal) pulldown

This method is used to convert a 24p source (film) into a 60i destination (NTSC video) by adding two extra fields for every four frames, effectively increasing the frame rate to 30 fps. The frame is split into fields and then two fields are repeated for every four original frames as shown in the illustration below.

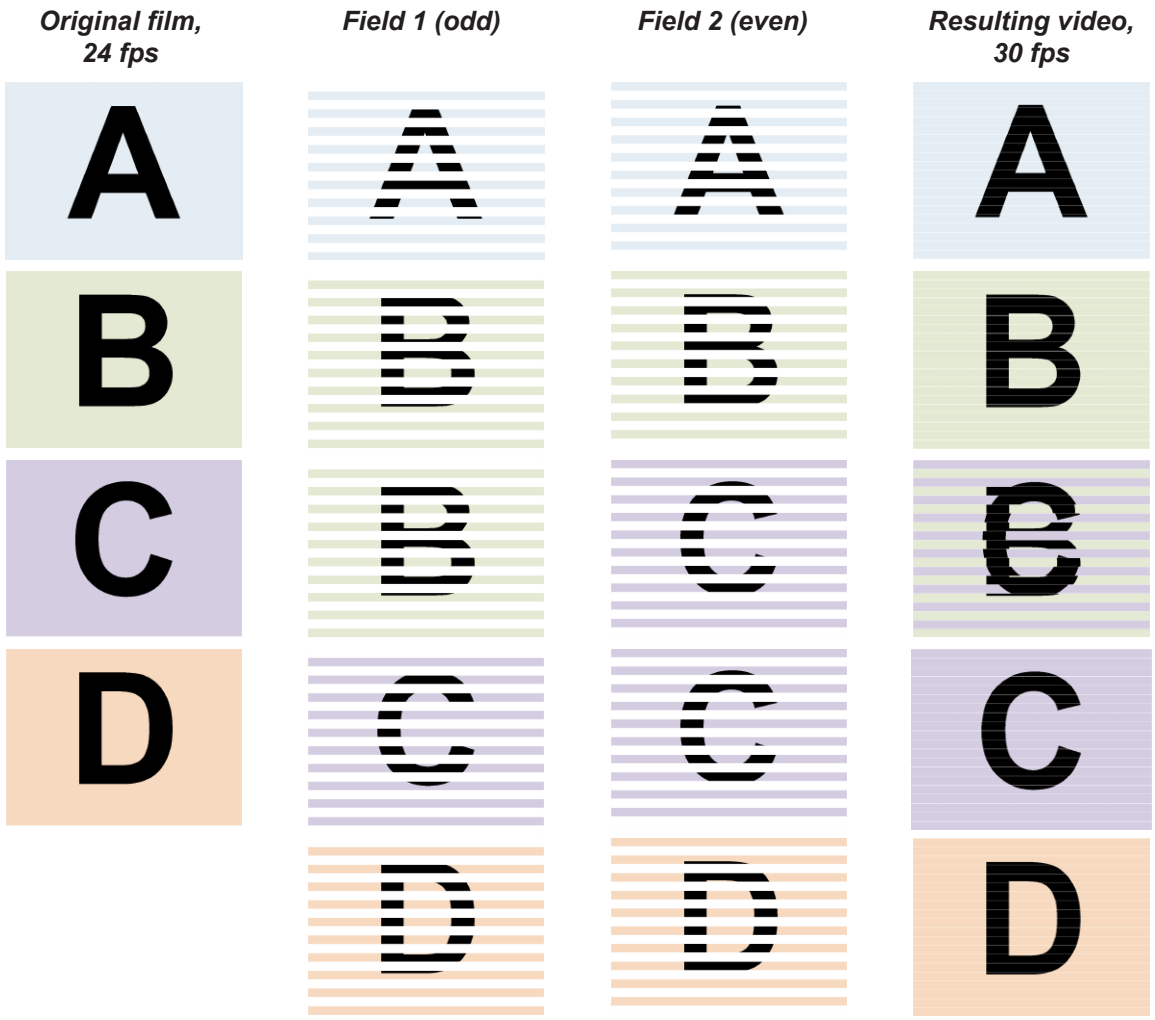


Notes

2:3:3:2 (advanced) pulldown

This method is very similar to the normal pulldown. Unlike the normal pulldown method, the resulting 30 fps video sequence contains only one frame containing fields from two different source frames.

The advantage of this method is that it is easier to reverse, if necessary.



Notes

The projector will use advanced pulldown on suitable video material, wherever possible.

Appendix A: Lens Part Numbers

Throw ratios	Part number	Focus range	Lens shift	Lens extension
0.38 : 1 fixed (UST)	117-341	0.82 m - 2.71 m	none	292.5 mm
0.75 - 0.93 : 1 zoom	115-339	1.02 m - 12.7 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	59.4 mm
0.76 : 1 fixed	112-499	0.81 m - 5.08 m	none	30 mm
1.25 - 1.79 : 1 zoom	112-500	1.33 m - 11.73 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	36.5 mm
1.72 - 2.27 : 1 zoom	112-501	1.83 m - 14.9 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	10.8 mm
2.22 - 3.67 : 1 zoom	112-502	2.36 m - 24.2 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	29.9 mm
3.58 - 5.38 : 1 zoom	112-503	3.8 m - 35.35 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	46.7 mm
5.31 - 8.26 : 1 zoom	112-504	5.59 m - 54.8 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame	87.3 mm

Notes

Throw distance calculations are based on the distance from the outer end of the lens, which will vary from lens to lens.

The 0.38 : 1 fixed lens has no adjustable shift value. However, the lens has an inherent offset depending on image size. See the UST documentation published separately on the Digital Projection website.

Appendix B: Supported Signal Input Modes

2D formats

Signal	Resolution	Refresh Rate (Hz)	VGA / 5BNC-YUV	VGA-RGBHV	5BNC-RGBHV	DVI-D	HDMI / HDBaseT			
							RGB	YUV 8-bit	YUV 10-bit	YUV 12-bit
PC	640x480	59.93		✓	✓	✓	✓			
	640x480	75		✓	✓	✓	✓			
	640x480	85.01		✓	✓	✓	✓			
	800x600	60.32		✓	✓	✓	✓			
	800x600	75		✓	✓	✓	✓			
	800x600	85.06		✓	✓	✓	✓			
	848x480	60		✓	✓	✓	✓			
	1024x768	60		✓	✓	✓	✓			
	1024x768	75.03		✓	✓	✓	✓			
	1024x768	85.03		✓	✓	✓	✓			
	1024x768	120		✓	✓	✓	✓			
	1024x768RB	119.98		✓	✓	✓	✓			
	1280x720	59.91		✓	✓	✓	✓			
	1280x720	120		✓	✓	✓	✓			
	1280 x 768	60		✓	✓	✓	✓			
	1280 x 800	60		✓	✓	✓	✓			
	1280x800RB	119.9		✓	✓	✓	✓			
	1280 x 960	60		✓	✓	✓	✓			
	1280x1024	60.02		✓	✓	✓	✓			
	1280x1024	75.02		✓	✓	✓	✓			
	1280x1024	85.02		✓	✓	✓	✓			
	1366 x 768	60		✓	✓	✓	✓			

continues on next page...

Notes

Signal	Resolution	Refresh Rate (Hz)	VGA / 5BNC-YUV	VGA-RGBHV	5BNC-RGBHV	DVI-D	HDMI / HDBaseT			
							RGB	YUV 8-bit	YUV 10-bit	YUV 12-bit
PC - continued	1440 x 900	60		✓	✓	✓	✓			
	1400X1050	60		✓	✓	✓	✓			
	1600x1200	60		✓	✓	✓	✓			
	1680x1050	59.94		✓	✓	✓	✓			
	1920x1200RB	60		✓	✓	✓	✓			
SDTV	480i	59.94	✓	✓	✓					
	1440x480i	60					✓	✓	✓	
	1440x576i	50					✓	✓	✓	
	576i	50	✓	✓	✓					
EDTV	480p	59.94	✓	✓	✓	✓	✓	✓	✓	
	576p	50	✓	✓	✓	✓	✓	✓	✓	
HDTV	1080i	50	✓	✓	✓	✓	✓	✓	✓	
	1080i	59.94	✓	✓	✓	✓	✓	✓	✓	
	1080i	60	✓	✓	✓	✓	✓	✓	✓	
	720p	50	✓	✓	✓	✓	✓	✓	✓	
	720p	59.94	✓	✓	✓	✓	✓	✓	✓	
	720p	60	✓	✓	✓	✓	✓	✓	✓	
	1080p	23.98	✓	✓	✓	✓	✓	✓	✓	
	1080p	24	✓	✓	✓	✓	✓	✓	✓	
	1080p	25	✓	✓	✓	✓	✓	✓	✓	
	1080p	29.97	✓	✓	✓	✓	✓	✓	✓	
	1080p	30	✓	✓	✓	✓	✓	✓	✓	
	1080p	50	✓	✓	✓	✓	✓	✓	✓	
	1080p	59.94	✓	✓	✓	✓	✓	✓	✓	
	1080p	60	✓	✓	✓	✓	✓	✓	✓	

Notes

3D formats

Signal	Resolution	Refresh Rate (Hz)	Total number of lines	Horizontal Frequency (kHz)	HDMI 1 / 2	DVI-D
720p50	1280x720	50.00	1470	37.50	✓	
720p59	1280x720	59.94	1470	44.96	✓	
720p60	1280x720	60.00	1470	45.00	✓	
720p50	1280x720	50.00	750	37.50	✓	✓
720p59	1280x720	59.94	750	44.96	✓	✓
720p60	1280x720	60.00	750	45.00	✓	✓
1080p23	1920x1080	23.98	2205	26.97	✓	
1080p24	1920x1080	24.00	2205	27.00	✓	
1080i50	1920x1080	50.00	1125	56.25	✓	✓
1080i59	1920x1080	59.94	1125	67.43	✓	✓
1080i60	1920x1080	60.00	1125	67.50	✓	✓
1080p50	1920x1080	50.00	1125	56.25	✓	✓
1080p59	1920x1080	59.94	1125	67.43	✓	✓
1080p60	1920x1080	60.00	1125	67.50	✓	✓
1080p50	1920x1080	50.00	1125	56.25	✓	✓
1080p59	1920x1080	59.94	1125	67.43	✓	✓
1080p60	1920x1080	60.00	1125	67.50	✓	✓
1080p50	1920x1080	50.00	1125	56.25	✓	✓
1080p59	1920x1080	59.94	1125	67.43	✓	✓
1080p60	1920x1080	60.00	1125	67.50	✓	✓

Notes

Only the HDMI and HDBaseT inputs support HDMI 1.4 3D formats.

Appendix C: Wiring Details

RS232

9 way D-type connector

1 unused

2 Received Data (TX)

3 Transmitted Data (RX)

4 unused

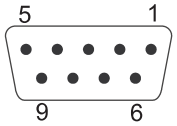
5 Signal Ground

6 unused

7 Short with pin 8

8 Short with pin 7

9 unused



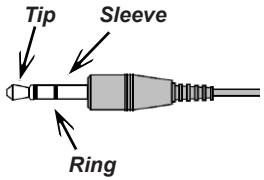
RS232:
pin view of female connector

Notes

Trigger 1 & Trigger 2

3.5 mm mini jack

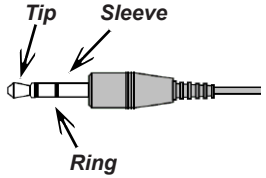
Tip VCC (12V)
Ring Signal
Sleeve Ground
Output: 12V



Wired remote control

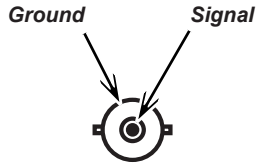
3.5 mm mini jack

Tip 3V output
Ring Signal
Sleeve Ground
Output: 2.85-3.15V, Max. 500 mA



3D Sync IN / OUT

75 ohm BNC



pin view of female connector

Notes

Appendix D: Glossary Of Terms

Notes

1080p

An ***HDTV resolution*** which corresponds to 1920 x 1080 ***pixels*** (a widescreen ***aspect ratio*** of 16:9).

3D active glasses

Wireless battery-powered glasses with LCD shutters. Synchronization information is communicated to the glasses by means of an infrared (IR) or radio frequency (RF) emitter which is connected to the Sync Out terminal on the projector. IR or RF pulses are transmitted by the emitter to signal when the left eye and right eye images are being displayed. The glasses incorporate a sensor which detects the emitter's signal and synchronises the left and right eye shutters with the projected image.

3D passive glasses

Passive glasses do not require a power source to work. Light with left-hand polarisation can pass through the left lens and light with right-hand polarisation can pass through the right-hand lens. These glasses are used in conjunction with another device which polarizes the image, such as a ***ZScreen***.

Adjust lines

A pattern applied to the image where its edge is to be blended with another image. Adjust lines are used to position the projectors in the array during the ***edge blend*** process.

Anamorphic lens

A special lens which, when used with the ***TheaterScope aspect ratio***, allows watching 2.35:1 content packed in a 16:9 source.

Aperture

The opening of the lens that determines the angle through which light travels to come into focus.

Aspect ratio

The proportional relationship between the width and the height of the projected image. It is represented by two numbers separated by a colon, indicating the ratio of image width and height respectively: for example, 16:9 or 2.35:1.

Not to be confused with ***resolution***.

Blanking (projection)

The ability to intentionally turn off, that is, set to black, areas around the edges of the projected image. It is sometimes referred to as “curtains” since it can be used to blank an area of image that literally falls on the curtains at the side of the screen in a movie theater. Usually no image resizing or geometric correction takes place and the “blanked” part of the image is lost.

Not to be confused with horizontal and vertical ***blanking (video signal)***.

Blanking (video signal)

The section of the video signal where there is no active video data.

Not to be confused with ***blanking (projection)***.

Blend region

The area of the image that is to overlap with another image in an ***edge blend*** setup. Sometimes called *overlapping region*.

Brightness (electronic control)

A control which adds a fixed intensity value to every ***pixel*** in the display, moving the entire range of displayed intensities up or down, and is used to set the black point in the image (see ***Contrast***). In ***Component Video*** signals, brightness is the same as ***luminance***.

Brightness (optical)

Describes how ‘bright’ an image that is projected onto a screen appears to an observer.

C

See ***Chrominance***.

Notes

Chrominance

Also known as '*C*', this is the component, or pair of components, of a *Component Video* signal which describes *color difference* information.

Color difference

In *Component Video* signals, the difference between specified colors and the *luminance* component. Color difference is zero for monochrome images.

Color gamut

The spectrum of color available to be displayed.

Color temperature

The position along the black body curve on the chromaticity diagram, normally quoted in Kelvin. It takes into account the preset values for color balance in the service set-up to take up the variations in the prism. The projector allows you to adjust this temperature (i.e. adjust the picture color temperature).

Component video

A three-wire or four-wire video interface that carries the signal split into its basic *RGB* components or *luminance (brightness)* and two-*color-difference* signals (*YUV*) and *synchronization* signals.

Contrast (electronic control)

The adjustment of the white point of the image without affecting the black point. This increases the intensity range of the displayed image.

Contrast (optical)

The intensity difference between the darkest and lightest areas of the screen.

Cr, Cb

Color difference signals used with '*Y'* for digital *Component Video* inputs. They provide information about the signal color. Not to be confused with *Pr, Pb*.

Notes

Crop

Remove part of the projected image.

Alternatively, fit an image into a frame with a different ***aspect ratio*** by removing part of the image. The image is resized so that either its length or its width equals the length or width of the frame, while the other dimension has moved outside the frame; the excess area is then cut out.

Dark time

The time inserted between ***frames*** when using ***3D active glasses***, to avoid ***ghosting*** caused by switching time between left and right eye.

DDC (Display Data Channel)

A communications link between the source and projector. DDC is used on the HDMI, DVI and VGA inputs. The link is used by the source to read the ***EDID*** stored in the projector.

Deinterlacing

The process of converting ***interlaced*** video signals into ***progressive*** ones.

DHCP (Dynamic Host Configuration Protocol)

A network protocol that is used to configure network devices so that they can communicate on an IP network, for example by allocating an IP address.

DMD™ (Digital Micromirror Device™)

The optical tool that transforms the electronic signal from the input source into an optical image projected on the screen. The DMD™ of a projector has a fixed ***resolution***, which affects the ***aspect ratio*** of the projected image.

A Digital Micromirror Device™ (DMD™) consists of moving microscopic mirrors. Each mirror, which acts as a ***pixel***, is suspended between two posts by a thin torsion hinge. It can be tilted to produce either a bright or dark pixel.

Edge blend

A method of creating a combined image by blending the adjoining edges of two or more individual images.

Notes

Edge tear

An artifact observed in ***interlaced video*** where the screen appears to be split horizontally. Edge tears appear when the video feed is out of sync with the refresh rate of the display device.

EDID (Extended Display Identification Data)

Information stored in the projector that can be read by the source.

EDID is used on the HDMI, DVI and VGA inputs, allowing the source to automatically configure to the optimum display settings.

EDTV (Enhanced Definition Television)

A ***progressive*** digital television system with a lower resolution than ***HDTV***.

Field

In ***interlaced video***, a part of the image ***frame*** that is scanned separately. A field is a collection of either all the odd lines or all the even lines within the frame.

Frame

One of the many still images displayed in a sequence to create a moving picture. A frame is made of horizontal lines of ***pixels***. For example, a 1920x1080 frame consists of 1080 lines, each containing 1920 pixels. In analog video frames are scanned one at a time (***progressive scanning***) or split into ***fields*** for each field to be scanned separately (***interlaced video***).

Frame rate

The number of ***frames*** shown per second (fps). In TV and video, a frame rate is the rate at which the display device scans the screen to “draw” the frame.

Frame rate multiplication

To stop low ***frame rate*** 3D images from flickering, frame rate multiplication can be used, which increases the displayed frame rate by two or three times.

Notes

Gamma

A nonlinear operation used to code and decode ***luminance***. It originates from the Cathode Ray Tube technology used in legacy television sets.

Ghosting

An artifact in 3D image viewing. Ghosting occurs when an image intended for one eye is partially seen by the other eye.

Ghosting can be removed by optimizing the ***dark time*** and sync delay.

HDCP (High-bandwidth Digital Content Protection)

An encryption scheme used to protect video content.

HDTV (High Definition Television)

A television system with a higher ***resolution*** than ***SDTV*** and ***EDTV***. It can be transmitted in various formats, notably ***1080p*** and 720p.

Hertz (Hz)

Cycles per second.

Horizontal Scan Rate

The rate at which the lines of the incoming signal are refreshed. The rate is set by the horizontal ***synchronization*** from the source and measured in ***Hertz***.

Hs + Vs

Horizontal and vertical ***synchronization***.

Hue

The graduation (red/green balance) of color (applicable to ***NTSC***).

Notes

Interlacing

A method of updating the image. The screen is divided in two ***fields***, one containing every odd horizontal line, the other one containing the even lines. The fields are then alternately updated. In analog TV interlacing was commonly used as a way of doubling the refresh rate without consuming extra bandwidth.

Interleaving

The alternation between left and right eye images when displaying 3D.

LED (Light Emitting Diode)

An electronic component that emits light.

Letterboxing

Black margins at the top and bottom of the image. Letterboxing appears when a wider image is packed into a narrower ***frame*** without changing the original ***aspect ratio***.

Lumen

A photometric unit of radiant power. For projectors, it is normally used to specify the total amount of emitted visible light.

Luminance

Also known as '***Y***', this is the part of a ***Component Video*** signal which affects the brightness, i.e. the black and white part.

Noise

Electrical interference displayed on the screen.

NTSC (National Television Standards Committee)

The United States standard for television - 525 lines transmitted at 60 ***interlaced fields*** per second.

Notes

OSD (on-screen display)

The projector menus allowing you to adjust various settings.

Overlapping region

See ***blend region***.

PAL (Phase Alternate Line)

The television system used in the UK, Australia and other countries - 625 lines transmitted at 50 ***interlaced fields*** per second.

Pillarboxing

Black margins at the left and right of the image. Pillarboxing appears when a narrower image is packed into a wider ***frame*** without changing the ***aspect ratio***.

Pixel

Short for *Picture Element*. The most basic unit of an image. Pixels are arranged in lines and columns. Each pixel corresponds to a micromirror within the ***DMD™***; resolutions reflect the number of pixels per line by the number of lines. For example, a ***1080p*** projector contains 1080 lines, each consisting of 1920 pixels.

Pond of mirrors

Area around the periphery of the ***DMD™*** containing inactive mirrors. The pond of mirrors may cause artifacts, for example during the ***edge blending*** process.

Pr, Pb

Color difference signals used with '***Y'*** for analog ***Component Video*** inputs. They provide information about the signal color. Not to be confused with ***Cr, Cb***.

Primary colors

Three colors any two of which cannot be mixed to produce the third. In additive color television systems the primary colors are red, green and blue.

Notes

Progressive scanning

A method of updating the image in which the lines of each ***frame*** are drawn in a sequence, without ***interlacing***.

Pulldown

The process of converting a 24 fps film footage to a video ***frame rate*** (25 fps for ***PAL***/***SECAM***, 30 fps for ***NTSC***) by adding extra ***frames***. DP projectors automatically carry out reverse pulldown whenever possible.

Resolution

The number of ***pixels*** in an image, usually represented by the number of pixels per line and the number of lines (for example, 1920 x 1200).

RGB (Red, Green and Blue)

An uncompressed ***Component Video*** standard.

Saturation

The amount of color in an image.

Scope

An ***aspect ratio*** of 2.35:1.

SDTV (Standard Definition Television)

An ***interlaced*** television system with a lower ***resolution*** than ***HDTV***. For ***PAL*** and ***SECAM*** signals, the resolution is 576i; for ***NTSC*** it is 480i.

SECAM (Sequential Color with Memory)

The television system used in France, Russia and some other countries - 625 lines transmitted at 50 ***interlaced fields*** per second.

SX+

A display ***resolution*** of 1400 x 1050 pixels with a 4:3 screen ***aspect ratio***. (Shortened from *SXGA+*, stands for *Super Extended Graphics Array Plus*.)

Notes

Synchronization

A timing signal used to coordinate an action.

Test pattern

A still image specially prepared for testing a projection system. It may contain various combinations of colors, lines and geometric shapes.

TheaterScope

An ***aspect ratio*** used in conjunction with a special ***anamorphic lens*** to display 2.35:1 images packed into a 16:9 ***frame***.

Throw distance

The distance between the screen and the projector.

Throw ratio

The ratio of the ***throw distance*** to the screen width.

TRC (Throw ratio correction)

A special number used in calculating ***throw distances*** and ***throw ratios*** when the image does not fill the width of the ***DMD™***.

TRC is the ratio of the ***DMD™ aspect ratio*** to the image source aspect ratio:

$$TRC = \frac{DMD\text{™ aspect ratio}}{Source\ aspect\ ratio}$$

TRC is only used in calculations if it is greater than 1.

UXGA

A display ***resolution*** of 1600 x 1200 ***pixels*** with a 4:3 screen ***aspect ratio***. (Stands for *Ultra Extended Graphics Array*.)

Notes

Vertical Scan Rate

The rate at which the ***frames*** of the incoming signal are refreshed. The rate is set by the vertical ***synchronization*** from the source and measured in ***Hertz***.

Vignetting

Optical cropping of the image caused by the components in the projection lens. This can happen if too much offset is applied when positioning the image using the lens mount.

Vista

An ***aspect ratio*** of 1.66:1.

WUXGA

A display ***resolution*** of 1920 x 1200 ***pixels*** with a 16:10 screen ***aspect ratio***. (Stands for Widescreen *Ultra Extended Graphics Array*.)

Y

This is the ***luminance*** input (***brightness***) from a ***Component Video*** signal.

YUV

See ***Pr, Pb***.

ZScreen

A special kind of light modulator which polarizes the projected image for 3D viewing. It normally requires that images are projected onto a silver screen. The ZScreen is placed between the projector lens and screen. It changes the polarization of the projected light and switches between left- and right-handed circularly polarized light at the field rate.

Notes

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