DIGITAL PROJECTION

E-Vision Laser 4K Series
High Brightness Digital Video Projector

▶ INSTALLATION AND QUICK-START GUIDE

▶ CONNECTION GUIDE

▶ OPERATING GUIDE

▶ REFERENCE GUIDE

About This Document

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

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:

⚠ **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.**

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

⚠ **LASER WARNING: this symbol indicates that there is a potential hazard of eye exposure to laser radiation 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.

Updates may be available online - visit the Digital Projection website for all latest documents.

Legal notice

Trademarks and trade names mentioned in this document remain the property of their respective owners.
Digital Projection disclaims any proprietary interest in trademarks and trade names other than its own.

Notes

Laser Information

LASER LIGHT
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT
455-470nm <13Watts
CLASSIFIED EN/IEC 60825-1 2007

Caution - use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Introduction

Congratulations on your purchase of this Digital Projection product.

Your projector has the following key features:

- Support for Frame Sequential and Dual Pipe 3D formats.
- HDBaseT® for transmission of uncompressed High Definition Video up to 100 m from the source.
- 3G-SDI with loop-through.
- Edge Blend.
- Blanking control for custom input window sizing.
- Cornerstone, Vertical & Horizontal Keystone, Pincushion & Barrel, and Image Rotation.
- Separate control of screen and source aspect ratio.
- Control via LAN and RS232.
- Motorised lens mount.

A serial number is located on the side of the projector. Record it here:

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CONTENTS (continued)

CONTENTS (continued)

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DIGITAL PROJECTION

E-Vision Laser 4K Series
High Brightness Digital Video Projector

▶ INSTALLATION AND QUICK-START GUIDE

IN THIS GUIDE

What's In The Box?

Remote control *2x AAA batteries* *Security screw* *Projector*
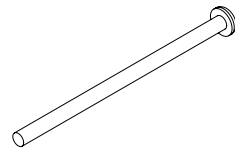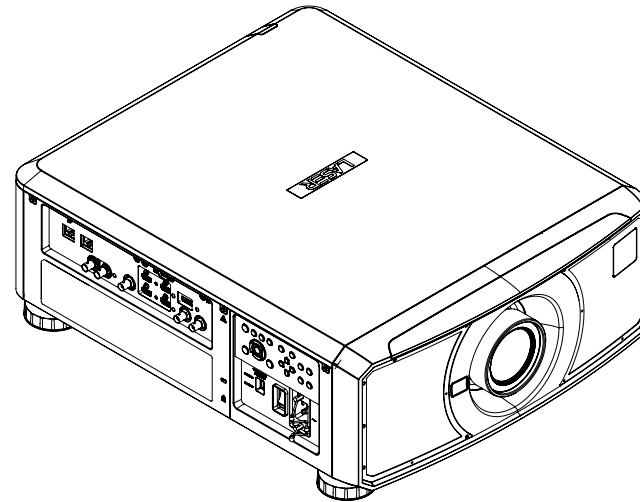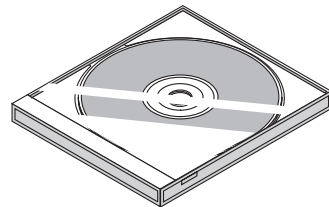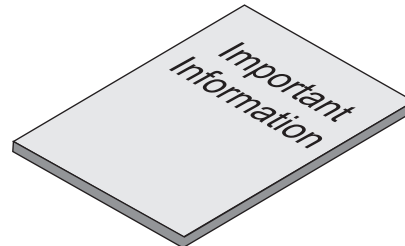
User Manual on disc *Important Information* *HDMI cable*
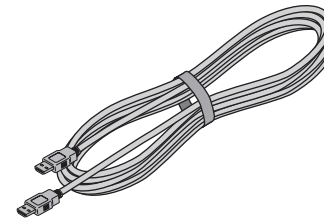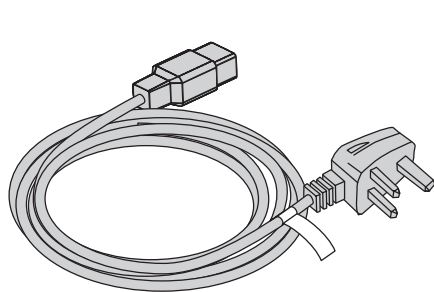
Power cable, United Kingdom *Power cable, Europe* *Power cable, North America* *Power cable, China*
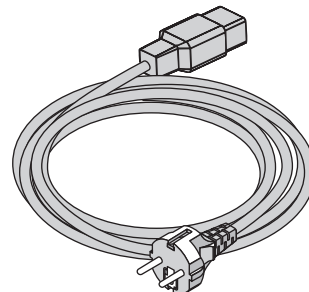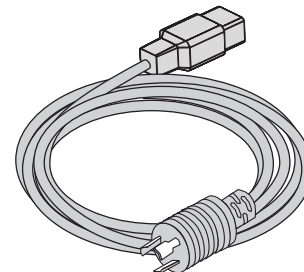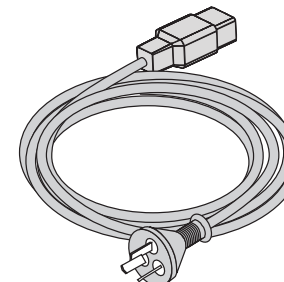
Connecting The Power Supply

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

❶
❷
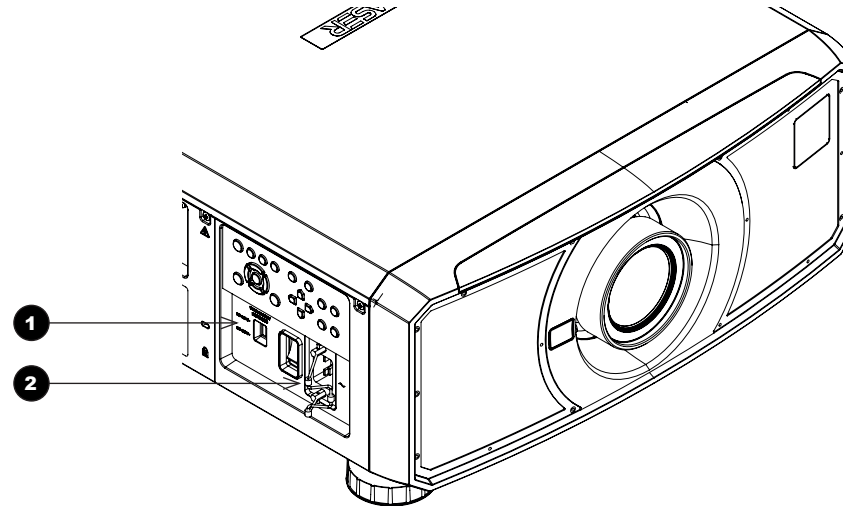
Voltage selection

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
AC100-130V outlet	200 240V~ 100 130V~
AC200-240V (single phase) outlet	200 240V~ 100 130V~

Projector Overview

Front and rear views

1   **Air inlet**

2   **Front infrared window and indicators**

3   **Air inlet**

4   **Lens mount**

5   **Rear infrared window**

6   **Air outlet**

7   **Connections panel**

8   **Control panel**

9   **Adjustable feet**

10   **Voltage selector**

11   **Mains socket and switch**

12   **Air inlets**

Front view

Rear view

Bottom view
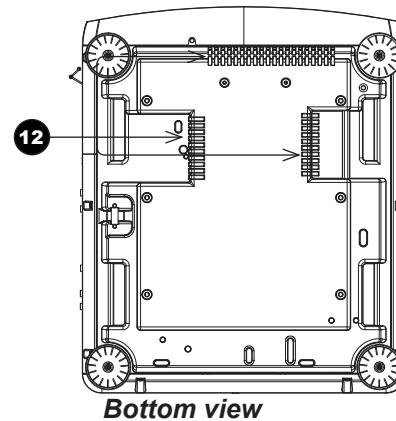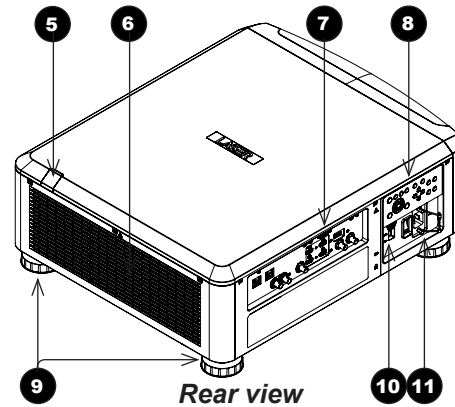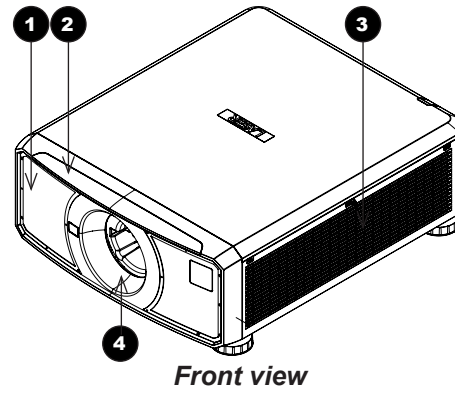
Notes

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 PIC MUTE
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.
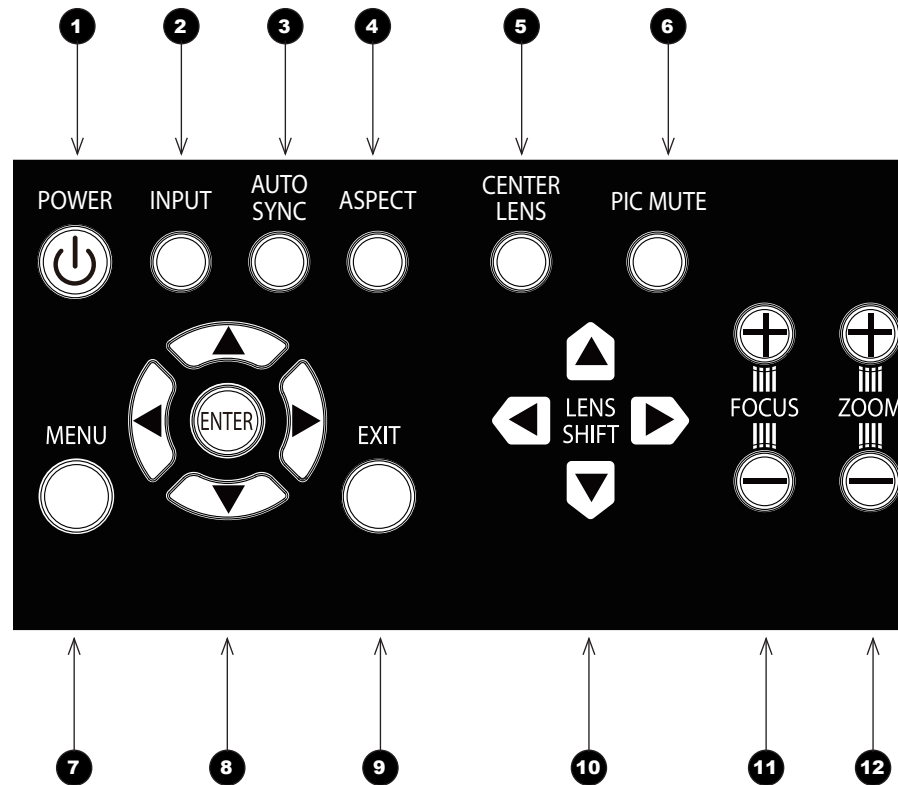
Notes

☞ *AUTO SYNC and ASPECT do not work when the projector uses HDMI 3 or 4.*

Projector indicators

TEMP.   Off = no problem
         Flashing red = temperature error

LIGHT   Off = light is switched off
         Flashing green = light is preparing to switch on
         Flashing red (cycles of six flashes) = light module failure
         On, red = light module has reached end of life
         On, green = light is switched on

STATUS Off = no problem
         Flashing red (continuously) = cover error
         Flashing red (cycles of four flashes) = fan error
         On, red = system error

POWER Off = the projector is switched off
         Flashing green = the projector is warming up
         Flashing amber = the projector is cooling down
         On, red = STANDBY mode
         On, green = the projector is switched on
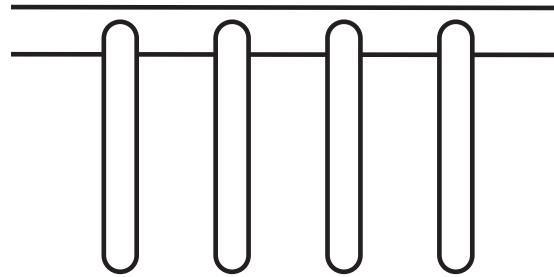
TEMP.   LIGHT   STATUS   POWER

Notes

Remote Control

1 Power ON / OFF
Turns power on and off.

2 Pic Mute OPEN / CLOSE
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.
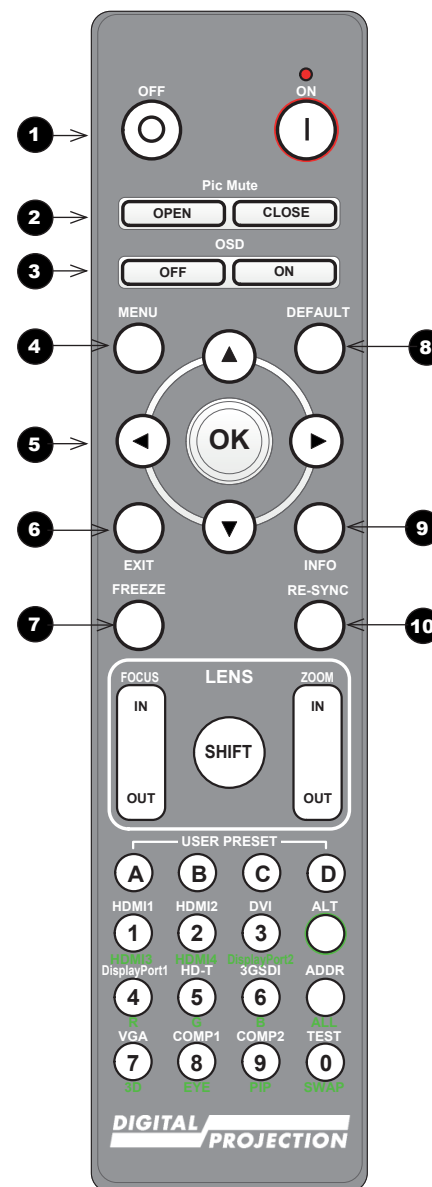
Remote control

Notes

☞ *FREEZE and RE-SYNC are not available when the projector uses input HDMI 3 or 4.*

☞ *3D is only available on the HDMI 3 and 4 inputs.*

☞ *This projector does not use the following options on the remote:*

DVI, VGA, COMP 1 and COMP 2.

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
Load user presets.

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

14 DVI / DisplayPort2 / numeric input 3
There is no DVI input on this projector.
Use with **ALT** to select the DisplayPort 2 input.

15 HDMI 2 / HDMI 4 / numeric input 2
Select the HDMI 1 input.
Use with **ALT** to select the HDMI 4 input.

16 HDMI 1 / HDMI 3 / numeric input 1
Select the HDMI 1 input.
Use with **ALT** to select the HDMI 3 input.

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...
When **PIP** mode is on, use this button with **ALT** to swap the main and sub images.
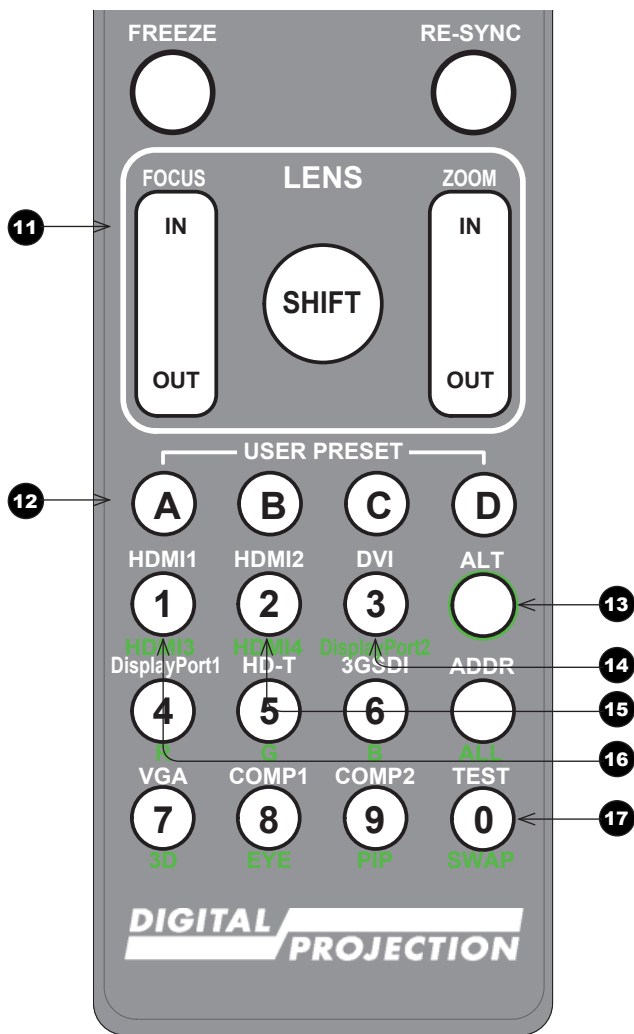
Remote control

17 **DISPLAYPORT 1 / R / numeric input 4**
Select DisplayPort 1 input.

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

19 **3GSDI / B / numeric input 6**
Select the 3G-SDI input.

20 **VGA / 3D / numeric input 7**
There is no VGA input on this projector.
Use with **ALT** to toggle the **3D Format** setting between **Off** and **Auto**.

21 **COMP1 / EYE / numeric input 8**
There is no Component 1 input on this projector.
Use with **ALT** to switch between left and right eye 3D dominance.

22 **COMP2 / PIP / numeric input 9**
There is no Component 2 input on this projector.
Use with **ALT** to switch on **Picture In Picture (PIP)** mode.

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.

OFF   ON

Pic Mute
OPEN   CLOSE

Remote control top

SHIFT

OUT   OUT

USER PRESET

A   B   C   D

HDMI1   HDMI2   DVI   ALT
1   2   3

HDMI3   HDMI4   DisplayPort2
DisplayPort1   HD-T   3GSDI   ADDR
4   5   6

R   ALL
VGA   COMP1   COMP2   TEST
7   8   9   0

3D   EYE   PIP   SWAP

DIGITAL PROJECTION
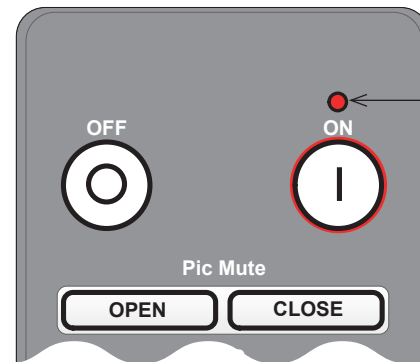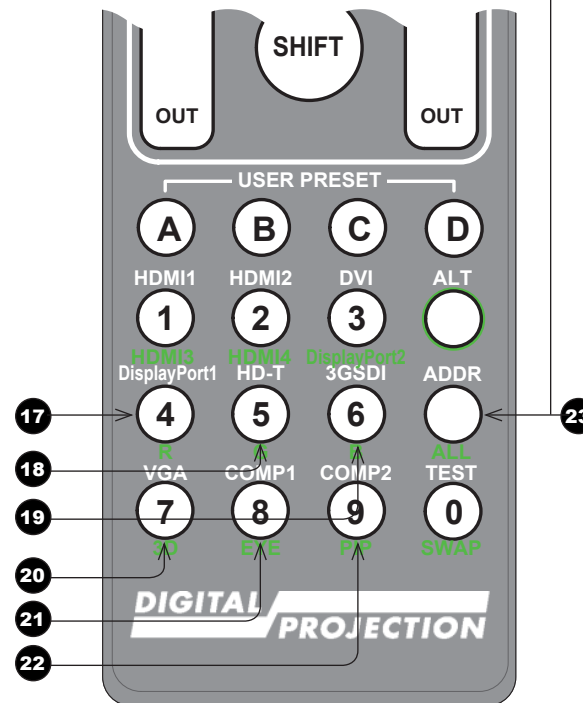
Remote control bottom

Notes

☞ *PIP is not available when the projector uses input HDMI 3 or 4.*

☞ *3D is only available on the HDMI 3 and 4 inputs.*

☞ *This projector does not use the following options on the remote:*

DVI, VGA, COMP 1 and COMP 2.

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.

40°

40°

Infrared reception
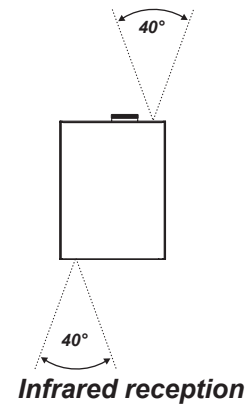
Positioning The Screen And Projector

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.

The drawing below shows the positions of the feet for table mounting, and the fixing holes for ceiling mounting.

1   **Four adjustable feet**

2   **Six M4 holes for ceiling mount**
    The screws should not penetrate more than 15 mm into the body of the projector.
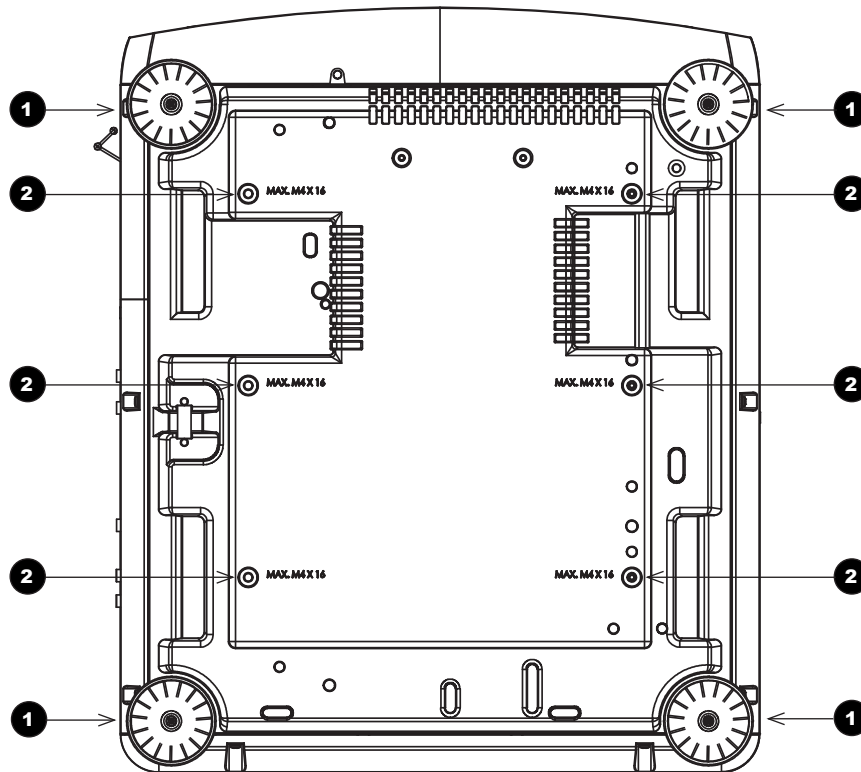
Notes

⚠ **Always allow the projector to cool for 5 minutes before disconnecting the power or moving the projector.**

⚠ **Ensure that there is at least 50 cm (19.7 in) of space between the ventilation outlets and any wall, and 30 cm (11.8 in) on all other sides.**

Roll and pitch

The projector can be operated in numerous positions.

In portrait mode, it is recommended to position the projector with inputs facing upward, as shown in the diagram.

Roll

Pitch
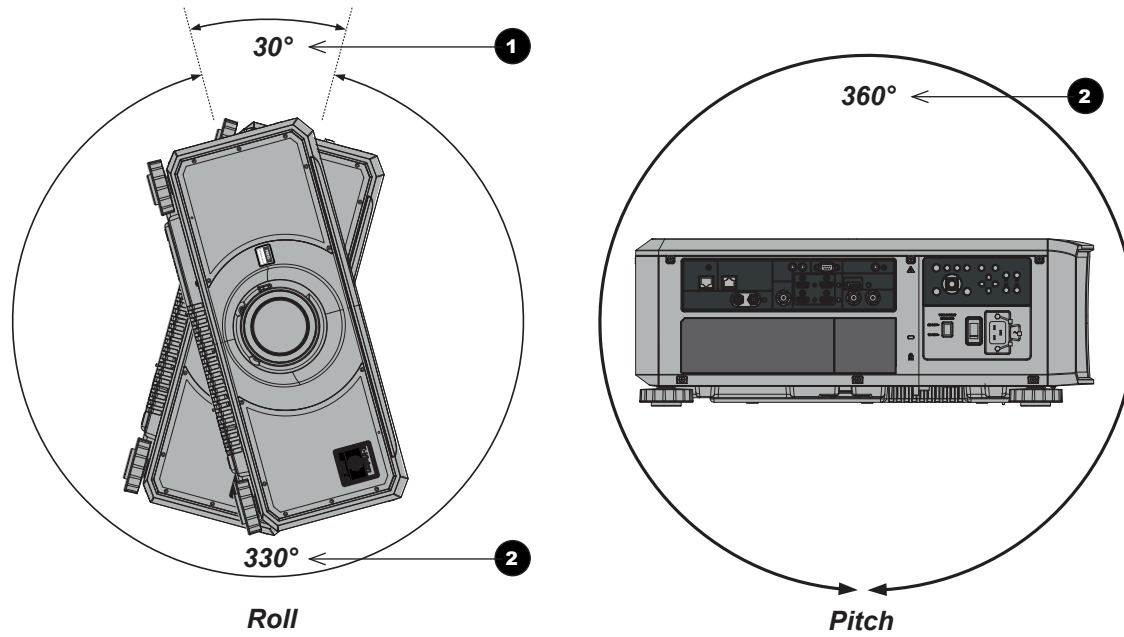
1   **Recommended positions: inputs side up**

2   **Also possible**

Notes

Changing The Lens

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.
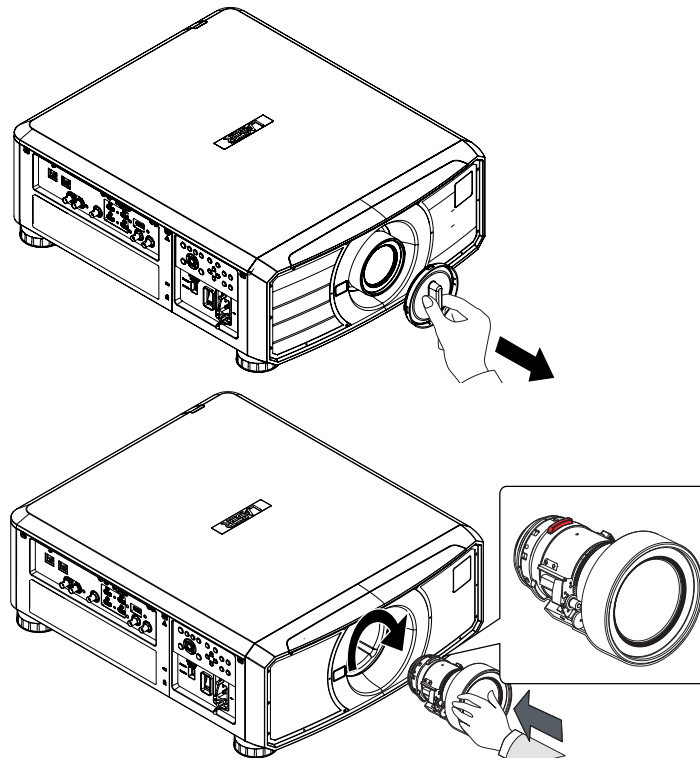
Removing the lens

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

2. Remove the lens.
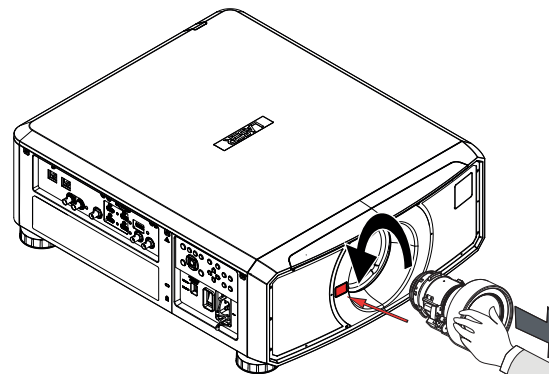
Notes

⚡ **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.*

☞ *The projector will not power on without the lens fitted.*

Operating The Projector

Switching the projector on

1. Ensure a lens is fitted. Connect the power cable between the mains supply and the projector. (See *Connecting the power supply* above.) Switch on at the switch next to the power connector.

2. The **POWER** indicator lights red to signal that the projector is in STANDBY mode. Press one of the following buttons:

   - On the remote control, the **ON** button

   - On the projector control panel, the **POWER** button.

   The fans begin working, then the **POWER** indicator begins flashing green. When the flashing stops, the **POWER** and **LIGHT** indicators both light steady green. The projector is switched on.

Switching the projector off

1. Press **OFF** on the remote control or **POWER** on the control panel, then press again to confirm your choice.

   The **POWER** indicator on the control panel will start flashing amber, the system will go out and the cooling fans will run for a short time until the **POWER** indicator goes steady red to indicate that the projector has entered STANDBY mode.

2. If you need to switch the projector off completely, switch off at the mains power switch next to the power connector and then disconnect the power cable from the projector.

Notes

☞ *See also **Connecting The Power Supply** earlier in this guide.*

☞ *The self-test is running when all the LEDs on the control panel are lit.*

⚠ **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.**

Selecting an input signal

1. Connect one or more image sources to the projector.

2. Select the input you want to display:

   - Press one of the input buttons on the remote control.

   - Alternatively, open the On-screen display (OSD) by pressing **MENU**. Highlight **Input** from the main menu, press **ENTER/OK** and then select an input signal using the **UP** ▲ and **DOWN** ▼ arrow buttons. Press **ENTER/OK** to confirm your choice.

Selecting a test pattern

To display a test pattern:

- Press **TEST** on the remote control.

  Change the test pattern using the **LEFT** ◀ and **RIGHT** ▶ arrow buttons. Test patterns are displayed in the following order:

  White, Black, Red, Green, Blue, Cyan, Yellow, Magenta, Off

- Alternatively, open the OSD by pressing **MENU**. Highlight **Test Patterns** from the main menu, then select a test pattern using the **LEFT** and **RIGHT** arrow buttons.

After the final test pattern, the projector exits test pattern mode and returns to the main image. To view test patterns again, you need to press **TEST** again. If you wish to exit the test patterns before you reach the final one,

- press **TEST** or **EXIT** at any time.

Notes

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

Adjusting the lens

The lens can be adjusted using the **Lens** menu, or using the lens buttons on the remote control.

Lens menu
The **Lens** menu provides access to the **Lens Control** setting and the **Lens Center** command.

Lens Control allows **Zoom**, **Focus** and **Shift** adjustment using the arrow buttons. The setting operates in **Zoom/Focus Adjustment** and **Shift Adjustment** mode.

Press **ENTER/SELECT** to switch between the two modes.

Remote control
Use the remote control to adjust zoom, focus and shift directly, without opening a menu:

- **OK** enters lens control, then switches between **Zoom/Focus Adjustment** and **Shift Adjustment**.

- **EXIT** exits lens control and opens the **Lens** menu.

- **MENU** exits lens control and returns to the main image.

- The arrow buttons adjust zoom, focus and shift as indicated on the screen.

Adjusting the image

Orientation
- This can be set from the **Setup** menu.

  Highlight **Orientation** and choose from **Front Tabletop**, **Front Ceiling**, **Rear Tabletop, Rear Ceiling** and **Auto-front**.

Geometry
- Settings such as **Keystone**, **Rotation**, **Pincushion / Barrel** and **Arc** can be set from the **Geometry** menu.

Picture
- Settings such as **Gamma**, **Brightness**, **Contrast**, **Saturation**, **Hue** and **Sharpness** can be set from the **Image** menu.

Notes

☞ *For full details of how to adjust the lens using the remote control, see Remote Control earlier in this guide.*

Setup menu

Geometry menu

Image menu

☞ *Neither of the settings under Picture are available with the HDMI 3 and 4 inputs.*

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DIGITAL PROJECTION

E-Vision Laser 4K Series
High Brightness Digital Video Projector

▶ CONNECTION GUIDE

IN THIS GUIDE

Signal Inputs

Digital inputs and outputs

1   **HDBaseT**

Receives digital signal from HDBaseT-compliant devices.

2   **3G-SDI in**

3   **3G-SDI out**

Connect a 3G-SDI cable to distribute the 3G-SDI signal to another projector.

4   **HDMI 1 / HDMI 2 / HDMI 3 / HDMI 4**

HDMI 1 and 2 are HDMI 2.0 inputs supporting HDCP 2.2.

HDMI 3 and 4 are HDMI 1.4b inputs supporting *Frame Sequential* and *Dual Pipe* 3D with HDCP 1.4.

Connect an *HDMI* cable to the connector.

5   **DisplayPort**

DisplayPort 1.2 input. Connect a DisplayPort cable to the connector.
Supports sources up to 1920x1200 resolution, 24-120 Hz. Supports HDCP 2.2.
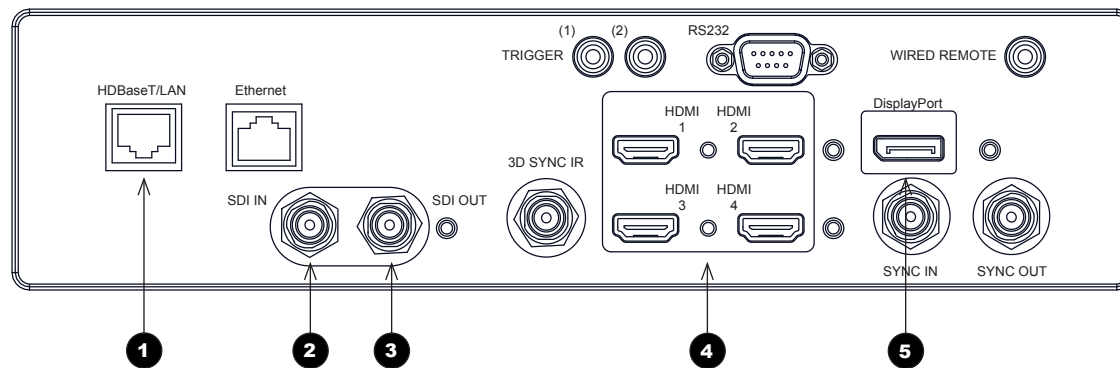
Notes

☞ *For simultaneous HDBaseT and LAN connectivity, a third-party distribution product can be utilised to combine HDBaseT video stream with LAN connection for delivery to the projector.*

EDID on the DisplayPort, HDMI and HDBaseT inputs

If you are using a computer graphics card or another source that obeys the EDID protocol, the source will automatically configure itself to suit the projector.

Otherwise refer to the documentation supplied with the source to manually set the resolution to the DMD™ resolution of the projector or the nearest suitable setting. Switch off the source, connect to the projector, then switch the source back on again.

Using DisplayPort/HDMI/HDBaseT switchers with the projector

When using a DisplayPort/HDMI/HDBaseT source switcher with the projector, it is important to set the switcher so that it passes the projector EDID through to the source devices. If this is not done, the projector may not be able to lock to the source or display the source correctly as its video output timings may not be compatible with those of the projector. Sometimes this is called transparent, pass-through or clone mode. See your switcher's manual for information on how to set this mode.

1 Sources

2 Switcher
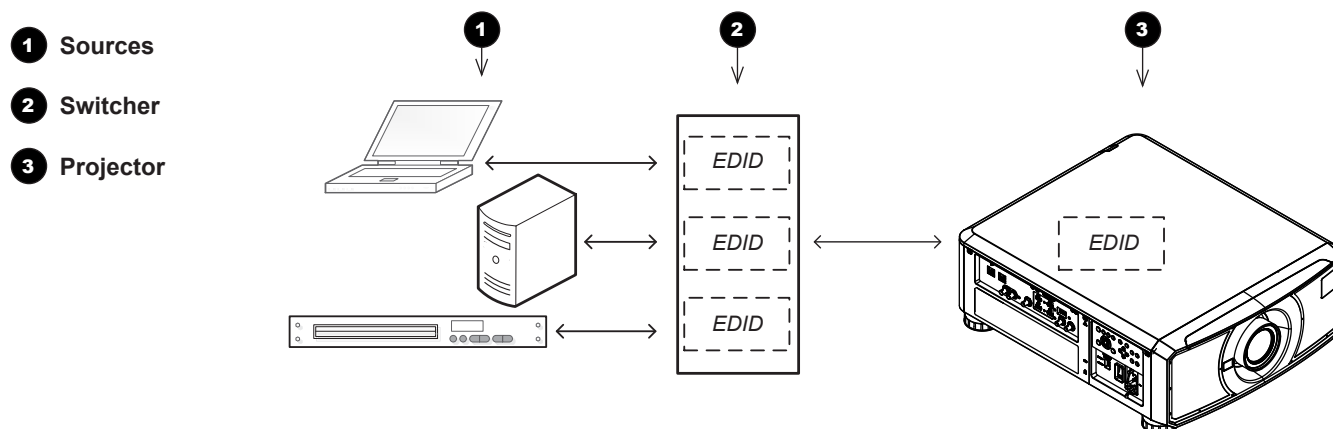
3 Projector

The EDIDs in the switcher should be the same as the one in the projector.

3D connections

Frame sequential 1080p and WUXGA 3D sources at 100 and 120 Hz

1. Connect to HDMI 3 or 4.

2. Set **3D Format** in the **3D** menu to **Frame Sequential**.

Dual Pipe 1080p, WUXGA and WQXGA 3D sources at 100 and 120 Hz

1. Connect the left eye output to the **HDMI 3** socket and the right eye output to the **HDMI 4** socket.

2. Set **3D Format** in the **3D** menu to **Dual-Pipe**.
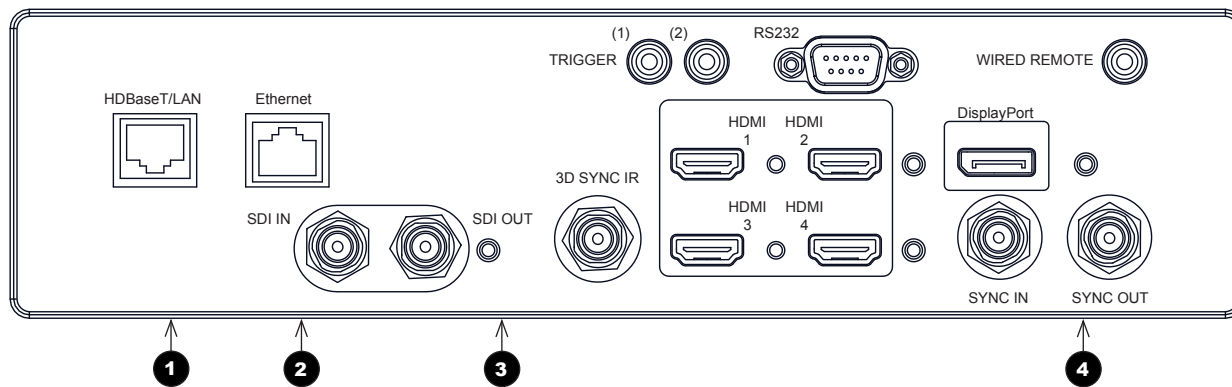
1. **HDBaseT**
2. **HDMI 1 / Dual Pipe Left**
3. **DVI**
4. **HDMI 2 / Dual Pipe RIGHT**

3D Sync

3D Sync In

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

3D Sync Out

Sync output signal. Enables 3D from multiple projectors.

3D Sync IR

Sync output signal. This may be affected by the **3D Sync Offset** setting in the **3D** menu.

Connect this to your IR emitter or ZScreen.
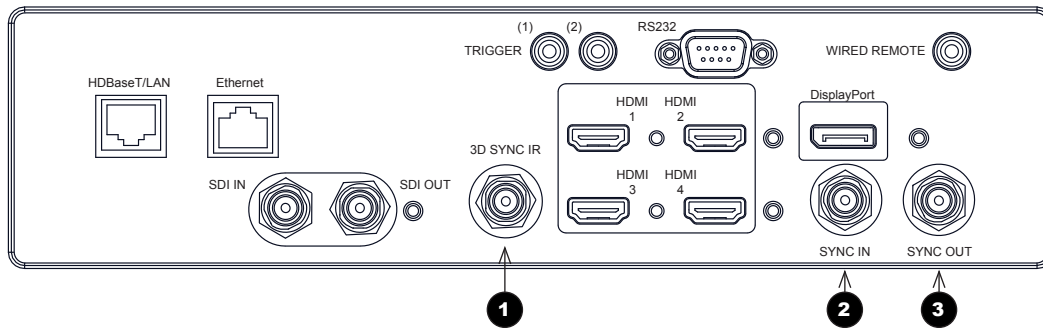
1   **3D Sync IR**

2   **Sync In**

3   **Sync Out**
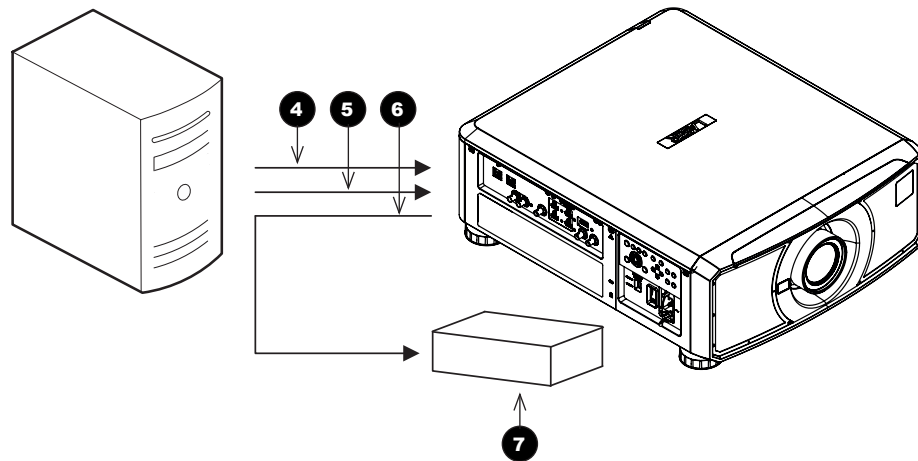
4   **3D input**

5   **3D Sync In**

6   **3D Sync IR**

7   **IR emitter** or **ZScreen**

Control Connections

① HDBaseT/LAN

The projector's features can be controlled via a LAN connection, using Digital Projection's *Projector Controller* application or a terminal-emulation program.

② Ethernet

This dedicated LAN connection can be used if *HDBaseT/LAN* is already being used for HDBaseT signal input.

③ Trigger 1 & Trigger 2

The Trigger outputs are activated by one of the three following conditions, as set in the **Setup** menu:

- Screen trigger: can be connected to an electrically operated screen, automatically deploying the screen when the projector starts up, and retracting the screen when the projector shuts down.
- Aspect ratio trigger: can be used to control screen shuttering for different aspect ratios.
- RS232 trigger: can be used to control the screen or screen shuttering on receipt of an RS232 command

④ RS232

- All of the projector's features can be controlled via a serial connection, using commands described in the *Protocol Guide*.
- Use a straight-through cable to connect directly to a computer.

⑤ Wired Remote

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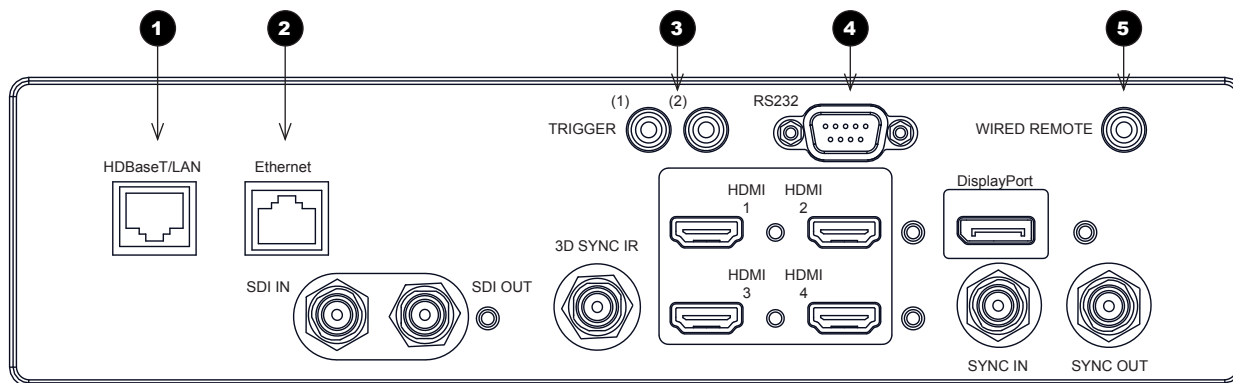
Notes

☞ *For a list of all commands used to control the projector via LAN, see the Protocol Guide.*

☞ *Only one remote connection (RS232 or LAN) should be used at any one time.*

☞ *With a LAN connection the projector can serve a web page offering basic projector controls.*

☞ *Trigger 1 and Trigger 2 are not available with HDMI 3 and 4 inputs.*

☞ *Projector Controller is available for download, free of charge, from the Digital Projection website.*

LAN connection examples

The projector's features can be controlled via a LAN connection, using Digital Projection's *Projector Controller* application or a terminal-emulation program

Un-crossed
LAN cable

Computer

Projector

Un-crossed LAN cables

Computer

Hub or LAN

Projector

Projector

HDBaseT/LAN   Ethernet

SDI IN   SDI

1

1 **LAN**

RS232 connection example

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

Straight-through cable

Computer   *Projector*

1

(1)   (2)   RS232
TRIGGER ○ ○   RS232 ▭   WIRED REMOTE ○

HDBaseT/LAN   Ethernet

HDMI HDMI
1   2
DisplayPort

3D SYNC IR

SDI IN   SDI OUT

HDMI HDMI
3   4

SYNC IN   SYNC OUT

1 **RS232**

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E-Vision Laser 4K Series

High Brightness Digital Video Projector

▶ OPERATING GUIDE

IN THIS GUIDE

Using The Menus

Opening the OSD

Access the various menus using either the projector control panel or the remote control. On either device,

- press the **MENU** button.

The on-screen display (OSD) opens showing the list of available menus.

Opening a menu

Move up and down the list using the **UP**▲ and **DOWN** ▼ arrow buttons. To open a menu,

- press **ENTER** on the control panel or **OK** on the remote control.

This guide refers to the above two buttons as **ENTER/OK**.

Exiting menus and closing the OSD

To go back to the previous page,

- press **EXIT**.

When you reach the top level, pressing **EXIT** will close the OSD.

To close the OSD from any page,

- press **MENU**.
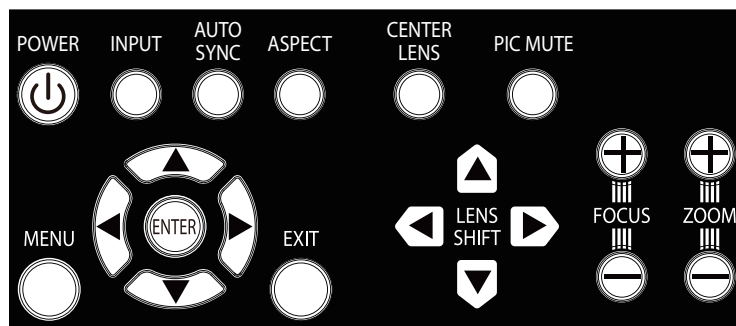
Projector control panel

Remote control

Main Menu	
Input	HDMI 1
Test Pattern	
Lens	▶
Image	▶
Color	▶
Geometry	▶
Edge Blend	▶
3D	▶
Laser	▶
Setup	▶
Network	▶
▼	

Main Menu	
▲	
PIP	▶
Information	▶
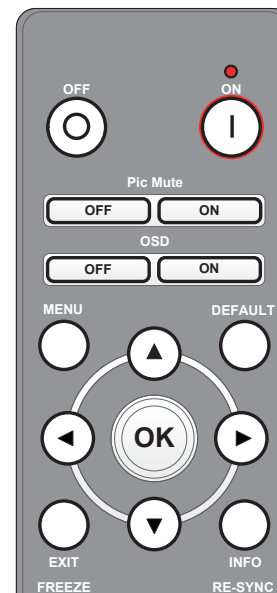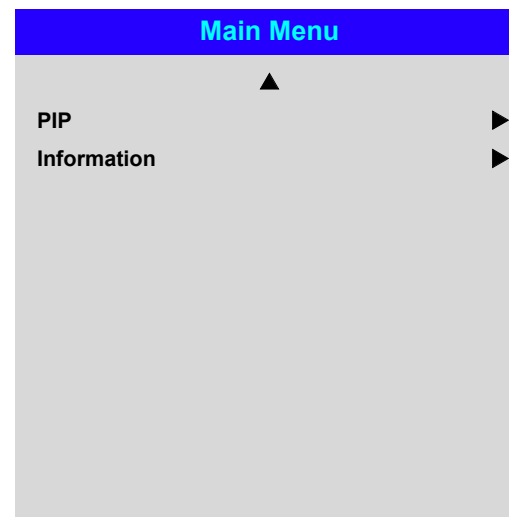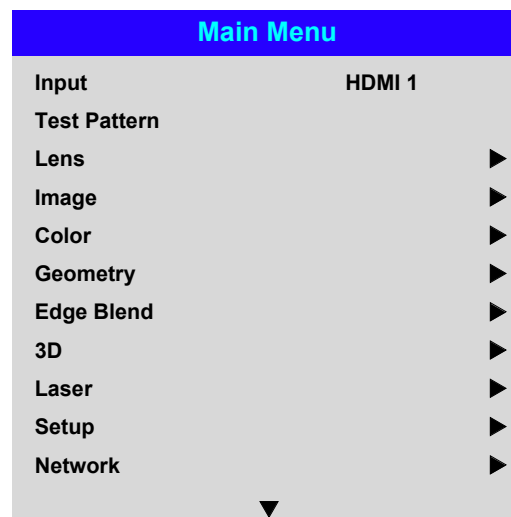
On-screen display (OSD): top level menus

Notes

Inside a menu

When you open a menu, the page consists of the following elements:

- Title bar at the top
  Shows which menu you have accessed.

- Highlighted item

- Available and unavailable items
  Unavailable items appear a pale gray color. Whether an item is available may depend on other settings.

- The text or symbol to the right of an item shows whether the item:

  - has a value that can be changed (the current value is shown)

  - opens a sub-menu (an arrow button ▶ is displayed)

  - executes a command (the space to the right of the item is blank).

Menu Name	
Highlighted Item	**Value**
Menu Item	**Value**
Unavailable Item	Value
Slider	**Value** ▭▬
Sub-menu	▶
Command	

Inside a menu

Accessing sub-menus

Use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight the sub-menu, then press **ENTER/OK**.

Executing commands

If the item contains a command, highlighting it reveals an **OK** button.

Press **ENTER/OK** to execute the highlighted command.

Menu Name	
Menu Item	**Value**
Highlighted Command	OK

Highlighted command

You may be asked for confirmation. Use the **ENTER/OK** to confirm, or **EXIT** to cancel.
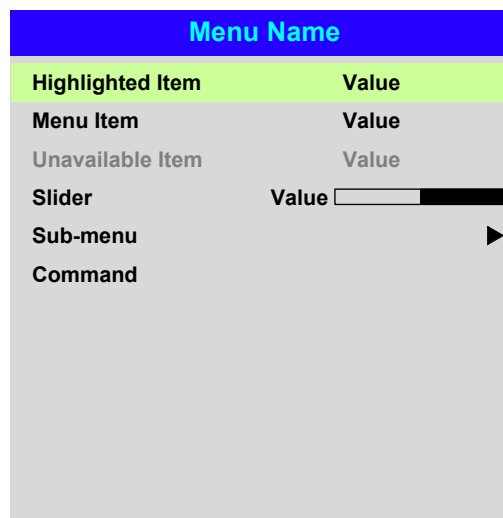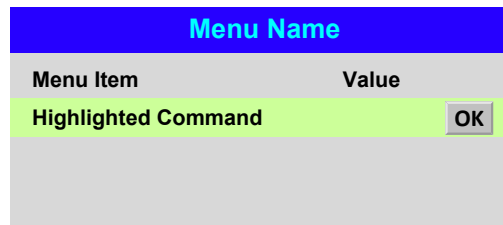
Command Name
WARNING
All [Menu] values will be lost.
Press OK to confirm
Press Exit to cancel
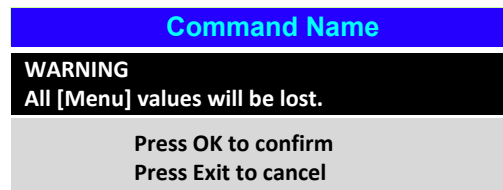
Confirmation dialog

Editing projector settings

If the highlighted menu item contains a list of values to choose from, you can change the value by doing the following:

1. Highlight the menu item and press **ENTER/OK**.

2. In the list of values that opens, use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight a value, then press **ENTER/OK** again to select the highlighted value.

Using a slider to set a value

Some parameters open a slider. To set such a parameter:

1. Press the **LEFT** ◄ or **RIGHT** ► arrow button, or **ENTER/OK**.
   The arrow buttons will open the slider and adjust the value at the same time.
   ENTER/OK will open the slider without altering the initial value.

2. Use the **LEFT** ◄ and **RIGHT** ► arrow buttons to move the slider.

3. When ready, press **EXIT** to exit the slider and return to the menu, or press **MENU** to exit the slider without showing the menu again.

Editing numeric values

Some parameters take numeric values without using sliders - for example, color matching values or IP addresses.

1. Use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight the row containing the numeric field you wish to edit.

2. Press **ENTER/OK** to enter edit mode. A numeric field in edit mode is white text on blue background.

3. In edit mode:
   - Use the **UP** ▲ arrow button to increase the numeric value.
   - Use the **DOWN** ▼ arrow button to decrease the numeric value.

4. Use the **LEFT** ◄ and **RIGHT** ► arrow buttons to edit the next or previous numeric fields within the same row.

5. Once ready, press **ENTER/OK** to exit edit mode.

Menu Name

Highlighted Item	Current Value
Menu Item	Highlighted Value
Menu Item	Value
	Value
	Value

List of values

Parameter	Value

Slider

Data

Row	x: 0.658	y: 0.339
Highlighted Row	x: 0.315	y: 0.662
Row	x: 0.146	y: 0.043
Row	x: 0.276	y: 0.283

Numeric values

Using The Projector

Main menu

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

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

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

- **Test Pattern**
  Choose from:

  ...Off, White, Black, Red, Green, Blue, Cyan, Yellow, Magenta...

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

- **Lens, Image**, **Color**, **Geometry**, **Edge Blend**, **3D**, **Laser**, **Setup** and **Network**
  Press **ENTER/OK** to open these menus and access various settings.

Press the **DOWN** ▼ arrow at the bottom of the page to access additional menus:

- **PIP** and **Information**
  Press **ENTER/OK** to open these menus and access various settings.

Press the **UP** ▲ arrow to return to the previous page.

Main Menu	
Input	HDMI 1
Test Pattern	
Lens	▶
Image	▶
Color	▶
Geometry	▶
Edge Blend	▶
3D	▶
Laser	▶
Setup	▶
Network	▶
▼	

Main Menu	
▲	
PIP	▶
Information	▶
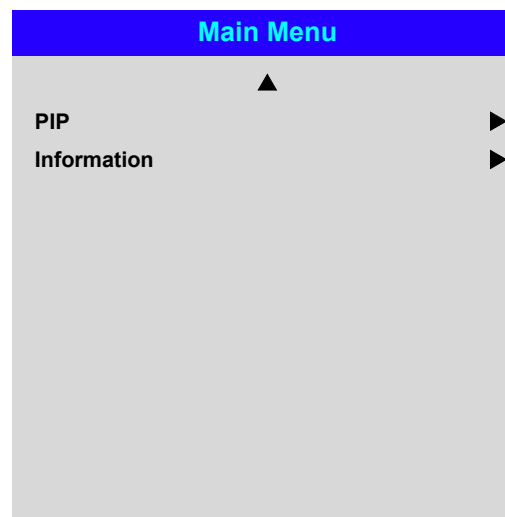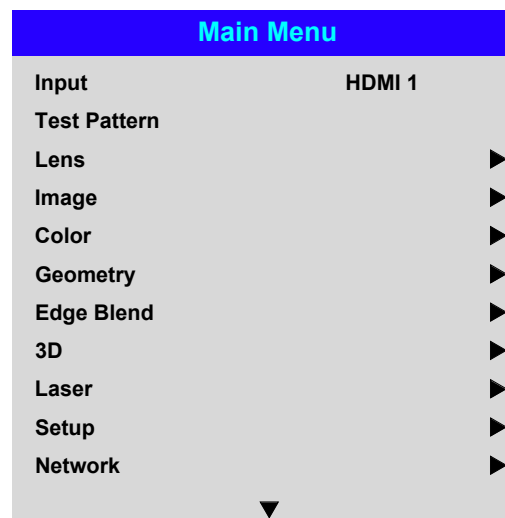
Main menu, page 1 and 2

Notes

☞ See *Signal Inputs* in the *Connection Guide* for further information about the available inputs and connections.

☞ Selecting a test pattern hides the OSD. Press **EXIT** to hide the test pattern, and then press **MENU** to show the OSD.

Lens menu

- **Lens Lock**

  When this feature is **On**, all other **Lens** menu items are disabled.

- **Lens Control**

  Opens a sub-menu, see below.

- **Center Lens**

  Centers the lens.

- **Lens Type**

  Choose a UST or a non-UST lens.

- **Lens Memory**

  Opens a sub-menu, see next page.

Lens	
Lens Lock	**Off**
Lens Control	▶
Center Lens	
Lens Type	**non-UST Lens**
Lens Memory	▶
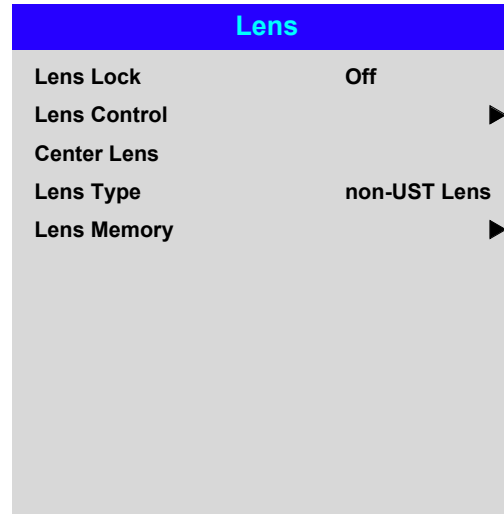
Lens Control

Lens Control settings operate in **Zoom/Focus Adjustment** and **Shift Adjustment** mode. Press **ENTER/OK** to switch between modes.

When in **Zoom/Focus Adjustment** mode:

- Use the **UP** ▲ and **DOWN** ▼ arrow buttons to adjust **Zoom**.

- Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust **Focus**.
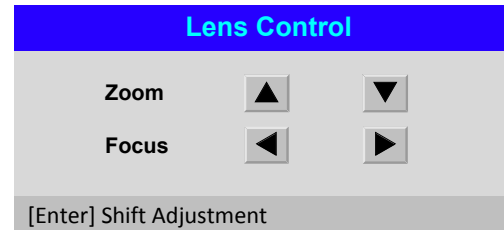
When in **Shift Adjustment** mode, use the arrow buttons to adjust **Shift**.

Lens Control		
Zoom	▲	▼
Focus	◀	▶
[Enter] Shift Adjustment		

Lens Control
▲
◀ **Shift** ▶
▼
[Enter] Zoom / Focus Adjustment
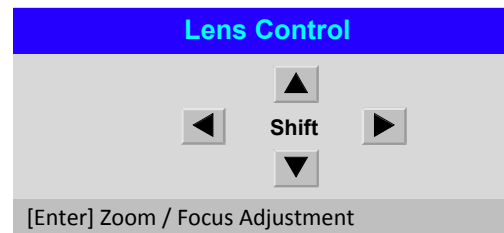
Lens menu continued from previous page

Lens Memory

This menu 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.

Lens Memory	
Load Memory	▶
Save Memory	▶
Clear Memory	▶

Lens Load Memory	
Memory 1	OK
Memory 2	
Memory 3	
Memory 4	
Memory 5	
Memory 6	
Memory 7	
Memory 8	
Memory 9	
Memory 10	

Lens Save Memory	
Memory 1	OK
Memory 2	
Memory 3	
Memory 4	
Memory 5	
Memory 6	
Memory 7	
Memory 8	
Memory 9	
Memory 10	

Lens Clear Memory	
Memory 1	OK
Memory 2	
Memory 3	
Memory 4	
Memory 5	
Memory 6	
Memory 7	
Memory 8	
Memory 9	
Memory 10	
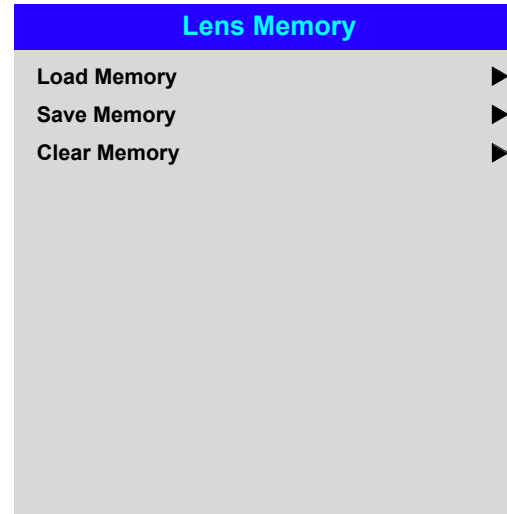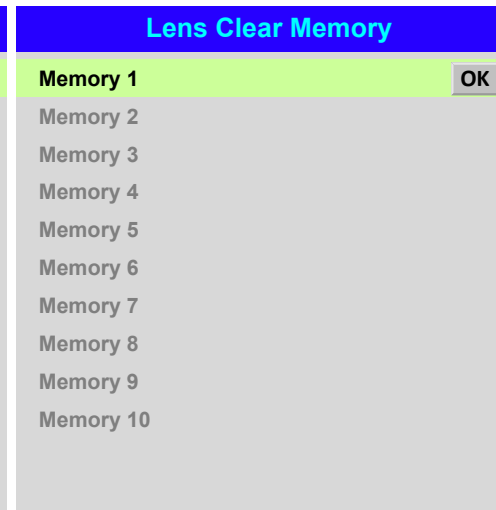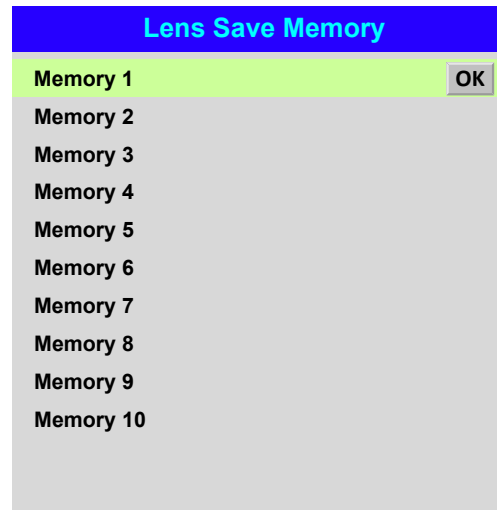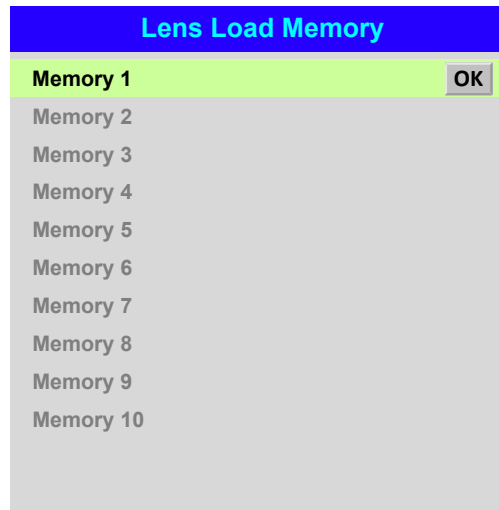
Image menu

- **Picture Mode**

  Choose from **High Bright**, **Presentation** and **Video**.
  Use a different setting depending the type of input source.
  Press **ENTER/SELECT** to open the list.
  Use the **UP** ▲ and **DOWN** ▼ arrow buttons to select a picture mode from the list, then press **ENTER/OK** to confirm your choice.
  Press **EXIT** to return to the main menu.

- **Dynamic Black**

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

- **Smooth Picture**

  When this feature is **On**, the projector is able to display lower resolution sources in 4K UHD resolution. Sources will be displayed within WQXGA+ if **Smooth Picture** is **Off**. **Auto** will allow the projector to decide based upon the bandwidth of incoming sources.

- **Gamma**

  Choose a de-gamma curve from **1.0**, **1.8**, **2.0**, **2.2**, **2.35**, **2.5**, **S-Curve** and **DICOM**.
  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.
  S-Curve is an enhanced mid-tone gamma.
  DICOM is a simulated DICOM display, which can be used for training applications.

- **Brightness, Contrast, Saturation, Hue, Sharpness**

  Highlight the setting you wish to edit, and then press **ENTER/OK**, or the **LEFT** ◄ or **RIGHT** ► arrow button to open the slider.
  Use the **LEFT** ◄ and **RIGHT** ► arrow buttons to adjust the slider.
  Press **EXIT** to close the slider and return to the menu, or **MENU** to close the slider and return to the projected image.

- **Noise Reduction**

  Choose a level of noise reduction from **Off**, **Low**, **Middle** and **High**.

- **Freeze**

  Freezes the current frame.

- **Resync**

  Press **ENTER/OK** to force the projector to resynchronise with the current input.

Image	
Picture Mode	High Bright
Dynamic Black	Off
Smooth Picture	Auto
Gamma	2.2
Brightness	100
Contrast	100
Saturation	100
Hue	100
Sharpness	10
Noise Reduction	Off
Freeze	
Resync	

Brightness	100

Notes

☞ *The following settings are not available with input HDMI 3 or HDMI 4:*

- **Smooth Picture**

- **Brightness**, **Contrast**, **Saturation**, **Hue**, **Sharpness**

- **Noise Reduction**

*The **Freeze** and **Resync** functions will also be unavailable.*

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**.

Color	
Color Space	Auto
Color Mode	ColorMax
ColorMax	Peak
Manual Color Matching	▶
Color Temperature	Native
Gains and Lifts	▶

Color	
Color Space	Auto
Color Mode	Auto
ColorMax	YPbPr
Manual Color Matching	YCbCr
Color Temperature	RGB PC
Gains and Lifts	RGB Video
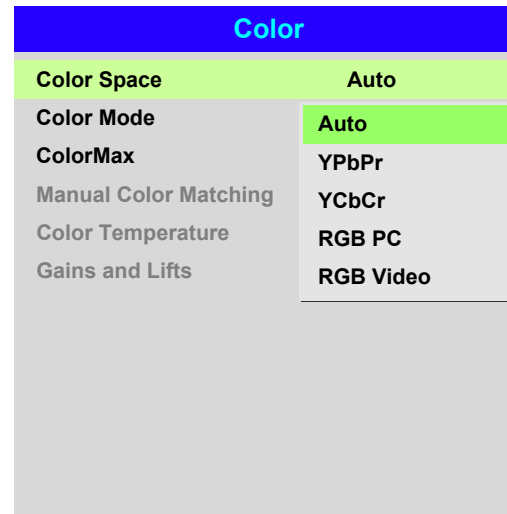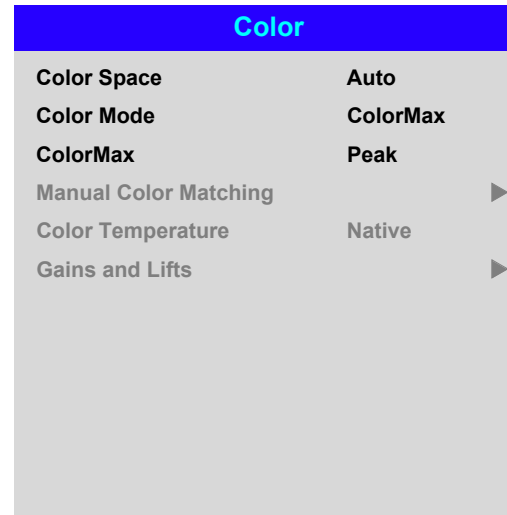
Color Mode

The projector can work in the following color modes: **ColorMax**, **Manual Color Matching**, **Color Temperature** and **Gains and Lifts**.

Color	
Color Space	Auto
Color Mode	**ColorMax**
ColorMax	**ColorMax**
Manual Color Match	**Manual Color Matching**
Color Temperature	**Color Temperature**
Gains and Lifts	**Gains and Lifts**

ColorMax

1. Set **Color Mode** to **ColorMax**.

2. Navigate to the **ColorMax** setting. Choose from **HDTV**, **Peak**, **User 1** and **User 2**.

User 1 and **User 2** are user-defined color gamuts set via the **Setup > ColorMax** menu.

☞ *Only one color mode can be selected at a time. Settings used by the other color modes are disabled.*

☞ *See Setup menu for further information about setting up the User 1 and User 2 color gamuts.*

Color menu continued from previous page

Manual Color Matching

1. Set **Color Mode** to **Manual Color Matching**.

2. Open the **Manual Color Matching** submenu.

   Here you can do the following:

   - Switch **Auto Test Pattern On** and **Off**.

   - Adjust **Hue**, **Saturation** and **Gain** settings for each individual color to improve the color balance of the projected image.

   - Adjust white balance RGB values.

   - Reset all values.

Manual Color Matching

Auto Test Pattern	Off
Red	▶
Green	▶
Blue	▶
Yellow	▶
Cyan	▶
Magenta	▶
White Balance	▶
Reset	

Manual Color Matching — Red

Hue	100
Saturation	100
Gain	100

Color

Color Space	Auto
Color Mode	ColorMax
ColorMax	Peak
Manual Color Matching	HDTV
Color Temperature	Peak
Gains and Lifts	User 1
	User 2

Color menu continued from previous page

Color matching parameters explained
The levels of hue, saturation and gain in the
Manual Color Matching menu 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.
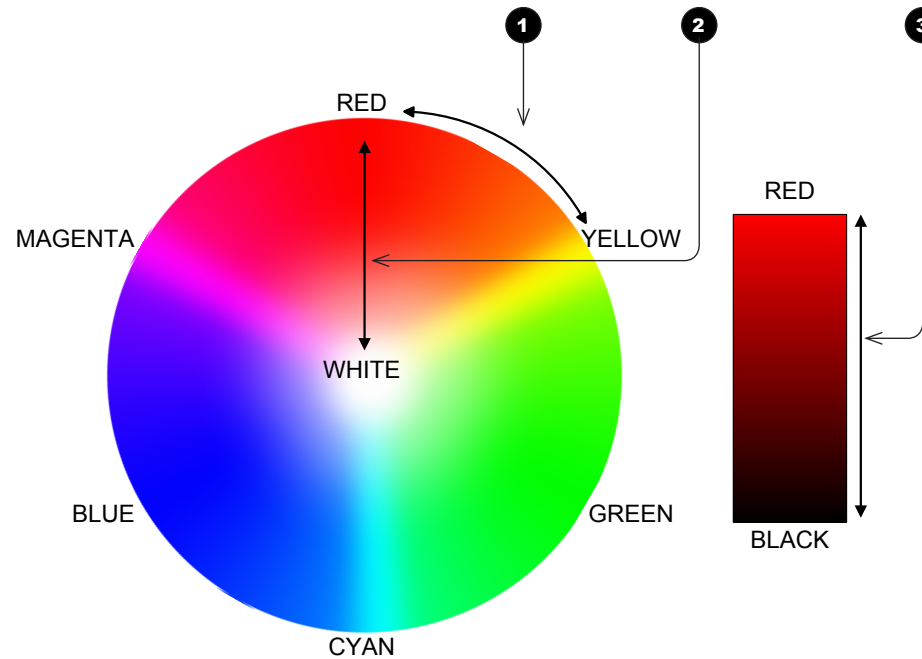
Color menu continued from previous page

Color Temperature

1. Set **Color Mode** to **Color Temperature**.

2. Navigate to the **Color Temperature** setting. Choose a value from **3200K** (warmer) to **9300K** (cooler) or **Native** (no correction).
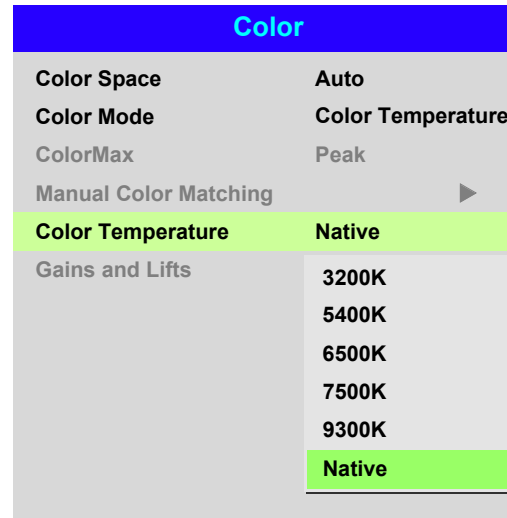
Color menu continued from previous page

Gains and Lifts

Lifts allow you to adjust black levels of individual colors, while gains adjust the bright part of the scale.

Set the sliders as required.

Gains and Lifts	
Red Lift	100
Green Lift	100
Blue Lift	100
Red Gain	100
Green Gain	100
Blue Gain	100
Reset	

Geometry menu

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

Geometry	
Aspect Ratio	Source
Digital Zoom	▶
Overscan	Off
Blanking	▶
Keystone	▶
4 Corners	▶
Rotation	▶
Pincushion / Barrel	▶
Arc	▶

Aspect Ratio

This feature defines the aspect ratio of the source. Use the **Setup > Screen Setting** to define the screen aspect ratio.

If you choose a preset aspect ratio from here, it will give you the best fit for your selection.

Choose from:

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

Theaterscope setting

The **TheaterScope** setting is used in combination with an anamorphic lens to restore 2.35:1 images packed into a 16:9 frame. Such images are projected with black lines at the top and bottom of the 16:9 screen to make up for the difference in aspect ratios.

Without an anamorphic lens and without the TheaterScope setting applied, a 16:9 source containing a 2.35:1 image looks like this:

Black margin – part of the source

Black margin – part of the source
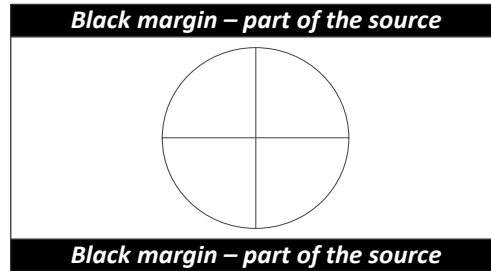
If we change the setting to **TheaterScope**, the black lines will disappear but the image will stretch vertically to reach the top and bottom of the DMD™:
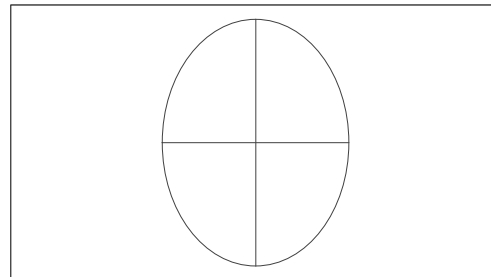
An anamorphic lens will stretch the image horizontally, restoring the original 2.35 ratio:
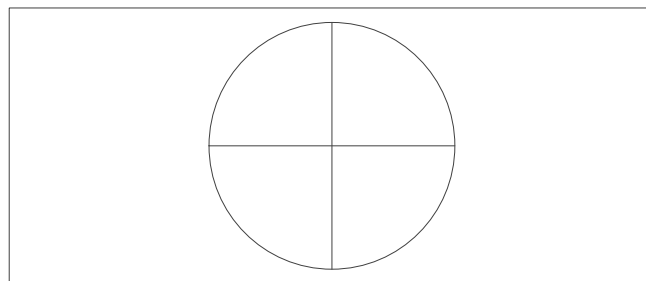
Geometry menu continued from previous page

Digital Zoom

Digital zooming enlarges a section of the image, while the area outside the enlarged section is cropped out to preserve the overall image size.

- **Digital Zoom** defines the level of zoom that needs to be applied. If **Digital Zoom** is set to **0**, then the other settings in the menu will be disabled.

- **Digital Pan** and **Digital Scan** specify the area that is being enlarged:
    - **Digital Pan** adjusts the horizontal coordinates.
    - **Digital Scan** adjusts the vertical coordinates.

The **Reset** command restores the default **Digital Zoom**, **Digital Pan** and **Digital Scan** values.

Digital Zoom	
Digital Zoom	0
Digital Pan	0
Digital Scan	0
Reset	
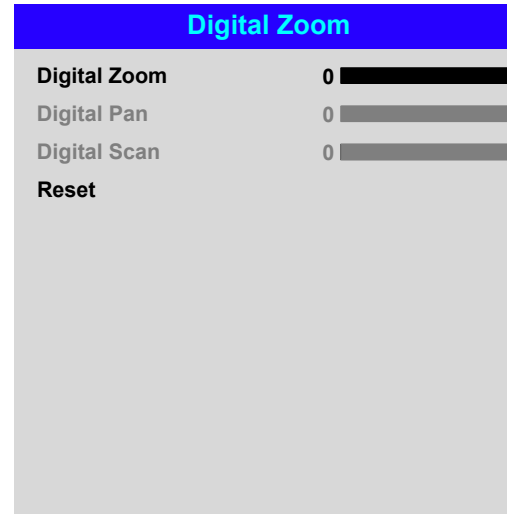
Geometry menu continued from previous page

Notes

Overscan

Use this setting to compensate for noisy or badly defined image edges.

Crop removes unwanted artifacts from the edges of your image by cropping the edges.
Zoom increases the size of the image to force the edges off-screen.

Geometry	
Aspect Ratio	**Source**
Digital Zoom	▶
Overscan	**Off**
Blanking	
Keystone	
4 Corners	
Rotation	▶
Pincushion / Barrel	▶
Arc	▶

Off
Crop
Zoom
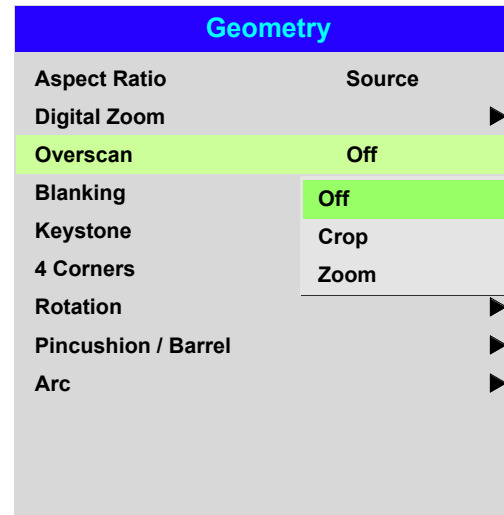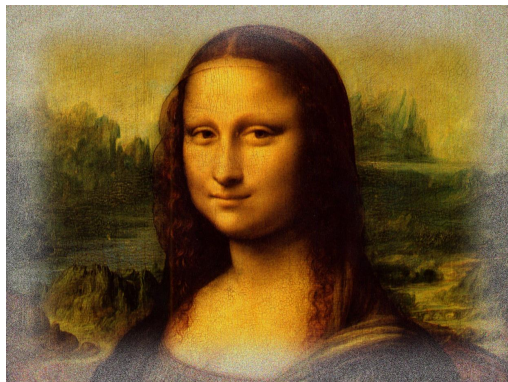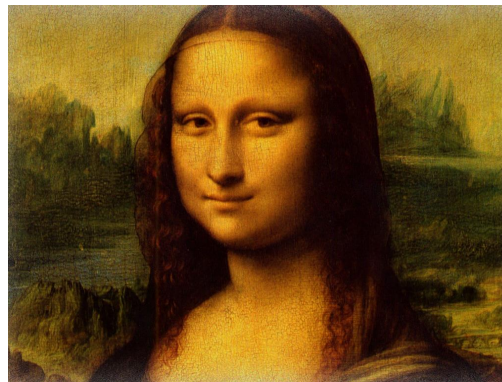
Image with noisy edges   *Overscanned image*

Geometry menu continued from previous page

Blanking

Use this feature to:

- fit an odd-sized screen;

- cut off timecode dots in the top line of a picture;

- cut off subtitles, etc.

Select the edge you wish to blank and use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to determine the amount of correction.

Use the **Reset** command to restore blanked edges.

Blanking	
Top	0
Bottom	0
Left	0
Right	0
Reset	
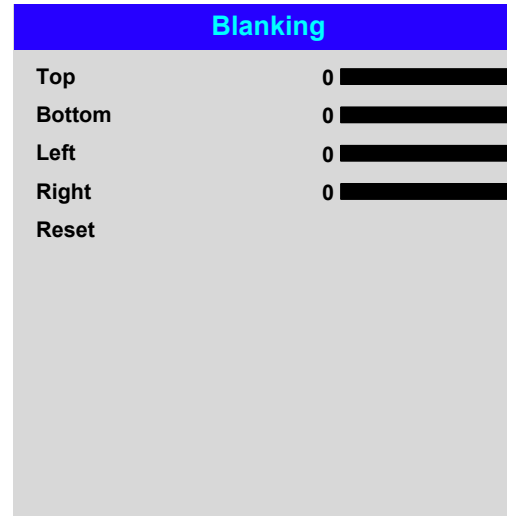
Geometry menu continued from previous page

Keystone

Use this setting to compensate for any distortion caused by the projector being in a different horizontal or vertical plane to the screen.

Keystone

H Keystone	0
V Keystone	0
Rotation	0
Reset	
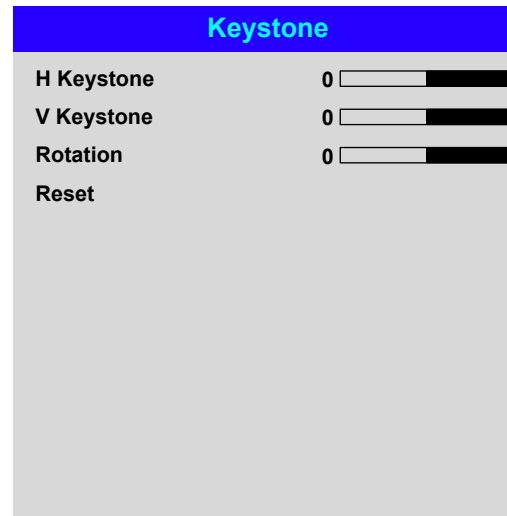
Keystone example

1 **The projector is positioned at an angle**

2 **The resulting image is distorted**

3 **The image is corrected when Keystone is applied**
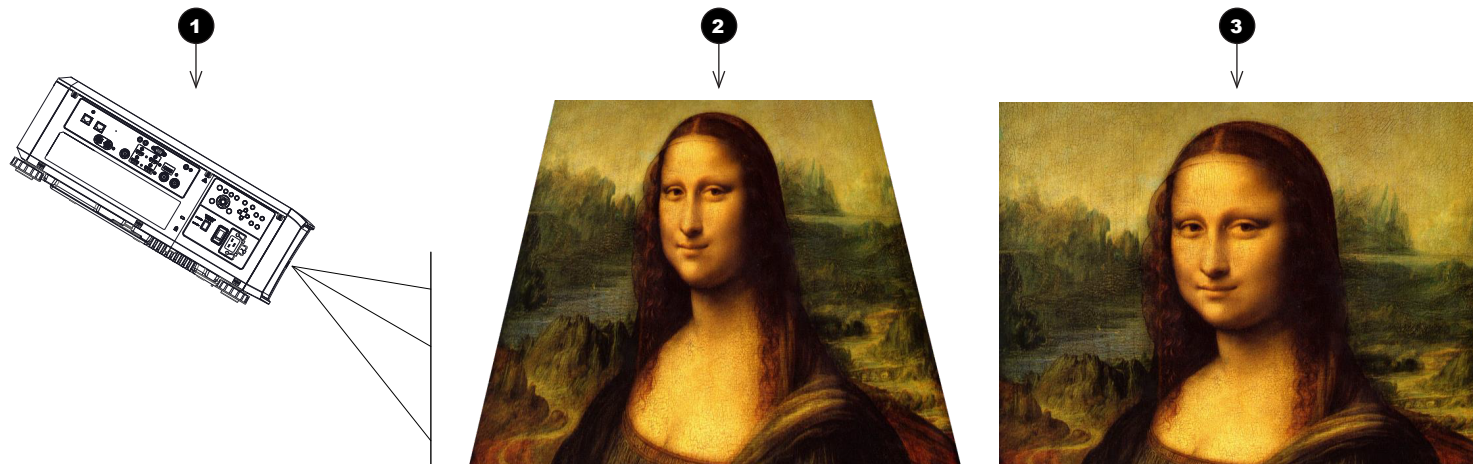
Geometry menu continued from previous page

Keystone settings

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

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

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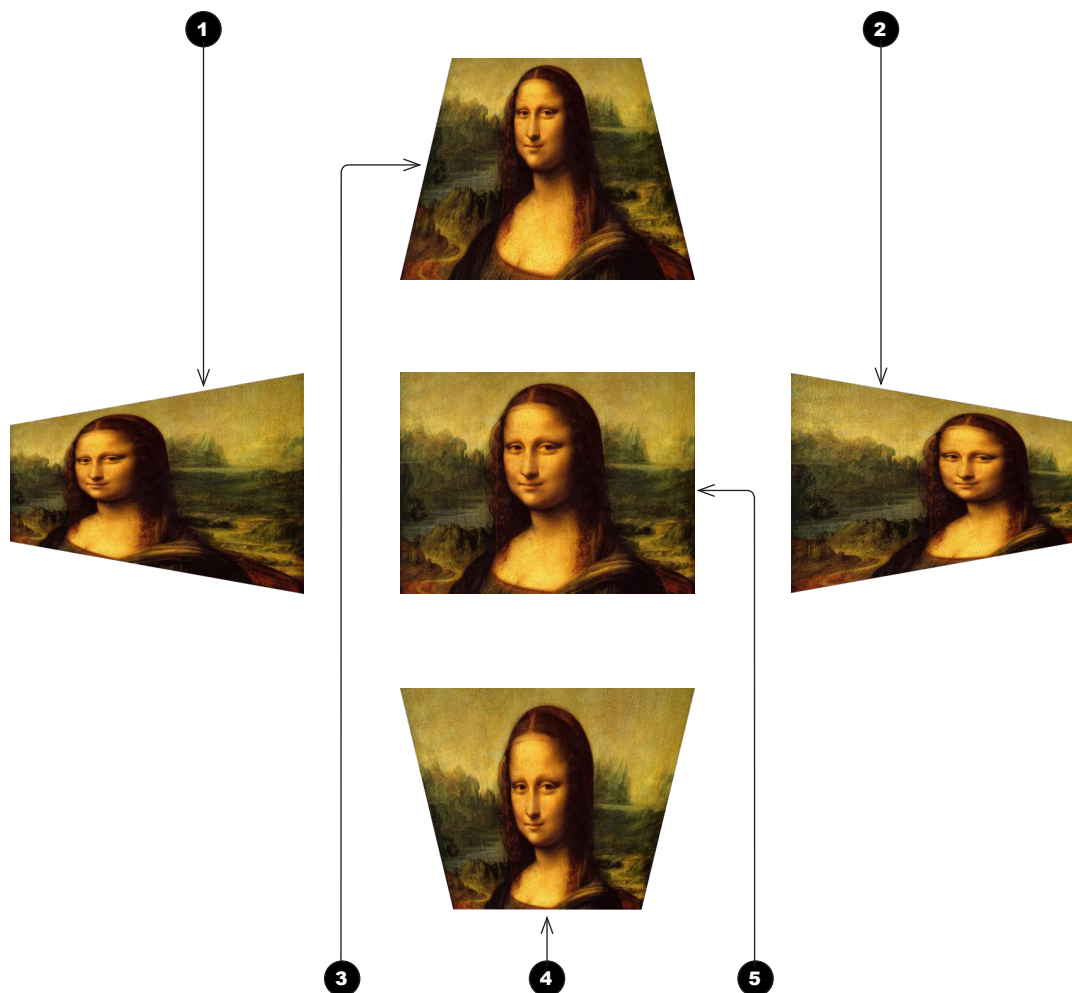
Horizontal and vertical keystone corrections

Notes

Geometry menu continued from previous page

4 Corners

For each corner, apply horizontal and / or vertical correction as necessary to restore the rectangular shape of the image.

4 Corners	
Top Left Corner	▶
Top Right Corner	▶
Bottom Left Corner	▶
Bottom Right Corner	▶
Reset	

Top Right Corner example

In this illustration, the top right corner requires both horizontal and vertical correction.
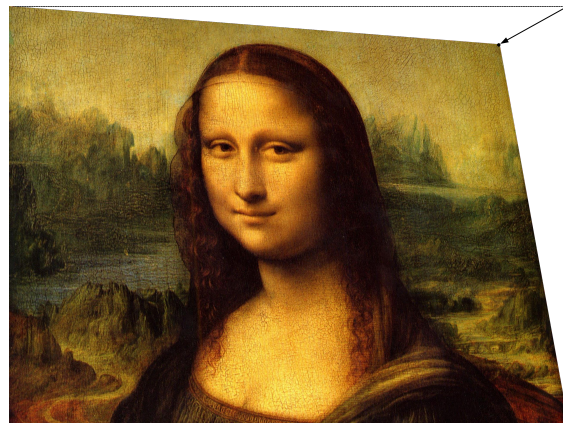
Top Right Corner *correction*

Top Right Corner Adjustment			
Top Right Corner x	◀	0	▶
Top Right Corner y	▲	0	▼

☞ *Corner corrections provide a simple setup for awkward installations and irregular shaped screens that may distort the image. To apply a similar (but less flexible) correction, while preserving the original aspect ratio of the image, use the* **Keystone** *menu.*

Geometry menu continued from previous page

Rotation

Use this feature for example to correct a mounting error causing the image not to be level with the screen.

Rotation example

1 **DMD™ area**
The DMD™ is not rotated. It still covers the area that would be occupied by the image without correction.

2 **Rotated image**
The image is smaller than the surrounding DMD™ area. It is scaled in order to remain within the DMD™ area.

3 **Angle of rotation**
The angle equals a quarter of the **Rotation** setting.
In this example the angle is 5°, therefore **Rotation = 20**.

Rotation	
Rotation	0
Reset	
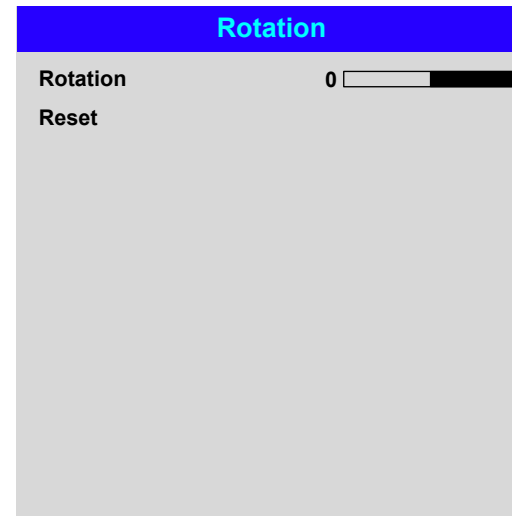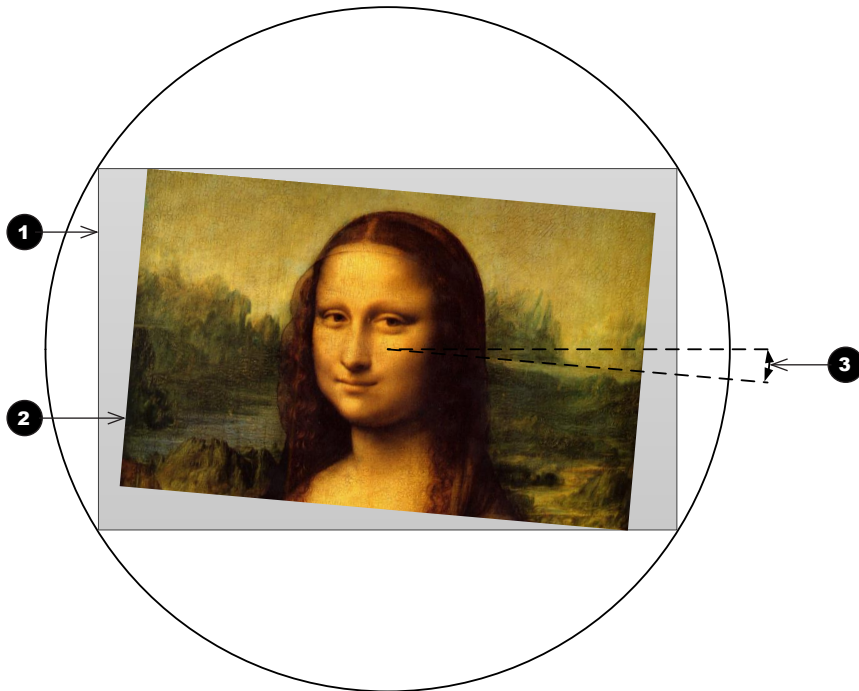
Geometry menu continued from previous page

Pincushion / Barrel

Pincushion or barrel distortions are the result of poor or incorrect tensioning of the screen or using a surface that is not flat.

Use the **Pincushion / Barrel** control to compensate electronically for such distortions.

You can also use this menu to make simple panoramic screen corrections without using external processors.

Pincushion / Barrel	
H Pin/Barrel	0
V Pin/Barrel	0
Keystone	▶
Reset	
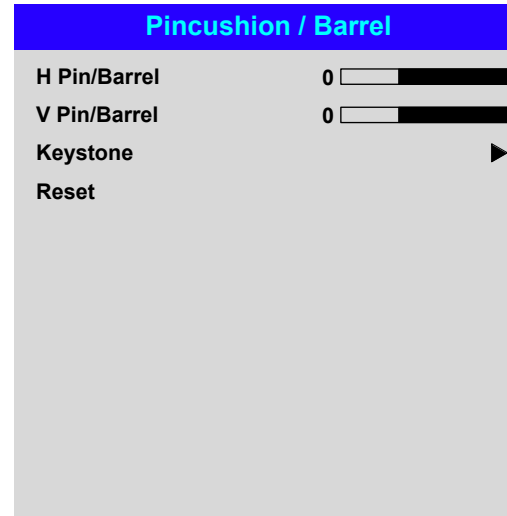
Pincushion / Barrel example

The illustration shows pincushion and barrel correction applied both horizontally and vertically, in equal measures.
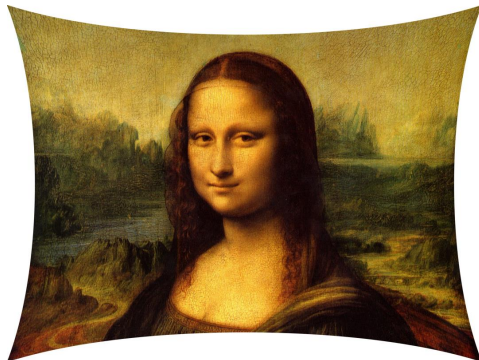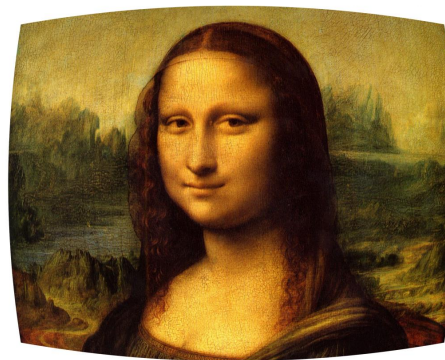
Pincushion   *Barrel*

Geometry menu continued from previous page

Arc

This feature is similar to **Pincushion / Barrel** but allows you to apply curvature to each edge of the image independently so you can have any combination of corrections.
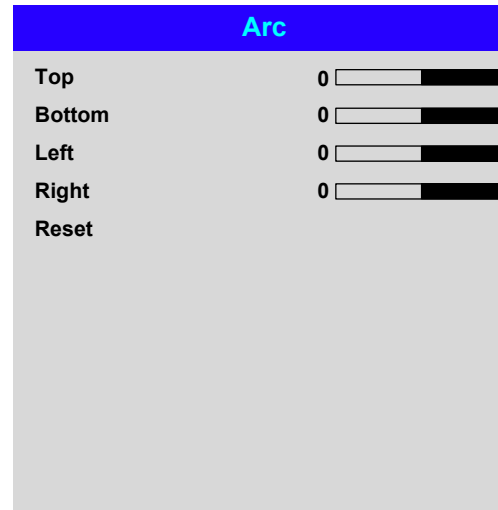
Arc	
Top	0
Bottom	0
Left	0
Right	0
Reset	

Edge Blend menu

Use this menu to blend together images from an array of two or more projectors.

The feature feathers the light output of the projector within the edges that overlap with other projectors in the array: as a result, the overlapping edges are evenly lit and easily blend in with the rest of the image.

- **Edge Blend**
  Enable and disable **Edge Blend**

- **Align Pattern**
  Add markers to the image showing the edges of the blend area and making the overlaps more visible to help adjust the physical position of the projectors in the array.

- **Blend Width**
  Determine the width of the blended regions.

- **Black Level Uplift**
  Adjust black levels to compensate if the blended regions appear brighter than the rest of the image.

- **Reset**
  Reset all **Edge Blend** settings to their factory default values.

Edge Blend	
Edge Blend	On
Align Pattern	Off
Blend Width	▶
Black Level Uplift	▶
Reset	

Notes

☞ *When **Edge Blend** is set to **Off**, all other edge blend settings are disabled.*

☞ *The picture in the blend region needs to be delivered to all overlapping projectors, which may require a special setup of the source.*

Edge Blend menu continued from previous page

Blend Width

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to set the width of the blended regions:

1   Top

2   Bottom

3   Left

4   Right

Blend Width	
Top	0
Bottom	0
Left	0
Right	0

Edge Blend menu continued from previous page

Black Level Uplift

Black in the blended regions appears less dark than in the rest of the image. To compensate for this, use this menu to raise the black levels of the rest of the image:

- Set **All** to the required amount of black level correction. This will apply equal correction to the black levels of all colors.

- If necessary, use the individual color sliders (**Red**, **Green** and **Blue**) for fine adjustment.

You may experience artifacts at the edges where the blended region of one projector overlaps the *pond of mirrors* of its neighbor. In the example below, the blended image comes from *two projectors*, **1** and **2**. Both images have black level uplift applied; as a result, *artifacts* **3** and **4** have emerged at the edges where the black level uplift region of one projector overlaps the pond of mirrors of the other.

To remove the artifacts, you need to slightly reduce the size of the black level uplift region of each projector so it does not overlap the pond of mirrors of the other projector.

- Depending on your array, use **Top**, **Bottom**, **Left** and/or **Right** to reduce the black level uplift size. In the example below, use the **Right** slider of the *projector on the left* **1** to remove the *artifact on the right* **4**, and the **Left** slider of the *projector on the right* **2** to remove the *artifact on the left* **3**.

Black Level Uplift	
Top	0
Bottom	0
Left	0
Right	0
All	0
Red	0
Green	0
Blue	0
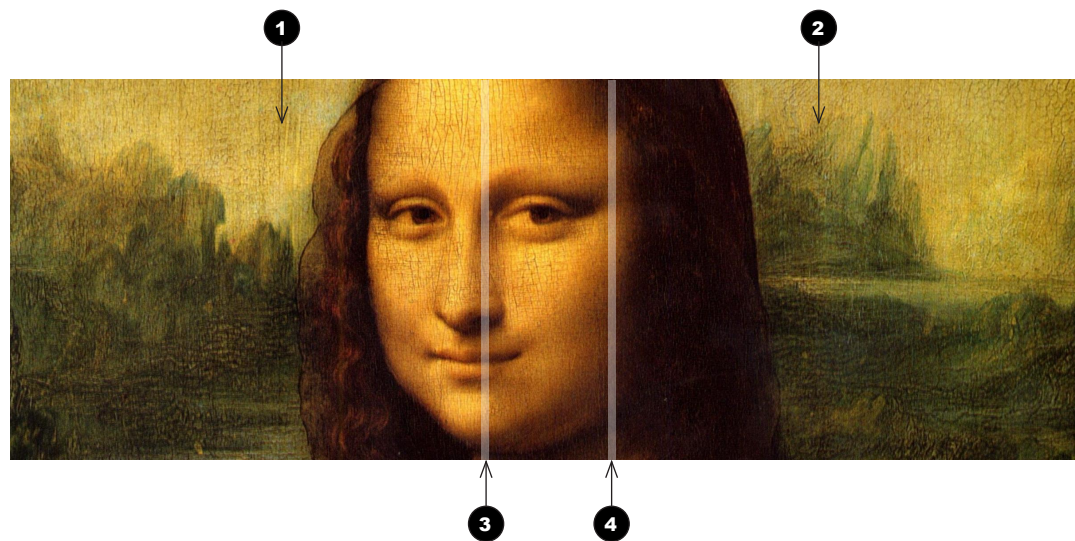
3D menu

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

- **3D Format** — **Off**, **Auto**, **Dual Pipe** and **Frame Sequential**.
  Frame Sequential is displayed at the incoming rate whereas **Dual Pipe** interleaves the input to display up to 120 Hz.

- **DLP Link** — **Off** / **On**.
  DLP Link On emits a sync pulse for the 3D glasses via the projected image.
  DLP Link Off will send the sync pulse to the sync out connector to use with an external third party emitter.

- **Eye Swap** — **Normal** and **Reverse** (set to **Reverse** if the left- and right-eye images are displayed in the wrong order)

- **Dark Time** — **0.65 ms**, **1.3 ms** and **1.95 ms**. Set to reduce the effect of images overlapping while the glasses are switching.

3D Sync

- **Offset** — use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to compensate for signal processing delays in the projector.

- **Reference**— **External** and **Internal**.

3D	
3D Format	Auto
DLP Link	Off
Eye Swap	Normal
Dark Time	1.95 ms
3D Sync	
Offset	100
Reference	Internal

Notes

☞ *3D video is only possible on the HDMI 3 and HDMI 4 inputs.*

☞ *While the projector is in 3D mode, the OSD is unavailable. Settings can be accessed via web pages served from the projector. For more information, see* Served Web Pages*.*

☞ *If* **3D Format** *is set to* **Off***, all other 3D settings will be unavailable.*

☞ *For further information about supported 3D formats, see* 3D connections *in the* **Connection Guide***.*

☞ *When 3D is on, the following settings become unavailable:*

- **Image > Smooth Picture**, **Brightness**, **Contrast**, **Saturation**, **Hue**, **Sharpness**, **Noise Reduction**, **Freeze**, **Resync**.
- **Color > Color Space**.
- **Geometry > Aspect Ratio**, **Digital Zoom**, **Overscan**.
- **Setup > Screen Setting**, **Auto Source**, **Trigger-1**, **Trigger-2**.
- **PIP >** *all settings.*

☞ *See also* 3D types *and* Some 3D settings explained *further in this guide.*

☞ *See* Appendix B: Supported Signal Input Modes > 3D formats *in the* **Reference Guide** *for 3D resolutions and frame rates.*

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:

* **Dual Pipe (LEFT and RIGHT)**
  The left and right eye images are delivered on two separate HDMI links, which the projector will interleave for 3D display.

HDMI 1

HDMI 2

Dual Pipe
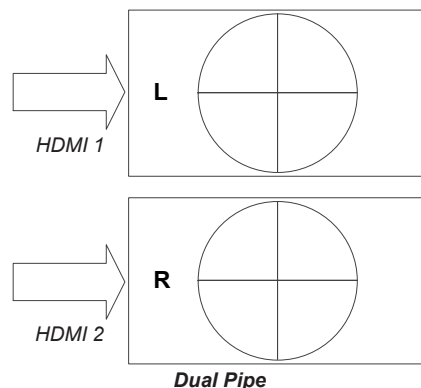
* **Sequential**
  Main will accept frame rates up to 160Hz. Lower frame rates can be multiplied for display. An example would be 60Hz (30 frames per eye in Left-Right sequence (L1, R1, L2, R2…) with **Frame Rate Multiplier** set to 2x, resulting in a displayed sequence at 120Hz (L1, R1, L1, R1, L2, R2, L2, R2…). **Sub** can accept frame rates up to 60Hz and frame-multiply in a similar manner.
  Frame Rate Multiplier should never be set to result in a displayed frame rate above 160Hz - doing so will result in an image error.
  For sequential 3D, an external sync is required to identify left and right frames. If no sync is available from the sequential source, the projector will generate an output sync, but it may then be necessary to manually reset the dominance each time the player is started.

Sequential
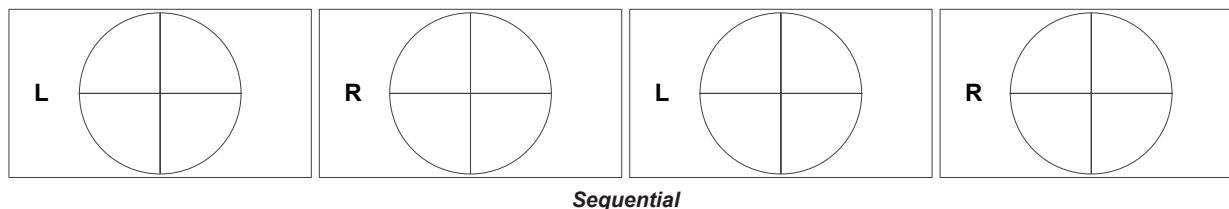
Dark Time and **Sync Delay** need to be set only once, to optimize the image for the glasses in use.

Notes

3D menu continued from previous page

Some 3D settings explained

Dark Time
Ghosting can be caused by the left and right images overlapping during the time that the ZScreen or 3D glasses are switching. **Dark Time** allows you to minimize this effect.

Fully on ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

           Left   *Right*

Fully off ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

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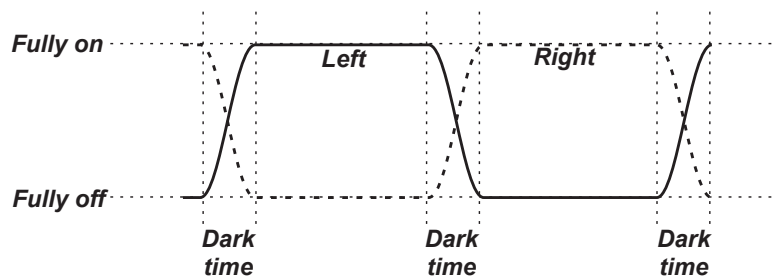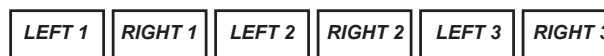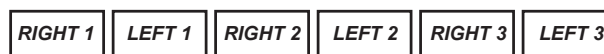
Eye Swap
The outgoing 3D frames are in pairs - the dominant frame being presented first. You can determine which frame should be the dominant one.

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 |

Sync Delay
The sync signal from the 3D server will be in phase with the frames generated by its graphics card. However, to compensate for processing delays in the projector, **Sync Delay** introduces a delay to the sync output signal sent to the ZScreen or 3D glasses.
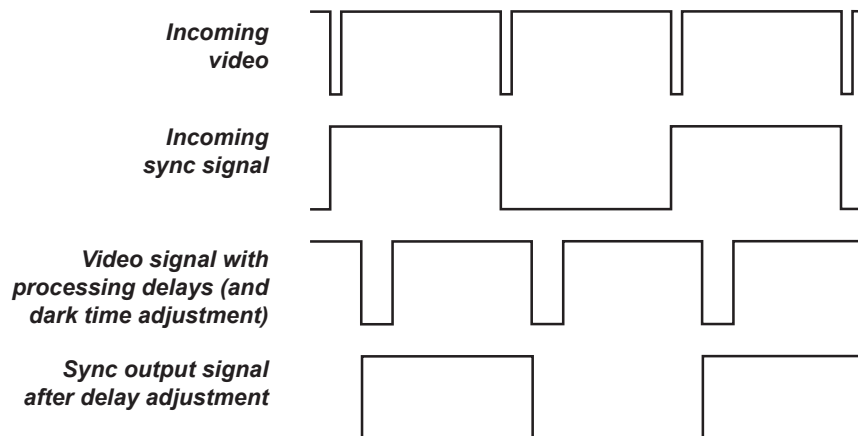
Incoming video

Incoming sync signal

Video signal with processing delays (and dark time adjustment)

Sync output signal after delay adjustment

Laser menu

- **Power Mode**
  - **Eco** will automatically set the laser power to 80%.
  - **Normal** will set the power to 100%.
  - Set to **Custom** if you wish to adjust the power manually.

- **Power Level**

  This setting is only available if **Power Mode** is set to **Custom**.

  Choose a value between 20 and 100, ranging from 20% to 100% laser power.

Laser	
Power Mode	Normal
Power Level	— — — —
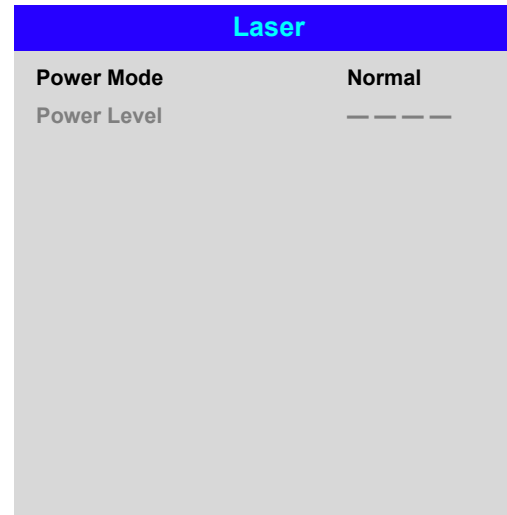
Notes

Setup menu

- **Orientation**
  Choose from **Front Tabletop**, **Front Ceiling**, **Rear Tabletop**, **Rear Ceiling** and **Auto-front**.

- **Cooling Condition**
  Choose from **Table**, **Ceiling**, **Freetilt** and **Auto**.

- **High Altitude**
  Choose from **On**, **Auto** and **Quiet**.

- **Standby Power**
  Choose from **SAVE**, **ECO** and **Normal**.

- **Screen Setting**
  Choose from **16:10**, **16:9** and **4:3**.

- **ColorMax**
  Set up user-defined color gamut values.

- **Power On/Off Management**
  Access the submenu to set up automatic projector power on and power off.

- **Clock Adjust**
  Access the submenu to set current date and local time.

- **Startup Logo**
  Set this to **On** if you want the DP logo to show when the projector is first switched on.

- **Blank Screen**
  Choose from **Logo**, **Black**, **Blue** and **White**.

- **Auto Source**
  If this setting is **On**, the projector will automatically search for an active input source.

Highlight the **DOWN** ▼ arrow at the bottom of the page and press **ENTER/OK** to navigate to the second **Setup** menu page.

Setup	
Orientation	**Auto-front**
Cooling Condition	**Auto**
High Altitude	**Auto**
Standby Power	**SAVE**
Screen Setting	**16:9**
ColorMax	▶
Power On/Off Management	▶
Clock Adjust	▶
Startup Logo	**On**
Blank Screen	**Logo**
Auto Source	**Off**
▼	

Notes

☞ **Auto-front** *automatically detects the projector's position and sets the orientation accordingly.*

☞ **Screen Setting** *and* **Auto Source** *are not available with input HDMI 3 or HDMI 4.*

Setup menu continued from previous page

- **Trigger1** and **Trigger 2**
Choose from **Screen**, **5:4**, **4:3**, **16:10**, **16:9**, **1.88**, **2.35**, **TheaterScope**, **Source**, **Unscaled** or **RS232** to determine what will cause each trigger output to activate.

- **Infrared Remote**
Set to **Off** if you wish to disable the remote control.

- **IR Code**
The projector and the remote control need a matching IR code: a two-digit number between **00** and **99**.

The default IR code is **00**. This is also a master code, which, if assigned to a remote, will work regardless of the value assigned to the projector.

To assign an IR code for the projector:

1. Select **IR Code**.

2. Use the **UP** ▲ and **DOWN** ▼ arrow buttons to change the values.

To assign an IR code for the remote:

1. Press and hold the **ADDR** button on the remote until the indicator starts flashing.

2. Release the **ADDR** 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.

- **IR Code Reset**
Use this command to unassign an IR code from the projector. This will revert the **IR Code** value to 00.

To unassign an IR code from the remote control,

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

- **OSD Settings**
Access this submenu to adjust the appearance and position of the on-screen display.

- **Memory**
Access this submenu to save up to four presets containing custom combinations of image settings, or to recall a saved preset.

Highlight the **UP** ▲ arrow at the top of the page and press **ENTER/OK** to go back to the first **Setup** menu page.

Setup	
▲	
Trigger-1	Off
Trigger-2	Off
Infrared Remote	On
IR Code	0
IR Code Reset	
OSD Settings	▶
Memory	▶
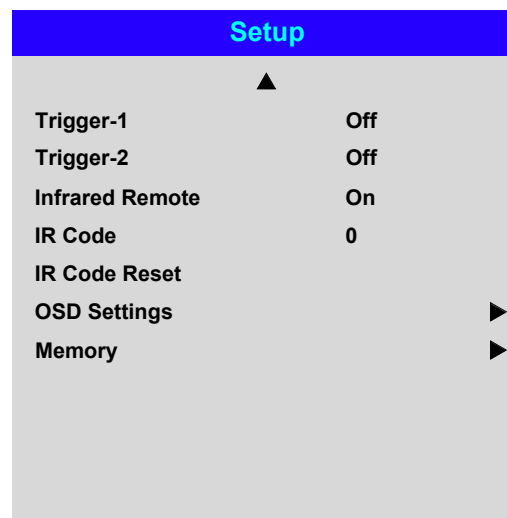
Notes

☞ *Trigger-1* and *Trigger-2* are not available with input HDMI 3 or HDMI 4.

☞ *If you turn the remote control off, you can only turn it back on again from the control panel or via the **Projector Controller** application.*

*The **Projector Controller** software is available for download from the Digital Projection website, free of charge.*

☞ *A wired remote control will also be disabled if **Infrared Remote** is set to **Off**.*

Setup menu continued from previous page

ColorMax Setting

ColorMax Setting permits seven point color matching of red, green, blue, yellow, cyan, magenta and white.

You can enter your own gamut values here, or edit values you have imported using the **Projector Controller** software.

Defining your own colorspace with individual x and y coordinates for each color enables you to match not only the whites but each individual color as well.

Highlight the submenu you wish to open and press **ENTER/OK** to confirm your choice.

ColorMax Setting	
Measured Data	▶
Target Data – User 1	▶
Target Data – User 2	▶

Measured Data / Target Data

1. Use the **UP ▲** and **DOWN ▼** arrow buttons to highlight a color, then use the **LEFT ◀** and **RIGHT ▶** arrow buttons to navigate to the **x** or **y** coordinate.

2. Use the **UP ▲** and **DOWN ▼** arrow buttons to increase and decrease the value, respectively.

3. Exit edit mode:
   - press **ENTER/OK**, if you want to save the edited values.
   - press **EXIT**, if you do not wish to save the edited values

4. If necessary, highlight another color and repeat the procedure.
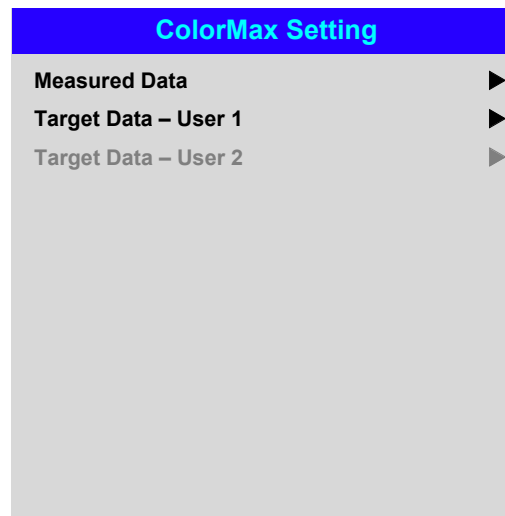
Measured Data		
Red	x: 0.658	y: 0.339
Green	x: 0.315	y: 0.662
Blue	x: 0.146	y: 0.043
White	x: 0.276	y: 0.283
Reset		

Target Data – User 1		
Red	x: 0.640	y: 0.390
Green	x: 0.300	y: 0.600
Blue	x: 0.150	y: 0.060
Yellow	x: 0.419	y: 0.505
Cyan	x: 0.225	y: 0.329
Magenta	x: 0.321	y: 0.154
White	x: 0.285	y: 0.302
Reset		

Setup menu continued from previous page

Power On/Off

- **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 **ON** button is pressed on the remote control.

Power On/Off	
Auto Power Off	**Off**
Auto Power On	**Off**
Scheduled on/off	▶

- **Scheduled on/off**

  Access this submenu to create a weekly schedule for automatic on and off times:

  1. Set a schedule:

     - Use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight a row, then press **ENTER/OK** to enable edit mode.

     - Within a row, navigate with the **LEFT** ◀ and **RIGHT** ▶ arrow buttons. Set values with the **UP** ▲ and **DOWN** ▼ arrow buttons.

     - To exit edit mode, press **ENTER/OK**. Alternatively, press **EXIT** if you don't want the changes to take effect. Move to another row using the **UP** ▲ and **DOWN** ▼ arrow buttons.

  2. To enable the schedule, set **Schedule** to **On**.

Scheduled on/off							
Schedule				**Off**			
	S	M	T	W	T	F	S	Time
On	☒	☐	☐	☐	☐	☐	☐	12: 34
Off	☒	☐	☐	☐	☐	☐	☐	12: 34
On	☒	☐	☐	☐	☐	☐	☐	12: 34
Off	☒	☐	☐	☐	☐	☐	☐	12: 34
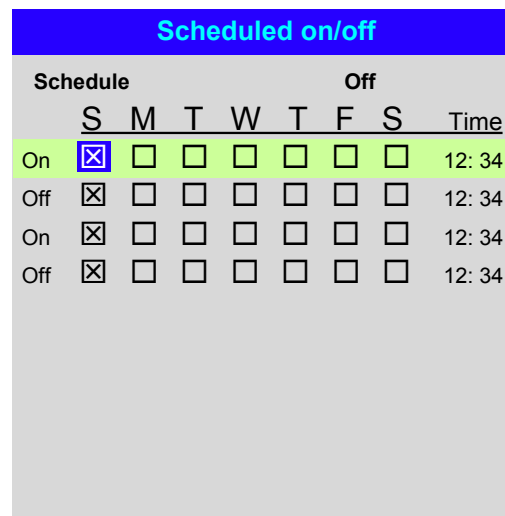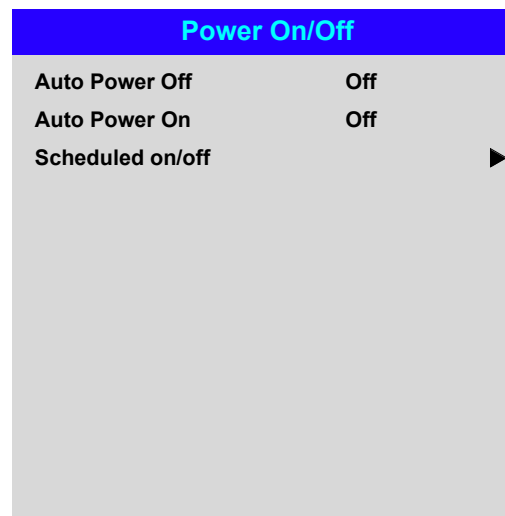
Notes

Setup menu continued from previous page

Clock Adjust

Use this menu to set date (in **dd:MM:yyyy** format), time (in **HH:mm** format) and time zone.

The date and time set here will affect any schedule created within the **Power On/Off** menu.

Clock Adjust	
Date (dd:MM:yyyy)	**20:11:2015**
Time (HH:mm)	**14:00**
Time Zone	**UTC 0**

Setup menu continued from previous page

OSD Settings

- **Language** sets the OSD language.
- **Menu Position** determines where the OSD should appear on the screen when activated.
- **Menu Transparency** sets OSD transparency between **0%** (no transparency), **25%**, **50%** and **75%**.
- **Time Out** determines how long the OSD should remain on screen if no buttons are pressed. Choose **Always On** to disable this feature.
- **Message Box** determines whether projector status messages should appear on the screen.

Memory

The current image settings can be saved as a preset, which you can recall later. The default settings can be recalled at any time as well.

Up to four custom presets can be stored for each input.

The following settings are saved in a preset:

- From the **Image** menu — Dynamic Black, Smooth Picture, **Gamma**, **Brightness**, **Contrast**, **Saturation**, **Hue**, **Sharpness** and **Noise Reduction**
- From the **Color** menu — **Color Space**, **Color Mode**, **ColorMax**, **Color Temperature**, **Dynamic Black**, **RGB Lift** and **RGB Gain**
- From the **Geometry** menu — **Aspect Ratio** and **Overscan**

To recall a saved preset:

- Select **Recall Memory** and press **ENTER/OK**, then select a preset from **Preset A** to **Preset D**. Select **Default** to load factory default values.

To save a preset:

- Select **Save Settings** and press **ENTER/OK**, then choose from **Preset A**, **Preset B**, **Preset C** and **Preset D**.

OSD Settings	
Language	English
Menu Position	Center
Menu Transparency	0
Time Out	30 Seconds
Message Box	On

Memory	
Recall Memory	Default
Save Settings	Preset A

Network menu

- **DHCP**, **IP**, **Subnet Mask**, **Gateway**, **DNS**

  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 **On**, it will not be possible to edit **IP Address**, **Subnet Mask**, **Gateway** or **DNS**.

  If **DHCP** is set to **Off**, edit **IP Address**, **Subnet Mask**, **Gateway** and **DNS** as required.

- **MAC**

  This field is read-only.

- **AMX**

  Switch on or off.

Network	
DHCP	Off
IP	192 . 168 . 000 . 100
Subnet Mask	255 . 255 . 255 . 000
Gateway	000 . 000 . 000 . 000
DNS	000 . 000 . 000 . 000
MAC	00: 18: 27: 2d: f2: 06
AMX	Off

Notes

PIP menu

- **PIP**

  Turn PIP on and off.

- **Source**

  Select an input source for the PIP image.

  Any combinations are possible between main and PIP input source, as long as one of the inputs is either **DisplayPort** or **3G-SDI**.

- **Position**

  Set the location of the PIP image on the screen. Choose from **Top-Left**, **Top-Right**, **Bottom-Left**, **Bottom-Right** and **PBP**.

PIP	
PIP	Off
Source	HDMI1
Position	Top-Left

Information menu

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

Information

Model Name	**E-Vision Laser 4K**
Serial Number	**X000XXXXX0000**
Software Version 1	**MD03-SE10-FE09**
Software Version 2	**STEP-D14-RE04-3092**
Software Version 3	**1.10.2.7-P496**
Active / PIP Source	**HDMI 1**
Signal Format	▶
Laser Hours	**41**
System Status	▶
Thermal Status	▶
Factory Reset	

Signal Format

Signal Format

Active Source

Timing	**1080p/60Hz**
H Refresh	**67.500 KHz**
V Refresh	**60.00 Hz**
Pixel Clock	**148.500 MHz**

PIP Source

Timing	**576p/50Hz**
H Refresh	**31.250 KHz**
V Refresh	**50.00 Hz**
Pixel Clock	**27.0 MHz**

☞ **PIP Source** *items are not available with input HDMI 3 or HDMI 4.*

Information menu continued from previous page

System Status

System Status	
Atmospheric Pressure	98988 Pa (116 m)
AC Voltage	160V – 264V
Ceiling Mode	0
Tilt Angle	4 deg
Portrait Angle	0 deg
Altitude Mode	Low
Laser Power	100%

Thermal Status

Thermal Status	
Inlet 1/2 Temp.	24 / 34 (C)
DMD Temp.	38 (C)
Laser 1/2 Temp.	49 / 42 (C)
Outside Temp.	32 (C)
Fan 1-3 Speed	1399 / 1402 / 1391
Fan 4-6 Speed	1410 / 1200 / 1205
Fan 7-9 Speed	1211 / 1407 / 1410
Fan 10-12 Speed	0 / 3005 / 3007
Fan 13-15 Speed	2986 / 2984 / 2984
Fan 16 Speed	3020 / NA / NA
Water Pump Speed	3506

Information menu continued from previous page

Factory Reset

To restore the factory default settings:

1. Navigate to **Factory Reset** and press **ENTER**/**OK**.

2. When prompted, press **ENTER**/**OK** to confirm your choice, or press **EXIT** to cancel.

Factory Reset
WARNING **All user settings will be lost!**
Press OK to confirm **Press Exit to cancel**
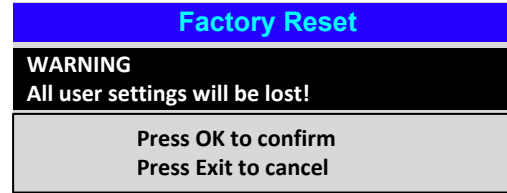
Served Web Pages

The served web pages allow you to control the projector remotely via LAN.

The default IP address is *192.168.0.100*.

DIGITAL PROJECTION

Projector Status	**Projector Information**
Projector Control	
Crestron RoomView	
Network Setup	
Alert Mail Setup	
Date/Time Setup	
Error Log	
DP OSD Function	

Model	E-Vision Laser 4K
Serial Number	W714ZETCY0003
Software Version 1	MD03-VD03-FE12-0.0.356
Software Version 2	STEP_D08-24-16-3120
Software Version 3	1.10.5.0-P503
Power Status	-
Input	-
Laser Status	Power : - Runtime : - H
Projection Mode	-
High Altitude	-
Inlet Temperature	- °C
DMD Temperature	- °C
LD Temperature	- °C
Diagnostic Status	-

Hot Key

[PicMute] [OSD]
[Freeze]

LAN Information

MAC address	00:18:23:50:92:DA

DIGITAL PROJECTION

Projector Status

Projector Control

Crestron RoomView

Network Setup

Alert Mail Setup

Date/Time Setup

Error Log

DP OSD Function

Hot Key

PicMute   OSD

Freeze

State Control

Power

On   Off

Input Selection

DisplayPort   HDMI 1   HDMI 2   HDBaseT

3G-SDI   HDMI 3 (3D)   HDMI 4 (3D)

Lens Control

Zoom Focus   Shift
In   In

Zoom Focus
OUT   OUT

DIGITAL PROJECTION

Projector Status

Projector Control

Crestron RoomView

Network Setup

Alert Mail Setup

Date/Time Setup

Error Log

DP OSD Function

Hot Key

PicMute   OSD

Freeze

NetWork

DHCP: ○ On ● Off

IP Address: 192 . 168 . 0 . 100

Subnet Mask: 255 . 255 . 255 . 0

Gateway: 192 . 168 . 0 . 254

DNS Server: 192 . 168 . 0 . 1

Save Settings

CAUTION: Incorrect settings may cause the projector to lose network connectivity.

Notes

DIGITAL PROJECTION

Projector Status

Projector Control

Crestron RoomView

Network Setup

Alert Mail Setup

Date/Time Setup

Error Log

DP OSD Function

Hot Key

PicMute | OSD

Freeze

Server Setup

SMTP Server: [   ] **Port:**

[25]

User Name: [   ]

Password: [   ]

[Apply]

Mail

E-mail Alert: ○ Enable ● Disable

From: [   ]

To: [   ]

CC: [   ]

Projector Name: [W714ZETCY0003   ]

Location: [   ]

[Apply]

Test

[Send Test Mail   ]

Periodic Report

days
☐Sun ☐Mon ☐Tue ☐Wed ☐Thu ☐Fri ☐Sat

Times
☐00:00 ☐01:00 ☐02:00 ☐03:00
☐04:00 ☐05:00 ☐06:00 ☐07:00
☐08:00 ☐09:00 ☐10:00 ☐11:00
☐12:00 ☐13:00 ☐14:00 ☐15:00
☐16:00 ☐17:00 ☐18:00 ☐19:00
☐20:00 ☐21:00 ☐22:00 ☐23:00

[reset] [Save Set]

Notes

DIGITAL PROJECTION

Projector Status	
Projector Control	
Crestron RoomView	
Network Setup	
Alert Mail Setup	
Date/Time Setup	
Error Log	
DP OSD Function	

Hot Key
[PicMute] [OSD]
[Freeze]

Time Zone:

Time Zone: [GMT(-12:00) ▲▼]

Select Local time zone, Current zone is GMT +00:00

[SaveTimeZone]

Time:

Date: [2000.01.26] e.g.2000.01.01

Clock: [16:10] e.g.23:59

Current time is set to : -   ; -

[SaveTime]

DIGITAL PROJECTION

Projector Status	
Projector Control	
Crestron RoomView	
Network Setup	
Alert Mail Setup	
Date/Time Setup	
Error Log	
DP OSD Function	

Hot Key
[PicMute] [OSD]
[Freeze]

Projector Error Log

ErrLog: 3 / Current PowerOn times: 10

No	Code	PwrOn	L1(Hr/Pwr/Vol)	T(Ti/Tc)	FANs	Desc
1	0825	5	0/0/0	0/0	(NoData)	ErrWheelSpinEnv
2	0825	4	0/0/0	0/0	(NoData)	ErrWheelSpinEnv
3	0825	6	0/0/0	0/0	(NoData)	ErrWheelSpinEnv
1	0825	5	0/0/0	0/0	(NoData)	ErrWheelSpinEnv
2	0825	4	0/0/0	0/0	(NoData)	ErrWheelSpinEnv
3	0825	6	0/0/0	0/0	(NoData)	ErrWheelSpinEnv

Page 1   Page 2

Notes

DIGITAL PROJECTION

Projector Status

Projector Control

Crestron RoomView

Network Setup

Alert Mail Setup

Date/Time Setup

Error Log

DP OSD Function

Hot Key
PicMute   OSD
Freeze

Input

- Input   HDMI2 ⌄

Test Pattern

Exit Test Pattern

Lens

- Lens Lock ⦿off ○on
- CenterLens Do
- Lens Type ⦿non-UST Lens ○UST Lens
- LensMemory Memory 1 ⌄ Save Load Clear

Image

- PictureMode Hight Bright ⌄
- DynamicBlack ⦿off ○on
- Gamma 2.2 ⌄
- Brightness ● − ▭▭▭▭ + 100
- Constrast ● − ▭▭▭▭ + 100
- Staturation ● − ▭▭▭▭ + 100
- Hue ● − ▭▭▭▭ + 100
- Sharpness ● − ▭▭▭▭ + 10
- Noise Reduction Low ⌄
- Freeze
- Resync

color

- ColorSpace Auto ⌄

Notes

DIGITAL PROJECTION

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Projector Status

Projector Control

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Network Setup

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Date/Time Setup

Error Log

DP OSD Function

Hot Key
[PicMute] [OSD]
[Freeze]

geometry

- Aspect Ratio [Source ▾]
- Digital Zoom
  Digital Zoom   [-] [========] [+] 0%
  Digital Pan   [-] [========] [+] 0
  Digital Scan   [-] [========] [+] 0
  [Digital Zoom Reset]
- Overscan [Off ▾]
- Blanking
  Top   [-] [========] [+] 0
  Bottom   [-] [========] [+] 0
  Left   [-] [========] [+] 0
  Right   [-] [========] [+] 0
  [Blanking Reset]
- ○ Keystone
  H Keystone   [-] [========] [+] 0
  V Keystone   [-] [========] [+] 0
  Rotation   [-] [========] [+] 0
  [Keystone Reset]
- ○ 4 Corners
  Top Left Corner X   [-] [========] [+] 0
  Top Left Corner Y   [-] [========] [+] 0
  Top Right Corner X   [-] [========] [+] 0
  Top Right Corner Y   [-] [========] [+] 0
  Bottom Left Corner X   [-] [========] [+] 0
  Bottom Left Corner Y   [-] [========] [+] 0
  Bottom Right Corner X [-] [========] [+] 0
  Bottom Right Corner Y [-] [========] [+] 0
  [4 Corners Reset]
  ○ Rotation   • [-] [========] [+] 0
  [Rotation Reset]
- ⊙ Pincushion/Barrel
  H Pin/Barrel   [-] [========] [+] 0
  V Pin/Barrel   [-] [========] [+] 0
  Keystone
  H Keystone   [-] [========] [+] 0
  V Keystone   [-] [========] [+] 0
  Rotation   [-] [========] [+] 0
  [Pincushion/Barrel Reset]
- ○ Arc

DIGITAL PROJECTION

- **Projector Status**
- **Projector Control**
- **Crestron RoomView**
- **Network Setup**
- **Alert Mail Setup**
- **Date/Time Setup**
- **Error Log**
- **DP OSD Function**

Hot Key
[PicMute] [OSD]
[Freeze]

Page 1   Page 2   Page 3

setup

- Orientation [Auto-front ▾]
- Colling Condition [Auto ▾]
- High Altitude [On ▾]
- Screen Setting [16:9 ▾]
- ColorMax
  Measured Data
  Red   X:0.650   Y:0.341
  Green   X:0.343   Y:0.622
  Blue   X:0.141   Y:0.021
  White   X:0.305   Y:0.343
  [Measured Data Reset]
  Target Data - User 1
  Red   X:0.[650]   Y:0.[341]
  Green   X:0.[343]   Y:0.[622]
  Blue   X:0.[141]   Y:0.[021]
  Yellow   X:0.[411]   Y:0.[557]
  Cyan   X:0.[230]   Y:0.[318]
  Magenta   X:0.[269]   Y:0.[099]
  White   X:0.[305]   Y:0.[343]
  [Target Data - User 1 Save] [Target Data - User 1 Reset]

  Target Data - User 2
  Red   X:0.[650]   Y:0.[341]
  Green   X:0.[343]   Y:0.[622]
  Blue   X:0.[141]   Y:0.[021]
  Yellow   X:0.[411]   Y:0.[557]
  Cyan   X:0.[230]   Y:0.[318]
  Magenta   X:0.[269]   Y:0.[099]
  White   X:0.[305]   Y:0.[343]
  [Target Data - User 2 Save] [Target Data - User 2 Reset]

- Power On/Off
  Auto Power Off   (•) off ( ) on
  Auto Power On   (•) off ( ) on
  Scheduled on/off   (•) off ( ) on

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Time(HH:MM)
On	☐	☐	☐	☐	☐	☐	☐	00:00
Off	☐	☐	☐	☐	☐	☐	☐	00:00
On	☐	☐	☐	☐	☐	☐	☐	00:00

Notes

DIGITAL PROJECTION

E-Vision Laser 4K Series
High Brightness Digital Video Projector

▶ REFERENCE GUIDE

IN THIS GUIDE

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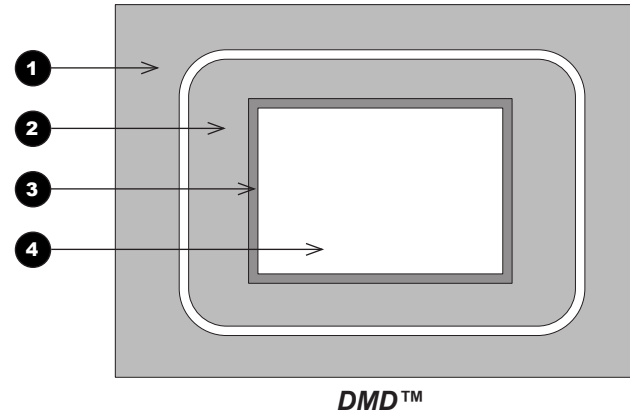
Each mirror element is suspended over address electrodes by a torsion hinge between two posts.

1 **Support posts**

2 **Mirror element**

3 **Torsion hinges**

4 **Offset address electrode**

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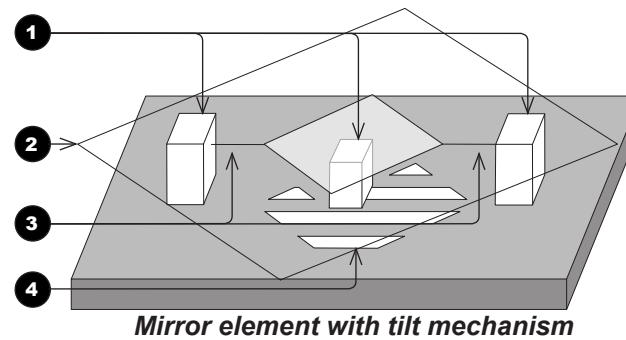
Depending on the voltage polarity applied, each mirror will either tilt to the left to produce a bright pixel or to the right for a dark pixel. When light is applied to the complete DMD™, only the light redirected from a mirror tilting to the left is projected.

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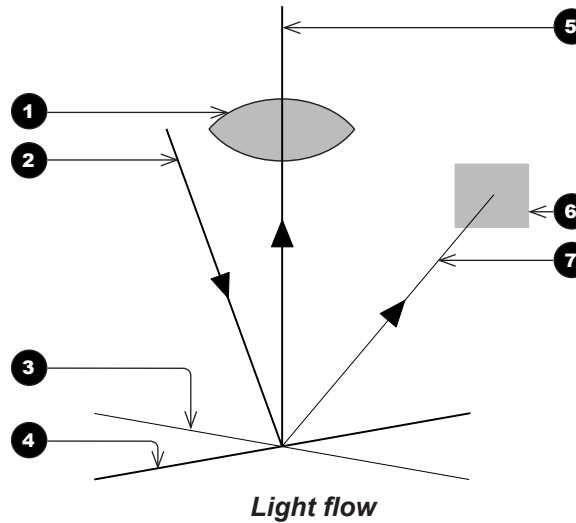
The projector optically filters white light from the illumination module into its constituent red, green and blue. Each color illuminates a separate DMD™ whose modulated output is then recombined with the other two to form the projected full color image.

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**

white light

RGB light

RGB

blue
light

green
light

red
light

B

G

R
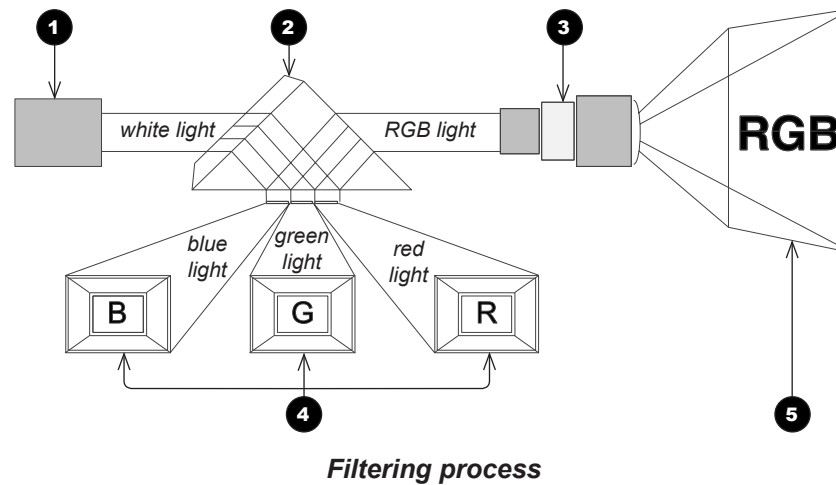
Filtering process

Choosing A Lens

A number of lenses are available. Which lens you choose depends on the screen size, image aspect ratio, throw distance and light output.

The following table shows all available lenses in order of their **throw ratios**:

Throw ratios	Focus range	Lens shift
0.38 : 1 fixed (UST)*	0.68 m - 2.44 m	Depends on image size, see **UST Lens Installation Guide** (separate document).
0.75 - 0.93 : 1 zoom	1.02 m - 12.7 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
0.76 : 1 fixed*	0.81 m - 5.08 m	none
1.25 - 1.79 : 1 zoom	1.33 m - 11.73 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
1.72 - 2.27 : 1 zoom	1.83 m - 14.9 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
2.22 - 3.67 : 1 zoom	2.36 m - 24.2 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
3.58 - 5.38 : 1 zoom*	3.8 m - 35.35 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
5.31 - 8.26 : 1 zoom*	5.59 m - 54.8 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame

Lenses marked with an asterisk (*) above are only available for High Brightness projectors. All other lenses have High Contrast counterparts.

To choose a lens, calculate the **throw ratio** required.

Notes

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

*The distance between the front of the projector chassis and the outer end of the lens is called **lens extension**. Lens extensions is measured when the lens is focused at infinity, and fully extended.*

☞ *Refer to the projector CAD drawings for individual lens extension figures.*

☞ *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.*

☞ *The **0.75 - 0.93 : 1 zoom lens** has an additional feature permitting barrel correction for curved screens. The front ring of the lens is a manual control which provides focus curvature adjustment to correct for the different focal distances between center and corner.*

☞ *Throw ratios of High Contrast lenses differ slightly from their High Brightness counterparts. For details, see Appendix A at the end of this document.*

☞ *For information about individual lens part numbers, see Appendix A at the end of this document.*

Basic calculation

Identify the required lens by calculating the *throw ratio*.

A **throw ratio** is the ratio of the throw distance to the screen width:

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width}}$$

1. Use the formula above to obtain the required throw ratio.

2. Match the throw ratio with a lens from the table below:

Throw ratios	Focus range
0.38 : 1 fixed (UST)	0.82 m - 2.71 m
0.75 - 0.93 : 1 zoom	1.02 m - 12.7 m
0.76 : 1 fixed	0.81 m - 5.08 m
1.25 - 1.79 : 1 zoom	1.33 m - 11.73 m
1.72 - 2.27 : 1 zoom	1.83 m - 14.9 m
2.22 - 3.67 : 1 zoom	2.36 m - 24.2 m
3.58 - 5.38 : 1 zoom	3.8 m - 35.35 m
5.31 - 8.26 : 1 zoom	5.59 m - 54.8 m

3. Ensure the required throw distance is within the range covered by the lens.
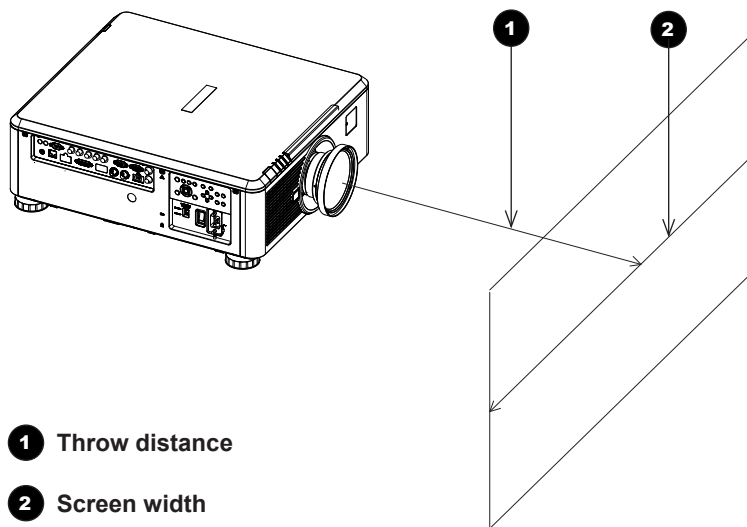
1 Throw distance

2 Screen width

Basic calculation example

1. **Calculate the throw ratio using the formula.**

   Your screen is **4.5 m** wide and you wish to place the projector approximately **11 m** from the screen. The throw ratio will then be

   $$\frac{11}{4.5} = 2.44$$

2. **Match the result with the lens table.**

   The lens matching a throw ratio of 2.44 is **the 2.22 - 3.67 : 1 zoom lens**.

3. **Check whether the lens covers the required throw distance.**

   The focus range quoted for the 2.22 - 3.67 : 1 zoom lens is **2.36 - 24.2 m**. The required distance of 11 m is within the range.

INFORMATION YOU NEED FOR THIS CALCULATION

- The throw ratio formula:

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width}}$$

- The lens table:

Throw ratios	Focus range
0.38 : 1 fixed (UST)	0.82 m - 2.71 m
0.75 - 0.93 : 1 zoom	1.02 m - 12.7 m
0.76 : 1 fixed	0.81 m - 5.08 m
1.25 - 1.79 : 1 zoom	1.33 m - 11.73 m
1.72 - 2.27 : 1 zoom	1.83 m - 14.9 m
2.22 - 3.67 : 1 zoom	2.36 m - 24.2 m
3.58 - 5.38 : 1 zoom	3.8 m - 35.35 m
5.31 - 8.26 : 1 zoom	5.59 m - 54.8 m

Notes

☞ *The lens table shown on this page includes High Brightness lenses only. For a full list, see* **Appendix A** *at the end of this document.*

☞ *The basic calculation on this page does not take into consideration DMD™ and image size, which could affect the throw ratio. For a more complex and realistic calculation, see* **Full lens calculation** *in this section.*

☞ *For information about individual lens part numbers, see* **Appendix A** *at the end of this document.*

Full lens calculation

Introducing TRC

The choice of lens will affect the image size and will address discrepancies between the DMD™ resolution and the source.

When an image fills the height of the DMD™ but not the width, it uses less than 100% of the DMD™ surface. A lens chosen using the basic formula may produce an image that is considerably smaller than the actual screen.

To compensate for loss of screen space in such situations, you need to increase the throw ratio using a *Throw Ratio Correction (TRC)*.

Example

Fig. 1 illustrates a 4:3 image within a WUXGA DMD™.

When a WUXGA projector is used for a 4:3 image, the image does not fill the width of the DMD™, creating a *pillarboxing* effect - blank spaces to the left and right.

Fig. 2 shows the same image projected on a 4:3 screen using a standard lens (chosen with the basic calculation).

The DMD™ accurately fills the width of the screen; however, the pillarboxing is now part of the projected image and is transferred to the screen.

The DMD™ does not fill the height of the screen, which has caused *letterboxing* - further blank spaces at the top and bottom of the screen.

The image is now surrounded by blank space, which can be removed if the throw ratio is increased.

Fig. 3 shows the image projected on the same screen with a lens chosen using TRC.

The increased throw ratio has allowed the 4:3 image to fill the 4:3 screen seamlessly.

Fig. 1

Fig. 2

Fig. 3

Calculating TRC

To calculate TRC, use the following formula:

$$TRC = \frac{1.6 \ (DMD™ \ aspect \ ratio)}{Source \ aspect \ ratio}$$

TRC table

Alternatively, you can save time by referencing the following table, which shows the TRC value for some popular image formats:

2.35:1 (Scope), 1920 x 817 pixels	TRC < 1, not used
1.85:1 (Flat), 1920 x 1037 pixels	TRC < 1, not used
1.78:1 (16:9), 1920 x 1080	TRC < 1, not used
1.66:1 (Vista), 1792 x 1080 pixels	TRC < 1, not used
1.6:1 (16:10), 1728 x 1080 pixels	TRC = 1, not used (native resolution)
1.33:1 (4:3), 1440 x 1080 pixels	TRC = 1.2
1.25:1 (5:4), 1350 x 1080 pixels	TRC = 1.28

Calculating the throw ratio with TRC

1. For TRC > 1, amend the basic throw ratio formula as follows:

$$\textit{Throw ratio} = \frac{\textit{Throw distance}}{\textit{Screen width } \textbf{x TRC}}$$

2. Once a throw ratio is established, identify the matching lens from the table:

Throw ratios	Focus range
0.38 : 1 fixed (UST)	0.82 m - 2.71 m
0.75 - 0.93 : 1 zoom	1.02 m - 12.7 m
0.76 : 1 fixed	0.81 m - 5.08 m
1.25 - 1.79 : 1 zoom	1.33 m - 11.73 m
1.72 - 2.27 : 1 zoom	1.83 m - 14.9 m
2.22 - 3.67 : 1 zoom	2.36 m - 24.2 m
3.58 - 5.38 : 1 zoom	3.8 m - 35.35 m
5.31 - 8.26 : 1 zoom	5.59 m - 54.8 m

3. Ensure the required throw distance is within the range of the matching lens.

Notes

☞ *The lens table shown on this page includes High Brightness lenses only. For a full list, see Appendix A at the end of this document.*

☞ *TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.*

Full lens calculation example

Your screen is **4.5 m** wide; you wish to place the projector approximately **11 m** from the screen. The source is **4:3**.

1. Calculate TRC as follows:

$$TRC = \frac{1.6}{1.33} = 1.2$$

2. Calculate the throw ratio:

$$Throw\ ratio = \frac{11}{4.5 \times 1.2} = \textbf{2.04}$$

3. Find a match in the lens table.

   The table shows that the matching lens is **the 1.72 - 2.27 : 1 zoom lens**.

4. Check whether the lens covers the required throw distance.

   The focus range quoted for the 1.72 - 2.27 : 1 zoom lens is **1.83 - 14.9 m**. The required distance of 11 m is within the range.

INFORMATION YOU NEED FOR THESE CALCULATIONS

- The TRC formula $TRC = \dfrac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$

- The TRC table (to use instead of the formula)

2.35:1 (Scope)	TRC not used
1.85:1 (Flat)	TRC not used
1.78:1 (16:9)	TRC not used
1.66:1 (Vista)	TRC not used
1.6:1 (16:10)	TRC not used (native resolution)
1.33:1 (4:3)	TRC = 1.2
1.25:1 (5:4)	TRC = 1.28

- The throw ratio formula $Throw\ ratio = \dfrac{Throw\ distance}{Screen\ width \times TRC}$

- The lens table:

Throw ratios	Focus range
0.38 : 1 fixed (UST)	0.82 m - 2.71 m
0.75 - 0.93 : 1 zoom	1.02 m - 12.7 m
0.76 : 1 fixed	0.81 m - 5.08 m
1.25 - 1.79 : 1 zoom	1.33 m - 11.73 m
1.72 - 2.27 : 1 zoom	1.83 m - 14.9 m
2.22 - 3.67 : 1 zoom	2.36 m - 24.2 m
3.58 - 5.38 : 1 zoom	3.8 m - 35.35 m
5.31 - 8.26 : 1 zoom	5.59 m - 54.8 m

Notes

☞ *The lens table shown on this page includes High Brightness lenses only. For a full list, see Appendix A at the end of this document.*

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.
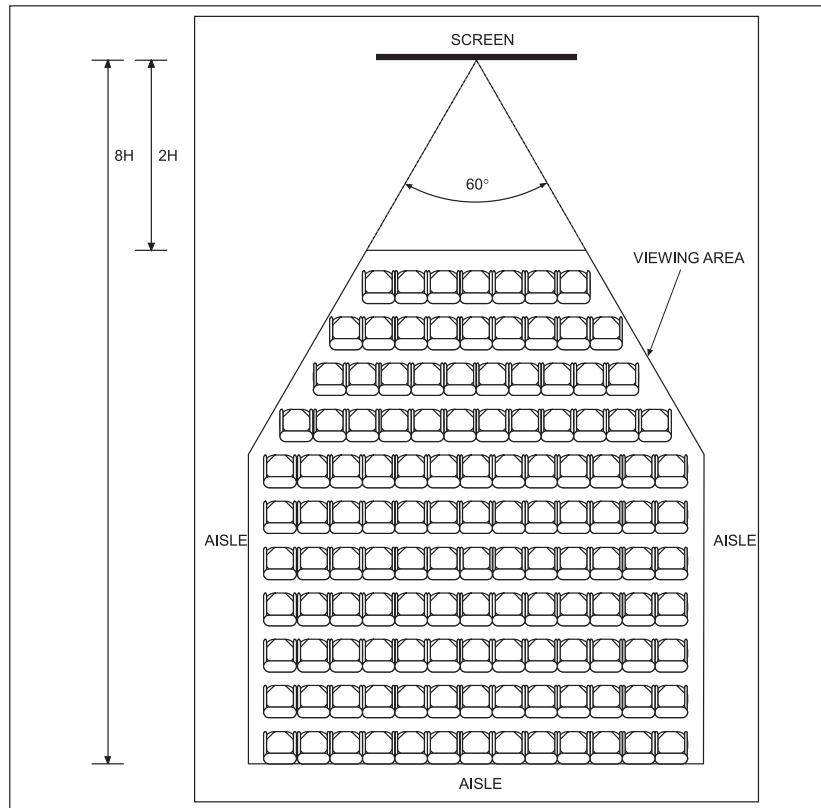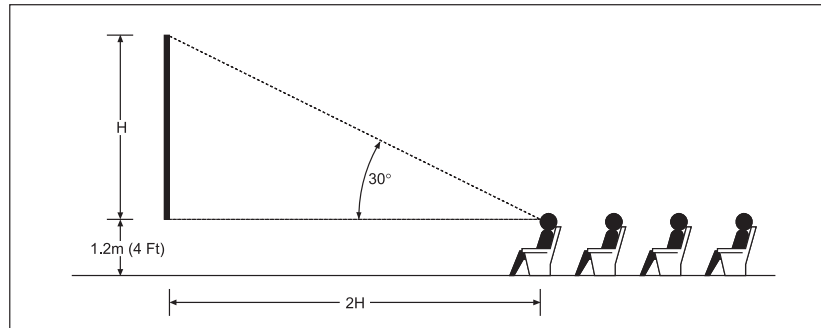
Notes

⚠ **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)
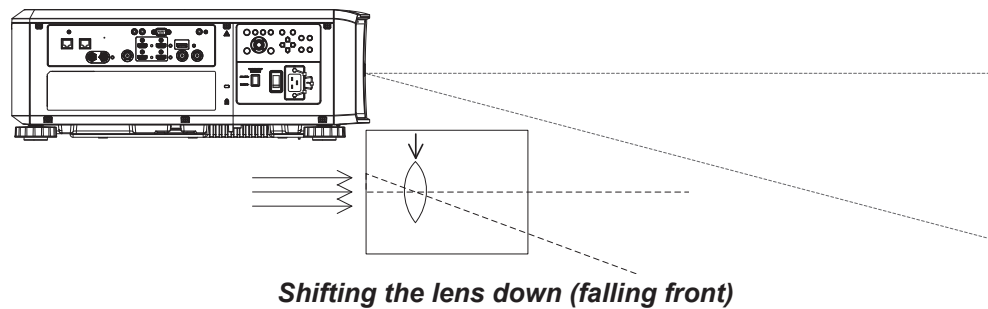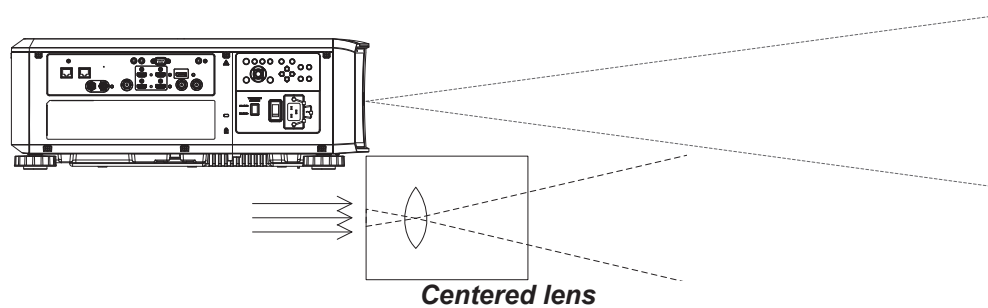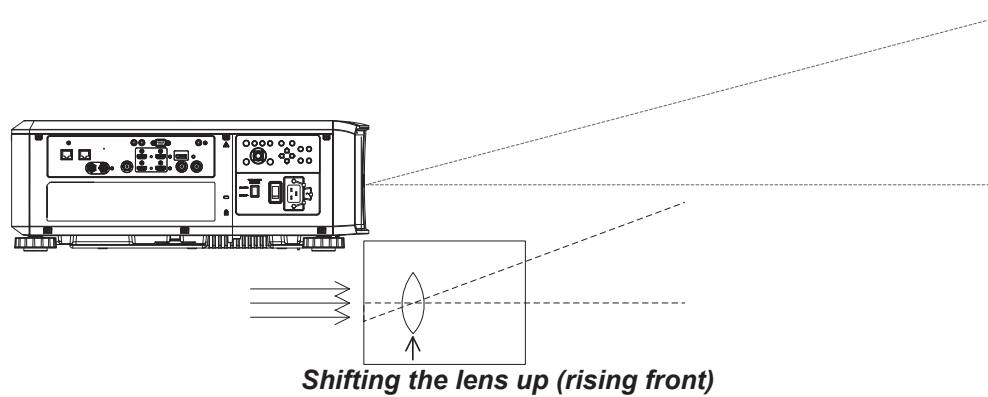
Notes

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.
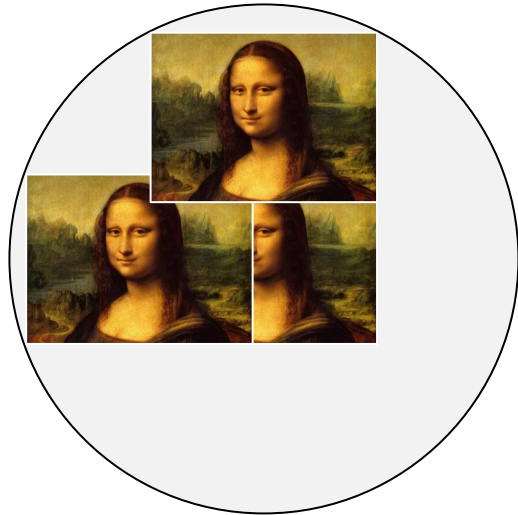
Full horizontal or vertical shift
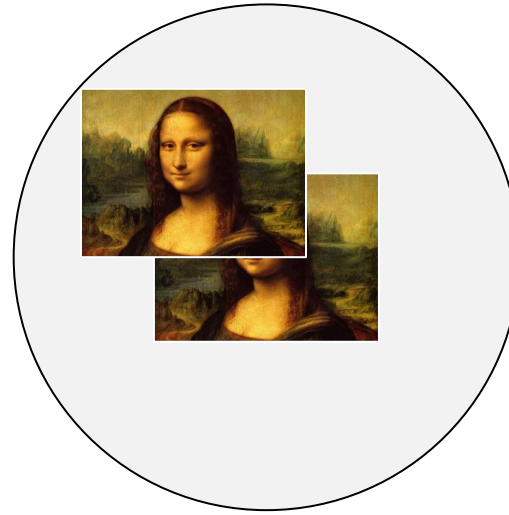
Combined shift is reduced

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.

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.

Original film, 24 fps	Field 1 (odd)	Field 2 (even)	Resulting video, 30 fps
A	A	A	A
B	B	B	B
C	B	C	B
D	C	D	D
	D	D	D
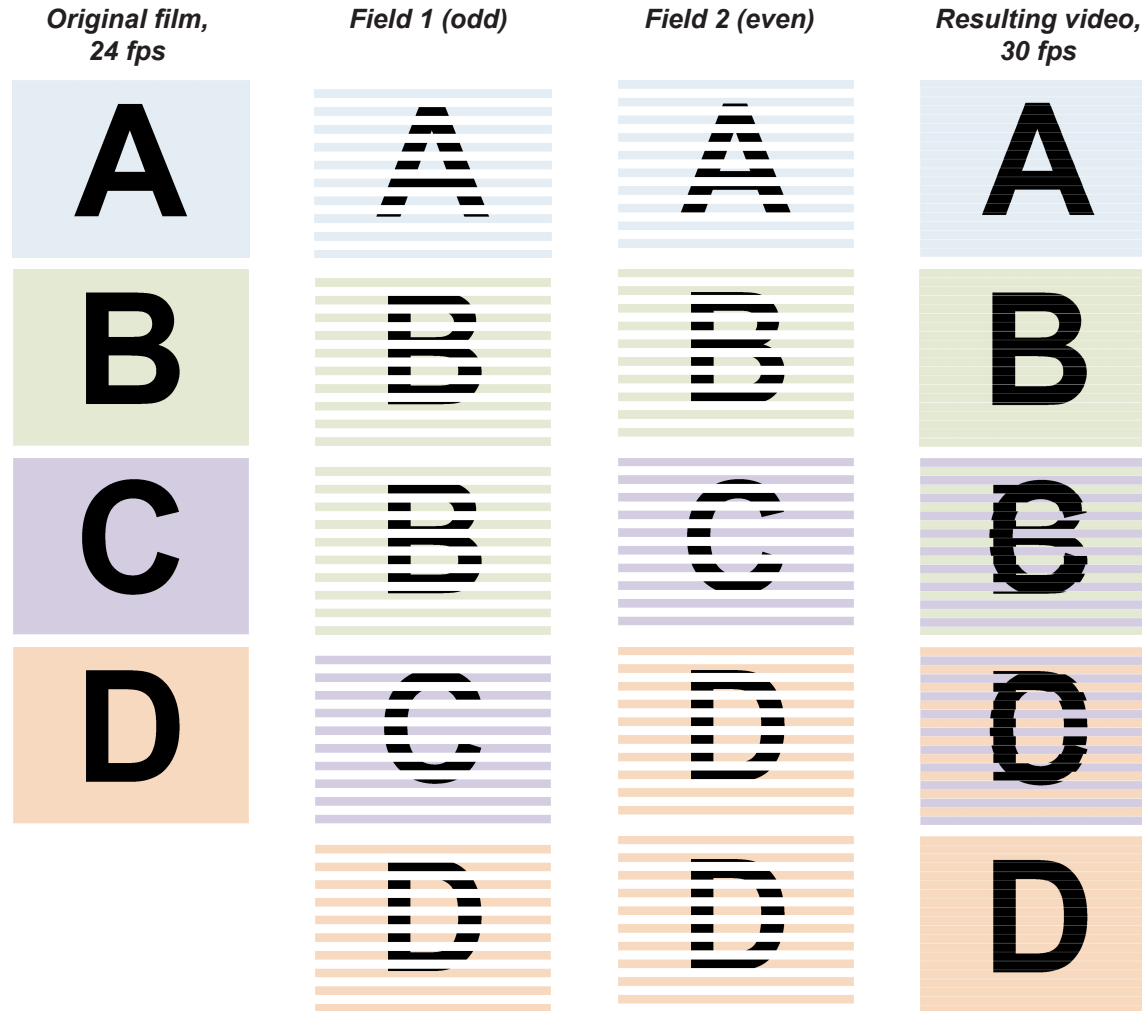
2:3:3:2 (advanced) pulldown

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.
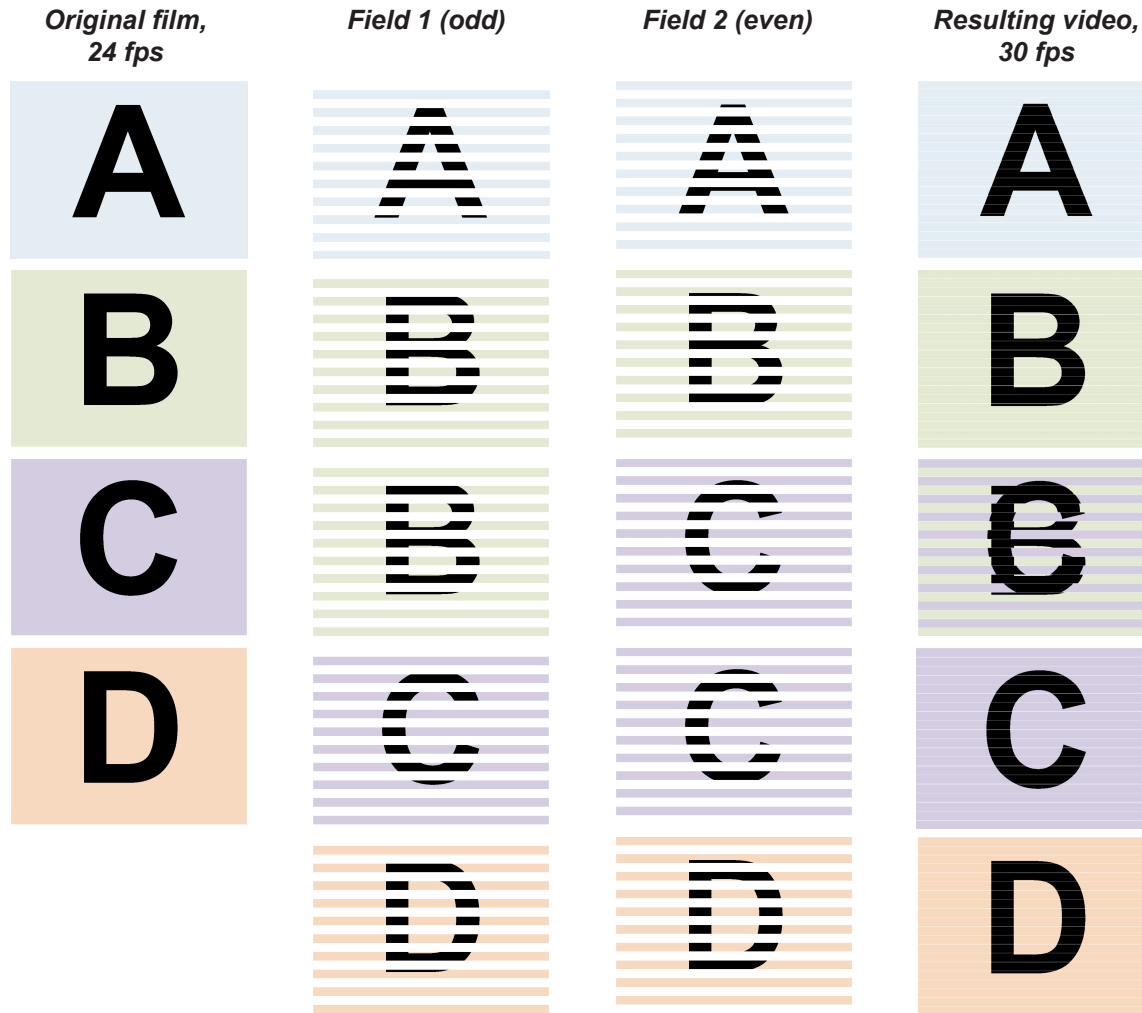
Original film, 24 fps	Field 1 (odd)	Field 2 (even)	Resulting video, 30 fps
A	A	A	A
B	B	B	B
C	B	C	B/C
D	C	C	C
	D	D	D

Appendix A: Lens Part Numbers

Throw ratio	High Brightness or High Contrast?	Part number (High Brightness)	Focus range	Lens shift
0.38 : 1 fixed (UST)	High Brightness	117-341	0.82 m - 2.71 m	none
0.75 - 0.93 : 1 zoom	High Brightness	115-339	1.02 m - 12.7 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
0.74 - 0.93 : 1 zoom	High Contrast	118-679	1.02 m - 12.7 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
0.76 : 1 fixed	High Brightness	112-499	0.81 m - 5.08 m	none
1.25 - 1.79 : 1 zoom	High Brightness	112-500	1.33 m - 11.73 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
1.24 - 1.78 : 1 zoom	High Contrast	118-563	1.33 m - 11.73 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
1.72 - 2.27 : 1 zoom	High Brightness	112-501	1.83 m - 14.9 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
1.71 - 2.25 : 1 zoom	High Contrast	118-562	1.83 m - 14.9 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
2.22 - 3.67 : 1 zoom	High Brightness	112-502	2.36 m - 24.2 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
2.20 - 3.67 : 1 zoom	High Contrast	118-680	2.36 m - 24.2 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
3.58 - 5.38 : 1 zoom	High Brightness	112-503	3.8 m - 35.35 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame
5.31 - 8.26 : 1 zoom	High Brightness	112-504	5.59 m - 54.8 m	V: 0.5 (U) 0 (D) frame H: 0.1 (L) 0.1 (R) frame

Notes

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

*The distance between the front of the projector chassis and the outer end of the lens is called **lens extension**. Lens extensions is measured when the lens is focused at infinity, and fully extended.*

☞ *Refer to the projector CAD drawings for individual lens extension figures.*

☞ *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.*

☞ *The **0.75 - 0.93 : 1 zoom lens** has an additional feature permitting barrel correction for curved screens. The front ring of the lens is a manual control which provides focus curvature adjustment to correct for the different focal distances between center and corner.*

Appendix B: Supported Signal Input Modes

2D formats

Signal Format	Resolution	Frame Rate (Hz)	DisplayPort	HDMI / HD-BaseT				Output Frame Rate (Hz)
				RGB	YUV 8-bit	YUV 10-bit	YUV 12-bit	
PC	640x480	59.94	X	X				60
	640x480	74.99	X	X				60
	640x480	85	X	X				60
	800x600	60.32	X	X				60
	800x600	75	X	X				60
	800x600	85.06	X	X				60
	848x480	47.95	X	X				48
	848x480	59.94	X	X				60
	1024*768	60	X	X				60
	1024*768	75	X	X				60
	1024*768	85	X	X				60
	1280x720	47.95	X	X				48
	1280x1024	60.02	X	X				60
	1280x1024	75.02	X	X				60
	1280x1024	85.02	X	X				60
	1600x1200	60	X	X				60
	1600x1200	120	X	X				120
	1920x1080	47.95	X	X				48
	1680x1050	59.94	X	X				60
	1920x1200 RB	50	X	X				50
	1920x1200 RB	60	X	X				60
	1920x1200 RB	100	X	X				100
	1920x1200 RB	120	X	X				120

| Signal Format | Resolution | Frame Rate (Hz) | DisplayPort | HDMI / HD-BaseT | | | | Output Frame Rate (Hz) |
				RGB	YUV 8-bit	YUV 10-bit	YUV 12-bit	
PC (continued)	1400X1050	60	X	X				60
	1366 x 768	60	X	X				60
	1440 x 900	60	X	X				60
	1280 x 768	60	X	X				60
	1280 x 800	60	X	X				60
	1280 x 960	60	X	X				60
	2712x1528	50	X	X				50
	2712x1528	60	X	X				60
	2712x1528	100	X	X				100
	2712x1528	120	X	X				120
Apple Mac	640x480	66.59	X	X				60
	832x624	74.54	X	X				60
SDTV	480i	59.94						60
	1440x480i	60		X	X	X	X	60
	1440x576i	50		X	X	X	X	50
	576i	50						50
EDTV	480p	59.94	X	X	X	X	X	60
	576p	50	X	X	X	X	X	50
HDTV	1035i	60	X	X	X	X	X	60
	1080i	50	X	X	X	X	X	50
	1080i	59.94	X	X	X	X	X	60
	1080i	60	X	X	X	X	X	60
	720p	50	X	X	X	X	X	60
	720p	59.94	X	X	X	X	X	60
	720p	60	X	X	X	X	X	60
	1080p	23.98	X	X	X	X	X	48

Notes

Signal Format	Resolution	Frame Rate (Hz)	DisplayPort	HDMI / HD-BaseT				Output Frame Rate (Hz)
				RGB	YUV 8-bit	YUV 10-bit	YUV 12-bit	
HDTV (continued)	1080p	24	X	X	X	X	X	48
	1080p	25	X	X	X	X	X	60
	1080p	29.97	X	X	X	X	X	60
	1080p	30	X	X	X	X	X	60
	1080p	50	X	X	X	X	X	50
	1080p	59.94	X	X	X	X	X	60
	1080p	60	X	X	X	X	X	60
	1080p	100	X	X				100
	1080p	120	X	X				120
	2K (2048x1080)	24, 25, 30, 50, 60	X	X	X	X	X	48/50/60/50/60
	4K-UHD	24, 25, 30	√	√	√	X	X	48/50/60
	4K-UHD	50, 60	X	X (8 Bits)	X	X (4:2:2)	X (4:2:2)	50/60
	1080p	100, 120	X	X	X	X	X	100/120
	2560x1600	100, 120	X	X	X	X	X	100/120
PsF formats	1080sf	30						60
	1080sf	25						50

SDI formats

Timing	SDI Link mode	Signal Standards	Color Encode	Sampling Structure	Bit Depth	Remark
NTSC	SD	SMPTE 259M-C 270Mbps SD	YCbCr	4:2:2	10	128M
PAL	SD	SMPTE 259M-C 270Mbps SD	YCbCr	4:2:2	10	128M
1035i60	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080i59	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080i60	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080P30	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080P25	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080i50	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080P24	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
720P60	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
720P50	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080Sf25	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080Sf30	HD	SMPTE 292M 1.5Gbps HD	YCbCr	4:2:2	10	128M
1080P50	3G Level A	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M
1080P59	3G Level A	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M
1080P60	3G Level A	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M
1080P50	3G Level B	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M
1080P59	3G Level B	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M
1080P60	3G Level B	SMPTE 424M 3Gbps	YCbCr	4:2:2	10	128M

Notes

3D formats

Standard		Resolution	V-Freq (Hz)	V-Total	H-Freq (kHz)	Output Frame Rate (Hz)	HDMI3 or 4	Dual-pipe HDMI 3 and 4	Remarks
1080p100	Frame Sequential	1920x1080	100	1125	112.5	100	√		
1080p120	Frame Sequential	1920x1080	120	1125	135	120	√		
WUXGA_100_RB	Frame Sequential	1920x1200	100	1258	125.72	100	√		
1080p50	Dual Pipe	1920x1080	50	1125	56.25	100		√	
1080p60	Dual Pipe	1920x1080	60	1125	67.5	120		√	
WUXGA_50_RB	Dual Pipe	1920x1200	50	1258	62.86	100		√	
WUXGA_60_RB	Dual Pipe	1920x1200	60	1125	74.04	120		√	
WQXGA_60_RB	Dual Pipe	2560x1600	60	1646	98.71	120		√	

Notes

Appendix C: Wiring Details

RS232

9 way D-type connector

1 unused

2 Transmitted Data (TX)

3 Received Data (RX)

4 unused

5 Signal Ground

6 unused

7 unused

8 unused

9 unused
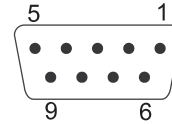
RS232:
pin view of female connector

Trigger 1 & Trigger 2

3.5 mm mini jack

Tip   Trigger
Ring   Not connected
Sleeve   Ground

Output: 12V, 200 mA max

Tip   Sleeve
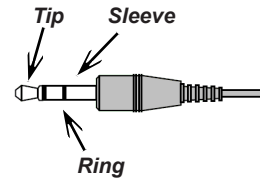
Ring

Wired remote control

3.5 mm mini jack

Tip   3V output
Ring   Signal
Sleeve   Ground

Output: 2.85-3.15V, Max. 500 mA

Tip   Sleeve

Ring
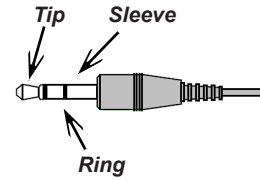
Sync IN, Sync OUT and 3D Sync IR

75 ohm BNC

Max input / output voltage: 5.5V

Ground   Signal

pin view of female connector
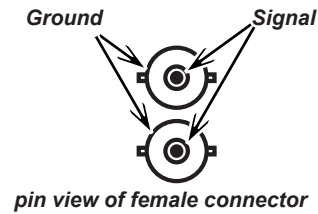
Appendix D: Glossary Of Terms

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*.

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.

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.

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.

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.

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:

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

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*.)

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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DIGITAL PROJECTION