E-Vision Laser 7500 Series
E-Vision Laser 8500 Series
E-Vision Laser 10K 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.

Legal notice

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Laser Information

CAUTION
Possibly hazardous optical radiation emitted from this product.
Do not stare at operating lamp.
May be harmful to the eyes.

Explanatory label: E-Vision Laser 8500

Laser warning symbol

Explanatory label: E-Vision Laser 10K

Laser Information

LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT
Emitted wavelength: 450-460 nm
Max. Pulse energy: 0.253 mJ, Pulse duration: 0.5 ms

激光辐射 避免眼睛受到直接照射 3R激光产品
波长：450-460 nm
最大脉冲能量：0.253 mJ, 脉冲时间：0.5 ms

RAYONNEMENT LASER
EXPOSITION DIRECTE DANGEREUSE POUR LES YEUX
APPAREIL À LASER DE CLASSE 3R
longueur d’onde : 450-460nm
maximum énergie de impulsion : 0.253 mJ,
durée de impulsion : 0.5 ms

CLASS 1 LASER PRODUCT
PRODUIT LASER DE CLASSE 1
IEC/EN 60825-1:2014

Notes

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 most 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:
CONTENTS

INSTALLATION AND QUICK-START GUIDE ............................................. 1
  WHAT’S IN THE BOX? ................................................................. 3
  CONNECTING THE POWER SUPPLY ........................................... 4
    Voltage selection ................................................................. 4
  PROJECTOR OVERVIEW ............................................................. 5
    Front and rear views ........................................................... 5
    Control panel ............................................................... 6
      Projector indicators ......................................................... 7
  REMOTE CONTROL ................................................................. 8
    Infrared reception ............................................................... 11
  POSITIONING THE SCREEN AND PROJECTOR ......................... 12
    Roll and pitch ................................................................. 13
  CHANGING THE LENS ............................................................. 14
    Inserting a new lens ......................................................... 14
    Removing the lens .......................................................... 14
  OPERATING THE PROJECTOR .................................................. 15
    Switching the projector on ............................................... 15
    Switching the projector off ............................................. 15
    Selecting an input signal ............................................... 16
    Selecting a test pattern .................................................... 16
    Adjusting the lens ......................................................... 17
    Adjusting the image ....................................................... 17

CONNECTION GUIDE .................................................................... 19
  SIGNAL INPUTS ....................................................................... 21
    Digital inputs and outputs ............................................... 21
    Analog inputs and outputs ................................................ 22
    EDID on the DVI and VGA inputs ........................................ 23
    Using HDMI/DVI switchers with the projector .................... 23
      3D connections ............................................................... 24
        3D sources up to 60Hz requiring frame doubling and left/right interleaving ........................................ 24
        Frame sequential 3D sources up to 120Hz ..................... 24
        Dual Pipe 3D .............................................................. 24
    3D Sync ............................................................................. 25
      3D Sync in ...................................................................... 25
      3D Sync out .................................................................... 25
  CONTROL CONNECTIONS ......................................................... 26
    LAN connection examples ................................................ 27
    RS232 connection example .............................................. 28
## OPERATING GUIDE

### USING THE MENUS

- Opening the OSD .......................................................... 31
- Opening a menu ............................................................ 31
- Exiting menus and closing the OSD ............................... 31
- Inside a menu ............................................................... 32
  - Accessing sub-menus .................................................. 32
  - Executing commands .................................................. 32
- Editing projector settings ............................................. 33
  - Using a slider to set a value ........................................ 33
  - Editing numeric values .............................................. 33

### USING THE PROJECTOR

- Main menu ................................................................. 34
- Lens menu ................................................................. 35
  - Lens Control ............................................................ 35
  - Lens Memory .......................................................... 36
- Image menu ................................................................ 37
  - Noise Reduction ....................................................... 38
  - Position and Phase .................................................... 38
- Color menu................................................................ 39
  - Color Space ............................................................. 39
  - Color Mode ............................................................. 40
- Geometry menu .......................................................... 45
  - Aspect Ratio ............................................................ 45
  - Digital Zoom & Shift (E-Vision Laser 7500 and 8500) ...... 47
  - Digital Zoom (E-Vision Laser 10K) ............................. 47
  - Overscan ............................................................... 48
- Blanking .................................................................... 49
- Keystone .................................................................. 50
- 4 Corners .................................................................. 51
- Rotation .................................................................... 52
- Pincushion / Barrel ..................................................... 53
- Geometry menu continued from previous page ............... 55
- Arc (E-Vision Laser 10K) ............................................ 55

### Edge Blend menu

- Blend Width ................................................................ 56
- Black Level Uplift ....................................................... 57

### 3D menu

- 3D types ..................................................................... 59
- Some 3D settings explained ........................................ 60
- Frame rate multiplication in 3D images .......................... 61

### Laser menu

- Setup menu ................................................................. 63
  - ColorMax Setting ...................................................... 66
  - Power On/Off ............................................................ 67
  - Clock Adjust ............................................................. 68
  - OSD Settings ............................................................ 69
  - Memory ................................................................. 69

### Network menu

- Network menu ............................................................ 70

### PIP menu

- PIP menu ................................................................. 71

### Information menu

- Information menu ........................................................ 72
  - Signal Format .......................................................... 72
  - System Status ......................................................... 73
  - Thermal Status ......................................................... 73
  - Factory Reset .......................................................... 74
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E-Vision Laser 7500 Series
E-Vision Laser 8500 Series
E-Vision Laser 10K Series
High Brightness Digital Video Projector

INSTALLATION AND QUICK-START GUIDE
IN THIS GUIDE

What's In The Box? ................................................................. 3
Connecting The Power Supply ............................................ 4
  Voltage selection ............................................................... 4
Projector Overview ............................................................. 5
  Front and rear views ....................................................... 5
  Control panel ................................................................. 6
  Projector indicators ........................................................ 7
Remote Control ................................................................. 8
  Infrared reception ......................................................... 11
Positioning The Screen And Projector ................................. 12
  Roll and pitch ............................................................... 13
Changing The Lens ........................................................... 14
  Inserting a new lens ...................................................... 14
  Removing the lens ......................................................... 14
Operating The Projector ..................................................... 15
  Switching the projector on .......................................... 15
  Switching the projector off ........................................... 15
  Selecting an input signal .............................................. 16
  Selecting a test pattern ............................................... 16
  Adjusting the lens ....................................................... 17
  Adjusting the image ..................................................... 17
What's In The Box?

- Remote control (117-780)
- 2x AAA batteries
- Projector
- User Manual on disc
- Important Information (117-440)
- Power cable, United Kingdom
- Power cable, Europe
- Power cable, North America

Notes

- Make sure your box contains everything listed. If any pieces are missing, contact your dealer.
- You should save the original box and packing materials, in case you ever need to ship your projector.
- The projector is shipped without a lens.
- Only one power cable - dependent on the destination territory - will be supplied with the projector.
Connecting The Power Supply

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

Voltage selection

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

<table>
<thead>
<tr>
<th>Voltage of power supply used</th>
<th>Position of VOLTAGE SELECT switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC100-139V outlet</td>
<td>200 240V~</td>
</tr>
<tr>
<td></td>
<td>100 130V~</td>
</tr>
<tr>
<td>AC200-240V (single phase) outlet</td>
<td>200 240V~</td>
</tr>
<tr>
<td></td>
<td>100 130V~</td>
</tr>
</tbody>
</table>

Notes

- Use only the power cable provided.
- Ensure that the power outlet includes a ground connection as this equipment MUST be earthed.
- Handle the power cable carefully and avoid sharp bends. Do not use a damaged power cable.
Projector Overview

Front and rear views

1. Connection panel
2. Control panel
3. Front infrared window
4. Indicators
5. Lens mount
6. Voltage selector
7. Power switch and power connection
8. Air inlet
9. Air inlets
10. Rear infrared window
11. Air outlets
12. Adjustable feet
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
**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
Remote Control

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

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

3. **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.

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

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

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

17 TEST / SWAP / numeric input 0
Show a test pattern. Press again to show the next test pattern:
...Off, White, Black, Red, Green, Blue, CheckerBoard, CrossHatch, V Burst, H Burst, ColorBar...
When PIP mode is on, use this button with ALT to swap the main and sub images.

continues on next page...
17. **DISPLAYPORT / R / numeric input 4**
   Select DisplayPort 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**
   Select the VGA input.
   Use with **ALT** to toggle the **3D Format** setting between **Off** and **Auto**.

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

22. **COMP2 / PIP / numeric input 9**
   Select the Component 2 input.
   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.
**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.
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.

- **Four adjustable feet**
- **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.
- Do not stack more than 3 projectors.
**Roll and pitch**

The projector can be operated in numerous positions.

It is not recommended to position the projector in portrait mode with inputs facing upward, as shown in the diagram.

1. Positions to avoid: inputs side up
2. Recommended positions
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, CheckerBoard, CrossHatch, V Burst, H Burst, ColorBar, Screen Layout, 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.

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

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**.

**Keystone**
- This 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.
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IN THIS GUIDE

Signal Inputs..............................................................................................................21
  Digital inputs and outputs....................................................................................21
  Analog inputs and outputs..................................................................................22
  EDID on the DVI and VGA inputs........................................................................23
  Using HDMI/DVI switchers with the projector....................................................23
  3D connections ....................................................................................................24
    3D sources up to 60Hz requiring frame doubling and left/right interleaving........24
    Frame sequential 3D sources up to 120Hz.........................................................24
    Dual Pipe 3D .....................................................................................................24
  3D Sync .................................................................................................................25
    3D Sync in ...........................................................................................................25
    3D Sync out ........................................................................................................25

Control Connections ...............................................................................................26
  LAN connection examples ....................................................................................27
  RS232 connection example ................................................................................28
**Signal Inputs**

**Digital inputs and outputs**

1. **HDBaseT**
   Receives digital signal from HDBaseT-compliant devices.

2. **HDMI 1**
   HDMI 1.4a input. Connect an HDMI cable to the connector.

3. **DVI-D**
   This input can receive digital signal from a compatible source.
   Supports sources up to 1920x1200 resolution, 24-60 Hz. Supports HDCP.

4. **DisplayPort**
   DisplayPort 1.1a input. Connect a DisplayPort cable to the connector.
   Supports sources up to 1920x1200 resolution, 24-120 Hz. Supports HDCP.

5. **3G-SDI in**

6. **3G-SDI out**
   Connect a 3G-SDI cable to distribute the 3G-SDI signal to another projector.

7. **HDMI II**
   HDMI 1.4 input. Connect an HDMI cable to the connector.

---

**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.

- While the projector can receive 100/120Hz and display 3D at 100/120Hz, video processing is limited to 60Hz.
Analog inputs and outputs

1. **Component**
   - **RGBHV, RGsB or RGBS**
     - Set **Color Space** in the Color menu to **Auto** or **RGB-Video**.
   - **YPbPr or YCbCr**
     - Set **Color Space** in the Color menu to **YPbPr** or **YCbCr**.

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

3. **Monitor Out**
   Connect an analog monitor (VGA) cable to the 15-pin D-type to output the signal received on the VGA input.
EDID on the DVI and VGA inputs
If you are using a computer DVI 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 HDMI/DVI switchers with the projector
When using an HDMI/DVI 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.

The EDIDs in the switcher should be the same as the one in the projector.
**3D connections**

**3D sources up to 60Hz requiring frame doubling and left/right interleaving**

1. Connect to either of the following inputs on the connection panel:
   - HDMI 1
   - HDMI 2
   - HDBaseT

2. Set **3D Format** in the **3D** menu to match the format of the incoming signal. Choose from **Auto, Side by Side (Half)** and **Top and Bottom**.
   
   The **Frame Packing** format is automatically detected by the projector.

**Frame sequential 3D sources up to 120Hz**

- Connect to the DisplayPort input.

  The **Frame Sequential** format is automatically detected by the projector and is supported on the DisplayPort input only.

**Dual Pipe 3D**

1. Connect the left eye output to the **HDMI 1** socket and the right eye output to the **HDMI 2** socket.

2. Set **3D Format** in the **3D** menu to **Dual-Pipe**.

---

**Notes**

While the projector can receive 100/120Hz and display 3D at 100/120Hz, video processing is limited to 60Hz.

This also applies to Dual Pipe 3D at 60 Hz per input.
3D Sync

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

3D Sync out
Sync output signal. This may be affected by the Sync Offset setting in the 3D Control menu.
Connect this to your IR emitter or ZScreen.
Control Connections

1  **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 shuttling for different aspect ratios.
- RS232 trigger: can be used to control the screen or screen shuttling on receipt of an RS232 command.

2  **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.

4  **Wired Remote**

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

5  **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.

---

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

---

**Notes**

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

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

*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.*
**RS232 connection example**

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

![Diagram of RS232 connection example]

**Notes**

*The Protocol Guide is available separately.*
E-Vision Laser 7500 Series
E-Vision Laser 8500 Series
E-Vision Laser 10K Series
High Brightness Digital Video Projector

OPERATING GUIDE
# IN THIS GUIDE

## Using The Menus
- Opening the OSD ................................................................. 31
- Opening a menu ...................................................................... 31
- Exiting menus and closing the OSD ..................................... 31
- Inside a menu ........................................................................ 32
  - Accessing sub-menus ......................................................... 32
  - Executing commands ......................................................... 32
- Editing projector settings .................................................... 33
  - Using a slider to set a value .............................................. 33
  - Editing numeric values ..................................................... 33

## Using The Projector
- Main menu ........................................................................... 34
- Lens menu ........................................................................... 35
  - Lens Control ................................................................. 35
  - Lens Memory ................................................................. 36
- Image menu .......................................................................... 37
  - Noise Reduction ............................................................ 38
  - Position and Phase .......................................................... 38
- Color menu .......................................................................... 39
  - Color Space ................................................................. 39
  - Color Mode ................................................................. 40
- Geometry menu .................................................................... 45
  - Aspect Ratio ................................................................. 45
  - Digital Zoom & Shift (E-Vision Laser 7500 and 8500) .... 47
  - Digital Zoom (E-Vision Laser 10K) ................................. 47
  - Overscan ................................................................. 48
  - Blanking ........................................................................ 49
  - Keystone ........................................................................ 50
  - 4 Corners ........................................................................ 52

## Other Menus
- PIP menu ............................................................................ 50
- Network menu ..................................................................... 51
- Laser menu ......................................................................... 53
- Setup menu ........................................................................ 54
  - ColorMax Setting .......................................................... 54
  - Power On/Off ............................................................... 55
  - Clock Adjust ............................................................... 55
  - OSD Settings ............................................................. 55
  - Memory ........................................................................ 55
- 3D menu ........................................................................... 56
  - 3D types ........................................................................ 56
  - Some 3D settings explained .......................................... 57
  - Frame rate multiplication in 3D images ......................... 58
- Edge Blend menu ............................................................... 59
  - Blend Width .................................................................. 59
  - Black Level Uplift .......................................................... 59
- Arc (E-Vision Laser 10K) ...................................................... 60
- 3D types ........................................................................... 61
- Some 3D settings explained .............................................. 61
- Frame rate multiplication in 3D images ......................... 62

## Possible Combinations Of Settings
- Rotation ............................................................................. 63
- Pincushion / Barrel ............................................................ 63
- Geometry menu continued from previous page .................. 63
- Arc (E-Vision Laser 10K) ...................................................... 64
- 3D types ........................................................................... 64
- Some 3D settings explained .............................................. 64
- Frame rate multiplication in 3D images ......................... 64
- Black Level Uplift ............................................................. 65
- Clock Adjust ............................................................... 65
- OSD Settings ............................................................. 65
- Memory ........................................................................ 65
- Network menu ................................................................ 66
- PIP menu ........................................................................ 66
- Information menu ........................................................... 66
  - Signal Format ............................................................ 66
  - System Status .......................................................... 66
  - Thermal Status ......................................................... 66
  - Factory Reset .......................................................... 66

## Rev D August 2017
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.
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).

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.

You may be asked for confirmation. Use the ENTER/OK to confirm, or EXIT to cancel.
**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.

---

**Notes**

Some menu items may be unavailable due to settings in other menus. Unavailable menu items appear gray.
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, CheckerBoard, CrossHatch, V Burst, H Burst, ColorBar...
  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.
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 Control

*Note:* 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 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.
**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.

- **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.

- **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, Position and Phase**
  These items open sub-menus, see next page.

- **Freeze**
  Freezes the current frame.

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

---

**Notes**

Some settings may be unavailable depending on other settings. For more information, see **Possible Combinations Of Settings** further in this guide.

Noise Reduction and **Position and Phase** are only available when the projector is connected to an analog VGA source.
Image menu continued from previous page

**Noise Reduction**

- **Temporal**
  A time-based filter that removes the noise on the luminance component.

- **Block**
  This filter helps reduce block noise, which appears like small blocks in the image and is caused by MPEG compression.

- **Mosquito**
  This filter helps reduce mosquito noise, which appears around the edges of the image and is caused by the image compression algorithm.

- **Horizontal, Vertical**
  These filters soften the image.

- **Reset**

**Position and Phase**

- **V Position** and **H Position**
  Set the sliders as required.

- **Phase**
  Adjusts the phase of the pixel sampling clock relative to the incoming signal. Adjust the phase if noise is visible.

- **Tracking**
  Adjusts the frequency of the pixel sampling clock. Flicker or vertical banding indicate poor tracking.

- **Sync Level**
  Adjusts the voltage level of the signal detection circuitry. Adjust if the projector loses sync during scenes where the signal drops below black.

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 exit both the slider and the menu.

### Noise Reduction

<table>
<thead>
<tr>
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<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal</td>
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<td>Block</td>
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</tr>
<tr>
<td>Mosquito</td>
<td>0</td>
</tr>
<tr>
<td>Horizontal</td>
<td>0</td>
</tr>
<tr>
<td>Vertical</td>
<td>0</td>
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<tr>
<td>Reset</td>
<td></td>
</tr>
</tbody>
</table>

### Position and Phase

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V Position</td>
<td>100</td>
</tr>
<tr>
<td>H Position</td>
<td>100</td>
</tr>
<tr>
<td>Phase</td>
<td>100</td>
</tr>
<tr>
<td>Tracking</td>
<td>100</td>
</tr>
<tr>
<td>Sync Level</td>
<td>100</td>
</tr>
</tbody>
</table>

**Notes**

Some of the settings within the **Position and Phase** sub-menu, **Phase**, **Tracking** and **Sync Level**, affect only VGA input source. These settings are not available if the projector is using a different source.

Adjust the **Phase** after adjusting **Tracking**.
**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 Mode
The projector can work in the following color modes: ColorMax, Manual Color Matching, Color Temperature and 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.

**Notes**
- 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.

**Notes**

For more details about the **Hue**, **Saturation** and **Gain** settings, see [Color matching parameters explained](#) further in this guide.
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).

<table>
<thead>
<tr>
<th>Color Temperature</th>
<th>Color Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gains and Lifts</td>
<td></td>
</tr>
<tr>
<td>3200K</td>
<td></td>
</tr>
<tr>
<td>5400K</td>
<td></td>
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<tr>
<td>6500K</td>
<td></td>
</tr>
<tr>
<td>7500K</td>
<td></td>
</tr>
<tr>
<td>9300K</td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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 Table]

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Lift</td>
<td>100</td>
<td>Blue Lift</td>
<td>100</td>
</tr>
<tr>
<td>Green Lift</td>
<td>100</td>
<td>Red Gain</td>
<td>100</td>
</tr>
<tr>
<td>Blue Gain</td>
<td>100</td>
<td>Blue Gain</td>
<td>100</td>
</tr>
<tr>
<td>Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Geometry menu

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

<table>
<thead>
<tr>
<th>Geometry, E-Vision Laser 7500 &amp; 8500</th>
<th>Geometry, E-Vision Laser 10K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aspect Ratio</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Digital Zoom &amp; Shift</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Overscan</strong></td>
<td>Off</td>
</tr>
<tr>
<td><strong>Blanking</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Keystone</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>4 Corners</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Rotation</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Pincushion / Barrel</strong></td>
<td>Source</td>
</tr>
<tr>
<td><strong>Custom Warp</strong></td>
<td>Off</td>
</tr>
</tbody>
</table>

**Aspect Ratio**

This feature defines the aspect ratio of the source. Use the Screen Setting feature (Setup menu) 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

Notes

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.

This menu differs slightly between E-Vision Laser projectors: there is an additional menu, Arc, on E-Vision Laser 10K.

See next page for further information about the TheaterScope aspect ratio.
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](image)

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™:

![Black margin – part of the source](image)

An anamorphic lens will stretch the image horizontally, restoring the original 2.35 ratio:

![Black margin – part of the source](image)

Notes

- TheaterScope is used with an anamorphic lens.
- If you use TheaterScope, set your screen aspect ratio to 16:9.
Geometry menu continued from previous page

Digital Zoom & Shift (E-Vision Laser 7500 and 8500)
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.

Digital Zoom (E-Vision Laser 10K)
This menu features the same settings as the **Digital Zoom & Shift** menu on the E-Vision Laser 7500 and 8500 OSD.

In addition it has a **Reset** command, which restores the default **Digital Zoom**, **Digital Pan** and **Digital Scan** values.

Notes
Some settings may be unavailable depending on other settings. For more information, see **Possible Combinations Of Settings** further in this guide.
Geometry menu continued from previous page

**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.

![Image with noisy edges](image1.jpg)  ![Overscanned image](image2.jpg)

### Geometry

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect Ratio</td>
<td>Source</td>
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<tr>
<td>Digital Zoom &amp; Shift</td>
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<td>Overscan</td>
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<td>Blanking</td>
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</tr>
<tr>
<td>Keystone</td>
<td>Crop</td>
</tr>
<tr>
<td>4 Corners</td>
<td>Zoom</td>
</tr>
<tr>
<td>Rotation</td>
<td></td>
</tr>
<tr>
<td>Pincushion / Barrel</td>
<td></td>
</tr>
<tr>
<td>Custom Warp</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Notes**

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Left</td>
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<td></td>
</tr>
<tr>
<td>Right</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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 example

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

Keystone

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H Keystone</td>
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</tr>
<tr>
<td>V Keystone</td>
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</tr>
<tr>
<td>Rotation</td>
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</tr>
<tr>
<td>Reset</td>
<td></td>
</tr>
</tbody>
</table>

Notes

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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.

Notes

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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.

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

Notes
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.

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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.

Notes

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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.

Notes
Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.

Pincushion / Barrel example
The illustration shows pincushion and barrel correction applied both horizontally and vertically, in equal measures.
Geometry menu continued from previous page

**Arc (E-Vision Laser 10K)**
This setting is only available on the E-Vision Laser 10K model.

<table>
<thead>
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<th></th>
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<tr>
<td>Right</td>
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<tr>
<td>Reset</td>
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**Notes**
Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
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.

### 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.

- Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
**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**

<table>
<thead>
<tr>
<th>Blend Width</th>
<th>Top</th>
<th>Bottom</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Notes**

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
**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.

![Artifacts Example](image)

**Notes**

- **Enable Align Pattern** from the _Edge Blend_ menu to see the black level uplift area.
- Some settings may be unavailable depending on other settings. For more information, see _Possible Combinations Of Settings_ further in this guide.
3D menu

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

- **3D Format** — Off, Auto, Side by Side (Half), Top and Bottom, Dual Pipe and Frame Sequential.
- **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, Internal and Auto.

### Notes

- For further information about supported 3D formats, see 3D connections in the Connection Guide.
- If 3D Format is set to Off, all other 3D settings will be unavailable.
- Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
- **Frame Sequential** is supported on the HDMI, DVI-D and DisplayPort inputs only.
- 3D video is only possible on the HDMI, HDBaseT, DisplayPort and DVI inputs.
- The **Frame Packing** format is automatically detected by the projector.
- See also 3D types and Some 3D settings explained further in this guide.
3D menu continued from previous page

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

The following 3D formats are supported:

- **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.

- **Frame Packing**
  This format will be detected, re-synchronised, frame-multiplied and displayed at 96 Hz with the left eye / right eye dominance automatically extracted from the video data. You need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses.

- **Top and Bottom**
  Sets the projector to reformat the video frames and map them to the display with the left eye / right eye dominance automatically extracted from the video data. You need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses.

- **Side by Side (Half): interlaced and progressive, 50 and 60Hz**
  The side-by-side image will be de-interlaced (if appropriate), resized and then sequentially displayed at 100 or 120 Hz. The left eye / right eye dominance will be automatically extracted from the video data, however you will need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses.

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

### 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.

**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**.

**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.

---

**Notes**

In order to achieve maximum light output and a smooth grayscale, whilst eliminating ghosting, the following procedure is recommended:

1. Set **Dark Time** to a value appropriate to the glasses or ZScreen, say 1.3 ms or 1.95 ms.
2. Adjust **Sync Offset** time to eliminate ghosting and achieve a smooth grayscale.
3. Repeat steps 1 and 2 until the best result is obtained.
Frame rate multiplication in 3D images

When displaying a low frame rate 3D video, the projector multiplies the frame rate to obtain a flicker-free image. For example, a 60Hz frame rate is doubled to 120 Hz, or a 48 Hz frame rate may be doubled to 96Hz or tripled to 144 Hz.

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

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

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

- **Power On/Off**
  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.

- **Trigger 1** 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.

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

<table>
<thead>
<tr>
<th>Setup</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Auto-front</td>
</tr>
<tr>
<td>Cooling Condition</td>
<td>Auto</td>
</tr>
<tr>
<td>High Altitude</td>
<td>Auto</td>
</tr>
<tr>
<td>Screen Setting</td>
<td>16:10</td>
</tr>
<tr>
<td>ColorMax</td>
<td></td>
</tr>
<tr>
<td>Power On/Off</td>
<td></td>
</tr>
<tr>
<td>Clock Adjust</td>
<td></td>
</tr>
<tr>
<td>Startup Logo</td>
<td>On</td>
</tr>
<tr>
<td>Blank Screen</td>
<td>Logo</td>
</tr>
<tr>
<td>Trigger-1</td>
<td>Off</td>
</tr>
<tr>
<td>Trigger-2</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Notes**

Auto-front automatically detects the projector’s position and sets the orientation accordingly.
Setup menu continued from previous page

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

- **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.

Notes

- 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.

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.
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.

- **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.

---

### Notes

**Power On/Off**

- **Auto Power Off**
  
  Off

- **Auto Power On**
  
  Off

- **Scheduled on/off**
  
  Off
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.

<table>
<thead>
<tr>
<th>Clock Adjust</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (dd:MM:yyyy)</td>
<td>20:11:2015</td>
</tr>
<tr>
<td>Time (HH:mm)</td>
<td>14:00</td>
</tr>
<tr>
<td>Time Zone</td>
<td>UTC 0</td>
</tr>
</tbody>
</table>
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 — 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.
**Network menu**

- **Network Mode**
  Choose between **Projector Control** and **Service**.

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

- **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.

<table>
<thead>
<tr>
<th>Network</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Mode</td>
<td></td>
</tr>
<tr>
<td>Standby Power</td>
<td>Off</td>
</tr>
<tr>
<td>DHCP</td>
<td>Off</td>
</tr>
<tr>
<td>IP</td>
<td>192.168.000.100</td>
</tr>
<tr>
<td>Subnet Mask</td>
<td>255.255.255.000</td>
</tr>
<tr>
<td>Gateway</td>
<td>000.000.000.000</td>
</tr>
<tr>
<td>DNS</td>
<td>000.000.000.000</td>
</tr>
<tr>
<td>MAC</td>
<td>00:18:27:2d:f2:06</td>
</tr>
<tr>
<td>AMX</td>
<td>Off</td>
</tr>
</tbody>
</table>
**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 the two inputs are **not** from the same group:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDMI 1</td>
<td>HDMI 2</td>
</tr>
<tr>
<td>DVI</td>
<td>VGA</td>
</tr>
<tr>
<td>DisplayPort</td>
<td>COMP</td>
</tr>
<tr>
<td>HDBaseT</td>
<td>3G-SDI</td>
</tr>
</tbody>
</table>

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

---

**Notes**

Some settings may be unavailable depending on other settings. For more information, see Possible Combinations Of Settings further in this guide.
### 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.

<table>
<thead>
<tr>
<th>Information</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>E-Vision Laser 8500</td>
</tr>
<tr>
<td>Serial Number</td>
<td>X000XXXXX0000</td>
</tr>
<tr>
<td>Software Version 1</td>
<td>MD03-SE10-FE09</td>
</tr>
<tr>
<td>Software Version 2</td>
<td>LE07-14-RE04-3092</td>
</tr>
<tr>
<td>Active / PIP Source</td>
<td>HDMI2 / DVI</td>
</tr>
<tr>
<td>Signal Format</td>
<td></td>
</tr>
<tr>
<td>Laser Hours</td>
<td>00041 HRS</td>
</tr>
<tr>
<td>System Status</td>
<td></td>
</tr>
<tr>
<td>Thermal Status</td>
<td></td>
</tr>
<tr>
<td>Factory Reset</td>
<td></td>
</tr>
</tbody>
</table>

### Signal Format

<table>
<thead>
<tr>
<th>Signal Format</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Source</td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td>1080p/60Hz</td>
</tr>
<tr>
<td>H Refresh</td>
<td>67.500 KHz</td>
</tr>
<tr>
<td>V Refresh</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td>Pixel Clock</td>
<td>148.500 MHz</td>
</tr>
<tr>
<td>PIP Source</td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td>576p/50Hz</td>
</tr>
<tr>
<td>H Refresh</td>
<td>31.250 KHz</td>
</tr>
<tr>
<td>V Refresh</td>
<td>50.00 Hz</td>
</tr>
<tr>
<td>Pixel Clock</td>
<td>27.0 MHz</td>
</tr>
</tbody>
</table>
### Information menu continued from previous page

#### System Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric Pressure</td>
<td>98988 Pa (116 m)</td>
</tr>
<tr>
<td>AC Voltage</td>
<td>160V – 264V</td>
</tr>
<tr>
<td>Ceiling Mode</td>
<td>0</td>
</tr>
<tr>
<td>Tilt Angle</td>
<td>4 deg</td>
</tr>
<tr>
<td>Portrait Angle</td>
<td>0 deg</td>
</tr>
<tr>
<td>Altitude Mode</td>
<td>Low</td>
</tr>
<tr>
<td>Laser Power</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### Thermal Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet 1/2 Temp.</td>
<td>24 / 34 (C)</td>
</tr>
<tr>
<td>DMD Temp.</td>
<td>38 (C)</td>
</tr>
<tr>
<td>Laser 1/2 Temp.</td>
<td>49 / 42 (C)</td>
</tr>
<tr>
<td>Outside Temp.</td>
<td>32 (C)</td>
</tr>
<tr>
<td>Fan 1-3 Speed</td>
<td>1399 / 1402 / 1391</td>
</tr>
<tr>
<td>Fan 4-6 Speed</td>
<td>1410 / 1200 / 1205</td>
</tr>
<tr>
<td>Fan 7-9 Speed</td>
<td>1211 / 1407 / 1410</td>
</tr>
<tr>
<td>Fan 10-12 Speed</td>
<td>0 / 3005 / 3007</td>
</tr>
<tr>
<td>Fan 13-15 Speed</td>
<td>2986 / 2984 / 2984</td>
</tr>
<tr>
<td>Fan 16 Speed</td>
<td>3020 / NA / NA</td>
</tr>
<tr>
<td>Water Pump Speed</td>
<td>3506</td>
</tr>
</tbody>
</table>
**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.

---

**Information menu continued from previous page**

<table>
<thead>
<tr>
<th>Information</th>
<th></th>
</tr>
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<td>Model Name</td>
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</tr>
<tr>
<td>Software Version 1</td>
<td>MD03-SE10-FE09</td>
</tr>
</tbody>
</table>

**Factory Reset**

**WARNING**
All user settings will be lost!

Press OK to confirm
Press Exit to cancel

**Thermal Status**

Factory Reset | OK
## Possible Combinations Of Settings

Some OSD settings cannot be used in combination with others. The table below shows the possible combinations.

A tick (✓) means that the combination is possible. A cross (✗) means applying the new setting is impossible if the existing setting is being used. A number sign (#) means applying the new setting will disable the existing one.

<table>
<thead>
<tr>
<th>Existing Setting</th>
<th>New Setting</th>
<th>3D</th>
<th>Warp / Geometry</th>
<th>Blending</th>
<th>Picture Mode</th>
<th>Color Temp.</th>
<th>Overscan</th>
<th>Aspect Ratio</th>
<th>Digital Zoom</th>
<th>PIP</th>
<th>Dynamic Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warp / Geometry</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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</tr>
<tr>
<td>Blending</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture Mode</td>
<td>#</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color Temp.</td>
<td>#</td>
<td>✓</td>
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<td>Overscan</td>
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<tr>
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<td>✓</td>
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<tr>
<td>Digital Zoom</td>
<td>#</td>
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<td>Dynamic Black</td>
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<td>✓</td>
<td>✓</td>
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</tr>
</tbody>
</table>

**Notes**
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E-Vision Laser 7500 Series
E-Vision Laser 8500 Series
E-Vision Laser 10K Series
High Brightness Digital Video Projector

REFERENCE GUIDE
IN THIS GUIDE

The DMD™ ................................................................. 79
Choosing A Lens ......................................................... 81
    Basic calculation .................................................. 82
    Basic calculation example ........................................ 83
    Full lens calculation ................................................ 84
    Introducing TRC .................................................... 84
    Calculating TRC ...................................................... 85
    Calculating the throw ratio with TRC ......................... 86
    Full lens calculation example .................................... 87
Screen Requirements ................................................... 88
    Fitting the image to the DMD™ ............................... 88
    WUXGA images displayed full width ........................ 88
    WUXGA images displayed with a height of 1080 pixels 89
    WUXGA images displayed full height ......................... 90
    Diagonal screen sizes .............................................. 91
    Fitting the image to the screen ............................... 92
    Positioning the screen and projector ......................... 93
Positioning The Image ................................................ 94
Frame Rates And Pulldowns Explained .......................... 96
    Interlaced and progressive scan .............................. 96
    Frame rates of image sources ................................. 96
    Pulldowns - conversion into destination formats .......... 97
        2:3 (normal) pulldown ....................................... 97
        2:3:3:2 (advanced) pulldown ............................... 98
Appendix A: Lens Part Numbers .................................. 99
Appendix B: Supported Signal Input Modes .................... 100
    2D formats ....................................................... 100
    3D formats ....................................................... 102
Appendix C: Wiring Details .......................................... 104
    RS232 ................................................................. 104
    Trigger 1 & Trigger 2 ........................................... 105
    Wired remote control ........................................... 105
    3D Sync IN and 3D Sync OUT ................................. 105
Appendix D: Glossary Of Terms ................................... 106
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

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
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

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
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:

<table>
<thead>
<tr>
<th>Throw ratios</th>
<th>Focus range</th>
<th>Lens shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.38 : 1 fixed (UST)</td>
<td>0.82 m - 2.71 m</td>
<td>none</td>
</tr>
<tr>
<td>0.75 - 0.93 : 1 zoom</td>
<td>1.02 m - 12.7 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
<tr>
<td>0.76 : 1 fixed</td>
<td>0.81 m - 5.08 m</td>
<td>none</td>
</tr>
<tr>
<td>1.25 - 1.79 : 1 zoom</td>
<td>1.33 m - 11.73 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
<tr>
<td>1.72 - 2.27 : 1 zoom</td>
<td>1.83 m - 14.9 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
<tr>
<td>2.22 - 3.67 : 1 zoom</td>
<td>2.36 m - 24.2 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
<tr>
<td>3.58 - 5.38 : 1 zoom</td>
<td>3.8 m - 35.35 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
<tr>
<td>5.31 - 8.26 : 1 zoom</td>
<td>5.59 m - 54.8 m</td>
<td>V: 0.5 (U) 0 (D) frame</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
</tbody>
</table>

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.

- 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:

<table>
<thead>
<tr>
<th>Throw ratios</th>
<th>Focus range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.38 : 1 fixed (UST)</td>
<td>0.82 m - 2.71 m</td>
</tr>
<tr>
<td>0.75 - 0.93 : 1 zoom</td>
<td>1.02 m - 12.7 m</td>
</tr>
<tr>
<td>0.76 : 1 fixed</td>
<td>0.81 m - 5.08 m</td>
</tr>
<tr>
<td>1.25 - 1.79 : 1 zoom</td>
<td>1.33 m - 11.73 m</td>
</tr>
<tr>
<td>1.72 - 2.27 : 1 zoom</td>
<td>1.83 m - 14.9 m</td>
</tr>
<tr>
<td>2.22 - 3.67 : 1 zoom</td>
<td>2.36 m - 24.2 m</td>
</tr>
<tr>
<td>3.58 - 5.38 : 1 zoom</td>
<td>3.8 m - 35.35 m</td>
</tr>
<tr>
<td>5.31 - 8.26 : 1 zoom</td>
<td>5.59 m - 54.8 m</td>
</tr>
</tbody>
</table>
3. Ensure the required throw distance is within the range covered by the lens.

Notes

- 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.
- When calculating the throw ratio, be sure to use identical measurement units for both the throw distance and the screen width.
- For information about individual lens part numbers, see Appendix A at the end of this document.
**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:**

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

### Notes

- 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.
**CHOOSING A LENS**

### 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.

---

**Notes**

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.
Calculating TRC
To calculate TRC, use the following formula:

\[
TRC = \frac{1.6 \text{ (DMD™ aspect ratio)}}{\text{Source aspect ratio}}
\]

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

Notes
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.
Calculating the throw ratio with TRC

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

\[
\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width} \times \text{TRC}}
\]

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

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

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

Notes

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:
   \[
   \text{Throw ratio} = \frac{11}{4.5 \times 1.2} = 2.04
   \]

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

- The TRC table (to use instead of the formula)
  
<table>
<thead>
<tr>
<th>Source aspect ratio</th>
<th>Throw ratio formula</th>
<th>Throw ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.35:1 (Scope)</td>
<td>TRC not used</td>
<td>2.35:1</td>
</tr>
<tr>
<td>1.85:1 (Flat)</td>
<td>TRC not used</td>
<td>1.85:1</td>
</tr>
<tr>
<td>1.78:1 (16:9)</td>
<td>TRC not used</td>
<td>1.78:1</td>
</tr>
<tr>
<td>1.66:1 (Vista)</td>
<td>TRC not used</td>
<td>1.66:1</td>
</tr>
<tr>
<td>1.6:1 (16:10)</td>
<td>TRC not used (native resolution)</td>
<td>1.6:1</td>
</tr>
<tr>
<td>1.33:1 (4:3)</td>
<td>TRC = 1.2</td>
<td>1.33:1</td>
</tr>
<tr>
<td>1.25:1 (5:4)</td>
<td>TRC = 1.28</td>
<td>1.25:1</td>
</tr>
</tbody>
</table>

- The throw ratio formula
  \[
  \text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width} \times \text{TRC}}
  \]

- The lens table:
<table>
<thead>
<tr>
<th>Throw ratios</th>
<th>Focus range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.38 : 1 fixed (UST)</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>3.58 - 5.38 : 1 zoom</td>
<td>3.8 m - 35.35 m</td>
</tr>
<tr>
<td>5.31 - 8.26 : 1 zoom</td>
<td>5.59 m - 54.8 m</td>
</tr>
</tbody>
</table>
Screen Requirements

Fitting the image to the DMD™

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

WUXGA images displayed full width

full width = 1920 pixels

Notes
WUXGA images displayed with a height of 1080 pixels

- 4:3 = 1.33:1 = 1440 pixels
- 16:10 = 1.6:1 = 1728 pixels
- 1.66:1 (Vista) = 1792 pixels
- Full width = 1920 pixels

Notes
WUXGA images displayed full height

- UXGA = 4:3 = 1.33:1 = 1600 pixels
- WUXGA = 16:10 = 1.6:1 = 1920 pixels

Notes

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

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

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

- **2.35:1 (Scope)**
  
  $W = D \times 0.92 \quad H = D \times 0.39$

- **1.85:1**
  
  $W = D \times 0.88 \quad H = D \times 0.47$

- **16:9 = 1.78:1**
  
  $W = D \times 0.87 \quad H = D \times 0.49$

- **1.66:1 (Vista)**
  
  $W = D \times 0.86 \quad H = D \times 0.52$

- **16:10 = 1.6:1 (native aspect ratio for WUXGA projectors)**
  
  $W = D \times 0.85 \quad H = D \times 0.53$

**Notes**

- $D =$ diagonal
- $W =$ width
- $H =$ height
**Fitting the image to the screen**

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

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

1. **4:3 = 1.33:1**
   \[ W = H \times 1.33, \quad H = W \times 0.75 \]

2. **16:10 = 1.6:1**
   (native aspect ratio for WUXGA projectors)
   \[ W = H \times 1.6, \quad H = W \times 0.625 \]

3. **1.66:1 (Vista)**
   \[ W = H \times 1.66, \quad H = W \times 0.6 \]

4. **16:9 = 1.78:1**
   \[ W = H \times 1.78, \quad H = W \times 0.56 \]

5. **1.85:1 (Flat)**
   \[ W = H \times 1.85, \quad H = W \times 0.54 \]

6. **2.35:1 (Scope)**
   \[ W = H \times 2.35, \quad H = W \times 0.426 \]
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.

![Diagram of lens shift](image)

**Shifting the lens up (rising front)**

**Centered lens**

**Shifting the lens down (falling front)**
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.

<table>
<thead>
<tr>
<th>Original film, 24 fps</th>
<th>Field 1 (odd)</th>
<th>Field 2 (even)</th>
<th>Resulting video, 30 fps</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
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<tr>
<td>C</td>
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<td>C</td>
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</tr>
<tr>
<td>D</td>
<td>D</td>
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Notes
### 2:3:3:2 (advanced) pulldown

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

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

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<thead>
<tr>
<th>Original film, 24 fps</th>
<th>Field 1 (odd)</th>
<th>Field 2 (even)</th>
<th>Resulting video, 30 fps</th>
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#### Notes

The projector will use advanced pulldown on suitable video material, wherever possible.
## Appendix A: Lens Part Numbers

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<th>Part number</th>
<th>Focus range</th>
<th>Lens shift</th>
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<td>117-341</td>
<td>0.82 m - 2.71 m</td>
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<td>0.75 - 0.93 : 1 zoom*</td>
<td>115-339</td>
<td>1.02 m - 12.7 m</td>
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<td></td>
<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
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<td>0.76 : 1 fixed</td>
<td>112-499</td>
<td>0.81 m - 5.08 m</td>
<td>none</td>
</tr>
<tr>
<td>1.25 - 1.79 : 1 zoom</td>
<td>112-500</td>
<td>1.33 m - 11.73 m</td>
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<td></td>
<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
</tr>
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<td></td>
<td>H: 0.1 (L) 0.1 (R) frame</td>
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</table>

### 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

<table>
<thead>
<tr>
<th>Standard</th>
<th>Resolution</th>
<th>Horizontal Frequency (kHz)</th>
<th>Frame Rate (Hz)</th>
<th>PCLK (MHz)</th>
<th>Component / 5BNC</th>
<th>VGA / RGBHV</th>
<th>5BNC / RGBHV</th>
<th>DisplayPort / DVI-D</th>
<th>HDMI / HD-BaseT</th>
<th>HD/SDI/3G</th>
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## APPENDIX B: SUPPORTED SIGNAL INPUT MODES

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<tr>
<th>Standard</th>
<th>Resolution</th>
<th>Horizontal Frequency (kHz)</th>
<th>Frame Rate (Hz)</th>
<th>PCLK (MHz)</th>
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<th>DisplayPort / DVI</th>
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**Notes**
## APPENDIX B: SUPPORTED SIGNAL INPUT MODES

### Standard | Resolution | Horizontal Frequency (kHz) | Frame Rate (Hz) | PCLK (MHz) | Component / 5BNC | VGA - RGBHV | 5BNC - RGBHV | DisplayPort / DVI | HDMI / HD-BaseT | Remark |
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### 3D formats

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### Notes

- Remarks:
  - *1: HB (High Bandwidth) mode without warping/blending.
  - *2: 8-bit / color.
  - *3: Frame drop at scaler and frame doubling at formatter. Sources greater than 60 fps are processed at half the frame rate, then frame doubled.
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**Notes**

Remarks:

*1: HB (High Bandwidth) mode without warping/blending.
*2: 8-bit / color.
*3: Frame drop at scaler and frame doubling at formatter. Sources greater than 60 fps are processed at half the frame rate, then frame doubled.
*4 Output display frame rate up to 96Hz for 24Hz 3D input.
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

Notes

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

---

**Wired remote control**

3.5 mm mini jack

- Tip: 3V output
- Ring: Signal
- Sleeve: Ground

Output: 2.85-3.15V, Max. 500 mA

---

**3D Sync IN and 3D Sync OUT**

75 ohm BNC

Max input / output voltage: 5.5V
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.
APPENDIX D: GLOSSARY OF TERMS

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.
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).
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.)
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:

\[
TRC = \frac{DMD\textsuperscript{™} aspect ratio}{Source aspect ratio}
\]

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.
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### Contact Information:

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