

ILD UST lenses

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About this chapter

This chapter mainly describes the installation and adjustment procedures for the **ILD 0.5 UST** lens and the **ILD 0.37 UST 90°** lens. The process overview provides a high-level description of the different installation stages and refers to detailed step-by-step procedures.



All UST lenses requires Pulse v2.5.10 or higher.

5.1 UST lens introduction

About UST lenses

The narrow depth of field in Ultra Short Throw (UST) lenses makes precise installation and adjustment critical for achieving sharp focus across the entire image. Here are a few key points to keep in mind:

1. **Follow instructions:** Always adhere to the specific guidelines in this manual for installing and adjusting the UST lens. These instructions are designed to help you achieve the best possible image quality.
2. **Precise alignment:** Ensure that the projector is perfectly level and positioned at the correct distance from the screen. Even small deviations can significantly impact focus due to the narrow depth of field.
3. **Back Focal Length:** Having the back focal length in its nominal position before installing the UST lens is crucial. This ensures that the focus plane is correctly aligned with the screen.
4. **Solid position:** Ensure that the projector and projection screen cannot move. Even a slight position change can result in a loss of sharp focus.

The ILD 0.37 UST 90° lens

- The ILD 0.37 UST 90° lens has a primary motorized focus for precise adjustments and a secondary manual adjustment ring for fine-tuning at different throw distances. The secondary ring has a limited impact on overall focus, hence it's called secondary manual focus.
- Due to optical and mechanical tolerances, the position of the primary motorized focus can vary. Each UST lens is measured at the factory, and the reference position of the primary motorized focus is indicated on a label on the lens body. This reference value is crucial for starting the adjustment of the primary motorized focus, especially given the narrow depth of field..
- A 90° lens uses an intermediate image in its optics, causing the top to become the bottom and left become right. Therefore, the projector orientation settings must be adjusted: Ceiling Mount becomes Table Mount and Front Projection becomes Rear Projection.
- The UST 90° lens can be configured to project left, right, up, or down by repositioning the lens body relative to the lens flange. The default orientation is to the left.
- The UST 90° lens is quite large and heavy. To avoid vibrations in the projected image and ensure that the lens axis remains parallel to the projector optics, the installation of the lens support is mandatory.

For correct installation see “[ILD 0.37 UST 90° lens installation process](#)”, [page 66](#), and related detailed step-by-step procedures.

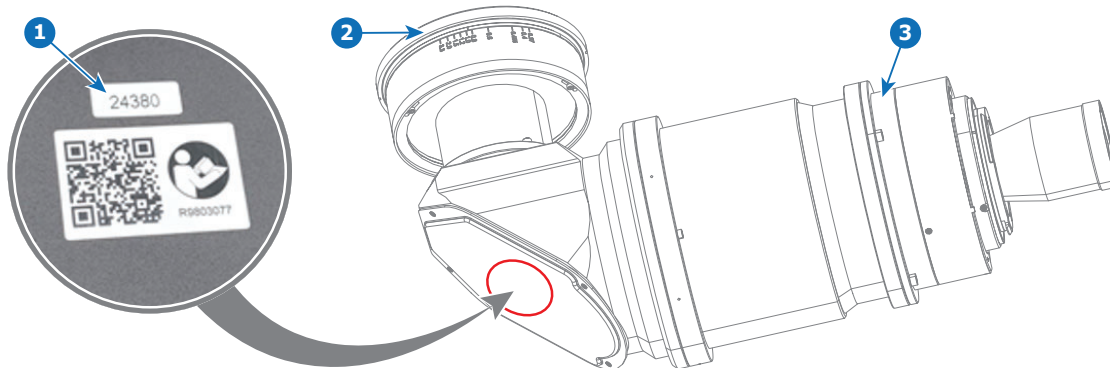


Image 5-1 ILD 0.37 UST 90° lens

- 1 Value reference position primary motorized focus
- 2 Secondary manual focus
- 3 Primary motorized focus

The ILD 0.5 UST lens

The installation of the ILD 0.5 UST lens is more straightforward. The lens support is not required. However, in case of vibrations the lens support is recommended. To install the lens with lens support see following procedures:

- “[Installing the lens support bottom plate](#)”, [page 67](#).
- “[Lens installation](#)”, [page 46](#).
- “[Installing the lens support bracket](#)”, [page 73](#).

The ILD 0.5 UST lens has a secondary manual adjustment ring for fine-tuning at different throw distances. The secondary ring has a limited impact on overall focus, hence it's called secondary manual focus.

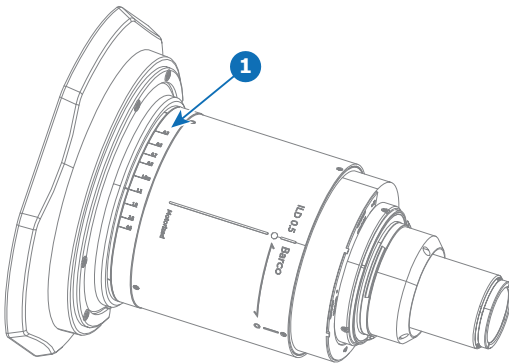


Image 5-2 ILD 0.5 UST lens

1 Secondary manual focus

Lens support

In the case where the heaviness of the lens leads to vibrations in the project image and to ensure that the lens axis remains parallel to the projector optics, it is recommended to install the lens support.

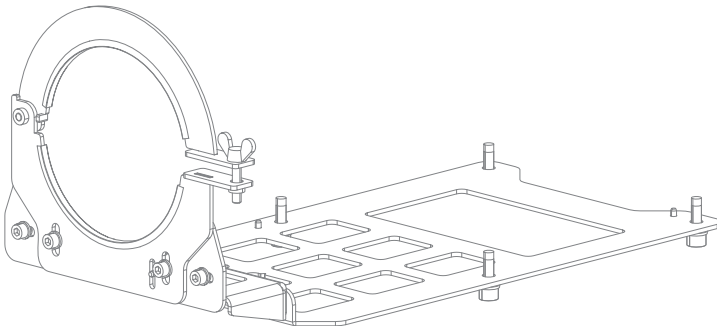


Image 5-3 Lens support for UST lenses.



CAUTION: The lens support secures the lens in place. After installation, do not shift the lens horizontally or vertically. To ensure this, disable the lens shift feature in the software.

5.2 ILD 0.37 UST 90° lens installation process

About this process

This process overview provides a high-level description of the different installation stages for the ILD 90° lens and refers to detailed step-by-step procedures. Follow this process flow and the instructions in the referred procedures precisely.

Process overview

- 1. Install the bottom plate of the lens support.**
See procedure [“Installing the lens support bottom plate”](#), page 67.
- 2. Set the Back Focal Length in nominal position.**
See procedure [“Set the Back Focal Length to nominal position”](#), page 68.
- 3. Adapt the UST lens orientation for the application.**
See procedure [“Configure the ILD 0.37 UST 90° lens”](#), page 69.
- 4. Install the UST lens.**
See procedure [“Lens installation”](#), page 46.
- 5. UST lens pre-alignment.**
See [“ILD 0.37 UST 90° lens pre-alignment”](#), page 70.
- 6. Install the lens support bracket.**
See [“Installing the lens support bracket”](#), page 73.
- 7. Final installation of the projector with UST lens and lens support.**
- 8. Fine tuning the UST lens.**
See [“ILD 0.37 UST 90° lens fine tuning”](#), page 75.

5.3 Installing the lens support bottom plate

Required tools


Allen wrench 6 mm

How to install the bottom plate

1. Turn the projector upside down.

 **Note:** Use a clean blanket to prevent scratches on the projector top cover.

2. Install the bottom plate of the lens support on the bottom side of the projector. Use 4 bolts M8 x 15 (reference 1) and apply a torque of 6 Nm.

 **Note:** The M8 fixation points for ceiling mount are used. See note on bottom plate.

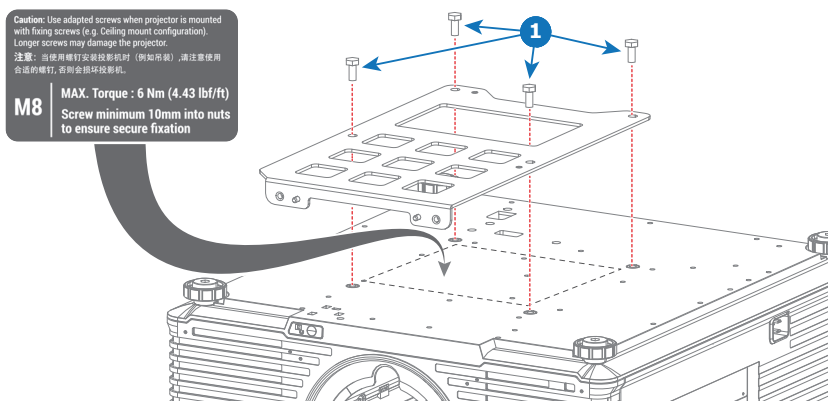



Image 5-4

 **Tip:** Now that the projector is placed upside down, it is a good opportunity to loosen the projector feet a little bit. On first delivery, the feet are firmly tightened.

3. Place the projector back on its feet.

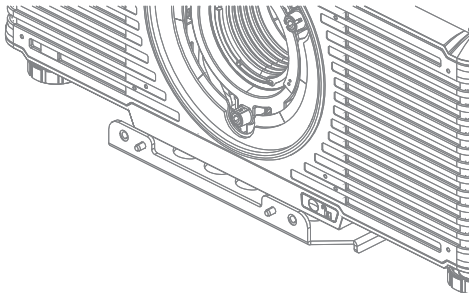


Image 5-5

5.4 Set the Back Focal Length to nominal position

What is Back Focal Length adjustment

Back Focal Length (BFL) adjustment involves moving the lens plane (Lp) closer to or further from the DMD plane. The closer the lens plane is to the DMD plane, the further and larger the depth of field (DoF) will be. Depth of field is the range of distances within which objects appear in sharp focus.

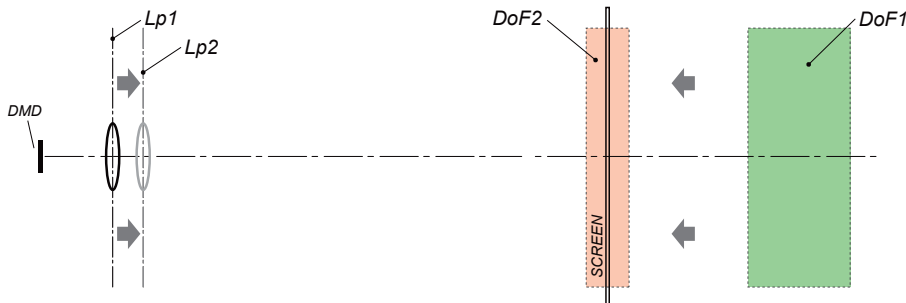


Image 5-6

When adjusting the Back Focal Length

The Back Focal Length (BFL) is factory-set to a nominal position suitable for all supported lenses, so adjustment is typically unnecessary. However, for Ultra Short Throw (UST) lenses with a narrow depth of field, slight BFL adjustments may be needed due to mechanical tolerances.

Required tools

- Allen wrench 5 mm
- Allen wrench 4 mm
- Torque wrench with hex socket of 4 mm
- Torque wrench with hex socket of 5 mm

How to set the Back Focal Length to nominal position

1. Remove the projection lens if installed.
2. Loosen the three Scheimpflug **lock nuts** a half turn (reference A, B, and C). Use an Allen wrench 5 mm.

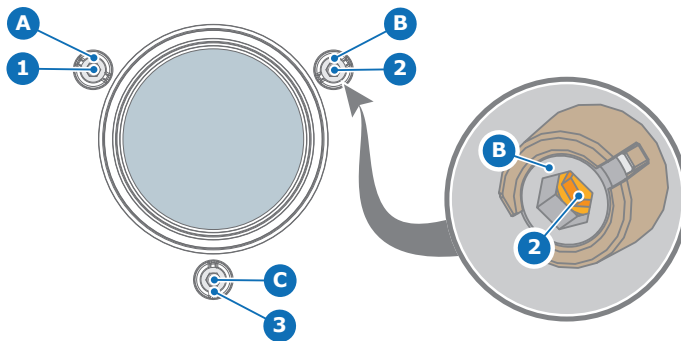


Image 5-7

3. Turn the three Scheimpflug **adjustment screws** clockwise (reference 1, 2, and 3 image [Image 5-7](#)) until resistance is noticed. Use a torque wrench with hex socket of 4 mm and apply a torque of maximum 2 Nm.
4. Turn the three Scheimpflug **adjustment screws** exactly 2 complete turns counterclockwise for nominal Back Focal Length.
5. Fasten the three Scheimpflug **lock nuts**. Use a torque wrench with a torque of 6 Nm.

5.5 Configure the ILD 0.37 UST 90° lens

Possible configurations

The lens body can be rotated per 90° relative to the lens flange containing the electrical socket towards the lens holder. However, the most common configuration is probably with the lens output oriented to the left seen from the rear side of the projector in table mount.

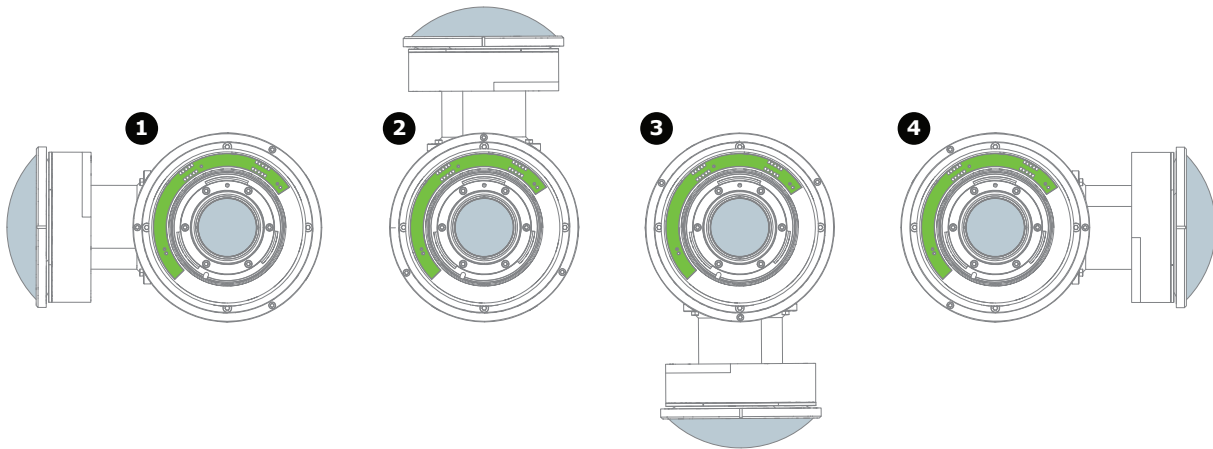


Image 5-8 UST 90° lens configurations.


- 1 Left (default)
- 2 Up
- 3 Down
- 4 Right

Required tools

Allen wrench 3 mm

How to configure

1. Remove the lens flange (reference 2 Image 5-9) from the lens body (reference 1 Image 5-9). Use a 3 mm Allen wrench to release the 4 bolts (reference 3 Image 5-9).
2. Carefully place the lens flange back on the lens body in the desired orientation (up, left, down or right).

 **Note:** Make sure the gears fit together.

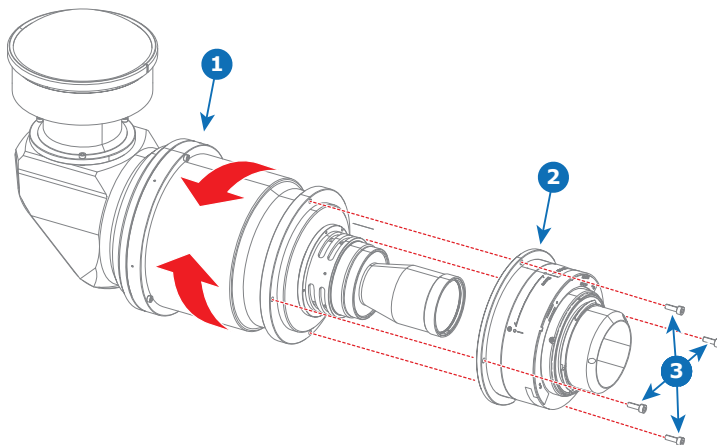


Image 5-9

3. Fasten the lens flange with 4 bolts.

5.6 ILD 0.37 UST 90° lens pre-alignment

Why pre-alignment

It is not always possible to make precise adjustments in the final projector position. The alignment phase is best performed when there is good visibility of the entire screen and the adjustment points are easily accessible. After pre-alignment, the projector can be installed in its final position. By fine-tuning a few parameters, the projector can then be adjusted to fit perfectly.

Prerequisites

This procedure assumes that the UST 90° lens is installed and configured in the applicable orientation and that the lens support bottom plate is attached to the bottom of the projector. See procedures:

- “Set the Back Focal Length to nominal position”, page 68.
- “Configure the ILD 0.37 UST 90° lens”, page 69.
- “Installing the lens support bottom plate”, page 67.

Required tools

- Tape measure
- Allen wrench 5 mm
- Allen wrench 4 mm
- Torque wrench with hex socket of 5 mm

How to pre-align the UST lens

1. Position the projector with UST lens in an easy accessible temporary configuration that equals the final setup.
 - Same environmental conditions.
 - Same screen size.
 - Same projection distance (throw).

2. Power on the projector and display the checkerboard test pattern.



Note: Allow the projector to warm up for at least 30 minutes. This ensures that the optics stabilize, preventing any focus drift after adjustments.

3. Adapt the image orientation according the configuration of the UST 90° lens. For example: Lens left orientation for projector table mount = Ceiling rear.
 - ▶ Using Pulse OSD: *Menu > Installation > Position > Orientation > Ceiling rear.*
 - ▶ Using Pulse Prospector: *Setup > Position > Projector position > Ceiling rear.*

4. Adjust the horizontal and vertical shift. Aim for the same shift that is required in the final installation.
 - ▶ Using Pulse OSD: *Menu > Installation > Optics > Shift*
 - ▶ Using Pulse Prospector: *Setup > Optics > Optical Shift*

5. Align the projector and lens exactly perpendicular to the screen. Projected image should be square and level. Proceed as follows:

- a) Project the green focus test pattern.
- b) Ensure that the left and right image height is the same.

If the left side of the image is larger than the right side, the projector is rotated toward the screen. If the right side is larger than the left side, the projector is rotated away from the screen.

- c) Ensure that the top and bottom image width is the same.

A keystone effect is visible if the top of the image is smaller than the bottom, indicating that the projector is leaning toward the screen. In this case, the projector and lens need to be tilted backwards. Conversely, if the top is larger than the bottom, the projector and lens are leaning away from the screen and need to be tilted toward the screen.

- d) Ensure that the image is leveled.

If both the left and right sides of the image are the same height, and the top and bottom are the same width, the projector is correctly squared to the screen. If the image is still not horizontal and level in this case, the projector needs to be leveled front to back, parallel to the screen

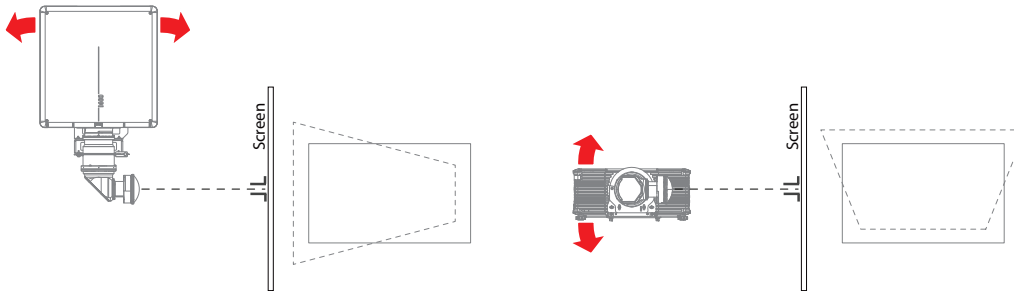


Image 5-10

6. Perform a lens focus calibration.

⚠ Caution: Do not calibrate the horizontal and vertical lens shift. The lens is very heavy and the calibration will potentially get stuck.

- ▶ Using Pulse OSD: *Menu > Settings > Maintenance > Lens calibration > Focus*
- ▶ Using Pulse Prospector: *Setup > Optics > Zoom & Focus > Focus calibration*

7. Set the primary motorized focus as close as possible to the **reference position** (reference 1) indicated on the label on the lens body.

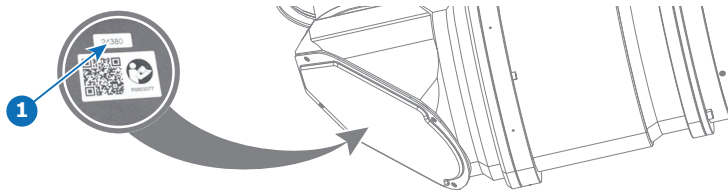


Image 5-11

The current focus position is displayed on screen and LCD when adjusting focus from the lens menu. The outer limits are 0 and 65535.

8. Rotate the barrel of the secondary focus to match the **throw distance** for the application (distance in meter).

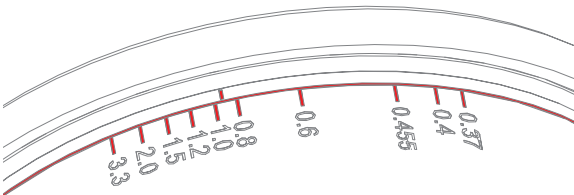


Image 5-12

9. Check if the depth of field (DoF) area is located behind the projection screen. Move a white paper from the projection screen towards the projection lens and check if the image comes into focus somewhere in between.
 - ▶ If nowhere focused, the DoF lies behind the projection screen. Proceed with the next step.
 - ▶ If somewhere focused, the DoF lies in front of the screen. The Back Focal Length is probably not in the nominal position. See “[Set the Back Focal Length to nominal position](#)”, page 68.
10. Adapt the Back Focal Length to gain good focus as follows:

⚠ Caution: Do not adjust the primary motorized focus and the secondary manual focus of the lens while adjusting the Back Focal Length. Rotating the Scheimpflug nuts will move the lens holder to where the lens is in focus.

- a) Loosen the three Scheimpflug lock nuts (reference A, B, and C [Image 5-13](#)). Use a 5 mm Allen wrench.

- b) Turn each of the three Scheimpflug screws (reference 1, 2, and 3) **counterclockwise 1/8th of a turn** at a time until the top and center of the projected image are in focus. Stop when the focus is good. Use a 4 mm Allen wrench.
- c) Ensure the focus is even between the left and right sides of the projected image by adjusting the left and right Scheimpflug screws (reference 1 and 2). It doesn't need to be perfect, just consistent. If the previous step was done evenly, minimal adjustment should be needed.
- d) Even out the focus at the top and bottom by adjusting the bottom Scheimpflug screw (reference 3). This step corrects for the lens weight. In this configuration, turn the bottom Scheimpflug screw **counterclockwise**.
- e) Fasten the three Scheimpflug lock nuts. Use a 5 mm Allen torque wrench with a torque of 6 Nm.

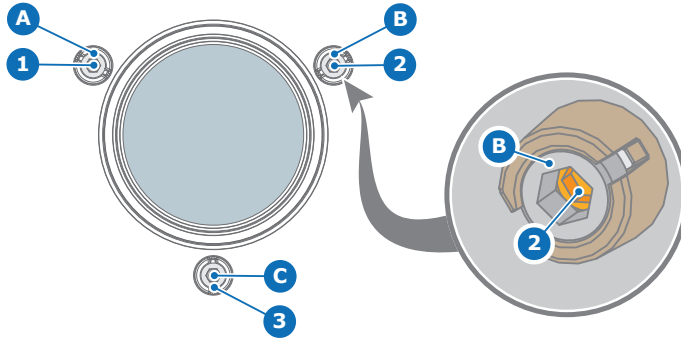


Image 5-13

- 11. Slightly adjust the primary motorized focus to gain good focus in the center of the projected image.
- 12. Install the lens support bracket. See procedure “[Installing the lens support bracket](#)”, page 73.

5.7 Installing the lens support bracket

Prerequisites

This procedure assumes that the bottom plate of the lens support is already attached to the projector and that the projection lens is installed. See procedures:


- “Installing the lens support bottom plate”, page 67.
- “Lens installation”, page 46.

Required tools


Allen wrench 5 mm

How to install the lens support bracket

1. Disable the Horizontal and Vertical shift via Pulse Prospector: *Setup > Optics > Optical Shift*

 **Note:** It's important to disable the lens shift feature in the software to prevent lens holder damage from unintentional shift movements while the lens is mechanically fixed in the lens support.

2. Install the 3 bottom brackets of the lens support. Do not tighten the screws (reference 12 and 13) of the brackets 2 and 3. Provide each screw with a plain washer.

 **Caution:** Ensure that all positioning pins fits in their slots.

 **Note:** The hook attached to the third bracket (reference 3) can maximum turn 90° open.

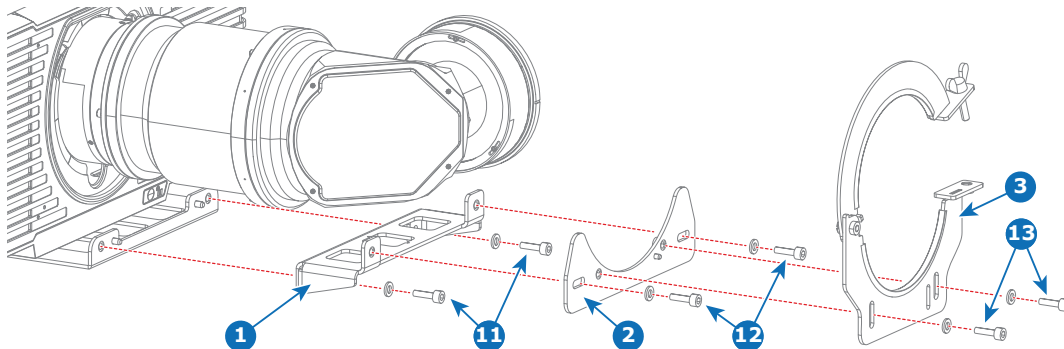


Image 5-14

3. Close the top bracket (reference 4) of the lens support and secure with a wing nut (reference 5).

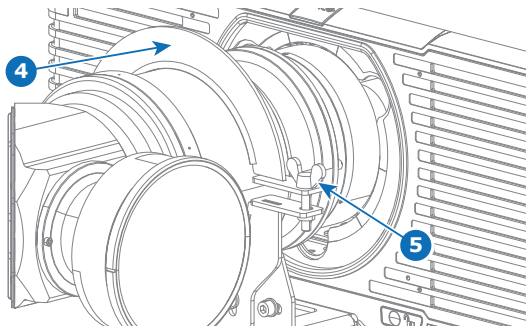



Image 5-15

4. Firmly tighten the four screws (reference 12 and 13).

 **Tip:** Due to the weight of the lens, it may sag slightly. Therefore, gently push the lens up while tightening the screws (reference 13) to ensure it is perfectly aligned with the projector optics.

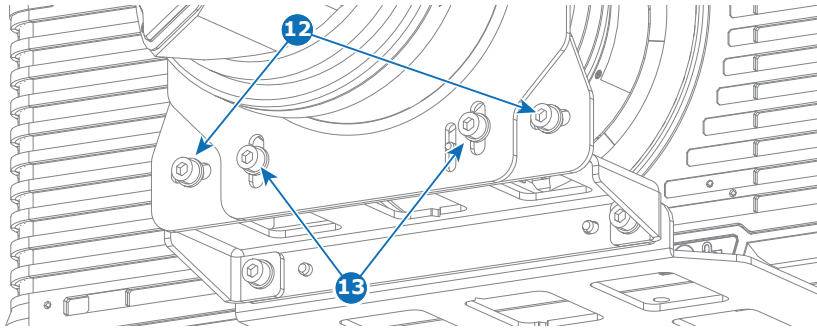


Image 5-16

5.8 ILD 0.37 UST 90° lens fine tuning

Prerequisites

This procedure assumes that the projector is installed in its final position and that the UST lens is pre-aligned and secured with the lens support. See procedures:

- “ILD 0.37 UST 90° lens pre-alignment”, page 70.
- “Installing the lens support bracket”, page 73.

Required tools

- Allen wrench 5 mm
- Allen wrench 4 mm
- Allen wrench 3 mm
- Torque wrench with hex socket of 5 mm

How to fine tune the UST lens in its final position

1. Power on the projector and display the checkerboard test pattern.



Note: Allow the projector to warm up for at least 30 minutes. This ensures that the optics stabilize, preventing any focus drift after adjustments.

2. Check if the projector is perfectly aligned with the screen. Projected image should be square and level. Project the green focus test pattern.
3. Rotate the barrel of the secondary focus to achieve the best focus for the projected image. If the UST lens is correctly pre-aligned, the best focus should correspond with the throw distance on the scale.

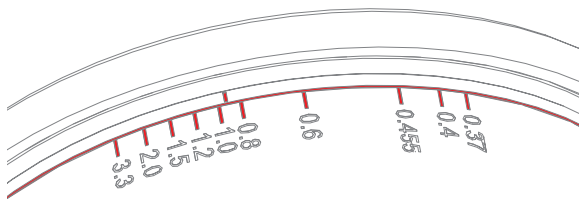


Image 5-17

4. If needed, fine tune the horizontal and vertical shift. Proceed as follows:
 - a) Loosen the four fixation screws (reference 12 and 13) of the lens brackets to allow horizontal and vertical shift movements. Use a 3 mm Allen wrench.
 - b) Enable the Horizontal and Vertical shift via Pulse Prospector: *Setup > Optics > Optical Shift*
 - c) Adjust the horizontal and vertical shift.
 - d) Disable the Horizontal and Vertical shift via Pulse Prospector: *Setup > Optics > Optical Shift*
 - e) Fasten the four fixation screws (reference 12 and 13) of the lens brackets. Use a 3 mm Allen wrench.

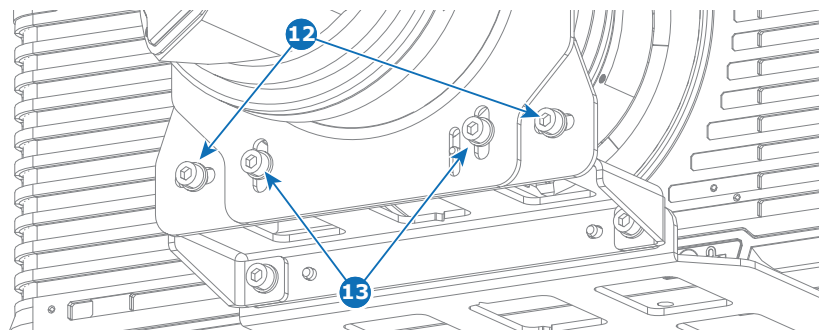


Image 5-18

5. If needed, the Scheimpflug can be slightly adjusted while the lens is fixed in the lens support to correct any focus issues in the corners. Proceed as follows:
 - a) Loosen the Scheimpflug lock nut (reference A, B, or C). Use a 5 mm Allen wrench.
 - b) Slightly turn the Scheimpflug screw (reference 1, 2, and 3) to improve focus. Use a 4 mm Allen wrench