

## VERSION: MAY 2017 (SN 7039 - PRESENT)

The TwinCam is a simple, yet powerful and stable device for pixel aligning images captured using different wavelengths, polarization states, fields of view or other imaging modalities onto two camera sensors. It is designed to meet the most demanding requirements for the sub-pixel mapping of Super Resolution imaging and is compatible with most scientific C mount and F mount cameras.

Please contact us if you require any assistance during setup or use (Tech@cairn-research.co.uk).

For the purpose of this Quick Start Guide, please refer to the TwinCam diagram on Page 3. All words in **bold blue** text are labelled on this diagram.

### A) Mounting to your microscope

1. Connect the TwinCam to your existing 1x camera c-mount (or confocal unit if appropriate).
2. If using an inverted microscope, two support jacks are normally supplied to support the weight of the unit. Position the support jacks in the **jacking point** on each output. The height can be adjusted and locked in position with the blue locking collar. A **spirit level** is also included in the input section to aid setup.
3. Remove the **C-mount camera tube** and protective **dust cap**. The **clamping screw** may need to be loosened (using the 2.5mm allen key provided).
4. Screw each camera onto the **C-mount camera tube** and replace on each arm of the TwinCam with the **calibration ring** still in place.

### B) Aligning two images

1. View a live image (ideally of a graticule using transmitted light) on the **transmitted port**. For initial setup, it is essential to be able to view all four edges of the **rectangular aperture**, therefore it is not advisable to use a fluorescent sample at this stage.
2. Close the **rectangular aperture** until in view on the image and rotate the camera until square.
3. Lock off the **clamping screw**.
4. Insert the calibration cube (containing a 50% mirror) into the unit by removing the magnetic **door cover**. Magnets will ensure the cube locates correctly.
5. Repeat steps 1 to 3 on the **reflected port**.
6. If the sample focus of the reflected camera is not precisely matching the focus of the transmitted camera, an adjustment is provided (to allow for any slight differences between positioning of the camera sensor). Remove the **calibration ring** on the reflected port and move the camera in Z until focused. Lock off the **clamping screw** once again.

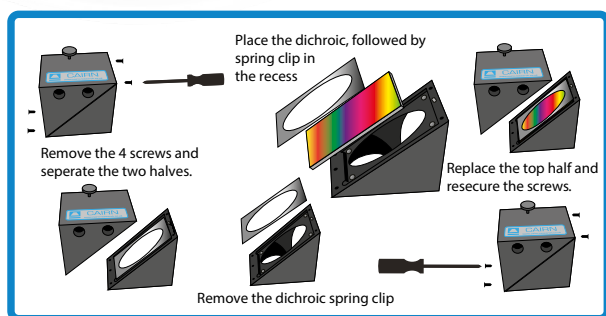
Each of the two images can now be overlaid in your imaging software and pixel aligned using two sets of XY controls:

7. With the **rectangular aperture** still in view, centre the transmitted port (using the 1.5mm allen key provided) by adjusting the **transmitted H&V controls**. It's useful to use a centred square or central crosshair as a reference point in your imaging software (if available).
8. Centre the reflected port using the **reflected H&V controls**.
9. Note the reflected image will be mirrored horizontally, which will need to be flipped in your imaging software.
10. Replace the calibration cube with a filter cube for dual channel imaging (see section C).
11. Open the **rectangular aperture** to slightly larger than the camera field of view to minimize scattered light.

## C) Filter cube assembly

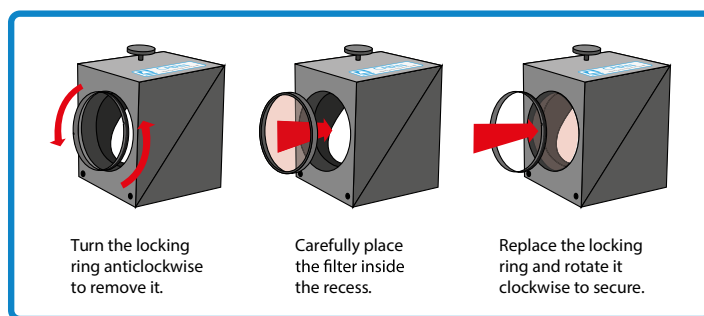
Often TwinCam units are supplied with populated filter cubes, however (if required), these can be installed using the guidance notes below.

Please note for all our emission splitter range we only recommend Chroma Ultra-Flat 2mm dichroic mirrors to minimise distortion. Please let us know if you require any filter assistance.



Installing Dichroic Mirrors into the Cairn Filter Cube

Please consult filter manufacturers instructions regarding orientation of the filter.



Installing Filters into the Cairn Filter Cube

## D) Auxiliary component mounts

In addition to the two positions in the filter cube, there is also an **auxiliary holder** on each camera output port to accommodate interference (bandpass) filters, long pass filters, ND filters, rotating polarisers, cylindrical lenses or Z-plane shifting lenses. The holders supplied with the unit have an angled thread (indicated by angled line on the top) to avoid back reflections from filter surfaces, however if using lenses or a polariser, then a flat holder is required. These can be purchased separately.

## E) Pupil Plane adjustment (advanced operation)

The custom designed relay optics in the TwinCam are optimized for a relatively short infinity space (to make the unit compact) and are designed to relay the primary image plane from a 1x microscope side port. However, many researchers use the TwinCam as a secondary lens relay system, for example after a spinning disk confocal unit. In this situation, vignetting (shading) may be observed in the corner of the image(s) due to light diverging within the TwinCam unit and being inappropriately apertured by the splitting cube. To correct for this, the position of the pupil plane can be adjusted by extending the TwinCam input section to optimize the image. This functionality can also be useful if the researcher wishes to accurately position an auxiliary optic in the light path, such as a phase plate or chromatic correction lens.

1. View the camera image on the **transmitted port**
2. Loosen eight **set screws** in total (four on the top, four on the underside) on the **spirit level** section of the TwinCam input using the 1.5mm allen key provided.
3. Slide the **pupil plane adjustment** section to extend its length, moving the cameras away from the microscope. (Baffling allows normal operation to continue).
4. Adjust the length until vignetting is removed
5. Re-tighten the **set screws**
6. Refer back to section B to perform any final adjustment

REFLECTED PORT

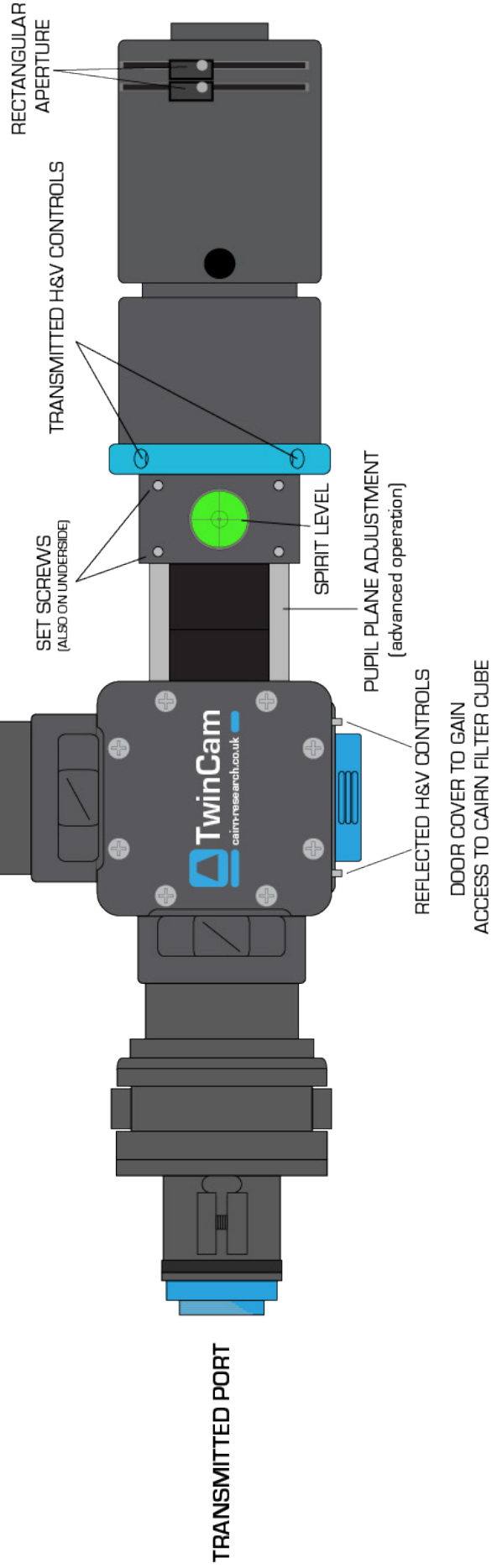


DUST CAP

C-MOUNT CAMERA TUBE  
CALIBRATION RING

CLAMPING SCREW

JACKING POINT



RECTANGULAR APERTURE

TRANSMITTED H&V CONTROLS

SET SCREWS  
(ALSO ON UNDERSIDE)

SPIRIT LEVEL

PUPIL PLANE ADJUSTMENT  
(advanced operation)

REFLECTED H&V CONTROLS

DOOR COVER TO GAIN  
ACCESS TO CAIRN FILTER CUBE

TRANSMITTED PORT