

World's Largest Inventory of Optical Components

# STEP-BY-STEP INSTRUCTIONS FOR BUILDING AN AUTOCOLLIMATOR



TECHSPEC®  
Optical Cage System



**Edmund**  
optics | worldwide

# INTRODUCTION

## What is an autocollimator?

- The Autocollimator is a precision instrument composed of an achromatic objective, a LED, reticle, beamsplitter, and an eyepiece with a reticle. The reticle cross-hair is projected onto a reflective surface, with the returning reflected beam diverted by the beam splitter to the eyepiece reticle. The deviation in angle is measured by the eyepiece. This instrument has multiple applications such as measuring small angles, as well as calibrating and aligning various optical instruments and components.

## Why TECHSPEC Optical Cage System?

- The TECHSPEC Optical Cage System makes alignment easy. In just a few short steps, a simple autocollimator can be assembled and aligned. Building an autocollimator with the TECHSPEC Optical Cage System makes it easy to swap the optics, allowing the user to change the field of view and resolution quickly and easily. In addition, a camera could be added in the place of the eyepiece for image capture or video capability.

# OVERVIEW

## Complete Parts List

### Sub-Assemblies:

1. Beamsplitter Assembly
2. Source Arm
3. Objective Arm
4. Eyepiece Arm

### Final Touches

Alignment & Calibration

Light Baffling & Mounting



# COMPLETE PARTS LIST

STOCK #	Description	QUANTITY
03-628	C-Mount Microscope Eyepiece Adapter	1
32-505	25mm 50R/50T Cube Beamsplitter	1
37-692	10X Kellner Adjustable Eyepiece for Reticle	1
39-444	21mm Crosshair Glass Reticle	1
45-415	Achromatic Doublet 30mm Dia. 200mm efl	1
46-105	12.5 D Opal Diffusing Glass	1
53-860	C-Mount 21mm Reticle Mount	1
54-420	19mm Scaled Crosshair Glass Reticle	1
54-615	C-Mount 12mm Lens Mount	1
55-246	C-Mount 12.5 mm Lens Mount	1
58-736	25mm C-Mount Extension Tube	1
58-972	Post Holder, 50.8mm Length, M6 Thread	1
83-143	Stainless Steel Mounting Post, 50.8mm length, M6 Stud	1
85-490	Cage Support Rod 6mm Diameter x 150mm Length, M3	4
85-518	25mm Cage Extension Tube 10mm	1
85-539	25mm Cage Blank Disk	1
85-624	Cage Sphere with (5) 30mm Port and (1) 43mm Port	1
85-627	30mm Cage Port Cover Disk	2
85-630	30mm Standard Cage Plate with M6 for Post Mounting	4
85-632	25mm Standard Cage Plate with M6 for Post Mounting	1
85-688	25/25.4mm Cube Beamsplitter Mount	1
85-719	30mm Cage Plate C-Mount Adapter	2
85-737	30mm Square Interface Plate	1
Coming Soon!	150mm Cage Cover Tube	1
Coming Soon!	LED w/power source	1

# 1. BEAMSPLITTER ASSEMBLY

# BEAMSPLITTER ASSEMBLY



Parts needed for this step:

STOCK #	Description	QUANTITY
32-505	25mm 50R/50T Cube Beamsplitter	1
85-688	25/25.4mm Cube Beamsplitter Mount	1
85-632	25mm Standard Cage Plate with M6 for Post Mounting	1
85-624	Cage Sphere with (5) 30mm Port and (1) 43mm Port	1
85-737	30mm Square Interface Plate	1
85-630	30mm Standard Cage Plate with M6 for Post Mounting	2

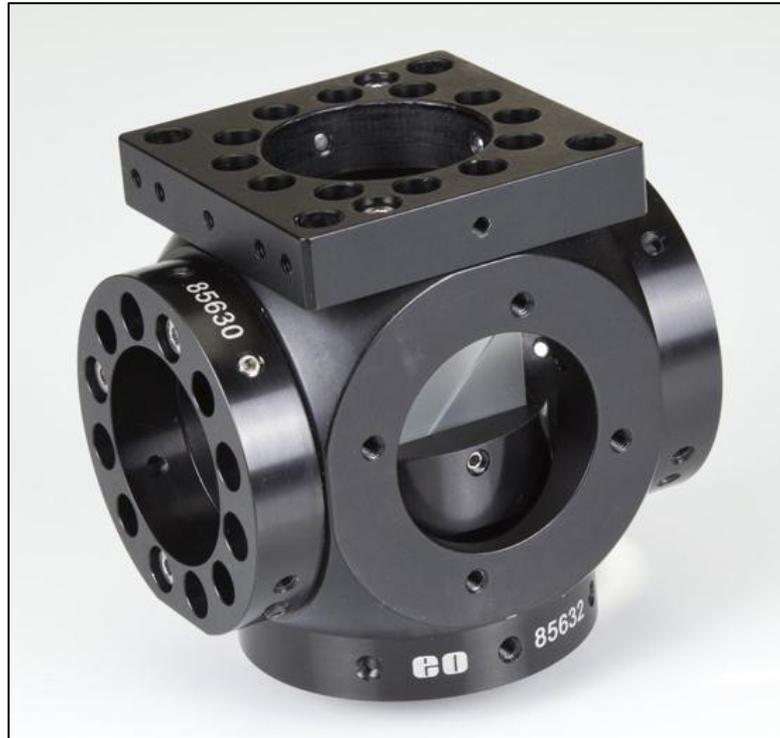
# BEAMSPLITTER ASSEMBLY

1. Insert the Cube Beamsplitter (#32-505) into the Cube Beamsplitter Mount (#85-688). Be sure that the ground surfaces of the beamsplitter are in contact with the mount and the optic is centered within the mount. Lock the optic into place with set screws. Set Aside.



# BEAMSPLITTER ASSEMBLY

- Using M3 SHCS, attach the 25mm Cage Mounting Plate (#85-632) onto the face of the Sphere (#85-624) opposite the 43mm port.
- Carefully insert the beamsplitter assembly (mount first) from Step 1 into the sphere through the 43mm port. Slide the base of the beamsplitter mount into the 25mm aperture of the cage plate from step 2. Use M3 set screws to lock the beamsplitter in place (alignment will be done later).



- Attach the Square Interface Plate (#85-737) onto the 43mm port with M3 SHCS.
- Attach 2 of the 30mm Cage Mounting Plates (#85-630) onto opposite faces of the sphere. Be sure the M6 tapped holes are oriented down toward the 25mm plate.

## 2. SOURCE ARM

# SOURCE ARM



Parts needed for this step :

STOCK #	Description	QUANTITY
85-719	30mm Cage Plate C-Mount Adapter	1
54-615	C-Mount 12mm Lens Mount	1
58-736	25mm C-Mount Extension Tube	1
46-105	12.5 D Opal Diffusing Glass	1
55-246	C-Mount 12.5 mm Lens Mount	1
53-860	C-Mount 21mm Reticle Mount	1
39-444	21mm Crosshair Glass Reticle	1
Coming Soon	LED with power source	1

# SOURCE ARM



6. Take the C-mount 12mm Lens Mount (#54-615) and insert the LED cable extending toward the female C-mount threads. Secure with the retaining ring.



7. Insert the 12.5mm Opal Diffusing Glass (#46-105) into the C-mount 12.5mm Lens Mount (#55-246). Secure with the retaining ring. Attach to the male threading of the mount from step 6.



8. Take the C-Mount 21mm Reticle Mount (#53-860) and insert the 21mm Crosshair Glass Reticle (#39-444) and secure with retaining ring. Attach to male threading of the mount from step 7.

# SOURCE ARM

9. Connect the 25mm C-mount Extension Tube (#58-736) to the male threading of the assembly from step 8.
10. Attach Cage Plate C-Mount Adapter (#85-719) to the male thread of the assembly from step 9.
11. Insert the entire assembly, C-mount adapter first, into one of the 30mm cage plates from step 5. Lock into place using M3 set screws.



## 3. OBJECTIVE ARM

# OBJECTIVE ARM



Parts needed for this step:

STOCK #	Description	QUANTITY
85-490	Cage Support Rod 6mm Diameter x 150mm Length, M3	4
85-630	30mm Standard Cage Plate with M6 for Post Mounting	2
45-415	Achromatic Doublet 30mm Dia. 200mm EFL	1

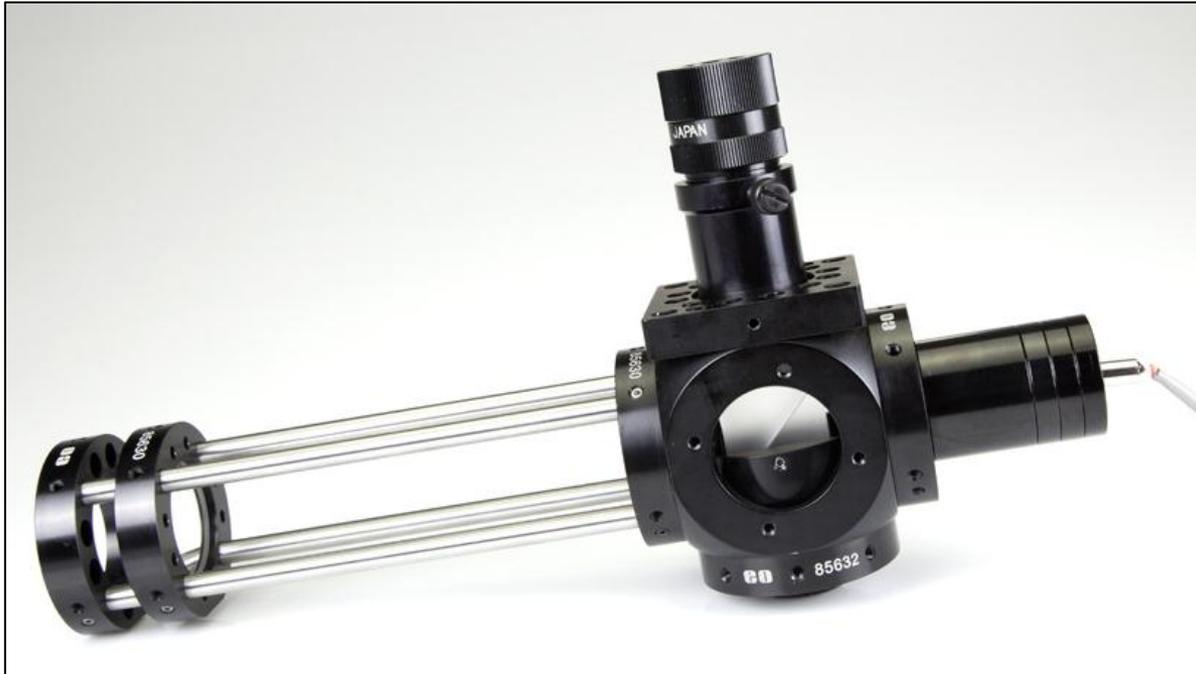
# OBJECTIVE ARM

12. Insert four of the 150mm rods (#85-490) into the remaining 30mm Plate opposite the the Source Arm. Lock each into place with M3 set screws.
13. Mount the 30mm x 200mm Achromatic Doublet (#45-415) into one of the 30mm Standard Cage plates (#85-630). Note the orientation of the lens within the plate. Slide the plate onto the 150mm rods with the bi-convex element facing away from the sphere assembly. Keep the plate loose on the rods for alignment.
14. Attach the final 30mm Standard Cage Plate to the end of the four 150 mm rods. Position the plate so it is flush with the end of the rods. Lock into place with M3 set screws.



## 4. EYEPIECE ARM

# EYEPIECE ARM



Parts needed for this step:

STOCK #	Description	QUANTITY
03-628	C-Mount Microscope Eyepiece Adapter	1
54-420	19mm Scaled Crosshair Glass Reticle	1
37-692	10X Kellner Adjustable Eyepiece for Reticle	1
85-719	30mm Cage Plate C-Mount Adapter	1

# EYEPIECE ARM

15. Insert the 19mm Scaled Crosshair Glass Reticle (#54-420) into the 10X Kellner Adjustable Eyepiece for Reticle (#37-692). Secure with retaining ring
16. Insert the Plate C-mount adapter (#85-719) into the 30mm aperture of the square plate with the female threading facing out and lock into place with M3 set screws
17. Thread the C-Mount Microscope Eyepiece Adapter (#03-628) onto the C-mount adapter from step 16. Slide the eyepiece into the adapter and lock into place with the thumbscrew.

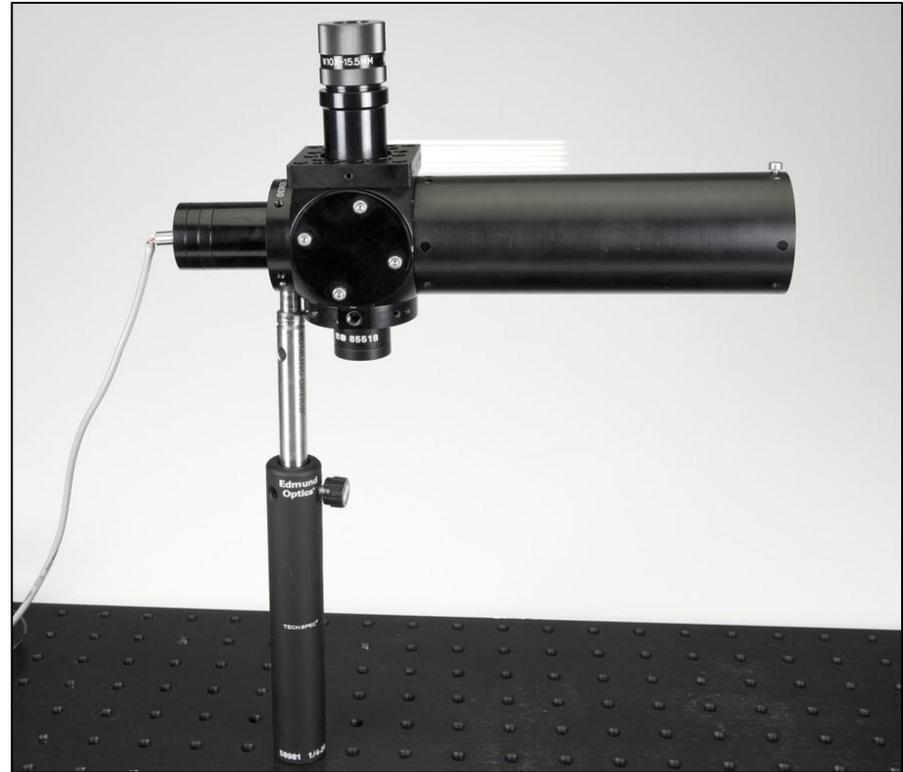


# FINAL TOUCHES

# ALIGNMENT & CALIBRATION

- Loosen the beamsplitter mount and adjust it so that ambient light coming from the objective goes to the source and eyepiece. Center and level the beamsplitter as much as possible. Lock into place.
- Simple Calibration: With the LED on take a mirror and place it flat against the outer 30mm Standard Cage Plate on the objective arm. Look through the microscope eyepiece, adjust the location of the plate with the achromatic doublet until you see the crosshair from the source in focus on the eyepiece reticle. Lock that plate onto the rods with M3 set screws.
- Camera Calibration: Place a camera with a fixed focal length lens focused at infinity. Move the plate with the achromatic doublet until the reticle is in focus. Lock that plate onto the rods with M3 set screws.

# LIGHT BAFFLING & MOUNTING



Parts needed for this step:

STOCK #	Description	QUANTITY
85-539	25mm Cage Blank Disk	1
85-518	10mm Cage Extension Tube	1
85-627	30mm Cage Port Cover Disk	2
Coming Soon	150mm Cage Cover Tube	1
83-143	Stainless Steel Mounting Post, 50.8mm length, M6 Stud	1
58-972	Post Holder, 50.8mm Length, M6 Thread	1

# LIGHT BAFFLING & MOUNTING

18. Attach the two 30mm Cage Port Cover Disks (#85-627) to the two open faces of the sphere using M3 SHCS.
19. Thread the 10mm Cage Extension Tube (#85-518) to the bottom of the beamsplitter mount. Then attach the 25mm Cage Blank Disk (#85-539).
20. Slide the 150mm Cage Cover Tube onto the cage rails. Lock into place with M3 SHCS.
21. The Mounting Post (#83-143) can be attached to the 30mm Cage plate holding the Source Arm. The Post Holder (#58-972), once attached to a breadboard or bench plate can support the entire assembly.



# START BUILDING NOW!

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