

# UCB - May 15, 2024

Item UCB was discontinued on May 15, 2024. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

# FIBERBENCH OPTIC MOUNTS & WALL PLATES

- Integrate Optical Components into FiberBenches
- Static, Tip/Tilt, and Rotational Mounting Options
- Easily Interchange Modules While Maintaining Optical Axis Height

Application Idea FiberBench Supporting Linear Polarizer and FT-EOMA Bracket with EO Modulator Installed



Cubes

**CPFB** 30 mm Cage System Mount

### OVERVIEW

Thorlabs offers several component modules that can be used to mount numerous precision optical components. These modules can then be easily integrated into a FiberBench system, and position optics at a consistent beam height of 0.56" (14.2 mm). In each case, the module is designed with two steel dowel pins on its underside that fit into the receiving holes on the FiberBench. Once inserted, the design of the mount ensures that the optic will be at the appropriate height for use within the free-space subsystem.



Ø1/2" Lens Tube Mount

- Ø1/2" Optic Rotation Mount
- Ø1/2" Precision Rotation Mount
- Ø1/2" Lens Tube Mount
- Ø1/2" Optic Mount
- Free Space Isolator MountStatic Mounting Platform

• Tip/Tilt Rotation Mount

- EO Modulator Mount
- Universal Base

for 5 mm Beamsplitter

- Wall Plates: FiberPort Compatible
- Wall Plates: Cage Compatible
- Adapters: Optomech FiberBench Mount

- Adapters: 30 mm Cage System Mount
- Adapters: Post-Mountable

FiberBench Accessories				
FiberPorts         Optic Mounts         Alignment Tools         Polarizers				
Beamsplitter Modules	Mirror Modules	Rotating Wave Plates	FiberBenches	

# **Reading a Vernier Scale**

Vernier scales are typically used to add precision to standard, evenly divided scales (such as the scale on Thorlabs' rotation mounts). A vernier scale has found common use in many precision measurement tools, the most common being calipers and micrometers. The direct vernier scale uses two scales side-by-side: the main scale and the vernier scale. The vernier scale has a slightly smaller spacing between its tick marks (10% smaller than the main). Hence, the lines on the main scale will not line up with all the lines on the vernier scale. Only one line from the vernier scale will match well with one line of the main scale, and that is the trick to reading a vernier scale.

Figures 1 through 3 show a vernier scale system for three different situations. In each case, the scale on the left is the main scale, while the small scale on the right is the vernier scale. When reading a vernier scale, the main scale is used for the gross number, and the vernier scale gives the precision value. In this manner, a standard ruler or micrometer can become a precision tool.



Figure 1: An example of how to read a vernier scale. The red arrow indicates what is known as the pointer. Since the tick mark labeled 10 on the vernier scale aligns with one of the tick marks on the main scale, this vernier scale is reading 75.60 (in whatever units the tool measures).

The 0 on the vernier scale is the "pointer" (marked by a red arrow in Figs. 1 - 3) and will indicate the main scale reading. In Figure 1 we see the pointer is lined up directly with the 75.6 line. Notice that the only other vernier scale tick mark that lines up well with the main scale is 10. Since the vernier 0 lines up with the main scale's 75.6, the reading from Figure 1 is 75.60 (in whatever units the tool measures in).

That is essentially all there is to reading a vernier scale. It's a very straightforward way of increasing the precision of a measurement tool. To expound, let's look at Figure 2. Here we see that the pointer is no longer aligned with a scale line, instead it is slightly above 75.6, but below 75.7; thus the gross measurement is 75.6. The first vernier line that coincides with a main scale line is the 5, shown with a blue arrow. The vernier scale gives the final digit of precision; since the 5 is aligned to the main scale, the precision measurement for Figure 2 is 75.65.

Since the vernier scale is 10% smaller than the main scale, moving 1/10 of the main scale will align the next vernier marking. This asks the obvious question: what if the measurement is within the 1/10 precision of the vernier scale? Figure 3 shows just this. Again, the pointer line is in between 75.6 and 75.7, yielding the gross measurement of 75.6. If we look closely, we see that the vernier 7 (marked with a blue arrow) is very closely aligned to the main scale, giving a precision measurement of 75.67. However, the vernier 7 is very slightly above the main scale mark, and we can see that the vernier 8 (directly above 7) is slightly below its corresponding main scale mark. Hence, the scale on Figure 3 could be read as 75.673 ± 0.002. A reading error of about 0.002 would be appropriate for this tool.

As we've seen here, vernier scales add precision to a standard scale measurement. While it takes a bit of getting used to, with a little practice, reading these scales is fairly straightforward. All vernier scales, direct or retrograde, are read in the same fashion.





### Ø1/2" Optic Rotation Mount



- Continuous 360° Rotation with Locking Setscrew
- Direct Read 2° Graduations Engraved on the Edge of the Rotation Dial
- Mount Ø1/2" (Ø12.7 mm) Optics up to 0.17" (4 mm) Thick
- Ø0.45" (Ø11.4 mm) Clear Aperture
- SM05-Threaded (0.535"-40) for Compatibility with Ø1/2" Lens Tubes
- Optics Secured with Included SM05RR Retaining Ring

The FBR FiberBench-compatible rotation mount has a knurled edge and 360° laser-engraved scale marked at 2° increments. It is SM05-threaded (0.535"-40) for mounting optics,  $\emptyset$ 1/2" lens tubes, and other SM05-threaded components. This mount is ideal for holding our  $\emptyset$ 1/2" polarizers and wave plates



Click to Enlarge [APPLIST] FBR Shown Holding a 1/2" Long Ø1/2" Lens Tube, Mounted on an FB-51 FiberBench



Click to Enlarge The FBR mount has a rotation lock screw (0.050" hex) and engraved scale with 2° increments.

(when removed from their Ø1" mounting cell). The mount's rotating cell has A convenient top-located setscrew (0.050" hex) secures the rotational position of the stage.

Part Number	Description	Price	Availability
	Description	THEE	Availability
FBR	Customer Inspired! FiberBench Rotation Mount for Ø1/2" Optics	\$96.53	Today

Ø1/2" Optic Hi	gh-Precision Rotation Mount			
FBRP	<ul> <li>Continuous 360° Rotation</li> <li>Direct Read 2° Graduations Engraved on the Edge of the Rotation Dial</li> <li>±5.5° of Fine Adjuster-Driven Rotation when Engaged</li> <li>Vernier Scale with 10 arcmin Resolution</li> <li>Mount Ø1/2" (Ø12.7 mm) Optics up to 0.23" (5.8 mm) Thick</li> <li>Ø0.43" (Ø10.9 mm) Clear Aperture</li> <li>SM05-Threaded (0.535"-40) For Compatibility with Ø1/2" Lens Tubes</li> <li>Optics Secured with Included POLARIS-SM05RR Retaining Ring</li> </ul>	Click to Enlarge [APPLIST] Align a waveplate to control the polarization angle between two fiber	C The mc s. eng (0 actua	Lick to Enlarge side of the FBRP punt features an gagement screw .028" hex) and ator (0.050" hex).
The FBRP stainless After fastening the e As the graduations Ø1/2" lens tubes, au This mount is ideal	s steel, FiberBench-compatible rotation mount. The mount's SM05-threaded (0 engagement screw with a 0.028" hex key, the cell can be precisely positioned engraved on the cell are 2°, values read from the vernier scale can be convert nd other SM05-threaded components. for holding our Ø1/2" polarizers and wave plates (when removed from their Ø1	.535"-40) rotating cell has a knurled ed by turning the actuator at the top of the ed to arcmins by multiplying by a factor " mounting cell). We also offer FiberBe	ge for coar part with a of two. Mo nch Polariz	rse positioning. 0.050" hex key. punt Ø1/2" optics, zation Modules and
FiberBench Rotatin Part Number FBRP	g Wave Plate Modules, which have linear polarizers, quarter-wave plates, or h Description FiberBench High-Precision Rotation Mount with Vernier Scale for Ø1/2"	alf-wave plates pre-mounted in FBRP r Optics	Price \$208.58	unts. Availability Today

\$55.83

Today

# Ø1/2" Optic Mount

Holds Ø1/2" Optics Up to 3.9 mm Thick\*

FiberBench Ø1/2" Lens Tube Mount

- SM05 Retaining Ring Included
- Ø11 mm Clear Aperture





The FT-SM05 optics mount is designed to hold  $\emptyset$ 1/2" optics (ND filters, diffusers, colored filters, and the VRC2D05 alignment disk) while maintaining the appropriate beam height when placed on a FiberBench. It features our standard SM05 thread (0.535"-40).

Click to Enlarge FT-SM05 Optic Mount on an FB-38 FiberBench

\*This specification is true for relatively flat lenses. For lenses with small focal lengths, and hence large lens curvatures, please contact Tech Support to ensure a proper fit.

Part Number	Description	Price	Availability
FT-SM05	FiberBench Mounting Base for Ø1/2" Optics, Internal SM05 Threading	\$49.61	Today

#### **Kinematic Tip/Tilt and Rotation Mounts**



- Use for 5 mm Cube or 1 mm Thick Plate Optics
- ▶ ±3° Tip/Tilt Adjustment via Three M2.5 x 0.2 Precision Adjusters
- 360° Continuous Rotation with ±12° Fine Adjustment
- Four Locking Collars and a Spanner Wrench are Included
- Additional Locking Collars Available Separately
- Please Contact Tech Support for Custom Mounting Options

These tip/tilt rotation FiberBench mounts are designed to mount either 5 mm cube optics, such as polarizing or non-polarizing beamsplitter cubes, (item # FBTC) or 1 mm thick plate optics up to 12.7 mm (0.5") wide, such as beamsplitters or mirrors, (item # FBTP) while maintaining the appropriate beam height. Both versions require epoxy to mount optical components. The circular rotation plate can be rotated a full 360° and is engraved with a scale marked every 5°. Additionally, a Vernier scale provides 1° resolution for fine rotation. These mounts do not suffer from left/right handedness restrictions, and thus can be used in any orientation on a FiberBench.

An engraved dot is present on the FBTP Plate Optic Mount between the 0° and 90° engravings. Beamsplitter optics should be installed with the beamsplitter coating facing this dot. This allows an incident beam to be aligned so that it is split at the center of the mount.

These mounts allow for tip, tilt, and rotational adjustment for precision beam alignment and steering control. Three screws control the tip/tilt of the mount (see Figure 1), yielding up to  $\pm 3^{\circ}$  of adjustment. Additionally, these screws can also provide some vertical adjustment when all three screws are rotated by the same amount. A physical stop prevents the tip/tilt springs from being overextended. When engaged, the fine rotation adjustment screw (see Figure 1) gives up to  $\pm 12^{\circ}$  adjustment. All adjustment screws use a 0.05" hex key, which is included with these mounts. Furthermore, they can be locked into position (see Figure 2) with a spanner wrench to prevent accidental movement. The necessary spanner wrench (SPW403) is included; simply insert the included hex key through the spanner wrench, and while holding the adjustment screw static, use the spanner wrench to tighten the locking nut (see Figure 3).

Additional locking collars and spanner wrenches are also available for purchase separately. If desired, two locking collars can be used together to create a hard stop (see Figure 4). Alternatively, a single collar can be epoxied to an adjuster using our G14250 epoxy to create a permanent hard stop.

We also offer post-mountable versions of these mounts with 8-32 (M4) taps for general mounting of optics on Ø1/2" Posts.



Adjustment Screw Fine Rotation Click to Enlarge **Figure 1:** These are the adjuster locations on the FBTC mount. The FBTP has its adjustment screws in the same locations.



Click to Enlarge Figure 2: A single locking collar can lock an adjuster in position.



Figure 3: Use the included hex key and spanner wrench to lock an adjustment screw in place.



Click to Enlarge Figure 4: Two collars can be locked together to create a hard stop.

Part Number	Description	Price	Availability
FBTC	Kinematic FiberBench Tip/Tilt Rotation Mount for 5 mm Cube Optics	\$370.63	Today
FBTP	Kinematic FiberBench Tip/Tilt Rotation Mount for 12.7 mm × 1 mm (W × T) Plate Optics	\$370.63	Today
F10SC1-5	Locking Collar for M2.5 x 0.20 Adjusters, 5 Pack	\$31.77	Today

Kinematic FiberBench Mount Features

Free-Space Isolato	<ul> <li>Mounts Isolators that h</li> <li>Aligns Optical Axis wit</li> <li>This mount secures ou FiberBench series, alig our FiberBenches.</li> <li>Compatible Isolators:</li> </ul>	nave a 0.865" Outer Diameter h Free-Space Isolator r Free-Space Isolators with an outer diameter of 0.865" to our ning the optical axis with the isolator. The mount is compatible with all of	Clic	k to Enlarge APPLIST
<ul> <li>IO-2D-633-VLP</li> <li>IO-3D-633-VLP</li> <li>IOT-3D-633-VLP</li> <li>IO-3D-633-PBS</li> <li>IO-3D-660-VLP</li> <li>IO-3D-780-VLP</li> </ul>	<ul> <li>IO-3D-830-VLP</li> <li>IO-3D-850-VLP</li> <li>IO-4-1150-VLP</li> <li>IO-4-1220-VLP</li> <li>IO-4-1310-VLP</li> <li>IO-4-1390-VLP</li> </ul>	<ul> <li>IO-4-1480-VLP</li> <li>IO-4-1550-VLP</li> <li>IOT-4-1550-VLP</li> <li>IO-4-1650-VLP</li> <li>IO-4-2050-VLP</li> </ul>	Optical Is FiberB	olator Mounted in ench Assembly
Part Number		Description	Price	Availability

HCB THORLASS HCB

H1C

Use for Fixed Mounting of a Variety of Optical Elements

FiberBench Adapter for Ø0.865" Free Space Isolators

Approximately 1.5 mm from Beam Centerline to Top Surface

The HCB Static Mounting Base allows a user-supplied optic to be secured to the top surface with epoxy and then inserted at the correct height into a FiberBench setup. Once inserted into the receiving holes of the FiberBench , the distance from the top surface of the platform to the point at which the source beam will strike the optic is approximately 1.5 mm. The figure to the right shows Thorlabs' PBB Polarizer attached to the HCB base.



Today

\$55.83

Click to Enlarge The HCB platform is used in our PBB-VIS-10-L Beam Displacer Module.

Part Number	Description	Price	Availability
НСВ	FiberBench Static Mounting Base	\$49.61	Today

#### **EO Modulator Mount**



- Adapter Plate Mounts an EO Modulator in the Beam Path
- 4 Tapped Holes for Mounting the Modulator (Screws Included)
- Alignment Pins for Mounting to any FiberBench Over 70 mm Long
- Mounting Screws Included

The FT-EOMA is a mounting bracket used to mount an Electro-Optic (EO) Modulator onto a FiberBench. The length of the bench needs to be at least 70 mm in the direction you wish to

mount the modulator. Incorporation of the optional EO Modulator optic mount and polarizer (EO-GTH5M) will require a longer FiberBench. The Linear Polarizer modules are well suited for use with an EO Modulator in a FiberBench System.



Click to Enlarge [APPLIST] EO Modulator Mounted in a FiberBench

#### **Universal Component Base**

- UCB
- Used for Mounting Square Filters, Mirrors, or Windows
- Non-Marring Nylon Construction
- Accepts Optics Up to 14 mm Thick

The UCB Universal Component Base is designed to secure a square optic, while maintaining the appropriate beam height, for use in a FiberBench system. Optics up to 14 mm thick can be secured into place using two nylon thumbscrews.



Click to Enlarge BPD254S-G Polka Dot Beamsplitter Mounted in a UCB on an FB-51 FiberBench

Part Number	Description	Price	Availability
UCB	FiberBench Universal Mounting Base	\$74.25	Lead Time

#### FiberBench Wall Plates: FiberPort Compatible



HCA3-CF

HCA3-SM05

- Mounts to the Edge of Thorlabs' FiberBenches
- HCA3 and HCA3-SM1 Mount a FiberPort Collimator/Coupler
- HCA3-SM1 has an SM1-Threaded (1.035"-40) Port

These Wall Plates can be attached to the sides of a FiberBench using the two included 8-32 mounting screws. The HCA3 and HCA3-SM1 are used to mount FiberPorts to FiberBenches using the four included 2-56 screws (see photo to the right). The HCA3-SM1

is internally SM1 (1.035"-40) threaded for compatibility with our Ø1" Lens Tubes and other SM1-threaded devices such as Thorlabs' Photodetectors. Each wall plate includes screws for mounting to our FiberBenches and the SM-threaded wall plates each include one retaining ring.



Click to Enlarge [APPLIST] FiberBench with HCA3 Wall Plates and FiberPort

Part Number	Description	Price	Availability
HCA3	Customer Inspired! FiberBench Wall Plate, FiberPort Compatible	\$64.45	Today
HCA3-SM1	FiberBench Wall Plate, FiberPort Compatible, Internally SM1-Threaded	\$71.88	Today

#### FiberBench Wall Plates: Cage System Adapters

- Mounts to the Edge of Thorlabs' FiberBenches
- HCA3-CP is Compatible with Thorlabs' 16 mm and 30 mm Cage Systems
- HCA3-SM05 has 4-40 Taps to Accept Cage Rods from Thorlabs' 16 mm Cage System
- SM05 (0.535"-40) Thread for Compatibility with Ø1/2" Lens Tubes



Click for Details The HCA3-CP FiberBench Adapter Plate accepts cage rods for 16 mm and 30 mm Cage Systems.



The HCA3-CP is used to combine a FiberBench and a 30 mm Cage System for a power sampling application. A beamsplitter picks off light to a detector and allows the rest of the signal to be coupled into a Fiber Patch Cable using a FiberPort. A polarizer between the beamsplitter and the detector allows the polarization state of light entering the fiber to be monitored.<sup>a</sup>

These Wall Plates allow FiberBenches to be combined with Thorlabs' Cage Systems. They can be attached to the sides of a FiberBench using the two included 8-32 mounting screws. The HCA3-SM05 features four 4-40 taps and is internally SM05- threaded (0.535"-40) for

compatibility with our 16 mm Cage System and Ø1/2" Lens Tubes, respectively (see photo to the right).

The HCA3-CP can accept cage rods for 30 mm and 16 mm cage systems either simultaneously or separately. Three #8 counterbores on the bottom of the plate allow it to be mounted to one of Thorlabs'

FiberBenches. The plate accepts Ø4 mm or Ø6 mm cage rods for 16 mm or 30 mm cage systems, respectively. The Ø4 mm cage rods are held in place for by locking screws that accept a 0.05" (1.3 mm) hex key. The Ø6 mm cage rods are secured using a flexure mechanism that can be tightened by a single locking screw on each side of the mount that accepts 5/64" (2.0 mm) hex keys. The port through the center is SM05-threaded, allowing it to accept lens tubes or other threaded optical components.



Click to Enlarge [APPLIST] FiberBench with FiberPort, HCA3-SM05 Wall Plate, 16 mm Cage System, and Ø1/2" Lens Tube

When combining a FiberBench with a cage system, make

sure that the FiberBench is properly supported to avoid applying excess torque to the cage rods. If the cage system is low enough, the FiberBench can rest directly on the optical table. For segments of the cage

system that are elevated off of the optical table, the FiberBench can be supported using a Ø1" optical post threaded into the 8-32 or M4 tap in the base.

Each wall plate includes screws for mounting to our FiberBenches. The HCA3-SM05 ships with one SM05RR retaining ring to aid in securing SM05-threaded components, while the HCA3-CP ships with two retaining SM05RR rings to secure unmounted optics up to 0.21" (5.3 mm) thick, such as Thorlabs' Premium Hard-Coated Bandpass Filters.

a. The cage system is shown with a previous generation CXYZ05 translation mount, which is not available for individual purchase. If a replacement is needed, the CXYZ05A Translation Mount can be used.

Part Number	Description	Price	Availability
HCA3-SM05	FiberBench Wall Plate, 16 mm Cage System Compatible, Internal SM05 Threads	\$71.88	Today
HCA3-CP	FiberBench Wall Plate, 16 mm and 30 mm Cage Plate, Internal SM05 Threads	\$75.14	Today

### FiberBench Adapter: Mount for Standard Optomechanical Components



For Mounting a Mirror Mount to FiberBench
 Mounting Screws Included

The FT-MMAC is ideal for mounting mirror mounts (or any 8-32 threaded mount) to the side of our FiberBenches. The FT-MMAC comes with all the screws necessary to mount it to the bench (two 8-32 shoulder screws) and to the mirror mount (one 8-32 and one M4). The FT-MMAC can be used to position a wide variety of our precision, smooth bore, or compact mirror mounts. Additionally, users can mount one of our VH1 V-clamps with this versatile



adapter.

Click for Details [APPLIST] A KS05 mirror mount positioned on a fiber bench with a FT-MMAC.

Part Number	Description	Price	Availability
FT-MMAC	FiberBench Adapter for Standard Optomech Components	\$35.94	Today

### FiberBench Adapter: 30 mm Cage System Mount for FiberBench Components

- Mount FiberBench Components in a 30 mm Cage System
- Quick-Release Snap-In Flexure Mechanism for Integration Into 30 mm Cage Systems
- Post Mountable via 8-32 (M4) Tap

This 30 mm Cage System Mount for FiberBench Components allows integration of our line of FiberBench Components with our 30 mm cage system. It includes two through holes that fit the dowel pins on our FiberBench optic mounts. Once



the dowels have been inserted, they can be locked in position using a 0.035" balldriver or hex key to tighten the setscrew on the front face of the mount.

The mount includes two snap-in flexure clamps for attaching our Ø6 mm cage rods, which can be locked with a 5/64" (2.0 mm) hex key. This snap-in feature allows components to be easily inserted and removed without disassembling the entire cage system. When this mount is used in a cage system that is attached to a



[APPLIST] [APPLIST] Output from a fiber passes through a FiberBench-based polarization controller before entering a 16 mm cage system through the HCA3-CP.

FiberBench with the HCA3-CP cage plate, the beam height for all optical components is the same. An 8-32 (M4) tapped hole on the bottom of the CPFB mount can be used to secure it to a  $\emptyset$ 1/2" post. Please note that this cage system mount cannot be used with FiberBench optic mounts that are more than 0.75" (19.1 mm) wide in the direction perpendicular to the optical axis.

Compatible FiberBench Accessories					
Optic Mounts (Compatible with FBR, FT-SM05, FBTP, and HCB)	Alignment Tools	Polarizers			
Beamsplitter Modules	Mirror Modules	Rotating Wave Plates			

Part Number	Description	Price	Availability
CPFB/M	30 mm Cage System Mount for FiberBench Components, M4 Tap	\$60.59	7-10 Days
CPFB	30 mm Cage System Mount for FiberBench Components, 8-32 Tap	\$60.59	Today

#### FiberBench Adapter: Post-Mountable Adapter for FiberBench Accessories



- Use FiberBench Components for Free-Space Applications
- Mount FiberBench Accessories with Dowel Pins to Ø1/2" Posts
- #2-56 Setscrew for Locking Accessory in Place (Hex Key Included)



Post Mounting Adapter

Thorlabs' FBA (/M) FiberBench Adapter Mounts can be used to secure compatible FiberBench accessories to  $\emptyset$ 1/2" Posts. The FBA can be mounted to a  $\emptyset$ 1/2" post via the 8-32 (M4) tapped hole that goes through the center of the adapter. This freedom to mount individual pieces to a post gives the user the option of using the compact FiberBench accessories for free space applications.

The adapter is designed to be compatible with FiberBench accessories that have two steel dowel pins on their underside. These pins fit into the receiving holes on the adapter, and the 2-56 setscrew on the side of the adapter can be used to lock the FiberBench accessory in position.

Compatible FiberBench Accessories					
Optic Mounts (Compatible with FBR, FBS05, FT- SM05, FBTP, H1C, HCB, and UCB)	Alignment Tools	Polarizers			
Beamsplitter Modules	Mirror Modules	Rotating Wave Plates			

Part Number	Description	Price	Availability
FBA/M	Ø1/2" Post-Mounting Adapter for FiberBench Accessories, M4 Thread	\$37.14	Today
FBA	Ø1/2" Post-Mounting Adapter for FiberBench Accessories, 8-32 Thread	\$37.14	Today

