

USER'S GUIDE

Translation Stages

Triple-Divide™ Series

Models 9064 and 9065

U.S. Patent #6,174,102



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Contents

The Basics	5
Introduction	5
Two Sizes—Same Features	6
Attaching the Stage to Your Optical Table.....	7
Fine Translation and Coarse Translation	8
Locking the Stage's Position (pint-sized only).....	8
Attaching the e•z•Trac to the Stage	9
Mounting Stages Together	10
Adding Actuators.....	10
Converting the Stage to a Z Configuration	11
Accessories	13
Actuators	13
e•z•Tracs	14
Modular Risers and Plates	14
Application Examples	15
Adding Tip and Tilt	15
Building a Vertical Stage	16
Building a Full XYZ Stage	17
Aligning Fiber using the Opti-Claw™	18
Adding a Rotational Axis	18
Adding a Motorized Rotary Stage.....	19
Horizontal Mounting using the Model 9026.....	20
Vertical Mounting using the Model 9026	21
Coarse X Positioning using Accessories	22
Coarse X-Y Positioning using Accessories.....	23
Coarse X-Z Positioning using Accessories.....	24
Building Telescopes.....	25

Triple-Divide Stability 27

Standard Configurations 29

- Model 9064-X, Z, and 9065-X, Z 29
- Model 9064-XY and 9065-XY..... 29
- Model 9064-XZ and 9065-XZ 30
- Model 9064-XYZ and 9065-XYZ..... 30

Specifications 31

- Full-Sized (2.5") Triple-Divide Characteristics 31
- Pint-Sized (1.5") Triple-Divide Characteristics 32

Customer Service 33

- Technical Support 33
- Service 33

The Basics

Introduction

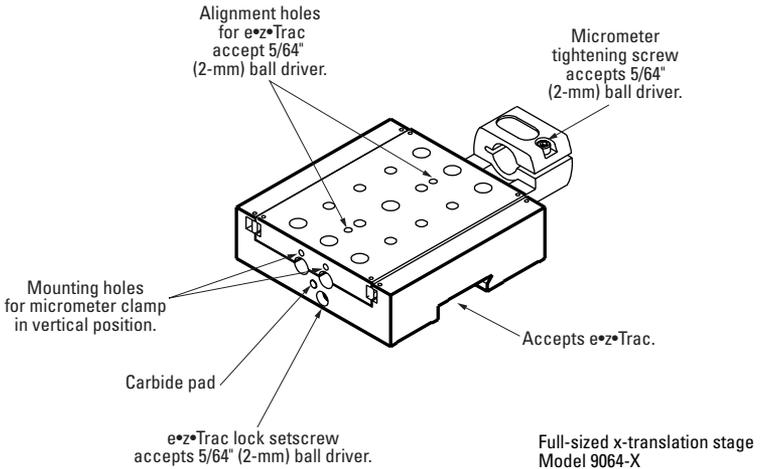
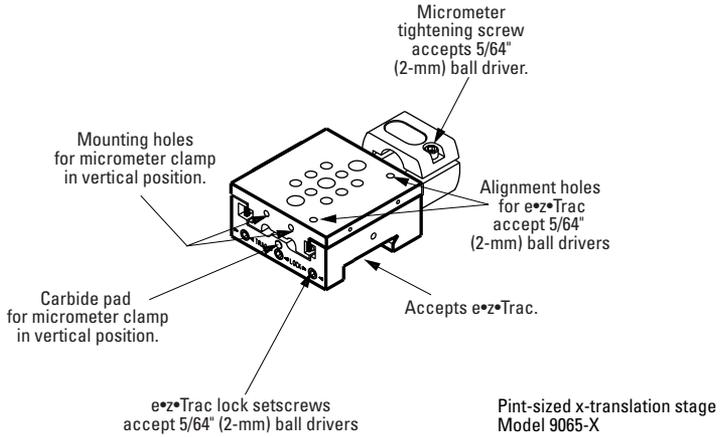
The full-sized Model 9064 and pint-sized Model 9065 Triple-Divide™ translation stages represent an entirely new concept in laboratory translation stages. Their novel modular design uses our patented e•z•Trac™ system, resulting in unparalleled adaptability and versatility while maintaining the highest level of performance. The ball-bearing design with hardened and polished stainless-steel races provides smooth and accurate positioning. We hope that you will find the Triple-Divide to be a valuable and dependable tool in your laboratory.

This chapter illustrates how to bolt the Triple Divide to the table, install different actuators, and use the e•z•Trac. Note that the e•z•Trac fits both the full- and pint-sized stages—choose the length of e•z•Trac that best fits your application.

Following this chapter, you will find a few examples that explore different possible uses of the Triple-Divide and its related accessories. These application examples represent just a few possibilities: Triple-Divide stages can solve many of your laboratory needs without the need to resort to custom machined parts or other half measures.

Two Sizes—Same Features

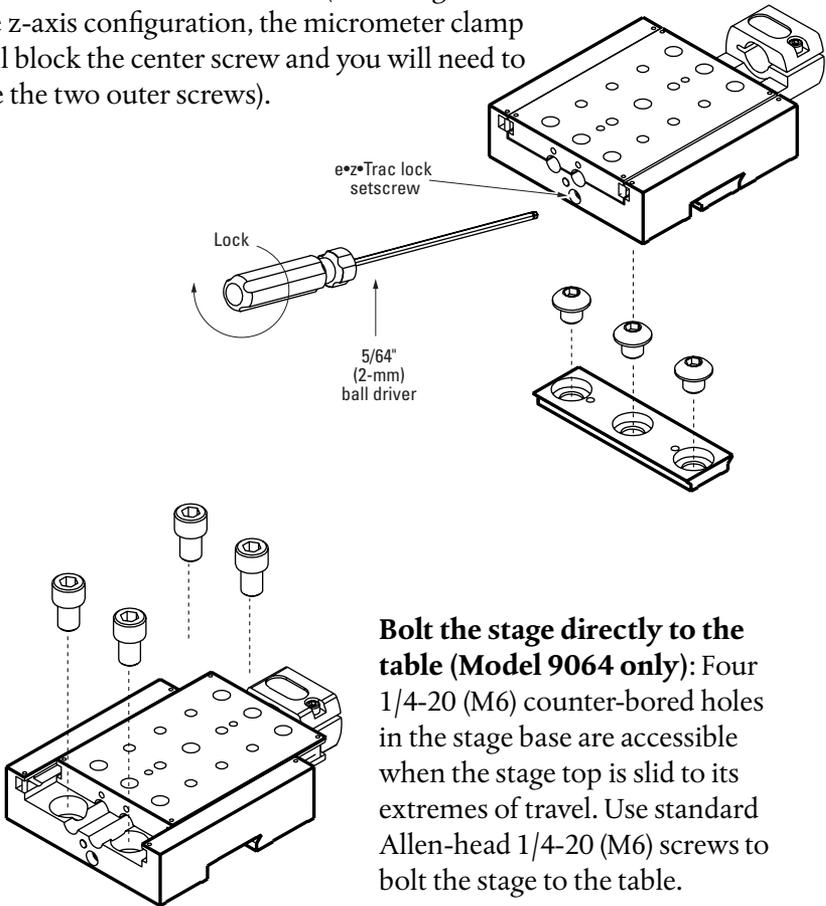
Our pint-sized and full-sized stages have nearly identical designs and feature sets, and are fully compatible with each other.



Attaching the Stage to Your Optical Table

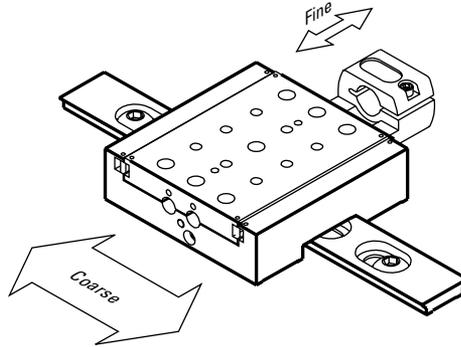
The Model 9064 Triple Divide translation stages may be attached to standard optical tables and breadboards by one of two methods:

Using the e•z•Trac: First attach the e•z•Trac to the table with at least two of the provided button-head screws. Slip the stage over the e•z•Trac and lock it down using the “Trac Lock” setscrew using a 5/64" (2-mm) ball driver (the stage will fit right over the e•z•Trac if the setscrew is withdrawn far enough). For the pint-sized stage, you can use just the center trac-lock screw (if the stage is in the z-axis configuration, the micrometer clamp will block the center screw and you will need to use the two outer screws).



Bolt the stage directly to the table (Model 9064 only): Four 1/4-20 (M6) counter-bored holes in the stage base are accessible when the stage top is slid to its extremes of travel. Use standard Allen-head 1/4-20 (M6) screws to bolt the stage to the table.

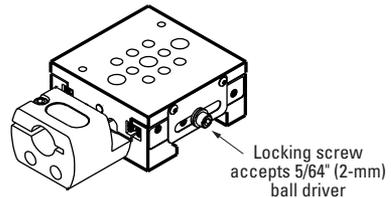
Fine Translation and Coarse Translation



One of the greatest benefits of the e•z•Trac design is that an orthogonal coarse axis of motion is provided for free with each stage. Full-sized and pint-sized stages both use the same Trac.

Locking the Stage's Position (pint-sized only)

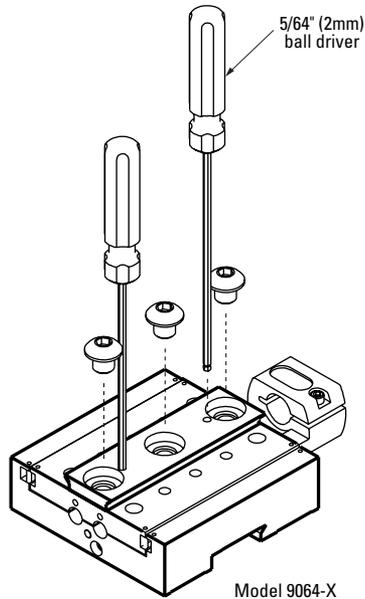
Pint-sized x-translation stage
Model 9065-X



You can lock the pint-sized stage into position by tightening the locking screw on the side of the stage with a $5/64$ " (2-mm) ball driver. For greater flexibility, the lock can be moved to the other side of the stage using a 0.050" ball driver.

Attaching the e•z•Trac to the Stage

The e•z•Trac can be fastened to the top of a stage to provide an attachment point for additional stages or accessories. To help align the Trac with the stage's translation axis to within 1 mrad (within 2 mrad for the pint-sized stages), alignment holes are included in both the stage and the Model 9022 2.5" e•z•Trac.

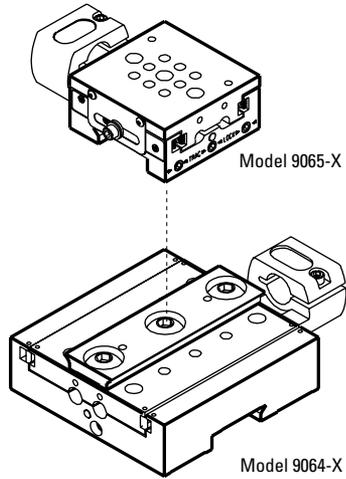


Aligning the e•z•Trac

Line the e•z•Trac up on the stage and insert two 5/64" (2-mm) ball drivers into the alignment holes on the stage. For the full-sized stage, make sure the drivers go through the e•z•Trac into the corresponding alignment holes in the stage. (The alignment holes for the pint-sized stages are to the side of the trac.)

Push the Trac to the right (or left) to take up the play, and tighten the button-head screws with a 5/32" (M4) Allen wrench. Remove the ball drivers, and the e•z•Trac is ready to use.

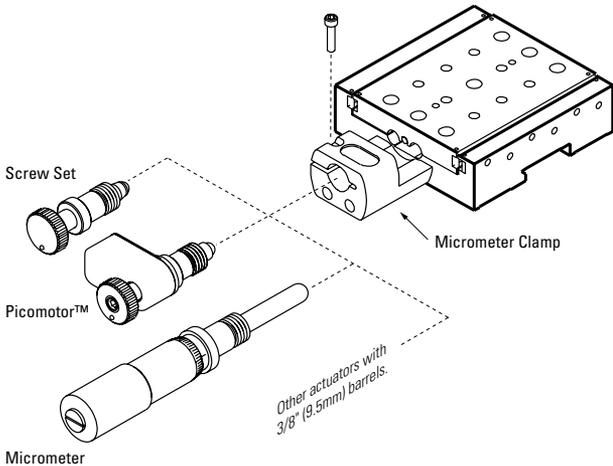
Mounting Stages Together



Slip the upper stage over the Trac and tighten the Trac Lock setscrew(s).

Adding Actuators

The micrometer clamps provided with the Triple-Divide accept all actuators with standard $3/8"$ (9.5-mm) barrel sizes, including micrometers, fine-pitched screw sets, and Picomotors™ from New Focus.



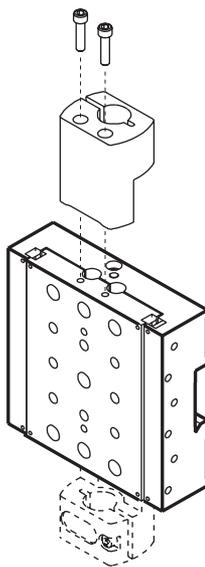
Note:

Several New Focus actuators are listed on page 13.

The same 5/64" (2-mm) ball driver used to tighten the e•z•Trac may be used to tighten and loosen the micrometer clamping screw.

Converting the Stage to a Z Configuration

When the translation stage is used in a vertical orientation, you'll need to configure the micrometer clamp so the weight of objects mounted on the stage top is borne by the actuator, rather than the springs.



Loosen the two screws holding the clamp to the stage base using a 5/64" (2-mm) ball driver, and move the clamp to the other side of the stage, attaching the screws to the tapped holes on the stage top. A wear-resistant carbide pad is provided on this side as well.

Note:

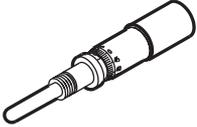
On the pint-sized stage, you can use the outer two e•z•Trac setscrews to lock the stage to the track. You do not need to use the middle setscrew, which is obscured by the micrometer clamp in the Z position.

Accessories

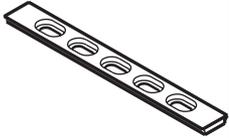
A wide range of accessories is available for the Triple-Divide translation stages, including actuators, additional e•z•Tracs, and modular risers and plates. The following chapter gives a variety of examples to show how some of these accessories may be used.

Actuators

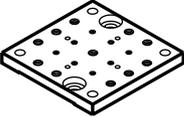
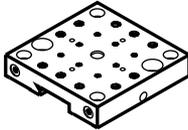
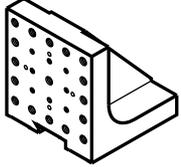
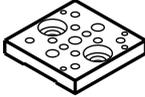
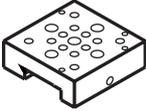
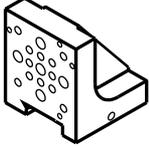
The included micrometer clamps accept all actuators with a standard 3/8" (9.5-mm) barrel size, including braked fine-pitch screw sets, Picomotors™, and micrometers made by New Focus.

<p>1" Screw Set Model 9302</p> 	<p>1" Picomotor™ Model 8302</p> 	<p>25-mm Micrometer Model 9353</p> 
<p>0.5" Screw Set Model 9301</p> 	<p>0.5" Picomotor™ Model 8301</p> 	<p>13-mm Micrometer Model 9352</p> 

e•z•Tracs

<p>1.5" e•z•Trac Model 9032</p> 	<p>2.5" e•z•Trac Model 9022</p> 	<p>6" e•z•Trac Model 9023</p> 
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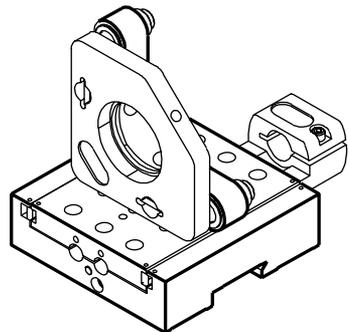
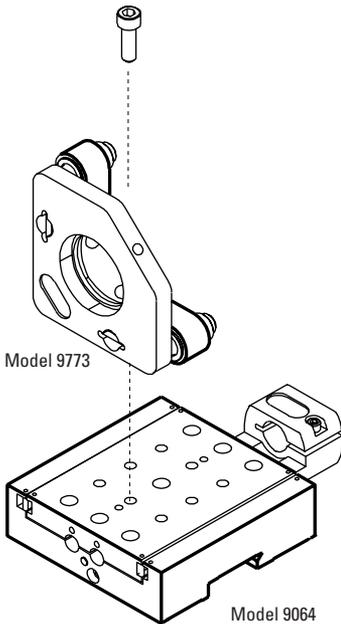
Modular Risers and Plates

<p>0.25" Modular Plate Model 9028</p> 	<p>0.5" Modular Riser Model 9026</p> 	<p>90° Adapter Model 9029</p> 
<p>Pint-Sized 0.25" Modular Plate Model 9038</p> 	<p>Pint-Sized 0.5" Modular Riser Model 9036</p> 	<p>Pint-Sized 90° Adapter Model 9039</p> 

Application Examples

Adding Tip and Tilt

Mirror mounts with through-hole mounting may be attached directly to a Model 9064 translation stage to add tilt axes to your system. (For pint-sized stages, use New Focus Model 988X pint-sized mirror mounts.)

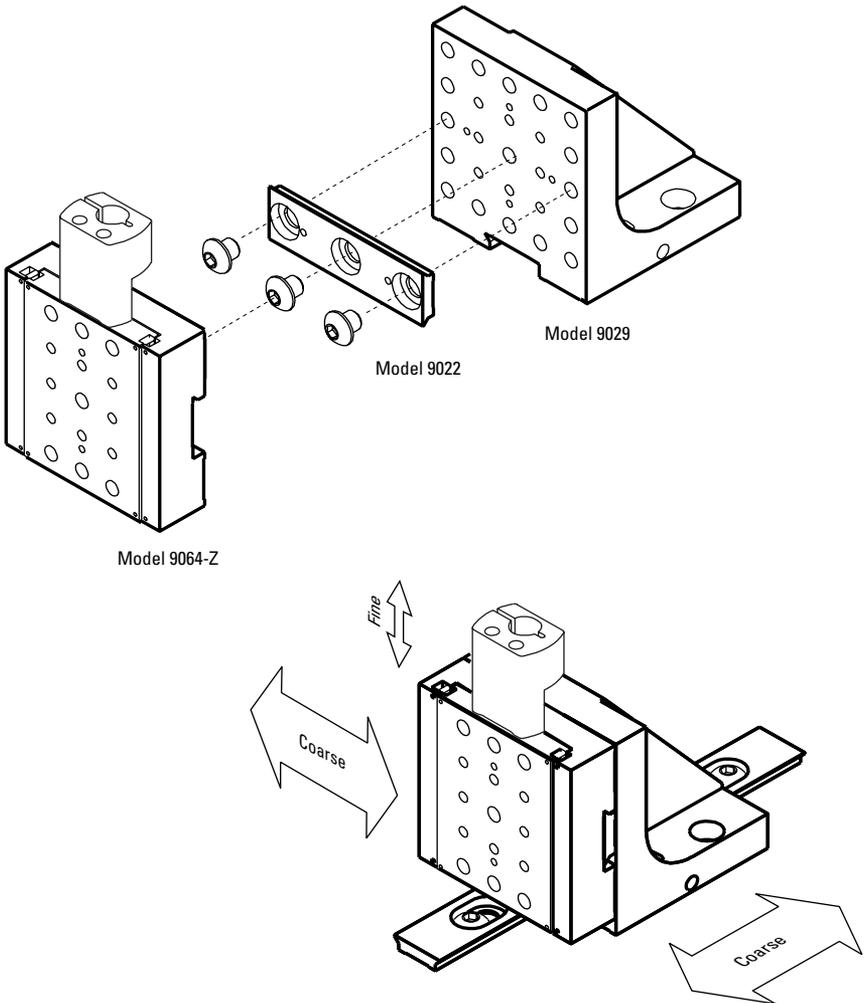


Building a Vertical Stage

When combined with the Model 9029 90° adapter, a single Model 9064 translation stage actually becomes a full XYZ stage, where the X and Y (or horizontal) axes are coarse, and the Z (or vertical axis) is fine. This same mounting scheme can also be used with our pint-sized mounts.

Note:

The micrometer clamp is mounted in the Z-axis configuration on the stage (see page 9).

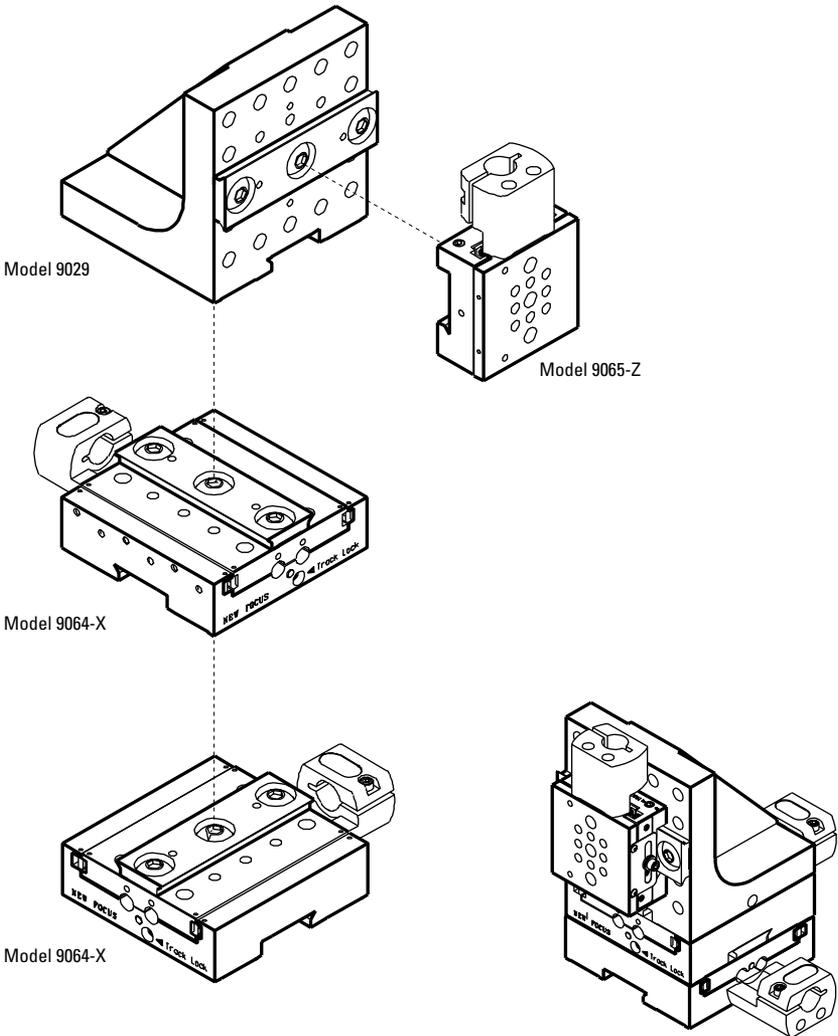


Building a Full XYZ Stage

A full XYZ stage with three axes of fine motion is created with three translation stages—you can mix full-sized and pint-sized stages—and one 90° adapter.

Note:

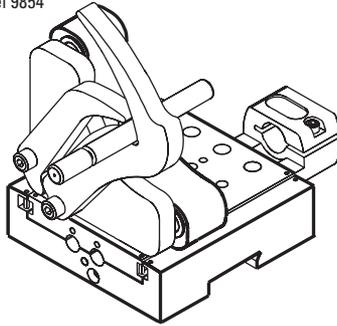
You may want to buy an additional e•z•Trac to attach the assembly to your table.



Aligning Fiber using the Opti-Claw™

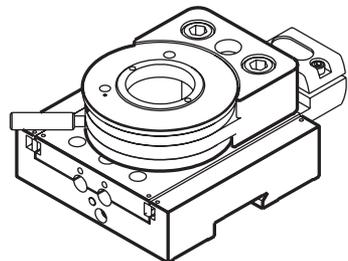
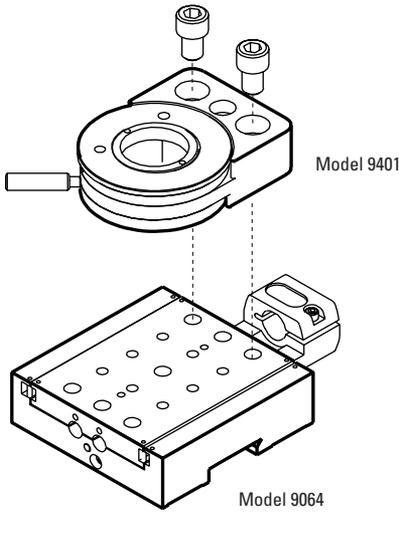
The New Focus line of Opti-Claw products can hold fiber chucks and other cylindrical objects. Combining them with our translation stages to achieve many axes of translation and tilt. Shown here is the Model 9854 Tilting Opti-Claw on the Model 9064 stage.

Model 9854



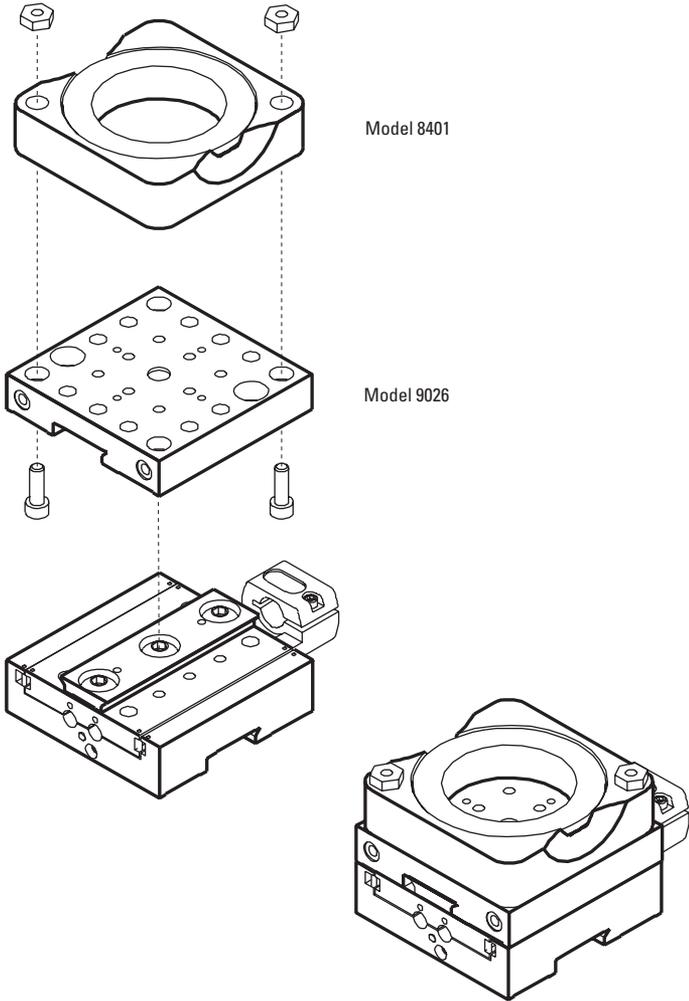
Adding a Rotational Axis

Bolt our Model 9401 rotary stage directly to the Model 9064 translation stage using two 1/4-20 (M6) Allen-head screws.



Adding a Motorized Rotary Stage

With a Model 9026 modular riser plate, our Picomotor-driven Model 8401 rotary stage may also be attached to the full-sized Model 9064 stage.

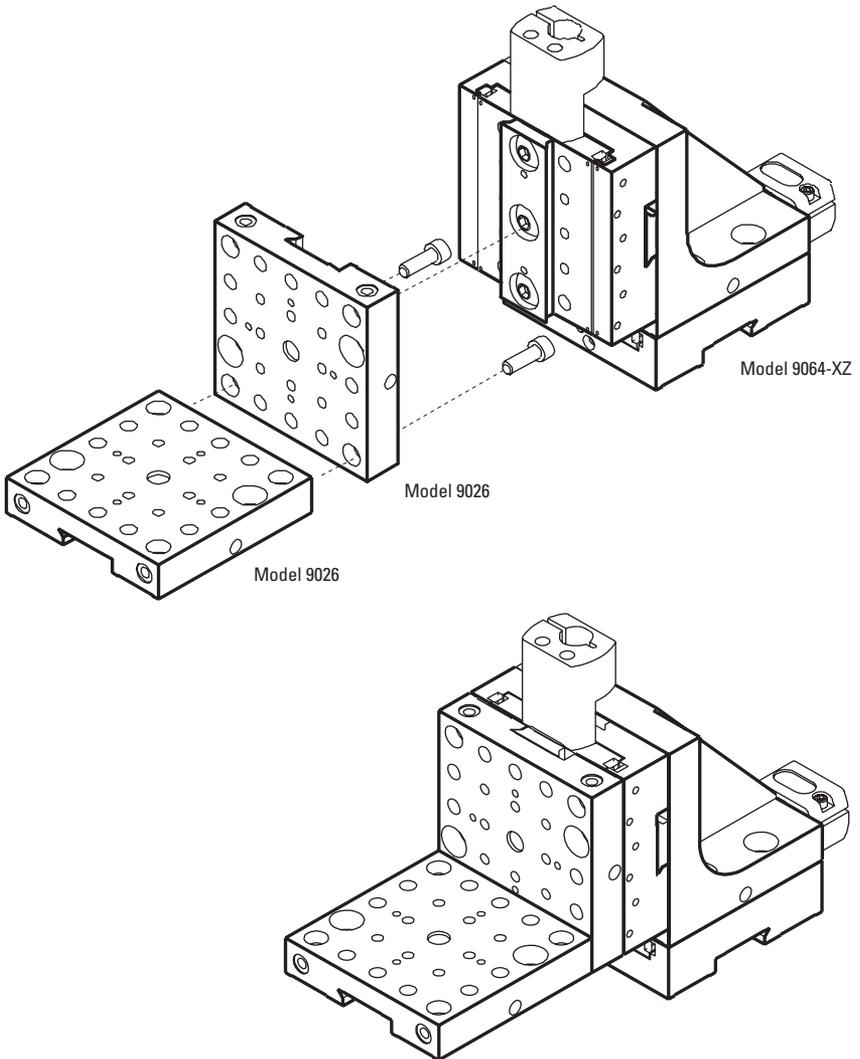


Horizontal Mounting using the Model 9026

With additional mounting holes on two edges, the Model 9026 modular riser plate is a particularly versatile accessory. If you need a horizontal mounting surface on a vertical translation stage you can combine two Model 9026 plates to form a right-angle bracket.

Note:

The pint-sized Model 9036 modular risers do not have mounting holes on their edges.

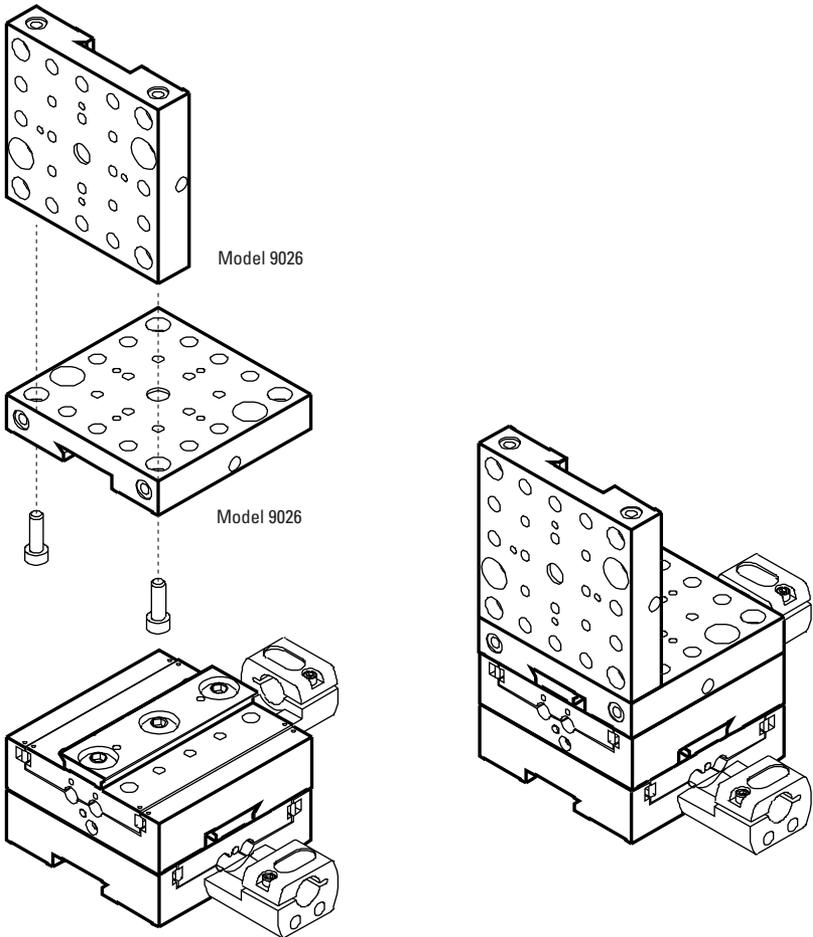


Vertical Mounting using the Model 9026

Combine two Model 9026 modular riser plates to form a vertical mounting surface. Reverse the vertical plate if you need to mount components over the center of the translation stage.

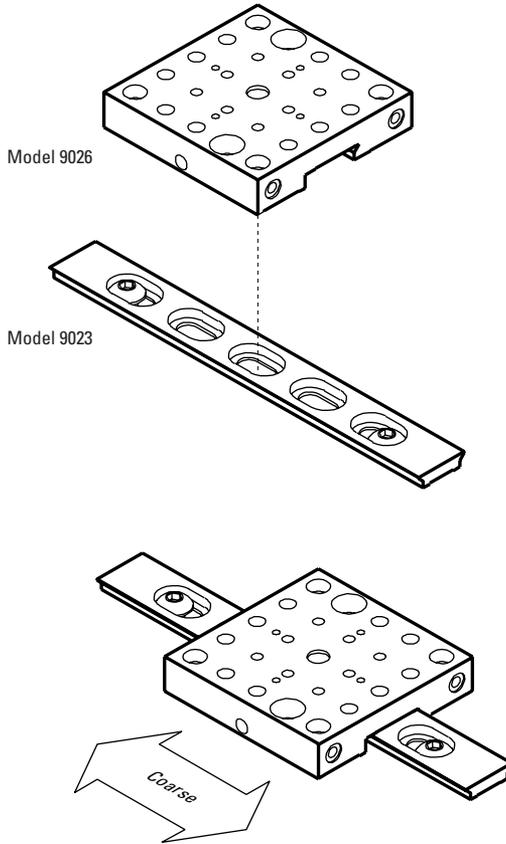
Note:

The pint-sized Model 9036 modular risers do not have mounting holes on their edges.



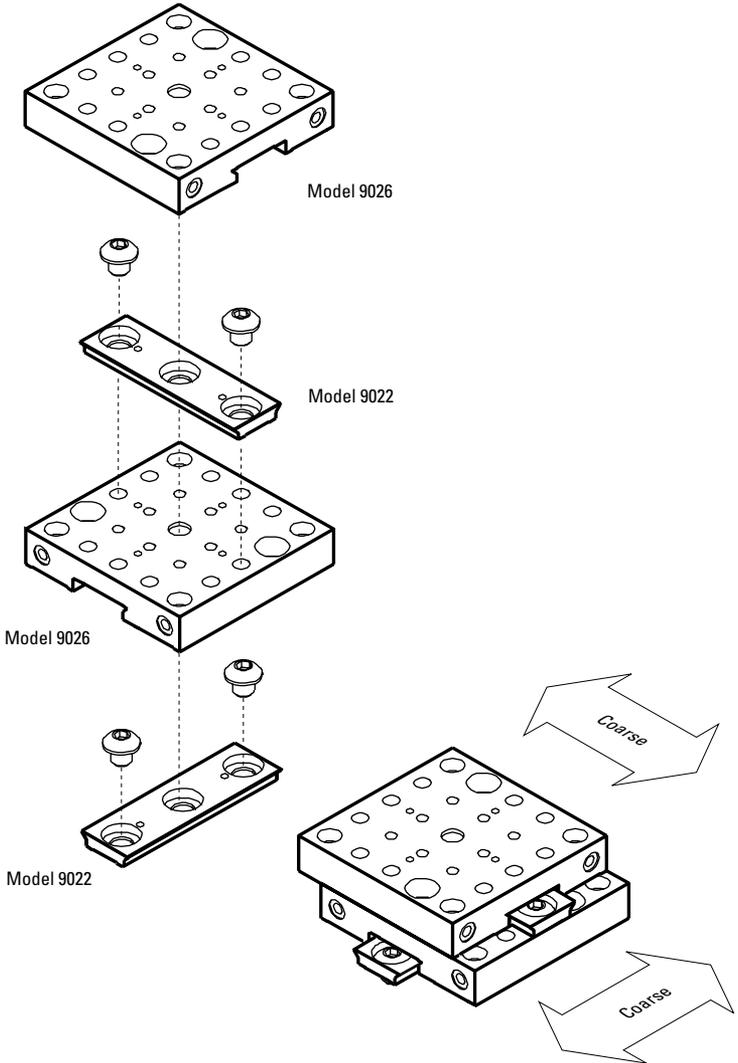
Coarse X Positioning using Accessories

The accessories in the Triple Divide line are useful even when they're not used with translation stages. For example, a Model 9026 modular riser plate combined with an e•z•Trac makes a coarse single-axis stage.



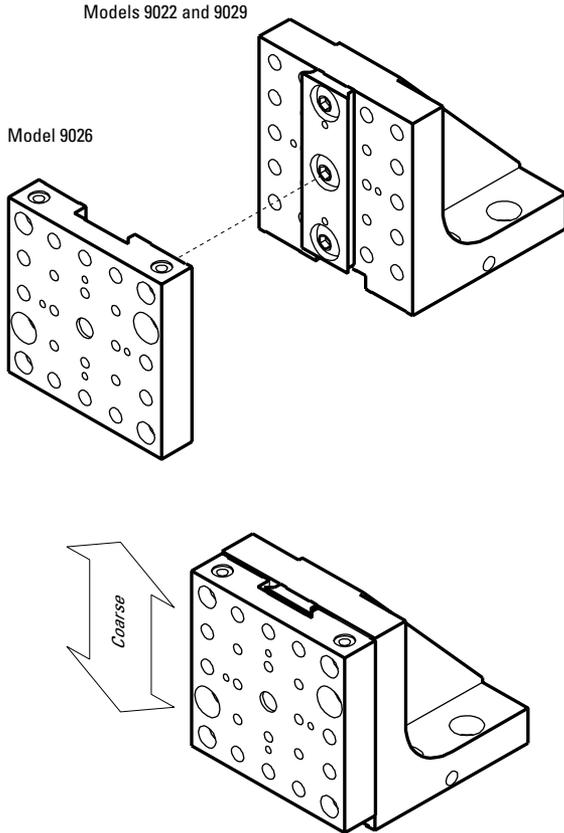
Coarse X-Y Positioning using Accessories

Any two modular riser plates can be attached with two e•z•Tracs to create a coarse XY stage.



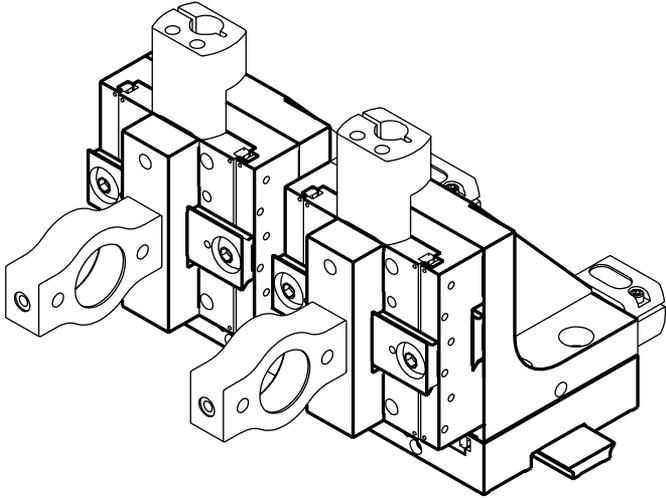
Coarse X-Z Positioning using Accessories

Combine a modular riser plate, an e•z•Trac, and a 90° adapter to get a coarse vertical stage.



Building Telescopes

This figure illustrates one of several ways to build a telescope with our Triple-Divide translation stages and associated accessories.

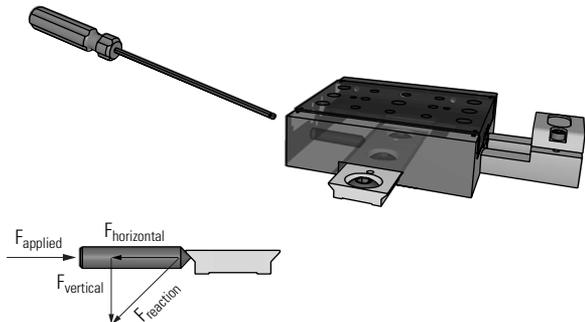


Triple-Divide Stability

Our Triple-Divide translation stages are as stable as other integrated XYZ stages, with the adaptability of a modular design.

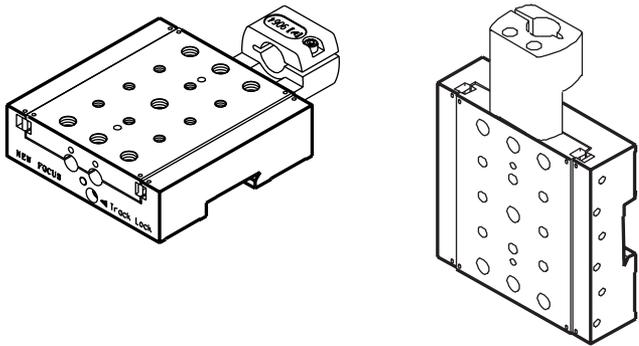
As the diagram below shows, the locking of these translation stages and accessories is accomplished with a cone-point setscrew acting on a dovetail-shaped steel rail, which we call the e•z•Trac. The sloped sides of the e•z•Trac transfer the horizontal thrust force of the setscrew into a vertical component. With a standard ball driver, the screw can easily exert a force of over 125 lbs (550 N), resulting in over 250 lbs (1100 N) of vertical force clamping the stage down.

The tremendous friction on the stage from the mounting surface and from the e•z•Trac keeps the stage from sliding along the long axis of the e•z•Trac. And since just two screws can keep the e•z•Trac itself locked down to an optical table with over 400 lbs (1780 N) of force, a stage locked to the e•z•Trac is highly resistant to torque in and out of the plane of the table, as well.



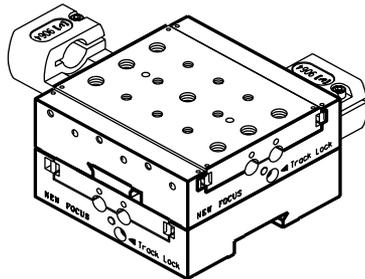
Standard Configurations

Model 9064-X, Z, and 9065-X, Z



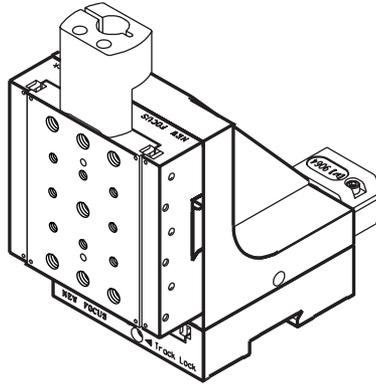
These are the basic units of our Triple-Divide line. In the z-axis configuration, any load on the stage rests on the micrometer and not on the springs.

Model 9064-XY and 9065-XY



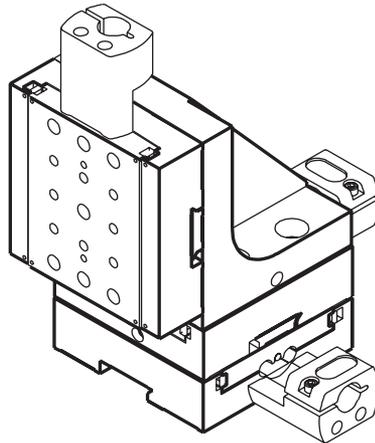
To convert between left and right configurations, loosen the Trac-Lock screw, flip the upper stage around, and lock it down again.

Model 9064-XZ and 9065-XZ



The vertical axis of the XZ stage comes with the micrometer clamp already reversed into position, so that the actuator bears the weight of objects mounted to the stage. See page 11 to see how this is done.

Model 9064-XYZ and 9065-XYZ



Like the XY stage, converting between left- and right-handed versions takes only a few seconds.

Specifications

Full-Sized (2.5") Triple-Divide Characteristics

Model #	9064-X	9064-Z
Style	X-Translation Stage	Z-Translation Stage
Travel	1.1" (28 mm)	1.1" (28 mm)
Resolution	<0.5 μm	<0.5 μm
Straight-Line Accuracy	<2.5 μm	<2.5 μm
Max. Normal Load	20 lbs (88 N)	20 lbs (88 N)
Orthogonality	-NA-	-NA-

Model #	9064-XY	9064-XZ	9064-XYZ
Style	XY-Translation Stage	XZ-Translation Stage	XYZ-Translation Stage
Travel	1.1" (28 mm)	1.1" (28 mm)	1.1" (28 mm)
Resolution	<0.5 μm	<0.5 μm	<0.5 μm
Straight-Line Accuracy	<2.5 μm	<2.5 μm	<2.5 μm
Max. Normal Load	20 lbs (88 N)	20 lbs (88 N)	20 lbs (88 N)
Orthogonality	<1 mrad	<1 mrad	<1 mrad

Pint-Sized (1.5") Triple-Divide Characteristics

Model #	9065-X	9065-Z
Style	X-Translation Stage	Z-Translation Stage
Travel	0.55" (14 mm)	0.55" (14 mm)
Resolution	<0.5 μm	<0.5 μm
Straight-Line Accuracy	<3 μm	<3 μm
Max. Normal Load	12 lbs (53 N)	12 lbs (53 N)
Orthogonality	-NA-	-NA-

Model #	9065-XY	9065-XZ	9065-XYZ
Style	XY-Translation Stage	XZ-Translation Stage	XYZ-Translation Stage
Travel	0.55" (14 mm))	0.55" (14 mm)	0.55" (14 mm)
Resolution	<0.5 μm	<0.5 μm	<0.5 μm
Straight-Line Accuracy	<3 μm	<3 μm	<3 μm
Max. Normal Load	12 lbs (53 N)	12 lbs (53 N)	12 lbs (53 N)
Orthogonality	<2 mrad	<2 mrad	<2 mrad

Customer Service

Technical Support

Information and advice about the operation of any New Focus product is available from our applications engineers. For quickest response, ask for “Technical Support” and know the model and serial numbers for your product.

Hours: 8:00–5:00 PST, Monday through Friday (excluding holidays).

Toll Free: 1-866-NUFOCUS (1-866-683-6287)
(from the USA & Canada only)

Phone: (408) 284-6808

Support is also available by fax and email:

Fax: (408) 980-8883

Email: techsupport@newfocus.com

We typically respond to faxes and email within one business day.

Service

In the event that your New Focus product malfunctions or becomes damaged, please contact New Focus for a return authorization number and instructions on shipping the unit back for evaluation and repair.

