

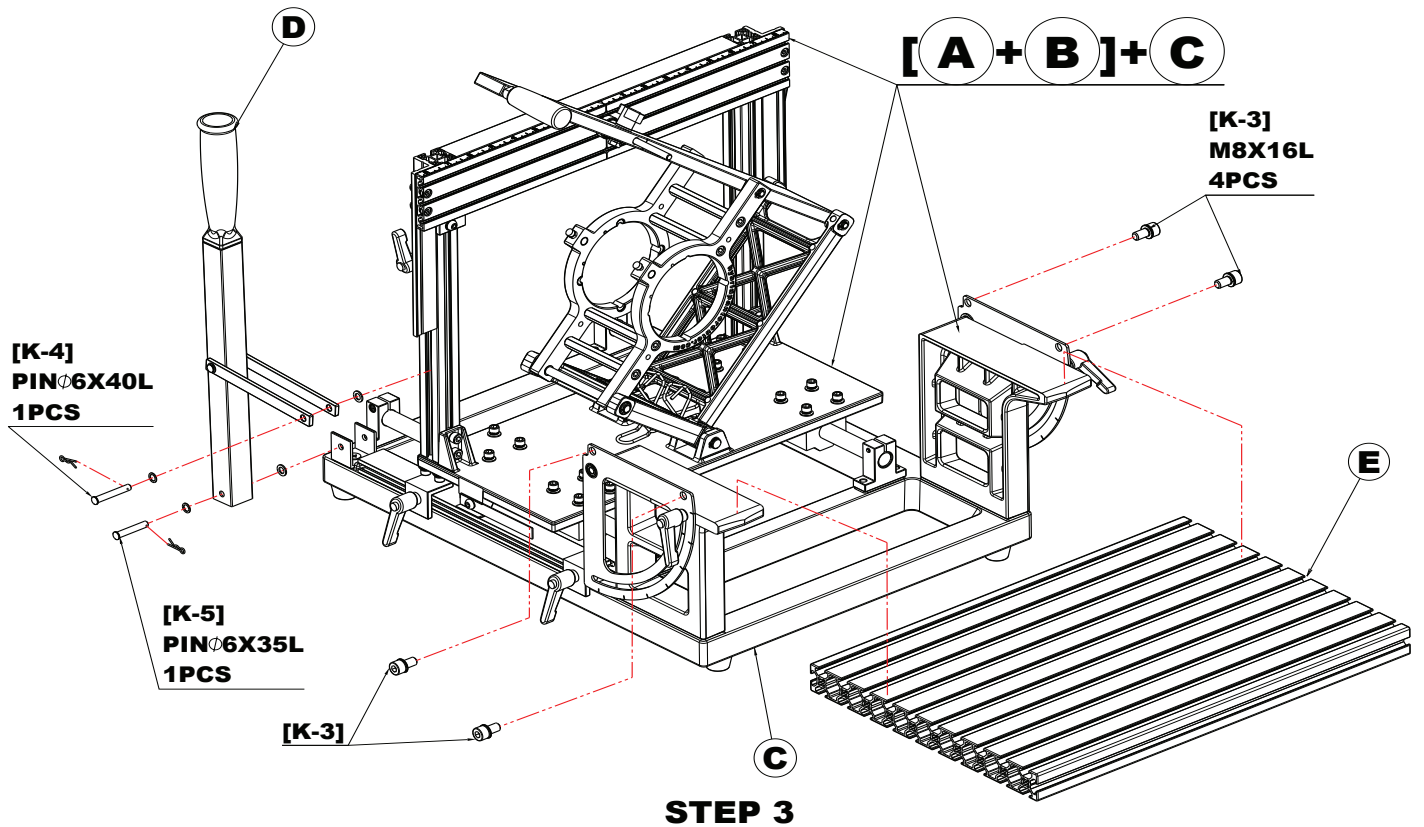
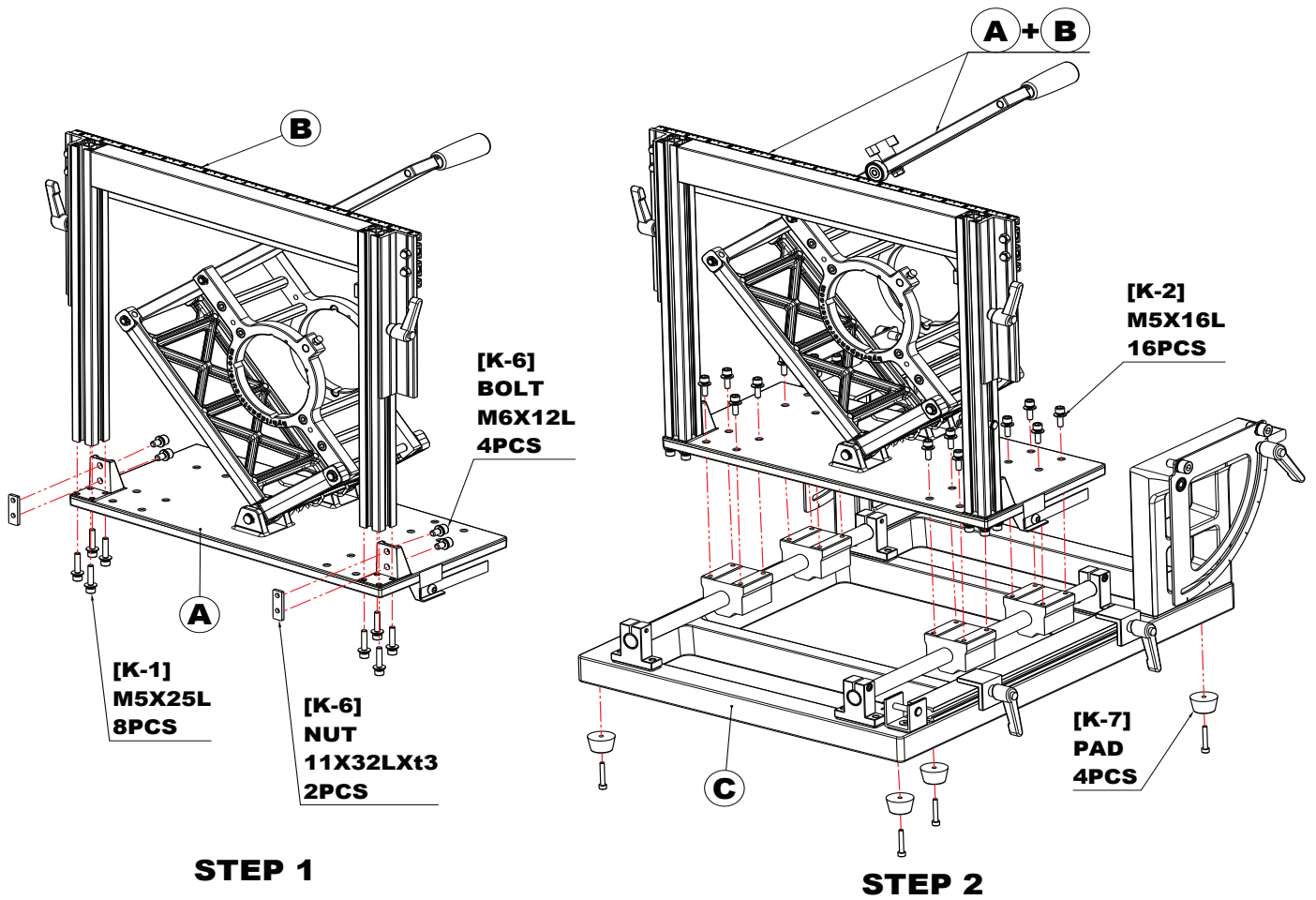


Assembly Guide



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General Assembly Diagram



SAFETY:

Woodworking is inherently dangerous. There are hazards inherent to using the PantoRouter™ and many other tools in the shop, whether operated by hand or electric power. Some of these hazards are discussed below. Use common sense when operating the PantoRouter™ and all woodworking tools, and use this tool in accordance with the instructions. **YOU ARE RESPONSIBLE FOR YOUR OWN SAFETY.**

Read and understand the Assembly Guide, the How-To Guide and the Warning Label on the PantoRouter™. Failure to follow instructions or heed warnings may result in electric shock, fire, serious personal injury or property damage. Save these instructions and refer to them whenever necessary.

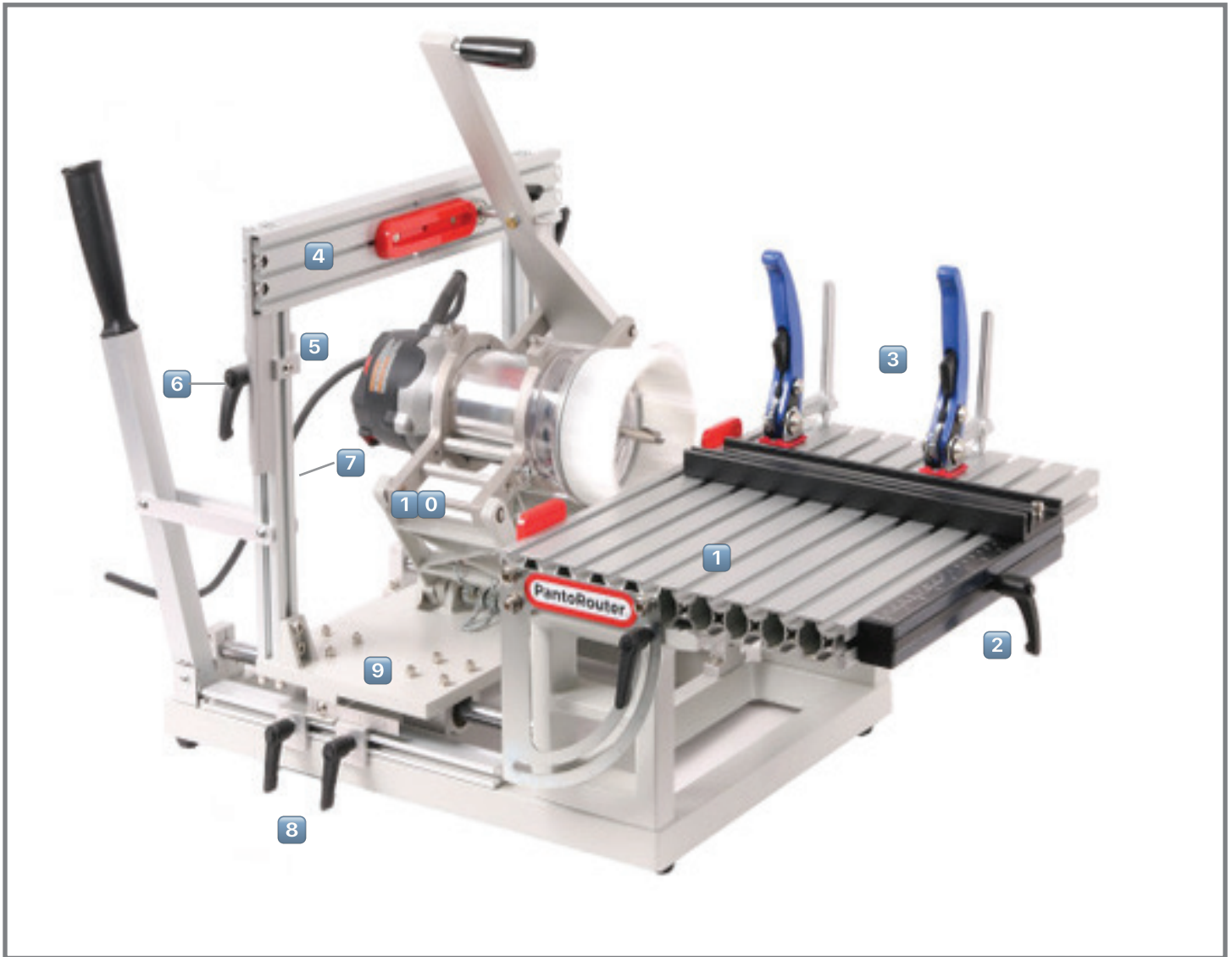
Warning: This product can expose you to chemicals including wood dust, which is known to the State of California to cause cancer. The exposure can come from drilling, sawing, sanding or machining wood products. For more information go to www.P65Warnings.ca.gov/wood. In addition, some types of dust created by sawing, sanding, grinding, milling, drilling and other construction and woodworking activities also contain chemicals known to cause cancer, birth defects or other reproductive harm. In addition, wood dust has been listed as a known human carcinogen by the U.S. government. The risk from exposure to these chemicals and to dust varies depending on how often you do this type of work. To reduce your exposure, work in a well ventilated area and work with approved safety equipment including dust collection, properly fitted dust masks or respirators designed to filter out such dust and chemicals.



TO REDUCE THE RISK OF INJURY, THE USER MUST:

- READ AND UNDERSTAND THE OPERATOR'S MANUAL BEFORE OPERATING PRODUCT.
- WEAR EYE PROTECTION, EARPLUGS AND DUST MASK.
- DO NOT WEAR GLOVES, NECKTIES, JEWELRY OR LOOSE CLOTHING. CONTAIN LONG HAIR.
- KNOW HOW TO SHUT OFF ROUTER IN AN EMERGENCY.
- DISCONNECT ROUTER FROM POWER SOURCE BEFORE SERVICING OR CHANGING ROUTER BIT.
- DO NOT ADJUST THE ROUTER UNTIL IT HAS BEEN DISCONNECTED FROM POWER.
- SECURELY MOUNT THE ROUTER IN MOUNTING BRACKET BEFORE TURNING POWER ON. IF ROUTER MOTOR CANNOT BE SECURELY MOUNTED AS DESCRIBED IN THE ASSEMBLY INSTRUCTIONS, DO NOT USE THE PANTOROUTER.
- CLAMP MATERIAL TO BE CUT SECURELY TO PLATFORM BEFORE STARTING ROUTER.
- KEEP HANDS AND CLOTHING AWAY FROM SPINNING ROUTER BIT.
- DO NOT OPERATE THIS MACHINE WHILE UNDER THE INFLUENCE OF ALCOHOL OR DRUGS.
- WHEN SERVICING, USE ONLY IDENTICAL PARTS.
- FAILURE TO COMPLY WITH THESE WARNINGS MAY RESULT IN SERIOUS PERSONAL INJURY

Basic Components of the PantoRouter™



1. Table
2. Centering Scale Fence
3. T-Slot Lever Clamps
4. Template Holder
5. Thickness Gage
6. Template Holder Locking Lever
7. Template Holder Support Frame
8. Depth Stops
9. Pantograph Carriage
10. Pantograph

PantoRouter™ Assembly Guide

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We thank you for your PantoRouter™ purchase and we hope you find great pleasure in creating all kinds of traditional and innovative joinery. There's no better jig for mortise and tenons, box joints and machine-cut dovetails, but this is just the beginning of the tasks you can master with the PantoRouter™.

Your PantoRouter™ experience starts with a few minutes of assembly then grab our How-To Guide for basic instruction and some ideas to help you get started.

First, open the KITS box where you'll find all of the fasteners and hex wrenches. Together with this guide, you should be up and PantoRouting in short order.

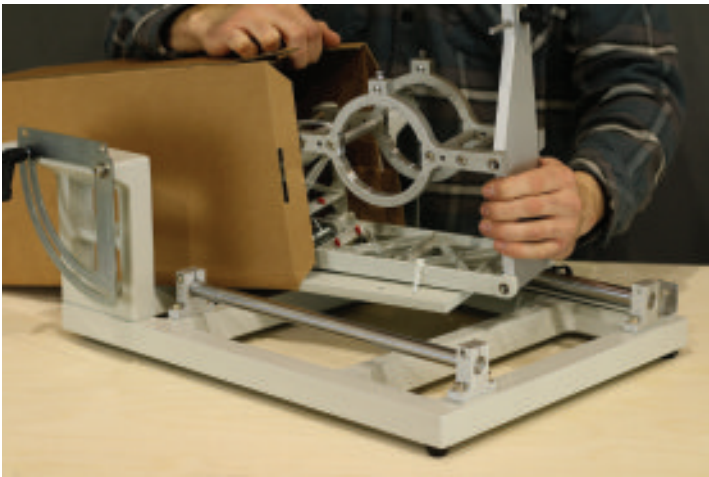
Inspect the pieces for any possible shipping damage then lay them out and refer to the diagram to get a good idea of how they'll all fit together.

Kits K-1 and K-6 contain the screws for mounting the template holder frame to the pantograph carriage, and K-2 contains the screws to secure the carriage to the glide-shaft bearings.

Open K-1, K-2, K-6 and K-8; the hex wrenches you'll need for assembly.

We recommend using the supplied hex wrenches or similar hand-held wrenches. Using a drill or impact driver for assembly can over-drive screws or strip threads.





Remove the pantograph carriage from Box-A but don't cut the nylon tie straps yet.



Check the machined surfaces to make sure they're clean and smooth. If needed, remove paint but don't use sand cloth. A sharp blade will clean the surface in a few seconds.



Loosely thread the K-6 cap screws into the nut plates on both sides.



Slide the template holder frame (B) into place with the nut plates in the slots on both sides then snug but don't tighten the cap screws.

Hand-thread the eight K-1 cap screws through the pantograph carriage (A) and into the template holder support frame (B).

Tighten the cap screws using the hex wrench provided.





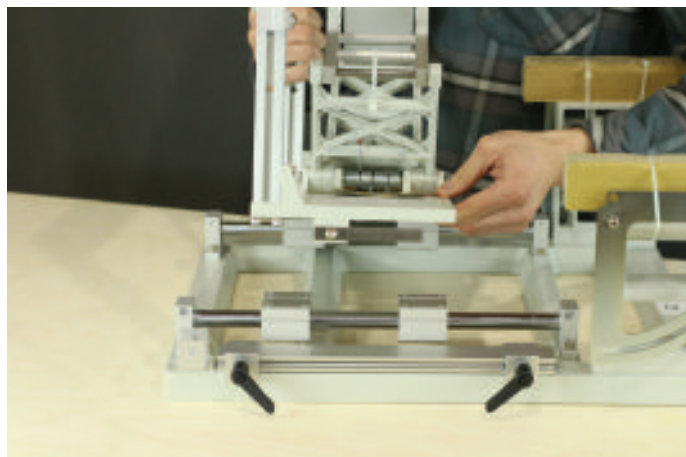
Using the hex wrench provided in Kit-8 tighten the cap screws to the plate nuts to secure the template holder frame. Clip the wire ties to access these cap screws.



Install the rubber feet to the bottom of the base frame without over-compressing the rubber.



Clean the machined landing pads from the underside of the pantograph carriage if needed.



Position the pantograph carriage on the glide-shaft bearings and align the screw holes. You might need to relocate the depth stop angles for the depth stop post to clear.

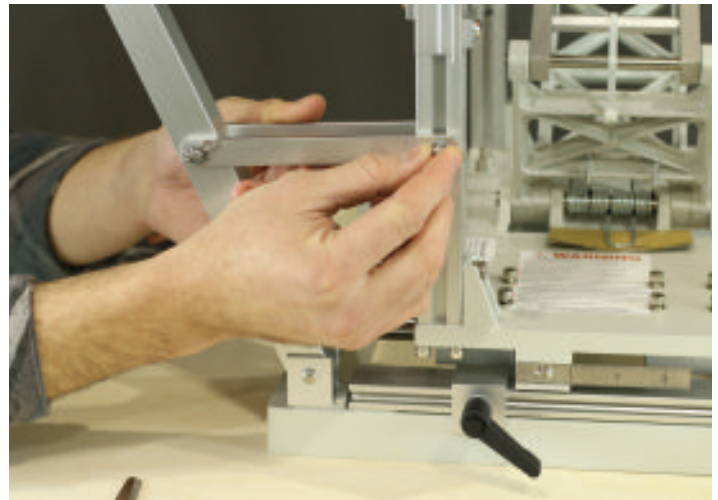


Tighten all 16 screws to secure the pantograph carriage to the glideshaft bearings.

The carriage should now move freely on the glide shafts.



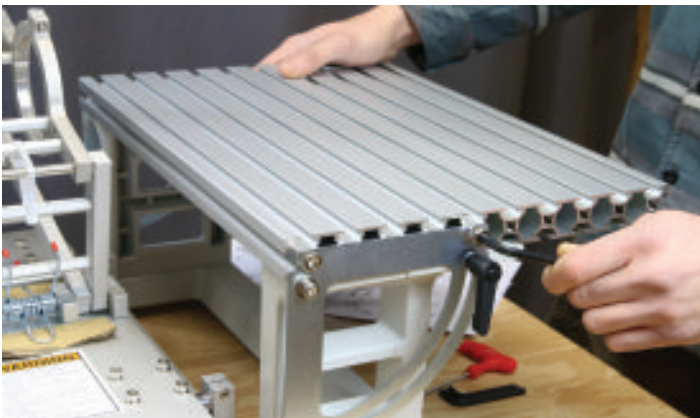
Insert pin K-5 through the plunge lever bracket as shown with a washer on both sides. Secure with locking clip. Note the K-5 pin is shorter than K-4.



Insert K-4 through the plunge lever arms and template holder support post using a washer on both sides and lock with the clip. The lever should now control the movement of the pantograph carriage.



Loosen and move the depth stops if necessary to feel the full range of motion.

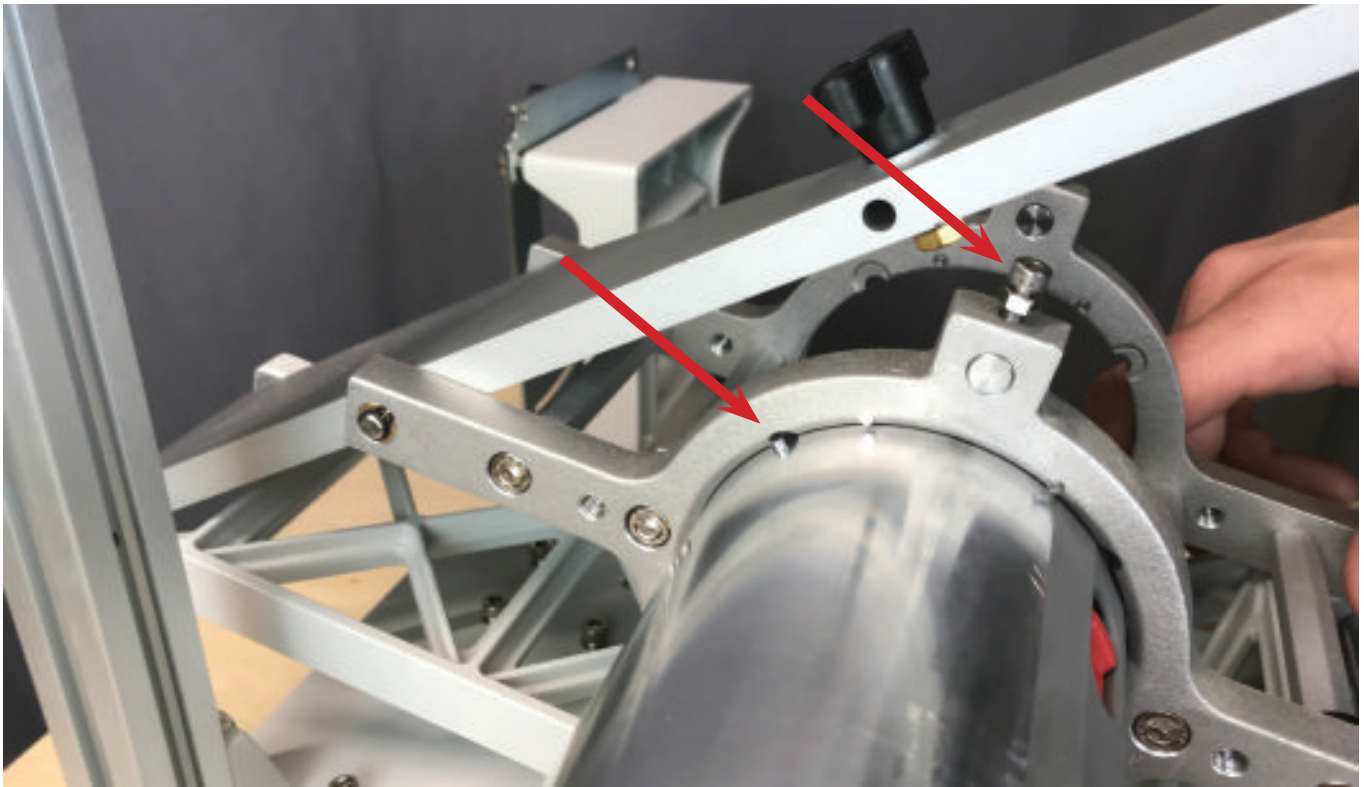


Check the two table supports to be sure they're clean and no debris is between the table and the support then hand-tighten all four table mounting cap screws (K-3) Next, secure the table to the protractor by tightening the four screws.

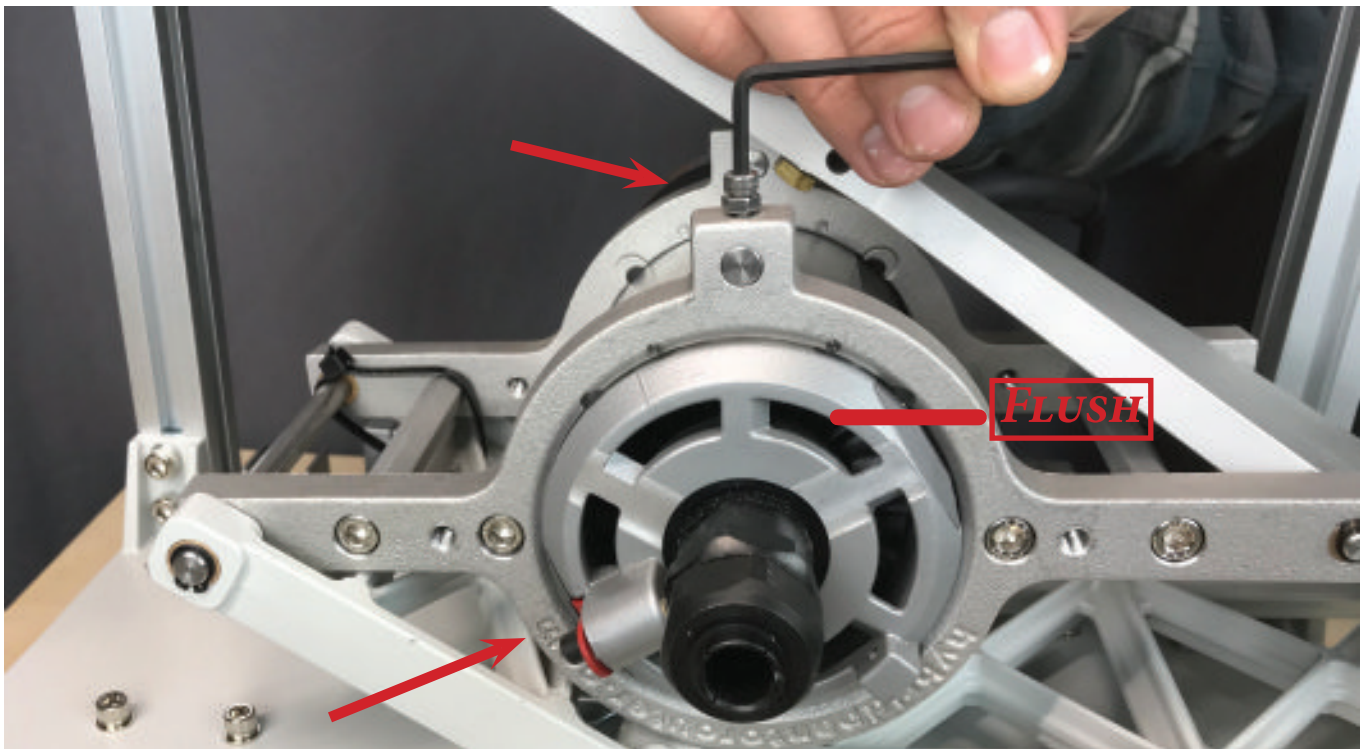
You can now loosen both protractor lever knobs and test the tilting table.



The Porter Cable 8902 router supplied with our Pro-Pack has a rack gear that is not used with the PantoRouter. Remove the two small screws and the gear. Do not remove the two pins pressed into the side of the router. The router mounts have notches to allow the router to pass through with the pins in place.



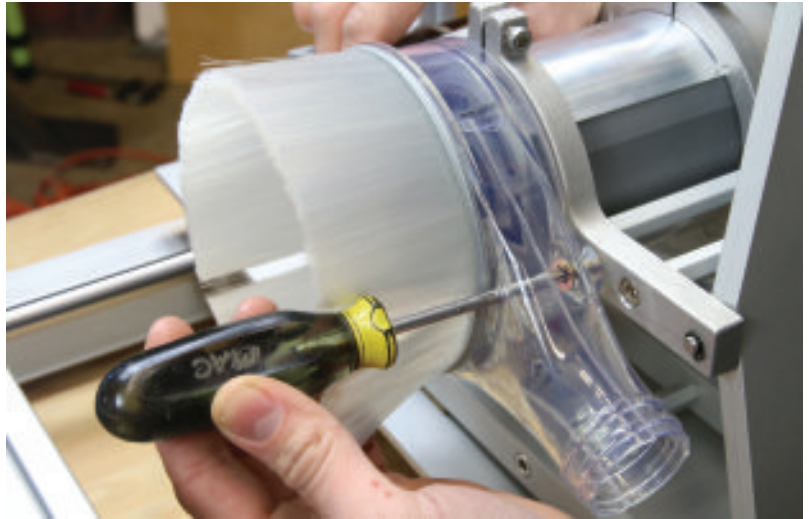
Loosen the two router mount cap screws but don't remove them. Align the pin with one of the slots in the rear router mount and slide the router through both router mounts. There are slots in the front router mount, but the router pins will not go that far.



Push the router forward until the full dimension of the router body is just flush with the front face of the router mount.

Rotate the router so the rotor lock button is aligned with the “m” in www.hybridpantorouter.com cast into the router mount. Tighten both router mount cap screws and locking nuts.

The dust collector hood attaches using two different screws. The countersunk screw goes on the discharge port side of the router mount. Use a small shaft screwdriver or hex driver through the access hole to tighten it.



The round head machine screw (hex) secures the other end as shown. If the router is mounted correctly the operator can access the router rotor lock button through the opening for single-wrench bit changes.



We recommend using a hose that fits over the discharge port, not inside it. It helps to soften the hose cuff by holding it under hot tap water. It should slip right onto the dust collection hood and as it cools it will grip tenaciously.

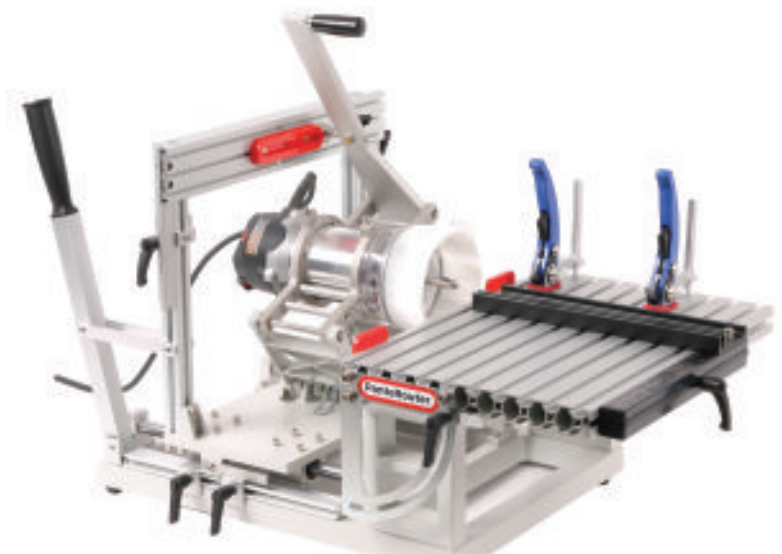
You can now remove the remaining nylon tie strap and cardboard cushions from the pantograph assembly.

Now that the basic assembly of the PantoRouter is complete continue on for directions to:

1. Calibrate the Template Holder
2. Setup and use the thickness gage
3. Scribe the centerline on the table
4. Assemble the centering-scale fence.

The How-To Guide has instructions and tips for mortise and tenon, box joints and variably-spaced dovetails. It also contains a chart showing bit and guide bearing combinations for different sized joints.

Most of the innovations added to the PantoRouter over the years have been in response to suggestions from our customers. We welcome your feedback and questions via email, phone or our website forum.



Happy PantoRouting!

Calibrate the Template Holder

The template holder frame assembly is aligned at the factory but can shift slightly in transit so the following procedure might be necessary to bring it back into perfect alignment. Check alignment using a square before loosening the screws to see if adjustment is needed.

Many people can feel variation of about a thousandth of an inch (0.025mm), so aligning by touch is often adequate.

If adjustment is needed, loosen the screws holding the template holder frame cross rail to the frame posts. There are two holes on each side to access these screws.

Flush the top, front and back of the cross rail to the post and be sure the assembly is square. Re-tighten the screws on both sides.

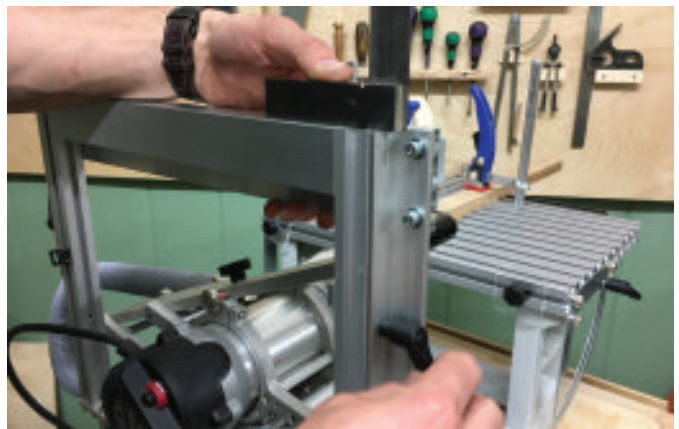
Alignment of the template to the pantograph and table is critical for accurate joinery. The template holder must be perfectly square to the frame and must slide freely on the posts. Adjusting it is quick and easy using the following method.

Inspect the template holder, checking for any sharp edges. Relieve edges with very fine sand cloth or a diamond file if necessary and you can wax the surfaces to lubricate.

Mount the template holder with the four screws on the sliders loosened. Tighten the lever knobs when the sliders are flush with the top of the posts.

Align the template holder to the top of the posts then tighten the four screws.

The template holder should now slide up and down freely and it should stay aligned to the template holder support frame.



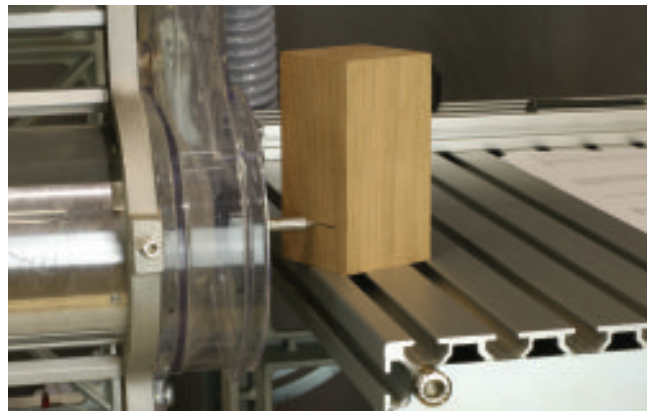
The template must be coplanar to the table (and the workpiece) in order to produce high quality joinery. This can be quickly checked after the template holder and template holder support frame have been squared and trued.

Cut a setup block from a piece of fine grain wood so it's square on the end then stand it up on the operator's side of the table. A piece about 1.5" X 1.5" X 3" works well.

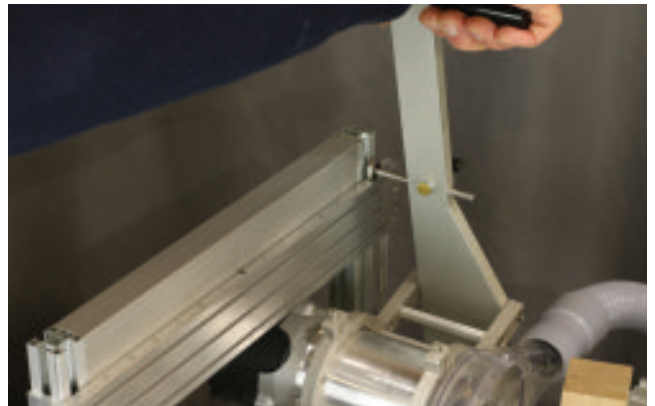
Mount your centering jig (pointer) in the router and lock a guide bearing so it rides the top of the template holder. Rest the template holder on top of the thickness gage and lock both template holder slider locks. If the thickness gage is not set yet, lock the template holder with the centering jig about an inch above the table.



Scribe a small line (1/2" or so) in the setup block as shown. We highlighted the line with pencil for clarity. It's easiest to see the line when you're scribing across the side grain.



Move the guide bearing to the far side of the template holder, which moves the centering jig across the table. Scribe a second line next to the first.



The two scribe marks should be identical or very nearly so. If they are off by more than the width of the scribe line, shims will be required under the glide shaft mounts on the low side.



CALIBRATE THE PANTOROUTER™ FOR ULTRA PRECISION

If your centering jig test indicates a difference from one side of the table to the other, please follow the procedure here to calibrate your PantoRouter for precision operation every time. This only needs to be done once.

Please go back to the first assembly steps to be sure the paint was removed if there was any. Paint between the machined surfaces could lift them slightly.

Next, recheck the alignment of the template holder and template holder support frame. The frame ends are milled to very close tolerance so again, if all of the milled surfaces are mating well, they should be aligned and square.

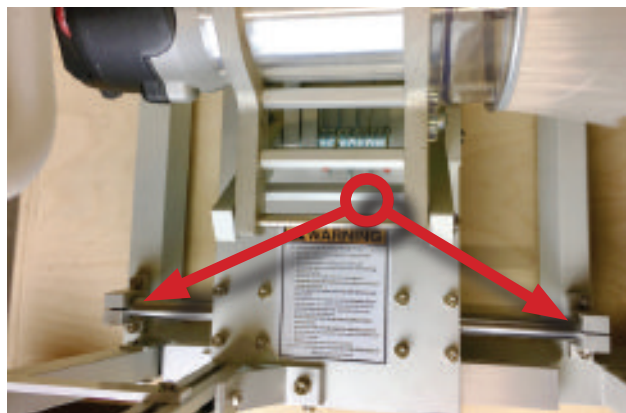
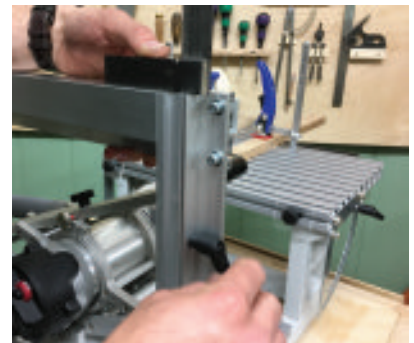
Provided the machined surfaces are mating correctly, there are two common reasons the PantoRouter might need to be adjusted when first assembled.

- 1- The table could be slightly high on one side
- 2- The router motor is not perfectly concentric

Loosen all four cap screws on the table and loosen the locking knobs and the protractor bearing screws. Make sure there's nothing under the table, between the table and the two side supports then carefully re-tighten all of the screws and locking knobs. It's good practice to go around the table snugging all screws half way then go around again to tighten them fully.

Router motors do not need to be perfectly concentric for normal router functions so it's not a high priority for the manufacturer. For our use, we need to keep it centered to the table and templates so there's an easy way to fix it.

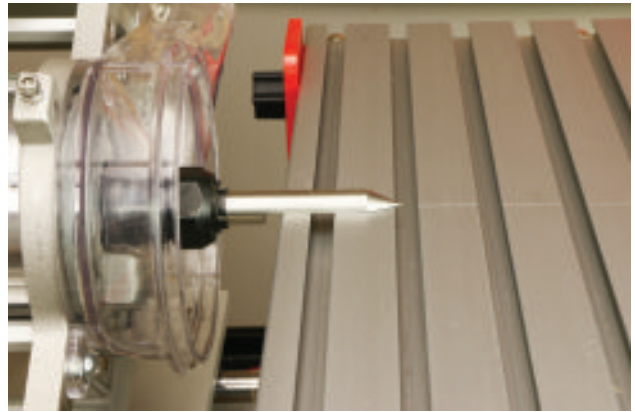
Loosen the Glide Shaft Mounts on the low side and slip a shim under each mount. Always use the same number under each mount to be sure the pantograph is raised evenly. Retest and it should be dead-on! We have provided a set of stainless steel shims but if more are needed, brass or any other durable material can work.



Setting the Thickness Gage



Insert one of the 6mm guide bearing shafts into the center hole of the template holder. You can use a template, as long as the shaft goes all the way through the template into the center hole of the template holder.



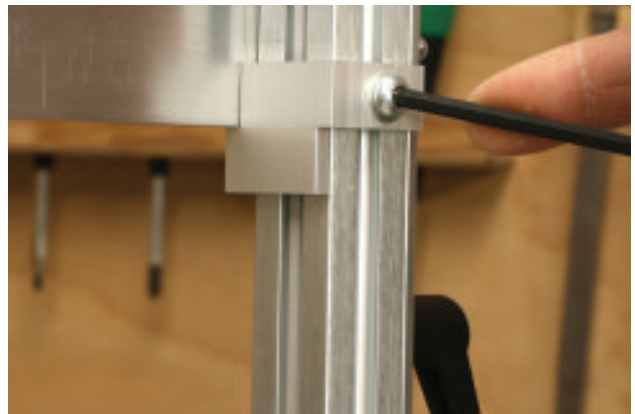
Chuck the Split Shaft Centering Jig in the router and tighten the collet. Lower the template holder until the split-shaft centering jig just touches the table. Lock both sides of the template holder.



Move the thickness gage up to contact the underside of the template holder and tighten the hex screw.



Lower the second angle onto the thickness gage. This is a reference in case you ever want to move or change the position of the thickness gage.





Using the thickness gage, mortises and tenons are located in the center of the workpiece regardless of the thickness of the board. Rest the workpiece on the thickness gauge and lower the template holder rail to contact the top surface of the workpiece. Lock the template holder in place and the bit should cut the mortise or tenon in the center of your workpiece.

If the mortise or tenon is slightly off center you can micro-adjust the thickness gage by moving it up or down as needed. Measure both shoulders of a mortise and adjust the thickness gage until the two shoulders are dead on.

Micro-Adjusting the Thickness Gage



Start with a piece of hardwood over 1" thick. Mill it parallel on all four sides.

Mark the top of your workpiece, then make your first mortise with a 1/4" bit.

Measure the shoulders then move the gage up or down as needed by the difference between the two measurements.

Make your second mortise cut with a 3/8" bit so it's in the same slot as the first cut.

Measure, adjust, then make your third cut if needed using a 1/2" bit. With this method you won't have wasted good wood.

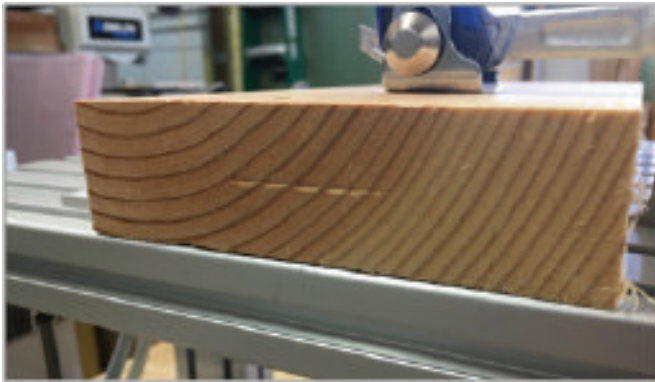
Locate your end clamp for this test so it's not directly over your mortise cut. As the shoulder gets thinner, the clamp can deflect the wood. It's a good idea to make your test mortises about 3/4" deep.

If adjustment is needed, loosen the template holder locking levers and raise the template holder to raise the split shaft. A feeler gage will help to control the distance raised.

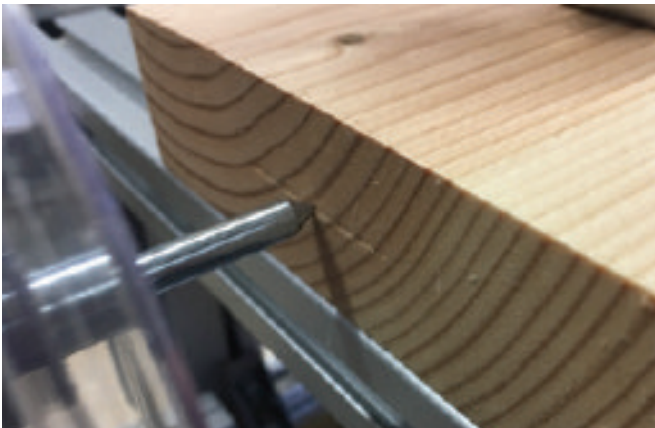


Setting the Thickness Gage - Method 2

Centering joinery in your workpiece vertically is easily done on the PantoRouter using the built-in thickness gage. Once adjusted it is fast, accurate and repeatable.



Start by marking the center of a workpiece.



Install a centering jig (pointer) in the router in place of a bit. Loosen the template holder locking levers and move the router mount so the centering jig is at the centerline of the workpiece. Lock the template holder on both sides.



Locate one of the mortise and tenon templates at the zero mark side-to-side and in the center slot of the template holder. The templates are easily centered using a 6mm shaft through the template into the template holder centering hole. Lock the shaft.



With the template holder locked in place and the guide bearing shaft holding the pantograph on center, hold the workpiece under the template holder horizontal rail and slide the thickness gage up so it contacts the bottom of the workpiece. Tighten the locking screw securely.

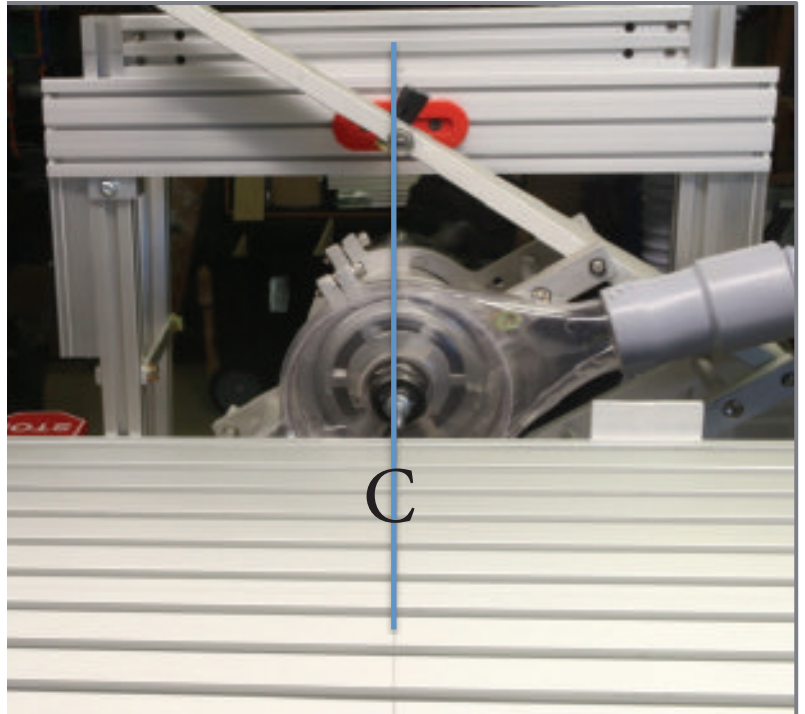


Slide the second angle down to contact the thickness gage angle and lock it in place. This one serves as a placeholder in case you need to move the thickness gage. You can drop (lower) the thickness gage angle down and out of the way of the template holder then bring it back into position without having to go through the whole setup process again. You can also use this second angle when adjusting the thickness gage for precision.

Finding and Marking the Table Centerline

All operations on the PantoRouter work from the center of the table. Finding and marking center is only done once and is quick and easy using our split-shaft centering jig and centering scale fence.

Following this section is a legacy method that doesn't use the split-shaft centering jig in case you don't have one.

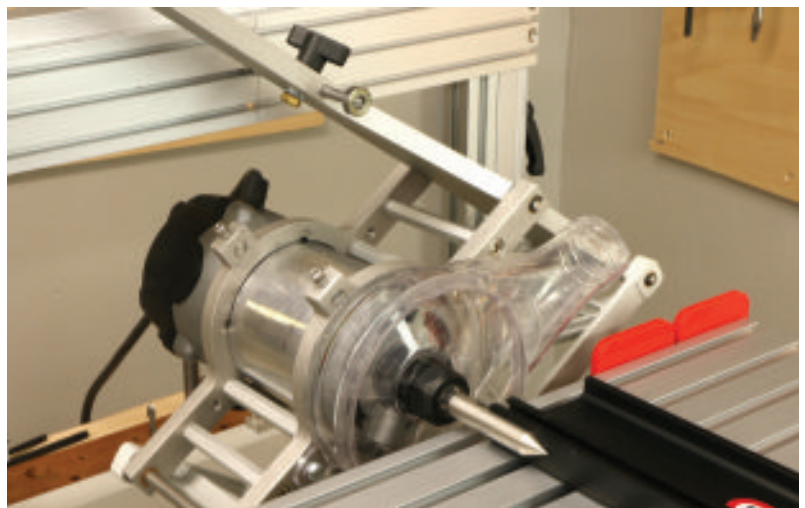


Insert a guide bearing shaft in the enter hole of the template holder with or without a template in place.

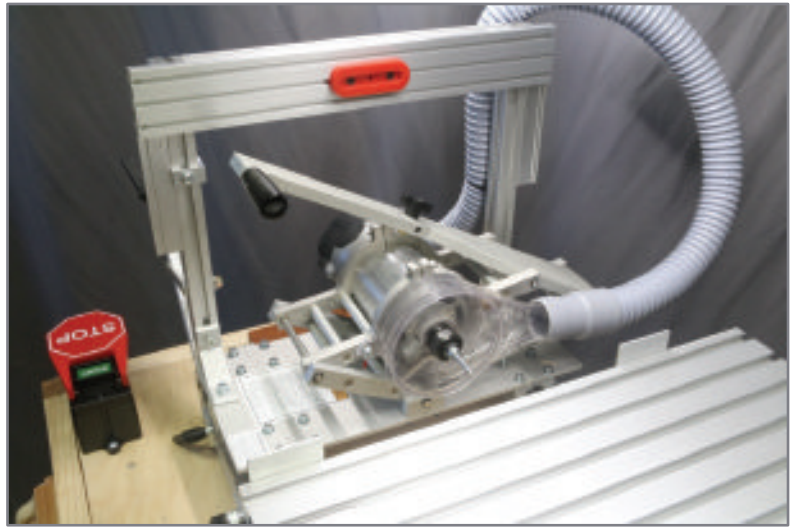
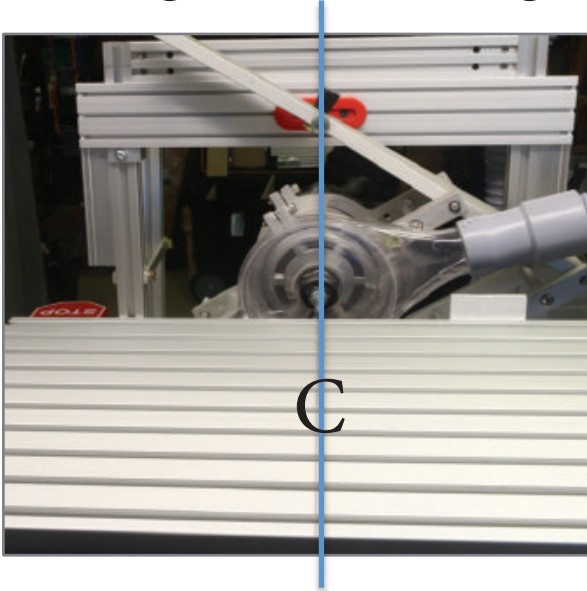
Raise the template holder so the collet clears the table then align the centering scale fence with the split side of the shaft.

Draw a pencil line down the center using the centering scale fence as your guide. Extend the line to the front of the table using a square.

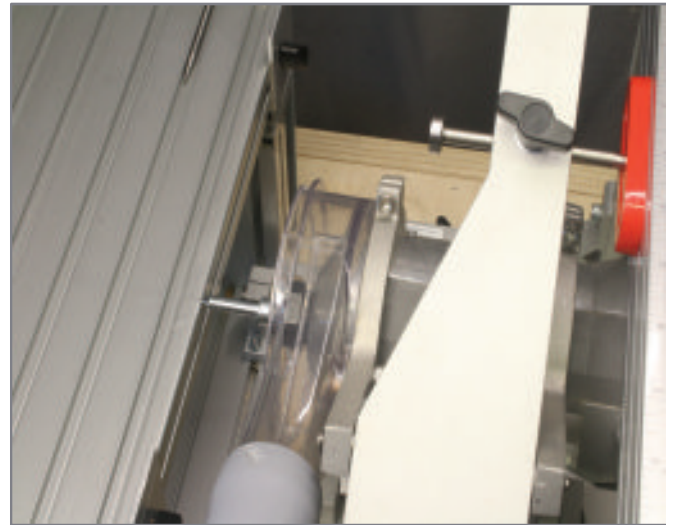
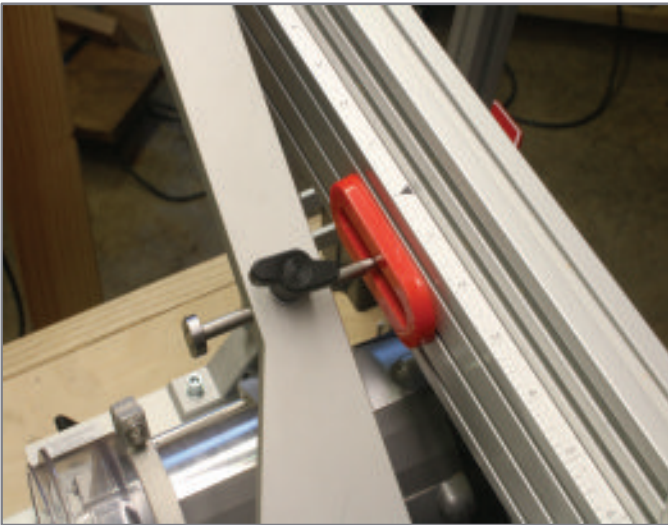
Use the PantoRouter for a while, and when you're confident in your center line, scribe it using the point of the split shaft centering jig.



Finding and Marking the Table Centerline - Method-2



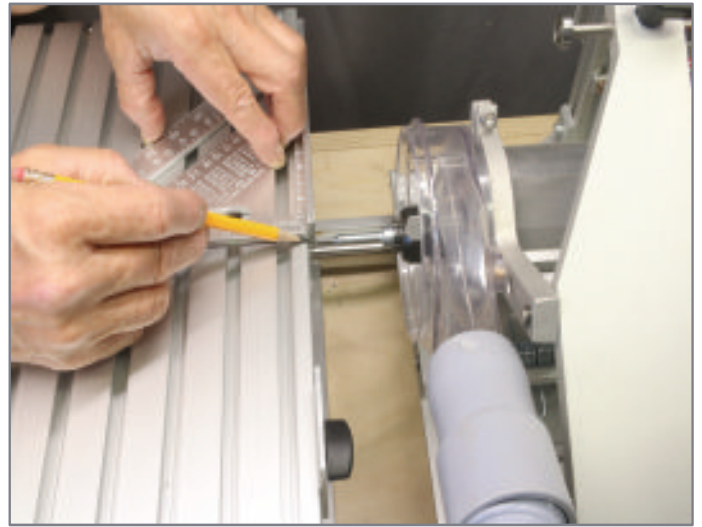
The PantoRouter™ transfers the shape of the template mounted on the template holder to the workpiece located on the table. Aligning the template, router bit and workpiece are essential to accurate joinery, and this is made fast and easy using the Centering Scale Fence.



Insert the 6mm guide bearing shaft through the center hole of the template and into the centering hole in the template holder then mount the centering jig (pointer) in the router collet. Plunge the pantograph carriage forward and lower the template holder so the tip of the centering jig rests gently on the top edge of the table.

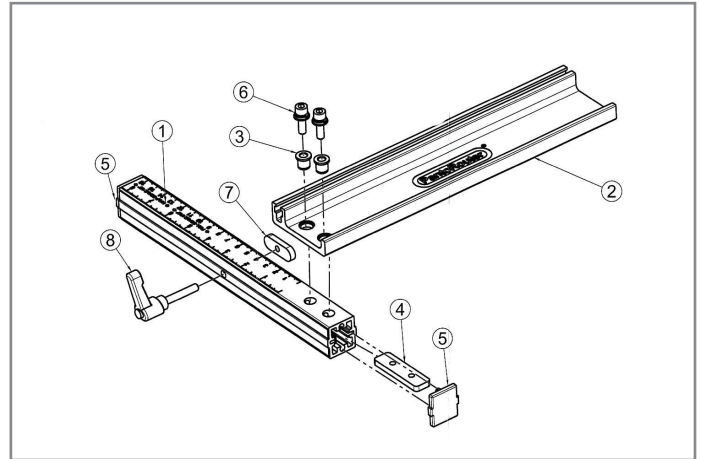
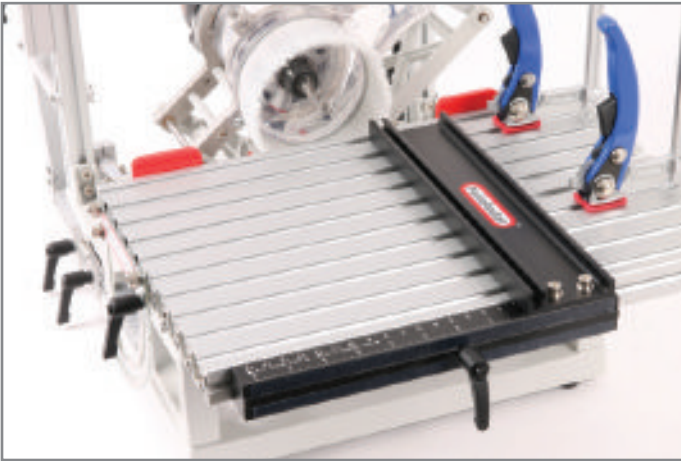
Lock the pantograph carriage using the two depth stops on the operator's side.



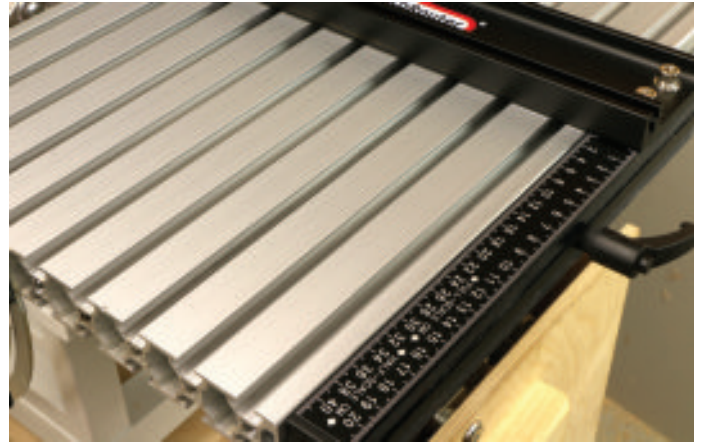


This is dead center of the table relative to the center of the template and router, so carefully mark this position and use a square to draw a line from this point across the center of the table. This mark can be in pencil, ink or scribed into the aluminum.

Setting up the Centering Scale Fence



Setting up the centering scale fence is super easy and due to the precision-machined centering pins, the fence will be dead-on 90° without any adjustment.



Before assembly you'll need to decide which scale to use. We recommend using the metric (CM) scale since you don't really care the size when centering (the size was determined when you milled your wood), you just want to find the middle. It's way easier to measure 8.7cm or 87mm than $3\frac{7}{16}$ inches.



To center your workpiece on the table, first measure the width on the outer scale then set that value on the inner scale at the centerline. Lock the fence and Boom....You're Centered!

MORTISE AND TENON GUIDE BEARING AND BIT SELECTION

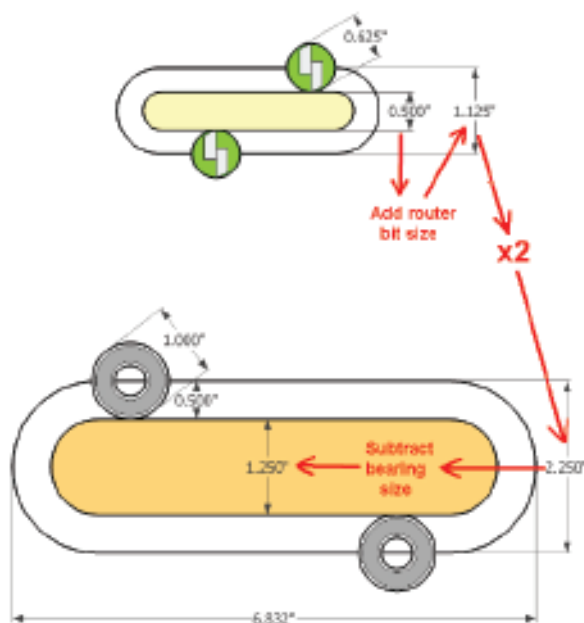
Tenon Thickness	GB (mm)		Bit (inch)	
	1/8"	6	1/2	
		10	1/2	
	1/4"	22	3/4	
		35	1	
	3/8"	10	3/8	
		15	1/2	
	1/2"	10	1/4	
		15	3/8	
		22	1/2	
		35	3/4	
		48	1	
	3/4"	22	1/4	
		35	1/2	
		48	3/4	
	1"	35	1/4	
		48	1/2	

It's best to use larger guide bearings and bits where possible.
 The 1/2" spiral upcut bit works with every size.

The 35mm and 48mm guide bearings come with the Monster Set along with 3/4" and 1" straight cut bits.

FORMULA TO CREATE CUSTOM TEMPLATES:

$2(\text{TENON THICKNESS} + \text{BIT DIAM}) - \text{GUIDE BEARING}$



Metric Bit and Bearing Combinations		
Bit mm	Guide Bearing mm	Tenon Thickness mm
12	19	12
12	15	10
12	10	8
12	6	6

Useful Metric Conversions		
MM	Decimal Inch	Fraction Inch
3.175	0.125	1/8
6	0.236	
6.35	0.250	1/4
10	0.394	
12	0.472	
12.7	0.500	1/2
15	0.591	
19	0.748	3/4
22	0.866	
25.4	1.000	1
35	1.378	
48	1.890	

Decimal Equivalents

English	Metric	Decimal	English	Metric	Decimal	English	Metric	Decimal	English	Metric	Decimal
..	.1	.0039	45	..	.0820	5	..	.2055	7/16	..	.4375
	.2	.0079	44	..	.0860	4	..	.2090	29/64	..	.453 1
..	.3	.0118	43	..	.0890	3	..	.2130	15/32	..	.4687
80	..	.0135	42	..	.0935	7/32	.	.2187	..	12.	.4724
79	.	.0145	3/32	..	.0937	2	..	.2210	31/64	..	.4844
1/64	..	.0156	41	..	.0960	1	..	.2280	1/2	..	.5000
..	.4	.0157	40	..	.0980	A	..	.2340	..	13.	.5118
78	.	.0160	39	..	.0995	15/64	..	.2344	33/64	..	.5156
77	.	.0180	38	..	.1015	..	6.	.2362	17/32	..	.5312
.	.5	.0197	37	..	.1040	B	..	.2380	35/64	.	.5469
76	.	.0200	36	..	.1065	C	..	.2420	..	14.	.5512
75	.	.0210	7/64	..	.1094	D	..	.2460	9/16	..	.5625
74		.0225	35	..	.1100	1/4	..	.2500	37/64	..	.5781
.	.6	.0236	34	..	.1110	F	..	.2570	..	15.	.5906
73	..	.0240	33	..	.1130	G	..	.2610	19/32	..	.5937
72	..	.0250	32	..	.1160	17/64	..	.2656	39/64	..	.6094
71	..	.0260	..	3.	.1181	H	..	.2660	5/8	..	.6250
..	.7	.0276	31	..	.1200	I	..	.2720	..	16.	.6299
70	..	.0280	1/8	..	.1250	..	7.	.2756	41/64	..	.6406
69	..	.0292	30	..	.1285	J	..	.2770	21/32	..	.6562
68	..	.0310	29	..	.1360	K	..	.2810	..	17.	.6693
1/32	..	.0312	28	..	.1405	9/32	..	.2812	43/64	..	.6719
..	.8	.03 15	9/64	..	.1406	L	..	.2900	11/16	..	.6875
67	..	.0320	27	..	.1440	M	..	.2950	45/64	..	.7031
66	..	.0330	26	.	.1470	19/64	..	.2969	..	18.	.7087
65	..	.0350	25	..	.1495	N	..	.3020	23/32	..	.7187
.	.9	.0354	24	..	.1520	5/16	..	.3125	47/64	..	.7344
64	..	.0360	23	..	.1540	..	8.	.3150	..	19.	.7480
63	..	.0370	5/32	.	.1562	O	..	.3160	3/4	..	.7500
62	..	.0380	22	..	.1570	P	..	.3230	49/64	..	.7656
61	..	.0390	..	4.	.1575	21/64	..	.3281	25/32	..	.7812
..	1.	.0394	21	..	.1590	Q	..	.3320	..	20.	.7874
60	..	.0400	20	..	.1610	R	..	.3390	51/64	..	.7969
59	..	.0410	19	..	.1660	11/32	..	.3437	13/16	..	.8125
58	..	.0420	18	.	.1695	S	..	.3480	..	21.	.8268
57	.	.0430	11/64	..	.1719	..	9.	.3543	53/64	..	.8281
56	..	.0465	17	..	.1730	T	..	.3580	27/32	..	.8437
3/64	..	.0469	16	..	.1770	23/64	..	.3594	55/64	..	.8594
55	..	.0520	15	..	.1800	U	..	.3680	..	22.	.8661
54	..	.0550	14	..	.1820	3/8	..	.3750	7/8	..	.8750
53	..	.0595	13	..	.1850	V3770	57/64	..	.8906
1/16	.	.0625	3/16	..	.1875	W	..	.3860	..	23.	.9055
52	..	.0635	12	..	.1890	25/64	..	.3906	29/32	..	.9062
51	..	.0670	11	..	.1910	..	10.	.3937	59/64	..	.9219
50	..	.0700	10	..	.1935	X	..	.3970	15/16	..	.9375
49	.	.0730	9	..	.1960	Y	.	.4040	..	2	.9449
48	..	.0760	..	5.	.1968	13/32	..	.4062	61/64	..	.9531
5/64	..	.0781	8	..	.1990	Z	..	.4130	31/32	..	.9687
47	..	.0785	7	..	.2010	27/64	..	.4219	..	2	.9842
..	2.	.0787	13/64	..	.2031	..	11.	.4331	63/64	..	.9844
46	..	.0810	6	..	.2040				1	25.4	1.000

Accessories Available in the Online Store

The auxiliary fence is very useful for setting and repeating angles. Set the angle using a sliding bevel gage, lock it down and it'll stay put for all of your cuts.



The Monster Mortise and Tenon set is especially useful for outdoor projects using construction lumber and for applications where big mortise and tenons are needed like the stretcher on a trestle table. You can make 3/4" and 1" mortise and tenons with widths of 1", 1.5", 2", 2.5" and 3".





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