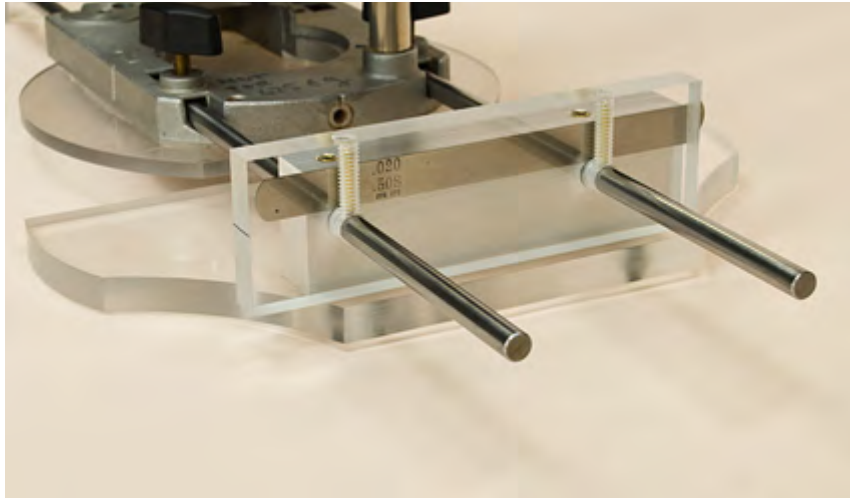


EDGE GUIDE ADJUSTER

Router Woodworking



Both of my edge guides ([mortising jig](#) and [edge of stock guides](#)) must be adjusted for each new application; an arbitrary setting is rarely right where you want it. The adjustment can translate the cutter pathway centerline, facilitate a pathway greater than the cutter diameter, or both. Translation of the cutter centerline can be done with a setting change of the edge guides or the guide rods can simply slide to a new location within the casting. In the latter case, the 2 hold down screws/knobs on the casting are loosened and the router is relocated a measured amount.

It is customary & essential to start an edge guide cut with a calibration cut. This is the case no matter what the edge guide design may be. From the calibration (test) cut you can determine how much the guide(s) or rods must be moved. If the guide(s) has to be moved it can be translated as follows (without the accessory below):

1. Slide the edge guide against the work and clamp the router to the work. The router cannot move during the adjustment.

2. Select a spacer of a thickness = desired translation. For example, if you'd like to move the cutter .25" away from you, put said spacer between the work and the loose edge guide. Then tighten the guide against the spacer. (A 1/4 drill, drill rod, gage block etc.)
3. The cutter will now reach .25" from where it was.

If the goal was to produce a .50" dado from 1/4" cutter, you'd start with 2 edge guides against the work with a 1/4 spacer between the work & one of the edge guides.

In this case the cut will probably start very near .50" but its centerline may not be where you'd like it to be. In this event, we have to move the router on its rods without changing the distance between the edge guides.

To move the router (a measured amount) on its rods without disturbing the edge guides:

1. Measure the distance between the subbase (or casting) & one of the edge guides (inside). Whilst an adjustable parallel* is the tool of choice here to get the inside measurement, a caliper or rule can suffice.
2. Now loosen the casting screws to free the guide rods. Subtract or add width to the parallel or create a scrap cutoff equal in width to the change necessary (+ the initial gap) to translate the centerline. E.g., if the cutter requires a 3/8" translation and the initial measurement is 1.0" then the spacer has to be 1-3/8" or 5/8" depending on which direction you slide the tool.
3. Move the bugger against the spacer and lock the casting screws.

Adjuster (Product)

The new edge guide adjuster is designed to assist in making the space adjustment between 2 edge guides for mortices, slots etc. It can also be used to translate the cutter centerline when only one edge guide is in play. Let's start with 2 edge guides snug against a parallel workpiece. To open the cutter pathway (of a mortise e.g.) you first measure the diameter of the cutter and subtract that number from the desired width of the intended cutter pathway. This number is duplicated with a spacer-feeler gage, adjustable parallel, gage block, drill rod, sheets of "Post-it" or whatever. Now you slide the acrylic adjuster up against one of the edge guides separated by the spacer.

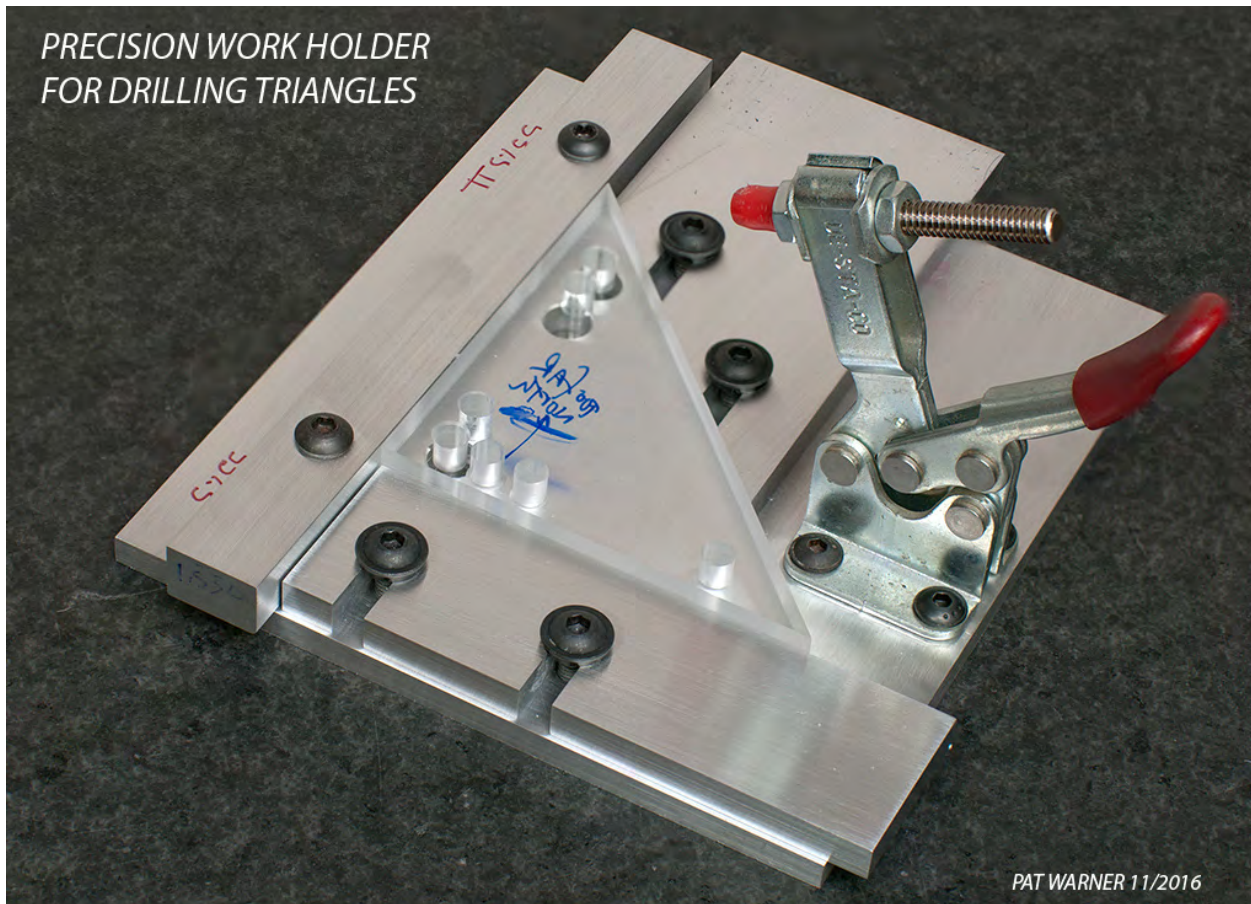
Lock the adjuster, remove the spacer, unlock the edge guide block & slide it up against the adjuster. If you spent more than 1 minute on this adjustment you should report yourself to the metrology police for disposition immediately.

The cutter pathway will be opened precisely by the amount of the spacer. If the starting pathway is too wide, slide the adjuster against the edge guide block and lock the two intimately together. Now loosen the edge guide, place the spacer between the guide & adjuster, and lock the edge guide. This maneuver shrinks the cutter pathway exactly the amount of the spacer.

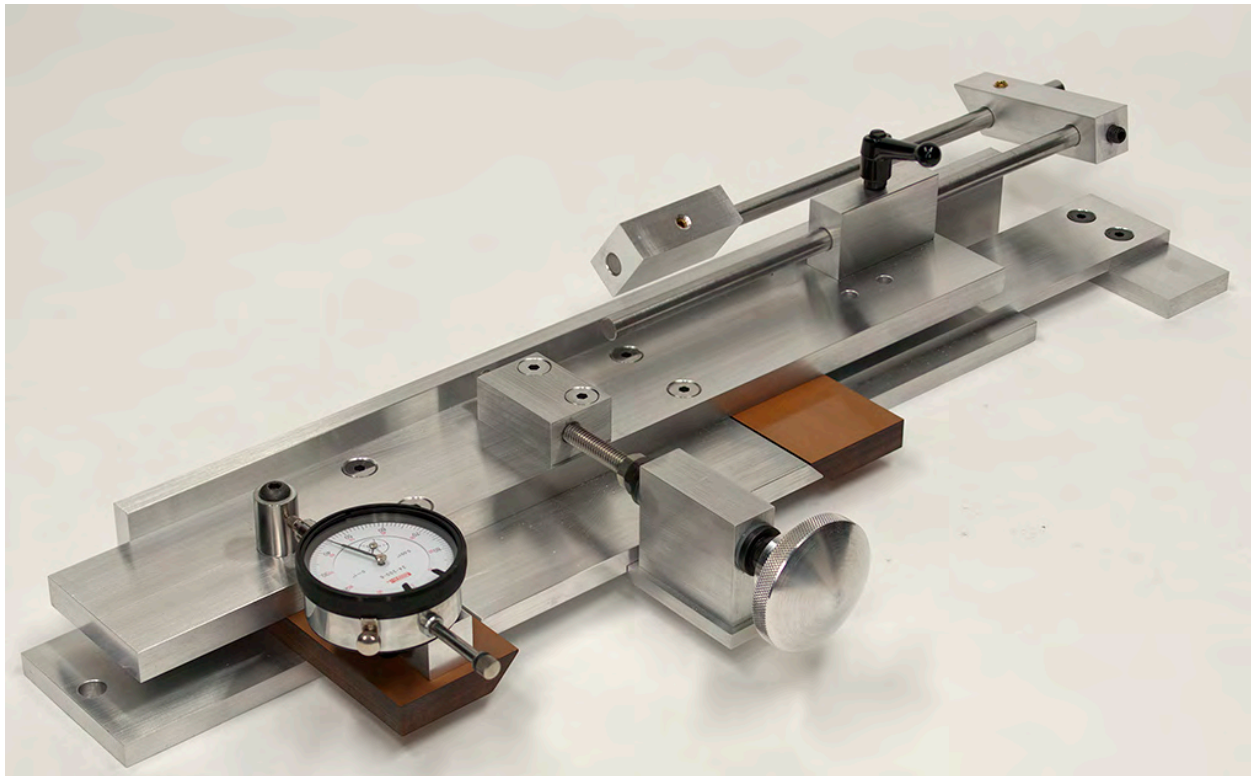
Tho not as sweet as an adjustable edge guide it is accurate to .001", fast, simple to use, and low tech, nuthin' to break. The 12mm Acrylic blank is fully machined, deburred, flat and contains 2 non-marring all brass set screws. It is sized to overlap your edge guide block and therefore will be easy to handle in use.

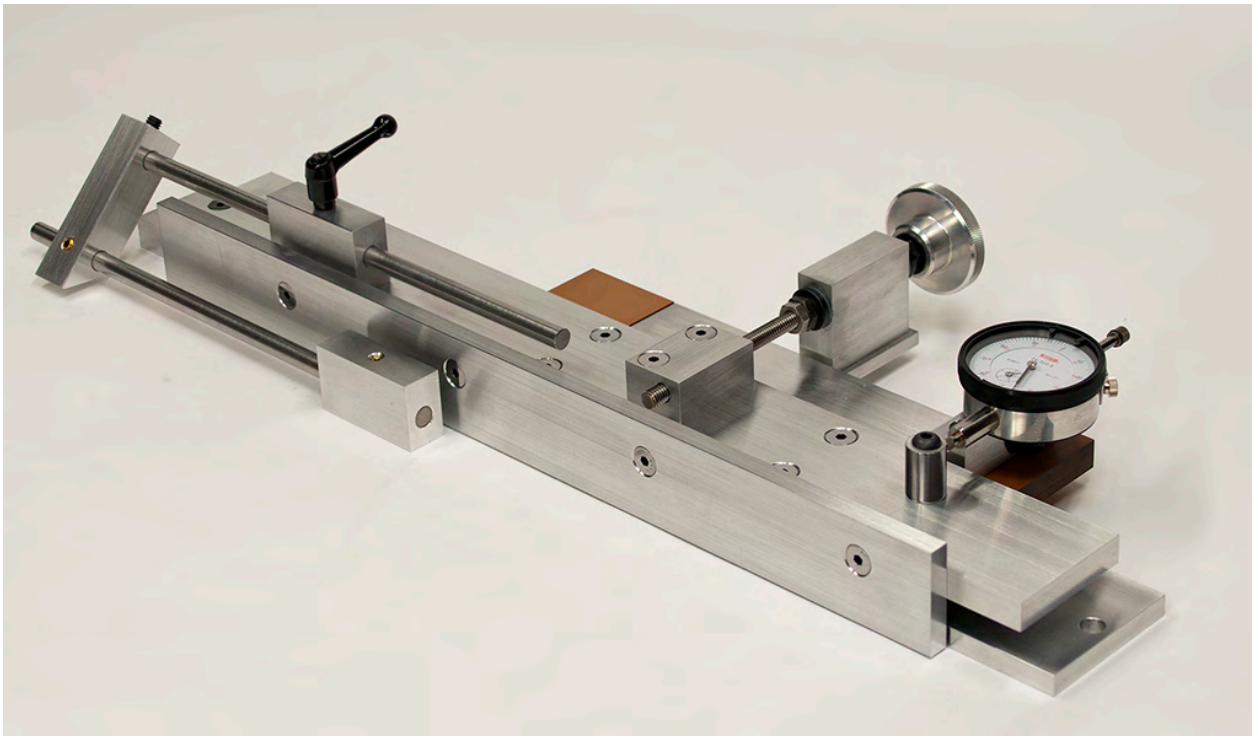


PRECISION WORK HOLDER
FOR DRILLING TRIANGLES



PAT WARNER 11/2016





JOINT CONNECTOR BOLT ASSEMBLY

Applies well in skinny drawer stock or 4" x 4" legs and rails.

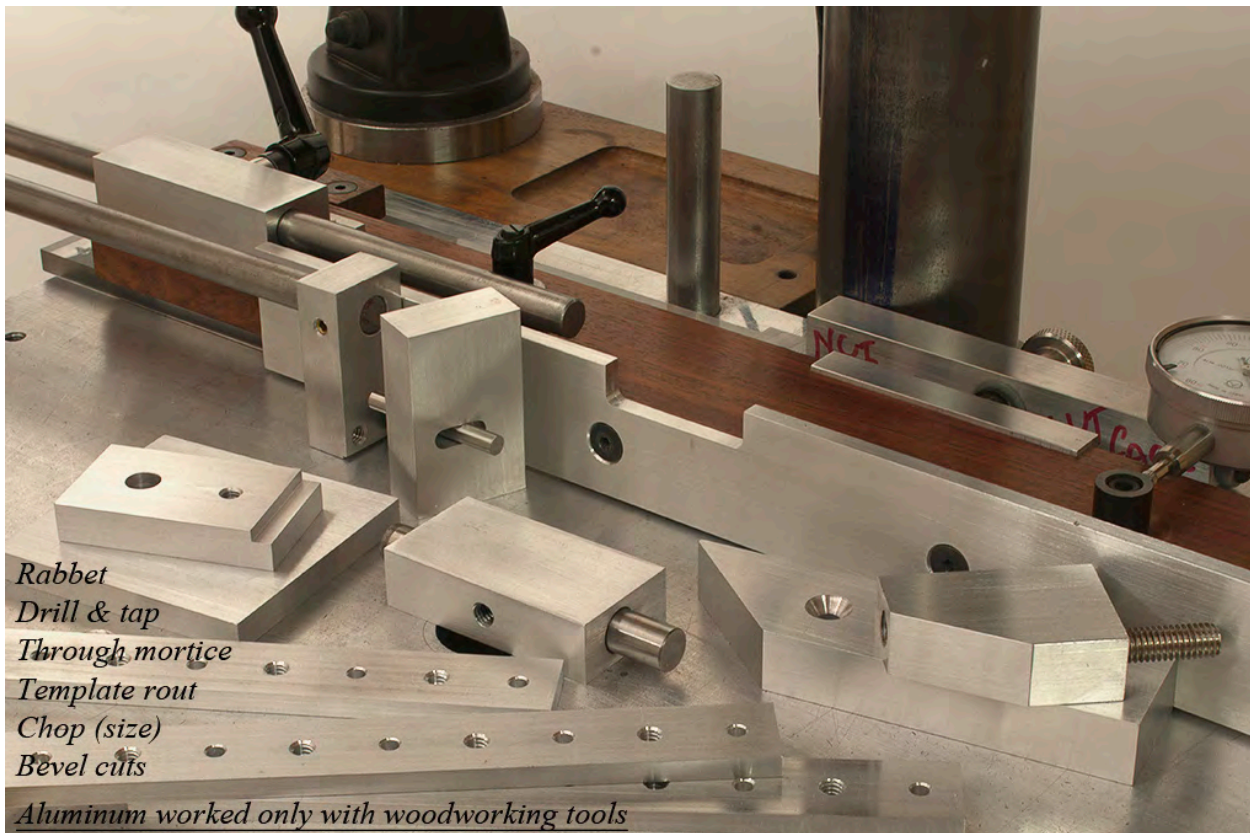
But there are trade-offs, no rose garden promises. On the plus side, the joint can be assembled and re-assembled on demand. No messy glue, a statement of strength, stronger than dovetails in 2 directions, clean/simple pre-joinery, and they're suitable for out-door apps in rain or snow. Moreover, they will outlast any adhesive.

On the negative, hardware is expensive, accurate drilling & layout are essential, you gotta cut square and you have to like steel.

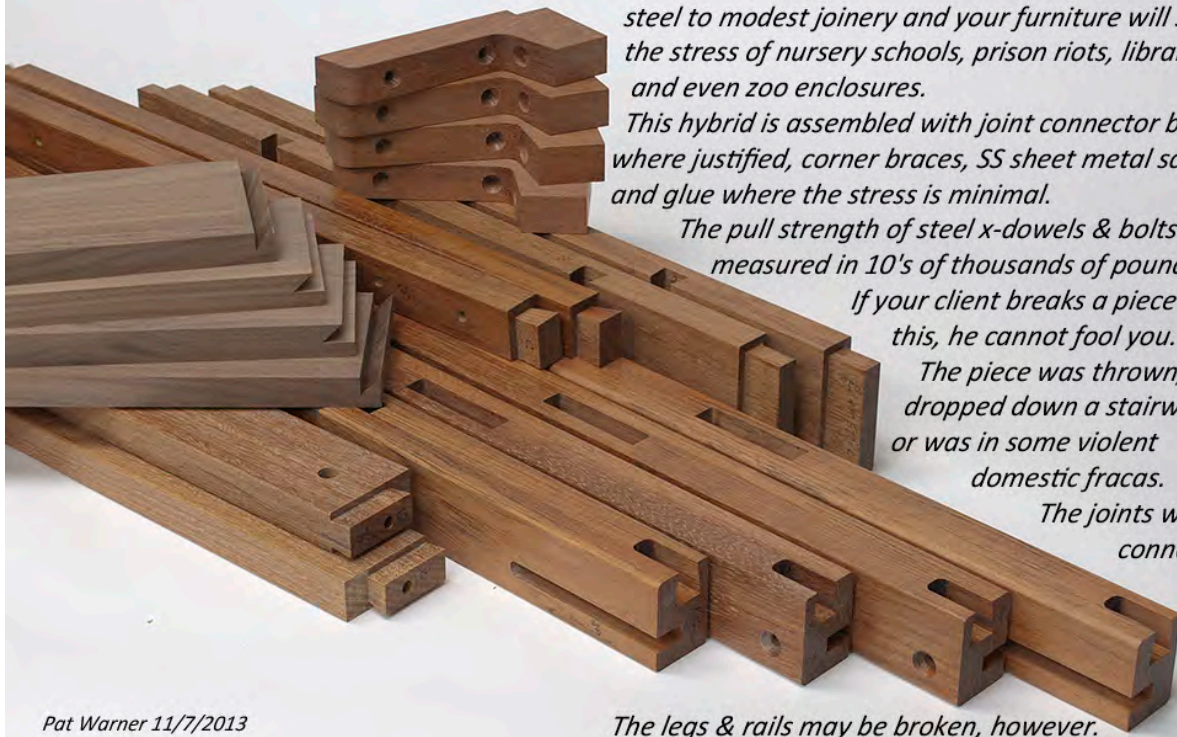
.368" x 1/2" tool steel

10-24 x 1.5"
Cap Screws





Printer Stand



Whilst all-wood connections are desirable in many applications, they do not stand the test of time. Add steel to modest joinery and your furniture will stand the stress of nursery schools, prison riots, libraries and even zoo enclosures.

This hybrid is assembled with joint connector bolts where justified, corner braces, SS sheet metal screws, and glue where the stress is minimal.

The pull strength of steel x-dowels & bolts is measured in 10's of thousands of pounds.

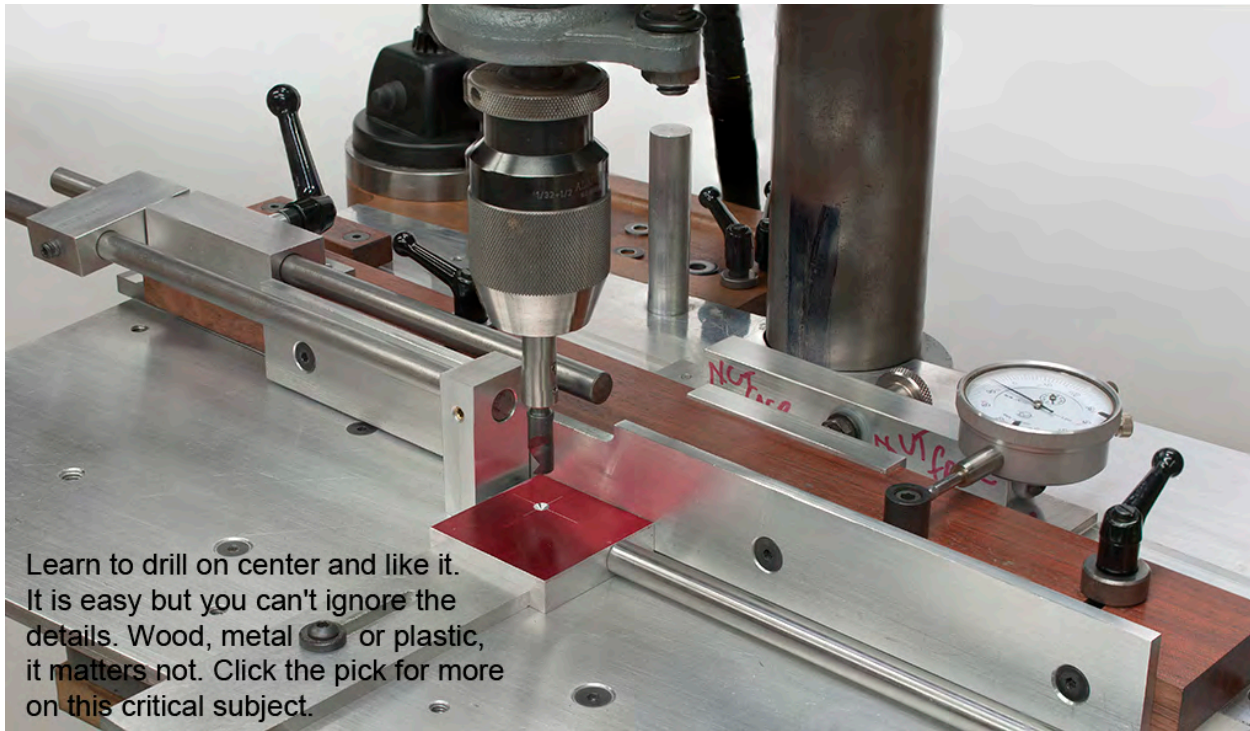
If your client breaks a piece like this, he cannot fool you.

The piece was thrown, dropped down a stairwell, or was in some violent domestic fracas.

The joints will be connected.

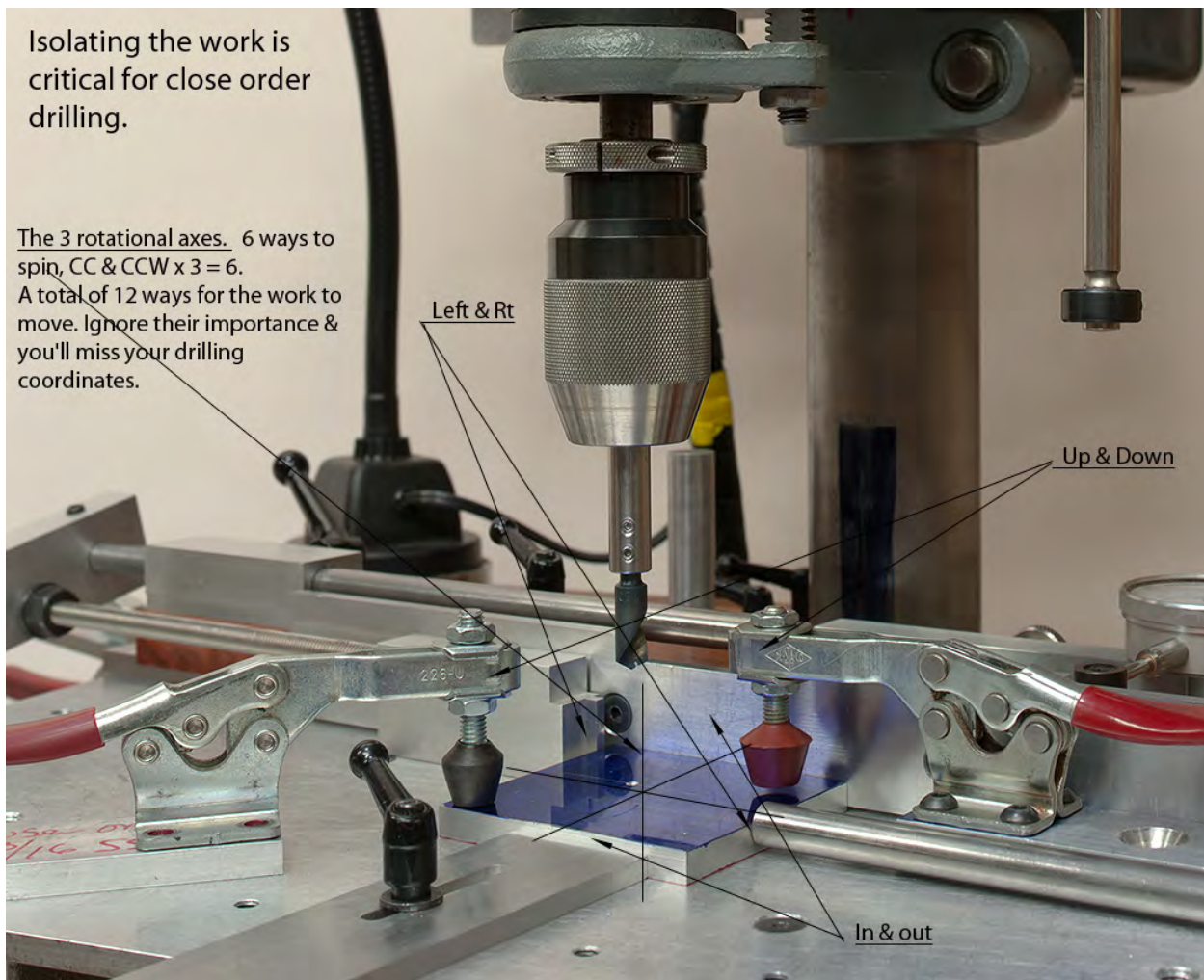
Pat Warner 11/7/2013

The legs & rails may be broken, however.



Isolating the work is critical for close order drilling.

The 3 rotational axes. 6 ways to spin, CC & CCW x 3 = 6.
A total of 12 ways for the work to move. Ignore their importance & you'll miss your drilling coordinates.



Old Rockwell good to + or - .001" on center.

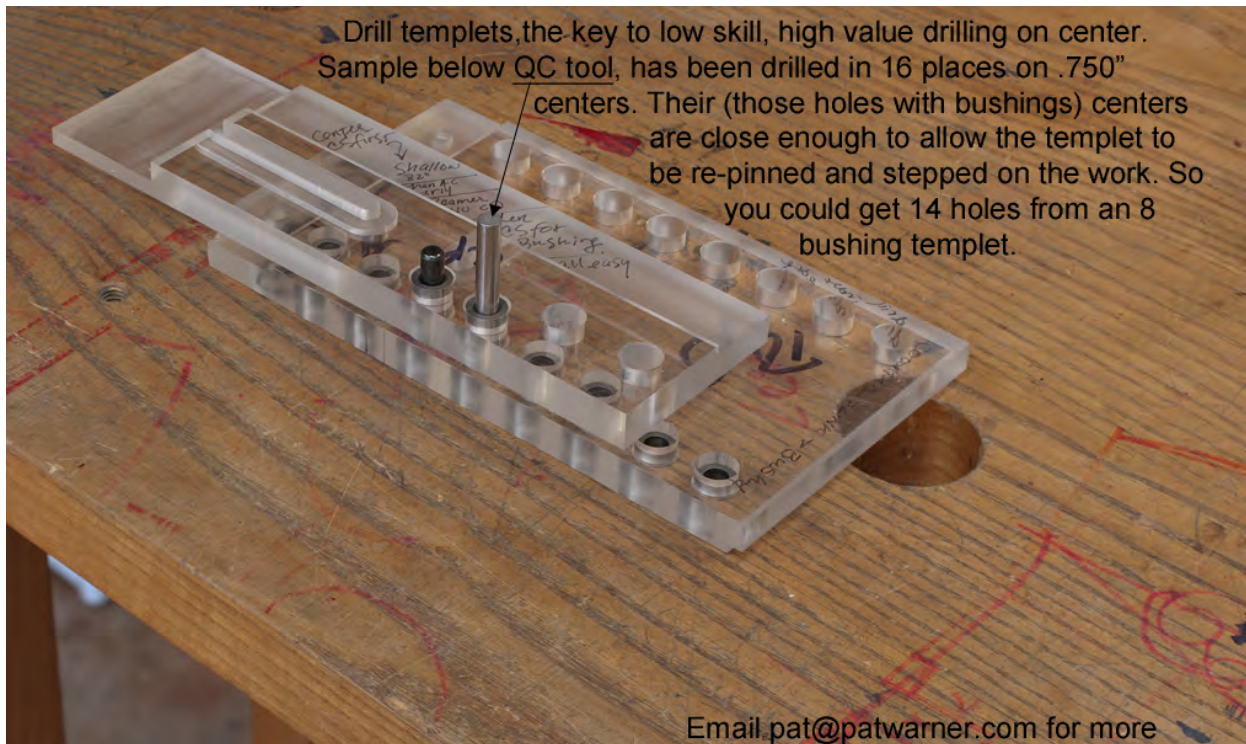
With Teco VFD, speeds from
~50-5000RPM

Up & down stops

Albrecht 1/16" - 1/2"

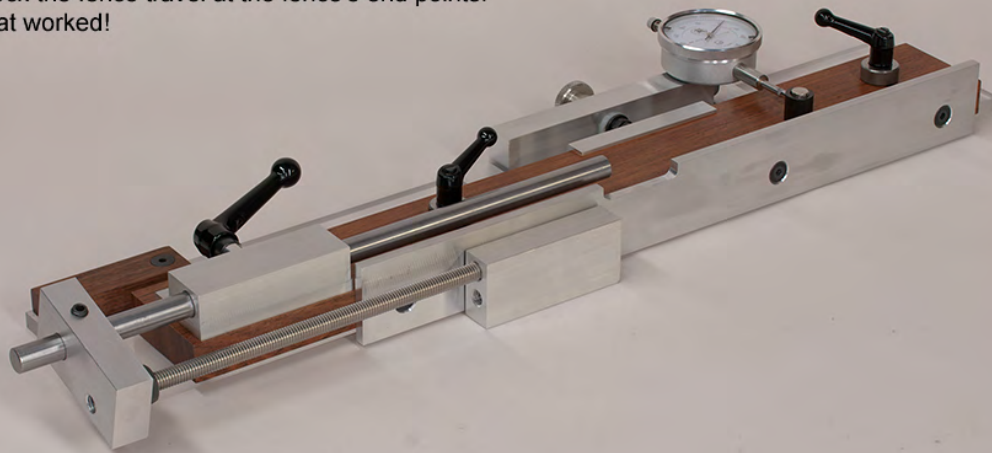
Adjustable fence with stops left and right





Drill Press Fence

~3/4" of fine metered (.001" resolution) travel & ~4" of rough pivot swing.
Adjustable stop good from -2" to >+14". A 2.5" lever locks its 0.5" ss rod.
2 shorter levers lock the fence travel at the fence's end points.
An experiment that worked!



NikonD300S PSE45mm f/1.1

Drill Press Fence (rear)

1/4-28 lead Screw just fast enough not to waste time.
Slide assembly shift from c/l: 2.5"
Backlash <.002". Makes drilling
swimmingly delightful.



Nikon D300S Nikkor 45PC-E/f/11



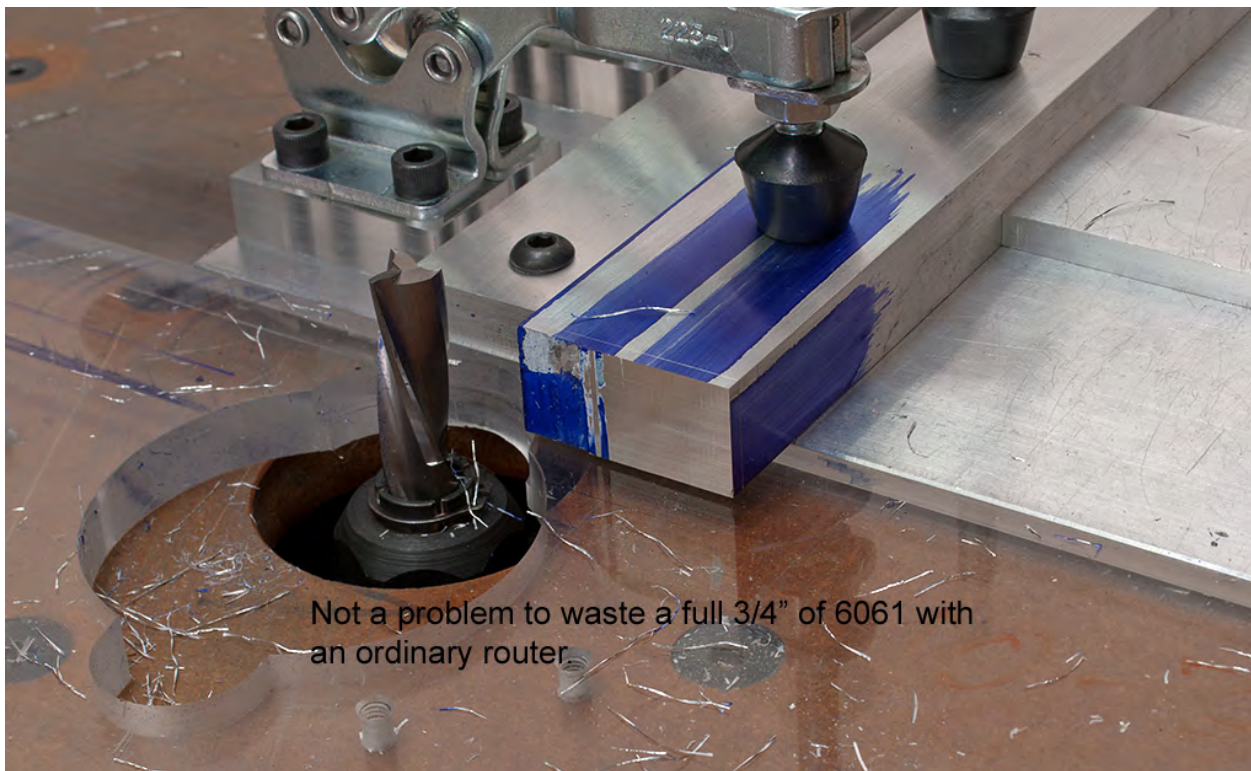
Ordinary SS socket heads, cheap, good lookin', stay shiny for decades.



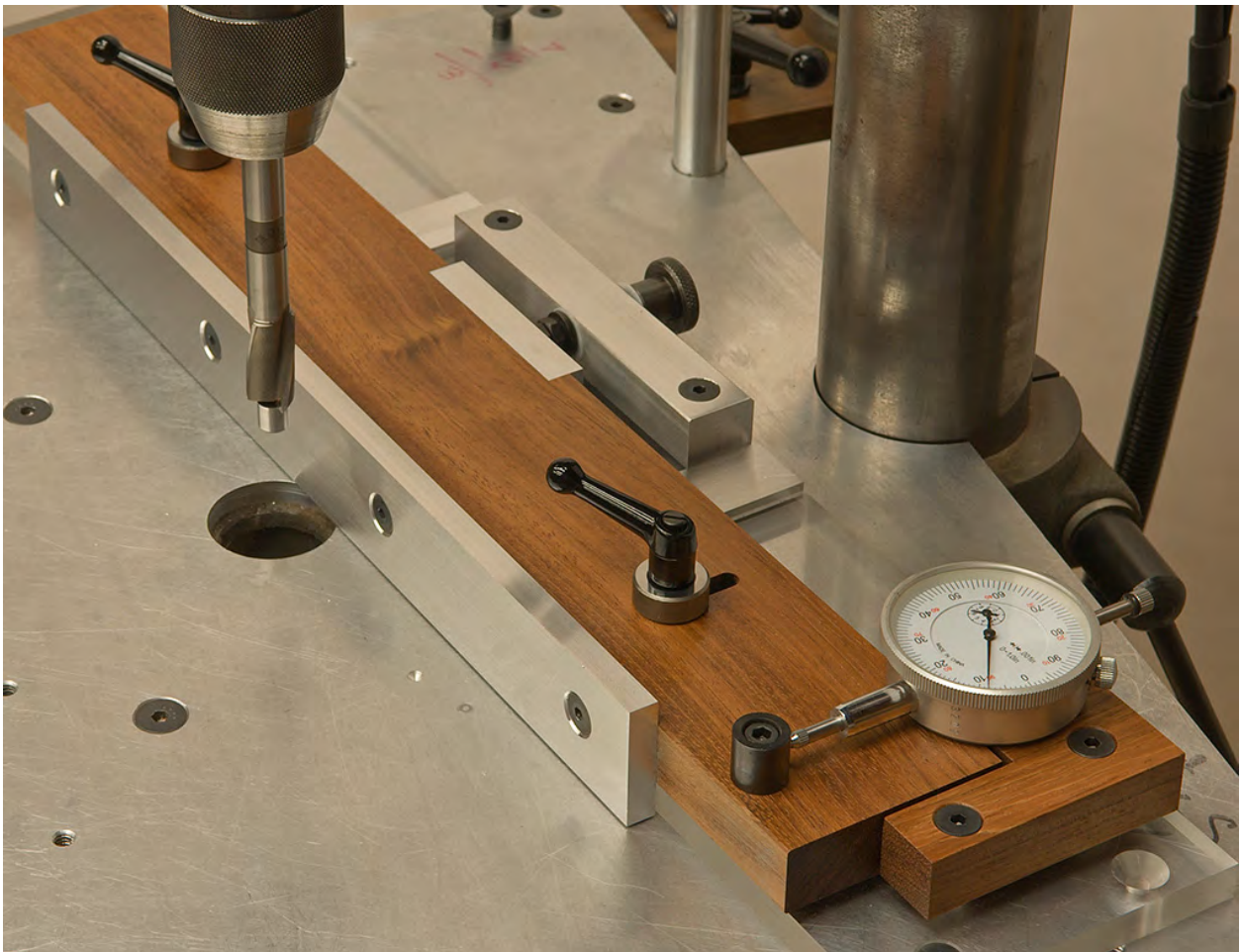
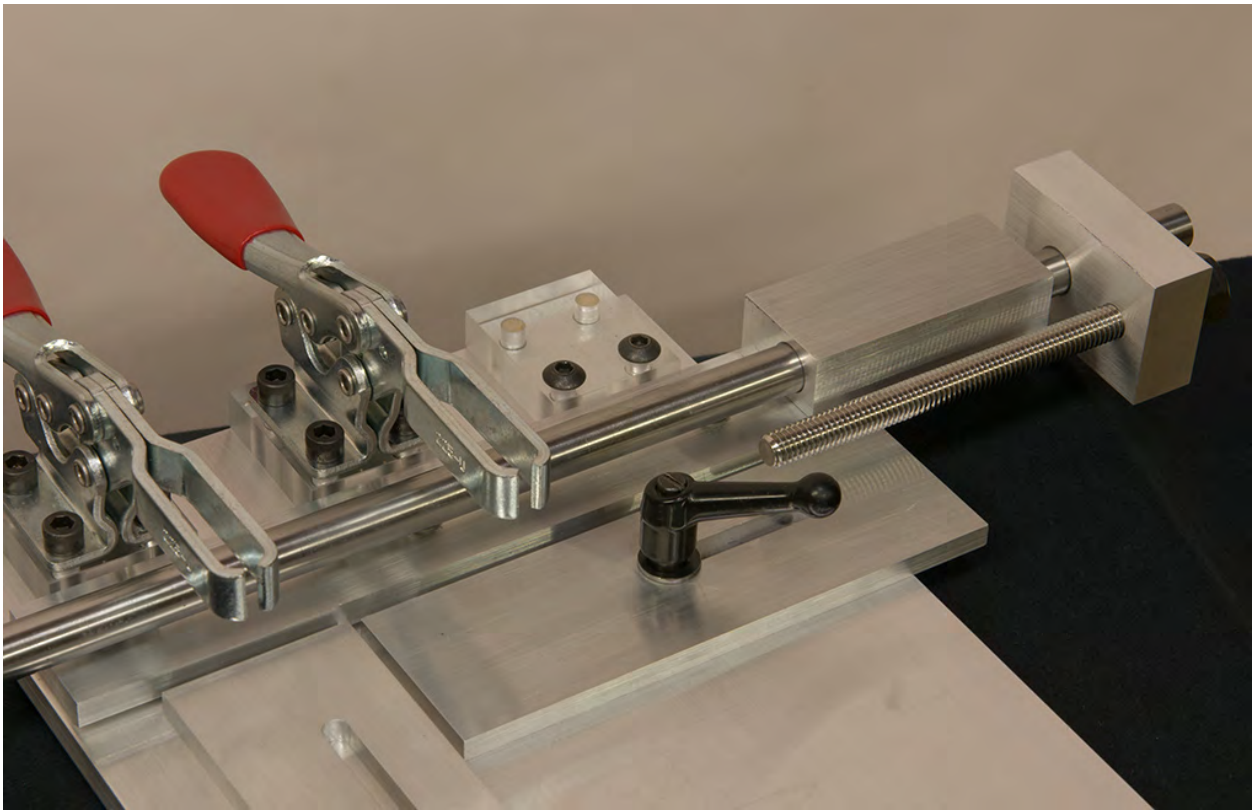
Ordinary SS socket heads, cheap, good lookin', stay shiny for decades.

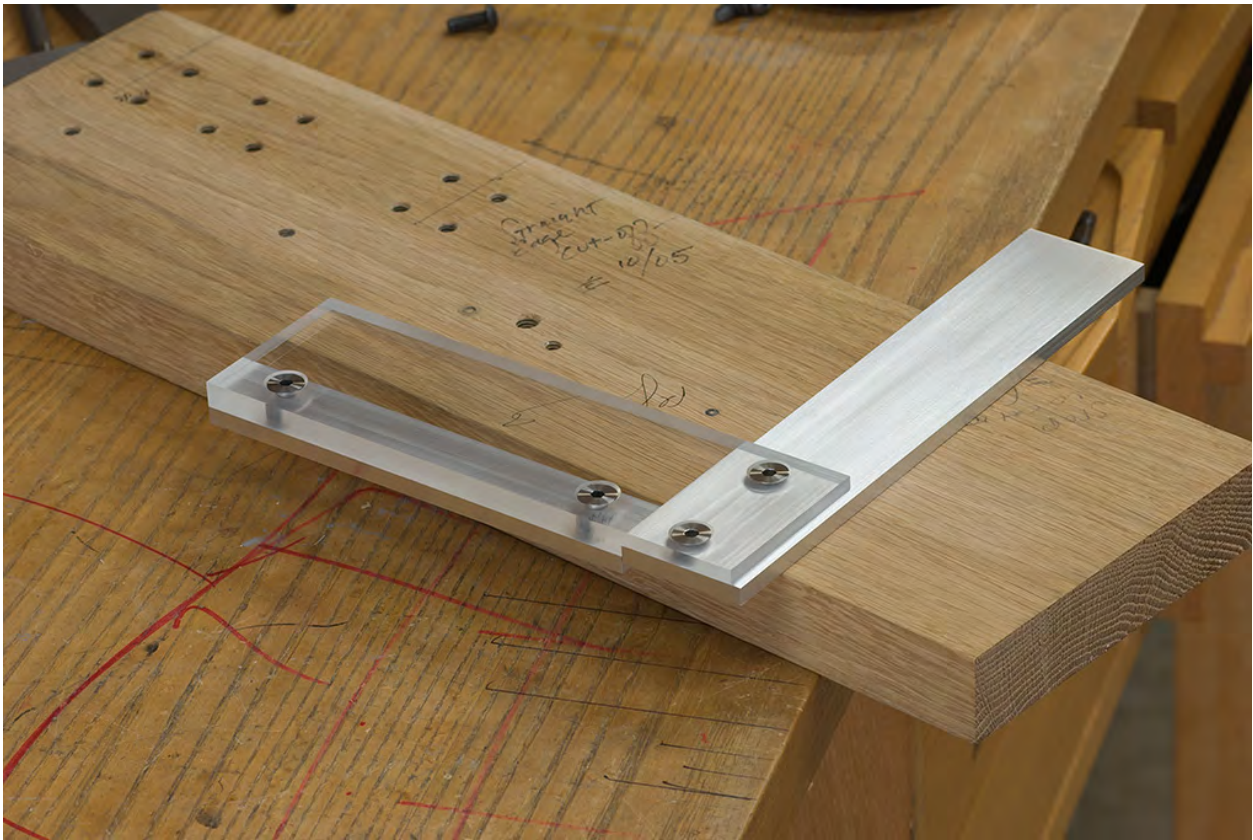
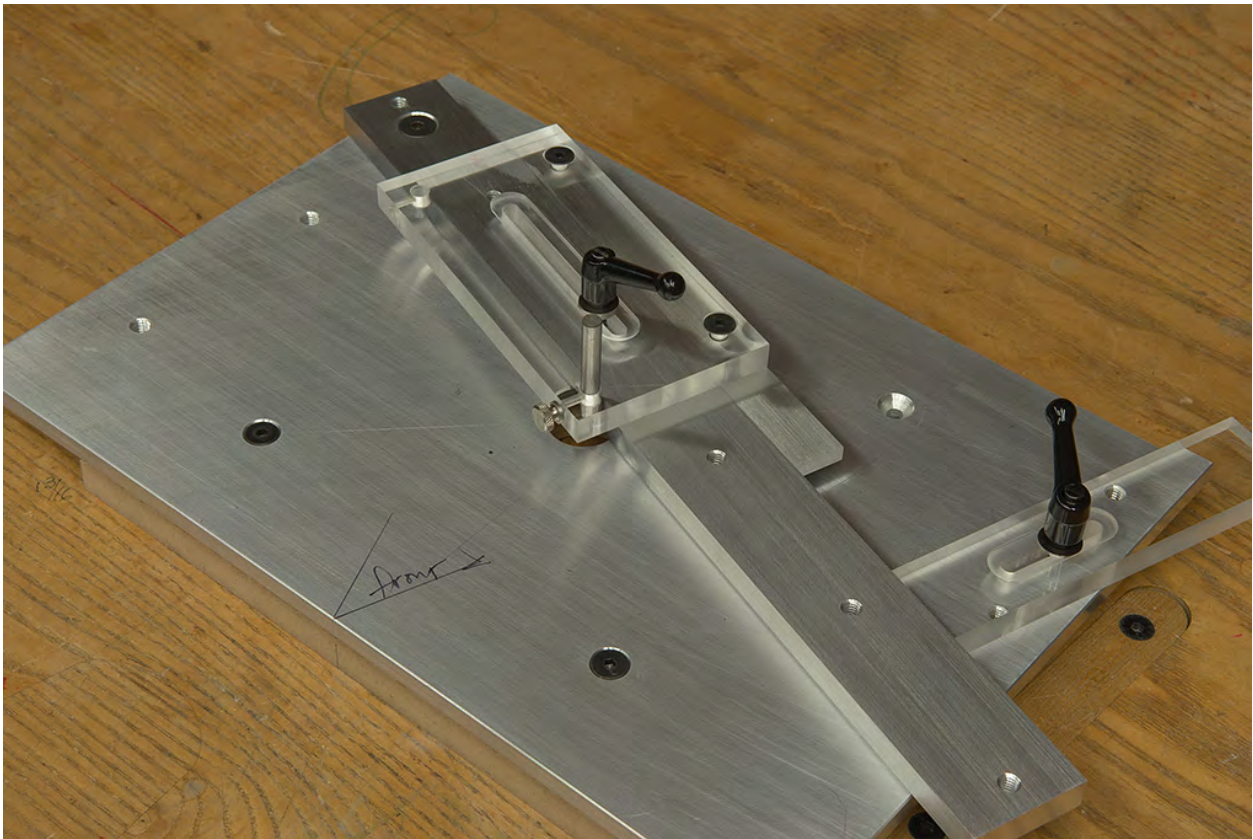


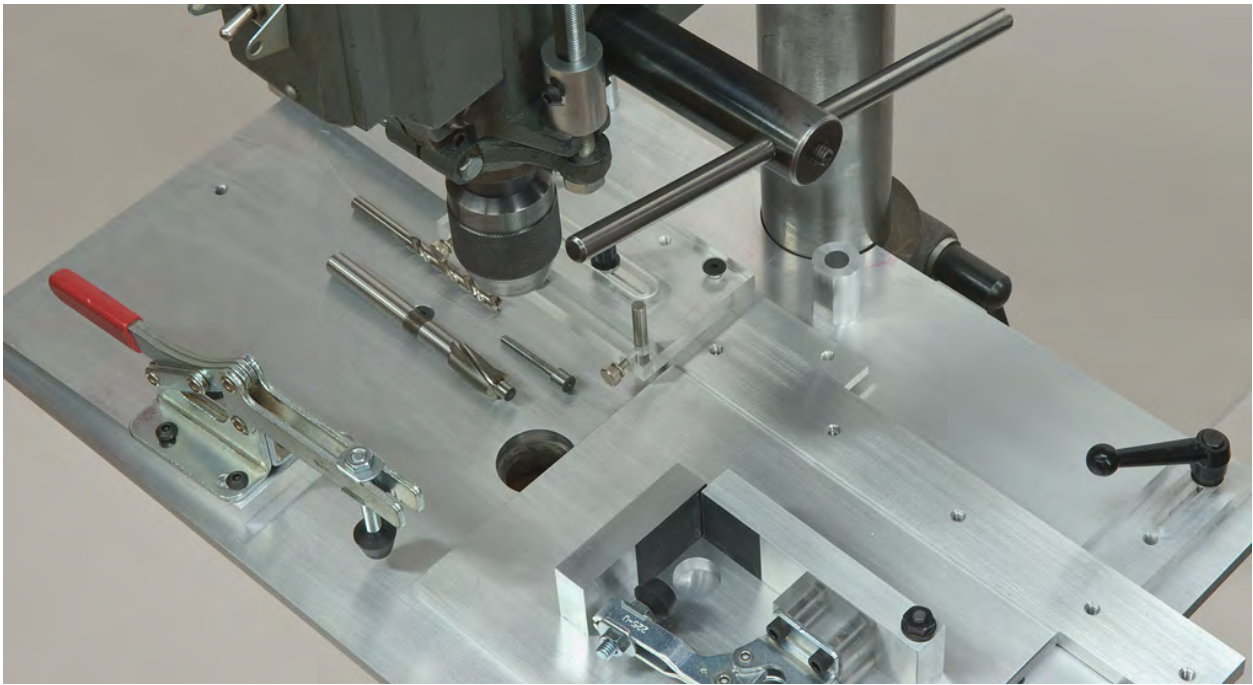
Ordinary SS socket heads, cheap, good lookin', stay shiny for decades.

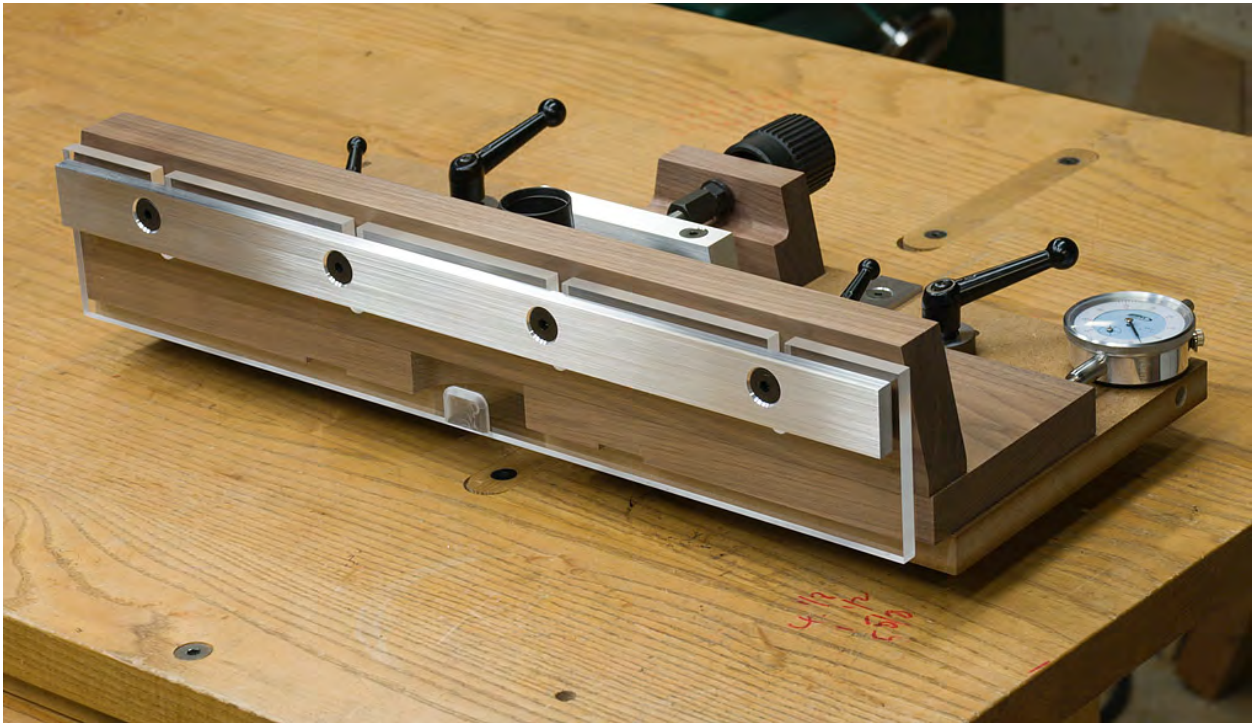
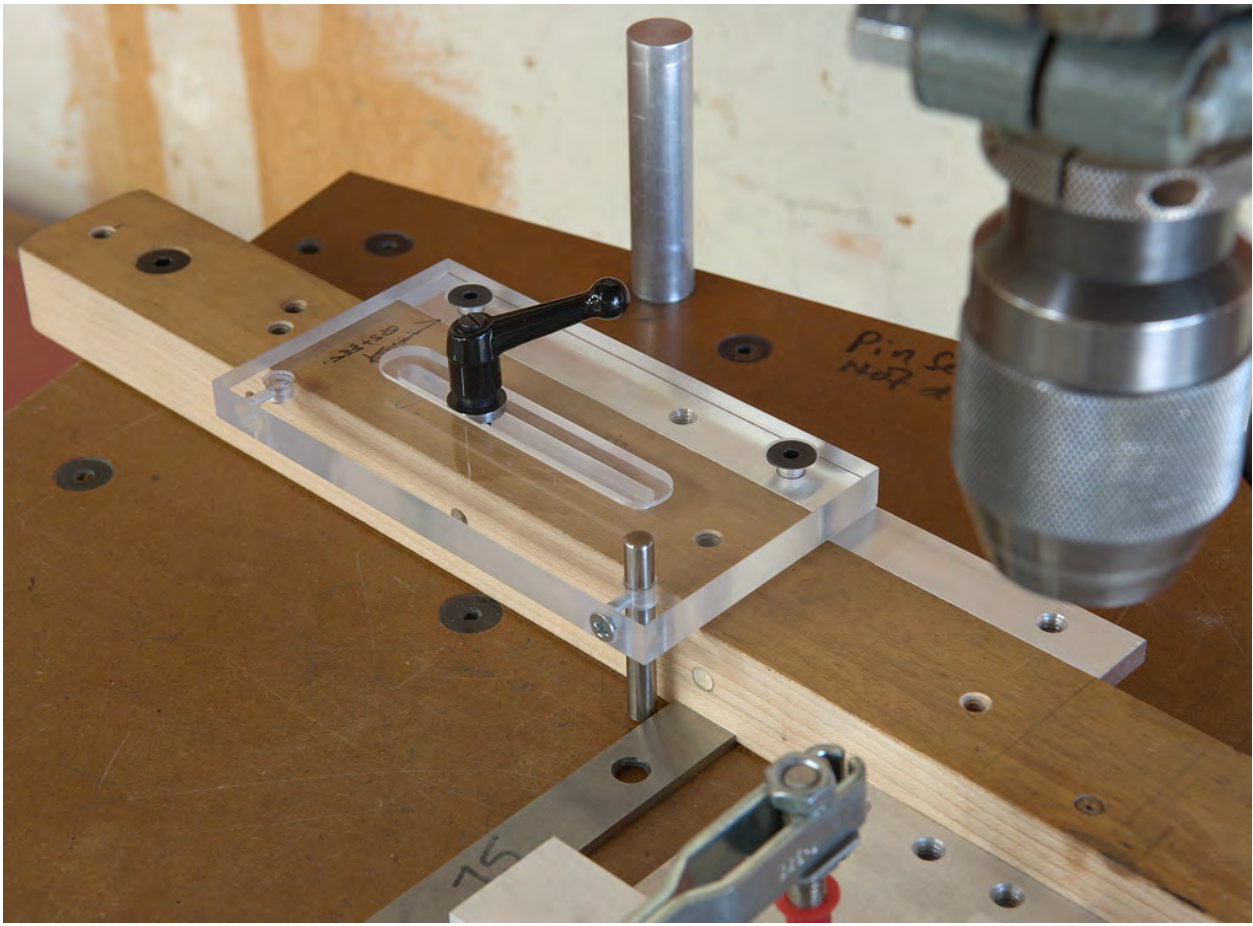


Not a problem to waste a full 3/4" of 6061 with an ordinary router.

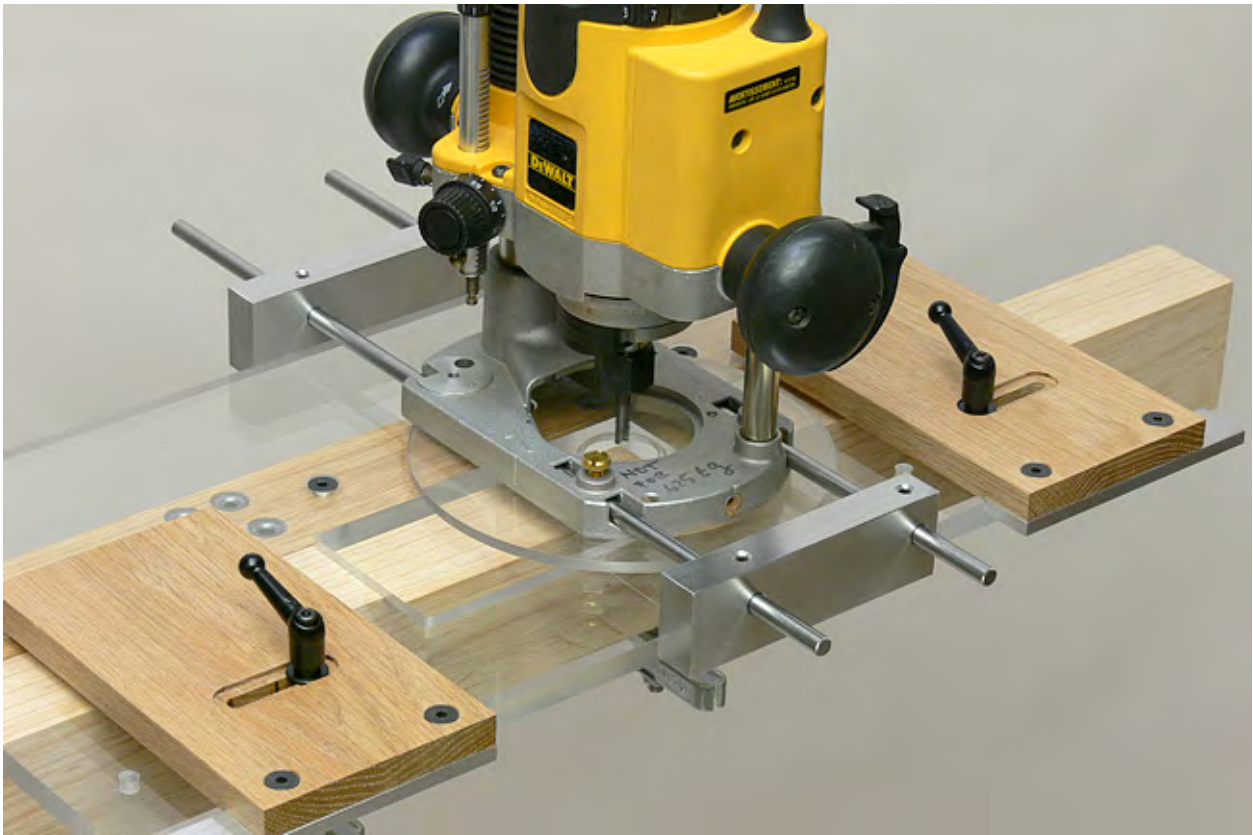
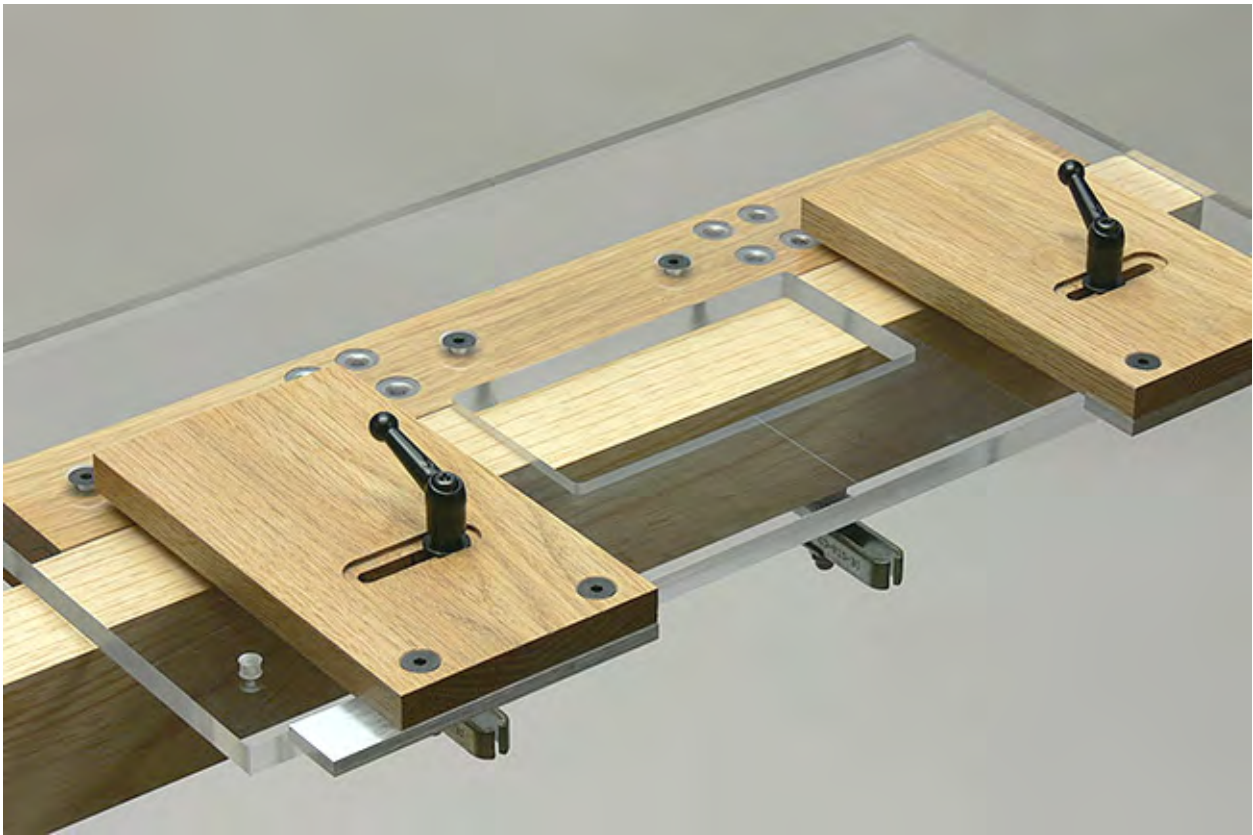


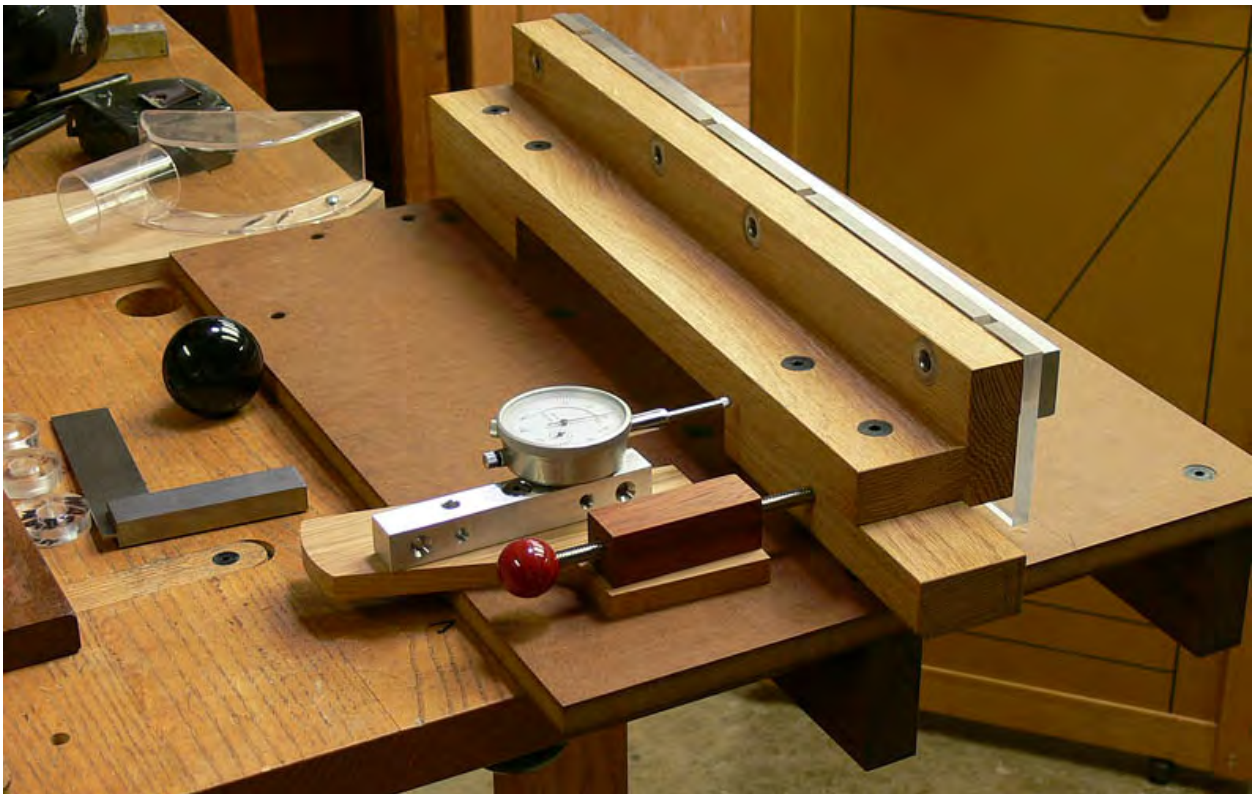














THE ROUTER TABLE PDF

Router Woodworking



Plans for this Spartan Router Table & Safety Curtain Fence in chapters 3 & 4.



The router table is a splendid setting for routing. Nonetheless, it does have its limitations, but expect to do 80+% of your routing on it. In my 8 chapter PDF I describe the nature of the tool, its advantages, and how to use it. There are chapters characterizing its components (the fence, top, stand & motor). And for your amusement, throughout the text, I present the red (hazardous), green (fun & safe) and grey areas so you will stay in the black and not get blue in the process.

There are instructions and pictures for making the Curtain Fence* and a one panel router table** to get you started. The table, in spite of its Spartan design, is capable of precise and substantial woodwork. The unit uses no floor space; clamp it to the bench for instant service or hang it on a rafter when you don't need it. From this simple one you can make another. It is easier to make a router table if you already have one! The chapter on making a stand will get you to the next level.

The Fence is as safe as it gets. It is transparent, continuous, and only that fraction of the cutter doing the work is exposed. The fence pivots from one end and is clamped on the other. Its tee-section prevents deflection, and the 3/8" thick plastic curtain and aluminum bar washer create a laminate the ordinary router person cannot bend.

"The Router Table PDF" *** was written for the starter but should provide some fun and surprise for the experienced too. You might have a router table but need another for a dedicated and safe procedure. This could be just the ticket. Expect to understand the stationary router table, make a simple one (with fence) and use the bugger safely with a thorough read of my work.

*The Curtain Fence is not for all applications. Cutters stacked on an arbor such as cope & stick, slotters, and finger joints, are not acceptable. Bearing guided cutters will have to run without their bearings. The vertical depth of cut is limited to ~1". 1/8" of stock (minimum) must always be in contact with the fence so full thickness cuts are not possible. Do not expect to make raised panel door cuts with this fence. This fence is for light to medium duty, straight line cuts, up to an inch high x any practical width.

**The table is relatively unsophisticated and does not support the usual metal or plastic insert router installation. The router casting is screwed directly to the top providing additional integrity & deflection resistance. Expect no sag from this configuration.

A ROUTING OUTING

Router Woodworking



The bar stock above was routed in a climb cut. Half the stock under the templet is galled and the result of anti-climb cutting. The safety issues and the procedure for routing aluminum is covered in "A Routing Outing".

"A Routing Outing" is an important (PDF) study of unpublished material on routers & routing. The router evaluations (24) are current and reflect the state of the art. A tool purchase based on the information in the PDF should not be met with surprise. Few stones were left unturned. Expect the facts, but more importantly, expect the information (good and bad) left out of the advertising and owner's manuals.

The routing section of the work has some answers for the guy who's thinking about putting his router in the tablesaw, routing aluminum, wanting to know the value of variable speed, in a quandry about charred cuttings, fabricating a good 50 cent starter router table fence, and getting a handle on collets. Other topics include an overview of templets, drilling and tapping wood. (This tech actually spends more time drilling than routing, a most important and underplayed woodworking process.)

To learn more about the character of the work, click on the [Introduction](#) and [Table of Contents](#) links. A copy of "A Routing Outing" is 20.00\$. And email pat@patwarner.com for purchasing details.

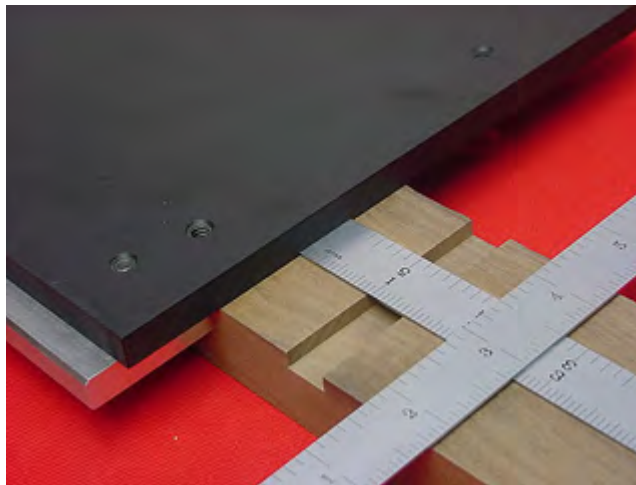
My first PDF, ["A Router Encounter"](#) includes topics not found in the work above, (nor anyplace else). In that treatise you will find files, pictures, and observations about selecting a router, its application, spindle locks, cutters for morticing and jointing, locking the fixed base router, getting any shelf to fit a templet cut dado, depth of cut issues, free hand routing, routing plastic and MDF, extending the reach of your router table fence, and more. The "Router Encounter" can be added to the "Routing Outing" for 10\$, (total \$30).

PRECISION RIGHT ANGLE TEMPLET

Router Woodworking



I've got the hook set so I can use the long side of the rectangle. With 10" of hook and ample work/templet intimacy, you'll need only one clamp to hold the jig down. No matter how you clamp it, there's still plenty of real estate for the router to vacation on.



Closeup of templet balanced on narrow (2-1/2") stock. Setup is easier if you don't have to hold the jig down whilst referencing and clamping. The location of the templet can be read from the rule for consistency and accuracy; you needn't scribe lines. Note the hook work edge is offset x 1-1/8" from the edge of the templet. This design gets the cutter on track before it ever gets to the work.



The second half of the stub tenon was cut into the backup stock to eliminate edge tearout. Use a marking gage to locate the templet without measuring.



Here the corner of the material has been rounded using a bearing guided trimmer. If you always rout into the end grain this cut will never tearout. The pins on the alinement tool line up the long edge of templet with the work edge. Store your collar in the tool. One templet corner radius= $\frac{1}{2}$ ", the other is $\frac{3}{4}$ ".



A step and repeat function is facilitated with the templet. The $\frac{1}{2}$ " brass bar is used to step the templet. The same process can be used to make dovetail comb templates. (More on this in "The Router Book", A Taunton Publication).



This through dovetail dado was cut into the backup stock for zero tearout/breakout. Butt the scrap up to the work, spring clamp in place then c-clamp for affinity. Rout with impunity!



On occasion the Right Angle Templet can be used to set up other templets or components. By default the thicker MDF has its work edge square to the edge of the stock. Use 2 clamps to secure it; it will rotate without a hook.



For consistent cuttings with collars don't rotate the router. To expedite, pull the collar against the templet and keep the offset subbase grip knob on a straight glide path as you rout. I begin the cut with the straight section of the subbase parallel to the edge of the templet.



The templet can be used as a cross-cut jig on the band saw. The edge of the templet (3/8" thick) is guided against the 1/4" thick acrylic fence. I cut aluminum bar stock on it and anything else I can get on the table. Place 3/8" scrap MDF under the work for support.



Product is tuned and both ends squared to <.0008"/length and verified on day of shipment. An offset subbase, 1" collar & nut, The Templet, an alinement tool, and freight (S&H) total 99\$; the perfect gift for you or your woodworking pal.



Product is shown upside down, with the hook in its conventional position. An alinement tool is resting on the work with a collar and ring stored in it. The hook can be located on either face and one end of the jig so you can use the long side of the rectangle as a guide edge too.

Most routing of any consequence usually requires some fixturing of the work and a platform for the router. This simple right angle templet is one example. The edge ground aluminum "hook" under the templet instantly renders both ends of the jig square to the edge of the work; one clamp holds it firmly in place. This design facilitates across-the-grain templet collar and precision bearing-guided end cuts, its principle application. You can also use the product for jig and templet setup, marking, knifing and all routing at right angles to the reference edge of the work. The 2 corners opposite the hook edge of the templet are quarter radiused to 1/2" and 3/4". When the tool is upside down and registered to the corner of the work it can be used as a corner radius templet for tabletops, stair treads, door lids, children's play surfaces and other sharp cornered components. An edge guide (supplied) alinement accessory simplifies its registration.

Most of the platform is uncluttered playground for the router. Moreover, there is often room to clamp backup stock against the work to prevent tear out on exit cuts. Because of its squareness and intimacy with the work you can easily use it to square up other templates and fixturing. It is ideal for those precision jig/fixture platform and component cuts where the table saw is "suspect" or the saw blade intolerant of the material. Everyday saw blades don't cotton to aluminum, Garolite, Lexan, and Lucite but router bits can handle these materials. I used a prototype of the jig to rout the plate and drill masters and square the ends of the aluminum bar stock. I also use the templet as a carriage for cross cuts on the band saw.

When used with collar guides and an offset subbase, expect facility with ordinary cross cuts like dado and dovetail ways. Since the work edge of the hook is offset by a 1-1/8" the cutter is on its pathway a 1-1/8" before it enters the work. The setup is just as provocative. The center of the cutter pathway, using a 1" O.D. collar e.g., is read straight from the scale (ruler) obviating the need for scribe lines. Butt the end of the scale against the templet and read it at the end of the work. The center of the cut will reside on the work at 1/2" less than the measurement. This is independent of the cutter diameter too. Moreover, routing on the templet above the chip fray (and bumpy surface tear out) results in cleaner and more consistent cuts.

My right angle templet is a precision tool made (by me) from phenolic laminate and thick aluminum bar stock. Both ends of the templet have been machined and are squared to the hook (3/8" thick x 1-1/2" aluminum bar stock). Squareness is better than .0008"/length and as such, it can be used as your squareness standard for all but rocket ship and racing motor applications. The platform (8-5/8" x 10-1/4") has been drilled to receive the hook on either face or on one end for longer cuts along the 10-1/4" length. It is insensitive to temperatures in the woodworking environment and water and solvent won't touch it.

The materials are durable and sympathize with one another. The 10" long hook provides substantial intimacy with the work edge while stiffening the platform. The platform is industrial strength XX 3/8" Black Garolite and wears like ironbark end grain. The product is so weighted that it will balance on narrow (2-1/2") stock and thus obviate the need for that "third hand" whilst searching for a clamp.

The bar stock button head cap screws do reside (centered) in sloppy holes and there is about +or-.006" of adjustment possible. Notwithstanding, it will take you more than 400 pounds to dislodge the bar once it's tightened down so don't expect to have to adjust its squareness too often. The slop is there to allow some remachining and re-squaring. If you bash or booger the bar or ding a templet edge there will be some margin for recalibration without major surgery.

The templet can be used with bearings or collars. Collars allow the use of cheaper unpiloted cutters with essentially no depth of cut limitations but diameters are restricted to ~1". The collar (guide bush) system does suffer from eccentricity problems but with an offset subbase it is easy (and required) to keep the same point of the collar on the templet for the whole trip across the work. Shank bearing guided cutters are usually too long for inside cuts but can and should be used for full thickness edge or end cuts. A table top corner radius for example should be done with a shank bearing piloted cutter. Bearing guided cutters are always centered to their bearings and copy their patterns precisely. Router work should be fun; with this tool it will be fun and more predictable.

Specs:

- Platform: XX 3/8" thick x 10-1/4" x 8-5/8" Garolite plastic laminate.
- Straight away useful cutter pathway on short side: 7", on long side: 9-1/8"
- Aluminum bar stock: 3/8" x 1-1/2" x 10", ground on 2 edges.
- Weight: 2.25 pounds
- Calibrated square and checked on day of shipment to: <.0008"/length.

Features:

- Multi-use heavy duty right angle templet.
- Precision design for collar or bearing guided use.
- Useful for corner radius cuts. Supplied with edge indexing tool and collarguide/ring holder.
- Made for X-grain cuts and precision jig making.
- Very handy for layout and templet setup.
- Will balance well on narrow stock for easy setup.
- 10" ground hook for quick and absolute right angle set ups.
- Can be used as cross-cut sled for short stock on the band saw.
- Drilled for quick hook changes to long side of templet.
- Can be re-squared by the user with machinist's square.
- Industrial strength design, material, fabrication and application.
- Can be re-trued for modest cost. Trivial calibration free, except you pay freight both ways.

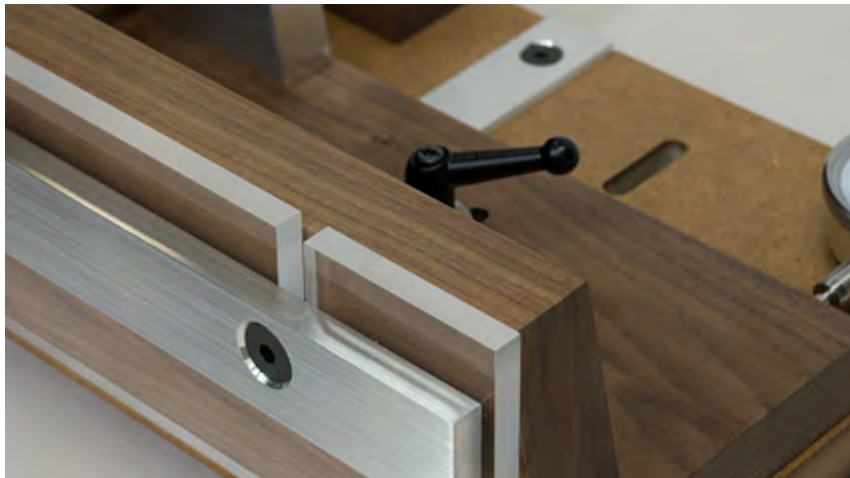
Prices:

1. Right Angle Templet, edge alinement tool with collar guide holder, and S&H (surface UPS in US lower 48): 69\$.
2. 2 copies of no. 1: 129\$
3. No. 1 with 1" collar guide and nut (ID=25/32"), extension=.200": 79\$
4. No. 1 plus offset subbase with collar guide cutter hole: 92\$
Select offset subbase from list at the bottom of the [Offset Subbbase](#) page. (621 Offset subbase not included in no. 4. 621 users should use 621 7-5/8" round collar plates.)
5. No. 4 with 1" collar guide and nut: 99\$

Prices are for the above combinations only and do not apply elsewhere on this site.

PRECISION INTEGRATED CURTAIN FENCE

Router Woodworking



3 layers of fence face, all pinched together, havin' fun, resisting deflection. Adjustable up & down to protect you from the cutter and support the work.



3 layers thick when levered down to the table top. Deflection free routing.



With integrated travel gage (.001" resolution), easy lead screw east/west adjustment. Fence locks down to the table with <1/4 turn on the 12-position levers.



Mortise pocket (on the C/L) within 1/8" from face of plastic panel to receive bearings, bosses, or unused sections of the cutter. 45 degree bevel in progress.



5/8" rad. cove, about an 1/8" of stock against the fence. The work cannot pivot into the cutter. Safety in your face. Good for short stock or end cuts that are always risky on conventional fences.

My second generation router-table fence is a fun and safe, precision tool. The fence has 2 stage adjustability, a 1.3" quick-adjust and a 1.0" micro-adjust monitored with an integrated dial indicator. The quick-adjust and fence hold-down functions are met with one set of levers. The micro-adjust function is managed with a lead screw and locked by another set of levers. Like a vise, the slide assembly (part of the fence face assembly) travels straight and parallel on a pair of precision ground guide bars. The 2 positioning mechanisms are independent of each other. The overall travel of the fence is 2.3" & can be extended x adding more sets of tee-nuts (supplied) under the table top.

All router operations have to address the extension of the cutter & its reach. Just as the Router-Lift industry has managed the cutter extension issue, my fence resolves the east/west position of the work with respect to the

cutter. The Acrylic fence face, where it all starts, has 2 functions. It is the reference/control surface for the work; the work slides against it. It is also a safety device; you can see the cutter and you're protected from most of it. Moreover, the fence is continuous so the work never jams or pivots into a cutter pocket. Edge and inside cuts (dados e.g.) are trivial; on-edge cuts can be accommodated with the curtain removed.

This blocky, multilayered assembly interlocks and enjoys its own components in such a way as to resist deflection in all directions. With all levers locked, a 25 pound force applied to the end of the fence, registers $<.001"$ of deflection on the gage. As such, the work does not squirm as it passes the cutter. Dial indicated cuttings of rabbets and dados measure $<.002"$ deviation along the full length of straight sticks. More than 20" of the work is supported continuously (unlike a split fence) along the fence and accounts for some of this good fortune. The $3/8"$ thick acrylic curtain is slotted in 4 places and well supported by a full length $3/8"$ thick x $1-1/2"$ wide aluminum washer. This 3 element fence face sandwich (metal, plastic, & wood), screwed down to the walnut substrate, contributes another measure of inelasticity.

Using the fence is a triviality, as it should be. The cutter is raised to its working height and the curtain is raised a $1/32"$ or so above that. A guess is made on the east/west fence position, the quick clamp-levers locked, and a slice is taken on some flat straight scrap. The sample will show one of 3 things: Too much wood taken, not enough wasted or it's right on. Loosen the micro-adjust lock levers, micro-adjust the fence as necessary, and lock. With the aid of the travel gage, it is possible to dial in the change to the nearest $.001"$. This whole procedure, including the curtain adjustment, should take only a minute.

As sweet as it is, it is not a fence for all occasions. I designed the fence to exploit the Router, not to compete with a Shaper. As such, it will not accept all router bits. Those contemporary cutters prostituted from the shaper for router table use will not fit in the fence cutter chamber (glue joint-miter & radial panel raisers e.g.). However, most router bits in the practical domain of Routerdom ($<2"$ in diameter and $1.6"$ in flute length) will enjoy play in the cutter pocket. The curtain adjusts (up/down) from 0 to $>1-5/8"$ to accommodate work thickness and cutter exposure. This is a straight line, continuous curtain fence; wasting the full thickness of stock (i.e. jointing) is not permissible. Notwithstanding, this lack of borderline shaper function is more than compensated for by a generous measure of safety, a clear view of the cutter, and the confidence the work will not slip into a cutter pocket and self-destruct. Moreover, you will have a hell of a time getting bitten by the cutter. You will be shielded from most of it, and x default, the work will cover that section of it that is not behind the curtain.

In summary, expect a no maintenance fence with easy storage, quick lock up, max cutter visibility, and prepare to arrive at the cutter target ahead of schedule. You will enjoy the dial in quick-adjust, efficiency, precision, safety, and its high play value. With its chip collector right behind the cutter, expect few chips in your socks and shoe laces too.

Questions? [Email pat@patwarner.com](mailto:Email_pat@patwarner.com) as needed; be certain of its limitations before purchasing. This is a life time tool.

Specs:

Curtain fence face: Acrylic, $3/8" \times 3.5" \times 20"$

Curtain up/down adjustment: 0 - $1.6"$.

Micro-travel: $1.0"$

Quick adjust: $1.3"$

Total travel/set of Tee-nuts: $2.3"$

Weight: 10.7 Lbs.

Max. Cutter dimensions: $1.6"$ vertical (exposed flute) x $\sim 2.0"$ in diameter

Minimum work piece thickness: $3/16"$

Minimum work thickness contact to fence: $1/8"$

Max. Work thickness with curtain: $2.5"$

Max. Work thickness without curtain: Unlimited

Minimum x-grain (end) cut width: 4.5"

Minimum work length: 6"

Chip collection: Integrated for 1.2" - 1.5" ID hose.

Price:

Includes fence, assembly, & all accessories: Acrylic face and Al. washer, 2 sets of tee-nuts, 5/16 transfer punch, dial indicator, all levers, all hardware: \$480 USD.

Shipping, packing and insurance: \$35. UPS lower 48, Alaska & HI shipped USPS. Canada: Inquire.

Spare fully machined, acrylic fence face: \$50. S&H required if shipped as separate order. \$0 S&H if shipped with fence.

ROUTING TO .001"

Router Woodworking



The sample clamped in the holder is being checked for squareness. A .001" feeler gage will not slide between the bar stock and the blade of the square. The bar stock is up against the shoulder of the stock (shown in the background). Refraction, reflection and parallax confound a visual inspection. The 1 mil gage either enters a gap or it doesn't, a simple solution without sophistication.

Routing to .001" (1 mil) is a 6800 word story about the principles of precision routing. The text and pictures (29) summarize the concepts, the nature of the fixturing, and the principles of measurement required to rout to .001". The emphasis is on the simple things, with ordinary woodshop technique; not machine shop tooling and technology. The work was inspired by the discoveries encountered making a precision tee-square.

Drilling on exact centers, zero-flattening the edges and faces of the T-square-body, routing parallel to .001", templet routing in stages, consistent and precise measuring, holding the work steady, handling small workpieces accurately, managing routing trauma, and staying in the safety zone, were some of the challenges. What I thought I could do with ordinary furniture making fixturing was not possible in the 1 mil universe. Every critical phase of the square, from milling to drilling had to be fixtured.

The routing, fixturing, jig design changes, and inspection methods are explained in general. Some of the t-square fixturing is used as props to tell the story. The concepts are ordinary; they're just redefined and refined for precision, exacting standards. In between the lines is another story, the story of the nuance, attention, attitude, and the changes in perception I had to make to get to .001".

The focus of this essay is routing and those subtleties necessary to prepare for precision routing, not drilling and milling. This work assumes skills in jointing, planing, routing, milling, sanding and drilling; it is not for the inexperienced, (though it may inspire those that aren't). This is a taste of the advanced work often ignored by the publishers.

It is not for everyone. ([Click here for sample page](#)). Even if you've no desire to hit .001", this work has value if you'd like to know more about precision, accuracy, repeatability, and the X-factors in woodworking. For example

you cannot read a precision rule to better than .010". Reasonable joinery has a 1-3 mil interference; you're guessing at adjustment if you're using a rule to get there.

The "Routing To .001" article is an E-mail-able PDF (read-able on almost all computers). The product (pictures & text) is mine, culled from 40 years of studying the art, and never before published. It is only available from me. To order, email pat@pwarner.com or just send \$24 to:

ROUTING TO .001"

Introduction

Router Woodworking

Introduction



Figure 3: My fence is 4 layers thick and the I-beams are as stiff as railroad track. The package is very resistant to deflection.



Figure 4: with more than 25 pounds of force near the stylus there is less than .001" of deflection.

A lot of woodwork is jig & fixture dependent. Precision routing is almost always done with some holder, jig, or fixture. Fixture component (and the fixture itself!) deflection in the .001-.003" area is a major source of error; you cannot see deflection of this magnitude so you cannot assume it does not exist (see Fig. 3). A travel indicator is called for here. Most have magnetic bases, useless for the woodworker working on substrates of wood and aluminum. I use a 15\$ Chinese indicator in a holder I made. I can weigh it down if I can't get a clamp on it. If the jig component (fence, toggle, holder, crowder, etc) is suspect, test it for deflection before committing it to service.

Set the indicator up and apply a force much greater than you expect to use in the operation (see Fig. 4). See if the damn thing bends. If it does, (2-3 mils are too much) take steps to stiffen it. Clamp it (the component) in more than one place, double its section, use another material, add more hardware, change its substrate, do what ever it

takes. This kind of error adds up fast. And, to be sure, we need to understand a few principles of measuring before we move on.

The indicator above, for example, is largely independent of technique; your touch has nothing to do with its accuracy. As such, if you can get it into play when investigating, it will be an advantage over other measuring devices. Most of the time we are not so lucky. Your touch, sight, and even your hearing are called upon for the close measurement. And these senses are all arbitrary and will influence the value of the measurement. This is metrology, the study and management of measurement.

SELECTING A ROUTER

Router Woodworking



The Bad Boys. These 3 routers, in my view, are the state of the art today in plungers even though the 621 and 625 (originally Elu's) have remained essentially unchanged for >20 years! The 6182 is part of the DW PK, a new tool, but of the same quality. With my offset subbase in play, expect fixed and plunge function, stability on edges, transparency of the work and cutter, circle cutting capability (precision 4, 6, 8, 10, & 12.00" holes), and safety.



The 7518 is as "bad" as it gets. If it can be routed, this locomotive, hand held, will rout it. Tho usually inverted in a router table, it is my router of choice for sustained, production, experimental, and all heavy duty chatter free cuttings. My offset subbase will keep its 14 pounds from tipping on edge and end cuts.



These 5 guys are first class mid range fixed base tools. (618, 890, 5615, 690LR, 1617). The PC890 has more motor travel, the 5615 its elastomer Bodygrip, the 618 its easy motor extraction and detachable power cord, and the 1617 its balance, light weight, and unique armature/collet assembly.



The Milwaukee 5625 is the best compromise for the router table and it's a wonderful hand held router. The casting is bolted right to the top; no inserts to complicate the design or frustrate the smooth, uninterrupted passage of the work. The casting acts as a mending plate, right in the center of the slab where it's stiffening is needed.



If you need a trimmer, the PC 310 has the best depth changer, ergonomics and control (with my subbase), and trouble with its collet. Cleanliness, a thin film of oil on the outside of the collet, and more frequent cutter changes will keep the collet from jamming in its seat. Ain't no perfect routers.

Choosing a router can be a complicated proposition. This January (2005) I count ~ 60 plungers and fixed base and maybe a dozen or so trimmers. Horsepower and weight, ergonomics, tool budget, application, the expected life of the tool and the operator, skill level and just what your future in woodworking is, all play a part and add to the consternation. There is more to the story. The router has more application than any other tool and as such (a single tool) can't be expected to perform in all arenas well. The multiple casting (plunge, Dee, and fixed base) PK's simplify this dilemma but not entirely. For example, table routing should be a 3 horsepower task; lesser powered tools will run hot and shake themselves to death taking the typical big bites of long duration in the router table. All of the PKs are in the 2 HP range.

Allow me to sort out (with specific examples) some of the ambiguities, starting with the trivial. In my view, the plunge and fixed base router functions are a first-base essential. However, there is a safety issue here if you purchase only one router. Plunging with a fixed base casting is done at risk; the router may steer itself or a cutter may break. Using a plunger in a fixed base application is nearly as hazardous; try plunging/routing on the edge of stock, for example. (You'll tip the tool over if you plunge it with only half the casting on the work.) Notwithstanding, the plunge router, though less frequented, should be the first router in the router armamentarium. There are many; every router manufacturer makes one or more. Some of my favorites include the big Festo, the Bosch RA 1166 (a PK plunger), PC's 7539, and all 3 of the DeWalts (625, 621, & 6182).

The Dewalts are well appointed with superb electronics. They're very ergonomic, powerful, plunge better than their competition, but they do have stability problems. All plungers are wide handled, top heavy, and will teeter easily whilst routing along the edge of stock. The stability problem is not a DeWalt exclusive. Routing where the casting is surrounded by substrate poses little stability risk but the same router hanging near the edge of templet or workpiece end, will tip, killing its fixed base function. (Fixed base function: Essentially single depth trim or joinery cuts).

So what to do if you want only one router with both fixed base and plunge functions? Get a DeWalt and one of my offset subbases. I designed a plate for each of the castings to accommodate their unique functionalities and equilibrium issues. Click the [Offset subbase](#) link for details, make your own subbase, or consider one of my competitors. Practicing the fixed base function with a plunger (and no oversized subbase) is risky business.

The next step up is for those on a budget who want the fixed and plunge functions but only one interchangeable motor, the PK. (The life long woodworker with a more generous budget should consider a separate plunger and

fixed base. Better choices are available in dedicated fixed and plunge routers with their own motors). To date there is only one omission (Milwaukee). All of the majors produce a PK or 2; (PC, Dewalt, Makita, Hitachi, Bosch, Ryobi and Sear's).

With this much competition, prices are at a minimum and quality at a maximum. In my estimation the [DeWalt 618PK](#), (no dee handle), is the best compromise in a PK. Caveat: All of the PK's are in the low 2HP class and, as such, cannot be counted on for sustained inverted router table use.

For the plunge only user there are at least 30 entries, ranging in power and price from ~3/4" to 3 and 75\$ to 300\$+ respectively. A plunger, in my view, is a multiple stab and excavate tool. As such, the cut/pass can be shallow and swift requiring only 1 or 2 horsepower. The 3 HP plungers are for deep cuttings of long duration. These buggers are heavy and unwieldy. The 2 HP tools (Bosch 1166, 1613, DW 618 & 621, and Makita 1100 e.g.) are spry and more easily manageable.

For the fixed base only users there are 30 + choices, many essentially the same tool with maybe a Dee handle or soft start differentiating one tool from another. There are only two 3 HP fixed base, Milwaukee and Porter Cable. (I suspect that with DeWalt now in the power seat, that may change.) Both of these tools are excellent for sustained, hand held, rigorous cuttings. In the 2 HP setting, there are many good choices, the PC 890 being on the top of my list. For detailed appraisals of the other 2 HP contenders (et.al), the reader is invited to the [Warner Magazine](#) link. The fixed base routers are designed for hand held use. Their snug and compact design render them best suited for edge work at a single fixed depth, (hence fixed base). They are wonderful for dado cuts, joinery and templets, but they are especially well suited for trim/decorative profiles along the edge of stock. An [offset subbase](#) will substantially upgrade handling and safety here. Do not plunge with a fixed base router.

Implicit in the choices above is hand only operation. But router table routing is viable and perhaps more important than hand routing. Oddly, of the more than 75 extant routers, there is not one of them designed for router table use! Plungers are all designed with handles and springs to work with gravity. The fixed based tools are underpowered (save PC 7518 and Milwaukee 5625), double gripped for hand held use and none of the graphics are printed upside-down. Moreover, their depth adjustment mechanisms are designed to enjoy gravity, switches are located for the hand held, and motors drop out of unlocked inverted castings.

So what's the deal? A table router is essential, right? There are many avenues to a solution, all compromises, some expensive, some ridiculous. In my view, the simplest way to manage the router table router is to turn a 5625 (Milwaukee) upside down and bolt its base casting to a well stressed, thin (5/8" in my case) piece of unclad MDF. Leave the big cutters to the shaper and keep the cutter hole to ~ 2". There will be ample depth reach with either a PC 7518 (>2.75") or the Milwaukee. That is the simplest and most practical approach to router table routing.

Is it common? Absolutely not. The 3HP plunger is the most common router in the router table. They are all fastened to metal or plastic subbases which rest, nest, and squirm in router table windows. Will I recommend one? I would be doing you a disservice if I did.

What about the expensive steel/aluminum lifts? They work with any router and pretty well at that. Would I recommend one? No. I do, however, strongly recommend you exploit the router table function no matter how you do it. Though the power requirement high (3HP), the functionality complicated, a router table is a critical player in Routerdom. Its safety, dust collect ability, ability to rout product on edge or face, produce tearout free cuttings, apply itself to joinery and abate noise should not be left unexploited.

What about the trimmer? Trimmers are great for that which they're designed. There are many and a life time woodworker should have at least one. Use them for shallow excavational work, trimming veneer, Formica and very light edge profiles like 1/4" round overs or bevels. Though not essential, they are nice to have and in my view, the PC 7310 and 310 trimmers are the friendliest. The 7310 depth adjust is poor but its power and ergonomics (with my [offset subbase](#)) outweigh the boondoggle. The 310, also with my [offset subbase](#), has the best of depth

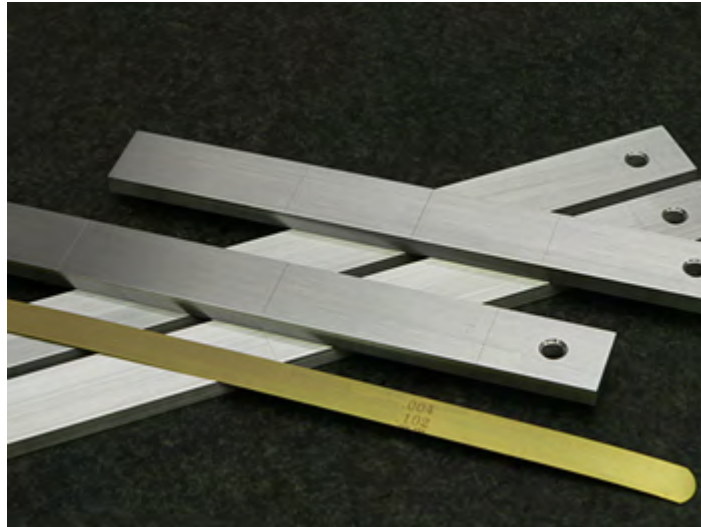
adjusters and for light work it is the best compromise. Bosch & DeWalt trimmers are great contenders but PC remains the industry leader. To be sure, the trimmer is ready for a makeover, and at least one company (not to be mentioned) is doing just that. For more on routing, consider "The Router Book".

And safe routing!

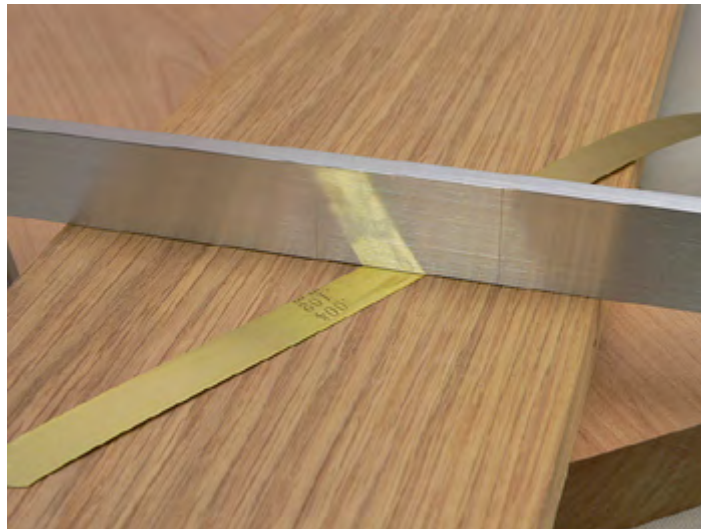
Pat Warner 1/02/05

PRECISION STRAIGHT EDGES

Router Woodworking



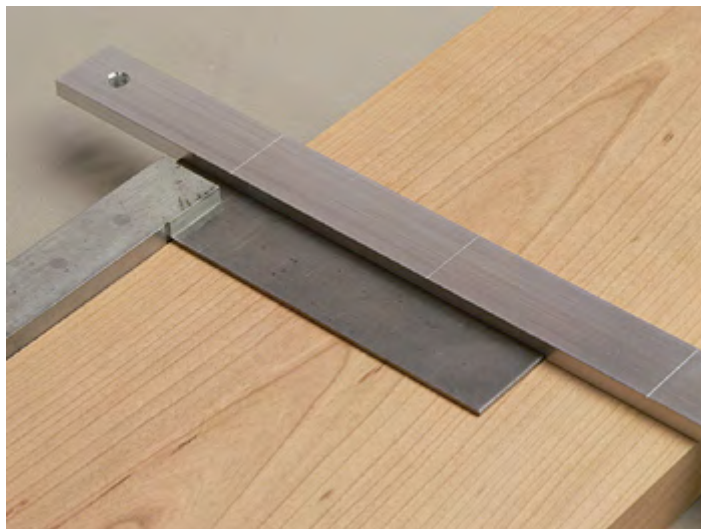
A straight edge has a lot of application. Supplied in 2 lengths (8" & 12"), with a .004" (x12") brass feeler gage for easy inspection.



If your work is not flat it will not register well. Cupped work is guesswork.



Castings that aren't flat register narrow & wide work differently. If you can't do anything about the casting at least you know where the error is and have the option of working around the defect.



The straight edge can be used to extend the reach of a short square.



My Edges have been scribed for centerline finding. Line both knife lines up with the edges of the work and mark the work adjacent to the centerline scribe.

A straight edge is a very useful shop reference and layout tool. You can use it to check for flatness on critical jig substrates and components and qualify the output from your jointer and planer. Moreover, you can interrogate the tablesaw, jointer, router and fence castings for divots and flatness. With the straight edge you can track and isolate potential sources of error.

The straight edge can be used to extend the blade of the short machinist's square. Since the ends are square you can also use it as a length standard. I mill and hand hone the edges straight to an accuracy (min.) of .0008"/length of bar. The instrument is made & inspected in America by me; it is not a farmed out product.

There are knife-lines on the centerline, equidistant from the centerline and on both sides to facilitate center finding. With only 3 lines/side, you can't confuse the centerline with the others. The aluminum bars measure ~1.0 in. width x .25 in. thick x 8.00" and 12.00" long. Parallelism is within .0015" and therefore a pair of them can be used as winding sticks*. One end is drilled for easy storage. All edges have been machined and deburred. The tool is hand and wood friendly. You can draw, scribe or knife along its thick edges.

In my view, when the work, casting, substrate or inspected surface deviates by more than .004" corrective action may be necessary. 4 mils is my threshold of suspicion. Joints get sloppy or jam. Assembly is sometimes frustrated with a 4 mil interference, deviant fences and substrates have trouble registering the work, and so on. As such, the Edges are supplied with a brass .004" (.5" x 12") feeler gage for inspection. A visual inspection always has merit but with the gage you'll have more objectivity. Moreover, both materials are non-magnetic, won't pick up stray shop steel fibers, stick to magnetized castings or surfaces, nor will they rust. Order one for yourself or for your woodworking pal.

Prices:

1. One 8" Straight Edge with .004" brass feeler gage: 19.50\$ + 4.50 S&H;
2. One 12" Straight Edge with .004" brass feeler gage: 22.50\$ + 4.50 S&H;
3. Both 8" and 12" Straight edges with 1 brass feeler gage (includes S&H): 39.50\$

Order [on line](#) or by mail. Supply your name, shipping address, email & choice(s). I will get back to you on delivery date, terms, and product availability. Please, no third party money handlers, (bank service checks acceptable). This transaction is between you and me.

US Mail orders to:

PAT WARNER
1427 KENORA STREET
ESCONDIDO CA 92027-3940

Specifications:

Material: Machined and hand ground 6061 Aluminum.

Length: Both lengths (8" & 12"): + or - .0025".

Width: From ~.940"-.970", parallelism: + or - .0015"/length of bar

Straightness: Better than .001"/length of blade

*Winding sticks will indicate twist but only on flat stock. If the stock is randomly cupped the readings will be ambiguous. Use the straight edge first to qualify flatness.

SPECIAL

Router Woodworking

Subbases for PC 310 trimmer

In my view, the PC 310 is the best of trimmers, not cheap, not perfect but a great tool nevertheless. The light, well styled, comfortable, 4 amp. tool is not as powerful as most of its competition but tough enough for its intended application. (For a detailed appraisal of the 310, see [my CD-ROM](#)). It might be expected that any aftermarket subbase on a trimmer is unnecessary. On the contrary, and although only 3 or 4 pounds, trimmers are just as unstable as any router routing along the edge of stock.



Either plate can be supplied with a counterbored PC collar cutter hole. Some say that a brass collar nut will hold a little better than steel.



That's me with my hands around the tool; it won't tip and I can see what's being cut.



Real works of industrial art, dated in design but timeless nonetheless, better with my plates. The lock/lever is a [reidtool.com](#) perfect match, catalog no. KHB-230.



An old CMT chamfer bit will fit through the collar hole. All of my plates have been deburred, either by machine or steel wool.

The base casting of the 310, more than 1/2 of a cylinder, does not allow a lot of work/cutter visibility nor stability. My subbases will make up for some of that, and to be sure, keep the tool from tipping as you rout along edges. The new offset plate positions the open face of the casting cylinder to the operator so you will see as much as possible. In addition to stability, visibility, and more control, you can wind the wire set around the offset knob for easy storage. Moreover, both the round and offset plates are substantially bigger than the castings and as such, if you drop the tool it will most likely meet the concrete at the subbase, not the router. It will chip, but go on about its business nevertheless; a router that lands on its head will probably be D.O.A.

The round plate is a 4" diameter disk x 1/4" thick. The offset base is 6" x ~3/8" thick and will not deflect. Its cutter hole is also centered to the diameter of the round end of the plate. 2 cutter hole designs are available for either plate; 1-3/16" and counterbored for PC collars and 1-5/8" for general (noncollar) use. A set of plates is 41\$, includes S&H to US and Canada.

To make a purchase:

A) Select cutter holes for each plate, (PC collar or 1-5/8").

B) Email shipping address, (shipping UPS surface).

C) And agree to send me a 41\$ check within 2 days of date of order. I will ship day of order. Please send remittance to:

PAT WARNER

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Questions or orders, please email to pat@patwarner.com. Concerns about collar/subbase/cutter centricity:

See [collarguides](#).

SPECIAL

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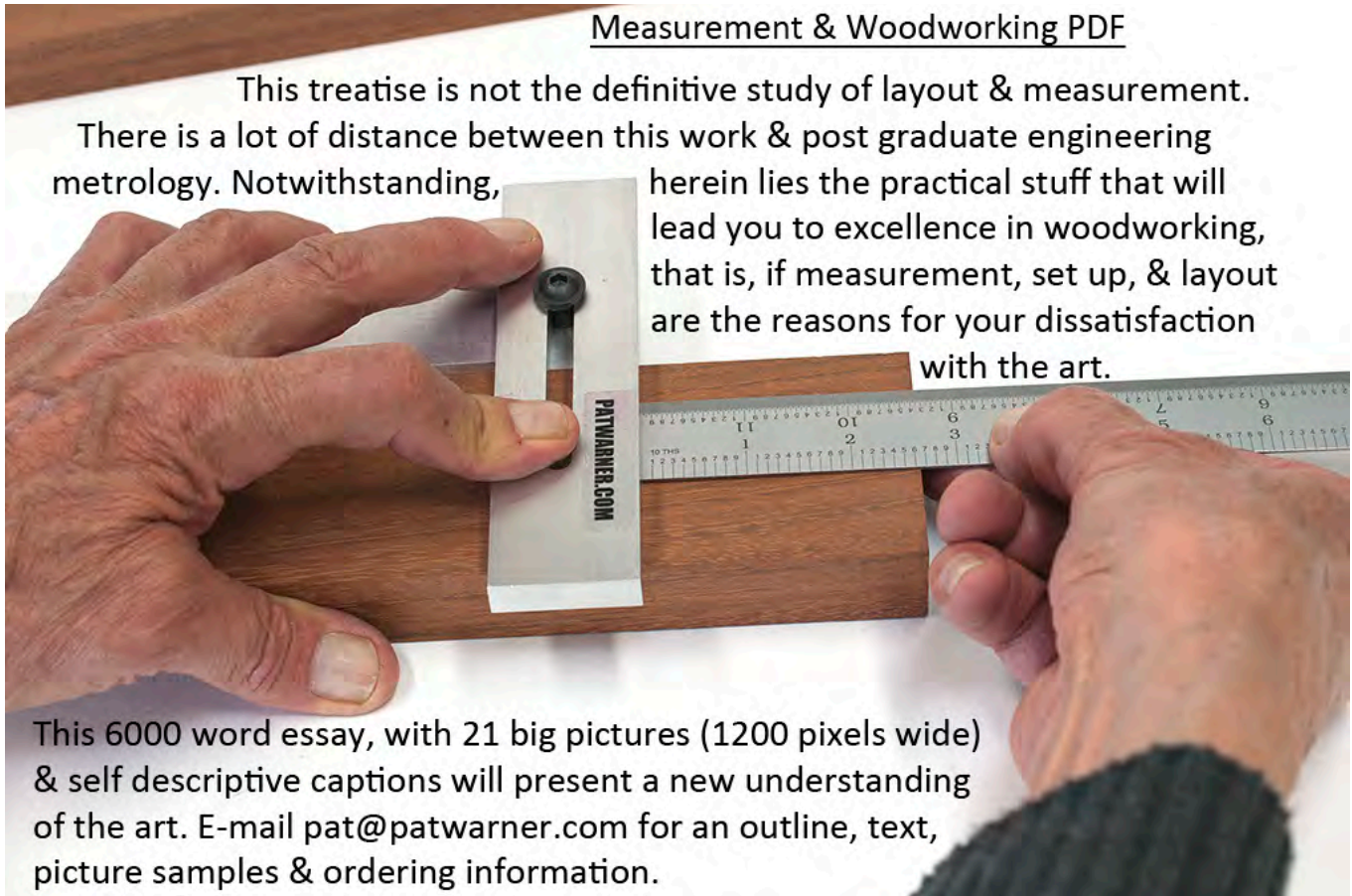
Questions or orders, please email to pat@patwarner.com. Concerns about collar/subbase/cutter centricity:
See [collarguides](#).

MEASUREMENT & WOODWORKING

Router Woodworking

Measurement & Woodworking PDF

This treatise is not the definitive study of layout & measurement. There is a lot of distance between this work & post graduate engineering metrology. Notwithstanding, herein lies the practical stuff that will lead you to excellence in woodworking, that is, if measurement, set up, & layout are the reasons for your dissatisfaction with the art.



This 6000 word essay, with 21 big pictures (1200 pixels wide) & self descriptive captions will present a new understanding of the art. E-mail pat@patwarner.com for an outline, text, picture samples & ordering information.

VERTICAL TRIM SUBBASE

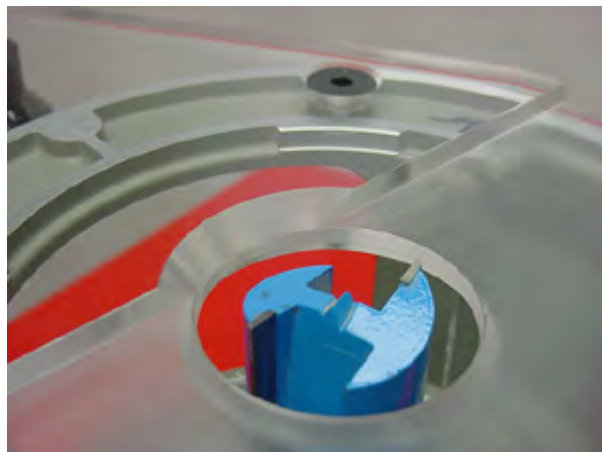
Router Woodworking



This trim plate has 3/16" of its thickness missing. Therefore, projections up to 3/16" proud of the face can be routed to near zero.



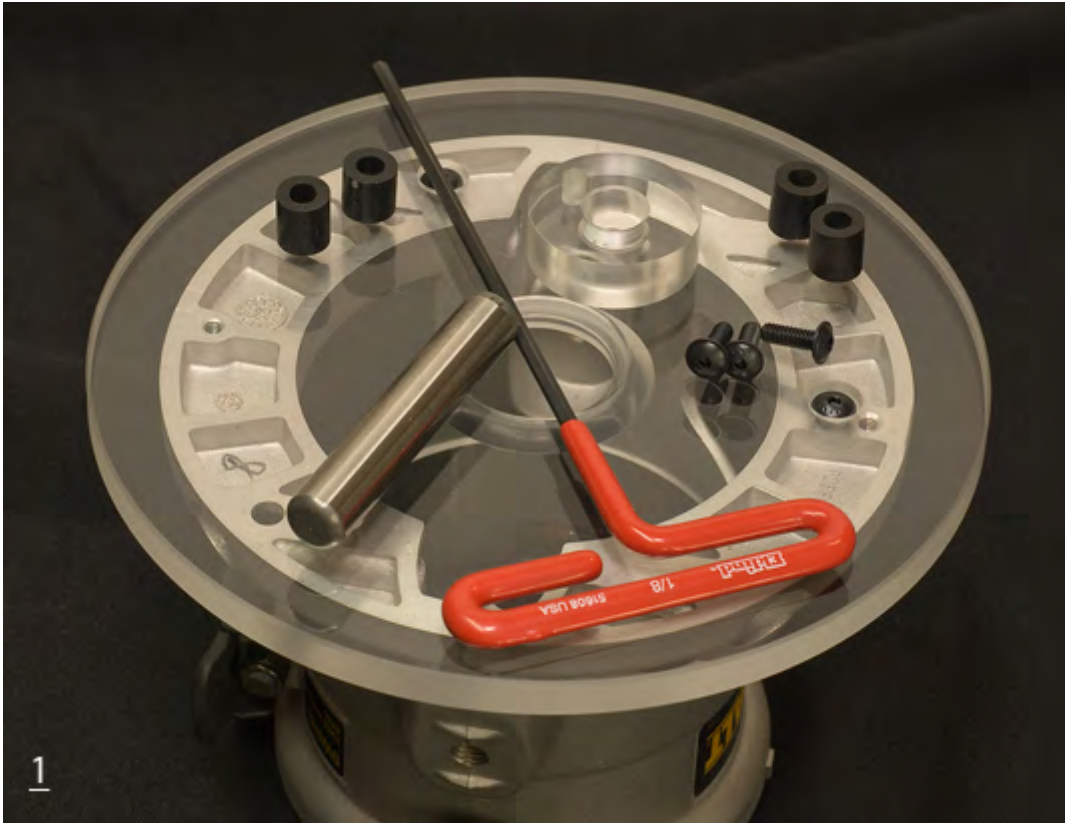
Use a large diameter, short fluted cutter for best results. Climb cut shallow (<1/8" thick) projections for minimum surface tearout. Larger diameter cutters are better at bottom cutting.



The unmilled section of the subbase is 12mm thick and will not deflect. All edges are deburred. Product is milled to your specs or mine.

PRECISION SUBBASE KIT

Router Woodworking



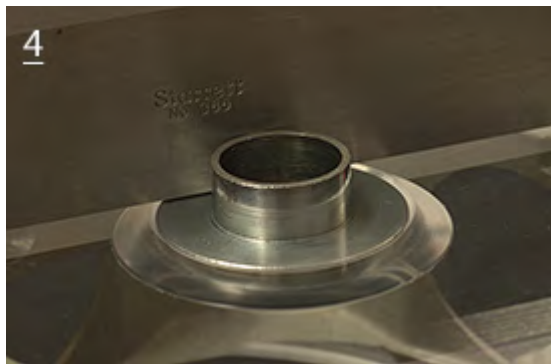
The subbase for critical operations requiring precision collar/cutter centricity.

My subbase, with its machined ring and pin, can be centered precisely to the router collet*.

As such, expect repeatability and on-target routing with dovetail & box joint jigs, in-lay kits & precision templets.

The subbase is centered with a .500" ground steel pin in the collet & a machined ring (both supplied) snapped into the subbase collar counter bore (2). The ring/pin fit is instantaneous, positive and unambiguous. Screw down the plate and you're ready to rout.

The footprint (7") of my subbase is larger (1) than any router casting in North America except the Bosch 1619. And at 9mm (~.350), the plate is thicker than any OEM base plate and less likely to deflect or break. As such, expect more control & stability, especially on the extremes of the substrate. Drop the router and the oversized plate is sure to hit the deck first and save the rest of your router from the impact. Moreover, there is >.250" of plastic under the head of the subbase screws. You can't drive the screws though the counter bore.



The special screws** reside in oversized counter bores. The head and shank of the screws have ~.045" swim room. As such, the plate will center itself on the worst of third world castings. Rated at 145,000 psi (min.) tensile strength, not only will you not break off the head of the screw, you will not spoil its socket.

Though the diameter & thickness of this precision base is the same for all routers, the subbase screw holes & circles are unique for each machine. There are no extra screw holes in it to clog with chip or frustrate your view of the work. The product is completely machined (sized, drilled, counter bored, reamed, chamfered, & polished) and ready for work. And each plate is supplied with a precision centering ring and ground .500" steel dowel.

I make the plate & rings here in the United States of America.

CAPTIONS

- 1) The oversized (.350" x 7.0") plate is counter bored & dished for your collar guides. The screw holes are also counter bored and chamfered; expect ~.045" of swim room for the screws. The cushioned wrench is supplied.
 - 2) Here on a Porter Cable 690 casting, the ring and pin are conspicuous. The screw heads reside ~.010" below the face of the plate.
 - 3) Neoprene, plier's jaw protectors (4 supplied) keep you from dingin' your guide bushes.
 - 4) Note how the collar flange sits below (~.010") the face of the plate. My plates are templet ready; they'll require no re-machining.
 - 5) See [New Pix/Product](#) page for enlargement.
-

* The centeredness of the subbase cutter hole counter bore to your collet should be ~ + or - .001". Nonetheless, errors can occur and accumulate on occasion. For example, if your collar (PC/DW type only) flange is out of the Porter Cable (1.373'-1.375") specification it may swim in the plate counter bore producing some eccentricity. Moreover, all collars are not created equal. Some are poorly made. Machine errors do occur in the extensions (the boss that slides against your templet). Some are out of round, others eccentric to the flange. Still, others may have been crushed on installation or removal. Yours may be worn. The point: My system is very likely to be your best shot at collar/cutter centricity but there are instances, out of our control (albeit rare), that may frustrate perfection.

**Flanged button head, low-profile, hex-socket, steel cap screws.

ORDERING OPTIONS

([Email pat@patwarner.com](mailto:pat@patwarner.com) please)

- 1) Product Kit: \$63. Includes subbase, screws, precision pin & ring, 1 neoprene wrench sleeve (not shown), 4 pliers tip protectors, 1 cushioned T-Allen key, and instructions.
 - 2) Subbase with screws only: \$36.
- 10% discount on second plate or kit.
- 3) Dictate: Router make/model, include shipping address, kit or 1 base plate (option 2).
 - 4) For the following routers: PC 890/690 series, PC7/8529, DW 618/616/PKs series, DW 621 & DW 625 (7.6" diameter), Milwaukee all (excepting 5625), Makita 1100 series, Makita RT0701C, Bosch 1617/18, PR011, PR-20, 1613 & 1166 (6.75") and 23, Festool OF 1400 EQ, DNP612 (DW611 plunge casting), Triton (2 & 3 HP), & DW 610 (6").

Yours not listed? Requests considered.

Specifications

Material: Acrylic

Dimensions: ~9mm (~.350") x 7.0" diameter

Weight: ~250 Gms (~0.5 lbs)

Loss of depth/cutter reach compared to standard .25" subbases: ~0.10"

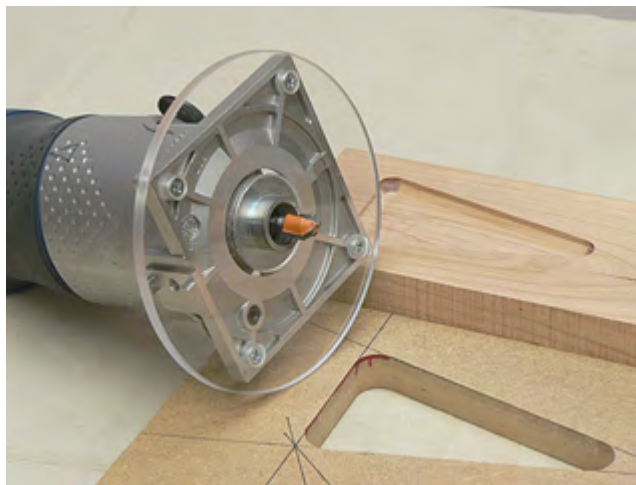
Collar flange counter bore: 1.375" - 1.378" x 0.105" min.

**BOSCH TRIMMER SUBBASES
(PR-10 & PR-20)**

Router Woodworking



The large platform (3/8" thick x 7-3/8") is supplied with either a PC collar guide cutter hole or standard 1-9/16".



Expect to do a little templet routing with this trimmer & its round subbase. Note, the cutter hole is not in the center of the casting; it is centered on my disk, however.



You'll have a hell of a time trying to tip this router over doing edge work.

The PR-20 is a wonderful trimmer, well powered, light (3.3 lbs.), nicely designed and worthy of respect. Its elastomer motor grip and handy electronics manage safety and control like no other trimmer. The VS (16-35Krpm) and soft start are unnecessary for small cutters, in my view, but sure to unnerve the competition. My sample vibrates a little too much at 35K but smooths out at common trimmer speeds of ~ 25K.

A tool that is handled by its motor and casting should be free of burr and sweet to the touch; few routers are. The [PR-20](#) is the first router I've ever handled that is completely de-burred. The long wire set (10') has its strain relief exit opposite the switch and view window of the casting, facilitating control and cutter visibility. The depth adjustment is 2 stage, and the motor travel is ~ 1.125". The use of the micro-adjust requires a twist of the casting to engage, an annoyance for this operator. The motor lock is a perfect, quick acting, over-center lever.

Expect to rout ~ 1/4" x 1/4" across grain, a demanding cut. However, this is a trimmer and as such, not designed to take this much wood for sustained periods. Use it for light, shallow trim and templet cuts. The self-release collet is the first in a trimmer. The collet nut is tightened with a single-wrench (with spindle lock); I use a 10mm wrench on the armature flats in lieu of the lock. The motor rests well upside down for this. The subbase end of the casting has been faced off but still rocks slightly on my granite surface plate.

To get the utmost control of this trimmer use my subbase accessories. You will not tip this router on tight turns or around tortuous templet contours with my offset subbase. The over sized (5") round plate provides more control for inside work and is cutter centered, (to the diameter, ~ + or - .006"). My subbases are supplied with either a 1-9/16" cutter hole or they are machined for PC collar guides.

SUBBASES

In my view, trimmers are too small to navigate around a work piece without tipping and spoiling the cut. An oversized round or offset subbase is an essential for this operator. I make 4 subbases for the PR20. 2 to accommodate the PC/DW collar guide system (round & offset). And 2 with 1-9/16" cutter holes. The Round plates are 5.0" x ~6 & 9 mm x 360°. The collar accepting plates are ~ 9 mm thick and center-able to ~ + or - .002"*. The offset plates are 7-5/16" x 9 mm thick. All plates made of cast Acrylic. All items include shipping & handling.

* Centricity depends on the collar flange diameter, best at 1.374" - 1.375".

1) 5.0" x 360° x ~6mm with 1-9/16" cutter hole: \$25

2) 9 mm x 7.3" Offset subbase with 1-9/16" cutter hole: \$36

3) nos. 1 & 2 : \$52

4) 5.0" x 9mm x 360° adjustable Collar accepting plate Kit: \$60 (Includes round plate, 4 flange button screws, 2.5 mm cushioned Tee-wrench, pliers protectors, Neoprene wrench sleeve, machined acrylic index ring and .250" centering spindle. See [Precision Subbase Kit](#))

4B) 5.0" x 9 mm x 360° collar accepting subbase with button flange screws only: \$35

5) 9 mm x 7.3" collar accepting Offset subbase kit, (includes accessories in No.4): \$64

6) 9 mm x 7.3" collar accepting Offset Subbase with button flange screws only: \$42

7) Nos. 4B & 5 (same \$ as nos. 4 & 6) : \$75

8) Inquire about combinations not shown.

[Email pat@patwarner.com](mailto:pat@patwarner.com) for purchase information or send check, cash, or money order with request(s) and shipping address to:

PAT WARNER 1427 KENORA STREET ESCONDIDO CA 92027-3940

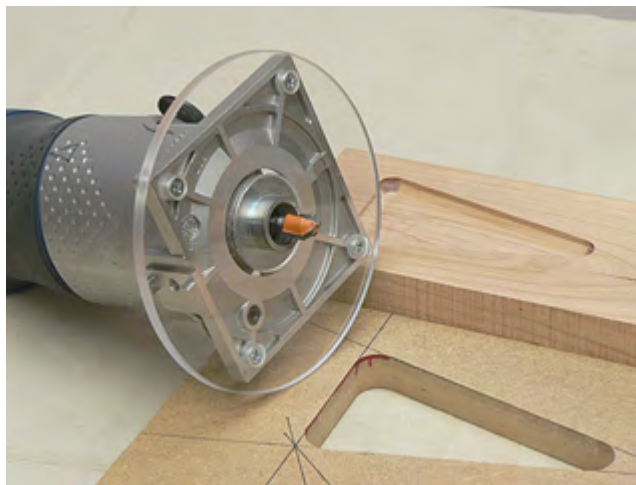
For more on cutter to collar to subbase centeredness see the [Collarguide](#) link.
Subbase prices elsewhere on PW.com do not apply to the PR-20.

**BOSCH TRIMMER SUBBASES
(PR-10 & PR-20)**

Router Woodworking



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[Email pat@patwarner.com](mailto:pat@patwarner.com) for purchase information or send check, cash, or money order with request(s) and shipping address to:

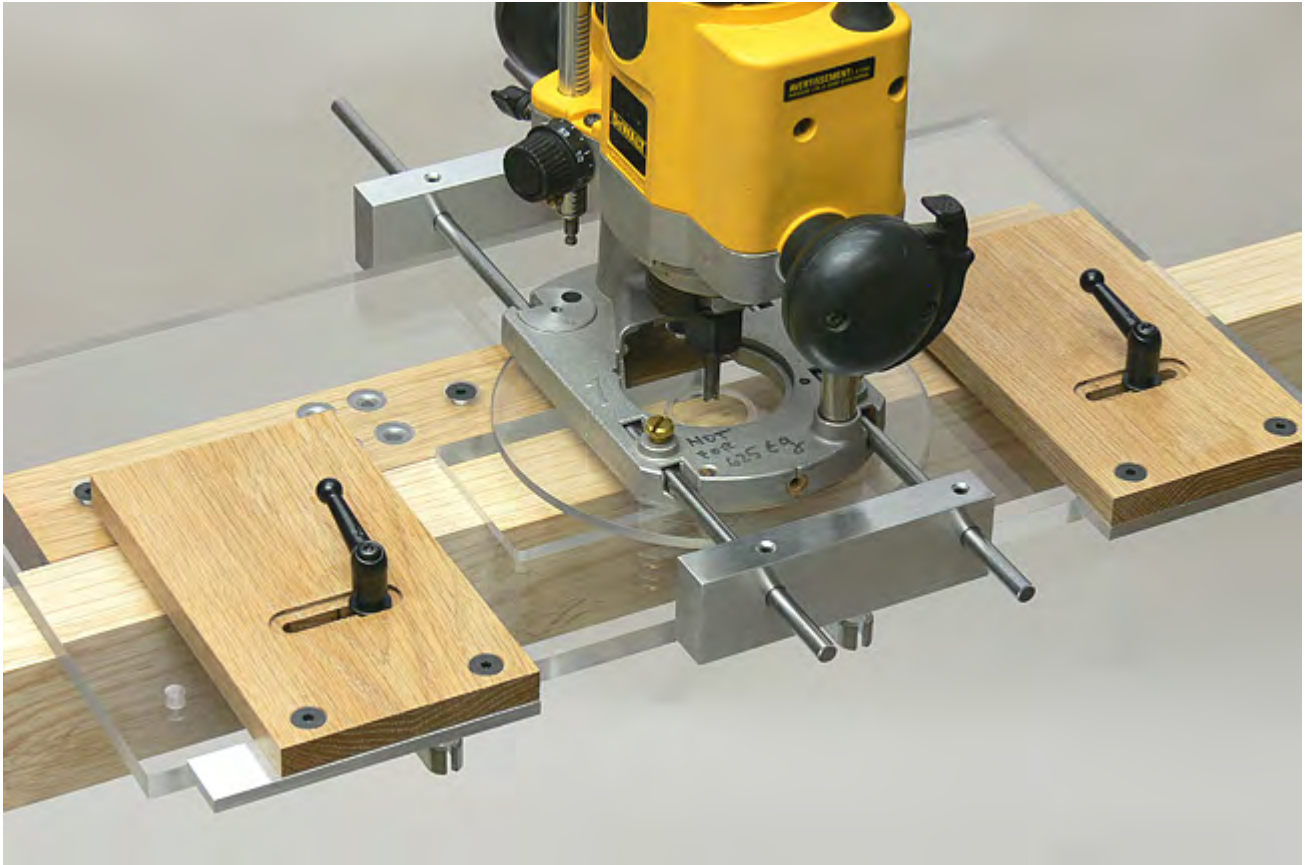
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MORTICING WITH A ROUTER

Router Woodworking

Why bother with a mortice? Without it, furniture joinery would be compromised. The mortice and tenon is the connection of choice in framed ware of all sorts, especially tables and seating. The joint resists tension (when glued) and twist, and enjoys itself in compression and shear.



Appreciate that with a mortice, you're only half way there. Most joints are asymmetric; they have gender (glue joints excepted). A mortice requires a tenon, a tongue a groove, a dovetail requires a socket (way) and so on, a complication to be sure. Notwithstanding, this complexity lends itself well to flexibility. There are a lot of ways to make a mortice. A chisel & hammer, a power chain morticer, a drill press with morticing attachments, a router, and there are assembly tricks, (glue ups e.g., can be such that space can be left vacant for a mortice).

Router Morticing has 2 requirements, one a layout and location function, the other fixturing. Locating the mortice is insensitive to the mortice making procedure. It makes no difference how the damn thing is cut; you always have to locate & layout the excavation. And there are always engineering, practical and esthetic variables to consider. The walls of the mortice cannot be too close to the edge or end of work for example. You must to decide whether you want it to poke through or stop blind. Is hardware part of the connection? Cross dowels and screws, for example, can change the entire design of the joint.

The fixturing demand presents several challenges. The complexity of the fixturing varies substantially depending on whether the work is hand or table routed. Each method has its advantages and risks. Plunging the work straight down on a hot spinning cutter (the most common table approach) is risky business, complicates stage routing, & can break a cutter. The ends of the mortices always burn, the chip is trapped, and the cutter gets beat to hell. Work piece control is precarious, and the dimensionality and quality of the excavation is invariably compromised. I would not recommend this method of mortice routing.

A more sophisticated approach has the work fixtured on the router table & the router spindle horizontal. The work clamped & indexed on a platform, moves in 2 or 3 planes, with or without templets & stops, and usually with levers. This method is common in semi-production, safe and accurate. It is complicated, however, with setup and hardware. As a rule, this approach is expensive, or the worker has to be damn good jig maker. The woodworker with resources can also buy ready-made tools for this, (Joint-Matic, Multi-Router, et.al.).

A third approach, & one I am a student of, has the work fixtured in a jig whilst the router zips around to plow out the diggin's. I like this method but it too has its complexities. You have to be a jig maker (or you can buy from me) and you have to be able to create the components of the jig precisely. The work is registered to the jig and the router and edge guides (2 opposing) are too. And, as such, your jig not only has to be made precisely, but the utmost in parallelism is essential. The fence, the work is toggled to, has to be parallel to the edges of the platform. Screw this up just a little bit and your mortices will not be parallel to the edges of the work. Nevertheless, there is a payoff for this design and your careful execution of it.

The beauty of this system is its simplicity. The skills required for cutting and fixturing have been transferred to the jig. The platform manages the router surface problem; there is always plenty of real estate for the work & the router. It matters not what the shape of the work is; skinny or fat, long or short, there is always support for the router and the work is handily secured to the fence with over-center toggle clamps. The routing is done through a window where the chip is easy to collect. There are no collars or cutter bearings to roll over the chip and spoil the cut. You can clamp the jig to the work if the stick is big, say 3.5" square, or can clamp the jig to the bench for sticks you can easily handle.

Adjustable end stops limit the router travel north & south (6") and define the length of the mortice. The width of the mortice is arrived at x the cutter diameter or the cutter diameter and the slop in the 2 edge guides. If the cutter diameter is 1/4" and the slop in the edge guides is 1/4", the mortice will be 1/2" wide. With this flexibility any mortice width is possible; you can tune the mortice width to match the thickness of the tenon. Use these concepts in your next jig and save time, improve yield, and your accuracy.

Cutters for Morticing

The gold standard for morticing is the up-spiral solid carbide garden variety straight bit. They are ground on the end, pull the chips out of the mortice but might make a mess exiting through mortices. They also can spoil the edge at entry. For my money an ordinary straight but solid carbide bit is the better choice. It also cuts on the bottom, but it enters and exits with far less insult to the work. Moreover they're cheaper and the chip collection on this jig is not much of a problem. The chip is in a well and exhaust tubes from DeWalt (& similar) routers, handily collect the mess. A third choice and cheaper yet is the double fluted carbide tipped straight (no shear) bit.



Morticing bit options.

The main advantage of this cutter is inventory variety. You can find this cutter in diameters from 3/16" to more than 1". Expect the diameters of solid carbide not to exceed 1/2". This bit, often claimed to be a plunge bit, will not plunge if the router is not moving, (Solid carbide drills into stock whether the router is moving or not.) So if you choose this design, anticipate a short learning curve to plunge and sweep simultaneously.

A new option, an experimental cutter I've been working on, is a short single flute, long shank bit for mortices up to 2" deep. The price range for these cutters will be in the 25 - 35\$ dollar area. We've cut the diameter to just over the shank (~.505") so whence the cut length of the flute has been exceeded the shank will not rub nor burn the walls of the mortice. The single flute plunges nicely tho not as efficiently as solid carbide. 1/4" & 3/8" diameter bits will be in the morticing bit ensemble. (See more jig pix at the [Morticer](#) link.)

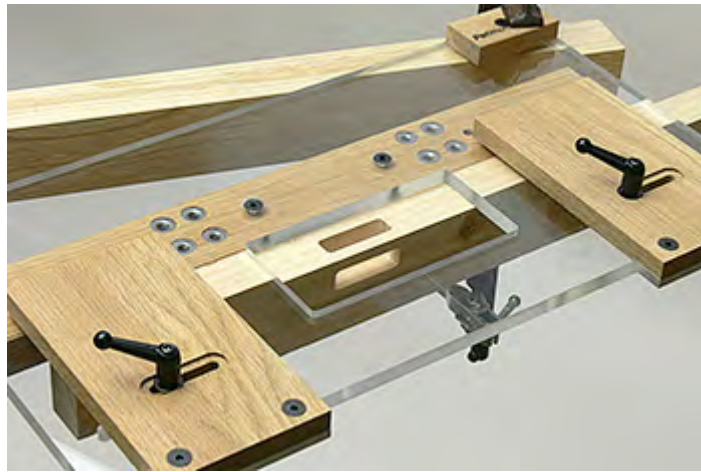
ROUTER MORTICING JIG

Router Woodworking



My router morticing jig is a fixtured acrylic panel. The work is toggled to the fence and excavated through a 3" x 6" window in the panel. A plunge router with a double edge guide is required. The adjustable stops on the panel limit the north/south travel of the router and therefore define the mortice length. The width (east/west dimension) of the mortice is determined by the cutter diameter and edge guide settings. You can rout a one diameter (wide) mortice or widths up to 2-7/8" with the same cutter. The maximum excavation without moving the work is 2-7/8" x 6" long. The jig uses no bearings or collar guides; it is not a templet morticing jig. With this jig you can tune the mortice width to match your tenon thickness.

Its Spartan design has many benefits. For example, the 7 pound jig can be clamped to the bench with one clamp, ready for work, in seconds. It can be stored on a rafter just as quickly. Whilst the jig is fixed to the bench, the work is clamped to the jig. If the sample is large, the jig can be clamped to it. In either case, two handy integral 500 pound DeStaCo clamps hold the work with one pull. The clamps and spacers (accessories) will accommodate stock to more than 3" thick or wide.



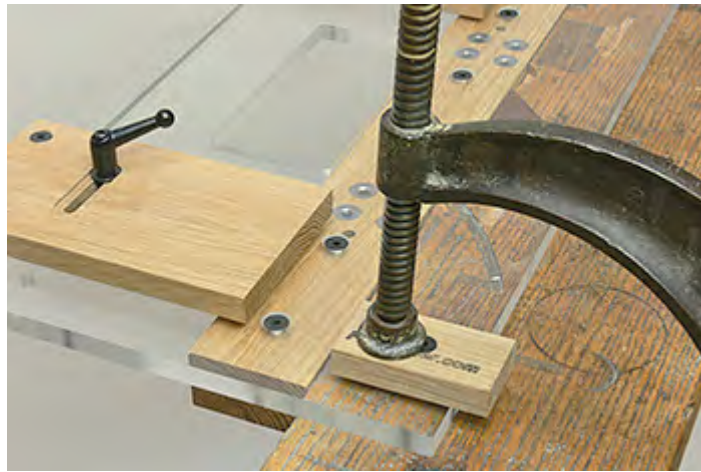
Edge guides and stops indirectly referenced from the stock, As such, the same settings yield the same mortice independent of sample size or section!



You will have a hell of a time slotting this narrow stick without this jig.



The edge guides hang over the panel and lock the router to it. Brass hardware prevents dings in the steel rods.



The jig, with the fence pulled to the edge of the bench, is secured with one clamp. A quick setup, stores just as handily.



The stops are square to better than .002" deviation/length of blade. As such you can use them for ordinary layout, router stop and setup functions.



Key to the design are the toggle clamps and spacers. Add a set for each 1/2" of stock > 1.5" thick.



The panel is 12mm transparent acrylic. The fence, (fastened in 6 places with 1/4-20 FH caps screws and flange nuts), has been strategically located to render the panel particularly resistant to deflection in any direction. You will play hell bending this package. Moreover, the stuff wears very well, requires no maintenance, and is dimensionally stable. You can see through it to facilitate setup. It is just the right size for its function and there is always more than enough surface for any plunge router. There is nothing in the way for the router to slam in to. The chip is trapped in the mortice well and is easily collectible. A down right pleasure to use and very accurate too. I machine the panel to + or - .0015" in parallelism, a requirement for the precision location of your mortice.

A round subbase (accessory available) is recommended for best results. The straight section of truncated castings and subbases (squared off like the DW 621/625 & Bosch 1613's) may not be at right angles to the edge guide rods. In that event, mortices greater than 1 cutter diameter may not have square ends. (Note: a 5-3/4" diameter subbase such as the plate on the PC 690/693 plunger will not dip into the window.)

The W.Oak/Aluminum end stops are precision machined. The 12 point lock levers that clamp them are studded and threaded into the acrylic. Adjustment is instant. They slide parallel for more than 4". Their combined travel (8"+) is farther than the window is long. The stops are handed and they are square to .001"/length. They can be used for close layout and metrology when not in the morticing function.

There are 3 things that make this morticer work. They are critical but subtle. The panel is precisely milled to parallel; without that the edge guides will jam as you walk the router down the jig. Moreover, a panel out of parallel will render a tapered mortice. The second criticality is the edge guides themselves, 2 required. The 2 guides trap the router on the platform and restrict the pathway of the router to only parallel cuts. This design feature substantially shortens the user learning curve, facilitates handling the router, and adds a generous measure of safety. The router bit can't crash into the access window and no matter how you steer the thing you wind up with square/rectangular, parallel and straight walled mortices. Simple edge guides are available (from me). A pair of your OEM edge guides will also work, provided you can get at least 12"-14" of space between them. You could also make a pair of simple blocks just like mine and save some money.

The third essential is the toggles (2 supplied) and clamp pad/spacers. The spacers increase the distance under the toggle plungers. The jig, as supplied, will accommodate stock from zero to 1.5" thick; each spacer (an accessory) increases that x 15/32". The jig has essentially no stock width restrictions but the practical limit to thickness is about 4". Stock to 3.2" can be morticed on its edge or face with the toggle clamps & spacers in play. Wider/thicker stock can be morticed but it may have to be C-clamped to the jig. Again, getting more room under

the clamp plunger requires spacers. Each added spacer requires a longer screw. The spacer kit consists of two 12mm (~15/32") thick acrylic spacers and 8 Allen head cap screws. Use one pair or up to 4.

To use the jig, first locate the mortice on the work; roughly pencil in its location. Stock should be sized so both clamps are in play. Set the toggles and clamp the work in the jig so your mortice map is anywhere in the panel window. Set the edge guides for zero slop (for single cutter width mortices) and lock them. Now loosen the guide bars on the router and slide the router to your cut line. Lock the rods. Slide the router so the cutter is at the north end of the mortice. Slide the north stop to the subbase and lock, ditto to the south end. Rout to depth, plunging at about 3/16"/pass. Measure and adjust (after the first pass) as necessary. Note that once the edge guide & stops are set, the mortices made at these setting are the same independent of sample size! As such, you can test and calibrate on any ol' piece of scrap and the mortice width & length are insensitive to minor or major errors in work piece section!

Ordering

1. Morticing Jig. Includes 2 U225 DESTACO toggle clamps & screws, fence, precision stops and levers, acrylic panel, completely machined, assembled & calibrated, ready for work: 319\$ + 45\$ shipping, handling & insurance.
2. Morticing Edge guides (3/4" Aluminum), two 17.5" rods & hardware for DW 625, DW 621, DW 6182, PC 6931 & 8931, Fein 1800, Bosch 1619, 1613 and 1166 (plunge casting in 1617EVSPK): 79\$. Free shipping (only with no.1).
3. Round subbases with 1-3/4" cutter hole for plungers listed above: 15\$ with no.1. (Free S&H only with no.1)
4. 1 spacer kit. Includes 8 1/4-20 x 1" cap screws & 2 drilled 1.8" x 2.2" x 15/32" acrylic pads: 20\$/set. (Zero s&h if included with no.1) Note: If the pads are stacked, request 1.5" long screws for the second set, 2" screws for the 3rd, and 2.5" screws for the 4th.
5. [Edge Guide Adjuster](#) /ea \$18, 2@ \$30.

[Email pat@patwarner.com](mailto:pat@patwarner.com) for ordering instructions or questions.

Specifications

Panel: 12MM cast Acrylic

Fence: 1.12" W. Oak, fully machined with 8 tee-nuts for toggles.

Toggles: DeStaCo U225 500# cap. 250# nominal load.

Weight (fully fixtured) ~ 7.0 pounds

Capacity: Mortices from 0 x 0 - 2-7/8" x 6" x practical length of cutter.

Stock Capacity: Thickness to ~3+" with toggles in play. Length: No length limitation.

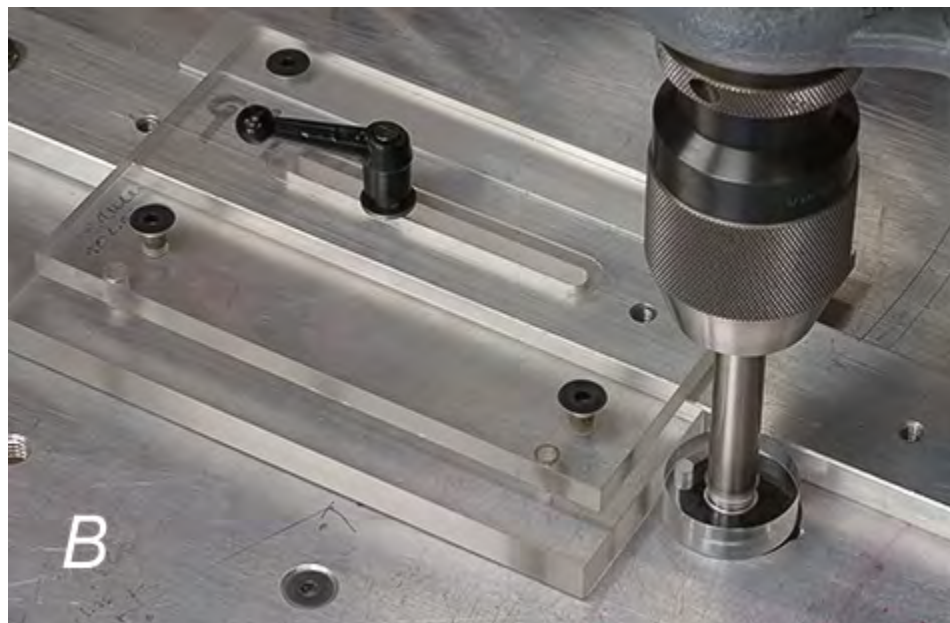
Width: Arbitrary. Will mortice within 1/16" of one edge of any width stock or anywhere on stock up to 3" x 3" in section and 1" from any end. For reference, you can mortice a 2" wide centered mortice in 3.5" square stock.

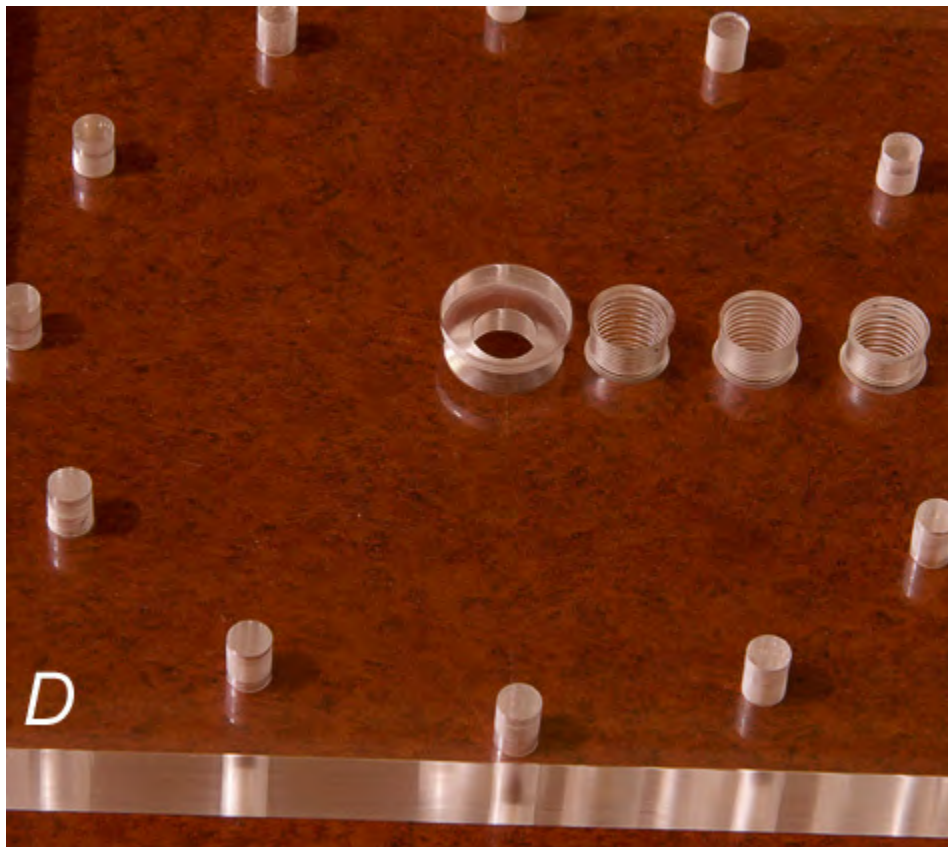
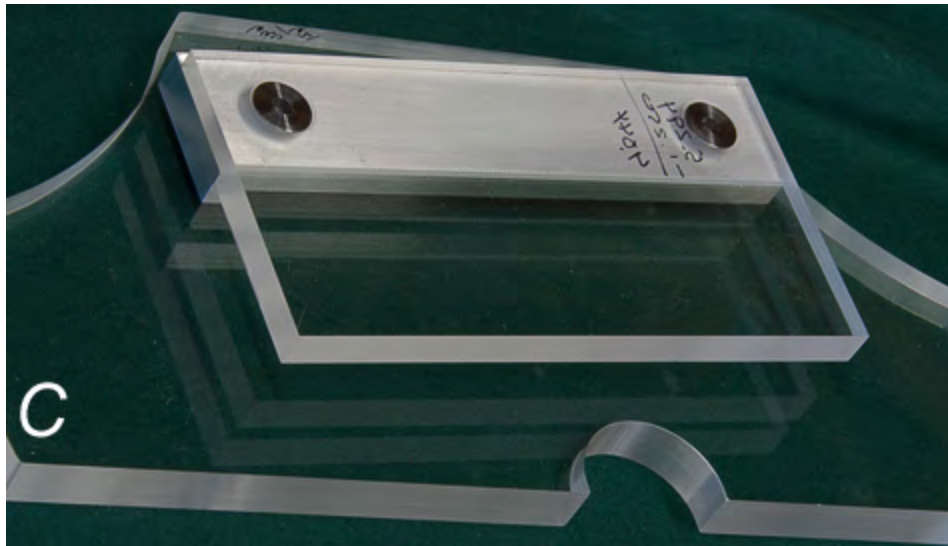
Inquire as necessary.

(For more on morticing see the [Morticing with a Router](#) link)

MACHINING PLASTICS

Router Woodworking





Learn to machine plastics* with ordinary woodshop tools.

Plastics have their place in the woodshop. Typical apps for plastic include templets, jigs, fixtures, surfaces, components and product. Whether for the plastics shop fabricator or the woodshop commando, facility with plastics is a damn worth while skill.

The lessons are essentially concerned with the management of the material after it has been sawn**.

At this stage I take over. If further conversion is required we can & will bandsaw to rough size and then rout to dimension. Hand or table routing, straight line or pattern work, all explained and demonstrated. Inside cuts (mortices, slots, dados) & the fixturing for such are part of the deal.

Drilling is required (in most cases) to facilitate fastening or access for other components. Drilling on center to .001" is ordinary, easy and expected. Moreover, we will learn about the drilling tools (countersinks/bores, drills, reamers, taps) and how to select & use them. Perfect round holes on near .001" centers with zero tearout & fracturing are easy and without heroics.

Hand wet sanding and polishing are shown. Flame polishing is not addressed. Whence heated, precision machined edge & hole geometry may be lost. MCI and other solvents and adherents are not covered. This is essentially a machine experience.

* Acrylic, PVC, Polycarbonate, Phenolics and others (up to 1").

**It is assumed the student has the capability of rendering 4 x 8's into handleable workpieces. Tho I do address the rough sizing of materials; it is expected the student either buys his material to rough net dimension or table-saws the stuff to size.

Lesson plans can be dictated by the student.

Material is taught one-on-one or up to 3 students at a time.

There are no scheduled dates and times. Dates/times are largely at the student's pleasure.

7 days/wk, usually up to 6 hrs/day. Rates are ~\$50/hr, \$40/hr for 2 or more students. Note, the lessons are not a substitute for kitchen cabinet Formica seminars.

[Email pat@patwarner.com](mailto:pat@patwarner.com) for more knowledge or appointment.

Captions

A) Ordinary templet and straight line routing.

B) Indispensable, & not so ordinary, drill press work stop. Tracks on Aluminum fence, square left and right.

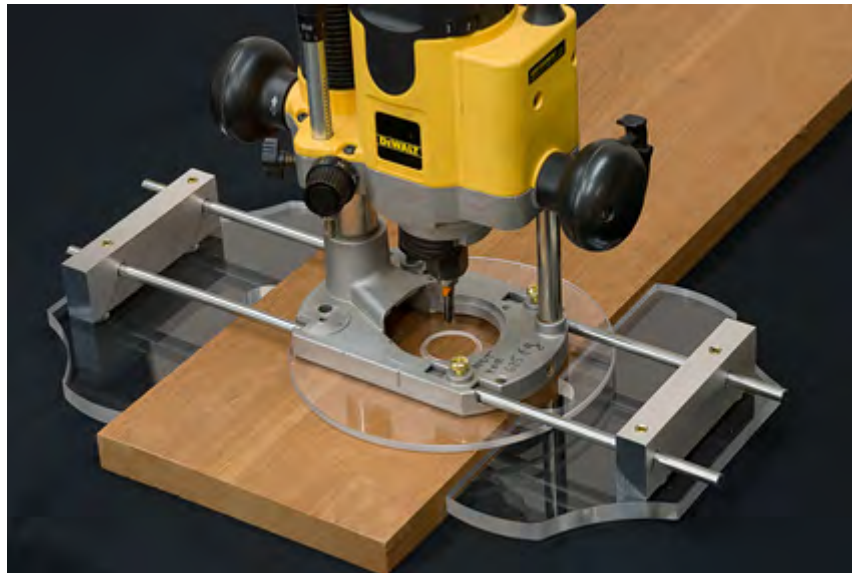
C) Short knife-scribe for marking metal bar stock.

D) Drill in a circle or whatever. Tap the stuff. Counterbore or countersink, (CS under CB). All with simple woodshop tools.

ROUTER EDGE GUIDE

Router Woodworking





Edge guides, whilst in contact with the edge of stock, control the router and its cutter pathway. The cuts can include part of the edge or they can be inboard. Most router guides, (bearings, collars, and subbases e.g.) change the cutter path x increment. A change of collar guide rings from 1" to 1.25", for example, will translate the cutter pathway x 1/8th". The edge guide has no such limitation. That (its continuous adjustability) and its ability to position the router anywhere on the work make it a most versatile accessory.

Given that freedom of motion and control you can mortise, dado, cut sliding dovetails, screw-slots and so on. Along the edge of stock, expect to make all of the conventional profiles, rabbets, bevels, round-overs, coves, tongues, grooves and so forth. Moreover, these cuttings can be of any width and do not require a bearing on the tool bit.

Add another edge guide to the opposite side of the work and you can't screw up an inside cut. The router will be trapped on the work and restricted to a one cutter pathway cut. With stops north and south you can restrict the cutter pathway to cut a well defined mortise or any practical rectangular excavation. With the edge guides against the work and no slop the cutter can only cut one diameter. Add a 1/4" of slop and you add a 1/4" to the width of the pathway.

The safest direction for edge guide routing is from left to right as you face the work. For more start-control I've shifted the centerline of the jig 1-3/8" to the left of center so more than half of the edge guide enjoys the work before the cutter gets there. Expect cruise-control from end to end and for stabilization use my offset subbase.

My Aluminum/Acrylic edge guide is simple, durable, transparent for easy work inspection, and designed for minimum deflection for precision cuttings. The work edge is straight to + or -.001" over its 9-3/8" length. The stout aluminum bar stock is square, routed to length and precision drilled. Its connection (2 1/4-20 cap screws) to the plate renders the ensemble deflection free, an essential for critical fail-safe routing. The rod fixing hardware is brass and will not slip nor ding up the rods.

Edge guides are easy on the router and they facilitate the routing process. My guides enjoy >4 square inches of intimacy with the edge of the work, averaging out sloppy material prep and ignoring jointer chop. Expect the best of routing with my edge guide, as the transfer of edge defects to the cutter path/profile is subtle to zero. Excess side loads from the edge guide are transferred to the casting not the cutter. That is one reason cuts from the edge guide are so well defined. Pull my edge guide as hard as you like against the work and expect profile definition and clarity. Over pull a bearing guided cutter against the work and expect some chatter or an image transfer of jointer chop, and prepare for the bearing to emboss the edge. Next time you have to do some quality routing, consider my Edge Guide, maybe a Subbase too.

Options & Ordering

1. Edge guide with standard 11.75" rods, (No S&H charges) for the routers listed below: \$85
2. No.1 with [round subbase](#) (1.75" cutter hole): \$100
3. No.1 with DW 621, 625 & 6182 (shown) Offset Subbase (1.75" cutter hole): \$125
4. No.1 with [Offset Subbase](#) (1.75" cutter hole) for PC 890/690, Milwaukee 5615 & Makita 1100: \$110
5. 2 Edge Guides with 17.75" guide rods, (spans~9" wide stock): \$150
6. [Edge Guide Adjuster](#) /ea \$18, 2@ \$30.

Routers that accept the Warner Edge Guide: PC 690/890 series, Milwaukee 5615/16, DeWalt 621, 625 & 618, Bosch 1619, 1617/18, 1613, & Makita 1100's.

Specifications:

1. Overall dimensions: 9-5/8" x 4-1/2" x 2" high.
2. Material: 12mm Clear Acrylic. 1.5" x .75" 6061 Aluminum bar stock.
3. Minimum material thickness rout-able: 5/16", with round plate, 3/32" with offset plate.
4. Reach: 0 to 8.5" (to center of 17" panel).
5. Straddle: With second edge guide and standard rods the router can lock on (straddle) boards up to 3-3/8" wide. Expect much more straddle width with longer rods.

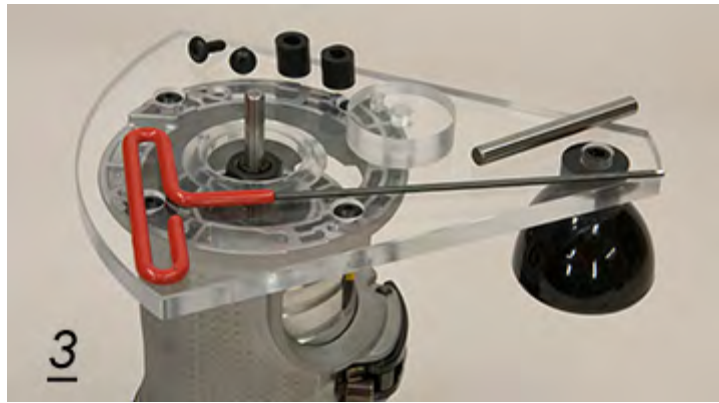
* Caveat: Not for speedy micro-adjustability. On occasion, a rod might have to be loosened to facilitate a small change adjustment. Do appreciate, that the same precision fit that may frustrate a slippery micro-adjustment serves to lock up the tool and keep it from ever losing position. 3-0 steel wool and wax to the rods will add to easier adjustment.

Notes: S&H included in all orders. Ask for quotes where product not listed. Longer guide rods available. Product usually ships within 1 day.

DW 611 VS FIXED BASE COMPACT ROUTER & SUBBASES

Router Woodworking





This great little tool may become the new leader in trimmers. DW made sure they met or exceeded the features of the competition. Moreover, they added some exclusives such as LED lighting, a brake pad motor lock (no split casting), & its easy 618 up/down depth mechanism and motor extraction facility. There is no router that makes less noise.

Its openers are no more nor less significant than the others. Its metal finishing, ergonomics, electronics, collet design & grip, depth adjust slop, work/cutter visibility and wire set are about what the leaders possess. I am annoyed by its unflattened/rocky motor cap, the inability to read the on/off switch position at 3 feet, one wrench only collet spindle, and its road-map folded 4 language owner's manual.

They did a yeoman's job on beauty and strength. It is a stunning industrial work of art. And its motor is above average. Its spin, balance & flywheel are remarkable. A couple of x-grain 1/4" x 1/2" wide tunnel cuts, its practical waste/pass limit, are no problem for this machine. Moreover, it will cut shallow ways & dovetails sockets, provided they're taken in 2 to 3 stages. I would add the caveat, however: 1/4" shanked tools are under-rated for full depth single pass dovetail templet cuts. You'll put this tool under duress and you may break cutters doing these excavations at full depth. This armature should have been supplied with a 1/2" collet, albeit for limited use. To be restricted to 1/4" shanked tool bits is a serious handicap for any router.

Bottom Line: Beneath it all, it's still a 4.25 pound, VS soft-start trimmer. Its performance is essentially the same as the PC 7310, PR-20 or any of the 1 h.p. Tom Collins routers. To be sure, it is easy to use, set depth, or trade its motor over to the Plunge casting.

For more balance and control use one of my subbases. They are designed exclusively for this casting, & will not associate (fit) with any other router, here or abroad.

Ordering

DW 611 subbase options. All product includes subbase screws, shipping & handling.

10% discounted on all but the first plate in your order.

1. Round replacement subbase, ~1/4" x 5" with 1-5/8" cutter hole: \$23
2. Precision Round/Centerable*, ~9mm x 5" Subbase with collar cutter hole.
 - A. With flange button head screws only.....: \$34
 - B. With centering accessories: screws, precision .250" pin & ring, 1 neoprene wrench sleeve (not shown), 4 pliers tip protectors, 1 cushioned T-Allen key, and instructions.....: \$56
3. 9mm x ~7-5/16" offset Subbase x 1-5/8" cutter hole: \$33
4. 9mm x ~7-5/16" Offset subbase with center-able collar cutter hole, supplied with screws only: \$46
5. 9mm x 7-5/16" Offset Subbase (as no.4) with centering accessories: \$59

To streamline the ordering process: [Email pat@patwarner.com](mailto:pat@patwarner.com) your request with your shipping address. Same day shipping is ordinary and should be expected.

* See the [Precision Subbase Kit](#) link for more on this design.

Picture Captions

- 1) 611 VS Compact Router with my 1/4" x 5" replacement subbase. The 1-5/8" cutter hole permits cutters up to ~1-1/2" in diameter.
- 2) Tho you wouldn't expect it, a one-handed tool is far more stable with 2. My offset plate will flatten the machine on the work whilst routing around corners or tortuous templet patterns. Made in 9mm Acrylic, just enough product to prevent deflection.
- 3) Improves handling, visibility, control, and safety. Available with DW/PC collar and 1-5/8" cutter holes. Use it when the round plates (no.4 or no.1) compromise stability. The centering and sundry accessories are available for precise cutter to collar centricity. Screws, (special large, flange head cap buttons on adjustable plates), are supplied. FYI I make all product and this one requires 34 operations.
- 4) The Precsion Round subbase, like the Offset plate in no.3, is centerable to .002" or better. Use it for close order templet cuts. The 611 has the power for dovetail templet cuts, albeit in 2 or 3 steps, never all at once.

JIG SUBSTRATE

Router Woodworking

JIG SUBSTRATE SAMPLES

A jig starts with a substrate.

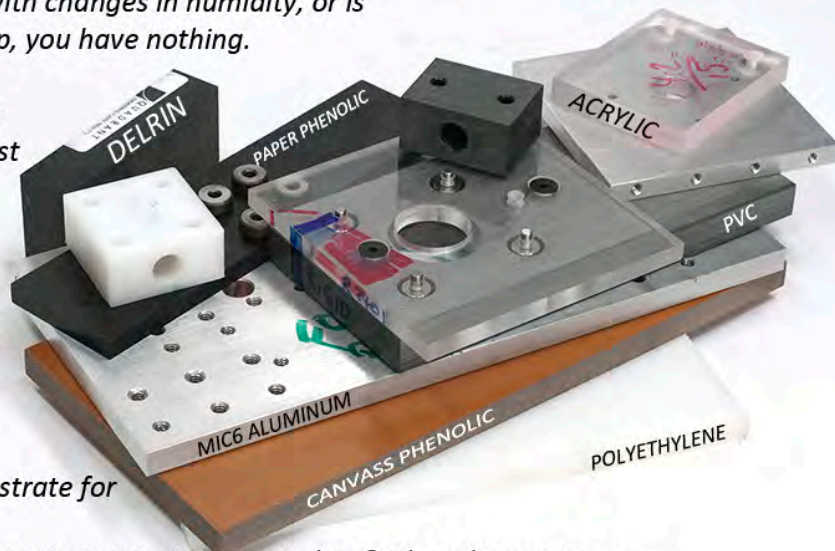
It's the foundation for your stops, crowders, clamps, indices, pins, fences, and so on. If it's compromised, your application will be too. If it bends from clamping forces, twists with changes in humidity, or is dimensionally screwed up, you have nothing.

Need an accurately sized substrate? One of the best substrates is ground, flat aluminum jig-plate. It's easy to machine, won't change shape in a flood, won't deflect from toggles, needs no finish, & wears well.

Can cut and supply a substrate for you, L&W to $\pm .002$ ".

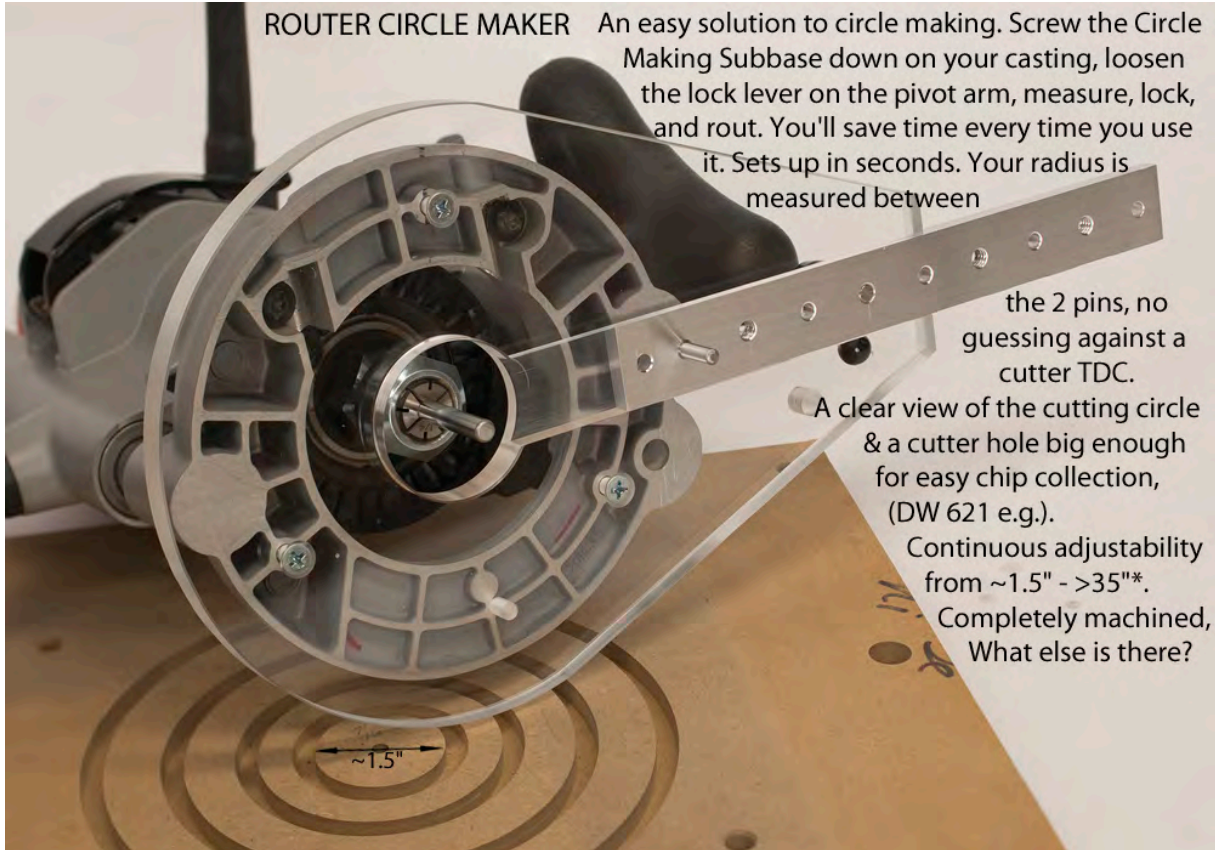
Can also size and supply AC, PVC, PC, MDF, PE, Delrin & Phenolic Laminate.

Email pat@patwarner.com for more info.

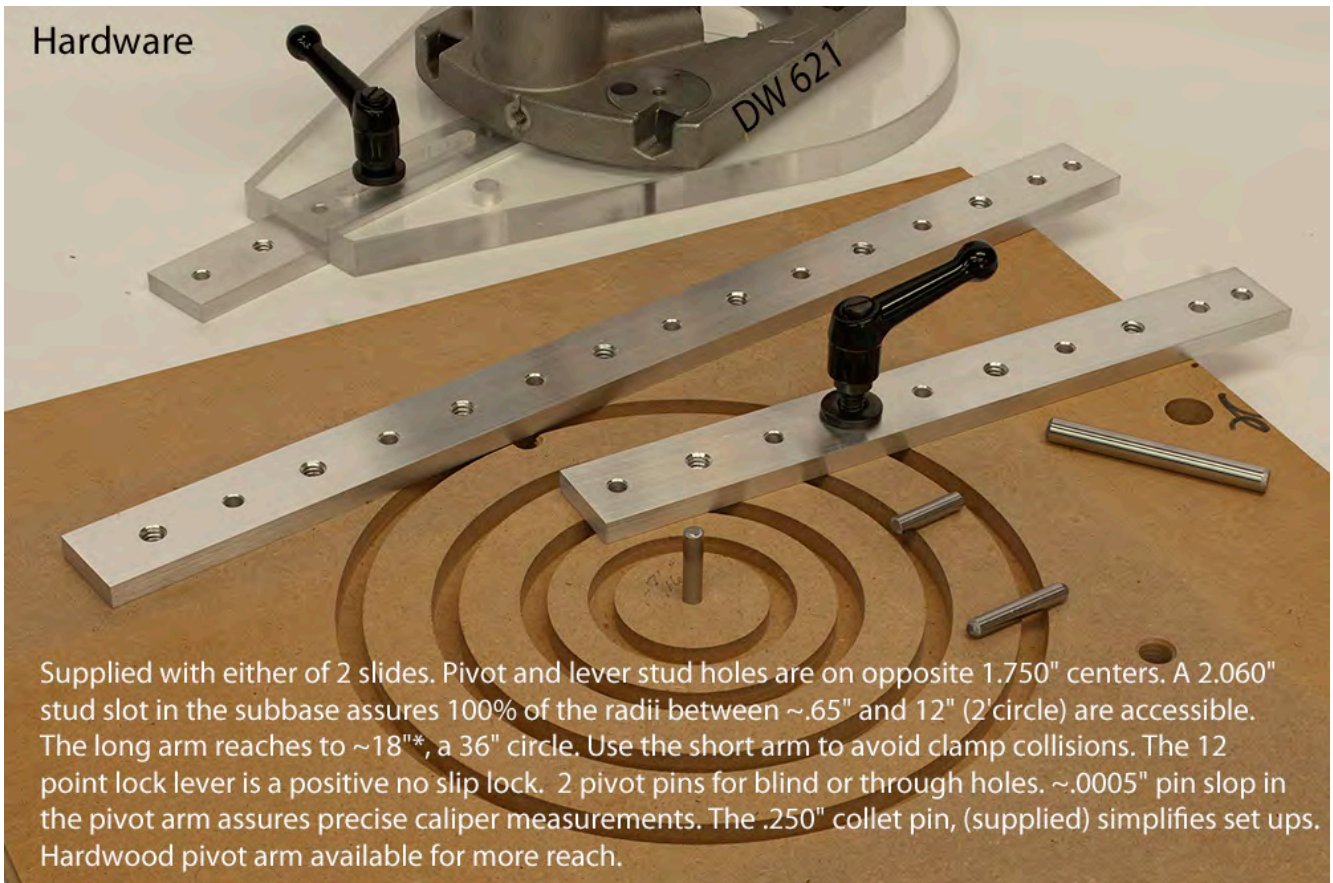


ROUTER CIRCLE MAKER

Router Woodworking



Hardware



Supplied with either of 2 slides. Pivot and lever stud holes are on opposite 1.750" centers. A 2.060" stud slot in the subbase assures 100% of the radii between ~.65" and 12" (2' circle) are accessible. The long arm reaches to ~18", a 36" circle. Use the short arm to avoid clamp collisions. The 12 point lock lever is a positive no slip lock. 2 pivot pins for blind or through holes. ~.0005" pin slop in the pivot arm assures precise caliper measurements. The .250" collet pin, (supplied) simplifies set ups. Hardwood pivot arm available for more reach.

In Action

Shown here with a DW 621. Note the handle axis is on the long axis of the plate. As such, you're driving the router around in its most stable & ergonomically favorable configuration. Control is not a problem. The 12mm Acrylic is inflexible, transparent, durable, and will last for years. With vacuum attached, the waste from the 4 rings was nearly nil.



It is recommended that a solid carbide 1/4" cutter be used for the circle cut. That diameter not only matches the setup pin but will make the best circle. It is also recommended to use a templet on the work, not the jig. Let all your arithmetic mistakes realize themselves on an MDF templet sample. Whilst still on the subject, be mindful, the disk & hole radii differ x 1 cutter diameter. And those diameters are dependent on the cutter diameter. Using a 1/4" tool bit not only simplifies calculations but minimizes your messes.

The Circle making subbase is supplied with screw holes and hardware for most routers with US labels (Bosch, PC, DW, Festool 1400, Milwaukee and Makita 1100's). The router's handle axis will be as close to the long axis of the plate as practical. It can also be provided with no screw holes if desired.

Ordering:

1) Circle making subbase with all hardware and short pivot arm: \$89
(Circles from ~1.5" - 24".)

2) As No.1 with long pivot arm only (13"): \$100
Note, the long arm will make circles continuously from ~1.5" - 36".

3) No.1 with both pivot arms: \$108

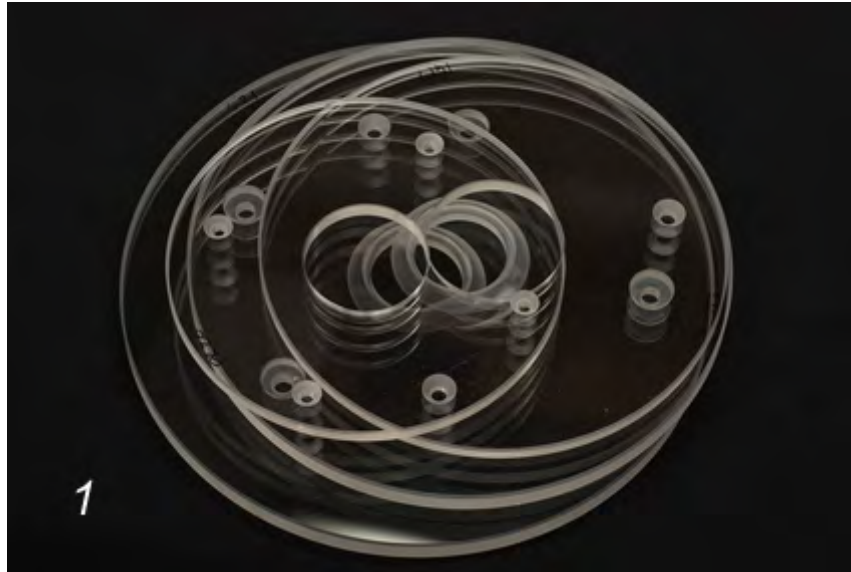
4) Long arm as a separate order: \$28

5) Short arm as a separate order: \$23

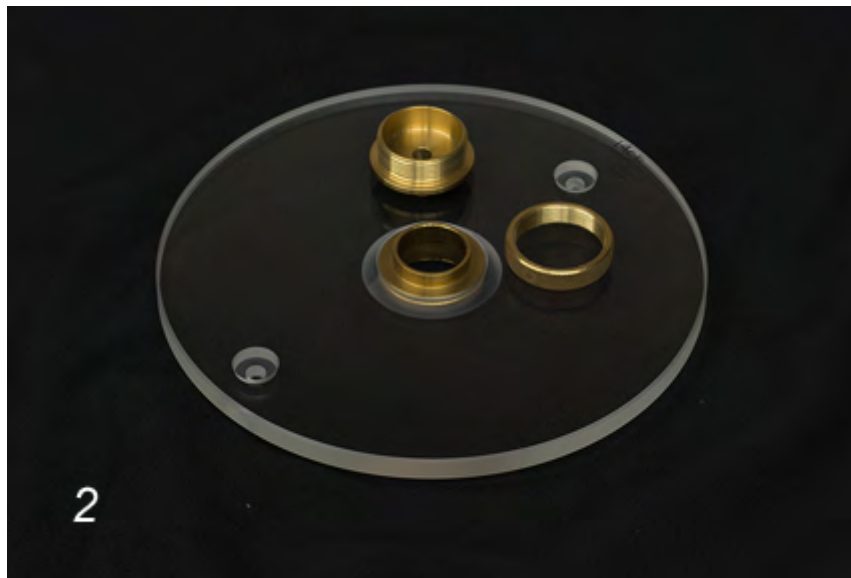
6) S&H: \$11

SELECTING A SUBBASE

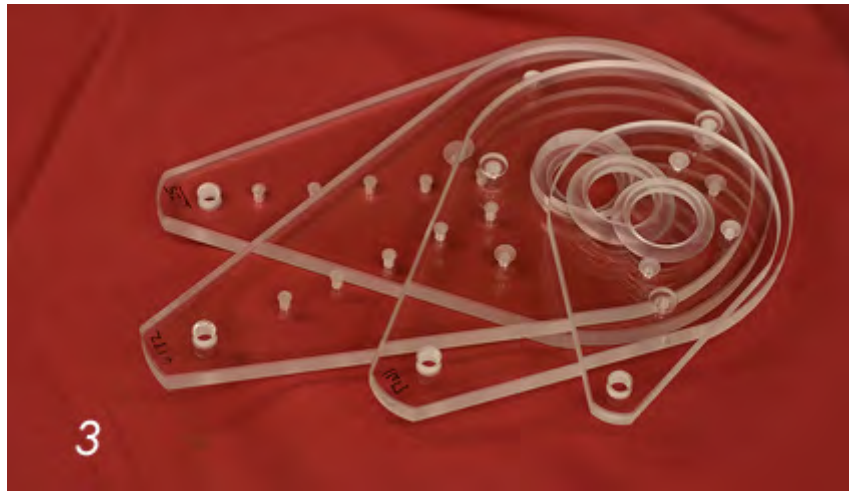
Router Woodworking



My round plates differ in diameter & screw hole patterns; they are machined to your casting diameters + ~1/16". One size does not fit all.



Precision plate with PC collar system in play (spare nut displayed). Given a ring flange near 1.375" (the PC spec.) expect centricity close to + or - .001".



Stack of different sized offset plates. Note one size does not fit all.

Routers for hand use require some sort of subbase. There are safety & control problems without them. Whether you choose to use the OEM plate, one of mine or one of the competition's, you should be using one. For the multitude of router apps, there are usually subbases to accommodate. They differ in size, shape, material and thickness. They are commonly made of metal and plastic, though MDF, masonite, plywood, and fabric (phenolic laminates) are just as common. This discussion is about Acrylic.

Why bother with anything but the OEM (the mfg's) plate? Well your router should sit flat on the work without rocking. If it rocks at all, the cutter will chatter the profile as you cut and you've lost the precision element of routing. Moreover, you may now have to sand where a mill finish might have done. Bakelite subbases (still common) are rarely flat and the new polycarbonate plates found on most new routers are not machined, they're cast. They have high spots here & there and their collar counterbores are sloppy, shallow, sometimes proud and out of round. To complicate matters, few castings are machined flat. So given a misshapen subbase and a casting that is not flat, you get a router that won't sit flat. For average work (non-joinery) I would not necessarily buy a new plate, I would wet sand the face of a "rocking" casting however, as no plate will sit flat on a poorly milled casting.

My subbases (plates aka) are either round or offset, supplied in a thickness that matches its application stress, and made of Acrylic. I make them. They are not farmed out; you have me to blame for success or failure. I supply them with either of 2 cutter holes. One sample uses the default diameters (1-3/16" x 1-3/8") of the PC 2 piece collar guide system (the inventors of the collar guide/bush). The other cutter hole is through and 1.75" for standard routers, (~1.56 or 1.62 for trimmers). I can also mill a cutter hole to your specification.

Standard Round Replacement Subbases

These plates are designed to get you collar guide service (inexpensively) or to simply replace a plate you no longer need. They are not easily center able. They are ~1/4" thick, a full 360 degrees of circumference, and cut to match the diameter of your machine. One size does not fit all. The plate has been made from templates that combine the 3 diameters (screw hole circle, cutter hole and plate) to ~ + or - .005". Some are bigger (DeWalt) than their castings to manage instability. All screws (supplied), because of plate thickness issues, are either 82 or 90 degree Phillips flat head machine screws. Machines deployed with round plates, are generally used for inside work where support/stability is not an issue. Moreover, inside work is usually small cutter work. And, as such, a collar guide cutter hole (1-3/16") is not a compromise. For larger cutters use the 1.75" cutter hole model.

Precision Round Plates

This plate is for dovetail/boxjoint fixtures. The plate is oversized (7" or 7.6"), .350" thick and counterbored for the PC collar guide system.

It will not deflect on your dovetail templet. Moreover, this plate is precisely center able. The screw holes are oversized & counterbored for flanged button head screws. Depending on the diameter of your guide ring it is possible to center this plate within .001" of its guide bush diameter. Use this plate on your dovetail templet systems or on templates where the router is well supported & precision paramount.

Offset Subbases

These plates are essentially designed for outside work where stability is an issue or on templates where router support is scarce. Their classic applications are bearing guided profile routings, such as rabbets, round overs, or decorative cuts on the edges of stock.

Few routers have more than 40% of their casting on the work whilst outside routing the ends or edges. In my view, my plate (or one like it) is essential for safety and quality of cut. The router can remain flat down on the work, even around corners where there is never more than 25% of the router on terra firma. Try these corner cuts with a round subbase and expect compromises and safety issues.

The offset plates are supplied with 1.75 cutter holes for nominally sized bearing guided tool bits. A collar guide option can also be enjoyed with the same fastening and centering system used with the precision round plate above. The collar hole samples are center able. The plates are made from 12mm (.472" min.) stock and designed for each of the most common fixed base castings, (Milwaukee, Bosch, PC and DW). Tho they will fit on most plungers, I make them only for the DW plungers, 618, 625 & 621. One word of caution: Offset plates less than 12mm (~.450") thick will deflect when overhung on outside cuts. A subbase that bends is a safety risk.

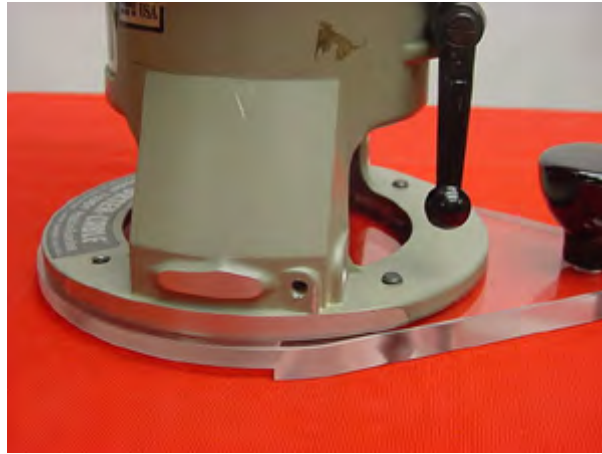
Trim Plates

These plates are offset subbases cut to order. 1/2 the business end of the plate has been milled away and the stability of the offset design is essential. I typically waste 3/16" of the plate to ~ the centerline of the cutter hole. This allows the router (with a 3/4" cutter) to approach and mow down anything in its pathway that is 3/16" proud or less. Trimmer (small routers) plates are too thin to be made into surface trim plates. A thicker plate is an option. All other offset plates can be made into surface trim plates. Trimming down proud hardwood trim around plywood is the most popular application for this accessory. The cutter hole is 1.75".

My subbases are all Acrylic, colorless, transparent, provided with either of 2 cutter holes, fully machined, supplied with all hardware, safe and ready for use.

VERTICAL TRIM SUBBASE

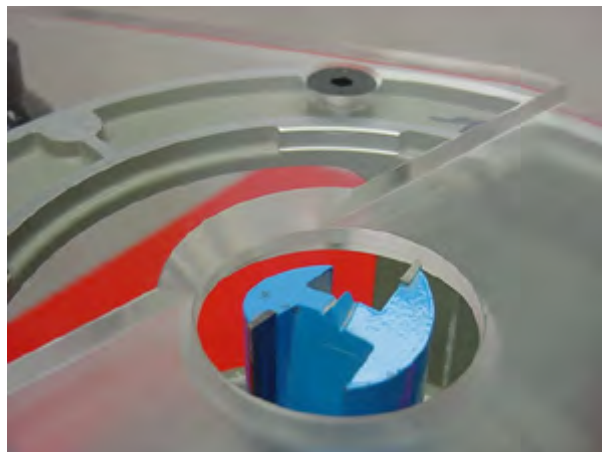
Router Woodworking



This trim plate has 3/16" of its thickness missing. Therefore, projections up to 3/16" proud of the face can be routed to near zero.



Use a large diameter, short fluted cutter for best results. Climb cut shallow (<1/8" thick) projections for minimum surface tearout. Larger diameter cutters are better at bottom cutting.



The unmilled section of the subbase is 12mm thick and will not deflect. All edges are deburred. Product is milled to your specs or mine.

There are occasions when it make sense for a router to trim something off the face side of the work. If 1/2 the subbase (and 1/3 of its thickness missing) is open to that obstruction it can be trimmed away without much ado. A proud dowel, peg or through tenon, for example, can be mowed down in no time with a router and trim subbase. Hardwood edging (thicker than the substrate) on ply is another possibility. Whatever is sticking up can be trimmed, (provided it's routable with HSS or carbide).

With the Trim Subbase in play, lower the cutter gently on the work and lock the motor; let that be zero, no cutting takes place. Now raise the cutter slightly. Rout away the obstruction. Use a medium sized straight bit ($>3/4$ " in diameter but much $<3/4$ " in length) and climb cut shallow ($<1/8$ ") projections for a minimum of surface tearout. Leave no more material than you can comfortably sand or scrape away. (Note: Even tho the cutter is not touching the substrate the obstruction is wasted away).

The operation is not power demanding, 7/8 horsepower is enough to waste a $3/4$ " thick edging x $1/16$ " proud. Plungers and fixed base routers perform equally well. Copy the design of my plate on your MDF or plastic or email for a product quote. Prices will vary.

Product is custom made on demand (usually same day) to your specifications. Cutter holes are $1-3/4$ " unless otherwise specified. The subbase work face is wasted by $3/16$ " or to your specified depth. The waste (as in the photo) is $\sim 3/16$ " inside of the cutter hole circle. Trim subbases are available for Milwaukee, most PC's, Bosch, some Makitas, and DeWalt routers. Email router model number and your specs for price quote. Prices will vary from 45\$ to about 80\$ with freight included.

ALUMINUM BASE PLATES

Router Woodworking

ALUMINUM SQUARE/RECTANGULAR BASE PLATES

From US made Alcoa & Vista ground Jig Plate Aluminum.

Flat and of constant thickness*.

Made to your dimensions in 1/4", 3/8" or 1/2" stock.

Drilled only for your router.

Counter bored for the PC collar system or drilled to your spec.

For those special applications where deflection and flatness errors, in a sub base, cannot be tolerated.

E.g.: Router table inserts, straddling templates, some dovetail fixturing, & outside straight line cuts.

Email for short PDF or questions:

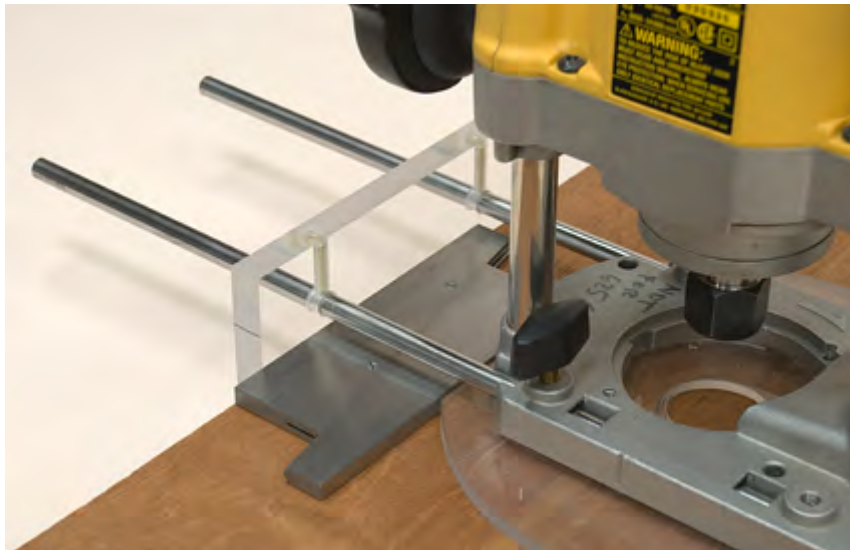
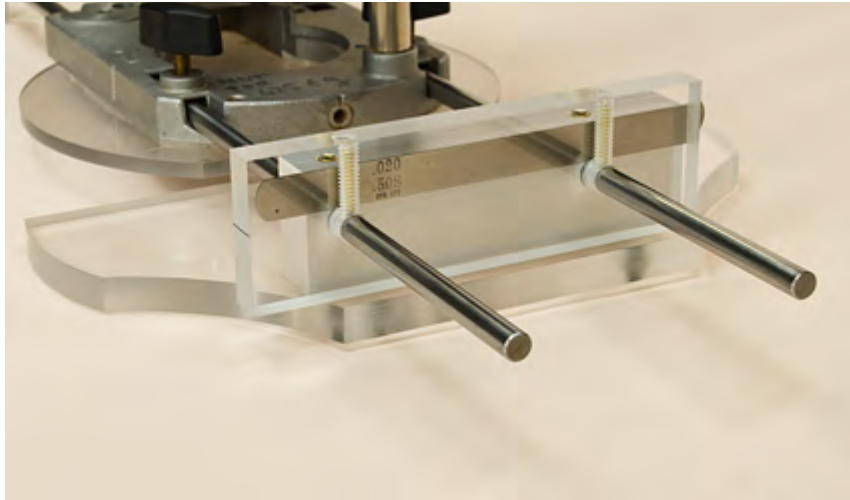
pat@patwarner.com

*+/- .0015"



EDGE GUIDE ADJUSTER

Router Woodworking



Both of my edge guides ([mortising jig](#) and [edge of stock guides](#)) must be adjusted for each new application; an arbitrary setting is rarely right where you want it. The adjustment can translate the cutter pathway centerline, facilitate a pathway greater than the cutter diameter, or both. Translation of the cutter centerline can be done with a setting change of the edge guides or the guide rods can simply slide to a new location within the casting. In the latter case, the 2 hold down screws/knobs on the casting are loosened and the router is relocated a measured amount.

It is customary & essential to start an edge guide cut with a calibration cut. This is the case no matter what the edge guide design may be. From the calibration (test) cut you can determine how much the guide(s) or rods must be moved. If the guide(s) has to be moved it can be translated as follows (without the accessory below):

1. Slide the edge guide against the work and clamp the router to the work. The router cannot move during the adjustment.

2. Select a spacer of a thickness = desired translation. For example, if you'd like to move the cutter .25" away from you, put said spacer between the work and the loose edge guide. Then tighten the guide against the spacer. (A 1/4 drill, drill rod, gage block etc.)
3. The cutter will now reach .25" from where it was.

If the goal was to produce a .50" dado from 1/4" cutter, you'd start with 2 edge guides against the work with a 1/4 spacer between the work & one of the edge guides.

In this case the cut will probably start very near .50" but its centerline may not be where you'd like it to be. In this event, we have to move the router on its rods without changing the distance between the edge guides.

To move the router (a measured amount) on its rods without disturbing the edge guides:

1. Measure the distance between the subbase (or casting) & one of the edge guides (inside). Whilst an adjustable parallel* is the tool of choice here to get the inside measurement, a caliper or rule can suffice.
2. Now loosen the casting screws to free the guide rods. Subtract or add width to the parallel or create a scrap cutoff equal in width to the change necessary (+ the initial gap) to translate the centerline. E.g., if the cutter requires a 3/8" translation and the initial measurement is 1.0" then the spacer has to be 1-3/8" or 5/8" depending on which direction you slide the tool.
3. Move the bugger against the spacer and lock the casting screws.

Adjuster (Product)

The new edge guide adjuster is designed to assist in making the space adjustment between 2 edge guides for mortices, slots etc. It can also be used to translate the cutter centerline when only one edge guide is in play. Let's start with 2 edge guides snug against a parallel workpiece. To open the cutter pathway (of a mortise e.g.) you first measure the diameter of the cutter and subtract that number from the desired width of the intended cutter pathway. This number is duplicated with a spacer-feeler gage, adjustable parallel, gage block, drill rod, sheets of "Post-it" or whatever. Now you slide the acrylic adjuster up against one of the edge guides separated by the spacer.

Lock the adjuster, remove the spacer, unlock the edge guide block & slide it up against the adjuster. If you spent more than 1 minute on this adjustment you should report yourself to the metrology police for disposition immediately.

The cutter pathway will be opened precisely by the amount of the spacer. If the starting pathway is too wide, slide the adjuster against the edge guide block and lock the two intimately together. Now loosen the edge guide, place the spacer between the guide & adjuster, and lock the edge guide. This maneuver shrinks the cutter pathway exactly the amount of the spacer.

Tho not as sweet as an adjustable edge guide it is accurate to .001", fast, simple to use, and low tech, nuthin' to break. The 12mm Acrylic blank is fully machined, deburred, flat and contains 2 non-marring all brass set screws. It is sized to overlap your edge guide block and therefore will be easy to handle in use.

One size does not fit all, however; you must dictate router model number for the correct adjuster.

Ordering

1. 1 unit: \$24
2. 2 units: \$40
3. 1 unit with an edge guide or mortiser: \$18
4. 2 units with an edge guide or mortiser: \$30
(S&H inclusive with all 4 options.)

*The Starrett adjustable parallel is not part of this package.

TRIANGLES FOR WOODWORKERS

Router Woodworking

45° x 45° x 90° RT. Triangle



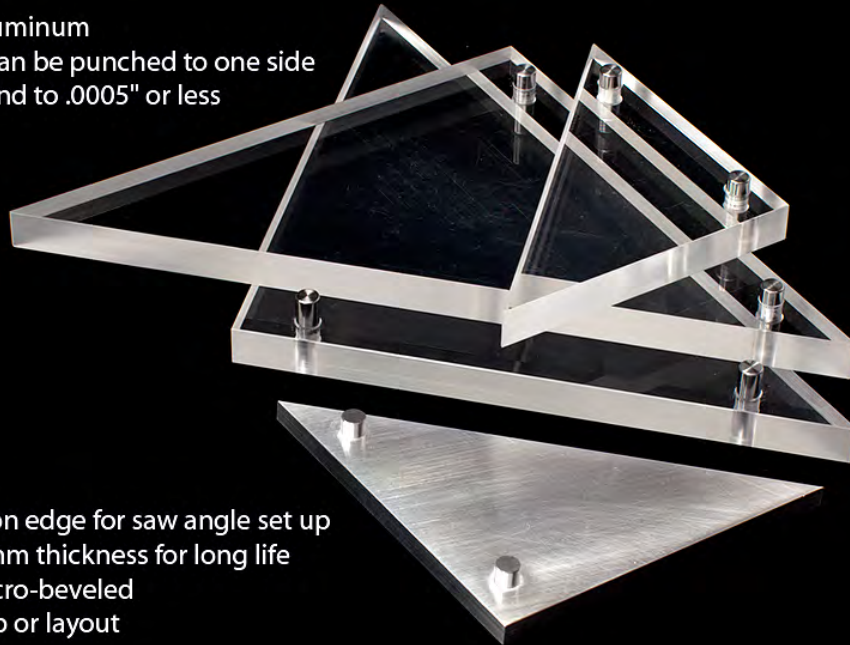
- Pins extend x 3/16"/side
- Use right side up or upside down
- Square to <<5' of arc
- 2 sizes, 3" x 3" and 6" x 6"
- 12 mm thick Cast Acrylic
- Custom sizes available
- Straight to <.0005"

AVAILABLE IN JIG PLATE ALUMINUM



- In 3 thicknesses: .25", .375" or .5"
- Pinpoint registration to the work
- Succinct ring to the work edge
- Diag. = 9", 5" on the 3" x 3"
- All product compared to Starrett metrology tools

- In Acrylic or Aluminum
- Stainless pins can be punched to one side
- Hand wet ground to .0005" or less
- Un-handed



- Able to rest on edge for saw angle set up
- Durable 12 mm thickness for long life
- All edges micro-beveled
- Use for set up or layout

The triangles (45-45-90) are made by me. After they're wet ground and micro-beveled, they're compared to Starrett metrology tools for inspection.

Available in MIC-6 Jig plate Aluminum and 12 mm Acrylic.

The perfect tool for QC, layout, machine set up, or maybe a birthday gift.

The pin registration to the work is very well defined. You can see and feel the pins against the work edge. The 90.0° and the 45.0°'s are accurate to < <5.0' of arc and all edges are micro-beveled and straight to <.0005".

Product price list follows; S&H is not included.

S&H will vary between \$4 and \$14, shipped either FC or USPS Priority.

All triangles 45-45-90 and with precision located, press-fit SS .250" pins inserted.

- 1) ~3.5" x 3.5" x 12 mm Acrylic: \$29
 - 2) ~ 6.4" x 6.4" x 12 mm Acrylic: \$39
 - 3) Nos. 1 and 2: \$60
-

- 4) MIC-6 Aluminum, ~3.5" x 3.5" x .25": \$39
- 5) As no.4 but x .375" thick: \$46
- 6) As no.4 but .50" thick: \$54

- 7) MIC-6 ~6.4" x 6.4" x .25": \$48
- 8) As no.7 but .375" thick: \$58
- 9) As no.7 but .500" thick: \$68