

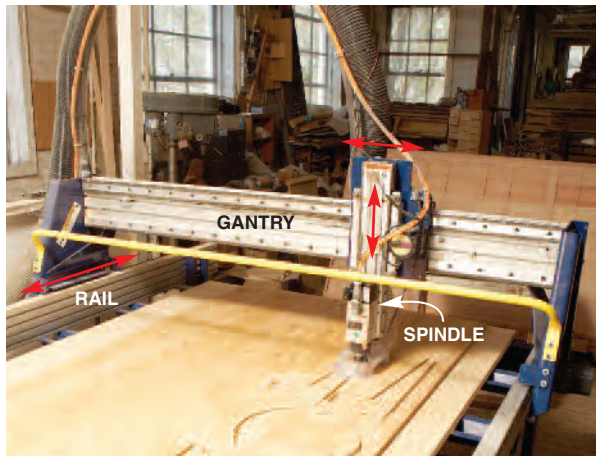
by Seth Keller

ShopBot CNC Router

**FAST, ACCURATE
AND CREATIVE**

Computer Numerically Controlled (CNC) machines for drilling, sawing and routing have been around for decades. Their precision, speed, versatility and ability to perform repetitive tasks have revolutionized the cabinet and furniture industry. But the CNC revolution came at a high price – six figures for the big production models – which has kept CNC technology off-limits to most small shop owners. Recently, that has changed. Thanks to companies like ShopBot, CNC routing machines have trickled their way down to the small shop. ShopBot sells CNC routers starting at \$5,000. The woodworking coop I belong to bought their most popular model, the PRS Alpha 96 x 48. At \$9,495, that's a good chunk of change, but we've been amazed at what it can do.





1 The ShopBot has a high-speed spindle or router, suspended over the table on a moving gantry. The spindle moves up and down and side-to-side across the gantry. The gantry itself rolls on rails along the length of the table. The result is a cutter that can move in three axes at once; vertical, side-to-side and front-to-back.



2 The brain of the ShopBot is your own PC. First a design like this sign (above) is drawn on the CAD program. (This sign was designed for my uncle's garage, dubbed "Kellers' Clubhouse". Don't ask me what goes on in there.) The computer then tells the spindle router how to carve the sign. At right is my uncle with his new sign. Gold painted letters and a black border are added embellishments.



Small shop owners use CNC routers like the ShopBot to carve signs, images, architectural elements and to machine cabinet parts. One of the great things about a CNC machine is the ability to "set-it-and-forget-it." Once you've got the machine working on it's task, you are free to go about other work in the shop.

A CNC router generally consists of a table with one or more routers (or "spindles") suspended from a gantry that moves over the table (Photo 1). The spindle moves up and down and across the gantry while the gantry rolls on rails along the length of the table. The result is a cutter that moves in three axes at once: vertical, side-to-side and front-to-back. Watching it work is like watching a well-choreographed ballet.

The brain of the system is a CAD (Computer Aided Drawing) program and a CAM (Computer Aided Machining) program. First, you draw the parts with the CAD program (Photo 2). Then the CAM program tells the spindle what to do. The precision is astounding; whatever you can draw on the computer, the CNC can execute to within .001 in.

THE LEARNING CURVE

It took me a few days to master the ShopBot CAD/CAM software. Designed for the beginner, the software is amazingly intuitive yet powerful. When showing off the machine's capabilities, more than once I heard, "Man, they thought of everything!"

Finding ways to hold the stock in place while it's being cut was another skill we had to develop. Screws and/or clamps are the usual method. It's not rocket science but it does take a little practice to get right. (We ruined a few router bits along the way.) Vacuum hold-downs are available as an accessory and simplify the job, but they add \$6,600 to the cost of the setup.

A SHOPBOT ODYSSEY

I belong to the Fourth Street Guild, a woodworking cooperative in Minneapolis, Minnesota. Pete Schmitt, Dan Cramer, David Olsen, Paul James, Keith Moore and I share shop space and pool our resources to equip the shop. We are a diverse group. Pete, David and I specialize in one-of-a-kind furniture pieces. Dan and Paul design contract furniture. They use the shop primarily for prototype building.

Our odyssey began last year when we decided to add a ShopBot to our shop. Some of us (myself included) feared that a CNC machine would stifle creativity and turn us into a dreary cyber shop. Instead, we found the ShopBot actually unleashed individual creativity. We were all surprised by the ShopBot's versatility and user-friendly design. After 6 months with our ShopBot, we can't imagine being without it.

Seth Keller

SET-UP AND INITIAL TESTS

The ShopBot arrived in two very large and very heavy boxes. The manual was relatively straightforward, and whenever we hit a dead end during assembly, a quick call to ShopBot solved the problem. We were cutting parts in two days, an amazing feat considering we knew next to nothing about this type of machine.

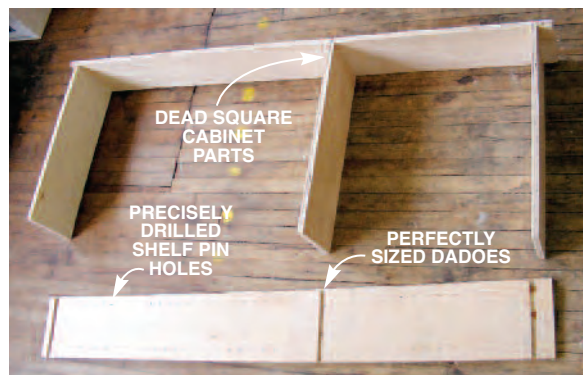
We tried out our new ShopBot on a basic bookcase (Photo 3). Drawing the rectangular parts was a great introduction to using the CAD program. The old problem of sizing the dados to fit undersized plywood was a dream: just measure the thickness of the plywood with a dial caliper and punch in the number. We even added adjustable shelf pin holes.

With the CAD design complete, it was time to get the sheet stock positioned on the table. A few clamps held the sheet of plywood down on the sacrificial MDF table.

Once the plywood was secure, it was show time. The nervous excitement in the air was palpable as we wondered what we might have forgotten or done wrong. Finally, with a shrug of the shoulders and a fatalistic “here it goes,” we flipped the power switch and engaged the router. I’ll never forget the thrill I got watching the spindle quietly float across the plywood to its designated starting point then gracefully drop the bit to a precise depth and start the first dado. It was a bit odd to see the dados and rabbets cut first, followed by the perimeters of the cabinet parts.

After the parts were cut and machined, the ShopBot dutifully paused while we swapped out the 3/8-in. straight cutter for a 1/4 in. drill bit. Back in action, the ShopBot made quick work of drilling all the shelf pin holes.

Everything was done with incredible accuracy. All the cabinet parts were dead-on square. Plus, there was no muscling sheet stock on a tablesaw, fussing with crosscut sleds or making test cuts.



3 Our First ShopBot project was a simple bookcase. The parts were drawn using ShopBot’s user-friendly software. All the parts were cut and machined in less than 15 minutes, including the shelf pin holes and the perfectly sized dados.



4 The ShopBot can be controlled manually with a keyboard. We used this feature in place of a handheld router and a straightedge to cut grooves, mortises, dados, etc. A tap of a key moves the ShopBot .005 in. Simply line the bit up with your mark and go.

NO-SWEAT SURFACING

Encouraged by our bookcase success, we turned our attention to an unusual slab of wood that was too big for our jointer or planer. Jointing and planing this 26-in.-wide piece of kauri, a valuable wood from New Zealand, was no problem for the ShopBot.

Jointing a gnarly piece of slab wood perfectly flat is a walk in the park for the ShopBot. A large end-mill bit makes multiple passes to flatten this piece of New Zealand kauri. It took about 40 min. to do both sides.



ShopBot-machined surfaces require only a little sanding before finishing. End-mill bits leave little or no tearout, even in highly-figured woods.





5 Full-scale prototypes are a cinch for CNC machines. Most of the chair parts for this prototype chair were cut from a single length of 2x12. With a CNC, you can make changes, then generate the new parts in minutes.



6 The table at right went from several full-sized mock-ups to the final result in mahogany in less than a day.

The ShopBot is an incredible design tool. It allows us to quickly build and modify prototypes to test out new designs.

Of course, we watched while the whole cabinet was cut out, but seasoned ShopBotters will set the machine in motion and go work on something else, returning only to change bits or stock.

The ShopBot can also be used in a manual mode for operations that are typically done with a hand held router and a straightedge guide (Photo 4).

QUICK DESIGN VARIATIONS

Many woodworkers use CAD to speed the furniture design process, but decisions affecting final design, construction and comfort are best made using full-sized prototypes. Building these prototypes was always a bottleneck in our shop. Here again, the ShopBot was like a gift from heaven. We're now able to translate our CAD concepts into three-dimensional reality without jiggling up to cut odd shaped parts or committing to hours of laborious hand shaping. The ShopBot makes it possible to quickly build and easily modify project prototypes.

As an example, I wanted to explore the comfort, construction, and aesthetic details of the dining chair I was designing. I drew chair parts in CAD and cut the parts out of a pine 2x12 (Photo 5). The ShopBot did most of the cutting, including the mortises. I had to modify some of the parts by hand, but most were ready to assemble right off the ShopBot.

I was also interested in exploring a three-legged table I had sketched out on a napkin. I transferred my sketch to CAD and made multiple versions on the ShopBot (Photo 6). Using samples made from MDF, I was able to check scale, thickness and construction details before settling on dimensions for my final piece.

CARVING: FROM SIMPLE TO COMPLEX

A friend was in the throes of remodeling her Victorian style house and asked me to duplicate some missing rosettes for the window and door trim. I could think of a number of ways to make the rosettes, all of them would take a fair amount of time. Once again, I found the ShopBot to be the perfect tool for the job. After I quickly made drawings on the computer, the ShopBot cut them out in minutes (Photo 7).

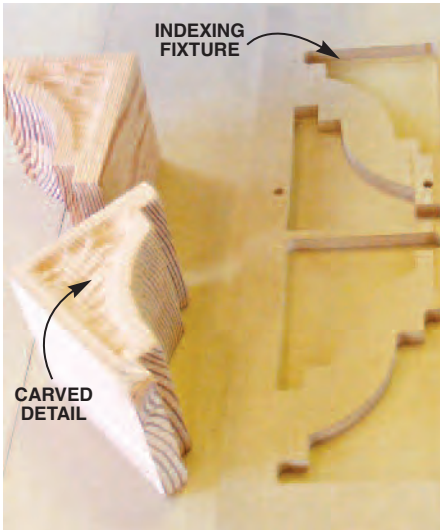
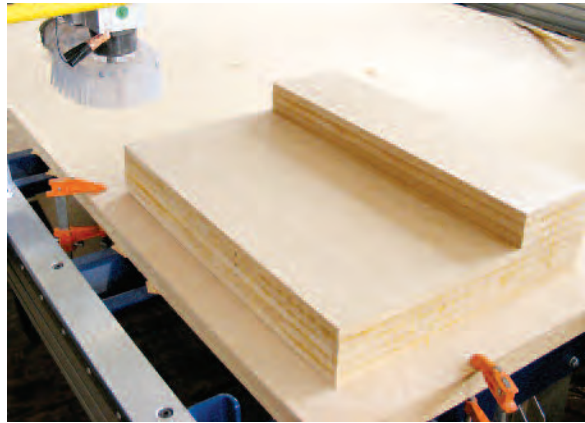
A shopmate turned to the ShopBot to make a pair of corbels for a mantel he was building (Photo 8). He used a 'texturing' tool to mimic a rustic gouging technique. He then sanded and detailed the corbels by hand.

The ShopBot also excels at three dimensional, or 'relief' carving. Thousands of predrawn models are available on the internet and can be made at any scale with precise detail (Photo 9).

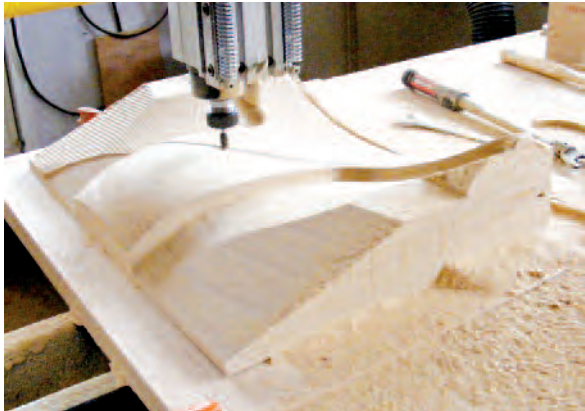
The ShopBot can "carve" out furniture parts as well. We used it on a chair back with a large sweeping arc (Photo 10). Work like this used to be as dusty as it was tedious. The ShopBot cured all that.



7 Simple carving tasks take only minutes. These rosettes replaced ones missing from a home restoration project. Both are based on a basic design of concentric circles with a small floral motif in the middle. The ShopBot created these in minutes.



8 These corbels are carved on both sides. A CNC-cut indexing fixture precisely positions the corbels for carving. The parts are held down with double-stick tape.



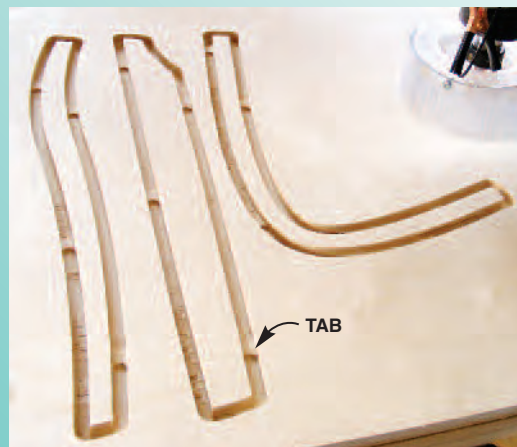
10 Deeply contoured work can be executed with ease on a CNC machine. Starting with a block of glued-up MDF, the ShopBot carves out a form for a vacuum-bag veneer job.



9 Sculpting is another CNC attribute. Many images like the ones above, can be downloaded as models from the internet and fed right to the ShopBot.

SECURING THE WORK

We programmed tabs into the cutting path to keep the parts anchored to the sheet. The tabs are areas where the cut doesn't go all the way through. The parts are released by cutting through the tabs with a hand held trim router and a flush cut bit.





TWO THUMBS UP

The ShopBot is an amazing machine, and it's fair to say that its most limiting factor is your imagination. Furthermore, if you are ever stuck on a problem with your ShopBot, there's a toll free number with patient, wise and willing tech support on the other end. If that isn't enough, online forums and chat rooms are filled with 'Botters' who relish the opportunity to bring new owners into their community, compare stories and help troubleshoot problems.

Some purists may argue that a CNC machine separates the craft from woodworking. Let me reassure you, the ShopBot won't replace your handplanes, or your tablesaw for that matter. Some of our power tools, especially the handheld router, do get used less, but the ShopBot is really just another tool that does the same processes in a different manner. Its efficiency, accuracy and speed have increased and enhanced our creativity as woodworkers. It's been half a year since we installed our ShopBot yet we've only just begun to explore the opportunities that this machine has to offer. There isn't a doubter left in our small shop.

For more on these marvelous machines, visit:
www.shopbottools.com, (888) 680-4466