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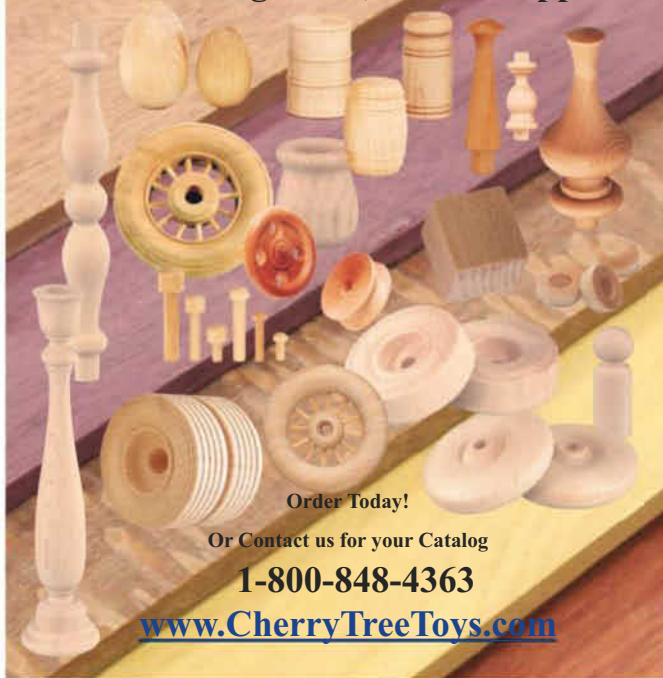


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Lightweight lithium-ion batteries, coupled with state-of-the-art motors and “smarter” electronics, are revolutionizing the potential of cordless tools these days. Heavy-duty drill/drivers, circular saws and even chainsaws are getting steadily better as a result. Whether you’re in the market for one of these tools we’ve tested this year, or just wondering what all the fuss is about, this section will help.

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Stationary & Benchtop Tools

If 2014 is the year to buy a portable table saw, be sure to read our tool review, starting on page 24. Sharpening your turning tools is quick and easy with a bench grinder. See page 20 to learn more about your grinder options. Ever wanted to make your own lumber? You can with a portable sawmill. Our in-depth guide provides the need-to-know essentials.

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New Stationary and Benchtop Tools

Molding Machine

Williams & Hussey has added the new 154CE molding machine to their line which, like the model 206 and 209 molders, is made in New Hampshire. It also can mill straight, round top and elliptical moldings. The unit has a new chip extractor that improves waste flow.

Its 2hp, 230-volt motor produces moldings at a rate of 11 feet per minute. The 154CE comes with a compact steel stand and costs \$2,195.



Rockler Woodworking and Hardware's newly redesigned Router Tables

Router Tables

Rockler Woodworking and Hardware's newly redesigned Router Tables include bright white tables to reflect more light and maximize visibility, built-in dual T-tracks and miter tracks to expand setup possibilities with additional jigs, a 2½" dust port and a translucent bit guard for

added safety and visibility. They come with adjustable fence faces and a CNC-machined aluminum plate that can fit any router and rests on a 10-point leveling/locking system. The Rockler Router Tables are available in a High Pressure Laminate Package priced at \$249.99 and a Pro Phenolic Package priced at \$399.99, with each package containing a tabletop, fence and plate.

Mini Lathe

Laguna's MLA10X16-1/2-0130 Revo 10 x 16 Mini Lathe is a part of their new line of Revo Lathes. Made of cast-iron, the lathes are powered by Servo motors. For the Revo 10 x 16 Mini Lathe, that motor is rated at 1/2hp (110 volts). Electronic variable speed provides a low speed of 300-900 rpm, mid speed of 600-1,800 rpm and high speed of 1,200-3,600 rpm. Laguna says that the Revo Lathes have more torque at both higher and lower rpm than other lathes, less vibration and more mass. The Revo 10 x 16 Mini Lathe also includes a digital readout and a poly-groove belt with a three-speed quick-change system. It has a 5" swing and a 10" turning capacity, with a maximum distance between centers of 17". The inboard faceplate measures 3⅝" with a 1" spindle; the outboard faceplate measures 4¼" with a 3/4" spindle. It sells for \$499.



JET 12" XACTA Saw

Cabinet Saw

JET's new 12" XACTA™ Saw (JTAS-12-DX) is a workhorse with a big work surface. Weighing in at 630 pounds, the cabinet saw has a 31½" x 80" footprint that includes an 80" cast-iron table with a beveled front edge. When you're not sawing, JET's director of product management for wood suggests that you could use its table as a work surface for prep work or layout. Safety features include a riving knife to reduce kickback and an integrated see-through blade guard for a clear view of the material being cut. The easily reachable On/Off switch provides overload protection. The saw has a 5hp, single-phase motor rated at 4,300 rpm and cuts with a 12" blade. The left-tilt saw has a 40½" XACTA fence and a 50" maximum rip capacity to the right of the blade and 14" to the left. It accommodates 8" dado blades up to 13/16" wide. JET's 12" XACTA Saw is priced at \$4,089.



Laguna Revo 10 x 16 Mini Lathe



Shop Fox W1833
Pocket Hole Machine

Pocket Hole Machine

The new Shop Fox W1833 Pocket Hole Machine offers a stationary approach for making pocket holes. Powered by a 1/2hp universal motor, the machine bores a single pocket hole with each pull of a lever, into workpieces ranging from 1/2" to 1½" thick. Cutting action happens by means of a standard 3/8"-dia., 6"-long stepped drill bit, which is replaceable. The machine features an extruded aluminum fence plus two "swing" stops and a hold-down made of high-density polyethylene. Shop Fox reports that the hold-down clamp is a "no adjust" patented design that accepts any workpiece within the thickness range without needing further adjustment. The machine measures 18" wide, 27" tall and 29" front to back, with a 14" x 25¾" footprint. It weighs 56 lbs. The W1833 has a list price of \$810.



General International
15-205 M1
15" Disc Sander

Disc Sander

General International's 15-205 M1 15" disc sander has a 2hp, 220-volt motor, a 22" x 12" full cast-iron table that tilts back 0 to 45 degrees for beveled sanding, and 3/4" X and Y miter slots, with an aluminum miter gauge included. A two-step safety switch with lock-out key prevents unintentional start-ups or unauthorized use of the sander. The enclosed heavy-duty steel stand has a built-in storage shelf and large access door. The 15-205 comes with a 4" dust collection port. The machine weighs 212 pounds, with a table height of 38¾". It is priced at \$1,459.99.

Band Saw

The new Powermatic PM1500 Bandsaw has a full 14" of resaw height and 14½" of blade-to-frame width. Its 21½" x 16" cast-iron table, situated 40" from the floor, tilts 45 degrees to the right and 10 degrees to the left. The miter gauge features a pivoting head with stops at 45° and 90° left and right. Its exclusive, extruded aluminum Accu-Fence is a T-style that's fully adjustable. Upper and lower blade wheels on the PM1500 are made from iron castings and accept blades up to 153" long, from 1/8" to 1" wide. Both wheels run on dual ball bearings. Safety features include a foot-operated braking system, a power shut-off switch and a blade tension release with an electrical interlock to prevent the saw from starting when the blade is de-tensioned or released. Its thrust bearing accommodates different sizes of blades with no need for

Powermatic
PM1500
Bandsaw



aftermarket stabilizers. A magnetic On/Off switch powers up the machine's 3hp TEFC motor, which spins blades at 3,000 sfpm. It is priced at \$2,900.



Apollo Sprayers'
ECO-3 HVLP
Turbine

HVLP Sprayer

Designed for small workshops with moderate budgets, the ECO Series of HVLP turbine systems from Apollo Sprayers, under the ASI-HVLP brand name, consists of three-, four- and five-stage turbines. Made in the U.S., they come with a choice of a bleeder style or non bleeder, Apollo HVLP spray gun and a Handi-Hold™ spray gun docking station and feature quick disconnect and computer-designed Quiet Technology™ to lower the decibel levels. The three-stage ECO-3 sprays thin to medium viscosity finishes at 7 pounds per square inch and is priced at \$649. The four-stage ECO-4 sprays a wider range of viscosities at 9 psi and is priced at \$749; the ECO-5 is a five-stage turbine that sprays the widest range of viscosities, including latex paint, at 9.5 psi and is priced at \$899.





Stepping up to a Stationary Planer

EVER CONSIDERED BUYING A BIGGER PLANER? HERE'S SOME EXPERT ADVICE.

How many times have you had a board or panel that was wider than the capacity of your 12" or 13" benchtop planer? If this is a regular occurrence, you might be ready to upgrade to a larger stationary planer in the 15" to 20" range.

It's true, these cast-iron behemoths are heavier and harder to

move, take up more room and are more expensive than even the largest, priciest portable models. And stepping up into the big leagues isn't cheap: A basic 15" model can cost anywhere between \$1,000 and \$2,000, and a mammoth 20" or 22" planer can set you back \$4,000 to \$5,000 or more. That's quite a big step up

from the \$300 to \$600 you'd spend on a benchtop unit. But what you gain in return for your investment is a lot more than just the ability to thickness wider stock. A good stationary planer can take on the biggest jobs in stride, allowing you to run stacks of rough stock quickly or surface big planks and slabs beautifully.

The powerful motors and heavy-duty feed mechanisms these machines sport can handle big cuts on wide panels without bogging down or stalling. Invest in a model with a helical cutterhead, and you'll have a quieter-running machine that offers advantages over traditional models with straight-knife cutterheads.

Greater Capacity

One of the main reasons to get a bigger planer is to gain the ability to thickness-plane wider boards. Even if you don't often work with lumber that's wider than the typical 12" or 13" portable planer can handle, a stationary model allows you to flatten glued-up stock. Planing a cutting board, door panel, the top of a dresser or desk, or other wide assembly is not only much quicker than hand planing or belt sanding it after glue-up, it is by far the easiest way to achieve absolute flatness and consistent thickness. Even if you don't buy a stationary model big enough to handle the full width of a large panel, you can always tackle the job in two steps: Glue up the top in two subassemblies, run them through the planer individually, then glue the halves together.

Depending on how big you go, a big planer may also allow you to thickness stock too thick for a portable: Most 20" machines can handle stock up to eight inches thick. Additional thickness capacity also allows the use of special planing jigs, say to surface tapered stock, or to dimension irregular workpieces.

More Power

One of the best things about stepping up to a stationary planer is leaving behind the



With a 15" planer, you can surface panels and tabletops up to 30" wide in two steps: Do half at a time, then glue the halves together.

noisy universal motor that's ubiquitous in all benchtop power tools, including portable planers. The same kind of induction motor that gives a contractor's or cabinet model table saw its "oomph" delivers loads of wood-shearing torque to a big planer. Even the smallest 13" stationary models come standard with 1½ to 2hp TEFC (totally enclosed, fan-cooled) induction motors, which seal out intrusion from fine dust which can cause problems. Bigger planers in the 15" to 22" range typically include motors in the 3 to 7½hp range that run (depending on the exact model) on either single-phase or three-phase electricity. That's the kind of power you need when it's time to take a deep cut on a wide board without the machine slowing down — which not only takes more time, but produces a less smooth planed surface.

While some smaller stationary planers have their motors mounted atop the body, as with the JET JWP-16OS (right), most large models have motors housed inside the machine's enclosed base, which not only keeps the motor out of harm's way, but also keeps the center of gravity lower.

To transmit all that power to their cutterhead and feed rollers,

big planers employ not just one, but two or three V-belts (see photo, next page). Multiple belts not only make the transfer of power more efficient, but they also prevent slippage under heavy cutting loads. Heavy-duty bearings, both in the motor and in the cutterhead and feed roller assemblies, are designed to endure high loads and keep the planer running for a long time without significant maintenance.

Unlike the simple light switch-style On/Off switches used on



JET's affordable 16" JWP-16OS planer runs on a powerful top-mounted 3hp induction motor.



Above: Big planers use three V-belts to transmit power. Right: A magnetic motor starter switches the tool on and off while ensuring better safety.



RIKON's model 23-400 16" planer features bed extensions with rollers to help stock glide.

benchtop portable planers, the induction motors in big stationary planers are switched using magnetic starters (see center photo, above). In addition to providing fuse protection for the motor, a magnetic starter also protects the user. Should the power in the shop go off during planing, the magnetic switch automatically turns off. When power comes back on, the planer doesn't power up until you switch it back on again.



General International's 15" model 30-125CE stationary planer employs heavy steel and cast-iron construction.

Heavier Construction

One advantage of the light materials and construction used in portable benchtop planers is also a shortcoming. In lieu of aluminum alloys, big planers are built with a plethora of heavy steel and cast-iron parts. The heavy castings or steel columns used to support and align a big planer's cutterhead and bed are stocky and keep things precisely aligned. Parts such as side plates and handles usually made of plastic on portable planers are instead made of iron or steel, which takes its share of use and abuse without breaking.

Plastic sprockets and belts used on depth adjustment mechanisms are rarely found on stationary units; instead, you'll find solid metal gears connected by a sturdy chain drive. Heavy iron head, table and base castings not only make stationary planers durable, but also serve to dampen vibration that can lead to cutterhead chatter and less-than-perfect planed surfaces. And while a 300- to 500-pound planer isn't exactly easy to move around when you want to, all that weight does keep the machine from tipping or scooting around when you're feeding long and heavy stock.

Another advantage of having a stationary planer is that their longer infeed and outfeed tables offer enough support to keep long stock flat during planing. The majority of stationary models sport solid cast-iron extensions bolted to the infeed and outfeed ends of the bed. On other models, such as the 16" RIKON model 23-400, shown above, the extensions are metal outboard supports fitted with rollers. In either case, the longer tables/supports help keep long boards flat as they pass under the cutterhead, which helps reduce or eliminate sniping.

Another reason that extension tables are an important feature on large planers is that, unlike portable planers, their beds, rather than the cutterhead assembly, raise and lower. That means that if you wanted to use freestanding outboard supports when planing long stock, the changing bed height would require resetting the outboard support each time you changed the planer's cutting depth — a big hassle.

Better Stock Handling

Small portable planers typically use a pair of rubber-covered rollers to feed the stock past the

A series of spring-loaded pawls with serrated teeth on stationary planers like this Powermatic model prevent stock from kicking back during planing.



cutterhead. This works pretty well most of the time but, as anyone who has ever used a portable knows, occasionally, the rollers lose their grip on a board and it stalls. At best, this leaves rubber stripes on the board; at worst, the cutterhead plows a big divot into the surface of the board. Bigger planers typically use a serrated steel infeed roller that offers a lot more grip on the incoming board, even if its pre-planed surface is hard and slippery — say, in the case of a previously surfaced piece of teak. Just ahead of this roller, there's a series of steel anti-kickback fingers (pawls) that prevent the workpiece from being hurled back, should the cutterhead grab the board during planing (see photo, above).

Chip breakers are another important device you'll find on big planers. Located in between the infeed roller and the cutterhead, the chip breaker presses down on the surface of the board, thus breaking chips off as they form to prevent them from splintering and creating grain tearout. A chip breaker also prevents thinner boards from bouncing or lifting, thus reducing snipe. It also helps direct the flow of chips from the cutterhead into the dust chute.

One feature that's found on some bigger planers, such as the 22" Powermatic model 201, is a pressure bar. Located between the cutterhead and outfeed roller

(see the *Drawing*, next page, bottom), this bar presses down on the work to keep it flat on the bed — preventing a board from lifting as it leaves the cutterhead, thus preventing snipe. A pressure bar also helps keep chips off the surface of the planed board, which keeps them from getting pressed into the wood by the outfeed roller.

Large planers also usually have bed rollers that can really help keep stock feeding smoothly. Woods like pine and fir sometimes have sap pockets and/or exude bits of pitch that can turn an otherwise smooth planer bed surface into a sticky mess — and cause the board to run slowly or stall during planing. Non-planed boards straight from the sawmill can also be difficult to plane, as the rough surface left by the sawmill's coarse blade creates a lot of friction. Bed rollers (also called table rollers) help remedy both situations by reducing friction between the board and planer bed. A pair of rollers are mounted in slots in the planer's bed just below the infeed and outfeed rollers. Raised just a few thousandths of an inch above the bed surface, the bed rollers keep boards feeding smoothly.

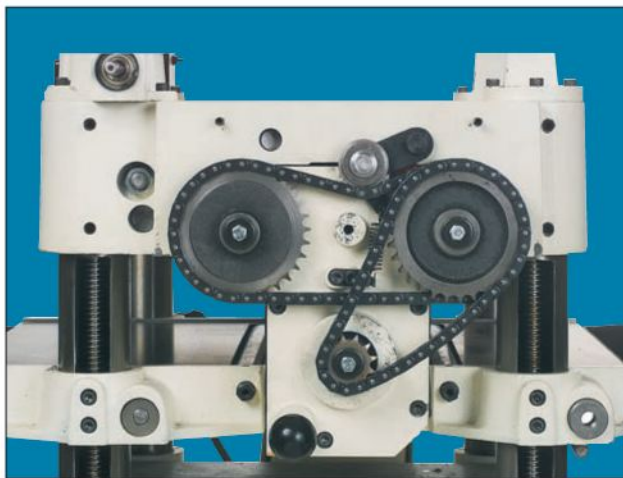
The height of the rollers is adjustable: When planing fairly smooth stock, they should be set flush with or just barely proud of the bed. For really rough stock, they may be raised as much as .006" or more. Larger planer mod-

els, such as the 22" Powermatic model 201, feature adjustment handles to make changes in bed roller settings quick and easy (see photo, below).

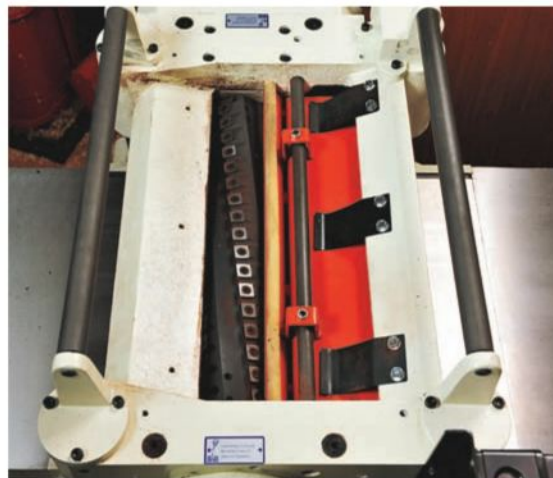
Large planers also allow you to run stock more quickly than portables do. A two-speed gearbox enables you to select a slower or faster feed speed, typically up to 20 feet per minute. The slower setting allows the cutterhead to take more cuts per inch of board travel, and hence creates the cleanest planed surfaces. The faster feed speed offers a bit less surface quality, but it allows you to plane more stock in a shorter amount of time; that can be a good tradeoff when you need to surface a mountain of rough stock.



Adjustable bed rollers on this Powermatic planer help rough or resinous boards glide across its stationary bed.



A pair of tensioned chains on this planer (shown here with the protective cover removed) transmit power from the machine's two-speed gearbox to its drive rollers.



A helical cutterhead like the one inside this JET planer has several spiraling rows of individual carbide inserts instead of a set of three or four long conventional knives.

Better Cutterheads

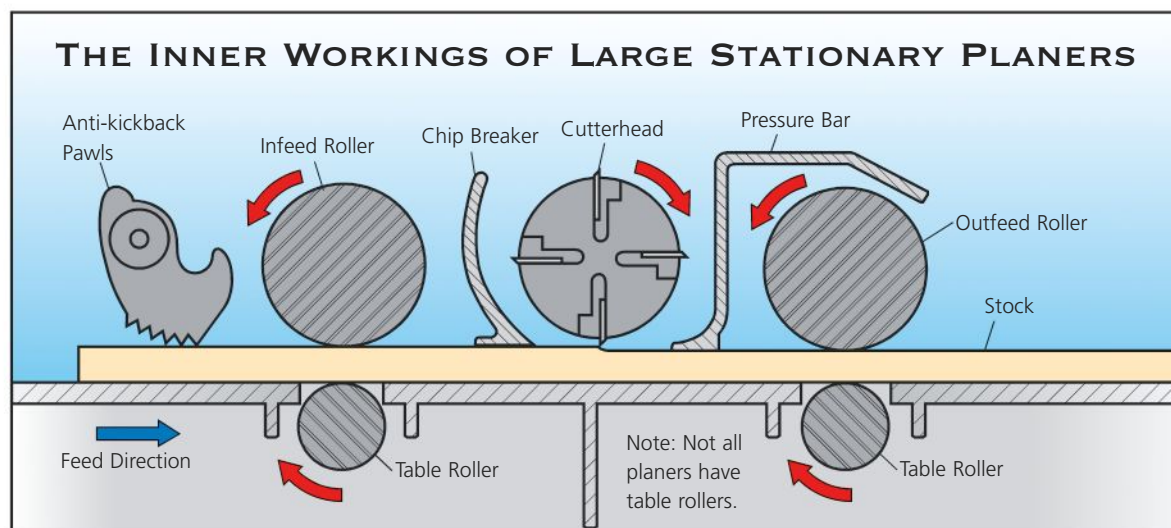
One of the most significant innovations in woodworking has been the availability of helical cutterheads for planers, jointers and shapers. Instead of cutting with two or three straight-edged knives as used in conventional planers, a helical head cuts via a series of small carbide inserts, arranged in several spiraling rows (see top photo, right). The insert's cutting edges overlap and are arranged to create a flat surface on the planed stock. While there is a booming business in retrofitting older planers with helical heads, several manufacturers now offer models that come standard with helical cutterheads. Although they're more costly, helical heads offer many

practical advantages:

- Because a helical head cuts with a series of overlapping inserts rather than continuous knife edges, they cause less tearout when planing woods with highly figured or squirrely grain. Some users say they don't worry about grain direction at all when planing with a helical head — the shearing cut of the angled inserts creates so little tearout.
- Helical cutterheads run significantly quieter than standard cutterheads, reducing peak noise during planing by 10 decibels or more. Thus, they can help reduce ear-damaging noise.
- The knives in a traditional large planer must be set parallel to the bed and carefully aligned to all be on the same cutting

circle. In contrast, the carbide inserts on helical heads fit into sockets machined into the head itself. Each insert indexes precisely in its socket, so no readjustments are necessary when they are removed and replaced.

- Traditional knives must be sent out for resharpener, replaced and readjusted (with the exception of some very large industrial planers with built-in knife-honing devices). Carbide inserts stay sharp far longer than HSS knives do; HSS knives may start off sharper than carbide inserts, but after a few cuts they are on par, and the inserts maintain their sharpness longer. Plus, each insert has four sides and can be rotated three times to reveal new cutting edges before



it requires replacement. (Yes, it's a time-consuming process — a 20" wide head has about 100 inserts. But you can rotate or replace inserts whenever necessary; you don't have to wait for your knives to come back from the sharpener.)

- If you get a significant nick in a set of regular planer knives, say from hitting a nail, stone, or other defect (that can't be cured by shifting the knives in the cutterhead relative to one another), the knives need to be removed, resharpened and reset. In a helical head, you simply rotate or replace only the damaged inserts, thus saving cost and downtime.

- Because helical cutter inserts take a series of smaller cuts across the width of a board,

smaller individual chips are produced, which are easier to entrain and remove with standard dust collection, resulting in fewer hassles with clogged chip chutes, hoses and ductwork.

Of course, no cutterhead is perfect. While planers with standard cutterheads tend to leave shallow scallops that run across the width of a board, helical heads can leave subtle ridges that run lengthwise. In both cases, if the planer is set up correctly and its cutters are sharp, it should only require a little scraping or sanding to achieve smooth, finish-ready surfaces.

Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and contributing editor to Woodworker's Journal. His books are available at Amazon.com.



A helical cutterhead's individual carbide inserts can be loosened and rotated to a fresh edge or replaced as necessary.

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Powermatic Launches Drill Press “Just for Woodworkers”

ON-THE-FLY SPEED CHANGES, DIGITAL READOUT AND LED LIGHTING ARE A FEW STANDOUT FEATURES OF THIS ALL-NEW DRILL PRESS.

Here's the latest entry in the collection of uncommon drill presses that have been designed primarily for woodworking. This sturdy offering from Powermatic has features that focus on accuracy.

From the perspective of this graying woodworking editor, new stationary power tool offerings have seemed a bit like a threatened species for the last few years: hard to find in the first place and even harder to get your hands on one of them when you do. That's one of the reasons that I was motivated to travel to LaVergne, Tennessee, recently, to get a grip on this new drill press from Powermatic — literally and figuratively. The Powermatic folks were kind enough to let me check out their one and only sample at the time, but by the time you read this it

will be widely available. If you haven't seen it yet, this PM2800B drill press deserves a closer look!

When you step back and think about it, the basic functionality of a drill press is pretty simple. Whether it is a floorstanding model or one designed for the benchtop, its basic configuration (motor, quill, drill chuck, table and post, etc.) has not changed much in many, many years. And that is part of the problem — drill presses were born in the machine shop and made for drilling steel, brass and other metals. They made their journey

POWERMATIC PM2800B DRILL PRESS AT A GLANCE:

- 1hp, 115-/230-volt motor
- 5/8" max-shank diameter, keyless chuck
- Aluminum extruded fence with cam locks
- Laser guide; Two LED worklights
- 250 to 3,000 rpm bit speed
- Table size: 14" x 20"
- Weight: 246 lbs.
- Warranty: 5 years
- Cost: \$1,399.99

to the woodshop without much difficulty, but without much focus on the differences between the materials being machined. In recent years, a few machines have been made with their focus specifically on the tasks that a woodworker will perform and, just as important, the material that we work with most frequently. The PM2800B is one of those.

What Goes Around

The proper operating rpm of various drill bits is a consideration that woodworkers should accommodate as we shift from large Forstner bits to slender brad points ... but mostly we don't. The reason is that, in most standard drill presses, changing the belt from one speed to another is an annoying, dirty and finger-pinching manual effort. That is why the on-the-fly variable speed controls on this tool are so valuable. In addition to making it easy to change the bit speed, the PM2800B has a digital readout that tells you what the rpm are.



Revolutions per minute (rpm) of drilling speed is adjustable on the fly using the wheel shown at right. The digital readout (above) reports the actual speed — and is variable from 250 to 3,000 rpm.



This provides repeatability and control as you use different bits. In this case, the rpm adjustment wheel looks like a control wheel on the front of your table saw — I found it easy to use, with clear labeling to tell me which direction was faster or slower. The display was easy to read as well.

With that bit spinning, one

complete revolution of the quill handle delivers a full six inches of spindle travel. This is an example of delivering value to woodworkers specifically, where boring deep holes is a common task. To control that depth of drilling, there is an easy-to-adjust depth stop. Another nice feature is the keyless chuck, which



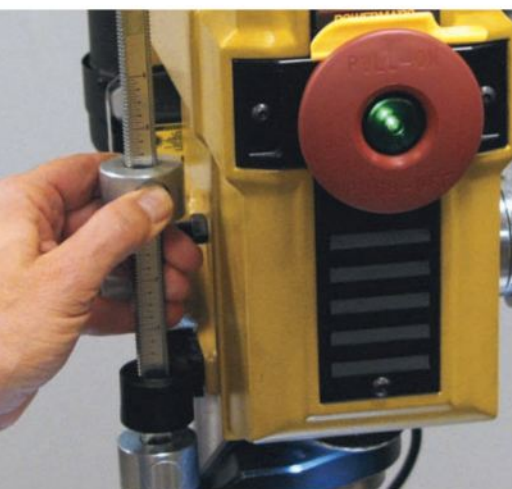
Two LED lights provide virtually shadow-free illumination to the workpiece. Also, note the left-hand optional placement for the quill handles to accommodate ambidextrous drilling operations.



A safety key must be in place or the machine will not turn on. Once removed, the machine will not start even if the large red button is pulled out. If the machine is plugged in, the green light is on.



Built-in Accuracy



Drilling accurately, especially repeated holes, requires accurate setup and fences. The PM2800B has a laser guide (upper right), a quick-adjust depth stop (lower left) and an adjustable flip-up stop attached to the fence (upper left). The fence has a slick and easy-to-use cam-lock system. The cams (above and lower right) are finger-operated, requiring no tools. The black square in the photo (above right) is a replaceable insert that can be adjusted to the level of the tabletop.

accepts shanks up to 5/8" diameter — it can handle big bits.

There are also two LED lights to illuminate the work surface and an adjustable laser guide to help accurately locate workpieces prior to drilling.

Cast-iron Table

The rectangular work table on this drill press is outfitted with a replaceable square insert that is aligned to the table using leveling screws. Another nice option is that the table can be rotated a complete 90 degrees (or anywhere on that scale), letting you bore holes into the end grain.

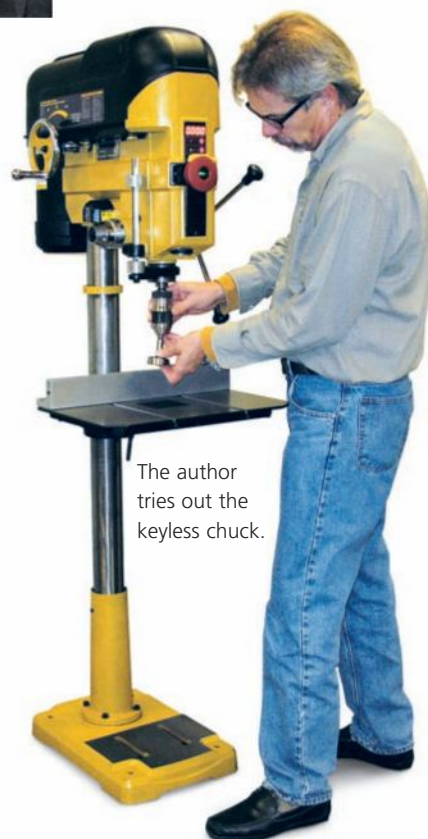
I found the fence and its cam-lock adjustment system to be a really nice touch. The fence is made from an aluminum extrusion, and it is secured to

the table with quick-adjust cams that have anchor heads in the table's machined slots. The one I tried slid across the table smoothly and then locked tightly in place. There is also a flip-up stop attached to the fence.

Additional features worth noting: a large and heavy base for added stability, a safety key to prevent accidental startup, reversible handles for you lefties out there and a 5-year warranty to tidy up the package.

All in all, this new drill press should be a very good addition to a woodworker's shop. While not a true "tool test," I found the features and details on the PM2800B to be top-notch.

Rob Johnstone is publisher of Woodworker's Journal.



The author tries out the keyless chuck.

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Bench Grinders: Covering the Basics

HERE'S HOW TO GET YOUR GRINDER READY FOR GENERAL TOOL SHARPENING — QUICKLY, AND ABOVE ALL, SAFELY.

A bench grinder is, in essence, a double-ended motor with a grinding wheel mounted on each of the protruding shafts. As well, the motor has a base and guards surrounding the grinding wheels and eye shields to protect you from sparks and debris. Top-end grinders have even more features. You can pay anywhere from well south of a hundred bucks to several thousand dollars for a grinder. Obviously, you get something for your money, so let's take a look at features.

Wheel Size

Size: Grinders are sold in 6", 7", 8" and 10" sizing, which refers to the diameter of the grinding

wheels the machine accepts. Unless you're on a limited budget, avoid the 6" and 7" machines. They generally lack enough power to grind tools quickly. My preference is for 10" grinders, but they tend to be industrial machines costing between \$450 and several thousand dollars.

The 8" size offers the best balance of value and utility for the home shop enthusiast. Before we get into the 8" size, we need to talk a little about motor speed. Induction motors run at two basic speeds: 1,725 rpm for low-speed motors and 3,450 rpm for the high-speed variety. Traditionally, 6", 7" and 8" grinders have been built on 3,450 rpm motor frames and 10"

on 1,725 rpm frames. The chart at far right shows the surface speeds for the size wheels and the motor rpm. Recently, 8" grinders have been showing up with 1,725 rpm motors. They're slower than the 10" grinders and actually below the optimum speed for dry grinding of tool steels. Don't let this bother you for even a moment, for the low speed allows much more control of the sharpening process. For the home shop guy, getting the job done safely and correctly far outweighs time constraints.

Grinding Rests: All grinders come with adjustable tool-rests, but most are not much good for woodturners as they are designed for machinists to

Basic Grinder Components: Knowing the components of your grinder is the first step towards setting up your tool properly. Here are the basics.

sharpen machine tool cutters. Fortunately, there are good aftermarket rests designed for woodturners. Therefore, the stock rests are of no concern in your buying decision because you should replace them. Adjust any rest to within 1/8" of the wheel before grinding.

Safety Shields: All grinders come with safety shields, but the protection they afford varies greatly with price. In my opinion, the plastic shields on economy grinders offer very little eye protection. My 10" Baldor is an industrial machine with heavy shields that consist of a sheet of polycarbonate between two sheets of safety glass, all held in a sturdy metal frame.

Even with all of this protection, I would not dream of not wearing safety glasses when grinding. While standard eyeglasses afford some degree of protection, they are not safety glasses. Wearing a face shield over your prescription glasses is a necessity.

Particles coming off your grinder wheels are hazardous to breathe, too. You should wear a respirator or have a vacuum system that completely sucks up the particles any time you grind.

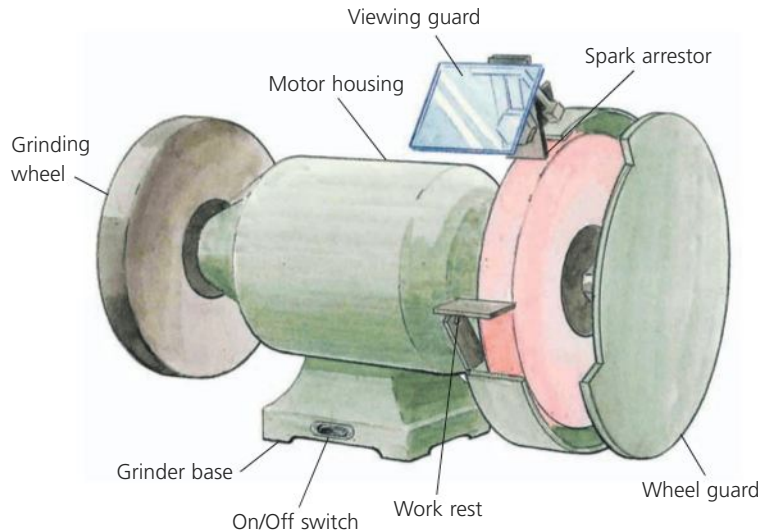
Setting Up Your Grinder

The first matter of business in setting up a grinder is location. As the name implies, a bench is a good place. It is best practice to secure your grinder to the bench with a clamp or other means. This is a necessity if you are going to use sharpening jigs. A pedestal base for your grinder can be a good investment as it frees up bench space and allows you to position the grinder in the most convenient location for the work at hand. You may have to

interpose a piece of wood under the base of the grinder to elevate it above the bench (or plywood on a pedestal) to allow jigs to mount under the guards. I have done this with my Rockwell Delta grinder shown on the following page.

Grinder Height: I have visited a number of private and club shops lately where the grinding machine is mounted at chest height, which puts the wheels at face level. The theory is that one has better visual acuity at this altitude. I think the practice is unwise. I have witnessed a couple of exploding grinding wheels in my days. Leave your grinder at bench height.

Wheel Inspection: Once you have your new or used grinder located and affixed to the bench or pedestal, you should remove the guards and dismount the wheels to visually inspect and ring test them. Visual inspection is straightforward: examine for cracks and defects. Also check that the maximum speed rating of the wheel exceeds that of the grinder. Ring testing entails balancing the wheel on one finger inserted into the center hole and tapping it lightly with a metallic



Your grinding wheel needs both sight and sound inspection: a solid wheel should ring if you tap it with a gouge.



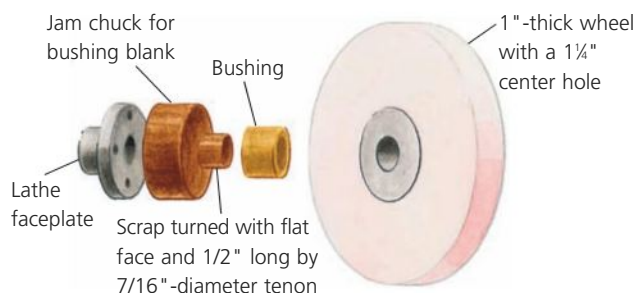
Rests should be no more than 1/8" from the grinding wheel. Rest adjustment is made with the grinder stopped.

Grinder Wheel Speed Chart

Wheel Diameter	Motor Speed	Surface Feet/Minute
6"	3,450 rpm	5,420
7"	3,450 rpm	6,320
8"	3,450 rpm	7,225
8"	1,725 rpm	3,615
10"	1,725 rpm	4,520



The author's grinder (above) has a shop-made base that lifts the grinder off of the table. He clamps the base to the bench when grinding. The additional handles are used when moving the hefty tool to where it is needed around the shop.



Shop-made Wheel Bushing: Many plastic bushings provided with grinder wheels are poorly sized. Woodturners can make their own bushings from hardwood on a lathe.

object. I use a big scraper. A serviceable wheel will yield a clarion ring while those with a defect have a dead tone reminiscent of a cracked baseball bat or a cracked wine goblet. You will recognize a bad wheel when you hear one. Once they are tested, remount them on the grinder, making sure to snug the arbor nuts, but not tighten them so much the wheel could be damaged. As a final precaution, I step to one side of the grinder and power it up. I then let it spin for five or 10 minutes. Defective wheel explosions usually happen at, or shortly after, startup.

Arbor Bushings: Which brings me to the next bit of troubled water, arbor bushings. Grinding wheels are cast around a central hub. To match the opening in a grinding wheel to the arbor shaft, manufacturers provide

plastic bushings. Bushings vary greatly from maker to maker, but suffice it to say many are poorly made. I overcome this problem by turning my own from wood as per the *illustration* above.

Spark Arrestor and Work Rests: The spark arrestor is at the top opening of the guards just under the viewing shields. It should be adjusted to about 1/8" from the wheel and readjusted anytime the gap reaches 1/4". Any work rest should be adjusted to within 1/8" of the wheel.

Grinding Wheels: The final weak link in grinders is the wheels themselves. If you are buying a grinder in the \$100 range do not expect quality wheels. A good upgrade is a new set of premium quality wheels, but a shocker will be that they can cost 60% of the price of the grinder, about \$32 per wheel in 8" sizing.

Grit and Structure: Do not make the mistake of thinking fine-grit wheels will give you sharper tools; they are more likely to burn your tools. I use a 46-grit wheel on the left side of my grinder and an 80 on the right. They grind fast, efficiently and, above all, coolly. A wheel structure of 5 gives enough open space between particles to grind cool. For the abrasive, you want an aluminum oxide or an aluminum zirconium wheel.

Friability: Friability is related to the amount and type of bonding agent used in the wheel. Friable means "to crumble." Abrasive particles dull and, as they do, they dislodge from the wheel. I prefer an "I" wheel for grinding carbon steel and a "K" wheel for high-speed steel (HSS).

Dressing: Because wheels are cast, they are never perfectly round when first mounted. Not only will this cause the grinder to jump around, it will prevent good grinding because it is eccentrically shaped. The first order of business is to adjust the grinding table to within 1/8" of the wheel, and employ a dresser to bring the wheel perfectly round. Simply set the dresser on the rest and run it across the wheel. This task should be repeated as the wheel wears or dulls.



Ernie Conover is the author of *The Lathe Book*, *Turn a Bowl* with Ernie Conover and *The Frugal Woodturner*.

WHAT ARE YOU BUYING?

Grinders that cost \$100 to \$150

Basic grinder with minimal shielding and great variation between individual machines. Horsepower anemic. Base will provide little elevation above table. Vibration prone. Wheels will work but will have to be replaced (about \$65) to grind well.

Grinders that cost \$151 to \$300

Heavier castings. Base elevates grinder sufficiently to mount most jigs under wheels. Better shielding, less vibration prone. Quality of wheels must be determined.

Grinders that cost \$301 to \$500

Vibration-free commercial machine. Heavy construction, excellent guarding. Decent shields. Lighting likely. Wheels sufficient.

Grinders that cost \$501 to \$2,000

True heavy cast-iron industrial machine with stout arbors, lights, glass/plastic sandwich viewing shields. Good stock rests, heavy guarding. May have facility to attach specialized spark arresting vacuum systems. May have cast-iron quench bowl.

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Portable 10-inch Table Saw Test: From Exceptional to Mediocre

NEED A COMPACT SAW ON WHEELS THAT CAN STILL CUT LIKE A BIGGER SAW? THEN CONSIDER ONE OF THESE PORTABLES.

About three paces from where I tested these portable table saws sits my late-model cabinet saw. As a serious woodworker and magazine editor, I can't imagine not having it. Its powerful 3hp motor, spacious cast-iron tabletop and almost hair-splitting precision makes most other saw options pale by comparison. But all this said, a cabinet saw isn't everything. The thought of moving that behemoth down the steps to a basement shop sends chills up my spine. I sure can't toss it into a car trunk to help a friend down the road. My saw takes up a huge footprint of shop floor, and it cost a small fortune. I don't know of any stationary table saw that sells for less than \$700 new these days, and that

can drain a modest tool budget.

Now, consider these five portable saws by comparison. All of them can split a sheet of plywood down the middle. Their 15-amp (universal) motors are tough enough to rip through thick hardwood with relative ease, and I cut plenty of it during testing. You can even install a stacked dado blade for cutting rabbets, dados, tenons and the like, so these saws offer "real" project potential for a lot less money. They feature today's required riving knives and improved guard systems for safety, and their rip fences are surprisingly accurate. Dust collection provisions come standard, and most have other creature comforts that make them both pleasant and practical

to use. Best of all, these models get around! Flip a few levers, and several have stands that turn into makeshift dollies, so you can roll your saw wherever you need to set up shop. When your wood-working is done for the day, these little saws stow in about a third of the space of a floor-gobbling stationary saw like mine.

There's actually quite a lot to like here. And that's why we've rounded up these five portables to pick a "Best Bet" for wood-working. If you need a table saw that stows and goes, one of these five could be a great fit.

DeWALT DW744X

While DeWALT's DW744X is the only model here without wheels, the saw is otherwise well appointed. It's got a unique rip

CUTTING TESTS SHOW NO MERCY

No matter the model or price, a table saw should cut a range of material thicknesses and hold its settings accurately. So, after installing a new Freud hi-ATB thin-kerf blade in each saw, I made repeated rip cuts on MDF, resetting the fence each time to check for consistently thick offcuts. After that, I raised the blade for more rip cuts on heavy, long planks of 2 x 12 Southern yellow pine, before tipping the blade to bevel-rip 2"-thick poplar. Then I switched to a 6" CMT dado set and made a long dado cut in MDF, so I

could check for consistent cutting depth — a sign that the undercarriage is stout enough to handle a heavy blade like this. Overall, my test criteria was stability of the stand, cutting accuracy, reasonable dust collection efficiency and all-around convenience of use. Results ranged from exceptional to mediocre, as you'll see.

All of these test saws will accept a 6-in. stacked dado set — it's their "big saw" capability that expands the versatility of these portables.





DeWALT DW744X

Street Price: \$499.99
 Motor: 15 Amp, 115 Volt
 Cutting Capacity: 3¼" @ 90°; 2¼" @ 45°
 Maximum Dadoing Width: 13/16"
 Height to Table: 35¼"
 Net Weight: 57 lbs
 Web: www.dewalt.com
 Phone: 800-433-9258

fence design: instead of sliding along front and back rails, the fence is fixed to them. To change rip fence settings, you extend the rails out on rack-and-pinion gears. The design keeps the fence parallel to the blade/miter slots and prevents it from deflecting if pushed laterally. A red hairline cursor makes fence settings easy to read, and it passed my ripping tests with flying colors.

The guard is a clear plastic split configuration that offers good visibility of the cutting area. It pops off quickly with a flip lever. But you won't feel that old urge to ditch it, because it functions well without getting in the way.

DeWALT's soft-start motor was powerful, and feedback circuitry keeps it cutting with consistent torque under load. Like Bosch, this saw also has a good vac-assisted dust shroud to help keep your cutting area tidy, plus a cleanout access door.



Portable table saws enable you to carry out sawing tasks wherever they're most convenient: on the deck, in the basement or out in the yard. You're not limited to the shop floor here.

Strangely, DeWALT provides no power cord wrap. It's a basic detail the other saws have and this one really needs. The steel "TV tray" type stand sets up fast, and rubber feet hold it firmly in place. When you are done sawing, you'll have to lift this wheel-less saw to transport it, and there are contoured grips molded into the table edges to make that easier. At more than 50 lbs., though, the saw feels heavy. But the tradeoff for the convenience of wheels is that DeWALT can keep this setup even more compact — probably much appreciated by contractors. The whole works fits easily in a car trunk.

Rockwell RK7241S

Rockwell is the "freshman" brand among the other longer-standing benchtop power tool companies represented here, and its table saw revealed some "first rodeo" shortcomings. While the motor was amply powerful for my cutting tests, the blade arbor assembly was 1/16" out of parallel with the



Changing rip fence settings on the DW744X involves unlocking the fence rails and rolling them in or out on rack-and-pinion gears — the fence moves with the rails. The design proved accurate and sturdy.

miter slots. It's a condition called "heeling" without easy adjustment in the manual. So, for my testing purposes I had to set the rip fence askew in order to align it parallel to the blade. The problem would need to be addressed on this sample saw for long-term use.

The machine has a more conventional rip fence/rail arrangement. The right half of the rail assembly folds out so the saw can achieve its full 30" of rip capacity — wider than any other model here — but the fence would not slide smoothly over the rails without catching on the hinge joint. While the rip fence did maintain its locked settings, it lacks the heft and build quality of the competition.

At their extreme end, the fold-out rails sloped down to 1/4" below the table, and the tabletop casting deflected from flat by almost 1/8". No saw table was dead-flat, but Rockwell fared the worst here.

Rockwell provides both a splitter and a riving knife to help prevent kickbacks, but the smoky-colored plastic guard isn't as easy to see through as other clear guards.

While the blade tilt scale on this machine is easy to read, the tilt lock lever is small and could be hard to lock or loosen for people with limited hand strength. Still, I do like that Rockwell



Rockwell RK7241S

Street Price: \$399.99
 Motor: 15 Amp, 115 Volt
 Cutting Capacity: 3 $\frac{1}{8}$ " @ 90°; 2 $\frac{1}{2}$ " @ 45°
 Maximum Dadoing Width: 9/16"
 Height to Table: 35"
 Net Weight: 73.7 lbs
 Web: www.rockwelltools.com
 Phone: 866-514-7625

provides the only full-size handle on its miter gauge; the rest are all stubby and harder to hold.

The RK7241S has two sturdy tubular legsets that fold down and lock, and one becomes a convenient handle for transport. The stand stayed put during heavy ripping operations, and lawnmower-style wheels make the tool easy to roll. But, once set up, you have to drag or lift the saw to move it, unlike other



Rockwell's RK7241S has extra-long rails (far left) that provide 30" of ripping capacity — helpful for splitting full-size sheet goods. A sliding table accessory (below) extends the saw's mitering and crosscutting capabilities.



portables that keep the wheels on the floor during use.

Dust collection is passive on this tool: it simply falls down through a circular grate and into a cinched fabric bag. Without the benefit of a shop vac hook-up, Rockwell left me in a cloud of fine dust. This might be OK on a jobsite, but not in an enclosed workshop.

Other features include a battery-powered laser for lining up cuts. I found it to be pretty dim under bright shop lights and not lined up correctly with the blade. It is non-adjustable. A pullout

rear extension provides some added support for long rip cuts. Rockwell also offers a couple of unique accessories: a sliding miter table (\$179.99) and a power planer-style "Finisher" (\$129.99). It mounts on the saw for flattening board edges.

Bosch 4100-09

I'm no stranger to Bosch's 4100-09 saw with Gravity-Rise™ stand. I've used one several times to



These jobsite-ready table saws should have sturdy mobile bases, and Bosch's Gravity-Rise design is an exceptional example. It is stable, sets up easily and is built to handle rugged terrain.

Bosch 4100-09

Street Price: \$599
 Motor: 15 Amp, 115 Volt
 Cutting Capacity: 3 $\frac{1}{8}$ " @ 90°; 2 $\frac{1}{2}$ " @ 45°
 Maximum Dadoing Width: 13/16"
 Height to Table: 38 $\frac{1}{2}$ "
 Net Weight: 105 lbs
 Web: www.boschtools.com
 Phone: 877-267-2499





Four of these five test saws, including Craftsman, have 2½" diameter dust ports that enable shop vac-assisted dust collection.

Craftsman 28463

Street Price: \$280.99
 Motor: 15 Amp, 115 Volt
 Cutting Capacity: 3" @ 90°; 2½" @ 45°
 Maximum Dadoing Width: 1½"
 Height to Table: 34"
 Net Weight: 61.3 lbs
 Web: www.craftsman.com
 Phone: 800-843-1682

build projects for this magazine. So, I was not surprised when it tested impressively here. Rip cuts were on the mark, thanks to a rugged, beefy fence that stayed parallel to the blade each time I reset it. A flip of a red lever underneath unlocks the rails so they slide out and extend ripping capacity up to 25".

It's easy to raise or lower the saw's riving knife for making either through or non-through (dadoes, rabbets, etc.) cuts, and blade changes are simple with one wrench and an arbor lock lever — the only saw here that doesn't make this a two-wrench job.

I'm not crazy about one feature, and it's common to three of these five saws: to tip the blade, you unlock a lever behind the blade height hand wheel, then swing the undercarriage up to the angle you need before re-locking the lever. A geared bevel control would make this process a little easier. But, once tipped, Bosch held its angle setting well through my test cuts.

After a couple of hours of cutting, very little sawdust was left on the floor — it routed neatly through a shroud that surrounds the blade and on into my shop vac. It has a cleanout door for when offcuts get stuck or when

you drop the arbor nut down inside ... we all do it eventually.

Bosch engineers deserve kudos for the Gravity-Rise stand, and it's a design some other manufacturers should emulate. Twist one lever, and the sturdy, steel frame folds up or down fluidly to convert from sawing to transport or storage. Eight-inch wheels and lugged rubber tires make this base easy to steer overland or pull up steps. Plus, the base's stance is wide, giving it sure footing if you are pushing long planks or heavy sheet goods through. It will not tip. But, the stand when erected sets the saw's tabletop quite high, at 38½". Shorter users may find this to be a bit too tall.

All in all, Bosch packages convenience, capability and woodworking "chops" into this machine. While it sets the high bar for pricing, I think \$599 is still a good bargain here.

Craftsman 28463

In terms of cutting results, Craftsman's 28463 Jobsite Table Saw made a decent showing. It delivered accurate rip cuts, kept



Craftsman's 28463 takes up just 18" x 24" of floor space when folded up — a plus for small shops with limited storage space.

its bevel setting for angled ripping and could handle a stacked dado blade without laboring. Dust collection through an enclosed shroud was on par with more expensive machines. I also appreciated the saw's clear, split guard and a riving knife system that is easy to install and adjust up or down.

However, there were some limitations. The rip fence build, with a thin-metal body, is light-duty. At just 2¾" wide, the saw's narrow throatplate makes it harder to reach down inside for swapping blades or retrieving a fumbled arbor nut. There's a geared mechanism for tilting the blade that engages when you push the blade height wheel in — a good thing — but the bevel lock lever is too short, and I would use care when bearing down on the plastic handle to tighten it.

Setting up or taking down Craftsman's spring-assisted stand is a six-step process, involving various release latches. It's not intuitive like that of Bosch or RIDGID. And, once the stand is folded down, don't lift the handles up too far when rolling the saw around, or the stand drags against the floor.



I also found that the stand's narrow stance and light weight couldn't prevent it from skittering on the floor as I pushed heavy lumber across the top.

At day's end, I think this little machine is light-duty at best. But, it is very affordable.

RIDGID R4510

RIDGID's 94-lb. R4510 might not be a saw you want to lift into a truck bed every day, but it's bound to deliver solid cutting results once you reach your destination. For starters, this saw includes a downright great stand. Step on one lever, and the tubular frame lifts and glides smoothly up into place. The same lever collapses it. It's sturdy, well-balanced and provides a wide stance to keep the saw from shifting or tipping. Large wheels and rubber tires roll the machine around easily during transport or just to reposition it when set up. The left-most tube is both a working-height handle and side support for balancing extra-long crosscuts. Smart.

RIDGID provides a robust rip fence with T-slots for featherboards, plus a micro-adjuster for nudging it to a final setting. It extends out to 25" on sliding extruded rails that unlock with a lever. The saw has a unique steel "tape measure" ripping scale that rolls out with the rails. It works well in this application.

I like the saw's blade height wheel: it has a separate outer geared rim that tips the blade. A large knob and lever lock both the height and bevel settings with little effort — a solid

design. Scales are bright and easy to read, and a full-size miter gauge with a steel bar tops things off.

RIDGID tested on par with Bosch and DeWALT in my cutting trials. Ripped offcuts were consistently thick. Bevel cuts were smooth, and the blade angle did not change when I powered through thick poplar test lumber. The saw drove a heavy dado blade without issue. It has an effective dust shroud, too, that kept sawdust at bay.

When I switched blades, I did find the locking lever for the riving knife very stiff. It raises to release the riving knife and pushes down to lock it. I resorted to gripping the lever with a pliers after nicking some skin on the blade teeth. But, on the softer side, RIDGID provides a nice complement of overmolds on the miter gauge handle and blade height handwheel knob.

Who Takes the Prize?

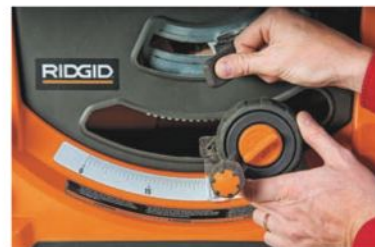
Sometimes picking a "Best Bet" is a real tossup, but not this time. While Bosch's 4100-09 doesn't disappoint, and DeWALT has what seems to be a bulletproof portable, I think RIDGID's R4510 table saw really shines. Its sturdy workaday features, powerful motor and well-designed stand show that portability doesn't have to mean compromise. It's an excellent woodworking choice.



Chris Marshall is senior editor of Woodworker's Journal.

RIDGID R4510

Street Price: \$499.99
Motor: 15 Amp, 115 Volt
Cutting Capacity: 3 1/2" @ 90°; 2 1/2" @ 45°
Maximum Dadoing Width: 3/4"
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Portable Sawmills: Lumber from Local Trees

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A Mobile Dimension sawmill (above) and portable band saw mill (top) both cut with motorized cutterheads that ride on a track.

Nowadays, more and more woodworkers, builders and DIYers are buying and using wood that comes from local trees sawn into lumber at a local sawmill. When you think sawmill, you're likely imagining an old rustic building and a huge circular saw powered by an engine as big as a '56 Buick chewing through giant logs like they were toothpicks. But the fact is that a lot of the lumber cut locally is produced by smaller portable sawmills. They're a popular choice for a wide range of users, including: landowners

who want to turn trees on their property into sellable lumber or studs, beams and planks for building barns, sheds and fences; woodworkers looking to use locally scavenged logs for their furniture and cabinets; or anyone who wants to start a business cutting other people's logs into lumber. As the price of commercially produced lumber continues to rise, more and more folks are looking for alternative ways of getting their materials from trees they have on hand.

One of the earliest portable sawmills was the Mobile

Dimension Mill, an ingenious device developed in the early 1960s. It uses a Volkswagen engine to power three circular saw blades: one large vertical blade, and two smaller horizontal blades that cut just ahead of it. The distance between the horizontal blades is adjustable. The motorized cutterhead travels on a track held by two end supports that suspend it above a stationary log. With each pass, the three blades produce an accurately dimensioned piece of lumber. While very efficient and productive, these circular saw blade mills are large, expensive machines not designed for the casual lumber sawyer.

Although there are other portable lumber sawing devices out there (see the *sidebar*, page 36), the machine that has proven to be the most efficient and versatile means of turning logs into high-quality lumber is the portable band saw mill (PBM). These ingenious machines have a motorized horizontal band saw that rides on a track over the top of a log which remains stationary as it's cut. A PBM is small enough to be loaded in the back of a pickup or be towed behind it, yet has enough power to transform even a sizeable hardwood log into slabs, beams or boards.

Compared to an old-fashioned sawmill's big circular blade, a thin band saw blade requires less power to run and creates a narrower kerf, thus producing less sawdust while yielding more useable lumber from every log. PBMs are not only safe, easy and



The portability of band saw mills allows trees to be milled where they are cut.



A portable band saw mill transforms fallen trees or salvaged logs into beams and boards for building projects.



The rigid bed of a band saw mill firmly supports a log or plank as the cutterhead travels along it to take a cut.

economical to run, but since they can be transported to where trees have been felled and used to saw them right on-site, they eliminate the hassle and expense of hauling whole logs to a standard sawmill.

At least a dozen American companies currently produce portable band saw mills. Models range considerably from smaller, simpler manual models with price tags in the low-to-mid four figures to big professional models that feature built-in hydraulics and computer controls and can cost as much as a luxury automobile.

Not only are portable band saw mills available as new machines, but there's a burgeoning market in used machines as well. Or, if you don't want to invest in your own mill, there are plenty of sawyers out there who will bring their PBM to your property and

saw your logs into lumber for an affordable fee. Either way, the lumber produced will be considerably less expensive than what you'd pay at a lumberyard.

Portable Mill Anatomy

The heart of a portable band saw mill is a motorized, horizontally oriented band saw mounted on a carriage that rolls along a pair of rails that act as a track. The track is part of a bed with cross supports that creates a level platform for the log (or branch, plank beam, etc.) to be cut. Adjustable posts and clamps attached to the bed are used to position the log and hold it firmly in place. During cutting, the carriage rolls over the top of the stationary log as the band saw takes a cut. The height of the blade relative to the log is adjusted by moving the entire cutterhead (band saw and motor) up



Professional sawyer Chuck Pyle removes the 1¼"-wide blade on his Wood-Mizer band saw mill.



A four-cylinder turbo diesel engine provides plenty of power to cut through even big hardwood logs.



The track and bed of the economical Lumber Smith portable band saw mill are built from wood by the purchaser.

or down, which sets the thickness of cut. The adjusting mechanism, called the "setworks," allows dimensional adjustments to be made in fine increments.

The band saws on all but the largest industrial-sized PBMs sport 19"-diameter wheels that run a 1¼"- or 1½"-wide blade. The distance between the wheels/blade housing determines the mill's maximum width-cutting capacity, which

ranges from 24 to 40 inches, depending on the model. A blade tensioning mechanism and a pair of heavy-duty guides (much like those found on a regular wood-working band saw) keep the blade running straight and true during cutting. When sawing resinous woods, like pine and fir, a small plastic tank and flexible hose feeds a water-based lubricating mixture onto the blade, to help keep the blade clean and running smoothly.

A PBM may be powered by either a gasoline or diesel engine, or a large electric motor (single- or three-phase). The engines/motors on smaller models range anywhere between 7hp and 30hp, while larger models may produce 50 horsepower or more. The more power the PBM has, the faster it cuts through logs, and the better it handles dense wood species and defects, like knots or areas of tight grain, without bogging down. A more powerful band saw mill also cuts a greater number of board feet per hour, hence is more productive and cost-effective to use.

The length of a PBM's bed determines the maximum length of logs that can be cut. Because the cutterhead carriage rides over the log, its track must be long enough for the carriage to clear the log at both the beginning and end of the cut. For example, Wood-Mizer's LT10 mill has a bed that's 14' 4" long and can cut logs up to 11 feet long. Fortunately, the majority of band saw mills accept bolt-on bed extensions, allowing them to handle longer logs — up to 25 feet or more. (The rock-bottom-priced Lumber Smith PBM requires users to make



Often referred to as "walkers" or "pushers," manual portable band saw mills have a cutterhead that must be pushed along its bed/track for cutting. This allows the user to adjust the feed speed as necessary.



Some band saw mills have an integrated trailer, for easy towing.



A hydraulic clamp holds a log firmly to the bed.



The setwork's controls are used to adjust the saw's depth of cut.

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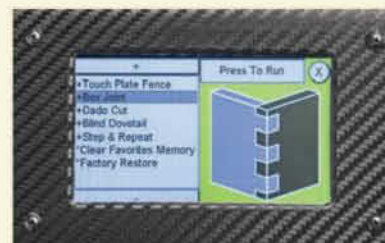
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Pyle loads a large walnut log onto the bed of his portable band saw mill, maneuvering it into place with his trusty telescopic forklift.



Hydraulically powered devices help position the log on the mill's bed before securing it.



The mill's cutterhead carriage travels the length of the bed as the band saw takes the first cut.



A hydraulic lifter is used to rotate the log 90 degrees in preparation for the second cut.



With two flat, square sides cut, the remainder of the log is sawn into accurately dimensioned planks.

their own bed and track from construction lumber, which can be built as long as necessary.)

For portability, most smaller PBMs break down into separate components, allowing the mill to be loaded into the back of a pickup truck. Or, some models have rigid beds built into wheeled trailers, allowing them to be easily towed.

Manual and Hydraulic

The main distinction between various PBM makes and models is whether they are entirely manually operated or employ hydraulic power. All lower-priced economy models are manual “pushers” (also known as “walkers”). They require the user to either physically push the cutterhead carriage along its track or propel it via a hand-cranked cable (some users say they prefer the fingertip feel they get from pushing the carriage, as they're better able to gauge and adjust feed speed when cutting through knots or dense sections of a log). The networks on most manual units employs a hand crank mechanism that raises or lowers the motor/cutterhead for setting the depth of cut (gas-filled cylinders found on some models make this operation easier). Log loading, positioning and clamping are also done manually, which requires the help of an assistant for handling all but the smallest logs. A popular

option on manual PBMs is a hand-crank-style winch, which makes log handling easier.

Larger, more expensive hydraulic PBMs employ a mix of hydraulic and electric power to drive various aspects of the mill's operation. Joystick controls are designed to handle a number of different functions, which typically include: lifting and loading the log onto the bed; positioning and clamping the log; turning and repositioning the log between cuts; and more.

Electric-motor-powered chains are used on hydraulic PBMs to raise and lower the cutterhead as well as propel the carriage along the track during cutting (carriages on some models have a built-in seat that the operator rides on). When returning the carriage to its start-of-cut position, some mills have pawls that push the board or slab that's just been cut, to help offload it. All these electric and hydraulic features are designed not only to make the user's job easier; they also increase the productivity tremendously. Hydraulics that control log handling allow just one or two sawyers to safely cut a significant amount of lumber in a single day.

Controls for all powered functions may be mounted to the mill itself or located on a remote console, allowing the operator to stand clear of all the noise and sawdust. Computerized consoles on the priciest, most sophisticated PBMs make it very easy to control all the mill's various settings and operations.

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The fully cut log is placed atop a pair of spacers, then the boards are stickered and left to air dry.

Cutting with a PBM

Before cutting can begin, any portable band saw mill — manual or hydraulic — must be set up with its bed perfectly straight and flat. Adjustable legs on the bottom of the bed are used to level and stabilize the mill on uneven ground. After the band saw's blade is tensioned and its guides are set, the log (or a large plank or beam to be resawn) is rolled or lifted onto the bed, using a loader or tractor, the mill's built-in winch or hydraulics, or by hand with a

Peavey and a fair bit of muscle. The log is set against vertical side supports, which help orient and stabilize it. If the log is tapered, one end must be elevated, either with shims or the bed's adjustable toe board, to orient the wood's grain more in line with the bed. Clamps are then positioned and engaged to firmly secure the log and keep it from moving during cutting.

With the motor/cutterhead carriage set in its starting position at the far end of the bed, the desired depth of cut

is adjusted using the mill's setworks. After the motor or engine is started up, the clutch is engaged to transmit power to the band saw. The carriage is then propelled forward until the blade has cut through the full length of the log. With the clutch disengaged, the slab or board is removed, and the carriage returned to its starting position.

If the log is to be cut into slabs, the depth of cut is reset and subsequent cuts are taken. Whether the mill is entirely manual or computerized, the setworks has some kind of indexing device to make it easier to set cutting depth for common board thicknesses. A scale mounted on one of the carriage support posts shows the blade's overall elevation relative to the bed.

If the end goal is to cut the entire log into lumber, the first cut (or cuts) must remove enough of the log's bark and sapwood to create a smooth, flat surface. The log is then rotated 90° or 180°, via muscle power or the mill's hydraulic log turner, so that another flat surface may be cut either parallel or adjacent to the first one. Sometimes, this process is repeated until all four sides of the log are flat and square, allowing the log to be cut into fully dimensional boards or beams.

After cutting is complete, the freshly cut lumber is offloaded and stacked in the order the boards came from the log. Spacers keep the wood off the ground, while stickers placed between the boards allow air to circulate while the wood dries.



Sandor Nagyszalanczy is a contributing editor to Woodworker's Journal. His books are available at Amazon.com.

CHAINSaw MILLING ATTACHMENTS

If you don't have the space or budget for a PBM, you can use a chainsaw fitted with a milling attachment. Chainsaw mills, which sell for between \$140 and \$250 (not including the chainsaw), provide the most economical way to cut lumber. Their compact size and light weight make them extremely portable. On the downside, they make a rougher cut and remove a thicker kerf than that produced by a PBM. A chainsaw mill attachment mounts to a regular chainsaw that's been fitted with a longer bar and special rip chain designed to cut efficiently with the wood's grain. A pair of rails on the attachment ride against the log to guide the saw along the log at a consistent depth of cut. The distance between the rails and the chainsaw bar is adjustable and determines the thickness of the planks or boards that are cut.



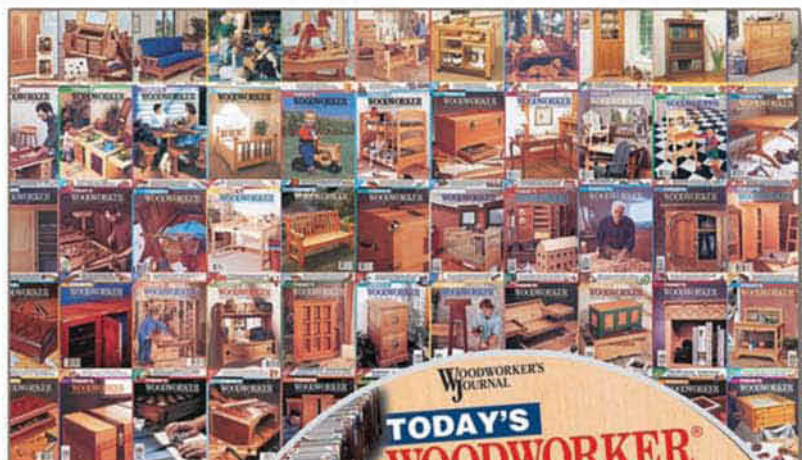
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Handheld Power Tools

If you need a cordless tool that can cut or drill, this Handheld Power Tools section has you covered. Read about which 18-volt circular saws and heavy-duty drill/drivers earned our editors' top honors. Did you know there's a new strobe-assisted jigsaw or a gyro screwdriver? See page 44 for details!

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Cordless Chainsaws62-65

New Handheld Tools



Festool SysLite LED Worklamp

Shop Light

Festool's SysLite LED Worklamp KAL 100 (item 498568) illuminates your workspace with 170° of dispersion of evenly balanced white light. The light comes with six LED bulbs housed within a rugged casing. Festool says the lightbulbs will not break or need to be replaced. The SysLite can run on a variety of power sources, including its internal battery, which has a life of 90 minutes on high or 240 minutes on low (180-minute charge time). You can also use the SysLite with a compatible Festool battery as an auxiliary power source — or run or charge the SysLite from the 120" AC adapter or 63" car charger included with it. The SysLite LED Worklamp KAL 100 is priced at \$175.



Ryobi 18-volt ONE+ LITHIUM+



Rockler 3-Piece Silicone Glue Application Kit

Glue Application Kit

The silicone tools in Rockler's 3-Piece Silicone Glue Application Kit are easy to use and clean: wet glue washes off the brush, spreader and tray with warm water, while dried glue cracks and peels off. Included in the kit are a 7" brush with silicone bristles (the opposite end features a tapered paddle for detail work); a 2½" x 4" spreader for larger surfaces; and a 3" x 5½" shallow tray. The 3-Piece Silicone Glue Application Kit (item 43662) sells for \$14.99.

Lithium-ion Batteries

Ryobi has introduced the 18-volt ONE+™ LITHIUM+™ System of lithium-ion batteries. These batteries provide fade-free power for maximum performance throughout the charge, with 35 percent more runtime, a charge held four times as long and a 45 percent lighter weight than Ni-Cd batteries. The LITHIUM+ batteries also increase torque up to 15 percent and are backwards compatible with any of Ryobi's previously released ONE+ tools.

The charger can charge batteries in as little as 30 minutes. Indicator lights show the battery's charging status, and a temperature LED display indicates if a battery is too hot or cold

to charge. The LITHIUM+ batteries are available in a single and double pack, priced at \$54 and \$99, respectively. Tools released with these batteries include the 18-volt six-piece Ultimate Combo Kit (model P884, \$299) which includes two 18-volt batteries, drill, impact driver, circular saw, reciprocating saw, JobPlus™ base with multi-tool attachment, worklight, dual chemistry charger, universal multi-tool accessory adapter, blades, sandpaper and a tool bag.



WORX SD SemiAutomatic Driver

Revolver-style Screwdriver

The new WORX® SD SemiAutomatic Driver™ has a six-slot revolving cartridge chamber that rotates screwdriver bits in and out without the need to touch the bit. You draw back the "magazine" (the cover) to advance a bit into the chamber, then slide it forward. All six of the bits are stored within the cartridge. The WORX SD accepts 1" hex-shanked bits in slotted, Phillips, square-recess, hex or Torx styles. It has a 1/4" chuck and a no-load speed of 230 rpm. Included: SemiAutomatic Driver, two bit cartridges, 11 screwdriving bits, a screw starter drill bit for pilot holes and a 5-hour charger. The Driver costs \$49.99.



Triton TRA001 Dual Mode
Precision Plunge Router

Plunge Router

Triton®'s TRA001 Dual Mode Precision Plunge Router can be used either handheld or mounted in a router table. A single-button switch changes the 3.25hp router from fixed to plunge-base, while a three-stage, pre-set height adjustment system allows the plunge return spring to be removed quickly for easy adjustment when mounted in a router table. It accepts both 1/4"- and 1/2"-shank router bits, and the automatic spindle lock will only engage when the power safety switch cover is closed, preventing the tool from being accidentally switched on during bit changes. The Triton TRA001 sells for around \$290.

Lamello Classic X
Biscuit Joiner



Biscuit Joiner

Lamello's new Classic X Biscuit Joiner has the first-ever flush base plate in a Classic machine. It allows easy and fast alignment to the side of a workpiece in all positions. Angle and height adjustment scales have been moved into clearer view, and a multifunctional stop square slides onto the base plate to make the application surface larger for more vertical use. The base plate retains Lamello's slide system for rendering precise workpiece alignment.

Lamello's Classic X motor has been updated to 780-watts. Simply pulling off the motor cap allows tool-less changes of spare parts like brushes, switches or electronic parts. Made in Switzerland, the Classic X can install 15 different Lamello joining elements for biscuit cutting, connector joining, cutting grooves for tongue and groove connections, cutting expansion gaps for wood ceilings and floors, repair of resin pockets and small defects and trimming of solid wood or plastic edges.

The new Lamello Classic X comes in a carrying case and is priced at \$599.

Combination Square

The LaSquare from LaGessee Products is a combination square on an extra-wide 2" aluminum base that can be used on odd-shaped materials



including crown molding, wooden posts, rounded objects and more. It has a built-in level, a fully hardened and tempered stainless-steel blade and a satin chrome finish with precisely etched graduation marks in 1/64" increments, which are black-filled for readability.

Its head is 5" long, with a 90° square face and a 45° miter face. The base model comes with a standard 12"-long blade, while other blade options include 18" or 24" precision-ground machinist blades. LaGessee Products' LaSquare is a patented design made entirely in the U.S. Pricing starts at \$38.95.

Hygrometer Thermometer

The WB200 Wet Bulb Hygro-Thermometer from Extech Instruments takes both wet and dry temperature readings, then derives relative humidity from that difference. (It doesn't rely on air, which can be contaminated by dust buildup.) The unit can be set with an alarm to warn of high or low temperature and humidity readings, with accuracy to plus or minus three percent relative humidity. The WB200 Wet Bulb Hygro-Thermometer is priced at \$110.



Extech Instruments
WB200 Wet Bulb
Hygro-Thermometer



Kreg Automaxx Clamps

Auto-adjusting Clamps

New Automaxx™ Clamps from Kreg Tool Company automatically adjust the clamp to the thickness of the material. To move from one thickness to another, you set the clamping pressure once with a thumbscrew. The Automaxx Clamps lock closed consistently with every thickness. They are available in two styles: Face Clamps for hand-held clamping and Bench Klamps that work with the Kreg Klamp Plate™ or Klamp Trak™. The Face Clamp offers a 3" reach and clamps materials up to 2 7/8" thick. The Bench Klamp offers a 3" reach and clamps to a 2 1/2" thickness. Kreg also offers an Automaxx Bench Klamp System, which combines a 3" Automaxx Bench Klamp that can be mounted into a benchtop to create a 360° clamping station. Pricing starts at \$29.99 for the Automaxx 3" Face Clamp and goes up to \$49.99 for the Automaxx Bench Klamp System.



Pin Nailers

SENCO'S new 23-gauge pneumatic Micro Pinners, the FinishPro®23SXP and FinishPro®23LXP, incorporate many upgrades: they fire

headless pins ranging from 1/2" up to 2" long, a self-adjusting magazine eliminates the need to manually reset the tool for different fastener lengths, and the motor delivers 70 to 120 pounds

per square inch of force. These headless pinners are also the first in the category to have an angled pistol grip design, instead of a 90° straight handle, to reduce wrist fatigue and increase maneuverability. Suggested price for the FinishPro23SXP, which accepts fasteners from 1/2" to 1 3/8", is \$159; suggested price for the FinishPro23LXP, which accepts fasteners from 1/2" to 2", is \$219.



DeWALT 8V MAX* Gyroscopic Screwdriver

Gyroscopic Screwdriver

DeWALT's 8V MAX* Gyroscopic Screwdriver uses Gyro Drive™, a motion-activated gyroscopic technology found in cell phones and video game controllers, to control the tool's operation.

Press a "motion control activation trigger," then rotate the hand to the right to activate the screwdriver in the forward mode, or to the left to activate it in reverse. The slower a hand rotates, the slower the screwdriver turns; conversely, the faster a hand rotates, the faster the screwdriver turns. Rotating the hand farther increases spindle speed; rotating it back toward the initial starting point decreases spindle speed.

Powered by an 8V MAX* lithium-ion battery, the tool has a no-load speed of 0 to 430 rpm and a 1/4" hex shank. Its adjustable handle sets into either a pistol-grip or in-line configuration. The

Gyroscopic Screwdriver comes in a kit with a 1-hour charger and a carrying bag. A single-battery kit (item DCF680N1) has a retail price of \$89.97, and a two-battery kit (item DCF680N2) is priced at \$99.



IRWIN Tools Folding Utility Knife Series

Folding Utility Knife

IRWIN® Tools has introduced a Folding Utility Knife Series with patented BladeLock Technology. The FK100, FK150 and FK250 knives are designed to prevent blades from accidentally pulling out of the handle during use. The user also has the ability to change blades only when the release button is engaged and the blade holder is in the 45° open position. Each knife has a liner lock for safe, one-handed operation and a 16° cutting angle for comfort and control. The FK100 has a built-in wire stripper, cast finger grooves and trigger-grip handle for comfort; the FK150 has built-in blade storage that holds up to two blades for quick blade changes, and also has the features included in the FK100. The FK250 adds an integrated foldout screwdriver for 1" insert bits, built-in blade storage and an additional insert bit storage compartment. Suggested prices for these BladeLock Technology knives range from \$10.99 to \$15.99.

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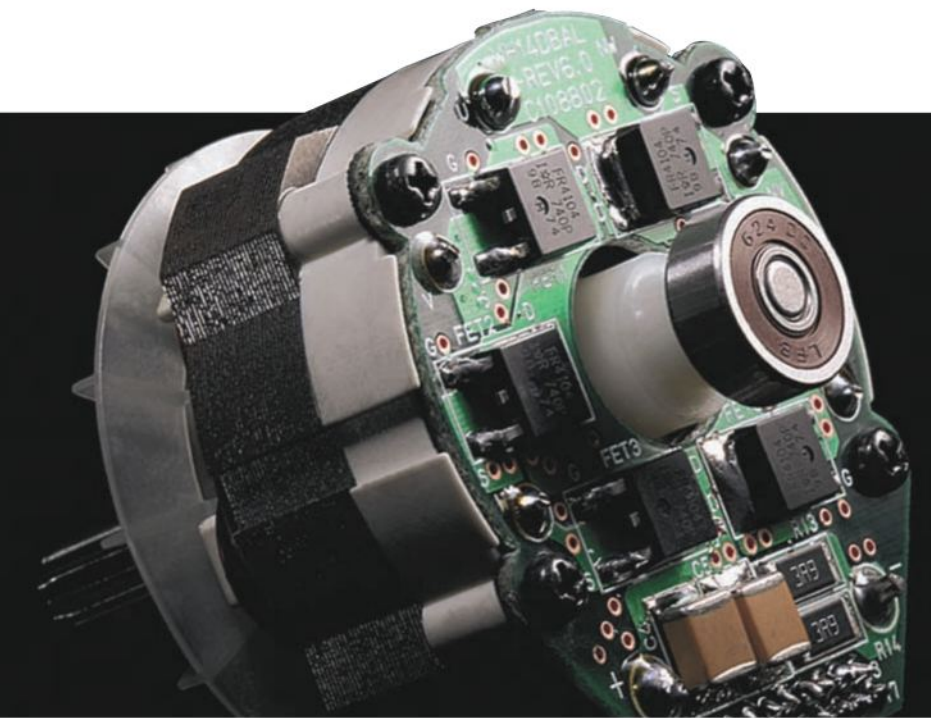
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What's New in Portable Power Tools?

DESPITE A STILL SLUGGISH GLOBAL ECONOMY, NEW BREAKTHROUGHS IN TOOL TECHNOLOGY MAY SURPRISE YOU.



Have you ever bought a product that's supposedly "new and improved" and, when you try it, you wonder if there's anything really different about the product besides that "new and improved" sticker on the box?

In the past couple of decades, we've seen some significant developments in the field of woodworking portable power tools: new battery chemistries such as nickel-metal hydride and lithium-ion; sophisticated electronics that improve tool performance and enhance battery life; improved ergonomics that make tools safer and more comfortable to use. But with the recent global economic downturn, relatively few tools released in the last couple of years boast significant new features (with a few notable exceptions, such as Festool's Domino joining system). Portable power tool companies do continue to develop new tool models, but most aren't that much different than previous versions. For example, one company's latest cordless drills feature slide-on battery packs. While slide-on packs are easier to install and



Many of the latest portable power tools feature brushless motors, in lieu of brush motors that have been standard for decades.

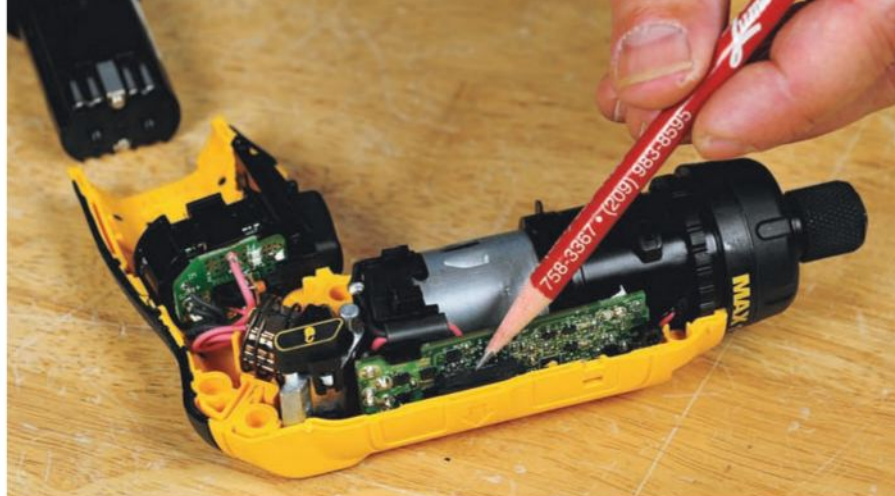
remove than the older stick-style packs, this doesn't exactly constitute an earth-shattering innovation. Some portable tool categories are expanding, such as cordless impact drivers, impact wrenches and rotary hammer drills. But these are tools for contractors, tradesmen and mechanics — not woodworkers.

Is there much of anything really new for woodworkers under the portable power tool sun? After scouring the industry for leads, I put together the following roundup of new (and nearly new) portable power tools that boast innovative features, clever designs or groundbreaking technologies. *These* are some of the coolest new tools around!

Gyroscopic Twist-Sensing Screwdrivers

Not that many years ago, about the only “sensory feedback” you might have received from a portable power tool was the jolt of pain you felt if you accidentally dropped the thing on your toe. Early attempts at increasing a tool's sensory prowess were somewhat gimmicky. For example, Skil's 7292 palm sander with “Pressure Control Technology”: a series of green, yellow or red LEDs light up in response to how hard you bear down on the orbiting sander to help you lighten your touch. Helpful? Maybe.

A more useful and innovative bit of sensory technology is found in DeWALT's new DCF680 cordless screwdriver: there's a gyroscopic sensor that allows motion control of the tool's rotational direction and speed. (The technology was first featured in Black & Decker's



The heart of DeWALT's new DCF680 powered screwdriver is a miniature gyroscopic sensor mounted inside the tool (top). The sensor allows speed and direction control with a twist of the wrist.



model BDCS40G Gyro 4V Li-ion cordless screwdriver released in 2012.) Simply depress the DeWALT's trigger and twist the tool in the direction you want the bit to turn — the same motion you'd use to turn a regular manual screwdriver. The gyro sensor measures the relative motion and adjusts the tool's direction and variable speed automatically: A quick twist of the wrist brings the motor up to full speed, while a more gentle twist (over a range of about 35 degrees) lets you drive at slower speeds.

The sensor is surprisingly sensitive, so you can dial in just the right speed for the task at hand, and it works with the tool held at any angle — even at an angle or upside down, say to drive screws into a rafter or the ceiling. Although it can take a bit of getting used to, wrist operation quickly becomes intuitive, and it could save a lot of time, especially when doing jobs where screws must be “finessed” into place (for example, driving flathead screws so that their heads are flush with the work's

surface), or when screws need to be removed and then reinstalled, as when mounting and adjusting hardware.

Part of DeWALT's new line of tools that run on compact 8-volt MAX lithium-ion battery packs, the gyroscopic screwdriver features twin LEDs, a 16-position adjustable clutch and a swiveling grip handle. The latter adjusts to either an in-line or a pistol-grip position, to suit your preferences. Although ruggedly built, the small lithium-ion cells used to keep the DCF680's 8-volt MAX pack size compact result in a relatively low torque output for the tool: a maximum of only about 24 in. pounds. That's plenty for smaller driving jobs, but you'll want to switch to a more powerful drill/driver or impact driver when tackling more serious driving tasks, like running 2-inch-long #10 screws into construction lumber without drilling pilot holes. Who knows, maybe gyroscopic sensing technology will find its way into higher-voltage, heavier-duty drilling and driving tools in years to come.



Festool's Carvex jigsaw features (left to right): stroboscopic LEDs that make it easier to see the line of cut; an optional angle-adjustable beveling base; and an innovative circle-cutting jig attachment.



Lamello's Zeta P2 joinery machine cuts curved T-slots for creating strong, glue-less joints.



Special Clamex fasteners slide into curved T-slots cut into each half of the parts to be joined.

Stroboscopic Jigsaws

Few new tools have shown as much innovation as Festool's new Carvex jigsaws. The saws, which come in both corded and cordless versions, don't look much different than standard jigsaws, but they share one feature that's totally unique in the world of portables: a stroboscopic work light. Here's how it works: When you first trigger the variable-speed saw at low speed, the LEDs light up the area around

the blade, just like with other newer cordless tools. However, when the motor reaches top speed (set by a dial on the side of the tool), the LEDs flash just like mini strobe lights in sync with the reciprocating action of the blade. The blade appears to stand still, thus allowing you to see the surface of the workpiece in front of the blade with great clarity. Coupled with the saw's excellent dust extraction, the strobe lets you follow even the faintest pencil line, assuring that your cut stays right on track. You can also monitor the quality of the cut the blade is producing, so you can change blades or blade speed and/or orbit settings as needed to reduce splintering and get the cleanest cut.

Festool's engineers also applied their ingenuity to the jigsaw's base and related accessories. Instead of having a fixed base and sole, the Carvex's standard base (used only for 90° square cuts) releases with the flip of a lever, and it may be replaced with any one of a number of accessory bases (it also accepts a number of different sole plates, each specialized to work best in a different cutting situation: rough stock, polished surfaces, etc.). The bevel-cutting base is particularly unique. It is split down the middle, and the halves articulate, like the wings of a butterfly. A single knob at the back lets you dial in any

angle between 0 and 45 degrees for standard beveled cuts with the saw tilted either left or right. Further, the base halves also pivot inwards and may be set at any angle up to where they are perpendicular to one another — an adjustment that automatically centers the blade on the outside corner of a board, cabinet, or other construction, allowing you to make an accurate angled cut right at the corner without the need for a fence or other guide.

Another accessory base adapts the Carvex to ride on Festool's track guide rails, for accurate straight cuts. This base accepts an ultra-cool adjustable circle-cutting jig with a guide arm that's a stiff measuring tape. After snapping the jig into the front end of the guide rail base, you pull out the amount of tape needed to set the jig for cutting the desired radius. Lock the tape in place, set the pivot pin into its pivot hole, and you're ready to cut accurate arcs and circles up to 302 centimeters in diameter.

Glue-less Joinery

Released in 2010 but improved this year, Lamello's Zeta P2 joinery machine is another portable power tool with some interesting innovations. Like the familiar Lamello biscuit machines, the primary job of the Zeta is to cut slots for joinery. But instead of glued-in biscuits, this machine works with the P2 detachable

joinery and clamping system used extensively in Europe to create knockdown (quick-assembled) furniture, like you'd buy from IKEA. The Zeta machine creates a semicircular "T" slot for special interlocking Clamex P connectors that use no glue and create strong joints that are totally reversible. The system is particularly great for cabinet-makers who build and install large cabinets and built-in furniture. Parts are transported flat to the jobsite, then rapidly assembled and put in place.

The slotting setup for the P2 system is very similar to that used for regular biscuits. But instead of plunge-cutting a simple slot, the Zeta P2 performs an elegant mechanical trick. When the blade has plunged to its deepest point, it trips the Zeta's VMD (Vertical Mechanical Drive) that rapidly oscillates the blade up and down. In a fraction of an instant, small tips on the top and bottom edges of the blade create a "T" slot. The VMD then re-centers the blade before it is withdrawn. Clamex P connectors are inserted into each slot and the two joint halves are then brought together and locked in place with cam-locking action operated by an Allen wrench. All this cleverness comes at a price: The basic Zeta P2 machine sells for about \$1,800. The Clamex fasteners cost about \$2.44 per pair.



Once Lamello's Zeta P2 joinery machine has created the slots for interlocking Clamex P connectors, an Allen wrench is used to lock together the two halves of each Clamex fastener.



Makita's latest cordless chainsaw will run on either a single 36-volt battery or a pair of 18-volt packs, attached via an adapter plate.

Battery Flexibility in Cordless Tools

The last couple of years have seen relatively few breakthroughs in battery chemistry. But that hasn't stopped toolmakers from coming up with more flexible ways to use batteries with their cordless tools.

If one battery pack is good, then two must be better. That seems to be a direction that portable power tool manufacturer Makita has taken with a couple of its latest cordless tools: the HCU02ZX2 X2 LXT chainsaw and HRH01ZX2 rotary hammer drill. Both of these power-hungry tools were originally designed to run on a large 36-volt pack. But in addition to using a single pack to power the tool, you can also run them each

on a pair of 18-volt packs. A special adapter locks into the tool's battery slot to adapt it for twin packs. The 18-volt LXT packs are the same batteries that run an extensive array of tools in Makita's cordless lineup, so the twin-battery scheme makes a lot of sense for woodworkers who already own one or more 18-volt Makita tools. They can use the batteries they have rather than have to buy expensive 36-volt packs that don't work with such a wide selection of other tools. To help keep all your extra battery packs charged up, Makita has also created a new multi-battery charger: The DC18SF accommodates up to four 18-volt lithium-ion batteries at a time, and it charges two depleted packs in about 60 minutes.



The Makita DC18SF battery charger has slots for four batteries and can charge two spent packs in about 60 minutes.



Panasonic's new line of dual-voltage tools offers users greater battery flexibility: Each tool can run on either an 18-volt or 14.4-volt pack.



Portable power tools can run on any of three different kinds of motors (left to right): brushed, four-pole or brushless.

Panasonic has taken another approach to adding battery pack flexibility to their new line of dual-voltage cordless tools, which include a pair of drill/drivers, a reciprocating saw, an impact driver and an impact wrench. All of these tools will run on either an 18-volt or a 14.4-

volt battery. Electronics in the tool adapt it to run properly on either voltage. This strategy allows users to run these tools on older 14.4-volt packs they may already own, as well as the company's newer 4.2 amp-hour 18-volt batteries. This could be particularly useful with the drill/drivers: Use the more powerful pack when you need more power or switch to a lighter 14.4-volt pack for lesser tasks, such as driving small screws.

Brushless Motors

Probably the single biggest innovation that's changing the face of the portable power tool is the move towards brushless motors. Motors with brush contacts have been the standard for portable power tools since they were first developed early in the last century. They're simple, compact and inexpensive to manufacture. But used in cordless tools, they suffer from an inefficient use of limited battery power. In a

traditional DC tool motor, carbon brushes ride against a commutator on the rotor (the spinning part of a motor) to complete the electrical circuit that powers the motor and runs the tool. Both brushes and commutator are subject to wear and occasionally need maintenance and eventual

replacement. The mechanical contact between brushes and commutator also causes electrical losses and frictional resistance, as well as heat buildup, all of which eat into motor performance and decrease durability.

In a brushless motor, an electronic microprocessor controls the current flow through the motor, thus eliminating the need for carbon brushes. In addition to virtually eliminating motor maintenance, the lack of brushes reduces heat and vastly improves electrical efficiency and power transfer. The design also improves heat dissipation and reduces electrical noise.

Brushless motors themselves aren't exactly new. They've been used to power computer fans and hard drives, CD and DVD players for decades. They've also been used as servo motors in robotic systems where high torque, speed and durability are essential. But it's the development of intelligent electronics that have made brushless motors practical for use in portable power tools.

Microprocessor controls not only monitor the motor itself but, coupled with electronics in the battery pack, optimize the tool's performance and protect it from overheating and damage. These electronic controls, in their various proprietary configurations, allow for a whole range of innovations in cordless tool performance.

For example, all of Hitachi's brushless-motor-equipped cordless tools feature a micro-processor that allows electronic adjustment of the tool's power output in four steps. Settings are selected via a small button on the tool's

base. Higher settings yield full power output as necessary for heavy-duty drilling or driving tasks. Lower power settings reduce the tool's battery consumption while performing lighter tasks, like drilling small holes or setting small fasteners.

Festool's line of drill/drivers use their electronically commutated technology (EC-TEC) to sense and regulate torque output in lieu of a conventional mechanical clutch. A 25-position adjustable electronic dial lets you accurately set the amount of torque that's delivered to the chuck. When the set torque level has been reached, the tool's electronics simply shut off power to the motor and emit a small "beep" to alert the user. Removing frictional losses incurred each time a mechanical clutch hits its release point (that clickity-clacking sound) not only makes Festool drills quieter, but more importantly, it results in a significant energy savings and even longer battery run times when driving fasteners.

The Move to Brushless

Since Festool launched its first brushless-motor-equipped cord-



A small button at the base of Hitachi's DS 18DBL brushless-motored cordless drill sets the tool's power output to suit the task.

less drill/driver to the U.S. mass market in 2005, most cordless power tool manufacturers have climbed aboard the brushless bandwagon. Festool has expanded its EC-TEC cordless tool line to include C-series (10.8V and 14.4V) and T-series (10.8V, 14.4V, and 18V) cordless drill/drivers, a CXS 10.8V compact drill and TI-series 14.4V impact driver. Milwaukee has a full line of lithium-ion-powered M12 FUEL (12-volt) and M18 FUEL (18-volt) drill/drivers, hammer drill, rotary hammers and impact drivers and wrenches. Hitachi's current brushless offerings include an 18-volt drill/driver, hammer drill, impact driver and impact wrench, and a 14.4-volt impact driver. Makita's entries into brushless include an 18-volt impact driver and a rotary hammer, both of which are part of their extensive LXT lithium-ion platform. DeWALT's 20V MAX and 20V MAX XR platforms currently feature an extensive line of compact drill/drivers, compact and regular hammer drills and impact drivers. Earlier this year, Bosch debuted an 18-volt rotary hammer drill and an oscillating multi-tool that both feature the company's CORE EC brushless motor technology.

AC Brushless Tools

Festool recently released its Carvex line of corded jigsaws (cordless models to come), all of which feature their EC-TEC brushless motors. Besides these saws, there are currently only a couple of other AC-powered corded tools on the market that feature brushless motors: the



Instead of a traditional mechanical clutch (left), Festool's T18+3 cordless drill uses electronics to monitor and limit torque output, set via a 25-position dial.



These DeWALT and PORTER-CABLE random orbit sanders are two of only a handful of AC-powered tools that employ brushless motors.

near-identical DeWALT D26456 and PORTER-CABLE 390 5-inch random-orbit sanders. Why not more brushless AC tools? Well, brushless motors cost more to manufacture, and their power efficiency and battery run time doesn't present an advantage for corded tools. There is one significant advantage for brushless motors in corded tools, especially sanders: better resistance to damage from dust. Fine dust that gets into the regular brush motor of a portable electric sander reduces the life of the brushes and commutator.



Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and contributing editor to Woodworker's Journal.

18-volt Circular Saws Cut the Cord

TODAY'S LITHIUM-ION CIRC SAWS ARE LONG ON POWER, LIGHTWEIGHT AND READY FOR YOUR TOUGHEST CUTTING JOBS.



Soon it will be summertime again, and if you're like me, that'll mean mending those cracked fence pickets, replacing some deck boards or building the dock you've had on your "honey-do" list all winter. I can't think of a single woodworker who doesn't also do home repair. And, when my "shop" shifts to some far corner of the yard, cordless tools are essential.

In recent years, lithium-ion batteries have taken the cordless industry by storm. Truth be told, this leapfrog in battery technology wasn't really intended for us hobbyists: lighter, longer running power packs matter most to the folks who make their livings in the trades. But we all benefit ... who wouldn't rather take fewer trips back to the charger?

That's why I expected top performance from these five 18-volt, pro-quality 6½" circular saws. And they delivered the goods in some tough cutting trials as I cut sheets of plywood to strips and made repetitive crosscuts on resiny, hard 2x12 Southern yellow pine. But, which "jobsite" saw edged out the rest for "Best Bet" honors? Read on!

DEWALT DCS390L

There are plenty of loyalists out there to DeWALT's bright yellow color, and I'm sure this compact circular saw is toted in quite a few truck boxes. Its magnesium base and upper guard keep the tool light but tough, when those

DeWALT DCS390L

Street Price: \$269

Volts: 18

Cutting Capacity: 2¼" @ 90°; 1½" @ 45°

Batteries Included: 1 XRP™ Li-ion

Charging Time: 1 hour

Net Weight (w/ power pack): 7.8 lbs

Web: www.dewalt.com

Phone: 800-433-9258



accidental drops occur, and a soft overmolded grip makes it comfortable in hand. I like the oversized flip lever and T-knob for changing cutting depth or setting up bevel cuts. They're easy to grab with gloves on.

The tool's single included battery also pulls free easily without taking your gloves off, by depressing two tabs. It charges in an hour, which is good, but other saws in this test with two power packs or faster chargers are more helpful for those really big cutting jobs. DeWALT provides a universal charger that will replenish either Li-ion or NiCad DeWALT batteries ranging from 7.2 up to 18 volts. This



DeWALT's oversized controls (left) work well with gloved hands, and a 2¼" cutting depth (right) will tackle 8/4 or 2x lumber with ease.



charger could cover all your DeWALT tools. Very practical.

A wide, marked slot on the saw base's front edge makes it easy to determine where the blade kerf will hit your workpiece, whether making straight cuts or tipped to 45°. The bevel scale is stamped with demarcations for each degree up to 50; a swipe of black paint would make them even easier to read.

With its battery topped up to full charge, I was able

to make 24 cuts across a quarter sheet of 3/4" plywood, using a fresh Freud Diablo 40-tooth blade, before the battery was spent. Then, once it cooled and fully recharged, I swapped in a new 24-tooth Diablo framing blade and went to work on a 2x12. DeWALT made 36 cross-cuts this go-round. A respectable showing but not the leader here by quite a stretch.

For \$269, here is a no-frills, get-it-done circular saw.



Bosch CCS180K

Street Price: \$299

Volts: 18

Cutting Capacity: 2" @ 90°; 1½" @ 45°

Batteries Included: 1 (2.6Ah) Li-ion

Recharging Time: 30 minutes

Net Weight (w/ power pack): 7.6 lbs

Web: www.boschtools.com

Phone: 877-267-2499



A helpful depth-setting scale in back (left) and upright handle position (right) when compared with other test saws are two of the CCS180K's stronger features.



Hitachi provides a hex T-wrench for blade changes (top), but it doesn't stow on the saw as do the Allen wrenches of other saws. Ample overmolds and grips (bottom) make gripping the C18DL more comfortable.

BOSCH CCS180K

When this sample came from Bosch, I was surprised at the small carton size. Turns out, that's because Bosch doesn't provide a hard carry case or a duffel bag for stowing this tool, unlike the other test saws. Odd.

The saw's standard features were a mixed blessing for me. It has comfortable overmolds on the top and front handles, and the primary grip is tilted back farther vertically than other saws to suit a more natural wrist position. I found the machine to

Hitachi C18DL

Street Price: \$309
Volts: 18
Cutting Capacity: 2¼" @ 90°; 1½" @ 45°
Batteries Included: 2 (3.0Ah) HXP Li-ion
Charging Time: 45 minutes
Net Weight (w/ power pack): 7.1 lbs
Web: hitachipowertools.com
Phone: 800-448-2244



be well-balanced, and it has a large safety lock button alongside the trigger for easier start-ups with gloves. There's also a helpful depth-of-cut indicator in back so you won't need a tape measure to set cutting depth. All good.

The bevel tilt scale, though, isn't as detailed as DeWALT's — demarcations at 5° increments only — and the two blade index slits in front should be marked in some fashion. They aren't, so you'll need to double-check by referencing the blade and slits instead of just looking down and lining up the correct notch with a layout line. It's less helpful but something you'll probably adapt to in a few cuts.

A single battery comes with this tool, and it charges up in just 30 minutes, which you'll appreciate if there's lots of cutting to do. I'd still rather have two batteries and a quick charger. Removing the power pack involves pushing a rear button while sliding the pack backward. It wasn't as easy for me as packs with two side

tabs and a pull-down release.

Depth of cut, tilt and arbor lock controls are amply sized, and the magnesium base is ribbed on the bottom for lower resistance when pushing the saw over rough surfaces.

Once charged up and outfitted with appropriate Freud blades, the CCS180K made short work of 30 passes across 24 inches of plywood. It bested DeWALT by six more crosscuts on a 2x12, before the battery dropped off to sleep. And, the saw had plenty of power throughout.

All in all, \$299 seems steep for a tool with one battery and no carry case, but you can buy this saw as a "bare" tool option if you already have other Bosch 18-volt Li-ion tools (see *sidebar*, page 54).

HITACHI C18DL

For ten bucks more than Bosch, Hitachi packs in added features for the money. You get two 3.0 Amp/hour (Ah) batteries, a hard case and an edge guide for making accurate rip cuts. When you hit the trigger safety, the C18DL

WITH LI-ION, WHO NEEDS NiCAD?

Ten years ago, I laid hands on a then-cutting-edge 24-volt, 6½" circular saw that felt like a lead anchor. While it cut well, it was so darn heavy, and NiCad batteries were partly to blame. What a change a decade makes! These new circ saws are both light and gutsy. Their lithium-ion cells offer much longer run times than NiCad, in compact packages that shed tool weight while delivering top performance.



Makita BSS610

Street Price: \$349
Volts: 18
Cutting Capacity: 2¼" @ 90°; 1½" @ 45°
Batteries Included: 2 (3.0Ah) Li-ion
Charging Time: 30 minutes
Net Weight (w/ power pack): 7.6 lbs
Web: www.makitausa.com
Phone: 800-462-5482



also sports a light to illuminate the blade area. Call it a sign of aging, but I really appreciate well-placed task lights on tools. Even though this one isn't an LED, the bulb is replaceable.

Hitachi never skimps on overmolds. This saw is fully wrapped on both front and primary grips with elastomer for sure handling and comfort. These grips are also amply sized for large hands, and I found the main grip's pistol styling to be my favorite of all.

Hitachi's fan-cooled charger will rejuvenate either Li-ion or NiCad batteries ranging from 7.2 to 18 volts. The charger's illuminated display is a bit counterintuitive: a constant green light means the battery is actually overheated, while blinking red tells you it's fully charged. Still, the process takes just 45 minutes while you're busy sawing with the other pack.

Hitachi outfits the C18DL with a black, stamped-steel base, which is fine, but don't drop the tool. Steel bases are more likely to bend out of shape. Two front cutouts set the index markers for lining up the blade, but my test saw cut 1/16" to the "keep" side of the layout line, thus leaving workpieces a kerf width short. It can't be adjusted.

In the cutting test, Hitachi was mid-pack all the way, producing 27 plywood cuts and 42 crosscuts in 2x with each charge. Sawdust ejection was messier

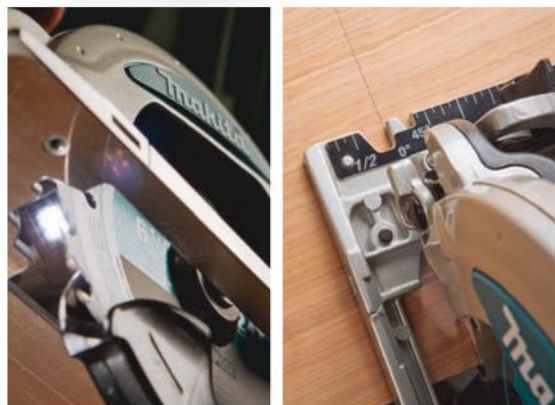
here than some other saws, with more debris left on the workpiece. But, overall, this green machine performed pretty well. I think \$309 seems a decent deal, and there's a "bare" option for about a third of that price.

MAKITA BSS610

With more than 60 different cordless tools in its inventory, Makita is heavily invested in prosumer options these days. And for those who want good performance without the bulk, this BSS610 is lightweight and is smaller in overall stature than these other saws.

A bright, white LED lights up the blade when you lightly depress the trigger, and the base's blade indexes are clear and accurate. Depth of cut is also easy to dial in, thanks to a series of common blade depths molded into the lower guard. Flip-lever controls for tilting the base or changing blade depth are smaller here but still easy to manipulate.

Makita's NiCad/Li-ion universal charger, which powers batteries back up in 30 minutes, has an elaborate diagnostic display and



Makita's bright LED light (left) makes cut lines easier to see in dim conditions, and they're simple to line up using the saw's front-mounted index notches (right).

a fan that draws air through the packs during charging to minimize heat buildup. Heat is the bane of tool batteries.

In testing, Makita came up a tad short on plywood cuts at 23, but that's still the equivalent of ripping almost six sheets lengthwise on one charge. It delivered 40 crosscuts on a 2x12 before the motor finally stopped.

Two batteries, an edge guide and carry case all are provided for the same price as Milwaukee's contender, next.

MILWAUKEE M18

Milwaukee boldly describes itself to be "Nothing but HEAVY DUTY," and after testing the M18 (Model 2630-22), I can see why the pros might agree. While it's a tad heavier than others, this saw features a thick, aircraft-grade aluminum base with oversized scales and a clear,

Milwaukee M18

Street Price: \$349

Volts: 18

Cutting Capacity: 2¼" @ 90°; 1½" @ 45°

Batteries Included: 2 RedLithium XC Li-ion

Charging Time: 1 hour

Net Weight (w/ power pack): 8.5 lbs

Web: www.milwaukeetool.com

Phone: 800-729-3878



easy-to-read tilt scale. Control levers are generous, and over-molded handles provide good control. Two proprietary RedLithium™ batteries come with it, and they have helpful illuminated readouts to show you their charge levels at any time. A universal charger with two battery mounts refreshes 12- or 18-volt Milwaukee batteries in an hour. A duffel bag stows the works, plus a steel edge guide.

Aside from this saw's rugged features, it simply left the competition in the dust during cutting trials. The 2630-22 sliced 38 cuts in plywood before I switched batteries, then it chomped an impressive 53 crosscuts on 2x

before the battery could go no further. With the exception of less-than-tidy sawdust ejection, which could be improved, the saw was a robust and pleasant tool to use. There's something special about Milwaukee's RedLithium technology, and it provided long-running endurance here. Given its performance and good features, while priced competitively with Makita, it deserves our "Best Bet" award ... and your consideration at buying time. It's a great cordless saw.

Chris Marshall is senior editor of Woodworker's Journal.



An illuminated fuel gauge (above) makes it easy to monitor remaining run time on Milwaukee's RedLithium batteries. The tool's black-on-silver tilt scale (bottom) sets to single-degree increments.



An increasing number of cordless tools, like the RIDGID and PORTER-CABLE 6½" circular saws shown here, are only available within a larger combo kit of tools powered by a single charger and battery set, or as "bare" options for use with the batteries you already own.

HAVE THE BATTERIES? THEN CONSIDER A "BARE" SAW.

Once you buy into a tool company's battery platform, you don't really need a charger and batteries for every new tool purchase. Use the packs you own, buy just the new "bare" tools, and save money. Many cordless tool manufacturers are pursuing it. In this test, for instance, Bosch's CCS180K can be had as the CCS180B for \$119; Hitachi offers a C18DLP4 for \$109; Makita sells the BSS610 as the bare BSS610Z saw for \$179; and you can nab Milwaukee's 2630-20 for \$119. Same tools ... no batteries or charger. Depending on the saw, you could save more than 60% by going "bare." Other



18-volt, 6½" saws, like the RIDGID R865N X3 and PORTER-CABLE's PC18CSL, currently are available only in larger kits or bare, which is why they were not tested here. Our aim was to present all-in-one saw/charger combinations for this test.

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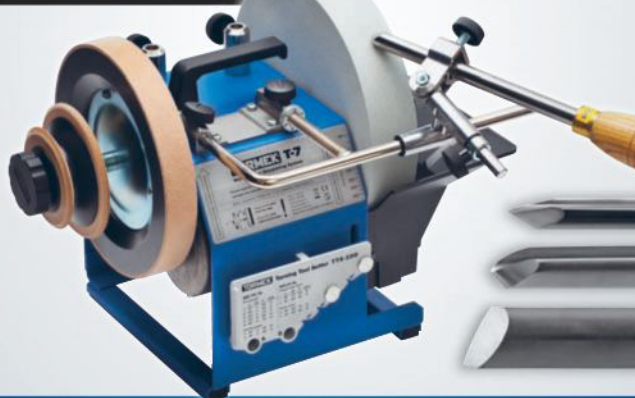
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Torture Test: Nine Heavy-Duty Drill/Drivers

OUR RESIDENT TOOL EXPERT TAKES NINE BIG DRILL/DRIVERS FOR AN EXHAUSTIVE TEST DRIVE AND PICKS A FAVORITE.

A big drill/driver fed by a powerful lithium-ion battery churns out enough torque to drill monster holes and drive the longest screws. Plus, the high amp-hour ratings of the latest drill batteries allow you to do enough work on a single charge to vanquish even the most challenging projects.

So, which drill should you buy? I decided to find out by testing a number of models in the 18- to 21.6-volt range. To maintain an “apples to apples” comparison,

I didn't include drills that come with lower-capacity slim-pack-style batteries. Although these are also plenty powerful, they just don't have the extended run time of the heavy-duty models featured in this article.

The Performance Trials

After carrying out some common drilling and driving tasks and making observations about each drill/driver's features and ergonomics, I also wanted to probe the outer limits of their

performance. Therefore, I subjected the drills to a series of downright torturous tests.

In the first test, I wanted to see how much maximum torque each drill could deliver, so I drilled a series of 1"-diameter holes through seasoned lumber — the kind of job you face when running new electrical circuits into a family room. I chucked up a not-too-sharp 1" Forstner bit and set the drill to its highest gear/speed range and disengaged its clutch. For the next



A 1"-dia. self-feeding auger bit pushes a cordless drill to its limits.



Each drill drove as many 5/16" lag bolts as possible on a single charge.

trial, I switched the drills into low gear and chucked up a 1" self-feeding auger bit. This bit really pushes cordless drills to their limit, as it pulls itself into wood very aggressively. I gave each drill 1 to 10 points based on its overall drilling performance.

Then I tested how much run time each drill/driver could deliver on a single battery charge by driving large lag bolts into 1/4" pilot holes drilled into construction-grade fir 4x4s. I counted the total number of bolts each drill was able to drive before it ran out of juice, and I awarded points accordingly. I also awarded bonus points to the speediest performers.

Once I had run down the battery packs, I wanted to see how long it would take to recharge them after they had thoroughly cooled. I gave each model points: 10 for the fastest charging time, and proportionally less for the others.

Bosch DDH181

In your hand, the Bosch comes across as being stout and hefty but reasonably compact and well-balanced. Its grip fit my medium-sized hand very well. Initially, I found it a bit tough to operate the drill's

reversing switch with my thumb. But I quickly got used to it. The trigger action is responsive when ramping the tool up from 0 rpm — really important when setting delicate screw heads. This unit's 25-position (plus a drill setting) clutch selection ring is moderately stiff but easy to set and feels very positive. Their two-position gear selector was one of the easiest to operate in this test group.

The Bosch has a nice all-steel chuck. It's also quite stubby, which helps keep the overall top length down — a good thing when working in confined spaces like inside a cabinet.

The Bosch has a stout feel in your hand. Unfortunately, that didn't translate into good scores

in my performance tests, where the DDH181 was only an average performer. I was particularly unimpressed by the speed with which the otherwise torquey

Bosch DDH181

Street Price: \$280

Volts: 18

Motor Type/Geared Trans. Range: 4-pole/2

Clutch Settings/Separate Drilling Selector: 25/No

Built-in Light?/Number of LEDs: Yes/1

Net Weight (w/ power pack): 4 lbs. 11.3 oz

Web: www.boschtools.com

Phone: 877-267-2499



The Bosch DDH181 features a sturdy and durable all-metal tool-less chuck.

Test Results

Make and Model	Drill Power Test	Driving Longevity Test/Speed Bonus Points	Recharge Time/Speed Points	Performance Points (Total)
Bosch DDH181	6	6.5/0	85 min./3	15.5
DeWALT DCD980L2	8.5	7.5/2	57 min./6	24
Festool T18+3	9	10/1	64 min./5.5	25.5
Hitachi DS18DBL	5	7.5/0	46 min./7.5	20
Makita LXFD03	6	5.5/0	26 min./10	21.5
Metabo BS18 LTX Quick	4	6/0	63 min./5.5	15.5
Milwaukee 2610-24	10	5.5/1	67 min./5	21.5
Panasonic EY7460LZ2S	3	3.5/0	74 min./4	10.5
RIDGID R8611501K-X4	8	6/1	41 min./8	23

Points are based on a scale of 1-10

DeWALT DCD980L2

Street Price: \$280

Volts: 20 max

Motor Type/Geared Trans. Range: Brush/3

Clutch Settings/Separate Drilling Selector: 22/Yes

Built-in Light?/Number of LEDs: Yes/1

Net Weight (w/ power pack): 5 lbs. 3.7 oz

Web: www.dewalt.com

Phone: 800-433-9258



A dedicated drill/drive selector, as featured on the DeWALT DCD980L2, makes it easy to switch functions without resetting the clutch.

Bosch drove fasteners: Top speed in low-gear is only 380 rpm. Its battery charger also disappointed, taking an incredible hour and twenty-five minutes to fully top up a depleted pack.

DeWALT DCD980L2

The big yellow and black DeWALT feels extremely solid in your grip, but it's also a handful (third heaviest in the test). It's the only drill in the test group that has a three-speed geared transmission. Unlike the majority of drills which top out at 1,600 rpm, this unit delivers a whopping 2,000 rpm maximum speed. This is very useful when drilling small holes in metal and allows you to use drill accessories such as rotary rasps. The drill's all-metal chuck feels strong, and its jaws feature serrated carbide inserts which grip bits with authority. The motor reversing

switch is well placed, but it's a little stiff to operate. The side handle is easy to attach and remove. I'm a big fan of a separate drill/drive selector on a drill. It saves time when you want to switch quickly from drilling to driving. With a separate selector, you can leave the clutch on the desired setting and still switch to drilling (with full power).

DeWALT's performance was rock-solid. Both in drilling and driving, the DCD980L2 was right at the top, bested only by the Festool. Not only did it hold its rpm well during my brutal lag bolt driving test, but its higher-speed low gear also drove the bolts faster than any other drill. And, its battery recharge time was better than average.

Festool T18+3

"Sophistication" is the word that came to my mind when I first used the Festool T18+3, with its quick-change chuck system and brushless motor managed by electronically commutated technology (EC-TEC). With no commutator or brushes, there are fewer motor parts to wear out. The electronics monitor battery voltage, temperature and power output, to optimize performance and protect the tool from damage. They also operate the T18+3's unique clutch: an adjustable dial determines the amount of torque delivered to the bit. When the set torque is

Festool T18+3

Street Price: \$625

Volts: 18

Motor Type/Geared Trans. Range: Brushless/2

Clutch Settings/Separate Drilling Selector: 25**/Yes

Built-in Light?/Number of LEDs: No

Net Weight (w/ power pack): 4 lbs. 3.3 oz

Web: www.festoolusa.com

Phone: 888-337-8600

** Clutch torque limited electronically



Remove the regular chuck, and the Festool accepts right-angle, eccentric, quick-change and screw-depth-setting accessories.



The T18+3 features a unique electronic clutch that has an adjustable dial for selecting maximum drive torque.

reached, the drill simply beeps and shuts off, thus saving energy, for longer battery run time. This electronic clutch has a very good range of torque delivery, from very low settings that allow you to sensitively set tiny screws in soft woods, to high settings powerful enough to drive the biggest screws.

Because the T18+3 is so quiet and smooth in use, my initial misperception was that it wouldn't have the power of other models. It's also the lightest drill in this group. But during my drilling and driving trials, the

Hitachi DS18DBL

Street Price: \$260

Volts: 18

Motor Type/Geared Trans. Range: Brushless/2

Clutch Settings/Separate Drilling Selector: 22/No

Built-in Light?/Number of LEDs: No

Net Weight (w/ power pack): 4 lbs. 5.8 oz

Web: www.hitachipowertools.com

Phone: 800-448-2244



A button at the base of the Hitachi drill changes speed ranges electronically.

Festool proved to be an absolute stellar performer, delivering top scores in both tests. It was especially impressive during the driving longevity test, where it drove many more lag bolts than its nearest competitor. A side handle would be useful for the big jobs, but none is available.

Hitachi DS18DBL

At first glance, you might mistake Hitachi's DS18DBL as a "compact" drill model, due to the trim proportions of its brushless motor. Like the Festool T18+3, the DS18DBL uses electronics to take advantage of the brushless motor's capacities, but in a unique way: A small button just above the Hitachi's battery pack selects one of four electronically controlled speed ranges. A segmented LED readout shows which speed is selected. Because the DS18DBL also has a two-speed mechanical gearbox, that means that the drill offers eight different speed ranges. Hitachi's "digital transmission" limits the amount of current

running to motor. You can dial down the power and tackle tasks on a single charge. Unlike the Festool drill, which uses electronics to limit its maximum torque output, the DS18DBL uses a traditional 22-position mechanical clutch and brake.

The Hitachi was a pleasure to use. Its pistol grip is thinner than most other models, and its rubber overmolded surface is comfy to hold. Trigger response is crisp and sensitive, and direction reversal is quick and positive.

Unfortunately, the Hitachi didn't do as well in my performance tests as some of the other drills. It delivered decent run time for the lag bolt driving test, but ran more sluggishly under heavy load than the best performing models. The Hitachi was particularly weak during the hole drilling test, slowing noticeably when boring with the auger bit.

Makita LXFD03

The LXFD03 features sturdy construction, twin LEDs mounted just below the side handle mount and a good amount of shock-absorbing rubber overmold on the back end of the body.

I found the LXFD03 to be a solid performer. I liked its quick trigger response but found the reversing switch a tad too short to depress easily with a side of a finger. Also, the Makita's clutch and drill/drive selector rings are relatively narrow, which makes

Makita LXFD03

Street Price: \$279

Volts: 18

Motor Type/Geared Trans. Range: 4 pole/2

Clutch Settings/Separate Drilling Selector: 21/Yes

Built-in Light?/Number of LEDs: Yes/2

Net Weight (w/ power pack): 5 lbs. 2.3 oz

Web: www.makitausa.com

Phone: 800-462-5482



Makita's sophisticated battery charger replenishes a spent pack in less than a half hour.

adjustments a little more challenging, especially if you're wearing work gloves.

Since Makita's published maximum torque numbers for the LXFD03 are high (850 in. pounds), I was a bit surprised by this drill's somewhat lackluster performance in both my drilling and driving tests. Whenever I pushed the drill hard, it bogged down a bit, although it never stalled completely. One quirk was that it generated lots of motor sparks during use, and emitted a hot electrical smell.

In the recharge time test, the Makita simply smoked the competition. Its battery charger replenished an empty pack in a blazing fast 26 minutes — less than half the time of the majority of other chargers.

Metabo BS18 LTX Quick

Like the T18+3, the German-made Metabo BS18 has a very compact body and an innovative removable chuck. With the standard chuck removed, you can mount a quick-change bit holder,

Metabo BS18 LTX Quick

Street Price: \$310

Volts: 18

Motor Type/Geared Trans. Range: 4 pole/2

Clutch Settings/Separate Drilling Selector: 7/No

Built-in Light?/Number of LEDs: Yes/1

Net Weight (w/ power pack): 4 lbs. 10.8 oz

Web: www.metabo.us

Phone: 800-638-2264



Milwaukee 2610-24

Street Price: \$330

Volts: 18

Motor Type/Geared Trans. Range: 4 pole/2

Clutch Settings/Separate Drilling Selector: 24/Yes

Built-in Light?/Number of LEDs: Yes/2

Net Weight (w/ power pack): 5 lbs. 8.3 oz

Web: www.milwaukeetool.com

Phone: 800-729-3878



Levers on both sides of the Metabo drill let you change gears without letting go of the grip. With its chuck removed, the drill accepts a quick-change bit holder.

a hex-shanked drill or driver bit to the end of the motor shaft itself. The latter allows the BS18 LTX to work in extremely tight spaces.

In lieu of a clutch selection sleeve behind the chuck, the Metabo features a simple lever mounted atop the body. Sliding the lever sideways lets you choose between seven detented clutch settings and a no-clutch drilling function. The clutch delivered plenty of power when driving large screws, but its lowest setting delivered too much torque when tackling a sensitive job, like setting 1/2"-long #6 screws into softwoods. I also had a small problem when gripping the top of the Metabo's body, as I'd occasionally inadvertently change the position of the clutch selector. The BS18's gear speed selector is a pair of levers on both sides of the drill's motor housing. It's easy to operate by righties or lefties.

Although I liked the Metabo's

balance and compact body size, I was somewhat underwhelmed by its performance. Despite having plenty of torque for average wood shop tasks, it didn't quite have the oomph of some of the other drills for my torture tests.

Milwaukee 2610-24

Milwaukee's 2610-24 is the heaviest drill in this test, but it is well-balanced and feels good in use, with a comfortable over-molded handle and well-placed reversing switch. It's a smooth running drill, generating very little vibration even at top rpm. I loved the feel of the 2610-24's clutch adjusting collar; each setting clicks in both easily and very positively. However, I found that even on its highest setting, the clutch cut out at lower torque than I would've liked. Set on their highest clutch settings, all the other drills were able to fully drive 3"-long, #10 wood screws, while the Milwaukee fell just a little short. I did like its drill/drive selector ring, which is easier to set than the ring on the DeWALT. I can't say the same for its gear selector, which was stiff to slide.

The Milwaukee drill runs on RedLithium™ battery packs that are reputed to operate in extremely low temperatures at which most Li-ion-powered tools barely run. The pack features a fuel gauge; during recharges, the four LEDs on the fuel gauge light in turn; more lights mean the pack is closer to a full charge



A detachable side handle is a very desirable accessory for a heavy-duty drill that produces lots of torque, but Milwaukee didn't deliver all of it even with the clutch on its highest setting.

— very helpful (the RIDGID's charger also does this). Milwaukee is also apparently the only company that uses the simple "stoplight" color code system on its charger: red light means no go; the pack is charging. Green light means go; the pack is charged.

With the side handle mounted, this Milwaukee is a torque monster. It's the only drill that passed both stages of my drilling test, blasting holes through lumber without the slightest hint of stalling. Although it achieved only an average score in my driving longevity test, the 2610-24's rpm didn't drop appreciatively until the pack was nearly drained.

Panasonic EY7460LZ2S

The first thing you notice about Panasonic's largest drill/driver is its enormous battery pack, that delivers 21.6 volts and has 3.1 amp hours of capacity. The

Panasonic EY7460LZ2S

Street Price: \$377

Volts: 21.6

Motor Type/Gearred Trans. Range: 4 pole/2

Clutch Settings/Separate Drilling Selector: 18/No

Built-in Light?/Number of LEDs: Yes/1

Net Weight (w/ power pack): 5 lbs. 4.8 oz

Web: www.panasonic.com

Phone: 800-211-7262



Rated at 3.1 amp hours, the Panasonic drill's substantially sized 21.6-volt battery pack releases with a single button push.

pack's weight does provide some counterbalance for the large body, although the tool does feel rather massive. All the Panasonic's controls — trigger, range selector, reversing switch — are well realized and operate smoothly. One quirk is that when you first pull the trigger on, motor speed jumps directly from zero to 100 rpm, making it more difficult to use in some instances. The drill has a single LED task light in its base that turns off after 5 minutes.

Despite its slightly greater voltage, the Panasonic didn't perform very well in my drilling and driving tests. It was able to bore 1" holes using the Forstner bit, albeit sluggishly. But when I used the self-feeding auger bit, the Panasonic's electronics would simply cut power to the motor when the bit was about 1" deep. Similarly, the drill was a bit more sluggish than the other drills when driving lag bolts. The power would also occasionally cut off with the drill in reverse,

RIDGID

R8611501K-X4 Hammer Drill

Street Price: \$270

Volts: 18

Motor Type/Gearred Trans. Range: 4 pole/2

Clutch Settings/Separate Drilling Selector: 24/Yes**

Built-in Light?/Number of LEDs: Yes/2

Net Weight (w/ power pack): 5 lbs. 4.6 oz

Web: www.ridgid.com

Phone: 800-474-3443

** Drill selector includes hammer setting



A light touch on the long flat button on the RIDGID drill's grip activates the two bright LED lights located in the base.

when I tried backing out one of the bolts. Overall, it was a disappointing performance.

RIDGID R8611501K-X4

The heavy-duty R8611501K-X4 has a nice slightly-biggish grip, with textured overmold that lends confidence. Its reversing switch is well placed, but slightly stiff to operate. The RIDGID's drill/drive selector has a pair of levers that extend on opposite sides of the body just behind the clutch ring. The levers make it easier to change settings, especially when you're wearing gloves. In addition to drill and drive, there's a hammer drilling function. A pair of twin LEDs, activated via a sensor in the grip, rather than by the trigger, provided the best illumination of any drill/driver I tested.

I liked the balance and smooth overall feel. It has one of the most responsive trigger actions and is an aggressive performer with above-average scores in both my drilling power and driving longevity tests. Charger performance was second-fastest, but I noticed that this unit heated up more than most of the other drills. The rear of the motor housing got very warm to the touch, especially when it was turned on and off a lot.

Wrapping it Up

Pushing a tool to its performance limits separates the best from the merely adequate. All

of these drills are capable of turning in a good day's work (although with the Panasonic, I'd hope the day isn't too long or tasks too arduous). However, at the end of the day, the two units that performed best were the Festool T18+3 and DeWALT DCD980L2. Both offer a good feature set and are just a little more powerful and longer running than their competitors. The top-scoring Festool offers cutting-edge technology and features not available on other drills. The only thing that tarnishes its glowing performance is its top-shelf selling price. Bringing value into the mix, I have to give our "Best Bet" award to the DeWALT DCD980L2. It turned in top-notch scores and proved itself a venerable performer with a strong feature set and an affordable price tag.



Sandor Nagyszalanczy is a contributing editor to Woodworker's Journal. His books are available at Amazon.com.



Cordless Chainsaws: Powerful, Portable and Quiet

TODAY'S BATTERY-POWERED CHAINSAWS ARE A PRACTICAL, CAPABLE ALTERNATIVE TO THEIR NOISY, SMOKE-SPEWING COUSINS.

Despite their portability and effectiveness in all types of woodcutting chores, gas chainsaws are some of the noisiest, smelliest, most annoying power tools on the planet. But fortunately, the latest electric cordless chainsaws now have the potential to get the job done more peacefully. Fueled by high performance batteries, cordless chainsaws are surprisingly pow-

erful and just as portable as gas saws, yet run very quietly and expel zero noxious emissions.

Cordless chainsaws have been around for a while. But the early models were small and not very powerful. In contrast, the cordless models of today are equipped with longer bars and run on voltages ranging from 18-volt to a whopping 40 volts. These tools are capable of doing

serious work and are worth consideration by anyone who needs a portable saw to help maintain wooded properties.

3 Types of Chainsaws

There are three kinds of chainsaws: gas, corded electric and cordless. Depending on your needs and situation, each has its own pluses and minuses. First developed back in the 1920s,



The three types of chainsaws: a gas-powered saw (the STIHL), a corded electric saw (the Makita) and a cordless saw (the OREGON).

gas-engine-driven chainsaws are powerful and flexible, but terrifically loud. Since they're powered by 2-stroke engines, they require a mixture of gasoline and 2-stroke motor oil, which must be mixed before being added to the saw. This blended gas produces clouds of bluish, odorous smoke.

Corded electric chainsaws are somewhat less powerful than gas chainsaws, but they're clean running and they are a lot easier to use: Just plug in the saw and pull the trigger to switch on the saw's electric motor and the tool delivers immediate and impressive torque to the chain. There's no fuel to mix and pour, and no deafening noise to assail your neighbors. Of course, a corded electric saw requires a heavy-duty extension cord, which limits the range that the tool can be used away from a 120-volt power outlet.

Although it's the least powerful of all chainsaw types, cordless saws offer all the convenience of corded electric saws, but they can be used virtually anywhere you can carry them. This is a tremendous convenience if you have a large property to roam, or you simply don't want the hassle of dealing with an extension cord.

All but a few cordless chainsaws currently on the market are

run by lithium-ion battery packs, which offer impressive power for their size, plus they're much lighter than older nickel-cadmium and nickel-metal hydride packs and more environmentally friendly as well. As with all cordless power tools, having a pair of battery packs — one in the tool while the other is charging — can keep you cutting all day long, with little interruption.

Chainsaw Anatomy

All types of chainsaws share the same basic design: A motor powers a flexible chain that's interspersed with sharp teeth around a lozenge-shaped bar. Tabs in the underside of the chain ride in a narrow slot

around the edge of the bar. A cog on the end of the motor shaft spins just behind the rear end of the bar, driving the chain around the bar. A tension mechanism lets you adjust the tightness of the chain on the bar: too loose and the chain may jump out of its slot; too tight, and the chain puts strain on the motor and bearings. Some saws feature tool-less tension adjustment. This can be a real convenience, especially if you're working away from your shop and don't have the right adjustment tools at hand.

Every chainsaw has a pair of handles: A pistol-grip-style rear handle houses the trigger that controls the saw's motor. A transverse-mounted front handle



As with other cordless power tools, having a second battery to use with your cordless chainsaw while the spent one is charging allows you to continue cutting all day long.

Parts of a Cordless Chainsaw



Tool-less chain tension adjustment provides a quick, convenient way to tighten a loose chain on a cordless saw any time it's needed.



On cordless chainsaws lacking an automatic oiler, the bar must be regularly lubricated by pressing a button that forces oil onto the chain.



As a rule, the lower a saw's battery voltage, the shorter its bar. The 18-volt Ryobi in front has a 10" bar; the 40-volt model, a 12" bar.

provides control as well as an easy way to carry the saw. A guard just ahead of the front handle protects your hand and, on some electric saws, also is used as a chain brake, to stop and lock up the chain in case of a sudden kickback. A plastic scabbard slides over the bar, to prevent accidental cuts, as well as protect the chain teeth from getting nicked when the saw isn't in use.

All chainsaws have a built-in system for lubricating the chain, to keep it traveling around the bar smoothly, with little friction. Premium models feature automatic lubricating systems. Cheaper model saws have manual oilers that require you to regularly press a button, usually on top of the saw just ahead of the handle, to dispense the oil.

Cordless Saw Sizes

As with all cordless power tools, cordless chainsaws come in different sizes, as determined by

both bar length and battery voltage. The smallest, most affordable saws, including the Ryobi ONE+ P543, Craftsman #315.34130, Black & Decker LCS120 and GreenWorks 20092B, have 8"- to 10"-long bars and use 18- to 24-volt battery packs. Bigger, more expensive saws feature more powerful batteries and longer bars. Models include the STIHL MSA 160 C-BQ, GreenWorks 20082A, Ryobi RY40510, and OREGON CS250-E6. The 36-volt STIHL and 40-volt GreenWorks and Ryobi saws sport 12" bars, while the 40-volt OREGON has a 14" bar.

Generally speaking, the higher the battery voltage, the more power a cordless saw has on tap, and the longer the bar it is fitted with and the thicker the stock the saw is capable of cutting. Smaller saws with 18- to 20-volt batteries and 7" or 8" bars are fine for light tasks, such as slicing up thin lumber, carving details on a log or ice sculpture or cutting up kindling and pruning small tree branches. Bigger saws naturally handle bigger jobs: Models with 36- to 40-volt batteries and 12" or 14" bars can tackle just about any job you'd do with a gas or corded electric saw.

In addition to its voltage, battery packs are also rated by amp hours. The higher a pack's amp hour rating, the more capacity it has and the longer it will power the tool before running out of juice. GreenWorks, STIHL and OREGON offer both standard and optional higher-amp-hour



A cordless chainsaw is extremely handy for yard work such as pruning trees, clearing downfall and cutting up small branches.

batteries. Although higher-capacity batteries are expensive (OREGON's 2.4-amp-hour Endurance pack costs over \$200), they're a good choice if you work away from power plugs for extended periods of time.

As with other power tools, the more you pay for a cordless chainsaw, the more useful features it's likely to have. All 36- and 40-volt saws sport automatic oilers and many also feature tool-less chain tension adjustment. Pricier saws also include more sophisticated battery chargers that not only recharge packs more quickly, but have electronics that monitor charging in order to prolong battery life. A unique feature found on OREGON's premium-priced CS250-E6 saw is a chain sharpener. This reduces the need for regular and tedious hand sharpening maintenance.

Something to consider when buying a cordless saw is, does its battery pack fit the manufacturer's other cordless tools? For example, the 18-volt packs that power Ryobi ONE+ chainsaws also work with an extensive line of workshop tools. If gardening is your passion, battery packs from GreenWorks, OREGON and STIHL chainsaws also work with weed trimmers, blowers and other landscaping power tools.

Do You Need One in the Workshop?

Some would say that there's no major advantage to having a cordless electric chainsaw in a

workshop. However, with a battery-powered saw, you'll never accidentally cut through or get tangled up in a power cord. You also won't worry about getting electrocuted when working in wet conditions.

If you're a woodturner, the larger 36- and 40-volt models are great for roughing out turning blanks, either from green logs or heavy timbers. They're great for quickly cutting big planks to size, if you build heavy furniture pieces, as well as for carpentry jobs such as trimming and shaping the ends of large beams and rafters. A big cordless model is also ideal for sawing smaller logs for building an outbuilding or small cabin and, of course, bucking logs for firewood (without waking the neighbors!).

Yes, big cordless saws are cool, but even smaller 18- to 24-volt cordless chainsaws are a nice addition to your tool arsenal. There are lots of small tasks for which these saws have adequate power and capacity: for example, trimming long boards or cutting panels down to a manageable size before taking them to the table saw, jointer or planer. The agility of smaller cordless chainsaws is also a definite advantage when taking on more delicate tasks, such as carving sculptures or shaping tenons and other joinery members.

Like all battery-powered tools, cordless chainsaws have their limitations. Even the priciest 40-volt model simply doesn't have the torque of a corded elec-



A unique feature found on OREGON's 40-volt cordless chainsaw allows you to lightly restore sharpness to dull teeth in a few seconds with the simple pull of a lever.



Even a small, 18- to 24-volt, cordless chainsaw can be extremely useful around the workshop for carving tasks, trimming large planks or roughing out large joinery.



Larger cordless chainsaws with 36- to 40-volt batteries and 12"- or 14"-long bars are great for cutting logs and burls into turning blanks.

tric saw, or the speed and horsepower of a gas saw. But unless you're in a big hurry, I don't think this limitation outweighs the convenience that modern cordless models offer.



Sandor Nagyszalanczy is a contributing editor to Woodworker's Journal. His books are available at Amazon.com.





Supplies & Accessories

How can you tell when your table saw blade is dull? What is the moisture content of that board you just bought? Does your lathe really need a four-jaw scroll chuck? Is resawing easier with a carbide-tipped band saw blade? All of these questions are answered in this section. We also share some exciting new product developments from 2013 on pages 68 and 69.

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New Supplies and Accessories



CMT ITK Plus saw blade

Thin-kerf Blades

CMT's new thin-kerf ITK Plus™ saw blades are designed to reduce material waste and power demand on the saw while delivering industrial-quality performance. Made from carbide that has gone through a new process called SinterHIP ("Hot Isostatic Processing"), in which the material reaches high temperatures up to 3,500° Fahrenheit and high pressures up to 1,500 psi., it prevents material failure and guarantees longer cutting life. The blade body steel is hardened to reach 44 on the Rockwell hardness scale. Specially designed slots allow the blade to expand under heat and stress to prevent warping, and laser-cut sound dampening channels help dampen running noise and control wobbling. A non-stick orange shield coating keeps these blades running cool, reduces pitch buildup and protects against corrosion. A shear angle grind on the front face of the teeth produces smooth cuts and improves cutting speed. The ITK Plus blades range from 5 $\frac{3}{8}$ " to 12" diameter in finishing, framing and combination styles. Retail price for the 10" diameter ITK Plus Ripping blade shown here (item # P10024) is \$24.90.

Paint Mixing Lid

Rockler has introduced a larger, gallon-sized version of its original (quart-sized) Mixing Mate™ Paint Lid. The new size (item number 44170) functions in the same manner as the smaller version: four cam locks create a tight seal to the can; after it's locked, the user cranks the handle clockwise for approximately 30 seconds to completely



Rockler Mixing Mate Paint Lid

mix the paint or finish. The pouring handle has a spring-loaded thumb trigger that allows one-handed operation, similar to a maple syrup dispenser. The spring-loaded spout seals itself for storage after you've finished pouring. Mixing Mate can be reused and transferred to other cans. The gallon-sized Mixing Mate is priced at \$19.99.



Flexy Cord

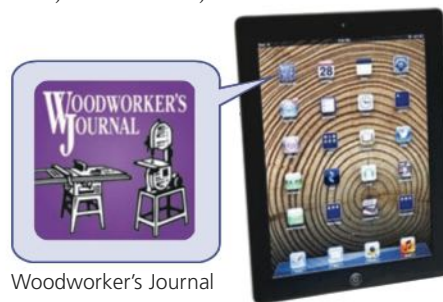


Power Cord

The Flexy Cord™ line of extension cords are designed to be tangle- and kink-proof, using material with "memory" that retracts the cord back to its original length. Flexy Cords are made in the U.S. and come in a variety of lengths, ranging from 4 inches (extending to 8 feet) to 20 inches (extending to 45 feet). Prices vary according to length, starting at \$10.99 for the small cord, while a multi-pack containing five different cord lengths is priced at \$79.99.

Tool Tune-up App

Woodworker's Journal has introduced our own Power Tool Tune-Up App, designed to work with iPad 4.2 or later operating systems. It provides step-by-step instructions for caring for popular power tools such as the table saw, band saw,



Woodworker's Journal Power Tool Tune-Up App

General Tools
& Instruments
E•Z Pro Crown King



jointer, drill press, planer, dust collection system, air compressor/nailer and moisture meter. There's more than 60 minutes of video footage from our experts on the care of these tools, plus a maintenance calendar, along with text and over 150 photos. Woodworker's Journal Power Tool Tune-Up App is priced at \$4.99 in the iTunes store.



Amana Tool 8-piece
Signmaking Router Bit Set

Signmaking Router Bits

The purpose of Amana Tool's 8-piece Signmaking Router Bit Set (AMS-130), according to technical director Frank Misiti, is "to enable sign-makers to quickly build a basic collection of popular CNC sign-making router bit profiles." Designed for creating signs and other CNC projects in a variety of materials, including wood, composites, and solid-surface materials, the set comes in a hardwood storage case. It includes a tool body and 30° knife from the In-Groove™ Insert Engraving System; a solid carbide up-cut spiral ball nose bit; plastic and aluminum "O" flute router bits; a V-groove carbide-tipped

router bit; a carving/engraving bit with a two-flute configuration; and an insert V-groove tool with a carbide insert knife. The 8-piece Signmaking Router Bit Set is priced at \$247.46.

Finishing Blades

The new Diablo Ultimate Flawless Finish saw blades have an ultra-thin laser-cut kerf designed to allow portable jobsite saws to perform to the level of stationary workshop saws. Part of the Freud family, the Diablo blades have an Axial Shear Face Grind (ASFG) design, in which the tooth face is angled to clearly shear through material and a Perma-Shield Coating of nonstick aluminum to create less heat, gumming and corrosion. The Ultimate Flawless Finish blades cut molding, veneered plywood, melamine and more and are available as a 10" blade (D1090X) priced at \$59.97 and as a 12" blade (D12100X) priced at \$69.97.

Diablo Ultimate Flawless
Finish saw blade



Crown Molding Cutting Jig

The E•Z Pro Crown King (880) from General Tools & Instruments is ready for use right out of the box — no assembly required. It's composed of two pieces: the jig itself and an insert/adaptor. Without the insert, the jig is positioned for cutting 45° spring-angle moldings. With the insert, it quickly reconfigures to accommodate 38- or 52-degree spring angles. To use the Crown King, you measure the corner angle, divide it by half, set your miter saw to that angle, cut and fit. The E•Z Pro Crown King is priced at \$29.99.



Accutrax Pencil Blade

Utility Knife Pencil Blades

The Accutrax Pencil Blade™ works similar to a razor blade in your utility knife, but it's an actual pencil. The Accutrax Pencil Blade will fit in any standard utility knife in place of the razor blade; when one side wears down, remove it, flip it around and reinsert to begin using the other end. According to Accutrax company representative Bob Cumings, testing has indicated that one Accutrax Pencil Blade lasts for about two months of continuous use. The Accutrax Pencil Blade comes in a pack of three blades, priced at \$5 for the pack.

Saw Blade Questions Answered

SIX MANUFACTURERS SHARE
EXPERT ADVICE ABOUT
CHOOSING, USING AND
CARING FOR SAW BLADES.

A few good quality saw blades can sure make wood-working more enjoyable, and often we spend a considerable chunk of change on them. We expect top-notch performance and long life from that investment. It only makes sense that questions come up now and then about how to choose, use and maintain blades properly, and you write in for our help. I think blade manufacturers are really the best sources for those answers, so I've rounded up some common FAQs that come into our offices and directed them to the experts at Amana, Forrest,

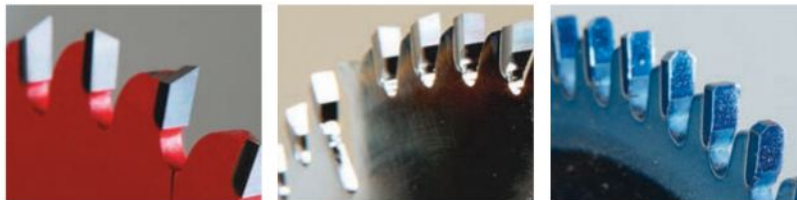
Freud, GUHDO, Infinity and Irwin Marples. These folks were happy to share some nuggets of wisdom for our benefit, and some of their feedback may even surprise you. I hope this article serves as a good quick reference for those recurring questions you might have about your blades.

Buying Tips

What do I need to know about blade tooth options?

Saw blades are optimized for fairly specific cutting applications and tools, and their carbide teeth are engineered precisely to suit the purpose. There are three main tooth shapes: beveled-edge, flat-topped or chamfered at the corners (called "triple chip"). Beveled teeth alternate left and right at a range of different angles, depending on the blade, to cut cleanly and quickly. Flat-topped teeth are used to clear away the remaining waste behind a group of beveled teeth

Common Tooth Styles



Blades are outfitted with three typical styles of teeth: alternating bevel-topped teeth (left), groups of beveled teeth followed by a flat-topped raker tooth (center) and triple-chip teeth (right) that may also be accompanied by flat-topped raker teeth.



For fine crosscutting with a miter saw, choose and install a blade with 80 to 100 teeth in a hi-ATB or triple chip grind.

on a combination blade or for fast stock removal on ripping blades. Triple-chip teeth are more stout than pointy beveled teeth and take smaller bites. You'll often find them on blades designed for cutting abrasive or chip-prone materials like melamine, laminates, solid surface, plastics and metal or for fine crosscutting.

Tooth geometries are very complex. Besides the top grind that establishes the overall tooth shape, there are shear and clearance grinds to boost performance even further. Space just doesn't allow for full explanation here. But one practical aspect to keep in mind when choosing a specific blade is hook angle. In lay terms, it's the degree to which the teeth tip forward or backward on the blade body. Teeth oriented in "positive" hook angles lean forward to cut more aggressively and quickly. Teeth canted to "negative" hook angles tip backward to withstand

greater abrasion while leaving a smooth cut. Hook angles range from 20° down to -5° or more; positive is typically used for ripping or general cutting and negative is reserved for slower, fine crosscutting applications and when s a w i n g composites.

If I spend more and buy more teeth, do I get a better blade?

This is a complex question, because bargain-basement priced blades typically won't deliver the results and long-term durability of more expensive, premium blades. On the flip



Improve your circular saw's capabilities with a two-blade approach: buy a general-purpose blade for DIY jobs and a fine crosscutting blade for more delicate sheet goods.





Specialty Blades



Dedicated ripping blades (left) and blades designed for composites, melamine or plastic (right) can be helpful, but they aren't must-haves for many hobbyist woodworkers.

side, an expensive blade with lots of teeth in a geometry that isn't suited for the way you're using it won't meet your expectations, either. More teeth doesn't necessarily make a blade "better." Manufacturers agree that we should trust their expertise: follow the tool and material suggestions for which the blade is designed to use it properly. Don't buy based on tooth counts. One blade does not suit all jobs.

OK then, so what are the best blades for my table saw, miter saw and circular saw?

Blade experts tell me that the best compromise for both smooth ripping and crosscutting on a table saw is a 40- to 50-tooth "combination" blade. Depending on the manufacturer, this might mean the blade has alternating top-bevel teeth (ATB) or has ATB teeth with an intermittent flat-topped or triple-chip raker tooth (ATB + R). For miter saws,

if you use the saw for general-purpose cutting where absolute smoothness isn't critical, choose a 40- to 60-tooth ATB grind with a positive hook angle. But if glass-smooth finish cuts on moldings and other fine work is what you want, switch to an 80- to 100-tooth "hi-ATB" grind (where the teeth are ground to extra-steep cutting angles) with a shallower hook angle, ranging from +10 to -5 degrees. In terms of circular saws, we use these tools for a broad gamut of cutting jobs, but two blades can cover the yeoman's share of tasks: use a 24- to 30-tooth general-purpose ATB blade for rough cuts and construction lumber. Swap that out for a 40- to 60-tooth ATB blade for clean cuts in plywoods, MDF and melamine.

The Truth About Thin Kerfs and Coatings

Why are there so many thin-kerf blades these days?

As miter saws and portable jobsite table saws have grown in popularity with both woodworkers and contractors, the industry is engineering thinner blades with narrower teeth to suit these lower-powered tools. A thin blade requires less energy from the motor to do its work. But, the experts agree that we should also consider thin-kerf blades to be excellent choices for heavier-duty radial arm and cabinet saws, too. They remove less material than regular-kerf blades — a benefit for both your wallet and the environment when working with expensive or precious figured woods and exotics. Thin-



Thin Kerfs



You should expect your thin-kerf blades to cut a nickel-thin kerf.

Thin-kerf blades produce a fraction of a regular blade's dust. Infinity's new Laser Thin Kerf features built-in blade stiffener plates.



Portable saws, like the Bosch shown here, benefit from thinner blades. But so can heavy-duty hybrid or cabinet saws.

kerf blades also produce less sawdust for a cleaner, healthier shop setting. I was told that advances in blade metallurgy and CNC machining make it possible to create thinner and lighter blade bodies without compromising stiffness or cutting performance. So, don't shy away from choosing them: today's premium options are suitable for every saw we use.

Do blade coatings really matter?

Short answer: yes. On low-cost, "disposable" blades, sometimes coatings are nothing more than paint. But coatings of chrome, a Teflon® derivative or a blend of Teflon and metals such as nickel or aluminum definitely serve important purposes and are part of the blade's design. For one, they reduce friction to keep the blade body and teeth from overheating, which can lead to warping, accelerated tooth wear and pitch buildup. Coatings also prevent corrosion and make blade deposits easier to clean away. Good coatings extend performance and longevity.

Maintenance Advice

How can I tell when my blades need sharpening?

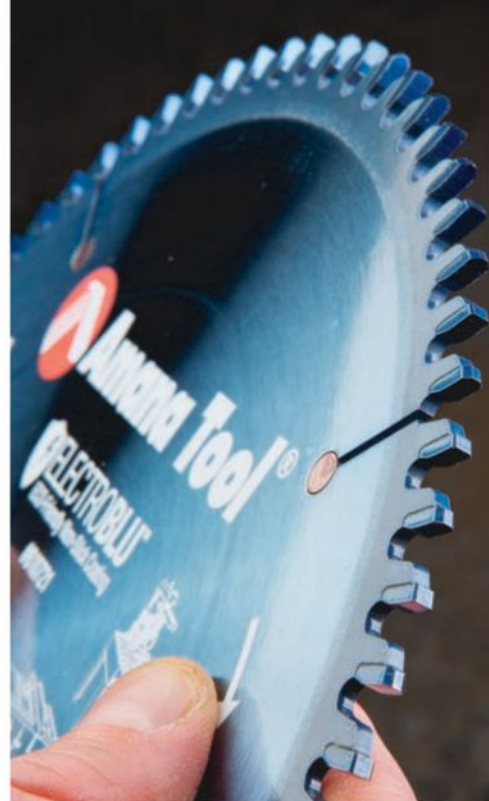
The experts echo what you've probably already guessed by experience: if cuts are harder to push through and the saw labors, the teeth are probably dull even if you can't see it with the naked eye. Increased burns and swirls on the wood are tell-tale signs, too. Of course, if any teeth are chipped, it's time to send the blade in for sharpening, but if the teeth all seem to be intact, try thoroughly cleaning your blades first to see if that improves their performance.

Is sharpening worth the cost?

Yes. Manufacturers outfit pro quality blades with thick teeth so that they can be resharpener five to 10 times before the teeth are spent. If you've never sent a blade off for sharpening, here's what may surprise you: the experts say it typically only costs around \$20 plus shipping to service a 50-tooth blade. That's a bargain compared with replacing the blade and spending three to six times as much. But, you need to start with thick teeth in the first place and then choose a quality sharpening service for best results; blade companies often can recommend authorized sharpeners to keep your blade arsenal in tiptop shape.

Do dirty blade teeth wear out faster than clean teeth?

They do, say the blade gurus, and here's why. Pitch on the teeth and blade body creates friction, and friction creates heat. That heat becomes extreme at the cutting edges, where it can break down the carbide on the molecular level. As pitch builds up on all the contact surfaces of the tooth, the problem just compounds itself, exacerbating heat buildup and reducing the ability of the teeth to cool themselves. Pitch deposits also can throw the blade off balance like a car tire, where wobbling at the rim will lead to poor cutting



A quality blade coating isn't just eye candy — it's a functional component that reduces pitch deposits, corrosion and heat buildup.

RESHARPENING:

If you notice harder cutting, more burning or certainly chipped teeth (as evidenced on the blade below), sharpening or repair is both economical and beneficial for your premium blades.





Thick teeth can be resharpened more often and offer better long-term value than thinner carbide teeth.



Skip the oven cleaner and save your blade teeth. Use a dedicated blade cleaner instead to prolong carbide life.

quality and yes, even more heat buildup. A clean saw blade dissipates heat more evenly and spins true. So, an occasional cleaning is definitely worth the effort.

What's the best blade cleaner?

There are many specially formulated blade cleaners on the market, and that's what we should use. The manufacturers agree that oven cleaner or other strong chemicals are altogether bad choices, regardless of how well they may seem to work. You wouldn't clean a prized shotgun or the chrome trim on your car with harmful chemicals, so use

the same reasoning with your expensive saw blades. Strong acids and bases are too caustic for this application; they can deteriorate the blade coating and weaken the cobalt that binds the carbide particles together. Even if you can't see the results of chemical damage from using the wrong blade cleaner, that doesn't mean it hasn't happened.

Neutral pH cleaners are best, say several of the experts. Even a mild dish detergent and warm water can clean off pitch deposits, so long as the blade is coated to protect against rust. Soak the blade until the deposits

soften up, then gently scrub the teeth clean with a nylon- or brass-bristle brush. Most of all, be patient. You may have to soak, scrub and then repeat the process, but eventually, all of the baked-on crud will come off. Then dry the blade and apply a rust-preventative spray or oil.

Quality blades can be outstanding performers. With some sensible know-how from the folks that live and breathe blades, we can reap every bit of benefit from our investment.



Chris Marshall is senior editor of Woodworker's Journal.



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Four-Jaw Scroll Chucks

A SCROLL CHUCK COULD IMPROVE YOUR TURNING SUCCESS, BUT LET OUR EXPERT SHOW YOU AROUND THE OPTIONS, FIRST.

A chuck is anything that holds work in the lathe, so a drive center, a live center or a faceplate are all chucks — and most lathes come with this useful trio. Simple spindle turning needs only the aforementioned drive and live center; however, they are insufficient for hollowing in spindle orientation. While it is

possible to turn a bowl by just screwing a piece of wood to a faceplate, turning the outside of the bowl is awkward, and much depth in the finished vessel is lost to the screws. A glue block can overcome this problem.

Still, a self-closing chuck is alluring because it offers no-hassle, vise-like grabbing of anything you want to turn. At

least, that is the advertising claim. This is all to say that what is properly called a scroll chuck is an easy sale to a turner — whether novice or seasoned veteran — walking into a wood-working supply store. One of the most frequent questions I am asked is, “What brand/model of chuck should I buy?” This places me squarely on the horns of a

dilemma, because a four-jaw scroll chuck is a very useful accoutrement for a seasoned turner. A beginner, however, will have a good deal of difficulty getting one to perform as advertised and may actually throw more work off of the lathe than with faceplates and glue blocks.

My aim in this article is to acquaint the reader with the desirable features to look for in a scroll chuck, and to detail the fine points of the basic holds you can accomplish with it, to lead to sure gripping of the work.

In metalworking, the use of a lathe chuck with jaws (sometimes called dogs) that close in unison to grip a workpiece is old hat. In my youth, I purchased a four-jaw metalworking chuck to quickly hold square pieces. Although useful, the problem with such chucks is that the jaws are designed for metal so they

mar wood egregiously. So it was a marketing tour de force in 1988 when Teknatool under the brand name NOVA introduced an economical four-jaw scroll chuck with top jaws specially designed for the needs of woodturning.

Now variously called engineering or scroll chucks, the jaws of these are usually of two pieces. The bottom jaw has a rack on the bottom and fits snugly in a T-shaped radial keyway in the chuck body. A scroll plate engages the racks on the bottom side of the jaws. Turning the scroll opens or closes the jaws simultaneously. The top jaw interlocks with the bottom jaw and is further secured to it with socket head cap screws. This scheme allows the top jaw to be changed to different shapes for specialized holds. The crucial factor is that the jaws have much larger

surface area for holding wood securely without deforming it. NOVA's initial chuck was a lever chuck.

In 1994, Oneway in Stratford, Ontario, introduced a superb gear-driven chuck called the Stronghold. In 1997, they started producing a smaller gear-driven chuck called the Talon. In a gear-driven chuck, the bottom side of the scroll is a bevel gear, which is engaged by a mating bevel gear either enclosed in the chuck itself or on the end of a T-handle, allowing

Scroll chuck jaws are two-piece. The bottom half (inset, below) engages the scroll, so the jaw closes or opens in unison. You can screw a variety of jaw extensions to the bottom jaw (right) for different needs.



greater closing force to be applied by the jaws, resulting in surer holds.

While lever chucks are still offered, a gear-driven chuck is much more desirable. The Australian firm Vicmarc offers a line of high-grade chucks well worth your consideration. Vicmarc's VM150 Chuck will work as either a lever or a gear chuck, making large adjustments with a lever, while final tightening is gear-driven. Penn State Industries offers both an inexpensive lever and a gear-driven scroll chuck under the name Barracuda. The Woodturners Catalog offers what appears to be the same chuck under the name Apprentice. Both companies offer the gear-drive chuck with an assortment of jaws in a basic package. While not up to the

quality of the other chucks mentioned, they are quite serviceable for someone just getting into turning with a small lathe. In general, most of the scroll chucks on the market perform the tasks reasonably well.

A safety concern with scroll chucks is that, at some point as you open the jaws, they lose their engagement with the scroll and may be pulled out of the keyways with your fingers. If you lose the engagement with one or more jaws and start the lathe, a very dangerous ballistic event will occur. An ironbound rule is that you never extend the jaws more than one-third out of the chuck! NOVA realized this danger from the beginning and designed their scroll to spiral in the opposite direction from all other chucks. That is because the forces of starting the lathe

with a chuck on the spindle that is holding nothing will cause the chuck to close and not open.

NOVA incorporated a further safety to their chuck: a stop screw that prevents the jaws from coming off of the scroll. Oneway does this same thing with a keyway. There are two keyways, with the shorter one not allowing the jaws to extend beyond the body of the chuck at all. This is a great feature for a young or beginning turner because they cannot be raked by the spinning jaws, which can leave a nasty wound.

Disassembly should be part of regular maintenance to keep the chuck accurate. You will have to remove the safety screw, or the top jaws in the case of the Oneway. Remove the bottom jaws and even the scroll for a very dirty chuck. Brush everything off and reassemble. Coating everything with paste wax or a dry lubricant like Dri-Slide® greatly enhances performance. The jaws are



A screw in a Oneway chuck (left) turns it into a heavy-duty screw chuck for roughing bowls.

Below, the author prepares a dovetail-shaped mortise for mounting in the NOVA chuck (inset below).





Setting dividers to the radius of the jaws when they form a perfect circle helps get a sure hold when reversing a bowl to turn its inside.



Most manufacturers taper the outside and inside of their jaws to form a dovetail shape.

numbered and have to be inserted and engaged by the scroll in numerical order. Once the chuck is reassembled, replace the safety screw or the top jaws and open it as far as possible. Now pull on each jaw and make sure they are engaged by the scroll. The jaws not centering is a sure indicator that the scroll did not grab them in order.

All chuck manufacturers offer a heavy screw in the 3/8" to 1/2" range. When the screw is gripped in the jaws, it converts the scroll chuck to a screw chuck, which is most useful to a bowl turner. To use these screws safely, you must be sure to have the head of the screw behind the top jaws and further ensure that

the bottom jaws engage the flats on the head.

All manufacturers, except Oneway, put a back taper (dovetail shape, photo, below left) on the outside of their jaws. By grinding a scraper to a mirror image of this taper, you can scrape a dovetail-shaped pocket in the base of the bowl. The jaws will then expand into this dovetail, giving a sure hold that is less susceptible to being pulled off the chuck. Oneway has a double edge on the outside face of their jaws, which works best with a mortise with straight sides.



Ernie Conover is the author of The Lathe Book, Turn a Bowl with Ernie Conover and The Frugal Woodturner.

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Moisture Meters in the Home Shop

KEEP TABS ON THE MOISTURE CONTENT OF YOUR GREEN OR SEASONED LUMBER WITH ONE OF THESE HIGH-TECH INSTRUMENTS.

Have you ever thought to yourself: “It would be so much fun to cut down a tree, slice it into lumber and make something from it!”? If so, you are not alone. We’ve heard from many of our readers saying that going from tree to fine furniture is something they’d really like to try. Even if you are not interested in the soup-to-nuts idea, perhaps you like the

concept of getting lumber from a local sawmill. Often, the price and unique selections of local wood species found with these smaller production sawyers can deliver a real bargain. (And who does not like a bargain?) But with the great price and added enjoyment of an excursion to a non-typical lumberyard comes the must-know question: “How well is the wood seasoned?”

Water in the Wood

The bottom line is, wood needs to be properly dried to be usable — especially for fine woodworking. Just to give you an idea of how much water needs to be removed at harvest, when a tree

is newly cut down, the weight of the water in the wood can easily be equal to or greater than the weight of the wood fibers.

Small lumber producers can deliver anything from perfectly dried and ready to work stock (either air- or kiln-dried), to just sawed boards fresh out of the forest and saturated with water. (So wet, in fact, that if you run the wood through your table saw you will get sprayed as you cut!) You can also be sold lumber that is somewhere between those two extremes. So, how do you know if your wood is ready to use or not? There is only one practical way: by using a moisture meter. (You could take the lumber, stick and stack it properly somewhere dry and just wait a long time, like a year for every inch of board thickness, but you’d still be guessing — it would just be a very safe bet.) And it’s a serious question, because it’s not too strong a statement to say that the primary consideration in solid lumber joinery is how to deal with wood movement.

Do You Need a Meter?

If the only lumber you ever use is procured from a regular lumberyard, woodworking specialty store or a legitimate Internet wood seller, you may never need a moisture meter. But if you use lumber from a source whose drying process or effectiveness is a bit sketchy or simply unknown — including reclaimed or found



wood or boards that a friend has given you — then a moisture meter can be a real benefit in your home shop.

In general, it makes absolutely no difference if wood is air-dried or kiln-dried ... it just needs to be at its proper Moisture Content (MC). As we all know, even after a piece of wood is properly dried, its MC will still vary enough to display expansion and contraction as it adjusts to the Relative Humidity (RH), but it will never regain the amount of water it had when it was harvested.

How Do They Work?

All of the moisture meters appropriate for home shops apply a weak electric current to the wood and measure the electrical resistance they find. Wetter wood has less resistance than drier wood, and the meters calculate the MC from their findings.

There are a couple of other things that commonly affect the electrical resistance of the wood: temperature and the density of the wood. So if you are checking out the moisture content of some stock in an outdoor lumber shed in Minnesota in February, it would be useful to have a meter that adjusts for temperature — not all of them do. All of the small shop practical moisture meters make some adjustment

for wood density to one degree or another. Some make very specific adjustments based on wood species, and others are simply selections of hardwood versus softwood. (Hardwood is generally more dense and softwood generally less so.)

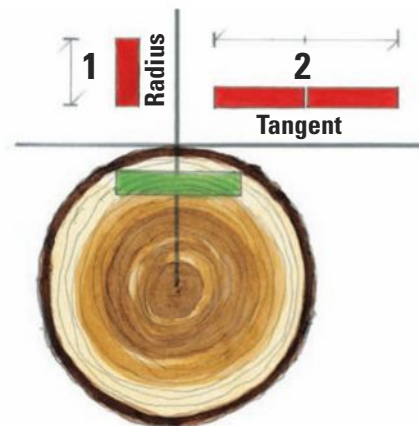
Additionally, these moisture meters break down into two groups — those with pins and those without pins. To use the meters with pins, you simply push the pointy ends into the wood and hit a button. The electrical field will run between the pins and the meter will do its calculation. The pinless style projects a three-dimensional electric field and measures the variations within that field to calculate the MC. (Editor's note: when using a pinless moisture meter on rough-sawn lumber, it's a good practice to carry a block plane with you to smooth a small patch of wood for testing. Refer to your moisture meter's user manual for proper use instructions ... but in any case, this is a reasonable caution.)

What Happens When the Water Leaves



By looking at this close-up photo of the end grain of red oak, it is easy to understand how water can be held in the vessels, pores and fibers of a live tree. When that water is removed, something has to give.

During the initial drying process of newly harvested and sawn lumber, the wood shrinks as a tremendous amount of water must be taken out of the wood. It is best done in a controlled manner, or flaws and distortion can develop.



A crosscut of a tree essentially produces a circle. As such, it has a radius and a tangent. Wood will shrink twice as much on the tangent as it will on the radius, and this is called differential shrinkage. So, in a flatsawn board (shown in green), the board will shrink twice as much across its width (tangent) as it will in its thickness (radius).



Note the annual rings in this example of a flatsawn board. Here, there is more tangential exposure on the tangential face on the top of the board than on the bottom of the board. For that reason, the tissue on the top of the board will shrink more than the bottom of the board. In this instance, this board will cup as it dries.

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Lignomat Mini-Ligno ED
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Wagner MMC220
\$395

How to Use Them

Sadly, for those of us who just like to take a tool out of its box and start using it, moisture meters require a bit of setup and some time with the instruction manual (more time with some, and less with others). At a very high level, the meters must be set for the type of wood you are testing: hardwood or softwood, and in some cases what species of wood. Then you should take a few sample readings along the board or boards, checking the MC, which is given in terms of a percentage. The ideal MC for hardwood intended for fine woodworking varies to some degree with geography — specif-

ically in relationship to the average RH of the region. In general, hardwood should be dried to a 6 to 8% MC, which will be just right for most of the United States. In the desert Southwest, 4 to 6% is better, and in the very humid Southeastern states, 8 to 10% is an acceptable target. Softwoods are dried a few percentage points higher MC in comparison to hardwoods: 10 to 12% is the ballpark (with regional adjustments for RH applying here as well). The goal is to get well-seasoned wood that will not move excessively after it has been machined into its final shape.

But with those guidelines in place, there are a few things that

you might want to know. For example, if you have a project where you want to bend hardwood, using stock that is at about 25% MC will make your work much easier. You'll need to let it dry completely after bending, but you'll have fewer fractures and an overall easier time of it at the higher MC. And if the primary use for your wood will be outdoors, then you can again stop at a higher MC ... 10 to 12% for hardwood and even higher for softwood. Once again, being able to make use of lumber at these various MC ratings is only truly possible if you know what your wood's MC is, and that requires a moisture meter of some sort. Which is just one of the reasons why they are finding themselves in more home shops every day.



WOOD MOISTURE AT A GLANCE

Recommended Moisture Content for Woodworking:

- Fine woodworking:

Hardwoods	6% to 8%
Softwoods	10% to 12%
- Outdoor woodworking:

Hardwoods	10% to 12%
Softwoods	14% to 16%

Key Terminology:

- Moisture Content: MC (given in terms of a percentage)
- Relative Humidity: RH (affects dried wood's seasonal MC percentages)

A Weighty Question

How did MC calculations get done before electricity? One way was by weighing a sample of the wood before drying and then after the drying process. The formula looks like this:

$$\frac{(\text{wet sample} - \text{dry sample}) \times 100}{\text{dry sample}}$$



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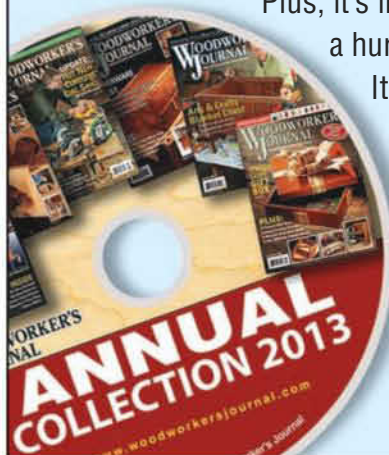
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Shop Test: Is Your Band Saw Ready for Carbide?

THERE ARE ADVANTAGES TO CARBIDE-TIPPED BAND SAW BLADES. SO WHY AREN'T THEY IN MORE HOME SHOPS?

Most woodworkers use carbon steel saw blades on their band saws. They come in a wide range of widths, tooth configurations and even quality. Carbon steel blades are not excessively expensive, especially in the 93½" and 105" sizes that fit the ubiquitous 14" band saws that have become a true shop favorite over the years. On the other hand, carbide-tipped band saw blades are not common. This, despite the fact that they have been on the market for a number of years now. I wanted to know why this is the case, and why they have not taken over the category as has happened with all manner of circular saw blades.

Ask the Experts

Even though I have been woodworking for decades, I had never personally used a carbide band saw blade. So before I even put one on a saw, I got in touch with three experts, people who make and sell these blades: Torbin Helshoj of Laguna Tools, Tom Davies of Suffolk Machinery and Joe Maidio of LENOX Tools.

To start with, I wanted to know what advantages this technology

provides for a woodworker. All of them zeroed in on how much smoother the cuts are with a carbide-tipped blade, pointing out the advantages that come along with that fact: less sanding and less waste. The kerfs formed are narrower than with the carbon steel blades, but because you also need less jointing or sanding to smooth out the saw marks, yield can be increased.

Durability was also a point that they all agreed on. These blades will last longer, and their teeth can be resharpened. Tom Davies reported that in some very specific operations, a carbide blade may exceed the run time of a standard blade by as much as 15 to 1. All of our experts also agree that, when it comes to resawing, the carbide blades are a far superior product. With virtually no blade drift to account for, plus a thin kerf and a silky-smooth finish on the surface of the wood, these saw blades make resawing a much easier operation.



Band saw blades with carbide teeth have been around for a long time, but have yet to make a significant entrance into the regular Joe or Josephine's woodworking shop. Here, our author uses the blades on a 14" 1½hp band saw and a 16" 3hp saw and reports on his experience.

The Downside

If these blades offer such upside, why are they not more popular? The primary reason is that carbide blades are so much more expensive than traditional carbon steel blades. For example, a quick look at rockler.com shows the 93½" Laguna Resaw King 3/4" blade is priced at \$159.99. A comparably sized Olson band saw blade on the same site, at 39 cents per foot, would cost \$36.50 — which means you could buy four Olson steel blades for the cost of one carbide. Considering the extra work and complexity in making the carbide saws, the price difference is quite reason-



Very smooth surfaces are the first thing a woodworker notices when using a carbide-toothed band saw blade.

Resawing results significantly improve with these blades. The smooth face and absence of blade drift add up to superior results.



able — but still, 160 bucks is not chump change. In addition to cost, it's possible to knock teeth off of the blade if you hit a nail or other metal inclusion in the wood. Two of my three experts also said that carbide blades work far better with kiln-dried wood than with green wood. It's true for all thin-kerfed blades, as removing the swarf from green wood requires larger gullets and more power than for powdery dry wood sawdust.

My Experience

I used three carbide-tipped band saw blades to get an idea of what they can do: one on a 14" JET 1½hp band saw with a riser block, and two on a 16", 3hp band saw. Right from the first cut, I was impressed with the finish on the edges of the wood. Whether I was cutting a curve or slicing 1/8" x 3"-wide pieces from a board, the surface of the wood was exceptionally smooth by band saw standards. In fact, I've used carbide table saw blades that produced rougher surfaces.

Resawing delivered the predicted results. Just to kick things off, the first cuts I made on Laguna's Resaw King were to freehand 1/8"-thick sections from a 3/4" x 4" x 16" chunk of mahogany, no fence, no pencil marks, nothing — a foolish thing to try. Contrary to any reasonable expectations, I was remark-

ably successful despite my foolishness. The blade really did make the task easy.

Using the 1" blade on my 16" saw produced excellent resawing results on 9"-wide cherry stock while simply using the regular fence as a guide; in other words, no point fence. This impressed me, because even with 1" or wider carbon steel blades on the same saw, I always needed to use a point fence to get good results. (I did use a point fence on the 14" saw — it's the only fence I have for it.)

The 3/8"-wide blade delivered very controllable curve cutting and a smooth finish to the cuts. Because the blade had no perceivable blade drift, it was very easy to cut on the line.

With my cursory cutting attempts completed, my opinion of the blades is quite positive. They represent a serious upgrade over carbon steel blades in resawing and ripping. But the value equation, when considering increased quality over against the much higher price, leads me to say that I will continue to buy carbon steel blades for the foreseeable future. The standard blades produce good results at a reasonable price — and for me, they represent the best value. If your primary band saw

CARBIDE-TIPPED BAND SAW BLADES AT A GLANCE

Benefits:

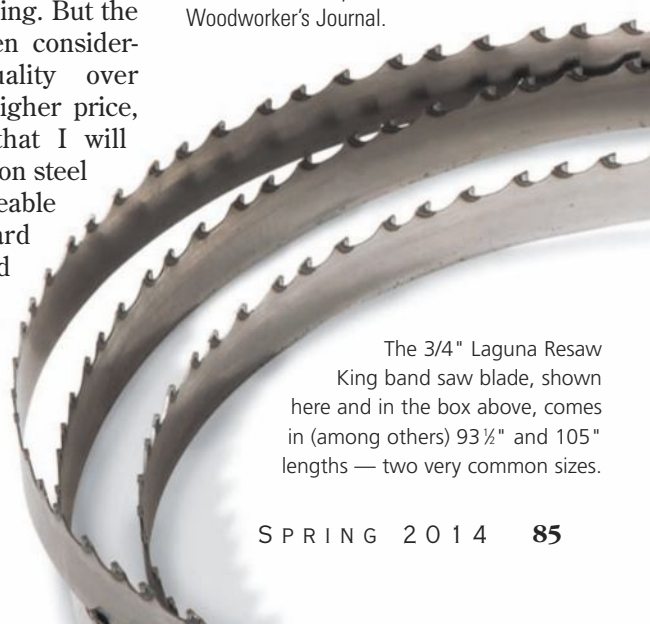
- Exceptionally smooth cuts
- Zero blade drift
- Superior resawing results
- Long blade life (per sharpening)
- Blades can be resharpened

Limitations:

- Very expensive
- Teeth are vulnerable to fracture or breaking off from metal strikes
- Limited blade selection (widths and lengths) from some manufacturers
- Challenging to use with green wood

use is resawing, that equation may tilt the other way. But unless the prices drop, these blades will be a rare visitor in my shop.

Rob Johnstone is publisher of Woodworker's Journal.



The 3/4" Laguna Resaw King band saw blade, shown here and in the box above, comes in (among others) 93½" and 105" lengths — two very common sizes.



One of our Kentucky readers has an unusual way of approaching a rip cut on his table saw. (Note: Guard and splitter removed for photos.)

Q I have a benchtop table saw and have always cut on the right side of the fence (i.e., the opposite side of how I see other users depicted in photos, etc.). I am right-handed, so it seems natural to cut this way, and I theorize it is safer should the cutoff or the workpiece itself be thrown back at me as less of my body is “in the line of fire.” Am I missing something?

David Long
Lexington, Kentucky

A Far be it from me to talk anyone out of working in a way that feels natural and comfortable to them, as long as they follow basic safety practices. Yes, using a table saw with the rip fence to the left of the saw blade allows you to feed the stock right-handed while standing clear of the workpiece, should it be launched by a sudden kickback. Even if this isn’t your daily practice,

some operations are best accomplished with a left-mounted fence. For example, trimming a large panel to size is easier when it’s supported by the saw’s extension table. However, if your table saw has a right-tilting blade, bevel cuts are best taken with the fence to the left of the blade. This prevents the cutoff piece from getting trapped between the fence and blade (an invitation for kickback!), and keeps the workpiece from being ruined should it lift during cutting.

There is one important reason I don’t recommend everyday use of a left-mounted rip fence: When feeding stock with your right hand, you simply can’t use your left hand to help guide it along. This isn’t an issue when ripping narrow stock with a push stick alone. But when cutting wider parts, your left hand is necessary for both stabilizing the part and keeping it pressed firmly

against the fence (plus, a standard saw has only about 1 foot of capacity left of the blade). Using the fence to the right of the blade is perfectly safe, as long as you:

1. Adopt the proper stance, keeping your body and arms out of the line of fire, should the stock be ejected.
2. Only rip stock with its fence-side edge jointed straight and square.
3. Always use a proper table saw guard fitted with a splitter and anti-kickback pawls.

— **Sandor Nagyszalanczy**

Q As a woodworker who is new to having an air compressor in my shop, I was surprised that in short order, there was a bunch of water in the air tank. So I drained the tanks, and a couple of days later, bango ... the same thing happened. My buddy said, “get



Drain the water from your compressor every day that you use it. Don’t let it get rusty like this.

used to it — there’s nothing to be done.” Is he right? Blowing water through my pneumatic tools can’t be good for them, right?

Bobby D. Johnson
Beaumont, Texas

Q&A & Readers' Tricks

Our editors often provide answers to tool-related questions from readers. Here's a sampling of some from our 2013 print issues. Readers also send in their favorite tool tricks. See pages 88 and 89 where we'll share a few with you.

Questions & Answers86-87

Tricks of the Trade88-89

A During the operation of the compressor pump, atmospheric air is compressed and condenses moisture into the tank. In general, the higher the temperature and the higher the max psi, the more that condensation will take place. This is a normal part of the compressor operation, which is why the tank has been outfitted with a drain valve (to drain this water from the tank). Compressor manuals and tank warning labels call for tanks to be drained daily. This is for two reasons:

1) To reduce the chance of water passing through the lines into air tools and onto work, as stated in the example. This is not good for either.

2) To reduce the chance of corrosion inside the tank. Regular tank draining can increase the life of the tank.

— James Vintzel

Q No one around here seems to be able to answer my biggest question about newer band saws, so I'm wondering if you can give me a logical answer. After reading and looking through numer-

ous books, magazines and catalogs, I find no explanation why or how they can list a saw as one size when it is not. If the saw is listed as 14", it should be able to cut 14", or 14 inches plus, on its table between the inside face of



Band saws are sized in inches ... but is it the size of the wheel or how wide a board it can resaw? Our reader wants some answers, and we deliver.

the blade and the saw's frame. The same with an 18" or 24". I would not buy a 1/2" drill bit if it would only make a 3/8" hole any more than I would buy 2" screws if they were only 1 1/2". Hope you can help me with this dilemma.

Lewis Kougher

Meadville, Pennsylvania

A Band saw sizes are derived from the diameter of the wheels in the saw. So a 14" band saw will have wheels that are 14" in diameter. But to clarify (we hope!), according to Rod Burrow, of RIKON Power Tools: "Band saws are sized by both wheel diameter and throat depth (blade to column). However, there is a guard on the column that protects the end user from the blade as it travels from the lower wheel to the upper wheel. The thickness of the guard is subtracted from the 'size' of the saw, resulting in the true throat depth." For that reason, a 14" band saw will usually have a throat depth (from the blade to the saw's frame) of around 13 to 13 1/4".

There is another measure that indicates how wide a board you can resaw. This will vary within a category — take the 14" class for example. Many 14" band saws can only resaw boards about 6" wide, while the newest JET 14" band saw will resaw boards up to 13 1/2" wide — more than twice as wide.

— Rob Johnstone

Tricks of the Trade



Scratch Awl from Recycled Screwdriver

Discarded screwdrivers tend to become paint can openers, but here's another way to give them a second life. When one reader needed a scratch awl, he took an old Philips screwdriver and gently reshaped the tip on a grinder. Then he sharpened the tip to a point using a piece of plate glass with sandpaper. The whole process should only take about 15 or 20 minutes. You'll end up with a fine awl at no extra cost.

Broader Shoulders Make for Better Planing

A shoulder plane set for a thin cut can adjust an uneven tenon shoulder. Trouble is, there isn't much bearing surface for the plane's sole to prevent accidentally rounding the shoulder's edge. So here's an easy fix: clamp a board beside the shoulder and align it to the amount of material you want to trim off. It provides more contact surface for the plane and keeps the shoulder's edge crisp and square.



Clamping a scrap alongside a tenon makes its shoulder easier to plane.



Tapering jig does double-duty as a supersized miter gauge.

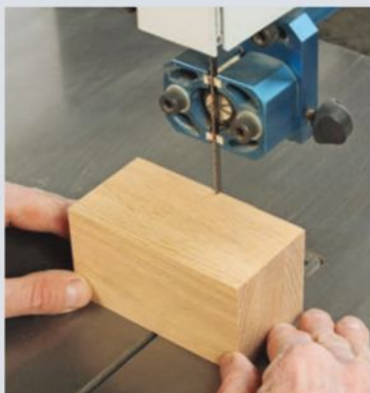
Supersized Miter Gauge

Some workpieces are just too wide to cut in one pass with a miter saw or too long and heavy to crosscut with a table saw's miter gauge. Here's a trick: use your V-style tapering jig (with the workpiece stop removed) held against the fence of a crosscut sled to set the cutting angle you need. It becomes a supersized miter gauge fence. Hold the jig and workpiece steady, and slide the sled through the cut as usual. Success!

No-slip Straightedges

Here's a way to improve the convenience of long metal rules and straightedges. Just affix strips of non-slip foam kitchen shelf liner to their back sides. You can use glue to attach the foam, but double-sided tape works well, too. The liner will hold your straightedge or rule firmly in place when taking measurements or drawing layout lines, and it doesn't scratch the contact surface on which you're working. It's a quick, useful upgrade.





Quick Check for Table Squareness

Every now and then, it's a good idea to check your band saw table for squareness to the blade. Here's a simple method: take a piece of flat, square-edged scrap and cut a shallow kerf into one edge, as shown in the photo above (left). Now pivot the block around so the kerf faces the back of the blade. If you can slip the kerf into the blade from the back side, you know the table is square. But, if the cut doesn't line up, as shown in the photo (right), the table needs some fine-tuning with a combination or engineer's square. Try the kerf-cutting trick again to check your adjustments after you've made them.



Air Hose Stopper

With several air hoses but only one compressor in her shop, one reader discovered that the hoses that weren't being used would gather debris — in her case, two spiders, a spider nest and a ball of mud. As a remedy, she now caps the open ends of the hoses with a plastic wine cork drilled with a blind hole in one end. It stretches and fits over the male coupling perfectly and costs her nothing to make.



Socket-assisted Speed Clamping

Tightening clamps doesn't have to cause hand strain anymore. Just drill and tap the ends of your wood-handled bar clamps for 5/16" machine bolts and nuts. By adding a nut beneath the bolt head, you can increase the surface area, giving you better purchase with a socket. This way, you can clamp or unclamp with the aid of a drill/driver, socket adapter and socket. Use #5 hardened nuts and bolts for longer life and some thread locker to hold them in alignment. Epoxy the hardware into the tapped holes, and you'll be all set for quicker clamping that's easier on your hands.



This clamp tightening trick is especially useful to woodworkers struggling with arthritis or carpal tunnel syndrome.

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