TOOL TEST

# Lithium-Ion Cordless Kits

These new tools promise longer runtimes, lighter batteries, and impressive power. But do they deliver?

by Andy Beasley

Imagine you can travel back and forth in time. You arrive at a job site 30 years in the past and tell your helper, "Grab the cordless rotary hammer and set up the laser level while I call the lumberyard on my cellphone." He'd probably ask what you'd been drinking.

Next, leap forward 30 years from now and ask your sidekick to roll out the extension cords. Chances are, you'd get the same reaction.

Plug-in tools are far from obsolete, but if all the hype we've been hearing is to be believed, the introduction of cordless tools powered by lithium-ion batteries may be the beginning of the end.

## The Technology

Lithium ion is not inherently more powerful than its older, nickel-based competitors, nickel cadmium (nicad) and nickel metal hydride (NiMH); 18 volts is 18 volts regardless of battery design. But it can cram comparable amounts of potential energy into a package that weighs as much as 45 percent less.

Low-voltage lithium-ion batteries have fueled cameras, cellphones, and laptops for years. Only recently, however, have manufacturers figured out how to build high-voltage lithium-ion batteries that aren't prone to overheating. Once Milwaukee overcame that hurdle in 2005, most of the other major tool-makers rushed to follow suit.

The result has been a volatile market, to say the least. Among the tools I tested, one manufacturer's offerings are clearly not ready for prime time and another's won't be available for purchase until June, despite promises of an earlier rollout. Yet another maker chose to delete the circular saw from its combo kit just before this review went to print, though the saw will continue to be offered as a stand-alone tool. (Individual tool reviews start on page 69.)

***Overheating.*** In contrast to the nicad market, in which most manufacturers outsource their batteries from a single supplier (Panasonic), the lithium-ion revolution has spawned a variety of power packs from rival companies. For the most part, the differences between competing products — proprietary chemical


Because lithium-ion batteries run strong up until the end, some makers — including Milwaukee (left), Metabo (center), and Ridgid (right) — provide LED charge indicators to warn users they might not have enough juice to finish the job.


Makita's 18-volt lithium-ion battery (left) is no bigger than a 12-volt nicad; DeWalt's 36-volt battery is quite a bit heftier.

Bosch's Flexible Power System gives users a choice of 36-volt battery packs (top): the SlimPack for lighter weight or the FatPack for longer runtime. The battery packs for both of Milwaukee's lithium-ion drills can be installed facing backward (left) or forward (right).

formulations, internal battery protection circuits, air vents, and the like — simply represent various ways to prevent overheating. Even with those safeguards, most makers warn that you can destroy a battery if you deliberately overstress the tool — by trying to break a bit free from a hole by repeatedly squeezing the trigger, for instance.

***More with less.*** A typical nicad battery is a collection of individual cells, each of which can produce about 1.2 volts. To make a 14.4-volt power pack, 12 cells are combined; add three more and you've got 18 volts. Since the only way to add power is to add cells, you can end up with a tool that's too heavy to do the job.

Lithium ion presents an attractive alternative because one cell — which weighs about the same as a nicad cell — can produce about 3.6 volts.

This ability to do more with less has inspired various manufacturers to head off in different directions. Some, such as Hitachi and Makita, have chosen to put 18-volt power into a nimble package comparable in size to a 12-volt nicad. Others, such as Bosch and DeWalt, have built 36-volt powerhouses that aren't much bulkier than 18-volt nicads.

***Further advantages.*** If you leave a pack in the case for a few weeks, you'll appreciate the molasses-slow discharge rate of these new batteries. During a month of inactivity, a lithium ion's charge will decline by less than 2 percent. Compare that with a nicad, which will lose 20 percent of its charge during the same amount of time.

Also, whereas nicad performance tapers off as the battery runs low, lithium-ion power output remains consistently high almost to the end. In fact, I found that most of the tools didn't begin to slow down until moments before they died. To prevent surprises, several makers incorporate LED "fuel gauges" on their batteries. It's a good idea to check these before worming your way to the far end of a crawlspace or climbing to the top of a scaffold.

Impartial experts agree that lithium-ion batteries can endure many more recharging cycles than their nicad cousins. However, only time will tell whether you'll get two to three times as many charges with them, as most manufacturers claim (published predictions range from 1,200 to 2,000 cycles).

Except for the Ridgid model, all the circular saws have blades mounted on the left side.


DeWalt makes the only full-size (7 1/4-inch) cordless circular saw — and the only one to incorporate a tool-free blade-change mechanism (left). Milwaukee's V28 circular saw features comfortable handles and a well-hidden blade-change wrench (right).

***Not cheap.*** Street prices for these kits average $600; a comparable 18-volt nicad setup can be found for half that. There is another option: Hitachi, Metabo, and Milwaukee have designed their 18-volt lithium-ion batteries to be compatible with their 18-volt nicad tools, which gives users a way to upgrade with only a modest investment.

***Circ saws excepted.*** The improved performance afforded by lithium ion means that more and more jobs that previously required a plug can be accomplished equally well with a cordless tool. If you were to purchase one of the higher-voltage combo kits (28 volts or higher), you might be able to do away with corded drills altogether, and you could probably leave your corded recip saw on the bottom of the job box.

But until the big tool companies discontinue their AC-powered circular saws, no one can argue that plug-ins are passé. In the cordless market, the circular saw remains the elusive Holy Grail; a full-time cutter for a busy framing crew still needs a plug.

## Testing, Testing

I rounded up eight kits for this head-to-head contest. With two exceptions, each kit contained a circular saw, a reciprocating saw, a hammer drill, a work light, a charger with two batteries, and a carrying case.

One exception was Metabo; its kit featured a standard driver/drill that does not have a hammer function. The other exception was Bosch. Its combo kit was so


The blade clamp on DeWalt's reciprocating saw contains an extra slot so blades can cut side to side as well as up and down (above). Makita's recip saw has a sturdy swing-out rafter hook plus an LED task light that illuminates the cut line (left).

new the manufacturer was not able to provide a work light in time to meet our publication deadline.

Before testing, I ran each battery through at least five cycles. I used only fully charged batteries for each of the measured tests. Tool testing is a subjective process, so I tried to minimize any biases of my own by making measurable, apples-to-apples comparisons whenever possible.

For the circular saws, I compared runtimes by counting the number of 2x4 crosscuts a saw could make before its power noticeably dropped off. I used the manufacturer-supplied blades, and I stopped and started the saws between each cut.

For the reciprocating saws, I followed the same 2x4 crosscut procedure to compare runtimes. I also tested the saws' power by timing them as they crosscut a 4x8 pressure-treated beam that had three 16d nails embedded in the blade's path. To keep feed pressure consistent,

## Kit Specifications

| | | 36-Volt | | 28-Volt & 24-Volt |
|---|---|---|---|---|
| **Manufacturer**<br><br>**Model** | | **Bosch**<br>boschtools.com<br>877/267-2499<br>**CPK40-36** | **DeWalt**<br>dewalt.com<br>800/433-9258<br>**DCX6401** | **Milwaukee**<br>milwaukeetool.com<br>800/729-3878<br>**0928-29/V28** |
| **Street Price** | | $750 | $800 | $730 |
| **Power Supply** | **Voltage** | 36 | 36 | 28 |
| | **Amp-hours** | Fat: 2.0/Slim: 1.3 | 2.4 | 3.0 |
| | **Battery fuel gauge** | Yes | No | Yes |
| | **Recharge minutes** | Fat: 60/Slim: 30 | 60 | 60 |
| | **Additional battery cost** | Fat: $180/Slim: $130 | $170 | $150 |
| | **Batteries and charger compatible with nicad tools?** | No | No | No |
| **Circular Saw** | **Weight** | 10.2 lb (w/FatPack battery) | 10 lb | 9.6 lb |
| | **Blade diameter** | 6½" | 7¼" | 6½" |
| | **Rpm** | 3,600 | 4,000 | 4,200 |
| | **2x4 crosscuts per charge** | Fat: 202/Slim: 131 | 228 | 221 |
| | **Power (subjective rating)** | Excellent | Excellent | Good plus |
| **½-Inch Drill** | **Weight** | 7.2 lb (w/FatPack battery) | 7.2 lb | 6.8 lb |
| | **Speeds/Max rpm** | 2/1,500 | 3/1,600 | 2/1,800 |
| | **Hammer function** | Yes | Yes | Yes |
| | **1" holes in 2-by per charge** | Fat: 138/Slim: 79 | 170 | 184 |
| | **Time to drill ½" hole 3" deep in concrete** | 64 seconds | 52 seconds | 33 seconds |
| **Recip Saw** | **Weight** | 9.2 lb (w/FatPack battery) | 8.4 lb | 9.2 lb |
| | **Spm** | 2,400/3,000 | 3,000 | 2,000/3,000 |
| | **Stroke length** | 1⅛" | 1⅛" | 1⅛" |
| | **2x4 crosscuts per charge** | Fat: 133/Slim: 73 | 121 | 112 |
| | **Time to crosscut 4x8 PT beam with embedded nails** | 35 seconds | 21 seconds | 32 seconds |
| **Work Light** | **Runtime (hours + minutes)** | N/A | 5 + 00 | 5 + 15 |
| **Kit** | **Accessories** | Bag, rip fence, aux. handle | Case, rip fence, aux. handle | Bag, rip fence, aux. handle, belt clip |
| | **Warranty** | Tools - 3 years<br>Batteries - 2 years | 3 years | 5 years |
| Other Compatible Tools Available | | Rotary hammer | Impact wrench, rotary hammer, jigsaw | Impact wrench, rotary hammer, band saw |

I hung a 12-pound weight from the front grip while holding onto the rear handle and squeezing the trigger. Although each kit came with recip blades, they weren't identical, so I installed a new Irwin blade in every tool.

Just as they do in the real world, the drills got a lot of work. I assessed their hammer capability by timing them while they bored a ½-inch hole 3 inches deep in concrete. I measured runtime by counting the number of holes they could drill through 2-by fir with a 1-inch self-feeding auger bit. And finally, I made subjective judgments about drill power and torque by boring with 1½-inch spade bits, and by driving a succession of screw sizes.

In addition to running these standardized tests, I scored tool ergonomics, warranties, accessories, and just about anything else I could think of. A few tests intentionally mirrored one in an earlier 18-volt nicad review in *JLC* ("Cordless Tool Kits," 3/02); I wanted to

## Kit Specifications

| 28-Volt & 24-Volt | 18-Volt | | | |
|---|---|---|---|---|
| **Ridgid**<br>ridgid.com<br>800/474-3443<br>**24v XLi** | **Hitachi**<br>hitachipowertools.com<br>800/706-7337<br>**KC18DBL** | **Makita**<br>makita.com<br>800/462-5482<br>**LXT401** | **Metabo**<br>metabousa.com<br>800/638-2264<br>**Combo 4.1** | **Milwaukee**<br>milwaukeetool.com<br>800/729-3878<br>**0920-29/V18** |
| $480 | $500 | $600 | $600 | $630 |
| 24 | 18 | 18 | 18 | 18 |
| 3.0 | 3.0 | 3.0 | 2.2 | 3.0 |
| Yes | No | No | Yes | Yes |
| 60 | 45 | 45 | 50 | 60 |
| N/A | $100 | $90 | $120 | $100 |
| No | Yes | No | Yes | Yes |
| 9.2 lb | 7.6 lb | 7.6 lb | 9.8 lb | 8.8 lb |
| 6½" | 6½" | 6½" | 6½" | 6½" |
| 3,900 | 3,400 | 3,700 | 2,500 | 3,200 |
| 182 | 147 | 124 | 91 | 171 |
| Good | Fair | Fair plus | Fair | Good plus |
| 6.8 lb | 5.4 lb | 5.2 lb | 4.6 lb | 6.2 lb |
| 2/1,500 | 2/1,800 | 3/1,700 | 2/1,450 | 2/1,700 |
| Yes | Yes | Yes | No | Yes |
| 111 | 107 | 93 | 71 | 106 |
| 45 seconds | 71 seconds | 69 seconds | N/A | 75 seconds |
| 9 lb | 8 lb | 7 lb | 8.7 lb | 8.6 lb |
| 2,500 | 2,100 | 2,900 | 2,600 | 2,700 |
| 1 3/16" | 1⅛" | 1⅛" | 1 1/16" | 1⅛" |
| 99 | 79 | 45 | 42 | 83 |
| 37 seconds | 36 seconds | 36 seconds | 48 seconds | 42 seconds |
| 5 + 05 | 5 + 45 | 4 + 10 | 3 + 15 | 3 + 45 |
| Bag, rip fence, aux. handle | Bag, rip fence, aux. handle | Bag, rip fence, aux. handle, depth stop | Case, rip fence | Case, rip fence, aux. handle |
| lifetime | 5 years | 3 years | 3 years | 5 years |
| None | Impact wrench, impact driver, drill/driver | 14 total | Rotary hammer | 13 total |

Milwaukee's V28 drill includes a secure, two-piece belt clip that attaches to either side of the tool (left). The 18-volt drills from Makita (below left) and Hitachi (below right) also feature useful belt hooks — as well as compact but effective task lights. The red switch on the Hitachi's handle limits the range of the variable-speed trigger, effectively giving the user a choice of four steady speeds.


As a rule, soft-sided bags like Makita's (left) are easier to load and carry than hard-shell cases. Putting the tools back into the right place in DeWalt's case (right) can be a challenge.

see if the lithium-ion tools lived up to their promise of improved performance. The upshot? In the earlier *JLC* test, the average reciprocating saw crosscut 43 2x4s and the circular saw 124. But the new recip saws in the three 18-volt 3.0–amp-hour lithium-ion kits worked harder: They averaged 69 cuts and the circular saws 147. And the higher-voltage lithium-ion tools did even better.

## Choosing the Right Kit

This is my favorite part of any tool review — where I tell other people what to do with their money. Of course, which kit you should buy — if any — depends on your particular circumstances and preferences.

If your present tools are getting the job done efficiently, don't buy anything. Wait to see what develops in the adolescent lithium-ion market. Prices will almost certainly come down as competition increases.

If you already own a Hitachi, Metabo, or Milwaukee 18-volt combo kit, consider replacing the batteries — especially if they're nearing the end of their useful lives — with compatible lithium-ion ones and a new charger.

If you're looking for an 18-volt level of performance in a new combo kit, I'd recommend the Milwaukee V18 group (for sheer power) or the collection from Makita (for superior ergonomic design but less power).

If cutting-edge performance is what you want, your best bet is the DeWalt or the Milwaukee V28. In terms of overall power, DeWalt wins hands-down. Besides packing a lot of juice, this kit fielded the highest-scoring circular saw and reciprocating saw. The work light was my favorite, too. But nobody would call the DeWalt tools nimble. That's why, if I were spending my own money, I would choose the Milwaukee V28 kit. Its tools are lighter and more ergonomic than DeWalt's but still plenty powerful; the V28 drill was the top performer in the test. I also really liked the battery fuel gauge.

***Andy Beasley** is a veteran woodworker in Monmouth, Ore.*

# 36-Volt Kits

## Bosch CPK40-36

For testing purposes, Bosch was able to provide ready-for-market tools, but the complete combo kit won't be available to buy until June. Although the kit will include a flashlight, one was not available when pictures were taken for this article.

Bosch offers a choice of battery packs for its 36-volt tools: the portly FatPack for heavy-duty applications or the svelte SlimPack for lighter work. The kit I tested came with one of each. Bosch also plans to offer a combo containing two SlimPacks (CPK41-36) and one with two FatPacks (CPK42-36).

I'd definitely go the FatPack-only route. These are large, robust tools, and the FatPack battery makes them competitive with the best on the market. With the SlimPack you get a slightly less heavy tool, but it's underpowered compared with its 28- and 36-volt competitors, and clunkier and more expensive than the lightweight 18-volt units.

The circular saw is plenty powerful, though its runtime was a bit disappointing. Slightly aft-heavy, it has excellent grips and controls. I liked the depth-of-cut scale and the sturdy rafter hook. I didn't like the way the blade-change wrench kept falling out of its storage hole.

The drill is first-rate. It's very well-balanced with either size of battery attached. All controls performed perfectly and were easily accessed with or without gloves.

Powered by a FatPack battery, the reciprocating saw easily won the 2x4 portion of the test, but ran third in the nail-embedded 4x8 portion. I liked the heavy-duty rafter hook and the one-handed blade clamp, which remains open until a new blade is inserted.

## DeWalt DCX6401

The power and runtime of these 36-volt tools are truly impressive, but lightweights they're not. This is a unique line of tools for DeWalt, so the batteries are not compatible with any of the company's earlier nicad models.

The circular saw was among the heaviest I tested, but it was the only one with a full-size $7^1/_4$-inch blade; it also sports a unique tool-free blade-change feature. It's well-balanced and all controls are easy to access, even with gloves on. It squeaked past the Milwaukee V28 saw to earn the top circular-saw rating for power and runtime.

The drill was also a heavyweight; although well-balanced, it became a real handful by the end of the day. Controls are merely adequate: The mode-selector ring, which determines whether the unit will function as a rotary drill, hammer drill, or screwdriver, is too narrow and the speed control slide is too stiff. Performance was excellent in all modes, however. It placed second among the drills.

I was particularly impressed with DeWalt's reciprocating saw. Not only was it more powerful than its competitors, but — despite its huge battery — it was also the most comfortable to use and is packed with user-friendly features. The tool-free blade change and the push-button shoe adjustment are excellent. But the standout detail is the blade clamp, which accepts blades either vertically or horizontally, meaning the teeth can point up, down, left, or right. It's like having a rotating handle, only simpler.

# 28-Volt & 24-Volt Kits

## Milwaukee 0928-29/V28

If I were spending my own money, this is the kit I'd buy. All the tools have plenty of power and are a pleasure to operate. They travel in a roomy no-frills bag that's easy to load and lug. The powerful batteries feature a four-light fuel gauge and a tactile rubber coating; unfortunately, they are not compatible with any other Milwaukee tools.

Even though it finished a whisker behind the DeWalt 36-volt circular saw in overall performance, the Milwaukee V28 was my favorite circular saw. The two rubberized hand grips feel great, the balance is good, and all controls are easy to use. One beef: The front blade guard — an otherwise useful safety feature — obscures the cut line when the saw is set on a bevel.

The drill was the top performer of all the ones I tested. It is fairly heavy but still a pleasure to use, thanks to a comfortable contoured grip and superb balance made even better by a battery pack that can be attached to face forward or backward. I also liked the two-piece belt clip. My only complaint is that the speed-selector switch frequently got stuck between the high and low settings.

The reciprocating saw is both solid and well-balanced, and it offers two speed ranges. The tool-free blade clamp and shoe adjustment worked fine. I also liked the engraved "max" line on the shoe, which made it easy to find the last locking detent (the Milwaukee V18 has the same feature).

## Ridgid 24v XLi

The week before this issue went to the printer, I found out that Ridgid was dropping the circular saw from this kit; it will still be sold as a stand-alone tool for $100 (without a battery). The price given in the chart on page 67 reflects the cost of purchasing the new combo ($380) plus a circ saw.

Of all the circular saws I tested, the Ridgid model was the only one to mount the blade on the right side, as a traditional sidewinder does; it was also the only one with a nonmetal shoe. Overall, the balance and ergonomics were acceptable, but the location of the front hand grip on the motor housing (not in line with the handle) would make it awkward for a left-hander to operate.


The drill felt solid and well-balanced. Although the controls mostly worked well, the mode-selector switch occasionally got stuck in "Driver" mode. Also, after I used the hammer feature to bore concrete, the chuck locked and refused to cough up the bit. Unlike the other drills I tested, this one doesn't have a bit holder on the tool body.

The reciprocating saw is a sturdy workhorse, but its chubby barrel grip made it the least comfortable to use. It seemed to vibrate more than its peers, but my objectivity may have been clouded by the uncomfortable grip. Both the blade clamp and the shoe adjustment are tool-free and easy to use.

# 18-Volt Kits

## Hitachi KC18DBL

These nimble tools make the most of lithium ion's weight advantage. The batteries and charger are compatible with some of Hitachi's existing nicad tools. The large bag has plenty of room for tools and accessories, but its black lining makes it hard for aging eyes to locate loose bits and blades.

The circular saw is the least desirable tool in the kit. There's a lot of plastic, the markings are poor, and there's no on-board wrench for blade changes. A task light actuated by the trigger safety switch shines from the right side and casts a troublesome shadow. Overall, it's not a tool for serious work.

The lightweight drill, on the other hand, is a solid performer, with easily accessible controls and one unique feature: a switch that limits the range of the variable-speed trigger, effectively giving the drill four steady speeds rather than two. The drill also comes with an adjustable belt hook and an effective task light. The rubberized grip is a nice touch, though the handle feels as if it's tapered the wrong way (larger at the bottom than at the top).

I really liked the power and the feel of Hitachi's reciprocating saw, but it has some annoying quirks. The blade-release lever is accessible only with the blade completely extended, and the clamp's small size makes it tough to operate with gloves on. I was also disappointed to find that the wrench I needed for adjusting the shoe is not stored on the tool.

## Makita LXT401


These are some of the most comfortable cordless tools I've ever used. They travel in the best soft bag of the bunch: heavily padded and loaded with pockets, yet smaller than the others. The fan-cooled charger was also a favorite. It accepts a wide range of battery types, and has easy-to-understand charging-status lights and a spring-loaded cover to keep the terminals dust-free.

Though not a powerhouse, the circular saw is exceptionally well-balanced. The controls are a bit small but work well, and the saw was the only one with set screws at both 0-degree and 45-degree bevel stops. I didn't like the dust chute much because it funneled the debris directly onto my pants, but an accessory dust-collection pickup is available.

The drill is the lightest of the hammer models — its superb grip and balance make it an ergonomic dream. Controls and markings are excellent, but the speed selector is balky at times. Maximum clutch torque was a little weak — the drill balked at tasks the heavier tools could handle. This handy tool also features a useful task light and a belt hook.

The reciprocating saw was very comfortable to use. Both the shoe adjustment and the blade change are tool-free, but, as with the Hitachi, I sometimes had to pulse the trigger to extend the blade far enough to access the blade-release mechanism. The saw also features a useful task light — directly in line with the blade — and a sturdy swing-out rafter hook.

## 18-Volt Kits (continued)

### Metabo Combo 4.1

I've used several Metabo tools over the years and have always found their quality and performance to be top-notch. Nevertheless, I can't find much reason to recommend this kit. None of the tools have enough power and runtime to be competitive with their 18-volt peers, and the awkwardly shaped hard-plastic hand grips are the opposite of ergonomic.

On the plus side, the batteries are compatible with Metabo's existing 18-volt tools, and the charger accepts a wide range of Metabo batteries.

A banana-shaped grip and poor balance make the heavy circular saw exhausting to use for long periods. The bulky saw body also obscures the cut line when beveling. One feature I did like was the swiveling, rear-mounted dust port.

Of all the drills I tested, the Metabo driver/drill was the smallest and weakest. Although its compact size allowed it to fit in spaces too tight for any of the other drills, its stubby front end made it hard for me to get a grip on the conical clutch ring, especially when I was wearing gloves.

The reciprocating saw was even more disappointing. Its slick grips and sloping rear handle were uncomfortable to hold, especially when I was using the tool upside-down. Another disappointing feature was the trigger safety switch. This device is standard equipment on circular saws, but I found it to be nearly unworkable on a tool that is often held upside-down and sideways. On a positive note, the tool-free blade-change mechanism worked great.

### Milwaukee 0920-29/V18

Although not as capable as their high-voltage siblings, these tools were the best of the 18-volt group, with excellent power, runtime, and quality. The charger accepts various nicad and lithium-ion voltages. The batteries are compatible with other Milwaukee 18-volt tools.

The circular saw is an excellent tool with a sturdy metal shoe and blade guard. The controls, grips, and balance are outstanding. Like its big brother V28, the kit comes with a first-rate rip fence but has the same front blade guard that obscures the cut line when beveling.

The drill's overall feel and balance are superb. All controls are clearly marked and easy to operate, and the battery pack attaches two ways for optimum work access and balance.

The reciprocating saw is a solid tool, but it doesn't match the terrific performance of its siblings in this kit. It's well-balanced with decent hand grips that could be improved with some rubber on the plastic rear handle. The tool-free blade clamp and shoe-adjustment lever worked well enough; the shoe often got stuck, however, and was difficult to work loose. More troubling was the temperamental variable-speed trigger, which effectively has only two speeds: "off" and "hold on for the ride."

I also have to quibble about this kit's case. Whereas its big brother packs away in a relatively compact soft-sided bag, Milwaukee's smaller V18 combo comes with an unwieldy plastic case that I suspect most purchasers will simply throw out.