14.4-VOLT Cordless Drill-Drivers

Brute strength and extended run-times are crowd pleasers, but don't overlook the importance of light clutch settings for fine work

by David Frane

For this article, I tested ten professional-grade tools from nine different manufacturers: Bosch, DeWalt, Hilti, Hitachi, Makita, Metabo, Milwaukee, Panasonic, and Porter-Cable. I chose to focus on the 14.4-volt tools because they're a reasonable compromise between the lighter 12-volt and the heavier 18- and 24-volt models. Tradespeople seem to agree, because they buy more 14.4-volt drill-drivers than any other cordless tool.

We included three 15.6-volt drills from companies that don't make 14.4-volt tools. It's reasonable to include them because they have similar specs and performance; the only difference is an extra cell in the 15.6-volt battery packs.

The current specs are impressive, but what really counts is what the tools can do. The Porter-Cable model wasn't available till recently, but the rest of the tools showed up while I was doing a major kitchen remodel. Every day I used two or three different guns. This meant using them for everything from drilling holes for Romex and plumbing lines to installing drywall and cabinets. I also put the drills through a side-by-side test to get an idea of power and run-time.

Power and Weight

Manufacturers break cordless drill users into two distinct groups. The people in the first group want as much power as they can get and don't mind carrying heavier tools to get it. The people in the second group are willing to sacrifice power to get a light, maneuverable drill with superior run-time.

The split makes sense. People who frame, build decks, or work in subtrades like electrical, plumbing, and hvac drill big holes and drive lags and oversized fasteners. Only the bigger, heavier drills have the power to perform those tasks. People who do finish work like hanging doors or building and installing cabinets don't need that much power and can be more productive with a light, compact tool.

Judging by the tools, manufacturers seem to favor the workers who want more power. The last time this magazine looked at 14.4-volt drills was in 1999, when the most powerful tool produced 330 inch-pounds of torque in the low speed setting. This time around, the top performer put out 484 inch-pounds. But that increase in power comes at the cost of some added weight. The current crop averages 5 pounds apiece, which is a half pound heavier than the models we tested in 1999. And the heaviest 14.4-volt tools outweigh some 18- and 24-volt models.

Power-to-weight ratio. Ask a tradesperson for an opinion about a power tool and you're likely to hear how powerful it is for its weight. Most of us want as much power as we can get for the weight we carry. It's easy to feel the difference between the most powerful and the least powerful drills, but it's harder to judge power in relation to weight. I calculated power-to-weight ratios by dividing each tool's torque rating by its weight. That allowed me to compare drills on the basis of inch-pounds of torque per pound of weight. I used the manufacturer's torque specs but weighed the tools myself.

The Metabo and Bosch Brute have the highest torque ratings of the tools I tested. They also have the highest power-to-weight ratios. The Milwaukee drill is nearly as powerful but has a lower power-to-weight ratio because it's heavier. I wouldn't buy a drill just because it had a high power-to-weight ratio. But if I had to choose between tools with similar features and one had 10 more inch-pounds of torque per pound, that's the drill I'd get.

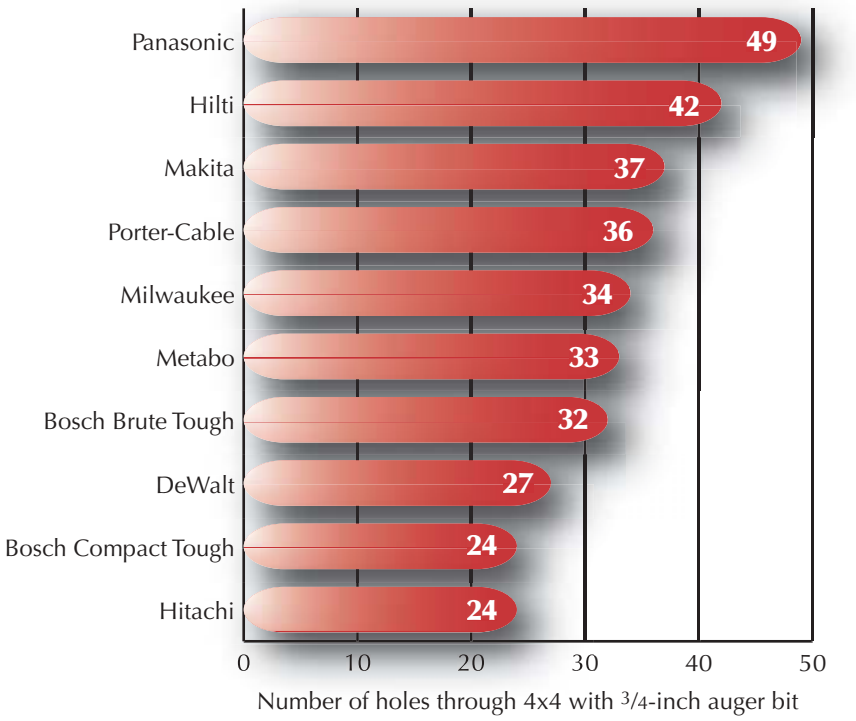

Figure 1. Drill run-time was tested by drilling holes through a 4x4 at low speed with a 3/4-inch auger bit. The number of holes each drill was able to bore on a single fully charged battery is shown.

Run-Time

Run-time is the amount of work you can do on a single charge. More is better, but you have enough if you can recharge a spare faster than you can drain the battery that's in the tool. Otherwise, you'll have to stop working when you run out of juice. Most chargers take 50 or 60 minutes to do the job, but it takes longer if the battery is hot.

Run-time is a function of the amount of energy the battery contains and how hard you work the drill. High-torque applications and continuous use drain

Figure 2. Most drill-drivers have two speed ranges; the DeWalt has three.

Bosch Brute Tough 33614

Battery: NiCad; 14.4 volts, 2.0 amp-hours, 28.8 watt-hours
Maximum torque: 475 inch-pounds
Weight: 5.3 pounds
Power-to-weight ratio: 90 inch-pounds/lb.
Speed range: 0-450, 0-1,400
Street price: $189
Comments: Excellent power and power-to-weight ratio; all metal gears; steel reinforcing collar at front of gun.

Bosch Compact Tough 32614

Battery: NiCad; 14.4 volts, 2.0 amp-hours, 28.8 watt-hours
Maximum torque: 300 inch-pounds
Weight: 4.2 pounds
Power-to-weight ratio: 71 inch-pounds/lb.
Speed range: 0-400, 0-1,200
Street price: $159
Comments: Very light and compact; good power for size; a top choice for finish work.

batteries faster than light-duty work and intermittent use.

Testing run-time. To test run-time, I counted the number of holes each drill could make through a 4x4 at low speed with a 3/4-inch auger (see Figure 1, page 2). The test was somewhat skewed in favor of the more powerful tools because they're designed for high-torque applications. It would have been fairer to also test the tools by driving small drywall screws, but with today's batteries I'd be in the hospital after driving that many fasteners.

What I learned was pretty much in line with the torque specs. Tools rated at or above 400 inch-pounds in low-speed mode had no trouble driving the auger bit. They didn't slow down or exhibit any noticeable strain. The rest of the drills drove the bit, but I could hear and feel that they had a hard time doing it.

In general, the higher the watt-hour rating, the more holes the drill could make. The Panasonic and Hilti have the highest battery capacities and bored the most holes.

Clutch

Most cordless drills have 16 to 21 clutch settings. But the actual number is less important than the amount of torque at the highest and lowest settings. Ideally, the lowest should be low enough for fine work and the highest high enough to drive big fasteners.

Most 14.4-volt drills are overkill for light-duty work. But if the tool can handle such tasks, you can get by with a single drill. I use low clutch settings to install electrical fixtures and to install door and cabinet hardware. The ultimate test is to use the drill to install plastic cover plates. The tool passes if it does the job without cracking plates or stripping screws. Seven out of ten drills passed this test. The Bosch Brute and the Hilti both stripped screws and broke plates. The low setting on the DeWalt was off the scale, high enough to sink drywall screws in oak.

The upper clutch settings are less important than the low ones because most workers drive all but the smallest fasteners in drill mode. That said, it's a plus if the high settings have enough torque to drive fasteners like the long screws used to install sliders and exterior door hinges. I tested that by sinking 2 1/2-inch #8 drywall screws into a 4x4. All of the tools had high enough settings to do it without clutching out.

Speeds and Gears

My first cordless drill was a state-of-the-art tool with a single speed range that topped out at 600 rpm. Compared with the tools you can get now, that drill was downright pathetic. Most of the tools I tested have two speed ranges and max out at around 1,400 rpm. Unlike early models, these tools have enough speed to drill metal and drive self-drilling screws. Low range usually tops out at 400 rpm and is intended for high-torque applications. The DeWalt model is unusual in that it has a third range that tops out at 1,800 rpm (Figure 2, page 2).

Some drills have all-metal gears, but most have a combination of metal and plastic. It's reasonable to think that

DeWalt DW983

Battery: NiCad; 14.4 volts, 1.7 amp-hours, 24.5 watt-hours
Maximum torque: 400 inch-pounds
Weight: 5.3 pounds
Power-to-weight ratio: 75 inch-pounds/lb.
Speed range: 0-450, 0-1,400, 0-1,800
Street price: $199
Comments: A solid performer; only drill with three speed ranges; all-metal gears and gear case; battery has the lowest amp-hour rating of the tools tested.

Hilti SF150-A

Battery: NiMH; 15.6 volts, 3.0 amp-hours, 46.8 watt-hours
Maximum torque: 300 inch-pounds
Weight: 4.9 pounds
Power-to-weight ratio: 61 inch-pounds/lb.
Speed range: 0-450, 0-1,450
Street price: $349
Comments: A sleek tool with superior batteries and run-time; comes with multiposition auxiliary handle.

Hitachi DS14DVB

Battery: NiCad; 14.4 volts, 2.0 amp-hours, 28.8 watt-hours
Maximum torque: 280 inch-pounds
Weight: 4.6 pounds
Power-to-weight ratio: 61 inch-pounds/lb.
Speed range: 0-350, 0-1,200
Street price: $149
Comments: Lightweight and low cost but doesn't stand out in performance.

tools with all-metal gears should be more durable than tools that use a combination of materials, but that isn't so. Different gears are subject to varying amounts of stress, so there are places where it's okay to use plastic. The main reason companies choose plastic is not to save money but to lessen the weight of the tool.

Chucks

Bosch's compact drill has a 3/8-inch chuck; all the others have 1/2-inch chucks. Most of the tools have a single-sleeve chuck equipped with a self-locking mechanism. The mechanism automatically locks the motor shaft when you twist the chuck by hand. That makes it easier to change bits because you can do it one handed without changing clutch settings. The Hitachi and the Makita have two-piece chucks that aren't self-locking.

Most of the chucks are made from a combination of plastic and steel, but the chucks on the Milwaukee and the Porter-Cable are all steel. Those manufacturers used only steel to increase durability, but it's one reason their drills are the two heaviest I tested.

Figure 3. Porter-Cable's Grip-to-Fit comes with interchangeable inserts, so you can customize the size of the grip.

Grip

The first thing you notice when you use a new drill is how it feels in your hand. This includes everything from weight and balance to the shape and texture of the grip. All of the drill-drivers except the Metabo have rubberized grips. The rubber provides a little padding but is really there to reduce user fatigue. It does that by making the tool easier to grip, even when your hands are wet.

All of the tools have a T-handle configuration, so they all feel balanced. The grips vary in shape, but they're all

Makita 6337DWDE Mforce

Battery: NiMH; 14.4 volts, 2.6 amp-hours, 37.4 watt-hours
Maximum torque: 350 inch-pounds
Weight: 4.8 pounds
Power-to-weight ratio: 73 inch-pounds/lb.
Speed range: 0-400, 0-1,300
Street price: $199
Comments: Midsize drill with better than average run-time; all-metal gears; drill mode activated by shift lever; unique two-piece motor; a good all-around performer.

Metabo BST 15.6 Plus

Battery: NiCad; 15.6 volts, 2.4 amp-hours, 37.4 watt-hours
Maximum torque: 484 inch-pounds
Weight: 5.1 pounds
Power-to-weight ratio: 95 inch-pounds/lb.
Speed range: 0-450, 0-1,600
Street price: $299
Comments: Highest power and power-to-weight ratio; unique pulse drilling mode makes it easier to drive and remove fasteners.

Milwaukee Lok-Tor 0616-24

Battery: NiCad; 14.4-volts, 2.4 amp-hours, 34.6 watt-hours
Maximum torque: 460 inch-pounds
Weight: 5.8 pounds
Power-to-weight ratio: 79 inch-pounds/lb.
Speed Range: 0-500, 0-1,700
Street Price: $199
Comments: Heavy and powerful; all-metal gears and chuck; comes with multiposition auxiliary handle; battery can be installed frontwards and backwards, allowing better clearance for some operations.

Figure 4. The Makita drill features a convenient top-mounted lever that allows switching from driver to drill and back without losing the dialed-in clutch setting.

comfortable. That said, you may want to avoid the Metabo and Bosch Brute if you have small hands because it's a stretch to reach the reversing switch with your thumb.

The Porter-Cable tool has a unique adjustable grip. It comes with interchangeable inserts that can be installed on the back of the grip. The thicker the insert, the bigger the grip (Figure 3, page 4).

Size and Configuration

We all have to work in cramped quarters occasionally. But if you do finish work like building or installing cabinets, you get into tight spots all the time. Two tools that stand out for that kind of work are the Panasonic and the Bosch Compact Tough. Both are a lot more compact than the other drills. Excluding the jaws, they measure about $8\frac{1}{4}$ inches front to back. By way of comparison, the longest drills, the Milwaukee, Porter-Cable, and DeWalt, are just over 10 inches long. This may not sound like much, but if you regularly work in tight quarters, an extra inch or two can mean the difference between doing the job with a drill and doing it by hand.

Special Features

All the drills I tested come with two batteries, a case, and a charger. But some have features that I hadn't seen before.

With most drills, you turn the clutch collar to go from drill to drive mode. But with Makita's tool, you go from drive to drive by moving a lever on top of the gear housing (Figure 4). That allows you to switch back and forth between drilling and driving without losing your clutch setting. Inside most cordless tools is a metal housing, a can that contains the entire motor. But if you open the Makita, you'll see a two-piece motor

Panasonic EY6432GQKW

Battery: NiMH; 15.6 volts, 3.5 amp-hours, 54.6 watt-hours
Maximum torque: 390 inch-pounds
Weight: 4.8 pounds
Power-to-weight ratio: 81 inch-pounds/lb.
Speed range: 0-450, 0-1,450
Street price: $209
Comments: Most advanced batteries and best run-time; extremely compact; good power for weight.

Porter-Cable Grip-to-Fit 9978

Battery: NiCad; 14.4 volts, 2.0 amp-hours, 28.8 watt-hours
Maximum torque: 420 inch-pounds
Weight: 5.6 pounds
Power-to-weight ratio: 75 inch-pounds/lb.
Speed range: 0-450, 0-1,400
Street Price: $189
Comments: A big heavy drill; all-metal chuck and gear case; unique adjustable grip.

that resembles what you'd find inside a corded tool. According to the manufacturer, this allowed the designers to make the motor smaller, more efficient, faster to cool, and easier to service (Figure 5).

The Metabo drill has a unique hidden feature. Flip a tiny switch on the back of the motor housing, and the tool goes into pulse mode, which causes the motor to pulse on and off when you squeeze the trigger. According to the manufacturer, that makes it easier to start holes in smooth materials like metal. It's also supposed to make driving and removing fasteners easier, especially if the head is damaged. I didn't notice any difference drilling metal, but the pulse action did make it easier to ease out damaged screws. I had never given it any thought, but I've been doing this manually for years by squeezing and releasing the trigger.

The Makita, Milwaukee, and Bosch Brute have externally replaceable

Figure 5. Most cordless drills, like the Hitachi (top), have can-style motors. The field, armature, fan, and brushes are encased in a metal housing and are typically serviced or replaced as a unit. The Makita drill (bottom) is built around an unusual two-piece motor equipped with a cooling fan.

Battery Basics

With cordless tools, power comes at the expense of run-time. Increase power beyond a certain point, and the tool drains batteries so quickly that it's no longer practical to use. Luckily, batteries keep getting better and better.

Most of us think of batteries in terms of voltage. But all voltage tells you is how many cells are in the battery. A 14.4-volt battery contains 12 cells, and a 15.6-volt unit contains 13. The amount of energy that individual cells can hold is determined by their amp-hour rating. Ten years back, state-of-the-art was 1.0 amp-hour cells. Right now, state-of- the-art is 3.5 amp-hours, and I'd be surprised if it doesn't go higher soon.

Watt-hours and storage capacity. The amount of energy contained in a battery is measured in watt-hours. You can calculate the watt-hour rating of a battery by multiplying its voltage by the amp-hour rating of its cells. For example, a 14.4-volt tool with 2.0 amp-hour cells is rated at 28.8 watt-hours (14.4 volts x 2.0 amp-hours). A battery with a 50-watt-hour rating contains twice as much energy as one with a 25-watt-hour rating.

NiCad vs. NiMH. Most cordless-tool batteries contain nickel-cadmium (NiCad) cells, but a small percentage use nickel-metal-hydride (NiMH) cells. NiCads have been around forever, but NiMH batteries have been in cordless tools for less than five years. NiMH cells have higher amp-hour ratings than NiCads.

But the jury's out on whether one type is better than the other. NiMH cells do hold more energy, but they're a lot more expensive and can be charged fewer times than NiCads. Just how many charging cycles a battery can undergo is open to debate. Depending on whom you talk to, NiCads can be charged 750 to 2,000 times before wearing out. Someone I know at one of the manufacturers said NiCads are good for about 1,200 cycles. His company doesn't use NiMH cells because it believes they're only good for 300 to 500 cycles. But according to Panasonic, which is the only company that makes battery cells as well as tools, NiMH cells are good for 1,200 cycles. And the companies that use NiMH batteries claim you get more run-time over the life of the batteries because they can go a lot longer between charges.

List of Manufacturers

Bosch Power Tool
877/267-2499
www.boschtools.com

DeWalt Industrial Tool
800/433-9258
www.dewalt.com

Hilti USA
800/879-8000
www.us.hilti.com

Hitachi Power Tools
800/829-4752
www.hitachi.com/powertools

Makita USA
800/462-5482
www.makitatools.com

Metabo USA
800/638-2264
www.metabousa.com

Milwaukee Electric Tool Corporation
877/729-3878
www.mil-electric-tool.com

Panasonic Professional Cordless Tools
800/338-0552
www.panasonic.com/commercial_building/power_tools/

Porter-Cable
800/487-8665
www.portercable.com

brushes. This feature is a plus for tools that get extremely heavy use, but I can't imagine it making much of a difference on a cordless drill. You'll probably wear out the batteries before you go through a pair of brushes. And at that point, the tool will be so out of date that you'll want to upgrade.

Favorites

My personal favorite is the Panasonic because it does everything well. It's in the middle of the pack in terms of power and weight. But it's extremely compact and has better run-time than any other drill tested. I also like the Bosch Compact because it's extremely small and light for a 14.4-volt tool. As for the big drills, I like the Bosch Brute and the Metabo because they have the most power and superior power-to-weight ratios. I also like the Milwaukee because it's comparable in power to the Bosch and Metabo but is easier to grip if you have smaller hands.