

Bench Test: 12-Volt Cordless Drills

by Clayton DeKorne

Cordless tools have made quite a splash in recent years. When the first cordless "screwdrivers" were introduced about a decade ago, they were no more than consumer novelties. But increased battery power, improved motor design, and innovative gearing systems have brought battery-operated drills into the mainstream of professional tools. And the latest wave is carrying 12-volt drills to the forefront.

This past year, four major tool manufacturers introduced a 12-volt drill into their line of cordless tools, bringing the number on the market to seven. All these tools are designed specifically for the light construction trades, and manufacturers expect these new drills to become their top-selling professional cordless tools. A few even venture hopes that, with the added power and endurance, these new drills will compete on job sites with their corded relatives.

I looked at six 12-volt drills — the AEG ABSE 15, the Black & Decker Super Cyclone 2665, the Milwaukee Hi Torque 0398, the Panasonic EY6205BC, the Porter-Cable Magnequench 9850, and the Skil Top Gun 2735-2. Another 12-volt model, the Ryobi 220VR, was introduced late in 1990 but we were unable to get it in time for testing.

High torque and prolonged power distinguish six top-of-the-line cordless drills

Tested Performance

Reading specifications at first seems like the easiest way to compare one tool to another, but these numbers will not always give you a fair basis for comparison. Most manufacturers, for instance, display a high torque rating to demonstrate the increased power of these larger 12-volt drills. The ratings range from 85 to 175 inch pounds. However, there are several different ways to measure torque. One way measures the *stall torque* — the maximum turning force that the motor can deliver — and a second measures *rated torque* — the turning force at a normal level of output. The first rating is equivalent to reporting the absolute heaviest weight a person can lift, the

second to the amount a person can lift in the course of working a full day. The two will show very different numbers, but there seems to be little consensus among manufacturers as to which measurement best describes the power of a tool. Furthermore, a torque rating might indicate either the torque of the motor, or the torque delivered at the chuck, which takes into account the inefficiencies of the drive train. There is no standard rating.

The best test of performance seems to be the work itself. So I put all six drills to task, drilling into hardwood, driving lag bolts into pressure-treated framing lumber, and driving drywall screws into CDX plywood. All these jobs seemed like good tests of the

drills' strengths. But the results were inconsistent. The drill that drove the most screws, for example, was not the tool that drilled the most holes.

In the end, I chose only to report on the results of the screw-driving test, because it gave the most consistent basis for comparison. First, plywood has a more predictable quality than hardwood and framing lumber. Second, driving screws depends less on the tester's performance which, over the course of several hours, might vary widely. Drilling efficiently, on the other hand, depends a great deal on both the amount of pressure the operator exerts on the bit and the speed of the motor. A high rpm drill, for instance, will bog down under too much pressure.

To equalize conditions for this test, I charged each battery five times, draining it fully between charges. I began driving the screws immediately after charging was complete, first setting each drill on the highest clutch setting and the lowest speed range. The low-speed range delivers the highest torque, but even so, two of the drills — the AEG and the Skil — had to be set on the drill position to get enough torque to fully sink the head.

The results in the Table below report the average of three trials driving coarse-thread, 1⁵/₈-inch dry-

12-Volt Cordless Drills						
Model	List Price	Weight (incl. battery)	No-load Speed (rpm)	Charge Time	Test Results (no. screws driven)	Standard Features
AEG ABSE 15	\$399	4lb 8oz	HI 0-1100 LO 0-380	1 hr	160	• 1/2-in. chuck • electric brake • universal charger • metal case
Black & Decker 2665	\$281	4lb 8oz	HI 0-1300 LO 0-400	50 min	258	• pressure-activated clutch • trickle charger • metal case
Milwaukee 0398	\$296	3lb 12oz	HI 0-1000 LO 0-350	30 min	230	• metal case
Panasonic EY6205BC	\$410	4lb 2oz	HI 150-1000 LO 0-350	15 min	216	• keyless chuck • electric brake • trickle charger
Porter-Cable 9850	\$240	4lb 7oz	0-400	1 hr	295	• metal case • trickle charge
Skil 2735-2	\$205	4lb 6oz	HI 0-1650 LO 0-500	1 hr	162	

Note: All drills have variable-speed, reversible triggers. List price includes case and charger.

wall screws into 2 inches of CDX plywood. In each trial I drove as many screws as possible on a single charge. It's not a demonstration of maximum torque, but it's a good comparison of the relative power of each tool.

By this standard, the Porter-Cable has the greatest endurance, followed closely by the new Black & Decker. But other features, such as speed, weight, balance, and charge time also affect how well these drills function on the job site, and contributed to my overall impression of each tool. Here are some observations:

AEG ABSE 15. AEG's newest cordless drill is the only one among the six I tested with a 1/2-inch chuck. But even with a 12-volt battery pack, I'm not sure the large chuck is appropriate for a drill of this class. With the 1/2-inch chuck and heavy-duty construction, it's one of the heaviest drills I tested (4lb 8oz), but it is very well balanced.

The motor has an electric brake, a feature worth opting for in a drill. Without it, you can spend a lot of time waiting for the chuck to slow down to place the next screw or change bits.

The ABSE 15 includes a small work light that attaches to the underside of the drill motor and runs off the battery. This feature is probably more desirable in the sub-trades where it

would frequently be used in a dim basement or attic, but it seems more like a clever gimmick than anything else. Running the screw driving test with the light on decreased the drill's productivity by about 20%.

The ABSE 15 lists for \$399 with a metal case and a charger. It's one of the most expensive drills I tested but it is probably the most durable of the lot. The foam-lined case is the finest standard-issue tool case I've seen. The "universal" charger, offered as standard equipment, will not only accommodate all AEG 2.4, 7.2, 9.6, and 12-volt batteries, but also most Makita and Ryobi batteries.

Black & Decker 2665. Black & Decker's newest cordless drill proved to be an excellent production screwdriver. Small features like a sensible chuck key holder and a well-designed case are reminiscent of the best Black & Decker industrial tools. And I think their newest feature — a pressure-activated "versa-clutch" — should be on all combination drill/drivers. The clutch is activated only in the screw position, and it operates like one on a conventional screwgun. The chuck only turns when you lean into the work, applying pressure on the chuck. I'm not sure it's wise to keep the motor running continuously as you might with

a corded screwgun. Since this is a battery-operated tool with a limited power supply, you would waste a lot of juice. (Perhaps that's why there's no trigger lock.) But the pressure clutch increases driving control. You can step up the torque of any given clutch setting by simply pushing on the bit a little harder. This is a great feature on a battery-operated tool, considering the ever-dwindling power supply continually changes the available torque.

The 2665 is as heavy as the AEG, which is heavier than I like, and it is the largest of the drills tested (11 inches along the handle).

Milwaukee 0398. The new 12-volt Milwaukee ended up as my favorite cordless drill. It is reasonably priced, and at 3 3/4 pounds and only 9 inches long, it is the lightest and smallest of the bunch. In fact, it fits better in my nailbag than many 9.6-volt drills. My only complaint is that it is easy to inadvertently trip the forward/reverse switch.

Panasonic EY6205BC. Among all the top name brands here, the Panasonic stands out as the most innovative, and if price weren't an issue I would choose it over the Milwaukee. Before I discovered this 12-volt drill, I thought Panasonic only made electronic stereo equipment. But I've since learned that Panasonic's parent company — Matsushita Electric — has the largest market share (about 40%) of cordless tools in Japan and has supplied Milwaukee and AEG with parts for years. The company is the second largest battery manufacturer, and the fourth largest electric motor manufacturer, in the world. All this adds up to a 12-volt drill that is made entirely by one company with a lot of experience manufacturing both electronic and mechanical devices. It shows.

The Panasonic EY6205BC is a good marriage between the electronic and mechanical. Most of the electronics are in the microprocessor-controlled 15-minute charger (no lie) that I think has most of the other manufacturers wondering what they've been doing with bulky transformers all this time. The drill is very light and extremely well balanced, but the T-shaped design doesn't fit into a pouch as well as the Milwaukee. The forward/reverse switch is the best I've seen — a button just above the trigger which is easily reached but can't be accidentally tripped.

Standard features include an electric brake and a keyless chuck.

Porter-Cable 9850. The Porter-Cable Magnaquench has been out for a couple of years, and it is still the most powerful 12-volt cordless drill out there. The trick to its endurance is a large battery, a fast motor, and a buslike drive train that gears the chuck down to a slow 400 rpm. This combination delivers a lot of torque and makes very efficient use of the battery's power, but the high speed is missed. It lists for \$240 but I've seen it for as low as \$160, including an extra

battery, charger and a metal case. Even at full list, though, you can't go wrong.

Skil 2735-2. The Skil Top Gun was introduced in 1987 and was the first 12-volt cordless drill on the market. Now it shows its age. While it is the fastest drill of the lot, it is one of the least powerful and most cheaply made. But it is also the least expensive, and is competitive in price and power with some 9.6-volt drills.

A Note on Batteries and Chargers

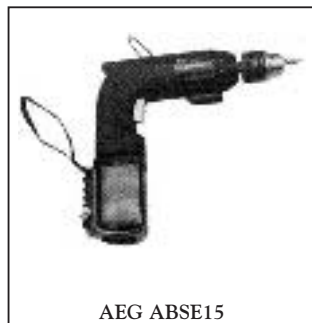
Many recent improvements in cordless tools are in the batteries and the chargers. From the user's point of view, the most noticeable improvements in some batteries is the disappearance of a "memory effect." Early nickel cadmium batteries had to be fully drained before recharging, or they eventually lost power. All the drill companies except Porter-Cable claim there is no memory effect with these new 12-volt batteries. And Panasonic and Black & Decker drills have chargers that will deliver a "trickle charge" to top the battery off. Porter-Cable has a similar trickle charger that will keep a full charge from bleeding off, but the manufacturer still recommends draining the battery before a recharge.

The most impressive charger innovation is Panasonic's 15-minute charger — aptly nicknamed the "coffee break charger." The Milwaukee gets pretty close with a half-hour charge. Still, with any cordless tool, I would always want to have an extra battery on hand during a job.

I tested all the chargers to make sure they lived up to their rated charge times. The Panasonic hits it right on the minute just about every time. The Milwaukee takes about 35 minutes before it shuts off. But the Skil, Porter-Cable, Black & Decker, and AEG take anywhere from 1 hour and 20 minutes, to 1 hour and 40 minutes, and they are all rated as 1-hour chargers! When I inquired about this apparent failure, I was told that the batteries have a full charge, but the charger will only shut off at a certain temperature. Once the battery has a full charge, incoming voltage is converted to heat until the battery gets hot enough to trip the off switch. This switch is set high to ensure the battery will get a full charge in hot weather. You can reportedly use the battery after the allotted time and before the charger shuts off, but leaving it in will give you an additional, slightly higher "surface charge."

By contrast, the Panasonic charger has a built-in timer and sensor that trip the off switch when the charge is complete. This is all on a circuit board and the charger is featherweight compared with the others. Panasonic is also planning another innovation that should prove useful on cordless tools: a battery that indicates how much charge it has. Stay tuned. ■

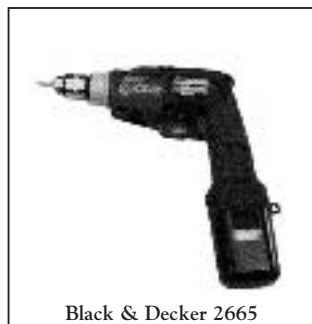
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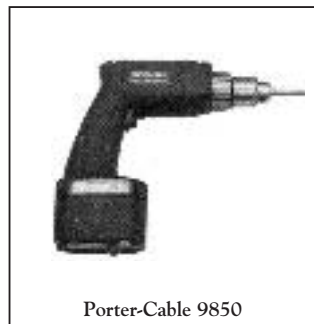
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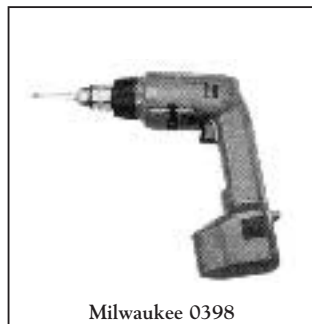
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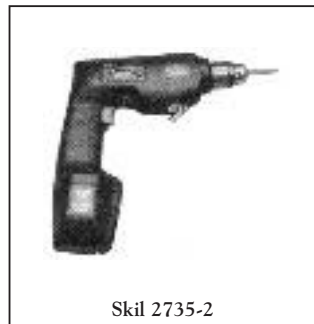
Black & Decker 2665



Porter-Cable 9850



Milwaukee 0398



Skil 2735-2