Power Tool Batteries for Portable or Emergency Operation

An inexpensive dc-dc converter allows lithium tool batteries to power a radio.

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There are many dc-dc converters available on Amazon and eBay for $20 to $45, depending on specifications. The output voltages available include 12 V, 13.8 V, and others that are adjustable. These dc-dc buck or buck-boost converters are of high efficiency (in the 95% range) and are enclosed in an aluminum heatsink (see Figure 1). They seem pretty clean, but spurious RF radiation may be evident on some bands. This can be reduced by using ferrite beads on the leads and keeping them short. Also, you can try floating or grounding the aluminum case.

Connections

A good option for your connections is an 8 to 40 V input to 13.8 V 25 A output converter, which has a wide

Figure 1 — When setting up for emergency communications, it can be helpful to have battery connectors of multiple brands to maximize your backup power options. A combiner for multiple batteries with Schottky diodes can also be used. [Chris Zajac, photo]

Lead photo — Power tool batteries are easily accessible, making them a good backup power option for emergency communications. [Chris Zajac, photo]

Precautions

Many affordable dc-dc buck converters can be destroyed if you put a battery (even built-in batteries in some radios) on the output with no input voltage. Some manufacturers state that their converters are not to be used as battery chargers. A diode at the output may solve this problem, but it will drop the voltage. Also, reverse-voltage connections may damage the battery or the converter. If you can, design your connectors to make cross connections impossible or difficult.

input voltage range and can power a 100 W radio. Figure 2 shows a Milwaukee M18 battery; these batteries are nominally 18 V, but they're more than 20 V when fully charged. The simplest way to interface to these batteries is to put female spade lug connectors on the input wires of the dc-dc converter (see the sidebar, "Precautions," for more information on your battery output). One blade of an ATC fuse is plugged into the spade lug connector, and the other is directly plugged into the battery (observing proper polarity). This method is small, lightweight, and affordable, and it provides fuse protection.

For more solid connections, there are plug-in battery connectors available on eBay and Amazon for brands like Milwaukee, DeWalt, and Makita batteries, as well as others.

Power Limitations

Almost any power tool battery will power a QRP radio. An 8 Ah battery at 18 V will power a 100 W transceiver. Lithium batteries are commonly rated as 2C, which means that the maximum current drawn in amperes is twice the ampere-hour rating of the battery. In addition, reducing the voltage from 18 to 12 V provides 50% more current, so an 8 Ah battery at 18 V can supply 24 A at 12 V.

Figure 2 — Gordon S. Novak, Jr., AF5KA, uses ATC fuses to plug into his Milwaukee M18 battery for QRP Summits on the Air operations. A 20 V 8 Ah battery will power a 100 W transceiver for a few hours [Gordon S. Novak, Jr., AF5KA, photo]

Transmit power should be limited to about 12 times the total ampere-hour rating of the batteries at 20 V; an 8 Ah battery supports a 100 W transmit, and a 4 Ah battery supports a 50 W transmit. An easy rule of thumb is to remember that the maximum amperage to the radio is three times the ampere-hour rating of the 18 V tool battery. Many tool batteries are smaller than 8 Ah, but several smaller batteries can be combined in parallel to provide more power by putting a 15 A 45 V Schottky diode (15SQ045) in series with each battery. The Schottky diode has a low forward voltage drop (diodes prevent a backflow of current in case the batteries have different voltages). A solar panel could be included in the mix, because nominal 12 V solar panels typically have an open-circuit voltage of more than 20 V.

Advantages

1 The batteries are multi-use and can power tools as well as a radio.

2 Tool batteries are mechanically and electrically rugged because they're designed for use in construction.

3 If you already have (or can borrow) the batteries, all it takes to get radio backup power is using an inexpensive dc-dc converter.

4 Many people own power tool batteries, potentially providing a plentiful source of emergency power. Having battery connectors by multiple popular tool brands will maximize the possible types of batteries that could be used.

5 Tool batteries are comparable in size, weight, and cost to popular 12 V lithium batteries.

6 The dc-dc converter supplies constant voltage to the radio as the battery discharges.

7 Adding a 12 V inverter will also allow tool batteries to provide 120 V of ac power.

Visit **www.cs.utexas.edu/users/novak/sources.html** for information on where to purchase some of the parts mentioned in this article.

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