



USING POWER TOOL BATTERIES FOR HAM RADIO

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AT HAMCON COLORADO
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TRADITIONAL PORTABLE POWER SOURCES

- Vehicle Battery (Sealed Lead-Acid)
- Generator
- Portable Power Stations/Solar Generator
- LiFePo₄ Batteries

The background is a blue gradient. In the corners, there are decorative white line art elements resembling circuit boards or neural networks, with lines and small circles.

TO KEEP COSTS DOWN
WHAT BATTERIES DO I
ALREADY HAVE THAT
I CAN USE?

DEWALT POWER TOOL BATTERIES!



ADVANTAGES OF USING POWER TOOL BATTERIES

1. Already paid for and have multiples
2. Already have the charger
3. Built-in safety features
4. Built for harsh environments
5. Built for high current draw

5 STEPS TO USING A DRILL BATTERY AS A POWER SOURCE

1. Determine +/- terminals
2. Connect power leads to terminals
3. Step down the voltage to $\sim 13.5\text{VDC}$
4. Connect to radio power
5. Adjust radio power/current draw

1. DETERMINE +/- TERMINALS - DEWALT



1. DETERMINE +/- TERMINALS - MAKITA



1. DETERMINE +/- TERMINALS - MILWAUKEE



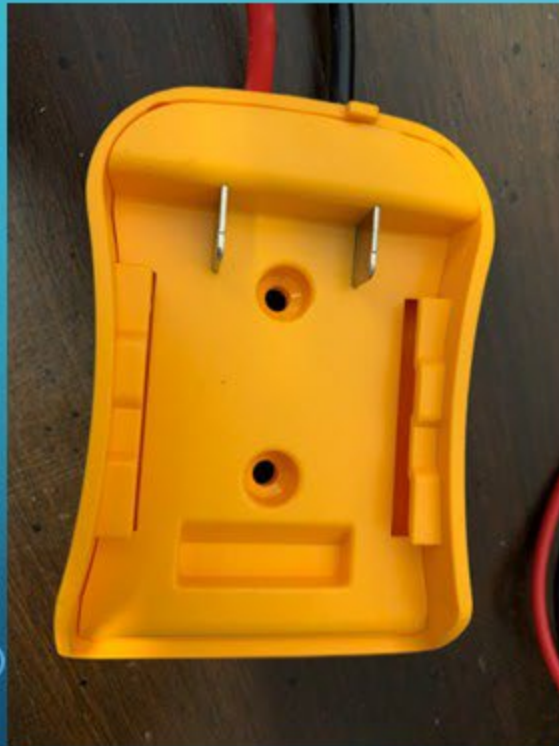
1. DETERMINE +/- TERMINALS - RIDGID



1. DETERMINE +/- TERMINALS - RYOBI



2. CONNECT POWER LEADS



EASY TO INSTALL AND REMOVE

Install



Remove



ADAPTERS ARE AVAILABLE FOR MOST MAJOR BRANDS



Easy to install
for Makita 18V Li-ion Battery



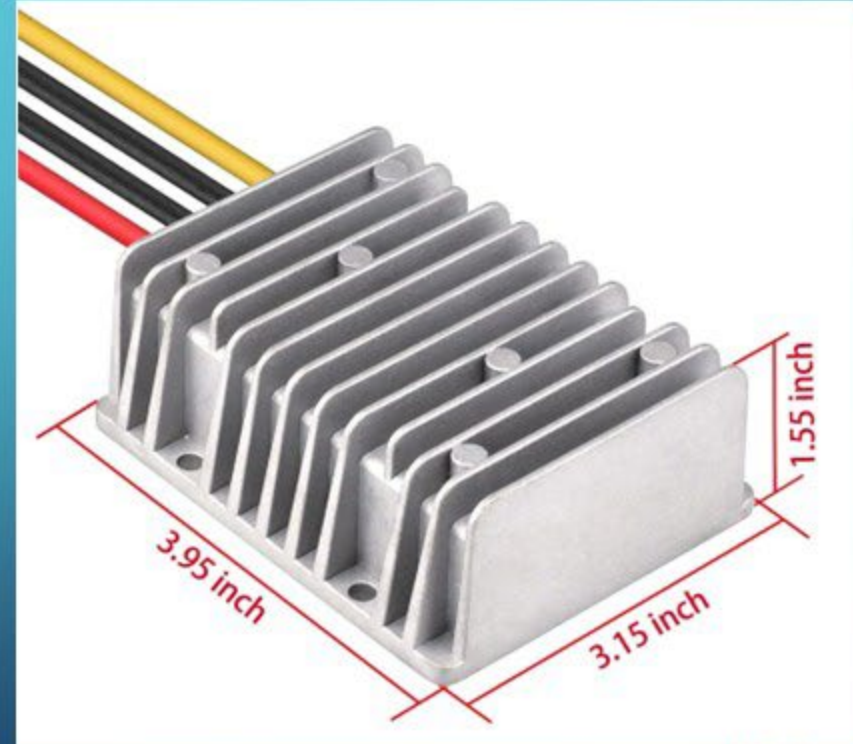
3-D PRINTER FILES ON THINGIVERSE



3. STEP DOWN THE VOLTAGE TO 13.5VDC – BUCK CONVERTER



Cllena
414W DC-DC CONVERTER
Input Output
24V 13.8V 30Amax
⊕ ⊖ ⊖ ⊕





Nilight LED Light Bar 2PCS 18W 6Inch Flood LED Pods Offroad Fog Light Waterproof for Boat SUV ATV 4WD... \$18.99 prime

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20V to 12V Step Down Converter 20A 240W Max - Compatible with DeWalt 20V Battery, Power Wheel Battery Adapter, DC 12V Buck Regulator with 30A Fuse & Wire Terminal

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Add to List



4. CONNECT TO RADIO POWER



4. CONNECT TO RADIO POWER



5. ADJUST RADIO POWER/CURRENT DRAW

Depending on your buck converter and battery specs.

My buck converter steps down to
13.8VDC, 30A and 414W

THE TEST

Tested two radios. Yaesu FT-991A and the Xiegu G90. Connected to dummy load.

HF SSB 40m band.

Transmitted for 15-30 seconds then received for 15-30 seconds.

YAESU FT-991A SPECS

Yaesu FT-991A at 5W min, 100W max

MFG Specs: max 23A HF, 15A VHF/UHF

ARRL Labs: HF: min 6.8A max 14A

VHF max 9A, UHF max 7A

YouTubers: HF min 7.2A max 15.3A

YAESU FT-991A SPECS

YouTuber: Yaesu FT-991A HF (SSB)

Current Draw

100W – 15.3A

80W – 13.9A

60W – 12.6A

50W – 12.0A

30W – 10.1A

20W – 9.1A

10W – 8.1A

5W – 7.2A

HOW LONG WILL IT RUN?

$$\text{Time (hrs)} = \text{Capacity (Ah)} / \text{Current (Amps)}$$

THEORY: HOW LONG WILL IT RUN

THE FT-991A AT 100W – 5AH DEWALT

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
100W Tx	15.3	5	0.33	19.6
Rx	1.6	5	3.125	187.5
Average 1:1	8.45	5	0.59	35.5

THEORY: HOW LONG WILL IT RUN THE FT-991A AT 50W – 5AH DEWALT

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
50W Tx	12.0	5	0.42	25
Rx	1.6	5	3.125	187.5
Average 1:1	6.8	5	0.74	44.1

THEORY: HOW LONG WILL IT RUN THE FT-991A AT 20W – 5AH DEWALT

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
20W Tx	9.1	5	0.55	32.9
Rx	1.6	5	3.125	187.5
Average 1:1	5.35	5	0.93	56.1

THEORY: HOW LONG WILL IT RUN

THE FT-991A SUMMARY

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
100W	8.45	5	0.59	35.5
50W	6.8	5	0.74	44.1
20W	5.35	5	0.93	56.1

THEORY: HOW LONG WILL IT RUN

THE FT-991A SUMMARY – 6.5AH

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
100W	8.45	6.5	0.77	46.1
50W	6.8	6.5	0.96	57.4
20W	5.35	6.5	1.21	72.9

THEORY VS. ACTUAL AT 50W

THE FT-991A – 6.5AH

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
Theory 50W	6.8	6.5	0.96	57.4
Actual 50W	Peak 10.7A (Ave. 9.03A)	6.5	0.72	43
Result: 75% of expected. Due to higher than expected current draw.				

XIEGU G90 SPECS

YouTuber: Xiegu G90 Draw HF (SSB)

Receive is 0.7A. Transmit:

1W – 2.29A

10W – 4.01A

20W – 5.04A

THEORY VS. ACTUAL AT 20W

XIEGU G90 – 6.5AH

Power Output	Current (Amps)	Capacity (Ah)	Run Time (hrs)	Run Time (mins)
Theory 20W	2.87	6.5	2.26	135.9
Actual 20W	Peak 2.37A (Ave. 2.03A)	6.5	2.58	155
*Never shut off. Voltage dropped to 15V Result: 114% of expected.				

COSTS

Battery Adapter: \$10/ea

Buck Converter: \$16-\$19/ea

Kit: Adapter and Buck 20A - \$25

Total Cost: \$25-\$30

COSTS FOR LIFEPO4 BATTERY

6Ah: \$20-\$30 (no name, 10A cont. max)

6Ah Bioenno: \$80 12A cont. max

8Ah Bioenno: \$95 12A cont. max

15Ah Bioenno: \$150 30A cont. max

Battery Charger: \$25-\$45

CONCLUSION

- Drill batteries are a cost-effective option for powering a ham radio station.
- You need to be prepared with the adapter and buck converter.
- To get longer runtimes you could connect two batteries in parallel.

CONCLUSION

- Practically speaking, for portable operations, if you can afford it, having a dedicated LiFePo4 battery or two that is 15Ah or more makes more sense.

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QUESTIONS?