Product Review: MFJ-4416 Super Battery Booster
by Phil Salas – AD5X

Introduction

Today's compact 100-watt HF transceivers are designed to operate from 13.8V ± 15%, or about from 12-16 volts. The low voltage end is very critical in that output signal distortion, output power problems, and transceiver reset can all occur when the voltage gets much below 12 volts. In the mobile environment, there are two problems that that can cause the transceiver voltage to drop below 12 volts:

First – there can be noticeable voltage drop on the DC input lines due to the high current drawn by your transceiver. Typical current requirements for a 100-watt rig are about 20-amps for 100-watts output power. If you just have 1/10th of an ohm resistance in your cable and connectors, you'll lose 2 volts! And second – When you turn your car off, the battery voltage drops from around 13.8 volts to close to 12 volts after a short period of time. Couple this with any voltage drop in the cables, and you have a problem.

MFJ-4416 Super Battery Booster to the rescue

One solution to this problem is the newly introduced MFJ-4416 Super Battery Booster from MFJ Enterprises. The MFJ-4416 boosts a low battery voltage to the standard 13.8VDC. The specs on the MFJ-4416 are as follows:

Size: 7-3/4"L x 4"W x 2-1/8"H
Weight: 1.5 pounds
Peak Output Current: 25 amps
Regulated output voltage: 13.8 volts for 9-13.8 volts input

Photos A and B show outside and inside views of the MFJ-4416. As you can see, the MFJ-4416 includes both Anderson Powerpole connectors and high-current 5-way binding posts for both the DC input and regulated output. There is an internally located input fuse, and the unit also includes output over-voltage crow-bar protection should regulation be lost.

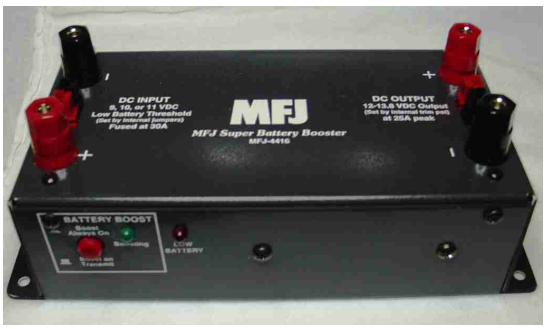

Photo A: MFJ-4416 External View

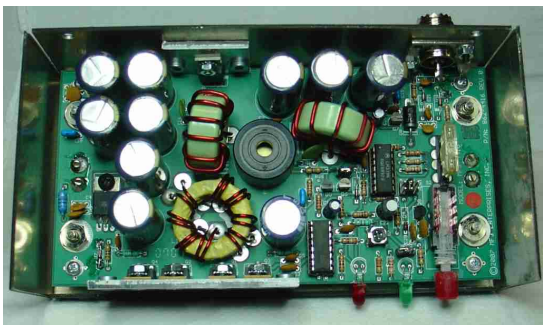
Photo B: MFJ-4416 Internal View

The MFJ-4416 is quite efficient, meaning that minimal power is lost in the regulator circuit. Table 1 shows the results of my testing of the MFJ-4416.

Table 1: MFJ-4416 DC Test Results

Vin	Iin	Vout	Iout	Eff
13V	24.6A	13.8V	21A	92%
12V	28.8A	13.8V	21A	84%
11V	25A	12.9	19.3A	90%
10V	23A	11.7V	17.5A	89%

MFJ-4416 Additional Features

The MFJ-4416 has several interesting features that bear mentioning. First, the unit can be left in-line at all times, as the input voltage connects directly to the output with about a ½-volt drop if the unit is turned off. Next, there is a Low Voltage Alarm feature, which provides an indication when the input voltage falls below a user-defined level. This protects you from over-discharging your battery. You can strap this to alarm at 9-, 10-, or 11-volts. When the input voltage falls below the alarm point, a Low Battery LED lights. You can also strap the MFJ-4416 to stop regulating when the low battery alarm comes on, which saves some current due to the efficiency of the MFJ-4416. And because the MFJ-4416 may often be placed where the alarm LED isn't readily visible, you can also strap an audio alarm to come on when the low voltage alarm is enabled.

Two additional features are included in the MFJ-4416. First, an RF sampling port can be connected to the transmission line with a UHF-T connector. When RF sampling is enabled, the MFJ-4416 is bypassed unless RF is sensed. Therefore, no regulator switching efficiency penalties are incurred during receive, and there is no possibility of switching tones being heard in the receiver since the regulator is off during receive. A switch enables or disables this feature. Photo C shows the RF sampling port.

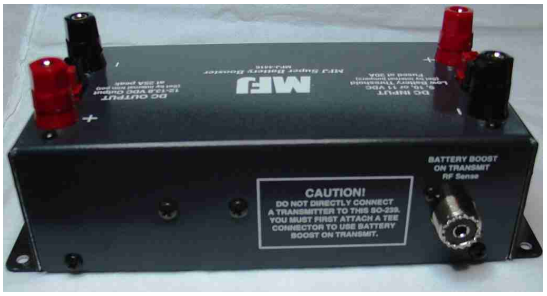

Photo C: RF Sampling Port

The second additional feature is a user-adjustable output voltage control which lets you set the output voltage anywhere between 12- and 13.8-volts. When setting the output at 12-volts, input voltages greater than 12V will pass through, while voltages below 12V will be boosted to 12V. Why would you want to do this? Since 12V is within the typical voltage operating range of most transceivers, your transceiver will run cooler. 20 amps at 1.8V less drop is a 36 watt savings in heat dissipation in your transceiver during transmit, and even 3-4 watts savings during receive. Additionally, higher output current is available at the lower output voltage (not as much limitation due to the input fuse). So it can be good to re-adjust the voltage to 12 volts, then have the regulator protect you from

lower voltages. Below is some regulator efficiency data I measured with the output voltage set to 12-volts.

Table 2: MFJ-4416 DC Test Results

Vin	Iin	Vout	Iout	Eff
13V	20.2V	12V	20.7A	94%
12V	22.5	12V	20.7A	92%
11V	25.8A	12V	20.7A	87%
10V	25.5A	12V	20.7A	88%

Finally I monitored the output ripple during all tests and found it to be less than 5mv, which is extremely low. I also checked the unit for switching tones. During my listening tests, I could hear very low level tones on 160-40 meters when draping a short antenna wire directly across the unit (12" wire connected directly to the radio's antenna port and draped across the MFJ-4416). These tones were so low that they didn't indicate on the S-meter. When I connected an antenna, I could not hear the tones at all. And, of course, the tones are completely gone during receive when using the RF-enable capability.

Conclusion

Battery boosters are an effective means of ensuring that you can compensate for voltage drops in your mobile or portable wiring. The MFJ-4416 Super Battery Booster lets you suffer some pretty significant voltage drops while permitting normal operation of your mobile 100-watt HF transceiver.