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A Compact Battery Pack for the SG-2020

While designed for the SG-2020, this portable pack can be used with most low power transceivers—think reasonable cost!

I really enjoy operating the HF bands with a portable transceiver. My favorite portable rig is probably the SGC SG-2020. I like this radio because it gives me the ability to switch to 20 W of RF output when necessary. Twenty watts is a nice compromise between QRP (low power) and QRO (high power). (Well, relative QRO—it's an S-unit up from 5 W, and about an S-unit down from 100 W.)

For portable operation, being able to run off a battery pack can be a benefit in many situations. Reasonable operating time, however, at the 20 W level, requires a pretty substantial battery pack. And, as many SG-2020 owners know, the SG-2020 is often unhappy by the time battery voltage drops to below 12 V. The '2020 is specified to operate from 10-18 V dc, but this should, in reality, be more like 12-18 V dc, at least for older SG-2020 examples.

The Battery Pack

Recently, I've been looking at nickel metal hydride (NiMH) radio-control (R/C) type battery packs since they tend to be pretty inexpensive, especially on Web auction sites. The popular voltages are 7.2 and 9.6 V dc. The 7.2 V dc packs are very interesting because two of these in series will give you 14.4 V dc. And reasonably priced packs have up to 3000 mAh of capacity.

I purchased a pair of 7.2 V dc, 3000 mAh packs, along with a fast/smart charger for $56.95.[1] The fast charger will charge 6, 7.2 and 9.6 V dc NiMH batteries, output 2 A of charge current, and then automatically switch to 50 mA of trickle charge when it detects a full battery charge. The charger is relatively small, as can be seen in Figure 1. For these 3000 mAh packs, the charge time is less than 2 hours for a fully depleted pack. Incidentally, I added additional electrical tape around the batteries, as there was some exposed terminal metal on the batteries that I received.

Again, the nominal series voltage is 14.4 V dc, with a maximum (fully charged) voltage of just over 16 V dc, and a discharged voltage level of 12 V dc. This is perfect for the SG-2020! While you're at it, buy a pair of male R/C connectors and a female R/C connector. The male R/C connectors are needed if you want to interface everything inside your battery box. The female R/C connector is used to make an R/C to 5.5 mm charging adapter cable. You can buy these R/C connectors at RadioShack (the two 7.4 V dc R/C repair kits called out in the parts list provide everything necessary).

The next problem is finding a box to house these batteries. My solution was a Serpac model 171 plastic enclosure. This 4.88×6.88×1.51 inch enclosure fits the R/C battery packs perfectly. These cases are available from Mouser Electronics for $8 each.[2] Actually, the case shown in the figures is their model 271-B, which has a 9 V battery door (I found it locally at Fry's Electronics). The Model 171, however, is less expensive and provides a less cramped battery fit.

Building the Battery Pack

Figure 2 shows the schematic of the battery pack and Table 1 contains a complete materials list. The two battery packs have to

Figure 1—The charger and battery pack next to the SG-2020 transceiver.

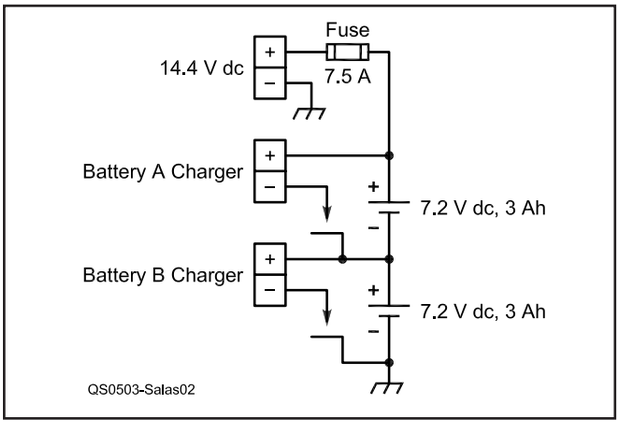

Figure 2—The schematic of the NiMH battery pack.

[1]Notes appear on page 52.

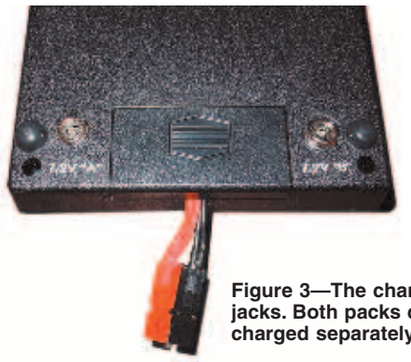

Figure 3—The charging jacks. Both packs can be charged separately.

Table 1
Materials List, Battery Pack

Batteryspace—**www.batteryspace.com**
Mouser—**www.mouser.com**
RadioShack—**www.radioshack.com**

Quantity	*Item*	*Source*	*Price*
1	2 NiMH batteries/charger	Batteryspace	$56.95
1	Serpac 171-B box	Mouser 635-171-B	$8
2	5.5×2.1 mm jacks	RadioShack 274-1582	$1.99
1	5.5×2.1 mm plug	RadioShack 274-1569	2/$1.99
2	7.2 V R/C repair kit	RadioShack 23-444	$1.99
1	Mini-blade fuse holder	RadioShack 270-1237	$1.99
1	7.5 A mini-blade fuse	RadioShack 270-1092	3/$1.59

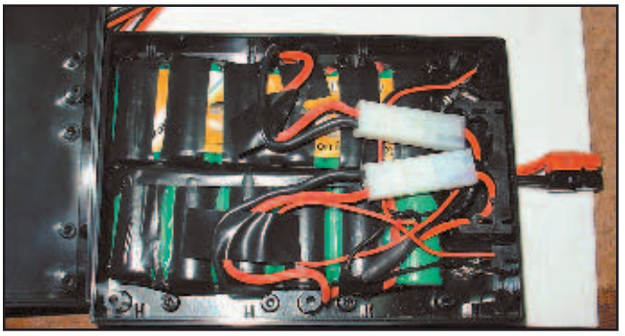

Figure 4—An internal view of the pack. The NiMH batteries fit snugly in the enclosure.

Figure 5—The battery pack and the transceiver. The pack furnishes sufficient voltage for over 1½ hours of operation at the 20 W level. Note the output voltage of the battery pack; the SG-2020 can meter the dc input voltage on its display.

be wired in series, but you also have to be able to charge them individually. For charging purposes, I used 2.1×5.5 mm jacks from RadioShack connected across each battery. Use the RS274-1582 jacks with internal switches, as these isolate the collar of the jack from the negative side of the battery until a charging plug is plugged in. This eliminates any possibility of accidentally shorting things if you put something metallic across these jacks. The jacks are placed as shown in Figure 3. Their positions are not critical, and you can determine where to put them once you position the batteries inside the box. The batteries fit snugly in the box as shown in Figure 4. You can also see in this drawing that I interfaced the wires such that the batteries can be easily removed. A small piece of foam over the batteries helps to keep them snug and immobile when the cover is in place.

I also put rubber feet on the bottom of the case, and labeled the case and charging connectors using "white on clear" Casio labeling tape.

Finally, don't forget to fuse the unit. These batteries can source up to 30 A for a short period of time! You can see the final unit, on top of the transceiver, in Figure 5. Incidentally, the total weight of this battery pack and charger is less than 2 pounds.

Table 2
SG-2020 Battery Current (A)

Transmit Power (W)	*160-20 M*	*17 M*	*15 M*	*12 M*	*10 M*
20	3.8 A	4.2 A	4.8 A	4.5 A*	4.6 A*
10	3.0 A	3.4 A	3.7 A	3.8 A	3.5 A
5	2.5 A	2.7 A	2.9 A	3.0 A	2.7 A

*On 12/10 meters, the maximum output was 15 W.
Receive current: 540 mA with ADSP2 on or off.

Operation

So how long can you go between charges? Over a period of two days, I made 5 contacts for a total QSO-only time of a little over 95 minutes, all running a full 20 W of CW on 40 meters. There was also some additional "in-between QSO time" when I was looking for contacts, but I didn't count this in the total operating time. My "end-of-charge" time was defined to be when the battery voltage fell to 12 V dc. I monitored this voltage on the SG-2020 (pressing CMD-SPEED brings up the voltage display). I did find that when the metered voltage drops to around 13 V, it's really time to consider recharging the batteries, as you are getting very close to a depleted pack.

I also measured the current drain of my SG-2020 so as to give you an idea of how you might do at different power levels. Obviously, you'll get longer operating time at lower power levels. For my ADSP2-equipped SG-2020, the measured key-down current drain data is as shown in Table 2.

Conclusion

The SGC SG-2020 is a great little portable rig that gives you the ability to operate up to 20 W when necessary. Since "portable" often means "battery powered," this article describes an effective, and relatively inexpensive, battery pack for this radio. And, since this battery pack can be recharged quickly, you may even start using it as the primary power supply for your SG-2020, just as I have! Finally, this battery pack may be of interest to you for other QRP portable transceivers. But you need to add at least two series power diodes in order to drop the voltage below 15 V dc when fully charged (15 V dc is the typical maximum voltage for many radios—the SG-2020 is an exception at 18 V dc maximum).

Notes

[1]**www.batteryspace.com**.
[2]**www.mouser.com**.

Photos by the author.

An ARRL Life Member, Phil Salas, AD5X, has been a ham for over 40 years. He received a BSEE degree from Virginia Tech and an MSEE from Southern Methodist University. Currently, he is the VP of Engineering at Celion Networks. Phil shares his station with his wife Debbie, N5UPT, and daughter Stephanie, AC5NF. He can be reached at **ad5x@arrl.net**.