

## Improved 9.6V Compact Fast Charger Phil Salas – AD5X

### Introduction

I had an article published in the November 2003 QST on a compact fast charger for the FT-817. Since then, I've started using 9.6V 3000 mah R/C NiMH batteries for portable operation. As a result, I've now modified the design so that you can select charging currents of either 750 ma or 1000 ma (originally 600 ma only), which works well with both 1600/1800/2250 ma AA NiMH 9.6 volt packs, and the 3000 mah R/C NiMH packs. Like the earlier project, this charger is used with a 13.8V DC supply. So if you have a miniature DC supply (like the MFJ-4103), you can use it both for powering your QRP radio (IC-703 in my case), and also for charging NiMH batteries. This takes up much less space in your portable pack than having to include both a separate charger and power supply. BatterySpace ([www.batteryspace.com](http://www.batteryspace.com)) sells two 9.6V 3-AH NiMH batteries and fast charger for \$56. But though the Batteryspace charger is smaller than a Maha C777, it still occupies more space than an MFJ-4103 and this compact fast charger combined.

### The Design

This compact charger is built around the Maxim MAX712/713 Fast-Charge Controller IC. Either IC can be used with NiMH batteries. These versatile ICs permit fast charging of many different types of battery packs with many different voltages. However, I was just interested in charging 9.6V NiMH battery packs.

The attached schematic shows the final design. The fast-charge current is selectable between 750 ma and 1000 ma by the switch (miniature slide switch mounted on one side of the plastic box) shown on the schematic, which selects between  $0.333\Omega$  and  $0.25\Omega$ . At the high current rate, it will charge a depleted 3-AH pack in 3-4 hours. This controller automatically senses when the battery is charged and switches to trickle. As a safety precaution, the circuit also times-out in 4.4 hours if a charge is not detected. The green LED is a "power" indicator. The red LED is on during fast charge, and turns off when the charger is in "trickle" mode. Other charging rates can be set by changing the value of  $R_{sense}$ .  $R_{sense} = 0.25/\text{Charge Rate}$ .

All parts, except the ICs and PowerPole connectors, are available from All Electronics ([www.allelectronics.com](http://www.allelectronics.com)). All resistors are 1/4-watt. The MAX712 can be purchased directly from [www.maxim-ic.com](http://www.maxim-ic.com) (you may even be able to get some free samples – check their "samples" page). All info on this IC is also available on that site.

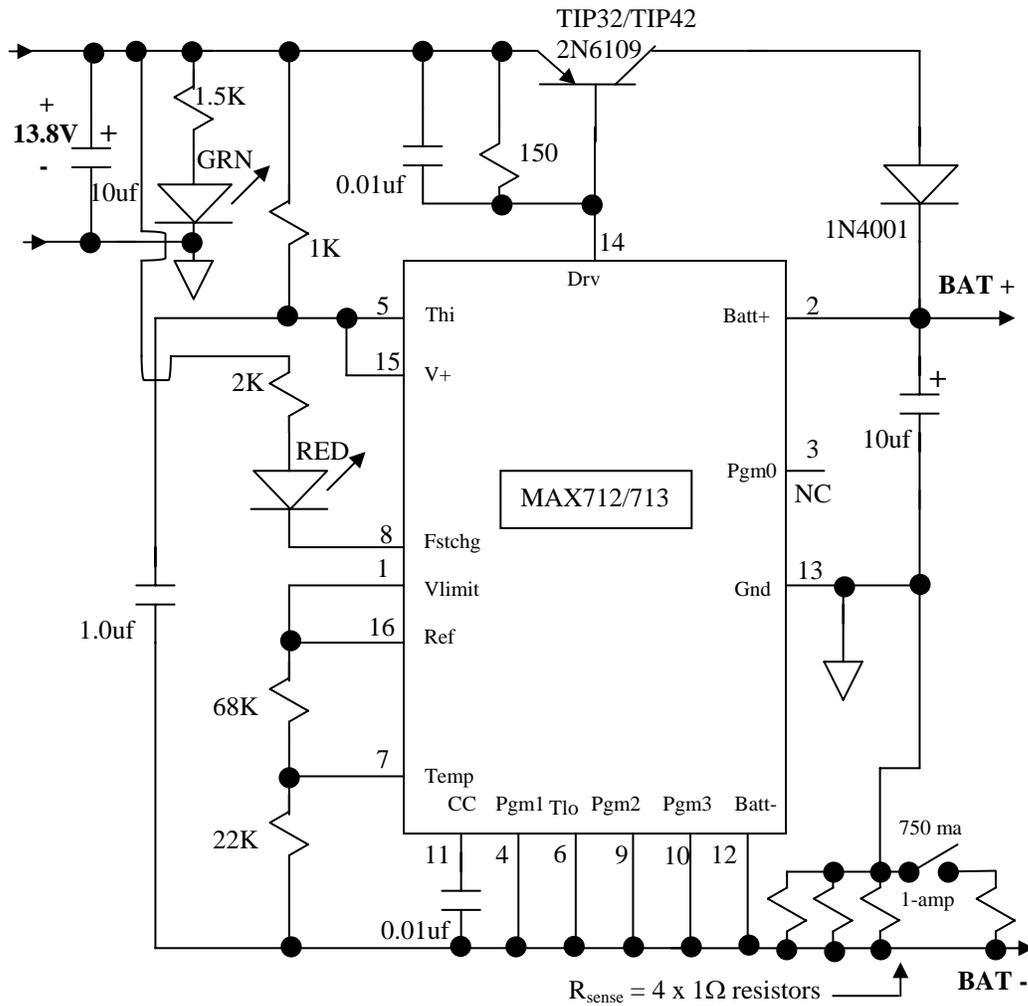
The entire unit is built into an All Electronics TB-1 plastic enclosure with metal cover, and most of the parts are mounted on an All Electronics PC-1 perf-board. The TIP32 transistor is mounted to the metal cover since it must dissipate heat during high-current charging. I mounted a 2.1mm DC socket on the plastic box for the 13.8V input (All Electronics DCJ-1) and used a PowerPole-to-2.1mm plug adapter cable (I'd converted my MFJ-4103 DC output to a PowerPole connector). I used a pendant cable with a PowerPole connector for the output that plugs into the battery (I replaced the RC battery connectors with PowerPole connectors). For those of you with the W4RT OPP on an

FT-817, you can use this same PowerPole-to-2.1mm plug adapter cable for charging the OPP. As you can see from the photo “charger inside1.jpg”, the perf-board is mounted with the components face-down.

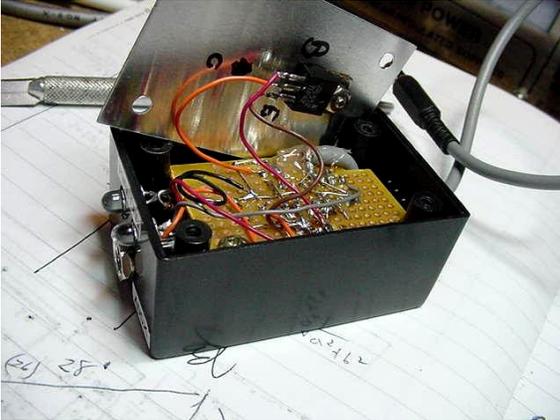
In my original design, a charging current of 600 ma resulted in the metal box cover getting warm, but extra heat-sinking wasn’t needed. For the 750 ma and 1000 ma charging rates, you’ll need to attach a heat-sink to the metal cover of the box. An All Electronics HS-101 heat-sink works well. I drilled and tapped two holes in this heat-sink for #4 screws, and attached it to the metal box cover. The TIP32 transistor mounting screw is one of the screws used for attaching the heat-sink.

Summary

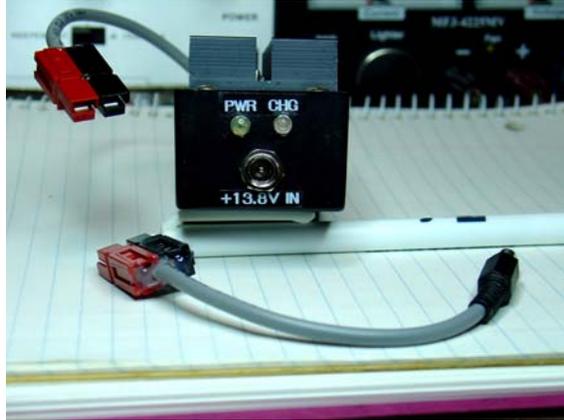
With just a few hours of assembly time and less than \$20 of cost, you can build a compact fast charger for your 9.6V NiMH portable battery packs. This will keep your IC-703 or FT-817 travel pack of accessories compact and light-weight.



Schematic: 9.6V 750/1000 milliamp Fast Charger



Inside wiring



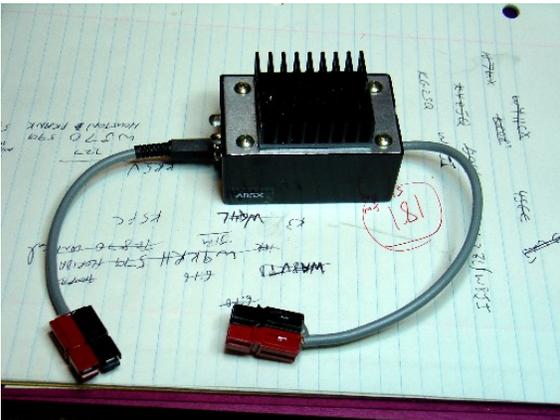
+13.8V DC input



Output to battery



Side view, showing charge switch



Final unit with heat-sink