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This **guide** is unfortunately not meant to be anything near a complete build manual for these buglers. It is merely to serve as a reference to someone who may attempt to extend, improve or service these devices. Some elements of the design are plainly obvious, while others are not. This guide will start with a brief overview, and then delve deeper into some of the more complicated components of the system.

Mechanically, the bugler is very simple; indeed, the first revision was merely the front end of a wagon with the electrical system bolted on top. The second revision, while seemingly similar, is lighter, and smaller. Pneumatic wheels are bolted to a frame made of welded steel. By examining the device, one should be able to easily replicate the design. Some users complain the handle is too short, and it may be extended in the future.

A 12 x 12 x 6 inch Carlon watertight enclosure is bolted to the top of this rolling frame. The heart of the system, a Valcom 1038 paging horn is subsequently bolted to the top of that box using the horn's recommended mounting points. It has been suggested an additional support should be added to the front of the horn (will be incorporated in future revisions – current versions will be modified).

Additionally, a single gang outdoor "in use" outlet is bolted to the outside of the main box to protect the switches, connectors and display from the elements.

Electrically, the bugler is… not so simple. While the amplifier is contained in the horn, some parts of the power supply and charging circuitry are…unnecessarily complicated (see the attached flowchart for evidence). There is however, some reason behind the madness.

The battery pack for example was chosen to be a 24V pack rather then a 48V pack because there was some uncertainty if the charge IC could indeed charge a 48V pack. Furthermore, it was impossible to find an appropriate transformer, and there are very few simple silicon power solutions which can handle voltages above 40V.

However, there are many solutions to charge 24V packs and convert voltages up to 48V. So, a 24V pack was chosen.

Examining the electrical overview, we see there are three components which may…require some thought. Those are the two switching power supplies (24V to 38V and 24V to 48V) and a switching charger.

The switchers are based on the stable reliable National Semiconductor LM2587-ADJ. These parts have been proven to provide reliable service in real world situations. They are extremely simple to use, and, if the datasheet proves too cryptic, the online calculator is very handy. Both switchers have the same PCB and share many of the same components. The schematic, and the artwork are provided in Eagle CAD format, the Gerbers for the PCB, and a parts list are also supplied.

The charger was slightly more difficult. It was based on the Texas Instruments BQ2031. For the most part, the reference schematic was used, and can be viewed by opening the .sch file in Eagle. There are some PCB errata. The protection diode was drawn backwards, and one of the sense resistors RT2 was shorted by the 1/8 ohm current sense resistors, requiring a cut in the PCB. The protection diode has been fixed in the attached schematic and board, but the resistor has not yet been fixed.

The charger PCB can be surely shrunk, hopefully in future revisions, the PCBs will be combined into one. In this revision they were separated in the event of a failure and to speed manufacture.

Future revisions should also include a mute switch, a power led, possible auto power off, and possible low battery indicator or battery fuel gauge. Actual heat sinks would be used (rather then chunks of angle aluminum due to an order snafu).

In terms of cost, significant savings were brought by using many donated components including the PCBs (thanks Bob House), free samples of some parts (TI, NI, Coilcraft). Some crucial parts, such as the FET in the charger, are embarrassingly over engineered. The FET is rated at over 50 times the needed amperage and 4 times the needed voltage. This shows that in the future, while some free parts would cost more, others could cost significantly less.

Nonetheless, around $660 was spent total in this project. Given the buglers were budgeted to be between $300 and $350 each, at ~$330 each, they fall well within budget.

In the future, they will probably cost a similar amount because the large number of donated/free components will offset the economies of scale. I anticipate the parts for the next revision will cost around $300 dollars each.

After some **reflection** this was a rather straight forward project, and a great learning experience. Unfortunately, due to the sheer cost of each unit, I am unsure if they are a viable commercial product.

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