

2020-01-07 DGI

Design Concept for LRAUV Replacement Battery Backplane

Requirement:

Design a new backplane PCB which monitors and controls 31 Inspired Energy NH2034 battery packs, without using the discontinued Ocean Server XP-08SR battery manager. It should maintain the same arrangement of packs and mechanical chassis as existing half-pack.

Proposal:

To minimize shorepower connector size/heating, use higher-than-bus-voltage shorepower and step-down converter to regulate charge current to packs. Use PI3740 DC-DC converter with 8-60V input range. Shorepower input voltage TBD but probably around 30V. Too low and the shorepower connector gets big. Higher and the converter is less efficient.

Configure PI3740 for regulated voltage and current: 17V , 3A output. We're limited to 3A because in case some packs are broken, the remaining pack might not charge correctly with more than 3A. 3A is nice because converter stays cool: converter temp rise will be about 25°C above ambient with no heat sink.

Divide the half-pack backplane into four sections: three with 8 packs and one with 7 packs. This is a good division because 8-way I2C mux ICs are available (use NXP PCA9548A), and pack-counts of sections are close to symmetrical so power is roughly balanced. The downside is it takes 16 hours to charge completely.

Microcontroller(s) poll all packs and report status to motherboard, when polled, via multidrop RS-232. Only one motherboard serial port is used for all packs.

Optional enhancement: Add discharge switch to allow putting battery into low-power storage mode. Bootstrap from storage mode by applying shorepower to liven up motherboard and backplane microcontrollers.

Optional enhancement: Shorepower isolation switches: Some day there will be a ground fault on the shorepower connector. Make this inconsequential by isolating this connector when not in use. This requires a few more switches. These can be FETs operated autonomously from shorepower supply.

Optional enhancement: Bootstrap diode integrated with backplane. That way just one supply connection can be used for bootstrap, hotel, and battery charging and we don't have the problem of fast load browning out the bootstrap supply before MB can switch over to battery power.

See block diagram on the next page.....

