Open Source Cell Top Battery Management System – OSCTBMS

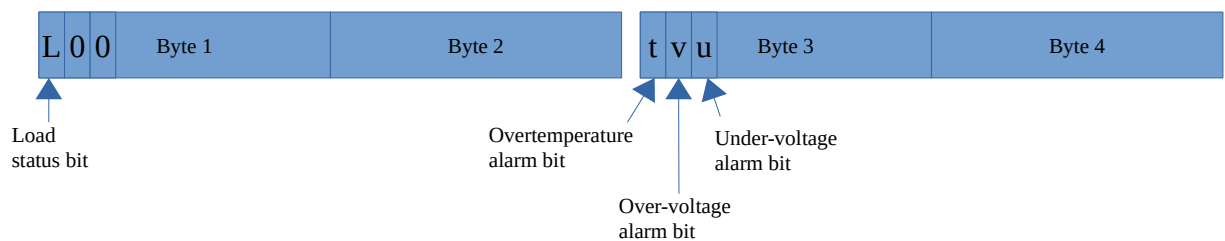## Inter-module communications

On the top of each cell is a monitor unit that measures the voltage and temperature of the cell.
Additionally, it has a load that can be turned on or off to balance the cells.
The cell top monitors have to report their information to the charger manager.
The messages are built around a 4 byte data packet – forward error correction expands this to 6 bytes when the data is actually transmitted. The first 2 bytes are used for the cell voltage in mV and the second 2 bytes are used for the cell temperature in 1/10ths of a degree Celsius.

Cell mV	0 – 4200	0x1068	13bits required
Cell Temperature	0 – 1000	0x3E8	10bits required

The state of the load is encoded in the msb of the voltage bytes, the next 2 bits are always zero.
The upper 3 bits of the temperature bytes are used for the 3 alarm indicators.

L	0	0	Byte 1	Byte 2	t	v	u	Byte 3	Byte 4

Load status bit

Overtemperature alarm bit

Under-voltage alarm bit

Over-voltage alarm bit

The charger controller needs to be able to initiate the sending of cell data so it can control the sampling rate for logging etc. The charge controller should also be able to activate individual cell loads to achieve dynamic balancing.
The initiator message from the charge controller is identified by having bits 1, 2 and 3 set to 1 in both pairs of bytes. This can NEVER occur with cell data as it would mean over-voltage AND under-voltage at the same time. Both pairs of bytes should be identical to ensure data integrity.
The initiator data is the mean cell voltage for dynamic balancing, cells will turn their load on if they're more than 50mv above the mean. Dynamic balancing is disabled by sending zero.

1	1	1	Byte 1	Byte 2	1	1	1	Byte 3	Byte 4

Calibration

In order to get the maximum accuracy from the cell readings the module should be calibrated.

You will need:

- accurate voltmeter.
- cell voltage supply, a cell will do fine.
- A way to read the cell data such as the arduino + shield or a decoding oscilloscope.
- compiler and programmer to re-flash the modules.

Calibration is a relatively simple process:

1. Connect the cell to a stable voltage supply, the cell will be fine.
2. Read the cell data to see what it reads.
3. Compare the voltage reading to a calibrated voltmeter.
4. Adjust the `CELL_VOLT_MAX_INPUT` value in the hardware.h file to adjust the cell reading.
5. Recompile the code and reprogram the module to apply the new reading.