

Dakota Battery System

Ted Lowe @ 2015-11-20 FVEAA Meeting

1. Overview - \$8K electric truck
2. What i just bought
3. How it will be hooked together
4. Composite Battery Boxes
5. Cell Balancing



YOU CAN'T BUY

HAPPINESS

• **BUT YOU CAN BUY A** •

TRUCK

AND THAT'S PRETTY CLOSE

**Will be a pretty
damn nice
electric truck for
about \$8K!**

What i just bought

- 48x CALB CA100 Cells @ \$120 = \$5,760
- Orion BMS \$1,020 (includes all wiring harnesses, current sensor, temp sensor and CANdapter)
- Elcon 2500W Charger (no CAN) \$550
- 21 Face-to-Face Bus Bars @ \$2 = \$42
- Shipping to nearby dock: \$282.93
- Total is: \$7,654.93

Bought from

- Don Blazer ~ Portland, Oregon
- Work: 503-245-9030, Cell: 503-706-5359
- Email: theoldcars@aol.com
- EV Enthusiast, has established business, not for profit purposes
- Same great guy as Mike Willuweit used for Porsche & recommended

Battery Pack Details

- 48x CALB CA100 Lithium Iron Phosphate (LiFePo) Cells - 100 Amp Hours
- Each cell tested to 118 AH aka high capacity
- System Voltage: $48 \times 3.2V = \mathbf{153.6V}$
- Pack Capacity: $3.2V \times 48 \times 118 \text{ AH} = \mathbf{18.1 \text{ KWH}}$
- Range @ 350 Watt-Hour/Mile:
 $18.1 \text{ KWH} / 350 \text{ WH/Mi} = \mathbf{51.2 \text{ Miles}}$
- Weight: $48 \times 7.5 \text{ lbs each} = \mathbf{360 \text{ lbs}}$ (removed 1800 lbs lead!)
- Continuous Current: 3C = 300A

Orion BMS

- Will be installed to monitor each cell during charging and discharging (driving)
- Will output detailed cell voltage data in real time and send it to a smartphone via bluetooth
- Also planning to integrate it with a car computer (Raspberry Pi)
- Will ALERT if a cell goes to low during driving
- Will turn off charger when cells get full (and do cell-by-cell balancing too)
- **To Be Continued**

Elcon 2500W Charger

- Field programmable for type of cells and # of cells (terminal voltage)
- Built-in algorithms to charge LiFePo properly - constant current, constant voltage (CCCV)
- Universal input voltage: 120VAC or 240VAC
- Will be turned off by Orion BMS
- Will be connected to EVSE via J1772 standard
- Will also have standard 120VAC inlet for standard residential/Event opportunity charging

Front

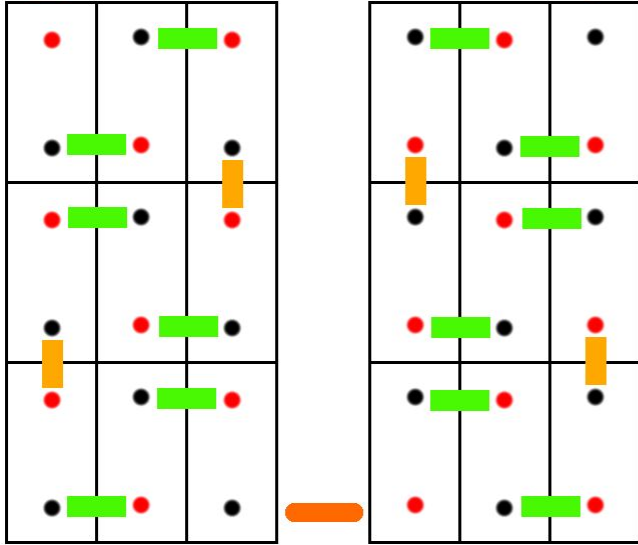
Dakota Battery Pack (48 CALB CA100 Cells)

24 E2E (60mm)

Rear

21 F2F (65mm)

(B+)

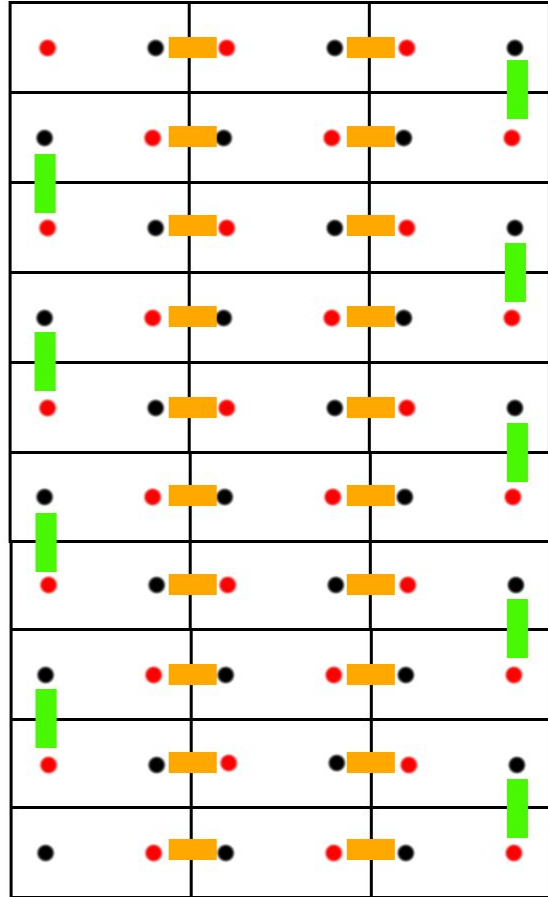


Box 1 (9 Cells)

Box 2 (9 Cells)

(Under Hood)

(B-)



Box 3 (30 Cells) (Under Bed)

Two different length bus bars (F2F=65mm, E2E=60mm)



Composite Battery Boxes

- Kevlar wrapped foam panels, epoxied together
- Jeff Miller did presentation last year on the details
- Lighter than steel, very strong, waterproof
- Jeff Miller did design and math at last work session
- i ordered 15' of kevar of 60" width & scissors
- Will be enough to make 3 battery boxes
- Using higher density foam ($\frac{3}{4}$ " thick, Formular-250 from Menards)
- Using slow epoxy, needs 70F to dry
- i will pre-cut foam and kevar and then hold another work session to build them



Cell Balancing

- New cells need to be balanced before use
- Two types of balancing: Bulk and Ongoing
- Bulk Balancing is a one-time action to bring all the cells close to the same state of charge (using George Hiller's cell discharging device to bring each cell down to 2.75V - long project - 48 cells!)
- Ongoing Balancing will be done by Orion BMS (to be continued)
- George's discharging device will be demo'ed at the break



The end for now...

... to be continued.