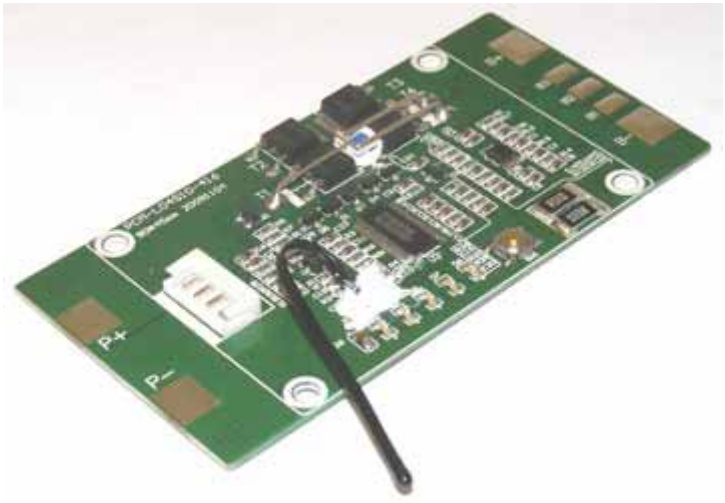
Operation Manual of

Smart Battery Systems (SBS) with SmBus V1.1 support for 14.8V @ 6.4Ah / 10Ah/ 12.6Ah Li-Ion battery pack



AA Portable Power Corp

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Prepared & Approved by Louis (01/04/10)

SBS-LP14.8V-PC is a Smart Battery System (SBS) which is designed to manage Li-Ion battery pack of 14.8V @ 6.4Ah/10Ah/12.6Ah capacity **(Please select capacity used via "For Capacity (Ah)?" Menu** with SMBus Interface. You can set up protection parameters and to collect battery data through the SMbus V1.1 protocol right from the SBS.

Smart Battery System (SBS) consist of the following:

- PCM board with temperature sensor & Fuel gauge for a 14.8V Li-Ion battery pack
  - Manufacture part# CMB010 (4S)
  - Over-Charge protection
    - Cell's level: 4.3V +/- 0.025V
    - Battery pack level: 17.5 +/- 0.05V /cell
  - Over-discharge protection
    - Cell's level: 2.5V +/- 0.05V
    - Battery pack level: 11.0V +/- 0.5V / cell
  - Limit 14.8V Li-Ion Battery pack's discharging current below **6.5A.**
  - Over-Temperature Protection
    - Charge: 55 +/- 5'C
    - Discharge: 60 +/- 5C
  - Max Dimension (LxWxH): 90mm(3.5") x 45mm(1.8") x 8mm (0.3")
- LED fuel Gauge
  - There are 6 micro-LEDs installed on PCM.
  - On/off Switch - to check estimate battery capacity status. (approx 15% per each LED light)
- Interface with PC.
  - **BQ20Z95DBTRG4** IC is installed on PCM for communication with PC or LCD display card (optional item)
  - 4 pins connector with 6.0" open end cable is included for connecting PCM to PC interface
    - To communicate with PC, you must order this Interface hardware, **EV2300** from Texas Instrument.
    - you must download software from Texas Instrument website
  - see attach specification on layout of the board and connector
  - From PC, you can collect battery pack running data as follow:
    - Voltage
    - RemCap (mAh) → Remain Capacity
    - DnCap (mAh) → Design Capacity
    - FullCap (mAh) → Full Capacity
    - Temp ('C)
    - Current (mAh)
    - Cycle (CYC)
  - You can check each cell's voltage as follow:
    - Cell -V1 (mV)
    - Cell-V2 (mV)
    - Cell-V3 (mV)
    - Cell-V4 (mV)
    - AveTTE (min)
    - AVETTF (min)
    - SN

Other components required to operate the SBS (Included)

- **LCD Display**
  - This LCD display will show all data available for you without the use of PC.
  - LCD display 1 (Push "On/Off" Switch 5 milli-sec)
  - LCD display 2 (Push "PU/PD" Switch)
  - Note: You may push ""On/Off" Switch" for switch back to LCD display 1

Other components required to operate the SBS (Not Included)

- **Charger**
  - You must choose a smart charger based on battery pack type and voltage. Ex: for a 4 cells Li-Ion battery pack, you will need a 14.8V smart charger with 16.8V CCCV cut-off
- **DIY connector**
  - Charge / Discharge terminal connector

Specification of Protection Circuit Board with Fuel Gauge for 14.8V (4S) Li-Ion pack
Manufacture part# PCM-L04S10-416

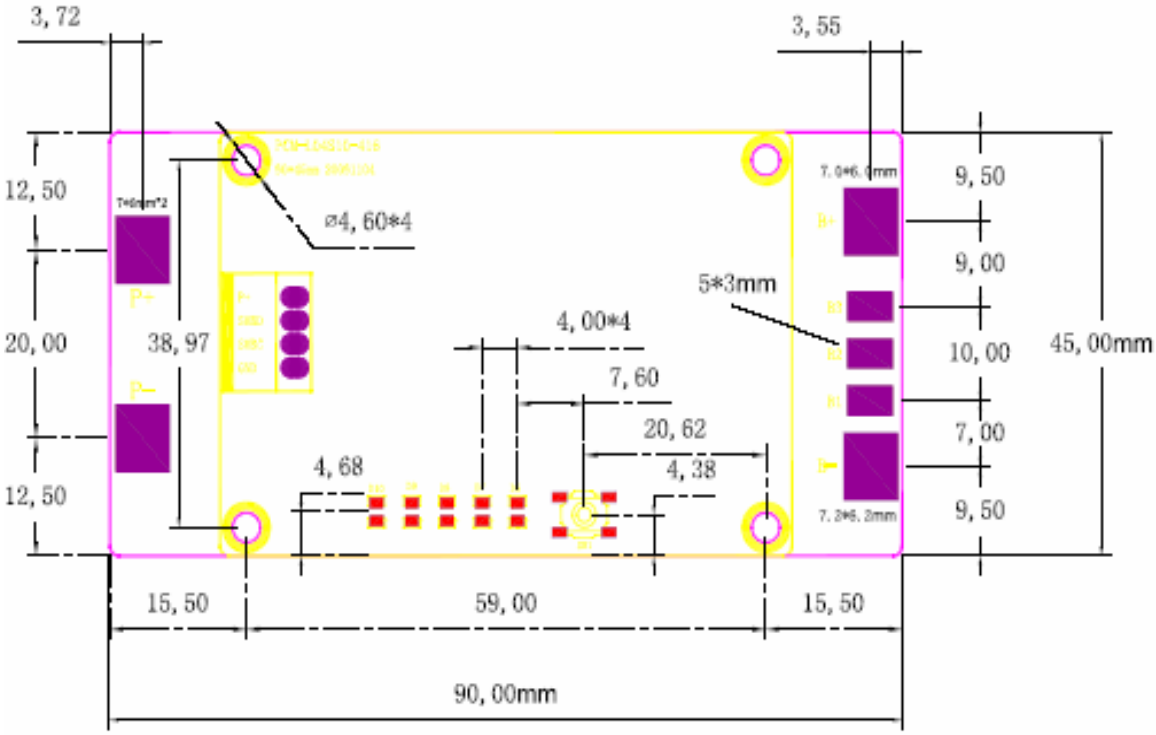
Test item (Test at normal temperature 25±2℃ and relative humidity≤90%)			Criterion		
			Parameter	Delay time	Release condition
Over charge Protection	Single cell	1st level safty	4.3±0.025V	2.0s±0.5s	4.1±0.05V
		2nd level safty	4.4±0.025V	1.5s±0.5s	Permanent fail
	Pack	1st level safty	4.375±0.05V/ Cell	2.0s±0.5s	4.0±0.1V/ Cell
		2nd level safty	4.1±0.05V/ Cell	0	Permanent fail
Over discharge protection	Single cell		2.5±0.05V	2.0s±0.5s	3.0±0.1V
	Pack		2.75±0.05V/ Cell	2.0s±0.5s	3±0.05V/ Cell
Over current protection	1st level safty		6500mA	2S±0.5s	200mA
	2nd level safty		8000mA	2S±0.5s	200mA
	SOC protection		10000mA	0	Permanent fail
Over temperature protection	Charge	1st level safty	55±5℃	2.0s±0.5s	50±5℃
		2nd level safty	65±5℃	0	Permanent fail
	Discharge	1st level safty	60±5℃	2.0s±0.5s	55±5℃
		2nd level safty	75±5℃	0	Permanent fail
Short circuit protection			20A	488±100uS	20mA

Electrical characteristics			
Item		Specification	Remark
Charging Voltage		4.2V *N	4.2V / 1Cell
Charging Method		CC/CV	Constant-current and -Voltage with Limited current
Supply voltage range （B+，B-）		–0.3 V to 34 V	
Impedance		≤100mΩ	B- to P- and B+ to P+
Current consumption	Firmware running	＜600uA	
	Sleep Mode	＜200uA	
Temperature	Operating Temperature	-40～+85℃	
	Storage Temperature	-40～+125℃	

Note: Charging voltage = 4.2V x 4 = 16.8V

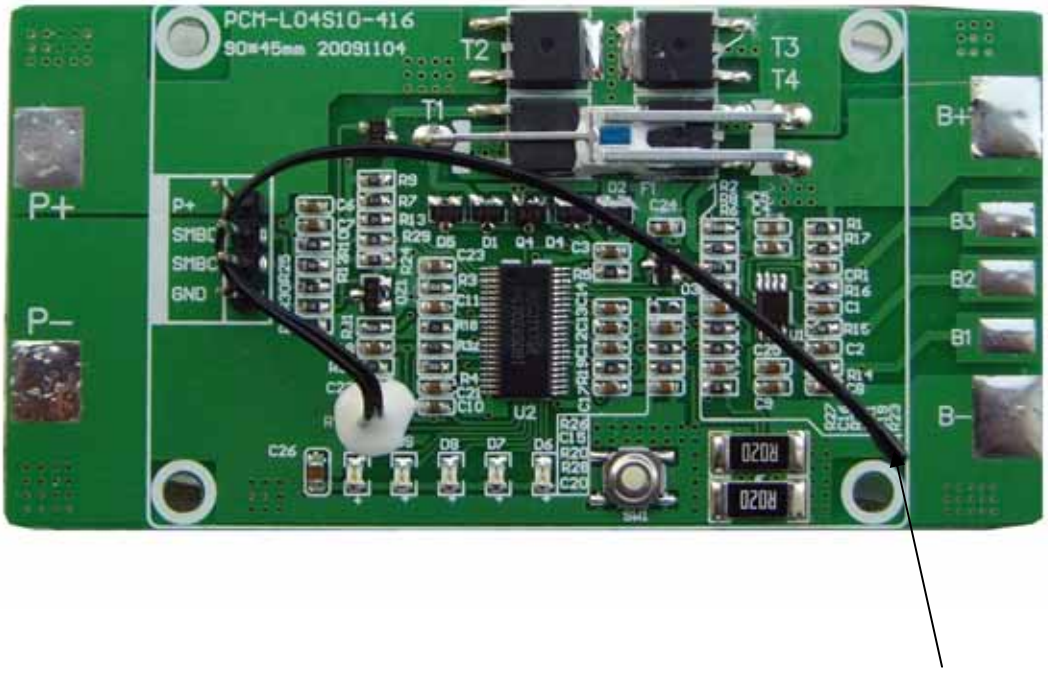
PCM Max Dimension (LxWxH): 90mm(3.5") x 45mm(1.8") x 8mm (0.3")

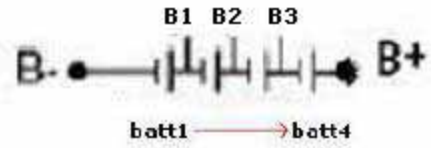
Drawing Diagram of 14.8V (4S) Li-Ion Protection Circuit Board (PCM-L04S10-416)



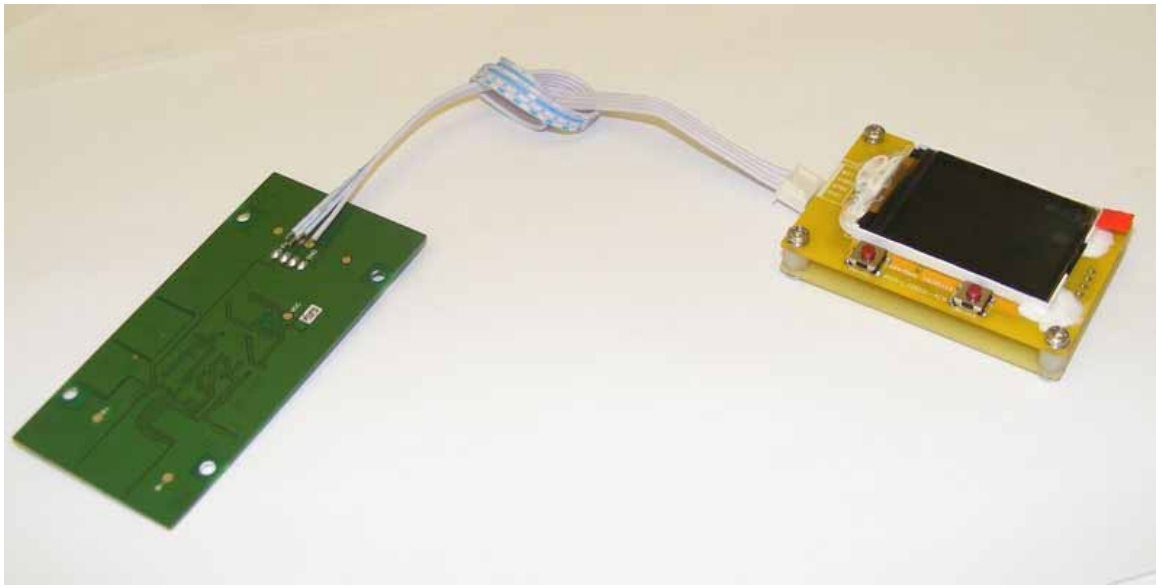
Wiring Diagram (Port Explanation)

P+ = Charge + / Discharge +
P- = Charge - / Discharge –
TS = Temperature Sensor Wire



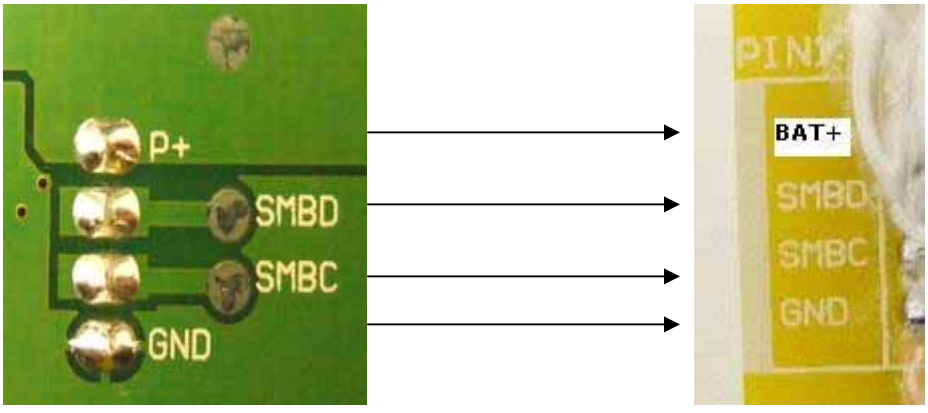


How to connect with Excluded Touch Screen LCD Display



PCB Board (Bottom Side) → LCD Display

P + → BAT +
SMBD → SMBD
SMBC → SMBC
GND → GND



Excluded LCD Display Picture (yellow color version)

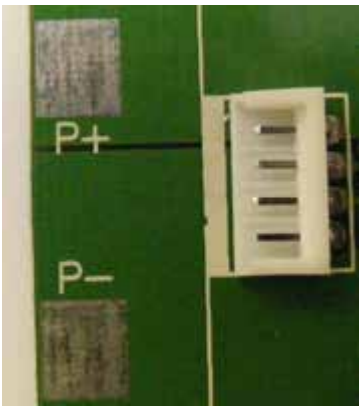
LCD Display 1

LCD Display 2

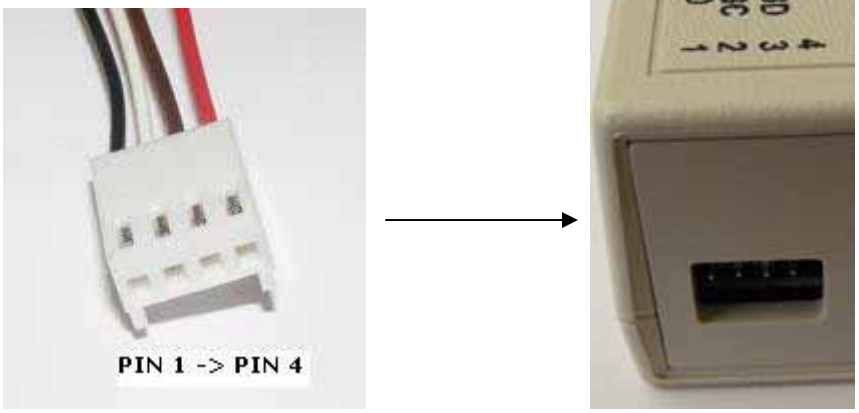
How to connect with Excluded EV2300 Evaluation Module Interface Board

- Connect with Excluded EV2300 Evaluation Module Interface Board Module by excluded Connector adaptor: Convert from 4 Pin JST Female plug to 4 pin Molex Connector

- Connect 4 Pin Female JST plug with 4 Pin Male JST socket on PCB Board



- Connect 4 Pin Female Molex plug with 4 Pin Molex plug on “SMB” socket of EV2300 Evaluation Module Interface Board



Pin Assignment for Molex Connector:

Pin 1 = GND = Black Wire

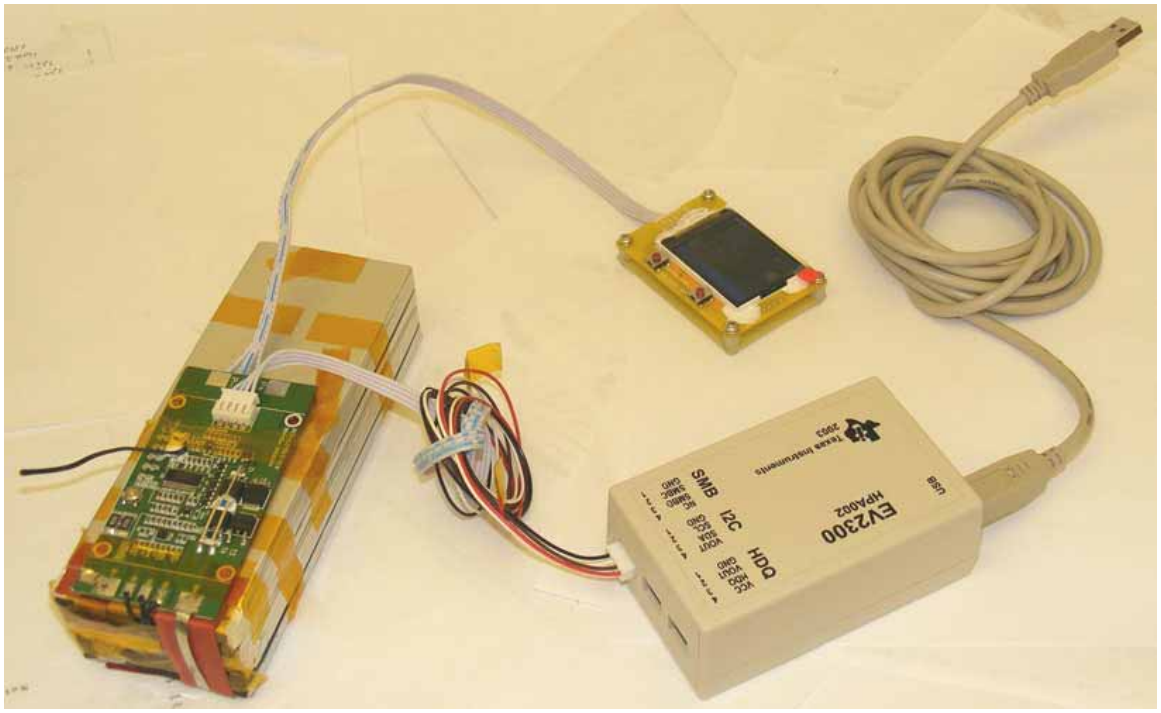
Pin 2 = SMBC = White Wire

Pin 3 = SMBD = Brown Wire

Pin 4 = NC (Not Connected / Floating) = Red Wire

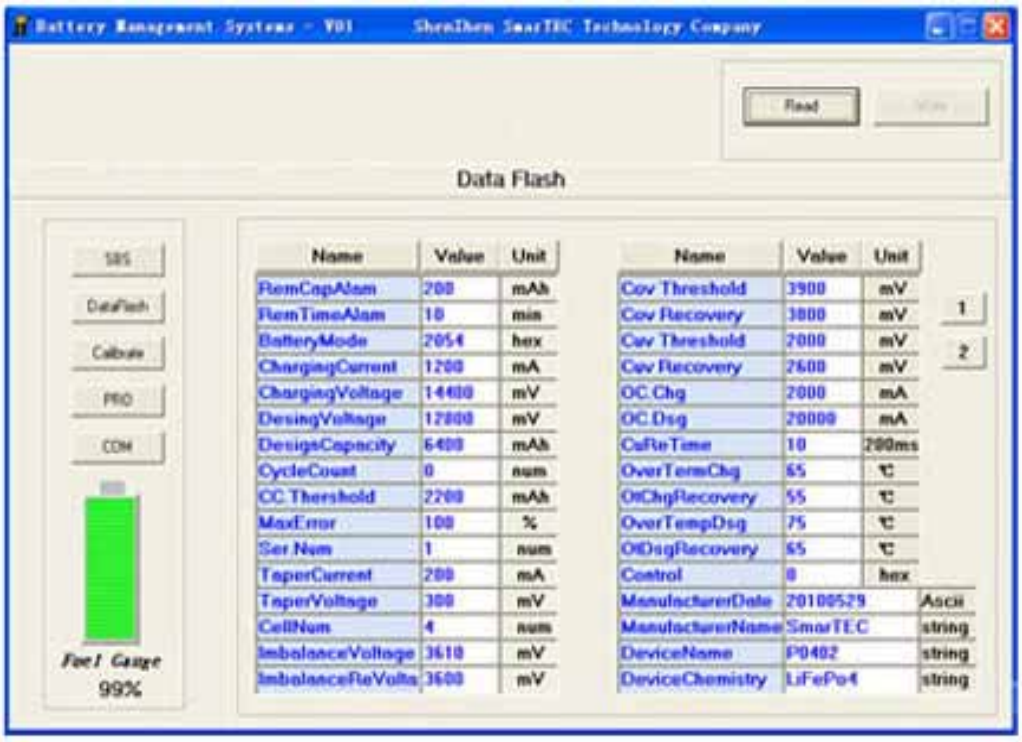
- Connect USB Male plug to PC. (Must Install excluded USB EV2300 Driver and excluded Software before use)

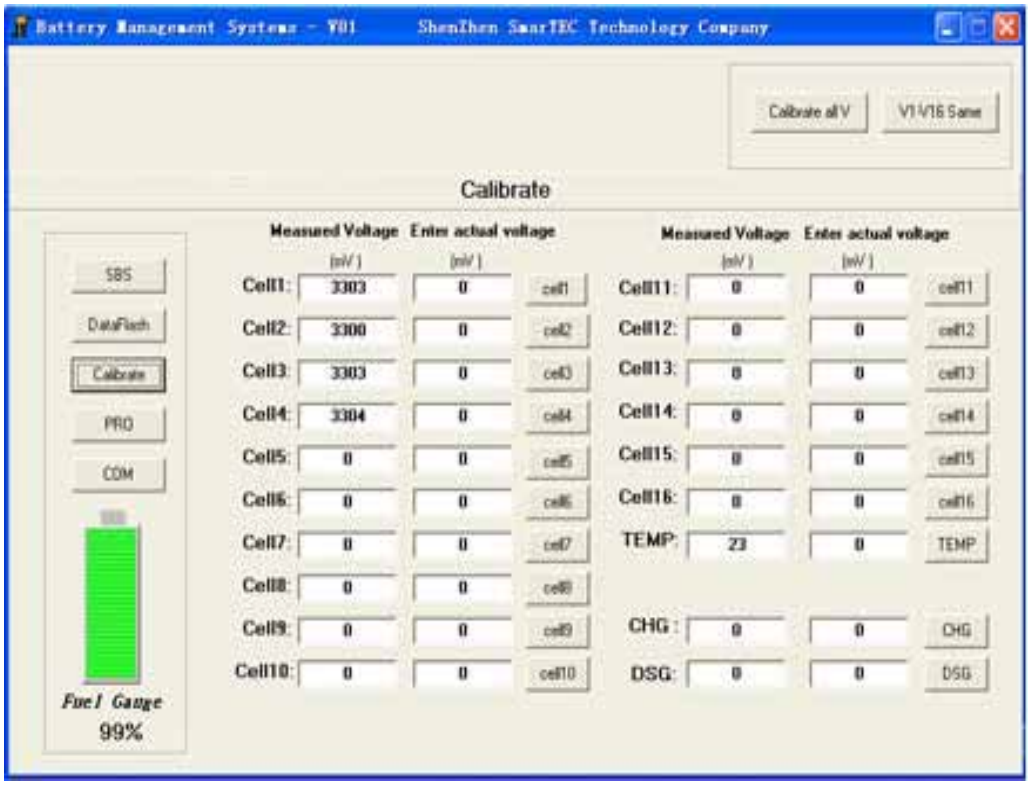
Final picture after connect with EV2300 Evaluation Module Interface Board

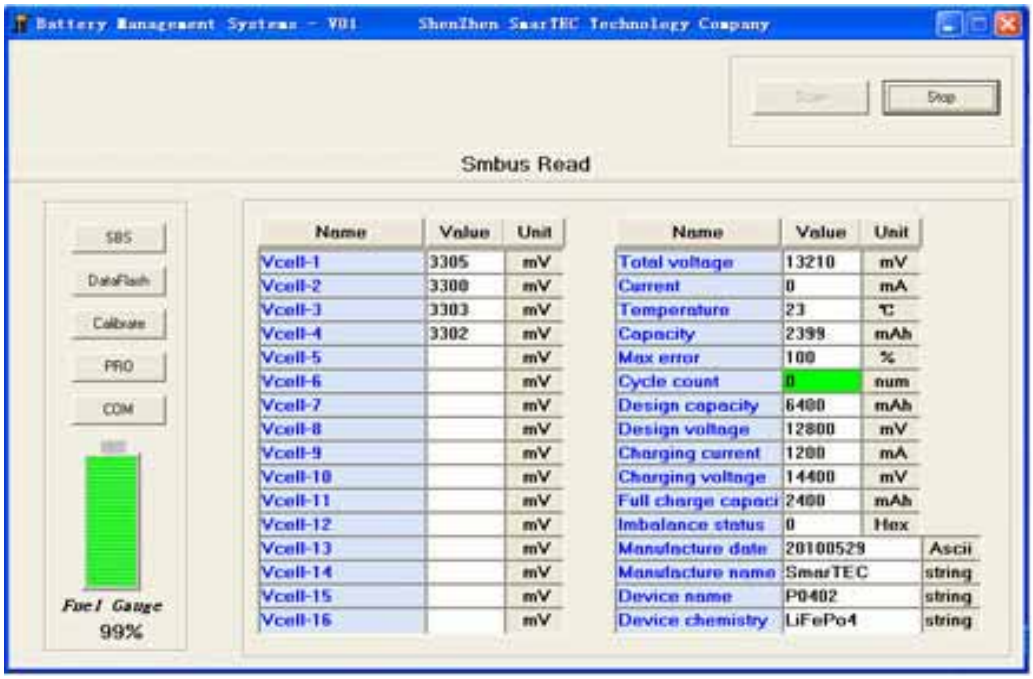


How to connect with laptop

Excluded USER Friendly Software Interface






Battery Management Systems - V01
ShenZhen SmarTEC Technology Company
Stop
Smbus Read
SBS
DataFlash
Calibrate
PRO
COM
Fuel Gauge
99%
Name
Value
Unit
Vcell-1
3305
mV
Vcell-2
3300
mV
Vcell-3
3303
mV
Vcell-4
3302
mV
Vcell-5
mV
Vcell-6
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Vcell-7
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Vcell-8
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Vcell-9
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Vcell-10
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Vcell-11
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Vcell-13
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Vcell-14
mV
Vcell-15
mV
Vcell-16
mV
Name
Value
Unit
Total voltage
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mV
Current
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mA
Temperature
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℃
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mAh
Max error
100
%
Cycle count
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mAh
Design voltage
12800
mV
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1200
mA
Charging voltage
14400
mV
Full charge capaci
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mAh
Imbalance status
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Hex
Manufacture date
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Ascii
Manufacture name
SmarTEC
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Device name
P0402
string
Device chemistry
LiFePo4
string