Operation Manual of

Smart Battery Systems (SBS) with SmBus V1.1 support for 12.8V LiFePO4 battery pack (6.6Ah-100Ah)

AA Portable Power Corp

AA Portable Power Corp (http://www.batteryspace.com)
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SBS-LP12.8V-PC is a Smart Battery System (SBS) which is designed to manage LiFePO4 battery pack of 12.8V **from 6.6Ah to 100Ah 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 12.8V Li-Ion battery pack
  - Manufacture part# PCM-L04S05-117
  - Over-Charge protection: 3.8 ~ 4.4V (Adjustable)
  - Over-discharge protection: 1.9 ~ 3.1V (Adjustable)
  - Limit 12.8V Li-Ion Battery pack's discharging current below **7.0A. (Higher rate available up to 60.0A upon requested)**
  - Over-Temperature Protection
    - Charge: 55 +/- 5'C
    - Discharge: 60 +/- 5C
  - Max Dimension (LxWxH): 102mm(4.0") x 50mm(2.0") x 8mm (0.3")
  - Weight: 1.0Oz (28 grams)
- 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 (click underlined to download IC specs) is installed on PCM for communication with PC or LCD display card (optional item)
  - **Excluded**Connector adaptor: 2' long Convert from 4 Pin Female JST plug to 4 pin Female Molex Connector for connecting PCM to PC interface
    - To communicate with PC, you must order this Interface hardware from Texas Instrument, EV2300 Evaluation Module Interface Board for SBS, (Please click underline to order)
  - 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 (Not Included)

- **LCD Display (Please click here to buy seperately)**
  - 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
- **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 12.8V (4S) Li-Ion pack
Manufacture part# PCM-L04S05-117

Technical parameters:

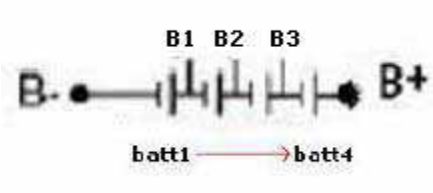
No.	Test item		Criterion
1	Voltage	Charging voltage	CC/CV: 3.6V /cell
		Balance voltage for single cell	3.5~4.2V (Adjustable)
2	Current	Balance current for single cell	0~100mA (Adjutsable)
		Low Current consumption for single cell	=< 25 uA
		Maximal continuous Discharging current	7.0A
3	Over charge Protection (single cell)	Over charge detection voltage	3.8~4.4V (Adjustable)
		Over charge detection delay time	0.5~2.5S
		Over charge release voltage	3.8~4.4V (Adjustable)
4	Over discharge protection (single cell)	Over discharge detection voltage	1.9~3.1V (Adjustable)
		Over discharge detection delay time	50~300 mS
		Over discharge release voltage	1.9~3.1V (Adjustable)
5	Over current protection	Over current detection voltage	0.06~0.6V
		Over current detection current	10~50A
		Detection delay time	1~50mS
		Release condition	Cut Load
6	Short protection	Detection condition	Exterior short circuit
		Detection delay time	200-500us
		Release condition	Cut Load
7	Resistance	Protection circuitry (MOSFET)	=< 50 milli - ohms
8	Temperature	Operating Temperature Range	-40~+85℃
		Storage Temperature Range	-40~+125℃

Note: Charging voltage = 3.6V x 4 = 14.4V

PCM Max Dimension (LxWxH): 102mm(4.0") x 50mm(2.0") x 8mm (0.3")

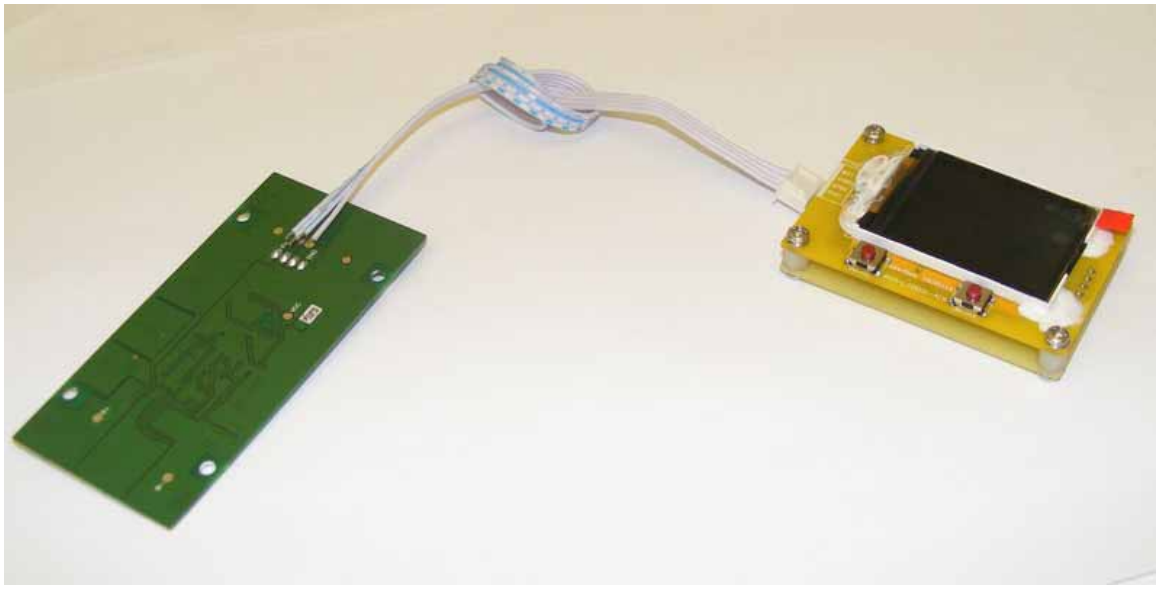
Wiring Diagram (Port Explanation)

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



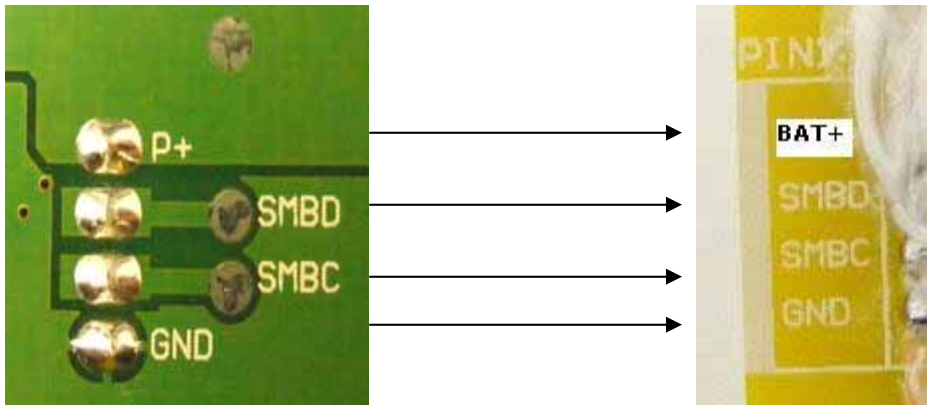
Perfect use with LFP-26650-4S2P battery pack

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)

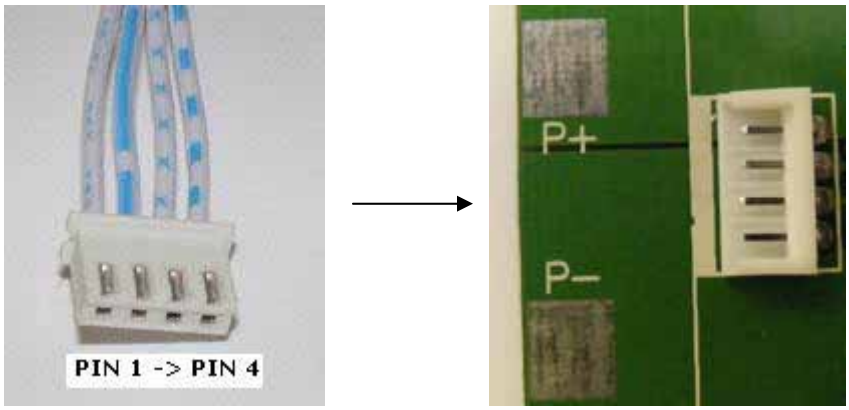
LCD Display 1

LCD Display 2

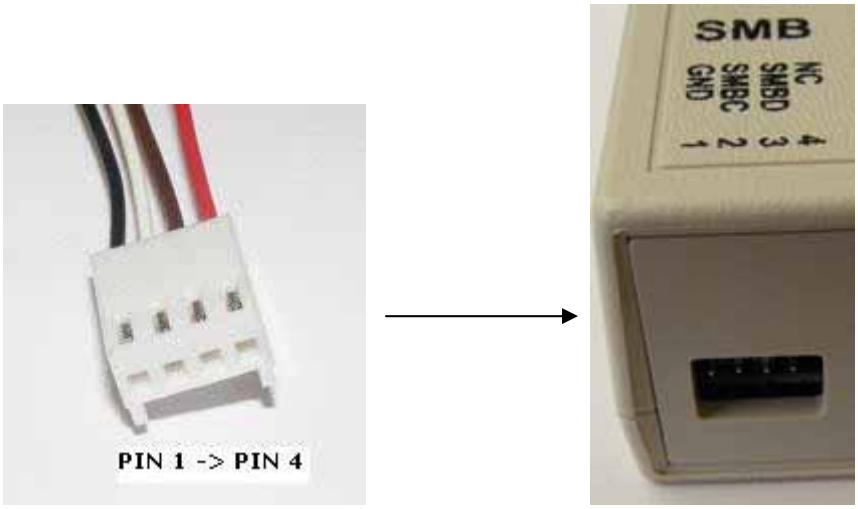
How to connect with Excluded EV2300 Evaluation Module Interface Board

- 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

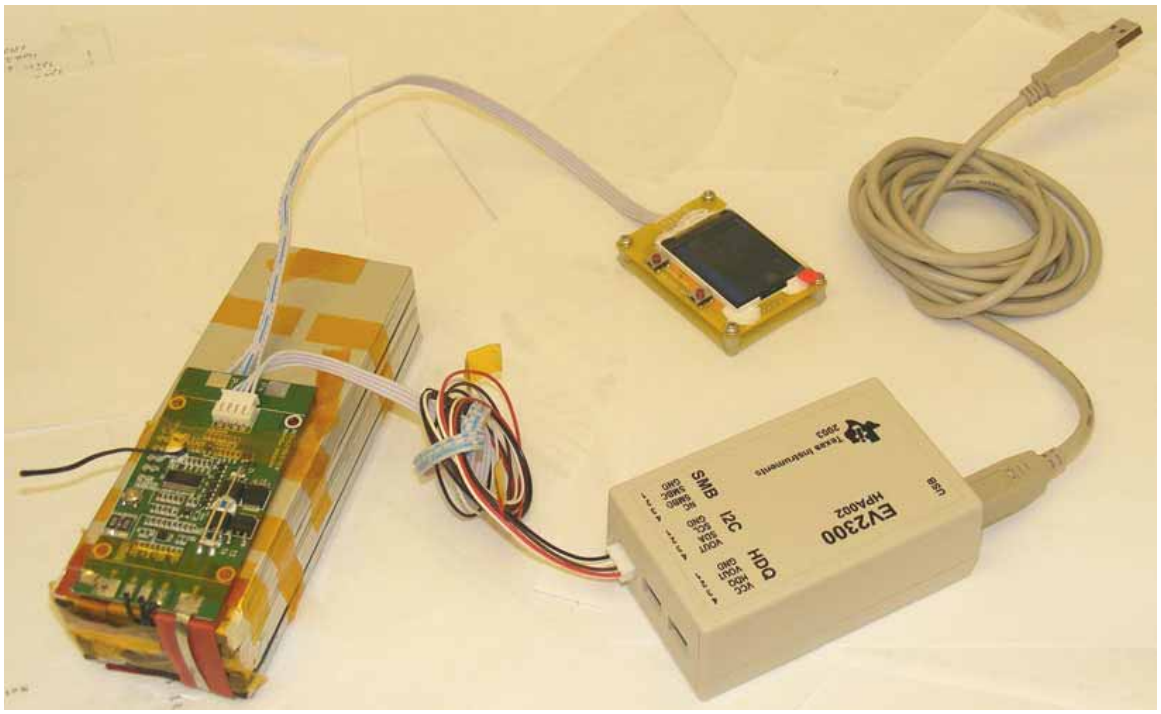
Pin 2 = SMBC = White Wire

Pin 3 = SMBD = Brown Wire

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

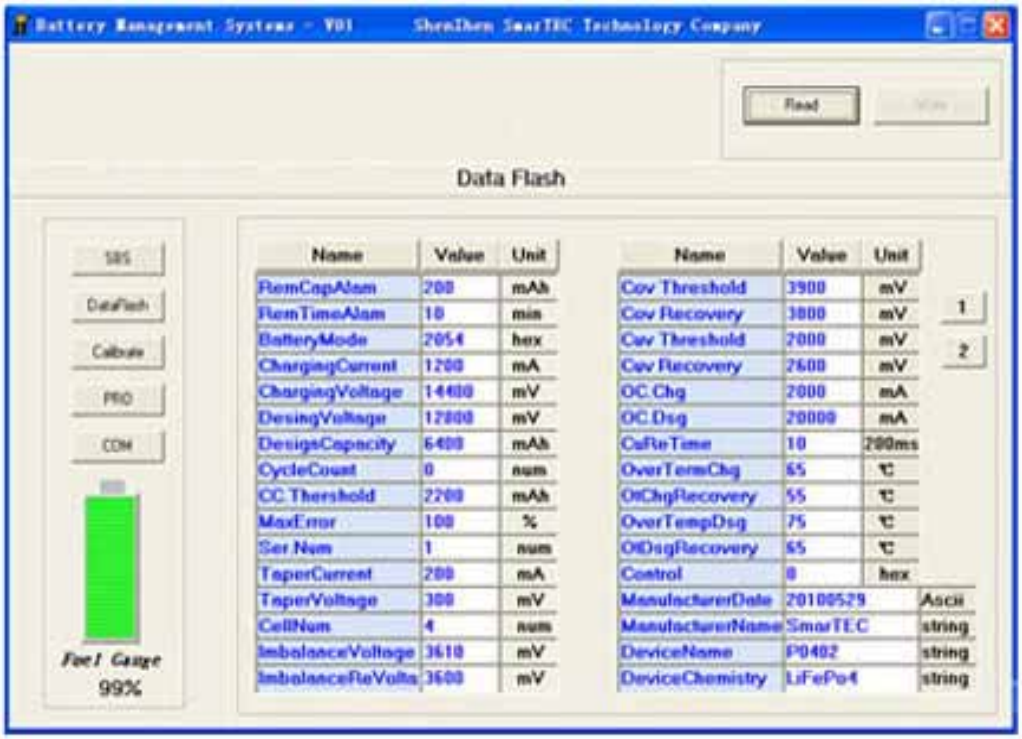
- Connect USB Male plug to PC. (Must Install excluded USB EV2300 Driver and excluded Software before use)

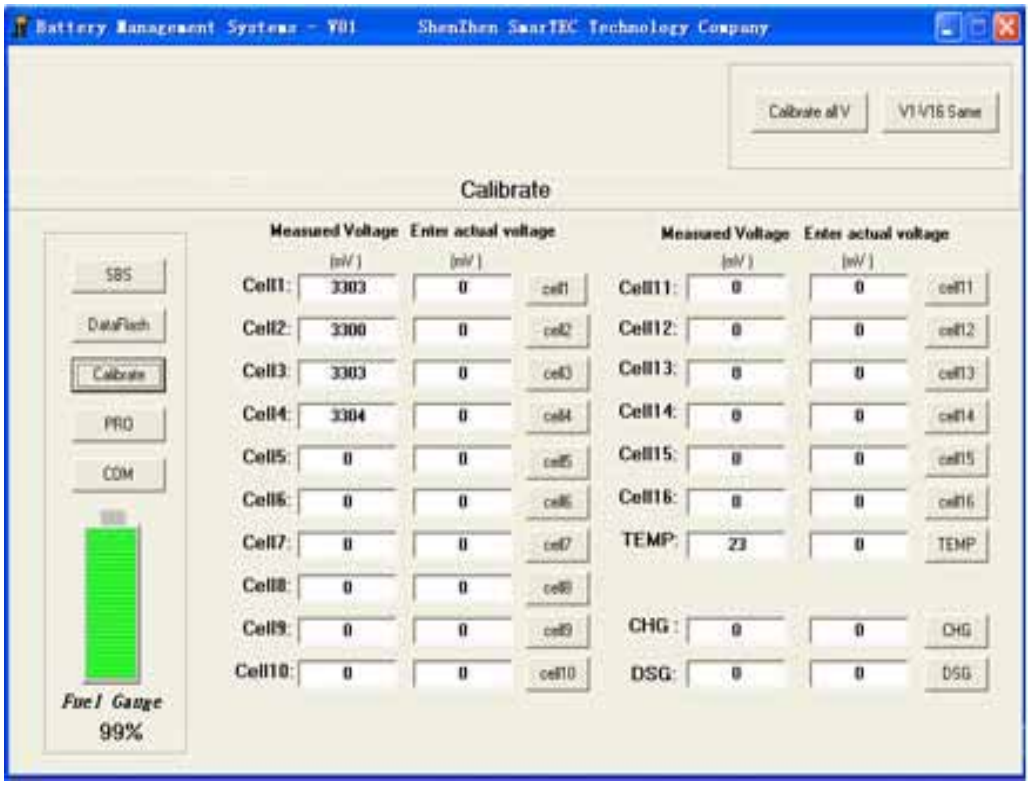
Final picture after connect with EV2300 Evaluation Module Interface Board

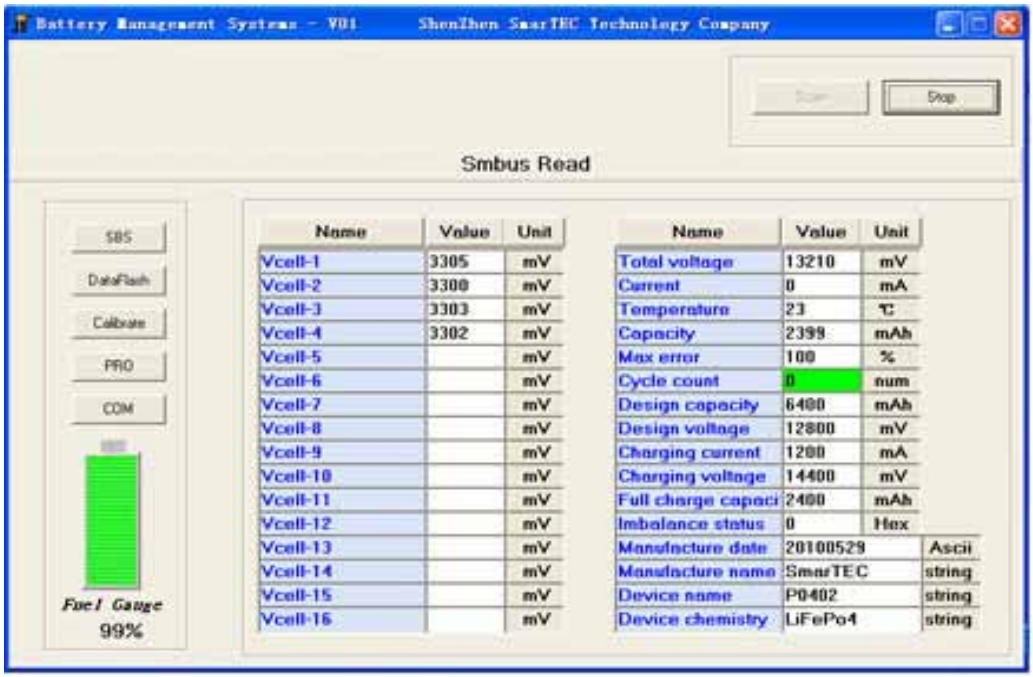


How to connect with laptop

Excluded USER Friendly Software Interface




Battery Management Systems - V01
ShenZhen SmarTEC Technology Company
Calibrate all V
V1-V16 Same
Calibrate
SBS
DataFlash
Calibrate
PRO
COM
Fuel Gauge
99%
Measured Voltage
Enter actual voltage
(mV)
Cell1: 3303 0 cell1
Cell2: 3300 0 cell2
Cell3: 3303 0 cell3
Cell4: 3304 0 cell4
Cell5: 0 0 cell5
Cell6: 0 0 cell6
Cell7: 0 0 cell7
Cell8: 0 0 cell8
Cell9: 0 0 cell9
Cell10: 0 0 cell10
Cell11: 0 0 cell11
Cell12: 0 0 cell12
Cell13: 0 0 cell13
Cell14: 0 0 cell14
Cell15: 0 0 cell15
Cell16: 0 0 cell16
TEMP: 23 0 TEMP
CHG: 0 0 CHG
DSG: 0 0 DSG


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 mV
Vcell-7 mV
Vcell-8 mV
Vcell-9 mV
Vcell-10 mV
Vcell-11 mV
Vcell-12 mV
Vcell-13 mV
Vcell-14 mV
Vcell-15 mV
Vcell-16 mV
Name Value Unit
Total voltage 13210 mV
Current 0 mA
Temperature 23 ℃
Capacity 2399 mAh
Max error 100 %
Cycle count 0 num
Design capacity 6400 mAh
Design voltage 12800 mV
Charging current 1200 mA
Charging voltage 14400 mV
Full charge capaci 2400 mAh
Imbalance status 0 Hex
Manufacture date 20100529 Ascii
Manufacture name SmarTEC string
Device name P0402 string
Device chemistry LiFePo4 string