ElectroDacus

SBMS60 & SBMS100

Manuel

Solar Battery Management System

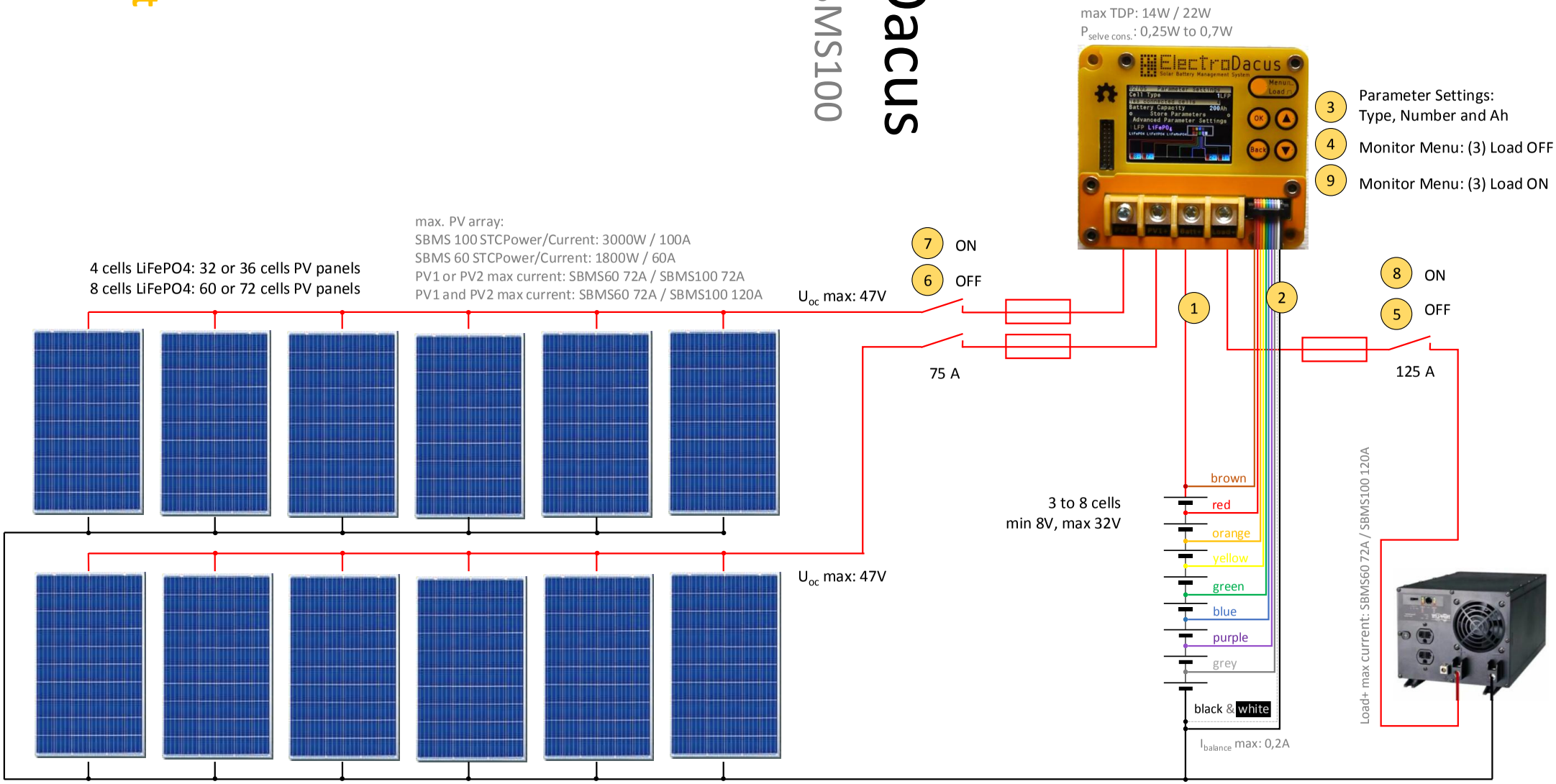
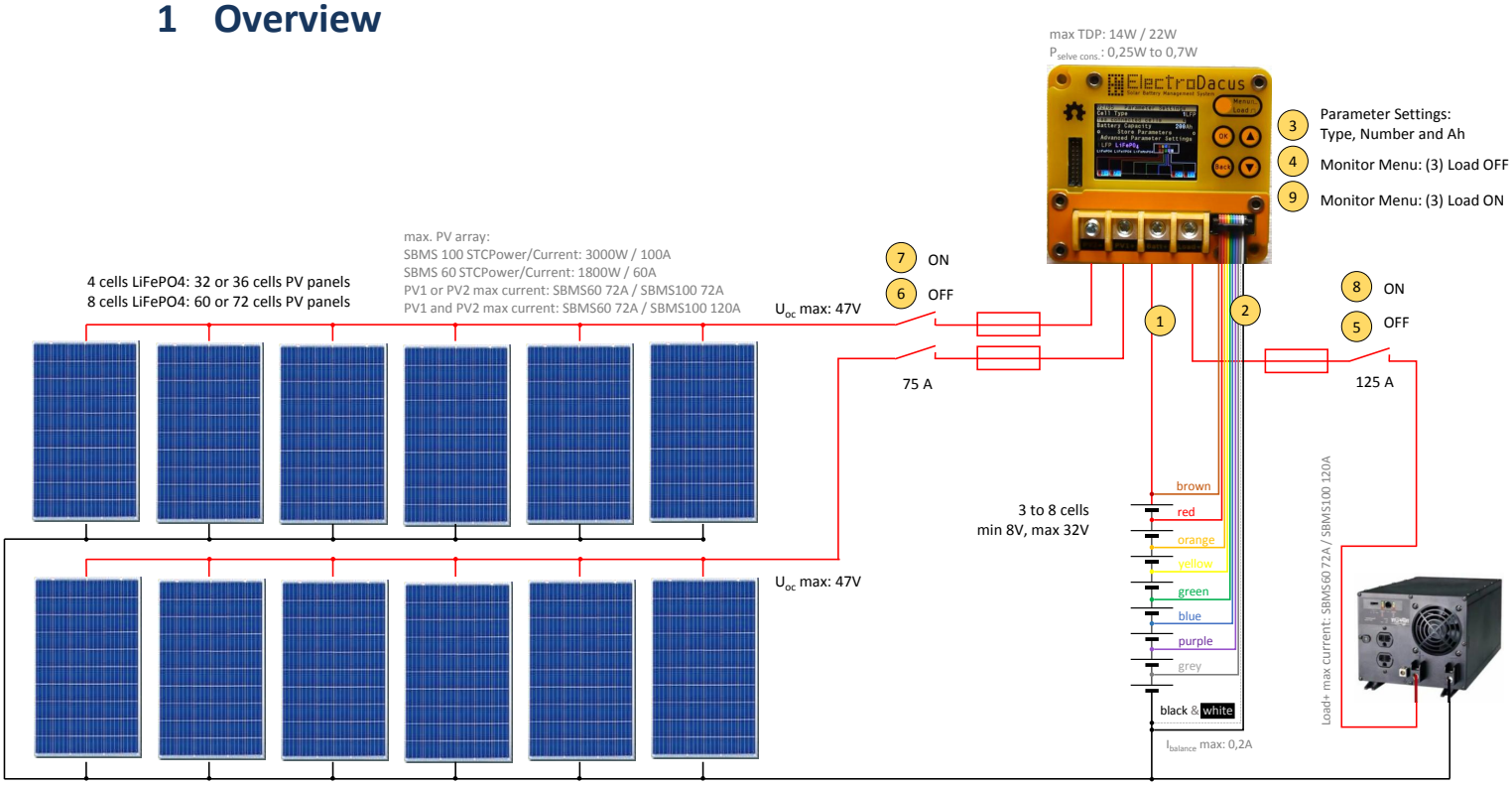


Table of Content

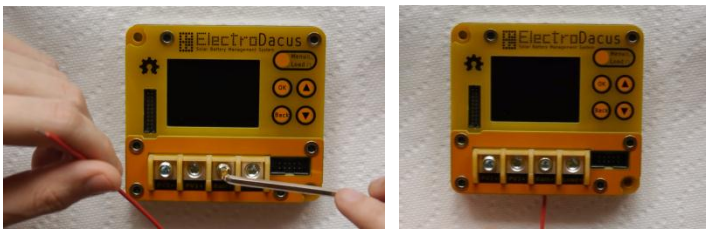
1 Overview



2 Install Instructions

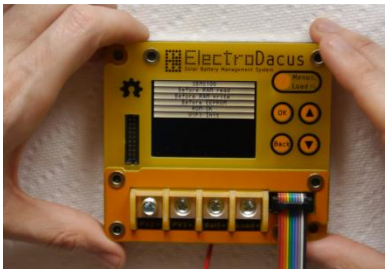
2.1 Batt+ power

Connect the Batt+ power connector to battery positive terminal with a max 2m of 16mm² (#6AWG) flexible copper wire with 200°C silicone insulation (check manual for more details about the recommended cable). Make sure this is the first connected and last to be removed.



2.2 10 pin cell monitor balancing cable

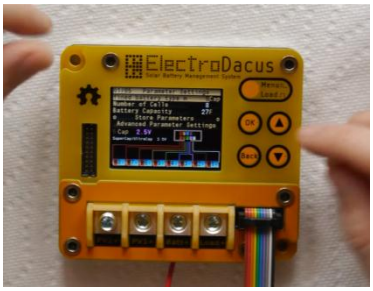
Connect the 10pin monitor and balancing cable. Make sure this is the second one to be connected after Batt+ and never disconnect while anything else is connected except for Batt+. See details in manual or Parameter Settings how this has to be connected to individual cells.



2.3 Parameter Settings

Go to Parameter Settings menu and select the type of cell, number of cells and battery capacity then push Store Parameters button to save data to SBMS.

Then remove the 10pin connector and reconnect for the new stored parameters to be accepted.



2.4 Monitoring menu

Go to Monitoring menu page 3 and push ok button then a small sub menu will be displayed in the top left corner. Use down key to select Load OFF and then push OK to enable this. You should see CFET and DFET flags change state from highlighted to not being highlighted meaning that load+, PV1 and PV2 are disconnected internally.

2.5 Load+

Connect Load+ using the same type of cable mentioned in step1 to a 125A circuit breaker in OFF position and from there to your load.

2.6 PV1 and PV2

Connect the PV1 and or PV2 to your PV array to appropriate size circuit breaker in OFF Position. See the manual for the type of PV panels recommended based on the number of cells and battery voltage.

2.7 Switch on

Switch the Load and PV breakers in ON position and then go again to page 3 of the Monitoring Menu and select Load ON this time. The CFET and DFET should be highlighted and the Load should now have power also the PV1 and PV2 should provide charging current.

2.8 Monitoring

Check the first page of the Monitoring Menu to see if all works correctly. You are done. Make sure you follow the install procedure in reverse when you want to remove the SBMS. **Make sure you never remove the Batt+ or 10pin cell monitoring connector while PV1, PV2 or Load+ is connected.**

3 Manual and Specifications

3.1 Specifications

1. Battery type: any rechargeable Lithium or supercapacitors
2. Number of cells: 3 to 8
3. Battery voltage limits: min (8V) max (32V)
4. Battery / PV recommendation for 12V: 4 cells LiFePO4 / 32 or 36 cells PV panels.
5. Battery / PV recommendation for 24V: 8 cells LiFePO4 or 7 cell LiCoO2 / 60 or 72 cells PV panels.
6. Max. PV open circuit voltage: 47V
7. Cell balancing current: max 200mA
8. Power terminal max wire size 35mm²/#2AWG
9. Weight: ~ 255g
10. Size: 100mm x 90mm x 26mm
11. Self consumption: 250mW to 700mW
12. Max. TDP: SMBS100 (22W), SMBS60 (14W)
    SBMS needs to be mounted on an external heatsink
13. Max PV array STC power (STC current): SBMS60 1800W (60A) / SBMS100 3000W (100A)
14. Load+ overcurrent limit: SBMS60 72A / SBMS100 120A
15. PV1 or PV2 max current: SBMS60 72A / SBMS100 72A
16. PV1 and PV2 max current: SBMS60 72A / SBMS100 120A

3.2 Thermal management

For detailed install procedure please see Install Instructions. The SBMS60 and SBMS100 will need to be mounted on an appropriate size heatsink able to dissipate the max TDP (Total Dissipated Power) that is as high as 22W for SBMS100 and 14W for the SBMS60 at full load (charge and discharge at the same time).

If size and weight is of great concern a fan can be used to cool the back of the SBMS. If SBMS is not used with full configuration then a smaller heatsink can be used or even no heatsink at all.

You can use the simple formula below to calculate the TDP.

TDP[W] = I[A] x I[A] x R[Ω]

For example you need to know the R for Load+ and PV1/PV2. Load+ resistance path on SBMS100 is 1mΩ and SBMS60 is 1,5mΩ where PVx input on SBMS100 is 2,4mΩ and on SBMS60 is 3mΩ.

So for max configuration on SBMS100 you have
on Load+ TDP = 100A x 100A x 0,001Ω = 10W

on PV1 TDP = 50A x 50A x 0,0024Ω = 6W, PV2 also 6 W
So total 10W + 6W + 6W = 22W on full load SBMS100

The SBMS100 without any heatsink or fan can at most dissipate 4W to 5W so below is an example with lower power to allow this.

SBMS100 with max 40A load and 24A on each PV
Load+ TDP = 40A x 40A x 0,001Ω = 1,6W
and on PVx TDP = 24A x 24A x 0,0024Ω = 1,38W
So total 1,6W + 1,38W + 1,38W = 4,36W
So 40A load and 48A charging is around max supported by SBMS100 without heatsink.

The SBMS has an internal 10k thermistor installed on the power board and will measure and display the temperature of that board. If temperature exceeds +60°C the charging and discharging will be turned off and only turn on the charging and discharging when temperature drops below 50°C.

3.3 Cable selections

SBMS requires flexible copper cables. For full load configuration I recommend using high quality 16mm² (sold as #AWG) flexible tinned copper cable with 3200 0,08mm strands and 200°C silicone insulation. I measured 1,125mΩ/m for this cable and you will want to keep the resistance of cable between battery positive terminal and SBMS Batt+ connector below 2,5 mΩ so around 2m max is recommended for this particular cable. No fuse or breaker is allowed between Batt+ and battery positive terminal.

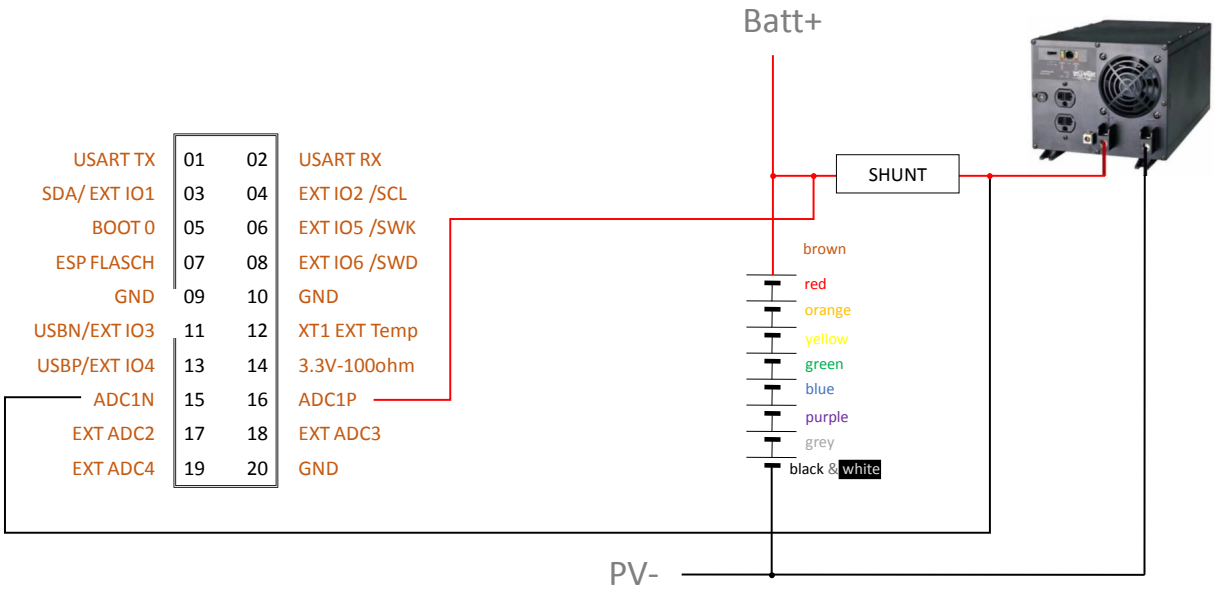
Use the same cable between Load+ and a DC circuit breaker.

The same cable can be also used between PVx and a DC circuit breaker. The circuit breakers on PVx and Load+ will allow for a way to manually disconnect the circuit and offer redundant overcurrent protection.

When you connect the cable to the SBMS power connectors please do not use to much torque. Since you will probably using a 4mm hex allen key the force pushing on the cable will multiplied 628 times even with a 10cm long key. Excessive force can break the connectors.

3.4 External Load

On both SBMS60 and SBMS100 an External Load can be connected allowing large loads of up to 500A to be connected.



All you need for this is a 75mV current shunt. Can be 10A up to 500% and the load needs to support remote ON/OFF. (Optoisolation may be required). The current sense output from the current shunt gets connected on pins 15 and 16 on the 20pin connector.

The pin16 (ADC1P) will be on the battery positive side of the current shunt resistor and pin15 (ADC1N) on the side going to your external load presumably a DC to AC power inverter.

The external load will need to support remote ON/OFF capabilities and that will be connected to one of the 4 EXT IO pins.

The EXT IO pin you decide to use for this will need to be programmed in the EXT IOx submenu as type 2 (Low Voltage Disconnect) or as type 4 if you want the load (inverter) to be disconnected when battery gets below a certain SOC level (user programmable). Another setting you will need to do is in the ADC (ExtLoad settings) submenu where you will be turning the ExtLoad ON and providing the ExtLoad shunt resistance value in [mΩ]

For example a 500A 75mV shunt will have a resistance value of 75mV/500A = 0,1500mΩ.

Another example for a 75mV/200A = 0,3750mΩ

and last example for a 75mV/10A = 7,5000mΩ.

3.5 External Temperature

It is possible to add external temperature sensor but it is optional and in most cases not needed.

All Lithium batteries require temperature above freezing (> 5°C) during charging otherwise they will be damaged.

Best way when possible is to have the battery inside the living space where temperature is ideal for battery operation.

The SBMS is designed to accept a thermistor as temperature sensor connected between pin 12 and one of the GND pins line pin 10 on the 20 pins connector.

USART TX	01	02	USART RX
SDA/ EXT IO1	03	04	EXT IO2 /SCL
BOOT 0	05	06	EXT IO5 /SWK
ESP FLASCH	07	08	EXT IO6 /SWD
GND	09	10	GND
USBN/EXT IO3	11	12	XT1 EXT Temp
USBP/EXT IO4	13	14	3.3V-100ohm
ADC1N	15	16	ADC1P
EXT ADC2	17	18	EXT ADC3
EXT ADC4	19	20	GND

The SBMS is calibrated for a particular 10K thermistor made by Murata NCP21XV103J03RA. This same thermistor is used internally to measure the power board temperature.

The low and high temperature limits for this external temperature sensor can be set from the Advanced Parameter Setting submenu parameter 29 and 30.

Value is a 12bit binary number and if you use the recommended thermistor the 0°C=3144b, +5°C=3000b, +50°C=1338b, +55°C=1182b, +60°C=1040b. You can see the actual temperature in Monitoring menu and the raw binary in Diagnostic menu.