DIY-Battery Monitor Manual

(Vers 1.00 and Vers 2.00)

The Battery Monitor is set up for a Lithium Polymer Pack, but can be used for other chemistries as well. Specific Voltage curves would have to be entered.

The Monitor is using any Micro Controller, with a couple of mostly I2C devices. If your MC doesn't have on-board WiFi, you can use a ESP-01 module for it. Modules:

- ADS1115 ADC for measuring Battery Voltage via a Voltage Divider 20k/1,680k (for 59V max)

- Modified INA219 Shunt sensor, only used for Shunt Voltage measurement!

- LCD Display (1602 or 2004 with I2C interface)

Logic: Voltage based prediction of SOC, corrected by Current measured on the Battery-Bus. Counting of real Charging Cycles

Values displayed are:

- Total Pack Voltage

- Charge and Discharge Current

- SOC

- Actual Power on Battery

- Internet Connection

- 2 Temperature Probes

- Cycle Counter

- kWhs charged during actual cycle

- Millis Counter

- Internet Disconnects
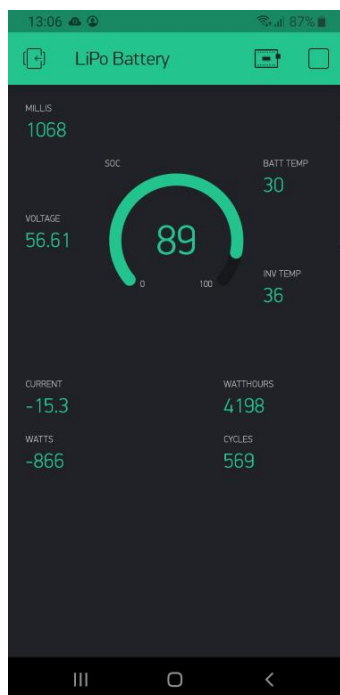
WiFi and remote Monitoring using Blynk-App

Page select Button:

Unpressed, the display will continuosly show Page 1. If the Page Button is pressed and kept pressed in, the display will show Page 2 and Page 3 (V1), switching from one to the other every few seconds, or Page 2 (V2). As soon the Page Button is released, the display will switch back to Page 1.


Normal(Monitoring) Mode Screens:

After the initial Start-up, which is showing individual steps of connecting to Wifi and Blynk, there are 3 Pages presenting you data:

Page 1(V1):
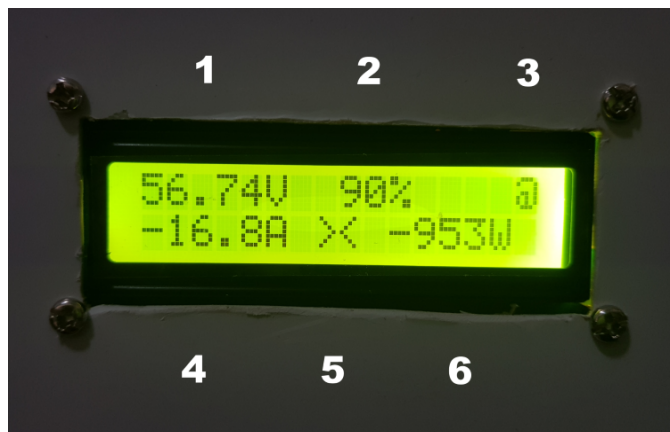
1... Battery Bus Voltage
2... calculated State of Charge
3... WWW connected Indicator (@=connected)
4... Current in(-) or out(+) of battery
5... "Homing"-Indicator. Shown when last measured Current is more then 3% different to actual Current measured. May indicate larger changes in Current Filter Buffer. If ">‹" Symbol is not shown, Currents are stable and readouts very accurate!
6... Power in(-) or out(+) of battery

Page 2:
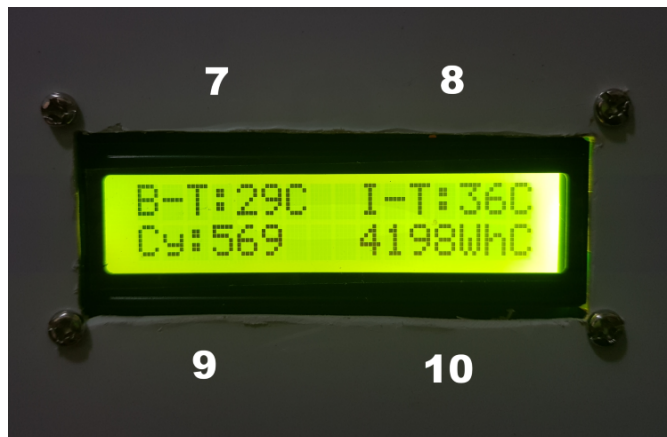
7... Temperatur Probe 1 (Battery) readout in degC
8... Temperatur Probe 2 (Inverter) readout in degC
9... Charging Cycles recorded
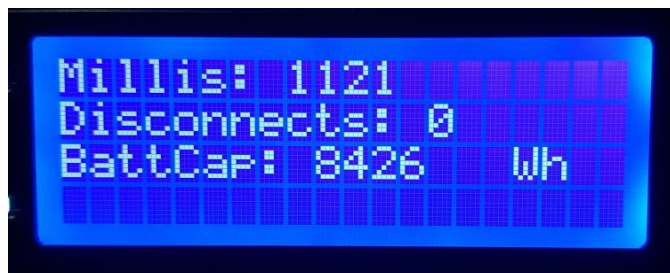10... actual Energy Charged during current Cycle

Page 3:

11... Millis Counter. One unit stands for 10 seconds, since when the microcontroller was restarted last time (360=1hr, 8640=1day, 60480=1week, etc).
12... Number of Disconnects from WWW since last restart of microcontroller

Page 1(V2):

Page 2(V2):

Row 3... Battery Capacity, which is stored inside the EEprom and used for cycle calculation

**Discharge Test (Capacity Test) Mode of Version 2:**

To enter the Discharge Test Mode, press the red switch into its ON position.

The Discharge Mode of the Battery Monitor, is working similar to any other Culoumb Meter. Capacity values are determined by counting up Amps and Watts during the test. A test will be more accurate,

when you are discharging your battery from Full to Empty, but nevertheless, there will be a capacity predicted, whenever you discharge more the 50% of the battery. Storing the new Capacity value is optional!
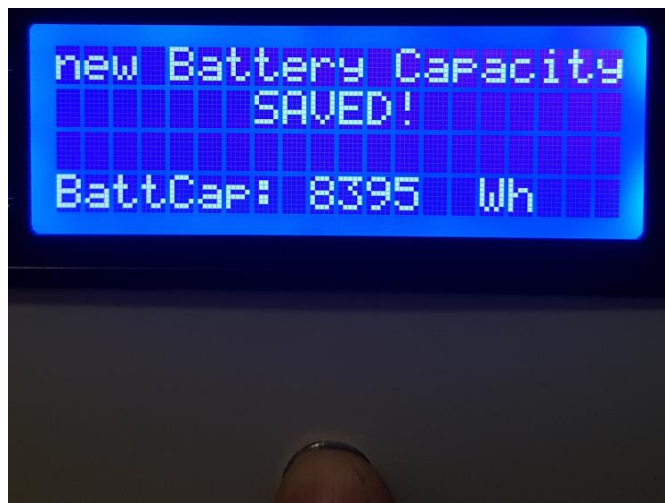
Page 1:
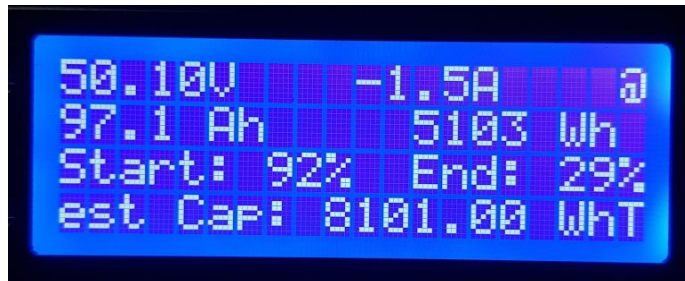
Row 1: Voltage, Amps, Internet connection
Row 2: Amp Hours Counter, "><"-Homing indicator, Watt Hours Counter
Row 3: SOC at Start of test, SOC at End of test
Row 4: estimated Battery Capacity will be shown after at least 50% of SOC was used during test

Page 2:

If after a finished test, there is an estimated Battery Capacity shown on Page 1, and you want to store that result in the EEprom, then press the green Push Button.
When finishing a test, and you can see the "><"-Indicator shown, it means, that the last (3-minutes) data is not yet included in the shown numbers. Please wait until the indicator is gone, or at least wait 3 minutes to have the latest result on the screen.

Blynk App: when using the Discharge Test Mode, the value for Watthours in Blynk App, will show the Actual Watthours Discharged

Connections to be made:
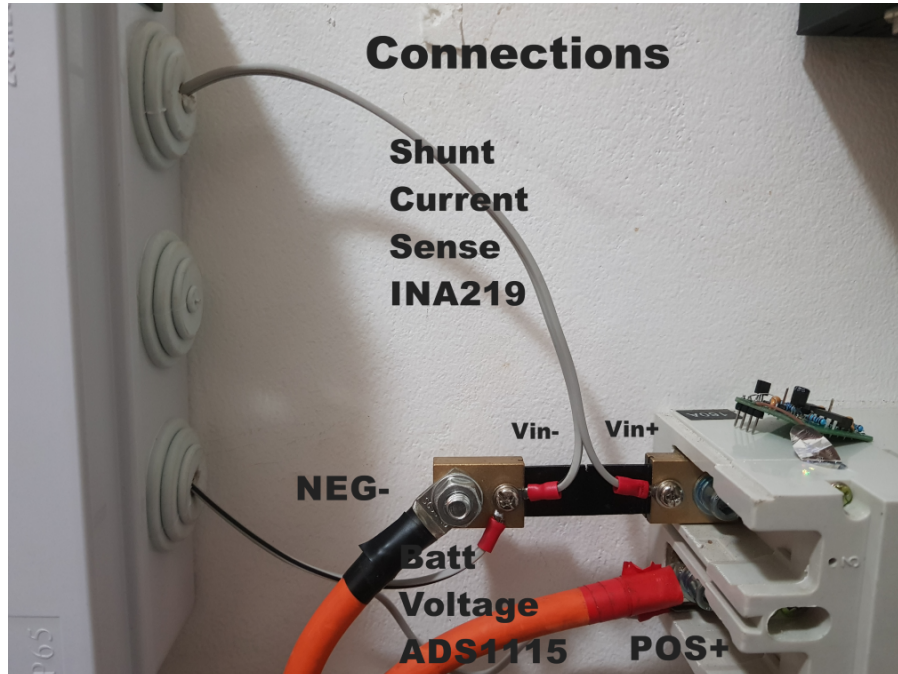
1. Please connect your monitor to a power source
2. The Shunt must be connected on the Battery Negative Side if your battery system is 24V or 48V nominal and higher!
Connect the wires from the INA219 current sensor to the shunt
Vin- needs to be connected to the Battery Negative
Vin+ needs to be connected to the other end of the shunt
3. The Total Voltage sense, needs to be taken from the Battery Plus and Minus terminals. Please be aware, that the MC-ADC can only measure up to 5V inputs. Therefore, you need to measure over a Voltage Divider, which is suitable to break down your Bus Voltage to the max. 5V level!

Please watch each individual Part of my YouTube series about the build of the DIY-Battery Monitor, for all detailed informations. Especially on how to modify the INA219 breakout board to make it suitable for this project. Channel: Roland W

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Donations: Paypal sales@thehillside.net Any donations, even small ones are appreciated to help us come throught this financially hard times caused by the pandemic!

Thanks!