E5IOT - Project presentation

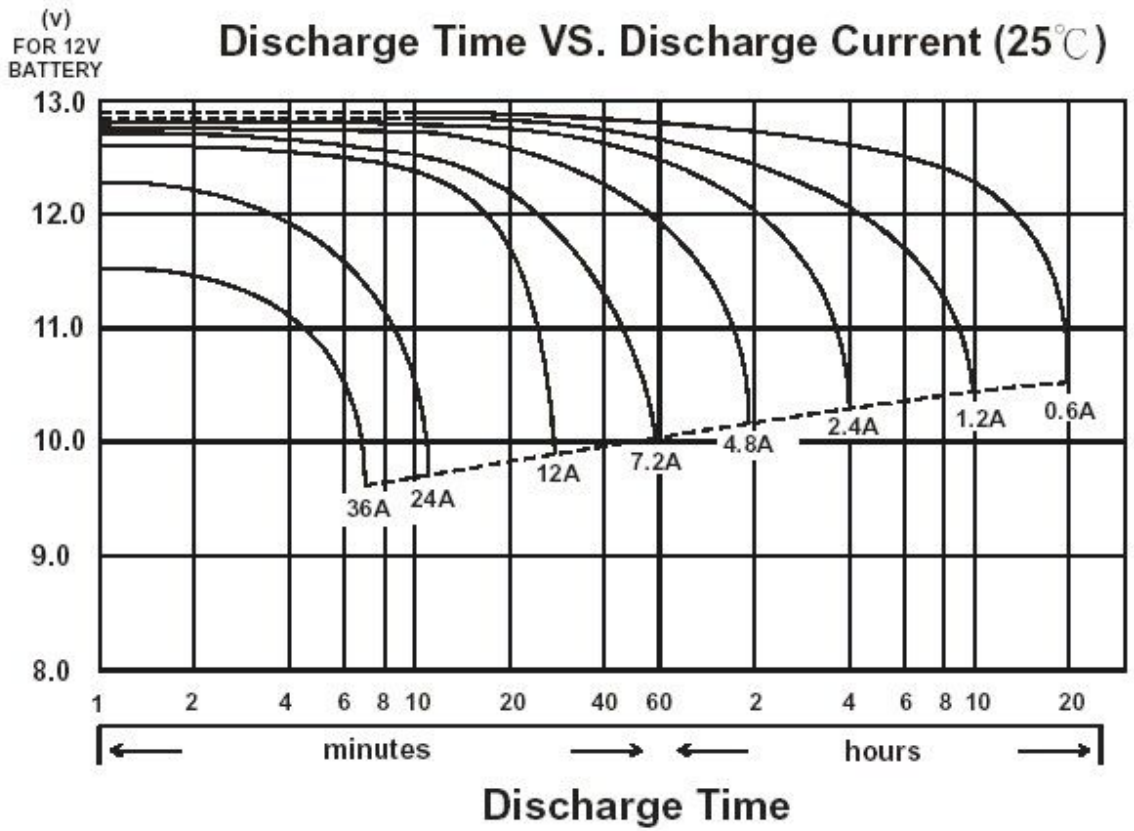
WiFi Enabled battery tester with webinterface

12V Lead Acid batteries

Marine batteries

- Heavy
- Rarely used
  - Boat is ashore 6 months a year
  - Charger connected sometimes
- Expensive (200€)
- Often old
  - Boats from 1970’s… But who knows when the battery was replaced?
- Owner does not know about the battery capacity

Discharge graphs



Project description

1. Disconnect the battery
2. Connect device in between the battery and the existing system
3. Load up the web interface
4. Set the cutoff voltage
5. Start the measurement
6. Wait for the notification telling measurement has completed.
7. Read out the Ah and total running time
8. Keep the browser window open for discharge curve

Requirements

- The device shall be an IOT device using WiFi
- The device shall log voltage and current to the internet
- The webinterface shall allow the user to toggle a relay on the device
- The webinterface shall show a graph showing the battery voltage over time
- The webinterface shall show the accumulated Ah
- The webinterface shall allow resetting and setting a cutoff voltage at which the relay is disengaged.
- The device will send a notification to the user when the relay shuts off

Hardware

- Microcontroller
  - ESP8266 (NodeMCU development platform)
- Current sensor
  - Measure current
  - Measure battery voltage
- Relay
  - To engage and disengage the load
- Connectors
  - MicroUSB for power
  - Alligator clips for batttery and load

INA219 Zerø-Drift, Bidirectional Current/Power Monitor With I²C Interface

1 Features

- Senses Bus Voltages from 0 to 26 V
- Reports Current, Voltage, and Power
- 16 Programmable Addresses
- High Accuracy: 0.5% (Maximum) Over Temperature (INA219B)
- Filtering Options
- Calibration Registers
- SOT23-8 and SOIC-8 Packages

2 Applications

- Servers
- Telecom Equipment
- Notebook Computers
- Power Management
- Battery Chargers

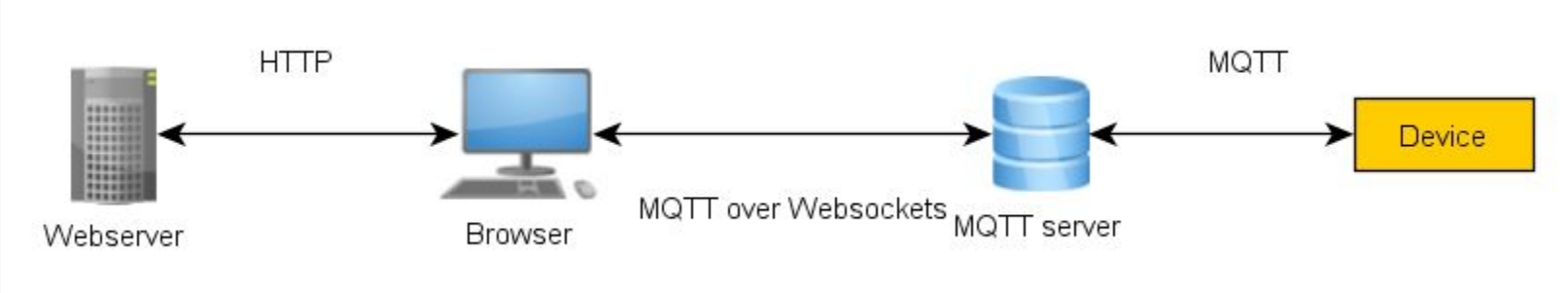
3 Description

The INA219 is a current shunt and power monitor with an I²C- or SMBUS-compatible interface. The device monitors both shunt voltage drop and bus supply voltage, with programmable conversion times and filtering. A programmable calibration value, combined with an internal multiplier, enables direct readouts of current in amperes. An additional multiplying register calculates power in watts. The I²C- or SMBUS-compatible interface features 16 programmable addresses.

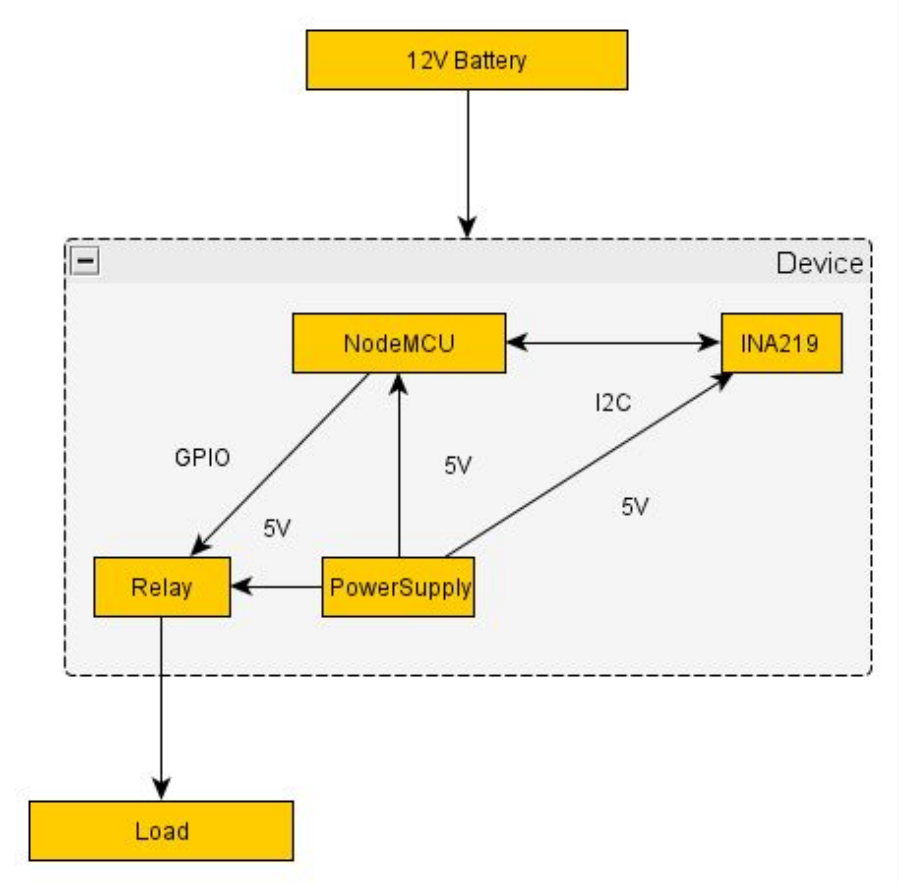
The INA219 is available in two grades: A and B. The B grade version has higher accuracy and higher precision specifications.

The INA219 senses across shunts on buses that can vary from 0 to 26 V. The device uses a single 3- to 5.5-V supply, drawing a maximum of 1 mA of supply current. The INA219 operates from –40°C to 125°C.

Communication



Electrical overview



Verification

- Test with a fixed load and battery
- Verify measurements
- Test cutoff voltage with a lab PSU

Github repository

- https://github.com/furyfire/espbatterytester
- embedded
  - Code for the embedded device
  - Platformio project using the Homie IOT framework
- mosquitto
  - Dockerfile and configuration for setting up a mosquitto MQTT server
- webinterface
  - HTML/CSS/JavaScript webinterface that connects over MQTT-WS