Buddy OHM User Manual

Overview

The Buddy OHM system has the capability to monitor electrical energy use / generation, temperature and humidity.

The system is made up of five main units. These can be assembled and configured to work for a variety of applications. The system is fully open-source, both hardware and software. All hardware is based on the Arduino and Raspberry Pi platforms.

The hardware options to set up a home energy monitor are as follows

The Buddy OHM is an all-in-one Raspberry Pi based energy monitoring unit making for a simple installation where Ethernet or 3G dongle is available at the meter location.

The Buddy OHM can monitor two single-phase AC circuits using clip-on CT sensors. The Buddy OHM can also monitor temperature, and interface directly with utility meters via an optical pulse sensor.

- Raspberry Pi-based energy monitor

- Install next to utility meter

- Local & remote data logging with Buddy cloud , our open-source web-app for processing, logging and visualising energy and other environmental data, such as humidity and temperature

- Requires 3G dongle

- Requires pre-built SD card image (included)

Sensors Required:

- 1 X Clip-on CT sensors (can accept up to two CT sensors; one is included as standard with the Buddy OHM)

- 1 x AC-AC voltage sensor adapter (optional but highly recommended)

Power Adapters Required: 1 x USB 5V DC

OHM Link

The OHM Link is a remote sensor node. Data is transmitted to an Buddy OHM via a low power 434MHz radio.

The OHM Link can monitor up to four single-phase AC circuits using clip-on CT sensors. A plug-in AC-AC adapter can be used to power the unit and provide an AC voltage sample for real-power calculations. 3 x AA batteries can be used to power the OHM Link, if AC power is not available.

- Energy monitoring add-on node

- Optional add-on if more then two circuits need to be monitored.

- RF Range is approximately similar to home WiFi and can be affected by obstacles e.g. thick stone walls

- Up to 2x OHM Link can be connected to a single Buddy OHM

OHM Pulse

- Optional add-on sensor for interfacing directly with utility meters

- Compatible with all utility meters with LED pulse output

- Compatible with Buddy OHM&OHM Link   (one pulse sensor per unit)

- Reports exact amount of energy (Wh) reported by utility meter

- Cannot measure instantaneous power

- Best used in conjunction with clip-on CT sensor(s)

OHM Link

1. Microcontroller: ATmega328p

2. Internal Sensor: Si7021 (internal temperature & Humidity)

3. Power: 2 x AA from onboard holder, LTC3525 3.3V DC-DC boost converter to extend battery life

4. RF Radio: RFM69CW 434Mhz

Si7021 Temperature & Humidity Sensor

1. Silicon Labs SI7021-A20-GM1R

2. Power supply 1.9V - 3.6V

3. Operating range humidity 0-80%RH; temperature -40~125℃

4. Accuracy humidity +-3%RH

5. Accuracy Temperature: +-0.4℃

6. Active current: 150uA

7. Sleep current 0.06uA

Installation

CT sensor

1. Clip the CT sensor around either the Live or Neutral cable

2. Connect jack plug into either CT1 or CT2 socket on the Buddy OHM

3. If the power reading is negative, reverse the CT sensor orientation

4. CT sensor cable should not be extended to avoid induced noise

AC-AC Adapter

1. Plug the AC-AC adapter into a power outlet

2. This may require installation of a new outlet or extending an existing one

3. AC-AC adapter cable can be extended if required

4. Plug power connector into the AC socket on the Buddy OHM

5. Provides AC waveform reference for accurate Real Power measurements.

DC 5V USB Adapter

1. Plug the DC 5V USB adapter into a power outlet

2. Plug the mini-B USB connector into the Buddy OHM

3. High quality minimum 2.5A power supply recommended

OHM Pulse Sensor

1. Connects to OHM / OHM Link via RJ45 connector

2. Self-adhesive velcro attachment to utility meter

3. One optical pulse sensor per OHM/ OHM Link

4. Can be used in conjunction with temperature sensors using RJ45 Breakout

OHM Sense

OHM Sense is wireless temperature & humidity sensor.   Data from the OHM Sense is transmitted via wireless RF (434MHz) to Buddy OHMweb-connected base-station for logging to BUDDY Cloud for data logging, processing and graphing.

Power Up

1. Switch on DC & AC power

2. Check CT sensor(s) & AC Wave are detected:

3. Buddy Ohm should remember 3G network and re-connect

Hardware Specification

Attribute	Parameter	
Accuracy	>89%	
Measuring Current (CT)	50mA-96A	
Measuring Voltage (AC-AC)	110VAC-254VAC	
Sample period	5s	
Frequency	434Mhz	I
RF range	100m	
Power Consumption	400-800mA RasPi3	
Embodied Energy	40KWh	
Operating temperature	-25 to +80℃	
Physical Dimensions	19cm x 3.5cm x 19cm	

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.　These limits are designed to provide reasonable protection against harmful interference in a residential installation.　This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.　However, there is no guarantee that interference will not occur in a particular installation.　If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is
  connected.

- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Canada, Industrie Canada (IC)

This Class B digital apparatus complies with Canadian ICES-003

Cet appareil numérique de classe B est conforme à la norme NMB-003.

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables auxappar eils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage adioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.