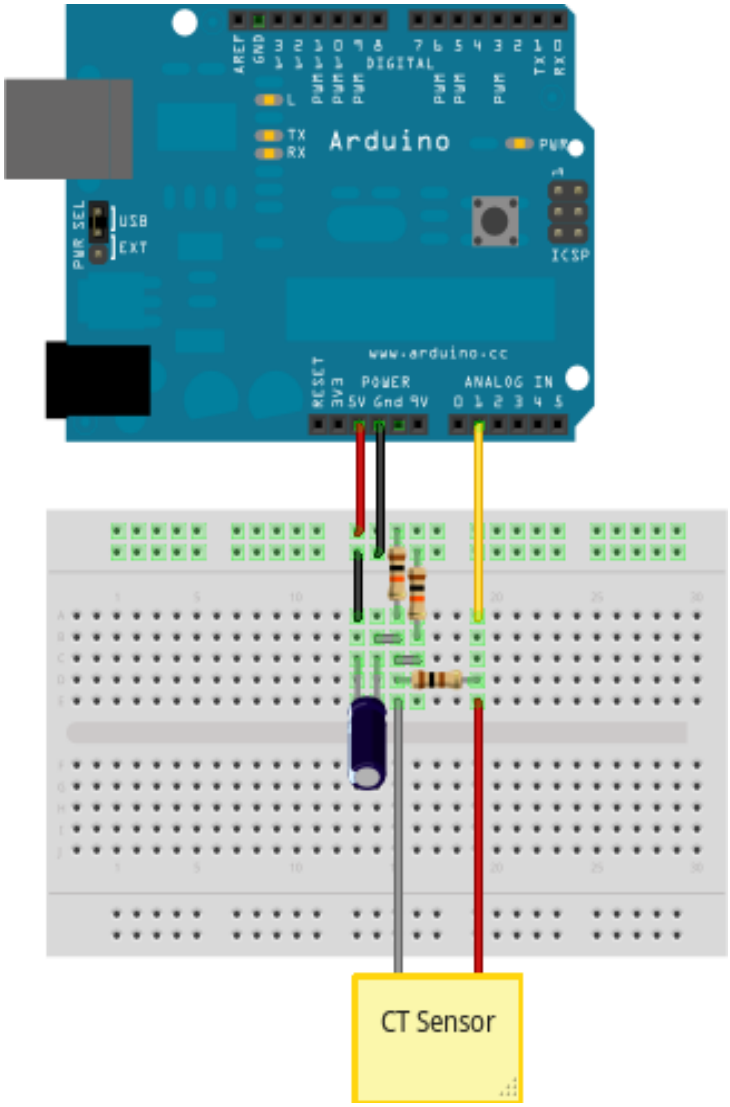
How to build an Arduino energy monitor - measuring mains current only.



This guide details how to build a simple energy monitor on a breadboard that can be used to measure how much electrical energy you use in your home. It measures current, but uses an assumed fixed value for voltage (230V, if you're in the UK) and calculates apparent power. Although not as accurate as a monitor that measures voltage as well as current, it is a method commonly used in commercially available whole house energy monitors for reasons of simplicity and cost.

Here's how to build it:

Step One – Gather Components

You will need:

1 Arduino

Current sensing electronics

1 CT sensor YHDC SCT-013-000

1 Burden resistor 18 Ohms if supply voltage is 3.3V, or 33 Ohms if supply voltage is 5V.

2 10k Ohm resistors (or any equal value resistor pair up to 470k Ohm)

1 10uF capacitor

Other

A breadboard and some single core wire.

Oomlout has a good Arduino + breadboard bundle here £29

Step Two – Assemble the electronics

The monitor consists of the current sensor (which produces a signal proportional to the mains current) and the sensor electronics that convert the signal into a form the Arduino can use.

For a circuit diagram and detailed discussion of sensors and electronics see:

CT Senors - Introduction

CT Sensors - Interfacing with an Arduino

Assemble the components per the diagram above.

Step Three – Upload the Arduino Sketch

The sketch is the software that runs on the Arduino. The Arduino converts the raw data from its analog input into human readable values, then sends them to the serial port monitor.

a) Download EmonLib from github and place it in your Arduino libraries folder.

Download: EmonLib

b) Upload the "current only" example:

```
#include "EmonLib.h"                   // Include Emon Library
EnergyMonitor emon1;                   // Create an instance

void setup()
{
  Serial.begin(9600);

  emon1.current(1, 111.1);             // Current: input pin, calibration.
}

void loop()
{
  double Irms = emon1.calcIrms(1480);  // Calculate Irms only

  Serial.print(Irms*230.0);            // Apparent power
  Serial.print(" ");
  Serial.println(Irms);                // Irms
}
```

c) Open the Arduino serial window

You should now see two columns of values. Apparent power on the left, RMS current on the right.

Re: How to build an arduino energy monitor - measuring current only

Submitted by Hazmatt (not verified) on Wed, 22/06/2011 - 11:45.

I have put a 6 channel version of the current only model to monitor two 3 phase motors. I have one ct on each leg of three phase of each motor. Then I hooked up the arduino to LCD and will output the amp draw to LCD screen. My problem is when I power it off of a 9 volt wall wart Analog 0 reads around 30 to 60, when I power it off of usb from my computer it will A0 will read zero just like the others. This is without any CT's plugged in. Someone told me I probably need a 10k pull down resistor. Just wondering if you agree or would this affect the circuit in a bad way.

Any Help you can give me would be much appreciated. Thanks.

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by Hazmatt (not verified) on Wed, 22/06/2011 - 20:14.

When reading actual current A0 will read about 4x higher that A1-A5. Even using the same ct. Do I just need to scale it back hat much??

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by TrystanLea on Sat, 25/06/2011 - 21:09.

Hello Hazmatt, I dont know why this should happen? Have you tried swapping the CT's and so on? Amin did I think have a similar sounding problem with analog input 0, problem being solved when moving to other pins. Could you have overloaded the input at some point? Have you another arduino at hand to see if the problem is the same?

»

- Identifying different types
- RFM12B - Part 1 - Hardware Overview
- RFM12B - Part 2 - Sending Data Between Modules
- Master-Slave Arduino networking
- Raspberry Pi WIFI
- Simple RF Link
- xbee-link
- Interfacing with SMA SunnyBoy PV Inverters (Bluetooth)
- 7 segment display
- Mains AC Relay Module
- Nokia 3310 LCD
- SD Card Logging with Nuelectronics Real-time Datalog & IO Shield
- SMA webBox data extractor
- USB Data Logger
- Graphing in KST
- Java Programs

Community
- Read this before posting

Archive and Unsorted
- FAQs
- Adding a picture to a post
- Emoncms Installation Guides

User login

Username: *

Password: *

Log in

- Create new account
- Request new password

Forum Sticky

- HELP US TO HELP YOU
- Dashboards missing after update
- Current Transformers (CTs)
- MQTT inputs stopped updating
- emoncms.org: incorrect kWh data

Active forum topics

- Trouble downloaded Emoncms.org feed to local Emoncms and seeing it *1 hour 27 min* ago
- emonpi update fails with avrdude error : stk500_paged_write(): (a) protocol error, expect=0x14, resp=0x10 *7 hours 12 min* ago
- (Release Candidate #1): emonSD-20Feb16 - emonPi / emonBase (Raspberry Pi + RFM69Pi) Emoncms v9 pre-built SD card image

Re: How to build an arduino energy monitor - measuring current only

Submitted by Hazmatt (not verified) on Mon, 27/06/2011 - 11:53.

I figured it out my problem was I forgot to complete connection of CT to burden resistor. I am so sorry. Thanks for your great tutorial thouh it was alot of help.

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by Michele (not verified) on Mon, 20/06/2011 - 22:11.

hi!
i have built this monitor with efergy ct sensor and 100 ohm burden resistor and i'm experiencing some problems
if i connect light loads (for example 60watt) everything works okk, but:
1) if i do not connect any device to the monitor i still read something like 10 watt!!!
2) if i connect big loads (from 300 to 2000 watt) the monitor reads wrong values (for example 290 instead of 300, 1700 instead of 2000, etc....)
any idea?
thank you very much!!

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by Sergegsx (not verified) on Mon, 20/06/2011 - 22:15.

Its normal to measure something (10watts) when nothing is connected as analog reading go from 0 to 1024 so sometimes a 1 in the reading leads to something like 10 or 20 watts.
as for higher loads, you need to calibrate the unit with big loads so that this phenomenom is reduce to the max. but if your error is 290/300 then i guess is not that bad. as for 1700 instead of 2000, calibrate again.

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by arnon (not verified) on Thu, 28/04/2011 - 14:53.

Is this project measures true rms?

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by arteqw (not verified) on Wed, 16/03/2011 - 13:42.

There is possible to calculate Real Power using current only ?

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by TrystanLea on Wed, 16/03/2011 - 13:48.

I'm afraid not, you really need the voltage measurement.

»

Re: How to build an arduino energy monitor - measuring current only

Submitted by Amin (not verified) on Sun, 23/01/2011 - 14:16.

Hi Trystan,
Still waiting for the AC-AC adapter but couldn't wait to test the current only setup. It works beautifully, but only with purely resistive loads...
And also with something strange: it shows the correct results only with ICAL = 0.07 in the sketch... is it because my burden resistor is too small?

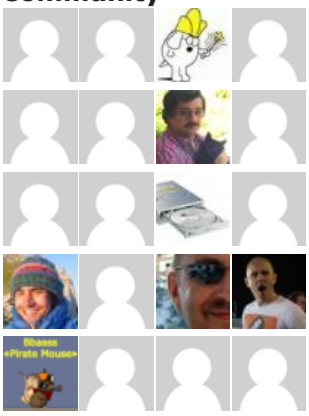
Amin

»

1 2 next › last »

6 hours 6 min ago
- Raspberry Pi 3 compatibility (BT disable & serial port remap fix)
  6 hours 35 min ago
- EmonPi schematic/board diffs, additional CTs and alternative firmware changes
  6 hours 37 min ago
- SCT013 100A 50mA -- different to SCT013-000 100A type ???
  6 hours 51 min ago
- Why different values?
  8 hours 19 min ago
- Noise with PV immersion controller
  10 hours 5 min ago
- emoncms 9.2 - power to kwh feed stopped incrementing
  11 hours 58 min ago
- Multiple RJ45 to Terminal Block Breakout
  13 hours 14 min ago
- evo home or possibly another setup. advice needed on radiator control
  15 hours 13 min ago
- Cracking Gas metering
  15 hours 39 min ago
- My Solar App power calculations.
  2 days 11 hours ago
- EmonTH with V2.6 and RFM69CW Programming help
  1 day 3 hours ago
- Use in the US
  1 day 4 hours ago

Community



more

Latest Blog posts

- Outdoor Temperature Data from Weather Underground to Emoncms & MQTT
- Heat pump Testing: Initial results

more

Tweets by @Openenergymon

OpenEnergyMonitor
@Openenergymon

Anyone any experience of @easyeda cloud based schematic and PCB CAD tool? Looks interesting, not fully open but but more so then Eagle CAD

4h

OpenEnergyMonitor Retweeted

Jeremy Poulter
@jeremypoulter

OWL Intuition to EmonCMS
bigjungle.net/blog/2015/3/13…

OWL Intuition to E…
The trials and tribul…
bigjungle.net

15 Oct

OpenEnergyMonitor Retweeted

Jeremy Poulter
@jeremypoulter

Embed View on Twitter

Popular topics updated in the last month

- Mk2 PV Controller, with triac
(869 comments) *1 week 4 days* ago
- EmonCMS 9.31 | 2016.02.13 released
(341 comments) *15 weeks 2 days* ago
- The Official Emoncms Android App
(193 comments) *1 week 1 day* ago
- (BETA): emonSD22Dec15 - emonPi / emonBase (Raspberry Pi + RFM69Pi) Emoncms v9 pre-built ready
(116 comments) *4 weeks 4 days* ago
- emonTH Unreliable reading timing?
(111 comments) *2 weeks 3 days* ago
- Use in the US
(92 comments) *1 day 4 hours* ago
- EmonPi schematic/board diffs, additional CTs and alternative firmware changes
(78 comments) *6 hours 37 min* ago
- Full-fat 3-phase monitor
(57 comments) *2 weeks 2 days* ago
- MQTT changes 6th Feb
(48 comments) *2 weeks 2 days* ago

- Feeds stop updating
  (48 comments) *1 day 13 hours* ago

1 2 3 4
5 6 7 8
9 ... next ›
last »

Syndicate