

INA219 - voltage & current sensor

This simple tutorial makes use of the INA219 device to read voltage and current in a circuit. Initially you can read the +3.3V and +5V pins on the Wemos D1 Mini and then use a solar-panel to see what voltage it gives out.

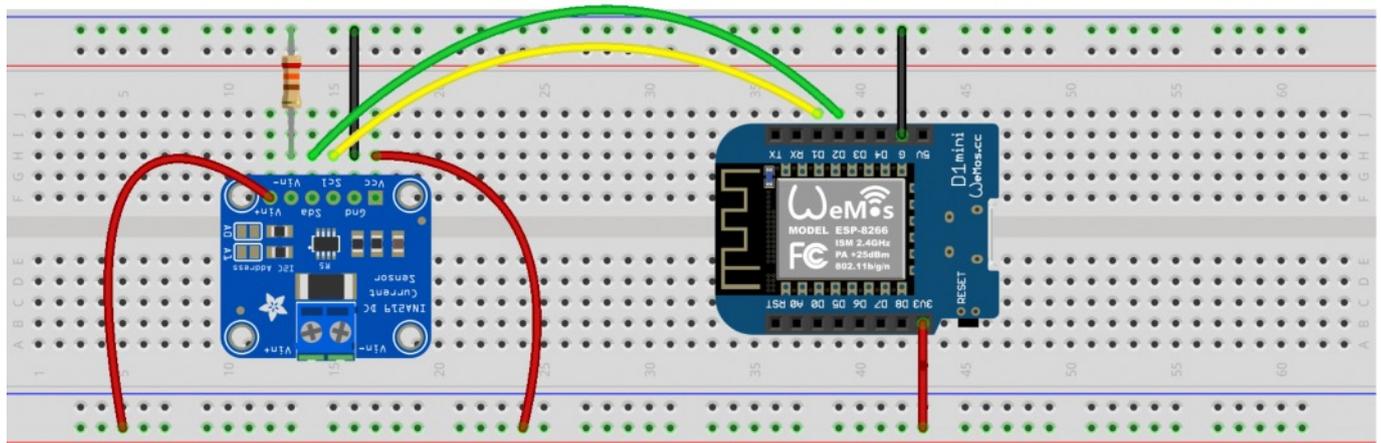
Hardware required

- Breadboard fitted with a Wemos D1 Mini (microcontroller)
- INA219 sensor
- 330 ohm resistor (to act as a 'light' load)
- Some connecting wires (black, red, green and yellow)
- USB power cable

Please contact Mr D if you have problems finding these items.

Hardware layout

Using the following screen-shot as a guide wire-up the breadboard.



fritzing

Note: Your breadboard might be smaller or shorter than the one shown above.

Get Mr D to check your wiring BEFORE you connect power to it.

INA219

The device on the left of the breadboard is a INA219 that is designed to measure the voltage at a point in a circuit and the current flowing. It can also indicate the energy being consumed by applying some simple maths.

Ask Mr D to explain Ohms Law to you and the role of the 0.1 ohm resistor (the large black rectangle) that is located on the surface of the INA219.



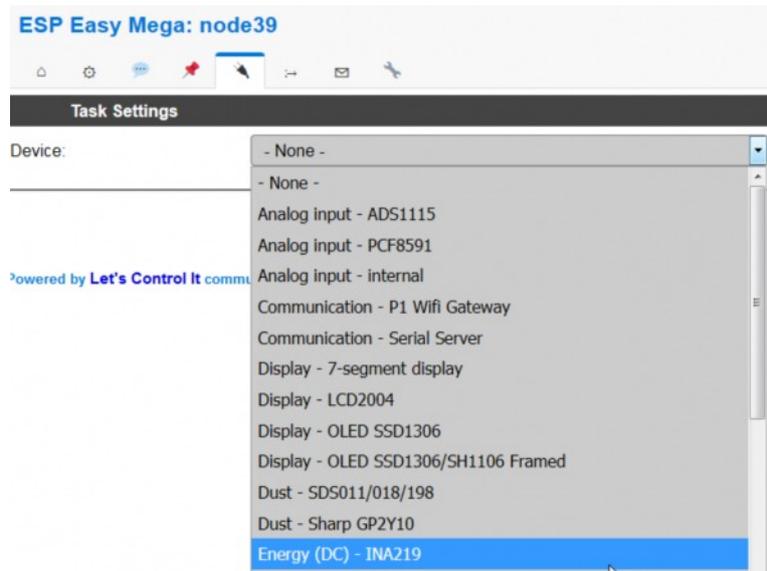
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Setting up the device drivers inside the Wemos D1 Mini

Login to the web management page by entering the URL for your Wemos.

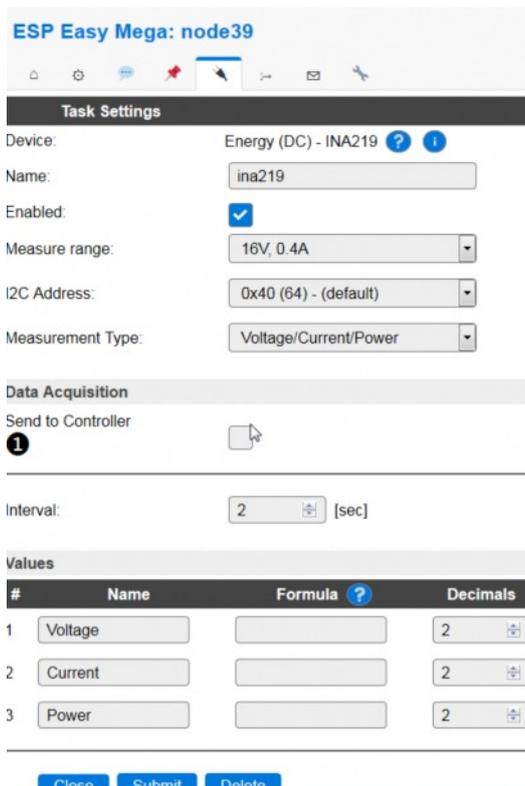
E.g. 192.168.1.<Wemos_node_number> 192.168.1.39

Click on the 'Devices' tab to bring up a window that looks like this:



Scroll down until you find the entry labelled 'Energy (DC) - INA219'.

Click it and then enter these details.



As well as the device name 'ina219' make sure you set the 'Measure range' to 16V, 0.4A

Also check the I2C Address is set correctly.

Also check the 'Measurement Type' setting is set to 'Voltage/Current/Power'

Finally click the 'Submit' button.



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Check your work

If you click on the 'devices' tab you should see this:

ESP Easy Mega: node39

	Task	Enabled	Device	Name	Port	Ctr (IDX)	GPIO	Values
Edit	1							
Edit	2	✓	Energy (DC) - INA219	ina219			GPIO-4 GPIO-5	Voltage: 3.25 Current: 0.01 Power: 0.03
Edit	3							

The INA219 is measuring the voltage of the +3V3 pin on the Wemos and as you can see it is showing 3.25V.

CAREFULLY take the red wire (that goes to Vin+ on the INA219) out of the 3V3 pin and insert it into the 5V pin on the Wemos D1 Mini.

You should see the 'devices tab' change to show this:

ESP Easy Mega: node39

	Task	Enabled	Device	Name	Port	Ctr (IDX)	GPIO	Values
Edit	1							
Edit	2	✓	Energy (DC) - INA219	ina219			GPIO-4 GPIO-5	Voltage: 4.71 Current: 0.01 Power: 0.07
Edit	3							

As you can see the voltage now shows 4.71V (near to +5V).

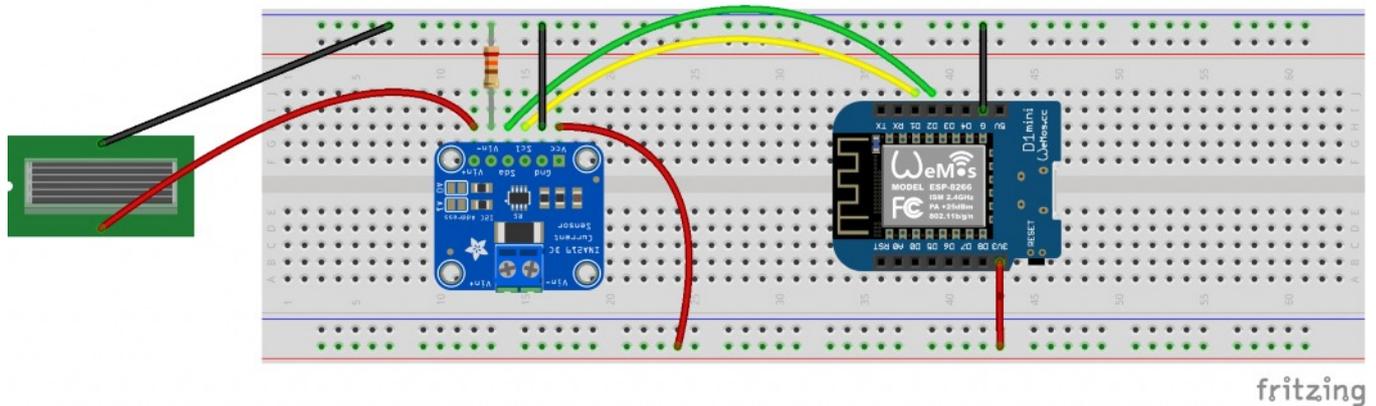
Connecting a solar panel

If you haven't already been given a solar panel, go and ask Mr D for one.



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Using this screen-shot as a guide connect the solar panel to the breadboard.



Pay attention to the markings on the solar panel. There should be a (+) and a (-) symbol to indicate positive and negative. The red wire needs to be connected to (+) and the black wire to (-).

Get Mr D to check your wiring BEFORE you connect power to it.

If you place the solar panel in bright sunlight, for example on the classroom windowsill, you should see the voltage climb to over 5 volts.

Ask Mr D for a power bank so you can wander around with the breadboard.

See what the maximum and minimum voltages you can get from the panel.

Congratulations on using the INA219 sensor

This forms the first part in making a solar powered weather station.

Some of the things you have learnt in this session include:

- Ohms law
- Using the INA219 sensor to measure voltage and current
- Wiring a breadboard to include the I2C connections
- Using a solar panel
- More hand-skills in handling miniature components