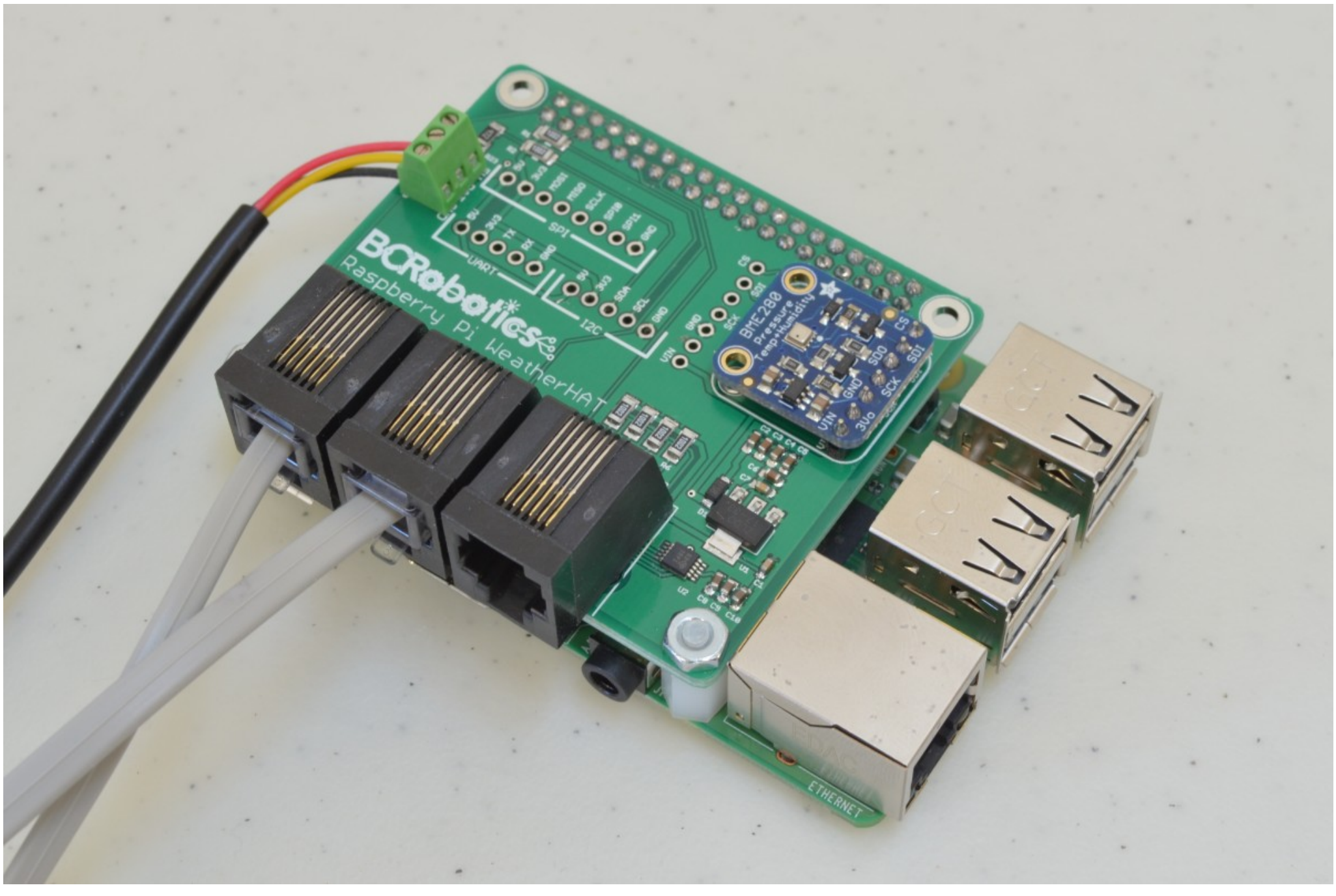


Raspberry Pi Weather Station – Part 2

Chris @ BCR July 28, 2021 124 Comments

In the last part of this tutorial we added our components to the weather board and connected everything up. Now that we have everything ready for power, we can work on the software / coding side of this project. In part two of this tutorial we will boot up the Raspberry Pi, do some initial configuration of the Raspbian operating system, install Python libraries for a few of the sensors, and write some basic Python code to collect and display data from each of the sensors. The Python code will be quite long, but we have broken it down into smaller steps. As always, if you have any questions, feel free to post at the bottom of the page.

Operating System:
Before we get started, you should have a microSD card pre-installed with Raspbian. We are using the installation image dated June 27, 2018. Using a different version than this *could* require additional steps during the installation process – so for this reason we recommend using the exact version we are. At the time of writing this tutorial, this is the most current version available from the Raspberry Pi Foundation and it can be found here.

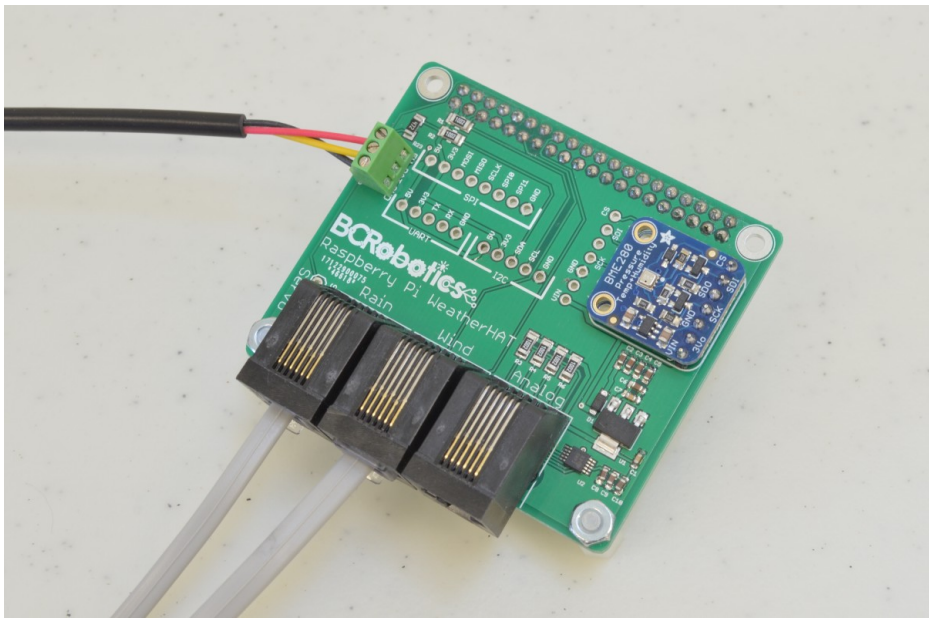
Requirements:

This tutorial requires several items:
[list type="check"]

- A completed assembly from Part 1 of this tutorial set
- 1 x microSD card (with Raspbian 2018-06-27)
- 1 x Pi 3 / 3+ capable power supply

- A USB Keyboard & Mouse
- A HDMI compatible monitor
- Internet access

[/list]



Step 1 – Boot Up

We are going to start by inserting the microSD card with our operating system pre-installed into the Pi. Your keyboard, mouse and monitor should also be connected at this time. Power up the Pi by plugging in the Power Supply. Once the Pi has done its initial boot of the operating system you should arrive at a desktop. A dialogue should appear for initial configuration – we will take care of this in the next step.

Step 2 – OS Configuration

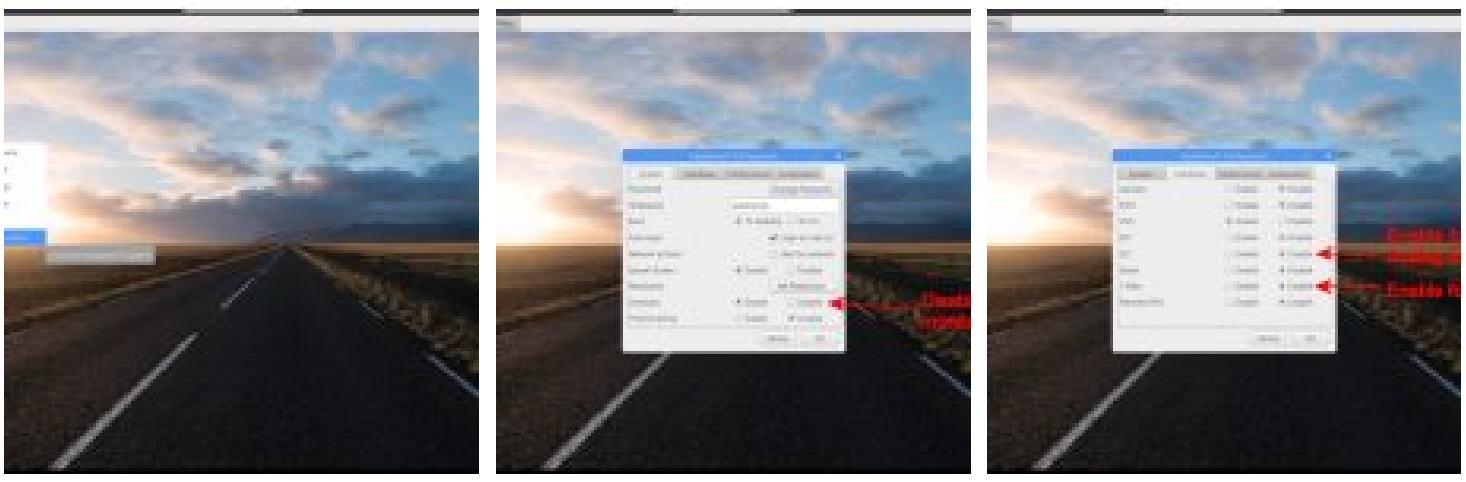
As of this version of Raspbian, most initial setup can be done by following the dialogue that pops up on first boot up. However, we do need to set up a few additional things once this is initial configuration is completed. Follow through the initial setup, if prompted to reboot – go ahead and do that as well.

Once all of that has been completed, we can go ahead and configure a few more things. Click the Raspberry Logo in the top left corner, scroll down to Preferences, and select “Raspberry Pi Configuration”.

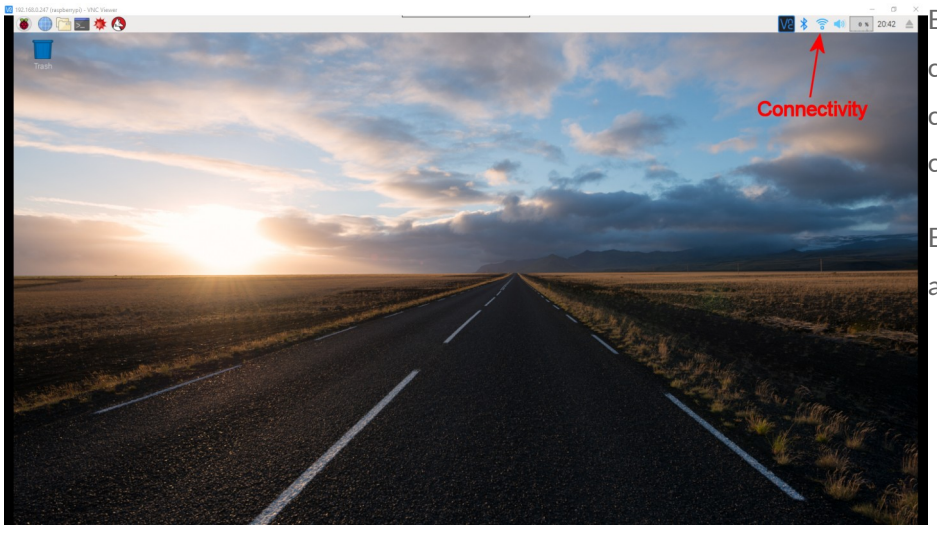
On the first tab you can change your overscan settings. If you are using a computer monitor, you may want to disable the overscan setting to remove the black bars on the sides of the screen.

On the second tab we are going to want to enable the I2C and 1-Wire interfaces. These are the two interfaces our sensors are using in this project.

If prompted to reboot, click yes. Once the Pi boots back up we can proceed.



Step 3 – Internet Connectivity

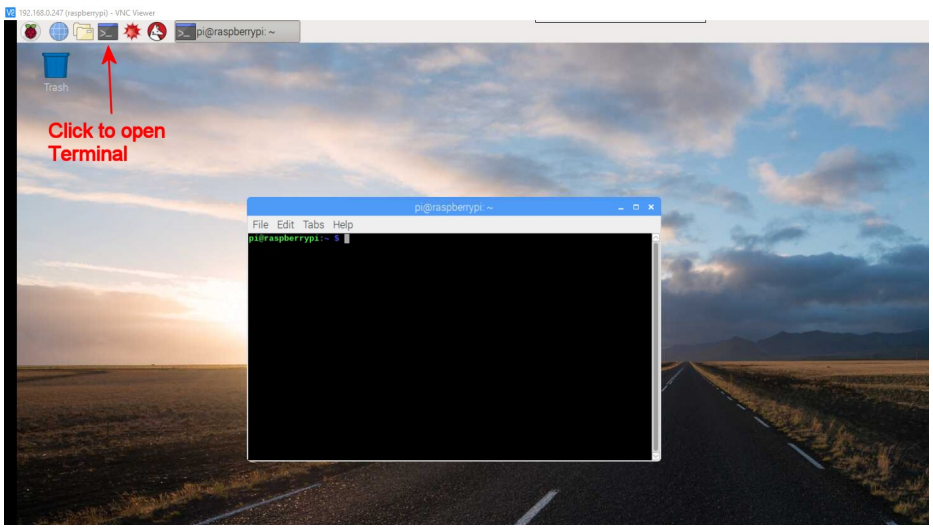


Before we can install any of the libraries or make any of the sensors work we need internet connectivity. If you are using WiFi, this was probably already set up during the initial configuration. If it isn’t working, or you skipped that step, it can be accessed by clicking the connectivity logo (located beside the Volume control in the top right corner of the screen).

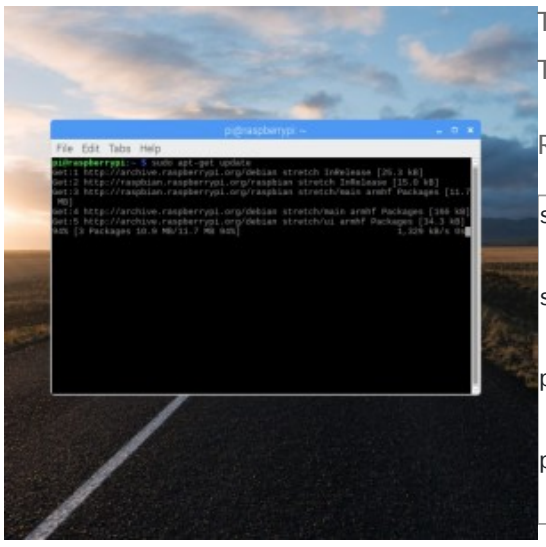
Ethernet is as simple as plugging it into the Pi – if you are planning to use ethernet, go ahead and plug this in if you haven’t already.

Step 4 – Terminal

Now that all of the basic configuration is done, we can get on with installing the software libraries needed to read each of the sensors. These libraries of code are going to take a lot of the hard work out of reading the sensors. We are going to install these using the "Terminal" , in the bar at the top of the screen, click the black square logo, and this window should pop up:



Step 5 – Adafruit Python GPIO Library



The first item to install is the Adafruit Python GPIO Library. This package is the basis for several others that we will be using. To install it we will type a series of commands into the terminal window we just opened up.

Run each of these commands (in order!) by typing them in and hitting enter:

```
sudo apt-get update

sudo pip3 install --upgrade setuptools

pip3 install RPI.GPIO

pip3 install adafruit-blinka
```

Step 6 – Adafruit BME280 Library

Next we will install the Adafruit BME280 library for Python. This library was also created by Adafruit and has been designed to work with their BME280 Temperature/Humidity/Pressure sensor breakout board.

Run the following command in the terminal:

```
sudo pip3 install adafruit-circuitpython-bme280
```

Step 7 – ADS1x15 Library

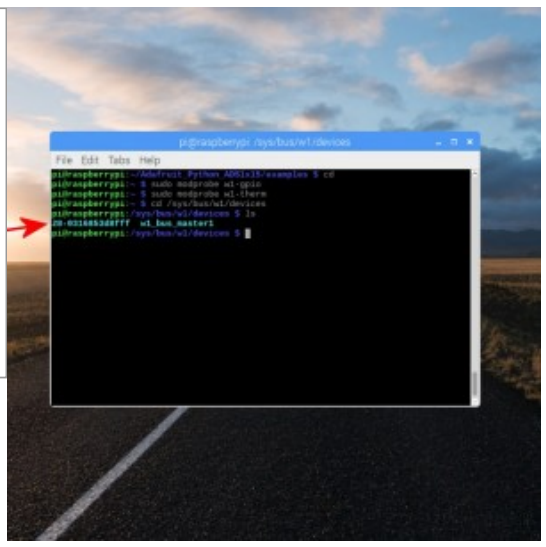
Next, we are going to set up the ADS1015 Analog to Digital chip. Adafruit has built an easy to use library for this series of Analog to Digital converters. We will use this to read the wind direction. To install the library, type the following command into the Terminal:

```
sudo pip3 install adafruit-circuitpython-ads1x15
```

Step 8 – DS18B20

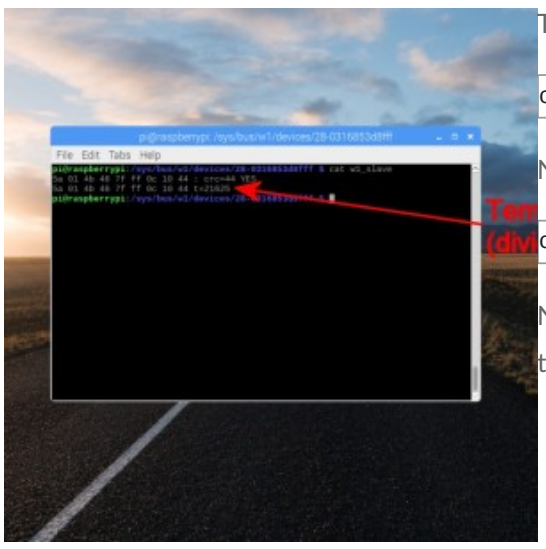
Now it is time to set up the DS18B20 temperature sensor. The setup for this sensor is a bit different; the past two sensors both used the I2C bus, the DS18B20 uses 1-Wire. Enter the following commands in the terminal:

```
cd

sudo modprobe w1-gpio

sudo modprobe w1-therm

cd /sys/bus/w1/devices

ls
```



Since the temperature sensor will be listed in the devices folder, we will want to see everything in that folder. The last command "ls" will display the contents of the folder in the window. Our DS18B20 shows up with an address of 28-0316853d8fff – but each sensor has a unique ID so your number will not match the image!

Step 9 – Test Your DS18B20



Time to get a reading from the DS18B20 sensor! Enter the following command with your sensor ID in place of *sensor ID*

```
cd *sensor ID*
```

Now we can pull a temperature from it by entering the following command:

```
cat w1_slave
```

Not as easy to read as the BME280, but the information should be there. The temperature is located in the second line, take the number given and divide by 1000 to get the temperature in degrees Celsius.

Step 10 – DS18B20 Library

Since the DS18B20 isn't the easiest sensor to read directly in Python, we will be installing one last library to make it a little more straight forward. In the terminal type the following commands:

```
cd

sudo apt-get install python3-w1thermsensor
```

This will make things quite a bit easier once we start writing some code.

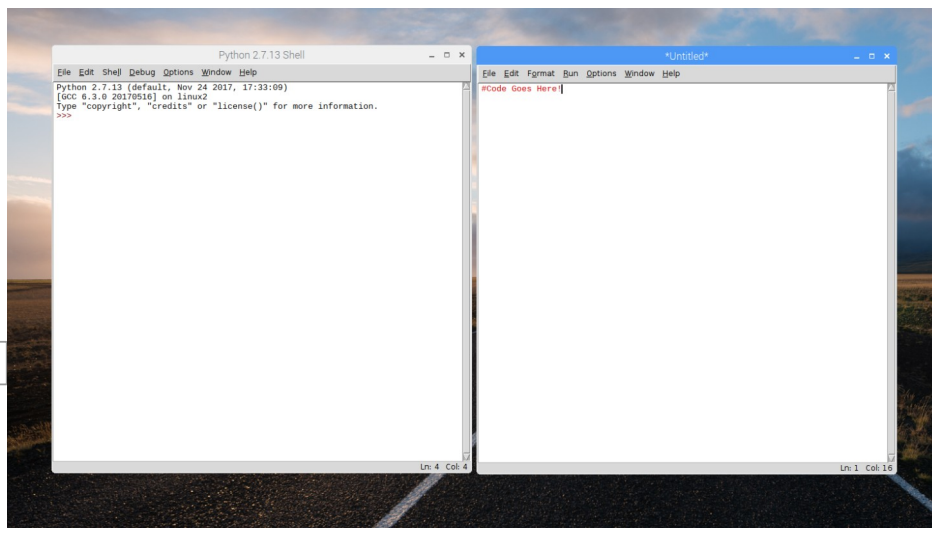
Step 11 – Python

Now we are getting somewhere! All of the complex sensors are sending back data so lets write some basic python code to poll each of the sensors and report back every 15 seconds. We aren't going for award winning code here, just something easy to understand for those relatively new to Python.

We want to program in Python 3 so type the following command in the terminal and hit enter:

```
idle3
```

Alternatively, Python 3 can be found by clicking the Raspberry Button in the top left. Under programming you will find a shortcut. Either way, A new window should have opened for the Python 3 Shell. We are now done with the terminal window so it can be minimized or moved out of the way (but don't close it!).



Step 12 – Getting Ready

In the Python Shell window we just opened, click "File" and "New File" to start a new Python file. This will open another window that we will write all of our code in.

There are a million different ways to approach writing code to accomplish our end result of collecting data from sensors and sending it to Thinkspeak. We are going to approach this by basing the code around the timing interval we want to send data to Thingspeak (once every 15 seconds). This allows us to structure the program around a simple 15 second time loop.

Why 15 seconds? Two reasons: We want to have sufficient time to measure a wind speed (there are ways to manage this at issue, but we want to keep this as simple as possible) and Thingspeak limits free accounts to a once per 15 second data rate.

Step 13 – Starting The Code

Before we can read any of the sensors, we will need to create the basic framework of the program. This means we need to import the time library, create our loop, and set the interval we want to pause the code each time the loop has completed. For those unfamiliar with Python, note that the white spaces (tabs and spaces) are very important in this language so be sure to format exactly as shown in the example.

[python]

import time

interval = 15 #How long we want to wait between loops (seconds)

while True:

time.sleep(interval)
[/python]

Libraries are added to the project using the import command. On the first line we are importing the time library. On line 3 we define a variable to store the length of time in seconds that we want to sleep the program during each loop of the code. Next, we want to create the loop itself – in Python this can be done in a variety of ways; "While true:" works well. Note that when you press "Enter" the next line becomes indented. Finally, on line 8 we "sleep" or pause our program using the variable we set above.

Note: Because we are going to be adding a lot of code over the next few steps, each new line we add will be highlighted in the example code and the line number will correspond to notes below the code.

Step 14 – Read The Temperature

During the set up we installed a bunch of libraries to make this program a lot easier to write. We are going to use one of these libraries right now to read the DS18B20 temperature sensor. In these next bits of code we are going to import the DS18B20 library, set up the sensor, read the sensor, and print the result.

[python highlight="2,4,13,16"]

import time
from w1thermsensor import W1ThermSensor

ds18b20 = W1ThermSensor()

interval = 15 #How long we want to wait between loops (seconds)

while True:

time.sleep(interval)

#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()

#Print the results
print('Temperature: ' , temperature)

[/python]

- (2) Similar to the time library, we import the w1Thermsensor library
- (4) Next we create our temperature sensor object and give it a name
- (13) Down in the loop we get the temperature from the sensor and store it in a variable named "temperature"
- (16) And finally print the result using the print command

Let's try it out – press "F5" and it should prompt you to save it. After saving it should run, and in the Python Shell window you should see the temperature appear after a 15 second wait. It will continue to post an updated temperature every 15 seconds. This can be stopped by pressing "Ctrl + C".

Step 15 – Read The BME280

Next we will tackle the BME280 – this provides us with three measurements: Temperature, Pressure, and Humidity. The library we have installed already handles most of the hard work, but because of the way this library is written there are a few tricks that will prevent issues going forwards.

Just like the last sensor, we will import the library, set up the sensor, read the sensor, and print the results. Since we are now using the Circuit Python compatible libraries in this tutorial, there are a few extra chunks of code to add.

[python highlight="4-7, 9, 24, 27, 28, 31, 35-37 "]

```
import time
from w1thermsensor import W1ThermSensor

import board
import busio
from adafruit_bme280 import basic as adafruit_bme280
i2c = busio.I2C(board.SCL, board.SDA)

bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)

ds18b20 = W1ThermSensor()

interval = 15 #How long we want to wait between loops (seconds)

while True:
time.sleep(interval)

#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()

#Pull temperature from BME280
case_temp = bme.temperature

#Pull pressure from BME280 Sensor & convert to kPa
pressure_pa = bme.pressure
pressure = pressure_pa / 10

#Pull humidity from BME280
humidity = bme.humidity

#Print the results
print( 'Temperature: ' , temperature)
print( 'Humidity: ' , humidity, '%')
print( 'Pressure: ' , pressure, 'kPa')
print( ' ')
```

[/python]

- (4) Import the board library from Adafruit Blinka
- (5) Import the busio library from Adafruit Blinka
- (6) Import the Adafruit BME280 library
- (7) Configure I2C to use the boards hardware I2C pins
- (9) Next we create our BME280 sensor object and give it a name. In the brackets we set it to I2C, as that is how it is connected
- (24) Get the temperature from the BME280 and store it in the variable "case_temp"
- (27) Get the pressure from the BME280 and store it in the variable "pressure_pa"
- (28) Since we want kilopascals, we will divide by 10. The new result is stored in the variable "pressure"
- (31) Get the humidity from the BME280 and store it in the variable "humidity"
- (35) Print the humidity
- (36) Print the pressure
- (37) Print a blank line to separate the data and make it easier to read

Although we are not using the BME's temperature sensor, we still need to read it. Because of the way the library is written, simply asking for the pressure and humidity without asking for the temperature first will cause your program to crash. So we have read the temperature and called it "case temp" as it would be a decent indication of the air temperature inside the box that this will eventually end up in.

Once your code looks like the above, hit "F5" again to run it. This time there should be a bunch more information!

Step 16 – Read The ADC (Wind Direction)

Wind direction is next – again we are going to import the library, set up the sensor, and read the results. Unlike all of the past sensors, this one does not simply spit out exactly what we want to know. The sensor has differing resistance for each of the 16 wind directions it is capable of monitoring – in its current configuration, this means each direction will output a different voltage. We will read this voltage with our Analog to Digital converter and convert this to useable information in the form of a direction.

[python highlight="9,10,13,14,39-42,44-106,112"]

```
import time
from w1thermsensor import W1ThermSensor

import board
import busio
from adafruit_bme280 import basic as adafruit_bme280
i2c = busio.I2C(board.SCL, board.SDA)

import adafruit_ads1x15.ads1015 as ADS
from adafruit_ads1x15.analog_in import AnalogIn

bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)
ads = ADS.ADS1015(i2c)
ads.gain = 1

ds18b20 = W1ThermSensor()
interval = 15 #How long we want to wait between loops (seconds)

while True:

time.sleep(interval)

#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()

#Pull temperature from BME280
case_temp = bme.temperature

#Pull pressure from BME280 Sensor & convert to kPa
pressure_pa = bme.pressure
pressure = pressure_pa / 10

#Pull humidity from BME280
humidity = bme.humidity

#Calculate wind direction based on ADC reading
chan = AnalogIn(ads, ADS.P0)
val = chan.value
windDir = "Not Connected"
windDeg = 999

if 20000 <= val <= 20500:
windDir = "N"
windDeg = 0

if 10000 <= val <= 10500:
windDir = "NNE"
windDeg = 22.5

if 11500 <= val <= 12000:
windDir = "NE"
windDeg = 45

if 2000 <= val <= 2250:
windDir = "ENE"
windDeg = 67.5

if 2300 <= val <= 2500:
windDir = "E"
windDeg = 90
```

```
if 1500 <= val <= 1950:
windDir = "ESE"
windDeg = 112.5

if 4500 <= val <= 4900:
windDir = "SE"
windDeg = 135

if 3000 <= val <= 3500:
windDir = "SSE"
windDeg = 157.5

if 7000 <= val <= 7500:
windDir = "S"
windDeg = 180

if 6000 <= val <= 6500:
windDir = "SSW"
windDeg = 202.5

if 16000 <= val <= 16500:
windDir = "SW"
windDeg = 225

if 15000 <= val <= 15500:
windDir = "WSW"
windDeg = 247.5

if 24000 <= val <= 24500:
windDir = "W"
windDeg = 270

if 21000 <= val <= 21500:
windDir = "WNW"
windDeg = 292.5

if 22500 <= val <= 23000:
windDir = "NW"
windDeg = 315

if 17500 <= val <= 18500:
windDir = "NNW"
windDeg = 337.5

#Print the results
print( 'Temperature: ' , temperature)
print( 'Humidity: ' , humidity, '%')
print( 'Pressure: ' , pressure, 'kPa')
print( 'Wind Dir: ' , windDir, ' (', windDeg, ')')
print( ' ')
```

[/python]

- (9) Just like the other libraries, we import the Adafruit_ADS1x15 library
- (10) Load the AnalogIn library for the ADS1x15
- (13) Next we create our ADC object and give it a name. It is also connected over I2C
- (14) Set the programmable gain amplifier to 1 in the ADC
- (39) Get the reading from the ADC channel 0 and store it in the variable "chan"
- (40) We only need the adc value, so pull that from chan and assign it to a new variable "val" after multiplying it by 16. This is required due to changes in the Adafruit Library.
- (41-42) Define a base level reading if sensor isn't connected
- (44-106) Check to see if val is between two values, if it is we assign the direction, otherwise it continues down the list until a match is found
- (112) Print the results

The code for this is large and cumbersome, but rather than slim it down to something elegant and easy to type, we would rather show the mental process of how to figure out what direction the wind is coming from. Each direction outputs a different number – but this number will change a small amount based on temperature, power fluctuations, etc. so we cant just check if our ADC output matches a number in a list. Instead we have to see if they fall within a range.

So where do each of the ranges of numbers come from that we are testing against? The numbers we are using were found by manually moving the wind direction sensor to each of the directions and reading the output. These numbers were written down and then we added a buffer to each “side” to ensure we don’t have any incorrect readings. So as long as the value from the ADC is between these large ranges, it will read that specific direction. Feel free to test the code again with the “F5” key.

Step 17 – Wind Speed

The last two sensors are simple digital inputs on the Pi, these do not have a fancy chip to read or anything of the sort. The wind speed sensor is effectively a magnet and a small magnetic switch. As the sensor spins the magnet moves past a switch, causing it to close. A wind speed of 1.2km/h will cause this switch to open or close once per second. So we just need to count how many times it is opening and closing per second to figure out a speed.

The Pi has an easy way of monitoring this sort of thing. Even though we have paused the entire program for a period of 15 seconds, we can create a background process that will still watch for changes in this pin and keep count while the main code is paused.

So lets get started: First we need to import the Raspberry Pi GPIO library, set up the pin we are using, and create the background process that monitors the pin. We will then calculate the windspeed and, finally, print the result.

[python highlight=”12,22,25,28,31-36,127,128,135″]

```
import time
from w1thermsensor import W1ThermSensor
import board
import busio
from adafruit_bme280 import basic as adafruit_bme280
i2c = busio.I2C(board.SCL, board.SDA)

import adafruit_ads1x15.ads1015 as ADS
from adafruit_ads1x15.analog_in import AnalogIn

import RPi.GPIO as GPIO

bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)
ads = ADS.ADS1015(i2c)
ads.gain = 1

ds18b20 = W1ThermSensor()

interval = 15 #How long we want to wait between loops (seconds)
windTick = 0 #Used to count the number of times the wind speed input is triggered

#Set GPIO pins to use BCM pin numbers
GPIO.setmode(GPIO.BCM)

#Set digital pin 17 to an input and enable the pullup
GPIO.setup(17, GPIO.IN, pull_up_down=GPIO.PUD_UP)

#Event to detect wind (4 ticks per revolution)
GPIO.add_event_detect(17, GPIO.BOTH)
def windtrig(self):
global windTick
windTick += 1

GPIO.add_event_callback(17, windtrig)

while True:

time.sleep(interval)

#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()

#Pull temperature from BME280
case_temp = bme.temperature

#Pull pressure from BME280 Sensor & convert to kPa
pressure_pa = bme.pressure
pressure = pressure_pa / 10

#Pull humidity from BME280
humidity = bme.humidity
```

```
#Calculate wind direction based on ADC reading
chan = AnalogIn(ads, ADS.P0)
val = chan.value
windDir = "Not Connected"
windDeg = 999

if 20000 <= val <= 20500:
windDir = "N"
windDeg = 0

if 10000 <= val <= 10500:
windDir = "NNE"
windDeg = 22.5

if 11500 <= val <= 12000:
windDir = "NE"
windDeg = 45

if 2000 <= val <= 2250:
windDir = "ENE"
windDeg = 67.5

if 2300 <= val <= 2500:
windDir = "E"
windDeg = 90

if 1500 <= val <= 1950:
windDir = "ESE"
windDeg = 112.5

if 4500 <= val <= 4900:
windDir = "SE"
windDeg = 135

if 3000 <= val <= 3500:
windDir = "SSE"
windDeg = 157.5

if 7000 <= val <= 7500:
windDir = "S"
windDeg = 180

if 6000 <= val <= 6500:
windDir = "SSW"
windDeg = 202.5

if 16000 <= val <= 16500:
windDir = "SW"
windDeg = 225

if 15000 <= val <= 15500:
windDir = "WSW"
windDeg = 247.5

if 24000 <= val <= 24500:
windDir = "W"
windDeg = 270

if 21000 <= val <= 21500:
windDir = "WNW"
windDeg = 292.5

if 22500 <= val <= 23000:
windDir = "NW"
windDeg = 315

if 17500 <= val <= 18500:
windDir = "NNW"
windDeg = 337.5
```

```
#Calculate average windspeed over the last 15 seconds
windSpeed = (windTick * 1.2) / interval
windTick = 0

#Print the results
print( 'Temperature: ' , temperature)
print( 'Humidity: ' , humidity, '%')
print( 'Pressure: ' , pressure, 'kPa')
print( 'Wind Dir: ' , windDir, ' (', windDeg, ')')
print( 'Wind Speed: ' , windSpeed, 'KPH')
print( ' ')
```

[/python]

- (12) Just like the other libraries, we import the GPIO library.
- (22) Create a variable to store the number of times the wind sensor pin is triggered
- (25) Set the GPIO pins to use Broadcom's pin numbering
- (28) Set pin 17 to be an input and enable the pullup
- (31-36) Create a background process to keep track of how many times pin 17 transitions from HIGH to LOW or LOW to HIGH, each time it does we add 1 to the count
- (127) Calculate the wind speed – 1.2km/h per tick per second. This will result in an average speed over the last 15 seconds
- (128) Reset our counter
- (135) Print the result

Once again, feel free to test the code again with the "F5" key. Spinning the wind speed sensor will result in an average speed over the last 15 seconds being printed every interval.

Step 18 – Rainfall

Similar to the wind speed sensor, the rain gauge works with a magnet and a reed switch. Inside this sensor a small tipping device will switch back and forth every 0.2794mm of rain that falls. So we just need to count the number of times it switches back and forth and multiply to calculate the rainfall.

We are going to do this with another background process, similar to the one used for the wind speed sensor. Instead of counting transitions from high to low and low to high, this sensor requires we only count when the pin is falling from high to low to accurately capture the tipping gauge moving. For this reason we will set the event detect to "Falling". Now it will ignore any change of low to high, and only increment our count when it goes from high to low.

[python highlight="23,32,42-48,143,144,152"]

```
import time
from w1thermsensor import W1ThermSensor

import board
import busio
from adafruit_bme280 import basic as adafruit_bme280
i2c = busio.I2C(board.SCL, board.SDA)

import adafruit_ads1x15.ads1015 as ADS
from adafruit_ads1x15.analog_in import AnalogIn

import RPi.GPIO as GPIO

bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)
ads = ADS.ADS1015(i2c)
ads.gain = 1

ds18b20 = W1ThermSensor()

interval = 15 #How long we want to wait between loops (seconds)
windTick = 0 #Used to count the number of times the wind speed input is triggered
rainTick = 0 #Used to count the number of times the rain input is triggered

#Set GPIO pins to use BCM pin numbers
GPIO.setmode(GPIO.BCM)

#Set digital pin 17 to an input and enable the pullup
GPIO.setup(17, GPIO.IN, pull_up_down=GPIO.PUD_UP)

#Set digital pin 23 to an input and enable the pullup
GPIO.setup(23, GPIO.IN, pull_up_down=GPIO.PUD_UP)
```

```
#Event to detect wind (4 ticks per revolution)
GPIO.add_event_detect(17, GPIO.BOTH)
def windtrig(self):
global windTick
windTick += 1

GPIO.add_event_callback(17, windtrig)

#Event to detect rainfall tick
GPIO.add_event_detect(23, GPIO.FALLING)
def raintrig(self):
global rainTick
rainTick += 1

GPIO.add_event_callback(23, raintrig)

while True:

time.sleep(interval)

#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()

#Pull temperature from BME280
case_temp = bme.temperature

#Pull pressure from BME280 Sensor & convert to kPa
pressure_pa = bme.pressure
pressure = pressure_pa / 10

#Pull humidity from BME280
humidity = bme.humidity

#Calculate wind direction based on ADC reading
chan = AnalogIn(ads, ADS.P0)
val = chan.value
windDir = "Not Connected"
windDeg = 999

if 20000 <= val <= 20500:
windDir = "N"
windDeg = 0

if 10000 <= val <= 10500:
windDir = "NNE"
windDeg = 22.5

if 11500 <= val <= 12000:
windDir = "NE"
windDeg = 45

if 2000 <= val <= 2250:
windDir = "ENE"
windDeg = 67.5

if 2300 <= val <= 2500:
windDir = "E"
windDeg = 90

if 1500 <= val <= 1950:
windDir = "ESE"
windDeg = 112.5

if 4500 <= val <= 4900:
windDir = "SE"
windDeg = 135

if 3000 <= val <= 3500:
windDir = "SSE"
windDeg = 157.5
```

```
if 7000 <= val <= 7500:
windDir = "S"
windDeg = 180

if 6000 <= val <= 6500:
windDir = "SSW"
windDeg = 202.5

if 16000 <= val <= 16500:
windDir = "SW"
windDeg = 225

if 15000 <= val <= 15500:
windDir = "WSW"
windDeg = 247.5

if 24000 <= val <= 24500:
windDir = "W"
windDeg = 270

if 21000 <= val <= 21500:
windDir = "WNW"
windDeg = 292.5

if 22500 <= val <= 23000:
windDir = "NW"
windDeg = 315

if 17500 <= val <= 18500:
windDir = "NNW"
windDeg = 337.5

#Calculate average windspeed over the last 15 seconds
windSpeed = (windTick * 1.2) / interval
windTick = 0

#Calculate accumulated rainfall over the last 15 seconds
rainFall = rainTick * 0.2794
rainTick = 0

#Print the results
print( 'Temperature: ' , temperature)
print( 'Humidity: ' , humidity, '%')
print( 'Pressure: ' , pressure, 'kPa')
print( 'Wind Dir: ' , windDir, ' (', windDeg, ')')
print( 'Wind Speed: ' , windSpeed, 'KPH')
print( 'Rainfall: ' , rainFall, 'mm')
print( ' ')
```

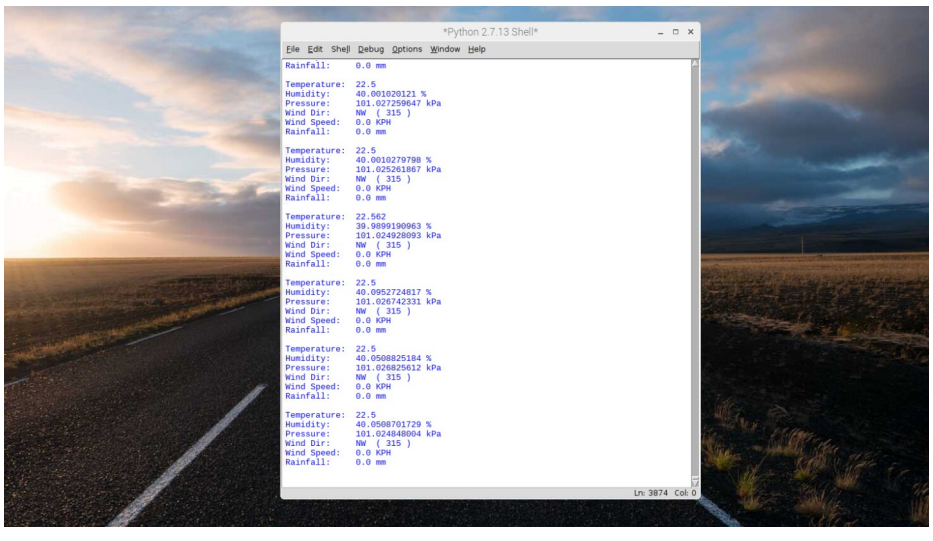
[/python]

- (23) Create a variable to store the number of times the rain sensor pin is triggered
- (32) Set pin 23 to be an input and enable the pullup
- (42-48) Create a background process to keep track of how many times pin 23 transitions from HIGH to LOW, each time it does we add 1 to the count
- (143) Calculate the rainfall – 0.2794mm per tick. This will result in a total rainfall over the last 15 seconds
- (144) Reset our counter
- (152) Print the result

Step 19 – All Done!

And that is it for our code! Hitting "F5" will run the program and should display all of the values every 15 seconds. Each sensor should respond, so feel free to try them all out. As always, if you have a question regarding the tutorial, please feel free to ask below!

In the next part of this tutorial we will be creating a Thingspeak account, modifying this program to send to Thingspeak, and looking at how this data can be used once it is logged there. Ready? Head on over to Part 3 of the Tutorial!



[info]Have A Question?

If you have any questions, or need further clarification please post in the comments section below; this way future users of this tutorial can see the questions and answers!

[/info]

122 THOUGHTS ON “RASPBERRY PI WEATHER STATION – PART 2”

AJ Reply

July 31, 2018

Hi

When I set mine up everything was good, except the Wind Directions were backwards. you might want to check yours.

CHRIS @ BCR Reply

July 31, 2018

Hi AJ,

I just fired ours up again with the code copied from the tutorial directly and it seems to be correct in our instance – when the nose of the wind vane is pointed to the “N” on the housing what do you get for an ADC reading?

Cheers,

SCOOBYTOO Reply

August 8, 2018

Ya your Right, I was just moving it around in my basement. added Dew point, Wind chill and a Feels like(humidex) values. I am workign on adding wind gust, average wind speed or rain in last hour. have you done any work on these values. I will be posting my code to git soon if anyone wants it.

CHRIS @ BCR Reply

August 8, 2018

I have on my last Arduino based system – you may find that ThingSpeak does a fairly good job internally calculating this . For all of my systems i tend to just send all the raw data out to ThingSpeak, and do the remainder of the calculations and analysis on that end. Lots more on that coming in the next part ☺

MIKE87 Reply

August 1, 2018

not an expert but mine reads north when it points to the north so that’s right? Or is it the other way round?

CHRIS @ BCR Reply

August 1, 2018

Hi Mike,

That’s right – the sensor will point into the wind (or towards the relative direction it is coming from) so that would be a correct reading.

Cheers,

JACK Reply

August 2, 2018

Hi Chris. Im having a issue with step 10. I give the command ls and don't see the serial number of the sensor.
Thanks

GUS Reply

December 7, 2020

I'm having the same problem, what do you mean by enable w1?

CHRIS @ BCR Reply

December 8, 2020

You need to enable 1-wire – what happened when you completed step 8?

JACK Reply

August 2, 2018

sorry found the problem! enable w1

CHRIS @ BCR Reply

August 2, 2018

No worries – glad you got it sorted!

ARJEN Reply

August 10, 2018

who can build for me this set ….im a dummy but searching for a WIFI weather station where i can wacth the weather on my beehives …..
any one a idea

LOUIS DE LANGE Reply

December 3, 2018

Chris, I have a question re. the wind speed calibration used in your code above.
According to the sparkfun wind sensor data sheet the magnetic switch closes once per second for 2.4km/h wind.
In Step 19 line 20 you comment that there are 4 ticks per rotation – I am not sure where this comes from.
Then in line 114 to calculate average speed you use the number of ticks / the interval (15 secs) x 1.2 The calculation makes sense if you use 2.4km/h per tick per second, but I dont know where the 1.2 comes from.
Reason for the questions is that I am adding code so my station can report max wind gust during the interval and I need to make sure I understand the wind anemometer function correctly.

CHRIS @ BCR Reply

December 4, 2018

Hi Louis,
I probably should have documented that one better – the sensor is actually capable of twice the resolution they state. Their information is based on measuring when the sensor is HIGH per revolution (so twice per rotation)
But, the interesting thing about this sensor is: if you measure the contact points, the sensor stays HIGH for ~90 degrees of rotation, and then stays LOW for ~90 degrees of rotation. Since the four transition points are spaced equally, we just measure the transition from HIGH to LOW and LOW to HIGH we can double the resolution of the sensor and get 4 ticks per revolution and 1.2km/h per tick, per second.
(Number of ticks * 1.2km/h) / 15 seconds = average wind speed
Hopefully that helps!

LOUIS DE LANGE Reply

December 6, 2018

Chris,
Thanks, excellent explanation.
Of course, when the data sheet does not provide accurate info it leaves me much less confident of the 2.4km/h per rotation.
I prefer to calibrate the sensors with real known measurements, but wind speed is the one thing I dont have an easy and cheap way to check.

CHRIS @ BCR Reply

December 8, 2018

Yeah that is a bit of a tricky one – it is also very subjective to your location so you cant really compare with stations near by.
One suggestion by another customer was to attach it to the outside of your car and drive at a low speed when the air is still. You could get data points at several speeds – but even car speedometers are ~ +/-10% so I'm not sure its worth the effort.

JOHN BLOOD Reply

March 30, 2019

weather project . in session 2 step 5 Iget error ensurepip is not defined .
pi@pi3two:~/Adafruit_Python_GPIO $ sudo python setup.py install
Traceback (most recent call last):
File "setup.py", line 1, in
ensurepip
NameError: name 'ensurepip' is not defined

CHRIS @ BCR Reply

March 30, 2019

Hi John,
Were there any errors when `sudo apt-get install build-essential python-pip python-dev python-smbus git` was run?

CHRIS @ BCR Reply

April 1, 2019

Looks like Adafruit has depreciated the GPIO library – we will be rolling out new instructions for this soon

GARETH Reply

April 1, 2019

Hi,
I get an error when executing, "sudo python setup.py install"
The error is; File "setup.py", line 1, in
ensurepip
NameError: name 'ensurepip' is not defined
Any suggestions?
Thanks!

CHRIS @ BCR Reply

April 1, 2019

Adafruit has depreciated most of their previous Python libraries and has now rolled out new Circuit Python libraries – there will be some changes to this tutorial (and several others) soon!

GARETH Reply

April 1, 2019

Hi Chris,
Thanks for your reply.
As a matter of interest, do you have an approximate timeline when the new tutorials will be online?
Thanks again!
Gareth

CHRIS @ BCR Reply

April 1, 2019

We are just modifying the instructions right now – for those that don't want to wait:
– remove the old Adafruit GPIO directory
– run `sudo pip3 install --upgrade setuptools`
– run `pip3 install RPI.GPIO`
– run `pip3 install adafruit-blinka`
and that should do it for that step. Every Adafruit library going forwards is going to have to be installed using the pip3 install method by the looks of things.. so:
sudo pip3 install adafruit-circuitpython-bme280
sudo pip3 install adafruit-circuitpython-ads1x15
Adafruit has seemingly removed their example files as well – so the commands for testing each device are no longer vaild.

GARETH

April 1, 2019

Thanks Chris.
If we apply these changes listed here, will anything else change in later parts?
Thanks again!

WILLIAM @ BC ROBOTICS

April 1, 2019

big changes… we gotta go to Python 3 (had to happen eventually) so probably best to hold for a day while we get this rewritten □

GARETH

April 1, 2019

No problem at all.
Once again, thanks so much for being on the ball with this. It's great to see such an awesome community.
You guys rock!

WILLIAM @ BC ROBOTICS

April 2, 2019

Thanks Gareth – it is now updated so give it a try. We are just firing through part 3 right now

JUDE

June 1, 2021

hi
Im getting this problem are entering
pip3 install adafruit-blinka
ollecting adafruit-blinka
Using cached https://www.piwheels.org/simple/adafruit-blinka/Adafruit_Blinka-5.13.1-py3-none-any.whl
Collecting sysv-ipc (from adafruit-blinka)
Using cached
https://files.pythonhosted.org/packages/0c/d7/5d2f861155e9749f981e6c58f2a482d3ab458bf8c35ae24d4b4d5899ebf9/sysv_ipc-1.1.0.tar.gz
Complete output from command python setup.py egg_info:
Traceback (most recent call last):
File "", line 1, in
File "/tmp/pip-build-eima54aa/sysv-ipc/setup.py", line 11, in
import prober
File "/tmp/pip-build-eima54aa/sysv-ipc/prober.py", line 137
d["SYSV_IPC_VERSION"] = f'"{version}"'
^

SyntaxError: invalid syntax

————————————-

Command “python setup.py egg_info” failed with error code 1 in /tmp/pip-build-eima54aa/sysv-ipc/

please help

CHRIS @ BCR

June 1, 2021

Hello,

What version of Raspbian are you running?

JOHN BLOOD Reply

April 1, 2019

Thanks for the quick attention . I will await the changes

WILLIAM @ BC ROBOTICS Reply

April 2, 2019

Should be good to go now John!

GARETH Reply

April 2, 2019

Hi,

Thanks for the changes, it’s really appreciated!

One quick question. All the sensors work apart from the wind direction. When I hit F5, I get Wind Dir: Not connected (999)

However, it is plugged in.

When I disconnect it, I get the following:

Wind Dir: ESE (112.5)

Any thoughts?

Thanks so much once again!

GARETH Reply

April 2, 2019

Just a quick update on this. It seems that when I hold the wind direction in a certain position, I get the ESE (112.5) message, but as soon as I change it, I get the ‘Not connected” message.

Thoughts?

GARETH Reply

April 2, 2019

Also, when I spin the wind speed indicator, I get no reading.

CHRIS @ BCR Reply

April 3, 2019

Hi Gareth,

Sounds like something isn’t plugged in right? Send us a few photos to support@bc-robotics.com and we can have a look.

Cheers!

GARETH

April 3, 2019

Hi Chris,

Sent. Thanks!

Gareth

JOHN BLOOD Reply

April 3, 2019

Thanks William

All good now !

JOHN Reply

April 4, 2019

John Here

I get not connected and 999 for wind direction .

CHRIS @ BCR Reply

April 4, 2019

Hey John,

Double check your code – specifically line 70:

```
val = chan.value * 16
```

JOHN Reply

April 5, 2019

I did a copy paste of your code and got the same result . I also printed chan.val and got 1644 no matter what direction vane was turned .I guess I am duplicating mssg here but suppose should have used reply !

JOHN Reply

April 5, 2019

I did a copy paste of your code and got the same result . I also printed chan.val and got 1644 no matter what direction vane was turned .

CHRIS @ BCR Reply

April 5, 2019

Hi John,

Can you email over a few photos of your setup to support@bc-robotics.com ?

GARETH Reply

April 7, 2019

Hi,

This is the error I get.

Was anyone able to sort out a fix?

Thanks!

CHRIS @ BCR Reply

April 7, 2019

Hey Gareth,

This error would indicate that something isn't plugged into the right socket. Double check your Anemometer is plugged into your Wind Direction sensor, and the long cable from your Wind Direction Sensor is plugged into the middle connector on the Weather Board.

Let us know if that doesn't solve it!

GARETH

April 8, 2019

Hi,

Thanks for the reply. Much appreciated!

Yes, all the cables are correct.

Could it be anything else?

Thanks again!

CHRIS @ BCR

April 8, 2019

Hmm – that is a bit odd. Best bet is to send over an email to support@bc-robotics.com referencing this post. They can drill down and help troubleshoot much more in depth!

GARETH Reply

April 11, 2019

Hi,
I sent an email earlier this week. We're you able to investigate?
Cheers
Gareth

CHRIS @ BCR Reply

April 11, 2019

Hi Gareth,
Just checked with Support – they wrote back earlier in the week and are waiting on photos – Cheers!

GARETH

April 18, 2019

Hi,
I didn't actually get an email from them but I had sent through some pics previously. Did they receive them?

CHRIS @ BCR

April 18, 2019

Hi Gareth,
Looks like they replied on April 9 @ ~ 2:58PM. I just had someone resend – double check the junk folder if you don't see it!

GARETH

April 20, 2019

Hi Chris,
The reply I got was for the initial, change of tutorial problem.
Is there any word on this latest issue?
Thanks again!
Cheers
Gareth

GARETH Reply

April 7, 2019

Hi John,
Were you able to fix this error? I get the same one.

DAVE ENSTROM Reply

April 18, 2019

Question on wind speed … from SparkFun " A wind speed of 1.492 MPH (2.4 km/h) causes the switch to close once per second".
So your conversion of "windSpeed = (windTick * 1.2) / interval" doesn't seem to make sense
Should it be "windSpeed = (windTick * 2.4) / interval"?
PS: My microSD card failed, so currently updating my Pi and WeeWX driver to Python 3. I'll let you know when available on GitHub.

CHRIS @ BCR Reply

April 18, 2019

Hey Dave – the sensor is actually capable of twice the resolution they state. Their information is based on measuring when the sensor is HIGH per revolution (so twice per rotation)
But, the interesting thing about this sensor is: if you measure the contact points, the sensor stays HIGH for ~90 degrees of rotation, and then stays LOW for ~90 degrees of rotation. Since the four transition points are spaced equally, we just measure the transition from HIGH to LOW and LOW to HIGH we can double the resolution of the sensor and get 4 ticks per revolution and 1.2km/h per tick, per second.
(Number of ticks * 1.2km/h) / 15 seconds = average wind speed
Hopefully that helps!

DAVE ENSTROM Reply

April 18, 2019

An update: Forgot that WeeWX only runs on Python V2 … so the driver will not be updated.

GEORGE Reply

October 7, 2019

Hi Dave,
I'm trying to do the same think (RPi + weewx).
Do you have any links to drivers or a general description of your software setup?
Thank in advance!

RON Reply

May 1, 2019

I'm a newbie and had the same problem as Jack in reply 8, no ID returned for w1. what is the specific command for enabling w1.
Thanks

WILLIAM @ BC ROBOTICS Reply

May 1, 2019

Hi Ron, best bet is to hit the Raspberry Menu in the top left corner, go down to Preferences and select Raspberry Pi Configuration. Under the "Interfaces Tab" make sure 1-Wire is set to enable.
(and I2C while you are there, it will be needed as well!)

RON Reply

May 1, 2019

thank you…

JUAN Reply

May 2, 2019

Hi, I need to set up a remote weather station and I would like to know if instead of reading wind directions in an approximate manner, can I obtain the wind direction in degrees (0 – 359º)?

WILLIAM @ BC ROBOTICS Reply

May 2, 2019

Hi Juan
Yes, but you would need to get a different wind direction meter that can provide that level of resolution. Most hobby / home grade out there are only capable of 16 directions.

JUAN Reply

May 3, 2019

Hi William, thanks for your reply. Could you give me a link to a wind direction meter that can provide 360 degree resolution and that can be connected to this RPi weather station?

JUAN

Reply

May 2, 2019

I have another question: where can I obtain solar radiation and UV sensors that can be connected to this weather station?

WILLIAM @ BC ROBOTICS

Reply

May 2, 2019

The Weather Board breaks out all of the data buses available on the Pi and has three extra analog inputs, so there is plenty of room for expansion. What sensor to use for each will depend on how accurate you need it to be.

JUAN

Reply

May 3, 2019

What I really need is a solar radiation sensor that can help determine plant growth.

DAVE

Reply

May 9, 2019

Hi Everyone, just got my weather station up and running using weeWX, but it's having an error problem with wind direction ie: weeWX [440]: BCRobo: MainThread: wind direction error: 26368
26384
25808
all errors seem to be around the 25k t0 26k range and just wondering if anybody knows what causing this, I'm thinking defective sensor

CHRIS @ BCR

Reply

May 9, 2019

Hey Dave,
Most likely a software issue – it is still providing you a reading so the ADC and the resistive sensor are doing their thing. Not being familiar with the weeWX, i would guess it is probably how the data is being interpreted. Best bet to rule out the sensor / ADC is to run our tutorial code on a fresh installation. There have been a lot of changes to some of the libraries we use in the past ~ 3 months.

DAVE

Reply

May 9, 2019

Thanks Chris
I have run the BCR test app and the problem does not show up, so then it must have to do with how weeWx interprets the data from the BCR driver

CHRIS @ BCR

Reply

May 9, 2019

We use the Adafruit ADS library – this has changed significantly in the past few months so my first hunch would be to check there. The way the gain was handled changed which caused some issues within our example code.

DAVE

May 9, 2019

I will try updating and see if that gets rid of the errors
Thanks for the help

DIA-SEA

Reply

May 16, 2019

I'm also print "Not Connected" at windDir with new code.
What is this value based on?
val = chan.value * 16

if 20000 <= val <= 20500:

if 10000 <= val <= 10500:

if 11500 <= val <= 12000:

if 2000 <= val <= 2250:

if 2300 <= val <= 2500:

if 1500 <= val <= 1950:

if 4500 <= val <= 4900:

if 3000 <= val <= 3500:

if 7000 <= val <= 7500:

if 6000 <= val <= 6500:

if 16000 <= val <= 16500:

if 15000 <= val <= 15500:

if 24000 <= val <= 24500:

if 21000 <= val <= 21500:

if 22500 <= val <= 23000:

if 17500 <= val <= 18500:

I found the data on the condition of 5V in the WeatherMeters datasheet.

WeatherMeters dataseet

https://www.sparkfun.com/datasheets/Sensors/Weather/Weather%20Sensor%20Assembly..pdf?_ga=2.198458284.2051866801.1558002594-1193397126.1558002594

However, the voltage of real circuit was 3V.

I could't found the condition of 3V.

Sorry, I'm a Japanese person with poor English.

CHRIS @ BCR Reply

May 16, 2019

No worries!

Since this is an analog sensor, the voltage doesn't really matter as long as your input voltage and your analog reference are the same. In this case both are 3V so it will work. The values are pulled from the ADS1015 Analog to Digital Converter by way of the Adafruit ADS1x15 Python Library – This library has been updated and the Gain has been changed – if you have an old version of the library installed it could be causing issues.

DIA-SEA Reply

May 17, 2019

Thank you for reply.

I understand it works.

The following is a different topic.

I think that old sample source code use ADS1115.

So I measured voltage between "wind R11 connecter" 1pin to 4pin with multimeter.

It was similar to the value output by the following sample code with ADS1115.

```
import adafruit_ads1x15.ads1115 as ADS
from adafruit_ads1x15.analog_in import AnalogIn
i2c = busio.I2C(board.SCL, board.SDA)
ads = ADS.ADS1115(i2c)
ads.gain = 1
chan = AnalogIn(ads, ADS.P0)
print(chan.voltage)
```

————————————————————

direction: N / multimeter: 2.51V / sample code output 2.548V

direction: E / multimeter: 0.28V / sample code output 0.302V

direction: S / multimeter: 0.91V / sample code output 0.934V

direction: W / multimeter: 3.02V / sample code output 3.066V

————————————————————

I think this board use ADS1115 for A/D converter isn't it?

And I tried calucration following this code.

This system use dataseet value.

https://os.mbed.com/users/okini3939/code/WeatherMeters/file/6a62f29b1bb5/WeatherMeters.cpp/

I can get wind direction resistance (Ohms).

```
ohm = chan.voltage / ((3.3 – chan.voltage) / 10000.0)
```

Wind Dir: N(0.0) 2.546V 33887.517Ohm

Wind Dir: N(0.0) 2.548V 33797.618Ohm

Wind Dir: N(0.0) 2.548V 33860.918Ohm
Wind Dir: NNE(22.5) 1.316V 6633.401Ohm
Wind Dir: NE(45.0) 1.496V 8293.146Ohm
Wind Dir: NE(45.0) 1.496V 8304.233Ohm
Wind Dir: NE(45.0) 1.498V 8293.146Ohm
Wind Dir: ENE(67.5) 0.272V 898.313Ohm
Wind Dir: E(90.0) 0.302V 1007.372Ohm
Wind Dir: E(90.0) 0.304V 1008.045Ohm
Wind Dir: E(90.0) 0.302V 1014.043Ohm
Wind Dir: ESE(112.5) 0.214V 693.477Ohm
Wind Dir: SE(135.0) 0.600V 2222.305Ohm
Wind Dir: SSE(157.5) 0.410V 1418.735Ohm
Wind Dir: S(180.0) 0.934V 3947.759Ohm
Wind Dir: SSW(202.5) 0.794V 3168.523Ohm
Wind Dir: SW(225.0) 2.042V 16191.770Ohm
Wind Dir: SW(225.0) 2.042V 16233.414Ohm
Wind Dir: SW(225.0) 2.042V 16217.514Ohm
Wind Dir: WSW(247.5) 1.942V 14301.502Ohm
Wind Dir: W(270.0) 3.064V 129970.716Ohm
Wind Dir: W(270.0) 3.066V 131082.056Ohm
Wind Dir: Not Connected(999.0) 3.066V 132212.564Ohm
Wind Dir: WNW(292.5) 2.684V 43611.026Ohm
Wind Dir: NW(315.0) 2.878V 68215.331Ohm
Wind Dir: NW(315.0) 2.878V 68262.736Ohm
Wind Dir: NW(315.0) 2.878V 68540.244Ohm
Wind Dir: NW(315.0) 2.880V 68587.875Ohm
Wind Dir: NNW(337.5) 2.280V 22311.396Ohm
Wind Dir: NNW(337.5) 2.278V 22335.539Ohm
Wind Dir: N(0.0) 2.548V 33887.517Ohm

CHRIS @ BCR Reply

May 17, 2019

Ahh ok , i see what you are asking – our numbers are based on raw ADC output. However, you could use voltage or calculated resistance as well – that is much more a matter of preference at that point.

DAVE Reply

May 18, 2019

Hi dia-sea, so you have been getting the not connected error, what i have found if your using the Argent weather vane is that the reed switches can degrade over time as in my case, replaced all switches which has fixed some errors. Where the problem seems to be is when the magnet is between two switches, if one or both switches do not close you'll get an error particularly in the NNE, ENE, SSW and so on and you'll get the 26363, 26252 and so on errors.I read a doc. on SwitchDoc Labs about the 16 possible directions which they say are rare. Software updates did not help as chris suggested. I have order a new wind vane to see if this helps as mine is over 10yrs old. hope this helps

---

CHRIS @ BCR Reply

May 18, 2019

Interesting point Dave – the other side of it may be that the magnet is degrading over time – if the effective field shrinks it could leave gaps between directions as well.

DIA-SEA Reply

May 19, 2019

Hi, Dave
I use unused wind vane, but that bought for spare 6 years ago.
I get "Not Connected", I think that reason is range.
I referred to this source code.
https://os.mbed.com/users/okini3939/code/WeatherMeters/file/6a62f29b1bb5/WeatherMeters.cpp/
In this source code, the resistance value "x0.9" to "x1.1″ is used as a range of direction.
By adjusting the value, I think to get current direction without error.
I'm trying this source code

I'm trying this source code:

————————————————–

```
import time
import board
import busio
import adafruit_ads1x15.ads1115 as ADS
from adafruit_ads1x15.analog_in import AnalogIn
i2c = busio.I2C(board.SCL, board.SDA)
ads = ADS.ADS1115(i2c)
ads.gain = 1
# dataseet values
tbl_windvane=[[0.0,33000,"N"],[22.5,6570,"NNE"],[45.0,8200,"NE"],[67.5,891,"ENE"],
[90.0,1000,"E"],[112.5,688,"ESE"],[135.0,2200,"SE"],[157.5,1410,"SSE"],
[180.0,3900,"S"],[202.5,3140,"SSW"],[225.0,16000,"SW"],[247.5,14120,"WSW"],
[270.0,120000,"W"],[292.5,42120,"WNW"],[315.0,64900,"NW"],[337.5,21880,"NNW"]]
interval = 1
while True:
time.sleep(interval)
chan = AnalogIn(ads, ADS.P0)
ohm = chan.voltage / ((3.3 – chan.voltage) / 10000.0)
windDir = "Not Connected"
windDeg = 999
for windvane in tbl_windvane:
if windvane[1]*0.9 <= ohm <= windvane[1]*1.1: # Need to ajust this value
windDir = windvane[2]
windDeg = windvane[0]
print ("Wind Dir: {}({:4.1f}) {:1.3f}V {:6.3f}Ohm".format(windDir,windDeg,chan.voltage,ohm))
```

DAVE Reply

May 23, 2019

Hi Chris, replaced wind direction sensor with a new one and errors are gone and I have all 16 points so no software issue here just mechanical and once again thanks for your help and the tutorials, now I've got to figure how to write the programming for UV and Lux senors just beginning to get my head around python

---

CHRIS @ BCR Reply

May 23, 2019

No worries!

DAVE Reply

May 18, 2019

That was what I've been thinking, with the board out of the housing and with another similar magnet I can get all 16 point which made me think of alignment or bad magnet

---

RON Reply

May 19, 2019

Having trouble with the rain sensor. Rain tick does not increase with bucket movement. On checking found that on the RJ11 connector one of the middle two wires measures 0.0vdc (Pi GRD), but the other is floating. I expected it to read (Pi) 3.33vdc. Thanks for any help

---

RON Reply

May 19, 2019

should have noted, GPIO 23 reads 3.33vdc on the Pi header.

CHRIS @ BCR

May 19, 2019

Hi Ron,

That is correct – the GPIO pin is being pulled high

```
GPIO.setup(23, GPIO.IN, pull_up_down=GPIO.PUD_UP)
```

When the rain gauge tips, the reed switch will close to ground and the Pi should register that. It only should register for a very short period of time as it crosses center to tip the other direction

```
#Event to detect rainfall tick
GPIO.add_event_detect(23, GPIO.FALLING)
def raintrig(self):
global rainTick
rainTick += 1
GPIO.add_event_callback(23, raintrig)
```

RON Reply

May 20, 2019

That is how I believed it should work also. Is'nt GPIO (23) tied directly to one of the RJ11 pins? If so, I should be able to measure 3.33vdc at the RJ11 connector, which I do not.

RON Reply

May 20, 2019

Thanks for you help, I found the problem. I failed to solder GPIO pin 23 on the header to the weather board. Only one I missed. I'm 80, so guess I better check on getting new glasses, ha.

DAVE Reply

May 23, 2019

Is there a product to coat the boards to protect them from the outdoor environment??

WILLIAM @ BC ROBOTICS Reply

May 23, 2019

Conformal coating (we don't carry it, pressurized cans of chemicals are not fun to ship!)

DAVE Reply

May 24, 2019

Thanks

SIMONE Reply

June 22, 2020

You dais above: "The Pi has an easy way of monitoring this sort of thing. Even though we have paused the entire program for a period of 15 seconds, we can create a background process that will still watch for changes in this pin and keep count while the main code is paused."
How could I change the code implementing the wind speed measurement in background while in those 15 seconds do other things?

SIMONE Reply

June 22, 2020

One more question. Do you consider the code below a valid alternative to measure the wind speed based on the time it actually takes to do a full revolution (as opposed to wait for a fixed interval)?
def calculate_elapse(channel): # callback function
global pulse, start_timer, elapse, speed
pulse += 1 # increase pulse by 1 whenever interrupt occurred
if pulse == 4:
elapse = time.time() – start_timer # elapse for every 1 complete rotation made!
start_timer = time.time() # let current time equals to start_timer
speed = pulse * 2.4 / elapse
pulse = 0

CHRIS @ BCR Reply

June 29, 2020

Your logic is correct, you could measure the time it takes to complete a revolution and figure it out from there rather than the number of revolutions in a span of time.
There are 4 ticks per revolution, 2 rising and two falling. Using both gives you slightly better resolution. So depending on how you approach it you will need to use the right calculation. If you use both, it is 1.2km/h per tick in a one second interval.

DAVEE Reply

October 24, 2020

A suggestion re: DS18B20 temperature sensor software library. I think the command should be:
$ sudo pip3 install w1thermsensor -U
Your direction will result in installing an old version I think. Yes?

FABIO Reply

April 5, 2021

Goodmorning,
I assembled the weather station but i've only one problem: Wind direction seems does'nt works.
I've ever 999 degrees!
All other sensors working fine.
What's the problem?
How I read the real value in output of the dac?
Thanks
Fabio

MICHAEL GRAINGER Reply

April 21, 2021

Good day:
This is a great project my only question has to do with the humidity reading. indicating 16.9 % in a room where the humidity is 58 %.
Any ideas as to the issue, bad sensor?
Regards,
Mike

CHRIS @ BCR Reply

April 22, 2021

Hey Mike,
There are a couple things that could be causing it – what version of the board are you running? WeatherHat (RAS-139) with the Adafruit BME Breakout installed, or a WeatherHAT Pro with the BME already installed?

GARY Reply

May 24, 2021

Hi guy
We download the latest operating system and had more luck get the comands to load on. But we got to the very last command step 10 and we are getting error unable to locate package python3-w1therms. Thanks again

---

GARY Reply

May 24, 2021

Fixed now was using a phone to read comands and was missing the last part of it on the phones screen

---

JUDE Reply

June 2, 2021

Thanks for the quick reply Chris.
we are running the image that is mentioned in the tutorial raspbain 27.6.2018.

JUDE Reply

June 6, 2021

hi
Im getting this problem are entering
pip3 install adafruit-blinka
ollecting adafruit-blinka
Using cached https://www.piwheels.org/simple/adafruit-blinka/Adafruit_Blinka-5.13.1-py3-none-any.whl
Collecting sysv-ipc (from adafruit-blinka)
Using cached https://files.pythonhosted.org/packages/0c/d7/5d2f861155e9749f981e6c58f2a482d3ab458bf8c35ae24d4b4d5899ebf9/sysv_ipc-1.1.0.tar.gz
Complete output from command python setup.py egg_info:
Traceback (most recent call last):
File "", line 1, in
File "/tmp/pip-build-eima54aa/sysv-ipc/setup.py", line 11, in
import prober
File "/tmp/pip-build-eima54aa/sysv-ipc/prober.py", line 137
d["SYSV_IPC_VERSION"] = f'"{version}"'
^
SyntaxError: invalid syntax
————————————————-
Command "python setup.py egg_info" failed with error code 1 in /tmp/pip-build-eima54aa/sysv-ipc/
please help

CHRIS @ BCR Reply

June 8, 2021

Hi Jude,
That is a little odd – try running update again:
[code]sudo apt-get update[/code]
and then run:
[code]pip3 install adafruit-blinka[/code]
see if that solves it…

GARY Reply

June 6, 2021

Traceback (most recent call last):
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 154, in __probe_for_device
self.i2c.writeto(self.device_address, b"")
File "/home/pi/.local/lib/python3.7/site-packages/busio.py", line 158, in writeto
return self._i2c.writeto(address, buffer, stop=stop)
File "/home/pi/.local/lib/python3.7/site-packages/adafruit_blinka/microcontroller/generic_linux/i2c.py", line 49, in writeto
self._i2c_bus.write_bytes(address, buffer[start:end])
File "/home/pi/.local/lib/python3.7/site-packages/Adafruit_PureIO/smbus.py", line 308, in write_bytes
self._device.write(buf)
OSError: [Errno 121] Remote I/O error
During handling of the above exception, another exception occurred:
Traceback (most recent call last):
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 160, in __probe_for_device
self.i2c.readfrom_into(self.device_address, result)
File "/home/pi/.local/lib/python3.7/site-packages/busio.py", line 148, in readfrom_into
return self._i2c.readfrom_into(address, buffer, stop=stop)
File "/home/pi/.local/lib/python3.7/site-packages/adafruit_blinka/microcontroller/generic_linux/i2c.py", line 56, in readfrom_into
readin = self._i2c_bus.read_bytes(address, end – start)
File "/home/pi/.local/lib/python3.7/site-packages/Adafruit_PureIO/smbus.py", line 179, in read_bytes
return self._device.read(number)
OSError: [Errno 121] Remote I/O error
During handling of the above exception, another exception occurred:
Traceback (most recent call last):

File "/home/pi/BME280.py", line 9, in
bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)
File "/usr/local/lib/python3.7/dist-packages/adafruit_bme280.py", line 534, in __init__
self._i2c = i2c_device.I2CDevice(i2c, address)
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 50, in __init__
self.__probe_for_device()
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 163, in __probe_for_device
raise ValueError("No I2C device at address: 0x%x" % self.device_address)
ValueError: No I2C device at address: 0x77
Please help getting this for all sensors except the temperature.
thanks

WILLIAM @ BC ROBOTICS Reply

June 8, 2021

Do you have I2C enabled in raspi-config?

GEORGE Reply

June 9, 2021

Hello again,
trying to install on a freshly updated OS and I get this error:
import adafruit_bme280
ModuleNotFoundError: No module named 'adafruit_bme280'
I think it has something to do with an recent update since I didn't get this error one week ago.

CHRIS @ BCR Reply

June 9, 2021

Hi George,
You are correct – things have changed – we are just in the process of updating the entire tutorial. The BME library has changed the way the chipset is addressed again:
line 6 changes to: [code]from adafruit_bme280 import basic as adafruit_bme280[/code]
line 7 changes to: [code]i2c = board.I2C() # uses board.SCL and board.SDA[/code]
line 9 changes to: [code]bme = adafruit_bme280.Adafruit_BME280_I2C(i2c)[/code]
that *should* solve it – but let us know if you run into anything else!

GEORGE Reply

June 9, 2021

Thank you Chris for the quick reply!
I will try the changes and also wait for the updated tutorial.

GEORGE Reply

June 10, 2021

Hello again Chris,
no luck with the changes, there is still the same error.
I think it has something to do with the libraries' order of installation.

GEORGE Reply

June 24, 2021

Hi Chris,
do you have a rough ETA for the updated tutorial?
Asking so I can schedule my visit to the site.
Thank you in advance.

CHRIS @ BCR Reply

June 24, 2021

Hi George,

No worries – We are looking to have it up in the next 10 days

GEORGE

June 25, 2021

Hey Chris,

that is great!

Thank you very much for your efforts!

GEORGE

July 19, 2021

Hey Chris,

any news about the tutorial?

Thank you once again!

WILLIAM @ BC ROBOTICS

July 28, 2021

Updated – the example code now reflects the new Adafruit BME280 Library.

MARK Reply

June 28, 2021

FYI George, I also needed to make these changes and it worked for me when I left the line:

i2c = board.I2C() # uses board.SCL and board.SDA

as

i2c = busio.I2C(board.SCL, board.SDA)

Hope this helps and thanks to BC-Robotics for this excellent tutorial!

Mark

IZZI Reply

July 7, 2021

Hi,

I've written the code and loaded all the files in terminal with the exception of an error message of unknown command for the "1s" test line.

My python code is reading that it has no errors and I am getting the restart message in the python 3.7.3 shell. However, nothing happens after that and I haven't been able to get any data readings. Not sure where to go to trouble shoot or what the problem may be.

Any help is really appreciated!!

PAOLO FIUMARELLA Reply

October 13, 2021

hello I need to read the converted bit value of the direction sensor, how do I do it?

PAOLO FIUMARELLA Reply

November 2, 2021

Hi, i'm building the weather station and i'm following its tutorial, but i have a problem, when i detach the sensor bme_280 the python script is not executed, how can i solve this problem?

DAVE ALDOUS Reply

December 22, 2021

Hi Chris

I'm getting a similar error as Jude with the pip3 install adafruit-blinka command. I get:

SyntaxError: Invalid syntax

Command "python setup.py egg_info" failed with error code 1 in /tmp/pip-build-e6qibl9a/sysv-ipc/

I'm also running Raspbian 2018-06-27

Thanks for your quick reply to my Part 1 question.

JOSEPH SHERRILL Reply

January 7, 2022

Something amiss. Am I fetching proper library? Python code is as in the tutorial:

```
import time
from w1thermsensor import W1ThermSensor
import board
import busio
from adafruit_bme280 import basic as adafruit_bme280
i2c=busio.I2C(board.SCL,board.SDA)
bme=adafruit_bme280.Adafruit_BME280_I2C(i2c)
ds18b20 = W1ThermSensor()
interval = 15 #How long we want to wait between loops(seconds)
while True:
time.sleep(interval)
#Pull Temperature from DS18B20
temperature = ds18b20.get_temperature()
#Pull temperature from BME280
case_temp=bme.temperature
#Pull pressure from BME280 Sensor and convert to kPa
pressure_pa=bme.pressure
pressure=pressure_pa/10
#Pull humidity from BME280
humidity=bme.humidity
#Print the results
print('Temperature:',temperature)
print('Humidity:',humidity,'%')
print('Pressure:',pressure,'kPa')
print('')
#Print the results
print('Temperature:',temperature)
```

Yet I am getting following error reports:

```
%Run ReadBME.py
Traceback (most recent call last):
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 154, in __probe_for_device
self.i2c.writeto(self.device_address, b"")
File "/home/pi/.local/lib/python3.7/site-packages/busio.py", line 166, in writeto
return self._i2c.writeto(address, buffer, stop=stop)
File "/home/pi/.local/lib/python3.7/site-packages/adafruit_blinka/microcontroller/generic_linux/i2c.py", line 49, in writeto
self._i2c_bus.write_bytes(address, buffer[start:end])
File "/home/pi/.local/lib/python3.7/site-packages/Adafruit_PureIO/smbus.py", line 314, in write_bytes
self._device.write(buf)
OSError: [Errno 121] Remote I/O error
During handling of the above exception, another exception occurred:
Traceback (most recent call last):
File "/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py", line 160, in __probe_for_device
self.i2c.readfrom_into(self.device_address, result)
File "/home/pi/.local/lib/python3.7/site-packages/busio.py", line 156, in readfrom_into
return self._i2c.readfrom_into(address, buffer, stop=stop)
File "/home/pi/.local/lib/python3.7/site-packages/adafruit_blinka/microcontroller/generic_linux/i2c.py", line 56, in readfrom_into
readin = self._i2c_bus.read_bytes(address, end – start)
File "/home/pi/.local/lib/python3.7/site-packages/Adafruit_PureIO/smbus.py", line 181, in read_bytes
return self._device.read(number)
OSError: [Errno 121] Remote I/O error
During handling of the above exception, another exception occurred:
Traceback (most recent call last):
File "/home/pi/ReadBME.py", line 9, in
bme=adafruit_bme280.Adafruit_BME280_I2C(i2c)
File "/usr/local/lib/python3.7/dist-packages/adafruit_bme280/basic.py", line 366, in __init__
self._i2c = i2c_device.I2CDevice(i2c, address)
```

File “/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py”, line 50, in __init__
self.__probe_for_device()
File “/usr/local/lib/python3.7/dist-packages/adafruit_bus_device/i2c_device.py”, line 163, in __probe_for_device
raise ValueError(“No I2C device at address: 0x%x” % self.device_address)
ValueError: No I2C device at address: 0x77
>>>
BTW, i2cdetect shows nothing at 0x76 or 0x77. The board IS an Adafruit BME280.

WILLIAM @ BC ROBOTICS Reply

January 7, 2022

Not a library issue – this would be related to a hardware / connection issue. Double check all connections, ensure I2C is enabled in Raspi Config, and work outwards from there

---

DAVID ENSTROM Reply

February 6, 2022

You need to update step 10 to:
sudo pip3 install w1thermsensor

STEVEN Reply

March 20, 2022

I’m having issues with step 10
I have followed the directions precisely but I keep getting
error unable to locate package python3-w1thermsensor
Any suggestions?

CHRIS @ BCR Reply

March 30, 2022

Hi Steven,
Just tested it again with

```
sudo apt-get install python3-w1thermsensor
```

or

```
sudo pip3 install w1thermsensor
```

and they both worked? what version of the OS are you running?

STEVEN Reply

April 15, 2022

Sorry the the delayed response. I just started over and I got it to work now. I’m using the latest version of Raspbian.
Now I’m just trying to figure out the codes. Stuck on step 14 as I can’t get it to print out any results but I’ll power through.

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