



The Canadian Satellite Design Challenge Management Society presents...

The CanSat Kit

for

DUMMIES

Future Space Scientists & Engineers!

Episode #5: Connecting the BMP-280 Temperature & Pressure Sensor

What we're going to do:

- Connect the BMP-280 Pressure & Temperature sensor to the Arduino
- Use a program to read the temperature and pressure data once every second

- This tutorial is based on:
 - <https://projecthub.arduino.cc/SurtrTech/bmp280-measure-temperature-pressure-and-altitude-6002cd>

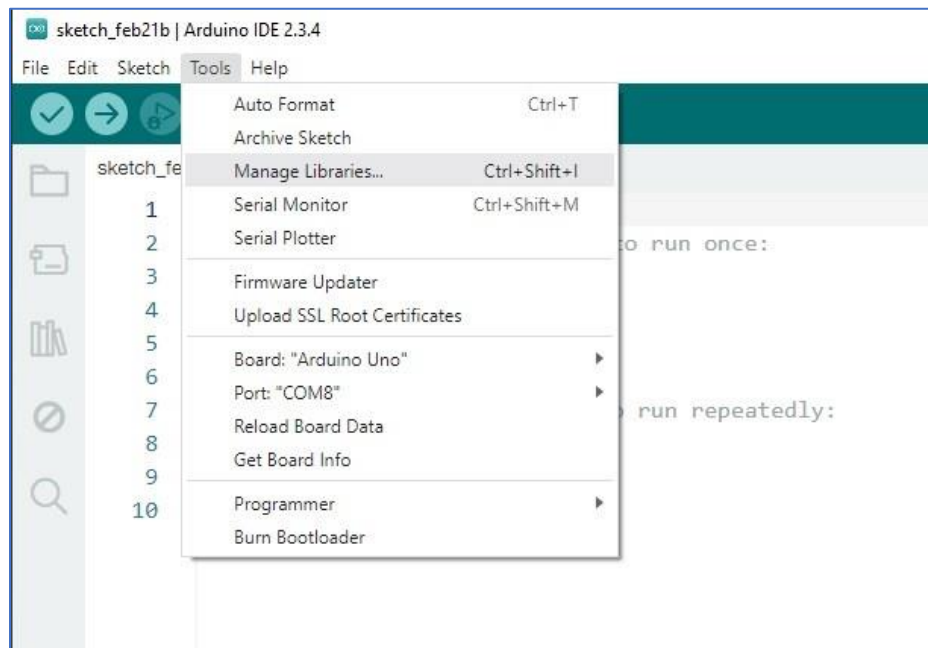
The BMP-280

- Temperature range: -40°C to $+85^{\circ}\text{C}$, $\pm 1^{\circ}\text{C}$
- Pressure range: 300 hPa to 1100 hPa, ± 1 hPa (~8m)
 - Sea level is approximately 1013.3 hPa
 - 300 hPa is approximately 9,000 metres altitude



Preparing to Connect the BMP-280

- In order to be able to access the BMP-280 in a program, you must first add the BMP-280 library to the Arduino IDE.
- To add in the library, navigate to Tools -> Manage Libraries..., or click the Library icon on the left.

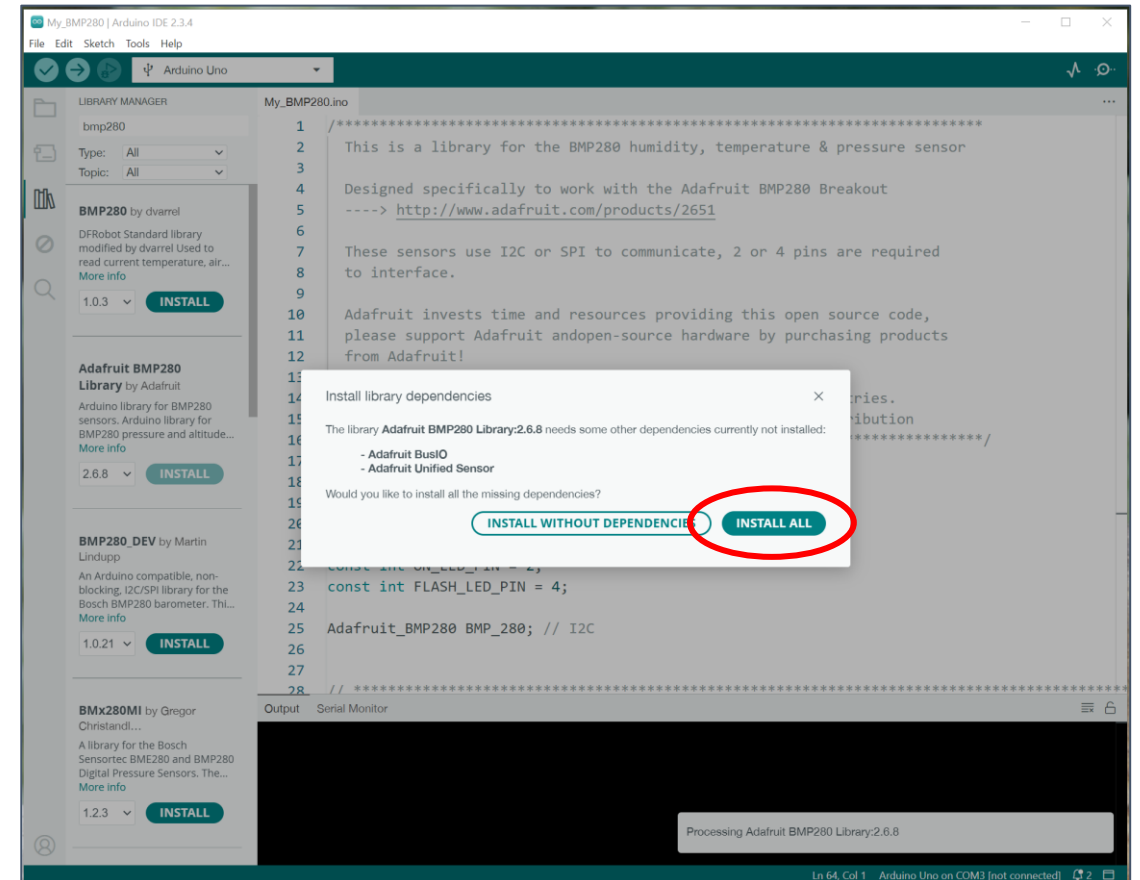
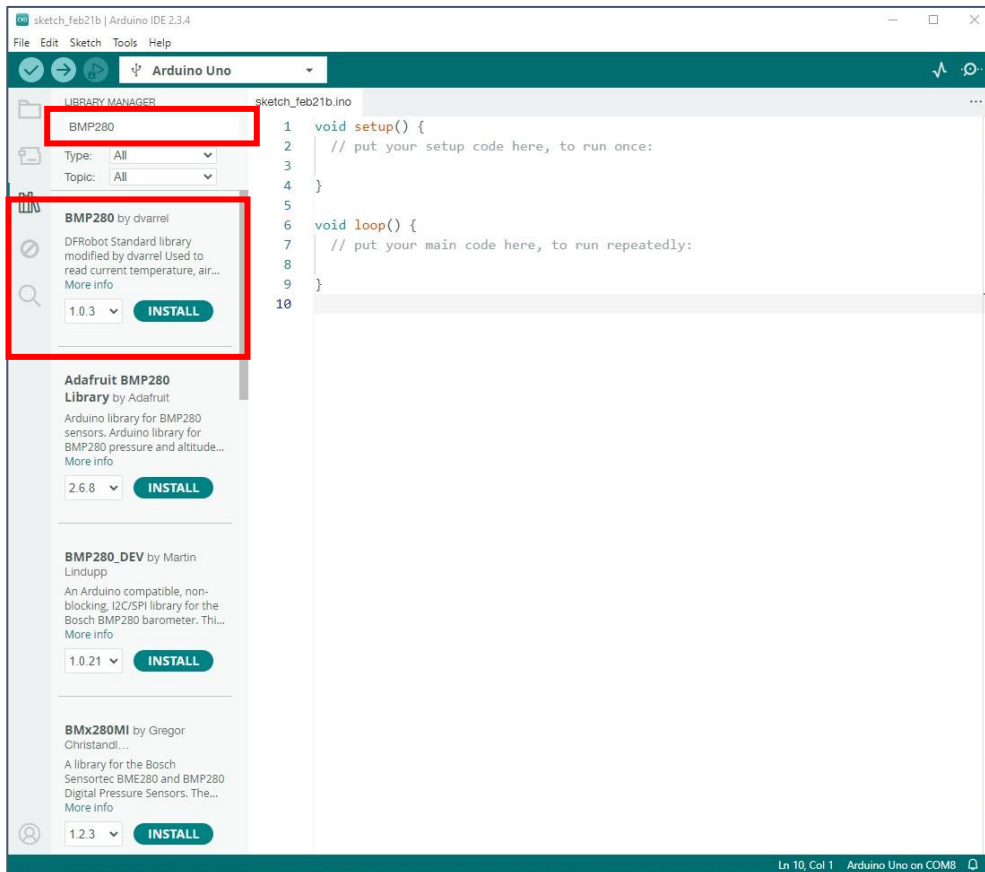


or



Loading the BMP-280 Library

In the Manage Libraries pane, enter “BMP280” in to the Search field. Several options will appear. The one we want to install is the “Adafruit BMP280 Library”. Click on the INSTALL button. Then, click on the “INSTALL ALL” dependencies pop-up.



Updating the BMP-280 Header File

The BMP280 library has an incorrect address for the sensor, and we need to correct it in order for the Arduino to be able to connect to it.

- Open a File Explorer window, and navigate to the directory:
Documents\Arduino\libraries\Adafruit_BMP280_Library
- Open the file “Adafruit_BMP280.h” in a text editor
- Notice line 34:

```
#define BMP280_ADDRESS (0x77) /**< The default I2C address for the sensor. */
```
- Change the value 0x77 to 0x76, then save the file.

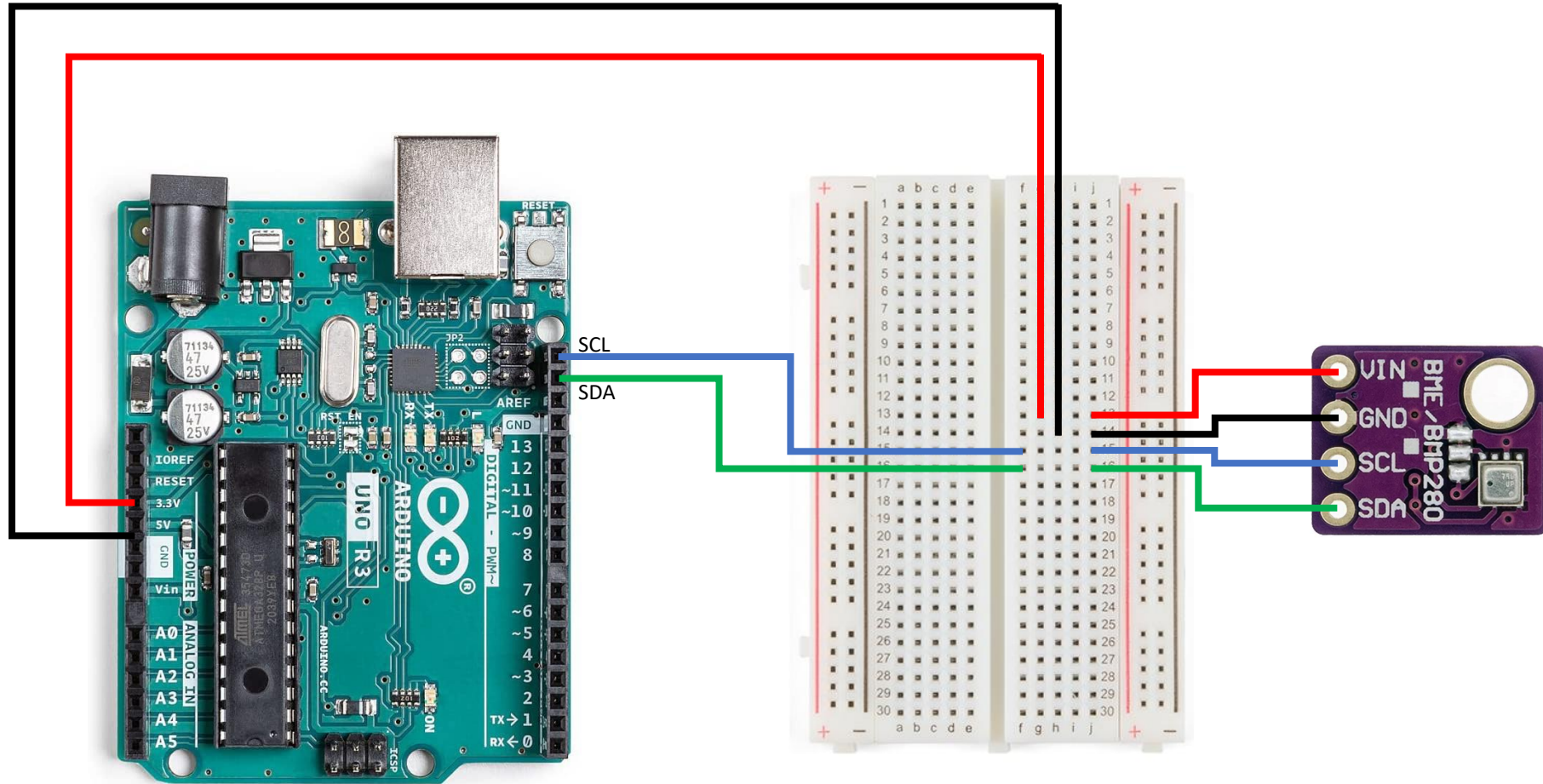
Updating the BMP-280 Header File

```
Documents\Arduino\libraries\Adafruit_BMP280_Library\Adafruit_BMP280.h - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
Adafruit_BMP280.h
16 *
17 * K.Townsend (Adafruit Industries)
18 *
19 * BSD license, all text above must be included in any redistribution
20 */
21 #ifndef __BMP280_H__
22 #define __BMP280_H__
23
24 // clang-format off
25 #include <Arduino.h>
26 #include <Adafruit_Sensor.h>
27 #include <Adafruit_I2CDevice.h>
28 #include <Adafruit_SPIDevice.h>
29 // clang-format on
30
31 /*!
32 * I2C ADDRESS/BITS/SETTINGS
33 */
34 #define BMP280_ADDRESS (0x77) /**< The default I2C address for the sensor. */
35 #define BMP280_ADDRESS_ALT
36 (0x76) /**< Alternative I2C address for the sensor. */
37 #define BMP280_CHIPID (0x58) /**< Default chip ID. */
38
39 /*!
40 * Registers available on the sensor.
41 */
42 enum {
43 BMP280_REGISTER_DIG_T1 = 0x88,
44 BMP280_REGISTER_DIG_T2 = 0x8A,
45 BMP280_REGISTER_DIG_T3 = 0x8C,
46 BMP280_REGISTER_DIG_P1 = 0x8E,
```

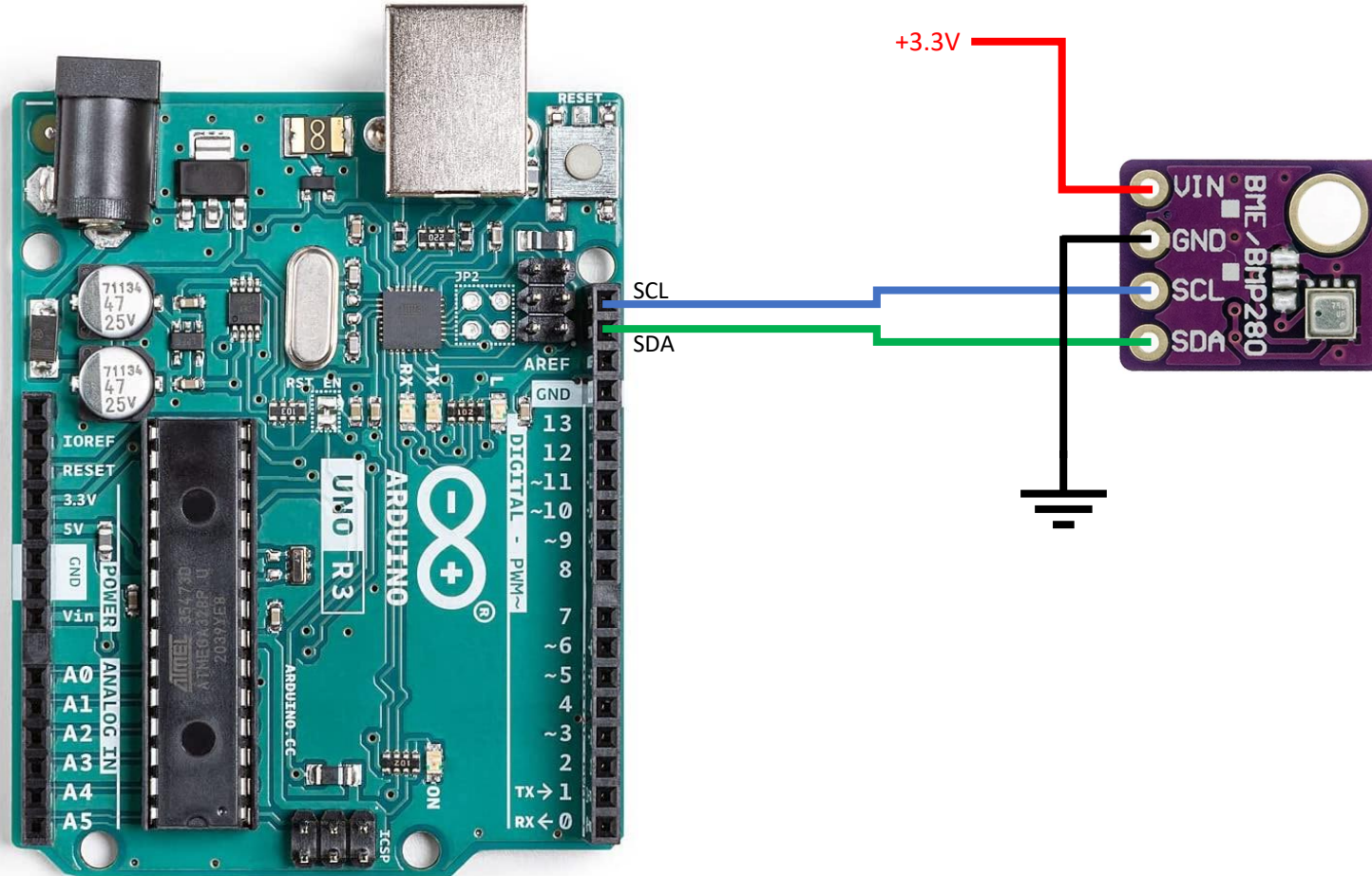
Change to 0x76 (then save)

C++ source file length : 8,084 lines : 268 Ln : 35 Col : 81 Pos : 1,021 Unix (LF) UTF-8 IN

BMP-280 Circuit Diagram

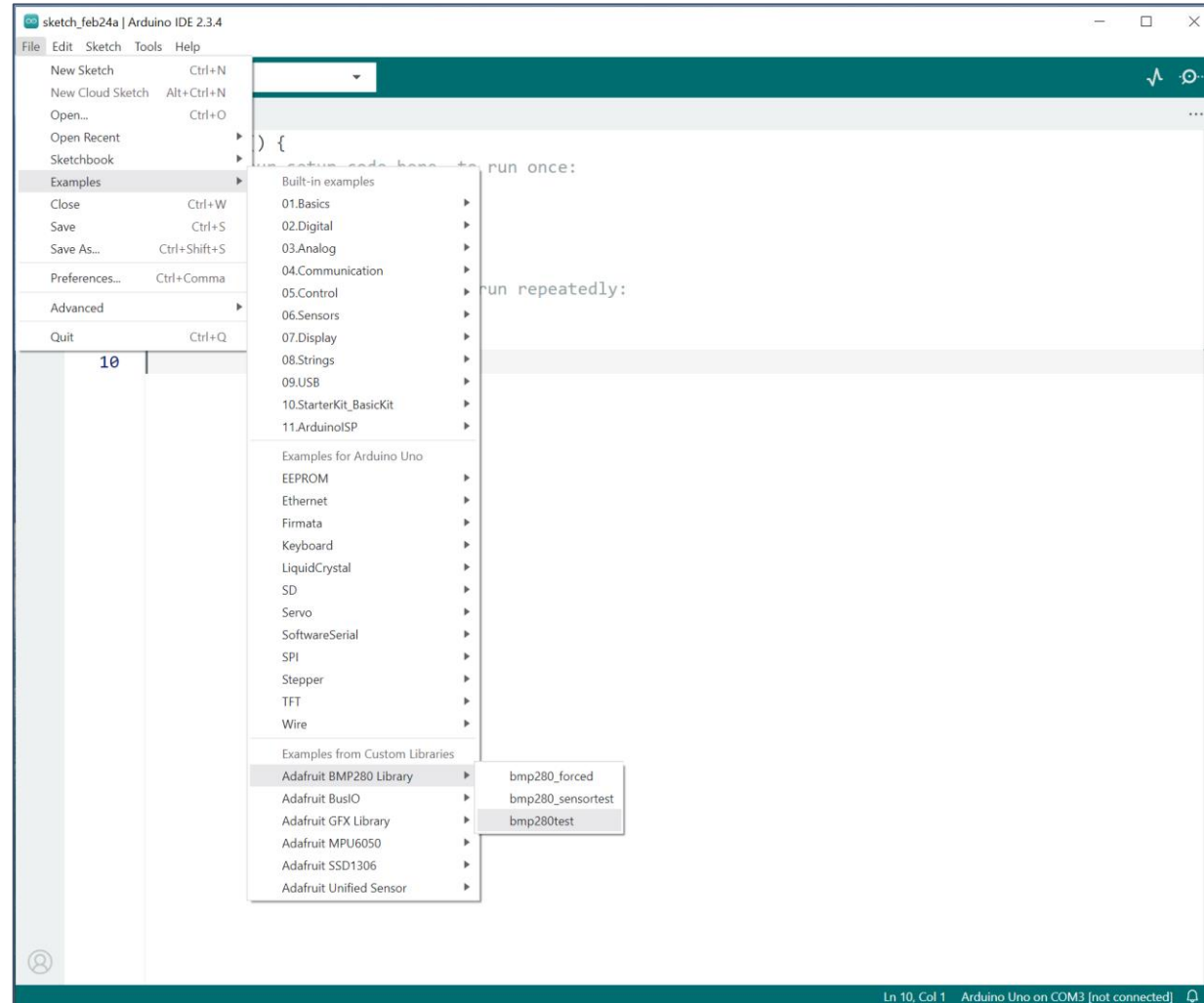


or simply...



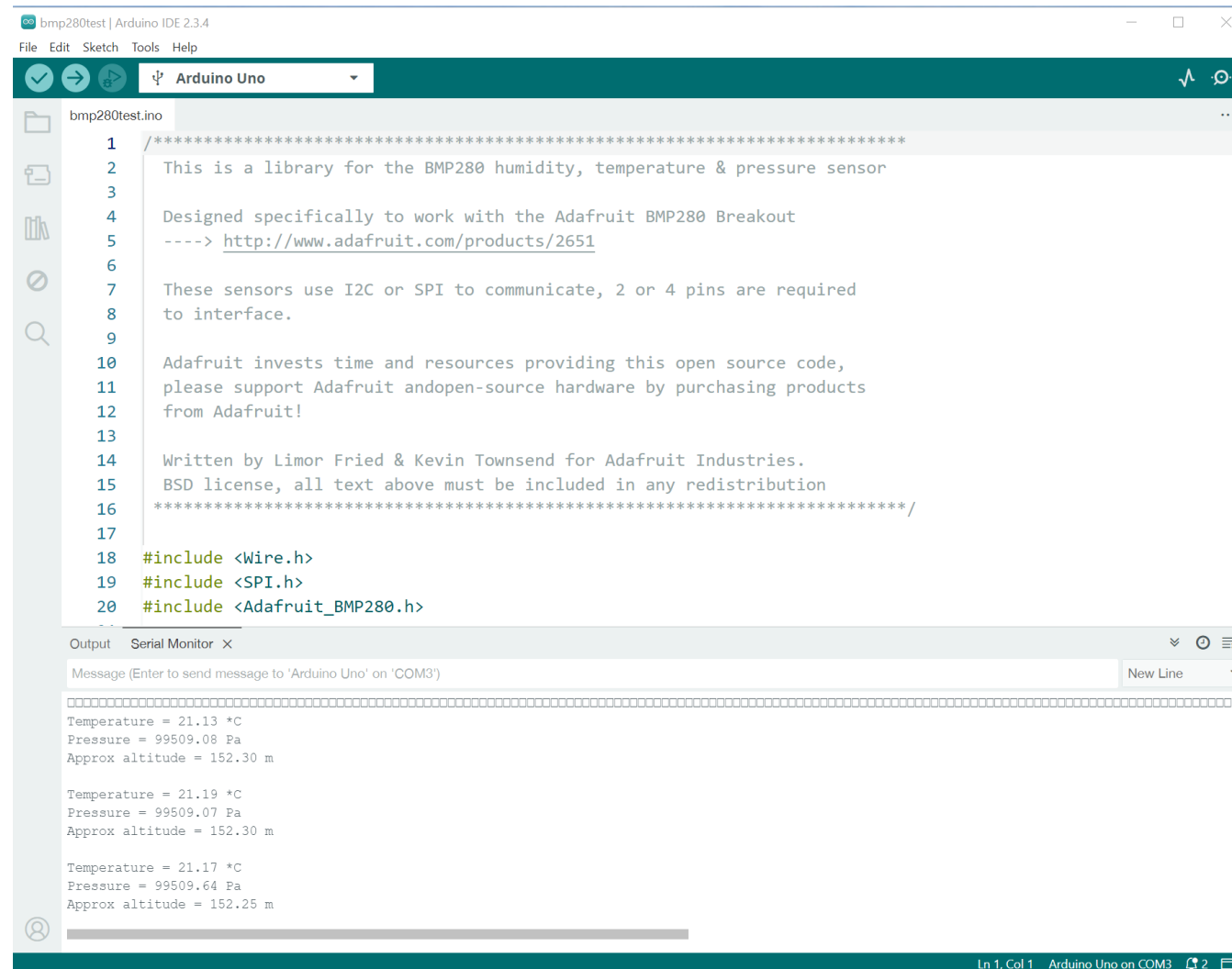
Loading the program

Load the program under File -> Examples -> Adafruit BMP280 Library -> bmp280test



Running the program

Upload the program, and you should see...



```
Arduino IDE 2.3.4 - bmp280test | Arduino IDE 2.3.4
File Edit Sketch Tools Help
Arduino Uno
bmp280test.ino
1 /*****
2 This is a library for the BMP280 humidity, temperature & pressure sensor
3
4 Designed specifically to work with the Adafruit BMP280 Breakout
5 ----> http://www.adafruit.com/products/2651
6
7 These sensors use I2C or SPI to communicate, 2 or 4 pins are required
8 to interface.
9
10 Adafruit invests time and resources providing this open source code,
11 please support Adafruit and open-source hardware by purchasing products
12 from Adafruit!
13
14 Written by Limor Fried & Kevin Townsend for Adafruit Industries.
15 BSD license, all text above must be included in any redistribution
16 *****/
17
18 #include <Wire.h>
19 #include <SPI.h>
20 #include <Adafruit_BMP280.h>
```

Output Serial Monitor x

Message (Enter to send message to 'Arduino Uno' on 'COM3') New Line

```
Temperature = 21.13 *C
Pressure = 99509.08 Pa
Approx altitude = 152.30 m

Temperature = 21.19 *C
Pressure = 99509.07 Pa
Approx altitude = 152.30 m

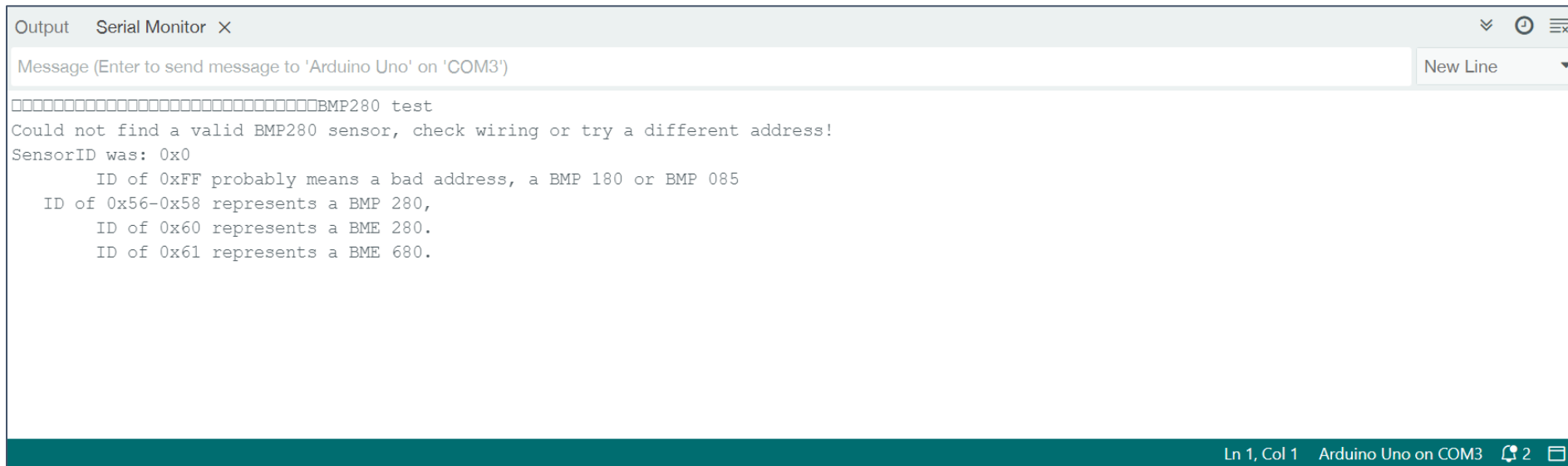
Temperature = 21.17 *C
Pressure = 99509.64 Pa
Approx altitude = 152.25 m
```

Ln 1, Col 1 Arduino Uno on COM3

Debugging the program

If you get no output at all, ensure that the “VIN” (Voltage In) pin is connected properly to 3.3V.

If you get the following error...



```
Output Serial Monitor X
Message (Enter to send message to 'Arduino Uno' on 'COM3') New Line
BMP280 test
Could not find a valid BMP280 sensor, check wiring or try a different address!
SensorID was: 0x0
  ID of 0xFF probably means a bad address, a BMP 180 or BMP 085
  ID of 0x56-0x58 represents a BMP 280,
  ID of 0x60 represents a BME 280.
  ID of 0x61 represents a BME 680.
```

Ln 1, Col 1 Arduino Uno on COM3 2

ensure that you saved the `Adafruit_BMP280_Library.h` file properly, and ensure that the BMP280 is wired correctly to the Arduino.