

# I2C-part 1

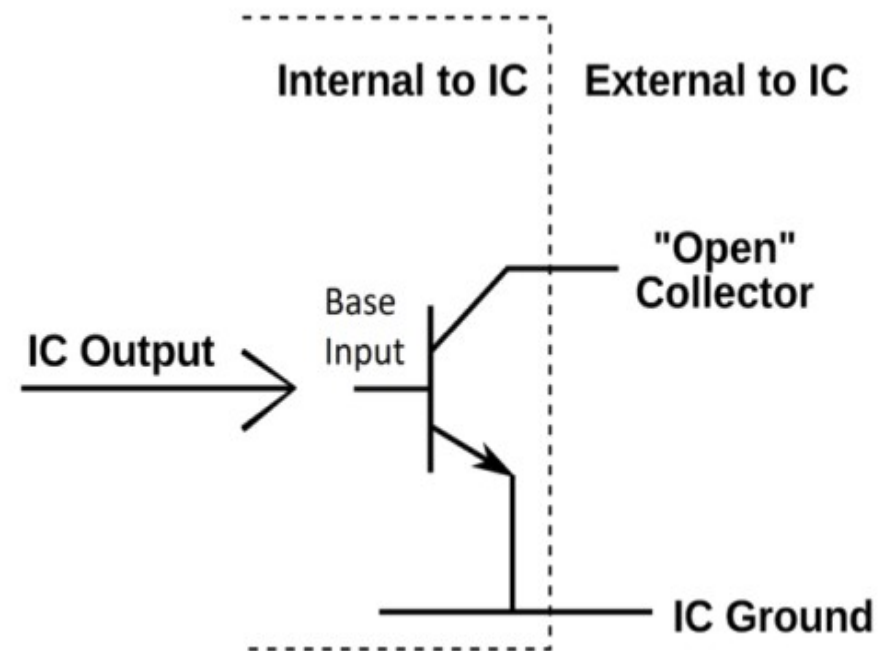
Protocol  
Setup  
BMP180  
Lab Exercise

# The I2C Protocol

- A multi-master serial bus used to connect devices to an embedded system controller
- Moderate speeds:
  - standard mode: 100Kbits/s
- Bus consists of 2 lines: SDA, SCL
- Devices can be either master or slave
- There is a unique start and stop sequence
- Master initiates transmission and slave sends ACK signal

# I2C Data Transfers

- Addresses are 7-bits plus 1 bit r/w
  - Every device has an address set by device designer
  - The placement of the 7 bit address is in the upper 7 bits of the byte
  - To write to address 21, you must actually send out 42 which is 21 moved over by 1 bit
  - If the r/w bit is zero the master is writing to the slave
- Data are 8 bit sequences
- There is an ACK bit sent after each 8-bit sequence
  
- Bus arbitration is facilitated by the **wired AND** configuration
  - the chip can drive its output low, b it cannot drive it high
  
- Master sets the clock speed but synchronization is facilitated by the wired AND configuration



# Details of Write

- To write to a slave device:
  1. Send a start sequence
  2. Send the I2C address of the slave with the R/W bit low (even address)
  3. **Send the internal register number to write to**
  4. Send the data byte
  5. [Optionally, send any further data bytes]
  6. Send the stop sequence.

# Details of Read

- To read a device:
  1. Send a start sequence
  2. Send I2C address of the device with the R/W bit low (even address)
  3. **Send the Internal address of the register to read**
  4. Send a start sequence again (repeated start)
  5. Send the address of the device with the R/W bit high (odd address)
  6. Read data byte from device
  7. Send the stop sequence.

# Wiring the BMP180

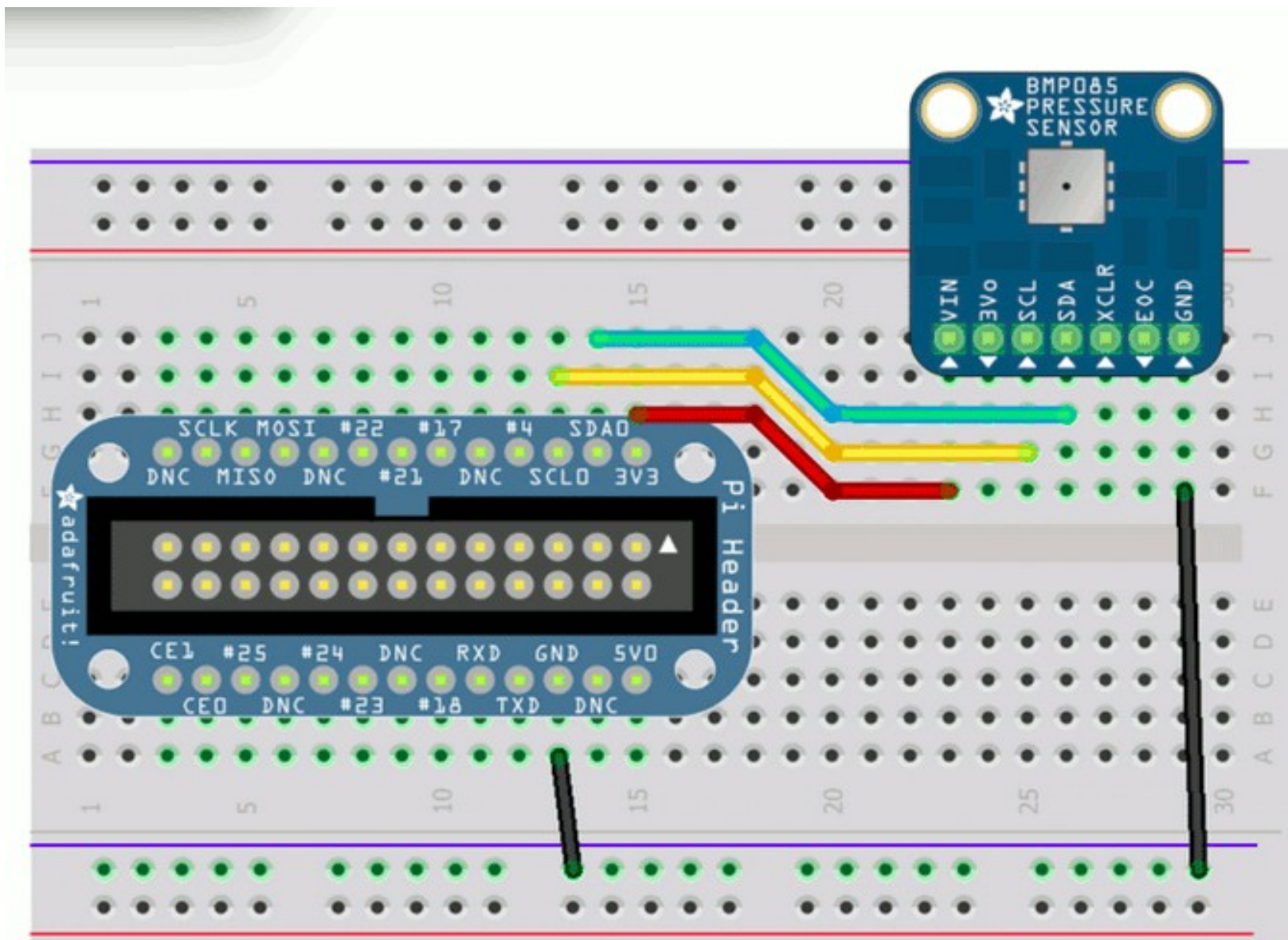


Image from: <https://learn.adafruit.com/using-the-bmp085-with-raspberry-pi>

# I2C-Tools

- The fast way to do experiments with this sensor is by installing and using the i2c-tools
  - You'll do this in the exercise that follows
- i2c-tools is a package contains a set of I2C tools for Linux such as:
  - a bus probing tool
  - a chip dumper
  - register-level access helpers

# In-Class Exercise

- Work the I2C exercise prepared by Dean Brock:
  - <http://www.cs.unca.edu/~brock/classes/Spring2014/csci320/labs/i2c.html>
- A quick look at the **BMP180 Data Sheet**