Setting up Temperature Sensor with a Raspberry Pi

Enable **i2c** and **1-wire** options on the Pi (use raspi-conf, under *interfacing options*)).

Optional (this is automatically done now)- verify that your **/boot/config.txt** has a line **dtoverlay=w1-gpio**

Two kernel modules, **w1-therm** and **w1-gpio** must already be loaded. You can verify by executing **lsmod**, which will list all the loaded kernel modules.

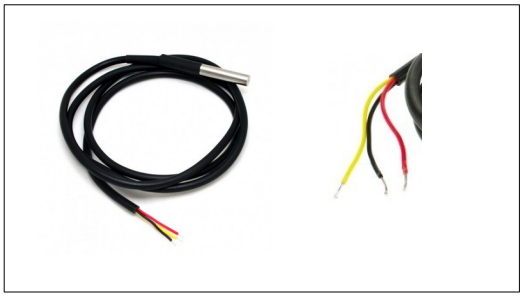
Executing **lsmod** will show three entries:

Module	Size	Used by
w1_therm	3584	0
w1_gpio	3657	0
wire	25219	2 w1_gpio,w1_therm

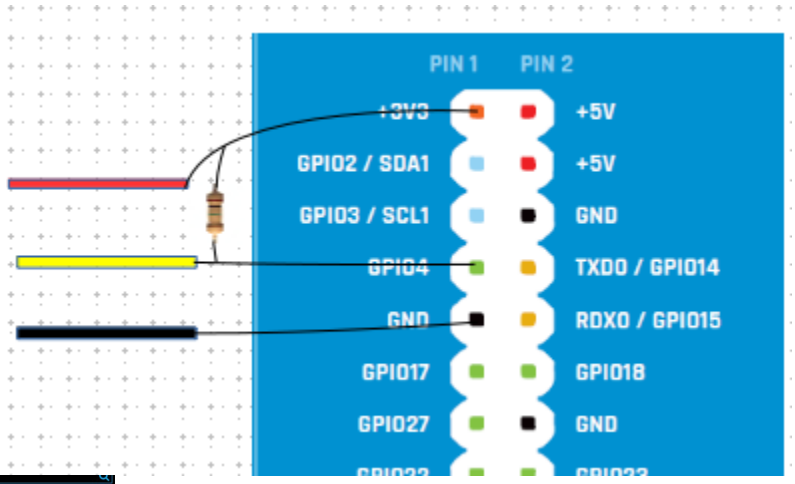
Kernel modules loaded

Wiring:

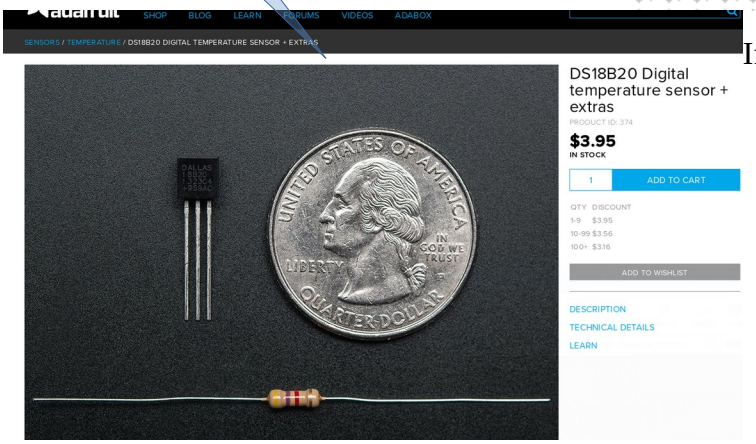
Cheaply available temperature sensors (DS18B20) have 3 wires – attach red to any 3.3V power pin, black to any ground pin, and yellow/green to **GPIO pin #4**. Put a 4.7kOhm (or thereabouts) resistor between data and power.



Waterproof DS18B20



DS18B20



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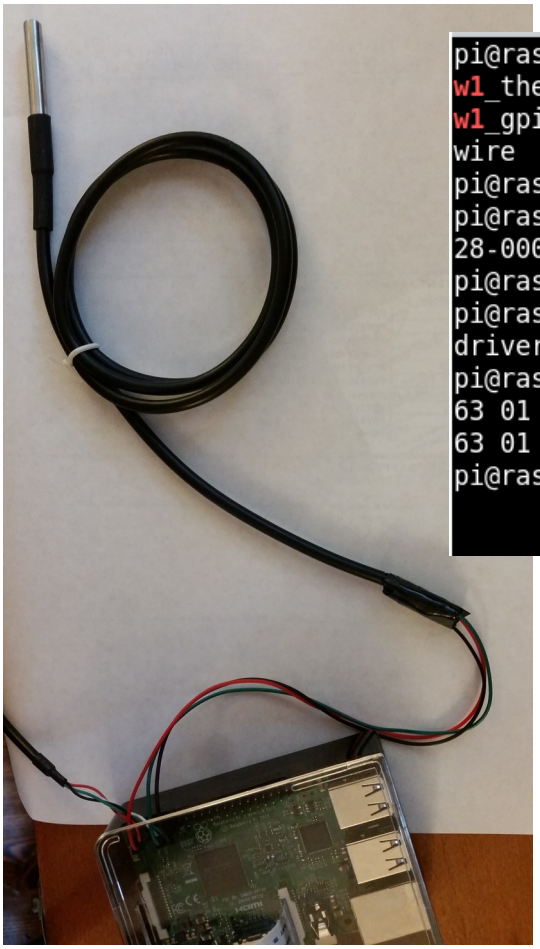
Once you connect all the wires, reboot, and look in **/sys/bus/w1/devices/** directory. You should find a directory, something like **28-00044a3b10ff/**. The file:

/sys/bus/w1/devices/28-00044a3b10ff/w1_slave
contains temperature information.

If you do **cat /sys/bus/w1/devices/28-00044a3b10ff/ w1_slave**
you should get an output like:

5e 01 55 00 7f ff 0c 10 6c : crc=6c YES
5e 01 55 00 7f ff 0c 10 6c t=21875

The CRC checksum should be correct (YES). Then the temperature measured, in Celsius, is 21.875.



```
pi@raspberrypi:~$ lsmod|grep w1
w1_therm               16384  0
w1_gpio                16384  0
wire                   40960  2 w1_gpio,w1_therm
pi@raspberrypi:~$ cd /sys/bus/w1/devices
pi@raspberrypi:/sys/bus/w1/devices$ ls
28-00044a3807ff  w1_bus_master1
pi@raspberrypi:/sys/bus/w1/devices$ cd 28-00044a3807ff
pi@raspberrypi:/sys/bus/w1/devices/28-00044a3807ff$ ls
driver  hwmon  id  name  power  subsystem  uevent  w1_slave
pi@raspberrypi:/sys/bus/w1/devices/28-00044a3807ff$ cat w1_slave
63 01 55 00 7f ff 0c 10 ec : crc=ec YES
63 01 55 00 7f ff 0c 10 ec t=22187
pi@raspberrypi:/sys/bus/w1/devices/28-00044a3807ff$
```

python script (readTemperature.py) to read temperature, and show the output in Celsius and Fahrenheit:

```
#!/usr/bin/python
import os
import time
""" Log Current Time, Temperature in Celsius and Fahrenheit
   Returns a list [time, tempC, tempF] """

def readTemp():
      tempfile = open("/sys/bus/w1/devices/28-00044a3b10ff/w1_slave")
      tempfile_text = tempfile.read()
      currentTime=time.strftime('%x %X %Z')
      tempfile.close()
      tempC=float(tempfile_text.split("\n")[1].split("t=")[1])/1000
      tempF=tempC*9.0/5.0+32.0
      return [currentTime, tempC, tempF]

print readTemp()
```

> python readTemperature.py
['08/01/16 17:29:02 UTC', 22.062, 71.7116]

Exercise (Show it to me beginning of Fall Semester, and I will buy you another sensor).

Hook up a temperature sensor and two LEDs, a green and a red one. The green led should be on when the temperature is below 25C, and the red led on when temperature >= 25C.

Test your set up by holding the sensor head in your hands. The temperature then should go up, well beyond 25C (unless you are cold-blooded).