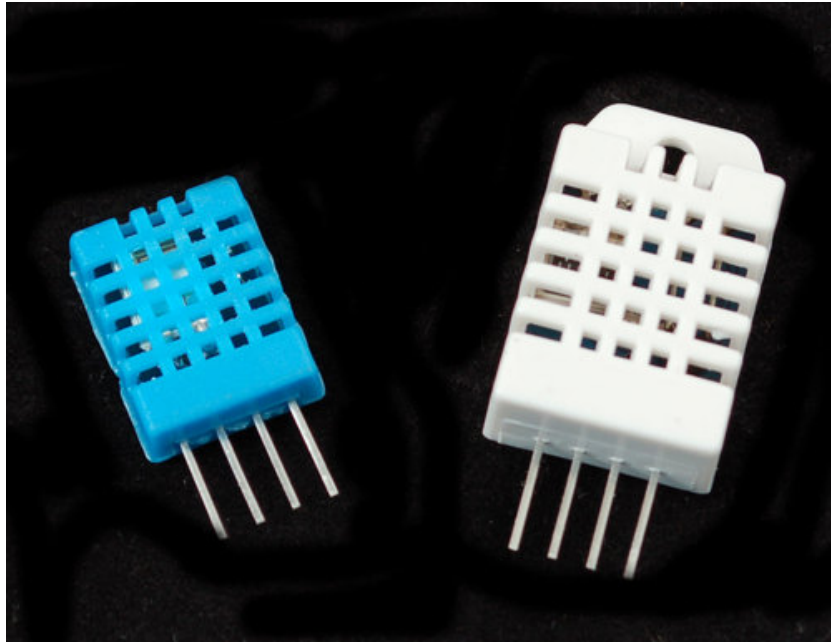


DHTxx Sensors

Created by Ladyada



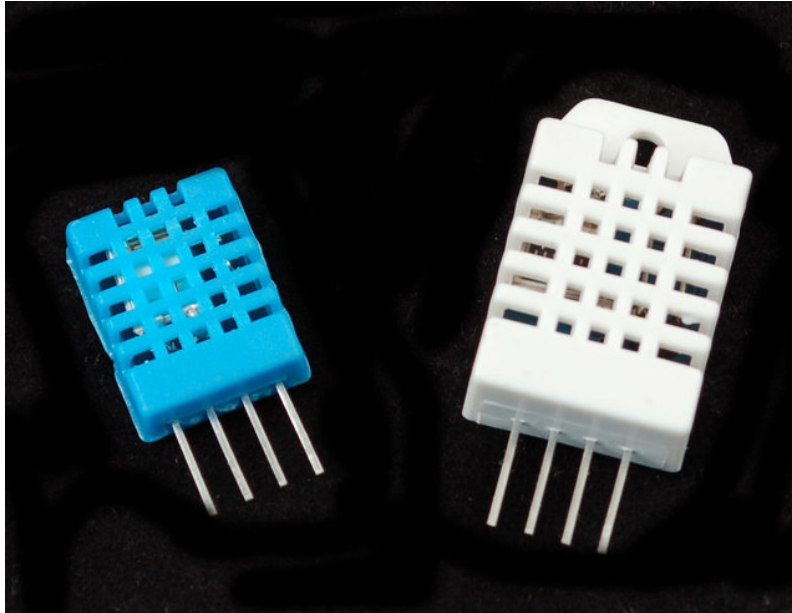
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Overview

This tutorial covers the low cost [DHT temperature & humidity sensors \(http://adafru.it/ajU\)](http://adafru.it/ajU). These sensors are very basic and slow, but are great for hobbyists who want to do some basic data logging. The DHT sensors are made of two parts, a capacitive humidity sensor and a [thermistor \(http://adafru.it/aHD\)](http://adafru.it/aHD). There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. The digital signal is fairly easy to read using any microcontroller.



DHT11 vs DHT22

We have two versions of the DHT sensor, they look a bit similar and have the same pinout, but have different characteristics. Here are the specs:

DHT11 (<http://adafru.it/386>)

- Ultra low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings $\pm 2^\circ\text{C}$ accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

DHT22 (<http://adafru.it/385>)

- Low cost

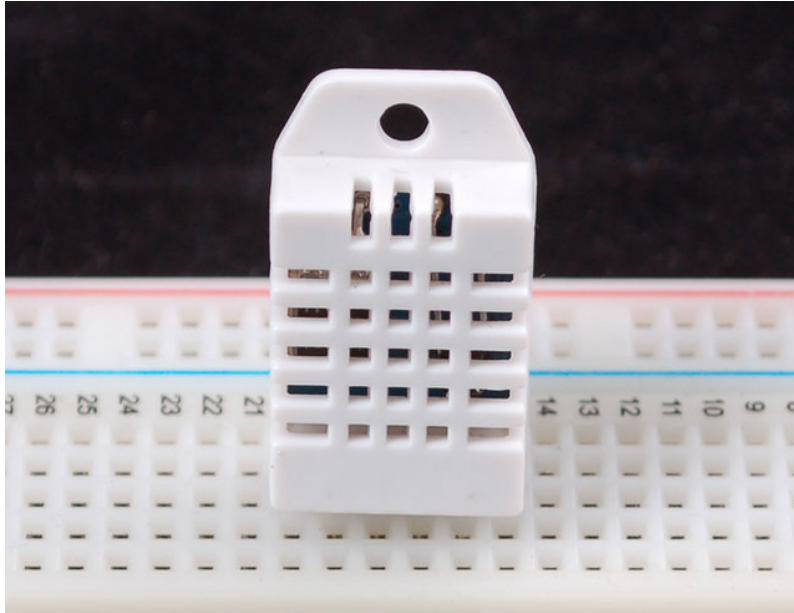
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 0-100% humidity readings with 2-5% accuracy
- Good for -40 to 125°C temperature readings $\pm 0.5^{\circ}\text{C}$ accuracy
- No more than 0.5 Hz sampling rate (once every 2 seconds)
- Body size 15.1mm x 25mm x 7.7mm
- 4 pins with 0.1" spacing

As you can see, the [DHT22 \(http://adafru.it/385\)](http://adafru.it/385) is a little more accurate and good over a slightly larger range. Both use a single digital pin and are 'sluggish' in that you can't query them more than once every second or two.

You can pick up both the [DHT11 \(http://adafru.it/386\)](http://adafru.it/386) and [DHT22 \(http://adafru.it/385\)](http://adafru.it/385) from the adafruit shop!

Connecting to a DHTxx Sensor

Luckily it is trivial to connect to these sensors, they have fairly long 0.1"-pitch pins so you can plug them into any breadboard, perfboard or similar.

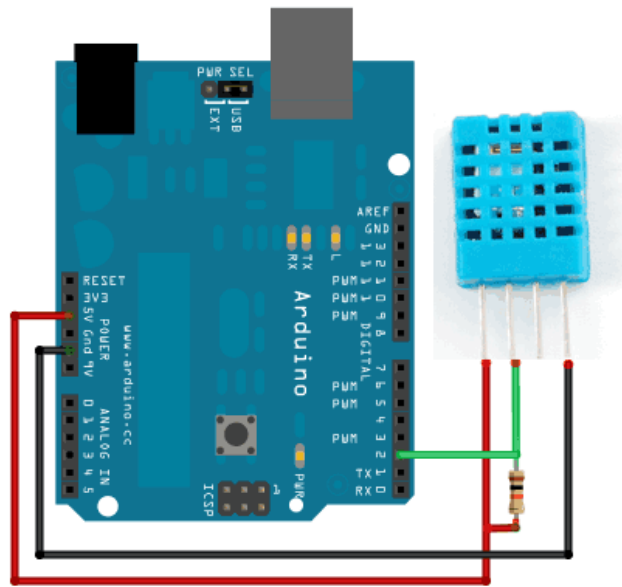


Likewise, it is fairly easy to connect up to the DHT sensors. They have four pins

- VCC (3 to 5V power)
- Data out
- Not connected
- Ground

Simply ignore pin 3, its not used. You will want to place a 10K resistor between VCC and the data pin, to act as a medium-strength pull up on the data line. The Arduino has built in pullups you can turn on but they're very weak, about 100K

This diagram shows how we will connect for the testing sketch. Connect data to pin 2, you can change it later to any pin.

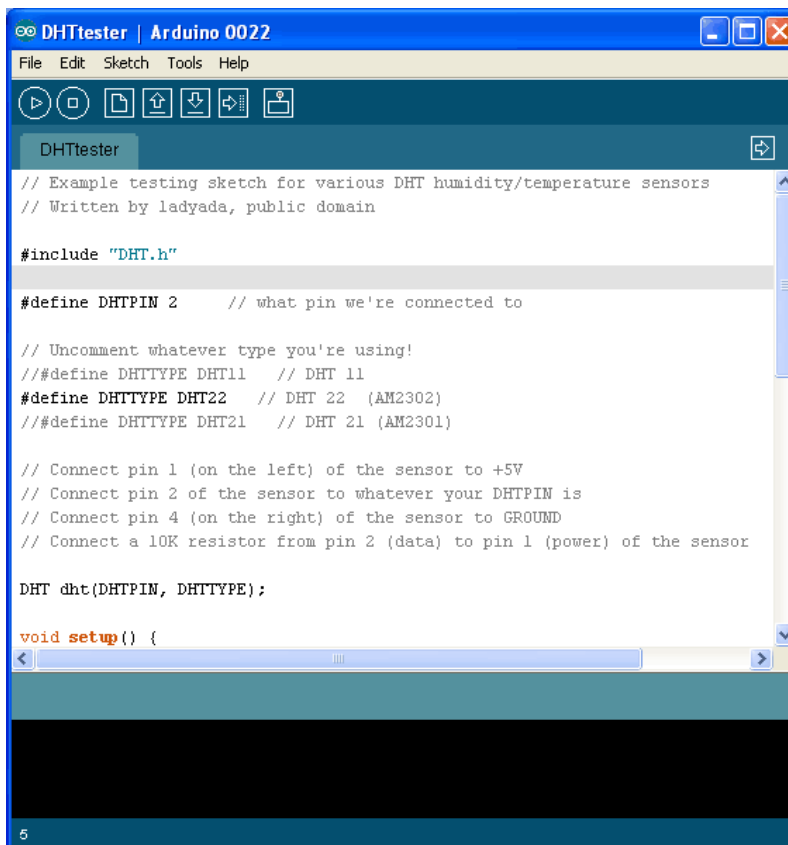


Using a DHTxx Sensor

To test the sketch, we'll use an Arduino. You can use any microcontroller that can do microsecond timing, but since its a little tricky to code it up, we suggest verifying the wiring and sensor work with an Arduino to start.

Begin by downloading the DHT library from our github repository. (<http://adafru.it/ajW>) To download, click the **DOWNLOADS** button in the top right corner. Rename the uncompressed folder **DHT** and make sure that it contains the **dht.cpp** file and others. Then drag the **DHT** folder into the **arduinodesketchfolder/libraries/** folder. You may have to create that libraries sub-folder if it doesnt exist. Restart the IDE

Now load up the **Examples->DHT->DHTtester** sketch



```

DHTtester | Arduino 0022
File Edit Sketch Tools Help
DHTtester
// Example testing sketch for various DHT humidity/temperature sensors
// Written by ladyada, public domain

#include "DHT.h"

#define DHTPIN 2 // what pin we're connected to

// Uncomment whatever type you're using!
// #define DHTTYPE DHT11 // DHT 11
#define DHTTYPE DHT22 // DHT 22 (AM2302)
// #define DHTTYPE DHT21 // DHT 21 (AM2301)

// Connect pin 1 (on the left) of the sensor to +5V
// Connect pin 2 of the sensor to whatever your DHTPIN is
// Connect pin 4 (on the right) of the sensor to GROUND
// Connect a 10K resistor from pin 2 (data) to pin 1 (power) of the sensor

DHT dht(DHTPIN, DHTTYPE);

void setup() {

```

If you're using a **DHT11** sensor, comment out the line that sets the type:

```

// #define DHTTYPE DHT22 // DHT 22 (AM2302)

```

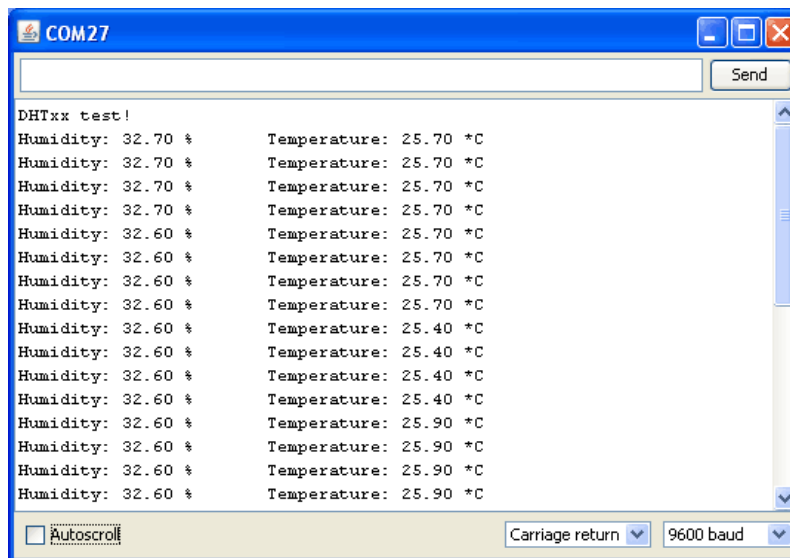
and uncomment the line that says:

```

#define DHTTYPE DHT11 // DHT 11

```

This will make the data appear correctly for the correct sensor. Upload the sketch!



You should see the temperature and humidity. You can see changes by breathing onto the sensor (like you would to fog up a window) which should increase the humidity.

Downloads

- [Arduino library and example code for DHT sensors \(http://adafru.it/aJX\)](http://adafru.it/aJX)
- [DHT11 datasheet \(http://adafru.it/aJY\)](http://adafru.it/aJY)(in chinese, so see the DHT22 datasheet too!)
- [DHT22 datasheet \(http://adafru.it/aJZ\)](http://adafru.it/aJZ)