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Interfacing HH10D with Arduino

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HH10D is capacitive-type relative air humidity sensor. It is cheap (~$8) and relatively precise (±3%). In this article I'll describe how to connect and use it with your Arduino board.

First of all, pay your attention that sensor's output signal is frequency – frequency of the square wave, in range between 5 and 10 kHz. (In fact, the capacitive sensor is connected to ICM7555 timer IC, which outputs the wave signal, depending on sensor's value). To get actual RH (Relative Humidity) reading, we must calculate it by the formula described in datasheet.

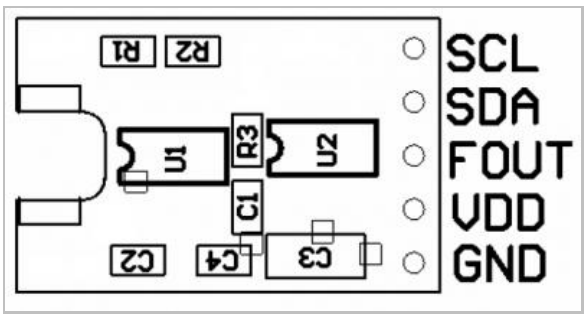
This formula, however, includes two calibration values. They are individual for each unit, and are stored in tiny on-board I^2C EEPROM, so first of all you need to read them from the EEPROM. This, however, may be done just once, and then you can throw out I^2C code and include them to your sketch as constants, saving the memory for other things.

Measuring frequency with Arduino is relatively simple, thanks to FreqCounter library. However, if you need more than 2 PWM outputs in your project, it turns into a problem. If this is not important to you, then just ignore it, but if it is, then conseider choosing another sensor – or read the chapter in the end of the article.

FreqCounter affects 2 of 3 ATMega's timers, and it PWM duty cycles on pins 10, 9, 6 change significantly. Pin 5 is take by FreqCounter – this cannot be changed, due to hardware restrictions, and you are left only with pins 11 and 3. Also I've heard that FreqCounter may conflict with Servo library, but I cannot say that for sure.

There's an alternative way to measure frequency, which is described in the end of the article. However, it is not as accurate as using hardware timers.

If you look on the top side of you sensor (the one which has ICs), you will see the following:



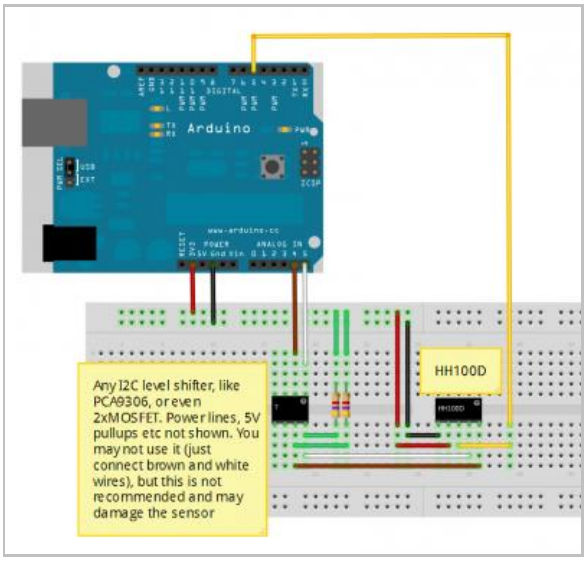
Connects them to your Arduino:

- SCL goes to pin A5
- SDA to A4 (these are pins for I^2C, they cannot be changed)
- FOUT to digital pin 5
- VDD to +3V3
- GND to GND

Also you should attach 2 4k7 resistors between 3V3 line and SCL\SDA lines.

VERY IMPORTANT: This sensor is 3.3v device, and to connect it to 5V-Arduino via I²C you will probably need a level shifter on SCL and SDA. In my case, everything worked normally without it, but this gives no warranty that your sensor will not be damaged. Read more here: http://www.nxp.com/news/backgrounders/bg_esc9727/ I'm not responsible for any damage or loss if you decide to follow my way, without level shifting.

You can use I2C+SMBus Voltage Translator or TI PCA9306 for this.



And now, having everything connected, let us prepare a sketch:
(Thanks to Arduino forum member, robtillaart, for his help with I2C)

```
/*
 HH10D humidity sensor sample code.
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 The circuit:
 * SCL to A5 via level-shifter (5V-3V3)
 * SDA to A4 via level-shifter (5V-3V3)
 * FOUT to digital pin 5
 * VDD to 3V3
 * GND to GND
 + pullup resistors for i2c(4k7, 10k) (http://www.nxp.com/news/backgrounders/bg_esc9727/)

 HH10D real I2C address is 81 (the datasheet contains error).

 */

#include <FreqCounter.h>
#include <Wire.h>

int freq, offset, sens;


void setup(){
 Wire.begin();
 Serial.begin(9600);
 sens    =  i2cRead2bytes(81, 10); //Read sensitivity from EEPROM
 offset =  i2cRead2bytes(81, 12); //Same for offset
}
void loop(){
 //Get Frequency
 FreqCounter::f_comp= 8;             // Set compensation to 12
 FreqCounter::start(1000);            // Start counting with gatetime of 1000ms
 while (FreqCounter::f_ready == 0)         // wait until counter ready
 freq=FreqCounter::f_freq;            // read result

 //Calculate RH
 float RH =  (offset-freq)*sens/4096; //Sure, you can use int - depending on what do you need

 Serial.println(RH);

}

int i2cRead2bytes(int deviceaddress, byte address)
{
 // SET ADDRESS
```

```
49.  Wire.beginTransmission(deviceaddress);
50.  Wire.send(address); // address for sensitivity
51.  Wire.endTransmission();
52.
53.  // REQUEST RETURN VALUE
54.  Wire.requestFrom(deviceaddress, 2);
55.  // COLLECT RETURN VALUE
56.  int rv = 0;
57.  for (int c = 0; c < 2; c++ )
58.  if (Wire.available()) rv = rv * 256 + Wire.receive();
59.  return rv;
60.  }
```

Compiled firmware takes 5444 bytes, and it outputs measured values to the computer.

I did not add a delay, because measuring frequency takes 1000ms – enough time as a delay. I would not recommend using shorter FreqCounter measurement periods (10 or 100 ms), as it decreases the resolution, and in our case even 1 Hz is important.

Additional info if you don't use FreqCounter library

This part is relevant to you only if you do not use FreqCounter library.

See this article

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