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## Arduino interface with I2C Pressure Sensor



I have a Honeywell ASDXRRX100PD2A5 I2C Pressure Sensor that I want to read using an Arduino.

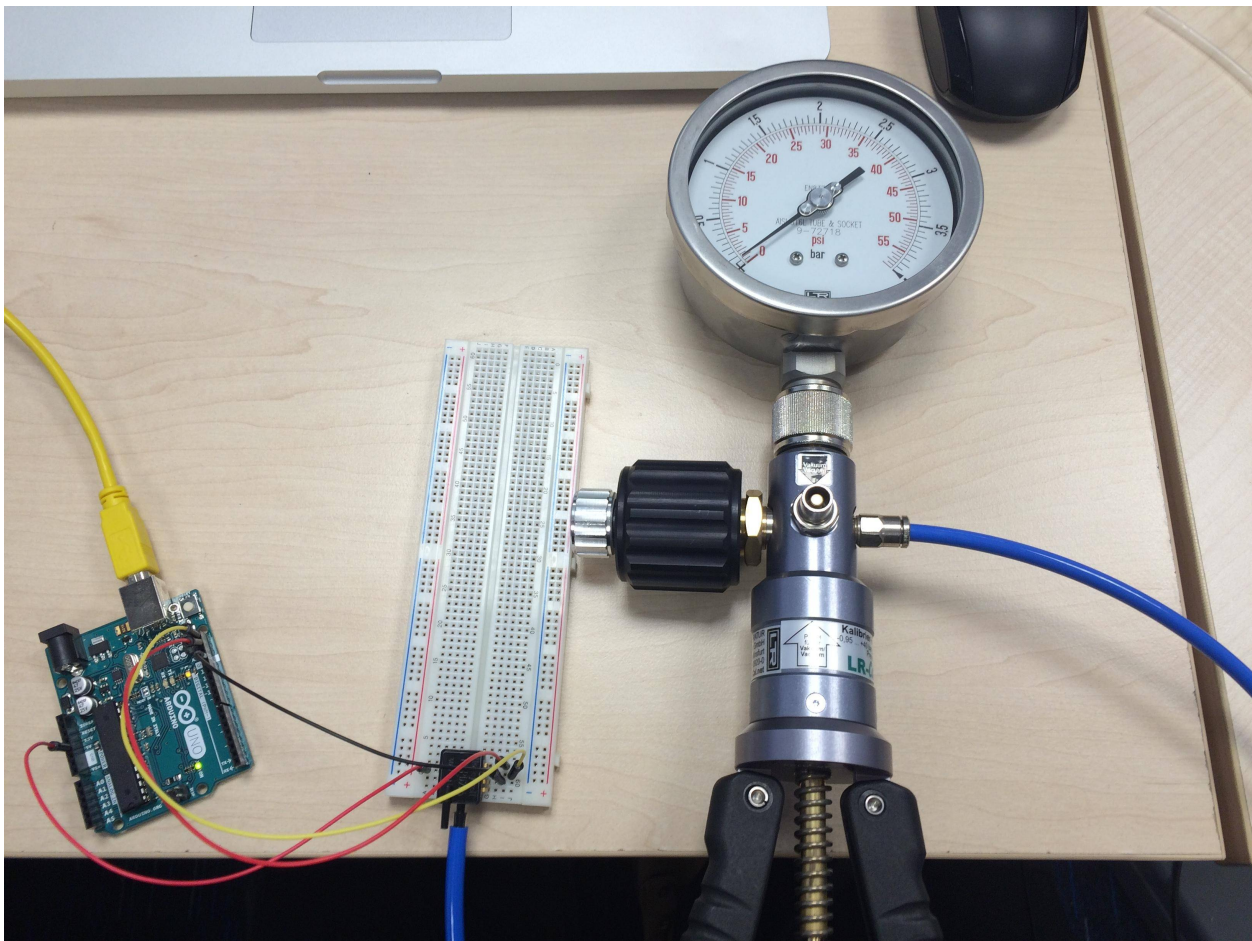
Looking at the datasheet, I know that the I2C address is 0x28, and I have had a play with bits of code I've found on the internet, but none of them make any sense. Numbers do increase as I increase the pressure, but not on the scale shown on the datasheet.

Here is a link to said datasheet: <http://www.farnell.com/datasheets/1676926.pdf>

Here is a datasheet that has information about communicating with Honeywell sensors using I2C: [http://sensing.honeywell.com/index.php/ci\\_id/45841/la\\_id/1/document/1/re\\_id/0](http://sensing.honeywell.com/index.php/ci_id/45841/la_id/1/document/1/re_id/0)

Without having much experience with I2C in the past it's hard for my to get my head around it.

Also, here is a picture of my setup:



The code I am using to test it out at the moment is as follows:

```
#include<Wire.h>
#define sensor 0x28 //Unique bus address

void setup()
{
  Wire.begin();//Wakes up I2C bus
```

```

Serial.begin(9600);
}

void getdata(byte *a, byte *b)
{
  //Move register pointer back to first register
  //Wire.beginTransmission(sensor);
  //Wire.write(1);
  //Wire.endTransmission();
  Wire.requestFrom(sensor,2);//Sends content of first two registers
  *a = Wire.read(); //first byte recieved stored here
  *b = Wire.read(); //second byte recieved stored here
}

void showdata()
{
  byte aa,bb;
  float pressure =0;
  getdata(&aa,&bb);
  Serial.print("byte 1: ");Serial.println(aa,DEC);
  Serial.print("byte 2: ");Serial.println(bb,DEC);
  delay(1000);
}

void loop()
{
  showdata();
}

```

I am getting the following results at the following pressures:

```

0psi   byte1: 31
       byte2: 246

10psi  byte1: 34
       byte2: 102

20psi  byte1: 32
       byte2: 30


30psi  byte1: 39
       byte2: 167

```

Any help pointing me in the right direction would be much appreciated.

arduino sensor i2c pressure

edited Nov 5 '15 at 11:22

 ricardomenzer  
800 3 11

asked Jul 22 '15 at 13:28

 JosephFTaylor  
33 1 5

100PD pressure type is not present in given datasheet. It might be different. can you check again – Umar Jul 22 '15 at 13:39

I have also noticed that, but I'm guessing it just an example, as the model I have is 100psi. Here is the exact sensor I purchased from Element14: [uk.farnell.com/honeywell-s-c/asdxrx100pd2a5/...](http://uk.farnell.com/honeywell-s-c/asdxrx100pd2a5/...) – JosephFTaylor Jul 22 '15 at 13:41

How is the I2c software protocol? Is it just a single read of that particular address (0x28)? Do you have mapping table for i2c values and actual pressure? – Umar Jul 22 '15 at 13:50

On page 4 of the datasheet, Table 6 shows the sensor output at significant percentages. I'm looking to be able to read something along the lines of this. – JosephFTaylor Jul 22 '15 at 13:53

What scale *do* the numbers follow, and is it linear? Perhaps you could post some examples of what you get at varying pressures. – CharlieHanson Jul 22 '15 at 14:09

### 3 Answers

You probably need to add pull-up resistors to the I2C clock and data lines. The datasheet says that 1 k $\Omega$  is the minimum, so maybe try 2.2 k $\Omega$ . The resistors should go from the pins to the +5V supply.

answered Jul 22 '15 at 15:00

 Adam Haun  
14.7k 3 26 64

I have since added these resistors and I am still having trouble understanding the data. – JosephFTaylor Jul 23 '15 at 8:50



What's wrong?

Sensor is differential, up to 100psi.  
 so  $P_{min}$  is -100psi,  $P_{max}$  is +100psi.  
 Total 14 bit (from 0 to  $2^{14}-1$ ),  
 $P_{min}$  is at 10%, so  $OUTPUT_{min}$  is 1638  
 $P_{max}$  is at 90%, so  $OUTPUT_{max}$  is 14745

from datasheet:

$$P = \frac{(OUTPUT - OUTPUT_{min}) \cdot (P_{max} - P_{min})}{OUTPUT_{max} - OUTPUT_{min}} + OUTPUT_{min}$$

- your first  $OUTPUT$  value is  $(31 \cdot 256) + 246 = 8182$   
 according to datasheet pressure is:

$$\frac{(8182 - 1638) \cdot (100 - (-100))}{14745 - 1638} - 100 \approx -0.14496071$$

- your second value is  $(34 \cdot 256) + 102 = 8806$

$$\frac{(8806 - 1638) \cdot (100 - (-100))}{14745 - 1638} - 100 \approx 9.376669$$

precision is not so good, but it is still acceptable

- third value:  $(32 \cdot 256) + 30 = 8222$

$$\frac{(8222 - 1638) \cdot (100 - (-100))}{14745 - 1638} - 100 \approx 0.46540017$$

something goes wrong, it isn't like 20psi, it is like 0psi.

- fourth value:  $(39 \cdot 256) + 167 = 10151$

$$\frac{(10151 - 1638) \cdot (100 - (-100))}{14745 - 1638} - 100 \approx 29.900053$$

edited Nov 7 '15 at 6:01

answered Nov 5 '15 at 2:29



edo1

23 6

I did a pretty extensive edit in your post to format the expressions using LaTeX (MathJax) style. Would you please check for errors? Thanks! Also, is the 2nd reference really to  $OUTPUT_{min}$  or to  $OUTPUT_{max}$ ? – Ricardo Nov 5 '15 at 10:40

1 Thanks a lot. It was my first reply, I'll use formatting next time. – edo1 Nov 6 '15 at 13:46

I can't really get head or tail on this. Particularly the 20 PSI value looks suspicious, as it is lower than the value at 10 PSI. Sure it isn't 37?

Any, this is a differential measurement, so I suspect that 32, 0 is the half of the scale, 63, 255 being to top (the max scale is  $63 \cdot 256 + 255 = 16383$  (or 3FFFh)).

So, each value you measure, you should subtract  $32 \cdot 256 = 8192$ .

The 0 PSI value is 32, 246, the complete value is 8438, so the pressure (still decimal) would be  $8438 - 8192 = 246$ . With the max scale (each side of 8192) corresponding 8192, this would be  $246/8192 = 3.0066$  PSI. Residual pressure? Or should it be 31, 246?

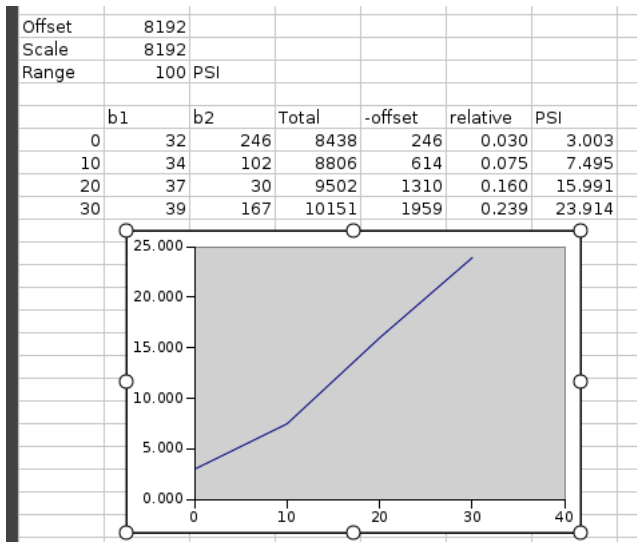
The 30 PSI value 39, 167, is really 10151, then  $10151 - 8192 = 1959$ . This is 1959/8192 of 100PSI, so 23.9 PSI.

The 10 PSI value 34, 102, is really 8806, then  $8806 - 8192 = 614$ . This results in 614/8192 of 100PSI = 7.5 PSI

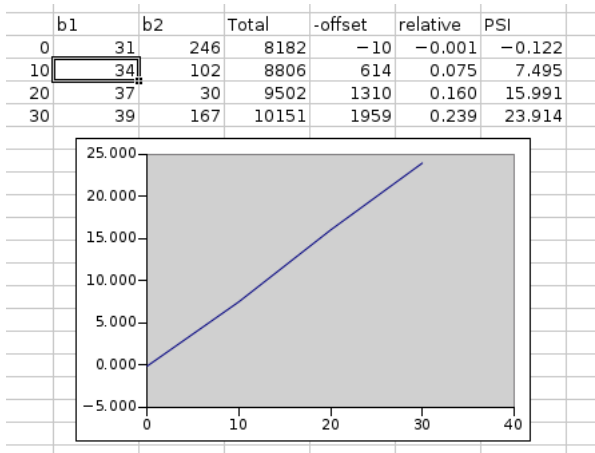
Hypothetically, if the first number for 20PSI were 37, the number would be 9502, or  $9502 - 8192 = 1320$  positive, or 1320/8192 of 100PSI = 16PSI

Could this be a good explanation?

Here's a screenshot of a spreadsheet:



Mmmm. 0PSI is way off. Maybe the value was 31, 246? That gives:



Which makes me suspect that maybe you should read several times till two consecutive values coincide? Note that it is unlikely that you mistake 31 and 32 because of a pull-up resistor or so. 31 are 5 consecutive ones, while 32 is just one one [;-)]. Also, the 0PSI value is really outside of the calibration range of the manufacturer, which ranges from 10 to 90%.

**Edit:** I doubt you are having read errors (though, of course, I can't exclude the possibility). To evaluate that, I suggest you try doing, say 100 measurements in the same conditions - i.e. same pressure. Easiest would be just at 0 PSI. Try doing the test without pause, then with 100ms intervals or so. Look for jumps larger than 1 in the combined b1 and b2 (i.e. in the number  $b1*256 + b2$ ).

edited Jul 23 '15 at 13:34

answered Jul 22 '15 at 15:35



jcoppens

840 2 11

I have tried other bits of code with different results, so could it be that the code I am using is reading incorrectly from the sensor? – [JosephFTaylor](#) Jul 23 '15 at 8:03

I have found this datasheet that refers to I2C communication with Honeywell sensors. I will add it to the main question: [sensing.honeywell.com/index.php/ci\\_id/45841/la\\_id/1/document/1/...](http://sensing.honeywell.com/index.php/ci_id/45841/la_id/1/document/1/) – [JosephFTaylor](#) Jul 23 '15 at 8:27

I added a suggestion for a reliability test to the answer. – [jcoppens](#) Jul 23 '15 at 13:35

Also, the calculations from the application confirm my calculations, with the difference that I subtracted the offset at readout, while the datasheet proposes to do it at pressure value. – [jcoppens](#) Jul 23 '15 at 13:40

I have since increased the amount of bytes that are read. It seems that byte 15 is 4 per psi, so 10 psi would show as 40, 20 psi would show as 80. It seems to be the only byte that I've recognised as a consistent reading. But it only goes up to 255, which is 63.75 psi. Thanks for your help so far by the way – [JosephFTaylor](#) Jul 23 '15 at 13:42

