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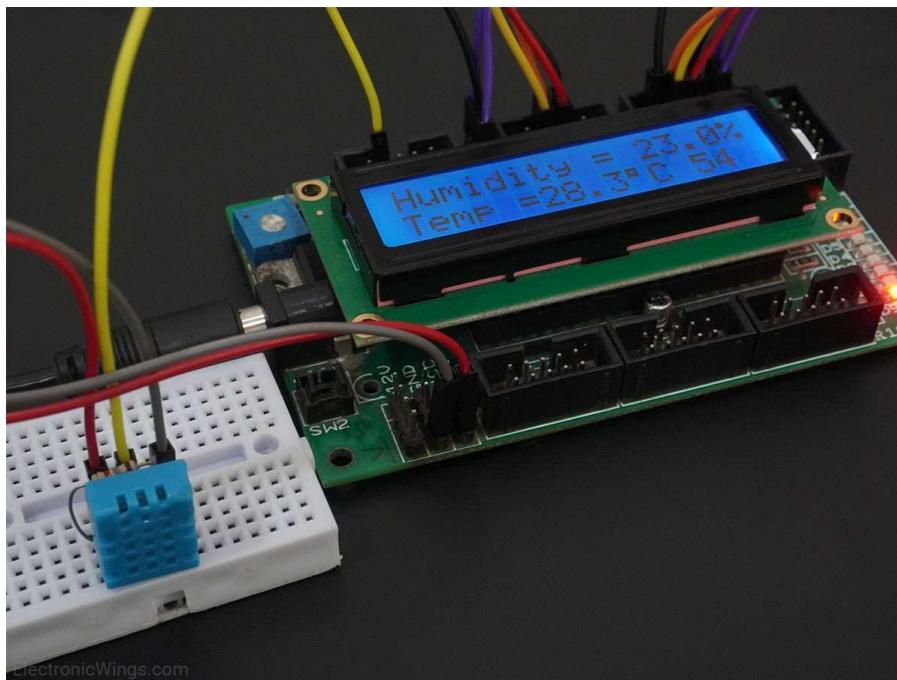
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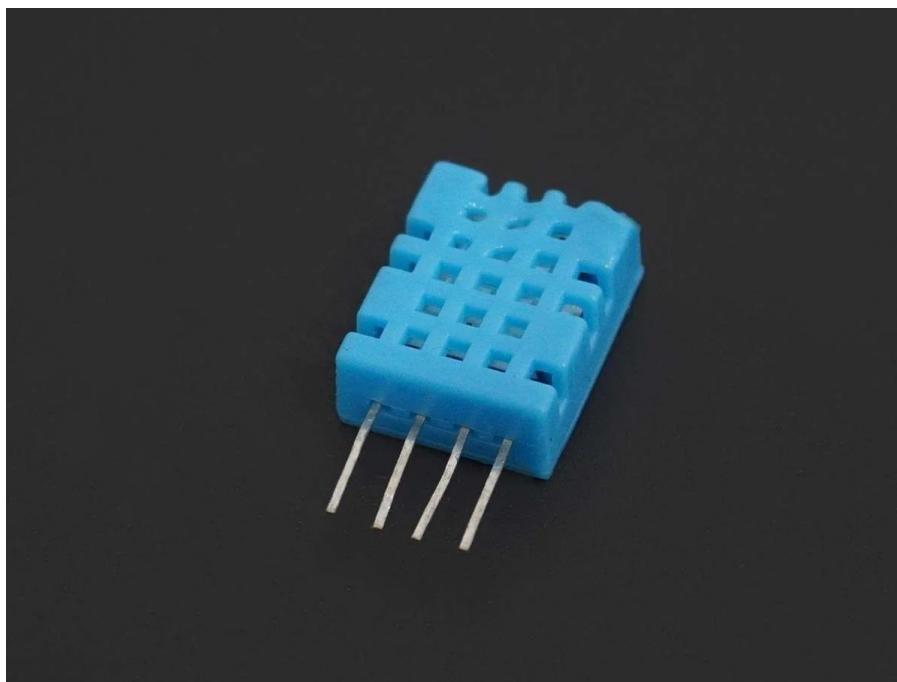
BorisDmitrenko

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# DHT11 Sensor Interfacing with AVR ATmega16/ATmega32.



## Overview of DHT11



DHT11 is a single wire digital humidity and temperature sensor, which provides humidity and temperature values serially.

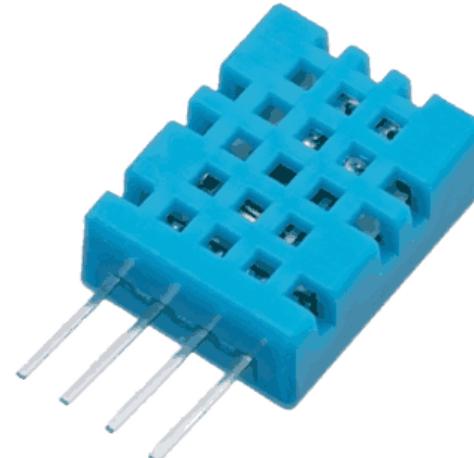


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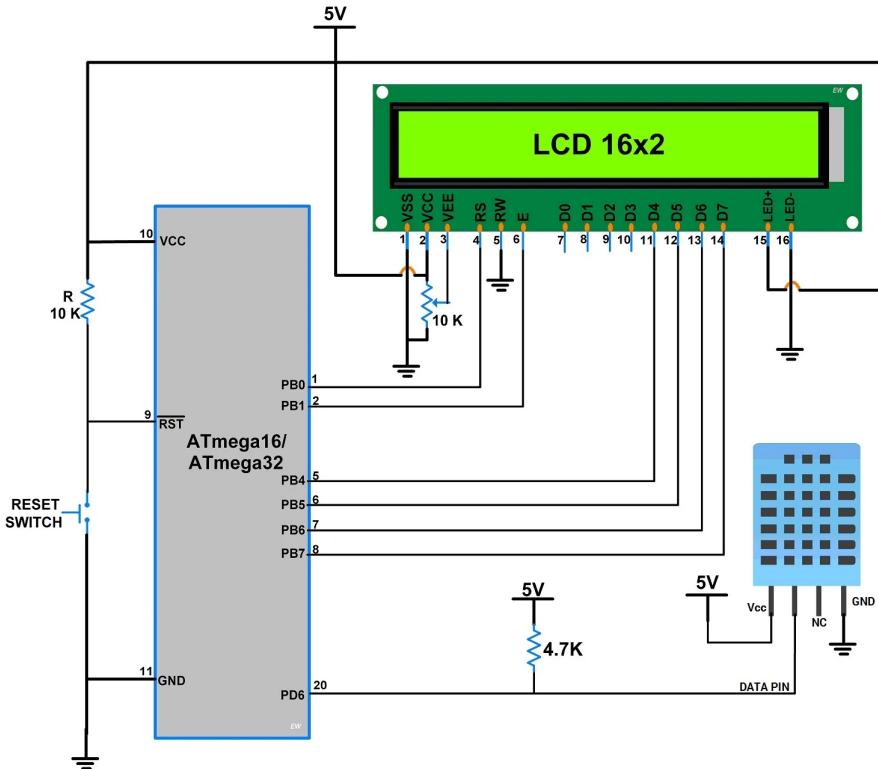
The data is the only pin used for communication. Pulses of different TON and TOFF are decoded as logic 1 or logic 0 or start pulse or end of the frame.

For more information about the DHT11 sensor and how to use it, refer to the topic **DHT11 sensor** (<http://electronicwings.com/sensors-modules/dht11>) in the sensors and modules topic.



DHT11 Sensor

## Connection Diagram of DHT11 with ATmega16/32



Interfacing DHT11 Sensor With AVR ATmega16/ATmega32



The above circuit diagram shows the interfacing of AVR ATmega16/ATmega32 to the DHT11 sensor.

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## DHT11 Code for ATmega16/32

- First, initialize the LCD16x2\_4bit library.
- Define pin no. to interface DHT11 sensor, in our program we define PD6 (Pin no. 20).
- Send the start pulse to the DHT11 sensor, making low to high.
- Receive the response pulse from the DHT11 sensor.
- After receiving the response, receive 40-bit data serially from the DHT11 sensor.
- Display this received data on LCD16x2 along with error indication.

### Code

```

itoa(D_RH,data,10);
lcd_print(data);
lcd_print("%");

itoa(I_Temp,data,10);
lcd_gotoxy(6,1);
lcd_print(data);
lcd_print(".");

itoa(D_Temp,data,10);
lcd_print(data);
lcddata(0xDF);
lcd_print("C ");

itoa(CheckSum,data,10);
lcd_print(data);
lcd_print(" ");

}

_delay_ms(10);
}
}

```

## Video of Measuring Temperature and Humidity using DHT11 and Atmega16/32


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## Components Used

**ATmega 16**  
ATmega 16

x 1



([https://www.mouser.in?utm\\_source=electronicswing&utm\\_medium=display&utm\\_campaign=mouser-componentslisting&utm\\_content=0x0](https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0))

🛒 ([https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7lq%2FgITS0tALAx6fMenLvg%3D%3D&utm\\_source=electronicswings&utm\\_medium=display&utm\\_campaign=mouser-componentslisting&utm\\_content=0x0](https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7lq%2FgITS0tALAx6fMenLvg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0))

📄 Datasheet (</components/atmega-16/1/datasheet>)



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## Components Used

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**Atmega32**  
Atmega32

x 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrrBurbvGdpkmjg7RWmsQ%3D%3D&utm\_source=electronicswings&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)

Datasheet (/components/atmega32/1/datasheet)

**DHT11**

DHT11 is a single wire digital humidity and tem...

x 1

(https://www.mouser.com/ProductDetail/Adafruit/386?qs=GURawfaeGuDbeGFpZ2393w%3D%3D&utm\_source=electronicswings&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)

**LCD16x2 Display**  
LCD16x2 Display

x 1

(https://www.mouser.com/ProductDetail/Adafruit/1447?qs=XAKIUOoRPe6ACImsjw7y7g%3D%3D&utm\_source=electronicswings&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)





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## Components Used

**Breadboard**  
Breadboard

x 1

(https://www.mouser.com/ProductDetail/Board-Prototype-Systems/BB830?qs=VEfmQw3KOauhPeTwYxNCaA%3D%3D&utm\_source=electronicswings&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)

Datasheet (/components/breadboard/1/datasheet)

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ATmega16 DHT11 Project File project file

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Datasheets

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## Comments



Comment



rajeevsharma2482

(/users/rajeevsharma2482/profile)  
2017-09-21 04:06:20

+ Project (/publish/project)

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Projects Sir in this project contest(1) is not working means it display humidity and temp for only one time... (/contests)  
[Reply](#) [Like](#) 1

abhijitp

(/users/abhijitp/profile)  
2017-09-21 07:05:10

⋮

@Rajeev Sharma: It worked perfectly for me.  
 Have you made connections according to the diagram given ?  
 How did you change the humidity and temperature ?  
[Reply](#) [Like](#)

hetupatel11h2

(/users/hetupatel11h2/profile)  
2018-01-19 16:36:01 • Edited

⋮

@rajeevsharma2482: 1)before while loop,put a delay of 100ms and 2)change last delay of 10ms..put delay of 500ms instead of that..

i m using 16mhz crystal...for my board..  
 hope it will work ;)  
[Reply](#) [Like](#)

Rehanzia

(/users/Rehanzia/profile)  
2022-09-13 00:04:50

⋮

YES, I HAVE TEST.  
[Reply](#) [Like](#)

sridhar

(/users/sridhar/profile)  
2018-10-09 08:47:16

⋮

Hi...above code is showing only humidity and temperature character in LCD display.  
 Values not showing there.

i have made connections according to the diagram given.

can you help to me guys?

[Reply](#) [Like](#) 1

lokeshc

(/users/lokeshc/profile)  
2018-10-09 23:26:53

⋮

may be your connection with dht11 sensor is wrong?  
[Reply](#) [Like](#)

sridhar

(/users/sridhar/profile)  
2018-10-10 01:22:53

⋮

Hi lokesh,  
 4.7 K resister should be connect between PD6 to DH11 data pin. Without register it will work....?  
[Reply](#) [Like](#)

lokeshc

(/users/lokeshc/profile)  
2018-10-10 22:43:46

⋮

It needs to pull up resistor on data pin. so it is required to connect 4.7K or more value resistor to DHT11 data pin. Some distributors provide a DHT11 module which in-built have a pull up resistor, so in this case there is no need to connect pull up resistor externally.

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Feylippubjee

Users/Feylippubjee/profile  
2022-07-13 12:39:27

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(/projects) Reply (1)

hugosart

(/users/hugosart/profile)  
2018-11-20 12:32:20

⋮

It was not working for me, it was only reading 4 or 5 times and after that stucked. My solution was to add two lines to the Request function:

```
void Request() /* Microcontroller send start pulse/request */
{
    DDRD |= (1<<DHT11_PIN);
    PORTD |= (1<<DHT11_PIN); /* add this line */
    _delay_ms(100); /* add this line */
    PORTD &= ~(1<<DHT11_PIN); /* set to low pin */
    _delay_ms(20); /* wait for 20ms */
    PORTD |= (1<<DHT11_PIN); /* set to high pin */
}
```

Reply Like

⋮

hugosart

(/users/hugosart/profile)  
2018-11-20 13:43:01

I added some more random code outside my dht11 functions. After that, I had to increase the \_delay\_ms(100) to \_delay\_ms(1000) at least. Don't know why

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⋮

lokeshc

(/users/lokeshc/profile)  
2018-11-21 08:13:58

⋮

Is it working properly for you?

Reply Like

⋮

yvesprudho

(/users/yvesprudho/profile)  
2019-05-20 20:22:50

Intéressant! pour moi un soucis avec atmel studio 7

```
Erreur conflicting types for 'Receive_data'
uint8_t Receive_data()
{
    for (int q=0; q<8; q++)
    {
        while((PIND & (1<<DHT11_PIN)) == 0);
        _delay_us(30);
        if(PIND & (1<<DHT11_PIN))
            c = (c<<1)|(0x01);
        else
            c = (c<<1);
        while(PIND & (1<<DHT11_PIN));
    }
    return c;
}
```

Reply Like

⋮

lokeshc

(/users/lokeshc/profile)  
2019-05-21 11:17:47



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yvesprudho

(/users/yvesprudho/profile)  
2019-05-21 12:12:29

Merci de la réponse!

pour aller un peu plus loin voici la portion de code où est exploitée la fonction receive\_data()

```
I_RH = Receive_data(); /* store first eight bit in I_RH */
D_RH=Receive_data(); /* store next eight bit in D_RH */
I_Temp=Receive_data(); /* store next eight bit in I_Temp */
D_Temp=Receive_data(); /* store next eight bit in D_Temp */
CheckSum=Receive_data();/* store next eight bit in CheckSum */
```

```
if ((I_RH + D_RH + I_Temp + D_Temp) != CheckSum)
{
    Lcd4_Set_Cursor(0,0);
    Lcd4_Write_String("Error");
}
```

```
else
{
    itoa(I_RH,data,10);
    Lcd4_Set_Cursor(11,0);
    Lcd4_Write_String(data);
    Lcd4_Write_String(":");
```

```
    itoa(D_RH,data,10);
    Lcd4_Write_String(data);
    Lcd4_Write_String("%");
```

```
    itoa(I_Temp,data,10);
    Lcd4_Set_Cursor(6,1);
    Lcd4_Write_String(data);
    Lcd4_Write_String(":");
```

```
    itoa(D_Temp,data,10);
    Lcd4_Write_String(data);
    lcddata(0xDF);
    Lcd4_Write_String("C ");
```

```
    itoa(CheckSum,data,10);
    Lcd4_Write_String(data);
    Lcd4_Write_String(" ");
}
```

Reply Like

nikhil77nik

(/users/nikhil77nik/profile)  
2019-05-21 12:39:58

The while loop is not working for me. It is getting stuck on Request() function.

Reply Like

lokeshc

(/users/lokeshc/profile)  
2019-05-21 13:03:55

it will not stuck in request() function. As request function only has GPIO operations.  
may be it will stuck in response().



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:



Kindly check your connections properly so that controller will receive proper response.

[+ Project \(/publish/project\)](#)



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(/projects)  
nikhil77nik (/contests)  
(/users/nikhil77nik/profile)  
2019-05-21 13:27:53 • Edited

Yes. You are right. Its Response(). But connections are right. What else could be the problem?

[Reply](#) [Like](#)

lokeshc  
(/users/lokeshc/profile)  
2019-05-21 14:00:16

Have you use pull-up resistor?

[Reply](#) [Like](#)

nikhil77nik  
(/users/nikhil77nik/profile)  
2019-05-21 14:34:57

I have a DHT11 module which doesn't require a pull-up resistor. I have even changed fuse bits of Atmega16 to 8 kHz. Still, the problem is being there.

[Reply](#) [Like](#)

lokeshc  
(/users/lokeshc/profile)  
2019-05-21 16:02:46 • Edited

Try to use 8MHz for this program, Add following line to the top of the main code

```
#define F_CPU 8000000UL
```

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nikhil77nik  
(/users/nikhil77nik/profile)  
2019-05-21 16:19:07

Done everything. It is getting stuck at Response part.

[Reply](#) [Like](#) 2 ↗

lokeshc  
(/users/lokeshc/profile)  
2019-05-21 16:58:04

Test code by replacing Request() function using below code,

```
void Request() /* Microcontroller send start pulse/request */  
{  
    DDRD |= (1<<DHT11_PIN);  
    PORTD &= ~(1<<DHT11_PIN); /* set to low pin */  
    _delay_ms(18); /* wait for 20ms */  
    PORTD |= (1<<DHT11_PIN); /* set to high pin */  
    _delay_ms(20); /* wait for 20ms */  
}
```

[Reply](#) [Like](#)

heshamadel888888  
(/users/heshamadel888888/profile)  
2019-07-11 07:03:12

i have write this code typically and it get stuck in response function and when i delete the lines that get stucked on it the sensor always reading logic 1

[Reply](#) [Like](#)

heshamadel888888  
(/users/heshamadel888888/profile)  
2019-07-11 09:42:14

i realized that the DHT22 never respond it always see High so it get stuck in the first wile of the response function?

any help please ?

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heshamadel888888

User (/users/heshamadel888888/profile)  
2019-07-15 00:04:03

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(/projects) Reply Like (/contests)

Ibuha

(/users/Ibuha/profile)  
2019-08-05 07:18:45

⋮

Hi! Is this topic still alive?

I have problem with this code. The readings are fine, but the readings go for only two or three loops, and then it stops. Because your code is a part of a loop, when your code stops, it doesn't allow for the rest of the loop to continue. How to solve this?

Thank you!

Reply Like

Ibuha

(/users/Ibuha/profile)  
2019-08-05 07:20:18

⋮

And also, the code works only just when it's burned on the chip. As soon as I turn off and back on the chip, code doesn't work

Reply Like

mohammedaminezaoui

(/users/mohammedaminezaoui/profile)  
2019-08-14 19:18:27

⋮

hey Ibuha, what microcontroller do you use?

Reply Like

Ibuha

(/users/Ibuha/profile)  
2019-08-24 20:10:43

⋮

ATMega16

Reply Like

979705195

(/users/979705195/profile)  
2019-11-20 02:04:11

⋮

I change this code and use it in Atmega 328P, there aren't any mistakes in code but it still can not readout value. Could you please give me some supports?

here is the code

```
#define D4 eS_PORTD4
#define D5 eS_PORTD5
#define D6 eS_PORTD6
#define D7 eS_PORTD7
#define RS eS_PORTB0
#define EN eS_PORTB1

#define F_CPU 16000000UL
#define BAUDRATE 9600
#define BAUD_PRESCALER (((16000000UL / (BAUDRATE * 16UL)) - 1)
#include <avr/io.h>
#include <stdlib.h>
#include "lcd.h"
#include <util/delay.h>
#include <string.h>
#define DHT11_PIN PINC0
uint8_t c=0,I_RH,D_RH,I_Temp,D_Temp,CheckSum;

void DHT11_initial() /* Microcontroller send start pulse/request */
{
DDRC |= (1<<DHT11_PIN);
PORTC |= (1<<DHT11_PIN); /* add this line */
_delay_ms(100); /* add this line */
```



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```

PORTC &= ~(1<<DHT11_PIN); /* set to low pin */
_delay_ms(100); /* wait for 100ms */

PORTC |= (1<<DHT11_PIN); /* set to high pin */

void DHT11_Response() /* receive response from DHT11 */
{
    DDRC &= ~(1<<DHT11_PIN);
    while(PINC & (1<<DHT11_PIN));
    while((PINC & (1<<DHT11_PIN))==0);
    while(PINC & (1<<DHT11_PIN));
}

uint8_t Receive_data() /* receive data */
{
    for (int q=0; q<8; q++)
    {
        while(!(PINC & (1<<DHT11_PIN))); /* check received bit 0 or 1 */
        _delay_us(30);
        if(PINC & (1<<DHT11_PIN))/* if high pulse is greater than 30ms */
            c = (c<<1)|(0x01); /* then its logic HIGH */
        else /* otherwise its logic LOW */
            c = (c<<1);
        while(PINC & (1<<DHT11_PIN));
    }
    return c;
}

int main(void)
{
    DDRD=0xFF;
    DDRB=0xFF;
    char data[5];
    Lcd4_Clear(); /* Clear LCD */
    Lcd4_Init(); /* Initialize LCD */
    Lcd4_Set_Cursor(1,0); /* Enter row and column position */
    Lcd4_Write_String("Humi=");
    Lcd4_Set_Cursor(2,0);
    Lcd4_Write_String("Temp=");

    while(1)
    {
        DHT11_initial(); /* send start pulse */
        DHT11_Response(); /* receive response */
        I_RH=Receive_data(); /* store first eight bit in I_RH */
        D_RH=Receive_data(); /* store next eight bit in D_RH */
        I_Temp=Receive_data(); /* store next eight bit in I_Temp */
        D_Temp=Receive_data(); /* store next eight bit in D_Temp */
        CheckSum=Receive_data();/* store next eight bit in CheckSum */

        if ((I_RH + D_RH + I_Temp + D_Temp) != CheckSum)
        {
            Lcd4_Set_Cursor(1,1);
            Lcd4_Write_String("Error");
        }

        else
        {
            itoa(I_RH,data,10);
            Lcd4_Set_Cursor(1,6);
            Lcd4_Write_String(data);
        }
    }
}

```



Lcd4\_Write\_String("");



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```
itoa(L_Temp,data,10);
Lcd4_Set_Cursor(2,6);
Lcd4_Write_String(data);
Lcd4_Write_String("");

itoa(D_Temp,data,10);
Lcd4_Write_String(data);
Lcd4_Write_String("C ");

}
```

```
_delay_ms(10);
}
```

```
}
```

[Reply](#) [Like](#) 1

helzparadox

(/users/helzparadox/profile)  
2020-06-10 08:21:12

⋮

Did you ever get this working on the ATmega328p? Because I am also trying to adapt the original code to this microcontroller

[Reply](#) [Like](#)

Linnea030

(/users/Linnea030/profile)  
2021-12-05 11:19:10

⋮

Hi, did you work out? I'm trying to adapt this code to ATmega328P. But the data displayed on LCD is always zero. I don't know why.

[Reply](#) [Like](#)

erfan4748

(/users/erfan4748/profile)  
2020-02-11 12:02:50

⋮

Its worked.

We should ad

uint\_t c=0;

in Receive\_data function

[Reply](#) [Like](#)

ultronmk6

(/users/ultronmk6/profile)  
2020-03-20 03:29:08

⋮

"cheers love, the cavalry's here."

Response() is main villain.

Solution is here.

1. replace response function

```
int Response()
{
    DDRD &= ~(1<<DHT11_PIN);
    _delay_us(39);
    if((PIND & (1<<DHT11_PIN))) //response signal error check!
        return 1;
    _delay_us(80);
    if(!(PIND & (1<<DHT11_PIN))) //pulled ready output check!
        return 1;
}
```



delay\_us(80);



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```
Request(); /* send start pulse */
if(Response() != 1) /* receive response */
{
    I_RH = Receive_data(); /* store first eight bit in I_RH */
    D_RH = Receive_data(); /* store next eight bit in D_RH */
    I_Temp = Receive_data(); /* store next eight bit in I_Temp */
    D_Temp = Receive_data(); /* store next eight bit in D_Temp */
    CheckSum = Receive_data(); /* store next eight bit in CheckSum */
}
```

3. good luck

Reply Like 1 ⌂

Imike2018

(/users/Imike2018/profile)

2020-05-20 19:42:43

⋮

it works i mean at least it doesn't stuck in Response() but humidity and temperature is 0 all the time...

Reply Like

Imike2018

(/users/Imike2018/profile)

2020-05-21 04:40:56

⋮

response always returns zero

Reply Like

RicardoZaragozaZamora

(/users/RicardoZaragozaZamora/profile)

2021-05-14 02:54:09

⋮

Hi, i'm having the exactly same problem, did you solve it?

Reply Like

maxprog

(/users/maxprog/profile)

2020-04-09 15:19:49

⋮

Hi, what software do You use to create Interfacing Diagram? or what are Your suggestions?

Reply Like

Imike2018

(/users/Imike2018/profile)

2020-05-21 04:41:32 • Edited

⋮

btw is anybody here ?

Reply Like

bermenmeong45

(/users/bermenmeong45/profile)

2020-06-29 05:02:14

⋮

hello what is the function of the c variable? please help me

Reply Like

EmilSeibaek

(/users/EmilSeibaek/profile)

2021-02-05 19:10:19

⋮

I have a problem where, when i connect as viewed on the circuit diagram, i get and "error" where nothing is displayed on the LCD, but the first row of pixels is on and the second is off? is there anyone who has the same problem? or knows what to do?

Reply Like 1 ⌂

sachichokhandre

⋮



(/users/sachichokhandre/profile)

2024-05-29 21:41:10

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Hi, I am also trying this and if you are not able to run this program, go to

cksel==interfacingwithatmega16

Believe me its working. Works for atmega16.

Good luck!! keep posting

Reply Like 1

ImpulseImp

(/users/ImpulseImp/profile)

2022-06-21 05:31:21

⋮

Nice guide, thanks, man. I changed it to run on Atmega328p via UART. I'll leave a link when I upload the code.

Reply Like

ImpulseImp

(/users/ImpulseImp/profile)

2022-06-21 14:40:58

⋮

here you go [https://github.com/ImpulseImp/My\\_libs/blob/main/DHT11/main.c](https://github.com/ImpulseImp/My_libs/blob/main/DHT11/main.c)

Reply Like

Rehanzia

(/users/Rehanzia/profile)

2022-09-24 16:25:31

⋮

IT WORKS ONLY 1 TIME AFTER RESET, IT SHOWS ONLY HUMIDITY &amp; TEMPRATURE IN WRITTEN NOT SHOWS THEIR VALUES

Reply Like

saeedkazemi7926

(/users/saeedkazemi7926/profile)

2023-06-12 01:40:07

⋮

hello, convert \_delay\_ms(10); to \_delay\_ms(2000);

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