

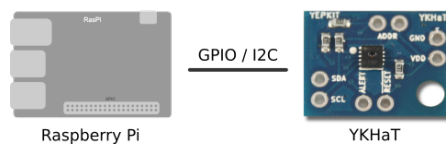
# Using YKHaT with Raspberry Pi

April 17, 2018

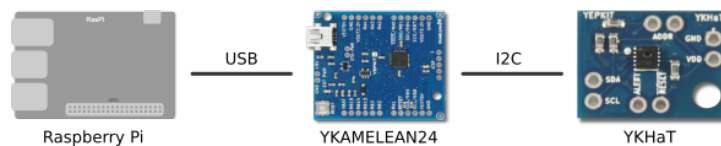
## 1 Introduction

Bellow we show how to get YKHaT readings in a Raspberry Pi board (Raspi). Two approaches will be presented. One is to connect the YKHaT board directly to Raspi using GPIO header pins. The other is to use a YKAMELEAN24 board to connect YKHaT to Raspi through USB.

**Approach 1** Connect YKHaT directly.



**Approach 2** Use a YKAMELEAN24 to connect YKHaT to Raspi.



## 2 Connect YKHaT directly to a Raspberry Pi board

I2C interface is available in the Raspberry Pi (Raspi) GPIO header. This can be used to interface with YKHaT directly. Also **GND** and **5V** pins of the GPIO header can be used to power the YKHaT board.

**What you need** Get hold of the following to implement this setup:

- YKHaT sensor board.
- Raspberry Pi board.
- Four wires to connect YKHaT to four pins of the Raspberry Pi board GPIO header.

## 2.1 Configure Raspberry Pi I2C

For this tutorial we are using a Raspberry Pi 3 Model B Rev 1.2 with Wheezy Linux. I2C is not enabled by default. Luckily it's not hard to enable it.

To start it is always a good idea to ensure you have an up-to-date system. So we start by running:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

Now to enable the I2C module do the following:

1. Open a terminal and run `sudo raspi-config`;
2. Select **5 Interfacing Options**;
3. Select **P5 I2C**;
4. Select **Yes** to the question to enable ARM I2C;
5. Select **Finish**;
6. Reboot.

Note that the above options on `raspi-config` may vary depending of the tool version. But it should be something not to dissimilar.

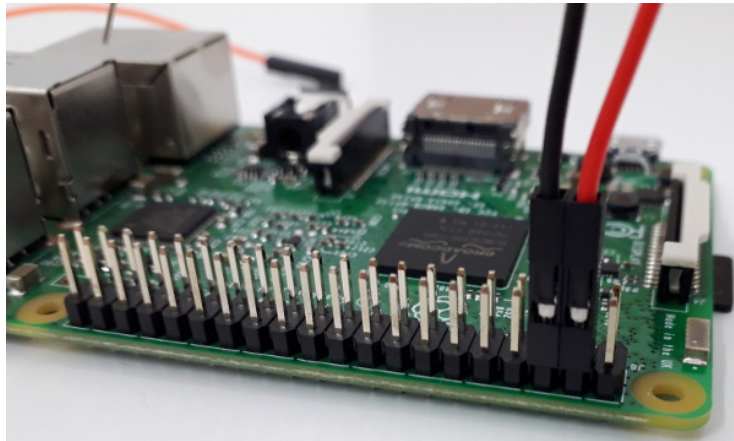
**The I2C bus** Now a new device for the I2C bus, `/dev/i2c-1`, should be available for use.

## 2.2 Connect the wires

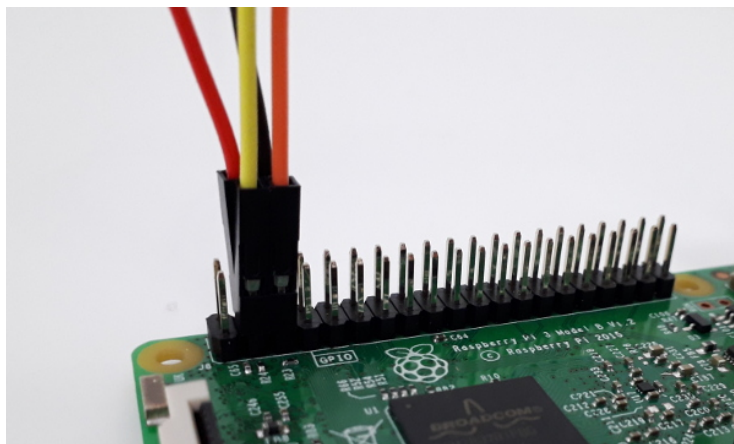
YKHaT boards have built-in I2C pull-up resistors. So you can connect **SDA** and **SCL** pins directly to the corresponding Raspberry Pi GPIO header pins.



Start by connecting the power pins of YKHaT, GND and Vdd, to the power pins of the Raspberry Pi GPIOs. YKHaT can be sourced from 1.8V to 5.5V so we can use the GND and +5V pins of the Raspberry Pi as shown bellow.



Next connect the I2C pins of YKHaT, SDA and SCL, to the I2C pins of Raspberry Pi as shown bellow.



### 2.3 Create a program to get temperature and humidity values from YKHaT

Check bellow the C source code for a small application that fetches from YKHaT an displays the temperature and humidity values.

Listing 1: C code for YKHaT on Raspberry Pi

```
1 #include <string.h>
2 #include <stdio.h>
3 #include <stdlib.h>
4 #include <unistd.h>
5 #include <linux/i2c-dev.h>
6 #include <sys/ioctl.h>
7 #include <sys/types.h>
```

```

8 #include <sys/stat.h>
9 #include <fcntl.h>
10
11
12 void main(void) {
13     int fp;
14     char filename[40], buf[10] = {0};
15     int temp_c, temp_f, hum, addr = 0b01000100; //addr is the I2C address
16                                                    //of YKHaT (default address)
17     long data;
18
19     sprintf(filename, "/dev/i2c-1");
20     if ((fp = open(filename, ORDWR)) < 0) {
21         printf("Failed to open the I2C bus.");
22         return;
23     }
24
25     if (ioctl(fp, I2C_SLAVE, addr) < 0) {
26         printf("Failed to acquire bus access and/or talk to slave.\n");
27         return;
28     }
29
30     //Write YKHaT command to start measuring temperature
31     //and humidity levels.
32     //Please check the
33     //www.yepkit.com/uploads/documents/17aae_SHT30-DIS-B_datasheet.pdf
34     //for details on the protocol.
35     buf[0] = 0x24;
36     buf[1] = 0x00;
37     if (write(fp, buf, 2) != 2) {
38         // ERROR HANDLING: i2c transaction failed
39         printf("Failed to write to the i2c bus.\n");
40         printf("\n\n");
41     }
42
43     if (ioctl(fp, I2C_SLAVE, addr) < 0) {
44         printf("Failed to acquire bus access and/or talk to slave.\n");
45         return;
46     }
47
48     //Get the YKHaT readings
49     if (read(fp, buf, 6) != 6) {
50         // ERROR HANDLING: i2c transaction failed
51         printf("Failed to read from the i2c bus.\n");
52         printf("\n\n");
53     } else {
54         // Get temperature in C from sensor reading
55         data = buf[0];
56         data = (data << 8) + buf[1];
57         temp_c = ((175 * data) / 65535) - 45;

```

```

58     printf("\ntemperature in C = %d", temp_c);
59
60     // Get temperature in F from sensor reading
61     temp_f = ((315 * data) / 65535) - 49;
62     printf("\ntemperature in F = %d", temp_f);
63
64     // Get humidity level in %RH from sensor reading
65     data = 0;
66     data = buf[3];
67     data = (data << 8) + buf[4];
68     hum = (100 * data) / 65535;
69     printf("\nhumidity in %RH = %d", hum);
70
71     printf("\n\n");
72 }
73
74 }

```

---

To build the application save the above file as `i2c-ykhat.c` and use the `gcc` command to build the application:

```
gcc i2c-ykhat.c -o i2c-ykhat
```

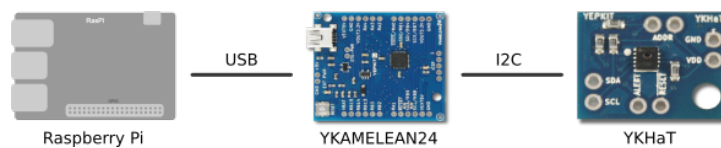
Now run the application:

```
sudo ./i2c-ykhat
```

And that's it.

### 3 Use a YKAMELEAN24 board to connect YKHaT to Raspberry Pi through USB

This application note shows how you can get temperature and humidity readings from the YKHaT to a computer using a YKAMELEAN24 board.



#### 3.1 What you need

You will need to get hold of some hardware pieces and download a small software. The hardware:

- Raspberry Pi;
- USB cable (Type A to Mini USB);

- YKAMELEAN24 microcontroller board;
- YKHaT sensor board;
- Some wires to connect YKHaT to YKAMELEAN24.

For the software you will need to download the `ykam24cmd` software which provides the commands to interact with YKAMELEAN24 boards and the devices connected to it. This software can be downloaded from the product page or from the GitHub repository ([github.com/Yepkit/ykam24cmd](https://github.com/Yepkit/ykam24cmd)).

### 3.2 Set it up

Let's take care of the software first. Download `ykam24cmd` from YKAMELEAN24 product page or the [github.com/Yepkit/ykam24cmd](https://github.com/Yepkit/ykam24cmd) GitHub repository. If you intend to use a PC with Windows operating system consider the executable file available for download at the YKAMELEAN24 product page.

Now run the `build.sh` and `install.sh` bash scripts on a terminal. Check the software documentation or the `README` file in the source code package for additional details on building and installing. Once this has been taken care you can start setting up the hardware. Connect the following:

1. YKHaT SDA and SCL pins to YKAMELEAN SDA and SCL pins;
2. Power input pins of YKHaT to GND and 3.3V or 5V pins of YKAMELEAN24 (both 3.3V and 5V works);
3. YKAMELEAN24 board to the PC using the Mini USB cable.

And you are done setting things up. Now the fun part.

### 3.3 Get the readings

Open a terminal, type the following command and press *Enter*.

```
ykam24cmd ykhat -tc 0
```

This command will print the temperature in Celsius degrees. If you want it in Fahrenheit use the following command.

```
ykam24cmd ykhat -tf 0
```

For humidity level use the following command.

```
ykam24cmd ykhat -h 0
```