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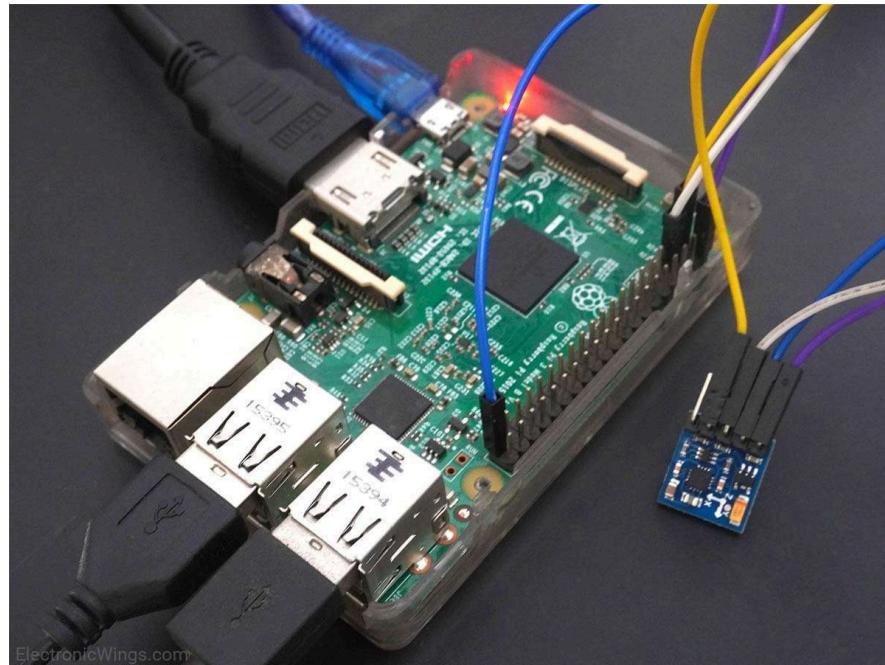
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Triple Axis Magnetometer HMC5883L Interfacing with Raspberry Pi



Overview of Magnetometer HMC5883L



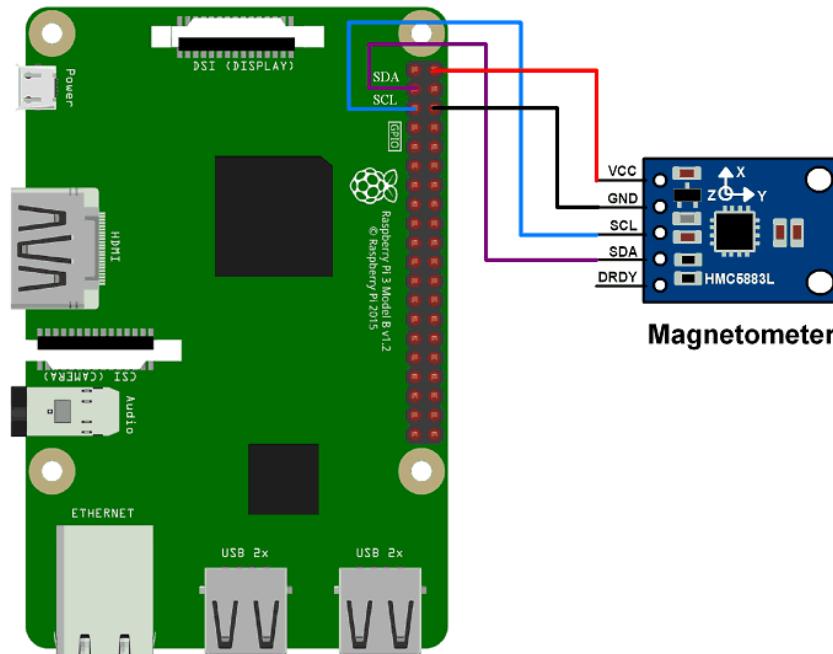
HMC5883L Magnetometer Module

- Magnetometer HMC5883L is used for measuring the direction and magnitude of the Earth's magnetic field. It is used for low cost compassing and [+ Project](#)
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- It measures the Earth's magnetic field value along the X, Y, and Z axes from milli-gauss to 8 gauss.
 - It can be used to find the direction of the heading of the device.
 - It uses the I2C protocol for communication with the microcontroller.

For more information about Magnetometer HMC5883L and how to use it, refer the topic **HMC5883L Magnetometer Module** (<http://www.electronicwings.com/sensors-modules/hmc5883l-magnetometer-module>) in the sensors and modules section.

To interface the HMC5883L magnetometer module with Raspberry Pi, we should ensure that the I2C protocol on Raspberry Pi is enabled. So before going for interfacing HMC5883L with Raspberry Pi, we need to make some I2C configurations on Raspberry Pi for which you can refer **Raspberry Pi I2C** (<http://www.electronicwings.com/raspberry-pi/raspberry-pi-i2c>).

Connection Diagram of HMC5883L Magnetometer with Raspberry Pi



HMC5883L Magnetometer Interfacing with Raspberry Pi 3



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(/projects)

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(/contests)

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Get the angle in degrees using HMC5883L Magnetometer and Raspberry Pi

Reading magnetic field strength along the x, y, and z axes from the HMC5883L magnetometer module, calculate the heading angle from these three axes and displaying heading angle on Serial Monitor.

Let's interface magnetometer HMC5883L with Raspberry Pi and calculate its heading angle. HMC5883L uses the I2C protocol for communication. We can interface it with Raspberry by using Python.

To know about Python based I2C functions used on Raspberry Pi, you can refer **Python based I2C functions for Raspberry Pi** (<http://www.electronicwings.com/raspberry-pi/python-based-i2c-functions-for-raspberry-pi>)

Programming steps

- First we need to set configuration register A for average of 8-sample measurement with 15 Hz default data output rate
- Set Gain using Configuration Register B i.e. here its 0xA0. (or we can choose any other desired gain)
- Select Continuous measurement mode of operation in Mode Register. Hence Mode Register value will become 0x00.

After initialization, read X, Y and Z-axis registers raw values.

Calculate Heading value by using following formula,



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(/explore)

Projects
(/projects)

Contests
(/contests)

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HMC5883L Python Program for Raspberry Pi



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Find Heading by using HMC5883L interface with Raspberry Pi using Python
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```
import smbus      #import SMBus module of I2C
from time import sleep #import sleep
import math

#some MPU6050 Registers and their Address
Register_A      = 0          #Address of Configuration register A
Register_B      = 0x01        #Address of configuration register B
Register_mode   = 0x02        #Address of mode register

X_axis_H       = 0x03        #Address of X-axis MSB data register
Z_axis_H       = 0x05        #Address of Z-axis MSB data register
Y_axis_H       = 0x07        #Address of Y-axis MSB data register
declination   = -0.00669    #define declination angle of location whe
pi            = 3.14159265359 #define pi value

def Magnetometer_Init():
    #write to Configuration Register A
```

HMC5883L Output



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(/explore)

Projects
(/projects)

Contests
(/contests)

+ Project

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HMC5883L Magnetometer Module

Magnetometer HMC5883L is developed by Honeywell...

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(https://www.mouser.in/ProductDetail/Olimex-Ltd/MOD-HMC5883L?qs=%2FHa2pyFaduiM2FizGGE3eZs8JvW%2Fsm6fbEJBqFTwYwfN63cbOSCmqA%3D%3D&utm_source=electronicwings&utm_medium=referral&utm_campaign=mouser-componentlisting)

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Raspberry Pi 4B

Raspberry Pi 4BRaspberry Pi 4B

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(https://www.mouser.com/ProductDetail/Raspberry-Pi/RPI4-MODBP-8GB-BULK?qs=sPbYRqrBIVIrhMid19vUA%3D%3D&utm_source=electronicwings&utm_medium=referral&utm_campaign=mouser-componentlisting)

Datasheet (https://www.mouser.com/ProductDetail/Raspberry-Pi/RPI4-MODBP-8GB-BULK?qs=sPbYRqrBIVIrhMid19vUA%3D%3D&utm_source=electronicwings&utm_medium=referral&utm_campaign=mouser-componentlisting)

Raspberry Pi Zero

Raspberry Pi Zero

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(https://www.mouser.in/ProductDetail/Seeed-Studio/102110357?qs=sGAEpiMZZMtyU1cDF2RqUKjVR%252BsHljvWiLJcsapOR6w%3D&utm_source=electronicwings&utm_medium=referral&utm_campaign=mouser-componentlisting)



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HG8

(/users/HG8/profile)
2018-07-06 05:44:25

Hi I need help with this code. I can't read any values of x, y or z axis. Furthermore, I only get 0's instead of any value. Here is the code (I changed the device address to 0x0d, I got this with previous codes I tried to implement):

```
"Python 3.5.3 (default, Jan 19 2017, 14:11:04) "
"[GCC 6.3.0 20170124] on linux"
import smbus #import SMBus module of I2C
from time import sleep #import sleep
import math

#some MPU6050 Registers and their Address
Register_A = 0 #Address of Configuration register A
Register_B = 0x01 #Address of configuration register B
Register_mode = 0x02 #Address of mode register

X_axis_H = 0x03 #Address of X-axis MSB data register
Z_axis_H = 0x05 #Address of Z-axis MSB data register
Y_axis_H = 0x04 #Address of Y-axis MSB data register
declination = 0.07389 #define declination angle (in radians) of location where
measurement going to be done
pi = 3.14159265359 #define pi value

def Magnetometer_Init():
    #write to Configuration Register A
    bus.write_byte_data(Device_Address, Register_A, 0x70)

    #Write to Configuration Register B for gain
    bus.write_byte_data(Device_Address, Register_B, 0xa0)

    #Write to mode Register for selecting mode
    bus.write_byte_data(Device_Address, Register_mode, 0)

def read_raw_data(addr):

    #Read raw 16-bit value
    high = bus.read_byte_data(Device_Address, addr)
    low = bus.read_byte_data(Device_Address, addr+1)

    #concatenate higher and lower value
    value = ((high << 8) | low)

    #to get signed value from module
    if(value > 32768):
        value = value - 65536
    return value

bus = smbus.SMBus(1) # or bus = smbus.SMBus(0) for older version boards
```

Device_Address = 0x0d # HMC5883L magnetometer device address

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Projects Magnetometer_Init() # initialize HMC5883L magnetometer
 Contests
 (/projects) print ("Reading Contests Angle")

while True:

```
#Read Accelerometer raw value
x = read_raw_data(X_axis_H)
z = read_raw_data(Z_axis_H)
y = read_raw_data(Y_axis_H)

heading = math.atan2(y, x) + declination

#Due to declination check for >360 degree
if(heading > 2*pi):
    heading = heading - 2*pi

#check for sign
if(heading < 0):
    heading = heading + 2*pi

#convert into angle
heading_angle = float(heading * 180/pi)

print ("Heading angle = %0.1f°" %heading_angle)
print (x)
print (y)
sleep(1)
```

What I obtain is this:

Heading angle = 4.2°

0

0

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parisotericmail

(/users/parisotericmail/profile)

2018-11-03 20:52:53

hi I had the same problem and it looks like the HMC5883L is actually a QMC5883L, working code can be found here :

https://github.com/RigacciOrg/py-qmc5883l/blob/master/py_qmc5883l/__init__.py

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UsamaAmjad

(/users/UsamaAmjad/profile)

2020-08-19 17:27:52

hello...! i am using raspberry pi 3 b+ and trying to get value from HM5883L in python code but i am getting this error.

bus.write_byte_data(Device_Address, Register_A, 0x70)

OSError: [Errno 121] Remote I/O error

I tryed multiple times but getting same error even after changing wires.

I need help for this thanku.

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AxxelUltime

(/users/AxxelUltime/profile)

2020-09-14 02:59:41

Hello, I think we all have the same problem (see reply of the other post), we received a QMC5883L that works on different addresses and with a different code (I had to change Device_Address to 0x0d)

More infos: <https://www.raspberrypi.org/forums/viewtopic.php?t=172244>

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NeftaliGonzalez

(/users/NeftaliGonzalez/profile)

2021-04-08 20:52:34

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Projects if the previous Contexts run an displays error "OSError: [Errno 121] Remote I/O

error" you may have a QMC5883L instead, corrected code is here:

```

import smbus #comunicación I2C
from time import sleep
import math

#direcciones requeridas
#-----config
Registro_A = 0x0B
Registro_B = 0x09
RegStatus = 0x06
RegCtrl = 0x09
#-----direcciones de la conexión
bus=smbus.SMBus(1)
deviceAdress = 0x0d
#-----datos
eje_X_Mag = 0x00
eje_Y_Mag = 0x02
eje_Z_Mag = 0x04
declination = -0.00669
pi=3.14159265359

def MagnetometerInit():
    #configurar registro A
    bus.write_byte_data(deviceAdress, Registro_A, 0x01)
    #configurar registro B
    bus.write_byte_data(deviceAdress, Registro_B, 0x1D)
    #configurar registro para seleccionar el modo
    #bus.write_byte_data(deviceAdress, ModoRegistro, 0)

    def read_raw_data(addr):
        #leer doble byte (16 bits)
        low = bus.read_byte_data(deviceAdress,addr)
        high = bus.read_byte_data(deviceAdress,addr+1)
        #concatenar los bytes
        valor = ((high << 8) | low)
        #obtener el signo
        if(valor > 32768):
            valor = valor - 65536
        return valor
    #-----main
    MagnetometerInit()
    print('leyendo magnetometro..')
    while True:
        bandera = bus.read_byte_data(deviceAdress,RegStatus)
        a="[0:b]".format(bandera)
        if a[len(a)-1] == 0:
            bandera = bus.read_byte_data(deviceAdress,RegStatus)
        x=read_raw_data(eje_X_Mag)
        y=read_raw_data(eje_Y_Mag)
        z=read_raw_data(eje_Z_Mag)
        heading = math.atan2(y,x)+ declination
        #compensar superiores a 360
        if(heading > 2*pi):
            heading = heading -2*pi
        #revisar el signo
        if(heading < 0):
            heading=heading+2*pi
        #convertir a grados
        heading_angle = int(heading * (180/pi))
        print("angulo = %d°" %heading_angle)
        sleep(0.5)

```



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