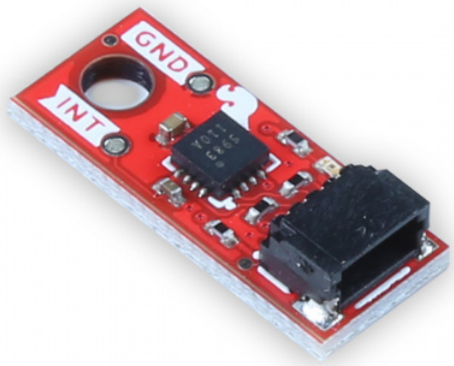
Qwiic Micro Magnetometer - MMC5983MA Hookup Guide

Introduction

The SparkFun Qwiic Micro MMC5983MA Magnetometer is a micro-sized, 0.75in. by 0.30in. sensor that utilizes the highly sensitive triple-axis magnetometer by MEMSIC. We've attached the magnetometer IC onto an incredibly small Qwiic board form factor that we like to call Qwiic Micro! The MMC5983MA is capable of sensing down to 0.4mG, enabling a heading accuracy of ±0.5°. The Qwiic MMC5983MA IMU communicates over I^2C by default utilizing our handy Qwiic Connect System, so no soldering is required to connect it to the rest of your boards.

Saturation is a problem for all mag sensors. The MMC5983MA has built-in degaussing circuitry to clear any residual magnetization. Output rates of 1000Hz, ±8G FSR, and 18-bit resolution make the MMC5983MA a phenomenal magnetic sensor for electronic compass applications.



SparkFun Micro Magnetometer - MMC5983MA (Qwiic)
SEN-19921

Required Materials

To follow along with this tutorial, you will need the following materials. You may not need everything though depending on what you have. Add it to your cart, read through the guide, and adjust the cart as necessary.

Qwiic Micro Magnetometer - MMC5983MA Hookup Guide Wish List SparkFun Wish List

	SparkFun Micro Magnetometer - MMC5983MA (Qwiic) SEN-19921
	SparkFun RedBoard Qwiic DEV-15123
	USB micro-B Cable - 6 Foot CAB-10215 USB 2.0 type A to micro USB 5-pin. This is a new, smaller connector for USB devices. Micro USB connectors are a…
	Flexible Qwiic Cable - 50mm PRT-17260

Suggested Reading

If you aren’t familiar with the following concepts, we recommend checking out these tutorials before continuing.

Logic Levels

Learn the difference between 3.3V and 5V devices and logic levels.

Accelerometer Basics

A quick introduction to accelerometers, how they work, and why they're used.

I2C

An introduction to I2C, one of the main embedded communications protocols in use today.

Serial Terminal Basics

This tutorial will show you how to communicate with your serial devices using a variety of terminal emulator applications.

Hardware Overview

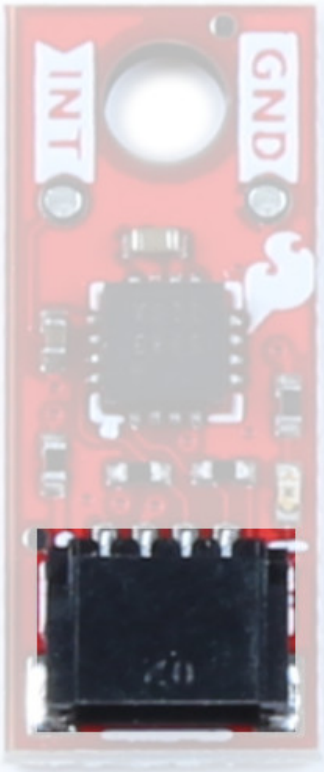
The beautiful thing about this Qwiic board is that it is extremely simple. Let's dive in and have a look at its features!

MMC5983MA

The MMC5983MA is an AEC-Q100 qualified, fully integrated 3-axis magnetic sensor with on-chip signal processing and integrated I^2C/SPI bus. It has superior dynamic range and accuracy with ±8G FSR, 18bit operation, 0.4mG total RMS noise, and can enable heading accuracy of 0.5º. More information can be found in the datasheet.

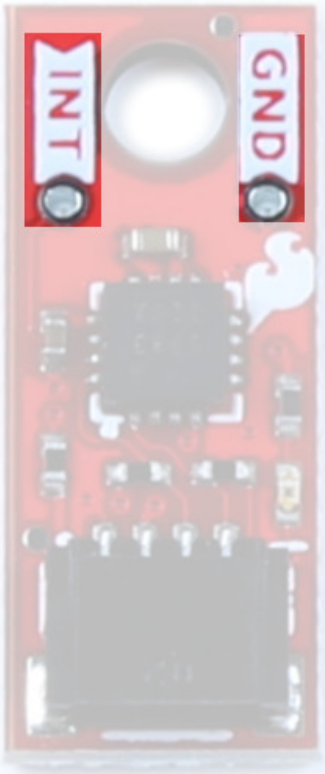
Qwiic Connector

Our Qwiic Ecosystem makes sensors pretty much plug and play. There's a Qwiic connector on the side of the Qwiic Micro Magnetometer to provide power and I^2C connectivity simultaneously. The default I^2C address is 0x30.



Pins

We've broken out the interrupt and ground pins to PTH on either side of the board. The interrupt pin is active high - writing “1” will enable the interrupt for completed measurements. Once a measurement is finished, either magnetic field or temperature, an interrupt will be sent to the host.



Jumpers

I²C

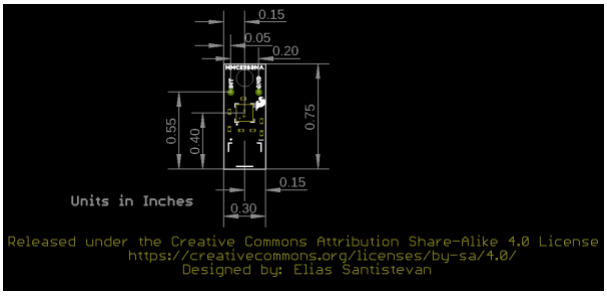
Like our other Qwiic boards, the Qwiic Micro Magnetometer comes equipped with pull-up resistors on the clock and data pins. If you are daisy-chaining multiple Qwiic devices, you will want to cut this jumper; if multiple sensors are connected to the bus with the pull-up resistors enabled, the parallel equivalent resistance will create too strong of a pull-up for the bus to operate correctly. As a general rule of thumb, disable all but one pair of pull-up resistors if multiple devices are connected to the bus. To disable the pull up resistors, use an X-acto knife to cut the joint between the two jumper pads highlighted here.

LED

If power consumption is an issue, cutting this jumper will disable the Power LED on the front of the board.

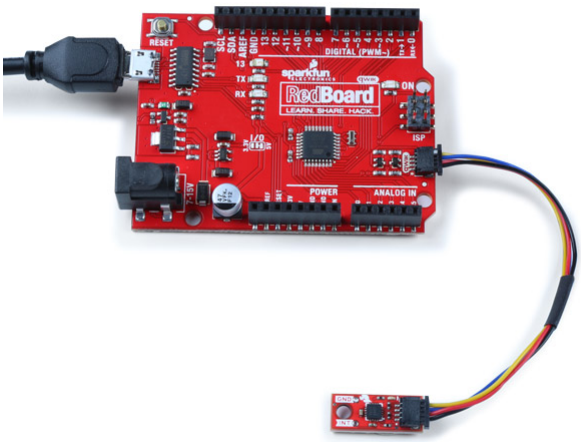
Board Outline

This ultra tiny Qwiic breakout board measures 0.75" x 0.30".



Hardware Hookup

Grab your Qwiic cable and plug one end into the RedBoard Qwiic and the other end into the Qwiic Micro Magnetometer. Voila!



Software Setup and Programming

Note: Make sure you are using the latest stable version of the Arduino IDE on your desktop.

If this is your first time using Arduino, please review our tutorial on installing the Arduino IDE. If you have not previously installed an Arduino library, please check out our installation guide.

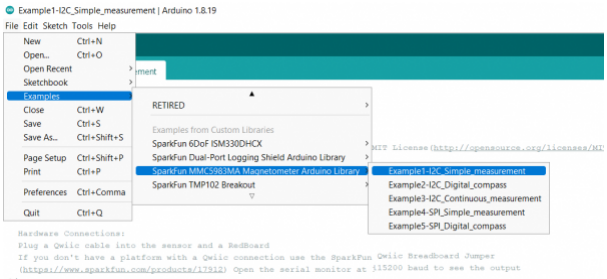
We've written a simple Arduino library to quickly get started reading data from the Qwiic Micro Magnetometer. Install the library through the Arduino Library Manager tool by searching for **"SparkFun MMC5983MA"**. Users who prefer to manually install it can get the library from the GitHub Repository or download the ZIP by clicking the button below:

SPARKFUN QWIIC MICRO MAGNETOMETER - MMC5983MA ARDUINO LIBRARY

Example 1: I2C Simple Measurement

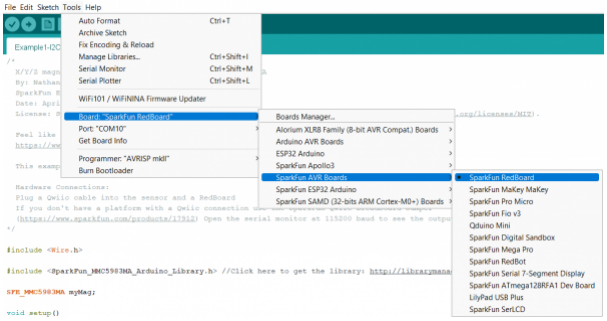
Now that we've got our library installed and our hardware all hooked up, let's look at some examples.

This first example just does some basic measurements. To find Example 1, go to **File** -> **Examples** -> **SparkFun MMC5983MA Magnetometer Arduino Library** -> **Example1-I2C_Simple_measurement**.



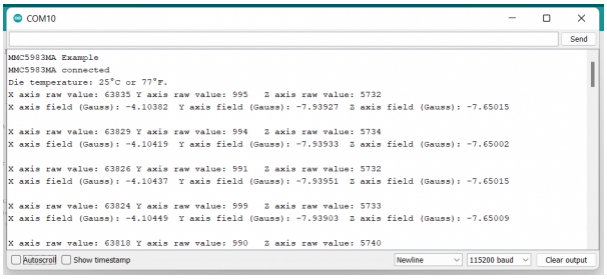
Having a hard time seeing the image? Click the image for a closer look.

Make sure you have the correct board and port selected. For this tutorial, your selections should look something like this:



Having a hard time seeing the image? Click the image for a closer look.

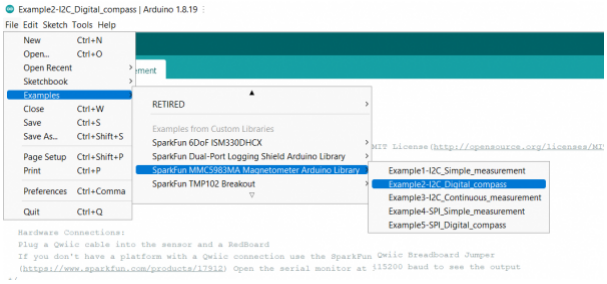
Once you're ready to go, go ahead and hit the upload button (the right facing arrow button under the "Edit" menu item). Once your code is uploaded, open the Serial Monitor and you'll see X, Y, and Z values start printing out.



Having a hard time seeing the image? Click the image for a closer look.

Example 2: I2C Digital Compass

Example 2 shows how to compute the heading based on the basic X/Y/Z readings from the sensor over Qwiic. To find this example, go to **File** -> **Examples** -> **SparkFun MMC5983MA Magnetometer Arduino Library** -> **Example2-I2C_Digital_compass**.



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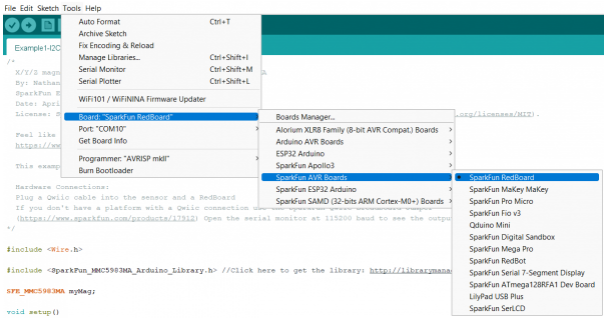
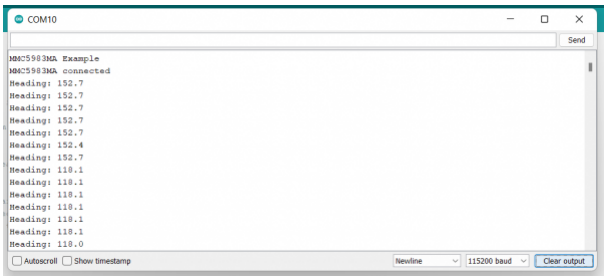


Having a hard time seeing the image? Click the image for a closer look.

Once you're ready to go, go ahead and hit the upload button (the right facing arrow button under the "Edit" menu item). Once your code is uploaded, open the Serial Monitor and you'll see compass readings start printing out.

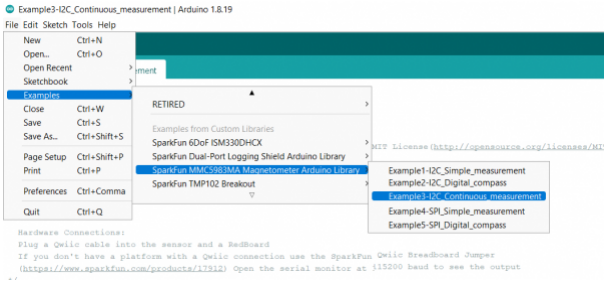


Having a hard time seeing the image? Click the image for a closer look.

If you look at the above image, you'll see where I abruptly changed the direction the sensor was pointing.

Example 3: I2C Continuous Measurement

Example 3 demonstrates how to use interrupts to quickly read the sensor instead of polling. To find this example, go to **File** -> **Examples** -> **SparkFun MMC5983MA Magnetometer Arduino Library** -> **Example3-I2C_Continuous_measurement**.



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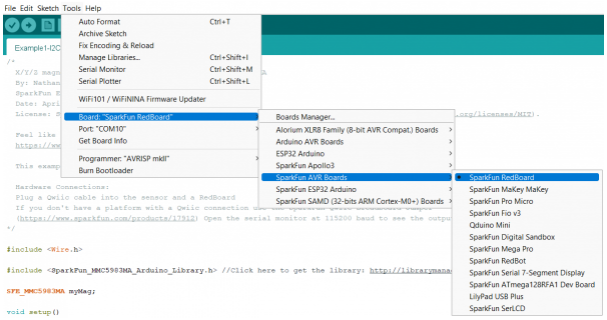
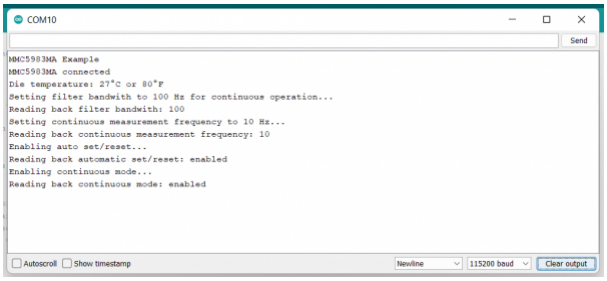
Make sure you have the correct board and port selected. For this tutorial, your selections should look something like this:



Having a hard time seeing the image? Click the image for a closer look.

Once you're ready to go, go ahead and hit the upload button (the right facing arrow button under the "Edit" menu item). Once your code is uploaded, open the Serial Monitor and you'll see compass readings start printing out.



Having a hard time seeing the image? Click the image for a closer look.

Examples 4 and 5

A Note on Examples 4 and 5: This library is shared with the SparkX Breakout Board using the same MMC5983MA chip. However, due to the tiny size of this Micro Breakout Board, SPI functionality is not available for the Qwiic Micro Magnetometer. The two SPI examples included with the Arduino Library are for use with the SparkX board only.

Troubleshooting

Need help?

If your product is not working as you expected or you need technical assistance or information, head on over to the SparkFun Technical Assistance page for some initial troubleshooting.

If you don't find what you need there, the SparkFun Forums are a great place to find and ask for help. If this is your first visit, you'll need to create a Forum Account to search product forums and post questions.

Resources and Going Further

Now that you've successfully got your Qwiic Micro Magnetometer up and running, it's time to incorporate it into your own project!

For more information, check out the resources below:

- Schematic
- Eagle Files
- Board Dimensions
- MMC5983MA Datasheet
- GitHub Link
- Library GitHub Link

Need some inspiration for your next project? Check out some of these related tutorials:

Build a Qwiic Jukebox that is Toddler Approved!

Follow this tutorial to build your own custom jukebox. Note, this is designed simple and tough for use primarily with toddlers. It's also a great introduction to SparkFun's Qwiic products!

Getting Started with the Autonomous Kit for the Sphero RVR

Want to get started in robotics? Look no further than the SparkFun autonomous kit for the Sphero RVR! Whether you purchased the Basic or Advanced kit, this tutorial will get you rolling...

SparkFun Qwiic 3-Axis Accelerometer (ADXL313) Hookup Guide

Let's get moving with the SparkFun Triple Axis Digital Accelerometer Breakout - ADXL313 (Qwiic), a low cost, low power, up to 13-bit resolution, 3-axis accelerometer with a 32-level FIFO stack capable of measuring up to ±4g. This hookup guide will get users started reading measurements from the ADXL313, by Analog Devices, with an Arduino microcontroller, Jetson Nano, or Raspberry Pi.

Qwiic Ultrasonic Distance Sensor (HC-SR04) Hookup Guide

Get started with the Qwiic Ultrasonic Distance Sensor!

Or check out some of these blog posts for ideas:

Electronic Campfire

MARCH 4, 2015

Shades of Gray in the 3D Printing Marketplace

FEBRUARY 21, 2018