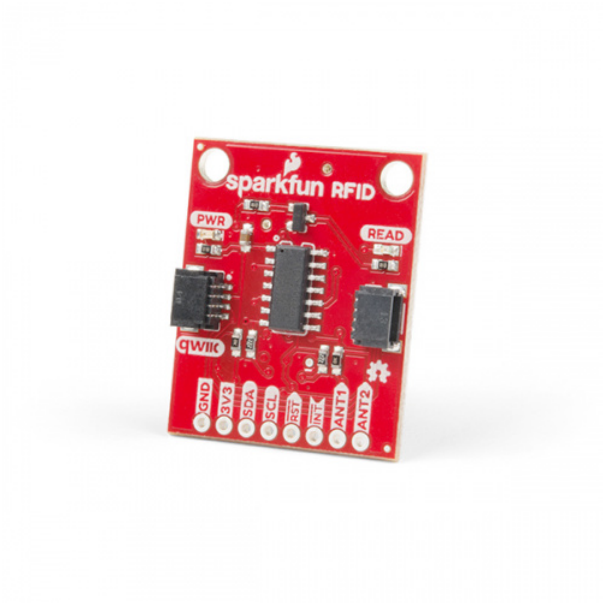
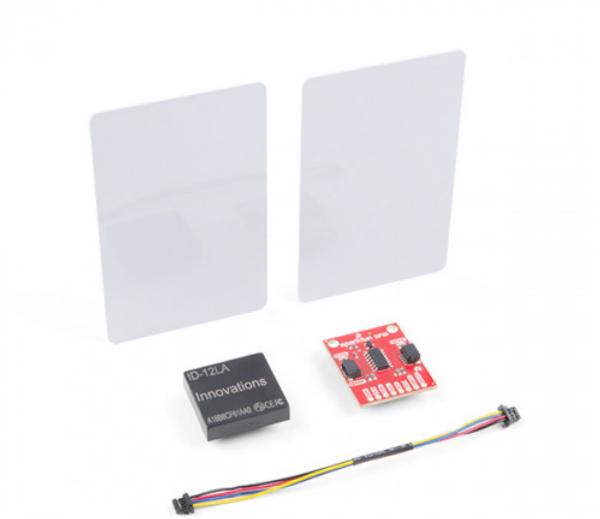
SparkFun Qwiic RFID-IDXXLA Hookup Guide

Introduction

The Qwiic RFID ID-XXLA is an I^{2}C solution that pairs with the ID-LA modules: ID-3LA, the ID-12LA, or the ID-20LA, and utilizes 125kHz RFID chips. Using the product's interrupt pin, we'll discuss how to get, store, and compare unique RFID IDs. Let's take a look at the hardware used for this RFID tutorial.



SparkFun RFID Qwiic Reader
SEN-15191



SparkFun RFID Qwiic Kit

KIT-15209

Product Showcase: SparkFun RFID Qwiic Reader

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.

RFID Reader ID-12LA (125 kHz)
SEN-11827

SparkFun RedBoard Qwiic
DEV-15123

USB micro-B Cable - 6 Foot
CAB-10215

Qwiic Cable - 50mm
PRT-14426

Jumper Wires Premium 6" M/M Pack of 10
PRT-08431

RFID Tag (125kHz)
COM-14325

Heads up! For the scope of the tutorial, we will be using the ID-12LA RFID reader. The board is also compatible with the following **ID-xxLA modules at 125kHz**. The range varies with each model. Keep in mind that you will need to an external antenna for the ID-3LA.

RFID Reader ID-20LA (125 kHz)
SEN-11828

RFID Reader ID-3LA (125 kHz)
SEN-11862

The following **RFID tags** are also compatible with the RFID reader.

RFID Glass Capsule (125kHz)
SEN-09416

RFID Button - 16mm (125kHz)
SEN-09417

RFID Tag (125kHz)
COM-14325

Tools

You will need a soldering iron, solder, and general soldering accessories.

Soldering Iron - 30W (US, 110V)
TOL-09507

Solder Lead Free - 15-gram Tube
TOL-09163

Suggested Reading

If you aren't familiar with the Qwiic system, we recommend reading here for an overview.

Qwiic Connect System

We would also recommend taking a look at the following tutorials if you aren't familiar with them.

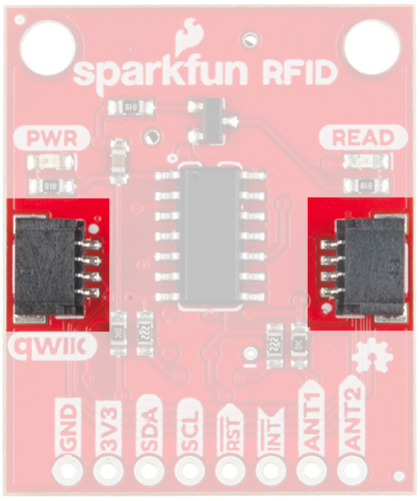
I2C
An introduction to I2C, one of the main embedded communications protocols in use today.

RFID Basics
An overview of Radio Frequency Identification (RFID) technology.

Hardware Overview

Qwiic Connectors

This is a Qwiic product but not a "pure" Qwiic product. You'll still need to solder or connect the interrupt pin if you decide to use that to indicate when an RFID card has been read (more on that later). Outside of that, Qwiic is an eco-system designed for I^2C devices that allows you to prototype quickly without needing to solder anything. Just plug your Qwiic product into a Qwiic capable microcontroller and you're good to go! There are two on this product which means you can daisy chain the product with other I^2C devices, like a Qwiic Keypad for example.

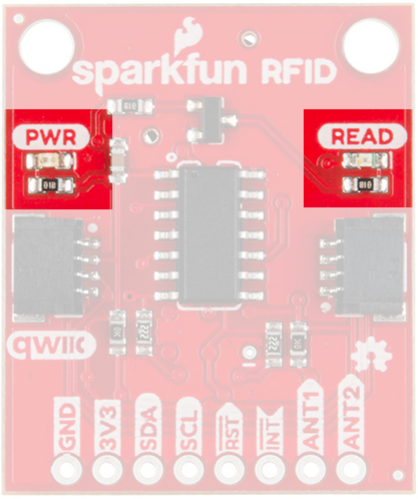


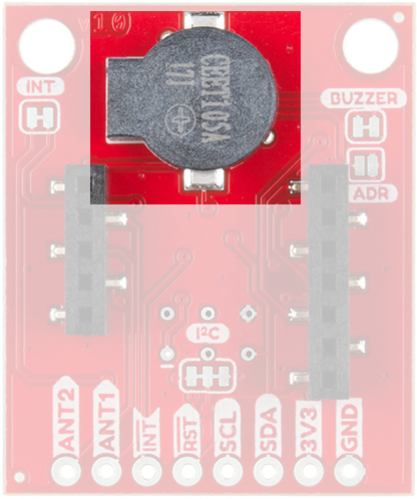
Power

The SparkFun Qwiic RFID ID-xxLA is a **3.3V** system. You can power the product with a Qwiic cable plugged into a capable microcontroller. You can also provide power through the `3V3` pin on the header.

LEDs and Buzzer

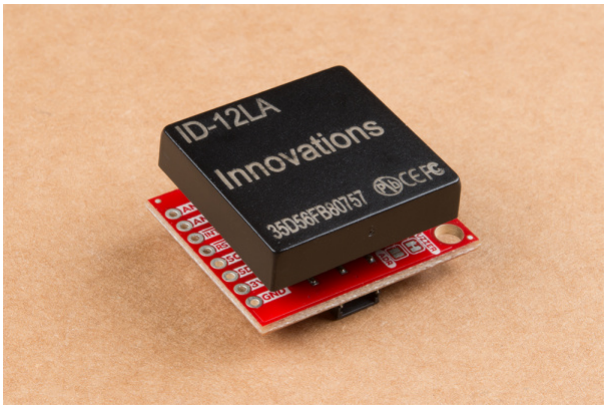
When you provide power to the board you will see the onboard red power LED light up. There's another LED opposite the power LED labeled **READ**. This blue stat LED and the onboard buzzer will light or beep respectively when an RFID tag is brought into range.





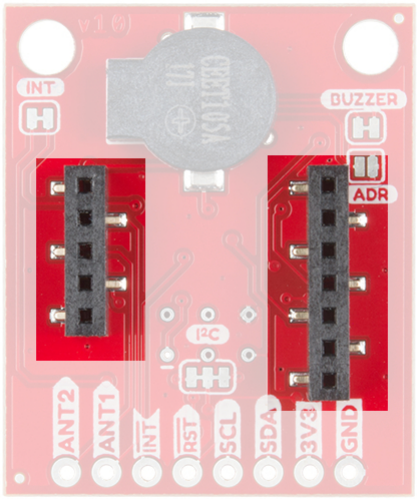
RFID Modules

There are three **ID-xxLA** options in our catalog that are listed above in the Introduction: the ID-3LA, the ID-12LA, and ID-20LA. If you purchased the SparkFun RFID kit then it includes the ID-12LA and RFID cards that you need. Pictured below is the ID-12LA plugged into the Qwiic RFID.



Each option is similar but there is a small variance in power consumption which translates into different read range capabilities. The ID-3LA is designed to be used with an external antenna which will get you 30cm of range. The ID-12LA and ID-20LA have a range of 12cm and 18cm respectively.

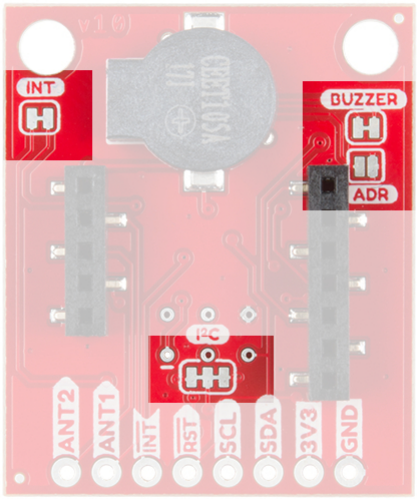
When plugging in your module, just take care that the side with less pins goes into the header with less pins.



Smaller header on the left, larger on the right.

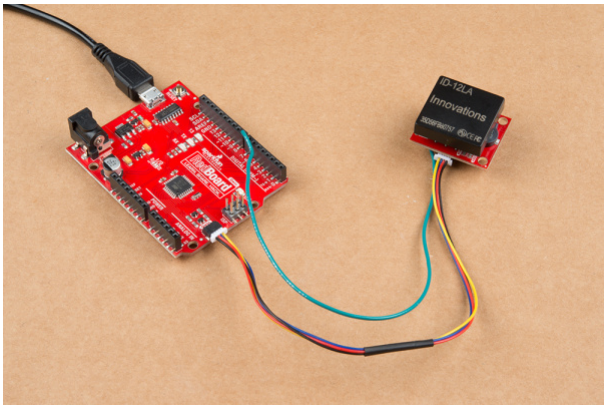
Jumpers

There are *four* jumpers on the header side of the product. Facing the product with the buzzer at the top, you'll see a jumper on the left side labeled `INT`. The interrupt pin can be disconnected here by cutting the trace. Now moving to the bottom near the header is a jumper labeled `I2C` that connects the I^2C pull-up resistors to the I^2C data lines. On the right side is a jumper labeled `Buzzer` that disconnects the buzzer when cut. This will disable the beeping sound when a RFID card is in range. Finally, the `ADDR` jumper allows you to change the default I^2C jumper from **0x7D** to **0x7C**.



Hardware Assembly

Simply insert a Qwiic cable between the RedBoard Qwiic and the Qwiic RFID reader. You will also need to solder wire between the Qwiic RedBoard's pin 8 and the Qwiic RFID reader's INT pin. When you are ready, align the headers of the module with the Qwiic RFID reader.



Note: The Qwiic system has a logic level of **3.3V**. I have attached the interrupt to pin 8 on the Redboard Qwiic even though the pin is at 5 volts. This will not harm the Qwiic RFID because we're doing a simple **digitalRead()** but also because the ATTiny84 is tolerant of voltages up to 5.5V.

Example Code

Note: This example assumes you are using the latest 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.

Let's take a look at the first example code for the SparkFun Qwiic RFID ID-xxLA. You can download all the example code from the GitHub Repo or by clicking the link below.

SPARKFUN QWIIC RFID ID-XXLA (ZIP)

Example 1 - Read Tag

For the scope of the tutorial, let's start at the top of **Example1_ReadTag.ino**. Open the example located in the in the examples folder: **SparkFun_Qwiic_RFID_ID-XXLA** > **Firmware** > **Arduino_Examples** > **Example1_ReadTag** . We use Arduino's I^2C library called Wire. The product's default address is at **0x7D** but can be changed to **0x7C** by closing the **ADDR** jumper. You will also need to adjust the code to reference the `RFID_ADD. TAG_REQUEST` is the size of the RFID tag that we'll request from the Qwiic RFID when the interrupt pin attached to pin 8 goes low.

```
#include <Wire.h>

#define RFID_ADDR 0x7D // Default I2C address
//#define RFID_ADD 0x7C // Close "ADDR" jumper for this address
#define TAG_REQUEST 6

// We'll use a pin attached to the interrupt line to initiate the check for the RFID tag ID.
// Alternately the product can store up to 20 tags.
const int eventPin = 8;

void setup()
{
    // Begin I-squared-C
    Wire.begin();
    Serial.begin(9600);
    Serial.println("SparkFun Qwiic RFID, waiting for RFID to be scanned.");
    pinMode(eventPin, INPUT_PULLUP);// Our pin is active low so let's put it in a known high sta
te.
}
```

In the loop, we're just monitoring the Qwiic RFID's interrupt pin that will indicate that a tag has just been read. Alternately, we could skip this and read it after an arbitrary amount of time to see the different tags that were scanned over some period of time. If you go this route, keep in mind that only 20 tags are stored at a time on the product.

When we read an interrupt, there is a call to the function `checkTagID()` that checks to see what tag has been read.

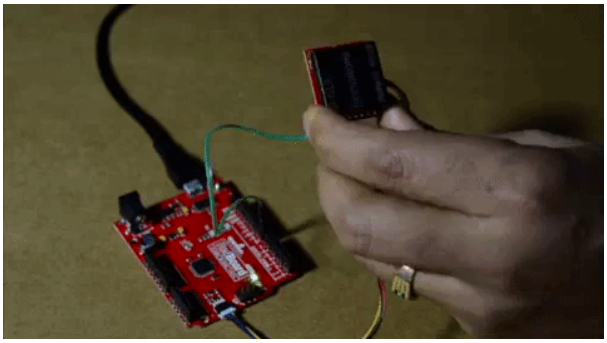
```
void loop()
{
    // When the interrupt pin changes to a LOW state, a tag has been scanned.
    if( digitalRead(eventPin) == LOW ) checkTagID();
    delay(250); // Slow it down
}
```

This is the meat of the code. It's a simple request to the product to hand over the first RFID tag that was scanned. Keep in mind that the product gives tags in the order that they are scanned. Each *scan* is unique because each *tag* that is scanned, gets a time stamp attached to it.

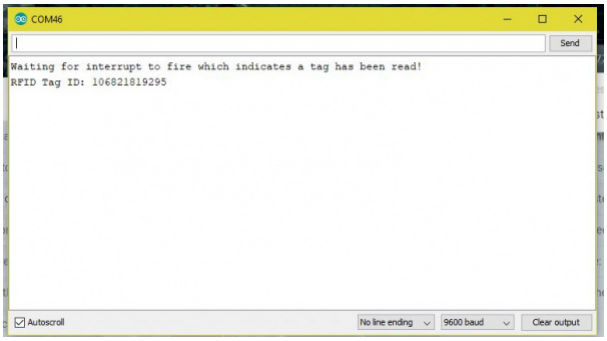
> **Note:** If you want to see example code that gives both the RFID tag and the time between when that tag was requested and when it was scanned, check out **Example 2_ReadTagTime.ino**.

```
// 20 tags can be stored by the product at a time, the first one to be scanned is the first one
// to be pulled from the tag stack. If the tag reads '000000' or the interrupt line never went l
ow
// then there are no new tags waiting to be read.
void checkTagID()
{
  byte tempTag = 0;
  // This variable stores the tag and could easily be a global variable. Just
  // make sure to clear it in between reads.
  String tagID;
    Serial.print("RFID Tag ID: ");
    Wire.requestFrom((uint8_t)RFID_ADDR, TAG_REQUEST);
    for( int x = 0; x < TAG_REQUEST; x++ ) {
    tempTag = Wire.read();
    // Concatenating the bytes onto the end of "tagID".
    tagID += String(tempTag);
  }
  Serial.println(tagID);
}
```

If you have not already, select the board and COM port of your Arduino and upload the **Example1_ReadTag.ino** code. Then open your Serial Monitor at **9600** and scan a tag,



You should see the following:



Resources and Going Further

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

For more information, check out the resources below:

- Schematic (PDF)
- Eagle Files (ZIP)

- Example Code
- GitHub Repo
- SFE Product Showcase

We carry other RFID options. Do you want a *high* powered RFID reader that can simultaneously pick up multiple RFID cards at a time? Perhaps you'd rather a RFID card reader that transmits over serial, check out the options below.

SparkFun Simultaneous RFID Reader - M6E Nano
SEN-14066

SparkFun RFID Starter Kit
KIT-13198

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

SparkFun RFID Starter Kit Hookup Guide
Learn the basics of how to get started with the SparkFun RFID Starter Kit.

Simultaneous RFID Tag Reader Hookup Guide
A basic guide to getting started with the RFID Tag Reader breakout and how to read and write multiple RFID tags over multiple feet!

RFID Basics
An overview of Radio Frequency Identification (RFID) technology.

Or check out this blog post for ideas:

Enginursday: Qwiic Escape Room
MARCH 7, 2019