Tsunami Super WAV Trigger Hookup Guide

Introduction

> **NOTE:** This guide is for the Tsunami Super WAV Trigger **(Qwiic)**. For the previous version of this board, the Tsunami Super WAV Trigger (without a Qwiic connector), please refer to the original Tsunami hookup guide.

> **NOTE:** This can be a relatively complex and overwhelming product for novice users, due to the numerous configuration options that make it so versatile. Novice users, may want to consider the WAV Trigger or MP3 Trigger first.
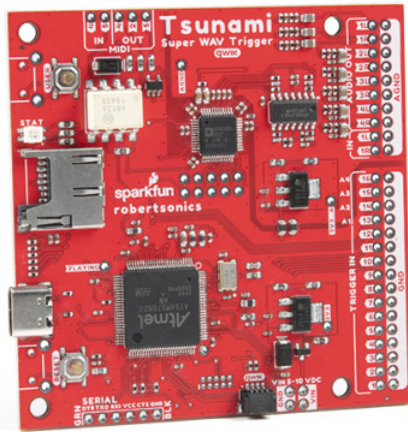

WAV Trigger
○ WIG-13660

MP3 Trigger
◉ WIG-13720

The Tsunami Super WAV Trigger (Qwiic) is a polyphonic WAV file player that was developed in collaboration with Robertsonics *(a portion of each sale goes back to them for product support and development)*. The Tsunami Super WAV Trigger **(Qwiic)** is an improved version of the Tsunami Super WAV Trigger (the bigger brother of the WAV Trigger), which can now, be controlled through the Qwiic connect system.

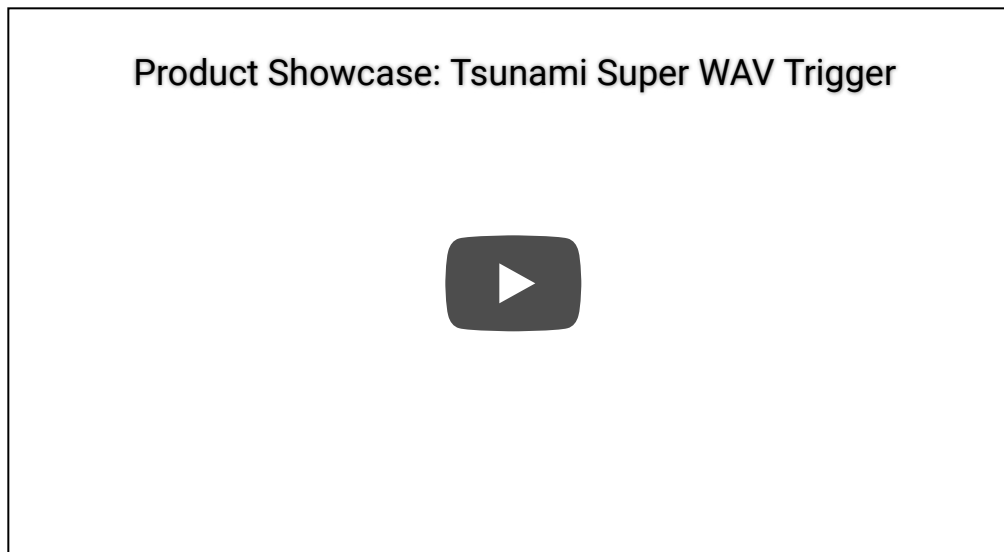# Tsunami Super WAV Trigger (Qwiic)
⊖ WIG-18159

Users familiar with the original Tsunami, will notice a few improvements to the Qwiic Tsunami:

- Input Voltage: 5 - 10V
  - USB-C Connector
- RGB Status LED
- I^{2}C Control
  - Qwiic Connector
- New Audio Codec
- Digital Filters

Comparison Table

	Tsunami WAV Trigger (Qwiic)	**Tsunami WAV Trigger**	**WAV Trigger**
Power - Range: - Inputs:	**5 - 10V** USB-C and PTH	**5 - 15V** micro-B USB and PTH	**6 - 15V** DC Barrel Jack

Tracks
- Number:
- Layer Mixing:
	Up to:
	4096 uncompressed files
	  - 18 stereo WAV files
	  - 32 mono WAV files
		Up to:
		4096 uncompressed files
		  - 18 stereo WAV files
		  - 32 mono WAV files
			Up to:
			2048 uncompressed files
			14 stereo WAV files

Audio Outputs	8-channel (Mono) 4-channel (Stereo)	8-channel (Mono) 4-channel (Stereo)	3.5mm TRRS Audio Jack Speaker connector (PTH) - Mono amplifier
Audio Input	Line-level stereo	Line-level stereo	None

Control			
• Triggers:	16 (3.3V)	16 (3.3V)	16 (5V or 3.3V)
• Serial:	Yes (3.3V)	Yes (3.3V)	Yes (5V or 3.3V)
• Qwiic (I^2C):	Yes (3.3V)	N/A	N/A
Status LED	RGB	Blue	Red
Hot Swap SD Card	Yes (with `RESET` button)	Yes (with `RESET` button)	No
Firmware Updates	via SD card	via SD card	via serial port
MIDI	Dedicated I/O pins	Dedicated I/O pins	Possible via serial port

Product Showcase: Tsunami Super WAV Trigger

Required Materials

The Qwiic Tsunami does need a few additional items, including a **pair of** *(corded)* **headphones**, for users to get started with this tutorial. You may already have a few of these items, including the required USB-C cable, so feel free to modify your cart based on your needs.

> **Note:** For the best results, we recommend **Class 10** SD cards with a **FAT16** or **FAT32** file system format and a 32kB file allocation size. We recommend avoiding:
> - The 1GB SparkX SD Card, from our catalog, since it isn't a Class 10 card and can lead to reliability issues.
> - SD Cards with a capacity larger than 32GB, since it can be difficult to convert them to the **FAT16** or **FAT32** file system format with a 32kB file allocation size.
>
> For more information on compatible SD cards, please check out the Robertsonics website.

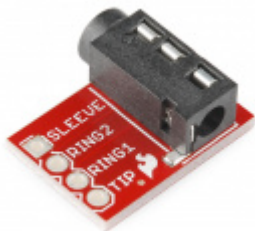Tsunami Super WAV Trigger (Qwiic)

⊘ WIG-18159

microSD Card - 16GB (Class 10)

◉ COM-15051

IC Hook Test Leads

◉ CAB-00501

microSD USB Reader

◉ COM-13004

SparkFun TRRS 3.5mm Jack Breakout

◉ BOB-11570

USB 3.1 Cable A to C - 3 Foot

◉ CAB-14743

There are other additional component options available from our catalog (*click the button below to display*).

ADDITIONAL COMPONENT OPTIONS (TOGGLE)

Arduino Example

For the Arduino example, a RedBoard Qwiic Plus and Qwiic cable are required. There are also alternative part options for this example as well (*click button below to toggle options*).

SparkFun Qwiic Cable Kit

○ KIT-15081

SparkFun RedBoard Plus

○ DEV-18158

USB 3.1 Cable A to C - 3 Foot

◉ CAB-14743

ALTERNATIVE MICROCONTROLLER AND QWIIC PARTS (TOGGLE)

Suggested Reading

Note: Robertsonics has a more detailed about this product on their Tsunami product page. Robertsonics also provides a cross-platform utility for generating Tsunami configuration files and updating the firmware. All of which, can be downloaded from the Robertsonics' Tsunami downloads page.

If you're unfamiliar with serial terminals, jumper pads, or I^2C be sure to checkout some of these foundational tutorials.
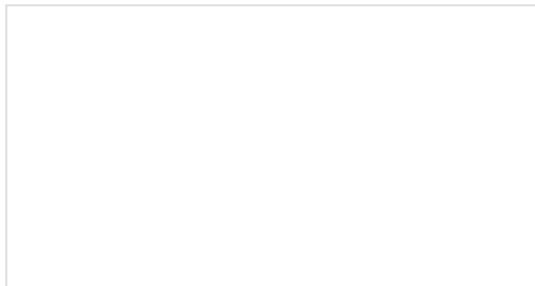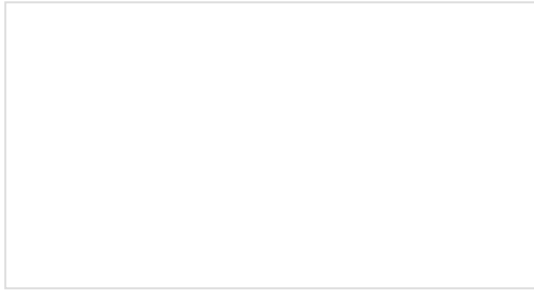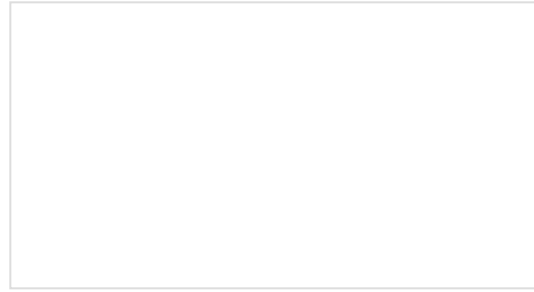

Logic Levels
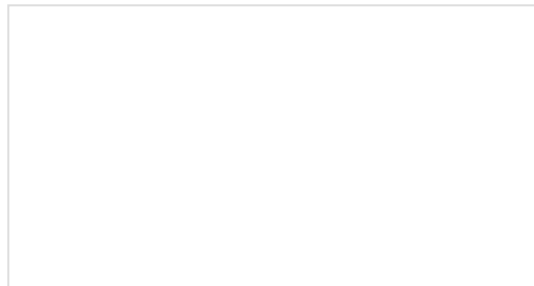
I2C

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

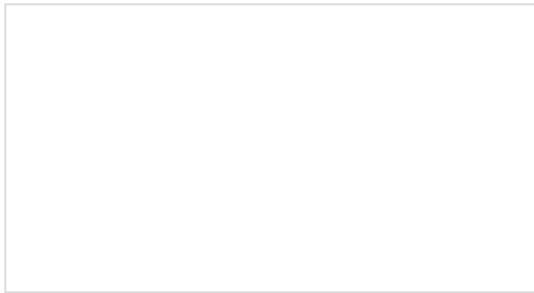An introduction to I2C, one of the main embedded communications protocols in use today.

Analog vs. Digital
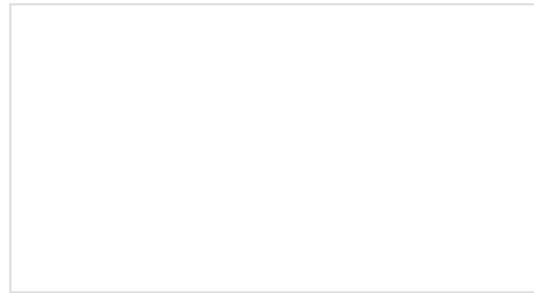This tutorial covers the concept of analog and digital signals, as they relate to electronics.

Serial Terminal Basics
This tutorial will show you how to communicate with your serial devices using a variety of terminal emulator applications.
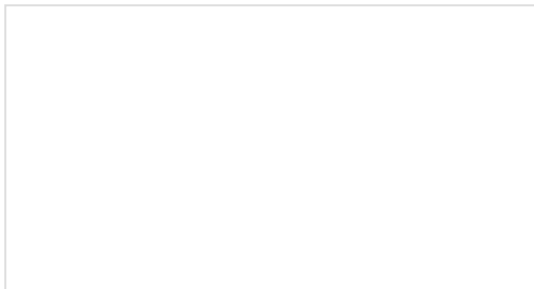
How to Solder: Through-Hole Soldering
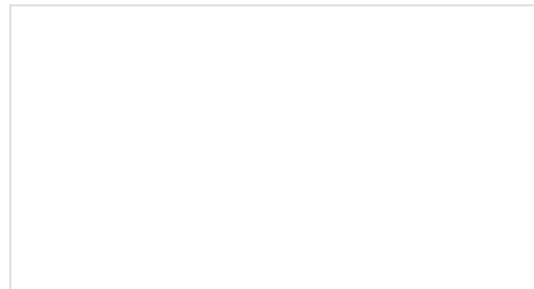This tutorial covers everything you need to know about through-hole soldering.

SD Cards and Writing Images
How to upload images to an SD card for Raspberry Pi, PCDuino, or your favorite SBC.
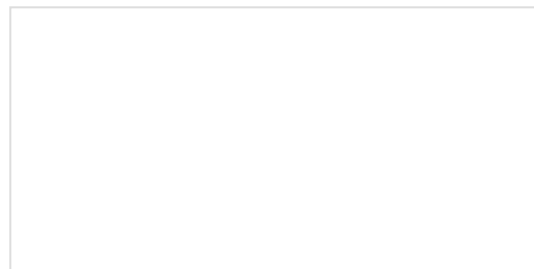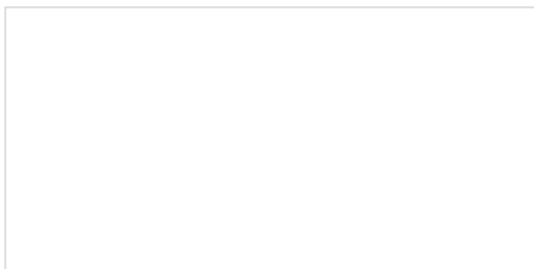
MIDI Tutorial
Understanding the Musical Instrument Digital Interface.

Tsunami Hookup Guide
Hit the ground running with Tsunami, the Super Wav Trigger.

Installing an Arduino Library
How do I install a custom Arduino library? It's easy! This tutorial will go over how to install an Arduino library using the Arduino Library Manager. For libraries not linked with the Arduino IDE, we will also go over manually installing an Arduino library.
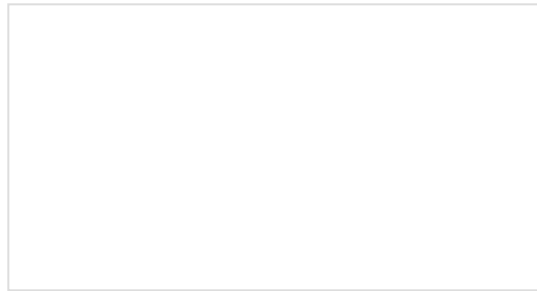
Installing Arduino IDE
A step-by-step guide to installing and testing the Arduino software on Windows, Mac, and Linux.
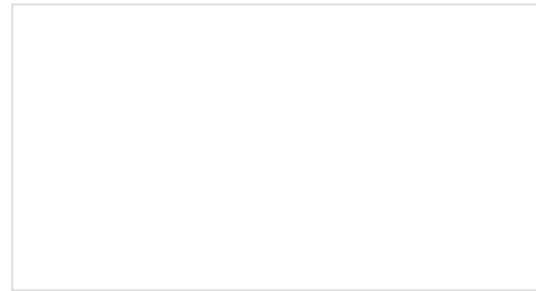
SparkFun Serial Basic CH340C Hookup Guide
SparkFun Serial Basic Breakout takes advantage of USB-C and is an easy-to-use USB-to-Serial adapter based on the CH340C IC from WCH. With USB-C you can get up to three times the power delivery over the previous USB generation and has the convenient feature of being reversable.

RedBoard Plus Hookup Guide
This tutorial covers the basic functionality of the RedBoard Plus. This tutorial also covers how to get started blinking an LED and using the Qwiic system.

The Tsunami Super WAV Trigger also utilizes the Qwiic connect system. We recommend familiarizing yourself with the **Logic Levels** and **I^{2}C** tutorials (above) before using it. Click on the banner above to learn more about our Qwiic products.


SparkFun's Qwiic Connect System

Hardware Overview

Note: For more details on the Tsunami Super WAV Trigger (Qwiic) check out these resources from the Robertsonics website:

- Tsunami User Guide
- Tsunami Product Page and FAQ
- Robertsonics Tutorial Page

Board Dimensions

The dimensions for the Qwiic Tsunami are essentially the same as the original Tsunami. The overall board size is 2.95" x 2.925" (approx. 7.5cm x 7.4cm) and includes four 0.13" mounting holes, which are compatible with standard 4-40 screws.
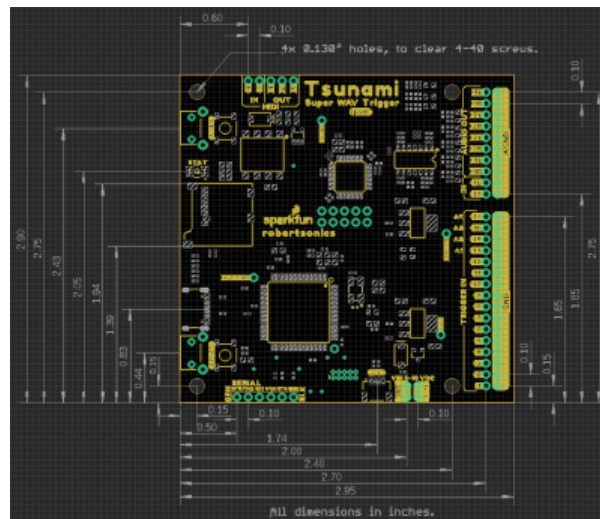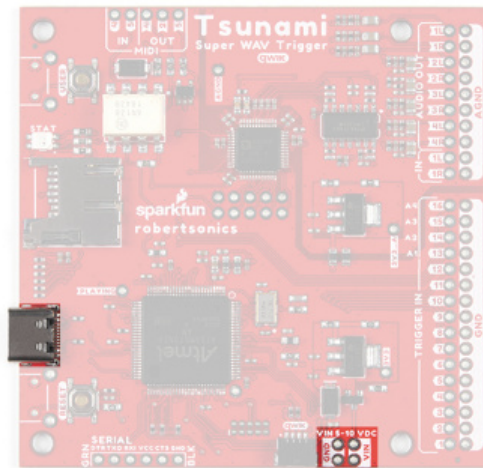

The dimensions for the Qwiic Tsunami. (Click to enlarge)

Power

WARNING: The input voltage on the Qwiic Tsunami is limited to **5 - 10V**; while the original Tsunami had a voltage range up to 15V. Users swapping or replacing boards should be aware of this change; exceeding the input voltage range will damage the board permanently.

There is a status LED to help make sure that the Qwiic Tsunami is getting power. On the Qwiic Tsunami, users can power the board through either the **USB-C connector** or the power **breakout pins** (VIN and GND). We recommend users power the board through the USB-C connector.

The power connections on the Qwiic Tsunami. (Click to enlarge)

The input voltage range for the power pins is **5V - 10V**, but we recommend providing a **5V** supply. The current draw from the Qwiic Tsunami is approximately 220mA (at 5V) at idle with an SD card inserted. When playing audio files, the current draw increases. *(When testing, playing a single* `.wav` *file to a mono (single) channel output, the current draw spiked just past 240mA.)*

By default, the board's power is isolated from the *polarized* **Qwiic connector** system. Although it isn't recommended, users can modify the `3V3_Qwiic` jumper to draw power from the Qwiic connector *(see jumper section below)*. The Qwiic system is meant to run on 3.3V, be sure that another voltage is NOT used with the Qwiic system.

Polyphonic Engine

The operation of the polyphonic engine on the Tsunami is proprietary to Robertsonics. While we can't go into exact details on how the board works, here are some highlights of the board:
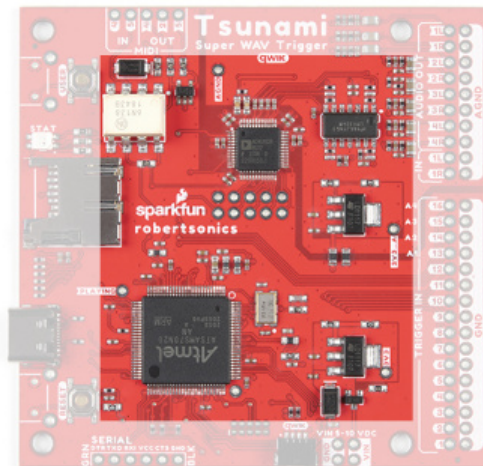
The primary polyphonic engine components of the Qwiic Tsunami. (Click to enlarge)

- Supports up to 4096 uncompressed 16-bit, 44.1kHz mono or stereo WAV files – CD quality
- Polyphonic – Play and mix 32 mono or 18 stereo tracks independently and simultaneously

- Dynamic routing to 8 mono or 4 stereo outputs
- Seamless looping over arbitrary track length
- Independent real-time volume and playback rate control per output
- Pause and resume individual or groups of tracks
- Minimal trigger-to-sound delay: 8 msecs typ, 12 msecs max
- Trigger inputs can be individually inverted and set to be edge, latched, or level sensitive
- Dedicated MIDI I/O
  - Assign individual MIDI notes to specific outputs, with individual looping control
  - Outputs provide independent real-time playback rate control and MIDI Pitch Bend
  - MIDI Velocity-sensitive triggering of up to 4096 tracks, adjustable attack and release times
- Line-level stereo audio input
- Output volumes adjustable from +10dB to -70dB
- Firmware track fades (attacks & decays)
- Extensive serial and I^{2}C control *(Default I^{2}C address: **0x13**)*
- Reset button allows changing SD cards without power-cycle
- Firmware updates from µSD card. No additional hardware required

For more details, users can checkout the Tsunami product page on the Robertsonics website.
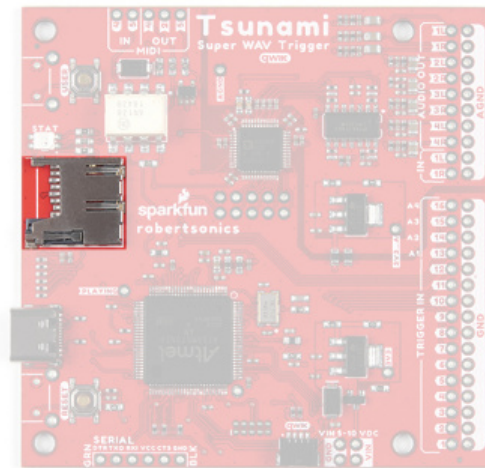
µSD Card Slot

> **Note:** For the best results, we recommend **Class 10** SD cards with a **FAT16** or **FAT32** file system format and a 32kB file allocation size. We recommend avoiding:
> - The 1GB SparkX SD Card, from our catalog, since it isn't a Class 10 card and can lead to reliability issues.
> - SD Cards with a capacity larger than 32GB, since it can be difficult to convert them to the **FAT16** or **FAT32** file system format with a 32kB file allocation size.
>
> For more information on compatible SD cards, please check out the Robertsonics website.

A µSD card is used store the audio `*.wav` files and initialization `tsunami.ini` file *(optional)* for the Qwiic Tsunami. The µSD card slot contains a spring-loaded locking mechanism:

- Insert the card and press in to lock the card into the slot.
- Press in to unlock and remove the card from the slot.

The µSD card slot on the Qwiic Tsunami. (Click to enlarge)

Buttons

There are two buttons available on the Qwiic Tsunami.

- `RESET` : Used to reset (reinitialize) the board after an SD card has been inserted.
- `USER` : Used to update the firmware from the SD card.
    1. Hold the `USER` button down
    2. Insert SD card with new firmware `tsunamix.hex` file (can have normal operation `*.wav` and `*.ini` files)
    3. Press `RESET` button
    4. Wait for successful firmware update status indicator before releasing the `USER` button
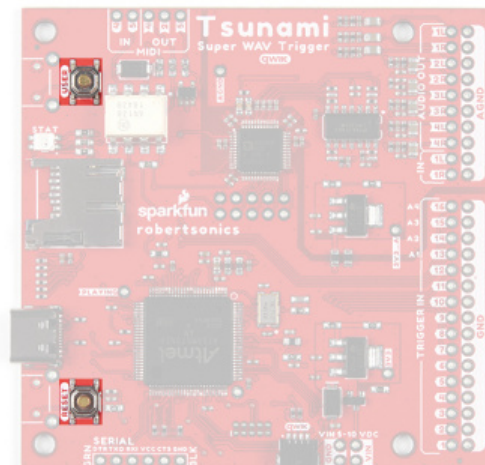
The `RESET` and `USER` buttons on the Qwiic Tsunami. (Click to enlarge)

Status LED

New on the Qwiic Tsunami is the RGB status indication LED.
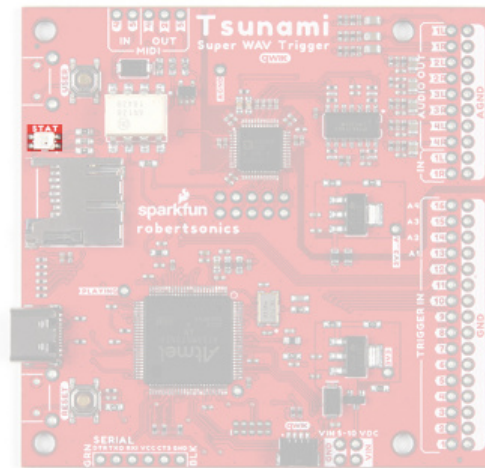
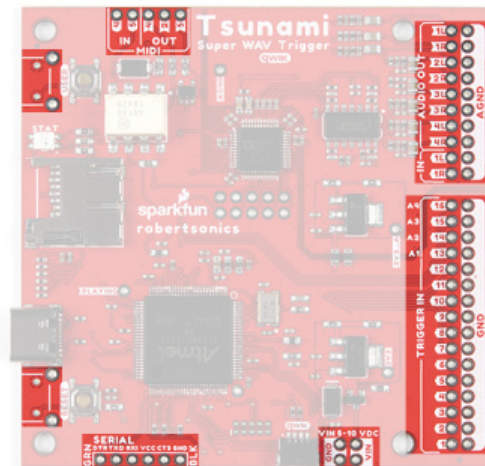*The RGB status LED on the Qwiic Tsunami. (Click to enlarge)*

Along with this improvement is a whole list of status indicators for users:

- After SD card is inserted and Tsunami is reset:
    - µSD card found and formatted correctly: 3 short green blinks, then idle state
    - Error Codes:
        - No µSD card: One long blue, then idle state
        - µSD card format error (card installed but can't read FAT): One long red, one short, then idle state
        - Audio hardware initialization error: One short red, repeats forever (continuous fast blinking red)
- During normal operation:
    - System idle state: 1 very short blue (flash) every 3 seconds.
    - Audio playing: Solid green.
    - Error Codes:
        - Stereo wave file is triggered with the mono firmware, or a mono wave file is triggered with the stereo firmware: 1 long red
- Bootloader operation (Updating firmware):
    - Firmware successfully updated: Solid green
    - Error Codes: *(All bootloader blink codes, except success, repeat forever)*
        - No µSD card: One long blue, repeats (slow blinking blue.)
        - µSD card format error (card installed but can't read FAT): One long red, one short red, repeats
        - No firmware hex file found, or incorrect file contents: One long red, two short reds, repeats
        - Flash write error (hardware error): One short red, repeats (fast blinking red.)
        - Firmware successfully updated: Solid green.

Breakout Pins

> **Note:** All the trigger, serial control, and button pins operate with **3.3V** logic. Do not provide 5V to any of these pins; it will permanently damage the board. The exception to this are the MIDI pins, which are opto-isolated.

There are a lot of breakout pins on the Qwiic Tsunami. While we won't cover them all, we'll discuss the pins with major functionality that users would normally interface with.

The breakout pins on the Qwiic Tsunami. (Click to enlarge)

Power Input

While we normally recommend that users power the Qwiic Tsunami through the USB-C connector, there are four power input pins on the bottom of the board for users, who wish to permanently attach an external power source. The input voltage range is **5 - 10V**, but we recommend providing a **5V** supply.
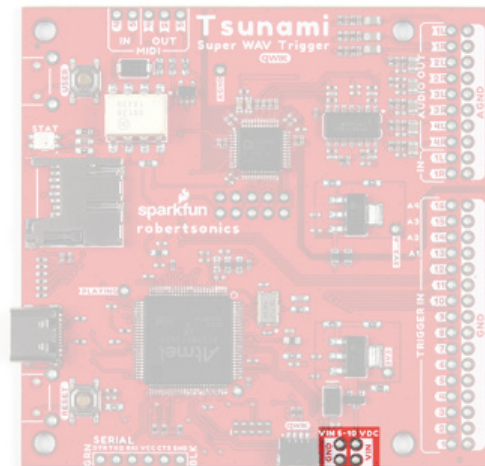
The power input pins on the Qwiic Tsunami. (Click to enlarge)

Audio Pins

The audio pins support up to 7.1 channel surround sound (or 8 mono channels) output and stereo (or 2 mono channels) line-level input.
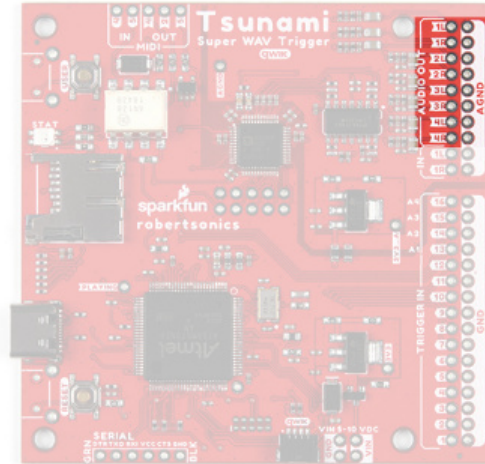
Output Channels

> **Note:**
> For impedance matching the audio output channels, the impedance of the speakers or amplifiers should be above **3.8kΩ**.

There is significant frequency roll off at the ends of the high and low range of the audio output channels. Extended use in these ranges can potentially damage the audio codec chip.

The audio output channels can be configured as stereo or mono outputs. By default, the factory programmed firmware on the Qwiic Tsunami only supports mono `.wav` file playback and audio output channels will act independently as eight mono outputs. For the best results, users should be hooking up the audio outputs to an amplifier or *active* speakers, which include an internal amplifier.

The audio output pins on the Qwiic Tsunami. (Click to enlarge)

Input Channels

There are two line-level inputs on the Qwiic Tsunami. The inputs have capacitors to negate any DC offsets and are compatible with $1.1V_{PP}$ signals.
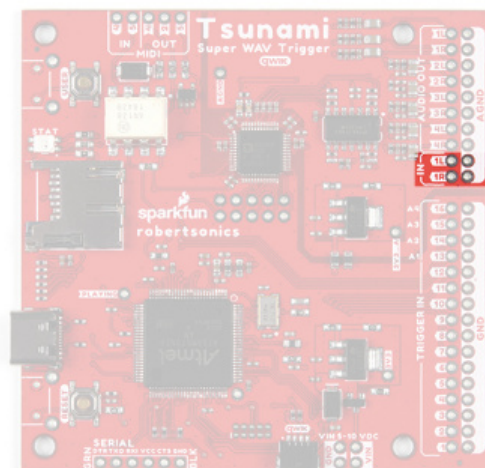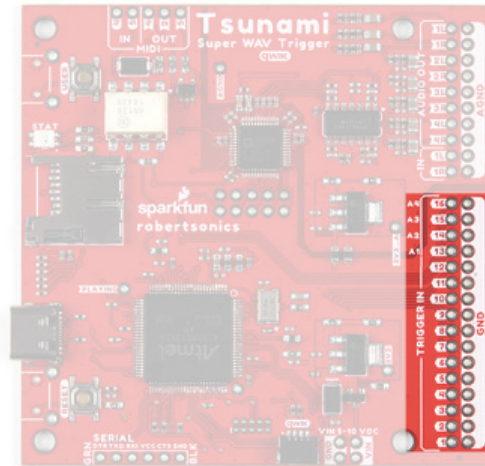

The audio input pins on the Qwiic Tsunami. (Click to enlarge)

Trigger Pins

> **Note:** Any inputs to the Qwiic Tsunami must use **3.3V** logic-levels; otherwise, users risk permanently damaging their board.

The trigger pins are the primary inputs for the Qwiic Tsunami. They can be configured to trigger various actions on the Qwiic Tsunami. By default, the 16 trigger pins are active-high and are triggered by pulling the pins low.
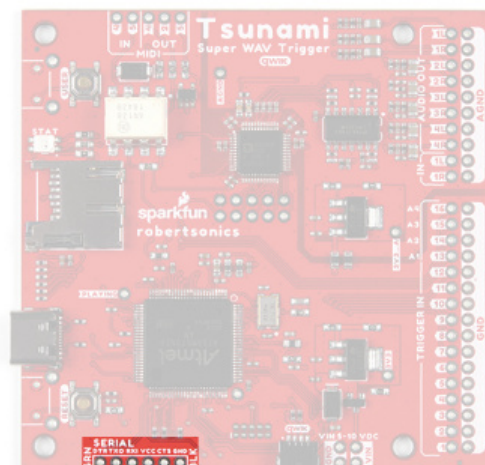

The trigger pins on the Qwiic Tsunami. (Click to enlarge)

Serial Control

> **Note:** Any inputs to the Qwiic Tsunami must use **3.3V** logic-levels; otherwise, users risk permanently damaging their board.

Users have the option of controlling the Qwiic Tsunami through the serial pins. Users can directly connect a USB-to-serial UART bridge like the Serial Basic Breakout or they can connect a microcontroller like the RedBoard Qwiic Plus.

MIDI Pins

> **Note:** The MIDI pins are the only exception to the 3.3V logic-level input voltage, as the pins are opto-isolated. Therefore, the pins can directly interface with the 5V logic levels of the MIDI standard.

The Qwiic Tsunami can be connected with MIDI controllers and instruments; users only need to solder the pins to a 5-pin DIN connector. For more details, users can checkout the Tsunami User Guide and tutorial on the Robertsonics website.
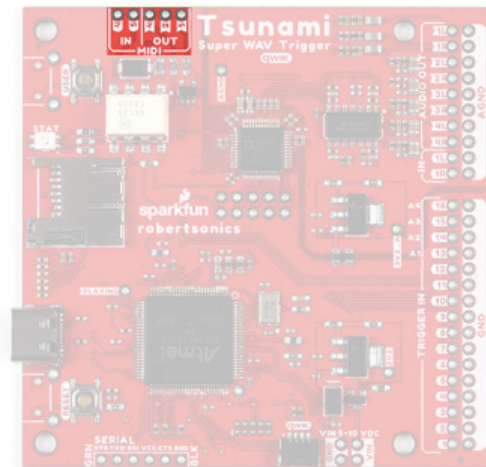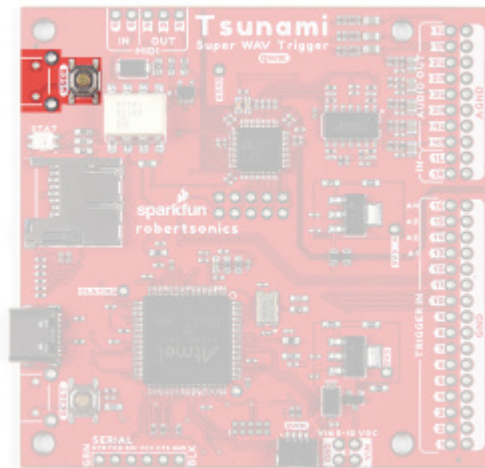

The MIDI interface pins on the Qwiic Tsunami. (Click to enlarge)

Buttons

There are two PTH breakouts for the two user buttons. These allow users to solder on their own right-angle buttons for a panel mounted operation.
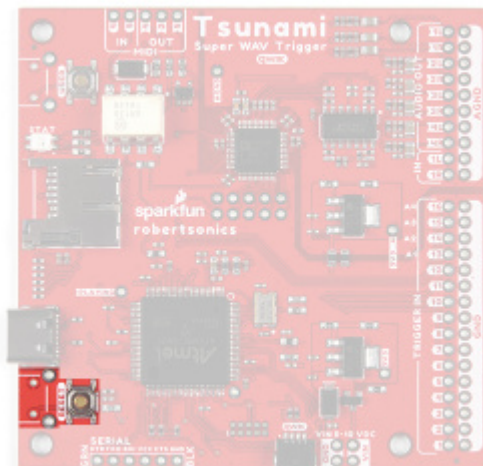
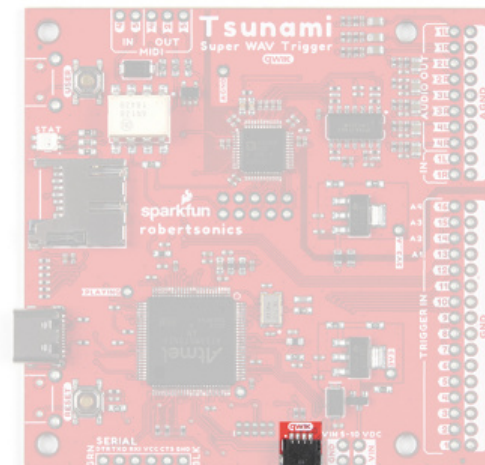*The reset breakout pins on the Qwiic Tsunami. (Click to enlarge)*

The user breakout pins on the Qwiic Tsunami. (Click to enlarge)

Qwiic Connector

> **Note:** By default, the board's power is isolated from the Qwiic connector system. Although it isn't recommended, users can modify the `3V3 Qwiic` jumper to draw power from the Qwiic connector. The Qwiic system is meant to run on **3.3V**, be sure that another voltage is NOT used with the Qwiic system.

New for the Qwiic Tsunami, users can now control the board through the an I²C protocol. The polarized Qwiic connector allows users to easily interface with the Qwiic connect system. The Qwiic Tsunami's default I²C address is **0x13** (7-bit).
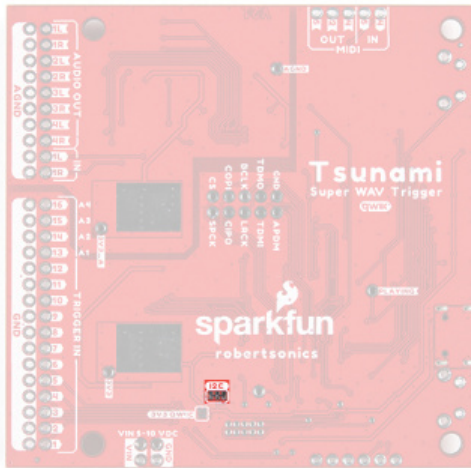

The Qwiic connector on the Qwiic Tsunami. (Click to enlarge)

I²C Jumpers

There are two jumpers on the Qwiic Tsunami:

- I2C
- 3V3_Qwiic

Cutting the `I2C` jumper will remove the **2.2kΩ** pull-up resistors from the I^{2}C bus. If you have many devices on your I^{2}C bus you may want to remove these jumpers.

The I^{2}C pull-up resistor jumper on the Qwiic Tsunami. (Click to enlarge)

By default, the board's power is isolated from the Qwiic connector system. Bridging the `3V3_Qwiic` jumper allows users to connect the board's power to the **3.3V** input voltage of the Qwiic connect system.
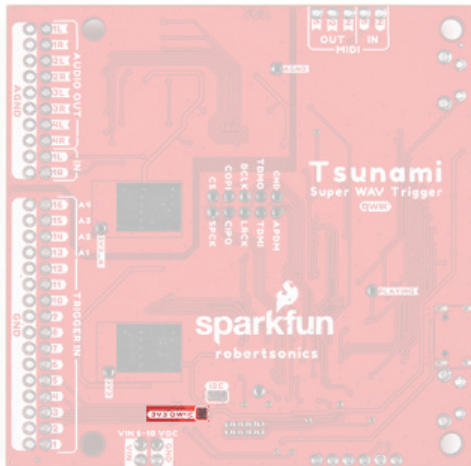
The 3.3V power jumper on the Qwiic Tsunami. (Click to enlarge)

Prepare the µSD Card

Format the µSD Card

> **Note:** For the best results, we recommend **Class 10** SD cards with a **FAT16** or **FAT32** file system format and a 32kB file allocation size. We recommend avoiding:
> - The 1GB SparkX SD Card, from our catalog, since it isn't a Class 10 card and can lead to reliability issues.
> - SD Cards with a capacity larger than 32GB, since it can be difficult to convert them to the **FAT16** or **FAT32** file system format with a 32kB file allocation size.

The μSD card is an integral part of the Qwiic Tsunami's operation. In order for the μSD card to be compatible with the Qwiic Tsunami:

- A **FAT16** or **FAT32** file system must be used
- The file allocation size must be **32 kilobytes**

For a *brand new card*, formatting may not be necessary. However, if users experience the Qwiic Tsunami missing commands, making occasional strange buzzing sounds, or sometimes crashing, then the file allocation size may be incorrect. The *Quick Format* option in the Windows operating system is the usually the simplest method to properly format the μSD card.
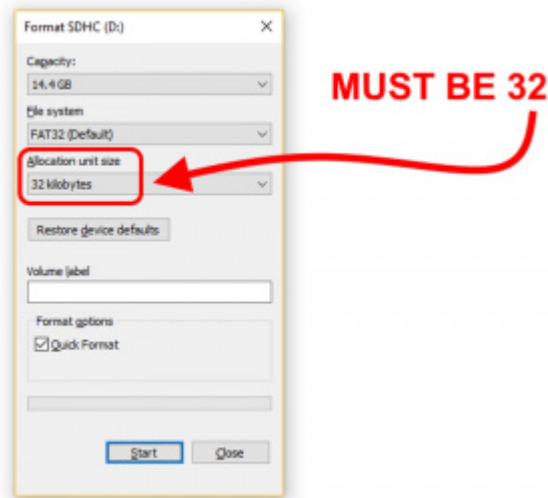
The format settings for a μSD card with a Windows operating system. (Click to enlarge)

μSD Card Contents

The contents of the μSD card are the key to how the Qwiic Tsunami operates. There are two types of files that the firmware on the Qwiic Tsunami will utilize: audio `*.wav` files and a `tsunami.ini` initialization file. The firmware on the Qwiic Tsunami, by default, is configured to operate in the following manner:

1. Default firmware operation *(filenames matching the trigger inputs, will output on the first audio output channel `1L`)*.
2. If there is a `tsunami.ini` file on the μSD card on reset, the Qwiic Tsunami will operate on its configuration content.
3. Any additional changes via I2C or serial commands then take precedence over the initialization file.

Audio Files

The Qwiic Tsunami is designed to playback `*.wav` audio files from the μSD card. However, the `*wav` files must be compatible with the firmware on the Qwiic Tsunami.

- The audio format of `*.wav` files must be compatible with the firmware on the Qwiic Tsunami.
    - By default, the Qwiic Tsunami is factory programmed with the mono audio firmware and will only work with `*.wav` files in mono audio format.
- The filenames if the `*wav` files must follow the naming convention utilized by the firmware for the Qwiic Tsunami to trigger the audio playback.

Audio File Format

The Qwiic Tsunami plays `*.wav` files recorded at 16-bit resolution, with a 44.1kHz sampling rate. Different firmware images allow for the playback of stereo or mono files. The Qwiic Tsunami also requires that the files not contain any additional header information. Some audio recording programs, such as Pro Tools, write additional information at the start of the file. An easy way to remove the unnecessary header information is to utilize Audacity. Users can use this software to export a file as *WAV (Microsoft) signed 16-bit PCM* and clear out the metadata containing the header infromation *(i.e. title, artist, genre, etc.)*.

The following video gives a brief demonstration of the Audacity export process.


Exporting from Audacity to Tsunami. (Click to enlarge)

> **Note:** For users curious about the header contents, Rail John Rogut has written the Header Investigator application, which can display Pro Tools region information and BWF time stamps. This extra data might be meaningful to DAW applications, but Tsunami doesn't use the information.

Naming Convention

The filenames contain the trigger input mapping for the Qwiic Tsunami. Each file should start with a three-digit number, which will assign it to a corresponding trigger input.
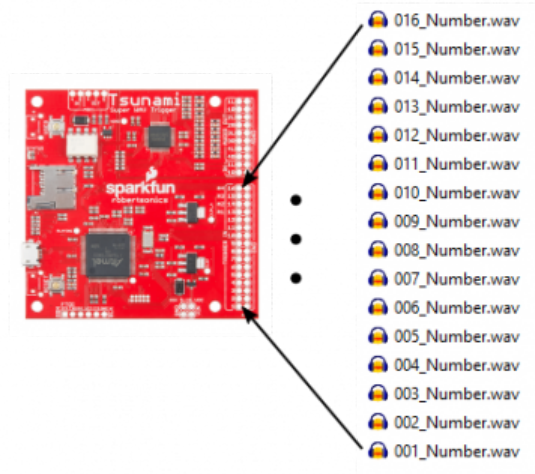
Example of a filename trigger mapping. (Click to enlarge)

In the example above, the firmware on the Qwiic Tsunami will correspond the filenames of the 16 files numbered 001 to 016 to each of the trigger inputs by default. The triggered `*.wav` files would be output on the first audio channel (`1L`).

Initialization File

Note: When creating an intialization `*.ini` file with the configuration tool, users should make sure to select the proper settings for the firmware on the Qwiic Tsunami. By default, the Qwiic Tsunami factory programmed firmware is configured for the **mono** setting and the configuration tool settings should match the image below:
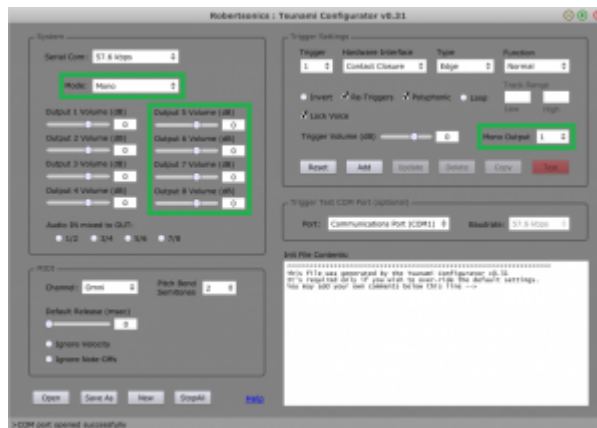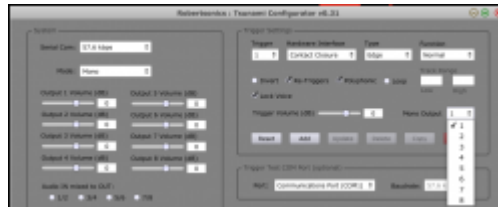

. (Click to enlarge)

Below is a comparison of the configuration tool appearance between the mono and stereo settings. Users will notice that some of the audio channel output options are greyed-out in the stereo setting.

*The **stereo** setting option for the configuration tool. (Click to enlarge)*

*The **mono** setting option for the configuration tool. (Click to enlarge)*

There is also an initialization file, `tsunami.ini`. The Qwiic Tsunami reads this file when it starts, to gather more details about how it should configure the trigger inputs. The `*.ini` files can be generated and edited using the Tsunami Configurator application. The files contain readable ASCII text, which can be created or edited with a text editor.

Tsunami configuration tool. (Click to enlarge)

More information about the configuration tool can be found in the Tsunami user guide.

Firmware

The firmware on the Qwiic Tsunami, by default, is configured to operate in the following manner:

1. Default firmware operation *(filenames matching the trigger inputs, will output on the first audio output channel `1L`)*.
2. If there is a `tsunami.ini` file on the µSD card on reset, the Qwiic Tsunami will operate on its configuration content.
3. Any additional changes via I2C or serial commands then take precedence over the initialization file.

Updating the Firmware

When necessary, users can easily update the firmware by saving the file to the µSD card. The latest firmware for the Qwiic Tsunami can be found on Robertsonics website. The file name needs to be changed to `tsunami.hex` for the bootloader to upload the new firmware. Once the files is saved onto the µSD card, users need to follow the following procedures to update the firmware on the board:

1. Hold the `USER` button down
2. Insert SD card with new firmware `tsunamix.hex` file (can have normal operation `*.wav` and `*.ini` files)
3. Press `RESET` button
4. Wait for successful firmware update status indicator before releasing the `USER` button
   - When the status LED is a solid green, the firmware update is complete.
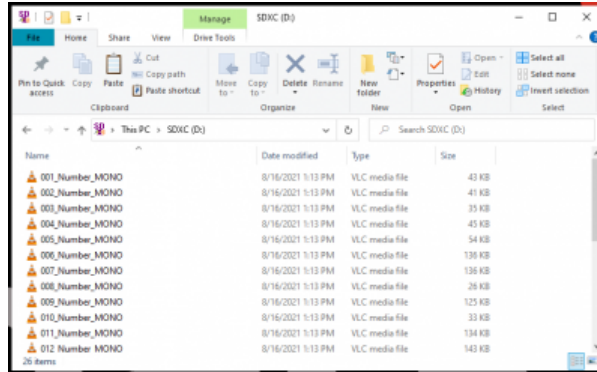
Example Files

For the examples in the following section, users will need to prepare their card with the demonstration files we provide.

1. Download the example files using the link below.

<div style="border:1px solid #ccc; padding:10px; text-align:center; width:300px;">

DEMO TSUNAMI FILES (.ZIP)

</div>

2. Unzip the folder and put the files on the root directory of the card.
3. Verify the files on the µSD card.

Files on the card

Hardware Assembly

Basic Operation

The basic operation of the Qwiic Tsunami only requires the use of the trigger pins to interact with the board. For the example in the next section, users must insert their configured µSD card with `*.wav` files and connect their headphones to the Qwiic Tsunami.

Inserting the µSD Card

Inserting the µSD card, prepared from the previous section, is straight forward. The µSD card slot contains a spring-loaded locking mechanism:

- Insert the card and press in to lock the card into the slot.
- Press in to unlock and remove the card from the slot.

The inserting an µSD card into the Qwiic Tsunami.
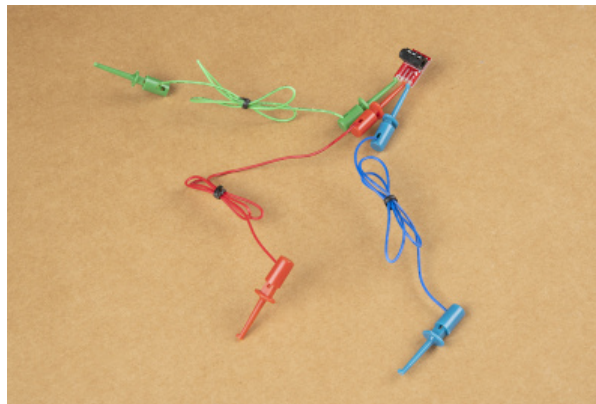
Connecting the Headphone Jack

> **Note:** If users experience problems with the audio output to their headphones, there are different headphone connector standards that might be the issue. If that is the case, users only need to swap the connection from `SLEEVE` pin on TRRS 3.5mm breakout board to the `RING2` pin.

Two of the more common variations of the headphone jack connection standards. (Click to enlarge)
Source: quora.com

This part of the guide will demonstrate how to temporarily connect a pair of headphones to the audio output channels of the Qwiic Tsunami with the IC hook cables. Connect the TRRS 3.5mm jack breakout board to the Qwiic Tsunami, as illustrated below:

- Connect three of the IC hook cables to the `TIP`, `RING1`, and `SLEEVE` pins on the TRRS headphone jack breakout board.

Attaching the IC hooks to the TRRS headphone jack breakout board. (Click to enlarge)
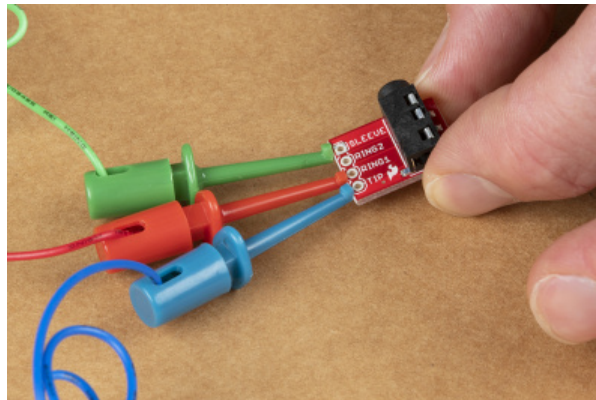
A close up of the IC hooks connected to the pins of the breakout board. (Click to enlarge)

- Connect the other end of the cables to the `1L`, `1R`, and `GND` audio output pins of the Qwiic Tsunami.
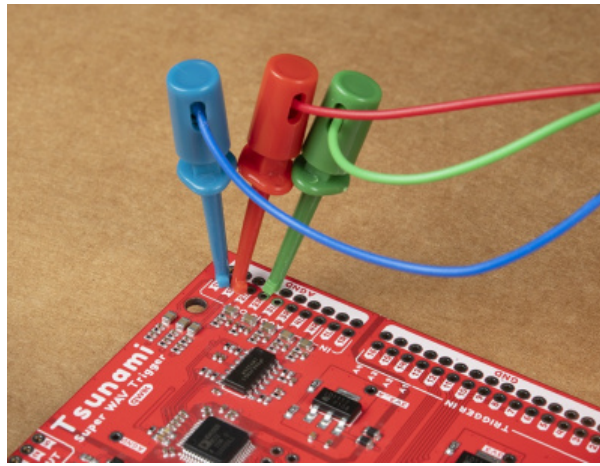
Attaching the IC hooks to the audio output channels of the Qwiic Tsunami. (Click to enlarge)

Below, is a table summarizing the cable connections between the Qwiic Tsunami's pins and the TRRS 3.5mm jack breakout board's pins:

	Qwiic Tsunami	TRRS Breakout Board
Cable 1	1L	TIP
Cable 2	1R	RING1
Cable 3	AGND	SLEEVE

Finally, users will need to connect their headphones to the TRRS 3.5mm jack breakout board. The overall hardware assembly should resemble the image below:
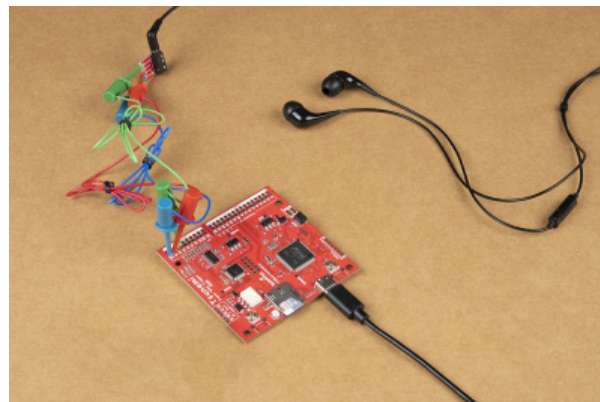

Completed assembly with headphones attached and the Qwiic Tsunami powered through a USB cable. (Click to enlarge)

For a more permanent solution, users can solder the boards together with hook-up wire.

## Assembly for Arduino (Qwiic) Example

The assembly for the example in the Arduino library section is similar to the previous assembly. Users only need to connect their RedBoard Plus to the Qwiic Tsunami with a Qwiic cable. The RedBoard Plus should also be connected to their computer with a USB cable.
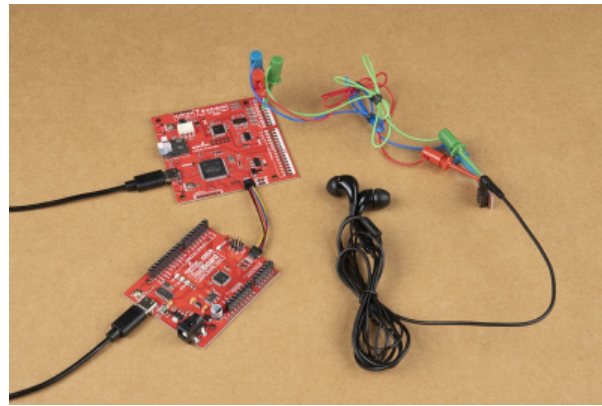
The assembly for the Arduino library example, with the Redboard Plus connected to the Qwiic Tsunami. (Click to eleagre)

MIDI

Users interested in connecting the Qwiic Tsunami to other MIDI devices will need to solder the MIDI pins to a 5-pin DIN connector. For more information, users can check out the original Tsunami hookup guide, our MIDI tutorial, and the Tsunami user guide.
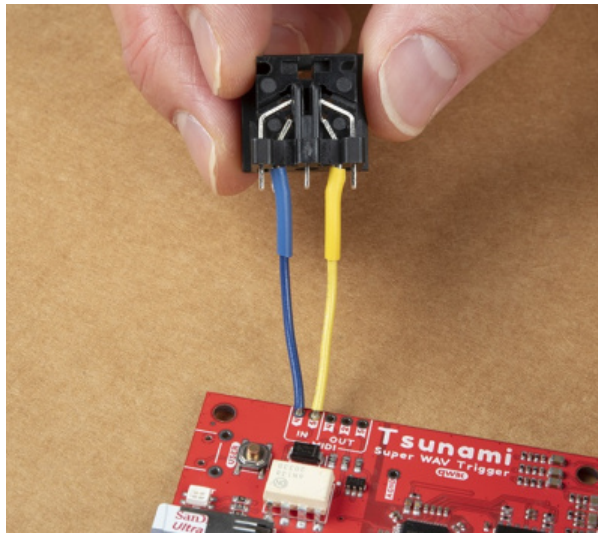
Attaching a MIDI connector to the Qwiic Tsunami. (Click to enlarge)
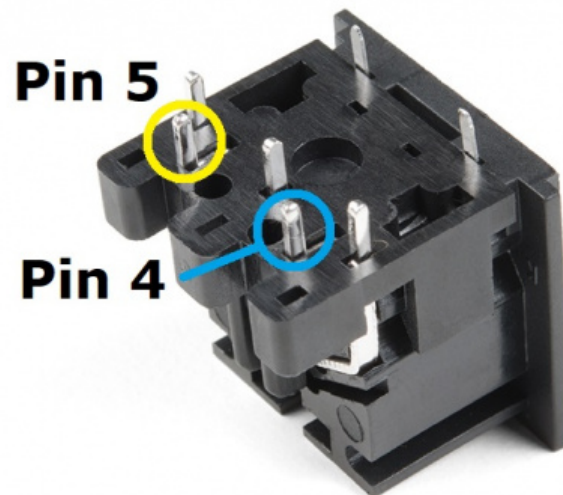
A close up of the MIDI connector pins. (Click to enlarge)

Basic Operation Example

> **Note:** The default firmware is for mono channel operation; therefore, users should only expect audio ouput on one side of their headphone. Users can use the configuration tool to create an initialization file to modify the default operation.
>
> If users experience problems with the audio output to their headphones, there are different headphone connector standards that might be the issue. If that is the case, users only need to swap the connection from `SLEEVE` pin on TRRS 3.5mm breakout board to the `RING2` pin.
>
>
>
> *Two of the more common variations of the headphone jack connection standards. (Click to enlarge)*
> *Source: quora.com*

The simplest way to utilize the Qwiic Tsunami is with the trigger pins. The trigger pins are active-high by default; therefore, the pins need to be shorted to ground for the board to react. As a simple demonstration, use one of the IC hook cables to bridge a trigger input to the corresponding ground pads:
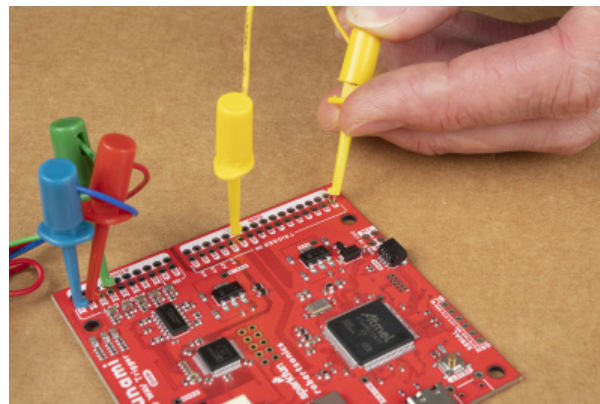
Triggering the Qwiic Tsunami to play a `*.wav` file. (Click to enlarge)

Once the wire makes contact, users should hear a sound on the output on one side of the headphone. The provided demonstration `*.wav` files are recordings of someone reciting the number of the trigger input. Users should also see the status LED illuminate green while a file is playing.

In a more permanent installation users could connect momentary switches, like this large push button.

Arduino Libraries and Example

Arduino Libraries

The Qwiic Tsunami is a unique product, in that two different Arduino libraries are available to control the board. For more information on how to install an Arduino library in the Arduino IDE, check out our tutorial below.
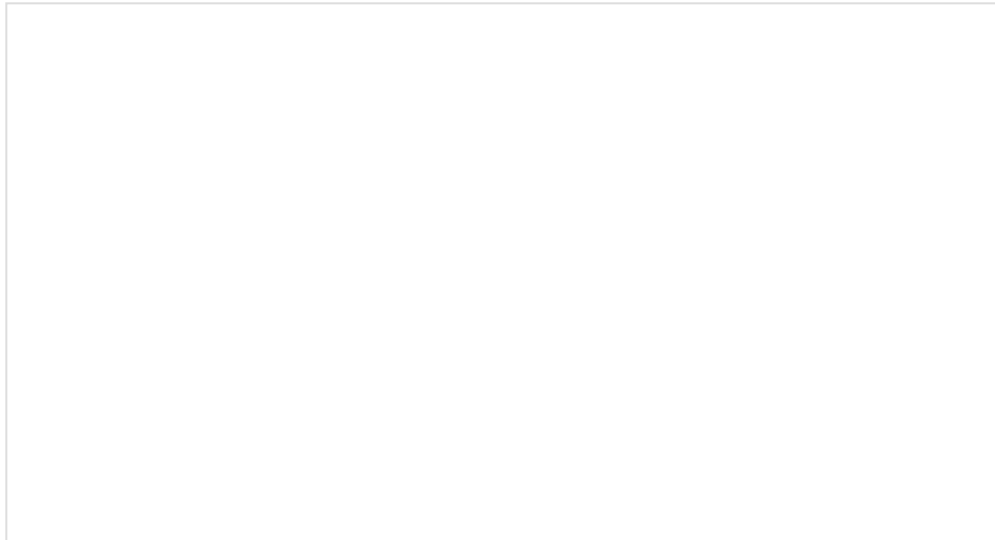
Installing an Arduino Library
JANUARY 11, 2013

How do I install a custom Arduino library? It's easy! This tutorial will go over how to install an Arduino library using the Arduino Library Manager. For libraries not linked with the Arduino IDE, we will also go over manually installing an Arduino library.

Serial Control

As with the original Tsunami, the Qwiic Tsunami can also be controlled from the serial connection with the Tsunami Arduino serial library. For more details on how to utilize this library, please refer to the Tsunami user guide and tutorial, which are available on the Robertsonics website.

DOWNLOAD THE TSUNAMI ARDUINO SERIAL LIBRARY

I^{2}C (Qwiic) Control

Unlike the original Tsunami, the Qwiic Tsunami now has a Qwiic connector; and therefore, the board can be controlled with I^{2}C, through the Qwiic connect system, using the SparkFun Tsunami Qwiic Arduino library.
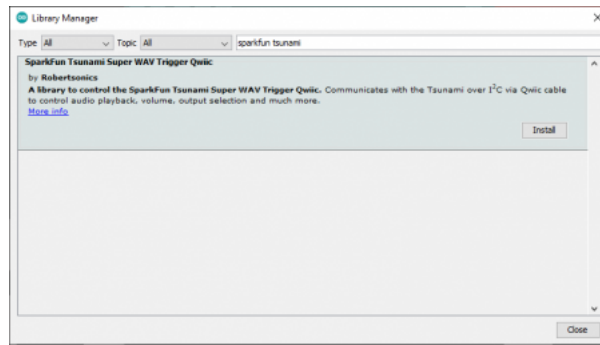
*The **SparkFun Tsunami Qwiic Arduino Library** in the Arduino library manager. Click to enlarge)*

Users can install this library through the Arduino Library Manager. Search for **SparkFun Tsunami Qwiic Arduino Library** and you should be able to install the latest version. Users who prefer manually downloading the libraries from the GitHub repository, can download it here:

<div align="center">

DOWNLOAD THE SPARKFUN TSUNAMI QWIIC ARDUINO LIBRARY

</div>

The utilization of this library mimics the serial control version to allow users to easily transition between the two. For more details on how to use this library, users can check out the documentation from the serial control library and the Tsunami user guide.

Tsunami Qwiic Arduino Library Example

Note: If users experience problems with the audio output to their headphones, there are different headphone connector standards that might be the issue. If that is the case, users only need to swap the connection from `SLEEVE` pin on TRRS 3.5mm breakout board to the `RING2` pin.

*Two of the more common variations of the headphone jack connection standards. (Click to enlarge)*
Source: quora.com

Once you've got the Qwiic version of the library installed, open the **Example 01 PlayFile** sketch. You can find it under

```
File > Examples > SparkFun Tsunami Super WAV Trigger Qwiic > Examples
```

Then load it onto your RedBoard Plus or Uno. Open your favorite Serial Terminal to see the debug output and trigger the board to reset.

- Users should hear the *"track 1"* `*.wav` file play on one side of the headphones.
- Users should also see the status LED illuminate green while a file is playing.
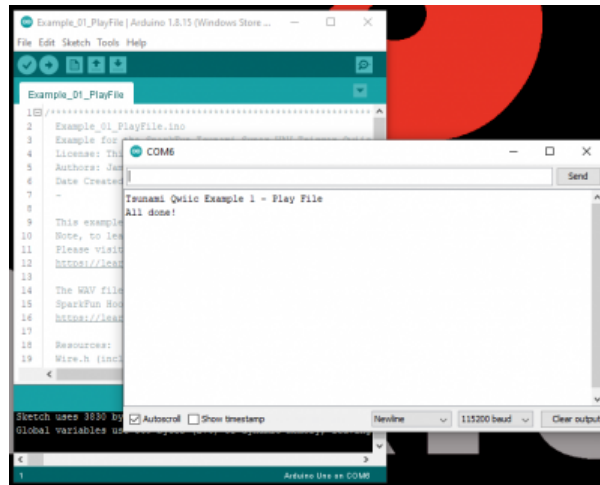
Running the Arduino library example. (Click to enlarge)

Feel free to try other examples as well to get a better understanding of the library operation.

Troubleshooting Tips

Below, we have also included some troubleshooting tips for issues that you may come across.

1. One of our employees compiled a great list of troubleshooting tips based on the most common customer issues. This is the perfect place to start.
2. For any Arduino IDE specific issues, we recommend starting with their troubleshooting guide.

The latest information on the Qwiic Tsunami can be found on the Robertsonics website; including instructions for serial control and MIDI implementation. Other useful resources include:

- Tsunami User Guide
- Tsunami Product Page and FAQ
- Robertsonics Tutorial Page
- Latest Firmware Downloads Page

For users looking for technical assistance, click on the link. There you will find, basic troubleshooting tips and instructions to get started with posting a topic in our forum. Our technical support team will do their best to assist you.

Resources and Going Further

For more information on the Tsunami Super WAV Trigger (Qwiic), check out the links below:

- Board Dimensions
- Schematic
- Eagle Files
- Tsunami User Guide
- Tsunami Downloads Page
- Tsunami Arduino Serial Library
- SparkFun Tsunami Qwiic Arduino Library
- Python Library (Special Thanks to Nicholas Hayeck!)
- GitHub Hardware Repo
- Product Showcase Video

For more inspiration, check out theses other audio related tutorials:
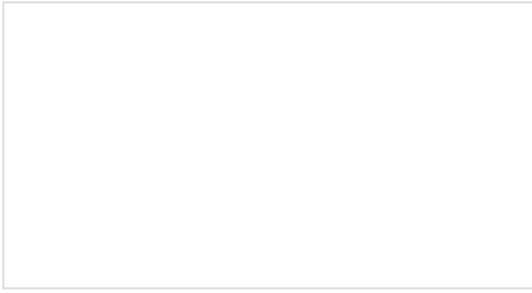
Getting Started with the LilyPad MP3 Player
The LilyPad MP3 Player is an amazing little board that contains almost everything you need to play audio files. You can use it to create all kinds of noisy projects, from MP3 hoodies to talking teddy bears. Your imagination is the only limit! This tutorial will help you get started.
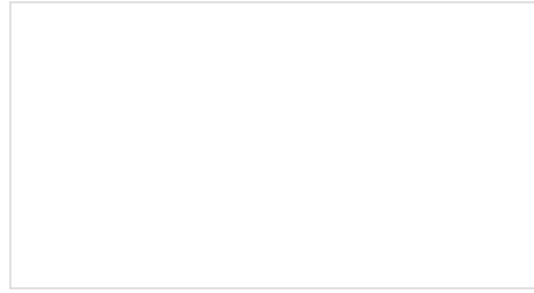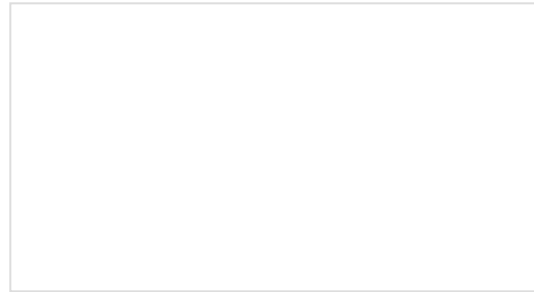
Touch Potentiometer Hookup Guide
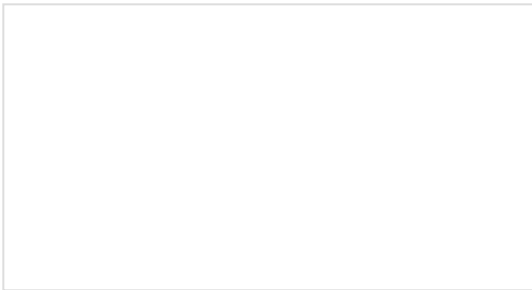Learn how to use the SparkFun Touch Potentiometer to control lighting, volume or other inputs in your daily life.
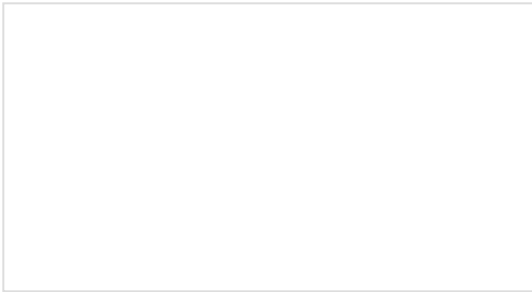
Si4703 FM Radio Receiver Hookup Guide
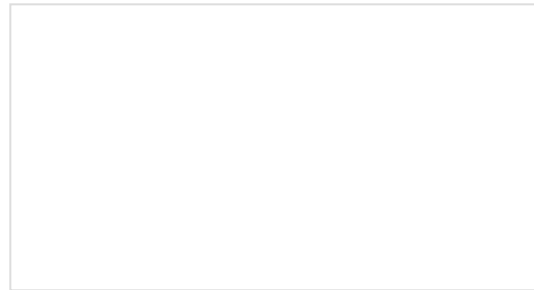Add some tunes to your project with the Si4703 FM Radio Receiver Breakout.

micro:bit Educator Lab Pack Experiment Guide
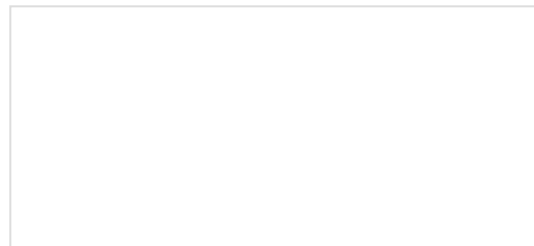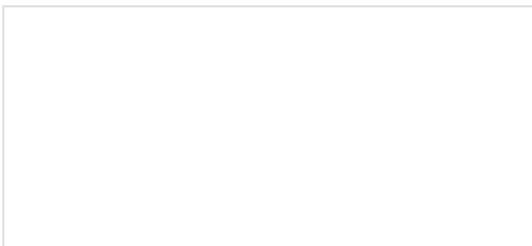A quickstart guide for the micro:bit educator lab pack.

Proto Pedal Assembly and Theory Guide
Getting started with the SparkFun Proto Pedal. We'll assemble the board, then discuss some of the details of the circuit.

Clap On Lamp
Modify a simple desk lamp to respond to a double clap (or other sharp noise) using parts from the SparkFun Inventor's Kit v4.0.

Vibe-O-Matic 3000
We attempt to emulate a car seat to ease a baby to sleep.

Papa Soundie Audio Player Hookup Guide
Add sound effects to your project, prop or costume with Papa Soundie Audio Player.