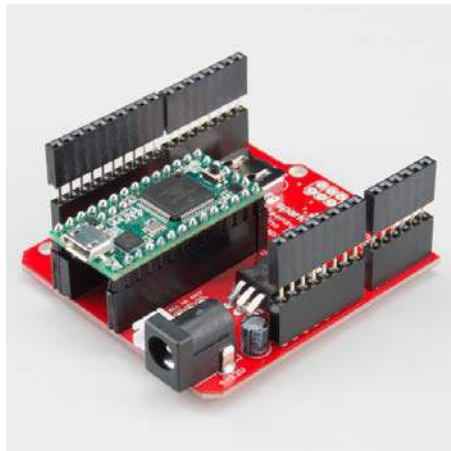sparkfun

Teensy Arduino Shield Adapter Hookup Guide

Introduction

The Teensy Arduino Shield Adapter is a useful tool for upgrading existing projects to a more powerful controller. If you have an Arduino shield you'd love to use, but prefer working with the Teensy, then this product is just what you need!

Materials Required

To follow along with this tutorial, we recommend you have access to the following materials.

Teensy Arduino Shield Adapter Wishlist SparkFun Wish List	
Tool Kit - Beginner TOL-13086 This assortment of tools is great for those of you who are new to sold…	
USB microB Cable - 6 Foot CAB-10215 USB 2.0 type A to micro USB 5-pin. This is a new, smaller connector f…	
Teensy 3.1 DEV-12646 The Teensy is a breadboard-friendly development board with loads of…	

Suggested Reading

If you aren't familiar with the following concepts, please review them before

beginning to work with the Teensy Arduino Shield Adapter.

- Getting Started with the Teensy
- Installing the Arduino IDE
- How to Power Your Project
- Battery Technologies
- How to Solder
- Working with Wire
- Arduino Shields

Hardware Overview

There are several features on the Teensy Adapter Shield to be aware of. While this shield provides basic Arduino compatibility with a standard shield, there's a few other fun features to check out.

Teensy Compatibility

The adapter design interfaces with all features of the Teensy 3.1, but the adapter fits the Teensy LC footprint as well. Not all of the features available on the adapter are compatible with the LC due to the microcontroller's limitations. Please check the datasheets to ensure functionality for your project to determine the best Teensy for your use case.

Real Time Clock Battery

The battery holder included for the shield allows the users to install this into a project and run the RTC (Real Time Clock) on the Teensy as a time keeping option. The included coin cell battery outputs 3V and will power the RTC in case of system power loss to maintain accurate time.

This feature does not work with the Teensy LC.

JST Power Connector

This connector breaks out the 3.3V power line from the Teensy. You can power external devices off of this using a JST jumper wire, or you can solder wires directly to this connection instead.

This header can also be used as a power input to both the Teensy and the Arduino footprint and is **not** regulated down. The voltage supplied on the connector must be 3.3V.

You must cut the VIN/VUSB jumper on the bottom of the Teensy if you intend to power the Teensy via this connection and use USB for communication/programming.

Barrel Jack

The barrel jack allows the user to power the Teensy and Shield combo using a wall adapter or any power supply with a male barrel jack. This voltage can be anywhere from 4-12V, and is regulated to 5V for powering the Teensy. This power supply connects directly to VRAW on the Arduino shield footprint and is not regulated down. Please read the datasheet for any shields you intend to connect to via the adapter shield.

You must cut the VIN/VUSB jumper on the bottom of the Teensy if you intend to power the Teensy via this connection and use USB for communication/programming.

I^{2}C Jumpers

The two solder jumpers included on the adapter allow the user to configure the I^{2}C lines on the board. The adapter ships with the jumpers closed by default, connecting the `SDA` and `SCL` pins of the Teensy to pins `A4` and `A5` on the Arduino footprint respectively. If you have an Arduino Leonardo-compatible shield, you can swap this jumper to isolate the SDA and SCL lines on the same-named pins, and access `A6` and `A7` of the Teensy on `A4` and `A5` of the Arduino footprint. `A4` and `A5` of the Teensy will still connect to the Arduino footprint `SDA` and `SCL`.

ICSP Header

The ICSP header breaks out the SPI pins for Leonardo-compatible shields. You can also use this header to reprogram the Teensy if you have an AVR programmer.

Additional Analog Pins
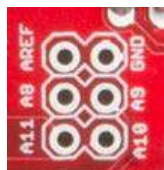
Just because you're using the Teensy with an Arduino shield doesn't mean you want to lose the extra features of the Teensy! We've broken out additional analog pins 8-11 from the Teensy to a 6-pin header, along with `AREF` and `GND`. These pins do not interact with the Arduino shields at all, and are simply a bonus for external sensors or inputs if desired.

DAC Pin Header

One of the other great features of the Teensy is the onboard Digital-to-Analog converter. We've broken this pin out to the board's edge, along with the `PROG` pin, and two corresponding `GND` pins.

Hardware Assembly

So you've got a bag of parts and are ready to get your Teensy interfaced with your Arduino shields. It's time to bust out that soldering iron!

We're going to solder the adapter together in order of smallest profile to largest. This will help make it easier to reach all the soldering points with the iron, as well as make it easier to line all the items up properly.

Battery Holder
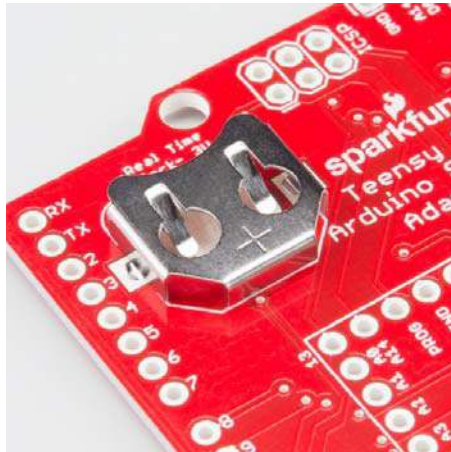
First, insert the battery holder and ensure it is sitting flush on the board. Flip the adapter over, and solder the connectors. Keep in mind that the battery clip is all metal and will conduct heat, so don't burn yourself!

Because the battery clip will endure a lot of strain on battery insertion or removal, you want to make sure you fully connect the pins to the board. Make sure your solder points look nice and filled in, like this:
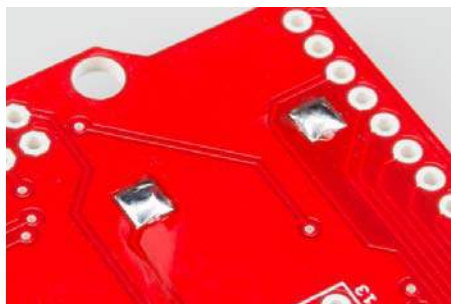

Capacitor

The next component to solder is the capacitor. The cap is polarized, so make sure you insert it correctly into the board. The negative side of the cap should be inserted closest to the barrel jack footprint.

Once you insert the cap, bend the legs out a bit to hold the capacitor flush against the board while you solder it.
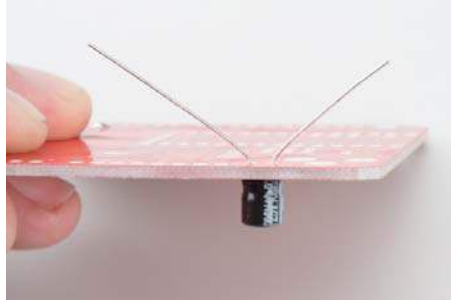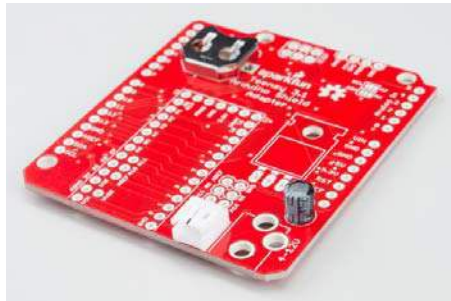

Once you've soldered the capacitor legs, clip any excess leg.
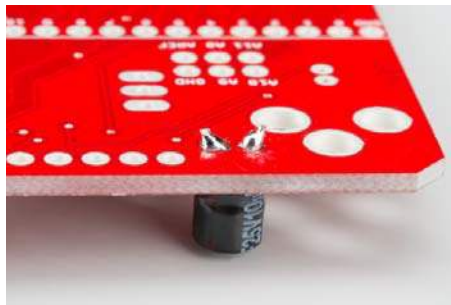
JST Connector

Next, insert the JST connector. This part tends to need a bit of a push to insert fully into the board, so make sure you get it sitting flush before soldering. Make sure the opening on the connector sits along the board edge and isn't inserted backwards.

Voltage Regulator

The voltage regulator does tend to be a bear to insert properly, so take your time with this step. First insert the regulator legs into the board. Make sure the regulator is inserted in the correct orientation, with the metal tab towards the ICSP header on the board and the plastic body casing closest to the JST connector.
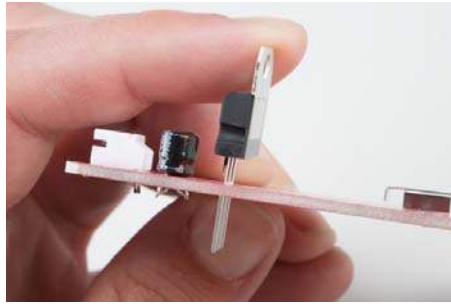
Proper orientation of voltage regulator from the side view.

Once you've verified the regulator is oriented correctly, but before soldering, bend the regulator down towards the PCB. The mounting hole on the regulator should match up with the mounting hole on the PCB.

Solder the regulator legs and clip any excess. This part does regulate the project voltage, so make sure to get a good solder connection on all the pins and ensure there are no jumpers or clippings that could short the board.


Female Headers for Teensy

At this point, you will need to determine how you want your adapter shield to interface with your Teensy and your Arduino shields. The steps shown are our recommended method of interfacing everything, but you can customize this. Please check our tutorial on Getting Started with the Teensy to see other possible configurations.

Take the female headers from your kit, and cut them down into individual strips to fit in the Teensy footprint. Plug in the headers, and verify that they line up well. You may also need to use one of the 6-pin female headers on the short edge of the Teensy footprint.
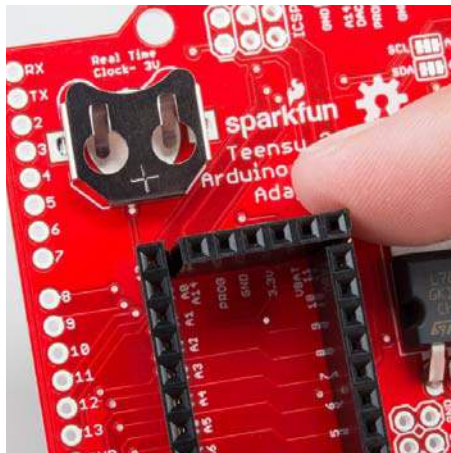
If you have gaps between the headers like shown above, you may need to file down the edges of the connectors to get everything to fit compactly. Start soldering the header rows one at a time. To help keep them straight as you solder, we recommend tacking the first and last solder points first.
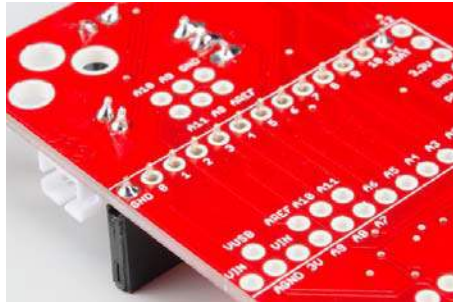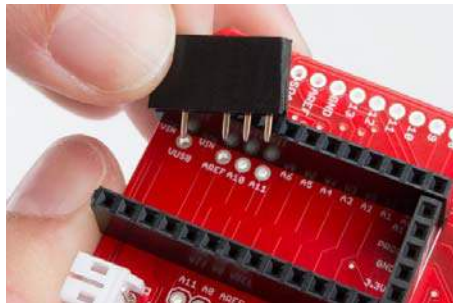

Notice the first and last headers are tacked down.

This allows you to easily fix any poorly inserted or angled headers that may occur.
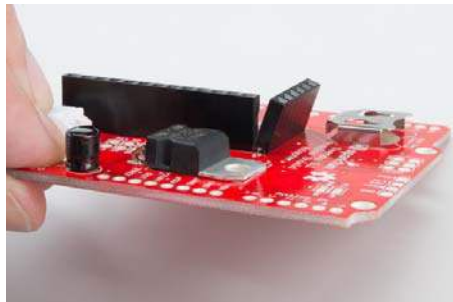

These headers will never do!

If you have decided to solder all of the Teensy pins, you will also need to solder in the inner row of headers on the shield.

Shield Headers

Next, solder on the 10-pin, 8-pin, and 6-pin headers onto the Adapter board. To make sure you line these headers up properly, we recommend using a pre-soldered shield as a soldering jig to hold the adapter headers in place.
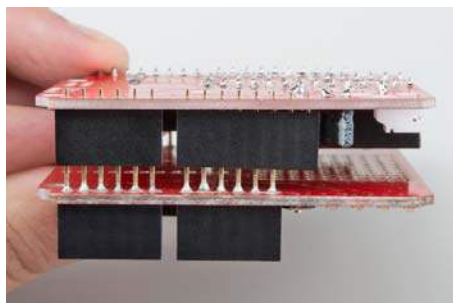
Pre-soldered shield used as a soldering jig to keep the headers lined up.

Keep in mind that you may need to add on the stackable headers from your kit onto your board in order to provide enough clearance between the Teensy and the shield you use.

Barrel Jack

The final part to solder is the barrel jack. Notice that when you insert it, the through holes are much larger than the standard headers.
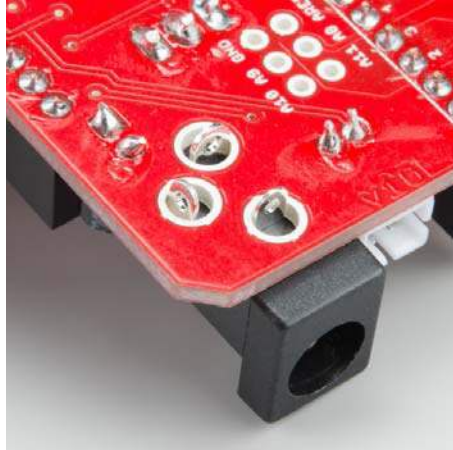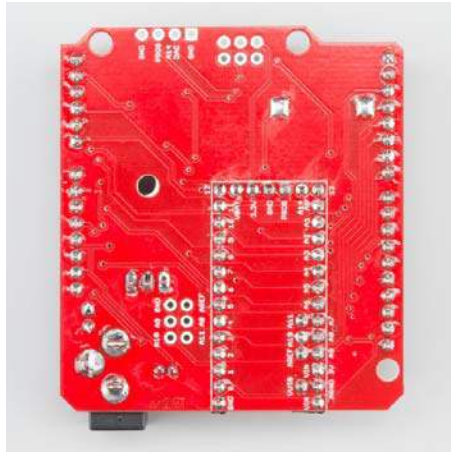

Because of the large plated through holes, you will need more solder and heat to properly connect these and fill them in (just like on that battery clip!). Be patient, and take it slow, to ensure you don't burn the PCB or any traces.

That's it! Your adapter should now be soldered and ready to go.
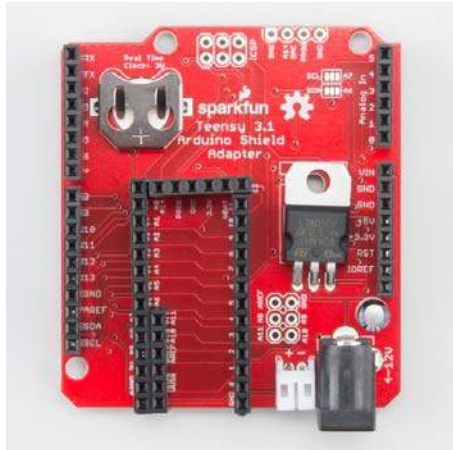
All pieces inserted and soldered!

Teensy Adapter successfully soldered!

Teensy Headers

Now that your adapter is completed, you can use this as a soldering jig to connect the male headers to your Teensy. Break the strip into smaller parts, and insert them into the pre-soldered headers on the adapter. Plug the Teensy on top, and solder away!
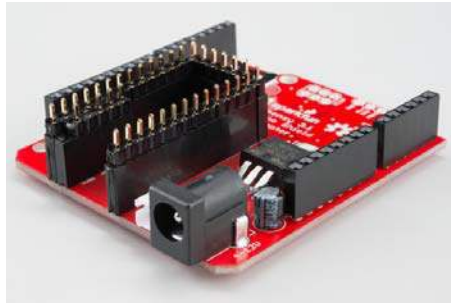
Crystal

> **Note:** This step is optional and only necessary if you intend to use the RTC feature on the Teensy 3.1.

If you intend to use the RTC on the Teensy 3.1, you will need to solder the crystal onto the Teensy. You can solder it via the bottom or the top, but keep in mind you should insert it where it is least likely to get knocked or short the body of the crystal onto other components.

Double check that the crystal won't short on any pins before soldering!

Plug it all in

Once everything is soldered properly, it's time to put your boards together. If you did not solder the Teensy directly to the adapter, plug the Teensy into the adapter, and insert whichever shield you've chosen to connect.

Plug in your Teensy via USB, upload your code, and you're good to go!

Final Adapter assembly with the Electric Imp Shield stacked on top.

> **Remember!** If you intend to use an external power supply, you must cut the jumper on the bottom of the Teensy to prevent shorting VUSB and VIN.

Don't forget to plug in your coin-cell battery, if you intend to use the RTC. This **does not** work with the Teensy LC.

Programming

Because this board is simply an adapter, there is no special programming required to start working with the adapter. You will, however, need to program the Teensy for any Arduino shield with which you'd like to work.

When programming your Teensy, remember to select the proper board from the Arduino IDE drop down, and select the proper serial port and baud rate.

Please review our tutorial on Getting Started with the Teensy, for more information on programming the Teensy in either the Arduino IDE or in a C compiler.

Don't forget to verify and update your pin definitions in your shield code if you intend on using `A6` or `A7` in place of `SDA` or `SCL`.

Resources and Going Further

Going Further

Now that you've successfully got your Teensy Arduino Shield Adapter up and running, it's time to incorporate it into your own project!

If you have any feedback, please visit the comments or contact our technical support team at TechSupport@sparkfun.com.

Additional Resources

Check out these additional resources for more information and other project ideas.

- Teensy 3.1 Product Page

- Adapter GitHub Repository
- Teensy XBee Adapter
- RGB Panel Jumbotron