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Assembling your Catena 4551 DIY Kit

Engineering Report 95000xxxx
Draft 1
Date: 2018-02-24

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Document Release History

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| Draft 1 | 2018-02-24 | First draft |
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1 Introduction

This document explains how to assemble the Catena 4551 DIY Kit.

1.1 Getting support

Support is available through the MCCI support portal community forums. Browse to <https://portal.mcci.com>.

1.2 Soldering

If you have not soldered before, we recommend searching out a suitable YouTube training video.

The IPC Hand Soldering Demo is an excerpt from a formal training program: <https://youtu.be/lpgMY1JeOAA>.

Less formal, but also useful, is this demo of through-hole soldering: <https://youtu.be/rYWwKe8f2kc>

If you are planning on using external sensors, you'll need to mount some surface-mount resistors (see section QQQ). If you've not done surface-mount soldering before, the following video is helpful: <https://youtu.be/PU7wLcuqc-I>.

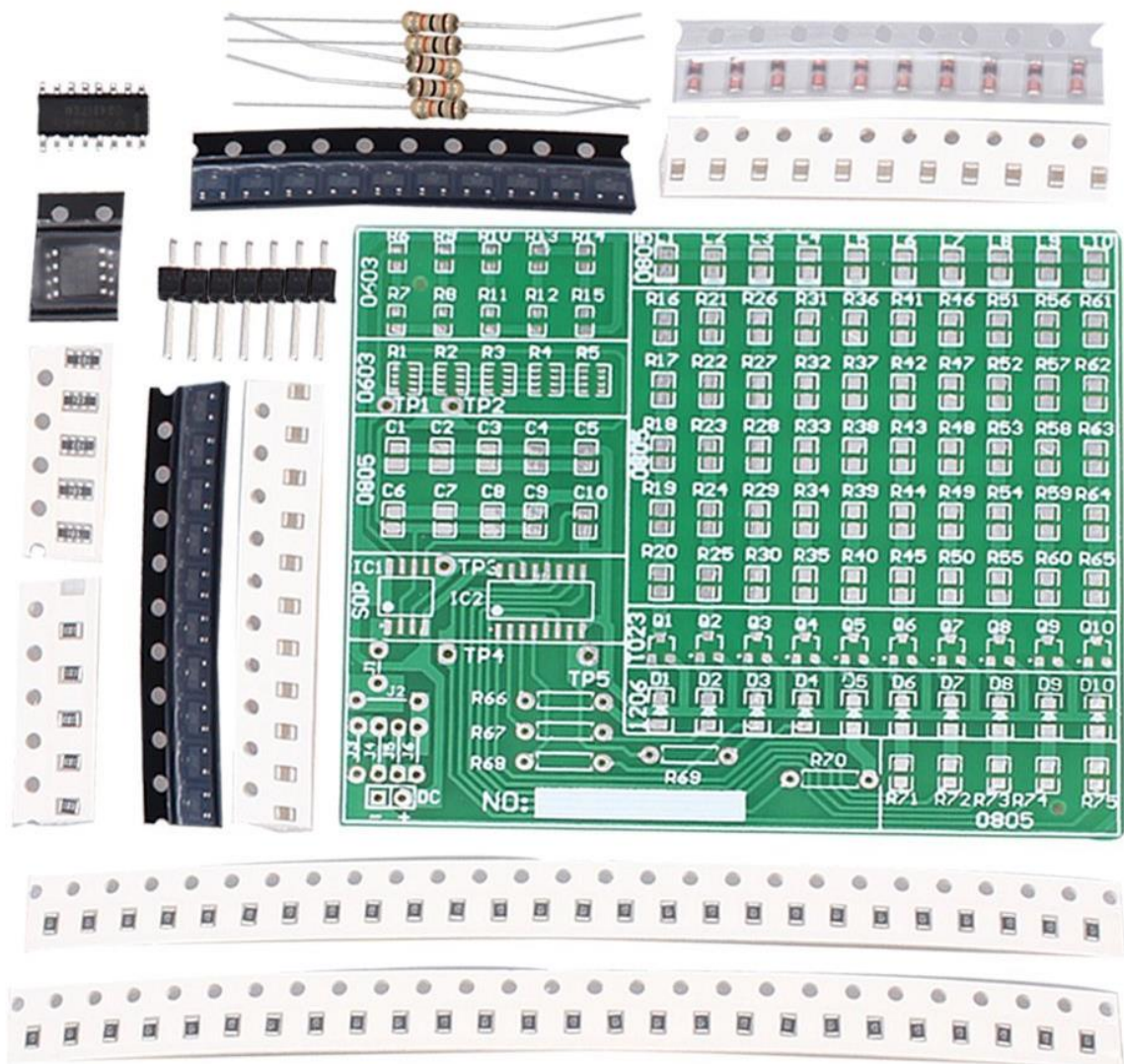
You might also want to get a practice board for SMT soldering. These are quite inexpensive. For example, the [Icstation DIY Electronics SMD SMT kit](#) looks good, but shipping time is 2 to 3 weeks. Check the [MCCI Store](#), we might start stocking it. See Figure QQQ for a representative photo.

A very similar product, more expensive, but available with Amazon Prime: the [WHDTs Training Suite](#). Don't be bothered by the mediocre reviews; you probably don't need to use the result or do all the soldering; you just want to practice soldering the components.

Be green! MCCI uses only lead-free processes, and we recommend you do the same. Buy lead-free solder, and run your irons at 330 to 350 degrees C.

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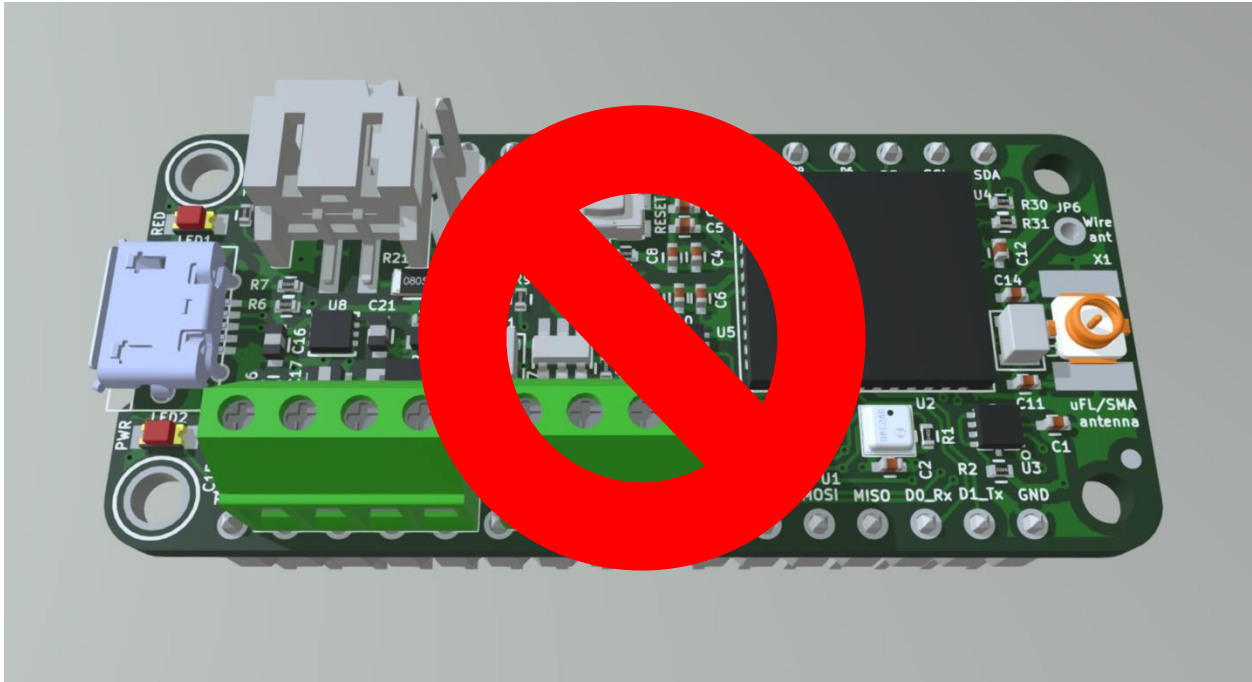
Figure 1. Sample Solder Practice Board



2 Kit Contents

Start by unpacking the contents of your kit. You should find items corresponding to Figure 2 below.

Figure 2. Kit Contents



2.1 Catena 4551 Board (item 1)

The MCCI Catena 4551 is a CPU + LoRa radio board that is compatible with the Adafruit Feather M0. It has an STM32L0 ARM Cortex M0+ CPU, a Bosch BME280 sensor for pressure, humidity, and temperature, a lux sensor, a 2K byte FRAM for configuration storage, and a 1 Mbyte Flash EPROM for data storage.

Check U2 (the temperature sensor carefully). During manufacturing, a piece of orange tape may have been attached to the top to protect it. If it's still attached, please remove it using a fingernail to gently lift the tape off the top of U2. Discard the tape.

2.2 Male Pin Headers (item 2)

The kit includes 12-pin (123001009) & 16-pin male headers (123001011). These headers have a pitch of 0.1" (2.54mm). These two pin headers are used for mating with Adafruit Feather-compatible wings and for attaching debug accessories.

Figure 3. 12-pin and 16-pin Male Headers



2.3 Whip Antennas (item 3)

Three quarter-wavelength whip antennas are provided in your kit. They are color-coded by frequency band.

| Color | Band |
|--------|---|
| Yellow | Americas, Asia, Australia 900-928 MHz ISM bands |
| Green | Europe 868 MHz band |
| Blue | India 865 MHz band |

2.4 Labels (item 4)

Two labels are provided to be affixed to the bottom of the Catena 4551.

- Serial Number Label – Each unit has a unique serial number (EUI-64) assigned by MCCI. We recommend that you place it on the bottom of the Catena 4551 board.
- “MCCI Catena 4551” – this identifies the model of the complete assembly. Again, we recommend that you place this on the bottom of the Catena 4551 board.

2.5 Dual AAA Battery Clip (item 5)

A battery clip is included, accepting two 1.5V AAA cells.

2.6 Industrial Alkaline AAA batteries (item 6)

We supply two high quality alkaline AAA batteries with the kit.

2.7 0805 Surface-Mount Resistors (item 7)

The Catena 4551 can be configured for a variety of different external sensors by attaching the appropriate surface mount resistors. For your convenience, we include 8 each of four different values of resistor: zero-ohm shunts, 100 ohm, 1000 ohm, and 4700 ohm.

If you don't need external sensors yet, or if you haven't identified which ones you need, set these aside for later. You can always come back and add them.

2.8 Pair of 1x04 Screw Terminals (item 8)

The 1x4 screw terminal blocks (123001012) have a pitch of 0.1" (2.54mm), which can be used as alternatives to standard male or female headers of 0.1". They help in connecting external sensors to the Catena.

Figure 4. Pair of 1x04 Screw Terminals



NOTE: If you don't need external sensors yet, or if you haven't identified which ones you need, set these aside for later. You'll have to install resistors to match your sensor, and it's much easier to install the resistors if the screw terminals are not yet installed.

3 Assembly Instructions

Assembly proceeds in the following steps.

1. Provision the resistor networks for the desired external sensors (optional).
2. Attach the labels.
3. Attach the antenna.
4. Mount the male header pins.
5. Attach the terminal blocks for external sensors (optional).

3.1 Provision the Resistor Networks for External Sensors

Each screw terminal block provides power (3.3V) and ground, and two undedicated terminals. Each undedicated terminal has a position for a pull-up resistor, a pull-down resistor, and a series (protection) resistor. Refer to Figure 9, Figure 10, and Table 1.

Figure 5. Input Network and Screw Terminals

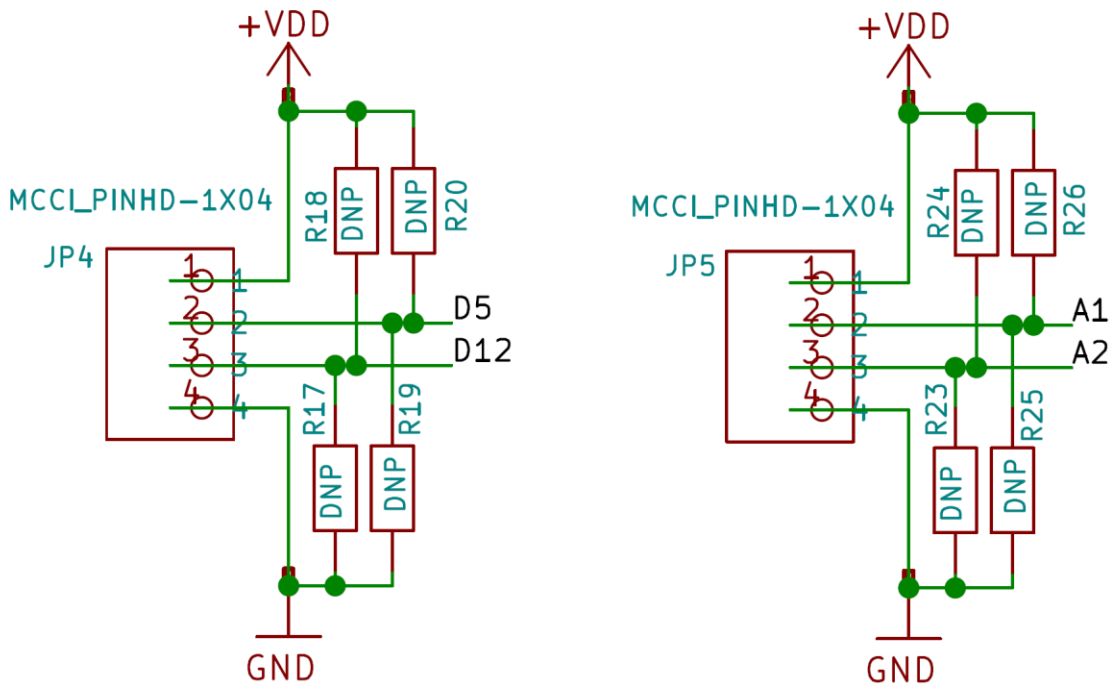


Table 1. Screw Terminal Resistor Mapping

| Screw-terminal position | Conventional Number | Signal | Pull-up | Pull-down |
|-------------------------|---------------------|--------|---------|-----------|
| JP4-1 | 1 | 3.3V | - | - |
| JP4-2 | 2 | D5 | R20 | R19 |
| JP4-3 | 3 | D12 | R18 | R17 |
| JP4-4 | 4 | GND | - | - |
| JP5-1 | 5 | 3.3V | - | - |
| JP5-2 | 6 | A1 | R26 | R26 |
| JP5-3 | 7 | A2 | R24 | R23 |
| JP5-4 | 8 | GND | - | - |

Refer to the schematics at <https://mcci.io/Catena4551-Schematic> and to the design of your sensors to determine which resistor configuration you want.

The 4551 I/O pins are connected directly to the indicated screw terminals. In many cases you can skip populating the resistors and just use the screw terminals directly. However, for some sensors you'll need to add resistors, either on the Catena 4551 or externally.

- For normally-open dry-contact closures, MCCI recommends a 1K pullup in the pull-up position.
- For OneWire temperature sensors like the [Adafruit DS18B20 Waterproof sensor](#), MCCI recommends a 4.7K resistor in the pull-up position. Only one data input is needed. The sensor also needs power and ground, which are available in the indicated positions.

- Soil sensors like the [Adafruit Weather-Proof Temperature/Humidity Sensor](#) need two data inputs, in addition to power and ground. MCCI recommends a 4.7K or 10K resistor on the input that's connected to the blue Data line.

If you're building a lot of sensors (ten or more), it may be easier to order your devices pre-configured by MCCI. Browse to MCCI technical support, <https://portal.mcci.com>, and enter a support request.

3.2 Attach the labels

QQQ

3.3 Attach the Antenna

Your Catena can be directly connected to a whip antenna, or can be connected to an external antenna by mounting an SMA or U.FL connector.

3.3.1 If using a whip antenna

Choose the antenna according to your desired operating band: yellow for 900-928 MHz, green for 868 MHz, blue for 865 MHz.

Solder the antenna into the ANT pad in the center of the SMA. We recommend that you insert the wire from the component side, so that you're soldering on the reverse side of the board.

3.3.2 If using SMA or U.FL

Obtain the connector type of your choice. MCCI recommends the Adafruit [SMA connectors](#) or [SMT U.FL connectors](#). Attach it in the provided footprint. (The U.FL connector must be mounted on the component side of the Catena.)

3.4 Attach the Male Header Pins

Again, this step is optional.

Attach the 12-pin & 16-pin Male Headers on JP3 and JP1 of Catena 4450 board respectively.

1. Solder one or two posts on each strip, to tack the header in place
2. Adjust the vertical and horizontal alignment
3. Solder the remaining posts for reliable electrical contact.

You may mount these so that they point down (for easy use in a prototyping board) or up (more convenient when mounting in an enclosure). However, if pointing up, you will not have room to mount the screw terminals.

If you're not going to use external sensors attached via the screw terminals, stop here; save the screw terminal blocks in case you need them later.

4 Testing

You can use the USB connector of your Catena 4551 for power, for monitoring serial output, and for downloading code. Please follow the instructions at <https://github.com/mcci-catena>.

5 Reference Pinout Information

