ctrl-M Assembly Instructions

Version 1.0

Thank you for buying the ctrl-M kit to give your Model M keyboard an extended life.

Don't start with soldering connectors to the board yet!
First disassemble your Model M and then mount what you actually need for your specific keyboard.

Read this instructions completely so you understand all assembly steps. It's quite easy and completely reversible. No modifications are needed on your beloved keyboard or it's case!
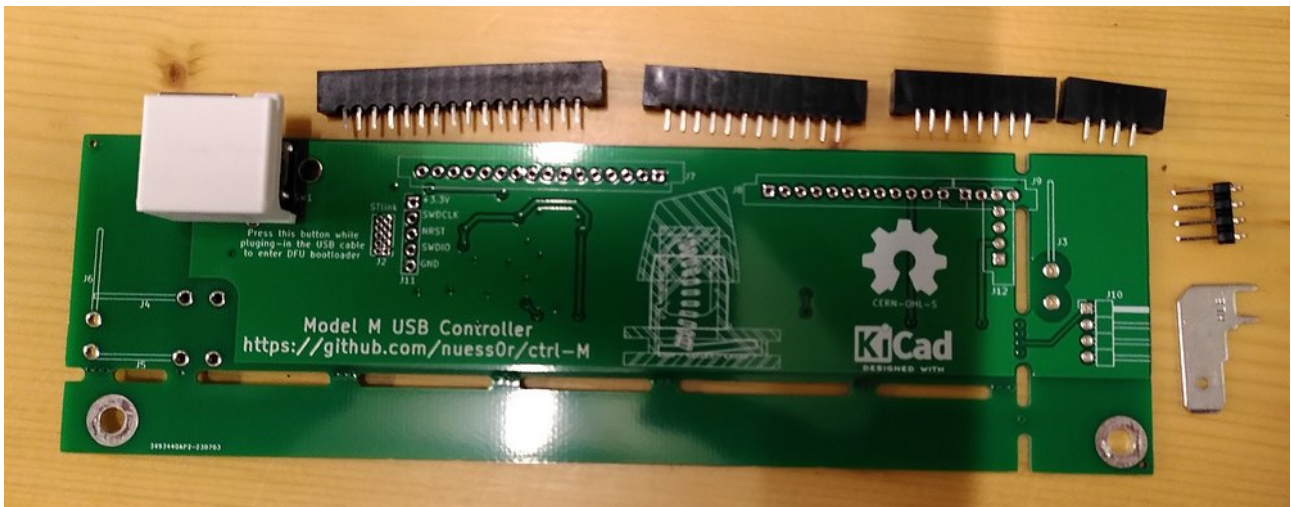
1 Table of Contents

2 Overview

2.1 Required Tools

To (dis-)assemble your Model M and mount the ctrl-M kit you need following tools:

- 5.5 mm hex nut screwdriver

- Soldering iron

- Solder wire

2.2   Kit Content

All parts of the ctrl-M kit

This is what you get with the kit, check that it is complete:

- ctrl-M controller with mounted SMD components, USB connector and push button. QMK firmware is already installed.

- 16, 12, 8 and 4 pin ribbon connector

- 4 pin right angled pin header

- 6.3 mm blade connector

- 3D printed spacer

Note: A USB cable is **not** included in the kit. A standard USB A to B cable is required (or a USB C to B cable if you use it with a modern laptop). Typically many A to B cables are lying around anyhow from printers, scanners etc.

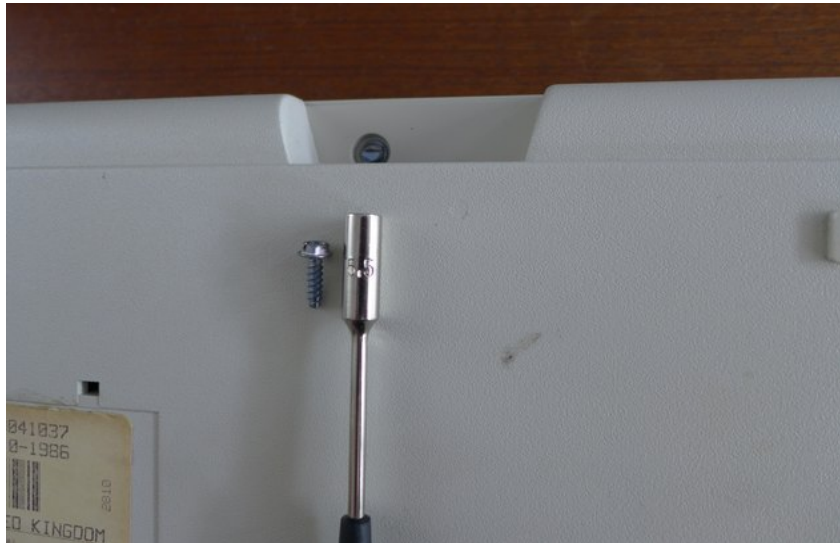*A USB A to B cable is needed additionally*

3 Disassemble the Model M

3.1 Open the case

Use the 5.5 mm hex nut screwdriver to remove the four screws from the bottom of the case. You can see the location of the screws in the picture below.

Note: You'll need a screwdriver as typically wrench and nut don't work for the screws that are deep inside the holes of the Model M case.

Flip the Model M to the other side, the screws will fall out. Put them to a safe place. Remove the top cover by lifting gently the back first and then slide it out of the holding noses at the front.

5.5 mm hex nut screwdriver and case screw

Location of the case screws

3.2   Remove the old controller

Sometimes the keyboard assembly gets hold by another screw inside the bottom half. Remove it with the screwdriver and lift up the whole keyboard assembly. The old controller will come out of the case together with it as it has no mounting screws.

Note: Handle the ribbon cables carefully. If you bend them to much the printed conductor inside them can break. This is very delicate and not easy to fix!

First pull gently the ribbon cables out of the old controller and second pull the earth wire out of the blade connector (Use a plier for this if needed).

Put the keyboard assembly to the side.

Tip: It's now also a good time to clean the whole keyboard from dust etc. You can also remove the keycaps and wash them gently. Take a picture before you remove them, so you can remember their correct location.

Open case with keyboard assembly and screw location (if present)

4   Prepare the ctrl-M

As you might have seen already, your specific keyboard might look slightly different to the pictures in this document. Over the years many different variants of keyboard controllers have been manufactured.

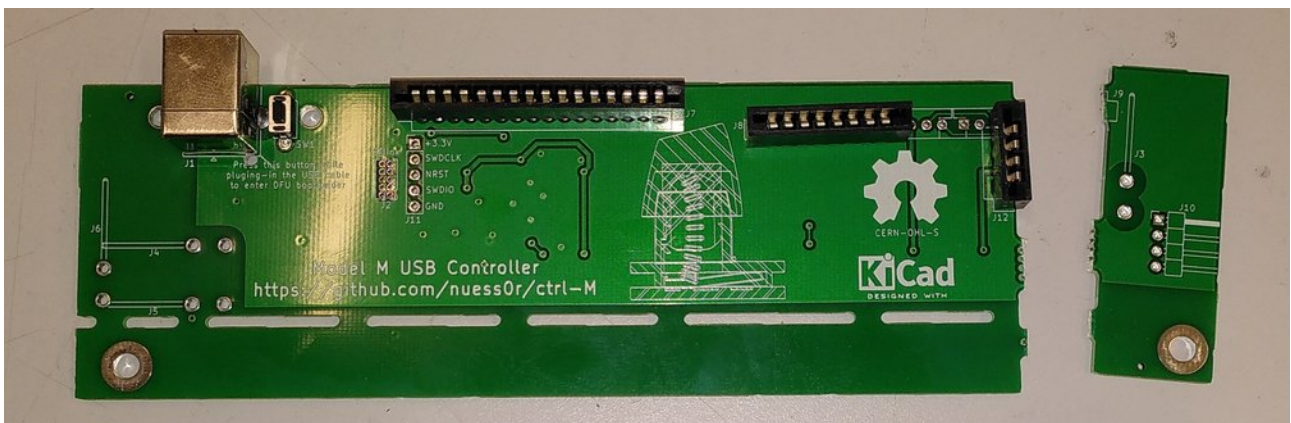No worries, the ctrl-M can replace all of them.

4.1   Make the ctrl-M smaller if needed

Compare the size of the original controller and the ctrl-M. If you have one of the smaller controller variants (Typically ones manufactured by Lexmark after 1994) make the ctrl-M smaller.

If the original controller has the same size as the ctrl-M simply skip this step.

Use a wire cutter, small metal saw, a fine cut table saw to cut away or otherwise use just the edge of a table to brake it away.

First remove the small piece on the right side of the ctrl-M then second remove the part on the bottom.

If you have a small controller variant, make the ctrl-M fit. First part removed
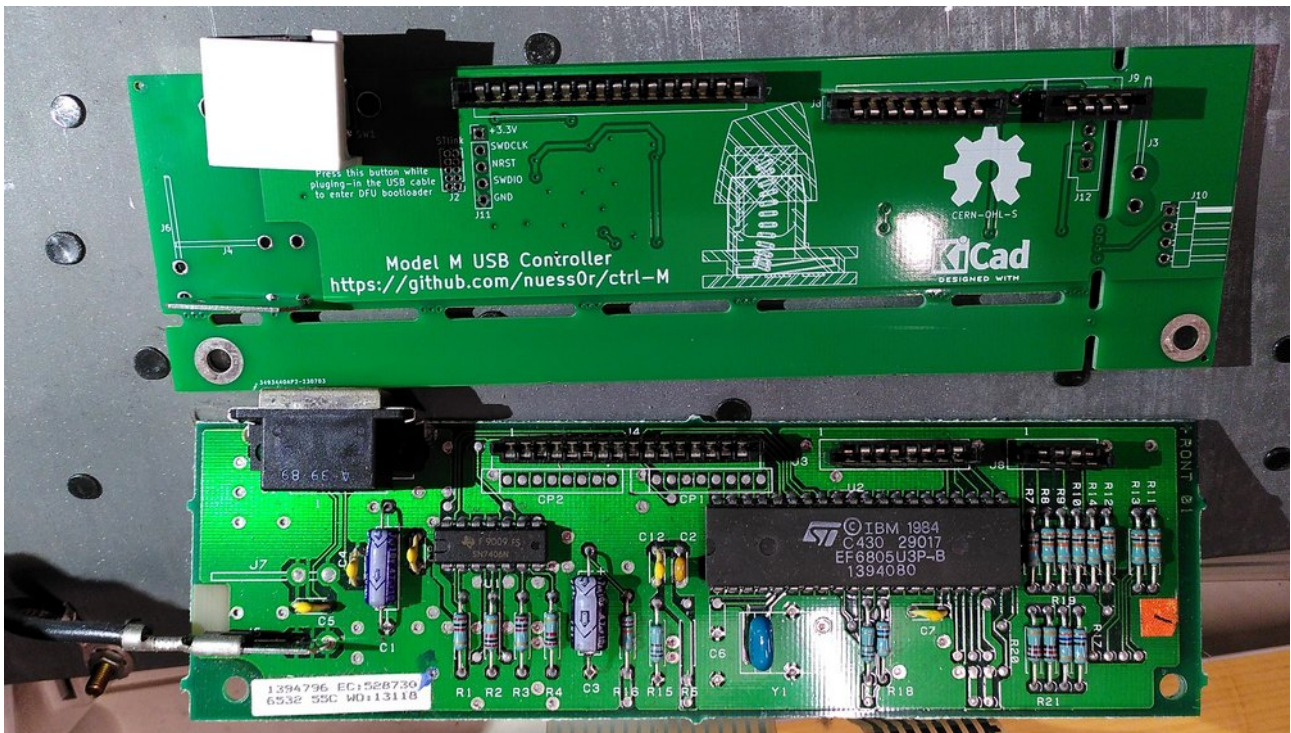
4.2   Select needed connectors and their position

Compare the original controller and it's connectors with the ones that are part of the ctrl-M kit to decide which connectors you have to solder in.

You have to find out::

- If you need both the 8 and 4 pin or just one 12 pin connector. In old variants the LEDs have cables and a plug, then you have to use the right angled pin header instead of the 4 pin connector

- The right position for the earth cable blade connector.

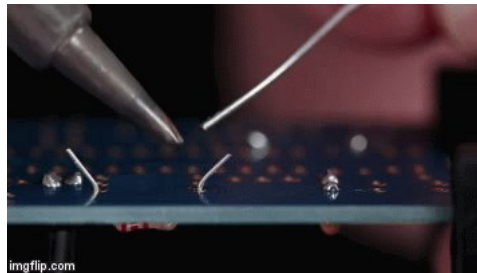Put away the connectors you don't need to avoid confusion.

Compare the original controller with the ctrl-M kit to select correct connectors

5   Solder the connectors

5.1   Short introduction to soldering

If you have soldered electronics or some connectors before, you can continue to the next section.

If you have never soldered before it's most likely that you don't have a soldering iron at hand. It's not complicated and quite easy to learn. But I would advise you to ask a friend, teacher, fab lab or your local hackerspace to use their equipment and give to some advice for the start.
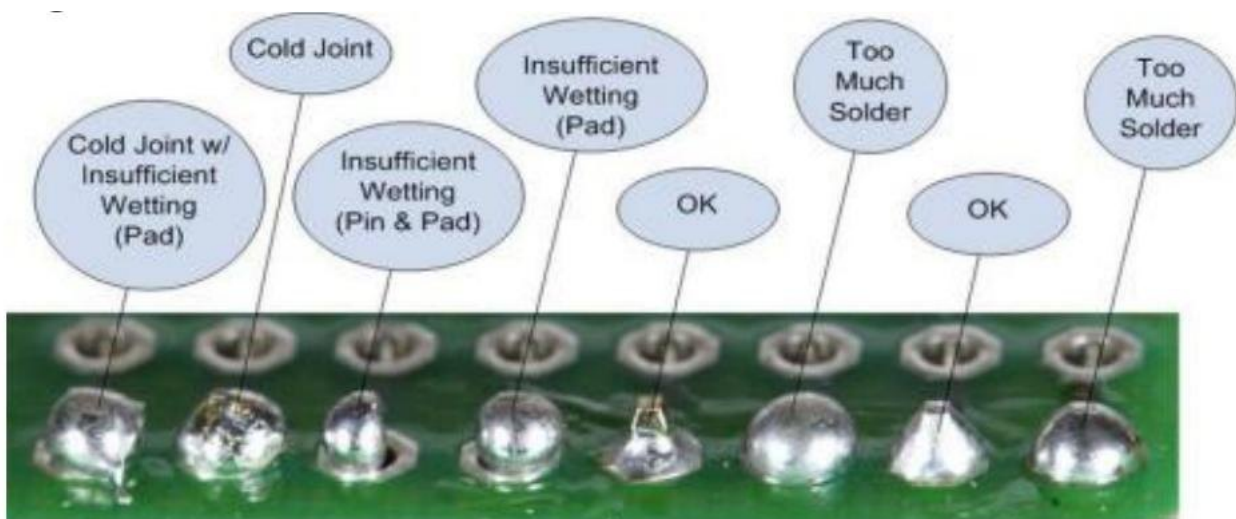

Soldering is easy

A good resource for beginners ist the *Soldering is easy* PDF (Written by Mitch Altman and others) and translated in over 20 languages:
https://mightyohm.com/blog/2011/04/soldering-is-easy-comic-book/

If you can read German or use a translator the Raumzeitlabor has also a good Wiki article about learning to solder: https://wiki.raumzeitlabor.de/wiki/L%C3%B6ten_lernen
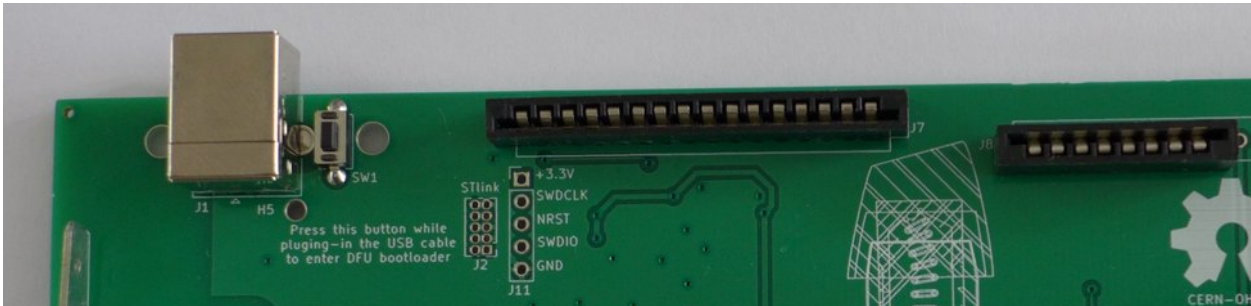

Source: https://cdn-learn.adafruit.com/downloads/pdf/adafruit-guide-excellent-soldering.pdf

5.2   Solder ribbon connectors

WARNING: The connectors in the kit (Manufactured by Connfly) have to be mounted 180° rotated compared to the original ones (From TE)!
Compare carefully with the pictures in these instructions before you solder them.

Correct orientation of Connfly connectors (180° rotated compared to original ones!)

Put the black ribbon connectors into the PCB one by one and bend the first and last pin on the bottom side so they don't fall out again.
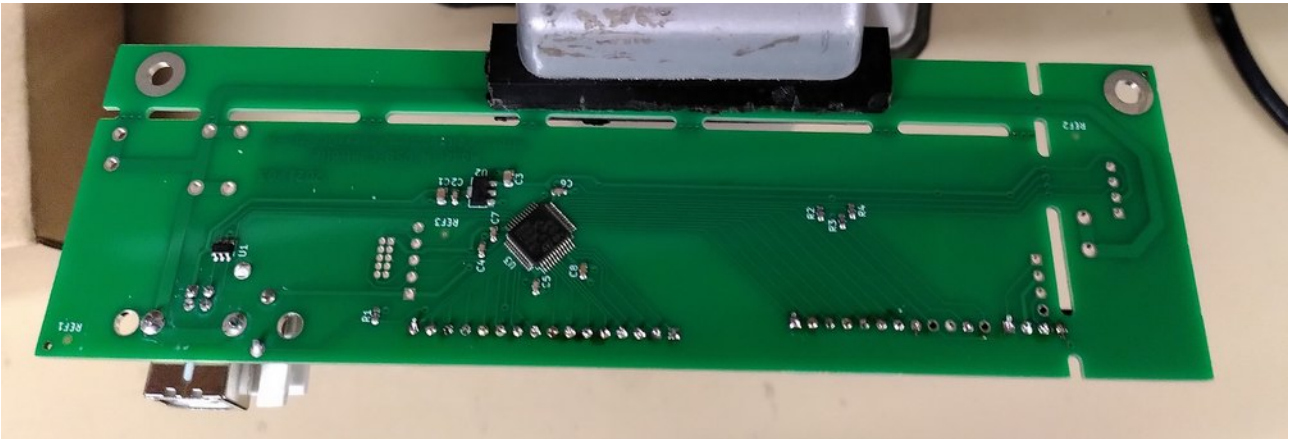
If you need the right angled pin header put it into the PCB and put some sticky tape over it, so it doen't fall out.

Put the connector through the PCB and bend two legs so it doesn't' fall out

Flip the PCB over and place it flat on a table or use a wise to hold it. Now solder the legs of these connectors.

To achieve perfect alignment, solder only one leg of the connector first, then check and align the connector again if needed. Then solder the remaining legs.

Finished soldering of the ribbon connectors

5.3 Solder earth connector

Then put the blade connector into the PCB, hold it with a finger and flip the PCB around. Place the PCB on a heat resistant surface (cardboard, scrap wood etc.) while removing your finger. You can hold it in place as well with heat resistant tape.

The blade connector is a somewhat bigger piece of metal, so it will take much more time to heat it up with your soldering iron. Just be patient before you move the solder wire to the soldering tip.

WARNING: After soldering the blade connector it stays hot for a while. Dont' burn your finger!
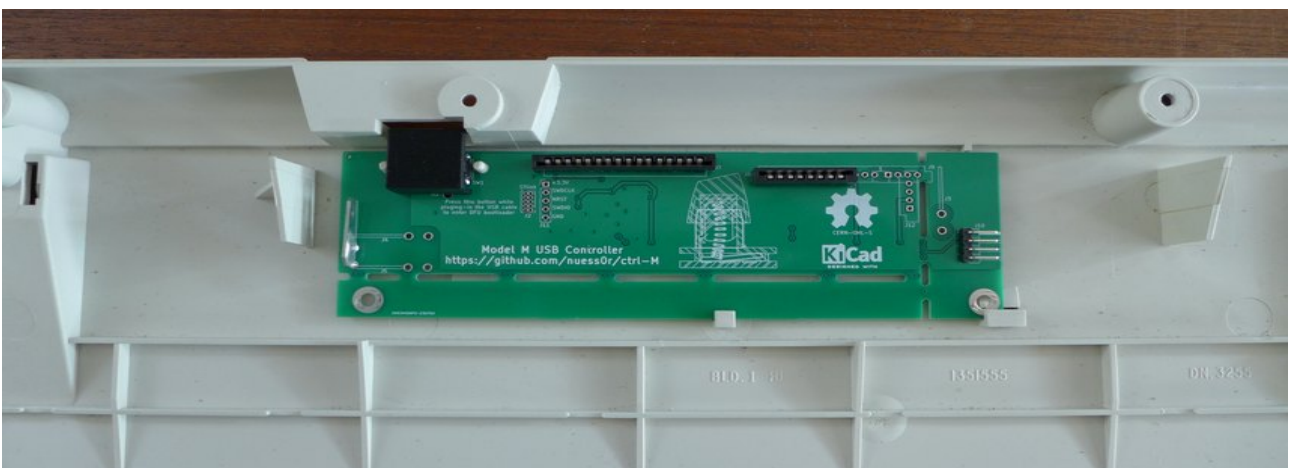
6   Install the ctrl-M

Connect to the ctrl-M in following order:

1. the earth wire

2. LED cable or ribbon (if you have a separate one)

3. the two keyboard ribbon cables

All cables are connected, ready to mount the ctrl-M into the Model M case

When everything is connected slide the board together with the attached keyboard assembly into the lower housing. Towards the front there are two notches you have to slide the PCB into as they hold the PCB in place. Lower the controller over the two plastic pins left and right of the USB connector. This all happens more or less at the same time.

Correct location of the ctrl-M inside the Model M case (shown without connected ribbon cables for better visibility)

6.1   Testing

Connect your partially assembled keyboard with a USB cable to your computer. It should be recognized as new device. No drivers are needed and you should be able to type with it as usual.

Test every key and modifier keys (`shift, control, alt`) if they are correctly recognized (be aware that the default keymap already replaces `caps lock` with the `windows` key). Observe if the LEDs work as well (be aware some modern operating systems don't activate the `scroll lock` LED anymore)

If something is not working, typically not only one but several keys are misbehaving. In that case remove and reinstall the ribbon cables again (typically they are corroded and inserting them several times should help making better contact). Also check your solder joints again.

7   Reassemble the Model M

Reinstall the 3D printed spacer if it fell off.

Reinstall the top cover of the Model M, first slide it into the holding noses at the front around the space key then the back. Hold the case together and flip it around, then reinstall the case screws.
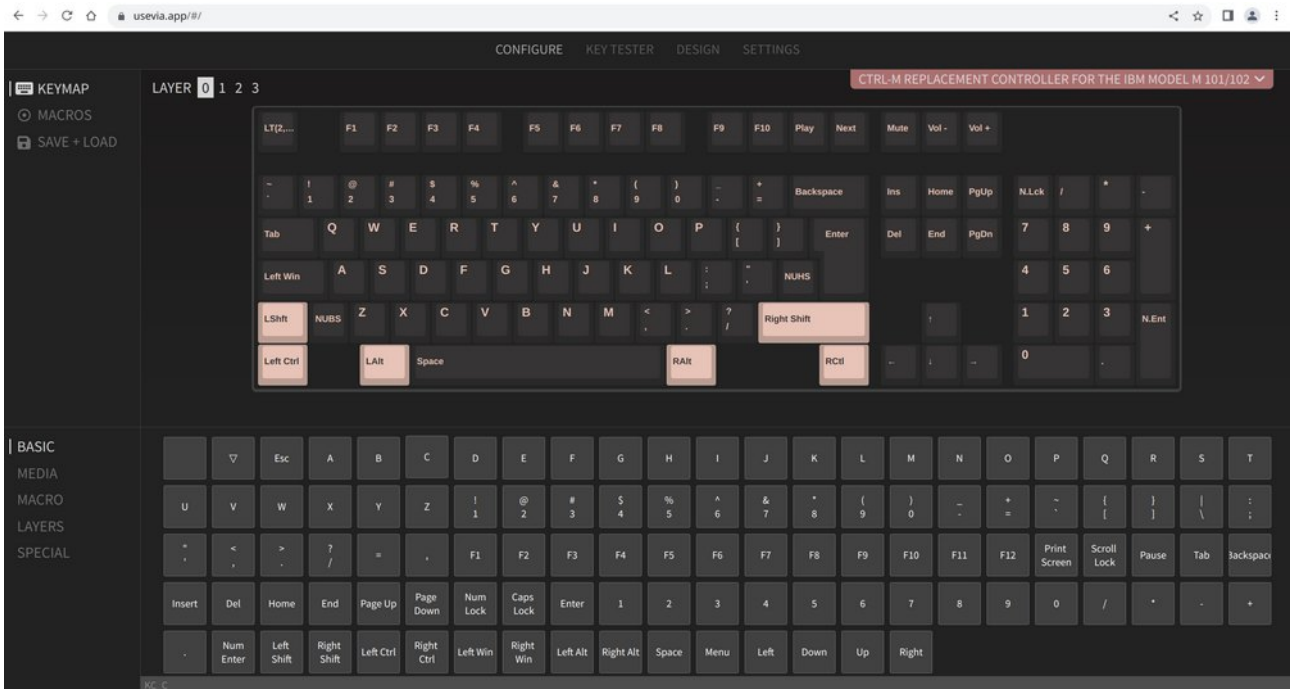

Finished assembly: Model M with USB port (visible as well the 3D printed spacer and button lever)

8   Configuration

If you want to modify the keyboard layout, change keys add shortcut commands or add more layers for different use cases you can do that either in your Chrom(-based) browser directly or use the QMK configurator to build and upload a customized firmware.

https://usevia.app/

https://config.qmk.fm/

VIA configurator

TODO: Add screenshot when in QMK mainline

QMK configurator