Glove80 User Guide

Date: 14 May 2023

Table of Contents

The story behind Glove80

Thank you for choosing Glove80. Glove80 is not your usual keyboard. It was designed by a bunch of keyboard warriors for themselves.

We are a small group of I.T. professionals, suffering from RSI and OOS. We needed a good ergonomic keyboard to do our jobs.

Nothing available has been good enough. We were using contoured keyboards, but we knew we could make one much better. A keyboard that would fit more hands and be more comfortable for all of us.

And so we did! We began in 2014. We had no idea how difficult it would be. Hundreds of variations and experiments later,[1] we finally made *the* keyboard we were happy with.

For five years, we used these keyboards as our daily drivers. We knew we had a great keyboard on our hands.

The news was getting out. Our friends were clamoring to get their hands on one of our keyboards. In 2021, Stephen took up this challenge and re-designed Glove80 for mass manufacturing. The same battle-tested ergonomics, distilled into a product anyone can use. The end result was the keyboard you now hold in your hands.

Glove80 is a labor of love. We hope you will love it too. *Thank you for believing in Glove80.*

An earlier iteration of Glove80 that was our daily driver for years

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[1] https://www.linkedin.com/pulse/repetitive-strain-injury-rsi-how-ultimate-ergonomic-keyboard-created

What's in the box?
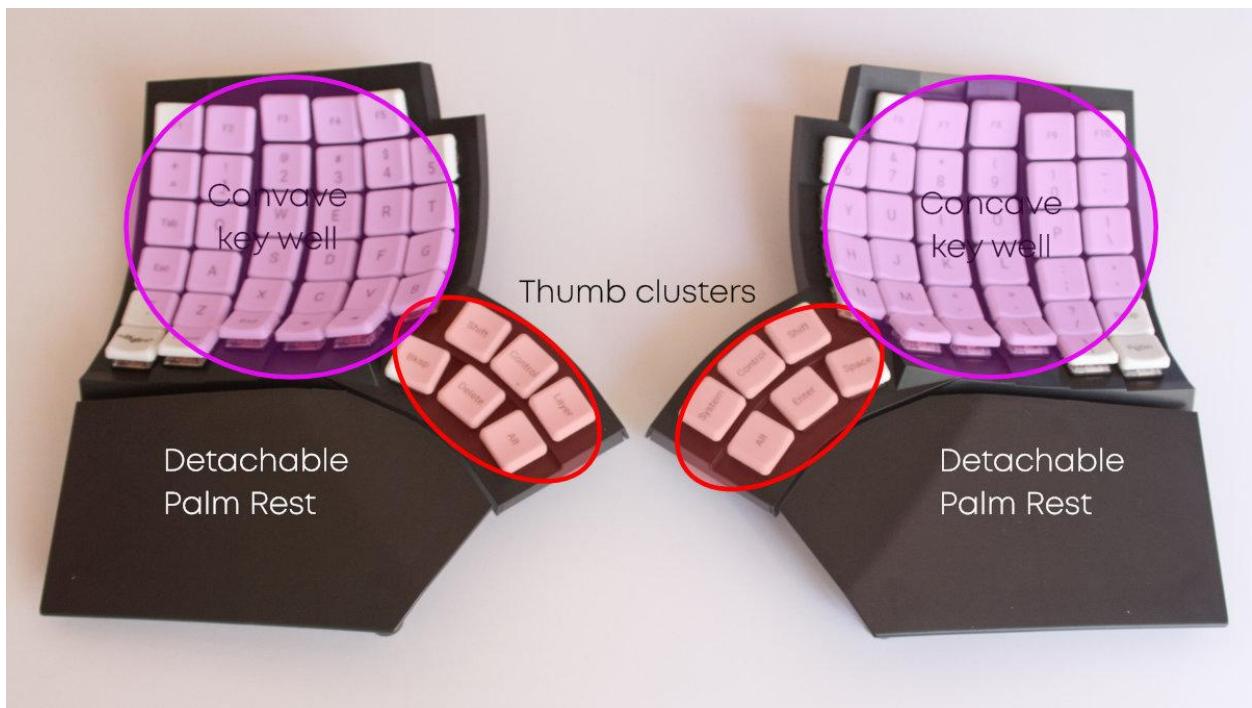
- Glove80 keyboard (a pair of 2 halves)
- A USB-A to USB-C cable
- A set of extra M4 threaded rods for high-angle tenting
- 12 extra feet for high-angle tenting and custom mounting
- 12 extra silicone bumpers for high-angle tenting and custom mounting
- 12 half-height M4 nuts for tenting
- A M4 wrench
- A keycap puller
- A set of extra keycaps

A look at Glove80

Glove80 is a split keyboard, consisting of a left half and a right half.

The left half is called the Central in ZMK vocabulary and acts as the "brain" of Glove80. When connected to a host like a PC or a phone the connection is always made with the left half. The left half communicates with the right half (which is called the Peripheral in ZMK vocabulary) through a Bluetooth Low Energy connection.

When connecting Glove80 to a host with a USB cable, the USB cable must be plugged into the left half. When Glove80 is connected to the host via Bluetooth Low Energy (BT Low Energy or BLE), the left half is the half that is talking to the host wirelessly.

Concave key wells: Keys to type with your four fingers on each hand
Thumb cluster: Keys to type with your thumbs
Detachable palm rest: Optional palm rest

USB Port   Power Button

Power button: For switching off power. Please note that it is still possible to charge the battery even when powered off.
USB port: For connecting to the host (left half only), updating firmware, and battery charging.

Fixed leg: The leg that is not height adjustable
Adjustable legs: Legs that are height adjustable
Side-car anchor studs: two M2 studs for attaching a sidecar add-on
Palm rest thumb screws: For attaching the palm rest to the keyboard

A quick test drive of Glove80

Procedure:

1. Plug in the USB cable to the left half of your Glove80

2. Plug in the other side of the USB cable to a host, such as a PC

3. Switch on both the left and right halves of Glove80 by pushing in the power button on each half

4. Start typing

If all goes well you should see the keystrokes showing on the host.

Your Glove80 is shipped with its battery partially charged for safety during transport. **We recommend fully charging both halves before using Glove80.** Sometimes the battery may have depleted during storage and shipping, in which case please charge the batteries on both halves before the test drive.
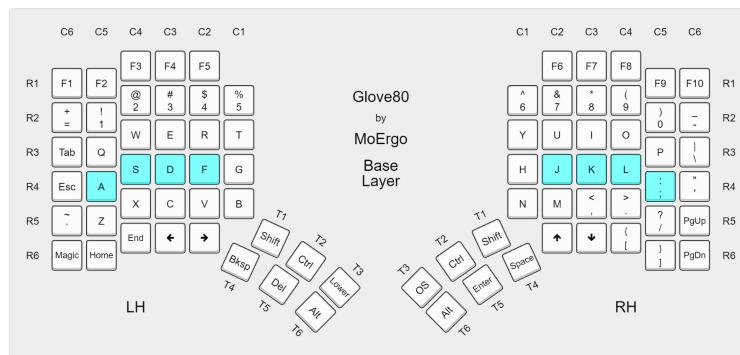
Typing with Glove80

Setting up Glove80 for comfortable typing

Glove80 has been designed to encourage good typing postures. For an overview of Glove80's ergonomic design features and the rationale behind Glove80, please read *Glove80 Keyboard Ergonomics and Keeping Your Hands Healthy*[2].

Here are quick instructions:
1. Make sure you have a properly set up and comfortable desk and chair, or alternatively a standing desk.

2. Attach the palm rest to each half of your Glove80.
    Note: you can type on your Glove80 without the palm rests. However for maximum comfort, we recommend attaching the palm rests.

3. Level the Glove80 such that all legs are touching the desk by adjusting the height of each adjustable leg.
    Hint: Start by adjusting the adjustable legs, until the fixed-height leg is touching the desk. Then adjust the adjustable legs until all legs are touching the desk.

4. Place the two halves in a comfortable position, such that:
    ● The two halves are separated at a distance suitable for your shoulder width;
    ● Your wrists are straight when viewed from above, i.e. no ulnar deviation;
    ● Your forearms are horizontal or slightly pointing downwards when you place your palms on the palm rests. If necessary, please re-adjust your desk and chair.
    ● When adjusted properly, your wrists should be straight or very slightly bending downwards when viewed from the side, i.e. neutral or slight negative tilt. If your wrists are bending upwards, please adjust your desk and chair height.

5. Place your fingers on the highlighted keys in the image below. This is the typical rest position for your fingers, also known as the "home row".

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[2] https://www.moergo.com/pages/glove80-split-ergonomic-keyboard-wrist-hand-pain-free.

6. Glove80 is a columnar keyboard: it is designed to reduce the need for fingers reaching sideways. Most of our finger movements are to curl and uncurl. The index and the pinky fingers are each responsible for two columns (C1 & C2 for index fingers, and C5 & C6 for the pinky fingers), while the middle and ring fingers are each responsible for one column.

7. Glove80's thumb cluster is unique. It is designed to require no or very little palm movement to reach all 6 thumb keys. The thumb keys are designed such that they are reachable primarily by pivoting the thumb at the base joint of the thumb.

8. Glove80 is designed such that most users can type comfortably while having the palm lightly resting on the palm rest, with no or little palm movements. See the next section Finding a comfortable palm position on how to find a comfortable position for your palms.

That's it!

If you are already familiar with typing on a columnar keyboard such as an Ergodox, you should very quickly adapt to your Glove80. If you have never typed on a columnar keyboard, there will be a learning curve to adapt to the columnar finger movement. Most people find themselves picking up the basics within a day, but mastery will take at least a few weeks of practice.

Here is a video of one of our testers typing on Glove80:

https://www.youtube.com/watch?v=68v-AztMob8
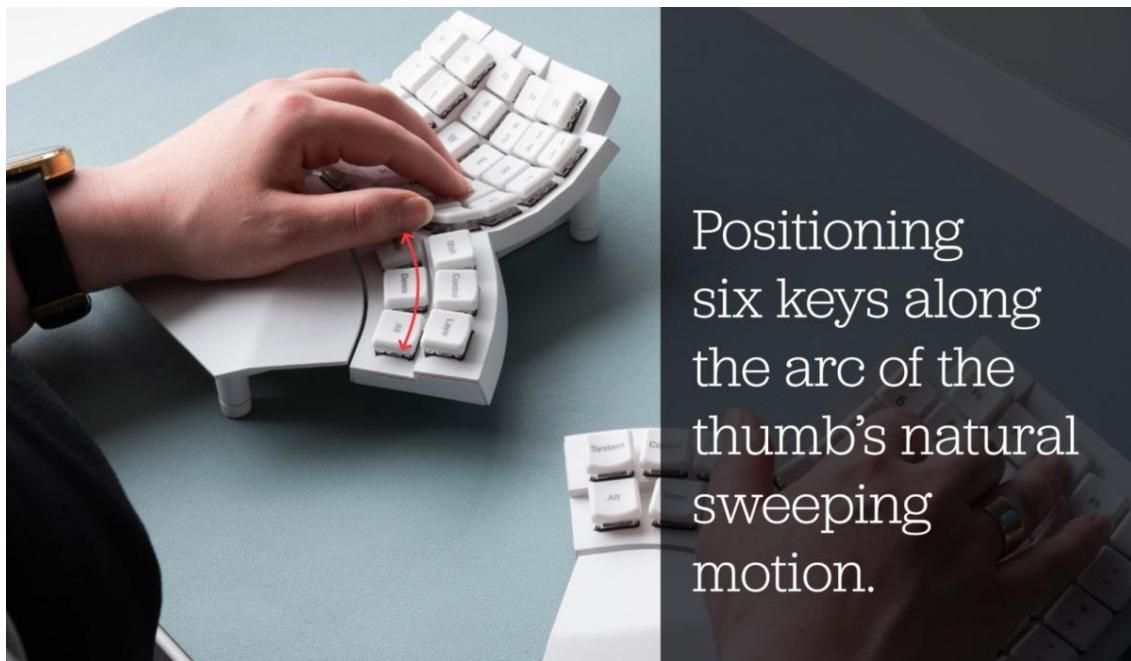
Finding a comfortable palm position

Each of us is different. As such, we all have different ideal positions of our palms on the palm rests. It will take some time and experimenting to find your sweet spot.

Here is a way to find a reasonable starting point for your palm position:

1. Very lightly place your four fingers on the keys on the home row

2. Pivot your thumb at the base joint, while keeping the other two thumb joints relaxed but straight

3. While your four fingers are on the home row and your thumb is pivoting at the base joint, reposition your palm on the palm rest such that *the tip of the thumb is able to glide along the bottom edges (i.e. the edge closest to you) of all three upper-row thumb keys*

This is a good starting position, as you can easily reach all 6 thumb keys and the home row in the concave keywell.

As you practice typing on the Glove80, you will naturally adjust and find a more comfortable position for your palm.

Learning tools

There are learning tools that will help in learning new keyboard layouts. Some of the well-known ones are

- https://www.keybr.com/
- https://monkeytype.com/
- https://ranelpadon.github.io/ngram-type/
- https://type-fu.com/

Note: we are not affiliated with these tools, and are not endorsing them.

Palm rests

Glove80 comes with detachable 3D sculpted palm rests, Generally speaking, the palm rests are recommended for maximum typing comfort.

Unlike other keyboards, by minimizing palm movements during typing, it is comfortable for many users to type on Glove80 while gently resting the palms on the palm rests.

However if you prefer to type without palm rests, it is simple and quick to detach the palm rests by unscrewing the thumb screws. Some circumstances in which you may want to detach the palm rests include:

- Very high angle mounting, especially vertical mounting
- Traveling light

Attaching palm rests

To attach a palm rest:

- Turn the two thumb screws gently until they don't turn any more.
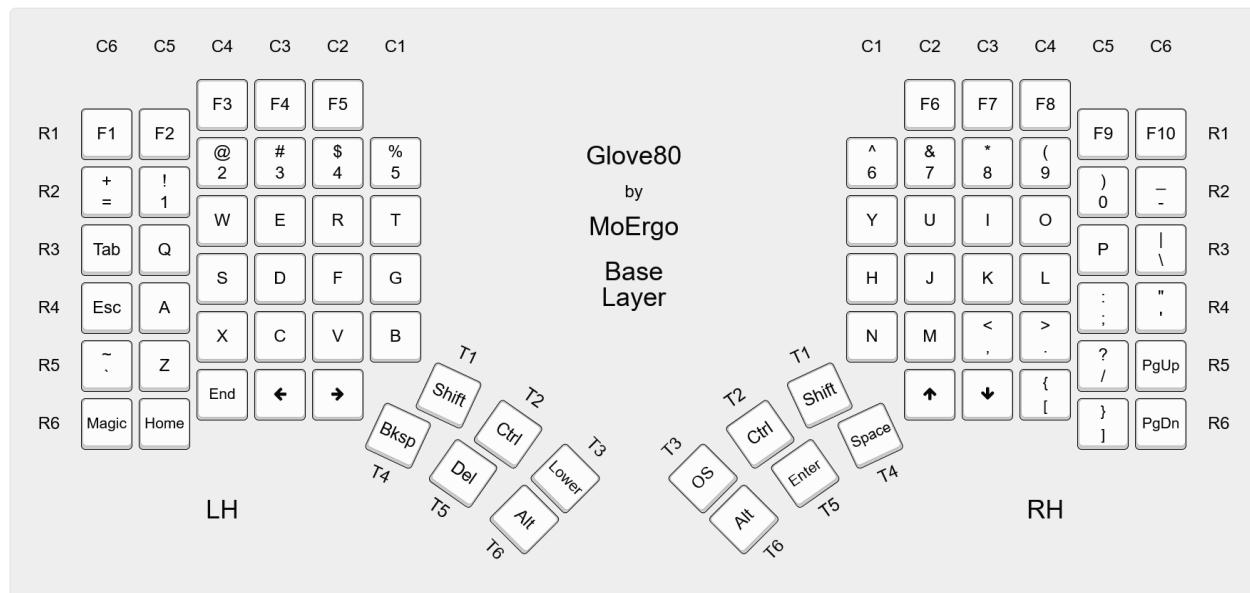
Default key layout

Glove80 supports the concept of multiple layers. When you power on the keyboard, the **Base Layer** will be active. However, you can switch to different layers in which the same key can serve multiple purposes. This isn't as confusing as it may sound; you do the same when you use the Fn key on a laptop. There are two ways of switching layers: you can switch to another layer momentarily (for as long as you hold down a trigger key, similar to "Fn" on many laptop keyboards) or indefinitely until you switch layers again.

When shipped, Glove80's default key layout has 3 Layers: **Base Layer**, **Lower Layer** and the **Magic Layer**.

Base layer

Here is the Base Layer. This layer is active when you switch on the keyboard.

Please note that legends in the illustration above, `R1..R6` (row 1 to 6), `C1..C6` (column 1 to 6), and `T1..T6` (thumb key 1 to 6), define the convention for labelling key positions on Glove80. For example, in the default layout Base Layer, `LH C2R3` is "R", and `RH T1` is the "Shift" key on the right hand.

The Base Layer is the home for the most commonly used keys on the keyboard. The functions of each key should be self-explanatory, other than the `Layer` key at `LH T3` and the `Magic` key at `LH C6R6.`
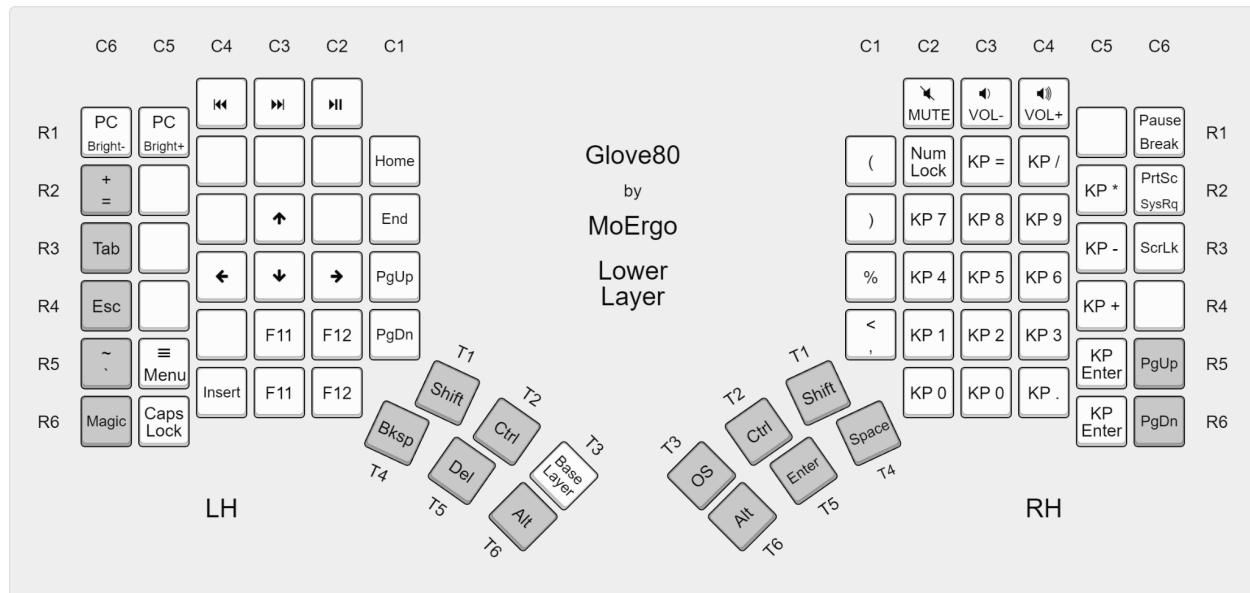
If you press and hold the `Layer` key at `LH T3`, Glove80 will momentarily change to the **Lower Layer**. As long as you continue to hold down the `Layer` key, the other keys will have the functions shown in "Lower Layer" below. *Please note that in the illustration above, the key says "Lower" as that is the function associated with the `Layer` key in this Base Layer.*

If you double-tap the `Layer` key at `LH T3`, Glove80 will persistently change to the Lower Layer: without further holding down the `Layer` key, the other keys will continue to have the functions shown in "Lower Layer" below. Pressing the Layer key again will return to the Base Layer. This is useful for using the numeric keypad and arrow cluster in the Lower Layer.

Single tap the `Magic` key at `LH C6R6`, and the RGB LED [indicators](#) will show the status of caps lock, scroll lock & num lock, the charge level of both batteries, the status of BT Profiles and which layers are active.

The **Magic Layer** is activated momentarily by holding the `Magic` key. While the `Magic` key is depressed, the other keys will have the functions described in the "Magic Layer" below.

Lower layer
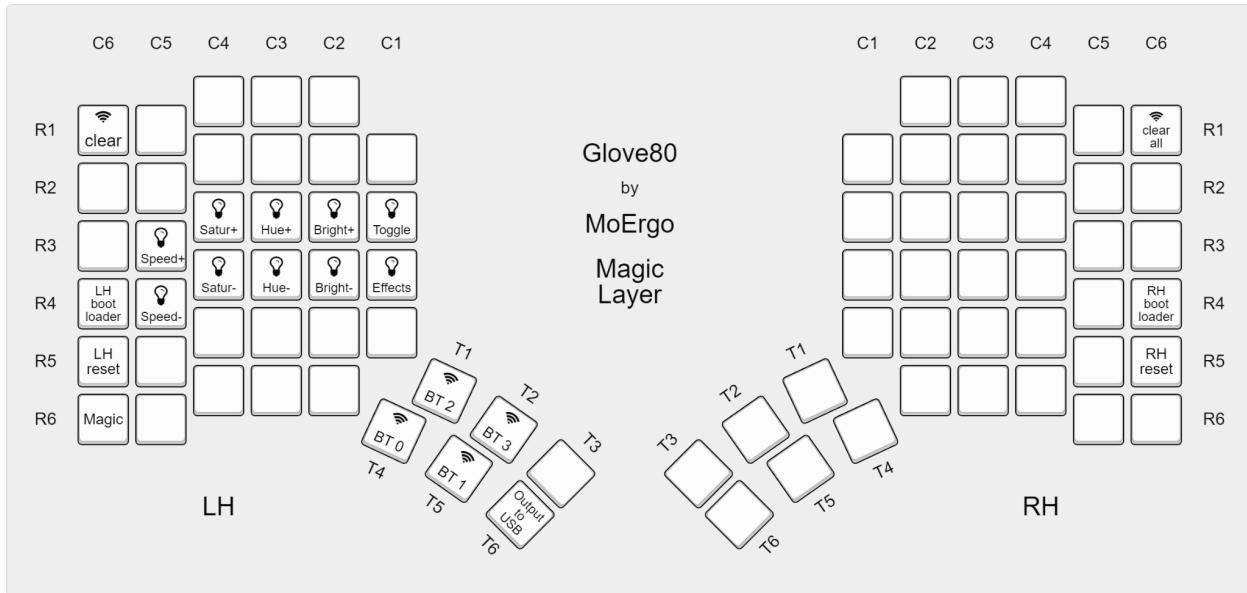
The Lower Layer contains:
- F11 and F12
- Less commonly used keys
- An extended numeric pad
- Media keys

To make F11 and F12 as comfortable as possible for everyone with different hand sizes, each is associated with *two* key positions. Activating the Lower Layer and pressing either of the key positions will generate the F11/F12 key code.

If you have persistently changed to the Lower Layer, pressing the `Layer` key at `LH T3` will return to the Base Layer.

Magic layer

The **Magic Layer** is the layer for controlling Glove80 itself.

This is the layer for:
- Controlling the RGB LED behavior
- Selecting which BT Profile or USB to output keystrokes to
- Other system functions on Glove80

Making the key layout yours
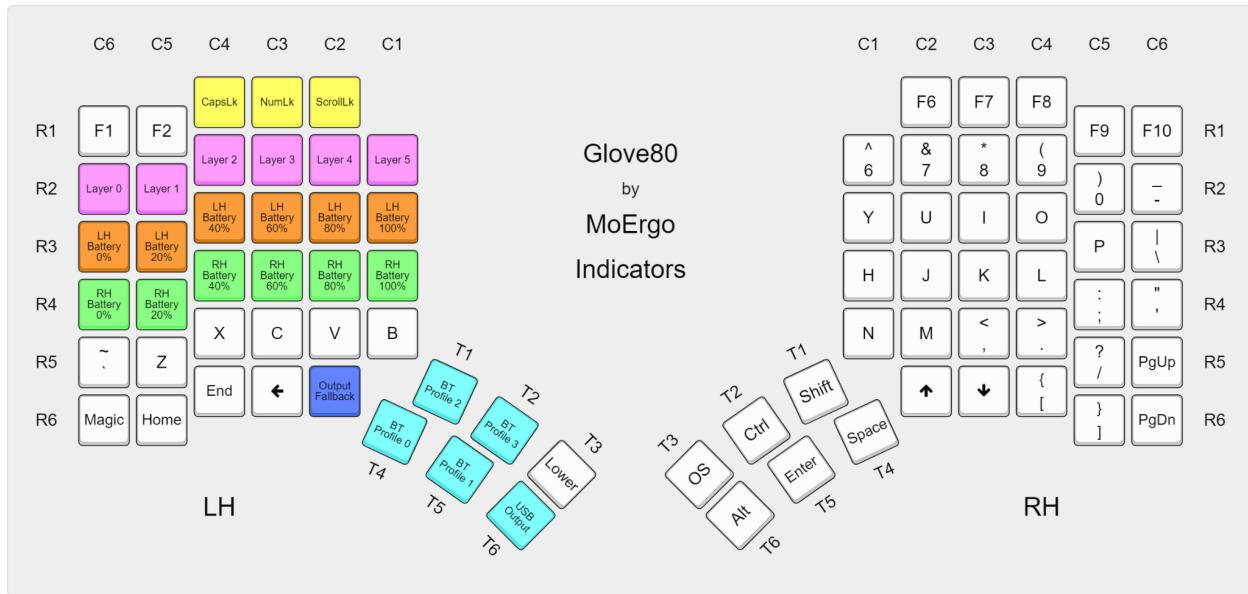
As you become familiar with Glove80, you may want to [customize Glove80's key layout](#) to match your typing habits.

Indicators

When you tap on the `Magic` key, the status indicators are activated for 10 seconds. The RGB LEDs under the keys on the left hand side of Glove80 will light up to indicate the status of the Glove80, showing:

- Caps lock, scroll lock, and num lock status
- The battery level and status of both left and right halves
- The status of each of the BT Profiles
- Which key layout layer is currently active

Here is a diagram showing the meaning and position of the indicator RGB LEDs:

Caps-lock, num-lock & scroll-lock

If the corresponding indicator is red, the lock is enabled.

Key layout layer status

If the corresponding indicator is purple, the layer is active

Layer 0 is the Base Layer of the key layout.
For the default key layout, Layer 1 is the Lower Layer.
For the default key layout, Layer 2 is the Magic Layer.
If you are using a customized key layout, the meaning of Layer 1 to Layer 5 will depend on your definition. If your customized key layout has more than 6 layers, the status of Layer 6 or above won't be shown.

Battery indicators

`LH R3` (i.e. row 3) indicates the battery status of the left half of Glove80.
`LH R4` (i.e. row 4) indicates the battery status of the right half of Glove80.

The number of LEDs in each row indicates the charge level:
- 1 LED: 0 to 19%
- 2 LEDs: 20 to 39%
- 3 LEDs: 40 to 59%
- 4 LEDs: 60 to 79%
- 5 LEDs: 80 to 99%
- 6 LEDs: 100% or charging

If the battery level is less than 20% the row will be in red.
Otherwise, if the battery level is less than 40% the row will be in yellow.

BT and USB indicators

Each of the four BT Profile outputs and one USB output of Glove80 is represented by an RGB indicator. The meaning of the colors for an output indicator is:

- **Purple**:
  - For BT Profiles: No device is paired to this BT Profile.
  - For USB: Unplugged
- **Red**:
  - For BT Profiles: The output device is paired but not connected.
  - For USB: Powered only but no data. *Note: Some chargers and USB power banks appear as USB hosts and will appear as green or even white.*
- **Green**: The output device is connected, but not being used for output.
- **White**: The output device is connected and is the current *actual output device* to which typing will be sent.

Please note that due to the behavior of ZMK, the *actual output device* may not be the same as the *selected output device* when the *selected output device* is not connected. ZMK's output fallback mechanism is explained further in the section ZMK output fallback mechanism. If the output fallback mechanism is in operation, i.e., the *actual output device* is not the same as the *selected output device*, the Output Fallback indicator will be lit in red.

Operating Glove80 wirelessly
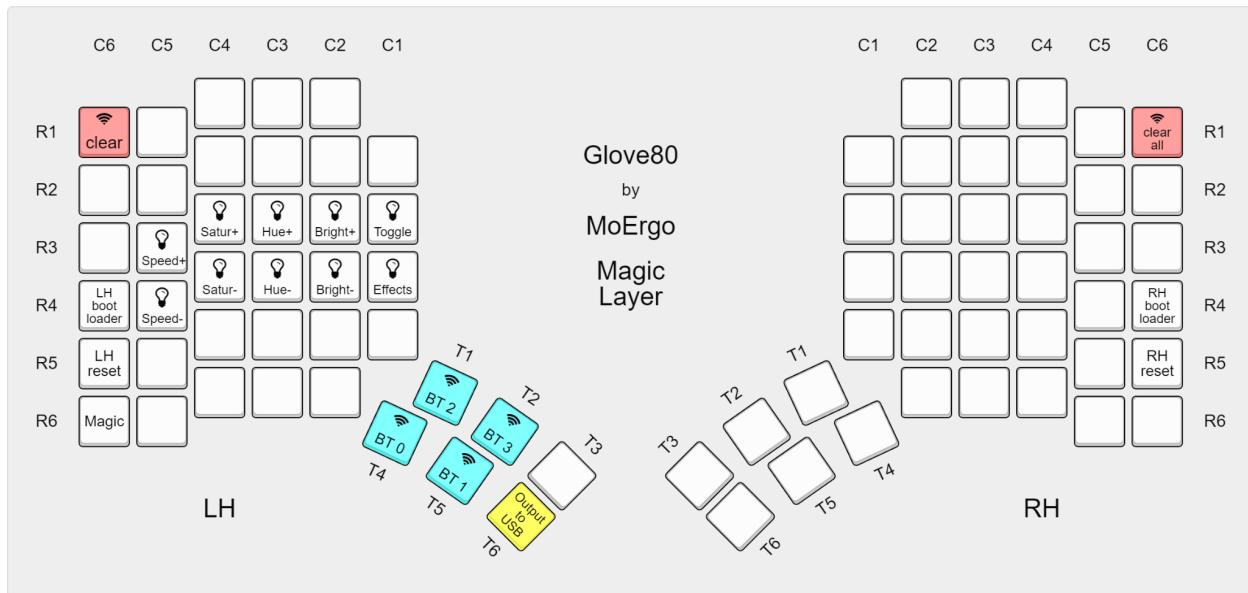
Introduction

Glove80 is capable of wirelessly connecting to your computer, your phone or other devices through Bluetooth Low Energy (BLE). Your devices need to support Bluetooth 4.2 or above.

Glove80 supports simultaneously connecting to up to 4 paired Bluetooth LE host devices ('BLE host'). Conceptually speaking, Glove80 has 4 BT Profiles, numbered BT Profile 0 to BT Profile 3.

Each BT Profile can be paired with a different BLE host. If you try to pair with the same BLE host using two BT Profiles, pairing will fail and may cause unexpected behavior.

Selecting BT Profile and USB-connected device

On a default key layout, you can select a BT Profile by pressing the Magic Key and the corresponding key highlighted in blue above.

Once paired and connected, you can quickly switch between BLE hosts and the USB-connected device by selecting the corresponding BT profile or selecting *Output to USB*.

For example you may pair with a MacBook on BT Profile 0, and an Android phone on BT Profile 1. If you want to type on the MacBook, you can switch to BT Profile 0 by pressing `Magic + BkSp` (on the default key layout). If you then want to switch to the Android phone, you can switch

to BT Profile 1 by pressing `Magic + Del`. If you want to switch to the USB-connected device, you can do so by pressing `Magic + Left-Alt.`

Pairing with a BLE host
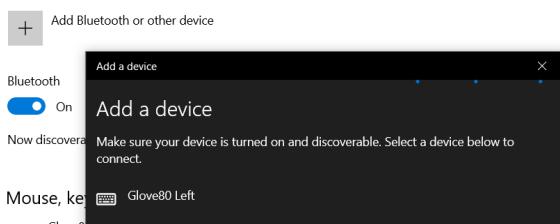
NOTE: Before you pair with a BLE host, if you had previously paired the Glove80 with the same BLE host, you must first remove the pairing from both the BLE host and Glove80, otherwise the pairing attempt will fail or could cause unexpected behavior. Please see the section on [Unpairing from a BLE host](#).

Pairing procedure:
1. Select a BT Profile on Glove80 that is currently not paired with a BLE host.

2. Press the Magic key. The selected BT Profile should be indicated in purple, confirming that it is not already paired to a device. See the section on [BT and USB indicators](#) for further details.

3. On the BLE host you intend to pair with, use the procedure appropriate for your operating system to pair with the "Glove80 Left" device.
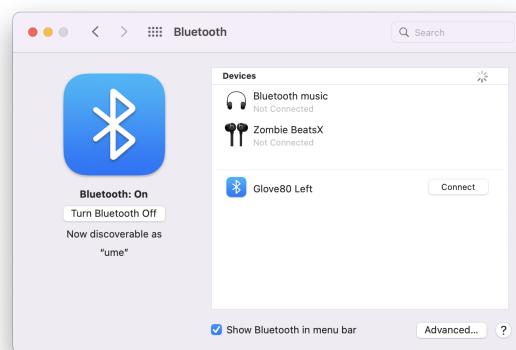
Windows 10	**MacOS**
1. Go to *Settings -> Bluetooth and other devices* 2. Make sure that Bluetooth is enabled 3. Click "*Add Bluetooth or other device*" 4. Choose the "Glove80 Left" device to pair with	1. Go to *System Preferences -> Bluetooth* 2. Make sure that Bluetooth is enabled 3. In the bottom selection of the *"Devices"* list, choose the 'Glove80 Left' device and click "*Connect"*

Adding a pairing on Windows 10

Adding a pairing on MacOS

Troubleshooting

If pairing fails or if there are problems, there are a number of possible explanations:

1. Does the BLE host support Bluetooth LE version 4.2 or later? If not, the BLE host may not be compatible with Glove80 using BLE.
2. If the "Glove80 Left" device is not listed among the new devices, or seemingly refuses to connect, it is possible there already exists a previous pairing with Glove80. To re-create the pairing, first delete the existing pairing on both Glove80 and the BLE host as described in Unpairing from a BLE host and then re-create it as described above.
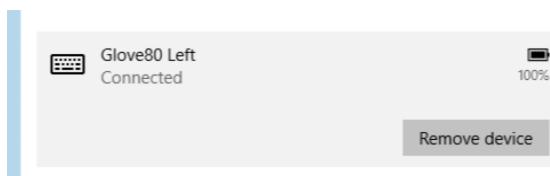
Unpairing from a BLE host

To un-pair Glove80 from a BLE host, you must remove the pairing from both Glove80 and from the host operating system. Procedure:

1. On Glove80, select the BT Profile that was previously used to pair with the BLE device. If you don't know which BT Profile was used, you will have to Unpair all BLE devices.

2. Press the key(s) to clear the bluetooth pairing. On the factory-default key layout, the keys are `Magic + F1`.

3. On the BLE host that was previously paired, use the procedure appropriate to the operating system to remove the pairing:
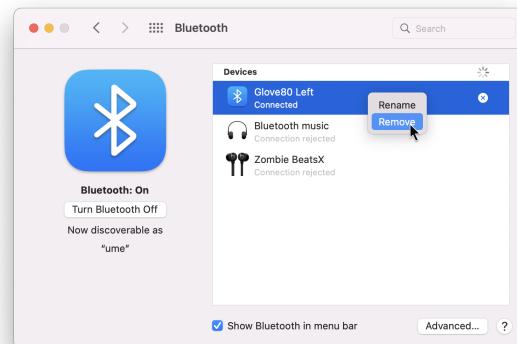
Windows 10	**MacOS**
1. Go to *Settings* -> *Bluetooth and other devices* 2. Select the paired "Glove80 Left" device 3. Click on the "*Remove Device*" button	1. Go to *System Preferences* -> *Bluetooth* 2. Right-click the paired "Glove80 Left" device from "*Devices*" 3. Select "*Remove*"

Removing a pairing on Windows 10

Removing a pairing on MacOS

Unpairing from all BLE hosts

CAUTION: This procedure will remove pairing with **all** paired BLE hosts on the Glove80. Please use this procedure with care.
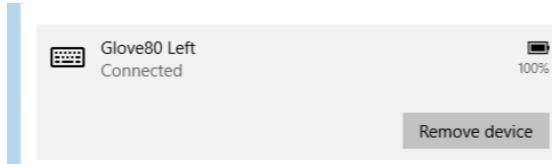
NOTE: You can also use this procedure when you have difficulties pairing with a host that you may have previously paired with, or attempted to pair with.

Procedure:
1. Press the key(s) to clear all Bluetooth pairings for all 4 BT Profiles. On the factory default key layout, the keys are `Magic + F10`.

2. On each BLE host that was previously paired, use the procedure appropriate to the operating system to remove the pairing:
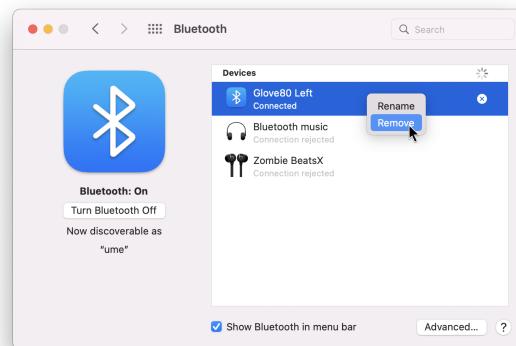
Windows 10	**MacOS**
4. Go to *Settings -> Bluetooth and other devices* 5. Select the paired "Glove80 Left" device 6. Click on the "*Remove Device*" button	4. Go to *System Preferences -> Bluetooth* 5. Right-click the paired "Glove80 Left" device from "*Devices*" 6. Select "*Remove*"

Removing a pairing on Windows 10

Removing a pairing on MacOS

BT Indicators

Glove80 provides indicators to show the status of each BT Profile, to indicate if a BT Profile is paired, or connected, or working as the output device.

Please see the section on BT and USB indicators for further details.

ZMK USB/BT Output Fallback Mechanism

If Glove80 is simultaneously connected to both a USB device and a BLE host device, and the currently selected device is disconnected, Glove80 will automatically switch its output to use the opposite connection method.

- If Glove80 is set to output to USB and the USB device is disconnected, the Glove80 firmware (ZMK) will automatically fall back to output to the last selected BT Profile.
- If Glove80 is set to output to a BT Profile, and the BLE host is disconnected, the Glove80 firmware (ZMK) will automatically fall back to output to USB.

This is a ZMK behavior meant to simplify switching between devices.

In the case of automatic output fallback, if the removed connection is restored, Glove80 will return to output to the originally selected connection method.

As described in the section [BT and USB indicators](#), when indicators are active Glove80 will always highlight the current actual output device, even if the output was activated by automatic output fallback. When output fallback is active, Glove80 will display this using the 'Output Fallback' indicator on `LH C1R5`.

For more information on this output fallback behavior, please refer to the ZMK documentation https://zmk.dev/docs/behaviors/outputs.

Battery-powered operation

Glove80 can be USB-powered or battery-powered. Each half of Glove80 has a separate lithium-polymer battery, and is powered independently.

Charging

To charge one half of Glove80, simply plug the half into a PC or USB charger with a USB-C cable. Typical charge time is around 3 to 4 hours.

You can continue to use Glove80 while charging.

Battery indicators

Glove80 has indicators to indicate the battery charging status and battery level of both halves.

Please see the section on Battery indicators for further details.

Battery saving with RGB Underglow
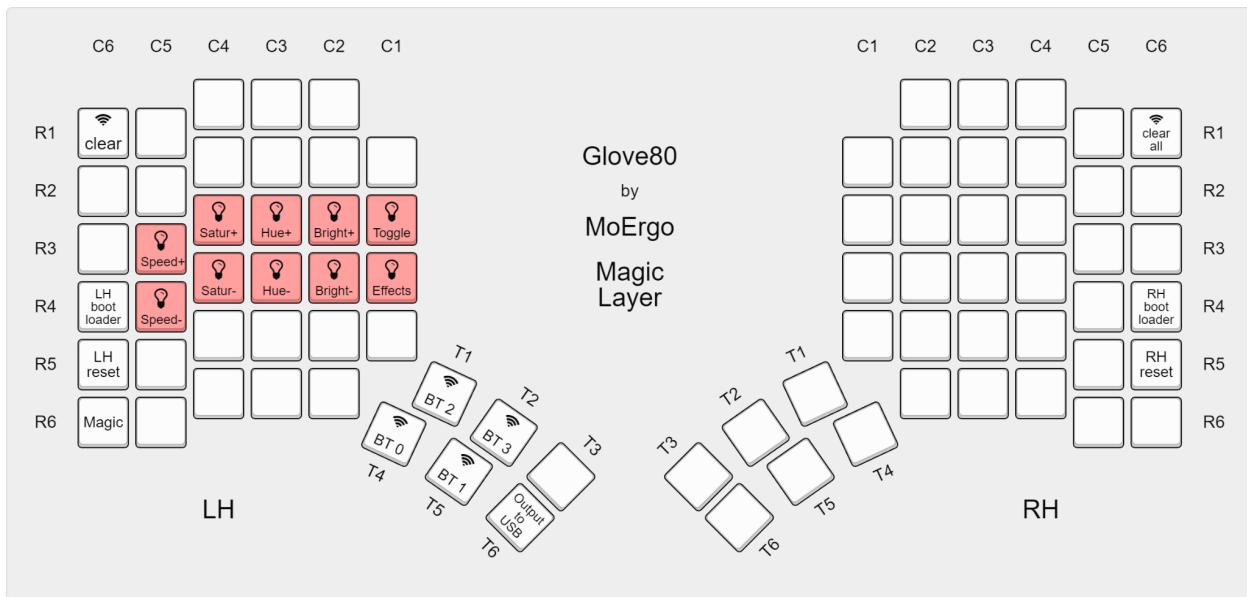
RGB LEDs can consume a lot of power, especially at peak brightness. To extend the battery life, Glove80 implements an automatic mechanism for the RGB underglow feature:
- When the battery level is below 20%, Glove80 will automatically limit the maximum brightness of RGB Underglow.
- When the battery level is below 10%, Glove80 will automatically disable the RGB Underglow feature. However, the Indicators function will continue to operate.

Configuring the RGB underglow

Depending on the product configuration of your Glove80, it has either RGB LEDs under all keys on both halves or has RGB LEDs under the keys on the left half only.

The RGB underglow displays beautiful patterns on your Glove80. On the default key layout, the RGB underglow function is controlled on the Magic Layer by the keys highlighted in the diagram below.

- Toggle: Turns the RGB Underglow function on and off
- Effects: Switch to the next underglow effect
- Bright+/Bright-: Controls the brightness
- Hue+/Hue-: Controls the hue
- Satur+/Satur-: Controls the saturation
- Speed+/Speed-: Controls the speed of the effect

Battery saving

When the battery runs low, RGB Underglow will be dimmed or switched off completely to extend battery life. For more details please see the Battery saving with RGB Underglow section.

Customizing key layout and swapping keycaps

Customizing key layout
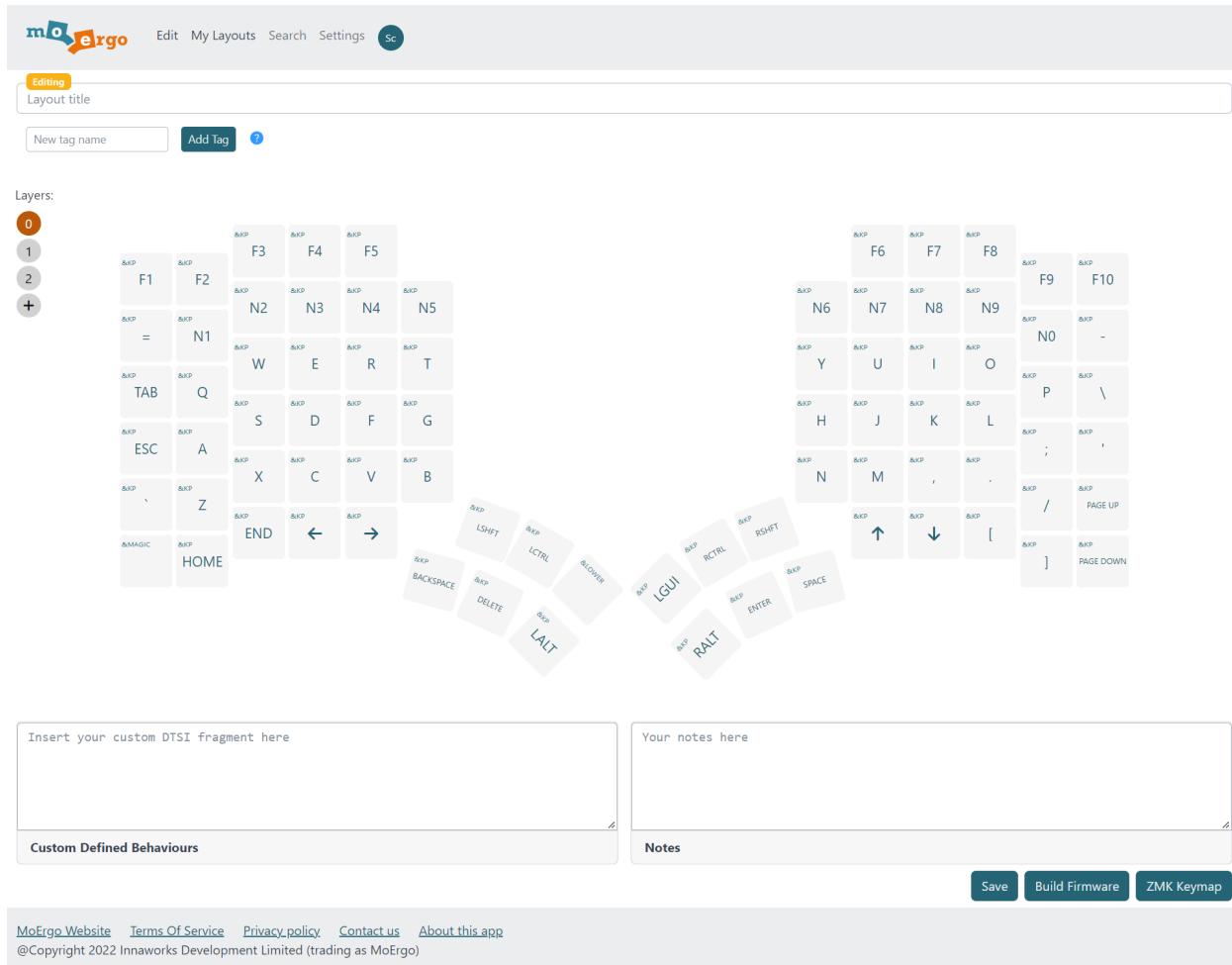
Each of us has a different hand size and shape, typing habits, and different application needs. Glove80 and its open-source ZMK-based firmware make it easy for you to customize your Glove80 to have exactly the key layout you want.

There are a few ways to change the key layout. The easiest way is to use the layout editor. An alternative is to edit the keymap file and compile your own ZMK firmware For more information on this, please see Appendix: ZMK.

After you have built a new ZMK firmware with the new key layout using either approach, you will have to load the firmware onto Glove80. To do this, follow the instructions in the Loading new ZMK firmware onto your Glove80 section.

Glove80 Layout Editor

Glove80 Layout Editor is an optional MoErgo service designed to complement your Glove80. Glove80 Layout Editor is an on-line web app accessible on most modern browsers, including on desktops and mobile devices. With Glove80 Layout Editor you can graphically design your own layout, and generate the firmware without any application installation.

mo Ergo   Edit My Layouts Search Settings Sc

Editing
Layout title

New tag name   Add Tag

Layers:
0
1
2
+

&KP F1 &KP F2 &KP F3 &KP F4 &KP F5
&KP = &KP N1 &KP N2 &KP N3 &KP N4 &KP N5
&KP TAB &KP Q &KP W &KP E &KP R &KP T
&KP ESC &KP A &KP S &KP D &KP F &KP G
&KP ` &KP Z &KP X &KP C &KP V &KP B
&MAGIC &KP HOME &KP END ← →
&KP LSHFT &KP LCTRL &LOWER
&KP BACKSPACE &KP DELETE &KP LALT

&KP F6 &KP F7 &KP F8 &KP F9 &KP F10
&KP N6 &KP N7 &KP N8 &KP N9 &KP N0 &KP -
&KP Y &KP U &KP I &KP O &KP P &KP \
&KP H &KP J &KP K &KP L &KP ; &KP '
&KP N &KP M &KP , &KP . &KP / &KP PAGE UP
&KP ↑ &KP ↓ &KP [&KP] &KP PAGE DOWN
&KP RCTRL &KP RSHFT
&KP LGUI &KP ENTER &KP SPACE &KP RALT

Insert your custom DTSI fragment here

Custom Defined Behaviours

Your notes here

Notes

Save   Build Firmware   ZMK Keymap

MoErgo Website   Terms Of Service   Privacy policy   Contact us   About this app
@Copyright 2022 Innaworks Development Limited (trading as MoErgo)

To use Glove80 Layout Editor, you will need to create an account, subject to its terms of use.

Glove80 Layout Editor is simple to use and learn. The Glove80 Layout Editor User Guide is available at Glove80 Support Site.

Loading new ZMK firmware onto your Glove80

The Glove80 Layout Editor generates a `.uf2` file which is the new firmware containing the new key layout. This new firmware needs to be loaded onto *both halves* of your Glove80.
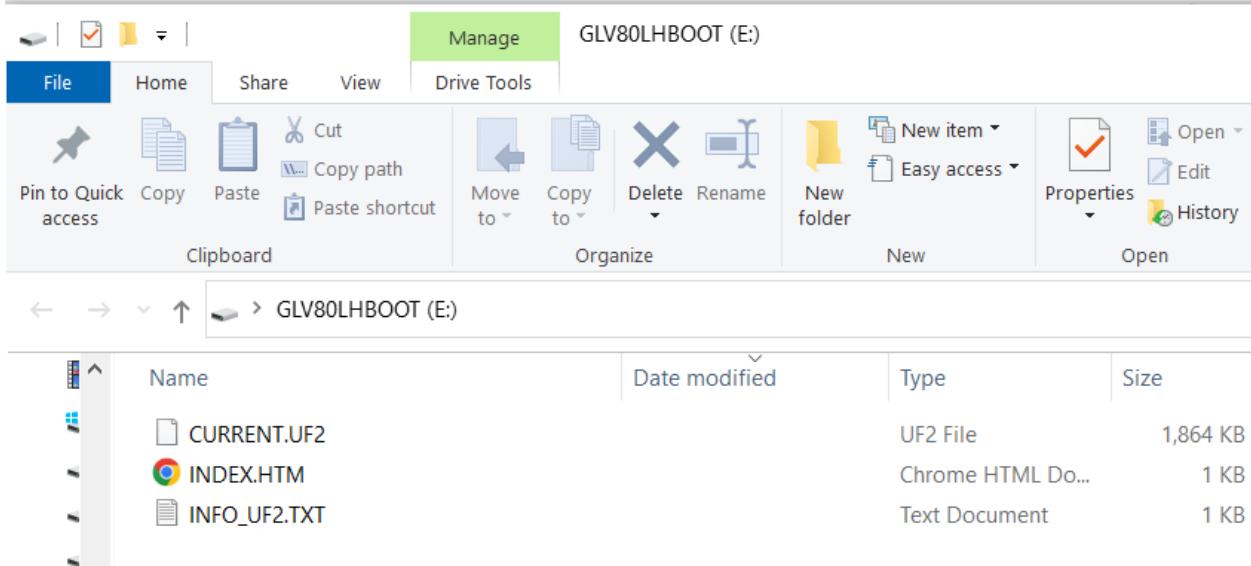
To do this safely, you will need:
-   A spare keyboard or on-screen keyboard (as safety insurance)
-   A USB-C cable to connect from your computer to Glove80
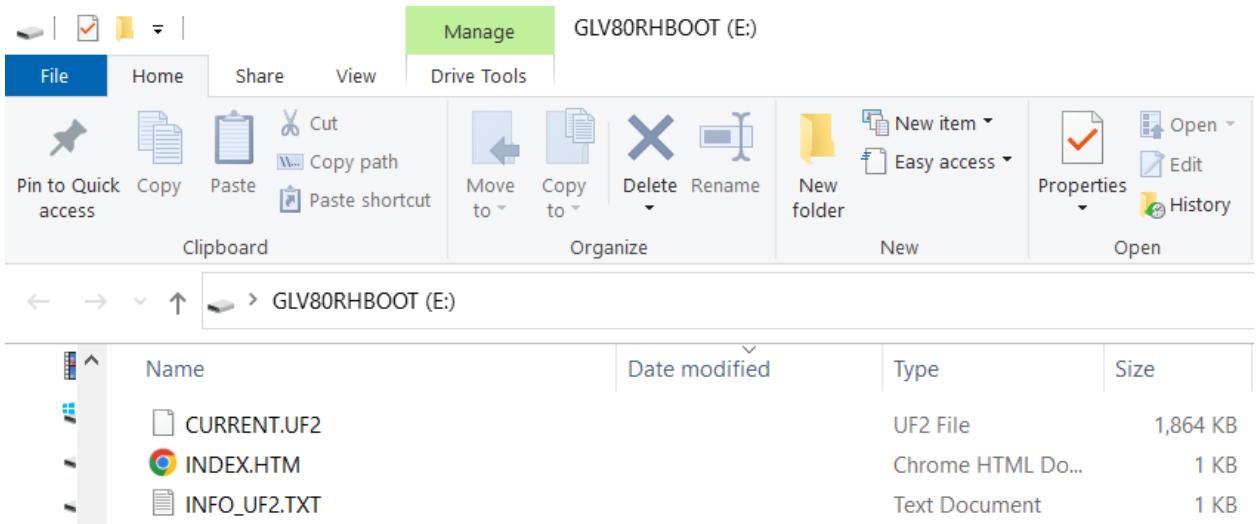
The steps to load the new firmware are:
1.   First plug in the USB-C cable to the **left** half of your Glove80 and to the host computer.

2. Put the left half into bootloader mode. On the default key layout, this is done by pressing the keys `Magic + Esc`. If you have changed this in your layout, please see the section on [Putting Glove80 into Bootloader for Firmware Loading](#).

3. If successful, the bootloader will present a USB Mass Storage Device. As an example, on Windows you will see a File Explorer window with the name `GLV80LHBOOT`

4. Copy the .UF2 file into this Mass Storage Device. If successful the Mass Storage Device will disappear.
NOTE: There is no need to rename the UF2 file to CURRENT.UF2. Any filename with the extension of .UF2 suffices.

5. Next plug in the USB-C cable to the **right** half of your Glove80 and to the host computer.

6. Put the right half into bootloader mode. On the default key layout, this is done by pressing the keys `Magic + '`. If you have changed this in your layout, please see the section on [Putting Glove80 into Bootloader for Firmware Loading](#).

7. If successful, the bootloader will present a USB Mass Storage Device. As an example, on Windows you will see a File Explorer window with the name `GLV80RHBOOT`.

Name	Date modified	Type	Size
CURRENT.UF2		UF2 File	1,864 KB
INDEX.HTM		Chrome HTML Do...	1 KB
INFO_UF2.TXT		Text Document	1 KB

Note: if you need to leave the bootloader without loading new firmware, simply power Glove80 off and on again using the power switch.
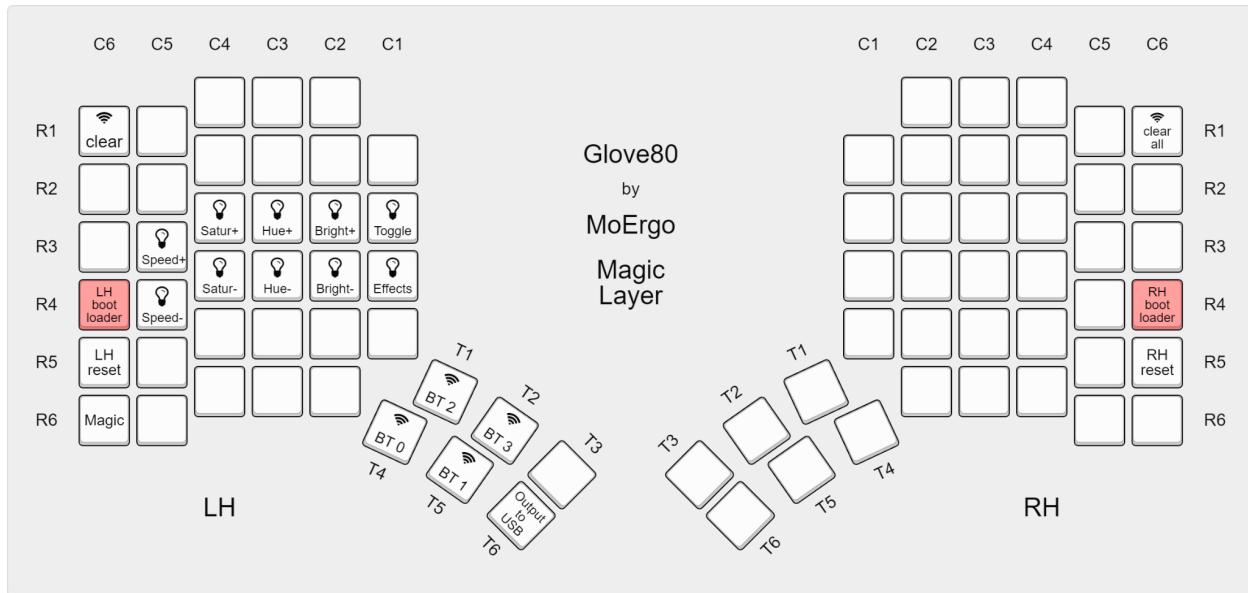
8. Copy the .UF2 file onto this Mass Storage Device. If successful the Mass Storage Device will disappear.
    NOTE: There is no need to rename the UF2 file to CURRENT.UF2. Any filename with the extension of .UF2 suffices.

Putting Glove80 into Bootloader for firmware loading

The bootloader is the piece of software that runs immediately after you turn on a Glove80 half. Normally it will simply pass the control over to the ZMK firmware. However, it also has the ability to load new ZMK firmware by presenting a USB mass storage device.

There are two ways to put Glove80 into the bootloader mass storage device mode for firmware loading.

Entering bootloader mass storage device mode from ZMK
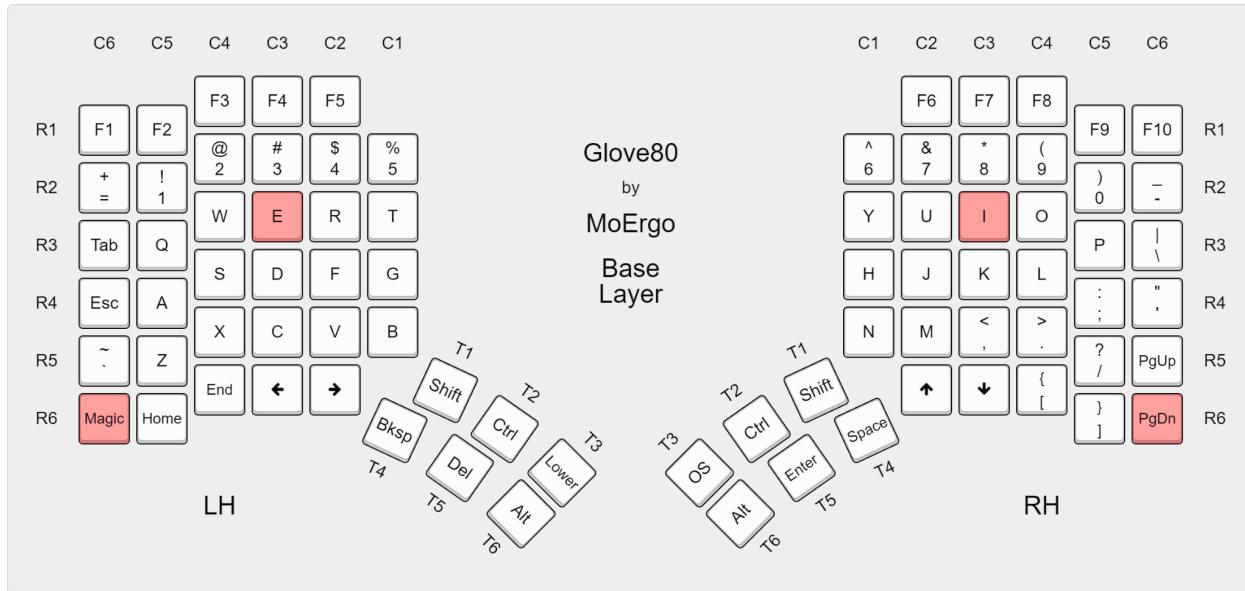
The simplest way is to use the key mapping on the ZMK key layout by activating the `&bootloader` behavior *on the half of the Glove80 that you want to load new firmware.*
On the default key layout, you can do so by
- First connect a USB cable from the host to the half of Glove80 you want to load firmware
- Pressing `Magic + Esc` for the **left** half
- Pressing `Magic + ‘` for the **right** half

Entering bootloader mass storage device mode on power-up

If the ZMK firmware is corrupted, or if the key layout has assigned no keys to the `&bootloader` behavior, there is a fallback option.

To put the **left** half into the bootloader mass storage device mode:
    a.   Switch off the power switch of the left half
    b.   Connect a USB cable from the host to the left half
    c.   Referring to the row-column key above, hold `C6R6 + C3R3` (`Magic + E` on the default layout)
    d.   While holding the two keys, switch on the power switch of the left half

To put the **right** half into the bootloader mass storage device mode:
    a.   Switch off the power switch of the right half
    b.   Connect a USB cable from the host to the right half
    c.   Referring to the row-column key above, hold `C6R6 + C3R3` (`I + PgDn` on the default layout)
    d.   While holding the two keys, switch on the power switch of the right half

Replacing keycaps to match key layout

Changing the key layout will change the behavior of the keys; however, if you are using labeled keycaps, the labels will no longer match the function of the modified keys.

Glove80 is designed so that all keys use the same keycap profile, which means the keycaps are freely interchangeable between any two keys.

Here is how to match the keycaps with the modified key layout:

1. Use the included keycap puller to gently pull out the keycaps that no longer match the key layout.

   WARNING: DO NOT APPLY EXCESSIVE FORCE. It is important that you pull out the keycap gently; excess force can cause permanent damage to the key switch and/or PCB. **DAMAGE CAUSED BY KEYCAP REPLACEMENT IS NOT COVERED BY THE WARRANTY.** If the keycap feels stuck, or if the key switch pops out of the keyboard case, try to apply one of the tips below.

   TIP: Do not continue to pull out the keycap if the key switch pops out of the keyboard case. Push the key switch back in. Use the wrench included with Glove80 or a screwdriver or similar tools to hold down the key switch, then try to pull out the keycap with the keycap puller.

   TIP: If the keycap you need to remove is surrounded by other keys, you may have to first remove other keycaps to reach it.

2. Push the correct keycaps gently onto the switches to match the modified key layout.

Customizing the tenting angle

Benefits of tenting

If you press your palm flat on your desk and hold it there for a few minutes, you will feel tension on your forearms; you are experiencing forearm pronation. If you rotate your palms such that your thumbs are raised slightly into the air, you should find the position more comfortable.

Tenting is designed to allow Glove80 to be used without forearm pronation.

Glove80 has a default tenting angle that is comfortable for most people. However, we found that this is one area where the preferred setting differs greatly between users.

Therefore, we built a tenting system into Glove80: the legs of Glove80 can be extended to change the tenting angle of the keyboard, allowing you to choose the precise degree of tenting that feels best for you.

How to adjust the tenting angle

NOTE: We do not recommend changing the tenting angle until you have used Glove80 for a few days. Glove80 comes with a tenting angle that is comfortable for many people. It would be worthwhile to type on Glove80 for at least a few days to get a good sense of the ergonomics of Glove80 before adjusting the tenting angle.

Unlike other keyboards, Glove80 allows you to finely tune the tenting angle so that you can find exactly the right angle for you.

Finding the most comfortable tenting angle is a journey of experimentation. Don't worry if you don't get it right the first time. Try what you think would work, test it out, and adjust accordingly.

For lower angle tenting adjustments

To adjust the tenting angle of one half of the keyboard:
1. Simply rotate the feet of the extensible legs clockwise or counter-clockwise (2 without palm rest, and 3 with palm rest) on the thumb/index finger side of the half keyboard, until the half is at a tenting angle that is comfortable for you. Make sure that the half keyboard sits stably on the desk; make adjustments to each individual leg if necessary.

2. [Optional]
    If desired for extra stability, once you have completed adjusting the tenting angle, you can add M4 nuts to tighten up the legs. To do so, do this one at a time for each of the extended legs:
    a. Take off the foot of one of the extended legs by rotating the foot counter-clockwise until it comes off.
    b. Now put one of the supplied M4 nuts onto the threaded rod that is attached to the foot and rotate the nut until it is at the bottom of the threaded rod.
    c. Put the foot back on its leg and adjust the feet until the keyboard half sits level on the desk.
    d. Now turn the M4 nut with the included tool until it is hard against the plastic case of the half keyboard.

For higher angle adjustments (up to roughly 25/30 degrees)

To adjust the tenting angle of one half of the keyboard:
1. Unscrew the feet of the extensible legs (2 if you are not using the palm rest, or 3 if you are) that are on the thumb/index finger side of the half keyboard.

2. In the Glove80 accessory kit, there are additional feet, threaded rods, M4 nuts, and silicone bumpers.

3. Pick 2 or 3 feet (matching the number of legs you removed in step 1), and attach a silicone foot bumper to the bottom of each one.

4. Choose a threaded rod of the length you think would work and attach the foot, rotating it until it touches the silicone bumper.

5. Screw two M4 nuts onto the threaded rod. The first M4 nut should be screwed tightly against the foot. The second M4 nut should be loose on the threaded rod.

6. Now attach the threaded rods and feet into the legs in step 1. Adjust the height of each foot until the Glove80 half is stable on the desk and at the tenting angle you desire.

7. Once you have completed adjusting the tenting angle, turn the loose M4 nut on each threaded rod until it is hard against the plastic case of the half keyboard.

NOTE: If you desire even higher angle mounting, please see the section on Custom Mounting.

Troubleshooting

Troubleshooting FAQs
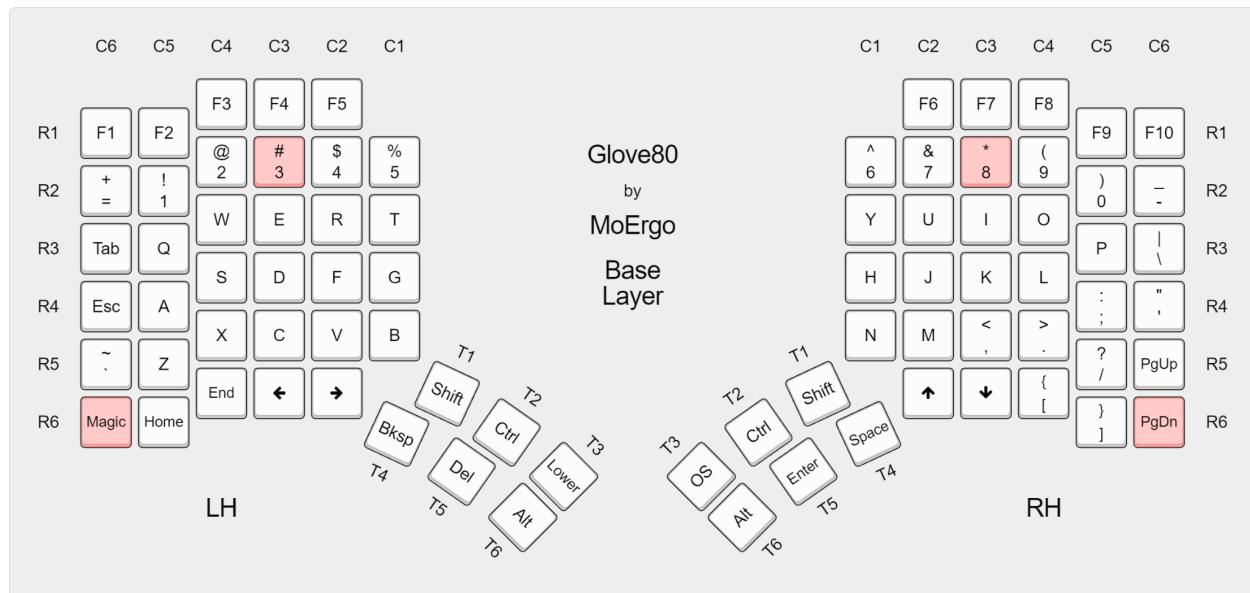
MoErgo maintains a set of FAQs for Glove80 troubleshooting at
https://www.moergo.com/pages/troubleshooting-faq. These FAQs will help you troubleshoot the
most common kind of problems.

Configuration factory reset and re-pairing left and right halves

The configuration factory reset procedure resets the non-volatile configuration of a Glove80 half
back to its original factory setting, i.e. your BLE profiles, preferences for RGB underflow and
other configuration settings will be removed. **Please note that this procedure does not
restore firmware to the factory firmware.**

Since the pairing information between the left half and the right half is also stored in the
non-volatile configuration in both halves, **if you perform a configuration factory procedure
on one half, you must also perform a configuration factory reset on the other half**. Left
and right halves will automatically re-pair with each other, after the configuration factory reset.

To perform the configuration factory reset procedure on the **left** half:
    a. Switch off the power switch of the left half
    b. Referring to the row-column key above, hold `C6R6` + `C3R2` (`Magic + 3` on the
        default layout)
    c. While holding the two keys, switch on the power switch of the left half

d. Wait for 10 seconds while holding the two keys

e. Switch off the power switch of the left half

To perform the configuration factory reset procedure on the **right** half:

a. Switch off the power switch of the right half

b. Referring to the row-column key above, hold `C6R6 + C3R2` (`PgDn + 8` on the default layout)

c. While holding the two keys, switch on the power switch of the right half

d. Wait for 10 seconds while holding the two keys

e. Switch off the power switch of the right half

To re-pair the left half and the right half:

a. Switch on the power switch of the left half and the right half at the same time

Appendix: Specification

Ergonomics	
Contoured keywell	✅
Thumb cluster	6-key 2-row curved (patent pending)
Split	Wireless full split
Neutral tilt	✅
Tenting	Built-in & continuously adjustable
Low profile design	20mm off the desk to top of keycap of lowest key
Low travel switches	✅
Palm rest	3D-sculpted & detachable

Keys & Layout	
Number of keys	80
Key switch family	Low profile mechanical Kailh Choc v1 switches rated at 70 million+ presses
Key switch choice	Linear (Red), Tactile (Brown) and Clicky (White)
Keycap	Premium POM translucent MCC profile keycap, blank or labelled
Standard keycap language	🇺🇸
Additional keycap language	🇬🇧 🇩🇪 🇳🇴 🇸🇪 🇫🇮 🇮🇹 🇯🇵 with add-on set
Rearrangeable keycaps to match layout	All keys share the same keycap profile
Colemak & DVORAK	✅

Connectivity	
Wireless Interface	Bluetooth LE 5.0
USB Interface	USB 2.0 over USB C
Multi-device support	4 BLE + 1 USB

Firmware & Configurator	
Firmware	Opensource ZMK
OS Supported	⊞ 🍎 🐧 🐧 🌐 iOS iPadOS
Configurator	Web-based. Requires 🌐 browser

Hardware	
Microcontroller	2 x Nordic nRF52840, with 256kB ram and 1MB flash
Battery life (estimated)	With LEDs off, 2-4 weeks for left hand & 2 months+ for right hand. Test condition: powered-on 24/7 with ZMK sleep functionality disabled
Per-key LEDs	(Standard Edition) 40 individually addressable RGB LEDs; (Gamer Edition) 80 individually addressable RGB LEDs

Customizability	
Custom mount support	✅
Hardware extension support	6 digital GPIOs

Dimensions	
Width	370mm (14.6 in)
Depth (w/o palm rests)	168mm (6.6 in)
Depth (with palm rests)	203mm (8.0 in)
Height	59mm (2.3 in)
Weight	approx 600g (1 lb 5 oz)

Appendix: ZMK

Glove80 is designed to work with the open-source ZMK firmware. The ZMK community (www.zmk.dev) maintains the incredible ZMK firmware.

For more details on the ZMK features, configuration and build procedures, please refer to the ZMK documentation at https://zmk.dev/docs. The ZMK community has a Discord server at https://discord.com/invite/sycytVQ.

The Glove80 fork of ZMK is maintained at https://github.com/moergo-sc/zmk.

Creating a ZMK config repo and building ZMK firmware the "traditional way"

The traditional way of building a ZMK firmware is by creating a Github repository for the ZMK configuration of your keyboard and then using a Github action to build the ZMK firmware. This is documented in https://zmk.dev/docs/user-setup. *If you use MoErgo's Glove80 Layout Editor you don't need to create a Github repository; please see* *Glove80 Layout Editor* *for details.*

However if you prefer not to use Glove80 Layout Editor, you can build your Glove80 firmware in the traditional way. We have created a template Glove80 ZMK Configuration, which is at https://github.com/moergo-sc/glove80-zmk-config. Please follow the instructions in README.md.

This approach is particularly useful if you decide to customize your ZMK firmware.

Appendix: Custom mounting

Glove80 is designed to facilitate custom mounting so that you can mount your Glove80 in countless creative ways.

Here are some of the possibilities:
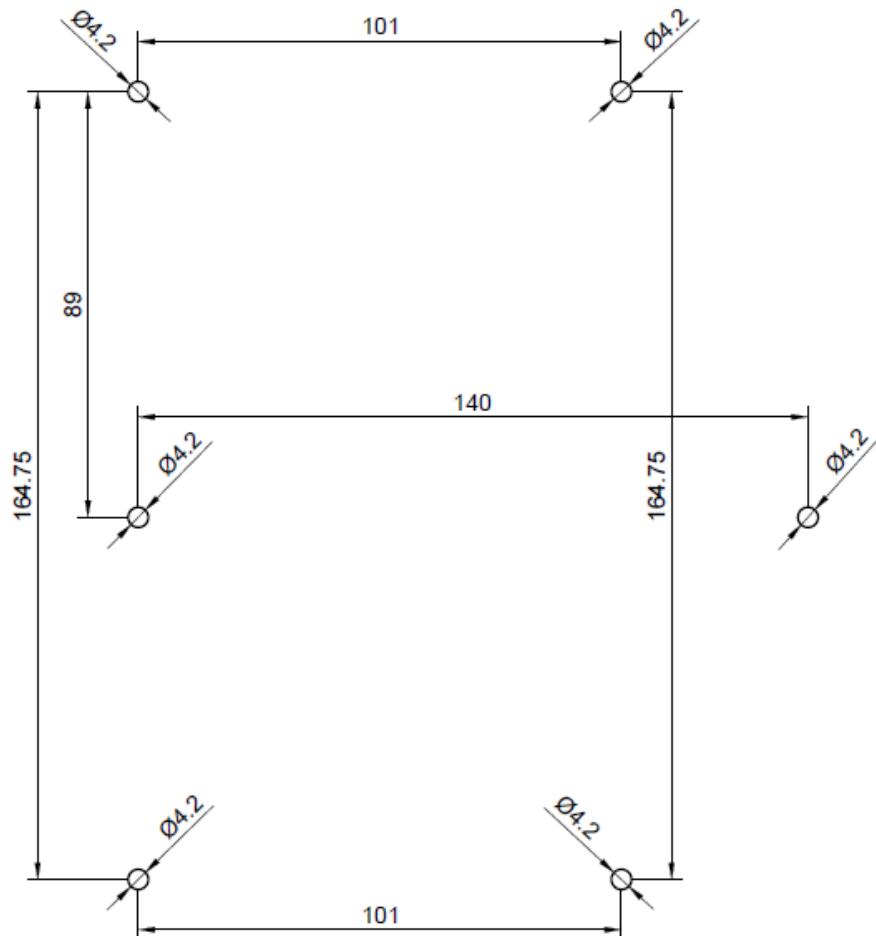
How to custom mount

Procedure:

1. For the extensible legs, remove the feet by rotating them to reveal M4 studs.

2. For the non-extensible legs, use a craft knife to remove the silicone bumper to reveal an M4 stud.

3. Attach M4 threaded rods or M4 screws and use other appropriate fasteners such as nuts to secure Glove80 onto your custom mounting mechanism.
   a. The additional feet without threaded rods and silicone bumpers included in the Glove80 box are useful as spacers for the extensible legs.

Leg stud positions

Installing tripod mounting plates

MoErgo makes mounting plates available for Glove80 to easily attach to a camera tripod or other mount using the standard tripod mount screws (1/4"-20). They come in two types: quck release or non-quick release.

A note of the components needed:
- The Glove80 plastic feet without threaded rods attached (either white or grey to match the Glove80 case color) are found in an accessory ziploc bag that comes with Glove80, as well as the accessory ziploc bag that comes with the tripod mounting plates.
- Silicone bumpers are found in an accessory ziploc bag that comes with Glove80
- The threaded rods are found in an accessory ziploc bag that comes with Glove80

To mount the tripod plate onto a Glove80 half:
1. Prepare the mounting plates. Please read Preparing the non-quick-release tripod mounting plate or Preparing the quick-release mounting plate, as appropriate for the type of tripod mounting plate you have.

2. For the extensible legs, remove the feet by rotating them to reveal M4 studs. Remember the original locations. Do not mix.

3. For the fixed leg, use a craft knife to remove the silicone bumper to reveal an M4 stud. Do not throw away this silicone bumper; please wrap it in wax paper or Glad wrap for safekeeping. Mark it as "Silicone bumper for Glove80 fixed leg" in case you need to use it again in the future. This silicone bumper is different from the others.

4. Turn the keyboard half upside down.

5. For the palm rest short leg, Add a foot without a silicone bumper, as a spacer, then screw in a 16mm threaded rod through the spacer into the M4 stud in the palm rest.

6. Position a foot without a threaded rod, to act as a spacer, for each extensible leg (other than the palm rest short leg).
.
7. Put the tripod mounting plate over the up-turned half, lining up the holes in the tripod mounting plate with the legs.

8. For all feet removed in step 2 (other than the one for the palm rest short leg) screw the feet through the spacer foot into the M4 studs in the same leg. Tighten each foot against the acrylic plate until finger-tight; don't overtighten.

9. For the fixed leg, use the foot removed from the palm rest short leg in step 2, and screw the foot into the M4 stud. Tighten the foot against the acrylic plate until finger-tight; don't overtighten.

10. For the palm rest short leg, screw in a 16mm threaded rod into the M4 stud. Then screw another foot without a threaded rod on top of the acrylic plate. Then apply a silicone bumper from the accessories bag that comes with Glove80. Tighten the foot against the acrylic plate until finger-tight; don't overtighten.

11. Now tighten all spacer feet tight against the acrylic plate.

The finished product should look like:

Preparing the non-quick-release tripod mounting plate

1. Peel off the protection sheets from the 2 tripod plates. The protection sheets are the brown layer on both sides of the acrylic plates for protecting against scratches during transport.

2. Attach your tripod gear through the hole in the middle of the tripod mounting plate.

3. Secure your tripod gear to the tripod mounting plate by installing and securing the tripod nut in the Tripod Mounting Plate Accessories Bag.

Preparing the quick-release mounting plate
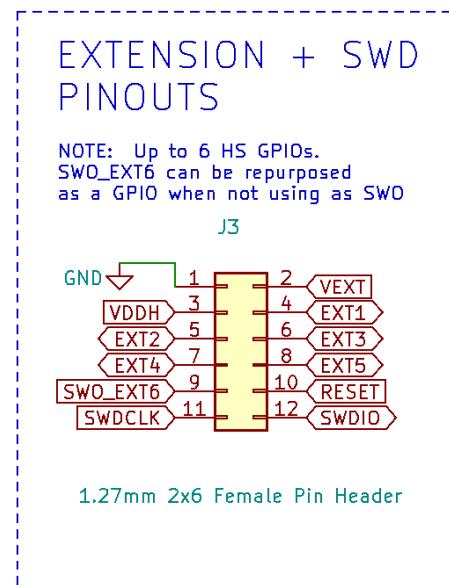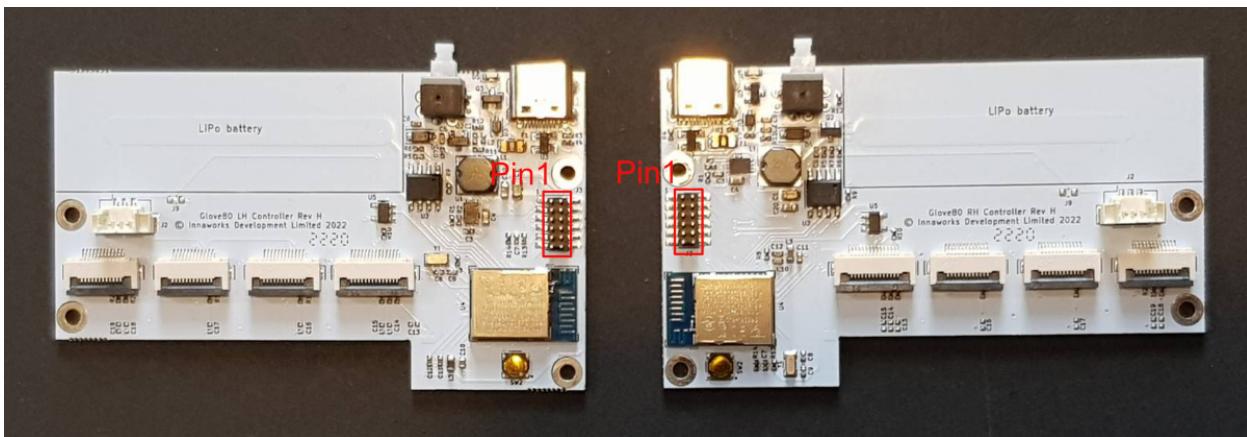
1. Peel off the protection sheets from the 2 tripod plates. The protection sheets are the brown layer on both sides of the acrylic plates for protecting against scratches during transport.

2. Take out the two quick release ball joints from the cardboard boxes

3. Peel off the double-sided tape on each of the two quick release ball joints

4. Attach a quick release ball joint to the rectangular trough in the middle of a mounting plate, lining up the rim of the quick release ball joint with the trough.

5. Screw tight the tripod nut in the Tripod Mounting Plate Accessories Bag to secure the quick release ball joint.

Appendix: More Customizations

Extending the Glove80 electronics

WARNING: Attaching custom electronics to Glove80 can damage Glove80. If you damage your Glove80 by making custom modifications, the damage will not be covered by the warranty. Skills and experience are required to develop electronics. Do this at your own risk. Specifically, the use of the GPIO pin header will void your warranty.

On each half of Glove80, 6 GPIO pins, GND pins and power pins are exposed via a 2x6 1.27mm pin header on the controller PCB.

Please note VDDH voltage changes depending on whether Glove80 is currently battery powered or USB powered. It can be anywhere from 3V to 5V. It is recommended you use a voltage regulator to power your circuit.

VEXT is the voltage that nRF52840 is internally operating at. It is also the voltage of the GPIO signals. VEXT is set by the bootloader, and is typically 2.4V.

Your circuit should be powered either by VDDH or VEXT. Please ensure that you are not exceeding the current limit. Generally speaking, you should not draw more than 3mA from VEXT and no more than 80mA from VDDH. However, these current limits are not guaranteed and are provided purely as a guideline. The amount of current used will depend on many factors, including the firmware version and what other peripherals (such as RGB LEDs) are powered on.
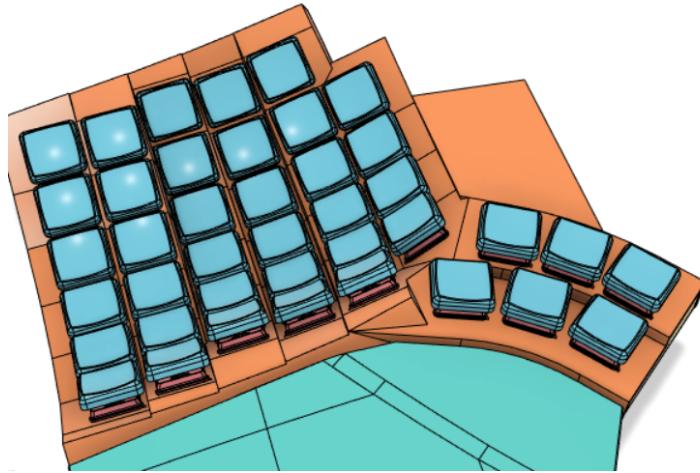
Your circuit must ensure that GPIO input signal voltage is no higher than VEXT. Otherwise permanent damage can occur. Please note that when the Glove80 is powered off, VEXT will be 0V but VDDH may not be 0V, for example if the Glove80 is charging. As such, care must be taken to ensure not to drive the GPIO when VEXT is 0V.

The pin mappings on nRF52840 are as follows:

	Left hand nRF52840 pin	Right hand nRF52840 pin
EXT1	P0.22	P0.21
EXT2	P0.21	P0.24
EXT3	P0.24	P0.20
EXT4	P0.20	P0.25
EXT5	P0.25	P0.22
SWO_EXT6	P1.00	P1.00

Sidecar Module

The underside of Glove80 provides a couple of M2 anchor points to position a "sidecar" module.

MoErgo provides the STEP file for an example sidecar, which you are free to use and modify.
https://moergo.com//files/Glove80_LH_Side_Car_Template_v7.step

A sidecar module can be used to extend your Glove80 by developing additional hardware or peripherals. Some possible uses include:
- Adding an external trackpad
- Adding an external trackball
- Adding a display
- Adding a rotary encoder or additional key switches

Appendix: Glove80 with switches-not-soldered option

WARNING: For Glove80 with switches-not-soldered option, **GLOVE80 WARRANTY DOES NOT COVER ISSUES RELATED TO THE SOLDERING QUALITY OF THE KEY SWITCHES, NOR DAMAGES THAT OCCUR DURING OR AS A RESULT OF THE DISASSEMBLY, SOLDERING, AND REASSEMBLY PROCESS.** Glove80 with the switches-not-soldered option are for customers with suitable electronics and soldering skills and equipment.

Replacing and soldering key switches

1. Make sure you are suitably grounded with a ground strap.

   WARNING: Electronics are sensitive to electric shock, which can result in immediate or delayed damage. Please make sure you are suitably grounded before opening the case of Glove80.
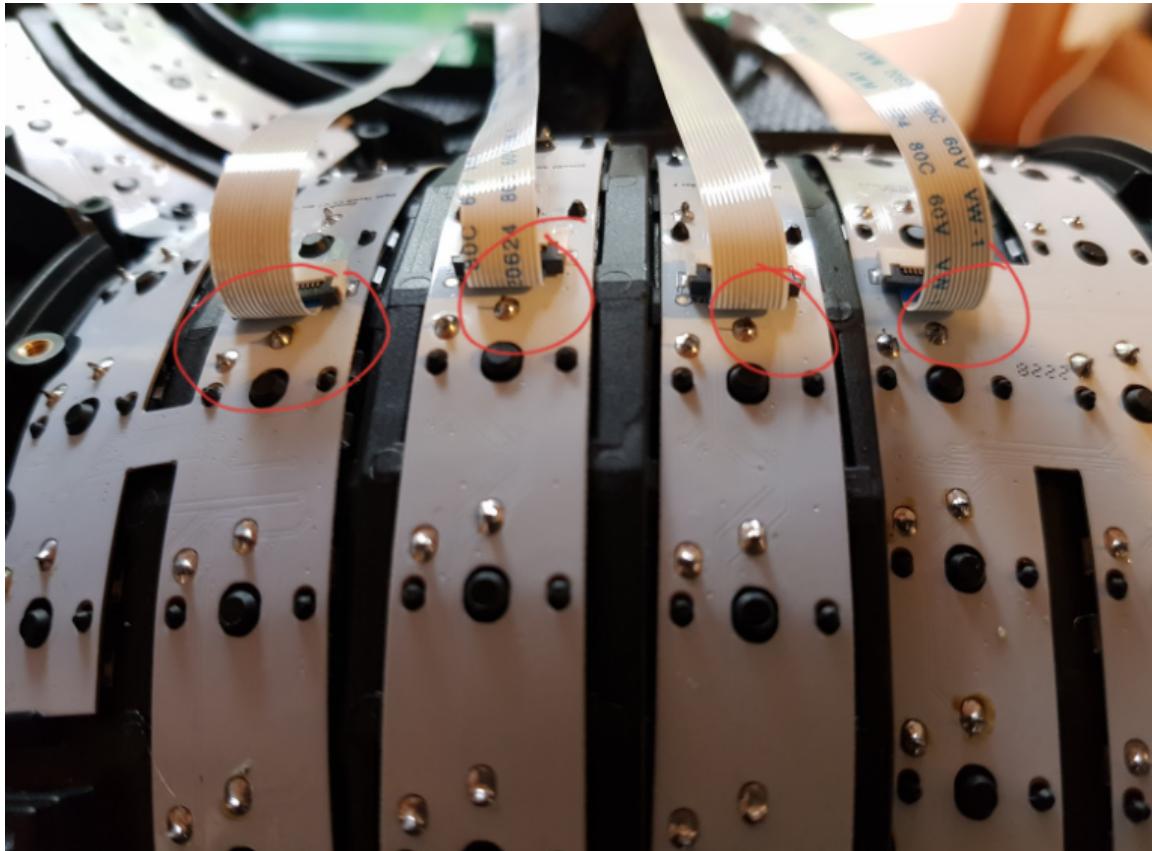
2. Removing the 8 case screws that hold together the case of each half, with a suitable screwdriver.

3. **While opening the keyboard case, be very careful and slow.** You will find that there are 4 FCC cables attached to the finger PCBs in the upper shell to the controller PCB in the lower shell.

.

4. Detach the 4 FCC cables by opening each of the 4 FCC connectors on the finger PCBs. To open the FCC connector, lift its black tab away from the FCC cable end like lifting a car bonnet.

5. Now you can separate the upper shell and the lower shell.

6. If you would like to replace the key switches,

   a. Remove **only one** key switch, by pushing from the inside of the shell on the 3 black plastic legs.
   .

   WARNING: Do not remove more than one key switch at a time from the Glove80. Removing multiple key switches will make it likely for the finger PCB(s) to disengage from the case. Without suitable knowledge and experience, it is possible to damage the electronic components when reinstalling the finger PCB back into the case.

   b. Install a suitable replacement Choc v1 key switch. Visually inspect that the key switch is sitting flat on the case, and that the two electrical pins are through the PCB.

7. Solder the pins of each key switch to a high quality. Please ensure that the soldering temperature and duration complies with the Kailh Choc v1 datasheets (http://www.kailh.com/en/Products/Ks/CS/).

8. On each side of the keyboard, please use a plier and clip short the key switch legs circled in the photo below. This step is essential for preventing damage to FCC cables. [Note: the photo is shown with FCC cables attached, to demonstrate the risk of damage to the FCC cables if these switch legs are not clipped]

9. Reconnect the 4 FCC cables.

10. Close the case shell and install the case screws.

Appendix: Compliance and Certifications

USA

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions. (1) This device may not cause harmful interference. (2) This device must accept any interference received, including interference that may cause undesired operation.

Canada

This device complies with Industry Canada license-exempt RSS Standard(s). Operation is subject to the following two conditions. (1) This device may not cause harmful interference. (2) This device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement