

HDZ 3.3 Assembly Guide

Intro

Thank you for purchasing the HDZ. We know you'll enjoy your purchase!

If you run into any issues during assembly, please contact us at support@carbide3d.com.

Prior to fitting the HDZ please ensure you can rotate the ball screw by hand and move the carriage to the top and bottom of travel. If you cannot do this please contact us at support@carbide3d.com.

If you can encounter binding or movement issues please contact us at support. We request that you do not attempt to diagnose or dismantle the HDZ.

IMPORTANT Software Information

You must run **Carbide Motion 4.17 and onwards with the HDZ**. Download it from: carbide3d.com/carbidemotion/beta.

WARNING: After installing the HDZ, you must update your GRBL settings. DO NOT HOME UNTIL YOUR SETTINGS HAVE BEEN UPDATED!

Assembly Video

Check out the assembly overview video for help with the assembly process: <https://youtu.be/ojVpMMRCeVU>.

NOTE: The only items you need to transfer from your existing X/Z-carriage are the X- and Z-homing switches, X- and Z-motor, spindle mount, spindle/router.

Required Tools and Parts

To carry out this modification, you need basic mechanical skills and an understanding of how the Shapeoko is assembled. The installation should take under 2 hours. You will need basic shop tools, a set of metric hex keys and wrenches. The tool kit that came with your Shapeoko should be adequate.

Your HDZ comes 95% ready to fit; however, a number of parts (listed below) will need to be transferred from your existing X/-carriage. As of this document, the HDZ comes with replacement guide bearings and spacers (these no longer need to be removed from the old carriage as stated in the overview video above).

It is important to use the screws provided in the HDZ kit. Please note that the screws used are METRIC, usually M5.

This assembly process is uniform for the Shapeoko 3, 3XL, and 3XXL.

Dust Caps

There are 10 small green dust caps included in your HDZ kit. These fit to the HDZ slider rails. See **Figure 1**. They have not been pre-fitted as there is a small chance you may need to re-align your rails. To fit these, you may need to use a small dab of rubber-based adhesive or CA glue. In most cases they can be pressed in using the ball-end of a screwdriver.

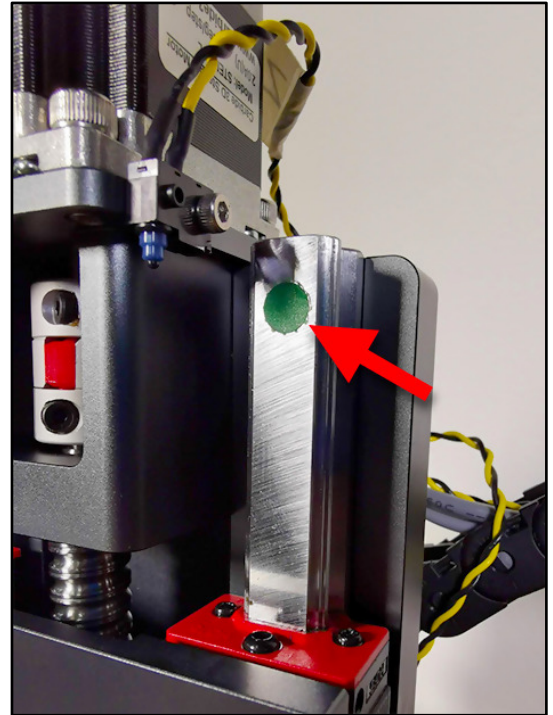


Figure 1

Components Needed from Your Existing Shapeoko Setup

The only components you need to transfer from your existing X/Z-carriage are:

- X- and Z-Homing Switches and Hardware
- X- and Z-Motor
- Spindle Mount
- Spindle/Router

HDZ Kit Contents

Each HDZ comes with the following standard hardware (everything required to install it to your Shapeoko):

- EZTram Router/Spindle Mounting Plate (1)
- M5 x 18mm Screw for Top of EZTram Plate (2)
- M5 x 10mm Screw for Bottom of EZTram Plate (2)
- Eccentric Spacer (non-threaded) for EZTram (2)
- Z-Motor Shaft Coupling (1)
- M5 x 25mm Male-Female Threaded Standoff for the X-Motor (4)
- M5 x 10mm Screw for Motor Standoffs (8)
- HD Eccentric Nut (2)
- Replacement V-Wheel (4)
- V-Wheel Shim (4)
- M5 x 25mm Screw for V-Wheel (4)
- M8 x 30mm X-Motor Idler Bolt (2)
- M8 Washer (2)
- M8 Spacer (2)
- M8 Guide Bearing (4)
- Green Dust Cap (10)
- Black Sledge (4)

Disassemble and Remove the Existing X/Z Carriage

The first step is to disassemble and remove the existing X/Z-carriage from your Shapeoko.

1. Turn off your machine and unplug it. Disconnect the USB cable.
2. Unplug the router or spindle and remove it from the spindle mount.
3. Remove one of the belt clips securing the x-axis belt to the X-rail. Unfeed the belt from the X/Z-carriage idler pulleys and put the free end of the x-axis belt, the belt clip, and the M5 x 10mm screw to the side—you will need to re-install them later.
4. Label, then disconnect the Z- and X-motor wires.
5. Remove the z-axis homing switch from the front of the X/Z-carriage.
6. Remove the z-axis homing switch from its mounting plate. Set the z-axis homing switch hardware, the M3 screw, washer, and lock nut, aside for the HDZ assembly (we won't be needing the mounting plate or the four M5 screws).
7. Remove the x-axis homing switch from the rear of the X/Z-carriage, below the drag chain bracket. Set the two M5 x 35 mounting screws and 1-inch spacers aside, we'll need them to re-install the homing switch onto the HDZ.
8. Remove the x-axis homing switch from the mounting plate. Set the mounting plate and hardware, the M3 screw, washer, and lock nut, aside for re-installation.

9. Remove the drag chain bracket from the rear of the X/Z-carriage, next to the Z-motor. Set the two screws and standoffs aside (the bracket will remain attached to the drag chain).
10. Use a hex key to loosen the v-wheels at the bottom of the X/Z-carriage and remove them. You will not be reusing these v-wheels; the HDZ ships with four v-wheels and two heavy duty eccentric nuts.
11. Lift the X/Z-carriage off your machine.
12. Remove the springs from either size of the carriage (not needed for the HDZ).
13. Loosen the idler assembly at the bottom of the carriage.
14. Remove the belt from the idler and the motor pulley at the top of the carriage and slide the Z-carriage down and off the X-carriage.
15. Remove the M5 x 16mm screws attaching the spindle mount to the Z-carriage. Set the spindle mount and screws aside we will need for installation on the HDZ.
16. Remove the X-motor from the standoffs at the back of the carriage. Set the motor aside (you will not need the screws or standoffs for the HDZ).
17. Remove the Z-motor from the top of the carriage.
18. Remove the gear pulley on the front of the Z-motor:
 - a. Loosen the two small motor pulley set screws (grub screws) and pry off the gear pulley.
 - b. The pulley may be hard to slide off. We recommend using a screwdriver, needle nose pliers, or the back of a claw hammer to lever the pulley off the Z-motor. See *Figure 2*.
 - c. Set the Z-motor to the side (you will not need the M5 screws).

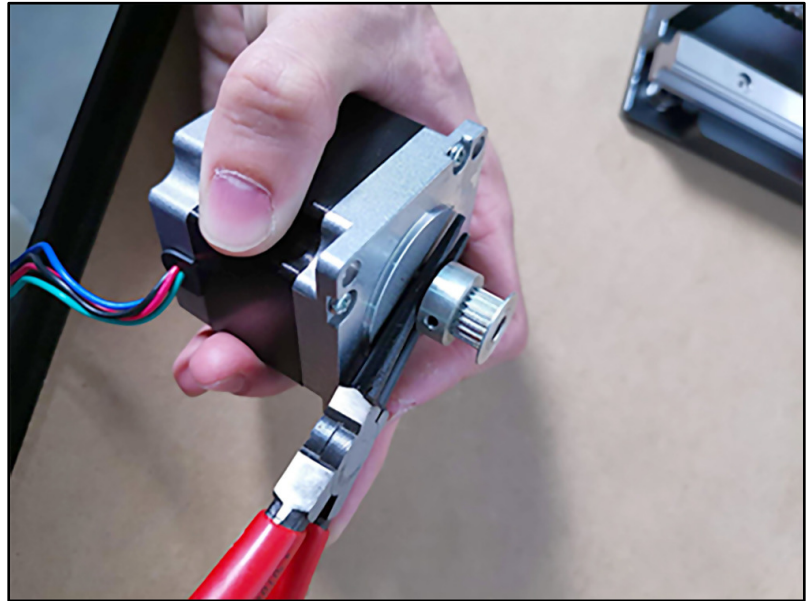


Figure 2

Assemble the HDZ

HDZ Assembly Tips

The quickest and easiest way to fit the HDZ is to assemble the majority of the HDZ components **BEFORE** fitting it to the Shapeoko.

Upon assembly it's up to you if you use thread lock or not. We suggest adding it post-assembly if any screws become loose during use. If you decide to use thread lock, use blue (i.e. light/medium grade).

Fit the Eccentric Nuts

You will need:

- HD Eccentric Nut (2)
1. Press the two supplied M5 eccentric threaded nuts into the holes on the bottom of the HDZ.
 2. Rotate them so the dimples on one side of the eccentric nuts face upwards—this is the loose/open position. See **Figure 3**.

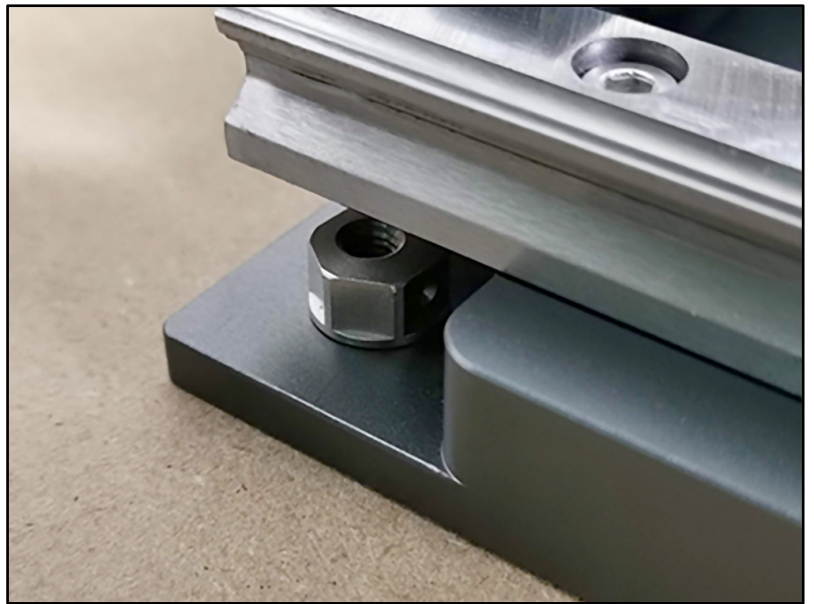


Figure 3

Install the Z-Motor and Coupling

You will need:

- Z-Motor Coupling
 - M5 x 10mm Screw (4)
 - Z-Motor from your existing setup
1. Place the Z-motor coupler on the ball screw at the top of the HDZ and slide it down as far as it will go.
 2. Tighten the lower side of the coupler as shown in **Figure 4**.

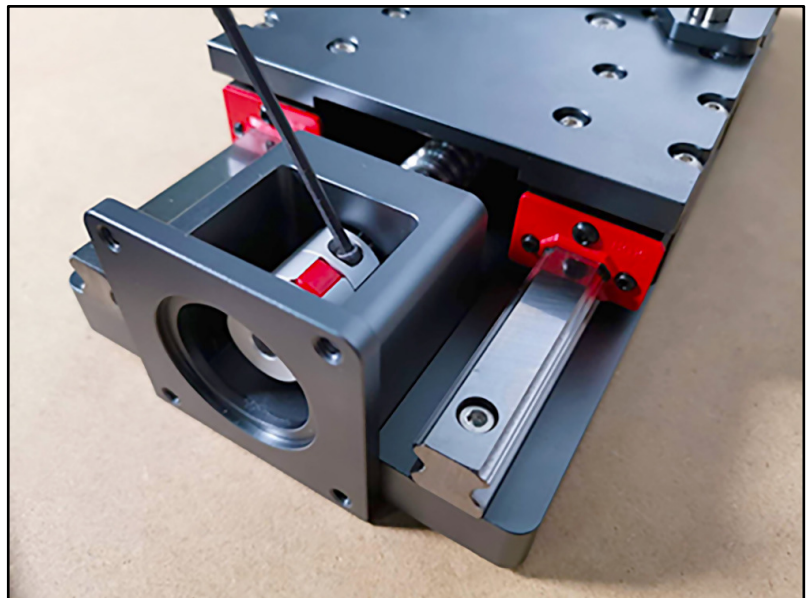


Figure 4

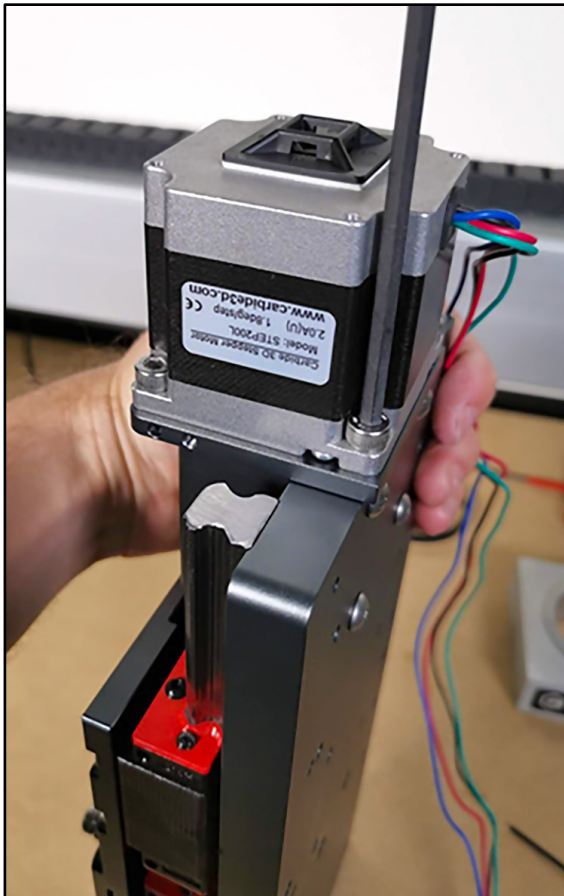


Figure 6

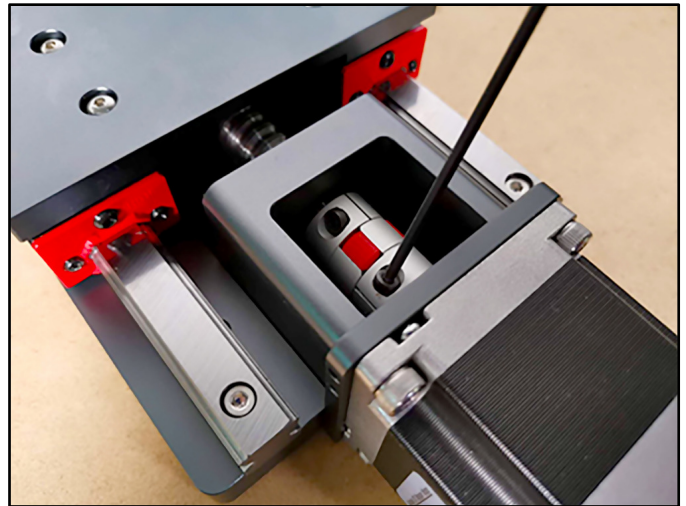


Figure 5

3. Slide your motor shaft onto the coupler and secure it using four (4) of the M5 x 10mm screws. Tighten the screws in a cross pattern. See **Figure 5**.
4. Once the motor is fitted, tighten the coupling at the motor side. See **Figure 6**.

NOTE: Ensure both screws on the coupling are tight. Failure to do so will lead to slippage. Using a small amount of blue thread lock on the motor shaft and ball screw shaft is acceptable.

Install the X-Motor Idlers

You will need:

- M8 x 30mm X-Motor Idler Bolt (2)
- M8 Washer (2)
- M8 Spacer (2)
- M8 Guide Bearing (4)

1. Slide a washer onto one of the bolts, then slide on two (2) of the bearings (with the flanged edges to the outside), then an M8 spacer. See **Figure 7**. Do the same for the second bolt.
2. Once both bolts are assembled, fit them to the two M8 holes on the rear of the HDZ.

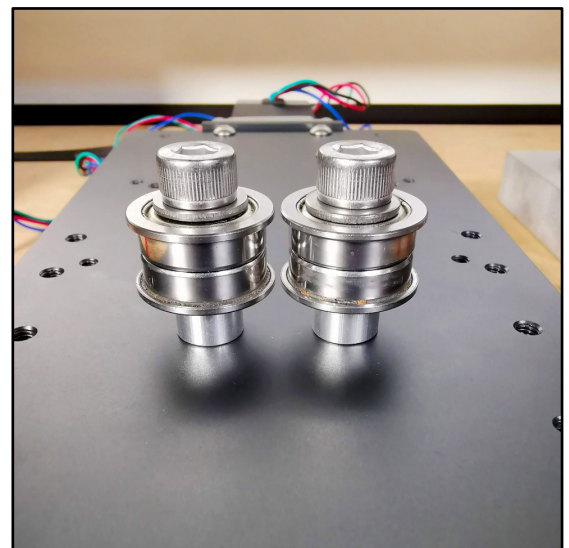


Figure 7

When fitted correctly, your X-motor idlers will look like **Figure 7** and the bolts will not poke through the front of the plate. Pay special attention to the order and orientation of each item on the bolt.

Install the X-Motor Standoffs

You will need:

- M5 x 25mm Male-Female Threaded Standoffs for the X-Motor (4)
1. There are four M5 threaded holes in the center of the carriage just above the M8 bolts. Insert the four (4) M5x25mm X-motor standoffs into the four holes. Do **NOT** over-tighten the motor standoffs; they are made of aluminum. See **Figure 8**.

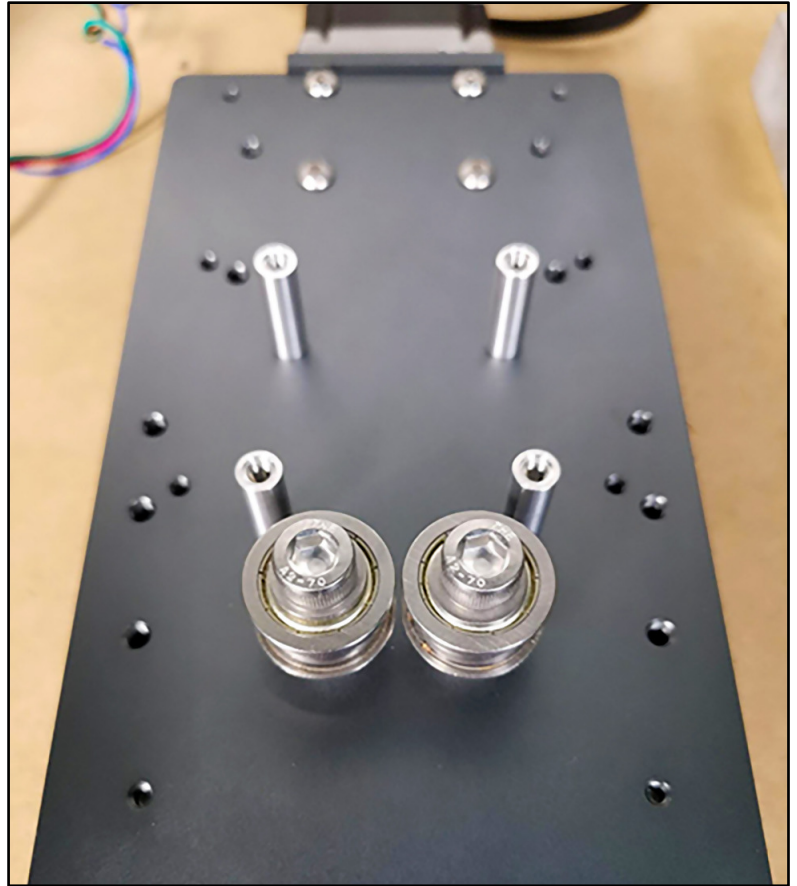


Figure 8

Install the V-Wheels

You will need:

- V-Wheel (4)
- M5 Shim (4)
- M5 x 25mm Screw (4)

The HDZ comes with a set of four v-wheels. You can save your old v-wheels for replacements. The top set of v-wheels will be installed to the outside of the X-motor idlers.

1. Fit the top two V-wheels first using the provided 25mm M5 screws. Ensuring there is a shim between the back plate and the V-wheel.



Figure 9

2. Use two (2) of the provided M5 x 25mm screws to fit the top v-wheels. See **Figure 9**.
3. When the top v-wheels have been fitted, lift the carriage onto the X-axis rail.
4. Fit the bottom v-wheels in the same manner. As you fit them, ensure the v-wheel grooves are on the rail. See **Figure 10**.
5. Once the bottom v-wheels have been fitted, ensure the HDZ moves freely left/right along the X-rail.
6. To properly seat the HDZ, tighten the lower M5 screws. As they tighten, they will rotate the eccentric nuts, applying pressure to the v-wheels. The v-wheels should move freely as you move the HDZ. If you need to, you can hold the screw in place and tighten (CLOCKWISE) the eccentric nut a fraction with a wrench. **If your V-wheels are not turning freely check the shims are fitted correctly.**

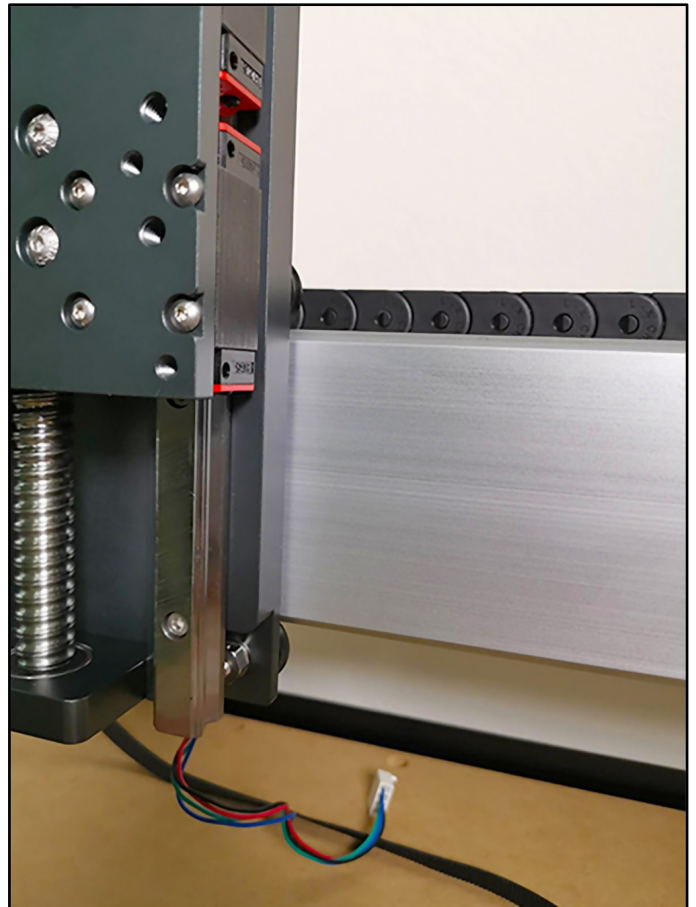


Figure 10

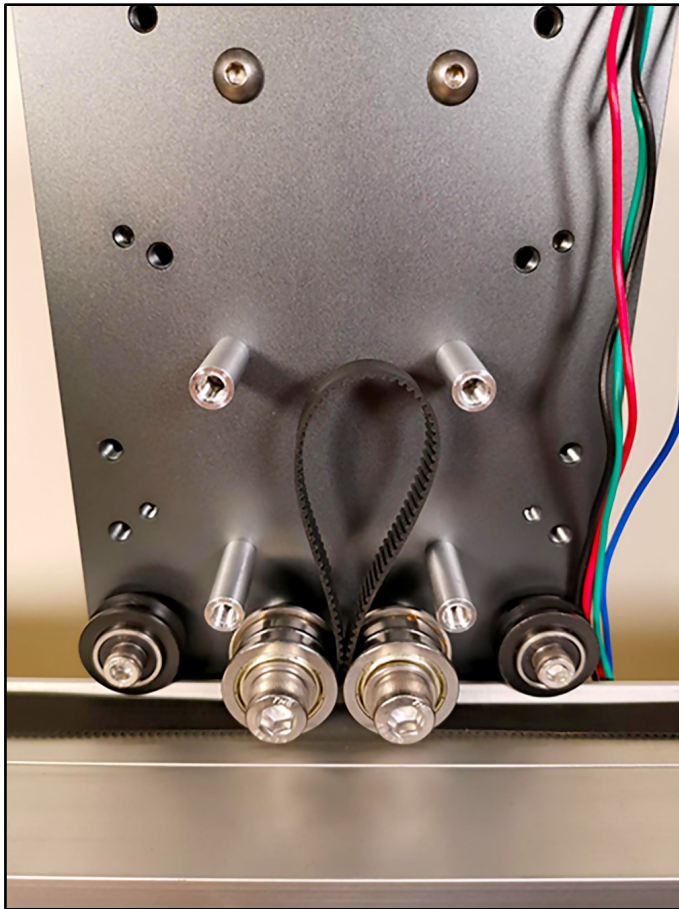


Figure 11

Install the X-Motor

You will need:

- M5 x 10mm Screw (4)
- X-Motor from your existing setup

1. Thread the free end of the x-axis belt under the idlers at the back of the HDZ.
2. Create a large loop between the idlers. See *Figure 11*.
3. Fit your X-motor to the X-motor standoffs using the four (4) M5 x 10mm screws. See *Figure 12*.

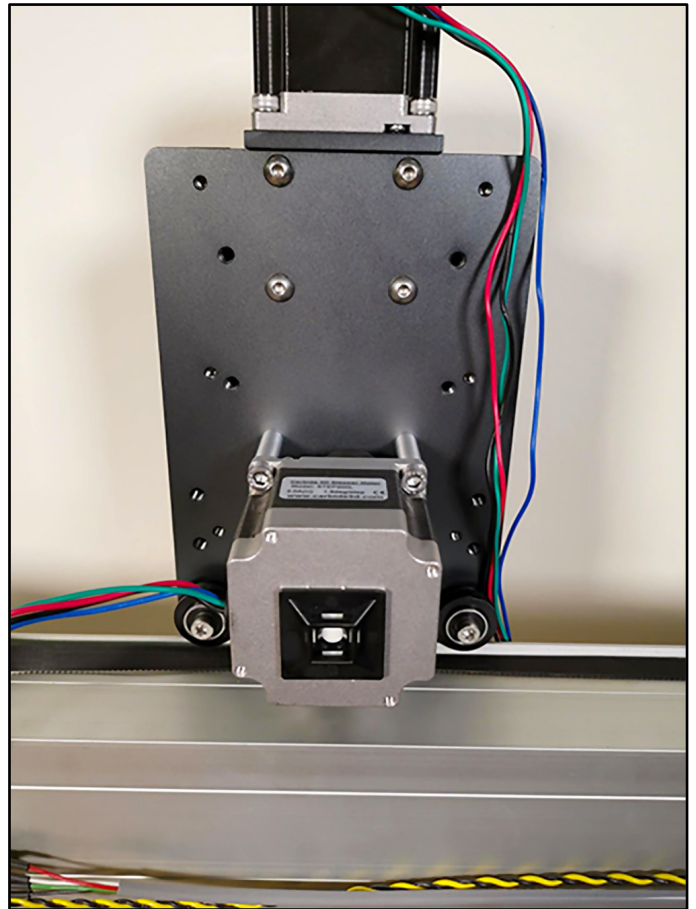


Figure 12



Figure 13

Re-Install the X Belt

You will need:

- Belt Clip from your existing setup
- M5 x 10mm Screw from your existing setup

1. Place the x-axis belt along the x-axis extrusion rail and re-fit the belt with the belt clip and M5 screw from your existing setup. Tighten the belt so it is taut. See **Figure 13**.

Install the Drag Chain Bracket

You will need:

- M5 x 10 mm screws from your existing setup (2)

The drag chain bracket fits to the two threaded M5 holes up and to the right of the X-motor (when viewed from the front of the machine).

1. Install the drag chain bracket using your two (2) existing M5 x10mm bracket screws. See **Figure 14**.

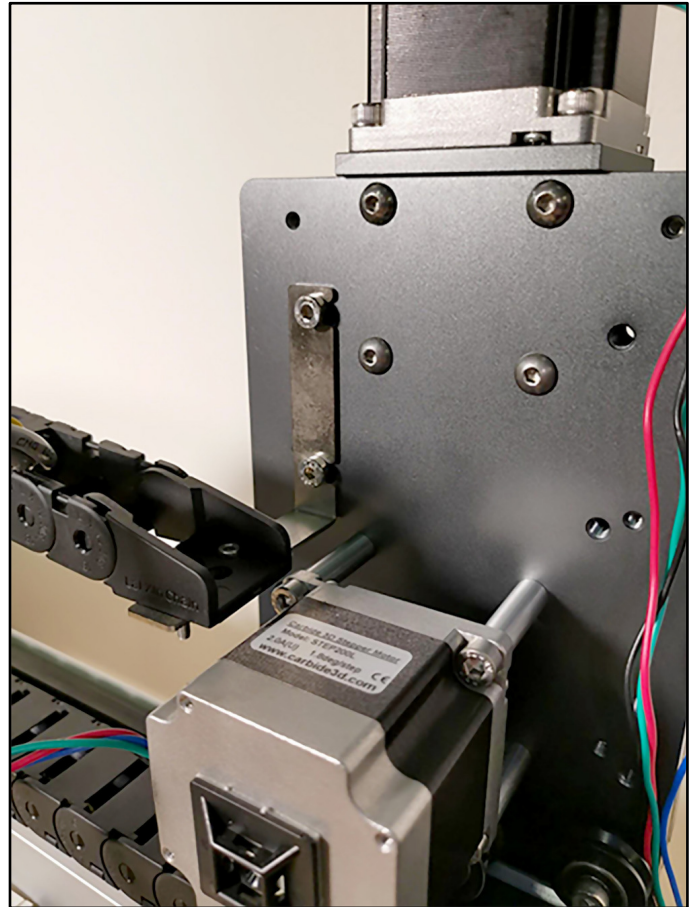


Figure 14

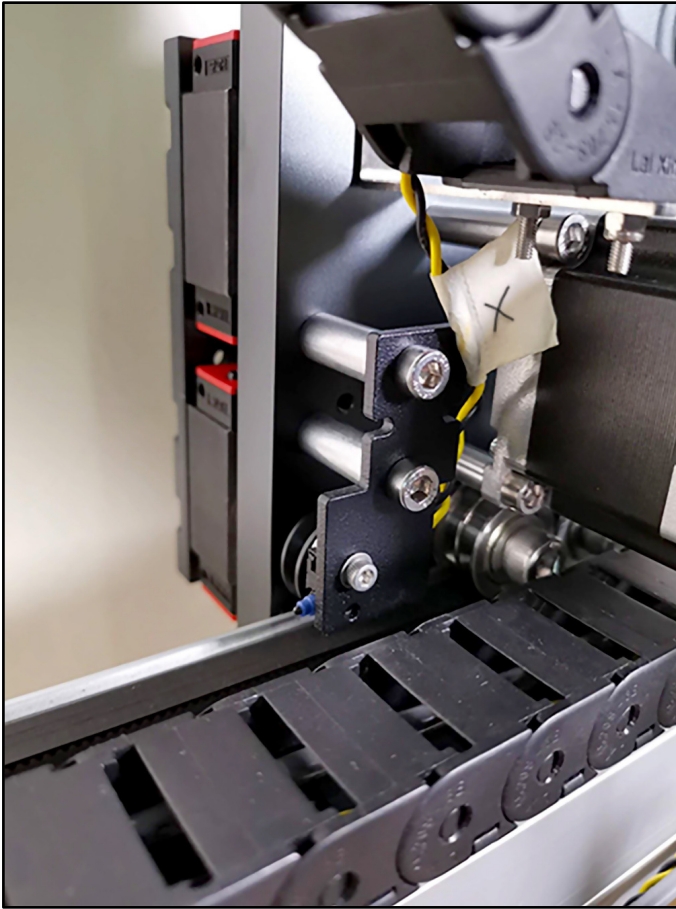


Figure 15

Install the X-Axis Homing Switch

You will need:

- M5 x 35mm Screw from your existing setup (2)
- 1-Inch Spacer from existing setup (2)
- Z-Axis Homing Switch, Mounting Plate, and Hardware from your existing setup

1. Mount the x-axis homing switch to the mounting plate with your existing hardware, the M3 screw, washer, and lock nut.
2. Use your two (2) existing M5x35 screws and two (2) 1-inch spacers to install the x-axis homing switch plate onto the rear of the HDZ. The homing switch mounts to the two threaded M5 holes on the right side of the X-motor (when viewed from the front of the machine). See **Figure 15**.

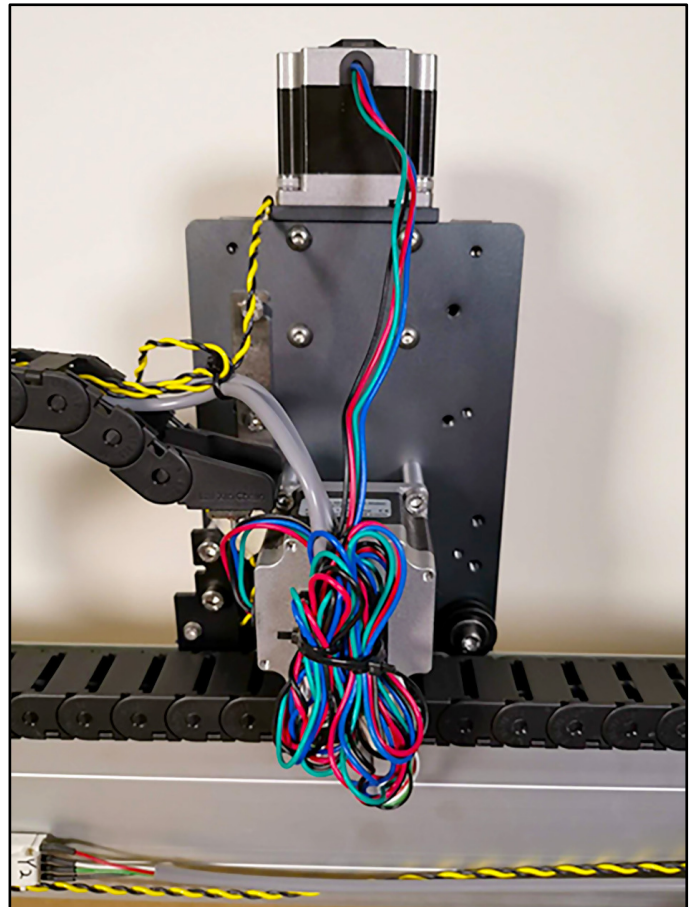


Figure 16

Connect the Motors

1. Connect the X- and Z-motor. Ensure each is connected correctly.
2. Tidy up your wiring with zip ties. See **Figure 16**.

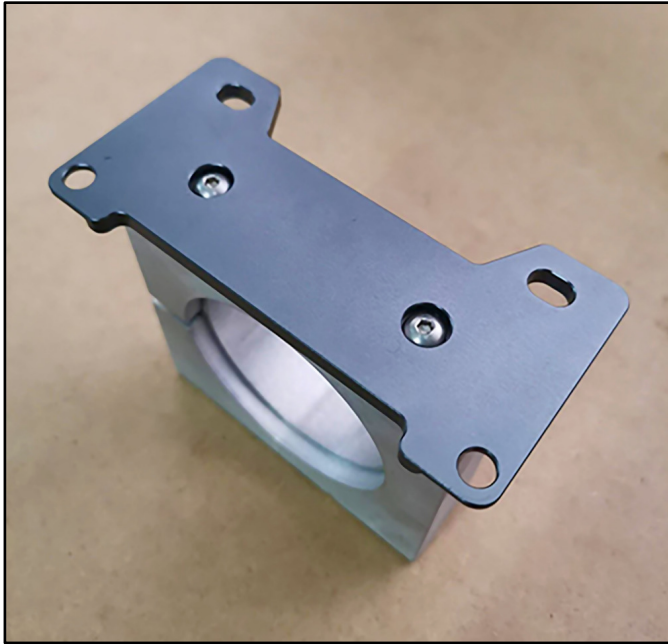


Figure 17

1. Fit your existing spindle mount to the EZTram mount using the existing M5 x 16mm screws. Ensure the recessed holes accommodate the screw heads and then tighten down the spindle mount. Feel free to use thread lock to secure the screws. See **Figure 17**.
2. Fit the two (2) eccentric spacers onto the two (2) M5 x 18 mm screws.
3. Place the EZTram mount on the lower front of the HDZ and thread the M5 x 18 screws and spacers through the top holes in the EZTram and into the HDZ. See **Figure 18**.
4. Lightly tighten the screws so the eccentric spacers can still move. When the spacers are turned so that the grooved side faces up, this indicates the EZTram mount is at its lowest point. Trimming instructions are below.
5. Fit the two (2) M5 x 10mm screws through the lower holes in the EZTram mount and finger tighten.

If you are using the 80mm spindle mount, there should be no need to tram the motor left/right, as it is precision milled. Fit the 80mm mount directly to the holes on the front of the mount. Use the provided M6 bolts. Note you will use two washers on each of the lower screws.

Install the Spindle Mount

You will need:

- Spindle Mount and Screws from your existing setup
- EZTram Router/Spindle Mounting Plate
- M5 x 18mm Screw (2)
- M5 x 10mm Screw (2)
- M5 Eccentric Spacer (2)

The EZTram mounting plate is a great feature on the HDZ. It's easy to fit and makes tramping your spindle much easier through the use of two eccentric spacers.

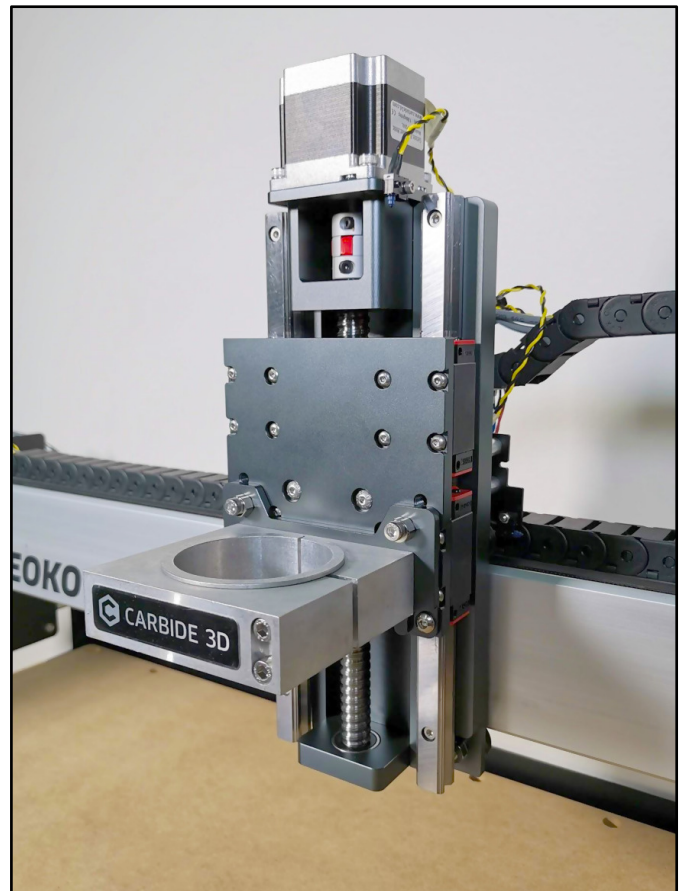


Figure 18

Install the Z-Axis Homing Switch

You will need:

- Z-Axis Homing Switch and Hardware from your existing setup
1. Fit your existing z-axis homing switch directly to the outside edge of the Z-motor mounting plate using your existing hardware, the M3 screw, washer, and lock nut. See **Figure 19**.

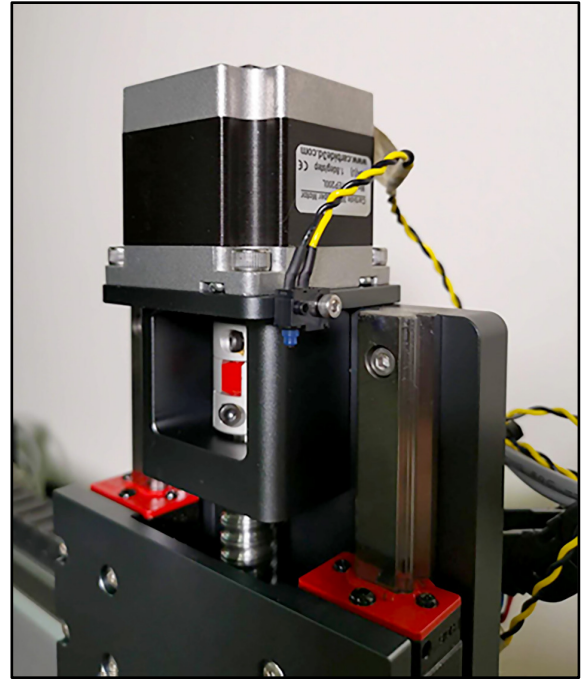


Figure 19

Tramming Instructions

Once your spindle has been re-fitted you can tram it using the EZTram mount. You can now tram your spindle quickly and easily. As a starting point, have all your EZTram bolts finger tight and rotate both eccentric spacers to their lowest points (groove up) then rotate them as needed to level out your Z-axis. Tighten your screws.

1. Tram the spindle from front to back, using aluminum foil as a shim.
2. Once you're happy with the front-back, move onto left/right.
3. Loosen the four (4) EZTram screws so they are finger tight
4. Use a wrench to rotate the upper eccentric spacers clockwise. This will lower or raise one side of the mount, adjust accordingly to tram your axis.
5. Once satisfied, lock down the position of the eccentric spacers by tightening the screws. You might need to repeat this process a few times doing a small surfacing cut in between each adjustment to analyze your level.

For additional advice on tramming, check out the Carbide 3D community: community.carbide3d.com.

Maintenance

The HDZ is pretty much maintenance free. We recommend keeping it as dust free as possible. A quick coat of synthetic grease (such as the Super Lube 41160) on the rails and ball screw every now and then does not hurt. All the parts are rubber sealed. You can also inject grease by removing the central M4 screw from the end of a bearing block and injecting machine grease through a syringe.

The black plastic sledges are used on the off chance you have to remove a slider block. As the block slides off a rail, slide the sledge into the block. Please **DO NOT** remove a slider block unless advised to do so by support— ball bearings can fall out.

Update the Software Settings

WARNING: The HDZ is supported by Carbide Motion 4.0.17 onwards. Do NOT try to use an older version of Carbide Motion.

After confirming all your homing switches and motors are connected correctly and you have ensured that there is nothing restricting the Shapeoko's movement, you will be ready to turn the Shapeoko back on to make the required software changes.

1. Plug in your USB cable.
2. Open Carbide Motion.
3. Turn your Shapeoko on.
4. Click the **Connect to Cutter** button.
5. Click **Settings** in the top menu bar.

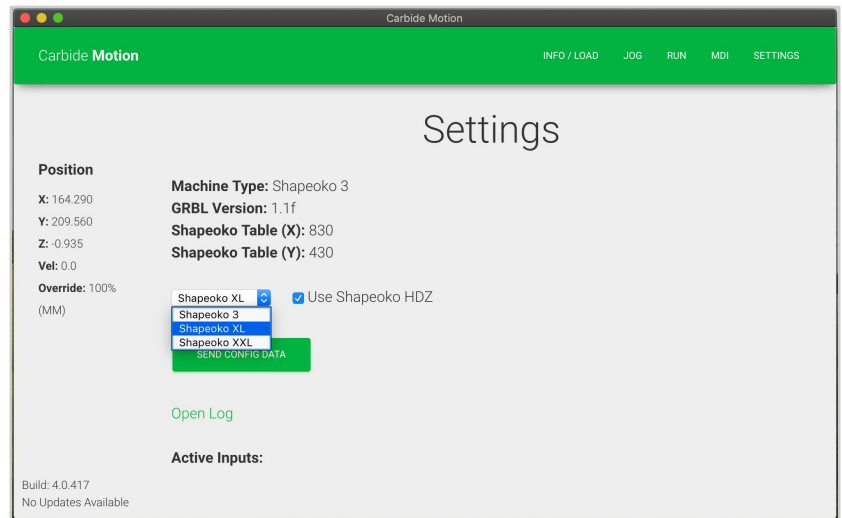


Figure 20

WARNING: DO NOT TRY TO HOME THE SHAPEOKO OR JOG IT before applying the settings.

6. Select your Shapeoko type from the dropdown list, then tick the **Use Shapeoko HDZ** checkbox. See *Figure 20*.
7. Click the **Send Config Data** button.
8. The config data will send. Wait until this has finished before moving on.

Test Homing Switches

As you have disconnected multiple switches it is good practice to test the homing switches.

1. Pressing each switch in turn and check to see if it is highlighted in the “Active Inputs” on the Settings dialogue page. See *Figure 21*.

Home Your Shapeoko

Once all switches have been checked, you are ready to use your Shapeoko again!

1. Click the **Jog** button in the top menu bar and then proceed to home your Shapeoko with the HDZ.

Happy milling!

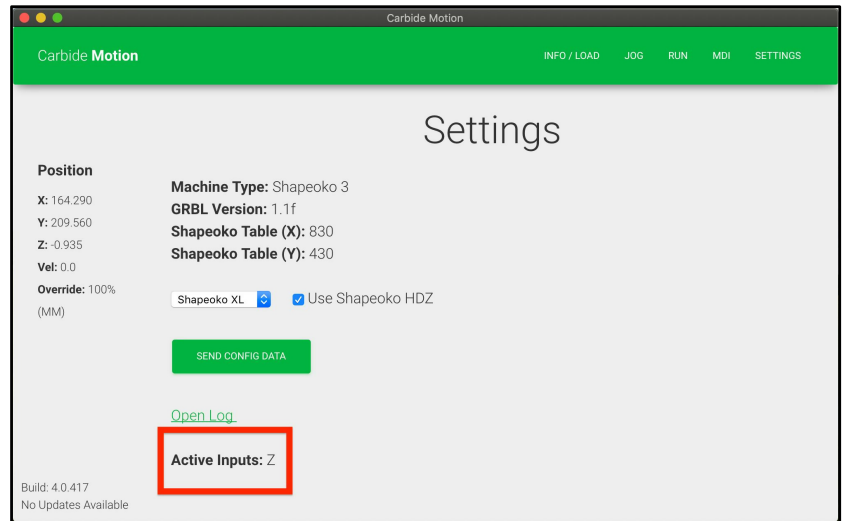


Figure 21

