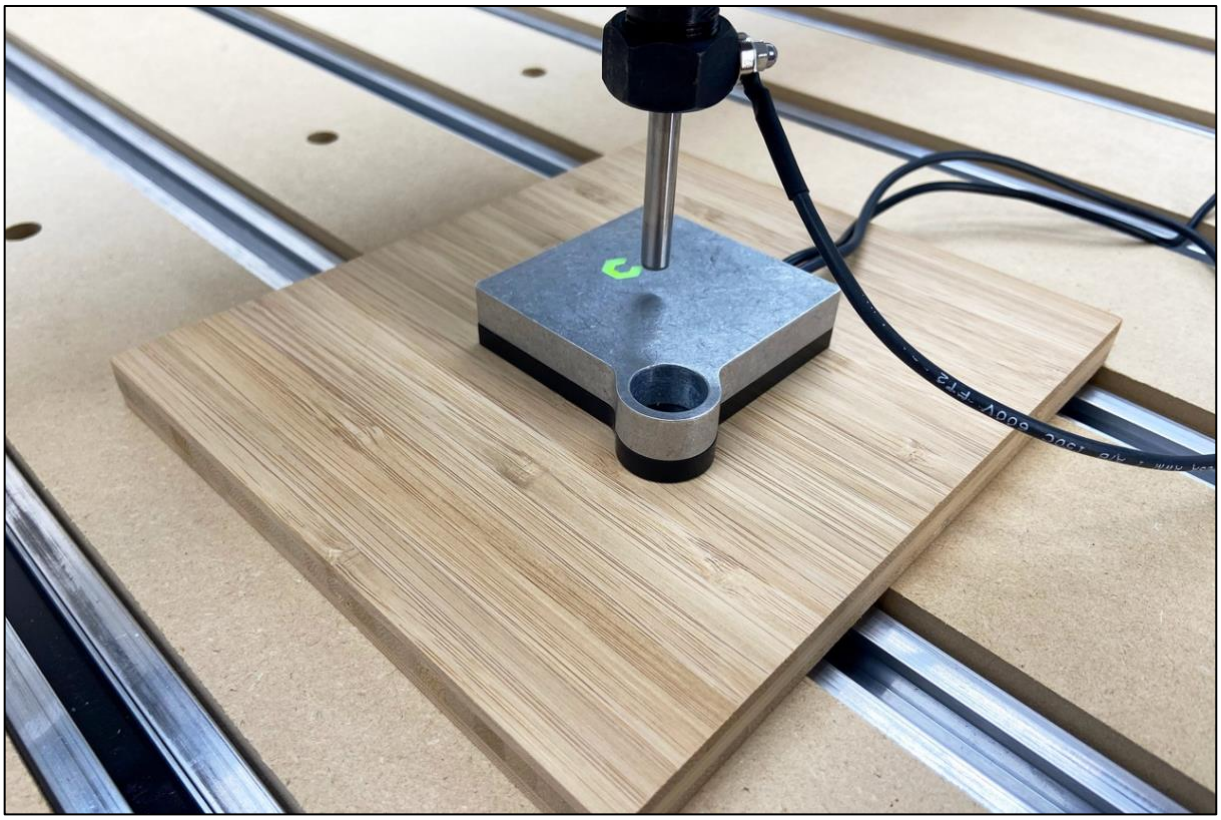
BitZero V2 for Shapeoko

Setup and User Guide



The BitZero V2 is the update to our original BitZero touch probe for setting zero location on your stock material. Use the BitZero V2 to find your X-, Y-, and Z-zero position, or use it to find X-, Y-, or Z-zero only. The BitZero V2:

- Is low-profile for easy probing with taller projects.
- Uses a magnetic ground connection.
- Uses a circular bore to probe in the X/Y direction so tool diameter doesn't matter.
- Is designed to be used on any material—wood, plastic, metal, synthetics.
- Features a non-conductive plastic base to insulate it from the workpiece so you can probe conductive materials. The machined plastic bottom will keep the BitZero V2 electrically isolated so it will only trigger on contact with a tool in the router/spindle.
- Uses our active probing design which makes it easy to confirm everything is working properly.
- Includes ¼″ and ⅛″ probing pins to eliminate accuracy problems caused by tool flutes.

NOTE: Carbide Motion 5.14 or higher is required for the BitZero V2.

If you run into any issues setting up or using your BitZero V2, please contact us at: support@carbide3d.com.

BitZero V2 Kit Contents

The BitZero V2 kit contains all of the components shown in ***Fig. 1*** and listed in the table below.

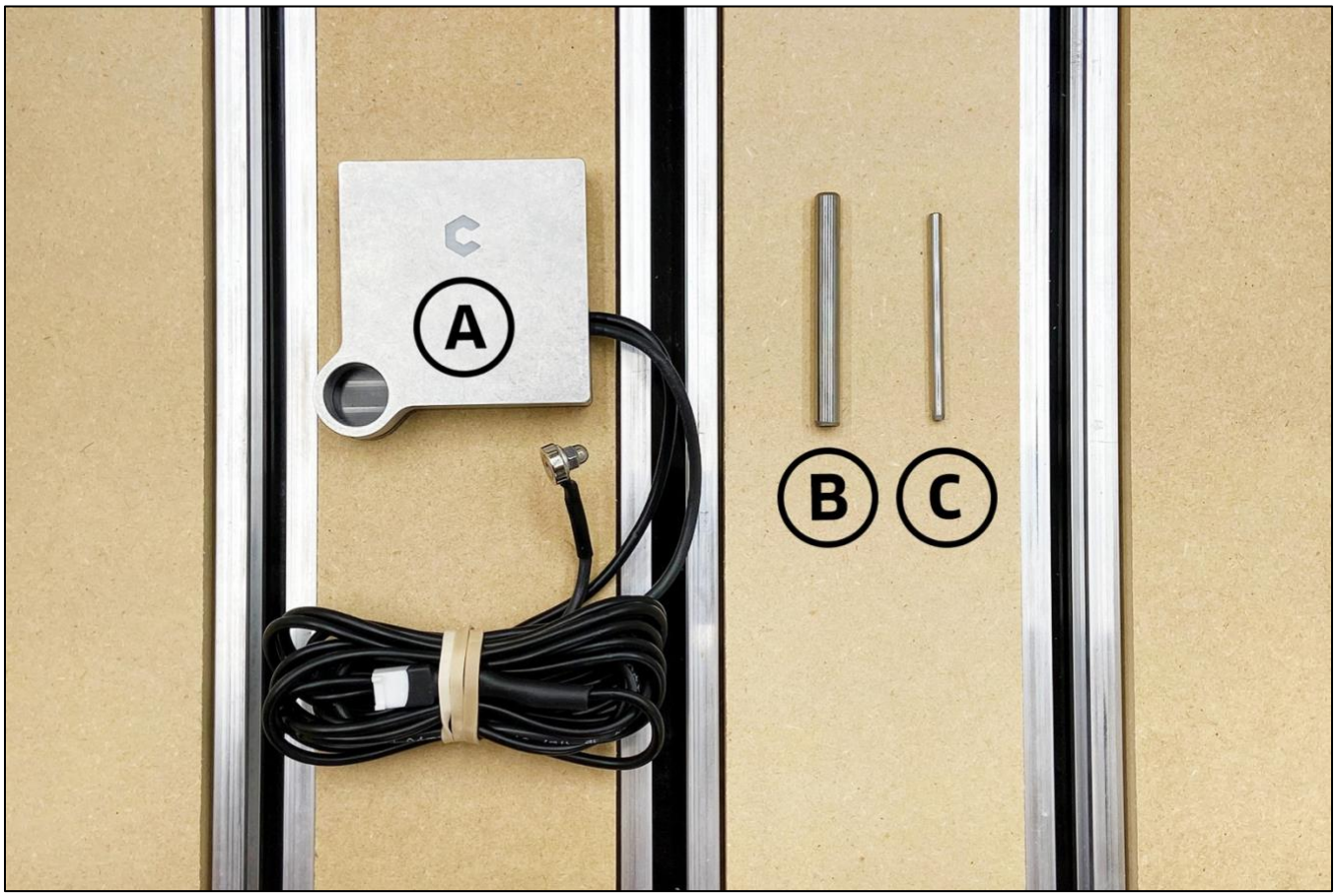


Figure 1

Item	Description	Qty	Note
A	BitZero V2	1	Touch Probe with Magnetic Grounding Clip
B	¼″ Probing Pin	1	Probing Tool, Installs in the Router/Spindle
C	⅛″ Probing Pin	1	Probing Tool, Installs in the Router/Spindle

Connecting the BitZero V2 to the Carbide Motion Board

The instructions in this document apply to the following versions of the Carbide Motion boards shipped with Shapeoko machines:

```
- 2.1
- 2.2
- 2.3
- 2.4d
- 2.4e
- 3.0b
```

To identify which version of the Carbide Motion board you own:

1. Remove the enclosure cover.
2. Look in the bottom-left corner of the PCB for the board version number. See ***Fig. 2***.

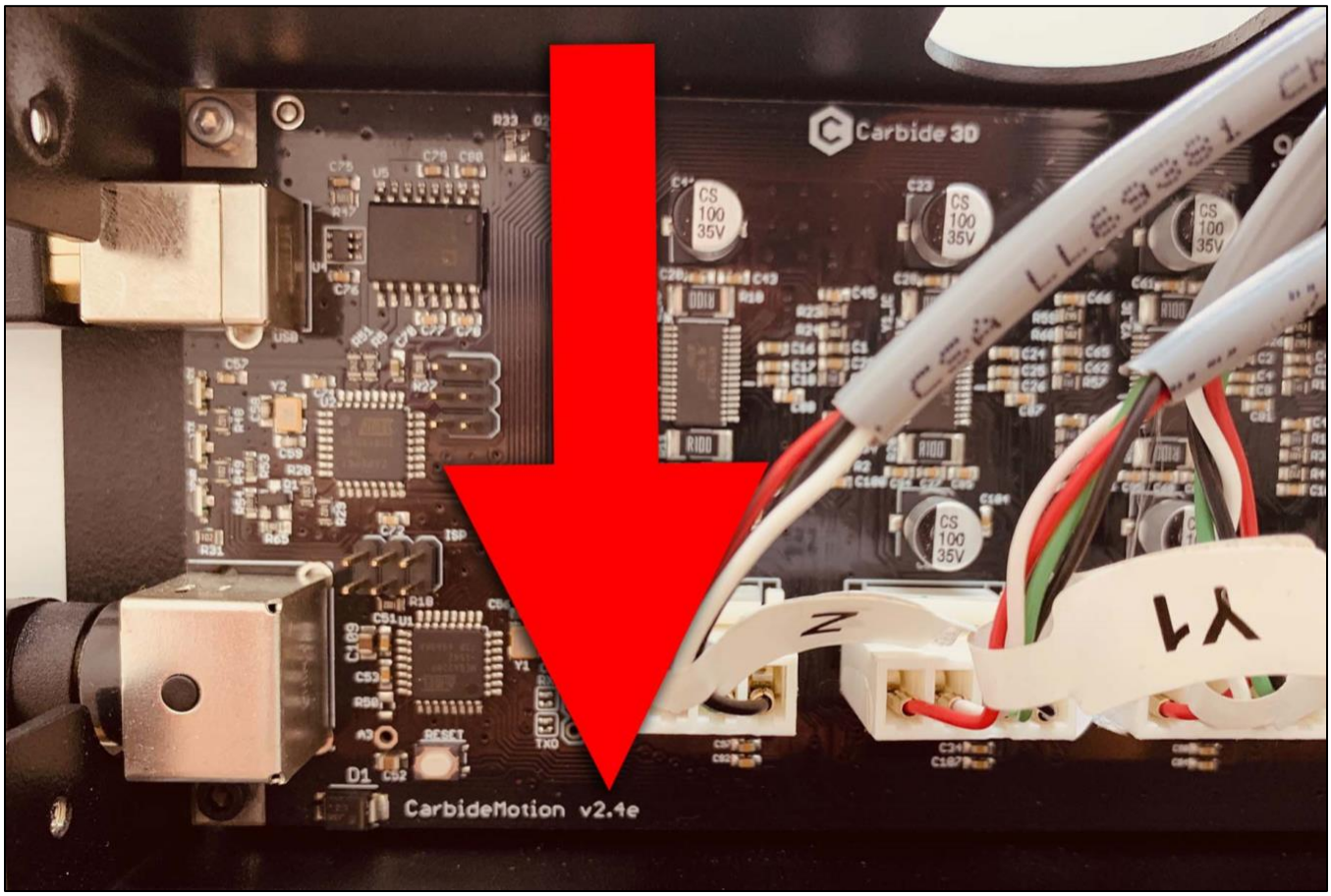


Figure 2

Connect to Board Version 2.1/2.2/2.3

To connect the BitZero V2 to a version 2.1, 2.2, or 2.3 Carbide Motion board, you'll need to use a legacy adapter cable and probe adapter PCB. Email us at: support@carbide3d.com and we'll send ship those items to you ASAP.

NOTE: The BitSetter kit includes a legacy adapter cable and probe adapter PCB.

1. Connect the 2-pin connector (green and white wires) of the legacy adapter cable to the pins labeled *Probe* in the top-right corner of the Carbide Motion board. See ***Fig. 3***.
2. Connect the 1-pin connector (+5V red wire) of the legacy adapter cable to the pin labeled *AVR Programming* on the left side of the board near the power port. See ***Fig. 4***.
3. Once both wires are connected, your board should look like ***Fig. 5***.
4. Connect the 3-pin connector of the legacy adapter cable to the port labeled *To Carbide Motion* on the probe adapter PCB.
5. Connect the BitZero V2 to the port labeled *BitZero* on the probe adapter PCB. (On earlier versions of the adapter PCB, this port is labeled *Touch Probe*.)
6. If you also have a BitSetter, connect it to the port labeled *BitSetter* on the probe adapter PCB. (On earlier versions of the adapter PCB, this port is labeled *Tool Probe*.)
7. Re-install the enclosure cover. Make sure not to pinch or accidentally loosen any of the cables.

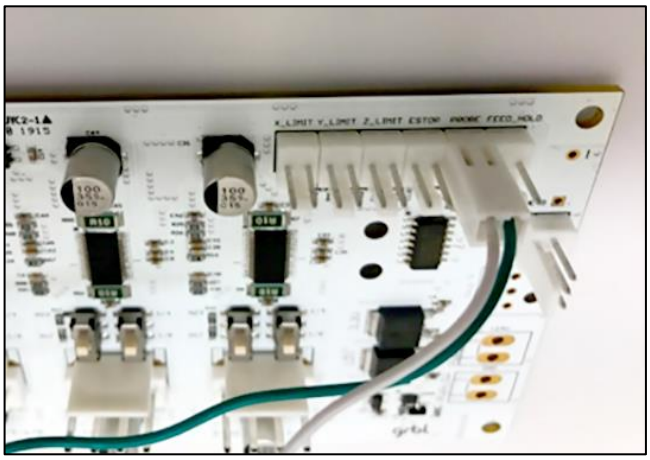


Figure 3

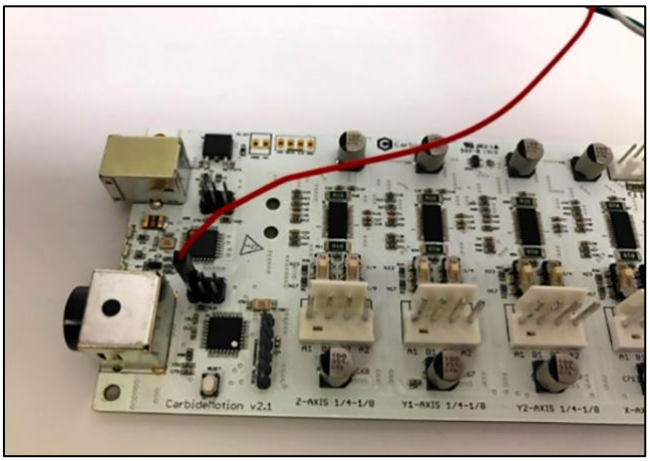


Figure 4

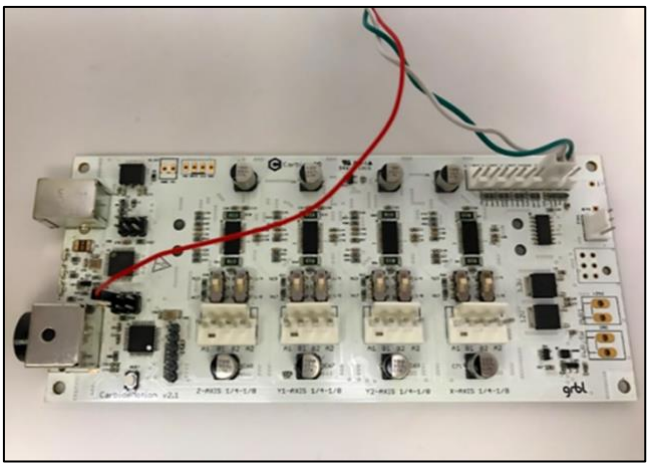


Figure 5

Connect to Board Version 2.4d/e

Beginning with version 2.4d of the Carbide Motion controller, PCBs have a purpose-built port labeled *Reserved*, which is intended for a touch or tool probe.

NOTE: If you have both a BitZero V2 and BitSetter, go to **Connect to BitZero V2 and BitSetter** on page 6.

Connect BitZero V2 Only

1. If you only have the BitZero V2, you can connect it directly to the port labeled *Reserved*. See ***Fig. 6***.
2. Re-install the enclosure cover. Make sure not to pinch or accidentally loosen any of the cables.

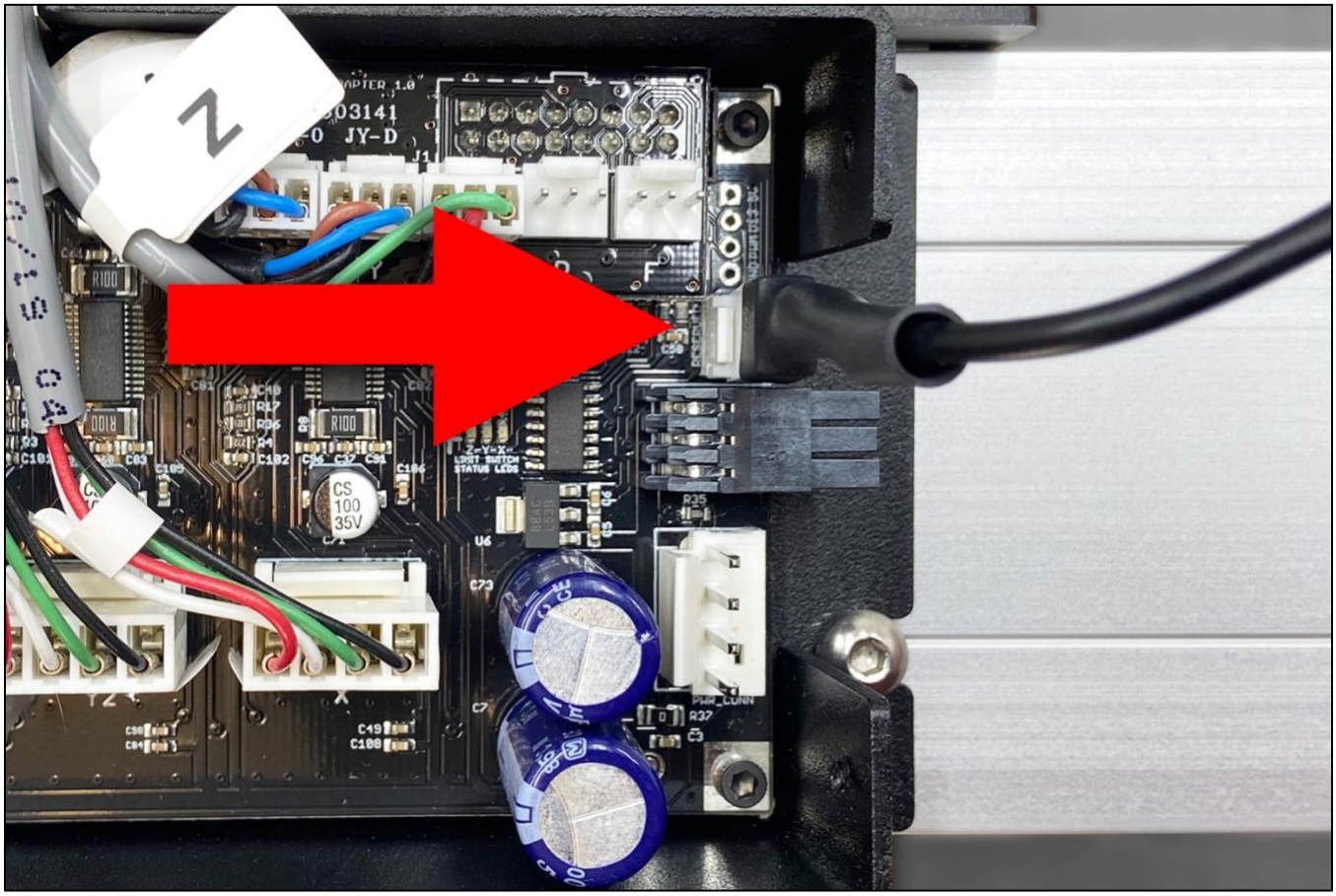


Figure 6

Connect BitZero V2 and BitSetter

If you have both the BitZero V2 and BitSetter, you will need to use the probe adapter PCB and 3-pin adapter cable included in the BitSetter kit. See ***Fig. 7***.

1. Connect the BitZero V2 to the port labeled *BitZero* on the probe adapter PCB. See ***Fig. 7***. (On earlier versions of the adapter PCB, this port is labeled *Touch Probe*.)
2. Connect the BitSetter to the port labeled *BitSetter* on the probe adapter PCB. See ***Fig. 7***. (On earlier versions of the adapter PCB, this port is labeled *Tool Probe*.)

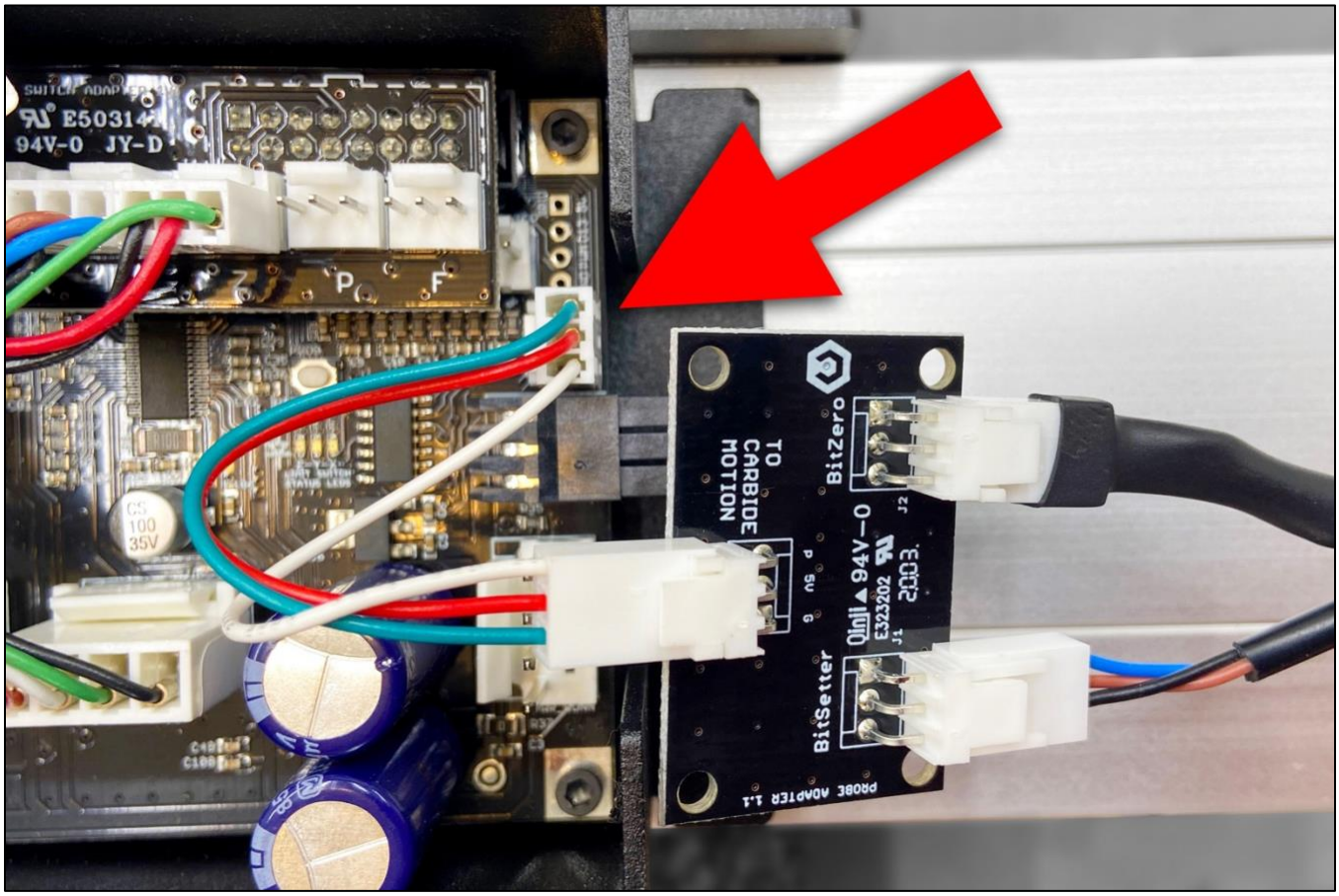


Figure 7

3. Connect one end of the 3-pin cable to the port labeled *To Carbide Motion* on the probe adapter PCB.
4. Connect the other end of the 3-pin cable to the port labeled *Reserved* on the Carbide Motion board.
5. Re-install the enclosure cover. Make sure not to pinch or accidentally loosen any of the cables.

NOTE: If your 2.4d/e board is missing the *Reserved* label, go to Connect to Board Version 2.1/2.2/2.3 on page 4 to connect the BitZero V2 (and BitSetter, if you have one).

NOTE: If you happen to have a prototype 2.4a/2.4b/2.4c Carbide Motion board, send us an email at: **support@carbide3d.com** and we'll exchange it.

Connect to Board Version 3.0b

Beginning with version 3.0b of the Carbide Motion controller, PCBs have a purpose-built port labeled *BitZero*.

1. Connect the BitZero V2 to the *BitZero* port. See ***Fig. 8***.
2. Re-install the enclosure cover. Make sure not to pinch or accidentally loosen any of the cables.

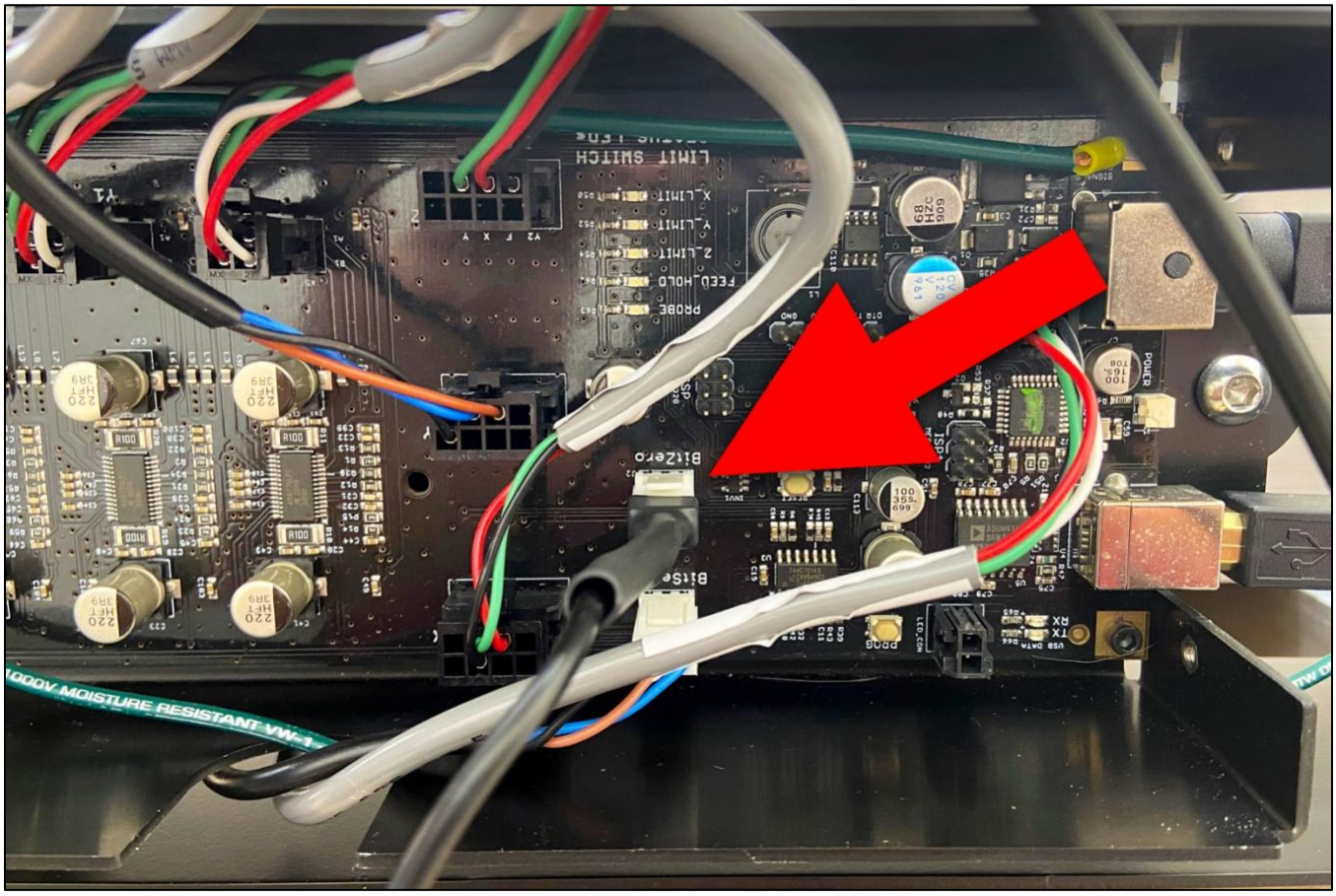


Figure 8

Using BitZero V2 with a Probing Tool Vs. an End Mill

While you can use an end mill while work probing with the BitZero V2, it is better to use one of the included probing pins. The flutes of an end mill do not always register against a touch probe at the full radius of the tool. A probing pin is consistent all the way around, so no matter how it's rotated in the router/spindle, it will provide the most accurate results possible.

Grounding the BitZero V2

The BitZero V2 must be properly grounded in order to activate. To ground the probe, place the magnetic grounding clip on the collet nut or installed probing pin. If using the probing pin for grounding, make sure at least ½" of the tool remains unobstructed. See ***Fig. 9***.

Figure 9

Testing the BitZero V2

You can verify the probe is active and that everything is working properly by tapping the BitZero V2 body against the probing pin and checking for the status light LED on the top to turn red. Ensure the probe is properly grounded. See ***Fig. 10***.

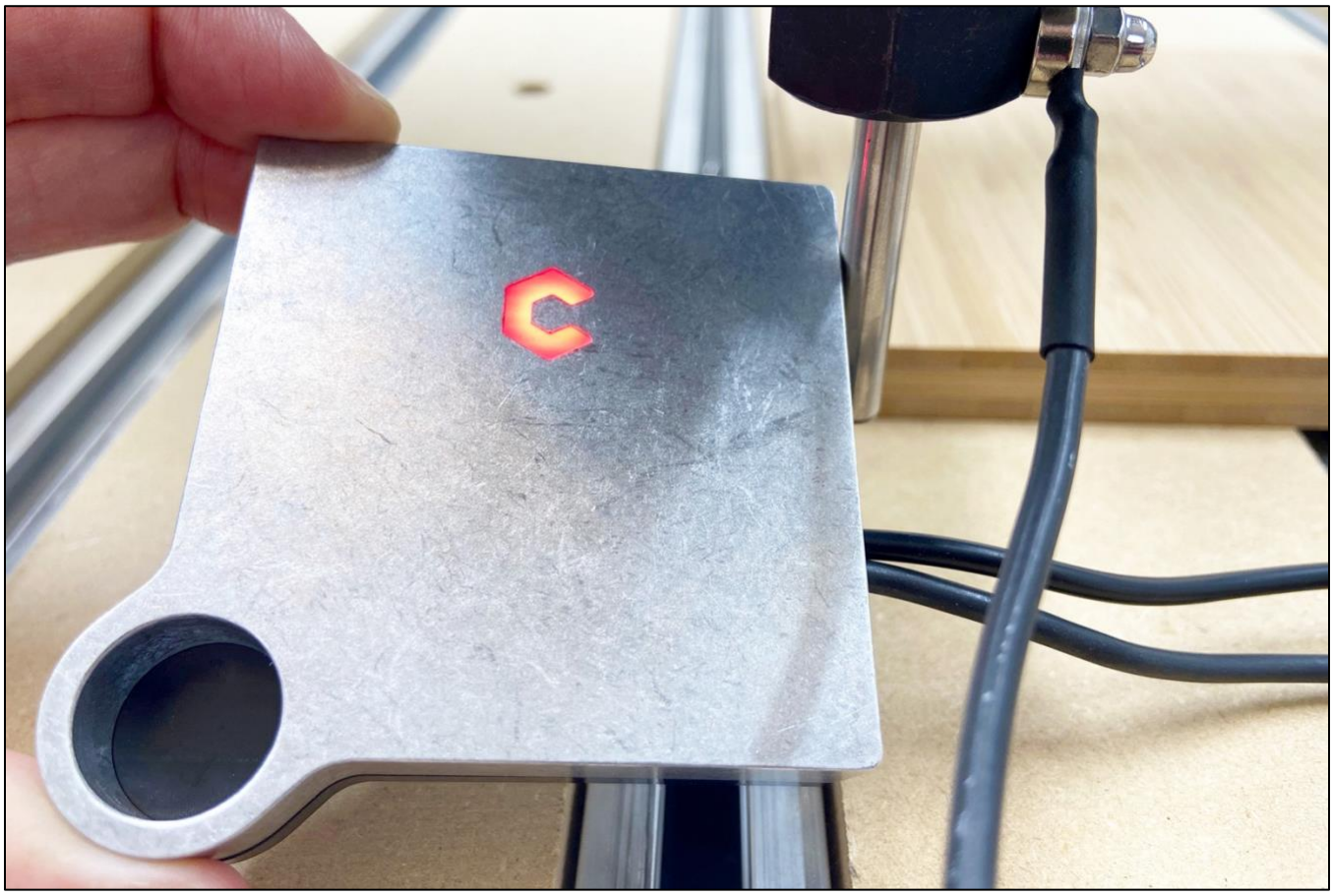


Figure 10

Using the BitZero V2 to Set Job Zero

You can use the BitZero V2 to set the following zero locations:

- The lower-left corner of your stock (X, Y, and Z)
- The surface of your wasteboard/stock (Z only)
- One side of your stock (X or Y only)

Click one of the zero location options to go to the specific instructions on the next pages.

NOTE: If you notice that your BitZero V2 moves slightly during jogging or during the probing sequence, you can secure it to the stock with a piece of double-sided tape.

Set Job Zero on the Lower-Left Corner

You can use the BitZero V2 to find job zero on the lower-left corner of your stock. To find and set zero for X, Y, Z:

1. Connect to and home the machine.
2. When prompted to load a tool, install a probing pin in the collet.
3. Set the BitZero V2 on the lower-left corner of your stock with the locating edges overhanging, but pressed up against the sides of your stock. See ***Fig. 11***.
4. In Carbide Motion, click **Jog** in the top menu bar to open the *Jog screen*.
5. Jog the machine until the tip of the probing pin is just inside the circular bore on the corner of the BitZero V2. See ***Fig. 11***.
6. Attach the magnetic grounding clip to the collet nut or the probing pin. See ***Fig. 11***.

Figure 11

7. Click the **Probe button** to open the *Probe Workpiece window*. See ***Fig. 12***.

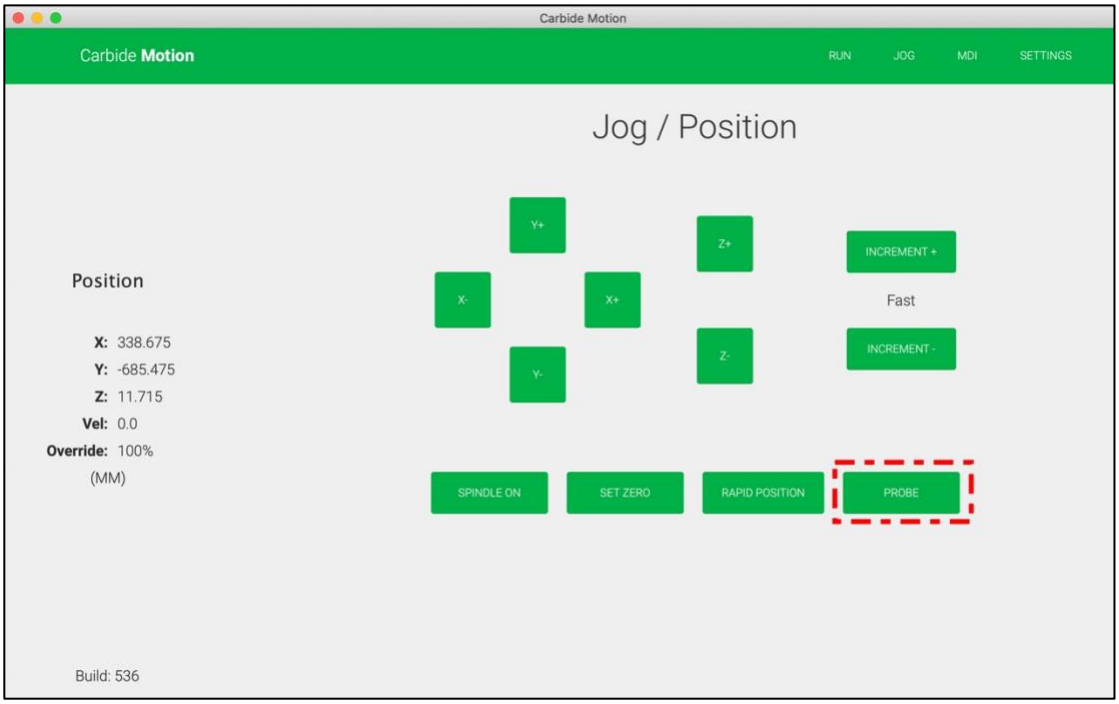


Figure 12

8. Select **BitZero V2** for the probe type. See ***Fig. 13***.

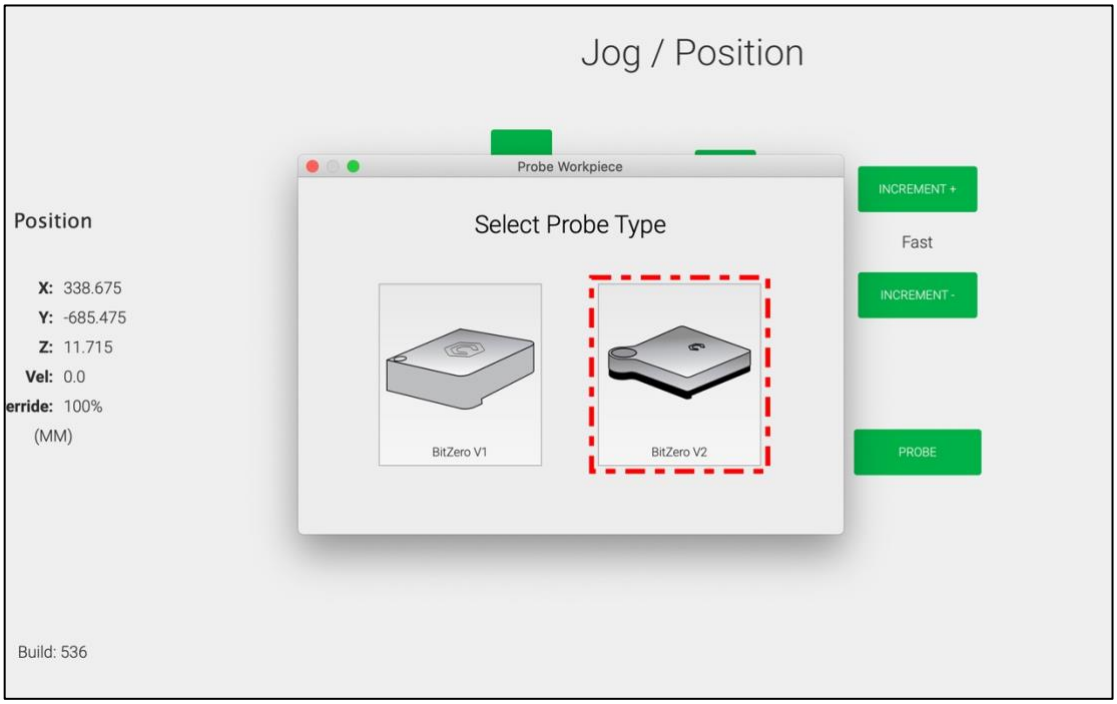


Figure 33

9. Select the **Corner** probe cycle. See ***Fig. 14***.

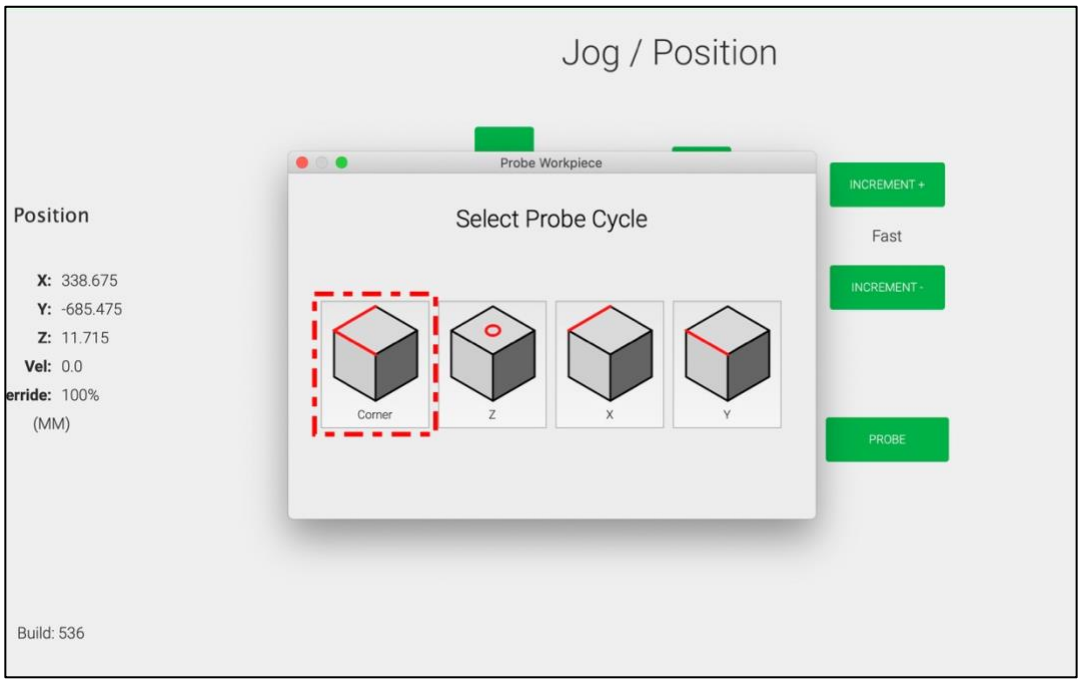


Figure 44

NOTE: Make sure your setup matches the graphic shown onscreen for the probe cycle you have selected. See ***Fig. 15***. If your setup does not match, the calculated zero location will be incorrect.

10. Click the **Begin Probe button** to run the probing sequence and set zero for X, Y, and Z. See ***Fig. 15***.

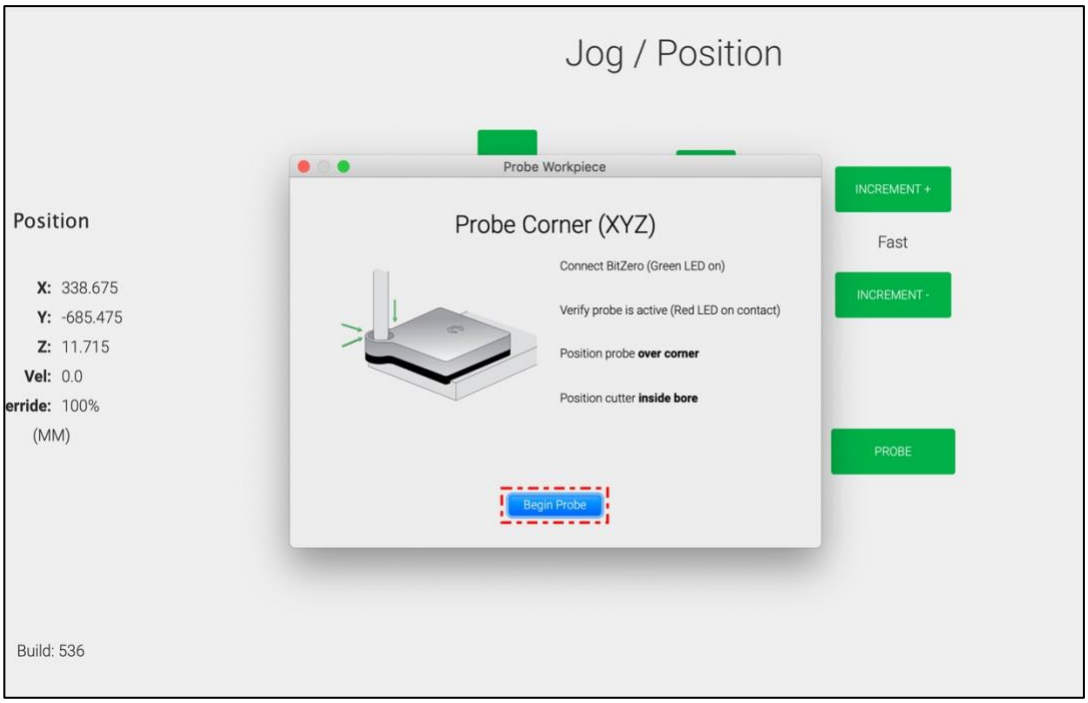


Figure 55

11. If you receive an error message, see ***Fig. 16***, repeat steps 1–10 to run a new probing sequence.

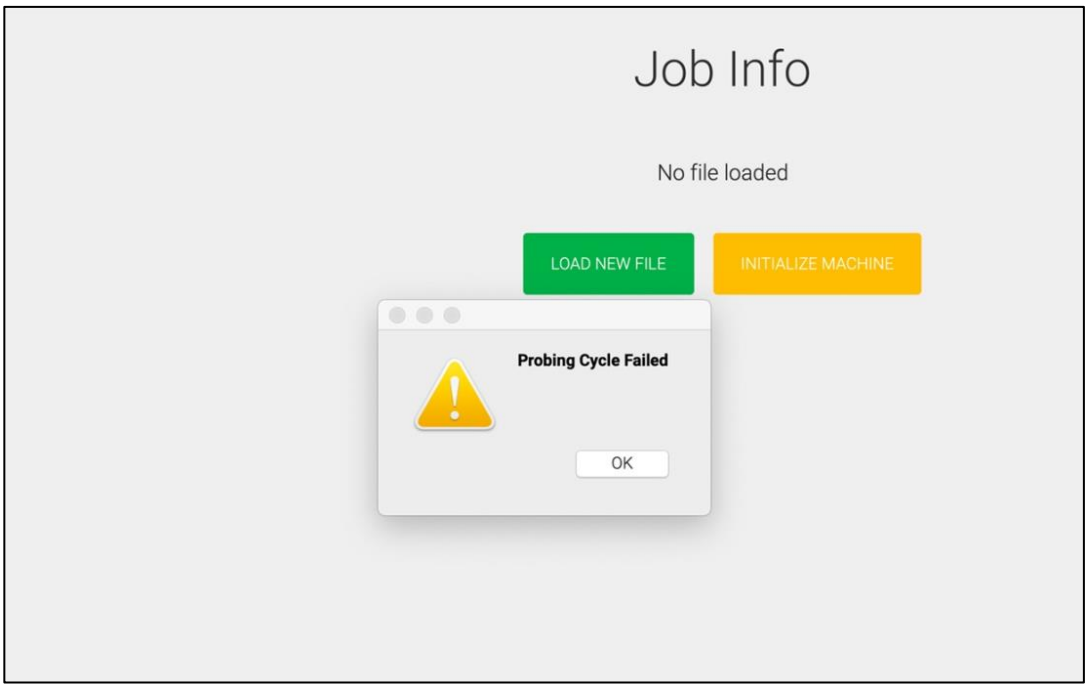


Figure 66

12. If you do not receive an error message, you're ready to begin machining. Remove the BitZero V2 and grounding clip from the machine's working envelope.

Set Job Zero for Z-Axis Only

If you want to find the zero location for the top of your material or wasteboard, you can find and set Z-zero only:

1. Connect to and home the machine.
2. When prompted to load a tool, install a probing pin in the collet.
3. Set the entire BitZero V2 on top of the surface to be measured (i.e. your stock or wasteboard).
4. In Carbide Motion, click **Jog** in the top menu bar to open the *Jog screen*.
5. Jog the machine until the tip of the probing pin is a few millimeters above the surface of the BitZero V2. See ***Fig. 17***.
6. Attach the magnetic grounding clip to the collet nut or the probing pin. See ***Fig. 17***.

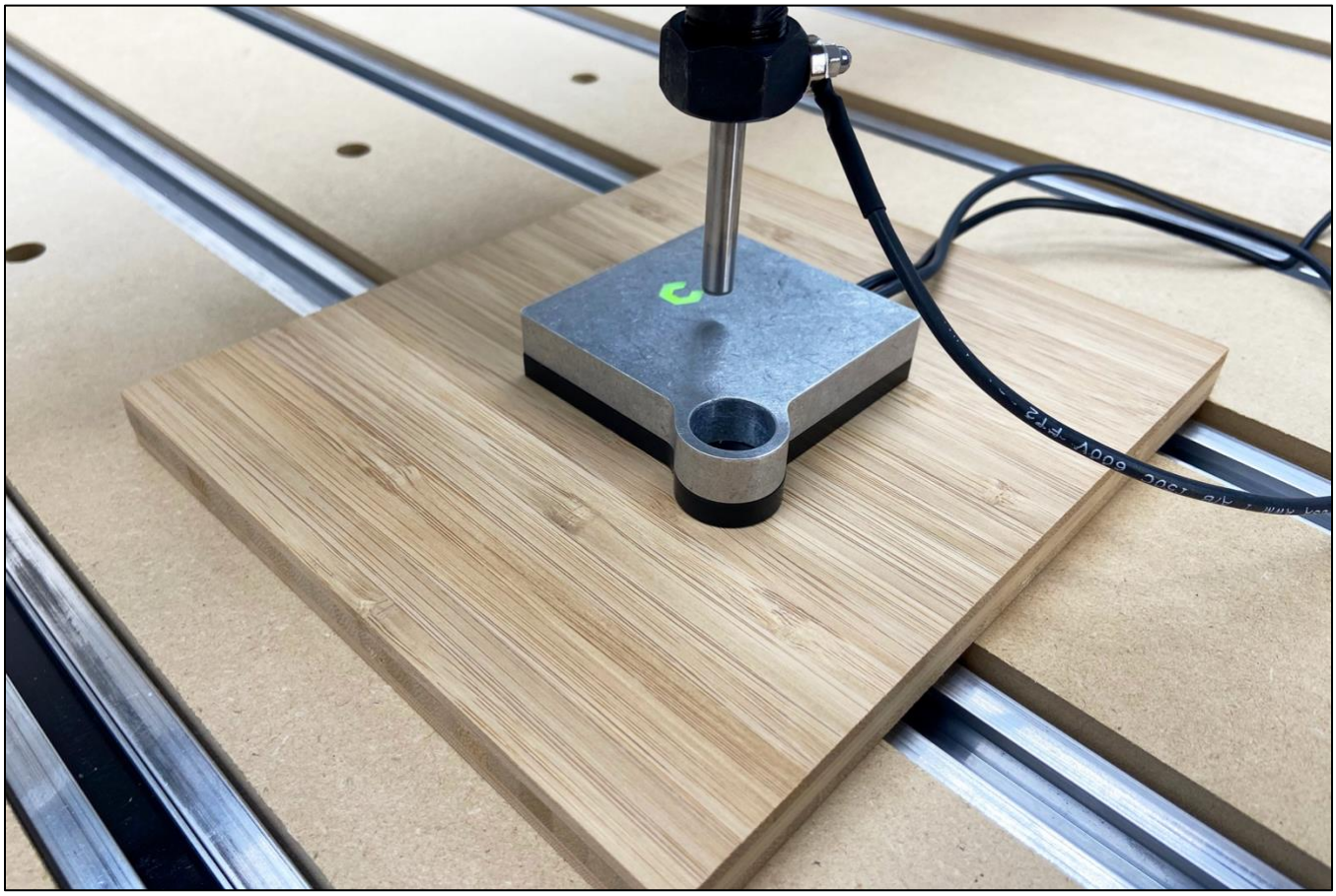


Figure 77

7. Click the **Probe button** to open the *Work Probing screen*. See ***Fig. 18***.

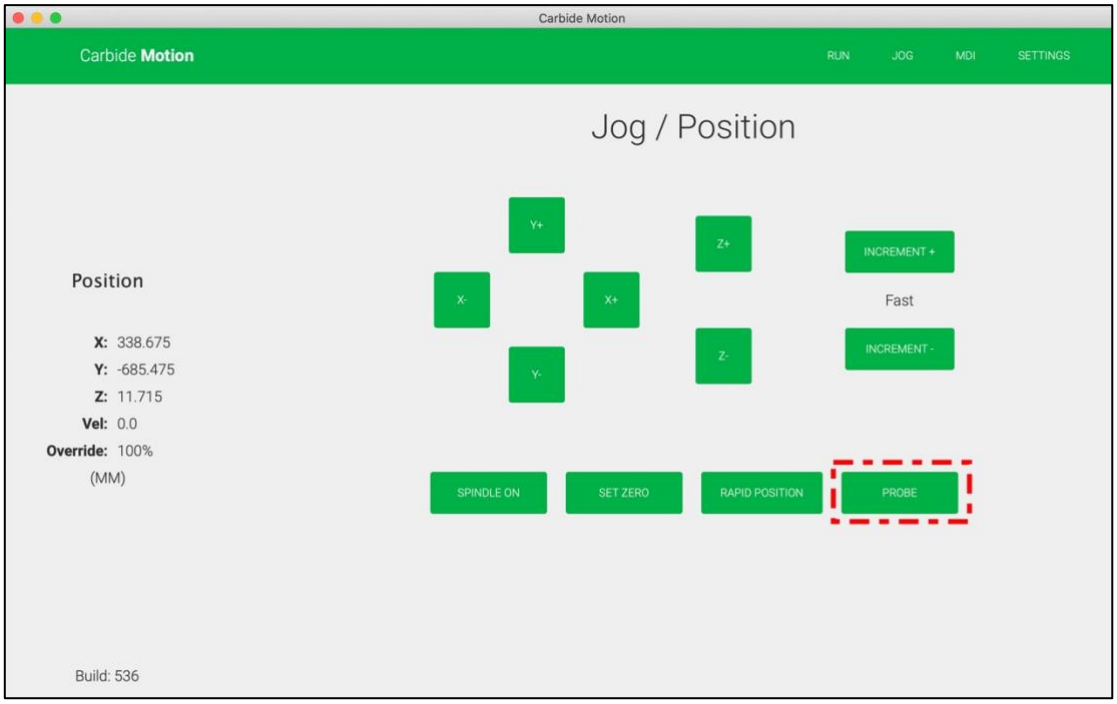


Figure 88

8. Select **BitZero V2** for the probe type. See ***Fig. 19***.

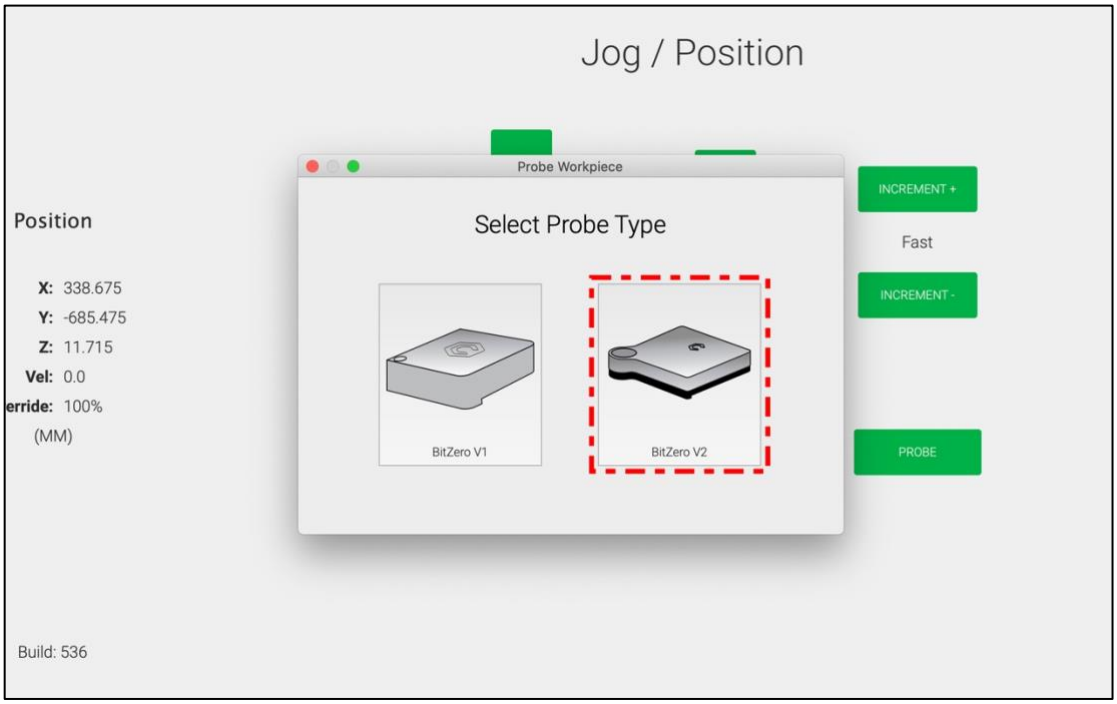


Figure 99

9. Select the **Z** probe cycle. See ***Fig. 20***.

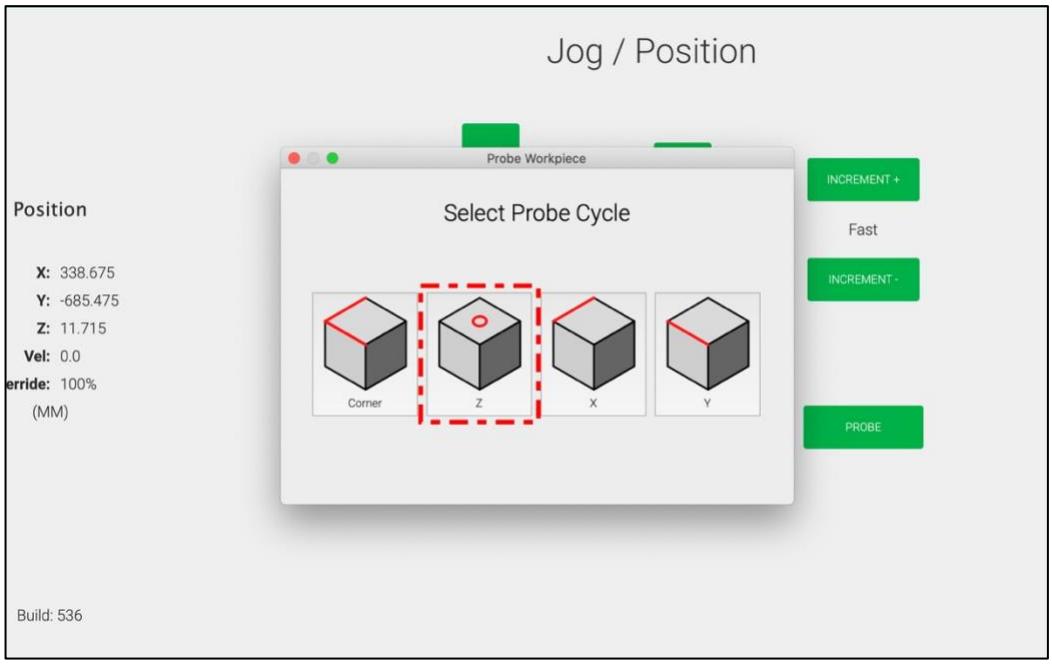


Figure 20

NOTE: Make sure your setup matches the graphic shown onscreen for the probe cycle you have selected. See ***Fig. 21***. If your setup does not match, the calculated zero location will be incorrect.

10. Click the **Begin Probe button** to run the probing sequence and set zero for Z. See ***Fig. 21***.

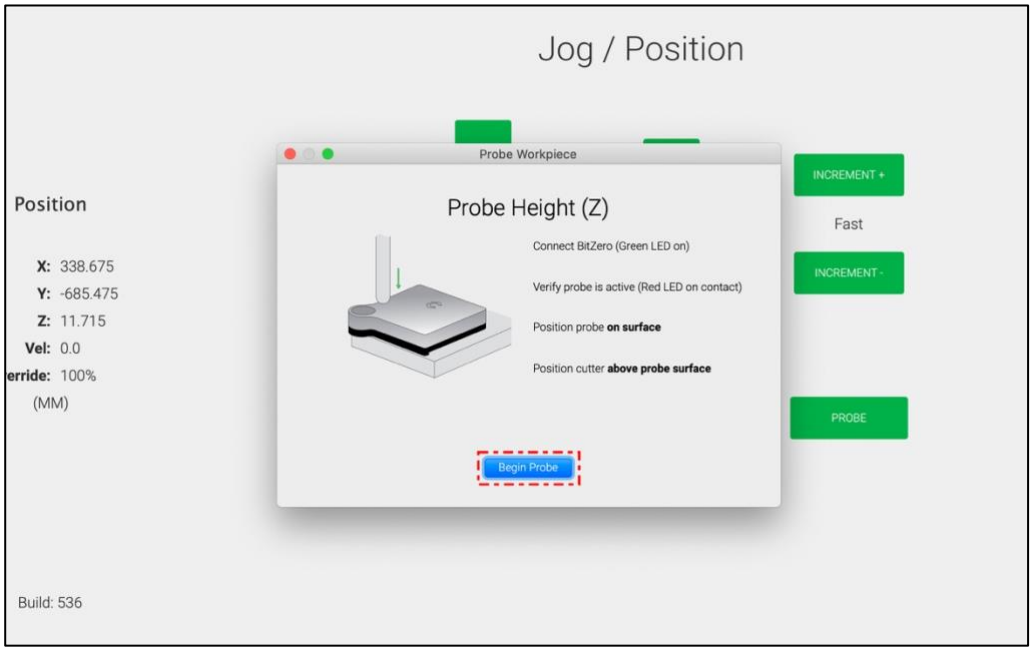


Figure 21

11. If you receive an error message, see ***Fig. 22***, repeat steps 1–10 to run a new probing sequence.

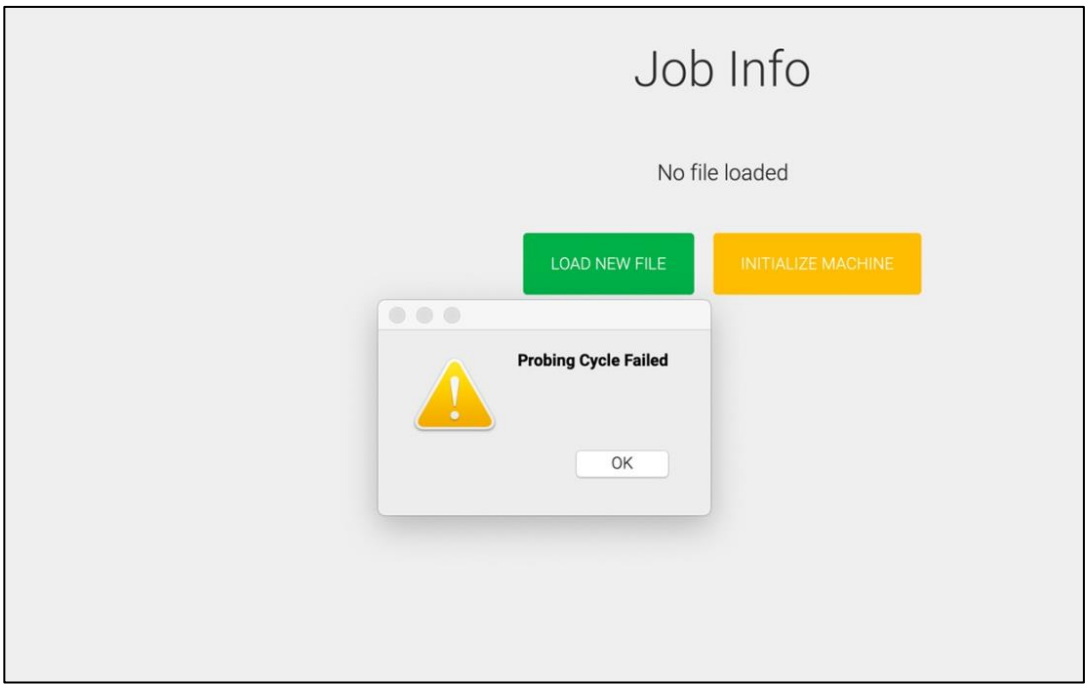


Figure 22

12. If you do not receive an error message, you're ready to begin machining. Remove the BitZero V2 and grounding clip from the machine's working envelope.

Set Job Zero for X- or Y-Axis Only

You can also use the BitZero V2 to find and set X- or Y-zero only:

1. Connect to and home the machine.
2. When prompted to load a tool, install a probing pin in the collet.
3. Set the BitZero V2 on a corner of your stock.
4. In Carbide Motion, click **Jog** in the top menu bar to open the *Jog screen*.
5. Jog the machine until the tip of the probing pin is just inside the circular bore on the corner of the BitZero V2. See ***Fig. 23***.
6. Attach the magnetic grounding clip to the collet nut or the probing pin. See ***Fig. 23***.

Figure 23

7. Click the **Probe button** to open the *Work Probing screen*. See ***Fig. 24***.

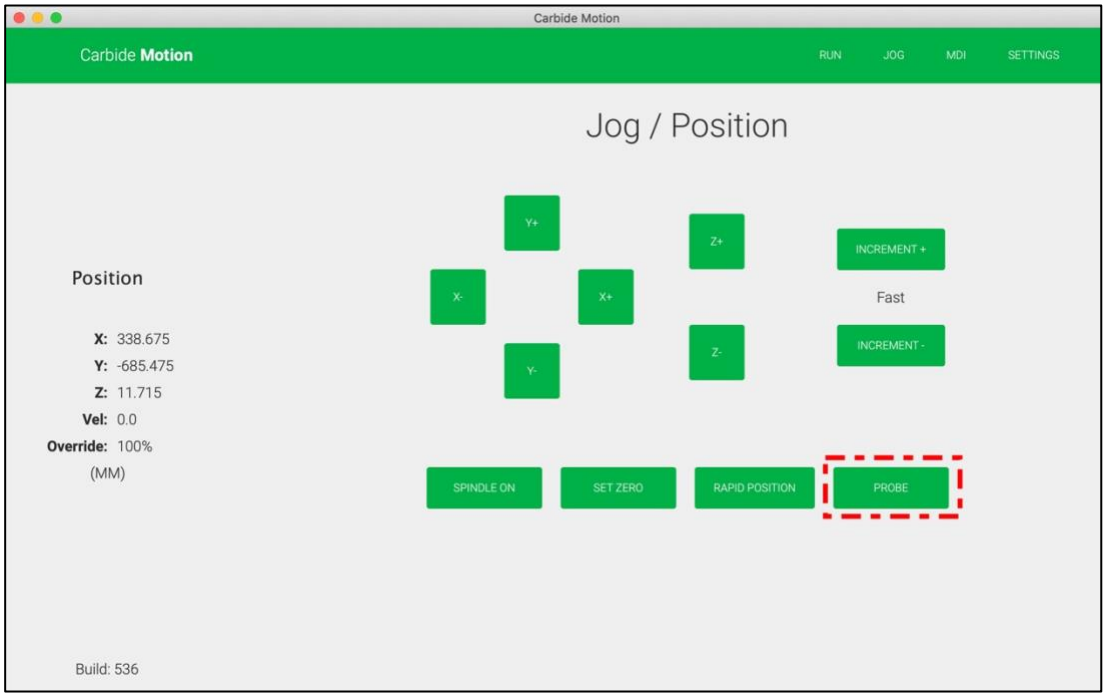


Figure 24

8. Select **BitZero V2** for the probe type. See ***Fig. 25***.

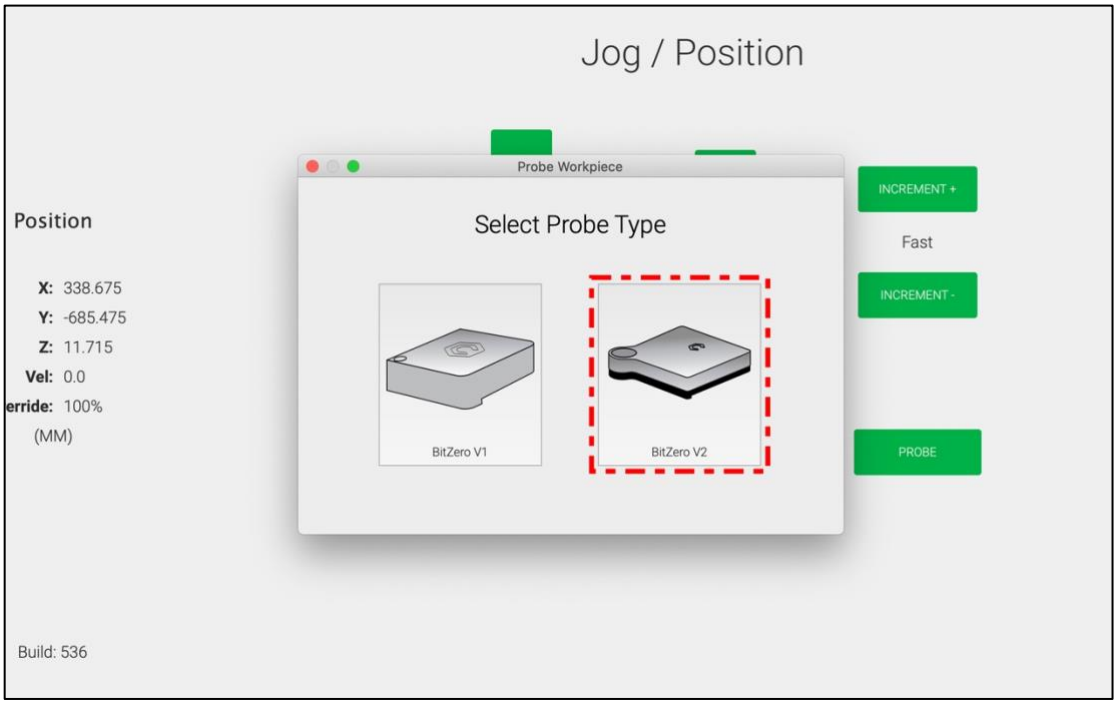


Figure 25

9. Select the **X** probe cycle if you want to set X-zero only (see ***Fig. 26***). If you'd like to set Y-zero only, select the **Y** probe cycle (see ***Fig. 27***).

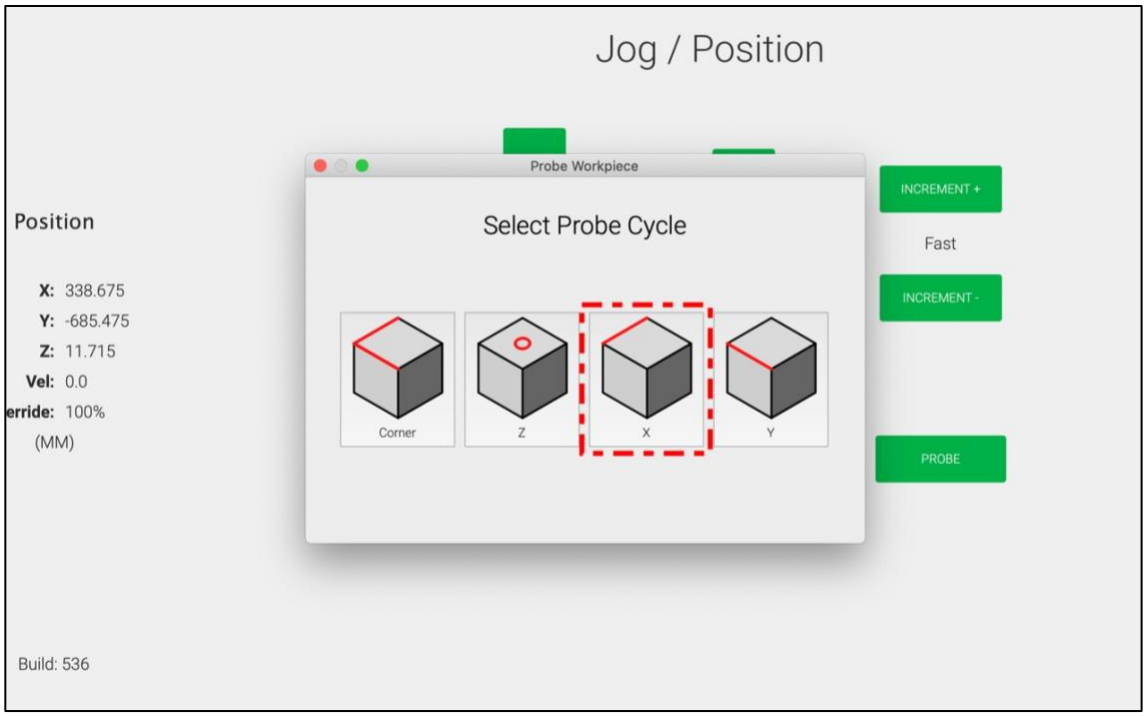


Figure 26

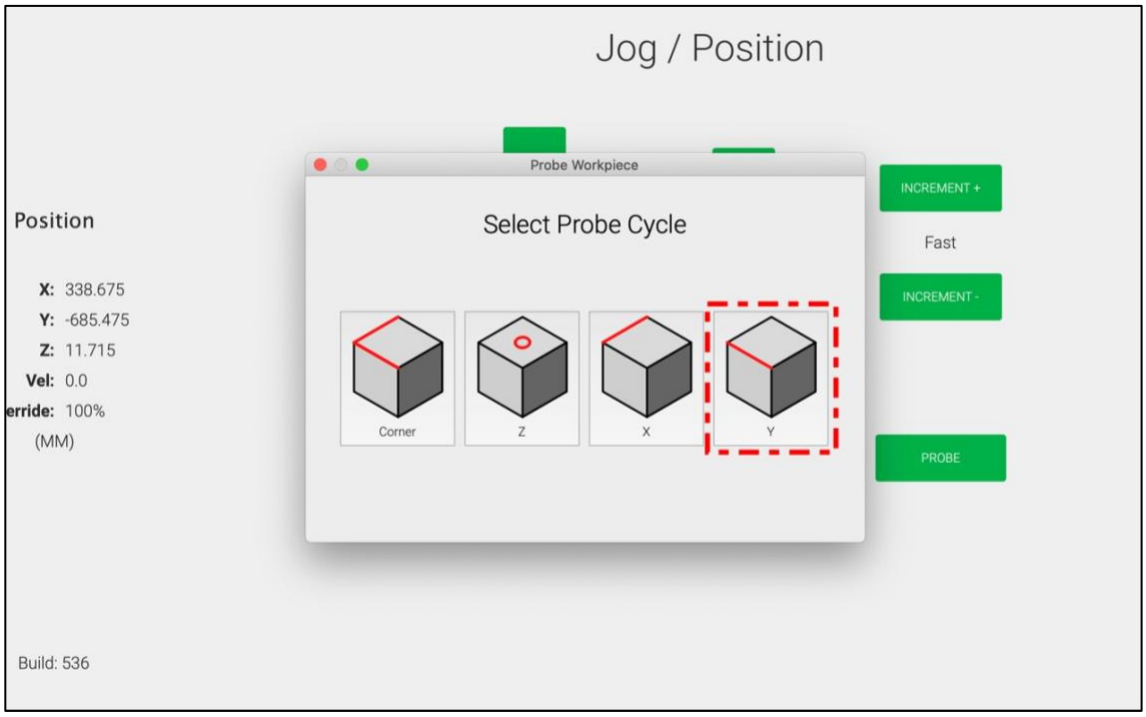


Figure 27

NOTE: Make sure your setup matches the graphic shown onscreen for the probe cycle you have selected. See ***Figs. 28*** and ***29***. If your setup does not match, the calculated zero location will be incorrect.

10. Click the **Begin Probe button** to start the probing sequence. See ***Figs. 28*** (X-only) and ***29*** (Y-only).

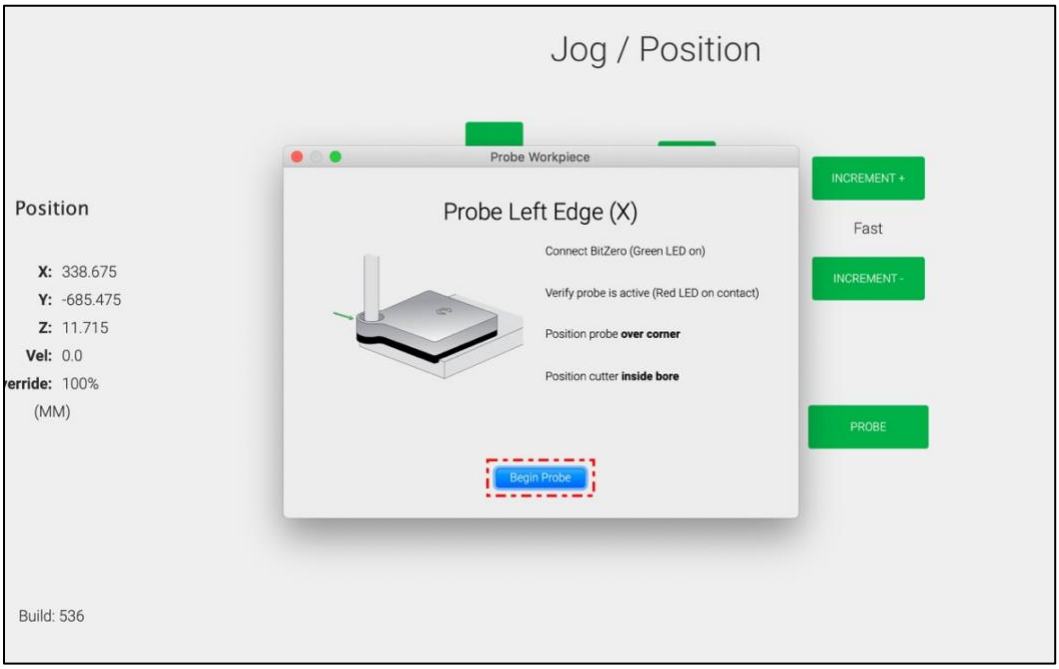


Figure 28

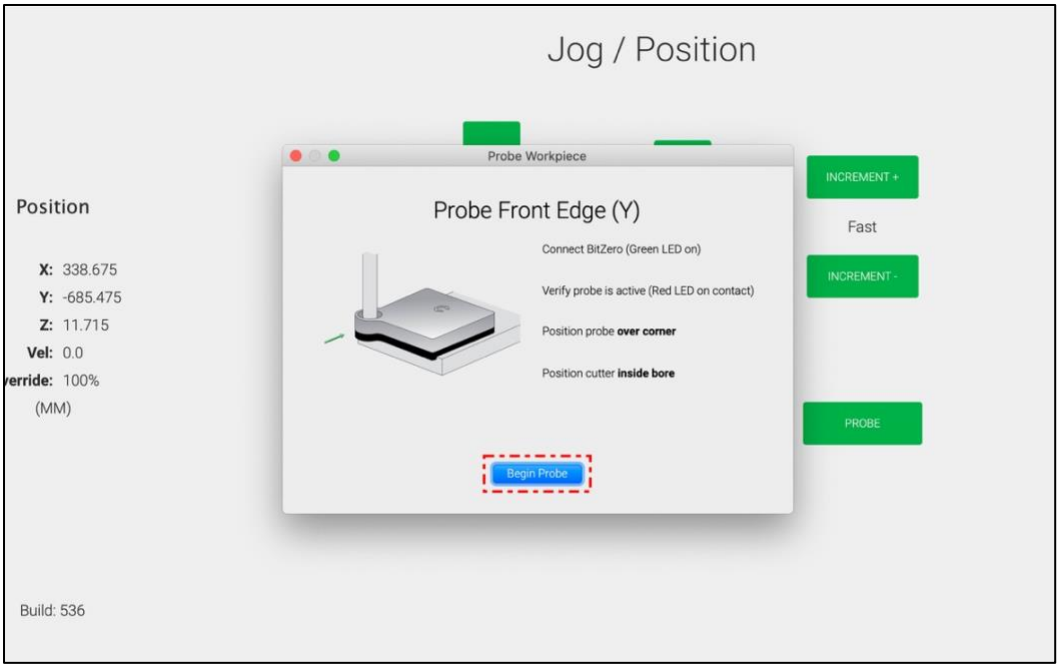


Figure 29

11. If you receive an error message, see ***Fig. 30***, repeat steps 1–10 to run a new probing sequence.

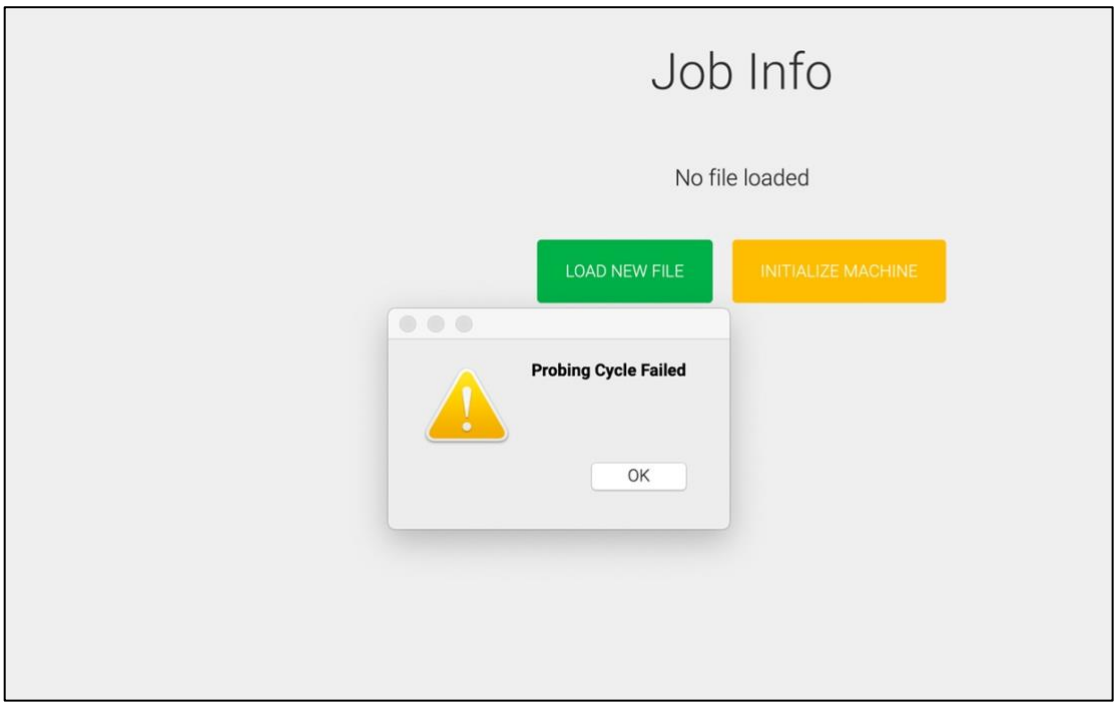


Figure 30

12. If you do not receive an error message, you're ready to begin machining. Remove the BitZero V2 and grounding clip from the machine's working envelope.