

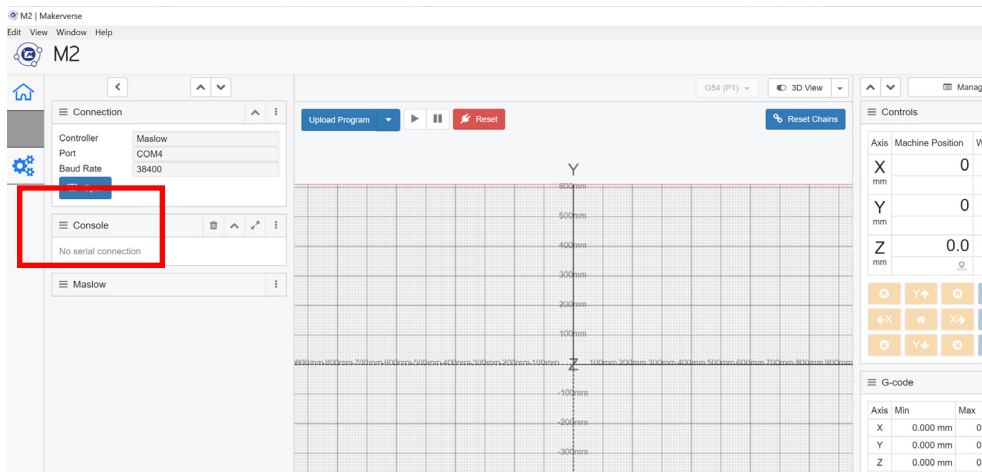
MAKERVERSE 1.1.3 CALIBRATION GUIDE

For the MakerMade M2 CNC Kit

SECTION 2: INITIAL M2 CALIBRATION

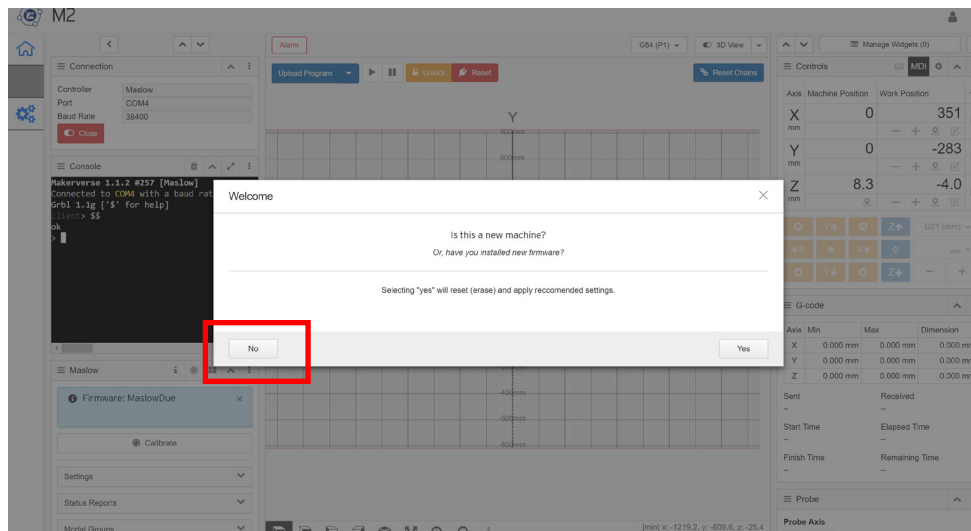
1. Connect M2 to Workspace

Click “Open” to connect your M2.



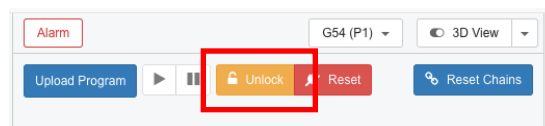
2. Prep the M2 for calibration

The prompt will ask: “Is This A New Machine?” Click “No”



3. Unlock Motors

To unlock the motors, click **Unlock**.



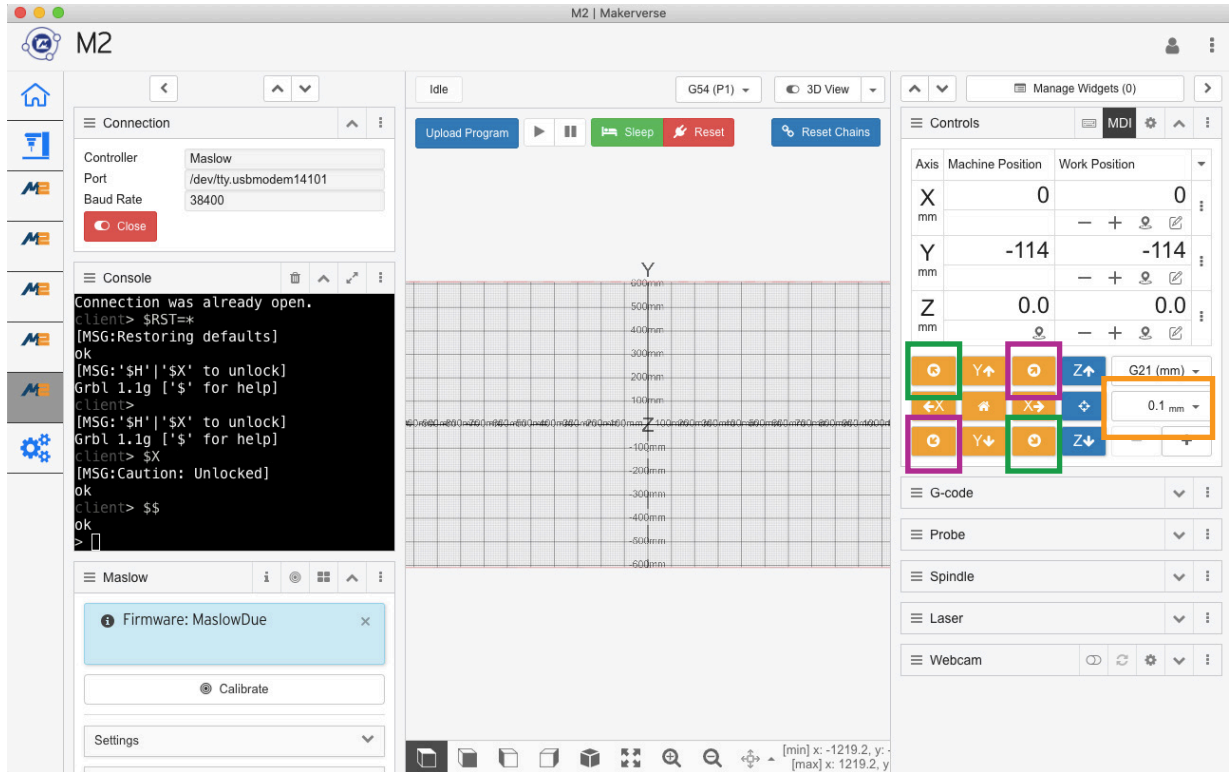


If you have the sled and chains attached to the motor sprockets, at this point you will need to remove them.



If the spring is attached, be aware that the spring is under tension. Remove the spring BEFORE removing the chains.

4. Move each motor to get one sprocket tooth in 12 o'clock position



Move each motor until one sprocket tooth is exactly at the 12 o'clock position.

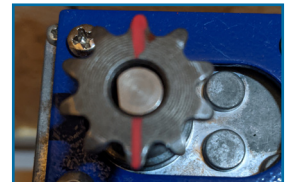
Set the jog control movement increments to 1mm. In yellow box above.

To move the LEFT motor, use the TOP LEFT and BOTTOM RIGHT arrows. In green above.

To move the RIGHT motor, use the TOP RIGHT and BOTTOM LEFT arrows. In purple above.

Move the left motor until a sprocket tooth is close to the 12 o'clock position. Then reduce the amount incrementally to 0.5mm, and then 0.1mm, until the target sprocket is exactly vertical at 12 o'clock.

Use the [Paint Marker](#) to mark the sprocket tooth vertical position. Do the same thing with the right motor.



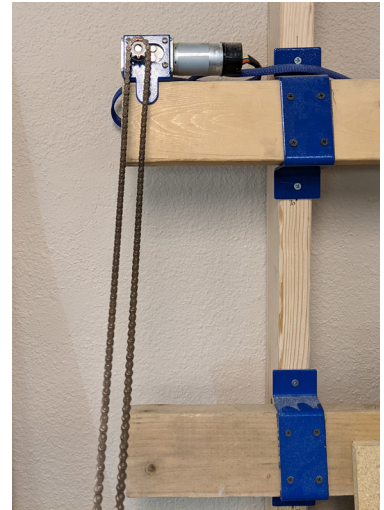
Using the 0.5mm/0.1mm movements, move the left motor back to 12 o'clock. If needed, repeat the process on the right, and alternate between the two motors until both the right and left motor sprockets have a tooth in the 12 o'clock position.

5. Hang the chains equally

If attached, remove the chains and nails from the frame. Drape one **chain** over the sprocket of the left motor. The ends of the chain need to be the same length for them to be equal.



To find the center of the chain, hold each end and walk a few steps out from the frame to check the ends. Move the chain on the sprocket until the two ends of the chain you are holding are exactly aligned when you step back.



Mark the chain center on the 12 o'clock sprocket tooth you marked in Step 4 using the **paint marker**.



Repeat the process with the other chain on the right motor.



Note: It's very important that the chains are exactly the same length for calibration! If they are off, even by one link, you will have trouble getting the M2 precisely calculated.

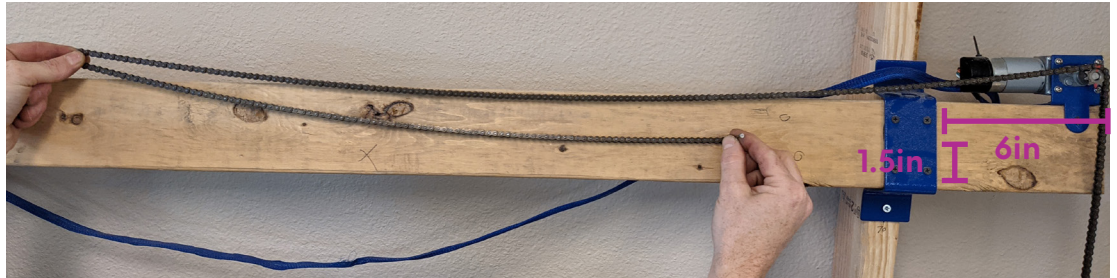
6. Attach the chains to the frame

Drew's Note: If you removed your chains and sled for this calibration, put the nail back into the original hole and attach your sled. These steps explain that process in detail.

(A) From the right end of the Standard or XL top beam, measure and mark 1.5in (4cm) from the bottom and 6in (15.24cm) toward the center. Hold the left half of the chain about two feet from the motor sprocket, and loop it around your thumb. Insert the small nail through loop in the last chain link on that left half and hammer it into the marked spot. Drape the chain over the nail. Symmetrically repeat the process on the left side of the beam, hammering the nail into the right half of the chain.



Chain Mounting Hardware Bag A



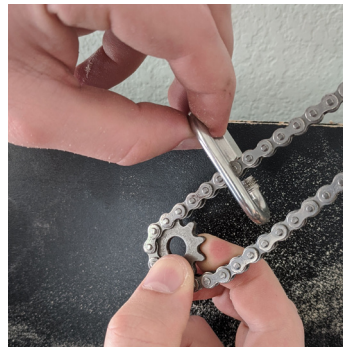
(B) On the right side, place the sprocket in the chain loop and attach the quick link through the hole in the sprocket, with its opening facing away from beam. Don't tighten the link. On the left side, attach the spring and tighten the quick link, ensuring the link nut is facing away from the beam.



Chain Mounting Hardware Bag A

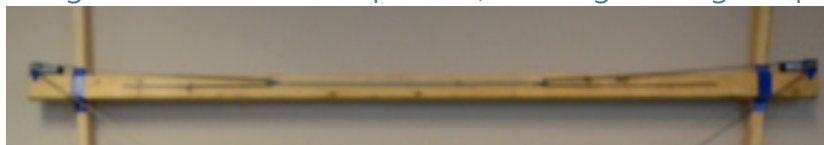


Spring Hardware Bag B



(C) Carefully stretch out the spring from the left side to attach it to the other end to the open quick link on the right side. Tighten the right quick link to lock the chains together.

Drew's Note: We recommend a friend help you connect the spring and each person wear safety goggles during stretching. The chain can snap back, causing damage to people, pets, and surroundings!

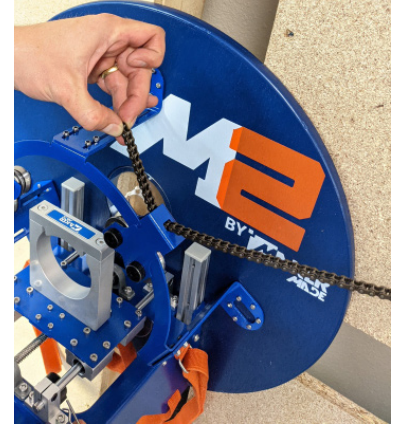


You can adjust the spring tension on your frame by moving the nails equally toward or away from center. The most important part is that the spring keeps the tension on the chains. We use nails to connect the chain to the frame, so if something goes awry, only the nails will be removed without damaging your frame.



7. Mount the M2 to the frame

(A) Hold the M2 sled against the wasteboard near the right chain. Hold it against the frame with your body weight or have a friend help by holding it for you. Take the loose end of one chain and thread up through the hole in the roller bearing carriage.



(B) Insert the **cotter pin**, with the flat side on the right, into the second to last chain link to attach. The flat side will be against the inside of the roller bearing carriage.



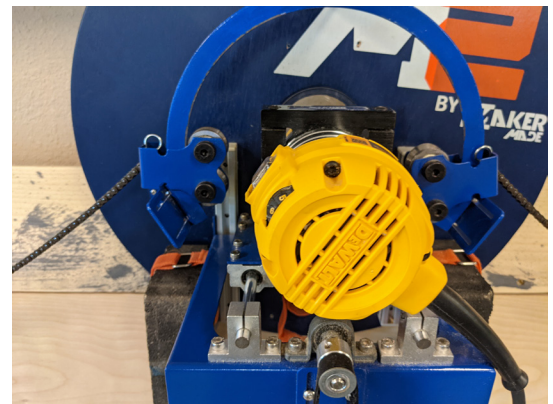
Chain Mounting
Hardware Bag A



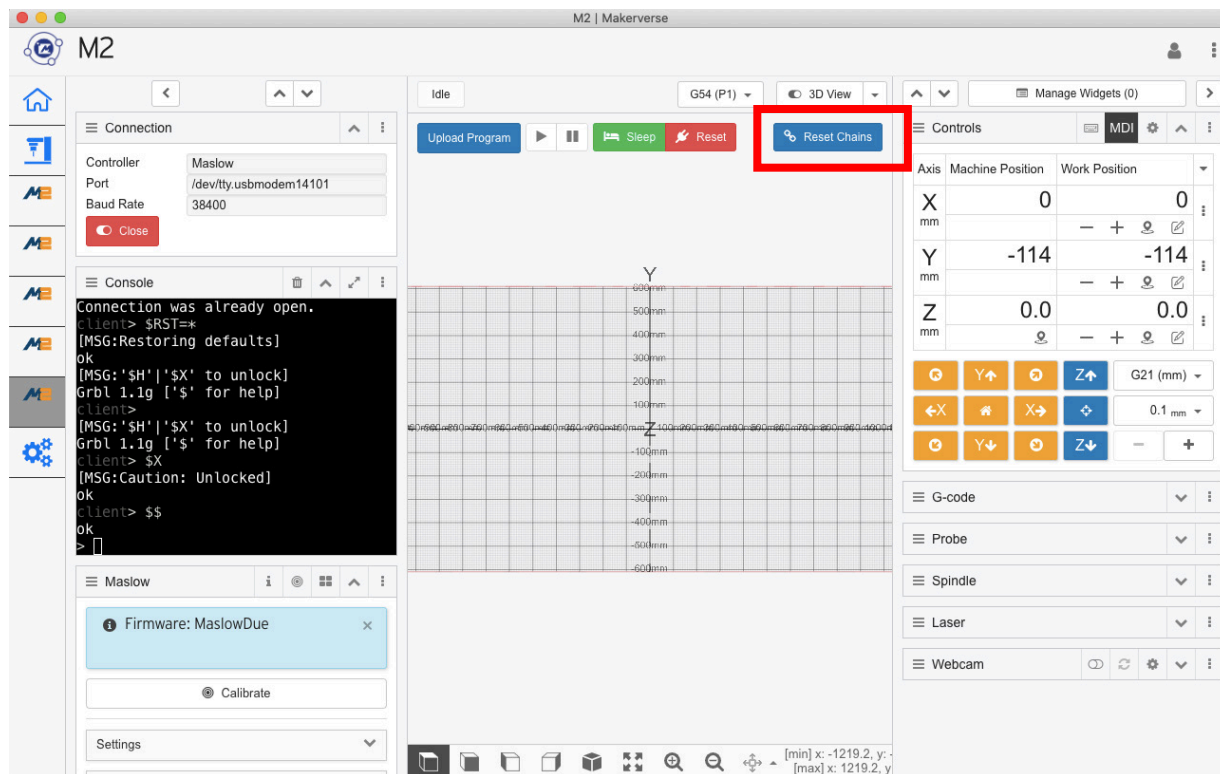
(C) Thread the left chain half through the other roller bearing carriage and attach with the cotter pin into the second to last chain link. Let go of the sled and it will rest against the canvas.



(D) If not installed, attach your router, with a bit installed, and the bricks/weight.



8. Click Set Home or Reset Chains button



RESET CHAINS / SET HOME

Clicking the Set Home/Reset Chains button creates a “save point” to return to in case the machine ever skips a tooth or loses calibration for another reason.

It is also a way to make sure that the chains are at an equal length on each side.

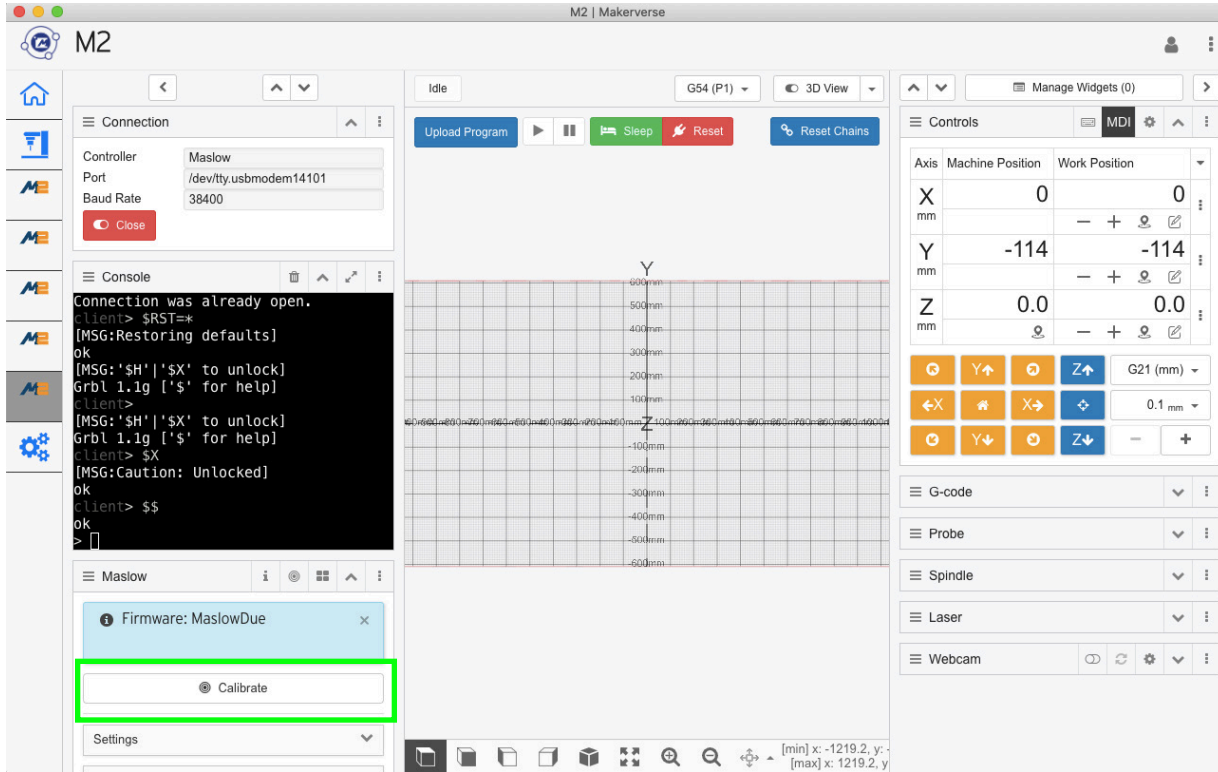
If you ever need to return the chains to this saved location, it is important to get the chains in exactly the same position as when you saved this position and marked the sprocket and chains. (as in step 3)

To return the chains to this saved location, use the jog controls to move the marked sprocket tooth to the 12 o'clock position matching up with your mark on the chain. You will likely need to move the chain manually by lifting it up from the motor sprocket and moving it to the marked location on the chain.

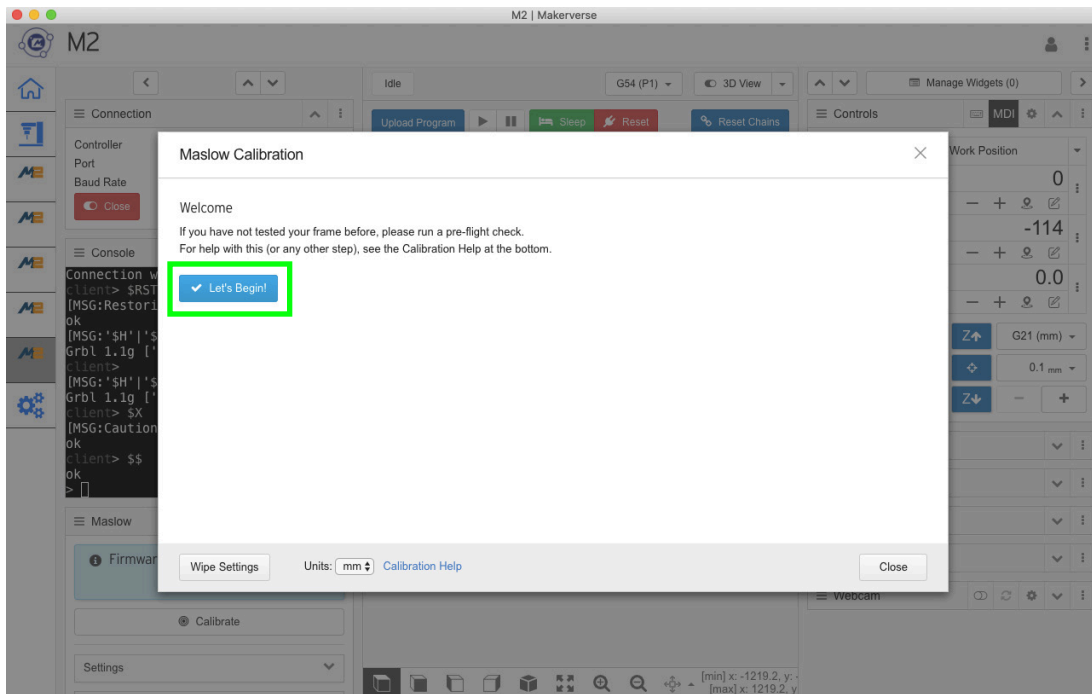
Once you are certain the chain is in the exact same position, press the “Reset Chains” button on the main screen and Makerverse will tell the machine it is back at this saved location. It is not necessary to re-calibrate after resetting chains but is a good idea to calibrate the machine every so often.

9. Begin Calibration

Click Calibrate to return to the calibration tabs.



Click "Let's Begin!"



10. Machine Tab

The first tab open is the machine tab.

Drew's Note: When you complete each tab, you will click "Apply" to apply the calibration settings. If the apply button is not clicked before moving to another tab, the settings will not be applied

Maslow Calibration Export Calibration ✕

Machine Stock Frame Sled Z-Axis Chains Edge Precision 🔒 Unlock 🔄 Reset

Your Maslow must be calibrated to account for the variables below.
Please validate the four settings (inputs) on this tab, then press "Next Step."
For help, or to change units, see the lower-left corner of this dialog.



These values on this tab should only be changed if you have a nonstandard setup.

Chain: Full Length:
Sled Weight: (Newtons) Rotation Disk Radius: ✓ Apply

Wipe Settings Units: [Calibration Help](#) Close

Chains set to Off Botttom

Sled Weight, calculated in Newtons.

Weigh your sled (bricks and all) and then convert your lbs/kg to Newtons.

Click Apply to apply your results.

11. Stock Tab

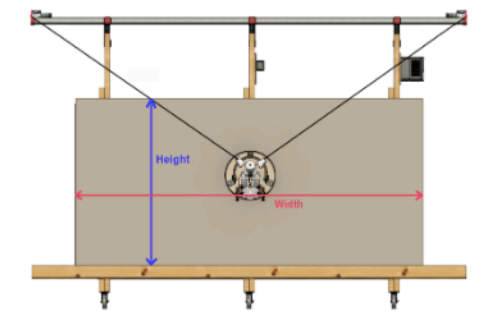
Click on the second tab labeled Stock.

Drew's Note: We recommend starting with a full 4ft x 8ft sheet of ply/MDF for calibration. Also, everything on the M2 is calculated with metric values, so we recommend measuring in millimeters to get the best accuracy.

Maslow Calibration Export Calibration ×

Machine **Stock** Frame Sled Z-Axis Chains Edge Precision Unlock Reset

*Please be certain of the size of your stock before pressing "Next Step."
Most Maslows use 8'x4' plywood. Later calibration steps will rely on this measurement being accurate.*



Note: if your sled is not yet attached, it will be done later in Calibration.

Stock Width: Stock Height: ✓ Apply

Wipe Settings Units: [Calibration Help](#) Close

The M2 needs to know the exact dimensions of the material you are cutting, called the stock. This stock must be level and aligned in the exact center of your frame for your M2 to properly cut.

Measure the actual width and height of your stock and write down the values. Use them to find the exact center of your stock and mark it with an “+”. Line the center + with the center lines on your top and bottom beams.

Then enter the exact width and height of your stock into this tab at the bottom.

Click Apply to apply your results.

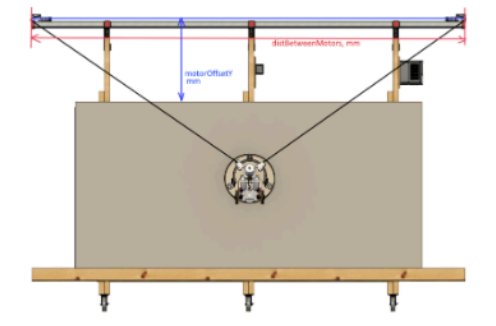
12. Frame Tab

The third tab is Frame.

Maslow Calibration Export Calibration ×

Machine Stock **Frame** Sled Z-Axis Chains Edge Precision Unlock Reset

Enter approximate measurements, within 6mm (1/4") tolerance. Then, press "Set Frame".



Use the center of the sprocket (motor axis) for both motor measurements.
Measure motor height coplanar with the stock.
Motor Height: Motor Width: Apply

Wipe Settings Units: [Calibration Help](#) Close

The M2 needs to know the exact distance between your motors and from the motors to the stock.

The best way to measure the Motor Height is to hook a tape measure on the back of your top beam, twist it, and bring it down to the top of your material. Take that measurement and add 31mm (1.25in) to account for the motor bracket. Enter the total value into Motor Height. It should be around 494mm (19.5in) on the Standard Frame.



The best way to measure the motor width is to have a friend hold a tape measure in the middle of the motor sprocket on one end and then measure the distance to the middle of the sprocket on the other. It should be about 3010mm (118.5) on the Standard Frame. Input that value in the motor width box.

Click Apply to apply your results.



13. Skip Sled Tab

The standard 18in M2 sled values are automatically calculated. Skip the tab.

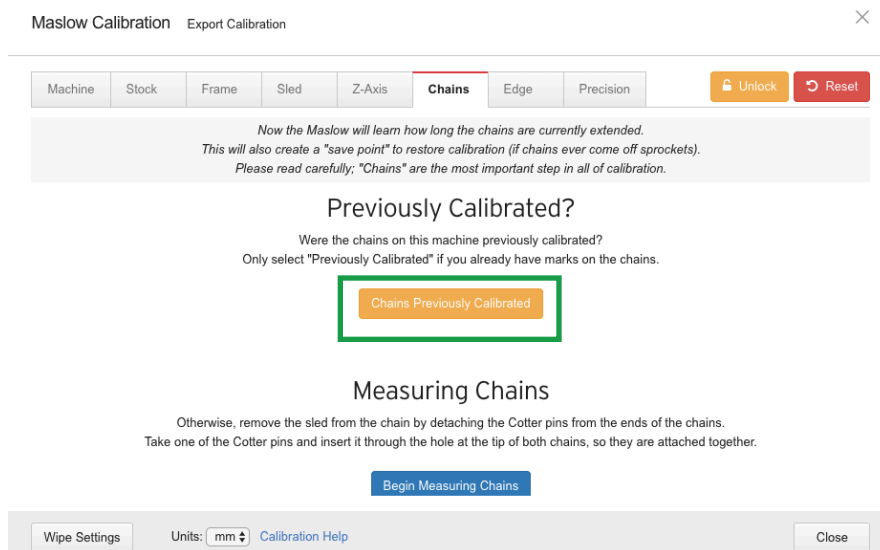
14. Skip Z-Axis Tab for initial calibration

When you selected your M2 as a new machine, the Z-Axis was automatically calculated. If you are having issues with your Z-Axis, you can troubleshoot it by recalibrating the scale or direction using this tab later.

12. Chains Tab

The tab labeled Chains will set the lengths of your chain, relative to your M2 on your frame. Since the M2 doesn't use limit switches, this will ensure that the M2 is physically in same the spot that Makerverse digitally displays.

(A) Click Chains Previously Calibrated



15. Measure actual location

Measure the exact distance between the top edge of the sled to the top of the stock.

Input the value into the box and click next.

Maslow Calibration Export Calibration

Machine Stock Frame Sled Z-Axis **Chains** Edge Precision

Unlock Reset

Now the Maslow will learn how long the chains are currently extended.
This will also create a "save point" to restore calibration (if chains ever come off sprockets).
Please read carefully; "Chains" are the most important step in all of calibration.

Measure Actual Location

Measure the distance from the **top of the stock to the top edge of the sled**.
Press the tape measure firmly against the sled.

Distance from top:

Previous **Next**

Wipe Settings Units: mm Calibration Help Close

16. Axes check

Next, you will measure how far the bit is from the center of your stock.

(A) Click **Move to Center**.

Maslow Calibration Export Calibration

Machine Wasteboard Frame Z-Axis **Chains** Edge Precision

Unlock Reset

Axes Checks

Ensure that the stock is loaded. Make a mark at the exact middle (0, 0).
When you press the "Move to Center" button below, the Maslow will try to move to this center location.
Once it is there, measure the distance from the **tip of the end-mill** to the center mark you made.
Use the Z-axis controls to help touch the tip to the stock.

Move to Center

Y+ Z+ G21 (mm) -
←X →X 0.1 mm -
Y- Z- - +

Enter the distance from the center, e.g., x="2" is right of center, and y="-5" is below center.
X Error: Y Error:

Previous

Wipe Settings Units: mm Calibration Help Close



(B) The M2 should have moved a little toward where you marked the center of your stock. To measure the X Error, feed a tape measure between the sled and stock. Measure how far from the left or right the tip of the bit is from the mark and input the value.

Treat your center mark as 0,0.
Just like a graph, if the bit is to the left it's a negative value, the right side would be positive.

For example, this is -24.5mm X Error.

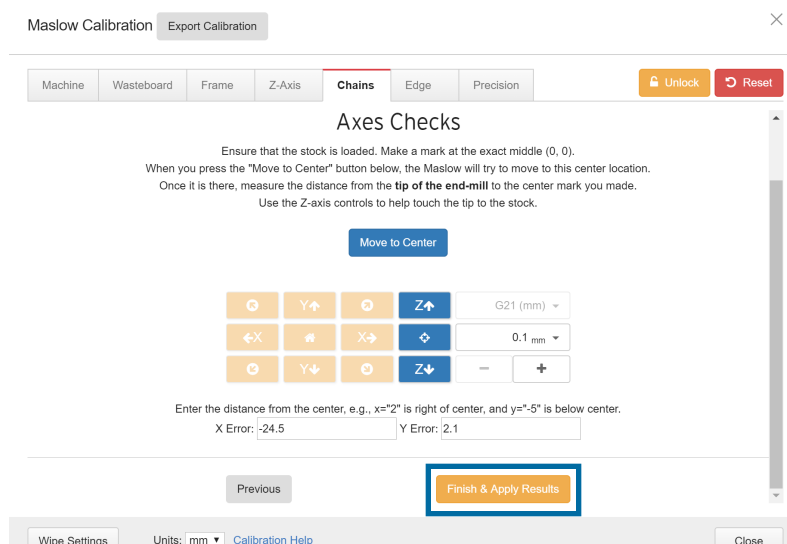


(C) Measure the Y Error and input the value.

For example, this is 2.1mm Y Error.



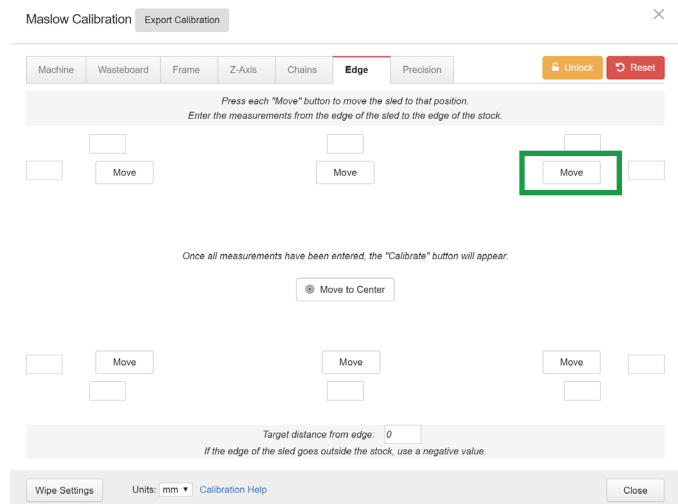
(D) Scroll down and click Finish & Apply Results to finish calibrating your chains.



17. Edge Tab

Click the Edge tab, the last step of initial calibration (the Precision tab should be skipped for initial setup). Edge calibration, will calibrate your M2 and frame to the stock that you want to cut and dial in the accuracy of your M2. Running the calibration multiple times will increase the accuracy of your machine.

(A) You will jog your M2 to each of the six points on your stock and measure the offset from the edge on each. Start by clicking the top right **Move**.



Maslow Calibration Export Calibration

Machine Wasteboard Frame Z-Axis Chains **Edge** Precision Unlock Reset

Press each "Move" button to move the sled to that position.
Enter the measurements from the edge of the sled to the edge of the stock.

Once all measurements have been entered, the "Calibrate" button will appear.

Move to Center

Target distance from edge: 0
If the edge of the sled goes outside the stock, use a negative value.

Wipe Settings Units: mm Calibration Help Close

If your sled stops and is within the boundaries of your stock material, then you will input a positive value into the box. If it stops and is hanging over your stock, input a negative value.

For example, this is 27.82mm.



And this is -6.38mm, because it is hanging over the stock onto the bottom skirt.



(B) Repeat at each point by clicking Move and then inputting the exact values. When you have values for each of the points, a blue Calibrate button will appear in the center.

Click it to apply your results.