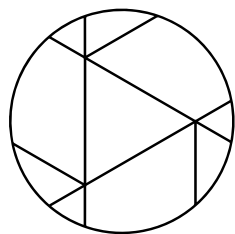


# MILL ONE

## Assembly Manual



**SIENCI LABS**

DESKTOP CNC MILLING

Manual Illustrated by Gontarz Design Studio

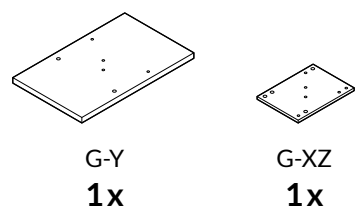
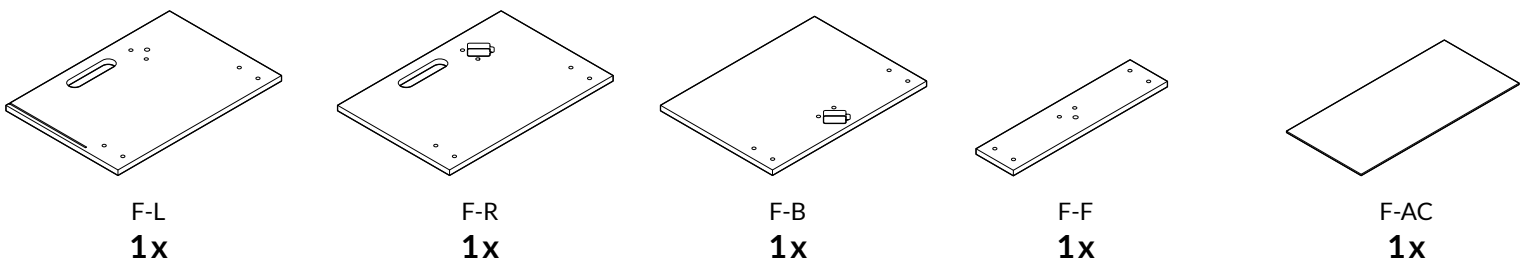
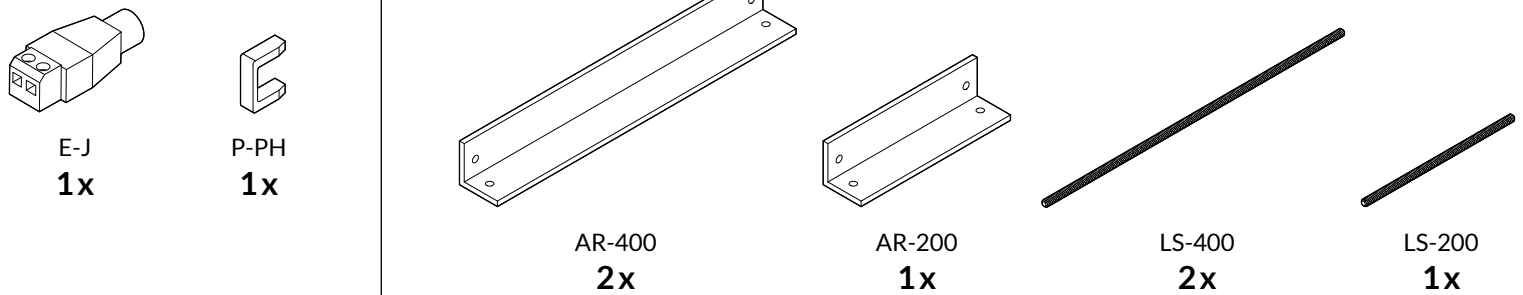
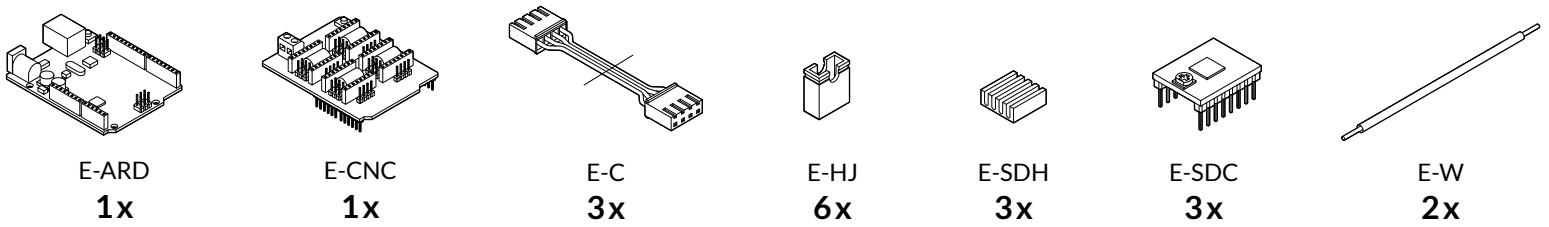
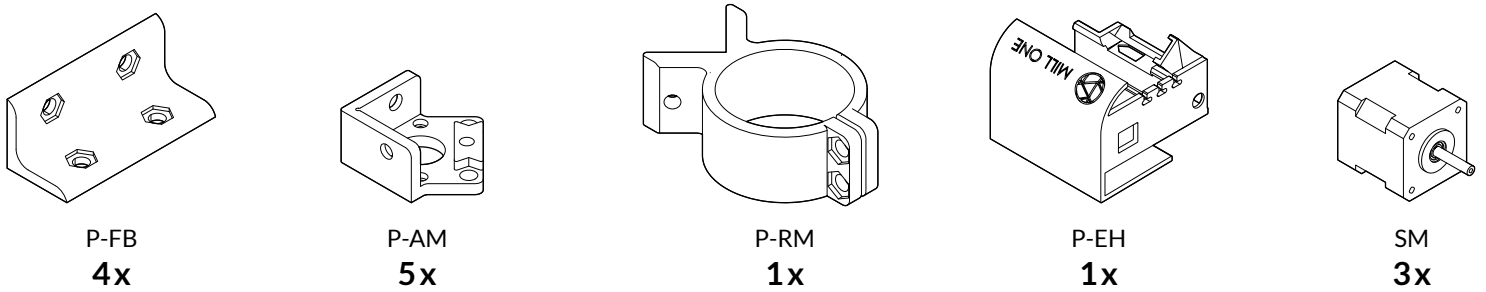
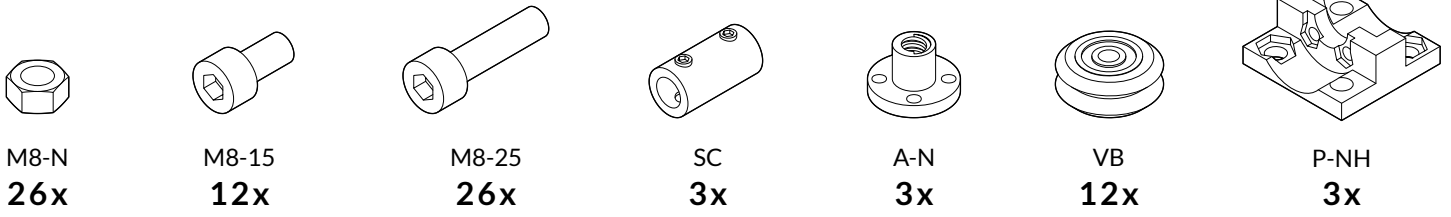
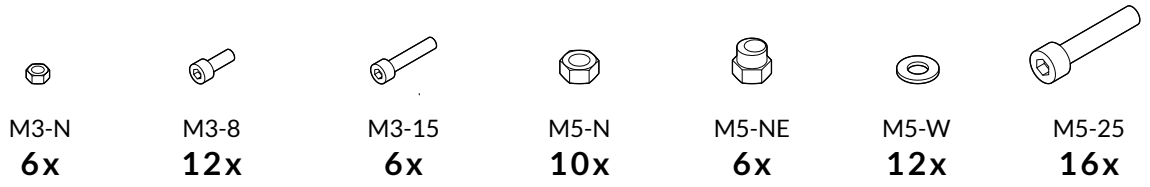
## Safety Warnings and Guidelines

1. Be sure to carefully follow provided machine assembly instructions before machine use to ensure operator safety.
2. All wires must be appropriately positioned before beginning the operation of this machine. Cutting a “live” wire may cause exposed metal parts of the routing/trimming tool to become electrified and shock the operator.
3. Ensure the machine is placed on a flat surface and in a well-ventilated space before operation.
4. Always wear eye protection during machine operation.
5. Always wear hearing protection during extended machine operation based on proximity to machine.
6. Materials may release chemicals that are toxic or unsafe to inhale when cut. Always check the Material Safety Data Sheet (MSDS) of the material in question before cutting. Always cover exposed skin and wear appropriate airway protection (e.g. dust mask/respirator) specific to the material used and its application.
7. Any workpiece must be appropriately secured before starting a cutting routine by clamps or other practical securing method. Holding the material by hand or employing any other unstable form of securing will lead to unsafe loss of machine control.
8. Cutting bits used for the Mill One should be used at the discretion of the user. Bits are sharp and can crack and break without notice so appropriate care should be taken by the user while manipulating and installing them. Carefully check bits for cracks or damage before operating the machine and replace any cracked or unfit bits immediately.
9. Carefully inspect any consumable material before use on the machine, any unforeseen inconsistency in material hardness or material quality may cause damage to the machine.
10. Keep away from all moving parts during machine operation.
11. Before beginning a cutting job, ensure the router/trimmer runs properly. Immediately disable the tool if visible vibration or wobble occurs. This might indicate a damaged tool or an improperly installed bit.
12. Make sure the bit is not contacting the workpiece before the router/trimmer tool is turned on.
13. Do not leave the machine running unattended, the machine should only be operated with the operator present.
14. Do not touch the cutting bit immediately after use. It may be hot and could burn the operator.
15. Use bits that are appropriate to the material and cutting speed used.

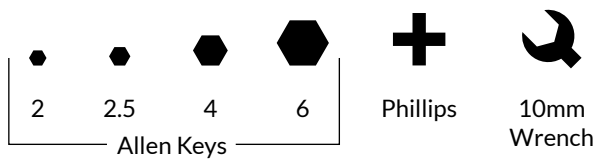
## Machine Disclaimer

The product user takes on all the associated liability pertaining to the operation and performance of the Mill One. The listed “Safety Warnings and Guidelines” outline the necessary precautions that should be taken any time the machine is operated. Sienci Labs will not be held responsible for any damages to property or injury incurred on the operator or bystanders. Sienci Labs will not be held responsible for damages to property or injury incurred on the operator or bystanders if any alterations are made to the design or assembly of our machine. Although care is taken to ensure the accuracy of information made available on this website and other forms of media, Sienci Labs will not be held liable for inaccuracies, errors, or inconsistencies in website content, the content of files linked to by this website, references made to external websites herein, and/or information produced by Sienci Labs. The information which has been made available will not be applicable to all situations and is subject to change without notice so it should not substitute for the discretion of product users. Variability in machine accuracy and performance may occur due to improper machine assembly by the user, as such, Sienci Labs takes on no responsibility for variation between claimed machine specifications and the performance of the user’s machine from improper assembly.

# LIST OF PARTS

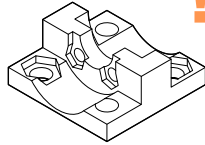


## Tools:

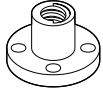


## STEP 1

### Lead Screw Nut Holding Assembly



P-NH  
3x



A-N  
3x



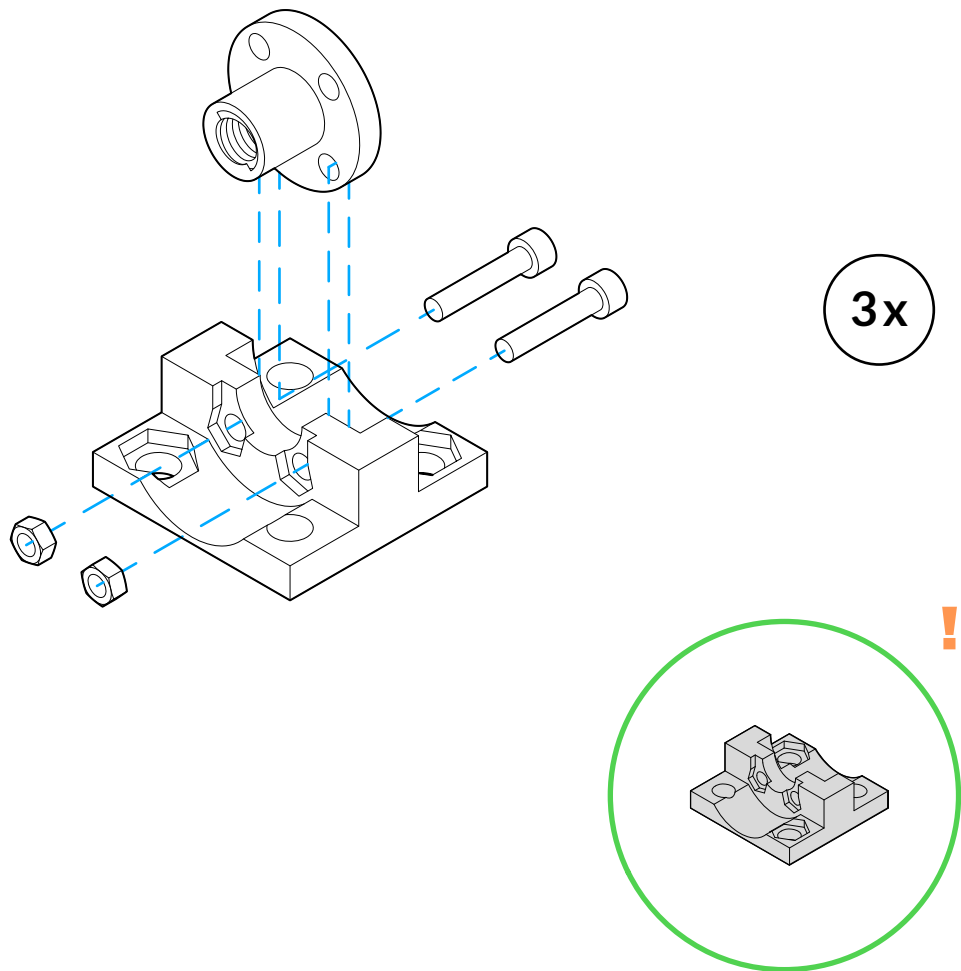
M3-15  
6x



M3-N  
6x



2.5  
Allen

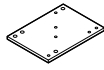


! Take note that one of the three plastic nut holders (P-NH) is a different colour and is not the same as the one depicted. It's still assembled the same way but is specially used for Step 2.

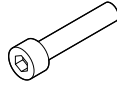
See: "Assembling the Mill One Gantries" -> 1:10 - 2:10  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=1m10s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=1m10s)

## STEP 2

### XZ Gantry Assembly



G-XZ  
**1x**



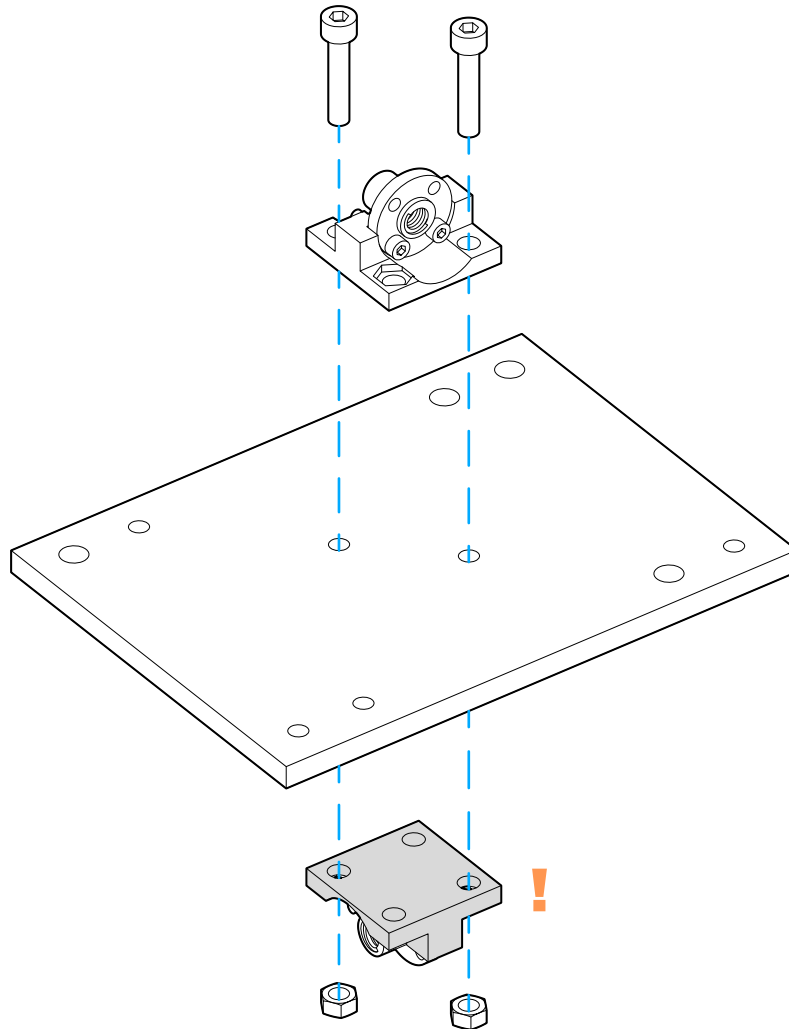
M5-25  
**2x**



M5-N  
**2x**



4  
Allen

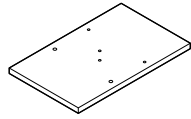


**!** This is the mirrored lead screw nut assembly.  
Check that the M5 nuts are properly fitting into  
the nut traps.

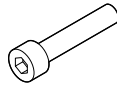
See: "Assembling the Mill One Gantries" -> 2:10 - 3:05  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=2m10s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=2m10s)

# STEP 3

Y Gantry  
Assembly



G-Y  
**1x**



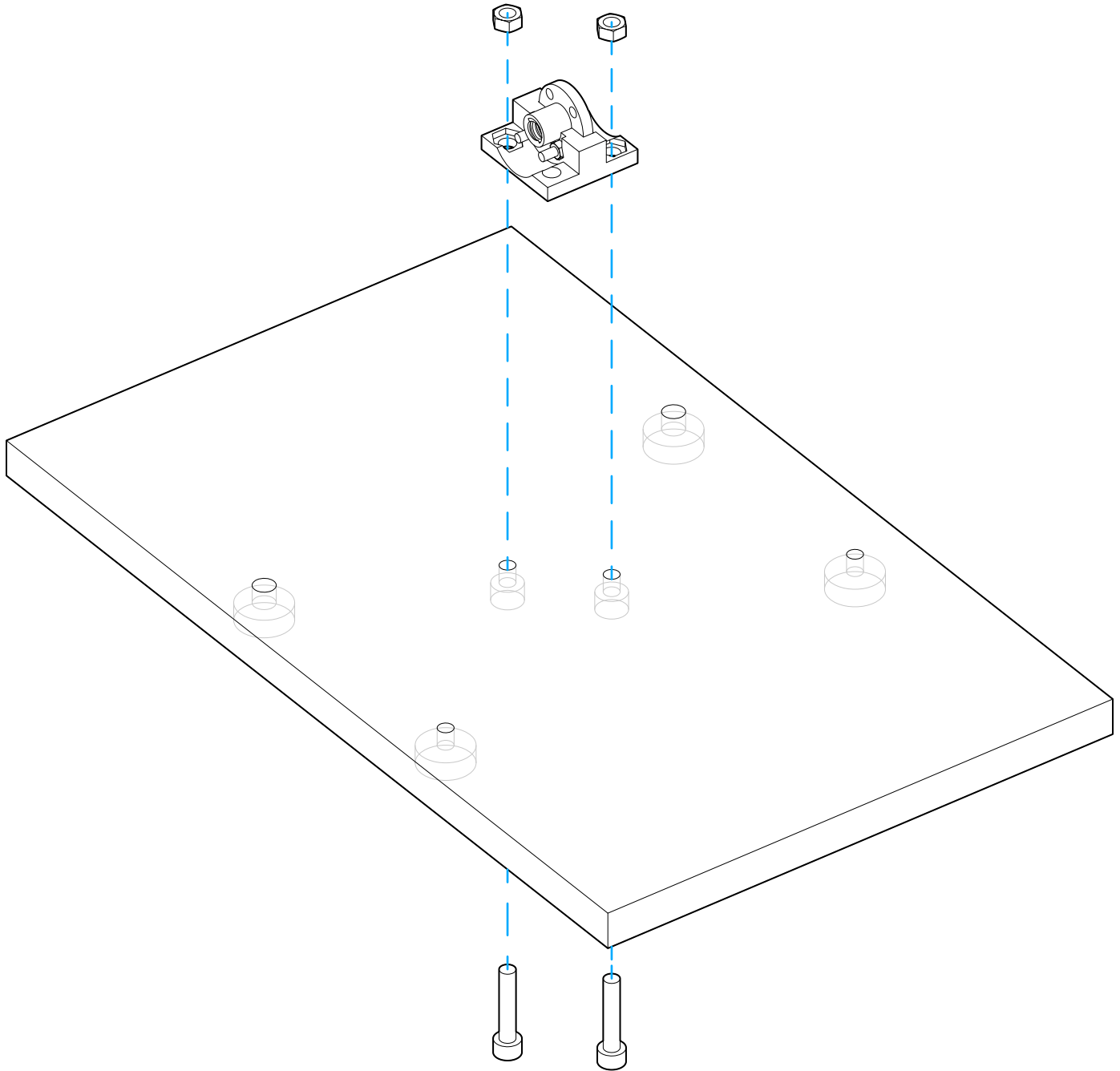
M5-25  
**2x**



M5-N  
**2x**



4  
Allen



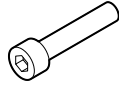
See: "Assembling the Mill One Gantries" -> 3:05 - 4:02  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=3m5s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=3m5s)

## STEP 4

### XZ Gantry Assembly



VB  
4x



M5-25  
4x



M5-W  
4x



M5-N  
2x



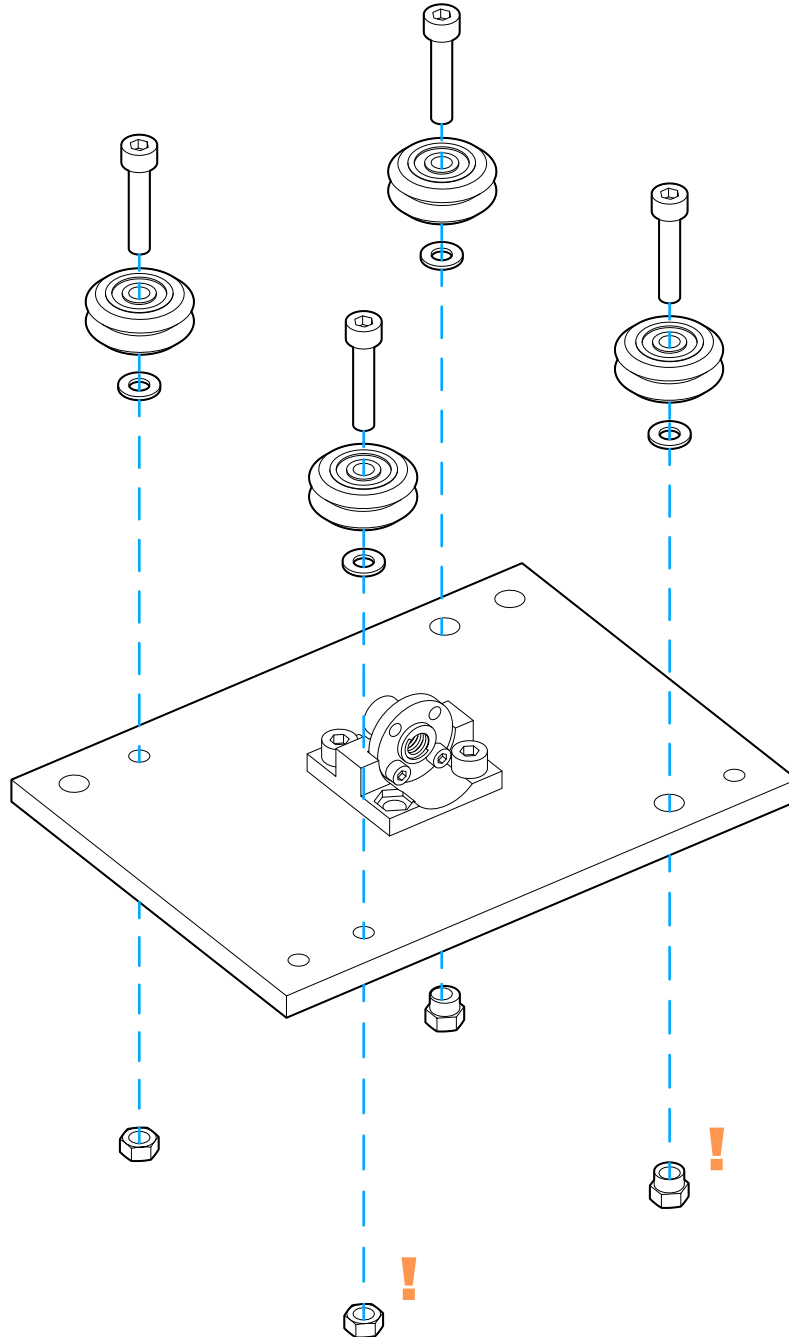
M5-NE  
2x



4  
Allen



10mm  
Wrench



! Match the eccentric nuts (M5-NE) to the larger holes, and the regular nuts (M5-N) to the smaller holes

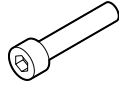
See: "Assembling the Mill One Gantries" -> 4:02 - 6:52  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=4m2s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=4m2s)

## STEP 5

### XZ Gantry Assembly



VB  
4x



M5-25  
4x



M5-W  
4x



M5-N  
2x



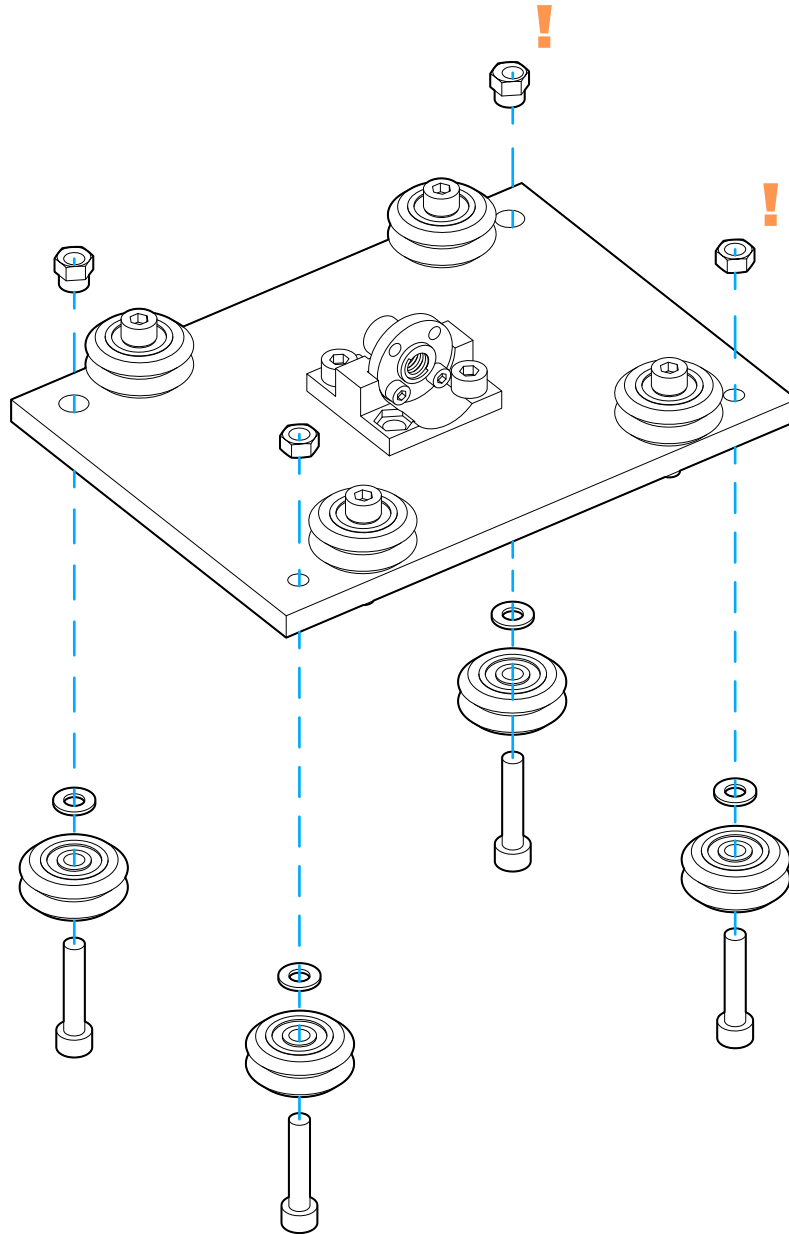
M5-NE  
2x



4  
Allen



10mm  
Wrench



! Match the eccentric nuts (M5-NE) to the larger holes, and the regular nuts (M5-N) to the smaller holes

See: "Assembling the Mill One Gantries" -> 4:02 - 6:52  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=4m2s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=4m2s)

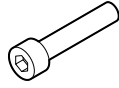


## STEP 6

### Y Gantry Assembly



VB  
4x



M5-25  
4x



M5-W  
4x



M5-N  
2x



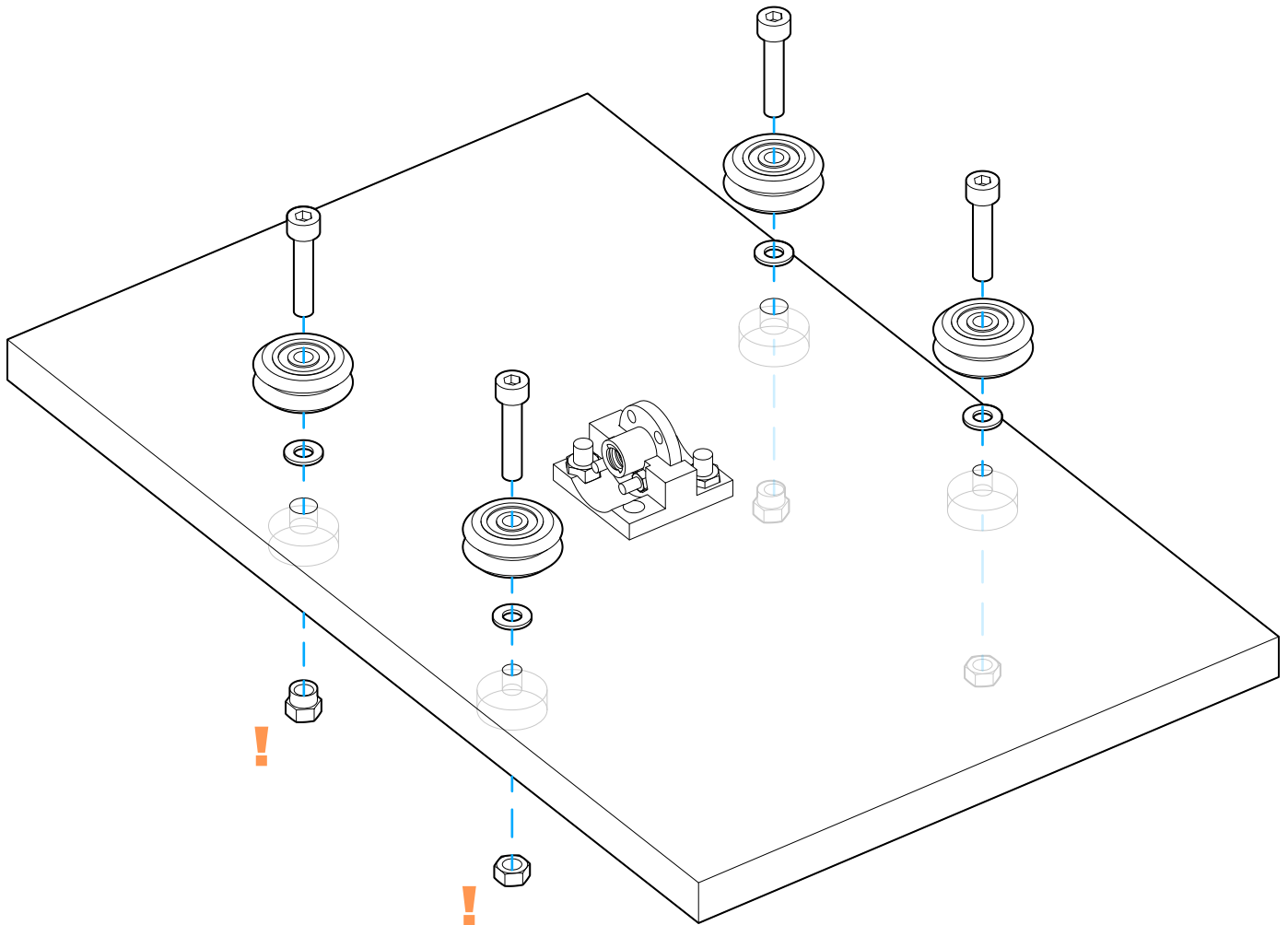
M5-NE  
2x



4  
Allen

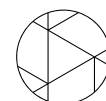


10mm  
Wrench



! Match the eccentric nuts (M5-NE) to the larger holes, and the regular nuts (M5-N) to the smaller holes

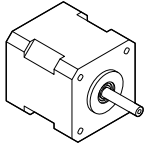
See: "Assembling the Mill One Gantries" -> 6:52 - 7:56  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=6m52s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=6m52s)



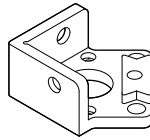
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## STEP 7

Mounting the  
Motors to the  
Rails



SM  
3x



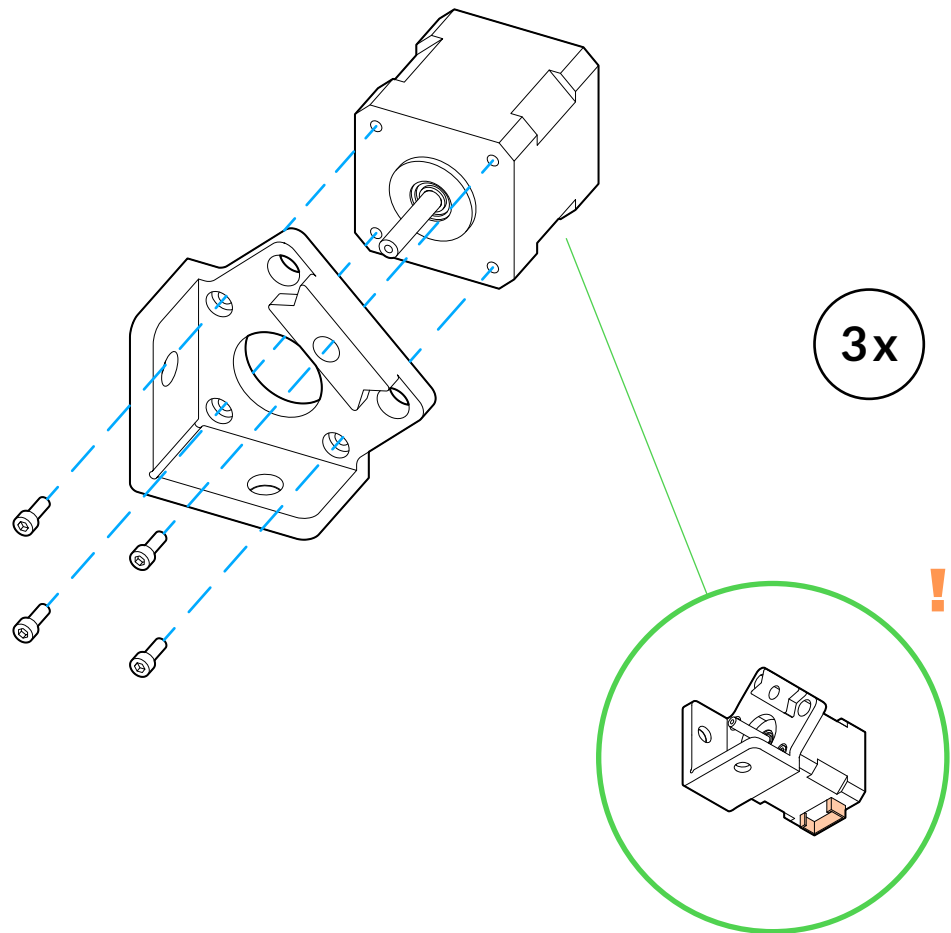
P-AM  
3x



M3-8  
12x



2.5  
Allen

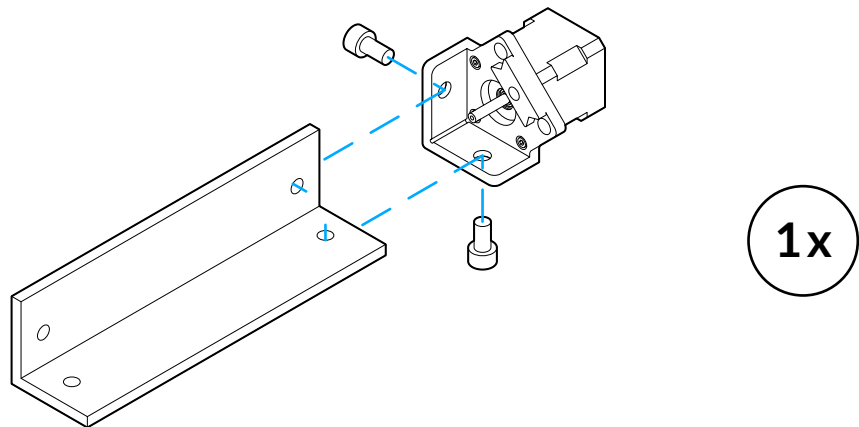
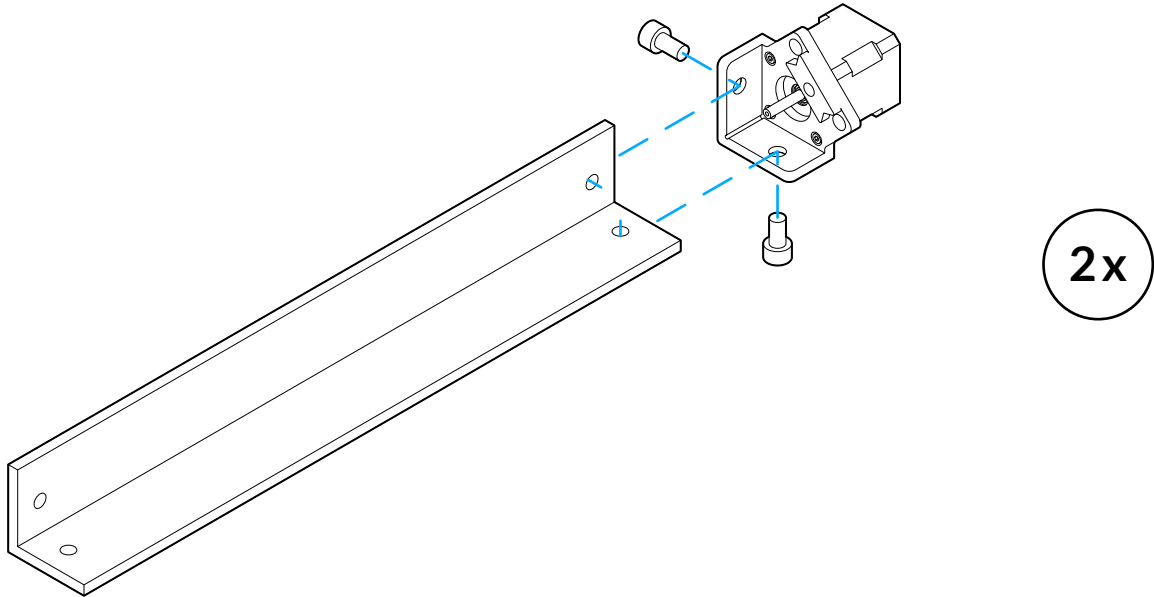
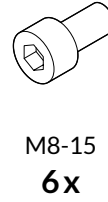
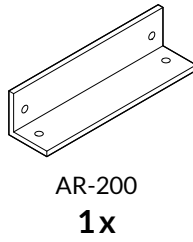
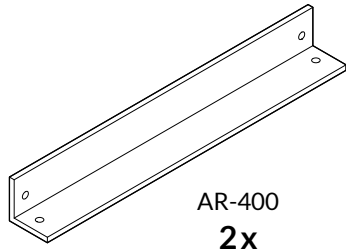


! Make sure that the motor connector is facing downwards

See: "Assembling the Mill One Gantries" -> 7:56 - 9:03  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=7m56s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=7m56s)

## STEP 8

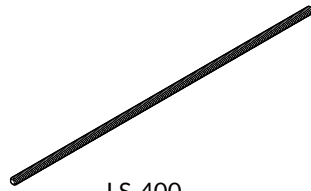
Mounting the  
Motors to the  
Rails



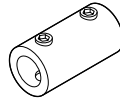
See: "Assembling the Mill One Gantries" -> 9:03 - 9:47  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=9m3s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=9m3s)

## STEP 9

Attaching  
X-Lead Screw  
to XZ Gantry



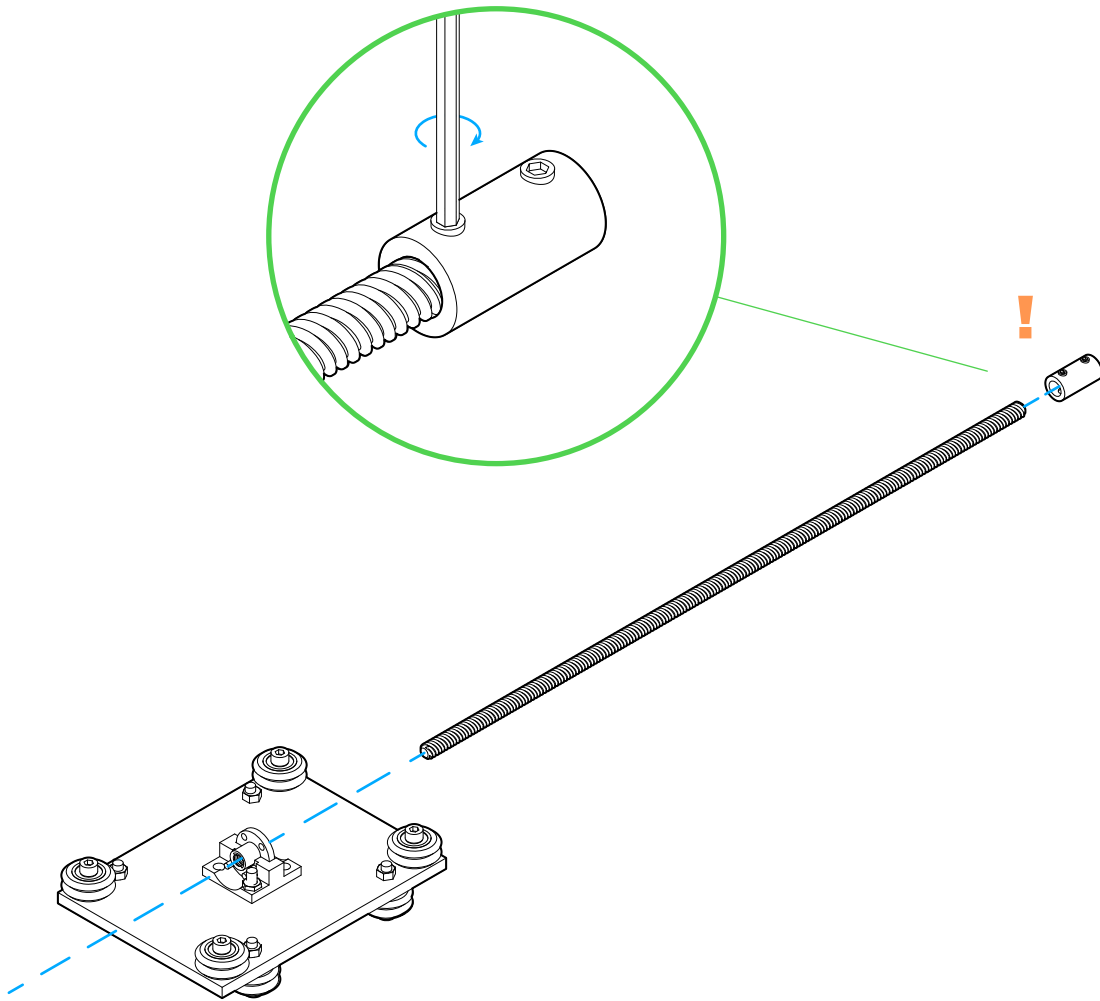
LS-400  
1x



SC  
1x



2  
Allen



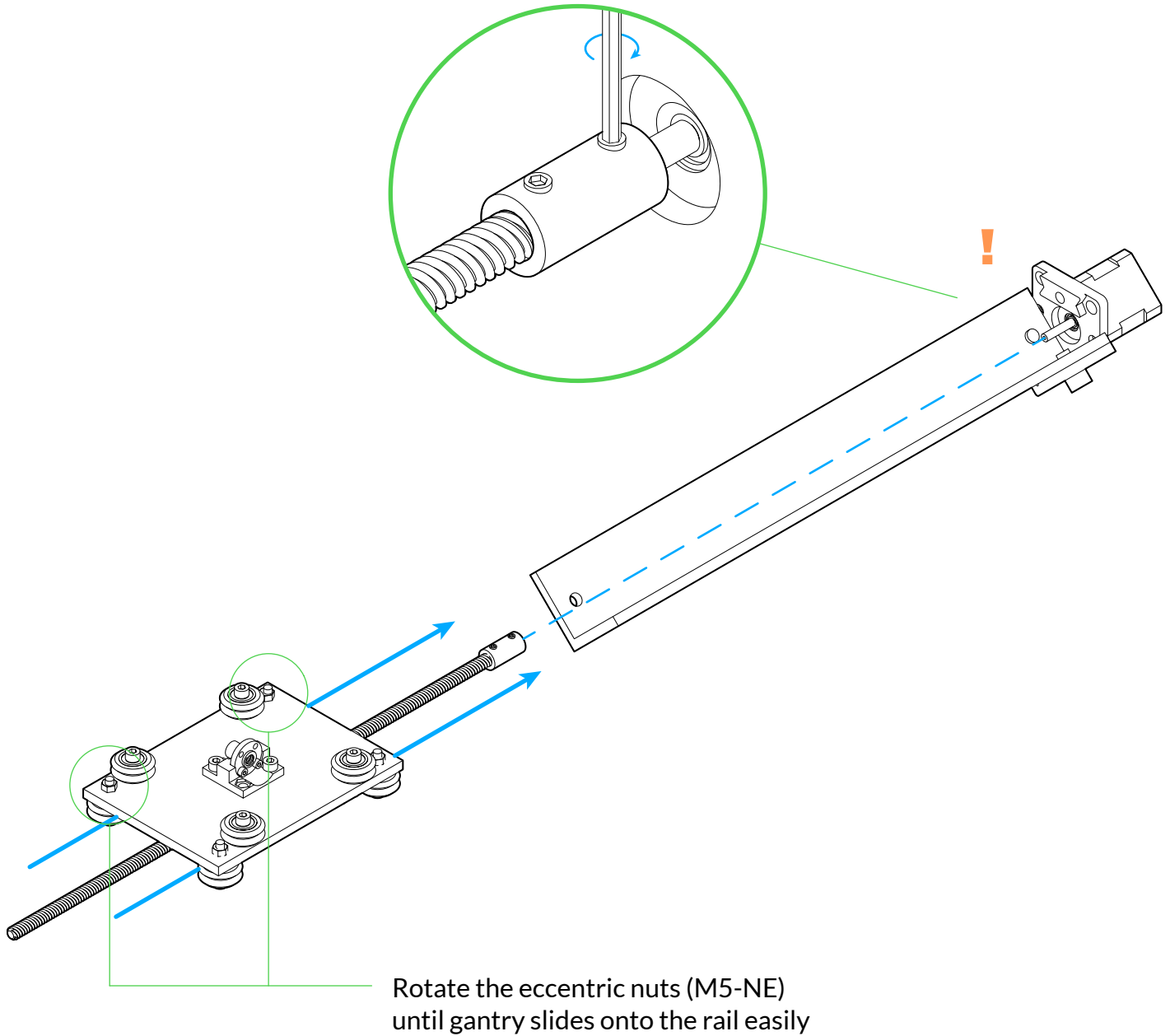
**!** Make sure to push coupler all the way onto lead screw before tightening

See: "Assembling the Mill One Gantries" -> 13:00 - 13:21  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=13m](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=13m)

## STEP 10

Attaching the  
X-Rail to the XZ  
Gantry

2  
Allen  
10mm  
Wrench

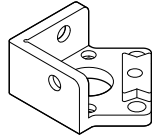


! Make sure to push coupler all the way onto  
motor shaft before tightening

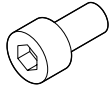
See: "Assembling the Mill One Gantries" -> 13:21 - 14:08  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=13m21s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=13m21s)

## STEP 11

Attaching the  
X-Rail to the XZ  
Gantry



P-AM  
**1x**



M8-15  
**2x**

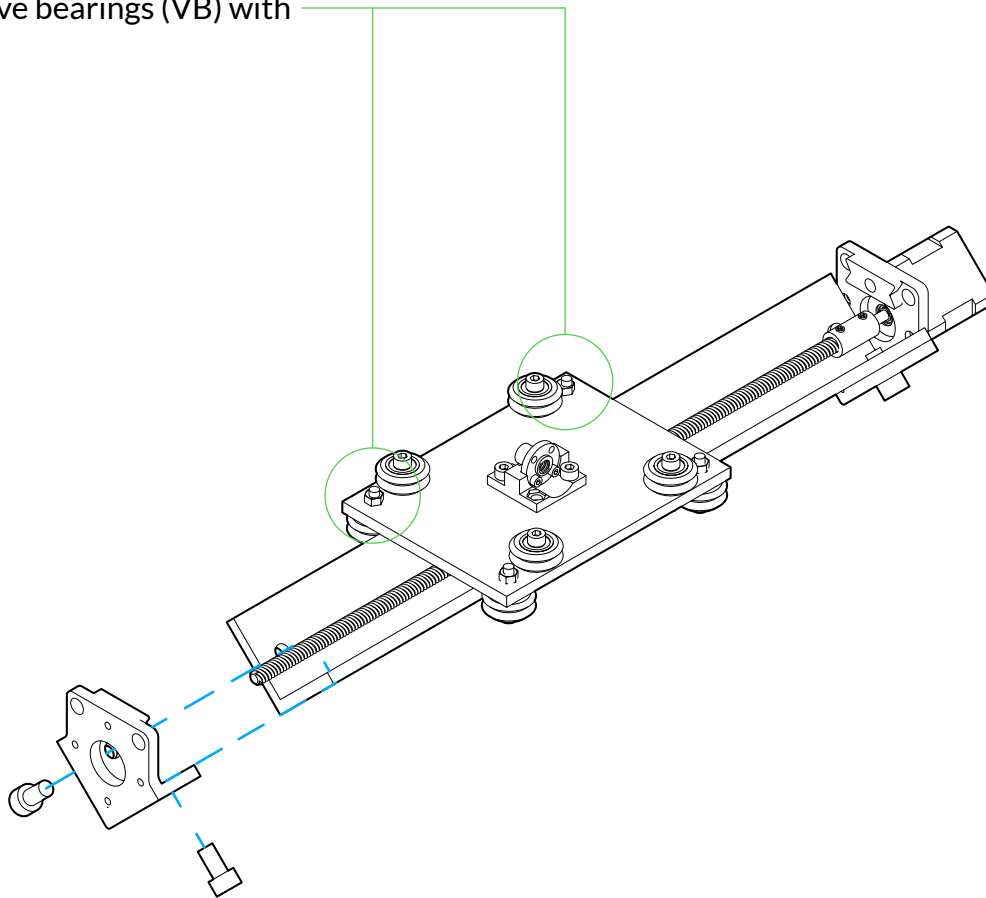


6  
Allen



10mm  
Wrench

Rotate the eccentric nuts (M5-NE) to  
tighten the grip of the wheels on the  
rail. Tighten until you can no longer  
rotate the V Groove bearings (VB) with  
your fingers.



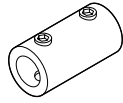
See: "Assembling the Mill One Gantries" -> 9:47 - 10:39  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=9m47s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=9m47s)

## STEP 12

Attaching  
Z-Lead Screw  
to XZ Gantry



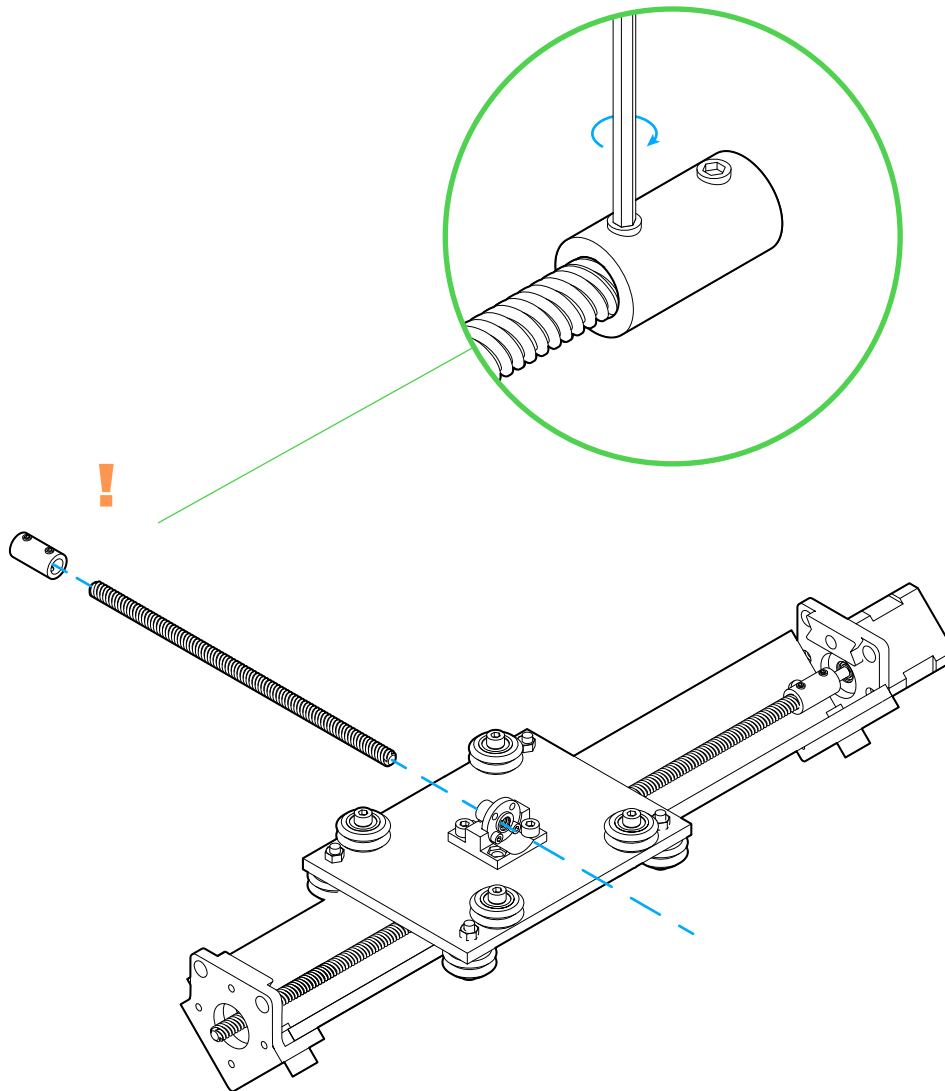
LS-200  
**1x**



SC  
**1x**



2  
Allen



**!** Make sure to push coupler all the way onto lead screw before tightening

See: "Assembling the Mill One Gantries" -> 11:03 - 12:07  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=11m3s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=11m3s)

## STEP 13

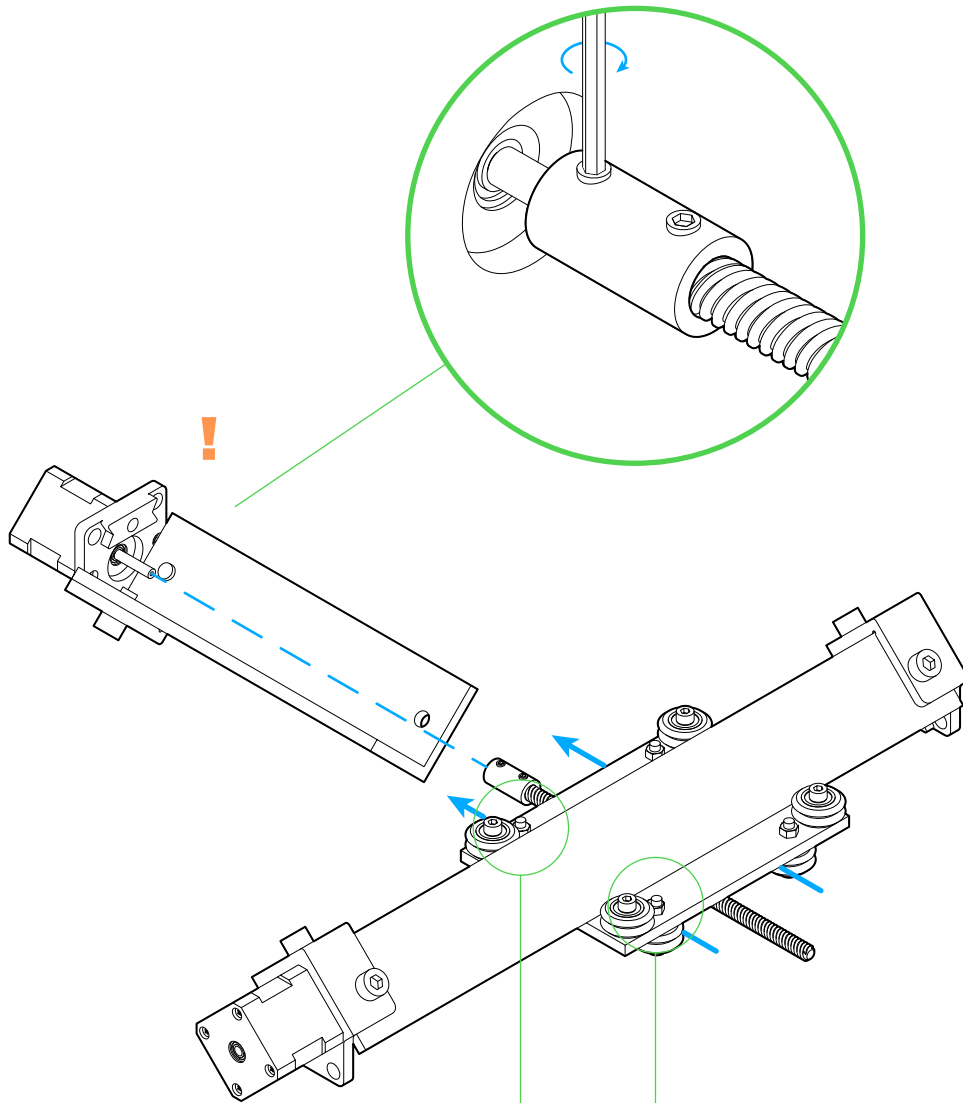
Attaching the  
Z-Rail to the XZ  
Gantry



2  
Allen



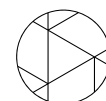
10mm  
Wrench



Rotate the eccentric nuts (M5-NE)  
until gantry slides onto the rail easily

! Make sure to push coupler all the way onto  
motor shaft before tightening

See: "Assembling the Mill One Gantries" -> 12:07 - 13:00  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=12m7s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=12m7s)



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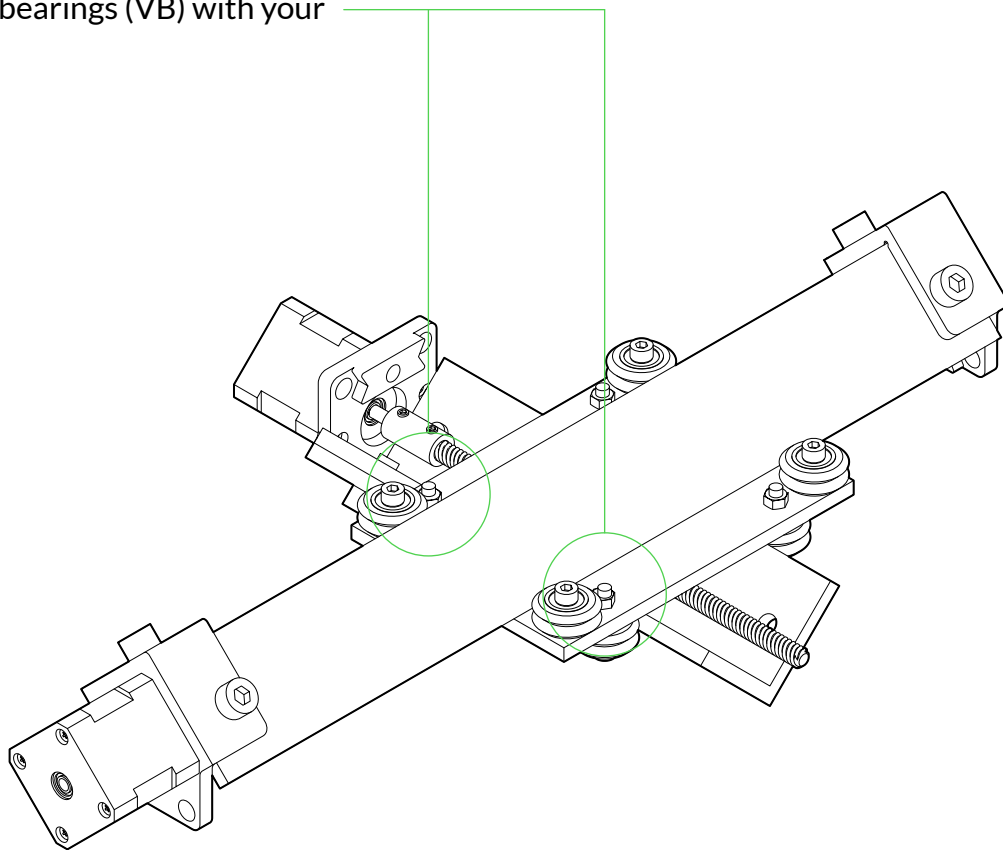
## STEP 14

Calibrating the  
V Groove  
Bearings on  
the XZ Gantry

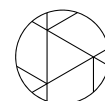


10mm  
Wrench

Rotate the eccentric nuts (M5-NE) to  
tighten the grip of the wheels on the rail.  
Tighten until you can no longer rotate  
the V Groove bearings (VB) with your  
fingers.



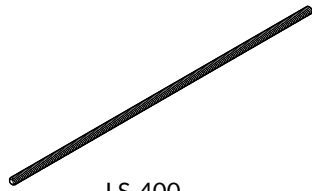
See: "Assembling the Mill One Gantries" -> 9:47 - 10:39  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=9m47s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=9m47s)



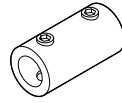
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## STEP 15

Attaching Lead  
Screw to Y  
Gantry



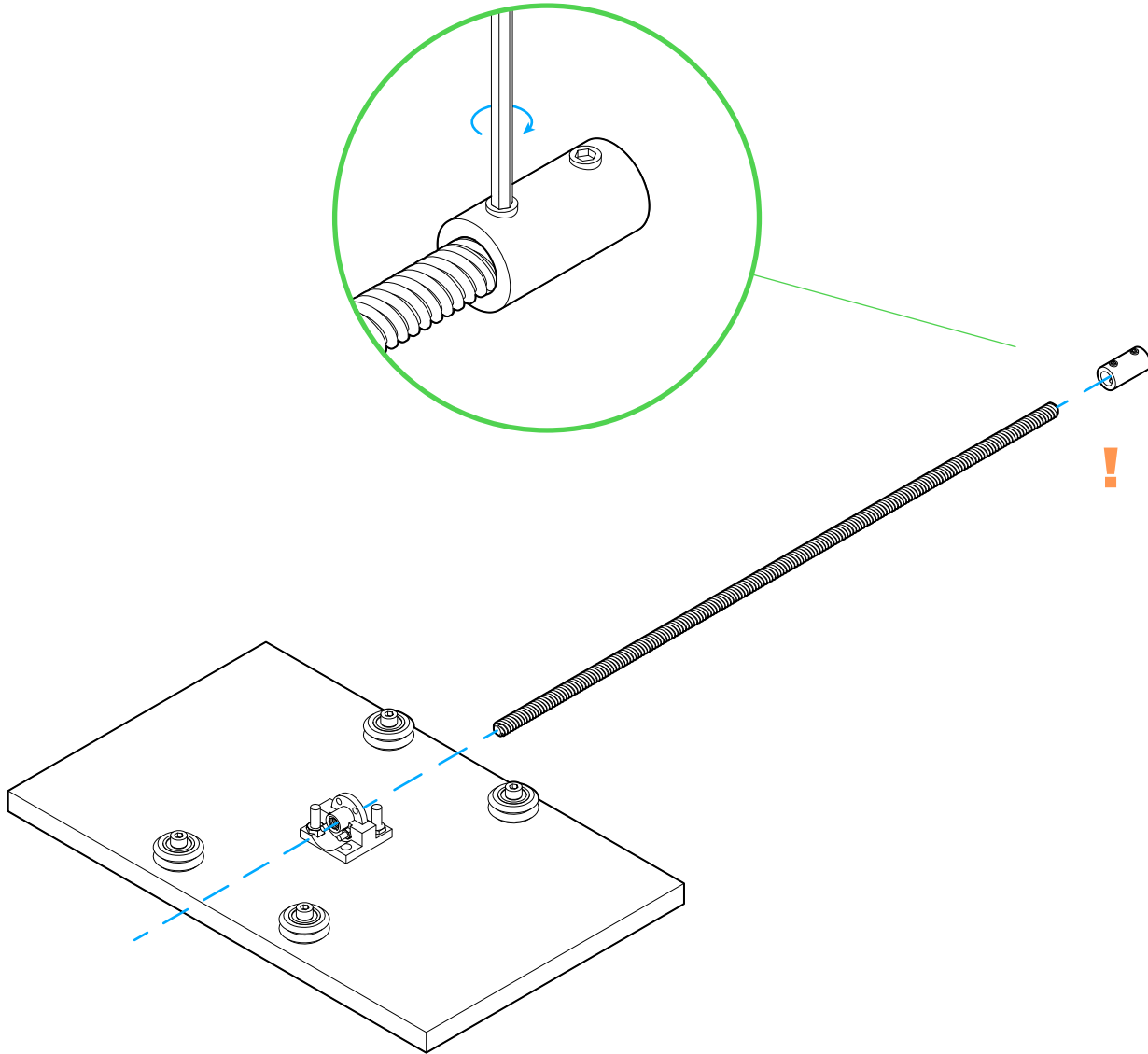
LS-400  
1x



SC  
1x



2  
Allen



! Make sure to push coupler all the way onto lead screw before tightening

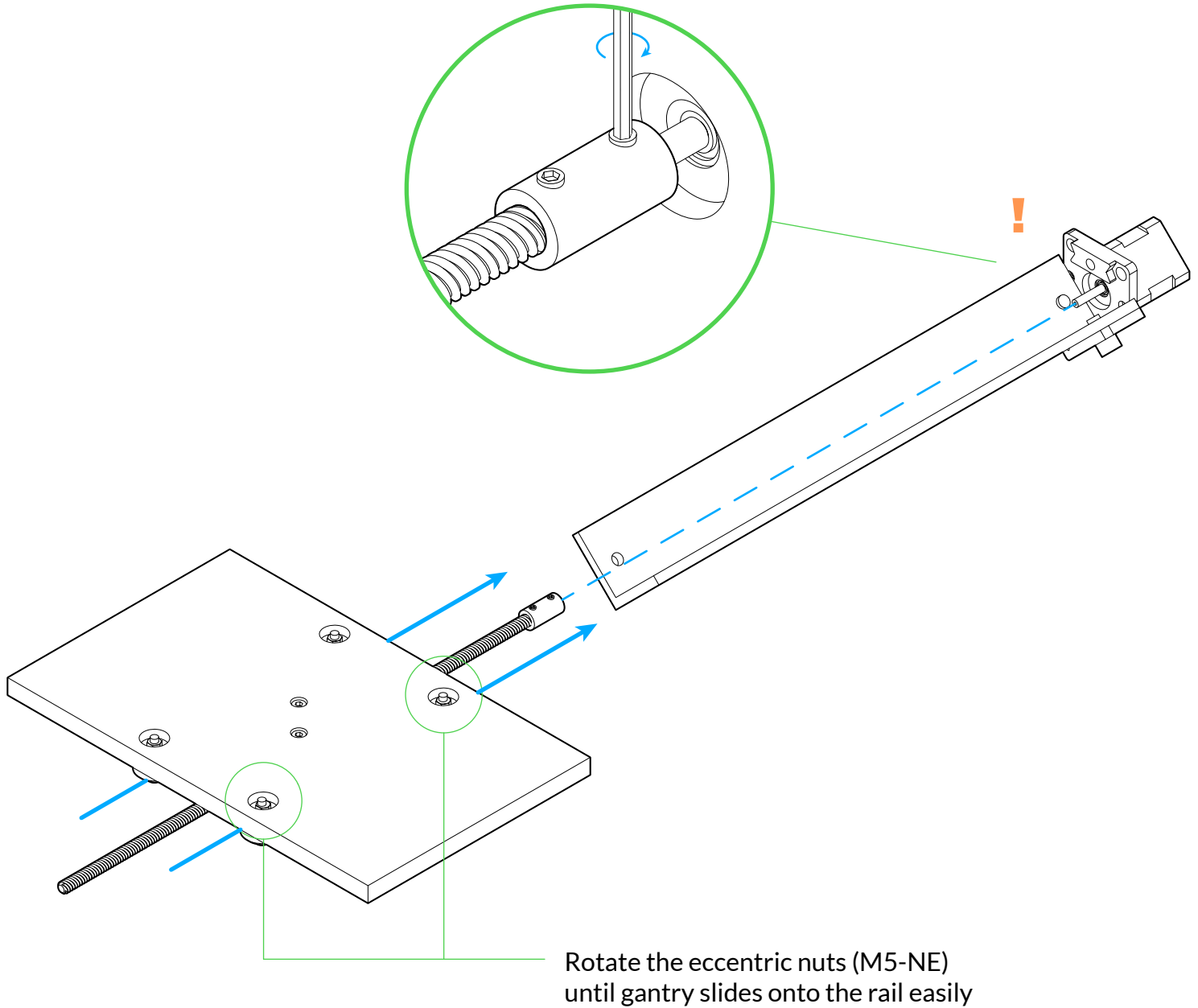
See: "Assembling the Mill One Gantries" -> 14:08 - 14:25  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=14m8s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=14m8s)

## STEP 16

Attaching the  
Y-Rail to the Y  
Gantry

2  
Allen

10mm  
Wrench

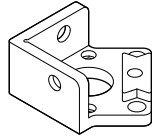


! Make sure to push coupler all the way onto  
motor shaft before tightening

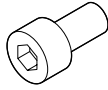
See: "Assembling the Mill One Gantries" -> 14:25 - 15:09  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=14m25s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=14m25s)

## STEP 17

Attaching the  
Y-Rail to the Y  
Gantry



P-AM  
**1x**



M8-15  
**2x**

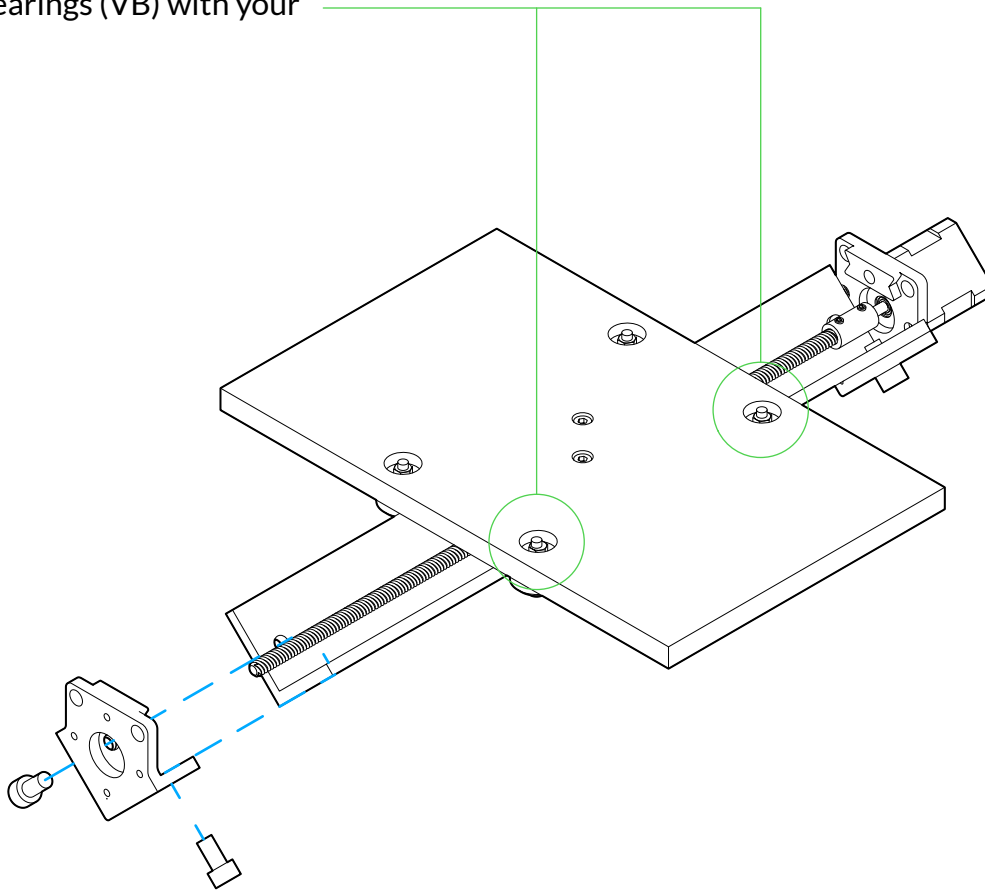


6  
Allen

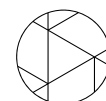


10mm  
Wrench

Rotate the eccentric nuts (M5-NE) to  
tighten the grip of the wheels on the rail.  
Tighten until you can no longer rotate  
the V Groove bearings (VB) with your  
fingers.



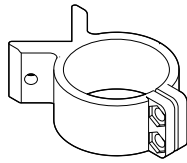
See: "Assembling the Mill One Gantries" -> 15:09 - 15:25  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=15m9s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=15m9s)



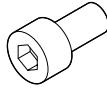
**SIENCI LABS**  
DESKTOP CNC MILLING

## STEP 18

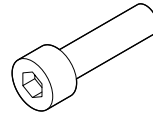
Attaching the Router Mount



P-RM  
1x



M8-15  
2x



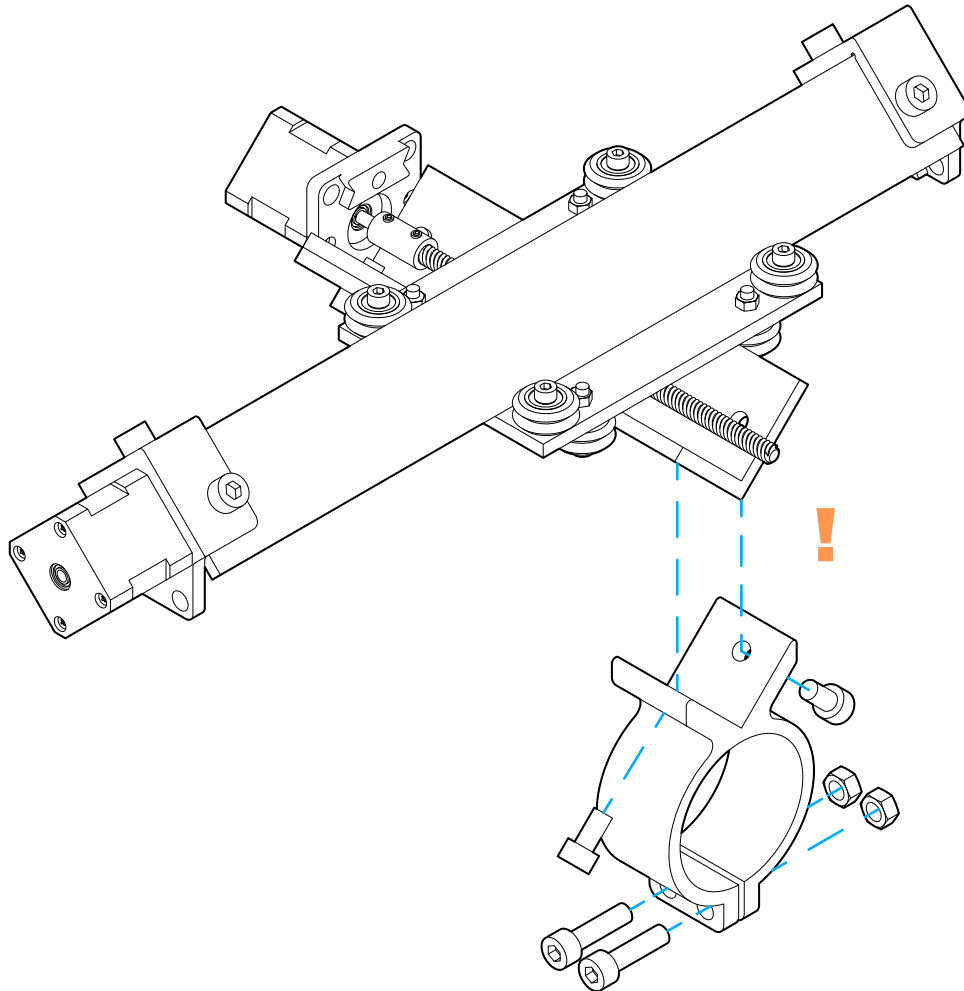
M8-25  
2x



M8-N  
2x



6  
Allen

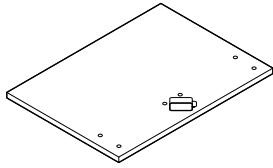


! The bottom of the mount (P-RM) should be the side that is more flush with the bottom of the aluminum rail (AR-200)

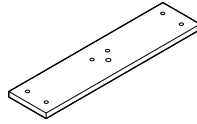
See: "Assembling the Mill One Gantries" -> 15:25 - 15:53  
[https://www.youtube.com/watch?v=\\_yZ2KRg6oNM&t=15m25s](https://www.youtube.com/watch?v=_yZ2KRg6oNM&t=15m25s)

## STEP 19

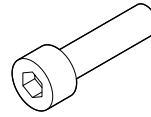
Attaching Y  
Gantry to  
Frame



F-B  
**1x**



F-F  
**1x**



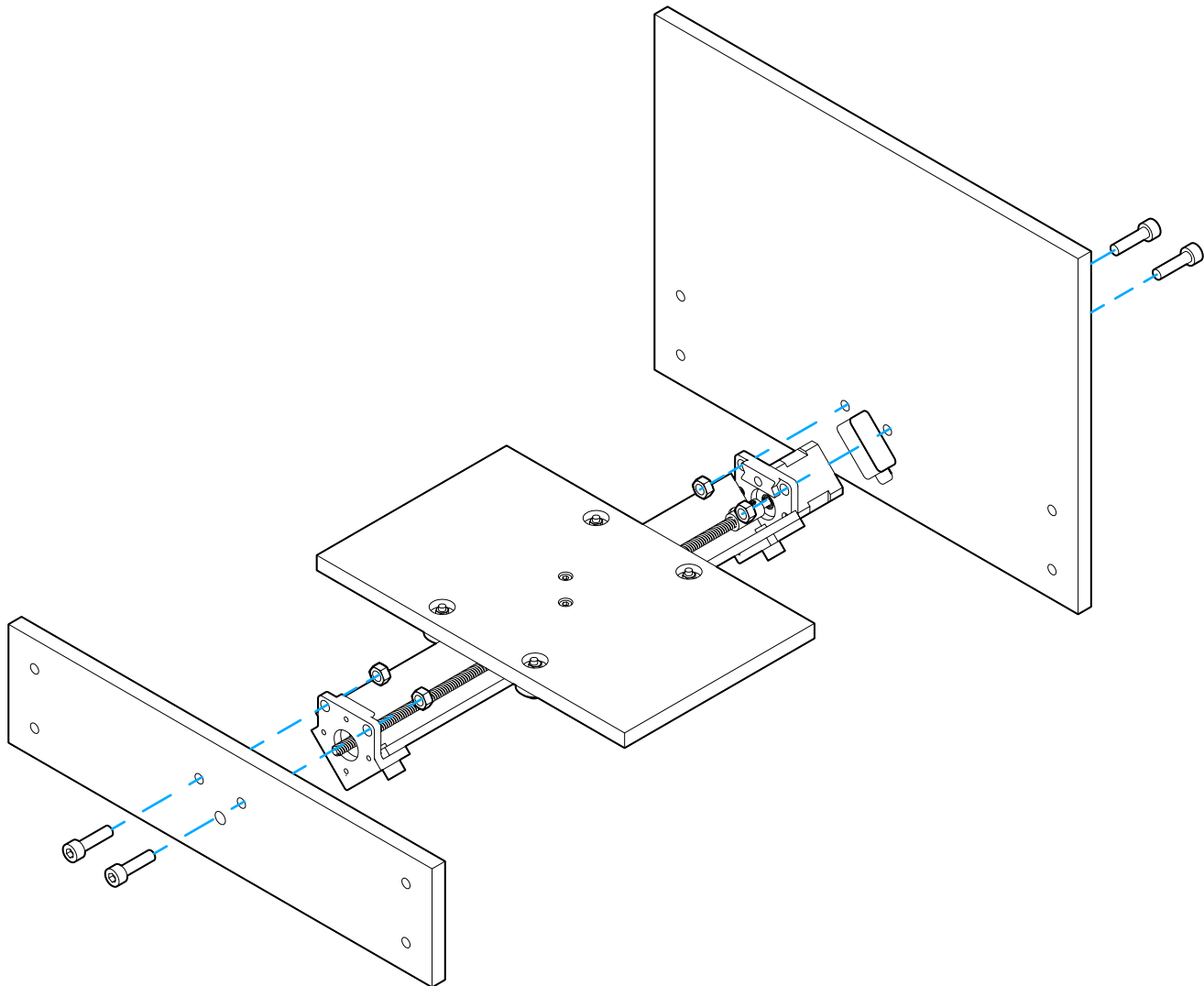
M8-25  
**4x**



M8-N  
**4x**



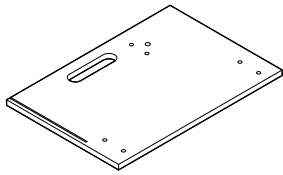
6  
Allen



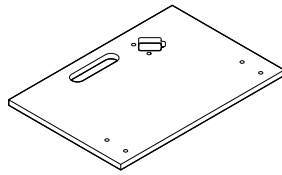
See: "Assembling the Mill One Frame" -> 0:46 - 2:05  
<https://www.youtube.com/watch?v=rzGFd-v3d30&t=46s>

## STEP 20

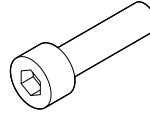
Attaching XZ  
Gantry to  
Frame



F-L  
**1x**



F-R  
**1x**



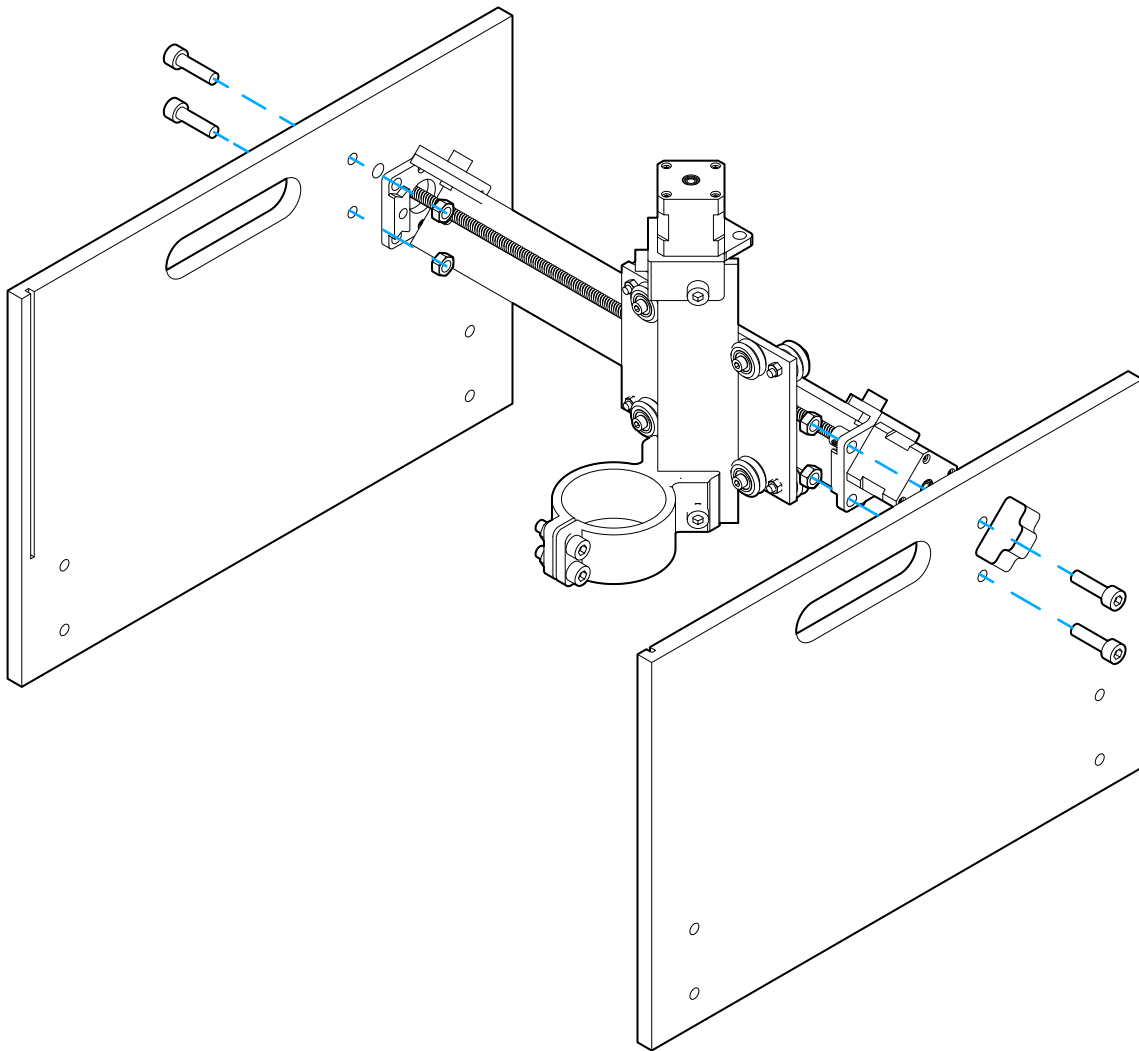
M8-25  
**4x**



M8-N  
**4x**



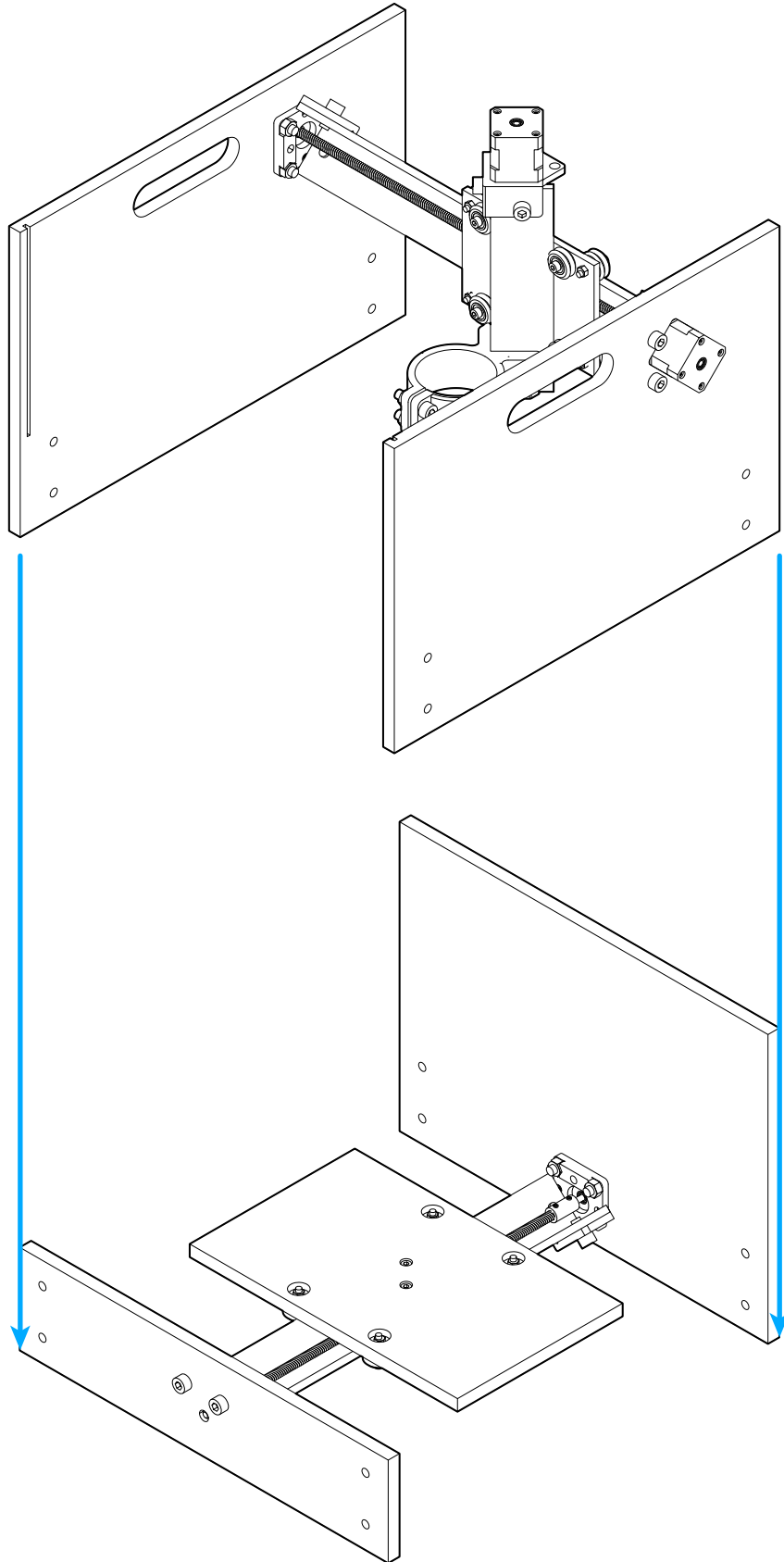
6  
Allen



See: "Assembling the Mill One Frame" -> 2:05 - 3:06  
<https://www.youtube.com/watch?v=rzGFd-v3d30&t=2m4s>

## STEP 21

Attaching the  
Assemblies

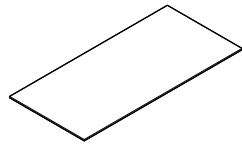


See: "Assembling the Mill One Frame" -> 3:06 - 3:14  
<https://www.youtube.com/watch?v=rzGFd-v3d30&t=3m6s>

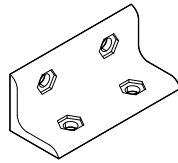


## STEP 22

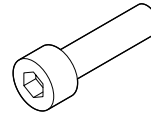
Attaching  
Frame Brackets  
and Acrylic  
Shield



F-AC  
**1x**



P-FB  
**4x**



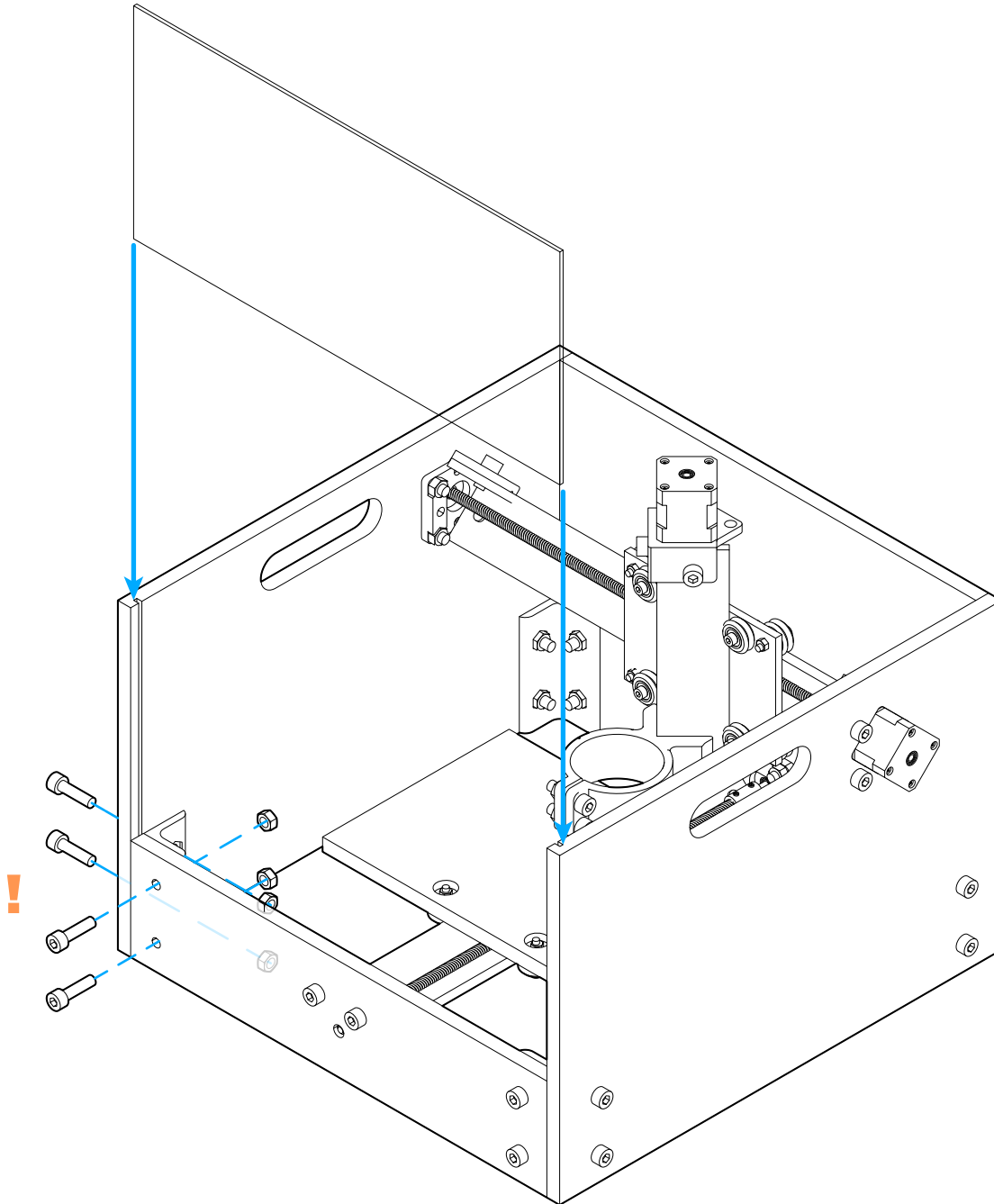
M8-25  
**16x**



M8-N  
**16x**



6  
Allen

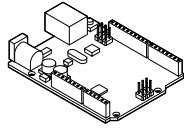


! Twist on nuts and bolts on all corners loosely,  
then tighten on a flat surface

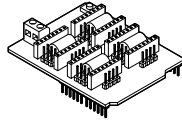
See: "Assembling the Mill One Frame" -> 3:14 - 3:52  
<https://www.youtube.com/watch?v=rzGFd-v3d30&t=3m14s>

## STEP 23

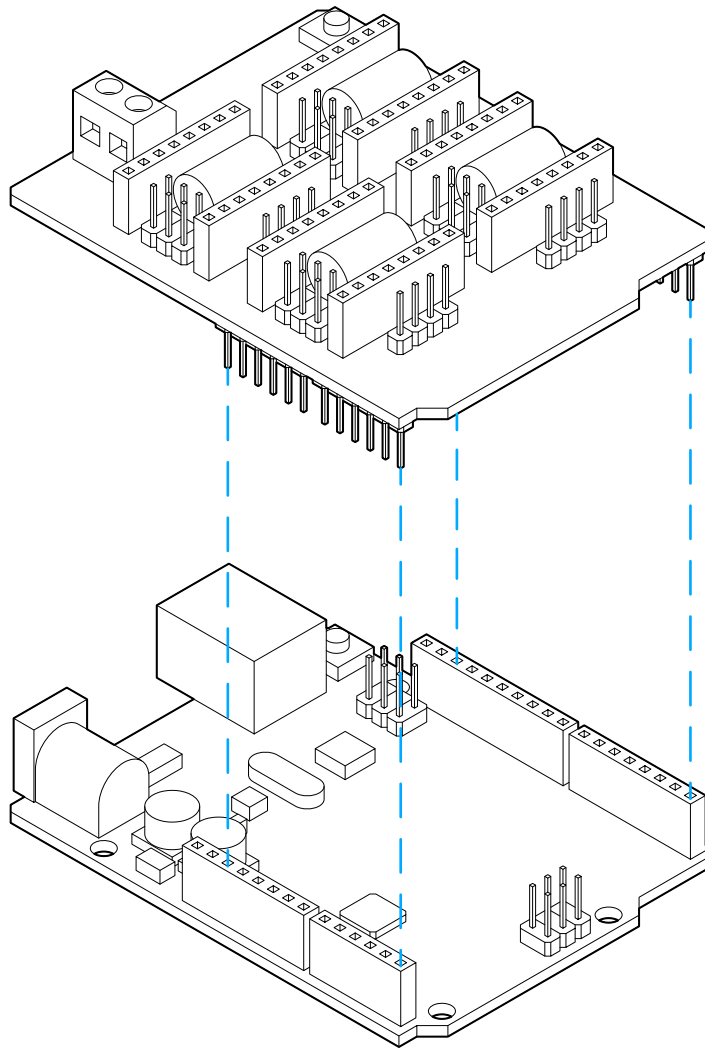
Combining the  
Arduino and  
CNC Shield



E-ARD  
**1x**



E-CNC  
**1x**



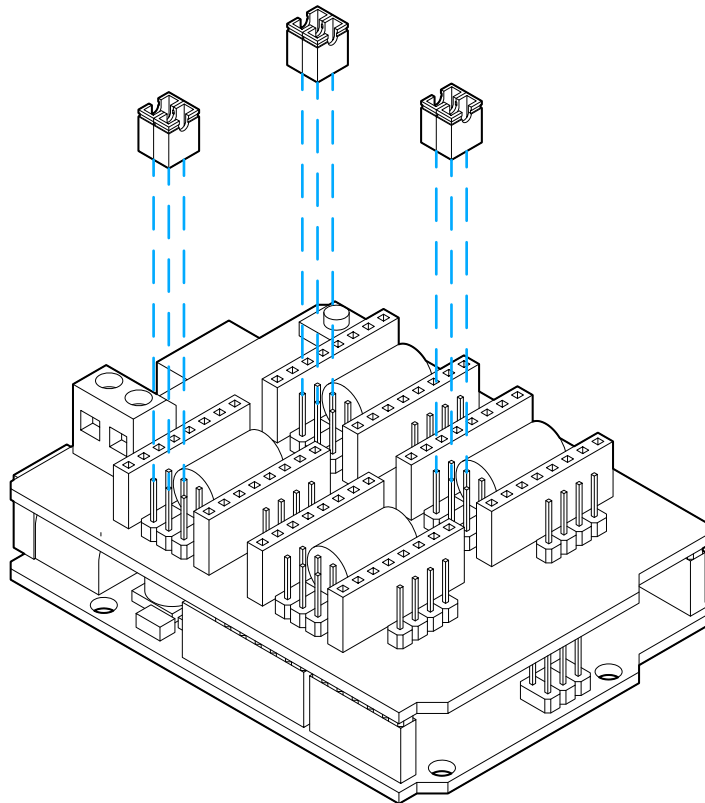
See: "Wiring the Mill One's Electronics" -> 0:16 - 1:40  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=16s>

## STEP 24

Attaching the  
Header  
Jumpers



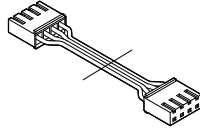
E-HJ  
**6x**



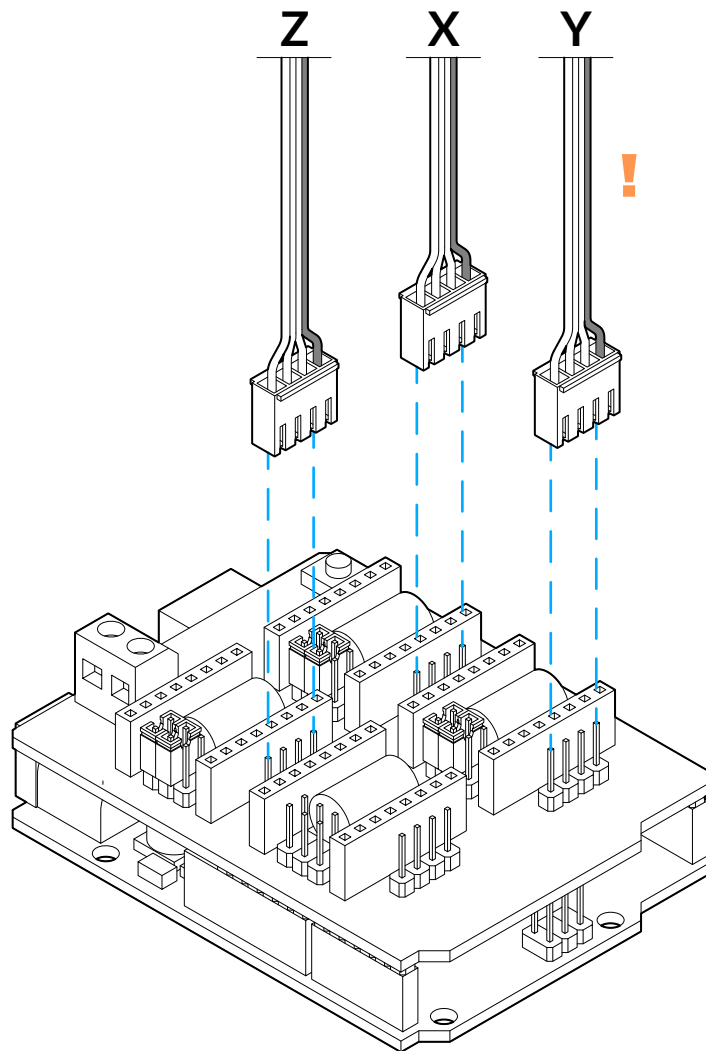
See: "Wiring the Mill One's Electronics" -> 1:40 - 1:56  
<https://www.youtube.com/watch?v=wYr3DWGXiFc&t=1m40s>

## STEP 25

Attaching  
Motor Cables



E-C  
3x



! Make sure the black wire is oriented as depicted

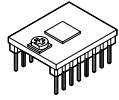
See: "Wiring the Mill One's Electronics" -> 1:56 - 2:30  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=1m56s>

## STEP 26

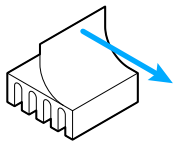
Attaching  
Stepper Driver  
Chips



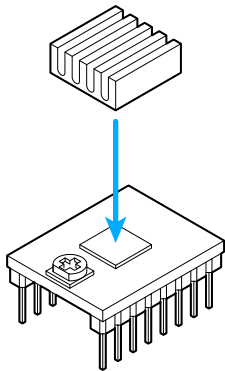
E-SDH  
3x



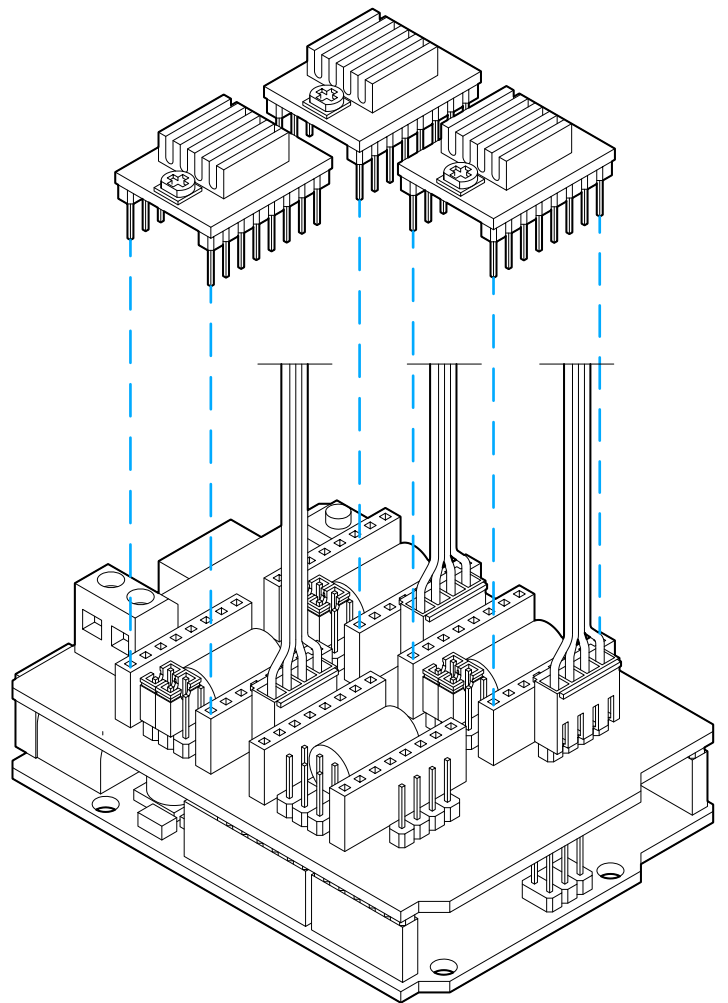
E-SDC  
3x



3x



3x



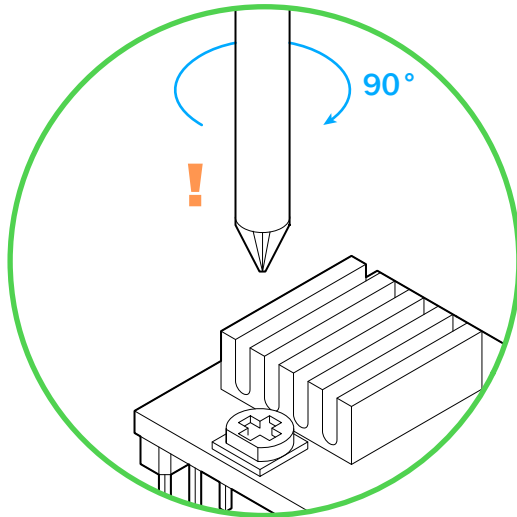
See: "Wiring the Mill One's Electronics" -> 2:30 - 3:38  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=2m30s>

## STEP 27

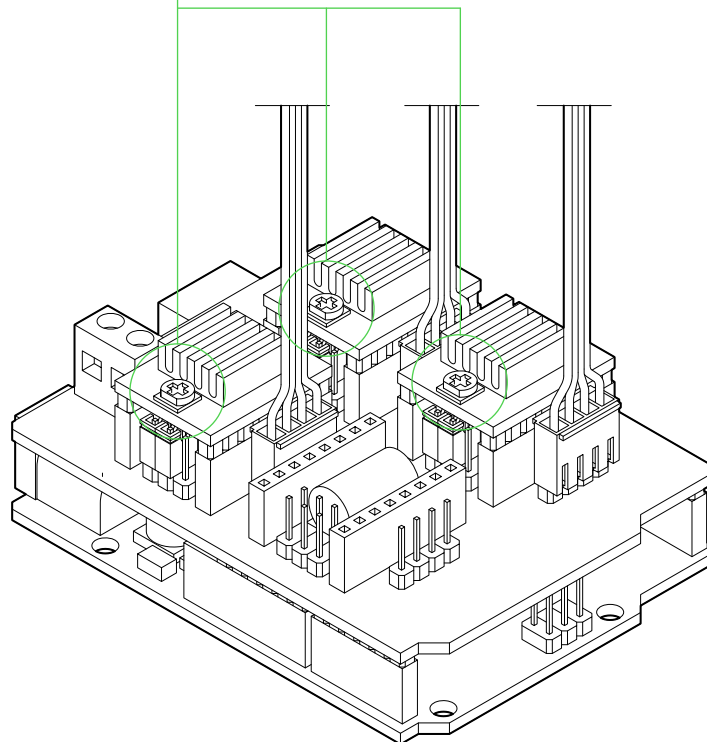
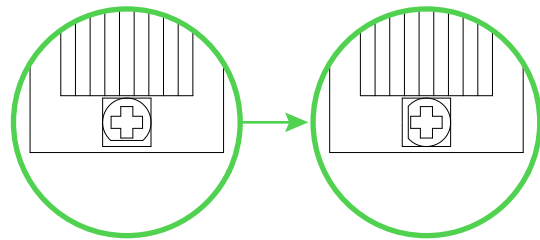
Tuning the  
Stepper Motor  
Drivers



Phillips



The stepper drivers should be tuned using the potentiometer on the front so that the flat edge on the dial faces to the left; this gives the stepper motors on the Mill One the right amount of power to run effectively. If further tuning is required, turning the flat either counterclockwise or clockwise will increase or decrease the motor power respectively.

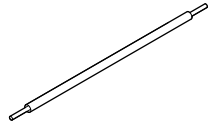


**!** Stepper driver potentiometers should never be turned while the board is powered up

See: "Wiring the Mill One's Electronics" -> 3:38 - 4:14  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=3m38s>

## STEP 28

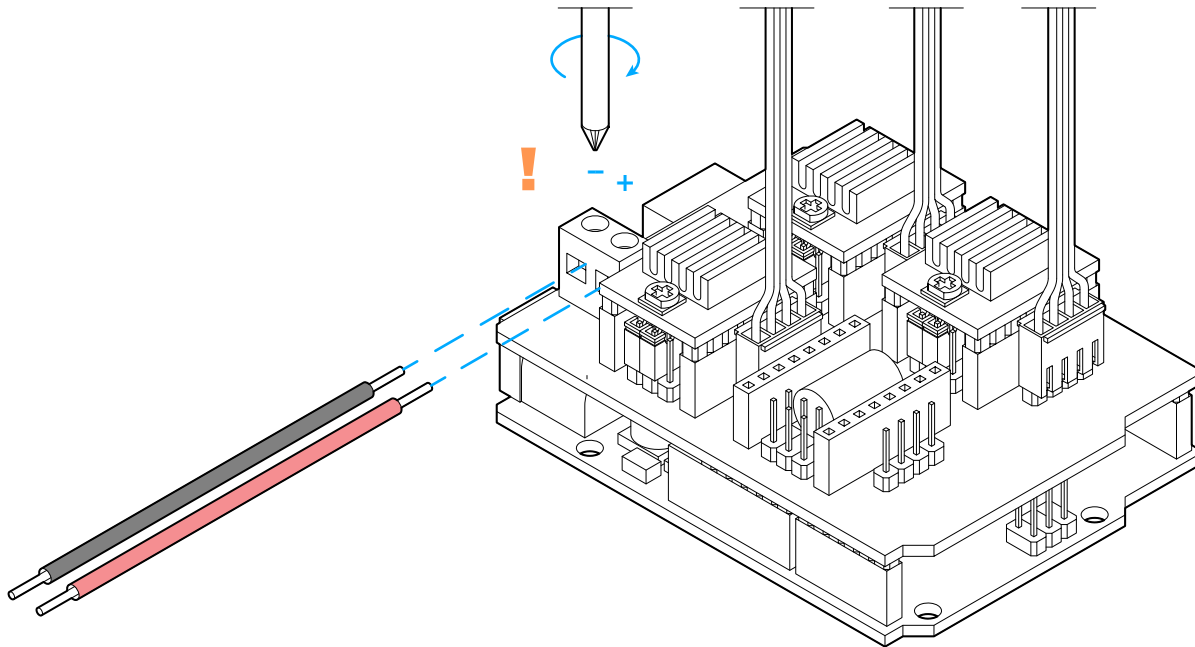
Attaching  
Wires to the  
DC Power  
Socket



E-W  
2x



Phillips

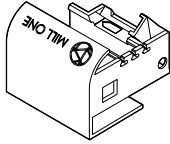


! Ensure polarity is correct to avoid damage to electronics

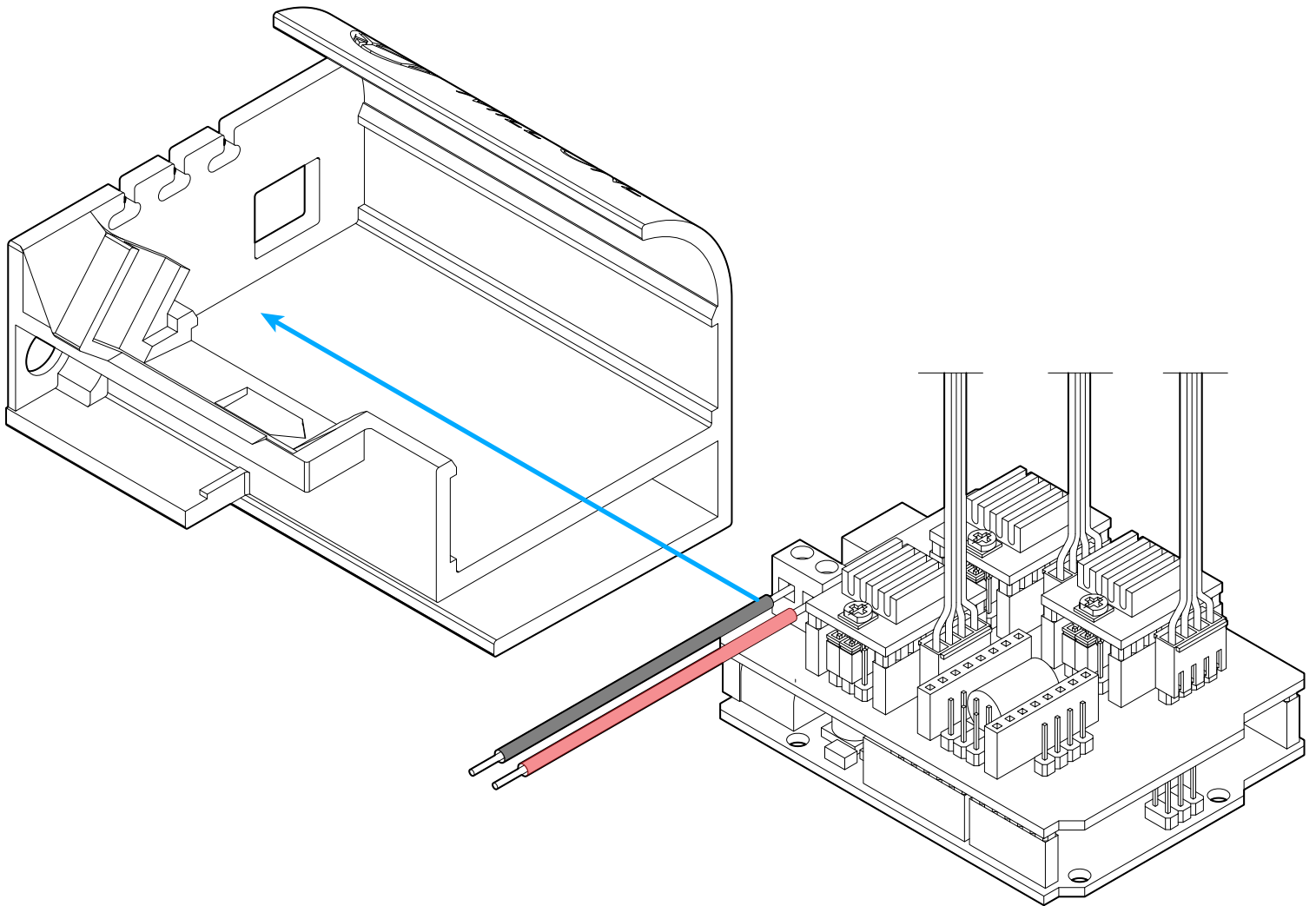
See: "Wiring the Mill One's Electronics" -> 4:14 - 5:19  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=4m14s>

## STEP 29

Placing Boards  
into Electronics  
Holder



P-EH  
**1x**

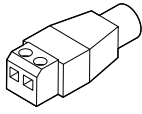


See: "Wiring the Mill One's Electronics" -> 5:19 - 5:52  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=5m19s>



## STEP 30

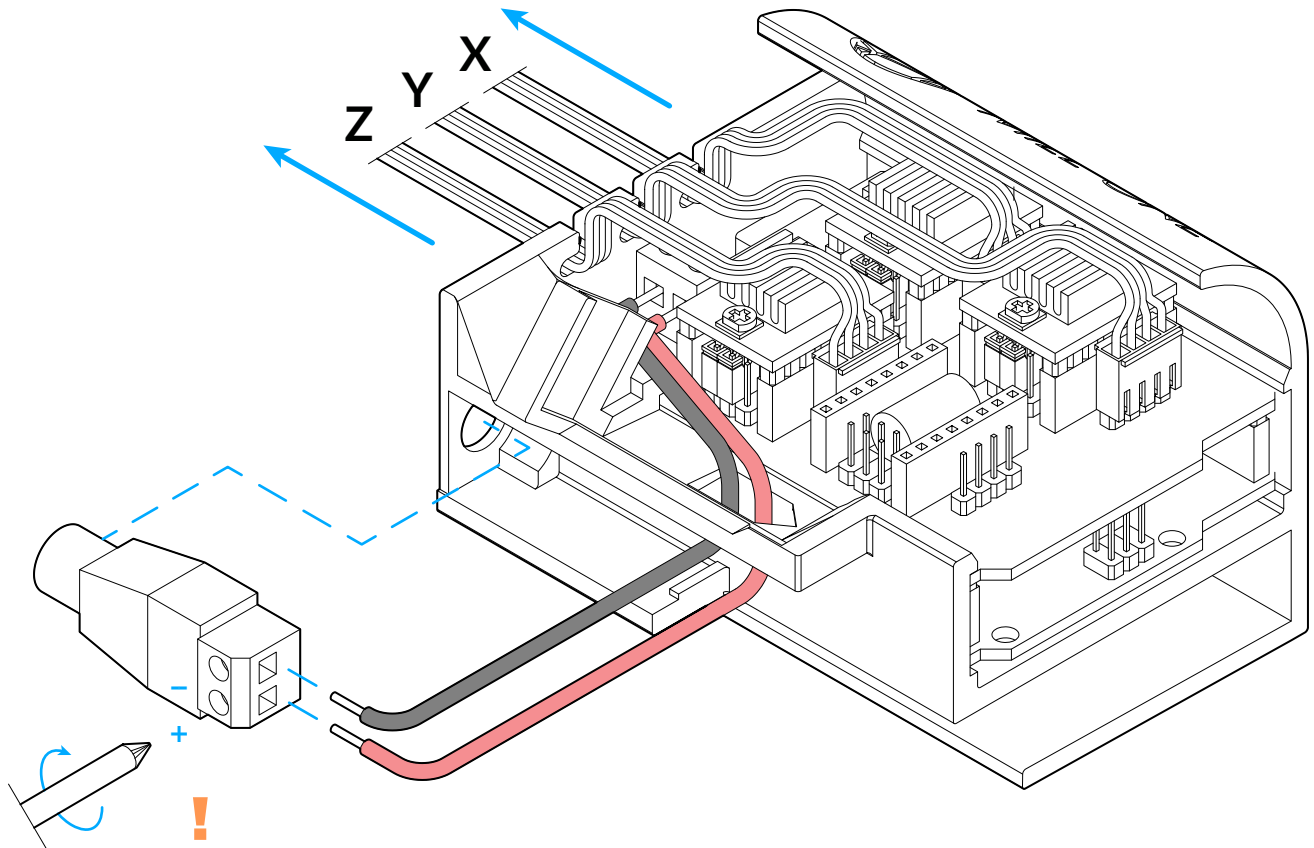
Feeding Wires  
Through Slots  
+ Attaching DC  
Jack



E-J  
1x



Phillips



! Ensure polarity is correct to avoid damage to electronics

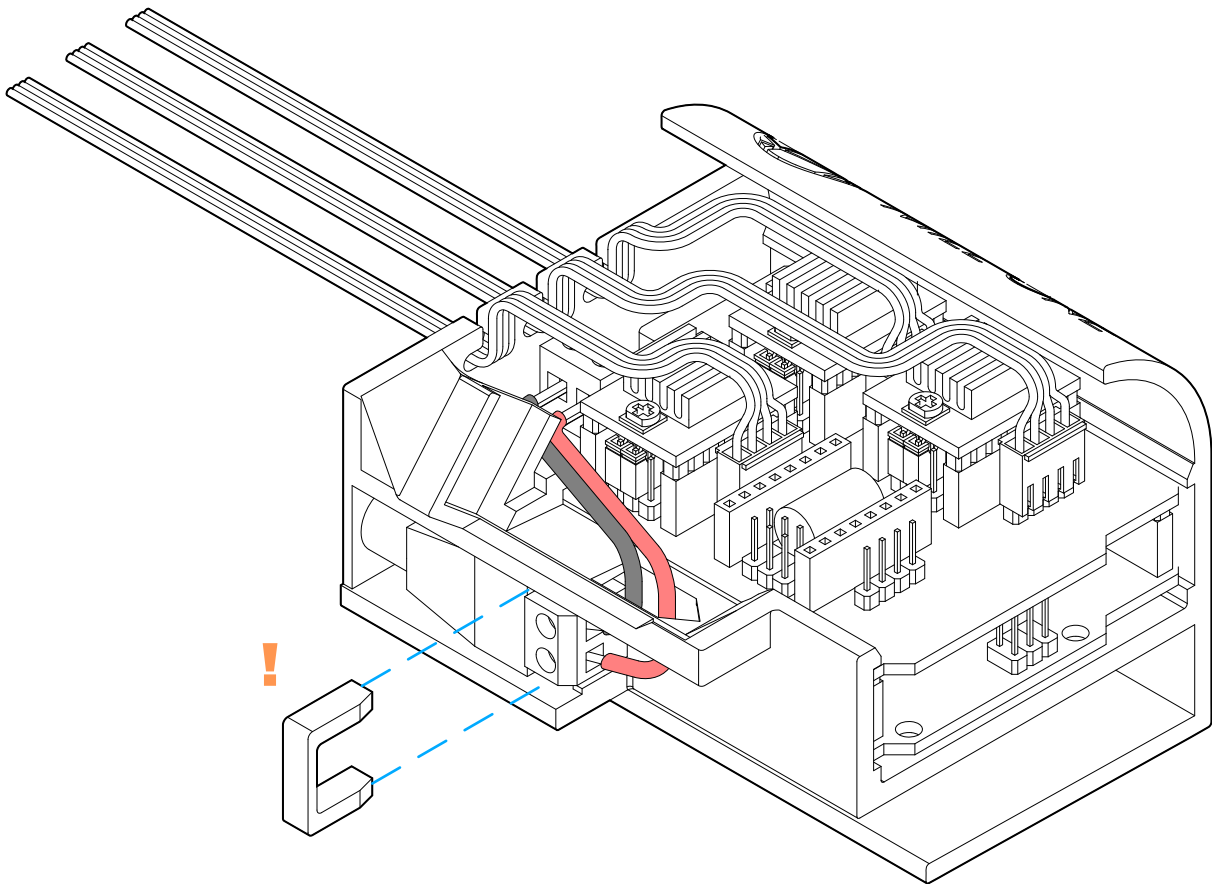
See: "Wiring the Mill One's Electronics" -> 5:52 - 8:03  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=5m52s>

## STEP 31

Securing the  
DC Jack



P-PH  
**1x**

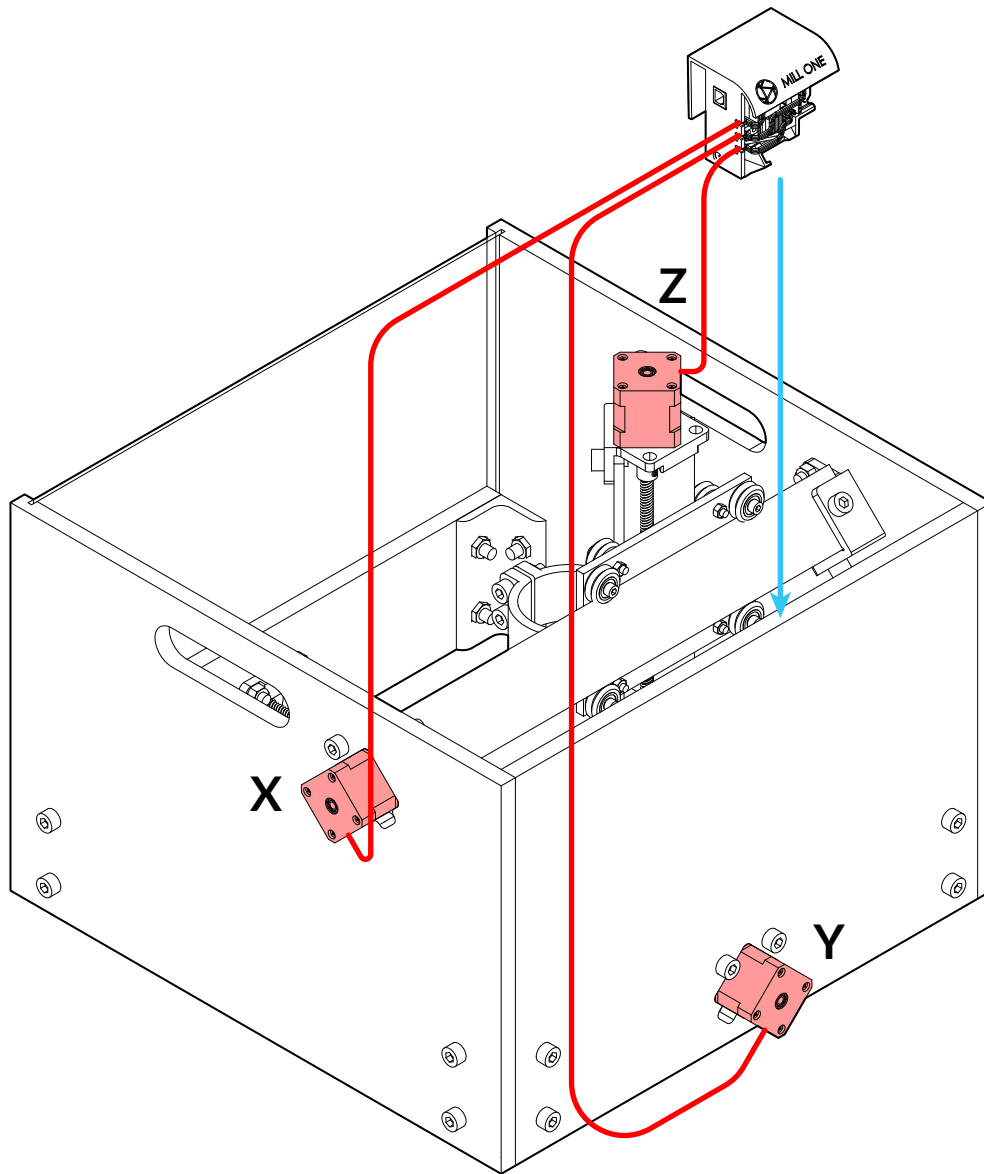


! Some machines may not need this step as the DC Jack (E-J) should fit snugly

See: "Wiring the Mill One's Electronics" -> 8:03 - 8:38  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=8m03s>

## STEP 32

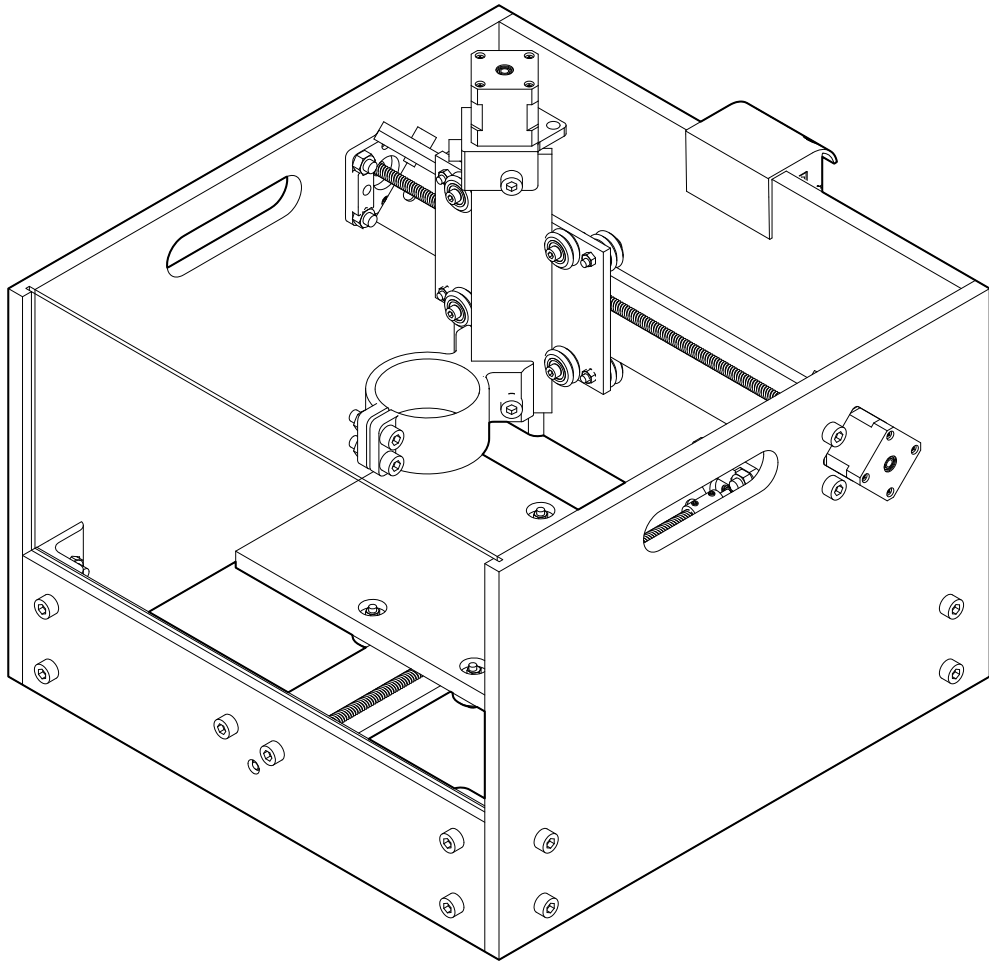
Attaching  
Electronics to  
Motors



See: "Wiring the Mill One's Electronics" -> 8:38 - 9:08  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=8m38s>

## STEP 33

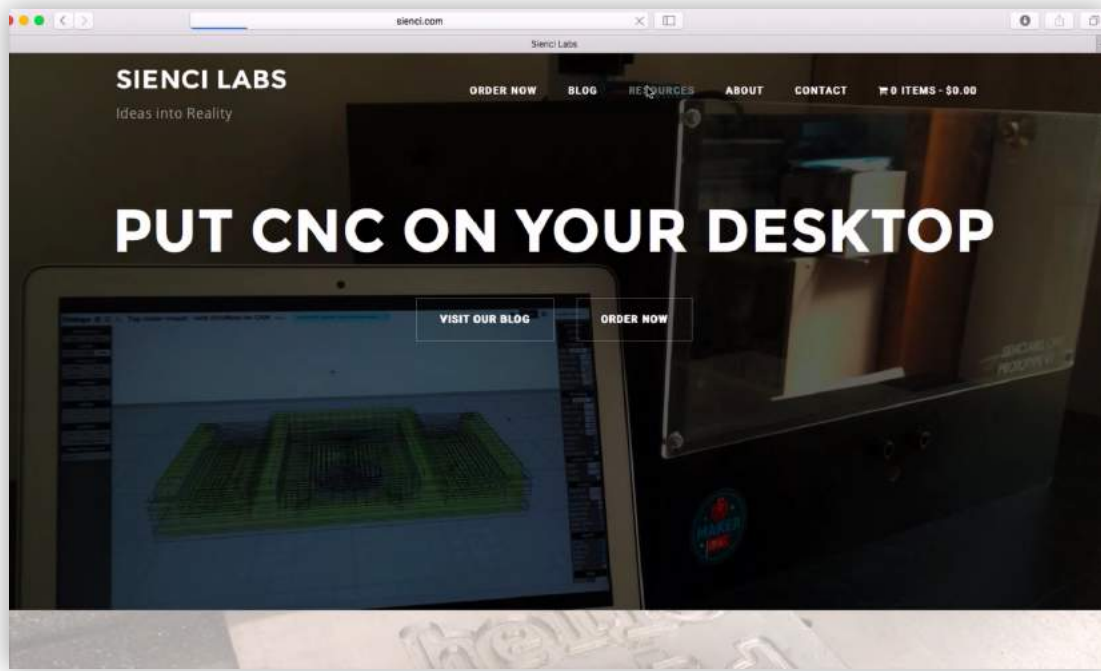
Assembled  
Mill One



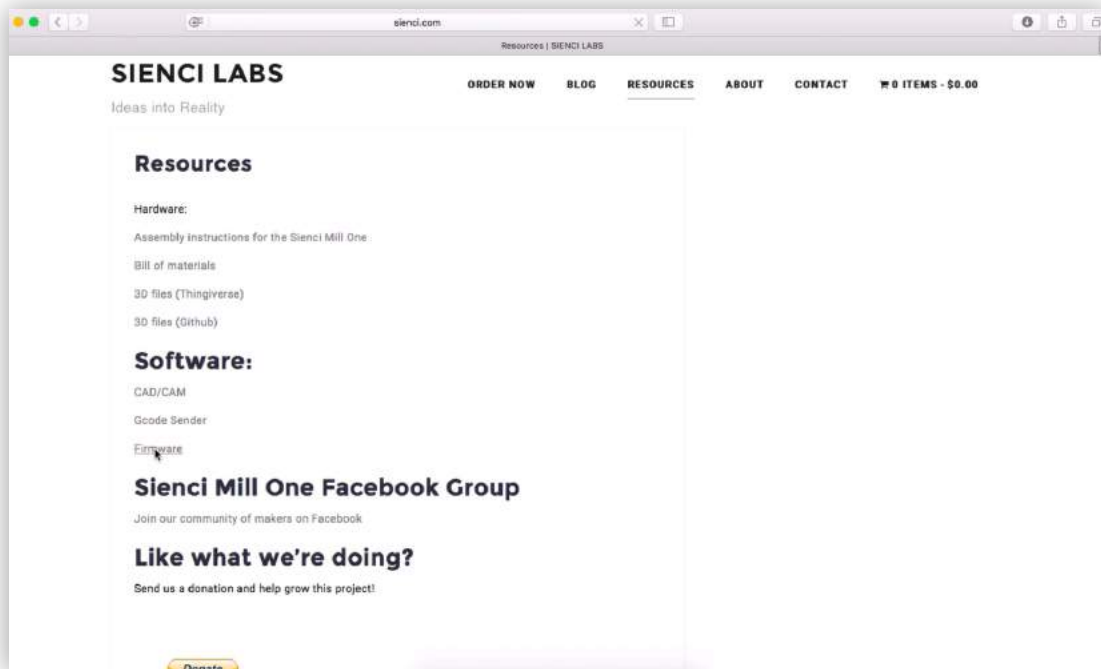
Your Mill One is now fully assembled. Don't plug in your power brick yet, simply connect the USB cable to your computer and continue onto the next steps.

See: "Wiring the Mill One's Electronics" -> 10:47 - 10:57  
<https://www.youtube.com/watch?v=wYr3DWGXIFc&t=10m47s>

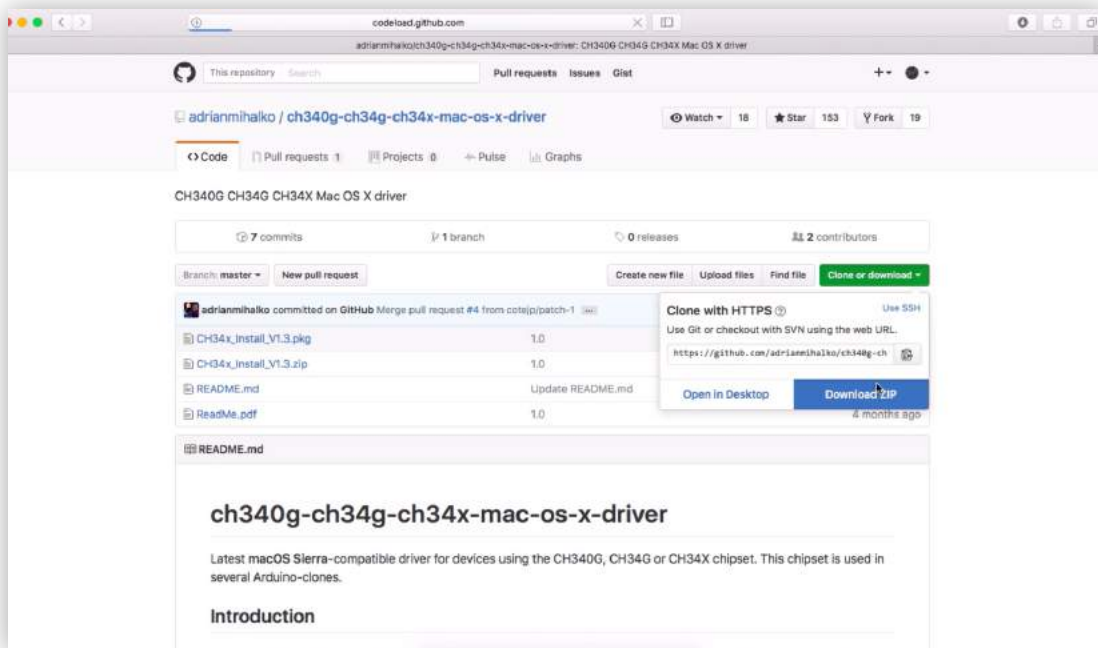
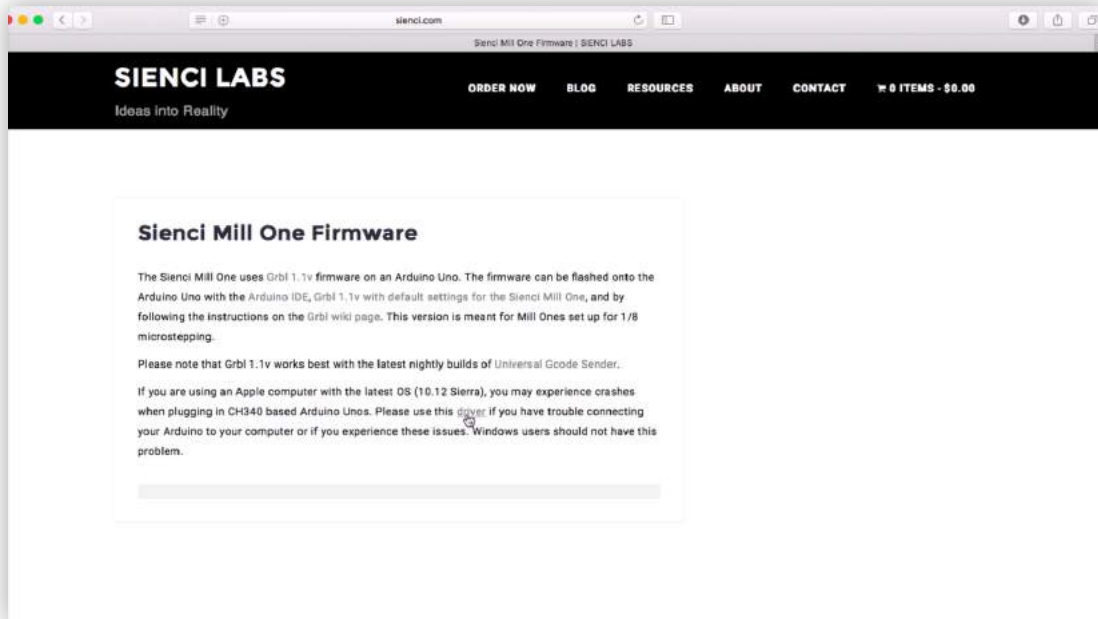
# INSTALLING FIRMWARE



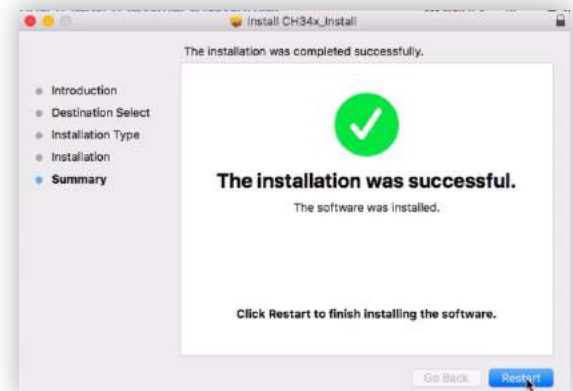
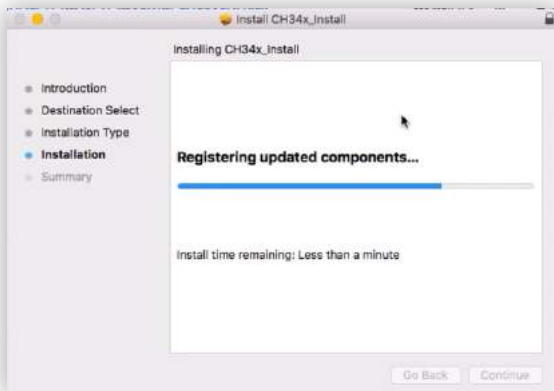
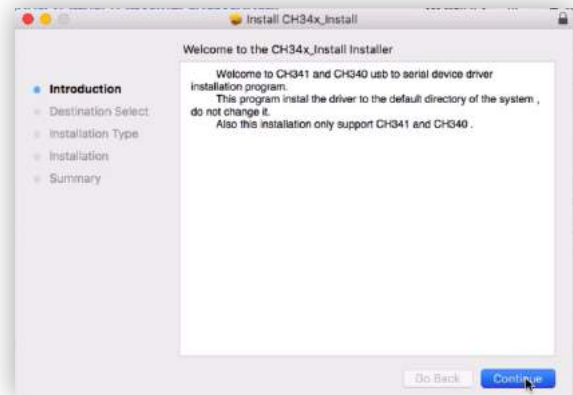
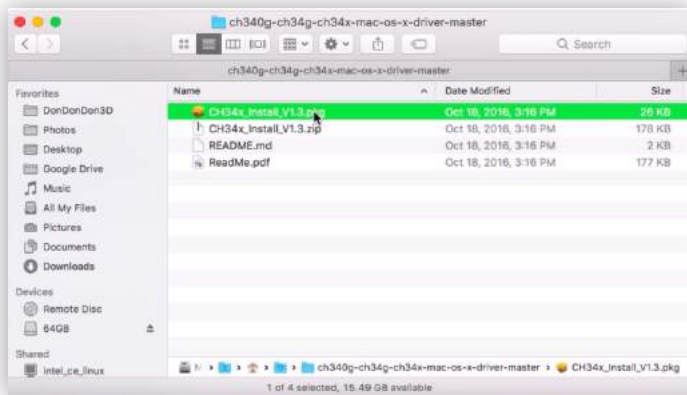
Open your favourite web browser and navigate to the Resources tab of our website.



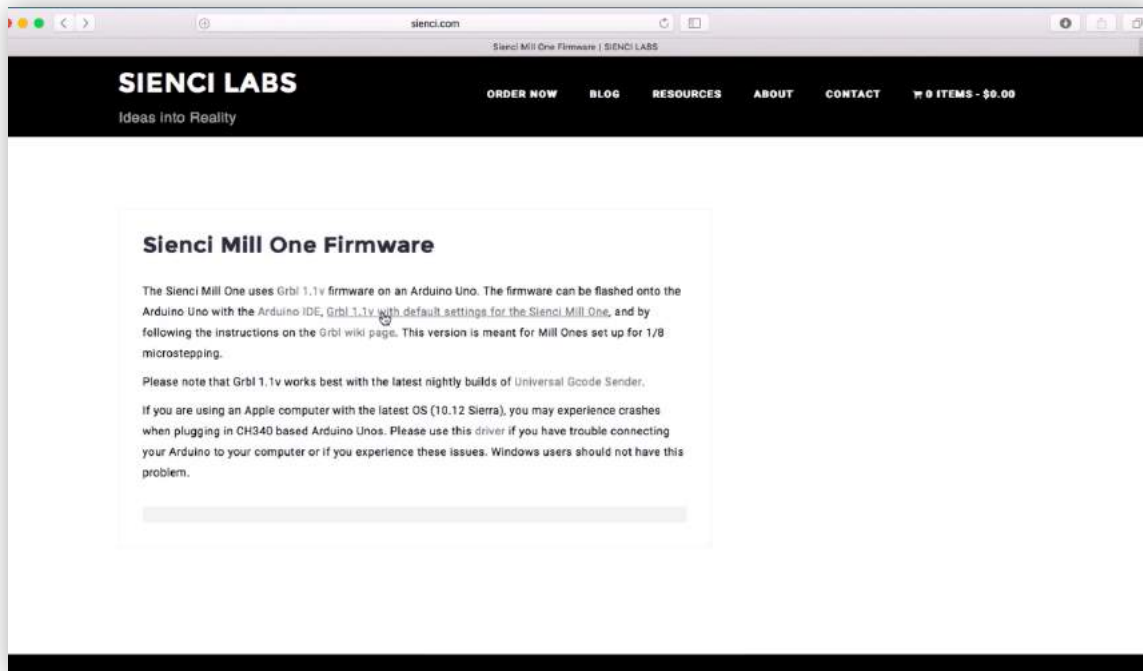
On the Resources page, under the Software heading, you should notice a link to the Firmware.



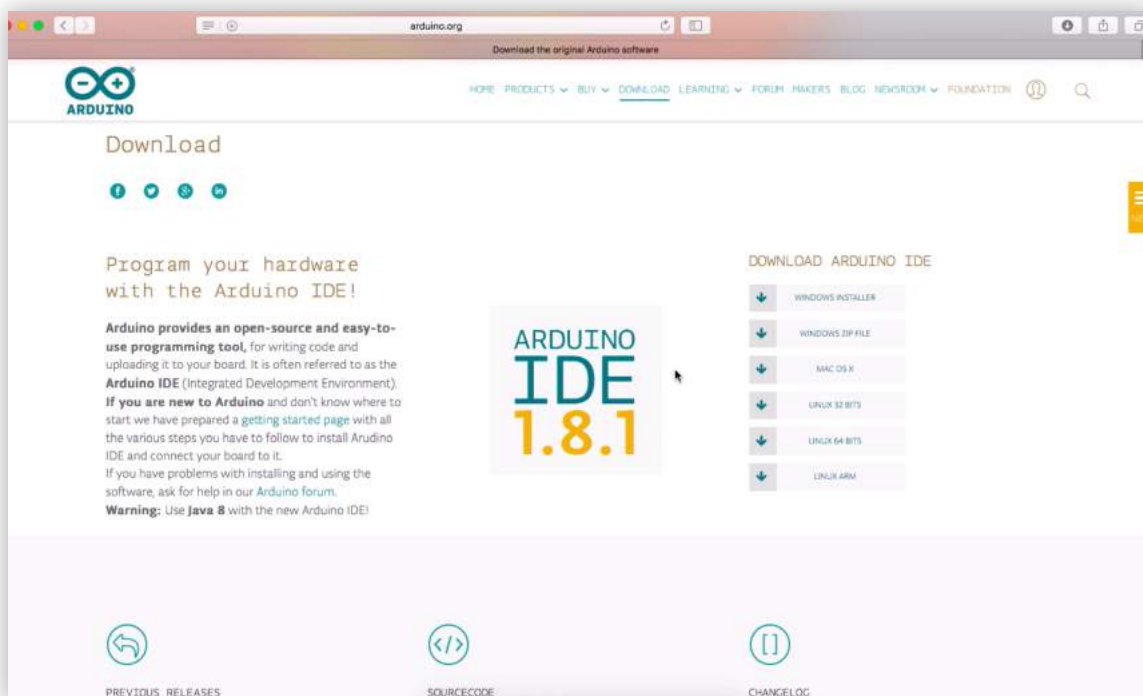
If you're using an apple product, your first step will be to download the driver linked on the page. This will ensure that plugging in your Arduino doesn't cause any issues.



Once you run the package in the downloaded folder, the driver will install. You will be prompted to restart your computer, once the restart has completed, you should return to the Firmware page of our website

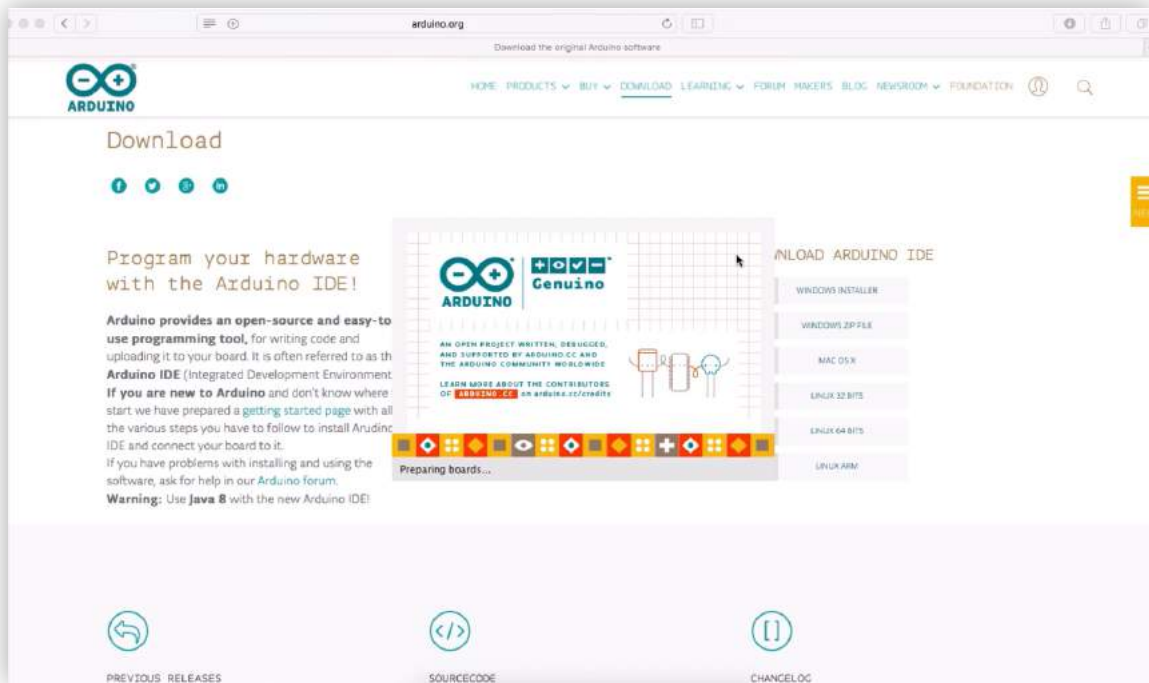


Back on the Firmware page, you'll want to click to download the "Grbl 1.1v with default settings for the Sienci Mill One" firmware.

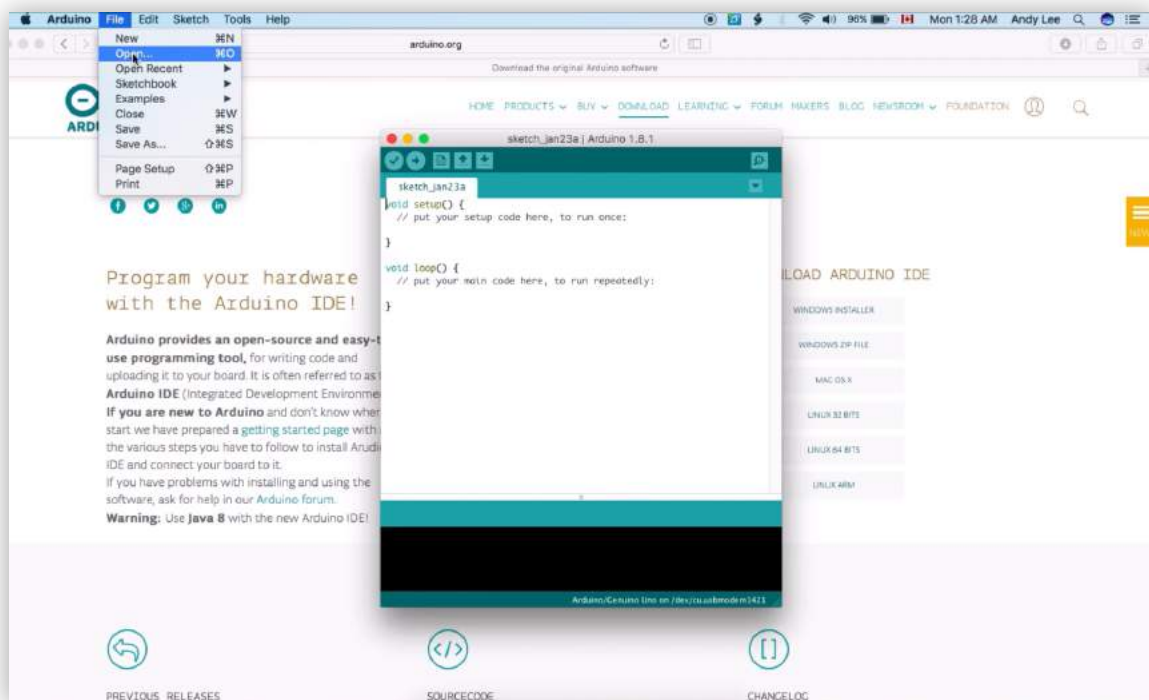


You'll also want to download the latest Arduino IDE onto your computer; select your operating system to download the appropriate package.

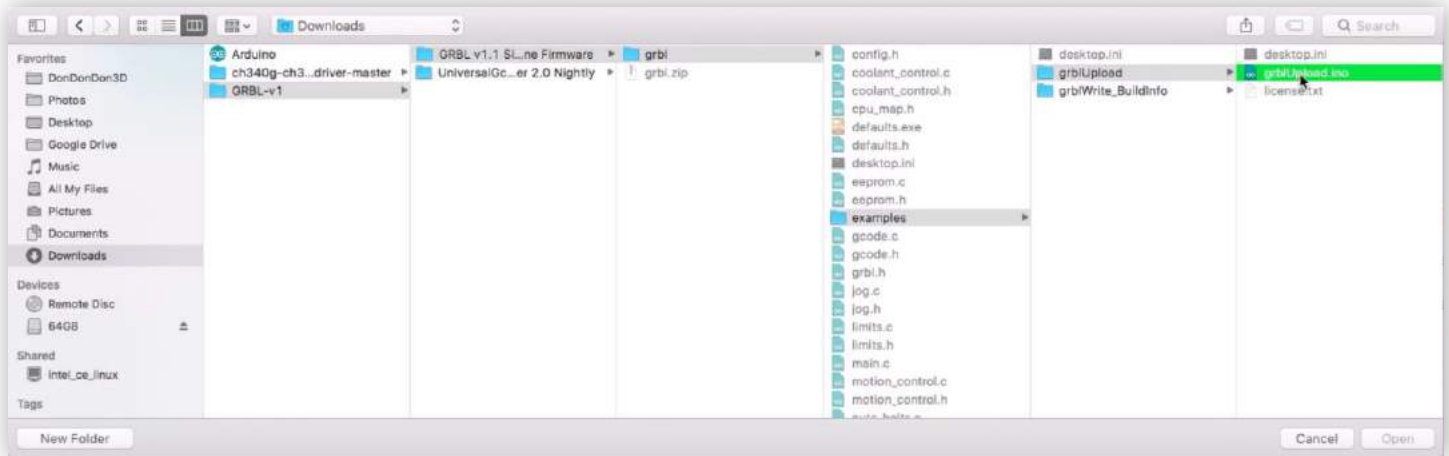




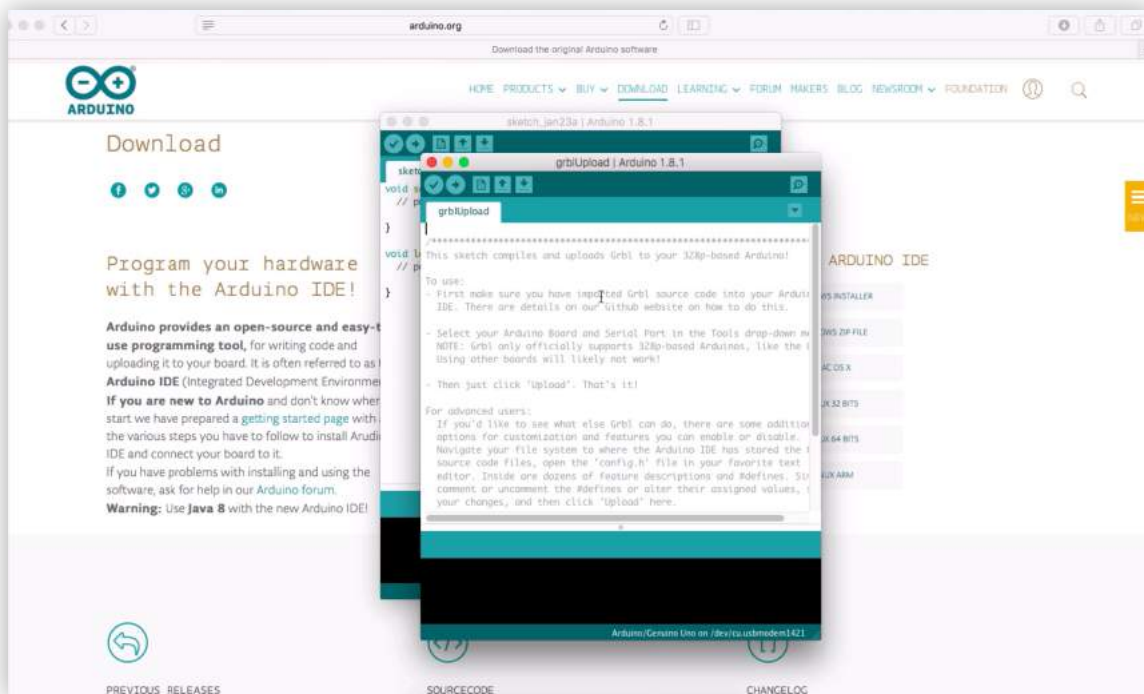
Open the Arduino IDE once it's installed



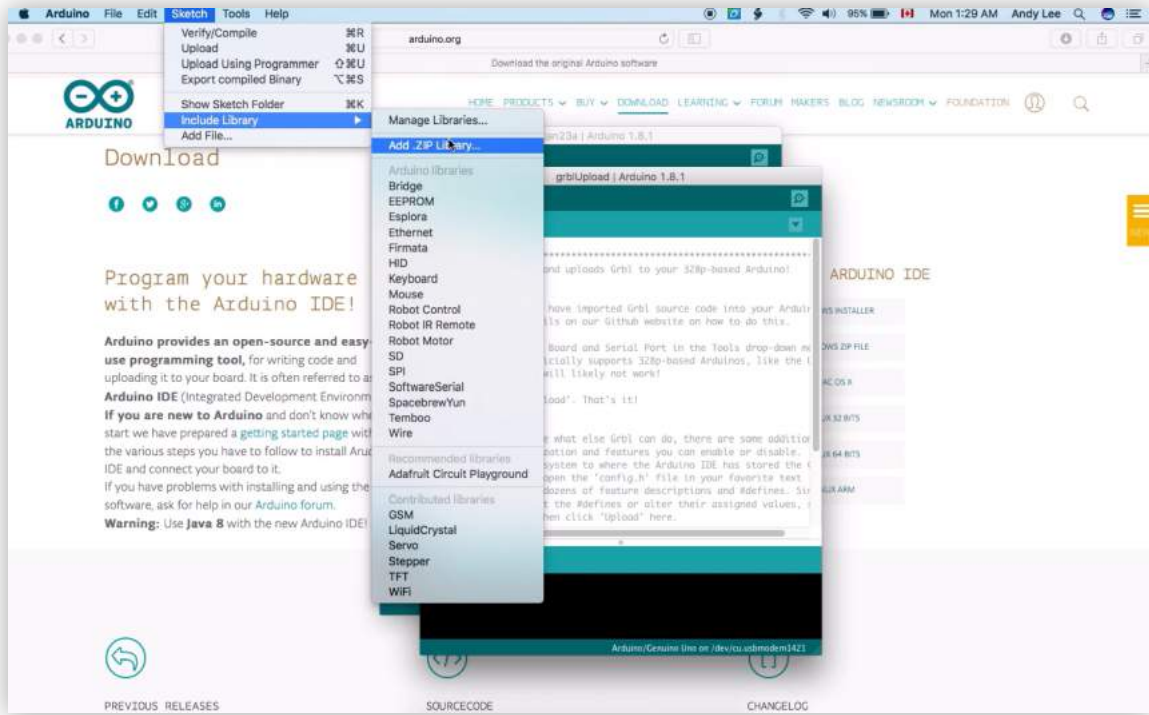
Once open, navigate to File-> Open



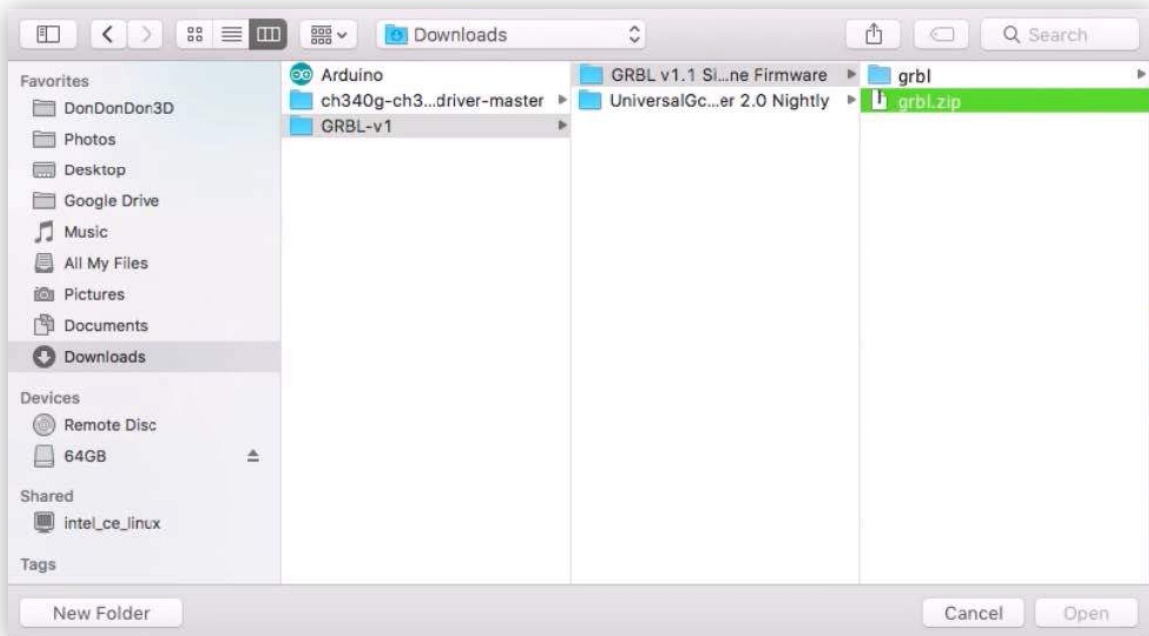
You should find a folder for the GRBL download in your downloads folder. Navigate through the folders until you find grblUpload.ino, double-click it to open it.



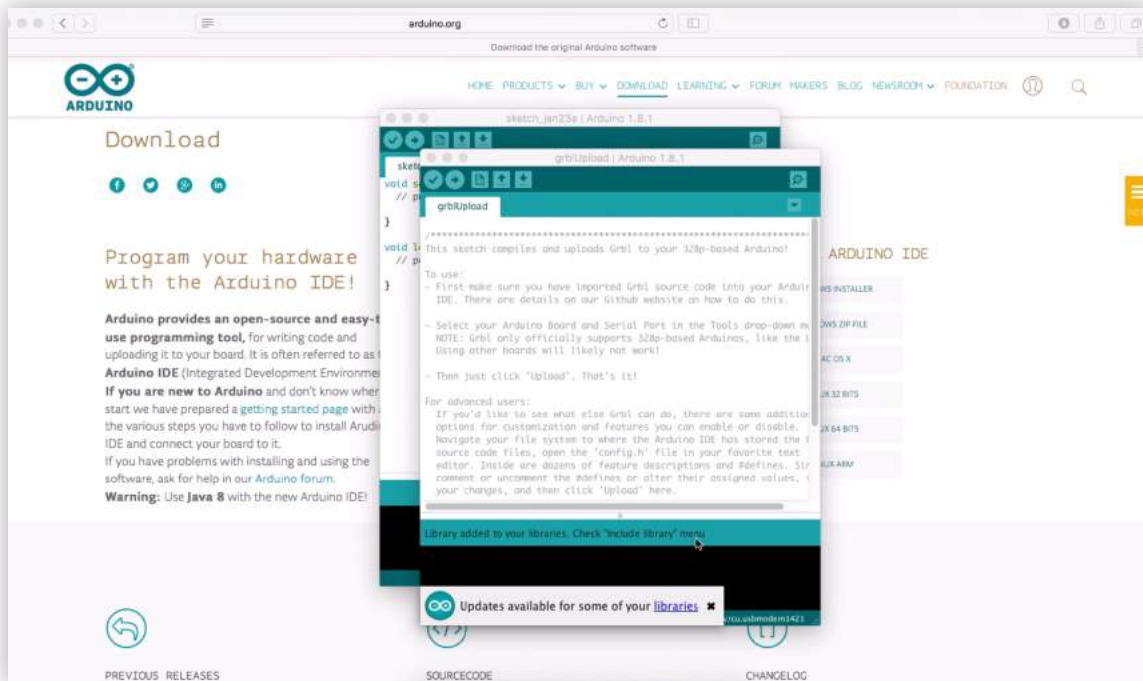
This is the code that needs to be uploaded to the Arduino.



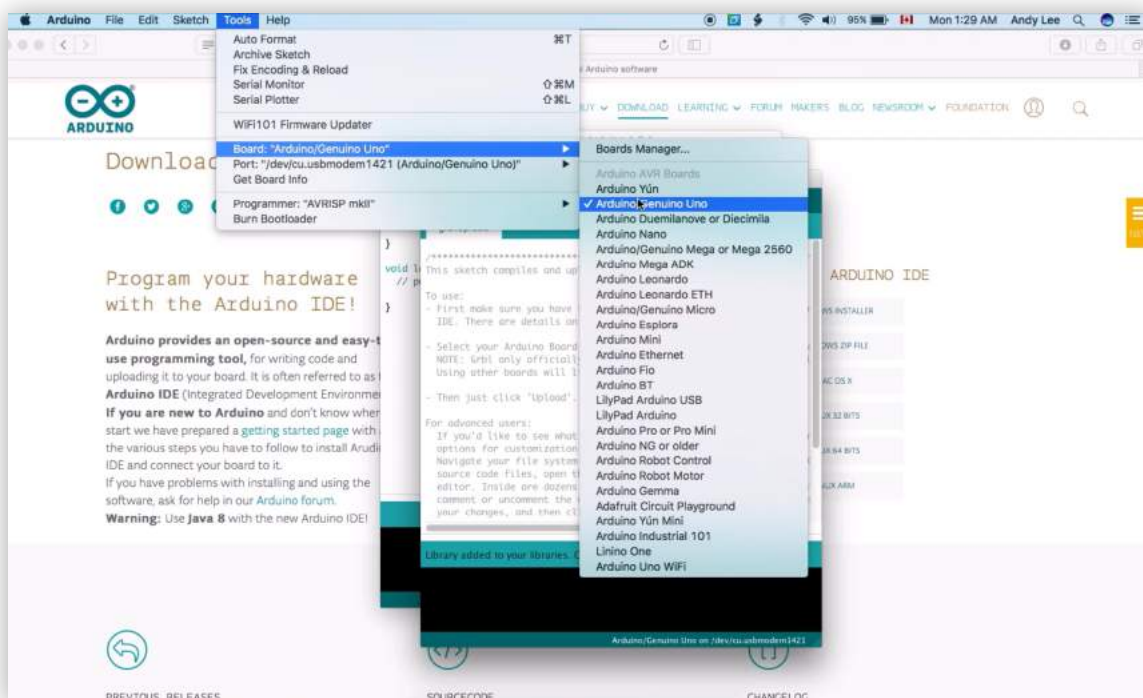
The last step to prepare for uploading the code is to include the Grbl library. Go to Sketch-> Install Library-> Add .zip Library then navigate back to your downloads folder.



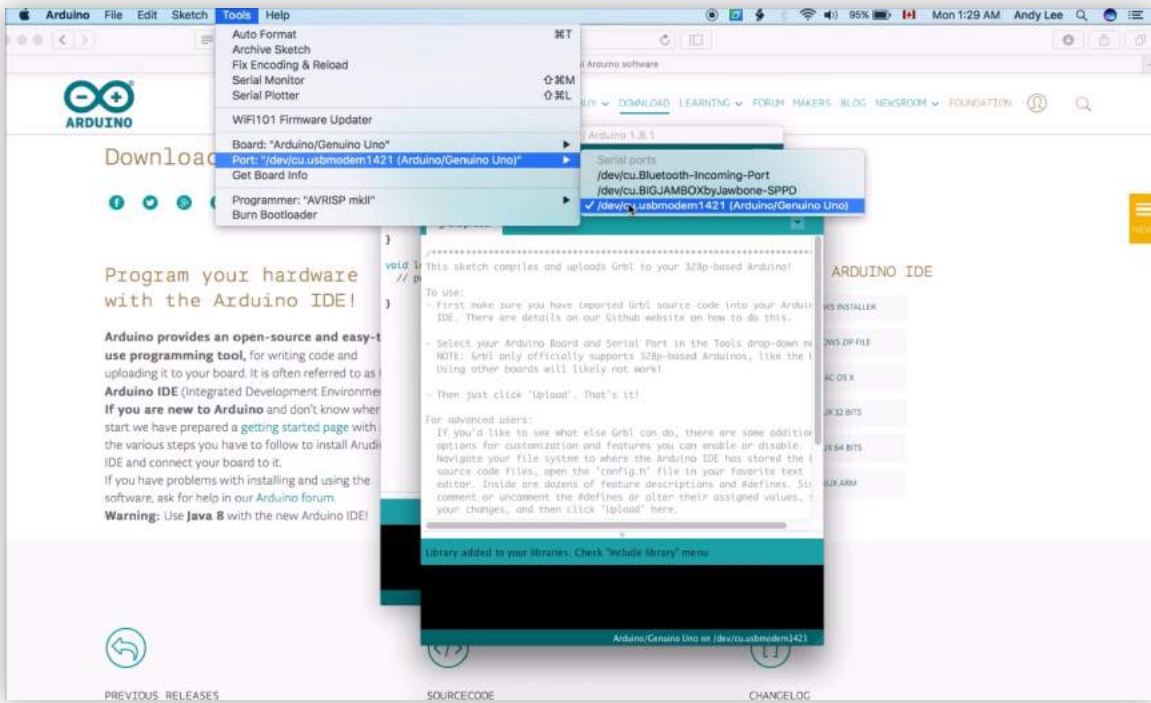
Once again, open the Grbl folder then navigate through and double-click on the grbl.zip file.



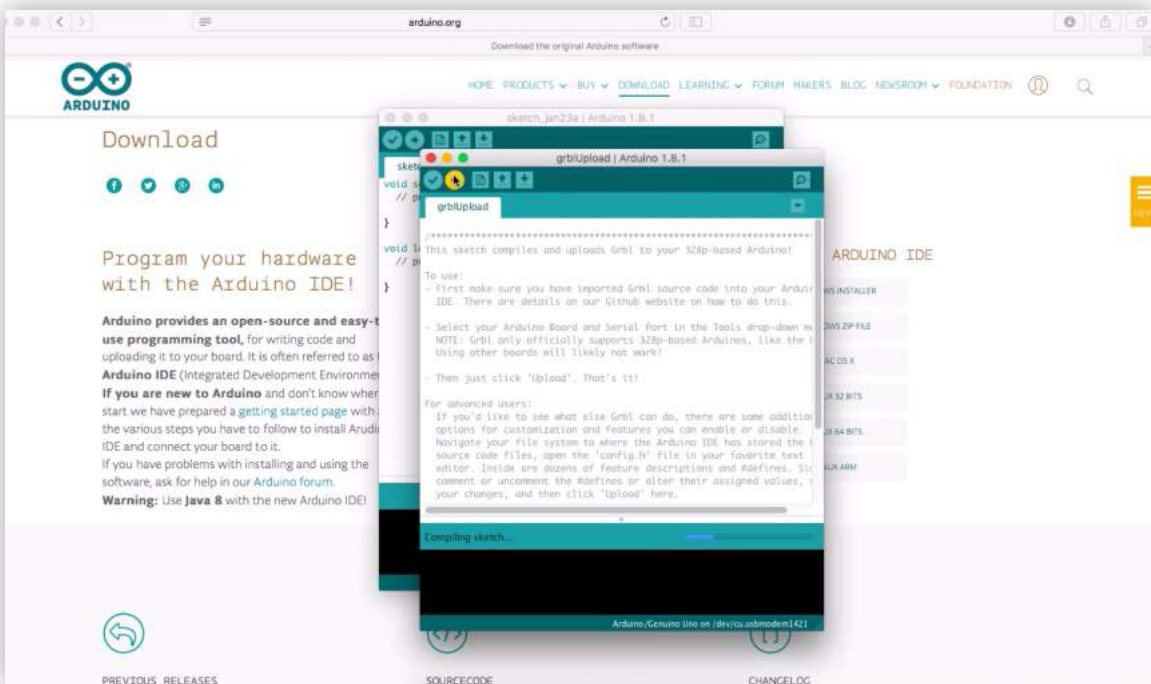
The Arduino IDE should confirm that the Library was added and you will now be able to upload the code to the Arduino.



Check in the Tools tab that you've selected your board to be the Arduino Uno.

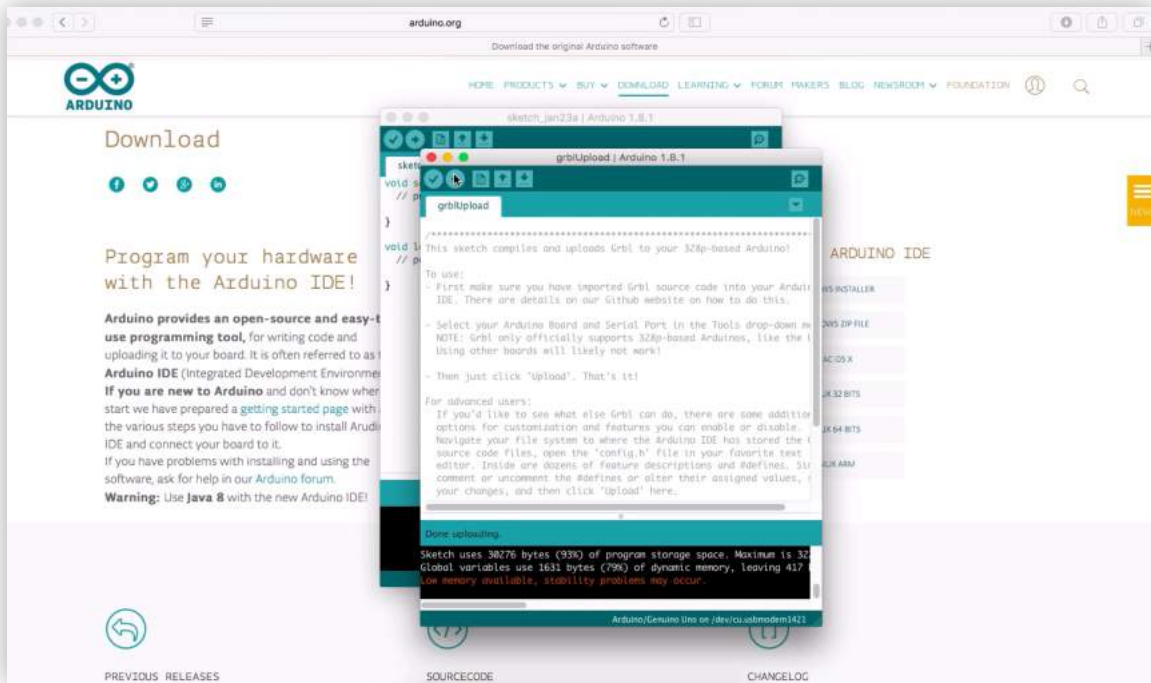


Also check that the proper port is selected.

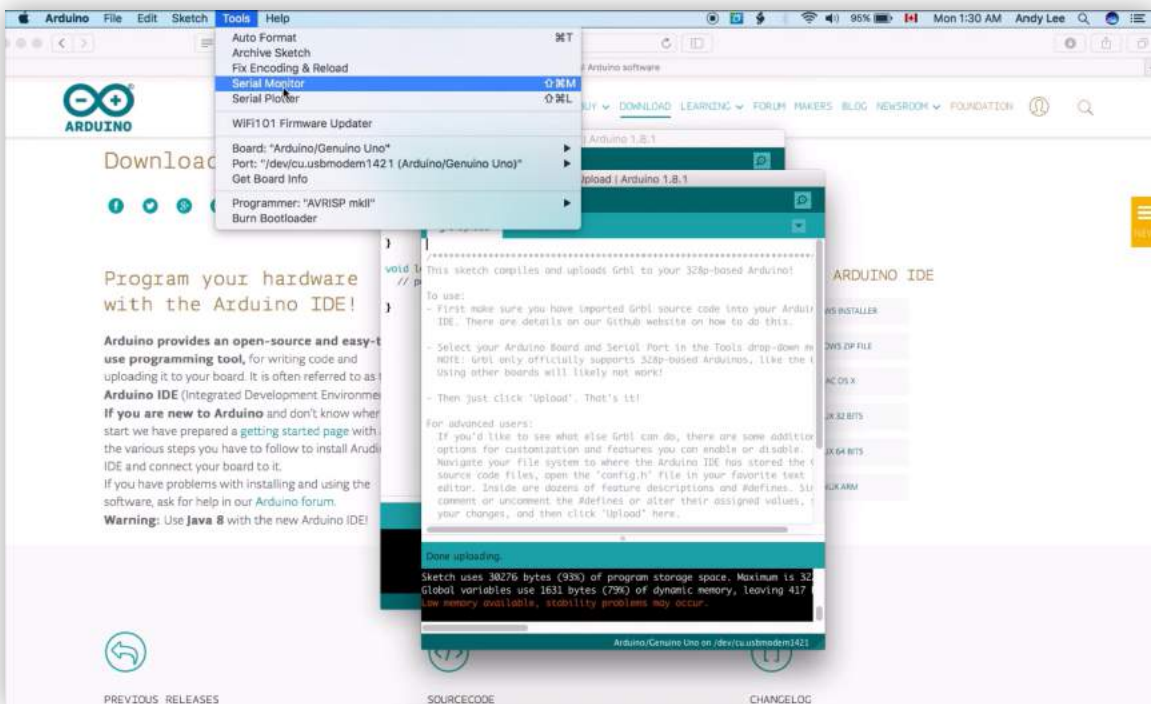


Then click Upload on the IDE to upload the code.

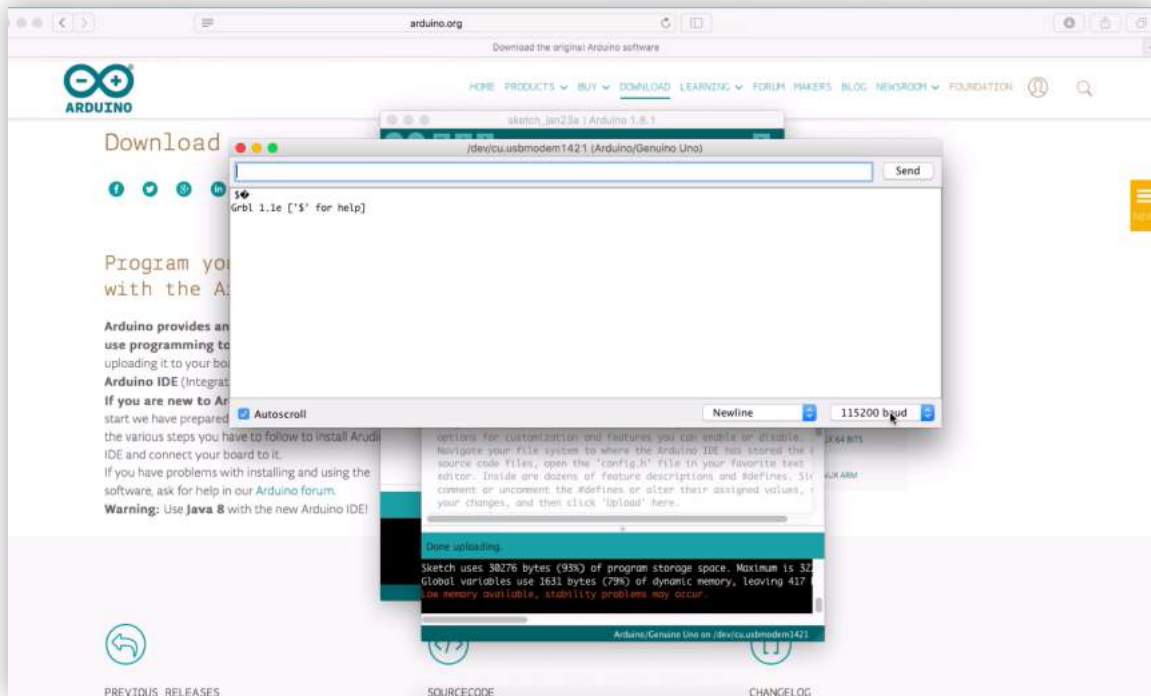




The IDE should confirm that the code is done uploading.



To confirm that the code was implemented correctly, go to Tools then open up the Serial Monitor.



Once you set your baud rate to 115200 you should see that the monitor shows the following message, this means that the firmware has been uploaded correctly.

## Congratulations!

Your Mill One should now be ready to go. In order to start using your machine you should start becoming comfortable with a CAM software as well as find a program which will send the g-code to your machine. For our software recommendations, you can navigate back to the Software heading on the Resources page of our website. For additional resources, be sure to check out our other hardware resources as well as request to join our user Facebook group where you can ask questions, find answers, and interact with the rest of the Sienci community.