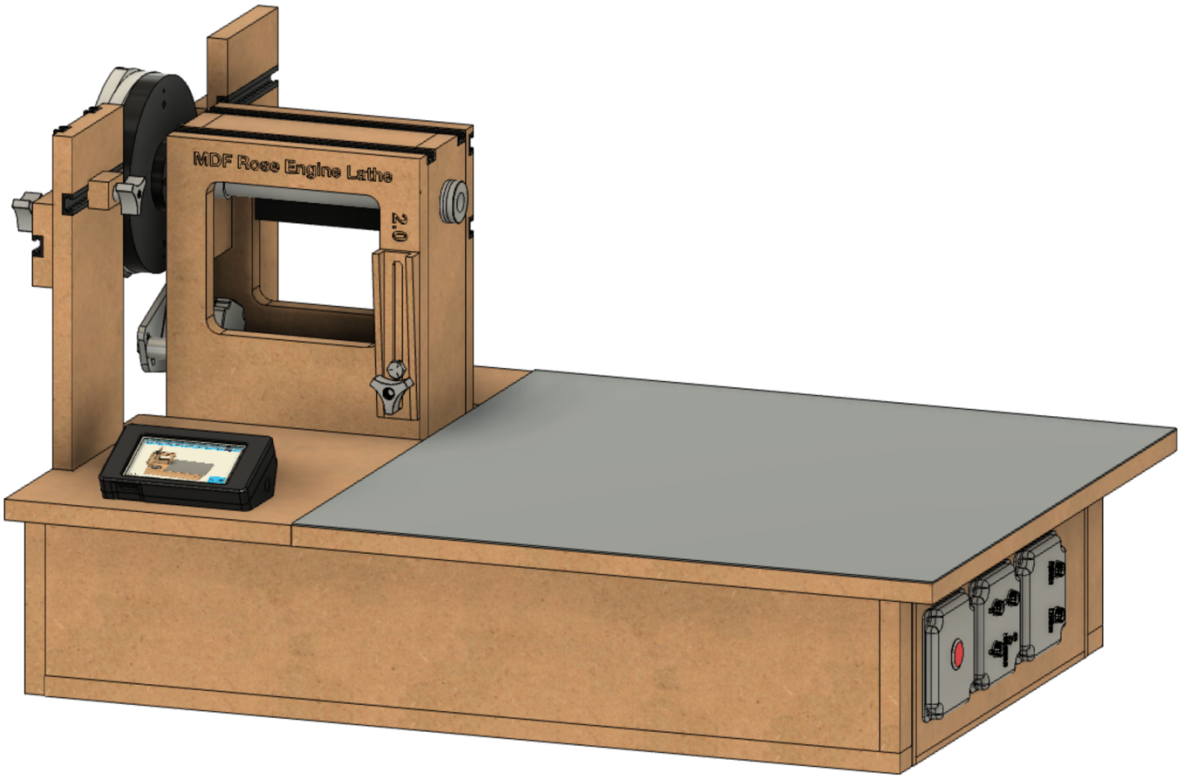
MDF Rose Engine Lathe 2.0
with Stepper Motor Drive



Instructions for Building Control System for Multiple Stepper Motors

Part 2 – MDF Case

Version 4.0
09 June 2022

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Permission is not granted to manufacture these for sale.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Table of Contents

Options for the Controls Box Enclosure **5**

Section 1, Option 1 – Controls Box Enclosure **6**

Before Assembly *6*

Assembly *11*

Electrical Plates for Connectors *12*

Mounting the Covers *15*

Section 1, Option 2 – Controls Box Enclosure **16**

Before Assembly *16*

Assembly *21*

Plates for Connectors *22*

Section 1, Option 3 – Controls Box Enclosure, v3 ..... **25**

Before Assembly *26*

Assembly *30*

Plates for Connectors *30*

Section 2 – Assembly of the Control Box Electronics **34**

Mounting Electronics to the MDF Base *34*

Notes Regarding the V3 Board *35*

Notes Regarding the Overhead Drives Control *35*

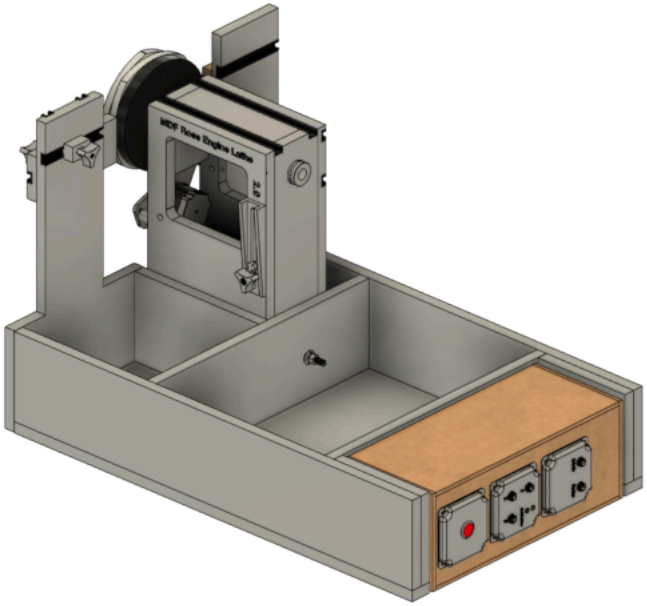
Document Version History **36**

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Some have chosen to put the stepper motor controls in the lathe's carcass, under the bed of the lathe. However, placing all the pieces together in a separate box gives these benefits:

1. This controls box is designed be placed under the bed in the MDF Rose Engine Lathe 2.0 (as shown in the picture to the right {the bed cover is removed}).
2. This approach also allows for the controls box to be used with the original MDF Rose Engine Lathe, just placing the box somewhere near the lathe.
3. This also frees up space under the bed for:
    a. Storage of parts or tools, or
    b. Making a gap-bed lathe.
4. The many connections between the various pieces inside the box are already in place and the user does not have to figure out the correct alignment of connectors when building the MDF Rose Engine Lathe.



MDF Rose Engine Lathe 2.0
(B1 and B1A removed)

The details for how we are building the one you can buy are below. These are documented for our use to ensure consistency, and we are publishing them for anyone who wishes to build their own.

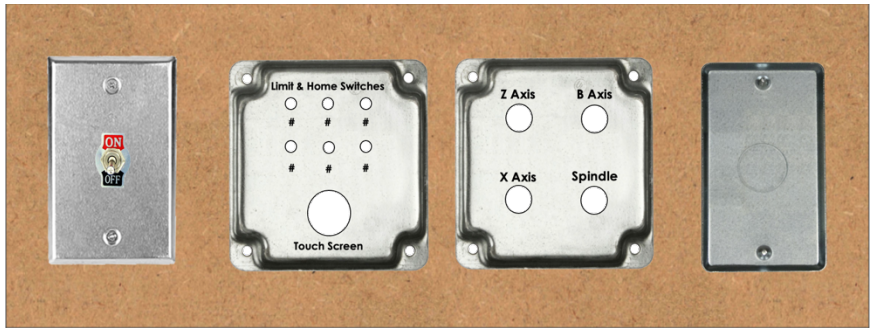
The sequence of activities follows the layout of this document. That was done consciously. Changes to the sequence should be considered strongly before making changes.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Options for the Controls Box Enclosure

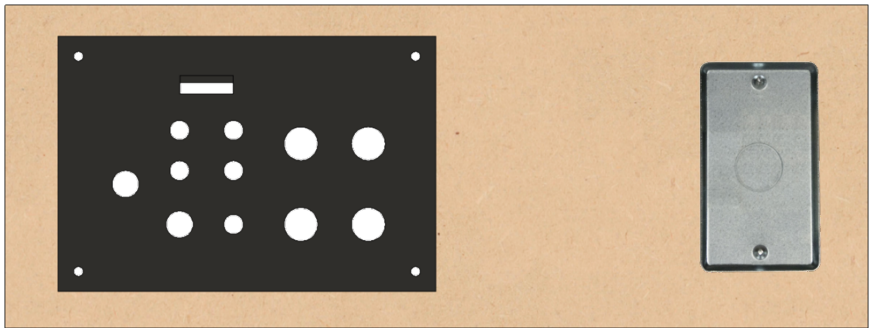
There are two options for building this box.



Option 1 – Original Design

- Uses off-the-shelf switch plates

If you choose this option, continue on page 16.



Option 2 – 3D-printed Panel

- Black panel is 3D printed.

  This panel design is available on the MDF Rose Engine Lathe 2.0 Library in the book titled, 3D Printed Parts. Open the section titled, "Control System for Multiple Stepper Motors".

  Use version 2 or 3, depending on the type of limit switch jacks you are using.

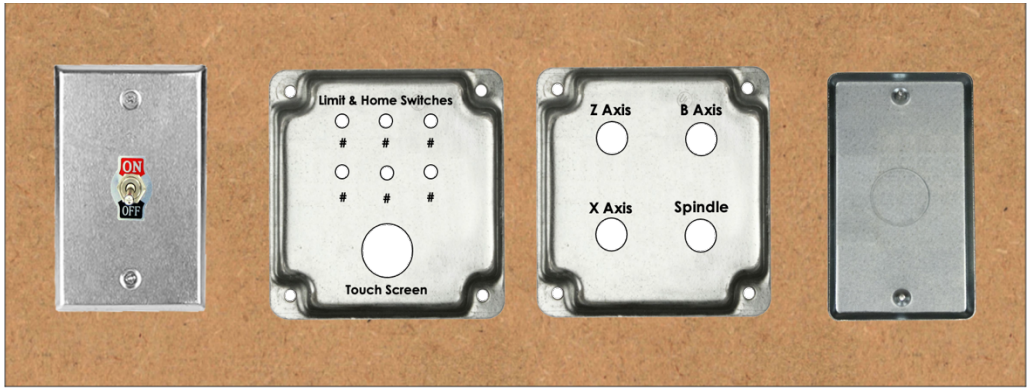
If you choose this option, continue on page 16.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Section 1, Option 1 – Controls Box Enclosure

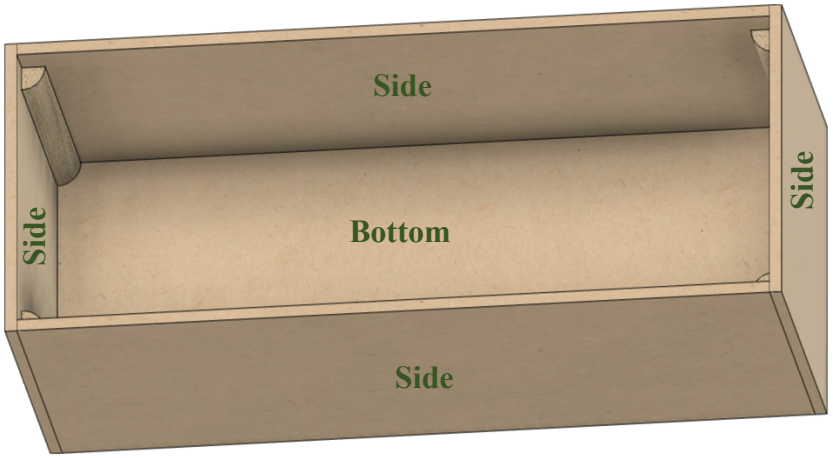
1. A top and bottom made from ¾” MDF,
2. Four sides made from ¼” MDF, and
3. 4 corner posts made from quarter-round trim (these are recommended but not required. The box can be assembled without them).



The quarter-rounds are used to give the top and bottom something to set the spacing correctly.

The four ¼” thick sides are screwed to the ¾” MDF used for the top and bottom.

Replacing the top, and removing the sides reveals the view to the left.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Before Assembly

The following instructions should be followed before assembling the controls box

Bottom

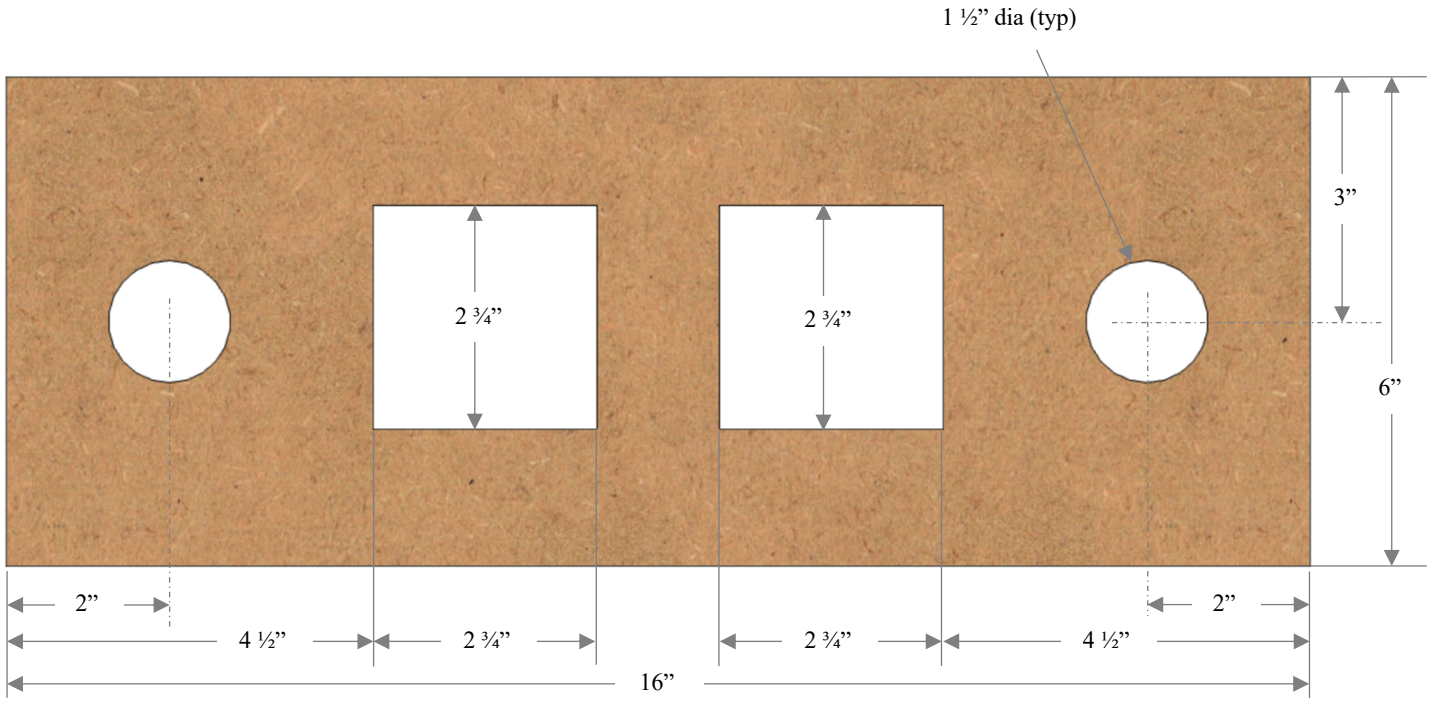
This is made from ¾” MDF.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Top

This is made from ¾” MDF.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Long Sides (2)

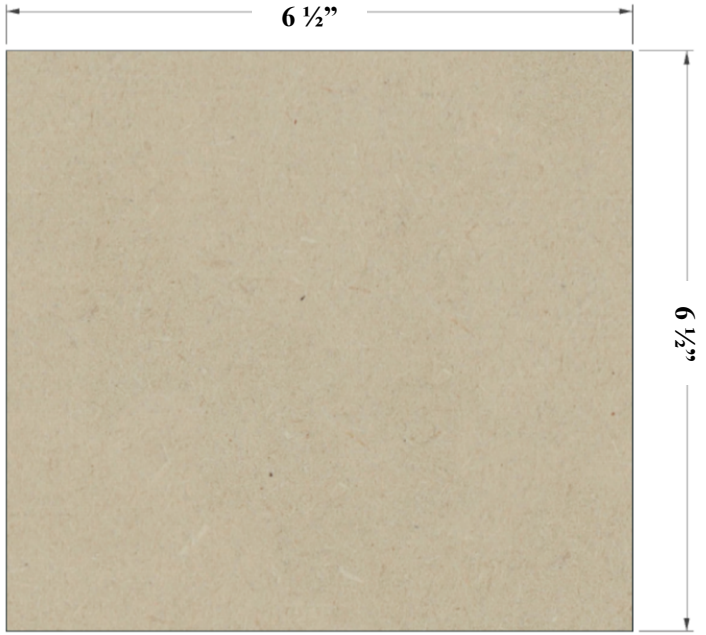
There are two of these, and they are made from ¼" MDF.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

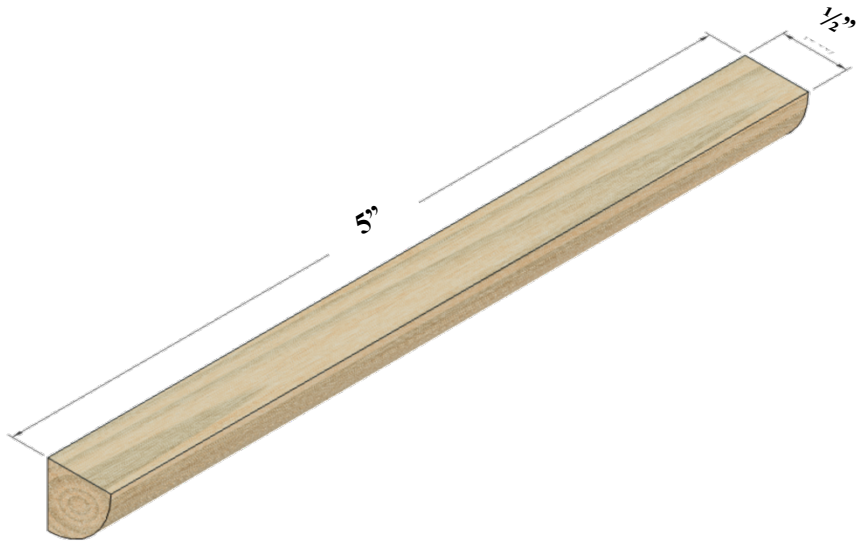
Short Sides (2)

There are two of these, and they are made from ¼" MDF.



Quarter Rounds (4)

There are four of these, and they are made from any good trim material. These are ½" radius, but that is not terribly critical.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Assembly

Glue the four quarter rounds to the ends of the two long sides. Be certain to:

1. center the quarter round so there is ¾" on each end, and
2. ensure the edges are flush to each other.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Electrical Plates for Connectors

Power Infeed

Use a 1-gang plate with the hole punched out for the cable strain relief. Secure the power cable in place using the 3/8 in. Twin-Screw Cable Clamp Connector. Wait until later to tighten the screws holding the power cable into place.

211

209

Power Switch

Use a 1-gang plate which is blank. Drill a ½" hole in the center and secure the power switch to it.

205

210

MDF Rose Engine Lathe 2.0

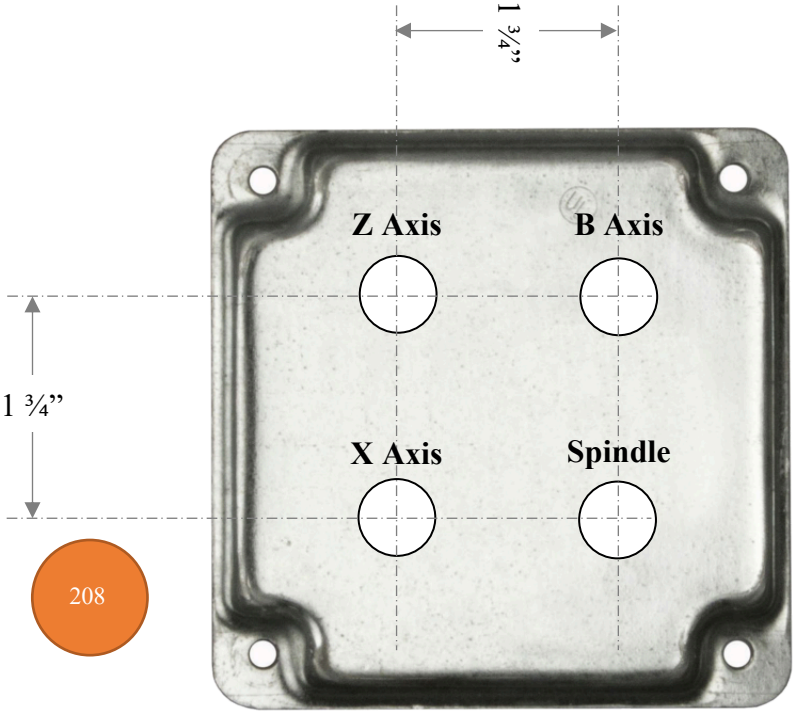
Build Instructions – Control System for Multiple Stepper Motors

Stepper Motor Jacks

Use a 2-gang plate which is blank. Drill 4 holes which are each 5/8" diameter.

Label these as:

- Z Axis
- B Axis
- X Axis
- Spindle



Other Jacks

Use a 2-gang plate which is blank.

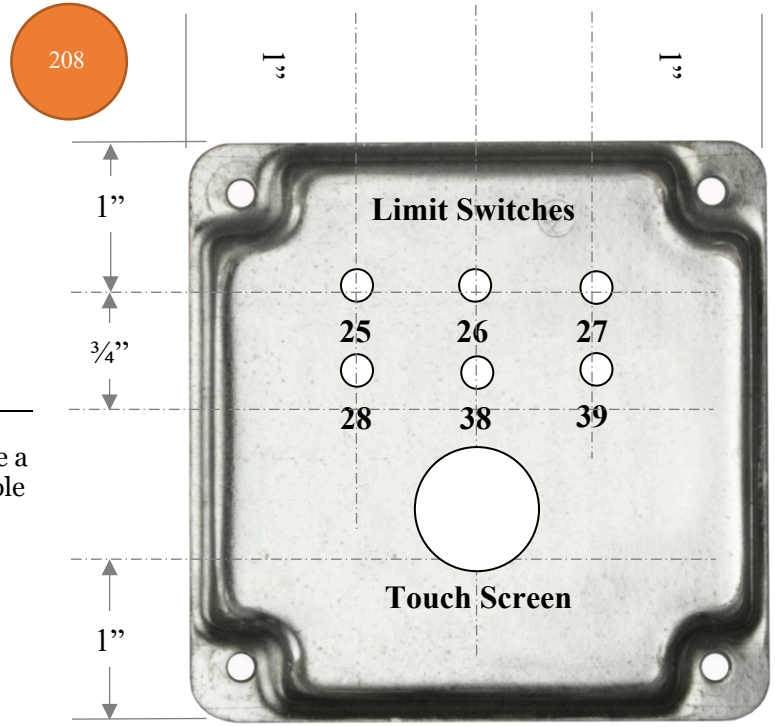
Drill 6 holes which are each 6mm or $^{15}/_{64}$" diameter. Label these as:

Limit Switches

25	**26**	**27**
28	**38**	**39**

For the touch screen (the Nextion touch screen), the recommended approach is to use a connector like a GX-12/4 (#215) to connect the wires. For that connector, drill the hole using a 12mm bit. Center it left to right and 1" from the outer edge. Label this as:

Touch Screen

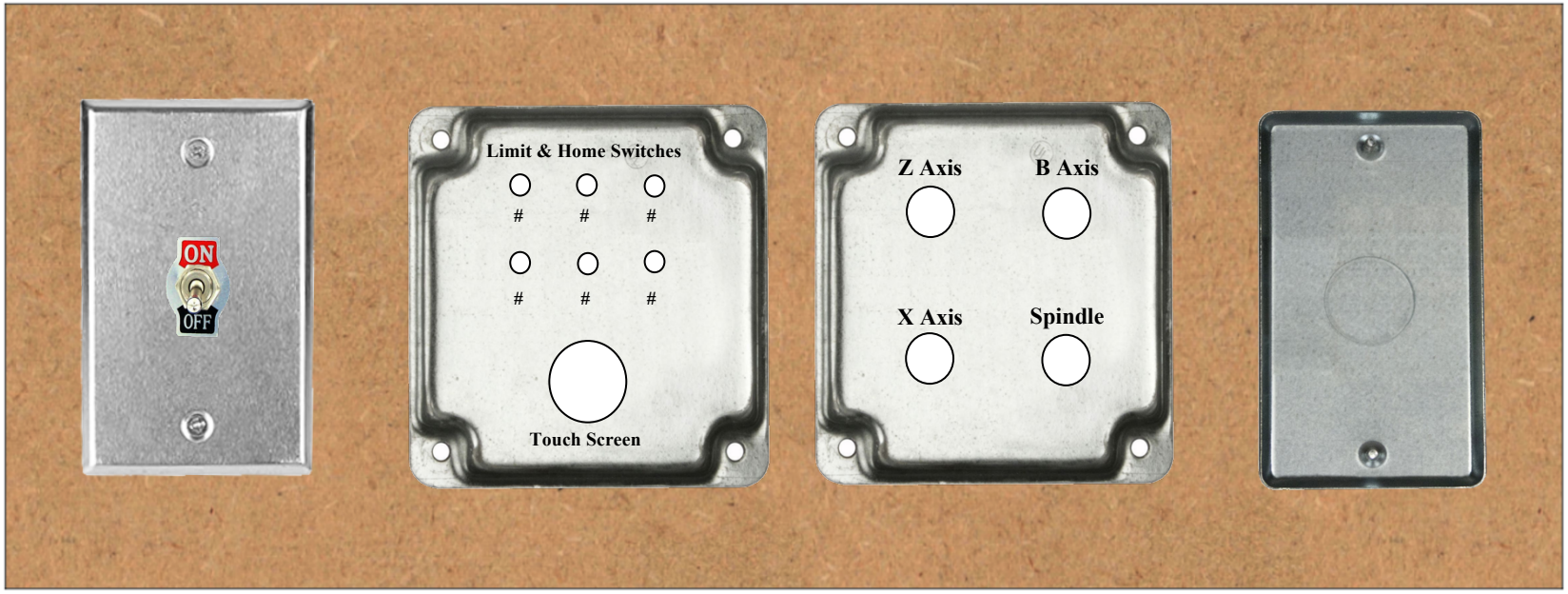


MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Mounting the Covers

The layout below is recommended. This minimizes cable management issues when used.



NOTE: Screw these plates into place using 5/8" #6, flat head, particle board screws (item #408 in the bill of materials).

408

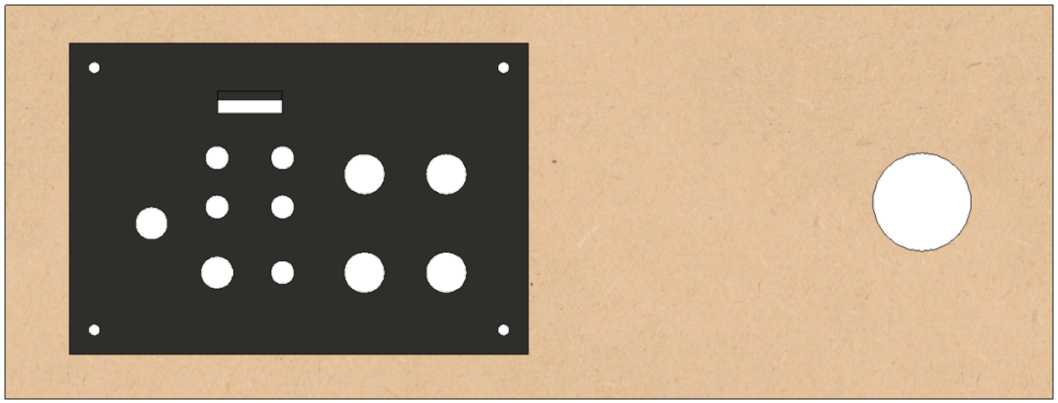
Continue on to Section 2, starting on pg. 34.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Section 1, Option 2 – Controls Box Enclosure

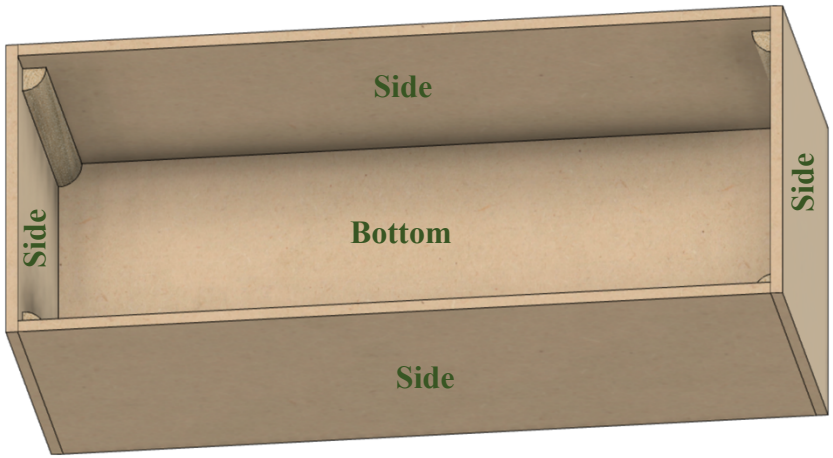
1. A top and bottom made from ¾" MDF,
2. Four sides made from ¼" MDF, and
3. 4 corner posts made from quarter-round trim (these are recommended but not required. The box can be assembled without them).



The quarter-rounds are used to give the top and bottom something to set the spacing correctly.

The four ¼" thick sides are screwed to the ¾" MDF used for the top and bottom.

Replacing the top, and removing the sides reveals the view to the left.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Before Assembly

The following instructions should be followed before assembling the controls box

Bottom

This is made from ¾” MDF.

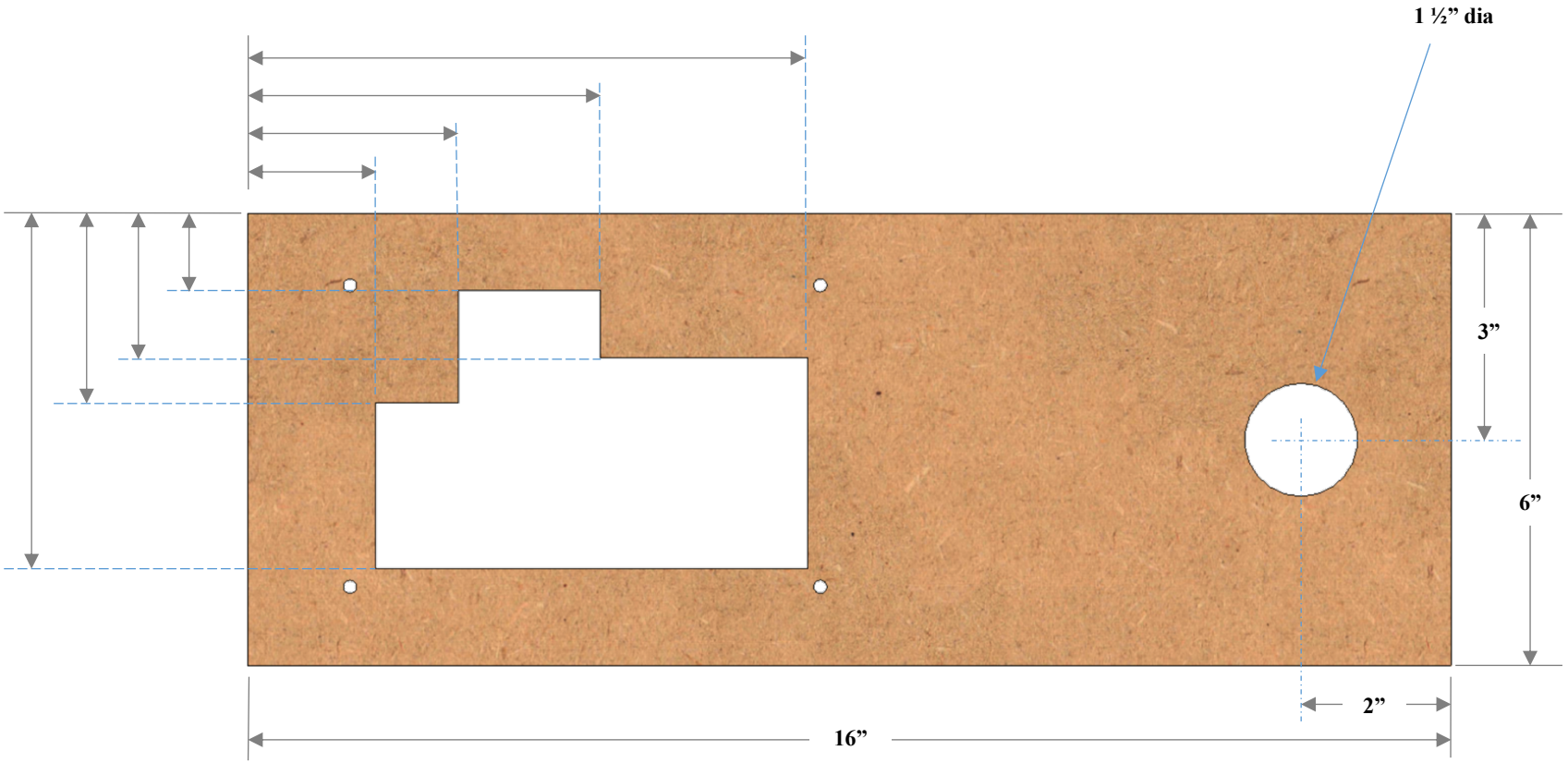
MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Top

This is made from ¾" MDF. This layout is for the version 2 or version 3 plate in the book titled, 3D Printed Parts. If you use version 1, modify the layout as necessary.

For the 3D-printed plate's mounting holes, it is best to drill them based on the plate's position after cutting the opening. Do be sure it is properly aligned before drilling the holes.



Long Sides (2)

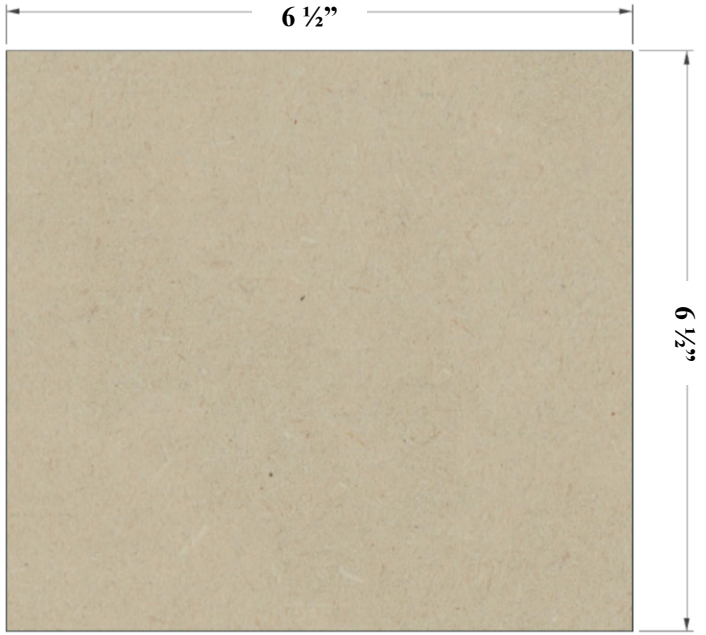
There are two of these, and they are made from ¼" MDF.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

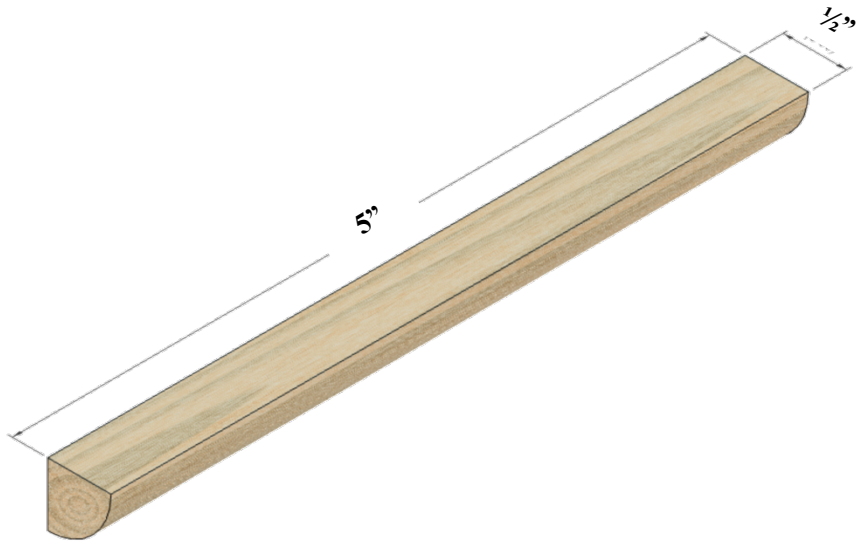
Short Sides (2)

There are two of these, and they are made from ¼" MDF.



Quarter Rounds (4)

There are four of these, and they are made from any good trim material. These are ½" radius, but that is not terribly critical.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Assembly

Glue the four quarter rounds to the ends of the two long sides. Be certain to:

3. center the quarter round so there is ¾" on each end, and
4. ensure the edges are flush to each other.

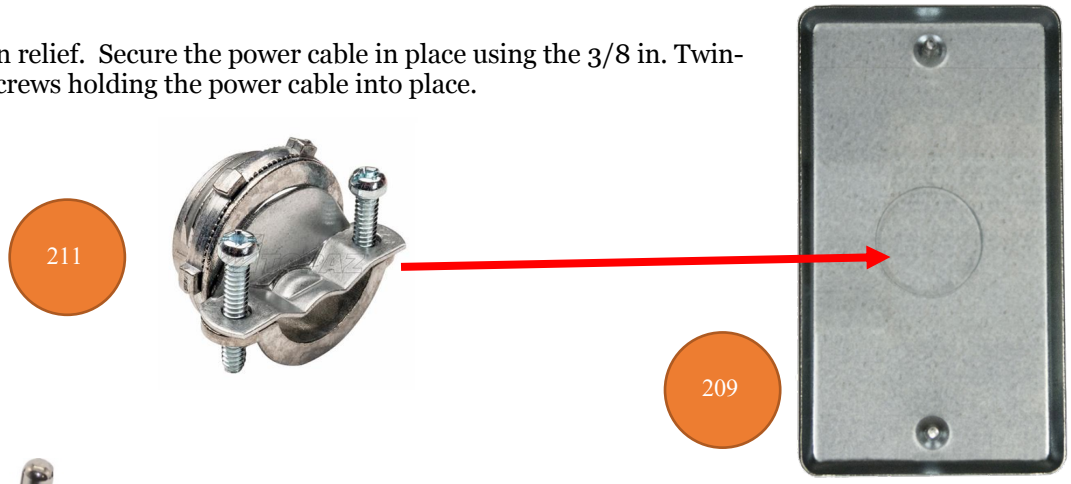
MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Plates for Connectors

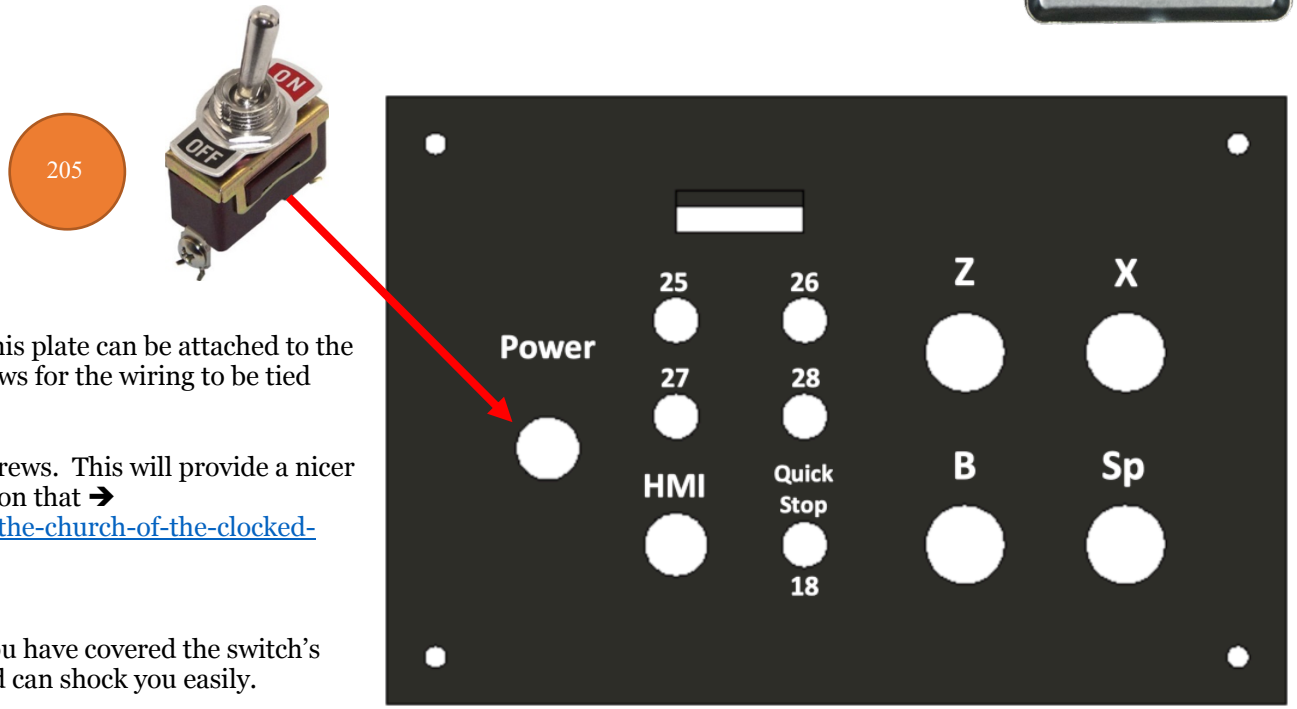
Power Infeed

Use a 1-gang plate with the hole punched out for the cable strain relief. Secure the power cable in place using the 3/8 in. Twin-Screw Cable Clamp Connector. Wait until later to tighten the screws holding the power cable into place.



Power Switch

Use the 3D-printed plate and install this switch in the position indicated.



Once the power switch has been installed, this plate can be attached to the MDF top. That is recommended as this allows for the wiring to be tied neatly down.

When attaching the plate, try to clock the screws. This will provide a nicer look. (This is a nice web site showing more on that ➔ https://blog.lostartpress.com/2019/04/18/the-church-of-the-clocked-screws/)

DO NOT POWER IT ON YET. Unless you have covered the switch's terminals, they will have power on them and can shock you easily.

MDF Rose Engine Lathe 2.0

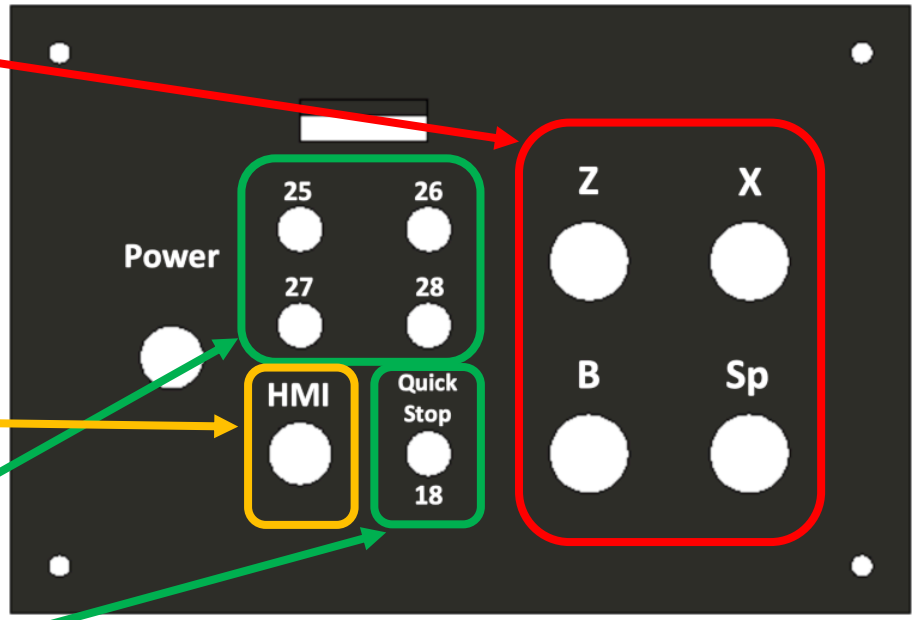
Build Instructions – Control System for Multiple Stepper Motors

Stepper Motor Jacks

Use the 3D-printed plate and install these jacks in the positions indicated.

Label these as:

- Z
- X
- B
- Sp



HMI Jack

Use the 3D-printed plate and install the HMI jack in the position indicated.

Label this as “HMI”.

Limit Switch Jacks

Use the 3D-printed plate and install these jacks in the positions indicated.

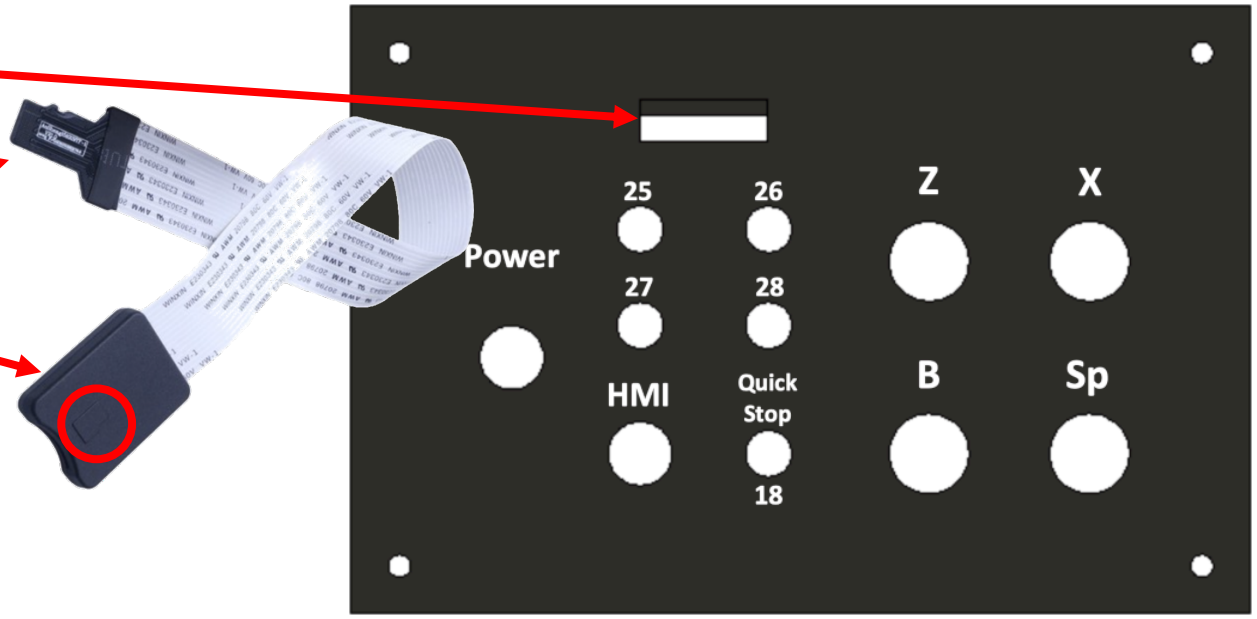
Label these with the Teensy Pins you are using (18 and 25-28 are shown here).

microSD Extension

The microSD extension cable is installed here.

Insert this end first

And before fully seating this end, ensure the image embedded on one side is up. This is not critical, but makes it easier to insert the microSD card later as the pins will always be down.

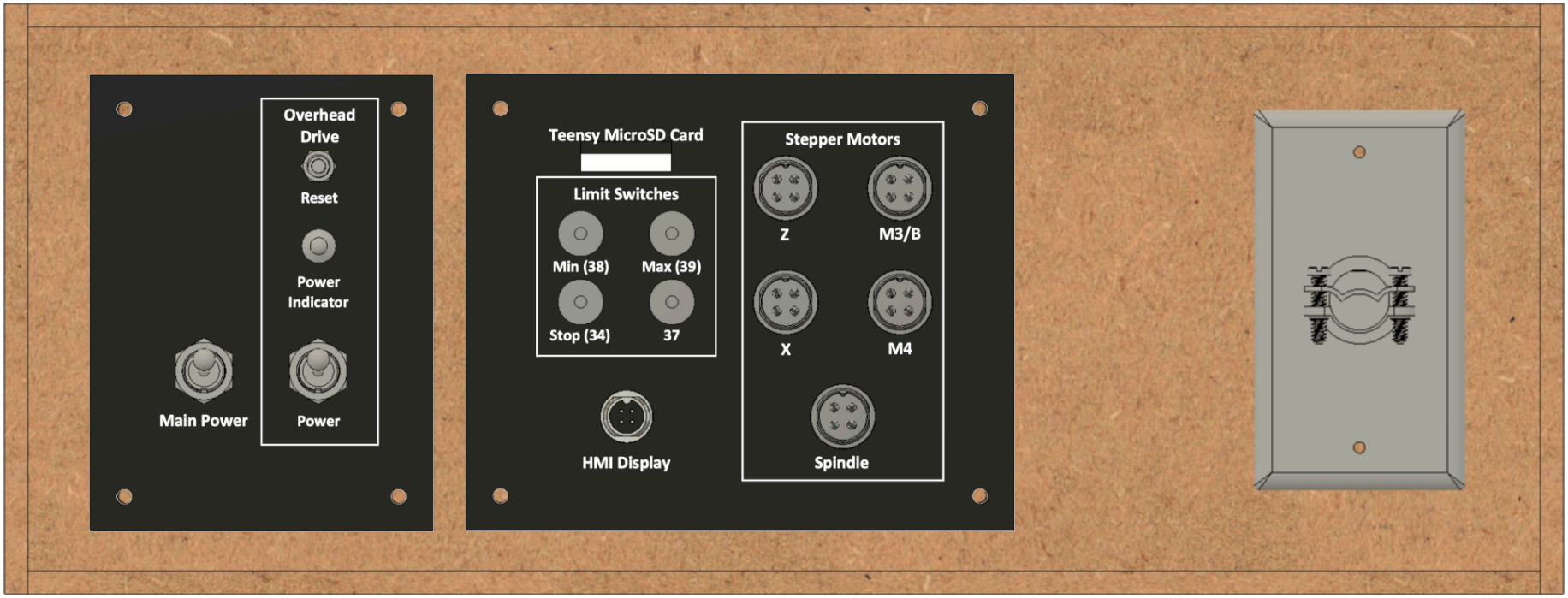


Continue on to Section 2, starting on pg. 34.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Section 1, Option 3 – Controls Box Enclosure, v3



1. A top and bottom made from ¾” MDF,
2. Four sides made from ¼” MDF.

The four ¼” thick sides are screwed to the ¾” MDF used for the top and bottom.

Replacing the top, and removing the sides reveals the view to the left.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Before Assembly

The following instructions should be followed before assembling the controls box

Bottom

This is made from ¾” MDF.

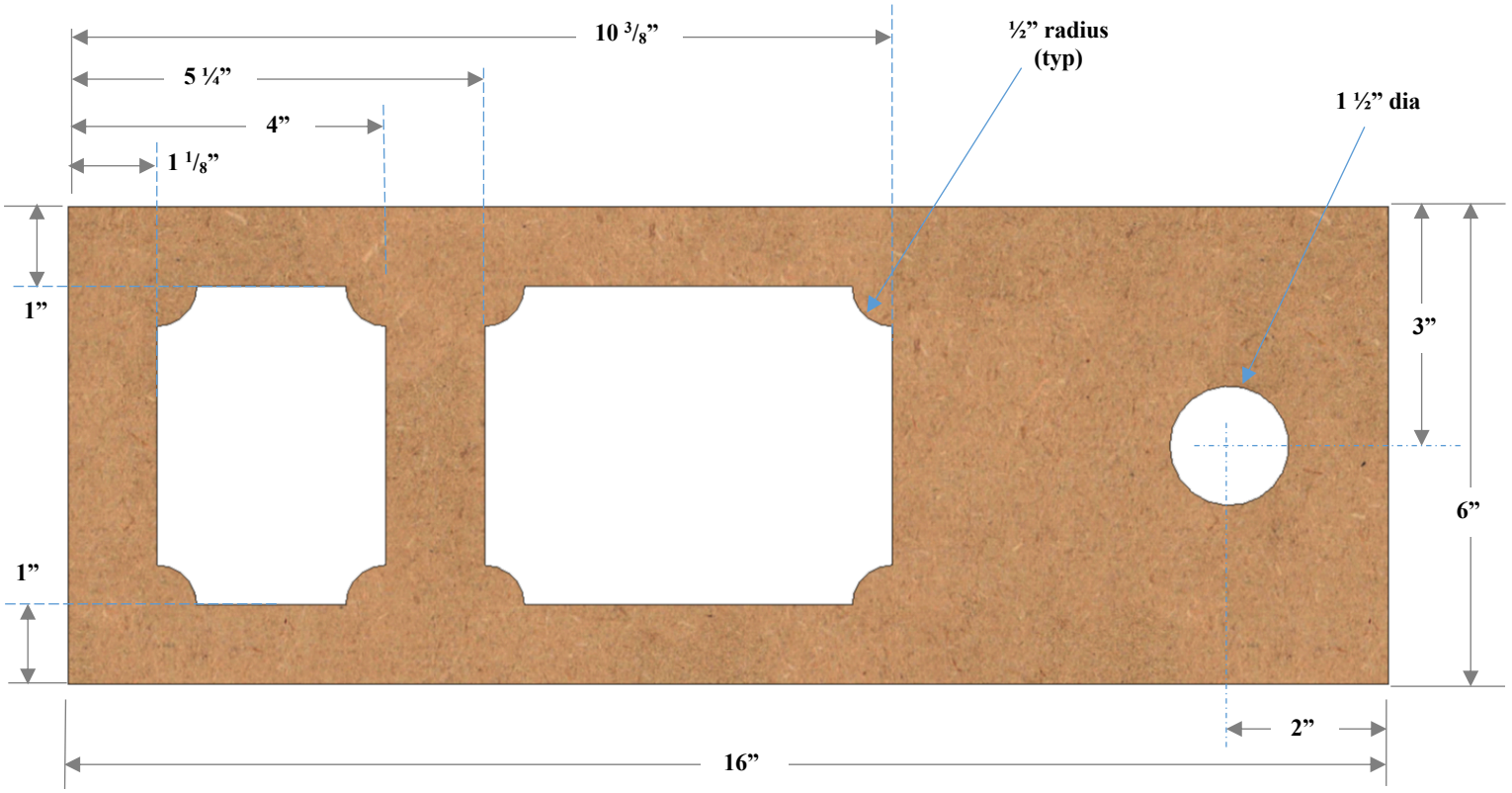
MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Top

This is made from ¾" MDF. This layout is for the version 2 or version 3 plate in the book titled, 3D Printed Parts. If you use version 1, modify the layout as necessary.

For the 3D-printed plate's mounting holes, it is best to drill them based on the plate's position after cutting the opening. Do be sure it is properly aligned before drilling the holes.

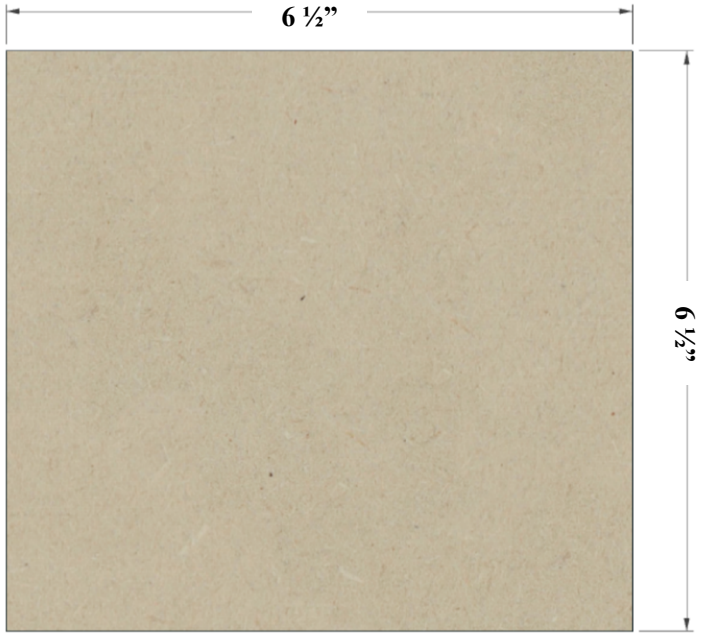


Long Sides (2)

There are two of these, and they are made from ¼" MDF.

Short Sides (2)

There are two of these, and they are made from ¼" MDF.



MDF Rose Engine Lathe 2.0

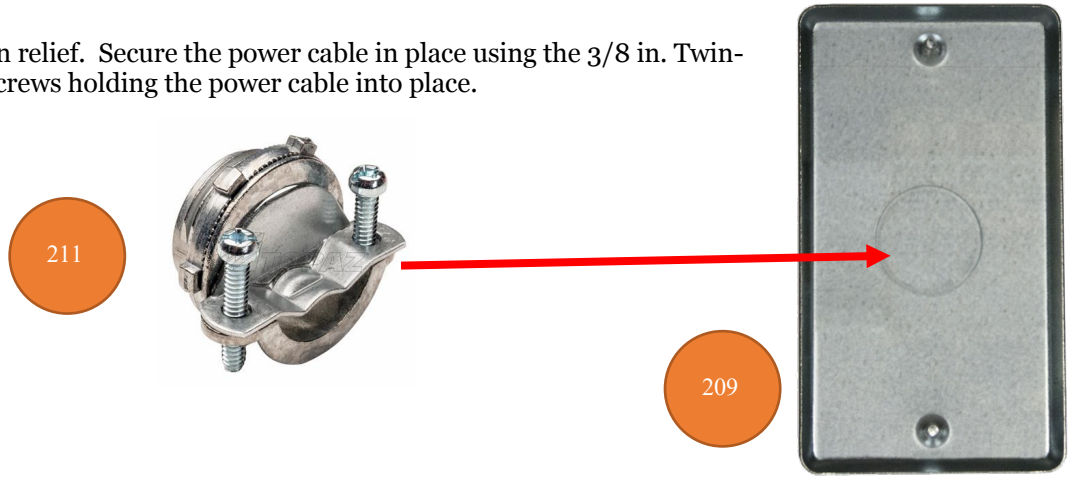
Build Instructions – Control System for Multiple Stepper Motors

Assembly

Plates for Connectors

Power Infeed

Use a 1-gang plate with the hole punched out for the cable strain relief. Secure the power cable in place using the 3/8 in. Twin-Screw Cable Clamp Connector. Wait until later to tighten the screws holding the power cable into place.

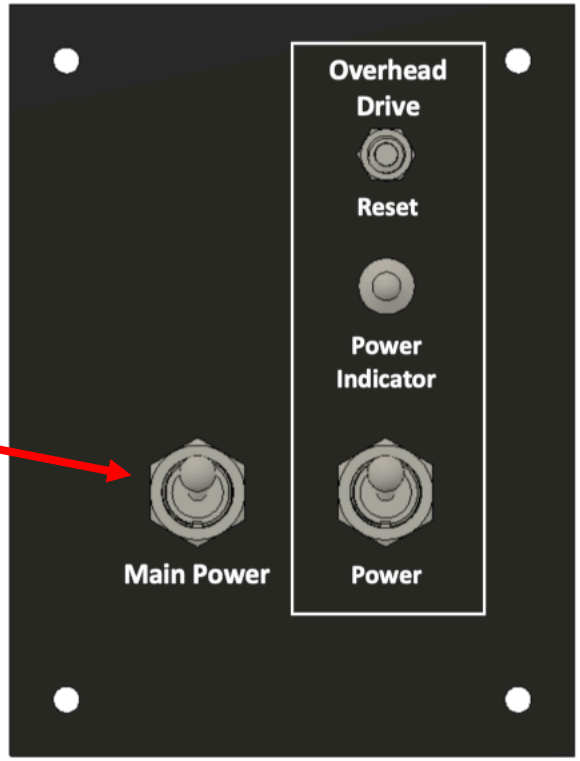


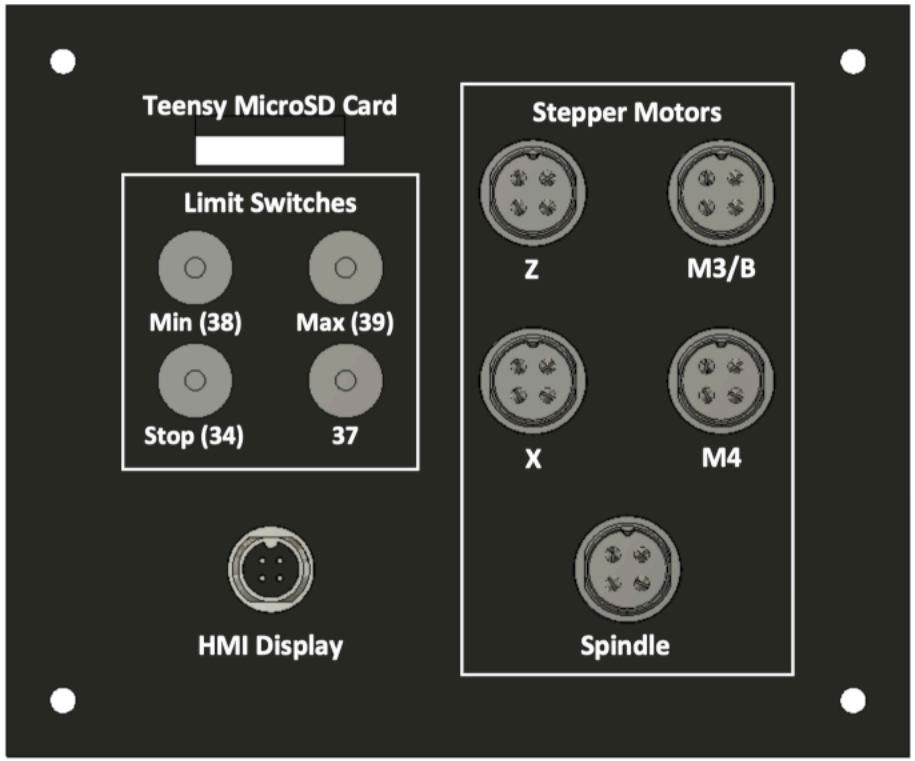
MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Power Switch

Use the 3D-printed plates and install the main power switch in the position indicated.





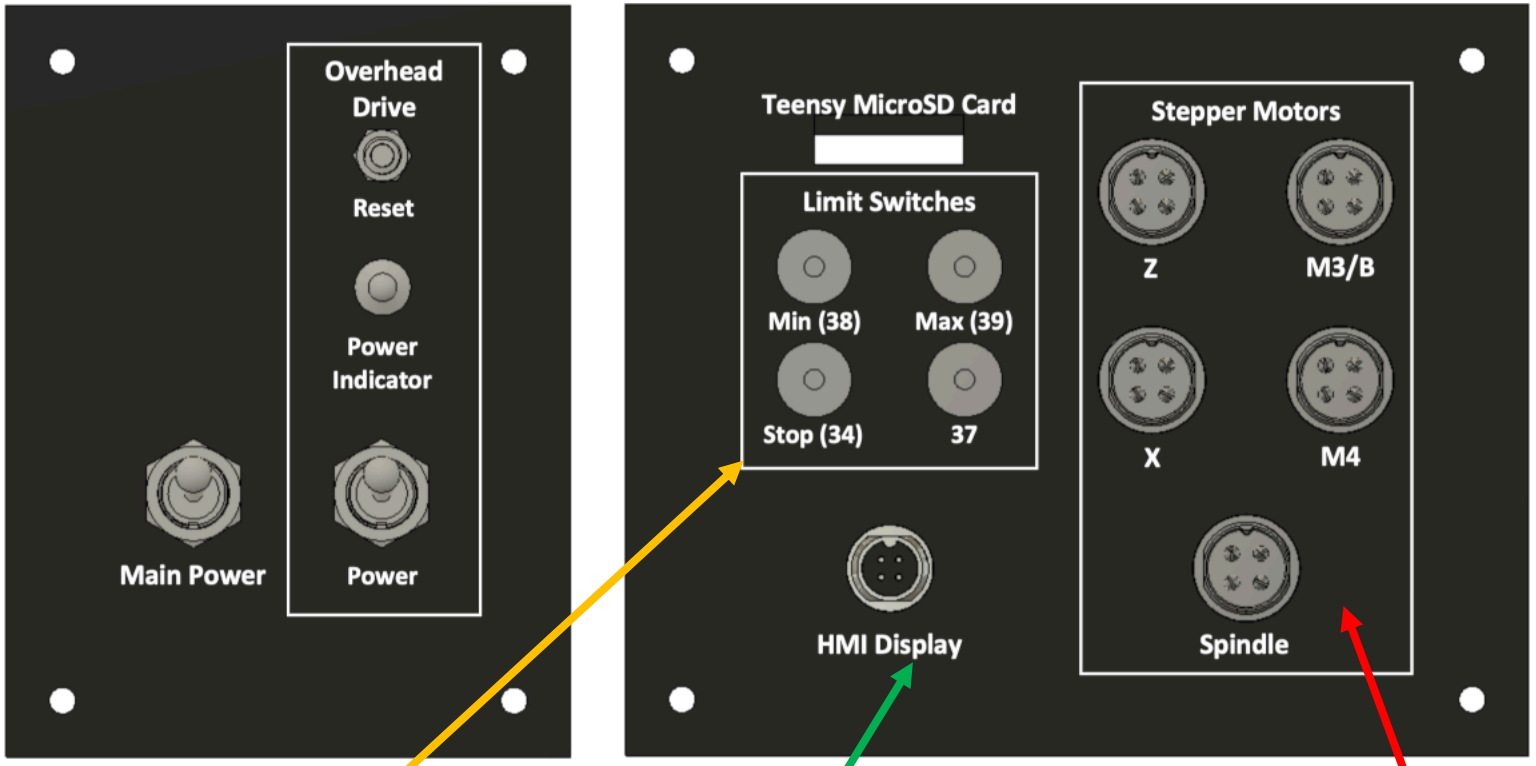
The positions indicated for the overhead drive are a separate option, and detailed in "Instructions for Building Jigs, Fixtures, & Add-Ons".

Once the power switch has been installed, this plate can be attached to the MDF top. That is recommended as this allows for the wiring to be tied neatly down. When attaching the plate, try to clock the screws. This will provide a nicer look. (This is a nice web site showing more on that ➔ https://blog.lostartpress.com/2019/04/18/the-church-of-the-clocked-screws/)

DO NOT POWER IT ON YET. Unless you have covered the switch's terminals, they will have power on them and can shock you easily.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors



Limit Switch Jacks
Install these jacks in the positions indicated.

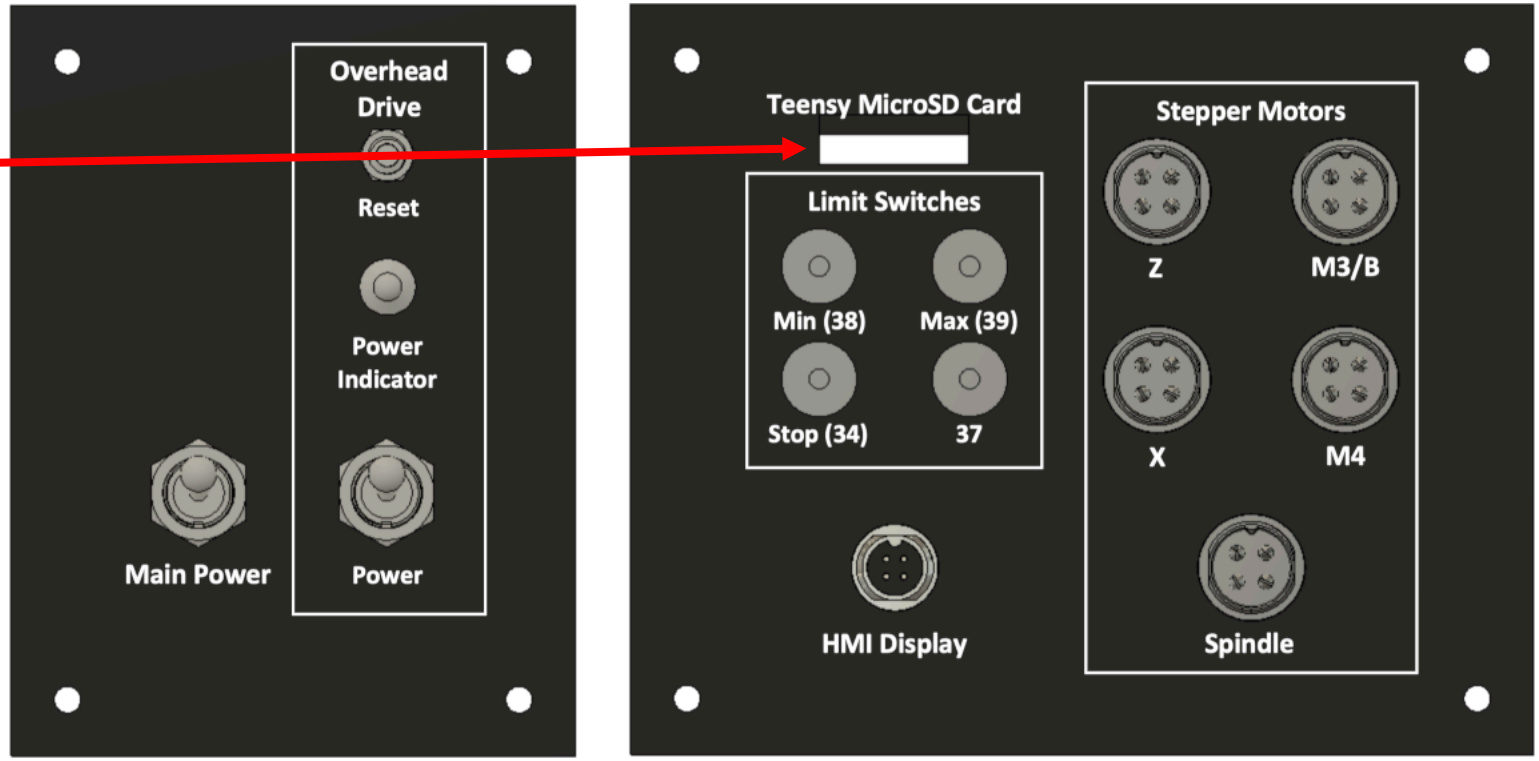
HMI Jack
Install the HMI jack in the position indicated.

Stepper Motor Jacks
Install these jacks in the positions indicated.

MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

microSD Extension
The microSD extension cable is installed here.



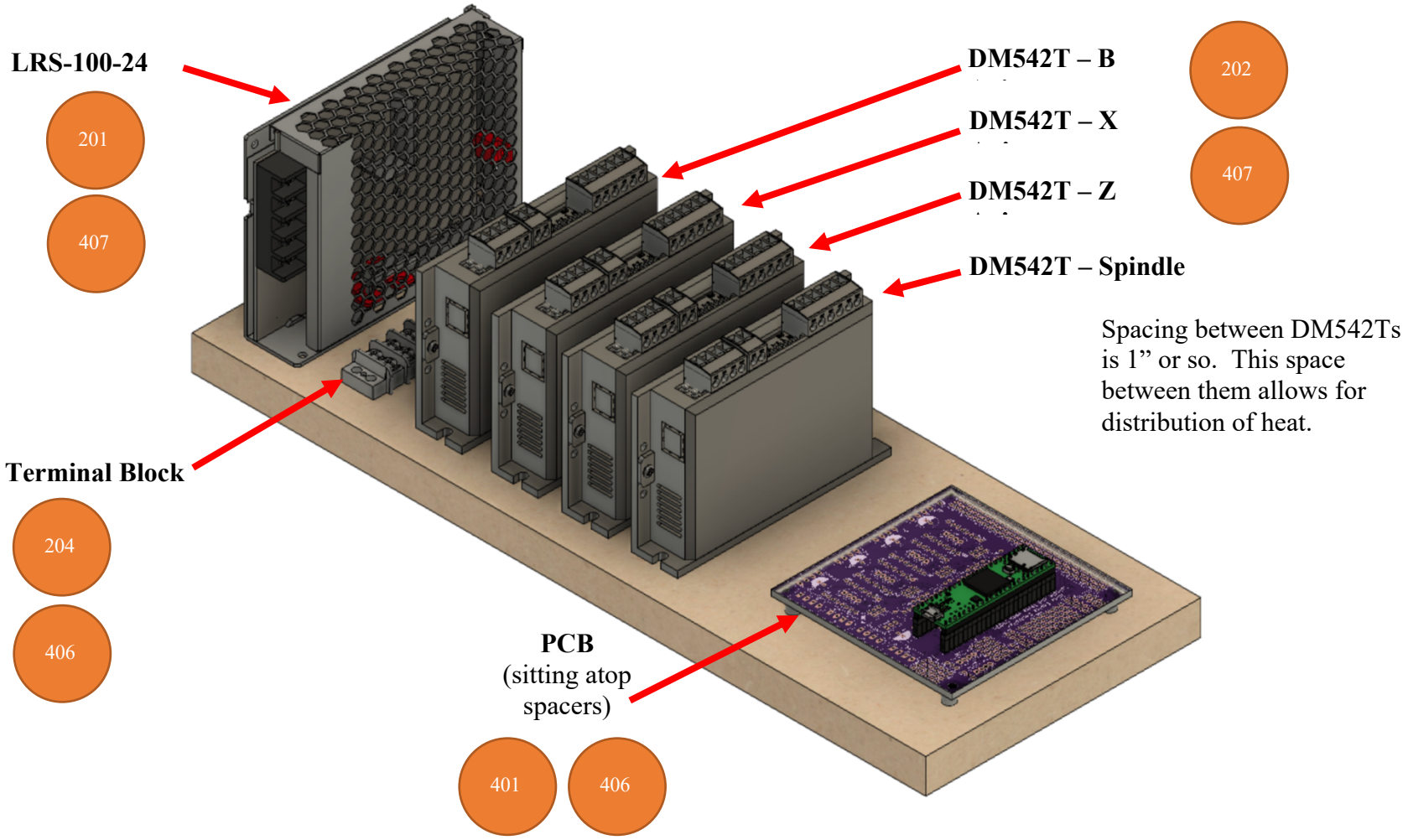
Insert this end first

And before fully seating this end, ensure the image embedded on one side is up. This is not critical but makes it easier to insert the microSD card later as the pins will always be down.

Section 2 – Assembly of the Control Box Electronics

Mounting Electronics to the MDF Base

Mount the electronics to the base piece of the MDF. The PCB is secured to the MDF with the ¼" spacers under the 4 corners to place the board so that there is a ¼" gap below.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

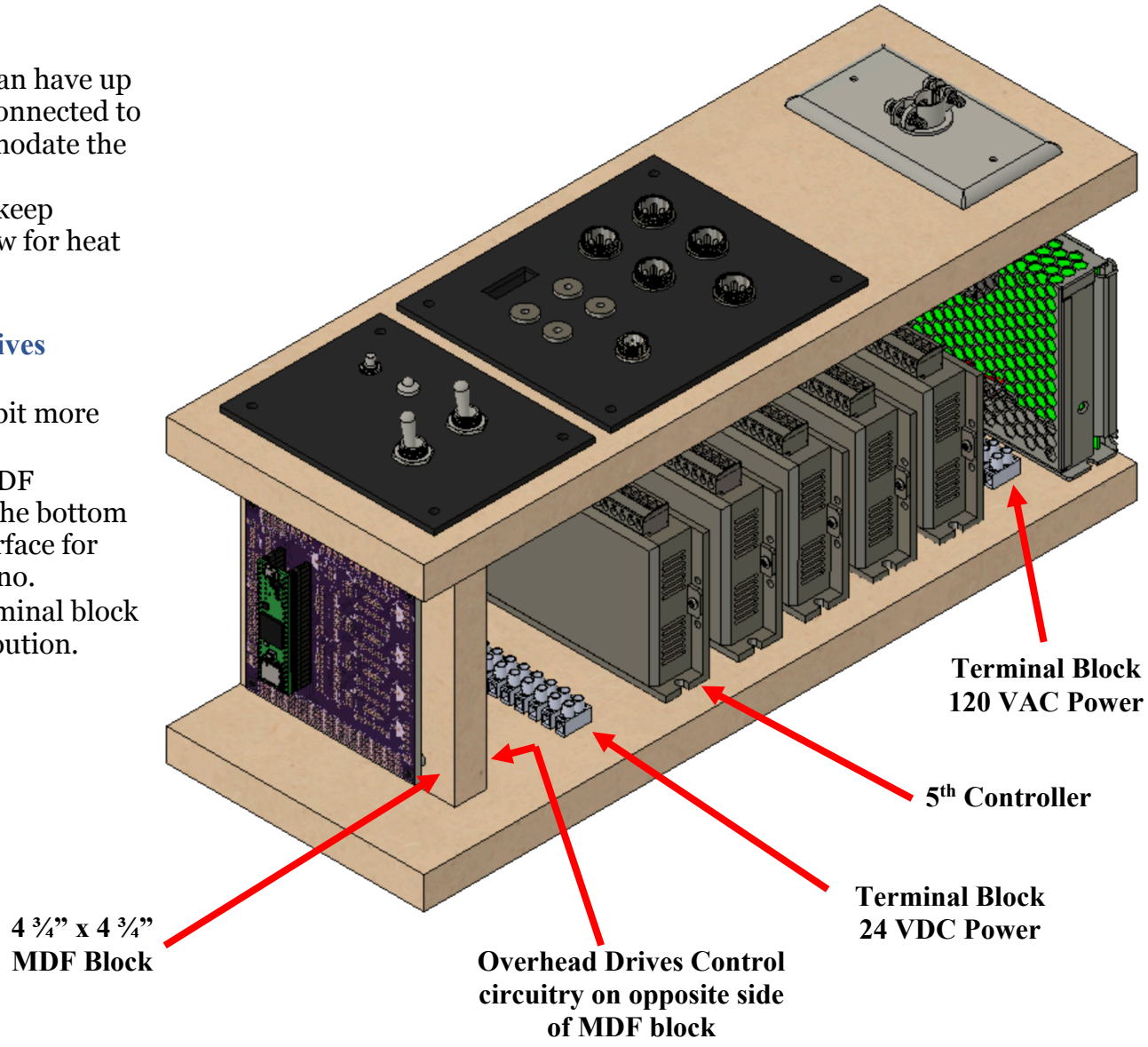
Notes Regarding the V3 Board

- When using this board, you can have up to 5 controllers (DM542Ts) connected to 5 stepper motors. To accommodate the 5th controller, space them out appropriately, but be sure to keep spacing between them to allow for heat to evacuate.

Notes Regarding the Overhead Drives Control

This option requires adding quite a bit more electronics and wiring. Thusly,

- Consider adding a piece of MDF mounted perpendicularly to the bottom board. This will provide a surface for mounting the PCB, the Arduino.
- You should also add a 2nd terminal block for the 120 VAC power distribution.



MDF Rose Engine Lathe 2.0

Build Instructions – Control System for Multiple Stepper Motors

Document Version History

Ver	Date	Comment
4.0	08 Jun 22	• This update accommodates the use of 3D-printed face plate.
3.0	19 Aug 21	• Original document split into 3 parts to allow for different case configurations to be handled easily.
2.1	14 Aug 21	• Changed pins used for limit switches • Added information regarding different Teensy and Nextion displays.
2.0	13 Jun 21	• This document incorporates changes to the way cables are attached to the PCB. It now shows how to use connectors in lieu of soldering the wires directly to the board.
1.4	10 Mar 21	• Reorganized a few steps to follow better flow of work. • Added notes on using GX-12/4 connector for Nextion display. • Updated instructions for loading software to reference web site. • Also added a few minor other tweaks.
1.3	01 Jan 21	• Added item numbers for optional build using a Pololu Tic (this is a separate document). • Renamed Document
1.2	15 Dec 20	• Added parts to the bill of materials • Added details on the installation of the 3.5mm phono jacks.
1.1	10 Dec 20	• Added details for optional configurations. • Added information for attaching the stepper motor to the headstock
1.0.2	07 Dec 20	• Updated p/n for item #204; also updated p/n & qty for item #102. • Added note on soldering on 3.5mm jacks first.
1.0.1	05 Dec 20	• Updated commentary about stepper motor needed. • Added information about stepper motor mount, pulleys, and belt. • Updated drawing dimensions.
1.0	01 Dec 20	Initial document

To the extent that material may appear to be infringed, we assert that such alleged infringement is permissible under fair use principles in U.S. copyright laws. If you believe material has been used in an unauthorized manner, please contact me at ColvinTools@Gmail.com.

The layout of the Printed Circuit Board (PCB) is copyright Ed French and is used with his permission.

Permission is not granted to manufacture these for sale.