Compact Main Base Build Instructions

These instructions explain how to build the Gugusse Compact Motion Picture Film Scanner Main Base. This is the bulk of the device including three different sub machines that interact with each other. There are lots of techniques utilized here based on previous experiences but this is NOT the only way to build the device and have it be fully functional.

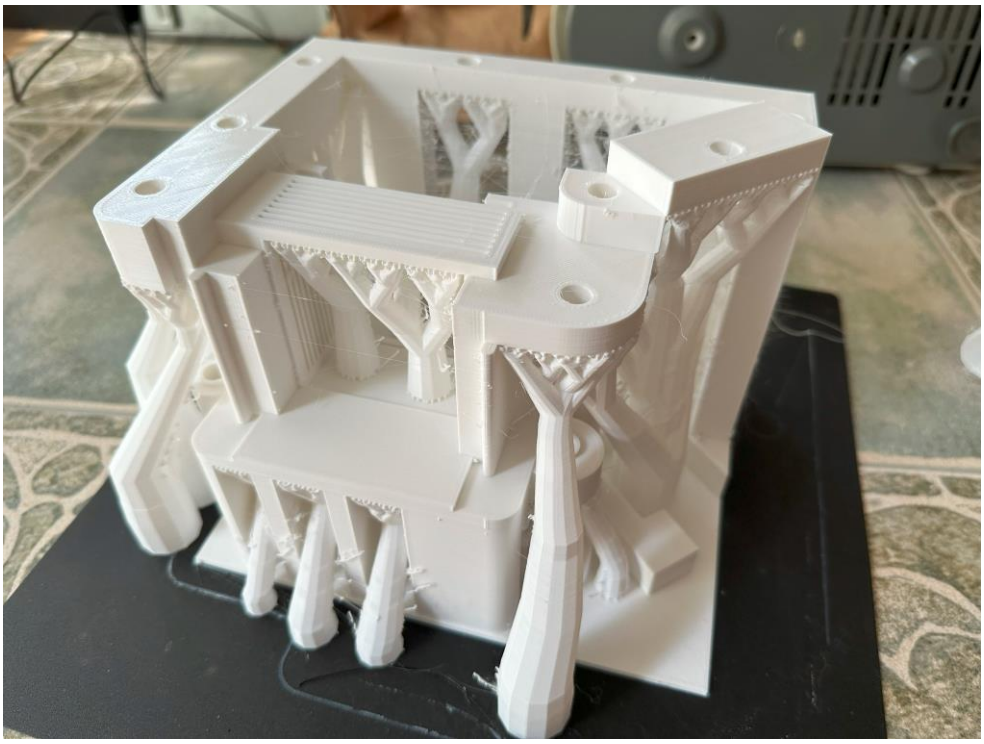
Purchased Parts Required:

ITEM	QTY	NOTES
608ZZ Ball Bearings	24+	16 additional for each additional format that you'll be scanning.
Longboard Wheel	1	65mm High, 75mm Diameter, 8mm Inner shaft, 73a Hardness.
Rods - 4mm X 150mm (6")	1	Rod should be strong and smooth (Polished Stainless Steel for example). Amazon B082ZNJ1DH
Rod – 8mm (0.315 inch) diameter, 15cm length (6 inches)	11	Rod should be strong and smooth (Polished Stainless Steel for example). Amazon B07XP4H2K5
F684ZZ Mini Ball Bearings Double Shielded Flanged Ball Bearings for 3D Printer Model 4x9x4mm	2	Amazon - B07CKLBBXX
4mm to 5mm Brass Shaft Coupling Joint Connector, Motor Shaft Coupling for RC DIY Airplane Boat Robot	1	Amazon - B0C1RD6KFY
Nema17, 42-34, 12v, 1.8 degrees/step, stepper motor	1	Bi Polar – 4-Wire. **Must have a D-Cut in shaft!**
LED ENG NW 3LEDS 4200K	16	Digikey 1647-1030-1-ND
Photocell	1	Digikey NSL-19M51
Sensor Optical 15mm Module	2	Digikey Z3028-ND
Connector HSG 3 Pos 2.50mm	2	Digikey A112637-ND
Connector Pin 20-26AWG Crimp Tin	6	Digikey A100469CT-ND (Get Extras)
12" Light Pipe - Thick	2	Digikey 492-SZ4-10.00-F5P-ND
Connector Housing	1	Digikey WM2900-ND
Connector Pins	2	Digikey WM2512-ND (Get extras in case you mess up the crimp.)
Housings Receptacle White 0.098" (2.50mm)	3	Digikey 2057-25CH-B-04-ND
APT, UHMW (Ultra-high Molecular Weight) Polyethylene Tape (2" x 5Yds, 5 Mil UHMW)	1	Amazon - B08CFVTX7T
Pre-Crimped Wires	10	Digikey 455-3241-ND (Get extras "in case")
26 Gauge Stranded Wire - Yellow & Black	36" Each	Amazon - B073QJZ3PD
22 Gauge Stranded Wire - Black	60"	Can be longer depending on the distance to your Circuit board.
22 Gauge Stranded Wire – Red	60"	Can be longer depending on the distance to your Circuit board.
22 Gauge Stranded Wire – Green	48"	Can be longer depending on the distance to your Circuit board.
22 Gauge Stranded Wire – Blue	48"	Can be longer depending on the distance to your Circuit board.
22 Gauge Stranded Wire – Brown (or another color beside Red or Black)	48"	Can be longer depending on the distance from the Gate to the Circuit board.
Small Wire Ties	Many	For holding wires together.
Rubber Bands	Various	Get good quality rubber bands and a variety of sizes.
Matte Archival Polyester Film	1 Pad	Grafix Matte 0.005 Dura-Lar Film - P05DM0912

Printed Parts Required:

Some words on printing in general. The Main Base is MASSIVE. The one pictured below took over 4 days to print. It is suggested that you print the Theatre Sleeve and any Hole Sensors in solid plastic (100% infill). The Sleve is very fragile and since the Hole Sensors reflect light, you want to have as little possibility of light leakage as possible. Again, these are just suggestions.

ITEM	FILENAME	PRINTING NOTES
Main Base	GugusseCompact.stl	Can be printed in Black or White. Suggested to slice with Ultimaker Cura in the Dynamic Quality mode with Tree supports everywhere at 40% Infill or better.
Back Light Panel	BackPanel.stl	Must be printed in White.
Big Swivel Arm	BigSwivelArm.stl	Print so it's strong. Color not important.
Small Swinging Arm	SmallSwingingArm.stl	Must be printed in Black – Qty 2 – Print so it's strong.
Conic Support	ConicSupport.stl	Can be replaced with Washers or Bearings.
Opto Coupler Top and Bottom	OptocouplerThickLightpipe.stl	Must be printed in Black. Must use new thicker lightpipe listed in parts.
LED Lightsource Box	led2lightpipeThickLightpipe.stl	Must use new thicker lightpipe listed in parts. Any color.
Theatre Sleeve	DarkSleeve.stl	Must be printed in Black – Probably optional for a Black Main Base. Print at 100% infill because it's very fragile.
Gate and Hole Sensor 8mm	GateAndHoleSensor_8mm.stl	Print if you're scanning 8mm film – Must be Black. Print high quality.
Gate and Hole Sensor Super 8	GateAndHoleSensor_Super8.stl	Print if you're scanning Super 8 film – Must be Black. Print high quality.
Gate and Hole Sensor 9.5mm	GateAndHoleSensor_Pathex.stl	Print if you're scanning 9,5mm film – Must be Black. Print high quality.
Gate and Hole Sensor 16mm	GateAndHoleSensor_16mm.stl	Print if you're scanning 16mm - Must be Black. Print high quality.
Gate and Hole Sensor 35mm	GateAndHoleSensor_35mm.stl	Print if you're scanning 35mm film - Must be Black. Print high quality.
8mm Fixed Height Flywheel	GCFlywheel8mm.stl	Print if you're scanning 8mm or Super 8 film - Qty 8 - White Suggested.
9,5mm Fixed Height Flywheel	GCFlywheel95mm.stl	Print if you're scanning 9,5mm film - Qty 8 - White Suggested.
16mm Fixed Height Flywheel	GCFlywheel16mm.stl	Print if you're scanning 16mm - Qty 8 - White Suggested.
35mm Fixed Height Flywheel	GCFlywheel35mm.stl	Print if you're scanning 35mm film - Qty 8 - White Suggested.



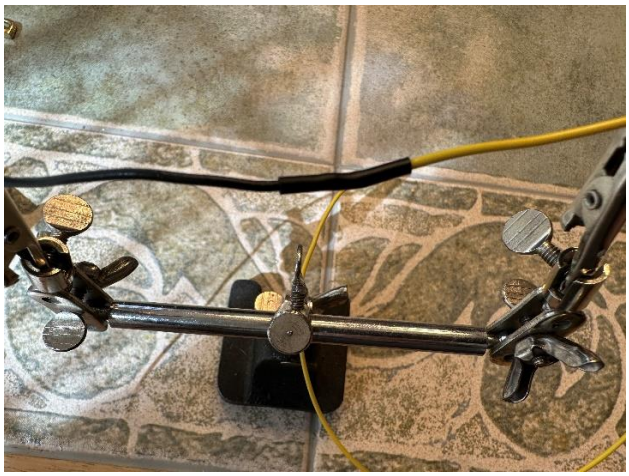
Wire Connection Technique

This section describes some a method for connecting wires together. You can use any method you want, this is just an example of how I've done it.

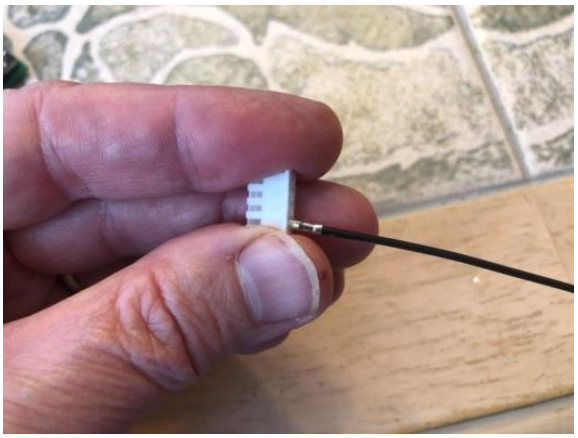
Hook & Solder

This method allows you to connect two wires in-line with each other quickly and securely. After stripping the end of the wires, twist them tight and make little hooks out of them by bending them with pliers or just your fingers. Connect them together and close the hooks.

Solder the wires together. Cover with shrink tubing and use a heat gun to shrink the tubing. Remember that you might need to put the shrink tubing on prior to making the connection.



The pins of the pre-crimped wires snap into the connector as shown with the locking pin engaging in the hole at the top.



Use Wire Ties to keep the wires together. Warning: Resist the urge to twist or braid the wires together. This can cause interference issues.

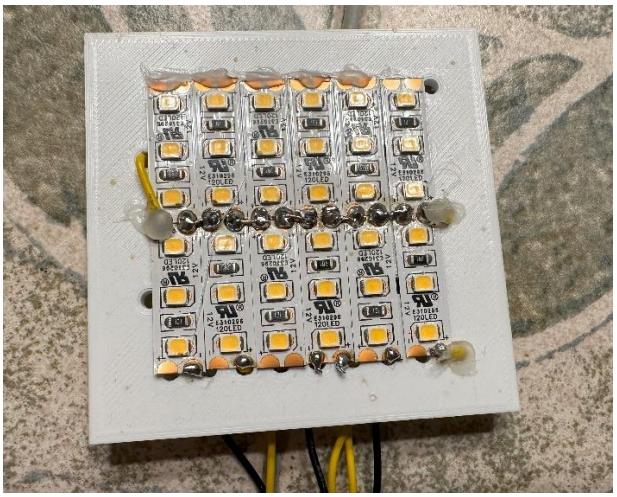
Notes on Bearings

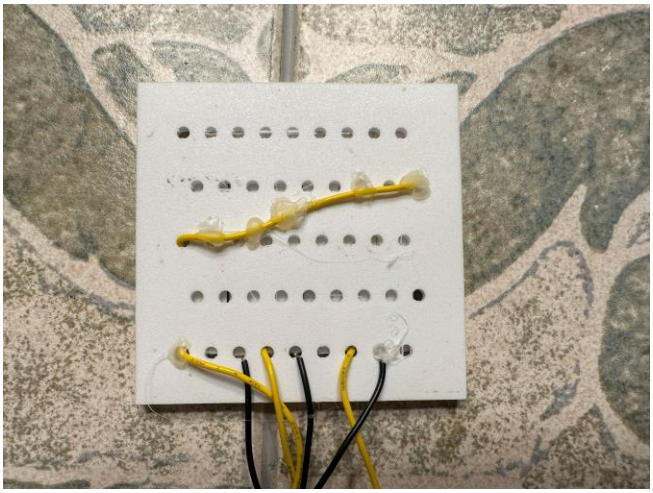
The Gugusse Compact uses a LOT of bearings. These need to be performing at top level or there will be random issues with your machine. Inexpensive bearings usually have the problem of being under lubricated or just plain gunked up. There are lots of methods to free up bearings on the internet. Here are a couple we've tried:

1) Soak them in Motor Oil - Put them in a disposable container and pour Motor Oil over them. If they are the type that have a removable bearing cover, remove it before soaking.
2) Soak them in Gasoline for a day or so, then Soak them in Motor Oil. The gasoline will help break down the original lubricant. Don't delay when moving them from the gas to the oil as they can rust when left without a coating on them.

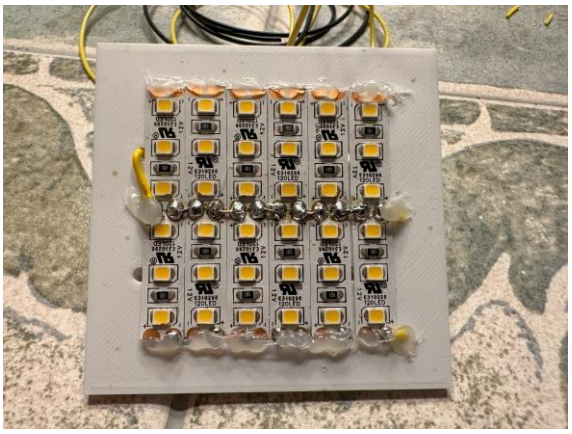
Building the Back Light Panel

There are six strips of six LEDs mounted on the front of the “Back Light Panel”. Arrange them vertically and so that the Positive and Negative contacts match in the middle line. The adhesive on the strips will hold them while you work. In our example below the left contact is positive, the second is negative, the third is Negative, etc. Solder a jumper wire between all of the center contacts going between the strips. This is tedious but will reduce the number of wires in half. Solder a yellow 26 gauge wire (routing on the back of the panel) between the two remaining Positive strips.





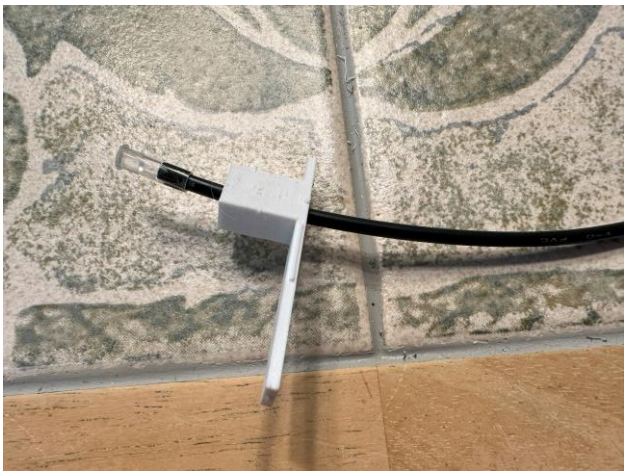
Cut 3 Black and 3 Yellow 26 gauge wires to about 4” (10cm) each and solder them to the appropriate contacts on the front of the panel through the holes. Secure all of the strips with hot glue to prevent them from falling off in the future. Cut one Black and one Yellow 22 gauge wires to about 24” (70cm) each. Connect the 3 Yellow wires to the single Yellow wire by soldering them together and cover with shrink tubing. Do the same for the Black wires. Put a couple of wire ties on the wires as shown to help with strain relief.



If you have a 12V power supply of some sort, test that the LEDs all light properly by hooking positive to Yellow and negative to Black. Install the panel in the Main Frame as shown and run the wires through the hole in the back. Hot glue the wires down as shown to keep them in the bottom of the unit and out of the way of where the tensioner arms will be swinging.

Cut two pieces of 22 gauge wire, one black, and one yellow to 24" (70cm) or so. Route them through the end hole of the LED Lightsource Box. Cut a strip of 6 LEDs (two strips) and solder the yellow to positive and the black to negative in the middle of the strip as shown below.

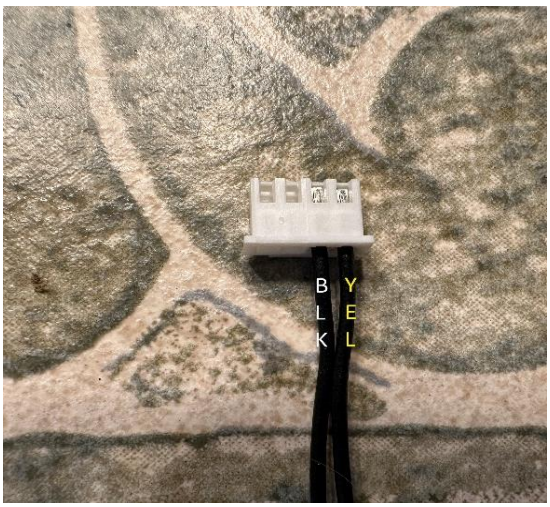
Peel the adhesive from the strip and put it at the bottom of the box. Put the Lightpipe through the box top as shown.



Snap the top to the bottom. You can test the lightpipe by putting 12V power to the LEDs. Glue the top to the bottom with some hot glue (not shown).

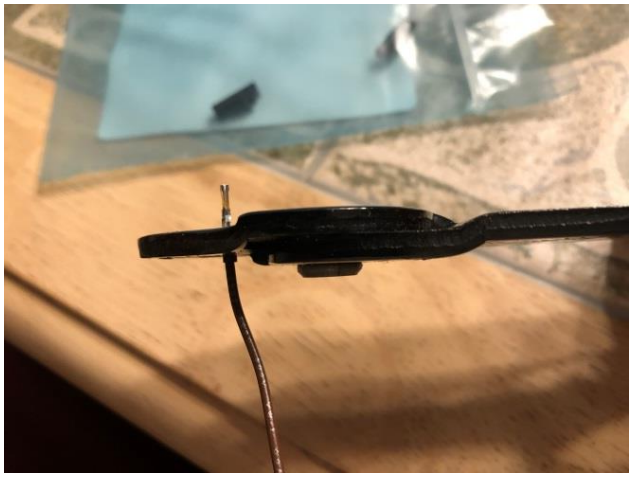
Cut the Yellow and Black wires coming out of the back of the unit to about the 4” (10cm) point and strip the wires. Connect the LED Lightpipe wires to LED Back Panel with the remaining wires you cut off by twisting, hooking, soldering and covering with heat shrink tubing. You now have a single set of wires to power all of the LEDs.

Attach the Yellow wire to a Pre-Crimped wire. Do the same for the Black wire and cover with shrink tubing. Push the ends of the pre-crimped wires into a Housings Receptacle with the Yellow wire on the right and the Black wire next to it as shown below. Use wire ties to hold the wires together for the length of the wires.

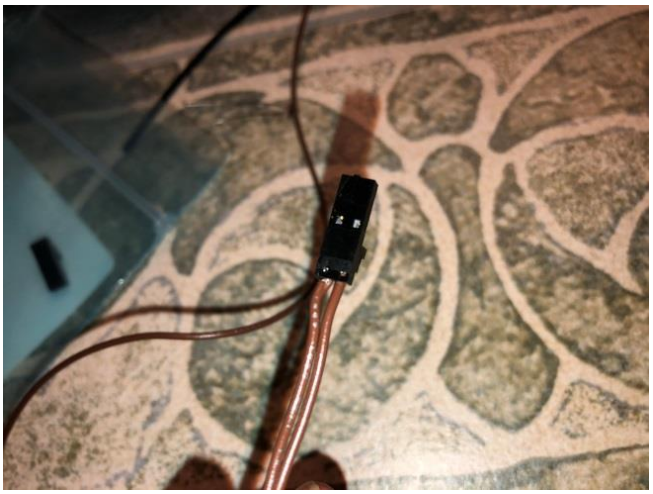


Test fit the Photocell into the Opto Coupler Bottom and cut back the leads a few millimeters so that wires will be insulated inside the coupler (older coupler shown in first illustration). Solder two 24” (70cm) 22 Guage wires of the same color to the ends of the leads.

Position the Photocell in the Opto Coupler Bottom. Insert a Light Pipe as shown. Attach the Opto Coupler Top, and tape or Hot Glue the two halves together. Crimp a Connector Pin (WM2512-ND) onto each of the other ends of the wires.

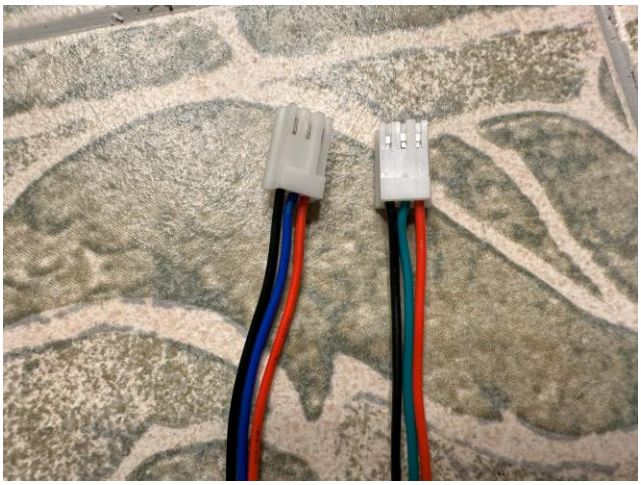


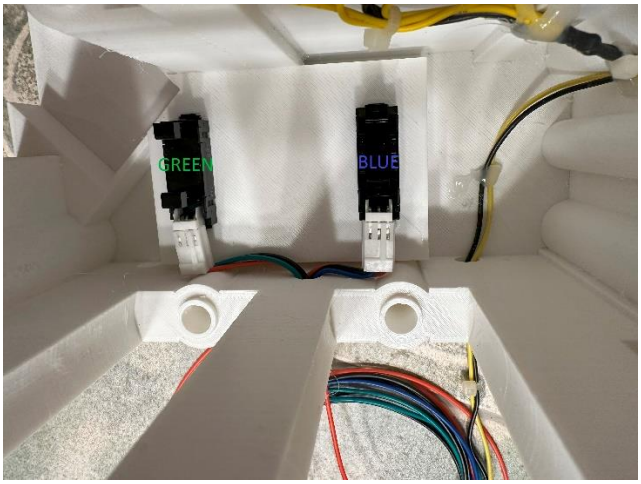
Push the pins into the Connector Housing. Use wire ties to hold the wires together for the length of the wires.



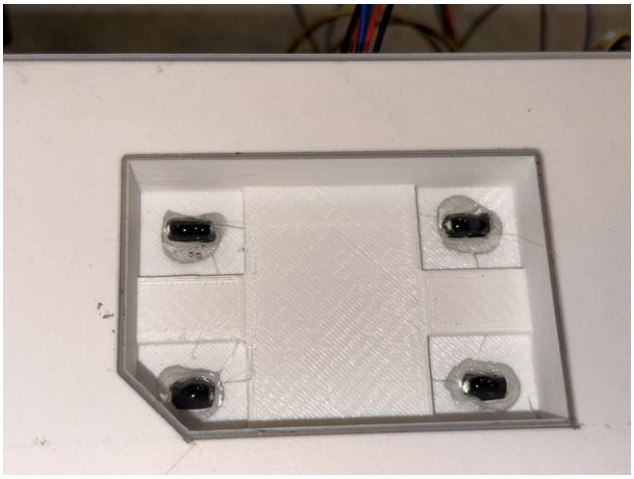
Tensioner Sensors

Cut two pieces of 22 Guage Red wire 24” in length, two pieces of 22 Guage Black wire 24” in length, and a single piece of both Green and Blue 22 Guage wire to 24” in length. Strip the ends on one side of each wire and crimp the A100469CT-ND pins to each of them. Push them into the two HSG 3 Pos 2.50mm Connectors as shown below with the Red wire on the right side of each connector, a Black wire on the left side of each connector, and a Green in the middle of one and a Blue in the middle of the other as below. Feed the wires through the hole on the Main Base and connect a sensor to each set of wires. Snap them into the lower mounting holes on the main base and be sure that the Green Wire is closest to where the motor will be installed. This is the “Right Tensioner Sensor”.

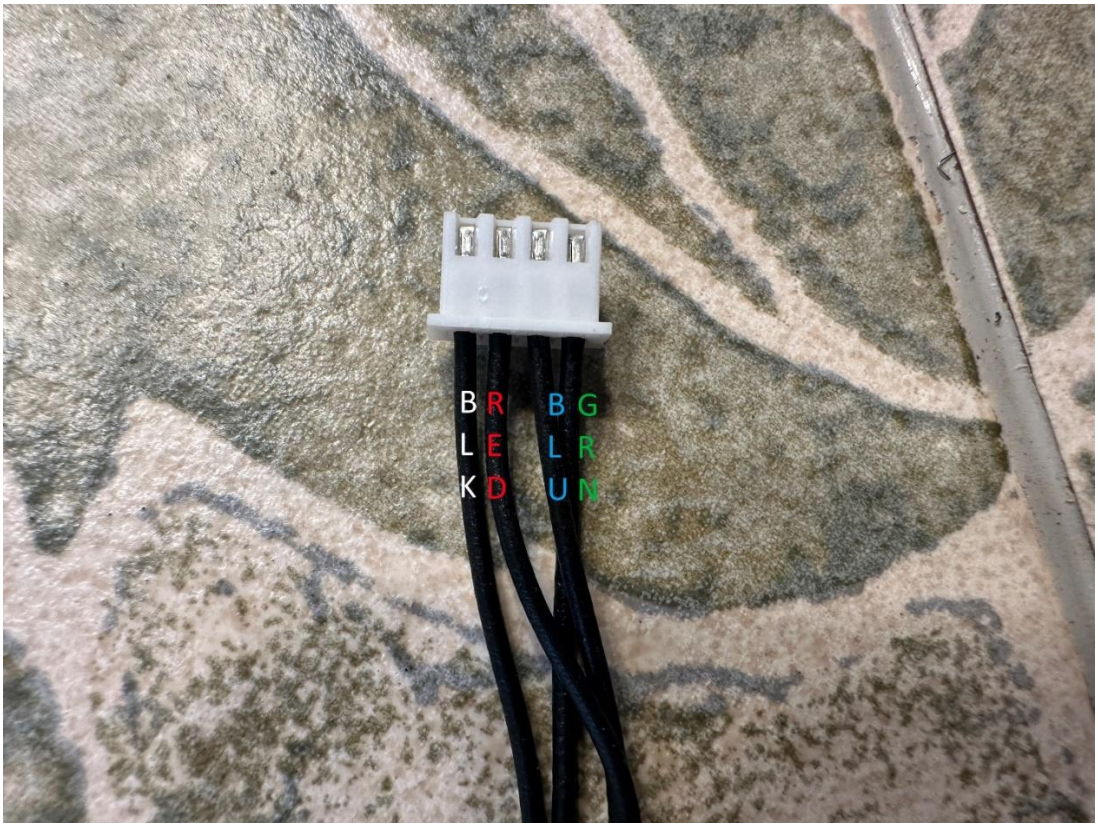




Hot Glue the sensors into Main Base on the bottom. Connect the two Red wires to a single Precrimped wire. Repeat for the two Black wires. Connect the Green and Blue wires to a pre-crimped wire each. You should now have four pre-crimped wires.

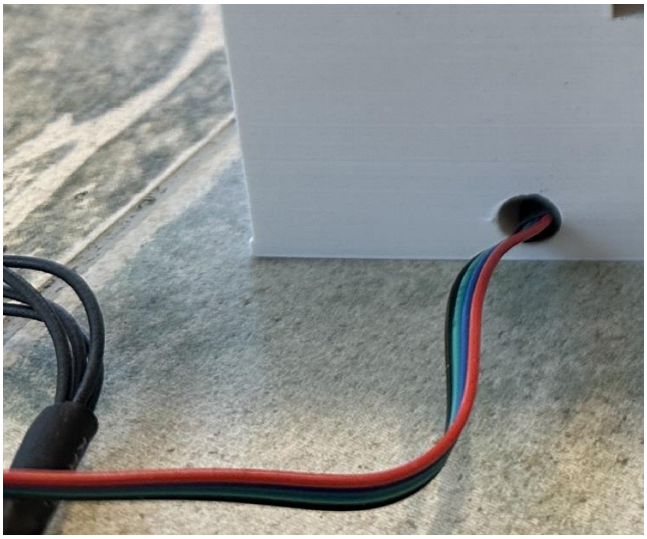


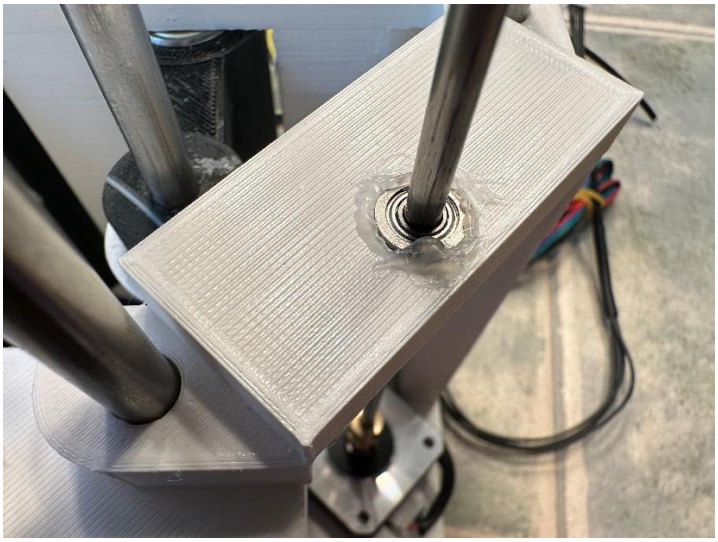
Connect the Black Wires on the Left, The Red Wire next to it, followed by Blue and then by Green. Mark this cable to distinguish it as the sensors. If this is accidentally plugged into one of the motor connectors on the PCB, it will destroy the sensors.



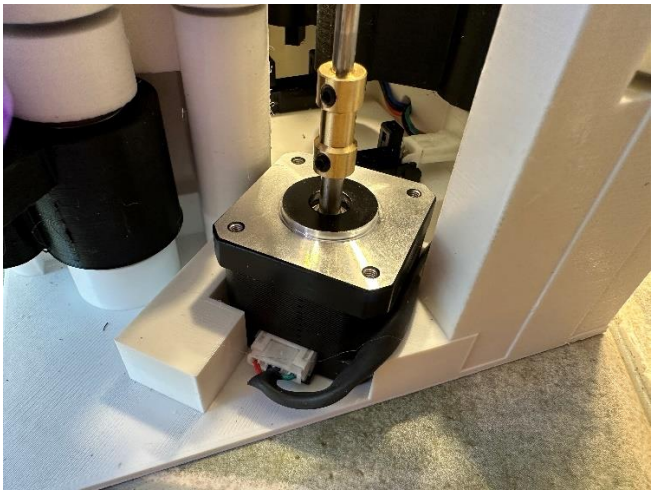
Main Drive Build

Run the Motor wires through the back of the Main Base through the hole provided. If there is a connector on the opposite side of the cable, simply cut it off. We will be attaching crimped wires to them to plug into the Gugusse control board. Push a 4mm Bearing into the top of the Main Frame above the motor mount and hot glue around the edge of it.

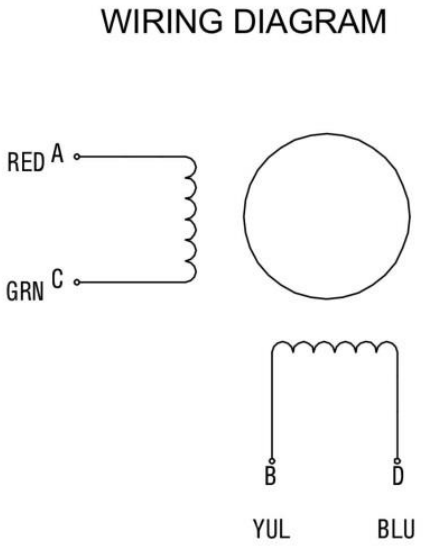




Put the motor in the base with the cables routed behind it. Attach the 4mm to 5mm Brass Shaft Coupling Joint Connector with the 5mm side clamped onto the motor. Push the 4mm Rod through the bearing at the top and clamp it to the motor at the coupling joint.



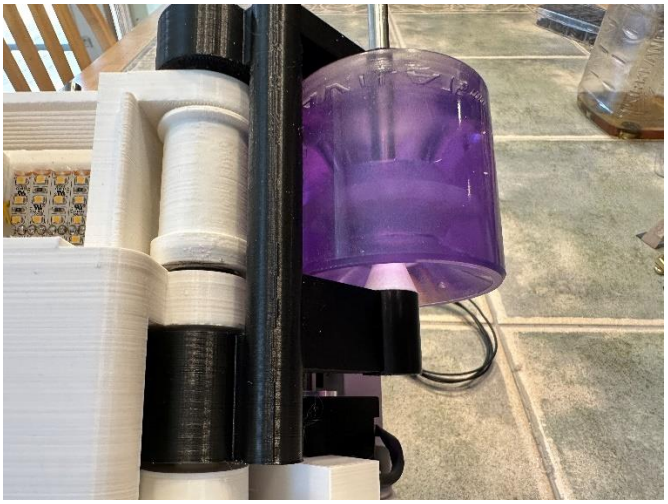
The motor has two windings internally and the datasheet for your motor should show you what two wires go to each winding. In our case, the [Green and Red] and the [Blue and Yellow] are how they are assigned. Connect all 4 wires from the motor to 4 separate pre- crimped wires. Connect the proper pairs into a connector keeping them together. It doesn't matter which pair is on either side as long as they stay together.



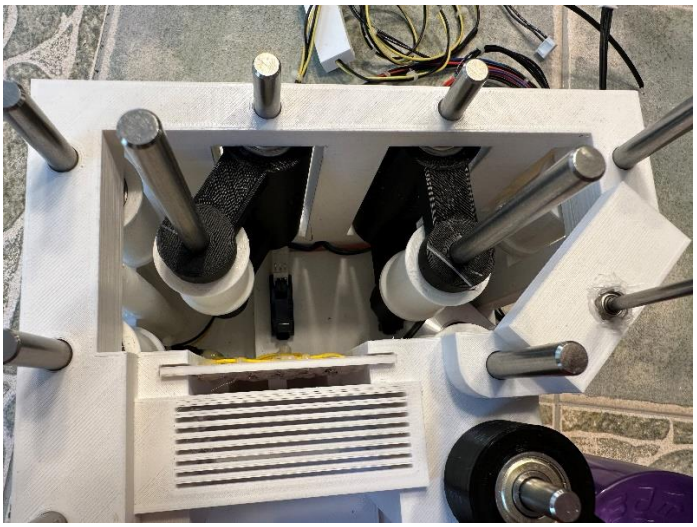
Mechanical Assembly

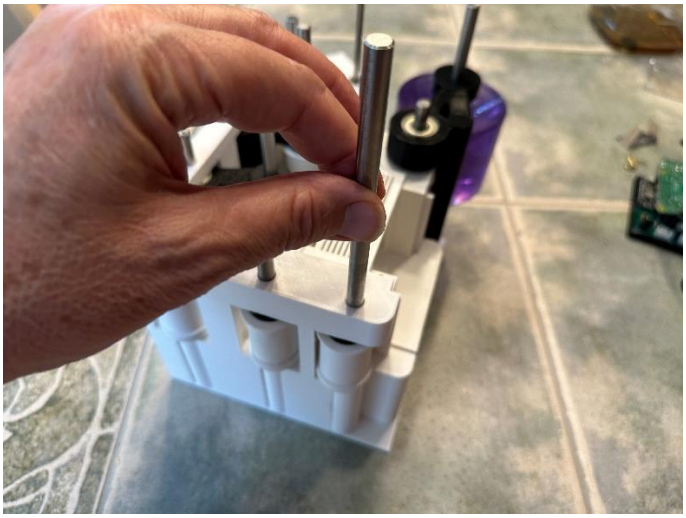
Push a bearing into both sides of the Longboard Wheel. Avoid using tools to install them; your thumb should be sufficient to push them in. There is a shallow and a deep side to the Longboard wheel. The Conic Support will be in the same position as shown below when we assemble it on the shallow side of the Longboard wheel.

Insert the Longboard Wheel with the Conic Support into the Big Swivel Arm and push the 8mm X 150mm (6”) metal rod down from the top through the Longboard bearings and the Conic Support. It’ll take some jiggling to get it but it’ll go all the way through. Put 4 bearings in the Big Swivel Arm. Push an 8mm Rod down through the top of the Big Swivel Arm, the Main Base, a proper sized Flywheel (with bearings), and down to the bottom of the Main Base. It should swivel easily and the Longboard Wheel and Flywheel should spin freely.

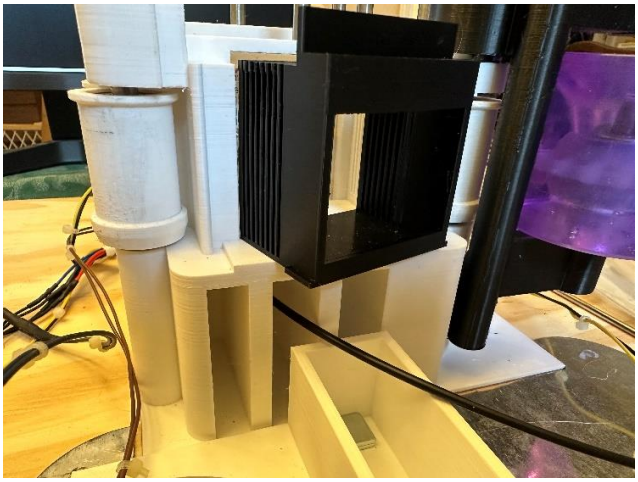


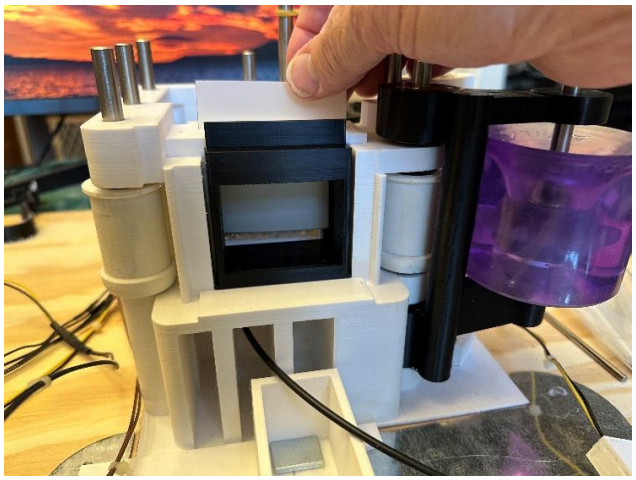
Hang two Small Swinging Arms with 8mm rods and bearings on the back wall. Put two properly sized flywheels (with bearings) on the arms. Put appropriately sized flywheels (with bearings) on all of the remaining spots.



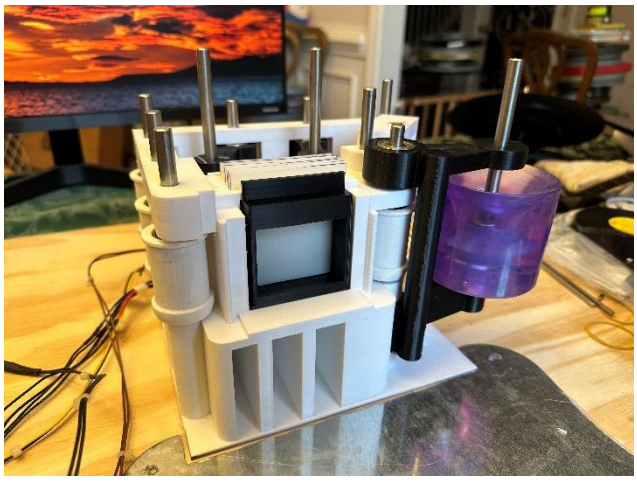


Cut the Matte Archival Polyester Film into eight squares that are 65 X 70mm each. There is a template available on the Wiki page to print the cutting lines with a laser printer on the film. Insert the Theatre Sleve in the front of the theatre. Secure it by inserting filters through the top of the Theatre.



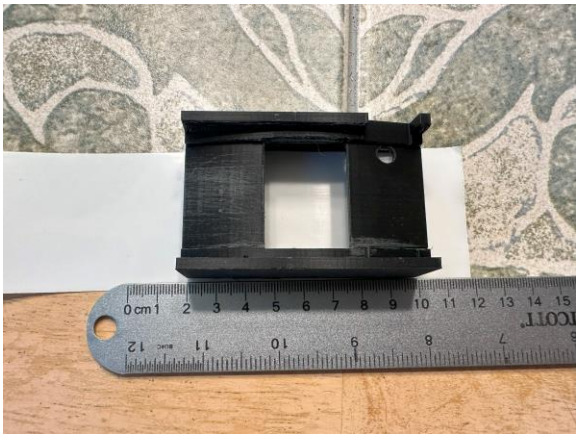


Strip about 4mm of insulation from the two lightpipes. This will allow them to fit in the Hole Detectors. The Main Base is complete.



Gates and Hole Sensors

Cut a piece of the Polyethylene Tape to 12cm. Measure off the width of your gate (in our example 35mm) and put mark on the back of the tape with a marker. Repeat on the other side of the tape and using a straight edge, draw a line between.

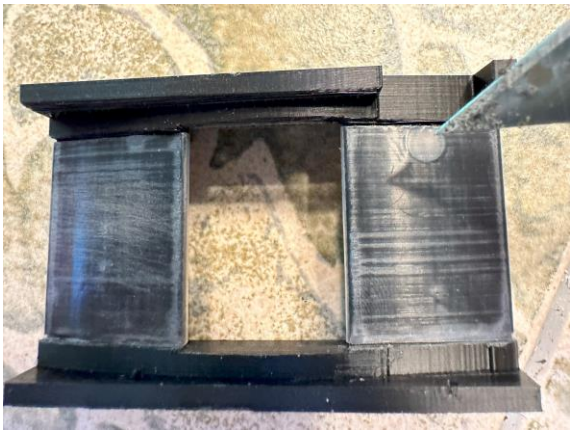


Cut the strip along the line with a razor or scissors. Note, keep the remaining tape, you can use it on a 16mm or smaller gate in the future. The tape should fit inside the track on the gate.

Cut the strip in half, peel, and wrap it around the left side of the gate. Trim so it doesn't overlap on the back.

Do the right side of the gate as well but leave a wide space for the hole detector to not touch on the back.


Use a sharp blade to cut through the hole. Be sure to cut only inside the hole. Use some spots of hot glue to help hold the tape on the back.




Test that the hole detector fits all the way on the gate. The Gate is completed. Repeat for any other formats you plan to scan.


This completes the Gugusse Compact Main Base documentation V1.0.
Gugusse Compact designed by Denis-Carl Robidoux
Documentation by Al Warner
https://www.deniscarl.com/dokuwiki/doku.php?id=start