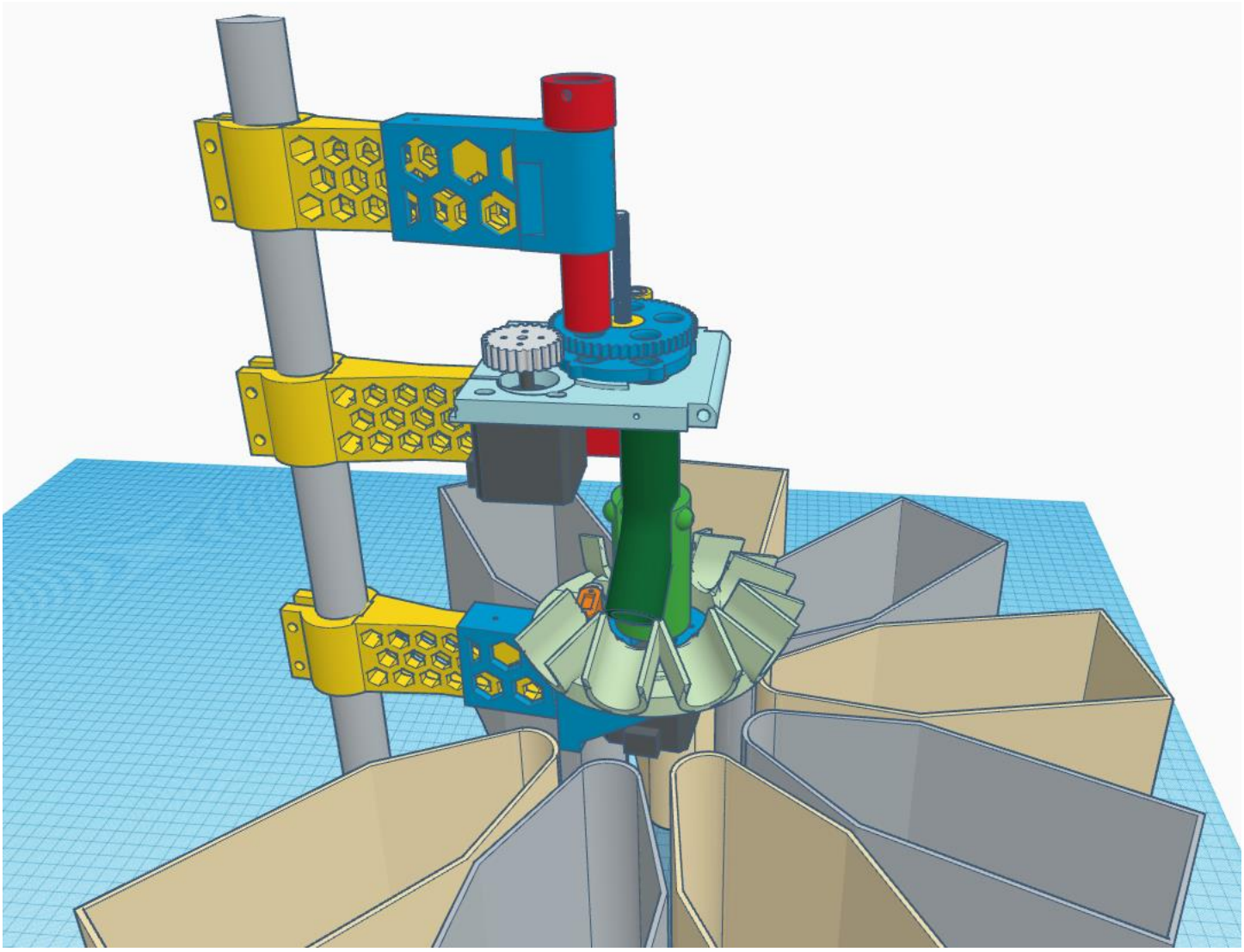
CS7.1 Instructions Manual and Build Guide



Introduction

This document is a guide for those who are interested in creating an AI Headstamp Sorter machine. This document references resources found in the GitHub Repository at https://github.com/sjseth/AI-Case-Sorter-CS7.1

Also available is the video build series at:

Release Video: https://youtu.be/s7dy0odA44U
Classifier Assembly - https://youtu.be/lhxDmvg5AVQ
Electronics - https://youtu.be/cS54LOCpNGc
Sorter Assembly - https://youtu.be/rP7bBV_uqF4
Camera Module - https://youtu.be/iOc7inAcXpQ

Computer Requirements

Central to this project is the Windows based software which handles the picture classification and builds the machine learning models used for classification. Here is the list of requirements to run the software:

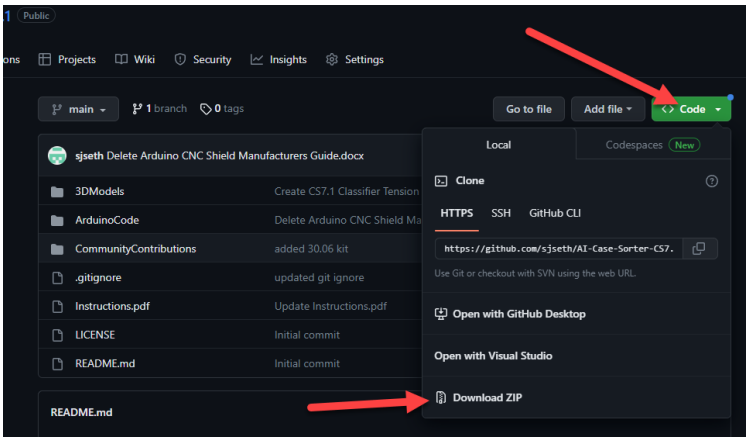
- Windows 10 (x64) or greater
- 64bit processor architecture
- 16GB Ram (recommended)
- Processor must support AVX instructions (AVX, AVX2, etc). Most processors made after 2015 support it. Most Celeron and Atom processors do not support AVX instructions.
- C++ VS Redistributable
- (2) USB 3.0 or type A ports. (a USB hub can be used if the machine has other USB port types)

Overview

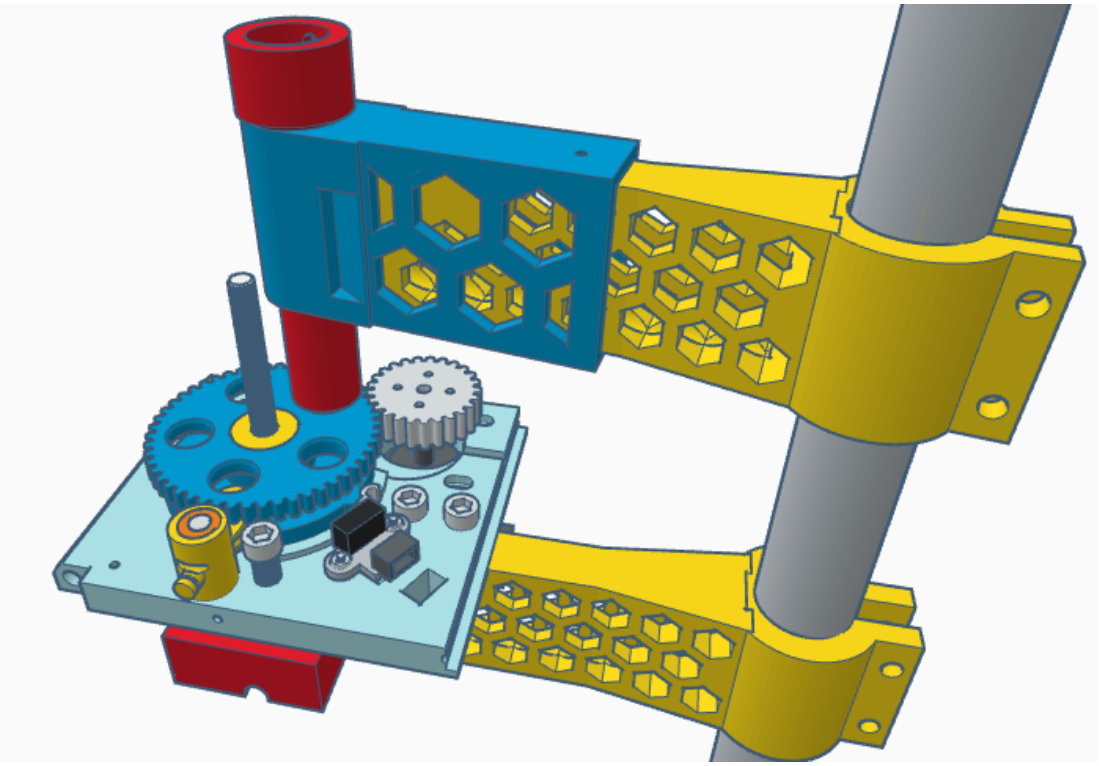
The AI Headstamp Sorter machine has 3 major components:

- Classifier – The part of the machine which takes a picture of the brass and classifies it. Then it is dropped into the sorter. The camera assembly is included as part of the classifier.
- Sorter – The bottom half of the machine which has a rotary arm with tubes to sort the brass into bins.
- Electronics & Enclosure – The electronics are housed in an enclosure which is powered by an external power supply and connects to the computer using USB.

All of the 3D Models are code are available in the GitHub repo and while it is possible to download individual files, because the repo is less than 20MB, it is recommended to download the entire repo so that you have all the files available for print and reference. You can download the entire repo from the repo home page by clicking the code menu and selecting download Zip. Once you have downloaded the zip, you should extract it to a known location (Documents or Desktop) so that you will have easy access/reference.



Building the Classifier



Printing the Classifier Models – General Settings

It is highly recommended that you use Black PLA+ for all components in this project. I have used the JAYO brand of PLA+ with great success. For all models, these are the general print settings that I have used:

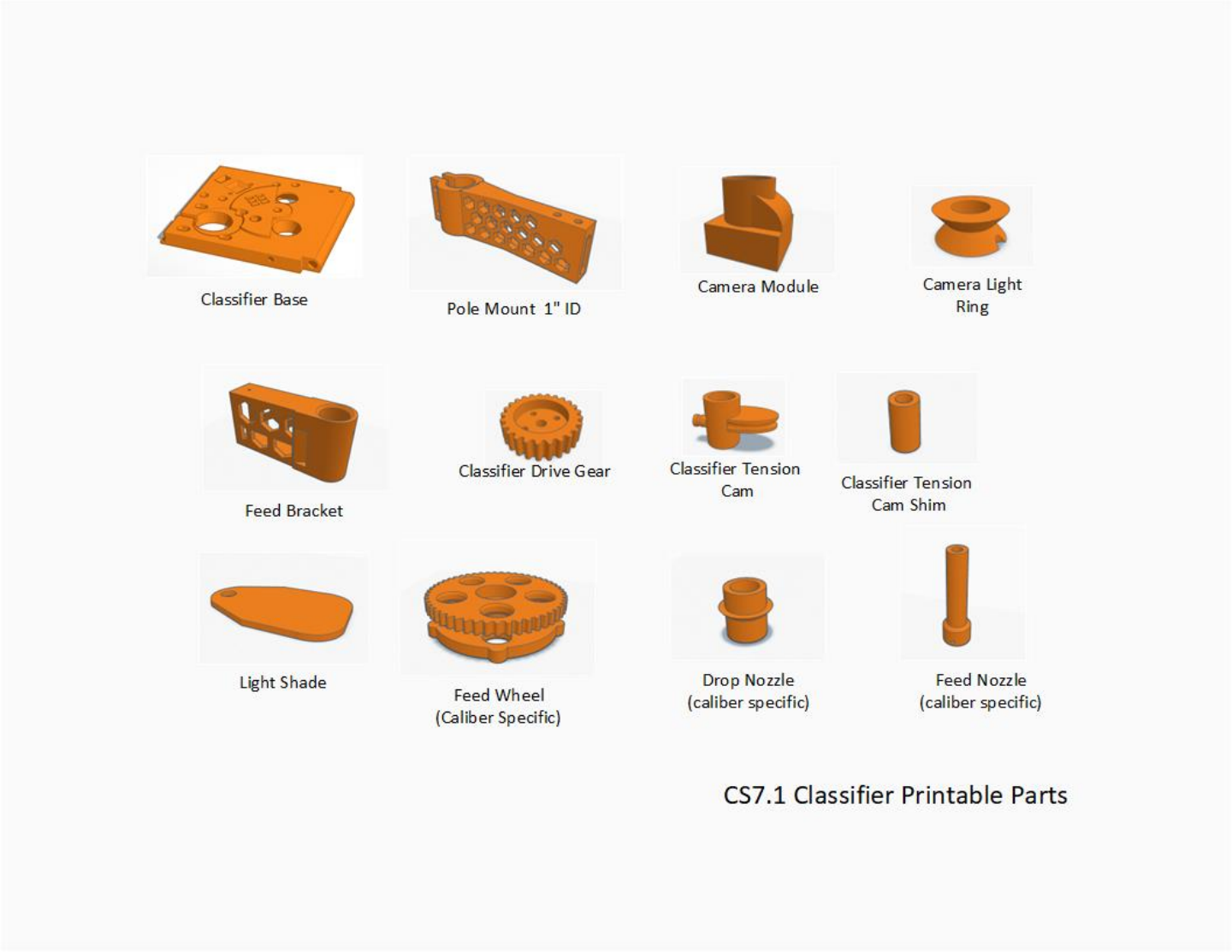
- **Nozzle Temp:** 222C
- **Bed Temp:** 60C
- **Layer Height:** .20mm
- **Support overhang angle:** 88 degrees.
- **Support type**: tree
- **Infill**: 30%
- **Infill Pattern**: Lines or Grid

These should be the assumed print settings for all models unless specific changes/overrides are indicated below.

The models account for shrinkage already and though a calibrated printer will give you better dimensional results, if you print all the parts with the same print settings, everything should fit together with minimal post-print modification.

The classifier models are available in the GitHub repo folder 3dModels/Classifier

Classifier Printable Parts Listing Diagram



Classifier – Base Plate

Recommend using black PLA+ but if you decide to use a different color, you will need to "black-out" the bottom of the camera hole and surrounding side surfaces to keep the picture dark. Flat black paint or a sharpy will usually work as these parts do not have any wear.

Classifier – Camera Module

Layer Height: .16mm (or smaller).

The camera module has some very small screw holes to facilitate the m2 screws needed to bolt on the blower fan. The more precision you can get out of your printer, the better. Recommended to use Black PLA or PLA+ as any other color will result in less-than-optimal image processing results.

It may also help to slow down your print speed on the first 10 layers of this print to get better screw hole definition.

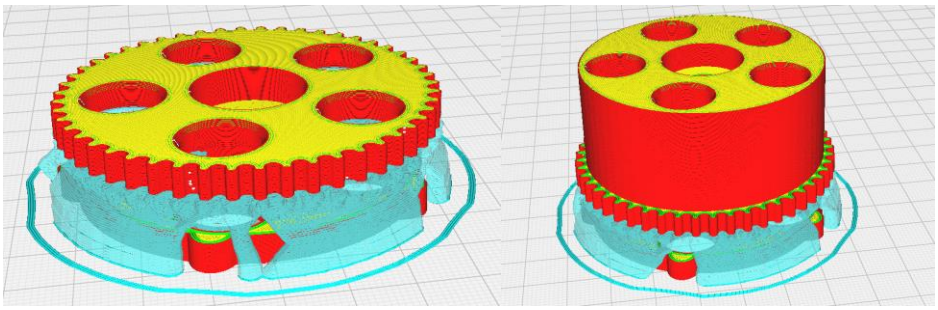
Classifier – Camera Light Ring

Color Material: Non-Opaque White PLA.

The purpose of this part is to diffuse the light from the LED light strip. The more translucent the material, the better. Generally cheap white PLA works great here.

Classifier – Feed Wheel (Caliber Specific)

This wheel can be printed in either orientation however, it is recommended to print the wheel with the bottom (non-geared side) down. If you are printing to a smooth glass bed, this may result in a very shiny bottom on the part and you will need to "scuff" it with some light sandpaper (300-400 grit) to avoid reflections from the camera backlight. Using print base with a matte texture is recommended. (Example of magnetic print surface). You may get better results using tree supports if your slicer supports them.



Classifier – Drive Gear

This part can be printed in any color you choose. Recommend PLA+ for greater durability but no problems have been reported with just standard PLA.

Classifier – Feed Bracket

This holds the feed nozzle and can be adjusted so that the tip of the nozzle hovers approx. 2-3mm over the feed wheel. The bracket attaches to the 2nd pole mount.

Classifier – Light Shade

The light shade is attached to the M6 feed wheel axel via a nut and should hover over the camera hole just above the feed wheel about 5mm. Should be printed in black or similar dark filament.

Pole Mount

You will need to print 3 pole mounts in total. Two for the classifier and 1 for the sorter. This can be any color but recommended to use PLA+ for increased strength.

Classifier – Feed Nozzle (Caliber Specific)

Any desired color can be used for this part.

Classifier – Tension Cam

- **Layer Height:** .16
- **Infill**: 100%

Classifier – Tension Cam Shim

This part should thread snugly onto an M6 bolt or threaded rod. It should also fit loosely in the tension cam. Print the part as is and if there is a fit issue, scale the part up or down by 1% until you get the desired fit. The cam should move freely and easily when installed over this part.

This part should be printed in Black.

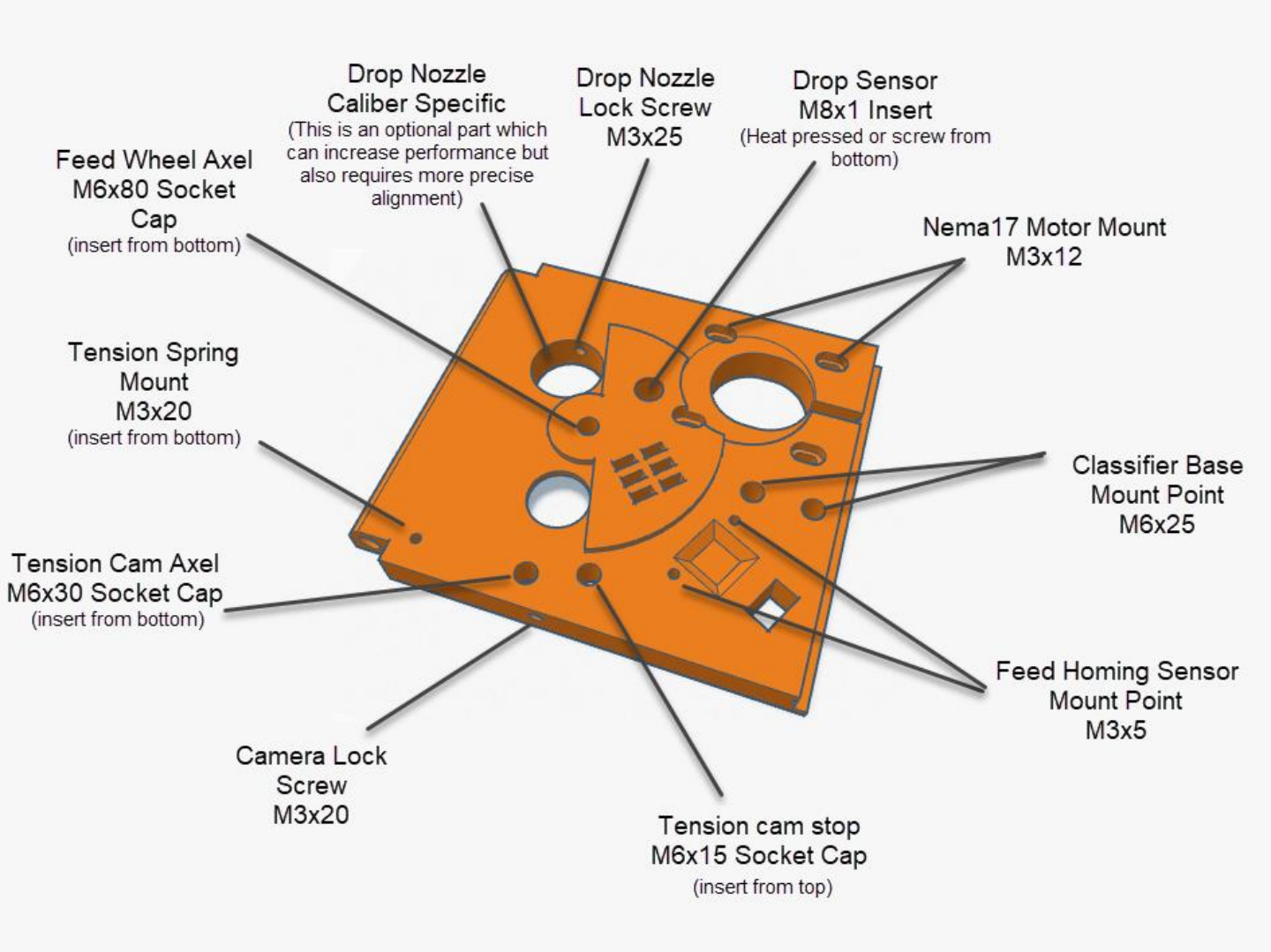
Classifier – Drop Nozzle (Caliber Specific)

The drop nozzle is designed cancel the rotational effect on the falling brass and allow the brass to drop straight down into the sorter tube which as the effect of a smoother/faster sort drop (vs the brass rattling around in the tube and not making it into the desired sorting bucket in time. Standard print settings apply but the part should be a press fit into the drop hole. If it is too tight/loose, use scaling in your slicer to upscale/downscale by 1%.

This part is not required but may improve performance. It can be printed in the color of your choosing.

Classifier Assembly

Assembly Diagram



Assembly Steps

Installing the parts in the correct order can save you time and frustration. Here is the best order I have found for construction:

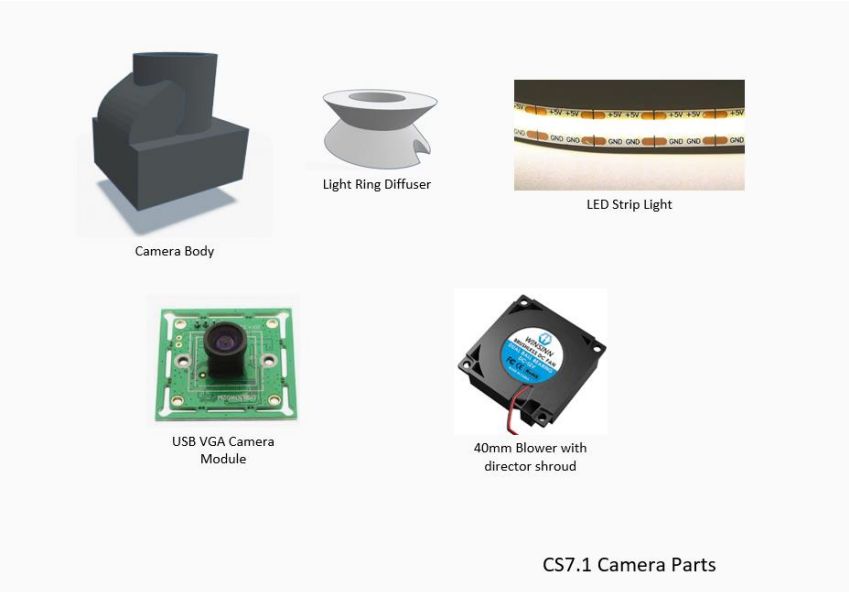
1. Test fit the camera housing into the base. It should have a snug press fit. If the fitment is loose, you will need to use the Camera Lock Screw (m3x20) to secure the camera in place. You will need to remove any burrs and might need to lightly sand the outside of the camera housing to get a good fit. We will install this part last, but it is easiest to make sure it is going to fit before installing the rest of the hardware.
2. Install the Drop Sensor insert. This is an M8x1.0 threaded insert (see parts list) (don't confuse it with M8x1.25 which is more commonly available). The threaded insert can be threaded into the sensor hole from the bottom if you have an m8x1 bolt handy, otherwise it is recommended to use a hot soldering iron to press fit it into the hole.
   Be careful not to seat the insert all the way in flush to the body and it should hang approx. 1/8in below the base.
3. Install the Proximity Sensor (Drop Sensor) into the threaded insert. You should screw this in until the top of the insert is flush or slightly below the top surface of the classifier base. If sensor is too high, it will catch on the feed wheel.

4. Install the Feed Wheel Axel (m6x80mm socket cap screw). This screw threads from the bottom and should be threaded snug to the base. **DO NOT OVER TIGHTEN.** If you use a different type of screw, it is possible the head of that screw may be too large and interfere with the camera hole. Socket head is recommended.
5. Install the Nema17 Motor. Do not tighten the motor screws all the way down yet. Slide the motor towards the back of the slot. Install the coupler flange on to the motor shaft.
6. Press fit the drop nozzle for your desired caliber (see caliber conversion kits). If the fit is too loose, you will need to use an m3x30 set screw to hold it in place.
7. Install Tension Cam Axel Screw from bottom and seat flush to base (M6x30). Thread the Tension Cam shim onto the tension cam screw until it is snug to the base. You should be able to thread this part by hand. If it is too tight, you might consider printing another which is 1-2% larger.
8. Install the Tension Cam spring mount from the bottom (m3x20)
9. Install the Tension Cam stop screw from the top and thread until the bolt is flush with the bottom of the base (m6x15). Slide the tension cam stop shim over the cap of the screw.
10. Insert [16x1.5 – 17x2.4] O-ring on the tension cam
11. Slide Tension cam over the tension cam shim/axel.
12. Attach extension spring to cam and spring mount. Thread m3 nut down onto spring mount screw.
    Pro Tip: Rather than use a nut to secure the spring, use the edge of a sharp file or Dremel to cut a notch about 1/4in down on the m3 screw. It only needs to be deep enough to keep the spring from sliding off. This makes removal of the cam much easier.
13. Install Feed wheel with bearing preinstalled. The wheel should easily slide down over the m6 axel screw. Add a lock nut or two standard nuts to the top of the wheel. Do not over tighten as the wheel should move freely.
14. Install the homing sensor. This takes two m3x10 (or shorter) screws.

Camera Assembly

*Note. If you are using the V2 Camera, you will need to skip this part and reference the Camera Assembly V2.pdf guide.

The following diagram illustrates the parts required to complete this part of the build.



CS7.1 Camera Parts

Here is an overview of the basic assembly steps to complete the camera module

1. Focus the camera
2. Build the Lighting Ring
3. Install the lighting ring and wiring
4. Install the camera

5. Install the Fan
6. Test

Focusing the Camera

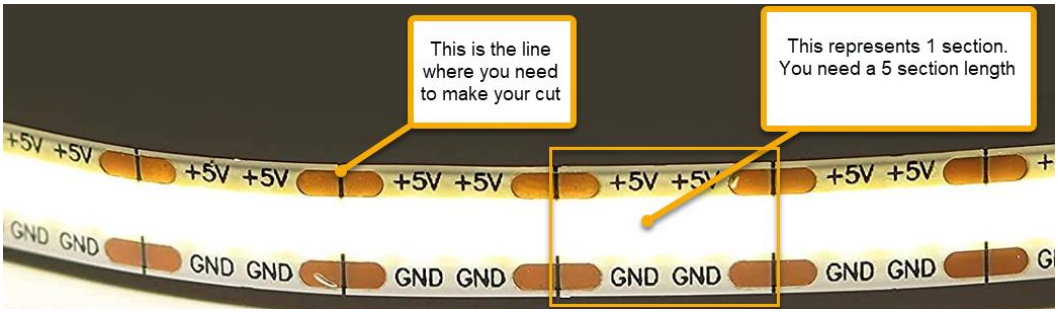
Connect Camera USB cable and connect to a computer and open the default windows camera app. Select the VGA camera.

Set the focus of the camera by using the camera body as a guide. You can rotate the camera lens to focus the camera. Set the camera body on its side and set or hold a piece of brass approx. 4mm from the top edge of the body. Place the camera into the body and check the focus on your computer.

Once you have the camera reasonably focused, you can unplug it and set it to the side.

Build the Light Ring

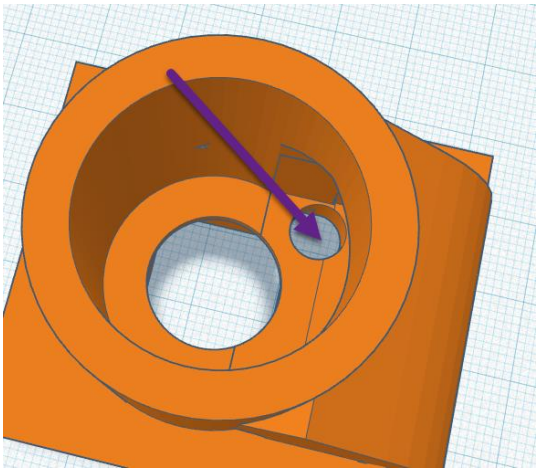
1. Unroll the USB strip light and cut a section length of 5 sections using scissors or a box cutter.



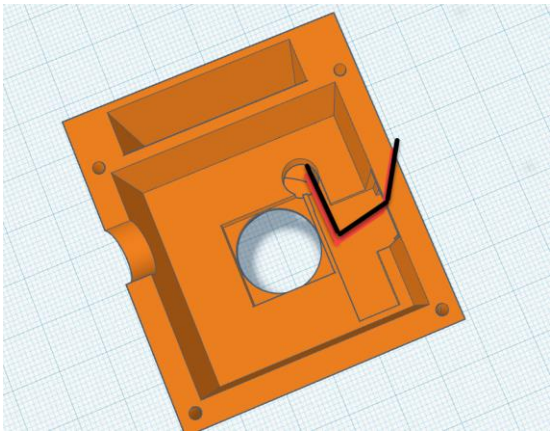
2. Solder a wire pair to the 5v and ground tabs. The wires should be at least 5 inches long. Recommend using yellow and black wire so the wiring is not confused later with the fan wiring but of course any color will work.

3. Wrap the light strip around the light wring with the strip facing into the ring. Make sure to align your wires with the notch in the light ring. Tightly wrap at least 2 lengths of electrical tape around the outside edge of the ring to secure the led strip and wiring in place.

4. Install the light ring into the camera housing through the top. Guide the wire pair through the offset hole (not the big center hole)



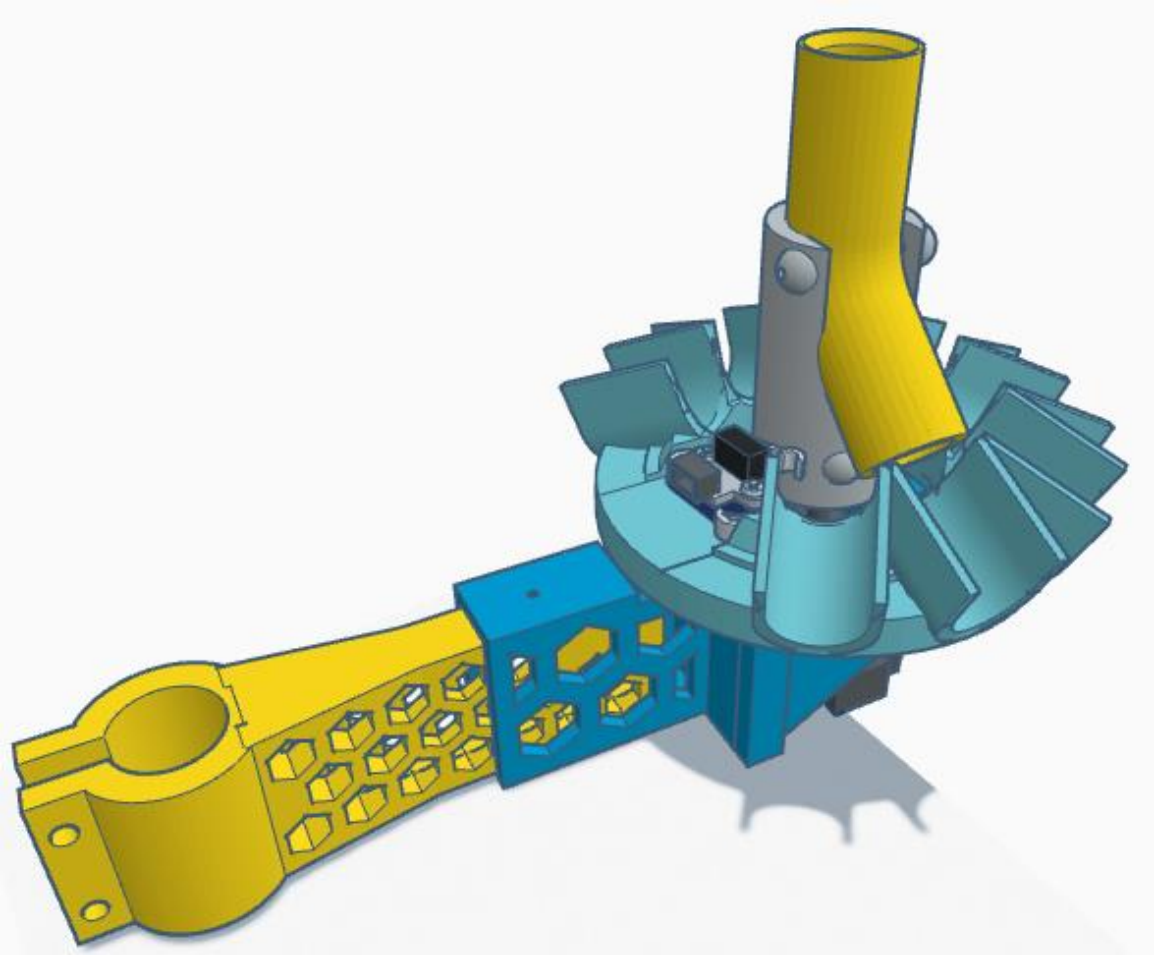
5. Run the wiring in the slots provided



6. Place the camera into the house making sure the connector side is oriented with the recessed slots
7. Place a piece of foam rubber or packing foam on the back of the camera so that it is pressed firmly in the housing when the fan is installed
8. Connect the USB cable to the camera
9. Run both the USB wire and the light ring wire out the half-circle hole
10. Install the fan on top the camera housing using 2mm socket head screws. Make sure the director shroud is oriented correctly.
11. At this point all the wires should close together (fan, light-ring and camera). It may be helpful to put a piece of electrical tape around them to keep them together.
12. Install male Dupont connectors on the fan and light ring wires so they can be easily detached later.

This completes the assembly of the ring. You can test the light ring by applying 5v power to it. The fan requires 12v.

Building the Sorter



Printing the Sorter Models – General Settings

When printing the sorter parts, you can use the filament type and color of your preference.

Recommend PLA+, PETG, PLA with layer height of .2.

The models account for shrinkage already and though a calibrated printer will give you better dimensional results, if you print all the parts with the same print settings, everything should fit together with minimal post-print modification.

Sorter Printable Parts List Diagram

Sorter – Base & Pole Mount

This part can be printed in any color you choose. Recommend PLA+ for greater durability but no problems have been reported with just standard PLA. **The base should be printed with standard supports with minimal support angle of 88 degrees**. The base slides over the pole mount so it is highly recommended to print these two parts together with the same material. If you print these with different colors/materials, you might have to do some light sanding on the pole mount to achieve the desired fit as difference filaments often have different shrink profiles.

Sorter – Base 8 Slot Ramp

This part slips over the sorter base and is secured by two m6 screws. No specific recommendations for this part.

Sorter – Pipe Bracket

This part is attaches to the sorter motor via a 5mm coupling flange. Supports should be turned off when printing this part and it is recommended to use the minimal infill possible 5-10% max. The lighter this part is, the better as it can affect the amount of torque needed to start/stop the sorter in correct position.

Sorter – Sort Pipe

There is some benefit in printing this part as high-quality as possible. Recommend .16 or finer layer height and using a glossy filament if available. The reason for these recommendations is that the smoothness of the internal surface of the pipe will affect the speed and consistency at which the brass drops through the pipe. It is also highly recommended to

use a 10–15 lines brim on this part for better surface adhesion. The part should be printed with the flat end of the tube on the print bed surface and no support should be used.

Sorter – Homing Bracket

Recommended to use a tough filament such as PLA+ or PETG but really any filament should work as long as you don't overtighten the m6 mount screw.

Sorter – Sort Bin

These optional sort bins can be used to sort the brass into. They are designed so that they can be oriented at the correct angles to the sorter arm. Recommended to use a layer height between 2 – 3 and print with 0 infill to reduce print time. Typical print time for each bin is roughly 6.5 hours. If you use "vase mode" in Cura, this can be reduced to 2-3 hours per bin, but the bins will be much weaker.

Sorter Assembly

Here below are the basic steps for building the Sorter Assembly.

1. Ensure you have a working tight fit between the sorter and the mounting arm
2. Install the motor to the sorter
3. Install the Flange into the sorter pipe bracket
4. Install the bracket onto the motor
5. Install the 8 slot sorter base
6. Install the homing sensor and bracket
7. Install the sorter pipe

Ensure Sorter / Pole Mount fitting are snug

Depending on your printer and filament, the fitment between the Sorter Base and Pole Mount may be very tight or slightly loose. If the fit is loose, this is easily remedied with the use of a set screw.

If the fit is so tight that you cannot insert the pole mount into the sorter base, you may need to remove some material from the pole mount. Also check the sorter base to ensure there are no artifacts remaining from the printer support material. When cleaning up the pole mount, start with the leading edges and corners first as this tends to be the areas which grow during printing. Usually after deburring the corners, the fit will be much better. If it is still too tight, use some 150-250 grit sandpaper to clean it up further until the parts fit.

Install the Motor

Use (4) M3x12mm screws to mount the motor. It is recommended to use washers to provide additional holding power when the motor heats up. Make sure you orient the motor in such a way that you will be able to connect the motor cable after the motor is installed. Generally, it is recommended that you orient the motor so the connector is facing out to the side.

Install the Flange

Use (4) m3x12 screws to attach the flange to the bottom of the Sorter Bracket Pipe Bracket. Make sure the flange coupler has the included Allen set screws installed but set so that the flange can be slipped over the motor shaft.

Connecting the Sorter Pipe Bracket to Motor

Typically, the motor shaft will have a flat side. Ensure that one of the Allen set screws are aligned with the flat on the motor shaft. Tighten down the set screws while adjusting the height of the flange so that the set screws are just above the top of the sorter base.

Install the Sorter Base 8 Slot Ramp

Slide the 8 Slot base over the Sorter pipe bracket and align the two m5 screw holes with the holes in the base. Only install the right (with mount side facing you) m5x20 screw. The homing bracket will be secured by the left screw.

Install the Homing Sensor and Bracket

Using (2) M3x7 (M3x10 will work too), mount the homing sensor to the homing bracket so that the mount point is to the left of the sensor when the sensor connector is facing you.

Thread the M5x20 screw through the Homing Bracket. The homing bracket should spin freely around the m5 screw. If not, you can “strip” it by continuing to turn the screw after the homing bracket is fully seated. Thread the screw into the left hole on the sorter base while holding the homing bracket in place. Do not overtighten as you can crush the homing bracket. Tight the screw down until the homing bracket moves under tension. Pivot the homing bracket over the other screw so that the homing bar lightly contacts the Sorter Pipe Bracket. Turn the sorter pipe bracket until the homing bump contacts the homing sensor. Ensure you have proper alignment with the first slot.

Install the Sorter Pipe

Insert the (2) M3x15mm screws in the designated holes on both sides of the Sorter Pipe Bracket. Thread the screws until the end of the screw is flush with the inside of the pipe channel. Position the pipe in the channel so that the top edges of the pipe are aligned and parallel to the sorter pipe bracket. Tighten the down the set screws on both sides of the bracket so that the pipe does not move.

Pole Mount

The sorter is the first item to be installed on the 1” pole. Use M6x25 screws with butterfly nuts to tighten the mount to the pole.

Electronics and Enclosure Assembly

Printing the Enclosure Models – General Settings

The electronics enclosures can be printed in any material and color of your choosing. This is entirely personal preference and I make no recommendations here.

Enclosure – Box

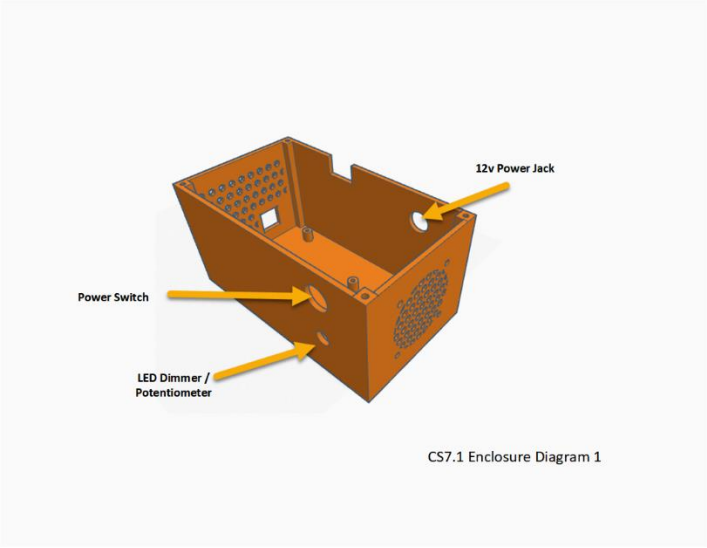
This box houses the electronics. If it is printed to spec, it should match up to existing Arduino uno holes. It is recommended that you should use a support angle of 88 degrees. The only support area needed is the USB hole.

Enclosure – Lid

Recommend printing along with the box with the same material so after accounting for shrinkage, everything works.

Electronics Assembly

Refer to the Parts List section below for the list parts and resources to acquire the needed components to complete this project



CS7.1 Enclosure Diagram 1

QUICK STEPS

1. Create your rails
2. Install 40mm Fan
3. Install LED Dimmer with 4.7K resistor.
4. Install 12v Jack
5. Install Power switch
6. Install Arduino Uno
7. Install Motor Shield
8. Install jumpers
9. Install TCM2209 Motor Controllers
10. Connect all 12v power lines and ground
11. Attach Sensor Cables
12. Attach motor cables to shield
13. Adjust Vref on motors
14. Load Arduino code onto Arduino

Detailed Instructions

Create or designate a 12v Rail

The 12v rail can be a wire nut, traditional terminal rail or the lever wire nut connectors which I prefer.

https://amzn.to/40GJgQx

This will be the connector where all your 12v connections will join.

Create a 5v Rail

Connect a yellow wire from the 5v pin on the motor shield to your 5v Rail. The 5v rail can be a wire-nut, traditional terminal rail or the lever wire nut connectors mentioned earlier.

Create a ground rail

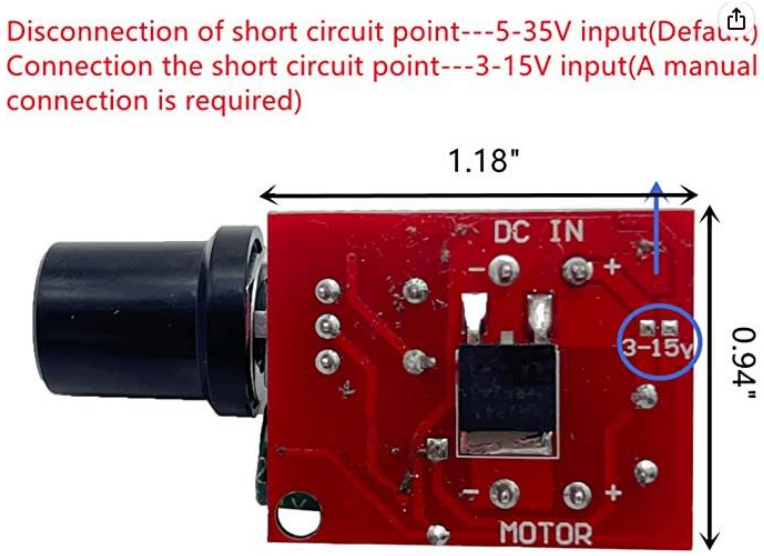
Just like our other rails, this rail will be where all our ground connections will be made.

Install 40mm Fan

The 40mm fan should be installed on the inside of the enclosure. The back of the fan has hex shaped holes where the 3mm nuts should be placed the front of the fan should face the enclosure wall grill. You will need (4) M3 screws of approximately 15mm length. The fan's red wire will be connected to the 12v rail and black to ground. You can wait to connect these if you want and I prefer to do it towards the end for better wire management

Install LED Dimmer

Before installing the PWM dimmer, you will need to connect the low voltage solder jumper point on the bottom of the PWM dimmer. From the manufacturer's instructions, the solder point is highlighted in the screenshot below and a bit of solder needs to be added between these two points:



Connect the yellow and black wires to the power side of the dimmer. The wires should be approx. 4-6 inches in length to and they can be cut down to size later. These wires will connect to your 5v rail and ground. On the motor/led side of the dimmer, connect two smaller wires (22-24AWG) of approximately 6-8in. You will need to install the .25watt 1.2K resistor between the negative output and the connector which will provide a more useable light range. It is recommended to use yellow and black to signify low signal and ground though you can use whatever colors you prefer of course. I generally use a 4 wire motor cable to feed this signal were two of the wires are feeding the camera housing fan (12v+,-) and the other two are connected to the dimmer output and the light right. For a standard motor cable, I cut the motor connector side off and wire strip those wires to install to my 12v rail and my dimmer.

Install Power Jack (12v)

If you are not using the power jacks with pre-soldered wires, you will need to solder 6" 16AWG wires to the leads. Red wire on the center pin and black on the outer.

Install Power Switch

Solder 16AWG red wires of approx. 6" length to both leads on the power button. Install into the enclosure and secure with a nut.

Install the Arduino Uno

The Arduino Uno should drop right into the box and us the USB hole for alignment. The Arduino is secured by M3 x 5mm screws. Do not over tighten these or you will break the screw risers. If you can get all 4 screws in, don't fight it. It will be plenty secure with just two screws. Magnetic screwdriver helps here.

Install the CNC Motor Shield

Before seating the motor shield, you should attach the two 16AWG wires (red & black) of approx. 6" length to the power connector on the shield. This can be difficult to do after it has been seated.

Align the pins and carefully press down on to the Arduino. If you have it lined up, it should only take mild pressure to seat it.

Install Jumpers

There are 7 jumpers in total which must be installed. 3 will go under each motor controller (C1 & C2) which are generally labeled **X** and **Y** on the motor shield. The 7th jumper will go on the EN/GRN pins adjacent to the reset button on the shield. (see diagram below)

Install the TMC2209 Motor Controllers

Once you have the jumper installed, you can install the controllers simply by aligning the pins and pressing them in.

Connect power wires and ground

The red wire from the power jack should connect directly to one of the red wires on the power switch (it doesn't matter which). The other red wire coming off the power switch should connect to your 12v Rail. In this way the 12v power will only be available when the switch is on.

Feed Homing Sensor

The homing sensors for this project come with a 3-color wire which is usually red, white and black. Red is a 5v feed, black is ground and white is signal.

Connect the red wire to your 5v rail, connect the black wire to your Ground rail and connect the white wire to Y+ (D10)

Sorter Homing Sensor

Just like the feed homing sensor above, with the only difference being that your white wire will connect to Z+ (D11)

Feed Sensor (Proximity Sensor)

The proximity sensor needs more voltage to work effectively. They are typically wired as Brown->12v, Blue->Ground, Black->signal.

Connect the brown to your 12v rail, blue to ground and black to X+ (D9)

Attach Motor Cables

Before attaching motor cables, ensure the system is disconnected from USB and 12v power

There are many types of motor cables available but the most common motor cable has the wiring orderd as: BLACK, GREEN,BLUE,RED. This cable should be connected next to the controller so that the red wire side of the cable is closer to the outer edge of the shield. (See diagram below). The feed motor is on the X motor controller while the sorter motor is connected to Y.

Optional 5v Power

Though it is not usually necessary, some computers may not provide adequate 5v power to keep the Arduino running reliably. If this is the case, you may elect to add a 5v external power supply. To connect this, you would attach the 5v signal to 5v pin as indicated in the diagram below and ground from the power supply would connect to the ground rail.

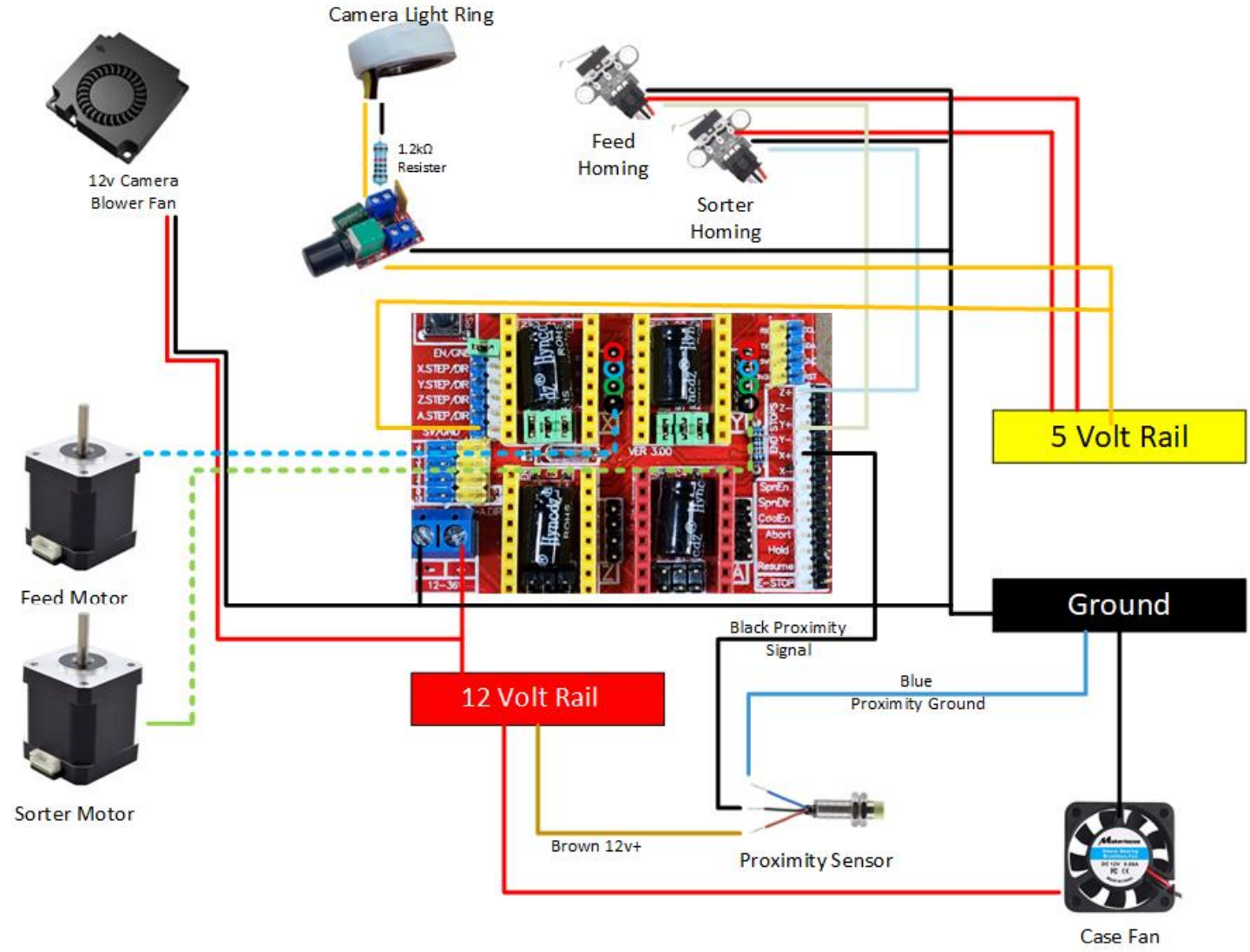


Diagram 1 - Electronics Schematic

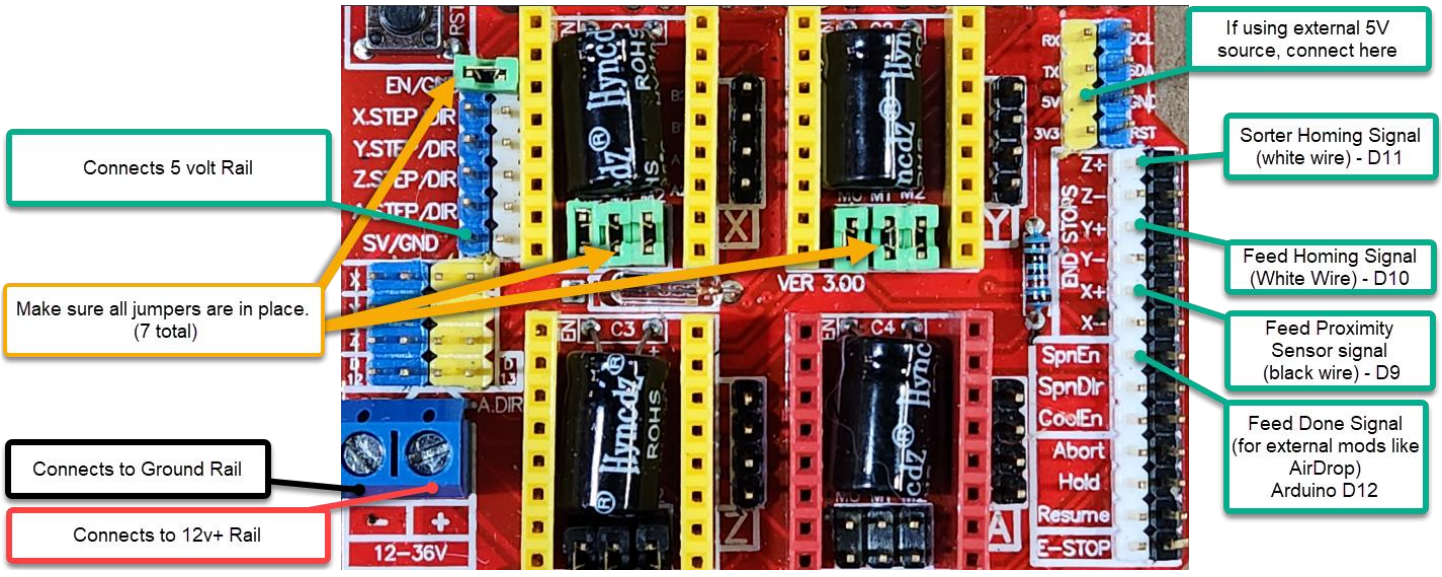


Diagram 2 - Uno Shield Pin Configuration

Configuring vRef (reference voltage) on TCM2209

Reference voltage determines or measures the amount of current the motor will receive. Usually this is the last thing you will check before closing the lid on the enclosure. Here is the procedure:

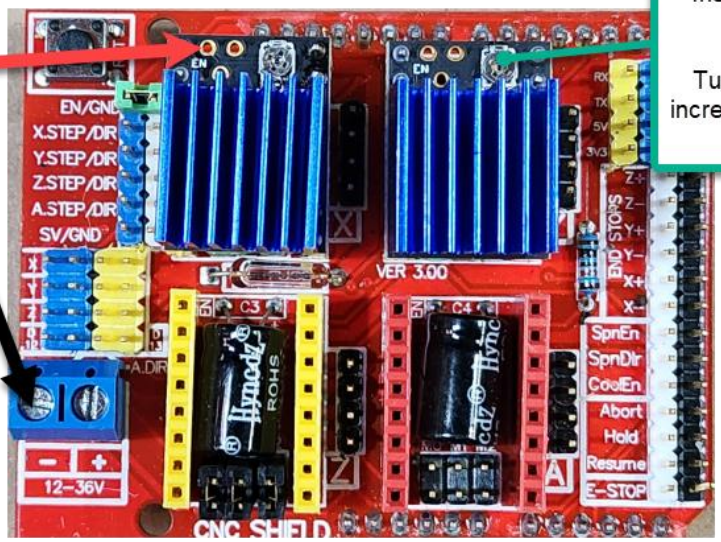
1. Power off the system (unplug the 12v and USB cables)
2. Unplug the cables from both motors (sorter and classifier)
3. Power on the system and connect USB.
4. Using a multimeter in DC mode, measure the vRef by placing the negative lead on the 12v negative input
5. Place the positive lead on the vRef measurement port.
6. Reference the Diagram and cheat sheet below to determine the current.
7. Generally, the target vRef should be between .9 and 1.2 amps. It is best to use the lowest amperage the system will operate smoothly under to reduce heat and stress on the motors. To low and the motors will lose steps, too high and the motors will lose steps and overheat.

This is the vRef measurement port.

To measure vRef, attach multimeter pos+ lead to this port and negative lead to 12v ground

The shield and arduino should be connected and powered via usb and a 12v power supply

!DANGER!
You should set vRef before the motors are connected. Always connect/disconnect motor cables while the system is off!



The TCM 2209 controllers should be oriented so the voltage POT is next to the edge of the shield. Installing these backwards will burn them out

Turning this potentiometer will increase / decrease the current to the motor

The equation to convert vRef to amps for a 12v connection is (vRef / .71) / 2

If you have a target amperage (say 1.5 amps), we use this to figure out what the vref should be
(targetAmps x .71) x 2 or... use the cheat sheet!

TCM2209 Cheat Sheet

Amps	vRef
0.7	0.994
0.8	1.136
0.9	1.278
1	1.42
1.1	1.562
1.2	1.704
1.3	1.846
1.4	1.988
1.5	2.13
1.6	2.272
1.7	2.414
1.8	2.556
1.9	2.698
2	2.84

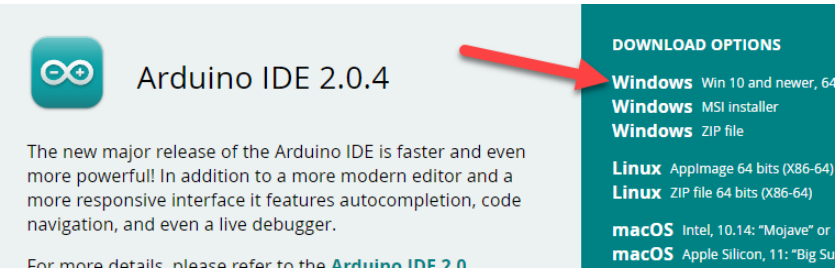
Uploading Code to the Arduino

The general steps to program the Arduino are as follows:

1. Download and install the Arduino IDE from https://www.arduino.cc/en/software
2. Download the CS7.1 sorter Arduino code (https://github.com/sjseth/AI-Case-Sorter-CS7.1/blob/main/ArduinoCode/CS71_Arduino/CS71_Arduino.ino)
    a. Here is the raw link to get the file: https://raw.githubusercontent.com/sjseth/AI-Case-Sorter-CS7.1/main/ArduinoCode/CS71_Arduino/CS71_Arduino.ino
    b. The file must be placed in a folder named CS71_Arduino)
3. Double-click to open the CS71_Arduino file in the Arduino IDE
4. Connect your USB cable to the electronics and to your computer
5. Configure the Arduino IDE to talk to your Arduino
6. Upload the code to the Arduino.
7. Test the sorter in the Arduino Serial Console.

Download and Install Arduino IDE

The Arduino IDE (Integrated Development Environment) is the software which is used to create/modify the code which is then programmed to the Arduino board. This is a free software download and is available from the Arduino web site at: https://www.arduino.cc/en/software. The recommendation is to use the latest version which at the time of this writing is 2.0.4.

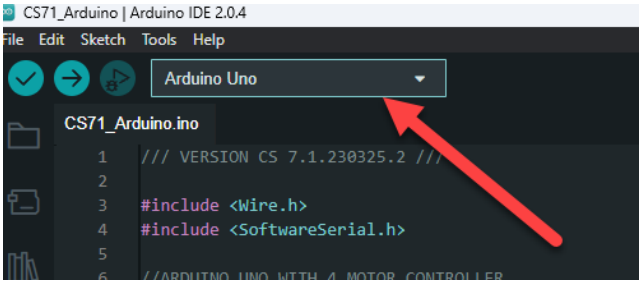


Download the CS7.1 sorter Arduino Code

If you have downloaded the entire repo as recommended earlier, the Arduino code will be in the folder path where you unzipped the files at: **/main/ArduinoCode/CS71_Arduino/CS71_Arduino.ino** otherwise you can download the individual file at https://github.com/sjseth/AI-Case-Sorter-CS7.1/blob/main/ArduinoCode/CS71_Arduino/CS71_Arduino.ino . The file will need to placed in a folder named **CS71_Arduino**. Once you have done that, you can double-click the file to open it.

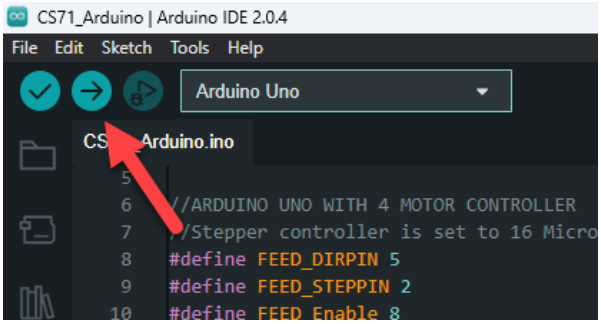
Connect the Arduino to your computer via USB cable.

In the Arduino IDE, use the device menu to select your Arduino type (UNO)



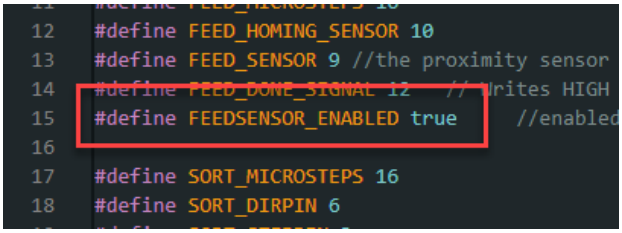
Upload the code to program the Arduino

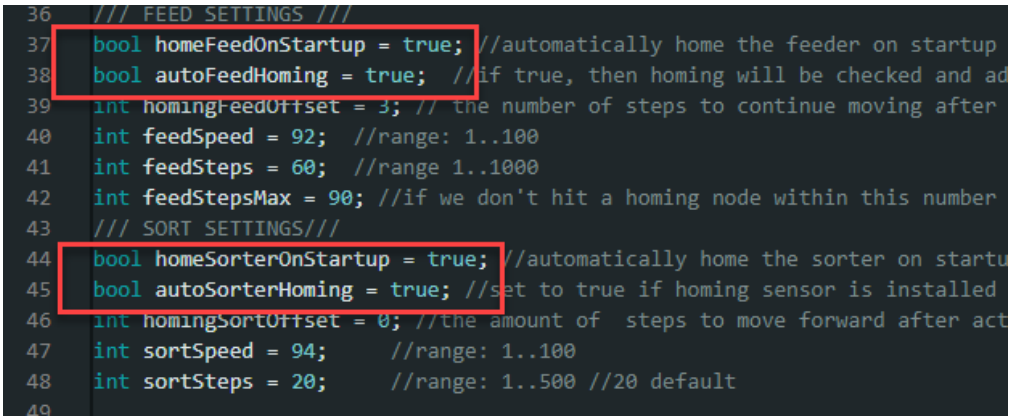
Use the upload button in the Arduino IDE to “push” the code to your Arduino device.



How to modify code for testing without sensors connected

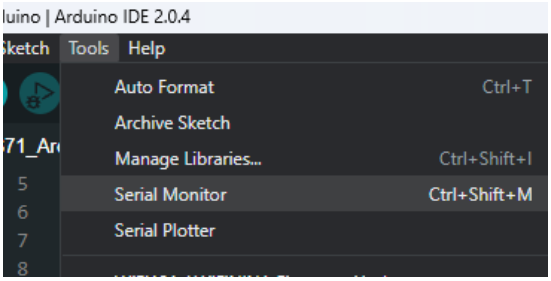
If you are interested in loading the code and testing it before you have completely wired up your Arduino, you can simply change the five variables listed below to have a value of “false”. After changing those variables, you can upload the code and test in the Arduino Serial Monitor by sending commands like “0”, “1” or “sortto:4”



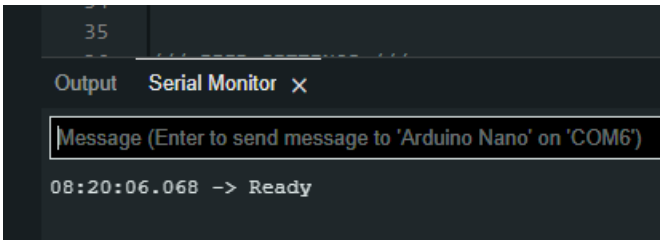


Testing the Sorter in Serial Monitor Console

You can launch the Serial Monitor with a keyboard short CTRL+SHIFT+M or from the Tools menu.

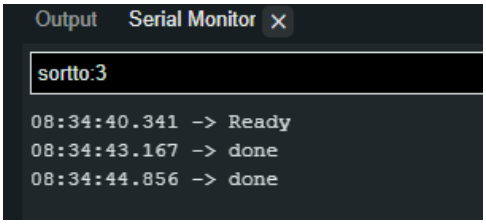


If the code has been loaded to the Arduino properly, you should see a “Ready” prompt response in the serial console.



You can now test the system by sending a number command like “0”. This will cause the system to feed one position. If you send “1” two times in a row, the system should feed two times but on the second time, the sorter arm will also move to the #1 slot position. This is because there is a 2 slot queue so that the sort is delayed by one command.

If you only want to test the sorter arm movement, you can send “sortto:3” command which will move the sorter arm to the #3 slot position. After each command is received and processed, you should receive a “done” response.



List of Serial Monitor Commands

{number} (example: 5)	Sending any number causes the system to feed one position and queue a sort to that number on the next feed.
sortto:{number} (example: sortto:5)	Moves the sorter arm to the specified {number} slot position
xf:{number} (example: xf:3)	Force feed to the specified number. (overrides/ignores the feed sensor status)
test:{number}	This command is designed to test the system. Based on the number passed, it will run through that number of feed cycles while moving the sorter arm to a random position between 0-6.
sorttest:{number}	This command will move the sorter {number} of times to a random slot position. Used to test the sorter tracking and if it is losing steps.
homefeeder	Initiates a homing for the feed wheel
homesorter	Initiates a homing for the sorter arm
getconfig	Returns a config which represents the current sorter and feed speed as well as the motor steps for each. Example response: {"FeedMotorSpeed":92,"FeedCycleSteps":60,"SortMotorSpeed":94,"SortSteps":20}

Parts List

The parts list has been moved to reloadingrecipes.com which will be easier to maintain going forward.

Here is the link:
https://www.reloadingrecipes.com/HeadstampSorter/Partslist