HERA LED Display Build Guide

This document will walk you through how I built the HERA LED display so that you can do it yourself. Some things in this guide may be slightly different to my process, with the intention of making the build quicker and smoother. I would HIGHLY recommend reading the "Problems and Suggested Improvements" document before starting this guide, as it will save you headache in the long run.

Step 1: Print the Dishes

You have 320 individual clear plastic dishes to print, so I would recommend starting this before anything else. It's very simple to start a print and then start working on other things while it goes. My printer took about 4 hours to print 10 dishes at a time. This means I could expect AT LEAST 128 hours of printing time, ignoring failed prints and mechanical issues. I could only churn out 20-30 dishes a day, so get this started early. Printing time will vary based on your printer and availability. Make sure you are printing the Scaled_HERA_Dish_LED_forprint.STL file.

Step 2: Laser Cut the Boards

Next step is to laser cut the acrylic and two plywood boards. Make sure that you match the drawings to the correct board: top=acrylic, middle=thin plywood, bottom=thick plywood. The bottom board also has cuts for the triangle supports and bottom brace to keep the display standing. Use the Full_XXX_Layer_Drawing.DXF files located under Laser_Drawings with your laser cutter software.

Step 3: Assemble the Boards

Stack the boards on top of each other and check that they are oriented correctly by checking that you can see through each hole from the back side. Place 7 M6 x 20mm screws through the middle hole and the 6 holes by the corners, with a washer on each side and a nut to hold it in place (every screw in this model uses 2 washers and a nut). Tighten each screw evenly to ensure flatness. Then, place 4 6-32 x 0.75" screws through the smaller, unused holes on the front. Affix a corner bracket to the backside of the display with the screws, with the open side of the bracket towards the inside of the display.

Step 4: Assemble the Supports

Attach the bottom support board to the triangle supports with 8 6-32 x 0.5" screws and angle brackets. Then attach the triangle supports to the angle brackets on the back of the main model boards, with the 4 more 6-32 x 0.5" screws. Your display should now be able to stand up, but be careful as it is top-heavy.

Step 5: Glue the LEDs

This step is very tedious and time consuming, as you must individually glue each LED into its hole on the backside of the display. Additionally, it is vital that you **FOLLOW THE CORRECT ORDER**! The code relies on the light indices, which are determined by the order in which they are wired up, so make sure you follow the map. You will start in the bottom right corner of the bottom third, and zipper your way up to the top right corner. From there, go to the left corner of the vertical third, and zipper again, starting towards the bottom right and ending in the top corner. Then jump over to the top right corner of the top third, and zipper down to the bottom right corner. I applied a healthy amount of glue to the part of the LED where the hard bulb casing meets the soft plastic sheath, and then just stuck it into place, and held it until the glue hardened (~1 minute). You'll notice that the wires between the LEDs are stiff and sometimes twisted; do your best to straighten them out before gluing. Most are wired in such a way where the wires will form nice arches, but not always. You'll have to add a new strand every 50 LEDs, just make sure you plug it in before gluing so that you are in the correct order.

Step 6: Add the Labels

If you are planning to use foamcore and printed labels, this step is very simple. Print out the 3 label images on a regular piece of paper. Make the images go almost to the edge of the paper, this should result in a good size. Cut the labels out of the paper with some scissors and place them on a section of foamcore. Cut out the foamcore to be slightly larger than the printed label. Tape the label to the foamcore and the foamcore to the acrylic with double-sided tape.

Step 7: Hooking up Power

You will want to add power to the beginning, middle, and end of your LED string, or the lights at the end of the string will be very faint. Each 50 LED strand of lights has two lights with extra power and ground input wires. I trimmed off all of these except for the ones I was planning on sending power to and soldered them to the 3 pairs of wires from the LEDs I wanted to give power. You will want to check and play with the lengths of each wire so that they all reach your power supply that is hanging out on the support board. In the end, you should have 3 power and 3 ground wires going from the power supply to different parts in your strand. The power supply simply plugs into a wall outlet with the accompanying cable.

Step 8: Hooking up the Pi

The Pi setup is very straight forward; plug in its power supply, HDMI to a monitor, and a mouse and keyboard to be able to power and use it. Then, use some jumper cables to wire the GPIO header to the start of the LED strand. You'll need a ground wire going from pin 6 into the ground port (blue wire on LEDs). You'll also need a signal wire going from pin 12 into the signal port (white wire on LEDs).

Step 9: Setting up the Software

Feel free to install whatever OS you'd like on your Pi. I will note that I elected to use Ubuntu Mate because ASU Wi-Fi does not take kindly to Pi's and Raspbian. Then, go to this page: https://tutorials-raspberrypi.com/connect-control-raspberry-pi-ws2812-rgb-led-strips/ . Scroll down to the "Preparation and Installation" section, and in your terminal, run the commands that are listed, eventually resulting in installing the rpi_ws281x library.

Step 10: Running the Display

Once you've gotten this far, all you should have to do is make sure you have HERAtest.py on the Pi somewhere. Navigate to that folder, and run

sudo python HERAtest.py -c

Your lights should now display the live HERA status! If you wish to change it up, HERAtest.py has some other display modes you can try. Scroll down to the bottom of the script, and underneath the main loop, you can comment and uncomment some functions to change what is displayed!

And you're now operational! Enjoy your display!