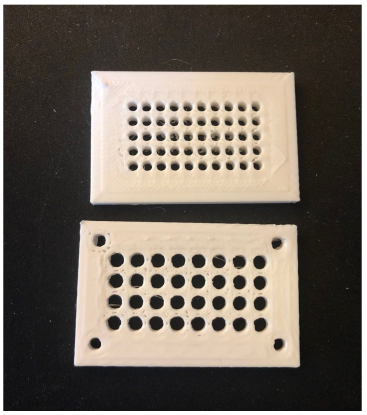
CRA2-D2 Dome Lights

By Christian Ramsvik

The files (.stl and Arduino code) referred to in this documentation is currently available at https://github.com/cramsvik/CRA2-D2 and are a small supplement to the files provided by Mr Baddeley. I highly recommend signing up at https://www.patreon.com/mrbaddeley/posts if you are into printing droids. Also see https://www.facebook.com/groups/MrBaddeley for more information.

PRINTING

You will need to print all the files in the STL folder. For some files you'll need more than one; the number needed is indicated on each file. Note that for the LED holder for the rear logic display you will use three (3) of the bases. These can be glued together for if you like, but it is not necessary.



The image shows (an early version) of the fiber front plate above the original display plate.

I strongly recommend printing the LED bases in black (or other dark) filament to prevent light from one LED going through the filament and into the surrounding fibers. I tried both white and black, and black gives *a lot* better results!

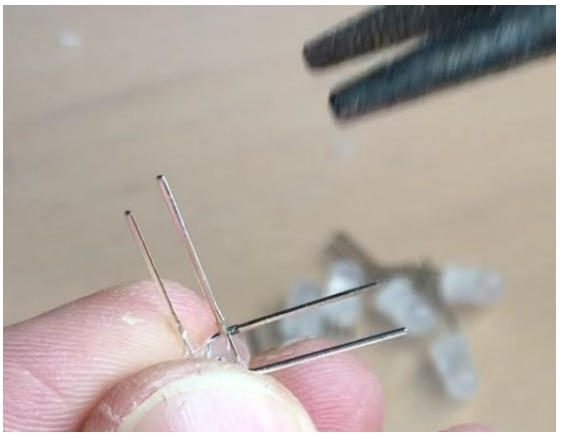
Look into "Horizontal expansion" (so named in Cura; it may have different names in other slicers) and get your printer calibrated before printing the parts. I learned it from this video: https://www.youtube.com/watch?v=TFsTo6cDmF8
You should have a snug fit, especially for the optical fibers. If the holes are a little bit tight they can be drilled out with a 2mm bit. I recommend running the drill in reverse when doing this so it is less aggressive on the walls.

I printed mine with a .4 nozzle, .2mm layer height, 40% infill. Printed front face down (ridges are on the back side for some more strength) If the front plates warp you can add more infill or even scale it in the Z direction.

PREPARING LEDs

I recommend soldering rows of ten, then test them to make sure they are OK before connecting them into larger modules.

The way I do it is to take ten LEDs and bend the positive leg 90 degrees to one side, then the negative to the other. I leave the data in/out as they are. Then I use a pair if pliers to bend the legs 90 degrees "forward". Take care not to twist the legs too much when you do this as it may damage them. Try instead to "push" the LED while holding the LED.

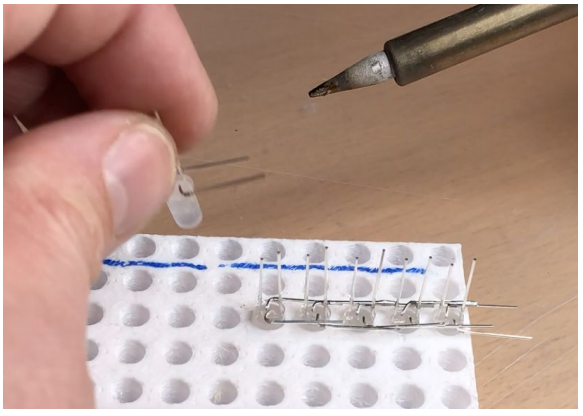


The image shows how I have bent the legs to each side and “forward”.

IMPORTANT: Take care to bend all the legs in the same direction/orientation! Keep an eye on the length on the legs and the flat side of the bulb. These are indicators of direction.

SOLDERING

When the ten LEDs are bent I place then in the holder. Try to get them evenly inserted into the holder for easier assembly. When you do this the legs should align up nicely and the solder should be a breeze. I don't bother cutting the power/ground legs. Also leave the protruding end on for now; it is useful for connecting power and data for testing. Also, for the read display you will be connecting three rows, and having these long legs will make it easier.

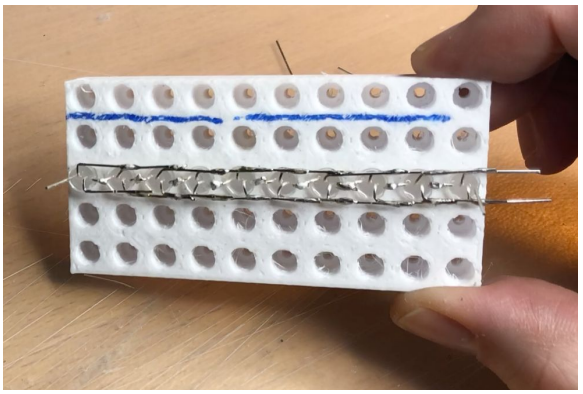


The image shows how I insert the LEDs one by one and solder the power and ground legs together (respectively).

When the power and ground is soldered it is only a matter of bending the Din and Dout pins. I usually also cut them after bending them, leaving a little overlap.

The image shows how I bend the Din and Dout pins together at an angle. I then snip away the excess legs

You now have a row of 10 LEDs. You should use the test-function in the code to make sure it works, as replacing a LED later will be harder. The test code should set all LEDs to R/G/B to test the color.



I have connected the LEDs in rows going the same way (starting top left), but the library used (Adafruit NeoMatrix) allows for easy configuration of direction and starting row, allowing start in any corner, and also connecting the row back and forth (zig-zag). Because I went left-right on all rows I alternated the sides I bent the legs of the LEDs so that + and - is not right next to each other when the rows are inserted into the holders. This makes it a lot easier to connect power and prevents shorts if the rows touch each other. If you opt for the zig-zag pattern (I'll try this on the next display) all legs should be bent the same way, and you'll avoid shorts since every second row is going in the opposite direction.

I also soldered in a capacitor to help with any power surges in the circuit. This is optional but probably a good idea. I used a 100uf as that was what I had at hand at the moment.

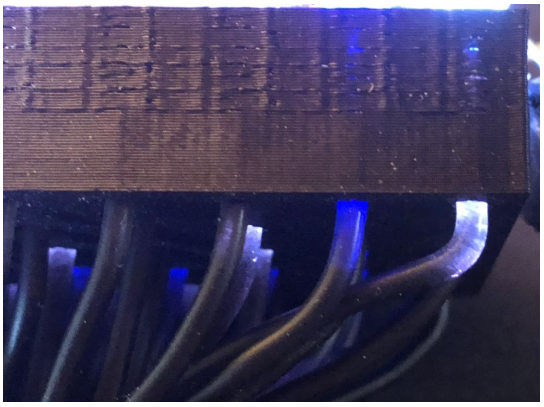
OPTICAL FIBER

The parts are made for using 2mm optic fiber. Don't be afraid to leave the fiber sticking out a bit in the front. This can prevent fibers from being pulled in while you are working on them, and they can easily be cut flush later. I also recommend testing the fit of the optic fiber while finishing the front plate so you can make adjustments if need be..

NOTE: You should have LEDs mounted in the LED bases when inserting the fibers to avoid inserting the fiber too far, as this might leave no room for the LEDs to be inserted. It can be a good idea to have something soft like a piece of yoga mat or similar under the LEDs to put less stress on your solderings.

Front displays
For the front logic displays you should start by adding ~10cm fiber to each corner and thus connect the front and the LED base. Then fit it inside the dome to see if there is enough room between the fiber and the hinges for the surrounding panels (if you have opening panels). If you (are planning to) have a lifter mechanism make sure there is room for it.

TIP: You can heat the fibers gently with a gas flame or heat gun to bend them easier. Then you can make sharper turns on the outer ones, gaining more space next to surrounding hinges. Be careful not to overheat as the fiber mai stretch or kink. This will affect its ability to let light pass through it.



The image shows how the outermost fiber is quite sharply bent. I heated it gently with a torch, inserted it into the holder then bent it at a sharp angle.

When threading the fibers I recommend starting in the middle and working your way out symmetrically to avoid warping.

Note: You may have to make a slight "bend" between the front and back for the bottom front logic display to make everything fit. (Front and back plates not being parallel)

The image shows how I put the bottom display back plate at an angle to make it fit. The dome lift mechanism my Matt Zwarts to the right.

I did not use any glue on any of the fibers, as the tension in it all keeps it in place well enough so far. If you notice significant warping in the front plate you might need more infill, or even just scale it slightly in the Z direction (printed with front face down; ridges are on the back side)

Rear display
The rear display works in the same way, but should be threaded after mounting. Mount the front plate and the LED bases, then thread fibers in through the front and into the base. Take care to leave room for hinges and lifting mechanisms if you have (or plan to have) any. Take care to insert fibers in the corresponding hole (30 x 5 matrix) or some of the effects will not display properly. If you only will use the random lights effect the order is not important.

PSIs
The PSIs require no optic fibers. They are simply holders for LEDs made to fit directly into the front and rear PSI mounts by MR Baddeley.

ASSEMBLY

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To keep the LEDs in the holder I used a few dabs of hot glue.