Stargate DHD Inspired Centerpiece

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Stargate DHD Inspired Centerpiece

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DISCLAIMER

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1 Overview

The Stargate DHD was designed to be a freestanding unit with a center crystal on the DHD device that will illuminate via two AA batteries. The illumination of the crystal is provided via a color changing RGB LED. The unit was designed to accommodate a request from a user that is getting married and wanted to have a Stargate DHD as a centerpiece on each of the tables at the reception. That was just nerdy and cool enough to peak my interest. The result is a wedding centerpiece or Stargate prop that any nerd would be proud of. The LED was running for 5 days straight on the (2) AA batteries with no sign of degradation. I finally stopped the test since I figured 5 days was a sufficient run time test.

The Stargate DHD is 3D printed and utilizes a single LED powered by two AA batteries.

The .stl files for printing the Stargate DHD are located here and can also be found at www.guarnero.com.

The Stargate DHD dial and base are based upon the work of Techno35 at

http://www.thingiverse.com/thing:49627

The dhd (dial home device) dial was resized so that it can print on a Lulzbot Mini printer and the dhd (dial home device) base was resized and heavily modified to provide a housing for the battery holder and reduce the amount of printed material required.

The .stl files include the dial, base, LED holder and battery pack retainer. The entire Stargate DHD was printed with HIPS filament. The Stargate DHD device is painted so any color filament will suffice.

A complete parts list along is provided at the end of this document.

2 Components

2.1 Cabochon

The Stargate DHD utilizes a cabochon for the center of the DHD dial. The cabochon is backlit via a color changing LED that is powered via (2) AA batteries.

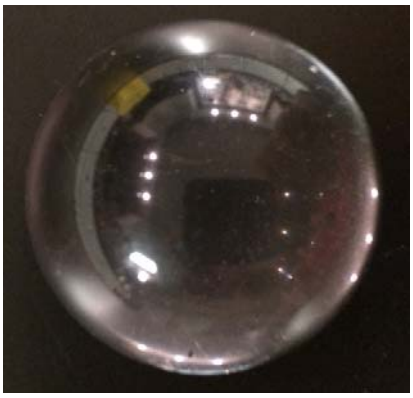

Figure 2.11 – Acrylic Cabochon

The cabochon can be purchased at Tapplastics.com. The clock requires (one) 1.5" acrylic cabochon.

http://www.tapplastics.com/product/plastics/plastic_rods_tubes_shapes/acrylic_cabochons/139

2.2 Cabochon LED & Resistor

The LED will cycle between colors by just applying power via the wires from the (2) AA batteries through a 200 ohm resistor. The LED's can be purchased in quantities of 30 LED's and come with the with 200 ohm resistors.

Figure 2.21 – RGB LED's and Resistors

The LED's were purchased from Amazon.com
http://www.amazon.com/gp/product/B007RO9X82?psc=1&redirect=true&ref_=oh_aui_detailpage_o08_s00 .

2.3 Battery Holder with On/Off Switch

A battery holder case with integrated on/off switch is used to power the RGB LED. Based on testing, the RGB LED will run continuously for at least 120 hours on two AA alkaline batteries.

Figure 2.31 – Battery Holder

The battery case was purchased from Amazon.com
http://www.amazon.com/gp/product/B00CQKCLWM?psc=1&redirect=true&ref_=oh_aui_detailpage_o00_s00

2.4 Screws

(4) #4 x 1/2” screws were used to attach the LED holder to the dial and (2) #4 x 1/2” screws were used to attach the battery pack retainer to the base. (2) #4 x 3/4” screws were used to attach the dial to the base.

Figure 2.41 – #4 x 1 / 2“ Screws

Figure 2.42 – #4 x 3 / 4“ Screws

The screws were purchased at Home Depot

2.5 Paint

The Stargate DHD was painted with RUST-OLEUM silver hammered paint. The cabochon was taped off prior to painting. The outline for the symbols were painted using a black Sharpie paint pen.

The paint was purchased at Home Depot.

Figure 2.51 – RUSTOLEUM Paint

Figure 2.52 – Sharpie Paint Pen

2.6 Filament

The DHD utilizes HIPS black filament for the entire assembly.

The black hips filament was purchased at Lulzbot.com
https://www.lulzbot.com/products/hips-3mm-filament-1kg-reel-esun .

The pictures below show the filament colors.

Figure 2.61 – HIPS Black

2.7 Bumpers

I installed bumpers on the base of the DHD to avoid scratching furniture and to provide a level base since the battery pack retainer is not flush with the base. The bumpers shown below were purchased at Walmart but can also be purchased at Home Depot.

Figure 2.71 – Bumpers

3 3D Printing

The Stargate DHD was printed using a Lulzbot Mini 3D printer. The Stargate DHD pieces were scaled and sized so they could be printed on the smaller print bed of the Lulzbot Mini. I used HIPS material for printing all parts.

The files are in .STL format and are as follows:

Dhd_base.stl
This file is the base for the clock that houses the battery holder. The DHD top attaches to the base via two #4 screws.

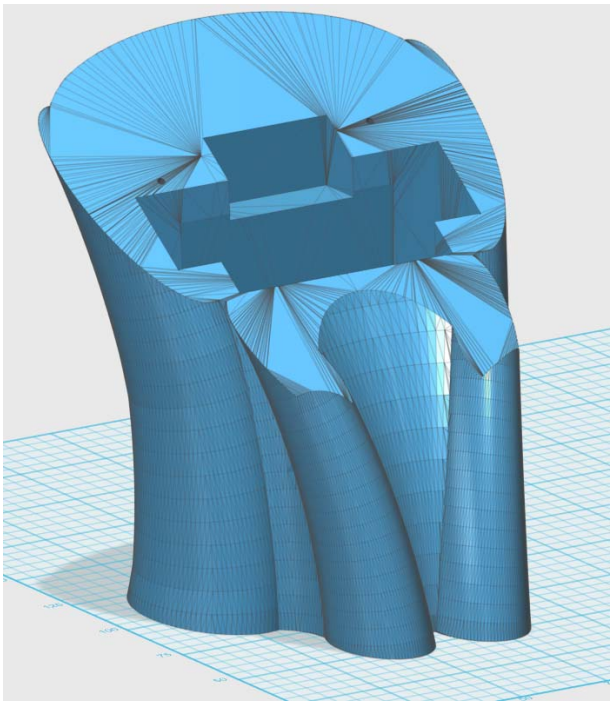

Figure 3.11 – DHD Base

dhd_dial.stl
This file is the DHD center dial piece that has a hole for the cabochon crystal.

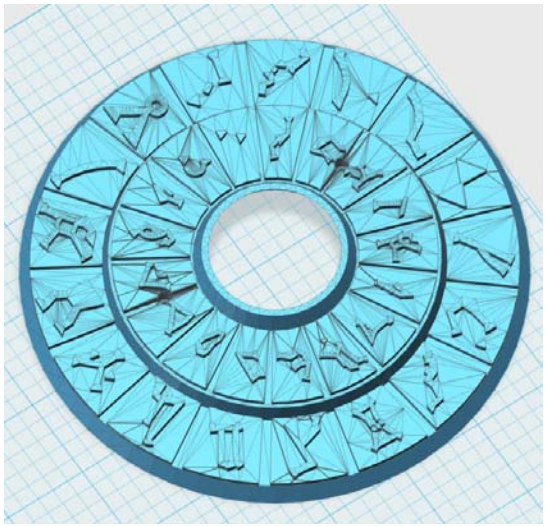

Figure 3.21 – DHD Dial Top

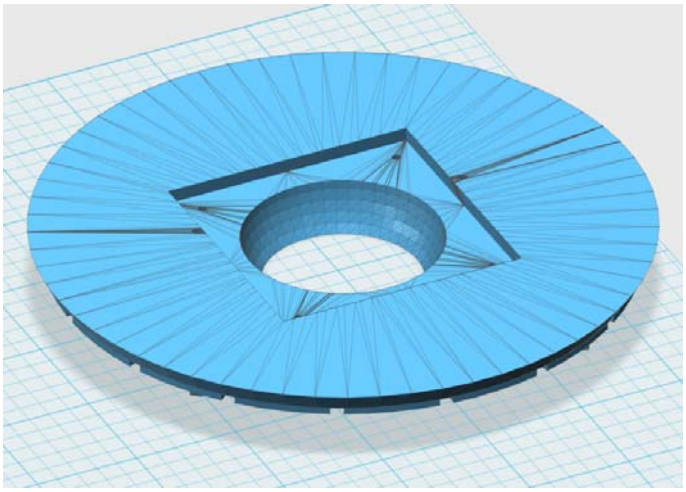

Figure 3.31 – DHD Dial Bottom

dhd_led_mount.stl
This file is the LED holder and cover for the DHD center crystal. This piece is attached with (4) #4 screw to the back of the dial.

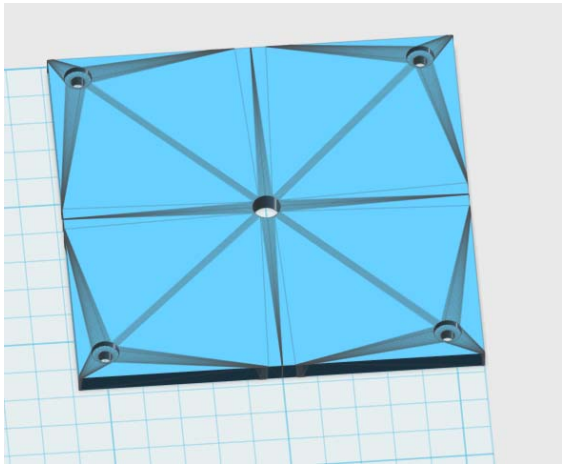

Figure 3.41 – DHD Dial Cabochon Cover

dhd_battery_retainer.stl
This file is the battery holder strap. This piece is attached with (2) #4 1/2 " screws to the bottom of the base.

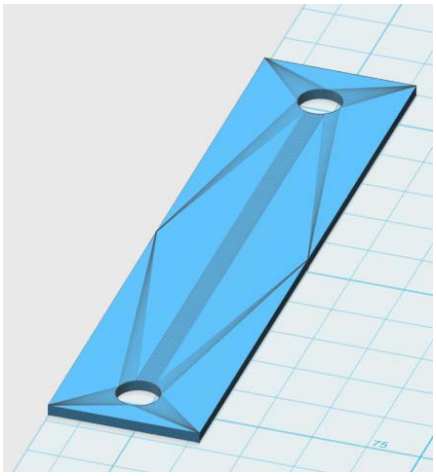

Figure 3.51 – Battery Holder Strap

4 Construction

Once the 3D parts are printed and the components have been gathered, it is time to start the build process. The following steps outline the assembly process.

4.1 Wire the LED

The color changing RGB LED will need to be wired so that black wire from the battery holder is soldered to the LED short lead. A 200 ohm resistor is included with each LED. The LED long lead is soldered to the included 200 ohm resistor. The other end of the resistor is soldered to the red wire from the battery holder. The wiring of the components is shown below. I soldered some extra wire between the battery holder and the resistor/LED so that the battery holder can be extended fully from the base to make changing the batteries a simpler process.

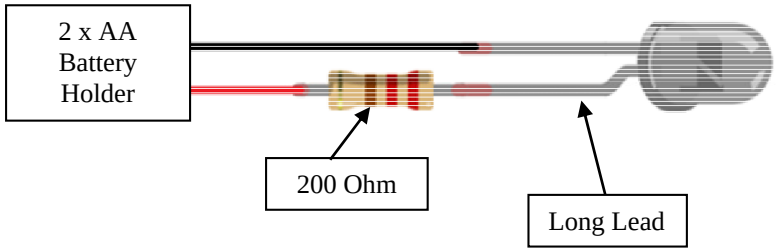

Figure 4.11 – LED Wiring

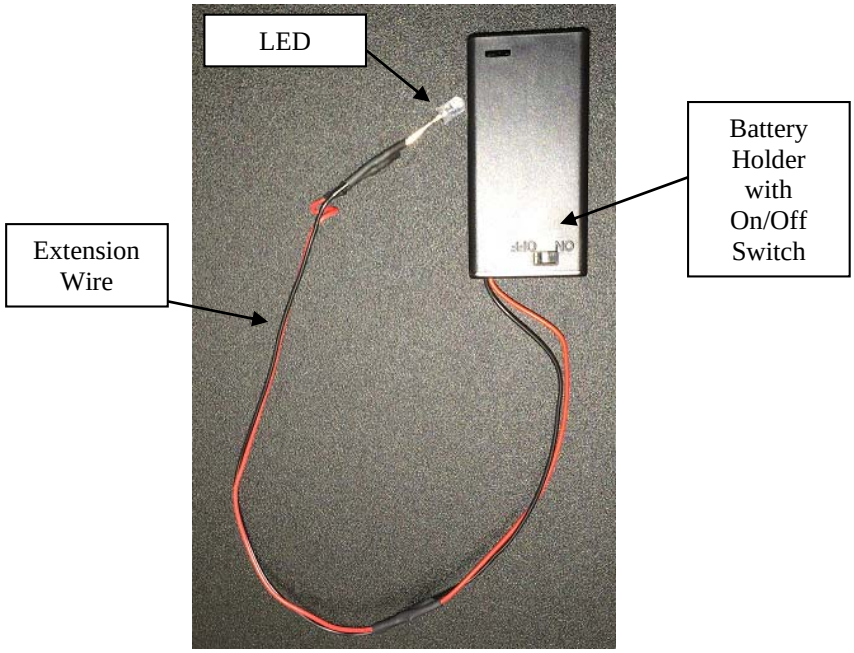

Figure 4.12 – Completed Assembly

4.2 Cleanup Dial Bottom

Cleanup the bottom side of the dial to allow the LED holder to be placed into the square recess. The goal here is not to make it nice and smooth but to just to remove some of the stands that will be there since it was printed without a support. This should only take a few minutes.

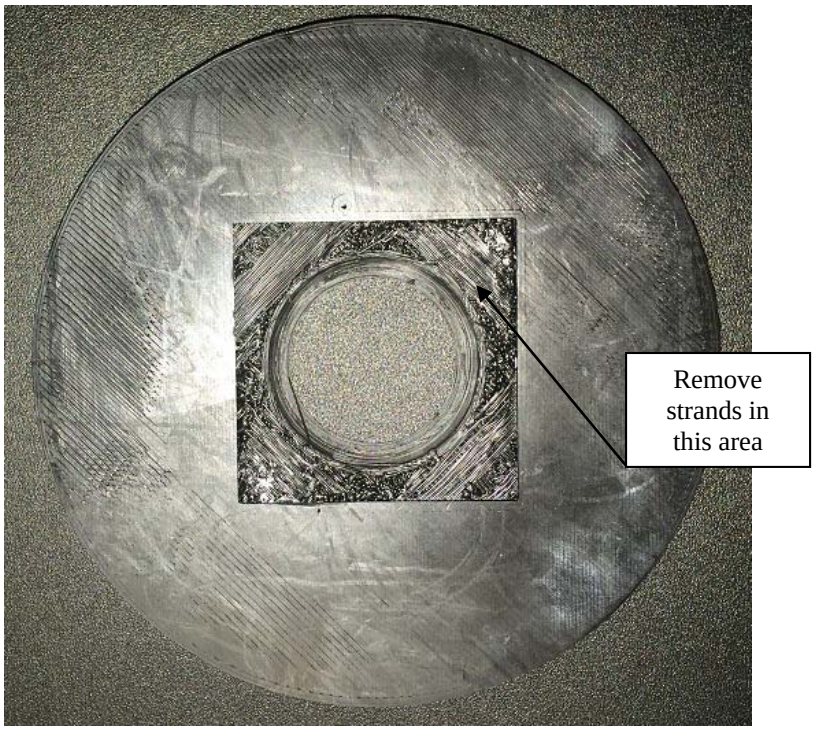

Figure 4.21 – DHD Dial Bottom

4.3 Mount the cabochon to the dial

Place the dial upside down over a cup so that the hole in the center of the dial is centered on the cup as shown below.

Figure 4.31 – Dial resting on cup

Place the cabochon in the center of the dial as shown. Make sure to press it down firmly so that when the epoxy is applied, it does not seep out between the dial and the cabochon.

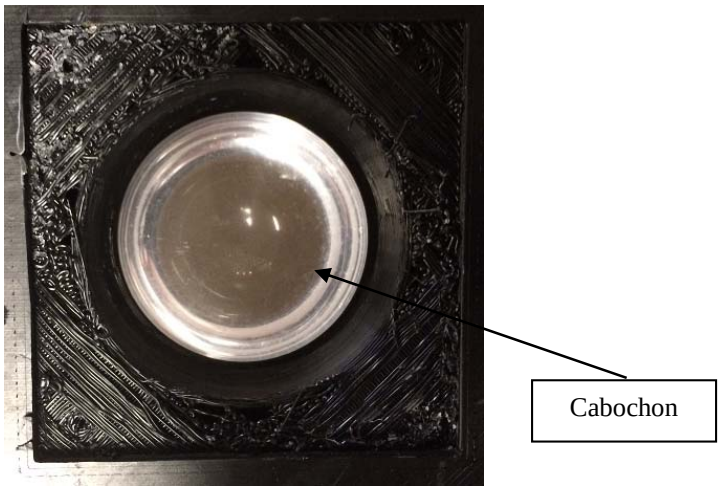

Figure 4.32 – Cabochon placed in dial

Mix some 5 minute epoxy and pour over the cabochon. Do not pour too much since the LED will need room between the LED holder and the cabochon. The goal is to only adhere the cabochon to the dial. The result will appear as the picture below. In the picture below I actually have a little too much epoxy.

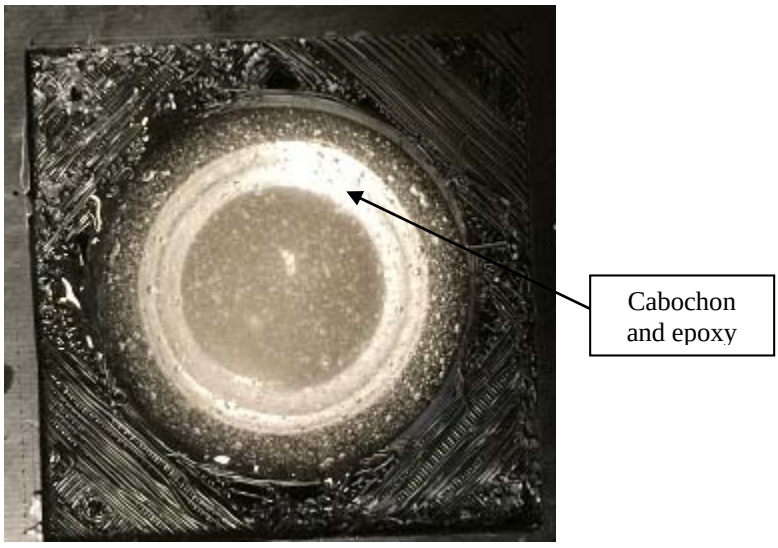

Figure 4.33 – Epoxy covering cabochon

4.4 Expand the hole in the LED holder for the LED

The existing hole in the LED holder too small for the 5mm LED. The hole is intentionally undersized to provide the flexibility to use other size LED's if desired. Drill the hole using an 11/64" drill bit as shown below.

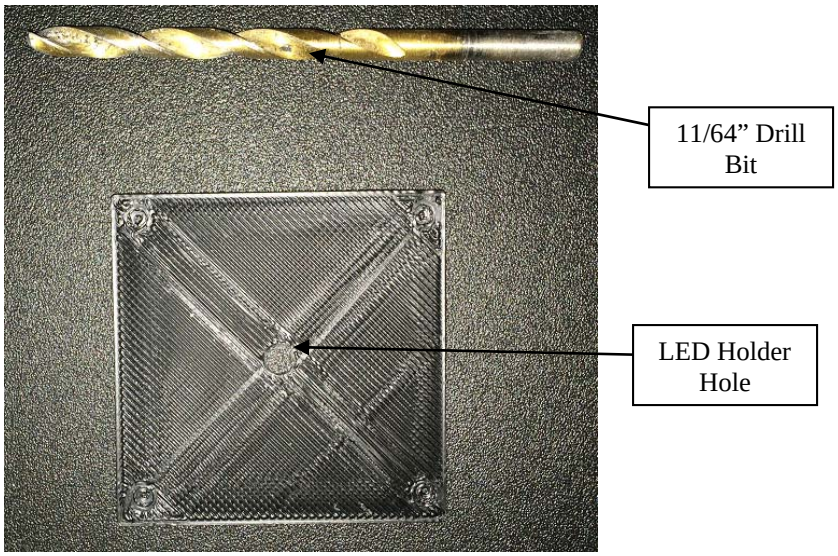

Figure 4.41 – LED Holder / Drill Bit

4.5 Mount the Led to the LED holder

Place the LED in the LED holder as shown. I placed the holder over a cup so the LED can protrude through the LED holder hole.

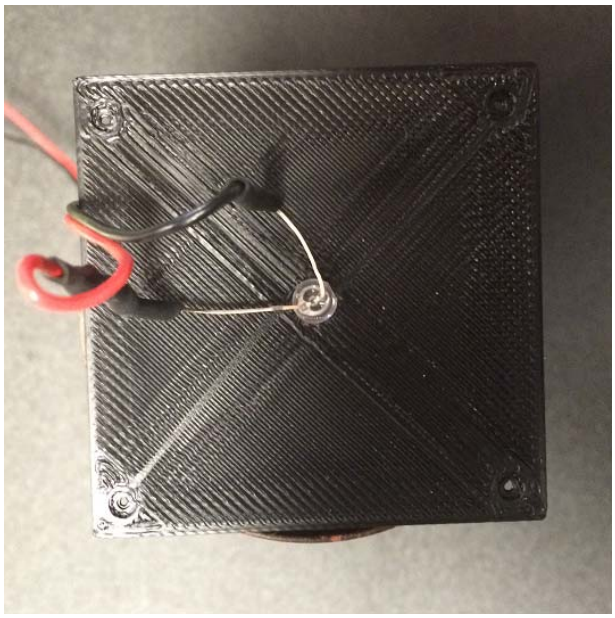

Figure 4.51 – LED / Holder resting on a cup

Attach the LED to the LED holder by pouring 5 minute epoxy over the LED as shown below.

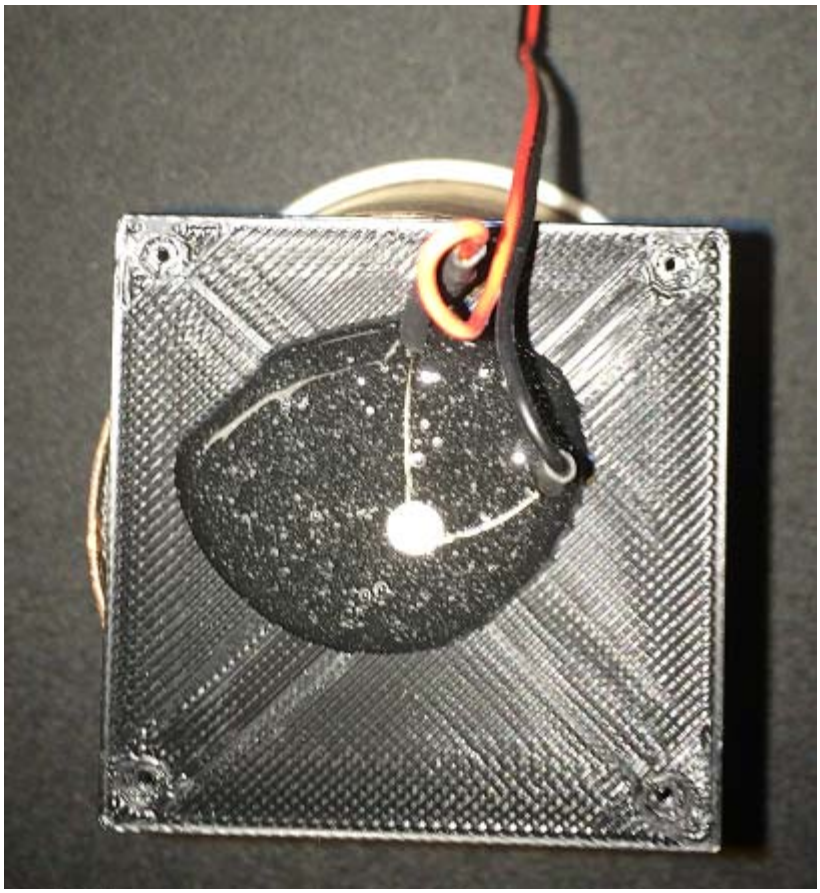

Figure 4.52 – Epoxy LED to Holder

4.6 Attach the LED holder to the dial

Attach the LED holder to the dial using #4 ½" screws as shown below.

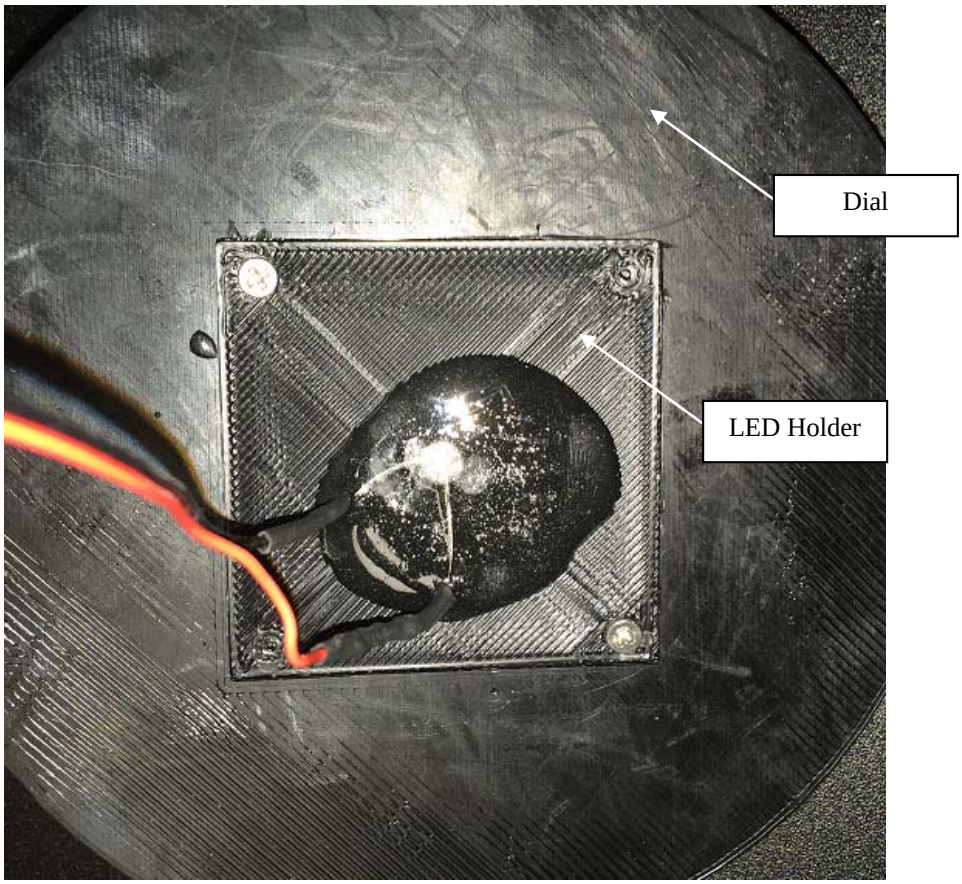

Figure 4.61 – Dial / LED Holder Mounting

4.7 Attach the dial the base

Attach the dial to the base using (2) #4 1/2 " screws.

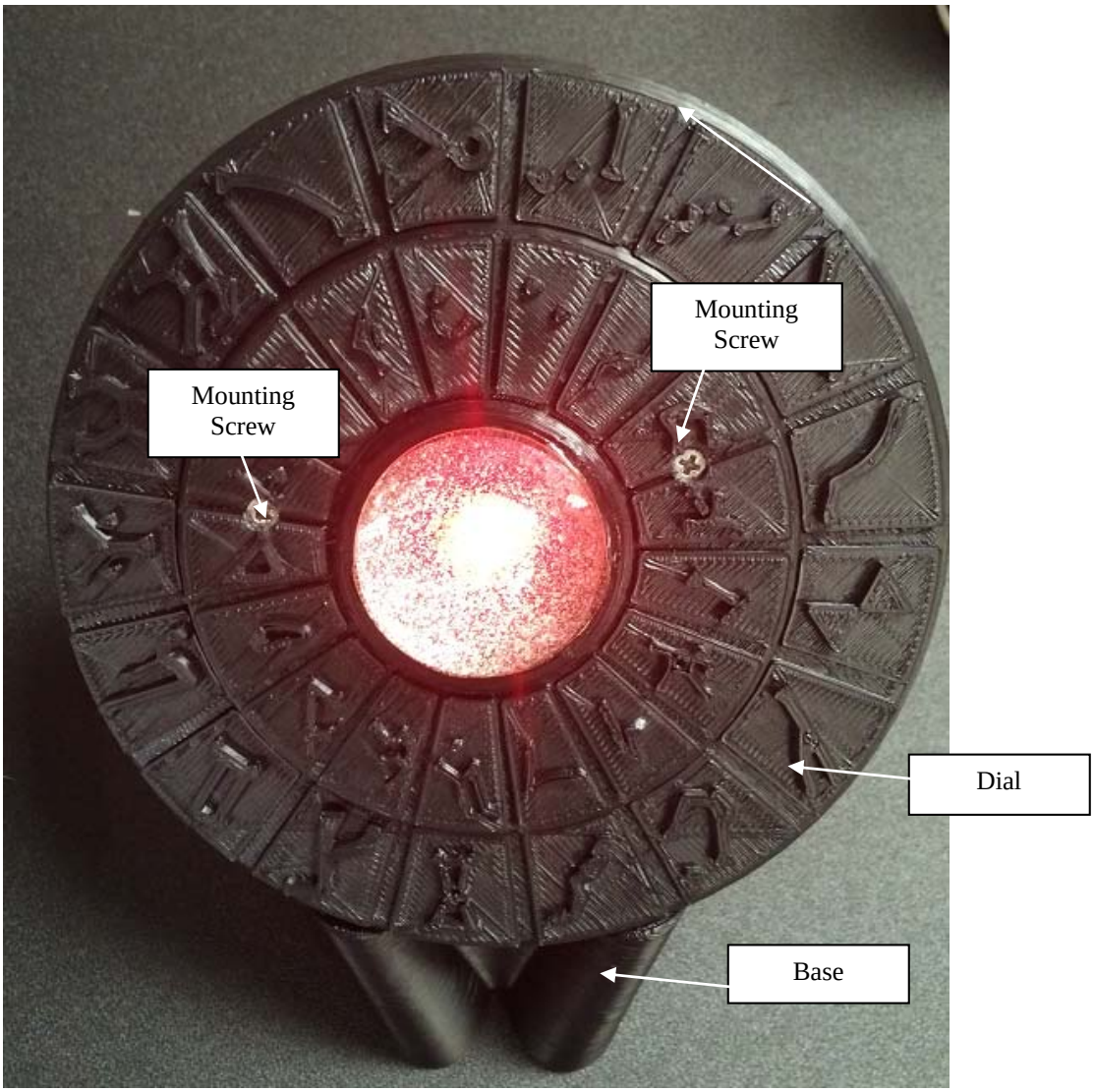

Figure 4.71 – Dial / Base Mounting

4.8 Tape the Cabochon

Tape the Cabochon in preparation for applying paint to the DHD assembly as shown below. On the DHD pictured in this document, I did not need to sand anything.

Figure 4.81 – Cabochon Taped

4.9 Paint the DHD Base and Dial

I sprayed the RUSTOLEUM Hammered Silver on the DHD. Wait for at least one day to allow the parts to dry fully. They parts feel dry to the touch in a few hours but it is best not to rush the process.

Figure 4.91 – DHD Base Paint

Figure 4.92 – DHD Dial Paint

4.10 Paint the Symbols on the Dial

Using a Sharpie paint pen, wipe the tip of the pen over the symbols. Since the symbols are raised, it is simple process that takes five minutes. A completed DHD is shown below with the painted symbols.

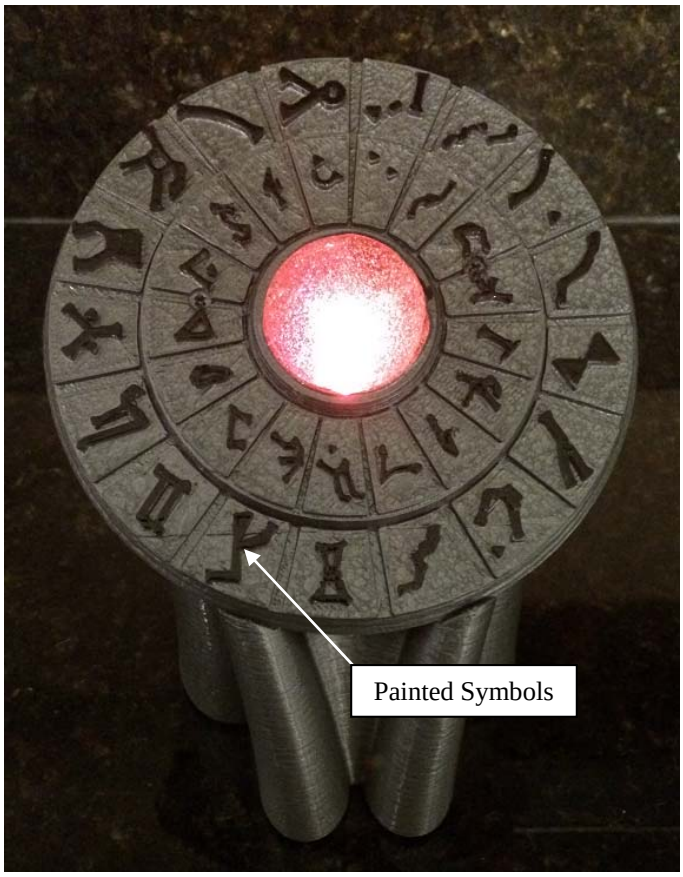

Figure 4.101 – DHD Symbols Painted

4.11 Attach Battery Retainer / Bumpers

The battery retainer prevents the battery pack from falling out. The bumpers are installed to the DHD to prevent scratching furniture. (2) #4 x 1/2 " phillips head screws are used to install the battery retainer.

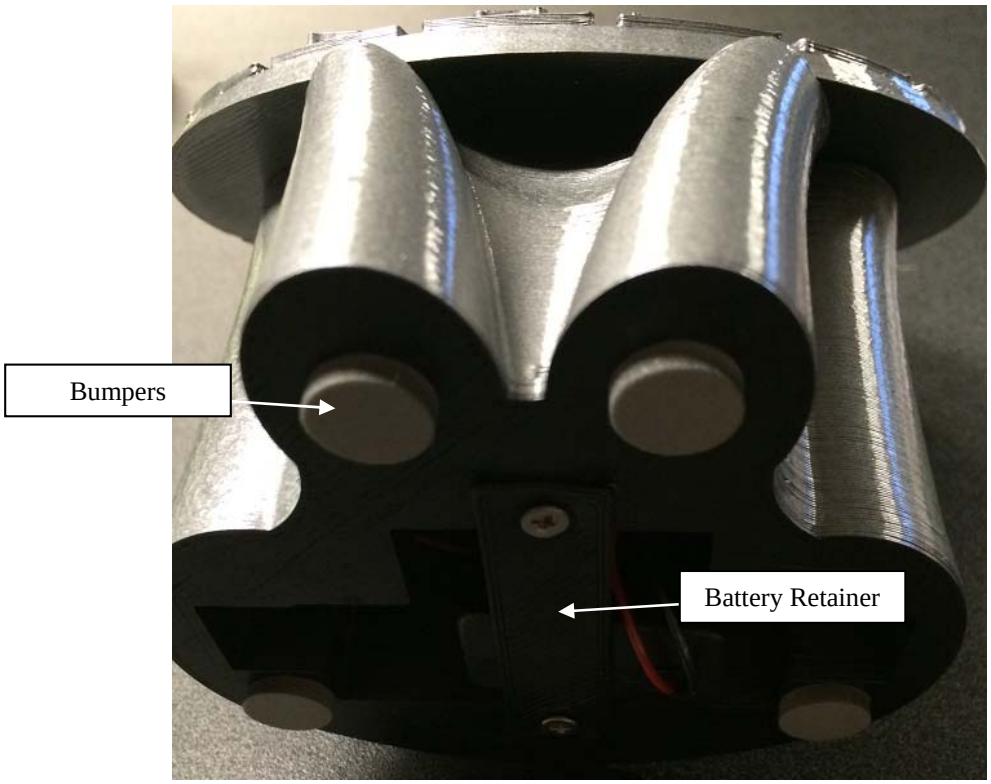

Figure 4.111 – Base Bumpers

5 Example DHD Display

The center crystal of the DHD changes colors in a continuous fashion as shown below.

6 Parts Listing

The parts listed below were used to make the DHD clock.

Description	Purchased	Part #	Qty
Microtivity 5 mm RGB LED	Amazon.com	http://www.amazon.com/microtivity-IL604-Slow-Rotating-Resistors-Pack/dp/B007RO9X82	1
Battery Holder	Amazon.com	http://www.amazon.com/gp/product/B00CQKCLWM?psc=1&redirect=true&ref_=oh_aui_detailpage_o00_s00	1
Acrylic Cabochon	Tapplastics.com	1.5 “ Cabochon	1
Paint	Home Depot	RUSTOLEUM hammered silver spray paint	1
Sharpie Paint Pen	Home Depot	Black Paint Pen	1
Screws	Home Depot	Flat head Philips #4 x 1/2 inch	1 PKG
Screws	Home Depot	Flat head Philips #4 x 3/4 inch	1 PKG
HIPS 3D Printer Filament	Lulzbot.com	https://www.lulzbot.com/products/hips-3mm-filament-1kg-reel-esun	1
Bumpers	Walmart or Home Depot	-	1