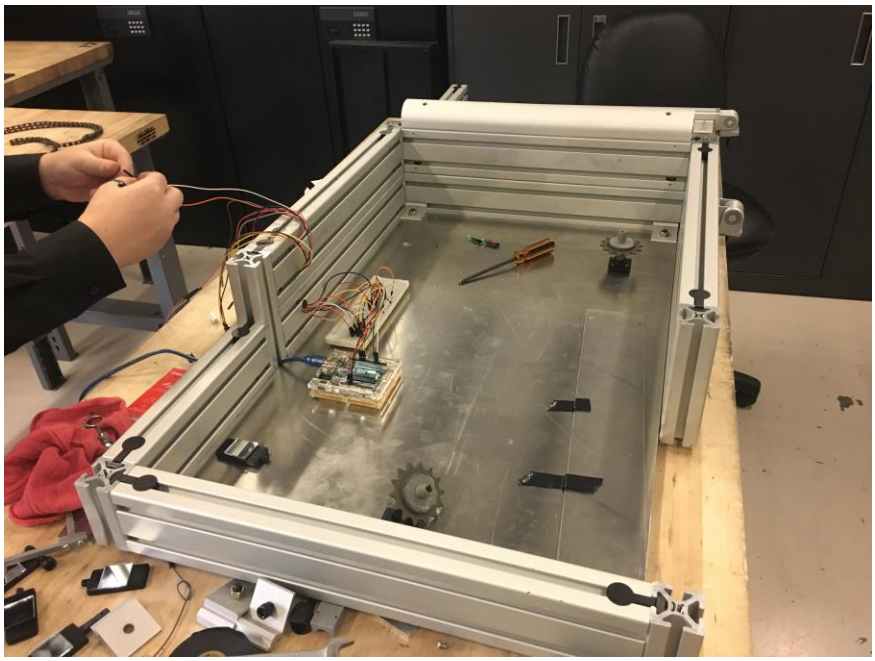
NORTHERN ARIZONA UNIVERSITY

WONDER FACTORY MIRROR REFRACTION BOX

OPERATIONS MANUAL



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1 INTRODUCTION

The purpose of this manual is to provide step by step instructions in assembling the GemMirror Box. The second section covers the assembly of the device and the last section covers the maintenance of the product should any part come under failure. The majority of the casing is made out of aluminum which should prevent any issues with the majority of the project however the third section does cover the parts that are most likely to come under failure.

2 MANUFACTURING and ASSEMBLY

This section cover the step by step process of assembling the GemMirror Box. The majority of the materials were all custom ordered from metal manufactures and TABLE 1 shows the total amount of parts as well as where the product was ordered from or where it was manufactured.

Table 1: Part and Manufacture List

Part ID	Part	Description	Quantity
A	3’ post	1.5’x1.5’x3’ post	2
B	6’ post	1.5’x1.5’x6’ post	4
C	18’ Beam no tap	1.5’x3’x18’ With no trappings	3
D	18’ Beam tapped	1.5’x3’x18’ With trappings	3
E	18’ Beam with channel	1.5’x3’x18’ With trappings and hole through it for cables	1
F	18’ Beam with angled channel	1.5’x3’x18’ With hole through it for cables on side	1
G	6’ Beam	1.5’x3’x6 With no tapings	2
H	Plate A	18’x29’ Plate with mirror holes and shaft holes	1
I	Plate B	18’x29’ Plate with just shaft holder holes	1
J	Laser Base A	Attaches to Plate A and holds laser	1
K	Laser Base B	Attaches to Laser Base B and secures the laser	1
L	Laser Assembly	Laser Diode with addition components for plug in compatibility	1
M	Arduino Assembly	Microprocessor that guides the functions of the lights	1
N	Shaft Assembly	Sprocket + Shaft	2
O	Chain	Bicycle chain	1
P	Crank Assembly	User input for actuating shafts	1
Q	Mirror Posts	Mirror on pieces of plastic	5
R	Mirror Shaft Post	Mirror post that can fit into a slotted shaft	1
S	19.24’ Post	1.5’x1.5’x19.24’ post	2
T	18’ Curved Post	1.5’x1.5’x18’ Curved	1
U	18’x18’ clear plate	18’x18’ Acrylic plate	1

2.1 Step by Step Instructions

1. Connect 4 18inX3inX1.5in using mounting brackets and 6inX1.5inX1.5in the corners.
2. Connect 2 C parts to the 1.5x1.5x6 posts on either side of one face such that they are parallel
3. Remove the 18x3x1.5 piece between the parts in the previous step such that you have a U shape
4. Use 2 3x1.5x1.5 and attach them to the ends of part C

5. Use the removed part from step 3 and place it between the parts used in step 4
6. Screw shaft holders onto the Plate A
7. Use 4 plate mounting brackets and attach Plate B to the bottom slots of the frame. The brackets need to be attached to the rear post and the front post. Do not attach them to the sides.
8. Place in electronic components using Velcro on the components and plate B
9. Carefully guide leds and sensors through the hole on the left post such that they are sticking out the top.
10. Use the drilled 18x3x1.5 post and pull the sensor cables through the holes between the slots on the side. Top hole for leds and bottom Hole for sensors
11. Pull wires such that they do not get pinched between the bottom post and the top post
12. Add the other 18x1.5x3 posts such that they make a U shape with the post that has wires in it
13. Attach laser and shaft components to plate A
14. Using plate mounting brackets, attach the plates just past post vertical posts 3 and 4 on the second side slots.
15. Push the plate back such that it is flush against the rear of the device
16. Remove the left part C and use a plate mounting bracket to attach Plate A to the front post
17. Place shafts into shaft holders taking care to keep chain attached. Bending plates is acceptable to place the shafts in their place
18. Replace the left part C
19. Repeat 16 through 18 until the shafts are in place with the chain and plate at is attached
20. Use remaining 18x3x1.5 and attach it between posts 3 and 4
21. Attach Cover to posts 5 and 6

3 MAINTENANCE

The majority of the device is meant to stay together after assembly. The casing of the device is sturdy enough to actually never need replacing with exception of the acrylic portion. If replacement is needed for the case the exact pieces can be ordered from 8020 which is the manufactures who sold the exact dimensions of the metal casing. If the dimensions are not exact a grinder may be used in order for the pieces to properly fit together.

The Electronics portion of the device are all inexpensive pieces that can all be replaced however this is the portion that is most likely to fail when being handled. The chain assembly if ever broken can be accessed with the electronics by removing the aluminum sheet metal plate which requires an Allen wrench. The bike chain can be replaced by any bike shop with adjustable chain pieces and all of the shaft components can be 3D printed until the shafts are made out of the aluminum billet.