



Conceptualization

"Make something that is practical, fun, and engaging."

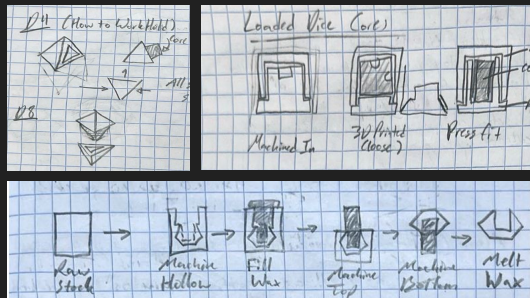
Decision Matrix

Main Focus: Motivation / Fun, Machinability, Design Intensity

	Weights	Handheld	Computer Peripheral	Figurine	Loaded Dice	Marble Track	Light Puzzle	Transformer	Planetarium	Walking Bot	Snitch
Inspiration / Motivation	0.3	10	0	7	8	4	7	6	5	4	5
Part Count (Low)	0.2	4	8	8	8	5	5	3	2	3	2
Work Holdability	0.5	7	7	2	4	4	4	5	2	8	2
Budget*	0.3	3	4	6	7	7	4	6	2	4	6
Interfaces	0.4	9	5	5	6	6	8	8	7	8	5
Machine Time (Low)	0.4	8	4	3	6	5	5	6	2	6	2
CAD Intensity (Low)	0.3	4	5	2	8	4	4	5	1	3	3
Fun	0.4	10	0	8	8	4	6	8	5	3	4
Variability / Design Freedom	0.2	6	2	9	5	7	8	5	2	4	1
Feasibility in 4 Weeks	0.6	6	8	3	9	5	6	5	1	2	2
Score		25	16.6	17.1	24.9	17.9	20.3	21	10.4	16.7	11.4
Rank		1	8	6	2	5	4	3	10	7	9

Loaded Dice

Focus on function and machinability



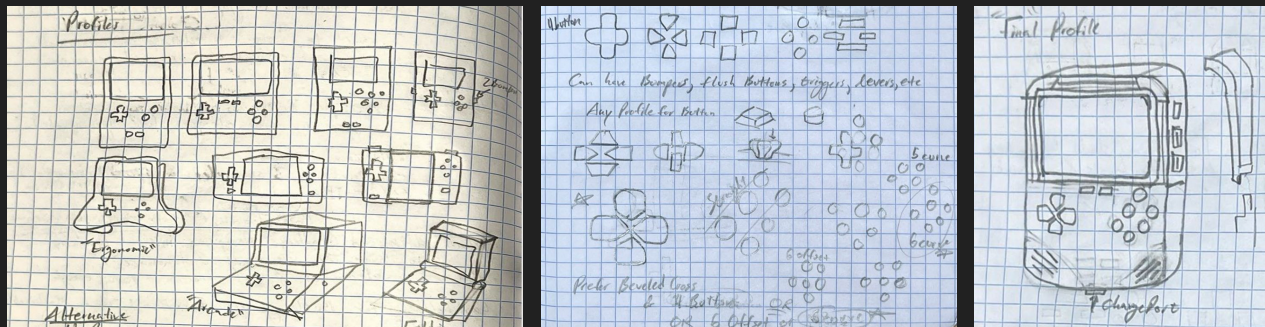
Shadow Projection Sculpture

Focused on understanding projections



Game Boy

Study focused on form factor and interaction, testing various button layouts and designs.

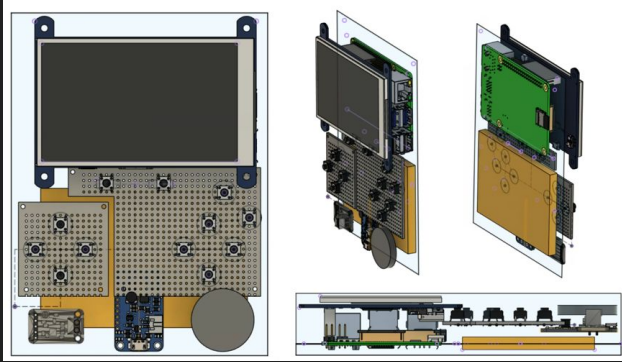


- List of Ideas
- Handheld Device (Game Boy Emulator)
 - Computer Peripherals
 - Mouse, Keyboard
 - Figurines
 - Hollow Knight, Doomguy, Kirby, Mario Galaxy, Mario + Bowser
 - Loaded Dice
 - Marble Track
 - Planetarium
 - Transformer
 - Wind Up Toy / Walking Bot
 - Golden Snitch
 - Shadow Projection Light Puzzle

Prototyping

Proto-CAD

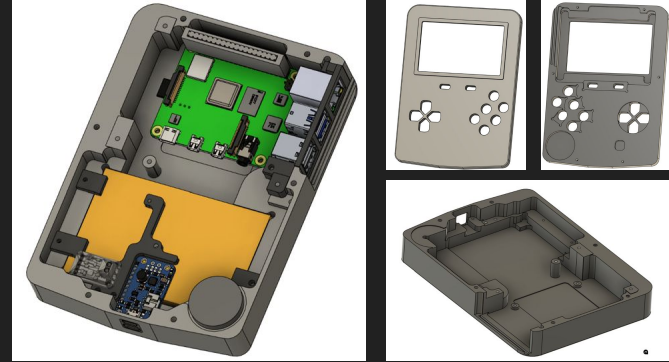
Rough size and position of electronics to gauge stock size



Creating the Draft CAD revealed that the electrical component references were not square or parallel with edge alignment. This resulted in the models being partially rebuilt from scratch for assembly and joint alignment.

Draft CAD

Final component positions and draft machined parts.



Foam Form Prototype

Minimal Viable Size that is ergonomic and within stock size

Sizes Tested:
• 6", 6.5", 7"

Chosen
Length: 6.5"



3D- Printed Prototypes

V1: Many minor clearance issues

V2: Everything ready for Machining



Final Model

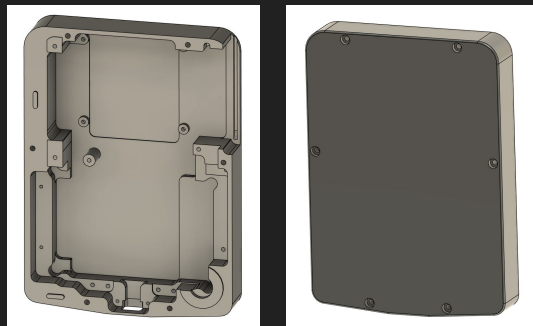
Top Panel



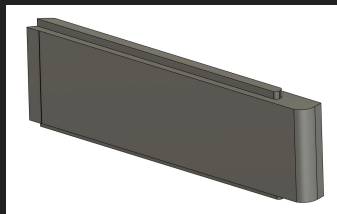
Full Model



Bottom Housing



Port Slot Cover



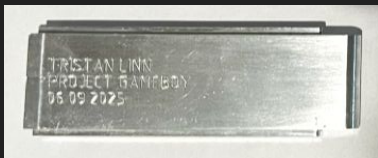
- 14 Sliding fits
- 2 press fits
- 1 zero tolerance fit

Stock Setup



- 1 Set of Soft Jaws
- Bottom Housing:
(4.875 x 6.665 x 1.08)
- Top Panel :
(7.49 x 5.054 x 0.502)
- Port Slot Cover:
(1.081 x 0.994 x 3.259)
- 13 Tools
- 8hr 40m Machine Time
- 11 CAM Setups

Final Assembly



Final Result and Reflection

This project was the first time I had to majorly consider form factor and internal structures to house electronics compactly. I believe that the digital proto-draft to foam testing to CAD to prototype workflow was a good decision. However, I should have spent more time optimizing electronics in terms of form factor and capabilities (compromising on performance for a smaller volume). Overall, I am proud of this project and know it was a success!

Takeaways:

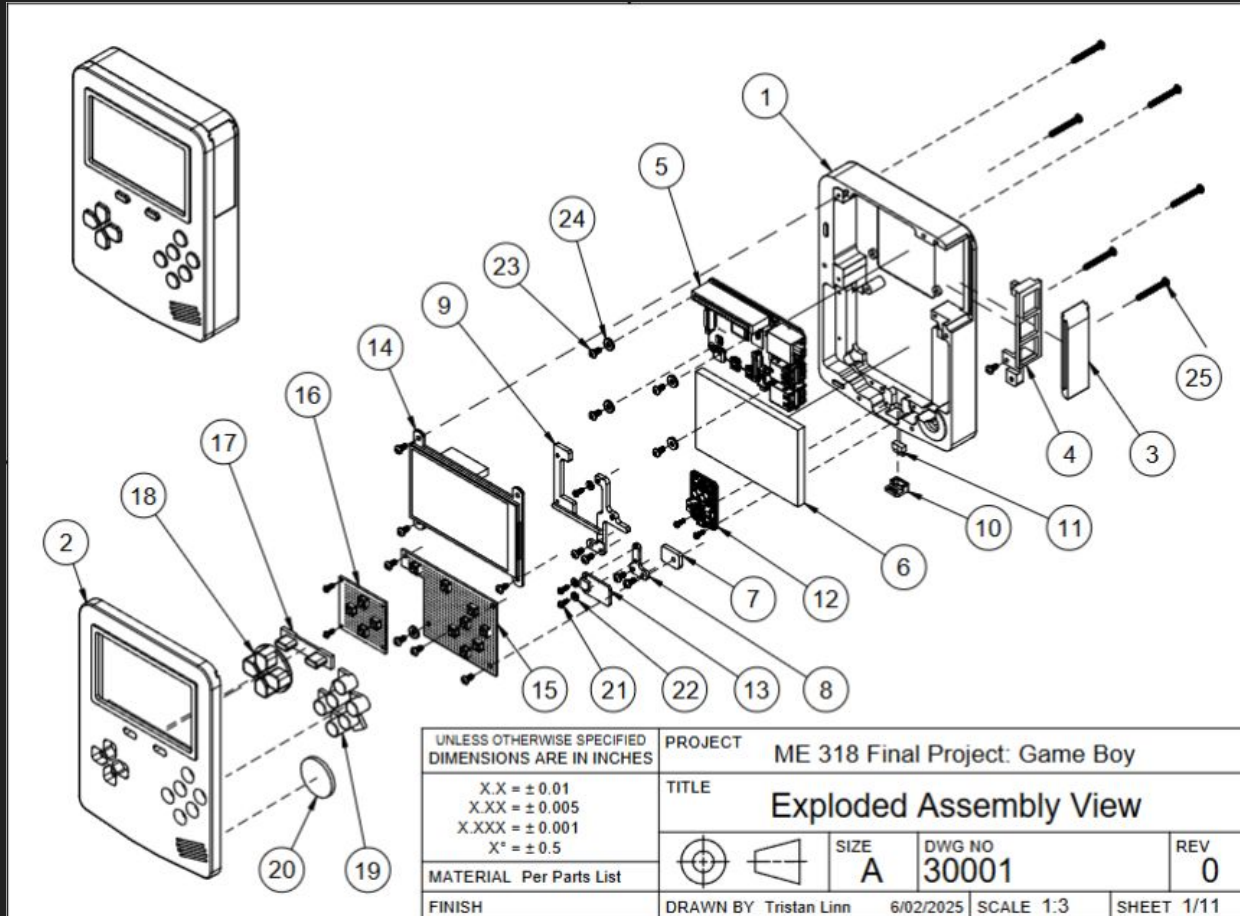
- Be open-minded to alternatives for non-critical design features to reduce complexity or lessen design challenges down the pipeline.
- Continue to be thorough in design validation in the prototyping phase and do a full assembly test before final production of product.

Areas of Improvement:

- Lightweighting / Optimization for form factor and nominal stock
- Finishing past machine lines / Clear Coating to prevent scratches



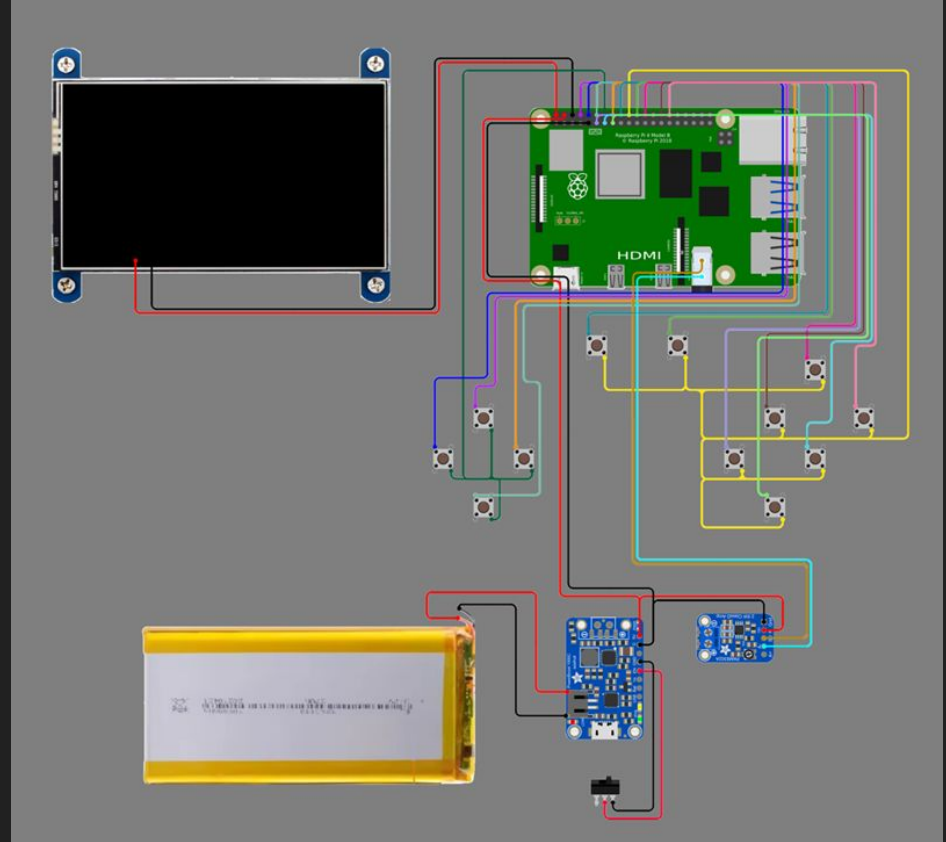
Appendix - Exploded View



Appendix - Circuit Diagram and Electronic Components

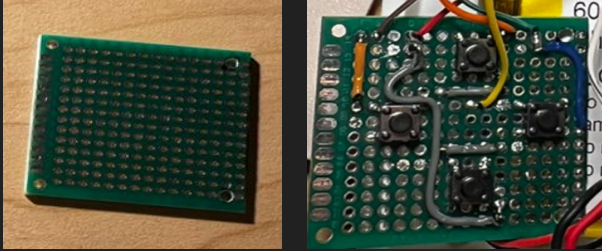
Electronic Components:

- Raspberry Pi 4 Model B
- WaveShare 4inch LCD
- 12 - 6mm Tactile Buttons
- Buttons
- 3.7V 4200mAh Battery
- 5v2A Step Booster
- Sound Amplifier
- Speaker
- 50V 0.5A SPDT 3mm Slide Switch

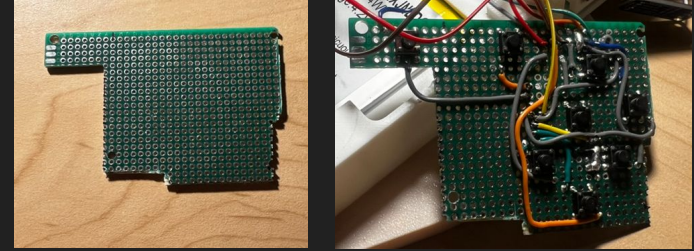


Appendix - Electrical Assembly

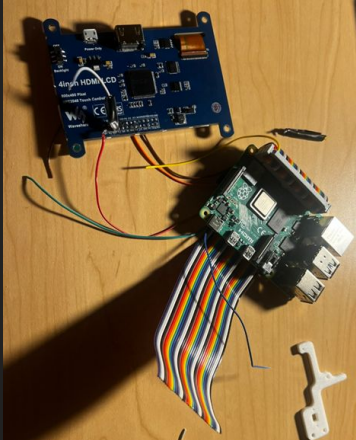
Left Gamepad



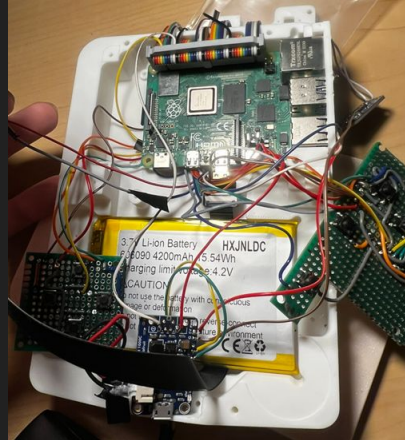
Right Gamepad



LCD to Pi



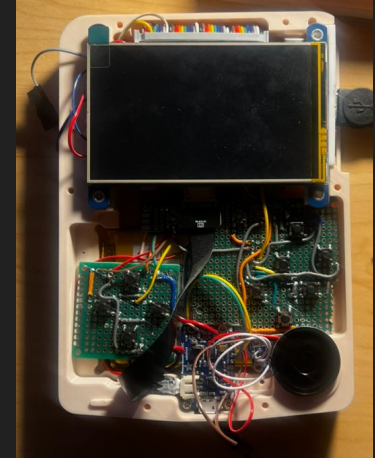
Gamepads to Pi



Step Booster + HDMI



Speaker and Install

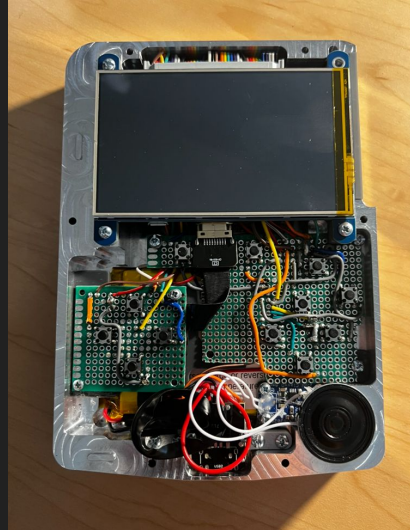


Appendix - Final Assembly

Raspberry Pi and Port Cover



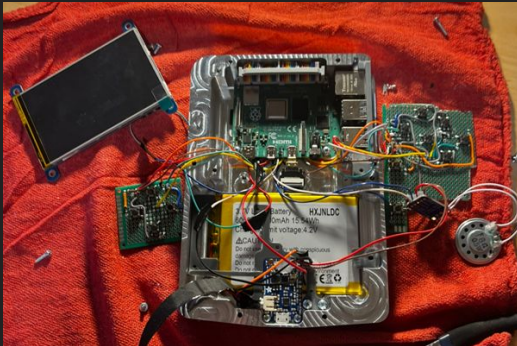
LCD Screen, Game control Buttons, Sound Amplifier, Speaker



Top Panel and Buttons

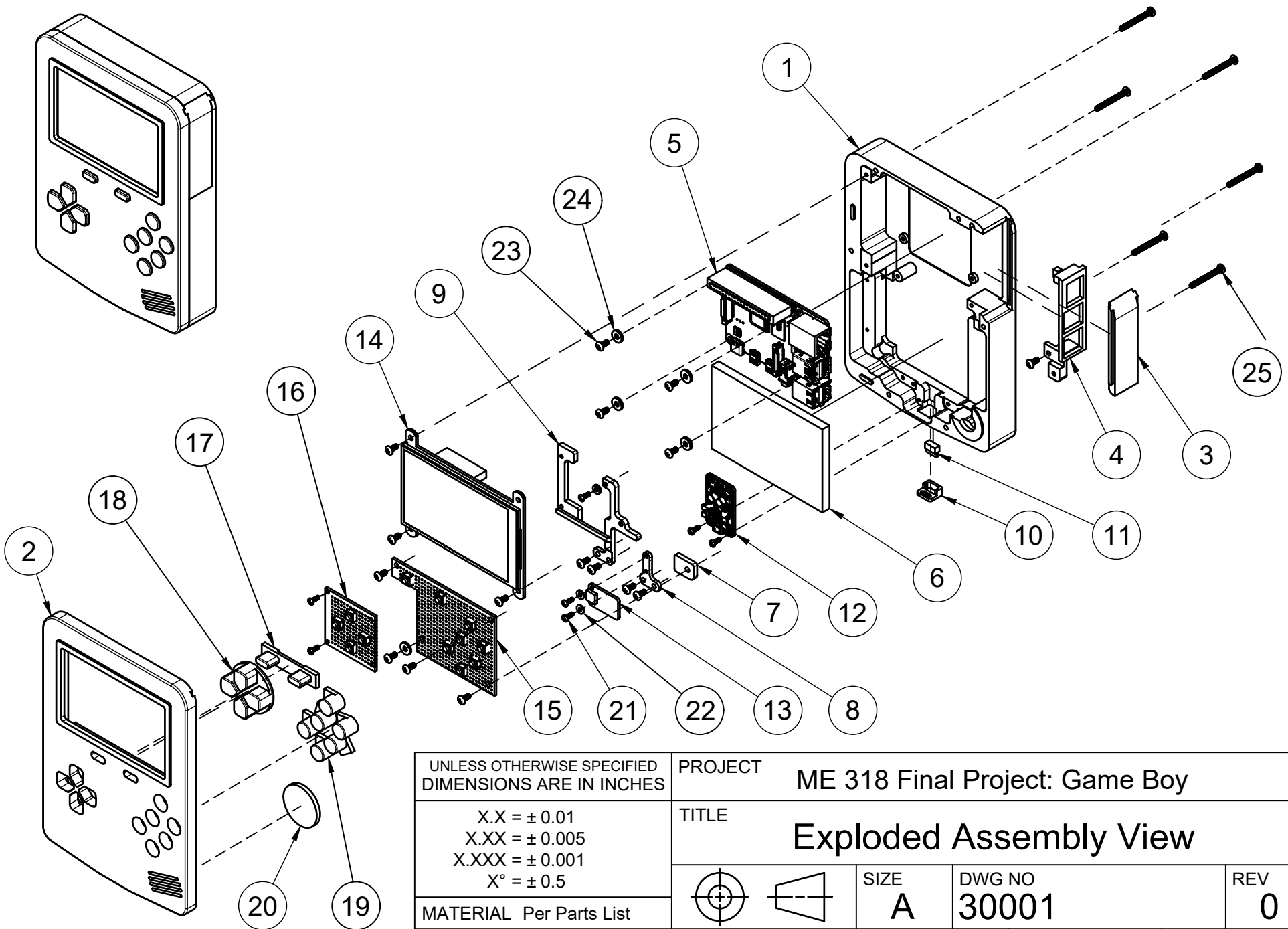


Battery, Mounts, Step Booster



Appendix - Budget

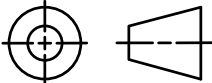
Part	Material	Actual Stock Size	Nominal Stock Size			"Purchased Stock Size"			QTY	Purchase Price	Nominal Price	Supplier	Salvage
			W	L	H	W	L	H					
Top Panel	Aluminum	7.49 x 5.054 x 0.50155	7.5	5	0.5	8	12	0.5	1	\$24.99	\$9.76	Amazon	Yes
Base Panel	Aluminum	4.875 x 6.665 x 1.08	4.875	6.75	1	8	8	1	1	\$82.80	\$42.57	McMaster	Yes
Mount Parts	Tough 2000	-	-	-	-	-	-	-	1	\$5	\$5	AMPS	No
4-40 x 1 Screw	Stainless								6	\$0.04	\$0.04	AMPS	No
4-40 x 0.25 Screw	Stainless								16	\$0.02	\$0.02	AMPS	No
2-56 x 0.25 Screw	Stainless								7	\$0.07	\$0.07	AMPS	No
Cover	Aluminum	1x3x1	1	3	1	1	3	1	1	82.8	\$9.76	Same Stock as Base Panel	Yes
3D Prints	Gray Resin	49.67 mL							1	\$0.14/mL	\$6.95		
										Total	\$75.10		

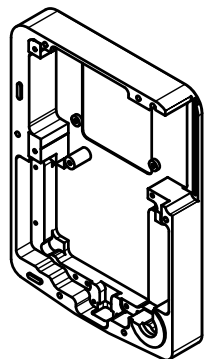
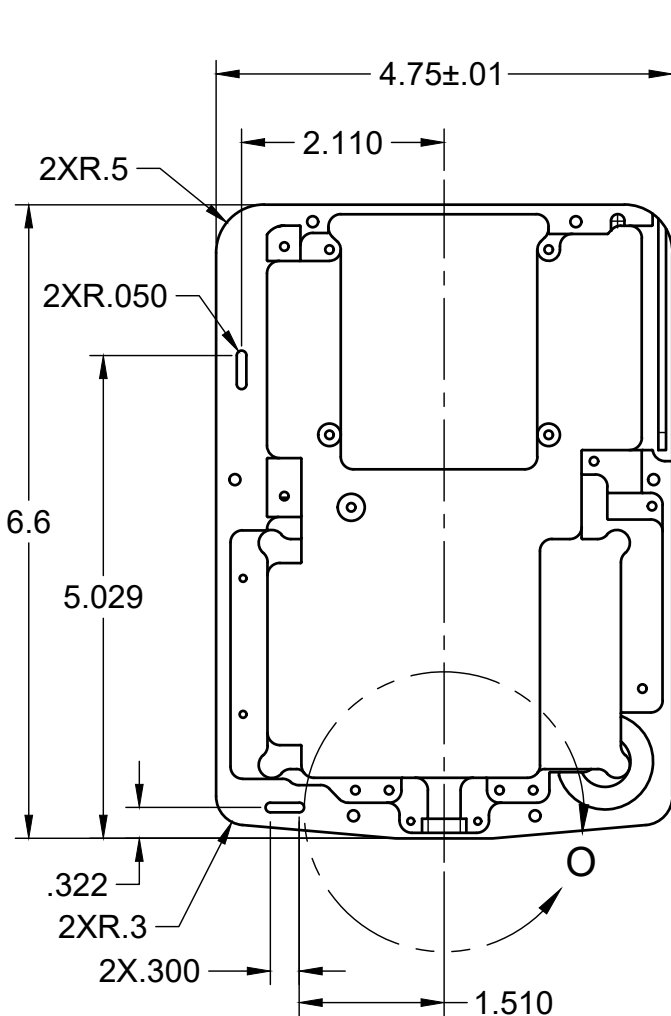


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5 MATERIAL Per Parts List FINISH	PROJECT ME 318 Final Project: Game Boy			
	TITLE Exploded Assembly View			
	 	SIZE A	DWG NO 30001	REV 0
	DRAWN BY Tristan Linn	6/02/2025	SCALE 1:3	SHEET 1/11

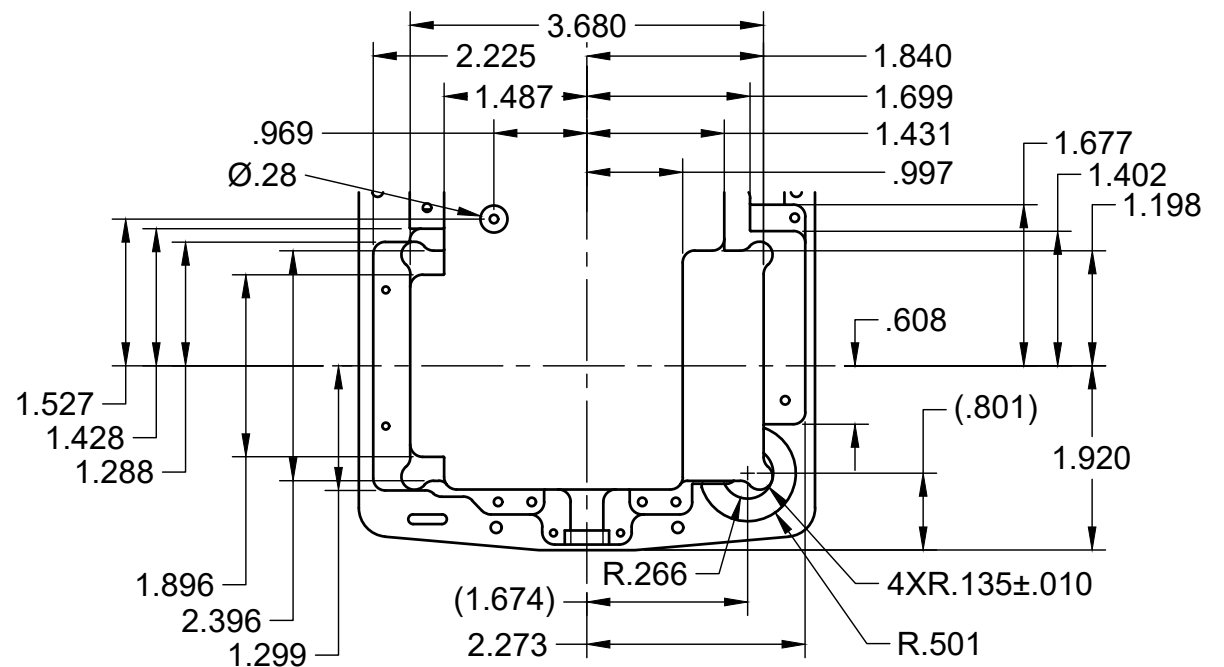
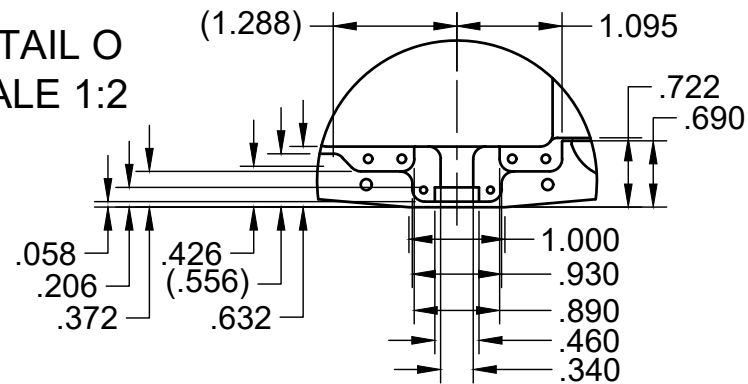
PARTS LIST		
ITEM	QTY	DESCRIPTION
1	1	BOTTOM HOUSING
2	1	TOP PANEL
3	1	PORT SLOT COVER
4	1	PORT PANEL
5	1	RASPBERRY PI
6	1	BATTERY
7	1	RIGHT BATTERY CLIP
8	1	AMPLIFIER MOUNT PLATE
9	1	LEFT BATTEY CLIP
10	1	CHARGE PORT INSERT
12	1	3-MM SPDT SLIDE SWITCH
13	1	SOUND AMPLIFIER
14	1	4-IN WAVESHARE LCD SCREEN
15	1	RIGHT GAMEPAD

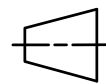
PARTS LIST		
ITEM	QTY	DESCRIPTION
16	1	LEFT GAMEPAD
17	1	OPTION BUTTON
18	1	DPAD BUTTON
19	6	ACTION BUTTON
20	1	SPEAKER
21	7	2-56 X 0.25-IN SCREW
22	9	#2 FLAT WASHER
23	16	4-40 X 0.25-IN SCREW
24	15	#4 FLAT WASHER
25	6	4-40 X 1-IN SCREW

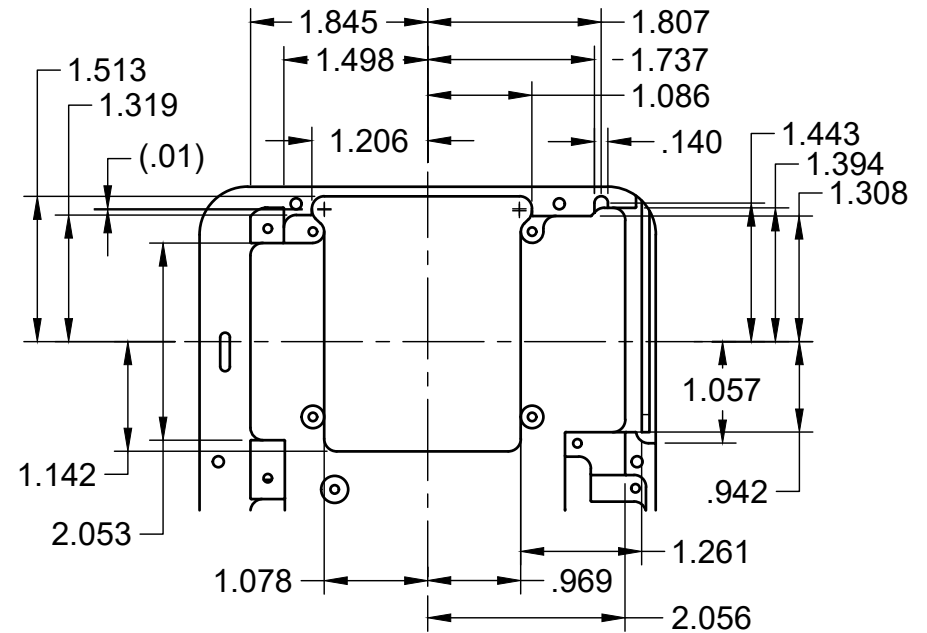
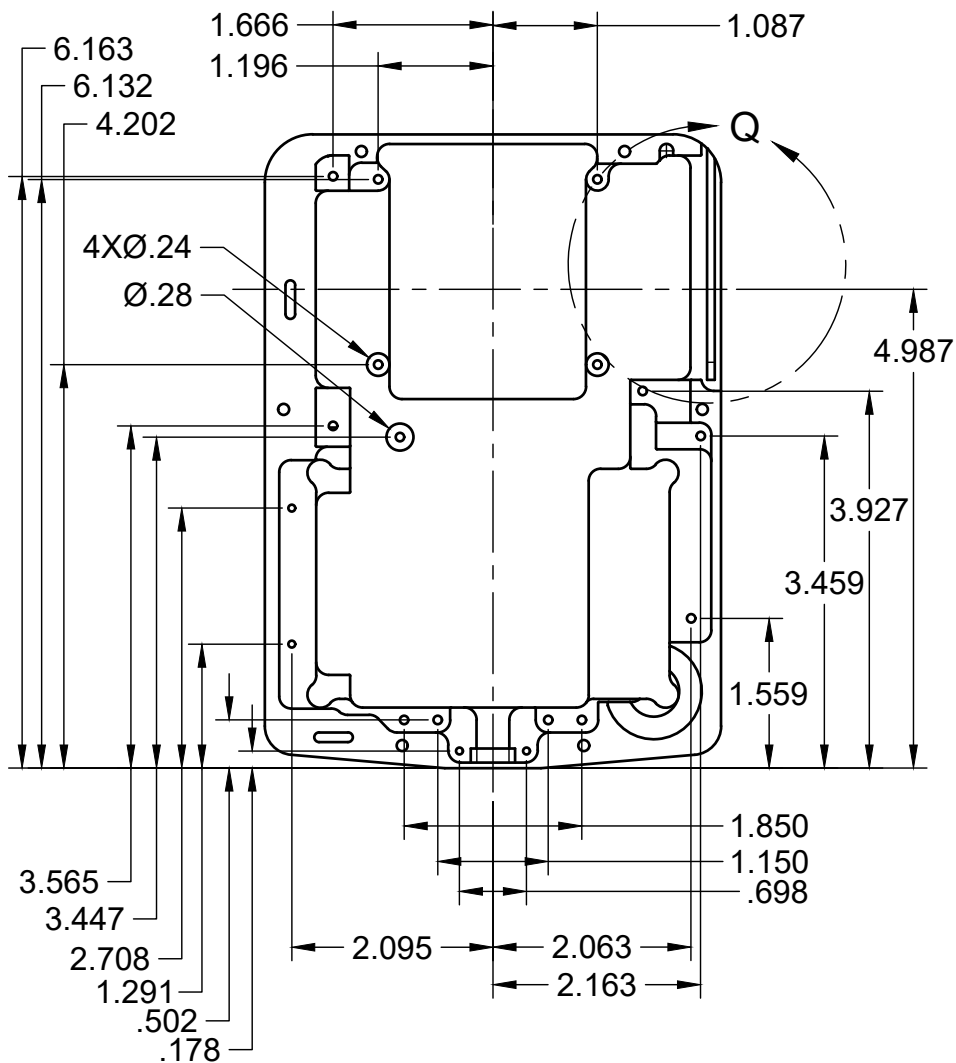
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	TITLE Exploded Assembly View			
		SIZE	DWG NO	REV
		A	30001	0
MATERIAL Per Parts List	DRAWN BY Tristan Linn		6/02/2025	SHEET 2/11
FINISH	SCALE 1:3			



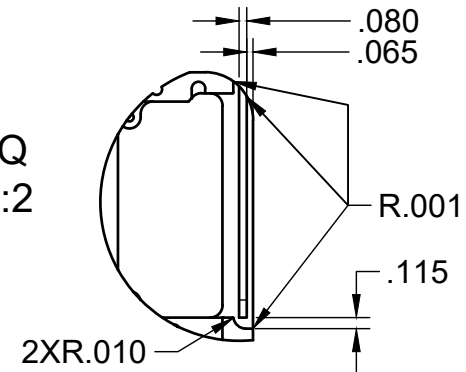
DETAIL O
SCALE 1:2



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	PROJECT ME 318 Final Project: Game Boy			
	TITLE Bottom Housing 1/5			
X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5	 	SIZE A	DWG NO 30001	REV 0
MATERIAL AL 6061				
FINISH	DRAWN BY Tristan Linn	6/02/2025	SCALE 1:2	SHEET 3/11

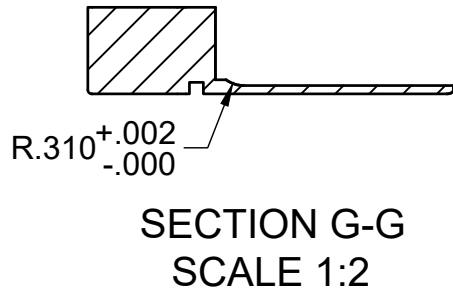
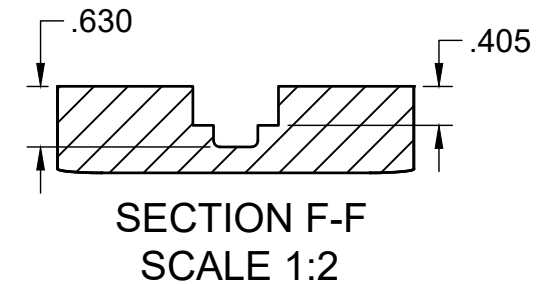
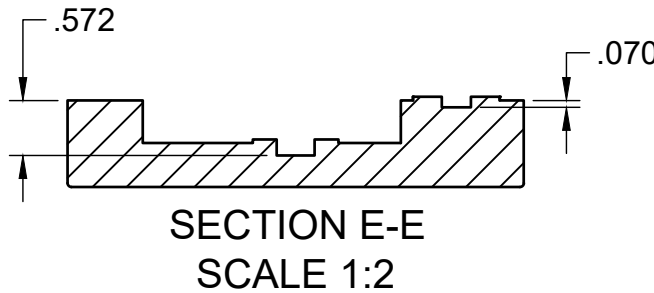
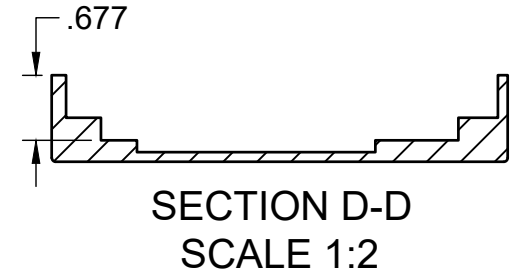
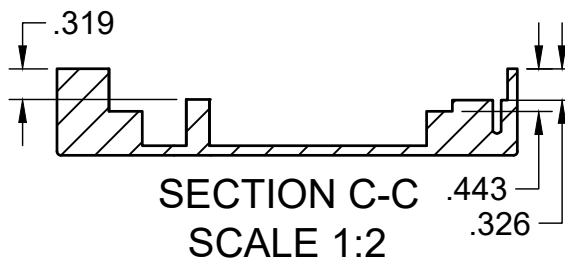
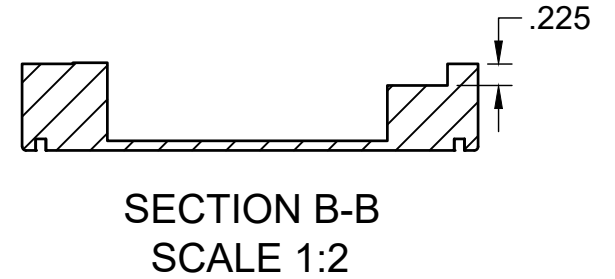
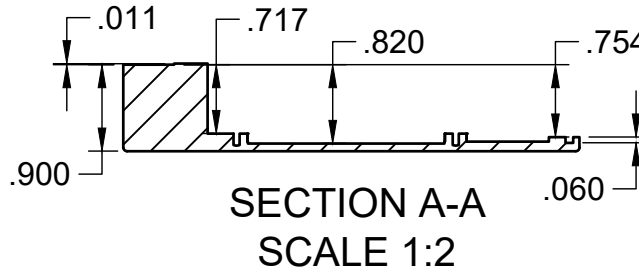
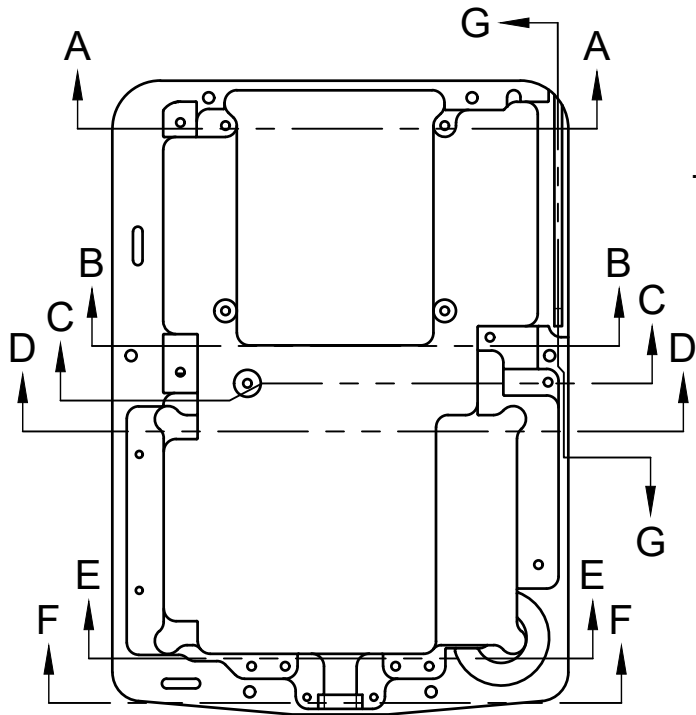


DETAIL Q
SCALE 1:2

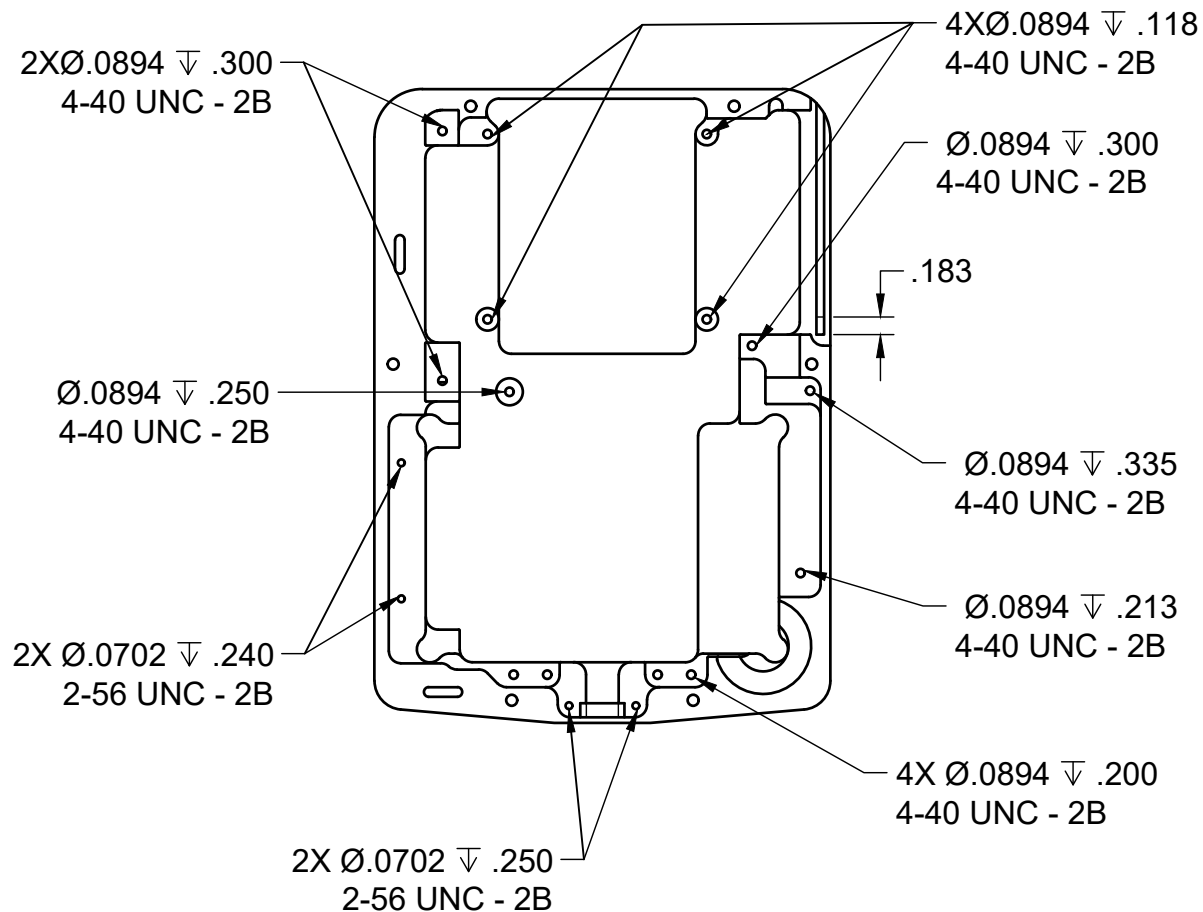


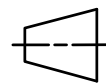
- NOTES;
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2. EXTERNAL CORNERS ARE R0.01

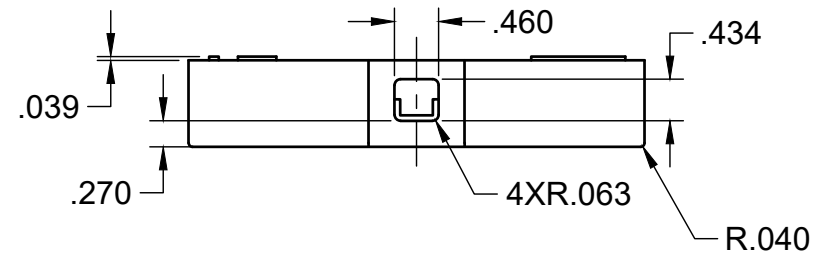
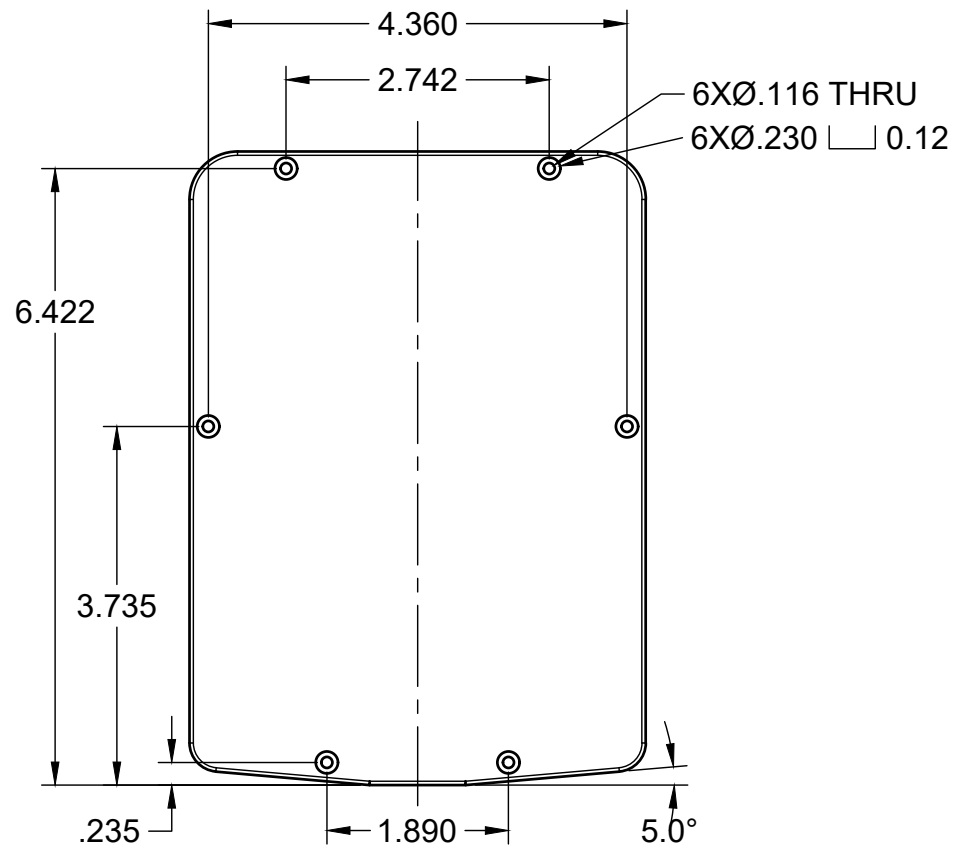
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5 MATERIAL AL 6061 FINISH	PROJECT ME 318 Final Project: Game Boy			
	TITLE Bottom Housing 1/5			
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		DRAWN BY Tristan Linn	6/02/2025	SCALE 1:2
				SHEET 4/11

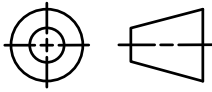


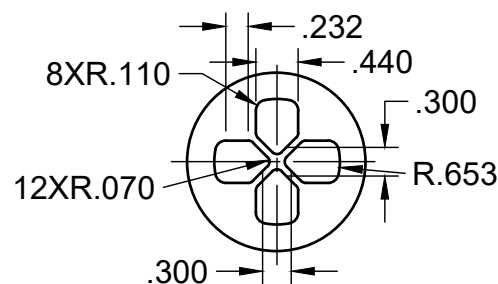
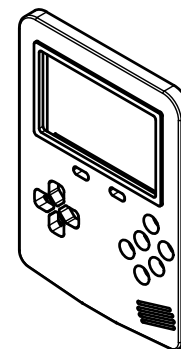
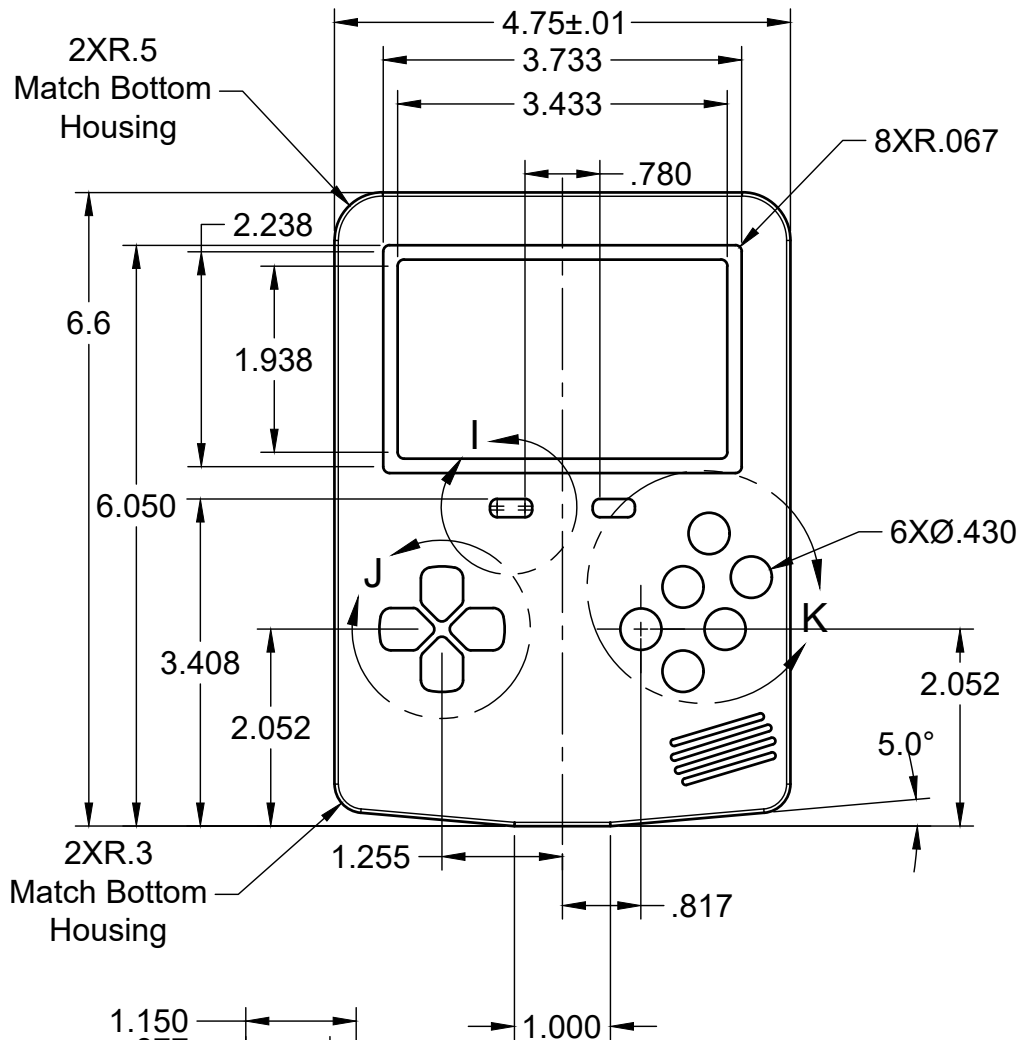
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MATERIAL AL 6061		SIZE A	DWG NO 30001	REV 0
FINISH		DRAWN BY Tristan Linn	6/02/2025	SHEET 5/11



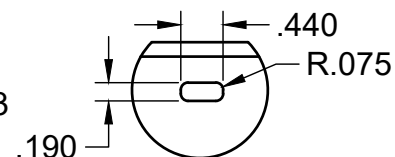
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	TITLE Bottom Housing 4/5			
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				SHEET 6/11



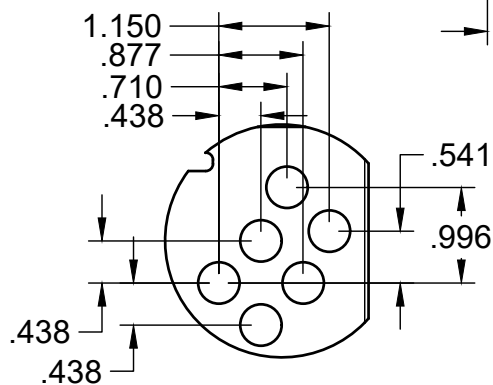
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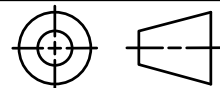
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SCALE 1:2

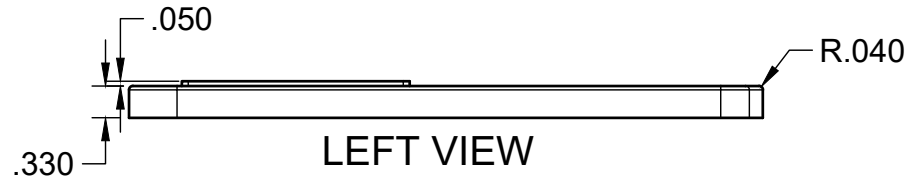
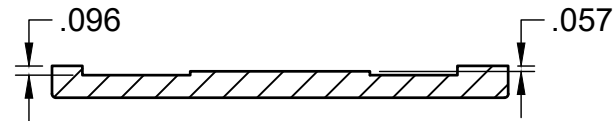
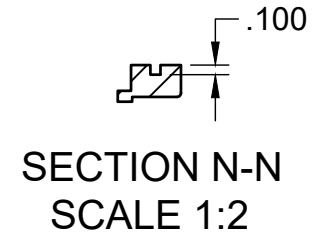
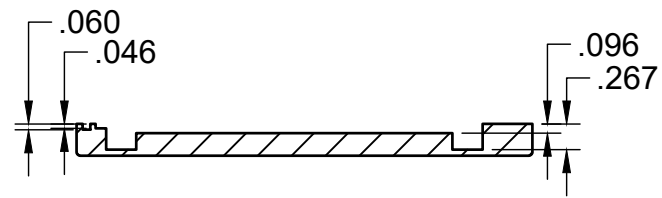
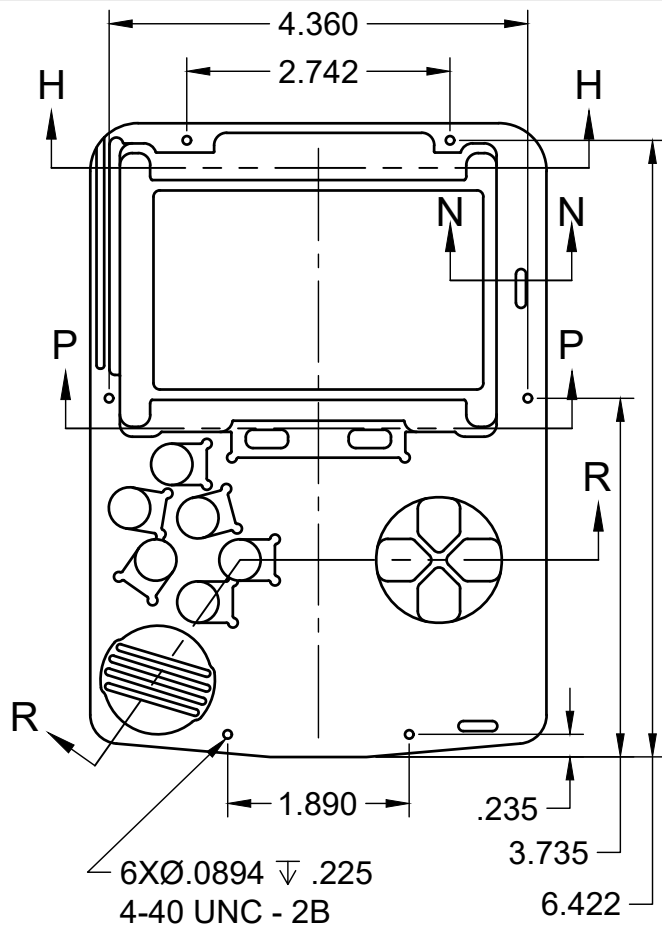


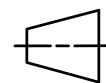
DETAIL I
SCALE 1:2

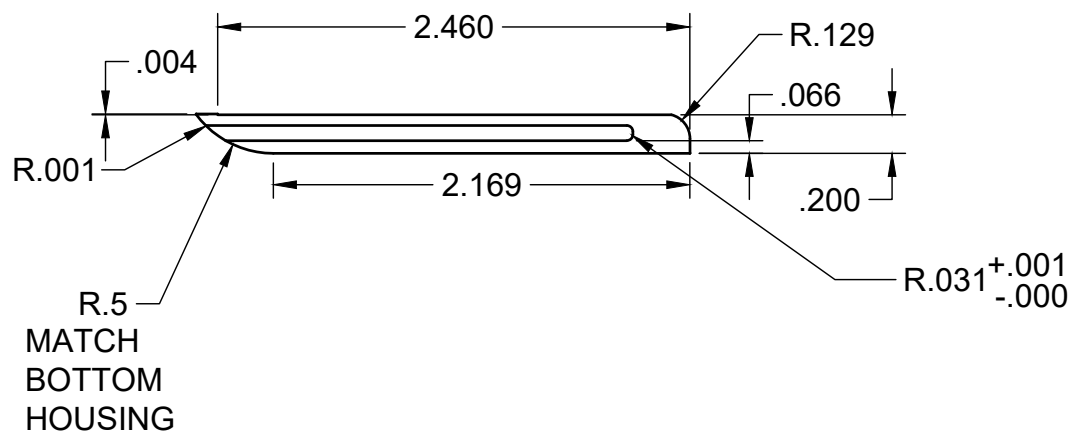
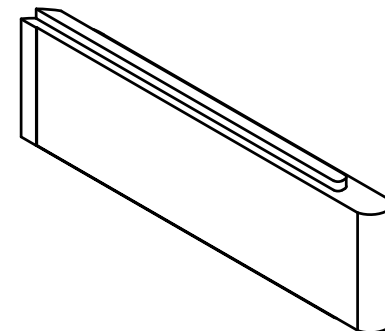
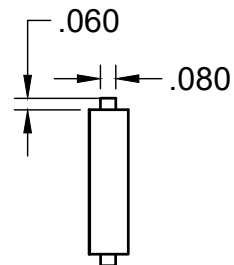
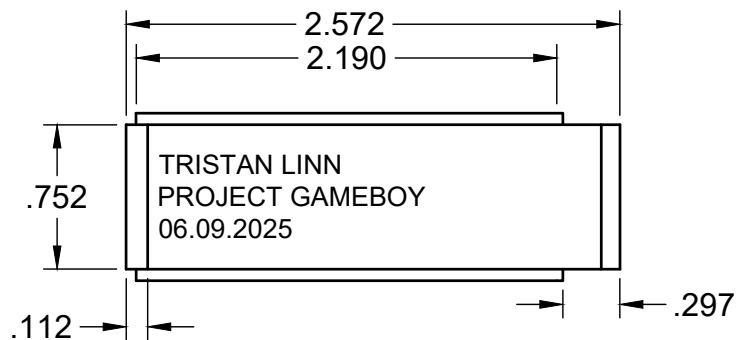


DETAIL K
SCALE 1:2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5	PROJECT ME 318 Final Project: Game Boy				
	TITLE Top Panel 1/3				
		SIZE A	DWG NO 30001		REV 0
		MATERIAL AL 6061			
FINISH	DRAWN BY Tristan Linn		6/02/2025	SCALE 1:2	SHEET 8/11



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5	PROJECT ME 318 Final Project: Game Boy				
	TITLE Top Panel 3/3				
			SIZE	DWG NO	REV
			A	30001	0
MATERIAL AL 6061					
FINISH	DRAWN BY Tristan Linn		6/02/2025	SCALE 1:2	SHEET 10/11



NOTES:
1. TEXT TO BE ENGRAVED
WITH 0.008" DEPTH.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X.X = ± 0.01 X.XX = ± 0.005 X.XXX = ± 0.001 X° = ± 0.5 MATERIAL AL 6061 FINISH	PROJECT ME 318 Final Project: Game Boy			
	TITLE Port Slot Cover			
		SIZE A	DWG NO 30001	REV 0
		DRAWN BY Tristan Linn	6/02/2025	SCALE 1:1
				SHEET 11/11