Final Project: Foosball Table

Design, Assembly, and Analysis

Course:
MEMS 202: Computer-Aided Design – Section 1

Team Members:
Luis Garcia
Enrique Garcia
Alec Garcia
David Howard

Date:
December 4, 2023

Washington University in St. Louis
McKelvey School of Engineering

Project Overview

Our project focused on creating a foosball table that blended modern aesthetics with a user-friendly design. The goal was to produce a visually appealing and easy-to-assemble product that enhanced the gaming experience.

Project Components

The foosball table consists of several essential elements: the playing surface, player rods, players, legs, scoring unit, frame, and cup holders. The frame and playing surface form the structural core, while the rods, legs, and players define the functionality and user interaction.

Design Choices

We adopted a modular design philosophy that divided the table into manageable subsystems, allowing for simpler assembly and effective organization of responsibilities. While features such as electronic scorekeeping were initially considered, we ultimately prioritized smooth gameplay and mechanical simplicity to maintain ease of use and reliability.

Individual Contributions

Each team member focused on a different subsystem:

- **Luis Garcia:** Designed the table frame and supervised system integration.
- **Enrique Garcia:** Developed the player rods, led final assembly, and produced documentation.
- **Alec Garcia:** Designed the score counter and the frame mounting interface.
- **David Howard:** Designed the leg supports, player components, and rubber foot features.

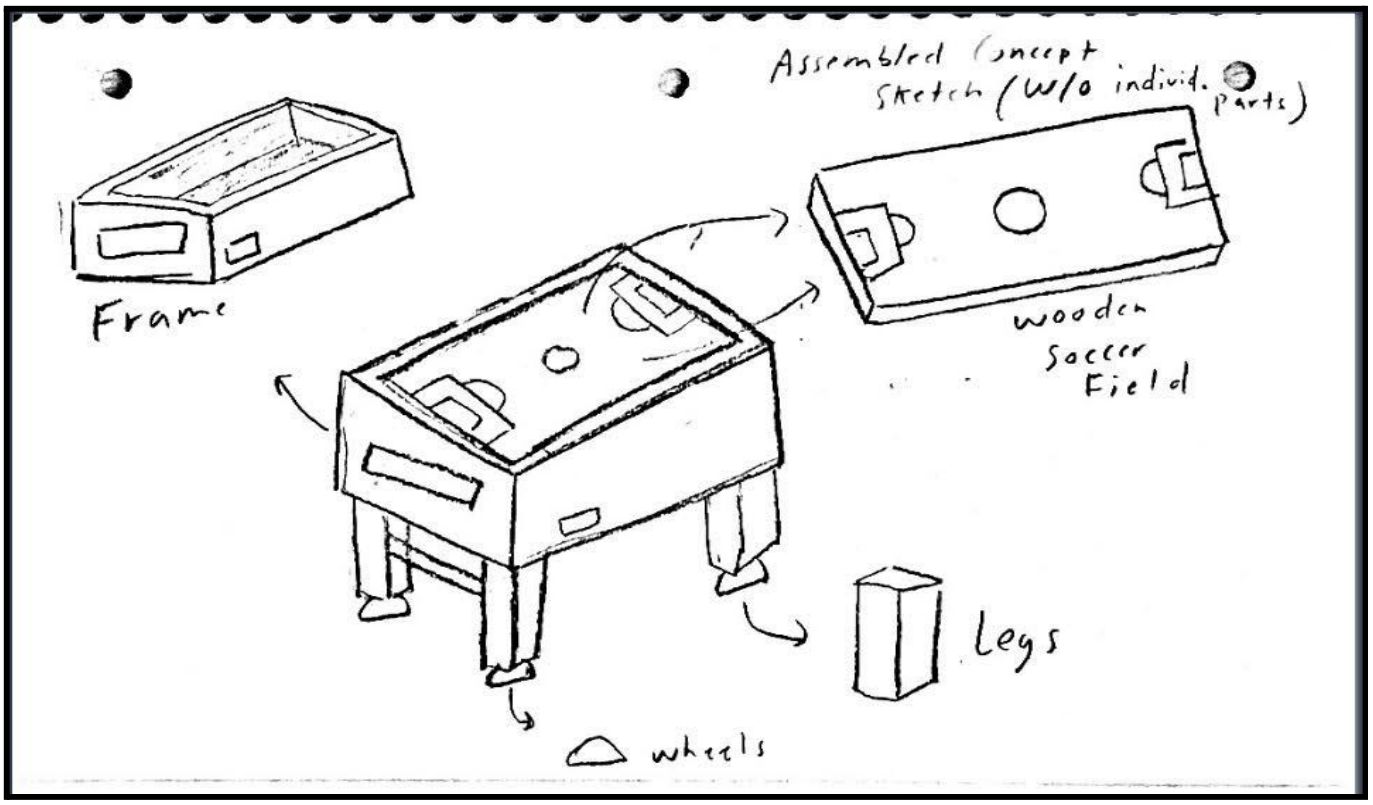
All members collaborated on assembly drawings, concept development, and design evaluation throughout the project.

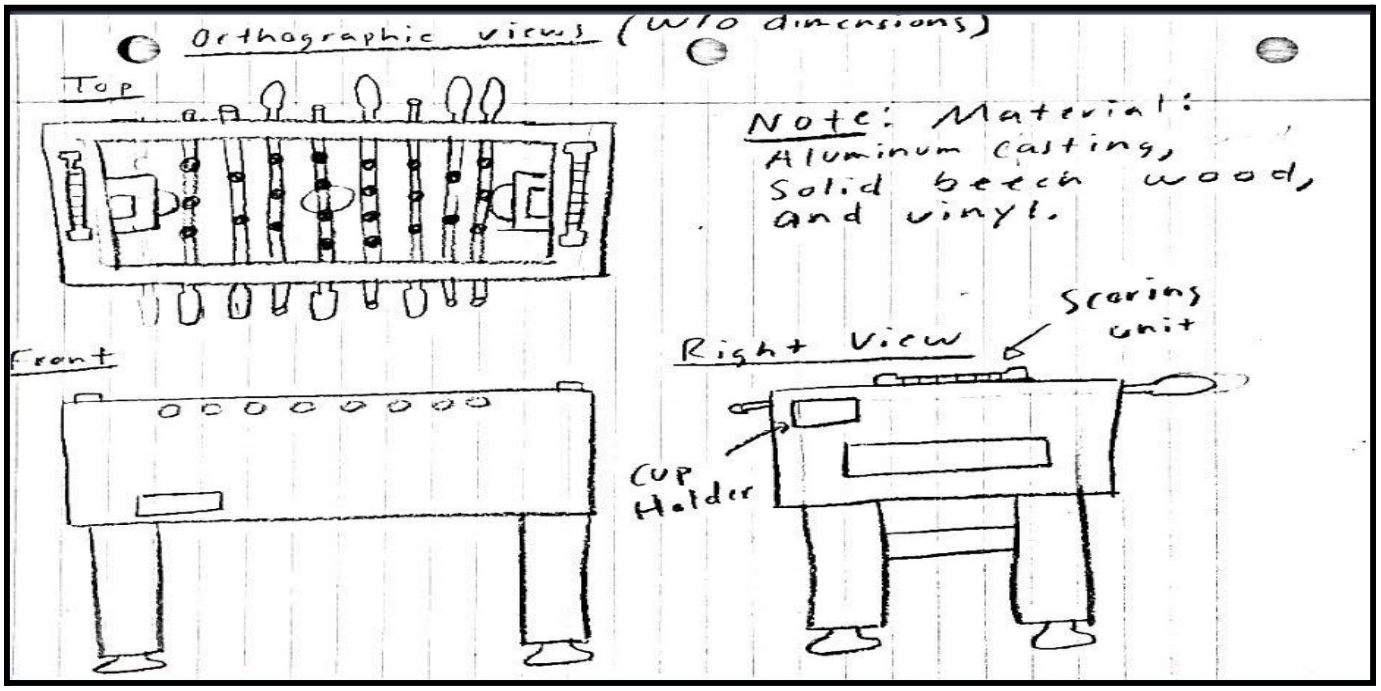
Challenges and Learnings

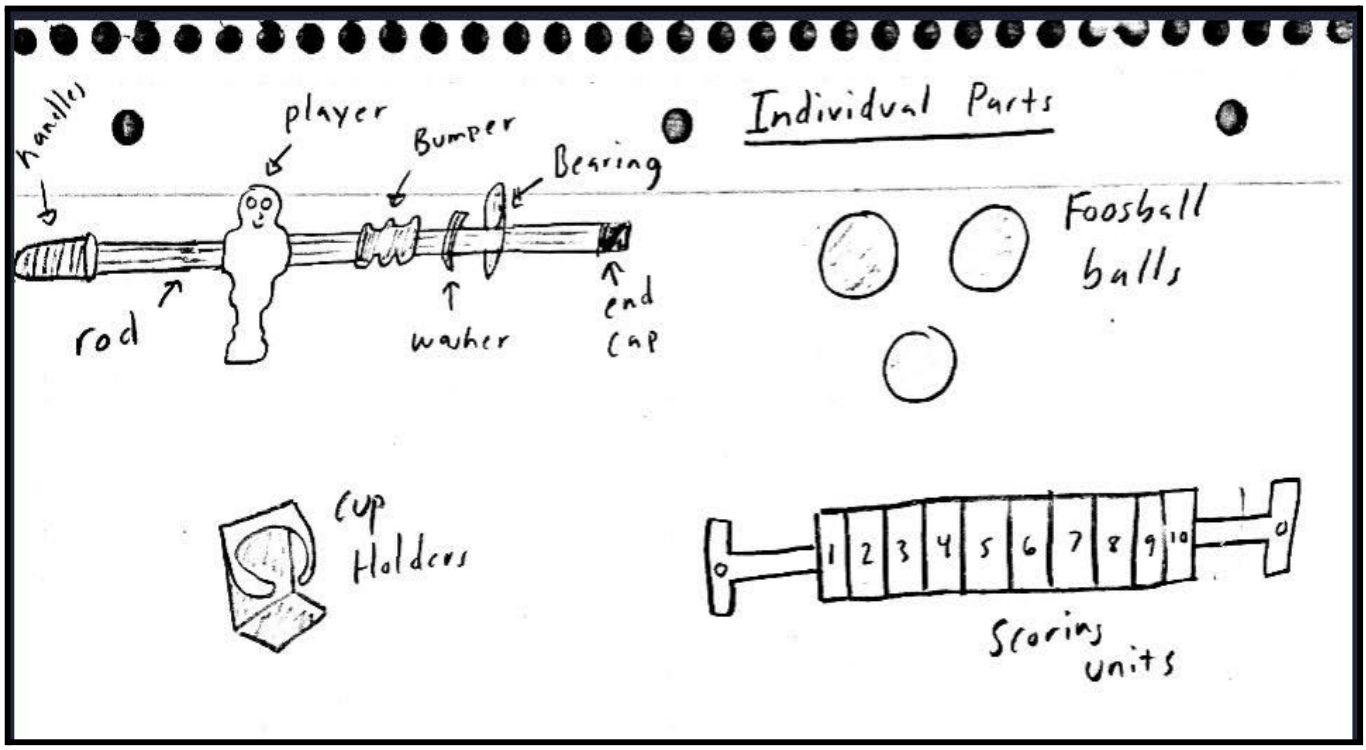
The assembly process revealed integration difficulties that stemmed from designing components in isolation early on. Although this approach simplified part development, it made final fit and alignment more challenging. This experience reinforced the importance of systems-level thinking and understanding how individual components interact. Overall, the project provided valuable insight into practical design considerations, tolerance planning, and effective teamwork—skills that will carry forward into future engineering work.

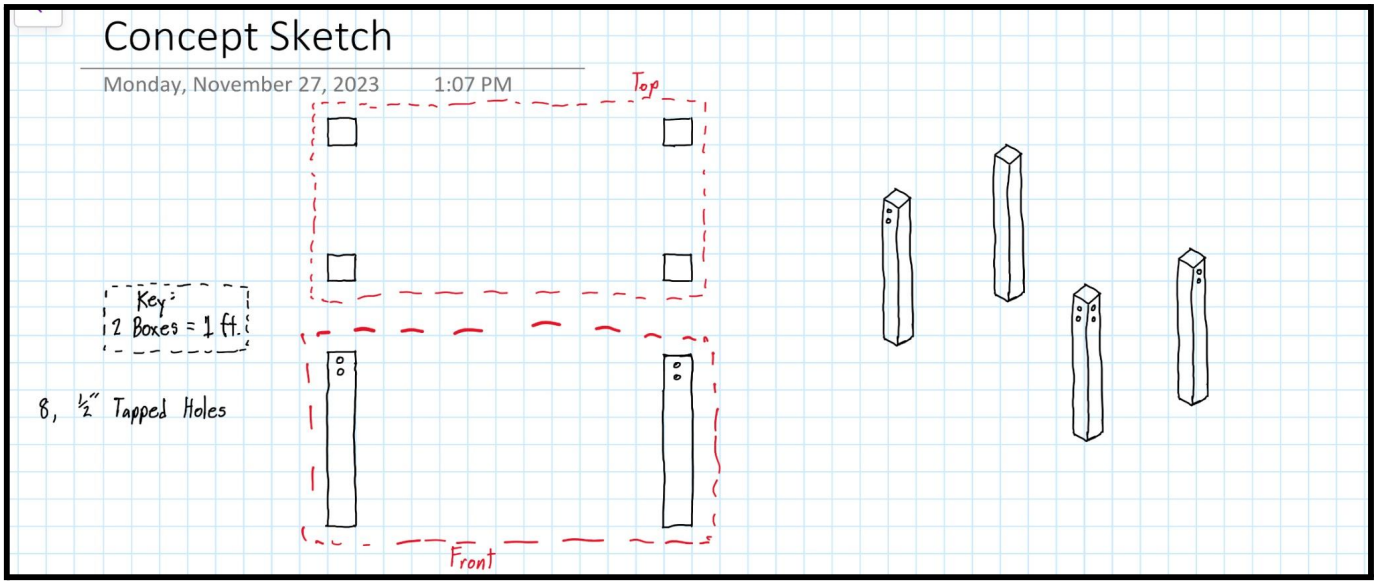
CONCEPT SKETCHES

Initial Concept Sketches

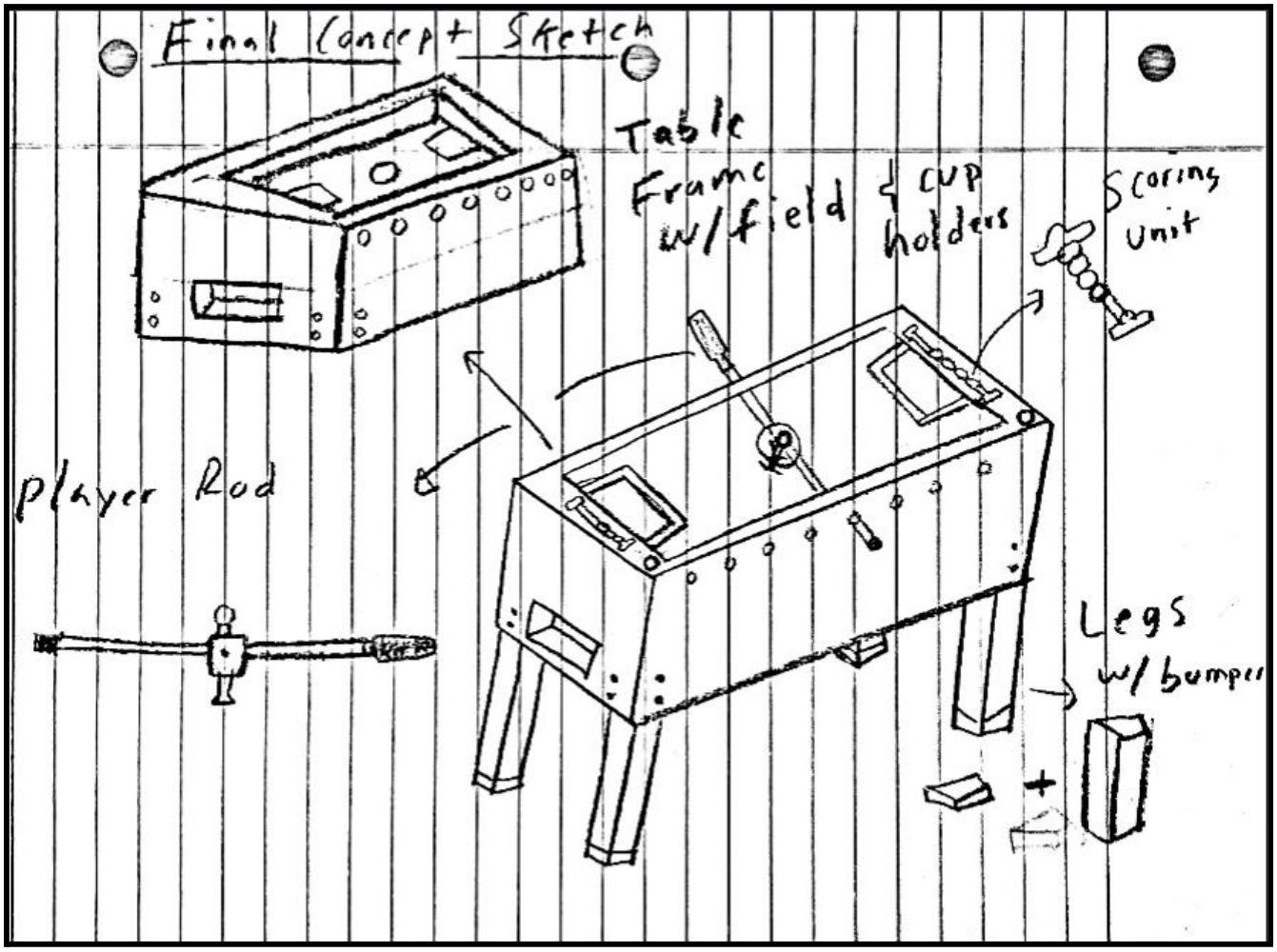




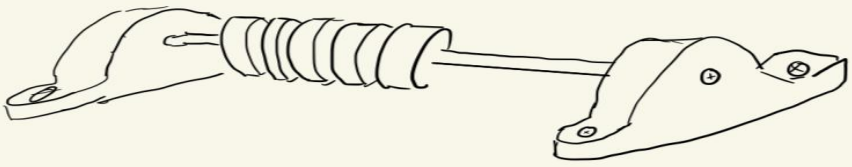

Individual Parts
handles
player
Bumper
Bearing
rod
washer
end cap
Foosball balls
Cup Holders
1 2 3 4 5 6 7 8 9 10
Scoring units


Concept Sketch
Monday, November 27, 2023 1:07 PM
Top
Key:
2 Boxes = 1 ft.
8, ½" Tapped Holes
Front

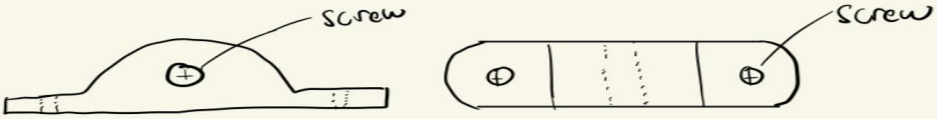
Final Concept Sketches



Score Counter

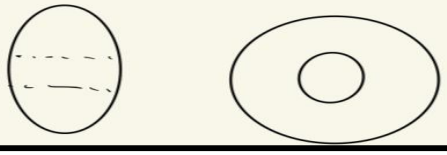


Individual Parts

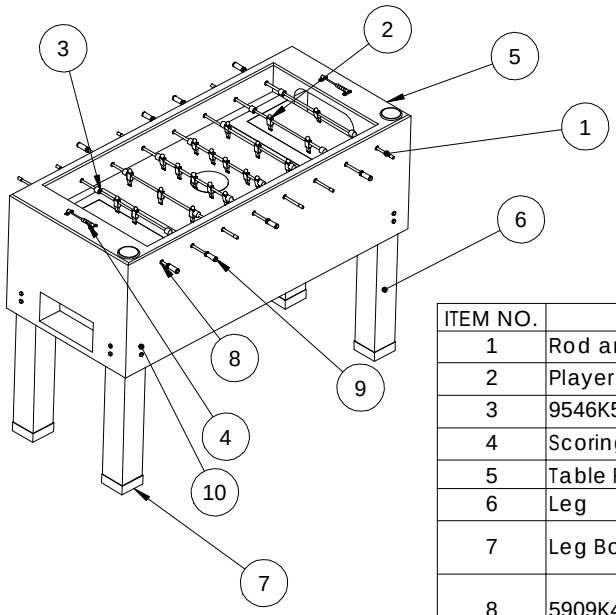


base

rod



beads



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Rod and End Cap	Foosball Pole and Cap	8
2	Player	Foosball Player	22
3	9546K521	Neoprene Bumper	16
4	Scoring Unit	Foosball Scoring Counter	2
5	Table Frame	Foosball Frame	1
6	Leg	Foosball Leg	4
7	Leg Bottom	Foosball Protective Rubber for leg	4
8	5909K44	0.032" Thick Washer for 1/2" Shaft Diameter Needle-Roller Thrust Bearing	32
9	97065K152	Foosball Hand Grip	8
10	93306A921	Aluminum Hex Head Screw	16

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

NEXT ASSY | USED ON

APPLICATION

Group 13

TITLE:

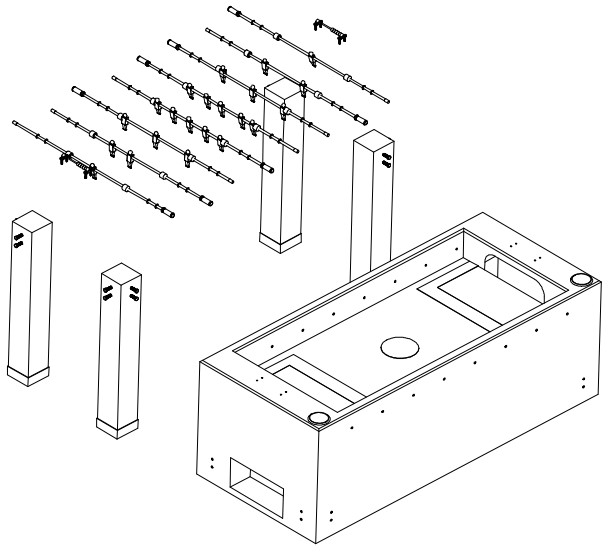
Foosball Table

SIZE	DWG. NO.	REV
A	Main Assembly	

SCALE: 1:28 | WEIGHT: | SHEET 1 OF 1

2 1

B B



A A

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

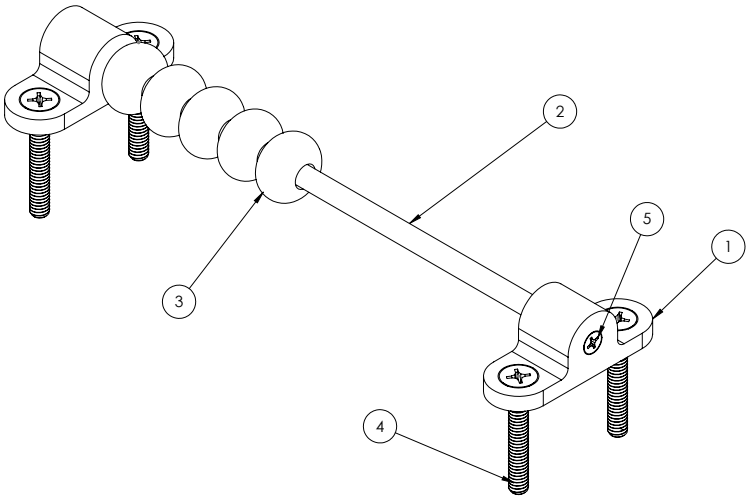
Group 13

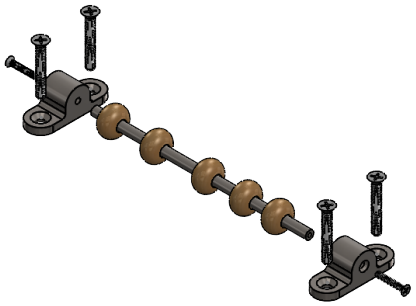
TITLE:

Exploded View

SIZE	DWG. NO.	REV
A	Main Assembly	
SCALE: 1:28	WEIGHT:	SHEET 1 OF 1

1





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	ScoreCounterBase	Alloy Steel	2
2	ScoreCounterRod	Alloy Steel	1
3	ScoreCounterBeads	Oak Wood	5
4	90273A299	12-24 X 1-1/2 FLAT HD SCREW 82*	4
5	90273A152	Zinc-Plated Steel Phillips Flat Head Screws	2

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

NEXT ASSY | USED ON

APPLICATION | DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		12/8/23
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

Group 13

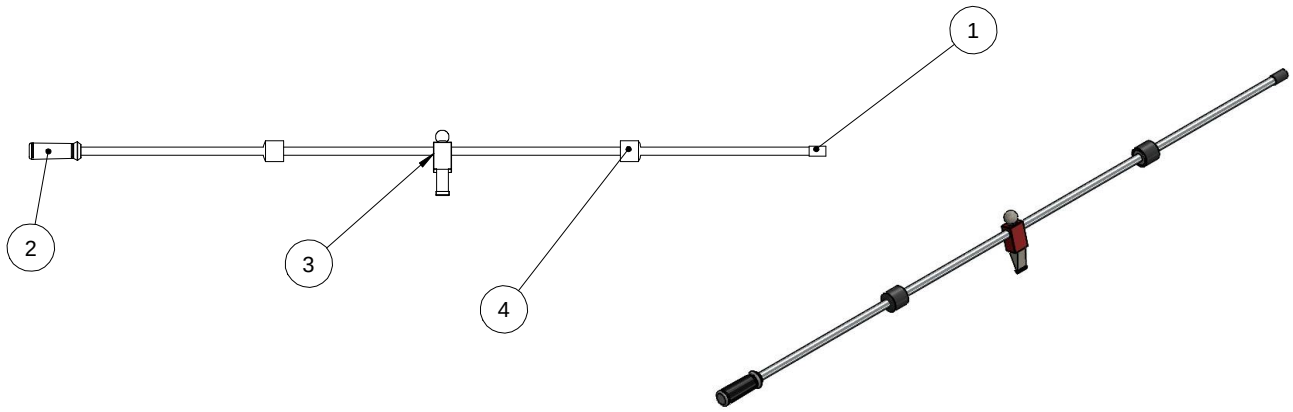
TITLE:
Score Counter

SIZE B | DWG. NO. Sub-Assembly | REV

SCALE: 1:1 | WEIGHT: | SHEET 1 OF 4

2 1

Note: Foosball Rod, Endcap, and the Players were modeled through Solidworks.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Rod and End Cap	Foosball Pole with Cap	8
2	97065K152	Foosball Handle Grip	8
3	Player	Foosball Player	22
4	9546K521	Neoprene Bumper	16

B B

A A

				NAME	DATE
		UNLESS OTHERWISE SPECIFIED:			
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
			Q.A.		
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

Group 13

TITLE:

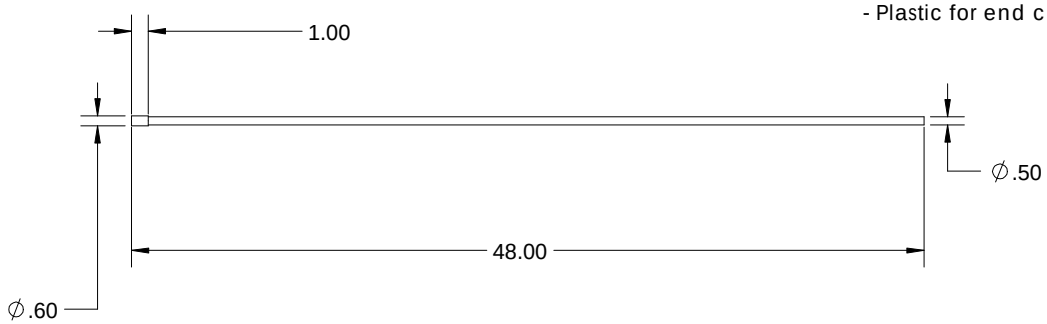
Player Rod

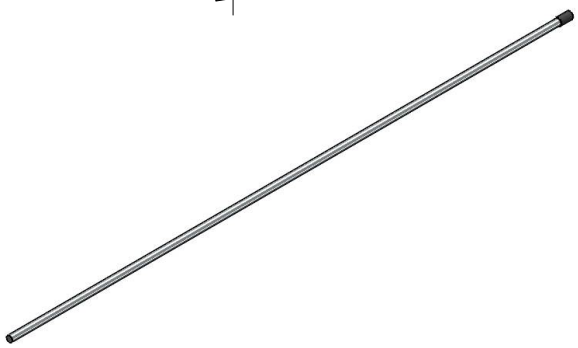
SIZE	DWG. NO.	REV
A	Sub-Assembly	
SCALE: 1:8	WEIGHT:	SHEET 1 OF 1

1

2 1

Note: Material:
- Steel for rod
- Plastic for end cap





B B

A A

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/32 ANGULAR: MACH ± 0.005 BEND ± 1° TWO PLACE DECIMAL ±.03 THREE PLACE DECIMAL ±0.015	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

Group 13

TITLE:

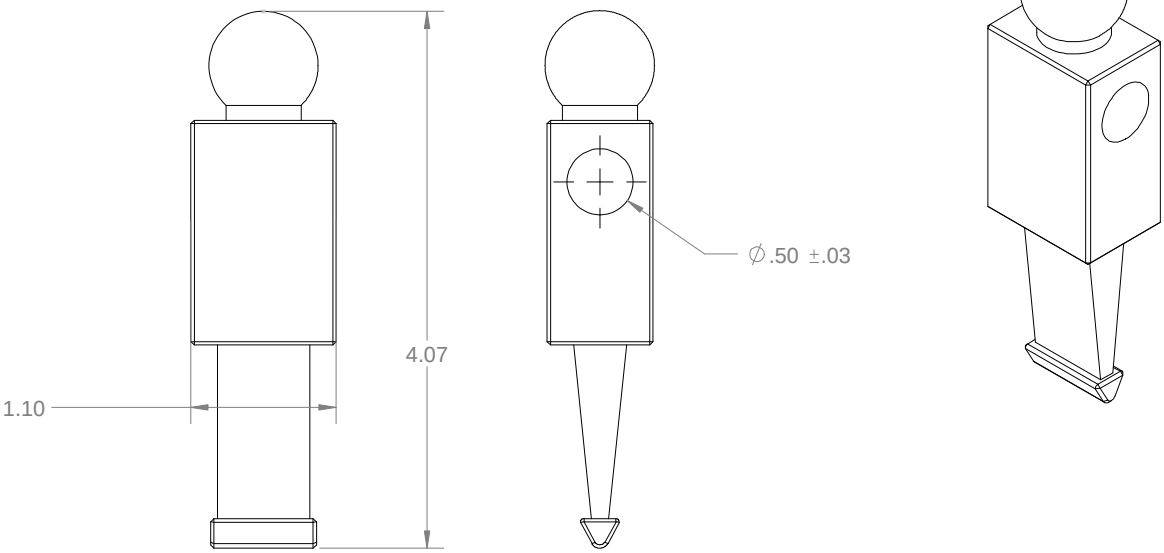
Pole and End Cap

SIZE	DWG. NO.	REV
A	Detailed Drawing	
SCALE: 1:8	WEIGHT:	SHEET 1 OF 1

1

2 1

B B



A A

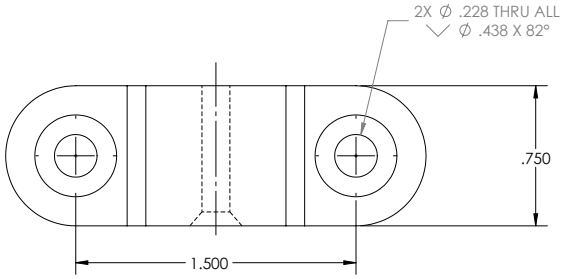
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: NO DECIMAL: ±.1 ANGULAR: ± 1/2° TWO PLACE DECIMAL ±.03 THREE PLACE DECIMAL : USE LIMITS SHOWN	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL EDPM PLASTIC	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

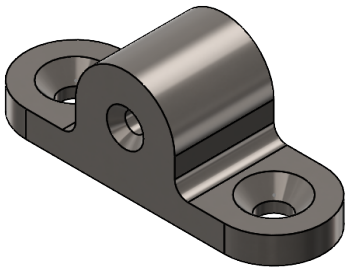
Group 13

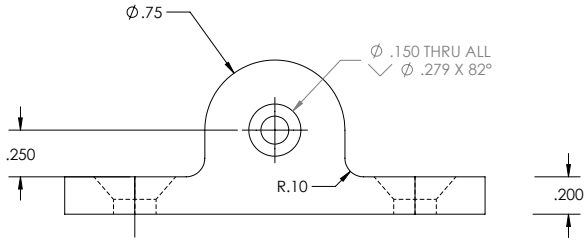
TITLE: Player Drawing

SIZE	DWG. NO.	REV
A		
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

1







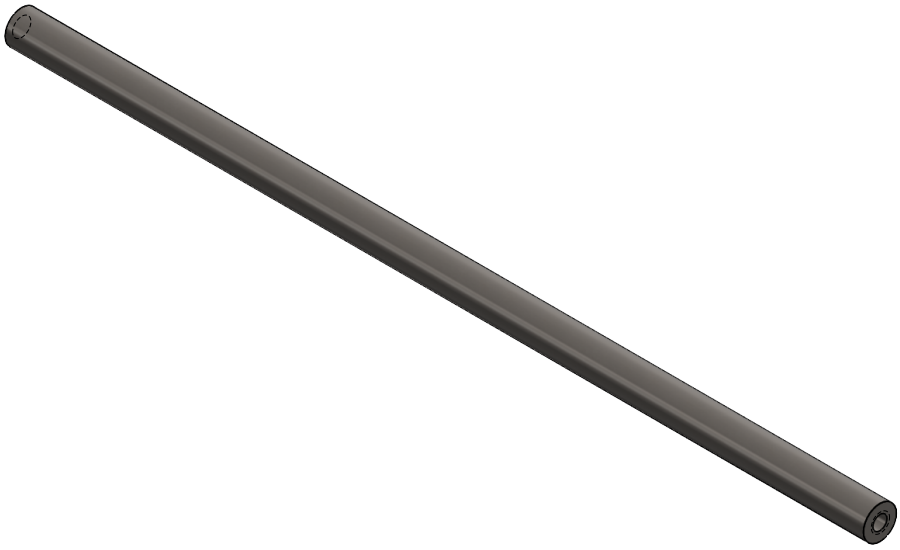
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: ANGULAR: ± .5° ONE PLACE DECIMAL ± .1 TWO PLACE DECIMAL ± .03 THREE PLACE DECIMAL ± .01	DRAWN		12/8/23
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL Alloy Steel	COMMENTS:		
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

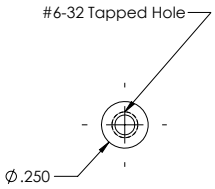
Group 13

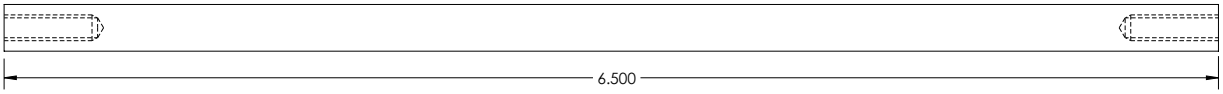
TITLE:
Score Counter Base

SIZE	DWG. NO.	REV
B		

SCALE: 2:1	WEIGHT:	SHEET 2 OF 4







		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: ANGULAR: ± .5° ONE PLACE DECIMAL ± .1 TWO PLACE DECIMAL ± .03 THREE PLACE DECIMAL ± .01	DRAWN		12/8/23
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL Alloy Steel	COMMENTS:		
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

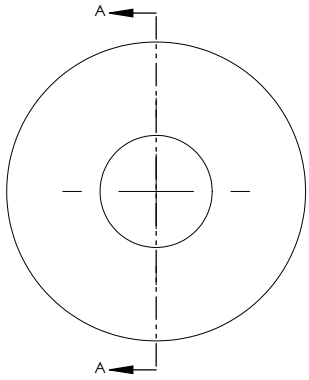
Group 13

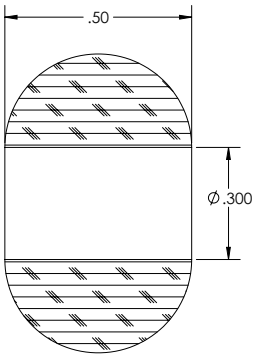
TITLE:

Score Counter Rod

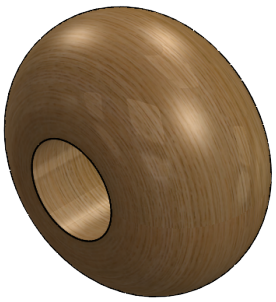
SIZE	DWG. NO.	REV
B		

SCALE: 2:1	WEIGHT:	SHEET 3 OF 4





SECTION A-A



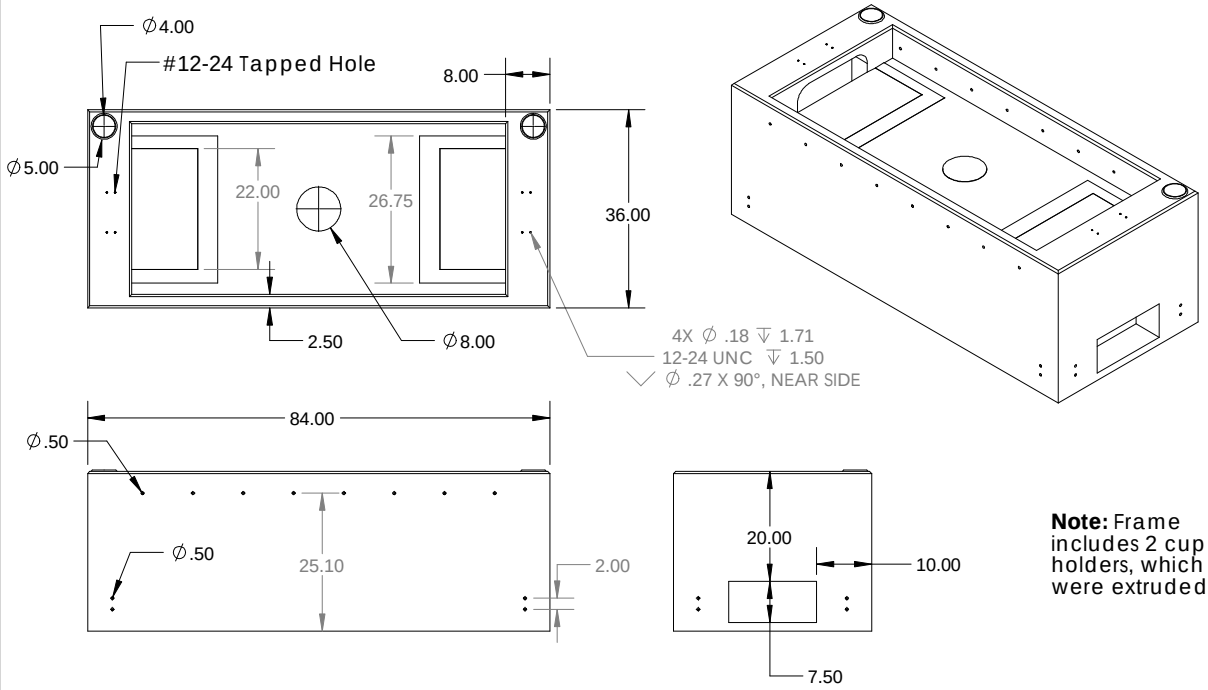
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: ONE PLACE DECIMAL ± .1 TWO PLACE DECIMAL ± .03 THREE PLACE DECIMAL ± .01	DRAWN		12/8/23
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL Oak Wood	COMMENTS:		
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

Group 13

TITLE:
Score Counter Bead

SIZE	DWG. NO.	REV
B		

SCALE: 4:1	WEIGHT:	SHEET 4 OF 4



Note: Frame includes 2 cup holders, which were extruded in.

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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			CHECKED		
			ENG APPR.		
			MFG APPR.		
			Q.A.		
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		
		MATERIAL Balsa			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

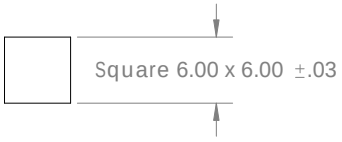
Group 13

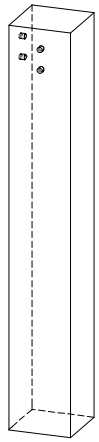
TITLE:

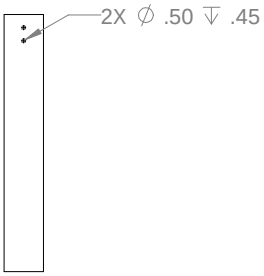
Table Frame

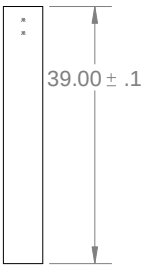
SIZE	DWG. NO.	REV
A	Detailed Drawing	
SCALE: 1:24	WEIGHT:	SHEET 1 OF 1

2 holes per side, on 2 sides of a leg
- (each side of the frame)









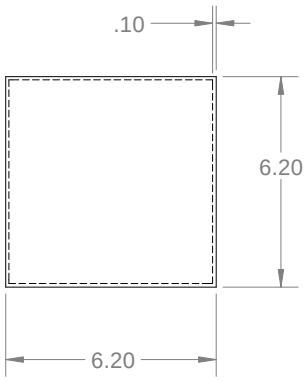
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: NO DECIMAL: ±.1 ANGULAR: ± 1/2° TWO PLACE DECIMAL ±.03 THREE PLACE DECIMAL : USE LIMITS SHOWN	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
			Q.A.		
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		
		MATERIAL BALSA WOOD			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

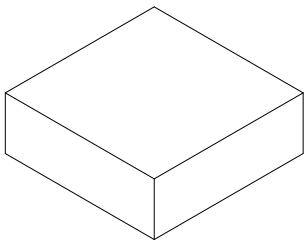
Group 13

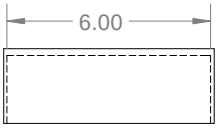
TITLE:

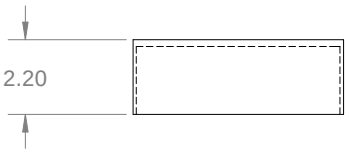
Leg

SIZE	DWG. NO.	REV
A		
SCALE: 1:12	WEIGHT:	SHEET 1 OF 1









		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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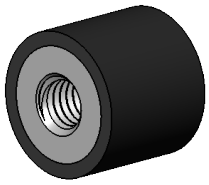
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL NATURAL RUBBER	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

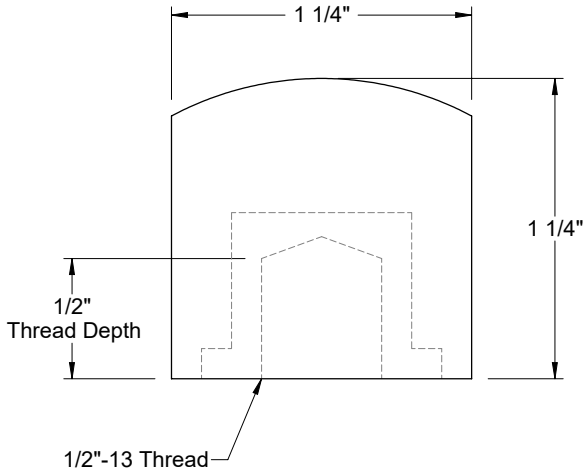
Group 13

TITLE:

Leg Bottom Cover

SIZE	DWG. NO.	REV
A		
SCALE: 1:4	WEIGHT:	SHEET 1 OF 1





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PART NUMBER **9546K521**

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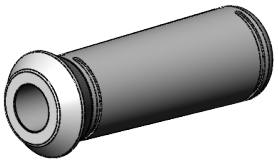
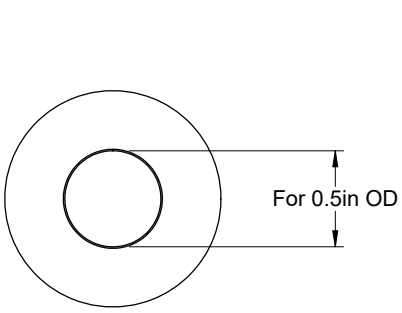
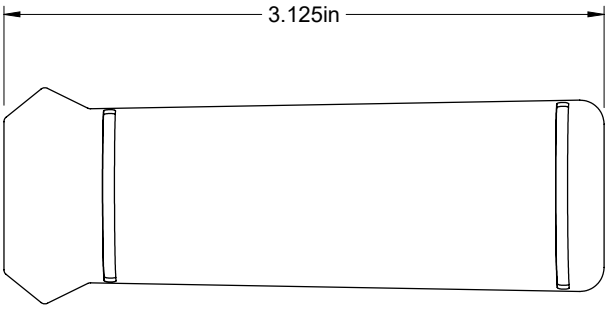
Neoprene
Bumper





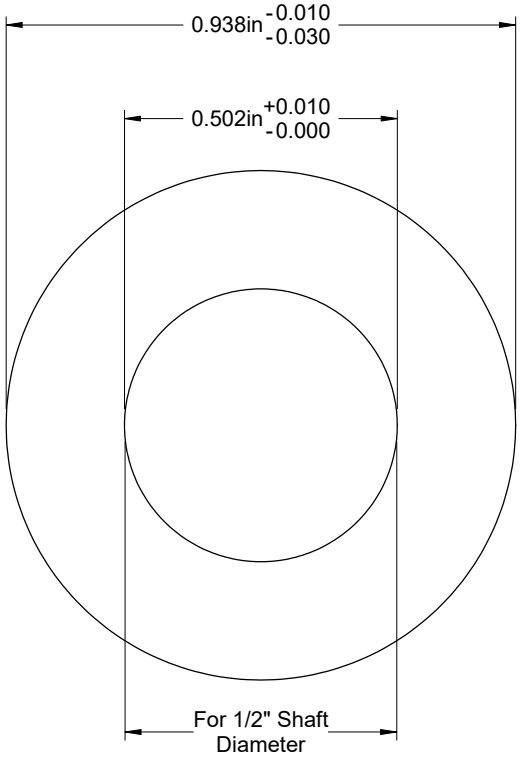


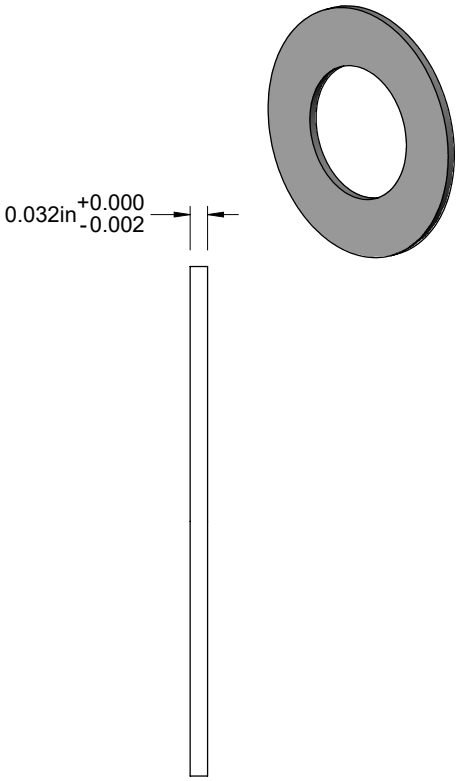
McMASTER-CARR® CAD

http://www.mcmaster.com

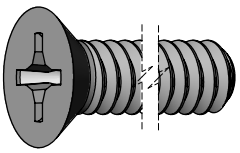
PART NUMBER **97065K152**

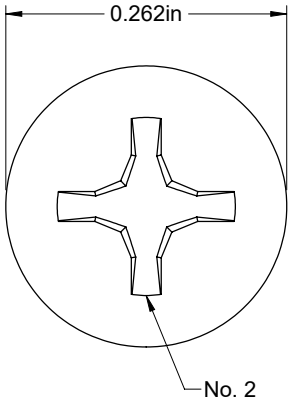
Round
Grips

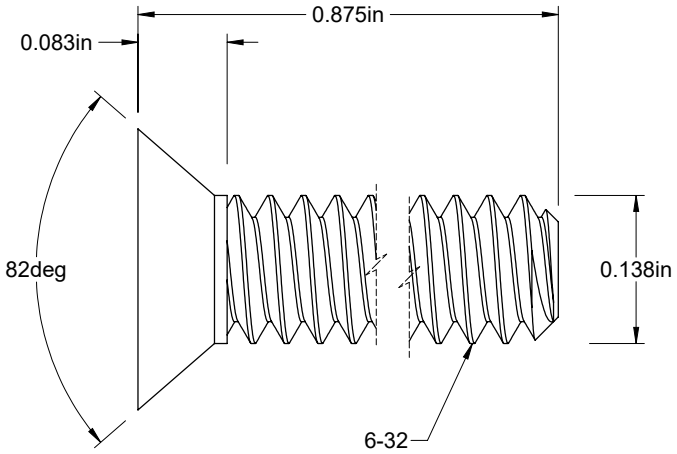




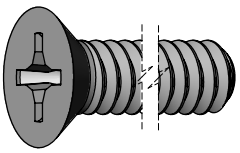
McMASTER-CARR® CAD	PART NUMBER **5909K44**
http://www.mcmaster.com	0.032" Thick Washer for 1/2" Shaft Diameter Needle-Roller Thrust Bearing

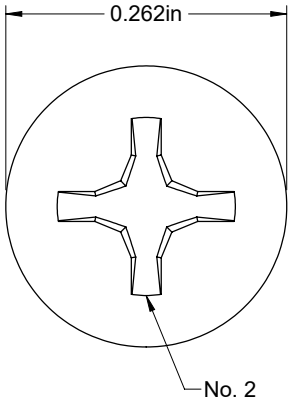


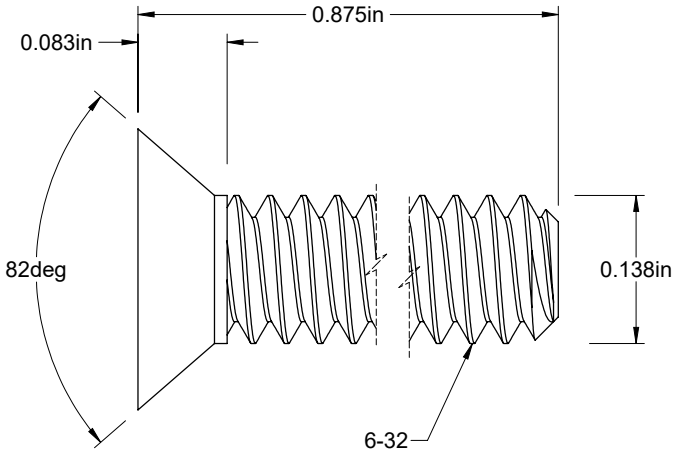




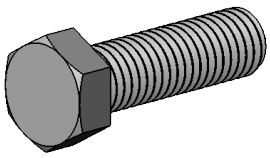
McMASTER-CARR® CAD http://www.mcmaster.com 	PART NUMBER **90273A152** Zinc-Plated Steel Phillips Flat Head Screws

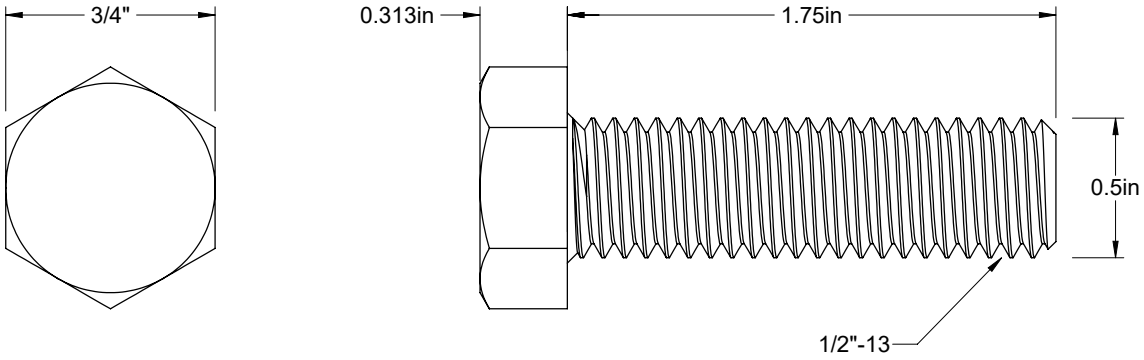






McMASTER-CARR® CAD http://www.mcmaster.com 	PART NUMBER **90273A152** Zinc-Plated Steel Phillips Flat Head Screws





McMASTER-CARR® CAD

http://www.mcmaster.com

Information in this drawing is provided for reference only.

PART NUMBER **93306A921**

Aluminum Hex Head Screw