

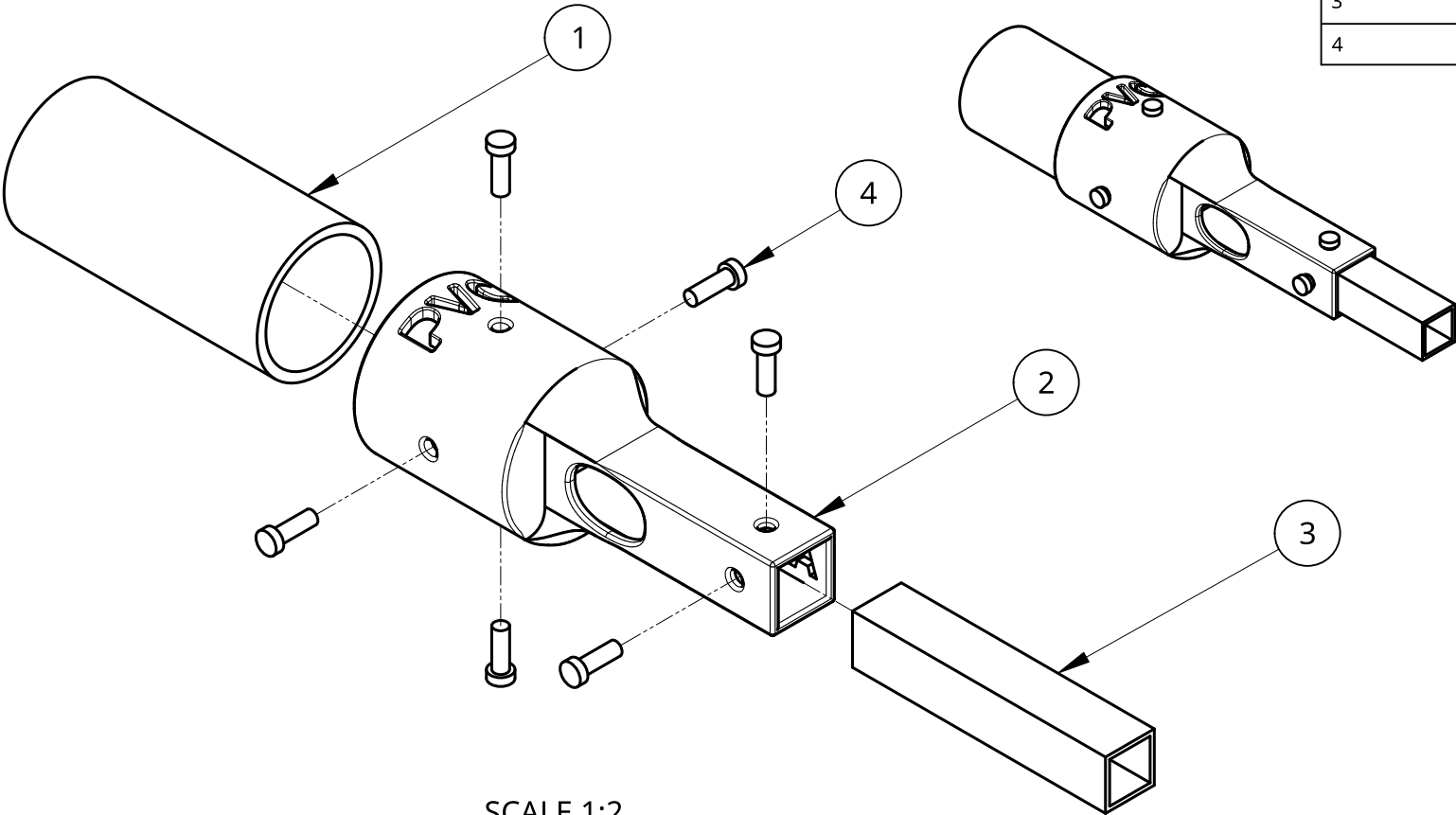
B

A

B

A

ITEM NUMBER	QUANTITY	PART NAME
1	1	PVC PIPE (1.5 INCHES)
2	1	ANTENNA TO PVC JOINT
3	1	ANTENNA
4	6	NYLON BOLTS

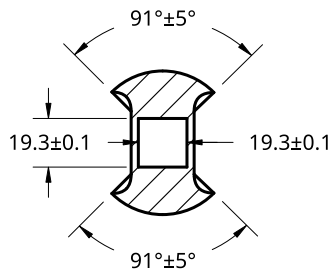


SCALE 1:2

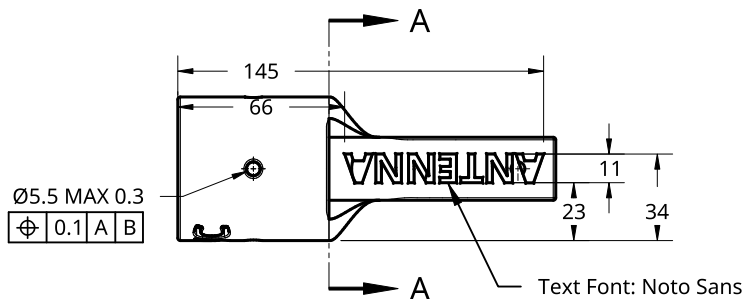
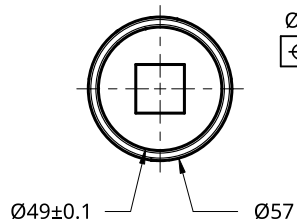
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		NAME	DATE	TITLE ANTENNA TO PVC JOINT EXPLODED VIEW		
	DRAWN	SOON YOUNG KWON	04/24/2024			
	CHECKED					
	APPROVED					
DO NOT SCALE DRAWING				SIZE A		
BREAK ALL SHARP EDGES AND REMOVE BURRS						
THIRD ANGLE PROJECTION	MATERIAL CARBON FIBER, NYLON, PVC		FINISH 3D PRINTED / PRE-BOUGHT		DWG NO.	REV.
					SCALE 1:3	SHEET 1 of 1

2

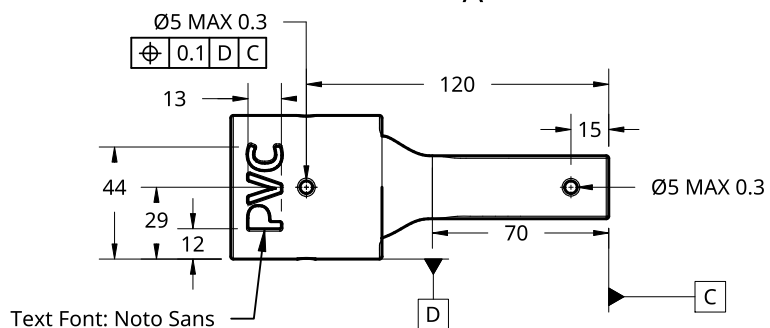
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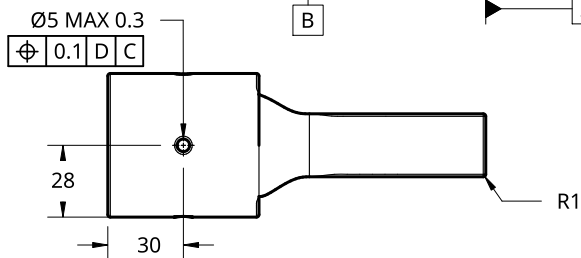
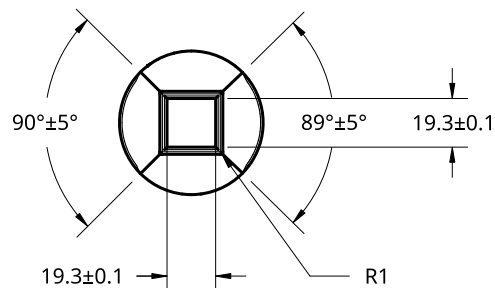
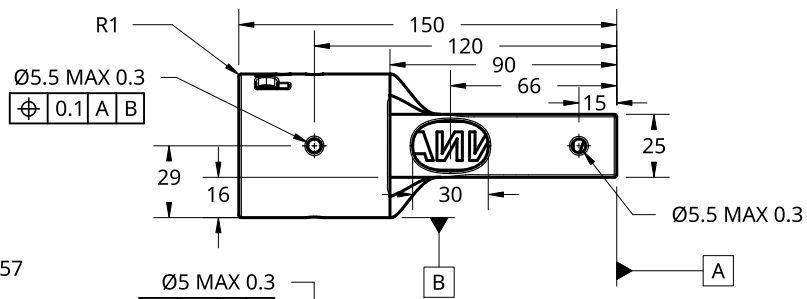
SECTION A - A
SCALE 1:3



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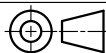


UNLESS OTHERWISE SPECIFIED,
DIMENSIONS ARE IN MILLIMETERS
TOLERANCES, UNLESS OTHERWISE
SPECIFIED:
ZERO PLACE DECIMALS: ±1

DO NOT SCALE DRAWING

BREAK ALL SHARP EDGES AND
REMOVE BURRS

THIRD ANGLE PROJECTION



NAME

DATE

DRAWN

SOON YOUNG KWON

04/23/2024

CHECKED

APPROVED

TITLE

ANTENNA TO PVC JOINT

SIZE

A

DWG NO.

E4 PROJECT

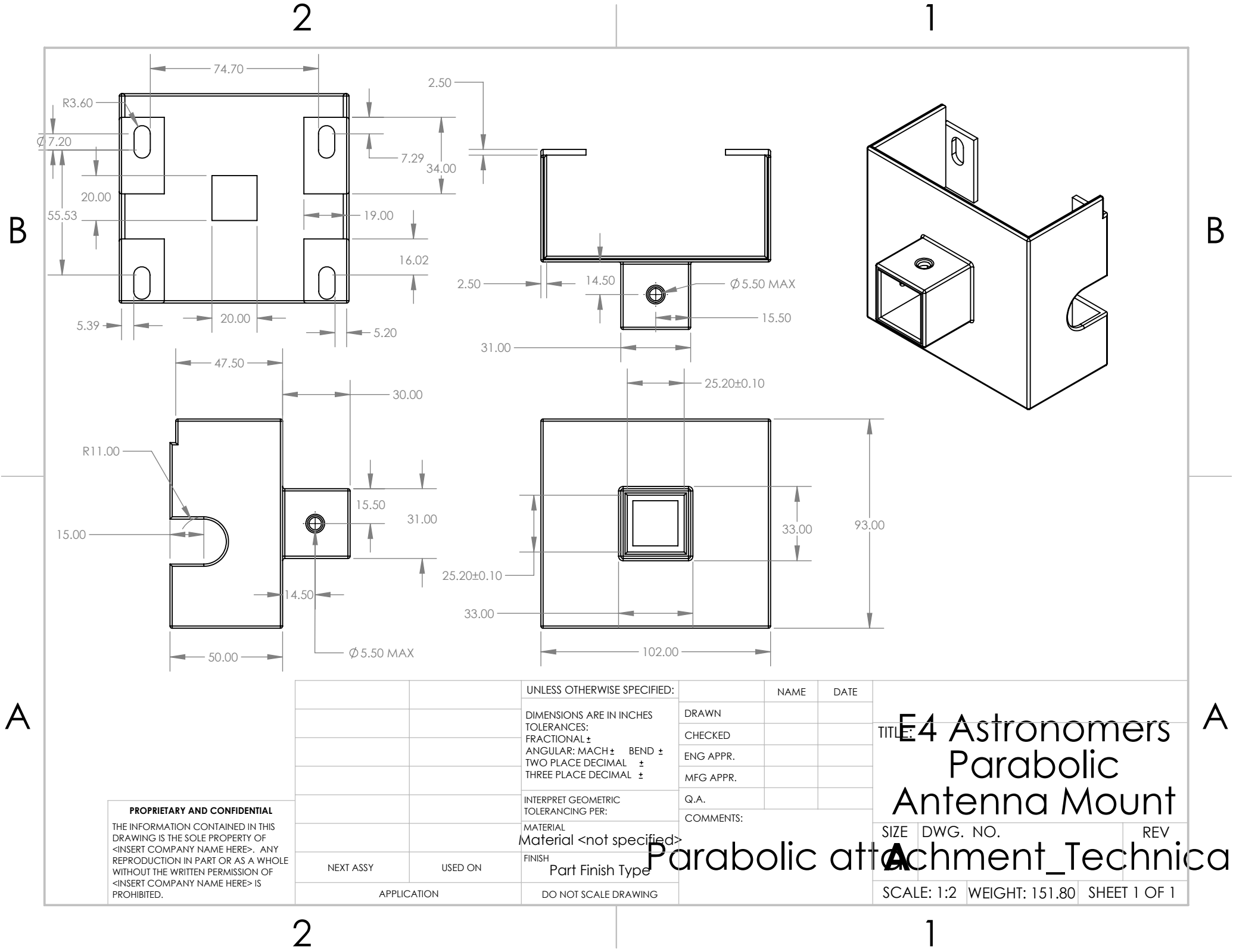
REV.

SCALE 1:3

WEIGHT

SHEET

1 of 1



B

B

A

A

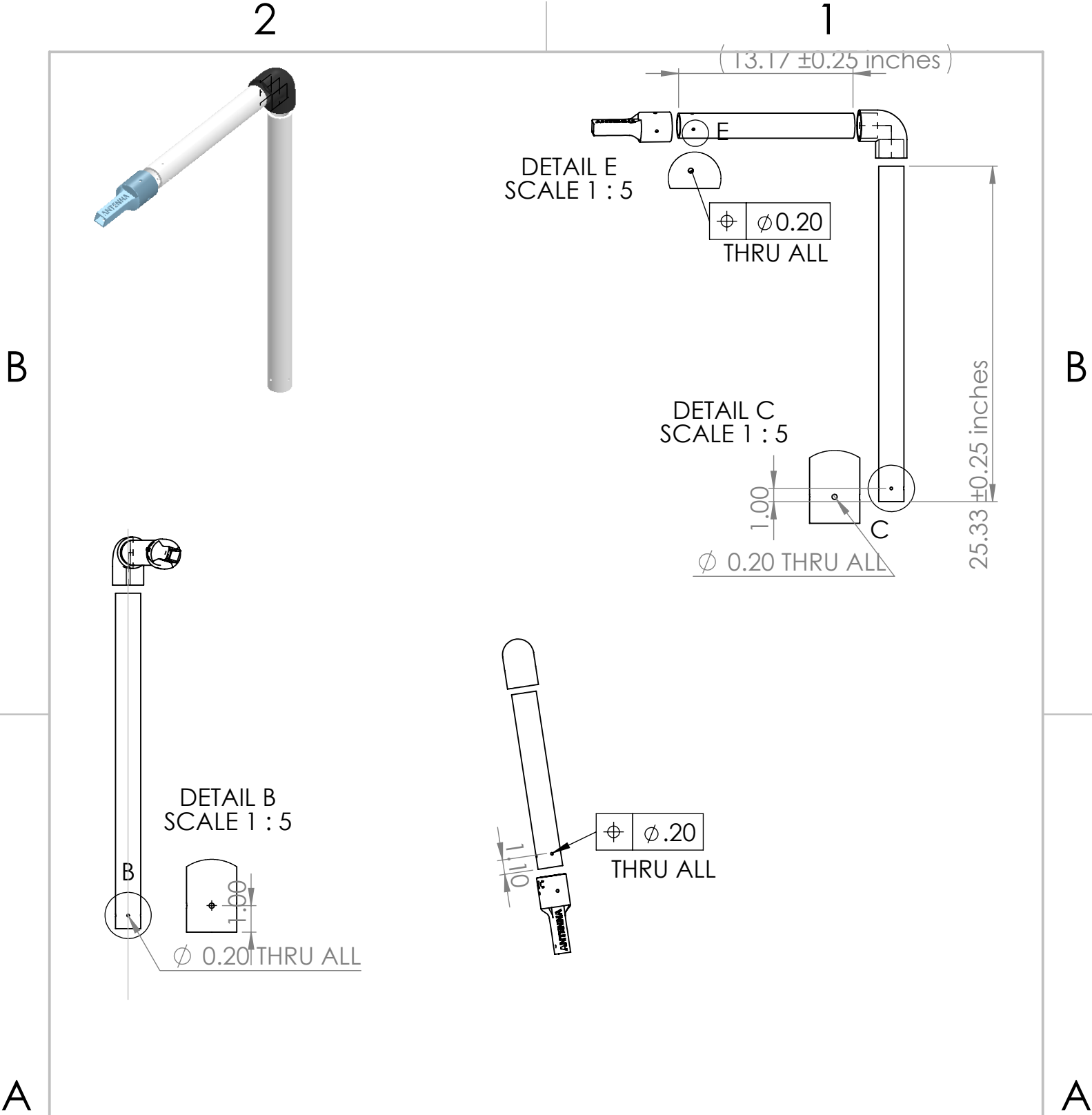
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <INSERT COMPANY NAME HERE>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <INSERT COMPANY NAME HERE> IS PROHIBITED.

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

E4 Astronomers Parabolic Antenna Mount

SIZE	DWG. NO.	REV
SCALE: 1:2	WEIGHT: 151.80	SHEET 1 OF 1

Parabolic attachment Technical



PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <COMPANY NAME>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <COMPANY NAME> IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .25 in ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		NAME	DATE	
					DRAWN		
					CHECKED		
					ENG APPR.		
					MFG APPR.		
					Q.A.		
					COMMENTS:		
	NEXT ASSY	USED ON	FINISH				
	APPLICATION		DO NOT SCALE DRAWING				
				SIZE	DWG. NO.	REV.	
				A	Beam Assembly		
				SCALE:1:10	WEIGHT:	SHEET 1 OF 1	

1

- 6.300

Ø.625 THRU
3/4-10 - 2B THRU

SHEET 1 of 1

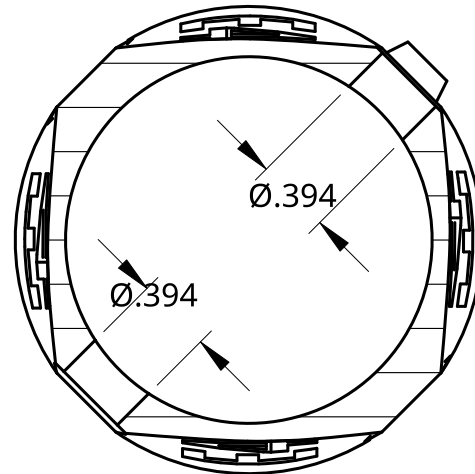
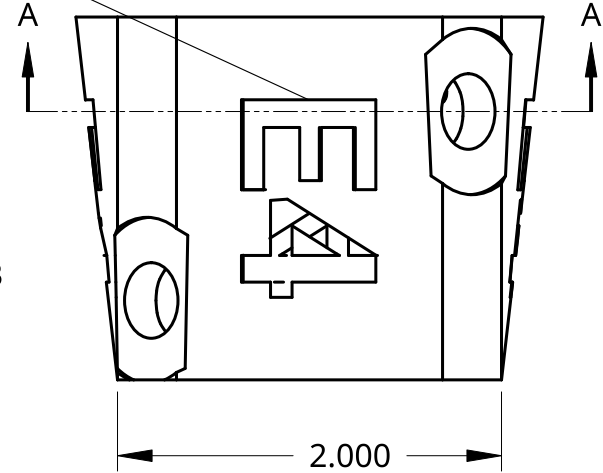
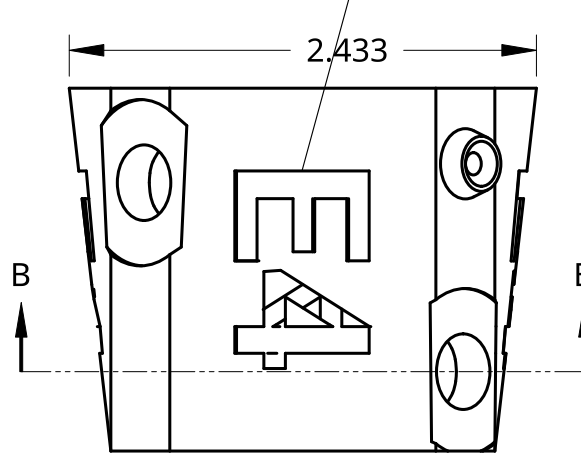
2

1

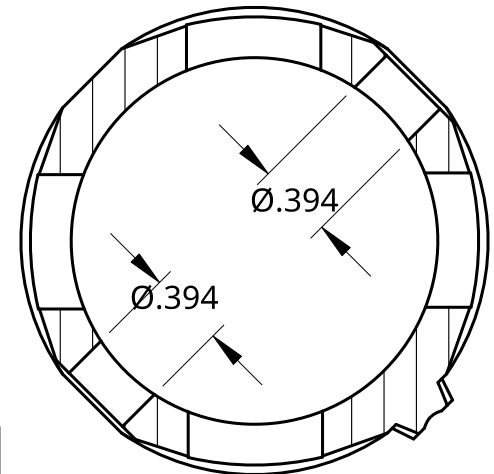
2

1

Text Font:
Roboto



SECTION B - B



SECTION A - A

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES				NAME	DATE
.XX = ±.01	ANGULAR = ± 0.1° FRACTIONAL = ±	DRAWN	JAMES CASSIDY		04/25/2024
.XXX = ±.005		CHECKED			
.XXXX = ±.002		APPROVED			
SURFACE FINISH 					
DO NOT SCALE DRAWING					
BREAK ALL SHARP EDGES AND REMOVE BURRS					
THIRD ANGLE PROJECTION		MATERIAL		FINISH	
					

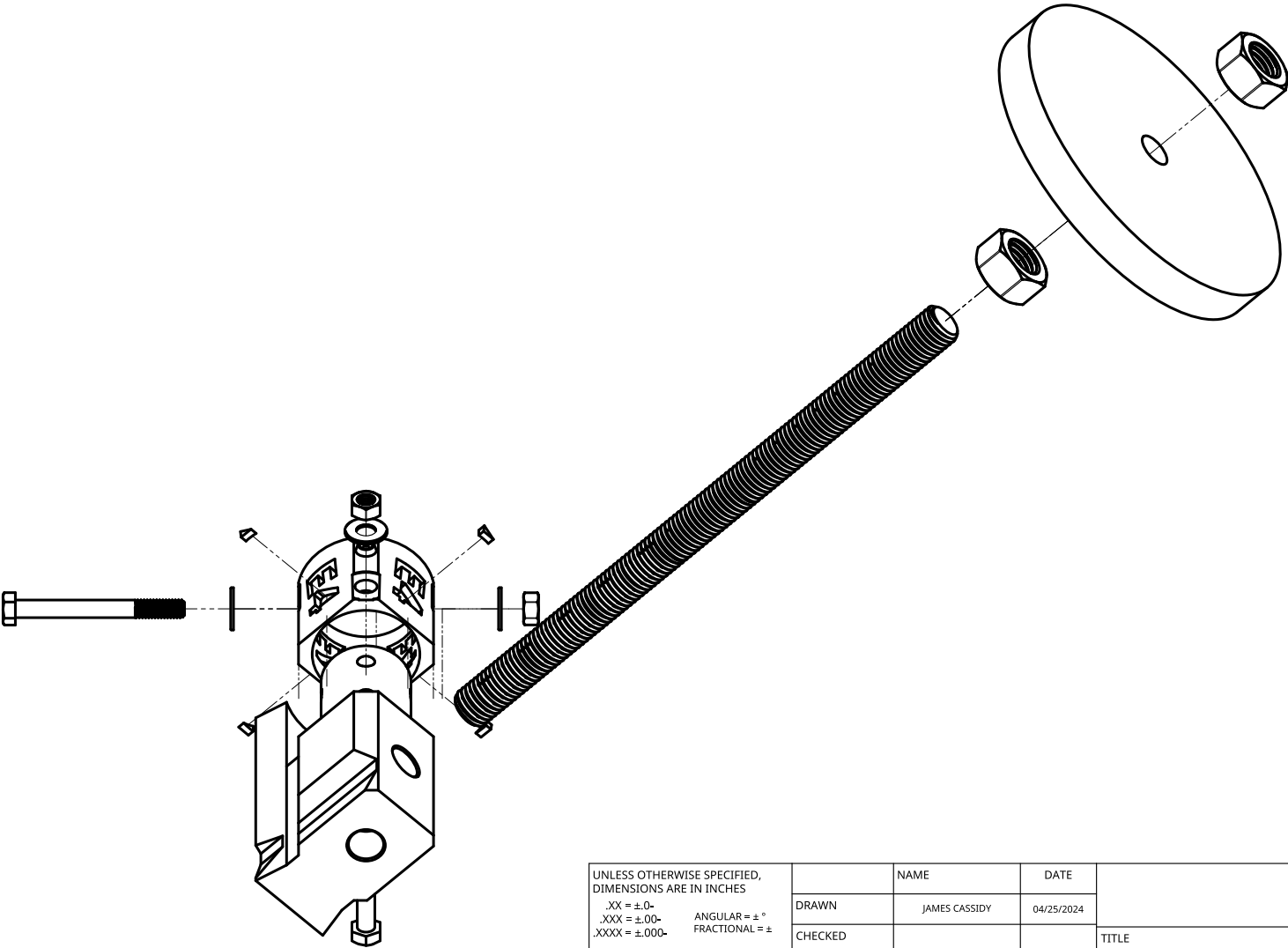
TITLE			
E4 Astronomers Telescope Mount			
SIZE	DWG NO.	REV.	
A	1		
SCALE	1:1	WEIGHT	SHEET
			1 of 1

2

1

B

A



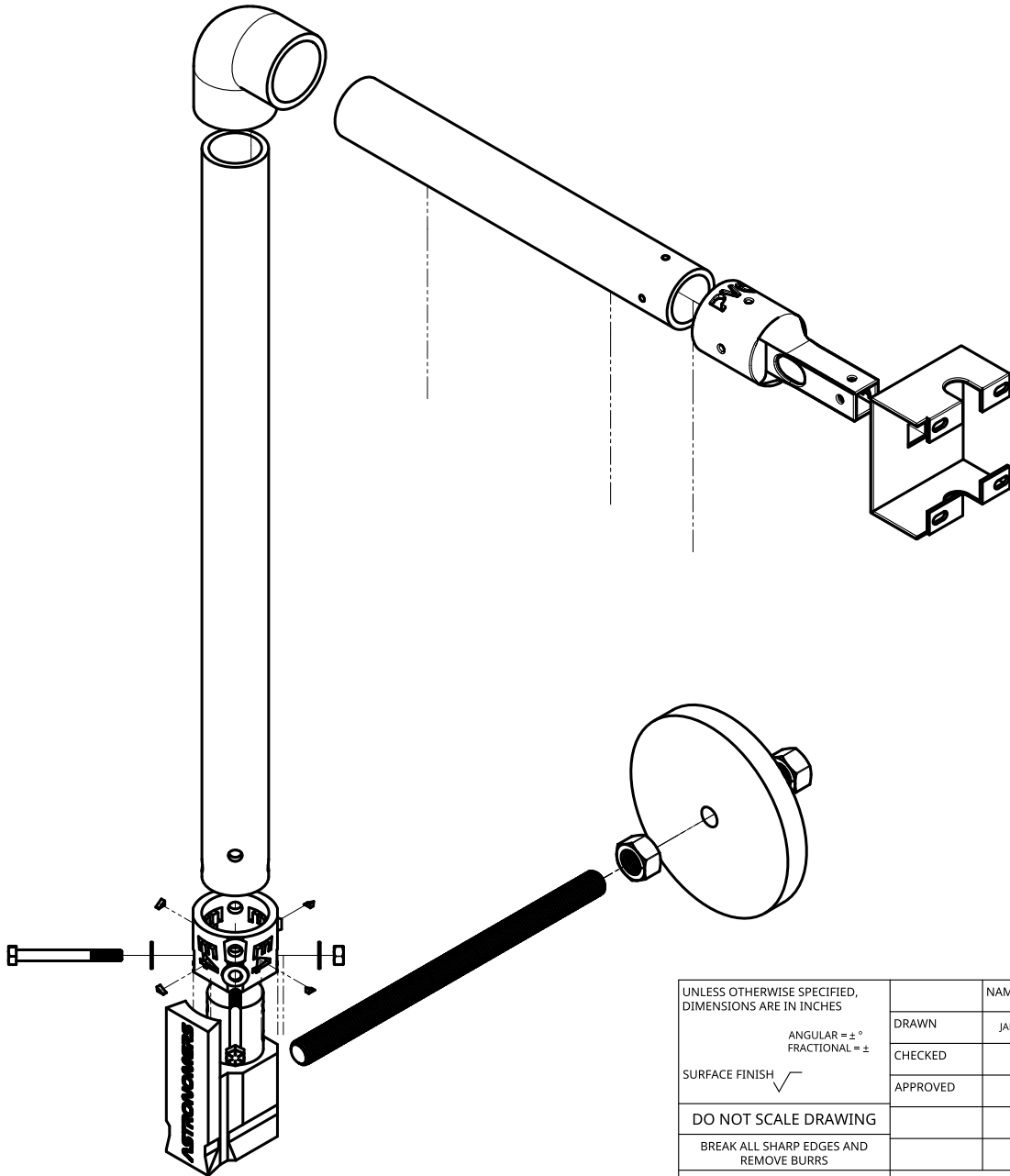
B

A

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES XX = ±.0- XXX = ±.00- XXXX = ±.000- SURFACE FINISH 		NAME		DATE		TITLE					
		DRAWN		JAMES CASSIDY						04/25/2024	
		CHECKED									
		APPROVED									
DO NOT SCALE DRAWING								SIZE A			
BREAK ALL SHARP EDGES AND REMOVE BURRS											
THIRD ANGLE PROJECTION		MATERIAL		FINISH				DWG NO.		REV.	
								SCALE 1:3		SHEET 1 of 1	

2

1



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES	
ANGULAR = $\pm$ ° FRACTIONAL = $\pm$	
SURFACE FINISH	
DO NOT SCALE DRAWING	
BREAK ALL SHARP EDGES AND REMOVE BURRS	
FIRST ANGLE PROJECTION	

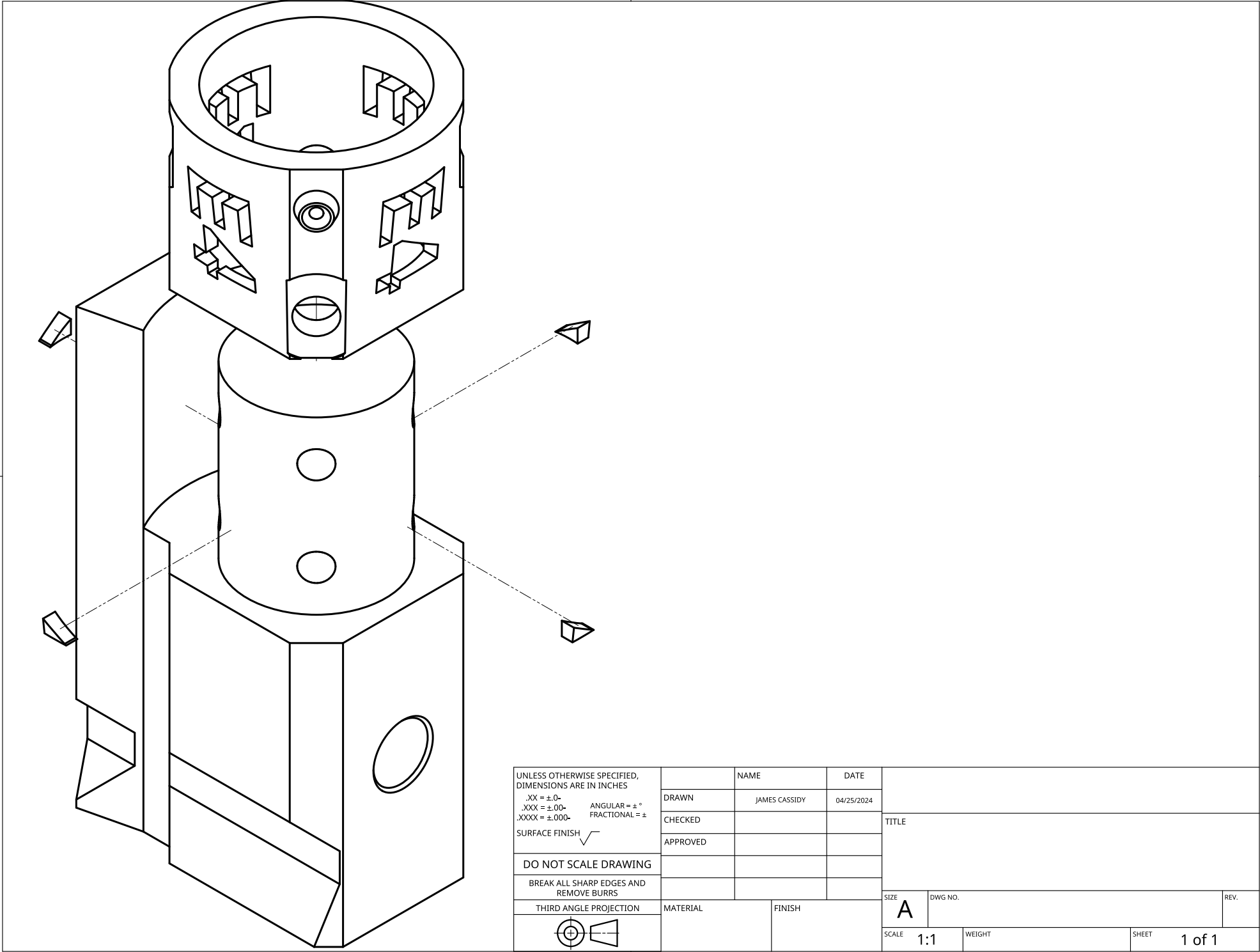
		NAME	SIGNATURE	DATE		
DRAWN		JAMES CASSIDY		2024-04-25		
CHECKED					TITLE	
APPROVED						
					SIZE	REV.
					A4	
					DWG NO.	
					SCALE	1:5
					WEIGHT	
					SHEET	1 of 1

B

B

A

A



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES . XX = ±.0- .XXX = ±.00- .XXXX = ±.000- SURFACE FINISH  DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS THIRD ANGLE PROJECTION 		NAME	DATE	TITLE		
	DRAWN	JAMES CASSIDY	04/25/2024			
	CHECKED					
	APPROVED					
				SIZE		
	MATERIAL	FINISH		DWG NO.		
				REV.		
				SCALE	1:1	WEIGHT
				SHEET	1 of 1	

ANTENNA TO PVC JOINT PROCESS ROUTER

The antenna to PVC joint serves to join the antenna to the PVC pipe semi-temporarily and provides a rigid support to allow the antenna to be steadily and accurately controlled by the telescope mount attached to the PVC pipe by another joint (not this one).

ANTENNA TO PVC JOINT

Process	Machine/Tool	Comments
Exporting to STL file from CAD file	Solidworks	Export the CAD file to a .stl file
Slicing the STL file from a compatible slicing software	Slicing Software	On the Markforged website, initiate a new print job and orient the design vertically, and reduce the thickness of the supports for easier support removal.
Printing the design	Markforged Mark Two	Make sure there is enough filament in the printer. Start the print and make sure to check if the first view layers are printing correctly.

NYLON BOLTS

Process	Machine/Tool	Comments
Dipping the 0.4mm diameter nylon bolts into coating rubber	Liquid coating rubber, 0.4mm diameter nylon bolts (6), Nylon gloves for protection	With gloves on, carefully hold the head of the bolt and dip the threads into the rubber for 3 seconds. Remove the bolt and lay it down on the ground head first. Repeat this for each bolt.
Applying multiple coats	Liquid coating rubber, 0.4mm diameter nylon bolts (6), Nylon gloves for protection	Let the bolt to air dry for 10 mins. Repeat the previous step for each bolt until it reaches the diameter of the holes on the prototype (0.5mm).
Drying the bolts	N/A	Let the rubber-dipped bolts air dry for at least 4 hours.

PARABOLIC ATTACHMENT PROCESS ROUTER

The parabolic attachment serves to join the parabolic antenna to the antenna-PVC pipe joint and semi-temporarily provides a rigid support to allow the antenna to be steadily and accurately controlled by the telescope mount attached to the PVC pipe by another joint (not this one).

Parabolic Attachment

Process	Machine/Tool	Comments
Exporting to STL file from CAD file	Solidworks	Export the CAD file to a .stl file
Slicing the STL file from a compatible slicing software	Slicing Software	On the Markforged website, initiate a new print job and remove supports not in the corners of the part or a 50mm x 50mm box in the center. This saves time and cost.
Printing the design	Markforged Mark Two	Make sure there is enough filament in the printer. Start the print and ensure the first view layers are printing correctly.

PVC Tube Process Router

Within the design, the PVC tube part was designed to be as versatile as possible, this process router comes with what must be done to all PVC pipes, while including optional changes seen in the set delivered.

Process	Machine / Tool	Comments
Cut to Length	PVC Cutter	Try to make as flat as possible
Create Mounting Sleeve	3D printer	Print out the sleeve, with the wider diameter end on the build plate along with 4 of the smaller pieces. Use 15% infill and 3 walls, along with a brim and support
(Optional) Attach Elbow	PVC Primer, PVC Glue	Sand down all connecting faces and clean beforehand. First adding the primer, then the glue, push pieces together, with a 90° twist at the end, for 20s. A youtube tutorial is recommended
(Optional) Spray Paint White	White Spray Paint	Spray paint the whole setup so far white
Attach Mounting Sleeve	Hammer, Handrill	Using a mallet from one of the mills, make sure the piece is flush with the tube, with the smaller outer diameter flush with the pipe end (if elbow is attached) ensure the piece is square with the elbow). Then attach a screw through the drill hole.
Attach Sleeve Decal	Hot Glue Gun	Glue in the 4 small pieces with the curved end facing the tube, align within the text on sleeve so it looks pretty

PVC Tube Process Router

Antenna Mount Holes	Hand Drill	Start by grabbing two friends (they will be needed to make sure everything is square). Put the antenna mounting 3D printed piece on the end of the tube and mark one of the holes. Start using the pilot hole drill bit, then use the full size bit. After creating the first hole, use the included plugs to lock the print in place. Then go around and drill out the remaining 3 holes. Make sure the holes are drilled so that the 3D printed piece is either square to the elbow (if using the elbow) or square to the sleeve.
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Telescope Mount Process Router

This process router covers how to make one of the two included Telescope Mounts. This requires a 2x3x5in block of aluminum stock. The two included were made by cutting a 3x4x5in block of aluminum through the middle of the 4in side with the band saw, and then facing both cut faces. This method is not recommended as it significantly decreases the width of each part, however, with proper stock sizing when CAMing, this design supports up to a minimum width of 1.72in in the 2in dimension.

Tool Feeds and Speeds:

→ 0.5in Short Roughing End Mill (~1.3in length)

- ◆ 4000 RPM
- ◆ 0.2in Stepover
- ◆ 0.2in Depth of Cut
- ◆ 30in/m Feedrate

→ 0.5in long Roughing End Mill (~3in length)

- ◆ 4000 RPM
- ◆ 0.2in Stepover
- ◆ 0.8in Depth of Cut
- ◆ 20in/m Feedrate

Process	Machine / Tool	Comments
Machine top face	Mill 5 → 0.5in Short Roughing End Mill	Place the piece of stock such that the 5in end is going along the vice, and the 2in side is what is being machined (A support block may need to be placed underneath to elevate the piece). In CAM, set the machining boundary to machine all of the top flat faces in the following cuts: 3D Adaptive with 0.05in stock to leave followed by two parallel finishes in each cartesian direction.
Machine bottom Face	Mill 5 → 0.5in Short Roughing End Mill	Repeat the previous step but with the piece flipped over. Make sure to create new G-Code as the cut should now be mirrored

Telescope Mount Process Router

Machine Connecting Tube Boss	Mill 5 → 0.5in Short Roughing End Mill → 0.5in Long Roughing End Mill	Flip the piece so that the longer dovetail contour is facing up. With a 3D Adaptive cut, with no machining boundary set and stock to leave disabled, dimension the cut to a depth of 1.3in and use the shorted roughing end mill. Afterward, duplicate the previous operation and use the long end mill, extending the cut depth to 50cm (flat face after tube boss, and enable rest machining.
Machine Connecting Boss Through Holes	Mill	Using the mill, place the part, with the long dovetail end facing up, on top of a Vee block in the vice. Zero along two sides of the connecting boss, when drilling the pilot hole, make sure to place the bit minimally inside of the drill chuck as extra length is needed. Once done with the first side, flip along the y-axis and repeat. When drilling the second set of holes, after drilling into the cavity made by the first set, use an end mill to clear the cavity, then continue with the drill bit.
Make Threaded Counterweight attachment holes	Mill	To fixture the part for the hole parallel to the 5in side, place a short Vee block against the Connecting Tube Boss, and clamp with the long dovetail side face. It is recommended to use the very long and big wrench for this operation.
(Optional) Shiny Finish	Mill	Using the 6 flute, 2.2in facing end mill, cut 0.05in deep, at a feed rate of 10in/min, 800 RPM on any face you want to be shiny
(Optional) ASTRONOMERS Decal	Mill 5	Using a 1/16in end mill, lie to the CAM and say the end mill has a diameter of 0.05in (it looks

Telescope Mount Process Router

better). Ramp into a 2D contour with a plunge(ramp) feed rate of 1.5in and a feed of 3in for the rest.

Counterweight Mount Process Router

This process router covers how to make one of the two included Telescope Mounts. This requires a 2x3x5in block of aluminum stock. The two included were made by cutting a 3x4x5in block of aluminum through the middle of the 4in side with the band saw, and then facing both cut faces. This method is not recommended as it significantly decreases the width of each part, however, with proper stock sizing when CAMing, this design supports up to a minimum width of 1.72in in the 2in dimension.

Tool Feeds and Speeds:

→ 0.5in Short Roughing End Mill (~1.3in length)

- ◆ 4000 RPM
- ◆ 0.2in Stepover
- ◆ 0.2in Depth of Cut
- ◆ 30in/m Feedrate

→ 0.5in long Roughing End Mill (~3in length)

- ◆ 4000 RPM
- ◆ 0.2in Stepover
- ◆ 0.8in Depth of Cut
- ◆ 20in/m Feedrate

Process	Machine / Tool	Comments
	→	
	→	
Make Threaded Counterweight attachment holes	Mill	To fixture the part for the hole parallel to the 5in side, place a short Vee block against the Connecting Tube Boss, and clamp with the long dovetail side face. It is recommended to use the very long and big wrench for this operation.