white river technologies

Build Book

Adjustable Buried Bomb Identifier

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Sponsored by

White River Technologies

Project Group 21
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THAYER SCHOOL OF ENGINEERING AT DARTMOUTH

1 Process BD001: Overall Assembly

1.a Bill of Materials

Part Number	Name	Quantity
ASMB003	Middle Coil	1
ASMB004	Left Coil	1
ASMB005	Right Coil	1
ASMB006	Back Coil	1
ASMB007	Front Coil	1
ASMB008	Top Coil	1
ASMB009	Bottom Coil	1
THCU005	Cube Beam Bracket	2
THOA005	Top Middle Bracket	2
THOA004	Top Side Bracket	2
THOA010	Side Support Bracket	8
THOA003	Top Beam	1
THOA006	Middle 1x1 Angle	1
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	16
OUTS003	2.5" 3/8-16 bolt	32
OUTS004	3/8-16 nut	48

1.b Process

1. Attach the Bottom Coil (PN ASMB009) and Right Coil (PN ASMB005) as shown in Figure 1.1. The Right Coil edge with no bolted brackets furthest from the plug should be bolted to the short edge of the Bottom Coil with the Bottom Corner Support for Plug. The Right Coil should slot in between the two Longer Outer Angle Bracket and Inner Angle Bracket pairs on the Bottom Coil. Bolt the currently unbolted holes in the brackets to the unbolted holes in the acrylic supports on the Right Coil using two 2.5” 3/8-16 bolts (PN OUTS003), and two 3/8-16 nuts (PN OUTS004). Note: match drill to fit as needed.

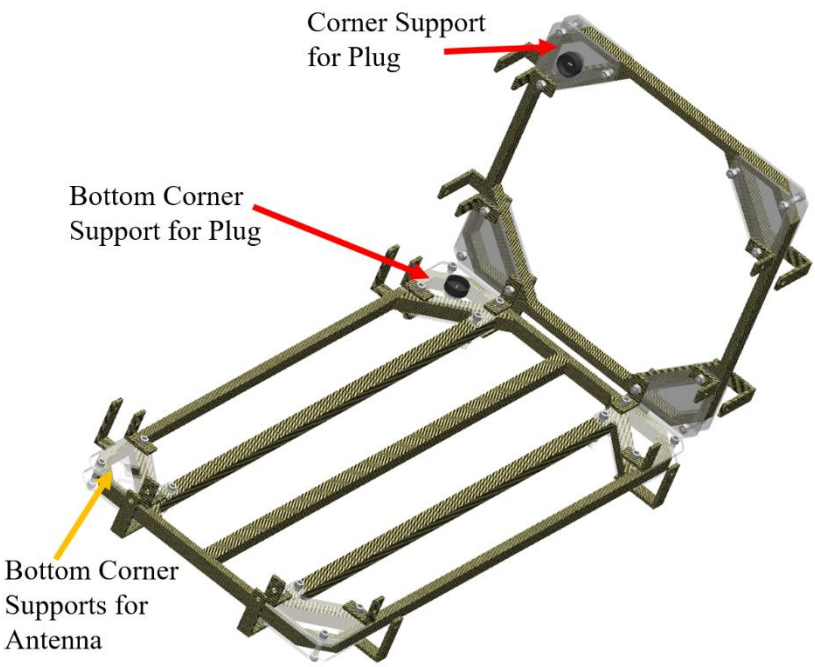


Figure 1.1

2. Epoxy two Side Support Brackets (PN THOA010) to the Bottom Coil as shown in Figure 1.2. One leg of the bracket should be flush to the Bottom Coil, and the other flush to the Right Coil. The leg flush to the Right Coil **SHOULD NOT** be epoxied to the Right Coil. The outside edge of each Side Support Bracket should be about 1”±0.75” away from the closest edge of the nearest Longer Outer Angle Bracket. Dimensioning is shown in Figure 1.3.

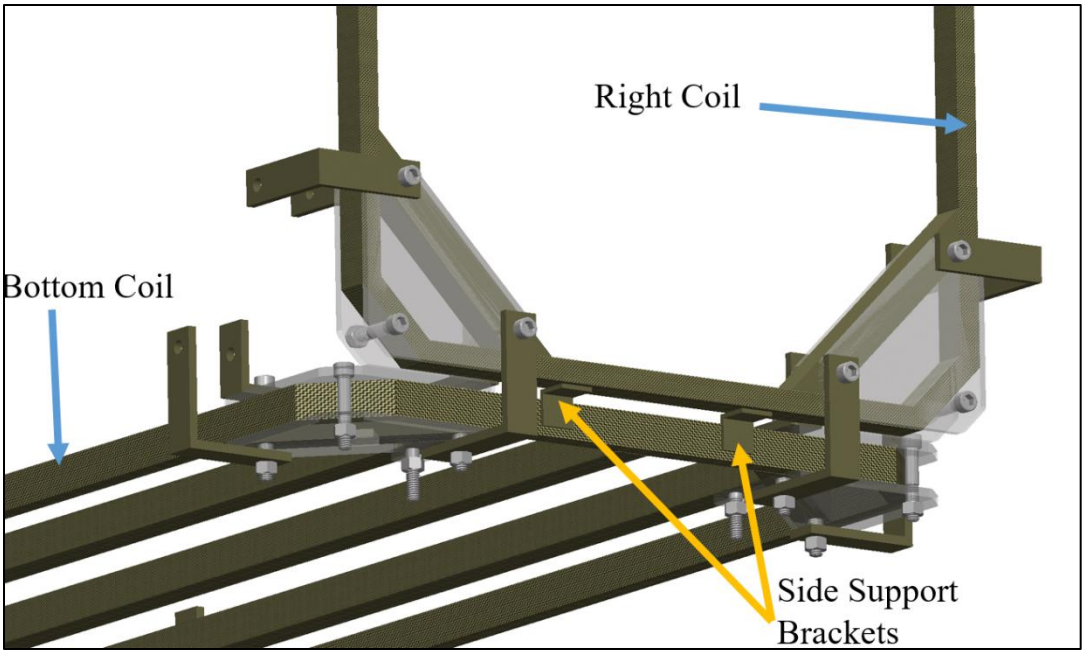


Figure 1.2

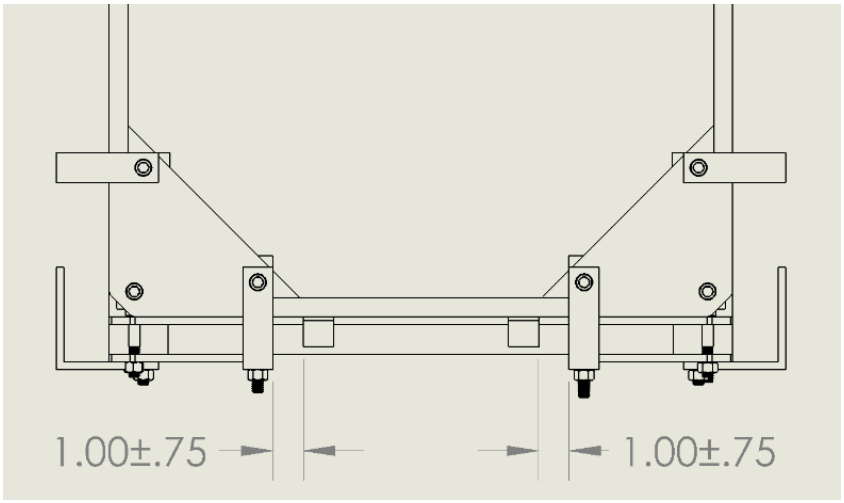


Figure 1.3

3. On the opposite short edge of the Bottom Coil (PN ASMB009), attach the Left Coil (PN ASMB004) as shown in Figure 1.4. The Left Coil edge with no bolted brackets closest to the plug should be bolted to the short edge of the Bottom Coil with the Bottom Corner Support for Antenna. Bolt the currently unbolted holes in the brackets to the unbolted holes in the acrylic supports on the Left Coil using two 2.5” 3/8-16 bolts (PN OUTS003), and two 3/8-16 nuts (PN OUTS004). Note: match drill to fit as needed.

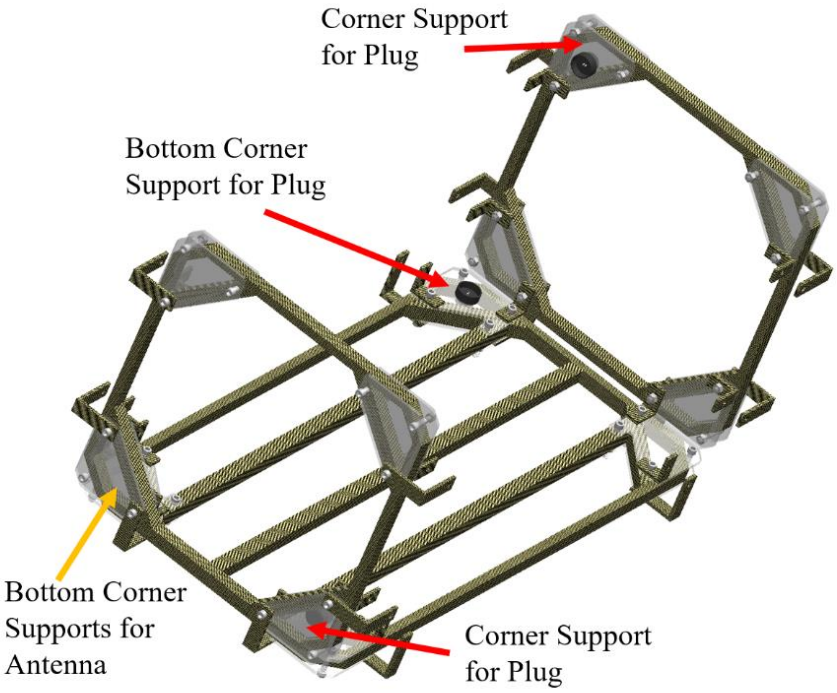


Figure 1.4

4. Epoxy two Side Support Brackets (PN THOA010) to the Bottom Coil as shown in Figure 1.3. One leg of the bracket should be flush to the Bottom Coil, and the other flush to the Left Coil. The leg flush to the Left Coil **SHOULD NOT** be epoxied to the Left Coil. The outside edge of each Side Support Bracket should be about 1”±0.75” away from the closest edge of the nearest Longer Outer Angle Bracket. See Figure 1.3 from Step 2 for reference on dimensioning and location details.
5. Epoxy the two Cube Beam Brackets (PN THCU005) to the Bottom Coil in the appropriate place as shown in Figure 1.5. The 1” wide Cube Beam Brackets should line up with the 1” wide Cube Support Beam (THCU002). The leg of the Cube Beam Brackets that does not have a hole drilled in it should be flush to the side of the Left or Right coil, while the side with the hole drilled in should be under the Cube Support Beam. **ONLY epoxy the Cube Beam Brackets to the Bottom Coil and Cube Support Beam**. **DO NOT epoxy the Cube Beam Brackets to the Right and Left Coils.**

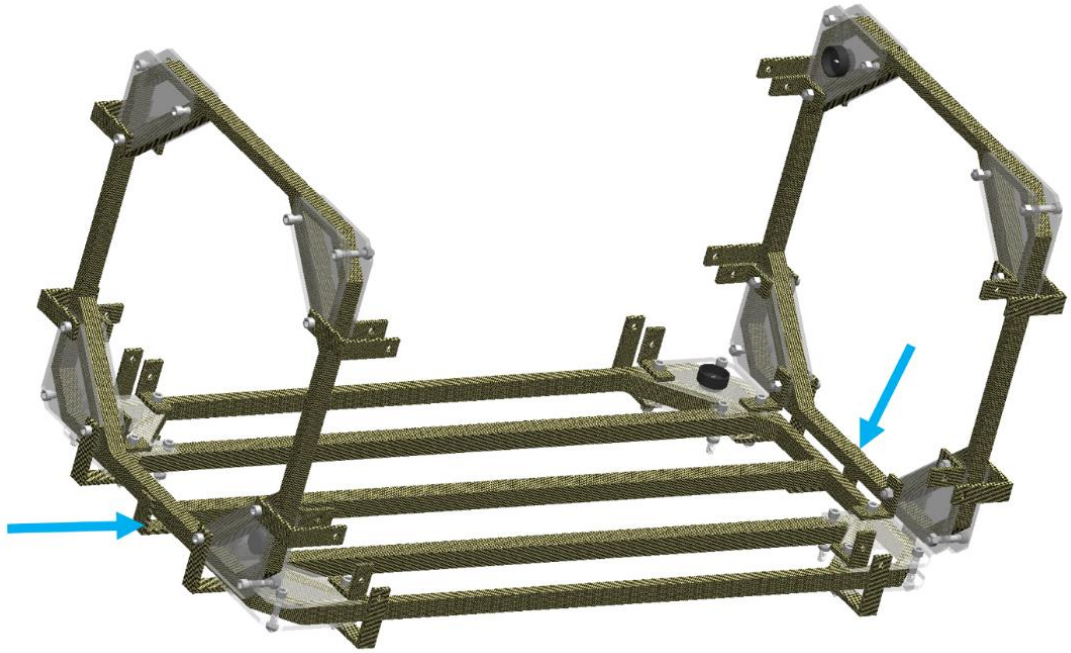


Figure 1.5

6. Once the epoxy on the Cube Beam Brackets is dry, match drill through the holes in the Cube Beam Brackets through the Cube Support Beam. Bolt the Cube Beam Brackets to the Cube Support Beam using two 2” 3/8-16 bolts (PN OUTS002), and two 3/8-16 nuts (PN OUTS004).
7. Attach the Back Coil (PN ASMB006) to the Bottom Coil (PN ASMB009), between the Right Coil (PN ASMB005) and Left Coil (ASMB004) as shown in Figure 1.6. The Back Coil long edge closest to the plug should be bolted to the long edge of the Bottom Coil furthest from the Bottom Coil’s plug. The Back Coil should slot in between the two Outer Angle Bracket and Inner Angle Bracket pairs on the on each of the other three coils. Bolt the currently unbolted holes in the brackets to the unbolted holes in the acrylic supports on the Back Coil using six 2.5” 3/8-16 bolts (PN OUTS003), and six 3/8-16 nuts (PN OUTS004). Note: match drill to fit as needed.

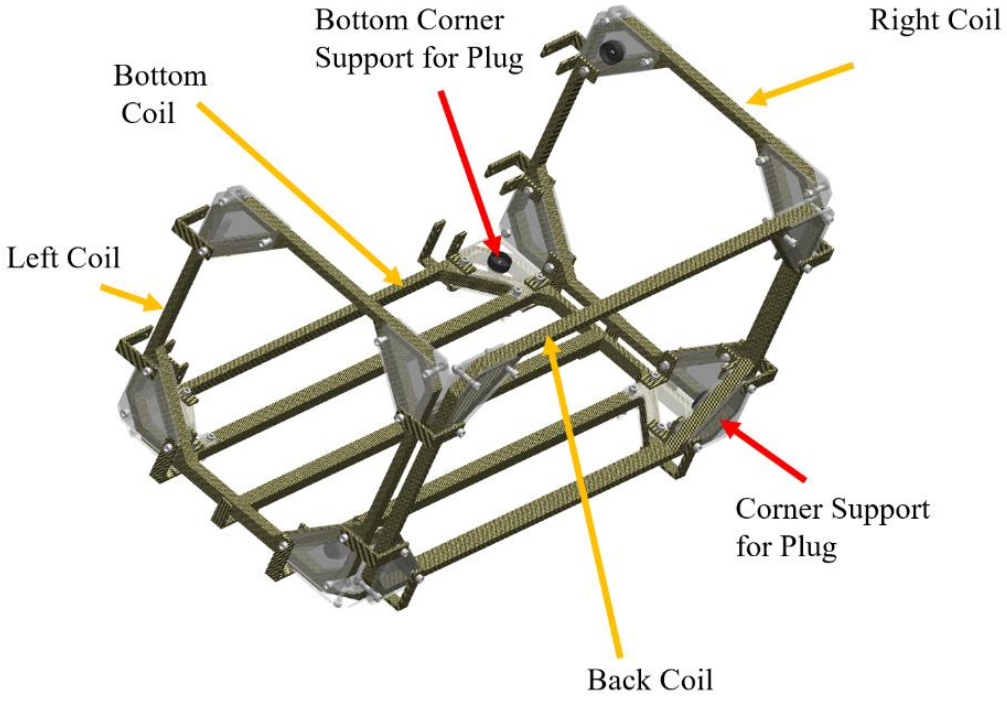


Figure 1.6

8. Epoxy two Side Support Brackets (PN THOA010) to the Bottom Coil, see step 2 for reference on this process. One leg of the bracket should be flush to the Bottom Coil, and the other flush to the Back Coil. The leg flush to the Back Coil **SHOULD NOT** be epoxied to the Back Coil. The outside edge of each Side Support Bracket should be about 9”±0.75” away from the closest edge of the nearest Longer Outer Angle Bracket. Dimensioning is shown in Figure 1.7.

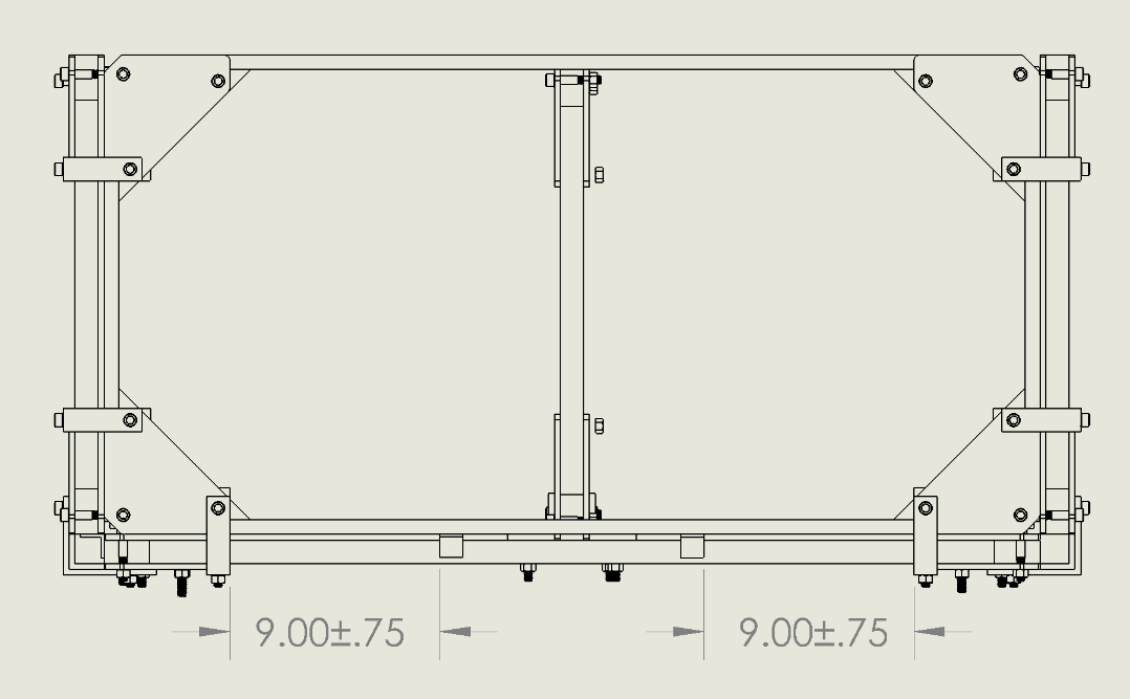


Figure 1.7

9. Attach the Front Coil (PN ASMB007) to the Bottom Coil (PN ASMB009), between the Right Coil (PN ASMB005) and Left Coil (ASMB004) as shown in Figure 1.8. The Front Coil long edge closest to the plug should be bolted to the long edge of the Bottom Coil closest to the Bottom Coil's plug. The Front Coil should slot in between the two Outer Angle Bracket and Inner Angle Bracket pairs on the left, right, and bottom coils. Bolt the currently unbolted holes in the brackets to the unbolted holes in the acrylic supports on the Back Coil using six 2.5" 3/8-16 bolts (PN OUTS003), and six 3/8-16 nuts (PN OUTS004). Note: match drill to fit as needed.

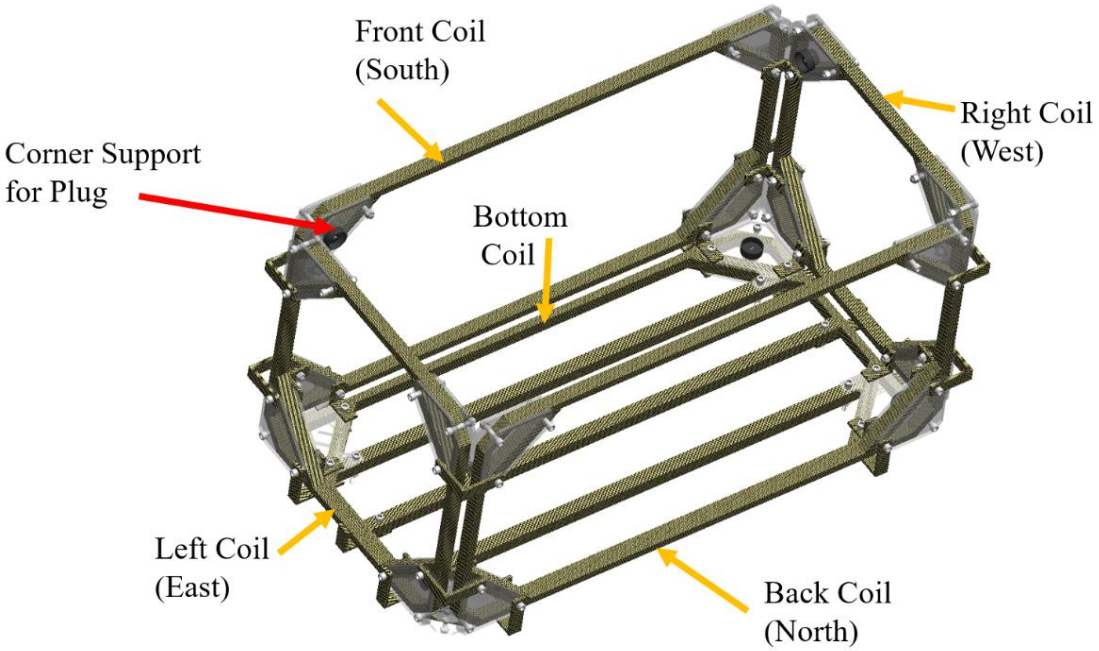


Figure 1.8

10. Epoxy two Side Support Brackets (PN THOA010) to the Bottom Coil, see step 2 for reference on this process. One leg of the bracket should be flush to the Bottom Coil, and the other flush to the Front Coil. The leg flush to the Front Coil **SHOULD NOT** be epoxied to the Front Coil. The outside edge of each Side Support Bracket should be about 9”±0.75” away from the closest edge of the nearest Longer Outer Angle Bracket. Dimensioning is shown in Figure 1.9.

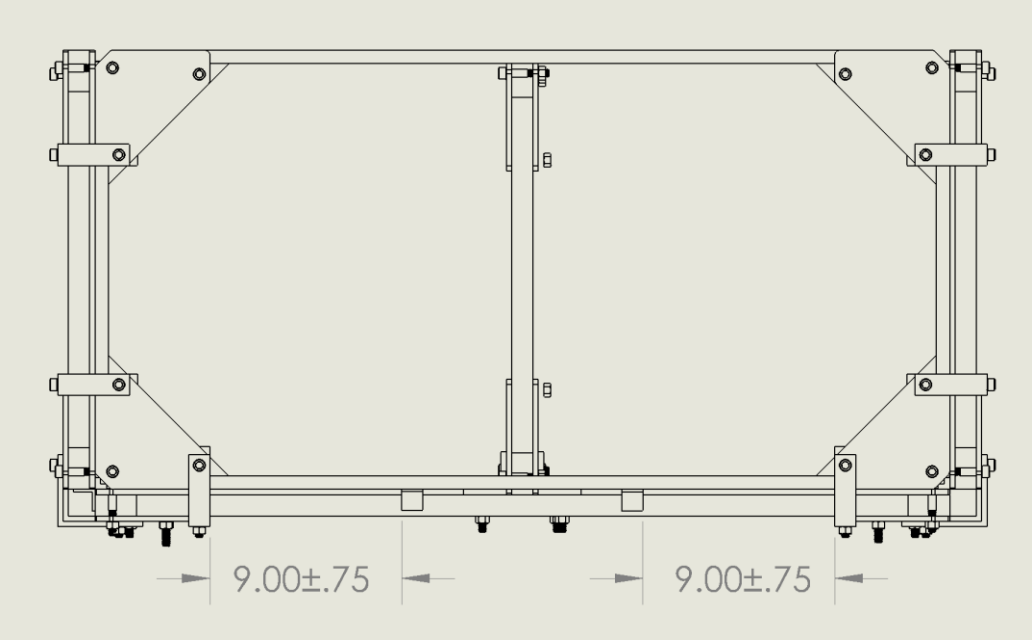


Figure 1.9

11. Align the Middle Coil (PN ASMB003) so that it is centered on the bottom coil both in the long and short direction as pictured in Figure 1.10.

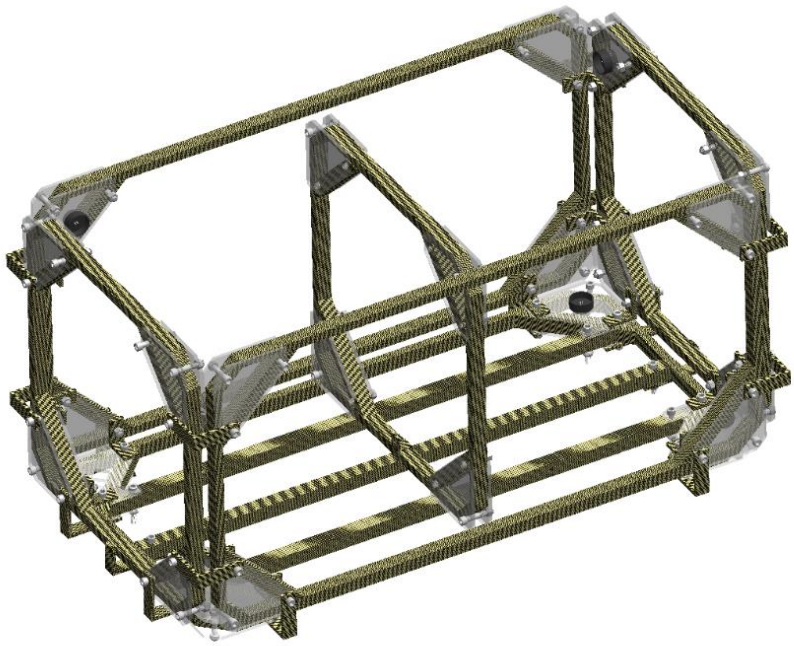


Figure 1.10

12. Do not move the middle coil from its centered configuration. Using the two bolt holes in the middle coil closest to the bottom coil, bolt a pair of Inner Angle Brackets (PN THOA002) to each hole in the middle coil using two 2” 3/8-16 bolts (PN OUTS002), and two 3/8-16 nuts (PN OUTS004) as shown in Figure 1.11. Center a third Inner Angle Bracket on the Cube Support Beam (PN THCU002) as shown in Figure 1.11. The sides of the Inner Angle Brackets should be flush to the sides of the Cube Support Beam or Angled Cube Support Beam (PN THCU001) that they are resting on. Ensure the middle coil is still in its centered configuration, if so, epoxy the bottom faces of the Inner Angle Brackets to their respective support Beams in the same configuration as shown in Figure 1.11. **DO NOT epoxy the Inner Angle Brackets to the Middle Coil, ONLY epoxy them to the Angled Support Beams.**

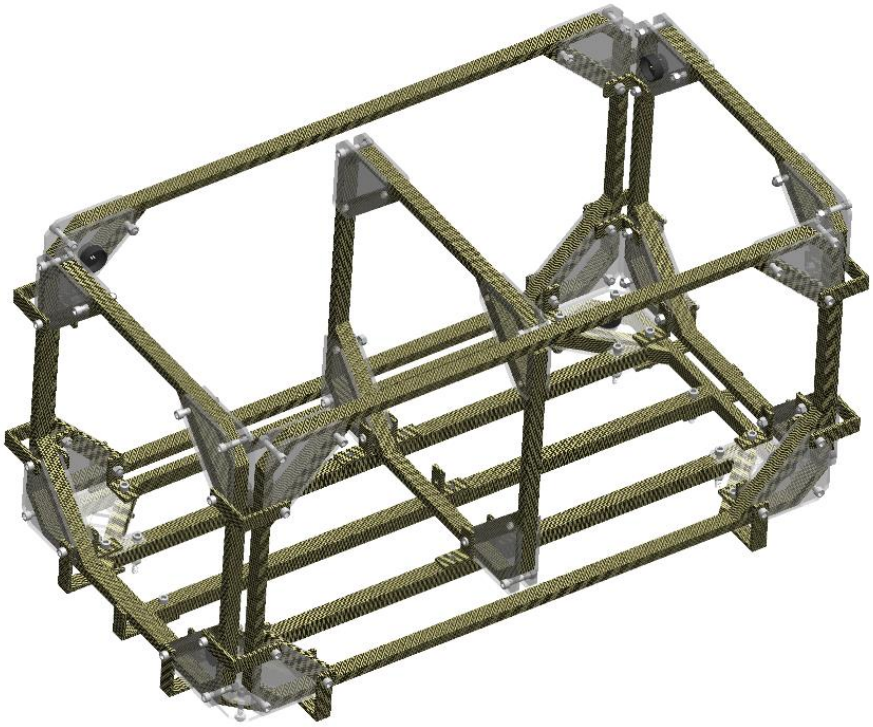


Figure 1.11

13. Once the epoxy is dry match drill through the holes in the Inner Angle Brackets (PN THOA002) through the Angled Cube Support Beams and the Cube Support Beam, and bolt the Inner Angle Brackets to their respective support beams using five 2” 3/8-16 bolts (PN OUTS002), and five 3/8-16 nuts (PN OUTS004) as shown in Figure 1.12

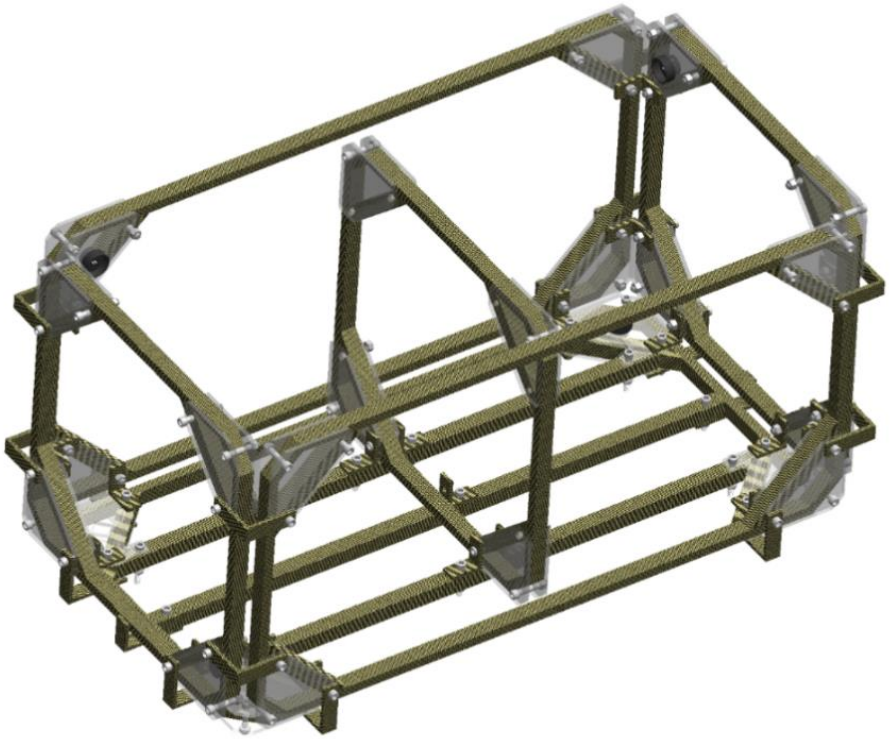


Figure 1.12

14. Attach the Top Coil (PN ASMB008) to the Right Coil (PN ASMB005), Left Coil (ASMB004), Back Coil (PN ASMB006), Front Coil (PN ASMB007) as shown in Figure 1.13. The Corner Supports for Antenna (PN THBC007) should line up to the Bottom Corner Supports for Antenna (PN THBC010). Bolt the currently unbolted holes in the brackets to the unbolted holes in the acrylic supports on the Back Coil using eight 2.5" 3/8-16 bolts (PN OUTS003), and eight 3/8-16 nuts (PN OUTS004). Note: match drill to fit as needed.

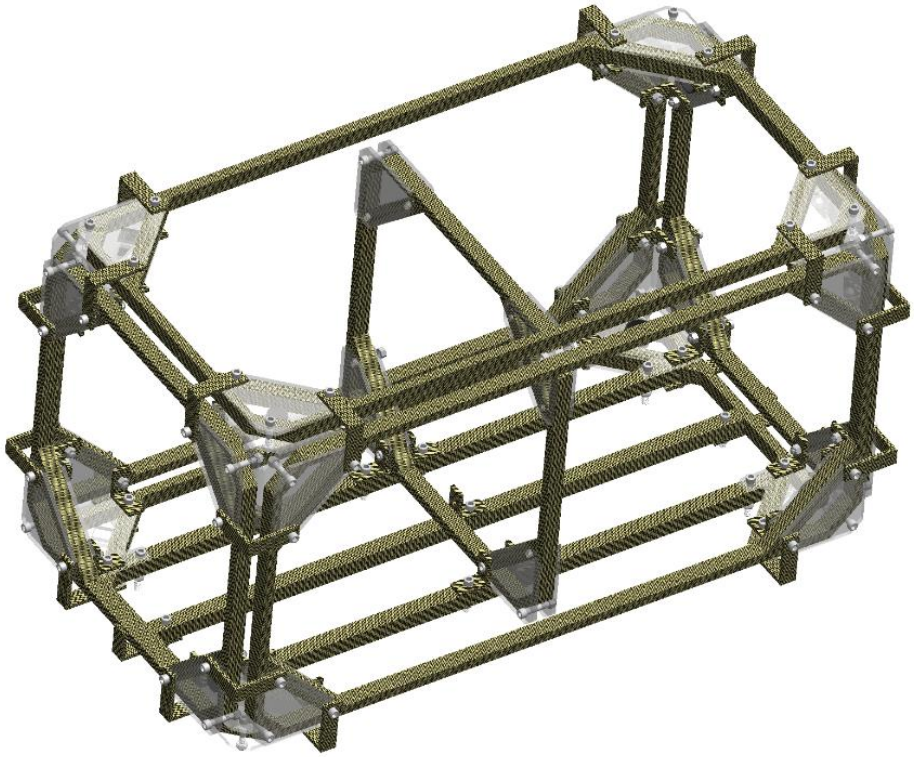


Figure 1.13

15. Epoxy the Top Beam Support (PN THOA003) to the inside faces of the longs sides of the Top Coil (PN ASMB008). Immediately after, without letting the epoxy dry, epoxy the two Top Side Brackets (PN THOA004) to both the Top Beam Support and the Top Coil as shown in Figure 1.14. Ensure that the sides of the Top Beam Support are flush with the sides of the Middle Coil (PN ASMB003).

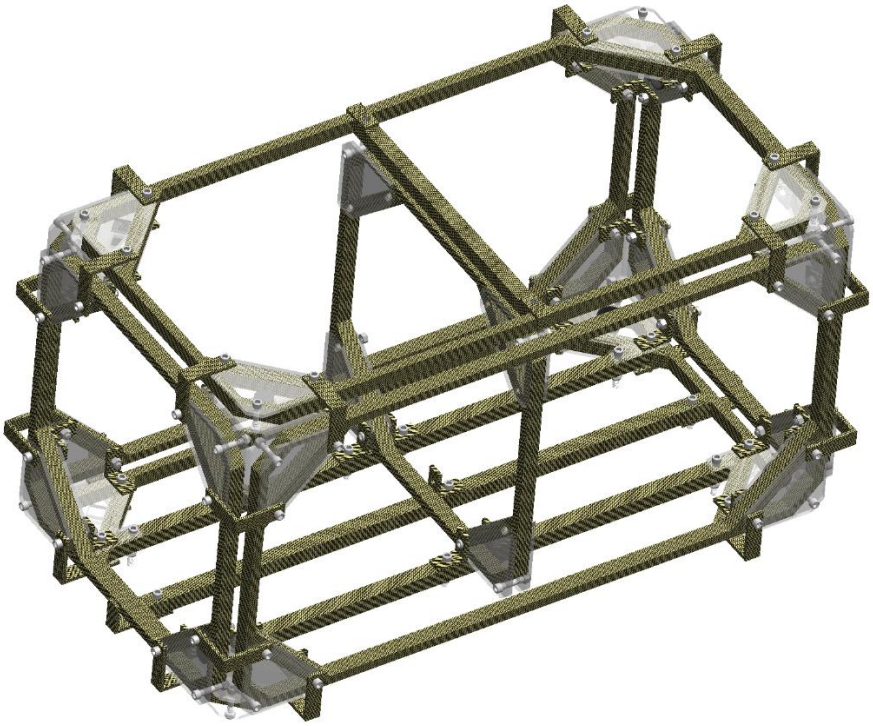


Figure 1.14

16. Once the epoxy applied in the previous step has dried, match drill through the Top Beam (PN THOA003) through the holes in the Top Side Brackets (PN THOA004), then bolt the Top Beam and the Top Side Brackets together with two 2” 3/8-16 bolts (PN OUTS002), and two 3/8-16 nuts (PN OUTS004).
17. Line up two Top Middle Brackets (PN THOA005) so the holes match up with the two top unbolted holes in the Middle Coil (ASMB003) as shown in Figure 1.15. The two Top Middle Brackets should mirror each other across the Middle Coil. Epoxy the Top Middle Bracket to the Top Beam (PN THOA003) as shown. Epoxy the Top Middle Bracket to the Top Beam. **DO NOT epoxy the Top middle Bracket to the Middle Coil.** Note: while the upper face of the Top Middle bracket will be flush to the top of the Top Beam, the side of the Top Middle Bracket will not be flush to the side of the Top Beam—shim as necessary. Bolt the Top Middle Brackets to the Middle Coil using two 2.5” 3/8-16 bolts (PN OUTS003), and two 3/8-16 nuts (PN OUTS004).

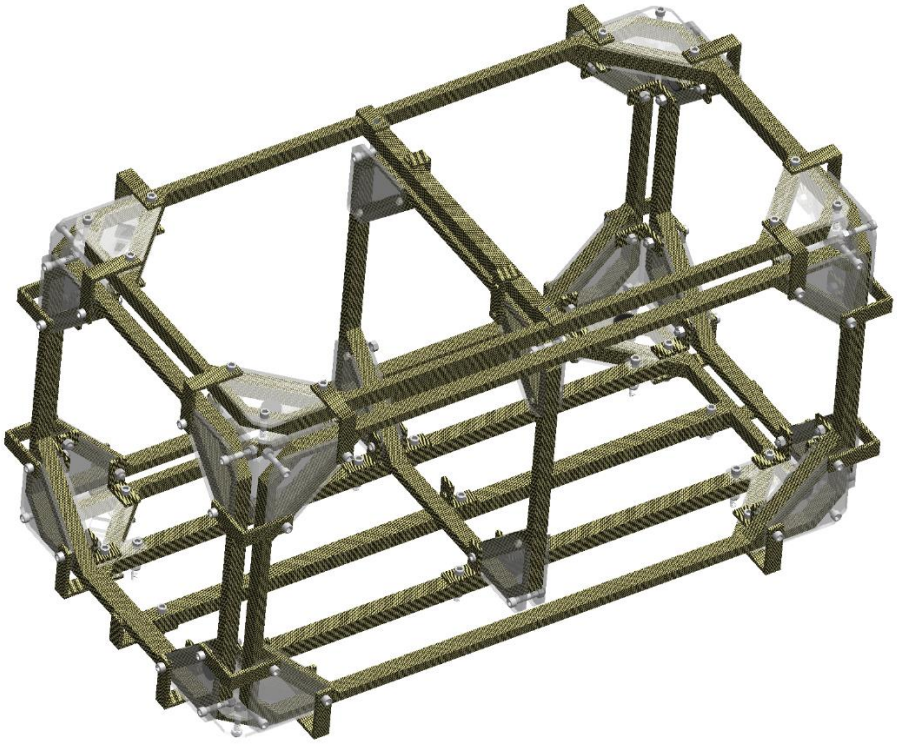


Figure 1.15

18. Match drill through the holes in the Top Middle Brackets (PN THOA005) through the Top Beam (PN THOA003). Bolt through the holes using two 2.5” 3/8-16 bolts (PN OUTS003), and two 3/8-16 nuts (PN OUTS004).
19. Epoxy the Middle 1x1 Angle (PN THOA006) to the Middle Coil (PN ASMB003) as shown in Figure 1.16. **DO NOT epoxy the Middle 1x1 Angle to the Inner Angle Bracket (THOA002) bolted to the Cube Support Beam (THCU002).** Use a 2” 3/8-16 bolt (PN OUTS002), and a 3/8-16 nut (PN OUTS004) to ensure that the Middle 1x1 Angle is aligned with the Inner Angle Bracket.

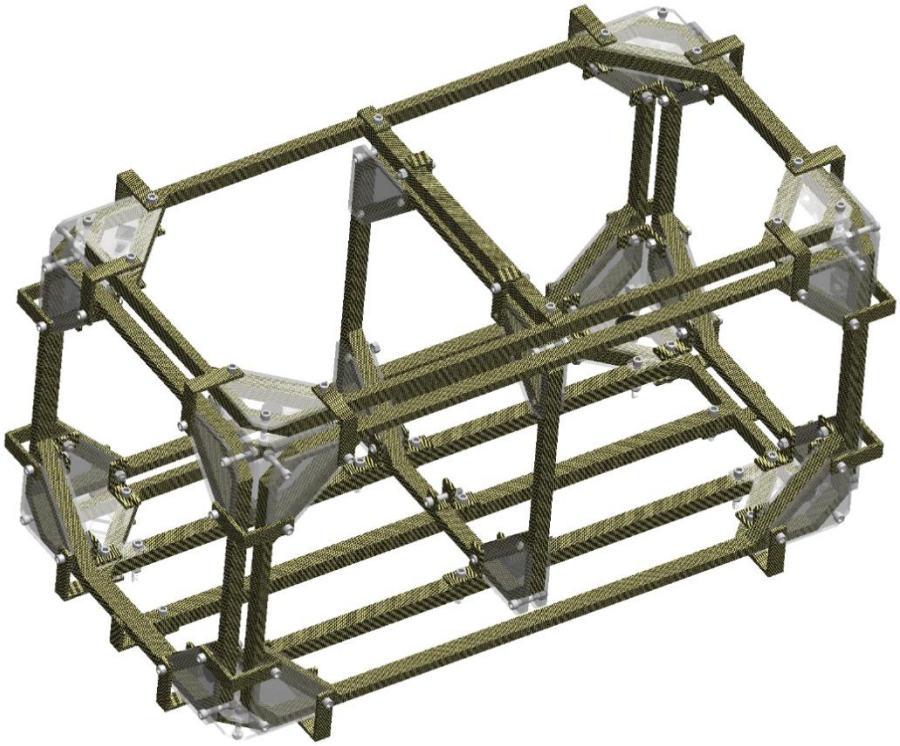


Figure 1.16

20. Bolt through any remaining unbolted holes in the Middle Coil using four 2” 3/8-16 bolts (PN OUTS002), and four 3/8-16 nuts (PN OUTS004).

2 Process BD002: Small Coil Assembly

2.a Bill of Materials

ASMB002	Small Coil	1
THBC001a and THBC001b	Corner Housing	4 pairs
THBC003a and THBC003b	Short Housing	4 pairs
THBC004	Brace	4
OUTS001	Epoxy	NA
OUTS006	12AWG Copper Magnet Wire	NA

2.b Process

1. Assemble four pieces of Corner Housing B (PN THBC001b) and four pieces of Short Housing B (PN THBC003b) as shown in Figure 2.1. Each piece of Corner Housing B should be epoxied to two pieces of Short Housing B. Figure 2.1 depicts four pieces of Corner Housing B and four pieces of Short Housing B epoxied together in the correct configuration. Laid outside the epoxied pieces of inner housing (parts B) are the corresponding pieces of outer housing (parts A).

Figure 2.1

2. Once the epoxy holding together the inner housing is dry, drill two holes both centered on one of the four pieces of Corner Housing B. Thread about 12” of the 12AWG copper wire through one hole. The other end of the magnet wire will be threaded out the other hole once the winding is complete.
3. Wind the 12AWG copper magnet wire around the coil for 20 turns, beginning the count at the corner at which the 12” of wire were pulled through the hole in on the piece of Corner Housing B. See Figure 2.2 for reference on winding methods.

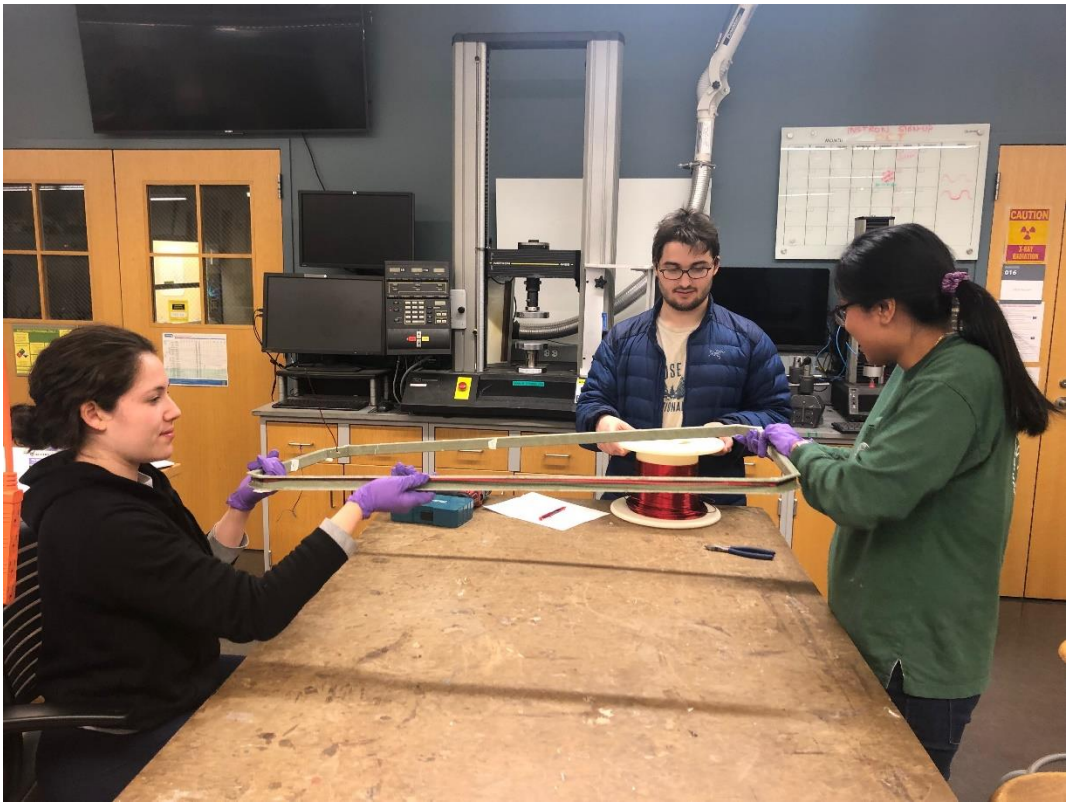


Figure 2.2

4. Once the 20 turns have been wound, thread the wire back out through the other hole. Figure 3.3 depicts a coil in this stage.

Figure 2.3

5. Epoxy the outsides of the coil onto the coiled inside. The respective parts to each outside section are depicted in Figure 2.1. Short Housing A (PN THBC003a) will be epoxied to any piece of Short Housing B. Epoxy the Short Housing A pieces to their corresponding B parts. **Ensure that DO NOT epoxy the Corner Housing A pieces on yet.** Clamp each pair of Short Housing A and Short Housing B together with at least at three clamps. This steps requires twelve clamps total at a minimum if all the sides are done at once. Figure 2.4 depicts the coil after this step.

Figure 2.4

6. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy four pieces of Corner Housing A (PN THBC001a) to the four pieces of Corner Housing B. Clamp each pair of Corner Housing together.
7. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy a Brace (PNTHBC004) inside each corner of the coil. This should be four Braces total. Set a clamp against each brace and Corner Housing A to hold the braces firmly to the frame. A braced corner is shown in Figure 2.5.

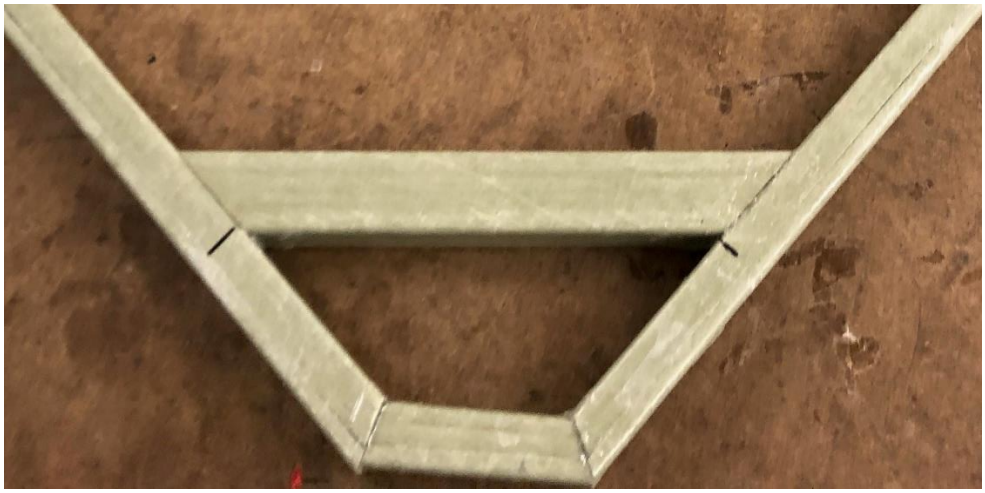


Figure 2.5

3 Process BD003: Large Coil Assembly

3.a Bill of Materials

ASMB002	Small Coil	1
THBC001a and THBC001b	Corner Housing	4 pairs
THBC002a and THBC002b	Long Housing	2 pairs
THBC003a and THBC003b	Short Housing	2 pairs
THBC004	Brace	4
OUTS001	Epoxy	NA
OUTS006	12AWG Copper Magnet Wire	NA

3.b Process

8. Assemble four pieces of Corner Housing B (PN THBC001b), two pieces of Long Housing B (PN THBC002b), and two pieces of Short Housing B (PN THBC003b) as shown in Figure 3.1. Each piece of Corner Housing B should be epoxied to one piece of Long Housing B and one piece of Short Housing B. Figure 3.1 depicts four pieces of Corner Housing B, two pieces of Long Housing B, and two pieces of Short Housing B epoxied together in the correct configuration. Laid outside the epoxied pieces of inner housing (parts B) are the corresponding pieces of outer housing (parts A).

Figure 3.1

9. Once the epoxy holding together the inner housing is dry, drill two holes both centered on one of the four pieces of Corner Housing B. Thread about 12” of the 12AWG copper wire through one hole. The other end of the magnet wire will be threaded out the other hole once the winding is complete.

10. Wind the 12AWG copper magnet wire around the coil for 20 turns, beginning the count at the corner at which the 12” of wire were pulled through the hole in on the piece of Corner Housing B. See Figure 3.2 for reference on winding methods.

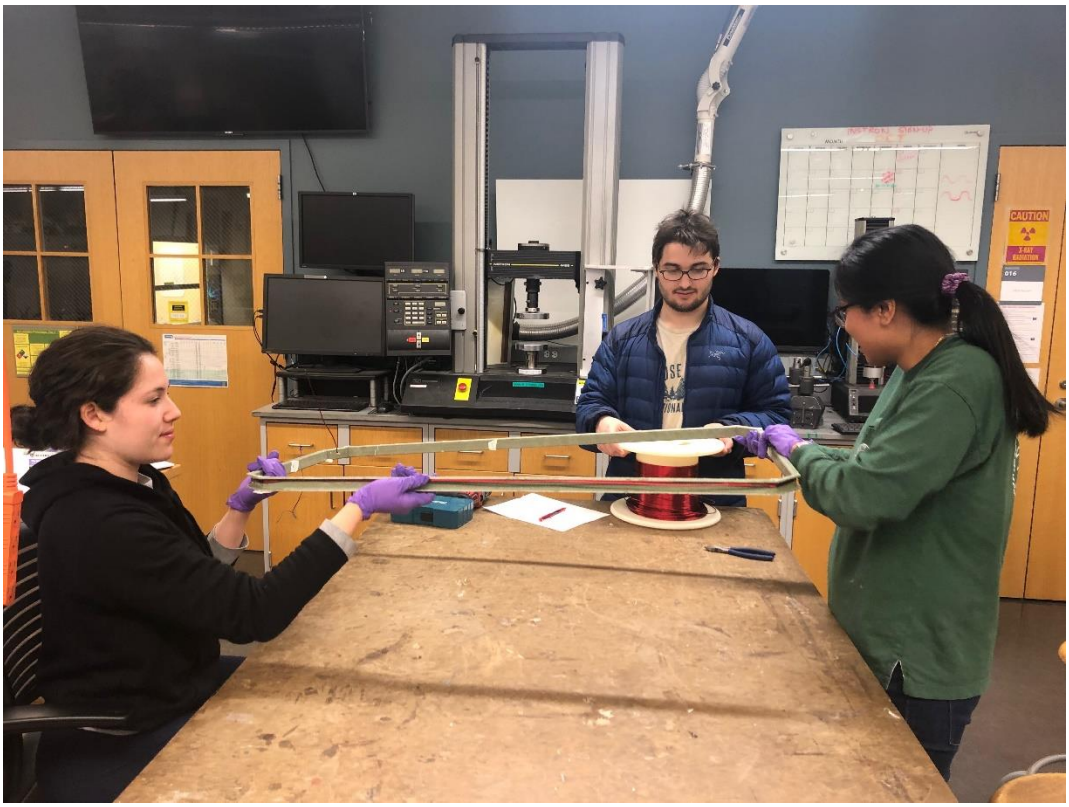


Figure 3.2

11. Once the 20 turns have been wound, thread the wire back out through the other hole. Figure 3.3 depicts a coil in this stage.

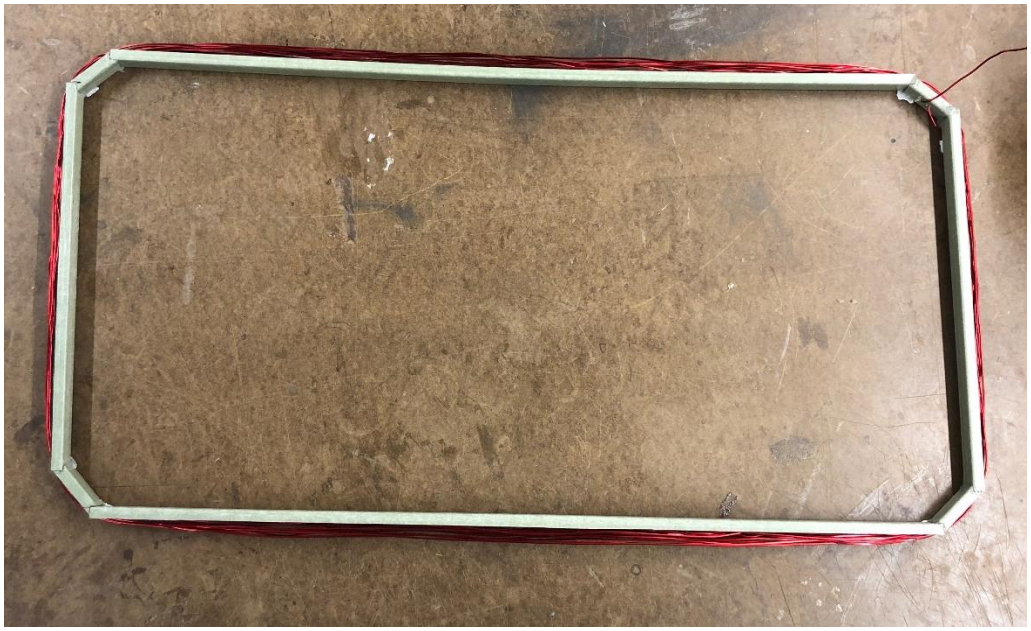


Figure 3.3

12. Epoxy the outsides of the coil onto the coiled inside. The respective parts to each outside section are depicted in Figure 3.1. Long Housing A (PN THBC002a) will be epoxied to any piece of Long Housing B. Short Housing A (PN THBC003a) will be epoxied to any piece of Short Housing B. Epoxy the Short Housing A and Long Housing A to their corresponding B parts. **Ensure that DO NOT epoxy the Corner Housing A pieces on yet.** Clamp each pair of Short Housing A and Short Housing B together with at least at three clamps. Clamp each pair of Long Housing A and Long Housing B together with at least five clamps. This steps requires sixteen clamps total at a minimum if all the sides are done at once. Figure 3.4 depicts the coil after this step.

Figure 3.4

13. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy four pieces of Corner Housing A (PN THBC001a) to the four pieces of Corner Housing B. Clamp each pair of Corner Housing together.
14. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy a Brace (PNTHBC004) inside each corner of the coil. This should be four Braces total. Set a clamp against each brace and Corner Housing A to hold the braces firmly to the frame. A braced corner is shown in Figure 3.5.

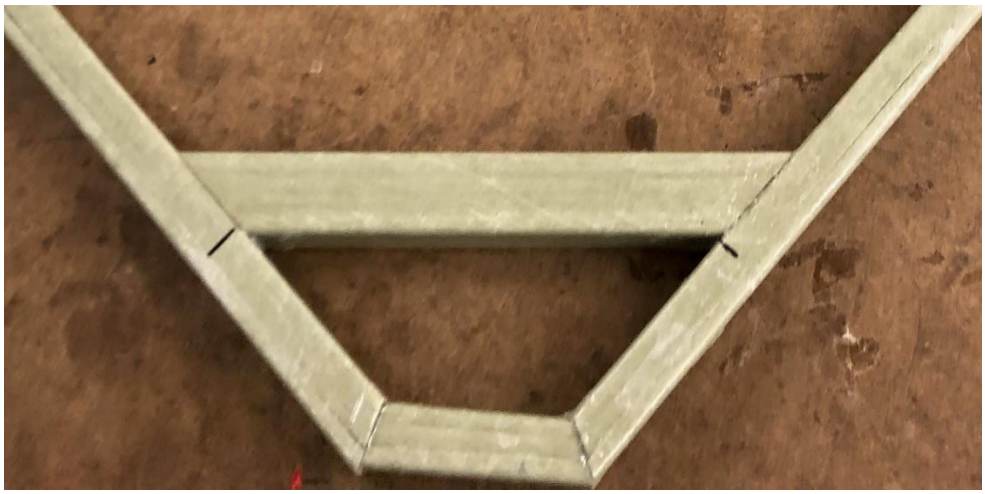


Figure 3.5

4 Process BD004: Middle Coil Assembly

4.a Bill of Materials

Part Number	Name	Quantity
ASMB002	Small Coil	1
THBC005	Corner Support	7
THBC006	Corner Support for Plug	1
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS004	3/8-16 nut	4

4.b Process

1. Begin with the assembled Small Coil (PN ASMB002).
2. Epoxy the Corner Supports (PN THBC005) and the Corner Support for Plug (PN THBC006) to the Small Coil. Corners 1, 2, and 3 as shown in Figure 4.1 will each have two Corner Supports (THBC005) epoxied to them, while corner four will have the one Corner Support for Plug (THBC006) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Corner Supports epoxied to each other for corners 1, 2, and 3. Corner 4 will only have the Corner Support for Plug epoxied to it as shown in Figure 4.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

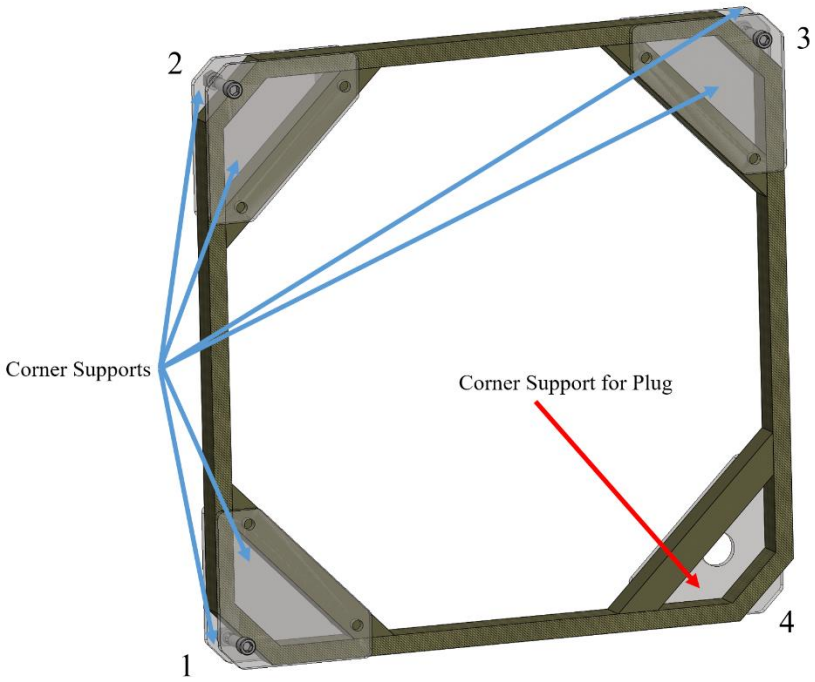


Figure 4.1

3. Pull wires through the hole in the plate.
4. Cut wire 1.5 inches above the hole.
5. Using dremel tool, remove insulation within 1 cm of wire ends.
6. Connect wire ends to male environment proof connector outlet.
7. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
8. Epoxy the remaining Corner Support (PN THBC005) to corner 4, and bolt the Corner Support to the Corner Support for Plug through the outside corner.
9. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.

5 Process BD005: Left (East) Coil Assembly

5.a Bill of Materials

Part Number	Name	Quantity
ASMB002	Small Coil	1
THBC005	Corner Support	7
THBC006	Corner Support for Plug	1
THOA001	Outer Angle Bracket	4
THOA002	Inner Angle Bracket	4
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS003	2.5" 3/8-16 bolt	4
OUTS004	3/8-16 nut	8

5.b Process

1. Begin with the assembled Small Coil (PN ASMB002).
2. Epoxy the Corner Supports (PN THBC005) and the Corner Support for Plug (PN THBC006) to the Small Coil. Corners 1, 2, and 3 as shown in Figure 5.1 will each have two Corner Supports (THBC005) epoxied to them, while corner four will have the one Corner Support for Plug (THBC006) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Corner Supports epoxied to each other for corners 1, 2, and 3. Corner 4 will only have the Corner Support for Plug epoxied to it as shown in Figure 5.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

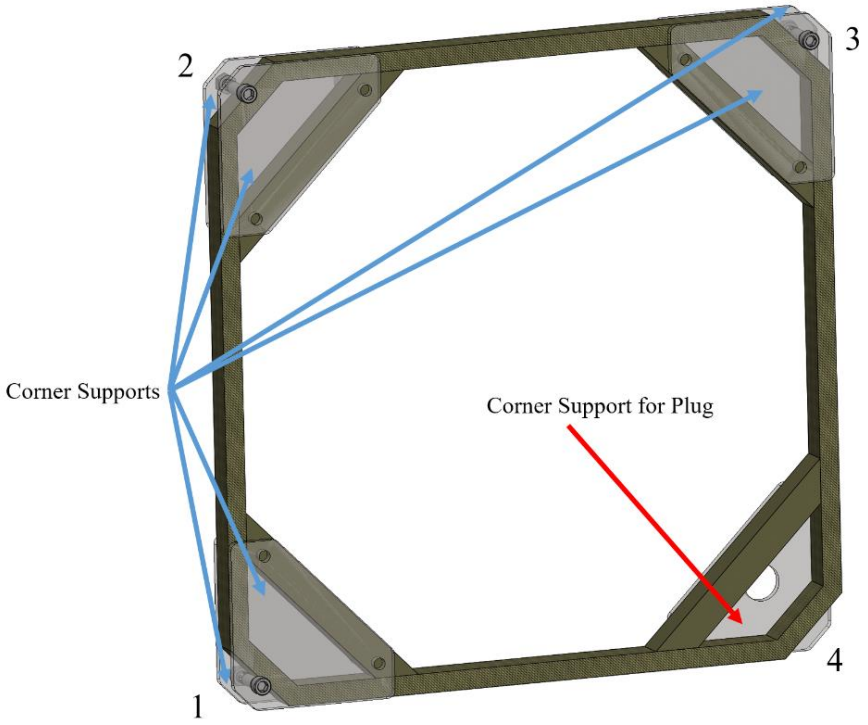


Figure 5.1

3. Pull wires through the hole in the plate.
4. Cut wire 1.5 inches above the hole.
5. Using dremel tool, remove insulation within 1 cm of wire ends.
6. Connect wire ends to male environment proof connector outlet.
7. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
8. Epoxy the remaining Corner Support to corner 4, and bolt the Corner Support to the Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).

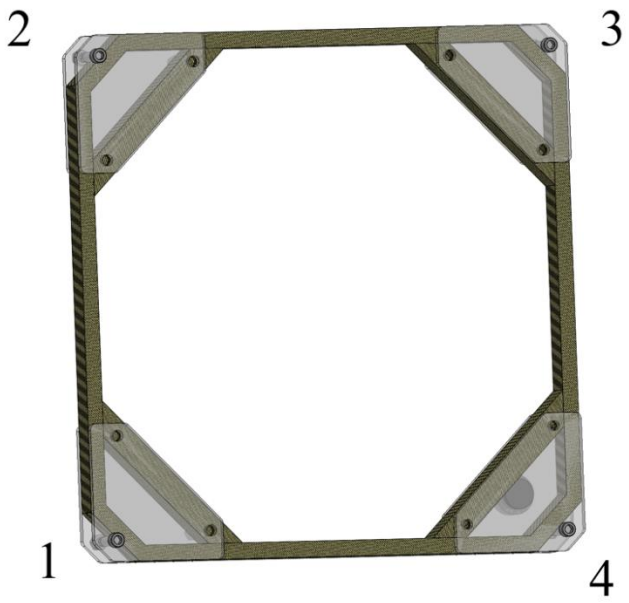


Figure 5.2

9. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.
10. Epoxy the Outer Angle Brackets (THOA001) and Inner Angle Brackets (THOA002) in the configuration shown in Figure 5.2. The holes in the Brackets should line up to the holes through the acrylic sheets and braces. One of the Inner Angle Bracket faces will be epoxied to the Corner Support for Plug. Each corner should have one Bracket Pair epoxied to it as shown in Figure 5.2. Immediately after putting the epoxied angles into place, bolt through the Angle Brackets, Acrylic Supports, and Braces using four 2.5" 3/8-16 bolts (PN OUTS003) and four 3/8-16 nuts (PN OUTS004). Ensure that the bolt heads are on the same side as the bolt heads already in the assembly. See Figure 5.2 for reference. The epoxy should still be wet when these are bolted in.
11. While the epoxy is still wet, arrange the bolted Angle Brackets so that they are perpendicular to the coils they are coming off of.

Figure 5.3

6 Process BD006: Right (West) Coil Assembly

6.a Bill of Materials

Part Number	Name	Quantity
ASMB002	Small Coil	1
THBC005	Corner Support	7
THBC006	Corner Support for Plug	1
THOA001	Outer Angle Bracket	4
THOA002	Inner Angle Bracket	4
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS003	2.5" 3/8-16 bolt	4
OUTS004	3/8-16 nut	8

6.b Process

1. Begin with the assembled Small Coil (PN ASMB002).
2. Epoxy the Corner Supports (PN THBC005) and the Corner Support for Plug (PN THBC006) to the Small Coil. Corners 1, 2, and 4 as shown in Figure 6.1 will each have two Corner Supports (THBC005) epoxied to them, while corner three will have the one Corner Support for Plug (THBC006) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Corner Supports epoxied to each other for corners 1, 2, and 4. Corner 3 will only have the Corner Support for Plug epoxied to it as shown in Figure 6.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

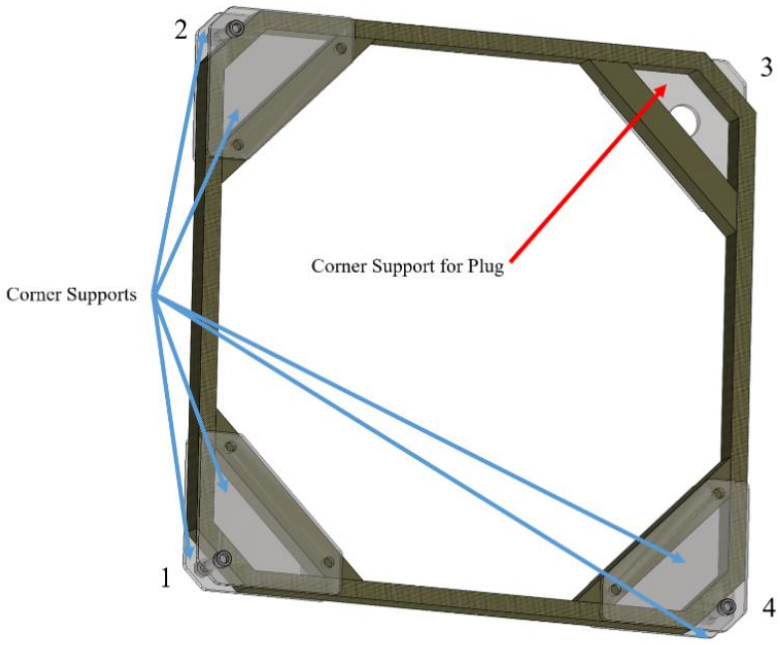


Figure 6.1

3. Pull wires through the hole in the plate.
4. Cut wire 1.5 inches above the hole.
5. Using dremel tool, remove insulation within 1 cm of wire ends.
6. Connect wire ends to male environment proof connector outlet.
7. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
8. Epoxy the remaining Corner Support to corner 3, and bolt the Corner Support to the Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).

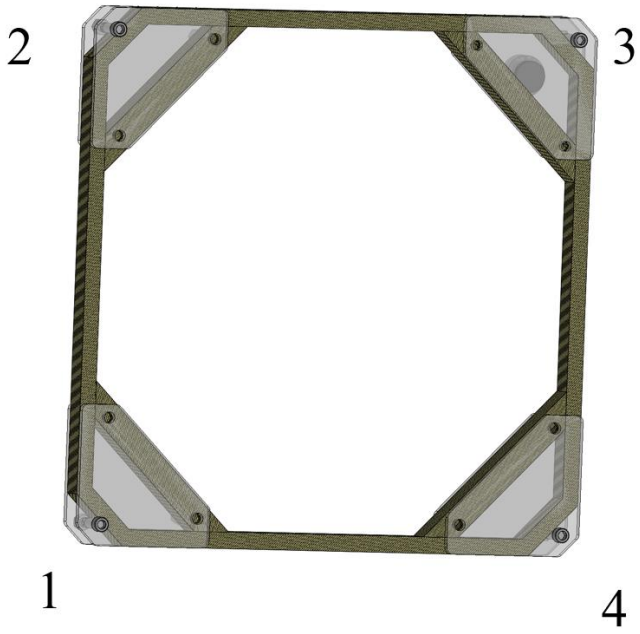


Figure 6.2

9. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.
10. Epoxy the Outer Angle Brackets (THOA001) and Inner Angle Brackets (THOA002) in the configuration shown in Figure 6.3. The holes in the Brackets should line up to the holes through the acrylic sheets and braces. One of the Inner Angle Bracket faces will be epoxied to the Corner Support for Plug. Each corner should have one Bracket Pair epoxied to it as shown in Figure 6.3. Immediately after putting the epoxied angles into place, bolt through the Angle Brackets, Acrylic Supports, and Braces using four 2.5" 3/8-16 bolts (PN OUTS003) and four 3/8-16 nuts (PN OUTS004). Ensure that the bolt heads are on the same side as the bolt heads already in the assembly. See Figure 6.3 for reference. The epoxy should still be wet when these are bolted in.
11. While the epoxy is still wet, arrange the bolted Angle Brackets so that they are perpendicular to the coils they are coming off of.

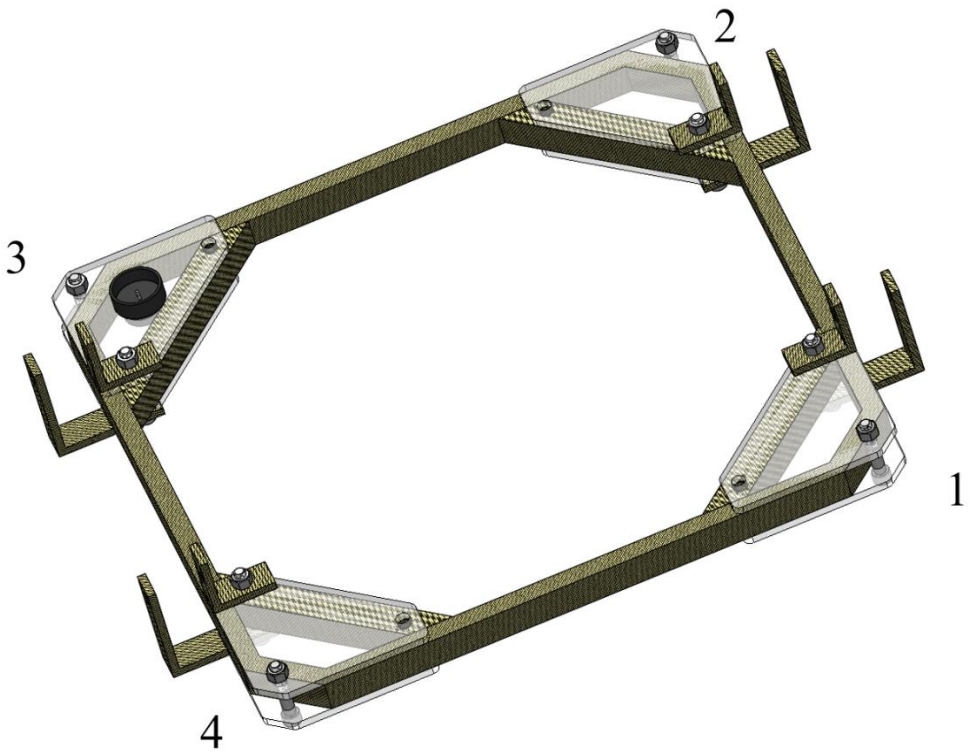


Figure 6.3

7 Process BD007: Back (North) Coil Assembly

7.a Bill of Materials

Part Number	Name	Quantity
ASMB001	Large Coil	1
THBC005	Corner Support	7
THBC006	Corner Support for Plug	1
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS004	3/8-16 nut	4

7.b Process

1. Begin with the assembled Large Coil (PN ASMB001).
2. Epoxy the Corner Supports (PN THBC005) and the Corner Support for Plug (PN THBC006) to the Large Coil. Corners 1, 3, and 4 as shown in Figure 7.1 will each have two Corner Supports (THBC005) epoxied to them, while corner two will have the one Corner Support for Plug (THBC006) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Corner Supports epoxied to each other for corners 1, 2, and 4. Corner 2 will only have the Corner Support for Plug epoxied to it as shown in Figure 7.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

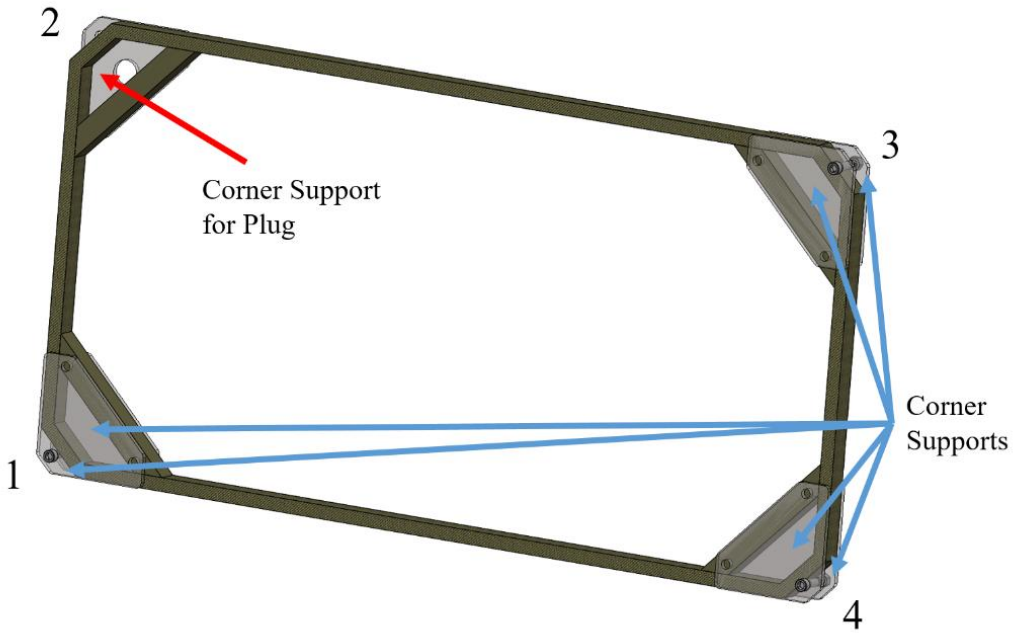


Figure 7.1

3. Pull wires through the hole in the plate.
4. Cut wire 1.5 inches above the hole.
5. Using dremel tool, remove insulation within 1 cm of wire ends.
6. Connect wire ends to male environment proof connector outlet.
7. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
8. Epoxy the remaining Corner Support to corner 2, and bolt the Corner Support to the Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).
9. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.

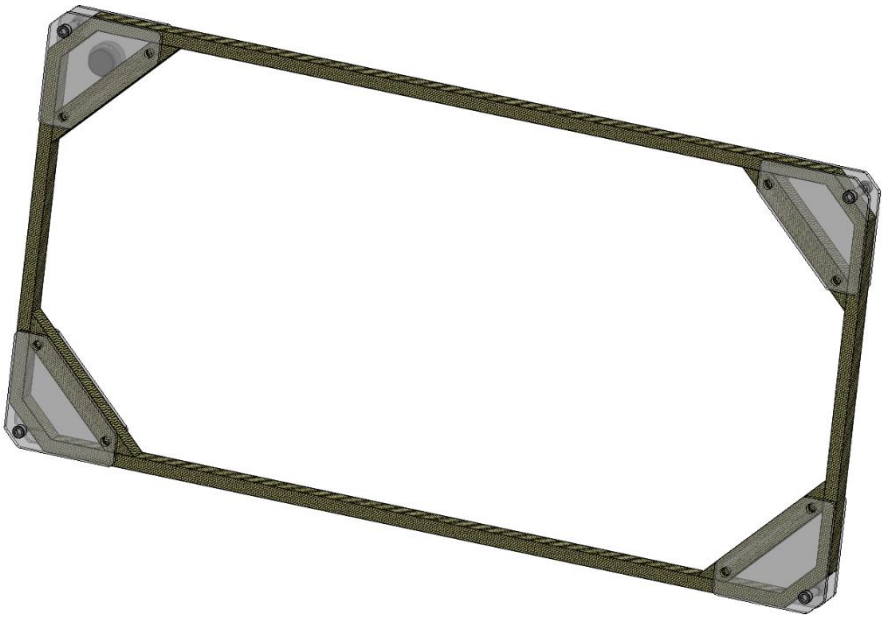


Figure 7.2

8 Process BD008: Front (South) Coil Assembly

8.a Bill of Materials

Part Number	Name	Quantity
ASMB001	Large Coil	1
THBC005	Corner Support	7
THBC006	Corner Support for Plug	1
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS004	3/8-16 nut	4

8.b Process

1. Begin with the assembled Large Coil (PN ASMB001).
2. Epoxy the Corner Supports (PN THBC005) and the Corner Support for Plug (PN THBC006) to the Large Coil. Corners 1, 2, and 4 as shown in Figure 8.1 will each have two Corner Supports (THBC005) epoxied to them, while corner three will have the one Corner Support for Plug (THBC006) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Corner Supports epoxied to each other for corners 1, 2, and 4. Corner 3 will only have the Corner Support for Plug epoxied to it as shown in Figure 8.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

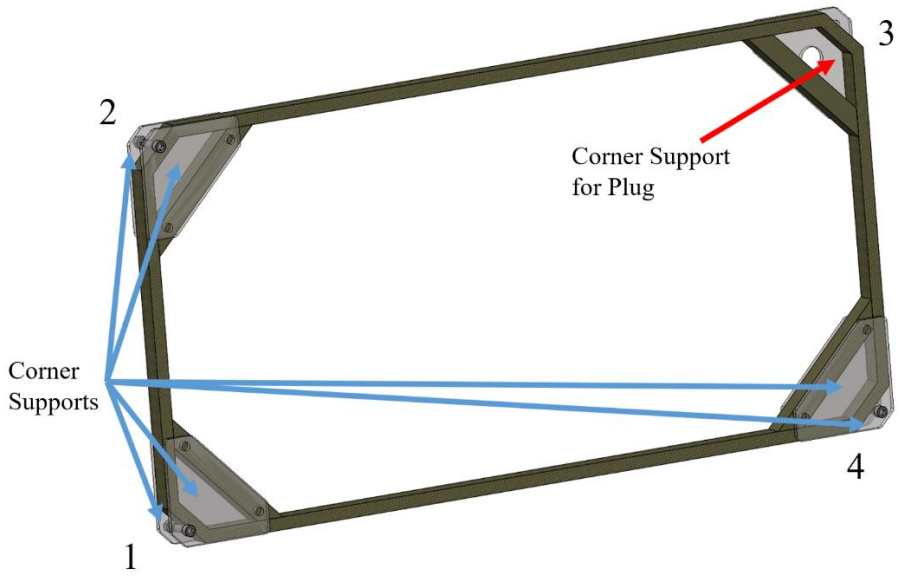


Figure 8.1

3. Pull wires through the hole in the plate.
4. Cut wire 1.5 inches above the hole.
5. Using dremel tool, remove insulation within 1 cm of wire ends.
6. Connect wire ends to male environment proof connector outlet.
7. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
8. Epoxy the remaining Corner Support to corner 3, and bolt the Corner Support to the Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).
9. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.

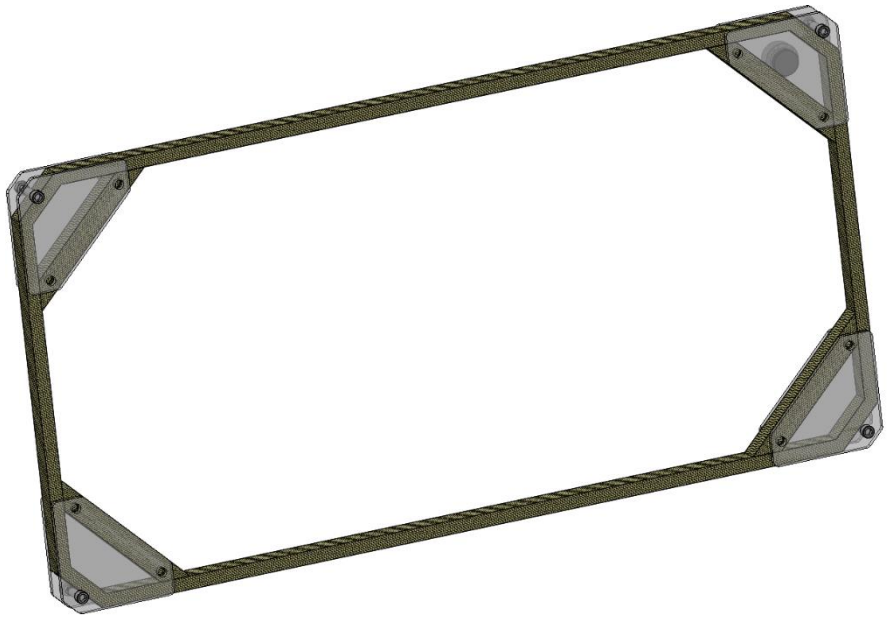


Figure 8.2

9 Process BD009: Top Coil Assembly

9.a Bill of Materials

Part Number	Name	Quantity
ASMB001	Large Coil	1
THBC005	Corner Support	5
THBC006	Corner Support for Plug	1
THBC007	Corner Support for Antenna	2
THOA001	Outer Angle Bracket	8
THOA002	Inner Angle Bracket	8
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	4
OUTS003	2.5" 3/8-16 bolt	8
OUTS004	3/8-16 nut	12

9.b Process

1. Begin with the assembled Large Coil (PN ASMB001).
2. Bolt in the two Top Side Brackets with two 2” 3/8-16 bolts (PN OUTS002) and two 3/8-16 nuts (PN OUTS004).
3. Epoxy the Corner Supports (PN THBC005), the Corner Support for Plug (PN THBC006), and Corner Supports for Antenna (PN THBC007) to the Large Coil. Corners 3 and 4 as shown in Figure 9.1 will each have two Corner Supports (THBC005) epoxied to them, while corner one will have the one Corner Support for Plug (THBC006) epoxied to it, and corner two will have the two Corner Supports for Antenna (THB007) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Supports epoxied to each other for corners 2, 3, and 4. Corner 1 will only have the Corner Support for Plug epoxied to it as shown in Figure 9.1. Ensure that the Coil Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the bolt heads being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the nuts should be resting on its surface.

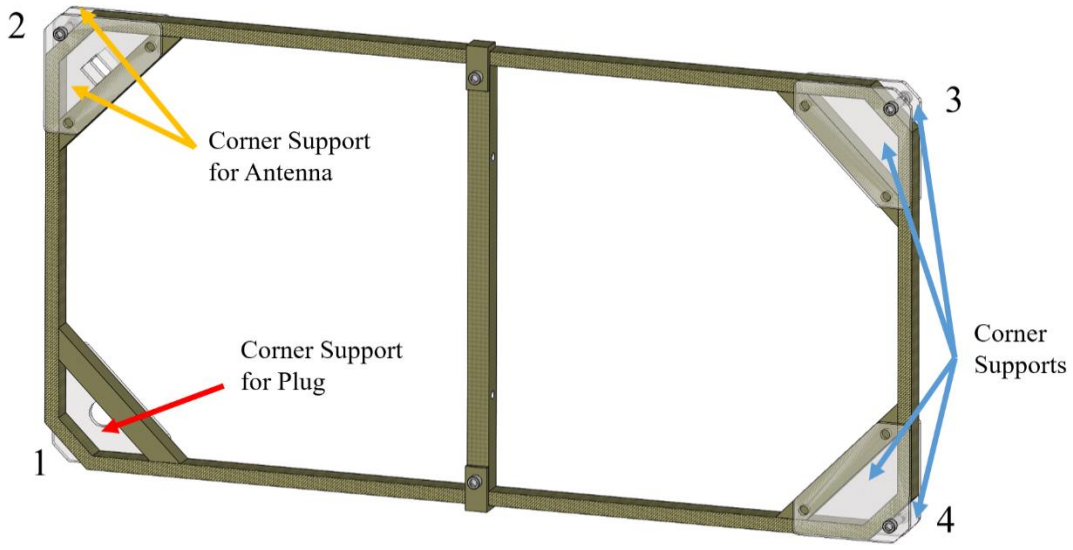


Figure 9.1

4. Pull wires through the hole in the plate.
5. Cut wire 1.5 inches above the hole.
6. Using dremel tool, remove insulation within 1 cm of wire ends.
7. Connect wire ends to male environment proof connector outlet.
8. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
9. Epoxy the remaining Corner Support to corner 1, and bolt the Corner Support to the Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).
10. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill.

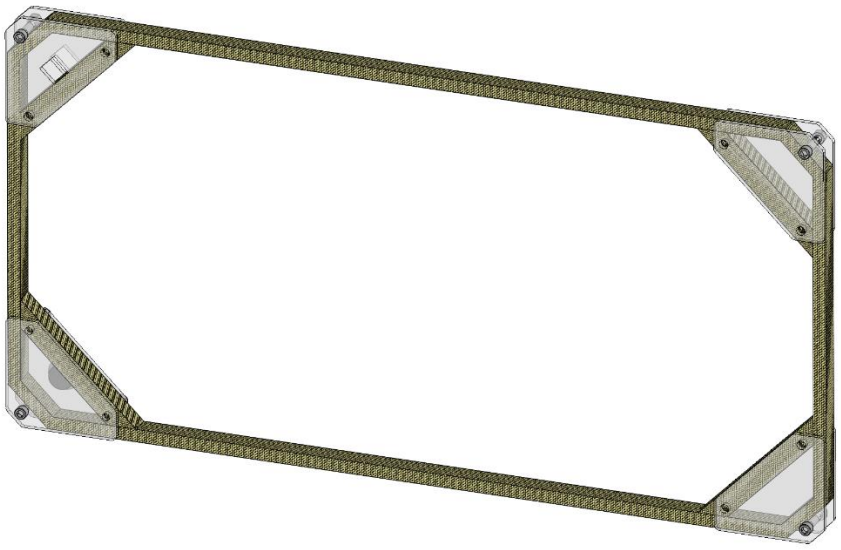


Figure 9.2

11. Epoxy the Outer Angle Brackets (THOA001) and Inner Angle Brackets (THOA002) in the configuration shown in Figure 9.3. The holes in the Brackets should line up to the holes through the acrylic sheets and braces. One of the Inner Angle Bracket faces will be epoxied to the Corner Support for Plug. Each corner should have one Bracket Pair epoxied to it as shown in Figure 9.3. Immediately after putting the epoxied angles into place, bolt through the Angle Brackets, Acrylic Supports, and Braces using eight 2.5" 3/8-16 bolts (PN OUTS003) and eight 3/8-16 nuts (PN OUTS004). Ensure that the bolt heads are on the same side as the bolt heads already in the assembly. See Figure 9.3 for reference. The epoxy should still be wet when these are bolted in.
12. While the epoxy is still wet, arrange the bolted Angle Brackets so that they are perpendicular to the coils they are coming off of.

Figure 9.3

10 Process BD0010: Bottom Coil Assembly

10.a Bill of Materials

Part Number	Name	Quantity
ASMB001	Large Coil	1
THBC008	Bottom Corner Support	5
THBC009	Bottom Corner Support for Plug	1
THBC0010	Bottom Corner Support for Antenna	2
THCU001	Angled Cube Support Beam	2
THCU002	Cube Support Beam	1
THOA001	Outer Angle Bracket	4
THOA002	Inner Angle Bracket	8
THOA007	Longer Outer Angle Bracket	4
OUTS001	Epoxy	NA
OUTS002	2" 3/8-16 bolt	8
OUTS003	2.5" 3/8-16 bolt	8
OUTS004	3/8-16 nut	16

10.b Process

1. Begin with the assembled Large Coil (PN ASMB001).
2. Epoxy in the Cube Support Beam (PN THCU002) as shown in Figure 10.1. The Cube Support Beam should be halfway along the coil going the long way (±1/16”). Epoxy in the Angled Cube Support Beam (PN THCU001) as shown in Figure 10.1 so that the angled ends of the beams are coincident with the faces of the braces.

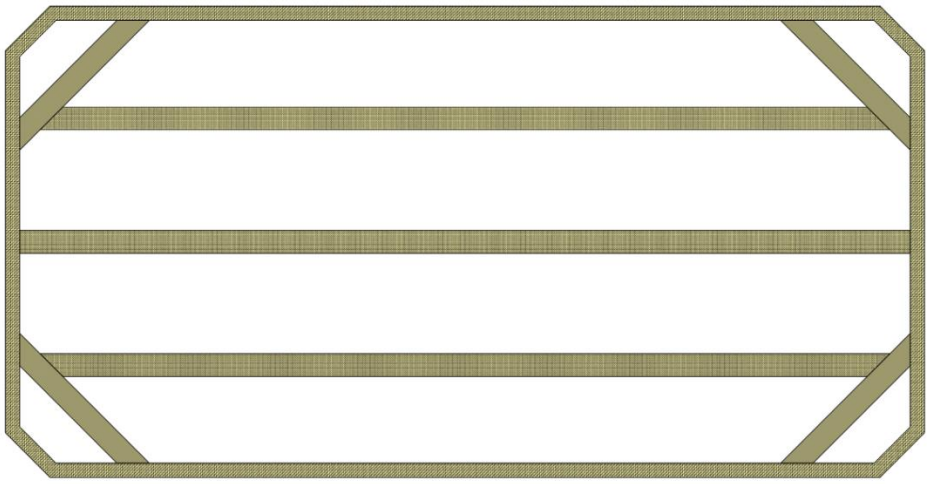


Figure 10.1

3. Epoxy the Bottom Corner Supports (PN THBC008), the Bottom Corner Support for Plug (PN THBC009), and Corner Supports for Antenna (PN THBC010) to the Large Coil. Corners 1 and 4 as shown in Figure 10.2 will each have two Bottom Corner Supports (THBC008) epoxied to them, while corner two will have the one Bottom Corner Support for Plug (THBC009) epoxied to it, and corner three will have the two Bottom Corner Supports for Antenna (THB010) epoxied to it. One 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004) will be used to secure each outside corner of the two Supports epoxied to each other for corners 1, 3, and 4. Corner 2 will only have the Corner Support for Plug epoxied to it as shown in Figure 10.2. Ensure that the Bottom Corner Support for Plug is epoxied to the back of the coil as it is shown in the configuration below, with the nuts being on the opposite side of the coil from the Corner Support for Plug. When the Corner Support for Plug is bolted in later in the process, the bolt heads should be resting on its surface. Note that this bolt head configuration is different from that of other coils.

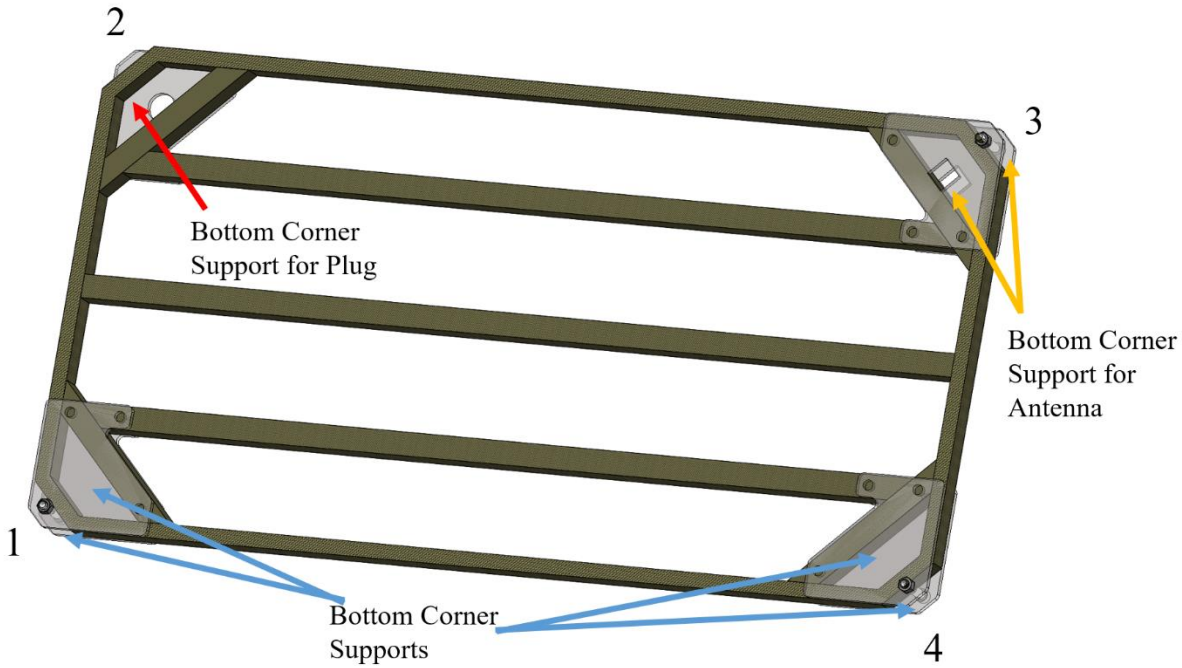


Figure 10.2

4. Pull wires through the hole in the plate.
5. Cut wire 1.5 inches above the hole.
6. Using dremel tool, remove insulation within 1 cm of wire ends.
7. Connect wire ends to male environment proof connector outlet.

8. Secure plug outlet to plate with Epoxy and threaded nut. Use socket wrench to tighten nut part.
9. Epoxy the remaining Bottom Corner Support to corner 2, and bolt the Bottom Corner Support to the Bottom Corner Support for Plug using one 2” 3/8”-16 bolt (PN OUTS002) and one 3/8”-16 nut (PN OUTS004).
10. Match drill through the braces using the holes in the acrylic sheets as a guide for where to drill. Also match drill through the Angled Cube Support Beams (PN THCU001) where the holes in the Supports overlap with the Angled Cube Support Beams.
11. Use four to 2.5” 3/8”-16 bolt (PN OUTS003) and four 3/8”-16 nuts (PN OUTS004) bolt through the newly drilled holes in the Angled Cube Support Beams as can be seen in Figure 10.3.

Figure 10.3

12. Epoxy the Outer Angle Brackets (THOA001) in the configuration shown in Figure 10.4. The holes in the Outer Angle Brackets should line up to the holes through the acrylic sheets and braces. The Bottom Corner Support for Plug should be on the opposite side of the coil for the Outer Angle Bracket faces getting epoxied to the coil. Each corner should only have one Outer Angle Bracket epoxied to them as seen in the figure. Proceed to next step while epoxy is still wet. If needed temporarily bolt the angles, acrylic supports, and epoxy together with four of the remaining nuts and bolts.

Figure 10.4

13. Epoxy the Longer Outer Angle Bracket (THOA007) in the configuration shown in Figure 10.5. The holes in the Longer Outer Angle Brackets should line up to the holes through the acrylic sheets and braces. The Bottom Corner Support for Plug should be on the opposite side of the coil for the Longer Outer Angle Bracket faces getting epoxied to the coil. Each corner should only have one Longer Outer Angle Bracket epoxied to them as seen in the figure. One leg of the Longer Outer Angle Bracket is the dimensioned the same as both legs of the Outer Angle Bracket (THOA001), while the other is longer. The longer leg should be epoxied to the faces of the supports as shown in the figure, while the shorter leg sticks out perpendicular to the plane of the coil. Proceed to next step while epoxy is still wet. If needed temporarily bolt the angles, acrylic supports, and epoxy together with four of the remaining nuts and bolts.

Figure 10.5

14. Epoxy the Inner Angle Brackets (THOA002) in the configuration shown in Figure 10.6. While the brackets on the outside are not all the same size (see steps 8 and 9 for the configuration of the differently sized outside brackets) the eight brackets on the inside (Inner Angle Brackets) are all the same. The holes in the Inner Angle Brackets should line up to the holes through the acrylic sheets and braces. The Corner Support for Plug should be epoxied to one of the Inner Angle Bracket faces. Immediately after putting the epoxied angles into place, bolt through the Angle Brackets, Acrylic Supports, and Braces using eight 2.5" 3/8-16 bolts (PN OUTS003) and eight 3/8-16 nuts (PN OUTS004). Ensure that the bolt heads are on the same side as the bolt heads already in the assembly. See Figure 10.6 for reference. The epoxy should still be wet when these are bolted in.
15. While the epoxy is still wet, arrange the bolted Angle Brackets so that they are perpendicular to the coils they are coming off of.

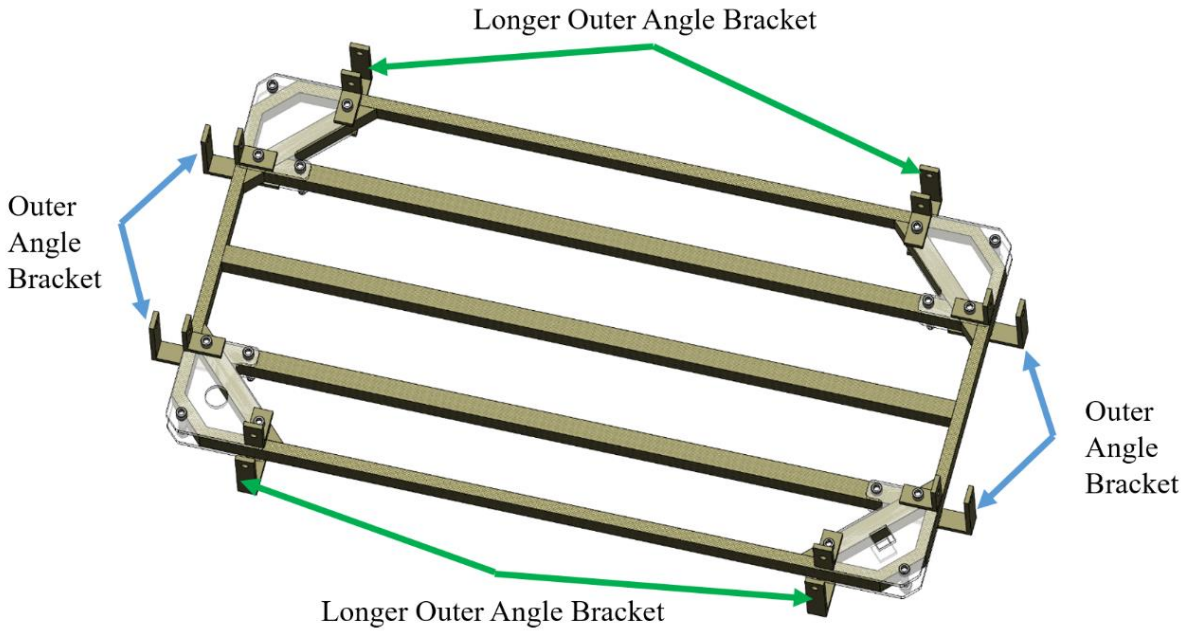

Longer Outer Angle Bracket
Outer
Angle
Bracket
Outer
Angle
Bracket
Longer Outer Angle Bracket

Figure 10.6

11 Process BD0011 Aluminum Coil

11.a Bill of Materials

ASMB002	Small Coil	1
THBC001a and THBC001b	Corner Housing	4 pairs
THBC002a and THBC002b	Long Housing	2 pairs
THBC003a and THBC003b	Short Housing	2 pairs
THBC004	Brace	4
OUTS001	Epoxy	NA
OUTS007	10AWG Aluminum Magnet Wire	NA

11.b Process

1. Assemble four pieces of Corner Housing B (PN THBC001b), two pieces of Long Housing B (PN THBC002b), and two pieces of Short Housing B (PN THBC003b) as shown in Figure 11.1. Each piece of Corner Housing B should be epoxied to one piece of Long Housing B and one piece of Short Housing B. Figure 11.1 depicts four pieces of Corner Housing B, two pieces of Long Housing B, and two pieces of Short Housing B epoxied together in the correct configuration. Laid outside the epoxied pieces of inner housing (parts B) are the corresponding pieces of outer housing (parts A).

Figure 11.1

2. Once the epoxy holding together the inner housing is dry, drill two holes both centered on one of the four pieces of Corner Housing B. Thread about 12” of the 10AWG aluminum wire through one hole. The other end of the magnet wire will be threaded out the other hole once the winding is complete.

3. Wind the 10AWG copper magnet wire around the coil for 20 turns, beginning the count at the corner at which the 12” of wire were pulled through the hole in on the piece of Corner Housing B. See Figure 3.2 for reference on winding methods in context of a copper coil.
4. Once the 20 turns have been wound, thread the wire back out through the other hole. Figure 11.3 depicts a coil in this stage.
5. 

Figure 11.3

6. Epoxy the outsides of the coil onto the coiled inside. The respective parts to each outside section are depicted in Figure 11.1. Long Housing A (PN THBC002a) will be epoxied to any piece of Long Housing B. Short Housing A (PN THBC003a) will be epoxied to any piece of Short Housing B. Epoxy the Short Housing A and Long Housing A to their corresponding B parts. **Ensure that DO NOT epoxy the Corner Housing A pieces on yet.** Clamp each pair of Short Housing A and Short Housing B together with at least at three clamps. Clamp each pair of Long Housing A and Long Housing B together with at least five clamps. This steps requires sixteen clamps total at a minimum if all the sides are done at once. Figure 3.4 depicts the coil after this step when it is being wound with copper wire.
7. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy four pieces of Corner Housing A (PN THBC001a) to the four pieces of Corner Housing B. Clamp each pair of Corner Housing together.
8. Once the epoxy is dry for the previous step (roughly 45 minutes), epoxy a Brace (PNTHBC004) inside each corner of the coil. This should be four Braces total. Set a clamp against each brace and Corner Housing A to hold the braces firmly to the frame. A braced corner is shown in Figure 11.5.

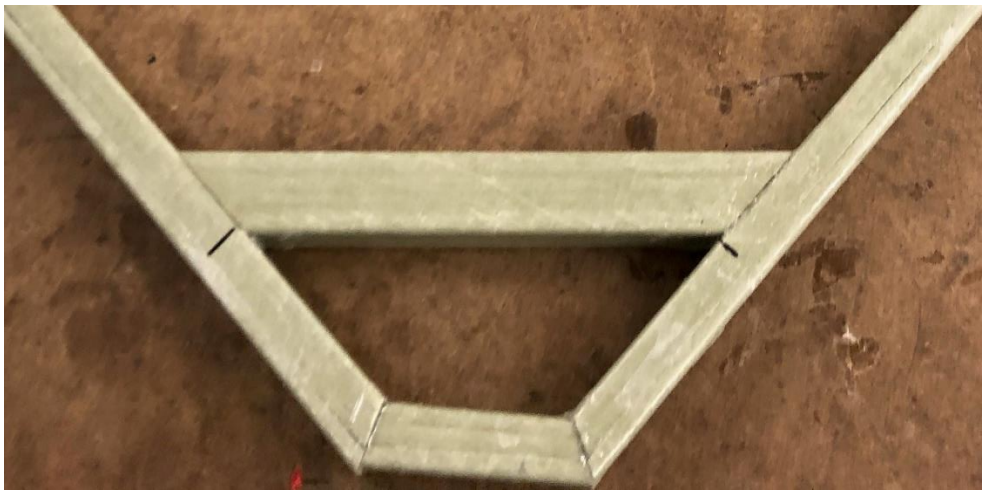
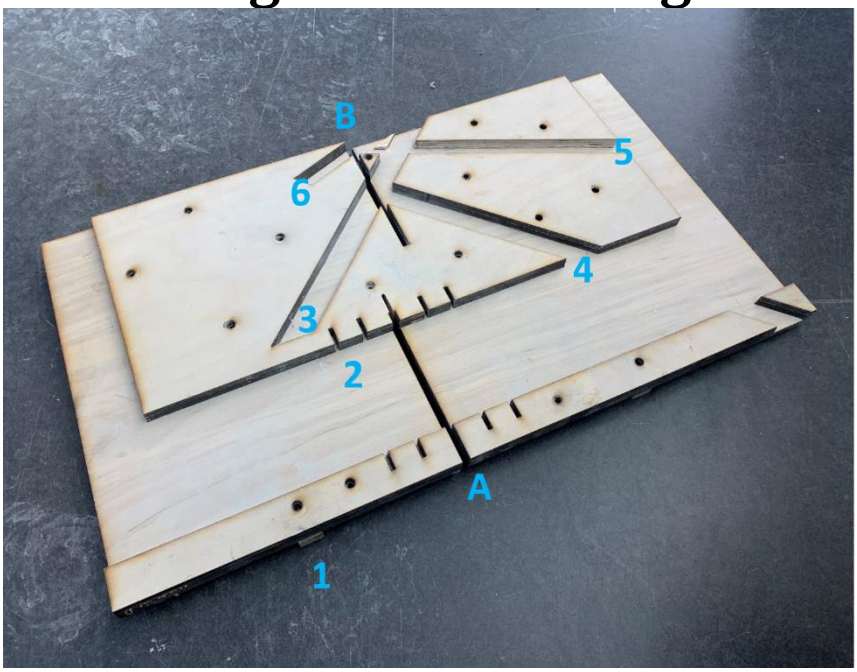


Figure 11.5

12 Fiberglass Machining



A: Slot for square cuts
B: Slot for angle cuts
1: Guiding strips
2: 1” markers to aid with cutting
3: Dimensioned slot to cut the braces to size
4: Angled slot for cutting at a 45 degree angle
5: Angled slot for cutting at a 22.5 degree angle
6: Dimensioned slot to cut the corner pieces to size

Figure 12.1

The two thinner channels measure slightly larger than 5/8” wide and meet the slot for the abrasive disc at an angle of 22.5 degrees, the longer of which is used to miter the end, which can then be inserted into the shape of the second to cut the 7cm long corner pieces, or measured, marked, and cut along the other side to cut the side pieces. The two wider channels (1” wide), act in the same way, but for the braces, cutting the 1” square stock at 45 degree angles at lengths of XX cm to support the frames. Flipping the sled backwards allows it to function as a cross-cut sled, with groove markings at 1” and 2” lengths to accurately cut all the angle pieces used in connecting the coil frames. For all of the fiberglass cutting, an abrasive disc should be used for safety as well as to avoid severely dulling standard table saw blades, since fiberglass itself is extremely abrasive to blades.

Cutting fiberglass results in a lot of very irritating and potential harmful dust, so appropriate personal protective equipment including goggles and a good dust mask or respirator must be used, and the cutting should be done at a location with adequate ventilation. In addition, fiberglass dust can be extremely irritating on bare skin, so latex gloves and long sleeves should be considered as long as everything is tight-fitting and poses no risk of being caught by the abrasive disc of the table saw.

13 Parts List

Part #	Part Type	Name	Description
THBC001	Base Coils	Corner Housing	Two pieces that make one corner of a coil's housing (THBC001a is outside thin piece and b inside)
THBC002		Long Housing	Two pieces that make a longer edge of frame housing (THBC002a is outside thin piece and b inside)
THBC003		Short Housing	Two pieces that make a short edge of frame housing (THBC003a is outside thin piece and b inside)
THBC004		Brace	Braces to support the corners
THBC005		Corner Support	Corner Gusset to hold the Braces and Corners Together
THBC006		Corner Support For Plug	Corner Gusset to hold the Braces and Corners Together with a hole for a plug
THBC007		Corner Support For Antenna	Corner Gusset to hold the Braces and Corners Together with a hole for the antenna
THBC008		Bottom Corner Support	Corner Gusset to hold the Braces and Corners Together on the bottom coil, with an extra support for the Angled Cube Support Beam
THBC009		Bottom Corner Support For Plug	Corner Gusset to hold the Braces and Corners Together on the bottom coil with a hole for a plug and with an extra support for the Angled Cube Support Beam
THBC010		Bottom Corner Support For Antenna	Corner Gusset to hold the Braces and Corners Together on the bottom coil with a hole for the antenna and with an extra support for the Angled Cube Support Beam
THOA001	Overall Assembly	Outer Angle Bracket	Standard outer symmetric angle for bolting coils together
THOA002		Inner Angle Bracket	Standard inner symmetric angle for bolting coils together
THOA003		Top Beam	Support on the Top Coil that helps hold the Middle Coil rigid
THOA004		Top Side Bracket	Angle that helps hold the Top Beam to the Top Coil

THOA005		Top Middle Bracket	Angle that attaches the Middle Coil to the Top Beam on the Top Coil
THOA006		Middle 1x1 Angle	1x1 Angle that attaches the Middle Coil to the Cube Support Beam
THOA007		Longer Outer Angle Bracket	Variation of the Outer Angle Bracket with uneven legs. The longer leg helps to support the Angled Cube Support Beam
THOA010		Side Support Bracket	1x1 Angle Supports that help to support under the Left, Right, Front, and Back Coils
THOA011		Male Plug Receptacle	Male end of a connector with a wall mount
THCU001	Cubes	Angled Cube Support Beam	Support Beam for the cubes with angled cuts so that it fits flush to the braces
THCU002		Cube Support Beam	Support beam for the cubes with a square cut that allows it to be epoxied directly onto the bottom coil
THCU003		Cube Bracket	Bracket that helps to hold a cube up
THCU005		Cube Beam Bracket	Bracket that attaches the Cube Support Beam to the Bottom Coil
ASMB001	Assemblies	Large Coil	Large coil assembly
ASMB002		Small Coil	Small coil assembly
ASMB003		Middle Coil	Middle coil assembly
ASMB004		Left Coil	Left coil assembly
ASMB005		Right Coil	Right coil assembly
ASMB006		Back Coil	Back coil assembly
ASMB007		Front Coil	Front coil assembly
ASMB008		Top Coil	Top coil assembly
ASMB009		Bottom Coil	Bottom coil assembly
OUTS001	Outside Manufacturer	Epoxy	Home Depot Epoxy
OUTS002		2" 3/8-16 bolt	Mcmaster-Carr 2" 3/8-16 bolt
OUTS003		2.5" 3/8-16 bolt	Mcmaster-Carr 2.5" 3/8-16 bolt
OUTS004		3/8-16 nut	Mcmaster-Carr 3/8-16 nut
OUTS005		3/8 washer	Mcmaster-Carr 3/8 washer
OUTS006		Copper 12AWG	AWS 12 Gauge Copper Magnet Wire
OUTS007		Male Plug Receptacle	Mcmaster-Carr Male end of a connector with a wall mount
OUTS008		Aluminum 10AWG	AWS 10 Gauge Aluminum Magnet Wire

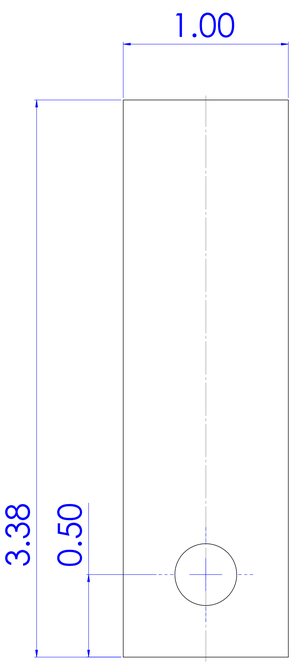
14 Drawings

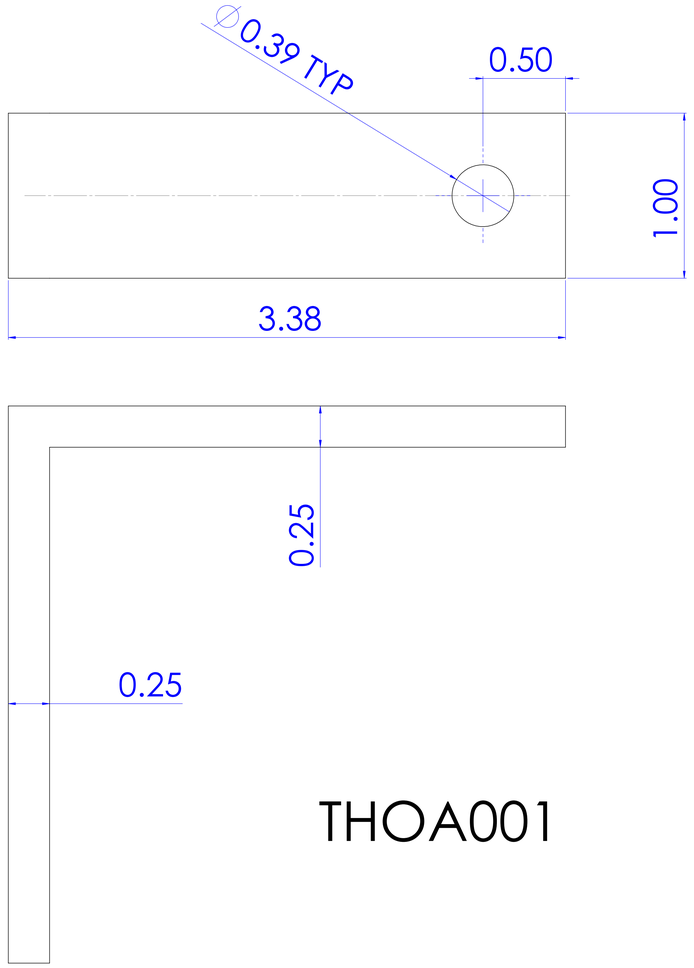
Unless otherwise specified, tolerances are ±0.04”.

Fiberglass is machined using a Band Saw, Drill Press, and Hand Drill.

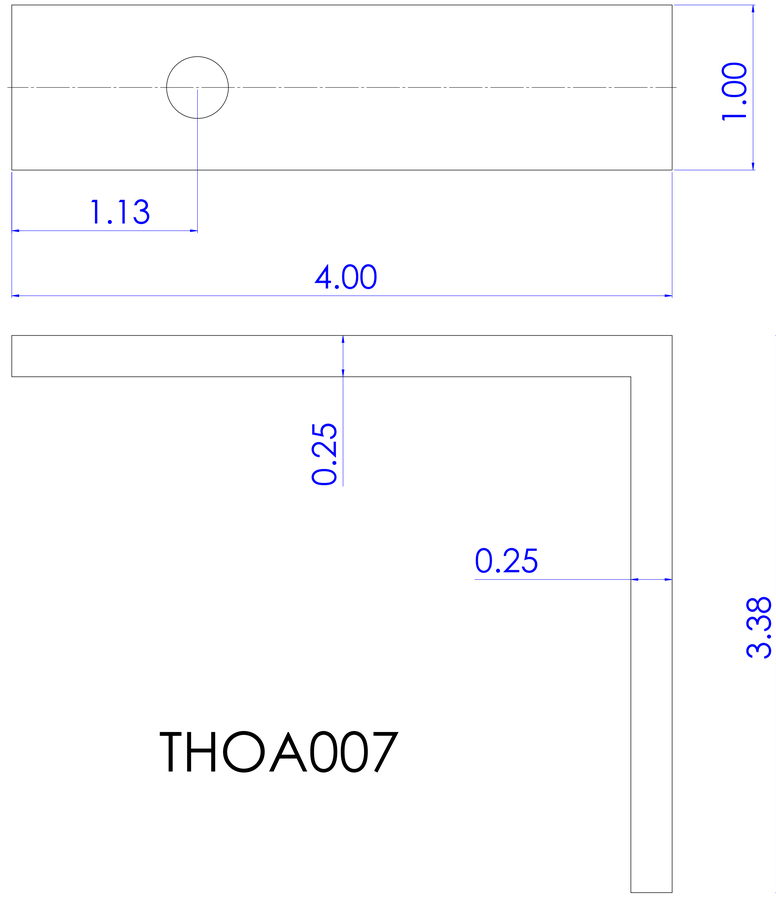
Polycarbonate or Acrylic Plastic is machined using a laser cutter or a pressure jet cutter.

20X





THOA001



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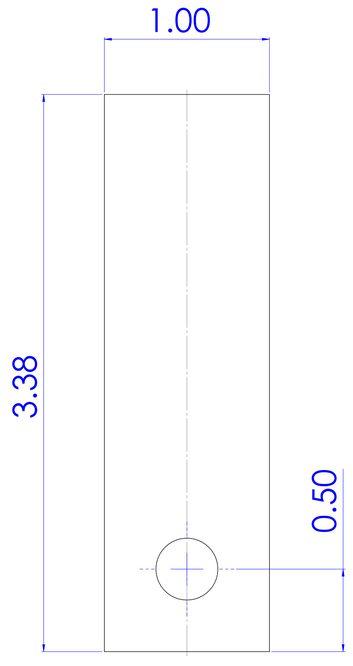
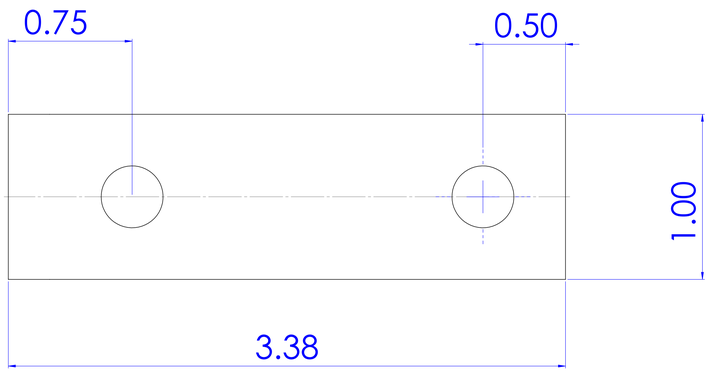
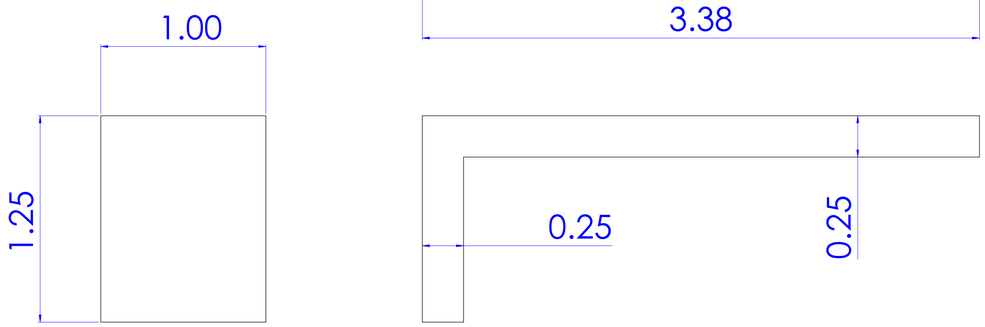


THOA007

THOA005





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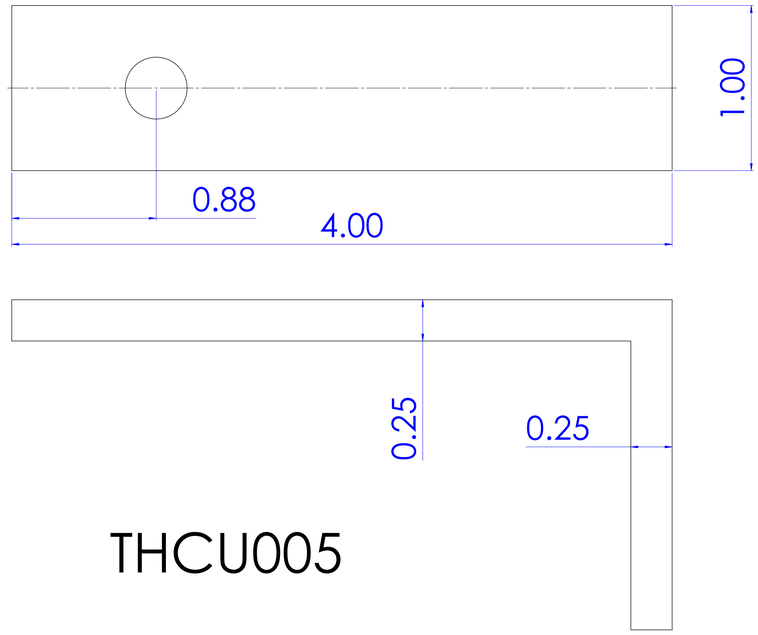

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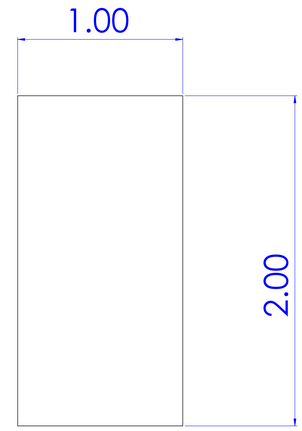
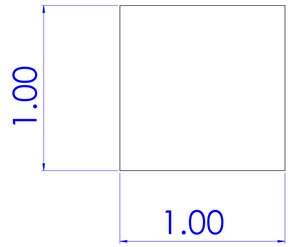


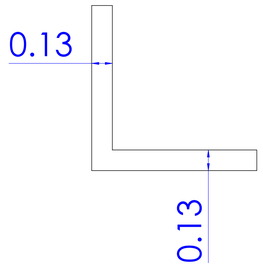
THCU005

MATL:
Fiberglass 4x4 90° Bracket
of 0.25" thickness

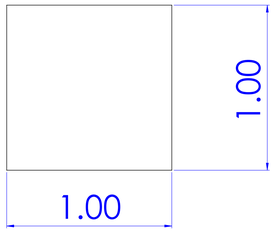
All units in Inches
Tolerances: ±0.04 inches
Unless otherwise marked

4x4 Angle

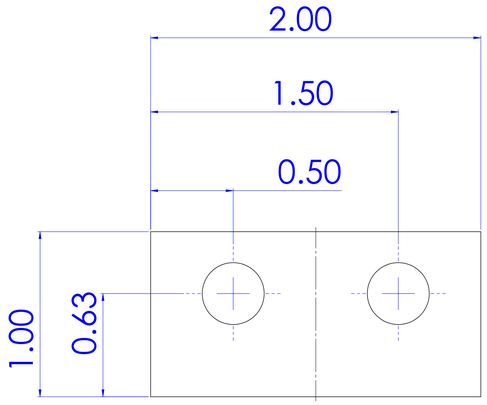




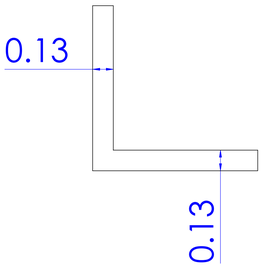
10X

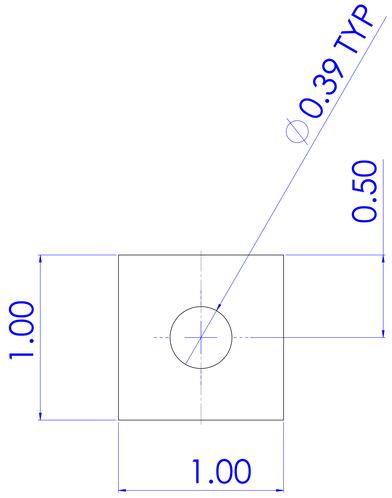


THOA010

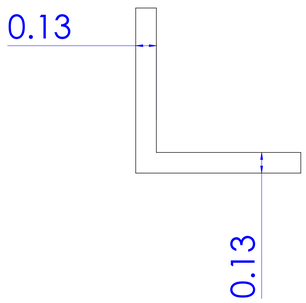


12X

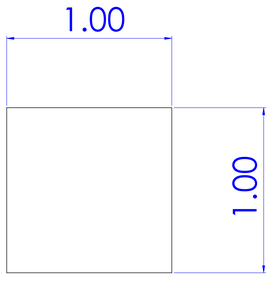


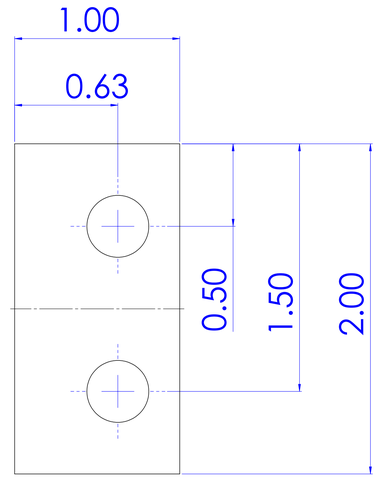


1X



THOA006





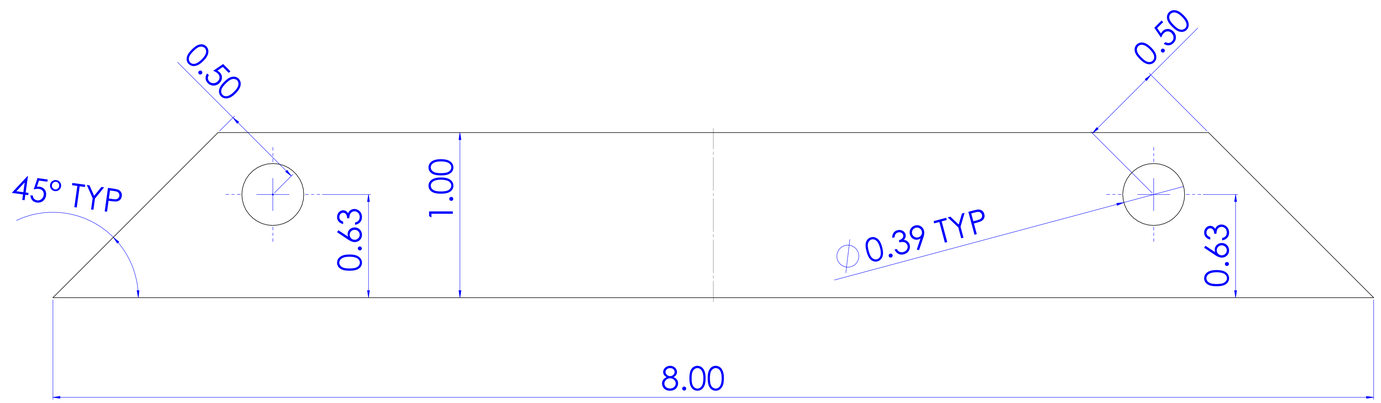
THCU003

MATL:
Fiberglass 1x1 90° Bracket
of 0.125" thickness

All units in Inches

Tolerances: ±0.04 inches
Unless otherwise marked

1x1 Angle



28X

THBC004

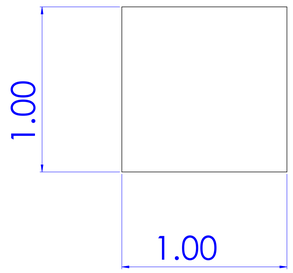
MATL:
Fiberglass 1x1 OD Square Tube
with 0.75x0.75 ID

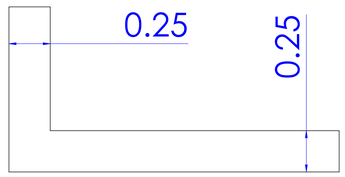
All units in Inches

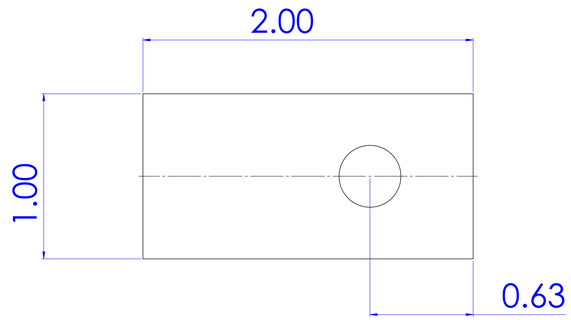
Tolerances: ±0.04 inches
Unless otherwise marked

Corner Brace

2X

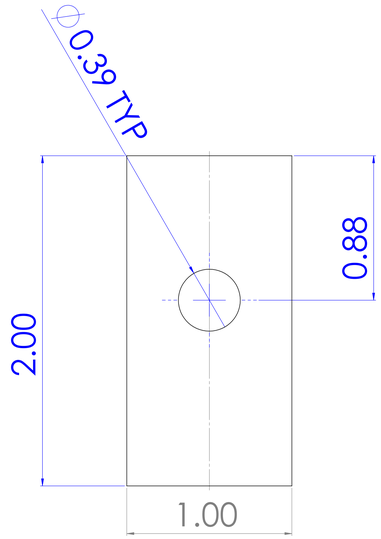


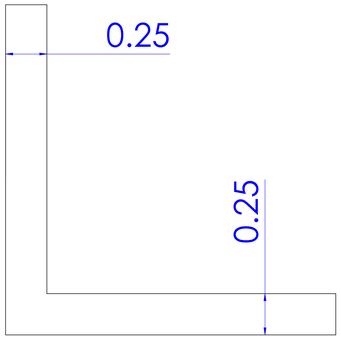


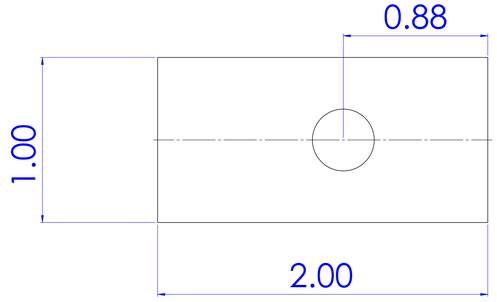


THOA004

30X







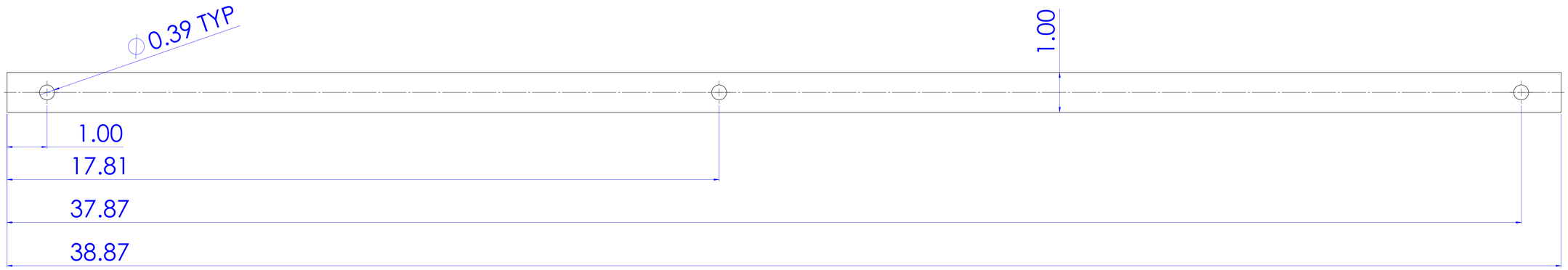
THOA002

MATL:
Fiberglass 2x2 90° Bracket
of 0.25" thickness

All units in Inches

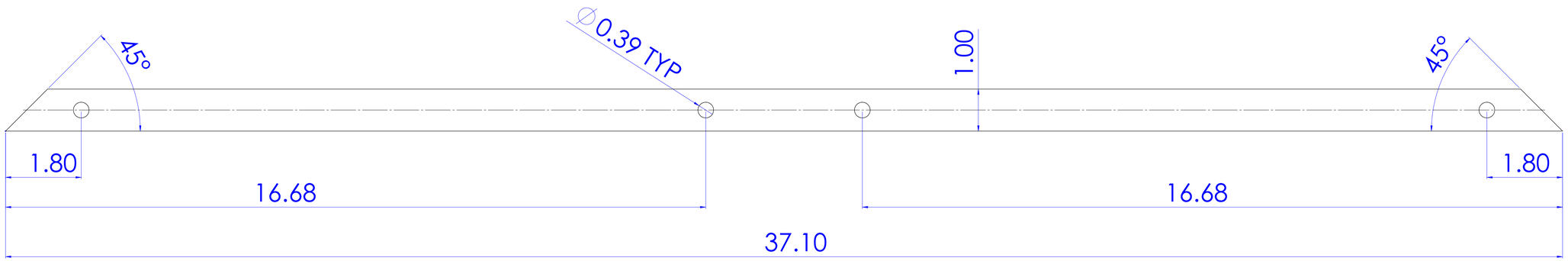
Tolerances: ±0.04 inches
Unless otherwise marked

2x2 Angle



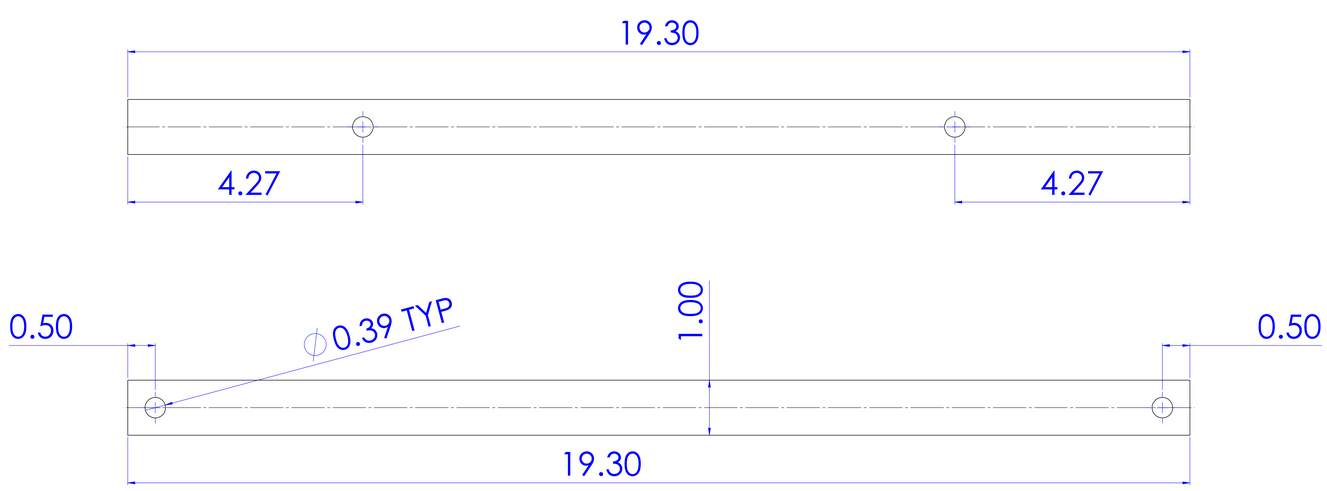
1X

THCU002



THCU001

2X



1X

THOA003

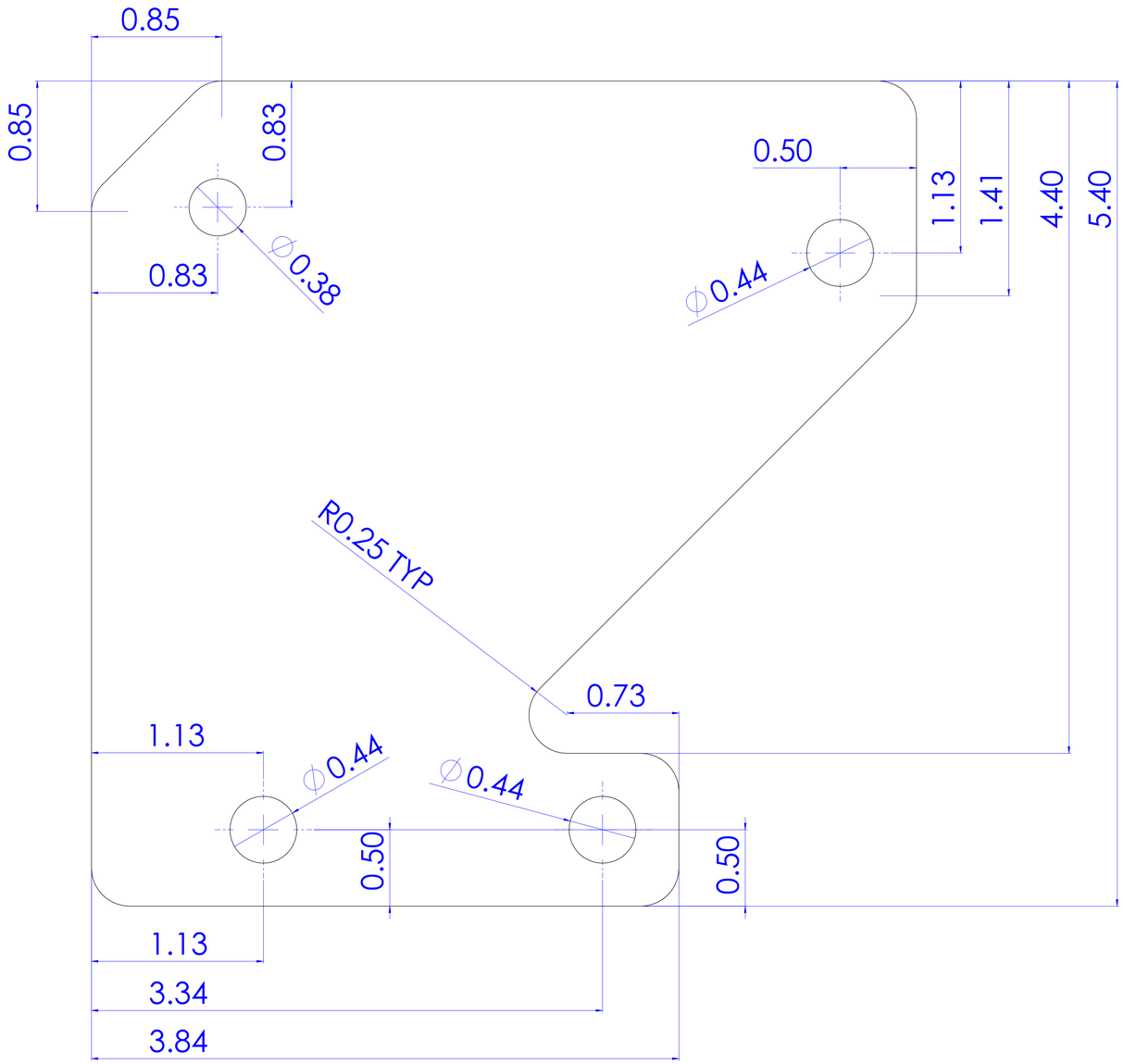
Note: The 0.39" holes in THOA003, THCU001 and THCU002 should all be match drilled. These holes will be added during assembly.

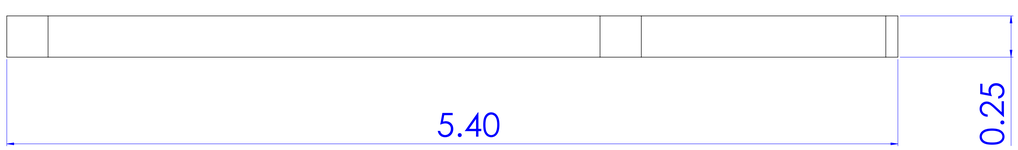
MATL:
Fiberglass 1x1 OD Square Tube with 0.75x0.75 ID

All units in Inches

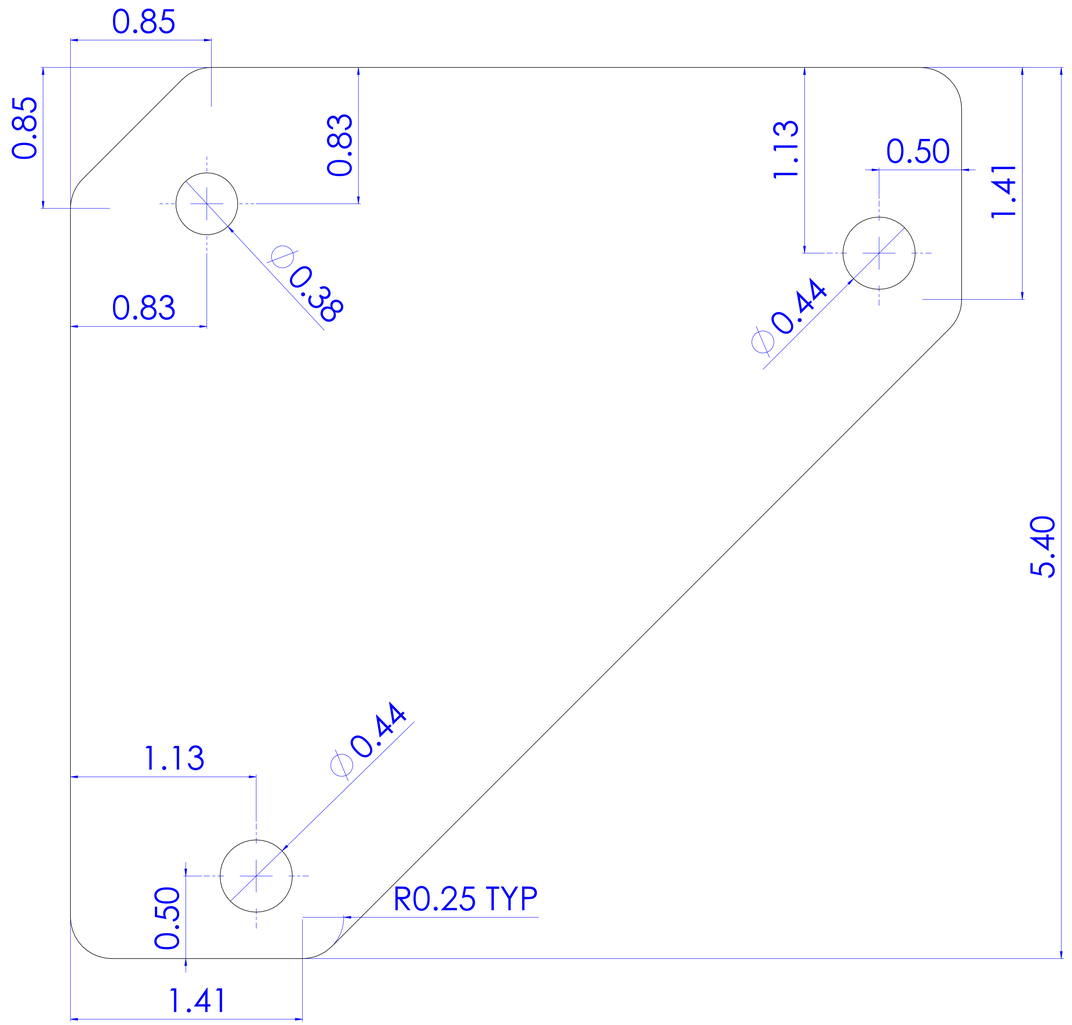
Tolerances: ±0.04 inches
Unless otherwise marked

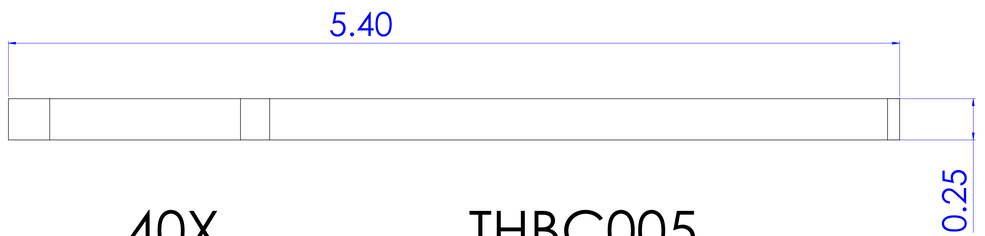
Other





4X THBC008





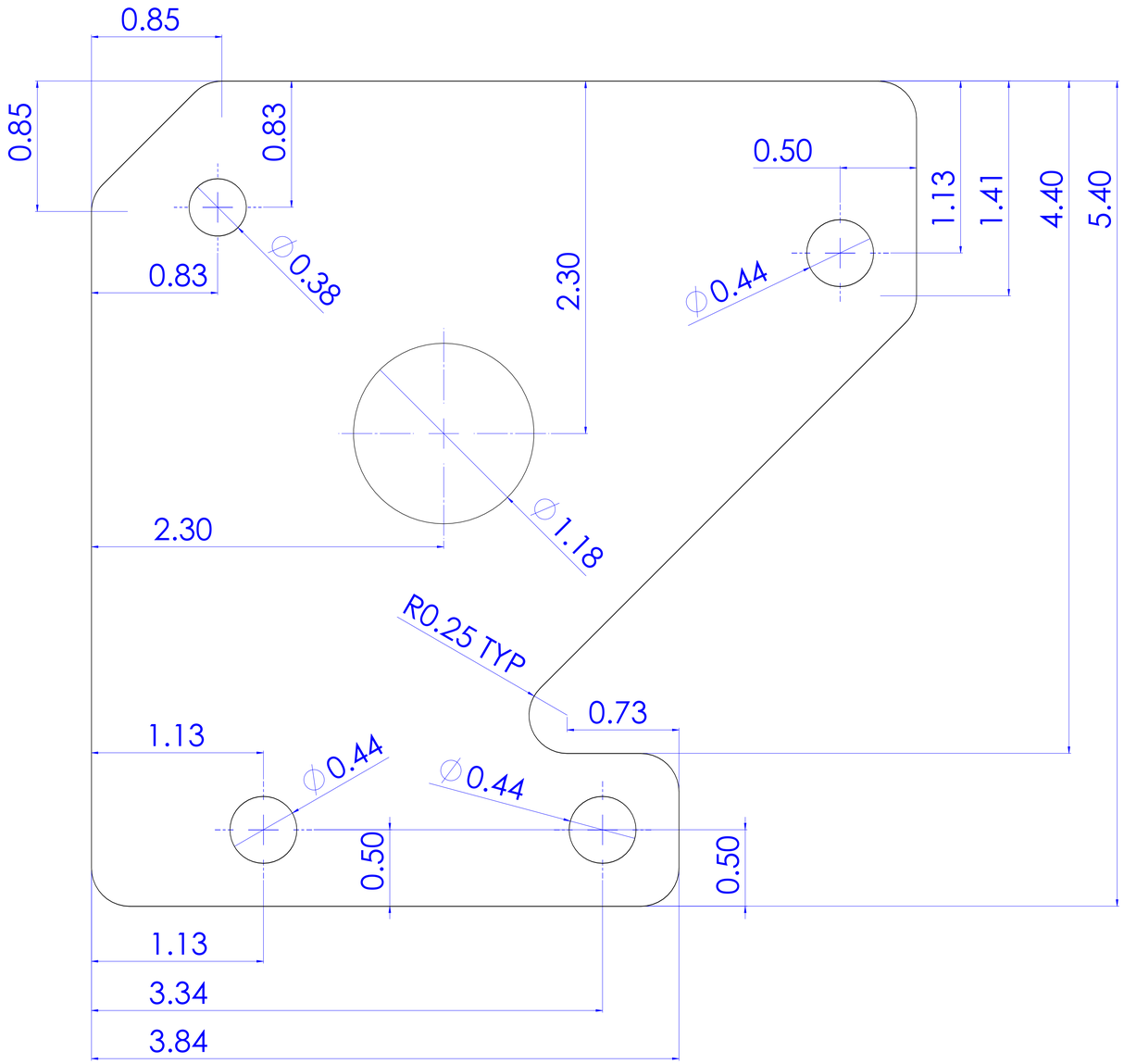
40X THBC005

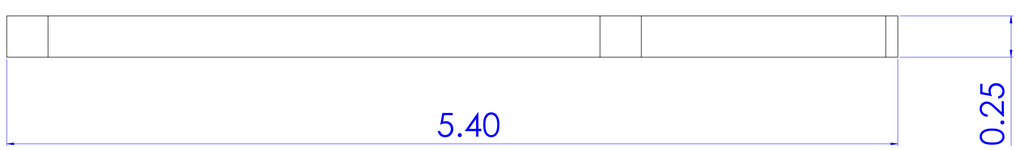
Note: Recommended to use a laser cutter or a water jet cutter

MATL:
0.25" thick plastic
polycarbonate

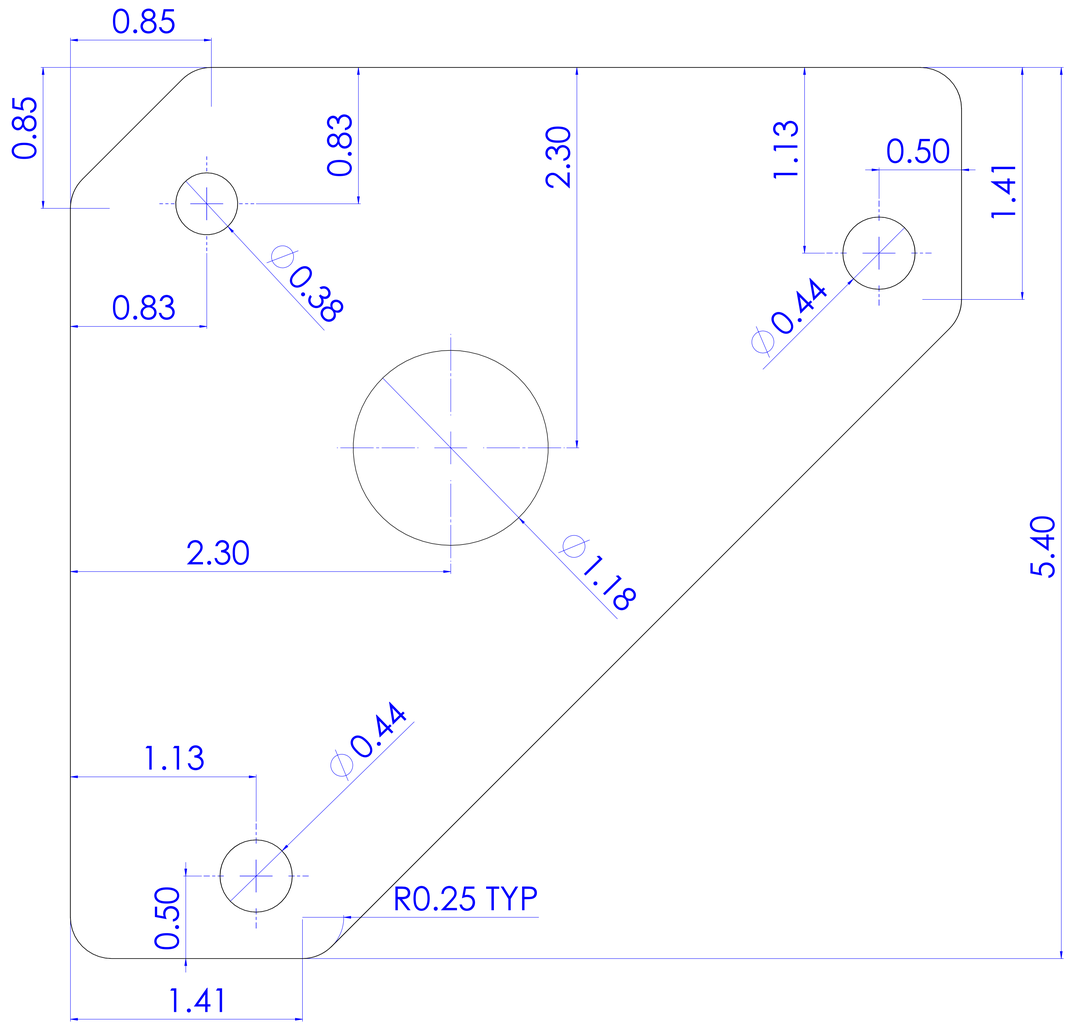
All units in Inches
Tolerances: ±0.04 inches
Unless otherwise marked

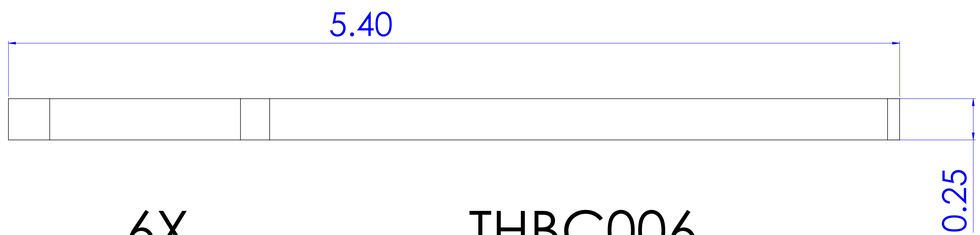
Corners_1





1X THBC009





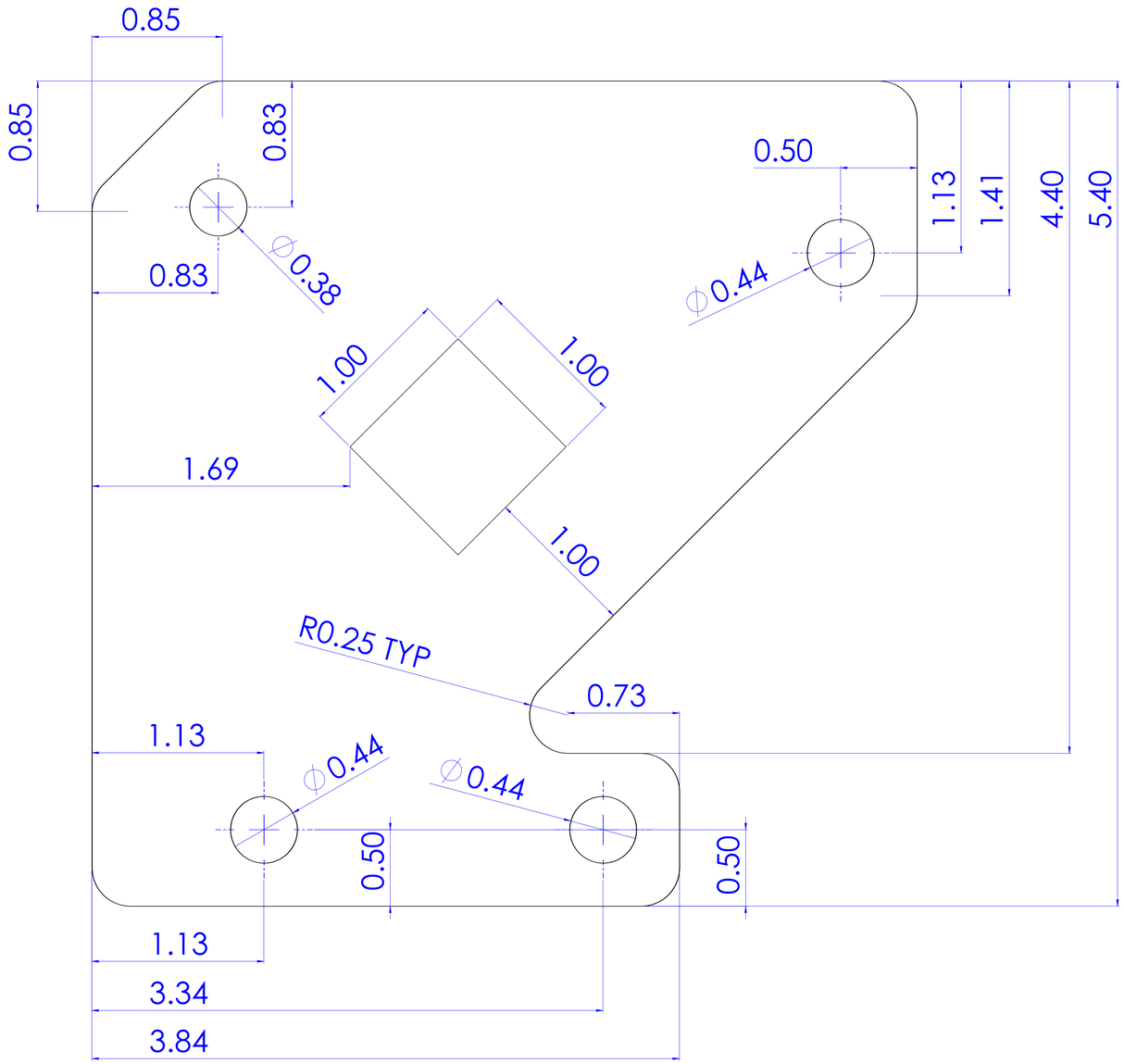
6X THBC006

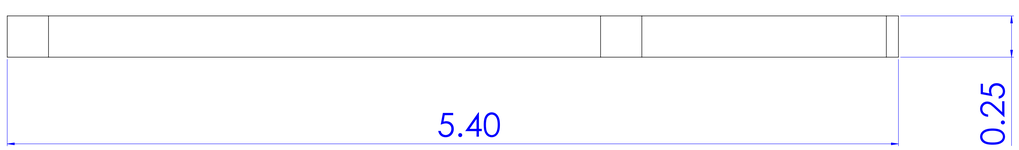
Note: Recommended to use a laser cutter or a water jet cutter

MATL:
0.25" thick plastic
polycarbonate

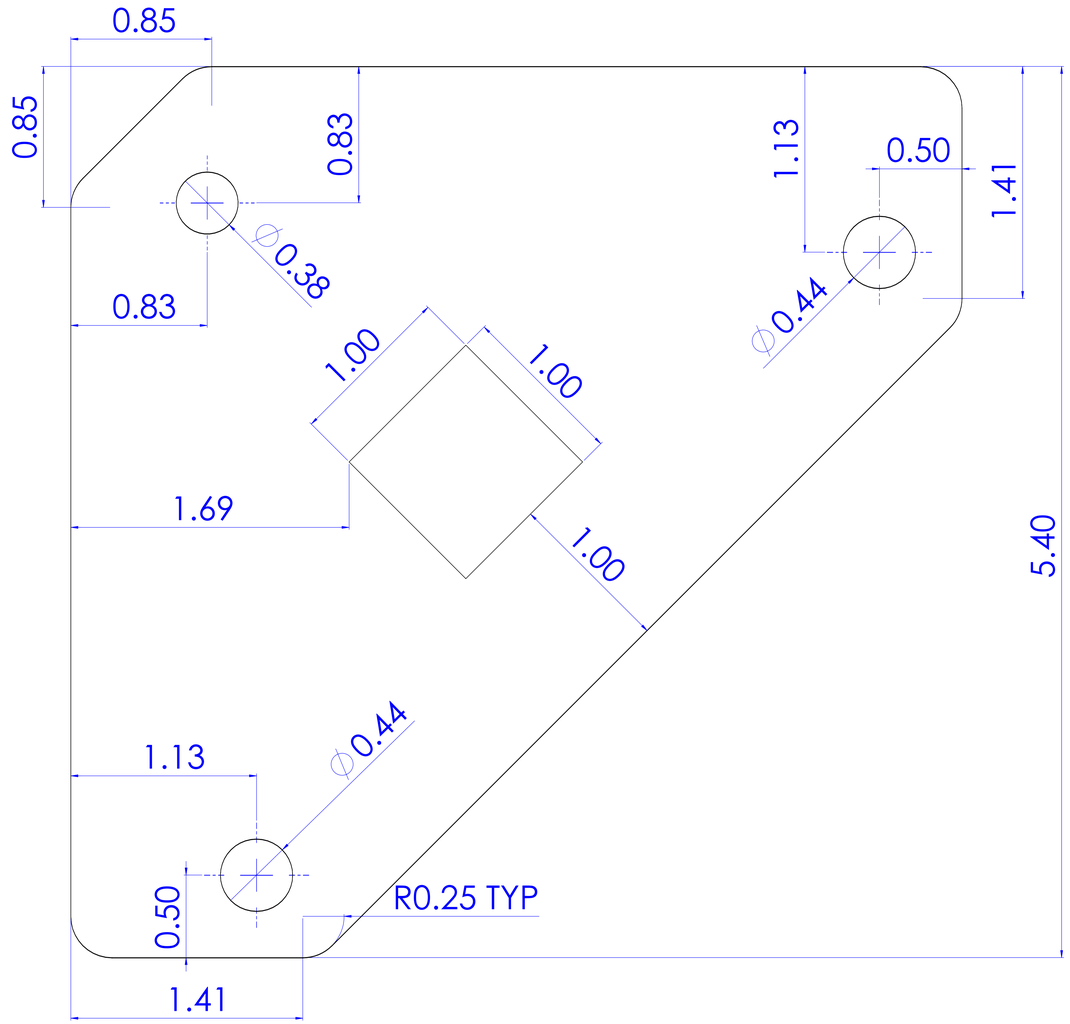
All units in Inches
Tolerances: ±0.04 inches
Unless otherwise marked

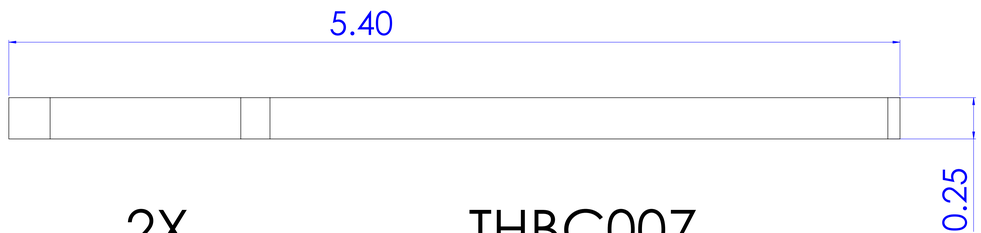
Corners_1





2X THBC010





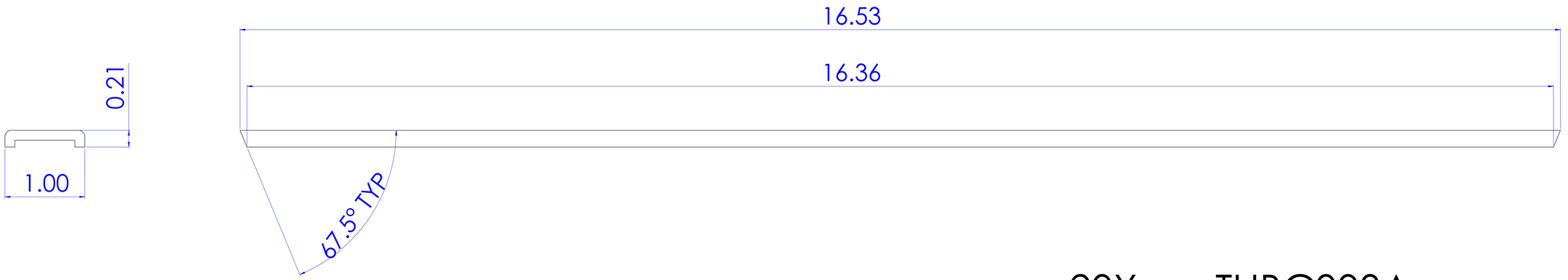
2X THBC007

Note: Recommended to use a laser cutter or a water jet cutter

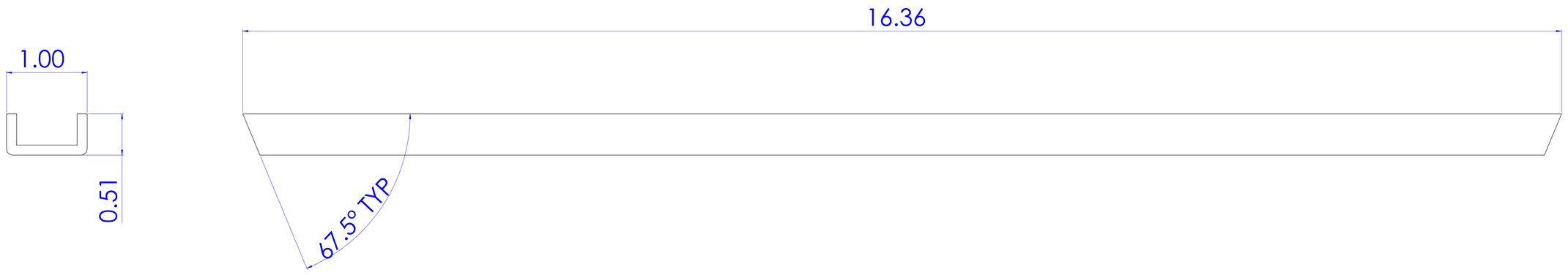
MATL:
0.25" thick plastic
polycarbonate

All units in Inches
Tolerances: ±0.04 inches
Unless otherwise marked

Corners_1



20X THBC003A



20X THBC003B

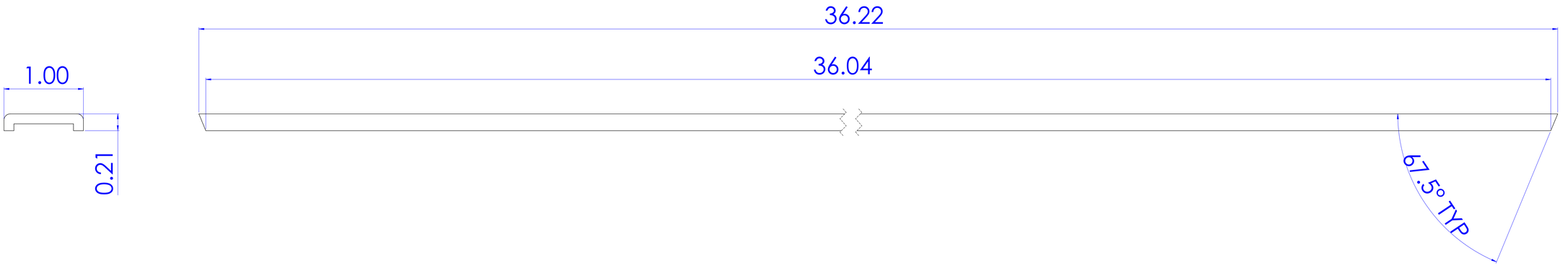
Note: Do not cut the two pieces separately.
They should line up to each other and be cut in pairs of one THBC003A and one THBC003B

MATL:
Fiberglass 1x1 OD Square Tube
with 0.75x0.75 ID

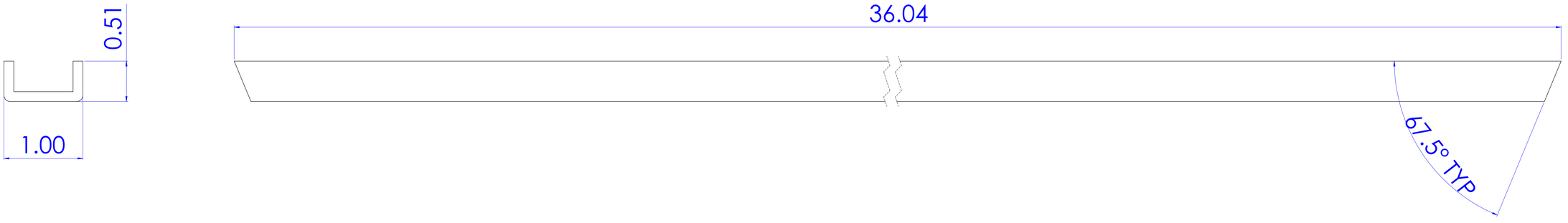
All units in Inches

Tolerances: ±0.04 inches
Unless otherwise marked

Short Housing



8X THBC002A



8X THBC002B

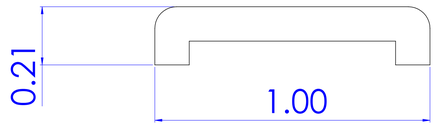
Note: Do not cut the two pieces separately.
They should line up to each other and be cut in pairs of one THBC003A and one THBC003B

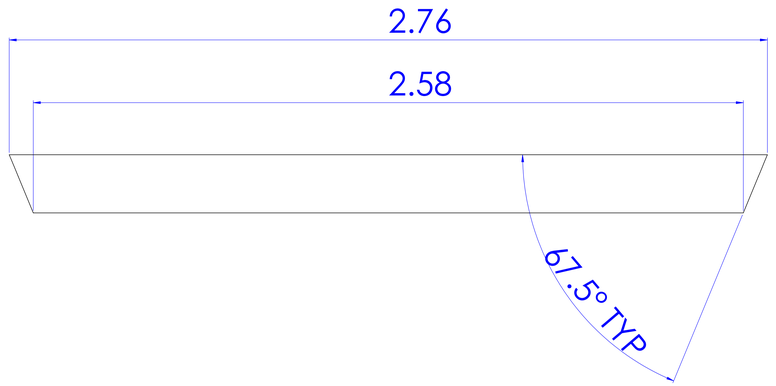
MATL:
Fiberglass 1x1 OD Square Tube
with 0.75x0.75 ID

All units in Inches

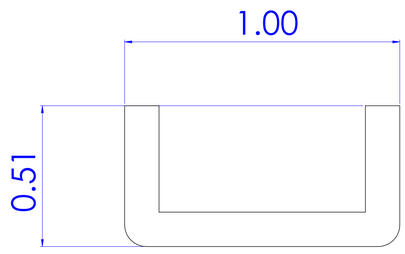
Tolerances: ±0.04 inches
Unless otherwise marked

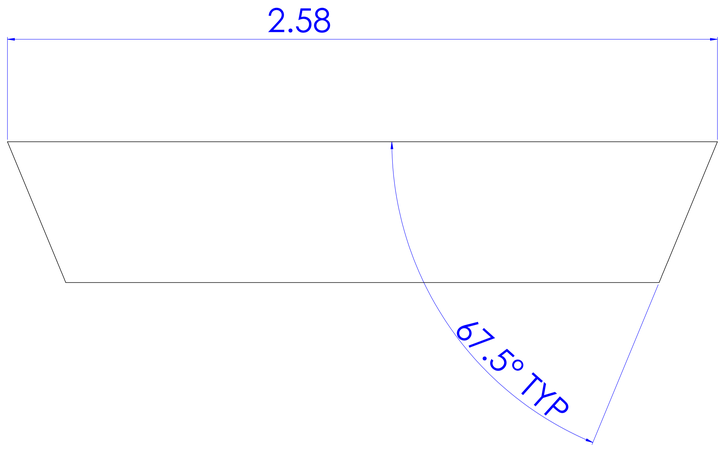
Long Housing





28X THBC001A





28X THBC001B

Note: Do not cut the two pieces separately.
They should line up to each other and be cut in pairs of one THBC003A and one THBC003B

MATL:
Fiberglass 1x1 OD Square Tube
with 0.75x0.75 ID

All units in Inches

Tolerances: ±0.04 inches
Unless otherwise marked

Corner Housing