If you are planning to disassemble frequently, you may want to consider using bolted connections instead of screws. It is helpful to consider ceiling height and ability to move assembly through doors before fastening sub-assemblies together.

Bolts spec’d as partially threaded can be replaced with fully threaded bolt of the same length.

TE-22190 can be replaced with TE-22190-AMActive (if pairing with AndyMark’s Motorized Agitator AM-4674) or TE-22190-AMPassive (if pairing with AndyMark’s Passive Agitator AM-4673).

Hardware Needed:

- #8 x 2" Long Screw - Qty 48
- #8 x 2.5" Long Screw - Qty 64

Optional, but recommended: Safety Edging such as pool noodles or baby proofing.

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22110</td>
<td>HUB - Complex Build - Base Assembly</td>
</tr>
<tr>
<td>2</td>
<td>TE-22120</td>
<td>HUB - Complex Build - Lower Exit Assembly</td>
</tr>
<tr>
<td>3</td>
<td>TE-22130</td>
<td>HUB - Complex Build - Fender Face Assembly</td>
</tr>
<tr>
<td>4</td>
<td>TE-22140</td>
<td>HUB - Complex Build - Connection Box Assembly</td>
</tr>
<tr>
<td>5</td>
<td>TE-22150</td>
<td>HUB - Complex Build - Lower Hub Ring Assembly</td>
</tr>
<tr>
<td>6</td>
<td>TE-22160</td>
<td>HUB - Complex Build - Upper Exit Assembly</td>
</tr>
<tr>
<td>7</td>
<td>TE-22170</td>
<td>HUB - Complex Build - Leg Assembly</td>
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<tr>
<td>8</td>
<td>TE-22180</td>
<td>HUB - Complex Build - Lower Hub Ring To Leg Assembly</td>
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<tr>
<td>9</td>
<td>TE-22190</td>
<td>HUB - Complex Build - Upper Hub Assembly</td>
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<tr>
<td>10</td>
<td>TE-22200</td>
<td>HUB - Complex Build - Upper Hub Vision Assembly</td>
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<tr>
<td>11</td>
<td>washer_flat_25</td>
<td>Flat Washer for 1/4&quot; Screw</td>
</tr>
<tr>
<td>12</td>
<td>nylon_25_20</td>
<td>Steel Nylon-Insert Locknut, 1/4&quot; - 20</td>
</tr>
<tr>
<td>13</td>
<td>hex_25_20_2</td>
<td>Steel Hex Head Bolt 1/4&quot; x 2&quot; long, fully threaded</td>
</tr>
<tr>
<td>14</td>
<td>hex_25_20_3_5 Partial</td>
<td>Steel Hex Head Bolt, 1/4&quot; x 3.5&quot;, partially threaded</td>
</tr>
<tr>
<td>15</td>
<td>hex_25_20_1</td>
<td>Steel Hex Head Screw, 1/4&quot; x 3.5&quot;, fully threaded</td>
</tr>
<tr>
<td>16</td>
<td>hex_25_20_5_5 Partial</td>
<td>Steel Hex Head Bolt, 1/4&quot; x 5.5&quot;, partially threaded</td>
</tr>
</tbody>
</table>

Note:
1. If you are planning to disassemble frequently, you may want to consider using bolted connections instead of screws. It is helpful to consider ceiling height and ability to move assembly through doors before fastening sub-assemblies together.
2. Bolts spec’d as partially threaded can be replaced with fully threaded bolt of the same length.
3. TE-22190 can be replaced with TE-22190-AMActive (if pairing with AndyMark’s Motorized Agitator AM-4674) or TE-22190-AMPassive (if pairing with AndyMark’s Passive Agitator AM-4673).
Note: On field there is a protrusion in approximately this location. See GE-22300 for details. (4X)
1. Align 3x assemblies from Step 1 to 4, as shown.
2. Loosely connect using 2x 14, 4x 11, and 2x 12 per 7. Hardware will be tightened in a later step.

1. Align 8 to 7, as shown.
2. Connect using 2.5" long screws. It is recommended to use 8x screws, 4x into each side.
3. Repeat 3x, for a total of 4x sub-assemblies.

1. Align 1 to Step 2, as shown. Attachment will happen in a later step.

Parts should touch (TYP.)

Edges of 4"x4" lumber should be aligned

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.013
THREE PLACE DECIMAL: ±.025

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MATERIAL/FINISH:

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.
1. Add remaining Step 1 assembly to Step 3, as shown. Ensure the plywood from 7 sits on top of the 4"x4" lumber of 1. 
   Note: Attachment between 7 and 1 will occur in a later step.
2. Connect 7 to 4 using 2x 14, 4x 11, and 2x 12. Ensure connection is tight.
3. Tighten hardware installed in Step 2.

1. Align 4x 10 to 9, as shown.
   Note: If you opted to match drill some/all holes on TE-22194, they should be drilled out now.
2. Connect using 3x 15, 3x 11, and 3x 12 per 10.
3. If needed, tighten hardware on 10.
1. Align Step 5 atop Step 4, as shown. Note: Ensure there are multiple people to lift Step 5 into place. Consider resting Step 5 atop 7, if needed. If using TE-22190-AMActive, be mindful of the motor protruding from the bottom of the assembly.

2. Connect 9 to 4 using 4x 13, 8x 11, and 4x 12.
1. Align 4x (6) to Step 6, as shown.
2. Connect using 2" long screws. It is recommended to use 8x screws per (6).
3. Optional: It is recommended to install safety edging on (6) at this time. Safety edging could be pool noodles, baby proofing material, etc.

It is recommended to install safety edging on (6).

Parts should touch

Bottom View
1. Align 4x 2 to Step 8, as shown. Connection will happen in a later step.

2. Add 4x 3 to Step 9, as shown.

3. Connect 3 to 2 using 2.5" long screws. It is recommended to use 8x screws per 3, 4x per side.

4. Optional: Add 2" long screws to connect 1 to 4x 7. It is recommended to 4x screws per 7.

Note: It is a best practice to avoid placing screws within 1" of the cut edge of 4x4" lumber.

Parts should touch Center on 7
Hardware Needed:
#8 x 2.5" Long Screw - Qty 32

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22111</td>
<td>Hub - Complex Build - Center Base Plate</td>
</tr>
<tr>
<td>2</td>
<td>TE-22112</td>
<td>Hub - Complex Build - Base Long 4x4</td>
</tr>
<tr>
<td>3</td>
<td>TE-22113</td>
<td>Hub - Complex Build - Base Short 4x4</td>
</tr>
<tr>
<td>4</td>
<td>TE-22114</td>
<td>Hub - Complex Build - Base to Leg Connection Plate</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:

FRACTIONAL: ±1/16
ANGULAR: ±1° BEND ±1°
TWO PLACE DECIMAL: ±.001
THREE PLACE DECIMAL: ±.000

MATERIAL/FINISH:

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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:4

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.13
THREE PLACE DECIMAL: ±0.125

MATERIAL/FINISH:

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COMMENTS:
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DO NOT SCALE DRAWING

TITLE:
HUB - Complex Build - Base Assembly

TEAM NAME DATE
DRAWN KAMC 12/16/2021

SIZE DWG. NO. REV
C TE-22110 SHEET 2 OF 3
Step 1
1. Align 2x3 to 1 as shown. Attachment will happen in next step.

Step 2
1. Align 1 to Step 1, as shown.
2. Connect using 2.5" long screws. It is recommended to use 4x screws into each 3 and 8x 2.
   Note: A best practice when screwing into a 4"x4" is to avoid placing a screw within 1" from the cut edge.

Step 3
1. Align a total of 4x4 such that 2x are on 2 and x1 is on each 3, as shown.
2. Connect using 2.5" long screws. It is recommended to use 4x screws per 4.
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \( \frac{1}{16} \)
ANGULAR: MACH \( \frac{1}{16} \)
TWO PLACE DECIMAL: \( \frac{1}{32} \)
THREE PLACE DECIMAL: \( \frac{1}{25} \)

MATERIAL/FINISH:
3/4" Plywood

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:2
DRAWN KAMC 12/16/2021
DO NOT SCALE DRAWING

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PROHIBITED.

COMMENTS:
REMOVE ALL BURRS AND SHARP
EDGES.

TEAM NAME DATE

DO NOT SCALE DRAWING

TITLE:
Hub - Complex Build -
Center Base Plate

SIZE DWG. NO. REV
C TE-22111 SHEET 1 OF 1
3.50 3 1
2"

4X R.13 1
8"

23.75 23 3
4"

4" x 4" Lumber

HUB - Complex Build
- Base Long 4x4

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:2
MATERIAL/FINISH:
4" x 4" Lumber
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.13
THREE PLACE DECIMAL: ±.125

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

TEAM NAME DATE
TEAM NAME DATE

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:2
MATERIAL/FINISH:
4" x 4" Lumber
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.13
THREE PLACE DECIMAL: ±.125

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:2
MATERIAL/FINISH:
4" x 4" Lumber
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.13
THREE PLACE DECIMAL: ±.125

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH ±1° BEND ±1/16
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005
MATERIAL/FINISH:
3/4" Plywood

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:1

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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

TEAM NAME DATE
C KAMC 12/16/2021

HUB - Complex Build - Base to Leg Connection Plate

TITLE:

SIZE DWG. NO. REV
C TE-22114 1

SCALE: 1:1 SHEET 1 OF 1
Hardware Needed:

- #8 x 2' Long Screw - Qty 1.6

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<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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<tbody>
<tr>
<td>1</td>
<td>TE-22101</td>
<td>HUB - Complex Build - Fender and Lower Exit Vertical 2x4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22122</td>
<td>HUB - Complex Build - Lower Exit Bottom with Loop Assembly</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-22124</td>
<td>HUB - Complex Build - Lower Exit Removable Edge with Hook Assembly</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>TE-22125</td>
<td>HUB - Complex Build - Lower Exit Top</td>
<td>1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
- SCALE: 1:6
- DIMENSIONS ARE IN INCHES
- TOLERANCES:
  - FRACTIONAL: 1/16
  - ANGULAR, MACH: 1° BEND
  - TWO PLACE DECIMAL: 0.13
  - THREE PLACE DECIMAL: 0.125

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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COMMENTS:
- REMOVE ALL BURRS AND SHARP EDGES.

TITLE: HUB - Complex Build - Lower Exit Assembly

SIZE: 1/6

DWG. NO. TE-22120

REV C

SHEET 1 OF 3
Step 1
1. Align 4x 1 onto 2 as shown.
2. Secure 1 to 2 by using 2" long screws through the bottom of 1 into 2. It is recommended to use 2x screws into each 1.

Step 2
1. Add 4 to Step 1 by aligning 1 to 4 in the same manner as aligning 1 to 2 from Step 1.
2. Secure 4 to 1 by using 2" long screws through the top of 4 into 1. It is recommended to use 2x screws into each 1.

Step 3
1. Attach 2x 3 to 2 using the pre-installed Hook and Loop, as shown.
Note:
Holes located at internal corners are provided predominately for teams making parts with a router. Corners with holes called out align with other parts or assemblies, and should not have internal fillets. A 90 degree angle is sufficient clearance.
Step 1
1. Attach 1 to 2 using adhesive backing. Align as shown on Sheet 2.
2. Optional: Use wood staples to connect 1 to 2.

Hardware Needed:
Optional: Wood Staples

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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<tbody>
<tr>
<td>1</td>
<td>Loop_1_12.5</td>
<td>1&quot; x 12.5' Loop, Adhesive Backed</td>
<td>2</td>
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<td>2</td>
<td>TE-22121</td>
<td>HUB - Complex Build - Lower Exit Bottom with Loop Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1'
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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COMMENTS:
REMOVES ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

Hardware Needed:
Optional: Wood Staples

<table>
<thead>
<tr>
<th>TEAM</th>
<th>NAME</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAMC</td>
<td></td>
<td>12/20/2021</td>
</tr>
</tbody>
</table>
3.50 3 1
2" 

1.50 1 1
2"

4X R.13 1
8"

12.50 12 1
2"

2" x 4" Lumber

HUB - Complex Build - Lower Exit Removable Edge 2x4

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH: 1° BEND: 1°
TWO PLACE DECIMAL: .13
THREE PLACE DECIMAL: .125

MATERIAL/FINISH:
2" x 4" Lumber

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COMMENTS:
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DO NOT SCALE DRAWING
**Step 1**

1. Attach 1 to 2 as shown using adhesive backing.
2. Optional: Use wood staples to connect 1 to 2.

**Hardware Needed:**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Hook_1_12.5</td>
<td>1&quot; x 12.5&quot; Hook, Adhesive Backed</td>
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<td>2</td>
<td>TE-22123</td>
<td>HUB - Complex Build - Lower Exit Removable Edge with Hook Assembly</td>
<td>1</td>
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</tbody>
</table>

**UNLESS OTHERWISE SPECIFIED:**

- **DIMENSIONS ARE IN INCHES**
- **TOLERANCES:**
  - FRACTIONAL: ±1/16
  - ANGULAR: MACH ±1° BEND ±1°
  - TWO PLACE DECIMAL: ±0.005
  - THREE PLACE DECIMAL: ±0.001
- **MATERIAL/FINISH:**
- **COMMENTS:**
  - REMOVE ALL BURRS AND SHARP EDGES.
- **DO NOT SCALE DRAWING**

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**SCALE:** 2:3

**REV:** C

**DATE:** 12/17/2021
UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1° BEND: 1°
TWO PLACE DECIMAL: .13
THREE PLACE DECIMAL: .125

MATERIAL/FINISH:

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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

TITLE: HUB - Complex Build - Lower Exit Removable Edge with Hook Assembly

C  TE-22124
SCALE: 2:3  SHEET 2 OF 2
Holes located at internal corners are provided predominately for teams making parts with a router. Corners with holes called out align with other parts or assemblies, and should not have internal fillets. A 90 degree angle is sufficient clearance.
**Hardware Needed:**

- #8 x 2" Long Screw - Qty 23
- #8 x 2.5" Long Screw - Qty 12

**ITEM NO.** | **PART NUMBER** | **DESCRIPTION** | **QTY.**
---|---|---|---
1 | TE-22101 | HUB - Complex Build - Fender and Lower Exit Vertical 2x4 | 2
2 | TE-22131 | HUB - Complex Build - Fender Front Face | 1
3 | TE-22132 | HUB - Complex Build - Fender Horizontal 2x4 | 3

**UNLESS OTHERWISE SPECIFIED:**

- SCALE: 1:6
- REV.

**DO NOT SCALE DRAWING**

**DIMENSIONS ARE IN INCHES**

**TOLERANCES:**

- FRACTIONAL: \( \frac{1}{16} \)
- ANGULAR: MACH \( \frac{1}{16} \) BEND \( \frac{1}{16} \\)
- TWO PLACE DECIMAL: \( \frac{3}{13} \)
- THREE PLACE DECIMAL: \( \frac{4}{125} \)

**MATERIAL/FINISH:**

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**COMMENTS:**

- REMOVE ALL BURRS AND SHARP EDGES.

**DRAWN:**

- TEAM: KAMC
- DATE: 12/20/2021

**TITLE:**

- HUB - Complex Build - Fender Face Assembly
Step 1

1. Align 2x 1 to the edges of 2, as shown.
2. Connect using 2" long screws. It is recommended to use 4x screws into each 1.

Step 2

1. Align 3x 3 between both 1, and position on 2 as shown. If needed, trim 3 to ensure fit.
2. Secure each 3 to 1 using 2.5" long screws. It is recommended to use 2x screws into each end of 3.
3. Secure 3 to 2 using 2" long screws. It is recommended to use 5x screws into each 3.
**Note:**
Use TE-22140-AM if pairing with AndyMark Upper Hub (AM-4671)

**Hardware Needed:**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22141</td>
<td>HUB - Complex Build - Connection Box 2x4</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>TE-22142</td>
<td>HUB - Complex Build - Connection Box Top</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-22143</td>
<td>HUB - Complex Build - Connection Box Bottom</td>
<td>1</td>
</tr>
</tbody>
</table>
Note: Hole should be centered in 2" x 4". This is NOT the case for TE-22141-AM configuration.
Step 1
1. Align 8x 1 on 3, as shown.
2. Connect using 2" long screws. It is recommended to use 2x screws into each 1.

Step 2
1. Align 2 to Step 1 as shown.
2. Connect using 2" long screws. It is recommended to use 2x screws into each 1.
Note:
Use TE-22141-AM if pairing with AndyMark Upper Hub (AM-4671)
Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.
Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.
Step 1
1. Align 2x 4 to each other.

Step 2:
2. Connect Step 1 using the center 3 holes in 4. Use 1x 1, 2x 4, and 1x 2 per hole.

---

### PART LIST

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>Steel Hex Head Screw, 1/4&quot;-20 x 2&quot; long, fully threaded</td>
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</tr>
<tr>
<td>2</td>
<td>nylock_.25_20</td>
<td>Steel Nylon-Insert Locknut, 1/4&quot;-20</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>washer_flat_.25</td>
<td>Flat Washer for 1/4&quot; Screw</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>TE-22151</td>
<td>HUB - Complex Build - Lower Hub Ring</td>
<td>2</td>
</tr>
</tbody>
</table>

---

**DIMENSIONS ARE IN INCHES**

**TOLERANCES:**
- FRACTIONAL: ±1/16
- ANGULAR MACH: ±1°
- BEND: ±1°
- TWO PLACE DECIMAL: ±0.01
- THREE PLACE DECIMAL: ±0.005

**MATERIAL/FINISH:**

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**COMMENTS:**

Remove all burrs and sharp edges.

---

**DRAWN**

KAMC
12/20/2021

**TITLE:**

HUB - Complex Build - Lower Hub Ring Assembly

**SCALE:** 1:6

**SHEET:** 1 OF 2
Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

Holes marked with ▲ are used to bolt together TE-22151 to TE-22151 in Assembly TE-22152. Match drilling at assembly level is acceptable.
Hardware:

#8 x 1.25" Long Screw - Qty 12

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22161</td>
<td>HUB - Complex Build - Upper Exit End</td>
</tr>
<tr>
<td>2</td>
<td>TE-22162</td>
<td>HUB - Complex Build - Upper Exit Base</td>
</tr>
<tr>
<td>3</td>
<td>TE-22163</td>
<td>HUB - Complex Build - Upper Exit Connection Plate</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1° BEND 1/16
TWO PLACE DECIMAL: .13
THREE PLACE DECIMAL: .125

MATERIAL/FINISH:

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
Step 1

1. Align 3 and 1 as shown.
2. Connect parts using 1.25" Long screws. It is recommended to use 6x screws.

Step 2

1. Add 2 to Step 1, as shown.
2. Connect parts using 1.25" Long screws. It is recommended to use 6x screws.

Align Edges
HUB - Complex Build - Upper Exit Connection Plate

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1° BEND, 1/16
TWO PLACE DECIMAL: 1/128
THREE PLACE DECIMAL: 1/256
MATERIAL/FINISH:
3/4" Plywood

UNLESS OTHERWISE SPECIFIED:
DO NOT SCALE DRAWING

TEAM
NAME
DATE
DRAWN KAMC 12/20/2021

PROPRIETARY AND CONFIDENTIAL
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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
Step 1:
1. Align 2 and 1, as shown.

Step 2:
1. Connect Step 1 using 2" long screws. It is recommended to use 5x screws on each side.

Hardware Needed:

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22177</td>
<td>HUB - Complex Build - Lower Leg Assembly</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22178</td>
<td>HUB - Complex Build - Upper Leg Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

- **SCALE**: 1:8
- **TOLERANCES**: 1/16, 1°
- **MATERIAL/FINISH**: Proprietary and Confidential
- **COMMENTS**: Remove all burrs and sharp edges.
HUB - Complex Build - Lower Leg Base 4x4

Dimensions: 3.50 in (3 1/2"

Material/Finish: 4" x 4" Lumber

Scale: 1:3

Comments: Remove all burrs and sharp edges.

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±1/16
THREE PLACE DECIMAL: ±1/32

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST IS PROHIBITED.
Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

Cut out is strongly recommended for ease of assembly.
Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

Cut out is strongly recommended for ease of assembly.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FRACTIONAL: 1/8
ANGULAR: MACH. 1° BEND
TWO PLACE DECIMAL: .13
THREE PLACE DECIMAL: .125
MATERIAL/FINISH:
3/4" Plywood

Do not scale drawing
Hardware Needed:

#8 x 2" Long Screw - Qty 20

Exploded View

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22171</td>
<td>HUB - Complex Build - Lower Leg Vertical 4x4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22172</td>
<td>HUB - Complex Build - Lower Leg Base 4x4</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-22173</td>
<td>HUB - Complex Build - Lower Leg Base Side</td>
<td>2</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

DO NOT SCALE DRAWING

PROPRIETARY AND CONFIDENTIAL
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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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COMMENTS:
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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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COMMENTS:
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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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COMMENTS:
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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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COMMENTS:
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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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COMMENTS:
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SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR, MACH: ±1° BEND: ±1°
TWO PLACE DECIMAL: ±0.01
THREE PLACE DECIMAL: ±0.005

MATERIAL/FINISH:

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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

SIZE: 1:6
DWG. NO.: TE-22177
REV.
SHEET 1 OF 3

TEAM: A A B B C C D D

DRAWN: KAMC 12/21/2021

TITLE: HUB - Complex Build - Lower Leg Assembly
Step 1

1. Align 2 and 3, as shown.
2. Connect using 2" long screws. It is recommended to use x5 screws.

Step 2

1. Add an additional 3 to Step 1, as shown.
2. Connect using 2" long screws. It is recommended to use x5 screws.

Step 3

1. Add 1 to Step 2 by sliding between both 3. Align as shown, such that 1 and 2 touch, and noting the orientation of the angle on 1.
2. Connect 1 to both 3 using 2" long screws. It is recommended to use x5 screws per 3.

Hidden Lines Shown

Parts should touch

Note angle orientation

Align bottom edges

Parts should touch

Hidden Lines Shown
Hardware Needed:

- #8 x 2" Long Screw - Qty 10
- #8 x 2.5" Long Screw - Qty 5

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<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22174</td>
<td>HUB - Complex Build - Upper Leg 4x4</td>
<td>1</td>
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<tr>
<td>2</td>
<td>TE-22175</td>
<td>HUB - Complex Build - Upper Leg Side</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TE-22176</td>
<td>HUB - Complex Build - Upper Leg to Connection Box 2x4</td>
<td>1</td>
</tr>
</tbody>
</table>

Unless otherwise specified:

- Scale: 1:4
- Material/Finish:
- Dimensions are in inches
- Tolerances:
  - Fractional: ±1/16
  - Angular, Machined: ±1°
  - Two place decimal: ±1/10
  - Three place decimal: ±1/125
- Proprietary and Confidential
- The information contained in this drawing is the sole property of FIRST®. Any reproduction in part or as a whole without the written permission of FIRST® is prohibited.
- Comments:
  - Remove all burrs and sharp edges.

Title: HUB - Complex Build - Upper Leg Assembly

Team: A A

Size: 1:4

Sheet: 1 of 3

Drawn: KAMC 12/21/2021

Comments:

- Do not scale drawing
HUB - Complex Build - Upper Leg Assembly

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: 0.13
THREE PLACE DECIMAL: 0.125

MATERIAL/FINISH:

DO NOT SCALE DRAWING

PROPRIETARY AND CONFIDENTIAL
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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

TEAM | NAME | DATE
--- | --- | ---
KAMC | KAMC | 12/21/2021

SIZE | DWG. NO. | REV
--- | --- | ---
C | TE-22178 | C

SCALE: 1:4  SHEET 2 OF 3
Step 1

1. Align (3) on (1), as shown.
2. Connect using 2.5" long screws. It is recommended to use 5x screws.

Step 2

1. Add x1 (2) to each side of (1), as shown.
2. Connect using 2" long screws. It is recommended to use 5x screws per (2).
Hardware Needed:

#8 x 2" Long Screw - Qty 8

<table>
<thead>
<tr>
<th>ITEM NO.</th>
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<th>DESCRIPTION</th>
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<tr>
<td>1</td>
<td>TE-22181</td>
<td>HUB - Complex Build - Lower Hub Ring to Leg 4x4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22182</td>
<td>HUB - Complex Build - Lower Hub Ring to Leg Side</td>
</tr>
</tbody>
</table>

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL: \( \frac{1}{16} \)

ANGULAR, MACH: \( \frac{1}{16} \) BEND

TWO PLACE DECIMAL: \( \frac{1}{32} \)

THREE PLACE DECIMAL: \( \frac{1}{64} \)

MATERIAL/FINISH:

PROPRIETARY AND CONFIDENTIAL

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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

SIZE | DWG. NO. | REV
---|--------|---
C | TE-22180 | SHEET 1 OF 3

SCALE: 1:2
Step 1

1. Align 2x as shown.
2. Connect using 2" long screws. It is recommended to use 4x screws per 2n.
HUB - Complex Build - Lower Hub Ring to Leg Side

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1° BEND ±1°
TWO PLACE DECIMAL: ±0.13
THREE PLACE DECIMAL: ±0.125

MATERIAL/FINISH:
3/4" Plywood

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

SIZE: 2:3
SHEET: 1 OF 1

REV C

TE-22182

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/21/2021

PROPRIETARY AND CONFIDENTIAL
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Hardware Needed:
#8 x 1" Long Screw - Qty 4
50 lb. cable ties - Qty 20

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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<tbody>
<tr>
<td>1</td>
<td>TE-22191</td>
<td>Hub - Complex Build - Upper Hub Base</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22193</td>
<td>Hub - Complex Build - Upper Hub Lower Ring</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>TE-22194</td>
<td>Hub - Complex Build - Upper Hub Upper Ring</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>TE-22196</td>
<td>Hub - Complex Build - Upper Hub Vertical Support and Bracket Assembly</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>TE-22197</td>
<td>Hub - Complex Build - Upper Hub Plastic</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>TE-22210</td>
<td>Hub - Complex Build - Passive Agitator</td>
<td>1</td>
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<tr>
<td>7</td>
<td>hex_.25_20_1</td>
<td>Steel Hex Head Screw, 1/4&quot;-20 x 3/4&quot; long, fully threaded</td>
<td>48</td>
</tr>
<tr>
<td>8</td>
<td>nylock_.25_20</td>
<td>Steel Nylon-Insert Locknut, 1/4&quot;-20</td>
<td>48</td>
</tr>
<tr>
<td>9</td>
<td>washer_flat_.25</td>
<td>Flat Washer for 1/4&quot; Screw</td>
<td>48</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR, MACHINE TOLERANCES: 1°
TWO PLACE DECIMAL: 0.13
THREE PLACE DECIMAL: 0.125

PROPRIETARY AND CONFIDENTIAL
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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

A A
B B
C C
D D
1. Align 6 to 1 as shown. Wheel should be able to freely rotate. If not, hole in 1 may need to be enlarged.
2. Connect using 1" long screws. It is recommended to use 4x screws.

1. Align 4x 4 to Step 1, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 4.
Step 3

1. Align 4x 3 to Step 2, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 3.

Step 4

1. Align 4x 2 to Step 3, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 2.
Step 5

1. Attach 5 to assembly. Do this by bending 5 while lowering into position. All rectangular cutouts (6x) in 5 need to align with hooks on 4. Note: It will be helpful to have multiple people to help with alignment.
2. Press 5 down firmly to ensure it is fully seated.

Step 6

1. Continue the process described in Step 4 by working around in a circular pattern until there is a total of 4x 5 installed. The orientation of overlaps should not matter (i.e. there is no need to worry about installing in a clockwise or counterclockwise manner). Note: It will be more difficult to seat 5 in overlapped locations - the final piece will be the most difficult.
2. Secure 5 to assembly using 20x 50 lb cable ties.
Hardware Needed:
- #8 x 0.5" Long Screw - Qty 4
- 1/4" Flat Washer - Qty 4
- 50 lb. cable ties - Qty 20

<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22191_AM-4674</td>
<td>Hub - Complex Build - Upper Hub Base for AM Agitator AM-4674</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22193</td>
<td>Hub - Complex Build - Upper Hub Lower Ring</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>TE-22194</td>
<td>Hub - Complex Build - Upper Hub Upper Ring</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>TE-22196</td>
<td>Hub - Complex Build - Upper Hub Vertical Support and Bracket Assembly</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>TE-22197</td>
<td>Hub - Complex Build - Upper Hub Plastic</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>AM-4674</td>
<td>AM Active Assembly</td>
<td>1</td>
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<tr>
<td>7</td>
<td>hex_25_20_1</td>
<td>Steel Hex Head Screw, 1/4&quot;-20 x 3/4&quot; long, fully threaded</td>
<td>48</td>
</tr>
<tr>
<td>8</td>
<td>nylock_25_20</td>
<td>Steel Nylon-Insert Locknut, 1/4&quot;-20</td>
<td>48</td>
</tr>
<tr>
<td>9</td>
<td>washer_flat_25</td>
<td>Flat Washer for 1/4&quot; Screw</td>
<td>48</td>
</tr>
</tbody>
</table>
1. Align 4x 4 to 1, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 4.
1. Align 4x 3 to Step 1, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 3.

1. Align 4x 2 to Step 2, as shown.
2. Connect using 4x 7, 4x 9, and 4x 8 per 2.
Step 4

1. Align 1x 5 to Step 3. Do this by bending 5 while lowering into position. The cutouts (6x) in 5 need to align with hooks on 4. Note: It will be helpful to have multiple people to aid with alignment.

2. Press 5 down firmly to ensure it is fully seated.

Step 5

1. Continue the process described in Step 4 by working around in a circular pattern until there is a total of 4x 5 installed. The orientation of overlaps should not matter (i.e. there is no need to worry about installing in a clockwise or counterclockwise manner). Note: It will be more difficult to seat 5 in overlapped locations - the final piece will be the most difficult.

2. Secure 5 to the assembly using 50 lb cable ties, as shown.
Step 6

Note - completion of this step will make installation of TE-22190-AMActive into TE-22100 more difficult. However, this step will be more difficult to complete when installed at the TE-22100 level. Consider your resources and proceed accordingly.

Align 6 to 1, as shown. Bolts in 6 should align with cutout in 1, as shown in Detail A.

Connect using 4x 0.5" long screws paired with and inserted through 4x 1/4" flat washers. Alternatively - drill holes in 1 and use 4x bolts with nuts (Nylock recommended) to fasten.

Wheel may need to be temporarily removed from 6 to fasten assembly down. Wheel should end up centered in assembly.
Hardware Needed:
- #8 x 0.5" Long Screw - Qty 4
- 1/4" Flat Washer - Qty 4
- 50 lb. cable ties - Qty 20

<table>
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<th>DESCRIPTION</th>
<th>QTY.</th>
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<td>TE-22194</td>
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<td>4</td>
<td>TE-22196</td>
<td>Hub - Complex Build - Upper Hub Vertical Support and Bracket Assembly</td>
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<td>5</td>
<td>TE-22197</td>
<td>Hub - Complex Build - Upper Hub Plastic</td>
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<td>AM-4673</td>
<td>Passive High Agitator</td>
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<td>washer_flat_.25</td>
<td>Flat Washer for 1/4&quot; Screw</td>
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UNLESS OTHERWISE SPECIFIED:
- DIMENSIONS ARE IN INCHES
- FRACTIONAL: $\frac{1}{16}$
- ANGULAR: Machined $1°$ Bend $\frac{1}{16}$
- TOLERANCES: Two Place Decimal, Three Place Decimal
- TOLERANCES: Two Place Decimal, Three Place Decimal

MATERIAL/FINISH:
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COMMENTS:
- REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

SIZE: 1:6
Dwg. No.: TE-22190-AMPassive
Rev.: C
Scale: 1:6
Sheet 1 of 5
Wheel may need to be temporarily removed from subassembly to access mounting holes.

Wheel should end up centered in assembly.

1. Align 4x to Step 1, as shown.
2. Connect using 4x, 4x, and 4x per .

Align to as shown. Bolts in should align with cutout in , as shown in Detail A.

Alternatively - drill holes in and use 4x bolts with nuts (nylock recommended) to fasten.
Step 3

1. Align 4x (3) to Step 2, as shown.
2. Connect using 4x (7), 4x (9), and 4x (8) per (3).

Step 4

1. Align 4x (2) to Step 3, as shown.
2. Connect using 4x (7), 4x (9), and 4x (8) per (2).
Step 5

1. Align 1x 5 to Step 3. Do this by bending 5 while lowering into position. The rectangular cutouts (4x) in 5 need to align with hooks on 4. Note: It will be helpful to have multiple people to help with alignment.

2. Press 5 down firmly to ensure it is fully seated.

Step 6

1. Continue the process described in Step 4 by working around in a circular pattern until there is a total of 4x 5 installed. The orientation of overlaps should not matter (i.e. there is no need to worry about installing in a clockwise or counterclockwise manner). Note: It will be more difficult to seat 5 in overlapped locations - the final piece will be the most difficult.

2. Secure 5 to assembly using 20x 50 lb cable ties, as shown.
Notes:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.
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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \( \frac{1}{16} \)
ANGULAR: MACH: \( \frac{1}{16} \)
TWO PLACE DECIMAL: \( \pm \frac{1}{16} \)
THREE PLACE DECIMAL: \( \pm \frac{1}{32} \)

MATERIAL/FINISH:
1/2" Plywood

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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
Notes:
1. Holes noted with A are used for cable ties that attach TE-22197. Consider match drilling, locations do not need to be precise.
2. Holes noted with B are for connection to TE-22196.
Notes:
1. Holes noted with A are used for cable ties that attach TE-22197. Consider match drilling, locations do not need to be precise.
2. Holes noted with B are for connection to TE-22196.
3. Holes noted with C are used to connect TE-22200. Consider locating one hole, and match drilling remaining.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL 1/16
ANGULAR MACH 1° BEND 1°
TWO PLACE DECIMAL .13
THREE PLACE DECIMAL .125

MATERIAL/FINISH:
1/2" Plywood

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COMMENTS:
REMOVE ALL BURRS AND SHARP
EDGES.
Step 1:
1. Attach 6x 1 to 1 using 6x 3 and 6x 4 as shown. Note orientation of 2.
Notes:

1. Holes labeled A are used for cable ties to attach this piece to TE-22193 and TE-22194. Consider match drilling, locations do not need to be precise.
2. Holes labeled B are for cable ties that tie adjacent pieces of TE-22197 to each other and to TE-22196.
3. Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.
Step 1:
1. Attach 1 to 2 using 3 and 4, as shown. Ensure the connection is slightly loose to allow for ease of assembly in future steps.
   Note that 1 should be on face opposite of vision tape.

Note:
Assembly will be bent to shape when attaching to Upper Hub.

<table>
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<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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<td>TE-22203</td>
<td>Hub - Complex Build - Vision Ring with Target Assembly</td>
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<td>nylock_25_20</td>
<td>Steel Nylon Insert Locknut, 1/4&quot;-20</td>
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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/16
ANGULAR, MACH ±1° BEND ±1°
TWO PLACE DECIMAL ±0.13
THREE PLACE DECIMAL ±0.025

MATERIAL/FINISH:
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COMMENTS:
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TITLE:
Hub - Complex Build - Upper Hub Vision Assembly

SIZE: Dwg. No. Rev
C TE-22200
SCALE: 1:3 SHEET 1 OF 2
Hub - Complex Build - Upper Hub Vision Ring Bracket

Material/Finish:
1.5" x 1.5" x .0625" Aluminum Angle, Cut to Size

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.001
THREE PLACE DECIMAL: ±0.0005

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DO NOT SCALE DRAWING

TEAM NAME DATE
KAMC 12/22/2021

SIZE: 2:1 SHEET 1 OF 1

C TE-22202

HUB - COMPLEX BUILD - UPPER HUB VISION RING BRACKET
Step 1:
1. Align 4x 2 to 1, as shown on Sheet 2. Note hole orientation on 1.
2. Connect 2 to 1 using the adhesive backing on 2.

Note:
Assembly will be bent to shape when attaching to Upper Hub.

ITEM NO. | PART NUMBER | DESCRIPTION | QTY.
---|---|---|---
1 | TE-22201 | Hub - Complex Build - Upper Hub Vision Ring Plastic | 1
2 | Reflective Tape, VISIONTARGET | 2" Wide, 5" Long Vision Target Tape | 4

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR, MACH: 1° BEND
TWO PLACE DECIMAL: 0.13
THREE PLACE DECIMAL: 0.125

MATERIAL/FINISH:
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COMMENTS:
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DO NOT SCALE DRAWING

TEAM NAME DATE
A A 12/22/2021
B B
C C
D D

SIZE DWG. NO. REV
C TE-22203
SCALE: 1:3 SHEET 1 OF 2
Notes:
1. Item 2 may be replaced with other equivalent parts. Excess hex shaft resulting from differences of shaft collar widths should protrude out bottom of assembly.
Step 1:
Fasten 3 to 1 using 6 and 5. 3 should be on the opposite face of the valve stem of 1.

Step 2:
Press a 4 into 8.

Step 3:
Press a 4 into 11.
Step 4:
Attach 11 and 8 to 7 using 1.25" long wood screws. It is recommended to use 4x screws per 7, 2x into each end.
Note flange orientation of 4 and 11. Flanges should be facing externally.

Step 5:
Slide components onto 9 as shown and tighten each 2. Shaft collars should be tightened such that everything is flush and snug. Excess shaft length should be adjust to below assembly.
Hub - Complex Build - Passive Agitator Top

Hole for .5" hex bearing

Dimensions are in inches

Fractions: 1/16

Angular Mach: 1° bend

Two place decimal: .13

Three place decimal: .125

Material/Finish: 1/2" Plywood

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Comments:

Remove all burrs and sharp edges.

Scale: 3:2

Sheet 1 of 1
Notes:
1. PVC may be replaced with equivalent length of hex spacer stock, or use of shaft collars.
Hub - Complex Build - Passive Agitator Bottom

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR MACH: 1° BEND, 1°
TWO PLACE DECIMAL: 0.13
THREE PLACE DECIMAL: 0.125

MATERIAL/FINISH: 1/2" Plywood

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:1
REVDWG. NO.

DO NOT SCALE DRAWING
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COMMENTS:
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-hole for 5/32 hex bearing

47/32