Hardware Needed:

- #8 x 1.25" Long Screw - Qty 16
- #8 x 2" Long Screw - Qty 32
- #8 x 2.5" Long Screw - Qty 20
- #8 x 3" Long Screw - Qty 16
- #10 x 3.5" Long Screw - Qty 64
- Wood Staples, Thumb Tacks, Tape, etc. for TE-22070 attachment

Optional, but encouraged: Safety Edging

Note:
1. Use TE-22000-AM if pairing with AndyMark Ring AM-4672.
2. 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.
Align B to 4 as shown. Note alignment information called out in Detail A.

Connect B to 4 using a fastener. Some recommendations would be Wood Staples, Thumb Tacks, or Tape.

Repeat 7x time, until there is a total of 8x B attached to 4.

Align edge of B with this edge. There will be a gap between B and the plywood ring of 4.
1. Align 4x (7) to 4 on the assembly from Step 2, as shown.
2. Connect using 3.5" long screws. It is recommended to use 8x screws per 7, 4x screws per 2"x4" lumber on 7. Note: Be mindful of screw placement into the 4"x4" lumber to ensure two screws do not collide.
3. Optional: It is recommended to install safety edging on 7 at this time. Safety edging could be pool noodles, baby proofing material, etc.

1. Align 4 to 5 as shown. Note the dimensions in Detail B. It is recommended to use 4x 1.25" long screws into each area indicated by A. It is recommended to use 5x 2.5" long screws into each area indicated by B.
2. Connect using 1.25" and 2.5" Long Screws. It is recommended to use 4x 1.25" long screws into each area indicated by A. It is recommended to use 5x 2.5" long screws into each area indicated by B.
### Step 4
1. Align 4x 1 to 5 from Step 3, as shown.
2. Connect using 3.5" long screws. It is recommended to use 8x screws per 1.

### Step 5
1. Align 4x 3 to corners created by 1's in Step 4, as shown.
2. Connect 3 to the surrounding 2x 1 using 2" long screws. It is recommended to use 8x screws per 3, 4x screws per 1.
Step 6

1. Align 4x 2 to each other, on top of 4x 3. Ideally, the triangular edges of 2 align with adjacent 3’s. If this does not occur, split the difference evenly amongst all 3’s.

2. Connect 2 to 3 using 3’ long screws. It is recommended to use 4x screws per 2, 2x per 3.

Note: Be careful not to screw too close to the edge of 3.

Step 7

1. Add 4x 6 to Step 6, as shown, by sliding into place. 6 does not rigidly attach to assembly.

Bottom View

Align ring of 2 to each other

SECTION F-F
Hardware Needed: 

#8 x 2" Long Screw - Qty 10

<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-22013</td>
<td>HUB - Basic Build - Fender Front Assembly</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22017</td>
<td>HUB - Basic Build - Fender Side Assembly</td>
<td>2</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:
- FRACTIONAL: ±1/16
- ANGULAR: ±1° BEND ±1/16
- 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

SCALE: 1:6

SHEET 1 OF 3
Step 1:
1. Align 2x 2 to 1 as shown.
2. Connect using 2" long screws. It is recommended to use 5x screws into each 2.
Step 1:
1. Align 2x 1 to 2 as shown, using dimensions provided on Sheet 2.
2. Connect using 2" long screws. It is recommended to use 7x screws into each 1.

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-22011</td>
<td>HUB - Simple Build - Fender Front</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>TE-22012</td>
<td>HUB - Simple Build - Fender Front Assembly</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: ±1°
  - TWO PLACE DECIMAL: ±0.03
  - THREE PLACE DECIMAL: ±0.003

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

TITLE: HUB - Basic Build - Fender Front Assembly

<table>
<thead>
<tr>
<th>SIZE</th>
<th>DWG. NO.</th>
<th>REV</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>TE-22013</td>
<td></td>
</tr>
</tbody>
</table>
Hardware:
#8 x 2" Long Screw - Qty 16
#8 x 2.5" Long Screw - Qty 8

<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-22014</td>
<td>HUB - Simple Build - Fender Side Horizontal 2x4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>TE-22015</td>
<td>HUB - Simple Build - Fender Vertical 2x4</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TE-22016</td>
<td>HUB - Simple Build - Fender Side</td>
<td>1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
- SCALE: 1:4
- PROPORTIONAL 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.
- MATERIAL/FINISH:
**Step 1**

1. Align 2x 1 and 2x 2, as shown.
2. Attach using 2.5" long screws. It is recommended to use 2x screws into each interface between a 2 and 1.

**Step 2**

1. Align 3 to the assembly made in Step 1, as shown.
2. Attach using 2" Long Screws. It is recommended to use 5x screws into each 2 and 3x screws into each 1.
Note:
1. Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.
2. Use TE-22021-Single if you are forming only 1/4 ring.
Hardware:
#8 x 1.25" Long Screw - Qty 8

Note: Use TE-22023-Single if you are only forming a 1/4 ring.

Step 1:
1. Align 2x as shown.
2. Connect using 1.25" long screws. It is recommended to use 8x screws. Screws should ONLY be placed around the arc. Avoid placing screws on the triangular ends.

ITEM NO.  PART NUMBER  DESCRIPTION  QTY.
1  TE-22021-Multiple  Hub - Simple Build - Lower Hub Ring  2
Note: Use Assembly TE-22030-AM if pairing with AndyMark’s Upper Hub Vision Ring Assembly (AM-4672)

Hardware Needed:
#8 x 1.25” Long Screw - Qty 12
#8 x 2" Long Screw - Qty 48
#10 x 3.5" Long Screw - Qty 16

<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-22036</td>
<td>Hub - Simple Build - Upper Hub Goal 4x4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22038</td>
<td>Hub - Simple Build - Upper Hub Goal Bottom Assembly</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-22037</td>
<td>Hub - Simple Build - Upper Hub Goal Rectangle Connection Plate</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>TE-22034</td>
<td>Hub - Simple Build - Upper Hub Full Ring 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: 0.13
THREE PLACE DECIMAL: 0.125

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

TEAM | NAME | DATE
--- | --- | ---
| | | 12/30/2021

SIZE | DWG. NO. | REV
--- | --- | ---
C | TE-22030 | -
Step 1

1. Align 4x 1 to 2, as shown.
2. Connect using 2" Long Screws. It is recommended to use 4x screws per 1.

Step 2

1. Align 4x 3 to Step 1, as shown.
2. Attach 3 to 1 using 2" Long Screws. It is recommended to use 8x screws per 3, 4x into each 1.
3. Attach 3 to the 2"x4" Lumber of 2 using 1.25" Long Screws. It is recommended to use 3x screws per 3. Be careful to center the screw into the 2"x4" Lumber to avoid splitting the wood.
1. Align 4 to Step 2, as shown. Note the orientation of 4.
   Note: Warping may be present on 1. If this is the case, evenly split the difference from the dimensions provided in Detail C to center 4 on assembly.

2. Connect using 3.5" Long Screws. It is recommended to use 4x screws into each 1.
Note:

Radii located at internal corners are provided predominately for routed parts. Corners with 90 degree angles are sufficient for clearance.

<table>
<thead>
<tr>
<th>Team</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAMC</td>
<td></td>
<td>12/29/2021</td>
</tr>
</tbody>
</table>

**Title:** Hub - Simple Build - Upper Hub Ring

**Material/Finish:**

3/4" Plywood

**Scale:** 1:4

**Drawing Number:** TE-22031
Hardware Needed:
#8 x 1.25" Long Screw - Qty 5

Step 1:
1. Align 2x , as shown.
2. Connect using 1.25" long screws. It is recommended to use 5x screws. Screws should ONLY be placed around the arc. Avoid placing screws on the triangular ends.
UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \( \frac{1}{16} \)
ANGULAR: Mach 1° BEND 1°
TWO PLACE DECIMAL: 0.125
THREE PLACE DECIMAL: 0.125

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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 - Simple Build - Upper Hub Ring Assembly

TEAM
NAME
DATE
12/30/2021

DRAWN
KAMC

REVDWG. NO.

SIZE
DWG. NO.
C
TE-22033

SCALE: 1:4

SHEET 2 OF 2
Hardware Needed:

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22032</td>
<td>Hub - Simple Build - Upper Hub Ring Connection Plate</td>
</tr>
<tr>
<td>2</td>
<td>TE-22033</td>
<td>Hub - Simple Build - Upper Hub Ring Assembly</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

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

MATERIAL/FINISH:

- REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
Step 1
1. Align 4x(2), as shown. Attachment will happen in next step.

Step 2
1. Align 4x(1) onto the ring formed in Step 1, as shown.
2. Connect using 2" long screws. It is recommended to use only 2x screws towards the center of 1, one into each 2. This will ensure there is room for connection when added to TE-22030.
Hardware Needed:

- #8 x 2" Long Screw - Qty 58

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22005</td>
<td>Hub - Simple Build - Upper Hub Square Connection Plate</td>
</tr>
<tr>
<td>2</td>
<td>TE-22006</td>
<td>Hub - Simple Build - Upper Hub 2x4 Connection Plate</td>
</tr>
<tr>
<td>3</td>
<td>TE-22035</td>
<td>Hub - Simple Build - Upper Hub Goal 2x4 Bottom Assembly</td>
</tr>
</tbody>
</table>
Note:
Dimensions with A indicate spacing for 4"x4" lumber from TE-22036 (or TE-22036-AM if you are connecting to AndyMark's Upper Hub Vision Ring AM-4672). It is recommended to measure the cross section of TE-22036 (or TE-22036-AM) and modify these dimensions as needed.
1. Align 2x 2 on 3, as shown.
2. Connect using 2" long screws. It is recommended to use 2x screws per 2 and locate them as shown above. Keep center of 2 clear of screws.
3. Repeat until you have a total of 4x sub-assemblies.

1. Align 4x 1 to the 4x Step 1 assemblies, as shown.
   - Dimensions with A indicate spacing for 4"x4" lumber from TE-22036 (or TE-22036-AM if you are connecting to AndyMark's Upper Hub Vision Ring AM-4672). It is recommended to measure the cross section of TE-22036 (or TE-22036-AM) and modify these dimensions as needed.
   - Connect using 2" long screws. It is recommended to use 8x screws per 3, 4x into each end.
Hardware Needed:
- #8 x 1.25" Long Screw - Qty 12
- #8 x 2" Long Screw - Qty 80

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22042</td>
<td>Hub - Simple Build - Upper Hub Base 4x4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22043</td>
<td>Hub - Simple Build - Upper Hub Base Rectangle Connection Plate 8</td>
</tr>
<tr>
<td>3</td>
<td>TE-22044</td>
<td>Hub - Simple Build - Upper Hub Base Top Assembly 1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
- 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 4x (1) to (3) as shown.
2. Connect using 2" Long Screws. It is recommended to use 4x screws per (1).

Step 2

1. Align 4x (2) to Step 1 as shown.
2. Attach (2) to (1) using 2" Long Screws. It is recommended to use 8x screws per (2), 4x into each (1).
3. Attach (2) to the 2"x4" Lumber of (3) using 1.25" long screws. It is recommended to use 3x screws per (2). Be careful to center the screw into the 2"x4" Lumber to avoid splitting the wood.
Step 3

1. Align 4x 2 to Step 2, as shown.

2. Attach 2 to 1 using 2" Long Screws. It is recommended to use 8x screws per 2, 4x into each 1.
Hardware Needed:

- #8 x 2" Long Screw - Qty 58

<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-22005</td>
<td>Hub - Simple Build - Upper Hub Square Connection Plate</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22006</td>
<td>Hub - Simple Build - Upper Hub 2x4 Connection Plate</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>TE-22041</td>
<td>Hub - Simple Build - Upper Hub Base 2x4</td>
<td>4</td>
</tr>
</tbody>
</table>
Note:
Dimensions with A indicate spacing for 4’x4’ lumber from TE-22042. It is recommended to measure the cross section of TE-22042 and modify these dimensions as needed.
Step 1

1. Align 2x 2 on 3, as shown.
2. Connect using 2" long screws. It is recommended to use 2 screws per 2 and locate them as shown above. Keep center of 2 clear of screws.
3. Repeat until you have a total of 4 assemblies.

Step 2

1. Align 4x 1 to the x4 Step 1 assemblies, as shown.
   - Dimensions with A indicate spacing for 4x4" lumber from TE-22042. It is recommended to measure the cross section of TE-22042 and modify these dimensions as needed.
2. Connect using 2" long screws. It is recommended to use 8 screws per 4x4 into each end.
Hardware Needed:

- #8 x 1.25" Long Screw - Qty 8

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22052</td>
<td>HUB - Simple Build - Lower Exit Base Back</td>
</tr>
<tr>
<td>2</td>
<td>TE-22053</td>
<td>HUB - Simple Build - Lower Exit Base Connection</td>
</tr>
<tr>
<td>3</td>
<td>TE-22055</td>
<td>HUB - Simple Build - Lower Exit Front with Loop Assembly</td>
</tr>
<tr>
<td>4</td>
<td>TE-22056</td>
<td>HUB - Simple Build - Lower Exit 2x4 with Hook Assembly</td>
</tr>
</tbody>
</table>

Scale: 1:3  SHEET 1 OF 3
1. Align 3 to 1, as shown. Connection will happen in the next step.

1. Align 2 to Step 1, as shown.
2. Connect using 1.25" Long Screws. It is recommended to use 8x screws, 4x into 3 and 4x into 1.

1. Add 2x 4 to hook on 3, as shown.
14.75 [4 1/4]

13.25 [3 1/4]

72 [2 3/16]

3/4" Plywood

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL: ±.001
THREE PLACE DECIMAL: ±.0005

MATERIAL/FINISH:
3/4" Plywood

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:2

REVDWG. NO.

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/29/2021

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.

HUB - Basic Build - Lower Exit Base Front

TE-22051

SIZE DWG. NO. REV

SCALE: 1:2 SHEET 1 OF 1
UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:
- FRACTIONAL: ±\(\frac{1}{16}\)
- ANGULAR: MACH ±\(\frac{1}{18}\) BEND ±\(\frac{1}{16}\)
- TWO PLACE DECIMAL: ±\(\frac{1}{13}\)
- THREE PLACE DECIMAL: ±\(\frac{1}{125}\)

MATERIAL/FINISH:
- 2"x4" Lumber

DO NOT SCALE DRAWING

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.

UNLESS OTHERWISE SPECIFIED:

SCALE: 2:3

TITLE:
HUB - Simple Build - Lower Exit 2x4

TEAM DRAWN DATE

权益所有

第一机器人

任何部分或整体的复制，未经FIRST®的书面许可，均属禁止。
Step 1:
1. Attach 2x 1 to 2 as shown using adhesive backing.
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>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loop_1_13.25</td>
<td>1&quot; x 13.25&quot; Loop, Adhesive Backed</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>TE-22051</td>
<td>HUB - Basic Build - Lower Exit Base Front</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: ±.013
- THREE PLACE DECIMAL: ±.005

MATERIAL/FINISH:

Do not scale drawing.
Attach 2 to 1 as shown using adhesive backing.
Optional: Use wood staples to connect 2 to 1.

Hardware Needed:
Optional: Wood Staples

<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-22054</td>
<td>HUB - Simple Build - Lower Exit 2x4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Hook_1_13.25</td>
<td>1&quot; x 13&quot; Hook, Adhesive Backed</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: ±0.001
THREE PLACE DECIMAL: ±0.0005

MATERIAL/FINISH:

PROCEDURAL 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
HUB - Simple Build -
Lower Exit 2x4 with Hook Assembly

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \( \frac{1}{16} \)
ANGULAR: MACH: \( \pm 1^\circ \) BEND: \( \pm 1^\circ \)
TWO PLACE DECIMAL: \( \pm \frac{1}{32} \)
THREE PLACE DECIMAL: \( \pm \frac{1}{64} \)

MATERIAL/FINISH:

DO NOT SCALE DRAWING

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:
REMOVAL OF ALL BURRS AND SHARP EDGES.

TEAM | NAME | DATE
---- | ---- | ----
TEAM A | A | DATE A
TEAM B | B | DATE B
TEAM C | C | DATE C
TEAM D | D | DATE D

SIZE | DWG. NO. | REV
---- | ------ | ----
SCALE: 2:3 | TE-22056 | SHEET 2 OF 2
Step 1:
1. Align 1 and 2, as shown on Sheet 2.
2. Connect using 2" Long Screws. It is recommended to use 6x screws.

### Hardware Needed:

- **#8 x 2" Long Screw** - Qty 6

### Exploded View

#### Step 1:
1. Align 1 and 2, as shown on Sheet 2.
2. Connect using 2" Long Screws. It is recommended to use 6x screws.

#### 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-22064</td>
<td>Hub - Simple Build - Upper Exit Chute Assembly</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22068</td>
<td>Hub - Simple Build - Upper Exit Connection Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>
4.25 4 1
4 "
5°
31.00
40.47 40 15
32"
to virtual intersection
16"
12/30/2021
KAMC
UNLESS OTHERWISE SPECIFIED:
SCALE: 1:6
REVDWG. NO.
C
SIZE
TITLE:
NAME DATE
DRAWN
TEAM
MATERIAL/FINISH:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1°
BEND 18°
TWO PLACE DECIMAL: 0.13
THREE PLACE DECIMAL: 0.125
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.
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED:
SCALE: 1:6
SHEET 2 OF 2
TE-22060
C
Hub - Simple Build - Upper Exit Chute Base

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.

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.

Title: TE-22063

Scale: 1:3

Sheet 1 of 1

Team: C

Drawn: KAMC

Date: 12/29/2021

UNLESS OTHERWISE SPECIFIED:
SCALE: 1:3

Comments:
- Remove all burrs and sharp edges.

Team Name Date

Material/Finish

Dimensions are in inches. Tolerances:
- Fractional: ±1/16
- Angular: Mach, ±1° bend, ±1°
- Two place decimal: ±0.13
- Three place decimal: ±0.125

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 - Simple Build - Upper Exit Chute Base

Team: C

Drawn: KAMC

Date: 12/29/2021

Material/Finish: 3/4" Plywood

Dimensions are in inches. Tolerances:
- Fractional: ±1/16
- Angular: Mach, ±1° bend, ±1°
- Two place decimal: ±0.13
- Three place decimal: ±0.125

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.
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TE-22061</td>
<td>Hub - Simple Build - Upper Exit Connection Plate 1</td>
</tr>
<tr>
<td>2</td>
<td>TE-22062</td>
<td>Hub - Simple Build - Upper Exit Chute End 1</td>
</tr>
<tr>
<td>3</td>
<td>TE-22063</td>
<td>Hub - Simple Build - Upper Exit Chute Base 1</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:

- SCALE: 1:5
- MATERIAL/FINISH:
- DIMENSIONS ARE IN INCHES
- TOLERANCES:
  - FRACTIONAL: ±1/16
  - ANGULAR, MACH.: ±1° BEND ±1/16
  - TWO PLACE DECIMAL: ±0.003
  - THREE PLACE DECIMAL: ±0.0005
- 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
1. Align 3 to 2, as shown. Connection will happen in the next step.

2. Align 1 to Step 1, as shown.

3. Connect using 1.25" Long Screws. It is recommended to use 8x screws, 4x screws into 3 and 4x screws into 2.
Hub - Simple Build -
Upper Exit Connection
Box Side

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \( \frac{\text{1}}{16} \)
ANGULAR, MACH:\( \pm 1^\circ \) BEND \( \pm 1\)\(^\circ\)
TWO PLACE DECIMAL \( \pm 0.13 \)
THREE PLACE DECIMAL \( \pm 0.125 \)
MATERIAL/FINISH:
3/4" Plywood

DO NOT SCALE DRAWING

TEAM | NAME | DATE
--- | --- | ---

COMMENTS:
- REMOVE ALL BURRS AND SHARP EDGES.

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.
Exploded View

Hardware Needed:

#8 x 2" Long Screw - Qty 24
#8 x 2.5" Long Screw - Qty 8

<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-22065</td>
<td>Hub - Simple Build - Upper Exit Connection Box 2x4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>TE-22061</td>
<td>Hub - Simple Build - Upper Exit Connection Plate</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TE-22066</td>
<td>Hub - Simple Build - Upper Exit Connection Box Side</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>TE-22067</td>
<td>Hub - Simple Build - Upper Exit Connection 2x4</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: 

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.

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.

Team: Kamc

Drawn: Kamc 12/30/2021
1. Align 2x (1) and (2), as shown.
2. Connect using 2" Long Screws. It is recommended to use 3x screws per (1).
3. Repeat until you have a total of 2 assemblies.

Circle 2x 1 and 2, as shown.

Connect using 2" Long Screws. It is recommended to use 3x screws per 1.

Repeat until you have a total of 2 assemblies.

1. Align 2x (3) to 2x Step 1 assemblies, as shown. Note the alignment information called out in Detail A.
2. Connect using 2" Long Screws. It is recommended to use 3x screws into each 1. Screws should not be used to attach 3 to 2.

Align back corner of 1 with edge of 3.
Note: 1 should not extend past 3.

1. Align 2x (4) to Step 2, as shown. Note dimension in Detail B.
2. Connect using 2.5" Long Screws. It is recommended to use 2x screws per 1.

Dimension in Detail B:

- 5°
- .13 8"
Step 1:
1. Align 2x 2 to 1, as shown on Sheet 2.
2. Connect 2 to 1 using the adhesive backing on 2.

Notes:
1. Assembly will be bent to shape when attaching to Upper Hub.
2. Poster board can be replaced with other similar thin, flexible materials.

<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-22071</td>
<td>Hub - Simple Build - Vision Backing</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Reflective Tape_VISIONTARGET</td>
<td>2&quot; Wide, 5&quot; Long Vision Target Tape</td>
<td>2</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
- DIMENSIONS ARE IN INCHES
- TOLERANCES:
  - FRACTIONAL: \( \pm \frac{1}{16} \)
  - ANGULAR: \( \pm 1° \)
  - BEND: \( \pm \frac{1}{16} \)
  - THREE PLACE DECIMAL: \( \pm 0.005 \)

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

TITLE: Hub - Simple Build - Vision Assembly

C
TE-22070
SCALE: 1:2
SHEET 1 OF 2

DRAWN: CO
DATE: 12/30/2021
Notes:
1. Part will be bent to shape when attaching to Upper Hub.
2. Poster board can be replaced with other similar thin, flexible materials.