Note: 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.

Hardware Needed:
- #8 x 1.25" Long Screw - Qty 16
- #8 x 2.5" Long Screw - Qty 20
- #10 x 3.5" 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-22010</td>
<td>Hub - Simple Build - Fender Assembly</td>
</tr>
<tr>
<td>2</td>
<td>TE-22040</td>
<td>Hub - Simple Build - Upper Hub Base Assembly</td>
</tr>
<tr>
<td>3</td>
<td>TE-22030-AM</td>
<td>Hub - Simple Build - Upper Hub Goal Assembly for AM Ring AM-4672</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: ±0.001

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.

NAME DATE
KAMC 1/4/2022

TEAM DRAWN

FIRST® ROBOTICS COMPETITION

TITLE: Hub - Simple Build - Full Upper Hub for AndyMark Ring AM-4672 + 1/4 Fender Assembly

SIZE DWG. NO. REV
C TE-22002-AM

SCALE: 1:12 SHEET 1 OF 3
1. Align 3 to 2, as shown. Note the dimensions in Detail A.
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.

1. Align Step 1 as shown.
2. Connect using 3.5" long screws. It is recommended to use 4x screws into each vertical leg of 2. The screw head should be on the 2"x4" lumber of 1.

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

MATERIAL/FINISH:
DO NOT SCALE DRAWING

COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

TE-22002-AM
SCALE: 1:24 SHEET 3 OF 3

Title: Hub - Simple Build - Full
Upper Hub for AndyMark Ring AM-4672
+ 1/4 Fender Assembly
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</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>
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.
HUB - Simple Build - Fender Front Horizontal 2x4

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: 2"x4" Lumber

Comments: Remove all burrs and sharp edges.

UNLESS OTHERWISE SPECIFIED:

PROJECT TITLE: HUB - Simple Build - Fender Front Horizontal 2x4

DRAWN BY: KAMC
DATE: 12/29/2021

SCALE: 1:3

DO NOT SCALE DRAWING

TEAM
NAME
DATE

THREE PLACE DECIMAL
.125

FRACTIONAL: ±1/16

ANGULAR: MACH: ±1° BEND: ±1°

TWO PLACE DECIMAL: ±0.13

MATERIAL/FINISH:
2"x4" Lumber

DIAGRAMS ARE REPRODUCIBLE.

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.

DATE
12/29/2021

KAMC

DRAWN

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:
2"x4" Lumber

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.

DRAWN

KAMC

DATE
12/29/2021

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:
2"x4" Lumber

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.
Step 1:
1. Align 2x1 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</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: 1/16
TWO PLACE DECIMAL .13
THREE PLACE DECIMAL .125

MATERIAL/FINISH:

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.

DO NOT SCALE DRAWING

COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.
DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: \(\frac{1}{16}\) ANGULAR: \(1^\circ\) BEND: \(\frac{1}{16}\)
TWO PLACE DECIMAL: \(0.13\) THREE PLACE DECIMAL: \(0.125\)

MATERIAL/FINISH:
2"x4" Lumber

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

UNLESS OTHERWISE SPECIFIED:

- SCALE: 1:4
- SIZE: 1:4
- SHEET 1 OF 3

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.

MATERIAL/FINISH:

- REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING
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.

Hidden Lines Shown

Align Edges

Align Edges

Align Edges

Align Edges

Align Edges

Align Edges
Note: Use Assembly TE-22030-AM if pairing with AndyMark’s AM-4672 Assembly

Hardware Needed:

- #8 x 1.25" Long Screw - Qty 12
- #8 x 2" Long Screw - Qty 60

<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-AM</td>
<td>Hub - Simple Build - Upper Hub Goal 4x4 for AM Ring AM-4672</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>AM-4672</td>
<td>AndyMark Produced - Upper Hub Vision Ring</td>
<td>1</td>
</tr>
</tbody>
</table>
1. Align 4x1 to 2, as shown.
2. Connect using 2" Long Screws. It is recommended to use 4x screws per 1.

1. Align 4x3 to Step 1, as shown.
2. Attach 3 to 1 using 2" Long Screws. It is recommended to use 4x 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 3 screws per 3. Be careful to center the screw into the 2"x4" Lumber to avoid splitting the wood.
1. Remove center bolt stack from 4 as shown in Detail C.
2. Align 4 to Step 2, as shown.
   Note: Warping may be present on 1. If this is the case, evenly split the difference from the dimensions provided
to center 4 on assembly.
3. Connect using 2" Long Screws and 1/4" Washers. It is recommended to use 1x Washer (salvage from AM-4672) and
   1x Screw to replace the removed bolt stack. It is recommended to use an additional 2x screws into the HDPE of
   4 into each 1. Note: drilling under-sized pilot holes into the HDPE may allow for easier assembly.
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-2205</td>
<td>Hub - Simple Build - Upper Hub Square Connection Plate</td>
</tr>
<tr>
<td>2</td>
<td>TE-2206</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 Bottom Assembly</td>
</tr>
</tbody>
</table>

#8 x 2" Long Screw - Qty 58

**NOTES:**

- REMOVE ALL BURRS AND SHARP EDGES.

**SCALE:** 1:6

**DRAWN:** KAMC

**DATE:** 12/30/2021

**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:**

**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.
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.
Align to Edge

Place Screw Approximately Here

2X DETAIL A
SCALE 1 : 4

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.

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.
2. 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</td>
</tr>
<tr>
<td>3</td>
<td>TE-22044</td>
<td>Hub - Simple Build - Upper Hub Base Top Assembly</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/16
ANGULAR: MACH 1° BEND, 1/16
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

TITLE:
Hub - Simple Build - Upper Hub Base Assembly

DRAWN: KAMC 12/30/2021

SIZE: 1:12
REV: C

SHEET: 1 OF 4
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.
Exploded View

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 Top Assembly</td>
<td>4</td>
</tr>
</tbody>
</table>

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±1/16
ANGULAR: MACH±1° BEND: ±1°
TWO PLACE DECIMAL: ±1/10
THREE PLACE DECIMAL: ±1/100

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
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 x2 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 x8 screws per 2, 4x into each end.

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

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