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<td>Flipped orientation of TE-18001-01 so that the EXCHANGE opening is on the correct side.</td>
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Using wood screws, attach the two leg assemblies to Item 1, so that the 2x4 is flush with the edge of the plywood. Place Item 4 between the two leg assemblies and secure with screws.

Attach Item 2 (Qty. 2) and Item 3 (Qty. 2) as shown with wood screws. Build two total.
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 1
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
NOTES:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 1
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Create leg assemblies by attaching Item 4 (qty. 2) to Items 2 and 3 with wood screws as necessary. Qty. 2.

Attach two leg assemblies to Item 1 as shown using wood screws.
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 1
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Note: The width of this platform varies from the field version to reduce cost. The top face of this platform is 96" wide, while the field version is 104".

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Step 1: Attach Item 1 and Item 2 (qty: 2) to Item 5 using wood screws. Build 2 identical assemblies.

Step 2: Attach Item 4 and Item 7 to Item 5 using wood screws. Repeat for the second assembly.

Step 3: Use wood screws to attach the identical assemblies together, with Item 2 (qty: 2) in the middle.
Step 4: Use wood screws to fasten Item 3 (qty: 2) to Item 4 (qty: 2), and Item 6 (qty: 2) to Item 7 (qty: 2).
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 6
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
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Step 1: Attach Item 4 (qty. 8) to Item 2 as shown with wood screws.

Step 2: Attach Item 2 to assembly as shown with wood screws.

Step 3: Attach Item 3 (qty. 4) to assembly as shown with wood screws.

Step 4: Attach Item 1 (qty. 2) to assembly as shown with wood screws.
Step 5: Attach Item 5 (qty. 2) to assembly as shown with wood screws.

Step 6: Attach Item 7 (qty. 4) and Item 8 (qty. 2) to Item 2 as shown with wood screws or staples. When using screws, pre-drill to avoid splitting.

Place Item 6 as shown, but do not attach.
NOTES:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 8
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 1.5" Diameter Wood Dowel (Any Wood)
2. QTY. Needed: 1
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
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**Fence**

Dimensions are in inches. Tolerances: Fractional ±1/16, Angular ±0°, 1° bend. Two place decimal ±.01, Three place decimal ±.001. Interpret geometric tolerancing per: ASME Y14.5M. Use this drawing on next assembly. Proprietary and confidential. The information contained in this drawing is the sole property of [insert company name here]. Any reproduction in part or as a whole without the written permission of [insert company name here] is prohibited.
Step 1: Attach Item 5 to Item 1 with wood screws. Build 4.

Step 2: Attach Item 10 (qty. 2) and Item 6 to Item 2 with wood screws. Build 2.

Step 3: Attach Item 4 (qty. 2) to Item 3 with wood screws. Build 4.

Step 4 (optional): Attach Item 7 (qty. 2) to Item 8 with wood screws. Only build if team is using vision targets.

Fence

Step 3: Attach Item 4 (qty. 2) to Item 3 with wood screws. Build 4.
Step 2 Subassembly

Step 1 Subassembly

Step 3 Subassembly

Step 4 Subassembly (Optional)

Step 5: Attach all subassemblies as shown using wood screw. Predrill to avoid splitting.

Vision Target Tape (Optional)

Step 6 (Optional): Attach vision tape as shown.
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 3" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 2" x 3" Pine Lumber
2. QTY. Needed: 8
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 2" x 3" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
3. This part is only necessary for use with an optional vision target component of the assembly. If retroreflective tape is not going to be applied, this part is not necessary.
4. The 1.75" material height may be undersized to allow for cutting blade thickness.
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 1
3. This part is only necessary for use with an optional vision target component of the assembly. If retroreflective tape is not going to be applied, this part is not necessary.
4. The 1.75" material height may be undersized to allow for cutting blade thickness.
Notes:
1. Material: 2" Retroreflective tape
2. QTY. Needed: 2
3. This part is only necessary for use with an optional vision target component of the assembly.
Notes:
1. Material: 2" x 3" Pine Lumber (1.5" x 2.5" actual)
2. Qty. needed: 6
Align parts as shown and secure with wood screws or staples.

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**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
- INTERPRET GEOMETRIC TOLERANCING PER:
  - MATERIAL
  - FINISH

**COMMENTS:**

- Q.A.
- MFG APPR.
- ENG APPR.
- CHECKED
- DRAWN

**PROPERTY 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.
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 1
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Lumber
2. QTY. Needed: 2
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REVISIONS

ZONE: A2, B3
REV.: A
DESCRIPTION: Updated to include updates to TE-18007-3, TE-18007-4, TE-18007-10, TE-18007-11. BOM sorted.
DATE: 1/12/2018
APPROVED:
Step 1: Attach as shown with wood screws. Build qty. 2.

Step 2: Attach as shown with wood screws. Use wooden dowel to help align Item 4 (qty. 2). Only attach with 2 screws until final assembly.
Step 3: Attach two assemblies from Step 1 to the main assembly. When attaching items 1, 10 and 11, ensure that dowel is level and the top surface is 84” from the ground. Use wood screws to keep dowel from rotating.

Do not fasten Item 2.
Notes:
1. Material: 1.5" dowel rod
2. QTY. Needed: 2
Notes:
1. Material: 1.5" dowel rod
2. QTY. Needed: 1
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 6
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
### Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2

### Table

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**Title:**

**Size:** A

**DWG. No.:** TE-18007-5

**Rev:**

**Scale:** 1:8

**Weight:**

**Sheet:** 1 of 1
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 6
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
2x Ø 1.50 THRU

38.25

1.13

Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
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**BOM Table Sorted by PART NUMBER:** Notes changed throughout to match new ITEM NO.

**Zone: REV. DESCRIPTION DATE APPROVED**

- A2 A BOM table sorted by PART NUMBER. Notes changed throughout to match new ITEM NO. 1/12/2018 CPO
Step 1: Attach Item 6 (qty. 2) and Item 5 to Item 7 as shown using wood screws. Build 2 identical assemblies.

Step 2: Attach Item 4 (qty. 2) to the two assemblies from Step 1 using wood screws.

Step 3: Attach Item 8 (qty. 2) as shown using wood screws.

Step 4: Attach Item 2 (qty. 2) as shown using wood screws. There should be a 1/2" overhang on each side.

Step 5: Attach Item 1 (qty. 4) and as shown using wood screws. Flip assembly over and attach Item 2 (qty. 2).
Step 6: Attach Item 11 (qty. 2) as shown using wood screws.

Step 7: Attach Item 3 (qty. 2) as shown using wood screws.

Step 8: Attach Item 9 (qty. 4) and Item 10 (qty. 2) and as shown using wood screws or staples. Pre-drill holes to avoid splitting.
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2” x 4” Pine Lumber
2. QTY. Needed: 4

Material: 2" x 4" Pine Lumber

Material: 2x4

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/16
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL ± .01
THREE PLACE DECIMAL ± .001

INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH

UNLESS OTHERWISE SPECIFIED:

COORDINATE SYSTEM
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:

APPLICATION
DO NOT SCALE DRAWING

FIRST® Robotics Competition
SOLIDWORKS

PROPRIETARY AND CONFIDENTIAL
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Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 3/4" AC Plywood
2. QTY. Needed: 2
NOTE: Two of these assemblies will be required to build all elements.

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</table>
Item 3 flush to Item 5. Secure with staples or screws. Pre-drill in all steps to avoid splitting.

Item 1 flush to Item 3. Secure with staples or screws.

Item 6 flush to Item 5. Secure with staples or screws.

Item 4 flush to Item 6. Secure with staples or screws.
Item 2 flush to Item 3. Secure with staples or screws.

Place Item 7 in slot. Should be able to move freely.
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 4
Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 4
Notes:
1. Material: 1" Dowel Rod
2. QTY. Needed: 2
<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-18010-02</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-18010-03</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-18010-04</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>TE-18010-05</td>
<td></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: ±.01
  - THREE PLACE DECIMAL: ±.001
- INTERPRET GEOMETRIC TOLERANCING PER:
  - MATERIAL
  - APPLICATION
- FINISH
- NEXT ASSY
- USED ON
- DO NOT SCALE DRAWING

**TITLE:** Ramp, Exchange

**NAME DATE**

**DRAWN**

**CHECKED**

**ENG APPR.**

**MFG APPR.**

**Q.A.**

**COMMENTS:**
Align Item 1 and Item 2 as shown. Fasten with wood screws.

Attach Item 3 and Item 4 as shown. Fasten with wood screws. Build a qty. of two.
For Kickoff, assemble using tape at the seams, and to the floor.
Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 1
Please exercise caution when cutting chamfer. If you feel the cut is too dangerous, cut a simplified 4.75" x 24" piece of plywood. Both versions will be able to represent the assembly, but the chamfered will be closer to the real design.

Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 1
Please use caution when making chamfers. If you are unable to make this part, it may be omitted. It's a nice-to-have, not mandatory.

Notes:
1. Material: 2" x 4" Pine Lumber
2. QTY. Needed: 2
Please exercise caution when cutting chamfer. Please note, if you feel you are unable to make this part, it can be omitted.

Notes:
1. Material: 1/2" AC Plywood
2. QTY. Needed: 2
<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-18002</td>
<td>Portal</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-18009</td>
<td>Chute Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table Notes:**
- **ITEM NO.**
- **PART NUMBER**
- **DESCRIPTION**
- **QTY.**

**Diagram Notes:**
- **TITLE:** Portal Full Assembly
- **SCALE:** 1:8
- **WEIGHT:**

**Drawing Information:**
- **DRAWN**
- **CHECKED**
- **ENG APPR.**
- **MFG APPR.**

**Interpret Geometric Tolerancing Per:**
- **DIMENSIONS ARE IN INCHES**
- **TOLERANCES:**
  - **FRACTIONAL**
  - **ANGULAR:**
    - MACH 1° BEND
  - **TWO PLACE DECIMAL**
  - **THREE PLACE DECIMAL**

**Material:**
- **FINISH**

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Align Item 2 as shown.
Fasten using wood screws.

Flush and centered.
<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-18001</td>
<td>Exchange</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-18009</td>
<td>Chute Assembly</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-18010</td>
<td>Ramp, Exchange</td>
<td>1</td>
</tr>
</tbody>
</table>
Step 1: Align Item 2 so it is flush and centered with the top opening. Fasten using wood screws.

Step 2: Align Item 3 so it is flush and centered with the bottom opening. Affix to floor using tape or hook and loop.
<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-18006</td>
<td>Switch Frame</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-18004</td>
<td>Switch Arm</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-18005</td>
<td>Fence</td>
<td>1</td>
</tr>
</tbody>
</table>

**Item Details:**
- **Title:** Switch Full Assembly
- **Sheet:** 1 of 2
- **Scale:** 1:16
- **Weight:**
- **Comments:**

**Tolerances:**
- Dimensions are in inches, tolerances are ±1/16.
- Angular: Mach 1° bend ±1°.
- Two place decimal: .01.
- Three place decimal: .001.

**Interpret Geometric Tolerancing Per:**

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Approximately flush, both ends.

Step 1: Insert Item 1 into the middle of Item 3. Fasten with wood screws.

Step 2: Attach Item 2 to Item 1 using the shaft (TE-18004-06) from Item 1. Shaft will have to be removed prior to installation.
<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-18007</td>
<td>Scale Frame</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TE-18008</td>
<td>Scale Arm</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>TE-18003</td>
<td>Platform</td>
<td>2</td>
</tr>
</tbody>
</table>
Step 1: Assemble Item 2 to Item 1 using the Scale Shaft (TE-18007-2). Shaft will have to be removed prior to installation.

Step 2: Complete Item 2 by attaching the Baskets (see TE-18008).
Step 3: Place Item 3 (qty: 2) flush and centered against Item 1.