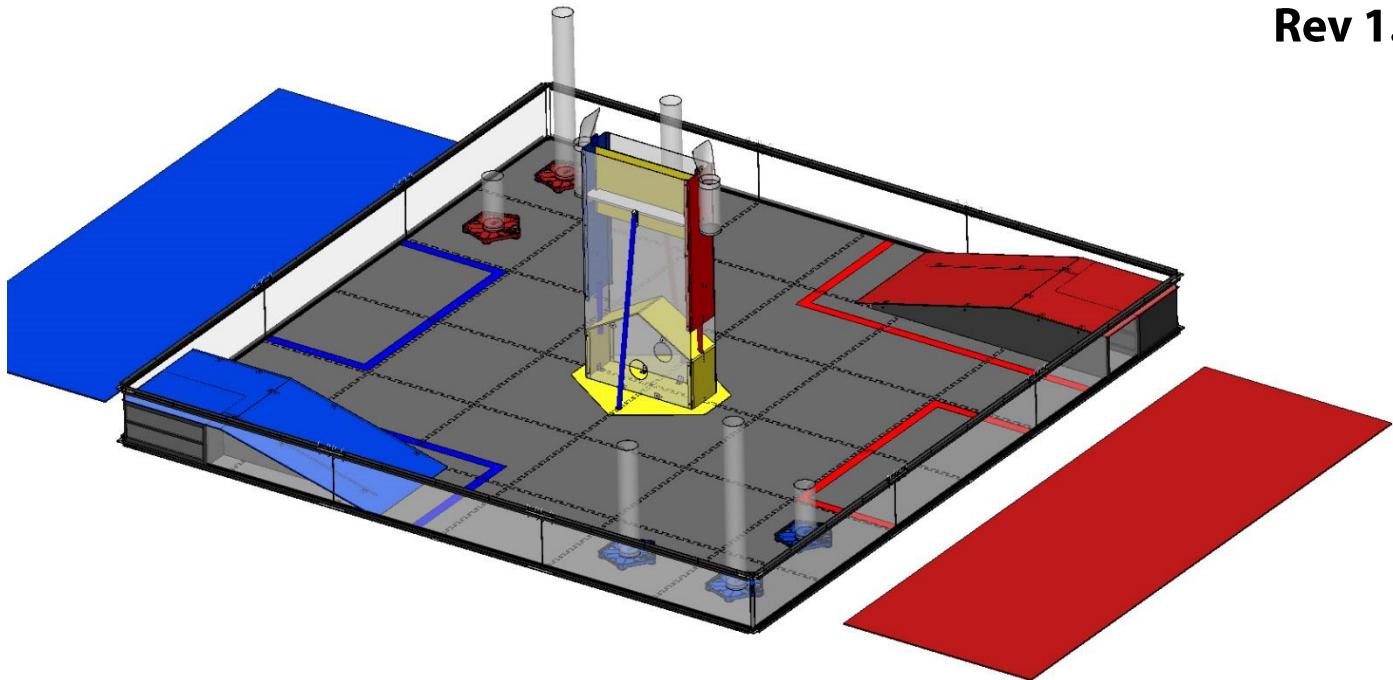




Field Assembly and Setup Guide

Rev 1.5



AndyMark Field Components for 2014-2015 FIRST® Tech Challenge



Read through all the instructions before you begin to set up!

This guide contains instructions for setting up the Field Elements for the 2014-2015 FIRST® Tech Challenge Game Cascade Effect. Field electronics are described in a separate document.

REVISION HISTORY

Rev.	Date	Description
1.1	9/3/2014	Initial Release
1.2	9/6/2014	Weblinks Edited, rivet quantities fixed
1.3	9/9/2014	Washers, Long Rivets added. Pics of brackets added. Minor Typos fixed.
1.4	9/22/2014	Links to YouTube assembly videos added.
1.5	10/28/2014	Added detail about alliance station dimensions. Added detail on hanging IR beacons.

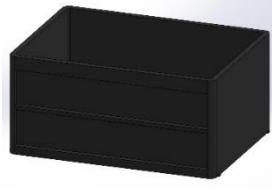
TOOLS NEEDED

Component	QTY	Part Photo
Rivet Tool*	1	
3/8" Wrench*	1	
7/16" Wrench*	1	
5/32 Hex Key Driver*	1	
#1 Philips Screwdriver*	1	
Rubber Mallet (optional)	1	
Standard Stapler	1	

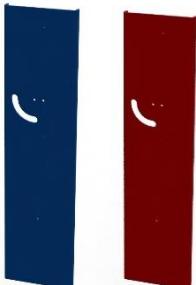
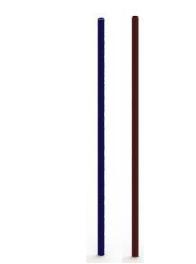
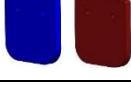
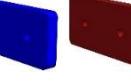
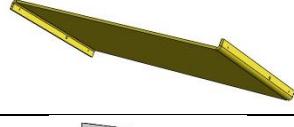
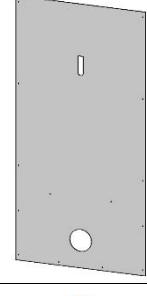
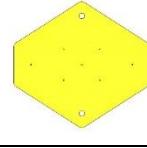
*Tools can be purchased as a tool set from AndyMark part number am-2837:

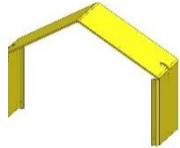
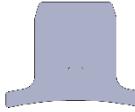
AndyMark.com/am-2837

RAMP/PLATFORM BUILD LIST

Component	QTY	Part Photo
Blue Ramp Panel	1	
Red Ramp Panel	1	
Blue Platform Panel	1	
Red Platform Panel	1	
Ramp Side Support	2	
Ramp Rib	2	
Folding Crate	2	
Ramp Hardware		
90° Bolt Bracket	12	
15° Bracket	4	
10-32 x 0.750 SHCS (Socket Head Cap Screw)	12	
#10 Washers	12	
10-32 Nylock Nut	12	
Short Rivets (1/8" x 0.313-375)	20	

CENTER FIELD STRUCTURE BUILD LIST

Component	QTY	Part Photo
Blue Side Panel	1	
Red Side Panel	1	
Blue Kickstand	1	
Red Kickstand	1	
Blue Diverter Pipe	1	
Red Diverter Pipe	1	
Blue Backboard Clip	1	
Red Backboard Clip	1	
Blue Backboard Spacer	1	
Red Backboard Spacer	1	
Upper Cross Brace	1	
Front Panel	2	
Floor Plate	1	

Splitter Ramp	1	
Ball Tray	2	
Center Pivot	1	
275mm Goal Tube	2	
Goal Backboard	2	
275mm Measuring Tape Stickers	2	
FTC Logo Sticker	2	
Base Number Stickers	6	
Center Goal Hardware Kit		
90° Bracket	4	
90° Bolt Bracket	6	
Long Rivets (1/8"x.501-.625 long)	58	
Rivet Washer	100	
Center Pivot Bolt and nut	1	
10-32 x 0.375 BHCS (Button Head Cap Screw)	6	
10-32 x 1.000 SHCS (Socket Head Cap Screw)	4	
10-32 x 1.250 (Socket Head Cap Screw)	2	
10-32 Nylock Jam Nuts	14	

ROLLING GOAL BUILD LIST

Component	QTY	Part Photo
Blue Pentagon Base	3	
Red Pentagon Base	3	
Blue Caster Cap	15	
Red Caster Cap	15	
Bearing Ball Caster	30	
275mm Goal Tube	2	
575mm Goal Tube	2	
875mm Goal Tube	2	
275mm Measuring Tape Sticker	2	
575mm Measuring Tape Sticker	2	
875mm Measuring Tape Sticker	2	

ADDITIONAL RESOURCES ON OUR YOUTUBE CHANNEL

([Youtube.com/user/AndyMarkTube](https://www.youtube.com/user/AndyMarkTube))

Ramp/Platform	Ramp/platform Assembly
Center Field Structure	Center Field Structure Assembly
Rolling Goals	Rolling Goal Assembly

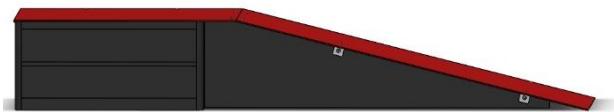
Videos can also be found on the *How to/Pictures* tab on each AndyMark.com product page



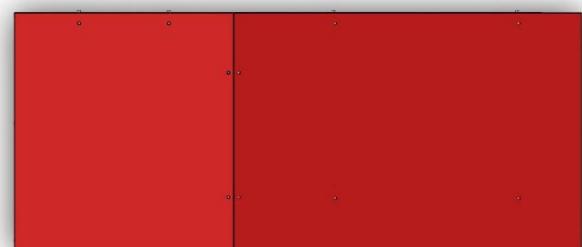
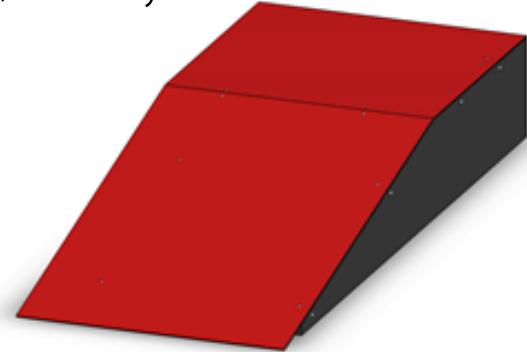
Ramp/Platform Assembly Instructions

Tools

Rivet Tool
3/8 Wrench
5/32 Hex Key Driver

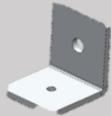


Side View

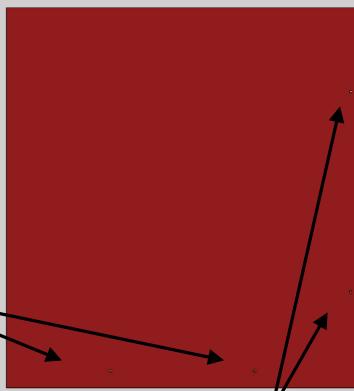


Top View

BRACKET LOCATIONS

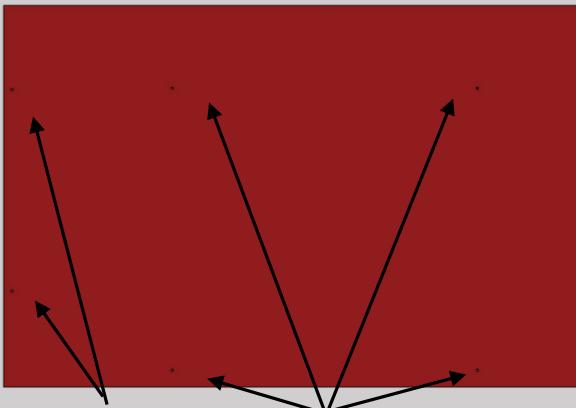


90° Bolt Brackets
(on short edge)



15° Brackets
(on long edge)

Platform Bottom View



15° Brackets

90° Bolt Brackets



Ramp Bottom View

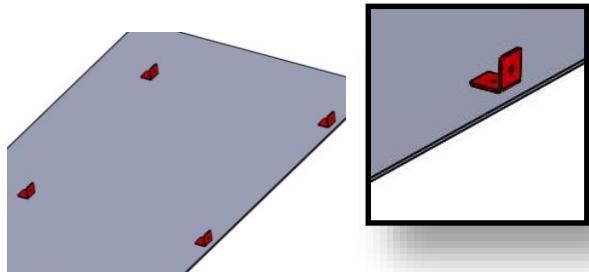
Step 1: Remove protective plastic film from both sides of the ramp and platform panels. Watch for sharp edges.



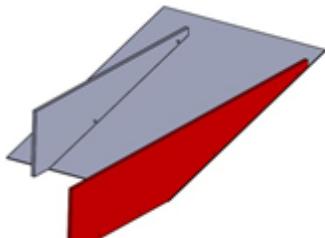
NOTE: The ramp/platform components have a shiny and a dull side. The pieces have been pre-drilled to fit together in one orientation. There is no significant difference in the co-efficient of friction between the shiny and dull sides.

Step 2: Add four 90° bolt brackets to the ramp panel using short rivets (1/8" x 0.313"-0.375"). All brackets should be facing the same direction.

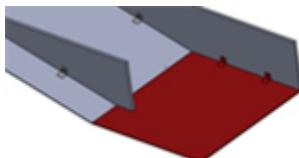
These brackets have two different sized holes.
Rivet through the smaller hole.



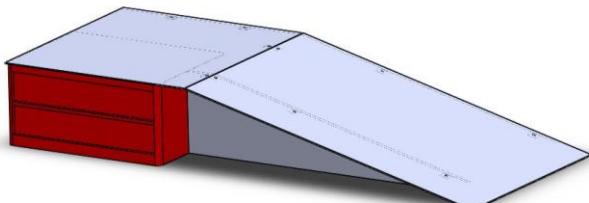
Step 4: Add side support to the outer brackets on the ramp panel using 10-32 x 0.750 SHCS, washers, and locknuts. The screw heads should be on the outside. The washer goes between the head of the screw and the rib.



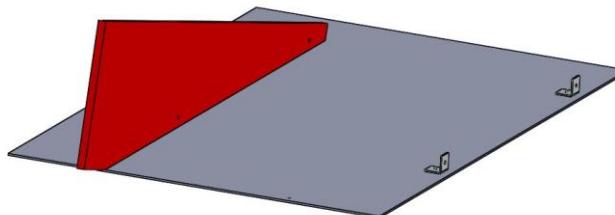
Step 6: Add the platform to the ramp assembly. Secure to the ramp side using two 10-32x 0.750 SHCS, washers, and locknuts. The screw heads should be on the outside. The washer goes between the head of the screw and the rib. These nuts should be secure but not over tightened.



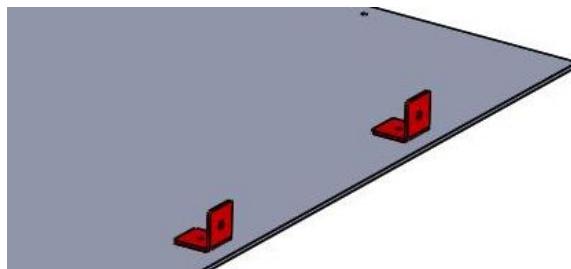
Step 8: Add one crate to the ramp assembly under the edge of the platform to support the ramp corner. The crate opening should face up.



Step 3: Connect one ramp rib to the inner brackets on the ramp panel using two 10-32 x 0.750 SHCS, washer and locknuts. The washer goes between the head of the screw and the rib. The nuts should be secure but not over tightened.

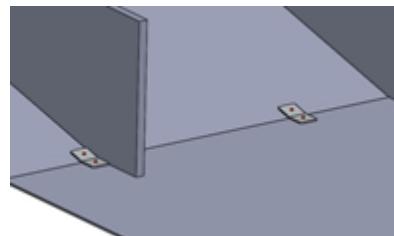


Step 5: Add two 90° bolt brackets to the short edge of the platform panel using short rivets (1/8" x 0.313"-0.375"). **These brackets have two different sized holes.** Rivet through the smaller hole.



Step 7: Add two 15° angle brackets to both the ramp and platform panel using short rivets (1/8" x 0.313"-0.375"). The rivet flange should be on the opposite side of the bracket.

The gap between the platform and the ramp should be minimal.

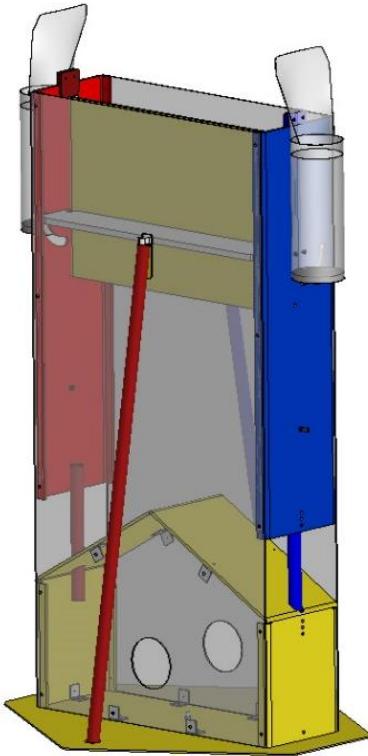


NOTE: Platform and crate will sink into SoftTile playing surface to sit level during game play.

Center Field Structure Assembly Instructions

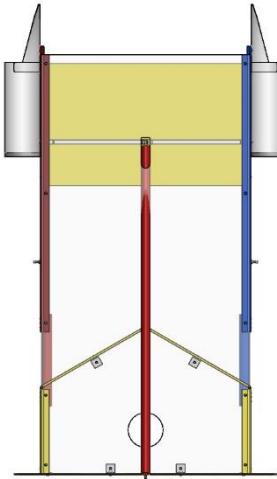
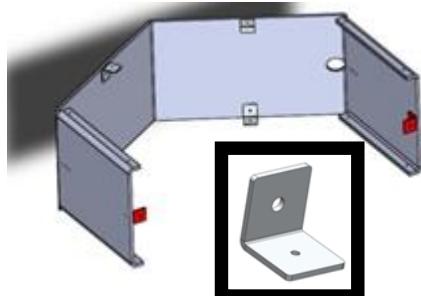
Tools

Rivet Tool
3/8 Wrench
7/16 Wrench
5/32 Hex Key Driver
#1 Phillips Screwdriver

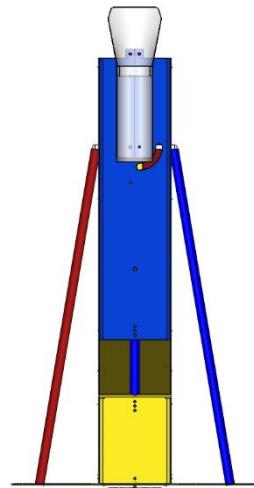


Step 2: Add two 90° bolt brackets (two holes of different sizes) to the outer sections of the splitter ramp, using long rivets. The flanges should be flush with the splitter ramp edge.

**These brackets have two different sized holes.
Rivet through the smaller hole.**



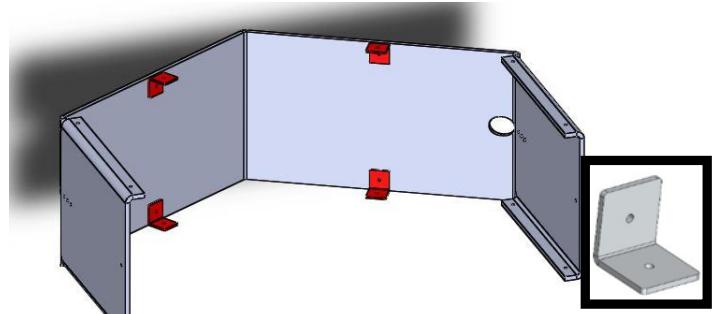
Front View



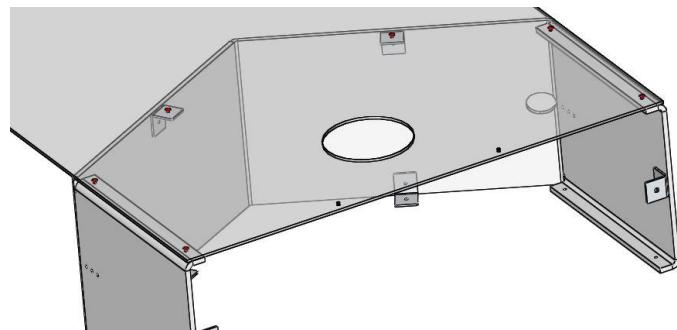
Side View

Step 1: Add four 90° brackets (two holes of the same size) to the center sections of the splitter ramp, using long rivets. The flange should be flush with the edge of the splitter ramp.

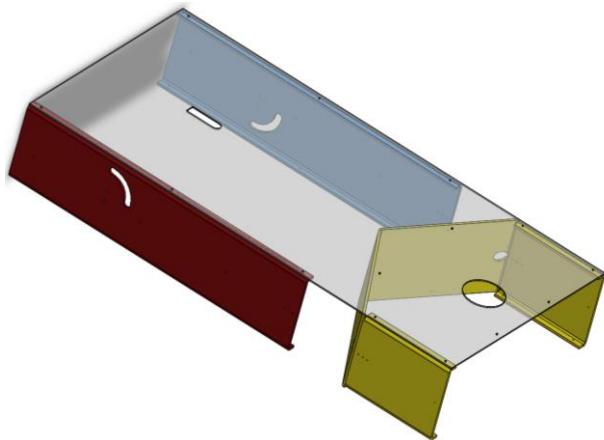
These brackets have two holes of the same size.



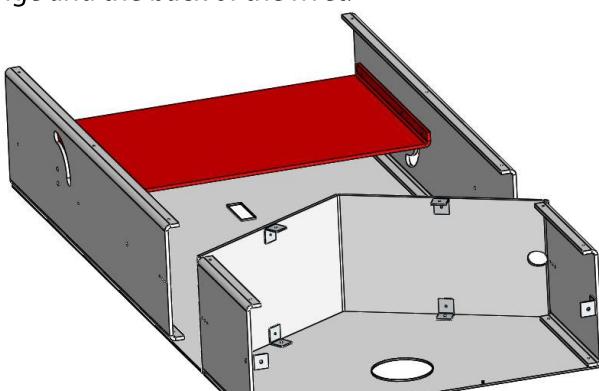
Step 3: Remove protective film from front panel. Attach the splitter ramp onto the front panel as shown using six long rivets and four rivet washers. The washers should be placed between the inside edge of the splitter ramp flange and the back of the rivet. The brackets should line up with pre-drilled holes.



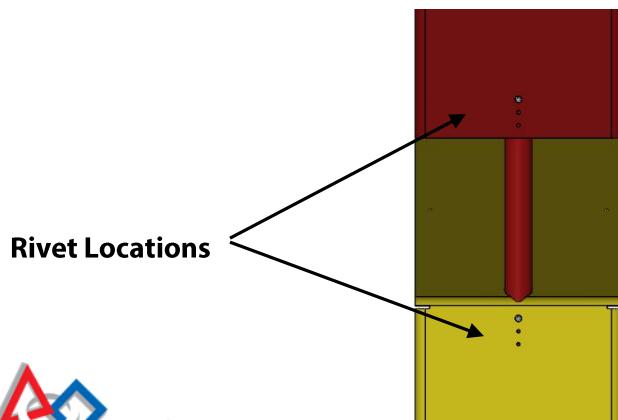
Step 4: Place one side red side panel and one blue side panel on the edge of the front panel. The flanges should face inside and the curved cutout should be oriented so it is furthest away from the splitter ramp.



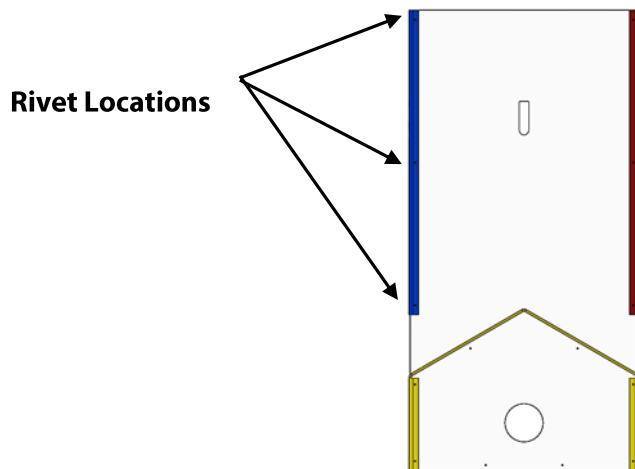
Step 6: Add the upper cross brace to the side panels and secure with long rivets and washers on each side. The washers should be placed between the inside flange and the back of the rivet.



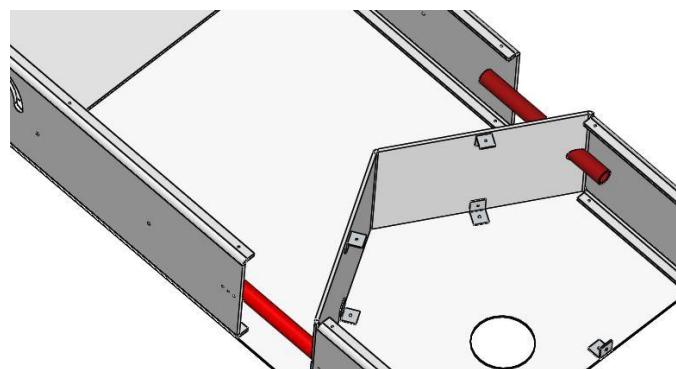
Step 8: Using six long rivets on each pipe attach the diverter pipes to the side panels and the ramp. The color should match the side panel.



Step 5: Using three long rivets and washers per side, attach the front panel to red side panel and the blue side panel through the pre-drilled holes. The washers should be placed between the inside flange and the back of the rivet.

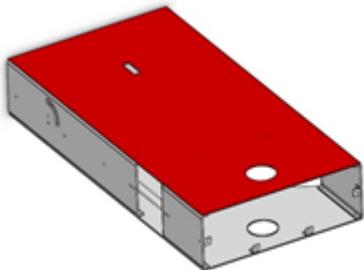


Step 7: Insert one red divider pipe into the splitter ramp on the red side and one blue divider pipe into the splitter ramp on the blue side. These pipes are a tight fit in the hole.

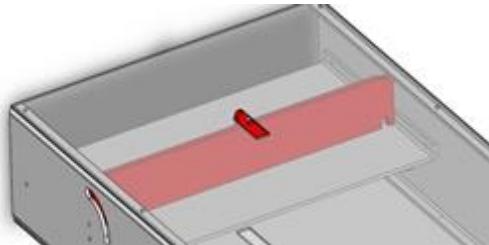


NOTE: Insert all six rivets into the diverter pipe and center structure pre-drilled holes to align before riveting to panels to keep parts straight.

Step 9: Remove protective film and add a front panel to the goal assembly. The orientation should match the existing front panel. Secure with 12 long rivets and washers to side panels and splitter ramp. The washers should be placed between the inside flange and the back of the rivet.

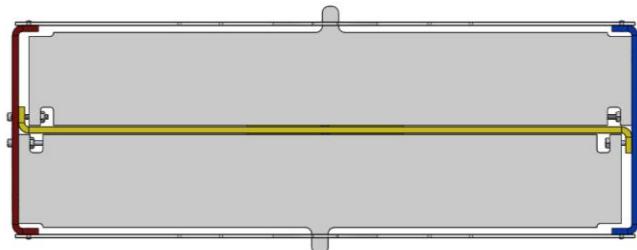


Step 10: Place one ball tray into the assembly. The tongue should sit in the slot on the front panel.



NOTE: Ball tray tongue will not be centered in the slot on the front panels.

Step 11: Two different length 10-32 screws are used to attach the ball tray. The longer 10-32 x 1.250" SHCS is used on the side where the upper cross brace flange is. The shorter 10-32 x 1.000" SHCS is used on the side where there is no flange. These screws act as the pivot point for the ball tray. Be careful not to over-tighten screws.



Top view

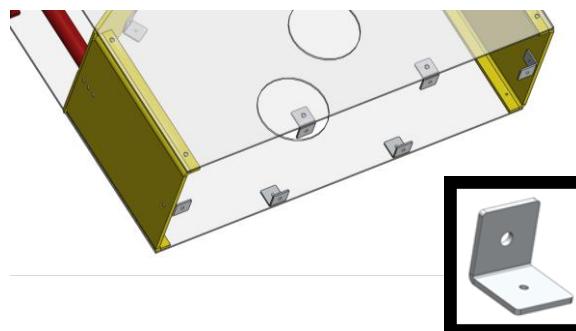
10-32 x 1.000" SHCS

10-32 x 1.250" SHCS

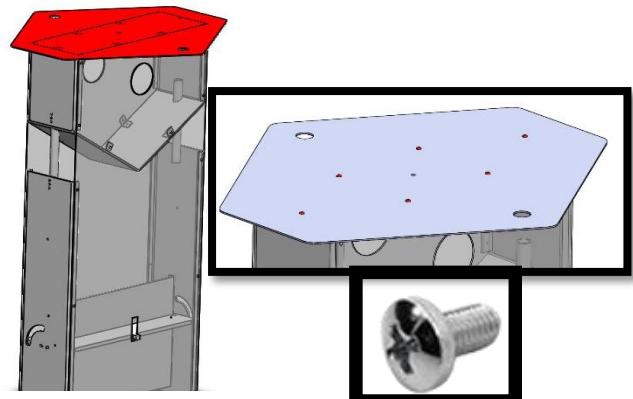
NOTE: Be careful not to over-tighten screws.

Step 12: Add four 90° bolt brackets to the both front panels and ramp and secure using long rivets.

**These brackets have two different sized holes.
Rivet though the smaller hole.**



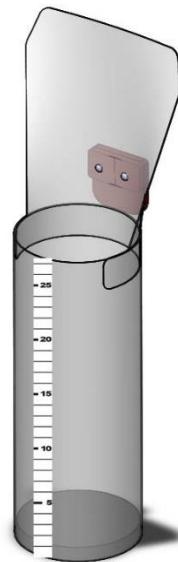
Step 13: Remove protective plastic film. With the assembly upside-down secure the floor plate to the 90° bolt brackets using six 10-32 x 0.375 BHCS and 10-32 locknuts.



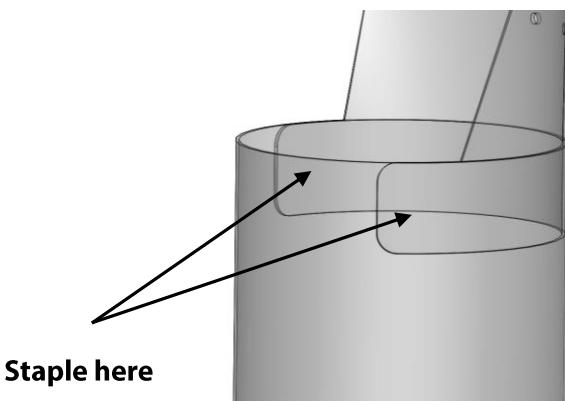
120cm Center Goal Assembly

Tools

Rivet Tool
Standard Stapler

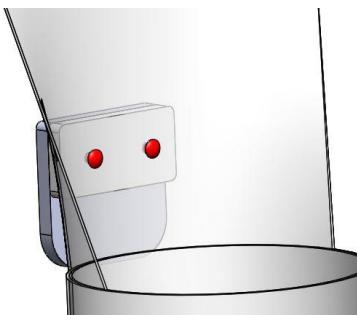


Step 2: Using a standard stapler, firmly staple each plastic backboard tab to the goal tube.



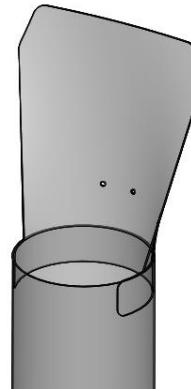
Step 4: Using two long rivets and rivet washers to fasten the clip and spacer to the backboard.

The rivet flanges should be on the inside face of the backboard. The washers should be placed between clip and the back of the rivet.

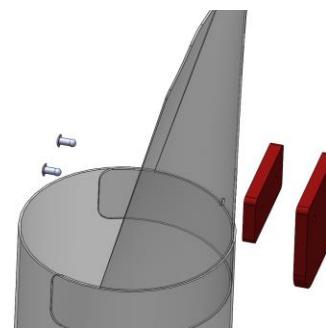


Step 1: Insert flat plastic backboard into 275mm Goal Tube.

The top of the tabs should be aligned with the top of the tube and the outer diameter of the backboard should match the inner diameter of the tube.



Step 3: Align the holes on the backboard clip and the backboard spacer so that the backboard spacer is sandwiched between the clip and the backboard.

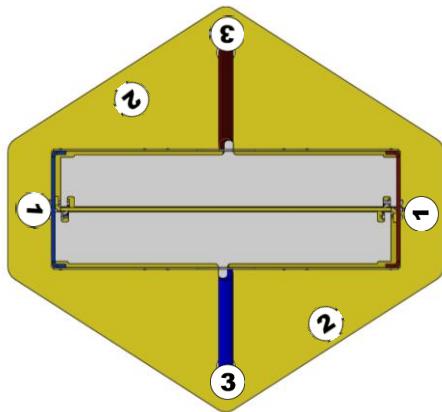


Step 5: Apply one 275mm measuring tape sticker to goal tube directly opposite the backboard clip. The tape should count up from the bottom of the goal.



Center Field Structure Finishing Details

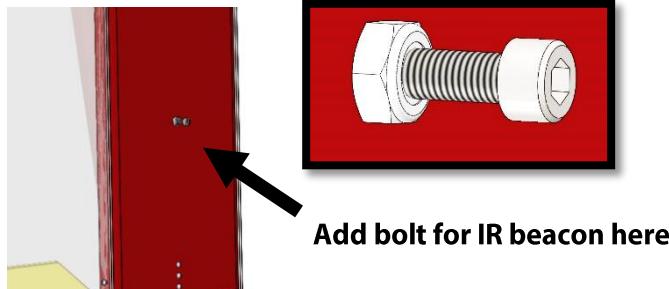
1. Place Base Number Stickers in the following locations on the base. These will be used to align center field structure before each match.



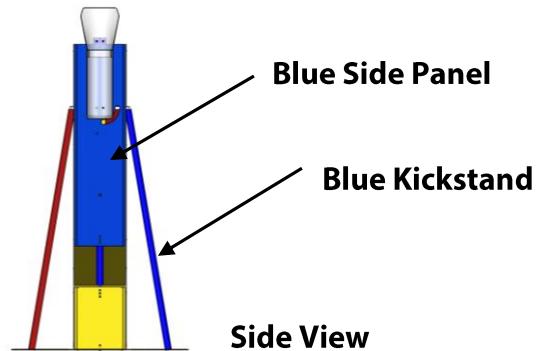
2. Apply FTC Decal to top edge of the Center Field Structure



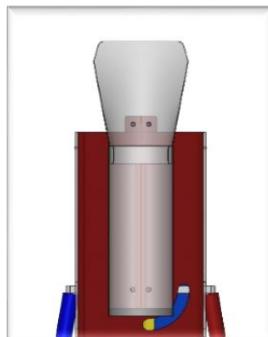
3. Add 10-32 x 1.000 SHCS to hang IR beacon on both the red and blue side panel. Screw should stick out from side of panel.



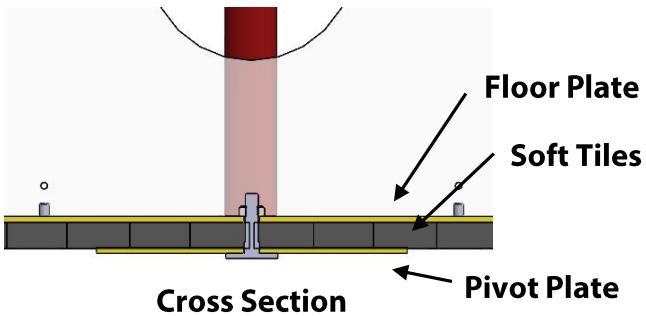
4. Kickstands are positioned to hold up ball tray with the bottom of the pipe sitting the base cutouts. The side panel color should match the kickstand located on the right side when looking at a side view.



5. The center goal should be centered on the side panel of matching color.



6. With the center structure placed on the soft tile playing surface, add center pivot using center pivot bolt and locknut.

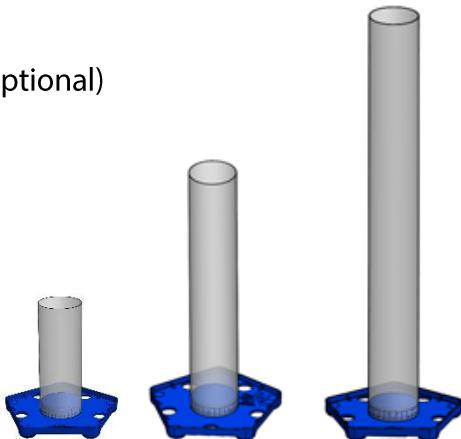


NOTE: To ensure Field Center Structure is secure but not over-tightened, tighten lock nut until flush with floor plate. The turn nut an additional 3/4 rotation.

Rolling Goal Assembly

Tools

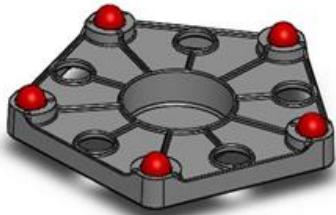
Rubber Mallet (Optional)



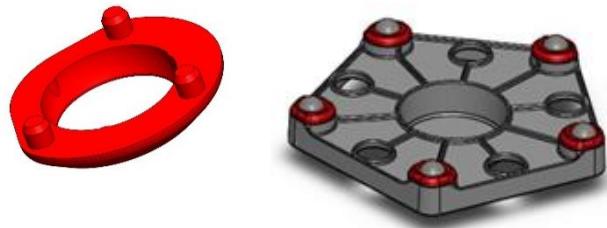
NOTE: Assembly process is the same for all 3 Rolling Goal Sizes.

A red and blue goal of each size is used on the field.

Step 1: Add five 1" Bearing Balls to the indents in the Red Pentagon Base.



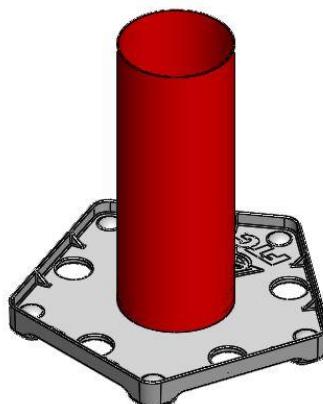
Step 2: Secure the five bearing balls to the base by pressing in the caster caps until they're flush with the base. This can be done by hand, or a rubber mallet may be used.



Step 3: Apply the stick-on measuring tape to the outside of the goal tube. This can be done by peeling the backing off, laying the label down on a flat surface and carefully rolling the tube across the label.



Step 4: Insert the goal tube onto the base on the side opposite the casters. The numbers on the measuring tape should be right side up when the goal is sitting on the floor.



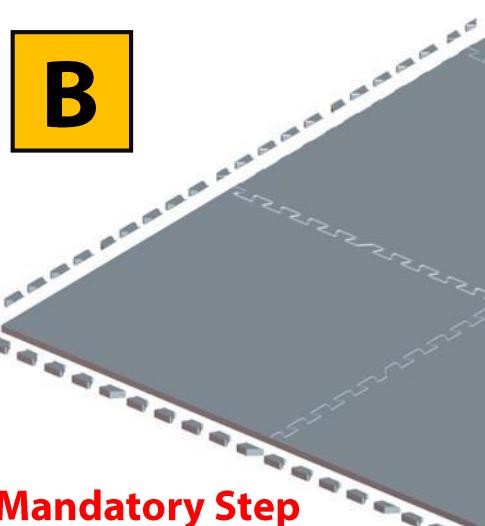
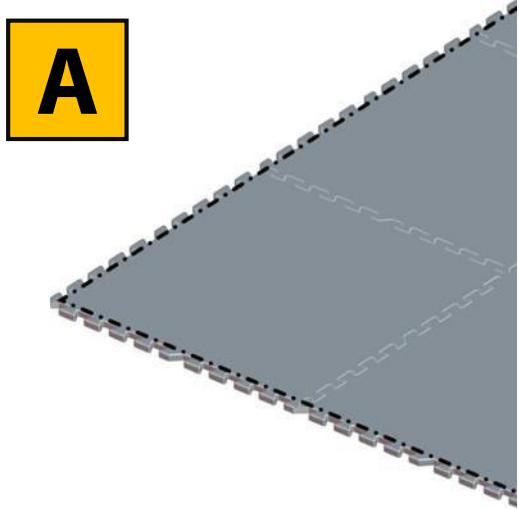
FIELD REQUIREMENTS

Component	QTY	Part Photo	Source
FTC Field Perimeter	1		AndyMark.com/am-481a
5/8" Gray Soft Tiles	36		AndyMark.com/Softtiles
IR Beacon (Either HBK2100 or FTCBCN)	2		http://www.hitechnic.com/ AndyMark.com/am-2978
Large Ball	40		AndyMark.com/am-2968full
Small Ball	120		
2" "Red" Gaffers Tape	as needed		http://www.findtape.com (pro gaff tape) AndyMark.com/am-2967
2" "Electric Blue" Gaffers Tape	as needed		http://www.findtape.com (pro gaff tape) AndyMark.com/am-2967

Center Field Structure	1		AndyMark.com/am-2835
Red Ramp/Platform	1		AndyMark.com/am-2836r
Blue Ramp/Platform	1		AndyMark.com/am-2836b
Red 30cm Rolling Goal	1		AndyMark.com/am-2832r
Red 60cm Rolling Goal	1		
Red 90cm Rolling Goal	1		
Blue 30cm Rolling Goal	1		AndyMark.com/am-2832b
Blue 60cm Rolling Goal	1		
Blue 90cm Rolling Goal	1		

All Official Field Elements can be found on <http://www.andymark.com/FTC>.
DIY plans for wooden practice models are available for the Center Field Structure
and the Ramp/Platforms

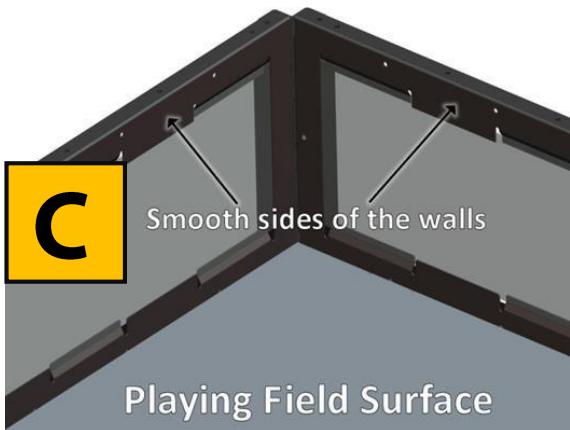
Setting up the Floor and Field Perimeter



Critical Mandatory Step

A. Lay the tiles with the **smooth** surface facing up.

B. **Critical Mandatory Step:** Trim all outer tabs from the Soft Tiles.



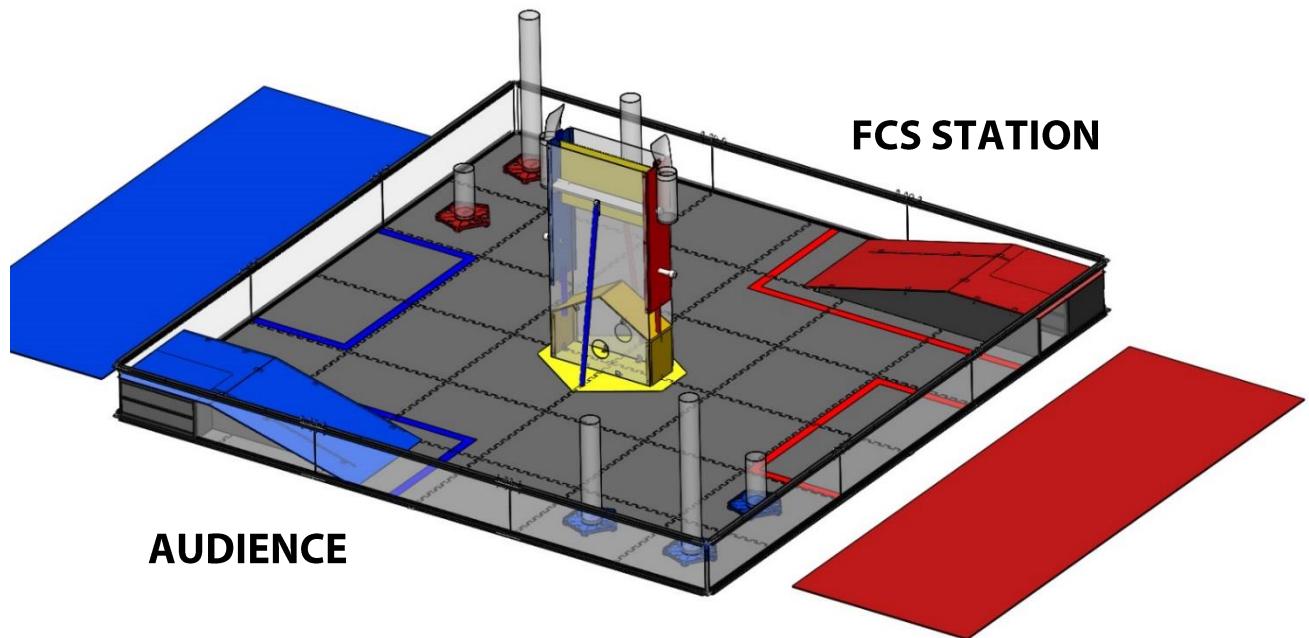
NOTE: Lay the tiles out and mark the outer edge to be cut. Use a sharp box cutter and a straight edge or a band saw (if available) to get a smooth clean edge

C. Note that there are several FTC Playing Field wall designs. The wall designs fall into two categories:

- 1) symmetrical inside and outside surfaces; and
- 2) smooth on one side and an open cavity on the other side.
The smooth/noncavity sides should face towards the inside of the Playing Field as shown in the illustration. If the wall has a cavity, it should be oriented so that it faces outside the Playing Field.

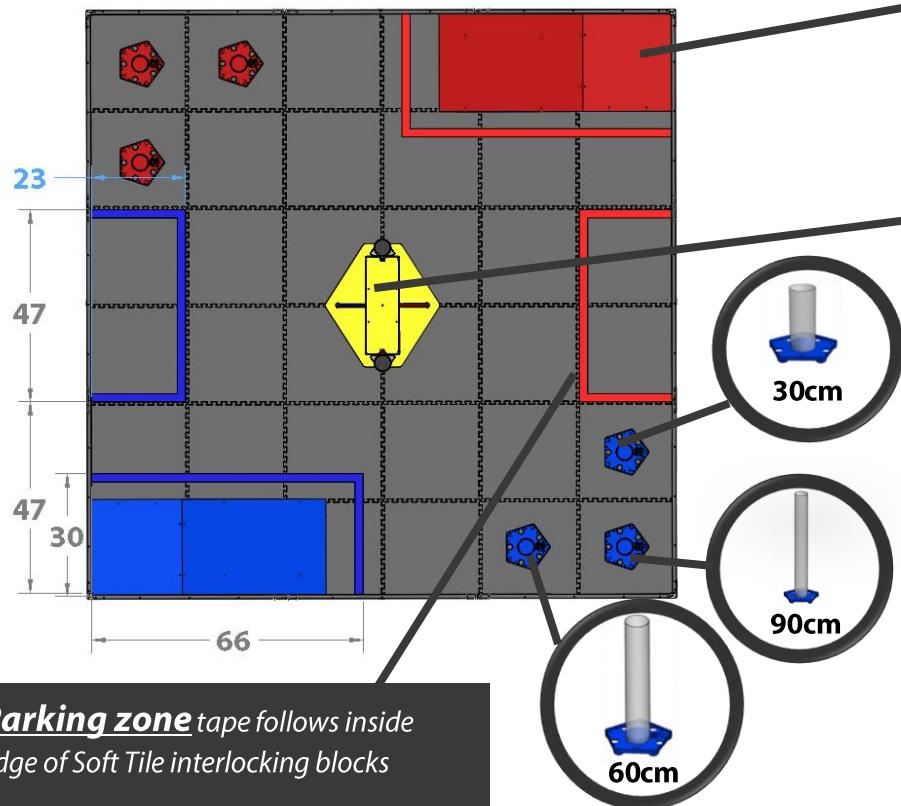
Follow the set-up instructions supplied with your Field for details.

Field Layout and Orientation



Tape Diagram and Field Element Placement

Tape dimensions measured to outside edge of tape. All tape is 2" wide.



Ramp/Platform is placed in the corner of the field with the crate towards the field perimeter

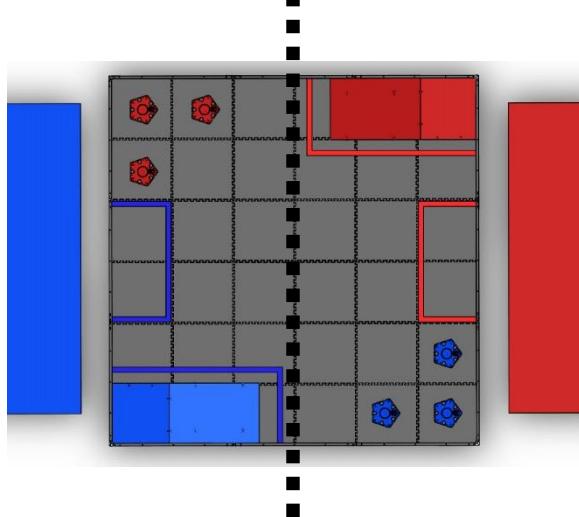
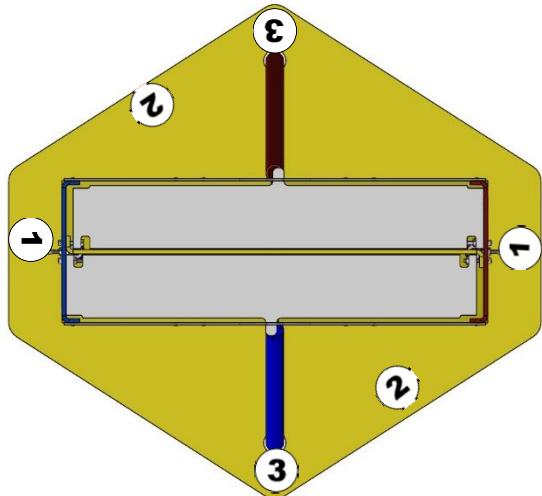
Center Field Structure is located 3 tiles in from each edge in the center of the playing field floor. Center Pivot sits under tiles.

Rolling Goals are centered in a tile, with the 90cm Rolling Goal in the corner, the 60cm Rolling Goal one tile towards the Alliance, and the 30cm Rolling Goal one tile from the corner toward the opposing Alliance Parking Zone.

Center Field Structure Starting Locations

Referees will rotate the Center Field Structure into 1 of 3 random positions with respect to the Alliance Station. The positions are as shown below.

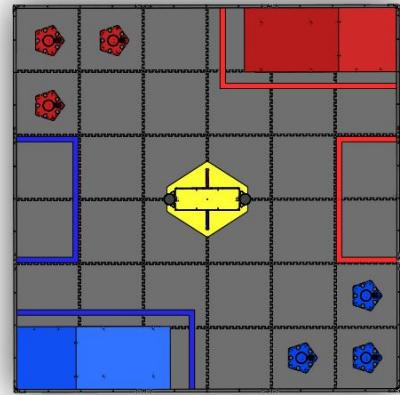
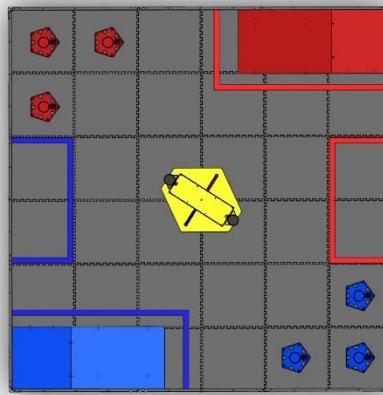
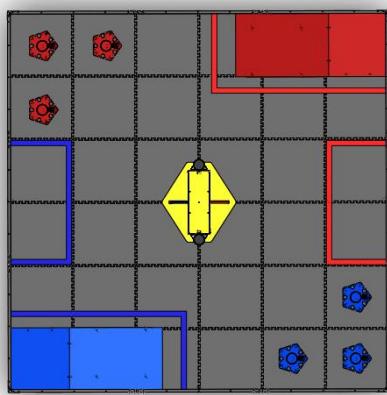
Sides of the Center Field Structure are labeled 1-3 and the number at the start of each match one number should be aligned with the center Soft Tile seam bisecting the playing field between the opposing alliance stations and that numbered edge should be parallel with the field perimeter.



1

2

3



AUDIENCE

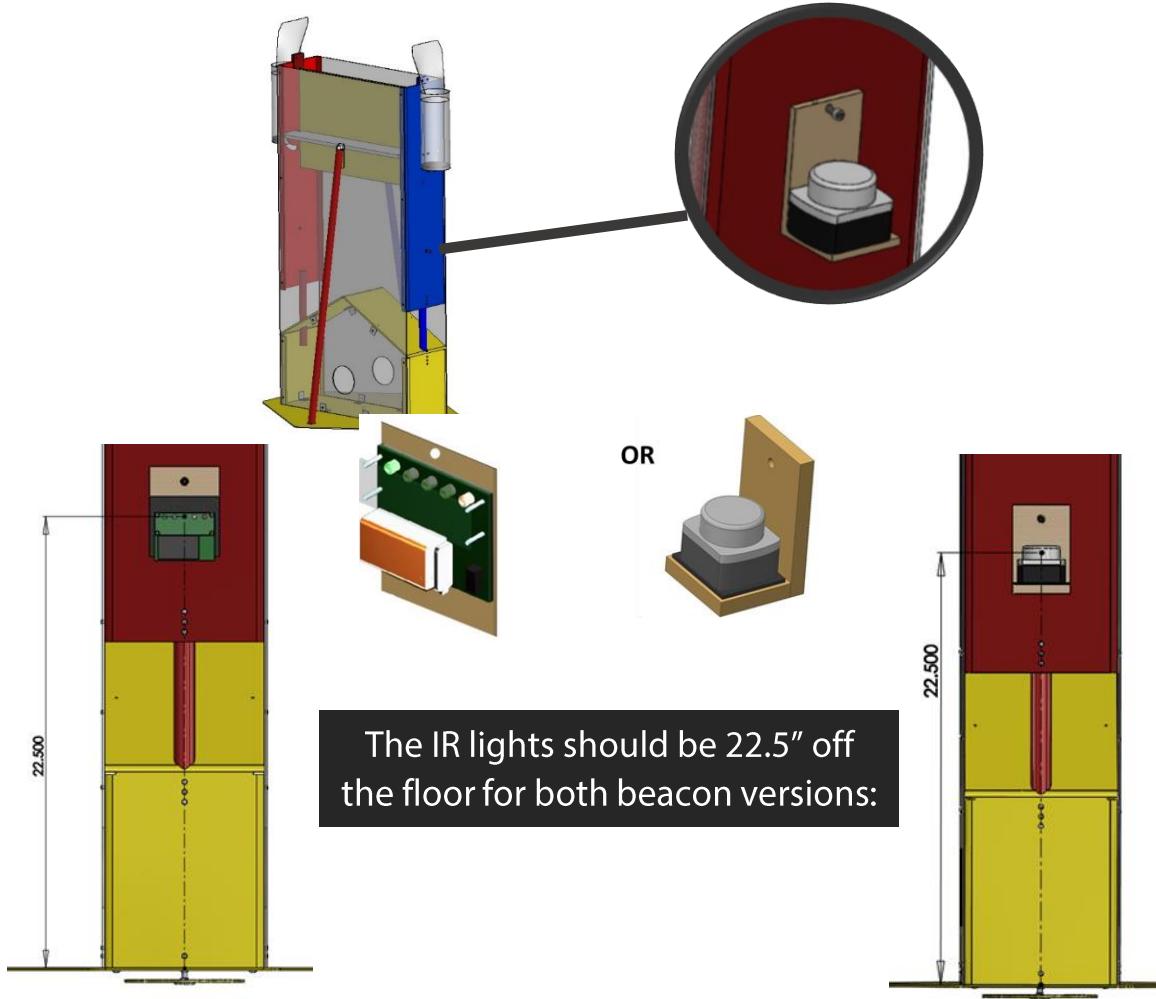
NOTE: The blue kickstand should always face towards either the blue parking zone, blue ramp/platform, OR Audience.

The red kickstand should always face towards the red parking zone, red ramp/platform, OR FCS station.

IR Beacon Placement

Place one IR Beacon on each hanging bolt on both the red and blue side panels.

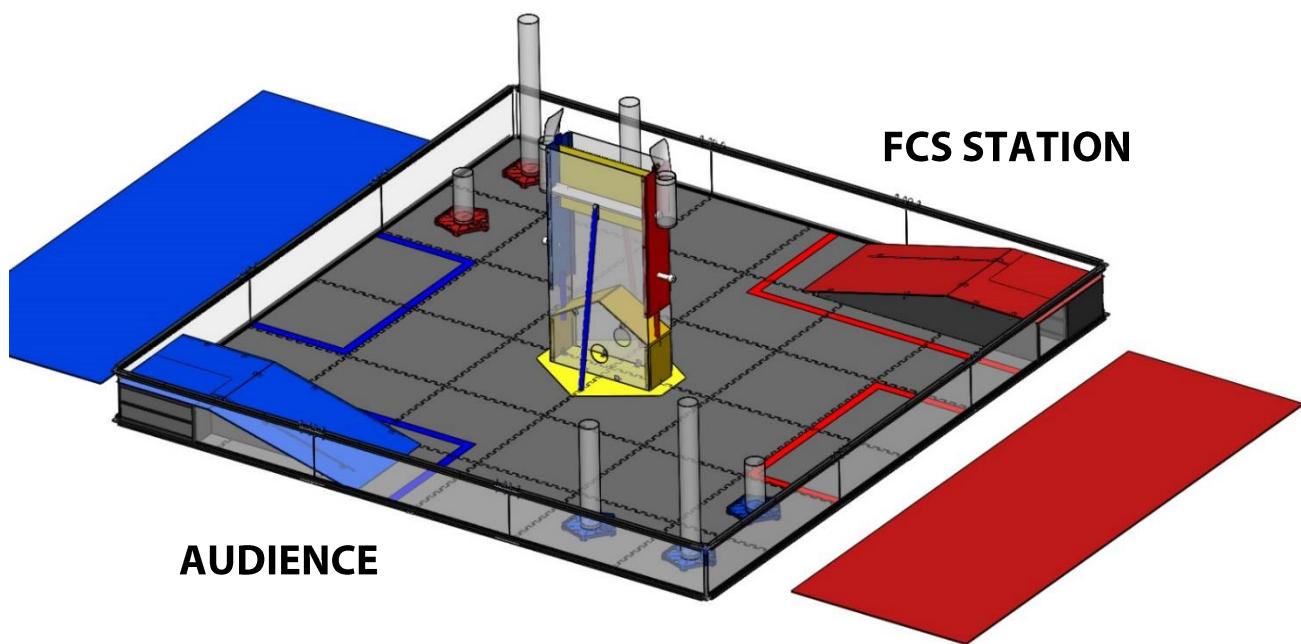
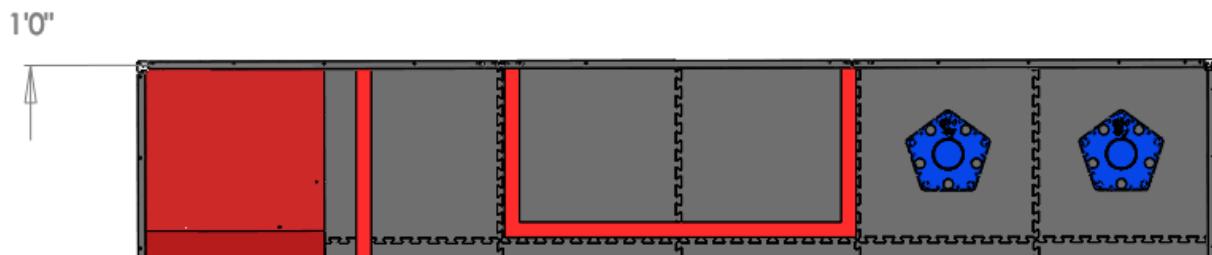
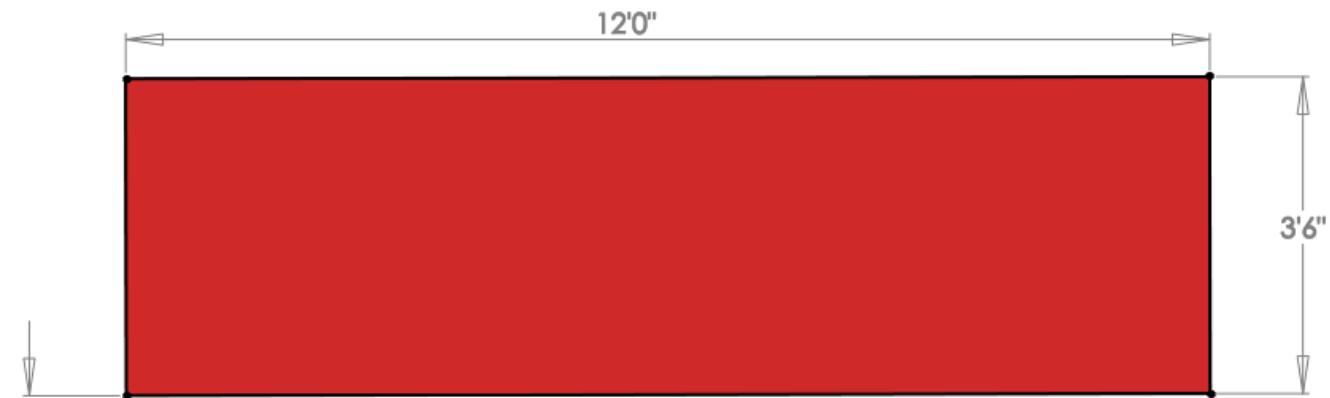
There are two styles of IR Beacons available for the 2014-2015 season. Note that you should use the same style of beacon per Field. Do not mix an older style beacon with a newer style beacon on the same Field. Either use all newer style beacons (HBK2100) or all older style beacons (FTCBCN) on a single Field. Guide and detailed drawings for how to build the IR beacon hanger for each beacon style is available later in this document.

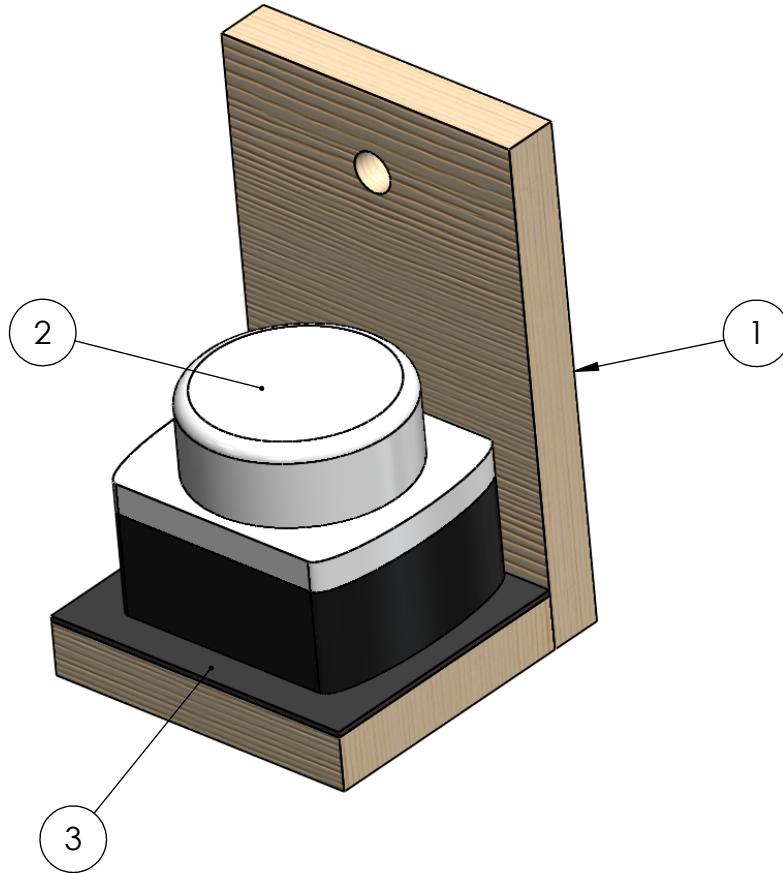


NOTE: For this season's game the four position switch should be set so the beacon is running in **1.2 KHz mode (the two leftmost positions)**. This is the same frequency mode that the older style beacons (#FTCBCN) use. Make sure to run the beacon in 180° (leftmost) mode not 360° mode (second from left). When running your beacon in 180° mode, then make sure the active side of the beacon is facing outward towards the playing field (and away from the back of the wooden hanger). There are red LEDs on the printed circuit board of the new IR beacon. A lit red LED indicates that a side of the beacon is active. In 180° mode only one of the LEDs will be lit. In 360° mode both red LEDs will be lit.

Alliance Station Measurements

Use 2" red and blue gaffers tape to mark the edges of the Alliance Station on the floor outside the playing field as shown below. The red alliance station should be positioned on the same side of the field as the red parking zone. The blue side of the field should be positioned on the same side of the field as the blue parking zone.





ITEM NO.	PART NUMBER	QTY.
1	360 hanger	1
2	NEW_IR_BEACON	1
3	360 Hanger - Velcro	1

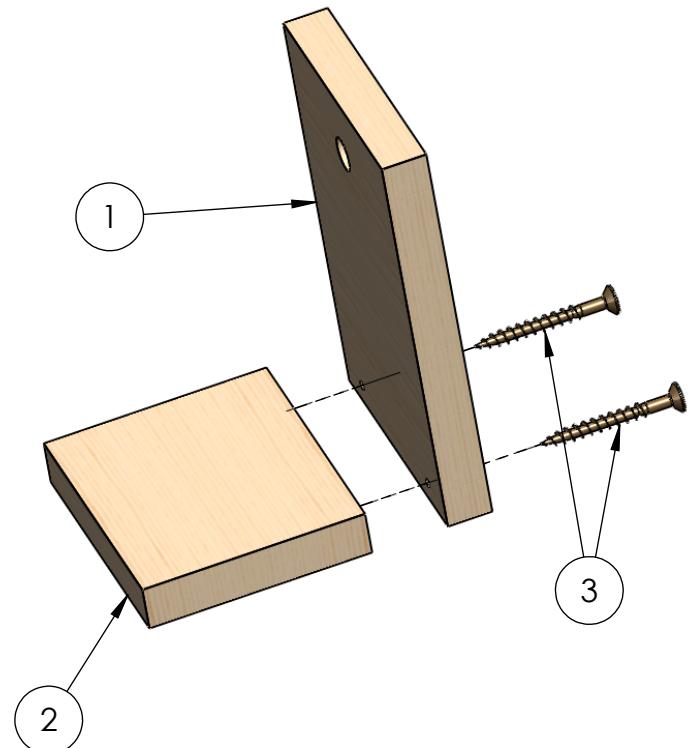
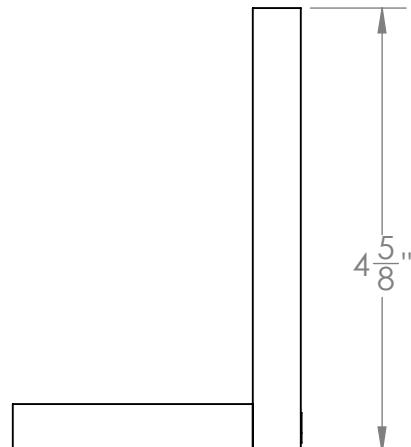
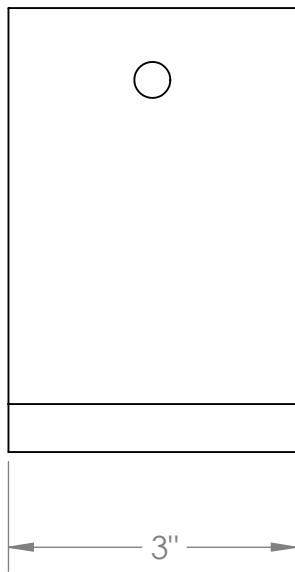
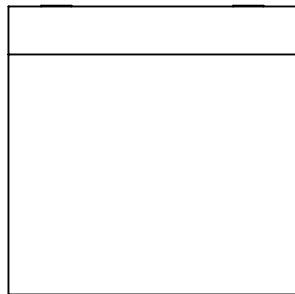
UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DB	10/24/14
TOLERANCES: FRACTIONAL $\pm 1/8$ ANGULAR: MACH \pm BEND $\pm 5^\circ$	CHECKED		
TWO PLACE DECIMAL ± 0.010	ENG APPR.		
THREE PLACE DECIMAL ± 0.005	MFG APPR.		
INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
MATERIAL	COMMENTS:		
FINISH			
DO NOT SCALE DRAWING			

 AndyMark

TITLE:

360 Beacon on Hanger

SIZE	DWG. NO.	REV
A		1
SCALE: 1:1.5 WEIGHT:		SHEET 1 OF 1



ITEM NO.	PART NUMBER	QTY.
1	360 hanger - back	1
2	360 hanger - floor	1
3	#8 x 1.500 Wood Screw	2

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/8$

ANGULAR: MACH \pm BEND $\pm 5^\circ$

TWO PLACE DECIMAL ± 0.010

THREE PLACE DECIMAL ± 0.005

INTERPRET GEOMETRIC
TOLERANCING PER:

MATERIAL

1/2" Plywood

FINISH

Debured

DO NOT SCALE DRAWING

NAME

DATE

DRAWN

DB

CHECKED

ENG APPR.

MFG APPR.

Q.A.

COMMENTS:

AndyMark

TITLE:

360 Hanger

SIZE

A

DWG. NO.

360

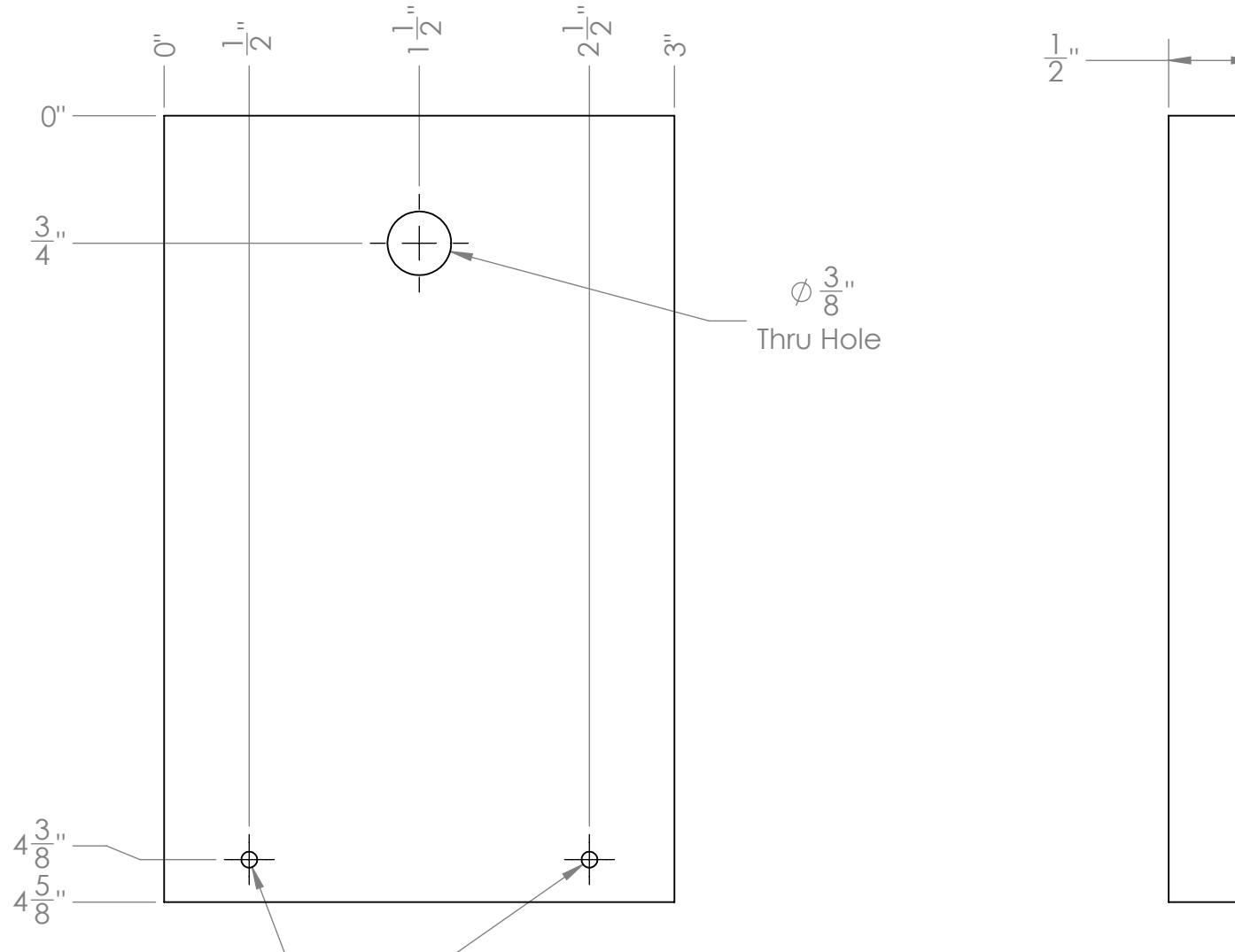
REV

1

SCALE: 1:2

WEIGHT:

SHEET 1 OF 1



$\left[\frac{3}{32}\right]$
 $\phi .094$

Thru Hole

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL $\pm 1/8$
 ANGULAR: MACH \pm BEND $\pm 5^\circ$
 TWO PLACE DECIMAL ± 0.010
 THREE PLACE DECIMAL ± 0.005
 INTERPRET GEOMETRIC
 TOLERANCING PER:
 MATERIAL
 1/2" Plywood
 FINISH
 Debured
 DO NOT SCALE DRAWING

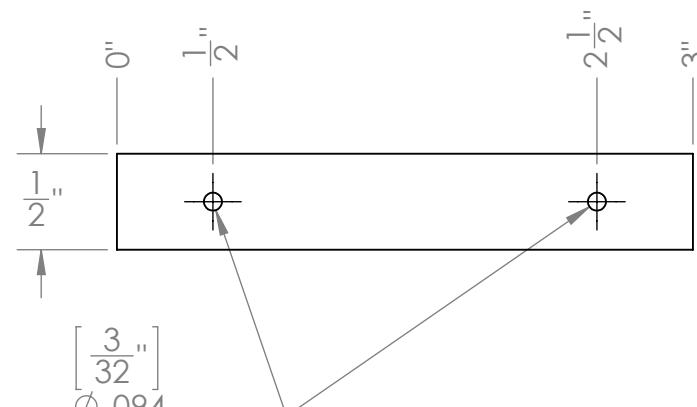
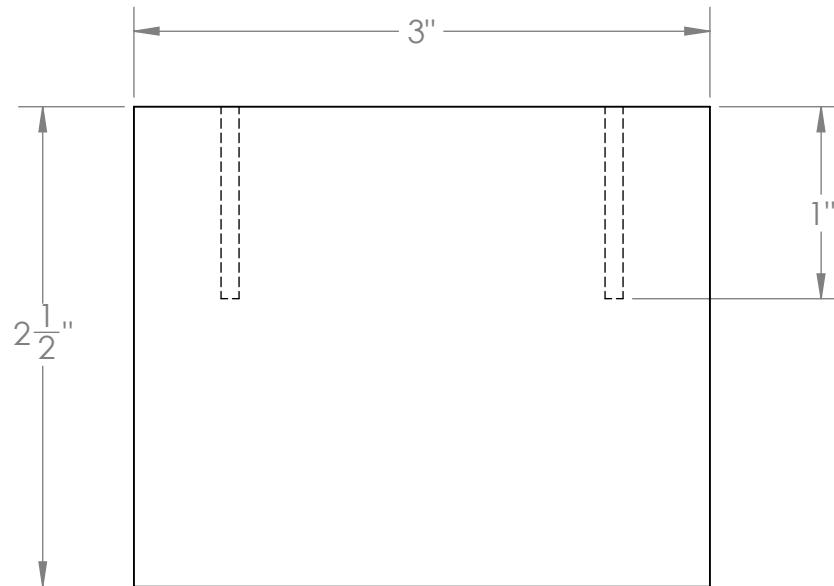
DRAWN	NAME	DATE
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		
COMMENTS:		

AndyMark

TITLE:

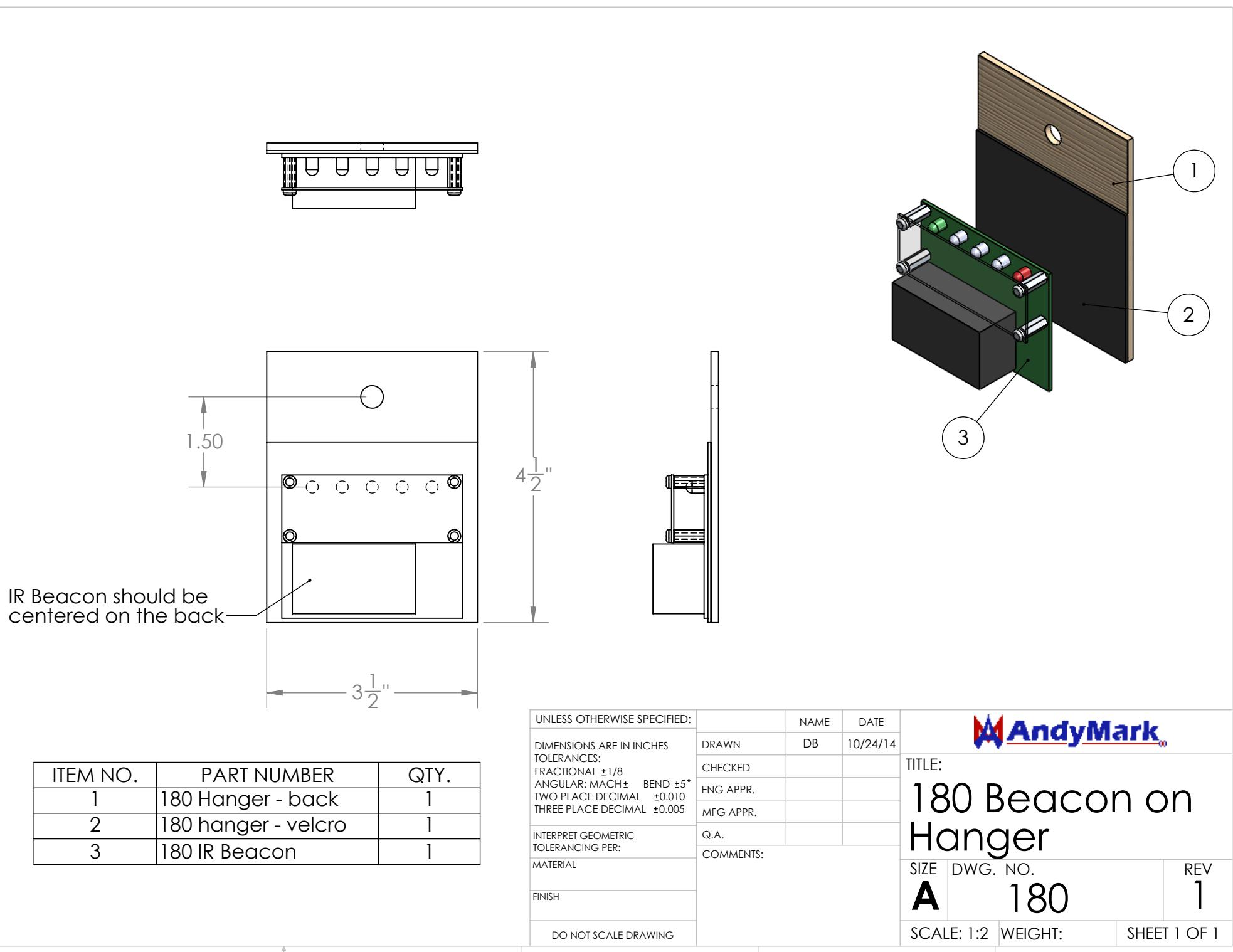
**360 Hanger -
Back**

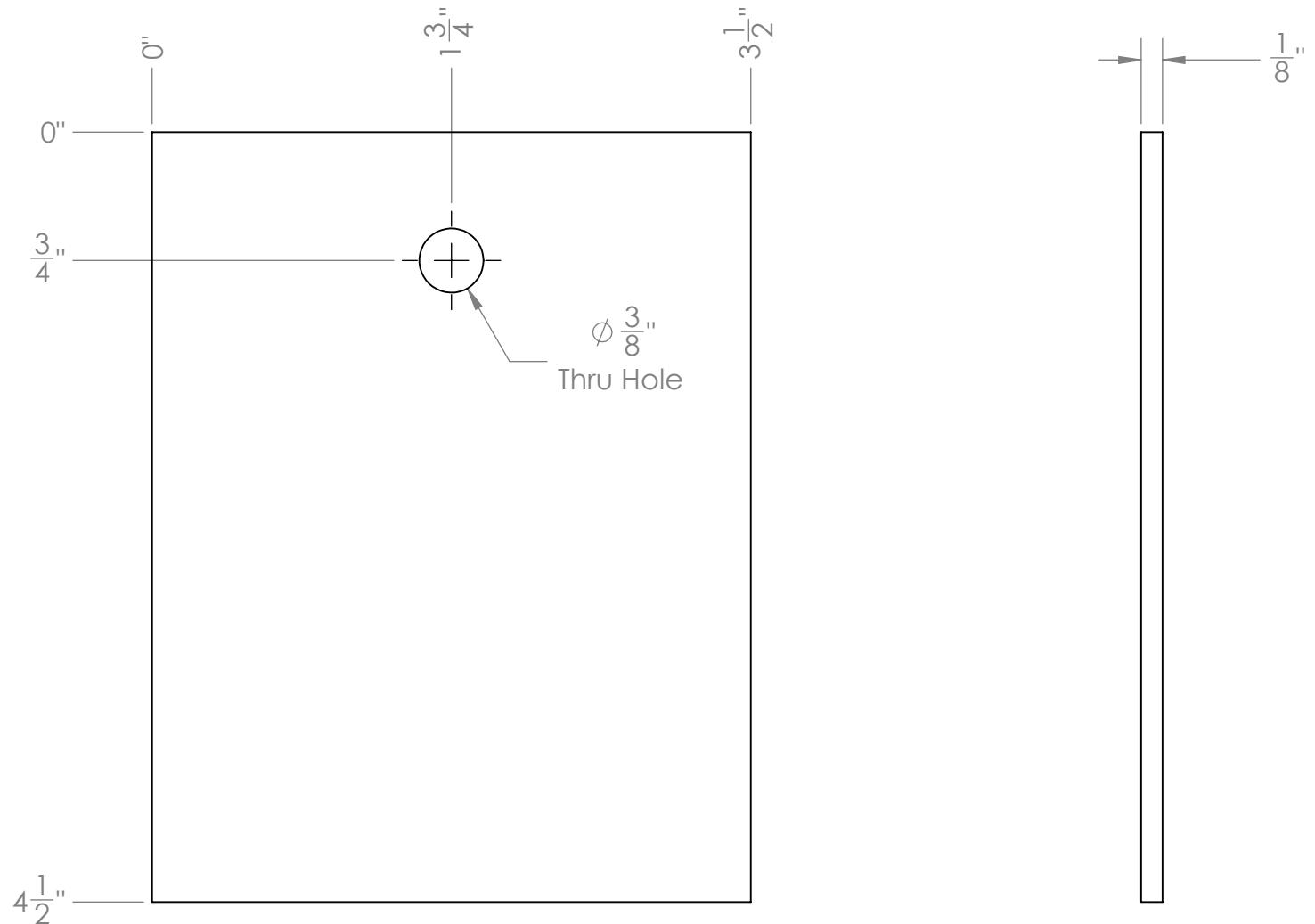
SIZE	DWG. NO.	REV
A	360-1	1
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1



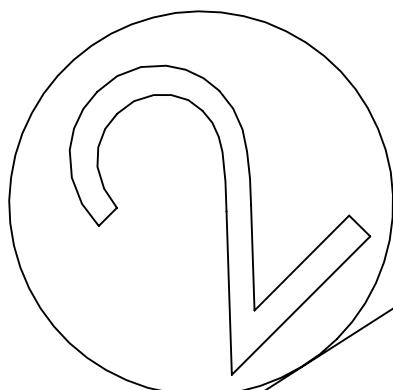
1.00 inch deep

UNLESS OTHERWISE SPECIFIED:				NAME	DATE	 AndyMark
DIMENSIONS ARE IN INCHES			DRAWN	DB	10/23/14	
TOLERANCES:			CHECKED			
FRACTIONAL $\pm 1/8$			ENG APPR.			
ANGULAR: MACH \pm BEND $\pm 5^\circ$			MFG APPR.			
TWO PLACE DECIMAL ± 0.010			Q.A.			
THREE PLACE DECIMAL ± 0.005			COMMENTS:			
INTERPRET GEOMETRIC TOLERANCING PER:						
MATERIAL 1/2" Plywood						
FINISH Debured						
DO NOT SCALE DRAWING						
SIZE	DWG. NO.	REV				
A	360-2	1				
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1				





UNLESS OTHERWISE SPECIFIED:		NAME	DATE	 TITLE: 180 Hanger - Back SIZE DWG. NO. REV A 180-1 1 SCALE: 1:1 WEIGHT: SHEET 1 OF 1
DIMENSIONS ARE IN INCHES	DRAWN	DB	10/24/14	
TOLERANCES: FRACTIONAL $\pm 1/8$	CHECKED			
ANGULAR: MACH \pm BEND $\pm 5^\circ$	ENG APPR.			
TWO PLACE DECIMAL ± 0.010	MFG APPR.			
THREE PLACE DECIMAL ± 0.005	Q.A.			
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:			
MATERIAL 1/8" Plywood				
FINISH Debured				
DO NOT SCALE DRAWING				



USE THIS DRAWINGS AS A TEMPLATE FOR STICKER PLACEMENT

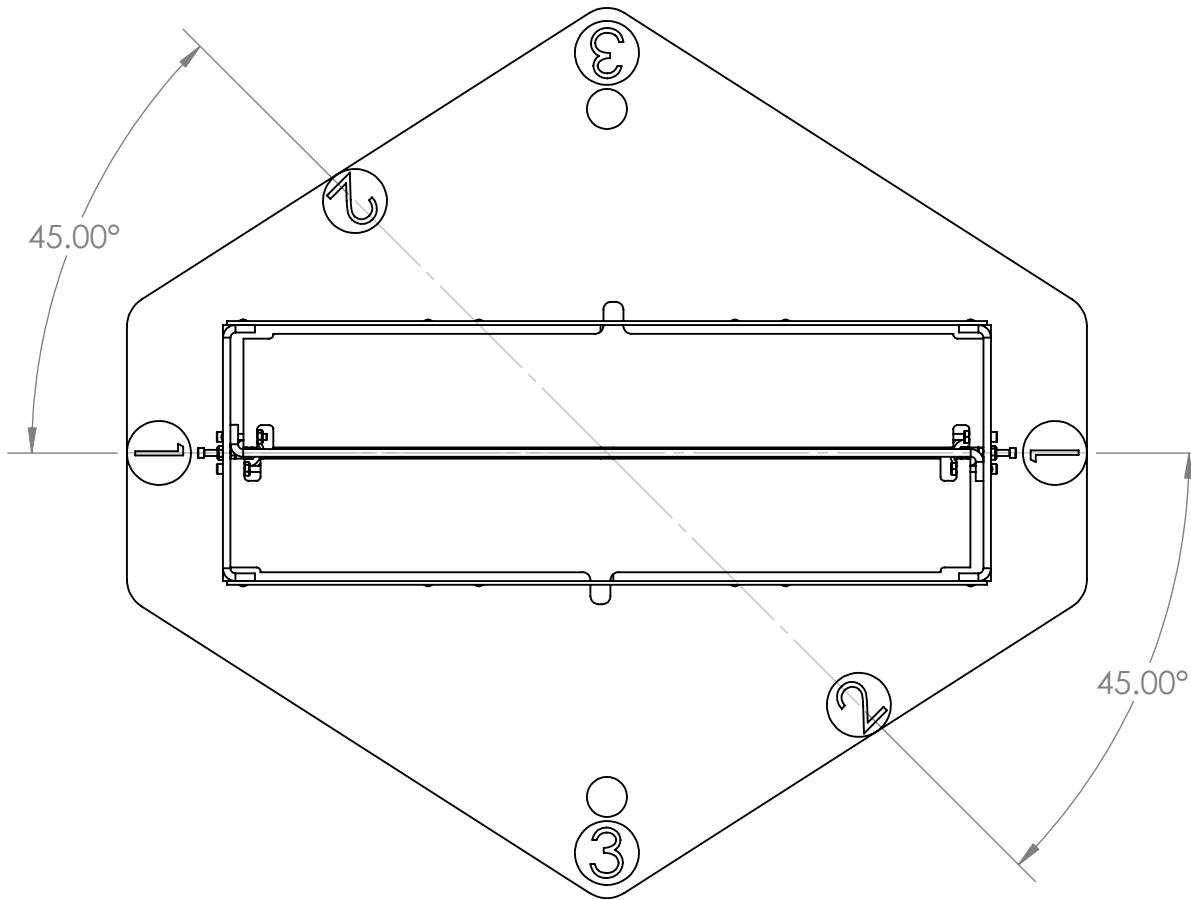
UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DB	10/28/14
TOLERANCES:	CHECKED		
FRACTIONAL \pm	ENG APPR.		
ANGULAR: MACH \pm BEND $\pm 5^\circ$	MFG APPR.		
TWO PLACE DECIMAL ± 0.010	Q.A.		
THREE PLACE DECIMAL ± 0.005	COMMENTS:		
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL			
FINISH			
DO NOT SCALE DRAWING			

 **AndyMark**

TITLE:

LR15 - Number 2 Sticker Placement

SIZE	DWG. NO.	REV
A		1
SCALE: 1:1	WEIGHT:	SHEET 1 OF 2



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL \pm
ANGULAR: MACH \pm BEND $\pm 5^\circ$
TWO PLACE DECIMAL ± 0.010
THREE PLACE DECIMAL ± 0.005

INTERPRET GEOMETRIC
TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	DB	10/28/14
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		
COMMENTS:		

AndyMark

TITLE:
**LR15 - Number 2
Sticker Placement**

SIZE	DWG. NO.	REV
A		1
SCALE: 1:6	WEIGHT:	SHEET 2 OF 2