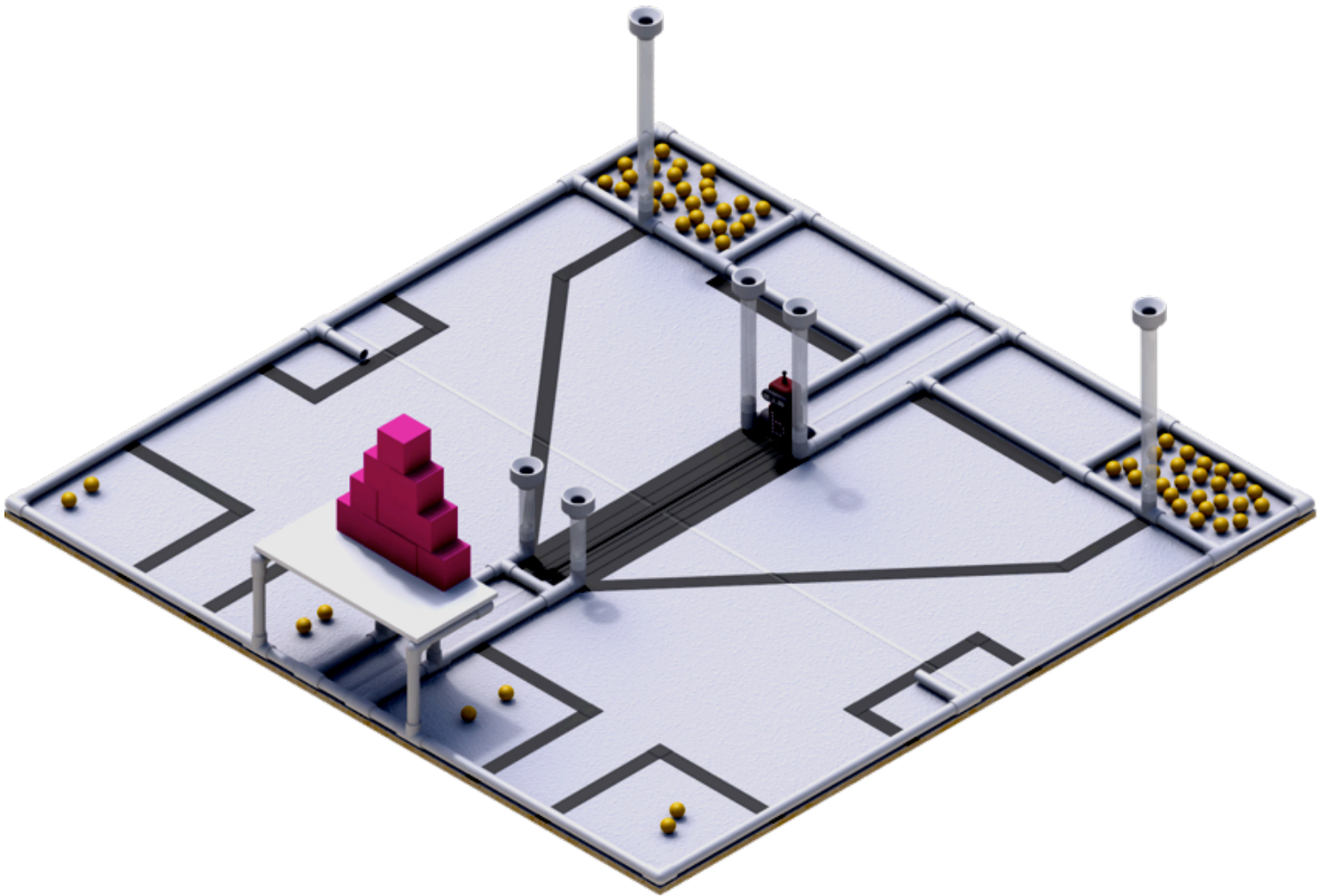


2011 KIPR Open Autonomous Robot Tournament Game Specification

Version 1.05



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Update History

v1.05 : Nov. 11, 2010 Game Rules Released

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International KIPR Open Tournament

KIPR produces the International KIPR Open Autonomous Robot Tournament each year at the Global Conference on Educational Robotics. The 2011 Global Conference on Educational Robotics will be held at the Hyatt Regency Orange County from July 8-12, 2011 (near Anaheim). For more information GCER, please see <http://www.botball.org/GCER>

KIPR Open Game

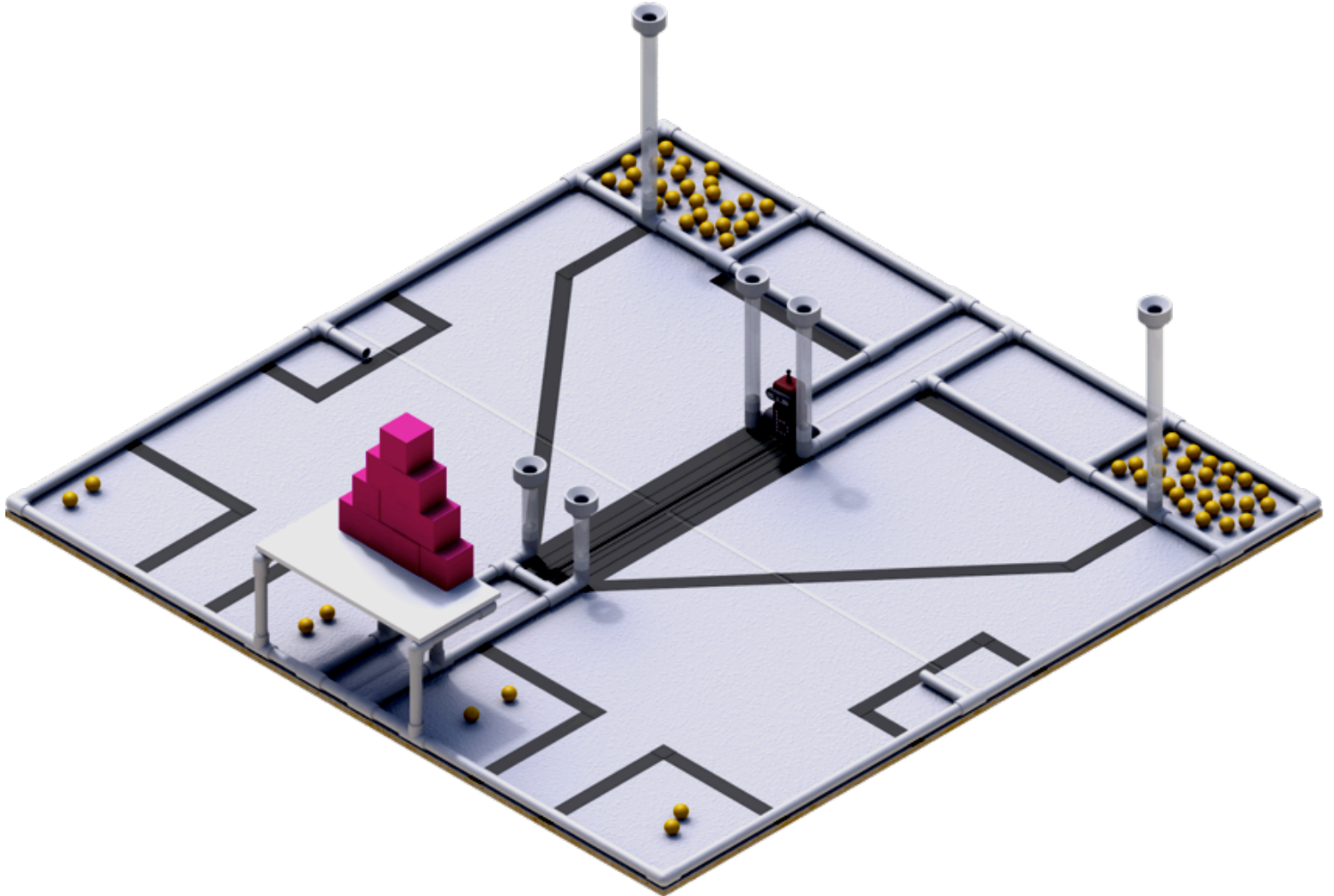
KIPR Open Game is an autonomous robotics challenge designed and distributed each year by the KISS Institute for Practical Robotics (KIPR) to encourage ongoing robotics education beyond the high school level. This document presents the official game rules for the KIPR Open Game. These game rules are free for educational use and are used in college courses and robotics events throughout the country. For the latest information on the KIPR Open Game and the International KIPR Open Tournament, including updates to this rules document, go to http://www.botball.org/kipr_open.

For information on KIPR's Botball Educational Robotics Program for students in middle school and high school visit <http://www.botball.org>.

This Year's Game: Stacking Blocks and Balls

The challenge: Acquire blocks and balls, then build stacks of blocks by placing one on top of another and create stacks of balls by inserting them into vertical tubes.

The Game Board



Team Identification

1. A team's side is the one containing their two starting boxes
2. The sides are arbitrarily labeled A or B to facilitate tournament logistics, and will not change during the tournament
3. In double elimination, teams are assigned to a side by tournament software
4. During seeding, a team may select their side

Scoring

Scoring Items

- 60 – orange ping pong balls, international standard size (40mm)
- 10 – 4” maroon blocks
- 1 – Botguy

Scoring Summary

			Tube Multiplier (m)		
	Points	Level*	Short	Medium	Tall
Blocks	2 ⁿ⁻¹ x 5	n			
Botguy	2 ⁿ x 5	n			
Balls	m x 5		1	2	4

Scoring Rules

1. Judges score the game after the end of the match
2. Each game piece will only score once. If a game piece is in multiple scoring positions, the piece will only score in the highest scoring position
3. Scoring areas are marked by the inside edge of the tape surrounding them
4. Botguy and Blocks are considered stacking objects.
5. An object touching the surface of the board is at level 0 ($n=0$) unless it is in contact with the side stacking zone.
6. An object touching the surface of the board in contact with the side stacking zone is at level 1 ($n=1$).
7. An object resting on a block at level n is at level $n+1$.
8. If there are objects on top of Botguy, Botguy and all objects above him are demoted to level 0 and do not score.
9. If a team's entry is in contact with any object, then that object and all objects below it are demoted to level 0 and do not score.
10. Blocks at level 0 have no score, but may be used in tie breaking situations.
11. Ping Pong balls
 - a. Ping Pong balls score points when they are in the clear plastic tubes
 - b. Ping Pong balls caught in the volume of the tube's funnel score as if in the tube itself with the following exception:
 - i. Ping Pong balls held in place by a restraint or in a containment such as a mesh bag do not score

Tie Breaking

In the event of a tie, the following tie breakers will be applied to determine the winning team (in order):

1. The team with the most balls in their tall tube
2. The team with Botguy scoring on a stack
3. The team with the most balls in their medium tube
4. The team with the highest stack level
5. The team with the most objects scoring in stacks
6. The team with the most points in their side stacking zones
7. The team with the most balls in their short tube
8. The team with the most blocks on their side
9. The team with Botguy on their side
10. The team having a robot's primary power switch closest to their tall tube

Game Board Construction

Game Surface Materials

To build the Game Board surface, you will need:

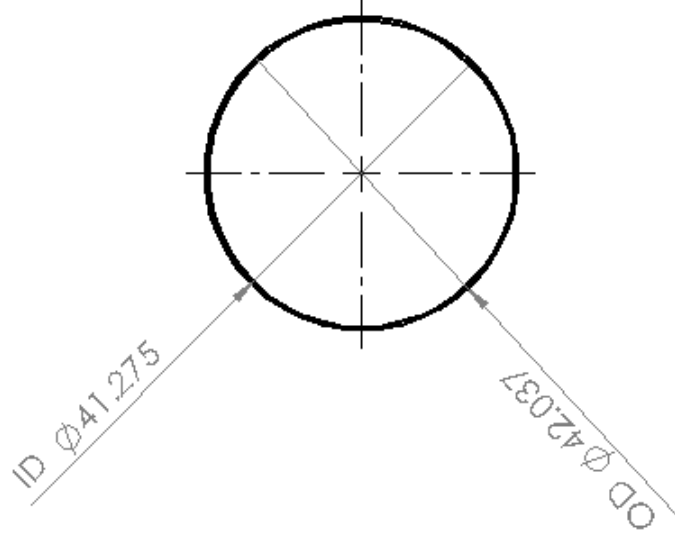
- 4 pieces of 4x4' MDF (122cm x 122cm)
- 4 pieces of 4x4' Fiberglass Reinforced Panels (FRP) (122cm x 122cm) [Home Depot Store SKU# 121586]
- 4 4' (122cm) lengths of FRP divider [Home Depot Barcode #070673858864]
- 1 4' section of 5/8" half round dowel (wood, usually in the trim section)
- 1 roll of black Duck brand duct tape

NOTE: The FRP Divider comes in different widths. This is the one that is 5/8" wide on the narrow side and just over 1" wide on the wide side (the other common one is 3/4" wide on the narrow side and 1 1/4" on the wide side).

These are the same materials used for the surface in last year's game.

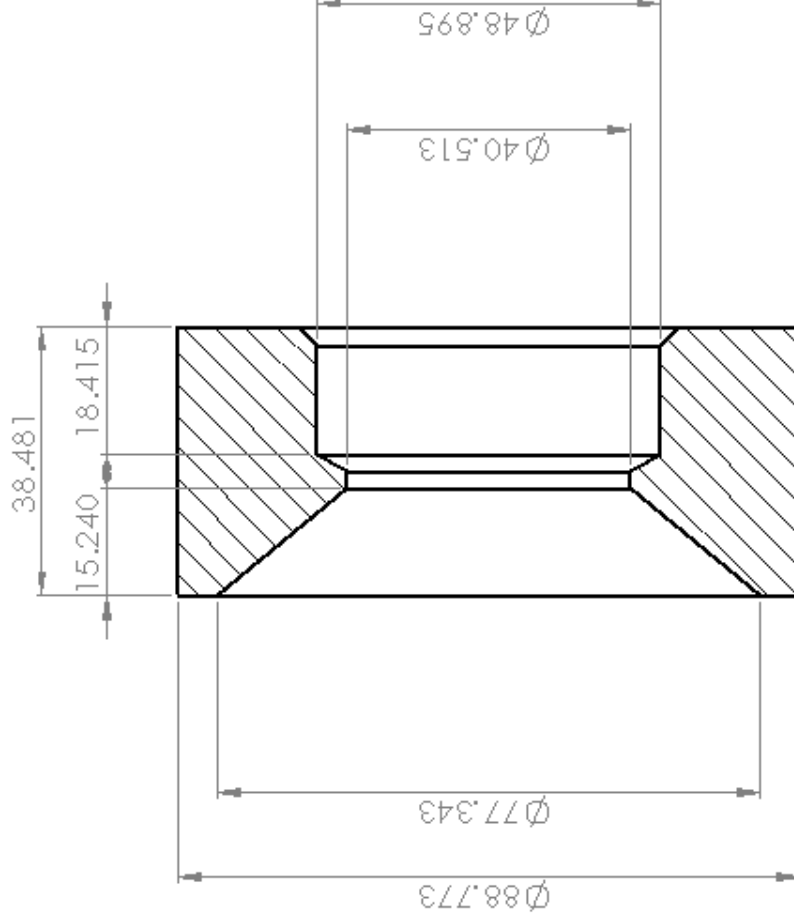
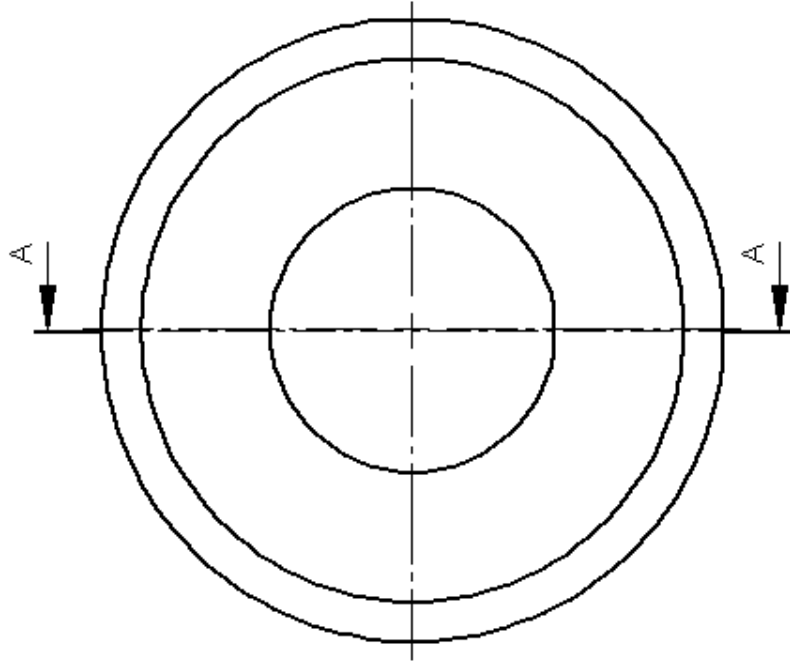
Game Board Layout

- The base of each starting box is defined by the boundaries given by the interior edge of the PVC and tape delineating it.
 - (38cm by 38cm or 15" by 15")
- The height of each inner starting box is given by the height of the platform
 - 31cm (13")
- The height of each outer starting box is 61cm (24")
- Designated areas (e.g., start box, side stacking zone, end zone) are delimited by interior edges of their border material (PVC and/or tape)
- Botguy is positioned to nestle in the PVC pocket between the two medium tubes, facing the platform
- After teams have set up and are ready to start, the judges will randomly select one of the two end zone area designations, then dump 23 ping pong balls in the selected zone for each side, balls to roll where they may
- Each team will start with 4 ping pong balls in their starting box(es).
 - The team may chose to divide the balls between the boxes
 - Balls may not be damaged
 - Balls must start in the starting box, even if not used
- The height from the playing surface to the top of the short, medium and tall ball tubes are respectively: 9.875", 17.625" and 25.125"
- All measurements on official boards, whose uncertainty is not otherwise specified will be as specified within +/- 1/2 inch (12mm) or 1%, whichever is greater, Deal with it.

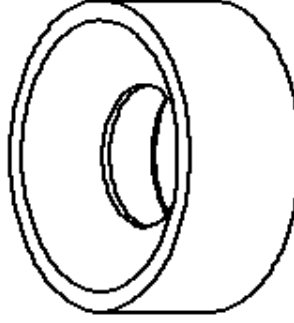


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		DIMENSIONS ARE IN mm		DRAWN			
		TOLERANCES:		CHECKED			
		FRACTIONAL ANGULAR MATCH BEND ±		ENG APPR.			
		TWO PLACE DECIMAL ±		MFG APPR.			
		INTERPRET GEOMETRIC TOLERANCING PER:		Q.A.			
		MATERIAL		COMMENTS:			
		Acrylic					
NEXT ASSY		USED ON				SIZE DWG. NO.	
APPLICATION						A	
						REV	
						SCALE: 1:1 WEIGHT:	
						SHEET 1 OF 1	

TITLE:
Ping Pong Tube

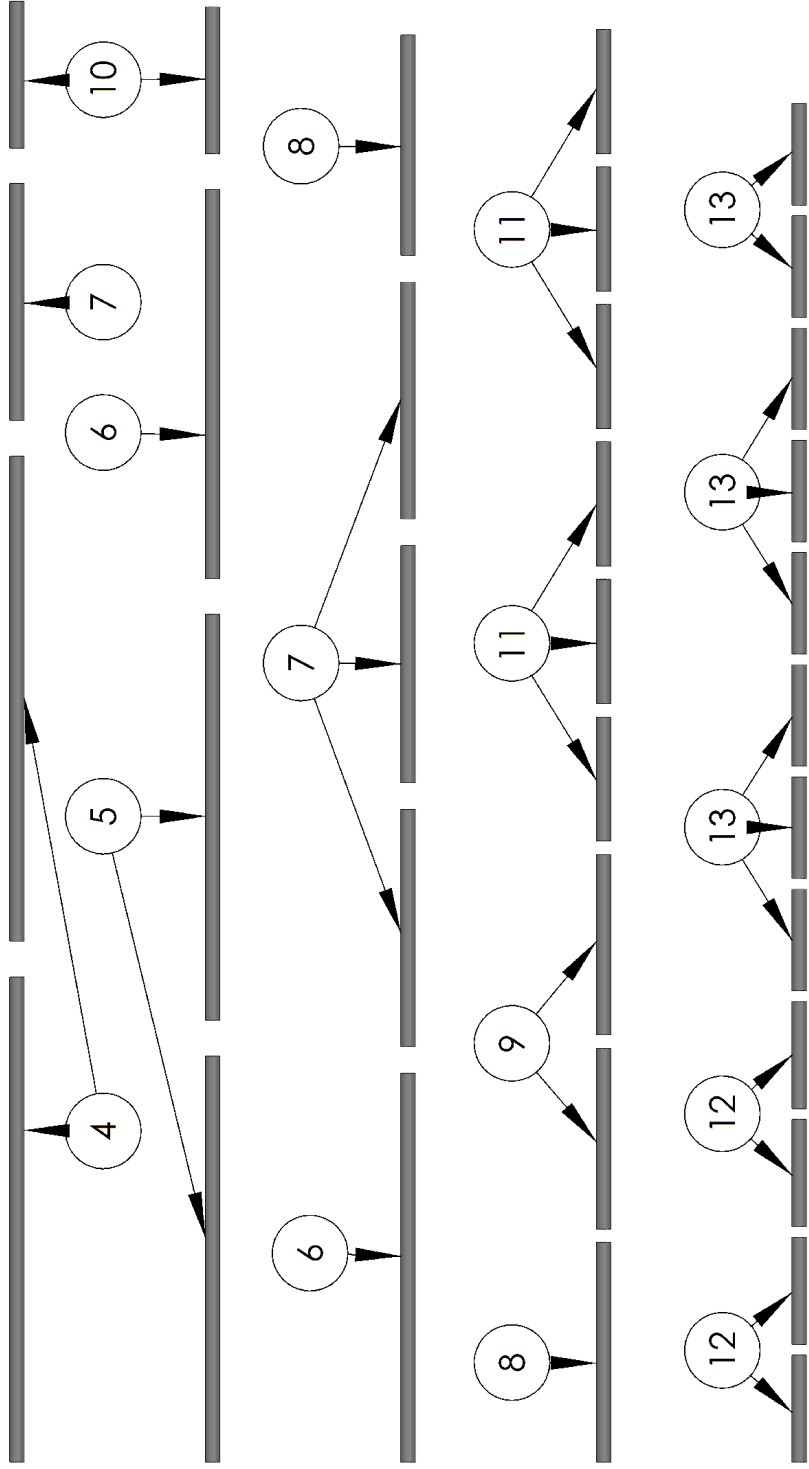


SECTION A-A
SCALE 1 : 1



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UNLESS OTHERWISE SPECIFIED:		DRAWN	NAME	DATE	TITLE:
DIMENSIONS ARE IN mm					
TOLERANCES:		CHECKED			PVC 1.5" to 3" Reducer
FRACTIONAL:		ENG APPR.			
ANGULAR: MM CH \pm BEND \pm		WFG APPR.			
TWO PLACES DECIMAL \pm		Q.A.			
THREE PLACES DECIMAL \pm		COMMENTS:			
INTERPRETING					
TOLERANCING PER:					
MATERIAL	PVC				
FINISH					
USED ON					
APPLICATION					
NEXT ASSY					
DO NOT SCALE DRAWING					
SCALE: 1:1	WEIGHT:				SHEET 1 OF 1
SIZE	DWG. NO.				REV
A					



ITEM NO.	PART NUMBER	QTY.
4	43.0 inch pvc	2
5	36.0 inch pvc	2
6	34.5 inch pvc	2
7	21.0 inch pvc	4
8	19.5 inch pvc	2
9	16.0 inch pvc	2
10	13.0 inch pvc	2
11	11.0 inch pvc	6
12	09.5 inch pvc	4
13	09.0 inch pvc	8
14	06.0 inch pvc	11
15	01.5 inch pvc	10

Comments:

Each row can be cut from 1 standard 10 foot length of PVC.
All PVC is 1 Inch schedule 40, unless otherwise specified.

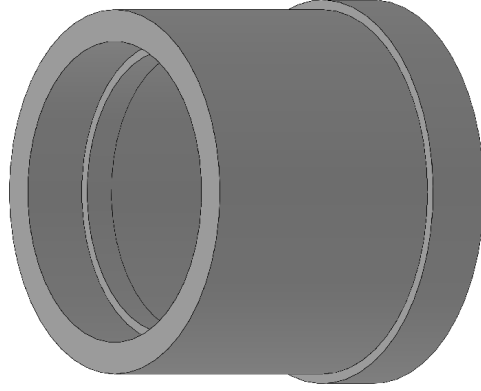
TITLE: PVC Cut Diagram

SIZE DWG. NO. A 2011 KO

REV

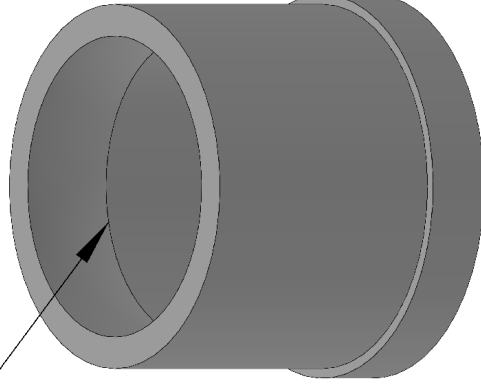
SCALE: 1:50 WEIGHT: SHEET 2 OF 10

Unmodified



Modified

Use high speed rotary tool or file to remove lip so tube inserts without bending and ping pong balls pass through



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TITLE:

Coupler Modification

SIZE	DWG. NO.	REV
------	----------	-----

A 2011 KO

SCALE: 1:50 WEIGHT:

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:

TOLERANCES:
FRACTIONAL +

ANGULAR: MACH± BEND ±

TWO PLACE DECIMAL \pm

THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC
TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

NAME	DATE
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DATE _____

DRAWN

CHECKED

ENG APPR.

MFG APPR.

Q.A.

COMMENTS:

NEXT ASSY

APPLICATION

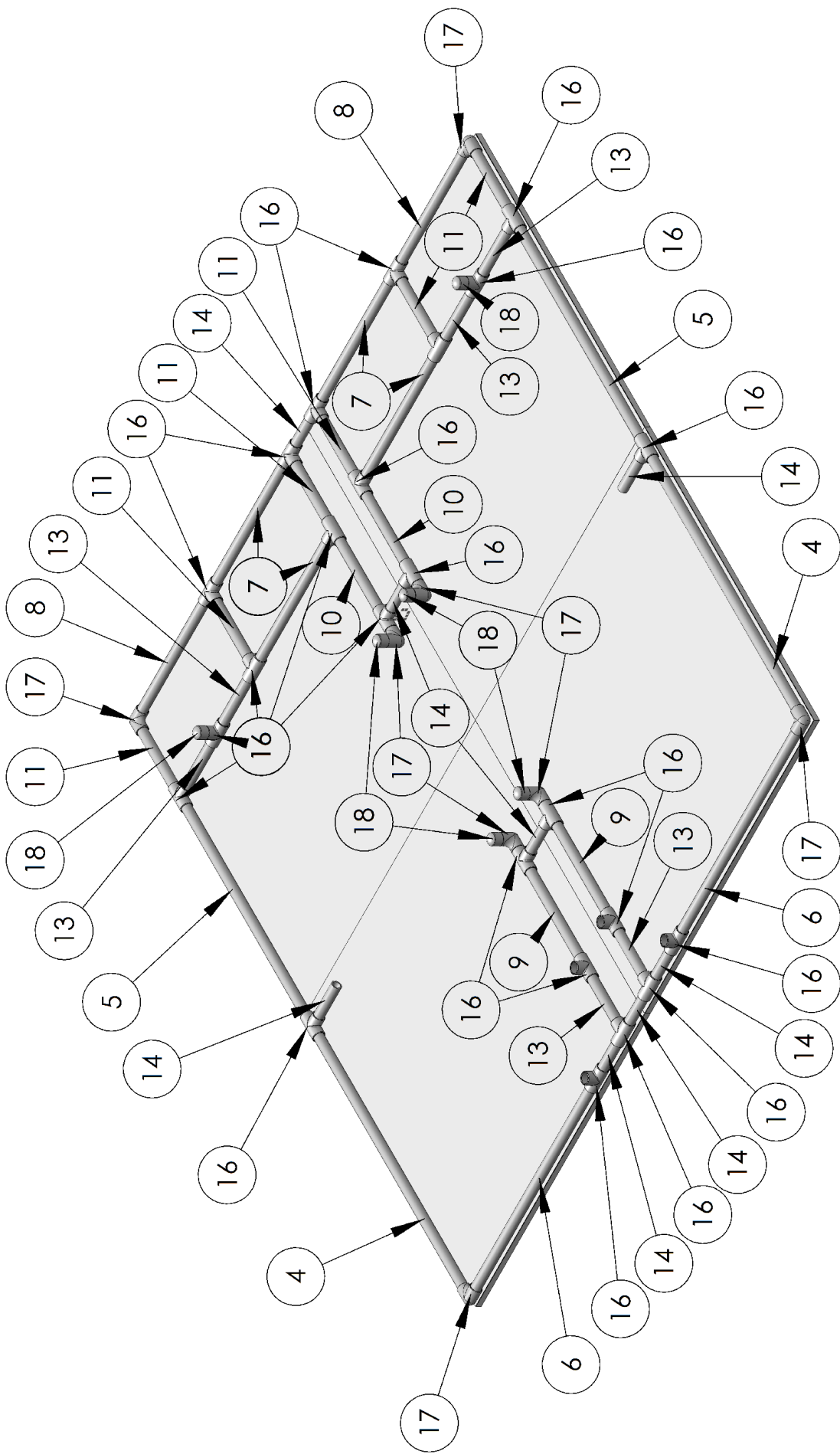
5

4

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2

1



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TOLERANCES:		ENG APPR.			
FRACTIONAL: ±		MFG APPR.			
ANGULAR: MACH ±		Q.A.			
BEND ±		COMMENTS:			
TWO PLACE DECIMAL ±					
THREE PLACE DECIMAL ±					
INTERPRET GEOMETRIC TOLERANCING PER:					
MATERIAL					
FINISH					
NEXT ASSY		USED ON			
APPLICATION		DO NOT SCALE DRAWING			

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SIZE

DWG. NO.

REV

A

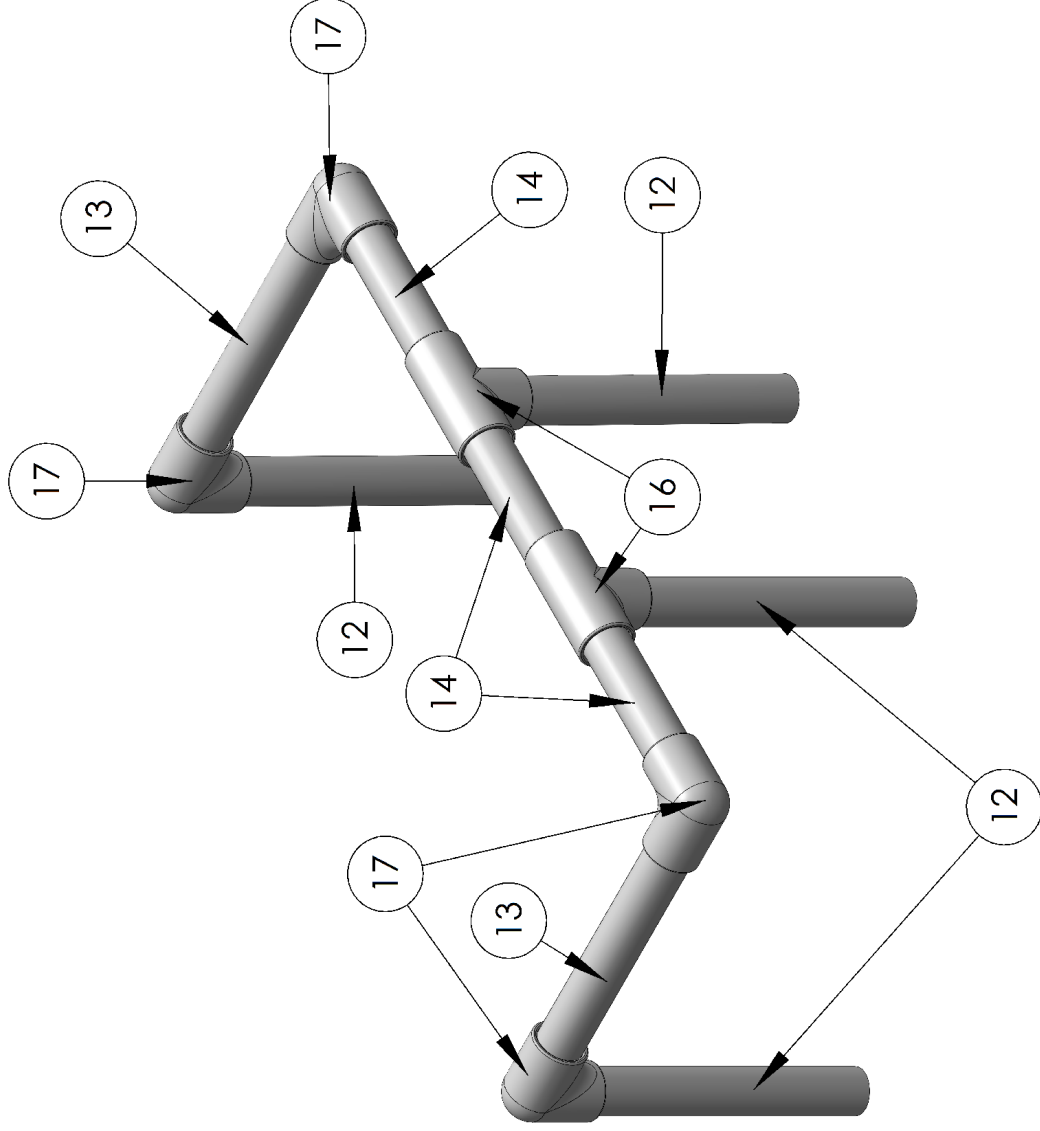
2011 KO

SCALE: 1:50

WEIGHT:

SHEET 5 OF 10

PVC Layout



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DIMENSIONS ARE IN INCHES		CHECKED			
TOLERANCES:		ENG APPR.			
FRACTIONAL: ±		MFG APPR.			
ANGULAR: MACH ±		Q.A.			
BEND ±		COMMENTS:			
TWO PLACE DECIMAL ±					
THREE PLACE DECIMAL ±					
INTERPRET GEOMETRIC TOLERANCING PER:					
MATERIAL					
FINISH					
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APPLICATION		DO NOT SCALE DRAWING			

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5

4

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2

1

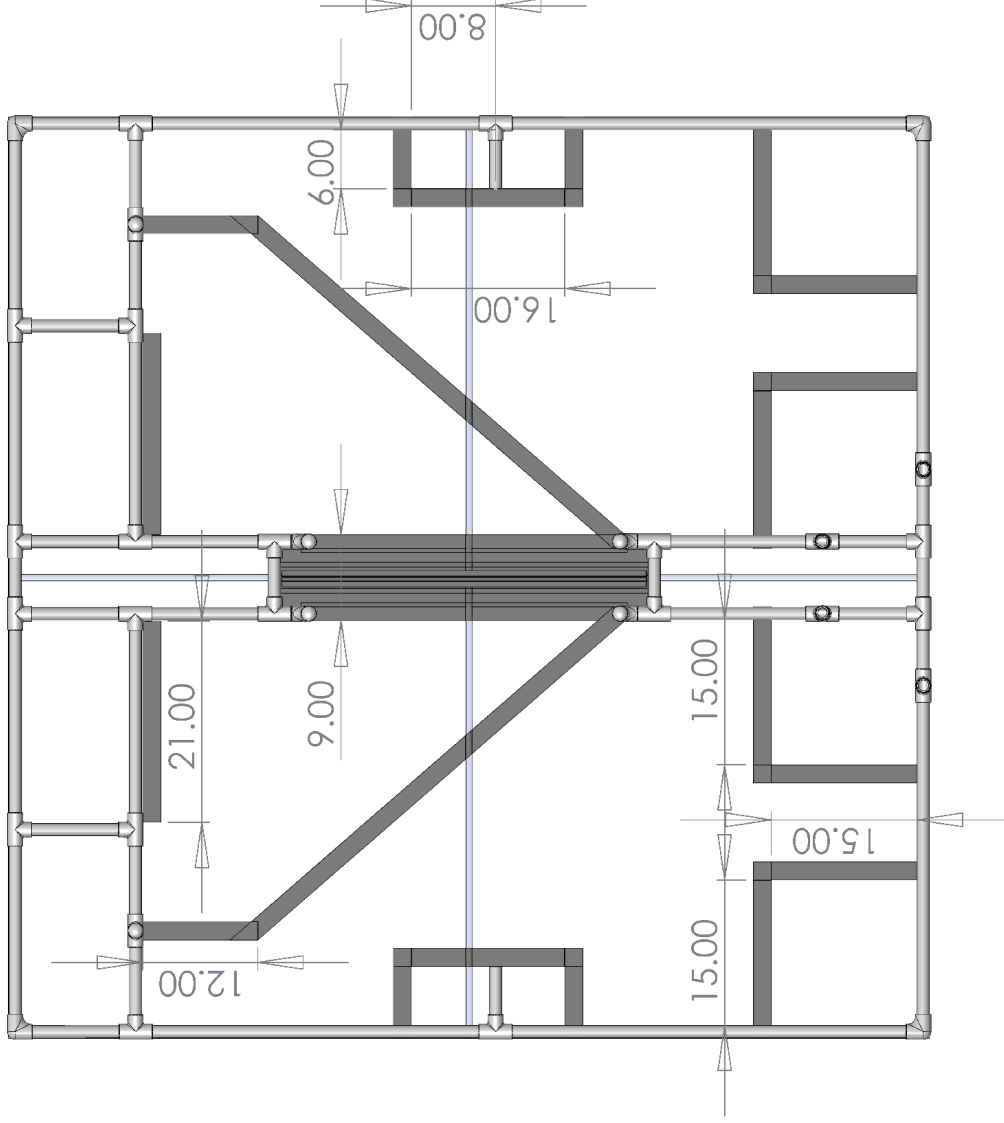
TITLE:

Shelf Support

SIZE DWG. NO. REV
A 2011 KO

SCALE: 1:50 WEIGHT: SHEET 6 OF 10

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					DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±							
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						MFG APPR.						
						Q.A.						
						COMMENTS:						
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						A		2011 KO				
						SCALE: 1:50		WEIGHT:		SHEET 7 OF 10		



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					DIMENSIONS ARE IN INCHES TOLERANCES:					DRAWN			
					FRACTIONAL ±					CHECKED			
					ANGULAR: MACH ± BEND ±					ENG APPR.			
					TWO PLACE DECIMAL ±								
					THREE PLACE DECIMAL ±					MFG APPR.			
					INTERPRET GEOMETRIC TOLERANCING PER:					Q.A.			
										COMMENTS:			
					MATERIAL								
					FINISH								
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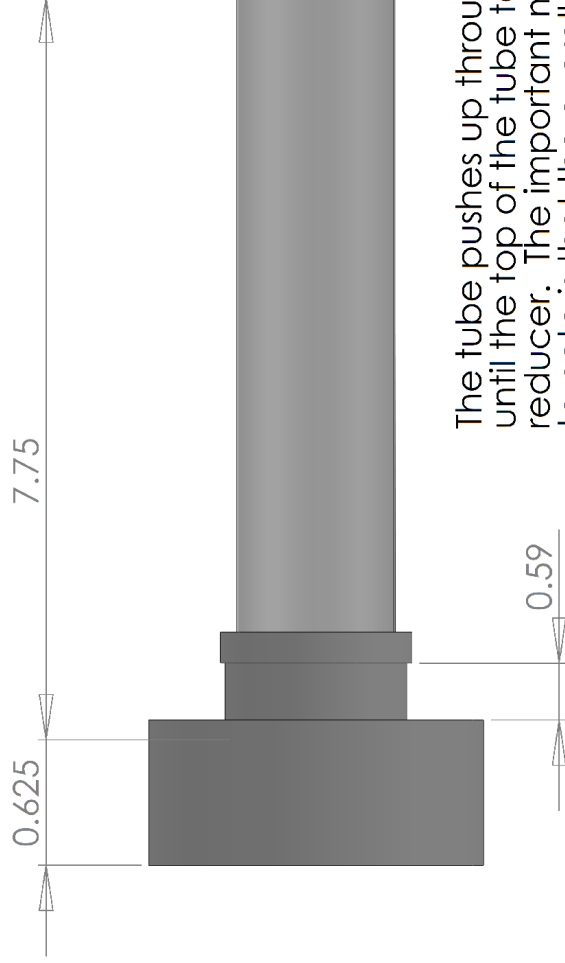
Reducer

Coupler

Tube

The tube and reducer meet here

The tube pushes up through the coupler until the top of the tube touches the reducer. The important measurement to note is that the overall height is 0.625 inches longer than the tube.



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TITLE: Ping Pong Ball
Tube Construction

SIZE DWG. NO. REV
A 2011 KO

SCALE: 1:50 WEIGHT: SHEET 9 OF 10

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN		
TOLERANCES:	CHECKED		
FRACTIONAL: ±	ENG APPR.		
ANGULAR: MACH ±	MFG APPR.		
BEND ±	Q.A.		
TWO PLACE DECIMAL ±	COMMENTS:		
THREE PLACE DECIMAL ±			
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL			
FINISH			
USED ON			
NEXT ASSY			
APPLICATION			
DO NOT SCALE DRAWING			

Robot Construction Rules

The following rules apply to all robots to be entered in the KIPR Open Robot Game:

1. A team's entry must fit completely within their two starting boxes.
2. A team's entry (all materials placed on the game-board) must mass less than 10kg (22 pounds).
3. A team's entry (all materials placed on the game-board) must fit within their (virtual) starting boxes without restraint (other than pressing against interior edge of any game board PVC bordering the starting box).
4. The team's entry may not contain or release pressurized materials at greater than 7 bar (100 psi).
5. The team's entry may not release any liquids during the game, or before, during, or after the game while the team is at the game table.
6. The team's entry may not release any gasses while at the game table that are considered hazardous by the judges, or are at a temperature below 0°C (32°F) or above 50°C (122°F).
7. Robots may not contain features (manipulators, protrusions or materials) that are designed to, or are deemed by the judges likely to, cause damage or destruction to the game board, or to game pieces, or to a reasonably constructed opponent robot.
8. A team's entry may not contain features (manipulators, protrusions or materials) that are designed to, or are deemed by the judges likely to, cause jamming or entanglement of a reasonably constructed opponent robot. Blocking and containing of opponent robots is allowed; strategies likely to entangle or damage opponents or the board or game pieces are not allowed.
9. Robots must operate autonomously (no external power or control from outside of the game board area will be allowed).
10. Each team may only have a maximum of four independent structures on the game board at a time.
11. Each robot must have a name suitable for broadcast over a PA system.
12. Team entries may NOT contain parts that may reasonably be confused with game pieces (entries may not contain mirrors, lights, colored objects, or tape designed to confuse an opponent)
13. A team's entry may be made out of any materials or parts (including Botball and non-Botball kits) as long as the entry conforms to the construction rules above.

KIPR Open Tournament Rules

Team Membership

- At least one team member must be beyond High School in their educational careers.
- College students, professional engineers, hobbyists, poets, and anyone else fulfilling the criteria above are all encouraged to participate

Seeding/Performance Rounds

1. S/P Rounds take place before the double elimination rounds
2. S/P rounds consist of best two out of three, unopposed rounds.
3. Scoring = (your points) - (their points)
4. Scores of less than -1 will be counted as 0
5. Passing on a round gives a score of -1 for that round
6. Seed Score = average of best two rounds

Double Elimination Tournament

1. A team is out of the tournament when it has lost two games
2. Initial matches are decided by seeding round
3. Matches are arranged using KIPR tournament software
4. Judges' decisions are final

Double Elimination

1. A team's entry must have broken the border of a starting box sometime during the 180 seconds of game play or that round will be forfeit.
2. Robots must stop all motors and other actuators at the end of the round. Failure to do so will result in loss of round (unless the other team never broke out of the starting box).
3. If neither team's entry manages to break the border of a starting box during game play, the round will be replayed once. If it happens again during the replay, the round will be decided by coin flip.
4. At least one robot from a team must be outfitted and programmed to respond to the starting light. A robot team that operates exclusively on a timer triggered by a hand operated switch is not allowed and will automatically cause that team to forfeit that round.

Tournament Logistics

1. Teams shake hands and visually inspect each other's robots before calibration.
 - a. If either team wants to challenge the validity of the robots they are facing, they have to do it then.
 - b. Inspection is limited to a max of 1 minute unless a specific challenge is made.
 - c. Challenges have to be of the form:
 - i. That robot contains high explosives
 - ii. That robot's hardened steel spike is designed to damage other robots.
 - d. Judges will be the final arbiter.
 - i. Judges can dismiss what they believe to be spurious challenges
 - e. Teams found in violation will (unless the judge decides there have been extenuating circumstances) forfeit that round or at the judge's discretion, be allowed to remove the offending pieces before the round begins.
 - f. In no case will a robot that is determined before the beginning of the round to be in violation of the construction rules be allowed to play while in that state.
2. If the judges determine that a robot violates the construction rules, whether or not a challenge has been made, that robot will not be allowed to run until it has been modified to meet the rules
3. Construction rules apply only to what is brought to the Game Table
4. Teams cannot use infrared links to program their robots within 10 yards of the game board.
5. During setup teams may adjust starting lights:
 - a. Starting lights must be attached to the PVC pipe for a starting box
 - b. Starting lights may not be in physical contact with any robot
 - c. Starting lights may not be aimed to disrupt an opponent or blind anyone (judge's decision)
6. During setup teams perform any necessary calibrations needed by their robots.
 - a. Setup time should be two minutes or less.
 - b. For each minute or fraction thereof in excess of 2 minutes the team's score will be reduced by 20%.
7. When both teams are ready or judges decide adequate time has been allowed for calibration, teams activate their robots and then -- Hands off!
 - a. After hands off, no part of a team's robot(s) may leave the starting box until the starting lights turn on.
 - i. If this happens, the judges will call a fault on the team.
 - ii. If a team receives a 2nd fault in a round, they forfeit the round
 - b. After hands off, judges will finalize game board setup.
 - c. After hands off, judges will turn on the starting lights to signal game start.
 - d. After hands off, teams may not broadcast ANY physical or electromagnetic signals to their robots once the teams are in "Hands-Off"
 - e. When the starting lights turn on the robots must autonomously start
8. Game duration is 180 seconds.
9. Lights will remain on for 5 seconds, turn off for 55 seconds, blink for 5 seconds, turn off for 110 seconds and flash the last 5 seconds

10. Once the starting lights are turned on, the round counts unless a judge rules outside interference
11. For the first 60 seconds of the game, a “no touch/no fly” rule is in effect; namely, a robot cannot touch the surface of its opponent’s side until 60 seconds have elapsed and a robot cannot cross the space between the two inner starting boxes into the other team’s starting box – this is signaled by the starting lights blinking after 60 seconds have elapsed.
 - a. Violation of this rule disqualifies the entry for the round
12. Robots must cut power to their motors and turn off or stop issuing motion commands to servos by the end of the round or risk forfeiting the round
13. Scoring is based on the location of pieces at the end of the round, not how the pieces got there.
14. There are no instant replays, and attempts to use videos to question a decision will be ignored.
 - b. If a team is unhappy with a judge's decision, they should challenge it then and there.
 - c. Challenges to scoring after the teams have left the table, will not be considered
15. Teams cannot touch, borrow equipment, modify robots or computers, or beam commands to another team’s stuff (including their pit table) without the permission and presence of a member of that team

Advice for Tournament Participants

Test your robots from start to end:

- a. Go through the entire starting sequence
- b. Test your robot on both sides of the game table
- c. Make sure you can calibrate to the starting light
- d. Make sure the robots stop when they are supposed to: verify with a stop watch!
- e. Does the starting sequence work with very bright overhead lights? (tournament tables will have bright lights hung about five feet above the tables)
- f. Test the shielding of your sensors!

Check <http://www.botball.org> regularly for rules updates.

Check out the KIPR Open Robotics Game discussion board and FAQ at <http://community.botball.org>

Good Luck!