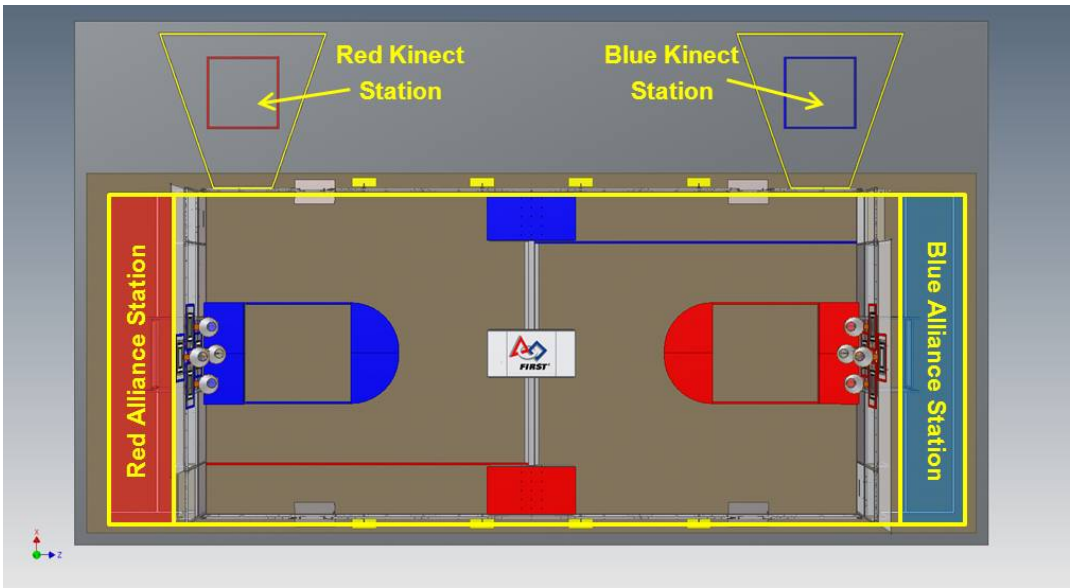
Section 2

The Arena

FRC FIRST Robotics Competition

2 The Arena

2.1 Overview



Note: These illustrations are for a general visual understanding of the Rebound Rumble Arena only. Please refer to the

official drawings for exact dimensions and construction details.

The Arena includes all elements of the game infrastructure that are required to play *Rebound Rumble*: the Court, the Alliance Stations, Kinect Stations and all supporting communications, arena control, and scorekeeping equipment.

Robots play *Rebound Rumble* on a rectangular field known as the Court. During the Matches, the Robots are controlled from Alliance Stations located outside the ends of the Court. These rectangular zones consist of three Player Stations that provide connectivity between the controls used by the Drivers and the Arena. Hoops are attached to the surface of the Alliance Walls facing the Court.

The drawings and CAD models for the *Rebound Rumble* Arena used in competition can be found on the *FIRST* web site here (dimensions stated in this document are approximate). Note that the web site also contains drawings for low-cost versions of the important elements of the Arena. Teams may choose to build these versions for their own use during the construction and testing of the Robot. These drawings can be found here. Links to CAD models, hosted by Autodesk and PTC, can be found here.

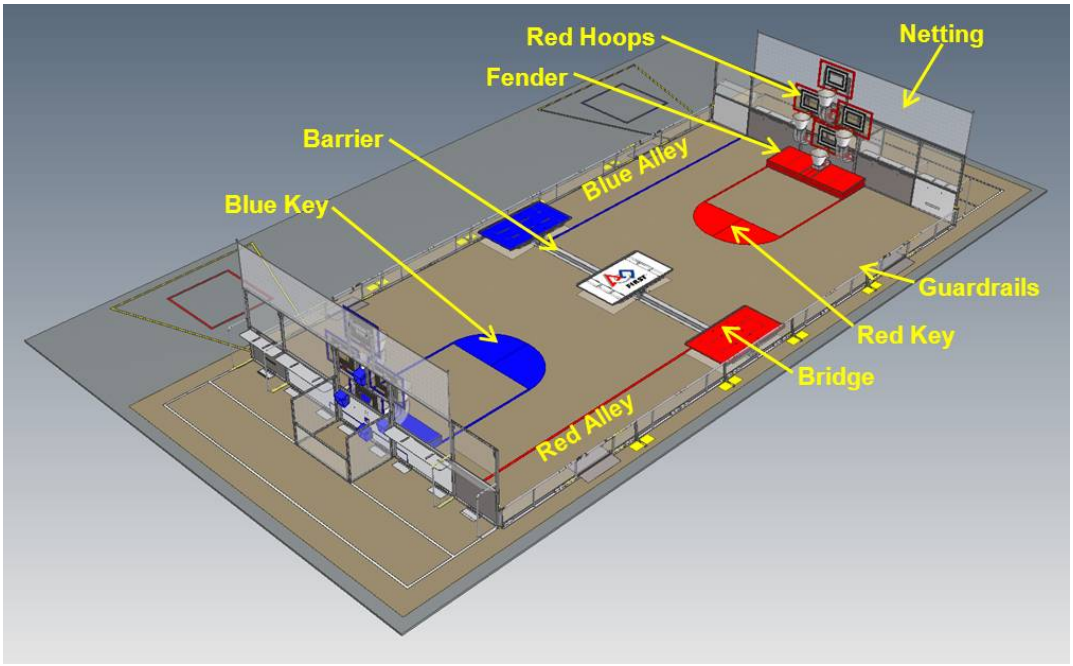
The competition Arenas are modular constructions that are assembled, used, disassembled, and shipped many times during the competition season. They may undergo wear and tear. The Arena is designed to withstand rigorous play and frequent shipping, and every effort is made to ensure that the Arenas are as identical from event to event as possible. However, as the Arenas are assembled in different venues by different event staff, some small variations do occur. Fit and tolerance on large assemblies (e.g. the Bridge) are ensured only to within ¼ in. Overall gross dimensions of the entire Court may vary up to 4 in. Successful teams will design Robots that are insensitive to these variations.

2.2 The Arena

Note: The official Rebound Rumble Arena description, layout, dimensions and parts list are contained in the "FE-00035 - 2012 Arena Layout and Marking" Drawing. Diagrams and dimensions below are for illustrative purposes only.

2.2.1 The Court

The Court for *Rebound Rumble* is a 27 by 54 ft carpeted area, bounded by two Alliance Walls and a guardrail system. The Court is covered with carpet (Shaw Floors, Philadelphia Commercial, Neyland II, 20, 30753, "park bench"). Hoops are located at the ends of the Court attached to the Alliance Walls. Three Bridges are located in the center of the Court. Areas of red and blue tape on the surface of the Court denote Alleys; solid red and blue semicircular areas are Keys.

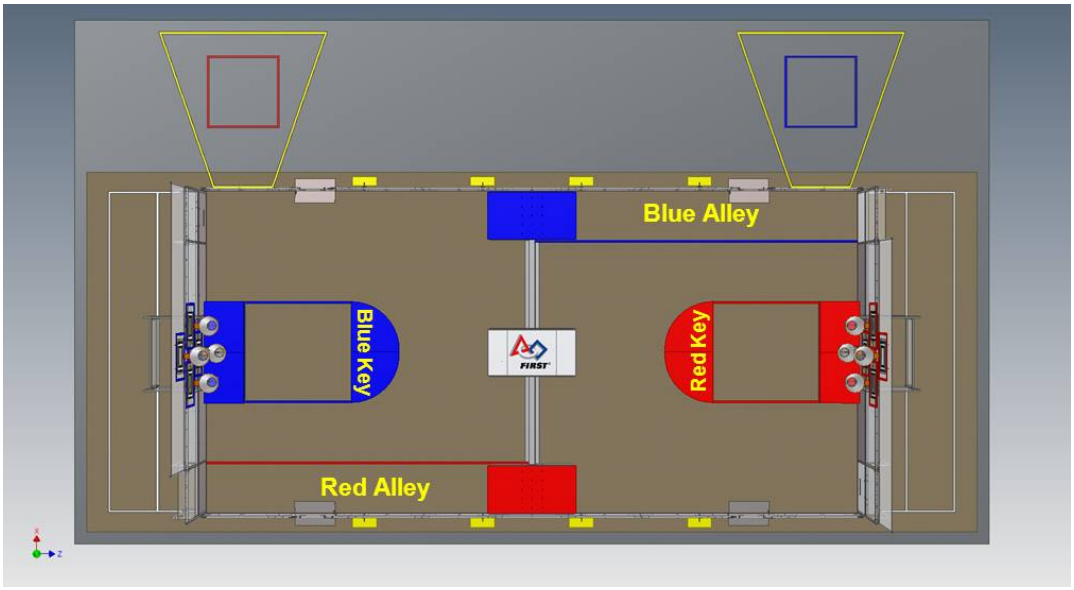


The Alliance Walls are 6 ½ ft high, 27 ft wide, and define the ends of the Court. The Alliance Wall protects the Player Stations, and is composed of a 3 ft high base of diamond plate aluminum topped with a 3 ½ ft high transparent polycarbonate panel.

The guardrail system is a horizontal pipe 20 in. above the floor, supported by vertical struts mounted on a 3 in. aluminum angle. A shield is attached on the inside of the guardrail system, extending from the floor to the top of the guardrail, and running the length of the guardrail. The shield is intended to help prevent Robots, in whole or in part, from inadvertently exiting the Court during a Match. The Guardrail System defines the borders of the Court, except where it is bounded by the Alliance Wall.

Four gates in the guardrail system allow easy access to the Court for placement and removal of Robots. The gates are 38 in. wide, and are closed and shielded during Matches.

2.2.2 Court Markings



(For illustrative purposes only - please refer to Drawing FE-00035 for exact dimensions)

There is one Key for each Alliance, located in front of their opponent's Alliance Wall. The Key is an elongated semicircle that is 101 in. wide and 48 in. deep. The flat edge of the Key is located 144 in. from the Alliance Wall and centered on the width of the Court. The Key is made of 1/8 in. thick red or blue HDPE plastic attached to the carpet via Velcro.

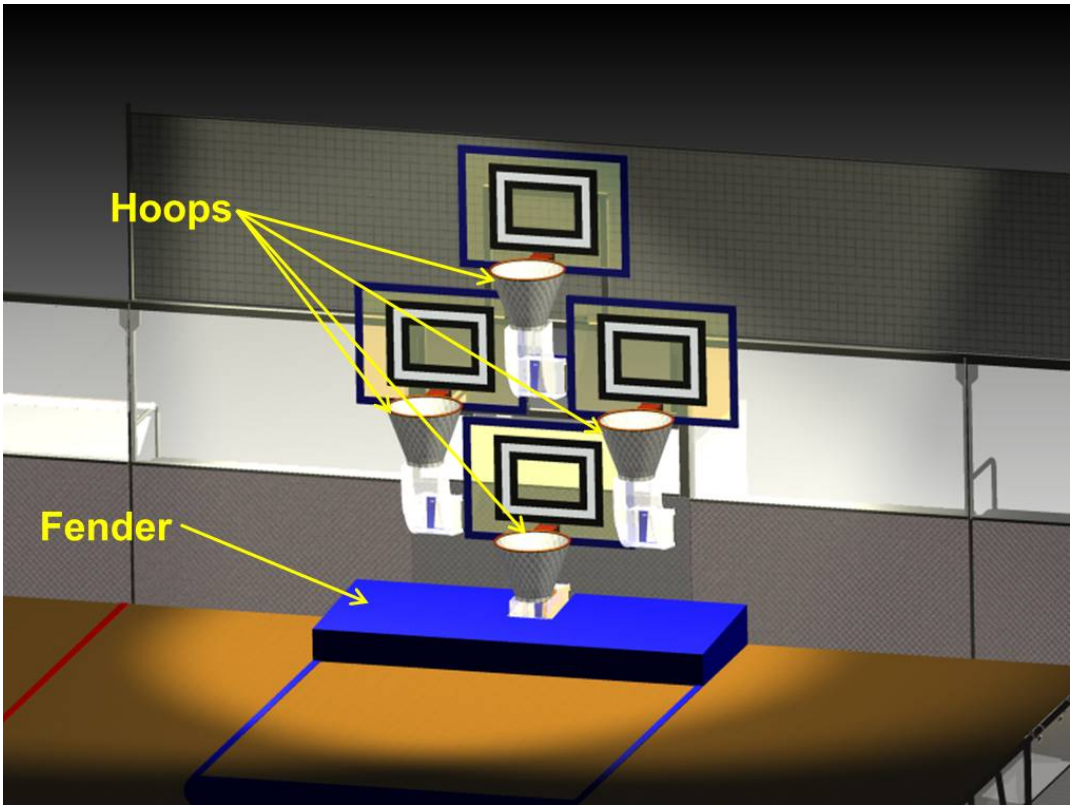
Each Alliance has one Alley that extends along the side of the Court from their Inbound Station to their Bridge. Each Alley is approximately 51 in. wide and is adjacent to the edge of the Court, and is marked by 2 in. wide gaffers tape (Pro Gaff Tape, "electric blue" and "red", 2 in.); the tape is part of the Alley.

The red and blue tape running from the Keys to the Fenders are purely decorative and have no other function in *Rebound Rumble*.

2.2.3 The Players

Each FRC team may provide up to four Players for each Match: two Drivers, one Inbounder, and one Coach. The Drivers must be pre-college student team members and are responsible for operating and controlling the Robot. The Inbounders must be pre-college student team members and are responsible for entering Basketballs onto the Court. The Coach may be a student or adult team member. The Coach must wear the designated "Coach" pin or button during the Match.

2.2.4 The Hoops



The Hoops (Huffy Spalding “Slam Jam” Red Replacement Basketball Rim, model #7800s; Lifetime Basketball Net 120gram, model #0790; McMaster #9573K68 used instead of stock spring) are used to receive Basketballs that are scored by the Robots as they play *Rebound Rumble*. Four Hoops are attached to the inside face of each Alliance Wall. There is one bottom Hoop, two middle Hoops, and one top Hoop. The bottom and top Hoops are centered on the Alliance wall while the middle Hoops are centered 27-3/8 in. to either side of the center of the Alliance Wall. When measured from the carpet to the top edge of a rim, the bottom, middle, and top Hoops are 28 in., 61 in., and 98 in. high off the floor, respectively. The rim of a Hoop has an inner diameter of 18 in. The closest point on the inside edge of a rim is 6 in. away from the face of a backboard. The backboard on each Hoop is 44 by 31-1/2 in. and made of smoked ½ in. thick polycarbonate. Backboards are outlined in a 2 in. thick blue or red stripe.

A retro-reflective Vision Target (Reflexite GP020, 50mm; Pro Gaff Tape, “black”, 2 in.) is mounted behind each Hoop. The Vision Target is a rectangle with an outer width of 24 in., an outer height of 18 in., and a stroke of 2 in. The Vision Target is centered on the backboard with a distance of 2 in. from the lowest edge of retro-reflective material to the upper edge of the rim. There is a 2 in. stroke strip of black gaffers tape on both the inside and outside of the retro-reflective rectangle.

A Fender is located directly below the Hoops at each end of the Court. The Fender is designed to protect the Hoops from damage by Robots. The Fender is 38-3/4 in. deep by 101 in. wide and measures 8-1/4 in. tall at the front, and 10-1/4 in. tall at the back against the Alliance Wall.

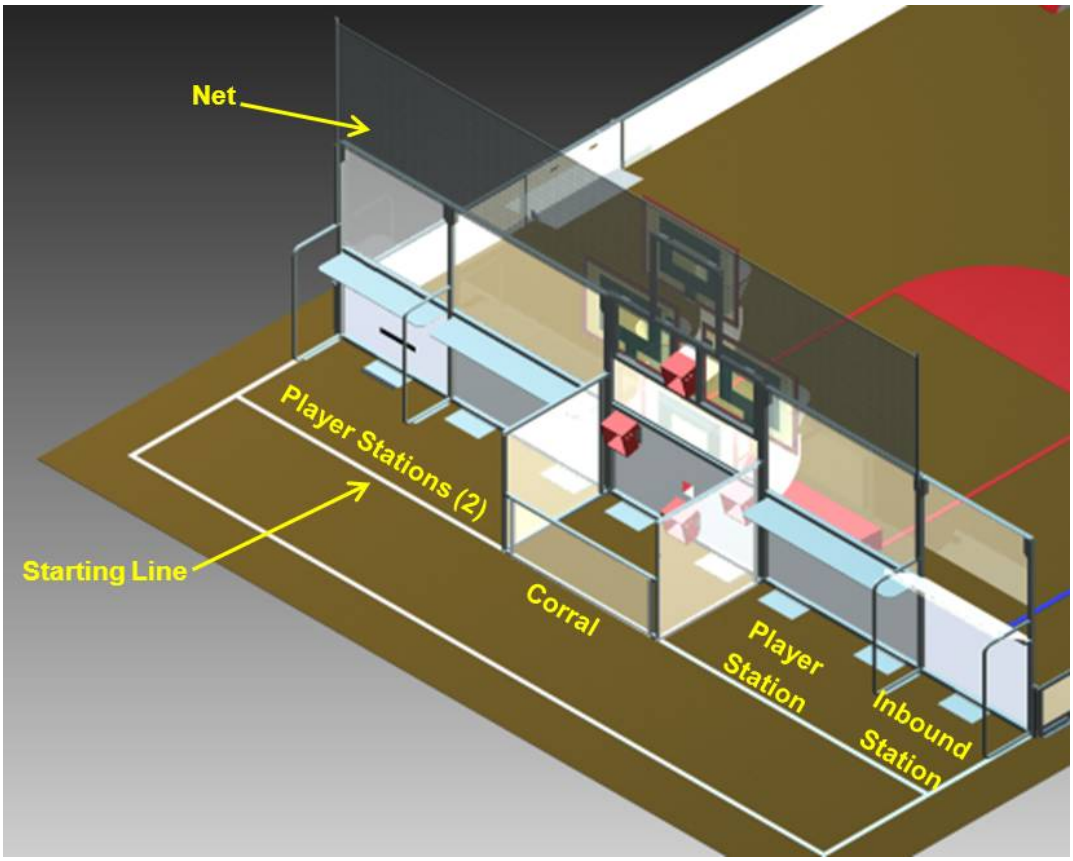
2.2.5 The Bridges

Robots traverse the center of the Court by crossing over either one of three Bridges or the 4 in. tall by 6 in. wide, smooth steel Barriers running between them. Each Alliance has one dedicated Bridge for their use at end of their Alley. An additional white Coopertition Bridge is located at the center of the Court. Each Bridge is 48 in. wide, 88 in. long (outside dimensions), and sits with the top platform 12 in. high off the ground when level. Each Bridge is mounted on a double-hinge that allows the Bridge to tip towards either end of Court. The top surface of each bridge includes an array of 15 small holes, details of which are included in the official field drawings.

A Bridge will count as Balanced if it is within 5° of horizontal and all Robots touching it are fully supported by it.

2.2.6 The Alliance Stations

The Alliance Stations are located at either end of the Arena, behind the Alliance Walls. The Players remain in their assigned Alliance Station during the Match.



The Alliance Station extends back 8 ft from the Alliance Wall, and spans the entire width of the wall. The Alliance Station includes the three Player Stations and one Inbound Station. The Starting Line is marked on the floor 4 ft back from the Alliance Wall, and extends across the width of the Alliance Station. The Alliance Station includes the area behind the Starting Line. All boundaries for the Alliance Stations are marked on the carpet with white tape (Pro Gaff Tape, “white”, 2 in.). The tape boundaries are considered part of the bounded areas.

Netting is located above each Alliance Wall to help keep Basketballs in the Court. This netting extends the full width of the Alliance Station, except for the Inbound Station.

2.2.7 The Inbound Stations

An Inbound Station is located on the side of the Alliance Station at the end of the Alley. The Inbound Station is approximately 4 ft 3 in. wide. There is no netting above the Inbound Station.

The Inbound Slots are openings in the Alliance Wall that can be used by the Inbounders to enter Basketballs onto the Court. One Inbound Slot is located in each Inbound Station. Each Inbound Slot is approximately 13 in. tall, and spans the width of the Inbound Station. The lowest edge of the slot is located 37 in. above the floor of the Court. Extending back from the Inbound Slot into the Inbound Station is a chute comprised of a sloped piece of polycarbonate. The chute spans the width of the Inbound Slot, and is sloped at an angle of 34° above horizontal

2.2.8 The Corral

In the center of the Alliance Station is the Corral. Basketballs scored in Hoops feed through the scoring counters and into this enclosed area. The interior dimensions of the Corral are 6 ft wide by 4 ft long. The Corral has 4 ft tall side walls, and a 2 ft tall front containment wall.

2.2.9 The Player Stations

One Player Station is located between the Inbound Station and Corral. The remaining two Player Stations are located on the opposite side of the Corral. The Player Station on the end of the Alliance Wall is 51 in. wide, while the other two Player Stations are 72 in. wide. All three Player Stations have the components detailed below.

Attached to the Alliance Wall in each Player Station is an aluminum shelf to support the Operator Consoles for the FRC team in that Player Station. The support shelf measures at least 48 in. wide by 12 in. deep. There is a 3 ft long by 2 in. wide strip of Velcro tape (“loop” side) along the center of the support shelf that may be used to secure the Operator Consoles to the shelf. Each setup location includes a competition cable (to provide Ethernet connectivity) that attaches to the Ethernet Port of the Operator Console. The cable provides communications with the Robot.

Each Player Station also includes a power adaptor cable that may be used to power the Classmate laptops that were provided to teams in the Kit of Parts starting in 2010. Emergency Stop (E-Stop) buttons for each Robot are located on the left side of each Player Station shelf. Arena components (including team number displays, competition arena hardware, alliance lights, control hardware cabinets and clock displays) are also located above the Player Stations and below the shelf.

Once plugged in to the Field Management System via the Ethernet cable provided, the ports that the teams will be able to access on the playing field are as follows:

– TCP 1180: This port is typically used for camera data from the cRIO to the DS when the camera is connected to port 2 on the cRIO. This port is bidirectional on the field.

– TCP 1735: SmartDashboard, bidirectional

– UDP 1130: Dashboard-to-Robot control data, directional

– UDP 1140: Robot-to-Dashboard status data, directional

– HTTP 80: Camera connected via switch on the robot, bidirectional

– HTTP 443: Camera connected via switch on the robot, bidirectional

All these ports are open on the playing field, so a team can use them as they wish if they do not employ them as outlined above (i.e. TCP 1180 can be used to pass data back and forth between the robot and the DS if the team chooses not to use the camera on port 2).

2.2.10 The Kinect Stations

Two Kinect Stations are located outside the Court. Each Kinect Station extends 8 ft from the Alliance Wall towards the center of the Court, and extends 10 ft back from the guardrail. At most competitions, both Kinect Stations will be located on the same side of the Arena as the scoring table. At some venues however, one Kinect Station may be located on the side of the Arena opposite the scoring table.

Each Kinect Station has a Microsoft Kinect mounted to shelf that is approximately 44 in. off the floor. A feedback monitor is located on a separate shelf directly below the Microsoft Kinect. The Microsoft Kinect is centered along the 8 ft side of the Kinect Station that is closest to the Court.

2.2.11 The Basketballs

While playing *Rebound Rumble,* Robots manipulate Basketballs to accomplish the objectives of the game. The Basketball is a Size 4 Compact foam basketball (Gopher Deluscious™ Foam Basketball, Item # 71-502) with an outer circumference of 25 in. and approximate weight of 11.2 oz.

2.3 Revision History

Revision	Release Date	Changes
-	1/3/12	Initial Release
A	1/10/12	Fixed spelling and grammatical errors Added information on Bridges and Balance to Section 2.2.5.
B	1/13/12	Section 2.2.5 - Changed "any" to "all" in last sentence.