

- 2 The Arena** 2
- 2.1 Overview 2
- 2.2 The ARENA 3
 - 2.2.1 The FIELD 3
 - 2.2.2 FIELD Markings 5
 - 2.2.3 The GOALS 6
 - 2.2.4 The VISION TARGETS 8
 - 2.2.5 The TRUSS 8
 - 2.2.6 The ALLIANCE STATIONS 9
 - 2.2.7 The HUMAN PLAYER AREAS 11
 - 2.2.8 The PLAYER STATIONS 12
 - 2.2.9 The BALLS 13
- 2.3 Revision History 13

2 The Arena

Section 2

FIRST®, the **FIRST®** logo, **FIRST®** Robotics Competition, **FRC®**, **Coopertition®**, and **Gracious Professionalism®** are registered trademarks, and **Sport for the Mind™** and **AERIAL ASSIST™** are common law trademarks, of the United States Foundation for Inspiration and Recognition of Science and Technology (**FIRST®**). ©2014**FIRST**. All rights reserved.

2.1 Overview

Note: These illustrations are for a general visual understanding of the AERIAL ASSIST ARENA only. Please refer to the [2014 Official FIRST Field Drawings & Models](#) for exact dimensions and construction details.

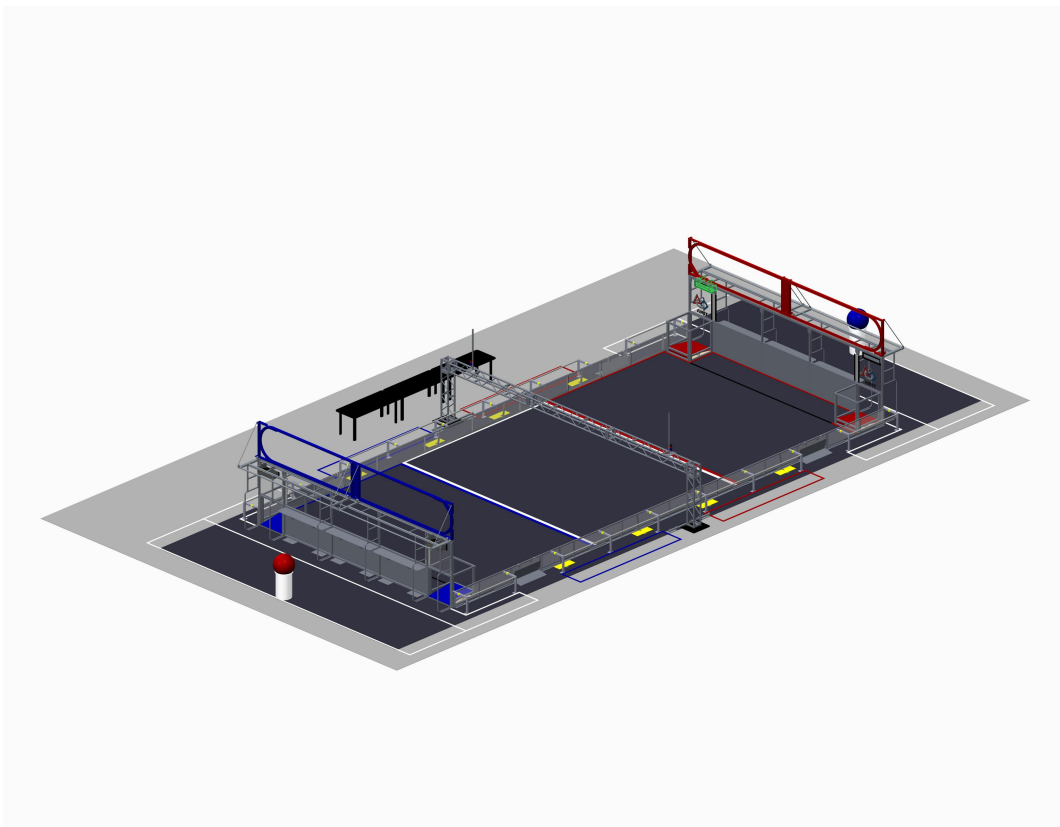


Figure 2-1: AERIAL ASSIST ARENA

The ARENA includes all elements of the game infrastructure that are required to play AERIAL ASSIST: the FIELD, the ALLIANCE STATIONS, the BALLS, and all supporting communications, ARENA control, and scorekeeping equipment.

ROBOTS play AERIAL ASSIST in a rectangular space known as the FIELD. During MATCHES, ROBOTS are

controlled from ALLIANCE STATIONS located outside the ends of the FIELD. Each ALLIANCE STATION consists of three (3) PLAYER STATIONS that provide connectivity between the controls used by the DRIVERS and the ROBOTS. There are GOALS in each FIELD corner and atop the entire length of the ALLIANCE WALLS.

The drawings and CAD models, drawings for low-cost versions of the important elements of the ARENA, and links to CAD models for AERIAL ASSIST can be found in the [2014 Official FIRST Field Drawings & Models](#) (dimensions stated in this document are nominal).

The competition ARENA is a modular construction that is assembled, used, disassembled, and shipped many times during the competition season. It will 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 consistent from event to event. However, as the ARENA is assembled in different venues by different event staff, some small variations do occur. For details regarding assembly tolerances, please refer to [FE-00037 – 2014 ARENA Layout and Marking](#). Successful teams will design ROBOTS that are insensitive to these variations.

2.2 The ARENA

Note: The official AERIAL ASSIST ARENA description, layout, dimensions and parts list are contained in [FE-00037 - 2014 ARENA Layout and Marking](#). Diagrams and dimensions below are for illustrative purposes only.

2.2.1 The FIELD

The FIELD for AERIAL ASSIST is a 24 ft. 8 in. x 54 ft. carpeted area, bounded by and including the GUARDRAILS, ALLIANCE WALLS, and rear faces of the LOW GOALS. The FIELD floor is covered with carpet (Shaw Floors, Philadelphia Commercial, Neyland II, 20, 30550, "Ground Pepper"). Two (2) HIGH GOALS are located at each end of the FIELD above the ALLIANCE WALLS. Two (2) LOW GOALS are located in the corners next to each ALLIANCE WALL. A TRUSS bisects and spans the width of the FIELD.

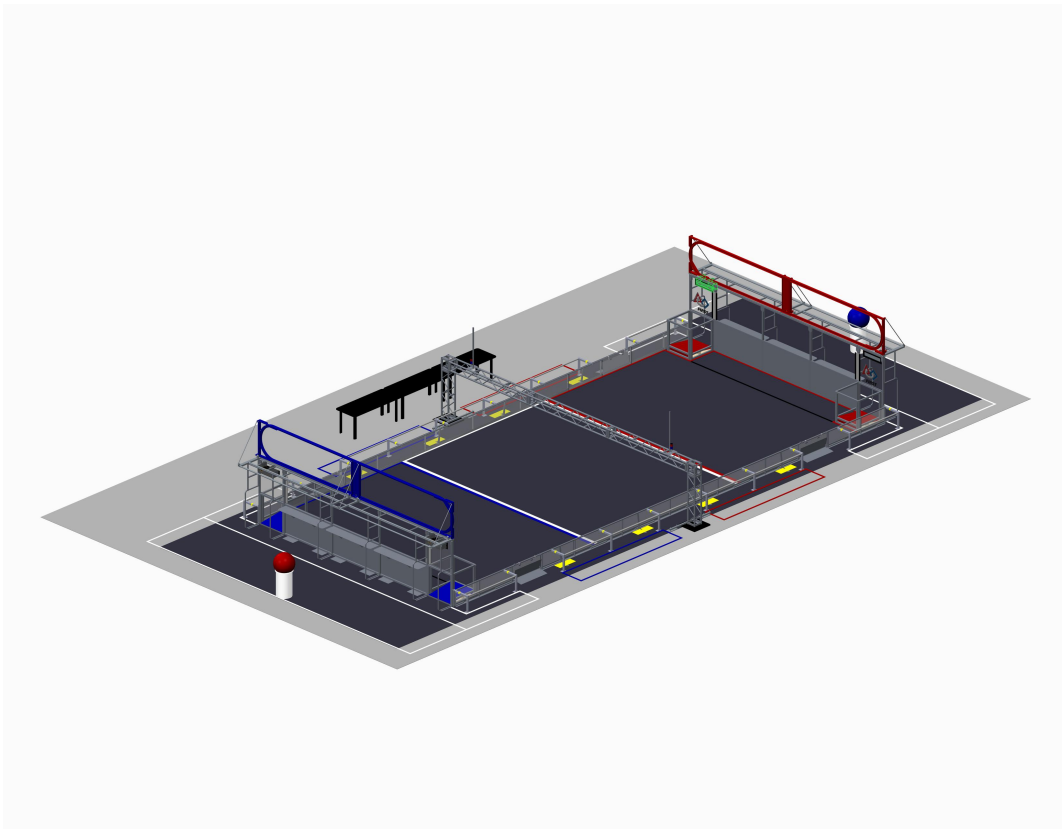


Figure 2-2: Basic FIELD Layout

The ALLIANCE WALLS are 6 ft. 6 in. high, 18 ft. wide, and define the ends of the FIELD. The ALLIANCE WALL protects the PLAYER STATIONS and is composed of a 3 ft. high base of diamond plate aluminum topped with a 3 ft. 6 in. tall transparent acrylic panel.

The GUARDRAIL is a system that consists of horizontal pipes that are 1 ft. 8 in. above the floor and supported by vertical struts mounted on a 3 in. aluminum angle. A transparent polycarbonate shield is attached on the inside of the GUARDRAIL, 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 FIELD during a MATCH. The GUARDRAIL defines the borders of the FIELD, except where it is bounded by the ALLIANCE WALL.

Four (4) gates in the GUARDRAIL allow access to the FIELD for placement and removal of ROBOTS. The gates are 38 in. wide, and are closed and shielded during MATCHES.

The HUMAN PLAYER BARRIER is a system that consists of horizontal pipes that are 1 ft. 8 in. above the floor and are supported by sheet metal struts that are integrated into the GUARDRAIL. The HUMAN PLAYER BARRIER extends 1 ft. 8 in. wider than the GUARDRAIL and creates a barricade between HUMAN PLAYERS and ROBOTS. The SAFETY ZONE is a 2 in. wide, infinitely tall region located 8 in. from the FIELD-side plane of the GUARDRAILS and is defined by yellow tape on the Human Player Barrier Brackets and the Human Player Barrier End Brackets.

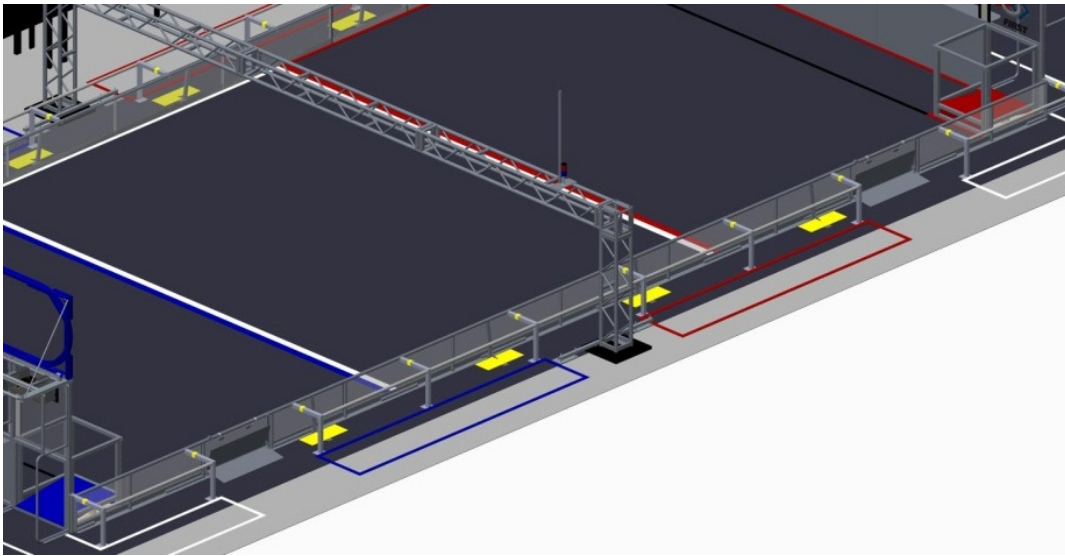


Figure 2-2a

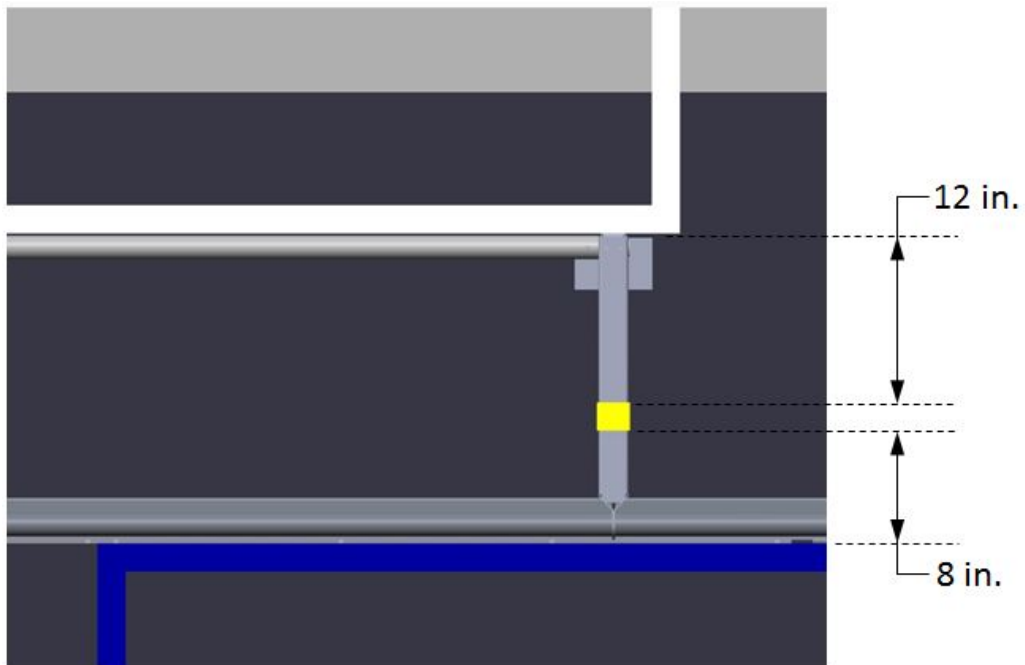


Figure 2-2b

2.2.2 FIELD Markings

FIELD markings are shown in [Figure 2-3](#) and are for illustrative purposes only. Please refer to drawing [FE-00037 - 2014 ARENA Layout and Marking](#) for exact dimensions.

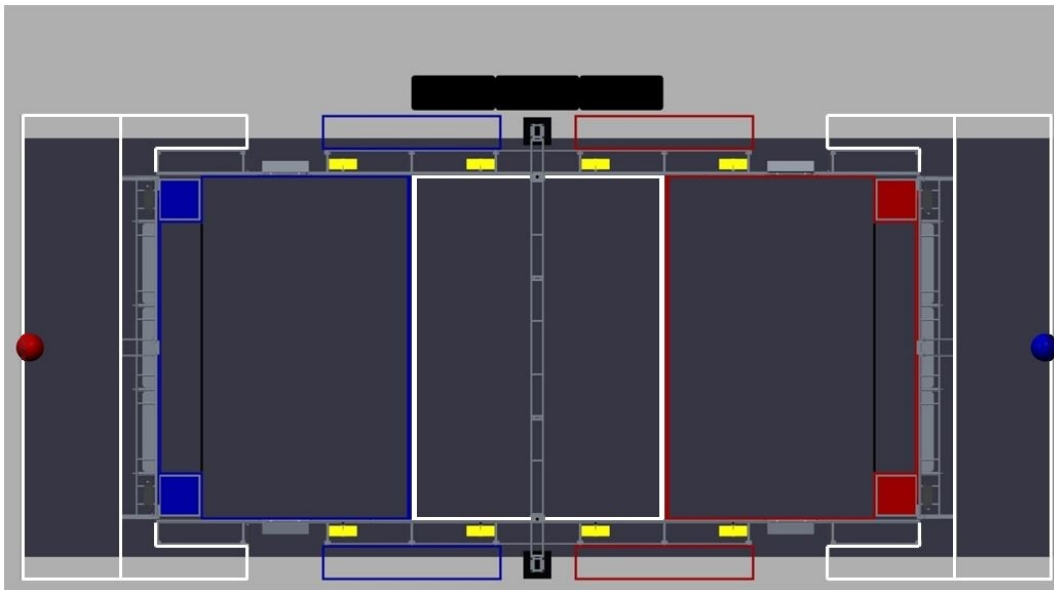


Figure 2-3: FIELD Markings

The FIELD is segmented in to three ZONES of equal length and width; Blue, White, and Red. The perimeters of each ZONE are marked on the FIELD with 2 in. gaffers tape along the FIELD border and 4 in. of gaffers tape across the width of the FIELD, in the corresponding color. At each end of the FIELD, Black lines mark the front of the GOALIE ZONE and span from the inside corner of one LOW GOAL to the inside corner of the other LOW GOAL.

2.2.3 The GOALS

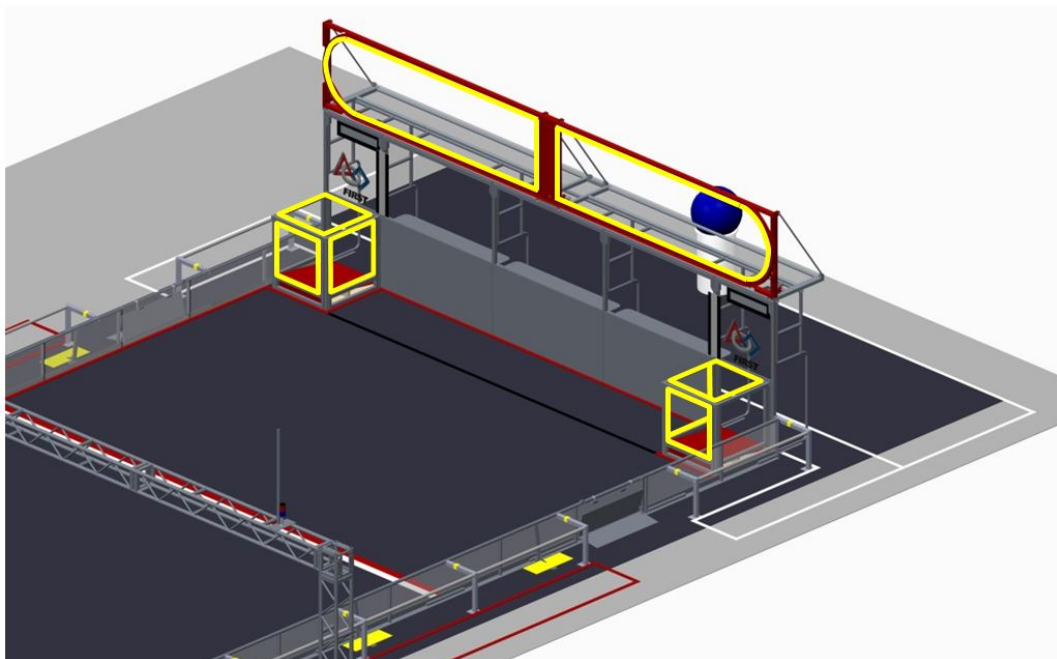


Figure 2-4: The GOALS

Each ALLIANCE has two (2) HIGH GOALS located above their opponent's ALLIANCE WALL. The HIGH GOALS are 11 ft. 6 in. wide and 3ft. 1 in. tall with the bottom edge of the opening located 6 ft. 10 ³/₄ in. above the carpet. The

outside edge of each HIGH GOAL is semi-circular with a radius of 1 ft. 6 ½ in. The HIGH GOALS are separated from each other by a 1 ft. wide divider.

Horizontal pipes are installed behind the bottom of each HIGH GOAL to prevent SCORED BALLS from dropping directly on DRIVERS. These pipes are covered in ¼ in. clear polycarbonate sheet.

The perimeter of each HIGH GOAL is surrounded by Phillips Color Kinetics iColor Flex LMX LED light strings. The LEDs have several states that indicate GOAL status:

- A. The perimeter of a HOT GOAL is lit with yellow LEDs. The non-HOT GOAL'S perimeter is not lit.

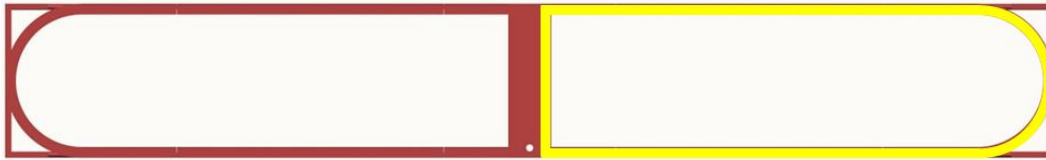


Figure 2-5: HOT GOAL

- B. The inside third of the GOAL perimeters are illuminated in the ALLIANCE color if an ALLIANCE has one (1) ASSIST.



Figure 2-6: One (1) Assist

- C. The inside two-thirds of the GOAL perimeters are illuminated in the ALLIANCE color if an ALLIANCE has two (2) ASSISTS.



Figure 2-7: Two (2) Assists

- D. The full GOAL perimeters are illuminated in the ALLIANCE color if an ALLIANCE has three (3) ASSISTS.



Figure 2-8: Three (3) Assists

The back of each HIGH GOAL has a light string. The two light strings together mimic the information portrayed in bullets A-D above.

Each ALLIANCE has two (2) LOW GOALS, one located in each corner of the FIELD which is formed by the opponent's ALLIANCE WALL and the GUARDRAILS. The side openings of the LOW GOAL are 2 ft. 5 in. wide x 2 ft. 4 in. tall. The top opening of the LOW GOAL is 2 ft. 8 ½ in. x 2 ft. 8 ½ in. The bottom edge of the LOW GOAL is located 7 in. from the carpet.

2.2.4 The VISION TARGETS

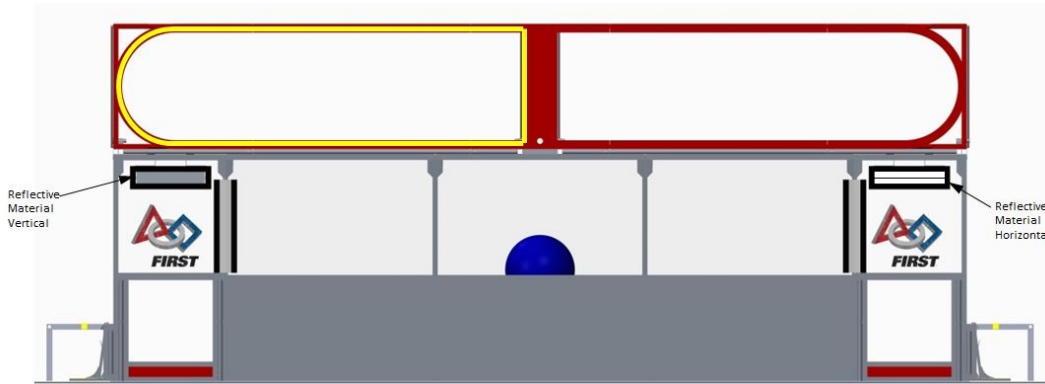


Figure 2-9: The VISION TARGETS

There are four (4) VISION TARGETS on each end of the FIELD: two (2) dynamic VISION TARGETS and two (2) static VISION TARGETS. There is one (1) dynamic VISION TARGET located above each LOW GOAL. Each dynamic VISION TARGET is located behind the polycarbonate panel on the ALLIANCE WALL. The dynamic VISION TARGET is horizontal and begins 5 ft. 8 in. above the FIELD carpet, is centered over the LOW GOAL, and consists of a panel with one (1) 4 in. wide, 1 ft. 11 ½ in. long strip of retro-reflective material (3M 8830 Silver Marking Film) adhered horizontally along the length of the panel with a 2 in. black ABS plastic border surrounding the retro-reflective material. The dynamic VISION TARGET is actuated to show the retro-reflective material when its corresponding HIGH and LOW GOAL are HOT. It will rotate to hide the retro-reflective material (pointing it upwards) when its corresponding HIGH and LOW GOAL are not HOT. Both of these conditions are shown in [Figure 2-9](#).

Before the MATCH starts and throughout TELEOP, both dynamic VISION TARGETS are positioned such that the the reflective material faces the FIELD.

The static VISION TARGET is mounted such that half is behind the polycarbonate sheet above the LOW GOAL and half is behind the acrylic panel of the PLAYER STATION. It uses vertical reflectors which are located above the inside edge of the LOW GOAL. The vertical reflector consists of a 4 in. wide, 2 ft. 8 in. tall stripe of retro-reflective material bordered by 2 in. wide black gaffers tape on the left and right sides. The vertical reflectors begin 3 ft. 1 ½ in. above the FIELD carpet.

The retro-reflective material on the dynamic VISION TARGET is nominally 3¾ in. from the FIELD-side surface of the ALLIANCE WALL polycarbonate sheet above the LOW GOAL.

2.2.5 The TRUSS

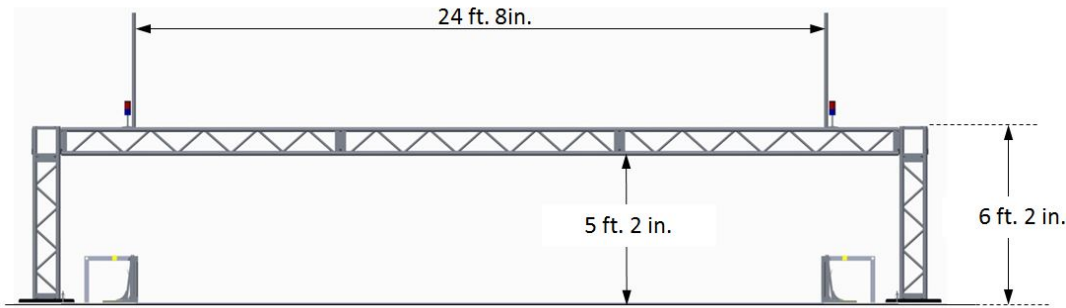


Figure 2-10: The TRUSS

The middle of the FIELD is spanned by the TRUSS. It is a [General Purpose 1 ft. x 1 ft. square TRUSS made by James Thomas Engineering](#). The TRUSS is manufactured from 2 in. diameter x 1/8 in. wall and 1 in. diameter x 1/8 in. wall 6082-T6 or 6061-T6 Aluminum round tubing. The bottom of the TRUSS is located 5 ft. 2 in. off the playing surface of the FIELD. The top surface of the TRUSS is located 6 ft. 2 in. off the playing surface of the FIELD. The TRUSS is 32 ft. long and is supported at each end by 5 ft. support columns (identical in construction to the main part of the TRUSS) mounted to steel base plates. The steel base plates are 2 ft. x 2 ft. steel plate approximately 2 in. tall, and they sit outside the HUMAN PLAYER BARRIER.

There are two (2) TRUSS POLES mounted to the top of the TRUSS that extend up. The TRUSS POLES are aligned with the GUARDRAIL and depict the vertical projection of the FIELD. Each TRUSS POLE has a 1-2/3 in. diameter and is 4 ft. tall.

Stack lights, one of each ALLIANCE color, are mounted on each end of the TRUSS. These lights turn on to indicate that the corresponding ALLIANCE has achieved a TRUSS SCORE for the current CYCLE.

2.2.6 The ALLIANCE STATIONS

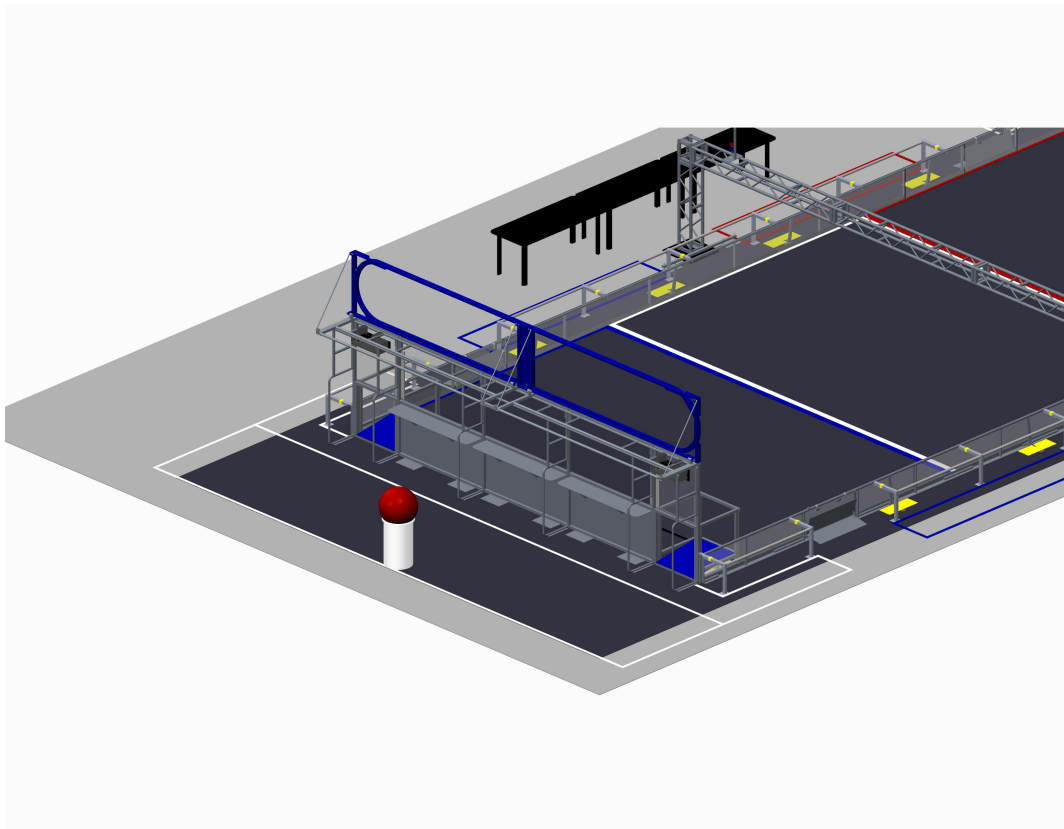


Figure 2-11: The ALLIANCE STATION

The Red and Blue ALLIANCE STATIONS are located at either end of the FIELD, behind the ALLIANCE WALLS. The ALLIANCE STATION extends 10 ft. back from the ALLIANCE WALL and 1 ft. 8 in. beyond the carpet on each side. The ALLIANCE STATION includes the three (3) PLAYER STATIONS and one (1) PEDESTAL. The STARTING LINE is marked with white 2 in. wide gaffers tape 2 ft. 6 in. behind the ALLIANCE WALL. The ALLIANCE STATION includes the area up to the entry gates of the FIELD, with the end of the ALLIANCE STATION marked out in 2 in. white gaffers tape.

Each ALLIANCE has a PEDESTAL used to stage the next BALL available to the ALLIANCE. It is centered behind the middle PLAYER STATION and tangent to the edge of the carpet. The PEDESTAL is constructed from a US Plastics Tamco 30 Gallon Polyethylene Tank (Item #: [4031](#)) and capped with a nylon cover. A light inside the PEDESTAL indicates the BALL'S eligibility for play. The PEDESTAL is illuminated red or blue (matching the ALLIANCE color) if the ALLIANCE may retrieve the BALL. The base is off if the BALL may not yet be removed. The PEDESTAL will turn green with other FIELD lights to indicate that the FIELD is safe to enter.

Each ALLIANCE STATION has one (1) flat panel display centrally mounted above the middle PLAYER STATION. The display shows the ALLIANCE each ZONE where the ALLIANCES' ROBOTS have been granted credit for POSSESSION. Further, the panel highlights the unique ROBOT-ZONE pairs that are recognized as ASSISTS. The display is shown in [Figure 2-12](#), [Figure 2-13](#), and [Figure 2-14](#).

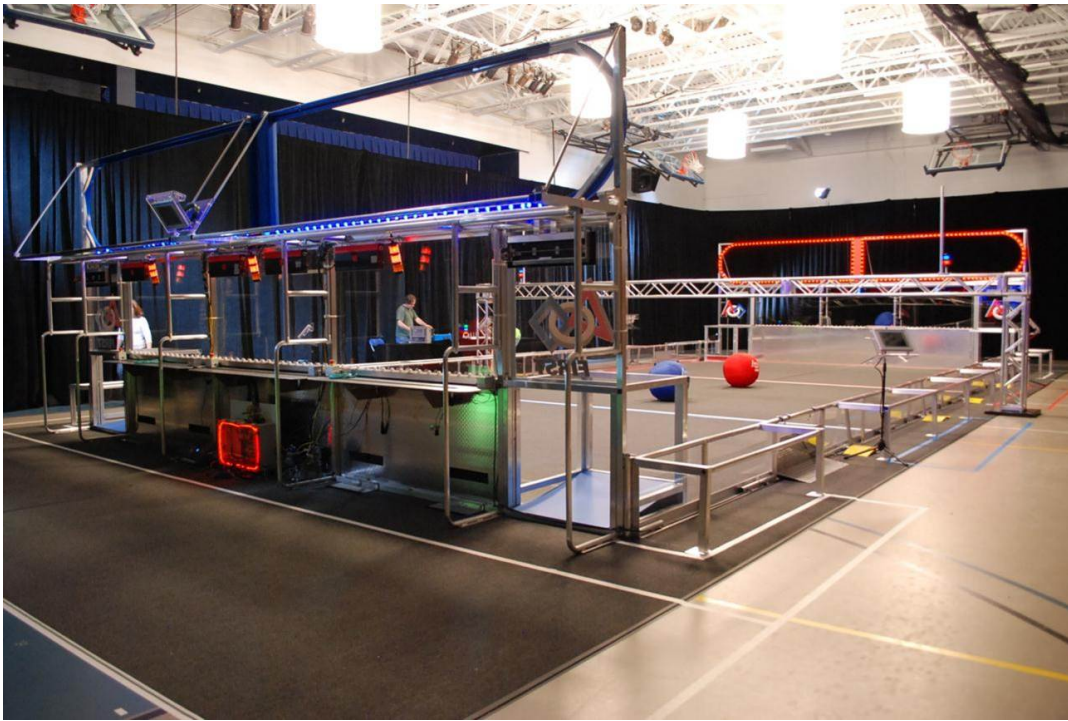


Figure 2-12: Display Location

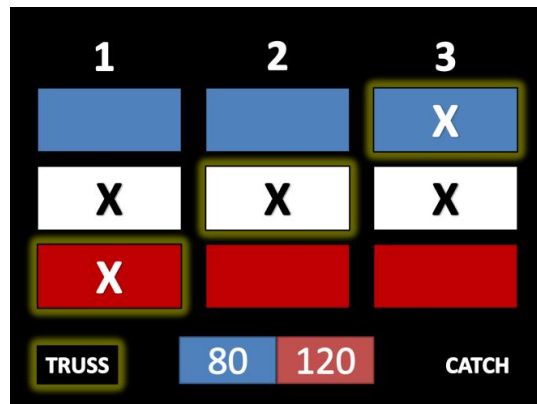


Figure 2-13: Blue Panel Display

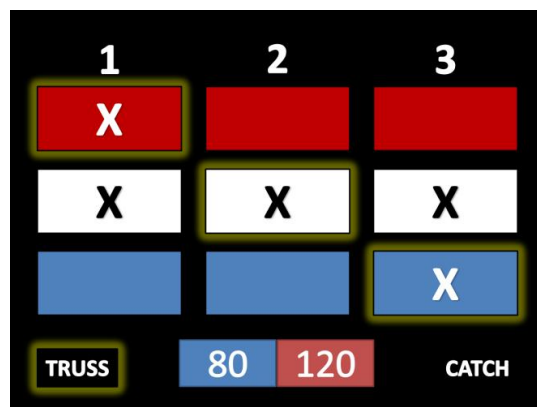


Figure 2-14: Red Panel Display

2.2.7 The HUMAN PLAYER AREAS

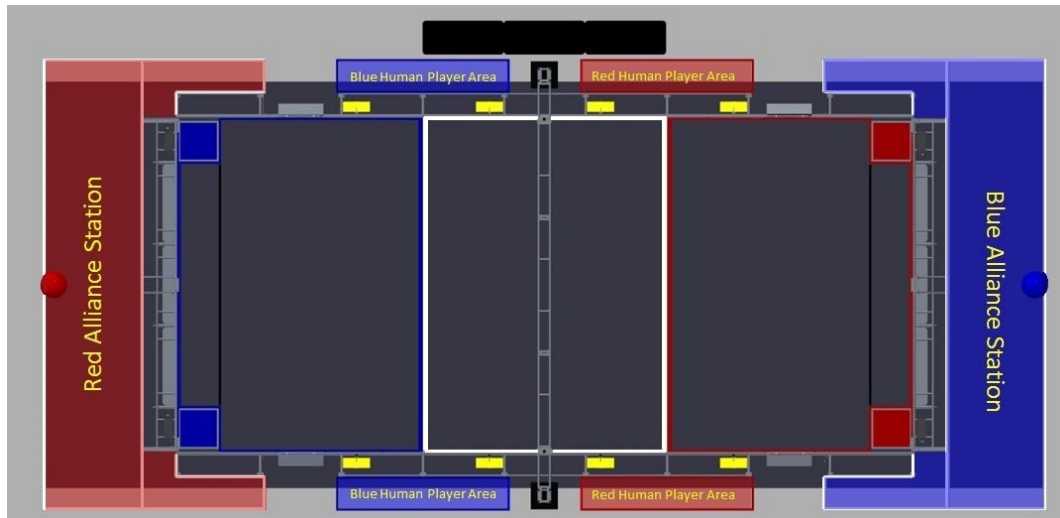


Figure 2-15: The HUMAN PLAYER AREAS

There are two (2) rectangular HUMAN PLAYER AREAS per ALLIANCE; each rectangle is 12 ft. 10 in. x 2 ft. 6 in. They are located on the same end of the FIELD as an ALLIANCE'S GOALS. They extend along the HUMAN PLAYER BARRIER from the TRUSS to the gate. The perimeter of each HUMAN PLAYER AREA is indicated with 2in. wide, corresponding red or blue gaffers tape.

2.2.8 The PLAYER STATIONS

Attached to the ALLIANCE WALL in each PLAYER STATION is an aluminum shelf to support the OPERATOR CONSOLE for the Team in that PLAYER STATION. The support shelf measures 5 ft. 9 in. wide x 1 ft. deep. There is a 4 ft. 6 in. long x 2 in. wide strip of hook-and-loop tape ("loop" side) along the center of the support shelf that may be used to secure the OPERATOR CONSOLE 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 via the ARENA network. Each shelf will also have a "DEAD BALL" placard that Teams must use if they need to signal to a Referee that a BALL is stuck in one of the ALLIANCE'S ROBOTS, per [Section 3.1.2: MATCH Logistics](#).

Each PLAYER STATION also includes a single 120VAC NEMA 5-15R power outlet. It is located on the right side of each PLAYER STATION shelf. This outlet is protected by a 3-Amp circuit breaker and can be used to power the OPERATOR CONSOLE.

There is no longer a Classmate power adapter at each PLAYER STATION.

Emergency Stop (E-Stop) buttons for each ROBOT are located on the left side of each PLAYER STATION shelf. ARENA parts (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.

Each PLAYER STATION includes one (1) Phillips Color Kinetics iColor Flex LMX LED light string. This light string is used to indicate the following states:

- During the MATCH, the string indicates the ZONES in which the Team's ROBOT has been credited with

- POSSESSION. Each string is segmented into red, white, and blue thirds, representing the FIELD ZONES.
- If the string is GREEN, then the Head Referee has determined that the FIELD is safe for humans.

Once plugged in to the Field Management System (FMS) via the Ethernet cable provided, the only open ports in the ARENA network are as follows:

- A. TCP 1180: This port is typically used for camera data from the cRIO to the Driver Station (DS) when the camera is connected to port 2 on the 8-slot cRIO (P/N: cRIO-FRC). This port is bidirectional.
- B. TCP 1735: SmartDashboard, bidirectional
- C. UDP 1130: Dashboard-to-ROBOT control data, directional
- D. UDP 1140: ROBOT-to-Dashboard status data, directional
- E. HTTP 80: Camera connected via switch on the ROBOT, bidirectional
- F. HTTP 443: Camera connected via switch on the ROBOT, bidirectional

Teams may use these ports 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).

2.2.9 The BALLS

The BALLS are approximately 2 ft. diameter exercise BALLS with 6-panel 400D nylon red or blue covers. They are manufactured by Sportogo. BALLS are inflated per guidelines provided in the [2014 BALL Inflation Guide](#).



Figure 2-16: Blue and Red BALLS

2.3 Revision History

Date	Section	Change
1/10/2014	2.2.4	Added detail on starting and TELEOP position of dynamic VISION TARGETS
1/17/2014	2.2.4	Added detail on spacing between ALLIANCE WALL and dynamic VISION TARGETS
1/31/2014	2	Updated images to match

		production HIGH GOAL
2/4/2014	2.2.5	Corrected symbols from "?" to "1/8"
2/14/2014	2.2.8	Added detail on "Dead BALL" placard in ALLIANCE STATION
2/18/2014	2	Updated images to include SAFETY ZONE
2/18/2014	2.2.1	Added detail on SAFETY ZONE
3/4/2014	2.2.3	Added detail on polycarbonate sheet above DRIVERS' heads by HIGH GOAL