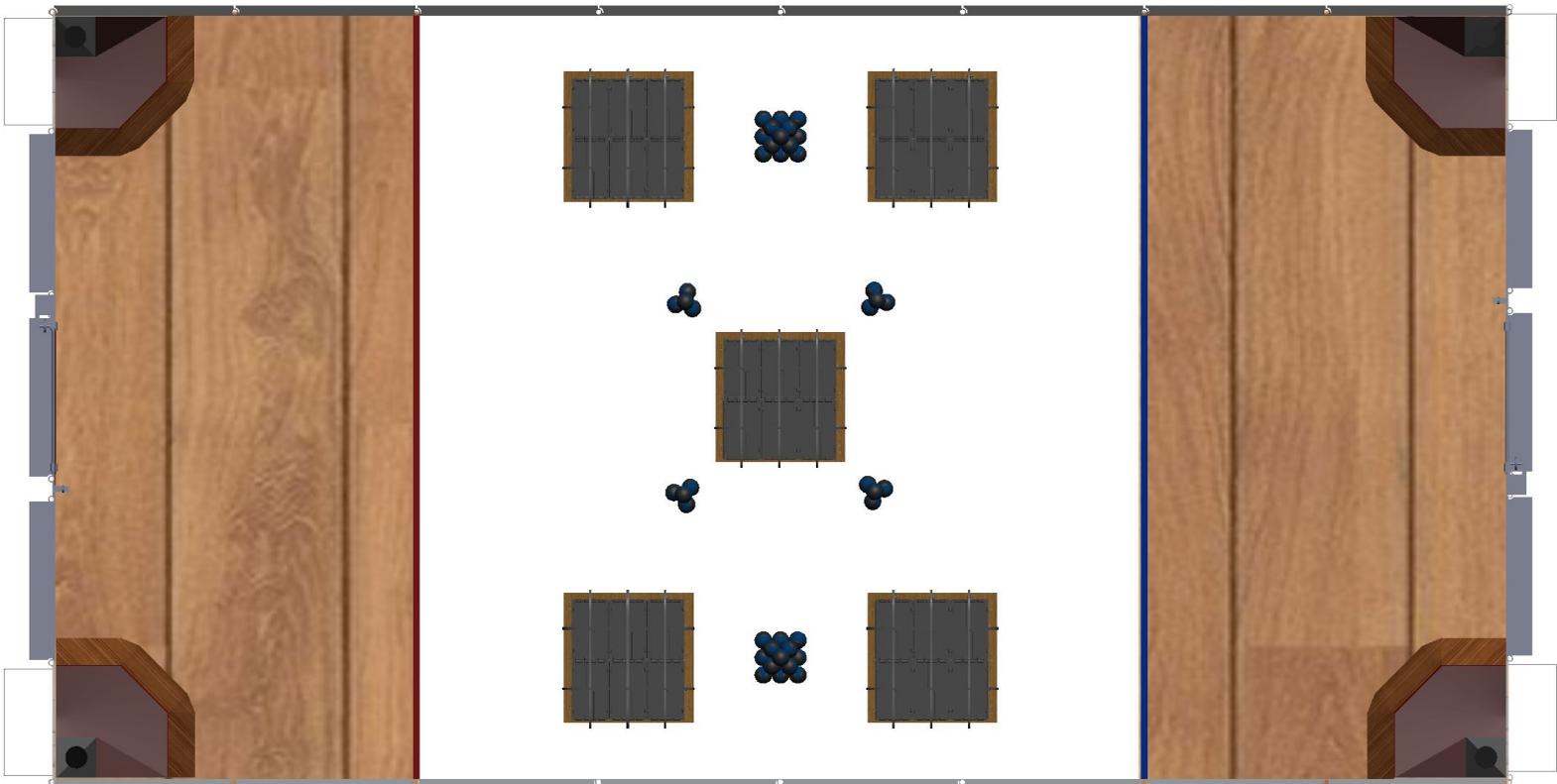




MATCH SETUP AND RULES



Match Setup

Five **Loot Caches** are staged as follows:

- Four **Loot Caches** are placed 24" from the sidewalls and 84" from the middle line of the field.
- One **Loot Cache** is placed at the very center of the field.
- Oriented with the short sides of the Totes facing the Alliance Stations.

44 **Cannonballs** are staged as follows:

- A **Stack** of 14 **Cannonballs** is placed on the centerline of the field 60" from each sidewall.
- A **Small Stack** of 4 **Cannonballs** is placed on each corner of the center **Loot Cache**.

All robots start on the **Deck Line** of their respective alliance ship zone. Robots may be pre-loaded with one **Cannonball**. If robots do not preload a **Cannonball**, the **Cannonball** is set aside and is not in play during the match.

Referee Panels

The field has four referee panels located at either end of the **Deck Line** for each Alliance. Referees have a clear line of sight to both Alliance's **Holds** and to the **Sail** and **Anchor**. The Head Referee panel is located, as is typically the case, in the middle of the scoring table side of the field.

Robot Rules

- A robot may not extend more than 12" past the frame perimeter unless, the robot's bumpers, intersect with the infinite vertical volume defined by the ramp of the **Hold**. Then, the robot may extend 36" past the frame perimeter.
- The robot may launch a **Cannonball** only when its bumpers intersect the infinite vertical volume of the **Hold** ramps.
- A robot must not have a frame perimeter greater than 120" and may not be over 48" tall at any point in the match.
- A robot's weight may not exceed 125 lbs excluding the battery and bumpers.
- A robot may not, intentionally damage opposing robots or field elements.
- A robot may not tip over, flip, or in any way prevent loot caches from rolling.



GAME PIECE AND FIELD ELEMENT DESCRIPTIONS

1 Loot Cache

The **Loot Cache** is comprised of 12 totes stacked two high on a 58" x 58" x 3/4" rolling platform. The totes are secured using chain and carabiners on eyebolts.

2 Hold

The **Hold** consists of three scoring goals. The **Low Goal** has three entrances (20" x 10") with a slight ramp (27°). The **Outer Goal** sits on top of the **Low Goal** (24" off the ground). The **Inner Goal** is elevated above the **Outer Goal** (9" x 9" x 35" from the field corner). Each Goal has its own exit into the **Corral** which contains sensors to automatically score the **Cannonballs**.

2 Corral

The **Corral** is a 48" x 22" x 15" and sits behind the Alliance Wall and connects to the **Hold**. **Cannonballs** roll into the **Corral** after being scored. Human players retrieve **Cannonballs** from the **Corral** to stack into the **Brass Monkey**.

3 Sail

The **Sail** is comprised of a 144" flag pole and a 72" bar located on top of the Alliance Stations. The **Sail** is a 70" wide and 62" tall fabric triangle rolled around the horizontal bar. Robots will pull on a 1/2" diameter rope to hoist their **Sail**.

4 Anchor

The **Anchor** is pulled up via a connected chain. The chain is on a pulley system with a 3/4" diameter pulley and 112", of steel chain.

5 Cannonball

The **Cannonball** is a 4 lbs 7.72" x 7.72" x 7.95" sand-filled ball contained with a rubber shell.

6 Brass Monkey

The **Brass Monkey** is a 22" x 22" sheet of 1" polycarbonate with 9, 4" diameter holes placed 8" apart in a grid pattern. The **Brass Monkey** holds a stack of 14 **Cannonballs**. Each hole contains an IR range sensor to detect when **Cannonballs**. When all 9 IR sensors are tripped, the button on the **Pedestal** will light up and teams can activate the **Cannonball Bonus**.

6 Pedestal

The **Pedestal** activates the **Cannonball Bonus**. The **Pedestal** is a 9" x 9" x 42" column, with a push button on top. Human players push the button to activate the **Cannonball Bonus** for 20 seconds.

7 Deck Line

The **Deck Line** is distinguished by a gaffers tape line spanning the width of the Field and located 120" from the Alliance Station in the color of the respective Alliance. The area between the **Deck Line** and the Alliance Station is the **Deck**.

Item Name	Vendor	Part Number	Qty.
Tote	Orbis	FP243	60 - 1
Cannonball	Walmart	563509504	44 - 5
Chain	McMaster	3594T17	1 & 4
Eyebolt	McMaster	3014T258	50 - 1
Wheel	McMaster	2407T56	20 - 1
Carabiner	McMaster	3079T21	50 - 1
Rope	McMaster	2222T48	3
Pulley	McMaster	3165T42	2 - 3
Pulley	McMaster	3524T24	2 - 4
Pedestal	SparkFun	COM-09181	2 - 6



SCORING TABLE AND NOTES

Action	Auto Points	Tele-Op Points	End Game Points
Leaving Deck Line	5 per robot	-	-
Scoring Cannonball - Inner Goal	5 per game piece	5 per game piece	-
Scoring Cannonball - Outer Goal	4 per game piece	4 per game piece or 5 points during Cannonball Bonus	-
Scoring Cannonball - Low Goal	3 per game piece	3 per game piece or 5 points during Cannonball Bonus	-
Cannonball Bonus	-	10 points	-
Loot Caches on Deck	10 points per Loot Cache	-	10 points per Loot Cache
Raising the Anchor	-	-	15 points
Raising the Sail	-	-	15 points
Parked on Deck	-	-	5 points per robot
Foul	Credit 5 points to opponents	Credit 5 points to opponents	-
Tech Foul	Credit 15 points to opponents	Credit 15 points to opponents	-
Match Win	-	-	2 RP
Match Tie	-	-	1 RP
Auto Loot: In Auto, bring 2 Loot Caches on Deck	1 RP	-	-
All Aboard: Raise the Sail and Anchor and have 14 Cannonballs in Brass Monkey	-	-	1 RP

Endgame Scoring

For endgame scoring, there is a mark on the rope and chain as well as the endgame structure. Teams must hold the rope or chain to be at or above the mark. Referees score the endgame five seconds after the match ends and visually compare the marks to see if teams have scored. Both the **Anchor** and the **Sail** will need to be raised 62" to be scored.

Cannonball Bonus/Ranking Point

In order to activate the **Cannonball Bonus** or complete the **All Aboard** RP, Alliances must have the required amount of **Cannonballs** stacked in the **Brass Monkey**. **Cannonballs** scored in the **Hold** do not count towards the Bonus, or RP. To activate the **Cannonball Bonus**, a human player must press a button on the **Pedestal**. Once the **Cannonball Bonus** is activated, LED strips on the backboards of the **Hold** will flash in the color of the alliance and turn off when **Cannonball Bonus** period is complete (20 seconds).



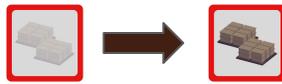
AUDIENCE DISPLAYS AND VISION TRACKING

Audiences Display

Once the match is ready to begin, and while the match is running, the “Real-Time Scoring” screen is displayed in the lower 20% of the live match video.



Auto Loot Ranking Point Indicator:



If an alliance brings two **Loot Cache** unto the deck of their ship during autonomous, this indicator will change from grey to colored to signify the team has received the ranking point.

Cannonball Bonus Indicator:



When the **Cannonball Bonus** is activated, the border of the cannonball scoring indicator will be highlighted in the color of the alliance. In addition the **Cannonball Bonus** icon will change from grey to a colored image to indicate the power-up has been activated that match.

Cannonball Scoring Status:



A cannonball scoring indicator will transition between three different stages during the match based on the number of **Cannonballs** alliance members score in their ship's **Hold**. The cannonball scoring indicator will have a counter in the top right corner that indicates the total number of **Cannonballs** scored during the match.

Once the match details have been finalized by the Head Referee, the “Match Results” screen will be shown. Badges are shown on the Match Results screen for successful completion of match goals that result in Ranking Points (RP): a raised **Sail** is represented by a “sail” icon, raised **Anchor** is represented by an “anchor” icon, and match outcome is represented by a trophy. Earned badges are emblazoned with the alliance color, unearned badges are shown without color.

Qualification 20 Match Results Powered By Raytheon Technologies

Team #	Rank	Score	Team #	Rank
294	10	130	4201	1
687	14		330	4
691	3		6904	7

1 RP (Sail), 4 RP (Anchor, Trophy)

15 Deck Line, 80 Cannonballs, 30 Loot Caches, 45 Endgame, 0 Penalty

Los Angeles Regional Event FIRST ROBOTICS COMPETITION

Vision Tracking

The lower totes on the **Loot Cache** will contain a vision target centered around the location of each length of chain. Teams can use the vision target to automatically line up their robot with a segment of chain to help with securing and moving a **Loot Cache**.

