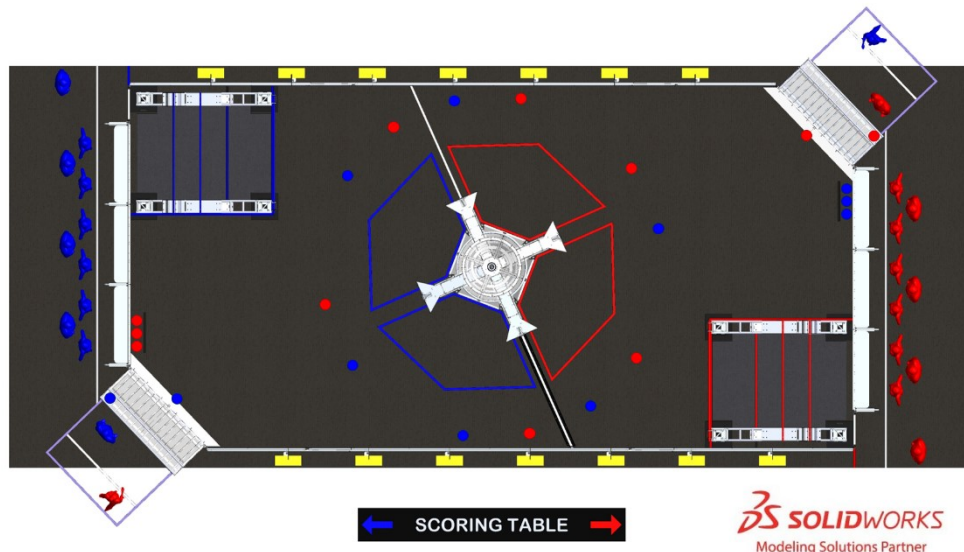# 6 MATCH PLAY

During RAPID REACT, 2 ALLIANCES (an ALLIANCE is a cooperative of up to 4 *FIRST* Robotics Competition teams) play MATCHES, set up and implemented per the details described below.

6.1 Setup

Figure 6-1 MATCH setup

SCORING TABLE

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6.1.1 CARGO

22 CARGO, 11 red and 11 blue, are staged for each MATCH as follows:

A. Each DRIVE TEAM may pre-load 1 of their CARGO in their ROBOT such that the CARGO is fully supported by their ROBOT.
   a. Any of the 3 CARGO not pre-loaded in the ALLIANCE'S ROBOTS are staged between the opponent's ALLIANCE WALL and the adjacent CARGO LINE.
B. 1 ALLIANCE colored CARGO is staged in the TERMINAL closest to its ALLIANCE AREA.
C. 1 ALLIANCE colored CARGO is centered in front of the TERMINAL closest to its ALLIANCE AREA and placed on a CARGO RING whose center is 1½ in. (~4 cm) from the edge of the ramp.
D. 12 CARGO, 6 red and 6 blue, are staged on CARGO RINGS beyond the TARMACS as shown in Figure 6-2. CARGO is placed as shown on a 25 ft. 6 in. (~777 cm) diameter circle centered around the HUB. Please refer to the 2022 ARENA Layout and Marking Diagram for a fully dimensioned drawing of the placement locations. CARGO centers are 40⅜ in. from the outside edges of the TARMACS.

Figure 6-2 CARGO staging just outside TARMACS

Ø25 ft. 6 in. (~777 cm)

40 ⅜ in. (~103 cm)

TARMAC

ƆS SOLIDWORKS
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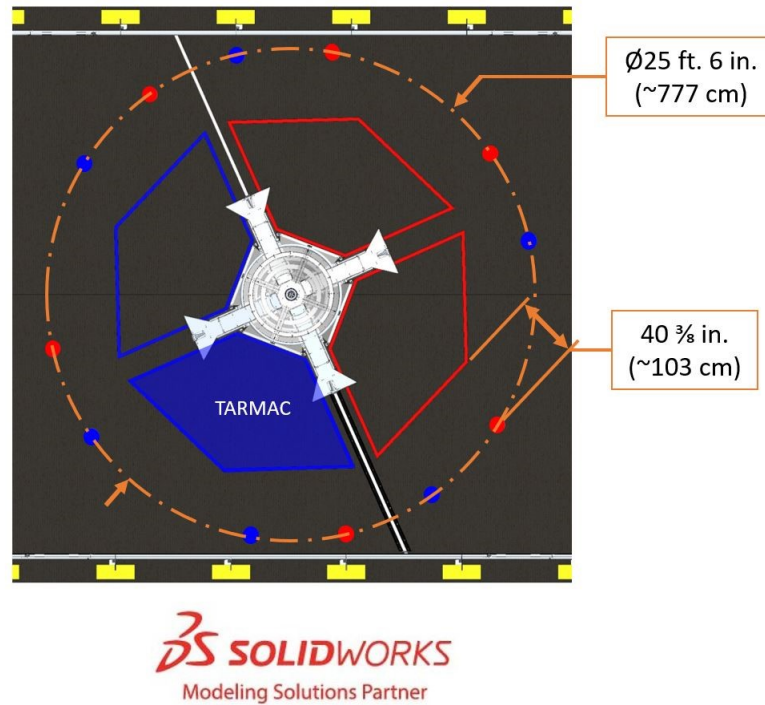
6.1.2   ROBOTS

Each DRIVE TEAM stages their ROBOT such that its BUMPERS are fully contained within 1 of its TARMACS.

If order of placement matters to either or both ALLIANCES, the ALLIANCE must notify the Head REFEREE during setup for that MATCH. Upon notification, the Head REFEREE will require ALLIANCES to alternate placement of all ROBOTS. In a Qualification MATCH, ROBOTS are placed in the following order:

1. red DRIVER STATION 1 ROBOT
2. blue DRIVER STATION 1 ROBOT
3. red DRIVER STATION 2 ROBOT
4. blue DRIVER STATION 2 ROBOT
5. red DRIVER STATION 3 ROBOT
6. blue DRIVER STATION 3 ROBOT

In a Playoff MATCH, the same pattern is applied, but instead of blue ALLIANCE placing last, the higher seeded ALLIANCE (regardless of color) places last.

6.1.3   Humans

Humans stage for the MATCH as follows:

A. exactly 1 HUMAN PLAYER per ALLIANCE stages in each TERMINAL AREA
    a. the HUMAN PLAYER in the TERMINAL AREA furthest from their ALLIANCE AREA stages behind the TERMINAL STARTING LINE,
B. DRIVERS, COACHES, and any additional HUMAN PLAYERS stage inside their ALLIANCE AREA and behind the STARTING LINE, and

C. TECHNICIANS stage in the event-designated area near the FIELD.

6.2   Autonomous Period

The first phase of each MATCH is called Autonomous (AUTO) and consists of the first 15 seconds. During AUTO, ROBOTS operate without any DRIVE TEAM control or input. ROBOTS attempt to TAXI from the TARMAC, score CARGO in the HUB, and retrieve additional CARGO from around the FIELD. HUMAN PLAYERS attempt to score their CARGO in the HUB.

6.3   Teleoperated Period

The second phase of each MATCH is called the Teleoperated Period (TELEOP) and consists of the remaining 2 minutes and 15 seconds (2:15). During this phase, DRIVERS remotely operate ROBOTS to retrieve and score their CARGO in the HUB and engage with their HANGAR.

6.4   Scoring

ALLIANCES are rewarded for accomplishing various actions through the course of a MATCH, including TAXIING, scoring CARGO in the HUB, engaging with their HANGAR, and winning or tying MATCHES.

Rewards are granted either via MATCH points (which contribute to the ALLIANCE'S MATCH score) or Ranking Points (sometimes abbreviated to RP, which increase the measure used to rank teams in the Qualification Tournament). Such actions, their criteria for completion, and their point values are listed in Table 6-1.

All scores are assessed and updated throughout the MATCH, except as follows:

A. assessment of CARGO scored in the HUB continues for up to 5 seconds after the ARENA timer displays 0 following AUTO.
B. assessment of CARGO scored in the HUB continues for up to 10 seconds after the ARENA timer displays 0 following TELEOP.
C. assessment of HANGAR points is made 5 seconds after the ARENA timer displays 0, or when all ROBOTS have come to rest following the conclusion of the MATCH, whichever happens first.

> TAXI and HANGAR points are both evaluated and scored by human REFEREES. Teams are encouraged to make sure that it is obvious and unambiguous that a ROBOT has met the criteria.

6.4.1   Point Values

Point values for tasks in RAPID REACT are detailed in Table 6-1.

A CARGO is scored in an UPPER or LOWER HUB if it passes through the top horizontal opening of the UPPER or LOWER HUB and passes through the sensor array, and the points awarded for that CARGO are assigned based on when the CARGO passed through the sensor array.

A ROBOT may only earn points for a single RUNG. To qualify for HANGAR points from a given RUNG, a ROBOT may only be contacting:

- RUNG(S) at that level or higher (i.e. the level is determined by the lowest RUNG with which a ROBOT is in contact),
- truss structure,

- LAUNCH PADS,
- the ALLIANCE WALL,
- guardrails, and/or
- another ROBOT qualified for any HANGAR points.

Table 6-1: RAPID REACT point values

Award	Awarded for…	MATCH Points		Ranking Points
		AUTO	TELEOP	
TAXI	each ROBOT whose BUMPERS have completely left the TARMAC from which it started at any point during AUTO	2		
CARGO	each ALLIANCE color CARGO scored in the LOWER HUB	2	1	
	each ALLIANCE color CARGO scored in the UPPER HUB	4	2	
HANGAR **(per** **ROBOT**)	LOW RUNG		4	
	MID RUNG		6	
	HIGH RUNG		10	
	TRAVERSAL RUNG		15	
CARGO BONUS	20 or more ALLIANCE colored CARGO scored in the HUB. If at least 5 ALLIANCE colored CARGO are scored in AUTO, called a QUINTET, this threshold drops to 18.			1
HANGAR BONUS	ALLIANCE is credited with at least 16 HANGAR points			1
Tie	completing a MATCH with the same number of MATCH points as your opponent			1
Win	completing a MATCH with more MATCH points than your opponent			2

An ALLIANCE can earn up to 4 Ranking Points per Qualification MATCH as described in Table 6-1. There are no Ranking Points or comparable points for the CARGO BONUS or HANGAR BONUS in Playoff MATCHES.

6.5   Rule Violations

Upon a rule violation, 1 or more of the penalties listed in Table 6-2 are assessed.

Table 6-2 Rule violations

Penalty	Description
FOUL	a credit of 4 points towards the opponent's MATCH score
TECH FOUL	a credit of 8 points toward the opponent's MATCH score

Penalty	Description
YELLOW CARD	a warning issued by the Head REFEREE for egregious ROBOT or team member behavior or rule violations. A subsequent YELLOW CARD within the same tournament phase results in a RED CARD.
RED CARD	a penalty assessed for egregious ROBOT or team member behavior or rule violations which results in a team being DISQUALIFIED for the MATCH.
DISABLED	the state in which a ROBOT is commanded to deactivate all outputs, rendering the ROBOT inoperable for the remainder of the MATCH.
DISQUALIFIED	the state of a team in which they receive 0 MATCH points and 0 Ranking Points in a Qualification MATCH or causes their ALLIANCE to receive 0 MATCH points in a Playoff MATCH

FIRST Robotics Competition uses 3 words in the context of how rules and violations are assessed in deliberate ways. These words provide general guidance to describe benchmarks to be used across the program. It is not the intent for REFEREES to provide a count during the time periods.

- MOMENTARY describes rule violations that happen for fewer than approximately 3 seconds.
- CONTINUOUS describes rule violations that happen for more than approximately 10 seconds.
- REPEATED describes rule violations that happen more than once within a MATCH.

See Section 11.2.1 YELLOW and RED CARDS for additional details.

6.5.1 Violation Details

There are several styles of violation wording used in this manual. Below are some example violations and a clarification of the way the violation would be assessed. The examples shown do not represent all possible violations, but rather a representative set of combinations.

Table 6-3 Violation examples

Example Violation	Expanded Interpretation
FOUL	Upon violation, a FOUL is assessed against the violating ALLIANCE.
TECH FOUL and YELLOW CARD	Upon violation, a TECH FOUL is assessed against the violating ALLIANCE. After the MATCH, the Head REFEREE presents the violating team with a YELLOW CARD.
FOUL per additional CARGO. If egregious, YELLOW CARD	Upon violation, a number of FOULS are assessed against the violating ALLIANCE equal to the number of additional CARGO beyond the permitted quantity. Additionally, if the REFEREES determine that the action was egregious, the Head REFEREE presents the violating team with a YELLOW CARD after the MATCH.
TECH FOUL, plus an additional TECH FOUL for every 5 seconds in which the situation is not corrected	Upon violation, a TECH FOUL is assessed against the violating ALLIANCE and the REFEREE begins to count. Their count continues until the criteria to discontinue the count are met, and for each 5 seconds within that time, an additional TECH FOUL is assessed against the violating ALLIANCE. A ROBOT in violation of this type of rule for 15 seconds would receive a total of 4 TECH FOULS (assuming no other rules were simultaneously being violated).

Example Violation	Expanded Interpretation
RED CARD for the ALLIANCE	After the MATCH, the Head REFEREE presents the violating ALLIANCE with a RED CARD in the following fashion: a) In a PLAYOFF MATCH, a single RED CARD is assessed to the ALLIANCE. b) In all other scenarios, each team on the ALLIANCE is issued a RED CARD.

6.6 DRIVE TEAM

A DRIVE TEAM is a set of up to 5 people from the same *FIRST* Robotics Competition team responsible for team performance for a specific MATCH. There are 4 specific roles on a DRIVE TEAM which ALLIANCES can use to assist ROBOTS with RAPID REACT. Only 1 of the 5 DRIVE TEAM members is permitted to be an adult mentor.

> The intent of the definition of DRIVE TEAM and DRIVE TEAM related rules is that, barring extenuating circumstances, the DRIVE TEAM consists of people who arrived at the event affiliated with that team and are responsible for their team's and ROBOT'S performance at the event (this means a person may be affiliated with more than 1 team). The intent is not to allow teams to "adopt" members of other teams for strategic advantage for the loaning team, borrowing team, and/or their ALLIANCE (e.g. an ALLIANCE CAPTAIN believes 1 of their DRIVERS has more experience than a DRIVER on their first pick, and the teams agree the first pick team will "adopt" that DRIVER and make them a member of their DRIVE TEAM for Playoffs).
>
> The definition isn't stricter for 2 main reasons. First, to avoid additional bureaucratic burden on teams and event volunteers (e.g. requiring that teams submit official rosters that Queuing must check before allowing a DRIVE TEAM into the ARENA). Second, to provide space for exceptional circumstances that give teams the opportunity to display *Gracious Professionalism* (e.g. a bus is delayed, a COACH has no DRIVERS, and their pit neighbors agree to help by loaning DRIVERS as temporary members of the team until their bus arrives).

Table 6-4 DRIVE TEAM roles

Role	Description	Max./ DRIVE TEAM	Criteria
COACH	a guide or advisor	1	STUDENT or adult mentor, must wear "COACH" button
DRIVER	an operator and controller of the ROBOT	3	STUDENT, must wear a "DRIVE TEAM" button
HUMAN PLAYER	a CARGO manager		
TECHNICIAN	a resource for ROBOT troubleshooting, setup, and removal from the FIELD	1	STUDENT or adult mentor, must wear "TECHNICIAN" button

A STUDENT is a person who has not completed high-school, secondary school, or the comparable level as of September 1 prior to Kickoff.

The TECHNICIAN provides teams with a technical resource for pre-MATCH setup, ROBOT connectivity, OPERATOR CONSOLE troubleshooting, and post-MATCH removal of the ROBOT. Some pre-MATCH responsibilities for the TECHNICIAN may include, but are not limited to:

- location of the ROBOT radio, its power connection, and understanding of its indicator lights
- location of the roboRIO and understanding of its indicator lights
- username and password for the OPERATOR CONSOLE
- restarting the Driver Station and Dashboard software on the OPERATOR CONSOLE
- changing the bandwidth utilization (e.g. camera resolution, frame rate, etc.)
- changing a battery
- charging pneumatics

While the TECHNICIAN may be the primary technical member of the DRIVE TEAM, all members of the DRIVE TEAM are encouraged to have knowledge of the basic functionality of the ROBOT, such as the location and operation of the main circuit breaker, connecting and resetting joysticks or gamepads from the OPERATOR CONSOLE, and removing the ROBOT from the FIELD.

If an ALLIANCE does not have at least 2 HUMAN PLAYERS, 1 of the ALLIANCE'S teams must substitute a STUDENT TECHNICIAN as a HUMAN PLAYER to be compliant with H310 for that MATCH only. In this case,

- the Head REFEREE must be notified,
- all HUMAN PLAYER rules now apply to this DRIVE TEAM member, and
- this DRIVE TEAM member is no longer considered a TECHNICIAN for that MATCH.

6.7   Other Logistics

CARGO that leaves the FIELD, other than via the TERMINAL, are placed back into the FIELD approximately at the point of exit by FIELD STAFF (REFEREES, *FIRST* Technical Advisors (FTAs), or other staff working around the FIELD) at the earliest safe opportunity.

Note that, except via the TERMINAL, ROBOTS may not deliberately cause CARGO to leave the FIELD (see G401).

An ARENA FAULT is not called for MATCHES that accidentally begin with damaged CARGO. Damaged CARGO is not replaced until the next ARENA reset period. DRIVE TEAMS should alert the FIELD STAFF to any missing or damaged CARGO prior to the start of the MATCH.

Once the MATCH is over and the Head REFEREE determines that the FIELD is safe for FIELD STAFF and DRIVE TEAMS, they or their designee change the LED lights to green and DRIVE TEAMS may retrieve their ROBOT.

In addition to the 2 minutes and 30 seconds (2:30) of game play, each MATCH also has pre- and post-MATCH time to reset the ARENA. During ARENA reset, the ARENA is cleared of ROBOTS and OPERATOR CONSOLES from the MATCH that just ended, ROBOTS and OPERATOR CONSOLES for the subsequent MATCH are loaded into the ARENA by DRIVE TEAMS, and FIELD STAFF reset ARENA elements.