

CIJE-Tech Middle School

Robotics Competition

2024-2025

Rapid Relay

CENTER FOR
INITIATIVES
IN JEWISH
EDUCATION

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Revision B, 09/11/2024

The Center for Initiatives in Jewish Education (CIJE)



The Center for Initiatives in Jewish Education (CIJE) strengthens and enriches the quality of education in Jewish schools throughout the United States. CIJE is investing in our nation's future by providing beneficiary schools with cutting-edge technology, engaging curricula, and vital support so that students can acquire the skills they need to excel in our global society. Currently, CIJE has more than 245 beneficiary schools across the United States and programs which span grades K-12. CIJE's innovative programs are paving the way for the achievement and success of tomorrow's leaders and thinkers.

CIJE-TECH STEM PROGRAM: AN OVERVIEW

More than ten years ago, the Center for Initiatives in Jewish Education began the implementation of various STEM programs in elementary Jewish schools. The success of these programs brought about the initiation of the CIJE-Tech Principles in Engineering and Applied Engineering programs.

Goals:

The CIJE STEM education programs:

- Provides a challenging and rigorous program of study focusing on the application of STEM subjects.
- Offers courses and pathways for preparation in STEM fields and occupations.
- Bridges and connects in-school and out-of-school learning opportunities.
- Provides opportunities for student exploration of STEM related fields and careers.
- Prepares students for successful college and university STEM education.

To increase STEM learning, the CIJE-Tech programs include activities that improve student and teacher content knowledge and teacher pedagogical skills. Innovative strategies are used, including small group collaborative work and the use of hands-on activities and experiments to promote inquiry and curiosity. Learning is connected to the real world through an emphasis on the application of STEM subjects to everyday life, employment, and the surrounding environment.

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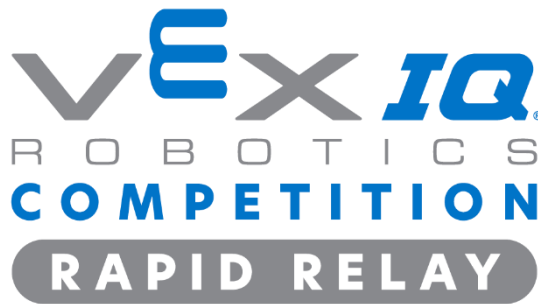
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Robotics Competition

Game Rules

2024-2025



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Revision B 09/11/24:

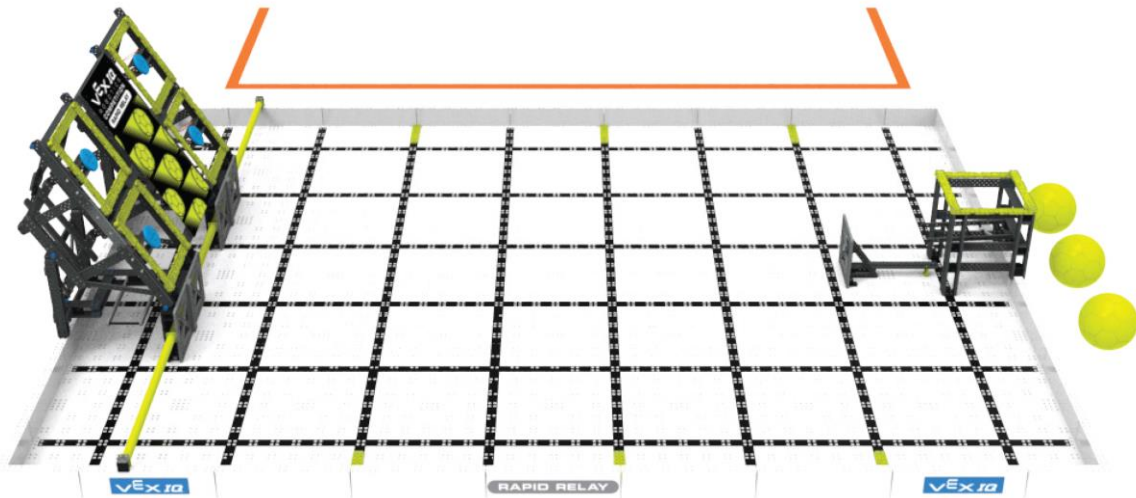
Updated rule 10 to allow 3D printing to replicate an already existing VEX part, without changing its form or function.

Summary

VEX IQ Robotics Competition Rapid Relay is played on a 6'x8' rectangular *Field*, set up as illustrated in the figures throughout this game manual. An *Alliance* composed of two (2) *Robots* works together to score as many points as possible in a sixty (60) second *Match*

The primary objectives of the game are to *Pass* the *Balls* between *Robots*, score *Balls* through *Targets*, and *Clear Switches*. *Balls* are introduced to the field through the *Loading Station* or, during the last 15 seconds of a *Match*, a *Rapid Load Zone*.

Points are awarded based on (1) how many *Goals* are *Scored*, (2) how many *Switches* have been *Cleared*, and (3) how many times the *Alliance* successfully *Passed* the *Ball* before scoring it.



All disputes are to be decided at the head referee's discretion.

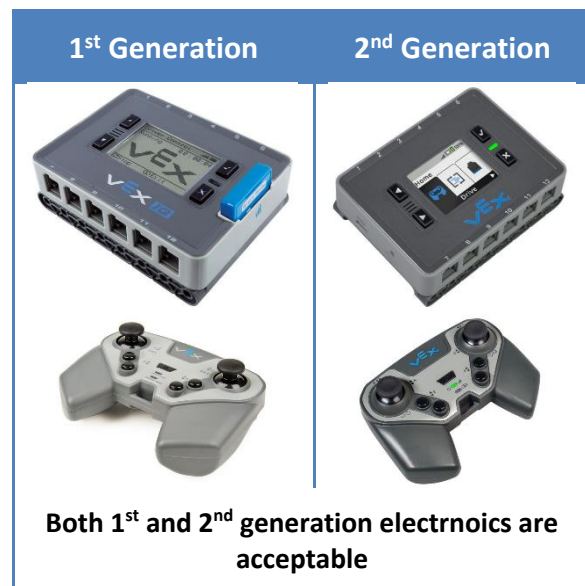
Robots Rules

1. Each team will undergo an official measurement before they can compete. Robots must fit within a 23" x 73" x 15"H dimensional box
2. The starting maximum dimensions (23" x 73" x 15"H) are also the maximum expansion limits during Match play.
3. Teams that do not meet the dimensional requirements will not be allowed to compete in matches until the infraction is fixed.

Each team will undergo an official measurement before they can compete. Teams that do not meet the dimensional requirements will not be allowed to compete until the size is corrected.

4. Throughout tournament play, a robot may never expand beyond the maximum starting dimensions (23" x 73" x 15"H).
5. Only official VEX IQ components specifically designed for use in Robot construction are allowed. With the following exceptions:
 - a) Mechanical/structural components from the VEX GO product line are legal for Robot construction.
 - b) 1/8" metal shafts from the VEX V5 product line are permitted to be used.

6. VEX IQ Packaging and Field Elements may not be used, unless possible to be reconstructed using standard VEX IQ components.
7. Official Robotics components from the VEX IQ product line that have been discontinued are still legal for Robot use.
8. To determine whether a product is “official” or not consult www.vexiq.com.
9. VEX IQ Pneumatics Kit (228-8795) may be used, but must satisfy the following criteria:
 - a) No more than two (2) Air Tanks, including any not connected, may be used.
 - b) No more than (1) Pneumatic Pump, including any not connected, may be used.
 - c) No additional parts that are not included in the VEX IQ Pneumatics Kit (e.g., unofficial tubing or fittings), may be used.
 - d) There are no restrictions on running the Air Pump prior to (or during) Matches.
10. 3D printed components may not be used, unless replicating an already existing VEX component, without changing its form or function.
11. Parts may NOT be modified. Examples of modifications include, but are not limited to, bending, drilling, cutting, sanding, gluing, or melting. The following exceptions are legal:
 - a) Cutting metal VEX IQ or VEX V5 shafts to custom lengths.
 - b) Bending parts which are intended to be flexible, such as string, rubber bands, or thin plastic sheets.
 - c) Cutting VEX IQ pneumatic tubing to custom lengths.
12. Any rubber bands may be used, up to a ¼” inch wide.
13. There is no weight limit on the robot.
14. The robot must be wireless and cannot have any connections (e.g. - wired, mechanical, string) to the drivers or competitors.
15. Robots may ONLY use one (1) VEX IQ Robot Brain.
 - a) If using a first generation VEX IQ Brain, Robots must use one (1) VEX IQ 900 MHz radio, VEX IQ 2.4 GHz radio, or VEX IQ Smart Radio in conjunction with their VEX IQ Robot Brain.
16. The only legal method of driving the Robot is the VEX IQ Controller.
17. Robots may use up to six (6) VEX IQ Smart Motors.
18. The only allowable sources of electrical power for a Robot are one (1) VEX IQ Robot Battery or six (6) AA batteries via the Robot AA Battery Holder (Part # 228-3493).

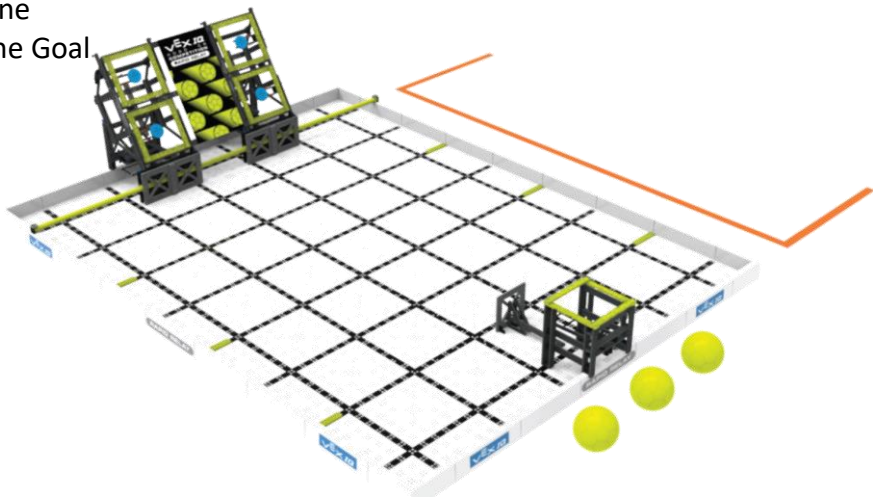


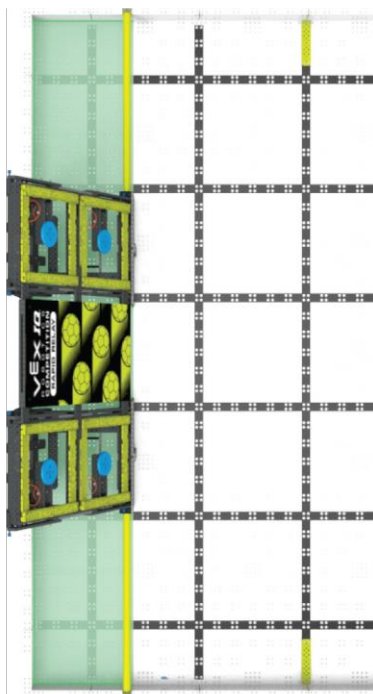
19. Additional batteries or motors cannot be placed on the Robot, even if not electrically connected.
20. The IQ Controller can be powered in any safe manner that you wish.
21. Robots may not intentionally detach or leave mechanisms on the field during the match.
22. A competitor may only “drive” for one robot throughout the day. Even if other robots belong to the same school as the competitor, he/she may only drive for one of them.
23. A team (a specific group of students) may not switch robots during a competition. This includes adding or amending to their robot so that it behaves in a significantly different manner or capability. The competition referee will decide all matters pertaining to changing robots during a competition.
24. Mechanisms and components that (1) could potentially damage playing field objects (2) potentially damage other competing robots (3) pose an unnecessary risk of entanglement are not allowed.
25. Robots may not be dangerous.
26. Teams may add non-functional decorations made of any materials, provided they do not affect the robot’s performance in any way or affect the outcome of the match.
27. The hosting school will be required to have their robot(s) in the designated tournament area throughout the competition, beginning from the official start time, and may not bring it to another part of the building for the duration of the tournament. They may bring tools and supplies to the tournament area.

Game Rules

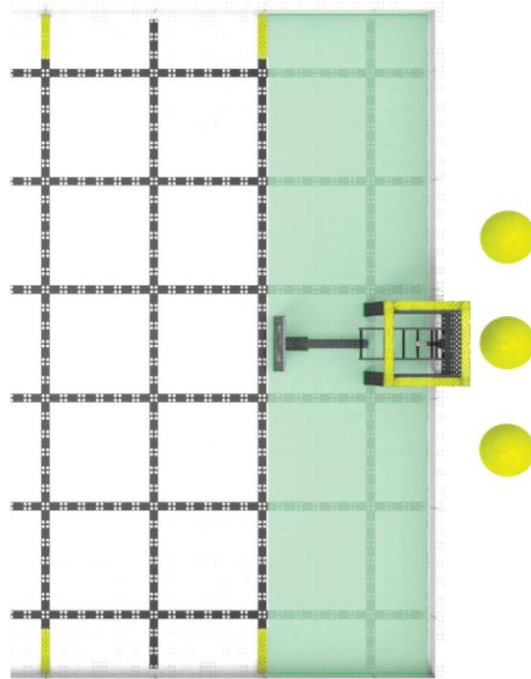
28. The VEX IQ Robotics Competition Rapid Relay field consists of the following:

- a) Three (3) *Balls*
 - Two (2), one per Robot, that can be used as Preloads
 - One (1) that begins outside the Field, to be used by a *Loader*
- b) One (1) Goal Wall containing:
 - Four (4) Targets
 - Four (4) Switches that begin the Match “un-Cleared”
- c) One (1) Pickup Zone
(located behind the Goal Wall)
- d) One (1) *Loading Station*, located within the *Load Zone*
- e) Two (2) Starting Zones





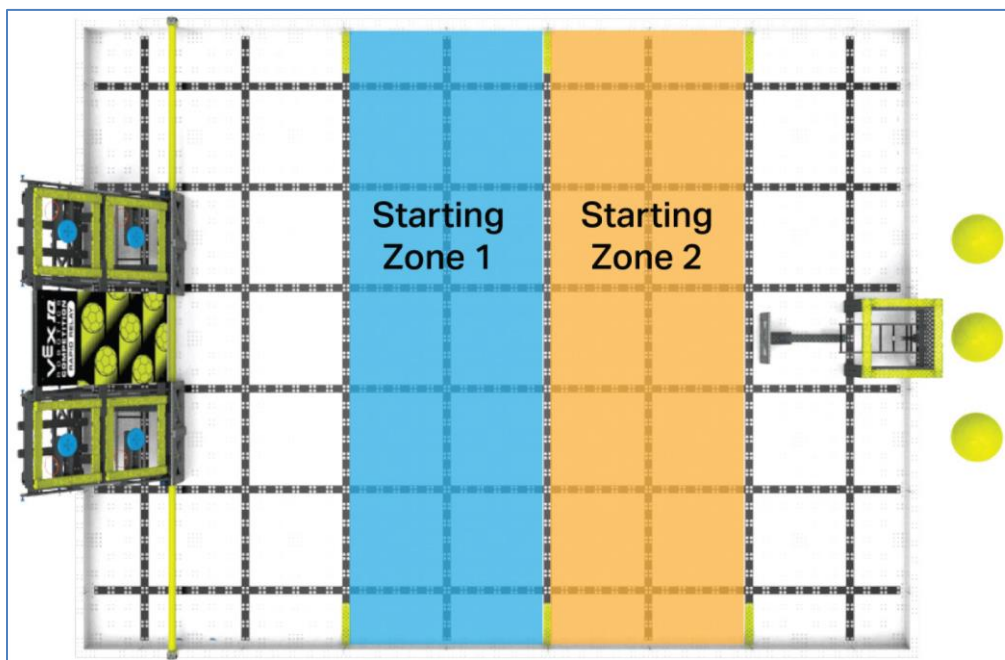
Pickup Zone

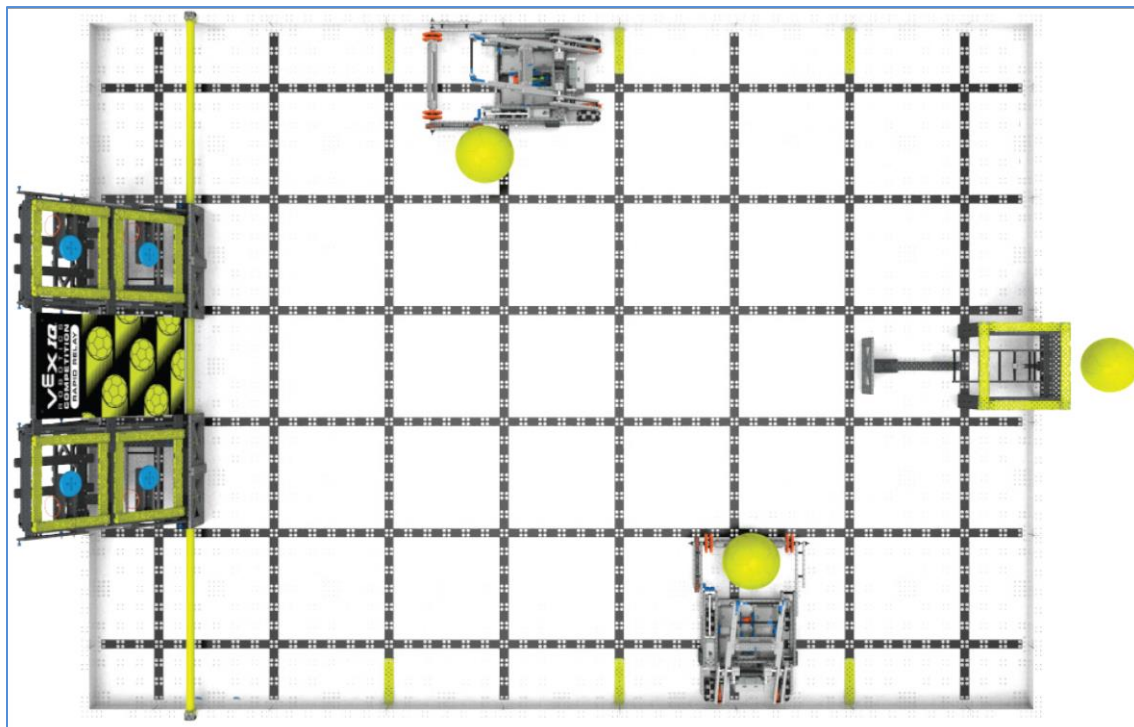


Loading Zone

29. At the start of each Match, the Robot must be able to satisfy the following constraints:

- a) Only be contacting the Floor and the inside face of the Field Perimeter.
- b) Fit within the volume of a Starting Zone (23" wide x 73" long)
- c) Be no taller than 15"
- d) Contacting exactly one (1) *Preload*.
- e) Completely stationary
- f) Not occupying the same *Starting Zone* as the *Alliance partner Robot*.



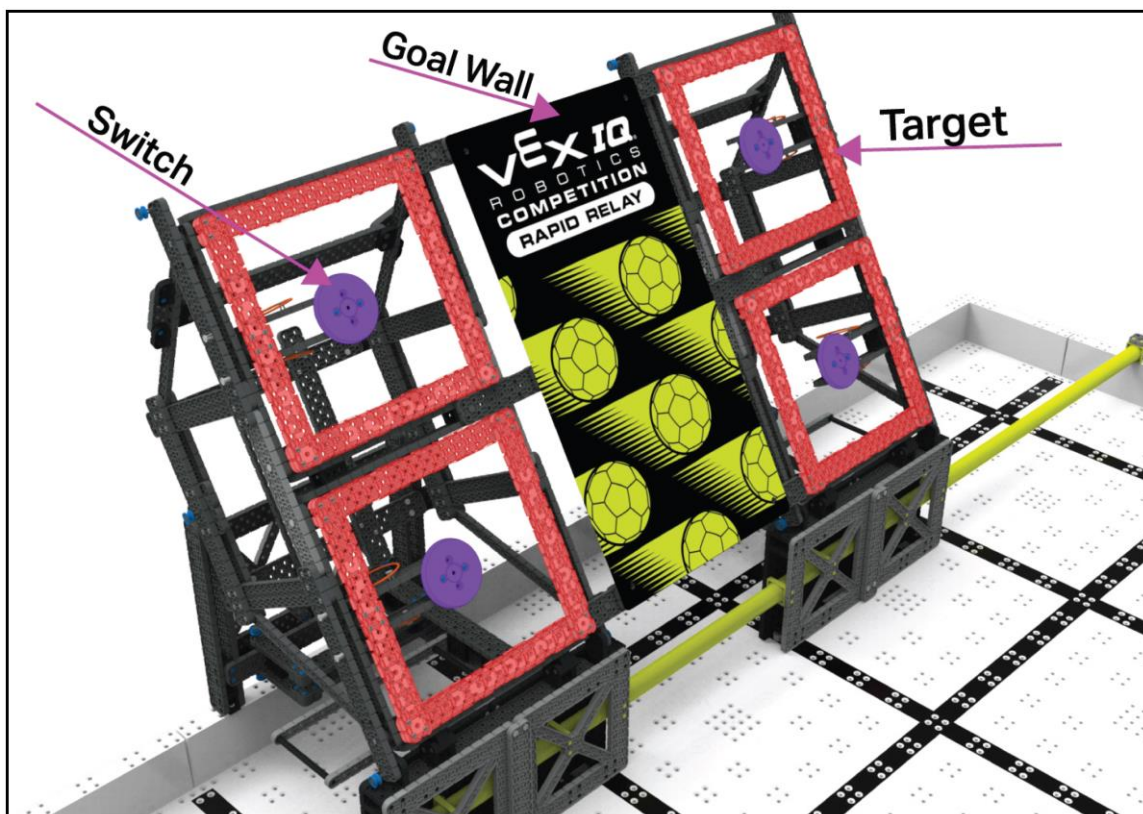


30. Points are awarded based on (1) how many *Goals* are *Scored*, (2) how many *Switches* have been *Cleared*, and (3) how many times the *Alliance* successfully *Passed* the *Ball* before scoring it.
31. The point value of each pass is determined at the end of the match based on how many switched were activated.

Action	Points
Each Goal Scored	1 Point
Each Cleared Switch	1 Point
Each Pass (with 0 Cleared Switches)	1 Point each*
Each Pass (with 1 Cleared Switch)	4 Points each
Each Pass (with 2 Cleared Switches)	8 Points each
Each Pass (with 3 Cleared Switches)	10 Points each
Each Pass (with 4 Cleared Switches)	12 Points each

* Maximum of four per *Match*

32. All Scoring statuses are evaluated after the Match ends, once all *Balls*, Field Elements, and Robots on the Field come to rest.
33. If a *Ball* is released from a Robot before this moment, it will be allowed to finish its path and the score will be calculated once it comes to rest.

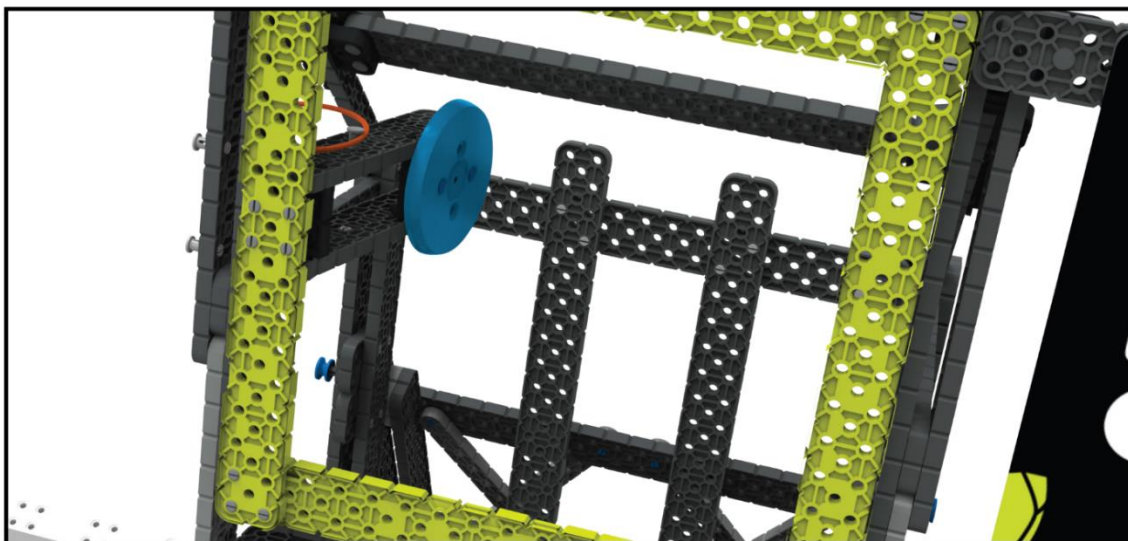


GOALS

34. An Alliance Scores a Goal, and receives one (1) point, once a *Ball* is no longer in contact with a Robot and has fully passed through a Target. (even if it does not touch down to the Pickup Zone).

SWITCHES

35. A Switch is Cleared, and one (1) point awarded, once it has been struck by a *Ball* and is no longer parallel with the front face of the Goal Wall. Robots may not Clear Switches by contacting them directly, unless it is part of the process of scoring a *Ball* through that Target.



36. There are theoretical edge cases in which a *Switch* has been *Cleared* without scoring a *Ball* through the *Target*, or a *Ball* has been *Scored* through a *Target* but the *Switch* is not *Cleared*.

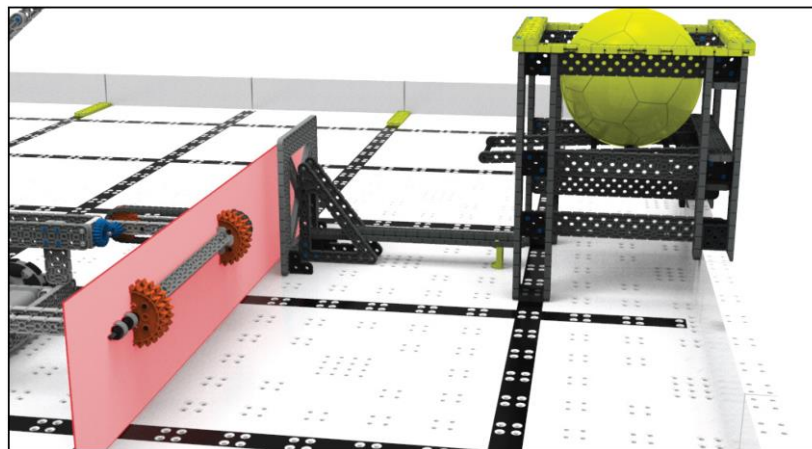
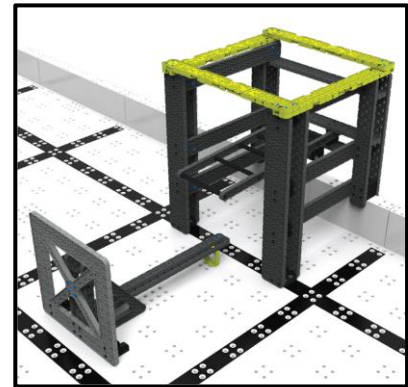
LOADING

37. Each alliance consists of two (2) drivers and two (2) loaders. Only *Loaders* are allowed to touch game balls. Drivers may never come in contact with a game *Ball*.

38. The *Loading Station* is intended to receive *Balls* from a human *Loader* and randomly send them left or right into the *Load Zone*.

39. *Balls* Loaded through the *Loading Station* must meet the following criteria:

- a) No more than two (2) *Balls* may be in play at any one time (i.e., the next *Ball* should not be Loaded until a previous *Ball* is either scored or leaves the Field).
- b) The *Loader's* hand may not cross into the volume of the *Loading Station* at any time.
- c) No Robot(s) may be in the *Load Zone* at the time the *Ball* is released by the *Loader*.
- d) If a *Ball* is introduced improperly through the *Loading Station*, or introduced improperly outside of the *Loading Station* (e.g., into the middle of the Field prior to the Rapid Load Period), the *Ball* must then be removed from the *Load Zone* by a *Loader* before it is retrieved by a Robot and legally Loaded again.



40. Once a Goal is scored, that *Ball* will fall through the Goal Wall and into the Pickup Zone. Once the *Ball* contacts the Floor of the Pickup Zone, a *Loader* may retrieve it.

- a) They may not reach into the Field until the *Ball* contacts the Floor.
- b) If a *Ball* gets stuck inside the Goal Wall structure and does not make it to the Pickup Zone, a referee may free it by carefully reaching into the Goal Wall.

41. The loading rules also apply to *Balls* that land in the Pickup Zone without being scored.

42. *Balls* may leave the Field without being scored. They may be retrieved by a *Loader* and legally Loaded through the *Loading Station*.

PASSING

43. An Alliance receives credit for a Pass once both Robots independently contact a *Ball* before it leaves the Field.

- e) For the purposes of this rule, “independent contact” refers to a moment where only one Robot is contacting the *Ball*. If both Robots are contacting the *Ball*, this is not considered a Pass.
- f) Each time a *Ball* is Loaded, it is treated like a new *Ball*. Any previous Robot contact and/or Pass tracking is “reset.”
- g) A *Ball* can count for a maximum of one Pass each time it is Loaded through the *Loading Station*.
- h) *Balls* that are Rapid Loaded (during the last 15 seconds of a match) directly into a Starting Zone are not eligible for Passes.

44. At the end of a Match, an Alliance cannot receive points for more Passes than Goals.

45. The point value per Pass is determined at the end of the Match, based on how many Switches have been Cleared:

Each Pass (with 0 Cleared Switches)	1 Point*
Each Pass (1 Cleared Switch)	4 Points
Each Pass (2 Cleared Switches)	8 Points
Each Pass (3 Cleared Switches)	10 Points
Each Pass (4 Cleared Switches)	12 Points

*If no Switches have been Cleared at the end of the Match, the maximum number of points that can be received for Passes is four (4). The only way this can occur is if *Balls* are repeatedly Passed and then sent out of the Field without being Scored.



46. All Passes are recorded during the Match, regardless of how many *Goals* have been scored up until that point in the match.

RAPID LOADING

47. During the last fifteen (15) seconds of the Match, *Loaders* have the option to introduce *Balls* directly into the Field Starting Zones (i.e., without using the *Loading Station*).

- a) Rapid Load *Balls* must contact the Floor inside a Starting Zone before being contacted by a Robot.
- b) *Balls* may never be in contact with both a Robot and a human *Loader* at the same time.
- c) Rapid Load *Balls* may not contact the Goal Wall or the Floor outside of a Starting Zone before being retrieved by a Robot.
- d) Rapid Load *Balls* are not eligible to receive credit for Passes.
- e) The human *Loader* may not contact the Floor while introducing the Match Load

48. *Balls* which leave the Field during the Rapid Load Period must be returned through the *Loading Station*; they may not be Loaded directly into a Starting Zone.

49. If a *Ball* is Rapid Loaded improperly, the *Ball* must be retrieved by a referee, given to a *Loader*, and re-Loaded legally before it may be retrieved by a Robot.

Note: Although it is not required, Robots are highly recommended to remain some distance away from the *Ball* entirely until the *Loader's* hand has clearly been removed.

Note: Although it is not required, placing the *Ball* gently down onto the Field without any additional motion is highly recommended.

SCORING EXAMPLES

Example 1

- 1) Robot A retrieves a *Ball* from the *Loading Station* and launches it down the Field.
- 2) Robot B retrieves the *Ball*.
- 3) Robot B scores a Goal.

Result: One Pass, one Goal.

Explanation: This is a “normal” Rapid Relay cycle.

Example 2

- 1) Robot A retrieves a *Ball* from the *Loading Station* and launches it down the Field.
- 2) Robot B retrieves the *Ball*.
- 3) Robot B attempts to score a Goal, but misses.
- 4) The *Ball* bounces off of the Goal Wall and back into the Field.
- 5) Robot A retrieves the *Ball* and scores a Goal.

Result: One Pass, one Goal.

Explanation: The *Ball* never left the Field, so it was not yet eligible for additional Passes.

Example 3

- 1) Robot A retrieves a *Ball* from the *Loading Station*.
- 2) Robot A attempts to score a Goal, but misses the Goal Wall entirely.
- 3) The *Ball* leaves the Field; a *Loader* retrieves and re-introduces it through the *Loading Station*.
- 4) Robot B retrieves the *Ball* and scores a Goal.

Result: Zero Passes, one Goal.

Explanation: As soon as the *Ball* left the Field, its previous contact was forgotten. Robot B's contact was not a Pass; rather, it became the "first Robot" for the new cycle.

Example 4

- 1) Robot A retrieves a *Ball* from the *Loading Station* and launches it down the Field.
- 2) Robot B retrieves the *Ball*.
- 3) Robot B attempts to score a Goal, but misses.
- 4) A human *Loader* retrieves the *Ball* and Loads it through the *Loading Station*.
- 5) *Robot A* retrieves the *Ball* and launches it down the *Field*.
- 6) *Robot B* retrieves the *Ball*.
- 7) *Robot B* scores a *Goal*.

Result: Two *Passes*, one *Goal*.

Explanation: It is possible to have a cycle with a Pass but no Goal. However, if the Match were to end at this moment, the Alliance would only receive points for one Pass (because you can't have more passes than goals at the end of the match)

Example 5

- 1) – 3) Same as example 4 above.
- 4) The *Ball* is *Rapid Loaded* into a *Starting Zone* instead.
- 5) – 7) Same as above.

Result: One *Pass*, one *Goal*.

Explanation: Since the *Ball* was *Rapid Loaded*, it's not eligible for a pass.

Example 6

- 1) – 7) Same as example 4 above.

After the *Goal* is scored in step 7, a human *Loader* retrieves the *Ball*, *Rapid Loads* it into a *Starting Zone*, where *Robot B* retrieves and scores it again.

Result: Two *Passes*, two *Goals*.

Explanation: When the match ended, there were not more passes than goals, so they all count, regardless of when they happened during the match.

Gameplay Rules

50. A Robot may only be driven by a member of its Team. No driver may fulfill this role for more than one Robot (i.e. – you can drive a lot, but only for one robot).
51. Drivers are not required to switch mid-Match. (Note this differs from official VEX Rules).
52. Drivers are prohibited from making intentional contact with any Field Element, Game Object, or Robot during a Match. If part of the robot inadvertently extends outside the arena it may not be touched as well.
53. If a Robot goes completely outside the Playing Field, gets stuck, tips over, or otherwise requires assistance, the Drive Team Members may retrieve & reset their Robot. To do so, they must do the following:
 - a) Receive verbal permission from the rink referee
 - b) Any *Balls* being controlled by the Robot while being handled must be removed from the Field, and can be returned through the *Loading Station* (or Rapid Loaded in the last 15 seconds)
 - c) Move the robot to a legal starting position.
54. Robots may not intentionally cause damage to game objects, field elements or rink components.
55. All Scoring statuses are evaluated visually by a Referee, to the best of their ability within the context of a given Match/event.
 - a) Referees and other event staff are not allowed to review any videos or pictures from the Match.
 - b) If there is a concern regarding the score of a Match, only the Drivers from that Match, not an Adult, may share their questions with the Referee.
 - c) Where a Scoring status is determined “too close to call” by the referee, Teams will be given the “benefit of the doubt,” and the higher of the two possible Scoring statuses should be assigned.
56. **Code of conduct:** Treat everyone with respect. All students, teachers, mentors and adults associated with a school are expected to conduct themselves in a respectful and positive manner while participating in the CIJE-Tech Robotics Tournament. If person(s) are deemed to be disrespectful or uncivil to staff, volunteers, or fellow teams at an event, the team can be disqualified from their current or upcoming match.
57. If the adult team leader feels there has been an error regarding tournament play, he/she may bring it exclusively to the attention of the head referee without involving students. Their decision will be final say in the matter.

Tournament Style

58. Multiple robots from the same school do not behave as a team or affect each other’s scores. For the purposes of the competition each robot is judged independently. There is no school average, combined school score, or school team.

59. Each robot in a match receives all the points scored in that match, regardless of which robot physically scored the points.
60. The tournament will consist of round-robin style play, with robots and alliances chosen at random to play in multiple Matches. It is possible for an alliance to contain two robots from the same school.
61. If a team does not show up to, or is late to, a match it is the judge's discretion on when to begin. The absent robot does not receive any points.
62. The remaining robot plays by itself, and is awarded a *Pass* automatically for each *Goal* scored (Note: this differs from VEX rules).
63. Teams are ranked by their AVERAGE Match scores.
64. Every Team will be ranked based on the same number of Matches.
65. A certain number of a team's lowest Match scores will be excluded from the rankings based on the quantity of Matches each team plays.

Number of Qualifying Matches per Team	Number of excluded Match scores
Between four (4) and seven (7)	1
Between eight (8) and eleven (11)	2
Between twelve (12) and fifteen (15)	3
Sixteen (16) or more	4

66. Ties in Team ranking are broken by removing the teams' lowest score and comparing the new average score (this can be done multiple times as needed).
67. At the end of all the qualifying matches, the top 16 teams will form 8 alliances for the Finals. Depending on tournament size, the number of teams that make the Finals may be adjusted.
68. Finals Alliances are assigned as follows: The first and second ranked Teams form an Alliance, the third and fourth ranked Teams form an Alliance, etc.
69. Each Alliance plays one match. The top score is declared the winner.