

Every attempt has been made to insure these are the current rules; however, the only official rules are those published in the Coaches and Student Manuals. In case of discrepancy, the rules in those manuals take precedence.

Robo-Cross

- DESCRIPTION:** The object of this event is to design and build a robot capable of performing certain tasks on a prescribed playing field.

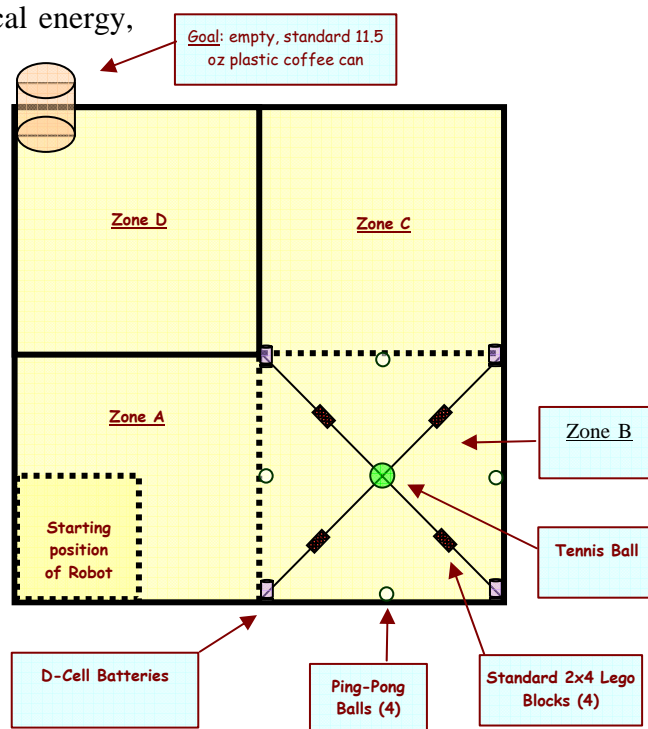
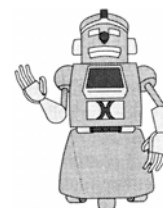
A TEAM OF UP TO: 2

IMPOUND: Yes

APPROXIMATE TIME: 5 minutes/Team

- MATERIALS:**

- Each team may enter only one robot that must be built prior to the competition.
- The robot may be controlled remotely by radio control, infrared, or by a control box with wires leading to the robot. Batteries used in the controller shall be as stipulated by the manufacturer without modification. Controllers constructed by the competitors shall be powered by a battery not exceeding 9.6 volts.
- At the start of the competition, the robot, with the exception of the wires connecting it to the student control box(es), must fit into a Plexiglas qualifying cube with inside dimensions of 30 cm x 30 cm x 30 cm.
- All robot motion must be powered only by electrical, elastic or gravitational energy. These forms of energy may not be converted to other forms such as hydraulics, pneumatics, and fluidics to power the robot.
- Each robot circuit must be energized by one or more commercial batteries that do not exceed 9.6 volts. If multiple batteries are used, they may be connected in series or parallel as long as the voltage output does not exceed 9.6 volts. The voltage stated on commercial batteries will be accepted.
- Each robot function (such as drive train, arm, etc.) may have its own independent circuit, source of electrical energy, and control mechanism.
- The robot must have a legible team name on it.
- Radio control equipment used for this event must operate on frequencies designated by the Federal Communications Commission (FCC) regulations for surface devices (cars, boats, etc.). The frequency must be marked by the manufacturer on the transmitter. Allowable frequencies are: 75 MHz band (75.41 through 75.99 MHz) which contains 30 channels, 27 MHz band (26.995 through 27.255 MHz), or 49 MHz band (49.8302 through 49.890). No other frequencies may be used. Robots using other frequencies will not be allowed to compete.



- PLAYING FIELD** See diagram of the Playing Field

- The playing field for the event shall be constructed on a piece of 1/4 inch thick Masonite® (tempered hardboard) 4 feet by 4 feet, placed on the floor, smooth side up. Students may not step or stand on the playing field.
- The perimeter of the playing field will have a border of commercial 1" x 2" (nominal, 3/4" x 1 1/2" actual) wood, attached to the top surface of the field with the 2" dimension placed vertical.

- c. The playing field will be equally divided into square zones labeled A, B, C, D counterclockwise. Zone D will have a border of commercial 11/16" quarter round molding separating it from the other zones. Rounded side will face Zone A & Zone C.
- d. The other interior boundaries will be drawn with a fine tipped marker.
- e. Zone A will contain the starting position for the robot.
- f. Zone B will contain all of the scorable items at the start of the competition.
- g. All materials for the event, including the playing field, qualifying cube, goal (coffee can), Ping-pong balls, tennis ball, D-cell batteries, and Legos will be provided by the event supervisor.
- h. At the start of the competition, the event supervisor will place the following objects in Zone B: 4 Ping-Pong balls (approx. diameter 38 mm), 4 D-cell batteries, 1 tennis ball, and 4 Lego blocks (standard 4x2 size), as shown in the playing field diagram.
- i. The goal will be an empty, 11.5 oz plastic coffee can with the top removed, bottom intact, and label removed (if paper). The goal will be placed in the outside corner of zone D (see playing field diagram).

4. **COMPETITION:**

- a. All robots and control systems must be impounded before the start of the competition and will be released after the last team has finished competing. Robots and controls entered by teams that have filed an appeal may be retained by the event supervisor until the appeal process is completed.
- b. Before starting the competition, students will place their robot in the designated starting position in the outside corner of Zone A.
- c. The students will then place the qualifying cube over the robot. If the robot does not fit in the cube, the students will be allowed to compete but their robot will be ranked behind all of the other robots that qualify. After this point, students may not touch their robot until their run is completed.
- d. The students will then remove the cube. After the qualifying cube is removed, the robot may self-activate a change in size or shape (not start). Changes may not be activated mechanically or electronically by the students until the competition begins.
- e. The competition will start by having the judge verify that the timer(s) and students are ready. The judge will then count aloud "1, 2, 3, go". Teams will be allowed three minutes, starting with the word "Go", to complete the task of moving the scorable items into scoring areas.
- f. The competition will stop (and the score will be determined at that point) when any of the following occur:
 - i. Three minutes have elapsed from the word "Go".
 - ii. The team says "Stop".
 - iii. Any part of the goal box is "out of bounds".
 - iv. The team touches the robot.
 - v. The robot is physically moved by the wires connecting it to a control box.
 - vi. A team member steps on the playing field after the team has received a warning.
- g. The robot may move the goal, but the goal must remain inside the playing field in any zone.
- h. If a scorable item is moved by the control wires, it will be out of play and may not be used to attain any points.
- i. The students will receive a warning if they step on the playing field. A second step onto the playing field ends the competition and their score will be based on the locations of the scoreable objects at the time the second violation occurred.
- j. Miscellaneous robot parts, or the entire robot, may end up in the goal without penalty.

- k. At the end of the competition, all controllers must be set on the floor immediately, and the event supervisor will allow 10 seconds for the robot to "come to rest" with the power off to determine if any parts are touching the ground outside of the playing field.

5. SCORING:

- a. At the end of the competition, points will be awarded based on the number and types of items that were moved into scoring areas.
- b. If the robot (parts touching the ground) is completely in:
 - i. Zone B at the end of the competition, the team will receive 3 points.
 - ii. Zone C at the end of the competition, the team will receive 5 points.
 - iii. Zone D or the Goal at the end of the competition, the team will receive 15 points.

c. Teams will receive the following points for each item moved into the following areas:

<u>Item</u>	<u>Quantity</u>	<u>Points if in Zone C</u>	<u>Points if in Zone D</u>	<u>Points if in Goal</u>
Ping-Pong Balls	4	1	2	3
Lego blocks	4	2	4	6
Tennis ball	1	3	6	9
D-cell batteries	4	4	8	12

Note: Points may be earned for only one location.

- i. A scorable item that touches the floor outside of the playing field at any time, even if it is under the control of the robot, is out of play and may not be used to attain points.
- ii. The robot or any scorable item on the line or straddling 2 zones will receive the lesser score.
- iii. If any part of the goal is out of bounds, the scoreable items within will have no point value.
- d. Maximum score is 108.
- e. The team with the most points will be the winner. In the case of a tie, the team that completed the task in the shortest length of time will receive the more favorable score value. If teams still have identical scores, massing the robot and batteries will break the tie. The robot and its batteries with the least mass will receive the more favorable score value (ranking).
- f. Robots that fail to meet any of the specifications under "Materials" will be allowed to compete but will be ranked behind those that meet specifications. Robots that violate the FCC regulations will not be allowed to compete and will receive participation point(s) only.

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