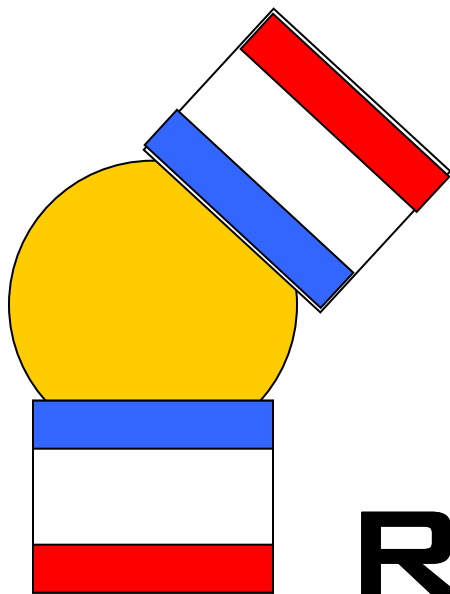
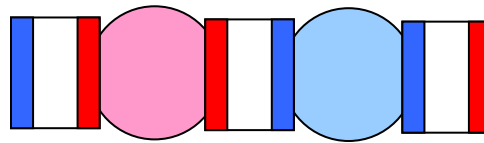


**2011 MVP ROBOTICS CHALLENGE**



**CHAIN**



**REACTION**

**PRESENTED BY:**

**THE ULTIMATE PROTECTION SQUAD 1675**

**SABER ROBOTICS 2506**

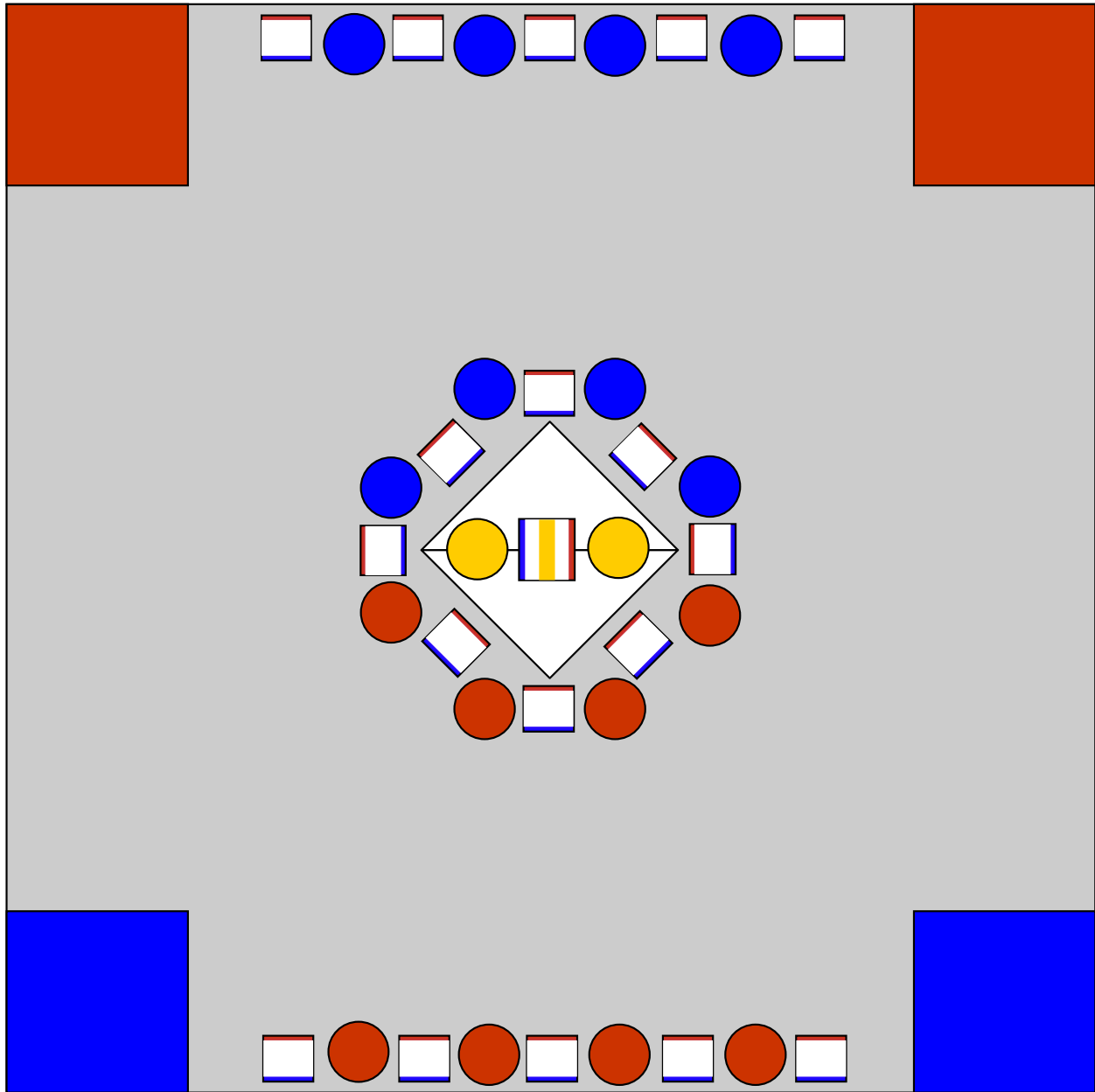
**COONEY ROBOTICS 269**

## 1. Objective

The objective of “Chain Reaction” is to design and build a radio-controlled robot that will allow you and your partnered team to earn a higher Match Score than the two opposing alliances.

## 2. The Game

### RED ALLIANCE STATION



### BLUE ALLIANCE STATION

## 2.1 Field Description

2.1.1 The Official Midwest Vex Programs Field measures 12' x 12'. The surface of the playing area consists of 2' x 2' interlocking foam floor tiles, rough side up, available from [www.softtiles.com](http://www.softtiles.com).

2.1.2 *The Field Border* is constructed of PVC piping and measures approximately 12" tall. Construction consists of a lower border and an upper border with vertical braces spaced at regular intervals.

2.1.3 All official field dimensions will be within +/- 1/2" tolerance.

2.1.4 A Red or Blue *Alliance Station* is located at either end of the playing field.

2.1.5 *Home Zones* are located in each corner of the field on the same side as the *Alliance Station* and are designated by either red or blue foam tiles. The zones measure approximately 24" x 24".

2.1.4 *The Platform* is a centrally located 24" x 24" x 2" tall acrylic structure, rotated 45 degrees from perpendicular.

## 2.2 Game Elements

2.2.1 There are 16 *Balls* on the field, 8 red and 8 blue, arranged strategically at the start of the match. Each *Ball* is nominally 9" in diameter but may vary +/- 1/2" due to inflation and atmospheric conditions. *Ball* dimensions will be checked at the beginning of an event. *Balls* are available at most local toy, department, or dollar stores. The specific brand is Hedstrom.

2.2.2 There are 2 *Super Balls* on the field which begin the match on top of *The Platform*. A *Super Ball* is identical to a red or blue *Ball* except for a golden indicator (color, tape, paint, etc.). Every attempt will be made to mark the *Super Ball* in such a way that does not significantly alter the surface characteristics from those of a regular *Ball*.

2.2.3 There are 18 *Tubes* on the field: 5 in front of either *Alliance Station* and 8 surrounding *The Platform*. A *Tube* is a 6" nominal schedule 40 PVC Sewer Pipe Coupling with a red marking on one end and a blue marking on the other end. A *Tube* has an approximately 6.5" OD, .25" wall thickness, and 6" length. A *Tube* can be found at any home improvement store but will be in a slightly different section than the regular 6" connectors – be sure to use a schedule 40 and not a schedule 80 pipe!

2.2.4 One *Uber Tube* will begin each match on top of *The Platform*. The *Uber Tube* is identical to a *Tube* except that it has a gold marking in the middle.

## 2.3 General Rules

- 2.3.1 An *Alliance* is made up of two *Teams*
- 2.3.2 At the playing field, a *Team* consists of a *Driver*, a *Coach*, and a *Human Player*. The *Coach* may be a student or an adult but the *Driver* and *Human Player* must be students
- 2.3.3 The *Human Player* and *Driver* may switch roles at any time during the match
- 2.3.4 All *Team* members must wear safety glasses while at the playing field
- 2.3.5 The *Human Player* may interact with his/her team's robot in any way desired while the robot is FULLY contained within the *Home Zone*
- 2.3.6 All referee decisions regarding rules of play and scoring are final. If there is a question regarding a referee decision the *Driver* may approach the head referee for clarification immediately following that match.

## 2.4 Scoring

- 2.4.1 All scoring will occur at the end of each two minute and thirty second match, after all robots and scoring objects have come to rest.
- 2.4.2 An *Alliance* will receive 1 point for each like colored *Ball* contacting the colored tiles of their *Home Zone*.
- 2.4.2 An *Alliance* will receive 1 point for each *Tube* contacting the gray playing field surface when their color is touching the playing field surface.
- 2.4.3 An *Alliance* will receive 2 points for each like colored end of a *Tube* contacting the colored tiles of their *Home Zone*.
- 2.4.3 An *Alliance* will receive 2 points if their color end of the *Uber Tube* is touching the gray playing field surface.
- 2.4.4 An *Alliance* will receive 4 points if their color end of the *Uber Tube* is touching the colored tiles of their *Home Zone*
- 2.4.5 An *Alliance* will receive 5 points for creating a *Connection* of two like colored elements. A *Connection* can only be formed vertically and not by elements resting on their side. A *Super Ball* is both red and blue when being considered for a *Connection*. Here are some examples of a *Connection*:
  - 2.4.5.1 A red *Ball* nested on the red end of a *Tube*
  - 2.4.5.2 The blue end of a *Tube* is standing on top of the blue end of another *Tube*
  - 2.4.5.3 A blue *Ball* is balancing on top of another blue *Ball*

2.4.5.4 A *Super Ball* is nested on the blue end of a *Tube* and the red end of a *Tube* is nested on top of the *Super Ball* (both *Alliances* have a valid connection)

2.4.6 An *Alliance* will receive 10 points for creating a *Chain* or three like colored elements. A *Chain* can only be formed vertically and not by elements resting on their side. A *Super Ball* is both red and blue when being considered for a *Chain*. Here are some examples of a *Chain*:

2.4.6.1 The red end of a *Tube* is nested on a red *Ball* which is nested on the red end of a *Tube*

2.4.6.2 A blue *Ball* is balancing on top of another blue *Ball* that is nested in the blue end of a *Tube*

2.4.6.3 The red end of a *Tube* is nested on a *Super Ball* which is nested on the red end of a *Tube*

2.4.7 The points earned from a *Connection* or *Chain* that utilize a *Super Ball* or the *Uber Tube* will be doubled. A *Chain* that contains the *Uber Tube* and a *Super Ball* will receive a 4x multiplier

2.4.8 An *Alliance* will receive a 10 point bonus for each of the alliance's robots that end the match not in contact with the gray, red, or blue tiles.

## 2.5 Penalties

2.5.1 A robot of one *Alliance* may not enter the opposing *Alliance's Home Zones*. The offending *Alliance* will receive a 5 point penalty for each offense.

2.5.2 Chain Reaction is meant to be a high scoring offensive game. Therefore, intentional toppling of *Connections* and *Chains* is not allowed. The highest scoring *Connection* or *Chain* of an alliance that topples an opposing alliance's *Connection* or *Chain* will be disregarded. Repeat occurrences may result in a disqualification.

2.5.2.1 The only exception to this rule is if the *Uber Tube* or a *Super Ball* is the top most element of a *Connection* or *Chain* it may be removed without consequence.

2.5.3 Pinning occurs when an opposing robot is held against an obstacle and cannot move, in any direction, because of your robot's presence. Pinning will be visibly counted out by the closest referee for a duration of 5 seconds. If a robot is being pinned for five seconds, the team doing the pinning must back off for at least five seconds before they can resume pinning. Failure to do so will result in a 10 point penalty of the aggressor. If a robot continues to engage in this behavior, they may be disqualified.

2.5.4 Flipping: Robots may not flip an opposing team's robot. The flipping robot will be disqualified from the match if in the referee's decision they initiated an action which

results in flipping. In incidents where the flipped robot initiates action or both robots are in motion, disqualification may not occur and will be at the discretion of the referees.

2.5.5 Intent to Destroy: Strategies resulting in the destruction of or damage to an opponent's robot or the field and field element is not in the spirit of the competition and will not be allowed.

2.5.6 Loss of Parts: All parts of the robot must remain attached to the robot for the duration of the match and must not cause any hazard of entanglement to any other robot, or else that robot's team may run the risk of disqualification. Minor pieces which become detached from the robot and do not affect the outcome of the match will not result in a disqualification.

2.5.7 Out of Bounds: If a robot leaves the playing field for any reason so that it must exert force on the ground outside of the field border, the robot will be immediately disabled. If a robot is forced out of bounds by an opposing robot, both robots will be disabled and the aggressor will be given a 10 point penalty.

2.5.8 A robot may not grab or attach to the playing field border (PVC pipes) at any time. Incidental contact with the border during normal match play is expected but a robot may not use the field border to assist with any game play function.

2.5.9 Each time a *Human Player* contacts his/her robot (see 2.3.5) a 5 point penalty will be given to the *Alliance*.

2.5.10 Safety Hazards:

2.5.10.1 Referees may request that teams alter any portion of their robot that is considered a safety hazard. It is the right of the referees to prevent *Teams* from playing in matches until such changes are made to the robot.

2.5.10.2 Referees will disqualify any robot that they deem to be a repeat safety hazard. A safety hazard is any direct action of, or mechanical failure on said robot which may increase the possibility of immediate damage to other robots, field objects, or personnel.

2.5.11 Robots may be disqualified based on their actions which violate the rules of the game. If a referee calls for a disqualification during a match, the robot will be disabled and they will receive a score of zero for the match. If disqualification is not determined until the completion of the match, the offending robot will receive a score of zero for the match. The *Alliance* partner of a disqualified robot will still receive the score earned by all robots during the match, provided that they are also not disqualified. In both situations, the opposing *Alliance* will receive a score based on the points that they earned. The disqualification of one robot during the Elimination Matches will disqualify the entire *Alliance*.

### **3. Tournament**

#### **3.1 Qualifying Rounds**

3.1.1 All *Teams* will play in approximately the same number of Qualifying Matches (the number of matches will differ by no more than one match). The number of qualifying matches at each event will be determined by the length of the event and the number of teams competing.

3.1.2 *Teams* will be given their schedule of qualification matches before the start of the first match. The qualification match schedule will show the match number, the alliances competing in each match, and the color that each team is assigned for that match.

4.4.3 At the end of each qualifying match, the Ranking Score for each alliance will be awarded based on the Match Score. The *Teams* that make up the *Alliance* with the highest Match Score receive two (2) points and the other teams receive zero (0) points. In the case of a tie, all teams will receive one (1) point

#### **3.2 Ranking**

At the end of the qualifying matches, *Teams* will be ranked from 1 to N (N being the total number of teams present) based on the following:

- Highest Ranking Score
- Highest Match Score
- Most times receiving the bonus for not being in contact with the gray, red, or blue tiles

#### **3.3 Elimination Matches**

3.3.1 The number of *Teams* participating in Elimination Matches will be no less than 18 but may be increased prior to the start of the event based on the number of *Teams* participating.

3.3.2 *Alliance* selection procedure for the Elimination Matches will be run like the FRC elimination alliance selections. The top ranked *Teams* become “Selecting *Teams*” and are able to select their own *Alliance* partners. In the first round of selections, the highest seeded *Team* will pick first and the lowest seeded *Team* will pick last. If a *Team* is picked that is ranked as a “Selecting *Team*”, then the next seeded *Team* is bumped up to pick. A “Selecting *Team*” may refuse an invitation from a higher seeded *Team*, but may not then accept an invitation from a different “Selecting *Team*”. A *Team* outside of the top seeded *Teams* may not accept an invitation from any *Team* if a previous invitation is refused. To allow more *Teams* to participate in the Elimination Matches, it may be determined prior to the start of the tournament to use three *Team Alliances*. In this case, the second round of selections will be conducted in reverse, with the lowest seeded *Team* making the first selection and the highest seeded *Team* making the last pick. If the competition allows for three *Team Alliance* selections, the third pick will go

from highest seeded *Team* to lowest. If *Alliances* are made up of three *Teams*, each *Team* must play at least once match in each elimination round.

3.3.3 The number of top seeded *Teams* that earn the right to select their *Alliances* partners will be determined prior to the start of the tournament based on the number of attending *Teams*.

3.3.4 The elimination tournament requires two victories in a round to advance to the next round. Therefore each round will consist of a minimum of two matches and may require three matches to determine a winner.

#### 4. The Robot

4.1 Robot Modification: *Teams* are allowed to modify their robots in between matches as long as the robot remains compliant with all specifications and rules after the modification. Any modification should be brought to the attention of the referees or head inspector prior to the start of the team's next match. *Teams* may be subject to re-inspection at the discretion of the referees/head inspector.

4.2 Every robot will be required to pass a full inspection before being cleared to compete. This inspection will ensure that all robot rules and regulations are met. Initial inspections will take place during team registration/practice time.

4.2.1 If significant changes are made to a robot, it must be re-inspected before it will be allowed to compete.

4.2.2 All robot configurations must be inspected before being used in competition.

4.2.3 *Teams* may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in disqualification.

4.2.4 Referees or inspectors may decide that a robot is in violation of the rules. In this event, the team in violation will be disqualified and the robot will be barred from the playing field until it passes re-inspection.

4.3 Robot Identification: *Teams* must have their team number clearly marked on four sides of their robot, such that it is visible from 15 ft. away. *Teams* must also have the ability to designate Red or Blue with a color insert or flag. These inserts must be provided by the team and must not be a functional part of the robot.

4.4 At the beginning of any match, robots must be smaller than 18" x 18" x 18".

4.4.1 During inspections, robots will be measured in one of two ways

4.4.1.1 Robots will be placed into a "sizing box" which has interior dimensions matching the above size constraints. To pass inspection, a robot must fit within the box without touching the box walls or ceiling.

4.4.1.2 Robots will be sized using a VRC Robot Sizing Tool. Robots will be placed on the base plate and must not touch the measurement

slide as it is passed over the base plate. Please see <http://www.vexrobotics.com/275-1455.html> for a visual reference

4.4.2 Robots may expand beyond their starting size constraints after the start of a match.

4.4.3 Any restraints used to maintain starting size (i.e. zip ties, rubber bands, etc) MUST remain attached to the robot for the duration of the match.

4.5 There is no restriction on the robot's weight, and it will not be measured at the competition.

4.6 Controls: *Teams* will be required to use one (1) competition remote control. Frequency modules will be provided by the competition coordinators and are not allowed to be brought to the competition site.

4.7 Pit Operation: *Teams* must bring a tether for robot control in the pit area. Robots may not be operated outside of the competition field or pit area. Failure to follow this rule may result in forfeiture of the next round of competition.

4.8 Construction Restrictions:

4.8.1 Robots may be built ONLY from Official **Robot** Components from the VEX Robotics Design System unless otherwise specifically noted within these rules.

4.8.1.1 During inspections if there is a question about whether something is an official VEX component, a *Team* will be required to provide documentation to an inspector, which proves the component's source. Such types of documentation include receipts, part numbers, or other printed documentation.

4.8.1.2 Only the VEX Robotics Design System Components specifically designed to be used for Robot construction are allowed. Using additional components outside their typical purpose is against the intent of the rule (i.e. please don't try using VEX apparel, competition support, packaging or other non-robot products on a VEX Robotics Competition Robot).

4.8.1.3 Products from the VEXpro product line cannot be used for robot construction. Products from the VEXpro line which are also cross listed as part of the VEX EDR product are legal.

4.8.1.4 Official Robotics Components from the VEX Robotics Design System which have been discontinued are still legal for competition use.

4.8.2 Official VEX products are ONLY available from VEX & Official VEX Resellers. To determine whether a product is "official" or not, consult [www.VEXrobotics.com](http://www.VEXrobotics.com).

4.8.3 Robots are allowed the following additional “non-VEX” components:

4.8.3.1 Any material strictly used as a color filter or a color marker for a VEX Light Sensor.

4.8.3.2 Any parts which are **identical** to legal VEX parts. For the purposes of this rule, products which are identical in all ways except for color are permissible. Note: It is up to inspectors to determine whether a component is “identical” to an official VEX component.

4.8.3.3 Any 6-32, 8-32, M3 or M4 screw up to 2" long, and any commercially available nut to fit these screws.

4.8.3.4 *Teams* may add non-functional decorations provided that these do not affect the robot performance in any significant way or affect the outcome of the match. These decorations must be in the spirit of the competition. Inspectors will have final say in what is considered “nonfunctional”.

4.8.3.4.1 Any decoration which interacts with a game piece (even a painted surface) would be considered functional, hence illegal.

4.8.3.5 Any non-aerosol based grease, when used in **extreme** moderation on surfaces and locations that do NOT come into contact with the playing field walls, foam field surface, game objects, or other robots.

4.8.3.6 Polycarbonate as cut from a single 12" x 24" sheet up to 0.0625" thick. (Please note that polycarbonate is different from acrylic sheet, which is not legal. Polycarbonate is sold under trade names such as Lexan® and Makrolon®.)

4.8.3.6.1 Polycarbonate can be mechanically altered by cutting, drilling or bending etc., but **it cannot be chemically treated, melted or molded**. Teams may heat the polycarbonate to aid in bending.

4.8.3.7 A small amount of tape may be used for the following purposes:

4.8.3.7.1 For the sole purpose of securing any connection between the ends of two (2) PWM cables.

4.8.3.7.2 For labeling wires and motors.

4.8.3.7.3 Teflon tape solely for the purposes of preventing leaks may be used on the threaded portions of pneumatic fittings.

4.8.4 The only allowable sources of electrical power for a VEX Robotics Competition Robot is any single (1) VEX 7.2V Robot Battery Pack of any type, unless the robot is utilizing the VEX Power Expander, and a single (1) 9V backup battery. Robots utilizing the VEX Power Expander can use a second (2) VEX 7.2V Robot Battery of any type.

4.8.4.1 Additional batteries cannot be used on the robot (even ones that aren't connected).

4.8.4.2 Robots are permitted to use a maximum of one (1) VEX Power Expander

4.8.4.3 Any VEX 7.2V Battery Pack is legal, in the quantities described above.

4.8.5 Robots may use up to ten (10) VEX EDR motors or VEX Servos (Any combination, up to ten)

4.8.5.1 Of these ten (10) allowed motors, teams may use a maximum of four (4) "2-Wire Motor 393" modules.

4.8.5.2 2-Wire Motors must be controlled by a 2-Wire Motor Port, either directly on a VEX Microcontroller, or on a "VEX Motor Controller 29" module.

4.8.5.3 *Teams* may NOT use multiple 2-wire Motor Ports, 3-wire PWM Motor Ports, or Motor Controller 29 modules on a single motor.

4.8.6 A maximum of one (1) VEX Y-cable can be used per Motor Port of the Microcontroller or Power Expander. (You cannot "Y off a Y" to have more than two (2) motors controlled by the same Motor Port.)

4.8.6.1 *Teams* using the Cortex Microcontroller can only power one (1) 2-wire Motor per each of the two 2-wire motor ports on the Microcontroller. It is illegal to "Y" off a 2-wire Motor Port.

All questions or requests for rule clarifications should be submitted to [rules@midwestvex.org](mailto:rules@midwestvex.org). Questions and answers will be publicly posted on the event website. Any questions or clarifications resulting from league nights will also be posted on the event website.