



APPENDIX

The Robot – 75 MHz Crystal Radio Rules Overview

This section provides rules and requirements for the design and construction of your robot, for competition at an event using VEX 75 Mhz Crystal Radio Transmitters & Receivers instead of or in conjunction with the VEXnet

802.11g Wireless link. A VEX Robotics Competition robot is a remotely operated and/or autonomous vehicle designed and built by a registered VEX Robotics Competition student team to perform specific tasks when competing in *Round Up*. Prior to competing at each event, all robots will have to pass an inspection. Refer to Appendix D for the Robot Inspection Guidelines.

Robot Rules

There are specific rules and limitations that apply to the design and construction of your robot. Please ensure that you are familiar with each of these robot rules before proceeding with robot design.

<CR1> Only one (1) robot will be allowed to compete per team in the VEX Robotics Competition. Though it is expected that teams will make changes to their robot at the competition, a team is limited to only one (1) robot.

- a. Teams may not compete with one robot, while a second is being modified or assembled.
- b. Teams may not switch back and forth between multiple robots during a competition.

<CR2> 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.

- a. If significant changes are made to a robot, it must be re-inspected before it will be allowed to compete.
- b. All robot configurations must be inspected before being used in competition.
- c. Teams may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in disqualification.
- d. 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.

For further information on the inspection process please refer to Appendix D, Robot Inspection Guidelines

<CR3> The following types of mechanisms and components are NOT allowed:

- a. Those that could potentially damage playing field components.
- b. Those that could potentially damage other competing robots.
- c. Those that pose an unnecessary risk of entanglement.

<CR4> At the beginning of any match, robots must be smaller than 18" x 18" x 18."

- a. During inspections, robots will be measured in one of two ways
 - i. 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.
 - ii. 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
- b. Robots may expand beyond their starting size constraints after the start of a match.
- c. 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.

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<CR5> Robots may be built ONLY from Official **Robot** Components from the VEX Robotics Design System unless otherwise specifically noted within these rules.

- a. 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.
- b. 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, or other non-robot products on a VEX Robotics Competition Robot).
- c. The packaging, manual binders, styrofoam, cardboard, plastic bags, software CD's etc. from the VEX kits are NOT included and CANNOT be used for robot construction. Only the VEX robot parts themselves are allowed.
- d. 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.

<CR6> Official VEX products are ONLY available from VEX & Official VEX Resellers. To determine whether a product is "official" or not, consult www.VEXrobotics.com.

- a. Products **identical** to those listed on this site are also considered "official VEX products". 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.
- b. VEX Robotics Competition teams from countries that primarily use the metric system may utilize metric fasteners comparable in size, length, and head type to VEX fasteners.

<CR7> Robots are allowed the following additional "non-VEX" components:

- a. Any material strictly used as a color filter for a VEX Light Sensor.
- b. 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.
- c. 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 "non-functional".
 - i. Any decoration which interacts with a game piece would be considered functional, hence illegal
- d. 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.
- e. 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®.)
 - i. 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.

<CR8> Additional VEX Robotics Design System Components that are released during the competition season are considered legal for use. This does NOT include parts that may be listed only under other competitions (BEST Robotics parts, for example).

- a. Some "new" components may have certain restrictions placed on them upon their release. These restrictions will be documented in a Team Update. Team Updates will be posted to the "VEX Round Up" home page in the Competition section of www.VEXrobotics.com

<CR9> Robots must use ONLY one (1) VEX EDR Microcontroller.

- a. Examples of VEX EDR Microcontrollers are the VEX v.5 PIC Microcontroller and the VEX Cortex Microcontroller.
- b. Microcontrollers that are part of other VEX product lines such as VEXpro or VEX RCR are not allowed.

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<CR10> Robots must ONLY utilize the VEX 75 Mhz Crystal Radio Transmitters & Receivers for robot communication.

- a. Robots may only use up to two (2) VEX RF Receiver Modules
- b. The Robot receiver must be accessible by competition personnel such that the crystals can be easily inserted or removed.
 - i. The radio crystals will be provided to each team for each match.
- c. Electronics from the VEX-RCR product line are prohibited including all VEXplorer electronics.

<CR11> Robots may use up to ten (10) VEX EDR motors or VEX Servos (Any combination, up to ten)

- a. Of these ten (10) allowed motors, teams may use a maximum of four (4) "2-Wire Motor 393" modules.
- b. 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.
- c. Teams may NOT use multiple 2-wire Motor Ports, 3-wire PWM Motor Ports, or Motor Controller 29 modules on a single motor.

<CR12> 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.)

- a. 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.

<CR13> 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. Robots utilizing the VEX Power Expander can use a second (2) VEX 7.2V Robot Battery of any type.

- a. Additional batteries cannot be used on the robot (even ones that aren't connected).
- b. Robots are permitted to use a maximum of one (1) VEX Power Expander
- c. Any VEX 7.2V Battery Pack is legal, in the quantities described above.

<CR14> No more than two VEX hand-held transmitters may control a single robot during the tournament. No modification of these transmitters is allowed of ANY kind.

- a. No other methods of controlling the robot (light, sound, etc) are permissible.

<CR15> Parts may NOT be modified as follows:

- a. Motors, extension cords, sensors, controllers, battery packs, and any other electrical component of the VEX Robotics Design System may NOT be altered from their original state in ANY way.
- b. Welding, soldering, brazing, gluing, or attaching in any way that is not provided within the VEX Robotics Design System will NOT be allowed.
 - Mechanical fasteners may be secured using Loctite or a similar thread-locking product.
 - This may be used for securing hardware ONLY.
- c. External wires on VEX electrical components may become damaged during use. These wires may be repaired using soldering or twist/crimp connectors such that the original functionality / length is not modified or enhanced in any way. These repairs may be covered by up to 1" of insulating tape, or heat shrink tubing as long as this covering is not used for other functional gain. Wire used in repairs must be identical to VEX wire. **Teams may make these repairs at their own risk; incorrect wiring may have undesired results.**

<CR16> The Robot on/off switch must be accessible without moving or lifting the robot. The Robot Microcontroller lights should also be visible by competition personnel to assist in diagnosing robot problems.

<CR17> Teams must bring their robots to the field prepared to play. Teams who use VEX pneumatics must have their systems charged before they place the robot on the field.

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<CR18> To participate in an official VEX Robotics Competition Tournament a team must first register on www.RobotEvents.com. Upon registering they will receive their VEX Team Identification Number (VEX Team ID#) and a welcome kit containing VEX Team Identification Number Plates. Every robot should have their VEX Team ID# Plates displayed on a minimum of 2-opposing sides.

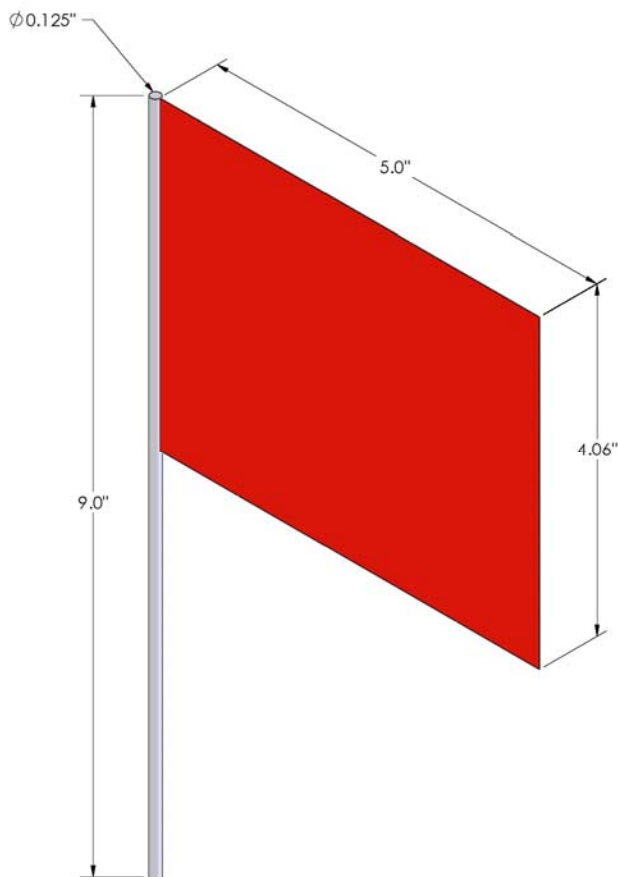
- The VEX Team Identification Number Plates are considered a non-functional decoration, and cannot be used as a functional part of the robot.
- These number plates must fulfill all robot rules (i.e. they must fit within the 18" cube per <CR4>, they cannot cause entanglement, etc.)

<CR19> Robots must include a mounting device to securely hold one VEX Robot Identification Flag throughout an entire match.

- The VEX Robot Identification Flags are considered a non-functional decoration, and cannot be used as a functional part of the robot.
- These flags must fulfill all robot rules (i.e. they must fit within the 18" cube per <CR4>, they cannot cause entanglement, etc.)

Notes on VEX Robot Identification Flags:

- The flags will be issued to teams in their VEX Robotics Competition registration materials.
- These flags may also be available at some events
- Replacement and extra flags are available for purchase at www.VEXrobotics.com
- For flag details please refer to the following diagram.
- VEX Threaded Standoffs work as simple flag holders, as shown below.



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<CR20> During the Autonomous Period human operators are prohibited from providing ANY feedback to the robots. Robots must operate and react only to sensor inputs and to pre-programmed commands. Human operators will not be allowed to use their hand-held controllers. As such, teams are responsible for programming their robot with custom software if they want to perform in Autonomous mode.

For more information on this, teams should consult the help guides produced by the developers of their chosen programming software.

Special Event Rule Modifications

The rules listed in this section represent the way the game will be played at ALL VEX Robotics Competition Events utilizing VEX 75 Mhz Crystal Radio Transmitter & Receivers. We know that some events will choose to modify the rules slightly to suit unique their circumstances. In particular, we expect some events will make the following rule exceptions:

- a. Allow AA batteries to power the robot instead of the VEX 7.2V Battery Pack