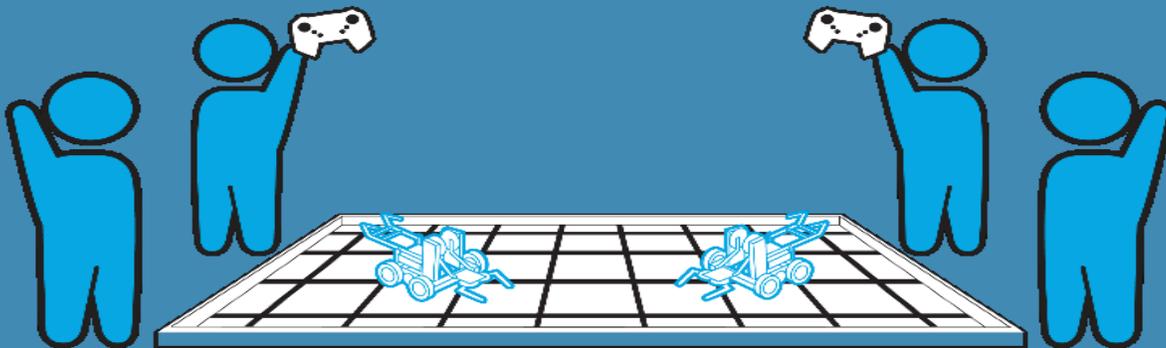


# OPERATION: ENERGY

## E-CADET 2019

### Game Manual



Presented by FRC Team 4063

Version 1.1  
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# E-CADET 2019 Operation: Energy

## About the Program

Teamwork. Dedication. Passion. Fun.

These are the pillars of Del Rio's FIRST Robotics Competition Team 4063. In the pursuit of robotics excellence, 4063's members hold these values in all aspects of the team. It is also our team's goal to innovate STEM education and inspire the children of our community to pursue these same values.

Innovation and ingenuity are the hallmarks that turn youth into successful adults; it is up to all adults to develop ways to show today's younger students how they can be the next generation of STEM (Science, Technology, Engineering, and Mathematics) leaders who know how to work together to solve complex problems. The exploration of open-ended challenges provides students with firsthand experience and knowledge on how classroom techniques apply to the real world.

Working with robots in a competition format is a very powerful tool that holds the attention of young students, inspiring them to become skilled at math and science concepts through hands-on skills. The life skills of teamwork, collaboration, development of critical thinking, project management, and communication will serve well in the creation of a successful future workforce.

E-Cadet® is a program that promotes the pursuit of STEM-related education and career paths for all students.

The entirety of the game challenges and designs are created by Team 4063. It is our hope that every E-Cadet child earns the opportunity to practice teamwork, dedicate towards a common goal, develop a passion for problem-solving, and, most of all, have fun!

## THE COMPETITION

Each match will consist of four teams. Two will be assigned to the red alliance, while the remaining two teams will be assigned to the blue alliance.

### **Saturday, November 16<sup>th</sup> - E-CADET Invitational**

Practice matches take place throughout the day. Teams are randomly assigned to a set number of matches. A filler line is available for teams to play extra matches. Points do not count towards any awards.

### **Saturday, December 7<sup>th</sup> - E-CADET Tournament**

The tournament is divided into two parts:

- Qualification Matches
  - Teams are randomly assigned to a set number of matches
  - Points earned contribute toward overall ranking
  - Schedule will be available prior to the opening ceremonies on the day of competition
  - In some cases, a team will be asked to play in an additional Qualifying Match, but will not receive any ranking points.
  - Teams are ranked based on total Ranking Points (2 per win, 1 per tie, 0 per loss). Combined scores across all matches (Total Points) will be used as a tiebreaker in rankings. In the unlikely event a tie is still present, the highest match score between the two teams will be used, then the next highest match score and so on. In the event a tie is still present, the captains will play Rock-Paper-Scissors.
- Playoff Matches
  - Teams choose each other to create alliances
  - Alliances play best two-out-of-three in a bracket-style playoff
  - In the event of a match tie, the match will be replayed.

## THE OBJECTIVE

On a distant planet, two spacecrafts have landed. Among the planet's rarest resources are special Spheres. To continue research, each spacecraft will need two things: energy and air.

The robot's primary task is to transport Spheres from the Loading Stations to the Converters. Spheres can be transformed into either Hydrogen or Oxygen.

At the center of this planet is the rarest of resources: the Power Cube. Control of the Power Cube is highly desired.

## THE GAME

Each match is divided into two periods.

### Power Outage (15 seconds)

The robot may be controlled using ONE of the following methods:

- Autonomously (pre-programmed), or
- Controlled by the Driver, who cannot view the field during the Power Outage. The Co-pilot assists through verbal or sign communication only. Drivers may be turned facing 180 degrees away from the field or may wear a mask (Driver preference). Masks will be inspected by referees prior to each match. **Only the co-pilot may communicate with the driver.**

Each robot may be preloaded with a Bonus Sphere, which can be deposited for extra points during the Power Outage.

**There will be a five second buffer period between Power Outage and Tele-op. No driving may take place during this period.**

### Tele-op (1 minute 45 seconds)

All drivers may control their robots as normal.

Each alliance has multiple opportunities to score:

- Deposit as many Spheres as possible into the Tubes
- Control the Power Cube by the end of the match
- Return to the Dock by the end of the match

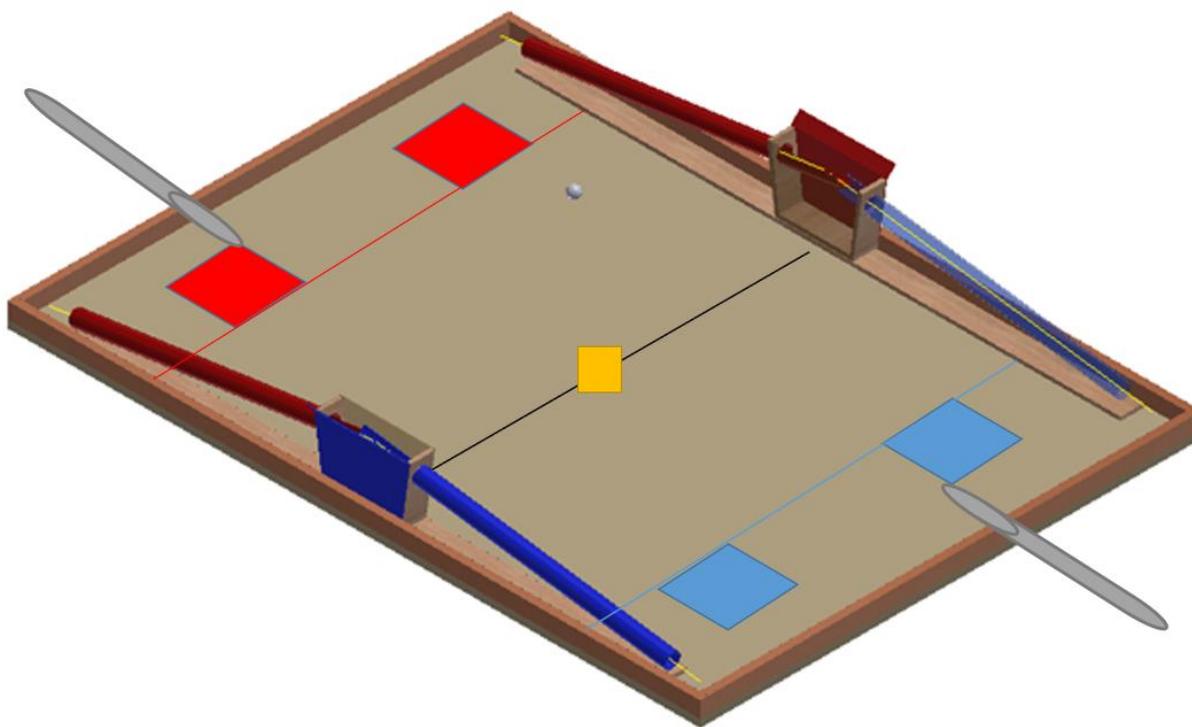
## SCORING CHART

	Objective	Score
Power Outage		
	Sphere in Hydrogen Tube	5 points per Sphere
	Sphere in Oxygen Tube	10 points per Sphere
Tele-op		
	Sphere in Hydrogen Tube	1 point per Sphere
	Sphere in Oxygen Tube	3 points per Sphere
	Control of Power Cube	12 points
	Return to Dock	5 points per Robot

\*\*\* Points will only be scored at the end of Power Outage and Tele-op \*\*\*

\*\*\* “Control of Power Cube” and “Return to Dock” are judged at referee’s discretion. \*\*\*

**THE FIELD (NOT SHOWN: THERE ARE TWO SPHERE DELIVERY RAMPS PER ALLIANCE)**



Hydrogen Tubes are designated by a (+) symbol and have longer entry points in the Converters than Oxygen Tubes (-).

## GAME PLAY RULES

Referees have the ultimate authority during the competition. Their rulings are final.

**The referees will not review any recorded replays of any kind.**

Any questions for the referees must be brought forward by a student team member within the time period of two (2) matches or immediately after the score is announced of a Finals Match **by standing in the designated question box.**

When reading and applying the various rules in this document, please remember that common sense always applies in the challenge.

<G1> Do not enter the opposing alliance's loading zone for more than 5 seconds. Entry for longer than 5 seconds will result in a penalty per second over the limit. **"Entry" means any part of the robot.**

<G2> Power Cubes may not enter any alliance's loading zone at any time. If any part of the Power Cube is in a loading zone **at the end of the match**, then it will not be scored. **The Power Cube may not be fully be controlled by any robot at any time. Examples include picking up the Power Cube or one robot enclosing it from opponent access. The definition of "controlled" is at the referees' discretion.**

<G3> Alliance shall include one Driver, one Co-pilot, and one Coach (Adult) from each team. Teams with only one Student member are granted an allowance to use only one Driver (per match), however, for a variety of reasons we do discourage single student teams and strongly encourage all teams to have multiple Student members.

<G4> During a Match, the Drivers and Coaches must remain in their designated zone. No one beyond the Drivers, Co-pilots, and Coaches, and event personnel are allowed near the field during a match. First violation is a warning while repeated violations may result in disqualification.

<G6> Drivers are prohibited from making intentional contact with any Game Object, Field Element or Robots during a Match. Any intentional contact will

result in a point penalty. Accidental contact will not be penalized, unless the contact directly impacts the final outcome of the match. This type of accidental contact may result in penalties.

<G7> During a Match, Robots may be operated only by the Driver and spheres may only be launched by the co-pilot. Violations of this rule will result in a warning for minor offenses that do not affect the match. Teams who receive multiple warnings may also receive penalties at the Head Referee's discretion.

<G8> Game Objects that leave the playing field will be promptly returned to the playing field at the location nearest the point at which they exited by field judge(s) only.

<G9> Robots may not intentionally detach parts during any Match, or leave mechanisms on the field. If an intentionally detached component or mechanism affects game play the team shall be disqualified at the referee's discretion.

<G10> Robots must be designed to permit easy removal of Spheres from any grasping mechanism without requiring that the Robot have power after the Match.

<G12> There are no time-outs in any matches.

<G13> All teams are expected to conduct themselves in a respectful and professional manner while competing in events. It is important that we all exhibit Gracious Professionalism when dealing with any difficult situations that may present themselves in both the challenge and life in general.

<G14> If a Robot goes completely out-of-bounds (outside the playing field), tips over, or otherwise needs assistance, the Driver may not retrieve and reset the robot. Only Co-Drivers may do so. In the process of resetting, they must move the Robot such that it is touching the field perimeter.

This rule is intended to help teams keep their robots functional during the match. It is not intended for teams to use as part of a strategy to gain an advantage in a match. If referees see teams intentionally or repeatedly reset, they may be disqualified in each match they do so.

<G16> All rules in this manual are subject to changes. We do not expect any major changes to take place, however we do reserve the right to make changes and any changes to the rules will be made available to all teams.

## ROBOT RULES

Robot - A vehicle designed and built by a VEX IQ Challenge team to perform specific tasks while competing. The robot can be constructed using only the VEX IQ platform parts. No other parts will be allowed on the Robot. Prior to participating in the competition, each Robot is subject to an inspection at the discretion of event personnel. Every team should use the rules below as a guide to pre-inspect their Robot and ensure that it meets all requirements.

<R1> The team's Robot must pass Hardware inspection before being allowed to compete in any Matches. Noncompliance with any Robot design or construction rule may result in disqualification of the Robot at an event.

<R2> 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.

<R3> At the start of each Match, the Robot must satisfy the following constraint: Only touching the Floor within a Starting Box.

<R4> Robots may be built ONLY from Official Robot Components from the VEX IQ product line unless otherwise specifically noted within these rules.

- a. During inspections if there is a question about whether something is an official VEX IQ 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 IQ components specifically designed to be used for Robot construction are allowed.
- c. Products from the VEX Robotics Design System or VEXpro product line can be used for robot construction. Products from the VEX product line that are also cross listed as part of the VEX IQ product line are legal.

- d. Official Robotics Components from the VEX IQ product line that have been discontinued are still legal for competition use.
- e. Rubber bands of less than ½” wide and .125” thick are legal in any quantity.
- f. Teams may add non-functional decorations if these do not affect the robot performance in any significant way or affect the outcome of the match.
- g. Robots must use ONLY one (1) VEX IQ Robot Brain.

<R5> The only allowable sources of electrical power for a VEX IQ Challenge Robot is any single (1) VEX IQ Battery Pack

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

<R6> Parts may NOT be modified.

- a. Examples of modifications include, but are not limited to, bending, cutting and painting. In general, VEX IQ components should be considered sacred, and not be modified in any way.
- b. <R7ii> is an exception to this rule.

## SAFETY RULES

<S1> If at any time the Robot operation or team actions are deemed unsafe or have damaged the Field Elements or Scoring Objects, by the ruling of the referees, the offending team may be Disqualified. The Robot will require re-inspection before it may again take the field.

<S2> Students should exemplify safe procedures on and off the playing field. Horseplay and running are NOT allowed during the event. Failure to comply with this rule can invalidate the offending team from qualifying for awards.

<S3> No food or drinks are allowed in the pits or in the match area.

\*\* All offenses will be handled on a case-by-case basis. \*\*

## VOCABULARY

Adult - Anyone not meeting the definition of Student.

Alliance - A pre-assigned grouping of two teams that work together.

Alliance Score - Points scored in a Match awarded to both robots.

Power Outage period - 15 second period non-driver controlled robot where the robot responds exclusively by a program or by communication between the Driver and Co-Driver while the driver is facing 180° relative to the field.

Bonus Sphere - Pre-loaded Sphere scored during the Power Outage

Coach - The adult leader of the Drive Team

Co-Pilot - A Student team member assisting, but not controlling the Robot.

Disqualification - A penalty applied to a team for a behavioral violation. A team who is Disqualified in a Match receives zero (0) points. At the head referee's discretion, repeated violations and Disqualifications for a single team may lead to its Disqualification for the entire event.

Dock - Any of the four indicated zones on the field. Each team must start within the colored tile that they have been assigned for that particular match.

Drive Team - The two student members of the team who are the Driver and Co-Pilot for a particular match. It is strongly encouraged that all students have the opportunity to be part of the Drive Team at each event.

Driver - A Student team member responsible for operating and controlling the Robot.

Driver Station - The region located behind each team's half of the short wall, where the Drivers must remain during the Match.

End Game - The last thirty (30) seconds of the tele-op period. An alarm will sound to designate these final 30 seconds.

Field Element - The field perimeter, Converter, Oxygen Tube, Hydrogen Tube, Loading Station, Dock

Floor - The part of the playing field that is within the outer walls.

Loading Station - The zone where Spheres are harvested.

Loading Zone - Zone between the field perimeter and the end of the dock on each alliance side. Robots are restricted from entering the opposing alliance's Loading Zone.

Sphere - Any white ping pong ball Scoring Object with an overall diameter of 1.5".

Match - A Match consists of a total time of two minutes (120 seconds).

Tube - Any of the clear pipes extending from the Converters.

Robot - Anything that has passed inspection that a team places on the field prior to the start of a Match.

Scored - A score occurs when a game challenge is completed prior to the end of the match

Student - Anyone enrolled in their school of origin grades 3rd - 5th. These should be the people doing the vast majority, if not all, of the hands-on building of the robots that end up competing at events.