FIRST ROBOTICS COMPETITION©

2017 Audience Game Manual

Contents

Introduction

The intended purpose of this manual is to help explain exactly what is happening at the *FIRST* Robotics Competition (FRC). At any point of confusion, feel free to ask the kid in the team t-shirt next to you for help, but this is to help answer a few of the questions and help you think like a *FIRST* participant.

On January 7, 2017, each team at this event received a challenge, a series of tasks that their robot must achieve. For the following six weeks, teams were to design, build, code, and strategize a robot from scratch. The teams then compete in at least one district/regional event in an attempt to qualify for the next event (District Championship or World Championship- depending on the region and event). Most of these teams devote a substantial amount of time and energy to these robots, so please respect them and encourage them all.

This manual will probably not give you all the information you may want. It's intention is to give you enough to understand and appreciate the game more.

For more information visit ***www.firstinspires.org/robotics/frc.***

What is *FIRST*?

The original intention of *FIRST (For Inspiration and Recognition of Science and Technology)* was to create a non-profit charity that encourages the young to participate in science, technology, engineering, math, and innovation. Throughout the program, students are also encouraged to learn communication and other skills that will continue to help them grow and develop in their community. It has been proven that *FIRST* participation has contributed to the growth of students pursuing a STEM-based career.

FIRST has programs for kids in kindergarten through high school.

FIRST Program	School Grade Range	Details
FIRST LEGO League Jr.	Kindergarten - Grade 4	Teams are given a theme each year to use to create and showcase their ideas
FIRST LEGO League	Grades 4 - 8	Teams are given a challenge to take on using LEGOs
FIRST Tech Challenge	Grades 7 - 12	Teams complete challenges by designing and creating a robot that is 18 in. wide by 18 in. long by 18 in. high
FIRST Robotics Competition	Grades 9 - 12	Challenges are completed by designing and creating robots with sizes of 36 in. by 40 in. by 24 in. tall or 30 in. by 32 in. by 36 in. tall

Each program is designed specifically to challenge teams to think outside the box and innovate to complete different objectives that change from year to year.

FRC has been dubbed the “sport of the mind”. Students are given six weeks to design, build, program, and test a robot in order to play that year’s game, as well as they can. Students are encouraged to create a brand for their team and advertise themselves to sponsors in order to raise funds. Students are helped by mentors that volunteer their time to assist and guide the team in the right direction.

Audience Expectations

FIRST embraces two primary values that all participants are expected to exhibit: Gracious Professionalism and Coopertition. The audience members are expected to follow the same etiquette at competitions. Doing so will not only make the competition better for everyone, but also teach everyone attitudes that can improve success in all areas of life.

During matches, please make sure not to walk in front of the field, or stand in the way of students trying to watch the match. Many students are collecting data for later use.

Gracious Professionalism, a term crafted by the founders of *FIRST*, inspires kids to produce with high quality, interact with respect and empathy, and value others and their insight. The idea is that you treat everyone as if there is no opponent and that everyone is part of one big alliance. However, everyone is encouraged and should have their own interpretation of the coined phrase.

Some of the most common meanings developed include:

- Having a win-win attitude at all times
- Work to please yourself, as well as others
- Understand that professionals have advanced understandings
- Advanced understandings should be used to contribute to society
- Live with respect of others and their possessions
- Be strong players that still compete with respect and integrity
- Making sure to be inclusive

Overall, Gracious Professionalism promotes behavior where people can act professionally, displaying respect, empathy and integrity. The best example of Gracious Professionalism in FRC, is how teams loan resources and knowledge to team that they will later compete against.

Coopertition, literally a portmanteau of the words cooperation and competition, is the idea that teams can still show unconditional kindness even when competing in intense matches. A team should always act as though they are competing, but should help others at every opportunity. Coopertition means to learn from mentors, teach teammates, and learn from teammates. When people use coopertition, they can easily find the balance between managing and being managed.

Hopefully, students, mentors, and volunteers will remember these values for the rest of their lives and use them to become more successful in the workforce. Therefore, please follow suit and keep the event a *FIRST* community by using Gracious Professionalism and Coopertition!

If you can't be an in-person audience member, you can go to ***www.thebluealliance.com****, search for your event, and watch a livestream.*

Competition Layout

Competitions generally are about two to three days. On the first night, the teams set up their pits and practice. The next morning the competition begins with a welcome and introduction followed by qualification matches all day. On the final day, qualification matches resume, alliance selection begins, playoffs are played, awards are handed out, and teams leave.

Each competition is comprised of teams that are all competing to rank well during qualification matches and to go on and win playoffs. The two basic divisions of a competition are qualifying matches and playoffs.

Qualifying matches are where teams demonstrate their abilities. Teams are randomly placed into several matches of 3 teams vs. 3 teams. Each set of 3 is called and alliance. The color red and blue is randomly assigned to each alliance each match. These alliances are NOT permanent. In each team's next match, they may play with or against any teams from the previous match. Each team plays an equal number of rounds to maximize opportunity. The random nature of these matches is meant to give each team an equal opportunity through the course of the event.

During qualifying rounds, teams can earn ranking points (specified in "Game Overview"). The teams are ranked in order from most ranking points to least.

*You can keep up with event and team rankings by going to **www.thebluealliance.com**, downloading the **FRC Spyder** app for Android and iOS, or messaging Subscribe #### (team number) to the **FRC Chatbot** in facebook messenger.*

After the qualifying rounds, alliance selection for the playoffs begin. These alliance's are permanent and will remain for the rest of the event,

with alliances winning or losing together. Each team sends a representative to the field. Teams are ranked based on their ranking points earned during the Qualification Matches. The team ranked number one is the alliance captain of the first alliance and invites a team to permanently join their alliance. The invited team may choose to decline or accept. If they decline, they may not be picked by any other team for the rest of the event, and will only play if they are an alliance captain. If a team accepts, the team becomes part of that alliance for the rest of the event. If the first seeded team (first alliance captain) picks the second seeded team and they accept then the third seeded team then becomes the second alliance captain, and all teams shuffle up. After there are a total of 8 alliances of two teams, each alliance picks a third team, except in reverse order, with alliance 8 choosing first and alliance 1 choosing last. At larger events, such as World's, alliances will pick a fourth team, but following the original order of alliance 1 first and alliance 8 last.

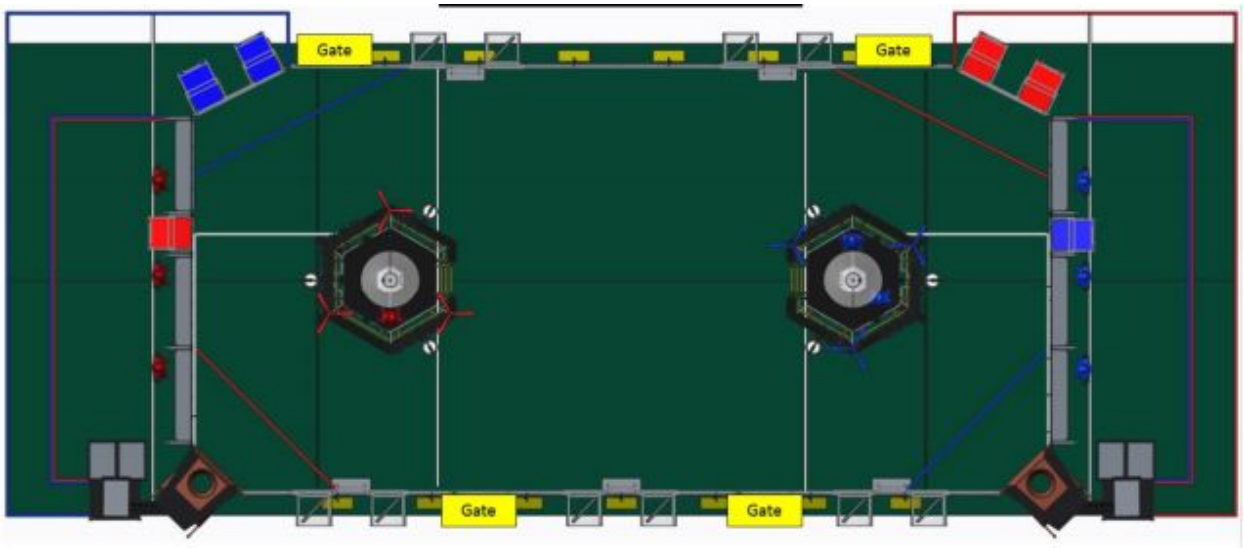
Once all eight of the alliances have been decided, **playoff rounds** begin! The alliances are put into an elimination style tournament that follows the following bracket:

<table>
<tr><th>Quarter Finals</th><th>Semifinals</th><th>Finalist</th><th>Finalist</th><th>Semifinals</th><th>Quarter Finals</th></tr>
<tr><td>Alliance One</td><td rowspan="2">Winner of Quarter Finals</td><td rowspan="4">Winner of Semifinals</td><td rowspan="4">Winner of Semifinals</td><td rowspan="2">Winner of Quarter Finals</td><td>Alliance Two</td></tr>
<tr><td>Alliance Eight</td><td>Alliance Seven</td></tr>
<tr><td>Alliance Four</td><td rowspan="2">Winner of Quarter Finals</td><td rowspan="2">Winner of Quarter Finals</td><td>Alliance Three</td></tr>
<tr><td>Alliance Five</td><td>Alliance Six</td></tr>
</table>

Each round is played “best of three”, however each round’s matches are not played right away. This means that each plays one match, then each does the second match, then if needed a third match is played after (in case each team won one match).

Game Overview and Scoring

Below is an image of the field. We will defer to this image throughout the section:



This year robot's score points by shooting balls into goals, placing gears onto pegs and climbing up a rope at the end of a match.

Each match is two minutes and 30 seconds long and played by two alliances (i.e. groups) of three robots each. There is some time before and after each match that allows for robot and team setup and field reset. Field reset consists of clearing all robots, team driving systems, and scores from the last played match. This allows each match to start out the same and equal for everyone.

On the side of the game field, there are **hoppers** that each contain 100 **fuel** (neon yellow wiffle balls) and can be emptied by robots during the match to access extra fuel. In the upper corners of the diagram, there are red and blue rectangles. Those rectangles represent the gear **loading**

stations on the field. Each alliance can go to the feeding station the corresponds to their alliance color and receive a **gear** to use in the match.

In the lower corners of the diagram, there are the **boilers**, which each have a upper hole and a lower hole. Each team gets points for shooting in their boiler.

In the middle of each half field there is the **airship**. The airships are where teams go to place gears in order to start the rotors. The rotor takes 1 gear, the second takes 2 gears, the third takes 4 gears, and the fourth takes 6 gears. When robots bring gears to the airship, the **pilots**, which are 1-2 pre-college team members from each alliance, bring the gears into the airship, attach them to the rotors, and spin the rotors once it has the necessary number of gears. The pilots are the only people that are allowed to interact with the game elements and robots during autonomous.

Every team chooses members to be part of their drive team. The drive team is composed of up to five members: a drive coach, 1-4 driver(s), 0-4 human player(s), and 0-1 pilot.

Before the match each team is assigned a drivers station, which is where they control their robot. Two alliances, one red and one blue, have driver stations on opposite sides of the field. Each side is appropriately colored. Each robot begins the match in contact against the wall directly in front of each driver station. Every team can start with up to one gear and up to 10 fuel on their robot.

Each match is started with a 15 second period, called the **autonomous** period, where drivers may not control their robot. This means that each team must write code that manually runs the robot during those 15 seconds.

During autonomous, each robot gets 5 points for driving over their baseline (The green line in front of their airship). If a team shoots 1 ball in the high hole of the boiler or 3 in the low hole, the alliance gets 1 match

point and 1 kPa point. Each rotor turning on the airship during this period is worth 60 match points.

After the 15 second autonomous period, a field sound plays and the last 2 minutes and 15 seconds begin with the **teleoperated** period. During this time the drivers are allowed to manually control their robots and all members may interact. Besides driving the robot, other team interactions include, refilling the fuel unit hoppers after they have been fed into the boiler, feeding gears through the feeding stations, communicating between teams of the alliance, and continuing work on the airship as a pilot.

During teleop, if an alliance gets 3 balls in the high goal of the boiler or 9 in the bottom, then the team gets 1 match point and 1 kPa point. After 40 kPa points have been scored, the team gets one ranking point if it's during qualification rounds or 20 points if it is a playoff round. Each rotor that starts turning during this period is worth 40 match points. If all rotors are spinning, the alliance gets 1 ranking point in the qualification rounds or 100 points in the playoff rounds.

In the last 30 seconds of the match, teams are allowed to climb a rope on the touchpad and aim to hit the touchpad. If the rope is climbed, the touchpad is touched for a full second, and the touchpad is being hit the the match ends, each robot doing so earns 40 match points for their alliances.

At the end of the match all teams on the winning alliance(whoever scored the most match points) gains 2 ranking points. If both alliances tie, each team gets 1 ranking point. After the match, the scores are cleared and the only points that follow the team are the ranking points. The ranking points are then used to determine rank for alliance selection in the playoffs. The team with the most points is ranked 1, the team with the second most points is ranked 2, and so on.

Cheatsheet

Use this at any time during the match for quick referencing to game scoring and field layout.

FIRST STEAMWORKS

Unofficial
Cheatsheet

A.R.T.
Andy Smith
Team 5546

Match Points

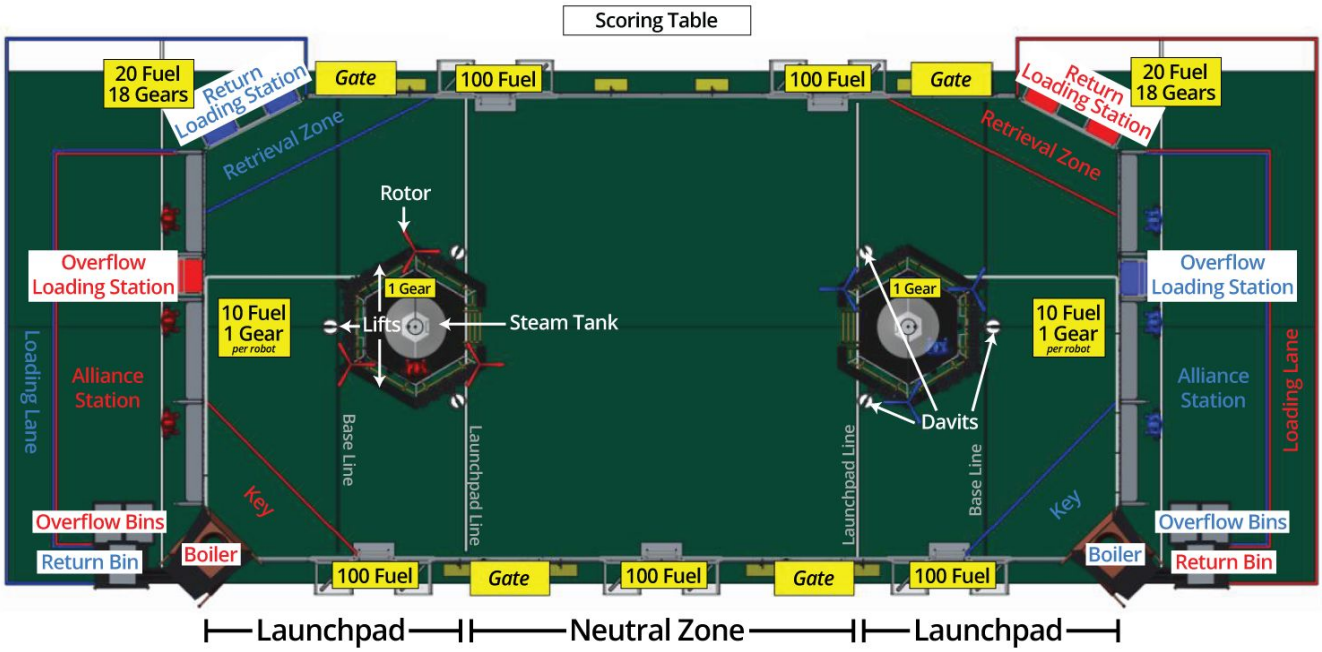
Auto		Teleop	
1 fuel in high efficiency goal	1 point	3 fuel in high efficiency goal	1 point
3 fuel in low efficiency goal	1 point	9 fuel in low efficiency goal	1 point
Rotor turning	60 points	Rotor turning	40 points
Cross the baseline	5 points	Ready for takeoff	50 points

Gear Placement

ROTOR #	*1*	*2*	*3*	*4*
Pre-populated	0	0	1	2
Pilot-placed	1	2	4	6

Ranking Points

Win	2 RP
Tie	1 RP
40 kPa in Boiler	1 RP (20pts in playoffs)
All 4 rotors turning	1 RP (100pts in playoffs)



The Pits

If you can't find a team on the field or in the bleachers, try checking out the pits!

Each team is given an 8-10 foot by 8-10 foot space to set up their robot, tools, and other items they may have. This is called **the pits**. The pits are normally in a gym or other large room close to the playing field. Anyone is welcome to come into the pits as long as they have closed toe shoes and safety glasses. Just make sure not to go into an individual team's pit unless they have given specific permission to do so.

Within the pits, teams often will give out buttons, wristbands, team info, or other promotional items. Feel free to ask each team if they have anything to give away, and feel free to about their robot (if they're not too busy!). Most teams will be more than happy to tell you about their robot.

Awards

At the end of each event (afternoon-evening), the judges announce who they have selected to be the winners of many different event awards. The awards are listed alphabetically below.

After an event, award winners can be found online at ***www.frc-events.firstinspires.org*** *or* ***www.thebluealliance.com.***

The **Chairman's Award** is the most prestigious award of *FIRST*. The award consists of essays, a video, and a presentation. The essays and video are submitted months before the event, and the presentation is done at the event. Teams are chosen at each event to be finalists. By winning at events, they advance to the next competition automatically. Teams that win at the World Championship are accepted into the *FIRST* Hall of Fame.

The **Creativity Award** is awarded to a team that is creative in strategy of gameplay, design, and use of robot elements and part. A spokesmen of the team must be able to describe how their team and robot was built in a creative way that took on the fact that there would be risks.

The **Digital Animation Award** is given to the team that makes an animation that represents the values of Science, Technology, Engineering, Art, and Mathematics (STEAM). Submission is done months before the event begins.

The **Engineering Inspiration Award** is an award given to the team that best encourages students and their community to appreciate engineering. The award focuses on what the team has done in the recent years.

The **Entrepreneurship Award** is given to teams that develop a successful business plan. The team must show enthusiasm for entrepreneurship and the ability to be able to sustain itself financially.

The **Excellence in Engineering Award** is awarded to teams that are able to create robot functions that practically solve problems in order to be a tough competitor on the field.

The **Finalist Award** is presented to any teams that make it to the finals in playoffs. This means that each event, will have six winners of the finalist award.

The **Gracious Professionalism Award** is given to the team that best displays gracious professionalism during all aspects of competition. On the last day of the event, teams are asked to each nominate another team for the award and explain why. The judges then view over the nominations and choose the team they feels best displays it.

The **Highest Rookie Seed Award** goes to the rookie team that ranks the highest at the end of the qualification rounds.

The **Imagery Award** is awarded to a team based on how they visually appear. The appearance of both the robot and the team is judged. The team also tends to have visual aesthetic.

The **Industrial Design Award** is awarded to the team that creates a robot that is elegant and effectively uses all functions to complete tasks in an effective way. The machine as a whole should be worth the recognition.

The **Industrial Safety Award** is given to the team that constantly demonstrates safety. They must innovate to eliminate potential safety hazards and monitor to ensure the safety of their team. The must surpass the standard precautions.

The **Innovation in Control Award** is presented to a team that shows innovation in the way they control their robot, program, and functions. The innovative method should be able to be used even when the competition is

heated. It should be reliable at all times and affects the team's method of game play.

The **Judge's Award** is given to a team that deserves recognition. The judges spend the course of the event interviewing and watching teams. The team applies large amounts of effort and is considered for many other awards. The team also displays that they fully understand the mechanics and values of *FIRST*.

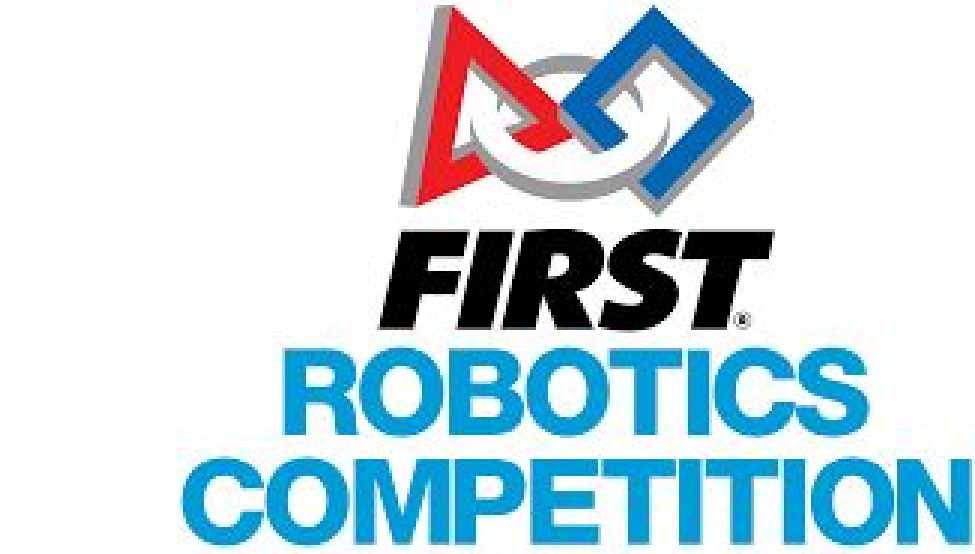
The **Quality Award** is awarded to a team whose entire robot is made robustly and of quality. Each part of the robot looks clean, proper, and professional. Fabrication of all elements are done correctly. The robot looks as if it were executed with a full plan in mind. The award is celebrating a team that appreciates workmanship.

The **Rookie All-Star Award** a rookie team that acts as if they were a "Chairman's team in progress." They display a full understanding of *FIRST* and they values it stands for. The team has a strong partnership with its school, community, and sponsors.

The **Rookie Inspiration Award** celebrates a team that inspires their students and community to respect and value the work of engineers. The team works to recruit students to be engineers. They also must display a full understanding of the values of *FIRST*.

The **Team Spirit Award** is presented to the team that displays high levels of enthusiasm for *FIRST* and their team. They spread the spirit to their school, community, and other teams. The spirit among the team is unified.

The **Woodie Flowers Award** is awarded to an exceptional mentor. The recipient is nominated by the team they mentor. The mentor works hard to communicate the importance of engineering, science, and math in a creative way. They must motivate and inspire their students in everything that they do. The mentor must stand out above all others in their abilities.


FIRST
ROBOTICS
COMPETITION


GREENGINEERZ
3452