FTC®

FIRST® Tech Challenge

FIRST Tech Challenge

2012-2013 Game Manual Part 1:
Tournament Information, Awards and Robot Rules

IMPORTANT NOTICE:

TEAMS MUST COMPLY WITH ALL RULES AND REQUIREMENTS LAID OUT IN THIS DOCUMENT, THE GAME MANUAL RELEASED AT KICKOFF IN SEPTEMBER AND ANY UPDATES ISSUED ON THE Q&A SECTION OF THE FTC FORUM AND AT HTTP://FTCFORUM.USFIRST.ORG/. FORUM RULINGS TAKE PRECEDENCE OVER INFORMATION IN SEASON MANUALS.

Revision History		
Rev	**Date**	**Description**
1	May-2012	Initial Release
2	June-2012	Section 2.14 - “Champion Alliance” changed to “Winning Alliance”
		Section 3.3 - clarification on pilot judging
		Section 4.2.2 <R07> reference to “<R2>n” changed to <R2>p
		Section 4.2.3 <RS06> - NXT sleep timer sets to NEVER. previously language said “OFF”
		Section 5.1 - “processes” changed to “process”
3	June-2012	Footer corrected to reflect proper revision.
		Section 4.2.2 <R07> reference to “<R2>” changed to <R03>p
		Page border modified to prevent footer from being truncated when printed
		Appendix A: Header moved to proper location
		Appendix B removed from table of contents
		Section 5.5: Corrected reference to advancement criteria from 2.18 to 2.8
		Section 2.6 sub-sections renumbered for clarity
4	Sept 8 2012	Minor typographical corrections
5	Oct 18 2012	Updated language in “About FIRST” section to reflect proper grade range for FTC. Corrected address for Official FTC Forum in the notice above.
6	Nov 9 2012	Correction on page 16 <RG02,d>: Changed “Section 8” to “Game Manual Part 2: Section 2.4
7	Nov 28 2012	Page 16, Section 2.4: Added verbiage clarifying requirement for BOM.

Contents

About *FIRST*®

> "…to create a world where science and technology are celebrated… where young people dream of becoming science and technology heroes."
>
> Dean Kamen, Founder, *FIRST*

FIRST® (For Inspiration and Recognition of Science and Technology) was founded by inventor Dean Kamen to inspire young people's interest and participation in science and technology. Based in Manchester, New Hampshire, *FIRST* is a 501(c)(3) not-for-profit public charity.

As a volunteer-driven organization, *FIRST* is built on partnerships with individuals as well as businesses, educational institutions, and government. Some of the world's most respected companies provide funding, mentorship time and talent, and equipment to make *FIRST*'s mission a reality. As a team coach, you join over 90,000 committed and effective volunteers who are key to introducing close to 250,000 young people to the joy of problem solving through engineering.

FIRST provides four programs: the *FIRST* Robotics Competition (FRC®) and the *FIRST* Tech Challenge (FTC®) for grades 7-12; *FIRST* LEGO® League (FLL®) for 9 to 14 year-olds, and Junior *FIRST* LEGO League (Jr.FLL®) for 6 to 9 year-olds. Also located at *FIRST* headquarters is the research and development facility called *FIRST* Place™. *FIRST* Place is integral to game design, new program development, evaluation, and professional development of *FIRST* mentors.

"We want to change the culture by celebrating the mind. We need to show kids that it's more fun to design and create a video game than it is to play one."

Dean Kamen,
Founder, *FIRST*

Dean Kamen is President of DEKA Research & Development Corporation; a dynamic company focused on the development of revolutionary new technologies that span a diverse set of applications. As an inventor, physicist, and entrepreneur, Dean has dedicated his life to developing technologies that help people lead better lives. Dean's proudest accomplishment is founding *FIRST*.

1. What is *FIRST*® Tech Challenge?

FIRST Tech Challenge (FTC) had its beginnings in 2005 and grew out of a need for a mid-level robotics program to transition teams from *FIRST*® LEGO® League to the *FIRST*® Robotics Competition. Piloted for two years as the *FIRST* Vex Challenge, FTC became an official *FIRST* program and was renamed *FIRST* Tech Challenge in 2007.

FIRST Tech Challenge is a student-centered activity that is mentor supported and is about giving students a unique and stimulating experience. We want students to learn the value of teamwork and to respect everyone's ideas and contributions to the team. *FIRST* Tech Challenge allows high school students to work hand-in-hand with technical professionals to develop a solution to the annual challenge. The students do a majority of the work, but the mentor is there to offer guidance, suggestions, and coaching to keep the students on task and successful. *FIRST* values are about appreciating our differences and learning what those differences add to our lives. *FIRST* programs succeed most fully when team members bring the *FIRST* values they learn back to their communities.

The FTC Competition Kit challenges students' creative problem-solving skills by enabling them to build robots that do amazing things. When you bring dedicated, enthusiastic students and a mentor together, the results can be phenomenal! Students design and construct robotic devices which can be autonomously programmed or operator-controlled to perform various tasks.

FIRST Tech Challenge teams receive each year's game during a September Kickoff. The game's rules and regulations are provided on the www.usfirst.org website.

1.1 Gracious Professionalism™ – A *FIRST* Credo

Dr. Woodie Flowers, National Advisor for *FIRST*, speaks about Gracious Professionalism™ in this way: "The *FIRST* spirit encourages doing high-quality, well informed work in a manner that leaves everyone feeling valued. Gracious Professionalism seems to be a good descriptor for part of the ethos of *FIRST*. It is part of what makes *FIRST* different and wonderful."

Gracious Professionalism can and should mean different things to each of us. It is possible however, to outline some of its meanings:

- ◊ Gracious attitudes and behaviors are 'win-win.'
- ◊ Gracious folks respect others and let that respect show in their actions.
- ◊ Gracious professionals make a valued contribution in a manner pleasing to others and to themselves as they possess special knowledge and are trusted by society to use that knowledge responsibly.

As Woodie says, "In the long run, Gracious Professionalism is part of pursuing a meaningful life. One can add to society and enjoy the satisfaction of knowing that you have acted with integrity and sensitivity. That's good stuff!"

"In *FIRST*, Gracious Professionalism means that we learn and compete like crazy, but treat one another with respect and kindness in the process. We try to avoid leaving anyone feeling like they have lost. No chest-thumping barbarian tough talk, but no sticky sweet platitudes either. Knowledge, pride and empathy comfortably blended."

2. The Tournament

2.1 Overview

The *FIRST* Tech Challenge will be played in a tournament format. Each tournament will include practice, qualifying, and elimination matches. After the qualifying matches, teams will be ranked based on their match performance. The top-ranked teams will select alliance partners and participate in the elimination matches to determine the event champions.

This section provides a general summary regarding a *FIRST* credo, mascots, uniforms, recommended items and equipment for teams to bring, pit rules, event schedules, registration, practice rules and time slots, and robot inspections. Please read the following to get a feel for competition schedules, registration procedures, practice times, and matches.

2.2 Tournament Definitions

Alliance - Each FTC match is comprised of two, two-team *Alliances*. At events with more than 20 teams, the semi-final and final round *Alliances* are made up of three teams each. However, only two of those teams will compete during a match.

Alliance Captain – The student representative from an *Alliance's* highest ranked team chosen to represent an *Alliance* during *Alliance Selection* and for the final *Elimination Matches.* The entire team may also be referred to as the *Alliance Captain*.

Alliance Selection – The process top-ranked teams choosing *Alliances Partners* for the *Elimination Matches*.

Elimination Match – A *Match* used to determine the *Winning Alliance*. *Alliances* of two or three teams face off in a series of *matches*, with two teams per alliance playing in each match. The first alliance to win two matches will proceed to the next round.

Practice Match – A *Match* used to provide time for teams to get acquainted with the official *playing field*.

Qualifying Match – A *Match* used to determine the teams that qualify for the *Alliance Selection* to move on to the *Elimination Matches*. *Alliances* compete to earn *Qualifying Points* and *Ranking Points*.

Qualifying Points (QPs) – The first basis for ranking teams, *Qualifying Points* are awarded for winning (two points) and tying (one point) a *Qualifying Match*.

Ranking Points (RPs) – The second basis of ranking teams, *Ranking Points* are used as the tiebreakers when teams have equal *Qualifying Points*. *Ranking Points* are awarded in the amount of the final score of the losing *Alliance* in a *Qualifying Match*. The winning *Alliance* will receive the pre-penalized score of the losing *Alliance* as their *RP*. The losing *Alliance* will receive the final score (including penalties) of the losing *Alliance* as their *RP*.

Surrogate Match – An additional *Qualifying Match* for some teams depending on the number of teams in the tournament. A *Surrogate Match* will not count in the standings for *Qualifying Points* or *Ranking Points* to the teams that are marked as playing as surrogates. However, these matches are very important in the entire standings and should be played by all as if they were regular *Qualification Matches*. *Surrogate Matches* will be marked as such on the official *Qualifying Match* schedule.

2.3 Tournament Event Schedule

Event schedules will be available through your Tournament Host prior to or at your tournament. Qualification Match schedules are created on tournament day by the scoring system after all teams have checked-in and

have begun or completed the inspection process.

2.4 Courtesies and Rules

You will hear the expression Gracious Professionalism (GP) often throughout your involvement in FTC. One of FTC's main goals is to encourage all team members to conduct themselves with kindness, consideration, and sharing. We hear heartwarming stories of teams sharing parts, helping to build and/or repair competing robots, and helping rookie teams avoid preventable pitfalls. These examples of GP are some of the benefits of being involved with this organization.

The pit is where the behind-the-scenes action takes place. The *FIRST* staff and volunteers want you to enjoy the competition. Follow the rules below while in the pit as well as in the audience so everyone can work and compete in a safe, sportsmanlike, friendly, and orderly manner.

Bands: No live bands in the audience or pit.

Battery Safety: Charge your batteries in an open, well-ventilated area.

Fire Extinguishers: Located at the pit administration station and in the competition area.

Food: You should check with the event organizer before bringing food to an event, as some venues will not allow outside food on-site due to contracts and agreements.

Music/Noise: No loud music, audio systems, whistles, banging sticks, blow horns, etc. They prevent teams from hearing important announcements. Power may be shut off and/or noisemakers confiscated.

Internet/Wireless Network Access: Teams may not setup a wireless computer network for any purpose (i.e. Internet access, team communication, team computer to robot, etc.) Teams are required to use the wireless computer network provided by the Tournament Organizers or venue for all robot communication. Internet access for the teams will be at the discretion of the Tournament Director.

Radios/Walkie-Talkies: Teams are not allowed to use Radios and walkie-talkies anywhere in the tournament facility.

Sales: Because of site regulations/contracts, *FIRST* cannot allow teams or individuals to sell items, such as T-shirts, pins, etc. at any events.

Seat Saving: Sitting together in a group during competition matches makes the game more exciting and fun. It's where you can show support for your team. Since there is often not enough seating to accommodate everyone, there has to be a policy regarding seating. Teams are not allowed to save seating space.

Team Safety Captain: Each team appoints a safety captain who will help maintain safety at events, especially in the pit. He or she will remind attendees about safety rules listed below.

Safety Glasses: All team members and onlookers must wear ANSI Z87.1 certified safety glasses in the pit and near the competition area. If you wear prescription glasses, you must wear safety goggles over them or attach safety side shields to them. Teams are required to bring enough safety glasses/goggles to supply to team members and guests.

Running: There is no running in the pit.

Painting: There is no painting in the pit.

Soldering, Gluing, Brazing, or other Large Power Tools: These activities and tools are not allowed in the pit

areas or at the competitions unless the tournament director specifically allows them.

2.5 Eye Protection and Safety

FIRST requires all teams to bring and supply ANSI Z87.1 certified safety glasses for their members and guests for each competition. Students and adult team members and guests must wear them to protect their eyes while working on the robot, when observing robot building/repair work, and while competing.

Operators, players, and coaches will not be allowed in the competition area without them. Regular glasses and sunglasses do not qualify as safety glasses. If you wear prescription glasses, you must wear safety goggles over them or attach safety side shields.

2.6 Event Day Overview

1. Team Check-in
2. Robot Hardware and Software Inspection
3. Judge's Interviews
4. Driver's Meeting
5. Practice Matches
6. Opening Ceremony
7. Qualification Matches
8. Alliance Selection
9. Elimination Matches
10. Awards and Closing Ceremony

2.6.1 Team Check-In

As a team arrives at the venue, the Coach or other adult mentor should register the team with the tournament officials. During check-in, the Coach will receive a packet of information for the team that may include drive team badges, a judging schedule, a map of the facilities and pits, and other information that is very important to the teams. The Coach should review all the material to make sure the packet is complete. At this time, the team should set up their Pit area and get familiar with the venue such as where the practice and playing fields are, where judging will take place, and review the schedule of events for the day.

2.6.2 Robot Hardware and Software Inspection

FTC robots will be required to pass hardware and software inspections before being cleared to compete. This inspection will ensure that all FTC robot rules and regulations are met. A copy of the official FTC "Robot Inspection Sheet" is located in another section. The "Robot Inspection Sheet" should be used by teams as a guide to pre-inspect their robot prior to tournament day. A Bill of Materials (BOM) of non-TETRIX (or non-MATRIX) parts must be presented at Hardware Inspection.

2.6.3 Judges' Interviews

At *FIRST* Tech Challenge events, there are generally three parts to the judging process: 1) interview with judges, 2) evaluation of performance during the tournament, and 3) evaluation of the Engineering Notebook. Each team will have a ten to fifteen minute "fact finding" discussion/interview with a panel of two or three judges. The Judge's Interviews generally take place before any qualification matches so that the entire team may be interviewed. When teams arrive at the event, the interview schedule should be included in the registration

materials. Make sure you know when your team will be interviewed and arrive to the interview room early. Please have at least two student team representatives and the robot available; the entire team is encouraged to participate. Mentors (no more than two) are welcome to observe the Judge's Interview at most events, but should not participate (see Section 4.7 for more details).

2.6.4 Driver's Meeting

The Driver's Meeting takes place prior to the start of qualification rounds and is a time when the drive team meets with the referees. During this time, the head referee gives a brief overview of what is expected of teams and any venue specific information, such as queuing paths, and explain any signals and commands they will give during matches.

2.6.5 Practice Matches

At the event, practice matches may be played in the morning until the drivers' meeting begins. Every effort will be made to equalize practice time for all teams, but may also be conducted on a first-come, first-served basis. These matches may be scored, but the scores do not affect team ranking.

2.6.6 Opening Ceremony

The Opening Ceremony is the official kickoff of the event's activities for the teams, the fans, and the public. During the Opening Ceremony, a tournament official or the emcee will welcome the teams and the public, introduce dignitaries and other special guests, and introduce the judges and the referees. Then the game will be described (usually with a video) and the national anthems of all the teams' countries will be played. Immediately after, the Qualification Match takes place.

If your team is in any of the first four matches on the day of your event, volunteers will ask you to line up before the opening ceremonies. Matches begin right after its conclusion. Please, make sure your team is on time in case you have an early match.

2.6.7 Qualification Matches

The qualifying match schedule will be available prior to opening ceremonies on the day of the event. This schedule will indicate alliance partners and match pairings. It will also indicate the alliance's color (red or blue) and the position in the alliance station (1 or 2) for the drive team. Robots may be placed in either of the alliance's starting locations. These matches will start immediately after the Opening Ceremonies in accordance with the qualification match schedule. The queue team will work together throughout the day to line up teams for the matches and maintain the schedule. It is very important to pay attention to the match schedule and listen for announcements throughout the day. You will need to know when you will compete, find out the number of the ending match before lunch, and which match is the last match of the tournament day.

Teams will be randomly assigned to matches and alliances. All teams will be scored based on the same number of qualifying matches. In some cases, a team will be asked to play a surrogate match which will not count towards their standings during the event. This additional match will be denoted on the match schedule and/or announced to the teams prior to the start of the qualifying matches.

At the conclusion of each match, Qualifying Points (QP) will be awarded:

- ◊ Winning teams of a qualifying match each receive two (2) QP.
- ◊ Losing teams of a qualifying match receive zero (0) QP.
- ◊ If a qualifying match ends in a tie, all four teams receive one (1) QP.
- ◊ If a team is disqualified, they receive zero (0) QP.

Teams will also receive Ranking Points (RP) based on the following:

- ◊ The number of ranking points assigned for each match, is that of the losing alliance's score. The winning alliance will receive the pre-penalized score of the losing alliance as their RP. The losing alliance will receive the final score (including penalties) of the losing alliance as their RP.
- ◊ In the event of a tie, both alliances will receive the same RP (equal to the tie score).
- ◊ If a team is disqualified, they receive zero (0) RP.
- ◊ If both teams on an alliance are disqualified, the teams on the winning alliance will be awarded their own score as their RP for that match.

Teams with non-functioning robots may receive credit for a qualifying match if their robot has passed inspection and at least one member of the drive team is present in the alliance station for the scheduled match. If no member of a team is present in the driver station at the start of a match, that team is declared a "no show" and will receive zero (0) QP and zero (0) RP.

At the conclusion of all Qualification Matches, the teams will be ranked from first through last on the basis of their total Qualifying Points (QPs). If multiple teams have the same QP total, then teams will be ranked on the basis of their total Ranking Points (RPs). If multiple teams have the same RP total as well, then teams will be ranked on the basis of their highest match score. If still tied, the next highest match score will be used until the tie is broken. In the unlikely event that there is still a tie based on identical match scores, then the teams will be ranked by a random electronic draw.

2.6.8 Alliance Selection

The number of teams in the Elimination Matches will be based on the number of teams in the tournament. If there are 21 or more teams in the tournament, the Elimination Matches will consist of alliances of 3 teams each. If there are 20 teams or less, then the alliances will consist of 2 teams each. There will be a total of four (4) alliances that will compete in the Elimination Bracket.

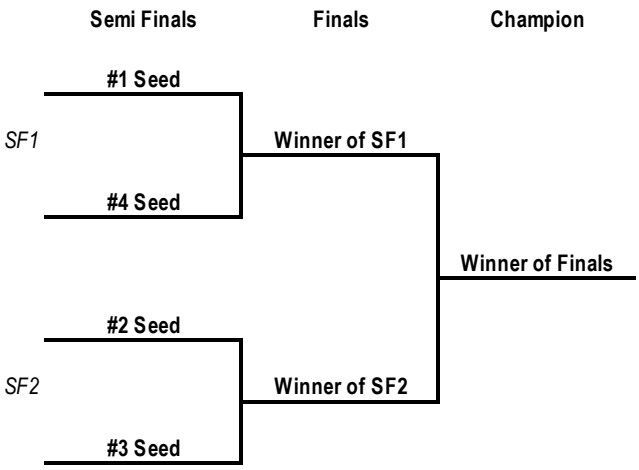
The alliance selection process will consist of a number of rounds of selections, such that all alliance captains will form elimination match alliances consisting of the requisite number of teams. These alliances will participate in a ladder-type tournament to determine the event's Winning Alliance. The alliance selection process is as follows:

- ◊ Each team will choose one student to act as the team's representative. These representatives will proceed to the competition area at the designated time to represent their teams in the alliance selection. It is recommended that the representative also bring their robot to the competition area as teams making selections may not know team names or numbers, but do know what the robots look like.
- ◊ In order of tournament ranking, the student representative of the highest ranked team not already in an alliance will be asked to step forward as the Alliance Captain to invite another available team to join their alliance.
- ◊ A team is available if they are not already part of an alliance, or have not already declined an alliance invitation. If the team accepts, it is moved into that alliance. If a team declines, they CANNOT be invited into another alliance, but are still available to select their own alliance if the opportunity arises. If a team declines, the alliance captain from the inviting team must then extend an invitation to another team.
- ◊ The process continues until all alliance captains have been designated and chosen one alliance partner.
- ◊ If there are more than 20 teams, the same method is used for each alliance captain's second choice (the third member of the alliance) from highest seed to lowest seed (i.e. 1 -> 2 -> 3 -> 4). Any teams remaining after the lowest seeded captain makes their choice will not compete in the Elimination Matches.

2.6.9 Elimination Matches

The Elimination Matches are very exciting. This is when the alliances determine who will be the Champion of the event. The matches are played in a seeded ladder format where the top seed goes up against the lowest seed, 2nd best seed vs. the 2nd lowest seed, and so on.

In the elimination matches, teams do not get qualifying points; they get a win, loss or tie. Within each bracket of the elimination, matches will be played to determine which alliance advances. The advancing alliance is the first one to win two matches. Any tied matches will be replayed until one alliance has two wins, and advances. An example tournament bracket appears here:



During each round of the elimination matches, two teams from an alliance will compete on the playing field. If the alliance has three teams on it, the team that sits out the first match in an elimination series must play in the second match, with no exceptions. If the alliances play more than two matches in any round, any combination of two alliance robots may be used. Teams should consider the robustness of the robots when picking alliance partners.

If a team is disqualified during an elimination match, then their entire alliance is disqualified, and the match will be recorded as a loss. Prior to each elimination match, the alliance captain must let the referee know which two teams will be playing in the upcoming match.

2.6.10 Awards and Closing Ceremony

The Awards and Closing Ceremony celebrates the accomplishments of the teams during the season and how they all did during the event. The ceremony will begin as soon as the last match is played, however some awards may be given out earlier in the event day (depending on the tournament officials). During the ceremony, all teams will be recognized for their accomplishments as the awards are handed out. The Winning Alliance teams and the Finalist Alliance teams will also be recognized. Finally, the Inspire Award winner will also be announced.

2.7 Tournament Types

There are several types of events and tournaments that teams and other organizers hold throughout the FTC season and off-season. These are categorized in the following sections.

2.7.1 Local Events

Anyone can host a local event, also known as a scrimmage, to prepare for a Championship or Qualifier, or as an alternative to attending other events. If you choose to create and host a local event, you are responsible for finding a location, organizing the format for the day, and inviting other teams to participate. You may also have to secure the field elements, computers, and other items depending on how you would like the local event to look and feel.

2.7.2 Qualifying Tournaments

Hosted and managed by FTC Affiliate Partners or Partner-appointed hosts. Qualifying Tournaments follow the same judging and game guidelines and format of Championship Tournaments. Qualifying Tournaments are usually held prior to Championship Tournaments in regions where there are many FTC teams. The number of

teams advancing to the state Championship Tournament depends on the capacity of the state Championship Tournament, the number of Qualifying Tournaments and the number of teams attending the Qualifying Tournament. The Advancement Criteria for moving up to the next level of tournament is detailed in Section 2.2 below.

2.7.3 Championship Tournaments

Hosted and managed by an FTC Affiliate Partner, Championship tournaments abide by certain standards in format, judging, awards, and overall quality. Some Championship tournaments require that teams win at a qualifying tournament in order to advance to the Championship. Championships may include teams from a geographic region, province, state, country, or several countries. Advancement eligibility for the World Championship is the same as moving on from Qualifying Tournaments to the local Championship Tournament and is based on the number of teams that are invited to the World Championships.

2.8 Advancement Criteria

Teams will advance to the next level of competition in the order indicated below according to the number of spots available. The advancement criteria will be applied to teams advancing from Qualifying Tournament to Championship Tournaments and from Championship Tournaments to the World Championship Tournament.

In the event that the team listed has already advanced or there is no team fitting that description (as in 2nd team selected at smaller events), the advancement will continue in order.

1. Qualifier Host Team (NOTE: Assuming that the team competes at one other tournament within the region and has met the criteria set forth by the Affiliate Partner in the agreement. This advancement applies to Qualifying Tournament hosts only, and does NOT apply to host teams of Championship Tournaments).
2. Inspire Award Winner
3. Winning Alliance Captain
4. Inspire Award 2nd place
5. Winning Alliance, 1st team selected
6. Inspire Award 3rd place
7. Winning Alliance, 2nd team selected
8. Think Award Winner
9. Finalist Alliance Captain
10. Connect Award Winner
11. Finalist Alliance, 1st team selected
12. Rockwell Collins Innovate Award Winner
13. Finalist Alliance, 2nd team selected
14. PTC Design Award Winner
15. Highest Ranked Team not previously advanced
16. Motivate Award Winner
17. Highest Ranked Team not previously advanced

2.9 Tournament Rules

<T1> Referees have ultimate game play and scoring authority during the competition. Their rulings are final.

a. The referees may not review any recorded match replays or pictures.

b. Any questions for the referees must be brought forward by one student drive team member per team within the time period of two (2) matches following the disputed match. Students are expected to support their questions by referencing specific rules or posts to the Q&A section of the official FTC Forum.

c. Team members are not allowed onto the playing field for any reason other than to place or retrieve their robots. Inspection of the playing field elements by team members for the express purpose of determining scoring is prohibited. Individuals and Teams that violate this rule will be subject to possible team penalties that could include match disqualifications or even removal from the tournament.

<T2> Only three team representatives permitted in the competition area; two (2) student drivers, and one (1) coach who are identified by badges designating 'driver' or 'coach'. These badges are interchangeable within a team in between matches. Only student team members wearing a badge designated as 'driver' may drive the robot during the match.

<T3> There are no time outs during the *qualifying* rounds. The matches must progress according to schedule. If a robot cannot report for a match, at least one member of the team should report to the playing field for the match.

<T4> Teams are guaranteed a minimum of five minutes (5:00) between participating in consecutive matches.

<T5> During the *elimination* rounds, each alliance will be allotted ONE time out of no more than three minutes (3:00). Time outs must be called at least two minutes (2:00) prior to their next match's starting time. The time out will begin at the time their match was going to start.

<T6> All team members and their guests, including coaches, must wear ANSI 87.1 certified safety glasses or prescription glasses with side shields while in the pits or alliance stations during matches.

NOTE: *FIRST* requires all teams to bring and supply, for each competition, ANSI-approved non-shaded safety glasses for its team members, mentors, and guests. For our purposes, amber lenses that allow for enhanced vision are considered tinted, not shaded, and their use is allowed at *FIRST* events. Sunglasses or deeply shaded safety glasses used in our indoor event environment are not acceptable.

2.10 Team Spirit

Competing as a team is fun as well as rewarding. Part of the pleasure and reward of being a team member is the way the team styles itself with team T-shirts, trading buttons, hats, cheers, cheerleaders, and costumes.

2.11 Team Styling

When deciding on a team name or acronym, consider how you can work a theme around it to make your team more fun and recognizable. Refer to Section 5.5 for information about *FIRST* and FTC logo use requirements.

2.12 Banners and Flags

Sponsors provide *FIRST* with banners so we can display them in specified areas as a way of thanking them for their generosity. We encourage teams to bring team flags and/or sponsor banners, but we ask that you adhere to the following:

- ◊ Do not use them to section off seating. Saving group seats is not permitted.
- ◊ Hang banners in your pit station only, not on the pit walls.
- ◊ You may bring banners to the competition area, but please do not hang them there. This area is designated for official *FIRST* sponsors' banners.

2.13 Spectators and Etiquette

Teams are permitted to have 2 student drivers and 1 coach (the Drive Team) at the playing field during their scheduled matches. Spectators are not allowed in the competition area at any time and must remain outside of the designated competition area. Some events may provide media passes for one additional team member to gain access to a designated "media area." Access to this area is only permitted with a media pass and only while the media representative's team is on the playing field. Spectators blocking the sidelines or accessing the media area without a pass will be asked to move. Repeated violations of this rule may cause the associated team to be disqualified.

2.14 Scouting

This information has been provided by the 2007 FRC Chairman's Award winners, FRC Team #365, the Miracle Workerz:

Teams use different methods to record information about other teams – paper, computer, hand-held PDAs, etc. Use whatever method is most comfortable for your team. Scouting is important to determine how you complement other teams in your alliance and how you match up against your opponents. No matter how you record it, focus on information which will be useful to your team when you meet your alliance partners to discuss strategy.

Some possible areas to gather information include:

- ◊ CAPABILITIES – what can the robot/team do and what can't it do?
- ◊ STRATEGIES – what does the robot / team do during the match? How do they play the game?
- ◊ PERFORMANCE – how well does the robot / team do what it attempts? What are the robot's strengths and weaknesses?
- ◊ AUTONOMOUS – what does the robot do in autonomous mode? Does the team have multiple program options?

The more data points you can collect on strategies and performance, the better understanding you will have of a given team. Information on a team's capabilities can be obtained by visiting the team in the pit area or watching match play.

3. Engineering Notebooks

3.1 Overview

This section describes the requirements for creating the Engineering Notebook, including formatting guidelines, Judge's tips, and the use of various forms of engineering support. It also provides links for sample pages from an award winning FTC Engineering Notebook.

3.2 What is an Engineering Notebook?

One of the goals of *FIRST* and FTC is to recognize the engineering design process and "the journey" that a team makes during the phases of the problem definition, concept design, system-level design, detailed design, test

and verification, and production.

Throughout the building of your robot you will come across obstacles, lessons learned, and the need to draw things out on paper. This is where you and your team will use an engineering notebook. These notebooks will follow your team from kickoff throughout the competitions. Judges will review your engineering notebook to better understand your journey, design, and team.

Note: Refer to the judging criteria in the Awards & Judging Criteria section for more details on how your engineering notebook will be judged.

3.3 The Notebook

Teams may choose to record their season with either handwritten or electronic or online documents. No distinction is made between handwritten and electronic Engineering Notebooks during judging.

Electronic/Online: Teams may choose to use electronic or online programs to create their Engineering Notebook. For the purposes of judging, teams must print out their Engineering Notebooks and place them in a binder, no larger than 1.5". All pages must be numbered and in order. Only one copy is required per team. Some events are piloting a video judging process for the 2012-2013 season. Your local Affiliate Partner will notify you if your event is piloting this and will let you know how to submit materials.

Written: Spiral-bound, Laboratory, or documentation notebooks are available through your school or local stationary supply store or you may use the notebook supplied by Rockwell Collins delivered to you in your Kit of Parts. Use the following criteria:

1. Do not use a loose-leaf notebook.
2. Numbered pages are recommended (but not necessary) so that pages cannot be substituted or deleted.
3. Only one Engineering Notebook is required per team.
4. Multiple teams may not share an Engineering Notebook.

3.4 Guidelines/Format

The FTC engineering notebook is a complete documentation of your team's robot design. This documentation should include sketches, discussions and team meetings, design evolution, processes, obstacles, and each team member's thoughts throughout the journey for the entire season. A new notebook should be created for each new season. The guidelines are:

1. Document EVERYTHING!!
2. Engineering Notebooks should be organized enough to have an outsider understand your team and your journey.
3. Written entries should be in permanent ink – not pencil.
4. Start your notebook by introducing each team member and mentor with a brief biography of their name, age (or school year), interests, and reasons for joining your FTC team.

Tip: Pictures along with the bios would serve as a great visual for the judges to get to know each member of your team.

5. Start a fresh page at every meeting. The date, and start/stop times should be recorded when starting a new page. Each day should start with two columns:
   a. Task Column – What is your team doing and discovering?

b. Reflections Column – Where your team records thoughts on what is happening and any questions that need to be answered.

6. Entries should be made by every team member, initialed, and dated.
7. All designs and changes to your robot should be recorded directly into your notebook. The inclusion of all details and sketches are preferable. Notes and calculations should be done in your notebook, NOT on loose paper.

Tip: A judging panel is always interested to see a unique design or playing strategy. On the other hand, a design without the substance to support its reasoning is not viewed as highly.

8. In the case of an error, draw a single line through the incorrect data. Do NOT erase or use correction fluid. All corrections should be initialed and dated.
9. Use both sides of a page. Never leave any white space: "X" out or crosshatch all unused space, and initial and date.
10. To insert pictures or outside information into your notebook, tape the picture into your notebook and outline with permanent ink, to note that it was there in case it falls out. Put the corresponding page number on that inserted page.

Tip: Pictures or sketches of your robot designs are recommended as part of a thorough documentation.

11. Insert a copy of your robot's Bill of Materials (BOM) as part of your Engineering Notebook as required by rules in the annual Game Manual.

Tip: Bring a second copy of the BOM for robot hardware inspection.

12. The Engineering Notebook is also a good place to discuss and show team activities that are done throughout the team's season. These activities can be placed in a separate section of the Engineering Notebook or chronologically within the design pages.
13. Include your team number inside your engineering notebook and on the cover so it is clear who to return it to after the judges have seen it.

3.5 Judges' Tips

1. Every notebook is a work in progress, forever changing and developing. Judges do not want to see a "final" copy notebook if yours is handwritten; they want the real thing complete with misspellings, stains, worn edges and wrinkled pages. Just remember to keep it real!
2. When turning notebooks into the judges at your event, place sticky tabs at the top of the page on your top 6-12 best moments as a team. Judges will use these pages as their preliminary review of your notebook.
3. Customize your Engineering Notebook to reflect your team's personality. At the end of the season, this notebook will be a great piece of memorabilia for your team.

3.6 Notebook Examples

Scanned copies of award-winning Engineering Notebook examples are posted on the FTC website. It is strongly encouraged for teams to look over these as great examples of what the judges will be looking for when reading through your Engineering Notebooks.

4. The Robot

4.1 Overview

A *FIRST* Tech Challenge Robot is a remotely operated vehicle designed and built by a registered *FIRST* Tech Challenge team to perform specific tasks when competing in the annual game challenge. This section provides rules and requirements for the design and construction of your Robot. Please ensure that you are familiar the Robot and game rules before beginning Robot design.

4.2 Robot Rules

The intent of the FTC Game Design Committee (GDC) is to create games that can be played with Robots constructed with the TETRIX®, MATRIX®, and/or LEGO® robotics system kits using basic tools and equipment. Anyone that has attended a tournament knows that FTC teams think outside the kit-of-parts to create unique and creative robots. For the 2012-2013 season the GDC has upped the creative potential for robot design by removing many of the legacy restrictions for mechanical/structural items. The GDC hopes that veteran FTC students will enjoy the increased freedom of choice and the resulting simplification of hardware inspection.

4.2.1 General Robot Rules

<RG01> Only ONE Robot will be allowed to compete per registered *FIRST* Tech Challenge team. It is expected that teams will make changes to their Robot throughout the season and at competitions.

a. It is against the intent of this rule to compete with one Robot while a second is being modified or assembled at a tournament.
b. It is against the intent of this rule to switch back and forth between multiple Robots at a tournament.

<RG02> Every Robot will be required to pass a full inspection before being cleared to compete. This inspection ensures that all FTC Robot rules and regulations are met. Teams are required to conduct a self-inspection of their robot and submit the completed hardware and software inspection forms at tournament check-in or at another designated place. Teams must present a bill of materials (BOM) listing any parts used on their robot along with the rule or Q&A post that allows the part. Lego, Tetrix, and Matrix parts as well as fasteners do not need to be included in the BOM. It is not necessary to list the quantity of each part in the BOM. A template for a BOM is available for download from www.usfirst.org/ftc/game.

a. All Robot configurations must be inspected before being used in competition.
b. If significant changes are made to a Robot after it has passed the initial inspection, it must be re-inspected before it will be allowed to compete.
c. Referees or inspectors may request the re-inspection of a Robot. The Robot is not allowed to participate in a match until it passes re-inspection. Refusal to submit to re-inspection will result in disqualification of the team.
d. Game Manual Part 2: Section 2.4 contains copies of the robot inspection forms and provides additional information about the inspection process.

<RG03> 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 or flip other competing Robots.
c. Those that contain hazardous materials (e.g. mercury switches).
d. Those that pose an unnecessary risk of entanglement.
e. Those that contain sharp edges or corners.

<RG04> At the beginning of any match, the maximum allowed size of a Robot is 18" x 18" x 18" (45.72cm x 45.72cm x 45.72cm).

a. During inspection, the Robot 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 exerting force on the sides or top of the box. The sizing box test is described in Section 8.
b. Robots may expand beyond the starting size constraint after the start of a match.
c. Any restraints used to maintain starting size (i.e. zip ties, rubber bands, string, etc.) MUST remain attached to the Robot for the duration of the match.

<RG05> The Robot main power switch MUST be mounted/positioned to be readily accessible and visible to competition personnel.

<RG06> Batteries MUST be securely attached to the robot.

<RG07> The NXT controller and Samantha WiFi Communication Module MUST be accessible and visible by competition personnel.

a. The NXT battery MUST be easily removable with minimal disassembly of the Robot.
b. The USB ports and buttons on the NXT and Samantha WiFi Communication Module MUST be easily accessible.
c. The NXT Controller liquid crystal display and Samantha WiFi Communication Module LEDs MUST be readily visible.
d. The NXT Controller and Samantha WiFi Communication Module shall be mounted such that they are protected from contact with the Playing Field elements or other Robots. These and other electrical components (batteries, motor and servo controllers, switches, etc.) make poor bumpers and are unlikely to survive the rigors of game play when attached in a Robot-to-Robot contact area.

<RG08> Robots MUST include a mounting device to securely hold one tournament supplied FTC Robot Alliance Identification Flag throughout an entire match. Because of the need to clearly identify a Robot's Alliance, the flag MUST be mounted at the TOP of the Robot and be clearly visible throughout the match. Flag posts are typically a soda straw with dimensions that are close to 0.250" (0.635cm) OD x 0.200" (0.5cm) ID x 8.250" (20.955cm) length with a triangular flag 4.000" (10.16cm) high x 6.000" (15.24cm) wide. These may vary from event to event. Mounting devices that damage the flag post are not acceptable.

<RG09> Robots MUST prominently display their team number (numerals only, e.g. "1234").

a. The judges, referees, and announcers must be able to easily identify Robots by team number.
b. Team number must be visible from at least two sides of the Robot (180 degrees apart).
c. The numerals must each be at least three inches high, at least in 0.5" (1.27cm) stroke width and in a contrasting color from their background.
d. Team numbers must be robust enough to withstand the rigors of match play.
e. Team numbers and their mounting surface are not required to be made of specifically allowed

materials so long as the materials do not affect the function or performance of the Robot. Examples of recommended number materials include: i) self-adhesive numbers (i.e. mailbox, or vinyl numbers); ii) ink jet or laser printed numbers on laminated paper or adhesive-backed paper.

<RG10> Energy used by *FIRST* Tech Challenge Robots, (i.e., stored at the start of a MATCH), shall come only from the following sources:

a. Electrical energy derived from the onboard TETRIX or MATRIX battery pack, HiTechnic 9-volt Battery Box for the sensor multiplexer, the battery for the visible LEDs, and the NXT battery.
b. Compressed air stored in the LEGO pneumatic system.
c. A change in the position of the Robot center of gravity.
d. Storage achieved by deformation of Robot parts. Teams must be very careful when incorporating spring-like mechanisms or other items to store energy on their Robot by means of part or material deformation. A Robot may be rejected at inspection if, in the judgment of the inspector, such items are unsafe.

<RG11> Game elements launched by Robots should not have a velocity greater than that required to reach a maximum of four (4) feet (1.2 meters) above the playing field surface, nor travel a horizontal distance greater than ten (10) feet (3 meters) from the point that the game element ends contact with the robot.

4.2.2 ROBOT PARTS AND MATERIALS RULES

<R01> Only TETRIX, LEGO, and/or MATRIX preformed robotics components (i.e. gears, wheels, extruded parts) may be used.

a. The following TETRIX components may not be used: R/C Controller (Product Id W34243 or W36117), R/C Receiver (Product Id W35496), Infrared Electronic Ball (Product Id W991458), DC Motor Speed Controller (Product Id W34244), Wireless Camera Kit (Product Id W37291), Autonomous Mounting Deck (W37799), and R/C Mounting Deck (W37663).

<R02> In addition to the TETRIX, LEGO, and/or MATRIX components, teams may use additional materials to construct their robots providing they meet the following constraints:

a. Commercial Off The Shelf (COTS) assemblies are not permitted with the exception of the following:
    1. Linear Slides.
    2. Non-motorized Turntables and Lazy Susans.
    3. Lead Screws and threaded rod plus compatible nuts.
    4. Servo blocks (e.g. ServoCity Part # SB608SH and SB609SH).
    5. #25 chain and compatible connector links and half-links.

The intent of **<R02>** is to augment the TETRIX, LEGO and MATRIX robot system kits with a few select assemblies/mechanisms that might be useful for this years game challenge. For the purpose of this rule, assemblies are considered to be component parts that have been fitted together.

b. Prefabricated and/or Preformed COTS plastics or metal are not permitted (i.e. buckets, cups, grippers, gears, etc.).
    1. Plastic or metal sheet, plastic spacers, and extruded aluminum are not considered to be

prefabricated and are allowed with no restrictions on dimension or quantity provided no other rules are violated.

c. LEGO plastic building parts are allowed.

d. The following additional structural parts, fasteners, and materials are allowed provided that they don't violate other rules, such as safety, entanglement, <R03>, etc. This includes no limits on quantity and size of the following materials:

   1. Raw Material (e.g. metal, plastic, etc.) provided that it is readily available to all teams from standard distributors (e.g. McMaster-Carr, Home Depot, Grainger, etc.). The definition of Raw Material are items before being processed or manufactured into a functional form.
   2. Standard bearings and bushings.
   3. Fasteners (e.g. nuts, bolts, screws, pop rivets, Velcro, etc.).
   4. Rope, cord, cable, monofilament, etc.
   5. Rubber bands.
   6. Surgical or Latex Tubing.
   7. Non-metallic cable ties (also known as Zip Ties).
   8. Non-Slip Pad without an adhesive backing (e.g. McMaster Carr Part #69275T54 or Home Depot SKU #134555). Packaging material must list the product as Non-Slip Pad.

<R03> Robot electronics are constrained to the following:

a. Exactly one (1) LEGO MINDSTORMS NXT Controller MUST be used. Additional microprocessors are not permitted unless they are an integral part of an allowed part or attached to the HiTechnic SuperPro Prototype or the NXT Prototype Boards.

b. The NXT controller must be powered either by the NXT rechargeable AC battery (W979798), NXT DC Battery (W979639), or six (6) AA batteries.

c. Exactly one (1) of the following battery packs: 1) TETRIX rechargeable battery pack; or 2) MATRIX battery pack. Only one of these battery packs is allowed on the Robot. These battery packs may only used to power HiTechnic DC Motor Controllers, HiTechnic Servo Controllers, the Samantha WiFi module, and visible light LEDs.

d. Exactly one (1) power switch that turns the robot on or off. The power switch MUST be installed between the battery and the first DC Motor or Servo Controller.

e. Any quantity of TETRIX (HiTechnic) or MATRIX Motor and Servo Controllers are permitted provided that the quantity doesn't exceed the technical specifications for these devices, the NXT, and the software.

f. A maximum total of eight (8) MATRIX or TETRIX motors and twelve (12) servos are allowed, provided that they are compatible with and controlled by TETRIX (HiTechnic) or MATRIX controllers (180 Degree HiTEC HS-475HB or HS-485HB and Continuous Rotation W39177 & HiTEC HSR-1425CR in any combination).

g. LEGO approved/certified motors may be used with the following constraints (per NXT motor port):

   1. One (1) NXT Interactive Servo Motor (LEGO Part # W979842)
   2. One (1) XL Power Function Motor (LEGO Part # W778882)
   3. Two (2) E Power Function Motors (LEGO Part # W979670)
   4. Two (2) M Power Function Motors (LEGO Part # W978883)
   5. One (1) E Motor and one (1) M Motor
   6. You are allowed to use any number of NXT conversion cables to connect the Power Function Motors with the NXT (LEGO Part #s W770323, W778886, or W778871)

7. You are NOT allowed to use any of the Power Function Battery Packs (LEGO Part #s W778881 or W778878)

h. Exactly one (1) Samantha WiFi Communication Module with one USB A-B cable to go from the Samantha module to the NXT (24”/60.96 cm or shorter is recommended) must be used. No other wireless communication is permitted during match play.

i. Only LEGO Approved NXT and RCX sensors (as indicated by the LEGO certified hardware label), and HiTechnic NXT compatible sensors are allowed to be directly connected to the NXT, the HiTechnic Sensor Multiplexor, and the HiTechnic Touch Sensor Multiplexor.

j. The HiTechnic NXT Touch Sensor Multiplexer (MUX) and NXT Sensor Multiplexer (MUX) are allowed. The HiTechnic 9-volt Battery Box that is sold as part of the NXT Sensor Multiplexer set may be used in conjunction with each NXT Multiplexer (i.e. one Battery Box per Sensor Multiplexer). It may be used only in conjunction with the NXT Sensor Multiplexer(s) to provide power for the MUX.

k. HiTechnic SuperPro Prototype Board, and the NXT Prototype Boards (both solderable and solderless) are allowed with the following constraints:

1. All power used in the circuits connected to the Prototype Board must be derived from the power connections provided within the board. No batteries or external power sources are allowed.
2. Circuits may connect only to the named connections provided by the Prototype Board (i.e. A4-A0, B5-B0, 3V, 4V, 9V, 5V, GND).
3. Communication to the NXT Controller may only occur through the included NXT connector.
4. Any compatible sensor may be connected to the Prototype Board, provided that no other rules are violated. Sensors may be distributed throughout the Robot; they do not need to be physically attached to the Prototype Board.
5. Additional circuit boards may be connected to the Prototype Board as needed.
6. The processor included in the Prototype Board may not be reprogrammed.
7. Circuits included as part of the HiTechnic Prototype Board may not cause interference with any Robot on the playing field, any part of the field management system or any game element.

l. LEGO-Approved NXT extension cables are allowed. Approved cables are currently only available from LEGO and HiTechnic.

m. LEGO-Approved NXT Conversion Cables to connect RCX sensors or Power Function Motors to the NXT (LEGO Part #s W770323, W778886, or W778871) are allowed.

n. Anderson PowerPole, and similar crimp or quick connect style connectors for joining electrical wires are allowed. Power splitters may also be used (and are strongly recommended) to make wiring easier.

o. Non-NXT power, motor control, servo, and encoder wires and their connectors may be extended, custom made, or COTS subject to the following constraints:

1. Battery wires are 16 AWG or larger
2. Samantha power wires are 18 AWG or larger
3. Motor control wires are 22 AWG or larger
4. PWM wires are 20 AWG or 22 AWG
5. Power and motor control wires are strongly recommended to use consistent color coding with different colors used for the Positive (red, white, brown, or black with a stripe are recommended) and Negative/Common (black or blue are recommended) wires.

p. Visible light LEDs with their connected electronic circuits are allowed. Power for the LEDs may be

provided by the main robot battery pack (TETRIX or MATRIX) or by no more than one (1) battery of any type not to exceed 9 volts.

q. Wire and cable management products of any type are permitted (e.g. cable ties, cord clips, sleeving, etc.).

r. Wire insulation materials of any type are permitted when used to insulate electrical wires or secure motor control wires to motors (e.g. electrical tape, heat shrink, etc.).

s. Electrical components that are not specifically allowed by the rules (i.e. sensors, batteries, microprocessors, etc.) are not permitted. Motors, sensors, controllers, and any other electrical components may not be altered from their original state in ANY way unless specifically allowed by the Robot rules. Also, the connectors on the TETRIX and MATRIX battery packs may be replaced or augmented with any compatible connector described in <R03>n above.

<R04> LEGO pneumatic elements are allowed. Teams may not modify LEGO pneumatic elements to attempt to change the pressure limits of the elements.

<R05> Electrical solder, tape, and any type of glue/cement are allowed.

<R06> Any type of COTS lubricant is allowed, provided that it doesn't contaminate the playing field, game elements, other Robots, etc.

<R07> Robots may contain decorations provided that that they are non-functional; do not affect how the robot interacts with the playing field, field elements, or other robots; do not require external power except as specified in rule <R03>p; do not affect the outcome of the match; are not hazardous to themselves or other teams; and are in the spirit of Gracious Professionalism.

4.2.3 ROBOT SOFTWARE RULES

<RS01> The Robot must be designed to be controlled by no more than two (2) Logitech Gamepads. Official FTC tournaments will provide either the Logitech DualAction or Logitech F310 gamepads in any combination for the competition playing fields.

<RS02> Each team MUST "name" their NXT with their official FTC Team number (e.g. "1234"). Spare NXTs should be named with the team number followed by a hyphen then a letter designation beginning with "B" (e.g. "1234-B", "1234-C"). Should a spare NXT be "loaned" to another team, the receiving team should rename the NXT with their corresponding team number along with the hyphenated letter designation showing the Field Control System that it is a spare.

<RS03> Programming for the *FIRST* Tech Challenge must be done with an approved programming language, using MANDATORY FTC Competition Templates, and corresponding firmware. Approved programming languages are:

a. ROBOTC version 3.0 or later (firmware version 9.0 or later)

b. LabVIEW for LEGO MINDSTORMS (NXT Firmware version 1.31 or later)

Templates for all programming choices are available at http://www.usfirst.org/ftc. If updates are announced later in the season, teams must update to the latest version prior to time of competition.

<RS04> The "Samostat" program MUST be installed on the NXT. Once installed, the team does not have

to install Samostat again unless a new version of the Samostat code is released, the programming environment is updated, or firmware is re-installed on the NXT.

<RS05> The "Program Chooser" program MUST be installed on the NXT. The Program Chooser enables teams to select the program started by the FCS for the Driver-Controlled portion of the match without having to connect the NXT to a computer. Once installed, the team does not have to install it again unless firmware is re-installed on the NXT, a new version of the Program Chooser code is released, or the programming environment is updated.

<RS06> The NXT MINDSTORMS® Controller Sleep Timer must be set to NEVER.

<RS07> Robots will connect to the tournament supplied Field Control System (FCS) located at each field. Teams must demonstrate that their Robot switches between Autonomous mode and Driver-Controlled mode correctly using the latest version of the FCS. This is done during Software Inspection.

5. Judging & Award Criteria

5.1 Overview

This chapter provides a complete description of all of the FTC Awards; the judging process, criteria and philosophy that teams need to be aware of in preparation for participating at FTC Tournaments.

In addition to winning points during the competition, the awards represent another positive way for mentors to instill important values like teamwork, creativity, innovation, and the value of the engineering design process. These judging guidelines are a part of the road map to success.

5.2 FTC Award Eligibility

To ensure fairness to all teams and to provide equal opportunity for all teams to win an award at an FTC Championship tournament, teams are only eligible to win an award at the first three Championship tournaments that they attend. Those teams who compete in more than three Championship tournaments do so for the purpose of being involved in the fun and excitement of the tournament and not with the intention of winning multiple awards.

Teams are allowed to win the Inspire Award only once during each tournament level (Qualifying and Championship). Once a team wins the Inspire Award at a Qualifying tournament, they are only eligible to win the other judged or alliance awards at subsequent Qualifying tournaments. The same restriction applies to teams attending multiple Championship tournaments.

Teams have spent several weeks designing, building, programming their robot, and learning what it takes to be a part of a team. For many FTC teams, the event is the reward for all their hard work throughout the season. While there are several types of events, they all offer a fun and exciting way for teams to demonstrate the result of their efforts.

5.3 FTC Award Categories

5.3.1 FTC Inspire Award

This formally judged award is given to the team that truly embodied the 'challenge' of the FTC program. The team that receives this award is chosen by the judges as having best represented a 'role model FTC Team. This Team is a top contender for all other judging categories and is a strong competitor on the

field. The Inspire Award Winner is an inspiration to other teams, acting with Gracious Professionalism™ both on and off the playing field. This team understands how to communicate their experiences and knowledge to other teams, sponsors, and the judges.

In past seasons, the winner of the Inspire Award at each Championship event received an automatic invitation to the FTC World Championship Event. Once a team has won an Inspire Award at a Championship, they are no longer eligible to win the Inspire Award at additional championship tournaments they may attend. Similarly, once a team wins an Inspire Award at a Qualifying tournament, they are no longer eligible to win the Inspire Award at subsequent Qualification tournaments.

Guidelines for the Inspire Award

- ◊ Team must demonstrate respect and Gracious Professionalism both for team members and fellow teams
- ◊ Engineering Notebook must be submitted, and must impress the judges
- ◊ Team must work beyond their robot to help spread awareness of the team, *FIRST*, and FTC within the community
- ◊ Team displays good communication and teamwork skills within the team as well as with their alliances
- ◊ Team communicates clearly about their robot design to the judges
- ◊ Team presents themselves well in the judges interview
- ◊ Robot effectively competes in the game challenge and impresses the judges
- ◊ Team and robot consistently perform well during matches
- ◊ Team is a strong contender for all other judged awards

5.3.2 Rockwell Collins Innovate Award

The Rockwell Collins Innovate Award celebrates a team that not only thinks outside the box, but also has the ingenuity and inventiveness to make their designs come to life. This judged award is given to the team that has the most innovative and creative robot design solution to any or all specific field elements or components in the FTC game. Elements of this award include elegant design, robustness, and 'out of the box' thinking related to design. This award may address the design of the whole robot, or of a sub-assembly attached to the robot. The creative component must work consistently, but a robot does not have to work all the time during matches to be considered for this award. The team's Engineering Notebook should be marked with journal entries to show the design of the component(s) and the team's robot in order to be eligible for this award, and entries should describe succinctly how the team arrived at that solution.

Guidelines for the Rockwell Collins Innovate Award.

- ◊ Robot or robot sub-assembly must be elegant and unique in its design
- ◊ Creative component must work reliably
- ◊ Team must submit an Engineering Notebook
- ◊ Robot is stable, robust and controllable
- ◊ Robot design is efficient and consistent with team plan and strategy

5.3.3 PTC Design Award

This judged award recognizes design elements of the robot that are both functional and aesthetic. All successful robots have innovative design aspects; however, the PTC Design Award is presented to teams that incorporate industrial design elements into their solution. These design elements could simplify the robot's appearance by giving it a clean look, be decorative in nature, or otherwise express the creativity of the team. The winning design should not compromise the practical operation of the robots but complement its purpose. This award is sponsored by Parametric Technology Corporation (PTC), developers of the CAD tools, Creo and Mathcad. PTC gives licenses to the FTC student teams for these software products to help them with their designs. Use of these tools is not required to be eligible, however, teams that use them in their design are given extra consideration for this award.

Guidelines for the PTC Design Award

- ◊ Team must submit an Engineering Notebook with detailed robot design drawings
- ◊ Robot differentiates itself from others
- ◊ Design is both aesthetic and functional
- ◊ Well considered basis for the design (i.e. inspiration, function, etc.)

5.3.4 Connect Award

This judged award is given to the team that most connected with their local community and the engineering community. A true *FIRST* team is more than a sum of its parts, and recognizes that its schools and communities play an essential part to their success. The recipient of this award is recognized for helping the community understand *FIRST*, the FTC, and the team itself. The team that wins this award is aggressively seeking engineers and exploring the opportunities available in the world of engineering, science and technology. In addition, this team has a clear fundraising goal and plan to achieve that goal (if the team's organization allows fundraising).

Guidelines for the Connect Award

- ◊ Team provides clear examples of outreach to community
- ◊ Team has worked to develop an in-person or a virtual connection with the engineering, science or technology community
- ◊ Team has a business plan or other way of determining their fundraising needs and a plan to achieve their fundraising goal if allowed to fundraise
- ◊ Team has a plan to give back to their community

5.3.5 Motivate Award

This judged award celebrates the team that exemplifies the essence of the FTC competition through team spirit and enthusiasm. They show their spirit through costumes and fun outfits, a team cheer or outstanding spirit. This team has also made a collective effort to make *FIRST* known throughout their school and community.

Guidelines for the Motivate Award

- ◊ Team spirit is consistent throughout the team and the competition.
- ◊ Team is enthusiastic

- ◊ The team functions well as a unit
- ◊ Team enthusiasm is evident in community outreach

5.3.6 Think Award

This judged award is given to the team that best reflects the "journey" the team took as they experienced the engineering design process during the build season. The engineering notebook is the key reference for judges to help identify the most deserving team. The Team's engineering notebook should focus on the design and build stage of the team's robot. Journal entries of interest to judges for this award will include those describing the steps, brainstorms, designs, re-designs, successes, and those 'interesting moments' when things weren't going as planned. A team is not be a candidate for this award if they have not completed the section of the engineering notebook describing the team's experience.

Guidelines for the Think Award

- ◊ Team must submit an engineering notebook
- ◊ Engineering notebook must demonstrate that the team has a clear understanding of the engineering design process, with pictures or drawings and details documenting all stages of robot design
- ◊ Engineering notebook must be organized and follow the formatting guidelines provided by *FIRST*
- ◊ Collaboration and co-ownership are dominant themes in the engineering notebook or in the judges interview

Note: Teams should review the engineering notebook section of this manual for a complete description and format specifications.

5.3.7 Promote Award (Optional)

This judged award is optional and may not be given at all tournaments. Please contact your tournament organizer to determine if it will be given at an event you attend.

The Promote Award is given to the team that is most successful in creating a compelling video message for the public designed to change our culture and celebrate science, technology, engineering and math.

Guidelines for the Promote Award

- ◊ Team must present a thoughtful and high-quality video which appeals to the general public.
- ◊ Strong production value is important, but the message and impact of the video are of greater weight for the judges.
- ◊ Creativity in interpreting the annually assigned theme is desired.
- ◊ Submissions for this award will be considered for the Inspire Award but are not required.
- ◊ Team must have rights to any music used in the video.

Winning videos will be submitted to *FIRST* and used to promote the higher values of the FTC. Teams may win the Promote Award only once at a Championship level event and only once at a qualifying level event.

Team must submit a one-minute long PSA video one full week prior to the event to be eligible for this award. Additional submissions are welcome but will not be eligible for awards. The submission process for this award may vary by tournament. Please check with your tournament's organizer for details.

PSA Subject for 2012-2013 Season

- Create a one-minute public service announcement (PSA) video that begins with the following sentence: *"What I'll carry with me from FIRST"*

5.3.8 Compass Award (Optional)

An FTC Team is about more than building robots, and competing at tournaments, it is a journey to a destination through trial and error, success and failure, with challenging new technology and obstacles to navigate where no road maps are provided. How does a team find their way?

The Compass Award recognizes an adult Coach or Mentor who has provided outstanding guidance and support for a team throughout the year. The winner of the Compass Award will be determined from candidates nominated by FTC team members, via a 40-60 second video submission, highlighting how their Mentor has helped them become a champion team. We want to hear what sets the Mentor apart.

Guidelines for the Compass Award

- Only one video submission per team will be considered. Teams may submit new or updated videos at each tournament.
- The video must be submitted at least one week prior to tournament day. Instructions for submitting videos may vary from tournament to tournament. Please check with your tournament's organizer for details.
- Videos must not be longer than 60 seconds (including introduction and credits if you choose to use them).
- Videos must be submitted in AVI, WMV or MOV format. Remember that the winning video may be shown on a large screen during the awards ceremony. Use the best resolution you have available for your final version.
- Video presentations are confidential, and may not be made public or shared with other teams prior to the award presentation.
- Team must have rights to any music used on the video.
- Team must submit an Engineering Notebook.

5.3.9 Judges' Award

During the course of the competition, the judging panel may encounter a team whose unique efforts, performance or dynamics merit recognition, yet doesn't fit into any of the existing award categories. To recognize these unique teams, *FIRST* offers a customizable judges award. The judging panel may select a team to be honored, as well as the name of the judges award.

5.3.10 Winning Alliance Award

This award will be given to the winning alliance represented in the final match.

5.3.11 Finalist Alliance Award

This award will be given to the finalist alliance represented in the final match.

5.4 Judging Process, Schedule, and Team Preparation

The schedules at the FTC tournaments may vary from site to site. Exact times for both the matches and meeting with judges cannot be given within this manual. All teams receive this schedule prior to or during check-in at the competition.

5.4.1 Judging Process

At FTC Championship Tournaments, there will be three parts to the judging process: 1) interview with judges, 2) evaluation of performance, and 3) evaluation of the Engineering Notebook. Each team will have an interview with a panel of two or three judges. No awards will be determined on the basis of this interview alone. Judges use the guidelines provided in this chapter to assess each team.

Teams should present their engineering notebooks at the Pit Administration Table during check-in unless otherwise directed by the tournament officials. The engineering notebooks are provided to the judges prior to the team interviews.

After the judges review the submitted Engineering Notebooks, complete the initial team interviews and evaluate the team and robot performance during matches, they convene to review their assessments and create a list of top candidates for the various judged awards. Judges may require additional impromptu discussions with teams if necessary. Deliberations are usually completed during the elimination matches. When the judges have finished their deliberations, the engineering notebooks are returned to teams.

Teams are asked to bring their robot to the judge interview. This is the best chance for teams to explain and demonstrate their robot design to the judges in a quiet and relaxed environment.

5.4.2 Judging Schedule

The judging generally takes place in a separate area(s) away from the noise of the competition and pit. Teams follow the schedule that outlines team interview times and locations. In some cases, teams may receive this information in advance, but more often, teams will receive this information when they check-in on the morning of the event.

Upon arrival please familiarize yourself with where the judging will occur and allow enough time to get there. To keep this process on time throughout the event, we require that all teams arrive at the judge queuing area five minutes before their scheduled judging interview.

5.4.3 Team Preparation

Teams are encouraged to use the award guidelines to assess where they are within an award category and help them establish higher goals. These guidelines are the same ones used by the judges during each FTC tournament, and at the FTC World Championship.

The judges want to know highlights about the team; its history and make up; what the team achieved during the competition season; and the experiences that were gained. Team representatives' abilities to answer the questions or elaborate on robot design functions or attributes are evaluated during the team interview. Check with the event organizer to see if Mentors and Coaches are allowed to observe the team interview. Mentors may not contribute to the judging process. Mentors should always keep in mind that FTC is a student-centered

activity and it is about giving the students a unique and stimulating experience in all aspects of the program.

5.5 FTC World Championship Event Eligibility

The culmination of the *FIRST* event season is the *FIRST* Championship Event held in St. Louis, MO. This event represents the conclusion of the season for Jr. *FIRST* LEGO League (Jr. FLL), *FIRST* LEGO League (FLL), the *FIRST* Tech Challenge (FTC), and the *FIRST* Robotics Competition (FRC). This is a fun and exciting experience for teams in all programs to participate.

FIRST Tech Challenge Teams earn their way to the FTC World Championship with their performance on and off the field. Advancement Criteria for the FTC World Championship is outlined in Section 2.8 and is similar to advancing from local Qualifiers to local Championship tournaments. Teams are responsible for their own entry fees, lodging, and travel costs to the FTC World Championship.

6. Team Resources

6.1 Overview

This chapter provides teams with necessary information for contacting FTC staff, accessing technical support, using the FTC Q&A system, and using the *FIRST* and FTC logos.

6.2 *FIRST* Contact Information

Teams can reach the FTC staff by e-mail at FTCteams@usfirst.org. The office is open Monday through Friday from 9:00 a.m. to 5:00 p.m., EST. Be sure to provide your team number in your message and leave contact information.

6.3 Getting Answers to your Questions

For general information and questions regarding the FTC, please send an e-mail request to: FTCteams@usfirst.org.

For specific information and questions regarding the FTC program in your area, please contact your region's Affiliate Partner. Search for your area's Affiliate Partner on the FTC web site: www.usfirst.org/regionalcontact.aspx.

For questions regarding the annual FTC game (released in September), please have your team leader log into the *FIRST* TIMS (Team Information Management System) to see your FTC team forum login under the 'What's New' information once your team has registered and paid. The FTC Forum opens in September.

Note: Accounts are updated weekly by the *FIRST* IT Department. If you have trouble accessing the forums, please feel free to contact *FIRST* at the information above.

6.4 Rules for Forum Participation

In order to ask official game questions in the FTC Forum, you must register and activate your account. The FTC Game Q&A is accessed directly at ftcforum.usfirst.org or by browsing to forums.usfirst.org and following the "*FIRST* Tech Challenge" link found under the "*FIRST* Programs" heading. Please do not use the FRC Game Q&A for FTC Questions.

Anyone can read this moderated forum. Only a single team leader is allowed to ask questions on the forum. Before posting a question, please make sure it has not already been answered. Game questions are not answered after 5:00 PM EST on Thursday during the competition season. Questions asked after this time

are answered after the events have concluded for that weekend. As the forum is moderated, questions and answers will be visible only after they have been reviewed and answered.

For detailed information on the FTC program, robot kit and accessories, playing field, etc., visit the following websites:

FTC information, game information, FAQs, and team resources: www.usfirst.org/roboticsprograms/ftc/

FTC Game Q&A: ftcforum.usfirst.org

6.5 Team Development Support

In addition to the staff at *FIRST* Headquarters, an additional regional level of support is available through the *FIRST* Tech Challenge Affiliate Partners, *FIRST* Regional Directors, *FIRST* Senior Mentors, and VISTA Volunteers. The FTC Affiliate Partners coordinate all FTC activities within a state, province, or region, and should be your foremost resource for help with the program. To find an Affiliate Partner, Regional Director, Senior Mentor, or VISTA volunteer available in your area, please contact *FIRST* at FTCteams@usfirst.org.

6.6 Using the *FIRST* and FTC Logos

We encourage Teams to develop and promote team identity. It is a great way to help *FIRST* judges, announcers, and audiences recognize your team at the competition, and it is also a way to help Teams create excitement in their communities.

Teams have incredibly creative opportunities in terms of designing your own identity. There are many examples of how teams brand their efforts with websites, team logos on robots, T-shirts, hats, banners, fliers, and giveaways.

You can download the *FIRST* and FTC logos and Logo Standards information from the FTC web site at: www.usfirst.org/roboticsprograms/resourcecenter.aspx?id=17122. Keep in mind the following when working with the *FIRST* and FTC logos:

Positive Promotion: Use the *FIRST* and FTC logos in a manner that is positive and promotes *FIRST*.

Unmodified: Use the *FIRST* and FTC logos without modification. This means that you will use our name and the triangle, circle, square as you see it on our website or letterhead. You can use it in red, blue, and white, or in black and white.

Modification Permission: If you have an interest in modifying the *FIRST* and FTC logos, you must *FIRST* contact *FIRST*. Please submit a written request letting us know why you want to modify the logo, how you plan to do it, and where you plan to apply it. Send an e-mail request to the *FIRST* Marketing Department, marketing@usfirst.org.

Advertising Use Approval: All teams and sponsors must obtain approval from *FIRST* prior to incorporating our logo in any advertising. Send an e-mail request for advertising approval to: marketing@usfirst.org.

JUDGE SUMMARY SHEET

Team Number: Team Name:	Needs Improvement	Fair	Good	Excellent
Think Award – Engineering Notebook is Required				
Notebook is well organized and follows the proper format.				
Notebook describes the physical construction of the robot				
Notebook describes team strategy, objectives, and reasoning behind the design.				
Content reflects the creative design process: identifying the problem, research, brainstorming, choosing the best solution, developing and prototyping.				
Rockwell Collins Innovate Award – Engineering Notebook is Required				
A robust, well-engineered robot that demonstrates the execution of a planned design that shows creativity and "out of the box" thinking.				
Robot has a competitive drive system tailored to support the strengths of the team's game strategy.				
Robot has an exceptional manipulator for game objects that performs consistently and effectively.				
Team has a well-planned strategy for maximizing their ability to play the game that takes scoring systems, alliance interaction, changes and events during a match into consideration.				
PTC Design Award – Engineering Notebook is Required				
Robot differentiates itself from others.				
Team utilizes PTC Software to prototype or assist with robot design.	NO		YES	
Design element is both aesthetic and functional.				
Incorporates industrial design elements into the solution.				
Well considered basis for the design (i.e. inspiration, function, etc).				
Connect Award				
Demonstrates awareness of community and desire to have a positive impact on society. Provides clear examples of outreach in their community.				
Reached out to those with careers in science, engineering, technology, and mathematics to learn more about professional fields.				
Demonstrates cooperation with other teams during the build season as well as during the competition.				
Shows strong communication skills in articulating how, as individuals and as a team, they have grown and interacted with others during the season.				
Has a business plan or other way of determining their fundraising needs and a plan to achieve their fundraising goal (if fundraising is allowed by team's organization).				
Motivate Award				
Shows spirit and enthusiasm for the FTC program, engineering, community outreach, etc.				
Shows their spirit through costumes and fun outfits, a team cheer or outstanding spirit.				
Makes a collective effort to make *FIRST* known throughout their school or community.				
Functions well as a team				
Inspire Award – This is the top Award for the Competition – Engineering Notebook is Required				
Demonstrates Gracious Professionalism, exemplary communication skills, and teamwork, within the team as well as with their alliances.				
Has an impressive design that is well executed and consistently performs well during matches.				
Exemplifies the spirit of discovery and the process of using science and engineering to create elegant solutions to an open-ended problem.				

Team Number: Team Name:	Needs Improvement	Fair	Good	Excellent
Inspire Award Continued				
Has a team direction with defined goals both on and off the playing field, and has enacted and executed plans to fulfill those goals.				
Works beyond their robot to help spread awareness of the team within the community.				
Engineering notebook is submitted, and impresses the judges.				

Additional notes on team:

Additional notes on robot:

Promote Award (Optional at Partner's Discretion)				
	Needs Improvement	Fair	Good	Excellent
Video has a compelling message for the public designed to celebrate science, technology, engineering and math				
Thoughtful, high quality video appeals to the general public				
Strong production value				
Annual theme interpreted creatively				

Video Notes:

Compass Award (Optional at Partner's Discretion) – Team Engineering Notebook is Required				
Mentor Name: Team Number:	Needs Improvement	Fair	Good	Excellent
Team articulates value of their relationship with mentor with clear examples				
Thoughtful, high quality video				
Mentor provides outstanding guidance and support for team members				

Video Notes: