



# INTRODUCTION

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# 1 INTRODUCTION

## 1.1 WHAT IS THE *FIRST*<sup>®</sup> ROBOTICS COMPETITION (*aka* FRC)?

Take dedicated, enthusiastic students, teachers, engineers and other professionals, add six (6) weeks for design and fabrication and you get a wide range of amazing machines that are competition ready.

The *FIRST* Robotics Competition (FRC) is an exciting program that assimilates teams, sponsors, colleges and technical professionals with high school students to develop their solution to a prescribed engineering challenge in a competitive game environment. The competitions, also known as Coopertition<sup>™</sup>(s), combine the practical application of science and technology with the fun, intense energy and excitement of a championship-sporting event. The program results in life-changing, career molding experiences for its participants and is a lot of fun.

In 2011, FRC will reach nearly 48,000 students representing approximately 2,000 teams. FRC teams come from every state in the United States, as well as from Brazil, Canada, the United Kingdom, Mexico, Chile, Germany, Israel, Turkey, Australia and The Netherlands. FRC has become an international program and is continuously growing. FRC teams will participate in 48 Regional Competitions, 9 Michigan District Events, and the Michigan State Championship. Approximately 300+ deserving teams will qualify to go to the *FIRST* Championship at The Edward Jones Dome in St. Louis, MO.

This year's challenge will be presented at the 2011 FRC Kickoff on Saturday, January 8, 2011. At the Kickoff event, all teams:

- see the 2011 game field for the first time;
- learn about the 2011 game rules and regulations; and
- receive a Kit of Parts (KOP). The KOP includes, but is certainly not limited to, motors, sensors, chassis hardware, transmissions, software packages, control systems and batteries. The intent of the kit is to provide a level starting point for all teams.

## 1.2 GRACIOUS PROFESSIONALISM<sup>™</sup>, A *FIRST* CREDO

Dr. Woodie Flowers, *FIRST* National Advisor and co-founder of FRC, asks:

"Why do *FIRST* folks talk so much about that phrase?"

Dr. Flowers elaborates on the significance of Gracious Professionalism<sup>™</sup> in *FIRST*, at work and in life, below.

"*FIRST* does not celebrate being an incompetent jerk. *FIRST* does celebrate high-quality, well-informed work done in a manner that leaves everyone feeling valued. Gracious Professionalism<sup>™</sup> seems to be a good descriptor for a big part of the ethos of *FIRST*. It is one of the things that makes *FIRST* different and wonderful.

Gracious Professionalism<sup>™</sup> has purposefully been left somewhat undefined because it can and should mean different things to each of us. We can, however, outline some of its possible meanings. Gracious attitudes and behaviors are win-win. Gracious folks respect others and let that respect show in their actions. Professionals possess special knowledge and are trusted by society to use that knowledge responsibly. Thus, gracious professionals make a valued contribution in a manner pleasing to others and to themselves.

In *FIRST*, one of the most straightforward interpretations of Gracious Professionalism<sup>™</sup> is 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.

Understanding that Gracious Professionalism™ works is NOT rocket science. It is, however, missing in too many activities. At *FIRST*, it is alive and well. Please help us take care of it.

In the long run, Gracious Professionalism™ is part of pursuing a meaningful life. If one becomes a professional, and uses knowledge in a gracious manner, everyone wins. One can add to society and enjoy the satisfaction of knowing that he or she has acted with integrity and sensitivity. That's good stuff!"

## 1.3 PROMINENT FRC AWARDS

*FIRST* recognizes both on-field and off-field team performance that promotes *FIRST*'s mission to change culture. Several awards celebrate team competencies including, but not limited to, technical expertise, community involvement, and safety practices. The two most prominent FRC awards are described below (however, for a complete list and description of awards available to teams, please reference *The FRC Administrative Manual, Section 6*).

### 1.3.1 The Chairman's Award

Every year, veteran FRC Teams have the opportunity to compete for *FIRST*'s most prestigious award; i.e., the Chairman's Award. This Award was created to maintain focus on changing culture in ways that would inspire greater levels of respect and honor for science and technology, as well as encourage more of today's youth to become scientists, engineers and technologists. It represents the spirit of *FIRST*. The Chairman's Award honors the team that best embodies the goals and purpose of *FIRST* and is a model for other teams to emulate.

One team is chosen at each regional to receive this award; these teams go on to be considered for the Chairman's Award at the *FIRST* Championship. Teams who have won the Chairman's Award at the Championship are entered into the *FIRST* Hall of Fame. Past Hall of Fame inductees are listed below.

Year	Team	Official Team Name
2010	341	DOW Chemical/Lockheed Martin/Cobham Defense Electronics/Comcast Cable/BAE Systems/Centocor Ortho BioTech/Johnson & Johnson PRD/JCPenney/PJM Interconnection/DeVry University & Wissahickon High School & North Montco Technical Career Center
2009	236	Dominion Millstone Power Station & Lyme-Old Lyme (CT) High School
2008	842	Honeywell / Arthur M. Blank Foundation / Science Foundation Arizona / Intel / Vegas Fuel / Wells-Fargo & Carl Hayden High School
2007	365	DuPont Engineering/DuPont CCRE/First State Robotics & MOE Robotics Group
2006	111	Motorola & Rolling Meadows High School & Wheeling High School
2005	67	General Motors Milford Proving Ground and Huron Valley Schools
2004	254	NASA Ames Research Center/Laron Incorporated/Unity Care Group/Line-X of San Jose/PK Selective Metal Plating, Inc. & Bellermine College Preparatory
2003	103	NASA/Amplifier Research/Custom Finishers/Lutron Electronics/BAE Systems & Palisades High School
2002	175	Hamilton Sundstrand Space Systems International/The New England Air Museum/Techni-Products/Veritech Media & Enrico Fermi High School
2001	22	NASAJPL/Boeing/Rocketdyne/FADL Engineering/Decker Machine & Chatsworth High School

Year	Team	Official Team Name
2000	16	Baxter Healthcare Corporation & Mountain Home High School
1999	120	NASA Lewis Research Center/TRW, Inc./Battelle Memorial Institute & East Technical High School
1998	23	Boston Edison & Plymouth North High School
1997	47	Delphi Corporation & Pontiac Central High School
1996	144	Procter & Gamble & Walnut Hills High School
1995	151	Lockheed Sanders & Nashua High School
1994	191	Xerox Corporation & JC Wilson Magnet High School
1993	7	AT&T Bell Labs & Science High School
1992	191	Xerox Corporation & JC Wilson Magnet High School

### 1.3.2 The Woodie Flowers Award

The Woodie Flowers Award celebrates mentors who lead, inspire and empower their team. Woodie Flowers Award winners demonstrate effective communication in the art and science of engineering and design. Founded in 1996 by Dr. William Murphy, the Woodie Flowers Award is presented to an outstanding engineer or teacher participating in FRC who lead, inspire, and empower using excellent communication skills.

Students submit an essay that nominates one mentor from their team for consideration. Past winners of this award are listed below.

Year	Name	Title
2010	Mr. Chris Fultz	Program Director - RR500 and New Product Introduction, Defense Sector, Rolls Royce
2009	Mr. John Novak	Engineer, Baxter Healthcare Corporation
2008	Mr. Mark Breadner	Vice Principal, Toronto District School Board
2007	Mr. Dan Green	Director, New Technology Business Operations, Motorola
2006	Mr. Rob Mainieri	Teacher, The Preuss School at UCSD
2005	Mr. Paul Copioli	Staff Engineer, FANUC Robotics America
2004	Mr. David Kelso	Teacher, Central High School
2003	Mr. Andy Baker	President, AndyMark, Inc.
2002	Mr. David Verbrugge	Engineer, GM Proving Ground
2001	Mr. William Beatty	Beatty Machine & Manufacturing Company
2000	Ms. Kyle Hughes	Teacher, OSMTech Academy
1999	Mr. Ken Patton	Engineer, GM Powertrain
1998	Mr. Michael Bastoni	Teacher, Plymouth North High School
1997	Ms. Elizabeth Calef	Teacher, Bridgewater-Raynham Regional High School

## 1.4 SAFETY: A *FIRST* CULTURE

Safety is critical within *FIRST* and must be observed continuously by all participants. As a part of the Safety Awareness and Recognition Program, teams are observed and evaluated at many different levels and by many individuals at the event.

“Safety Advisors” evaluate team safety behavior and practices at Regional Competitions.

“Referees” observe safety on the playing field as well as adherence to the game rules.

“Judges” evaluate how teams have integrated safety into their robot designs when considering the team for technical awards.

Safe practices at the competitions are required. Teams are urged to adopt safe habits throughout the entire competition season including during travel to and from events and while working in their shops at home.

## 1.5 LOGOMOTION SUMMARY

*LogoMotion* is played by two competing alliances on a flat 27' x 54' foot field. Each alliance consists of three robots each. They compete to hang as many inflated plastic shapes (triangles, circles, and squares) on their grids as they can during a 2 minute and 15 second match. The higher the teams hang their game pieces on their scoring grid, the more points their alliance receives.

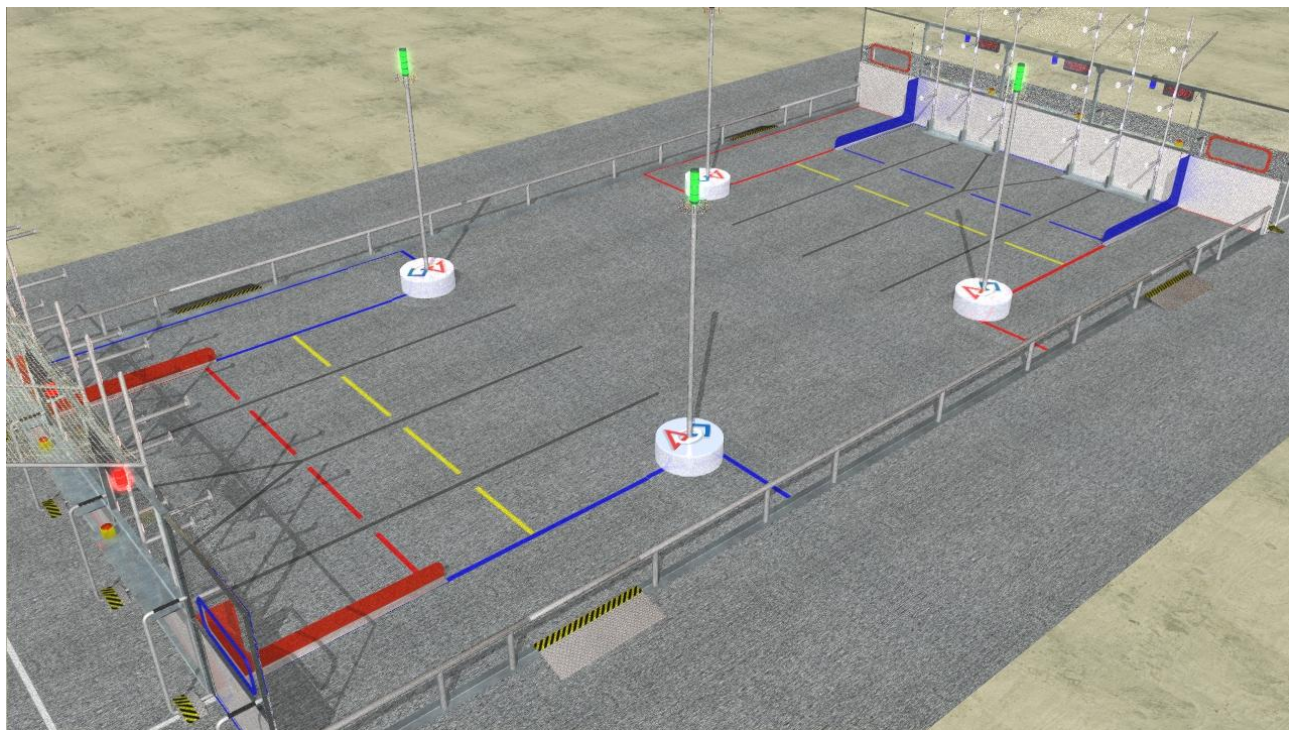
The match begins with one 15-second Autonomous Period in which robots operate independently of driver inputs and must hang Ubertubes to score extra points. For the rest of the match, drivers control robots and try to maximize their alliance score by hanging as many logo pieces as possible. Any logo piece hung on the same peg as an Ubertube receives double points. If teams assemble the logo pieces on their scoring grids to form the *FIRST* logo (triangle, circle, square, in a horizontal row in that order), the points for the entire row are doubled.

The match ends with robots deploying minibots, small electro-mechanical assemblies that are independent of the host robot, onto vertical poles. The minibots race to the top of the pole to trigger a sensor and earn additional bonus points. Scoring is summarized below:

Ubertubes hung during Autonomous	
On bottom row	2 points
On middle row	4 points
On top row	6 points

Logo pieces	Alone	Over Ubertube
On bottom ROW	1 point	2 points
On middle ROW	2 points	4 points
On top ROW	3 points	6 points

Minibot race bonus	
1st MINIBOT	30 points
2nd MINIBOT	20 points
3rd MINIBOT	15 points
4th MINIBOT	10 points



## 1.6 LOGOMOTION GLOSSARY

The following terms and definitions provide detail intended for all competitors in the 2011 *FIRST* Robotics Competition.

**ALLIANCE** – a set of three FRC TEAMS that work together during a MATCH to play *LogoMotion* against an opposing ALLIANCE. ALLIANCES are identified during the MATCH by their assigned color, either red or blue.

**ALLIANCE CAPTAIN** – the TEAM representative for each ALLIANCE lead.

**ALLIANCE STATIONS** – the areas located at either end of the ARENA, behind the ALLIANCE WALLS; they extend back eight feet from the ALLIANCE WALL, and across the 18-foot wide center section of the wall; include three identical PLAYER STATIONS each.

**ALLIANCE WALL** – a 6-1/2 feet high, 27 feet wide, wall that defines the ends of the FIELD.

**ANALYST** – a HUMAN PLAYER that assists the COACHES with strategy. There is one ANALYST per ALLIANCE.

**ARENA** - all elements of the game infrastructure that are required to play *LogoMotion*: the FIELD, the ALLIANCE STATIONS, the GAME PIECES, and all supporting communications, arena control, and scorekeeping equipment.

**AUTONOMOUS PERIOD** – DRIVER control of the ROBOT is not permitted at this time. During this period, the ROBOTS may react only to sensor inputs and commands programmed into the onboard control system. All ROBOT safety rules are still applicable during the AUTONOMOUS PERIOD.

**AUTONOMOUS SCORE** – the sum of points determined by the positions of the three ALLIANCE UBERTUBES at the conclusion of the AUTONOMOUS PERIOD.

**BACKUP TEAM** – one of the 8 highest seeded TEAMS remaining after ALLIANCE pairing that are available to play, should a HOSTBOT need replacing during the Elimination MATCHES.

**BASE** – a cylindrical section approximately 30 inches in diameter by 12 inches tall at the bottom of the TOWER. The BASE is considered part of the TOWER.

**BUILD SEASON** - the period between the Kick-off and the shipment deadline.

**BUMPER** – an assembly designed to attach to the exterior of the HOSTBOT and constructed as specified in **Section 3.4.2, Bumper Rules**.

BUMPERS are for absorbing shock and preventing damage from bumping. They are excluded from the weight and volume calculations specified in Rule <R11>.

**BUMPER PERIMETER** – the polygon defined by the outer-most set of exterior vertices of the BUMPERS when they are attached to the HOSTBOT. (To identify the BUMPER PERIMETER, wrap a string around the BUMPERS at the level of the BUMPER ZONE - the string describes the polygon.)

**BUMPER ZONE** – the volume contained between two virtual horizontal planes, one inch above the floor and seven inches above the floor.

**CAUTION LINE** – a 2-inch wide yellow line 4 feet in front of the ZONE that can be used as a field reference point for TEAMS.

**CIRCLE** – a white round inflated tube.

**GAME PIECE** – any one of the four plastic inflated objects used to score in *LogoMotion*.

**COACH** – a student or adult mentor identified as the person wearing the designated "COACH" pin or button during a MATCH. There is one COACH per TEAM.



**COMPONENT** – a ROBOT part in its most basic configuration, which can not be disassembled without damaging or destroying the part, or altering its fundamental function.

Example 1: raw aluminum stock, pieces of steel, wood, etc., cut to the final dimensions in which they will be used on the ROBOT, would all be considered components. Bolting pieces of extruded aluminum together as a frame would constitute a MECHANISM, and the collection of pieces would not be considered a COMPONENT.

Example 2: a COTS (see immediately below) circuit board is used to interface to a sensor on the ROBOT, and it includes the circuit board and several electrical elements soldered to the board. The board is considered a COMPONENT, as this is the basic form in which it was purchased from the vendor, and removing any of the electrical elements would destroy the functionality of the board.

**COTS** – a “Commercial, Off-The-Shelf” COMPONENT or MECHANISM, in its unaltered, unmodified state. A COTS item must be a standard (i.e. not custom order) part commonly available from the VENDOR, available from a non-team source, and available to all teams for purchase.

Example 1: a team orders two ROBOT grippers from RoboHands Corp. and receives both items. They put one in their storeroom and plan to use it later. Into the other, they drill “lightening holes” to reduce weight. The first gripper is still classified as a COTS item, but the second gripper is now a “custom part” as it has been modified.

Example 2: a team obtains openly available blueprints of a drive component commonly available from Wheels-R-Us Inc. and has local machine shop “We-Make-It, Inc.” manufacture a copy of the part for them. The produced part is NOT a COTS item, because it is not commonly carried as part of the standard stock of We-Make-It, Inc.

Example 3: a team obtains openly available design drawings from a professional publication during the pre-season, and uses them to fabricate a gearbox for their ROBOT during the build period following kick-off. The design drawings would be considered a COTS item, and may be used as “raw material” to fabricate the gearbox. The finished gearbox itself would be a FABRICATED ITEM, and not a COTS item.)

For the purposes of the FRC, generally available software modules obtained from open sources (e.g. professional publications, commonly used FRC community-accessible web resources, industry source code repositories, etc.) that are not specifically affiliated with individual FRC teams shall be considered COTS items.

**DEPLOYMENT** – the act of positioning a MINIBOT on a TOWER. DEPLOYMENT starts when the MINIBOT breaks the vertical projection of the TOWER BASE circumference during the END GAME. (Related form, DEPLOY, verb)

**DEPLOYMENT LINE** – located on the POST, approximately 18 inches above the top surface of the BASE.

**DRIVER** – a pre-college student team member responsible for operating and controlling the HOSTBOT. There are two DRIVERS per TEAM.

**END GAME** – the final 10 seconds of a MATCH.



**FABRICATED ITEM** – any **COMPONENT** or **MECHANISM** that has been altered, built, cast, constructed, concocted, created, cut, heat treated, machined, manufactured, modified, painted, produced, surface coated, or conjured partially or completely into the final form in which it will be used on the **ROBOT**.

Example 1: A piece of extruded aluminum has been ordered by the team, and arrives in a 20-foot length. To make it fit in their storage room, the team cuts it into two ten-foot lengths. These would not be considered **FABRICATED ITEMS**, as they have not been cut to the final length in which they will be used on the **ROBOT**.

Example 2: A team designs an arm mechanism that uses gears with a half-inch face width. They order a 12-inch length of gear stock and cut it into precise half-inch slices. They do not bore out the mounting bores in the center of the gears. The slices are now considered **FABRICATED ITEMS**, as the final fabrication process has started, even though all the machining operations (the center bore) may not yet be completed.)

**FEEDER** – a **HUMAN PLAYER** that feeds **LOGO PIECES** to **ROBOTS**. There are two **FEEDERS** per **ALLIANCE**.

**FEEDER STATION** – the area used to confine the **FEEDER**. The **ALLIANCE'S** two **FEEDER STATIONS** are located on either side of the opponent's **ALLIANCE STATION**.

**FEEDING SLOT** – openings in the **ALLIANCE WALL** that can be used by the **FEEDER** to pass **LOGO PIECES** to a **ROBOT** and enter them into play.

**FIELD** – the 27-foot by 54-foot carpeted playing area, bounded by two **ALLIANCE WALLS** and a **Guardrail System**.

**FRAME PERIMETER** – the polygon defined by the outer-most set of exterior vertices on the **HOSTBOT** (without the **BUMPERS** attached) that are within the **BUMPER ZONE**.

To determine the **FRAME PERIMETER**, wrap a piece of string around the **HOSTBOT** at the level of the **BUMPER ZONE** - the string describes this polygon.

Note: to permit a simplified definition of the **FRAME PERIMETER** and encourage a tight, robust connection between the **BUMPERS** and the **FRAME PERIMETER**, minor protrusions such as bolt heads, fastener ends, rivets, etc are excluded from the determination of the **FRAME PERIMETER**.

**GAME PIECES** – the **TRIANGLE**, **CIRCLE**, **SQUARE** and **UBERTUBE**.

**HANGING** – a **GAME PIECE** is **HANGING** when it is fully supported by a **PEG** and released by the **POSSESSING ROBOT**. Once a **GAME PIECE** has been released by the **POSSESSING ROBOT** (even momentarily) and is **HANGING** (e.g. it is fully supported by the **PEG**), it is considered to be **HANGING** until the end of the match. If a **GAME PIECE** on the floor is preventing a **GAME PIECE** that has been hung on a bottom **PEG** from becoming fully supported (that is, if the floor **GAME PIECE** was not there, the hung **GAME PIECE** would be scored) then that **GAME PIECE** will still be counted as scored.

**HERDING** – controlling the movement of a **GAME PIECE**. A **GAME PIECE** shall be considered **HERDED** if it is in contact with the floor and, as the **ROBOT** moves in the direction of the **GAME PIECE**, the **GAME PIECE** is pushed in the same direction in a controlled manner, but does not remain in the position relative to the **ROBOT** if the **ROBOT** changes direction or orientation.

**HOSTBOT** – the electromechanical assembly used to carry the **MINIBOT**. (**ROBOT** – **MINIBOT** = **HOSTBOT**). If a **TEAM** plays a **MATCH** without a **MINIBOT**, then the **HOSTBOT** is the **ROBOT**.

**HUMAN PLAYER** – a pre-college student team member that fills one of the **ALLIANCE** roles of **FEEDER** or **ANALYST**. There is one **HUMAN PLAYER** per **TEAM**.

KIT OF PARTS (KOP) – the collection of items listed in the **2011 Kit of Parts Checklist** provided on the *FIRST* website at <http://www.usfirst.org/frc/competitionmanual>.

For rookie teams, all of these items will be provided to them by *FIRST* at the FRC Kickoff. For veteran teams, some of these items will be provided by *FIRST* and some must be either retrieved from previous ROBOTS or purchased separately. For the purposes of these rules, the 2011 versions of all of the items listed in the **2011 Kit of Parts Checklist** will be considered 2011 kit parts regardless of the method of acquisition.

LANE – a 4-foot, 3-inch wide area that extends for approximately 19-1/2 feet from each FEEDING SLOT toward the center of the FIELD.

LOGO – a series of LOGO PIECES on the same row of a single SCORING GRID in the order of TRIANGLE-CIRCLE-SQUARE when read from left to right on a single row while looking at a SCORING GRID from the FIELD.

LOGO BONUS – the added points granted to an ALLIANCE for creating a LOGO

LOGO PIECES – the TRIANGLE, CIRCLE, and SQUARE.

MATCH – a single iteration of play in which ALLIANCES attempt to complete the objectives of the *LogoMotion* game during a competition.

MATCH SCORE – the total number of points earned by an ALLIANCE during a MATCH less any PENALTIES.

MECHANISM – a COTS or custom assembly of COMPONENTS that provide specific functionality on the ROBOT. A MECHANISM can be disassembled (and then reassembled) into individual COMPONENTS without damage to the parts.

MINIBOT – an autonomous vehicle designed and built to perform specific tasks when competing in the 2011 competition *LogoMotion*. The MINIBOT must obviously follow a design approach intended to play the 2011 FRC END GAME and must be compliant with all MINIBOT rules defined in **Section 3.4.14**.

MINIBOT RACE – a competition in which MINIBOTS are DEPLOYED, climb the TOWER, and TRIGGER the TARGET. The MINIBOT RACE begins at the start of the END GAME.

OPERATOR CONSOLE – the collection of the hardware used to run the Driver Station software and any associated equipment, control interfaces, display systems, structure, decorations, etc. used by the DRIVERS to operate the ROBOT.

PEG SCORE – the sum of points determined by the position of GAME PIECES on the ALLIANCE'S SCORING GRIDS.

PENALTY – a 3-point decrement in the ALLIANCE score assigned when a deserving violation of the game rules has been identified by a Referee.

PLAYER STATION – positions behind the ALLIANCE WALL where each TEAM sets up their OPERATOR CONSOLE

PLAYING CONFIGURATION – one of any of an infinite number of postures a ROBOT may take once the MATCH has begun.

POSSESSION – controlling the position and movement of a GAME PIECE. A GAME PIECE shall be considered in POSSESSION if, as the ROBOT moves or changes orientation (e.g. backs up or spins in place), the GAME PIECE remains in approximately the same position relative to the ROBOT.

POST – a 1.75-inch diameter (O.D.) steel pipe that extends upward from the BASE. The POST is considered part of the TOWER.

RACE SCORE – the points assigned to an ALLIANCE based on their finish in the MINIBOT RACE.

RED CARD – an indication of disqualification of a TEAM .

REPLACEMENT PARTS – a COMPONENT or MECHANISM constructed as a functional duplicate of an existing part of the ROBOT, for the purpose of replacing a broken or defective part.

REPLACEMENT PARTS may be either COTS items or FABRICATED ITEMS. They must be functionally identical to the original part but can be modified to provide more robust performance of the function.

Example 1: A lever arm made of polycarbonate on your ROBOT breaks. You manufacture a REPLACEMENT PART made of aluminum plate, using the design drawings of the original. As the new part provides the same function as the broken part, the new part is a valid REPLACEMENT PART.

Example 2: A sensor on the HOSTBOT is connected to the control system with 24 AWG single-strand wire, and runs across a hinged joint. The flexing of the wire causes it to break and you want to replace it with 18 AWG multi-strand wire. If the new wire follows the same path as the original and connects only the same devices, then it is a valid REPLACEMENT PART (i.e. it has added robustness without changing function). But if the wire is then used to connect an additional sensor to the same circuit, it is providing a functionally different capability, and is no longer a

ROBOT – the composite electromechanical assembly designed and built by a FRC team to perform specific tasks when competing in the 2011 competition *LogoMotion*. The ROBOT must include all the basic systems required to be an active participant in the game – power, communications, control, mobility, and actuation. The ROBOT implementation must obviously follow a design approach intended to play the 2011 FRC game (e.g. a box of unassembled parts placed on the FIELD, or a ROBOT designed to play a different game, would not satisfy this definition). The ROBOT includes both the HOSTBOT and the MINIBOT (ROBOT = HOSTBOT + MINIBOT).

SCORING GRID (GRID) – used to receive GAME PIECES placed by the ROBOTS as they play *LogoMotion*. There are four SCORING GRIDS on the FIELD, two located immediately in front of each ALLIANCE STATION and attached to the ALLIANCE WALL

SCORING PEG (PEG) – one of nine round, horizontal pieces on each SCORING GRID. Each PEG can hold up to two GAME PIECES.

SPARE PARTS – a COMPONENT or MECHANISM constructed as an identical duplicate of an existing part of the ROBOT, for the purpose of replacing a broken or defective part. SPARE PARTS may be either COTS items or FABRICATED ITEMS, but they must be physically and functionally identical to the original part.

SQUARE – a blue quadrangular inflatable GAME PIECE.

STARTING LINE – the line marked on the floor four feet back from the ALLIANCE WALL, and extends across the width of the ALLIANCE STATION.

STARTING CONFIGURATION – the physical configuration and orientation of the ROBOT when the MATCH is started. This is the state of the ROBOT immediately before being enabled by the Field Management System, before the ROBOT takes any actions, deploys any mechanisms, or moves away from the starting location. This configuration is static, and does not change during a single MATCH (although it may change from MATCH to MATCH).

SURROGATE – a TEAM randomly selected by the Field Management System (FMS) to play an extra Qualification MATCH. A SURROGATE receives no Qualification, Ranking, or Coopertition points for the extra MATCH.

TARGET – part of the TOWER, attached to the top of the POST. The TARGET is the “finish line” that indicates the MINIBOT has reached the top of the POST.

TEAM – four representatives from an FRC team that interact with their ROBOT and ALLIANCE partners to play *LogoMotion*. Positions on the TEAM are COACH, DRIVER and HUMAN PLAYER.

TELEOPERATED PERIOD – at the beginning of the TELEOPERATED PERIOD the OPERATOR CONSOLE controls are activated and DRIVERS may remotely control their HOSTBOTS. The DRIVERS continue to teleoperate their HOSTBOTS for the remainder of the MATCH. The TELEOPERATED PERIOD ends when the arena timer displays zero seconds. This also indicates the end of the MATCH.

TIMEOUT – a period of up to 6 minutes, which teams can use to pause Elimination Match progression. Each ALLIANCE is granted one, and only one, TIMEOUT.

TOWER – an assembly composed of a BASE, POST, and TARGET.

TRACKING LINE – lines on the FIELD that may be used to guide ROBOTS toward SCORING GRIDS.

TRIANGLE – a red three-cornered inflatable GAME PIECE.

TRIGGERED – the act of pushing the bottom disk of the TARGET so that the sensors are tripped and a signal is sent to the Field Management System (FMS). When a TARGET is TRIGGERED, the MINIBOT RACE on that TOWER is complete.

UBERTUBE – the yellow GAME PIECE used to score during the AUTONOMOUS PERIOD.

UPGRADE PARTS - a COMPONENT or MECHANISM intended to provide additional functionality not currently available on the ROBOT. UPGRADE PARTS may be COTS items or custom FABRICATED ITEMS, and may either add to or replace existing functionality.

Example: A HOSTBOT is designed with a c-channel frame. The system works well, but can be misshapen if hit aggressively. The team adds two more pieces of c-channel to brace the frame and prevent this problem. The c-channel is identical to that already on the HOSTBOT. The new pieces of c-channel would be considered UPGRADE PARTS even though they are the same as the ones already in place, as they alter the functionality of the HOSTBOT and provide new capability.

VENDOR – a legitimate business source for COTS items that satisfies all of the following criteria:

- A. The VENDOR must have a Federal Tax Identification number. In cases where the VENDOR is outside of the United States, they must possess an equivalent form of registration or license with the government of their home nation that establishes and validates their status as a legitimate business licensed to operate within that country.
- B. The VENDOR shall not be a “wholly owned subsidiary” of a team or collection of teams. While there may be some individuals affiliated with both a team and the VENDOR, the business and activities of the team and VENDOR must be completely separable.
- C. The VENDOR must be able to ship any general (i.e., non-*FIRST* unique) product within five business days of receiving a valid purchase request. (It is recognized that certain unusual circumstances (such as 1,000 *FIRST* teams all ordering the same part at once from the same VENDOR) may cause atypical delays in shipping due to backorders for even the largest VENDORS. Such delays due to higher-than-normal order rates are excused.)
- D. The VENDOR should maintain sufficient stock or production capability to fill teams’ orders within a reasonable period during the build season (less than 1 week). (Note that this criterion may not apply to custom-built items from a source that is both a VENDOR and a fabricator. For example, a VENDOR may sell flexible belting that the team wishes to procure to use as treads on their drive system. The VENDOR cuts the belting to a custom length from standard shelf stock that is typically available, welds it into a loop to make a tread, and ships it to a team. The fabrication of the tread takes the VENDOR two weeks. This would be considered a FABRICATED ITEM, and the two weeks ship time is acceptable.) Alternately, the team may

decide to fabricate the treads themselves. To satisfy this criterion, the VENDOR would just have to ship a length of belting from shelf stock (i.e. a COTS item) to the team within five business days and leave the welding of the cuts to the team.)

- E. The VENDOR makes their products available to all FRC teams. VENDORS must not limit supply or make a product available to just a limited number of FRC teams.

The intent of this definition is to be as inclusive as possible to permit access to all legitimate sources, while preventing *ad hoc* organizations from providing special-purpose products to a limited subset of teams in an attempt to circumvent the cost accounting rules. *FIRST* desires to permit teams to have the broadest choice of legitimate sources possible, and to obtain COTS items from the sources that provide them with the best prices and level of service available. Teams also need to protect against long delays in availability of parts that will impact their ability to complete their ROBOT. The FRC build season is brief, so the VENDOR must be able to get their product, particularly *FIRST* unique items, to a team in a timely manner. Ideally, chosen VENDORS should have national distributors (e.g. Home Depot, Lowe's, MSC, Radio Shack, McMaster-Carr, etc.) Remember, FRC events are not usually near home – when parts fail, local access to replacement materials is often critical.

VISION TARGET – retro-reflective targets that may be used by ROBOTS to locate SCORING PEGS. The VISION TARGET is Reflexite Corporation part number GP010.

WITHHOLDING ALLOWANCE – a limited amount of FABRICATED ITEMS that are withheld from the shipping requirements (specified in the **2011 FRC Administrative Manual, Section 5**) and retained by the team following the shipping deadlines. These items are then hand-carried to a competition event by the team. The OPERATOR CONSOLE is automatically included in the WITHHOLDING ALLOWANCE. Beyond that, the incoming material maximums specified in Rule <R33> limits the amount of FABRICATED ITEMS included in the WITHHOLDING ALLOWANCE.

Please note that for “Bag & Tag” teams attending 2-day events, items within the WITHHOLDING ALLOWANCE cannot be exchanged for other FABRICATED ITEMS on the ROBOT during the “Robot Access Period” as described in **Attending a Bag and Tag Event, Section 4** posted on the *FIRST* website at [www.usfirst.org/frc/competitionmanual](http://www.usfirst.org/frc/competitionmanual).

YELLOW CARD – a warning of egregious ROBOT or FRC team member behavior.

ZONE – an area approximately 18 feet wide and 7 feet deep located immediately in front of the ALLIANCE WALL. The boundaries are marked with tape that matches the color of the ALLIANCE stationed directly behind the adjacent ALLIANCE WALL.