FIRST Tech Challenge
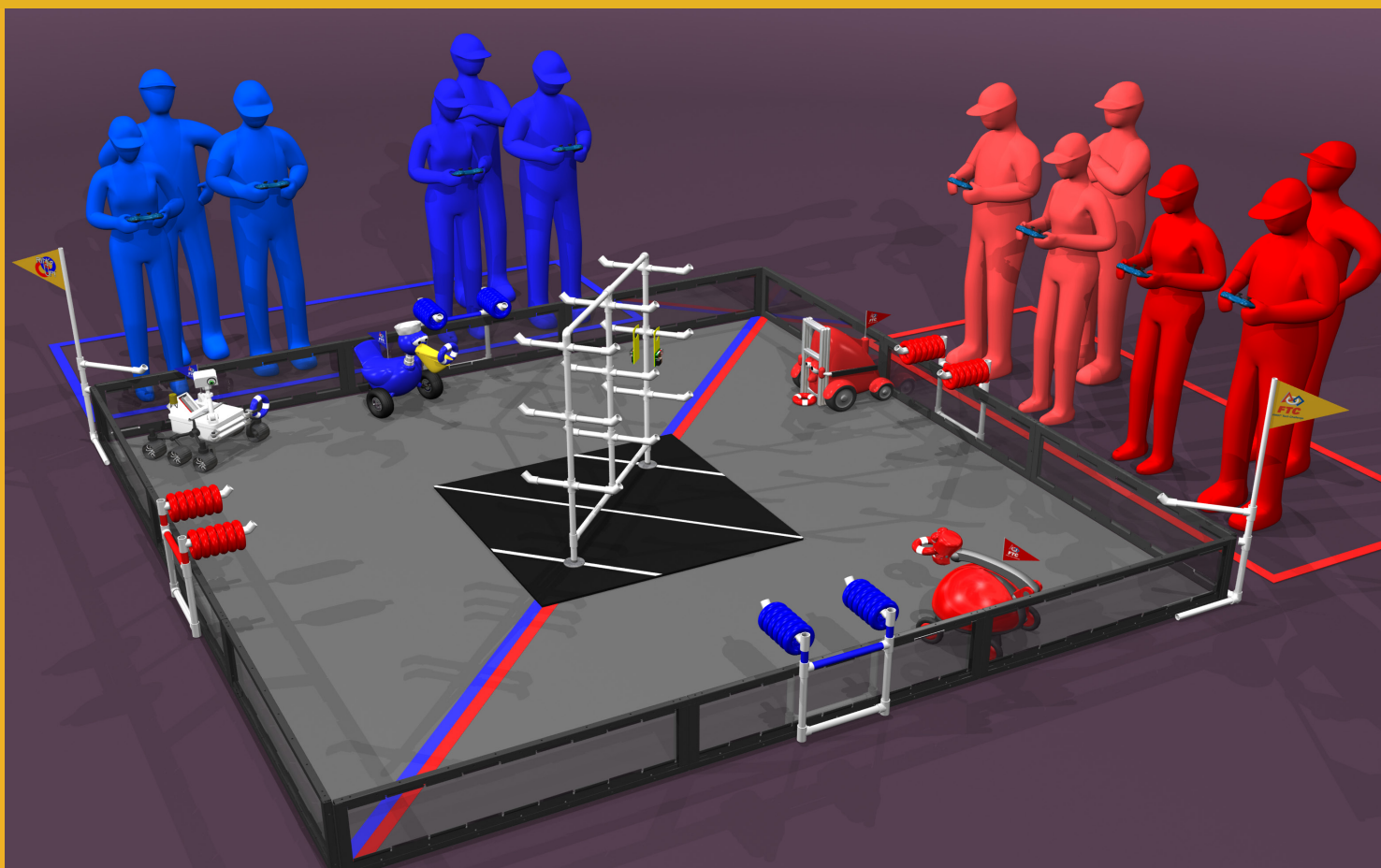
2012-2013 Game Manual Part 2:
Ring It Up! Game Rules

IMPORTANT NOTICE:

TEAMS MUST COMPLY WITH ALL RULES AND REQUIREMENTS LAID OUT IN THE

GAME MANUAL PARTS ONE AND TWO, 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	Sep-8-2012	Initial Release

Contents - Game Manual Part 2

Section 1 — The Game

1.1   Overview

This section describes the *FIRST* Tech Challenge game for the 2012-13 season called, Ring It Up! It also lists the game rules and game definitions.

1.2   Game Description

Matches are played on a *Playing Field* initially set up as illustrated in the figure below. Two *Alliances* – one "red" and one "blue" – composed of two teams each, compete in each *Match*. The object of the game is to attain a higher *Score* than your opposing *Alliance* by placing *Alliance*-colored *Rings* on various *Pegs* on the *Rack* or *Corner Goal*.   The game is played in two distinct periods, *Autonomous* and *Driver-Controlled.*

In the thirty (30) second *Autonomous Period*, teams are challenged to use *robots* to hang pre-loaded *Autonomous Rings* onto either side of the *Rack. Autonomous Rings Scored* on the *Rack* during the *Autonomous Period* give *Ownership* of the *Peg* to the *Alliance. Owning* a *Peg* will be important for the final game *Score. Autonomous Rings Scored* on a column that is designated by randomly placed Infrared (IR) Beacons also earn bonus points for the *Alliance*.

The two-minute *Driver-Controlled Period* follows the *Autonomous Period*. Teams earn points for their *Alliance* by *Scoring Rings* onto *Pegs* in various *Levels* or *Columns*. Having more *Rings* on *Pegs* give teams *Ownership* of the Peg. Three *Owned Pegs* in a horizontal, vertical, or diagonal line on one side of the *Rack* earn bonus points for the *Alliance*. Special *Weighted Rings Scored* on the *Corner Goal* serve as a *Corner Goal Bonus*. The final thirty (30) seconds of the *Driver-Controlled Period* is called the *End Game*. Each *Alliance* is challenged to raise their partner's *Robot* off of the playing field floor during the *End Game* to *Score* additional bonus points based on the height of the *Robot*.
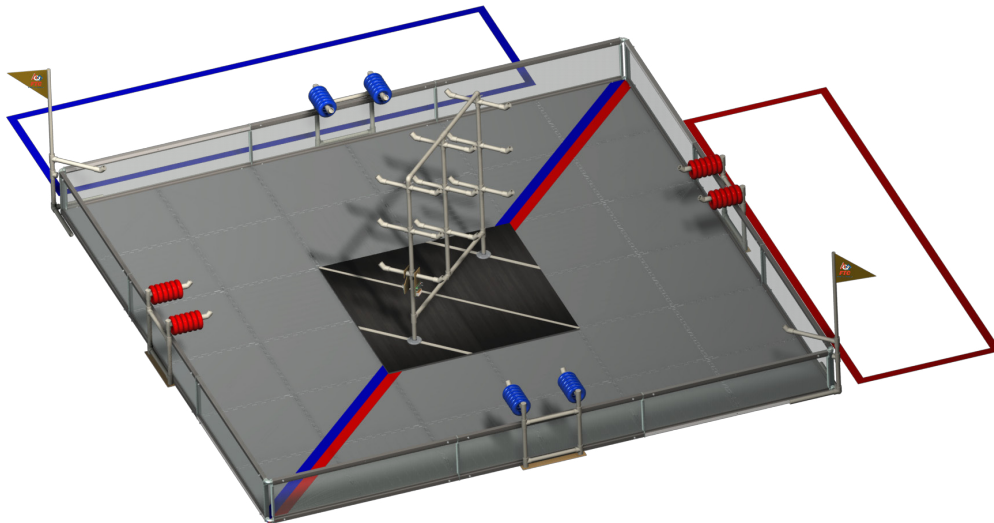
Note: The illustrations in this manual are only provided to give a general visual understanding of the game. Teams should refer to the official field drawings available at www.usfirst.org under "Game and Season Information" for exact field dimensions, a full field Bill of Materials (BOM) and the exact details for field construction. Items listed in the full field BOM are recommended for an official Field Kit. Substitutions that don't affect game play are acceptable.   Lower cost field options are also provided at www.usfirst.org in the "Game and Season Information" section.

1.3   Game Play

There are three (3) types of *Alliance*-colored *Rings* – *Normal Rings* (18 per *Alliance*), *Weighted* Rings (6 per *Alliance*), and *Autonomous Rings* (2 per *Alliance*). The *Normal* and *Weighted Ring*s are visually identical and are placed prior to the start of a *Match* on *Ring Dispensers* located on the perimeter of the field. There are two Red *Alliance Ring Dispensers* and two Blue *Alliance Ring Dispensers* each containing 12 *Rings* (both *Normal* and *Weighted* – randomly intermixed). The *Corner Goals* are located in the field perimeter wall corners next to each *Alliance Station*. The *Scoring Area* consists of a *Rack* of *Pegs* (3 levels x 3 columns) and a *Center Floor Goal*. There are two sides to the *Rack*, one facing the Red *Alliance Station* and the other facing the Blue *Alliance Station,* but *Alliances* may score on either side as each 3x3 grid is scored independently.

1.3.1   Pre-Match

Teams may place their *Robots* in any orientation on the playing field tiles with the following constraints:

    a.   *Robots* are required to touch exactly one field perimeter wall.

    b.   *Robots* are allowed to touch either the field perimeter wall along their *Alliance Station*, or the adjacent wall that isn't along the opposing *Alliance Station*.

    c.   *Robots* may not touch the dispenser or *Rings* on the dispenser.

    d.   *Robots* must not be inside or extend into the colored taped boundary of the opposing *Alliance*.

Each *Alliance* is given two (2) *Autonomous Rings* that may be placed in contact with their *Robot*s. An *Autonomous Ring* must be in contact with a single *Robot* of the corresponding *Alliance* and it may touch the *Playing Field*. *Autonomous Rings* are *Normal Rings* with three white stripes added. A *Robot* can only touch one *Autonomous Ring* while in the pre-match starting position.

After teams place their *Robots* on the field and pre-load the *Autonomous Rings*, the referees will place a pair of IR Beacons on both sides of a column that is randomly selected by the scoring system. The beacons will be placed on the *Rack* directly below the middle level of *Pegs*. Once the IR Beacon is placed, no adjustments may be made to the *Robots*. The *Autonomous Period* will then begin the *Match*.

1.3.2   Autonomous Period

The game starts with a 30-second *Autonomous Period* where the *Robot* is operated via pre-programmed instructions only. *Autonomous Rings* not placed on the *Rack* during the *Autonomous Period* will have no value for the *Match*. Bonus points will be awarded for *Autonomous Rings* placed on a column of *Pegs* that is designated by a randomly placed IR Beacon.

Scoring in the *Autonomous Period*:

    1.   *Ownership* – A properly placed *Autonomous Ring* will result in the *Alliance Owning* the *Peg* for the entire *Match* regardless of other *Normal* or *Weighted Rings* placed on the same *Peg*. If both *Alliances* place an *Autonomous Ring* on the same *Peg*, they will both *Own* the *Peg*.

    2.   *Peg Score Bonus* – An *Autonomous Ring* that is properly placed on the *Rack* on the same column as the IR Beacon will earn 50 *Peg Score Bonus* points. Any *Peg* on the column where the IR Beacon is located is eligible for the *Peg Score Bonus*.

    3.   *Autonomous Rings* placed on the *Center Floor Goal* have no value. *Autonomous Rings* have value only when placed on the *Rack*.

1.3.3   Driver-Controlled Period

At the end of *the Autonomous Period*, *Robot Drivers* pick up their Gamepad controllers and a two-minute (2) *Driver Controlled Period* begins. *Robots* are tasked with placing *Rings* on *Pegs* on the *Rack*, the *Center Floor Goal*, or the *Corner Goals*. The *Rack* is made up of two independent 3x3 grids of *Pegs*. Multiple *Rings* of any *Alliance* color and type (*Normal* or *Weighted*) may be *Scored* on any *Peg* (i.e. the red *Rings* can be *Scored* on the blue-facing side of the *Rack*). Teams with the most *Rings* on a *Peg* will *Own* that particular *Peg* unless an *Autonomous Ring* already *Owns* it. If both *Alliances* have the same number of *Rings* (greater than zero), then the *Peg* will be *Owned* by both *Alliances*. To *Score* on the *Center Floor Goal*, a *Ring* must be fully within the wooden area of the *Center Floor Goal* (i.e. no portion of the ring can be outside of the edge of the Goal extending infinitely upward). Only *Weighted Rings Score* onto the *Corner Goal*. *Normal* or *Autonomous Rings* placed there have no value and will not count toward the *Corner Goal Bonus*.

Scoring in the *Driver-Controlled Period*:

1. *Ring Score – Rings* in a *Scoring* position in the *Rack* or *Center Floor Goal* are worth:
    a.   *Center Floor Goal* – 1 point
    b.   Level 1 – 5 points – first height level up from floor
    c.   Level 2 – 10 points
    d.   Level 3 – 15 points
2. *Line Score Bonus* – Consecutive rows of *Owned Pegs* (either horizontal, vertical, or diagonal) on the same side of the *Rack* will earn the *Alliance* a *Line Score Bonus* of 30 points. The *Center Floor Goal* is not included in the *Line Score Bonus* calculation.
3. *Corner Goal Bonus* – A *Weighted Ring* placed on a *Corner Goal* earns a 20% *Corner Goal Bonus* for the corresponding *Alliance*. The *Corner Goal Bonus* is applied to the total of the *Alliance's Ring Score* and *Line Score Bonus* points for the match. For example, 3 Red *Weighted Rings* legally placed on any *Corner Goals* adds a 60% bonus to the Red *Alliance's* total *Ring Score* and *Line Score Bonus* (rounded to the nearest whole number). The *Multiplier Bonus* is not applied to the *Peg Score Bonus* or the *Lifting Bonus*.

1.3.4   End Game

The last thirty (30) seconds of the *Driver-Controlled Period* is called the *End Game*. During the *End Game* (and not before), *Robots* may lift their *Alliance* partner's *Robot* above the *Playing Field* floor to receive *Lifting Bonus* points. *Lifting Robots* are protected in their *Alliance's Zone*. The field is bisected into a Red *Alliance* side and a Blue *Alliance* side by diagonal colored stripes across the floor. *Robots* in the process of *Lifting* or being *Lifted* are protected from interference when fully within their corresponding *Alliance* side. In order to earn the *Lifting Bonus*, the lifted *Robot* must be fully supported by the *Alliance* partner's *Robot* and not by any other game object (i.e. 100% of the weight of a robot must be supported by the *Alliance* partner's *Robot*). *Lifting Robots* may not use any field elements (i.e. the *Rack*, *Ring Dispensers*, etc.) to aid with the lifting of a *Robot*. *Robots* must remain supported for at least one (1) minute, or until the referees have *Scored* the *Match* in order to receive the *Lifting Bonus*.

Scoring in the *End Game*:

1. *Lifting Bonus – Robots* that are supported at least 1" (2.5cm) above the floor tiles will earn 30 *Lifting Bonus* points for the *Alliance*. The measurement is taken from the lowest point on the *Robot* to the floor tiles.

Alliances earn an additional five (5) *Lifting Bonus* points for every additional inch the *Robot* is lifted above 1" (2.5cm), up to maximum of 24" (61 cm) above the floor tiles.

1.3.5   Game Restrictions

Game play is restricted by the <GR> rules. Violation of these rules may lead to *Penalties* and/or *Disqualification* of the offending team and/or *Alliance*.

<GR1>   *Autonomous Rings* placed on the *Center Floor Goal* have zero *Score* value. *Autonomous Rings* placed on *Pegs* during the *Driver-Controlled Period* have zero *Score* value.

<GR2>   Robots may *Possess* no more than two (2) *Ring*s at any time. If a *Robot* is *Possessing* more than 2 *Rings*, the *Alliance* will be penalized ten (10) points per *Ring* plus an additional 10 points for each 5 second interval that this situation continues. *Rings* will not be legally *Scored* while a *Robot Possesses* more than two (2) *Rings* (i.e. the extra *Ring* will not count).

<GR3>   *Robots* may not make contact with an opposing *Alliance's Ring* while that *Ring* is in contact with the opposing *Alliance's Ring Dispenser*. Violations will result in a 50 point Penalty per occurrence. Once a *Ring* has been removed from a *Ring Dispenser*, it may be handled by either *Alliance* provided no other rules are violated.

<GR4>   *Robots* may not place the opposing *Alliance's Rings* on their own *Ring Dispenser*. The offending *Alliance* will be penalized 10 points per occurrence. *Teams* may place their own *Rings* on their own *Ring Dispenser* without penalty.

<GR5>   *Robots* may not deliberately remove *Rings* from the playing field. Field personnel will replace *Rings* that incidentally fall outside the playing field at the earliest convenient opportunity. Teams deliberately removing the opposing *Alliance's Rings* from the *Playing Field* will be penalized 10 points per occurrence. Continued violation of this rule may lead to *Disqualification*.

<GR6>   *Robots* may not de-score *Rings* from the *Corner Goals or* from the *Rack*, however they may be de-scored from the *Center Floor Goal*. If *Rings* are de-scored illegally, the offending *Alliance* will be penalized 100 points per occurrence (a DOUBLE major P*enalty*). In other words, once a *Ring* is scored on a *Peg*, it may not be removed by any *Robot*, even one of the same *Alliance's* color.

<GR7>   *Autonomous Rings* that are in contact with a *Robot* of the corresponding *Alliance* at the end of the *Autonomous Period* will not count for *Ownership* or a *Peg Score Bonus*. Referees will remove the *Autonomous Ring. Scored Rings* that are in contact with a *Robot* of the corresponding *Alliance* at the end of the *Match* have zero *Score* value and will also be removed by the Referee.

<GR8>   *Robots* may not interfere with the opposing *Alliance's Robots* during the *End Game* when they are in the process of lifting their partners or being lifted when the opposing *Alliance* is performing the lift on their side of the field. If this occurs, a TRIPLE Major *Penalty* of 150 Points will be assessed to the violating *Alliance*.

<GR9>   *Robots* lifting their *Alliance* partner's *Robot* before the *End Game* begins will not be awarded the *End Game Bonus*.

<GR10>   Teams are not allowed to touch their *Robots* once the IR Beacons have been placed on the *Rack* in their designated location for the *Match*. If this occurs, a 10 point *Penalty* will be assessed to the violating *Alliance* and the *Autonomous Ring* for the corresponding *Robot* will have zero value.

1.4   Game Rules

Besides the game specific rules and restrictions outlined above, there are other game rules that must be followed including those that address safety, game setup, and general behavior.

1.4.1   Safety Rules

\<S1\>   If at any time the *Robot* operation is deemed unsafe or has damaged the *Playing Field*, another *Robot*, field elements, surface, or borders, by the determination of the referees, the offending team may be *Disqualified*. The *Robot* will require re-inspection before it may again compete.

Note: Teams should pay close attention to other *Robot* Specific Safety Rules outlined elsewhere in other sections of the Game Manual.

\<S2\>   If any portion of the *Robot* goes outside of the perimeter wall and makes contact with anything outside of the *Playing Field* it will be disabled for the remainder of the *Match*.

1.4.2   General Game Rules

\<G1\>   Before the start of a *Match*, each *Robot* must not exceed a volume of 18" (45.7cm) wide by 18" (45.7cm) long by 18" (45.7cm) tall. An offending *Robot* will be disabled/turned off for the *Match* at the Head Referee's discretion. Alignment devices that are not part of the *Robot* may NOT be used to assist with the positioning of the *Robot*.

\<G2\>   Each *Drive Team* shall include up to two *Drivers* and one *Coach*. Electronic communications (cell phone, two-way radio, etc.) by *Drive Team* members after an *Alliance* has been called to the *Playing Field* for its *Match* is not allowed and will result in a *Penalty* or *Disqualification*.

\<G3\>   During a *Match*, the *Drivers* and *Coach* must remain in their *Alliance Station*. The first instance of leaving the *Alliance Station* will result in a warning, with any following instances resulting in a *Penalty* or *Disqualification*. Leaving the *Alliance Station* for safety reasons will not result in a *Penalty*.

\<G4\>   *Drivers* and *Coaches* are prohibited from making contact with the *Playing Field* or any game or field object. The first instance of contact will result in a warning, with any following instances resulting in a *Penalty* and/or *Disqualification*. Contact that affects *Scoring* and/or game play will result in *Disqualification*.

\<G5\>   During a *Match*, *Robots* must be remotely operated only by the *Drivers* and/or by software running in the on-board control system. The first instance of *Coach* interference (i.e. touching a Gamepad) will result in a warning, with any following instances resulting in a major *Penalty* or *Disqualification*.

\<G6\>   Scores will be calculated at the end of the *Match* when all objects on the *Playing Field* have come to rest.

\<G7\>   *Robots* may not deliberately detach parts during any *Match*, or leave mechanisms on the *Playing Field*. If a deliberately detached component or mechanism prevents additional *Scoring*, the *Robot* will be disabled and the team will be *Disqualified*. Multiple infractions may result in *Disqualification* for the entire competition.

\<G8\>   *Robots* may not grab, grasp, grapple, or attach to any *Playing Field* element or structure other than

the *Scoring* element. Violations of this rule may result in a major *Penalty* or *Disqualification*.

<G9> Strategies and mechanisms aimed solely at the destruction, damage, tipping over, or entanglement of *Robots* are not in the spirit of the *FIRST* Tech Challenge and are not allowed. However, FTC games are highly interactive and *Robot*-to-*Robot* contact should be expected. Some tipping, entanglement, and damage may occur as a part of normal game play. If the tipping, entanglement, or damage is ruled to be deliberate, the offending team may be *Disqualified* for that *Match*. Repeated offenses could result in a team being *Disqualified* from the remainder of the competition. See also <G17>.

<G10> A *Robot* cannot *Pin* another *Robot* for more than five seconds. If a referee determines this rule is violated, the offending *Alliance* will receive a minor *Penalty* and the offending *Robot* may be disabled for the *Match*. A *Robot* cannot incur a *Pinning Penalty* during the *Autonomous Period*. If a *Pinning* occurrence happens during the *Autonomous Period*, the first action done by the offending *Robot* during the *Driver-Controlled Period* must be to back away from the *Pinned Robot* or a *Penalty* will be assessed. If a Referee *declares a Pinning* warning during the *Match*, the offending *Robot* must back away at least 3 feet (0.9m) or the approximate distance of 1.5 floor tiles from the *Pinned Robot*.

<G11> The actions of an *Alliance* or their *Robots* shall not cause an opposing *Alliance* or *Robot* to break a rule and thus incur penalties. Any rule violations committed by the affected *Alliance* shall be excused, and no penalties will be assigned.

<G12> *Robots* must be designed to permit easy removal of *Scoring* elements from any grasping, containing, or holding mechanism after the *Match*.

<G13> At the beginning of each *Match*, each *Alliance Robot* must be set up onto the *Playing Field* in the *Starting Location* ready to begin play. *Drive Teams* are required to stand in the *Alliance Station* location specified by the *Match* schedule to assure that the Logitech Gamepads are assigned to the correct *Drive Team* and *Robot*.

   a. During the qualification *Matches*, the blue *Alliance Robots* must be set up on the *Playing Field* first.
   b. During the elimination *Matches*, the lower seeded (i.e. 3rd seed is lower than 2nd seed) *Alliance Robots* must be set up on the *Playing Field* first.
   c. *Alliance*s may waive their right to place their *Robots* on the *Playing Field* after the opposing *Alliance* places their *Robots* as specified above.
   d. Teams that deliberately delay the start of the *Match* are not considered Gracious or Professional and may be penalized or even *Disqualified* by the referees for delaying the start of the *Match*.

<G14> *Matches* are replayed at the discretion of the Head Referee only under the following circumstances:

   a. Failure of a game element that was likely to have impacted which *Alliance* won the *Match*.
   b. Loss of control of a *Robot* due to a VERIFIABLE failure of the tournament-supplied *FCS* computer, *FCS* software, USB Hub, or Logitech Gamepad that was likely to have impacted which *Alliance* won the *Match*.
   c. Loss of control of all four *Robots* due to a failure of the field's wireless router that was likely to have impacted which *Alliance* won the *Match*.

Unexpected *Robot* behavior in itself will not result in a *Match* replay. Team induced failures, such as low battery conditions, processor sleep time-outs, *Robot* mechanical/electrical/software failures, *Robot* communication failures, etc. are **NOT** valid justifications for a rematch.

<G15> At the conclusion of the *Autonomous Period*, the head referee will if needed, untangle *Robots*, place *Robots* on their drivetrain, make minor adjustments to *Robot* position, etc. so that the *Robots* can participate in the *Driver-Controlled* portion of the *Match*. The referee will do this after finding out from the team where the best place is to touch their *Robot*.

<G16> Field and field element tolerances may vary by as much as +/-1.0" (2.5cm). Teams must design their *Robots* accordingly.

<G17> Egregious *Robot* or team member behavior at the playing field, as determined by the referees, will result in a major *Penalty* of 50 points and possible *Disqualification*. Subsequent violations will result in team *Disqualification*. Egregious behavior includes, but is not limited to, repeated and/or flagrant violation of game rules, uncivil behavior towards *Drivers*, *Coaches*, competition personnel and event attendees, and repeated or flagrant unsafe behavior or actions.

1.5   Game Definitions

Alliance – A pre-assigned grouping of two teams that work together for a given *Match*. *Alliances* are designated as either "Red" or "Blue."

Alliance Station – The designated region where the *Drivers* and *Coach* stand or move within during *Matches*.

Autonomous Period – A thirty (30) second period in which the *Robots* operate and react only to sensor inputs and to commands pre-programmed by the team onto the onboard *Robot* control system. Human control of the *Robot* is not permitted during this time.

Competition Area – The area where all the *Playing Fields*, *Alliance Stations*, *Scoring* tables, and other event officials and tables are located.

Disqualified / Disqualification – A team that is *Disqualified* from a *Match* will not receive credit for any points for the *Match* (i.e., no *Qualifying* and *Ranking* points).

Drive Team – Up to three representatives (two *Drivers* and one *Coach*) from a legally registered entity with *FIRST* and for the competition.

> *Driver* – A pre-college student team member responsible for operating and controlling the *Robot* and wearing a "*Driver*" badge or identifying marker.

> *Coach* – A student or adult mentor designated as the team advisor during the *Match* and identified as the person wearing a "*Coach*" badge or identifying marker.

Driver-Controlled Period – The two-minute time period in which the *Drivers* operate the *Robots* after the *Autonomous Period*.

End Game – The last thirty (30) seconds of the *Driver-Controlled Period* at the end of the *Match*.

Field Control System (FCS) – The *Field Control System* is the computer hardware and software that will serve as the communications system between the *Drivers* and the *Robot* during each *Match*.

Match – A *Match* consists of an *Autonomous Period* followed by a *Driver-Controlled Period* for a total time of two minutes and thirty seconds (2:30).

Penalty – A deduction to the *Alliance*'s *Score* assigned by a Referee for a rules violation.

Pin / Pinning – Preventing the movement in all directions of an opposing *Robot* while in contact with the *Playing Field* boundary wall, one or more field elements, or another *Robot*.

Playing Field – The part of the *Competition Area* that includes the 12' x 12' (3.66m x 3.66m) field and all of the elements described in the official field drawings. The *Playing Field* is split into two sides (a *Red Zone* and a *Blue Zone*) across a diagonal to indicate protected zones for the purposes of the *Lifting Bonus*.

Possess / Possessing – Controlling the position and movement of a *Ring*. A *Ring* shall be considered in *Possession* if, as the *Robot* moves or changes orientation (e.g. backs up or spins in place), the *Ring* remains in approximately the same position relative to the *Robot*. *Rings* in *Possession* by a *Robot* are considered to be part of the *Robot*.

Ring – One of the *Scoring* elements for the 2012-13 *FIRST* Tech Challenge game, Ring It Up! The *Ring* is a 4.75" (12cm) outer diameter (O.D.) and a 2.25" (5.7cm) inner diameter (I.D.) *Alliance*-colored plastic toroid. There are three types of *Rings*: *Autonomous*, *Normal*, and *Weighted*.

> *Normal Rings* – These are ordinary *Alliance*-colored toroids. There are eighteen (18) Red colored *Normal Rings* and eighteen (18) Blue-colored *Normal Rings* placed onto the *Ring Dispensers*. *Normal Rings* weigh approximately 0.88 ounces (25 grams).

> *Autonomous Rings* – These are like *Normal Rings* except they have white taped stripes signifying that they can only be *Scored* during the *Autonomous Period*. The *Autonomous Rings* are placed in contact with a single *Robot* of the corresponding *Alliance* before the game begins and it may touch the *Playing Field* . There are two (2) Red and two (2) Blue *Autonomous Rings*. *Autonomous Rings* weigh approximately 0.88 ounces (25 grams).

> *Weighted Rings* – These look like *Normal Rings*, however, they weigh approximately three (3) times as much. There are six (6) Red and six (6) Blue *Weighted Rings* placed randomly onto the *Ring Dispensers*. *Weighted Rings* weigh approximately 2.64 ounces (75 grams).

> *Ring Dispenser* – A container that holds a total of twelve *Normal* and *Weighted Rings* in any combination at the start of the *Match*. There are four (4) *Ring Dispensers* located on the Playing Field. Two *Ring Dispensers* hold Red *Ring*s and the other two hold Blue *Rings*.

Robot – Any mechanism which has passed inspection that a team places in their corresponding *Starting Location* prior to the start of a *Match*. A more detailed definition of *Robot* also appears in the *Robot* Rules and Inspection sections.

Scoring – *Rings Scored* successfully will be supported by only the *Pegs* and not touching a *Robot* of the corresponding *Alliance* color. There are several methods of *Scoring* in this year's game:

> *Owning / Ownership* – When one *Alliance* has placed more *Rings* on a *Peg* than the other, it is said to be *Owning* the *Peg*. If both *Alliances* have the same number of *Rings* (greater than zero), then both *Alliances Own* the *Peg*. *Autonomous Rings* trump all other types of *Rings* for the purpose of *Peg Ownership*. Consecutively *Owned Pegs* earn *Line Score Bonus* points.

> *Line Score Bonus* – Having three (3) *Owned Pegs* in a row, either horizontally, vertically, or diagonally on the same side of the *Rack* will *Score* 30 points.

> *Ring Score* – The *Score* given to an *Alliance* for correctly placing *Rings* on the *Rack* or the *Center Floor Goal*. Each level of the *Rack*, from the floor upward, is awarded a higher *Ring Score*.

Peg Score Bonus – The bonus points given to an *Alliance* for correctly placing an *Autonomous Ring* on a column of *Pegs* that has the IR Beacon attached during the *Autonomous Period*. All of the *Pegs* on a column designated by an IR Beacon are eligible for the *Peg Score Bonus* of 50 points per *Autonomous Ring.*

Corner Goal Bonus – The bonus points given to an *Alliance* for correctly placing *Weighted Rings* on the *Corner Goal*. The *Corner Goal Bonus* is calculated as 20% (per *Weighted Ring*) of the total *Ring Score* plus the *Line Score Bonus* for the *Alliance*.

Lifting Bonus – The bonus points given to an *Alliance* for supporting a *Robot* legally at least 1" (2.5cm) above the *Playing Field* floor tiles.

Scoring Area – The following are the *Scoring* areas for this year's game:

Rack – The central *Scoring* element for the game. The *Rack* is made from PVC piping and is comprised of 18 *Pegs* in two independent 3 level by 3 column arrangements. The *Rack* includes the IR Beacons.

Peg – A horizontal projection of PVC piping from the *Rack*. *Rings* placed successfully will be supported by only the *Pegs* and not touching a *Robot* of the corresponding *Alliance* color.

Center Floor Goal – The wooden base of the *Rack*. *Rings* placed successfully on the *Center Floor Goal* do not extend over the edge of the wooden base, and are not touching a *Robot* of the corresponding *Alliance* color.

Corner Goal – These are made of PVC pipe and are located in the corner of the field next to each *Alliance Station*. Successfully placed *Weighted Rings* will be supported by only the *Corner Goal Peg* and no other item on the *Corner Goal,* and not in contact with a corresponding *Alliance's Robot*. *Regular Rings* placed on the *Corner Goal* will have zero value.

1.6 Ring It Up! Penalty Summary

There are two types of penalties in Ring It Up! – Minor (10 points) and Major (50 points). Keep a lookout for the rules with DOUBLE Major (100 points) or TRIPLE Major (150 points) Penalties – DON'T BREAK THESE RULES . The following table shows the possible rule violations and their consequences:

Violation	Consequence	Rule
GENERAL GAME RULES		
Use of electronic communications after being called for *Match*	Warning; followed by Minor *Penalty* (10 points) per offense. May lead to *Disqualification* for *Match*	<G2>
Drive Team outside of *Alliance Station*	Warning; followed by Minor *Penalty* (10 points) per offense. May lead to *Disqualification* for *Match*	<G3>
Drive Team contacts field or game object	Warning; followed by Minor *Penalty* (10 points) per offense. May lead to *Disqualification* for *Match*	<G4>
Coach touches Gamepad joystick controller after start of *Match*	Warning for first offense. Repeated offense will result in a Major *Penalty* (50 points) per offense. May lead to *Disqualification* for *Match*	<G5>
Robot deliberately detaches parts in scoring area	*Robot* disabled and team *Disqualified* for *Match* Multiple infractions may result in *Disqualification* for the entire competition	<G7>
Robot grabs or attaches to *Playing Field* element or structure	Warning for first offense. Repeated offense will result in a Major *Penalty* (50 points) per offense. May lead to *Disqualification* for *Match*	<G8>
Deliberate tipping, entanglement, or damage	*Robot* disabled and team disqualified	<G9>
Pinning	Minor *Penalty* (10 points) per offense. May lead to *Disqualification* for the *Match*	<G10>
Team delays start of *Match*	Minor *Penalty* (10 points) per offense. May lead to *Disqualification* for the *Match*	<G13>
Egregious *Robot* or *Team* member behavior	Major *Penalty* (50 points) per offense. May lead to *Disqualification* for the *Match*	<G17>
RING IT UP! SPECIFIC GAME RULES		
Robots Possessing more than 2 *Rings*	Minor *Penalty* (10 points) per offense	<GR2>
Contact with opposing *Alliance's Ring* on their *Dispenser*	Major *Penalty* (50 points) per offense	<GR3>
Placing opposing *Alliance's Rings* on your *Dispenser*	Minor *Penalty* (10 points) per offense	<GR4>
Deliberately removing *Rings* from *Playing Field*	Minor *Penalty* (10 points) per offense. May lead to Disqualification	<GR5>
De-score *Rings* from the *Corner Goals* or from the *Rack* regardless of ownership	DOUBLE Major *Penalty* (100 points) per occurrence	<GR6>
Interference with lifting *Robots* on opposing *Alliance's* side of field	TRIPLE Major *Penalty* (150 points) per occurrence	<GR8>
Lifting your partner's *Robot* prior to the start of *End Game*	*Lifting Bonus* does not count	<GR9>
Touching *Robots* once IR Beacons have been placed	Minor *Penalty* (10 points) per occurrence and *Autonomous Ring Bonus* does not count	<GR10>

1.7   Ring It Up! Scoring Example
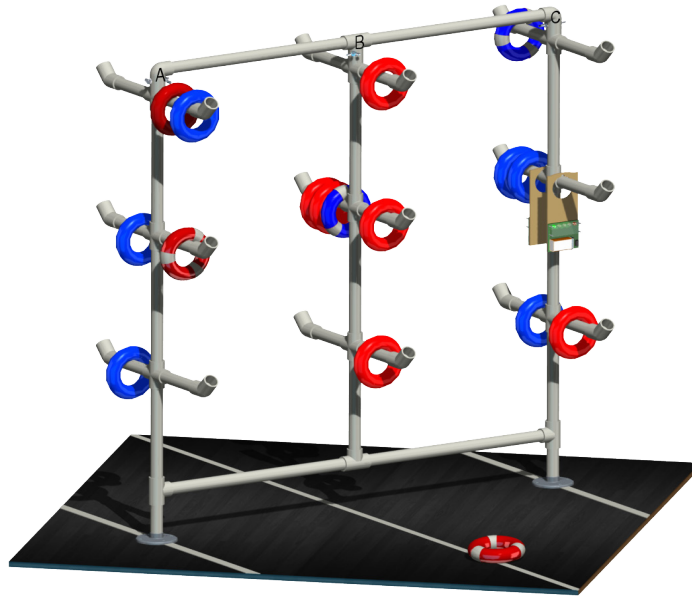
The picture above shows the status of the Rack after a match. For the purposes of discussion, the IR Beacons are placed on Column C (farthest away from audience; closest to FCS table). The red side of the rack is on the front side of the picture; the blue side is on the reverse.   The table below shows a summary of the scoring and then the final score will be calculated.

	Red Alliance	Blue Alliance
Autonomous Period	Red Side: A2 Peg Score Bonus: 0 points	Blue Side: C3, B2 Peg Score Bonus: 50 points (on Column C)
Ring Score	Level 1: 2 rings x 5 = 10 points Level 2: 4 rings x 10 = 40 points Level 3: 2 rings x 15 = 30 points Ring Score = 80 points (see note 1)	Level 1: 2 rings x 5 = 10 points Level 2: 4 rings x 10 = 40 points Level 3: 2 rings x 15 = 30 points Ring Score = 80 points
Peg Ownership	Red side: A2, A3, B1, B2, B3, C1. Blue side: None (see note 2)	Red side: A3. Blue side: A1, A2, B2, C1, C2, C3
Line Score Bonus:	Red side: B1-B2-B3 30 points A3-B2-C1 30 points Blue side: none	Red side: none. Blue side: A1-B2-C3 30 points A2-B2-C2 30 points C1-C2-C3 30 points
Notes	1) The Autonomous Ring on the Center Floor Goal does not count per <GR1>. 2) Even though Red has 2 rings on Blue side B2, Red does not own the Peg due to Blue having an Autonomous Ring there.	3) Both alliances own Red side A3 as they both have 1 ring on the peg. 4) Blue column A does not count for a Line Score Bonus because A3 is not owned on the Blue side. Likewise, the same for the Blue diagonal.
Final Score	Peg Score Bonus: 0 points Ring Score: 80 points Line Score Bonus: 60 points Corner Goal Bonus: <unknown> Lifting Bonus: <unknown> Penalties: <unknown> **Final Score: 140 points**	Peg Score Bonus: 50 points Ring Score: 80 points Line Score Bonus: 60 points Corner Goal Bonus: <unknown> Lifting Bonus: <unknown> Penalties: <unknown> **Final Score: 220 points**

Section 2 —Robot Inspection

2.1 Overview

This section describes *Robot* Inspection for the *FIRST* Tech Challenge 2012-2013 competition. It also lists the inspection definitions and inspection rules.

2.2 Description

The FTC *Robot* will be required to pass hardware and software inspections before being cleared to compete. These inspections will ensure that all FTC *Robot* rules and regulations are met. Initial inspections will take place during team check-in/practice time. The official FTC "Robot Inspection Checklists" are located in this section. **Teams are required to conduct a self-inspection of their robot and submit the completed hardware and software inspection forms at tournament check-in.**

2.3 Definitions

Robot - An operator controlled and/or autonomous programmed vehicle designed and built by a *FIRST* Tech Challenge team to perform specific tasks while competing in the annual game challenge. The Robot may only be constructed from materials and components outlined in Game Manual Part 1, Section 4.2.

Robot Initialization Routine – A set of programming instructions inserted immediately prior to the match control loop of the Autonomous or Driver-Controlled programs that serves to ready the *Robot* for a match.

Robot Sizing Box – A sturdily constructed cube with the interior dimensions; 18 inch (45.72cm) by 18 inch (45.72cm) by 18 inch (45.72cm) that has one open side with an interior opening size of 18 inch (45.72cm) by 18 inch (45.72cm). The Sizing Box is used for Robot Inspection as outlined in Section 2.4.

2.4 Inspection Rules

<I1>   FTC teams must submit their *Robot* for inspection prior to participating in practice rounds. At the discretion of the FTC Lead Inspector, the *Robot* may be allowed to participate in practice rounds before passing inspection.

<I2>   The team's *Robot* must pass all inspections before participating in Qualification Rounds. Noncompliance with any *Robot* design, construction rule, or programming requirements may result in disqualification of the *Robot* at an FTC event.

<I3>   The maximum size of the *Robot* for starting a Qualifying or Elimination Match is 18 inches (45.72cm) wide by 18 inches (45.72cm) long by 18 inches (45.72cm) high. The *Robot Sizing Box* will be used as the official gauge in determining conformance to this rule. The *Robot* must be self-supporting while in the *Robot Sizing Box* either:

a.   by mechanical means with the *Robot* in a power-OFF condition, or

b.   by a *Robot Initialization Routine* in the Autonomous mode program that may pre-position the servo motors, with the *Robot* in a power-ON condition, to the desired position by means of a single instruction to the HiTechnic Servo controller for each servo motor effected. If the *Robot* Initialization Routine does move the servos when a program is executed, there must be an indicator on the *Robot* of this fact. A warning label provided by the Tournament Host that is placed near the robot's main power switch will suffice:

WARNING! - Robot moves during Initialization Routine

<I4>   The team is required to request a re-inspection of their *Robot* by an Inspector when a modification to improve performance or reliability of their *Robot* has been made.

<I5>   It is the FTC Inspector's responsibility to evaluate *Robots* to insure each *Robot* has been designed to operate and function safely. Section 1.4.1 **<S1>** and Game Manual Part 1, Section 4 specify the safety rules and limitations that apply to the design and construction of all *Robots*.

<I6>   *Robot* inspection is a Pass / Fail process. A *Robot* has passed inspection when ALL requirements listed on the official FTC "*Robot* Inspection Sheets" have been successfully met and recorded as passed by an FTC Inspector.

Hardware Inspection Checklist

Team Number: _____   Overall Status (circle): **PASS / FAIL**

Team	Inspector	General Robot Rules	
		Robot fits within the Sizing Box (18" x 18" x 18") without exerting force on box sides or top	RG4
		Robot does NOT contain any components that could damage the playing field or other robots	RG3a&b
		Robot does NOT contain any hazardous materials	RG3c
		Robot poses NO obvious unnecessary risk of entanglement	RG3d
		Robot does NOT contain any sharp edges or corners	RG3e
		Main Power Switch is readily accessible and visible to competition personnel and installed properly	RG5 & R3d
		All batteries are securely attached to the robot	RG6
		NXT battery can be easily removed with minimal disassembly of the robot	RG7a
		USB ports (NXT and Samantha) are easily accessible	RG7b
		NXT Controller and Samantha Module buttons are readily accessible	RG7b
		NXT Controller liquid crystal display and Samantha LEDs are readily visible	RG7c
		Electrical components are mounted such that they are protected from Robot-to-Robot contact	RG7d
		Robot Flag Holder is present and adequately holds the flag during normal robot operation	RG8
		Team Number is visible from at least 2 sides (180 deg. apart), 3" tall, 1/2" stroke on a contrasting background. The numbers are robust enough to withstand the rigors of match play.	RG9
		Stored energy is provided by approved sources	RG10
		Game elements launched by the robot don't exceed height and range constraints	RG11
		Robot Parts and Materials Rules	
		All preformed components on the Robot are from the TETRIX, LEGO, and MATRIX robotic systems	R1 & R2c
		Robot does NOT contain COTS assemblies other than those specifically allowed in the rules	R2a
		Robot does NOT contain prefabricated and/or preformed COTS plastics or metal	R2b
		Robot does NOT contain additional mechanical parts other than the items listed in R2d	R2d
		Robot has exactly one (1) NXT controller and additional microprocessors comply with R3a	R3a
		Robot has one (1) official NXT rechargeable battery pack (AC or DC) or six (6) AA batteries (not both)	R3b
		Robot has exactly one (1) official TETRIX or MATRIX main battery pack	R3c
		Only HiTechnic or MATRIX motor and servo controllers are used (any quantity is permitted)	R3e
		Maximum of eight (8) TETRIX or MATRIX motors and twelve (12) servos, all controlled by HiTechnic or MATRIX controllers	R3f
		Each NXT motor port (A, B or C) controls no more than: (i) one NXT Interactive Servo Motor, or (ii) one XL Power Function Motor, or (iii) two E Power Function Motors, or (iv) two M Power Function Motors, or (v) one E plus one M Power Function Motors	R3g
		Robot has exactly one (1) Samantha module and one (1) USB cable	R3h
		All sensors attached directly to the NXT, HiTechnic Sensor Multiplexor, or HiTechnic Touch Sensor Multiplexor are LEGO or HiTechnic products	R3i
		HiTechnic 9-volt Battery Box (if used) is only used as part of the NXT Sensor Multiplexor	R3j
		HiTechnic SuperPro Prototype Board and NXT Prototype Board comply with the specified constraints	R3k
		Only LEGO approved NXT extension and conversion cables are used	R3l&m
		Electrical connectors are Anderson PowerPole, crimp, or quick connect styles	R3n
		Power, motor control, servo and encoder wires are the correct size	R3o
		Only visible light LEDs are used and powered by either the main battery or no more than one battery of any type not to exceed 9 volts	R3p
		Robot contains only specifically allowed electrical components and the electrical components have NOT been modified from their original state except as permitted by the rules	R3s
		LEGO Pneumatic Elements have NOT been modified to change their pressure limits	R4
		Decorative components used on the robot are constructed with allowed parts or they are non-functional. Decorations are in the spirit of Gracious Professionalism	R7

General Comments or Reason(s) for Failure (if any):

I hereby state that all of the above is true, and to the best of my knowledge all rules and regulations of the *FIRST* Tech Challenge have been abided by.

_____ _____

Hardware Inspector   Team Student Representative

Software Inspection Check List

Team Number: _____   Overall Status (circle): **PASS / FAIL**

Queuing Area Checklist:

Team	Inspector	Drive Team Members Present	
		Coach	
		Driver1	
		Driver 2 (optional)	
		NXT Configuration	
NA		Samantha unit has the latest firmware and competition connection settings flashed to it (see instructions below)	
		NXT named with team number (optional hyphenated letter appended)	RS2
		NXT Firmware Version (circle one) LabVIEW - 1.31 or newer ROBOTC - 9.0 or newer	RS3
		Samostat program is loaded on the NXT	RS4
		Program Chooser program is loaded on the NXT	RS5
		NXT Sleep Timer set to NEVER	RS6
		Queuing Process	
		Team understands that no software changes are allowed in Queue Area.	
		Team understands that the match schedule is only an estimate. Matches may start prior to or after the scheduled time and it is the teams' responsibility to monitor schedule changes and show up when required.	
NA		Team knows where to receive alliance flags and where to return them after the match.	

I certify that the robot is in the proper software configuration.

Queuing Area Inspection Completed by: _____

How to Flash Samantha For Competition at Software Inspection

1. Obtain the flash drive created by the FTA/FCS Operator with the Samantha.hex file and network key folders loaded.
2. Turn off the main robot battery.
3. Remove the NXT USB cable from Samantha and insert the flash drive into the USB port on the Samantha.
4. Hold down the red button on the Samantha, then power on the robot battery. Release the red button when the LEDs on the Samantha light up.
5. The Samantha LEDs will complete TWO cycles of: Red-White-Blue-White-Red.
6. After two full light cycles are complete (approximately 40-seconds), remove the flash drive from the Samantha and reconnect the NXT USB cable.

Important: ENSURE two full LED light cycles complete before removing the flash drive from the module.

Field Inspection Checklist:

Team	Inspector	Field Setup
NA		Connection with tournament-supplied FCS is successful
		Robot Setup procedure on the field is understood by the team and is successful
		Robot Functionality
		(Optional) Robot successfully ran an Autonomous program
		Robot did not move prior to the start of the Autonomous period except for servo initialization
		Robot did not move between the Autonomous and Driver-Controlled periods
		Robot's Driver-Controlled mode started when commanded to do so by the FCS
		Robot stopped at the end of the Driver-Controlled period
		Match Process
NA		Team understands how to call for FTA assistance during a match
		Team understands they cannot touch any robot or field element after the match ends until instructed to do so by the referees
		Teams understand they are to clear the alliance station as soon as the match ends with one team member remaining behind to collect the robot

I hereby certify that this team has demonstrated their understanding of the match process, their ability to properly control their robot, and that their robot operates as required during a match.

General Comments or Reason(s) for Failure (if any):

_____   _____

Software Field Inspector   Team Student Representative