2017-2018 FIRST® Tech Challenge
Game Manual Part 2
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Volunteer Thank You

Thank you for taking the time to volunteer for a FIRST® Tech Challenge event. FIRST® and FIRST® Tech Challenge rely heavily on volunteers to ensure events run smoothly and are a fun experience for teams and their families, which could not happen without people like you. With over 4,600 teams competing yearly, your dedication and commitment are essential to the success of each event and the FIRST Tech Challenge program. Thank you for your time and effort in supporting the mission of FIRST!

Revision History

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<tr>
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Gracious Professionalism® - “Doing your best work while treating others with respect and kindness - It’s what makes FIRST, first.”
Introduction

What is FIRST® Tech Challenge?
FIRST Tech Challenge is a student-centered program that focuses on giving students a unique and stimulating experience. Each year, teams engage in a new Game where they design, build, test, and program autonomous and driver operated robots that must perform a series of tasks.

They also cultivate life skills such as:

- Planning, brainstorming, and creative problem-solving.
- Research and technical skills.
- Collaboration and teamwork.
- Appreciating differences and respecting the ideas and contributions of others.

To learn more about FIRST Tech Challenge and other FIRST® Programs, visit www.firstinspires.org.

FIRST Tech Challenge Core Values
FIRST asks everyone who takes part in FIRST Tech Challenge to uphold the following values:

- We display Gracious Professionalism® with everyone we engage with and in everything we do.
- We act with integrity.
- We have fun.
- We are a welcoming community of students, Mentors, and Volunteers.
- What we learn is more important than what we win.
- We respect each other and celebrate our diversity.
- Students and adults work together to find solutions to challenges.
- We honor the spirit of friendly competition.
- We behave with courtesy and compassion for others always.
- We act as ambassadors for FIRST and FIRST Tech Challenge.
- We inspire others to adopt these values.

Gracious Professionalism®

FIRST uses this term to describe our programs’ intent and is shared with all young people engaging in FIRST programs. At FIRST, team members help other team members, but they also help other teams.

Gracious Professionalism® is not clearly defined for a reason. It has different meanings to everyone.

Some possible meanings of Gracious Professionalism include:

- Gracious attitudes and behaviors are win-win.
- Gracious folks respect others and let that respect show in their actions.

FIRST Tech Challenge is MORE THAN ROBOTS®!
While competing, students develop personal and professional skills they will be able to rely on throughout their life.
- Gracious Professionals make valued contributions in a way that is pleasing to others and to themselves.

In *FIRST*, Gracious Professionalism teaches teams and student participants:

- Learn to be strong competitors, but also treat one another with respect and kindness in the process.
- Avoid leaving anyone feeling as if they are excluded or unappreciated.
- Knowledge, pride and empathy should be comfortably and genuinely blended.

In the end, Gracious Professionalism® is part of everyday life. When professionals use their knowledge in a graciously and individuals act with integrity and sensitivity, everyone wins, and society benefits.

Watch Dr. Woodie Flowers explain *Gracious Professionalism* in this [short video](#).

**Gracious Professionalism for Volunteers**

It is a good idea to spend time going over this concept with Volunteers. Provide Volunteers with real-life examples of *Gracious Professionalism* in practice before, during, and after the event and recognize great *Gracious Professionalism* when you see it in action!

**Youth Protection Program**

The *FIRST* YPP sets minimum standards recommended for all *FIRST* activities. Adults working in *FIRST* programs must be knowledgeable of the standards set by the *FIRST* YPP, as well as those set by the school or organization hosting their team.

**Youth Protection Expectations and Guidelines**

Coaches and Mentors should read and follow the *FIRST* Youth Protection Program guide. Anything labeled as required is mandatory in the United States and Canada, and cannot be waived without approval from the *FIRST* Youth Protection Department. *FIRST* recommends that the standards set forth in the *FIRST* Youth Protection Program guide be applied outside of the United States and Canada to the extent possible. At a minimum, local regulations regarding youth protection must be complied with.

Most up to date forms are available here: [http://firstinspires.org/resource-library/youth-protection-policy](http://firstinspires.org/resource-library/youth-protection-policy)

The US Screening process, the Canadian Screen process, Frequently Asked Questions (FAQ), and additional information are on the *FIRST* Youth Protection Program Website: [http://firstinspires.org/resource-library/youth-protection-policy](http://firstinspires.org/resource-library/youth-protection-policy)

**NOTICE OF NON-DISCRIMINATION**

For Inspiration and Recognition of Science and Technology (*FIRST*) does not discriminate based on race, color, national origin, sex, disability, age, status as a veteran who served in the military, religion, gender, gender identity, or gender expression in its programs and activities.

Keep updated at: [http://www.firstinspires.org/about/legal-notices](http://www.firstinspires.org/about/legal-notices)
1.0 The Game

1.1 Introduction
This document describes FIRST® RELIC RECOVERY™ presented by Qualcomm® Incorporated, the FIRST®
Tech Challenge game for the 2017-2018 season. Teams must comply with all rules and requirements
stated in this document and in Part 1 of the Game Manual. Clarifications to the game rules are issued on the
Question & Answer section of the game forum at FTCFORUM.USFIRST.ORG. Forum rulings take
precedence over information in the game manuals.

1.2 Game Description
Matches are played on a Playing Field initially set up as illustrated in Figure 1.3-1 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 the opposing Alliance by Scoring Glyphs into the Cryptoboxes, transferring
Relics to the Recovery Zone, retrieving Jewels, balancing on the Balancing Stones, performing Autonomous
tasks, and navigating to specific parts of the Playing Field. The Scoring Elements for the game are 48
Alliance neutral Glyphs, 8 Alliance-specific Jewels (4 per Alliance) and 4 Alliance-specific Relics (2 per
Alliance). The game is played in two distinct periods: Autonomous and Driver-Controlled.

The Match starts with a 30-second Autonomous Period in which Robots operate using pre-programmed
instructions only. Alliances earn points by: (1) Selecting and removing opponent colored Jewels, (2) Scoring
Glyphs into the Cryptoboxes, and (3) Parking their Robot in a Safe Zone.

The two-minute Driver-Controlled Period follows the Autonomous Period. During this period, Teams earn
points for their Alliance by: (1) Scoring Glyphs into their Alliance’s Cryptoboxes and (2) Creating Cipher
patterns with their Glyphs in the Cryptoboxes.

The final 30 seconds of the Driver-Controlled Period is called the End Game. In addition to the previously
listed Driver-Controlled Period Scoring activities, Alliances earn points by (1) moving their Relics to safety in
the Recovery Zone and (2) balancing Robots on the Balancing Stones.
1.3 Playing Field Illustration

The following illustration identifies the Game Elements and give a general visual understanding of the game. Teams should refer to andymark.com/FTC for the exact Game Element dimensions. The official Playing Field documents including the official Field Setup Guide are available at https://www.firstinspires.org/resource-library/ftc/game-and-season-info. Please note: Playing Field wall heights may be different depending on the manufacturer. Measurements are located in the official Field Setup Guide. Please incorporate that into the design of your Robot.

![Figure 1.3-1 – Isometric view of the Playing Field](image)

Gracious Professionalism® - "Doing your best work while treating others with respect and kindness - It's what makes FIRST, first."
1.4 Game Definitions

The following definitions and terms are used in FIRST® RELIC RECOVERY™ presented by Qualcomm Incorporated:

Alliance – A grouping of two Teams that work together for a given Match. Alliances are designated as either “Red” or “Blue.”

Alliance Station – The designated “Red” or “Blue” Alliance Area adjacent to the Playing Field where the Drivers and Coach stand or move within during a Match. Station One is the Alliance Station closest to the audience.

Area – The space defined by the vertical projection of the outside edge of a region’s boundary (for example, gaffers tape, goal, Playing Field Wall). The boundary element (tape, wall, markings, etc.) is considered to be part of the Area for the purposes of determining Inside and Outside.

Autonomous Period – A thirty-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.

Balanced – The condition where a Robot is Completely Supported by a single Balancing Stone and no outer edge of the Balancing Stone is Supported by the Playing Field Floor, Robot parts, or Game Elements.

Balancing Stone – A 23 inches (58.4 cm) x 23 inches (58.4 cm) surface located approximately 2 inches (5.08 cm) above the Playing Field Floor. The Balancing Stone surface is Supported by a 5.75 inches (14.6 cm) x 5.75 inches (14.6 cm) x 1.375 inch (3.5 cm) tall pylon.

Block / Blocking – Preventing an opposing Alliance Robot from accessing an Area or Alliance-specific Game Element for an extended period by obstructing ALL paths of travel to the object or Area. Active defense played by a Robot shadowing an opposing Alliance Robot that effectively eliminates all paths of travel between the opposing Alliance Robot and an Area or Alliance-specific Game Element is considered Blocking, even though at any frozen point in time there is an open path. See also Trap / Trapping (which may be considered the same except it is FROM a Game Element or Area of the Playing Field).

Cipher – The Cipher is a pattern of twelve (12) brown and gray Glyphs Scored into a Cryptobox. There are six (6) Ciphers (see Appendix E) that if completed by an Alliance will earn that Alliance points and the ability to Score a Relic prior to the End Game.

Coach – A student Team member or adult mentor designated as the Drive Team advisor during the Match and identified by wearing a “Coach” badge or identifying marker.

Column – There are three (3) Columns per Cryptobox; Left, Center, and Right. A Column is Scored when there are four (4) Scored Glyphs in the Column and there is a Scored Glyph in each of the four (4) Rows that make up that Column.

Competition Area – The Area where all the Playing Fields, Alliance Stations, scoring tables, on-deck queuing tables, event officials, and other tournament items relating to Match play are located. The Team Pit Area and practice Playing Fields are not part of the Competition Area.

Control / Controlling – An object is considered to be Controlled by a Robot if the object is following the movement of the Robot. Objects that are Controlled by a Robot are considered to be part of the Robot. See Possess / Possessing to learn about a related term. Examples include, but are not limited to:
• Carrying – holding Game Elements Inside or Outside of a Robot.
• Herding – pushing or impelling Game Elements to a desired location or direction that gains a strategic advantage beyond moving the Robot around the field.
• Holding – Trapping one or more Scoring Elements against a Game Element, Playing Field Wall, or Robot in an attempt to shield or guard them.
• Launching – propelling Game Elements into the air or throwing in a forceful way.

Examples of interaction with Game Elements that are not Controlled include, but are not limited to:

• Plowing – Inadvertent contact with Game Elements while in the path of the Robot moving about the Playing Field.
• Deflecting – Inadvertent contact with a launched Game Element as it bounces off a Robot.

Cryptobox – An Alliance-specific Scoring Area where Robots place Glyphs. Each Cryptobox contains three (3) vertical Columns and four (4) horizontal Rows. There are four (4) Alliance-specific Cryptoboxes (2 red, 2 blue).

Cryptobox Key – A randomly selected Cryptobox Column used as a Scoring achievement during the Autonomous Period.

Disable / Disabled – A Robot that is no longer active for the remainder of the Match due to a Robot failure or by the request of a referee. Teams may not Disable a Robot without the permission of a Field Technical Advisor or referee. If a referee Disables a Robot during a Match, he/she will ask the Team to drive their Robot to a neutral position on the Playing Field, issue a stop command with the Driver Station, and place their Driver Station in a hands-off location on a tournament-provided structure or the Alliance Station floor.

Disqualified / Disqualification / Disqualify – A Team that is Disqualified from a Match has their Robot Disabled and will not receive credit for the Match (i.e., no Qualifying or Ranking points).

Drive Team – Up to three representatives (two Drivers and one Coach) from the same Team.

Driver – A pre-college student Team member responsible for operating and controlling the Robot and identified by wearing a tournament supplied “Driver” badge or identifying marker.

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

Driver Station – Hardware and software used by a Drive Team to control their Robot during a Match. The Driver Station consists of an Android device, FIRST Tech Challenge supplied Android App, adapter cable(s), optional non-powered (i.e., does not draw power from a DC power input port) USB Hub, an optional commercial off the shelf USB external battery connected to the USB Hub to charge the Android device at any time, and up to two controllers to drive the Robot. The only allowed controller models are the Logitech F310 Gamepad and the Xbox 360 Controller for Windows (Part #: 52A-00004).

End Game – The last thirty seconds of the Driver-Controlled Period.

Game Element – Any item Robots interact with to play the game. Game Elements for this year’s game include: Glyphs, Relics, Jewels, Balancing Stones, Relic Recovery Zones, Pictographs, and the Cryptoboxes.

Glyph – An Alliance neutral Scoring Element for the game. The Glyph is a foam cube measuring approximately 6 inches ± 0.25 inches (15.2 cm ± 0.635 on a side). Brown Glyphs weigh approximately 4.18 ounces (118.39 gm) and gray Glyphs weigh approximately 3.83 ounces (108.64 gm). There are twenty-four (24) gray Glyphs and twenty-four (24) brown Glyphs.
**Glyph Scoring** – A Glyph is considered Scored when any part of the Glyph is between two Cryptobox Rails and is not in contact with a Robot of the corresponding Alliance. A 2 inch wide strip of tape is placed on the Playing Field Floor across the tips of the Rails to provide a visual aid to help determine if a Glyph is between the Rails. See Appendices C and D for further detail.

**Glyph Pit** – The location where forty-four (44) Glyphs reside at the start of a Match (there are an additional four (4) Glyphs Pre-loaded into the Robots). The Glyphs are randomly placed into the Glyph Pit.

**In (Inside) / Completely In (Completely Inside)** – An object that has crossed into the upwards vertical (i.e., at a right angle to the Playing Field Floor) extension of a defined Area’s boundary is Inside the Area. An object that is entirely within the upwards vertical extension of a defined Area’s boundary is Completely Inside the Area. The boundary element (tape, wall, markings, etc.) is part of the Area for the purposes of determining Inside and Outside.

**Inadvertent** – An outcome that is not a planned strategy and not the predictable result of persistent or repeated actions.

**Inconsequential** – An outcome that does not influence Scoring or gameplay.

**Jewel** – An object that Robots interact with during the Autonomous Period to earn points for their Alliance. FIRST® RELIC RECOVERY℠ is played with four (4) Jewel Sets which are located as shown in Figure 1.3-1. There are four (4) Jewels per Alliance. The Platform is a 0.48 inches (1.2 cm) thick plate with two holes into which the Jewels are placed. The Platforms are not affixed to the Playing Field in any manner. The Jewels measure 3.75 inches (9.5 cm) in diameter and weigh approximately 1.98 ounces (56.13 gm).

**Jewel Set** – Jewel Set consists of a platform and two Jewels. Each Jewel Set starts the Match with two Jewels, one red, one blue.

**Match** – A head-to-head competition between two Alliances. A Match consists of a thirty-second Autonomous Period followed by a two-minute Driver-Controlled Period for a total time of two minutes and thirty seconds.

**Off / Completely Off** – Not physically in contact with or Supported by an object, surface, etc.

**On / Completely On** – An object that is physically in contact with and at least partially Supported by an object, surface, etc. is considered On. An object that is entirely Supported by another object, surface, etc. is Completely On.

**Out / Outside** – An object that has NOT crossed into any part of a defined Area is Outside the Area.

**Park / Parked** – The condition where a Robot is motionless.

**Penalty** – The consequence imposed for a rule or procedure violation that is identified by a referee. When a Penalty occurs, points will be awarded to the Alliance that did not incur the Penalty. Penalties are further defined into Minor Penalties (ten points) and Major Penalties (forty points). Penalties may also escalate to issuing of a Yellow Card or Red Card as a result of a continued occurrence of a rule violation and upon discretion of the Referee.

**Yellow Cards and Red Cards** – In addition to rule violations explicitly listed in section 1.6, Yellow Cards and Red Cards are used in the FIRST Tech Challenge to manage Team and Robot behavior that does not align with the mission of FIRST.
The Head Referee may assign a Yellow Card as a warning, or a Red Card for Disqualification in a Match, as a result of egregious Robot or Team member behavior, or repeated (3 or more) violations of a rule at the event. A Yellow Card or Red Card is indicated at the end of a Match by the Head Referee standing in front of the Team’s Alliance Station and holding a Yellow Card and/or Red Card in the air.

Yellow Cards are additive, meaning that a second Yellow Card is automatically converted to a Red Card. A Team is issued a Red Card for any subsequent incident in which they receive an additional Yellow Card, including earning a second Yellow Card during a single match. To issue the second yellow card, the Head Referee will stand in front of the Team’s Alliance Station and hold a Yellow Card and Red Card. The Head Referee will signal the second Yellow Card after the match has ended.

A Team that has received either a Yellow Card or a Red Card carries a Yellow Card into following matches, except as noted below. A Red Card results in match Disqualification. Multiple Red Cards may lead to Tournament Disqualification. Once a Team receives a Yellow Card or Red Card, the Team number is presented with a yellow background on the audience screen at the beginning of all following matches. This is a reminder to the Team, referees, and audience the Team carries a Yellow Card.

Yellow Cards do not carry over from the qualification Matches to the elimination Matches. During the elimination Matches, Yellow and Red Cards count against the entire Alliance, not to a specific Team. If a Team receives a Yellow Card or Red Card, it results in the entire Alliance receiving the Yellow Card or Red Card for that Match. If two different Teams on the same Alliance are issued Yellow Cards, the entire Alliance is issued a Red Card. A Red Card results in zero (0) points for that Match, and the Alliance loses the Match. If both Alliances receive Red Cards, the Alliance which committed the action earning the Red Card first chronologically loses the Match.

Pictograph – An image containing an encoded message that reveals the location of the Cryptobox Key. The Pictograph is attached to the Playing Field Wall adjacent to each Jewel platform. There are three different Pictographs, each representing a different Column in the Cryptobox. The Pictograph is randomly chosen prior to the start of each Match as described in Appendix G. Pictographs are difficult for humans to decode; however, a Robot can easily decrypt the Pictograph using its onboard Android phone camera and the Vuforia software built into the FIRST Tech Challenge software development kit.

Pin / Pinning – Preventing the movement in ALL directions of an opposing Alliance Robot while it is in contact with the Playing Field Wall, one or more Game Elements, or another Robot.

Playing Field – The part of the Competition Area that includes the 12 ft. x 12 ft. (3.66 m x 3.66 m) field, the Recovery Zone, and all the Game Elements described in the official field documents. From the audience viewpoint, the Red Alliance Area is on the right side of the Playing Field.

Playing Field Damage – A physical change to a Game Element or Playing Field that affects game play or an action that causes harm to the playability of a Game Element or Playing Field.

For example: Black tire marks on a Game Element is not considered Playing Field Damage. However, digging a hole larger than 1 inch (2.54 cm) diameter (approximately the size of a US quarter) into the Playing Field tiles or Glyphs is considered Damage.

Playing Field Floor – The surface of the tiles that make up the base of the Playing Field.

Gracious Professionalism® - "Doing your best work while treating others with respect and kindness - It's what makes FIRST, first."
**Playing Field Perimeter** – The outside face of the *Playing Field Wall*.

**Playing Field Wall** – An approximate 12 inches (0.3 m) tall, 12 ft. (3.66 m) long by 12 ft. (3.66 m) wide wall surrounding the *Playing Field Floor*. The height of the *Wall* will vary depending on which *Playing Field Wall* is being used at the event. *Robots* should be built to interact with all legal perimeters.

**Posess / Possessing** – An object is in Possession by a *Robot* if, as the *Robot* moves or changes orientation (for example, moves forward, turns, backs up, spins in place), the object remains in approximately the same position relative to the *Robot*. Objects in Possession of a *Robot* are considered to be Controlled, and they are part of the *Robot*. See also Control/Controlling.

**Rail** – The portion of the Cryptobox that extends from the back panel of the *Cryptobox* onto the field where Glyphs can be Scored. The color of the Rails indicate which Alliance owns the Cryptobox.

**Recovery Zone** – There are two (2) Alliance-specific Recovery Zone mats that are located outside the Playing Field Perimeter, adjacent to the wall facing the audience. Each Recovery Zone contains three (3) distinct Scoring Areas at different distances from the *Playing Field Wall* where a *Robot* may place a *Relic*. The Scoring Areas are designated as 1, 2, and 3. Recovery Zone 1 is closest to the *Playing Field Wall*.

**Relic** – An Alliance-specific Scoring Element. The Relics measure 6.0 inches (15.2 cm) side to side, 3.25 inches (8.25 cm) front to back, and 10 inches (25.4 cm) tall and weigh approximately 4.72 ounces (141 gm) each. There are four (4) Relics, two (2) per Alliance. At the start of a Match, one Relic is placed in each corner of the *Playing Field Wall*, the Relic will be in a standing orientation and must touch both adjacent walls. The two (2) Blue Relics are adjacent to the wall in front of the Blue Alliance Station and the two (2) Red Relics are adjacent to the wall in front of the Red Alliance Station.

**Robot** – Any mechanism that has passed inspection and a Drive Team places on the *Playing Field* prior to the start of a Match. A detailed definition of *Robot* is in the *Robot* rules section in the Game Manual Part 1.

**Row** – There are four (4) Rows per Cryptobox. Each Row is delineated by a strip of 1 inch (2.54 cm) wide, white gaffer tape. The bottom edge of each Row is coincident with the bottom edge of a tape strip. A Row is Scored when there is a Scored Glyph in each of the three (3) Columns that make up that Row.

**Safe Zone** – The Area in front of the Cryptobox that is outlined in red or blue gaffer tape. The triangle is 32 inches (81.28 cm) wide at the base and the apex extends 24 inches (61.0 cm) from the wall.

**Scoring / Score** – Robots earn points for their Alliance by interacting with Scoring Elements and Parking in specific Areas of the *Playing Field*. Scoring Elements are considered to be Scored when they are placed in the appropriate location and are no longer in contact with a *Robot* from the corresponding Alliance. The Scoring achievements and their point values are described in section 1.5.

**Scoring Elements** – Objects that Robots manipulate to earn points for their Alliance. The Scoring Elements for *FIRST® RELIC RECOVERY®* are Glyphs, Relics, and Jewels.

**Support / Supported / Completely Supported** – A *Robot* is Supported by an object if that object is bearing at least some of the weight of the *Robot*. If the object is bearing all the *Robot*’s weight, the *Robot* is Completely Supported by the object.

**Team** – Mentors, supporters, and pre-college-aged students affiliated with an entity registered with *FIRST* and for the competition.

**Trap / Trapping** – Preventing an opposing Alliance *Robot* escaping from a constrained Area of the *Playing Field* or from a Game Element for an extended period of time by obstructing ALL paths of travel from the...
object or Area. See also Block / Blocking (which may be considered the same except it is TO a Game Element or Area of the Playing Field).

1.5 Game Play
Prior to the start of the Match, Drive Teams perform some basic Robot setup steps that are described in section 1.5.1. Matches are made up of several periods totaling two minutes and thirty seconds. There is a thirty-second Autonomous Period, followed by a two-minute Driver-Controlled Period. The last thirty seconds of the Driver-Controlled Period is called the End Game.

1.5.1 Pre-Match
Field personnel will place all forty-eight (48) Glyphs in the Glyph Pit and the four (4) Relics in the corresponding Alliance corners.

Drive Teams receive an Alliance-colored Robot-identification flag from field personnel; this flag must be securely mounted on the Robot as defined in the Robot rules. Drive Teams place their Robots in any orientation on the Playing Field with the following constraints:

1) Robots must start Balanced on a Balancing Stone of the same color as the Alliance, one (1) Robot per Balancing Stone. The Balancing Stone must remain square to the Playing Field Walls when the Robot is placed. If a Robot cannot be Balanced, the Robot is not eligible to earn points for their Alliance during the Autonomous Period however it still must start On the Balancing Stone.

2) Drive Teams are required to pre-position or pre-load one (1) Glyph per Robot. Drive Teams may choose which color Glyph they want to pre-load. Field Personnel will retrieve the Glyphs from the Glyph Pit and provide them to the Drive Teams. Teams are not allowed to retrieve Glyphs from the Glyph Pit themselves. The Glyph must be in contact with the Robot.

Field personnel will randomize the Jewels and Pictographs as described in Appendix G.

Once the first Jewel or Pictograph has been placed:

1) Drive Teams may no longer touch their Robots (including pre-loaded / pre-positioned Glyphs) until the conclusion of the Match, and

2) Drive Teams may not touch their Driver Stations or Controllers until the Autonomous Period has ended, except to start their Autonomous program with a single touch to the Driver Station Android device screen.

1.5.2 Autonomous Period
The Match starts with a thirty-second Autonomous Period where Robots are operated via pre-programmed instructions only. Teams are not allowed to control Robot behavior with the Driver Station or any other actions during the Autonomous Period. The Driver Station is placed in a hands-off location during the Autonomous Period so that it is evident that there is no human control of Robots. The only exception is to allow Drive Teams to start their Robot with a single start command issued on the Driver Station Android device using the built-in thirty-second timer. The Autonomous Period begins following a start countdown (for example, 3-2-1-go) by field personnel, signaling Drive Teams with Robots that plan to run an Autonomous OpMode to issue a Robot start command with their Driver Station. Failure to adhere to this procedure may subject the Team and/or Alliance to a Penalty as specified in the game rules in Section 1.6.2.

The Autonomous Score is based on the number and locations of Glyphs placed in Cryptoboxes during the Period, the state of the Jewels, and location of the Robots at the end of the Period after all Game Elements and Robots have come to rest. Points are awarded for the following achievements:

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1) **Jewels** – The Jewels are randomly set up at the start of a Match, as described in Appendix G, so that Robots must use onboard sensors to identify the correct Jewel to remove in favor of their Alliance (i.e., Robots on the Red Alliance will try to remove the blue Jewel).

Platforms with a single Jewel remaining on them will earn thirty (30) points for the Alliance corresponding to the color of the Jewel.

2) **Glyph In Cryptobox** – Each Glyph that is Scored into an Alliance-specific Cryptobox by a Robot will earn the corresponding Alliance fifteen (15) points regardless of its location or which Alliance placed it. See Appendix C and D.

3) **Cryptobox Key** – One of the three Cryptobox Columns is randomly selected at the start of the Match to be the Cryptobox Key. Robots, using a vision sensor, may decrypt the Pictograph’s message to reveal which of the three Columns is the Cryptobox Key. If the first Glyph Scored into a Cryptobox is placed in the correct Cryptobox Key Column (at any height), it earns a thirty (30) point bonus in addition to the fifteen (15) points earned for loading the Glyph into the Cryptobox. This Score is awarded to the Alliance corresponding to the Cryptobox’s color.

4) **Robot Parking** – A Robot Parked In a Safe Zone for their Alliance earns ten (10) points.

### 1.5.3 Driver-Controlled Period

Directly following the end of the Autonomous Period, Drive Teams have five (5) seconds to pick up their Driver Stations. This is followed by a 3-2-1 countdown which signals the beginning of the two-minute Driver-Controlled Period.

Drive Teams start their Robots by pressing the start button on their Driver Station Android device. Failure to adhere to this procedure may subject the Team and/or Alliance to a Penalty as specified in the game rules in Section 1.6.2.

The Driver-Controlled Score is based on the number of Glyphs Scored into the Cryptoboxes, the state of the Cipher pattern in each Cryptobox, and the locations of the Relics and Robots at the end of the Match after all Game Elements and Robots have come to rest. At the end of the Driver-Controlled Period, points are awarded for the following achievements:

**Glyphs Scored** into an Alliance-specific Cryptobox earn points as follows:

1) Each Glyph Scored in the Cryptobox earns two (2) points for the corresponding Alliance.
2) Each completed Row of Glyphs (a Scored Glyph in each of the three (3) Columns that make up the Row) earns ten (10) points.
3) Each completed Column of Glyphs (must have a total of four (4) individual Glyphs with a Scored Glyph in each of the four (4) Rows) earns twenty (20) points.
4) A completed Cipher, consisting of all twelve (12) individual Glyphs in the proper arrangement, earns thirty (30) points.
5) Points earned in the Cryptobox are cumulative. For instance, if an Alliance Scores twelve (12) Glyphs into a Cryptobox they earn 24 points (2 per Glyph) + 40 (10 per Row) + 60 (20 per Column) for a total of 124 points. If the twelve (12) Scored Glyphs form a Cipher the Alliance will earn a 30-point bonus for a total of 154 points.

### 1.5.4 End Game

The last thirty seconds of the Driver-Controlled Period is called the End Game. During the End Game Robots may reach over the Perimeter Wall and Score a Relic in the Recovery Zone. If a Cryptobox Cipher is correctly solved prior to the start of End Game, Teams are permitted to reach over the Perimeter Wall and
attempt to *Score* a *Relic* early. One (1) *Relic* may be *Scored* early for each completed *Cipher*. Referees will signal the *Alliance* when they are allowed to *Score* a *Relic*. If a *Cipher* has not been completed, the *Alliance* must wait for the start of the *End Game Period* to score their *Relic*. *Robots* may continue to perform all the other *Driver-Controlled Scoring* activities during the *End Game*. Points are awarded at the end of the *Match* for the following *End Game* achievements:

1. **Relics in the Recovery Zone** – An *Alliance* will earn points for all *Relics* that are *In* their corresponding *Recovery Zone* at the end of the *Match* subject to the following provisions:
   a. **Zones** – *Relics* *In* Zone 1 earn ten (10) points, *In* Zone 2 earn twenty (20) points, *In* Zone 3 earn forty (40) points. *Relics* may only earn points for being in one (1) *Zone* at a time. If a *Relic* is touching two (2) *Zones*, points will be awarded for the higher value *Zone*.
   b. *Relics* that remain upright *In* the *Recovery Zone* (bottom surface is the only part of the *Relic* that is in contact with the *Relic Recovery Zone*) earn an additional fifteen (15) points per *Relic*.

2. **Robots Balanced on Balancing Stone** – A *Robot* will earn twenty (20) points for being * Balanced on a Balancing Stone* at the end of the *Match*. *Robots* may only *Balance* on *Balancing Stones* corresponding to their *Alliance* color.

At the conclusion of the *Driver-Controlled Period*, *Drive Teams* are required to press the “Stop” button on their *Driver Station* Android Device. Failure to press the “Stop” button within a reasonable human reaction time is considered a violation of Rule <G9>.

**1.5.5 Post Match**

After the *Match*, *Score Trackers* will complete recording the number of *Glyphs*, *Rows*, *Columns*, and *Ciphers* *Scored* into *Cryptoboxes*, the state of the *Robots*, and the locations of the *Relics*. After the *Score Trackers* are finished *Scoring* the *Playing Field*, Referees will signal for the *Drive Teams* to enter the *Playing Field* and retrieve their *Robots*. *Drive Teams* should not step on or over the *Balancing Stones* or the *Recovery Zone* mats when retrieving their *Robots*. The *Drive Teams* should return *Glyphs*, *Jewels*, and *Relics* that are *Possessed* by the *Robot* to the *Playing Field* and return the *Alliance*-colored *Robot* identification flag to the field personnel. The *Playing Field* reset crew will set up the *Playing Field* for the next *Match*.

**1.5.6 Penalty Scoring**

*Penalty points are added to the non-offending Alliance’s Score* at the end of the *Match*. *Minor Penalties* give the non-offending *Alliance* ten (10) points per occurrence. *Major Penalties* give the non-offending *Alliance* forty (40) points per occurrence.
1.5.7 Flowchart of Match Play
The following figure shows the flow of the Match and the actions taken on the Driver’s Station Android device.

1.6 Rules of Game Play
Game play is restricted by the Safety rules (<S#>), the General rules (<G#>), and the Game-Specific rules (<GS#>). Other rules to pay close attention to are the Robot rules, the inspection rules, and the tournament rules defined in the Game Manual Part 1. Violation of rules may lead to Penalties, Yellow Cards and/or Red Cards, a Disabled Robot, Disqualification of the offending Team and/or Alliance from either a Match or the tournament. Rules apply to all periods of play unless specifically called out otherwise. If rules are in conflict, Safety rules take precedence over all rules and Game-Specific rules take precedence over General rules. The official FIRST Tech Challenge Question & Answer Forum rulings take precedence over all information in the game manuals.

1.6.1 Safety Rules
<S1> Unsafe Robot and Playing Field Damage – If at any time the Robot operation is deemed unsafe or has damaged the Playing Field or another Robot, by the determination of the referees, the offending Robot may be Disabled and the Team may be issued a Yellow Card. Re-inspection of the Robot is required before it may play another Match.

The intent of this rule is to immediately stop unsafe Robot actions or Playing Field Damage that is likely to persist with continued Robot operation. Robots that can continue safe operation without damaging the Playing Field will receive a warning and may continue to play the Match. Robots will be Disabled for unsafe operation or Playing Field Damage that occurs after the first warning for the tournament.
Robin Extension Outside the Playing Field Perimeter – If any portion of the Robot contacts anything Outside the Playing Field Perimeter, the Team will be issued a Yellow Card and it may be Disabled immediately for the remainder of the Match, unless allowed by Game-Specific rule(s) listed in Section 1.6.3. See the game definitions in section 1.4 for a complete description of the Playing Field Perimeter.

The intent of this rule is not to Penalize an Alliance for Inadvertent, safe Robot extension Outside the Playing Field Perimeter. Intentional Robot extension Outside the Playing Field is not permitted, except as allowed by game-specific rules listed in Section 1.6.3.

Safety Gear – All members of the Drive Team are required to wear approved eye protection and shoes with closed toes and a closed-back. If any member of the Drive Team is not wearing these safety items, the referee will issue a warning and if the situation is not remedied within thirty seconds, the offending member(s) of the Drive Team must leave the Competition Area for the remainder of the Match and may not be replaced by another Team member. Failure to comply with a request to leave the Competition Area violates rule <G27>.

1.6.2 General Game Rules

Drive Team – Each Drive Team shall include up to two Drivers and one Coach. Electronic communications (cell phone, two-way radio, Wi-Fi, Bluetooth, etc.) by Drive Team members after an Alliance has been called from the queue to the Playing Field for its Match are not allowed. The first instance of violating this rule will result in a warning, with any following instances during the tournament resulting in a Minor Penalty. Items that may be mistaken by a casual observer as being in violation should not be brought to the Playing Field. The Driver Station is exempt from this rule, but must be used only for operating the Robot.

Pre-Match Robot Setup – At the beginning of a Match, each Alliance Robot must be set up on the Playing Field in accordance with section 1.5.1. After Robots have been set up on the Playing Field, Drive Teams are required to stand Completely Inside the Alliance Station at the location (Station one or Station two) specified by the Qualification Match schedule.

a. During the Qualification Matches, the Blue Alliance Robots are set up on the Playing Field first, unless the Red Alliance waives their right to set up on the Playing Field second.

b. During the Elimination Matches, the 3rd and 4th seeded Alliance Robots are set up on the Playing Field first, unless the higher seeded Alliance waives their right to set up on the Playing Field second. Alliance color doesn’t change the seeding of a Team during the Elimination Matches. If the 4th seed defeats the 1st seed in the Semi-Finals, they will still have to place their Robot on the field first in the Finals because their seeding will be lower than the 2nd or 3rd seed.

c. Teams may implicitly waive their right to place their Robots on the Playing Field last by placing their Robots on the Playing Field before or in conjunction with the opposing Alliance. There is no need to notify the referees; Teams waive their right by the act of placing their Robots on the Playing Field.

d. Teams that unnecessarily delay the beginning of a Match and/or field reset will incur a Minor Penalty for each offense.

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Drive Teams are expected to stage their Robots for a Match, and remove them from the Playing Field afterwards, safely and swiftly. Drive Team efforts that either intentionally or unintentionally delay the start of a Match or the Field reset are not allowed. Examples include, but are not limited to:

- Late arrival to the Playing Field.
- Robot maintenance once on the Playing Field.

**<G3> Robot Starting Volume** – Before the start of a Match, each Robot in its starting location must not exceed a volume of 18 inches (45.7cm) wide by 18 inches (45.7cm) long by 18 inches (45.7cm) tall. The Alliance identification flag and pre-loaded Scoring Elements may extend Outside the 18-inch (45.7cm) cube volume constraint. An offending Robot will be Disabled and powered off for the Match at the Head Referee’s discretion and must remain on the Playing Field in its starting location for the length of the Match. After the start of a Match, the Robot may extend in any dimension unless restricted by the Game-Specific rules detailed in Section 1.6.3.

**<G4> Robot Setup Alignment Devices** – Alignment devices are allowed during pre-Match setup if they are constructed from legal components, are part of the Robot, and remain Completely Inside the 18-inch (45.7cm) cube starting volume constraint during the set up process. A Minor Penalty will be assessed to the Team for violation of this rule.

The intent of this rule is to prohibit the use of devices external to the Robot and to prevent the extension of any object or tool Outside the 18-inch (45.7cm) cube starting volume. Humans standing on the other side of the field to aid in aligning the Robot are not allowed.

**<G5> Alliance Station** – During a Match, the Drivers and Coach must remain Completely Inside their Alliance Station. The first instance of leaving the Alliance Station will result in a warning, with any following instances resulting in a Minor Penalty. Leaving the Alliance Station for safety reasons will not result in a warning or Penalty.

**<G6> Starting Game Play Early** – Robots that start play of the game (Autonomous or Driver-Controlled Period) prior to competition personnel announcing the start of a Match Period receive a Minor Penalty. Referees have the option of issuing a Major Penalty in place of the Minor Penalty if the early start results in a competitive advantage for the offending Alliance.

**<G7> Late Start of the Autonomous Period** – Teams participating in the Autonomous Period are expected to press the "start with 30-second" button on their Driver Station Android device and then place the Driver Station in a hands-off location without delay when field personnel signal the start of the Autonomous Period. A Minor Penalty is assessed for violating this rule. Referees have the option of issuing a Major Penalty in place of the Minor Penalty if the late start results in a competitive advantage for the offending Alliance.

**<G8> Stopping Autonomous Period Game Play Early** – Drive Teams that use their Driver Station to stop their Robot before the end of the Autonomous Period will receive a Major Penalty. In the case of unsafe Robot behavior, the Drive Team will not be Penalized for stopping the Robot if it is performed with the approval of a referee or Field Technical Advisor.
<G9> Stopping Game Play Late – Robots that do not stop playing the game at the end of the Autonomous or Driver-Controlled Periods when competition personnel or timer software announce the end of a Match period receive a Minor Penalty and the actions of the Robot occurring after the end of a Match period do not count towards their Alliance’s Score. Referees have the option of issuing a Major Penalty in place of the Minor Penalty if the late stop results in a competitive advantage (other than Scoring) for the offending Alliance.

Scoring Elements that were launched before the end of the period are eligible to be counted as Scored. Other Robot Scoring achievements that occur after the announced end of the Autonomous Period and before the start of the Driver-Controlled Period do not count towards the Score for the Autonomous or Driver-Controlled Periods. Referees may remove any Scoring Elements from a Scoring Area that are improperly Scored in this manner.

The intent of this rule is for Robots to stop playing the game within a reasonable human reaction time following the start of the game sound (i.e., buzzer) signaling the end of the period. Drive Teams should make their best effort to stop game play immediately when the end of period game sound begins. Before the consequences come into play, referees will use their discretion to give Drive Teams an approximate one second grace period following the conclusion of the game sound signaling the end of the period for Robots to stop playing the game.

<G10> Drive Team Contact with the Playing Field or Robot – During a Match, the Drivers and Coaches are prohibited from making contact with the Playing Field, any Game Element, or any Robot. The first instance of contact will result in a warning, with any following instances resulting in a Minor Penalty. Contact that affects Scoring and/or game play will result in issuance of a Yellow Card at the discretion of the referees. Contact with the Playing Field, a Game Element, or a Robot for safety reasons will not result in a warning or Penalty.

For example, a Game Element is launched from a Robot on the Playing Field and it Inadvertently hits a Team member in the Alliance Station and is deflected back onto the field. The Team would NOT receive a Penalty because the Team member was protecting him/herself (safety). However, if that same Game Element is caught and/or directed to a specific location on the Playing Field, the Team may be issued a Penalty.

<G11> Autonomous to Driver-Controlled Period Transition – At the conclusion of the Autonomous Period, Robots will remain in a hands-off state. Field personnel will not enter the field, and will not touch Robots on the field from the Autonomous to Driver Controlled transition.

Important Note: Rule <G11> is a major change for the 2017-2018 season. Volunteers, Coaches and Teams must be prepared for this new transition during the competition season.

<G12> Drive Team Coach Driver Station Control – During the Driver-Controlled Period, Robots must be remotely operated only by the Drivers using the Gamepads connected to the Team’s Driver Station and/or by software running in the on-board Robot control system. The first instance of Coach controlling a Robot (for example, operating a Gamepad) will result in a warning, with any following instances resulting in a Major Penalty. During the Driver-Controlled Period, Drive Team Coaches and/or Drivers are allowed to hold the

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Team’s Driver Station Android device and interact with it to select an Op Mode, view information displayed on the screen, and initialize, start, stop, and reset the Robot.

**<G13> Recording the Scores During the Match/After Objects Come to Rest** – Scoresheets will be filled out by the Score Trackers throughout the Autonomous and Driver-Controlled Periods of the Match. At the conclusion of the Match, the final Score will be recorded once all elements have come to rest. A change in state of a Game Element or Robot after its Score is recorded on the scoresheet will not change an already-recorded Score.

**<G14> Robots Deliberately Detaching Parts** – Robots may not deliberately detach parts during a Match, or leave mechanisms on the Playing Field. The consequence of deliberately detaching a part is a Minor Penalty if it does not Block an opposing Alliance Robot, Alliance-specific Scoring Element or Scoring Area. If a deliberately-detached component or mechanism affects gameplay by any Robot, the offending Robot will receive a Major Penalty and will be issued a Yellow Card. Robot parts that are released but remain connected by a tether are considered detached for the purposes of this rule.

Tethered components that move independent of the main Robot are considered a detached component and are illegal.

**<G15> Robots Grasping Game Elements** – Robots may not grab, grasp and/or attach to any Game Element or structure other than Scoring Elements, unless specifically allowed by game-specific rule(s) listed in Section 1.6.3. The first instance will result in a warning with any following violations resulting in a Major Penalty.

**<G16> Destruction, Damage, Tipping, etc.** – Strategies and/or mechanisms aimed solely at the destruction, damage, tipping over, or entanglement of Robots or Game Elements are not in the spirit of the FIRST Tech Challenge and are not allowed. However, FIRST Tech Challenge games are highly interactive and Robot-to-Robot contact and defensive game play 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 or chronic, the offending Team will receive a Major Penalty and a Yellow Card.

**<G17> Pinning, Trapping, or Blocking Robots** – A Robot cannot cause an opposing Alliance Robot to become Pinned, Trapped, or Blocked for more than five seconds. If a referee determines this rule is violated, the offending Alliance will receive a Minor Penalty for every five seconds that they are in violation. If a referee declares a Pinning, Trapping, or Blocking warning during the Match, the offending Robot must immediately move away at least 3 feet (0.9 m), approximately 1.5 floor tiles, from the Pinned, Trapped, or Blocked Robot.

The intent of this Rule is that Drive Teams begin to immediately move their Robots away and have a five second grace period to move the required distance, and NOT that they are permitted to intentionally Block for up to five seconds.

A Robot cannot incur this type of Penalty during the Autonomous Period unless it is determined by the Referee to be part of a deliberate strategy and will be penalized as described above. If the violation happens during the Autonomous Period, the first action done by the offending Robot during the Driver-Controlled Period must be to move away from the Pinned, Trapped, or Blocked Robot or a Minor Penalty will
be assessed immediately and again for every five seconds that they are in violation. Game-specific rule(s) listed in Section 1.6.3 that further define *Pinning, Trapping, or Blocking* take precedence over this general game rule.

**<G18> Forcing an Opponent to Break a Rule** – 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 forced rule violations committed by the affected *Alliance* shall be excused, and no Penalties will be assigned.

**<G19> Removing Game Elements from the Playing Field** – *Robots* may not deliberately remove *Game Elements* from the *Playing Field* during a *Match*. *Game Elements* that *Inadvertently* fall *Outside* the *Playing Field* will be returned to the *Playing Field* by field personnel at the earliest safe and convenient opportunity at a non-*Scoring* location approximately where it left the field. *Game Elements* removed from the *Playing Field* in an attempt to *Score* are also not subject to this *Penalty*. *Teams* deliberately removing *Game Elements* from the *Playing Field* will incur a *Minor Penalty* per *Game Element* removed from the *Playing Field*. Game-specific rule(s) listed in Section 1.6.3 that allow the removal of specified *Scoring Elements* from the *Playing Field* take precedence over this general game rule.

**<G20> Scoring Elements in Contact with Robots** – *Scoring Elements* in a *Scoring Area* that are in contact with a *Robot* on the corresponding *Alliance* for the *Scoring Area* have zero *Score* value when *Score* Trackers record the *Score* at the end of the *Autonomous* and *Driver-Controlled Periods*. Game-specific rule(s) listed in Section 1.6.3 that allow *Robot* contact with *Scoring Elements* take precedence over this general game rule.

**<G21> Post-Match Removal of Game Elements from Robots** – *Robots* must be designed to permit easy removal of *Game Elements* from any grasping, containing, or holding mechanism after the *Match*. *Robots* should also be able to be removed from the *Playing Field* without damaging the *Playing Field*. A *Minor Penalty* will be assessed for violations of this rule.

The intent of this rule is to have timely removal of *Robots* from the *Playing Field* following a *Match*.

*Drive Teams* are expected to stage their *Robots* for a *Match*, and remove them from the *Playing Field* afterwards, safely and swiftly. *Drive Team* efforts that either intentionally or unintentionally delay the start of a *Match* or the *Field* reset are not allowed. Examples include, but are not limited to:

- Failing to exit the *Playing Field* once instructed by a *Referee.*
- Failing to remove *Driver Stations* in a timely manner.

**<G22> Robot Manipulation of Scoring Elements** – *Scoring Elements* that are *Controlled* or *Possessed* by a *Robot* are considered to be part of the *Robot*.

**<G23> Robot or Scoring Elements In Two or More Scoring Areas** – *Robots* or *Scoring Elements* that are *In* two or more *Scoring Areas* earn points only for the highest value achievement. If the achievement values are equal, only one achievement counts as *Scored*. Exceptions to this general rule may be specified in the Game Play section (1.5) or in the game-specific rules.

**<G24> Disabled Robot Eligibility** - If a referee *Disables* a *Robot*, it will not be eligible to *Score* or earn points for the remainder of the *Match*. A *Disabled Robot* (whether referee induced or failure) does not earn penalties after becoming *Disabled*.
<G25> **Playing Field Tolerances** – Playing Field and Game Elements will start each Match with tolerances that may vary by as much as +/-1.0 inch (2.5 cm). Teams must design their Robots accordingly.

<G26> **Match Replay** – Matches are replayed at the discretion of the Head Referee only for a failure of a Game Element or verified Wi-Fi interference 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/communication failures, etc. are NOT valid justifications for a replaying of a Match.

<G27> **Egregious Behavior** – Egregious Robot or Team member behavior at the Playing Field, as determined by the referees, will result in a Major Penalty and issuance of a Yellow Card and/or Red Card. Subsequent violations will result in Team Disqualification from the tournament. Egregious behavior includes, but is not limited to, repeated and/or flagrant violation of game rules, unsafe behavior or actions, use of game or field elements to amplify the difficulty of scoring activities, and uncivil behavior towards Drivers, Coaches, competition personnel, or event attendees.

<G28> **Inadvertent and Inconsequential** - Robot actions that violate a rule may be ruled at the referee’s discretion to be Inconsequential and Inadvertent and will not be Penalized.

**1.6.3 Game-Specific Rules**

<GS1> **Drive Teams Touching Robots or Driver Stations after Jewel/Pictograph Randomization** – Drive Teams are not allowed to touch or interact with their Robots or Driver Stations once field personnel have begun the randomization process. If this occurs, a Minor Penalty will be assessed per Robot and the affected Robots are not eligible to Score a Jewel/Cryptobox Key in the Autonomous Period. This Penalty only affects the offending Team. The non-offending Alliance Partner Robot remains eligible for the Jewel/Cryptobox Key Scoring achievement.

<GS2> **Autonomous Period Robot Keep Out Area** – Robots may not go Inside the opposing Alliance’s Area of the Playing Field at any time during the Autonomous Period. A Major Penalty will be assessed for violating this rule and any Scoring that occurs in the opposing Alliance’s Area by the offending Robot will not benefit the offending Alliance. The red and blue gaffer tape on the Playing Field Floor divides the Playing Field into equal sized Alliance Areas. Robots may enter the Glyph Pit at any time.

The intent of this rule is to allow Robots to Score their Jewels and Glyphs without defensive play by the opposing Alliance. Inadvertent and Inconsequential incursions will be treated per <G28>.

<GS3> **Control/Possession Limits of Glyphs** – Once a Match begins, a Robot may Control or Possess a maximum of two (2) Glyphs. Plowing through any quantity of Glyphs is allowed but herding or directing multiple Glyphs to gain a strategic advantage (i.e., Scoring, accessibility, defense) is not allowed. The Penalty for Controlling or Possessing more than two (2) Glyphs is an immediate Minor Penalty for each Glyph above the limit plus an additional Minor Penalty per Glyph for each 5-second interval that this situation continues. A double Major Penalty will be assessed for each Glyph Scored while a Robot Controls or Possesses more than two (2) Glyphs. Continued violation of this rule will escalate to Yellow Cards quickly.

<GS4> **Glyph Hoarding** – Once an alliance has successfully scored more than 20 Glyphs, the members of the Alliance may not collectively possess/control/block access to more than the number of Glyphs required for the Alliance to completely fill their Cryptoboxes. Violation of this rule will result in an immediate Major Penalty and an additional Minor Penalty assessed for each 5 seconds the rule violation persists per Glyph in excess of the limit. Intentional or repeated violations of this rule will escalate quickly to issuance of Yellow Cards to all members of the Alliance.
Control/Possession Limits of Relics – Once a Match begins, a Robot may Control or Possess a maximum of one Relic at a time. The Penalty for Controlling or Possessing more than one Relic is that no Relics will be eligible to be Scored at the end of the Match by either Robot for the Alliance.

De-scoring Glyphs – Robots may not remove or re-position Glyphs from their opposing Alliance’s Cryptoboxes. A Double Major Penalty will be assessed for every Glyph illegally removed or re-positioned. Robots are allowed to remove or re-position Glyphs from their own Alliance’s Cryptoboxes.

De-scoring Relics – Robots may not remove or re-position Relics In the opposing Alliance’s Recovery Zone. In the event of any re-positioning (for example, if a Blue Relic is dropped into the Blue Recovery Zone, bounces to the Red Recovery Zone and knocks the Red Relic from one Scoring position to another) the opposing Alliance’s Relic is awarded the maximum potential points (40 + 15 = 55).

Interfering with Access to Cryptobox – Robots may not interfere with an opposing Alliance Robot that is In their Alliance’s Safe Zone and attempting to Score a Glyph. A Robot must have a Glyph in its Control to be considered as attempting to Score. The first instance will result in an immediate Major Penalty and an additional Minor Penalty assessed for every five seconds that the rule violation persists. Additional occurrences of violations of this rule will escalate to Yellow Cards quickly.

Non-Glyph Game Elements Inside Cryptobox – Glyphs are the only item allowed to be placed In a Cryptobox. A Major Penalty will immediately be assessed for each non-Glyph item (Jewel, Relic, etc.) placed In an opposing Alliance’s Cryptobox. Removal of the illegal Game Element is up to the Alliance that owns the Cryptobox.

Controlling or Blocking access to Relics - Robots may not Control, Trap, or Block access to an opposing Alliance’s Relic. The first instance will result in an immediate Major Penalty and an additional Minor Penalty assessed for every five seconds that the rule violation persists. If the referee declares a Controlling, Trapping, or Blocking access Penalty, the offending Robot must move away at least 3 ft. (0.9 m), approximately 1.5 floor tiles from the opponent’s Relic. Additional occurrences of violations of this rule will escalate to Yellow Cards quickly.

The intent of this rule is to allow Robot access to their Relics. Blocking means denying ALL access, so general Robot movement with respect to other Robots should not be considered in violation unless there is no other way to traverse the Playing Field to get the Relic. Also, note that this rule requires attempted action on the part of the opposing Alliance.

Blocking access to Balancing Stone – During the End Game, Robots may not Block access to the opposing Alliance’s Balancing Stones. The first instance will result in a warning with any following violations resulting in a Major Penalty and an additional Minor Penalty assessed for every five seconds that the rule violation persists. If the referee declares a Blocking access warning during the End Game, the offending Robot must move away at least 3 feet (0.9 m), approximately 1.5 floor tiles from the Blocked Balancing Stone. Failure to move the required 3 feet (0.9 m) within 5 seconds is considered an additional violation and will incur the penalties described above. Additional occurrences of violations of this rule will escalate to Yellow Cards quickly.

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The intent of this rule is to allow Robot access to and from their Alliance’s Balancing Stones. Blocking and Trapping means denying ALL access, so general Robot movement with respect to other Robots should not be considered in violation unless there is no other way to traverse the Playing Field to get to the Balancing Stone. Also note that this rule requires attempted access to a Balancing Stone on the part of the opposing Alliance.

<GS12> **Balancing Stone Interference** – Robots may not interfere with the opposing Alliance’s Robot or Balancing Stone while that Robot is attempting to Balance during the End Game. Once a Robot is in contact with the Balancing Stone this rule will apply. The first instance will result in a warning with any following violations resulting in a Major Penalty and an additional Minor Penalty assessed for every five seconds that the rule violation persists. The intent of this rule is to allow Robots to Balance on the Balancing Stones without interference. Additional occurrences of violations of this rule will escalate to Yellow Cards quickly.

<GS13> **Preventing Relic Scoring** – Robots may not interfere with opposing Alliance Robots that are attempting to Score a Relic. A Robot must have a Relic in its Possession and be within 24 inches (61 cm), approximately one tile, of the wall facing that Alliance’s Recovery Zones to be considered as attempting to Score. Incidental contact that is Inadvertent and Inconsequential will not be Penalized. The first instance will result in a Major Penalty and an additional Minor Penalty assessed for every five seconds that the rule violation persists.

<GS14> **Relic Control** - Robots may Control or Possess their own Alliance’s Relics at any time but may only Score their Relic (i.e. reach over the Playing Field Wall) during the End Game or when the Relic is eligible to be Scored (whichever is earlier). If a Cryptobox Cipher is correctly solved prior to the start of End Game, Teams are permitted to Score their Relic early. One (1) Relic may be Scored early for each completed Cipher. Referees will signal the Alliance when they are allowed to Score a Relic early. Relics that are moved Outside the Playing Field Wall (by their Alliance) before they are eligible will have zero Score value.

<GS15> **Outside Contact during Relic Scoring** – Robots may reach over the audience-facing Playing Field Perimeter Wall (and touch the floor outside the Playing Field) only while attempting to Score or attempting to re-position a Relic.

Robots may contact the top and outside surface of the Playing Field Perimeter Wall as well as the Recovery Zone mats while attempting to Score a Relic. Robots extending Outside the Playing Field and Relics removed from the Playing Field in an attempt to Score are not subject to rule <S2> or <G19>. For example, a Robot reaching over the wall while attempting to score a Relic in the Recovery Zone is allowed. Note that rule <S1> still applies, so Robots will need to ensure safe behavior when extended Outside the Playing Field Wall.

<GS16> **Scoring Relics** - The only legal way to Score a Relic is by placing/dropping it in the Relic Recovery Zone. Relics may not be propelled with any noticeable force (i.e. shooting, launching, flicking, etc.). Illegally launched Relics have zero Score value. Relics that miss the Recovery Zones are not replaced into the Playing Field. They remain where they land and are available for Robots to attempt recovery.
1.7 Scoring Summary
The following table shows the possible Scoring achievements and their point values. The table is a quick reference guide and not a substitute for a thorough understanding of the game manual.

<table>
<thead>
<tr>
<th>Scoring Achievement</th>
<th>Autonomous Points</th>
<th>Driver-Controlled Points</th>
<th>End Game Points**</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jewels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- One Jewel remains on the Platform</td>
<td>30 points</td>
<td></td>
<td></td>
<td>1.5.2.1</td>
</tr>
<tr>
<td>Relic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- In Zone 1</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>1.5.4.1</td>
</tr>
<tr>
<td>- In Zone 2</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>- In Zone 3</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>- Upright Bonus</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Glyph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Scored in Cryptobox</td>
<td>15</td>
<td>2</td>
<td></td>
<td>1.5.2 and</td>
</tr>
<tr>
<td>- Bonus for a correct Cryptobox Key</td>
<td>30</td>
<td>-</td>
<td></td>
<td>1.5.3</td>
</tr>
<tr>
<td>- Completed Row of 3</td>
<td></td>
<td>10 per Row</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Completed Column of 4</td>
<td></td>
<td>20 per Column</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Completed Cipher</td>
<td></td>
<td>30 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robot Parked</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- In Safe Zone</td>
<td>10</td>
<td></td>
<td></td>
<td>1.5.2.4</td>
</tr>
<tr>
<td>Robot Balanced</td>
<td>-</td>
<td>20</td>
<td></td>
<td>1.5.4.2</td>
</tr>
</tbody>
</table>

** - The End Game occurs during the last thirty seconds of the Driver-Controlled Period.

1.8 Rule Summary
The following table shows the possible rule violations and their consequences. The table is a quick reference guide and NOT a substitute for a thorough understanding of the complete rule descriptions in section 1.6.

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule</th>
<th>Consequence</th>
<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
<th>Card Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Safety Rules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;S1&gt;</td>
<td>Unsafe Robot.</td>
<td>Disable if unsafe operation is likely to persist. Optional Yellow Card.</td>
<td>D</td>
<td></td>
<td></td>
<td>YC*</td>
</tr>
<tr>
<td></td>
<td>Damage to the Playing Field.</td>
<td>Warning escalating to Disable.</td>
<td>W</td>
<td></td>
<td></td>
<td>YC*</td>
</tr>
<tr>
<td>&lt;S2&gt;</td>
<td>Contact Outside the Playing Field.</td>
<td>Immediate Yellow Card. Optional Disable unless allowed by rule.</td>
<td>D*</td>
<td></td>
<td></td>
<td>YC</td>
</tr>
<tr>
<td>&lt;S3&gt;</td>
<td>Drive Team missing safety gear.</td>
<td>Warning and if not resolved within 30 seconds, the offending member(s) of the Drive Team must leave the Competition Area and may not be replaced.</td>
<td>W+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Rules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G1&gt;</td>
<td>Drive Team using disallowed electronic communication.</td>
<td>Warning followed by a Minor Penalty.</td>
<td>W</td>
<td>1x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Rule #</th>
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<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
<th>Card Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;G2&gt;</td>
<td>Pre-Match Robot setup – Deliberately delaying the start of the Match.</td>
<td>Minor Penalty for each offense.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G3&gt;</td>
<td>Robot starting volume.</td>
<td>Robot is Disabled and powered off in a valid starting Area on the Playing Field.</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G4&gt;</td>
<td>Illegal Robot setup alignment devices.</td>
<td>Minor Penalty for each offense.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G5&gt;</td>
<td>Drive Team member(s) leaving the Alliance Station.</td>
<td>Warning for the first instance with any following instances resulting in a Minor Penalty.</td>
<td>W</td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G6&gt;</td>
<td>Starting Game Play Early.</td>
<td>Minor Penalty with the option of a Major Penalty if the early start results in a competitive advantage for the offending Alliance.</td>
<td></td>
<td>1x</td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G7&gt;</td>
<td>Late Start of the Autonomous Period.</td>
<td>Minor Penalty with the option of a Major Penalty if the late start results in a competitive advantage for the offending Alliance.</td>
<td></td>
<td>1x</td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G8&gt;</td>
<td>Stopping Autonomous Game Play Early.</td>
<td>Major Penalty unless it is done with referee or Field Technical Advisor approval.</td>
<td></td>
<td></td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G9&gt;</td>
<td>Stopping Game Play Late.</td>
<td>Minor Penalty and the actions of the Robot that occur after the end of game play do not count towards their Alliance’s Score. Major Penalty if the late stop results in a competitive advantage other than Scoring.</td>
<td></td>
<td>1x</td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G10&gt;</td>
<td>Drive Team contact with the Playing Field or Robot.</td>
<td>Warning for the first instance with any following instances resulting in a Minor Penalty. Contact for safety reasons will not result in a warning or Penalty. Optional Yellow Card if contact affects Scoring and/or game play.</td>
<td>W</td>
<td>1x</td>
<td></td>
<td>YC*</td>
</tr>
<tr>
<td>&lt;G11&gt;</td>
<td>Autonomous to Driver-Controlled Period transition – Robot failure.</td>
<td>A Robot that cannot be controlled by the Drive Team will be Disabled and remain in place for the remainder of the Match.</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G12&gt;</td>
<td>Drive Team Coach Driver Station Control.</td>
<td>Warning for the first instance with any following instances resulting in a Major Penalty.</td>
<td>W</td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G14&gt;</td>
<td>Robots deliberately detaching parts.</td>
<td>Minor Penalty, Major Penalty and a Yellow Card if it affects gameplay.</td>
<td></td>
<td>1x</td>
<td>1x</td>
<td>YC</td>
</tr>
<tr>
<td>&lt;G15&gt;</td>
<td>Robots illegally grasping Game Elements.</td>
<td>Warning for the first instance with any following instances resulting in a Major Penalty.</td>
<td>W</td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule #</td>
<td>Rule</td>
<td>Consequence</td>
<td>Warning Disable</td>
<td>Minor Penalty</td>
<td>Major Penalty</td>
<td>Card Issued</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>-------------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>&lt;G16&gt;</td>
<td>Destruction, damage, tipping, etc.</td>
<td>Deliberate or chronic violations of this rule will receive a Major Penalty and a Yellow Card.</td>
<td></td>
<td>1x</td>
<td>YC</td>
<td></td>
</tr>
<tr>
<td>&lt;G17&gt;</td>
<td>Pinning, Trapping, or Blocking for more than 5-seconds in the Driver-Controlled Period.</td>
<td>Minor Penalty for every five seconds the Robot violates this rule.</td>
<td></td>
<td>1x+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G19&gt;</td>
<td>Deliberately removing Game Elements from the Playing Field.</td>
<td>Minor Penalty per Game Element removed from the Playing Field.</td>
<td></td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G20&gt;</td>
<td>Scoring Elements in contact with Robots of the corresponding Alliance.</td>
<td>Points are not earned for any Scoring Elements in contact with Robots of the corresponding Alliance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G21&gt;</td>
<td>Delay caused by removal of Robots from the Playing Field and Game Elements from Robots.</td>
<td>A Minor Penalty will be assessed.</td>
<td></td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;G27&gt;</td>
<td>Egregious behavior.</td>
<td>Major Penalty and a Yellow Card and/or Red Card. Possible Match Disqualification. Subsequent violations result in Team Disqualification for the tournament.</td>
<td></td>
<td>1x</td>
<td>YC RC</td>
<td></td>
</tr>
</tbody>
</table>

**Game-Specific Rules**

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule</th>
<th>Consequence</th>
<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
<th>Card Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;GS1&gt;</td>
<td>Drive Teams touching Robots or Driver Stations after Jewel / Pictograph randomization.</td>
<td>Minor Penalty plus that Team not eligible to Claim a Jewel/Crypto Key bonus during the Autonomous Period.</td>
<td></td>
<td>1x+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS2&gt;</td>
<td>Robot enters opposing Alliance Area during Autonomous.</td>
<td>Major Penalty is assessed. No benefit for Scoring activity in opponent Area.</td>
<td></td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS3&gt;</td>
<td>Controlling more than two (2) Glyphs.</td>
<td>Minor Penalty plus additional Minor every 5 seconds per Glyph.</td>
<td></td>
<td>1x+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS4&gt;</td>
<td>Scoring while Possessing more than two (2) Glyphs.</td>
<td>Double Major Penalty plus additional Minor every 5 seconds per Glyph. May lead to Yellow Card.</td>
<td></td>
<td>2x</td>
<td>YC*</td>
<td></td>
</tr>
<tr>
<td>&lt;GS5&gt;</td>
<td>Glyph Hoarding</td>
<td>Major Penalty plus additional Minor every 5 seconds per Glyph</td>
<td></td>
<td>1x</td>
<td>YC*</td>
<td></td>
</tr>
<tr>
<td>&lt;GS6&gt;</td>
<td>Controlling or Possessing more than one (1) Relic.</td>
<td>Zero Score value for all Relics of the offending Alliance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS7&gt;</td>
<td>De-scoring opposing Alliance Glyph.</td>
<td>Double Major Penalty is assessed for each Glyph removed.</td>
<td></td>
<td>2x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS8&gt;</td>
<td>De-Scoring opposing Alliance Relic.</td>
<td>Opposing Alliance gets full value of Relic.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS9&gt;</td>
<td>Interfering with access to the opposing Alliance’s Cryptobox.</td>
<td>Major Penalty plus additional Minor Penalties per 5 seconds in violation. May lead to Yellow Card.</td>
<td></td>
<td>1x+</td>
<td>1x</td>
<td>YC*</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Rule #</th>
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<th>Consequence</th>
<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
<th>Card Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;GS9&gt;</td>
<td>Non-Glyph Game Elements Inside Cryptobox.</td>
<td>Major Penalty per illegal Game Element.</td>
<td></td>
<td></td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;GS10&gt;</td>
<td>Controlling or Blocking access to Opposing Alliance’s Relics during End Game.</td>
<td>Minor Penalty plus additional Minor Penalties per 5 seconds in violation. More occurrences of violations of this rule will escalate to Yellow Cards quickly.</td>
<td>1x+</td>
<td>1x</td>
<td></td>
<td>YC*</td>
</tr>
<tr>
<td>&lt;GS11&gt;</td>
<td>Blocking access to Opposing Alliance’s Balancing Stone.</td>
<td>Warning for the first instances with any following instances resulting in a Major Penalty plus additional Minor Penalties per 5 seconds in violation. More occurrences of violations of this rule will escalate to Yellow Cards quickly.</td>
<td>W</td>
<td>1x+</td>
<td>1x</td>
<td>YC*</td>
</tr>
<tr>
<td>&lt;GS12&gt;</td>
<td>Balancing Stone Interference.</td>
<td>Warning for the first instance with any following instances resulting in a Major Penalty plus additional Minor Penalties per 5 seconds in violation. More occurrences of violations of this rule will escalate to Yellow Cards quickly.</td>
<td>W</td>
<td>1x+</td>
<td>1x</td>
<td>YC*</td>
</tr>
<tr>
<td>&lt;GS13&gt;</td>
<td>Preventing Relic Scoring.</td>
<td>Major Penalty plus additional Minor Penalties per 5 seconds in violation.</td>
<td>1x+</td>
<td>1x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS14&gt;</td>
<td>Relic Scoring permitted in End Game or completed Cipher.</td>
<td>Scoring Relics early will have zero Score value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS15&gt;</td>
<td>Launching or Shooting Relics.</td>
<td>Zero Score value for Relic.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Column Key**

- **W**: Warning
- **D**: Robot Disabled
- **YC**: Yellow Card issued
- **RC**: Red Card issued
- **Pts**: Points that would have counted without violation
- **+**: indicates more than one may be issued if violation persists
- ***: indicates optionally issued penalties**
Appendix A – Resources

Game Forum Q&A

http://ftcforum.usfirst.org/forum.php
Anyone may view questions and answers within the FIRST® Tech Challenge Game Q&A forum without a password. To submit a new question, you must have a unique Q&A System User Name and Password for your team.

FIRST Tech Challenge Game Manuals

Part 1 and 2 - http://www.firstinspires.org/node/4271

FIRST Headquarters Pre-Event Support

Phone: 603-666-3906
Mon – Fri
8:30am – 5:00pm
Email: FTCTeams@firstinspires.org

FIRST Websites

FIRST homepage – www.firstinspires.org
FIRST Tech Challenge Page – For everything FIRST Tech Challenge.
FIRST Tech Challenge Volunteer Resources – To access public Volunteer Manuals.
FIRST Tech Challenge Event Schedule – Find FIRST Tech Challenge events in your area.

FIRST Tech Challenge Social Media

FIRST Tech Challenge Twitter Feed - If you are on Twitter, follow the FIRST Tech Challenge Twitter feed for news updates.
FIRST Tech Challenge Facebook page - If you are on Facebook, follow the FIRST Tech Challenge page for news updates.
FIRST Tech Challenge YouTube Channel – Contains training videos, Game animations, news clips, and more.
FIRST Tech Challenge Blog – Weekly articles for the FIRST Tech Challenge community, including Outstanding Volunteer Recognition!
FIRST Tech Challenge Team Email Blasts – contain the most recent FIRST Tech Challenge news for Teams.
FIRST Tech Challenge Google+ community - If you are on Google+, follow the FIRST Tech Challenge community for news updates.

Feedback

We strive to create support materials that are the best they can be. If you have feedback about this manual, please email ftcteams@firstinspires.org. Thank you!
Appendix B – Vision Patterns for Pictographs

Pictographs will be placed adjacent to each Jewel platform to provide information to the Robots about the Cryptobox Key – the Column worth bonus points during the Autonomous Period. Teams are encouraged to use the Pictographs and Vuforia™ Navigation software, which is part of the default application library software available from FIRST Tech Challenge, to enhance their Robot’s autonomous navigation accuracy.

Thumbnail size images for the three (3) Pictographs are shown below. The images will be printed on 8.5 inch x 11 inch paper (21.6 cm x 27.9 cm). They are available to download from the FIRST website:
http://www.firstinspires.org/resource-library/ftc/game-and-season-info

The printing and placement instructions for the images are contained in the AndyMark Field Setup Guide that is available for download from the same webpage that hosts the image files.

When this Pictograph is placed on the field the first Glyph Scored into a Cryptobox during the Autonomous Period must be Scored into the Left Column to earn the Cryptobox Key bonus.

When this Pictograph is placed on the field the first Glyph Scored into a Cryptobox during the Autonomous Period must be Scored into the Center Column to earn the Cryptobox Key bonus.

When this Pictograph is placed on the field, the first Glyph Scored into a Cryptobox during the Autonomous Period must be Scored into the Right Column to earn the Cryptobox Key bonus.
Appendix C – Glyph Scoring

For a Glyph to Score, some portion of the Glyph must be between two Rails (the side of the Rail, not the top surface) and not in contact with a Robot of that Alliance. A 2-inch wide strip of tape on the Playing Field Floor at the tips of the Rails provides a visual aid to help determine if a Glyph is between the Rails.

The circled Glyphs are not Scored because no portion of the Glyph lies between two Rails.
Appendix D – Row and Column Scoring

The bottom edge of the 1 inch wide white tape on the Cryptobox Rails is coincident with the bottom edge of a Row. A Glyph that crosses over the bottom edge of the tape is considered to be in multiple Rows.

**Scored Rows**

Row 1 - Yes  
Row 2 - Yes  
Row 3 - Yes

To earn the Column bonus, there must be four Glyphs in a Column and a legally Scored Glyph in each Row of the Column.

**Scored Columns**

**Left Column**  
Yes  

**Right Column**  
No  

This Glyph is not between two Rails and is therefore not legally Scored
In this Scoring example, the Red Alliance earns:

- **Rows**: $4 \times 10 = 40$ points
- **Columns**: $2 \times 20 = 40$ points
- **Glyphs**: $11 \times 2 = 22$ points
- **Cipher**: $0 \times 30 = 0$ points

**Total Scored**: = 102 points

- The Red Alliance did not earn the **Cipher Score** because there are not 12 Glyphs in the Cryptobox nor is it a valid Cipher.
- Red has earned four (4) **Row Scores** because the topmost brown Glyph in the Center Column extends into the top Row.
- Red does not earn the Center Column Score because there are only three (3) Scored Glyphs in that Column.
Appendix E – Ciphers

If an Alliance Scores twelve (12) Glyphs into a Cryptobox in the proper arrangement to form any one of the six (6) Ciphers shown below, then the Alliance will earn the Cipher Score as described in Section 1.5.3.4. The images are as seen by a Robot on the Playing Field. Note: the Glyphs do not have to be perfectly aligned horizontally but all twelve (12) Glyphs must be in the proper arrangement to earn the bonus.

Frog

Bird

Snake
Appendix F – Critical Dimensions

Key dimensions for the *Playing Field* and *Game Elements* are shown below. The official Field Setup Guide, which includes additional measurements and *Game Element* placement can be found at [https://www.firstinspires.org/resource-library/ftc/game-and-season-info](https://www.firstinspires.org/resource-library/ftc/game-and-season-info).

![Figure F-1 Playing Field Layout](image)

*Gracious Professionalism®* - “Doing your best work while treating others with respect and kindness - It’s what makes FIRST, first.”
Note: The bottom of the 1 inch wide white tape is aligned to the bottom of the Row.

The Glyphs are made from a closed-cell foam. Teams should be aware that the actual size of the Glyph will vary as much as +/- 0.25 inches in any direction.
**Figure F-5 Relic**

A 1-inch wide strip of gaffer tape denotes whether the *Relic* is Red or Blue.

**Figure F-6 View of Pictograph and Jewel Set as seen from the Balancing Stone**

Regardless of which *Field Perimeter Wall* is used, all *Pictographs* are located on the outside wall of the *Field Perimeter* and are offset 3 inches to the left of the center of the *Balancing Stones* as viewed from a *Robot* sitting on the *Balancing Stone*.

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Appendix G – Randomization

The *Pictograph* types (Left, Center, Right) and the orientation of the *Jewels* (*Red Jewel*, left or right) are determined by the roll of a die. The orientation of the *Jewels* is as seen from the viewpoint of someone standing in the middle of the *Playing Field*. The orientation of all four (4) *Jewel Sets* will be the same.
Appendix H – Relic Scoring

Relics are scored when they are *in a Zone*. There are three (3) Zones on each *Recovery Zone* mat. They are outlined with a thick, black border.

**H-1 Zone Borders**

A black border defines the perimeter of each *Zone*.

The border is considered part of the *Zone* that it encloses.

**H-2 Definition of *In the Zone***

Even though the Relic is not touching the Mat inside of the black border, the *Blue Relic* still scores because it has broken the infinitely vertical plane that defines the *Zone* and is therefore considered to be *In the Zone*.
A – Blue earns 40 points for a Relic in Zone 3 plus 15 points for the Relic being Upright

B – Blue does not earn any Relic points because the Relic is not In any of the Zones

C – Blue earns 20 points for a Relic in Zone 2 plus 15 points for the Relic being Upright

D - Blue earns 20 points. The Relic is In both Zone 1 and Zone 2 but per Rule 1.5.4.the Alliance earns points for the highest value Zone.

E – Neither Blue nor Red earn points for a Red Relic in the Blue Recovery Zone