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2020-2021 FIRST® Tech Challenge

Game Manual Part 2 – Remote Events
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## Revision History

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<th>Section</th>
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| Section 4  | 1.1      | 9/12/2020  | • Section 4 – Various – Changed Ultimate Goal℠ to ULTIMATE GOAL℠  
• Section 4.6.2 – Added orange box to rule <G7>                                                                 | |
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• Section 4.5.1 – 1) a) Added that Drive teams place their robot as well as a possessed scoring element  
• Section 4.5.2 and 4.5.4 – Clarified that Power Shot Targets requiring direct contact with a Ring to be scored  
• Section 4.6.3 - <GS13> Power Shot Targets must be scored by direct contact with a Ring. See rule for full details | |
| Section 4  | 1.3      | 11/24/2020 | Section 4.3 – Updated images to correct pre-match wobble goal placement  
Section 4.4 – Added exception for Human Player | |

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1.0 Introduction

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

1.2 FIRST Core Values
We express the FIRST® philosophies of Gracious Professionalism® and Coopertition® through our Core Values:

- **Discovery:** We explore new skills and ideas.
- **Innovation:** We use creativity and persistence to solve problems.
- **Impact:** We apply what we learn to improve our world.
- **Inclusion:** We respect each other and embrace our differences.
- **Teamwork:** We are stronger when we work together.
- **Fun:** We enjoy and celebrate what we do!

2.0 Gracious Professionalism®

FIRST® uses this term to describe our programs’ intent.

Gracious Professionalism® is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

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

3.0 How to Use This Document

The Game Manual Part 2 – Remote Events is a resource for all FIRST® Tech Challenge Teams competing in a remote event format. There are two types of event formats a Team might experience this season; traditional events and remote events. This manual describes the game and rules for remote events. Remote events were developed to mimic traditional FIRST Tech Challenge events, while practicing social distancing guidelines. Since Teams are not able to gather and compete in the traditional head-to-head competition format, the season’s official full Playing Field has been adapted to allow Teams to play Matches as a single Team. Remote Teams may order an official half version of this season’s field or compete using a low-cost version of the field.

The intent of this manual is that the text means exactly, and only, what it says. Please avoid interpreting the text based on assumptions about intent, implementation of past rules, or how a situation might be in “real life”. There are no hidden requirements or restrictions. If you have read everything, you know everything.

Key words that have a specific meaning within this document are defined in the Game Definitions section and are indicated with the first letter capitalized, and the entire word in *Italics.*
4.0 The Game

4.1 Introduction
This document describes ULTIMATE GOAL™ presented by Qualcomm, the FIRST® Tech Challenge remote game for the 2020-2021 season. We recommend viewing the traditional events game animation prior to reading this manual to gain a general understanding of the game. The animation is not intended as a replacement for official game rules. Remote event documentation and the game animation can be accessed on our website https://www.firstinspires.org/resource-library/ftc/game-and-season-info

Teams must comply with all rules and requirements stated in this document and in the Game Manual Part 1 – Remote Events. Clarifications to the game rules are issued on the Question & Answer section of the forum at ftcforum.firstinspires.org. Forum rulings take precedence over information in the game manuals.

4.2 Game Description
Matches are played on a Playing Field initially set up as illustrated in Figure 4.3-1 below. The object of the game is to Deliver Wobble Goals to a randomly selected Target Zone, place in or Launch Rings into the Tower Goal, and Launch Rings to knock over Power Shot Targets.

The Match starts with a 30-second Autonomous Period in which a Robot operates using only pre-programmed instructions and sensor inputs. During the Autonomous Period, a Team earns points by: Delivering Wobble Goals to a randomly selected Target Zone, Parking In the Launch Line, Launching or placing Rings into the Tower Goal, and Launching Rings to knock over Power Shot Targets.

The two-minute Driver-Controlled Period follows the Autonomous Period. During the Driver-Controlled Period, a Team earns points by Launching or placing Rings into the Low, Medium, and High Goals on the Tower Goal.

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, a Team earns points by Delivering a Wobble Goal to the Start Line or to the Drop Zone, Placing Rings on the Wobble Goals, and Launching Rings to knock over Power Shot Targets.

4.2.1 Game Narrative
In every game we play, we set out to make ourselves a collaborative teammate, a respected competitor, and a stronger person. No expectations are greater than those we place on ourselves.

While we revel in the big plays and vital scores, the real lessons we learn are when we fail and work with our teammates to recover. And each time our team steps up to a new challenge, we establish bolder goals, fueling our ambitions to work together, enhance our skills, and transcend all boundaries.

It’s the passion that drives us forward. As game changers, we use our strengths to outscore the competition and legendary players that have come before us. Together we are teammates at the top of our game, competing in a thrilling sport – to score, to win and to leave a legacy that lasts.

No matter the outcome, we stand up in the face of competition, pushing each other to do better, work harder, and exceed our team and personal potentials.

It’s time to set the records straight by breaking them. Are you up to the challenge?
4.3 Remote Playing Field Illustrations
The following illustrations identify 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 – Remote Events, are available at https://www.firstinspires.org/resource-library/ftc/game-and-season-info. Please Note: The following illustration shows the Playing Field with optional perimeter wall as the Playing Field Boundary.

Figure 4.3-1 – Isometric view of the Playing Field (red)

Figure 4.3-2 – Top view of the Playing Field (red)
4.4 Game Definitions
The following definitions and terms are used for the Remote game version of ULTIMATE GOAL™ presented by Qualcomm:

**Alliance Station** – The designated Team Area adjacent to the Playing Field where the Drivers and Coach stand during a Match.

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

**Autonomous Period** – A thirty-second Match period in which the Robot operates and reacts 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.

**Barrier** – An approximate 12 inch (30.5 cm) tall structure that separates the Playing Field from the Drop Zone. The Barrier can be constructed from a range of materials including an AndyMark perimeter, Do-It-Yourself wall, cardboard, etc.

**Coach** – A student Team member or adult mentor designated as the Drive Team advisor during the Match.

**Competition Area** – The Area where the Playing Field is located.

**Control / Controlling** – An object is Controlled by a Robot if the object is following the movement of the Robot. Objects that are Controlled by a Robot are part of the Robot. See Possess / Possessing to learn about a related term. Examples include, but are not limited to:

- **Carrying** – holding one or more Game Elements inside or outside of a Robot.
- **Herding** – pushing or impelling one or more Game Elements to a desired location or direction that gains a strategic advantage beyond moving the Robot around the Playing Field.
- **Holding** – Trapping one or more Scoring Elements against a Game Element or Playing Field Boundary to shield or guard them.
- **Launching** – see definition below.

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 the Playing Field or a Robot.

**Delivery** – A Scoring achievement where a Robot deposits a Wobble Goal.

**Disable / Disabled** – A Robot that is no longer active for the remainder of the Match due to a Robot failure.

**Drive Team** – Up to four representatives; two (2) Drivers, one (1) Coach, and one (1) Human Player.

**Driver** – A pre-college student Team member responsible for operating and controlling the Robot.

**Driver-Controlled Period** – The two-minute Match time period in which the Drivers operate their Robot.

**Driver Station** – Hardware and FIRST supplied software used by a Drive Team to control their Robot during a Match. A detailed description of Driver Station is listed in Game Manual Part 1 – Remote Events.
Drop Zone – The Area Outside the Playing Field Boundary, between the plane formed by the front Playing Field Boundary and the audience, where the Robot Delivers Wobble Goals during the End Game.

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

End of the Period/Match - The moment when the Match timer reaches 2:00 for the Autonomous Period or 0:00 for the Driver-Controlled Period and which coincides with the start of the sound that designates the End of the Period.

Field Personnel – People selected by the Team to help run an official Remote competition Match. Typical activities performed by Field Personnel include preparing the Playing Field for a Match, adjusting the number of randomly selected Rings in the Starter Stack, retrieving Rings that leave the Playing Field Boundary, keeping track of the Match Score, running the cloud-based scoring system, and providing as needed technical assistance to the Drive Team during pre-Match setup. One person may fill several roles. At a Traditional competition, these activities are performed by trained volunteers. Teams may select anyone except for the Drive Team to be Field Personnel. Some Field Personnel roles require specialized knowledge. For example, the person scoring the Match should be able to recall rules and Penalties in real time while watching an official Match.

Game Element – Any item a Robot or Human Player interacts with to play the game. Game Elements for this year’s game include:

<table>
<thead>
<tr>
<th>Game Element</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Rings</td>
<td>10</td>
</tr>
<tr>
<td>Wobble Goals</td>
<td>2</td>
</tr>
<tr>
<td>Power Shot Targets</td>
<td>3</td>
</tr>
<tr>
<td>Tower Goal</td>
<td>1</td>
</tr>
<tr>
<td>Return Rack</td>
<td>1</td>
</tr>
</tbody>
</table>

Human Player – A pre-college student Team member who supplies Rings to the Playing Field and resets Power Shot Targets.

It is preferred that the Human Player is a student competing on the Team. However, for the 2020-2021 season, exceptions can be made to allow an adult mentor, coach, parent, etc. to fill the role as Human Player if there are strict social distancing guidelines that do not allow more than a Team of one student to meet and participate in official Matches.

Human Player Station – The Area where the Human Player stands during a Match.

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, unless otherwise specified.

Inadvertent – An outcome that is not a planned strategy and not the predictable result of persistent or repeated actions. Unforced or unexpected Robot actions based on software commands are not considered to be Inadvertent.

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

Launching – Propelling Game Elements with enough force such that they move independent of contact with the Robot or Human Player. Movement due to gravity is not Launching.

Launch Line - A two (2) inch wide, white gaffer tape line extending from the Alliance Station boundary to the opposite boundary that defines the Launch Zone Area. The Launch Line should be considered to be a...
continuous line even though there may be breaks in the tape at the Tile interfaces and at the Target Zone tape.

**Launch Zone** – The part of the Playing Field bounded by the front and side boundaries, and the Launch Line. The Launch Line is considered to be part of the Launch Zone.

**Match** – 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.

**Match Manager** – Any person selected by the Team to oversee an official Match and Field Personnel. The Match Manager cannot be a part of the Drive Team.

**Navigating** – An Autonomous Period Scoring task where a Robot is Parked in a specified Area.

**Navigation Image** - Three (3) unique images positioned on the Playing Field Boundary that the Robot can use to navigate around the Playing Field. Images are printed on standard letter size paper, 8 1/2 inches x 11 inches (216 mm x 279 mm) or A4 (210 mm x 297 mm) paper. For detailed locations please see the official Field Setup Guide, as well as Appendix F for general image locations.

**Off** – Not physically in contact with or Supported by an object, surface, etc. Objects that are Off are also considered Completely Off.

**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. When a Penalty occurs, points will be deducted from the Score. Penalties are further defined into Minor Penalties (ten (10) points) and Major Penalties (thirty (30) points).

**Playing Field** – The Area that includes the 12 ft. x 8 ft. (3.66 m x 2.44 m) field and where the Game Elements are located, and the Robot plays Matches. There are two equivalent official versions of the Playing Field: Red and Blue, that are mirror images of each other.

**Playing Field Boundary** – A taped line or a wall that marks the Area where a Robot operates

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

**Playing Field Floor** – The top surface of the Area inside the Playing Field Boundary.

**Possess / 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 by a Robot are considered to be Controlled, and they are part of the Robot. See also Control/Controlling.
**Power Shot / Power Shot Target** – A Game Element containing three (3) Targets. The Targets have two states:

- **Forward** - The Targets are oriented towards the interior of the Playing Field.
- **Back** – The Targets are oriented away from the interior of the Playing Field.

**Pre-Load** - A Game Element that the Drive Team positions during pre-Match setup so that it touches a Robot or is Possessed by a Robot at the start of the Autonomous Period.

**Return Rack** – A Game Element attached to the Tower Goal that is used by the Human Player to introduce a Ring into the Playing Field.

**Ring** – An approximate 5-inch diameter torus-shaped, orange colored, Scoring Element that a Robot Launches or places into a goal. A Match is played with a total of ten (10) Rings.

**Robot** – Any mechanism that has been built to compete in the game challenge and complies with the Robot rules outlined in Section 7 of Game Manual Part 1 – Remote Events.

**Scoring / Score** – A Robot earns points by interacting with Scoring Elements and Parking in specific Areas of the Playing Field. Scoring Elements still in contact with a Robot have zero score value, unless stated otherwise in Section 4.5 or 4.6.

Scoring determination is done by one of three methods: “Scored Live”, “Scored at End of the Period”, and “Scored at Rest.” The specific method for each Scoring achievement will be stated in the achievement’s description in Section 4.5.

- **Scored Live**: The achievement is considered Scored the moment it is successfully completed, i.e. all criteria are met.

- **Scored at End of the Period**: The achievement’s Scoring status is determined based on the Robot or Scoring Element’s position at the End of the Period.

- **Scored at Rest**: The achievement is considered Scored based on the position of the Robot or Scoring Element when the entire field has come to rest after the Match Period ends.

**Scoring Elements** – Objects that a Robot manipulates to earn points for their Team. The Scoring Elements for ULTIMATE GOAL™ are Rings and Wobble Goals.

**Start Line** – An approximate 22.75-inch (57.8 cm) long x 2 inch (5.1 cm) wide strip of colored gaffer tape where a Robot is setup to start a Match.

**Starter Stack Area** – The Playing Field location where zero (0), one (1), or four (4) Rings are placed during pre-Match setup.

**Starter Stack** – A pre-placed stack of Rings that corresponds to a selected Target Zone. Zero (0), one (1), or four (4) Rings correspond to Target Zone Goals A, B, or C respectively.

**Support / Supported / Completely Supported** – An object (i.e. Robot, Scoring Element, Game Element, etc.) is Supported by another object if the second object is bearing at least some of the weight of the first object. If the second object is bearing all the weight of the first object, it is Completely Supported by the second object.

**Target Zone Goal** – An approximate 22.75 inch (57.8 cm) by 22.75 inch (57.8 cm) Autonomous Period Scoring Area where a Robot Delivers Wobble Goals. There are three Target Zone Goals. Each Zone is indicated by gaffer tape on the Playing Field Floor.
Team – Mentors, supporters, and pre-college-aged students affiliated with an entity registered with FIRST and for the competition.

Tile – An approximate 24 inch x 24 inch (609.6 mm x 609.6 mm) foam rubber mat.

Tower Goal – A Playing Field element containing three vertically stacked goals named the Low, Mid, and High Goals.

Wobble Goal – A moveable Goal for Scoring Rings and a location-based Scoring Element.

4.5 Gameplay

Prior to the start of the Match, the Drive Team performs some basic Robot setup steps that are described in section 4.5.1. 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.

4.5.1 Pre-Match

The Playing Field is set up as depicted in Figure 4.3-1. The two (2) Wobble Goals are placed adjacent to their Start Lines, a stack of four (4) Rings is placed on the Playing Field Floor Starter Stack Area, and three (3) Rings are placed into the Low Goal for the Human Player to use during the Driver-Controlled Period.

The Robot is set up on the Playing Field with the following required constraints:

1) Starting Location - The Team selects their Robot’s starting location.
   a) The Robot and its Possessed Scoring Elements may be placed in any orientation and must be Completely Inside the Playing Field Boundary.
   b) The Robot must touch or break the plane of the front facing (i.e. opposite from the Tower Goal) Playing Field Boundary.
   c) The Robot must be Parked In one of the Start Lines.

2) Wobble Goal - A Robot is required to Pre-Load exactly one (1) of their Wobble Goals. During set-up, the Drive Team may move their Pre-Loaded Wobble Goal from its initial Field set-up position. The remaining Wobble Goal that is not Pre-Loaded by the Team must stay in its setup position.

3) Pre-Load Rings – A Robot may Pre-Load up to three (3) Rings. Rings that are not Pre-Loaded have no Score value for the Autonomous Period and they are placed into the Low Goal for the Human Player to use during the Driver-Controlled Period. Rings cannot be loaded onto the Wobble Goal.

4) Op Mode – The Drive Team uses their Driver Station Android device to select an Op Mode. Pressing the Driver Station Init button is not required unless it is needed for the Robot to satisfy the Match start size constraint.

The Drive Team may position themselves anywhere In their Alliance Station. When the Robot and Drive Team is in position, the Human Player must also be In their Human Player Station and stay there for the remainder of the Match.

Once the Match Manager gives the set-up complete signal:

1) The Drive Team may no longer touch their Robot until the conclusion of the Match.

2) The Drive Team may not touch their Driver Station or controllers until the Autonomous Period has ended, except to initialize and/or start their Autonomous program using the Driver Station Android device screen. A Robot that requires Autonomous program initialization to satisfy the Robot starting size constraint must be initialized before Match Manager gives the set-up complete signal.
After the Robot set-up process is complete, Field Personnel will randomize the field into one of the three (3) configurations. The pre-placed stacks of Rings will be adjusted to either zero (0), one (1), or four (4), corresponding to the selected Target Zone Goal (A, B, or C). Excess Rings will be dropped into the Low Goal.

4.5.2 Autonomous Period
The Match starts with a thirty-second Autonomous Period where the Robot is operated via pre-programmed instructions only. The Team is 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 the Robot. The only exception is to allow the Drive Team to start their Robot with “init” and/or “start” commands issued on the Driver Station Android device. The Team must use the built-in thirty-second timer.

Following a countdown by Field Personnel, the Autonomous Period begins. The Drive Team may issue Robot start commands with their Driver Station Android device to run the Autonomous Op Mode selected during pre-Match setup. Failure to adhere to this procedure may subject the Team to a Penalty as specified in the game rules in section 4.6.2. The Drive Team is not required to start executing an Op Mode during the Autonomous Period.

Illegally Scored Rings and Power Shot Targets earn points for the Team but also earn an offsetting Penalty per rules <GS12> and <GS13>.

Autonomous points are awarded for the following achievements:

1) **Wobble Goal Delivery to a Target Zone** – At the End of the Period, every Wobble Goal that is Completely In its Target Zone (as identified by the size of the Starter Stack) earns fifteen (15) points.

2) **Robot Navigating** – A Robot that is Parked at the End of the Period with any portion of the Robot In the Launch Line earns five (5) points.

3) **Tower Goal** – Each Ring that enters the Low, Mid, or High Goal earns points. Stuck Rings removed from Inside a Tower Goal by the Human Player count as Scored. Rings in Tower Goals are Scored Live and recorded as Scored the moment the Rings are Completely In the Tower Goal, are not in contact with a Robot or Human Player, and do not exit back out through the front of the Goal. Rings Launched prior to the End of the Period are still eligible to be Scored.

   a) **Low Goal** - Each Ring that is placed or Launched by a Robot into the Low Goal earns three (3) points. The Scoring Robot can be anywhere Inside the Playing Field.

   b) **Mid Goal** – Each Ring Launched into the Mid Goal by a Robot earns six (6) points. The Scoring Robot must be Completely In the Launch Zone.

   c) **High Goal** – Each Ring Launched by a Robot into the High Goal earns twelve (12) points. The Scoring Robot must be Completely In the Launch Zone.

4) **Power Shot** – A Power Shot Target that is changed from Forward to Back by direct contact with a Launched Ring earns points for the Team. The Scoring Robot must be Completely In the Launch Zone. Rings Launched prior to the End of the Period are still eligible to be Scored.

   a) Each Scored Power Shot Target earns fifteen (15) points.

   b) Power Shot Targets can be Scored in any sequence.
c) **Power Shot Targets are Scored at Rest.**

The intent of the **Mid Goal, High Goal** and **Power Shot Scoring** achievements is for **Robots** to be **Completely In** the **Launch Zone**. Small, **Inconsequential Robot** extension **Outside** the **Launch Zone** while **Launching** a **Ring** is allowed.

### 4.5.3 Driver-Controlled Period

Directly following the end of the **Autonomous Period**, the **Drive Team** has five (5) seconds plus a "3-2-1-go" countdown to prepare their **Driver Station** for the start of the **Driver-Controlled Period**. On the countdown word "go," the **Driver-Controlled Period** starts, and **Drive Team** presses their **Driver Station** start button to resume playing the **Match**.

During the **Driver-Controlled Period**, the **Human Player** is expected to return **Rings** to the **Playing Field** via the **Return Rack** and reset **Scored Power Shot Targets** back to an **un-Scored** state (i.e., **Forward**). **Power Shot Targets** that start the **End Game** already in the **Back** position are not eligible to be counted as **Scored** during the **End Game**.

The **Driver-Controlled Score** is based on completing **Tower Goal** tasks as outlined below. Stuck **Rings** removed from **Inside a Tower Goal** by the **Human Player** count as **Scored**. **Rings** in **Tower Goals** are **Scored Live** and recorded as **Scored** the moment the **Rings** are **Completely In** the **Tower Goal**, are not in contact with a **Robot** or **Human Player**, and do not exit back out through the front of the **Goal**. **Rings Launched** prior to the **End of the Period** are still eligible to be **Scored**.

Illegally **Scored Rings** and **Power Shot Targets** earn points for the **Team** but also earn an offsetting **Penalty** per rules <GS12> and <GS13>.

Points are awarded for the following achievements:

1. **Low Goal** - Each **Ring** that is placed or **Launched** by a **Robot** into the **Low Goal** earns two (2) points. The **Scoring Robot** can be anywhere **Inside** the **Playing Field**.
2. **Mid Goal** - Each **Ring Launched** into the **Mid Goal** by a **Robot** earns four (4) points. The **Scoring Robot** must be **Completely In the Launch Zone**.
3. **High Goal** - Each **Ring Launched** into the **High Goal** earns six (6) points. The **Scoring Robot** must be **Completely In the Launch Zone**.

The intent of the **Tower Scoring** achievements is for **Robots** to be **Completely In** the **Launch Zone** to **Score** in the **Mid** and **High Goals**. Small, **Inconsequential Robot** extension **Outside** the **Launch Zone** is allowed.

### 4.5.4 End Game

The last thirty seconds of the **Driver-Controlled Period** is called the **End Game**. **Driver-Controlled Period Scoring** can still take place during the **End Game**. **End Game** tasks **started and/or completed** prior to the start of the **End Game** will earn zero (0) points for those tasks.

Points are awarded for the following **End Game** achievements:

1. **Wobble Goal Delivery** – At the start of the **End Game**, **Wobble Goals In a Target Zone** or **not** located in the **Launch Zone** are eligible for the following achievements:
   a. **Start Line** – Each **Wobble Goal In a Start Line** at the **End of the Match** earns five (5) points. To earn the points, the **Wobble Goal must break the vertical plane of any side of the Start Line**.
b) **Drop Zone** - Each Wobble Goal placed over a Barrier and Supported by the Drop Zone at the End of the Match earns twenty (20) points. The Wobble Goal is not required to be Completely Supported by its domed base (i.e., a tipped over Wobble Goal counts as Scored).

The intent of the Drop Zone achievement is that the Robot Delivers a Wobble Goal without damaging the floor outside the Playing Field. Robot designs for Delivering a Wobble Goal to a Drop Zone should take into account that flooring may vary from competition to competition. Flooring could be robust (e.g., carpet, foam tile, etc.) or easily damaged (e.g., polished wood basketball floor).

2) **Wobble Goal Rings** – Each Ring Completely Supported by a Wobble Goal or another Ring Completely Supported by the Wobble Goal at the End of the Period earns five (5) points. Any Wobble Goal location and orientation are allowed for this achievement.

3) **Power Shot** – A Power Shot Target that is changed from Forward to Back by direct contact with a Launched Ring earns points for the Team. The Scoring Robot must be Completely In the Launch Zone.

   a) Each Scored Power Shot Target earns fifteen (15) points.

   b) Power Shot Targets that start the End Game already Back are not eligible to be Scored. The Human Player has a 10 second grace period following the start of End Game to reset the Targets.

   c) Power Shot Targets are allowed to be Scored in any sequence.

   d) Power Shot Targets are Scored at Rest.

**4.5.5 Post Match**

After the Match, Field Personnel will finalize the Score. The Match Manager will signal for the Drive Team to enter the Playing Field and retrieve their Robot. The Drive Team should return any Rings and/or Wobble Goals that are Possessed by the Robot to the Playing Field. The Playing Field reset crew will set up the Playing Field for the next Match.

**4.5.6 Penalty Scoring**

Penalty points are subtracted from the offending Team’s Score at the End of the Match. Minor Penalties subtract ten (10) points per occurrence. Major Penalties subtract thirty (30) points per occurrence.

**4.5.7 Flowchart of Match Play**

The following figure shows the flow of the Match and the actions taken on the Driver’s Station Android device.
4.6 Rules of Gameplay

Gameplay 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 and the tournament rules defined in the Game Manual Part 1 – Remote Events. Violation of rules may lead to Penalties and/or Disqualification of the offending Team from a Match. 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.

There are rules in the Game Manual Part 2 – Traditional Events, that do not apply to Teams competing remotely. Those rules have been removed from this manual; however, the numbering of the rules has been kept the same for consistency. The remaining rules may have modifications as appropriate for single Robot gameplay.

4.6.1 Safety Rules

<S1> Unsafe Robot or Playing Field Damage – If at any time the Robot operation is deemed unsafe or has damaged the Playing Field the offending Robot may be Disabled.

<S2> Robot Extension Outside the Playing Field Boundary – For safety reasons, no portion of the Robot may contact anything Outside the Playing Field Boundary. A Major Penalty will be assessed per occurrence. See the game definitions in section 4.4 for a complete description of the Playing Field Boundary.

The intent of this rule is for safe or Inadvertent Robot extension Outside the Playing Field Boundary. Intentional Robot extension Outside the Playing Field is not permitted, except as allowed by Game-Specific rules listed in section 4.6.3

<S3> Safety Gear – Matches must not be played until all members of the Drive Team are wearing approved eye protection and shoes with closed-toes and a closed-back.

4.6.2 General Game Rules

<G1> Autonomous to Driver-Controlled Period Transition – At the conclusion of the Autonomous Period, the Robot will remain in a hands-off state. Field Personnel will not enter the field and will not touch the Robot on the field during the Autonomous to Driver-Controlled transition. The scoring system display will provide visual and audio cues for Drive Teams to pick up their Driver Stations. Drive Teams will have 5 seconds to pick up and prepare their Driver Station. After the 5 seconds, there will be a “3-2-1 go” countdown and the Driver-Controlled Period of the Match will begin.

<G2> Certifying the Score at Match End – Scores will be tracked by Field Personnel throughout the Autonomous and Driver-Controlled Periods of the Match. At the End of the Match, the final Score will be certified as quickly as possible. A change in state of a Game Element or Robot at the End of the Match after its final Score is recorded will not change an already-recorded Score. Scoring Elements will not be recounted at the End of the Match unless specified by a Game-Specific rule.

<G4> Robot Manipulation of Scoring Elements – Scoring Elements that are Controlled or Possessed by a Robot are part of the Robot except when determining the location of the Robot or otherwise specified by a Game-Specific rule.

For Example: If a Robot Possesses a Scoring Element, and only that Scoring Element breaks the plane of a Scoring Area, the Robot does not receive points for being In that Area.

<G5> Robot or Scoring Elements In Two or More Scoring Areas – A Robot 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 Gameplay section (4.5) or in the Game-Specific rules.

<G6> **Disabled Robot Eligibility** - A Disabled Robot is not eligible to Score, earn points, or incur Penalties for the remainder of the Match. Game-Specific rule(s) listed in section 4.6.3 take precedence over this general game rule.

<G7> **Playing Field Tolerances** – Playing Field and Game Elements will start each Match with tolerances that may vary by as much as +/-1.0 inch (25.4 mm). Teams must design their Robots accordingly.

Commercial Off The Shelf and Do It Yourself Playing Fields and Game Elements are expected to be manufactured, assembled, and set up using a high standard for dimensional and location accuracy. The intent of the generous +/- 1.0 inch tolerance is to accommodate unintentional size and location variations that may occur. The tolerance is not an excuse for intentional or imprecise accuracy in construction or setup.

<G8> **Match Replay** – Once started, Matches are not paused or replayed.

<G9> **Inadvertent and Inconsequential** - Robot actions that violate a rule may be ruled to be Inconsequential and Inadvertent, and will not be Penalized.

<G10> **Scoring Elements in Contact with a Robot** – Scoring Elements in a Scoring Area that are in contact with or Controlled by a Robot for the Scoring Area have zero Score value. Game-Specific rule(s) listed in section 4.6.3 that allow Robot contact with Scoring Elements take precedence over this general game rule.

<G11> **Drive Team** – The Drive Team shall include up to two Drivers, one Coach, and one Human Player.

<G12> **Playing Field Access** – Drive Team members cannot enter the Playing Field for any reason other than to place or retrieve their Robot. A Minor Penalty is assessed for violation of this rule.

If a Team feels the Playing Field is not set up correctly, Teams should notify Field Personnel prior to the start of the Match.

<G13> **Pre-Match Robot Placement** – At the beginning of a Match, the Robot must be set up on the Playing Field according to section 4.5.1 Pre-Match. After the Robot is set up on the Playing Field, the Drive Team must stand Inside the Alliance Station or Human Player Station.

<G14> **Robot Starting Volume** – Before the start of a Match, the Robot in its starting location must not exceed a volume of 18 inches (457.2 mm) by 18 inches (457.2 mm) by 18 inches (457.2 mm) unless otherwise allowed or restricted by Game-Specific rules detailed in section 4.6.3. A Pre-Loaded Scoring Element may extend Outside the 18-inch (457.2 mm) cube volume constraint. Match play must not begin until the Robot’s starting volume constraint is satisfied.

After the start of a Match, the Robot may extend in any dimension unless restricted by the Game-Specific rules detailed in section 4.6.3.

<G15> **Robot Setup/Alignment** – The Drive Team may align its Robot during pre-Match setup if they do so with legal components that are part of the Robot and can be reset to be within the 18-inch (457.2 mm) cube starting volume constraint. A single member of the Drive Team may also align the Robot by sight if they are next to the Robot and their action does not delay the start of a Match. A Minor Penalty will be assessed to the Team for violation of this rule.

<G16> **Alliance Station and Human Player Station** – During a Match, the Drivers, Coach, and Human Player must remain In their Stations.
a) The first instance of leaving the Station will result in a warning, with any following instances during the Match resulting in a Minor Penalty. Leaving the Station for safety reasons will not result in a warning or Penalty.

b) The Drive Team may be anywhere in their respective Alliance Station and Human Player Station. The Human Player should not obstruct the view of Field Personnel scoring the Match.

The intent of this rule is to prevent Drive Team members from leaving their assigned Station during a Match to gain a competitive advantage. For example, moving to another part of the Field for better viewing, reaching into the Field, etc. Simply breaking the plane of the Station during normal Match play is not a Penalty. It is reasonable for the Human Player to leave the Human Player Station to retrieve Rings.

**<G17> Post-Match Removal of the Robot** – The Robot must be designed to permit easy removal of Game Elements from the Robot after the Match. The Robot 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 Playing Field reset are not allowed. Examples include, but are not limited to:

1) Failing to exit the Playing Field once instructed by Field Personnel.
2) Failing to remove Driver Stations in a timely manner.

**<G18> Starting Gameplay Early** – A Robot that starts playing the game (Autonomous or Driver-Controlled Period) prior to the start of a Match Period receives a Minor Penalty. Field Personnel have the option of issuing a Major Penalty in place of the Minor Penalty if the early start results in an advantage for the offending Team.

**<G19> Late Start of the Autonomous Period** – A Team participating in the Autonomous Period is 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. Field Personnel have the option of issuing a Major Penalty in place of the Minor Penalty if the late start results in an advantage for the offending Team.

**<G20> Parked at End of the Period** – The Robot must Park at the end of the Autonomous and Driver-Controlled Periods. The Drive Team should make its best effort to stop gameplay immediately when the End of the Period game sound begins. A Robot that is not Parked at the conclusion of the game sound receives a Minor Penalty and the actions of the Robot do not count towards their Team’s Score. Field Personnel have the option of issuing a Major Penalty in place of the Minor Penalty if the late stop results an advantage (other than Scoring) for the offending Team.

Scoring Elements that were Launched (unless disallowed by Game-Specific rules) 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.

**<G21> Robot Control During Autonomous Period** - During the Autonomous Period, the Drive Team may not directly or indirectly control or interact with their Robot or Driver Station. Early stopping of the Robot while running its Autonomous code is not allowed, except in cases of personal or equipment safety. A Major Penalty will be assessed for violating this rule.
<G22> Drive Team Contact with the Playing Field or Robot – During a Match, the Drive Team is prohibited from making contact with the Playing Field, the Robot, or any Game Element (except for allowed Human Player activities). The first instance of contact will result in a warning, with any following instances resulting in a Minor Penalty. 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.

<G23> Drive Team Coach Driver Station Control – During the Driver-Controlled Period, a Robot must be remotely operated only by the Drivers using the Gamepads connected to the Team’s Driver Station and/or by software running on 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, the Drive Team Coach and/or Drivers are allowed to hold the 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.

<G24> Robot Deliberately Detaching Parts – A Robot may not deliberately detach parts during a Match or leave mechanisms on the Playing Field unless permitted by a Game-Specific rule. Possessed or Controlled Scoring Elements are not considered to be a part of the Robot for the purpose of this rule. The consequence of deliberately detaching a part is a Minor Penalty per occurrence. A Robot will receive a Minor Penalty each time gameplay is affected by the deliberately detached component or mechanism. Robot parts that are released but remain connected by a tether are considered detached for the purposes of this rule.

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

<G25> Robot Grasping Game Elements – A Robot 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 4.6.3. The first instance will result in a warning with any following violations during the tournament resulting in a Major Penalty.

<G26> Destruction, Damage, Tipping, etc. – Robot actions aimed at the destruction, damage, tipping over, or entanglement of Game Elements are not in the spirit of the FIRST Tech Challenge and are not allowed unless permitted by Game-Specific rules. Some tipping, entanglement, and damage may occur as a part of normal gameplay. If the tipping, entanglement, or damage is ruled to be deliberate or chronic, the Team will receive a Major Penalty.

<G27> Removing Game Elements from the Playing Field – A Robot 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. A Team that deliberately removes Game Elements from the Playing Field will incur a Minor Penalty per Game Element removed from the Playing Field. Game-Specific rules listed in section 4.6.3 that address the removal of specified Scoring Elements from the Playing Field take precedence over this general game rule.

<G29> Illegal Usage of Game Elements – A Robot may not deliberately use Game Elements to ease or amplify the difficulty of any Scoring or game activity. A Major Penalty will be assessed for violations of this rule.
4.6.3 Game-Specific Rules

<GS1> Robot extension outside the Playing Field Boundary – A Robot may safely extend outside the Playing Field Boundary for Scoring Rings in the Low Tower Goal (back Boundary) and during the End Game for Scoring a Wobble Goal in the Drop Zone (front Boundary). All other extensions outside the Playing Field Boundary will be handled per rule <S2>.

<GS2> Human Player Station – The Human Player may change position Inside the Human Player Station while actively collecting Rings, placing Rings into the Team’s Return Rack, and resetting Power Shot Targets. It is reasonable for the Human Player to leave the Human Player Station to retrieve Rings.

<GS3> Grasping Scoring Elements – A Robot may grasp Rings and Wobble Goals.

<GS4> Human Player Ring Handling – The Human Player may introduce Rings Onto the Playing Field Floor with the constraints listed below. After a Field Personnel issued warning, subsequent violations of these constraints within the tournament result in a Minor Penalty per occurrence.

a) A Human Player may not introduce Rings into the Playing Field before the start of the Driver-Controlled Period.

b) A Human Player may only introduce Rings into the Playing Field using the Return Rack. The Drive Team may not bring tools (except for <GS4>-g) or devices to the Playing Field for handling Rings. Accommodations and exceptions for a Human Player with disabilities or extenuating circumstances can be made but must take into consideration all safety, general, and Game-Specific rules.

c) Storing a supply of Rings by a Human Player is not allowed during the Driver-Controlled Period. Rings should be returned to the Playing Field as quickly as practical. Penalties will be assessed per Ring with additional Penalties per Ring for every five seconds the violation continues.

d) The Human Player may not extend Inside the Playing Field Boundary.

e) The Human Player is allowed to reach into the Tower Goal to retrieve stuck Rings when the Robot is at least 24 inches (609.6 mm) from the Tower Goal.

f) The Human Player may hold more than one Ring at a time.

g) The Human Player may use a tool to remove Rings that are stuck in the Return Rack.

<GS5> Drive Team Touching the Robot or Driver Station after Starter Stack Randomization – The Drive Team is not allowed to touch or interact with their Robot or Driver Station once Field Personnel have begun the randomization process. If this occurs, a Minor Penalty will be assessed, and the Robot is not eligible to earn the Wobble Goal Delivery Score in the Autonomous Period.

<GS6> Control/Possession Limits of Scoring Elements –

1) Rings – A Robot may Control or Possess a maximum of three (3) Rings. A Launched Ring is considered Controlled until it makes contact with something else (e.g. Playing Field Floor, net, Tower Goal).

   a) Plowing through any quantity of Rings is allowed but Herding or directing Rings above the allowed limit to gain a strategic advantage (i.e., Scoring, accessibility) is not allowed. The Penalty for Controlling or Possessing more than the allowed quantity is an immediate Minor Penalty for each Ring above the limit plus an additional Minor Penalty per Ring in excess of the limit for each 5-second interval that this situation continues. An additional Minor Penalty will be assessed for each Ring that is Scored while a Robot Controls or Possesses more than the allowed quantity.
b) **Controlling or Possessing a Ring by a Robot** before the Ring has been **Supported by the Playing Field Floor** will earn a **Minor Penalty** for each occurrence. Violation of this **Rule** will escalate to a **Major Penalty**.

c) **Rings Supported by a Wobble Goal** are exempt from the **Control/Possession Limit**.

*Rings that may become Possessed Inadvertently still earn a Penalty. Teams should design their Robots to minimize the possibility of accidently Possessing a stray Ring.*

2) **Wobble Goals** - A Robot may **Control or Possess** a maximum of one (1) Wobble Goal. **Inconsequential Control** of Wobble Goals above the limit is allowed. The **Penalty** for **Controlling or Possessing** more than the allowed quantity is an immediate **Minor Penalty** for each Wobble Goal above the limit plus an additional **Minor Penalty** per Wobble Goal for each five second interval that this situation continues. A **Major Penalty** will be assessed for each Wobble Goal in excess of the limit that is **Scored** while a **Robot Controls or Possesses** more than the allowed quantity.

<GS7> **Launching of Game Elements** –

1) **Rings** – A Robot may **Launch Rings** during any **Match Period**. Any **Ring Launched over a Boundary** that is not the **Tower Goal Boundary** will receive a **Minor Penalty**.

2) **Wobble Goals** – **Launching Wobble Goals** is **not allowed**. A **Major Penalty** will be assessed for violating this rule and the **Wobble Goal** will not earn points for the period (**Autonomous or Driver-Controlled**) when the violation occurred.

*The intent of this rule is not to Penalize Inadvertent Launching of Rings over the Tower while attempting to Score.*

<GS9> **Wobble Goal Constraint** – The **Robot** may not place **Rings onto Wobble Goals** except during the **End Game**. A **Minor Penalty** will be assessed for each **Ring**.

<GS12> **Illegal Tower Goal Scoring** – A **Robot Outside the Launch Zone** that places or **Launches a Ring into a Mid or High Tower Goal** receives a **Major Penalty** per Ring.

<GS13> **Illegal Power Shot Scoring** – **Power Shot Targets** may only be **Scored** by direct contact with a **Ring Launched by a Robot Completely In the Launch Zone**. A **Robot Outside the Launch Zone** that **Scores a Power Shot Target** by its actions (**e.g. Launching a Ring, contact with the Power Shot assembly, etc.**) or **Completely In the Launch Zone and Scores a Power Shot Target** through indirect contact (**e.g. Rings contacting Power Shot assembly, etc.**) is assessed a **Major Penalty** per **Scored Power Shot Target**.
4.7 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>
<th>When Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wobble Goals Delivered (each)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of Period</td>
</tr>
<tr>
<td>• Target Zone</td>
<td>15</td>
<td></td>
<td></td>
<td>4.5.2.1</td>
<td></td>
</tr>
<tr>
<td>• Start Line</td>
<td>-</td>
<td></td>
<td>5</td>
<td>4.5.4.1</td>
<td></td>
</tr>
<tr>
<td>• Drop Zone</td>
<td>-</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robot Navigating (each)</td>
<td>5</td>
<td></td>
<td></td>
<td>4.5.2.2</td>
<td>End of Period</td>
</tr>
<tr>
<td>Rings Scored In Tower Goal (each)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Low</td>
<td>3</td>
<td>2</td>
<td></td>
<td>4.5.2.3</td>
<td>Scored Live</td>
</tr>
<tr>
<td>• Mid</td>
<td>6</td>
<td>4</td>
<td></td>
<td>4.5.3</td>
<td></td>
</tr>
<tr>
<td>• High</td>
<td>12</td>
<td>6</td>
<td></td>
<td>4.5.2.4</td>
<td>Scored at Rest</td>
</tr>
<tr>
<td>Power Shot</td>
<td></td>
<td></td>
<td></td>
<td>4.5.4.3</td>
<td></td>
</tr>
<tr>
<td>• Target moved from Forward to Back (each)</td>
<td>15</td>
<td>-</td>
<td>15</td>
<td>4.5.2.4</td>
<td></td>
</tr>
<tr>
<td>Wobble Goal Rings (each)</td>
<td>-</td>
<td></td>
<td>5</td>
<td>4.5.4.2</td>
<td>End of Period</td>
</tr>
</tbody>
</table>

4.8 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 4.6.

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Safety Rules</td>
<td></td>
</tr>
<tr>
<td>&lt;S1&gt;</td>
<td>Unsafe Robot or Damage to the Playing Field.</td>
<td>Disable if unsafe operation is likely to persist.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D*</td>
</tr>
<tr>
<td>&lt;S2&gt;</td>
<td>Contact Outside the Playing Field Boundary.</td>
<td>Major Penalty for each occurrence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;S3&gt;</td>
<td>Drive Team missing safety gear.</td>
<td>Match must not start until the entire Drive Team is wearing all the required safety gear.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Rules – Further definitions, no Penalties earned</td>
<td></td>
</tr>
<tr>
<td>&lt;G10&gt;</td>
<td>Scoring Elements in contact with the Robot.</td>
<td>Points are not earned for any Scoring Elements in a Scoring Area that are also in contact with the Robot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Rules – Pre-Match Penalties</td>
<td></td>
</tr>
<tr>
<td>&lt;G12&gt;</td>
<td>Drive Team enters the Playing Field for purpose other than placing or retrieving their Robot.</td>
<td>Minor Penalty for each offense.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>Rule #</td>
<td>Rule</td>
<td>Consequence</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>&lt;G15&gt;</td>
<td>Robot setup alignment devices.</td>
<td>Minor Penalty for each offense.</td>
</tr>
<tr>
<td>&lt;G16&gt;a</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>
</tr>
<tr>
<td>&lt;G17&gt;</td>
<td>Post-Match Removal of the Robot</td>
<td>A Minor Penalty will be assessed.</td>
</tr>
</tbody>
</table>

**General Rules – Gameplay Penalties**

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule</th>
<th>Consequence</th>
<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;G18&gt;</td>
<td>Starting Gameplay Early.</td>
<td>Minor Penalty with the option of a Major Penalty if the early start results in a competitive advantage.</td>
<td></td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G19&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.</td>
<td></td>
<td>1x</td>
<td>1x*</td>
</tr>
<tr>
<td>&lt;G20&gt;</td>
<td>Robot is not Parked at the end of period.</td>
<td>Minor Penalty and the actions of the Robot that occur after the end of gameplay do not count towards their Score. Major Penalty if the late stop results in a competitive advantage.</td>
<td></td>
<td>1x</td>
<td>1x*</td>
</tr>
<tr>
<td>&lt;G21&gt;</td>
<td>Robot control during Autonomous Period / Early stopping of the Autonomous code.</td>
<td>Major Penalty.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;G22&gt;</td>
<td>Drive Team contact with the Playing Field, Game Element, or Robot.</td>
<td>Warning for the first instance with any following instances resulting in a Minor Penalty.</td>
<td>W</td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;G23&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></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;G24&gt;</td>
<td>Robot deliberately detaching parts.</td>
<td>Minor Penalty plus a Minor Penalty each time gameplay is affected.</td>
<td></td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;G25&gt;</td>
<td>Robot 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></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;G26&gt;</td>
<td>Destruction, damage, tipping, etc.</td>
<td>Deliberate or chronic violations of this rule will receive a Major Penalty.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;G27&gt;</td>
<td>Deliberately removing Game Elements from the Playing Field.</td>
<td>Minor Penalty per Game Element deliberately removed from the Playing Field.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>Rule #</td>
<td>Rule</td>
<td>Consequence</td>
<td>Warning Disable</td>
<td>Minor Penalty</td>
<td>Major Penalty</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>&lt;G29&gt;</td>
<td>Illegal Use of Game Elements to ease or amplify Scoring.</td>
<td>Major Penalty.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
</tbody>
</table>

**Game-Specific Rules – Gameplay Penalties**

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule</th>
<th>Consequence</th>
<th>Warning Disable</th>
<th>Minor Penalty</th>
<th>Major Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;GS4&gt;</td>
<td>Human Player Ring Handling.</td>
<td>Warning followed by a Minor Penalty per occurrence for violating constraints.</td>
<td>W</td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td>&lt;GS5&gt;</td>
<td>Drive Teams touching their Robot or Driver Station after Randomization.</td>
<td>A Minor Penalty will be assessed, and the Robot is not eligible to earn the Wobble Goal Delivery Score.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;GS6&gt;1</td>
<td>Control/Possession Limits for Rings.</td>
<td>a) Minor Penalty per excess Ring plus a Minor Penalty for each excess Ring every five seconds. Additional Minor Penalty for each Ring Scored while in violation.</td>
<td>1x+</td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Minor Penalty for Controlling or Possessing a Ring before it has been Supported by the Playing Field Floor.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS6&gt;2</td>
<td>Control/Possession Limits for Wobble Goals</td>
<td>Minor Penalty per excess Wobble Goal plus a Minor penalty for each excess Wobble Goal every five seconds. Additional Major Penalty for each Wobble Goal Scored while in violation.</td>
<td>1x+</td>
<td>1x</td>
<td>1x if Wobble Goal Scored</td>
</tr>
<tr>
<td>&lt;GS7&gt;</td>
<td>Launching Game Elements.</td>
<td>1)Launching Ring over front or side Playing Field Boundary.</td>
<td></td>
<td>1x per Ring</td>
<td>1x plus no Score per Wobble Goal for that period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2)Launching Wobble Goal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GS9&gt;</td>
<td>Wobble Goal Constraint.</td>
<td>A Minor Penalty will be assessed for each Ring.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;GS12&gt;</td>
<td>Illegal Tower Goal Scoring.</td>
<td>Major Penalty per Ring.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
<tr>
<td>&lt;GS13&gt;</td>
<td>Power Shot Scoring</td>
<td>Major Penalty per Power Shot Target.</td>
<td></td>
<td></td>
<td>1x</td>
</tr>
</tbody>
</table>

**Table Key**

- **W**: Warning 1x: Penalty at single cost
- **W^T**: Tournament Warning 1x+: Penalty at single cost every 5 seconds
- **D**: Robot Disabled 2x: Penalty at double cost
- * indicates optional
Appendix A – Resources

Game Forum Q&A
https://ftcforum.firstinspires.org/
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 username and password for your team.

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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.

Feedback
We strive to create support materials that are the best they can be. If you have feedback about this manual, please email firsttechchallenge@firstinspires.org. Thank you!
Appendix B – Playing Field Details

B-1 Tower Goals

B-2 Tower Goal Dimensions
**B-3 Power Shot Dimensions**

**B-4 Playing Field Tape Dimensions**

**Note:**
1) These dimensions are approximate. Refer to the Set-up Guide for exact placement. For fields that use *Tiles*, the tape runs along the tabs of the *Tile* and the tape square is centered along one side of the *Tile*.

2) This diagram shows dimensions for a field that is set up with the *Red Tower* Goal. A *Blue Tower* Goal setup will be a mirror image.
Appendix C – Scoring Elements

C-1 Wobble Goal

C-2 Ring
Appendix D – *Starter Stack* Randomization

D-1 *Starter Stack* Setup

Note: During setup, the *Rings* are centered on the tape squares
Appendix E – **Wobble Goal Ring Scoring Examples**

<table>
<thead>
<tr>
<th>Ring</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
</tr>
<tr>
<td>E</td>
<td>0 Not Completely Supported</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
</tr>
<tr>
<td>G</td>
<td>0 In contact with Robot</td>
</tr>
</tbody>
</table>

**E-1 Wobble Goal Ring Scoring Examples**
Appendix F – Navigation Images

F-1 Navigation Image Locations