2026-2027 *FIRST*® Tech Challenge

Competition Manual

BIOBUZZ™ Presented by RTX

Version: TU09

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1 Introduction

1.1 About *FIRST*®

FIRST® (For Inspiration and Recognition of Science and Technology) was founded to inspire young people's interest in science and technology. Since its founding, *FIRST* has grown to be the world's leading youth-serving nonprofit advancing STEM education and has become a worldwide movement: inspiring innovation, building confidence, and preparing young people for the future.

Our programs have a proven and lasting impact on learning, interest, and skill-building inside and outside of the classroom, and are only possible because of the *FIRST* volunteers, educators, mentors, and sponsors who tirelessly support our students as they build their future.

Each year participants experience firsthand the inspiration that comes from joining a global community of people with the same mission, and the bonding that comes from working to solve the same shared challenge. *FIRST* students will go on a journey of discovery that merges the rigor of STEM learning with the fun and excitement of traditional sports.

Please visit the *FIRST* website for more information about *FIRST* and its programs.

Purpose	Vision	Mission
FIRST exists to prepare the young people of today for the world of tomorrow.	To transform our culture by creating a world where science and technology are celebrated and where young people dream of becoming science and technology leaders.	The mission of *FIRST* is to provide life-changing robotics programs that give young people the skills, confidence, and resilience to build a better world.

1.2 *FIRST*® Tech Challenge

FIRST provides a wide spectrum of robotics experiences designed to meet students where they're at: engaging and exciting students at every level, whatever their circumstances. What makes *FIRST*® Tech Challenge special among the family of exceptional *FIRST* programs?

Scale, Skill Level, Complexity, Flexibility, and Student Ownership

- **Scale.** With a classroom sized field and classroom safe robots - *FIRST* Tech Challenge can be implemented anywhere students want to gather. The ability to succeed with smaller teams provides a social structure in which students on a team can either excel in all roles or specialize in a single role.
- **Skill Level.** *FIRST* Tech Challenge provides challenges for students looking for championship play with advancement opportunities, and for those just now learning to play in their own classroom. It provides a scaffolded experience for growth that does not require experts to drive the experience, only caring adults to enable self-exploration.

- **Complexity.** Robots can be fully built from a basic Starter Kit, fully fabricated from custom designs, or built in a way that mixes both approaches. There are opportunities for advanced manufacturing, but non-classroom tools are optional, not required.
- **Flexibility.** With an extended season kicking off in September and running through March with capstone events held April through July, teams can adjust their season to incorporate intense peaks spread out between recovery periods or other school activities while still providing an improvement driven, iterative build experience.
- **Student Ownership.** Smaller teams competing in an extended season with classroom safe robots enable students to learn independently through self-exploration and feel ownership over more of their team's journey.

And of course, *FIRST* Tech Challenge provides all the opportunities for community, collaboration, outreach, and growth found across the *FIRST* programs.

Please visit the *FIRST* Tech Challenge webpages for more details.

1.3 *FIRST* Ethos and Core Values

1.3.1 *Gracious Professionalism*®

Gracious Professionalism® is part of the ethos of *FIRST*. It's a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

Through *Gracious Professionalism*, fierce competition and mutual gain coexist. Participants compete intensely while treating each other with respect and empathy. There is no trash talking, but there are also no disingenuous platitudes. Knowledge, competition, integrity, and empathy blend comfortably.

Ultimately, *Gracious Professionalism* is part of pursuing a meaningful life. When professionals use knowledge in a gracious manner and individuals act with integrity and sensitivity, everyone wins and society benefits.

The term was coined by Dr. Woodie Flowers, (1943 - 2019) executive advisory board chair emeritus, distinguished advisor to *FIRST*, and father of competition robotics.

Figure 1-1: Dr. Woodie Flowers, Father of Competition Robotics, Gracious Professionalism advocate and exemplar



"The FIRST spirit encourages doing high-quality, well-informed work in a manner that leaves everyone feeling valued. Gracious Professionalism seems to be a good descriptor for part of the ethos of FIRST. It is part of what makes FIRST different and wonderful."

- Dr. Woodie Flowers

Gracious Professionalism is a gift from Woodie, and all of us have now become its stewards. Woodie often said that it is not critical that we define *Gracious Professionalism*, but Woodie would continue to say it is very important to talk about *Gracious Professionalism*.

> *Gracious Professionalism* can be difficult to understand because the pursuit of it should be different for everyone. When talking about *Gracious Professionalism*, it is quickly evident that it has come to symbolize all that is good inside all of us and all that is good when we interact with one another and our world.
>
> It is an aspirational ideal to always strive towards, not a goal to be achieved, and not a method of measuring someone. For that reason, you can never say someone "is" or "is not" being Graciously Professional, but instead they might embody some of its aspects.
>
> Whenever something is being discussed as "not GP," it's more appropriate to talk about specific behaviors that need improvement. Was the person disrespectful? Impolite? Dishonest?
>
> Being Graciously Professional is more than any of its individual attributes.

Some possible meanings of *Gracious Professionalism* include:

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

In the context of *FIRST*, this means that all teams and participants should:

- learn to be strong competitors but also treat one another with respect and kindness in the process, and
- avoid leaving anyone feeling as if they are excluded or unappreciated.

Successful teams spend time going over this concept and reinforcing it regularly. Team members should work together to identify real-life examples of *Gracious Professionalism* in practice. Routinely highlight opportunities to display aspects of *Gracious Professionalism* to each other at events and encourage every team member to suggest ways in which they can embody aspects of this quality themselves.

Figure 1-2: Words which might apply to individuals embodying Gracious Professionalism. What words would you put in your word cloud?



1.3.2 *Coopertition*®

Coopertition® is displaying unqualified kindness and respect in the face of fierce competition. It is founded on the concept and philosophy that teams can cooperate and help one another even when they're directly competing against each other. The alliance structure of *FIRST* Tech Challenge inherently showcases *Coopertition*® - a team's opponent in one match may be their alliance partner in the next. In this sense, every team benefits when everyone plays their best.

1.3.3 Core Values

The *FIRST* Core Values are fundamental to *FIRST* and unique to our programs. They emphasize friendly sportsmanship, respect for the contributions of others, teamwork, learning, and community involvement. Our community expresses the *FIRST* philosophies of *Gracious Professionalism*® and *Coopertition*® through the *FIRST* 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!

1.3.4 Why Embrace the *FIRST* Ethos and *Gracious Professionalism*?

Some people new to *FIRST* and our values may think: *"This doesn't apply to me. I don't see this in the world around me. Why do I need to act this way?"*

To build a better world, pursue a more meaningful life, and celebrate all that makes us uniquely human.

Build a Better World

Our mission is to “give young people the skills, confidence, and resilience to build a better world.” What kind of world do we want that to be? What kind of culture do we want to be a part of?

We at *FIRST* believe that a world where everyone strives to embody the *FIRST* values and demonstrate *Gracious Professionalism* in their actions would be a pretty great world to live in.

Pursue a Meaningful Life

And, these actions make people feel good! We know, being an effective contributor is a huge part of feeling good about yourself. These behaviors will have a positive impact in all areas of your life.

Working hard can be fun and profoundly satisfying, and achieving this rational self-esteem is a big part of long-term happiness. You may start these behaviors because you’re trying to build a better world, but you’ll also find yourself building a more meaningful life.

Still skeptical? Try it in *FIRST*.

In many ways, *FIRST* is practice for the real world; we have the chance to shape the *FIRST* community however we want. We’re giving students the opportunity to make Graciously Professional choices when it’s easy - so they’ll see how it feels, learn how it works, and be prepared to do the same when it’s *not* as easy.

We get what we celebrate: so, let’s celebrate hard work, integrity, fair play, sportsmanship, empathy, and all the things which make us uniquely human.

1.4 The Spirit of the Competition

1.4.1 A Note from the *FIRST* Staff

Welcome to BIOBUZZ presented by RTX! We are excited to begin the 2026-2027 *FIRST* Tech Challenge Season. We'd like to describe some changes that are happening, some things we hope will never change, and some challenges we're facing due to the success and growth of the program. *FIRST* Tech Challenge serves participants with a wide variety of backgrounds, ages, and skill levels. Our program is both a capstone experience and a foundational experience. The highest skilled competitors in *FIRST* Tech Challenge are creating robots with technical achievements that impress even industry experts and perform tasks most people don't think are possible. At the same time, *FIRST* Tech Challenge provides an on-ramp for students and teams who are experiencing a robotics-sport for their first time. Our games are played at levels which would rival the excitement and spectacle of any sporting event, but they are also played in classrooms, garages, and in school libraries.

As veterans know and rookies will soon learn:

"There are no perfect solutions, only tradeoffs. Only compromise. We must choose the tradeoffs we believe provide the best balance of outcomes."

Our commitment is that students and teams from across this entire spectrum find a welcoming home in *FIRST* Tech Challenge. We will ensure every team can "play robots" in a way where they can meaningfully contribute to their alliance, iterate as they grow in experience, and feel the thrill that comes from competing in a true *sport of the mind*™.

Season Challenges: Championship Play vs. Learning to Play.
Whether you're the defending world champion or you're building your first StarterBot, we will provide engaging games with challenges that enable student learning and skill growth. These challenges will include familiar themes from the past to encourage building on the skills from prior seasons, while also including new dynamics which shift the 'meta,' encouraging the community to continuously learn and experiment.

FIRST Tech Challenge will always provide high-integrity Championship level experiences where our top teams can showcase their capabilities and find creative, exceptional solutions to the season's challenges. That is not changing. However, we also want more kids around the world to be able to participate in *FIRST* Tech Challenge, even if they don't have any prior STEM experience and don't have access to a Championship level event. To do that, we need to make the program more accessible to students, coaches, volunteers, and local leaders.

Competition Integrity at all Levels.
The *FIRST* Staff and all *FIRST* volunteers want every match of every competition to be perfect. Even if they can't be perfect, we want to protect the integrity of the competition and ensure fair play for all our teams. As our sport has matured, teams have made us very proud as they have *dramatically* improved in performance. With their success has come additional challenges, and now maintaining the integrity of the competition is becoming increasingly difficult. Recent years have placed more burden on our game design, our field designs, and our volunteers. Many of our efforts to enable the highest levels of

play only make it more difficult to enable introductory play experiences. We feel we need to change something to be successful at enabling both.

Changes for 2026-2027 (and beyond).
The 2026-2027 Season includes a deliberate change in how we designed BIOBUZZ and wrote its Competition Manual. This change is something we plan to continue for future games and future seasons. The manuals from prior seasons focused on covering exact circumstances and details, removing flexibility in favor of attempting to cover all scenarios.

The BIOBUZZ manual emphasizes the "spirit of the rule" and empowers event volunteers to make good-faith judgement calls. BIOBUZZ rules are written to emphasize "intended gameplay" and make it simpler for participants and volunteers to understand the spirit and intent of the rule. The rules are designed to allow volunteers to watch for larger behaviors and strategies that run counter to the spirit of the competition, rather than be required to watch for and record every action or incident that occurs (e.g., strategically blocking an opponent from access to their gate vs. going into an opponent's gate zone). This will make it easier to volunteer, allow volunteers to focus more on supporting teams in line with the spirit of *FIRST* Volunteering, and result in a more consistent competition experience for everyone.

This change can only be possible if we all commit ourselves to the ethical standards described by the *FIRST* Ethos and *FIRST* Core Values. We still want teams to compete to win. We want that to be done in a manner that is gracious and respectful to both their fellow competitors and the event volunteers enforcing the rules. To enable this culture, we're emphasizing a Framework of Behaviors all *FIRST* participants should follow, and a Competition Integrity Contract. When all our participants and volunteers are aligned with this framework it will allow us to simplify many of our regulations, remove some burden from everyone in the program, and make it easier for all of us to be successful!

Thank you, and we look forward to everything to come this season!

- ***FIRST* Tech Challenge Staff**

1.4.2 Framework of Behaviors

The culture of *FIRST* Tech Challenge is shaped by the habits and behaviors of our global community. To ensure our sport remains a positive space for our teams, we rely on all our participants, mentors, educators, supporters, alumni, and volunteers to follow a framework of ethical behaviors. These range from aspirational philosophies to firm rules and regulations.

- ***Gracious Professionalism* & *FIRST* Core Values**
  Gracious Professionalism remains the guiding star for all our behaviors, and we should always strive to act in a way that aligns with its philosophy. Celebrating the *FIRST* Core Values and ensuring they remain central to our behavior is how we embody *Gracious Professionalism* and preserve the unique *FIRST* culture.
- ***FIRST* Code of Conduct**
  Adults (and parents of minors) in *FIRST* each certify adherence to the *FIRST* Code of Conduct which provides behavior and youth protection requirements to ensure the safety of all *FIRST* participants.
- **Competition Integrity Contract**
  Every team in *FIRST* Tech Challenge must follow the Competition Integrity Contract (CIC) in Section 1.5 Competition Integrity Contract (CIC) below. The CIC outlines team behaviors which protect the integrity of the competition and long-term health of The Sport.
- **Competition Rules: The Competition Manual, Team Updates, and Q&A**
  Each season's game is defined by the rules and regulations in its Competition Manual. While these rules change each year, they describe the criteria all teams must meet to be eligible for competition, and the specific behaviors all teams must follow while competing.

1.4.3 The Role of Mentors

The *FIRST* mission is to create programs that give young people skills, confidence, and resilience to build a better world, and mentors are a key component to that in *FIRST* Tech Challenge. Adult mentorship is a proven part of what makes *FIRST* so effective:

> ***Working with a mentor or coach is a critical part of the learning process.***
> *FIRST programs provide mentoring of students which may lead to a better understanding of STEM careers as well as increased confidence, self-esteem and satisfaction of the student.*

This naturally leads to the question: *"How much involvement in building the robot should the mentors have?"*

The answer continues to be: *"However much is needed to inspire the youth on the team."*

Each team's robot should be representative of their journey and experience, and every team's journey is unique.
The level of involvement of mentors on a team will vary team-by-team and often season-by-season. For example, a team may have a student or group of students with enough CAD skills to largely create the CAD model of their robot with limited mentor guidance and oversight. The same mentor may need to take a more hands-on approach the next season if those students graduate, and no other students have those skills yet.

FIRST does not provide a prescriptive process for running a team; each team should be structured to meet students where they're at. Success should always be based on individual student outcomes. This is reinforced

through mentor training resources and the sharing of best practices, so all teams may continuously improve as they find what works best for their students.

1.4.4 The Spirit of *FIRST* Volunteers

FIRST volunteers are there to help every team succeed and should actively help the competitors avoid breaking rules whenever possible. One of the things which makes *FIRST* special is the culture in which volunteers have the opportunity to serve as mentors to all *FIRST* students.

It is easy for volunteers to default to a culture of enforcement and for teams to default to adversarial behaviors. *FIRST* teams and volunteers need to remember during all their interactions, they should be working together, not fighting each other.

It is often said:

> *"Through Gracious Professionalism, fierce competition and mutual gain coexist. Participants compete intensely while treating each other with respect and empathy."*

In this way, fierce and intense competition can be a direct part of embodying *Gracious Professionalism*. Everyone should remember that *FIRST* teams, students, and mentors are deeply passionate about our sport. They will, as they should, compete very hard as they pursue excellence and "success on the field."

FIRST prepares volunteers to likewise respond with respect and empathy in the face of this competitive intensity. To be successful, volunteers must take advantage of the resources and training *FIRST* provides each season. This means they must fully understand not only the rules, but also the published guidelines on how *FIRST* intends them to be enforced. This will ensure that each competition is conducted as fairly and consistently as possible.

For many *FIRST* students, their competition experience will be defined by a few interactions with a handful of adult volunteers. This is why it is so important that all *FIRST* volunteers behave in a friendly, supportive, fair, and team-focused manner at all times. **This is another reason why *FIRST* volunteers are so special; they are charged with maintaining the integrity of the competition but doing so by reinforcing the *FIRST* Core Values and always doing their best to act with *Gracious Professionalism*.**

There are two phrases which drive and motivate the individuals that volunteer their time with *FIRST*: "Giving Back" and "Paying It Forward." Each year, you have the extraordinary opportunity to help create the best-ever experience for our students, mentors, and fellow volunteers by becoming a *FIRST* volunteer.

Please consider volunteering at local events near you, but know that not all applicants can be placed in all roles at any given event. Please work with your volunteer coordinator and local Program Delivery Partner (PDP) to help identify the most meaningful way you can help in your region. A complete set of all role-specific volunteer materials can be found on our Volunteer Resources Page.

1.5 Competition Integrity Contract (CIC)

As an actionable part of the Framework of Behaviors described in Section 1.4.2 Framework of Behaviors, the Competition Integrity Contract (CIC) defines ways that every team in *FIRST* Tech Challenge should behave, both at and outside events.

The CIC is divided up into two categories: Sporting Ethics Code, which all teams must follow to protect the integrity of the competition, and Behavior Guidelines, which help teams act in a way that embodies *Gracious Professionalism* and ensures that every team can: Have Fun, Make Friends, and Chase Excellence.

1.5.1 Sporting Ethics Code

Our Team Certifies:

We Don't Cheat.
Our team will never intentionally violate the spirit of a rule. We won't circumvent the systems *FIRST* uses to keep the competitions running. We would be ashamed to win a student competition by cheating. The only true wins come when everyone is playing by the same rules: with honor, fair play, and integrity.

We Always Behave with Integrity.
We take pride in behaving with honor, even when "no one is watching." We appreciate the spirit of *FIRST* Volunteering, and we want the volunteers to focus on supporting teams rather than simply enforcing rules. We understand that teams need to abide by *all* the regulations, even the ones that are not checked. **Our actions are based on *what is right*, not *what we think we can get away with*.**

We Play the Game as Intended.
We understand The Sport is designed to be: "Red Alliance vs. Blue Alliance," it is not supposed to be "Teams vs. Volunteers." We understand the rules aren't designed to list every possible situation that can occur. Our team will not try to gain an advantage using any "loopholes" in the rules. If there is ever ambiguity in the specific wording of a rule, we will look to the intent of the rule and spirit of the competition to guide our behavior.

We Know Our Team Doesn't Enforce the Rules.
Our team values fair play and good sportsmanship. If we see something which we know is inappropriate, we will politely bring it to the attention of competition staff. We understand it is the responsibility of the event staff and *FIRST* Headquarters to handle any escalation and mitigation. We understand it is not appropriate for us to accuse, investigate, publicly call-out, or persecute *anyone* for a perceived infraction, especially in a disrespectful or confrontational manner.

1.5.2 Behavior Guidelines

Our Team Certifies:

We Focus on Journey, Before Destination.
Our team will try hard to win. We will chase excellence in everything we do. We will not define our success based on the competition results, but on the lessons we learn and friends we make. *FIRST* competitions are opportunities to measure our progress, and alongside other teams, celebrate the journey we've all taken together!

We Behave with Respect and Good Sportsmanship.
We will always strive to treat others with respect. Regardless of the outcomes, we will always strive to act professionally and behave in a way that we will be proud to remember (even when the competition gets intense and emotions are running high). Long after the competition is over, we know we won't remember if things didn't go exactly the way we wanted, but we will remember how we acted during those tough moments.

We support our teammates. We praise our partners. We celebrate our opponents.

We Help Each Other.
We do our best work when we're helping others and treating them with respect and kindness.
We want to succeed, but we don't want it to happen because someone else failed. We want to help everyone to play at their best, even when we're playing against each other. Then, we're going to celebrate with each other regardless of the outcome. *(...but we're hopefully going to win.)*

We 'Take the High Road.'
We're all still growing, no one is perfect. Being respectful means being understanding, empathetic, and sometimes being forgiving when someone else's behavior doesn't meet our expectations. If someone acts in a way which doesn't seem right, we will try not to let it affect how we behave. Everyone is on their own journey; everyone is struggling in ways we don't always see. We will remain focused on our own growth. We will be respectful to everyone, even those who are disrespectful to us.

We Respect Property and Facilities.
Our team will always work to leave things in a better state than we find them. We will behave in a way that prevents foreseeable damage to equipment, facilities or the property of others. We will clean up any messes we make. Accidents happen, and we will report any accidental damage to the appropriate individuals.

We Build a Positive Culture of Safety.
We will never knowingly jeopardize our own safety, or the safety of those around us. Our team will enable the safety of everyone we meet. Instead of a culture of safety enforcement, we emphasize teaching safe decision making and understanding safety best practices. In doing so, we help our members learn how they can be safe even in unfamiliar situations.

We Make Healthy Choices.
The competition is exciting and sometimes there is a risk of it becoming all-consuming of our time and attention. We understand that to succeed in *FIRST* Tech Challenge, and in life, it's important to prioritize our mental and physical health. Even when things get "very busy," we will ensure everyone on our team is: staying hydrated, eating well, staying active, getting enough sleep, and taking regular breaks.

We also understand that in any creative process a measured (and sometimes relaxed) schedule which leaves time for recuperation will often result in a better outcome than “grinding” for long hours. We know our team is most successful when every member is at their best, both at competitions and outside them.

We’re All on the Same Team.
This is a global community of great people with unique backgrounds who all have experiences to share. On the field, teams are supposed to compete fiercely against each other. Off the field, we’re all on the same team. Students, Mentors, Volunteers, Event Organizers… Everyone is here for the same reasons. We’re going to have fun, play robots, share stories, build something awesome, learn from everyone we meet, celebrate cool stuff, and more than anything: we'll be excellent to each other!

1.5.3 Infractions, Mitigations, & Escalation

Violations of the CIC may require escalation and/or mitigation depending on the circumstances of the infraction. These infractions may occur at an event and/or outside of events.

Escalations for violations related to specific competition regulations are outlined in the Escalation Guidelines. Some situations may require escalation to competition volunteers such as a Lead Robot Inspector (LRI), Head Referee, or *FIRST* Technical Advisor (FTA) for mitigation.

More serious violations, especially violations of the Sporting Ethics Code, will be escalated to the Event Director, and/or to *FIRST* Headquarters. At the discretion of *FIRST* Headquarters, these violations may result in the team being sanctioned, and/or disqualified from current and/or future events. Following an investigation, at the discretion of *FIRST* Headquarters, serious violations could result in a team or individuals being suspended or permanently removed from the *FIRST* Tech Challenge program.

FIRST has an open door policy; concerns from an event may be brought to the attention of *FIRST* Headquarters by emailing customerservice@firstinspires.org or contacting support.

1.6 Accessibility and Inclusion

FIRST is committed to *STEM for Everyone™* and as such, *FIRST* makes reasonable accommodations for persons with disabilities who need and request accommodations. If a participant needs accommodation for an event, please contact your local leadership before the event so they can help ensure the accommodation is provided. Local leadership may make exceptions to rules to allow for reasonable accommodation given the exceptions do not create an undue hardship or cause safety concerns.

1.7 Understanding & Using the Competition Manual

1.7.1 This Document & Its Conventions

The 2026-2027 Competition Manual is a resource for all *FIRST* Tech Challenge teams for information specific to the 2026-2027 season and the BIOBUZZ™ presented by RTX game. Its audience will find the following details:

- a general overview of the BIOBUZZ game,
- detail about the BIOBUZZ playing FIELD,
- a description of how to play the BIOBUZZ game,

- rules (related to safety, conduct, gameplay, inspection, event, etc.),
- ROBOT construction rules, and
- a description of how teams advance throughout the season.

The Competition Manual is intended to be the "source of truth" and while the intent is for supporting documents to be consistent with information some inconsistencies may exist. In cases of discrepancy, the Competition Manual takes precedence.

Specific methods are used throughout this manual to highlight warnings, cautions, key words, and phrases. These conventions are used to alert the reader to important information and are intended to help teams in constructing a ROBOT that complies with the rules in a safe manner.

Links to other section headings and rule references within this manual appear in `blue underlined text with a grey background`. Links to external resources appear blue underlined text.

For linked references not included in a preview release of this document, the links will appear with the section letter and ### for the rules number within square brackets. For example, a cross link to a game rule before a game rule is released will appear as `[G###]` and will be replaced with the current linked rule when that section of the manual is released.

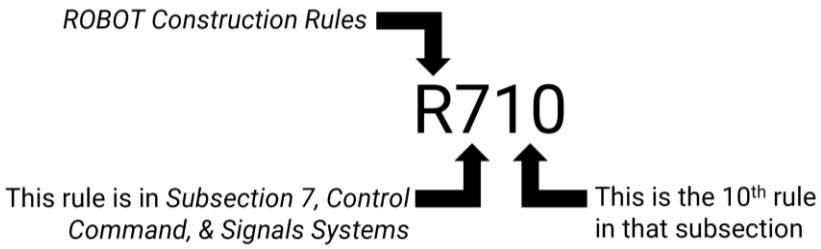
Key words that have a particular meaning within the context of *FIRST* Tech Challenge and BIOBUZZ are defined in Section `16 Glossary` and indicated in ALL CAPS throughout this document.

The rule numbering method indicates the section, subsection, and position of the rule within that subsection. The letter indicates the section in which the rule is published.

- I for Section `3 Competition Eligibility and Inspection (I)`
- E for Section `5 Event Rules (E)`
- A for Section `6 Awards (A)`
- G for Section `11 Game Rules (G)`
- R for Section `12 ROBOT Construction Rules (R)`
- T for Section `13 Tournament (T)`
- L for Section `14 League Play Tournaments (L)`
- C for Section `15 FIRST Championship (C)`

The following digit(s) represents the subsection in which the rule can be found. The final digits indicate the rule's position within that subsection.

Figure 1-3 Rule numbering method



Warnings, cautions, and notes appear in orange boxes. Pay close attention to their contents as they're intended to provide insight into the reasoning behind a

rule, helpful information on understanding or interpreting a rule, and/or possible "best practices" for use when implementing systems affected by a rule.

While orange boxes are part of the manual, they do not carry the weight of the actual rule (if there is an inadvertent conflict between a rule and its orange box, the rule supersedes the language in the orange box).

Imperial dimensions are followed by comparable metric dimensions in parentheses to provide metric users with the approximate size, mass, etc. Metric conversions (e.g., dimensions) round to the nearest 0.05 cm, e.g., "17.5 in. (~44.45 cm)." The metric conversions are offered for convenient reference only and do not overrule or take the place of the imperial dimensions presented in this manual and the official drawings (i.e., dimensions and rules will always defer to measurements using imperial units).

Rules include colloquial language, also called headlines, in an effort to convey an abbreviated version of the rule or rule set. There are two versions of headline formatting. Evergreen rules, rules which are expected to be present each season with only their specific details changing from season to season, are indicated with their headline presented in ***bold green text** with a leading asterisk. This means that the overall subject and presence of the rule from season to season is constant, but game specific details and terms may be updated as needed (e.g., changing game specific terms, or changing the specific details around ROBOT expansion within an Evergreen rule about expansion limits, or changing the quantity of allowed motors within an Evergreen actuator rule). These rules also start their respective section, so their rule number is less likely to change from season to season. All other rule headlines use **bold orange text**.

Any disagreement between the specific language used in the rules and the colloquial language is an error, and the specific rule language is the ultimate authority. If you discover a disparity, please let us know at customerservice@firstinspires.org.

Team resources that are not generally season specific (for example, what to expect at an event, communication resources, team organization recommendations) can be found on the *FIRST* Tech Challenge Resources Page.

1.7.2 Translations & Other Versions

The *FIRST* Tech Challenge Competition Manual is originally and officially written in English and is occasionally translated into other languages for the benefit of *FIRST* Tech Challenge teams whose native language may not be English. These assets are posted on the Game and Season Materials page.

A text-based English version can be provided only for use with assistive devices and not for redistribution. For more information, please contact *FIRST* Tech Challenge at customerservice@firstinspires.org.

Additional resources such as a *FIRST* Tech Challenge AI Chatbot are provided as a helpful tool, but the Competition Manual is the final authority. In the event that a rule or description is modified in an alternate version of this manual, the latest English PDF version as published on the Game and Season Materials page is the authoritative version.

1.7.3 Team Updates

Team Updates are used to notify the *FIRST* Tech Challenge community of revisions to the official season documentation (e.g., the manual, drawings) or important season news. Team Update posts are scheduled as follows on the Game and Season Materials page:

- Every Thursday beginning on Kickoff day and ending two weeks prior to *FIRST* Championship.

Team Updates are indicated using the following formatting:

- Additions are highlighted in yellow. This is an example.
- Deletions are indicated with a strikethrough. ~~This is an example.~~

Team Updates that are published after the driver's meeting at an event will not apply to that event.

1.7.4 Question & Answer System

The Question and Answer System (Q&A) is a resource for teams to ask questions about gameplay, competition rules, judging and advancement, ROBOT build rules, and FIELD setup. Teams can search for previously asked questions and responses or pose new questions. Questions can include examples for clarity or reference multiple rules to understand the relationships and differences between them.

The Q&A opens on September 28, 2026, 12:00p.m. ET. Access to the Game Q&A system is through the Lead Coach 1 or Lead Coach 2's account on the *FIRST* dashboard.

The Q&A may result in revisions to the text in the official manuals (which are communicated using the process described in Section 1.7.3 Team Updates).

Moderators will answer team questions beginning each Monday and close on Thursday at 5:00p.m. ET. The responses in the Q&A do not supersede the text in the manual, although every effort will be made to eliminate inconsistencies between the two. While responses provided in the Q&A may be used to aid discussion at each event, REFEREES and INSPECTORS are the ultimate authority on rules. If you have concerns about enforcement trends by volunteer authorities, please notify *FIRST*.

The Q&A is not a resource for firm predictions on how a situation will play out at an event. Questions about the following may not be addressed:

- rulings on vague situations
- challenging decisions made or at past events
- design reviews of a ROBOT system for legality
- questions that are overly broad, vague, and/or include no rule references
- questions about how a REFEREE should have ruled when specific gameplay happened at a past event
- duplicate questions
- questions clearly defined/addressed in this manual

Good questions ask generically about features of parts or designs, gameplay scenarios, or rules, and often reference one or more relevant rules within the question. Some examples of questions that will likely be answered in the Q&A are:

- A device we are considering using on the ROBOT comes with purple AWG 40 wire, does this comply with R?? and R??

- We're not sure how to interpret Rule G?? applies if blue ROBOT A does X and red ROBOT B does Y, can you please clarify?
- If a ROBOT does this specific action, is it doing what this defined term is describing?

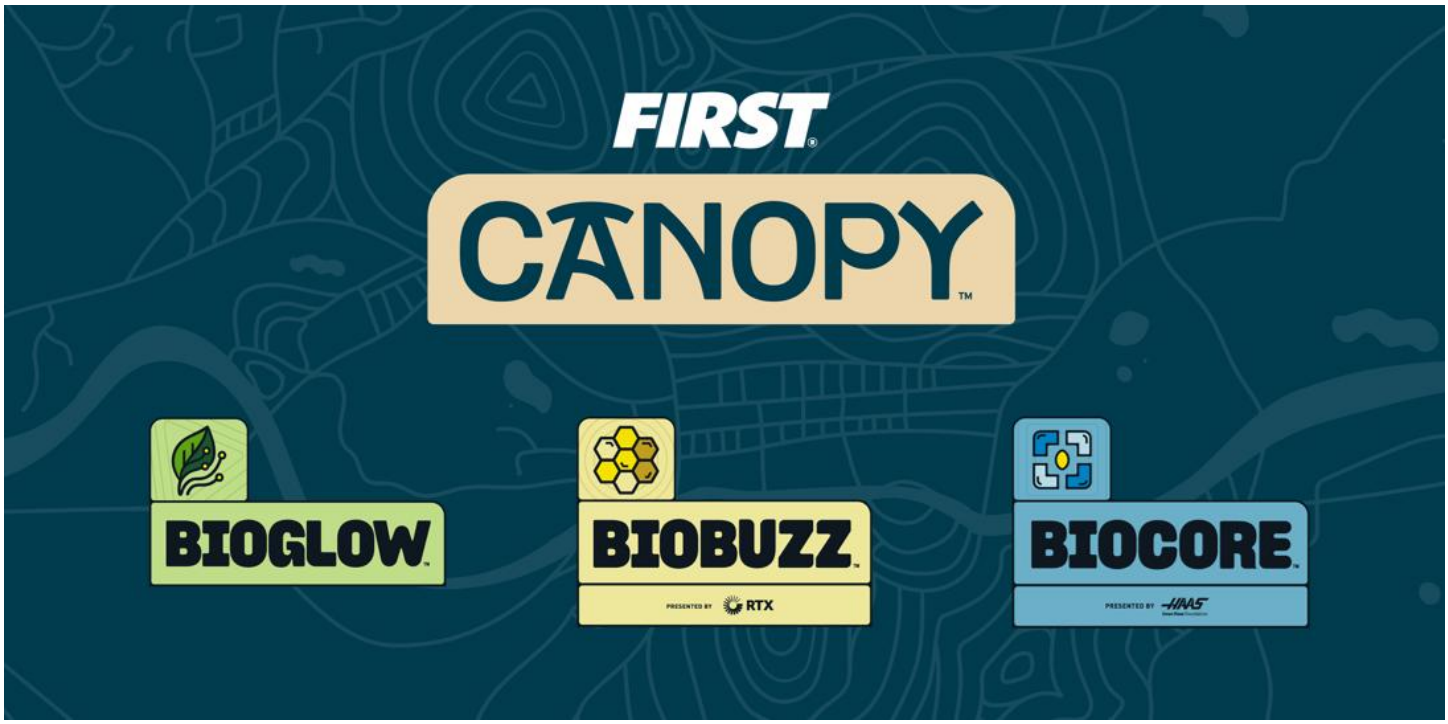
2 *FIRST* Season Overview

Engineer a Thriving Planet with *FIRST*

Nothing on Earth thrives alone. Every gene, species, and ecosystem is part of a rich web of biological diversity that powers clean air, fresh water, and food. With STEM as their tool and nature as inspiration, today's boldest innovators are finding new ways to strengthen the connections that protect our shared home.

Building. Problem solving. Growing stronger through teamwork.

Welcome to *FIRST*® CANOPY™, our 2026-2027 robotics season inspired by nature.



LEARN MORE: https://www.firstinspires.org/first-canopy

3 Competition Eligibility and Inspection (I)

3.1 Team Eligibility Rules

I101 ***Teams must be registered with *FIRST*.** Teams must be "competition ready" in order to compete in *FIRST* Tech Challenge official events and earn MATCH points or be eligible for judged awards.

A. North America - competition ready requirements:
   i. complete annual registration process through the *FIRST* dashboard
   ii. pay annual registration fee
   iii. 2 adults must be assigned in the Lead Coach 1/Lead Coach 2 roles and have passed Youth Protection Program (YPP) screening,
   iv. complete any additional Youth Protection screening requirements (may vary from region to region), and
   v. register all youth team members on the *FIRST* dashboard.
B. outside North America - competition ready requirements:
   i. complete annual registration process through the *FIRST* dashboard and
   ii. complete any additional requirements by the local *FIRST* Program Delivery Partner with regards to program fees, registrations and youth protection screening.

> The local Program Delivery Partner may, in rare cases, make exceptions for delayed payment on a case-by-case basis. Teams who have not paid annual registration fees will not earn any official season record and will not be allowed to advance.

I102 ***Check-in at the event on time.** An adult team member must check-in at the Pit Administration station, or designated check-in location, no later than 45 minutes before Qualification MATCHES are scheduled to start, unless otherwise specified or approved by the Event Director. Check-in must be completed by a team adult and at least one STUDENT must be present at the venue before check-in can be completed.

Additional check-in requirements will vary by region but may require one or more of the following items:

A. A current, completed team roster from the team's *FIRST* dashboard as specified by the local Program Delivery Partner,
B. local Program Delivery Partner team member registration or consent forms (varies by region),
C. a ROBOT built to specifications in Section 12 ROBOT Construction Rules (R), if they intend to participate in MATCHES, and
D. a printed team PORTFOLIO (optional, see Section 6 Awards (A)).

> Teams should be aware of the competition schedule and note any key activities (such as inspection or judging) that may occur prior to the check-in deadline.
>
> All teams, regardless of how "ready" they think they are, are encouraged to participate in gameplay and judging. Teams are encouraged to reach out to their Program Delivery Partner and other teams to request help getting their ROBOT ready to compete before attending an event.

I103 ***A responsible adult must be present for the whole event.** At least 1, preferably 2, adult(s) responsible for the STUDENT team members must be present at all times during the event. Responsible adult(s) are recommended to be listed on the team roster.

3.2 Awards Eligibility Rules

To be eligible for Team Judged Awards, a team must participate in an Initial Interview (A203). For some awards, submitting a PORTFOLIO (A201) is also required.

Teams competing in multiple Qualifying or League Tournaments, or at events outside of their HOME REGION, are subject to A213 and A214. Details on a HOME REGION can be found in Section 4 Advancement.

Complete details and rules about *FIRST* Tech Challenge awards can be found in Section 6 Awards (A).

3.3 MATCH Eligibility Rules

Prior to participating in Qualification or Playoff MATCHES, teams are required to pass a ROBOT inspection facilitated by INSPECTOR volunteers. The goal of inspection is to ensure the team's ROBOT meets baseline safety and competition requirements before engaging in MATCH play.

> Some events may offer scheduled Practice MATCHES. Teams are permitted to participate in scheduled Practice MATCHES before passing inspection, but they may not participate in unscheduled or "filler line" Practice MATCHES before passing inspection. Teams are responsible for ensuring their ROBOTS are safe and will not damage the playing FIELD.
>
> The FTA, LRI, or Head REFEREE may prohibit a team from participating in a Practice MATCH if they determine that their ROBOT is unsafe or likely to damage the playing FIELD.

3.3.1 Inspection

Inspection is often one of the first activities a team experiences upon arrival at an event. Some events may assign specific inspection time slots for teams, and others may schedule a general span of time for teams to complete inspection. Teams are responsible for completing inspection within the scheduled time.

During inspection, student team members present their ROBOT, all COMPONENTS that will be used by that ROBOT, and their OPERATOR CONSOLE. INSPECTORS will review baseline safety and competition requirements with the team. If any requirements are not met, INSPECTORS will work with the team to find a resolution. The Lead ROBOT INSPECTOR (LRI) has the final authority on a team's eligibility to participate in Qualification and Playoff MATCHES on matters related to ROBOT construction.

Teams may power on and enable the ROBOT during inspection to demonstrate adherence to ROBOT construction rules. Team members should let INSPECTORS know if the ROBOT must be powered on and/or enabled to meet any inspection criteria. Team members should also inform INSPECTORS if the ROBOT, in its inspection configuration, has any stored energy (for example, springs stretched) and collaborate with each other to ensure a safe inspection experience.

Inspection is not comprehensive. Teams are expected to adhere to the spirit of the rules in Section 12 ROBOT Construction Rules (R), even if INSPECTORS do not check every part of the ROBOT. Teams that STRATEGICALLY circumvent ROBOT construction rules are not adhering to the Competition Integrity Contract (CIC) and may be subject to mitigation.

An Inspection Checklist is available to help teams self-inspect their ROBOT. Teams are strongly encouraged to self-inspect before every event.

Inspection may not happen all at once if, for example, a team needs to take a break to resolve a ROBOT construction issue or participate in a scheduled Practice MATCH. The process may involve multiple inspection volunteers. Either the INSPECTOR or the team may request assistance from the LRI.

I301 ***Bring the complete ROBOT and supporting equipment to inspection.** Teams should present the ROBOT and OPERATOR CONSOLE with all COMPONENTS, including decorative parts, that will be used during MATCHES. Teams are not required to use all inspected COMPONENTS in every MATCH, but they should not add any un-inspected COMPONENTS to the ROBOT without re-inspection. Teams should demonstrate to INSPECTORS all ways the ROBOT will be configured for a MATCH.

I302 ***Certain limits apply to all configurations.** The total number of electronics (motors, servos, Android Devices, etc.) used to build all MECHANISMS and base ROBOT, whether they are used on the ROBOT at the same time or not, may not exceed the constraints specified in Section 12 ROBOT Construction Rules (R).

3.3.2 Re-Inspection

Teams may make changes to their ROBOT during an event after they complete their initial inspection. With some exceptions, all changes to the ROBOT must be re-inspected before the team can participate in further Qualification or Playoff MATCHES. During re-inspection, teams demonstrate the changes to INSPECTORS and make any additional changes necessary to meet baseline safety and competition guidelines. Re-inspection may also be requested by the Head REFEREE or *FIRST* Technical Advisor (FTA) if they observe potentially unsafe or disallowed ROBOT construction.

Teams are encouraged to seek the advice and assistance of Team Support volunteers when making a change to their ROBOT. Attempting to participate in a MATCH with a ROBOT that does not meet the rules in Section 12 ROBOT Construction Rules (R) may cause unnecessary delays and stress for teams. Deliberately making changes to a ROBOT after inspection to gain a competitive advantage without re-inspection is against the spirit of the competition.

I303 ***Request re-inspection for most changes to the ROBOT.** A team should request re-inspection when it makes changes to a ROBOT that may cause it to not comply with safety and competition guidelines or when requested by the Head REFEREE or FTA.

Re-inspection is generally **not** necessary for the scenarios listed below (unless they result in a significant change to the ROBOT'S size, legality, or safety):

A. addition, relocation, or removal of fasteners (e.g., cable ties, tape, and rivets),
B. addition, relocation, or removal of labeling or marking,
C. addition, relocation, or replacement of the team SIGN,
D. revision of ROBOT code,
E. replacement of a COMPONENT with an identical COMPONENT,
F. replacement of a MECHANISM with an identical MECHANISM (size, weight, material), and
G. additions, removals, or reconfiguration of ROBOT with a subset of MECHANISMS already inspected.

All teams should make a good faith effort to comply with ROBOT construction rules if they make changes to their ROBOT during an event.

If a team is unclear if reinspection is required, they should confirm with the LRI or FIELD STAFF. For example, if a team is unsure if reassembling a part changes their ROBOT'S size, they should have it checked.

I304 ***Do not exploit re-inspection.** Teams may not use the re-inspection process to circumvent any other rules.

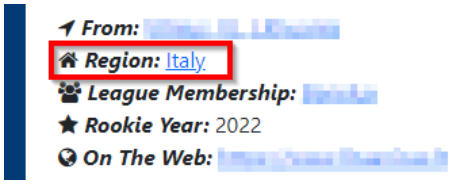


4 Advancement

Teams are only eligible to advance from events within their HOME REGION. Teams may be invited to compete at tournaments outside of their HOME REGION; however, they are not advancement eligible from these out-of-region events.

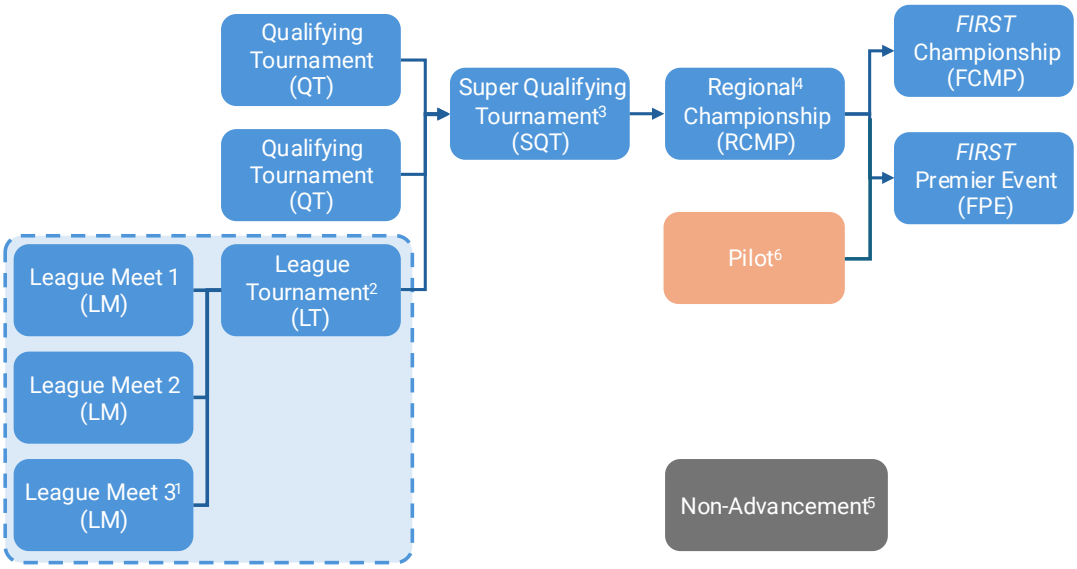
Teams can check what HOME REGION they are assigned to on the FTC-Events page by looking up their team number. Teams in regions that do not have a local Program Delivery Partner, or who are geographically isolated within their HOME REGION can work with *FIRST* by emailing customerservice@firstinspires.org to get reassigned to another more accessible region once per season for advancement.

Figure 4-1: Region assignment display on FTC-Events page



FIRST Tech Challenge tournament progression is shown in Figure 4-2. Teams can advance from any of their first three entry-level events: Qualifying Tournaments (QT) and League Tournaments (LT). Teams may only participate in one League per season. See Section 14 League Play Tournaments (LT) for more details on League Tournaments. Teams may participate in more than three entry-level events but are eligible to advance from the first three chronological events.

Figure 4-2: Tournament Advancement Structure



1,3,5 – Optional event, not offered in all regions.
2 – All teams within a League play in the League Tournament.
4 – Can also be called State, Region, or Country Championship.
6 – Only in select new or emerging regions.

Teams may advance from their region's Qualifying Tournaments or League Tournament to either a Super Qualifying Tournament (SQT) or directly to a Regional Championship (RCMP). Super Qualifying Tournaments (SQT) are an optional advancement level often used in large regions which need more levels of competition. A team may only participate in one Super Qualifying Tournament (SQT).

Teams in a few specific geographical regions may advance from a Pilot event - the highest tier of competition within a new or emerging region - to *FIRST* Championship and/or a *FIRST* Premier Event.

The local Program Delivery Partner determines the advancement numbers from each tournament in their region, up to a Regional Championship. *FIRST* Staff determine the advancement from each Regional Championship to *FIRST* Championship and *FIRST* Premier Events.

4.1 Advancement Points Calculation

For each advancing event, teams will be ranked based on the advancement points they earn through their overall performance at that individual event. The top ranked teams not already advanced will qualify for the next level of play, up to the total allocated advancement spots for that event. Advancement points are awarded to teams based on Table 4-1 below.

Table 4-1: Advancement Point Assignment

Category	Advancement Points Earned
Qualification Phase Performance	Normal distribution of points from 16 to 2 across the highest ranked team to the lowest based on the equation in Section 4.1.1 Qualification Phase Performance. (This will result in a minimum of 2 points and a maximum of 16 points being awarded for Qualification phase performance.)
ALLIANCE lead	Equal to 21 minus the ALLIANCE lead number (e.g., 18 points for ALLIANCE #3 lead)
Draft Order Acceptance	Equal to 21 minus the Draft Order Acceptance number (e.g., 18 points for the team which accepts the third draft position)
Playoff Advancement	40 points for 1st Place (Winners) 20 points for 2nd Place (Finalists) 10 points for 3rd Place 5 points for 4th Place (See Section 13.8 Dual Division Events for modifications to this section)
Team Judged Awards	60 points for Inspire Award 1st Place 30 points for Inspire Award 2nd Place 15 points for Inspire Award 3rd Place 12 points for all other 1st Place Awards 6 points for all other 2nd Place Awards 3 points for all other 3rd Place Awards (See A211 for a list of points-eligible awards)

If there is a tie in the point totals between teams, the higher ranked team will be determined using the following additional sorting criteria in Table 4-2.

Table 4-2 Advancement Sorting Criteria Including Tiebreakers

Order Sort	Criteria
1st	Total Advancement Points (as calculated in Table 4-1)
2nd	Judged Team Award Points
3rd	Playoff Advancement Points
4th	ALLIANCE Selection Results Points (ALLIANCE Lead or Draft Order Acceptance)
5th	Qualification Phase Performance Points
6th	Average Qualification MATCH Points (excluding FOULS)
7th	Average Qualification AUTO Points
8th	Highest individual Qualification MATCH Points (excluding FOULS)
9th	Second Highest individual Qualification MATCH Points (excluding FOULS)
10th	Random Selection by Event Management System

4.1.1 Qualification Phase Performance

The calculation of Qualification Phase Performance points is done using the equation below. This equation is an inverse error function which utilizes the following variables:

- **R** – the qualification rank of the team at the event at the conclusion of Qualification MATCHES (as reported by the Event Management Software and defined in Section 13.6.3 Qualification Ranking)
- **N** – the number of *FIRST* Tech Challenge teams participating in the Qualification rounds at the event
- **Alpha (α)** – a static value (1.07) used to standardize the distribution of points at events

$$\boldsymbol{QualificationPoints}(\boldsymbol{R},\boldsymbol{N},\boldsymbol{\alpha}) = \left\lceil \boldsymbol{InvERF}\left(\frac{\boldsymbol{N}-2\boldsymbol{R}+2}{\boldsymbol{\alpha N}}\right)\left(\frac{7}{\boldsymbol{InvERF}\left(\frac{1}{\boldsymbol{\alpha}}\right)}\right)+9\right\rceil$$

This formula generates an approximately normal distribution of Qualification Phase Performance points at an event, based on rank, with most teams getting a moderate number of points, and fewer teams getting the highest or lowest numbers of points available.

Table 4-3 displays sample Qualification Phase Performance points for variously ranked teams at a 28-team event. The system will automatically generate the appropriate points for each team based on their rank and the number of teams at the event.

Table 4-3 Sample Qualification Round Point Assignments

Rank	1	2	3	4	…	12	13	14	…	25	26	27	28
Points	16	15	14	14	…	10	10	10	…	6	5	5	4

4.1.2 ALLIANCE Selection Results

This attribute measures both individual team Qualification round seeding performance and recognition by peers.

ALLIANCE Leads are recognized based on their Qualification phase seeding rank. This rank is a result of the rules of the game, which typically incorporate several team performance attributes. ALLIANCE partners are rewarded based on peer recognition. To be invited to join an ALLIANCE, a team's peers have decided that the team has attributes that are desirable.

Note also that ALLIANCE leads are given the same number of points as the team drafted in the same sequence. For example, the team who accepts the pick from the 3rd ALLIANCE lead receives the same number of points as the 3rd ALLIANCE lead. Numerical analysis supports the idea that ALLIANCE leads are about as strong in ROBOT performance as equivalently drafted teams.

4.1.3 Playoff Performance

This attribute measures team performance as part of an ALLIANCE.

Teams earn points based on how far they progress into the Playoffs. Points are given to all teams within the ALLIANCE as described in Table 4-1.

See Section 13.7.2 Playoff MATCH Bracket for more details on the number of ALLIANCES that are formed for the Playoffs and an example of the Playoff MATCH bracket.

4.1.4 Team Judged Awards

This attribute measures team performance with respect to team awards judged at the event.

The points earned for team awards in this system are not intended to capture the full value of the award to the team winning the award or to represent the full value of the award to FIRST.

Points are being assigned to awards in this system only to help teams recognize that *FIRST* continues to be "*More than Robots*®," and to assist in elevating award-winning teams above non-award-winning teams in the ranking system.

Teams only get points for team awards judged at the event and are limited to win only a specific number of awards per A215. If an award is not judged, is not for a team (e.g., the *FIRST* Leadership Award), or is not judged at the event (e.g., Safety Animation Award), no points are earned. Points for awards not given at the event are not assigned to any team. See A211 for the list of points-eligible awards.

4.2 Advancement Distribution by Region

Advancement within a region is determined by the Program Delivery Partner and minimum advancement numbers should be made publicly accessible to participating teams as early as possible before the event, and no later than when ALLIANCE selection begins. Advancement information may be published on the FTC-Events page as shown in Figure 4-3.

Figure 4-3 Event Advancement Information as shown on the ftc-events.firstinspires.org/page

Event Information

Basic information about the NYC QUALIFIER 1 can be found in the chart below. All times and dates displayed here and on the event's individual result pages are local to the event.

Event Code	USNYNYNYQ
Dates	Event Complete (Week 11 since kickoff) Sunday, November 17 to Sunday, 17 November 2024
Venue	East Harlem Tutorial Scholars Academy 2017 FIRST Avenue New York, NY USA
Region	New York - NYC
Advancement	8 teams advance to NYC SUPER QUALIFIER 2
Website	https://www.eastharlemscholars.org/high-school

Advancement to *FIRST* Championship and *FIRST* Premier Events is determined by *FIRST* Headquarters based on a number of factors including:

- Global and regional representation
- New developing regions with a Program Delivery Partner
- Number of teams registered within the region before the cutoff date (November 17th, 2026 for the BIOBUZZ season)
    - Regions who meet minimum registration requirements
    - Total number of teams within the region

Regional allocations of advancement slots information will be published on the FTC-Events page starting in early December. Regionally allocated slots which are not secured by the event deadline will be returned to *FIRST* HQ or Premier Event Host for reallocation which may include reallocation to a new region or waitlist team invitation.

5 Event Rules (E)

This section includes general rules which apply from the beginning of the public schedule when teams arrive through the end of the event with departure from the venue.

> *Universal Violation Note: A violation of any Event Rules (E) will result in a VERBAL WARNING. Egregious or subsequent violations of an Event Rule may result in escalation to FIRST Headquarters and/or disqualification for the team from MATCHES and awards. Criminal behavior will not be tolerated and will result in removal of individual(s) involved and/or disqualification for the team from the event.*
>
> *Any items that are deemed unsafe or outside specifications by FIRST personnel and/or the Event Director must be removed. Additional rule specific violations, if applicable, are listed with their corresponding rule.*

FIRST is committed to *STEM for Everyone*™ and as such, *FIRST* strives to make reasonable accommodations for persons with disabilities that request accommodation. Please see Section 1.6 Accessibility and Inclusion for more information.

Rules around safety and security within this section are minimum requirements, and Program Delivery Partners are able to implement increased restrictions due to local or venue requirements (e.g., requiring badging for all attendees, reserving seating for accessibility). Partners should communicate additional local requirements early enough to allow teams to plan.

5.1 General Rules

E101 ***Personal safety comes first.** All team members must observe the following safety practices throughout the event:

A. wear safety glasses or safety rated glasses with side shields (ANSI-approved, UL Listed, CE EN166 rated, AS/NZS certified, or CSA rated) in specified areas. There is a 10-minute grace period when the venue opens each day of the event for teams to find and distribute safety glasses.

Clear or lightly tinted safety glasses are preferred. Shaded glasses are allowed for those who need them and do not require a specific accommodation request.

B. wear closed toed/heeled shoes,
C. control entanglement risks by tying back long hair and removing other dangling decorations including lanyards, spirit wear, and rings as needed while working on or around a ROBOT or ROBOT related materials or tools,
D. wear appropriate clothing,
E. walk in the venue, and
F. comply with government and venue-specific health and safety requirements in place for that event (i.e., mask wearing).

Teams are responsible for bringing their own personal protective equipment.

For more information about safety at *FIRST* events, please reference the *FIRST* Safety Manual.

E102 ***Be Respectful.** All participants should follow the framework of behaviors listed in Section 1.4 The Spirit of the Competition while attending a *FIRST* Tech Challenge event. Uncivil behavior toward any participants is not tolerated.

Examples of inappropriate behavior include, but are not limited to:

A. use of offensive language or other uncivil conduct towards someone,
B. "weaponizing *Gracious Professionalism*" by accusing another person or team of being "not GP",
C. intentionally blocking the view of other participants or spectators for an extended period (Team members momentarily holding up team signs while directly supporting their team is not considered a violation of this rule.), and
D. anything that interferes with a ROBOT or the ARENA operations.

Examples of particularly contemptible behavior that may result in ejection from the event include, but are not limited to, the following:

E. assault, e.g., throwing something that hits another person (even if unintended),
F. threat, e.g., saying something like "if you don't reverse that call, I'll make you regret it,"
G. harassment, e.g., badgering someone with no new information after a decision has been made or a question has been answered,
H. bullying, e.g., using body or verbal language to cause another person to feel inadequate or unsafe,
I. insulting, e.g., telling someone they do not deserve to be on a team,
J. swearing at another person (versus swearing under one's breath or at oneself), and
K. yelling at another person(s) in anger or frustration.

E103 ***Children with adults, please.** Children under 12 must be accompanied in the pits by an adult at all times.

E104 ***Respect the venue.** Teams may not damage the venue, including but not limited to bleachers, floors, walls, and railings, in any way. This includes littering with team giveaways including candies, flyers, and stickers or items thrown from the stands.

E105 ***Event resources are for competing teams only.** Only teams registered for an event may use that event's competition FIELD, practice FIELD, and inspection unless pre-approved by the Event Director or the Program Delivery Partner. Host teams supplying practice FIELD elements and/or machine shop resources may use them; however, teams registered for that event must be granted priority.

E106 ***Practice only when/where permitted.** Teams may only practice with their ROBOT in their pit space, in the designated event practice areas, or while in a Practice MATCH.

Teams may not set up their own practice equipment outside their pit in other areas of the event venue. If the Event Director determines a pit practice setup is unsafe or interferes with activity in adjacent pits or aisles, the team must discontinue the activity.

Demonstrating robot functionality to guests or JUDGES is not considered practice.

E107 ***Work in designated areas only.** At the event venue, teams may only produce FABRICATED ITEMS as follows:

A. in their pit area,
B. in another team's pit area with permission from that team,
C. while queued for a MATCH or practice FIELD (given space constraints, extra scrutiny regarding safety is required),
D. any area designated by event staff (e.g., playoff pit area), or
E. as permitted at provided machine shops that are available to all teams.

E108 ***Some things do not belong at events.** Do not bring or use the following:

A. Skateboards,
B. 'hoverboards,'
C. drones,
D. bottled gas tanks (e.g., helium),
E. noisy devices or noisemakers, such as floor stompers, whistles and/or air horns,
F. scooters, except for those used for accommodations.
G. any item with bright lights which flash faster than approximately 5 times per second

E109 ***Do not arrange for additional services or utilities.** Do not arrange for power, internet access, or phone lines from venue service providers or attempt to use venue internet connections reserved for event purposes (e.g., *FIRST* event management software or webcasting).

E110 ***Do not sell stuff.** Teams may not conduct sales at an event. This includes, but is not limited to, raffle tickets, food, hats, shirts, candy, water, soft drinks, fruit, or any promotional products unless specifically allowed by the Event Director.

E111 ***No Loud Music.** Do not invite or bring live bands to play in the audience. Do not play loud music.

E112 ***Hang banners with care.** Be respectful when hanging your banners.

A. Do not cover or move other team or sponsor signs already in place.
B. Share the available space fairly with other teams.
C. Do not obstruct the view of spectators.
D. Get permission from the Event Director before hanging banners outside of your pit.
E. Hang signs and banners in a safe manner.
F. Banners hung outside team pits must not be larger than 25 $ft.^2$ (~2.3 m^2).

We encourage teams to bring team flags and/or signs for display in their pits and/or the ARENA.

Respect venue-specific rules regarding sign location and hanging methods. At the end of the event, safely remove all signs and anything used to hang the signs (tape, string, etc.).

E113 ***Limit flag and flagpole size if used in the ARENA.** Flags and flagpoles may not be of unreasonable size and weight if they are going to be used around the FIELD.

> As a guideline, reasonable flags are less than 3 ft. by 5 ft. (~91 cm by 152 cm) in size and weigh less than 2 lbs. (~907g). Reasonable flagpoles may not be more than 8 ft. (~243 cm) long and must weigh less than 3 lbs. (~1360g).

E114 ***No firearms or other weapons.** Firearms or other weapons are prohibited at all *FIRST* events for all *FIRST* programs, including without limitation, all official *FIRST* Events posted here. This rule includes prop or simulated weapons which appear to be real. This policy does not apply to law enforcement or venue security personnel.

E115 ***Inspection required for practice FIELD access.** A team may only use a practice FIELD with a ROBOT that has passed an initial, complete inspection. This rule only applies to events not using scheduled inspection times.

E116 ***Do not record anyone at the event without their consent.** Do not record interactions with anyone at an event, without the person's consent. *FIRST* event staff and volunteers are empowered to excuse themselves from an interaction in which they are being recorded after declining consent.

> Please note that many *FIRST* events are livestreamed and *FIRST* participants have given permission to appear in footage from *FIRST*. This does not mean that people can record specific interactions without additional consent.
>
> Laws regarding recording of conversations vary state-to-state and country-to country, and, in some cases, recording without consent may be criminal. Introducing the idea of recording a conversation with an implied reason of proving someone's error can escalate a discussion and is likely to increase its adversarial nature.

E117 ***Enter only 1 ROBOT in the tournament.** At a given *FIRST* Tech Challenge event, each team may only inspect and play MATCHES with 1 ROBOT. *FIRST* Tech Challenge teams may only participate in 1 concurrent event at a time.

> The intent of this rule is to use tournament resources responsibly by not requiring volunteers to inspect multiple ROBOTS and to prevent loopholes around having multiple inspected ROBOTS that can be switched out between MATCHES.
>
> This rule does not prohibit teams from bringing other ROBOTS or robot-like assemblies into the venue for other purposes such as awards presentations or pit displays.
>
> It is expected that teams will update, make changes and even build multiple ROBOTS during a season; this rule only applies to bringing multiple different ROBOTS to a single event to play MATCHES.

E118 ***No saving seats.** Teams are not permitted to save or designate seats for team members that are not actively using them.

Teams may not hang banners or ribbons or otherwise designate seating. (Event staff will remove and discard any banners, roping, etc., used to designate seating.) Please take turns sitting in the bleachers/stands if seating is limited. If there is a crowding problem, we ask that you kindly leave after your team's MATCH and return later, if possible.

The Event Director may reserve seats for attendees who require accessible seating, for certain volunteers, or to ensure teams in the Playoffs have seats to watch their teams play.

5.2 Machine Shops and Host Team Build Spaces

Rarely, some events host a machine shop or open their team's build space, during specific hours (see the event public agenda), to help teams with repair and fabrication of their ROBOT. Machine shops are typically sponsored by the local host organization. In most cases, the machine shop is on site and readily accessible to all teams. All competing teams should have access to the same resources.

5.3 Wireless Rules

E301 ***No wireless communication.** Teams may not set up their own Wi-Fi (802.11a/b/g/n/ac/ax/be) wireless communication (e.g., access points or ad-hoc networks), Bluetooth, or any other communications systems using 2.4GHz or 5GHz wireless in the venue.

A wireless hot spot created by a cellular device, camera, smart TV, etc. is considered an access point.

Some smart TVs have access points enabled by factory default. Please make sure that functionality is disabled for any TVs brought to the event.

Bluetooth uses 2.4GHz frequencies to communicate which can interfere with venue and ROBOT systems.

Many R/C toys (including drones, wireless vehicles, FPV systems) use 2.4GHz and 5GHz communications. Do not operate these in the venue.

E302 ***Don't interfere with wireless networks.** Participants may not interfere, attempt to interfere, or attempt to connect with any other team or *FIRST* wireless network without expressed permission.

Teams are encouraged to report suspected wireless security vulnerabilities to the *FIRST* Technical Advisor (FTA) or Event Director if at the event or to *FIRST* via customerservice@firstinspires.org to report a suspected issue after the event.

5.4 Load-In

Some large events (often multi-day events) may set specific time frames, published on the event public schedule, in which teams are invited to load their ROBOT and equipment into their pit areas before pits officially open.

Load-in can be stressful for teams and volunteers, which can be mitigated by preparation and planning. Unanticipated factors, like traffic or weather, can change a team's scheduled arrival time, making the process difficult. The most important things a team should remember are to be safe, gracious, and professional.

5.5 Pits

A team pit is the designated space, varying in size but typically no larger than a 10 ft. by 10 ft. by 10 ft. (~3 m x 3 m x 3 m) area, where a team may work on their ROBOT. Each team is assigned a pit space typically marked with their team number. This helps team members, JUDGES, and visitors find teams easily. Pit spaces may vary based on competition venue size limits.

The pit area refers to the general area where team pits are located which encompasses the aisles between the pits, pit admin, ROBOT inspection, practice FIELD, or other areas where ROBOTS may be active or worked on. All pit rules apply to the full pit area.

> Additional limitations beyond those listed below may be imposed by the Event Director but they should be clearly communicated at least 48 hours before the event start time and applied to all teams fairly.

Team pits may or may not have a table and power outlet. If individual team outlets are not provided, the venue must provide access to team-usable outlets in the pit area for charging batteries. Power may not be available overnight for a multi-day event.

E501 ***Pits are unavailable if closed.** Teams may not access their pit area outside the designated hours.

E502 ***Pit set ups should be self-contained within the space assigned by the Event Organizers.** Teams should set up their allowed equipment fully within their assigned pit space. Teams may not:

A. run power or internet lines from their team pit to any other area except as instructed or allowed by the Event Director,
B. swap team pits with other teams if pits have assigned team numbers, or
C. move themselves to empty team pits without Event Director approval.

E503 ***Keep aisles and exit pathways clear.** Teams may not block aisles and pathways.

E504 ***Open flames and spark emitting devices must be limited and carefully controlled.** Tools that throw sparks or produce open flames are generally prohibited, except in limited and safely controlled instances. The Event Director may impose additional restrictions on open flames or sparks.

> Examples which are generally acceptable: limited use of a lighter to melt strings or strap to prevent fraying, using a sander to shorten a bolt as long as the sparks are directed safely and is limited in duration.

Examples of tools that violate this rule include, but are not limited to: welders, bench and angle grinders, and gas torches.

E505 ***Only small benchtop machinery is permitted in team pits.** Small machinery is allowed but floor standing power tools are prohibited. The Event Director may impose additional limitations.

'Small' machinery is machinery that can be easily lifted by one person and examples include, but are not limited to: 3D printers, small band saws, small drill presses, desktop CNC mills, and sanders.

Examples of prohibited machinery include, but are not limited to: full-size free standing drill presses, and band saws.

E506 ***No brazing or welding.** Brazing/welding is prohibited.

E507 ***Solder with specific tools only.** Soldering may be done using an electric iron/gun only.

E508 ***Pit structures must be safe.** Teams may not build any structure that supports the weight of people or stores items overhead. Structures may not block or inhibit fire sprinkler systems or otherwise be unsafe. The Event Director may impose additional restrictions.

Popup tents may be used assuming they comply with E502, but the coverings may violate this rule if they interfere with fire suppression systems.

E509 ***Only use aerosol or other chemicals with noxious fumes in approved areas.** Any aerosol or chemical that produces noxious fumes or sprays particulates should only be used in approved areas. Not all venues will allow the use of these products anywhere on site.

E510 ***Don't heat or cool ROBOT components to gain an advantage.** Teams may not attempt to gain a competitive advantage by heating or cooling ROBOT parts above or below the ambient temperature of the venue.

The intent of this rule is that ROBOTS should compete as if they were left alone for an extended period of time in the competition venue at ambient temperature. Behaviors that are against the spirit of this rule include, but are not limited to:

- Cooling fuses so they take longer to trip than normal,
- Heating batteries to increase their performance, and
- Freezing heatsinks so they are more effective at cooling other components.

Examples of behaviors that would not violate this rule include, but are not limited to:

- Heating or cooling components for reasons unrelated to ROBOT performance (e.g., warming up heat shrink tubing during installation)
- Using a battery that is slightly above ambient temperature as a result of its regular charging cycle, and
- Using a ROBOT with components that are warm as a result of prior use.

E511 ***Charge batteries in a safe and fair manner.** When charging batteries teams must:

A. Charge batteries at a safe rate, following all manufacturer recommendations,
B. Never charge batteries on a battery charger that exceeds a 3-amp average channel current, and
C. Charge batteries using safe connectors.

Safe connectors are those with a polarized connector corresponding to the connector on the battery itself. Batteries must never be charged using alligator clips or similar.

5.6 ROBOT Carts

E601 ***Carts must not be a nuisance.** Teams may use carts to transport their ROBOT throughout an event. Carts must:

A. be easy to control and maneuver,
B. pose no risk to bystanders,
C. fit through a standard 30-inch (762mm) door,
D. remain in the team pit when not in use,
E. not be equipped with music or other sound generating device, and
F. not use powered propulsion.

5.7 Ceremonies

At most events, there are opening and closing ceremonies to show honor and respect for represented countries, sponsors, teams, mentors, volunteers, and award winners. Ceremonies provide everyone with the opportunity to collectively applaud the successes of all participants. They also give teams a chance to "meet" the volunteers, sponsors, and supporters involved with the event. Closing ceremony elements are at the end of most events and are integrated into and presented between Playoff MATCHES.

At the awards ceremony, *FIRST* presents trophies and medallions to outstanding teams. All team members are encouraged to attend the ceremonies, be punctual, and show appreciation to volunteers that staffed the event, and celebrate their fellow teams.

E701 ***Quiet in the pits during ceremonies.** During ceremonies outside of Playoff MATCHES, team members may not:

A. use power tools,
B. use loud hand tools (hammers, saws, etc.), or
C. shout, yell, or use loud voices in a way that's disruptive to the ceremony.

E702 ***Pit person limit during ceremonies is 5.** No more than 5 team members may be in the pits during ceremonies outside of Playoff MATCHES. Each team must have at least 1 representative observing ceremonies to be responsible for relaying important information to the entire team.

> All teams are encouraged to have as many people in the stands for ceremonies as possible. This is important both to celebrate all who are recognized during ceremonies, but also to listen for important day-of information from event organizers which might be critical for your team.

E703 ***Be respectful during anthems.** Team members, including any remaining in the pits, should exhibit peaceful behavior during the presentation of all national anthems. If team members wish to abstain from traditional anthem observance behaviors, they have a right to do so, as long as they remain silent and non-disruptive.



6 Awards (A)

This section includes a high-level description of each of the components of judging and ROBOT game specific awards in *FIRST* Tech Challenge.

FIRST Tech Challenge celebrates the excitement of competition both on and off the field. Through the following awards, we celebrate the *FIRST* Core Values which makes us so much "*More than Robots®*". Please note that different event types (e.g., League Tournaments, Regional Championship, *FIRST* Championship) or event sizes may offer different sets of awards. Not every award is presented at every *FIRST* Tech Challenge event. No awards are presented at League Meets - see Section 14 League Play Tournaments (L); additional details by event type are available in the sections below.

Team judged awards are determined by volunteers from the community who prepare for the event with thorough training and certification. There are two key judging volunteer roles:

- **JUDGES** – meet with teams to learn about and celebrate the unique journey and accomplishments of each team and evaluate these against award requirements. JUDGES interact with STUDENTS in the pits and sometimes in dedicated judging spaces. As a group, JUDGES determine the teams that receive awards at events with the guidance of the JUDGE Advisor.
- **JUDGE Advisor (JA)** – trains, directs, and supervises JUDGES throughout the event. JUDGE Advisors oversee the judging processes and procedures to make sure they are in accordance with *FIRST* Tech Challenge judging guidelines but they do not select who wins the awards.

FIRST Tech Challenge judging is delivered in one of two ways. Most events will have in-person ("traditional") judging along with the standard in-person gameplay. The second option is hybrid format which has in-person gameplay, but some or all judging is done remotely for all teams before in-person gameplay. This manual will primarily describe the traditional in-person judging process. The remote judging process follows the same overall judging standards and requirements, but some or all interviews are conducted online, and in-person meetings may not occur.

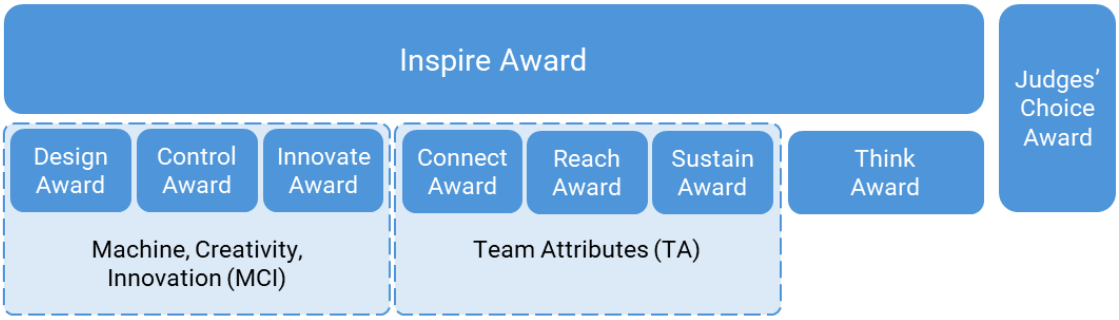
Teams may also read the Judge and Judge Advisor Manuals to gain more insight into the complete judging process. Teams are also encouraged to review the Outreach Terms and Definitions Document to ensure all teams can clearly communicate with JUDGES and our community the great things they do to grow *FIRST*.

6.1 Team Judged Awards Overview and Schedule

FIRST Tech Challenge team judged awards fall into three categories, which have one or more awards each: Machine, Creativity, and Innovation (MCI), Team Attributes (TA), and Documentation. In addition, the Judges' Choice Award is given to a stand-out team which was not recognized in one of the other categories. The most prestigious, all-around award is Inspire Award (Figure 6-1).

The local Program Delivery Partner may elect to give additional awards to celebrate local sponsors or initiatives, but these awards are not considered Team Judged Awards for the purposes of advancement calculations as described in Section 4 Advancement.

Figure 6-1: Award hierarchy



- The **Inspire Award** recognizes teams who excel in MCI, TA, and Documentation accomplishments. This team is an all-around inspiration for others.
- **MCI awards** recognize the technical accomplishments of teams in the brainstorming, design, construction, operation, and control of their ROBOTS.
- **TA awards** recognize teams who have expanded their skillset, created a plan to sustain their program and team, and spread the message of *FIRST* throughout their outreach.
- The **Think Award** recognizes teams who masterfully document their team's process and ROBOT using their PORTFOLIO.
- **Judges' Choice Award** recognizes a team whose unique efforts, performance, or dynamics merit recognition, but does not fit into any of the other award categories.

The JUDGES will gather information from the teams through several different pathways (Figure 6-2). All teams will have the opportunity to submit a team PORTFOLIO which should document aspects of their team which directly support the team judged award criteria or information which they would like the JUDGES to consider.

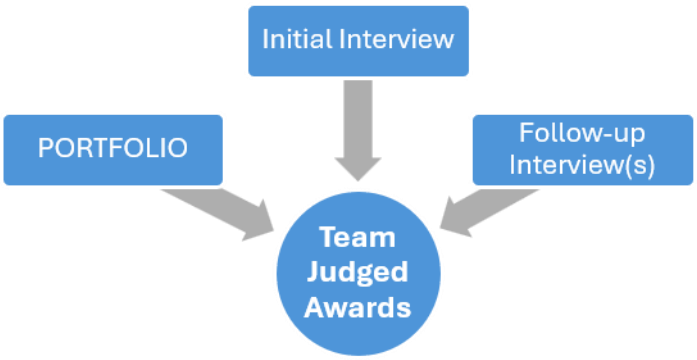
> All award winners chosen by the JUDGES are recognized as being positive examples of the award criteria, not necessarily the "best" team. JUDGES will only consider the published award criteria in Section 6.3 Team Judged Award Descriptions.

Teams may participate in judging regardless of the inspection status of their ROBOT and are eligible for awards even if they are attending the event without a ROBOT.

6.1.1 Sources of Information Considered for Awards

JUDGES will use the Initial Interview, any follow-up interview, and the PORTFOLIO (where applicable) as sources of information for each award consideration.

Figure 6-2: Sources of Information for Team Judged Awards.



In addition to the specific information sources JUDGES use to evaluate teams, there are also sources of information which are specifically disallowed. JUDGES are strictly instructed to only consider information from the current event and the current season.

For the purposes of judging, the current season begins on January 1, 2026. JUDGES cannot consider information from outside of what they have seen or heard at the current event.

> Per A201.E, progress, challenges, and accomplishments which have taken place since January 1, 2026 can be documented in the team PORTFOLIO and will be considered as part of the current season.

Examples of information that cannot be considered during the judging process include, but are not limited to:

- Past performance (good or bad) of a team,
- Personal knowledge of a team,
- External sources such as websites and/or social media,
- A ROBOT's performance (e.g., how many points scored in a MATCH) unless it is specifically listed as an award criteria,
- ROBOT penalties during gameplay, or
- A team's ranking in the tournament.

The awards are a method *FIRST* uses to inspire STUDENTS and open their eyes to building a better future together. The judging process should foster a positive STUDENT interaction with JUDGES who are independent caring adults and can recognize their achievements and encourage them to continue learning.

6.1.2 Initial Interview

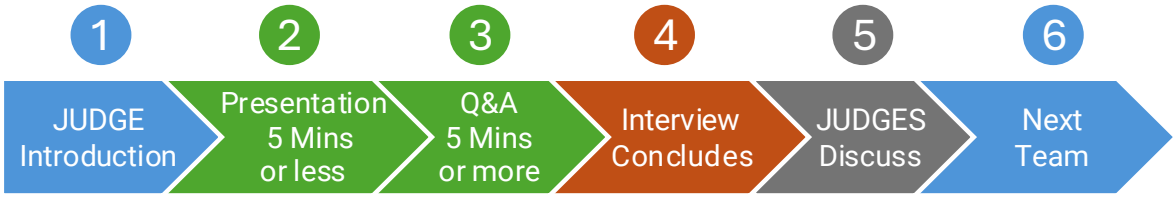
All teams are encouraged to prepare for an Initial Interview session where the team may present a prepared oral presentation to a small panel of JUDGES, followed by an open Q&A session.

The Initial Interview may be conducted in one of three formats:

- **Scheduled in-person:** A planned meeting with JUDGES, at a specific time, in a dedicated judging space.
- **Unscheduled in-person:** The interview is not scheduled for a specific time. JUDGES meet teams in their pit area at the event or in a dedicated judging space.
- **Remote:** A meeting with the JUDGES held online on a video conferencing platform.

All three types of Initial Interviews have the same rules and allow teams to share information with the JUDGES.

Figure 6-3: Initial Interview Timeline



1. JUDGES introduce themselves to the team and ask if the team has a prepared presentation they would like to start with.
2. Teams may present to the JUDGES uninterrupted for up to about 5 minutes, per A205.
3. JUDGES will ask open ended questions and interact with the team for the remaining interview time.
4. The interview is concluded by the JUDGES.
5. JUDGES privately discuss the details of the interview and complete the feedback form.
6. JUDGES identify the next team to be interviewed and repeat the process.

The Event Director, in coordination with the JUDGE Advisor and the regional planning committee, is responsible for determining the format for the Initial Interview and communicating this information to the teams prior to the event. All teams, regardless of the option chosen, are expected to be interviewed using the same format at their event.

> Teams participating at events where the Initial Interview is conducted in the pits should be mindful that the pit area is an active and often noisy environment. While JUDGES will provide teams with an uninterrupted opportunity to present information and answer questions, external distractions (such as pit announcements and general background noise) may occur during the interview and could create communication challenges.
>
> For interviews that take place in the pits, JUDGES will work with MATCH queuers and technical volunteers to ensure teams are able to attend MATCHES and work on their ROBOTS.

Teams are encouraged to review the Judge Interview Question Bank prior to their judging interviews to understand the type of questions that may be asked by the JUDGES. At each event, the JUDGE Advisor will

select two questions from the question bank that all teams will be asked at the start of the Initial Interview's question and answer session. One question will be focused on the MCI award category, and one question will be focused on the TA award category. After the first two questions are asked and answered, JUDGES may ask additional questions to help evaluate the team's performance against the award criteria.

> Additional questions asked during interviews may come from the question bank but teams should be prepared to answer questions that are not listed within the document.

6.1.3 Pit Interview(s)

After all the judging panels have finished the Initial Interviews, the JUDGES compare notes and may elect to follow up with the teams in the pit area during the competition and conduct informal pit interviews. During this round of pit interviews, teams have the opportunity to expand upon materials presented in the Initial Interview and share additional content with the JUDGES (e.g., ROBOT prototypes, design artifacts, and photos or letters from outreach events). A team does not need to prepare another presentation for this pit interview but should be ready to answer questions from the JUDGES.

> JUDGES may read additional information during pit interviews but will not bring back additional content to be referenced as part of the JUDGE deliberations.

6.1.4 Sustained Outreach and Demonstrating Impact by Numbers

In general, JUDGES will consider ongoing, sustained outreach to be of higher quality than occasional or one-off outreach. JUDGES will seek to understand what is the impact of the outreach to the individuals being reached by the activity.

> Teams are encouraged to review the Outreach Terms and Definitions Document to understand the requirements behind specific terms (starting a *FIRST* team, running an event, reaching x number of people). JUDGES may ask specific questions when a specific term listed in this document is mentioned in a team's PORTFOLIO or during an interview.

6.2 Team Judged Award Rules

A201 ***Team PORTFOLIOS have limits.** Teams have the opportunity to submit a team PORTFOLIO to be used as part of the judging process. Other printed or digital content outside this document will not be collected by the JUDGES for consideration during deliberations. Team PORTFOLIOS must meet the following requirements:

A. must consist of 1 cover page including the team number and optionally: team name, PORTFOLIO table of contents, team organizations, sponsors, logo, motto, and picture of the ROBOT and/or team,
B. no more than 15 pages of content,
C. use only US Letter (8.5” x 11”) or A4 (210 x 297 mm) size pages,
D. if submitted digitally, the complete submission must be less than 15MB in size, and
E. must only include progress, challenges, and accomplishments which have taken place since January 1, 2026.

None of the content of the cover page will be used by JUDGES to evaluate any awards criteria. Any content beyond the allowed 15 pages will not be reviewed by the JUDGES.

Teams must strictly minimize Personally Identifying Information (PII) in the PORTFOLIO. For student privacy, use only first names and last initials. While student photographs are permitted, full names must not be disclosed.

The JUDGES use the cover page to identify the team associated with the PORTFOLIO. Teams who forget to include a cover page may be disqualified from judging if the JUDGES cannot determine what team the PORTFOLIO is associated with.

Design your PORTFOLIO for readability. Avoid fonts under 10 pt and low-contrast text on images—JUDGES cannot evaluate what they cannot read. Use free tools like the WebAIM Contrast Checker to ensure your font size, color, and design choices are clear.

JUDGES will not click on links, websites, or videos in a PORTFOLIO. They also cannot take extra printed papers from an interview back to their judging room. Teams should put everything they want JUDGES to see directly in their PORTFOLIO.

Teams may use AI and research aids to compose their PORTFOLIOS, provided they respect intellectual property rights and include a footnote or endnote credit. Example Credit: “Portfolio created by Team XXXXX and ChatGPT”

A team may reference previous seasons (for example, in a team or organizational plan) to demonstrate growth, but the emphasis must be on the current season.

A202 ***PORTFOLIOS must be submitted on time and as requested.** Teams must submit their PORTFOLIO as instructed by the Event Director and by the stated deadline if they wish to have it considered during the judging process. If no other instructions are provided, teams should submit 1 printed copy of their PORTFOLIO during the Initial Interview.

> Instructions about when and how teams should submit their PORTFOLIOS should be communicated by the Event Director before the event.
>
> If circumstances prevent a team from following the PORTFOLIO submission instructions, the Event Director should work with the JUDGE Advisor to make reasonable accommodations to accept all team PORTFOLIOS unless doing so poses an undue burden to the judging process.
>
> Teams are encouraged to have an additional copy (digital or physical) of their PORTFOLIO available in their pit to assist with interviews they have with the JUDGES.

A203 ***Teams must participate in an Initial Interview session.** To be considered for any judged awards the team must participate in an Initial Interview session.

> If scheduled, teams should be informed of their assigned time by the Event Director or local Program Delivery Partner in advance of the event.
>
> If there is a schedule conflict or the team misses their Initial Interview slot due to unforeseen circumstances the team should work with the Event Director or local Program Delivery Partner to make reasonable alternate accommodations for an Initial Interview at the event if possible.

A204 ***Have the right resources available for your Initial Interview.** Teams should be prepared for their Initial Interview by having:

A. no fewer than 2 STUDENT representatives for teams of 2 STUDENTS and larger,
B. a copy of their team PORTFOLIO for reference during the interview,
C. “show and tell” demonstration items which may include the team’s ROBOT (encouraged, but optional),
D. 1 silent observer per A208 (optional), and
E. 1 support person to fill accommodation needs per A209 (optional, as needed).

> Teams are encouraged to have as many STUDENTS as possible involved in the Initial Interview process.
>
> A team does not have to have a ROBOT to participate in judging or be eligible for judged awards.
>
> Teams may power on and demonstrate their ROBOT functions during the Initial Interview but may not cause significant delays during the interview.

A205 ***Everyone gets equal Initial Interview time**. All teams will be scheduled for the same length Initial Interview of at least 10 minutes.

A206 ***The Initial Interview timer starts when the team starts.** The timer starts after the JUDGES have introduced themselves and either, the team begins their presentation, or the Q&A portion of the interview begins. Teams who take an extended amount of time to begin will be warned by the JUDGES to begin promptly and then the Initial Interview timer will be started regardless of the readiness of the presenting team.

A207 ***Prepared initial presentation time should not be interrupted.** The first 5 minutes of the Initial Interview are reserved for the team to present a prepared oral presentation uninterrupted, if they choose. The uninterrupted presentation time may be ended early by the team. Any remaining time should be a question and answer conversation with the STUDENTS and led by the JUDGES.

A208 ***One adult silent observer is welcome.** One adult may attend the judging session and be present for any interaction between the JUDGES and the STUDENT team members. Adult coach(es) may be present for any interactions between the JUDGES and the STUDENT team members outside of the Initial Interview. The adult observer and coach(es) may not interact or actively coach during any interaction between the JUDGES and the STUDENT team members.

> The purpose of the adult silent observer is to provide silent confidence to the STUDENT team members presenting in an unknown environment with new people.

A209 ***Translator and/or Sign Language Interpreter accommodations will be made for teams who need it.** Teams who need to use a translator to communicate with the JUDGES may provide one if the team's native language does not match that of the JUDGES. This includes sign language or other adaptive technology. Teams who intend to interview with the assistance of a translator must work with the Event Director in advance to request additional interview time of between 2 and 5 minutes, if needed. The translator may be an adult and can be in addition to the silent observer in A208.

> In most cases the translator will need to be provided by the team. If other accommodation is needed, the team should contact your local leadership to discuss options.

A210 ***No Photos, Video or Audio recording during Initial Interview.** In addition to the restrictions of E116, no recording of video or audio, or photos may be taken during the Initial Interview.

A211 ***The number of awards given scales with event size.** The total number of awards given is based on the number of teams checked in at the event. Not all awards are given at every competition. Only the awards specified in Table 6-1, based on the event size are, points-eligible for advancement.

Table 6-1: Total judged awards available based on all event participating teams

Total Event Participating Teams					
Award		4-10 Teams	11-20 Teams	21-40 Teams	41-64 Teams
Inspire Award		1st Place	1st Place 2nd Place	1st Place 2nd Place 3rd Place	1st Place 2nd Place 3rd Place
Think Award		1st Place	1st Place	1st Place 2nd Place	1st Place 2nd Place *(3rd Place*)*
TA Awards	**Connect Award**	1st Place (Only one of Connect, Reach, or Sustain will be given)	1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Reach Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Sustain Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
MCI Awards	**Design Award**	1st Place (Only one of Innovate, Control, or Design will be given)	1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Innovate Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Control Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
Judges' Choice Award		Optional*	Optional*	Optional*	Optional*

**Discretionary awards*

See Section 13.8 Dual Division Events for the modified dual division version of this rule.

A212 ***Judging feedback is provided to all teams.** All teams will receive feedback from their Initial Interview session. The JUDGES complete a form immediately following the Initial Interview based on their initial impression of the team. This feedback form is not used during deliberations and does not include any updated feedback based on later interactions by the JUDGES with the team.

> The feedback form will either be returned with the PORTFOLIO for in-person judging, near the end of the event, or the Lead Coach 1 will receive access to a digital version in FTC-Scoring following the event.

A213 ***Teams are only eligible to win the Inspire Award in their own region.** Teams are only eligible to be considered for the Inspire Award (1st, 2nd, or 3rd place) when competing at a tournament within their HOME REGION.

> *FIRST* Championship and *FIRST* Premier Events are an exception to this rule. At these events, all teams may be considered for the Inspire Award.

A214 ***Teams cannot win the Inspire Award at multiple Qualifying or League Tournaments.** Teams are only eligible to win 1st place Inspire Award once per season from any Qualifying or League Tournament.

> Teams who have won 1st Place Inspire are eligible to win 2nd or 3rd place Inspire Award at subsequent Qualifying or League Tournaments.
>
> Teams who have won 1st Place Inspire at a Qualifying or League Tournament are eligible to win it at their Regional Super Qualifying Tournament (where applicable) and Regional Championship.

A215 ***Teams can only get one judged award.** Teams are only eligible to win or be a runner-up for a single team judged award at the event.

> This rule does not prevent a team from winning additional awards listed in Section 6.4 Tournament ALLIANCE Awards and Section 6.5 Individual Awards.

6.3 Team Judged Award Descriptions

6.3.1 Inspire Award

The Inspire Award recognizes a team that is a strong role model for all *FIRST* programs. This team is a top contender for many judged awards and competes with a positive, respectful attitude.

The Inspire Award winner inspires other teams both on and off the playing field. Their actions reflect the *FIRST* Core Values and embody *Gracious Professionalism.* They regularly share their experiences, enthusiasm, and knowledge with other teams, sponsors, their community, and the JUDGES. Working as a unit, this team will have shown success in performing the task of designing and building a ROBOT.

Table 6-2: Inspire Award Criteria

Inspire Award Criteria		
Required	1	Team must submit a PORTFOLIO.
Required	2	The Inspire Award celebrates the strongest qualities of all the judged awards. A team must be a strong contender for **at least one award in each** of the following judged award categories: A. Machine, Creativity, and Innovation Awards, B. Team Attributes Awards, and C. Think Award.
Required	3	Team must be positive and inclusive, and each team member contribute to the success of the team.
Required	4	Team is able to share their experiences and knowledge to the JUDGES.

6.3.2 Think Award

The Think Award recognizes a team for their excellent PORTFOLIO. The PORTFOLIO is a clear and organized record of the team's engineering journey and growth this season. JUDGES look at this document to find the most deserving recipient. Teams may also share extra details about their building, design, or programming process in their PORTFOLIO to help JUDGES understand their choices.

Table 6-3: Think Award Criteria

Think Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include **at least one** of these engineering topics: A. evidence of use of the engineering process, B. lessons learned and applied relating to the design of their ROBOT, C. comparing choices: Show how you looked at different ideas and explain why you chose one over the other, and/or D. math choices: Show how you used math to make decisions about your ROBOT or programming design.
Encouraged	2	Information in the PORTFOLIO should be easy to read and easy to find.

6.3.3 Connect Award

The Connect Award recognizes a team that builds meaningful partnerships with members of the science, technology, engineering, and mathematics (STEM) community. Through these partnerships, the team develops new knowledge, skills, and resources that support its long-term growth. The team has a clear plan with defined actions to achieve its goals. A PORTFOLIO is not required for this award.

Table 6-4: Connect Award Criteria

Connect Award Criteria		
Required	1	Team demonstrates professional development competency by explaining its plan for developing team member skills, including **both**: A. the team's goals for learning, and B. the steps the team has taken or will take to reach those goals.
Encouraged	2	Team demonstrates networking competency by building and maintaining meaningful in-person or virtual relationships with professionals in STEM.
Encouraged	3	Team demonstrates collaboration competency by actively working with members of the engineering community through mentoring, knowledge sharing, technical guidance, or collaborative activities.

6.3.4 Reach Award

The Reach Award recognizes a team that has introduced and recruited new people into *FIRST*. Through their outreach efforts, they have inspired and motivated others to join the *FIRST* community and actively participate in its programs. A PORTFOLIO is not required for this award.

Table 6-5 Reach Award Criteria

Reach Award Criteria		
Required	1	Team demonstrates outreach planning competency by clearly explaining **all of** the following: A. its outreach objectives, B. the strategy behind its outreach activities, and C. how these activities support the growth of the *FIRST* community.
Required	2	Team demonstrates successful recruitment of new teams, coaches, mentors, or volunteers who have not previously participated in the *FIRST* community
Encouraged	3	Team demonstrates strong communication competencies by serving as an ambassador for *FIRST* and increasing public awareness of *FIRST* programs through effective outreach and communication.
Encouraged	4	Demonstrates media and promotion competencies by developing creative, continuously improving outreach materials that effectively introduce both the team and *FIRST* to the public.

6.3.5 Sustain Award

The Sustain Award recognizes a team that has established the leadership, resources, and organizational practices needed to ensure that its team or program can continue and grow in future seasons. A PORTFOLIO is not required for this award.

Table 6-6 Sustain Award Criteria

Sustain Award Criteria		
Required	1	Team demonstrates organizational sustainability competency by explaining its plans for long-term success, including **one or more** of the following: A. financial sustainability, B. season planning, and/or C. long-term team sustainability objectives.
Required	2	Team demonstrates project management competency by explaining how it measures, reviews, and tracks progress toward its sustainability plans and objectives.
Encouraged	3	Team demonstrates leadership development competency through clearly defined team roles and an intentional process for preparing future student leaders.
Encouraged	4	Team demonstrates risk management competency by identifying organizational constraints, implementing mitigation strategies, and adapting plans when challenges arise.

6.3.6 Innovate Award sponsored by RTX

The Innovate Award recognizes a team that designs creative solutions to game challenges. JUDGES give this award to a team with a creative and original design for one or more parts of their ROBOT. JUDGES look at the design itself, how well it works, and the creative thinking behind it. The award can recognize the design of the whole ROBOT or one MECHANISM on the ROBOT. The design should work well during most MATCHES, but it does not need to work every time. A PORTFOLIO is not required for this award.

Table 6-7: Innovate Award Criteria

Innovate Award Criteria		
Required	1	The team demonstrates their engineering competency by showing examples of their engineering work that explain how the team developed their design.
Required	2	The design of the ROBOT or ROBOT MECHANISM is creative, unique, or both.
Required	3	The creative design must be stable and reliable. It must help the team reach its game goals most of the time.
Encouraged	4	Designs often involve risks. The team should explain how they reduced those risks.

6.3.7 Control Award

The Control Award recognizes a team that uses sensors and software to solve game challenges in a creative way. Examples include autonomous operation, smarter mechanical systems, or sensors that improve results. The solution should work well during most MATCHES, but it does not need to work every time. Teams may use their solution during the AUTO period, the TELEOP period, or both. The team's PORTFOLIO must include a summary of the software, sensors, and mechanical control system. The PORTFOLIO does not need to include the full code itself.

Table 6-8: Control Award Criteria

Control Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include **all of** the following: A. hardware or software control COMPONENTS on the ROBOT, B. the challenges each COMPONENT or system solves, and C. the function of each COMPONENT or system.
Required	2	The team must use one or more hardware or software solutions that use external feedback to control the ROBOT and improve how it performs.
Encouraged	3	The control solution(s) should work consistently during most MATCHES.
Encouraged	4	The team can explain how reliable their solution is. They can show this by demonstrating that it works, or by explaining how it could be improved.
Encouraged	5	The team should describe what they learned while using the engineering process to develop their control solutions (sensors, hardware, algorithms, or a combination).

6.3.8 Design Award

The Design Award recognizes a team that understands the principles of industrial design. This means balancing form, function, and appearance while meeting the needs of this season's game. The team's design process should result in a ROBOT that is efficient and that solves the game's challenges well. A PORTFOLIO is not required for this award.

Table 6-9: Design Award Criteria

Design Award Criteria		
Required	1	Team must describe or demonstrate that their ROBOT is elegant, efficient (simple to build and operate), and/or practical to maintain.
Required	2	The design of the entire ROBOT, or the detailed process used to create it, must be considered – not just one COMPONENT.
Encouraged	3	The ROBOT stands out from other ROBOTS because of its appearance and how well it functions.
Encouraged	4	The team has clearly thought through the reasons behind their design choices, such as inspiration or function.
Encouraged	5	The design works consistently and aligns with the team's game plan or strategy.

6.3.9 Judges' Choice Award

The Judges' Choice Award is optional and not given at all *FIRST* Tech Challenge events.

During the competition, the judging panel may meet a team whose unique efforts, performance, or dynamics merit recognition, but does not fit into any of the other award categories. To recognize these unique teams, *FIRST* offers a Judges' Choice Award.

6.4 Tournament ALLIANCE Awards

6.4.1 Winning Alliance Award

This award will be given to the winning ALLIANCE represented in the final MATCH of the Playoffs of a single-division Tournament or Championship event. If the event is a dual-division or multi-division event, there will be Winning Alliance Awards awarded to both the division playoff winners and the event finals playoff winners.

6.4.2 Finalist Alliance Award

This award will be given to the finalist ALLIANCE represented in the final MATCH of the Playoffs of a single-division Tournament or Championship event. If the event is a dual-division or multi-division event this will be awarded to the division playoff finalists and the event finals playoff finalists.

6.5 Individual Awards

6.5.1 *FIRST* Leadership Award

FIRST Leadership Award semi-finalists, finalists, and winners exemplify student leadership. These individuals actively promote the *FIRST* mission, champion Core Values like Inclusion, Teamwork, and Impact, and embody *Gracious Professionalism*. *FIRST* aims to support these students as they continue to serve as lifelong leaders, alumni, and advocates.

Please visit the *FIRST* Leadership Award webpage to see complete award submission details and to see past *FIRST* Tech Challenge winners.

6.5.2 Compass Award

This is an optional award offered at the Regional Championship tournament level of competition. All teams attending *FIRST* Championship will have an opportunity to submit for this award at *FIRST* Championship.

The Compass Award recognizes an adult coach or mentor who has given outstanding guidance and support to a team throughout the year and demonstrates to the team what it means to be a Gracious Professional. The winner of the Compass Award will be chosen from candidates nominated by *FIRST* Tech Challenge STUDENT team members, via a 40-60 second video submission. The video must highlight how their mentor has helped them become an inspirational team. The video should emphasize what sets the mentor apart.

Table 6-10: Compass Award Criteria

Compass Award Criteria		
Required	1	Team must be able to clearly articulate this mentor's contribution to the team and explain what sets this mentor apart.
Required	2	Submission must be in video format and meet the following requirements: A. submitted by the deadline established by the Event Director or local Program Delivery Partner, B. be in one of the following formats: .mp4, .mov, .avi, or .wmv (no links to streaming services will be accepted), C. one video submission per team per event (videos can be updated or changed between events), D. all music must be used with permission from the copyright owners and be indicated in the video credits, and E. videos cannot be longer than 60 seconds, including credits.

Teams are encouraged to review the *FIRST* Branding and Style Guidelines before creating their video.

6.6 Project-Based Global Awards

Project-based global awards are awards that are only judged and awarded once per season and are open to all registered *FIRST* Tech Challenge teams. Each award has its own independent requirements and deadlines. These awards do not contribute towards team advancement.

6.6.1 Digital Animation Award Sponsored by Worcester Polytechnic Institute (WPI)

This award, sponsored by WPI, celebrates STEAM (Science, Technology, Engineering, Art, and Mathematics) and emphasizes the ability to tell a story through animation that integrates technological, social, and humanistic concepts.

The 2027 Digital Animation Award is offered to help encourage students to cultivate skills in design and creation of animation while telling a story about the impact of technology on society. This award is open to all *FIRST* Robotics Competition teams and *FIRST* Tech Challenge teams and **is optional**. More information can be found on the Digital Animation Award webpage.



7 Game Sponsor Recognition

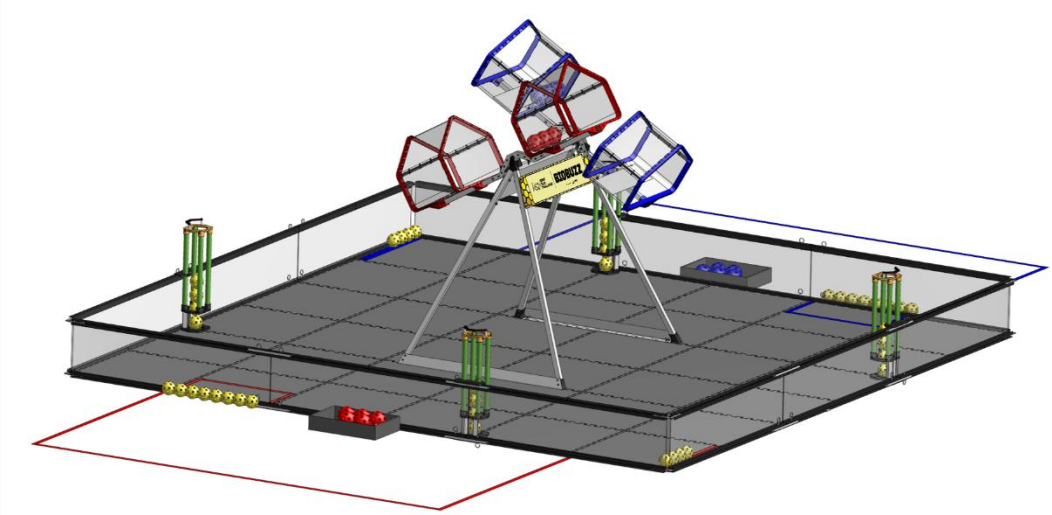
Thank you to the 2026-2027 *FIRST*® Tech Challenge season presenting sponsor, RTX.







8 Game Overview



In BIOBUZZ™ presented by RTX, 2 competing ALLIANCES of 2 teams each collect POLLEN and NECTAR, LAUNCHING them into their HIVE and placing them into FLOWERS.

During the first 30 seconds of the MATCH, the ROBOTS operate autonomously. ROBOTS can use sensors to collect POLLEN from FLOWERS and navigate to LAUNCH into the CELLS of their HIVE. When enough SCORING ELEMENTS are LAUNCHED into the CELL, the HIVE will tip. Each time a HIVE is TIPPED, points are earned, and additional NECTAR is unlocked.

During the remaining 2 minutes of the MATCH, human DRIVERS take control of their ROBOTS. ROBOTS continue to collect and score POLLEN and NECTAR, tipping their HIVE to earn points and unlocking more NECTAR.

As time runs out, ALLIANCES work to fill FLOWERS with POLLEN and NECTAR. ALLIANCES earn points by placing their ALLIANCE'S NECTAR in each FLOWER before their opponent. ALLIANCES also earn points for owning a FLOWER if their NECTAR is the top-most placed in a FLOWER.

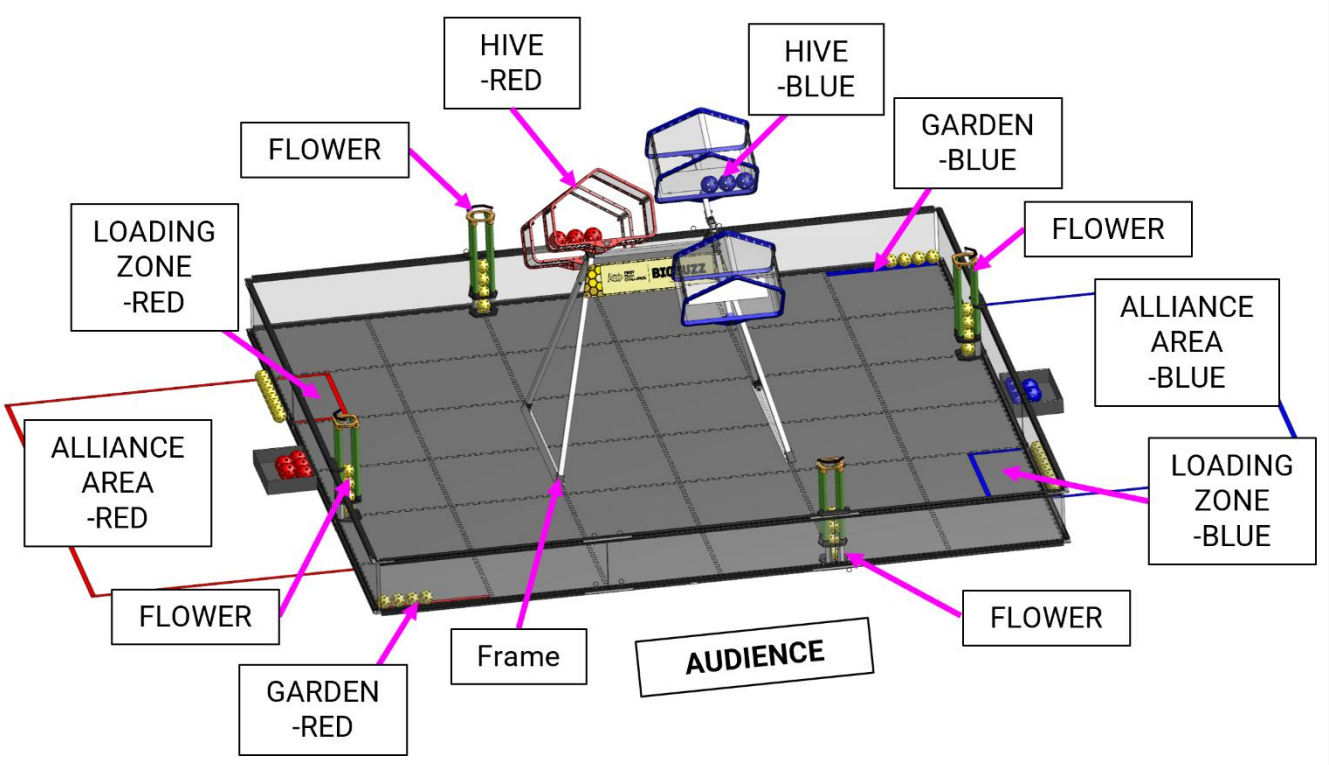
The ALLIANCE that earns the most points wins the MATCH and additional RANKING POINTS can be earned by completing other scoring achievements.



9 ARENA

The ARENA includes all elements of the game infrastructure that are required to play BIOBUZZ: the FIELD, SCORING ELEMENTS, queue area, team media area, and all equipment needed for event management.

Figure 9-1 BIOBUZZ (queue area, FIELD display, and optional media area not pictured)



9.1 Dimensions and Accuracy

The specifications for the BIOBUZZ FIELD can be retrieved from a few locations:

- The 3D CAD model is the official representation of the BIOBUZZ FIELD and how it is constructed. Measurements may be taken from this model with a general tolerance of +/- 1 in. (+/- 2.5 cm).
- The Event Field Setup Guide includes instructions on how to build the FIELD and details about its construction which may influence the FIELD tolerances; it also includes many of the key dimensions for the FIELD.
- The Field Acceptance Checklist includes the controlled dimensions (with relevant tolerances), functional tests, and inspection criteria which will be regularly performed by event staff.
- The Field Mitigation Guide provides FIELD STAFF recommended mitigation measures to ensure the FIELD remains within spec during the event.
- Illustrations included in the Competition Manual are for a general visual understanding of the BIOBUZZ ARENA, and any dimensions included are nominal. Unless specifically noted, all these dimensions carry a tolerance of +/- 1 in. (+/- 2.5 cm).

The complete list of BIOBUZZ FIELD resources is posted on the Playing Field Resources page on the *FIRST* website.

> The ARENA is modular and is assembled, used, disassembled, and transported many times during the competition season. It undergoes wear and tear. Every effort is made to ensure that ARENAS are consistent from event to event.
>
> However, ARENAS are assembled in different venues by different event staff and volunteers, with some regions facing unique challenges resulting in some small variations.
>
> The ARENA specifications are designed to accurately reflect the variations which may be present in official play, while still ensuring consistency of critical items. Contact your local support to request more information.
>
> Successful teams will design ROBOTS that are insensitive to these variations.

9.2 FIELD

Each FIELD for BIOBUZZ is an approximately 144 in. by 144 in. (365.75 cm by 365.75 cm) area bounded by the inside surface of the walls of the FIELD perimeter. The flooring surface of the FIELD is made of 36 interlocking soft foam TILES which are each approximately 24 in. by 24 in. by 0.59 in. (60.95 cm by 60.95 cm by 1.50 cm) nominally sized.

The FIELD is populated with and surrounded by the following FIELD elements:

- 1 HIVE Structure, consisting of 1 Frame with 2 mounted HIVES (1 HIVE per ALLIANCE)
- 4 FLOWERS

Official events use the full BIOBUZZ FIELD manufactured and sold by AndyMark (am-5850_Full) or officially licensed equivalent.

The soft foam TILE surface of the FIELD is *FIRST* Tech Challenge Field Soft Tiles (am-2499) or equivalent.

The primary version of the FIELD perimeter is the *FIRST* Tech Challenge Perimeter Kit (am-0481) sold by AndyMark. All illustrations in this manual show the am-0481 version of the FIELD design. Other versions of the FIELD perimeter of similar functionality may also be used in competitions.

Some events, including the *FIRST* Championship (see Section 15.2 Game Modification), will place the FIELDS on platforms or risers such that the FIELD is raised while the ALLIANCE AREAS remain at ground level.

The Event Field Setup Guide allows events to optionally anchor the FIELD perimeter in place. Events using the AndyMark Perimeter Kit that choose to anchor their FIELD in place do not need to install the Perimeter Straps that are part of the AndyMark Perimeter.

The FIELD variant used at an event will be determined by the local Program Delivery Partner, and all competition FIELDS at the same event must comply with Section 9.1 Dimensions and Accuracy and be consistent with each other per T404.

9.3 Areas, Zones, & Markings

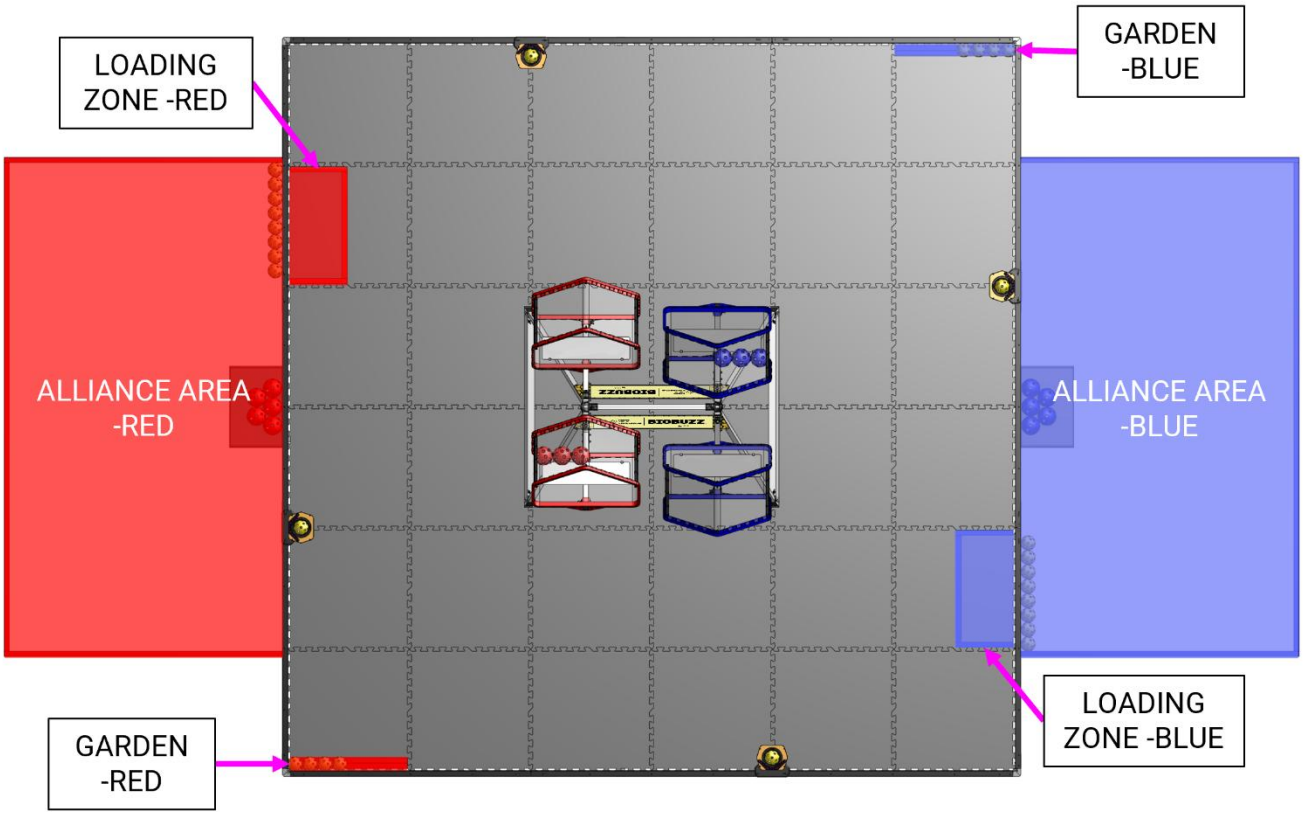
FIELD areas, zones, and markings of consequence are described below.

- The term “zone” is used to identify spaces within the FIELD.
- The term “area” is used to describe spaces outside of the FIELD.

Unless otherwise specified, the tape used to mark lines and zones throughout the FIELD can be either 1 in. (2.50 cm) wide or 2 in. (5.10 cm) wide ProGaff® Premium Professional Grade Gaffer Tape, or comparable gaffers tape in red, and electric blue. Areas outside the FIELD may be marked with other types or widths of tape, depending on the event.

The tape used to mark lines and zones throughout the FIELD is shown as continuous strips in all official specifications. While in some games the tape lines are permitted to be applied in non-continuous segments, this is not necessary this season. On the BIOBUZZ FIELD, none of the tape lines span across TILE seams. Events are encouraged to apply the tape lines continuously as shown in the specifications.

Figure 9-2: BIOBUZZ ZONES and AREAS

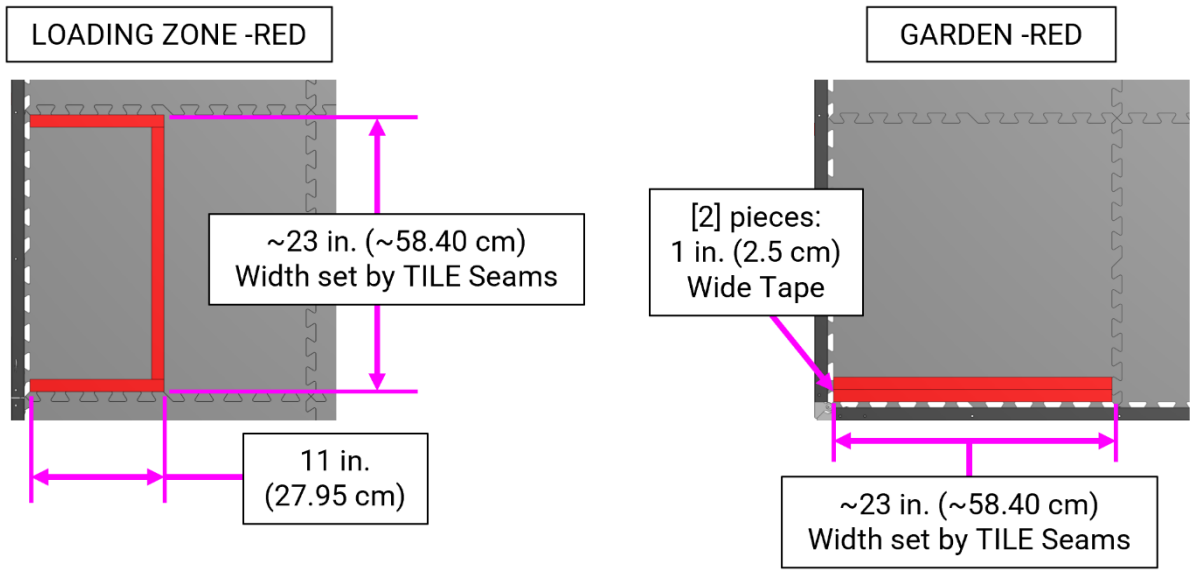


- **ALLIANCE AREA:** an approximately 97 in. (246.40 cm) wide by 54 in. (137.15 cm) deep by infinitely tall volume formed by placing ALLIANCE colored tape onto the flooring surface outside of the FIELD. The ALLIANCE AREA includes the taped lines (Figure 9-2).
- **LOADING ZONE:** an approximately 23 in. (58.40 cm) wide by 11 in. (27.95 cm) deep infinitely tall volume bounded by red or blue tape and the adjoining FIELD perimeters. The LOADING ZONE

includes the tape lines (Figure 9-3). The LOADING ZONE is an ALLIANCE specific zone belonging to the ALLIANCE with the adjacent ALLIANCE AREA.

- **GARDEN:** an approximately 23 in. (58.40 cm) by 2 in. (5.10 cm) wide and infinitely tall volume defined by the outside edge of blue or red tape in opposite corners of the FIELD, as shown in Figure 9-2.

Figure 9-3: LOADING ZONE and GARDEN (shown with POLLEN hidden)



9.4 TILE Coordinates

TILE coordinates are used to assist with FIELD setup. Figure 9-4 defines the intersections of each of the TILES on the FIELD where the TILE tabs interlock. Figure 9-5 defines the grid coordinate system for each of the TILES.

Figure 9-4: TILE seam/tab-line locations

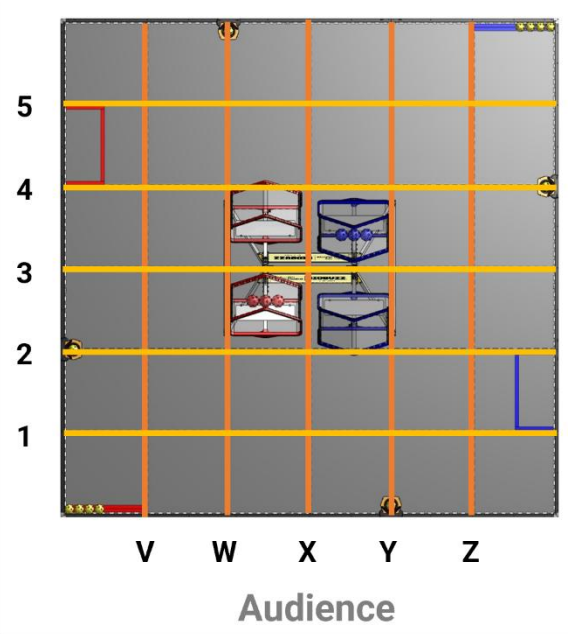
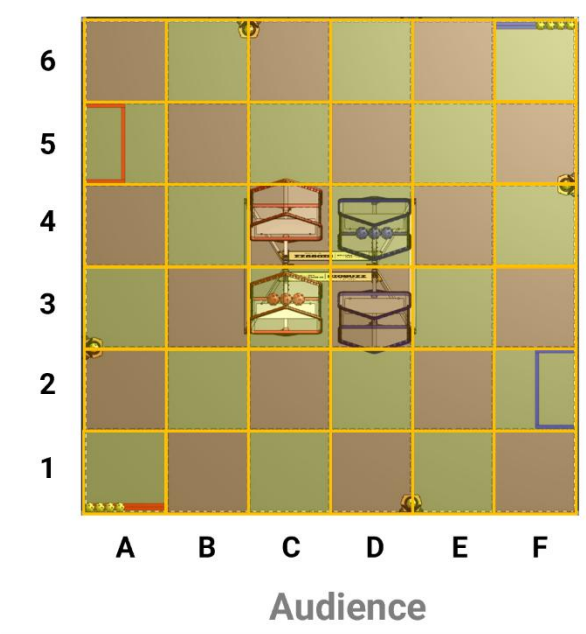


Figure 9-5: TILE locations



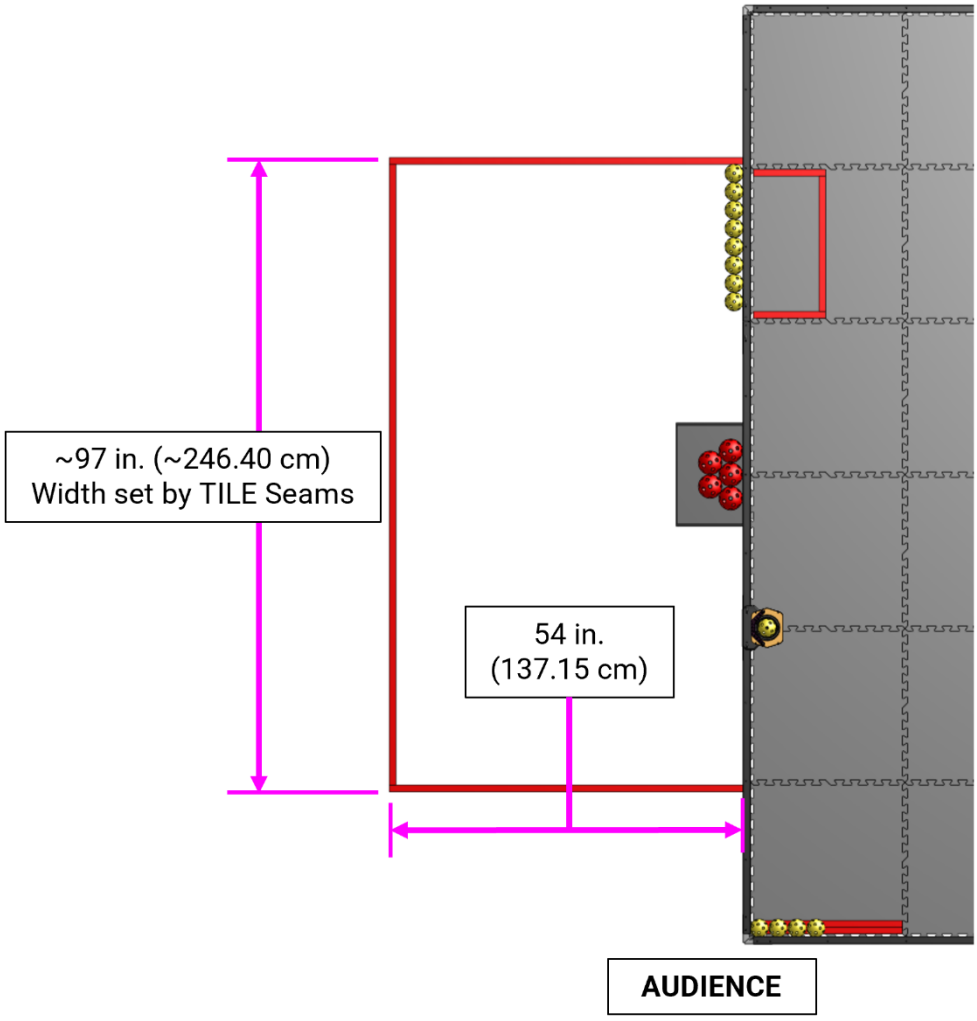
9.5 ALLIANCE AREA

An ALLIANCE AREA is the designated red or blue ALLIANCE AREA adjacent to the FIELD where the DRIVE TEAMS stage themselves during a MATCH.

The FIELD is oriented such that the red ALLIANCE AREA is located on the left from the primary audience viewing direction.

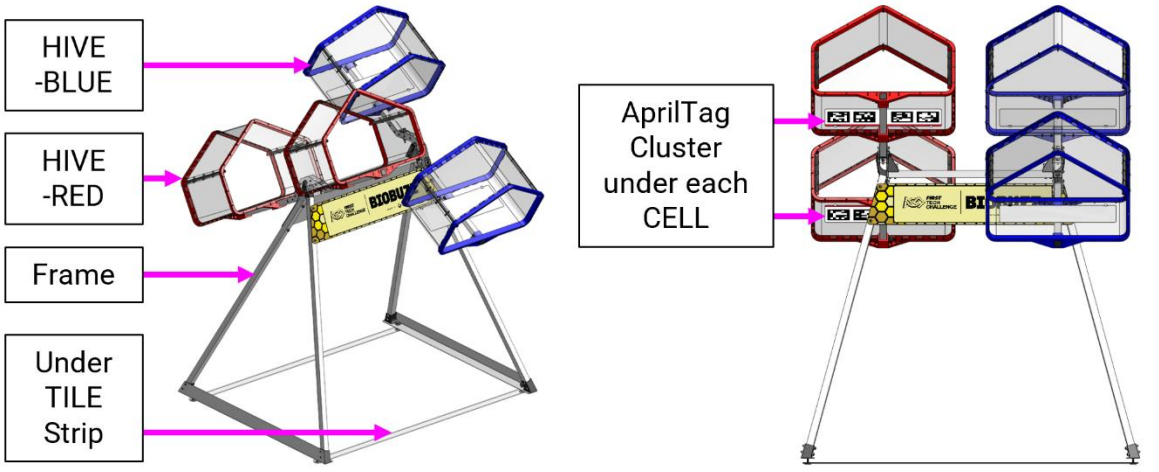
Short tables, stands, or stools may be provided for teams to place their OPERATOR CONSOLES by the event which will sit near the FIELD perimeter inside the ALLIANCE AREA. If provided by the event, these tables may not be removed or rearranged by the teams without permission from the Head REFEREE, FIELD Supervisor, or FTA.

Figure 9-6: ALLIANCE AREA



9.6 HIVE Structure

Figure 9-7: HIVE Structure



The HIVE Structure is located in the center of the FIELD. A frame holds a red HIVE and a blue HIVE. Each HIVE consists of 2 CELLS, one on either end of each HIVE. Each CELL is a three-dimensional structure that can hold NECTAR and POLLEN.

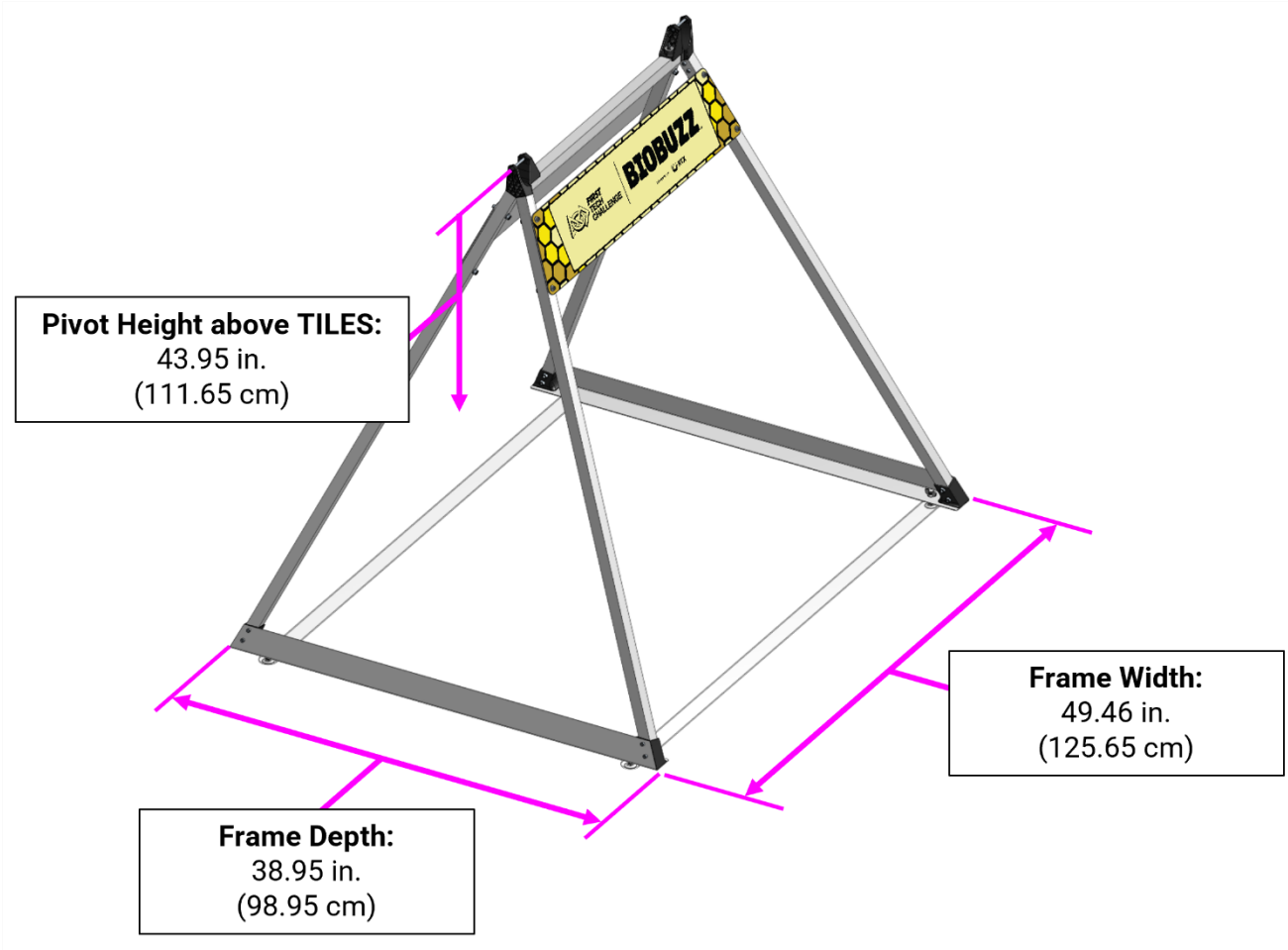
Each HIVE is on a pivot and can tip so that one of the CELLS is facing upwards at any given time. Each HIVE is bi-stable and will hold its position until enough POLLEN or NECTAR are LAUNCHED into the upwards-facing CELL. On the bottom face of each CELL is a unique AprilTag Cluster containing 4 distinct AprilTags.

9.6.1 Frame

The frame is made up of two triangular metal structures that attach to mounting strips under the TILES which are connected at their apex by a crossbar. The frame is 49.46 in. (125.65 cm) wide, and 38.95 in. (98.95 cm) deep at its base, which is also its widest point. The Frame supports 2 pivots with their axis 43.95 in. (111.65 cm) above the TILES. The frame dimensions are shown in Figure 9-8.

A panel is attached to each side of the frame with the BIOBUZZ logo. This graphic may not be present at all events.

Figure 9-8: Frame



9.6.2 HIVE and CELL

Each HIVE is a bi-stable structure made up of two CELLS and a connecting assembly that rotates on a pivot. Each HIVE includes two CELLS (either both red or both blue) approximately 18.8 in. (47.8 cm) apart as shown in Figure 9-9. Each HIVE rotates around a pivot located at the top of the frame and has two stable positions: each one with one CELL facing upwards.

The opening of the CELL is approximately 20 in. (50.8 cm) wide by 14 in (35.6 cm) tall and 12 in. (30.5 cm) deep as shown in Figure 9-11.

Figure 9-9: HIVE Details

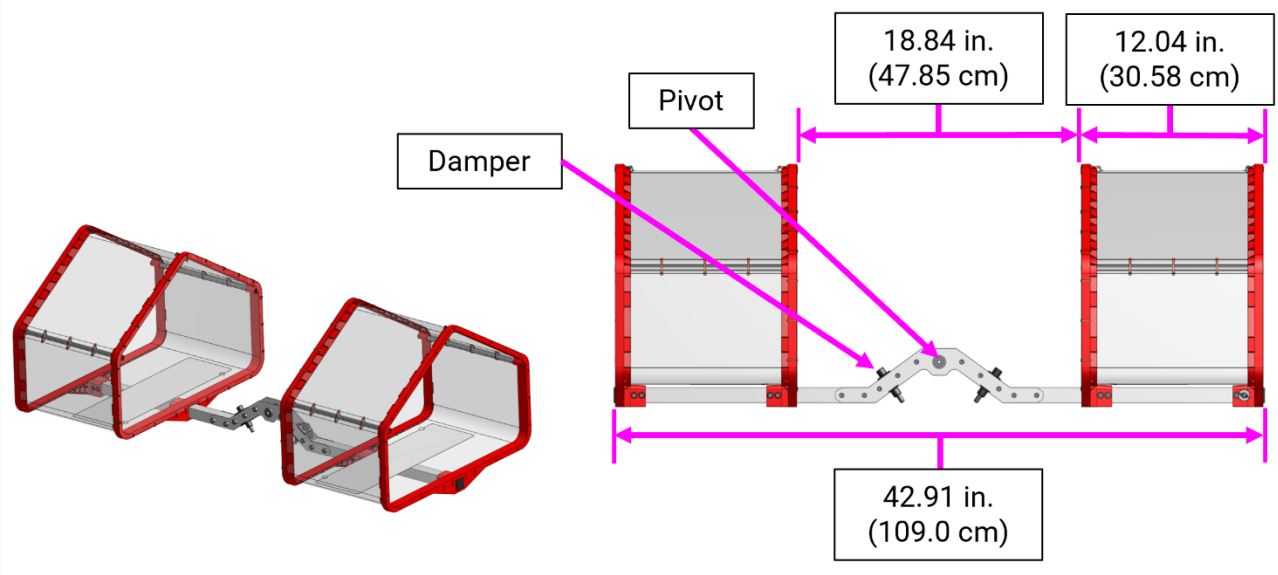


Figure 9-10: HIVE and CELL Key Details

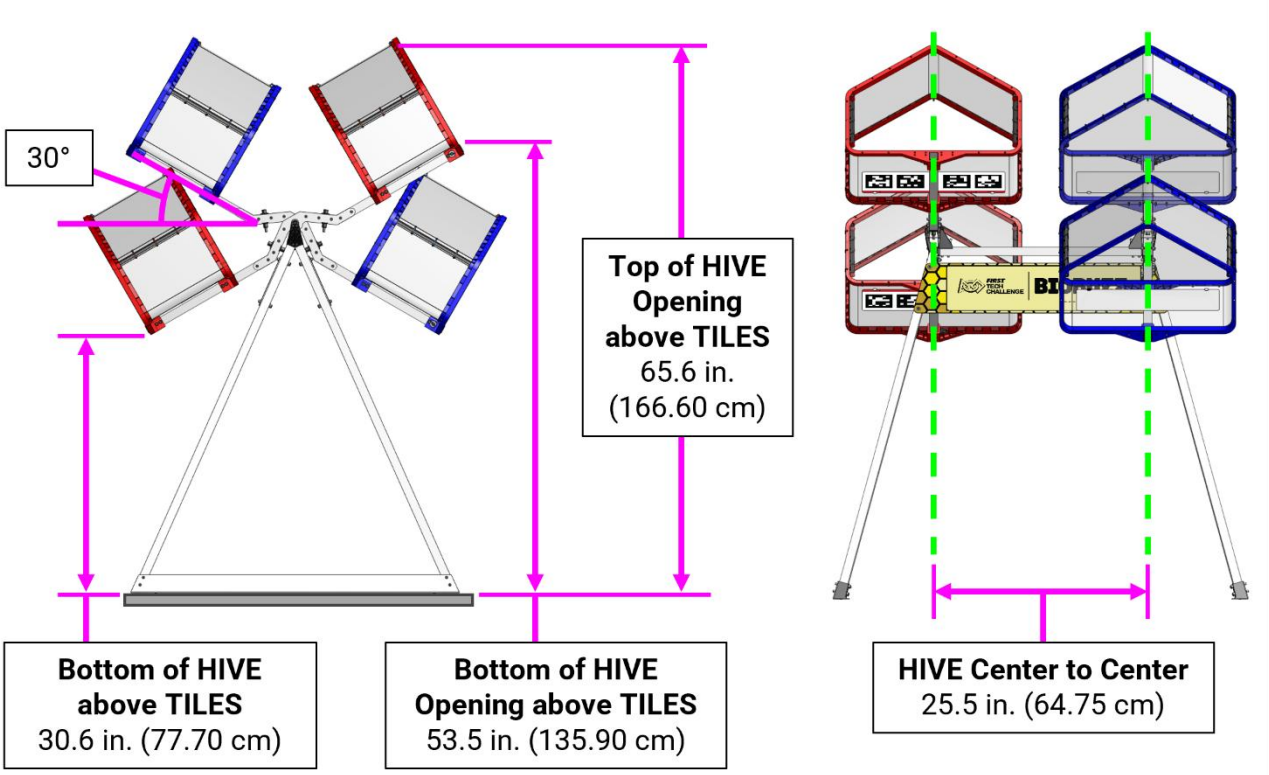
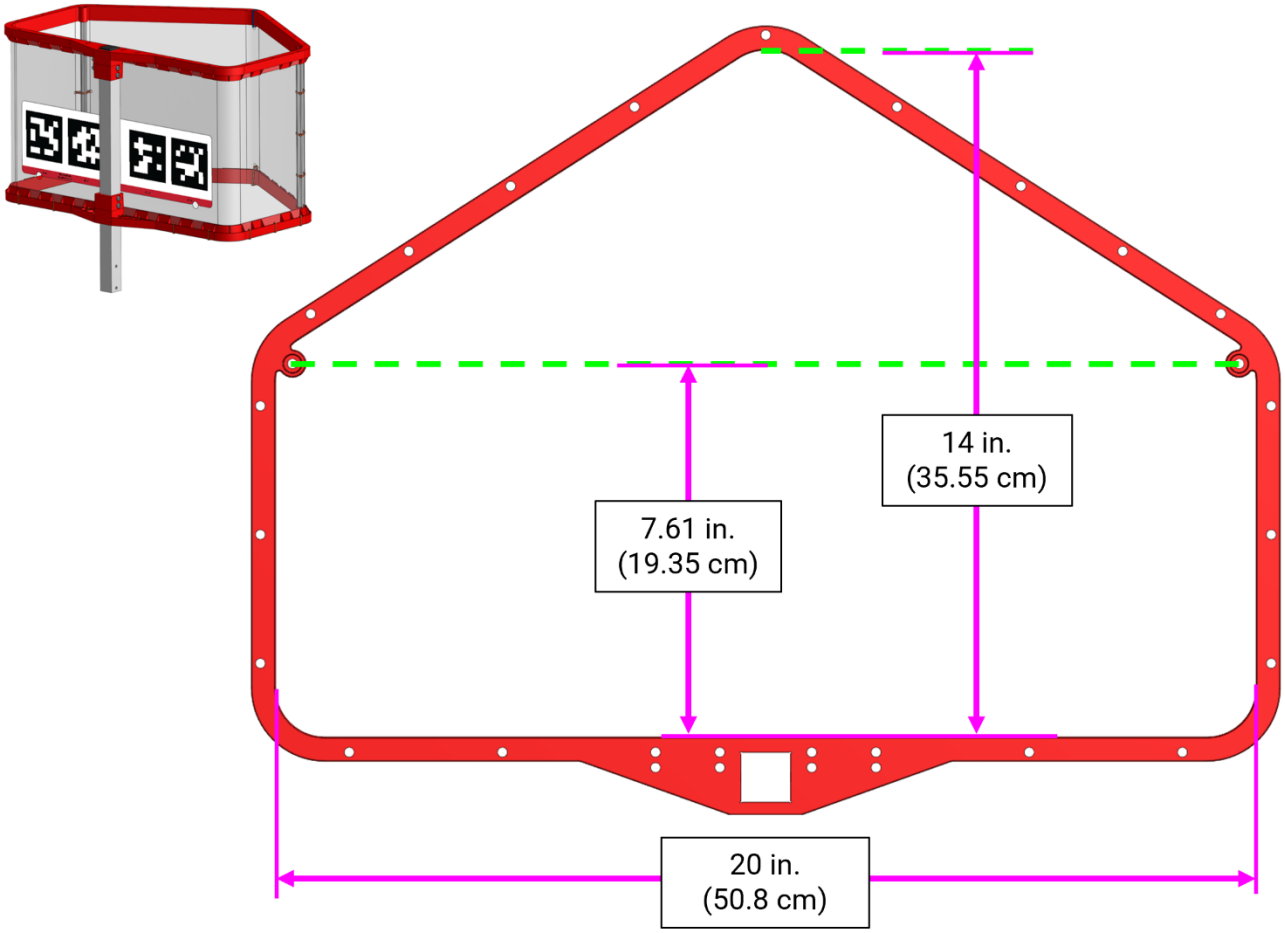


Figure 9-11: CELL



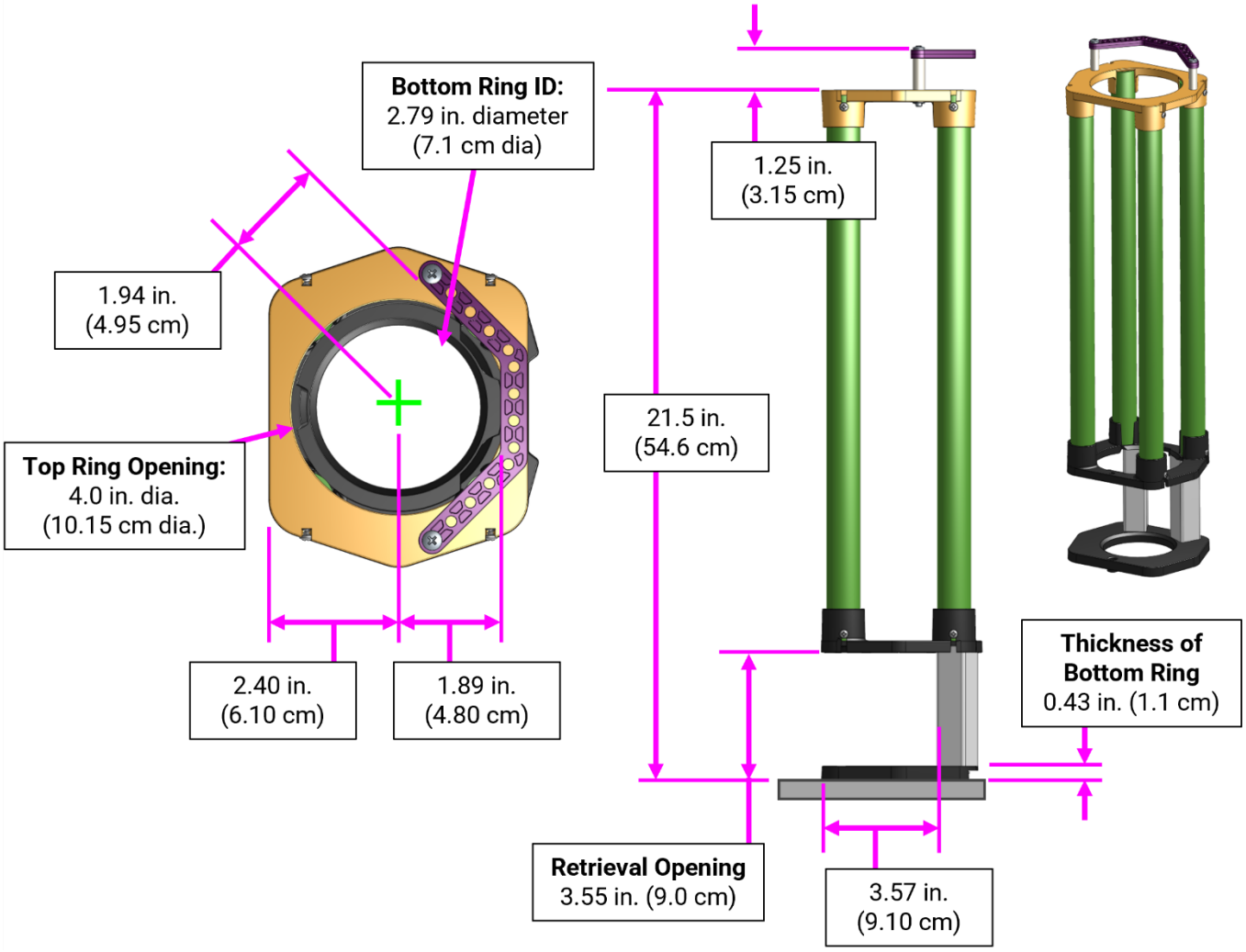
9.7 FLOWER

The FLOWER is a structure on the FIELD in which POLLEN and NECTAR can be placed into the top, and POLLEN can be removed from the bottom. There are four FLOWERS on the FIELD attached to the perimeter wall. Each FLOWER has the following key features:

- The opening on the top of each FLOWER is approximately 4 in. (10.15 cm) in diameter and is approximately 21.5 in. (54.6 cm) above the TILES.
- There is a backstop on top of each FLOWER to help guide POLLEN and NECTAR into the FLOWER. This backstop is 1.25 in. (3.15 cm) tall, with dimensions shown in Figure 9-12.
- There is a Retrieval Opening at the bottom of the FLOWER for ROBOTS to remove SCORING ELEMENTS which is approximately 3.55 in. (9.0 cm) tall and 3.57 in. (9.1 cm) deep.
- There is a lower ring that sits on the TILE floor and is approximately 0.4 in. (1.0 cm) tall with an hole for POLLEN to sit in that is approximately 2.79 in. (7.1 cm) diameter.

The upper and middle rings are connected with four HIPS pipes, and the middle and lower rings are connected on the perimeter wall side with square extrusion.

Figure 9-12: FLOWER details



9.8 SCORING ELEMENTS

SCORING ELEMENTS for BIOBUZZ are POLLEN and NECTAR.

- POLLEN are approximately 2.8 in. (7.1 cm) Gopher ResisDent™ polyethylene balls in yellow (am-5851_yellow).
- NECTAR are approximately 3.6 in. (9.1 cm) Gopher ResisDent™ polyethylene balls in red (am-5852_red) and blue (am-5852_blue).

There are 40 POLLEN, 8 red NECTAR, and 8 blue NECTAR total in a BIOBUZZ MATCH.

POLLEN and NECTAR are not perfectly spherical and may vary in size. Teams should plan for this variation when designing their ROBOTS.

Figure 9-13: SCORING ELEMENTS: POLLEN



Figure 9-14: SCORING ELEMENTS: NECTAR

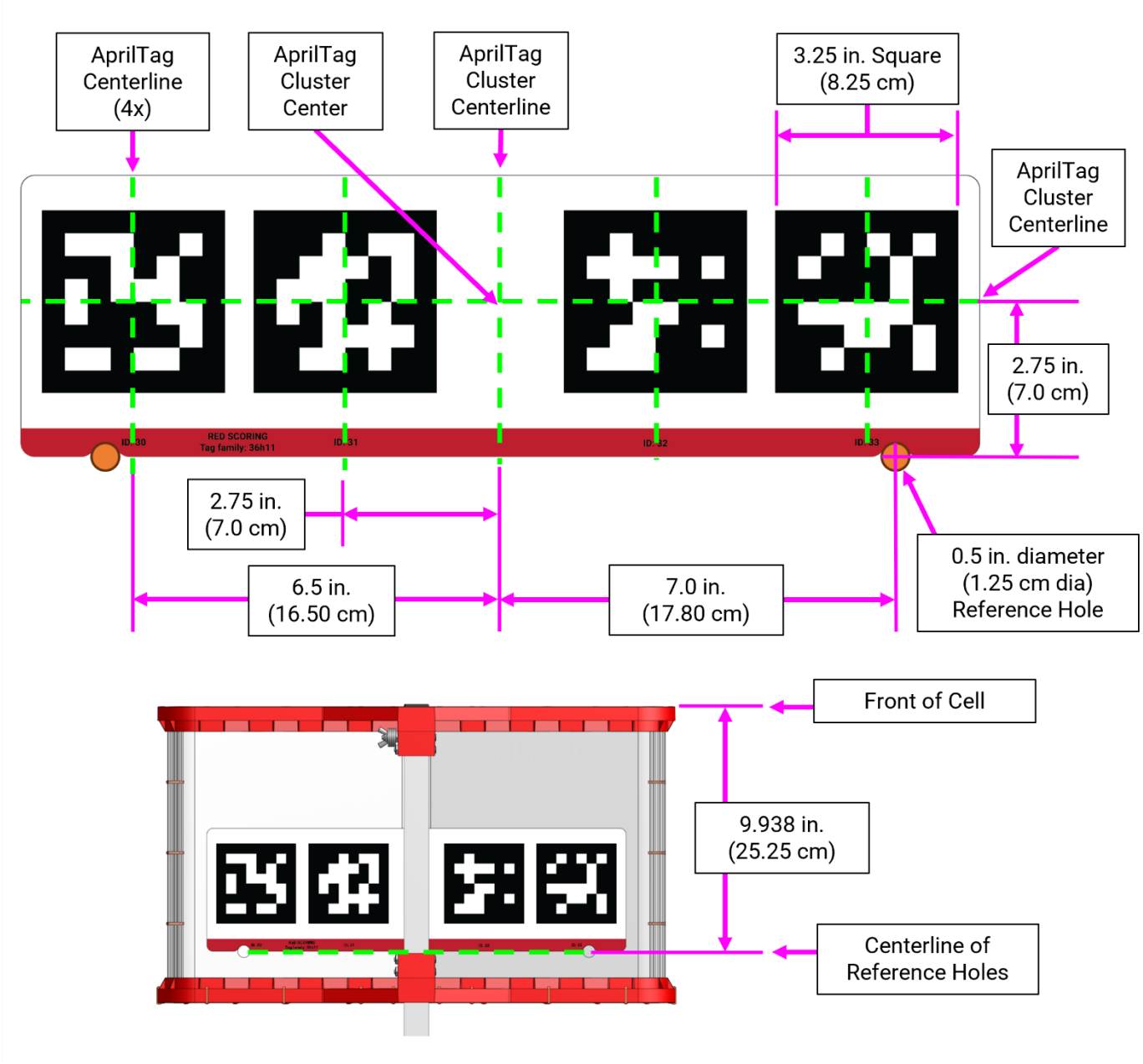


9.9 AprilTags

AprilTags for BIOBUZZ are 3.25 in. (8.25 cm) square targets from the 36h11 tag family (Figure 9-17) which are used to aid in ROBOT navigation and targeting.

AprilTags are arranged in AprilTag Clusters, consisting of four AprilTags laid out on a single sticker. Each individual AprilTag has an identifying “ID” text label. The AprilTag Clusters are applied to the CELLS as part of a single sticker, that is aligned using Reference Holes. These Reference Holes can be used to measure the location of the AprilTag Cluster relative to the rest of the FIELD. AprilTag dimensions are shown in Figure 9-15.

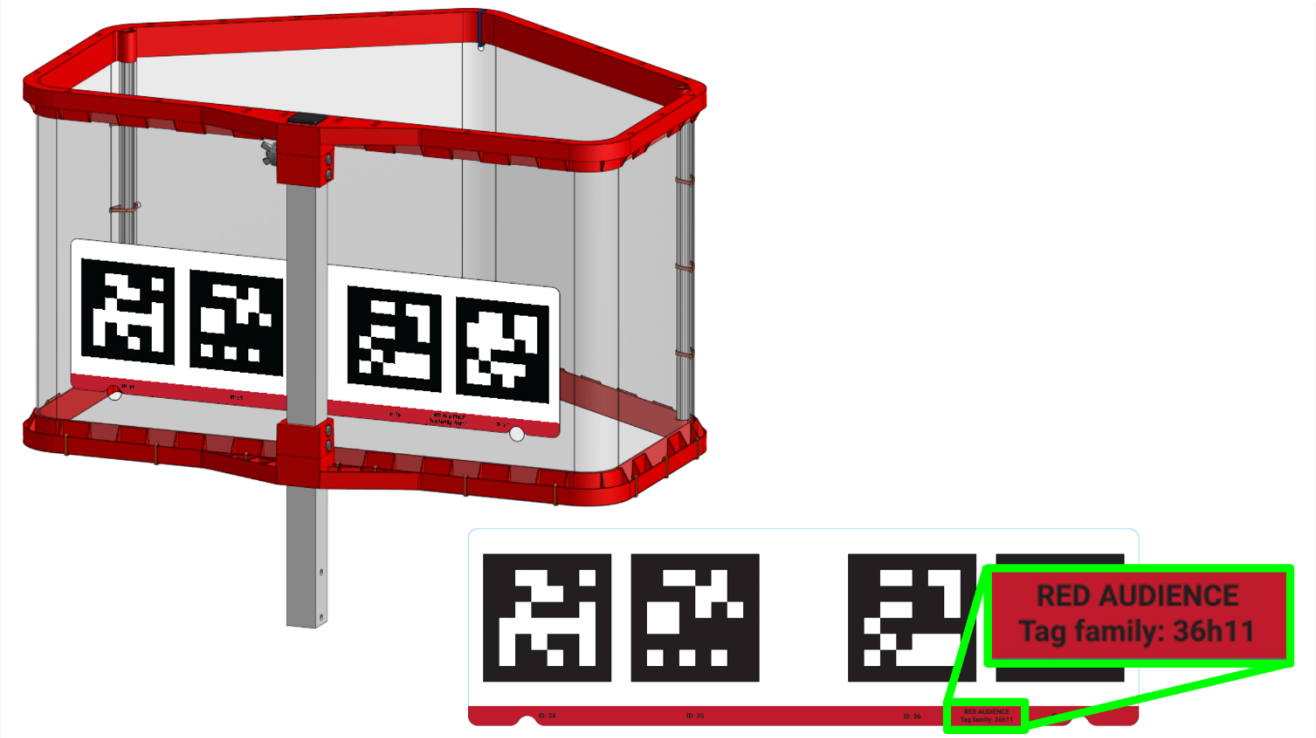
Figure 9-15: AprilTag Cluster and Reference Hole layout



Images from this manual are examples and not to scale and not intended to be printed for practice purposes.
Please refer to the Playing Field Resources page for printable versions of these images.

Each AprilTag Cluster is placed on the bottom of a CELL facing downward towards the TILES with its bottom edge oriented towards the center of the FIELD (Figure 9-16).

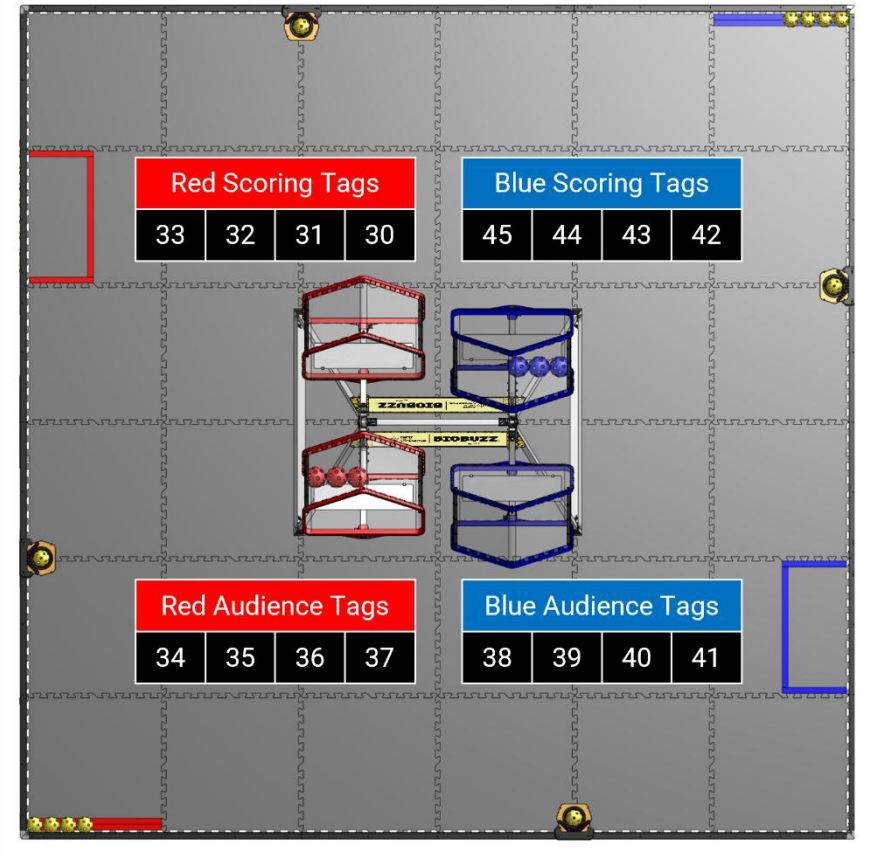
Figure 9-16: AprilTag Cluster on CELL



The AprilTags are located in the following locations on the FIELD, and in the order indicated in Figure 9-17:

- AprilTag ID's 30, 31, 32, 33 on the red CELL on the side of the FIELD opposite of the audience.
- AprilTag ID's 34, 35, 36, 37 on the red CELL on the audience side.
- AprilTag ID's 38, 39, 40, 41 on the blue CELL on the audience side.
- AprilTag ID's 42, 43, 44, 45 on the blue CELL on the side of the FIELD opposite of the audience.

Figure 9-17: AprilTag Locations on the BIOBUZZ FIELD



9.10 FIELD STAFF

FIELD STAFF are volunteers present in and around the ARENA that are responsible for making sure the MATCHES are cycled through efficiently, fairly, safely, and with a spirit of cooperation, *Gracious Professionalism*®, and generosity of spirit.

FIELD STAFF roles are filled by volunteers from the community who prepare for the event with thorough training and certification. There are 3 FIELD-side key volunteer roles with whom teams should be familiar with and are encouraged to use as resources to make their event experience valuable.

- **Head REFEREE** – trains, directs, and supervises REFEREES and Official Scorers. They oversee all scoring processes and procedures in collaboration with other FIELD STAFF. They interact with STUDENTS, volunteers, and event staff. The Head REFEREE has final authority for decisions regarding MATCH scores, FOULS, and YELLOW and RED CARD assignments.
- ***FIRST* Technical Advisor (FTA)** - ensures events run smoothly, safely, and in accordance with *FIRST* requirements. The FTA collaborates with *FIRST* staff, event staff, and other event volunteers in many different areas at events. The FTA focuses on all technical things related to the FIELD, ROBOTS, and game, and acts as a team advocate for all teams competing at the event.
- **FIELD Supervisor** - (may be the same as the FTA or Head REFEREE at smaller events) directs activity on the FIELD to ensure efficient execution of the MATCHES, pacing of the event, and smooth flow of MATCH play. FIELD Supervisors are responsible for ensuring the FIELD is intact and lead FIELD reset teams, who are responsible for resetting the FIELD after each MATCH in preparation for the subsequent MATCH.

For additional details about each of these roles, as well as other *FIRST* Tech Challenge volunteer roles, please refer to the volunteer resources.

9.11 Event Management System

The *FIRST* event management system is the software responsible for managing the MATCH scores and other event inputs. The system encompasses all FIELD electronics, including computers, displays, REFEREE, and other volunteer electronic devices, wireless access point, ethernet cables, etc.

The *FIRST* event management system alerts participants to milestones in the MATCH using audio cues detailed in Table 9-1. Please note that audio cues are intended as a courtesy to participants and not intended as official MATCH markers. If there is a discrepancy between an audio cue and the visual FIELD timers, the visual FIELD timers are the authority.

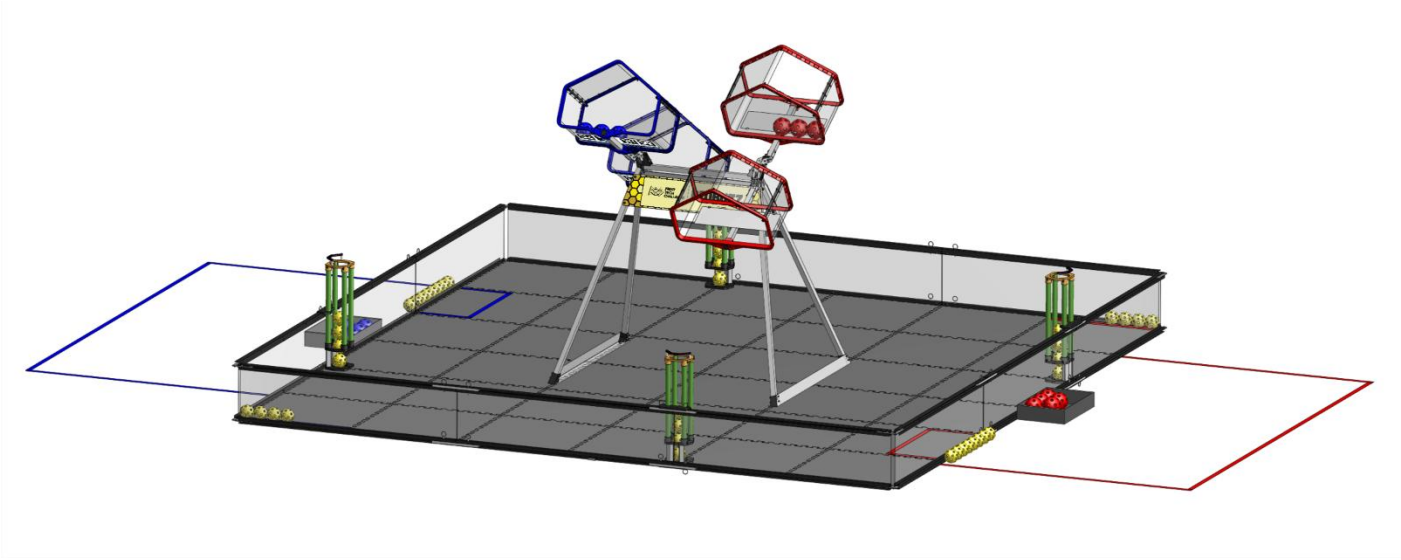
Table 9-1 Audio cues

Event	Timer Value	Audio Cue
MATCH start	2:30	“This MATCH begins in 3, 2, 1, GO” (optional) “Cavalry Charge”
AUTO ends	2:00	“Buzzer x 3”
AUTO to TELEOP Transition	0:08 to 0:01	“Drivers, pick up your controllers, 3-2-1”
TELEOP begins	2:00	“3 Bells”
FLOWER Ownership Unlocked	1:00	“Chime”
Final 20 seconds	0:20	“Train Whistle”
MATCH end	0:00	“3-second Buzzer”
MATCH stopped	N/A	“Foghorn”



10 Game Details

Figure 10-1: FIELD for BIOBUZZ



In BIOBUZZ, 2 ALLIANCES (an ALLIANCE is a cooperative of 2 *FIRST* Tech Challenge teams) play MATCHES, set up and implemented per the details described below.

10.1 MATCH Overview

MATCHES consist of pre-MATCH setup, a 30-second AUTO period, an 8-second transition period between AUTO and TELEOP, and a 2-minute TELEOP period, followed by the post-MATCH reset.

During the MATCH, ROBOTS collect POLLEN and NECTAR to move them to their GARDEN, to place into the FLOWERS, and to LAUNCH them into their CELLS to cause a HIVE TIP – all to earn points.

Each time a HIVE is TIPPED, an ALLIANCE is allowed to enter one of five NECTAR initially staged in the ALLIANCE AREA. With 60 seconds left in the MATCH, ALLIANCES can enter all remaining NECTAR.

ROBOTS conclude the MATCH by claiming ownership of the FLOWERS by placing NECTAR and returning to their LOADING ZONE.

10.2 DRIVE TEAM

A DRIVE TEAM is a set of up to 4 people from the same *FIRST* Tech Challenge team responsible for team performance for a specific MATCH. There are 3 specific roles on a DRIVE TEAM which ALLIANCES can use to assist ROBOTS, and only 1 member of the DRIVE TEAM is allowed to be a non-STUDENT.

> The intent of the definition of DRIVE TEAM and DRIVE TEAM related rules is that, barring extenuating circumstances, the DRIVE TEAM consists of people who arrived at the event affiliated with that team and are responsible for their team's and ROBOT'S performance at the event (this means a person may be affiliated with more than 1 team).

The intent is not to allow teams to "adopt" members of other teams for STRATEGIC advantage for the loaning team, borrowing team, and/or their ALLIANCE (e.g., an ALLIANCE Lead believes 1 of their DRIVERS has more experience than a DRIVER of their ALLIANCE partner, and the teams agree the partner team will "adopt" that DRIVER and make them a member of their DRIVE TEAM for Playoffs).

The definition is not stricter for 2 main reasons. First, to avoid additional bureaucratic burden on teams and event volunteers (e.g., requiring that teams submit official rosters that Queuing must check before allowing a DRIVE TEAM into the ARENA). Second, to provide space for exceptional circumstances that give teams the opportunity to display *Gracious Professionalism* (e.g., a bus is delayed, a DRIVE COACH has no DRIVERS, and their pit neighbors agree to help by loaning DRIVERS as temporary members of the team until their bus arrives).

Table 10-1: DRIVE TEAM roles

Role	Description	Max./ DRIVE TEAM	Criteria
DRIVE COACH	a guide or advisor	1	any team member and may be an adult, must wear "DRIVE COACH" badge
DRIVER	an operator and controller of the ROBOT	3	STUDENT, must wear a "DRIVE TEAM" badge
HUMAN PLAYER	a SCORING ELEMENT manager		

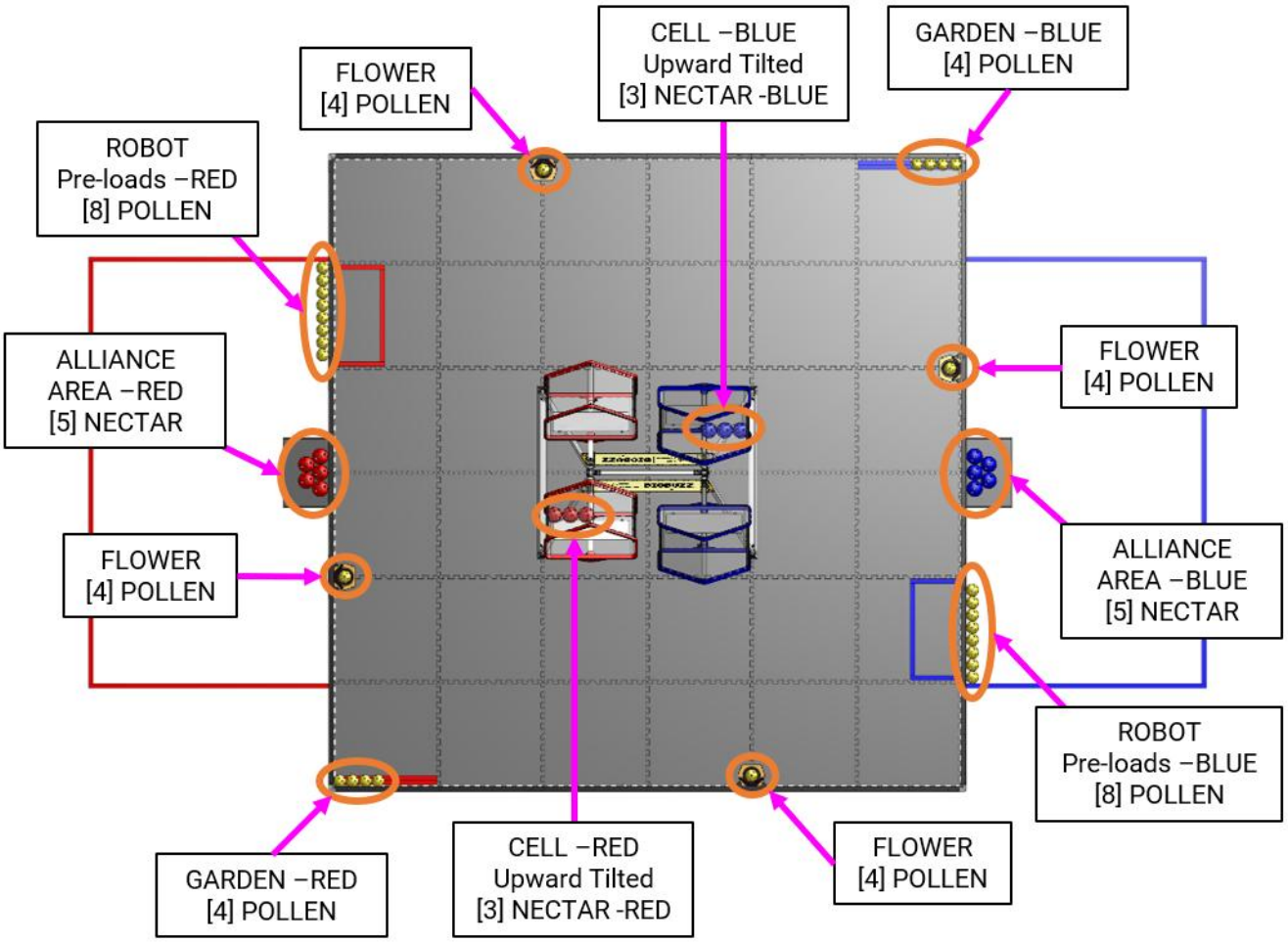
A STUDENT is a person who has not completed high-school, secondary school, or the comparable level in their HOME REGION as of September 1st of the current season.

10.3 Setup

Before each MATCH begins, FIELD STAFF stage SCORING ELEMENTS as described in Section 10.3.1 SCORING ELEMENTS. DRIVE TEAMS stage their ROBOTS (as described in Section 10.3.4 ROBOTS) and OPERATOR CONSOLES (as described in Section 10.3.3 OPERATOR CONSOLES). Then, DRIVE TEAMS take their places as described in Section 10.3.2 DRIVE TEAMS.

10.3.1 SCORING ELEMENTS

Figure 10-2: SCORING ELEMENT staging positions



Each HIVE is tilted such that one CELL is pointed down, and the other CELL is pointed up, as shown. (An easy way to remember this is the CELL which “points at” a FLOWER should be the one tilted down.) SCORING ELEMENTS are staged on the FIELD as follows (Figure 10-2):

A. 40 POLLEN are staged on the FIELD as follows:
   i. 4 POLLEN in each of the 4 FLOWERS (16)
   ii. 4 POLLEN in the red GARDEN (4)
   iii. 4 POLLEN in the blue GARDEN (4)
   iv. 4 POLLEN pre-loaded in each ROBOT (16) (Section 10.3.4 ROBOTS)

Pre-loaded POLLEN start the MATCH located in or on the ROBOT, or on the TILES contacting the ROBOT. ROBOTS that are not present for their MATCH will have their pre-load POLLEN placed in approximately the center of the LOADING ZONE against the perimeter wall.

POLLEN in the GARDEN is placed in a line starting in the corner closest to the ALLIANCE AREA and contacting the audience or rear perimeter wall. Some minor variance in placement may occur.

B. 8 red and 8 blue NECTAR are staged on the FIELD as follows:
    i. 3 NECTAR in each upward-facing CELL of corresponding color (6)
    ii. 5 NECTAR are in each ALLIANCE AREA of corresponding color (10)

NECTAR in the CELL is placed contacting the back wall of the CELL and in a line against the side closest to the ALLIANCE AREA of corresponding color. There may be some variation in where these NECTAR are placed by volunteers, but they will be generally placed as shown.

As described in 15.2 Game Modification: the number, type, and distribution of SCORING ELEMENTS may be adjusted for the *FIRST* Championship and *FIRST* Premier Events. For the *FIRST* Championship, any game modifications will be published on or before the last regularly scheduled Team Update as described in Section 1.7.3 Team Updates. For *FIRST* Premier Events, game modifications will be posted by the event organizers prior to the event.

10.3.2 DRIVE TEAMS

DRIVE TEAMS prepare for a MATCH by staging in the ALLIANCE AREA after the DRIVE TEAM from the previous MATCH has left. DRIVE TEAM starting conditions are listed below, and a DRIVE TEAM obstructing or delaying any of the conditions is at risk of violating G301.

A. Only DRIVE TEAM members assigned to the upcoming MATCH are present.
B. Only DRIVE TEAM members whose ROBOTS have passed initial, complete inspection are present.
C. DRIVE TEAM members are staged in their designated ALLIANCE AREA. If members of the ALLIANCE cannot agree where their DRIVE TEAM members will be staged, the team listed on the MATCH schedule as “Red 1” or “Blue 1” will stage closest to the audience.
D. DRIVE TEAM members clearly display their designated DRIVE TEAM badges above their waists.
E. If a Playoff MATCH, the ALLIANCE CAPTAIN clearly displays their designated ALLIANCE CAPTAIN identifier (e.g., hat, armband).

10.3.3 OPERATOR CONSOLES

DRIVE TEAMS set up their OPERATOR CONSOLES as soon as they are staged in their ALLIANCE AREA. OPERATOR CONSOLES must be compliant with all relevant rules, specifically those in Section 12.9 OPERATOR CONSOLE. A DRIVE TEAM obstructing or delaying OPERATOR CONSOLE set up is at risk of violating G301.

A. DRIVE TEAMS intending to run an OpMode during AUTO must select an OpMode within their DRIVER STATION app with the 30 second timer enabled.
B. Otherwise, DRIVE TEAMS must select a TELEOP OpMode within the DRIVER STATION app.
C. The selected OpMode must be initialized by pressing the “INIT” button on the DRIVER STATION app.

10.3.4 ROBOTS

DRIVE TEAMS stage their ROBOT in accordance with G304. A DRIVE TEAM obstructing or delaying ROBOT setup requirements is at risk of violating G301.

ROBOTS must start the MATCH contacting 4 pre-loaded POLLEN. POLLEN may be held in or on a ROBOT or placed on the TILES fully contained on its own ALLIANCE side of the FIELD contacting the ROBOT in its starting location.

If a ROBOT is DISABLED prior to the start of a MATCH, it can be removed from the FIELD in coordination with FIELD STAFF. A team whose ROBOT is DISABLED or not present is eligible to receive Qualification MATCH Points or Playoff MATCH points provided that its ROBOT has passed inspection per Section 3.3.1 Inspection, and as long as at least one STUDENT DRIVE TEAM member is present in the ALLIANCE AREA

If order of placement matters to either or both ALLIANCES, the ALLIANCE notifies the Head REFEREE or their designee before setting up for that MATCH, and the Head REFEREE instructs ALLIANCES to alternate placement of ROBOTS. REFEREE instructions are that ROBOTS are placed in the following order:

1. first red ROBOT
2. first blue ROBOT
3. second red ROBOT
4. second blue ROBOT

In Qualification MATCHES, the ROBOT assigned to Red 1 or Blue 1 places first within their ALLIANCE. In Playoff MATCHES, the ALLIANCE lead decides which ROBOT places first within their ALLIANCE.

10.4 MATCH Periods

The first period of each MATCH is 30 seconds (0:30) long and called the Autonomous Period (AUTO). During AUTO, ROBOTS operate without any DRIVER control or input.

There is an 8-second transition period between AUTO and TELEOP for scoring purposes as described in Section 10.5 Scoring.

The third period of each MATCH is 2 minutes (2:00) long and called the teleoperated period (TELEOP). During TELEOP, DRIVERS remotely operate ROBOTS to score points. See Table 9-1 for detailed MATCH timing.

10.5 Scoring

ALLIANCES are rewarded for accomplishing various actions throughout a MATCH as shown in Table 10-2.

ALLIANCES are rewarded for their performance during MATCHES via MATCH points and RANKING POINTS (RP), which increase the measure used to rank teams per Section 13.6.3 Qualification Ranking.

All achievements are updated throughout the MATCH. Scoring achievements are assessed as follows:

A. Assessment of HIVE TIPS occurs throughout the MATCH and continues until all SCORING ELEMENTS and ROBOTS have come to rest at the conclusion of the MATCH.
B. HIVE TIPS that are complete prior to the start of TELEOP are assessed as part of AUTO.
C. Assessment of POLLEN and NECTAR remaining in the CELL will occur after all SCORING ELEMENTS and ROBOTS have come to rest at the conclusion of the MATCH.
D. Assessment of SCORING ELEMENTS scored in a FLOWER will occur throughout the MATCH with final assessment taking place at the end of TELEOP after all SCORING ELEMENTS and ROBOTS have come to rest at the conclusion of the MATCH.
E. Assessment of GARDEN scoring occurs at the end of TELEOP when all ROBOTS and SCORING ELEMENTS have come to rest at the conclusion of the MATCH.
F. Assessment of LEAVE and AUTO PARK occurs at the end of AUTO.
G. Assessment of TELEOP PARK occurs at the end of the MATCH.

Scoring is evaluated and scored by human volunteers. Delays or errors in the live score are not considered an ARENA FAULT (see Section 13.2 MATCH Replays). Teams are encouraged to make sure that it is obvious and unambiguous that the criteria are met.

Achievements scored before the MATCH starts, during the AUTO-to-TELEOP transition period, and after the MATCH ends at 0:00 may be subject to penalties.

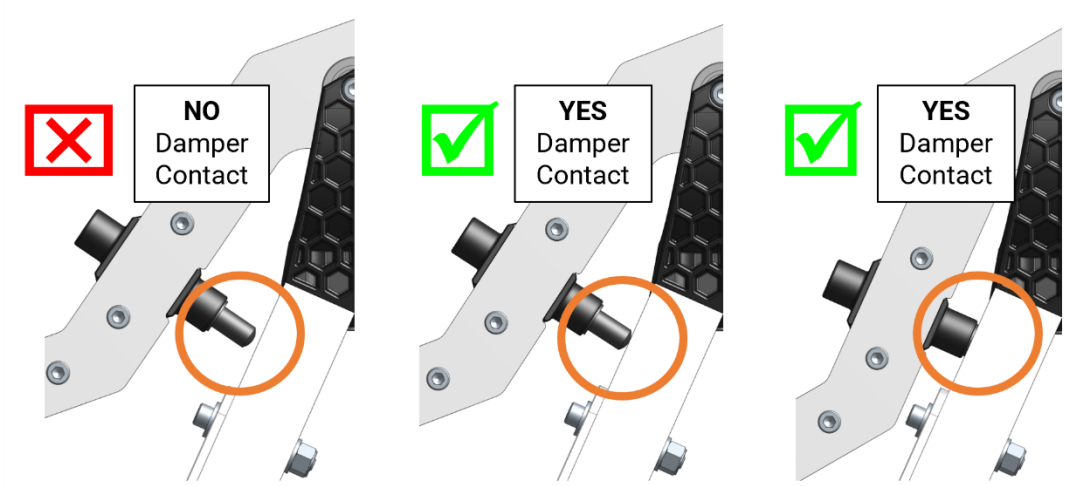
10.5.1 HIVE Scoring Criteria

HIVE TIP

The HIVE is considered TIPPED when:

A. it moves from one stable state to the other stable state with the downwards-facing CELL becoming the upwards-facing CELL, and
B. subsequently, the damper on the HIVE that was previously not contacting the frame begins to contact the frame.

Figure 10-3: HIVE damper and frame



The HIVES are designed to be bi-stable, and it should be obvious in most circumstances that a HIVE has moved from one stable state to the other. While the specific HIVE TIP criteria has been provided, volunteers are not expected to watch for the specific instant the damper contacts the frame.

Teams should be aware that LAUNCHING at the downward-facing CELL while a HIVE is tipping may disrupt its movement and may result in the TIP not being achieved. While this is unlikely to occur during normal gameplay, teams in this situation may need to pause their LAUNCHING to make sure it is obvious and unambiguous to volunteers that a TIP has been achieved.

LAUNCHING into the upward-facing CELL is the only allowed way to earn a HIVE TIP. ROBOTS must follow G417 and cannot disrupt or cause a HIVE TIP in other ways.

POLLEN and NECTAR remaining in CELL

At the end of the MATCH, any POLLEN and/or NECTAR left in an upward-facing CELL will earn points for that ALLIANCE.

10.5.2 FLOWER Scoring Criteria

NECTAR and POLLEN score when they are at least partially within the FLOWER scoring volume: between the top ring and the middle ring as highlighted purple and included in CAD Reference 10-4.

CAD Reference 10-4: FLOWER scoring volume, Click to View more Details



FLOWER scoring cannot begin until there is one minute remaining in the MATCH per G410. Achievements scored prior to one minute remaining are still scored, but subject to penalties.

Placing SCORING ELEMENTS into the top of the FLOWER is the only allowable way to score. ROBOTS must follow G418 while interacting with the FLOWER.

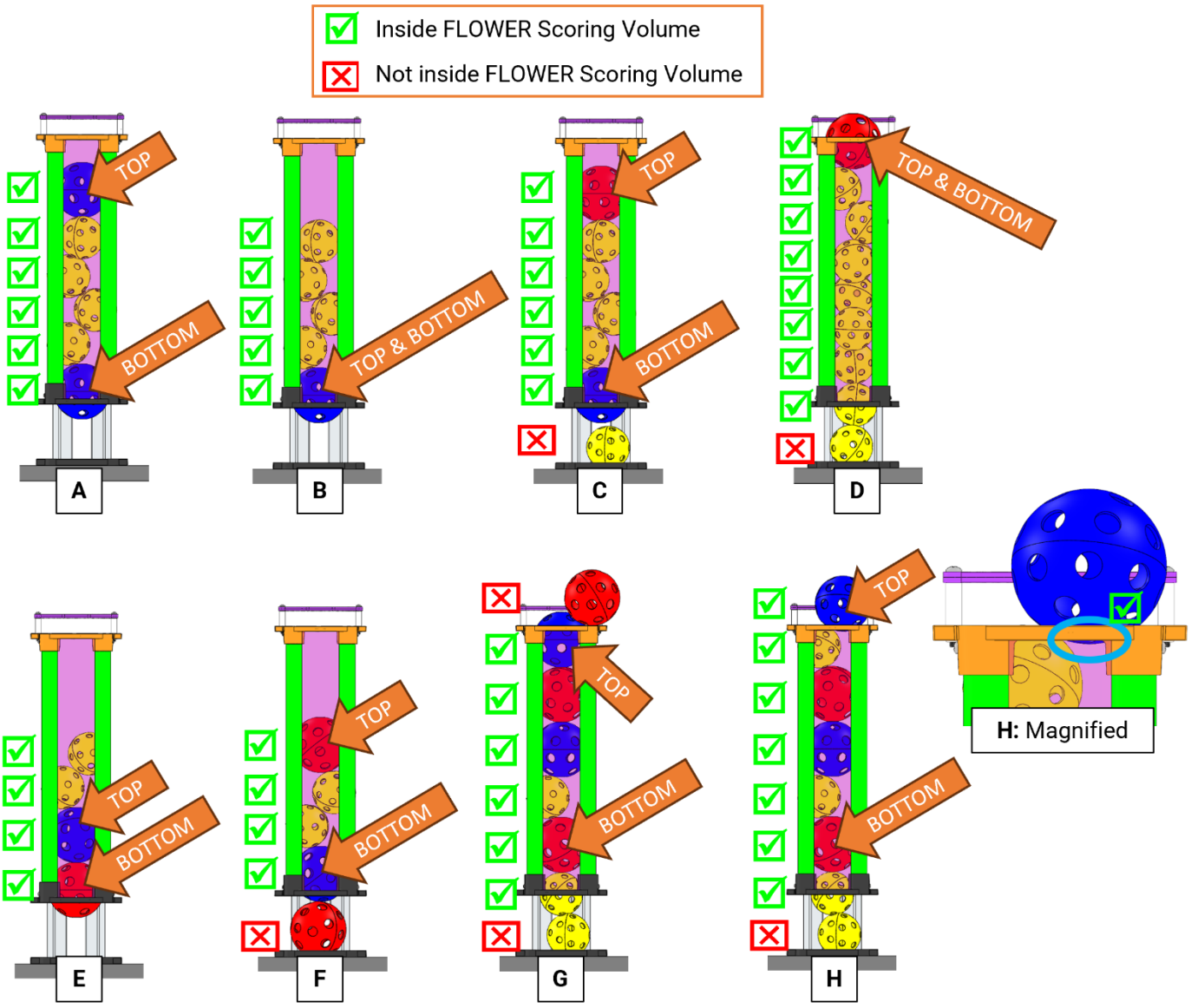
Bottom NECTAR Bonus

The ALLIANCE that has the bottom-most NECTAR of its color that meets the criteria for scoring in a FLOWER earns points.

FLOWER Owner

The ALLIANCE that has the top-most NECTAR of its color that meets the criteria for scoring in a FLOWER owns that FLOWER and will earn points for every POLLEN and NECTAR that meet the scoring criteria for that FLOWER, regardless of which ALLIANCE placed the POLLEN and/or NECTAR in the FLOWER.

Figure 10-5: FLOWER Ownership

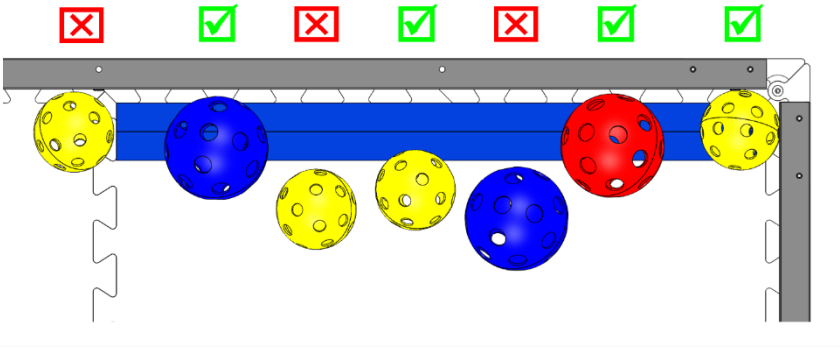


10.5.3 GARDEN Scoring Criteria

To qualify for GARDEN points, POLLEN or NECTAR must be at least partially in the GARDEN zone.

- GARDENS are ALLIANCE SPECIFIC and earn points for the ALLIANCE of corresponding color regardless of which ALLIANCE placed the POLLEN or NECTAR in the GARDEN.
- GARDENS are not protected zones, and either ALLIANCE can remove SCORING ELEMENTS from either GARDEN during the MATCH.
- NECTAR belonging to either ALLIANCE and POLLEN scores in the GARDEN for the ALLIANCE that corresponds with the color of the GARDEN.

Figure 10-6: GARDEN Scoring



10.5.4 ROBOT Scoring Criteria

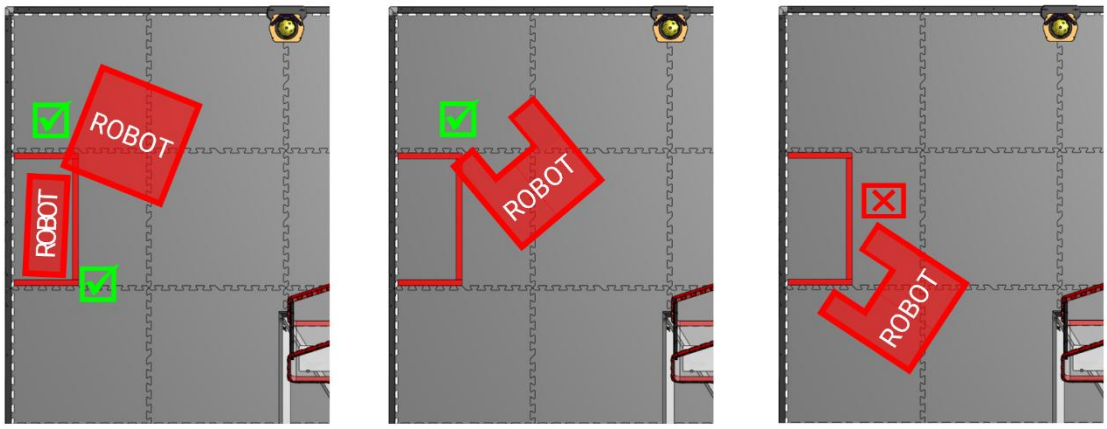
LEAVE

To qualify for LEAVE points, a ROBOT must move so that it is no longer contacting the perimeter wall.

PARK

To qualify for PARK points, a ROBOT must move so that it is at least partially in the LOADING ZONE. (Figure 10-7)

Figure 10-7: LOADING ZONE PARK Examples



10.5.5 Point Values

Table 10-2: BIOBUZZ Point Values

		MATCH points		RANKING POINTS
		AUTO	TELEOP	
LEAVE		3		-
PARK		5	5	-
HIVE	HIVE TIP	20	20	-
	POLLEN and/or NECTAR remaining in CELL	-	2	-
FLOWER	Bottom NECTAR Bonus	-	5	-
	POLLEN and/or NECTAR in an owned FLOWER	-	2	-
GARDEN	POLLEN and/or NECTAR in GARDEN	-	1	-
SWARM RP – Combined LEAVE + PARK points earned at or above threshold				1
POLLINATOR 1 RP – The number of TIPS at or above threshold				1
POLLINATOR 2 RP – The number of TIPS at or above threshold				1
WIN	Completing a MATCH with more MATCH points than your opponent			3
TIE	Completing a MATCH with the same MATCH points as your opponent			1

Table 10-3: BIOBUZZ RP thresholds

RP Type	*FIRST* Championship	Regional Championships	All Other Events*
SWARM RP	TBA	TBA	16 Points
POLLINATOR 1 RP	TBA	TBA	4 TIPS
POLLINATOR 2 RP	TBA	TBA	7 TIPS

RP thresholds for Regional Championships and *FIRST* Championship will be announced in Team Updates.

*Premier Events will be able to set their own thresholds to best reflect the experience they want to provide teams.

10.6 Violations

FIRST Tech Challenge uses 3 words in the context of how durations and actions are assessed with regards to evaluation of rules and assignment of violations. These words provide general guidance to describe benchmarks. It is not the intent for REFEREES to provide a count during the time periods.

- MOMENTARY describes durations that are fewer than approximately 3 seconds.
- CONTINUOUS describes durations that are more than approximately 10 seconds.
- REPEATED describes actions that happen more than once within a MATCH.

FIRST Tech Challenge uses the word STRATEGIC to describe specific types of violations that are not in the spirit of the competition, as outlined in Section 1.5 Competition Integrity Contract (CIC):

- STRATEGIC describes actions done with the aim of gaining a competitive advantage.

Some rules prohibit specific actions if they are perceived to be STRATEGIC or provide an increased violation for actions perceived to be STRATEGIC (e.g., impeding or enabling scoring actions). This includes actions that are deliberate or reckless with foreseeable consequences. Accidental/unforeseeable occurrences cannot be STRATEGIC.

In general, a team may face additional scrutiny from REFEREES who will determine if there is a STRATEGIC violation when either:

A. multiple warnings are given during an individual MATCH for the same violation that individually can be perceived to be accidental or unforeseeable, or
B. multiple VERBAL WARNINGS are issued to a team over multiple MATCHES for the same violation that individually can be perceived to be accidental or unforeseeable.

Accidental situations that are then deliberately used to a team's advantage will be viewed as STRATEGIC.

Unless otherwise noted, all penalties are assigned for each instance of a rule violation, and a single action may violate multiple rules. A description of the penalties is listed in Table 10-4. All rules throughout the Game Rules section are called as perceived by a REFEREE.

Table 10-4: Rule violations

Penalty	Description
VERBAL WARNING	a warning issued by event staff or the Head REFEREE
MINOR FOUL	a credit of 5 points towards the opponent's MATCH point total
MAJOR FOUL	a credit of 20 points towards the opponent's MATCH point total
YELLOW CARD	a warning issued by the Head REFEREE for egregious ROBOT or team member behavior or rule violations. A subsequent YELLOW CARD within the same tournament phase results in a RED CARD

RED CARD	a penalty issued by the Head REFEREE for egregious ROBOT or team member behavior or rule violations which results in a team being DISQUALIFIED for the MATCH.
DISABLED	The REFEREE instructs the team to stop the ROBOT which will deactivate all outputs, rendering the ROBOT inoperable for the remainder of the MATCH.
DISQUALIFIED	the state of a team in which they receive 0 MATCH points and 0 RANKING POINTS in a Qualification MATCH or causes their ALLIANCE to receive 0 MATCH points in a Playoff MATCH.

10.6.1 YELLOW and RED CARDS

In addition to rule violations explicitly listed throughout this document, YELLOW CARDS and RED CARDS are used in *FIRST* Tech Challenge to address team and ROBOT behavior that violates behavioral and ethical guidelines as described in Section 1.5 Competition Integrity Contract (CIC).

The Head REFEREE may assign

- a YELLOW CARD as a warning, or
- a RED CARD for behaviors that violate the CIC as outlined by the Escalation Guidelines.

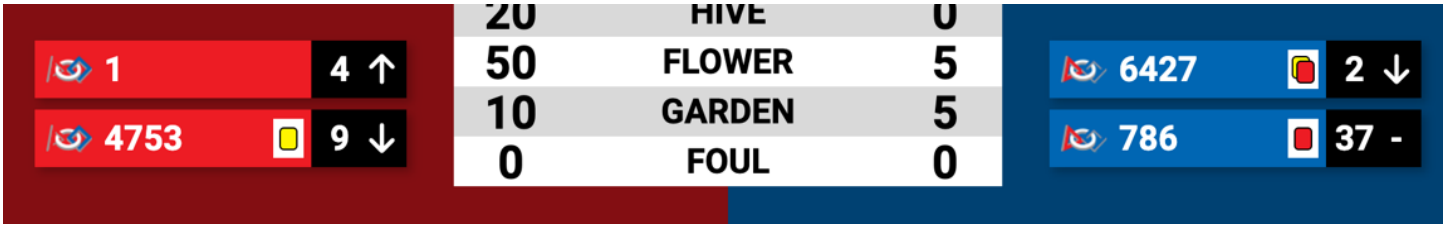
A RED CARD results in MATCH DISQUALIFICATION. A team that has received either a YELLOW or a RED CARD carries a YELLOW CARD into subsequent MATCHES, except as noted below.

If an action resulting in the assignment of a YELLOW or RED CARD is determined to be the result of an ARENA FAULT, per Section 13.2 MATCH Replays, the CARD will be rescinded.

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.

A YELLOW CARD, a second YELLOW CARD, or RED CARD is indicated on the audience display MATCH results screen (Figure 10-8). A YELLOW CARD is displayed as a yellow rectangle, a second YELLOW CARD is displayed as a red rectangle over a yellow rectangle, and a RED CARD is displayed as a red rectangle.

Figure 10-8: Example MATCH results graphic showing YELLOW and RED CARD indicators



In the event that MATCHES are played out-of-order, a subsequent MATCH is any chronologically later MATCH play, regardless of the originally scheduled time or the numbering of the MATCH.

Once a team receives a YELLOW or RED CARD, its team number is presented with a yellow background on the audience display screen during all subsequent MATCHES, including any replays, as a reminder to the team, the REFEREES, and the audience that they carry a YELLOW CARD.

Figure 10-9: Example in-MATCH audience screen graphic showing YELLOW CARD indicators



All YELLOW CARDS and G301 VERBAL WARNINGS are cleared at the conclusion of Practice, Qualification, and division Playoff MATCHES. Other VERBAL WARNINGS issued by the Head REFEREE are cleared after Practice MATCHES and persist from Qualification MATCHES through subsequent tournament phases, except when stated otherwise.

10.6.2 YELLOW and RED CARD application

YELLOW and RED CARDS are applied based on the following:

Table 10-5: YELLOW and RED CARD application

Time YELLOW or RED CARDS earned:	MATCH to which CARD is applied:
Prior to Qualification MATCHES	REFEREES may or may not be present at the FIELD before the start of Qualification MATCHES. With input from event staff, the Head REFEREE may opt to perpetuate a VERBAL WARNING or YELLOW CARD earned prior to Qualification MATCHES to the first Qualification MATCH for particularly egregious behavior.
during the Qualification MATCHES	team's current (or just completed) MATCH in which they are not a SURROGATE. For SURROGATE MATCHES the card is applied to the team's previous Qualification MATCH.
between the end of Qualification MATCHES and the start of Playoff MATCHES	ALLIANCE'S first Playoff MATCH
during the Playoff MATCHES	ALLIANCE'S current (or just completed) MATCH

A MATCH is no longer the current MATCH once the results of the MATCH have been posted or the Head REFEREE or their designee has indicated that teams can collect their ROBOTS, whichever is later.

Please see examples of the application of YELLOW and RED CARDS as shown in Section 10.6.4 Violation Details.

10.6.3 YELLOW and RED CARDS during Playoff MATCHES

During Playoff MATCHES, YELLOW and RED CARDS are assigned to the violating team's entire ALLIANCE instead of to only the violating team. If an ALLIANCE receives 2 YELLOW CARDS, the entire ALLIANCE is issued a RED CARD which results in DISQUALIFICATION for the associated MATCH.

10.6.4 Violation Details

There are several styles of violation wording used in this manual. Below are some example violations and a clarification of the way the violation would be assessed. The examples shown do not represent all possible violations, but rather a representative set of combinations.

Table 10-6: Violation examples

Example Violation	Expanded Interpretation
MINOR FOUL	Upon instance of violation, a MINOR FOUL is assessed against the violating ALLIANCE.
MINOR FOUL per SCORING ELEMENT.	Upon instance of violation, a MINOR FOUL is assessed against the violating ALLIANCE equal to the number of SCORING ELEMENTS used in violation of the rule.
MAJOR FOUL per instance. MAJOR FOUL per instance and YELLOW CARD per MATCH if REPEATED.	Upon initial violation in a MATCH, a MAJOR FOUL is assessed against the violating ALLIANCE per instance of a violation occurring. If the condition of REPEATED in the second statement is met – i.e., the ROBOT repeats the infraction an additional time in the MATCH, then an additional MAJOR FOUL is assessed against the violating ALLIANCE for the subsequent instance of violation and after the MATCH, the violating team is issued a YELLOW CARD for the subsequent instance of violation. Assuming no additional infractions of that rule by that ROBOT in that MATCH, the ROBOT is assessed two MAJOR FOULS and a YELLOW CARD for their team in that MATCH. Additional violations of this rule during the MATCH would increase the number of MAJOR FOULS assessed during the MATCH but not the number of YELLOW CARDS issued for the MATCH.
MAJOR FOUL and an additional MAJOR FOUL for every 3 seconds in which the situation is not corrected	Upon violation, a MAJOR FOUL is assessed against the violating ALLIANCE and the REFEREE begins to count. Their count continues until the criteria to discontinue the count are met, and for each 3 seconds within that time, an additional MAJOR FOUL is assessed against the violating ALLIANCE. A ROBOT in violation of this type of rule for 15 seconds is assessed a total of 6 MAJOR FOULS (assuming no other rules were being simultaneously violated).

Example Violation	Expanded Interpretation
VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.	Upon a general violation of the rule, a VERBAL WARNING is issued to the violating team. However, if the violation is perceived to be STRATEGIC by the REFEREES, then a MAJOR FOUL is assessed against the violating ALLIANCE and after the MATCH, the violating team is issued a YELLOW CARD.
MAJOR FOUL per MATCH. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.	If one or more violations occurs by a team during MATCH, a MAJOR FOUL is assessed against the violating ALLIANCE per MATCH. However, if the violation is perceived to be STRATEGIC by the REFEREES, a MAJOR FOUL is assessed per team per MATCH against the violating ALLIANCE. After the MATCH, the team is issued a YELLOW CARD per MATCH. Only 1 MAJOR FOUL and up to 1 YELLOW CARD can be earned by a team in a single MATCH.
VERBAL WARNING. YELLOW CARD if subsequent violations occur during the event.	Upon the first instance of violation, a VERBAL WARNING is issued to the violating team. If an additional instance of violation of the same rule occurs later in the event, that is: a MATCH during the same event phase or a later event phase, then following any subsequent violation: after the MATCH, the violating team is issued a YELLOW CARD per instance.
VERBAL WARNING. MAJOR FOUL and YELLOW CARD per instance, if STRATEGIC. MAJOR FOUL and RED CARD per instance, if STRATEGIC and either CONTINUOUS or opponent ROBOT is unable to drive.	Upon a general violation of this rule, a VERBAL WARNING is issued to the violating team. However, if the violation is perceived to be STRATEGIC by the REFEREES, then a MAJOR FOUL is assessed against the violating ALLIANCE and after the MATCH, the team is issued a YELLOW CARD. However, if the violation is perceived to be STRATEGIC by the REFEREES and the opponent ROBOT is unable to drive or the entanglement persists for 10 seconds or more, then upon violation, a MAJOR FOUL is assessed against the violating ALLIANCE. After the MATCH, the team is issued a RED CARD. Only 1 MAJOR FOUL and 1 CARD can be earned for a single violation instance; however, multiple MAJOR FOULS and CARDS may be earned in a single MATCH if multiple instances of the violation occurred during the MATCH.

10.7 Head REFEREE

The Head REFEREE has the ultimate authority in the ARENA during the event, per T401, but may receive input from additional sources, e.g., *FIRST* personnel, FTA, Event Director, or other event staff. The Head REFEREE rulings are final. No event staff, including the Head REFEREE, will review video, photos, artistic renderings, etc. of any MATCH, from any source, under any circumstances.

10.8 Other Logistics

10.8.1 Practice MATCH Participation

The FTA, LRI, or Head REFEREE may prohibit a team from participating in a Practice MATCH if they determine that their ROBOT is unsafe or likely to damage the ARENA.

10.8.2 SCORING ELEMENT Logistics

POLLEN that exits the FIELD will be reintroduced into the FIELD at the earliest safe opportunity by FIELD STAFF in the nearest convenient location.

NECTAR that exits the FIELD will be returned to that ALLIANCE'S DRIVE TEAM for reintroduction per Section 11.4.6 Human. An ARENA FAULT is not called for MATCHES in which there are reasonable delays in FIELD STAFF reintroducing POLLEN to the FIELD or returning NECTAR to a DRIVE TEAM.

An ARENA FAULT (an error in ARENA operation described in Section 13.2 MATCH Replays) is not called for MATCHES that accidentally begin with:

- damaged SCORING ELEMENTS,
- the incorrect number of SCORING ELEMENTS, or
- incorrectly placed SCORING ELEMENTS.

Damaged SCORING ELEMENTS are not replaced until the next MATCH reset. DRIVE TEAMS should alert the FIELD STAFF to any missing, incorrectly placed, or damaged SCORING ELEMENTS prior to the start of the MATCH.

10.8.3 FIELD Mitigation

During a MATCH, FIELD STAFF may follow steps in the Field Mitigation Guide to mitigate some FIELD issues during a MATCH.

10.8.4 FIELD Reset

Once the MATCH is over and the Head REFEREE or their designee determines that the FIELD and FIELD STAFF are ready, they will give a signal, which initiates FIELD reset and prompts DRIVE TEAMS to retrieve their ROBOTS.

During FIELD reset, the FIELD is cleared of ROBOTS and OPERATOR CONSOLES from the MATCH that just ended, ROBOTS and OPERATOR CONSOLES for the subsequent MATCH are loaded into the FIELD by DRIVE TEAMS, and FIELD STAFF reset ARENA elements.



11 Game Rules (G)

11.1 Personal Safety

G101 ***Humans, stay off the FIELD during the MATCH.** A team member may not enter the FIELD during a MATCH.

Violation: VERBAL WARNING.

> The intent of this rule is that team members should stay outside of the FIELD perimeter during a MATCH and not impact a MATCH except as allowed in Section 11.4.6 Human. A team member stepping onto the FIELD or hanging a large portion of their body over the FIELD is a violation of this rule.
>
> A team member pointing their arm, waving, or leaning over the FIELD perimeter wall without impacting the MATCH are not violations of the rule.

G102 ***Be careful when interacting with ARENA elements.** A team member is prohibited from the following actions with regards to interaction with ARENA elements:

A. climbing on,
B. hanging from,
C. manipulating such that it does not return to its original shape without human intervention, and
D. damaging.

Violation: VERBAL WARNING.

> DRIVE TEAM members may brace the FIELD perimeter at any point during the MATCH. Moving the FIELD perimeter out of position is considered a violation of G102.C.

11.2 Conduct

G201 ***Be a good person.** All teams must be civil toward everyone and respectful of team and event equipment while at a *FIRST* Tech Challenge event. Please review the *FIRST* Code of Conduct, Core Values, and the rest of Section 1.4.2 Framework of Behaviors for more information.

Violation: VERBAL WARNING. YELLOW CARD if subsequent violations occur during the event.

> Particularly contemptible behavior may result in ARENA ejection for individuals, disqualification for teams, and may be subject to further escalation as described in the Escalation Guidelines.

G202 ***Follow the Competition Integrity Contract (CIC).** When playing BIOBUZZ, teams must follow the rules and follow the Competition Integrity Contract (CIC) described in Section 1.5 Competition Integrity Contract (CIC) during every MATCH.

Examples of behaviors that would violate this rule include, but are not limited to:

A. deliberately violating the spirit of the rules,
B. throwing MATCHES, deliberately missing RPs, or playing beneath your ability to manipulate rankings,
C. asking other teams to throw MATCHES, deliberately miss RPs, or play beneath their ability to manipulate rankings,
D. asking teams to not show up to their MATCH,
E. distracting, disrupting, and/or taunting opponents, or
F. disrupting ARENA operations.

Violation: VERBAL WARNING. YELLOW or RED CARD if subsequent violations occur during the event.

These rules are not intended to prevent an ALLIANCE, who intends to play the game and follow the rules, from planning and/or executing strategies in specific MATCHES in which teams play specific and potentially unconventional roles that contribute to their ALLIANCE.

Playing with integrity is required in *FIRST*; YELLOW or RED CARDS will be given at the discretion of the Head REFEREE based on severity of the infraction and impact on the MATCH.

G203 ***Show up to your MATCHES.** If a ROBOT has passed initial, complete inspection, at least 1 member of its DRIVE TEAM must report to the ARENA and participate in each of their assigned Qualification MATCHES.

Violation: DISQUALIFIED from the current MATCH.

The team should inform the Lead Queuer if the team's ROBOT is not able to participate.

If there are extenuating circumstances which prevent at least 1 member of a team from attending each of their MATCHES, that team should discuss with FIELD STAFF whether an accommodation is available.

G204 ***Do not expect to gain by doing others harm.** Actions clearly aimed at forcing the opponent ALLIANCE to violate a rule are not in the spirit of *FIRST* Tech Challenge and not allowed. Violations forced in this manner will not result in an assignment of a penalty or penalties, to the targeted ALLIANCE.

Violation: MAJOR FOUL per instance. MAJOR FOUL per instance and YELLOW CARD per MATCH if REPEATED. The ALLIANCE that was forced to break a rule will not be assessed a penalty.

This rule does not apply for strategies consistent with standard gameplay.

This rule requires a deliberate act with limited or no opportunity for the team being acted on to avoid the penalty, such as:

A. a red ALLIANCE ROBOT deliberately drives into a blue ALLIANCE ROBOT that is lined up to score NECTAR into a FLOWER with 65 seconds left in the MATCH, causing them drop the NECTAR into the FLOWER early in violation of G410.
B. a red ALLIANCE ROBOT drives through the blue LOADING ZONE while a blue DRIVE TEAM member is introducing NECTAR to the FIELD, deflecting the blue NECTAR before it contacts the TILE in the LOADING ZONE, in violation of G427.

G205 ***Egregious or exceptional violations.** Egregious behavior beyond what is listed in the rules or subsequent violations of any rule or procedure during the event is prohibited.

In addition to rule violations explicitly listed in this manual and witnessed by a REFEREE, the Head REFEREE may assign a YELLOW or RED CARD for egregious ROBOT actions or team member behavior at any time during the event.

Continued violations will be brought to *FIRST* Headquarters' attention. *FIRST* Headquarters will work with event staff to determine if further escalations are necessary, which can include removal from award consideration and removal from the event.

Deliberately violating a rule because the benefit of the violation outweighs the penalty is not in the spirit of *FIRST* and is an example of egregious behavior. For example, multiple violations of rules without an escalation path because the cumulative benefit outweighs the cumulative penalty. Violating a rule that only results in a YELLOW CARD in an ALLIANCE'S potential last MATCH prior to cards clearing per Section 10.6.1 YELLOW and RED CARDS or the end of an event (such as a team's last qualification MATCH, a lower bracket MATCH) will be under increased scrutiny and will likely result in a RED CARD.

Please see Section 10.6.1 YELLOW and RED CARDS for additional detail.

Violation: YELLOW or RED CARD.

The intent of this rule is to provide the Head REFEREES with the flexibility necessary to keep the event running smoothly, as well as keep the safety of all the participants as the highest priority.

The Head REFEREE may assign a YELLOW or RED CARD for a single instance of a rule violation or for multiple instances of any single rule violation. Teams should be aware that any rule in this manual could escalate to a YELLOW or RED CARD. The Head REFEREE has final authority on all rules and violations at an event.

11.3 Pre-MATCH

G301 ***Don't delay MATCHES.** DRIVE TEAM members may not cause significant delays to the start of their MATCH. Both of these conditions must be met prior to team actions being considered:

A. the expected MATCH start time has passed, and
B. the DRIVE TEAM has access to the ARENA.

In order for a team to cause a significant delay, the Head REFEREE must perceive that the team is neither MATCH ready (G303) nor making a good faith effort to quickly become MATCH ready.

> During Qualification MATCHES, the expected start time of the MATCH is the time indicated on the MATCH schedule or ~3 minutes after the end of the previous MATCH on the same FIELD, whichever is later.
>
> During Playoff MATCHES, the expected start time of the MATCH is the time indicated on the MATCH schedule or 8 minutes from either ALLIANCE'S previous MATCH, whichever is later
>
> During back-to-back MATCHES, T406 is in effect, and teams may have a longer minimum break.
>
> Teams that have 1 DRIVE TEAM member present and have informed FIELD STAFF that their ROBOT will not be participating in the MATCH are considered MATCH ready and not in violation of this rule.

Violation: VERBAL WARNING. MAJOR FOUL for the upcoming MATCH if a subsequent violation occurs within the tournament phase. In a Playoff MATCH, the VERBAL WARNING is issued to the entire ALLIANCE.

If the team/ALLIANCE is not MATCH ready within 2 minutes of the VERBAL WARNING/MAJOR FOUL having been issued, and the Head REFEREE perceives no good faith effort by the DRIVE TEAM(S) to quickly become MATCH ready, the offending team's ROBOT is DISABLED.

> The intent of this rule is to provide an equitable amount of time for both ALLIANCES to prepare for each MATCH and give DRIVE TEAMS grace given extenuating circumstances that cause them to be late. Teams should avoid disrupting ARENA operations and proactively communicate with the Head REFEREE and FIELD STAFF to let them know their status.
>
> FIELD STAFF will make a good faith effort to wait for missing or unprepared teams and will avoid beginning any MATCH when teams are not present or not MATCH ready and making good faith effort to become MATCH ready.
>
> Once a VERBAL WARNING/MAJOR FOUL is issued, the Head REFEREE starts a 2-minute timer and makes a good faith effort to share the timer's status with the delaying DRIVE TEAM.
>
> In general, good faith efforts to quickly become MATCH ready are entirely for the purposes of transitioning the ROBOT into a MATCH ready state (i.e., not attempts to significantly alter a ROBOT'S capabilities). Examples of good faith efforts to

quickly become MATCH ready that would not be a violation include but are not limited to:

A. walking safely towards the FIELD with a ROBOT that a team is not actively modifying,
B. applying quick fixes such as tape or cable ties to make the ROBOT compliant with STARTING CONFIGURATION requirements,
C. waiting for a DRIVER STATION device to boot,
D. actively working with field technical staff, including the FTA, to resolve an issue in a reasonable amount of time, or
E. performing a MOMENTARY "wiggle test" to confirm communication between the DRIVER STATION and the ROBOT CONTROLLER. The ROBOT should not drive or interact with SCORING ELEMENTS (except contact with pre-loaded POLLEN) while performing this test.

G302 ***Limit what you bring to the FIELD**. Items brought to the FIELD to be used for a MATCH, in addition to the ROBOT and OPERATOR CONSOLE, must fit in the team's designated ALLIANCE AREA, be worn or held by members of the DRIVE TEAM, or be an item used as an accommodation (e.g., crutches, cushions, kneeling mats, or single-step stools no more than 12 in. tall (30.5 cm) that are designed to be stood on and are locked such that they do not roll/fold).

Regardless of whether the equipment fits the criteria above, it may not:

A. be employed in a way that disrupts normal ARENA operations or introduces a safety hazard,
B. extend more than 6 ft. 6 in. (~198 cm) above the TILES,
C. communicate with anything or anyone outside of the ARENA with the exception of medically required equipment,
D. block visibility for FIELD STAFF or audience members, or
E. jam or interfere with the remote sensing capabilities of another team.

Exceptions to G302.B are granted for MOMENTARY extensions above 6 ft. 6in. and for individuals wearing PPE or reasonable decorative apparel such as hats, headbands, etc.

Violation: MATCH will not start until the situation is remedied. VERBAL WARNING, if discovered or used inappropriately during a MATCH. YELLOW CARD if subsequent violations occur during the event.

It is not a violation of this rule to bring an alignment device to the FIELD to aid pre-MATCH ROBOT set-up and alignment. The use of any alignment devices should not delay MATCH start in violation of G301.

Examples of equipment that may be considered a safety hazard in the confined space of the ALLIANCE AREA include but are not limited to: a ladder or a large signaling device.

Using an item that has wireless communications disabled complies with G302.C above.

Examples of jamming or interfering with remote sensing capabilities include but are not limited to: mimicking the FIELD AprilTags and shining bright lighting or laser pointers onto the FIELD during a MATCH.

G303 ***ROBOTS on the FIELD must come ready to play a MATCH.** A ROBOT must meet all following MATCH-start requirements:

A. does not pose a hazard to humans, ARENA elements, or other ROBOTS,
B. meets all the requirements from Section 3.3 MATCH Eligibility Rules including those regarding inspection/re-inspection,
C. is the only team-provided item left in the FIELD, and
D. has ROBOT SIGNS that indicate the correct ALLIANCE color (see R402).

Violation: The MATCH will not start until all requirements are met if there is a quick remedy. DISABLED if it is not a quick remedy, and, at the discretion of the Head REFEREE, ROBOT must be re-inspected. RED CARD if a team's ROBOT is not compliant with G303.B participates in the MATCH.

For assessment of many of the items listed above, the Head REFEREE is likely to consult with the LRI.

G304 ***ROBOTS must be set up correctly on the FIELD.** A ROBOT must be positioned on the FIELD such that it meets all of the following requirements:

A. fully contained on its own ALLIANCE's side of the FIELD (FIELD columns A, B, C for red, or FIELD columns D, E, F for blue) (Figure 9-4),
B. not attached to, entangled with, or suspended from any FIELD element,
C. touching the FIELD perimeter wall,
D. not contacting or in the scoring volume of a FLOWER,
E. not in the LOADING ZONE,
F. confined to its STARTING CONFIGURATION (see R102 and R103),
G. in contact with exactly 4 POLLEN pre-loads as described in Section 10.3.1 SCORING ELEMENTS fully contained on its own ALLIANCE side of the FIELD, and
H. fully motionless following completion of OpMode initialization,

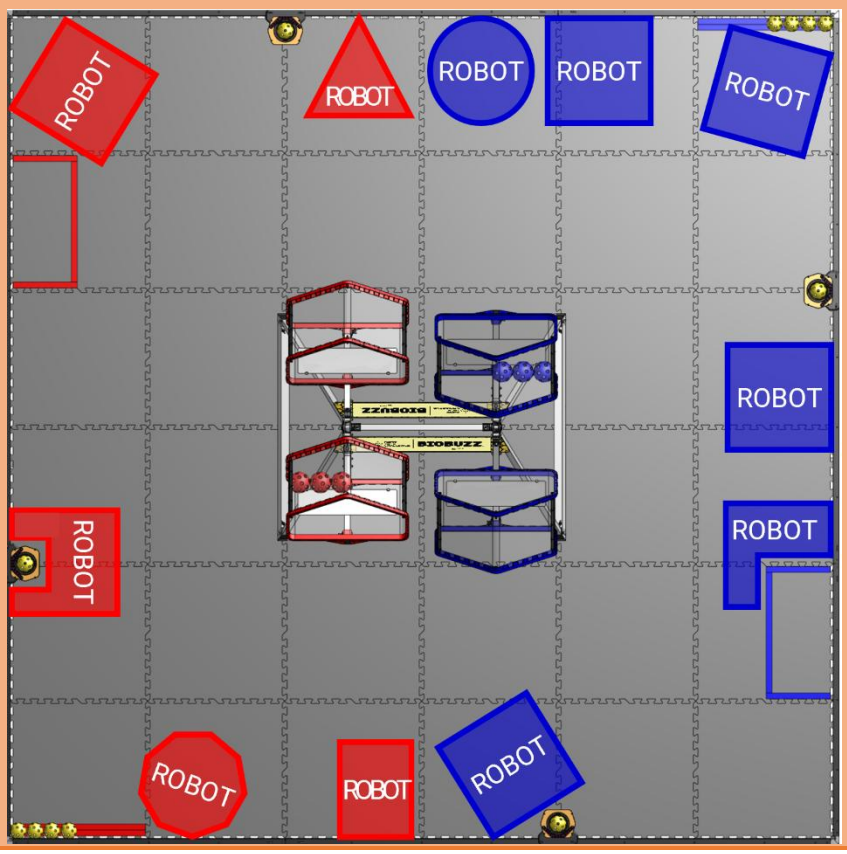
Violation: The MATCH will not start until all requirements are met, if there is a quick remedy. DISABLED or removed from FIELD, if it is not a quick remedy.

G304.A requires the ROBOT to be fully contained within the FIELD perimeter and not overhang the FIELD perimeter wall.

Each ROBOT must start contacting 4 pre-load POLLEN either located in or on the ROBOT, or on the TILES contacting the ROBOT. These pre-load POLLEN are specifically allocated as 4 for each team as described in Section 10.3.1 SCORING ELEMENTS. ROBOTS may contact other POLLEN setup on the FIELD, but these do not count towards their pre-load requirement. ROBOTS that are no-shows for their MATCH will have their POLLEN placed in the LOADING ZONE against the perimeter wall.

Figure 11-1 shows examples of several possible legal ROBOT starting locations.

Figure 11-1: Examples of allowed ROBOT starting locations



G305 ***Teams must select an OpMode.** An OpMode must be selected on the DRIVER STATION app and initialized by pressing the INIT button. If this OpMode is an AUTO OpMode, the 30 second AUTO timer must be enabled.

Violation: MATCH will not start until the situation is remedied. DISABLED if ROBOT cannot initialize an OpMode or the situation cannot be remedied quickly.

This rule requires all teams to select and INIT an OpMode, regardless of whether or not an AUTO OpMode is planned to be used during AUTO. FIELD STAFF will use this as an indication that a team is ready to start the MATCH.

Teams without an AUTO OpMode should consider creating a default AUTO OpMode using the BasicOpMode sample and use the auto-loading feature to automatically queue up their TELEOP OpMode.

11.4 In-MATCH

Rules in this section pertain to gameplay once a MATCH begins.

11.4.1 AUTO

AUTO is the first 30 seconds of the MATCH, during which DRIVERS may not provide input to their ROBOTS, so ROBOTS operate with only their pre-programmed instructions. Rules in this section apply only during the AUTO period.

G401 ***Don't interact with a ROBOT during AUTO.** As soon as the countdown to start the MATCH begins and until the end of AUTO, DRIVE TEAM members may not directly or indirectly interact with a ROBOT or an OPERATOR CONSOLE, with the following exceptions:

A. to press the (▶) start button within a MOMENTARY margin of the start of the MATCH,
B. to press the (■) stop button at the team's discretion, or
C. for personal safety or OPERATOR CONSOLE safety.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> Teams do not have to start an OpMode if they choose not to run an AUTO OpMode.
>
> The intent of G401.A is for teams to start AUTO on time, accounting for some variability due to human factors.

G402 **No AUTO opponent interference.** During AUTO, a team may not disrupt AUTO for the opposing ALLIANCE.

Violation: MAJOR FOUL per MATCH. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> During AUTO, FIELD columns A, B, C constitute the red side of the FIELD, and columns D, E, F (Figure 9-5) constitute the blue side of the FIELD. Each ALLIANCE has priority over those FIELD and SCORING ELEMENTS on their side of the FIELD.
>
> Navigating into the opposing ALLIANCE'S side of the FIELD during AUTO is a risky gameplay strategy that may be seen as STRATEGIC.
>
> Examples of actions that are considered disruption of AUTO include but are not limited to:
> A. CONTROLLING SCORING ELEMENTS located on the opposing ALLIANCE'S side of the FIELD, and
> B. contact an opposing ROBOT on their side of the FIELD.
>
> SCORING ELEMENTS that happen to enter the other side of the FIELD after being deflected by another object in the FIELD (e.g., FIELD element, ROBOT) will likely not be penalized.

11.4.2 TELEOP

G403 ***ROBOTS are motionless between AUTO and TELEOP.** Any powered movement of the ROBOT or any of its MECHANISMS is not allowed during the transition period between AUTO and TELEOP.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> Movement due to inertia, gravity, or de-energizing of actuators, etc. is not considered powered movement.
>
> Teams may press buttons on their DRIVER STATION app to stop the AUTO OpMode, initialize or start a TELEOP OpMode during the AUTO to TELEOP transition period. If the INIT portion of the OpMode causes the ROBOT to violate this rule (powering actuators such that they move or twitch in any way), then the team should wait until TELEOP begins before pressing INIT.

G404 ***ROBOTS are motionless at the end of TELEOP.** ROBOTS must no longer have powered movement after the end of TELEOP until the Head REFEREE or their designee signals that teams may retrieve their ROBOTS.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> DRIVE TEAMS should make it obvious that the ROBOTS are no longer being controlled by pressing the (■) stop button on the DRIVER STATION app or by discontinuing any operation of the ROBOT by the end of the MATCH period and setting down their controllers.
>
> Movement due to inertia, gravity, or de-energizing of actuators, etc. is not considered powered movement.

11.4.3 SCORING ELEMENT

G405 ***Keep SCORING ELEMENTS In bounds.** A ROBOT may not deliberately eject a SCORING ELEMENT from the FIELD (either directly or by bouncing it off a FIELD element or another ROBOT).

Violation: MAJOR FOUL per SCORING ELEMENT.

> SCORING ELEMENTS that leave the FIELD during scoring attempts, as the result of a ROBOT blocking another ROBOT's scoring attempt, or as the result of ROBOT-to-ROBOT interactions are not considered deliberate ejections and are not violations of this rule.

G406 ***Do not damage or make a mess in the ARENA.** Neither a ROBOT nor a DRIVE TEAM member may make a mess or damage any part of the ARENA.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC. DISABLED if the damage is caused by a ROBOT, and the Head REFEREE perceives that further damage is likely to occur.

Corrective action (such as eliminating sharp edges, removing the damaging MECHANISM, and/or reinspection) may be required before the ROBOT may compete in subsequent MATCHES.

The intent of this rule is that DRIVE TEAM members and ROBOTS negatively impact the ARENA, including FIELD elements and SCORING ELEMENTS in a way that would result in significant repair or extensive cleanup that disrupts ARENA operations. Rule R201 describes examples of ROBOT features related to this rule that are scrutinized during inspection.

SCORING ELEMENTS are expected to undergo a reasonable amount of wear and tear as they are handled by ROBOTS and humans, such as scratching, marking, and eventually damage due to fatigue. Routinely gouging, tearing off pieces, or marking SCORING ELEMENTS are violations of this rule.

G407 **No more than 4 at a time.** A ROBOT may not simultaneously CONTROL more than 4 SCORING ELEMENTS.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

The intent of this rule is that ROBOTS play MATCHES while only CONTROLLING a maximum of 4 SCORING ELEMENTS at a time.

ROBOTS that CONTROL 5 or more SCORING ELEMENTS at any time during the MATCH will be under scrutiny to determine whether it is STRATEGIC.

Examples of actions that are likely to be perceived as STRATEGIC include, but are not limited to:

A. A ROBOT that picks up and CONTROLS 6 or more SCORING ELEMENTS, moving them to a scoring location.
B. Multiple instances of greater than MOMENTARY CONTROL of 5 or more SCORING ELEMENTS by a ROBOT throughout a MATCH.

Examples of actions that are likely to **not** be perceived as STRATEGIC include, but are not limited to:

C. A ROBOT MOMENTARILY CONTROLS 5 SCORING ELEMENTS which they “reverse” quickly so that at least one SCORING ELEMENT returns to approximately its original state.

Teams are encouraged to design their ROBOTS to prevent inadvertent or deliberate CONTROL of more than 4 SCORING ELEMENTS. This could involve guards to prevent SCORING ELEMENTS from accidentally becoming stuck on top of the ROBOT and systems to prevent active pickup/intaking of more than 4 SCORING ELEMENTS.

REPEATED instances of a ROBOT CONTROLLING 5 or more SCORING ELEMENTS are likely to be perceived as STRATEGIC, even if the ROBOT has a “keep 4 and discard the rest” sorting mechanism.

Examples of interaction with a SCORING ELEMENT that are not “CONTROL” and would not be a violation of this rule include, but are not limited to:

D. “bulldozing” (inadvertent contact with a SCORING ELEMENT while in the path of the ROBOT moving about the FIELD)

E. "deflecting" (being hit by a SCORING ELEMENT that bounces into or off a ROBOT), or
F. SCORING ELEMENTS that have been LAUNCHED by a ROBOT that are no longer in contact with the ROBOT.

G408 **Don't CONTROL opponent NECTAR.** A ROBOT may not CONTROL the opponent's NECTAR.

Violation: VERBAL WARNING. YELLOW CARD per MATCH, if STRATEGIC.

REPEATED instances of a ROBOT CONTROLLING an opponent's NECTAR are likely to be perceived as STRATEGIC, even if the ROBOT has a sorting mechanism that automatically discards opponent NECTAR by returning it to approximately its original state.

G409 **Don't catch SCORING ELEMENTS.** A ROBOT may not catch or deflect a SCORING ELEMENT released by a TIPPED HIVE unless and until that SCORING ELEMENT contacts anything else besides that ROBOT.

Violation: VERBAL WARNING. YELLOW CARD per MATCH, if STRATEGIC.

The intent of this rule is for the POLLEN and NECTAR that spills out of a TIPPED HIVE to hit the TILE floor before it is collected by any ROBOT. It is not the intent to penalize accidental catches of SCORING ELEMENTS of ROBOTS that happen to be under a TIPPING HIVE.

Teams are encouraged to design their ROBOTS such that they are unable to accidentally catch SCORING ELEMENTS. This could involve guards to prevent SCORING ELEMENTS from accidentally becoming stuck on top of the ROBOT. ROBOT features of this type will make it more obvious to REFEREES that the team is not employing catching as a strategy and avoid being determined to be in violation of this rule.

Examples of actions that are likely to be perceived as STRATEGIC include, but are not limited to:

A. A ROBOT REPEATEDLY is stopped underneath the HIVE waiting for a TIP to occur and collect SCORING ELEMENTS that fall.
B. A ROBOT has a MECHANISM at the top of their ROBOT that opens wide to accept SCORING ELEMENTS, and it is used to catch falling SCORING ELEMENTS as the ROBOT drives under the HIVE.
C. A ROBOT REPEATEDLY positions itself so multiple SCORING ELEMENTS that fall from the HIVE hit the ROBOT and move with an advantageous vector before contacting anything else.

Examples of actions that are likely to **not** be perceived as STRATEGIC include, but are not limited to:

D. A ROBOT drives under the HIVE and has one or two POLLEN land on a flat surface of their ROBOT while driving by.
E. A ROBOT that is no longer functioning remains stationary under the HIVE and has SCORING ELEMENTS collect on the top of their ROBOT.

G410 **NECTAR only goes into FLOWERS with one minute left.** ROBOTS may not enter NECTAR into the FLOWER scoring volume until the last 60 seconds of the MATCH.

Violation: MAJOR FOUL per NECTAR.

> See Section 10.5.2 FLOWER Scoring Criteria for details on the FLOWER scoring volume.
>
> The primary FIELD timer display is the cue to indicate when there is 60 seconds left in the MATCH.
>
> Teams are encouraged to make it obvious and unambiguous to REFEREES that they are not placing NECTAR into a FLOWER too early.

G411 ***Do not hoard SCORING ELEMENTS.** An ALLIANCE may not prevent the opposing ALLIANCE from accessing more than 8 SCORING ELEMENTS.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> An ALLIANCE using their own NECTAR and/or POLLEN for scoring is not a violation of this rule.
>
> Corralling more than 8 relevant SCORING ELEMENTS into a limited portion of the FIELD and preventing opposing ALLIANCE access is likely a STRATEGIC violation of this rule.

11.4.4 ROBOT

G412 ***ROBOTS must be under control.** A ROBOT must not pose an undue hazard to a human or an ARENA element during a MATCH in the following ways:

A. the ROBOT or anything it CONTROLS, i.e., a SCORING ELEMENT, disrupts anything outside the FIELD or contacts a human that is outside the FIELD, or
B. the ROBOT operation is dangerous.

Violation: DISABLED and VERBAL WARNING. DISABLED and YELLOW CARD per MATCH, if subsequent violations occur during the event.

> Please be conscious of REFEREES and other FIELD STAFF working around the ARENA who may be in close proximity to your ROBOT.
>
> Examples of violations include, but are not limited to:
> A. wildly flailing outside the FIELD,
> B. knocking over a DRIVER STATION stand,
> C. moving/damaging the FIELD timer display, or
> D. contacting FIELD STAFF or a DRIVE TEAM member outside the FIELD.
>
> ROBOT contact with ARENA elements outside the FIELD, such as a DRIVER STATION stand, the floor outside the FIELD, or the FIELD wall perimeter outside of the FIELD is not a violation of this rule.

G413 ***ROBOTS must stop when instructed.** If a team is instructed to DISABLE their ROBOT by a REFEREE per T402, a DRIVE TEAM member must press the (■) stop button on the DRIVER STATION app and set down their controllers.

Violation: VERBAL WARNING. RED CARD, if STRATEGIC.

G414 ***ROBOTS must be identifiable.** A ROBOT'S team number and ALLIANCE color must not become indeterminate, as perceived by the Head REFEREE.

Violation: VERBAL WARNING. YELLOW CARD, if STRATEGIC.

> Teams are encouraged to robustly affix their ROBOT SIGNS to their ROBOT in highly visible locations such that they do not easily fall off or become obscured during normal gameplay.
>
> Corrective action such as revising ROBOT SIGNS may be requested before the ROBOT participates in a subsequent MATCH.

G415 ***Watch your ARENA interaction.** A ROBOT is prohibited from the following interactions with an ARENA element, except for SCORING ELEMENTS:

A. grabbing,
B. grasping,
C. attaching to,
D. becoming entangled with, or
E. suspending from.

Violation: VERBAL WARNING. YELLOW CARD per MATCH, if STRATEGIC. DISABLED if the Head REFEREE perceives that damage is likely.

Corrective action (such as removing the offending MECHANISM, and/or re-inspection) may be required before the ROBOT will be allowed to compete in subsequent MATCHES.

> ROBOTS with a concave shape that wraps partially around a FLOWER for purposes such as to aid in alignment would not be in violation of this rule.

G416 **ROBOTS have construction limits.** ROBOTS may not violate the limits outlined in R105 during the MATCH. ROBOTS may not:

A. expand such that they exceed the expansion limits noted in R105.A or R105.B, or
B. deliberately detach parts per R105.C.

Violation: VERBAL WARNING. MAJOR FOUL per instance, if STRATEGIC.

> A ROBOT is allowed to have parts that move after the start of a MATCH that extend outside its STARTING CONFIGURATION, but these extensions must stay within the expansion limit and not deliberately detach COMPONENTS as described in R105.

G417 **ROBOTS may not meddle with the HIVE Structure.** ROBOTS may not manipulate the motion of the HIVE in any way other than by LAUNCHING SCORING ELEMENTS into an upward-facing CELL.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

HIVES are designed and intended to only have a TIP induced by LAUNCHING POLLEN and NECTAR into an upward-facing CELL. Any other interaction with the HIVE that causes or could cause or impeding a TIP is a violation of this rule.

Examples of ROBOT actions that are likely to be perceived as STRATEGIC include, but are not limited to:

A. ramming into the HIVE frame at high-speed,
B. ramming into the HIVE frame multiple times in a short time period,
C. deliberately LAUNCHING NECTAR or POLLEN into the external bottom, sides, or top faces of a CELL,
D. impeding the TIP of an opponent's HIVE by LAUNCHING NECTAR or POLLEN at it,
E. contacting a HIVE directly or transitively through a CONTROLLED SCORING ELEMENT, or
F. actions that are REPEATED after a warning has been given.

Examples of actions that are likely to **not** be perceived as STRATEGIC include, but are not limited to:

G. A ROBOT accidentally bumping into a HIVE frame while attempting to pick up POLLEN, or
H. A ROBOT attempting to LAUNCH POLLEN or NECTAR into the upward-facing CELL and missing in a way that hits the bottom, sides, or top of the CELL.

G418 **ROBOTS may not meddle with FLOWERS.** ROBOTS may not enter SCORING ELEMENTS into or remove SCORING ELEMENTS from a FLOWER except:

A. only enter POLLEN and NECTAR into the top of a FLOWER, and
B. only remove POLLEN from the bottom of a FLOWER.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

The FLOWERS are designed and intended to only allow POLLEN and NECTAR to enter through the top of the top ring and only allow POLLEN (not NECTAR) to be removed from the bottom of the middle ring. Any other actions to score or remove SCORING ELEMENTS from the FLOWER are considered a violation of this rule.

The intent is not to disallow ROBOTS from contacting the FLOWER or interactions that occur when attempting allowed scoring actions.

Examples of ROBOT actions that are not violations of this rule include:

A. contacting the FLOWER while attempting to enter or remove SCORING ELEMENTS,
B. contacting POLLEN or NECTAR scored in a FLOWER while attempting to score, or
C. driving into a FLOWER and contacting the POLLEN or NECTAR inside it.

Examples of actions that are likely to be perceived as STRATEGIC include, but are not limited to:

D. A ROBOT attempts to pull POLLEN through the side of the FLOWER,
E. A ROBOT grabs onto the FLOWER and shakes it,
F. A ROBOT forces NECTAR out of the middle ring with a MECHANISM,
G. A ROBOT deliberately drives into the perimeter wall at high-speed causing a SCORING ELEMENT to fall out of a FLOWER, or
H. A ROBOT deliberately holds a NECTAR up to the side of the FLOWER pipes such that it meets the FLOWER scoring criteria.

Examples of actions that are likely to **not** be perceived as STRATEGIC include but are not limited to:

I. A ROBOT drives into a FLOWER while attempting to pick up POLLEN off the TILES and causes a POLLEN to fall out the top of a FLOWER, or
J. A ROBOT knocks out a scored POLLEN while attempting to score another POLLEN.

11.4.5 Opponent Interaction

Note, G419 and G420 are mutually exclusive. A single ROBOT to ROBOT interaction which violates more than 1 of these rules results in the most punitive penalty, and only the most punitive penalty, being assessed.

G419 ***Do not damage an opponent ROBOT.** A ROBOT may not damage or functionally impair an opponent ROBOT.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per instance, if STRATEGIC. MAJOR FOUL and RED CARD per instance if STRATEGIC and opponent ROBOT is unable to drive.

BIOBUZZ is a highly interactive game and may include defensive and high-contact gameplay. While this rule prevents teams from damaging their opponents STRATEGICALLY and aims to limit severe damage to ROBOTS, teams should design their ROBOTS to be robust.

The damage or functional impairment of exposed or unprotected COMPONENTS or MECHANISMS in the course of normal gameplay is not likely to be considered a violation of this rule. This includes, but is not limited to:

A. an exposed or unprotected main power switch (see R603),
B. exposed or unprotected wiring, or
C. a delicately constructed MECHANISM (such as an intake).

When a team's ROBOT is interacting with an opponent ROBOT that is in a precarious or disadvantaged position, that team should make it obvious and unambiguous that they are trying to avoid damaging their opponent.

Examples of actions that are likely to be perceived as STRATEGIC include, but are not limited to:

D. A ROBOT high-speed rams and/or REPEATEDLY smashes an opponent ROBOT and causes damage.

Examples of functionally impairing another ROBOT include, but are not limited to:

E. disconnecting wires inside the ROBOT CHASSIS required for operation of a COMPONENT,
F. disconnecting the opponent ROBOT'S battery (this is also an example of a ROBOT no longer able to drive), or
G. powering off an opponent's ROBOT by contacting their reasonably well-protected power switch. (This is also an example of a ROBOT no longer able to drive.)

At the conclusion of the MATCH, the Head REFEREE may elect to visually inspect a ROBOT to confirm violations of this rule made during a MATCH and remove the violation if the damage cannot be verified.

"Unable to drive" means that because of the incident, the DRIVER can no longer drive to a desired location in a reasonable time (generally). For example, if a ROBOT can only move in circles, or can only move extremely slowly, the ROBOT is considered unable to drive.

G420 ***Do not tip or entangle.** A ROBOT may not attach to, tip over, or entangle an opponent ROBOT.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per instance, if STRATEGIC. MAJOR FOUL and RED CARD per instance, if STRATEGIC and either CONTINUOUS or opponent ROBOT is unable to drive.

The attachment to, or entanglement with, exposed or unprotected COMPONENTS or MECHANISMS in the course of normal gameplay is not likely to be considered a violation of this rule. This includes, but is not limited to:

A. exposed or unprotected wiring, or
B. a delicately constructed MECHANISM (such as an intake).

Examples of actions that are likely to be perceived as STRATEGIC include, but are not limited to:

C. using a wedge-like MECHANISM to tip over an opponent ROBOT,
D. making frame-to-frame contact with an opponent ROBOT that is attempting to right itself after previously falling over and causing them to fall over, or
E. causing an opponent ROBOT to tip over by contacting the ROBOT after it starts to tip if, as determined by the REFEREE, that contact could have been avoided.

Tipping as an unintended consequence of normal ROBOT-to-ROBOT interaction, including single frame-to-frame hits that result in a ROBOT tipping, as perceived by the REFEREE, is not a STRATEGIC violation of this rule.

"Unable to drive" means that because of the incident, the DRIVER can no longer drive to a desired location in a reasonable time (generally). For example, if a ROBOT can only move in circles or can only move extremely slowly, the ROBOT is considered unable to drive.

G421 ***There is a 3-count on PINS.** A ROBOT may not PIN an opponent's ROBOT for more than 3 seconds. A ROBOT is PINNING if it is preventing the movement of an opponent ROBOT by contact, either direct or transitive (such as against a FIELD element). A PIN count ends once any of the following criteria below are met:

A. the ROBOTS have separated by at least 2 ft. (~61 cm) from each other for more than 3 seconds,
B. either ROBOT has moved 2 ft. from where the PIN initiated for more than 3 seconds, or
C. the PINNING ROBOT gets PINNED.

For the criteria in G421.A, the PIN count pauses once ROBOTS are separated by 2 ft. until either the PIN ends or the PINNING ROBOT moves back within 2 ft., at which point the PIN count is resumed.

For the criteria in G421.B, the PIN count pauses once either ROBOT has moved 2 ft. from where the PIN initiated until the PIN ends or until both ROBOTS move back within 2 ft., at which point the PIN count is resumed.

Violation: MAJOR FOUL per instance and an additional MAJOR FOUL for every 3 seconds in which the situation is not corrected.

11.4.6 Human

G422 ***DRIVE TEAM stays in the ALLIANCE AREA.** Once a MATCH starts, DRIVE TEAM members may not leave their designated ALLIANCE AREA.

Violation: VERBAL WARNING. MINOR FOUL per instance, if STRATEGIC.

> The intent of this rule is to prevent DRIVE TEAM members from leaving their assigned ALLIANCE AREA during a MATCH to gain a competitive advantage. For example, moving to another part of the FIELD for better viewing or reaching into the FIELD. Simply breaking the plane of the AREA during normal MATCH play is not a violation.
>
> DRIVE TEAMS may be anywhere in their ALLIANCE AREA during a MATCH. DRIVE TEAM members may retrieve their own ALLIANCE'S NECTAR that has left the FIELD that they can reach while remaining in the ALLIANCE AREA.
>
> Exceptions are granted in cases concerning safety.

G423 ***DRIVE COACHES and other teams: hands off the controls.** Once the MATCH starts, DRIVE COACHES or members of another team may not handle the gamepads of the OPERATOR CONSOLE.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

> The penalty is applied to the team to which the DRIVE TEAM member that violates the rule belongs.
>
> If a team is facing extenuating circumstances due to a major conflict (i.e., religious holidays, major testing, transportation issues), that team should discuss with FIELD STAFF whether an accommodation is available.
>
> DRIVE COACHES, if desired, may help the DRIVERS in the following ways:

A. holding the DRIVER STATION device,
B. troubleshooting the DRIVER STATION device,
C. selecting OpModes on the DRIVER STATION app,
D. pressing the INIT button on the DRIVER STATION app,
E. pressing the (▶) start button on the DRIVER STATION app, or
F. pressing the (■) stop button on the DRIVER STATION app.

G424 ***DRIVE COACHES, SCORING ELEMENTS are off limits.** DRIVE COACHES may not contact SCORING ELEMENTS, except for safety purposes.

Violation: VERBAL WARNING. MINOR FOUL per instance, if STRATEGIC.

G425 ***DRIVE TEAMS, watch your reach.** Once a MATCH starts, a DRIVE TEAM member may not directly or indirectly:

A. contact a ROBOT,
B. contact a SCORING ELEMENT in contact with a ROBOT or TILE,
C. disrupt SCORING ELEMENT scoring, or
D. contact a FIELD element.

Violation: VERBAL WARNING. MAJOR FOUL and YELLOW CARD per MATCH, if STRATEGIC.

Hand-held controllers, hanging wires, items of clothing, and other objects in the ALLIANCE AREA can all result in DRIVE TEAM members indirectly contacting a ROBOT, and would be violations of this rule.

Exceptions are granted in cases concerning safety.

For G425.A and G425.B, the penalty is applied to the team to which the DRIVE TEAM member regardless of whether the DRIVE TEAM member belongs or ROBOT initiates contact.

Disrupting scoring includes, but is not limited to:
A. blocking a ROBOT from scoring in a FLOWER, or
B. deliberately hitting or shaking the perimeter wall to descore NECTAR or POLLEN from the FLOWER.

G426 **Humans may not enter NECTAR onto the FIELD early.** DRIVE TEAM members may not enter NECTAR onto the FIELD except:

A. for each time the HIVE of their corresponding ALLIANCE color is TIPPED, one additional NECTAR may be entered for that ALLIANCE, or
B. when 60 seconds or less remain in the MATCH, all remaining NECTAR can be entered

whichever comes first.

Violation: MINOR FOUL per NECTAR.

The primary FIELD timer is the cue to indicate when there is 60 seconds left in the MATCH.

NECTAR that leaves the FIELD may be re-entered at any time as described in G427.

DRIVE TEAMS are encouraged to ensure the remaining NECTAR in their ALLIANCE AREA is visible and make it obvious and unambiguous to REFEREES that they are not entering NECTAR too early.

NECTAR does not have to be entered into the FIELD immediately when a HIVE TIP occurs.

G427 **Humans, only enter NECTAR via the LOADING ZONE.** NECTAR may not be introduced to the FIELD, except as follows:

A. without the use of a tool,
B. by a DRIVE TEAM member of the ALLIANCE of the corresponding color, and
C. such that NECTAR contacts the TILE within the LOADING ZONE before contacting a ROBOT or a FIELD element.

Violation: MINOR FOUL per NECTAR.

> The intent of this rule is to only allow DRIVE TEAM members to introduce their own NECTAR into the LOADING ZONE. While there are limited restrictions on how that is done, teams should not attempt to push the boundaries of this rule to gain competitive advantage.
>
> Humans scoring into a HIVE or FLOWER is never allowed and subject to G202 violations.
>
> If DRIVE TEAM members come into possession of any POLLEN or opposing ALLIANCE NECTAR that has exited the FIELD, they should pass it to the nearest FIELD STAFF for reintroduction into the FIELD per Section 10.8 Other Logistics.
>
> Note: When introducing NECTAR, DRIVE TEAM members must avoid contacting a SCORING ELEMENT that is also in contact with a TILE to avoid violating G425.

G428 **Humans, don't remove SCORING ELEMENTS from the FIELD.** DRIVE TEAM members may not remove SCORING ELEMENTS from the FIELD.

Violation: MINOR FOUL per SCORING ELEMENT.

> A SCORING ELEMENT is considered on the FIELD if it is contacting a TILE, or in and/or on a ROBOT, FIELD element, or SCORING ELEMENT.



12 ROBOT Construction Rules (R)

The rules listed below explicitly address legal parts and materials and how those parts and materials may be used on a ROBOT. A ROBOT is an electromechanical assembly built by a *FIRST* Tech Challenge team to play the current season's game and includes all the basic systems required to be an active participant in the game –power, communications, control, and movement about the FIELD.

There are many reasons for the structure of the rules, including safety, reliability, parity, creation of a reasonable design challenge, adherence to professional standards, and impact on the competition.

Another intent of these rules is to have all energy sources and active actuation systems on the ROBOT (e.g., batteries, motors, servos, and their controllers) drawn from a well-defined set of options. This is to ensure that all teams have access to the same actuation resources and that the INSPECTORS can accurately and efficiently assess the legality of a given part.

> ROBOT construction rules in this section only apply to the construction of your ROBOT as it might be inspected. MATCH play rules and consequences for violating rules during MATCH play are outlined in Section 11 Game Rules (G).

ROBOTS are made up of COMPONENTS and MECHANISMS.

- A COMPONENT is any part in its most basic configuration, which cannot be disassembled without damaging or destroying the part or altering its fundamental function.
- A MECHANISM is an assembly of COMPONENTS that provide specific functionality on the ROBOT. A MECHANISM can be disassembled (and then reassembled) into individual COMPONENTS without damage to the parts.

Many rules in this section reference Commercial-Off-The-Shelf (COTS) items. A COTS item must be a standard (i.e., not custom order) part commonly available from a VENDOR for all teams for purchase. To be a COTS item, the COMPONENT or MECHANISM must be in an unaltered, unmodified state (with the exception of installation or modification of any software). Items that are no longer commercially available but are functionally equivalent to the original condition as delivered from the VENDOR are considered COTS.

> Example 1: A team orders 2 ROBOT panels from RoboPanels Corp. and receives both items. They put 1 in their storeroom and plan to use it later. Into the other, they drill "lightening holes" to reduce weight. The first panel is still classified as a COTS item, but the second panel is now a FABRICATED ITEM, as it has been modified.
>
> Example 2: A team obtains openly available blueprints of a drive module commonly available from Wheels-R-Us Inc. and has local machine shop "We-Make-It, Inc." manufacture a copy of the part for them. The produced part is not a COTS item, because it is not commonly carried as part of the standard stock of We-Make-It, Inc.
>
> Example 3: A team obtains openly available design drawings from a professional publication and uses them to fabricate a gearbox for their ROBOT. The design

drawings are considered a COTS item and may be used as "raw material" to fabricate the gearbox. The finished gearbox itself would be a FABRICATED ITEM, and not a COTS item.

Example 4: A COTS part that has non-functional label markings added would still be considered a COTS part, but a COTS part that has device-specific mounting holes added is a FABRICATED ITEM.

Example 5: A team has a COTS gearbox which has been discontinued. If the COTS gearbox is functionally equivalent to its original condition, it may be used.

A VENDOR is a legitimate business source for COTS items that satisfies all the following criteria:

A. has a Federal Tax Identification number. In cases where the VENDOR is outside of the United States, they must possess an equivalent form of registration or license with the government of their home nation that establishes and validates their status as a legitimate business licensed to operate within that country.
B. is not a "wholly owned subsidiary" of a *FIRST* team or collection of teams. While there may be some individuals affiliated with both a team and the VENDOR, the business and activities of the team and VENDOR must be completely separable.
C. should maintain sufficient stock or production capability so they are able to ship any general (i.e., non-*FIRST* unique) product within a timely manner. It is recognized that certain unusual circumstances (such as a global supply chain disruption and/or 1,000 *FIRST* teams all ordering the same part at once from the same VENDOR) may cause atypical delays in shipping due to backorders for even the largest VENDORS. Such delays due to higher-than-normal order rates are excused. This criterion may not apply to custom-built items from a source that is both a VENDOR and a fabricator.

For example, a VENDOR may sell flexible belting that the team wishes to procure to use as treads on their drive system. The VENDOR cuts the belting to a custom length from standard shelf stock that is typically available, welds it into a loop to make a tread, and ships it to a team. The fabrication of the tread takes the VENDOR 2 weeks. This would be considered a FABRICATED ITEM, and the 2-week ship time is acceptable. Alternately, the team may decide to fabricate the treads themselves. To satisfy this criterion, the VENDOR would just have to ship a length of belting from shelf stock (i.e., a COTS item) to the team within 5 business days and leave the welding of the cuts to the team.

D. makes their products available to all *FIRST* Tech Challenge teams. A VENDOR must not limit supply or make a product available to just a limited number of *FIRST* Tech Challenge teams.

The intent of this definition is to be as inclusive as possible to permit access to all legitimate sources, while preventing ad hoc organizations from providing special-purpose products to a limited subset of teams in an attempt to circumvent any applicable cost accounting rules.

FIRST desires to permit teams to have the broadest choice of legitimate sources possible, and to obtain COTS items from the sources that provide them with the

best prices and level of service available. Teams also need to protect against long delays in availability of parts that will impact their ability to complete their ROBOT. The build season is brief, so the VENDOR must be able to get their product, particularly *FIRST* unique items, to a team in a timely manner.

Ideally, chosen VENDORS should have effective distribution channels. Remember, *FIRST* Tech Challenge events are not always near home – when parts fail, local access to replacement materials is often critical.

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

Note that it is possible for an item (typically raw materials) to be neither COTS nor a FABRICATED ITEM. For example, a 20 ft. (~610 cm) length of aluminum which has been cut into 5 ft. (~152 cm) pieces by the team for storage or transport is neither COTS (it is not in the state received from the VENDOR), nor a FABRICATED ITEM (the cuts were not made to advance the part towards its final form on the ROBOT).

Teams may be asked to provide documentation (i.e., reference the relevant rule in this manual) proving the legality of items during inspection where a rule specifies limits for a legal part (e.g., motors, servos, current limits, COTS electronics).

If your team has a question about a part's legality, please e-mail your question to customerservice@firstinspires.org for an official ruling. This process should also be employed to seek approval for alternate parts/devices for inclusion in future *FIRST* Tech Challenge seasons.

12.1 General ROBOT Design

FIRST Tech Challenge can be a high-contact competition and may include rigorous gameplay. While the rules aim to limit intentional damage to ROBOTS, interaction between ROBOTS is allowed and expected. Teams should design their ROBOTS to be robust.

R101 ***It is your team's ROBOT.** The ROBOT and its MAJOR MECHANISMS must be built by the *FIRST* Tech Challenge team that has registered for the event and intends to use the ROBOT to participate in MATCHES or as part of judged awards.

A MAJOR MECHANISM is a group of COMPONENTS and/or MECHANISMS assembled together to address at least 1 game challenge: ROBOT movement, SCORING ELEMENT manipulation, FIELD element manipulation, or performance of a scorable task without the assistance of another ROBOT.

This rule requires that the ROBOT and its MAJOR MECHANISMS were built by its team but is not intended to prohibit or discourage assistance from other teams (e.g., fabricating elements, supporting construction, writing software, developing game strategy, contributing COMPONENTS, and/or MECHANISMS).

Examples that would generally not be considered MAJOR MECHANISMS, and thus are not subject to this rule include, but are not limited to:
A. a gearbox assembly,
B. a COMPONENT or MECHANISM that is part of a MAJOR MECHANISM, or
C. COTS items.

The intent of this rule is that a team's ROBOT is a product that's representative of the current team members' experience and is intended to discourage complete solutions which are provided wholly by outside organizations or companies. Also see R301 and R303.

R102 ***STARTING CONFIGURATION is limited to an 18-inch Cube.** In the STARTING CONFIGURATION (the physical configuration in which a ROBOT starts a MATCH), all parts of the ROBOT must be fully stationary, and the ROBOT must be fully self-contained within an 18 in. (45.70 cm) wide, by 18 in. (45.70 cm) long, by 18 in. (45.70 cm) high volume.

If a ROBOT uses interchangeable MECHANISMS per 3.3 MATCH Eligibility Rules, teams should be prepared to show compliance with this rule and R105 in all configurations.

Any pre-loaded SCORING ELEMENTS may extend outside the starting size constraint.

R103 ***ROBOTS may assist in holding the STARTING CONFIGURATION.** In the STARTING CONFIGURATION, ROBOTS must be fully self-supported (i.e., does not exert force on the sides or top of a sizing tool). ROBOTS may accomplish this using any combination of:

A. mechanical means while powered-off, and/or
B. initializing an OpMode that pre-positions servos and motors to a desired stationary position. OpMode may control motors and servos to hold their position to maintain the STARTING CONFIGURATION.

ROBOTS holding STARTING CONFIGURATION during inspection or waiting for a MATCH to start may have to do so for several minutes and should limit the possibility of thermal failure (e.g., not having motors stalled against a hard stop). Teams should be especially cautious when operating a running ROBOT during inspection, please notify the INSPECTOR that the ROBOT is live.

R104 ***There is no ROBOT weight limit.** There is no explicit weight limit for *FIRST* Tech Challenge ROBOTS playing BIOBUZZ.

While there is no official weight limit, teams should still consider the impact of a ROBOT'S weight on various factors including, but not limited to:

- FIELD TILE damage
- battery consumption
- ROBOT transportation
- overall ROBOT performance

R105 **A ROBOT must stay as one assembly, and there are limits to how much it can expand.** After the MATCH has started, ROBOTS may expand beyond the STARTING CONFIGURATION but are still subject to sizing constraints relative to the ROBOT, based on the initial STARTING CONFIGURATION. The sizing constraints are:

A. After the start of the MATCH, ROBOTS may expand beyond the STARTING CONFIGURATION but at all times must remain within a 18 in. (45.70 cm) by 24 in. (61.0 cm) by 29 in. (73.65 cm) tall sizing volume when fully expanded per G416,
B. ROBOTS must be physically constrained to fit within these limits without the use of software, and
C. ROBOTS may not be designed to deliberately detach COMPONENTS.

The sizing limit volume is defined relative to the FIELD surface and is oriented such that the 29 in. (73.65 cm) dimension is always the vertical height above the FIELD surface.

Figure 12-1: Expansion Limit – Top View

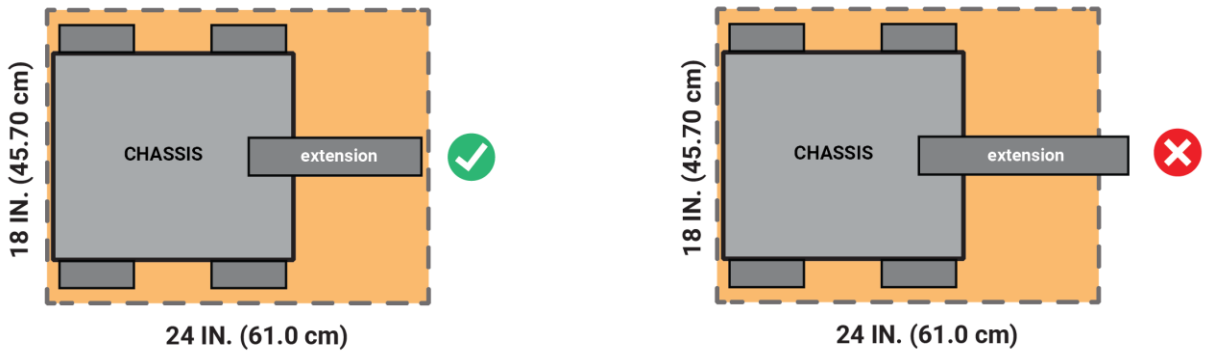
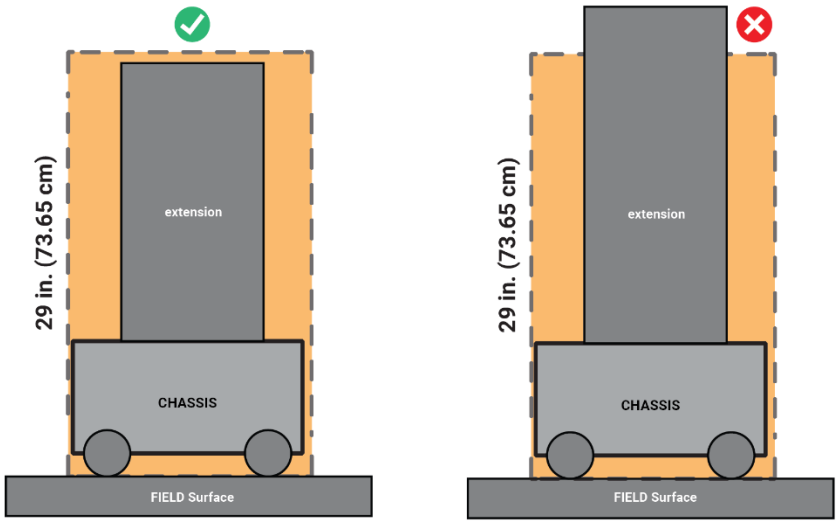


Figure 12-2: Expansion Limit – Side View

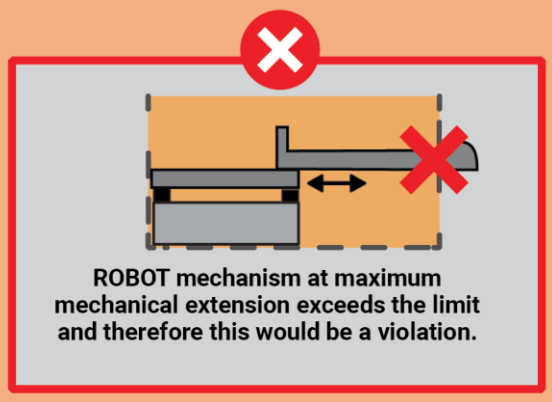


The sizing volume is defined relative to the FIELD surface and is oriented such that the 29 in. (73.65 cm) dimension is always the vertical height above the FIELD surface.

ROBOTS are measured in “stable” configurations they would use during normal gameplay on the FIELD (i.e., with their wheels all touching the TILES). If a ROBOT is “tilted” slightly due to interactions on the FIELD, this is not a violation of this rule if the ROBOT would still be within the sizing volume when it is returned to a stable configuration.

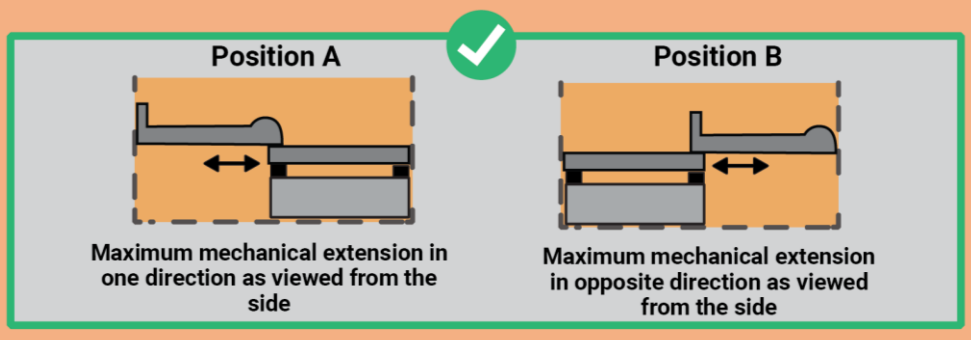
Teams should be prepared to demonstrate to INSPECTORS that their ROBOT has no configurations where it is outside the sizing volume. ROBOTS must show their maximum mechanical extensions during the inspection process. A ROBOT that can mechanically exceed the sizing limit would be in violation even if the ROBOT has software limiting the position of the extension during the MATCH. (Figure 12-3)

Figure 12-3: Expansion Limit – Sizing Limit Violation



A ROBOT with a single MECHANISM that can extend out of both sides of a ROBOT would be allowed as long as the overall dimension at maximum mechanical extension does not exceed the sizing limit. (Figure 12-4)

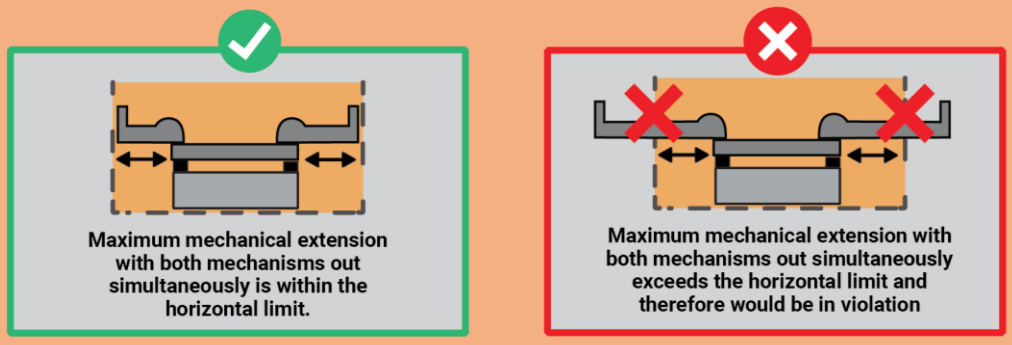
Figure 12-4: Expansion Limit – Allowable Extension



A ROBOT with multiple MECHANISMS that are not mechanically linked that can extend out of both sides of a ROBOT simultaneously would NOT be allowed if the

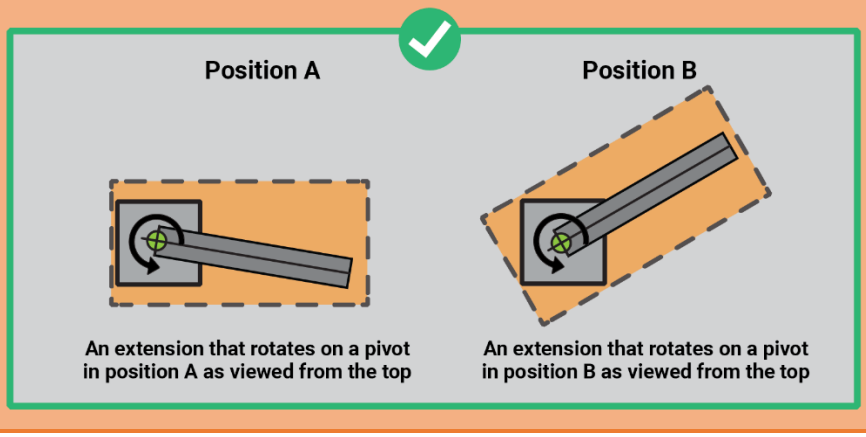
overall horizontal dimension at maximum mechanical extension exceeds the sizing limit (Figure 12-5).

Figure 12-5: Expansion Limit – Simultaneous Extension



A ROBOT with an extension on a pivot that rotates in the horizontal plane would be allowed as long as the overall dimension does not exceed the sizing limit at any point in its travel (Figure 12-6).

Figure 12-6: Expansion Limit – Rotating Extension



12.2 Fair Play & Damage Prevention

R201 ***ROBOTS should be designed so they don't damage anything or make a mess in the ARENA.** The ROBOT must not pose a risk of making a mess or pose a hazard to anything in the ARENA.

The intent of this rule is that teams should design their ROBOTS in a way that will avoid damage to the ARENA and minimize the risk of ROBOTS releasing materials that would require cleanup and may result in damage and/or MATCH delays.

SCORING ELEMENTS are expected to undergo a reasonable amount of wear and tear as they are handled by ROBOTS, such as scratching or marking. Gouging, tearing off pieces, or routinely and repeatedly marking SCORING ELEMENTS are violations of this rule and G406.

Examples of "damage risk" ROBOT features include, but are not limited to:

A. traction devices with features that are known to damage the TILE floor,
B. COMPONENTS with exposed sharp edges or sharp protrusions, and
C. features with abrasive surfaces that scratch objects that rub across them.

Examples of ROBOT features "at risk of making a mess" include, but are not limited to:

D. excessive use of lubricants that may spin off or drip during ROBOT operation,
E. any COMPONENT not secured sufficiently, including loose ballast such as sand, coffee beans, kitty litter, glitter, or ball bearings, such that it may be released on the FIELD during a MATCH,
F. liquid or gel materials,
G. tire sealant, and
H. other lubricants including graphite powder.

R202 ***Design ROBOTS and OPERATOR CONSOLES for safety and fair play**. ROBOT and OPERATOR CONSOLE parts shall not be made from hazardous materials, be unsafe, cause an unsafe condition, or interfere with the operations of other ROBOTS or FIELD STAFF.

Examples of items that may violate this rule include, but are not limited to:

A. shields, curtains, or any other devices solely designed or used to limit the vision of any DRIVE TEAM members,
B. audio devices that generate sound at a level sufficient to be a distraction or mimic MATCH sounds,
C. any devices or decorations specifically intended to interfere with the remote sensing capabilities of another ROBOT, including vision systems, acoustic range finders, sonars, infrared proximity detectors, etc. This includes imagery on your ROBOT that utilizes or closely mimics 36h11 AprilTags,
D. flammable gasses or any device intended to produce flames or pyrotechnics,
E. hazardous materials like liquid mercury or lead,
F. high intensity light sources used on the ROBOT should only be illuminated for a brief time while targeting and may invite additional scrutiny, and teams may be asked to disable or modify their lighting at the discretion of the Head REFEREE and/or LRI,
G. animal based materials,
H. any device designed to damage or flip competing ROBOTS,
I. devices or conditions that pose an unnecessary risk of entanglement,
J. decorative or functional lighting which flashes at greater than 5Hz will invite additional scrutiny and teams may be asked to disable or modify their lighting at the discretion of the Head REFEREE and/or LRI, and
K. other items not listed which violate the spirit of the rule regarding safe and fair play.

R203 ***ROBOTS must be designed to be quickly removed from the FIELD without requiring power.** ROBOTS must allow removal of SCORING ELEMENTS from the ROBOT and the ROBOT from FIELD elements while powered off.

> Some events may allow teams to use ROBOT power during FIELD reset (e.g., driving a ROBOT to the edge of the FIELD) but ROBOTS should be designed such that this is not required.

R204 ***No grabbing the floor.** ROBOTS may not use any MECHANISM which is designed to increase downforce by either grabbing FIELD surfaces or by using some form of generated airflow to provide downward suction.

12.3 Fabrication

R301 ***COTS MECHANISMS are legal but have limits.** COTS MAJOR MECHANISMS purposefully designed to complete a game task are prohibited. Allowed exceptions to this rule are:

A. COTS drive CHASSIS, provided none of the individual parts violate any other rules, and
B. COTS MAJOR MECHANISMS created as part of the official *FIRST* Tech Challenge StarterBots.

> COTS parts are intended to help teams design and build ROBOT MECHANISMS to complete game tasks and solve challenges but are not intended to be purpose-built solutions to complete game objectives.
>
> A vendor selling “build to print” manufacturing of publicly available, purpose-built solutions is against the spirit of this rule.

R302 ***Legal COTS parts and raw materials can be modified.** Allowed raw materials and legal COTS parts can be modified (drilled, cut, painted, etc.) as long as no other rules are violated.

> Raw materials refers to unfinished building stock including, but not limited to:
> A. sheet stock,
> B. extruded shapes,
> C. metals, plastic, rubber, and wood, and
> D. magnets.

R303 ***COTS must be single DoF.** COTS COMPONENTS and MECHANISMS must not exceed a single degree of mechanical freedom (DoF). Examples of allowed COTS single degree of freedom MECHANISMS and COMPONENTS are as follows:

A. linear slide kit,
B. linear actuator kit,
C. single speed (non-shifting) gearboxes,
D. pulley,
E. turntable,
F. lead screw, and
G. single DoF gripper.

Allowed exceptions to this rule are:

H. ratcheting devices (wrenches, bearings, etc.),
I. holonomic wheels (omni or mecanum),
J. dead-wheel odometry kits,
K. items that transfer motion between misaligned COMPONENTS (such as universal joints, flexible shaft couplers, and similar items), and
L. items that connect structures at variable angles (such as ball joint linkages, rod ends, and similar items).

The intent of this rule also extends to disallow highly specialized individual COMPONENTS only designed to assemble into a multiple DoF COTS COMPONENT.

The general test for a single degree of freedom MECHANISM is whether the orientation and position of each COMPONENT in the MECHANISM can be generally predicted based on the orientation and position of a single COMPONENT (such as the input) of the system.

Example 1: A mecanum drivetrain is made up of 4 independent drive modules, each with a single DoF (ignoring the DoF of the mecanum wheels as allowed by this rule), attached to a common structure (e.g., CHASSIS). The overall MECHANISM is still a single DoF.

Example 2: Dead wheel odometry modules, allowed by this rule, are typically composed of a 1 DoF wheel (ignoring the effect of the holonomic wheel) providing forward/backwards motion and a spring force providing an additional unique rotational or vertical motion, creating a 2 DoF system.

Example 3: Simple gripper claws, comprised of a single actuator moving 2 gripper jaws simultaneously or double actuators each controlling an independent gripper jaw, are by and large a single DoF. However, grippers that incorporate additional actuators providing additional twisting and/or bending actions (like a wrist) add degrees of freedom that are prohibited in COTS MECHANISMS.

R304 ***Custom software, designs, and parts can be reused year-to-year**. ROBOT software, designs, and FABRICATED ITEMS created before Kickoff are permitted.

R305 ***SCORING ELEMENTS are not allowed for ROBOT construction.** Current season SCORING ELEMENTS or replicas of SCORING ELEMENTS are not allowed to be used as part of ROBOT construction.

12.4 ROBOT SIGN Rules

A ROBOT SIGN is a required assembly which attaches to the ROBOT. A ROBOT SIGN simultaneously identifies a ROBOT'S team number as well as its ALLIANCE affiliation for FIELD STAFF. Criteria used in writing these rules include the following:

- Maximize FIELD STAFF'S ability to determine team number and ALLIANCE of a ROBOT,
- Minimize the amount of design challenge in creating ROBOT SIGNS, and
- Increase consistency in displaying ROBOT identification.

A template ROBOT SIGN is available for download in US Letter and A4 size.

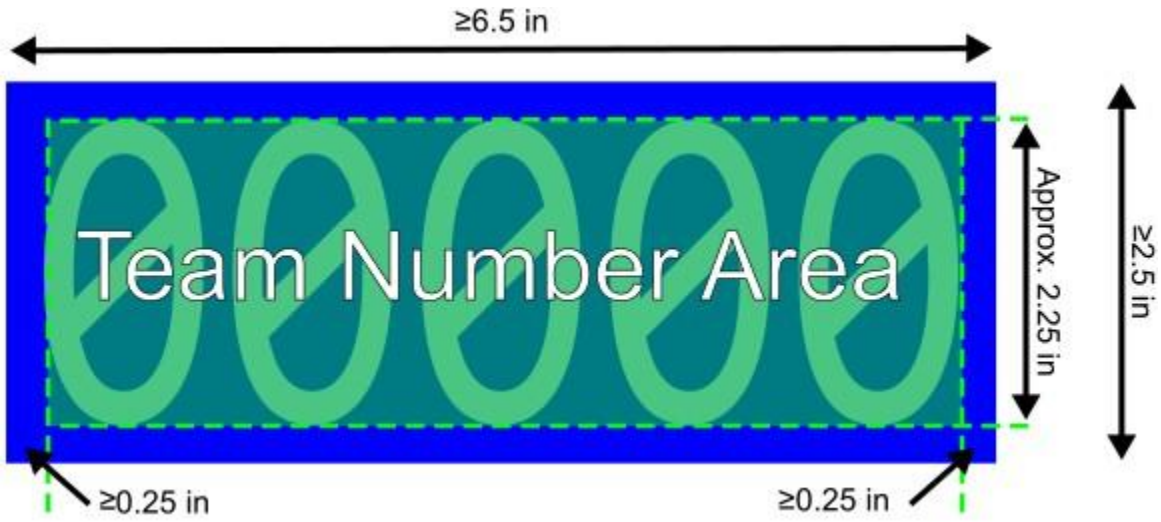
R401 ***Minimum of two ROBOT SIGNS per ROBOT.** ROBOT SIGNS must be placed in at least 2 separate locations on the ROBOT. These locations must be on opposite or adjacent surfaces of the ROBOT, ≥90 degrees apart. All ROBOT surfaces visible to FIELD STAFF can be used for placing ROBOT SIGNS including the top of the ROBOT. ROBOT SIGNS must meet the following criteria:

A. be made of a robust material,
B. minimally be 6.5 inches (16.5 cm) wide,
C. minimally be 2.5 inches (6.4 cm) tall (Figure 12-7), and
D. be supported by the structure/frame of the ROBOT.

The intent of this rule is for FIELD STAFF to easily view ROBOT SIGNS from at least 12 feet (3.65 meters) away before, during, and after the MATCH.

ROBOT SIGNS should be robust enough to withstand the rigors of MATCH play, but there is no specific guidance on what is robust enough. Teams should make a good faith effort with whatever they have available.

Figure 12-7: Team Number ROBOT SIGN Sizing

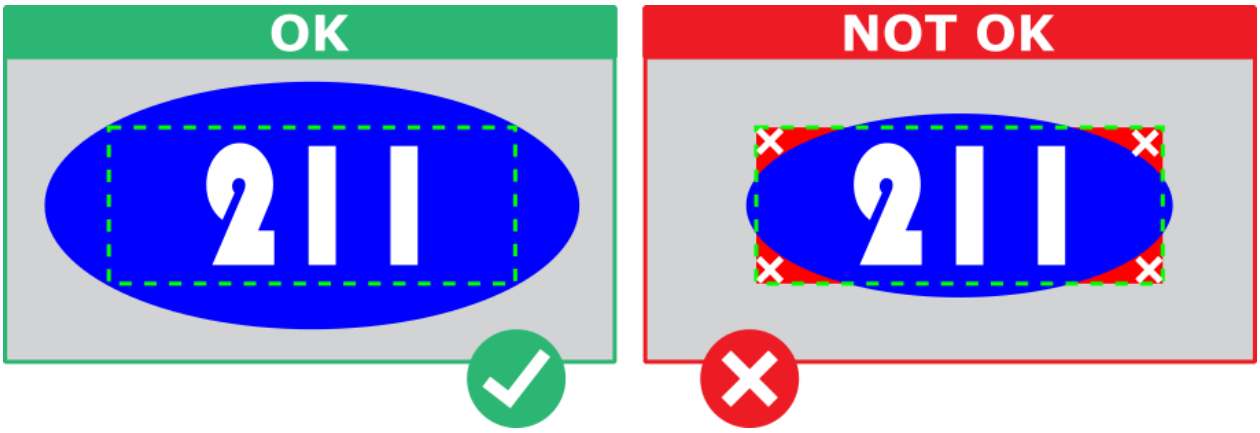


R402 ***ROBOT SIGNS indicate your ALLIANCE**. Each ROBOT SIGN must contain a rectangle with a solid red or blue opaque background at least 6.5 in. by 2.5 in. (16.50 cm by 6.35 cm) in size to indicate their ALLIANCE color (Figure 12-7), as assigned in the MATCH schedule at the event. Visible markings on ROBOT SIGNS when installed on the ROBOT, other than the following, are prohibited:

A. those required per R403,
B. small amounts of hook-and-loop tape, hard fasteners, or functional equivalents,
C. narrow areas of differing colors exposed at corners, folds, or cutouts,
D. narrow markings on background solely for template purposes, and
E. cannot be powered or rely on power from any sources to illuminate/reveal ALLIANCE color.

ROBOT SIGNS that are reversible or configurable must not allow the opposite ALLIANCE color to be visible to FIELD STAFF, except where permitted by this rule.

Figure 12-8: Minimum sized ALLIANCE rectangle



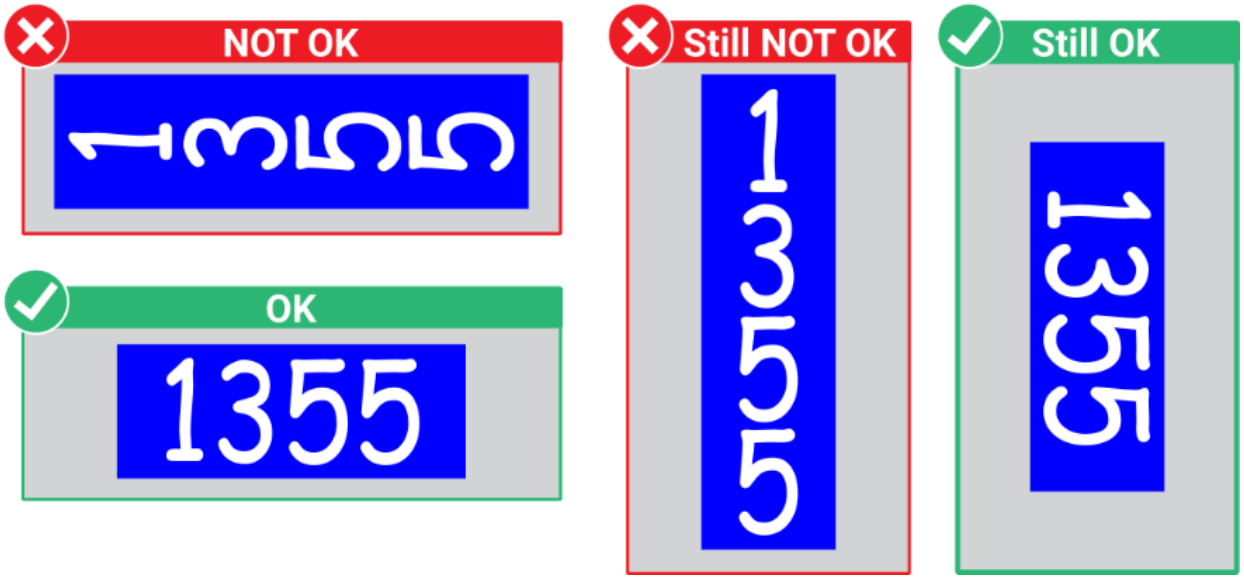
R403 ***Team number on ROBOT SIGNS.** Team numbers must be displayed and positioned on the ROBOT SIGN as shown in Figure 12-7, Figure 12-9, and Figure 12-10 and meet the following additional criteria:

A. consist of solid opaque white Arabic numbers (e.g., 1,2,3,4) which are approximately 2.25 in. (5.70 cm) tall,
B. there must be a minimum of approximately 0.25 in. (0.60 cm) of background surrounding the numbers,
C. numbers may not be vertically stacked (Figure 12-10),
D. be made of robust materials, and
E. cannot be powered or rely on power from any sources to illuminate/reveal numbers.

Figure 12-9: Legal number for team 21001 playing on the blue ALLIANCE



Figure 12-10: Team number orientation examples for team 1355 playing on the blue ALLIANCE



If a team at an event does not have completely legal ROBOT SIGNS, and there is no color printer or other means available at the event to create a legal ROBOT SIGN, the Head REFEREE may approve an alternate substitute for use at the event.

Team numbers should be robust enough to withstand the rigors of MATCH play, but there is no specific guidance on what is robust enough. Teams should make a good faith effort with whatever they have available. If there are limited materials available at an event, substitute ROBOT SIGNS may be simply handwritten on plain paper.

Small decorative elements and gaps in numbers are okay as long as the team number remains legible from 12 feet (3.65 meters) away and is discernable from a quick glance.

Examples of prohibited team numbers on ROBOT SIGNS include, but not limited to:

- team numbers only visible by edge lit engraved plastic
- LED Display numbers

12.5 Motors & Actuators

R501 ***Only specific motors are allowed.** The only allowed motor actuators are:

Table 12-1: Motor allowances

Motor Name	Part Numbers Available	Notes
AndyMark NeveRest 12V DC	am-3104, am-3104b	
AndyMark NeveRest Hex 12V DC	am-3104c	
goBILDA Yellow Jacket 520x Series 12V DC	5201-0002-0026, etc.	5201, 5202, 5203, and 5204 series
goBILDA 5000 Series 12V DC	5000-0002-4008, etc.	
Modern Robotics / MATRIX 12V DC	5000-0002-0001	Discontinued
NFR Products Yuksel 12V DC	NFR-600-100-000	
REV Robotics HD Hex 12V DC	REV-41-1291	
REV Robotics Core Hex 12V DC	REV-41-1300	
Studica Robotics Maverick 12V DC	75001	
SWYFT Robotics SWYFT Spike Motor	SR-MOTOR-DC-01	
TETRIX MAX 12V DC	739530, 39530	Discontinued
TETRIX MAX TorqueNADO 12V DC	W44260	
WATTOS Stingray 12V DC	WDM12	
Factory installed vibration and autofocus motors resident in COTS computing devices (e.g., rumble motor in a smartphone); can only be used as part of the device and cannot be removed and/or repurposed. These motors do not count toward the limit in R503.		
Motors integral to a COTS sensor (e.g., LIDAR, scanning sonar), provided the device is not modified except to facilitate mounting. These motors do not count toward the limit in R503.		

Additional motors may be added to the legal motor list in future Competition Manual updates.

Many legal gearmotors are sold with labeling based on the entire assembly. These motors may be used with or without the provided gearbox, and/or with any other compatible gearbox.

R502 ***Servo usage is restricted.** Servo actuators must meet the requirements below. Servos must be compatible with the power regulation devices they are ultimately used with (per R505) and may include additional servo position output interfaces (e.g., 4th Wire Position Feedback).

Table 12-2: Servo Requirements at 6V

Actuator Class	Mechanical Output Power	Stall Current	Example Servos (including, but not limited to)
Servo	≤ 8 watts @6V	≤ 4 amps @6V	AndyMark High-Torque Servos (am-4954)
			Axon MAX+ Servo (Axon MAX+)
			DSSERVO 35KG Coreless (DS3235MG)
			FEETECH Digital Servo (FT5335M-FB)
			goBILDA Dual Mode Servo (2000-0025-0003)
			REV Robotics Smart Servo (REV-41-1097)
			Studica Multi-Mode Smart Servo (75002)
Linear Servo	N/A	≤ 1 amp @6V	Actuonix Micro Linear Servo (P8-100-252-12-R)
			Hitec Linear Servo (HLS12-3050-6V)
			Studica Linear Servo RC Actuator (75014)
Servo mechanical output power is approximated by the following formula (using 6V data reported by manufacturer): • **Mechanical Output Power** = **0.25** x (**Stall Torque** in *N-m*) x (**No Load Speed** in *rad/s*)			

Servos must meet both requirements to be legal for use. Refer to the Inspection Quick Reference document for a list of servos that are pre-approved, otherwise teams must be able to provide documentation verifying servo specifications. Use the online calculator to verify output power compliance.

If a manufacturer does not provide 6V specs, any specs for voltages that exceed 6V are allowed to be used.

Stall current is the maximum stall current possible for the device at the specified voltage, regardless of any user or VENDOR adjustable software limits that may be available within the servo.

It is important to ensure the voltage provided by the intended power regulation device is within the operating voltage range of the desired servo. The REV Control Hub and REV Expansion Hub provide 5V to servos, and the goBILDA Servo Power Injector, REV Servo Power Module, Studica Servo Power Block, and REV Servo Hub provide 6V to servos. While virtually all servos are compatible with 6V, servos with an operating voltage range of 6-8.4 DCV, for example, may not work properly when only provided 5V.

R503 ***ROBOTS are limited to a total of 8 motors and 8 servos.** A ROBOT may not have more than 8 motors and 8 servos from the allowable actuator lists per R501 and R502 for all MECHANISMS used in all configurations.

> If a ROBOT has multiple configurations used at a single event which use different MECHANISMS, the sum total of all motors and servos must be less than or equal to the limit set in this rule.

R504 ***Do not modify actuators unless explicitly allowed.** The integral mechanical and electrical system of any motor or servo must not be modified. Motors and servos used on the ROBOT shall not be modified in any way, except as follows:

A. the mounting brackets and/or output shaft/interface (including pinion gears) may be modified to facilitate the physical connection of the motor to the ROBOT and actuated part,
B. the electrical leads may be trimmed to length as necessary and connectors or splices to additional wiring may be added (per R609), and purely electrical enclosures can be substituted with functionally equivalent replacements,
C. servos may be modified as specified by the manufacturer (e.g., setting soft limits or modification for continuous rotation),
D. labeling may be applied to indicate device purpose, connectivity, functional performance, etc. as long as the team applied label does not obstruct the markings used to identify the device,
E. insulation may be applied to electrical terminals,
F. repairs, provided the original performance and specifications are unchanged, and
G. maintenance recommended by the manufacturer.

R505 ***All actuators must be controlled and powered through approved devices.** With the exception of servos, fans, or motors integral to sensors of COTS computing devices permitted in R501, all actuator control signals must originate from a power regulating device. The only power regulating devices for actuators permitted on the ROBOT are:

Table 12-3: Power Regulators and Limits

Power Regulating Device	Part Number	Load Limit per Device
goBILDA 6V Servo Power Injector	3125-0001-0001	2 Servos per Port
REV Control Hub or Expansion Hub Motor Ports	REV-31-1153 / REV-31-1595	2 Motors per Port
REV Control Hub or Expansion Hub Servo Ports	REV-31-1153 / REV-31-1595	2 Servos per Port
REV Servo Power Module	REV-11-1144	2 Servos per Port
REV Robotics Servo Hub	REV-11-1855	2 Servos per Port
REV SPARKmini	REV-31-1230	2 Motors per Device
Studica Servo Power Block	75005	2 Servos per Port

R506 ***The use of relays, electromagnets, and electrical solenoid actuators is prohibited.** The application of electromechanical actuation through the use of additional relays, electromagnets, electrical solenoid actuators, or related systems is prohibited. In addition, the use of relays and electromagnets is also prohibited.

12.6 Power Distribution

R601 ***ROBOTS can contain only 1 main battery**. ROBOTS must contain 1 and only 1 approved 12V NiMH main battery. This battery is only legal source of electrical energy for the ROBOT control system and actuation during the competition and must be unaltered from the battery manufacturer state except as follows:

A. the fuse may be replaced with a COTS equivalent in-line 20A ATM mini blade fuse installed per R610, and
B. installed connectors may be replaced with other popular connectors such as Anderson Powerpole, XT30, or any connector with a comparable power rating.

The only allowed ROBOT main power battery packs are:

Table 12-4: Legal ROBOT Main Power Battery Packs

Battery Pack	Part Number	Notes
AndyMark Flat Pack Battery DC 12V	am-5290	
goBILDA 12V NiMH Nested Battery	3100-0012-0020	
Matrix 12V 3000mAh NiMH	14-0014	May be labeled as “Modern Robotics”
REV 12V Slim Battery	REV-31-1302	
Studica 12V 3000mAh NiMH	70025	
TETRIX MAX 12V 3000mAh NiMH	W39057	Formerly 739023
WATTOS 12V Battery	WT-NMH1230	

There are many other similar style batteries available from multiple VENDORS, but only the listed manufactures and part numbers are legal for use at *FIRST* Tech Challenge Events.

Other batteries may be used for self-contained devices as listed in R602.

R602 ***Other batteries are only allowed for self-contained peripheral devices and LEDs only.** COTS USB battery packs with a capacity of 100Wh or less (27,000mAh at 3.7V), with 5V/5A max output or 12V/5A max output using USB-PD per port, and batteries integral to a self-contained devices such as camera (e.g., GoPro-style camera) may be used provided they are:

A. not supplying power to any of the ROBOT actuators, and

B. not used by any devices receiving control signals from the ROBOT control system (i.e., COTS USB battery packs must remain electrically isolated from the ROBOT power systems.). Exceptions to part B of this rule are:
   i. powered USB Hubs, and
   ii. ROBOT CONTROLLER smartphones.

Any device receiving signals from a REV Control or Expansion Hub must be powered by the main ROBOT battery.

R603 ***Connect the ROBOT battery though the Main Power Switch.** Exactly one main power switch must control all power provided by the ROBOT battery pack to all power regulating devices on the ROBOT (except as specified by R602) such that all the following conditions are met:

A. must be one of the following approved power switches:

Table 12-5: Legal Power Switches

Power Switch	Part Number
AndyMark FTC Power Switch w/ Bracket	am-4969
goBILDA Floodgate Power Switch	3103-0005-0001
REV Switch Cable and Bracket	REV-31-1387
Studica On/Off Power Switch Kit	70182
TETRIX R/C Switch Kit	W39129
WATTOS Power Switch Kit	WTS-SW1220

B. must be mounted or located where it is accessible to the team, away from high-speed moving parts and pinch hazards, and
C. secondary power switches can be used on the 12V line downstream of the main power switch.

There are no specific location requirements for the main power switch, but it should be located clear of any high-speed moving parts and pinch hazards. Teams are permitted to mount the main power switch behind removable panels.

The main power switch should be mounted on the ROBOT such that it is protected from ROBOT-to-ROBOT contact to avoid inadvertent actuation or damage.

R604 ***Fuses must be used as directed and must not be modified**. The intent of this rule is that teams utilize fuses as directed by a device manufacturer, and do not attempt to gain a competitive advantage by modifying the fuses, replacing the fuses with ones that have a higher trip point, or replacing them with fuses that are self-resetting.

R605 ***The ROBOT frame cannot be used as a current path.** All wiring and electrical devices shall be electrically isolated from the ROBOT frame. The ROBOT frame must not be used to carry electrical

current. Electrically grounding the control system electronics to the frame of the ROBOT is only permitted such that all of the following conditions are met:

A. straps/cables used must be from the following approved parts:

Table 12-6: Legal ROBOT Grounding Straps

Grounding Strap	Part Number
AndyMark Resistive Grounding Strap	am-4648a
REV Resistive Grounding Strap	REV-31-1269
Swyft Grounding Cable	SR-Ground-01

B. the strap/cable must directly connect to a fully COTS COMPONENT with an XT30 connector, and also must connect directly to the frame of the ROBOT (via the resistive terminal), and
C. no ROBOT COMPONENTS or MECHANISMS are designed to electrically ground the ROBOT frame to the FIELD.

For additional details on installation of the grounding strap, please see the ROBOT Wiring Guide.

R606 ***ROBOT CONTROLLER and the ROBOT electrical system must be inspectable.** ROBOT electrical COMPONENTS must be mounted with accessibility in mind, as follows:

A. all power regulating devices (per R505), associated wiring, and all fuses must be able to be made visible for inspection, and
B. the ROBOT CONTROLLER device must be mounted on the ROBOT such that the diagnostic lights, or device screen if applicable, can be visible for inspection.

"Visible for inspection" does not require that the items be visible when the ROBOT is in STARTING CONFIGURATION or normally during a MATCH, provided the team can make the items viewable during the inspection process if necessary.

Teams are strongly encouraged to make the diagnostic lights visible in all ROBOT configurations used during normal MATCH play. If diagnostic LEDs are not visible during a MATCH, FIELD STAFF may not be able to provide comprehensive support to the team.

R607 ***Custom Circuits must not provide regulated power above 5V unless they are only powering LEDs.** Any active electrical item that is not an actuator (specified in R501) or power regulation device (specified in R505) is considered a CUSTOM CIRCUIT. CUSTOM CIRCUITS shall not provide regulated output voltages exceeding 5V, except if solely used for powering LEDs. CUSTOM CIRCUITS may pass through unregulated battery voltage.

R608 ***All Power regulating devices must be connected and powered through approved ports.** All power regulating devices (R505) must be powered per the manufacturer's instructions and the following table must be true:

Table 12-7: Power Regulation Device Power Requirements

Power Regulating Device	Part Number	Method of Powering
goBILDA 6V Servo Power Injector	3125-0001-0001	Only powered using the XT30 connectors on the device by the ROBOT main battery
REV Control Hub / REV Expansion Hub	REV-31-1153 / REV-31-1595	Only powered using the XT30 connectors on the device by the ROBOT main battery
REV Servo Power Module	REV-11-1144	Only powered using the screw terminals and must only be powered by the ROBOT main battery
REV Robotics Servo Hub	REV-11-1855	Only powered using the power terminals and must only be powered by the ROBOT main battery
REV SPARKmini	REV-31-1230	Only powered by the Power input and must only be powered by the ROBOT main battery
Studica Servo Power Block	75005	Only powered by JST-VH power connector, and must only be powered by the ROBOT main battery

R609 ***Use appropriately sized wire.** All circuits shall be wired with appropriately sized insulated wire:

Table 12-8: Wire sizing requirements

Application	Minimum Wire Size
12V Main Battery Power	18 AWG (19 SWG or 1 mm^2)
Motor Power (unless otherwise listed)	
11-20A fuse protected circuit	
Motor Power - TETRIX MAX 12V DC Motors, REV Robotics Core Hex (REV-14-1300)	22 AWG (22 SWG or 0.5 mm^2)
PWM / Servo	
LEDs (5V / 12V)	
≤10A fuse protected circuit	
Signal level circuits (i.e., circuits which draw ≤1A continuous and have a source incapable of delivering >1A, including but not limited to: I2C, DIO, Analog, encoder and RS485 connections)	28 AWG (29 SWG or .08 mm^2)

Integrated wires originally attached to legal COTS devices or wires included/sold by the manufacturer are considered part of the device and by default legal. Such wires are exempt from this rule.

In order to show compliance with these rules, teams should use wire with clearly labeled sizes if possible. If unlabeled wiring is used, teams should be prepared to demonstrate that the wire used meets the requirements of this rule (e.g., wire samples and evidence that they are the required size).

Combining multiple smaller wires in parallel cannot be used to create an equivalent larger wire which meets minimum wire cross section requirements.

R610 ***Use specified wire colors for specific buses.** The 12V main power bus and +5V auxiliary bus wires must be color-coded along their entire length. The following colors must be used:

A. positive (e.g., +12VDC / +5V Aux): red, yellow, white, brown, or black-with-stripe, and
B. negative (e.g., common/GND): black or blue.

Note: this rule does not apply to other types of wires including, but not limited to: motor wiring, signal level wiring (e.g., encoder and sensor wires), servo cables, and extensions, or wires originally attached to legal devices by their manufacturer.

R611 ***Powered USB hubs must draw energy from approved sources.** Powered USB hubs used on the ROBOT can only be powered through one of the following ways:

A. an approved COTS USB battery Pack per R602, or
B. the 5V auxiliary power port on the REV Expansion Hub or REV Control Hub.

R612 ***Do not modify critical power paths.** CUSTOM CIRCUITS must not directly alter the power or control pathways between:

A. the ROBOT battery and main power switch,
B. the main power switch and a power regulating device (per R603),
C. any two power regulating devices (per R607), or
D. power regulating devices and actuators.

Dynamic electrical interfaces (including linear sliding contacts) or continuous-rotation electrical interfaces (including slip rings) placed along any of these pathways must be unmodified COTS items; custom or fabricated electrical interfaces of this type are prohibited.

Custom high impedance voltage monitoring or low impedance current monitoring circuitry connected to the ROBOT'S electrical system is acceptable if the effect on power pathways is inconsequential.

Altering a power pathway includes, but is not limited to, altering the voltage of the power pathway using a boost (DC voltage step-up) or buck (DC voltage step-down) converter or otherwise altering the natural variable DC voltage provided by the ROBOT battery to create a constant DC voltage.

Devices that modify actuator control signals or power (except those allowed by R505) are prohibited, such as the goBILDA Servo Travel Tuner.

R613 ***Do not mix and match power on or between power regulation devices.** The following rules must be adhered to when using power on any power regulation device (per R505):

A. sensors, encoders, and other devices must be powered solely by the power regulation device they are connected to. Do not use outside power sources (e.g., custom circuits or a second hub) to power them,

B. power from a specific port may only power devices plugged into that exact port. Do not cross-wire power to other ports, and do not combine power from multiple ports into a single power bus/line,
C. 6V power from approved Servo Power modules/injectors may only be used to power servos, and
D. the +5V Aux port on a REV hub may be used to power devices not connected to other power regulation devices except via USB.

12.7 Control, Command & Signals System

R701 ***Control the ROBOT with a single ROBOT CONTROLLER.** ROBOTS must be controlled via 1 programmable ROBOT CONTROLLER. The ROBOT CONTROLLER is the only source of control for the ROBOT actuators and must be comprised of:

A. a REV Control Hub (REV-31-1595), or
B. a smartphone Android device connected to a REV Expansion Hub (REV-31-1153).

In addition to A or B, a ROBOT may also contain:

C. no more than one additional REV Expansion Hub (REV-31-1153).

We recommend teams always keep all control system device software up to date. Check the *FIRST* Tech Challenge Firmware Update Page for release announcements and most recent software versions.

Due to unpredictable variations in Android software across different manufacturers and updates, the REV Control Hub is the only officially supported ROBOT CONTROLLER device. Teams choosing to use any other unsupported device (e.g., smartphones) are responsible for testing and verifying its compatibility, functionality, and performance.

R702 ***Teams may not alter coprocessor software.** Modifying software on coprocessors, unless explicitly permitted in this rule, is not allowed by teams. Firmware updates in binary form provided by the manufacturer may be applied as directed by the manufacturer. Programmable vision coprocessors natively supported by the FTC SDK are an exception to this rule, and reprogramming them is permitted. A list of programmable vision coprocessors is found in Table 12-9.

Table 12-9: Supported programmable vision coprocessors

Device	Part Number
Limelight Vision Limelight 3A	LL_3A

The following are examples of allowed and disallowed devices:

Example 1: The Adafruit BNO055 Absolute Orientation Sensor is an IMU package with an onboard ARM Cortex-M0 based coprocessor to crunch sensor data and produce composite output. Its coprocessor contains software that is not intended by the manufacturer to be modified by users. This device is allowed.

Example 2: The SparkFun Optical Tracking Odometry Sensor is a laser and IMU tracking device that uses an onboard microcontroller to perform complex calculations and produce simplified results. SparkFun does provide the source code and toolchain for advanced users to modify/update the software, which is not permitted by this rule. Firmware updates provided by SparkFun are allowed to be applied to the device. This device is allowed.

Example 3: The Digital Chicken Labs OctoQuad FTC Edition is an 8-channel encoder/PWM interface, utilizing a Raspberry Pi Pico coprocessor. Teams are not permitted to modify software running on the device, including replacing the software with their own. Updates provided in binary form by the manufacturer (Digital Chicken Labs) may be applied to the device. This device is allowed.

Example 4: Optical Flow sensors are an example of a sensor that utilizes a vision coprocessor that is treated no differently than other coprocessors per R702. These devices are allowed.

Example 5: The DFRobot HuskyLens and the Charmed Labs Pixy2 are examples of vision coprocessors that are configurable but not programmable and are treated no differently than other coprocessors per R702. These devices are allowed.

Example 6: The OpenMV Cam, Luxonis OAK-1, and LimeLight Vision Limelight 3G are examples of programmable vision coprocessors that are prohibited.

R703 ***Smartphone Android devices used as a ROBOT CONTROLLER must connect to the REV Expansion Hub using USB.** If used as a ROBOT CONTROLLER, the smartphone Android device must be connected via its integrated USB port to a REV Expansion Hub with any combination of USB cables (including USB OTG cables) and/or USB hubs (powered or unpowered, with or without OTG integrated into the hub).

R704 ***Use networks and bandwidth as directed.** Teams and ROBOTS must use Wi-Fi networks and bandwidth in a way that enables fair play and does not interfere with other teams or ARENA operations. Teams must abide by the following guidelines:

A. Teams may not use any other form of wireless communication, except those offered by the provided official tools, to communicate to, from, or within the ROBOT.
B. Teams may not interfere with the ROBOT networks. All communication signals must originate from only the ROBOT CONTROLLER device or the DRIVER STATION device using the ROBOT CONTROLLER Wi-Fi network. No other devices may attempt to connect to, interfere with, or alter the ROBOT CONTROLLER Wi-Fi network.
C. Ensure all programming laptops and other devices (other than the DRIVER STATION device) are disconnected from the ROBOT CONTROLLER Wi-Fi network during MATCH play.
D. Software with access to the ROBOT CONTROLLER Wi-Fi network must limit the amount of data being streamed (i.e., continuous transmission of data) over Wi-Fi. Software may only stream robot control data, debugging data, and telemetry to and from the ROBOT using the FTC Driver Station Application. Additional logging/streaming services, such as those hosted by third party plugins and tools such as FTC Dashboard, FTControl Panels, and others are prohibited. No continuous video stream is allowed.

E. Some events may assign Wi-Fi bands and/or channels to teams. If requested by event staff, teams must use the specific frequency band or channel on the day of the competition.

R705 ***Configure devices for your team number.** The ROBOT CONTROLLER, DRIVER STATION, and any spares used must be configured/named to correspond to the correct team number as follows:

A. ROBOT CONTROLLER should be named <team number>-RC (e.g., 12345-RC),
B. DRIVER STATION should be named <team number>-DS (e.g., 12345-DS), and
C. If a spare ROBOT CONTROLLER or DRIVER STATION is configured, a letter designator may be added <team number>-<letter>-RC/DS (e.g., 12345-A-DS, 12345-B-DS)

> See the DRIVER STATION Instructions and ROBOT CONTROLLER Instructions for a detailed procedure for updating DRIVER STATION and ROBOT CONTROLLER "names."

R706 ***Only specified modifications to core control system devices are permitted.** The DRIVER STATION device and software, Android-based ROBOT CONTROLLER device, main and secondary power switch(es), power regulation devices, fuses, and batteries shall not be tampered with, modified, or adjusted in any way (tampering includes drilling, cutting, machining, rewiring, disassembling, painting, removing enclosures and replacing with custom enclosures, etc.), with the following exceptions:

A. wires, cables, and signal lines may be connected via the standard connection points provided on the devices,
B. fasteners (including adhesives) may be used to attach devices to the OPERATOR CONSOLE or ROBOT or to secure cables to the device,
C. thermal interface material may be used to improve heat conduction,
D. labeling may be applied to indicate device identification, purpose, connectivity, functional performance, etc. as long as they do not cover labels or markings used to identify the product,
E. jumpers or switches may be moved to configure devices per the manufacturer's manual,
F. device firmware may be updated with manufacturer supplied firmware,
G. integral wires on motor controllers and batteries may be cut, stripped, and/or connectorized,
H. devices except batteries may be repaired, provided the performance and specifications of the device after the repair are identical to those before the repair,
I. insulating material may be added to exposed conductors,
J. tape may be applied for debris protection, and
K. power switch mounting brackets can be modified or replaced.

> Please note that while repairs are permitted, the allowance is independent of any manufacturer's warranty. Teams make repairs at their own risk and should assume that any warranty or return options are forfeited. Repairs must be functionally equivalent to original device condition.
>
> Be aware that diagnosing and repairing COMPONENTS such as these can be difficult.
>
> For example, "repairs" that change connector types, include device footprint modifications, or provide mechanical enhancements, are prohibited.

R707 ***USB is for vision.** Only the following devices may be connected to the ROBOT control system using USB:

A. webcams and optical vision sensors per R708,
B. USB hub or USB switch, and
C. a REV Expansion Hub.

R708 ***Use only supported USB vision.** Only single image sensor vision devices that are natively supported by the ROBOT CONTROLLER app are allowed to connect to USB (stereoscopic cameras are not allowed). This includes the following:

A. all UVC compatible USB webcams (Logitech C270, and related), and
B. Vision coprocessors allowed per R702.

UVC compatible USB webcams may only use the UVC provided stream / data. No other interfaces or data provided by the webcam may be used.

To request support (or to provide sample drivers) for alternate USB vision devices for inclusion in future *FIRST* Tech Challenge seasons, please send an email to customerservice@firstinspires.org with the following details:

- Subject of email should be: "USB Vision Future Support Request"
- Contact details for providing feedback or clarifications
- Details on the device requesting support

R709 ***Recording devices are okay.** Self-contained video recording devices (GoPro or similar) are allowed providing they are used only for non-functional post-MATCH viewing and the wireless capability is turned off.

R710 ***Lasers are only allowed if they're part of a sensor, low-energy, and non-visible.** Lasers are not allowed unless they meet all of the following criteria:

A. must be part of a sensor,
B. must be rated as IEC/EN 60825-1 "Class I" or IEC/EN 62471 "Exempt," and
C. must use non-visible spectrum.

R711 ***Configure Android devices appropriately.** ROBOT CONTROLLER and DRIVER STATION Android devices (smartphones, REV Control Hub, REV Driver Hub) must additionally be configured in the following ways:

A. REV Control Hub users must change the Wi-Fi password to a non-default password,
B. smartphone users must enable Airplane Mode,
C. on ROBOT CONTROLLER and DRIVER STATION Android devices, Wi-Fi must be enabled and Bluetooth must be disabled, and
D. on DRIVER STATION Android devices, remove all remembered Wi-Fi Direct Groups and Wi-Fi connections, leaving only the ROBOT CONTROLLER Wi-Fi connection.

12.8 Pneumatic Systems & Airflow Devices

R801 ***No Pneumatic Actuators, High-Speed Blowers, or Vacuums.** ROBOTS are restricted in their use of air in the following ways:

A. ROBOTS may only use sealed, COTS closed-air systems which are pre-charged by the manufacturer (such as gas shocks),
B. ROBOTS may not use any stored pressure COMPONENTS that are actuated by a device like a solenoid and/or are able to change their stable state,
C. ROBOTS may not generate pressure or vacuum,
D. ROBOTS may not use any user-adjustable gas storage vessels, except air-filled (pneumatic) COTS wheels, and
E. ROBOTS may not use any device which creates high-speed airflow, except cooling fans integrated into COTS computing devices.

The intent of this rule is that ROBOTS may not use pneumatic actuators, pressure or vacuum storage devices, compressors, vacuum generators, or air blowers, but they may use "closed air" systems which were sealed by their manufacturer. This includes items such as gas springs, and dampers.

Examples of a "device which creates high-speed airflow" include but are not limited to a fan designed to move SCORING ELEMENTS on the FIELD. High-speed flywheels or rollers used for manipulating SCORING ELEMENTS would not on their own be considered a high-speed airflow device.

12.9 OPERATOR CONSOLE

R901 ***Use only a specified DRIVER STATION device.** The OPERATOR CONSOLE may only have one approved Android-based DRIVER STATION device connected and powered on. The OPERATOR CONSOLE must have at least one of the following:

A. REV Driver Hub (REV-31-1596), or
B. Any Android Device with or without any combination of USB cables (including USB OTG cables) and/or USB hubs (powered or unpowered, with or without OTG integrated into the hub) for connecting one or more gamepads.

Due to unpredictable variations in Android software across different manufacturers and updates, the REV Driver Hub is the only officially supported DRIVER STATION device. Teams choosing to use any other unsupported device (e.g., smartphones) are responsible for testing and verifying its compatibility, functionality, and performance.

Teams who wish to have a spare DRIVER STATION device as part of their OPERATOR CONSOLE may do so as long as only one DRIVER STATION device is connected and powered on at a time.

R902 ***The OPERATOR CONSOLE must make the touch screen accessible.** The OPERATOR CONSOLE, the set of COMPONENTS and MECHANISMS used by the DRIVE TEAM to relay commands to the ROBOT, must make the touch screen of the DRIVER STATION device accessible. The DRIVER STATION device must be positioned within the OPERATOR CONSOLE so that the screen display can be clearly seen during inspection and in a MATCH. The DRIVER STATION device touch screen must be functional without the requirement of additional aides (e.g., mouse) in order to be used.

R903 ***OPERATOR CONSOLE physical requirements.** The OPERATOR CONSOLE, including all power sources (e.g., power banks), must not exceed a volume of 3ft wide, 1ft 6in deep and 2 ft tall (91.4 cm by 45.7 cm by 61.0 cm), excluding any items that are held or worn by the DRIVERS during the MATCH.

> Also refer to R203 for restrictions on designing OPERATOR CONSOLES for fair play and ARENA safety.
>
> Please note that while there is no hard weight limit, OPERATOR CONSOLES that weigh more than 20 lbs. (~9 kg.) will invite extra scrutiny as they are likely to disrupt normal ARENA operations.
>
> Teams who wish to have a spare external USB hub as part of the OPERATOR CONSOLE may do so as long as only one USB hub is connected at any time.
>
> The intent of this rule is to allow teams to use a container to store, organize, and transport the DRIVER STATION device and support electronics. The OPERATOR CONSOLE rules are not intended to allow systems that function as a ROBOT cart or replace a competition-provided OPERATOR CONSOLE stand, table, etc.

R904 ***ROBOT application wireless communication only.** Other than the connection controlled by the ROBOT CONTROLLER app running on the ROBOT and the DRIVER STATION app running on the DRIVER STATION device, no other form of wireless communications shall be used to communicate to, from, or within the OPERATOR CONSOLE during a MATCH.

> Examples of prohibited wireless systems include, but are not limited to, active wireless network cards, wireless gamepad communication, and Bluetooth devices.



13 Tournament (T)

13.1 Overview

Each *FIRST* Tech Challenge competition is played in a head-to-head tournament format. Each tournament consists of 3 types of MATCHES: Practice MATCHES (not played at all events), Qualification MATCHES, and Playoff MATCHES.

- Practice MATCHES provide teams with an opportunity to operate their ROBOT on a competition FIELD prior to the start of the Qualification MATCHES.
- Qualification MATCHES allow each team to earn MATCH points and RANKING POINTS which determine their seeding position and may qualify them for participation in the Playoff MATCHES.
- Playoff MATCHES determine the event winning ALLIANCE.

These rules apply to all event types described in Section 4 Advancement. Additional rules may apply to League Meets and League Tournaments as covered by Section 14 League Play Tournaments (L).

13.2 MATCH Replays

T201 ***Replays are allowed, but rare.** MATCH replays are only allowed in extreme circumstances due to an ARENA FAULT or for MATCHES which are stopped because FIELD STAFF anticipated FIELD damage or personal injury.

An ARENA FAULT is an error in ARENA operation that includes, but is not limited to:

A. broken FIELD elements due to normal, expected gameplay,
B. broken FIELD elements due to ROBOT abuse of FIELD elements that affects the outcome of the MATCH for their opponents,

> A broken FIELD element caused by ROBOT abuse that affects the outcome of the MATCH for their ALLIANCE is not an ARENA FAULT.

C. FIELD elements moving beyond normal tolerances (not as the result of ROBOT interaction),
D. Wide-spread wireless interference affecting multiple ROBOTS typically at the same time and on both ALLIANCES,
E. failure of the MATCH timer display, or
F. errors by FIELD STAFF (except those listed in Section 10.8 Other Logistics).

If, as determined by the Head REFEREE, an ARENA FAULT occurs that affects the outcome of the MATCH and any team on the affected ALLIANCE desires a replay, the MATCH will be replayed. In addition, *FIRST* Headquarters reserves the right to, with consultation of the Head REFEREE and FIELD STAFF, replay any MATCH in which an ARENA FAULT impacts the outcome of an event.

> Unexpected ROBOT behaviors which are the fault of the team are not justifications for a replay. Conditions such as, but not limited to, low ROBOT battery, programming issues, or ROBOT mechanical problems are not grounds for a replay.

The outcome of the MATCH is affected if an error occurs that, as perceived by the Head REFEREE, changes which ALLIANCE would have won the MATCH and/or the assignment of RANKING POINTS.

The outcome of an event is affected if an error occurs that, in the judgement of *FIRST* Headquarters, changes the assignment of RANKING POINTS or has a dramatic effect on points used for ranking criteria.

Note that an ARENA FAULT that does not affect MATCH outcome, as perceived by the Head REFEREE, does not lead to a MATCH replay. Examples include, but are not limited to:

A. a piece of FIELD plastic falls into the FIELD, far away from any human or ROBOT activity, and in such a way that it does not affect MATCH outcome,
B. delay in the playing of an ARENA sound, and
C. any adjustment or delay in assignment of a penalty or scoring achievement (including those made after the MATCH).

T202 ***Replays will replicate the conditions of the original MATCH.** All reasonable effort is made to create the same conditions when replaying a MATCH caused by an ARENA FAULT or FIELD damage. This includes:

A. a ROBOT that was not present for the MATCH or DISABLED prior to the start of the original MATCH, which is to be replayed, is DISABLED for the replay MATCH
B. the same FIELD will be used unless otherwise deemed necessary by the Head REFEREE due to severity of FIELD damage

Exceptions to this rule are:

C. ROBOT and DRIVE TEAM starting locations and pre-loaded SCORING ELEMENTS do not need to be replicated when replaying a MATCH

While efforts will be made to replicate the same conditions of the original MATCH, there are environmental factors, such as changes to ambient lighting, that may be outside the control of the event.

13.3 Clarifications on MATCH Play Results ("Question Box")

Each event will have one or more designated Question Boxes in the ARENA area. If a DRIVE TEAM has a question about a MATCH, the FIELD, etc., they may send up to two representatives wearing a DRIVE TEAM badge to their corresponding Question Box. Depending on timing, the Head REFEREE or FTA may postpone any requested discussion until the end of the subsequent MATCH.

Technical questions regarding FIELD or ROBOT operation are addressed by the FTA, and additional team members are invited to participate in these conversations if necessary. If a DRIVE TEAM needs clarification on a ruling or MATCH results, per T301, up to two representatives should address the Head REFEREE after the MATCH results have been shown.

While the *FIRST* event management software tracks quantities of MINOR and MAJOR FOULS, *FIRST* instructs REFEREES to not self-track details about MINOR FOULS and MAJOR FOULS; as a result, we do not expect

REFEREES to recall details about what MINOR FOULS and MAJOR FOULS were made, when they occurred, and against whom.

> Any reasonable question is fair game in the Question Box, and Head REFEREES will make good faith efforts to provide helpful feedback (e.g., how/why certain FOULS are being called, why a particular ROBOT may be susceptible to certain FOULS based on its design or gameplay, how specific rules are being called or interpreted), but please know that they may not be able to supply specific details.

T301 ***Head REFEREE interactions.** A team may only address the Head REFEREE with a maximum of 2 people, 1 of which must be a STUDENT.

Violation: The Head REFEREE will not address additional, non-compliant team members or peripheral conversations.

> Some events may restrict ARENA access to members of the DRIVE TEAM. Team members are permitted to swap buttons within their team as needed to access the Question Box.
>
> As much as possible, the STUDENT should be an active participant in the conversation. Teams should not record interactions without consent (see E116).

T302 ***MATCH questions must be timely.** If a team would like to clarify or dispute the results of a MATCH using the process per T301 they must present their STUDENT representative in the Question Box in a timely manner as outlined below:

A. questions regarding events in a Qualification MATCH may be asked at any time before ALLIANCE selection begins, or within 5 minutes of the last Qualification MATCH at events without Playoff MATCHES, and
B. questions regarding events in a Playoff MATCH must be asked before the start of the next Playoff round or, for the last Playoff MATCH, immediately following the MATCH.

> Please keep in mind that our REFEREES are human, and the more time has passed between the MATCH in question, the less likely they are to remember the details of a specific MATCH. It is best to ask for clarification or to dispute the results of a MATCH within 3 MATCHES.
>
> Teams are encouraged to ask questions as soon as possible. Questions asked more than 5 minutes after the last Playoff MATCH will likely not be addressed.

T303 ***Keep questions factual and constructive.** Teams coming to the Question Box should think through their requests in advance and are encouraged to have relevant references to rules or the Q&A website available to aid discussions.

> There should be no negative implications for teams using the Question Box to advocate for themselves, but everyone should keep in mind it can be a high stress situation for team youth and for volunteers alike and it is important to remember *FIRST* Core Values during these discussions.
> At some events, MATCH results may be available on the FTC-Events page.

13.4 General Tournament Rules

T401 ***The Head REFEREE has ultimate and final authority regarding gameplay during the event.** The Head REFEREE may receive input from additional sources, e.g., *FIRST* personnel, FTA, Event Director, Program Delivery Partner, and other event staff. The Head REFEREE rulings are final. No event staff, including the Head REFEREE, will review video, photos, artistic renderings, etc. of any MATCH, from any source, under any circumstances.

A. When issuing a RED CARD or YELLOW CARD the Head REFEREE must record the rule violation.
B. Event Directors and Program Delivery Partners may not overrule a Head REFEREE decision.
C. Framework of Behaviors and Competition Integrity Contract (CIC) violations may involve escalation beyond the Head REFEREE'S initial ruling.
D. Every Qualification and Playoff MATCH must be observed by a certified Head REFEREE. Head REFEREES may only watch 1 MATCH at a time.

> Rules in this manual are written for *human* Head REFEREES to enforce. Some have clear unambiguous criteria which can be easily checked, but other rules will rely on human judgement. Head REFEREES are asked to make the best call they can in the moment with what they or other REFEREES observed during the MATCH.
>
> When there is an ambiguous situation or controversial call it is human instinct to wonder what was the "right call" or "what-if..." – for the purposes of *FIRST* Tech Challenge gameplay, the right call is the one that was made in good faith by the Head REFEREE with the information they had available at the time.

T402 ***Only REFEREES can declare a ROBOT DISABLED.** A ROBOT is only considered DISABLED once a REFEREE has declared the ROBOT DISABLED during a MATCH. A ROBOT may only be DISABLED as a consequence of a rule violation. If a REFEREE DISABLES a ROBOT, the REFEREE may instruct the team to drive the ROBOT to a specific neutral position on the FIELD before DISABLING.

T403 ***The Event Director has ultimate authority regarding all non-gameplay decisions during an event.** The Competition Manual is intended to provide a set of rules for the competition including gameplay and judging but it is not an exhaustive compilation of guidelines for running a *FIRST* Tech Challenge event. Issues outside of specific gameplay rules which are under the authority of the Head REFEREE per T401 are at the discretion of the Event Director such as, but not limited to:

A. venue access as published via the public schedule,
B. pit sizes and utility access,
C. health and safety,
D. team registration and competition eligibility, and
E. team conduct away from the ARENA.

T404 ***All competition FIELDS at an event must be consistent with each other.** Events which have multiple competition FIELDS (as indicated by the MATCH schedule Figure 13-1) will be consistent with each other. Examples of set-up which must be considered includes, but is not limited to:

A. elevation of the FIELD off the floor,

B. FIELD display monitors,
C. FIELD perimeter type, and
D. FIELD TILE size and type.

Other FIELDS (e.g., practice FIELDS) at the event do not need to be consistent with each other or competition FIELDS.

T405 ***During optional FIELD measurement and calibration time(s) ROBOTS may not practice on the FIELD.** During any period when the ARENA is open for measurement, ROBOTS may run OpModes but cannot move the ROBOT (e.g., CHASSIS) under its own power around the FIELD.

Violation: VERBAL WARNING. YELLOW CARD if subsequent violations occur during the event.

At the discretion of the Event Director at the event, the ARENA may be open for at least 30 minutes prior to the start of Qualification MATCHES, during which time teams may survey and/or measure the ARENA and bring ROBOTS on the FIELD to perform sensor calibration. The specific time that the FIELD is open will be communicated to teams at the event. Teams may bring specific questions or comments to the Head REFEREE or FTA.

Allowed activities during ROBOT calibration and measurement time(s) include:
A. ROBOT may be powered on,
B. team may initialize an OpMode,
C. ROBOT may operate or extend MECHANISMS outside the ROBOT CHASSIS,
D. ROBOT may CONTROL SCORING ELEMENTS,
E. ROBOT may be connected to programming laptops and other devices,
F. team members may be on the FIELD with the ROBOT,
G. team members may manually move the ROBOT to multiple positions around the FIELD (e.g., without driving the ROBOT under its own power), and
H. team members or ROBOTS may measure the FIELD with tools (e.g., tape measures) or sensors.

Activities not allowed during ROBOT calibration and measurement time(s) include:
I. ROBOT CHASSIS may not move under its own power around the FIELD (i.e., “driving” as part of AUTO or TELEOP),
J. ROBOT may not LAUNCH SCORING ELEMENTS, and
K. team members may not practice (e.g., repetitive actions by a team member in the ALLIANCE AREA placing SCORING ELEMENTS).

T406 ***No team timeouts, but MATCHES have breaks.** Teams playing in back-to-back MATCHES will have a minimum break between their MATCHES as follows:

A. In Qualification MATCHES, each team will have a minimum of 5 minutes from when the MATCH results are posted from their previous MATCH until the expected start time of their next MATCH for the purpose of G301.

B. In Playoff MATCHES, each team will have a minimum of 8 minutes from when MATCH results are posted from their previous MATCH until the expected start time of their next MATCH for the purpose of G301.

If a MATCH'S results will not be posted, (e.g., due to an immediate replay) each team will be afforded a reasonable time to reset at the Head REFEREE'S discretion.

These breaks are automatically tracked by the *FIRST* event management system. FIELD STAFF will communicate expected start times with teams as appropriate. Teams may ask the FTA, Head REFEREE, or their designee about the timing of affected MATCHES.

T407 ***MATCHES are played in order.** Qualification and Playoff MATCHES will be played in numerical order except for extenuating circumstances at the discretion of the Head REFEREE in consultation with the Event Director. All Qualification MATCHES must be played before the start of ALLIANCE selection and all Playoff MATCHES for the current round must be played before the start of the next round. The timing of MATCHES played out of order or replayed MATCHES will be communicated by FIELD STAFF or event personnel to the teams involved.

Extenuating circumstances that might lead to a MATCH being played out of order include, but are not limited to:

A. A MATCH replay occurring at the next available break, end of day, at the conclusion of other Qualification MATCHES, or the end of the current playoff round.
B. A lengthy repair on one competition FIELD preventing MATCH play from continuing on that FIELD, but other FIELDS may continue to be used.
C. Urgent and/or extenuating circumstances related to a team.

The intent of this rule is to ensure that MATCHES are played in an orderly fashion while providing flexibility for unforeseen circumstances. Regardless of play order, T406 and G301 remain in effect.

13.5 Practice MATCHES

Practice MATCHES are played before Qualification MATCHES, at events that have them. The Practice MATCH schedule is available as soon as possible but no later than the start of Practice MATCHES. Schedules may also be available on the FTC-Events site.

Practice MATCHES are randomly assigned, and teams may not switch scheduled Practice MATCHES. Each team is assigned an equal number of Practice MATCHES unless the number of teams multiplied by number of Practice MATCHES is not divisible by 4. In this case, the event management software randomly selects some teams to play an extra Practice MATCH.

Practice MATCHES are not guaranteed at all events due to schedule constraints.

13.5.1 Filler Line

A Filler Line is used to fill open slots at events that employ scheduled Practice MATCHES or all slots at events with an open Practice MATCH schedule. Teams from the Filler Line are used on a first come, first served basis to fill empty spots in Practice MATCHES left by other teams that do not report to Queueing. The number of teams in the Filler Line is dependent upon space at venues.

Only teams that meet all criteria below qualify for the Filler Line:

A. ROBOTS in the Filler Line must have passed inspection (this requirement may be waived for events with open Practice MATCH schedules),
B. DRIVE TEAMS must join the Filler Line with their ROBOT,
C. teams may not work on their ROBOT while in the Filler Line,
D. teams may not occupy more than 1 spot in the Filler Line, and
E. if a team is queued for their Practice MATCH, they may not also join the Filler Line.

13.6 Qualification MATCHES

13.6.1 Schedule

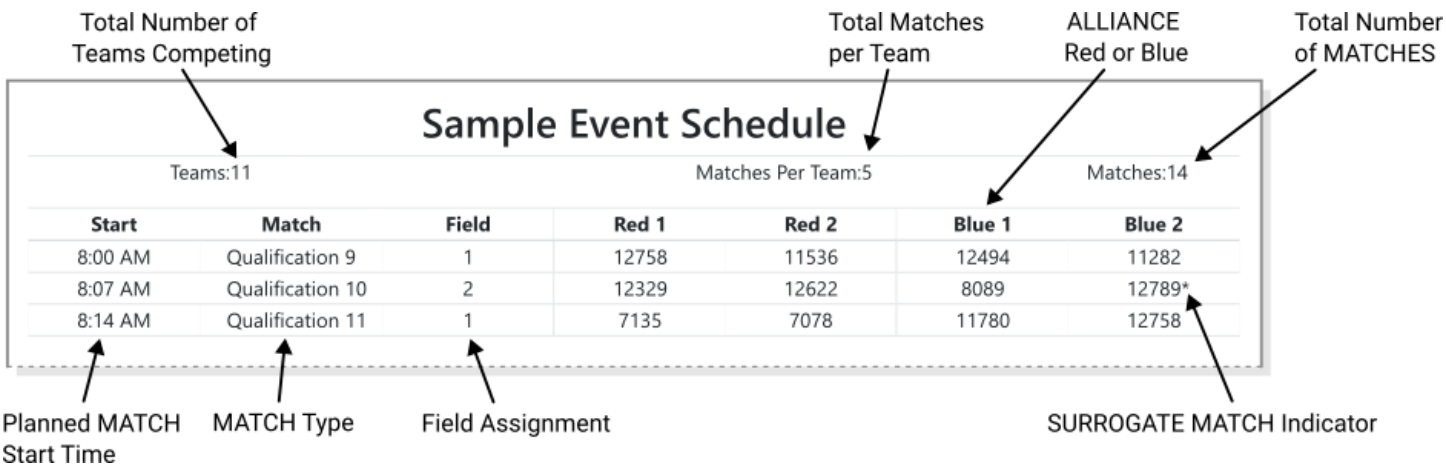
The Qualification MATCH schedule is made available as soon as possible, but no later than 15 minutes before Qualification MATCHES are scheduled to begin. Only teams who are eligible and have completed check-in on time will be included in the schedule per I102.

Teams will receive access to the schedule through one or more of the following methods: 1 printed hard copy, notice of publicly posted hardcopy available to photograph, and/or local digital schedule display. Schedules may also be available on the FTC-Events site. Each qualification schedule consists of a series of rounds in which each team plays 1 MATCH per round.

All event types will schedule either 5 or 6 Qualification MATCHES per team as determined by the Event Director based on available schedule time allocated. *FIRST* Championship, *FIRST* Premier Events, and Regional Championship Tournaments may schedule more MATCHES per team at the discretion of *FIRST* Headquarters and the Event Director.

A MATCH schedule is used to coordinate MATCHES at an event. Figure 13-1 details information shown on each schedule. SURROGATE MATCHES are described in Section 13.6.2 MATCH Assignment.

Figure 13-1: Sample MATCH Schedule



13.6.2 MATCH Assignment

FIRST event management software assigns each team 1 ALLIANCE partner for each Qualification MATCH using a predefined algorithm, and teams may not switch Qualification MATCH assignments. The algorithm employs the following criteria, listed in order of priority:

1. ensure each team has at least the minimum required time between MATCHES (varies by event size)
2. minimize the number of times a team is allied with any team
3. minimize the number of times a team plays opposite any team
4. minimize the use of SURROGATES (teams randomly assigned by event management software to play an extra Qualification MATCH)
5. provide even distribution of MATCHES played on blue and red ALLIANCE

> For more information about the MATCH scheduling algorithm, please see Idle Loop software's website.

All teams are assigned the same number of Qualification MATCHES, equal to the number of rounds, unless the number of teams multiplied by number of MATCHES is not divisible by 4. In this case, the *FIRST* event management software randomly selects some teams to play an extra MATCH. For the purpose of seeding calculations, those teams are designated as SURROGATES for the extra MATCH. If a team plays a MATCH as a SURROGATE, it is indicated on the MATCH schedule with an * after their team number, it is always their third Qualification MATCH, and the outcome of the MATCH has no effect on the team's ranking. YELLOW and RED CARDS assigned to SURROGATES, however, do carry forward to subsequent MATCHES.

If a team is scheduled to play in a back-to-back MATCHES (e.g., Qualification MATCH 40 and 41) they will receive a minimum break per T406 before their next MATCH.

13.6.3 Qualification Ranking

RANKING POINTS (RP) are units credited to a team based on their ALLIANCE'S performance in Qualification MATCHES. These points are awarded to each eligible team at the completion of each Qualification MATCH per Table 10-2.

A team's RANKING SCORE (RS) is the average number of RANKING POINTS earned by a team throughout their Qualification MATCHES (excluding any SURROGATE MATCH).

All teams participating in Qualification MATCHES are ranked by RANKING SCORE. If the number of teams in attendance is 'n', they are ranked '1' through 'n', with '1' being the team with the highest RANKING SCORE and 'n' being the team with the lowest RANKING SCORE.

SURROGATE MATCHES are excluded from all calculations. A MATCH in which a team is DISQUALIFIED contributes 0 to all sort criteria.

Teams are ranked in order, using the sorting criteria defined in Table 13-1.

Table 13-1: Qualification MATCH Ranking Criteria

Order Sort	Criteria
1st	RANKING SCORE (RS)
2nd	Average ALLIANCE MATCH points, not including MINOR FOULS and MAJOR FOULS (Average MATCH points minus FOULS)
3rd	Average number of TIPS
4th	Average AUTO points
5th	Random sort by the *FIRST* event management software

T601 ***DISQUALIFICATION applies only to the DISQUALIFIED team in Qualifications.** During Qualification MATCHES, a team DISQUALIFICATION has no effect on their ALLIANCE partner.

13.7 Playoff MATCHES

Playoff MATCHES follow the Qualification MATCHES. In the Playoffs, teams play on set ALLIANCES, chosen during ALLIANCE selection, and advance through a double elimination bracket to determine an event winner. Teams do not earn RANKING POINTS; they advance based on winning or losing MATCHES. If a team is DISQUALIFIED during Playoff MATCHES, the DISQUALIFICATION applies to the entire ALLIANCE, and all teams in the ALLIANCE receive 0 MATCH points.

T701 ***Send one or two STUDENT representatives.** Each team must choose and send a minimum of one and a maximum of two STUDENT team representatives to the ARENA at the designated ALLIANCE selection time (typically just after the last scheduled Qualification MATCH) to represent their team.

Violation: Teams who do not send a representative are ineligible for the playoff tournament

> If an absent team would have been an ALLIANCE lead, all lower ranked ALLIANCE leads are promoted 1 spot.
>
> If a team is planning to not participate in the playoff tournament, they should proactively inform the Event Director and Head REFEREE as soon as possible.

T702 ***Declining teams cannot be picked.** An ALLIANCE CAPTAIN may not invite a team that has declined another ALLIANCE'S invitation to participate in the playoff tournament.

Violation: The ALLIANCE CAPTAIN must make another selection

> An ALLIANCE lead that declines an invitation from another ALLIANCE is able to invite teams to join their ALLIANCE but may not be invited to join another ALLIANCE.

T703 ***There are no backup teams in Playoff MATCHES.** An ALLIANCE may not request a backup team in a Playoff MATCH.

> Teams are encouraged to consider reliability when selecting partners because all teams on an ALLIANCE must play in each round of the playoff tournament.

T704 ***During Playoff MATCHES, teams may have more ARENA access.** At the direction of the Event Director, during the Playoff MATCHES teams may need extra team members to maintain the ROBOT between MATCHES in a timely manner. Each team is permitted to have up to 3 additional pit crew members to help with needed ROBOT repairs. These team members should be granted the same ARENA access as the DRIVE TEAM but may not participate in any MATCH play.

> This allocation of additional pit crew members is venue specific and at the discretion of the Event Director.

T705 ***Multiple DISQUALIFICATION is handled specially.** During Playoff MATCHES, 1 or more ALLIANCE DISQUALIFICATIONS are handled accordingly:

A. if an ALLIANCE is DISQUALIFIED, the DISQUALIFIED ALLIANCE loses
B. if both ALLIANCES are DISQUALIFIED, the one that is DISQUALIFIED first chronologically loses

C. if, as perceived by the Head REFEREE, both ALLIANCES are simultaneously DISQUALIFIED, the MATCH results in a tie

13.7.1 ALLIANCE Selection Process

At the end of the Qualification MATCHES, the top ranked teams become the ALLIANCE leads. The designated STUDENT representative from each ALLIANCE lead is called the ALLIANCE CAPTAIN. This representative may change between ALLIANCE selection and Playoff MATCHES.

The ranked ALLIANCES are designated, in order, ALLIANCE 1, ALLIANCE 2, etc., down to the maximum number of ALLIANCES shown in Table 13-2. Using the ALLIANCE selection process described in this section, each ALLIANCE lead chooses 1 other team to join their ALLIANCE.

If the team accepts, it becomes a member of that ALLIANCE. If an invitation from an ALLIANCE lead to another ALLIANCE lead is accepted, all lower ALLIANCE leads are promoted 1 spot. The highest-ranked, unselected team becomes the newest ALLIANCE lead.

If the number of complete ALLIANCES in Table 13-2 cannot be formed (e.g., due to too many declining teams, due to teams leaving early) the event will proceed by playing with incomplete ALLIANCES. ALLIANCES with 0 teams will grant an automatic win to the opponent and the MATCH will be skipped. ALLIANCES with only 1 team will play the MATCH 1 versus 2.

13.7.2 Playoff MATCH Bracket

The Playoff MATCH bracket is how the event winners are determined.

The number of ALLIANCES for an event is determined by the number of teams who are eligible to participate in the Playoffs based on all Qualification MATCH participating teams as shown in Table 13-2.

Teams that sign up for the event but do not show up and teams that participate in Awards but are not included in the Qualification MATCHES are not included in determining the Playoff MATCH bracket size. Teams that participated in the Qualification MATCHES but don't intend to participate in the Playoff MATCH bracket are included in determining the Playoff MATCH bracket size.

Table 13-2: Number of playoff ALLIANCES based on all Qualification MATCH participating teams

Total playoff eligible teams	Number of playoff ALLIANCES formed
4-10 Teams	2
11-20 Teams	4
21-40 Teams	6
41-64 Teams	8

See Section 13.8 Dual Division Events for the additional dual division related rules.

The double elimination tournament consists of an upper and lower bracket that will scale based on the number of ALLIANCES. Tournaments with 2 ALLIANCES will have those ALLIANCES face each other in the finals.

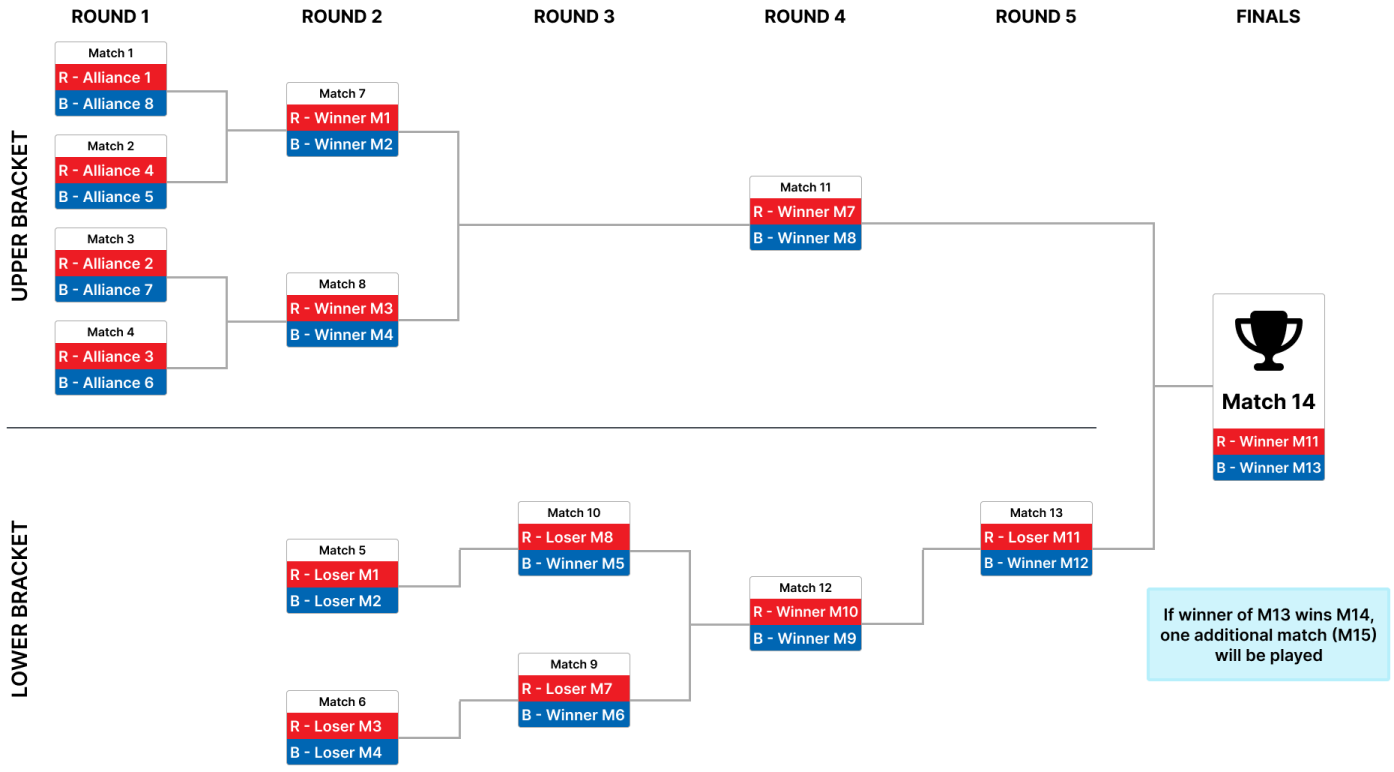
Each ALLIANCE begins in the upper bracket. If an ALLIANCE wins a MATCH in the upper bracket, they remain in the upper bracket. If an ALLIANCE loses a MATCH in the upper bracket, they transition to the lower bracket. ALLIANCES in the lower bracket must win all subsequent MATCHES to remain in the tournament, i.e., once they lose 2 total MATCHES, they are out of the tournament.

Ties play another MATCH until the MATCH results in 1 winner.

In Round 1, the higher ranked ALLIANCE is assigned to the red ALLIANCE. For subsequent rounds, ALLIANCE color is assigned as shown in Figure 13-2, regardless of ALLIANCE rank at the start of the playoff tournament.

As shown in Figure 13-2, Playoff MATCHES consist of up to 6 rounds with breaks between later rounds. Breaks begin after the MATCH RESULTS have been posted from the latest MATCH. The Blue and Red Gap columns indicate the approximate time between each ALLIANCE'S MATCHES. The expected start time of the scheduled MATCH is the time indicated on the MATCH schedule or 8 minutes from the end of either ALLIANCE'S previous MATCH, whichever is later per T406.

Figure 13-2: 8-ALLIANCE playoff bracket



If a Playoff MATCH needs to be replayed as described in Section 13.2 MATCH Replays or an additional MATCH needs to be played due to tie, teams are notified of when the MATCH will occur. A minimum 8-minute delay is provided for teams to reset their ROBOTS prior to the MATCH unless all teams are ready sooner (T406). The affected MATCH must be played before the next round begins.

13.7.3 2-ALLIANCE Bracket and Typical Timing

Figure 13-3: 2-ALLIANCE playoff bracket

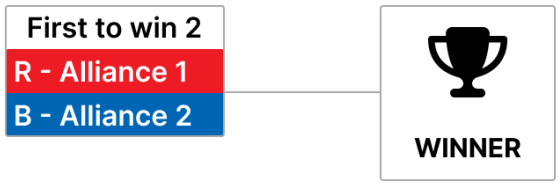


Table 13-3: 2-ALLIANCE playoff bracket typical timing

Round	MATCH	Upper/ Lower	FIELD	Blue	Red	Gap (min) Blue	Gap (min) Red	Next MATCH (MATCH # (ALLIANCE color)) Winner	Next MATCH (MATCH # (ALLIANCE color)) Loser	Estimated Start (min)
15-minute break			Judges' Choice* (1), Innovate/Design/Control Award (1)							0
Finals	1		1	A2	A1			M2	M2	15
15-minute break			Sustain/Reach/Connect Award (1)							18
Finals	2		1	A2	A1	0:15	0:15	M3*	M3*	33
15-minute break			Think Award (1)							36
Finals	3*		1	A2	A1	0:10	0:10			51
Awards: Compass*, Finalists, Winners, and Inspire Award (1)										54

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

13.7.4 4-ALLIANCE Bracket and Typical Timing

Figure 13-4: 4-ALLIANCE playoff bracket

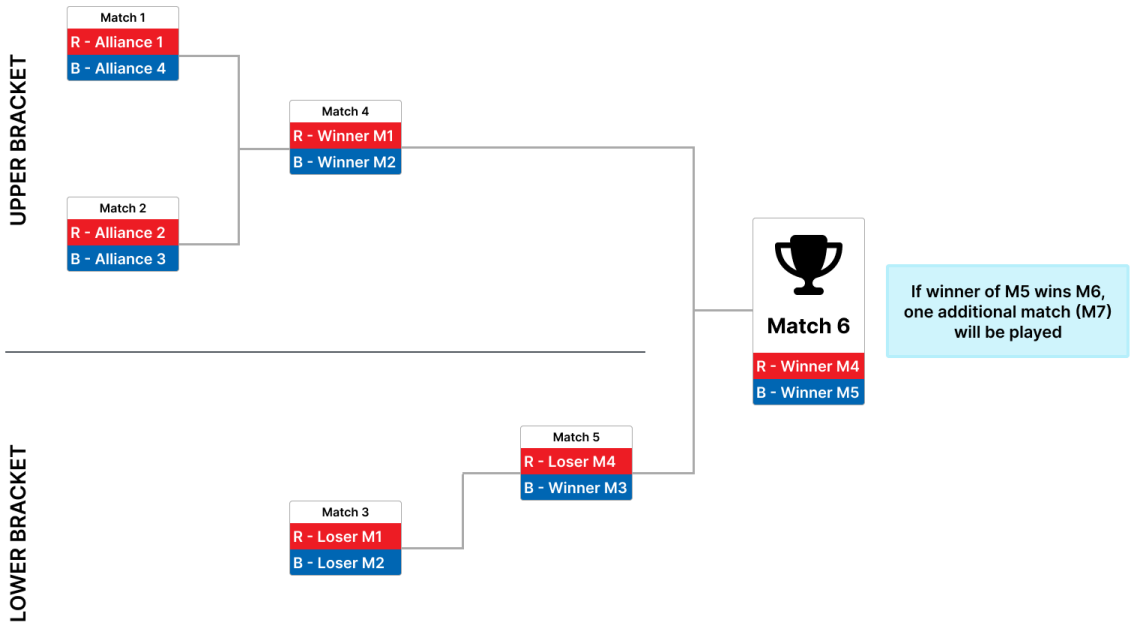


Table 13-4: 4-ALLIANCE playoff typical timing

Round	MATCH	Upper/ Lower	FIELD	Blue	Red	Gap (min) Blue	Gap (min) Red	Next MATCH (MATCH # (ALLIANCE color)) Winner	Next MATCH (MATCH # (ALLIANCE color)) Loser	Estimated Start (min)
1	1	Upper	1	A4	A1			M4 (R)	M3 (R)	0
	2	Upper	1	A3	A2			M4 (B)	M3 (B)	6
15-minute break										9
2	3	Lower	1	L2	L1	0:08	0:14	M5 (B)	4th	25
	4	Upper	1	W2	W1	0:14	0:20	M6 (R)	M5 (R)	31
15-minute break			Judges' Choice* (1), Design Award (1), Reach Award (1)							33
3	5	Lower	1	W3	L4	0:21	0:15	M6 (B)	3rd	48
15-minute break			Control Award (1), Innovate Award (1), Sustain Award (1)							51
Finals	6		1	W5	W4	0:15	0:33	M7*	M7*	66
15-minute break			Connect Award (1), Think Award (1)							69
Finals	7*		1	W5	W4	0:15	0:15			84
Awards: Compass*, Finalists, Winners, and Inspire Award (2, 1)										87

*If Required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

13.7.5 6-ALLIANCE Bracket and Typical Timing

Figure 13-5: 6-ALLIANCE playoff bracket

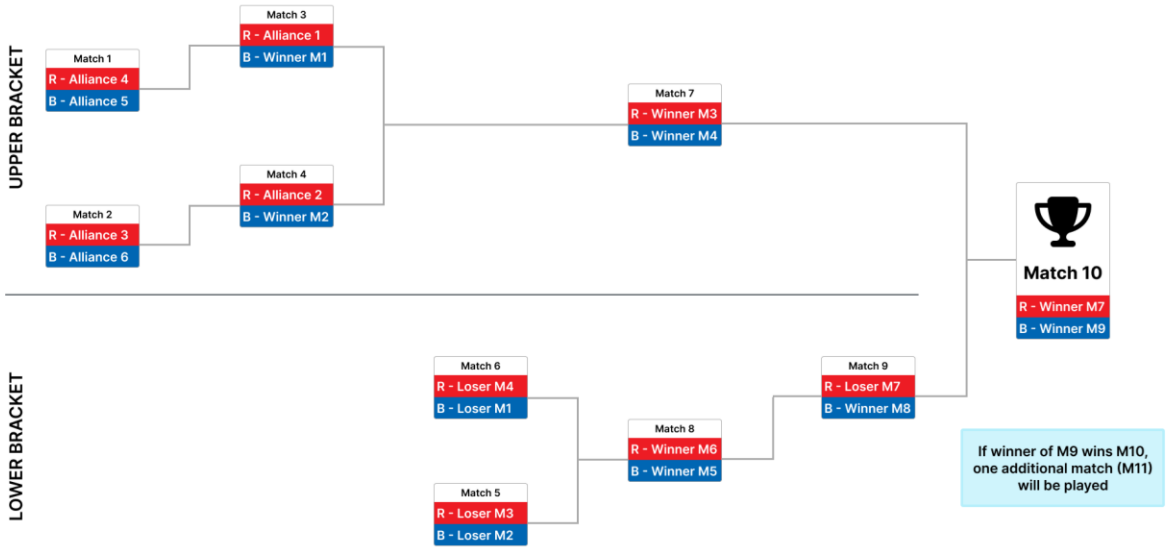


Table 13-5: 6-ALLIANCE playoff bracket typical timing

Round	MATCH	Upper/ Lower	FIELD	Blue	Red	Gap (min) Blue	Gap (min) Red	Next MATCH (MATCH # (ALLIANCE color)) Winner	Next MATCH (MATCH # (ALLIANCE color)) Loser	Estimated Start (min)
1	1	Upper	1	A5	A4			M3 (B)	M6 (B)	0
	2	Upper	2	A6	A3			M4 (B)	M5 (B)	6
2	3	Upper	1	W1	A1	0:09		M7 (R)	M5 (R)	12
	4	Upper	2	W2	A2	0:09		M7 (B)	M6 (R)	18
3	5	Lower	1	L2	L3	0:15	0:09	M8 (B)	Tied 5th	24
	6	Lower	2	L1	L4	0:27	0:09	M8 (R)		30
4	7	Upper	1	W4	W3	0:15	0:21	M10 (R)	M9 (R)	36
	8	Lower	2	W5	W6	0:15	0:09	M9 (B)	4th	42
15-minute break			Judges' Choice* (1), Design Award (2, 1), Reach Award (2, 1)							45
5	9	Lower	1	W8	L7	0:15	0:21	M10 (B)	3rd	60
15-minute break			Control Award (2, 1), Innovate Award (2, 1), Sustain Award (2,1)							63
Finals	10		1	W9	W7	0:15	0:39	M11*	M11*	78
15-minute break			Connect Award (2, 1), Think Award (2, 1)							81
Finals*	11		1	W9	W7	0:15	0:15			96
Awards: Compass*, Finalists, Winners, and Inspire Award (3, 2, 1)										99

* if required

**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

13.7.6 8-ALLIANCE Bracket and Typical Timing

Figure 13-6: 8-ALLIANCE playoff bracket

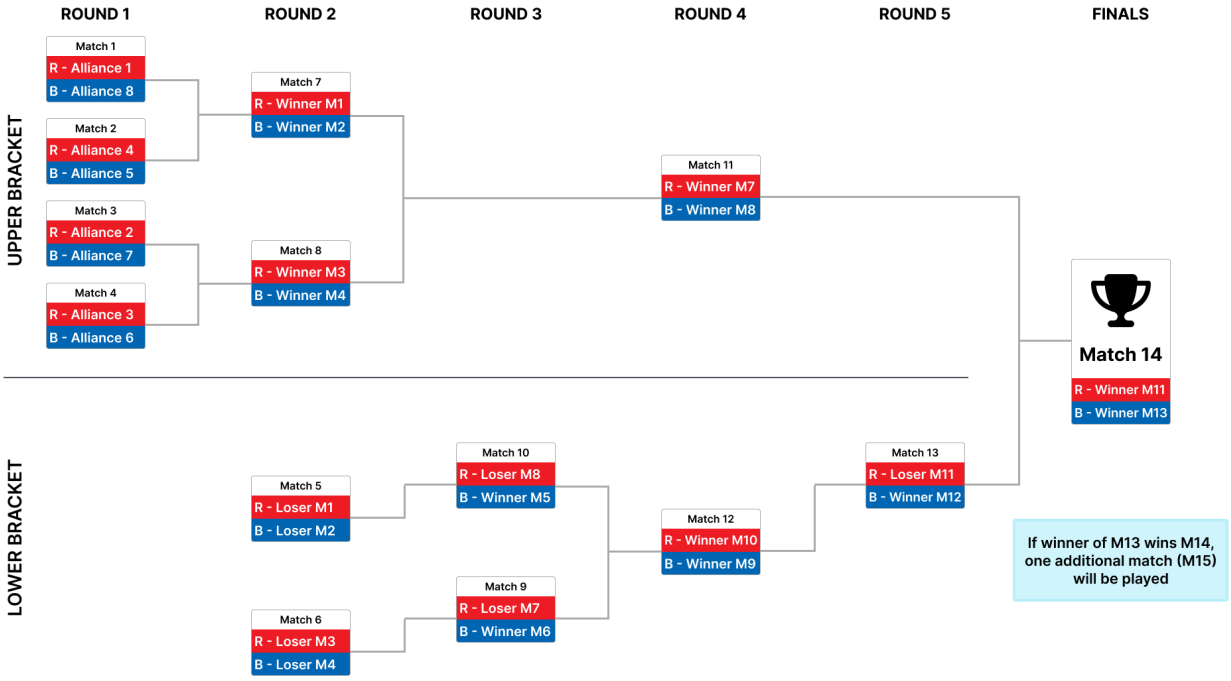


Table 13-6: 8-ALLIANCE playoff bracket typical timing

Round	MATCH	Upper/ Lower	FIELD	Blue	Red	Gap (min) Blue	Gap (min) Red	Next MATCH (MATCH # (ALLIANCE color)) Winner	Next MATCH (MATCH # (ALLIANCE color)) Loser	Estimated Start (min)
1	1	Upper	1	A8	A1			M7 (R)	M5 (R)	0
	2	Upper	2	A5	A4			M7 (B)	M5 (B)	6
	3	Upper	1	A7	A2			M8 (R)	M6 (R)	12
	4	Upper	2	A6	A3			M8 (B)	M6 (B)	18
2	5	Lower	1	L2	L1	0:15	0:21	M10 (B)	Tied 7th	24
	6	Lower	2	L4	L3	0:09	0:15	M9 (B)		30
	7	Upper	1	W2	W1	0:27	0:33	M11 (R)	M9 (R)	36
	8	Upper	2	W4	W3	0:21	0:27	M11 (B)	M10 (R)	42
3	9	Lower	1	W6	L7	0:15	0:09	M12 (B)	Tied 5th	48
	10	Lower	2	W5	L8	0:27	0:09	M12 (R)		54
4	11	Upper	1	W8	W7	0:15	0:21	M14 (R)	M13 (R)	60
	12	Lower	2	W9	W10	0:15	0:09	M13 (B)	4th	66
15-minute break			Judges' Choice* (1), Design Award (3,2,1), Reach Award (3,2,1)							69
5	13	Lower	1	W12	L11	0:15	0:21	M14 (B)	3rd	84
15-minute break			Control Award (3,2,1), Innovate Award (3,2,1), Sustain Award (3,2,1)							87
Finals	14		1	W13	W11	0:15	0:39	M15*	M15*	102
15-minute break			Connect Award (3,2,1), Think Award (3,2,1)							105
Finals*	15		1	W13	W11	0:15	0:15			120
Awards: Compass*, Finalists, Winners, and Inspire Award (3, 2, 1)										123

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

13.8 Dual Division Events

Dual Division events are typically larger events which run as 2 different competition events (e.g., 2 parallel Qualifying Tournaments each with a minimum of 2 FIELDS each) with concurrent judging for all teams. After the Playoff MATCHES have concluded in each division, the 2 division winning ALLIANCES compete to determine the overall event winner.

Advancement from a Dual Division event is defined in Section 13.8.1 Dual Division Advancement Points.

In Dual Division events, teams can be assigned to division in a few different methods briefly described below. For complete details, reference the event management software documentation. The method used is at the discretion of the local Program Delivery Partner.

A. **Random Assignment** – Random division assignment takes the team list, shuffles it, and splits the list in half. If equal division sizes cannot be made, the software randomly chooses which division will have an extra team.
B. **FIM Method** – Algorithm is based on the process developed by *FIRST* in Michigan (FIM) and utilizes a ”brute force randomizer” approach. It attempts to balance ROBOT performance while maintaining a decent factor of randomness. Teams are ranked based on a qualification performance metric based on the two best events and then assigned to quartiles and distributed between divisions such that each quartile is equally represented. Division assignments are measured against several metrics to ensure divisions are closely matched.
C. **Alternating Assignment** – Alternating division assignment sorts the team list by team number, then assigns teams by alternating divisions while iterating through the team list. The lowest team number will be assigned Division 1, the next Division 2, then Division 1, etc.
D. **Child League Split-up** (only available for League Tournaments) – Algorithm attempts to balance the representation of each child league in each division.
E. **OPR Method** – Algorithm attempts to balance the ROBOT performance across the division. It calculates every team’s Offensive Power Rating (OPR) for every official event they competed in for the current season and selects each team’s highest OPR. Then it ranks all the teams by highest OPR and alternately assigns teams from highest to lowest OPR into each division.
F. **Manual** – The Program Delivery Partner can upload a list of manually assigned teams.

In addition to rules listed in previous manual sections, Dual Division events have the following rules:

T801 ***Divisions will use the same size playoff brackets.** The number of playoff ALLIANCES will be determined based on the number of playoff eligible teams in the smaller division as shown in Table 13-2.

T802 ***Dual Division awards are given at the event level.** All awards are judged and awarded at the tournament level, not the division level.

T803 ***Dual Division award counts are based on total teams.** The number of awards distributed at a Dual Division event is determined using Table 6-1.

13.8.1 Dual Division Advancement Points

For Dual Division events, advancement points are calculated per Table 4-1 except for playoff advancement points which are instead calculated as described in Table 13-7 below.

Table 13-7: Dual Division Playoff Advancement Points

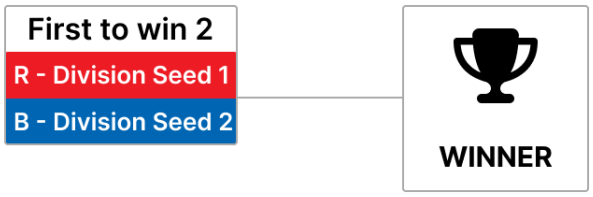
Category	Advancement Points Earned
Playoff Advancement	40 points for 1st Place (Winners) 20 points for 2nd Place (Finalists) 10 points for all Division Finalists 5 points for all Division 3rd Places

13.8.2 Dual Division Playoffs

Each division plays a standard tournament as described in Section 13.6 Qualification MATCHES followed by Divisional Playoffs to produce the Division Winning ALLIANCE. Those 2 Division Winning ALLIANCES have their win-loss records reset and proceed to play each other in a 2-ALLIANCE double eliminations bracket.

Divisions are ranked by the criteria in Table 13-1, excluding RANKING SCORE.

Figure 13-7: 2-ALLIANCE grand finals playoff bracket (Dual Division)



Dual division events will play divisional playoff brackets and then the two ALLIANCES will play as shown in Figure 13-7. The first to win 2 MATCHES will be the event winning ALLIANCE. An example of Dual Division Playoff Timing is shown in Table 13-8.

Table 13-8: 6-ALLIANCE Dual Division playoff bracket typical timing

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	**MATCH**	**Upper/ Lower**	**FIELD**	**Blue**	**Red**	**Blue**	**Red**	**Winner**	**Loser**	**Estimated Start (min)**
1	1	Upper	1	A5	A4			M3 (B)	M6 (B)	0
	2	Upper	2	A6	A3			M4 (B)	M5 (B)	6
2	3	Upper	1	W1	A1	0:09		M7 (R)	M5 (R)	12
	4	Upper	2	W2	A2	0:09		M7 (B)	M6 (R)	18
3	5	Lower	1	L2	L3	0:15	0:09	M8 (B)	Tied 5th	24
	6	Lower	2	L1	L4	0:27	0:09	M8 (R)		30
4	7	Upper	1	W4	W3	0:15	0:21	M10 (R)	M9 (R)	36
	8	Lower	2	W5	W6	0:15	0:09	M9 (B)	4th	42
15-minute break										45
5	9	Lower	1	W8	L7	0:08	0:14	M10 (B)	3rd	60
15-minute break										63
Finals	10		1	W9	W7	0:08	0:25	M11*	M11*	78
15-minute break										81
Finals*	11		1	W9	W7	0:08	0:08	F1		96
End of Divisional Playoffs/ Judges Choice*(1), Design Award, (3, 2, 1), Reach Award (3, 2, 1)										99
Event Finals 1	F1		1	DivA	DivB	0:15	0:15	F2	F2	114
15-minute break	Control Award (3, 2, 1), Innovate Award (3, 2, 1), Sustain Award (3, 2, 1)									117
Event Finals 2	F2		1	DivA	DivB	0:08	0:08	F3*	F3*	132
15-minute break	Connect Award (3, 2, 1), Think Award (3, 2, 1)									135
Event Finals 3*	F3*		1	DivA	DivB	0:08	0:08			150
Awards: Compass*, Div. Finalists, Division Winners, Event Finalist, Event Winners and Inspire Award (3, 2, 1)										153

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

14 League Play Tournaments (L)

Not all regions offer participation in League play. Leagues are closed groups of teams which play in multiple different League Meet events typically spread over several weeks or months. All the teams in the same League should have the opportunity to play in a roughly equal number of MATCHES. A minimum of 10 League Meet MATCHES should be played by all teams in the League.

League Meet events each play between 5 and 6 Qualification MATCHES per team as described in Section 13.6 Qualification MATCHES but do not include Playoff MATCHES or judging for awards.

In addition to the behavior described in Section 10.6.1 YELLOW and RED CARDS, VERBAL WARNINGS, and CARDS also clear at the end of each League Meet event.

Teams may belong to only 1 League per season and can participate in only 1 League Tournament per season. A team can participate in a League outside their region, provided that is the only league they participate in. A team may not advance from a League Tournament to a Regional Championship that is outside of their region unless the Program Delivery Partners in both regions have agreed to move a team to a new region for the entire season.

League Tournaments function the same as a Qualifying Tournament including judging and advancement except that qualification rankings as described in Section 13.6 Qualification MATCHES, used for both ALLIANCE Selection and Qualification Round Performance Points, are calculated with the addition of each team's top 10 MATCHES played at any League Meet and the MATCHES played at the League Tournament. Top MATCHES are defined by the sort order in Table 13-1.

Teams that played fewer than 10 MATCHES at League Meets will have RANKING POINTS, MATCH Points, and all scoring criteria, that are effectively 0 for the missing MATCHES.

League Tournament advancement (Table 4-1) is calculated only using team performance at the League Tournament except for the Qualification Round Performance which is based on the League Tournament Ranking which include the top 10 League Meet MATCHES as described above.



15 *FIRST* Championship (C)

At the 2026-2027 *FIRST* Championship, teams are split into 6 divisions. Each division plays a standard tournament as described in Section 13.6 Qualification MATCHES and Section 13.7 Playoff MATCHES to produce the Division Winning ALLIANCES. Those 6 Division Winning ALLIANCES proceed to the Championship Playoffs, on the *FIRST* Championship FIELD(s), to determine the *FIRST* Tech Challenge Championship Winners, per 15.5 FIRST Championship .

15.1 Awards Modifications

The Judging process may be modified for the *FIRST* Championship to accommodate for venue limitations and the large number of teams at the event. Any process or awards modifications will be published in or before the last regularly scheduled Team Update as described in Section 1.7.3 Team Updates.

Awards from Section 6 Awards (A) are all awarded in each division only, except for as shown in Table 15-1.

Table 15-1: FIRST Championship Awards

Award	Per Division	*FIRST* Championship
Inspire Award	1st, 2nd and 3rd Place	1st Place
***FIRST* Leadership List**	0	10
Compass Award	0	1

15.2 Game Modification

The number, type, and distribution of SCORING ELEMENTS and scoring achievement (RP) thresholds may be adjusted for the *FIRST* Championship BIOBUZZ tournament. Any game modifications will be published in or before the last regularly scheduled Team Update, as described in Section 1.7.3 Team Updates.

All division FIELDS will be placed on risers which are elevated approximately 24 in. (60.95 cm) from the floor. All DRIVE TEAM members and FIELD STAFF will be at floor level. A portion of the practice FIELDS will also be elevated for teams to use. To see examples of how the elevated FIELD looks, please watch the FIELD tour video from Kickoff.

All division FIELD Perimeters will be anchored in place and will not include the AndyMark Perimeter Straps.

Some or all division FIELDS may also have additional modifications which change their appearance, including different or additional decals, metal coatings, material changes, and lights. Every effort will be made to ensure these modifications are exclusively aesthetic in nature and will not affect the performance of the FIELD or impact ROBOT designs. The details of these modifications will be published in or before the last regularly scheduled Team Update as described in Section 1.7.3 Team Updates.

15.3 3-ROBOT ALLIANCES

ALLIANCES at the *FIRST* Championship will be made up of 3 ROBOTS. Before each division playoff tournament, ALLIANCES are selected per the process as described in Section 13.7.1 ALLIANCE Selection Process; however, the process continues with a 2nd round of selection as follows:

Round 2: The same method is used for each ALLIANCE lead's second choice except the selection order is reversed, with ALLIANCE 8 picking first and ALLIANCE 1 picking last. This process results in 8 ALLIANCES of 3 teams each.

ALLIANCES may start each of their MATCHES with any 2 of the 3 ROBOTS on their ALLIANCE during Division and Championship Playoff MATCHES. ALLIANCES do not need to inform FIELD STAFF of which 2 ROBOTS will play ahead of the MATCH but must not delay the start of the MATCH per G301 by making a late decision.

> For example, an ALLIANCE deciding a different set of 2 ROBOTS will be playing in the MATCH after 2 ROBOTS have left queuing is likely a delay of MATCH.

C301 ***Replays use the same ROBOTS.** If a Playoff MATCH must be replayed, the 2 ROBOTS used in the replay must be the same as in the original MATCH. The sole exception is: if, in the opinion of the Head REFEREE, the ARENA FAULT rendered a ROBOT inoperable, in which case the ROBOTS can be changed. If an additional MATCH is played due to a tie, any 2 of the 3 ROBOTS may be played in the additional MATCH.

> *FIRST* Tech Challenge teams play significantly more MATCHES at the *FIRST* Championship than they do at most events, and there are significantly more teams at the event. Drafting a 3rd ROBOT provides each ALLIANCE with a built-in backup ROBOT and flexibility to draft for different MATCH strategies in mind.

15.4 *FIRST* Championship Pit Crews

Each team on an ALLIANCE playing in the *FIRST* Championship Playoffs may have an additional 3 pit crew team members inside the ARENA to assist with pre-MATCH strategy, ROBOT repair and maintenance, and other team support functions per T704. Additional pit crew members must stay in the pit areas of the ARENA.

The additional team members may be adults or STUDENTS.

15.5 *FIRST* Championship Playoffs

> More information about the *FIRST Championship playoff tournament structure will be released as part of a future Team Update.*



16 Glossary

The following definitions and terms are used for the *FIRST* Tech Challenge game BIOBUZZ. Defined terms are in ALL CAPITAL LETTERS throughout the manual (for example, ALLIANCE). Competition rules mean what they plainly say. If a word is not given a game definition, then you should use its common conversational meaning.

Term	Definition
ALLIANCE	a cooperative of 2 *FIRST* Tech Challenge teams
ALLIANCE AREA	an approximately 97 in. (246.40 cm) wide by 54 in. (137.15 cm) deep by infinitely tall volume formed by placing ALLIANCE colored tape onto the flooring surface outside of the FIELD
ALLIANCE CAPTAIN	the designated STUDENT representative from each ALLIANCE lead
ARENA	includes all elements of the game infrastructure that are required to play this season's FTC game including: the FIELD, SCORING ELEMENTS, queue area, team media area, and all equipment needed for FIELD control, ROBOT control, and scorekeeping
ARENA FAULT	an error in ARENA operation
AUTO	the first 30 seconds of the MATCH, during which DRIVERS may not provide input to their ROBOTS, so ROBOTS operate with only their pre-programmed instructions
CELL	a three-dimensional structure that can hold NECTAR and POLLEN
CHASSIS	ROBOT'S MAJOR MECHANISM that enables it to move around a FIELD
COMPONENT	any part in its most basic configuration, which cannot be disassembled without damaging or destroying the part or altering its fundamental function
CONTINUOUS	describes durations that are more than approximately 10 seconds
CONTROL	an action by a ROBOT in which the SCORING ELEMENT is fully supported by or stuck in, on, or under the ROBOT or it intentionally pushes a SCORING ELEMENT to a desired location or in a preferred direction (i.e., herding). CONTROL requires contact with a ROBOT, either directly or transitively through other SCORING ELEMENTS. Typically, CONTROL requires one of the following to be true: A. The SCORING ELEMENT is fully supported by the ROBOT B. The ROBOT is moving the SCORING ELEMENT in a preferred direction with a flat or concave face of the ROBOT
COTS	a standard (i.e., not custom order) part commonly available from a VENDOR for all teams for purchase

CUSTOM CIRCUIT	any active electrical item that is not an actuator (specified in R501) or power regulation device (specified in R505)
DISABLED	The REFEREE instructs the team to stop the ROBOT which will deactivate all outputs, rendering the ROBOT inoperable for the remainder of the MATCH
DISQUALIFIED	the state of a team in which they receive 0 MATCH points and 0 RANKING POINTS in a Qualification MATCH or causes their ALLIANCE to receive 0 MATCH points in a Playoff MATCH
DRIVE COACH	a guide or advisor
DRIVE TEAM	a set of up to 4 people from the same *FIRST* Tech Challenge team responsible for team performance for a specific MATCH
DRIVER	an operator and controller of the ROBOT
DRIVER STATION	Android device (smartphone or REV Driver Hub) that runs the DRIVER STATION App software to communicate with a ROBOT per R901
FABRICATED ITEM	any COMPONENT or MECHANISM that has been altered, built, cast, constructed, concocted, created, cut, heat treated, machined, manufactured, modified, painted, produced, surface coated, or conjured partially or completely into the final form in which it will be used on the ROBOT
FIELD	an approximately 144 in. by 144 in. (365.75 cm by 365.75 cm) area bounded by the inside surface of the walls
FIELD STAFF	volunteers present in and around the ARENA that are responsible for making sure the MATCHES are cycled through efficiently, fairly, safely, and with a spirit of cooperation, *Gracious Professionalism*®, and generosity of spirit
FLOWER	a structure on the FIELD in which POLLEN and NECTAR can be placed into the top, and POLLEN can be removed from the bottom
FTA	*FIRST* Technical Advisor
GARDEN	an approximately 23 in. (58.40 cm) by 2 in. (5.10 cm) wide and infinitely tall volume defined by the outside edge of blue or red tape in opposite corners of the FIELD
HIVE	a bi-stable structure made up of two CELLS and a connecting assembly that rotates on a pivot
HOME REGION	the region in which a team is assigned and in which they are only eligible to advance from events within
HUMAN PLAYER	a SCORING ELEMENT manager

INSPECTOR	a person determined by *FIRST* to accurately and efficiently assess the legality of a given part or the whole of a ROBOT, an event volunteer role
JUDGE	volunteers who determine the teams that receive awards at events
LAUNCH/LAUNCHING	an action by a ROBOT in which the SCORING ELEMENT is shot into the air, propelled across the floor to a desired location or in a preferred direction, or thrown in a forceful way
LEAVE	a scoring achievement in which a ROBOT must move so that it is no longer contacting the perimeter wall
LOADING ZONE	an approximately 23 in. (58.40 cm) wide by 11 in. (27.95 cm) deep infinitely tall volume bounded by red or blue tape and the adjoining FIELD perimeters
LRI	Lead ROBOT INSPECTOR
MAJOR FOUL	a credit of 20 points towards the opponent's MATCH point total
MAJOR MECHANISM	a group of COMPONENTS and/or MECHANISMS assembled together to address at least 1 game challenge: ROBOT movement, SCORING ELEMENT manipulation, FIELD element manipulation, or performance of a scorable task without the assistance of another ROBOT
MATCH	a 30-second AUTO period, an 8-second transition period between AUTO and TELEOP, and a 2-minute TELEOP period in which the ROBOT plays the current season game
MECHANISM	an assembly of COMPONENTS that provide specific functionality on the ROBOT. A MECHANISM can be disassembled (and then reassembled) into individual COMPONENTS without damage to the parts.
MINOR FOUL	a credit of 5 points towards the opponent's MATCH point total
MOMENTARY	describes durations that are fewer than approximately 3 seconds
NECTAR	approximately 3.6 in. (9.1 cm) Gopher ResisDent™ polyethylene balls
OPERATOR CONSOLE	the set of COMPONENTS and MECHANISMS used by the DRIVE TEAM to relay commands to the ROBOT
PARK	a scoring achievement in which a ROBOT must move so that it is at least partially in the LOADING ZONE
PIN/PINNING	an action by a ROBOT that is preventing the movement of an opponent ROBOT by contact, either direct or transitive (such as against a FIELD element)
POLLEN	2.8 in. (7.1 cm) Gopher ResisDent™ polyethylene balls in yellow

POLLINATOR 1 RP	an RP earned when the number of TIPS at or above threshold
POLLINATOR 2 RP	an RP earned when the number of TIPS at or above threshold
PORTFOLIO	a document used as part of the judging process with requirements outlined in A201
RANKING POINTS (RP)	credited to a team based on their ALLIANCE'S performance in Qualification MATCHES
RANKING SCORE (RS)	the average number of RANKING POINTS earned by a team throughout their Qualification MATCHES
RED CARD	a penalty issued by the Head REFEREE for egregious ROBOT or team member behavior or rule violations which results in a team being DISQUALIFIED for the MATCH.
REFEREE	an official who is certified by *FIRST* to enforce the rules of the current season's game, an event volunteer role
REPEATED	describes actions that happen more than once within a MATCH
ROBOT	an electromechanical assembly built by a *FIRST* Tech Challenge team to play the current season's game and includes all the basic systems required to be an active participant in the game –power, communications, control, and movement about the FIELD
ROBOT CONTROLLER	Android device (a REV Control Hub (REV-31-1595) or a smartphone Android device connected to a REV Expansion Hub (REV-31-1153)) that runs the ROBOT CONTROLLER app to control the ROBOT as defined in R701
ROBOT SIGN	a required assembly which attaches to the ROBOT and simultaneously identifies a ROBOT'S team number as well as its ALLIANCE affiliation
SCORING ELEMENT	SCORING ELEMENTS for BIOBUZZ are POLLEN and NECTAR
STRATEGIC	describes actions done with the aim of gaining a competitive advantage
STARTING CONFIGURATION	the physical configuration in which a ROBOT starts a MATCH
STUDENT	a person who has not completed high-school, secondary school, or the comparable level in their HOME REGION as of September 1st
SURROGATE	a team randomly assigned by event management software to play an extra Qualification MATCH
SWARM RP	an RP earned when the combined LEAVE + PARK points earned at or above threshold

TELEOP	third period of each MATCH is 2 minutes (2:00) long and called the teleoperated period (TELEOP). During TELEOP, DRIVERS remotely operate ROBOTS
TILE	flooring surface of the FIELD is made of 36 interlocking soft foam TILES
TIP/TIPPED	a scoring criteria in which the HIVE moves from one stable state to the other stable state with the downwards-facing CELL becoming the upwards-facing CELL and the damper on the HIVE that was previously not contacting the frame begins to contact the frame
VENDOR	a legitimate business source for COTS items that satisfies criteria defined in Section 12 ROBOT Construction Rules (R)
VERBAL WARNING	a warning issued by event staff or the Head REFEREE
YELLOW CARD	a warning issued by the Head REFEREE for egregious ROBOT or team member behavior or rule violations