



Training and
Support

2018-2019 *FIRST*[®] Tech Challenge Wi-Fi Technical Advisor Manual

ROVER RUCKUS



Presented By **Qualcomm**

www.firstinspires.org

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FOR INSPIRATION & RECOGNITION OF SCIENCE & TECHNOLOGY

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Volunteer Thank You

Thank you for taking the time to volunteer for a *FIRST*® Tech Challenge event. *FIRST*® and *FIRST*® Tech Challenge rely heavily on volunteers to ensure events run smoothly and are a fun experience for teams and their families, which could not happen without people like you. With over 5,500 teams competing yearly, your dedication and commitment are essential to the success of each event and the *FIRST* Tech Challenge program. Thank you for your time and effort in supporting the mission of *FIRST*!

Revision History		
Revision	Date	Description
1	08/1/2018	Initial release
1.1	11/12/18	<ul style="list-style-type: none"> Added revision history and date Appendix A – Update to on call event support line to include scoring system support

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Introduction

What is FIRST® Tech Challenge?

FIRST® Tech Challenge is a student-centered program that focuses on giving students a unique and stimulating experience. Each year, teams engage in a new game where they design, build, test, and program autonomous and driver operated robots that must perform a series of tasks. To learn more about FIRST® Tech Challenge and other FIRST® Programs, visit www.firstinspires.org.

FIRST Core Values

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

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

Gracious Professionalism®

FIRST® uses this term to describe our programs' intent and *Gracious Professionalism®* is not clearly defined for a reason. It has different meanings to everyone. Some possible meanings of *Gracious Professionalism* include:

- Gracious attitudes and behaviors are win-win.
- Gracious folks respect others and let that respect show in their actions.
- Gracious Professionals make valued contributions in a way that is pleasing to others and to themselves.

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

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

Gracious Professionalism for Volunteers

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

FIRST Volunteer Rights and Responsibilities

NOTICE OF NON-DISCRIMINATION

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

Keep updated at: <http://www.firstinspires.org/about/legal-notice>

Volunteer Rights and Responsibilities

Volunteers are the most valuable asset to FIRST®. Your selfless contribution of time and resources are instrumental in accomplishing our mission of inspiring the next generation of science, technology, engineering, and mathematics leaders and innovators. The foundation of the relationship between FIRST and our volunteers is respect.

It is your right to:

- Be treated with *Gracious Professionalism*®. *Gracious Professionalism* is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.
- Feel valued. FIRST recognizes the significant efforts that volunteers contribute. The time that you donate not only helps FIRST succeed but also builds the FIRST community.
- Understand your role. FIRST will inform you about what's expected of you, your schedule, any meals you will be provided, any changes to program or policy, and who to contact should you need assistance.
- Expect a safe environment. FIRST strives to create and maintain a safe environment for all volunteers and participants and will always factor safety into program planning.
- Receive fair treatment and inclusion. All volunteers will be treated with respect and dignity in inclusive environments. FIRST does not discriminate on the basis of race, color, national origin, sex, disability, age, status as a veteran who served in the military, religion, sexuality, gender, gender identity, or gender expression in its programs and activities.
- Reevaluate your time commitment. FIRST appreciates all of our volunteers and understands that volunteers experience life situations that may affect their commitment.
- Communicate with your Volunteer Coordinator or your local FIRST leadership about:
 - Concerns or limitations that are affecting your volunteer role.
 - Any mistreatment towards you or others. You may be required to fill out a [non-medical incident form](#).
 - Contact FIRST Headquarters directly if you feel that you are being treated improperly and attempts to resolve issues and conflicts at the local level are not successful. Volunteers can call (800) 871-8326 or email volunteer@firstinspires.org.

It is your responsibility to:

- Treat others with *Gracious Professionalism*®.
- Follow the schedule and the role description provided for your position. Contact your local FIRST leadership if there are any issues.
- Respect others, treat them fairly and kindly. Be inclusive and follow the non-discrimination policy of FIRST.
- Follow safety rules and ensure safety of others. Adhere to all [FIRST Youth Protection Program \(YPP\) policies](#). Report any injuries or safety concerns within 48 hours.
- Adhere to the [FIRST Code of Conduct](#).
- Have FUN!

Tournament Organization Structure

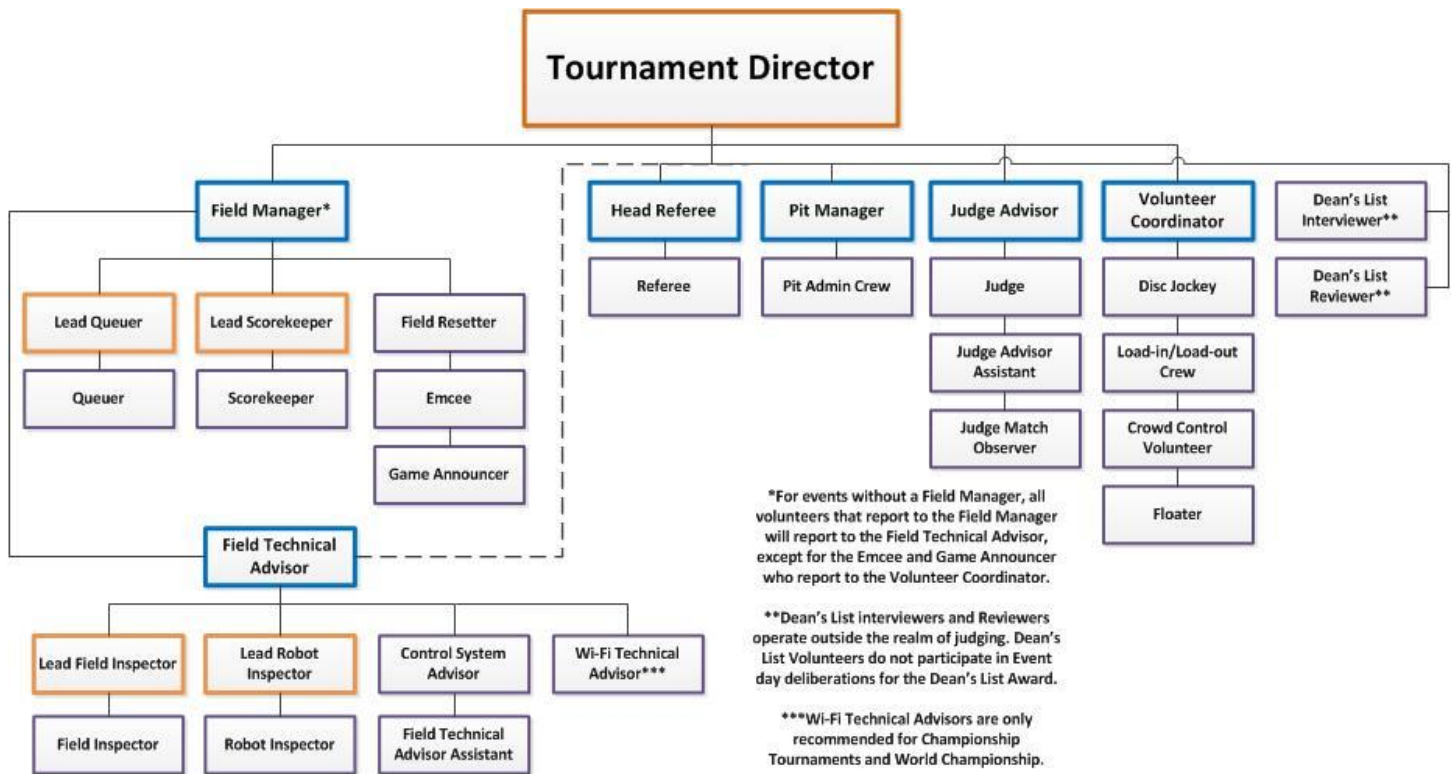


Figure 1 - League Championship, Qualifying Tournament, Championship Tournament Organization

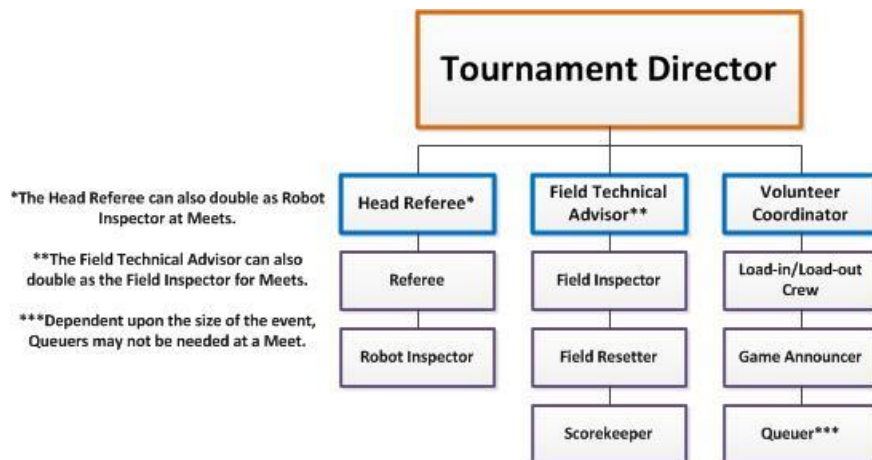


Figure 2 - League Meet Organization

Learn more about the roles of volunteers on our [Volunteer Resources page](#), "Volunteer Role Description".

Job Description

Introduction

The Wi-Fi Technical Advisor (WTA) is a volunteer who helps a Tournament Director plan for large *FIRST* Tech Challenge events. The WTA is also responsible for monitoring the wireless spectrum and troubleshooting wireless issues at large and/or critical *FIRST* Tech Challenge events. This position requires a high level of technical knowledge and interpersonal skills, and can affect the quality of the event.

Not every *FIRST* Tech Challenge event will require a WTA. Most smaller events (less than 40 robots) do not require the skills of a WTA. However, events with many robots (greater than 40 robots), or events that have difficult wireless conditions or where malicious wireless activity might occur would benefit from having a designated WTA available.

- **Physical/Technical Requirements:**
 - Technical – High
 - Physical – Low
 - Administrative – Medium
 - Communication – High
- **Time commitment:**
 - Training – Approximately four to six hours
 - Event Day – Approximately eight hours
- **Proper Dress:**
 - Wear comfortable shoes, closed-toe and closed-back shoes, most of the day will be spent standing and walking between the pit area and the competition fields.
 - ANSI Z87.1 certified safety glasses are required in the competition area.



Volunteer Training and Certification

Volunteers must apply to their role using the [Volunteer Registration System](#). After the volunteer has applied to their role, *FIRST* Tech Challenge will send an email to the volunteer with access instructions to training and certifications (if applicable). Emails with access to the training and certifications will be sent within one business day from applying to the role. If you have applied for a role but have not received access to the training, please email FTCTrainingSupport@firstinspires.org.

The Wireless Technical Advisor should read this manual before the event. She/he should speak to the Tournament Director or Affiliate Partner to check for additional requirements, such as meetings before the event. The estimated training time is four to six hours.

Wi-Fi Technical Advisor Selection

The Wi-Fi Technical Advisor (WTA) role is a very specialized and highly skilled position. Currently the *FIRST* Tech Challenge does not have certification process for this specific role since there are only a few events per season, which require a WTA. The Tournament Director, with assistance from *FIRST* can help identify potential candidates for the role of WTA.

Volunteer Minimum Age Requirement

FIRST requires that FIRST event volunteers be at least 13 years old, however, the Regional Planning Committee can increase the age requirement as needed. Adult volunteers cannot have children with them while volunteering nor be responsible for supervising children at the event. Children under the minimum age are welcome at FIRST competitions with suitable supervision by someone other than a volunteer.

WTA and CSA Minimum Age Requirement

The minimum age allowed for Control System Advisors (CSA) and Wireless Technical Advisors (WTA) is 18.

Bring a Friend!

Volunteers are a huge part of the FIRST Tech Challenge Program and continuing to inspire students to seek out careers in science, technology, engineering, and math (STEM). FIRST Tech Challenge needs your help in recruiting new volunteers to keep our programs thriving for future generations! If you have a friend or co-worker you think would be interested in volunteering at an event, there are just a few easy steps to help get them involved!

1. Check out our full list of [volunteer opportunities](#) online!
2. Have them apply for the event in the [Volunteer Registration System](#). Volunteers must be screened before volunteering.
3. Have them contact FTCTeams@firstinspires.org with any questions they may have.

If they are concerned about jumping in head first, no worries! Job shadowing at a FIRST Tech Challenge event is a great way to get a taste of what a full day's worth of competition looks like. New volunteers can discover ways they can fit their personal skills into a volunteer position!

Overview of Responsibilities

The Wi-Fi Technical Advisor is the technical volunteer who helps ensure that the wireless environment at a FIRST Tech Challenge event is clean and not too noisy in order to ensure that teams are able to compete effectively.

Before an event, the WTA might be asked to conduct a wireless network survey to determine if there are potential sources of wireless interference in the venue. The WTA might also be asked to work with the venue's IT staff to make any appropriate changes to the wireless equipment in the venue to ensure a clean environment for the scheduled event.

During an event, the WTA will be responsible for monitoring wireless activity near the competition field to identify and resolve any wireless issues. The WTA might also need to "police" the wireless environment and look for clues for potential malicious activity during an event.

The WTA might be asked to assist the Field Technical Advisor (FTA) and/or Control System Advisor (CSA) to answer questions that they might have about the wireless environment.

The WTA requires advanced and very specialized skills:

- Experience with Wi-Fi and Wi-Fi Direct networking;
- Experience using tools such as Wireshark, Fluke (NETSCOUT) AirCheck Meter, Aircrack-ng, AirTight Networks SpectraGuard and MetaGeek inSSIDer.
- Recent and in-depth knowledge of the FTC Android-based control system and diagnostic tools;
- Experience/familiarity with computers running the Windows® 7/8/10, Mac OSX, and Linux operating systems;
- Able to use deductive reasoning to solve technical problems.

Pre-Event Day Responsibilities

It is important that prior to the event, the Wi-Fi Technical Advisor (WTA) reviews this WTA Manual, and reads the supporting documents listed in the checklist below. These training materials will help WTAs learn how to provide effective Wi-Fi monitoring and technical assistance for the event. Learning ahead of time will go a long way towards keeping the event running smoothly and on time.

The document names that are underlined are hyperlinks to public documents on the *FIRST* Tech Challenge website. The remaining documents are stored in the Schoology learning management system.

Outlined below are responsibilities that a Wi-Fi Technical Advisor has before event day. Make sure to check with the Tournament Director to see if they need help setting up before the event.

- Print this Manual. Read it thoroughly. Complete all the checklists. Bring it to the competition for the technical element references it provides.
- Read the [Control System Troubleshooting Guide](#), which explains how to troubleshoot common problems with the *FIRST* Tech Challenge Android-based control system. Print this document and bring it to the competition for the technical element references it provides.
- Read the [FIRST Tech Challenge Wi-Fi Event Guide](#).
- Read and complete the [FIRST Tech Challenge Wi-Fi Event Checklist](#).
- Watch the [FIRST Tech Challenge Game Animation/Video](#). Focus on understanding what the teams are trying to accomplish during a match and the names of the playing field elements.
- Download the [Game Manual Part 1](#) and read *Section 4, The Tournament* and become familiar with the tournament terminology and structure.
 - It might also be beneficial to read *Section 8* for the robot construction rules and the [Game Manual Part 2](#) to learn the game rules, though this is not required.
- Verify with the Tournament Director that a table, chair, and power drop are available in the competition area for you to set up your Wi-Fi monitoring equipment.
- The Android-based robot control system does not require any centralized control infrastructure. Teams will bring their own driver stations and robot controllers to the event. However, the WTA should do a wireless survey and conduct some wireless tests a week or more before event day. This helps to avoid troubleshooting wireless issues immediately before an event. Feel free to contact the [on-call Technical support](#) person if there are any problems with the setup or the wireless spectrum on event day. The *FIRST* Tech Challenge Affiliate Partner or the Tournament Director will have the telephone number for the on-call Technical expert which also appears at the end of this document.
- **Prior to every event**, Read the frequently updated Wi-Fi Tech Advisor Discussion Forum located in [Schoology](#) in the Wi-Fi Technical Advisor folder. This is a discussion forum where volunteers can ask questions, or share tips and best practices with one another. *FIRST* staff will respond to posts and share tips and important technical information in this forum.
- Prior to event day, the WTA should conduct a wireless survey of the venue to make sure the wireless environment is clear and that there are no Wi-Fi suppressors operating in the venue. The FTA will perform this task if a WTA or CSA is not available. Coordinate this activity and share the results with the Tournament Director and the Field Technical Advisor. The WTA can use one or more pairs of Android devices to measure the ping time in different areas of the venue and on different Wi-Fi channels of the spectrum. If available, use a tool (such as the Fluke or NETSCOUT AirCheck meter) to measure Wi-Fi and non-Wi-Fi activity in different areas of the venue. If necessary, the WTA should coordinate with local IT staff at the venue in order to turn

off any Wi-Fi signals which could be detrimental to the event, particularly for events involving 40 or more robots.

- Select preliminary Wi-Fi channels for the Wi-Fi direct robot communications and any other Wi-Fi access points needed to run the event based on the Wi-Fi site survey of the venue. Share the channel recommendations with the Tournament Director and the FTA.

Event Day Responsibilities

Tournament Set-Up Day for the Wi-Fi Technical Advisor (WTA)

- Dress for the day includes safety glasses or side shields on shatterproof prescription eyeglasses. These are required around the competition playing fields and in the pit areas, along with comfortable clothing that will allow you to move easily and closed-toed and closed-back shoes that will not harm the foam playing field floor covering.
- Tournament set-up generally occurs on the day before the competition. Setting up the competition area and testing the wireless environment normally takes two to three hours for a single field event and three to four hours for a two-field event, although those times will decrease with experience. The WTA will survey the wireless environment in the competition area and practice area. It is helpful to have a pair of Android devices running the *FIRST* Tech Challenge apps (FTC Driver Station and FTC Robot Controller) to test the wireless environment on the field.
- Select the Wi-Fi channels for the competition and share the recommendation with the Tournament Director and FTA.
- Be sure to have all passwords of the computers or devices being used, if applicable.

Event Day for the Wi-Fi Technical Advisor (WTA)

- Arrive early; the WTA should be one of the first volunteers to arrive on event day.
- Verify that the reserved wireless channels for the competition are clear and that low ping times are observed for a test robot controller-driver station (RC-DS) pair operating on these channels.
- The remainder of the day will be spent monitoring the wireless environment at the competition field. The WTA should monitor the spectrum to make sure the Wi-Fi channels that are designated for robot control are clear and not overloaded. The WTA should also monitor the spectrum to look for clues of potential malicious activity. Report issues of concern to the FTA.
- The WTA should remember that their primary focus is to ensure that teams are able to control their robots over the Wi-Fi spectrum without interference. As such when dealing with potential interference (such as a spectator running a portable hotspot) it is better to communicate that goal instead of acting like an enforcer. In this manner, it turns the spectators into assistants in keeping the spectrum clean instead of creating an adversarial situation.
- The WTA may also monitor which channels teams are on and help guide teams to the designated channels.
- The WTA might also be required to help the FTA and/or CSA troubleshoot wireless issues.

Suggested Event Day Equipment & Document List for the Wi-Fi Technical Advisor (WTA)

- Safety glasses.
- Closed-toe and closed-back comfortable shoes (that will not damage the field).
- A pair of ZTE Speed Android phones (or another compatible set of approved phones that support Wi-Fi channel changing).
 - Current FTC Driver Station App installed on one phone.
 - Current FTC Robot Controller App installed on the other phone.
 - Current Channel Change App installed on Robot Controller phone. (ZTE Speed only.)
 - Wi-Fi Analyzer app (available from the Google Play Store) installed on the Driver Station phone.
- USB FLASH drive with current *FIRST* Tech Challenge apps (driver station, robot controller, and ZTE Speed channel change).

- USB Cable to allow plugging the USB FLASH drive into the phone for side-loading.
- Laptop that supports wireless Monitor Mode with Wireshark installed.
- If available, specialized Wi-Fi analyzing tools (such as Fluke/NETSCOUT AirCheck Meter, MetaGeek inSSIDer with Wi-Spy hardware, etc.)
- Hardcopy or electronic copy of the WTA Manual.
- Hardcopy or electronic copy of the Control System Troubleshooting Guide.
- Hardcopy or electronic copy of the Wi-Fi Event Checklist.

Non-Allowed Wi-Fi Communication

This rule can be located in the [Game Manual Part 1](#). It is important for the WTA to read and understand this rule and how to interpret potential violations.

<T4> No team, Team Member, or tournament attendee can set up their own Wi-Fi 802.11 (2.4GHz or 5GHz) wireless communication in the venue. Non-allowed wireless communications include, but are not limited to:

- a. Cellular hot spots (for example, cell phones, tablets, MiFi).
- b. Ad-hoc networks.
- c. Nintendo DS peer-to-peer.
- d. Bluetooth communication with robots in the competition area.



No team, Team Member, or tournament attendee shall interfere with a team's Wi-Fi Direct® communication with their own robot.

The penalty for violating rule **<T4>** is disqualification of the entire team from the tournament and their removal from the venue property. Teams may not appeal the penalty and no refunds will be given for registration fees, prepaid meals, etc. *FIRST* may conduct a post-tournament review and decide if any added penalties will be imposed on the offending team.

Teams are encouraged to report wireless security vulnerabilities to the Field Technical Advisor (FTA) at a tournament. Teams should always keep in mind Gracious Professionalism®, and therefore only report valid and verifiable violations of this rule. After the Field Technical Advisor is alerted of a potential rule violation, he or she will confer with the Head Referee. The Field Technical Advisor and Head Referee will further explore the potential violation of this rule. The Head Referee will work with *FIRST* Headquarters staff to determine if rule **<T4>** has been violated, and to disqualify the offending team.

<T4> Rule Interpretation

The Head Referee will work with the FTA, CSA, and WTA to determine the cause of any un-allowed Wi-Fi communications and to determine if the rule has been violated. Locating the source is an important step when notified of a possible violation of this rule. There are times when an audience member could inadvertently violate this rule, without knowledge or intent to cause harm. It is important for the FTA, WTA, CSA, and the Head Referee to evaluate the situation and to conclude whether or not the interference was intentional. The final determination to disqualify a team or not will rest with the Head Referee with the guidance of *FIRST* Headquarters staff if the Head Referee's recommendation is to disqualify the offending team.

<T4> & <T5> Rule and the Robot Controller Hosted Development Tools

The FTC Blocks Programming Development Tool and FTC OnBot Java Programming Tool lets teams use a web browser to edit their op modes directly on the robot controller. The tool is hosted by the robot controller

and it requires a team connect their laptop to the robot controller's Wi-Fi network. This Wi-Fi network is the *same* wireless network the driver station uses to communicate with the robot controller. The use of the FTC Blocks Programming Development Tool or FTC OnBot Java Programming Tool does not violate rule <T4> or <T5> as long as this is done in the pit area, and not the competition area.

Match Replays

The most important role of the FTA is correctly diagnosing the problem and working with the Head Referee to decide if the issue will cause the match to be replayed. The FTA will likely consult with the WTA and/or CSA when wireless interference is suspected. Matches should be replayed if the issue or malfunction can be **absolutely traced back to excessive wireless interference**. Issues caused by the team's robot do NOT warrant a match replay.

Rule <G27> in the Game Manual Part 2 addresses match replays:

<G27> Match Replay – Matches are replayed at the discretion of the Head Referee only for a failure of a non-team supplied game element or verified Wi-Fi interference that was likely to have impacted the outcome of the match.

Unexpected robot behavior will not result in a match replay. Team-induced failures, such as low battery conditions, processor sleep time-outs, robot mechanical/electrical/software/communication failures, etc. are not valid justifications for a replaying of a match.

If a match does need to be replayed, the FTA and WTA must present their case to the Head Referee as soon as possible. The Head Referee will make a final decision on the replay of the match.

Common questions asked by Teams and suggested responses

Q1: Why aren't you going to replay that match?

A1: *There are only certain situations that warrant replaying a match and this decision is up to the Head Referee. Unless we can prove that it was a field fault or Wi-Fi interference, we cannot replay a match.*

Q2: Why did you replay a match for someone else, but not us?

A2: *Explain the team's situation versus the other situation. How were they different?*

Q3: Why don't you fix/cleanup the wireless environment? It's obvious that the wireless environment is disruptive and causing disconnects.

A3: *We have been monitoring the field's wireless channel throughout the day and then state the relevant facts about the wireless environment for the tournament.*

Q4: We were seeing high ping times during the match.

A4: We have been monitoring the spectrum continuously and haven't seen any significant problems. Sometimes the metal of the robot or the field border blocks the signal to the robot. You are allowed to lift up the driver station during the match if you think that is happening.

End of the Day

At the end of the day, walk away from the event knowing you have done your absolute best to be an exemplary role model, and maintain a clean wireless environment so the competition runs smoothly for all teams. These are the ultimate goals of the Wi-Fi Technical Advisor (WTA) position.

Appendix A – Resources

Game Forum Q&A

<http://ftcforum.usfirst.org/forum.php>

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

Volunteers that apply for a specific volunteer role will receive an email from FTCTrainingSupport@firstinspires.org with their username and password to the forum. You will receive access to the forum thread specific to your role.

FIRST Tech Challenge Game Manuals

Part 1 and 2 - <https://www.firstinspires.org/resource-library/ftc/game-and-season-info>

FIRST Headquarters Pre-Event Support

Phone: 603-666-3906

Mon – Fri

8:30am – 5:00pm

Email: firsttechchallenge@firstinspires.org

FIRST Tech Challenge Event On-Call Support

*These numbers are available for event personnel only. Please **do not** call these numbers if you are a team looking for a ruling, a decision, or assistance. We trust that you will not misuse this resource.*

Day of event Robot Control and Scoring System Support: 603-206-2450

All other Day of event support: 603-206-2412

FIRST Websites

FIRST homepage – www.firstinspires.org

[FIRST Tech Challenge Page](#) – For everything FIRST Tech Challenge.

[FIRST Tech Challenge Volunteer Resources](#) – To access public Volunteer Manuals.

[FIRST Tech Challenge Event Schedule](#) – Find FIRST Tech Challenge events in your area.

FIRST Tech Challenge Social Media

[FIRST Tech Challenge Twitter Feed](#) - If you are on Twitter, follow the FIRST Tech Challenge Twitter feed for news updates.

[FIRST Tech Challenge Facebook page](#) - If you are on Facebook, follow the FIRST Tech Challenge page for news updates.

[FIRST Tech Challenge YouTube Channel](#) – Contains training videos, game animations, news clips, and more.

[FIRST Tech Challenge Blog](#) – Weekly articles for the FIRST Tech Challenge community, including Outstanding Volunteer Recognition!

[FIRST Tech Challenge Team Email Blasts](#) – contain the most recent FIRST Tech Challenge news for teams.

Feedback

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