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2022-2023 FIRST® Tech Challenge

Wi-Fi Technical Advisors Manual



Sponsor Thank You

Thank you to our generous sponsors for your continued support of the *FIRST*® Tech Challenge!



Raytheon Technologies

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 6,500 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
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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. Participants and alumni of FIRST programs gain access to education and career discovery opportunities, connections to exclusive scholarships and employers, and a place in the FIRST community for life. To learn more about FIRST® Tech Challenge and other FIRST® Programs, visit www.firstinspires.org.

Gracious Professionalism®

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

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

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

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

FIRST Privacy Policy

FIRST takes the privacy of our community seriously. As a nonprofit and a mission-driven youth-serving organization, we are compelled to understand who we are serving, how our programs are performing, and make improvements so that we can achieve our goals of making FIRST accessible to any youth who wants to be part of the fun, exciting and life-changing experience. Thus, we need to collect certain personal data from participants and volunteers to ensure we are meeting our goals and responsibilities as a youth-serving nonprofit organization.

As a volunteer, you may be asked to handle the personal data, or personally identifiable information (PII), of coaches, team members, and even other volunteers. It is critical that you understand and follow the [FIRST Privacy Policy](#) and complete any data protection and privacy training required by your role. If you have any questions regarding data protection and privacy, please reach out to the FIRST Data Governance Team at privacy@firstinspires.org.

Volunteer General Information

Volunteer Training and Certification

To Access BlueVolt and Complete a Volunteer Role Training Course:

Once you have applied for a volunteer role that requires certification a link will appear in your FIRST dashboard that will connect you to our learning management system BlueVolt.

1. Login to your FIRST Dashboard
2. On the grey menu below "Dashboard" Click on "Volunteer Registration"
3. Click on "Roles Missing Certification"
 - a. Click into the link to "Review Outstanding Tasks" which will take you to the BlueVolt site where you can complete your certifications and sign up for new training

How to Access BlueVolt After Certifications are Complete:

Once you complete your certifications, you will no longer see a “Roles Missing Certification” link or a link to “Review outstanding Tasks” to get to BlueVolt. If that is the case, follow the steps below to access BlueVolt courses and updates.

1. Login to your *FIRST* Dashboard
2. At the top right of the page, click on the dropdown under your name and go to “My Profile”
3. Once there, on the left menu of the page, click on the “Certifications” link which will take you to the BlueVolt site where you can view/print your existing certifications and sign up for new training

If you have applied for a role but do not see the link to training in your dashboard, or you have other training related questions please email FTCTrainingSupport@firstinspires.org.

Volunteer Minimum Age Requirement

The minimum age requirement of a *FIRST* volunteer is **13 years old**.

A minor must have a parent or guardian give written permission to volunteer. In addition, the *FIRST* Consent and Release Forms will need to be signed by a parent or guardian in the Volunteer Registration system for any volunteer under age 18.

Key Volunteer Role Minimum Age Requirement

Volunteers **MUST** be at least 21 years old before they can serve in a key volunteer role for the *FIRST* Tech Challenge. Key volunteer positions include: volunteer coordinator, head referee, judge advisor, field manager, field technical advisor, lead robot inspector, lead field inspector, and lead scorekeeper. Local program delivery partners can make case by case exceptions to these guidelines by contacting *FIRST* for approval.

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 Firsttechchallenge@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!

Job Description

Introduction

The Wi-Fi Technical Advisor (WTA) is a volunteer who helps a Tournament Director plan for large *FIRST* Tech Challenge (FTC) 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

The WTA should read this manual before the Event. They should speak to the tournament director or program delivery partner to check for additional requirements, such as meetings before the event or run-throughs of the queuing path before the event. The estimated training time for this role is one hour.

- Training – Approximately four to six hours
- Event Day – Approximately eight hours

Proper Dress

- Wear comfortable, 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 and pit areas.

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 also 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 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 Learning Management System (LMS)

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 technical reference.
- Read the [Control System Troubleshooting Guide](#), which explains how to troubleshoot common problems with the *FIRST* Tech Challenge control system. Print this document and bring it to the competition for technical element reference.
- 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 Competition 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 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 Program Delivery Partner (PDP) or the tournament

director will have the telephone number for the on-call technical expert which also appears at the end of this document.

- Read the frequently updated Wi-Fi Tech Advisor discussion forum located in the new learning management system 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, 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. Obtain the local IT on-call phone number in the event there is a need to contact them on event day.
- Select preliminary Wi-Fi channels for the Wi-Fi direct robot communications, FTC Live Scoring System, 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.
 - If there are any Wi-Fi or wireless devices operating in the venue that cannot be turned off by the local IT staff, select channels that will not overlap or interfere with these existing devices.
 - If your event will take place alongside a *FIRST* Robotics Competition, then you will need to coordinate with the FRC event organizer to select Wi-Fi channels that will not overlap or interfere with the FRC wireless activity.

Important Note: A Wi-Fi Suppressor or Blocker is a device that disrupts the operation of unauthorized Wi-Fi networks in a venue. They are typically used to prevent people from creating Wi-Fi hotspots through cellular tethering. Schools often use the device to force students onto the school's network where it can monitor traffic and institute firewalls to block sites deemed unsuitable. Hotels used to use the devices to force patrons to pay for hotel Wi-Fi services. If a hotel patron used a cell phone to set up a Wi-Fi hotspot, the blocking device would simply tell clients of the private hotspot to disconnect.

- If a Wi-Fi Suppressor or Blocker is present at an event, then teams will be unable to control their robots properly. The most common symptom that a Wi-Fi suppression device is in use in a venue is that the Driver Station and Robot Controller will not be able to pair or will pair but then shortly thereafter will disconnect.
- The FTA should check for the presence of such a device **before** the event, then work with the IT staff to disable the device for the day of the scheduled event.

Event Day Responsibilities

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

- 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 playing field(s).

- Select the Wi-Fi channels for the competition and share the recommendation with the tournament director and FTA. Verify that the selected channels will not overlap or interfere with other wireless devices in the venue.
- 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. 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 are required.
- A pair of FIRST approved Android smartphones that support Wi-Fi channel changing).
 - Current FTC Driver Station App installed on one smartphone.
 - Current FTC Robot Controller App installed on the robot controller.
 - Wi-Fi Analyzer app (available from the Google Play Store) installed on the Driver Station Android device.
- Laptop that supports wireless monitor mode with Wireshark installed. Note that Windows laptops will not support monitor mode. Apple Mac's out of the box will support monitor mode. Alternatively, most Linux distributions will support monitor mode and can be burned to a usb drive and live booted.
- 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.

Appendix A – Resources

Game Forum Q&A

<https://ftc-qa.firstinspires.org/>

Anyone may view questions and answers within the FIRST® Tech Challenge game Q&A forum without a password. To submit a new question, you must have a unique Q&A system user name and password for your team.

Volunteer Forum

Volunteers can request access to role specific volunteer forums by emailing FTCTrainingSupport@firstinspires.org. 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

The on-call event support number is 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 system 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!