Wi-Fi Event Planning Guide

Revision History	
Revision	**Description**
V26-27.1	Initial 2026-27 Season Release
V26-27.2	Corrected Table of Contents

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Introduction

The *FIRST* Tech Challenge control system uses two Android based devices as the primary robot controller and driver station controller. This system enables a point-to-point wireless connection between the driver station and the robot. This document offers some basic suggestions on how to prepare for and support the wireless control system at any *FIRST* Tech Challenge competition.

More information about the control system used in *FIRST* Tech Challenge can be found on FTC Docs in the Control System Section and from the primary control system vendor REV Robotics technical documentation.

Figure 1: Driver Station Device connected wirelessly to a FIRST Tech Challenge Robot

Point-to-Point Wireless Connectivity

The *FIRST* Tech Challenge control system is a point-to-point solution. This means that teams use two Android devices to control their robot. The first device is mounted on the robot and acts as the *robot controller*. The second device resides with the team drivers and is connected to a pair of gamepad controllers. This second device is known as the *driver station*. The driver station communicates wirelessly with the robot controller.

Teams use their driver station to control their robot. The driver station has a user interface that the teams use to see status information about their robot, and to select special programs (called OpModes) to run on the robot controller. Teams may also use the gamepad to configure the functionality of their autonomous programs and start the program. During the driver-controlled portion of a match, teams use their gamepad to direct functions in the robot controller.

It is important to note that with a point-to-point control system, each driver station-robot controller pair establishes its own independent wireless network.

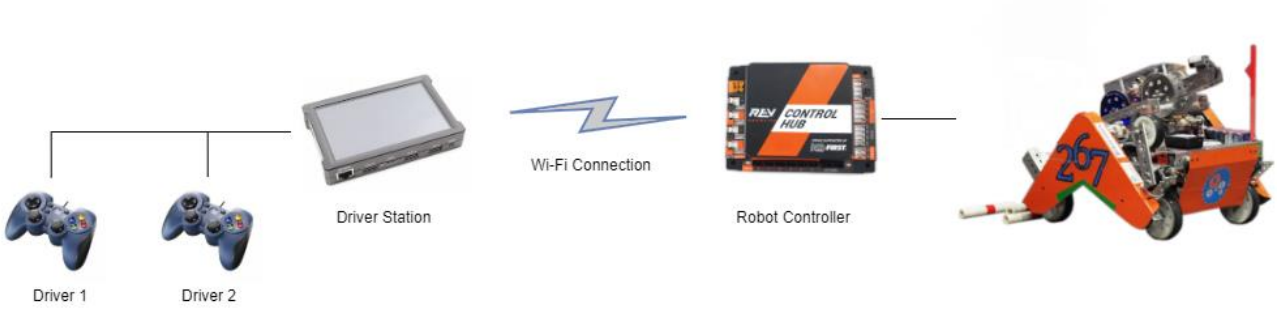

Figure 2: Point-to-point connection between the robot controller and driver station.

For example, if you have four robots operating in a venue, then you will have four independent wireless networks, one for each driver station-robot controller pair. If you have 16 robots operating in a venue, then you will have 16 independent wireless networks in that venue, one for each driver station-robot controller pair.

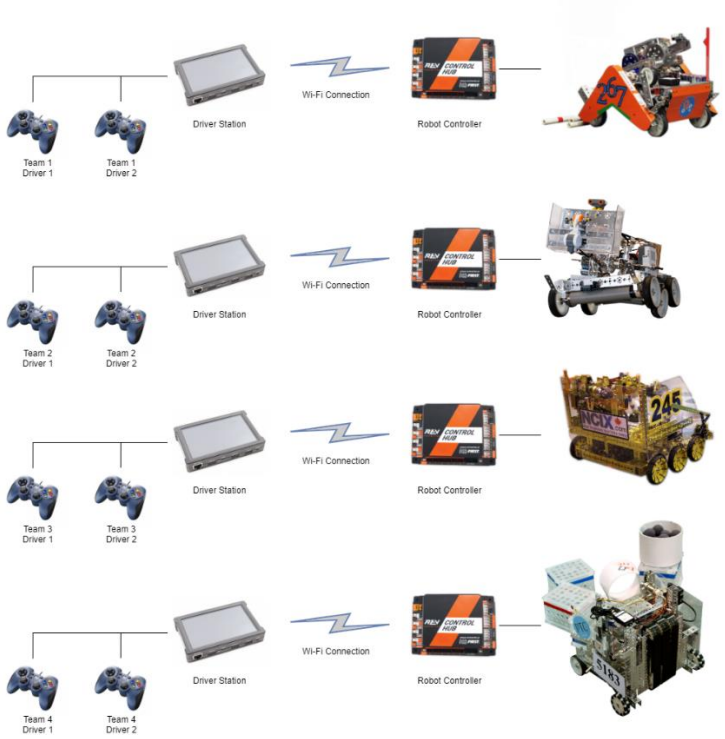

Figure 3: Four independent wireless network are required for four different robots to operate

During a competition, each team brings their own gamepads, driver station and robot to which a robot controller is mounted. The teams are responsible for understanding how to establish and maintain the Wi-Fi connection between their driver station and robot controller. However, it is the responsibility of the event director to take some precautions before and during a *FIRST* Tech Challenge event to ensure that the wireless environment is "clean enough" so that the teams will have reliable, uninterrupted connections to their robots.

Volunteers Roles to Help Support the Control System

FIRST Technical Advisor (FTA)

The *FIRST* Technical Advisor (FTA) oversees the technical aspects of the playing field and serve as the primary escalation point for field-related issues during an event. FTAs ensure field safety and functionality, mediate issues, and support both team experience and volunteer operations. The role requires significant technical knowledge, leadership, and communication skills.

Control System Advisor (CSA)

The Control System Advisor (CSA) role is another important technical volunteer position responsible for identifying and troubleshooting technical issues in greater depth than an FTA. Although the skills of a CSA and FTA overlap, it is important to have a CSA present at most *FIRST* Tech Challenge events.

Technical Director (TD)

Some larger events may staff a Technical Director (TD) to oversee the setup of scoring, A/V, and other systems that support the event. Because they manage scoring-related wireless systems, they assume responsibility for the wireless environment and work with the FTA to select appropriate wireless channels for teams. They monitor, identify, and resolve issues related to Wi-Fi and non-Wi-Fi interference.

Wi-Fi Event Checklist

This is a set of recommended steps that an event director can take before and during an event to ensure a smooth wireless environment for a competition. The event director can work with a technical volunteer such as the FTA, the CSA, or the TD to follow the steps in the checklist prior to and during an event.

If possible, it is important to try and follow these steps to ensure that there aren't any sources of interference (such as audio/video public announcement systems or Wi-Fi suppressors) operating in the venue for all events. The Wi-Fi Event Checklist has timeline tasks that begin at least 6 weeks in advance of an event, at least 4 weeks in advance of an event, and day of the event. It is important to review the checklist well in advance of an official *FIRST* Tech Challenge competition and ensure a seamless and professional event.

> **Need More Support?** If you have technical questions about the *FIRST* Tech Challenge control system and how it relates to your event, you can visit the *FIRST* Tech Challenge Technology Forum and search for related posts or post your own.

6 Weeks Before

Pre-event Planning

Task	Date Complete	Notes
Designate/recruit a Wi-Fi expert to assist with event planning and to help on tournament day.		
Provide designated Wi-Fi expert with the appropriate training documents.		
Wi-Fi expert should visit event site at least one week prior to event.		

4 Weeks Before

Consult with Venue IT Staff

Task	Date Complete	Notes
Review the proposed dates and times for the *FIRST* Tech Challenge event.		
Can all Wi-Fi networks in the venue (that would affect the rooms used by the event) be turned off for the *FIRST* Tech Challenge event?		
Provide the IT staff with the Venue Networking Requirements Guide		
Does the IT staff have any guidelines or restrictions on *FIRST* Tech Challenge-related wireless networks operating in the venue? (For example: Are there any venue restrictions that would prevent you from operating a wireless network for the FTC Scoring and local FTC Live system?)		
Will there be an active guest Wi-Fi network to access the Internet at the venue? If so, what is the SSID/name and what are the login credentials for the guest network.		
Is the IT team aware of any Wi-Fi Suppressors/Blockers (such as Cisco's Air Marshal technology) present at the venue that would prevent the robots' wireless networks from operating properly? If so, these suppressors will need to be turned off for the event.		
Can the IT staff designate a venue IT staff member to be the primary point of contact that can be available for questions/support prior to and during the event?		

Conduct Wireless Survey of the Venue

Task	Date Complete	Notes
List all Wi-Fi networks by channel for the bands that you plan to use for your event (2.4 and/or 5GHz).		
If feasible, measure non-802.11 wireless activity in these bands.		
Visually check for potential sources of interference (such as access points, wireless audio/visual equipment, Bluetooth devices, microwave ovens, etc.) in these bands.		

Test Wi-Fi Connectivity in the Venue

Task	Date Complete	Notes
Use driver station/robot controller (DS/RC) pair to measure ping times on the Wi-Fi channels that are being considered for use by the teams during the event.		
Use DS/RC pair to see if Wi-Fi suppression is present (test on different channels). Note that if a Wi-Fi suppressor is present, the DS/RC pair might have difficulty staying connected.		
Examine the ping times between the DS/RC devices at various points in the venue.		
If feasible, test an actual robot in driver-controlled mode to check for latency and reliability of connection.		
If requiring that the teams be distributed over multiple Wi-Fi channels, assign each team their operating channel.		

Determine How to Distribute Teams over Available Wireless Channels

Task	Date Complete	Notes
How many teams will be participating at the *FIRST* Tech Challenge event?		
How many clean non-overlapping wireless channels will be available at the *FIRST* Tech Challenge event?		
Does the number of teams per channel exceed 20 on 2.4GHz or 40 on 5GHz? If so, consider distributing teams across multiple channels.		
Will there be a *FIRST* Robotics Competition event running at the same time? If so, coordinated with the FRC organizers to pick non-conflicting Wi-Fi Channels.		

1 Week Before

Provide Attendees with Guidelines for Wireless Activity at the Event

Task	Date Complete	Notes
Except for the teams' robot controllers and driver stations, all Wi-Fi devices should be turned off when in or near the venue.		
Other wireless devices (including Bluetooth-enabled devices) should be turned off when in or near the venue.		
Teams, spectators, and volunteers are not permitted to operate their own wireless access points anywhere in the venue.		
Intentionally disrupting the wireless control network for a *FIRST* Tech Challenge robot is ungracious behavior and subject to major penalties under the game rules.		
If requiring that the teams be distributed over multiple Wi-Fi channels, assign each team their operating channel.		

Useful Links and Information

On-Call Support Numbers

These numbers are for *volunteer support only*. Teams should not use these numbers to call about rulings or technical assistance.

Administrative, Judge, Referee and Non-Technical Issues: (603)206-2412

Scoring System (FTC Live) or other Technical Issues: (603)206-2450

Call or use the **built-in chat feature on FTC Live** available for events with internet access

Pre-Event Support

Mon – Fri 8:30am – 5:00pm Eastern Time (UTC-4 or UTC-5)
Contact Support including live chat or email customerservice@firstinspires.org

Program Resources

Event Search
ftc-events.firstinspires.org

Game and Season Resources
ftc-resources.firstinspires.org/ftc/game

FIRST Tech Challenge Blog

Event Resources
ftc-resources.firstinspires.org/ftc/event

FIRST Tech Challenge Website
firstinspires.org/robotics/ftc

Volunteer Resources
ftc-resources.firstinspires.org/ftc/volunteer

Feedback

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