FIRST TECH CHALLENGE

CENTER STAGE
PRESENTED BY Raytheon Technologies

FIRST® IN SHOW℠
presented by Qualcomm

firstinspires.org/robotics/ftc

2023-2024 *FIRST*® Tech Challenge

Field Inspector Manual

Sponsor Thank You

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

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**
1	7/12/2023	Initial Release

Contents

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.

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

Our *FIRST* Volunteer Handbook is a comprehensive guide to the different ways people can volunteer with *FIRST*. It includes expectations, descriptions of training, policies, and more.

Learn more about the roles of volunteers on our Volunteer Resources page, "Volunteer Role Descriptions

Volunteer Training and Certification

Volunteers must create an account on www.firstinspires.org and apply to the role. Upon application, training can be accessed from within the dashboard. Please follow these instructions to access training through the dashboard.

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.

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!

Helping Teams Succeed
A volunteers role is about helping a team succeed so they can compete. Teams spend countless hours, weeks and sometimes months working and reworking their robot design and strategies. After all this effort, some teams will still need a friendly volunteer to help create a positive event experience for the students.

Job Description

Introduction
The field inspection process is in place to ensure that every team and their robot can successfully compete in a match. The field inspector will go through the field inspection checklist which includes verifying settings on the team's Android devices, running a practice match, and instructing teams about a tournament's unique match play procedures.

A field inspector needs to have the following knowledge/skills:

- Familiarity with the *FIRST* Tech Challenge control system;
- Experience with devices using the Android operating system; and

Additional features of the field inspector volunteer role include:

- **Physical/Technical Requirements:**
  - Technical – Medium
  - Physical – Low
  - Administrative – Low
  - Communication – High
- **Time commitment:**

  - Pre-event training: field inspectors should expect to spend two to three hours to go through required reading/training prior to the event.
  - Event day: A field inspector may only volunteer at an event for 2 hours, as the field inspections happen at the beginning of the event. Field inspectors might also serve in another role once field inspection is complete. If a field inspector has indicated on their application they are available for the full day, the tournament director may assign them another role once field inspections are completed.
- **Proper Safety Attire:**
  - Wear comfortable, close-toed and closed-back shoes that will not damage the competition playing field foam tile floor. Most of the volunteer's time will be spent standing or walking around the competition area.
  - ANSI Z87.1 certified safety glasses are required in the competition and pit areas.

Event Time Commitment
Most *FIRST* Tech Challenge events are whole-day events. While field inspection happens at the start of the event, many field inspectors fill other volunteer roles at an event.

Overview of Responsibilities

Lead Field Inspector
Field inspectors perform mandatory field inspections to ensure that every robot can successfully compete in a match. Lead field inspectors supervise the field inspectors and act as a resource to the field inspectors performing the inspections. The lead field inspector's responsibilities include:

- Collaborate with the tournament director and lead robot inspector to create an inspection schedule.
- Assure that the required field inspection tools and materials are available on event day.
- Work closely with the lead robot inspector so that the entire inspection process runs smoothly, and all robots pass inspection before the opening ceremony.
- Provide periodic progress updates to the tournament director and field technical advisor.

Prerequisite for Lead Field Inspector Role
To serve as a lead field inspector, previous experience as a field inspector is required.

Field Inspector
The field inspection process is in place to ensure that every robot can successfully connect wirelessly and compete in a match. The field inspector must also go through the field inspection checklist which includes verifying settings on the team's Android devices and reminding the teams to arrive on time for each match.

Pre-Event Day Responsibilities

FIRST Tech Challenge tournaments squeeze a lot of activity into one day. One of the keys to running a smooth and successful event is for teams and volunteers to show up prepared. Teams spend countless hours preparing for competition day and we ask our volunteers to prepare for tournament day as well. Field inspectors are required to participate in training prior to the event. This training is provided by *FIRST* Headquarters.

Required reading for training:

- The Field Inspection Manual.
- Sections 7 and 8 of the Game Manual Part 1 – Traditional Events.

- The Field Inspection checklist.

It is important prior to the event that the field inspector reviews these manuals. To access the appropriate training materials to fulfill this role, make sure to apply to the position in the volunteer registration system. Upon application, an email will be sent providing access to the field inspector training folder which includes a copy of this manual, call schedules for robot and field inspector monthly key role discussion calls, and recordings from past calls. The most current version of the Game Manual Part 1 – Traditional Events is located on our website.

Event Day Responsibilities

It is the responsibility of the field inspector to:

- Greet the team. Inspectors are generally the first volunteer a team will interact with.
- Verify that the team's driver station and robot controller have the correct hardware, software, and operating system.
- Verify that the driver station and robot controller's settings follow the rules in the Game Manual Part 1 – Traditional Events.
- Conduct practice matches to ensure the drivers station connects using Wi-Fi with the robot controller, and to confirm the driver station can properly control the team's robot.
- Help the team to be successful.
- Be fair and apply the same level of thoroughness to every team.
- Treat all teams with *Gracious Professionalism*®.

Field inspections generally take place at the beginning of the event. The inspections run concurrently with robot inspections (where the robot inspectors inspect the team's robot hardware) and team judging appointments. Robots are not required to pass robot inspection before attending field inspection. Each inspection should take approximately 10-15 minutes. The following supplies (provided by the tournament director or lead field inspector) will be available:

- Field inspection checklist for each team (located in the Game Manual Part 1 – Traditional Events).
- Field Inspection Manual.
- Sections 7 and 8 of the Game Manual Part 1 – Traditional Events.
- A printout of the relevant sections of the Game Q&A Forum (forum responses are official and enforceable and sometimes supersede the game manual).
- Team list.
- Inspection stickers or other method of identifying robots that have passed field inspection that can be placed onto the robot. Field inspection stickers are not required and are used at the discretion of the lead inspector and the tournament director.
- Pens.

Helping Teams Succeed

A common theme you will read throughout this manual is that the field inspector's role is not just about the inspection, it is about helping a team succeed and be able to compete. Teams spend countless hours, weeks and sometimes months working and reworking their robot design and strategies. After all this effort, some teams will still need a friendly field inspector to help them solve unexpected issues.

The recommended inspection schedule and procedures were created with the expectation that teams and volunteers will have a low stress and successful experience. If inspection runs behind schedule, keep in mind that volunteers still need to give every team the best possible experience; be kind and do not rush teams.

Field Inspection Process

The field inspection is independent of robot inspection. The field inspection generally takes place at the competition fields in order for the team to demonstrate that the robot functions as it should per the Game Manual Part 1 – Traditional Events rules. If inspection times are not scheduled, teams may do the field inspection first if they find the line too long at the robot inspection station (and vice versa).

The field inspectors core responsibilities are:

- Checking the driver station and robot controller for the correct settings.
- Make sure the driver's station wirelessly connects with the robot controller.
- Reviews the field inspection checklist.
- Verifies robot performance by running a practice match.

Always keep in mind that as a field inspector your role is not to fail a team. You are in a role to help a team pass inspection while keeping within the rules so that they can compete.

The field inspection checklist is in the Game Manual Part 1 as well as on the *FIRST* website. This is the complete list of the items a field inspector will need to check off to pass a team through the field inspection. In addition, Appendix B and C of this document outlines the manual steps a field inspector can take to make sure the driver's station and robot controller are configured properly and can connect to each other over Wi-Fi.

Field Inspection Checklist

The field inspector must check off each step in the field inspection checklist prior to passing the team for field inspection. The drive team coach and at least one driver should report to field inspection.

Smartphones*:

a. Motorola Moto G4 Play (4th Generation)/Motorola Moto G4 Play†**
b. Motorola Moto G5
c. Motorola Moto G5 Plus
d. Motorola Moto E4 (USA versions only, includes SKUs XT1765, XT1765PP, XT1766, and XT1767)
e. Motorola Moto E5 (XT1920)
f. Motorola Moto E5 Play (XT1921)

Other:

g. *REV Driver Hub* may only be used as part of the *Driver Station.*
h. *REV Control Hub* may only be used as part of the *Robot Controller* and not as the *Driver Station*.

†The use of smartphones operating on Android version 6.x (Marshmallow) are no longer allowed in the 2023-2024 season. Android smartphones must use Android 7 (Nougat) or newer to be compatible with the current season's software minimum. The Moto G4 Play is no longer supported by over-the-air updates, and devices that have not yet been updated to Android 7 (Nougat) may be unable to update. Certain models might be able to be updated by the Motorola Rescue and Smart Assistance Tool, but there are no guarantees.

*A smartphone *Android Device Robot Controller* USB interface may only connect to a *REV Expansion Hub*, or a USB hub.

**The Motorola Moto G4 Play may be sold as either Motorola Moto G Play (4th gen)", or "Motorola Moto G4 Play". Either phone is acceptable however *FIRST* Tech Challenge highly recommends that *Teams* purchase

either model number XT1607 or XT1609, as these are the US versions and have been tested and are fully compatible with the *FIRST* Tech Challenge software. *Teams* that have purchased phones with model numbers XT1601, XT1602, XT1603, or XT1604 may continue to use these phones as legal, however there is a potential for issues with these phones not being fully compatible with the software or the approved gamepads.

Driver Station and Robot Controller Software Inspection

The purpose of the software inspection is to make sure the Android devices and/or REV Expansion Hub have the correct settings. The field inspector will have to check to ensure:

- The driver station operating system is at least 7.0 or higher.
- Driver station uses the official *FIRST* Tech Challenge driver station app to control the robot.
- The *FIRST* Tech Challenge robot controller app when running on an Android phone is the default app for the USB-connected hardware modules on the robot.
- The robot controller is set to the correct Wi-Fi channel (if required by the tournament). Bluetooth is "OFF", and Airplane Mode is "ON"
- Driver's station is named appropriately with the team number followed by "-DS"
    - If the team is using a spare, the name should be the team number followed by a hyphen then a letter designation beginning with "A" (for example, "12345-A-DS", "12345-B-DS").
- Robot controller is named appropriately with the team number followed by "-RC"
    - If the team is using a spare, the name should be the team number followed by a hyphen then a letter designation beginning with "A" (for example, "12345-A-RC", "12345-B-RC)
- The driver station is not connected to any local networks except for the robot controller's wireless network.
- All remembered Wi-Fi Direct groups have been removed.

One field inspector may perform the software checks with a group of up to four teams at a time. It is easy and time efficient to verify each checklist item for several teams at once. If a team has trouble at any point in the checklist, encourage them to get help from one of the other teams in your group or help them yourself if you know the solution.

The Robot Self-Inspection App[1] has been integrated into the driver station and robot controller apps. Ask the team(s) to run the software inspection function from the dropdown menu in the driver station and robot controller apps to display the status of all the software rule checklist items on a single screen. Using the robot self-inspection app is highly recommended because it reduces the time needed for field inspection. Appendices B and C contain instructions for manually checking the Android device software settings. Use these instructions as a guide to correct deficiencies identified on the robot self-inspection status screen.

Programming Language Versions

The following tools are recommended for use in the *FIRST* Tech Challenge:

a. FTC Blocks Development tool – a visual, blocks-based programming tool hosted by the *Robot Controller*.

b. FTC OnBot Java Programming tool – a text-based integrated development environment hosted by the *Robot Controller*.

c. Android Studio – a text-based integrated development environment.

d. Java Native Interface (JNI) & Android Native Development Kit (NDK) – *Teams* can incorporate native

[1] Adapted from the "Robot Inspection for FTC" app developed by Team HazMat: 9227 and 10650.

code libraries into their apps using the JNI framework and the Android NDK.

Allowed Hardware System Versions

The following table lists the *Android Devices*, minimum Android versions, minimum operating system and firmware versions, and minimum FTC software versions allowed per device.

Android Smartphones		
Device	**Minimum Android Version**	**Minimum FTC Software Version**
Motorola Moto G4 Play (4th Generation) / Motorola Moto G4 Play (See <RE07> for details)	7.0 (Nougat)	9.0
Motorola Moto G5	7.0 (Nougat)	
Motorola Moto G5 Plus	7.0 (Nougat)	
Motorola Moto E4 (USA versions only, includes SKUs XT1765, XT1765PP, XT1766, and XT1767)	7.0 (Nougat)	
Motorola Moto E5 (XT1920)	7.0 (Nougat)	
Motorola Moto E5 Play (XT1921)	7.0 (Nougat)	

REV Hubs			
Device	**Minimum Software**	**Minimum Firmware Version**	**Minimum FTC Software Version**
REV Control Hub	Control Hub OS 1.1.2	Firmware 1.8.2	Robot Controller 9.0
REV Expansion Hub		Firmware 1.8.2	
REV Driver Hub	Driver Hub OS 1.2.0		Driver Station 9.0
Note: The REV Hardware Client software can be used to install software onto the REV Hubs.			

IMPORTANT: Rules <RS02> or <RS03> do not require that *Teams* upgrade to the latest version of the software. A mandatory upgrade (announced by *FIRST*) would only be required if *FIRST* determined there was a critical software fix that must be adopted by *Teams*. *Teams* must install the upgrade before the time of competition. Additionally, beta versions of the software are allowed at official tournaments. Mandatory upgrades will be communicated in the following ways:

- Via *Team* Blast – The mandatory upgrade and version number will be communicated to *Teams* on the *Team* Blast, which will also show the date the required upgrade must be made.
- Online – the minimally required software will be listed on our Technology Resources page, with the date *Teams* are required to make the mandatory software upgrade.
- Forum – The minimally required software will be listed in the Technology Forum page, with the date *Teams* are required to make the mandatory software upgrade.

Templates for all programming choices are available through the links located at http://www.firstinspires.org/node/5181.

Field inspectors should not fail a team for not having the latest versions of the software. A team should only fail for not having the minimally required software as indicated by *FIRST*.

Robot Operation Inspection

The robot performance inspection is a vital test to ensure that a robot will operate successfully in its first qualification match and for the competition. Field inspection verifies that the driver station can wirelessly control

the robot; the robot operates as expected during a practice match; and the robot is programmed to start and stop when commanded by the driver station.

Once the field inspector has confirmed that the driver station has connected with the robot controller, they should run a brief practice match. Field inspectors should gather up to 4 teams on the field at a time to run the robot operation inspection. Ideally, the inspection process should involve multiple robots on a field to simulate what would happen in a real match and reduce the time required for field inspection. Teams should run their complete 30 second autonomous period so that the field inspector can confirm that robots remain motionless at the end of the autonomous period. The field inspector should then instruct the teams to run their driver-controlled mode. The tournament director may elect to run a full two-minute driver-controlled match period during field inspection if there is sufficient time in the event schedule.

Teams that are not going to operate their robots during the autonomous period at this event are not required to demonstrate the autonomous phase of match play during field inspection. These robots should remain motionless on the playing field.

A sample robot operation inspection script is in Appendix F. Feel free to adapt this script to address the unique aspects of the tournament.

Robot Sensor Calibration

Playing field lighting has a significant effect on a robot's vision and color sensors. Teams require a brief period on each of the competition playing fields to calibrate their robot's sensors under competition lighting conditions. Events may specify a window of time for sensor calibration or teams may have extra time during field inspection to collect sensor calibration data. The tournament director and lead field inspector will select the time for robot sensor calibration. Since sensor calibration time may vary from event to event, the time selected should be announced to teams.

Queueing Process

The last steps in the field inspection are about educating the teams on the flow of the day, and basic rules. The teams need to be reminded that they should not make any software changes after they are queued for a match; last-minute software changes could hinder a team's performance on the field. Teams are, however, allowed to continue making minor mechanical fixes to their robot.

Teams should also be reminded that the match schedule is only an estimation. As with all competitions, sometimes the matches could run early or late. Although these circumstances are usually communicated to them in the pit area, it is a best practice to remind teams early in the day that they should be diligent about when their matches are so they can be on time.

Disabling a Robot

The field inspector should be prepared to tell the teams during the field inspection what it means to disable their robot, if instructed to do so by the referee during a match. There are a few steps that a field inspector should instruct the team to do:

1. The team must first drive their robot to a neutral position on the playing field.

2. The team should press the “Stop” button on the driver station.
3. The team should then place all components of their driver station on the stands provided in the competition area or on the alliance station floor.
4. The team must not touch their driver station or robot until the match is complete and are instructed by the referee or field personnel to do so.

Inspection Troubleshooting

Repeated Failures

If a robot repeatedly fails inspection, identify the team to a control system advisor (if there is one present at the event), or the tournament director and request that they find someone to work directly with the team. Our goal is for every team to be successful, so please make every effort to assist the team.

If a team is unable to pass inspection by the time inspection is over, even with assistance, the program delivery partner or tournament director must decide how to proceed.

Field Inspection Tips and Tricks

Inspector Specialization

An individual field inspector paired with one team, progressing through the inspection checklist from beginning to end is effective, however, there is a more efficient inspection process. Experienced field inspectors have learned that inspection time and the number of volunteers are both reduced when inspection is split into two pieces, allowing volunteers to specialize in specific sections of the checklist and taking advantage of the opportunity for one or two inspectors to oversee up to four robots at a time during the practice match. For example, tabletop inspection specialists perform the static checks by completing the first three inspection sections of the checklist (drive team members present, driver station and robot controller hardware rules, and driver station and robot controller software rules). Robot operation inspector specialists perform the dynamic checks at a playing field by completing the final two sections of the inspection checklist (robot operation verified at the playing field combined with the instructional queueing process information).

Tabletop Inspection Time Goal

The tabletop checklist items are easily and quickly determined by observing the driver station and robot controller hardware and then running the self-inspection feature in the driver station app. Using the self-inspection feature built into the *FIRST* Tech Challenge driver station app is key to a speedy tabletop inspection. For most robots, an experienced field inspector will complete the tabletop inspection checkboxes (i.e., first three sections of the checklist) in less than three minutes.

Express Robot Operation Inspection at the Playing Field

Thorough progression through the robot operation inspection at the playing field section of the checklist and the sample script in Appendix F are the recommended inspection best practices for drive teams that are participating in their first tournament of the season. The instructional information in the script and checklist will give drive teams the knowledge and experience that will help them have a successful tournament day.

After their first tournament, drive teams are veteran competitors that no longer need detailed tournament procedure instructions at subsequent competitions. Robot operation inspection at the playing field can be significantly shortened for these veteran drive teams; an express version of field inspection is sufficient and recommended. The inspector should ask each drive team if this is their first event of the season. If the drive

team is experienced, the inspector can skip most of the instructional information in the script and only describe qualification match tournament procedures that are unique to the event. The robot operational aspects of the inspection should always be performed.

2023-2024 Season Changes and Topics for Emphasis

<RE07> Android Devices: The use of smartphones operating on Android version 6.x (Marshmallow) are no longer allowed in the 2023-2024 season. Android smartphones must use Android 7 (Nougat) or newer to be compatible with the current season's software minimum.

The following Android phones will no longer be supported:

- Motorola Moto G 2nd Generation
- Motorola Moto G 3rd Generation

The Moto G4 Play is no longer supported by over-the-air updates, and devices that have not yet been updated to Android 7 (Nougat) may be unable to update. Certain models might be able to be updated by the Motorola Rescue and Smart Assistance Tool, but there are no guarantees.

<RS03> Allowed Software System Versions: Minimum Android version is 7.0 and minimum FTC software version is 9.0.

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.

Scoring System and Robot Control System on call event 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.

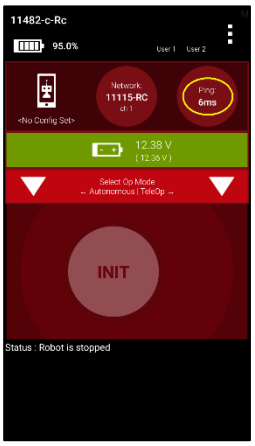
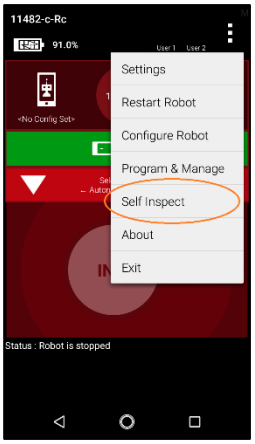
Feedback

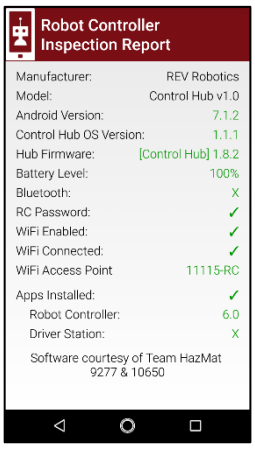
We strive to create support materials that are the best they can be. If you have feedback about this manual, please email firsttechchallenge@firstinspires.org. Thank you!

Appendix B – Field Inspection Steps for the Robot Controller

REV Control Hub

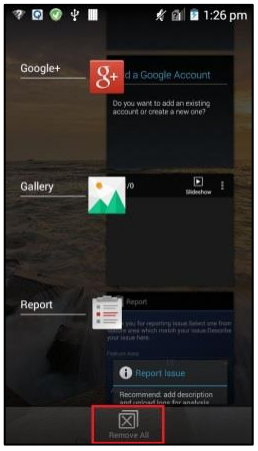
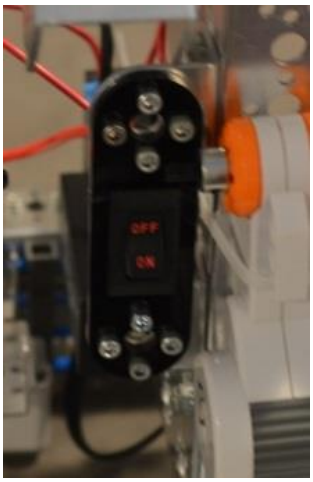
The REV Robotics Control Hub lacks a built-in touch-screen. An inspector needs to use a connected driver station device to inspect the control hub remotely.

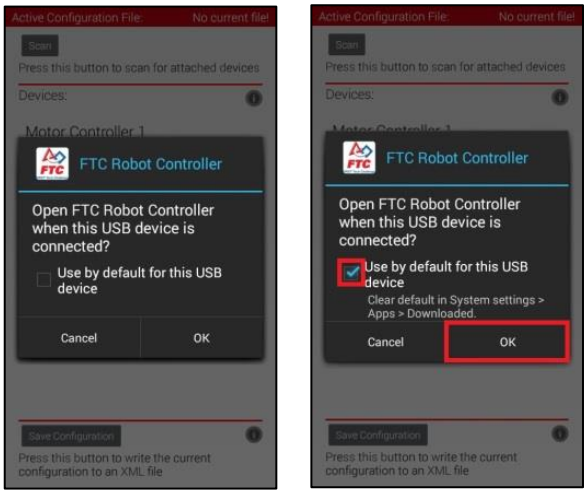
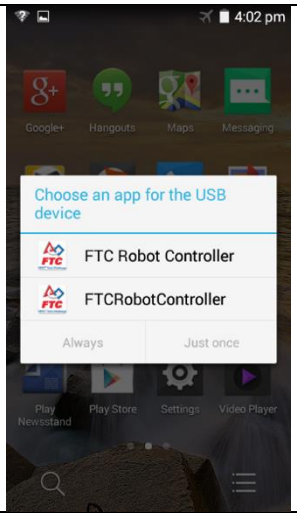
Field Inspection Steps for the Control Hub	
	Have the team verify that the driver station is connected to the control hub and that there are active ping times being displayed on the main driver station screen.
	Select the menu in the upper right-hand corner (represented by the three vertical dots) and then select the “Self Inspection” option from the pop-up menu.

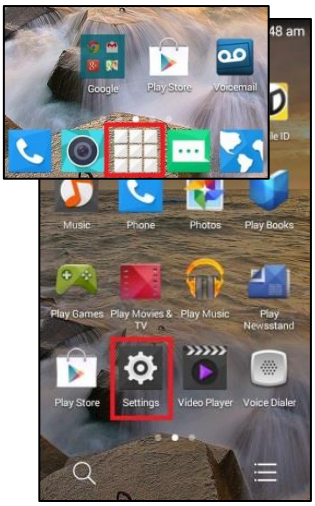
	Select the “Inspect Robot Controller” option from the “Inspection Reports” screen. This will display the remote inspection report for the control hub.
	Check the inspection report to see if there are any issues that need to be addressed on the control hub. Note that a team can use the REV Robotics Hardware Client software to update a control hub’s firmware, Hub OS software, and its robot controller app.

Android Device

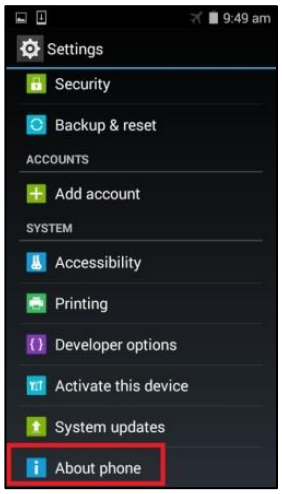
An Android device connects to the expansion hub through an external USB connection.

Field Inspection Steps for the Robot Controller	
	Have the team unlock the device to get to the main screen.
	Make sure there are no apps running on the Robot Controller. This image shows multiple apps running. Click “Remove All’ to stop all other apps from running.
	Power the robot “Off” using the Main Power Switch. The team’s Main Power Switch should be clearly labeled, as outlined in the Robot Inspection Rules. Make sure the robot remains off for a **minimum of 5 seconds**. 

	The default app should start automatically once the robot is powered on, and should show: Wi-Fi Direct – enabled Robot Status: running
	If the *FIRST* Tech Challenge robot controller App pops up with a message that says, “Open FTC robot controller when this USB device is connected?” hand the device back to the team. The team will need to check the box “Use by default for this USB Device” and click “OK”. In some instances, this message may come up several times. Make sure that the team checks the box each time until the message no longer comes up. This box should come up once for every module on the robot. If it does not pop-up multiple times, then the team has likely accepted some modules previously.
	If the following dialog box opens after the robot is turned on, please tell the team to uninstall one of the apps off of the robot controller. This message means the phone has two different robot controller apps installed, which could cause issues for the team during competition.



Locate the “Settings” icon on the robot controller. This could be on the default screen, or it could be under additional applications.

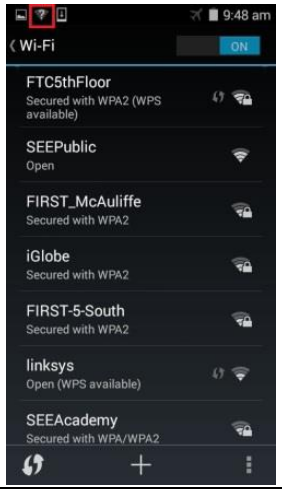
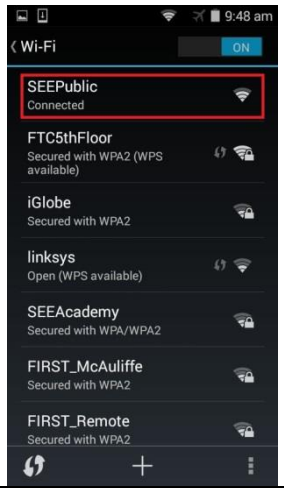
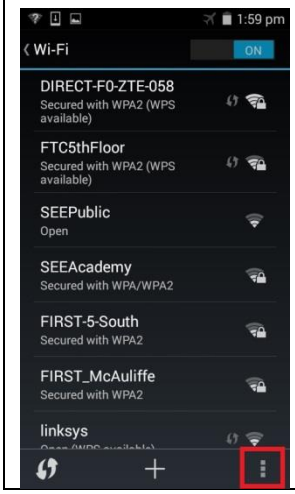
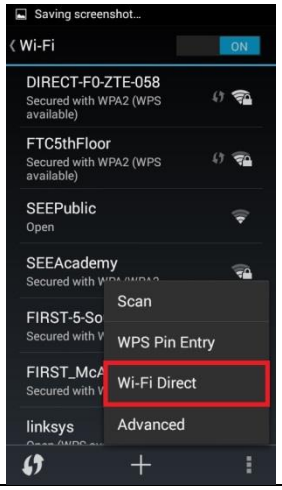


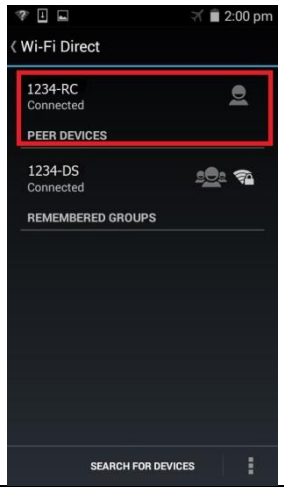
Scroll to the bottom of the Settings menu and click “About Phone”. The next screen will display the Android operating system, and Inspectors should make sure the robot controller has the correct version of the operating system:

<u>7.0 or higher</u>

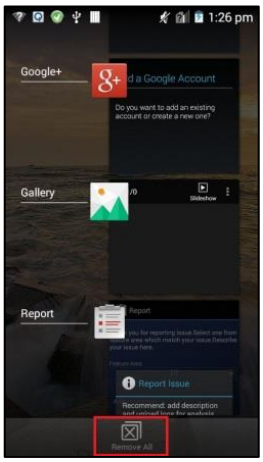
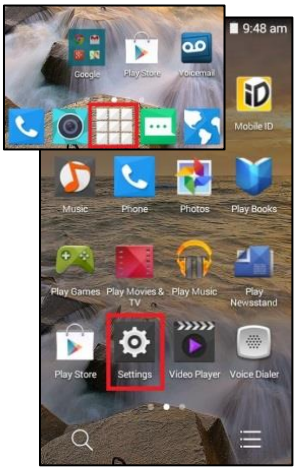
- Motorola Moto E4
- Motorola Moto E5
- Motorola Moto G4 Play
- Motorola Moto G5
- Motorola Moto G5 Plus

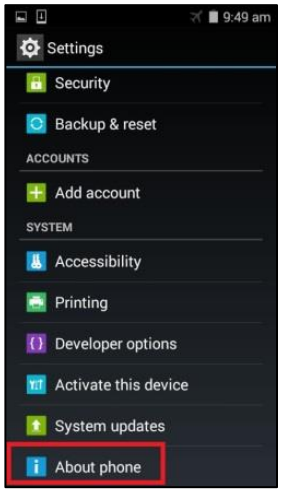
After checking the operating system version, hit the back button on the bottom of the screen. In the “Settings” Menu, check to make sure the devices Airplane Mode is “ON”, and Bluetooth is set to “OFF”.

	Click the Wi-Fi button to check Wi-Fi connections.
✓ Not Connected  ☒ Connected 	Check that the Wi-Fi is on, and verify it is connected. The second image shows that the device is connected to a Wi-Fi network. If the device is connected to a network, make sure to disconnect and forget the device from that network. Go to the next step prior to leaving this screen.
 	Click the 3 dots in the bottom right-hand corner of the screen. This will bring up a new menu, click “Wi-Fi Direct” Note: In Android 6.0 and higher, the Wi-Fi direct menu is one step deeper. The user needs to click the 3 dots, then go to "Advanced" then select Wi-Fi direct.

	The robot controller device should have the team number listed followed by "–RC" (robot controller).
	Check to see if there are any listings under "Remembered Groups". If there are remembered groups other than the team's driver station, the team should be sure to erase the remembered group. To remove the remembered group, click on the remembered group name and answer the prompt "Forget this group?" by pressing the "OK" button.

Appendix C – Manual Field Inspection Steps for Driver Station

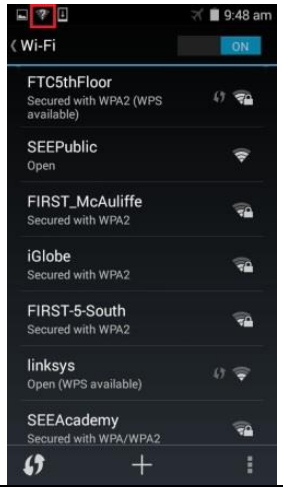
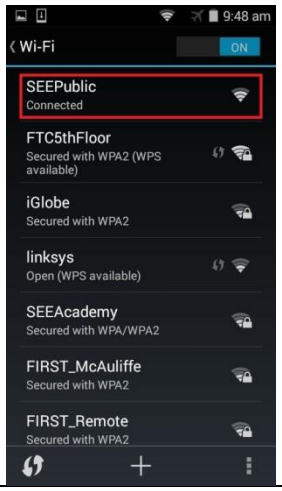
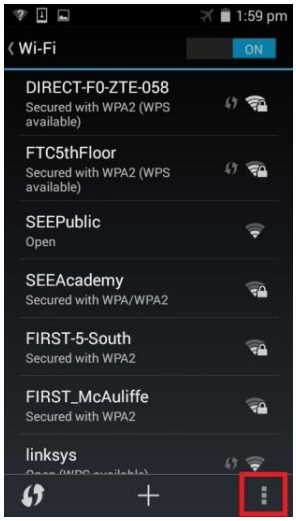
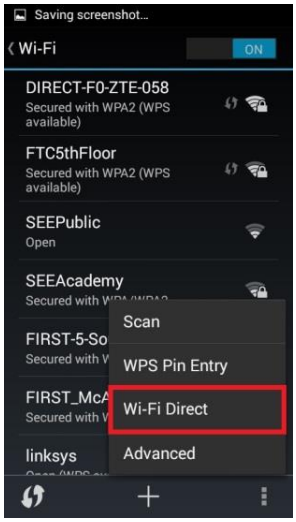
Field Inspection Steps for the Driver Station	
	Have the team unlock the device to get to the main screen.
	Make sure there are no apps running on the Driver Station. This image shows multiple apps running. Click “Remove All’ to stop all other apps from running.
 	Locate the “Settings” icon on the driver station. This could be on the default screen, or it could be under additional applications.

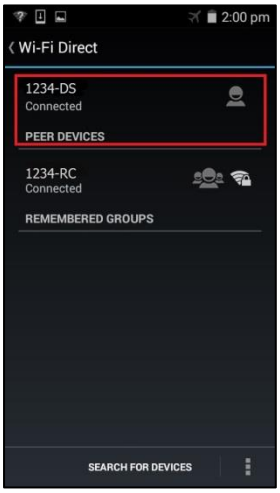
<table>
<tr>
<td> 


</td>
<td>Scroll to the bottom of the Settings Menu and click “About Phone”. The next screen will display the Android Operating System, and Inspectors should make sure the driver station has the correct version of the operating system:

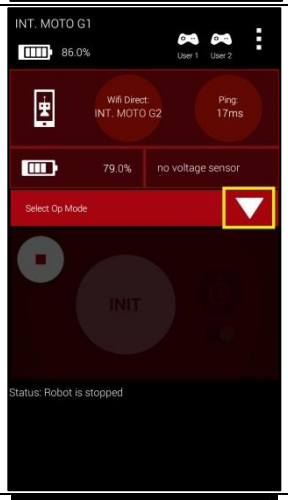
<u>7.0 or higher</u>
• Motorola Moto E4
• Motorola Moto E5
• Motorola Moto G4 Play
• Motorola Moto G5
• Motorola Moto G5 Plus

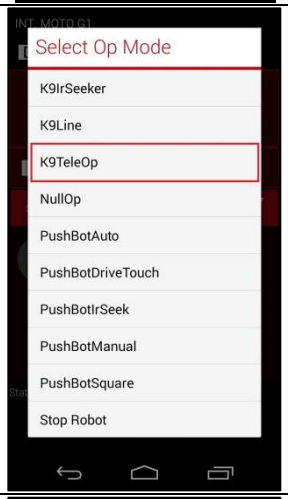
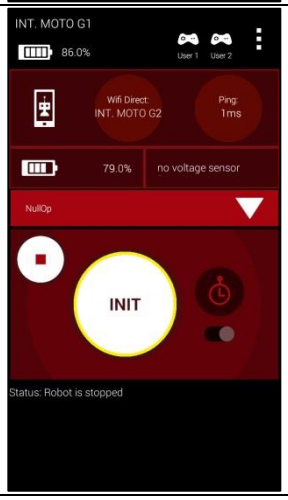
<u>6.0 or higher</u>
• Motorola Moto G 2nd Generation
• Motorola Moto G 3rd Generation</td>
</tr>
<tr>
<td> 
</td>
<td>After checking the Operating System version, hit the back button on the bottom of the screen. In the “Settings” Menu, check to make sure the devices Airplane Mode is “ON”, and Bluetooth is set to “OFF”.</td>
</tr>
<tr>
<td> 
</td>
<td>Click the Wi-Fi button to check Wi-Fi connections.</td>
</tr>
</table>

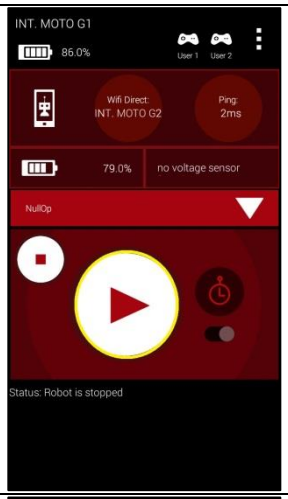
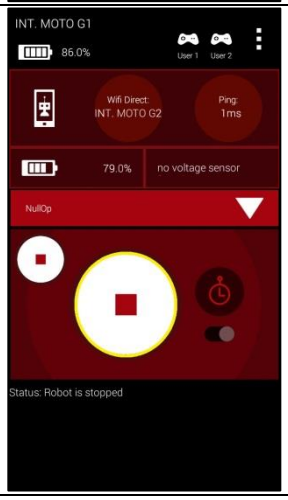
✓ Not Connected  ☒ Connected  	Check that the Wi-Fi is on, and verify it is connected. The second image shows that the device is connected to a Wi-Fi network. If the device is connected to a network, make sure to disconnect the device from that network and “forget” that Wi-Fi network. Go to the next step prior to leaving this screen.
  	Click the 3 dots in the bottom right-hand corner of the screen. This will bring up a new menu, click “Wi-Fi Direct”

	The driver station device should have the team number listed followed by “–DS“. NOTE: In these screenshots, you will also see “Remembered Groups”. If there are remembered groups other than the robot controller, the team should be sure to erase the remembered group. To remove a remembered group, click on the remembered group name and answer the prompt “Forget this group?” by pressing the “OK” button.

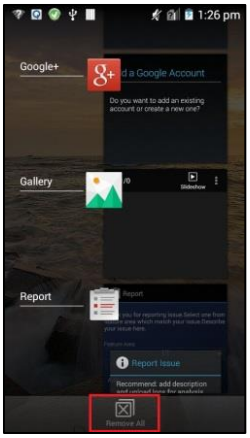
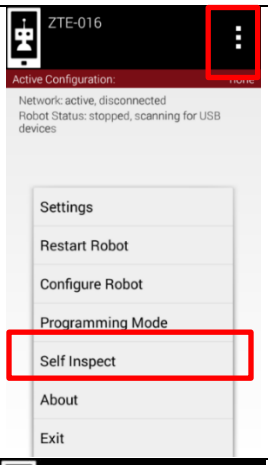
Appendix D – Robot Operation Inspection

Robot Operation Inspection	
	On the driver station home screen, click the “FTC Driver’s Station” icon.
	Click the down white arrow from the app and choose the Driver-Controlled program to run the field inspection test.
	Choose the “Autonomous Op Mode” to test the robot on the field.

	On the driver station, click the “INIT” button, then click the “START” button to run the autonomous program.
	After autonomous ends, the field inspector will need to test the driver-controlled program. Choose the driver-controlled or tele-op program to test the robot on the field.
	On the driver station, click the “INIT” button

	Click the Start button to run the program. Have the team use the joysticks on the gamepad to make sure the driver station is communicating with the robot controller.
	Next, click the stop button. This should stop the robot right away. Once again move the joysticks to make sure the robot controller has received the stop command, and no longer moves.

Appendix E – Self-Inspection App

Inspection App Instructions	
	Make sure there are no apps running on the robot controller or driver station. This image shows multiple apps running. Click “Remove All’ to stop all other apps from running.
	Select the driver station or robot controller App. Select the 3 dots in the upper right-hand corner, and then select “Self Inspect”. This should be run for both the driver station and robot controller apps. Time saving tip: If the driver station and robot controllers are connected with Wi-Fi Direct, the driver station is capable of remotely viewing the Self Inspection results for the robot controller.
	Any text in **GREEN** means the phone has the proper settings. Anything identified in **RED** does not meet requirements and must be corrected. In this example, Wi-Fi is connected but it is red, which means they are connected to an access point. That access point is likely a router that would connect them to the internet. The team must also rename their phone to the standards outlined in Game Manual Part 1, section 7.3.5. **Important Note:** The Samsung Galaxy S5 will show the following message when the app checks the phone name:  Inspectors should manually check the name of the phone to ensure the phone is named correctly.

	This example shows that the team has met all requirements and can pass the software part of the field inspection!

Appendix F – Sample Field Inspection Script

This sample field inspection script contains the most common tournament procedures; inspectors may need to convey additional information or modify the script to convey the unique features of the tournament. In your own words, provide the following information to drive teams during the field inspection practice match.

Pre-Match Robot Setup and the Autonomous Period:

- Remind teams that the qualification match schedule is an estimate, not a guarantee. Teams are responsible for monitoring the flow of matches so that they arrive in the competition area at the correct time.
- Please do not make software changes in the queueing area. Software changes that have not been thoroughly tested may result in undesirable robot behavior during the match.
- Instruct teams that their robots should be ready to play a match before leaving the queueing area. There is little time at the playing field for teams to make mechanical adjustments, untangle gamepad cables, etc.
- The driver station and robot controller Android devices should be powered on and paired together over Wi-Fi Direct while the drive team is in the queue.
- For safety reasons, the robot's main power switch must be turned off while the robot is transported between the queue and the playing fields. The driver station and robot controller Android devices should remain powered on and paired together during transport to the playing field.
- When teams set up on the playing field, they should quickly power on their robots and prepare for the start of the match.
- If the team has an autonomous OpMode:
    - Choose it;
    - Press the driver station “Init” button;
    - Drive teams are required to use the autonomous 30 second timer.
- Teams should now set down their Android devices and gamepads.
- Instruct teams to pay attention to the announcer and at the appropriate time, give a thumbs up so he/she knows they are ready.
- If the team is running an autonomous program for the match, someone is required to press the init and/or start button(s) immediately when the “go” command is issued.
- Review the queueing guidelines on the inspection checklist with the teams.
- Instruct the teams to call out for an FTA if their robot behaves unexpectedly during a match.
- For the practice match, start the autonomous period with a “3-2-1-go!” countdown.

Transition between the Autonomous and Driver-Controlled Periods:

- Drive teams should not touch their driver station until after the end of the autonomous period.
- Field personnel will not instruct drive teams to ready their robots for the driver-controlled period. Drive teams are responsible for selecting their driver-controlled period OpMode and Initing their robot after the conclusion of the autonomous period.
- Drive teams start their robot following a “3-2-1-go!” countdown.

Driver-Controlled Period:

- After approximately 30 seconds, ask the teams to press the stop button on their driver station Android device to confirm this important safety operation.
- Verify that the gamepads no longer cause the robot to move.
- Teams may restart their robot and finish the practice match if the field inspection plan is to run a full

two-minute driver-controlled period.

- Tell teams that they are required to press their driver station stop button at the end of the driver-controlled period. Stopping the OpMode is critical to assuring that the robot is safe for field personnel that may need to enter the field upon the completion of the match.
- Instruct teams to set down their gamepads and Android device at the end of the driver-controlled period and wait for the referees to signal that is time to remove their robots from the playing field. One member of the drive team should remain to collect the robot. If needed, a second person may remain to assist with a heavy robot. The rest of the drive team should collect their driver station if it is not needed to prepare the robot for transportation and leave the competition area until a referee gives a signal to remove robots from the playing field.