
Field Management System Manual

Release 2024a

FIRST

Mar 18, 2024

OVERVIEW AND KEY TERMINOLOGY

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OVERVIEW AND KEY TERMINOLOGY

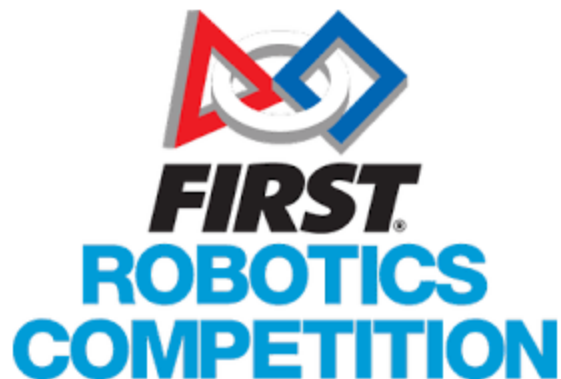
1.1 Disclaimer



Robots can be dangerous. By using the Field Management System (FMS) Software, you understand that in addition to the safety mechanisms built into the software, you, the operator, play a critical part in making sure that the environment around you is safe before enabling robots. You should only enable robots (use the “Match Start” button) when the robots are in a contained area and segregated from humans, who may be injured due to the robot’s motion. If you disagree, or are not willing to use the software under these conditions, you should not proceed.

1.2 About FMS Documentation and Notes

1.2.1 Introduction



The Field Management System (FMS) is the electronics core of a FIRST Robotics Competition (FRC) playing field and encompasses both hardware and software components. The software package is used to control all the field electronics (LED Displays, Station Control Cabinets, E-stops, enable/disable of the Robots, network security, etc.) and is used to manage the event by creating match schedules, scoring the matches in real-time, and posting information to the Audience screen.

1.2.2 Official Game Manual

Information provided in this documentation is not intended to overrule or supersede the Official FRC Game Manual. While game specific information might be referenced in describing a particular feature or product, descriptions found here are not considered replacements for, or updates of, the necessity of reading the official information published on [this Game Manual page](#).

1.2.3 Current Revision



Every effort is made to update the documentation to remain instep with all current features and season information. As best as possible, the documentation is accurate for the current FIRST Robotics Competition game (based on the logo shown).

1.2.4 Documentation Accuracy

Due to the dynamic nature of this documentation, and the annual changes to the software necessary to facilitate each game, there may occasionally be inaccuracies between documented information and available features within the software itself. The documentation will reflect the most recent release of the software as best as possible, and unless otherwise noted, applies to the currently active FRC season. For example, a feature may be documented here, but not visible within the program when using a previous release.

1.3 Terminology

A fair number of acronyms are used throughout this manual. Below is a list of many of these acronyms and additional terms along with their definition. **The official definitions and descriptions of field components are found in the FRC Game Manual.**

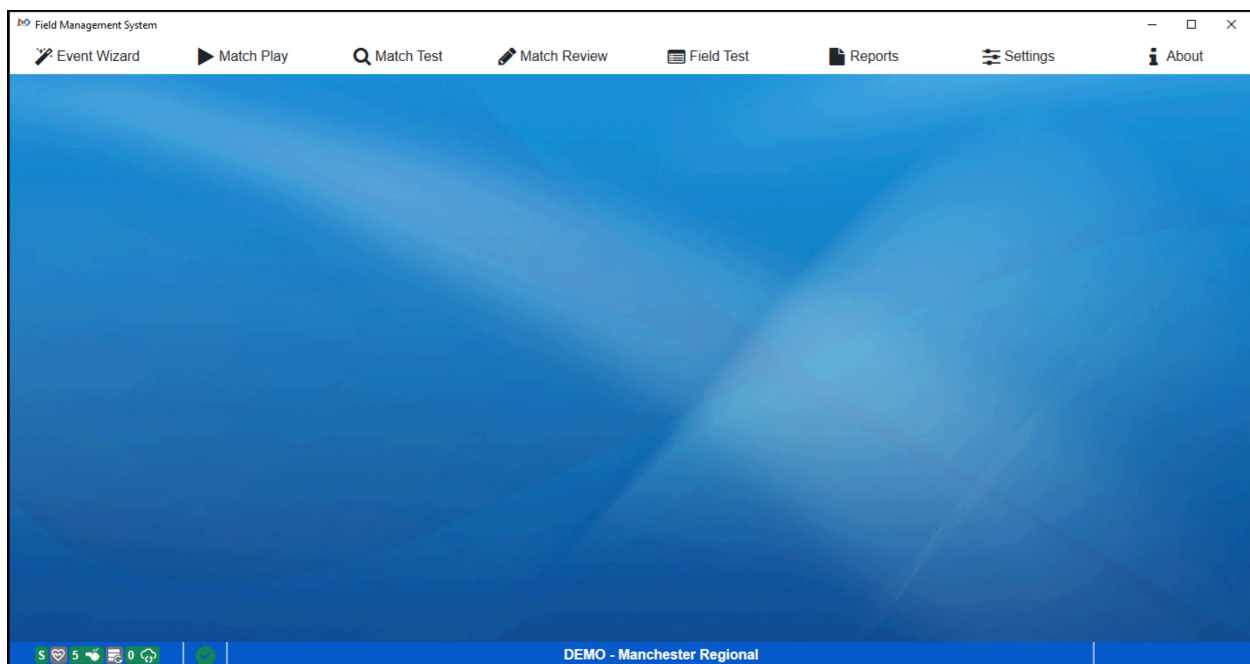
Acronym	Term	Description
FRC	FIRST Robotics Competition	The original FIRST program, for high school students.
FMS	Field Management System	The software (provided by FIRST) that walks volunteers through the course of an FRC event
SCC	Station Control Cabinet	A series of plastic enclosures that house electronics that are assembled and maintained by FIRST Engineering, and setup around the field
DS	Driver Station	A computer, usually a Windows laptop, used to relay control commands from the Team to the Robot
PCK	Philips Color Kinetics	A line of products manufactured by Philips, including controllers and light strings, that commonly appear around FRC fields to relay scoring information to the audience and teams
AD	Audience Display	A software program that is used to control the display of game information to the audience, including real-time scoring, rankings, playoff brackets, and more.
FTA	FIRST Technical Advisor	Volunteer representative of FIRST HQ at events, supervises field operations and troubleshooting
	roboRIO	Control system “brain” manufactured by National Instruments and required on each FRC Robot
	Pit Display	A laptop, provided by FIRST that displays ranking information at each event to people not in the immediate area of the field

NAVIGATION AND INDICATORS

2.1 Tab Navigation

Navigating between the portions of the event manager

2.1.1 Opening View



The above shows the Event Manager interface when opened for the first time. The different tools are accessed via the tabs along the top of the window. These tools are:

- *Event Wizard Navigation* - the main interface for setting up the entire tournament. Creating match schedules, input award winners, generating WPA keys, etc. are all done from this interface
- *Interface* - the main interface for starting and stopping matches, managing the score, and controlling the information posted to the Audience screen
- *Match Test* - the tool used to test the playing field in order to verify proper functionality of all electronics and scoring devices
- *Match Review* - review or modify the score from a previous match

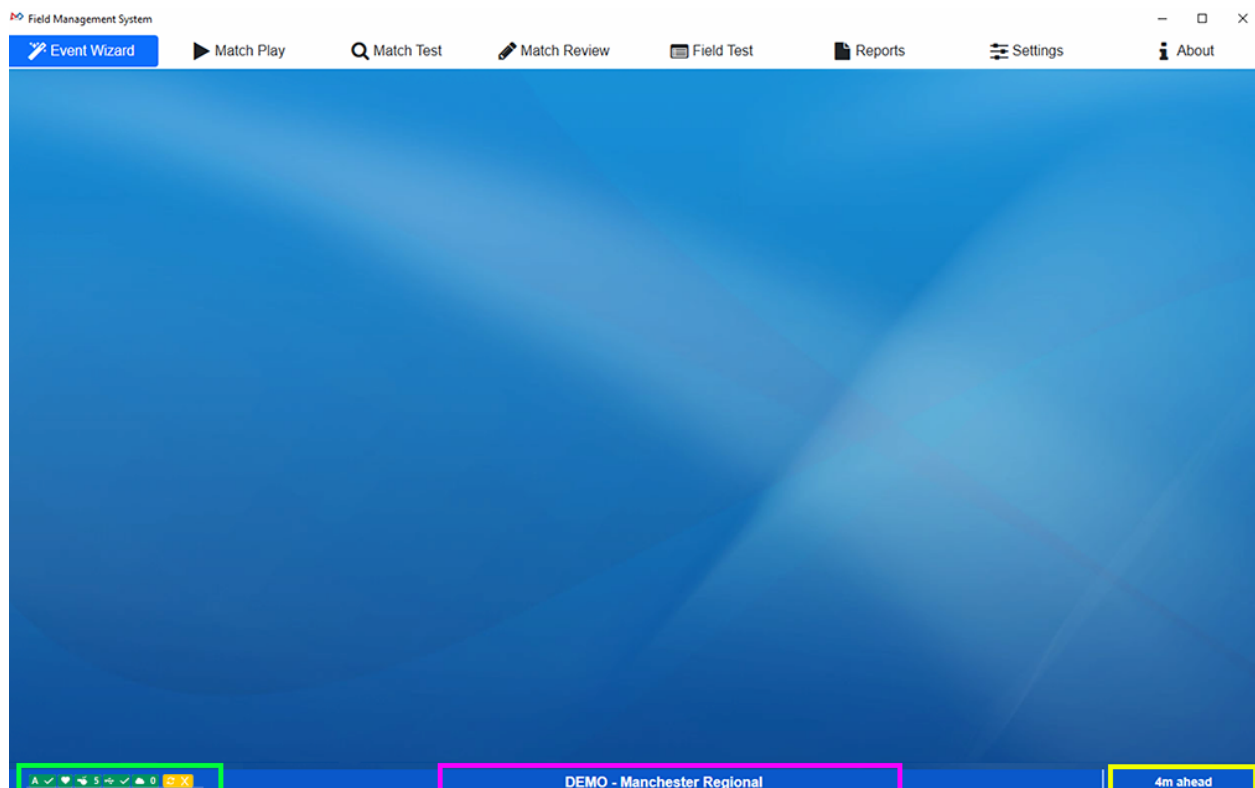
- *Field Test* - perform basic initial functionality tests of the playing field (not available in Off-Season version)
- *Reports* - generating printable reports such as match schedules, team lists, or printouts for Announcers are all handled through this interface
- *Network Status* - Global settings for the software, as well as Administrative functions
- *About Tab* - shows the current software version number, allows updates, and shows the EULA

Further details on each function are detailed later in this User Guide.

2.2 Indicators

Indicators around the main window of Event Manager

2.2.1 Indicator Bar



[Green Box] The bubble indicators relay quick status information about major hardware and software status information on the field. The bubbles are not displayed in the Off-Season version.

- “A” - Status of the Game-Specific Field Hardware
- “Heart” - PLC Heartbeat and Arena Light Status (flashes at 1Hz)
- “Whistle” - Referee screen status (If red, the number of screens missing are displayed)
- “USB Symbol” - Backup Status
- “Cloud” - Sync Status (if red, number of outstanding tasks)
- “Checkmark” - Additional Sync status information

Most items have hover text with additional information. Generally, green means status is good, red means status is bad, and gray or yellow means requires attention.

[Yellow Box] The “ahead behind” timer displays once at least two matches have been played since FMS was opened. The time difference between when the match was started and when it was scheduled to begin will be displayed here. Hover over this timer to see recent cycle times.

Note: As a general rule of thumb, events should not be operating more than one cycle time ahead of schedule. For example, if your cycle time is 7 minutes, then your “ahead behind” time should be “7 minutes ahead” or less.

[Pink Box] The event name and code are displayed at all times

2.2.2 Other Indicators



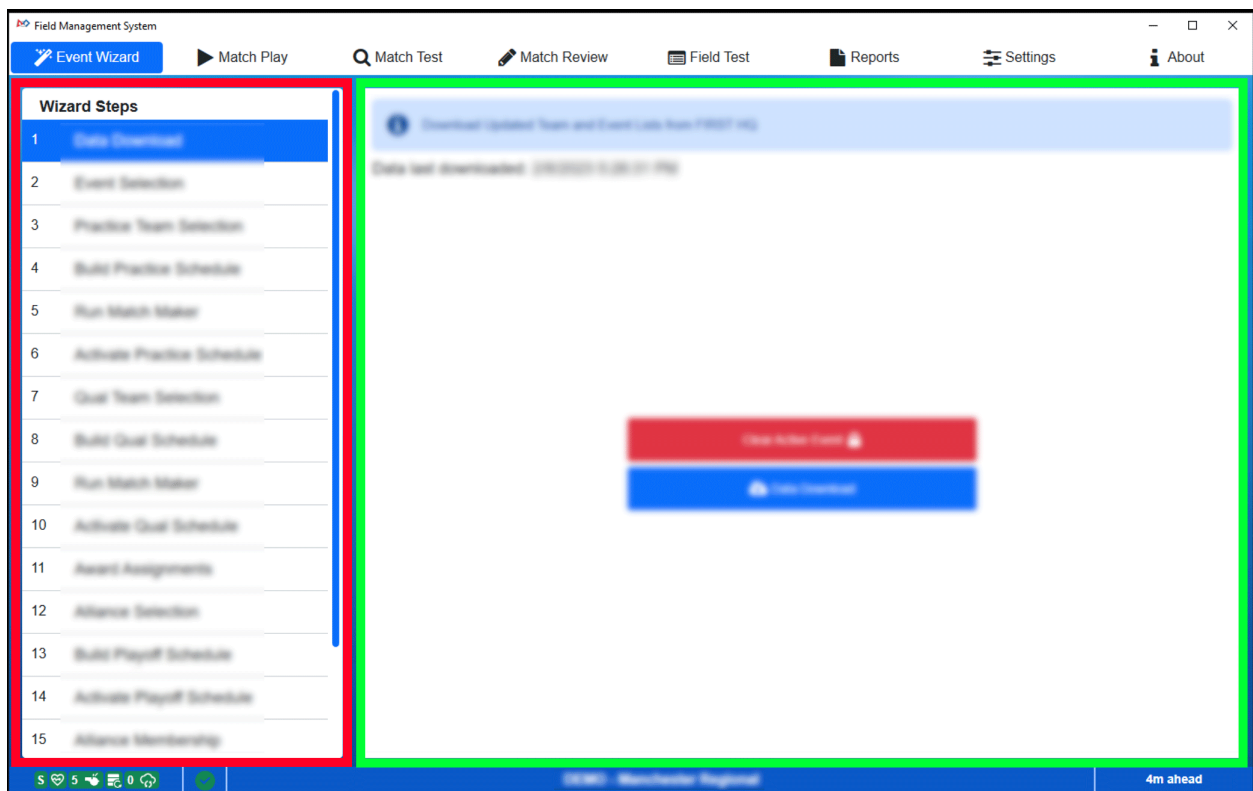
As long as at least two matches have been run since opening FMS, hovering over the ahead/behind time in the bottom right corner will list recent cycle times as a quick preview.



When a task requires additional time to complete (such as schedule generation) a “busy indicator” will appear and block the screen until the operation completes

EVENT WIZARD

3.1 Event Wizard Navigation



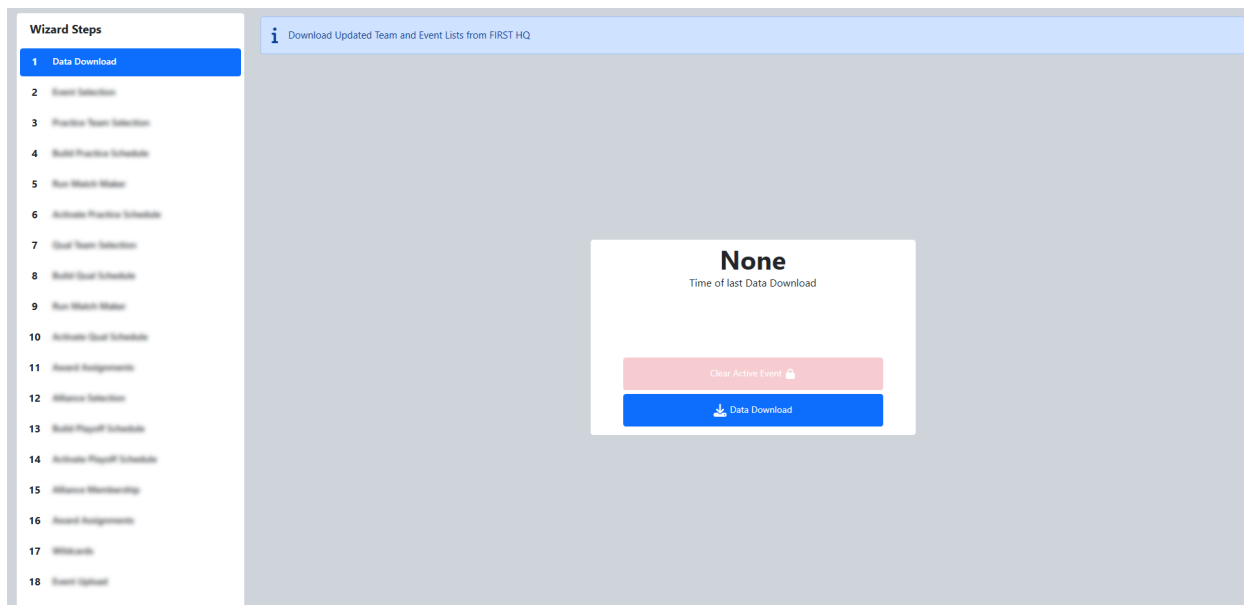
The Event Wizard is used to guide the Scorekeeper through the entire multi-day tournament. It is organized such that the user can configure a portion of the tournament, the Practice schedule for example, then go to Match Play and play through all those matches. Once finished, the user returns to the Event Wizard to configure the next part of the tournament. This process continues until the entire wizard is complete.

Each step of the Event Wizard is shown in this chapter along with a detailed description of the functionality found on each page. For some elements, like activating a schedule, the process is the same for all phases of the tournament. In those cases, the steps are not shown multiple times, but rather noted that it applies multiple times and only listed once.

[Red Box] The left side of the screen is used to navigate between available wizard steps.

[Green Box] The right side displays the content for the selected wizard step.

3.2 Data Download



The Data Download step of the Event Wizard is used to download the complete event list of all official FIRST Robotics Competition Events and Teams. It will also ensure that the data is up-to-date with any changes the teams may have made to their Team Registration profile. Data download should be done at the start of each competition and can optionally be done again at a later time to query for any changes that may continue to be made. For example, if a team changes their name in the dashboard, it would need to be retrieved using Data Download (after being processed by FIRST HQ) before it would be reflected in reports or across other portions of the software.

For more information on how FMS collects and uses data, please see the data services page on <http://frc.events>

This step also downloads all approved Team Avatars.

This step does not apply to FMS Off-Season as the software installation includes the complete registered team list from the current season.

3.3 Event Selection

3.3.1 Selecting a traditional event

Wizard Steps

- 1 Data Download
- 2 **Event Selection**
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule
- 15 Alliance Membership

Select An Event To Play or Add New Unofficial Event

Code	Event Name	Location	Venue
DEMO	Manchester Regional	City, State/Prov Country	Venue
ISDE1	ISR District Event #1	Ra'anana, M Israel	Metro West High School
BCVI	Canadian Pacific Regional	Victoria, BC Canada	Save-On-Foods Memorial Centre
ARLI	Arkansas Regional	Searcy, AR USA	Harding University
ISDE2	ISR District Event #2	Ra'anana, M Israel	Metro West High School
MNDU	Lake Superior Regional	Duluth, MN USA	DECC Arena/South Pioneer Hall
MNDU2	Northern Lights Regional	Duluth, MN USA	DECC Arena/Edmund Fitzgerald Exhibit H
MXMO	Regional Monterrey	Monterrey, MEX Mexico	ITESM Campus Monterrey - Arena Borreg
FLWP	South Florida Regional	West Palm Beach, FL USA	Palm Beach Convention Center
UTWV	Utah Regional	West Valley City, UT USA	Maverik Center
MIFOR	FIM District Calvin University Event presented by Amway	Grand Rapids, MI USA	Van Noord Arena at Calvin University
MIESC	FIM District Escanaba Event	Escanaba, MI USA	Escanaba High School
MIJAC	FIM District Jackson Event presented by Consumers Energy	Spring Arbor, MI USA	Spring Arbor University
MIKET	FIM District Kettering University Event #1 presented by Ford	Flint, MI USA	Kettering University
MIMIL	FIM District Milford Event presented by GM Proving Grounds	Highland, MI USA	Milford High School
TXWAC	FIT District Waco Event	Waco, TX USA	Extraco Event Center
CAPH	Hueneme Port Regional	Port Hueneme, CA USA	Port of Hueneme
NHGRS	NE District Granite State Event	Salem, NH USA	Salem High School
GAALB	PCH District Albany Event	Albany, GA USA	Albany Civic Center
ORORE	PNW District Clackamas Academy Event	Oregon City, OR USA	Clackamas Academy
VABLA	CHS District Blacksburg VA Event	Blacksburg, VA USA	Blacksburg High School
INMIS	FIN District Mishawaka Event	Mishawaka, IN USA	Penn HS
TXDAL	FIT District Dallas Event	Allen, TX USA	Becky Lowery Freshman Center
PAHAT	FMA District Hatboro-Horsham Event	Horsham, PA USA	Hatboro-Horsham High School

+ New **Edit** **Create Event Database**

The Event Selection step of the Event Wizard displays the complete list of events from Data Download. Select the event to be played by clicking on it. In this example, the selected event is shown with a green marker and highlighted blue background on the row.

[Green Marker] The currently selected event, if there is one, will be shown with a highlighted row background

[Red Box] The “new” and “edit” buttons can be used to manipulate Off-Season events

[Pink Box] Create a database for a selected event (see below)

3.3.2 Creating an Off-Season Event

Event Code: ABCD

Event Type: Off-Season

Event Name: EventName

Location: City State/Prov Country

Venue: Venue

Start Date: 15

End Date: 15

Alliance Selection: ThreeTeam

Alliance Count: EightAlliance

Playoff Bracket: SingleElimination

Backup Substitution: BackupPermanentReplacement

Lineup change type: NotPermitted

Save Cancel

For FMS Off-Season, clicking “New” will allow the addition of an unofficial (Off-Season) event. Only events added with the “New” button can be edited, those downloaded from FIRST are protected from edits (including off-season events that come from FIRST HQ). If you’ve requested to sync results with FIRST HQ, do not manually add your event. Instead, use data download to receive it and use the downloaded event.

The Event Code (*red box*) must be unique from any other events on the machine (official events or Off-Season events).

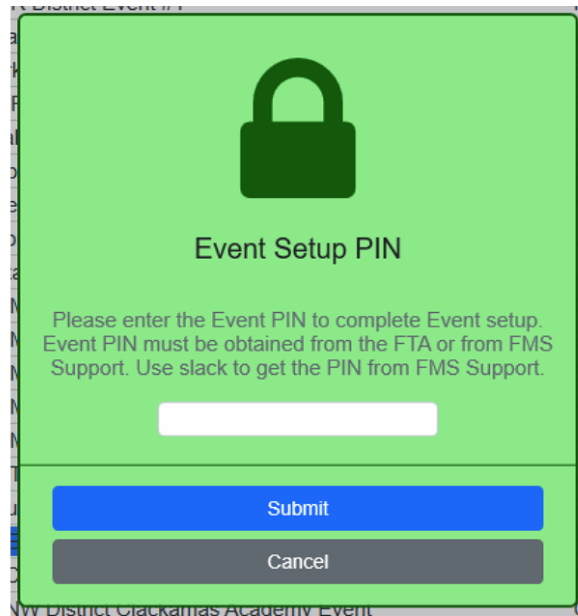
Note: Make sure the inclusive start and end dates (*green box*) are marked properly, as they are used to validate schedules.

The alliance count and playoff style can also be edited on this screen, but only before the playoff tournament process has begun (i.e. until Alliance Selection). It cannot be changed in a downloaded event (Official or Off-Season)

3.3.3 Creating Event Database

Once the target event has either been selected or created a database must be created to store the event results. Click the “Create Event Database” button (the *pink box* in the first photo on this page). For official events an Event PIN prompt will be presented before a database can be created.

3.3.4 Event PINs

A screenshot of a mobile application dialog box titled "Event Setup PIN". The dialog has a light green background. At the top center is a large black padlock icon. Below the icon, the text "Event Setup PIN" is displayed in bold. Underneath, a message reads: "Please enter the Event PIN to complete Event setup. Event PIN must be obtained from the FTA or from FMS Support. Use slack to get the PIN from FMS Support." Below this text is a white rectangular input field. At the bottom of the dialog are two buttons: a blue "Submit" button and a grey "Cancel" button. The dialog is overlaid on a blurred background of a mobile app interface.

For traditional events, and Off-Season events that are Syncing data with FIRST, clicking “Create Event Database” will prompt for an Event PIN to be entered. The FTA will need to enter the PIN number they were provided by FIRST HQ. Upon pressing Submit, the creation process proceed as described below.

3.3.5 Event Database Creation in Progress



The system will create a new database to store the event results and data. This will temporarily disable the screen until the process is complete. This process also populates registration information, team award history and more from the cloud.

Once the process completes, and each time this step is re-opened thereafter, the button will be disabled as the database has already been created.

3.4 Team Selection

3.4.1 View and Add Registrations

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection**
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule
- 15 Alliance Membership
- 16 Award Assignments
- 17 Unlocks
- 18 Event Upload

Select Teams to Participate in the Qualification Rounds Or Add Unofficial Teams

Team #	Team Name	Key Generated	Key Status	Rookie	Location
<input checked="" type="checkbox"/>	1 The Juggernauts	True	Not Tested	1997	Pontiac, Michigan USA
<input checked="" type="checkbox"/>	4 Team 4 ELEMENT	True	Not Tested	1997	Van Nuys, California USA
<input checked="" type="checkbox"/>	8 Paly Robotics	True	Not Tested	1996	Palo Alto, California USA
<input checked="" type="checkbox"/>	11 MORT	True	Not Tested	1997	Flanders, New Jersey USA
<input checked="" type="checkbox"/>	16 Bomb Squad	True	Not Tested	1996	Mountain Home, Arkansas USA
<input checked="" type="checkbox"/>	20 The Rocketeers	True	Not Tested	1992	Clifton Park, New York USA
<input checked="" type="checkbox"/>	21 ComBBAT	True	Not Tested	1998	Titusville, Florida USA
<input checked="" type="checkbox"/>	23 PNITA Pilgrim Nuclear Technology...	True	Not Tested	1995	Plymouth, Massachusetts USA
<input checked="" type="checkbox"/>	25 Raider Robotix	True	Not Tested	1997	North Brunswick, New Jersey USA
<input checked="" type="checkbox"/>	27 Team RUSH	True	Not Tested	1997	Clarkston, Michigan USA
<input checked="" type="checkbox"/>	28 Pierson Whalers	True	Not Tested	1996	Sag Harbor, New York USA
<input checked="" type="checkbox"/>	31 Prime Movers	True	Not Tested	1997	Jenks, Oklahoma USA
<input checked="" type="checkbox"/>	33 Killer Bees	True	Not Tested	1996	Auburn Hills, Michigan USA
<input checked="" type="checkbox"/>	34 Rockets	True	Not Tested	1997	Athens, Alabama USA
<input checked="" type="checkbox"/>	41 RoboWarriors	True	Not Tested	1997	Warren, New Jersey USA
<input checked="" type="checkbox"/>	45 TechnoKats Robotics Team	True	Not Tested	1992	Kokomo, Indiana USA
<input checked="" type="checkbox"/>	48 Team E.L.I.T.E.	True	Not Tested	1998	Warren, Ohio USA
<input checked="" type="checkbox"/>	51 The Wings of Fire	True	Not Tested	1996	Pontiac, Michigan USA
<input checked="" type="checkbox"/>	56 R.O.B.B.E.	True	Not Tested	1997	Bound Brook, New Jersey USA
<input checked="" type="checkbox"/>	58 The Riot Crew	True	Not Tested	1996	South Portland, Maine USA
<input checked="" type="checkbox"/>	59 RamTech	True	Not Tested	1997	Miami, Florida USA
<input checked="" type="checkbox"/>	60 Kingman FIRST Robotics Team 60...	True	Not Tested	1997	Kingman, Arizona USA
<input checked="" type="checkbox"/>	61 The Intimidators	True	Not Tested	1995	Upton, Massachusetts USA
<input checked="" type="checkbox"/>	63 McDowell Robotics Team 63	True	Not Tested	1997	Erie, Pennsylvania USA
<input type="checkbox"/>	66 Grizzly Robotics	False	Not Tested	1998	Ypsilanti, Michigan USA
<input type="checkbox"/>	67 The HOT Team	False	Not Tested	1997	Highland, Michigan USA
<input type="checkbox"/>	68 Truck Town Thunder	False	Not Tested	1998	Ortonville, Michigan USA
<input type="checkbox"/>	69 HYPER	False	Not Tested	1998	Quincy, Massachusetts USA
<input type="checkbox"/>	70 More Martians	False	Not Tested	1998	Goodrich, Michigan USA
<input type="checkbox"/>	71 Team Hammond	False	Not Tested	1996	Hammond, Indiana USA
<input type="checkbox"/>	74 Team CHAOS	False	Not Tested	1995	Holland, Michigan USA
<input type="checkbox"/>	75 RoboRaiders	False	Not Tested	1996	Hillsborough, New Jersey USA

Show Teams: ☒ All ☐ Competing Only (24 teams)

Filter By Team Number:

+ New Team **Edit Team**

File: **Browse...**

Import Teams from File

Clear All Keys **Export Keys** **+ Generate Security Keys**

Team Selection displays the downloaded list of registered FRC teams, with those registered for the event pre-checked. This list should be used to verify all the teams registered are actually present at the venue.

Note: The Qualification schedule should not be generated until all teams have arrived at the venue, or otherwise instructed by HQ and/or the local event manager. Otherwise, a schedule may need to be re-generated if a team ends up not attending and there may be confusion if multiple versions of the schedule have been created.

[Red Box] Checkboxes indicate the registration status of a particular team at the event. If the box is checked, the team on that row is set as “competing” for the event. Unchecked teams are not competing.

[Green Box] The count of competing (checked) teams along with the ability to filter the team list. Radio buttons can also be used to switch the view list from all FRC Teams (All) to just those that are checked (Competing Only)

[Blue Box] The “new” and “edit” buttons can be used to add unofficial teams for Off-Season use. These are disabled at official events.

Note: Having any teams that were manually added (using “New”) checked as competing teams (red column) will prevent data from being sent to FIRST (scores, results, etc) and therefore is not available in-season.

Warning: Teams should not be checked off at official events (added as participants) without the direction of the FTA or event manager as there must be corresponding paperwork at FIRST HQ for each participant at official events.

3.4.2 Adding Off-Season Teams (Optional)

If additional teams are needed at an Off-Season event, the “new” button (blue box in the top photo on this page) can be used to create a custom team. The team number (red marker) must be unique. Make sure the team is checked as competing once created. Only teams added manually can be edited, those downloaded from FIRST are protected from edits.

Events with custom teams cannot sync with FIRST servers.

Note: FIRST HQ has designed and “pre-loaded” a set of Teams that, while not “official teams” in FRC, can be used during the Off-Season at an event without disabling the ability to Sync with FIRST servers. These teams contain “Demo” in their name and appear at the end of the team list.

3.4.3 Generate Security Keys

Team #	Team Name	Key Generated	Key Status	Rookie	Location
<input checked="" type="checkbox"/>	1 The Juggernauts	True	Not Tested	1997	Pontiac, Michigan USA
<input checked="" type="checkbox"/>	4 Team 4 ELEMENT	True	Not Tested	1997	Van Nuys, California USA
<input checked="" type="checkbox"/>	8 Paly Robotics	True	Not Tested	1996	Palo Alto, California USA
<input checked="" type="checkbox"/>	11 MORT	True	Not Tested	1997	Flanders, New Jersey USA
<input checked="" type="checkbox"/>	16 Bomb Squad	True	Not Tested	1996	Mountain Home, Arkansas USA
<input checked="" type="checkbox"/>	20 The Rocketeers	True	Not Tested	1992	Clifton Park, New York USA
<input checked="" type="checkbox"/>	21 ComBBAT	True	Not Tested	1998	Titusville, Florida USA
<input checked="" type="checkbox"/>	23 PNITA Pilgrim Nuclear Technology...	True	Not Tested	1995	Plymouth, Massachusetts USA
<input checked="" type="checkbox"/>	25 Raider Robotix	True	Not Tested	1997	North Brunswick, New Jersey USA
<input checked="" type="checkbox"/>	27 Team RUSH	True	Not Tested	1997	Clarkston, Michigan USA
<input checked="" type="checkbox"/>	28 Pierson Whalers	True	Not Tested	1996	Sag Harbor, New York USA
<input checked="" type="checkbox"/>	31 Prime Movers	True	Not Tested	1997	Jenks, Oklahoma USA
<input checked="" type="checkbox"/>	33 Killer Bees	True	Not Tested	1996	Auburn Hills, Michigan USA
<input checked="" type="checkbox"/>	34 Rockets	True	Not Tested	1997	Athens, Alabama USA
<input checked="" type="checkbox"/>	41 RoboWarriors	True	Not Tested	1997	Warren, New Jersey USA
<input checked="" type="checkbox"/>	45 TechnoKats Robotics Team	True	Not Tested	1992	Kokomo, Indiana USA
<input checked="" type="checkbox"/>	48 Team E.L.I.T.E	True	Not Tested	1998	Warren, Ohio USA
<input checked="" type="checkbox"/>	51 The Wings of Fire	True	Not Tested	1996	Pontiac, Michigan USA
<input checked="" type="checkbox"/>	56 R.O.B.B.E	True	Not Tested	1997	Bound Brook, New Jersey USA
<input checked="" type="checkbox"/>	58 The Riot Crew	True	Not Tested	1996	South Portland, Maine USA
<input checked="" type="checkbox"/>	59 RamTech	True	Not Tested	1997	Miami, Florida USA
<input checked="" type="checkbox"/>	60 Kingman FIRST Robotics Team 60...	True	Not Tested	1997	Kingman, Arizona USA
<input checked="" type="checkbox"/>	61 The Intimidators	True	Not Tested	1995	Upton, Massachusetts USA
<input checked="" type="checkbox"/>	63 McDowell Robotics Team 63	True	Not Tested	1997	Erie, Pennsylvania USA
<input type="checkbox"/>	66 Grizzly Robotics	False		1998	Ypsilanti, Michigan USA
<input type="checkbox"/>	67 The HOT Team	False		1997	Highland, Michigan USA
<input type="checkbox"/>	68 Truck Town Thunder	False		1998	Ortonville, Michigan USA
<input type="checkbox"/>	69 HYPER	False		1998	Quincy, Massachusetts USA
<input type="checkbox"/>	70 More Martians	False		1998	Goodrich, Michigan USA
<input type="checkbox"/>	71 Team Hammond	False		1996	Hammond, Indiana USA
<input type="checkbox"/>	74 Team CHAOS	False		1995	Holland, Michigan USA
<input type="checkbox"/>	75 RoboRaiders	False		1996	Hillsborough, New Jersey USA

Once the teams competing at the event have all been checked off and the proper number is displayed under “Total Competing Teams”, security (“WPA”) keys should be generated. This is done using the “Generate Security Keys” button (green button inside the pink box). Once keys are generated the “Key Generated” column will display the new status of “True”.

Note: If additional teams are added later, the same process can be used to generate keys for those new teams- teams

with existing keys will remain untouched.

Once the keys are generated, the FTA should use the WPA Kiosk program on the WPA Laptop to download keys from FMS to the kiosk program. This download process will require FTA authentication and is outlined in more detail [WPA Kiosk](#).

As a backup to the traditional WPA Kiosk setup process, the Export Keys button (*blue button inside the pink box*) can be used to save the key file needed to run the Radio Kiosk. This should only be used by the FTA, as it requires their password to complete, and is only used as a backup solution.

The schedule generation steps assume that all teams will use the same security keys throughout the event; as a result, performing Keys steps is not necessary to repeat on each Team Selection step of the Wizard (even though there are multiple).

The Clear All Keys button (*red button in the pink box*) returns all teams to their default, keyless, state. This should only be used at the direction of FIRST HQ and requires the FTA password.

3.4.4 WPA Kiosk Key Download

Once security keys have been generated they can be downloaded to the WPA Kiosk for team radio programming. For more information, see [WPA Kiosk](#).

Note: Downloading keys will require FTA Authentication. At an off-season event, use the code “0000” to bypass the FTA Authentication.

3.5 Build Schedule

3.5.1 Define Tournament Level Parameters

Tournament levels are configured and managed in the build steps of the Event Wizard. This step is used to setup the schedule for the Day(s), the lunch period, number of matches per team, and match duration. This documentation will build a traditional two day qualification tournament.

[Green Box] Enter the initial Cycle Time (in minutes) for matches, which should be pre-populated with the suggested value. This is the start-to-start time for matches. This time can change across the day or between days using the “Add Cycle Change” button described later.

[Pink Box] Enter the number of matches per team (which will usually be pre-populated with the number required by FIRST HQ)

[Gold Box] Confirm the number of Teams matches the number expected (as defined in the Team Selection step). This is critical to team experience (not having to re-do a schedule if a team is added/missing). Please confirm with the event manager / appropriate party that all teams are present or accounted for before building a schedule.

The number of matches that will be needed will be displayed on the far right (Total # Matches)

3.5.2 Add Days

Once the level parameters have been defined, days must be added. A Day should be added for each day on which matches will be played for that tournament level (normally one day for practice, two for qualifications and one for playoffs). Use the “Add Day” button (*marked in Green*) to add the number of days necessary to the list. If necessary, a Day (and any associated breaks and cycle changes) can be deleted by using the “Delete Day” button (*marked in Gold*).

[*Pink Box*] Confirm the start date and time for each day of the level. The day of the week is displayed next to the box, and should be used to confirm the schedule day is entered correctly.

Warning: It is critical to confirm the correct date and day of week- it cannot be changed without regenerating the schedule.

[*Blue Box*] Enter the approximate number of matches for each day of the level (estimates are fine, this can be adjusted as breaks and cycle changes are added)

Note: The total number of matches over the course of all days in a level must be the same as the Total # Matches shown at the top of the parameters window

3.5.3 Add Breaks

The screenshot shows the 'Configure Qualification Schedule Generation Parameters' interface. On the left is a 'Wizard Steps' sidebar with 12 steps. Step 8, 'Build Qual Schedule', is highlighted. The main area is titled 'Configure Qualification Schedule Generation Parameters' and has two tabs: 'Schedule Parameters' and 'Schedule'. Under 'Schedule Parameters', there are fields for 'Default Cycle Time (min): 7', 'Matches Per Team: 10', 'Total # Teams: 24', and 'Total # Matches: 40'. Below these are '+ Add Day' and '+ Add Break' buttons. The 'Schedule' tab shows a table of days with columns for 'Day Start', 'Day End', 'Day Start Cycle (min)', 'How Many Matches', and 'Day End'. The first day is Wednesday, 9:00 AM to 01:45 PM, with a cycle of 7 minutes and 30 matches. The second day is Thursday, 9:00 AM to 10:10 AM, with a cycle of 7 minutes and 10 matches. Each day has a '+ Add Break' button highlighted with a green box. Below the table, there are fields for 'Description', 'Is Lunch?', 'After Match Number', 'Length (min)', and 'Break Start'. The first break is for 'Speaker' (Length: 15 min, Break Start: 09:35 AM). The second break is for 'Lunch' (Length: 60 min, Break Start: 11:00 AM). Each break has a 'Delete Break' button.

Once level days have been defined, day breaks can be added. Breaks can be added for things like lunch, speakers, sponsor presentations, etc. Breaks are associated with a particular day, which means the matching Add Break button must be used under the matching day on which the break will occur.

[Green Box] Press the “Add Break” button to add the appropriate number of breaks to each day on your schedule. If any breaks must be removed, they can be deleted using the corresponding red Delete Break button. There is no limit to the number of breaks on a particular day.

[Red Box] Short description (which will appear on the printed schedules and the web)

[Pink Box] If the break is related to lunch/a meal, check this box (which will affect the appearance on the web)

[Gold Box] The match number after which the break will happen (must be unique, i.e. no cascading breaks)

[Purple Box] The length (in minutes) of the break measured from the end of the proceeding match to the start of the next match

To the right of the break length the start time will be displayed based on the criteria entered (i.e. if the event remains on schedule, the break will start at that time).

Note: Once the schedule has been generated (teams have been assigned to matches) breaks and cycle changes cannot be changed or removed. If a break is no longer needed, it should simply be ignored.

3.5.4 Add Cycle Changes

The screenshot shows the 'Configure Qualification Schedule Generation Parameters' interface. On the left is a 'Wizard Steps' sidebar with 12 steps. Step 8, 'Build Qual Schedule', is highlighted. The main area is titled 'Configure Qualification Schedule Generation Parameters' and has two tabs: 'Schedule Parameters' and 'Schedule'. Under 'Schedule Parameters', there are fields for 'Default Cycle Time (min): 7', 'Matches Per Team: 10', 'Total # Teams: 24', and 'Total # Matches: 40'. Below these are '+ Add Day' and '+ Add Break' buttons. The 'Schedule' tab shows a table of days with columns for 'Day Start', 'Day End', 'Day Start Cycle (min)', 'How Many Matches', and 'Day End'. The first day is Wednesday, 9:00 AM to 01:18 PM, with a cycle of 7 minutes and 30 matches. The second day is Thursday, 9:00 AM to 10:10 AM, with a cycle of 7 minutes and 10 matches. Each day has a '+ Add Break' button and a '+ Add Cycle Change' button highlighted with a green box. Below the table, there are fields for 'Description', 'Is Lunch?', 'After Match Number', 'Cycle Change +/- (min)', and 'Break Start'. The first cycle change is for 'Speaker' (Cycle Change: -1 min, Break Start: 09:33 AM). The second cycle change is for 'Lunch' (Cycle Change: -1 min, Break Start: 10:48 AM). Each cycle change has a 'Delete Cycle Change' button.

Once level days and breaks have been defined, cycle changes can be added. Cycles are associated with a particular day, which means the matching “Add Cycle Change” button must be used under the matching day on which the change will occur.

The primary intended use for Cycle Changes are to allow teams and field staff to have a slightly slower cycle time for each team’s first appearance on the field that day, then lower that cycle time for the remainder of the day.

[Green Box] Press the “Add Cycle Change” button to add the appropriate number of changes to each day on your schedule. If any changes must be removed, they can be deleted using the corresponding red Delete Cycle Change button. There is no limit to the number of cycle changes on a particular day, though FIRST HQ recommends no more than one change.

[Purple Box] The match number after which the change will happen (must be unique, i.e. no cascading changes)

[Pink Box] The change that will happen in whole minutes. Negative numbers will make the cycle “faster” while positive numbers will make the cycle “slower”

To the right of the cycle change details will confirm when the change will take place, relative to the event schedule. Decimals (partial minutes) are allowed, but not recommended. Reports and other areas of the software do not show partial minutes, and this may cause confusion for viewers.

Note: Once the schedule has been generated (teams have been assigned to matches) breaks and cycle changes cannot be changed or removed. If a break is no longer needed, it should simply be ignored.

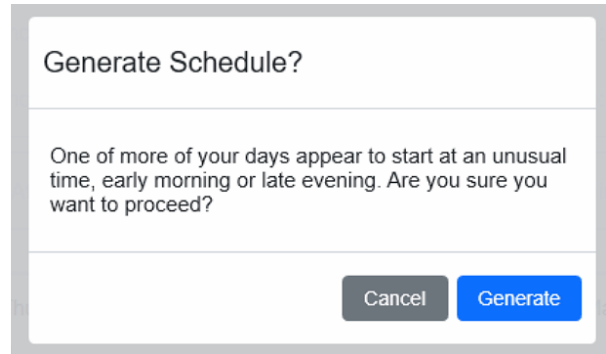
3.5.5 Confirm and Generate

The screenshot displays the 'Configure Qualification Schedule Generation Parameters' wizard. The 'Build Qual Schedule' step is selected in the left sidebar. The main area shows two days: Wednesday and Thursday. For Wednesday, the 'Matches Per Team' is 10, 'Day End' is 01:18 PM, and 'Break Start' is 09:33 AM. For Thursday, the 'Day End' is 10:10 AM. A green box highlights the 'Generate Schedule' button at the bottom right, indicating the schedule is ready to be generated.

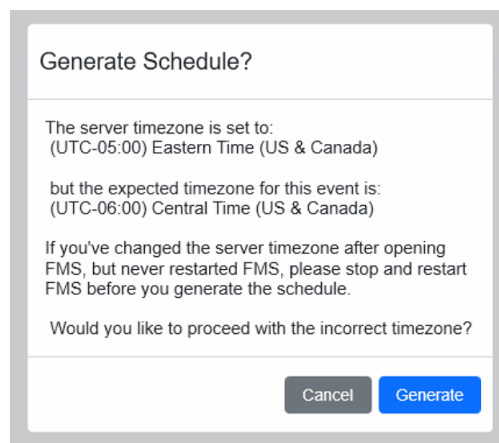
Before generating the schedule, confirm all data is accurate as displayed. Particularly those items indicated with red boxes as pictured as these are critical to event schedule. If the event has a Regional Director (RD) or show manager, the schedule should be reviewed with them as well.

[Green Indicator] Click the Generate Schedule button once all the critical details are confirmed.

In the example below, we’ve accidentally attempted to create a schedule that starts at 9:00 PM instead of 9:00 AM. We could still go with 9:00 PM if we wish by selecting Yes, or selecting No to go back and make a correction.



There are other messages that can appear during this process as well. It is important to read and understand them, and contact support if unsure. For example, below, a schedule is being made in Eastern time but HQ believes the event should be in Central time. Confirmation is required before continuing.



3.5.6 Review

The screenshot shows the "Wizard Steps" on the left and the "Configure Qualification Schedule Generation Parameters" window on the right. The "Schedule" tab is highlighted in a green box. The "Schedule Parameters" section shows a table of qualification matches.

Description	Time	Match #	Red Alliance			Blue Alliance			#
			1	2	3	1	2	3	
Qualification 1	Wed 09:00 AM	1	0	0	0	0	0	0	
Qualification 2	Wed 09:07 AM	2	0	0	0	0	0	0	
Qualification 3	Wed 09:14 AM	3	0	0	0	0	0	0	
Qualification 4	Wed 09:21 AM	4	0	0	0	0	0	0	
Qualification 5	Wed 09:27 AM	5	0	0	0	0	0	0	
Speaker									
Qualification 6	Wed 09:48 AM	6	0	0	0	0	0	0	
Qualification 7	Wed 09:54 AM	7	0	0	0	0	0	0	
Qualification 8	Wed 10:00 AM	8	0	0	0	0	0	0	
Qualification 9	Wed 10:06 AM	9	0	0	0	0	0	0	
Qualification 10	Wed 10:12 AM	10	0	0	0	0	0	0	
Qualification 11	Wed 10:18 AM	11	0	0	0	0	0	0	
Qualification 12	Wed 10:24 AM	12	0	0	0	0	0	0	

After generation, select the "Schedule" tab (green box) to view the full schedule based on the parameters that were supplied. This schedule should again be reviewed for accuracy with any appropriate parties. Breaks/changes cannot be made later without regenerating the full schedule and losing any played matches.

The displayed schedule times are fixed and will not update, "The Schedule is The Schedule" so to speak. Even if the event is running ahead or behind, the schedule times will remain the same.

Note: As a general rule of thumb, events should not be operating more than one cycle time ahead of schedule. For example, if your cycle time is 7 minutes, then your "ahead behind" time should be "7 minutes ahead" or less. Getting

too far ahead can be confusing to teams, parents, VIPs, sponsors, etc. who show up or tune in to see a particular team compete only to find out the match was played early. Running ahead could cause an online viewer to miss important content.

3.5.7 Playoff Notes

In order to generate a Playoff Schedule, alliance selection must be complete. If it is not, an error message will be presented.

The software will only populate the initial round of matches in Playoffs. As alliances advance in the Playoff Tournament the software will automatically them.

3.6 Run Match Maker

3.6.1 Execute Match Maker

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 **Run Match Maker**
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics Rounds

File: Browse...

Description	Time	Match	Red 1 S	Red 2 S	Red 3 S	Blue 1 S	Blue 2 S	Blue 3 S
Qualification 1	Wed 09:00 AM	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 2	Wed 09:07 AM	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 3	Wed 09:14 AM	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 4	Wed 09:21 AM	4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 5	Wed 09:27 AM	5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speaker								
Qualification 6	Wed 09:48 AM	6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 7	Wed 09:54 AM	7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 8	Wed 10:00 AM	8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 9	Wed 10:06 AM	9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 10	Wed 10:12 AM	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 11	Wed 10:18 AM	11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 12	Wed 10:24 AM	12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 13	Wed 10:30 AM	13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 14	Wed 10:36 AM	14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 15	Wed 10:42 AM	15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lunch								
Qualification 16	Wed 11:48 AM	16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 17	Wed 11:54 AM	17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 18	Wed 12:00 PM	18	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Import Matches from File

Execute Match Maker

Once the match schedule has been generated it's necessary to generate the alliances. The MatchMaker algorithm is used for this purpose. It creates over 5 million possible schedules and selects the best one that meets the criteria outlined in the game manual. MatchMaker should only be run one time for the Practice schedule, and one time for the Qualification schedule. If it is believed that the schedule is not optimum, consult FRC Engineering for additional review. This process should be done with the FTA present.

The schedule generated in the previous step will be present on the MatchMaker step.

[Green Marker] Click the "Execute Match Maker" button to generate the randomized alliances.

3.6.2 Match Maker In Progress



Upon execution, MatchMaker will begin formulating the alliances. A progress message will indicate how much time (approximately) remains in the process. This process takes more time when more teams are involved- occasionally upwards of four minutes. The process should not be interrupted

Note: MatchMaker can only run if the user has Administrator permissions on the server and has FMS running as an admin. This should be automatic on FIRST owned hardware, but may need to be done manually on personal hardware.

3.6.3 Review Schedule

Wizard Steps
1 Data Download
2 Event Selection
3 Practice Team Selection
4 Build Practice Schedule
5 Run Match Maker
6 Activate Practice Schedule
7 Qual Team Selection
8 Build Qual Schedule
9 Run Match Maker
10 Activate Qual Schedule
11 Award Assignments
12 Information Administration

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics Rounds

File:

Description	Time	Match	Red 1	S	Red 2	S	Red 3	S	Blue 1	S	Blue 2	S	Blue 3	S
Qualification 1	Wed 09:00 AM	1	27	<input type="checkbox"/>	66	<input type="checkbox"/>	23	<input type="checkbox"/>	61	<input type="checkbox"/>	8	<input type="checkbox"/>	56	<input type="checkbox"/>
Qualification 2	Wed 09:07 AM	2	48	<input type="checkbox"/>	1	<input type="checkbox"/>	4	<input type="checkbox"/>	28	<input type="checkbox"/>	51	<input type="checkbox"/>	45	<input type="checkbox"/>
Qualification 3	Wed 09:14 AM	3	21	<input type="checkbox"/>	20	<input type="checkbox"/>	59	<input type="checkbox"/>	33	<input type="checkbox"/>	25	<input type="checkbox"/>	31	<input type="checkbox"/>
Qualification 4	Wed 09:21 AM	4	60	<input type="checkbox"/>	63	<input type="checkbox"/>	11	<input type="checkbox"/>	16	<input type="checkbox"/>	58	<input type="checkbox"/>	34	<input type="checkbox"/>
Qualification 5	Wed 09:27 AM	5	8	<input type="checkbox"/>	41	<input type="checkbox"/>	1	<input type="checkbox"/>	56	<input type="checkbox"/>	66	<input type="checkbox"/>	4	<input type="checkbox"/>
Speaker				<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Qualification 6	Wed 09:48 AM	6	20	<input type="checkbox"/>	28	<input type="checkbox"/>	61	<input type="checkbox"/>	48	<input type="checkbox"/>	21	<input type="checkbox"/>	45	<input type="checkbox"/>
Qualification 7	Wed 09:54 AM	7	34	<input type="checkbox"/>	31	<input type="checkbox"/>	51	<input type="checkbox"/>	63	<input type="checkbox"/>	27	<input type="checkbox"/>	58	<input type="checkbox"/>
Qualification 8	Wed 10:00 AM	8	59	<input type="checkbox"/>	33	<input type="checkbox"/>	60	<input type="checkbox"/>	23	<input type="checkbox"/>	11	<input type="checkbox"/>	41	<input type="checkbox"/>
Qualification 9	Wed 10:06 AM	9	16	<input type="checkbox"/>	56	<input type="checkbox"/>	45	<input type="checkbox"/>	51	<input type="checkbox"/>	25	<input type="checkbox"/>	61	<input type="checkbox"/>
Qualification 10	Wed 10:12 AM	10	20	<input checked="" type="checkbox"/>	66	<input type="checkbox"/>	31	<input type="checkbox"/>	27	<input checked="" type="checkbox"/>	34	<input type="checkbox"/>	8	<input type="checkbox"/>
Qualification 11	Wed 10:18 AM	11	11	<input type="checkbox"/>	4	<input type="checkbox"/>	51	<input type="checkbox"/>	59	<input type="checkbox"/>	21	<input type="checkbox"/>	61	<input type="checkbox"/>
Qualification 12	Wed 10:24 AM	12	41	<input type="checkbox"/>	28	<input type="checkbox"/>	21	<input type="checkbox"/>	25	<input type="checkbox"/>	63	<input type="checkbox"/>	16	<input type="checkbox"/>
Qualification 13	Wed 10:30 AM	13	1	<input type="checkbox"/>	60	<input type="checkbox"/>	58	<input type="checkbox"/>	27	<input type="checkbox"/>	20	<input type="checkbox"/>	33	<input type="checkbox"/>
Qualification 14	Wed 10:36 AM	14	34	<input type="checkbox"/>	48	<input type="checkbox"/>	61	<input type="checkbox"/>	56	<input type="checkbox"/>	31	<input type="checkbox"/>	23	<input type="checkbox"/>
Qualification 15	Wed 10:42 AM	15	21	<input type="checkbox"/>	11	<input type="checkbox"/>	8	<input type="checkbox"/>	4	<input type="checkbox"/>	60	<input type="checkbox"/>	63	<input type="checkbox"/>

Upon successful completion, the team numbers will be shown in their places on the schedule. If any teams are playing as a Surrogate, the box to the right of the team number will be checked (*shown in green circles*). The schedule (now showing the alliances) should match what was entered on the previous step as far as timing and breaks.

3.6.4 Review Statistics

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics Rounds

Team	Matches	Surrogates	# Partners	# Opponents	Alliance Partners	Opponents
1	10	0	19	19	4, 8, 11, 20, 21, 25(2), 31, 33, 41, 45, 48, 51, 56, 58, 59, 60, 61, 63, 66,	4(2), 16, 20(2), 21(2), 23(3), 24(2)
4	10	0	19	19	1, 8, 11, 16, 20, 21, 23, 25, 27, 28, 31(2), 34, 48, 51, 56, 59, 60, 61, 63, 66,	1(2), 8(2), 11(3), 16, 21(3), 23(2)
8	10	0	20	19	1, 4, 11, 20, 21, 23, 25, 27, 33, 34, 41, 45, 48, 51, 56, 58, 59, 60, 61, 63,	4(2), 16(2), 20, 21, 23(2), 25,
11	10	0	19	20	1, 4, 8, 20, 21, 23, 27, 31, 33, 41, 45, 48, 51(2), 58, 59, 60, 61, 63, 66,	4(3), 16, 21, 23(2), 25, 27(2),
16	10	0	19	20	4, 20, 23, 25, 27, 31, 33, 34, 41, 45, 48(2), 51, 56, 58, 59, 60, 61, 63, 66,	1, 4, 8(2), 11, 21(2), 25(2), 27,
20	11	1	21	19	1, 4, 8, 11, 16, 21, 25, 27, 28(2), 31, 33, 34, 45, 48, 51, 56, 58, 59, 61, 63, 66,	1(2), 8, 21(2), 25, 27(3), 28, 3
21	10	0	20	19	1, 4, 8, 11, 20, 23, 27, 28, 31, 33, 34, 41, 45, 48, 56, 58, 59, 61, 63, 66,	1(2), 4(3), 8, 11, 16(2), 20(2),
23	10	0	20	17	4, 8, 11, 16, 21, 25, 27, 28, 31, 33, 34, 41, 51, 56, 58, 59, 60, 61, 63, 66,	1(3), 4, 8(2), 11(2), 21(2), 31,
25	10	0	18	21	1(2), 8, 16, 20, 23, 28, 31, 33, 34, 45, 48, 51(2), 56, 58, 59, 60, 61, 63,	1, 8, 11, 16(2), 20, 21(2), 27,
27	11	1	21	19	4, 8, 11, 16, 20, 21, 23, 28, 33, 34, 41, 45, 48, 51, 56, 58, 59, 60, 61(2), 63, 66,	1(2), 4, 8(3), 11(2), 16, 20(3),
28	10	0	19	20	4, 20(2), 21, 23, 25, 27, 31, 33, 34, 41, 45, 48, 51, 56, 58, 59, 60, 61, 63, 66,	1(2), 4(2), 8, 11(3), 16(2), 20,
31	10	0	19	19	1, 4(2), 11, 16, 20, 21, 23, 25, 28, 33, 34, 41, 45, 51, 56, 59, 60, 61, 66,	8, 11, 16, 20, 21, 23, 25, 27(3)
33	10	0	19	21	1, 8, 11, 16, 20, 21, 23, 25, 27, 28, 31, 41, 45(2), 51, 58, 59, 60, 63, 66,	1, 4, 8, 11, 16(2), 20, 21, 23(2)
34	10	0	19	21	4, 8, 16, 20, 21, 23, 25, 27, 28, 31, 41, 45, 48, 51, 56, 58(2), 60, 61, 66,	1(2), 4(2), 8, 11, 16, 20(3), 21
41	10	0	20	17	1, 8, 11, 16, 21, 23, 27, 28, 31, 33, 34, 45, 48, 56, 58, 59, 60, 61, 63, 66,	4, 8, 11, 16(2), 20(3), 25, 28(2)
45	10	0	19	20	1, 8, 11, 16, 20, 21, 25, 27, 28, 31, 33(2), 34, 41, 48, 51, 58, 60, 63, 66,	1(2), 4, 8, 16, 20, 23, 25(3), 2
48	10	0	19	20	1, 4, 8, 11, 16(2), 20, 21, 25, 27, 28, 34, 41, 45, 51, 56, 58, 59, 61, 66,	1, 4(2), 11, 16, 20(2), 23, 25,
51	10	0	18	21	1, 4, 8, 11(2), 16, 20, 23, 25(2), 27, 28, 31, 33, 34, 45, 48, 56, 60, 63,	1, 4, 8, 11, 16, 21, 23(3), 25,
56	10	0	20	21	1, 4, 8, 16, 20, 21, 23, 25, 27, 28, 31, 34, 41, 48, 51, 58, 60, 61, 63, 66,	1(2), 8(2), 11, 16, 20(2), 21, 2
58	10	0	19	20	1, 8, 11, 16, 20, 21, 23, 25, 27, 33, 34(2), 41, 45, 48, 56, 59, 60, 61, 63,	1, 4, 11, 16, 20, 23, 25, 27(3)

Import Matches from File

Execute Match Maker

The statistics tab contains helpful information for evaluating the strength of the schedule.

- Team - Team Number
- Matches - number of matches played which are used to calculate rankings. This number should match the number in “Matches Per Team” at the top of the build screen.
- Surrogates - number of matches played in which this team is a surrogate. Teams should only play 1 surrogate match maximum. If any team has more than 1 in this column, click the “Execute MatchMaker” button again to regenerate the alliance pairings.
- # Partners - total number of different alliance partners. The total possible number of different alliance partners is the number of matches played * 2
- # Opponents - total number of different opponents. The total possible number of different opponents is the number of matches played * 3.
- Alliance Partners - a complete list of all the teams which will be on an alliance with the team in the Team column. Notation is given as Team Number (number of times this team will be on your alliance). For example: 812(2) means the team on that row will be on an alliance with team 812 twice over the course of all Qualification matches.
- Opponents - A complete list of all teams which will be an opponent of the team in the Team column. Notation is the same as Alliance Partners column.

If a team is playing with (or against) the same team multiple times, it will be shown in parentheses next to the other team’s number, as shown in the *green box* above.

If the statistics seem unsatisfactory, contact FRC Engineering before re-running the MatchMaker process in order for additional steps to be taken.

3.6.5 Rounds

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 **Run Match Maker**
- 10 Activate Qual Schedule
- 11 Report Results/Summary

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics **Rounds**

This table represents the number of matches it would take to make sure each team had, at minimum, the corresponding matches per team. This data is not available for pr

Matches Per Team	Matches Needed
1	5
2	9
3	13
4	18
5	24
6	27
7	31
8	35
9	39
10	42

Import Matches from File
Execute Match Maker

The “Rounds” tab displays information about the number of matches that must be played for a “round” to be completed. A round consists of a single match for each participating team. This tab is primarily for use by event support. For Off-Season events it could be used to understand where to end matches if Qualification matches must be skipped due to time. Rounds data is not displayed for the Practice Schedule as teams may be added or removed from the schedule.

3.6.6 Alternate Alliance Pairing Method (Optional)

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics Rounds

File: Browse...

If an alternative Alliance Pairing Algorithm is desired for the Practice or Qualification Tournament, it can be imported into the software. This is done on either “Run Match Maker” step in the Wizard. This is not supported for official FIRST Events.

Before adding pairings, the schedule itself must be generated on the previous step. Schedules (time/date portion) cannot be imported, only the pairings.

Select the file using the “Browse...” button, and click Load Matches from File on the bottom of the display (not pictured). The imported alliance pairings overwrite the alliances generated by the software, but retain the scheduled match times. Do not use the “Execute Match Maker” button if a custom pairing is being loaded.

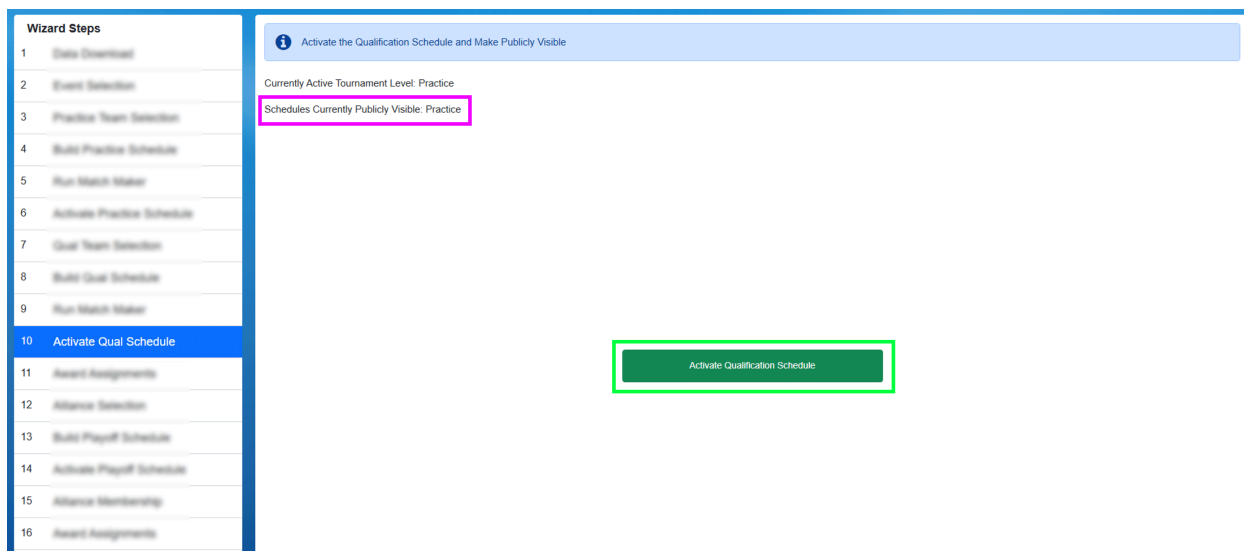
The fields in the import file must be:

- Field1 - Match Number - A number that represents the match number
- Field2 - Red Team 1 Number - A number that represents a team number
- Field3 - Red Team 1 Is Surrogate - true or false indicating that the team is a surrogate
- Field4 - Red Team2 Number - A number that represents a team number
- Field5 - Red Team2 Is Surrogate - true or false indicating that the team is a surrogate
- Field6 - Red Team3 Number - A number that represents a team number
- Field7 - Red Team3 Is Surrogate - true or false indicating that the team is a surrogate
- Field8 - Blue Team 1 Number - A number that represents a team number
- Field9 - BlueTeam1 Is Surrogate - true or false indicating that the team is a surrogate
- Field10 - BlueTeam2 Number - A number that represents a team number

- Field11 - BlueTeam2 Is Surrogate - true or false indicating that the team is a surrogate
- Field12 - BlueTeam3 Number - A number that represents a team number
- Field13 - BlueTeam3 Is Surrogate - true or false indicating that the team is a surrogate

Each match is one line, for a total of 13 fields per line, tab delimited.

3.7 Activate Schedule



After the schedule has been generated and alliances defined, the schedule must be activated in order to use Match Play or appear on the web.

[*Pink Box*] All levels that are publicly visible

[*Green Box*] Used to make the schedule available for Match Play and available for viewing on the FIRST website (the schedule does not sync in FMS Off-Season or when disabled)

3.7.1 Database Backup

The software does incremental backups stored on the local hard drive and USB drive (if so indicated in Settings >> Backup Config) throughout the tournament, but it's also important to do a complete backup at the end of each stage as well.

Full backups of the event database can be made in the *Backup Config*

Note: Backups never hurt- and can be done as often as requested.

Under normal circumstances, award winners are downloaded by the Scorekeeper using the process outlined below.

[*Green Box*] If awards could not be downloaded, or an adjustment needs to be made, manual editing must be enabled. This requires authorization of the FTA and should only be used as a last resort.

There are two Award Assignment steps in the Event Wizard- both function identically. The first Award Assignment step is intended for use at the end of day 1, and by default displays only day 1 awards. The second Award Assignment step is intended for use at the end of day 2, and by default displays only day 2 awards.

[*Pink Box*] Toggle the visible award set. This is especially useful when an award is being presented from the other award set, as toggling the visible set avoids having to switch back and forth between wizard steps.

3.8.1 Assignment Interface

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule
- 15 Alliance Membership
- 16 Award Assignments
- 17 Win/Loss

Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advisor using the below download button. There is no n

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	No	No	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	Autonomous Award sponsored by Ford	1	Two	No	No	No		
<input type="checkbox"/>	Creativity Award sponsored by Rockwell Automation	1	Two	No	No	No		
<input type="checkbox"/>	Quality Award	1	Two	No	No	No		
<input type="checkbox"/>	Industrial Design Award sponsored by General Motors	1	Two	No	No	No		
<input type="checkbox"/>	Innovation in Control Award	1	Two	No	No	No		
<input type="checkbox"/>	Excellence in Engineering Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Sustainability Award	1	Two	No	No	No		
<input type="checkbox"/>	Judges' Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	2	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	3	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	1	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	2	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	3	Two	No	No	No		
<input type="checkbox"/>	Rookie All Star Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Engineering Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	2	Two	No	No	No		
<input type="checkbox"/>	Regional FIRST Impact Award	1	Two	No	No	No		
<input type="checkbox"/>	Wildcard	1	Two	No	No	No		

Allow Manual Editing: ☒ No ☐ Yes

Stealth Mode: ☒ Enabled [Winners Hidden]

Award Set: ☒ Today Only ☐ All Awards

Buttons:

- Set Field To Awards Mode
- Download Judge's Award Assignments
- Upload Award Assignments
- Load Next Award
- Display Award
- Reveal Winner

[Red Box] In order for an award to be visible on the web through the FIRST website, it must be marked as “Public” using the checkbox in that award’s row.

[Gold Box] Indicates whether or not stealth mode is on, see below for more information.

[Black Marker] Using the Set Field to Awards Mode button the lights and team signs can be changed in the arena to a more universal look that’s ready for the awards ceremony.

[Purple Marker] Download the Award Assignments from the Judge’s system.

[Green Box] Control buttons used to manage the award presentation process, as described below.

[Pink Marker] Used to Upload Award Assignments marked “Public” to the FIRST website after all awards for the day (or the event) have been presented

3.8.2 Stealth Mode

Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advisor using the below download button. There is no n

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	No	No	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		

Allow Manual Editing: ☒ No ☐ Yes

Stealth Mode: ☒ Enabled [Winners Hidden]

Buttons:

- Assign Award
- Duplicate Award

When stealth mode is enabled, the data in “Team Number”, “Team Name” and “Person” fields are hidden. This data remains hidden until the stealth mode is disabled. Stealth mode is on by default when the page is loaded, and whether it is on or off has no impact on the ability to use the presentation process.

3.8.3 Assignment Download

At official events, Judge Advisors use the “Award Entry System” to submit the winners of various awards from the Judge’s room throughout the event. Once they’re done with assignments for a given day, they’ll “release” those assignments to the Scorekeeper.

Award Entry System

🔑

☐

I'm an authorized Judge Advisor of the selected event, and understand that my IP Address will be logged for abuse prevention. I understand that use of the forward/backward buttons may cause disruptions to my user experience.

Login

Judges' Entry System

When assignments have been released, a message will be posted to the Slack channel on the FMS Computer at the event to let the Scorekeeper know that assignments are available for download.

i Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advisor using the below download button. There is no n

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	No	No	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		

Allow Manual Editing: ☒ No ☐ Yes

Stealth Mode: ☒ Enabled [Winners Hidden]

Assign Award

Duplicate Award

After assignments are downloaded, the “Is Assigned” and “Has Script” fields should change to “Yes” to reflect that they were successfully downloaded. The “Is Assigned” field will still change to “Yes” if an award was assigned manually.

Note: Not all awards have an associated script, so it is possible that “Has Script” may remain a “No” even after a successful download of an award. For example, the Dean’s List awards do not have scripts.

Warning: Manual award assignments should not be used without consulting FIRST HQ and/or the FTA. If the download process fails, contact your event support staff.

3.8.4 Present an Award

This process assumes all awards have been downloaded or manually entered before the start of the awards ceremony.


Note: Some awards may be presented during the Playoff tournament, between matches. Scorekeepers will need to go back and forth from the Event Wizard to Match Play to facilitate this process.

Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advisor


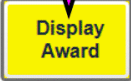

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input checked="" type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	No	No	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	Autonomous Award sponsored by Ford	1	Two	No	No	No		
<input type="checkbox"/>	Creativity Award sponsored by Rockwell Automation	1	Two	No	No	No		
<input type="checkbox"/>	Quality Award	1	Two	No	No	No		
<input type="checkbox"/>	Industrial Design Award sponsored by General Motors	1	Two	No	No	No		
<input type="checkbox"/>	Innovation in Control Award	1	Two	No	No	No		
<input type="checkbox"/>	Excellence in Engineering Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Sustainability Award	1	Two	No	No	No		
<input type="checkbox"/>	Judges' Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	2	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	3	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	1	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	2	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	3	Two	No	No	No		
<input type="checkbox"/>	Rookie All Star Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Engineering Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	2	Two	No	No	No		
<input type="checkbox"/>	Regional FIRST Impact Award	1	Two	No	No	No		
<input type="checkbox"/>	Wildcard	1	Two	No	No	No		

Load Next Award
Display Award
Reveal Winner

[Pink Marker] Load an award to present either by clicking on it, or by clicking “Load Next Award” to load the next award that FMS believes should be presented.


 Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advis

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input checked="" type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	No	No	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	Autonomous Award sponsored by Ford	1	Two	No	No	No		
<input type="checkbox"/>	Creativity Award sponsored by Rockwell Automation	1	Two	No	No	No		
<input type="checkbox"/>	Quality Award	1	Two	No	No	No		
<input type="checkbox"/>	Industrial Design Award sponsored by General Motors	1	Two	No	No	No		
<input type="checkbox"/>	Innovation in Control Award	1	Two	No	No	No		
<input type="checkbox"/>	Excellence in Engineering Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Sustainability Award	1	Two	No	No	No		
<input type="checkbox"/>	Judges' Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	2	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	3	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	1	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	2	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	3	Two	No	No	No		
<input type="checkbox"/>	Rookie All Star Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Engineering Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	2	Two	No	No	No		
<input type="checkbox"/>	Regional FIRST Impact Award	1	Two	No	No	No		
<input type="checkbox"/>	Wildcard	1	Two	No	No	No		






[Blue Marker] The loaded award will be shown with the blue highlighted background

[Pink Marker] The “Display Award” button will trigger the Audience Display(s) to show the name of the award being presented. For more information see *Displays* The “Display Award” option does not reveal the winner of the award, only the name of the award and event. This should be done as the Emcee/Announcer begin to talk about the associated award.

 Enter Award Assignments and Make Assignments Publicly Visible. At most events, award assignments can be downloaded from the Judge Advice

Public?	Award Name	Series	Day	Is Assigned	Has Script	From Judges	Team Number	Team Name
<input type="checkbox"/>	Highest Rookie Seed	1	Two	No	No	No		
<input checked="" type="checkbox"/>	Imagery Award in honor of Jack Kamen	1	Two	Yes	Yes	No		
<input type="checkbox"/>	Gracious Professionalism Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Spirit Award	1	Two	No	No	No		
<input type="checkbox"/>	Rookie Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	Autonomous Award sponsored by Ford	1	Two	No	No	No		
<input type="checkbox"/>	Creativity Award sponsored by Rockwell Automation	1	Two	No	No	No		
<input type="checkbox"/>	Quality Award	1	Two	No	No	No		
<input type="checkbox"/>	Industrial Design Award sponsored by General Motors	1	Two	No	No	No		
<input type="checkbox"/>	Innovation in Control Award	1	Two	No	No	No		
<input type="checkbox"/>	Excellence in Engineering Award	1	Two	No	No	No		
<input type="checkbox"/>	Team Sustainability Award	1	Two	No	No	No		
<input type="checkbox"/>	Judges' Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	1	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	2	Two	No	No	No		
<input type="checkbox"/>	Regional Finalists	3	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	1	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	2	Two	No	No	No		
<input type="checkbox"/>	Regional Winners	3	Two	No	No	No		
<input type="checkbox"/>	Rookie All Star Award	1	Two	No	No	No		
<input type="checkbox"/>	Regional Engineering Inspiration Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	1	Two	No	No	No		
<input type="checkbox"/>	FIRST Dean's List Finalist Award	2	Two	No	No	No		
<input type="checkbox"/>	Regional FIRST Impact Award	1	Two	No	No	No		
<input type="checkbox"/>	Wildcard	1	Two	No	No	No		



Load Next Award

Display Award

Reveal Winner

[Pink Marker] The loaded award will be shown with the blue highlighted background The “Reveal Winner” option will show the winning team/person to the audience. This should only be done after the Emcee/Announcer have named the winning team.

After the award winner has been revealed, press “Load Next Award” or click another award to prepare for the next presentation.

3.8.5 Manual Award Assignments (Backup)

Warning: This is a backup process and should only be done upon direction of FIRST HQ and/or your FTA

When in manual assignment mode, click on an award to assign and select the “Assign Award” button.

Type the team number of the winning team in the corresponding box and the team name will appear below. The team name can be used to confirm that the right team has been entered. If the award is presented to a team that’s not competing (such as at District Championships) the number will show an “error” indicator, meaning the team did not compete at the event. This can be bypassed to still assign the award.

After a team and/or person has been entered, the Save button commits this change. Cancel ignores the edits, Clear removes a previously entered award winner.

For award presented to individuals, such as Volunteer of the Year, additional first/last name boxes are offered on the award assignment screen.

3.8.6 Award Assignment from Application

Warning: This process is part of the Manual Award Assignment process, and considered a backup process as well. This should not be necessary except upon direction of FIRST HQ and/or your FTA

Some award require the winning team/person to have previously applied or been nominated, such as the Woodie Flower’s Award. In these cases, when assigning the award in FMS, a drop-down list of potential winners will be offered. The winning team should be included on the list, and selecting them will populate the corresponding data on the assignment screen. Select save to commit the change, as with other awards. For awards where nominees are a specific person, from a specific team, the person first and last name fields additionally appear. Selecting the winner from the dropdown completes all necessary corresponding fields.

3.8.7 Award Assignment Confirmation Messages

When a team number is entered on the Assign Award dialogue, there are potential confirmation messages that can be presented.

Upon each award assignment, the assignment is compared against an eligibility algorithm for the given team to determine if they qualify for that award. If an attempt is made to assign an award to an ineligible team, a message is

presented and requires attention. Consult with the Judge Advisor for additional information.

3.8.8 Award Assignment Notes

If more than one instance of an award is being presented, but not enough instances are showing in the available awards list, a duplicate can be made. For example, if two Judges' Awards are presented, click on the Judges' Award and press the "Duplicate Award" button. A second instance (with "Series" 2) will be created and available for assignment.

Note: FMS Off-Season does not support award distribution.

3.9 Alliance Selection

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection**
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule
- 15 Alliance Membership
- 16 Award Assignments
- 17 Awards
- 18 Team Upload

Manage the Alliance Selection Process for Playoff Rounds

Alliance Name	Captain	Round 1	Round 2	Round 3 / Backup
Alliance 1	3117	2370		
Alliance 2	5422			
Alliance 3	2084			
Alliance 4	2423			
Alliance 5	78			
Alliance 6	316			
Alliance 7	4909			
Alliance 8	3467			

Event Type OffSeasonWithAzureSync

Alliance Size ThreeTeam

Alliance Count EightAlliance

Bracket Type SingleElimination

Backup Substitution Type BackupPermanentReplacement

Rank	Team #
10	1058
11	5687
12	9443
13	58
14	88
15	811
16	8567
17	9101
18	4761
19	5813
20	2342
21	509
22	1153

MATCH DISPLAYS

☐ Video Only ☐ Video and Score ☐ Match Preview

PLAYOFF DISPLAYS

☐ Alliance Selection ☒ Alliance Selection (Chroma) ☐ Bracket ☐ Break

SPECIALTY DISPLAYS

☐ Qualification Rankings ☐ Schedule ☐ WiFi Reminder ☐ Background

Buttons:

- Edit Alliance Names
- Clear Alliances
- Set Field To Awards Mode
- Save Alliances

[Green Box] At all official FRC Events, the 8-alliance tournament is used, but smaller Off-Season events may use other formats. The current settings, as picked on the Event Selection step, are displayed.

[Pink Box] The list of available teams for selection is shown and can be viewed sorted by Rank (default) or by team number (the "Team #" tab).

[Gold Box] Use the Audience Video Control panel to manipulate the Audience Display(s)

The Scorekeeper populates the team numbers into the table on the center of the page. If a number is entered that is not in the available team list, an icon will appear in the upper left corner of the text box (and hover text will indicate the error). If a team number is entered twice, the newest entry takes priority and the old location is changed to blank.

If an alliance captain is selected in a Round 1 pick, the captains from lower ranked alliances will be promoted automatically. If a team number is deleted, they're re-added to the available teams box. A team is only shown on the Audience Display (and removed from Available Teams) once focus is changed away from that team (such as tabbing out).

Note: The recommended process is to only enter a team once they are guaranteed into that position, either because they accepted an invitation, or because they're the captain of the alliance making the next selection. This means that at

the beginning of the Alliance Selection process, only the Alliance #1 captain will be filled in.

Once the selection process is complete, select “Save” and move on to the next step of the Wizard.

3.10 Alliance Membership

3.10.1 Substitution

Wizard Steps

- 1 Data Download
- 2 Event Selection
- 3 Practice Team Selection
- 4 Build Practice Schedule
- 5 Run Match Maker
- 6 Activate Practice Schedule
- 7 Qual Team Selection
- 8 Build Qual Schedule
- 9 Run Match Maker
- 10 Activate Qual Schedule
- 11 Award Assignments
- 12 Alliance Selection
- 13 Build Playoff Schedule
- 14 Activate Playoff Schedule
- 15 Alliance Membership**
- 16 Award Assignments
- 17 Withdrawals
- 18 Event Upload

Add Backup Robot To Alliance During Playoff Rounds

Alliance Name	Captain	Round 1	Round 2	Round 3 / Backup
Alliance 1	1156	1772	9163	
Alliance 2	1860	5800	9162	
Alliance 3	6404	7033	9110	
Alliance 4	7459	7563	9085	
Alliance 5	7565	7567	9066	
Alliance 6	8066	8276	9050	
Alliance 7	8882	9045	9049	
Alliance 8	9046	9047	9048	

Event Type Regional

Alliance Size ThreeTeam

Alliance Count EightAlliance

Bracket Type DoubleElimination

Backup Substitution Type BackupFreeSubstitution

Rank **Team #**

1	9200
2	9459
4	9603
6	9166
9	9305
10	9484
12	9611
14	9219
15	9602
16	9218
18	9169
22	9604
23	9178

MATCH DISPLAYS

☐ Video Only ☐ Video and Score ☐ Match Preview

PLAYOFF DISPLAYS

☐ Alliance Selection ☐ Alliance Selection (Chroma)

☐ Bracket ☐ Break

SPECIALTY DISPLAYS

☐ Qualification Rankings ☐ Schedule

☐ WiFi Reminder ☐ Background

Set Field To Awards Mode

Save Alliances

Playoff rules stipulate that if any member of an alliance becomes unable or unwilling to continue playing through the tournament, the alliance captain may adopt the next highest-ranking team not selected during Alliance Selection process to act as a Backup Robot. The alliance membership wizard step is used to assign the backup robot into an alliance.

[Pink Box] Type the incoming team number into the corresponding row for the alliance they are joining

[Green Box] The list of available team eligible to come into the playoff tournament. This list should be compared to the teams on the “Backup Team List” report and discussed with the Head Referee to select the correct team to bring into the tournament- it is not up to the choice of the alliance.


Substitute team in alliance?

Are you sure you would like to substitute Team 78 for Team 67?

Cancel **Submit**

Click the green Save button to initiate the swap. This will add the incoming team into the schedule in place of the outgoing team for all matches which have not yet been played.

3.10.2 Un-doing Substitution

Alliance Name	Captain	Round 1	Round 2	Round 3 / Backup
Alliance 1	1156 <input type="radio"/>	1772 <input type="radio"/>	9163 <input type="radio"/>	9200 <input checked="" type="radio"/> 
Alliance 2	1860 <input type="radio"/>	5800 <input type="radio"/>	9162 <input type="radio"/>	<input type="text"/>
Alliance 3	6404 <input type="radio"/>	7033 <input type="radio"/>	9110 <input type="radio"/>	<input type="text"/>
Alliance 4	7459 <input type="radio"/>	7563 <input type="radio"/>	9085 <input type="radio"/>	<input type="text"/>
Alliance 5	7565 <input type="radio"/>	7567 <input type="radio"/>	9066 <input type="radio"/>	<input type="text"/>
Alliance 6	8066 <input type="radio"/>	8276 <input type="radio"/>	9050 <input type="radio"/>	<input type="text"/>
Alliance 7	8882 <input type="radio"/>	9045 <input type="radio"/>	9049 <input type="radio"/>	<input type="text"/>
Alliance 8	9046 <input type="radio"/>	9047 <input type="radio"/>	9048 <input type="radio"/>	<input type="text"/>

If a substitution is made by accident it can be undone. Though it is possible to undo, it can add confusion to field staff and audience members. Scorekeepers should be double checking before entering backup robots.

[Green Marker] Click the red “X” next to the backup robot to remove it. The software will confirm that you want to undo the backup robot and requires a password before completing the process.

A backup robot cannot be removed once it has played in a match.

3.11 Wildcards

1 Wildcard Wizard
2 Event Selection
3 Practice Team Selection
4 Build Practice Schedule
5 Run Match Maker
6 Activate Practice Schedule
7 Qual Team Selection
8 Build Qual Schedule
9 Run Match Maker
10 Activate Qual Schedule
11 Award Assignments
12 Alliance Selection
13 Build Playoff Schedule
14 Activate Playoff Schedule
15 Alliance Membership
16 Award Assignments
17 **Wildcards**
18 Event Upload

Wildcard Wizard

Determine any Wildcard winning teams based on teams who have previously qualified, or qualified multiple times at this event.

Wildcards have been calculated. If you need to re-calculate, you can do so using the “Calculate” button.

Wildcard Eligible Event ☒ Yes

FMS Data Up-To-Date ☒ Yes [Data Download](#)

Playoffs Complete ☒ No

Culture Awards Assigned ☒ No

[Calculate Wildcards](#)

Wildcard Assignments:

#	Finalist Team #	Wildcard?	Generating Team	Generating Event	Generating Award
No Wildcards To Award					

Per the FRC Manual, Wildcards are sometimes generated at Regional events and afford the opportunity for additional teams to attend the FIRST Championship. This step of the Wizard assists the Scorekeeper in determining if the event has any Wildcards, and to which team the award should be given.

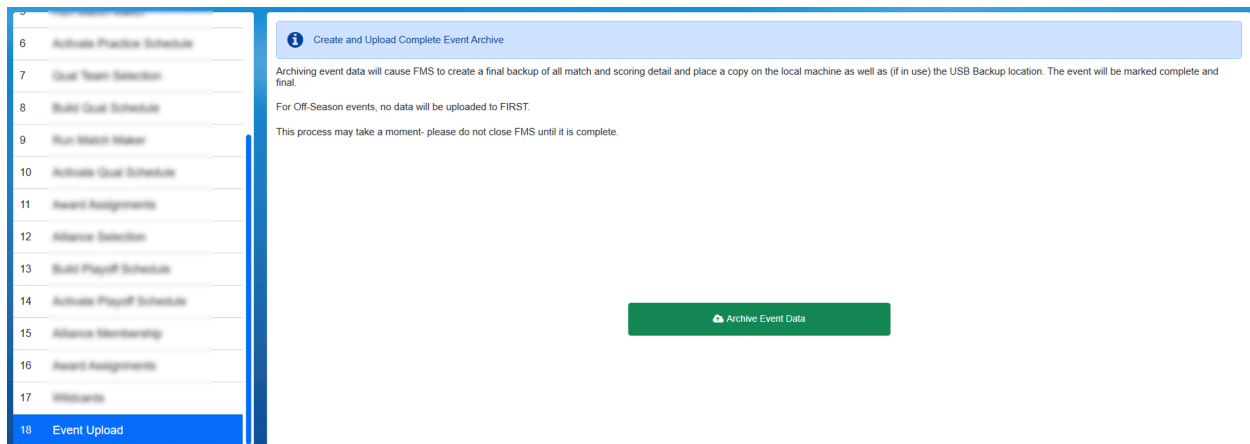
Four prerequisites (*the green box*) are required in order for the “Calculate Wildcards” button to become active:

- *Wildcard Eligible Event* - the current event must be a Regional event, Wildcards are not generated at other event types
- *FMS Data up-to-date* - The current FMS team list must have been downloaded recently. If the data is old “Stale” will appear. Click Data Download to update the data as needed.
- *Playoffs Complete* - All required Playoff matches have been played (aka there is a declared winning alliance of the Playoff Tournament)
- *Culture Awards Assigned* - All the FIRST Championship qualifying awards must have been assigned and awarded (they need not have been presented to the audience)

Once all prerequisites are complete, the “Calculate Wildcards” (*gold box*) button becomes active. If any Wildcards are generated at the event the recipients will be listed in the area represented by the *pink box*. The accompanying script for the Emcee/Announcer to read at the conclusion of the Awards Ceremony is available via Reports (Wildcard Script).

If any validation errors occur, or any status messages, they will appear in the spot shown by the red arrow. If no Wildcards are generated, the words No Wildcards To Award will appear under the status message area, to the right.

3.12 Archive and Upload



The Event Data Upload step is used to do a complete backup of all event information. Copies are placed on the Event Server, USB drive (which must be connected), as well as uploaded to FIRST (provided an Internet connection is available and the event is an official FIRST event). Verification is also done to confirm the upload was successful.

DEPENDING ON THE SIZE OF THE DATABASE, THE AMOUNT OF LOG DATA STORED, AND THE SPEED OF THE INTERNET CONNECTION AT THE EVENT THIS STEP MAY TAKE UP TO 10 MINUTES!

Status information will be shown during the Upload.

If the upload fails, be sure to check the backup settings in the Settings >> Backup Config page and force a manual event backup. The backup is what is used to upload, so if you find there are problems performing a manual backup this is the best place to start debugging:

- Ensure that the backup location is still present (the USB drive, in most cases)
- Ensure the backup location is set
- Ensure the backup has been performed (check the file is on the disk and there is sufficient space)

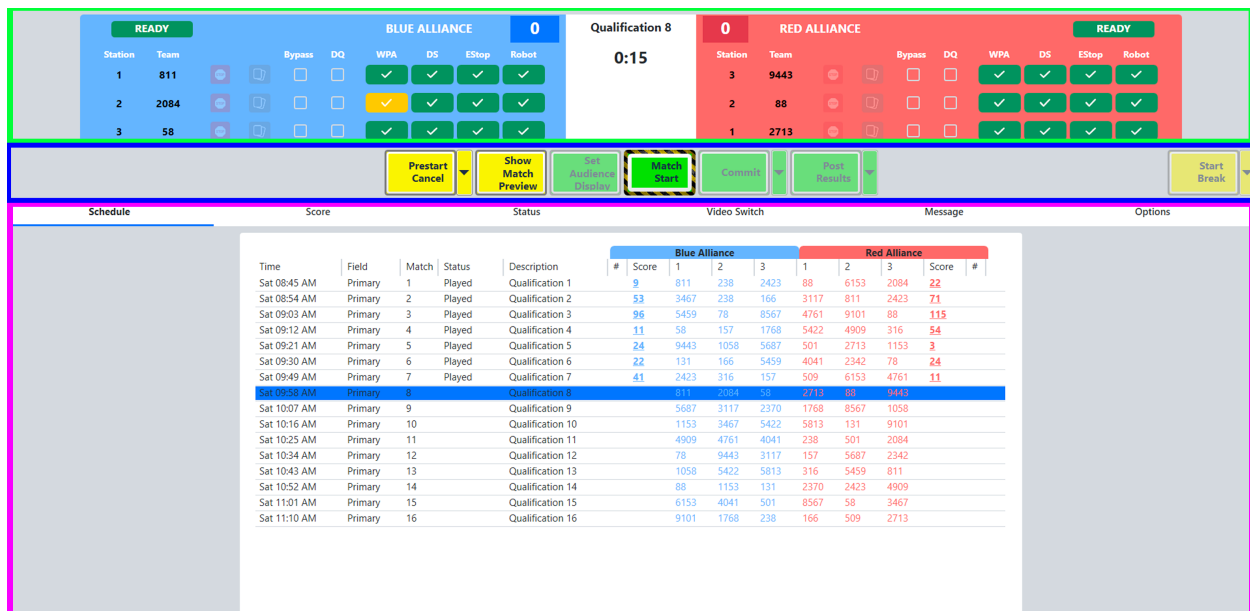
Performing a forced event backup will cause the backup to be generated, and the upload may be re-attempted by returning to the archive and upload step.

Warning: Contact FRC Engineering before shutting down the server at the event, or if uploads are unsuccessful.

MATCH PLAY/TEST

4.1 Interface

4.1.1 Match Play



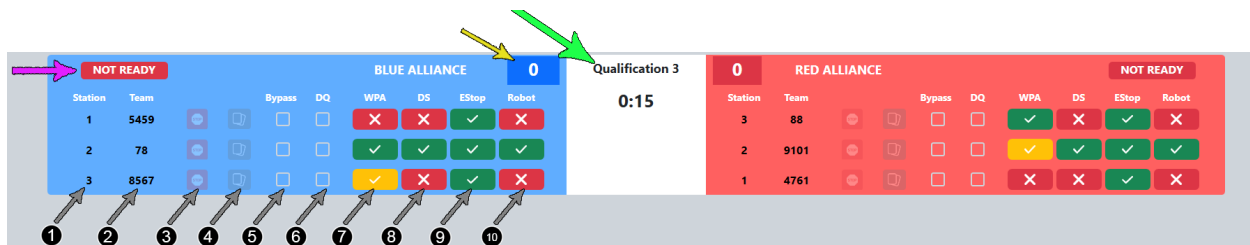
Match Play (and Match Test) are the most commonly used environments during an FRC event. The screen is used to start and stop matches, disable robots, and control the Audience Display.

[Green Box] The top part of the screen shows the current match number, match time, score for the alliances and detail by station. Match time is updated in real time and will correspond with the same information shown on the LED Displays. The status of the robots at each end of the playing field is communicated to FMS by the SCCs and DSs. The color of each box corresponds to each end of the playing field, blue for the Blue Alliance, and red for the Red Alliance. Each box includes information on the status of the three robots on each alliance.

[Blue Box] Match Control is handled using the buttons in the center of the Match Play and Match Test screens.

[Pink Box] The lower portion of the screen changes based on the selected tab to display schedule information, detailed scoring, and more (described later)

4.1.2 Field Status



Match number and timing information in the center of the display (yellow arrow), with time represented in minute:seconds to match the timers on the field. The match number is also displayed, and additional conditional indicators will appear below the timer as applicable (such as when a referee review is underway). The status indicator on the “Blue Alliance” and “Red Alliance” sides (indicated by the pink arrow) will turn from Red to Green when there is a known ready state for all Robots on that Alliance (connected or bypassed). In order for a match to start, both backgrounds must be green (known state for all Robots on the Field).

The top bar of Match Play also contains detailed station information- the background color indicates the alliance (Red or Blue) and meanings are detailed below. Markers in the example graphic are shown for Blue Alliance, though the layout is the same for the Red Alliance.

Gray Arrows

The fields left to right indicate information about the connection state of each Driver Station, Robot and Team.

1. Station - Assigned station for corresponding team (Stations are 1, 2 and 3 from left to right when viewed from within the Alliance Station)
2. Team - The team number which corresponds with the team designated to play in this station. Teams need to be in the correct station to ensure that they receive the proper Station ID and Position information from FMS.
3. Stop Button - used to EStop the robot during the match
4. Card State (entered by Head Referee, can only be edited after Match is over by toggling through possible states):
 - Green - no card, team in good standing
 - Yellow - team has been assigned a yellow card
 - Red - team assigned a red card in this match. Setting the indicator to red also bypasses the Player Station and automatically assigns the team a DQ for the current match. Note that in a subsequent match FMS will automatically change the red card to yellow
5. Byp - Select to bypass this particular station and force it to a ready (but disabled) state. (Note: During Match Test and Practice Matches only, the CTRL-SHIFT-B key combination will bypass all currently unconnected stations.)
6. DQ - Select to indicate that the corresponding team has been DQ'd for this match (will also cause Bypass)
7. WPA Key status:
 - Red with X - team has not been on the playing field
 - Yellow with Check - has linked with the field, but has not played in a match
 - Green with Check - the team has played in a match on the field
8. DS Status:
 - Red with X - Driver Station is not detected by the playing field (FMS-to-DS link is down)
 - Green with Check - Driver Station is detected by the field
9. Stop Status:

- Red with A - Robot has been A-Stopped by the Team
- Red with B - Robot has been E-Stopped by the Team (button)
- Red with S - Robot has been E-Stopped by the Scoring Table
- Green with Check - the team has played in a match on the field

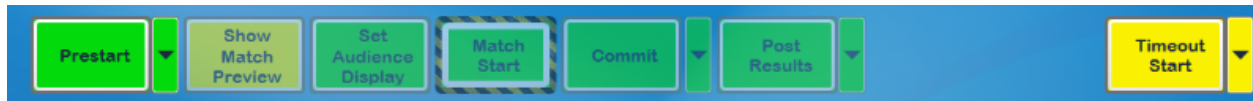
10. Robot Status:

- Red with X - Robot is not connected to the Driver Station
- Green with Check - Robot is connected to the Driver Station

Note: The amber light in each Player Station window indicate the Stop status of the corresponding team. A solid amber light means the Robot has been E-Stopped (regardless of who initiated the E-Stop) and a flashing amber light indicates a A-Stop (initiated by the team, which will automatically clear upon entering the Teleoperated period)

Warning: All E-Stops and A-Stops need to be in the up (released) position to prestart or begin a match. Prestarting a match with any Stop down will prompt a dialog box to be shown indicated in which Player Station the Stop(s) are down.

4.1.3 Match Control (FCUI)



The buttons in the middle section are used to step through the Match process. In order to be available for use, a match must be selected from the Schedule tab. This bar is commonly referred to as the “FCUI” or Field Control User Interface (which came from the former version, which was a piece of hardware on the scoring table).

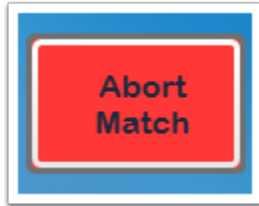
- *Prestart* - prepares the field for the upcoming match by configuring the field hardware for the upcoming match
Prestart can be cancelled if necessary while it's running
In Match Test/Practice/Playoff matches, clicking Prestart will allow for entry of team numbers (in playoff matches this is also used to move teams between stations)
- *Show Match Preview* - display the Match Preview screen on the Audience Display(s) with team names and current ranking data for teams in the upcoming match
- *Set Audience Display* - display the real-time-score screen on the Audience Display(s)
- *Match Start* - starts the Match
Match Cancel - cancels a match in progress (button text changes after start)
Discard Match - discard the match result and logs (button text changes after match ends)

Warning: MUST ONLY BE USED WHEN THE FIELD IS IN A SAFE STATE AND NO HUMANS ARE IN DANGEROUS POSITIONS. FTA MUST GIVE PERMISSION FOR A MATCH TO START!

- *Commit* - confirm the score of the match and write the details to the database
- *Post Results* - display the final score and results on the Audience Display(s) and publish the results to the web (when applicable)

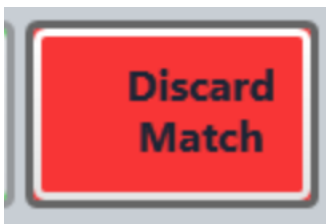
- *Timeout Start* - start or stop a timeout and update the Audience Display(s) with the timing data. Also updates the on field LED displays. Timeout duration can be changed on the “Options” tab.

4.1.4 Abort Match Option



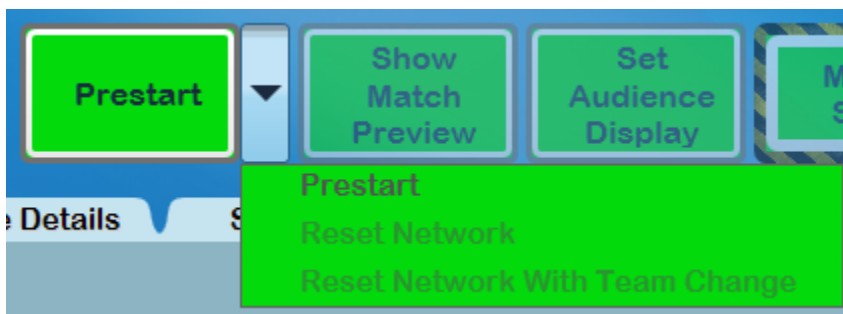
Once a match has started, the “Start Match” option becomes “Abort Match” as shown, which requires confirmation before ending a Match in progress. In non-emergency situations, the “Abort” option is preferred to the field E-Stop, as the E-Stop will put all Robots in an emergency shutdown state, whereas the “Abort” option will not.

4.1.5 Discard Match Option



Once a match has ended, the “Abort Match” option becomes “Discard Match” as shown, which requires an HQ password / intervention to use. The purpose of this option is to discard results and logs that will be declared invalid regardless, and thus bypass the need to commit and/or post the result (and risk it showing on the web).

4.1.6 Prestart Dropdown

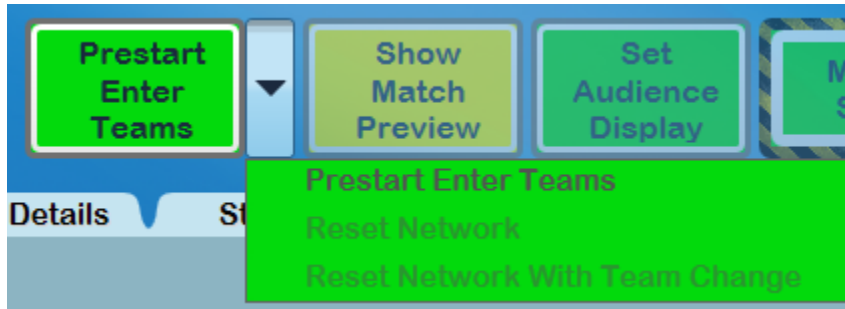


The Prestart button has additional options available via a dropdown.

- *Prestart* - the “typical” Prestart process, as outlined in the previous section
- *Reset Network* - allows for re-programming of the field network hardware without a full “Prestart”
- *Reset Network With Team Change* - allows for re-programming of the field network hardware while also changing a team in one or more stations

Note: The reset network option will not clear locked E-Stop and A-Stop states, instead a full “Back Out” and “Re-Prestart” is required to clear Stop flags.

4.1.7 Prestart Dropdown in Match Test/Practice



In Match Test, Practice, and Playoff Matches, the Prestart button replaces “Prestart” with “Prestart Enter Teams.” In these tournament phases FMS needs to know which teams are participating and in which positions, whereas in qualification matches teams cannot swap stations so no option is presented to adjust team numbers or positions.

- All other options work as described previously. Selecting Prestart Enter Teams will prompt for team numbers to participate in the match, as shown below. If teams were scheduled for the Match, they would be pre-populated in the display.

 A screenshot of the 'Test Match' dialog box. It has a blue header 'Test Match'. Below it are two columns: 'BLUE ALLIANCE' and 'RED ALLIANCE'. Each column has a 'Teams' section with three input fields. The Blue Alliance fields are labeled 1, 2, and 3, with values 'Test 1', 'Test 2', and 'Test 3'. The Red Alliance fields are labeled 3, 2, and 1, with values 'Test 6', 'Test 5', and 'Test 4'. At the bottom are three buttons: 'Prestart', 'Undo Changes', and 'Cancel'.

Team Number	Team Name
1	Test 1
2	Test 2
3	Test 3

Team Number	Team Name
3	Test 6
2	Test 5
1	Test 4

4.1.8 Commit Dropdown



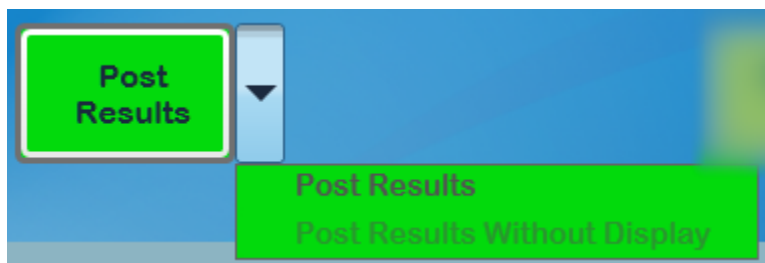
The Commit button has additional options available via a dropdown.

- *Commit* - traditional path of committing scores as final
- *Commit with Comments* - allows for entering a comment before the scores are committed

At official events, if the scores were edited by the Scorekeeper after the match a comment will be required regardless of selection. A comment is also required if any team was assigned a card. If required or requested, a box will appear during the commit process. Select from the template buttons as a starting point for comments or type freely in the provided box.

A screenshot of a comment entry form. It contains the following text: "Scores were edited post-match, a Card has been issued, or you requested to enter comments." and "Please provide a meaningful comment to associate with this commit for historical accuracy. You may optionally select one of the below buttons as a template for your comments." Below this text are four buttons: "Head Referee Request", "Referee/Scorer Mistake", "Post-Match Ref Discussion", and "Yellow/Red Card". Below the buttons is a text input field labeled "Comments:". At the bottom are two buttons: "Save and Continue" and "Return to Edit".

4.1.9 Post-Results Dropdown

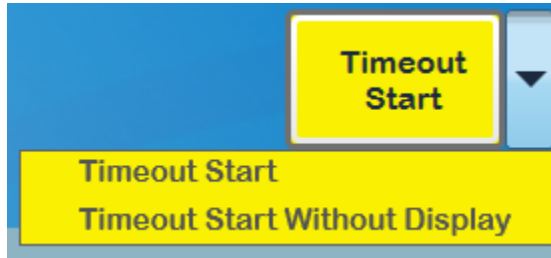


The Post-Results button has additional options available via a dropdown.

- *Post Results* - traditional path of posting results from the Match to the Audience Display

- *Post Results Without Display* - allows for posting of results from the Match without changing the Audience Display

4.1.10 Timeout Dropdown



The Timeout button has additional options available via a dropdown.

- *Timeout Start* - start a timeout with the given length according to the “Options” tab
- *Timeout Start without Display* - start a timeout without changing the Audience Display (avoids interrupting portions of the event in progress, like an award ceremony)

4.1.11 Alternate Flow



Some elements of the FCUI have alternate flows. Above are examples are alternate flows for “Show Match Preview,” clicking an alternate (yellow) button will return the FCUI to that step. Also shown is the style for Match Start, which has additional highlighting due to the dangerous nature of enabling robots and starting a Match.

4.2 Bypass vs DQ vs Red Card

4.2.1 Significance

Bypass and DQ essentially perform the same function to the Driver’s Station, but have different outcomes with respect to event Rankings. Bypass is used when a team is unable to compete due to a malfunctioning robot, but still chooses to participate in the match by standing in the Alliance Station or utilizing a Human Player. For this participation, the team is awarded full ranking points. Bypass will disable any inputs from the corresponding team’s Driver Station and cause the Team Light to flash at a 1Hz rate.

DQ is used to disqualify a team from a match. A DQ is given to a team which plays a qualification match without having passed Inspection, or simply chooses not to participate in the match.

The referee will issue a Red Card for a number of reasons, such as rules violations or inappropriate conduct during a match. If the Red Card indicator is showing when “Commit Score” is pressed the team receives 0 (zero) ranking points for that match (or, in a Playoff match, their alliance loses).

4.3 Tabs

Schedule	Score	Status	Video Switch	Message	Options																																																																																																																																																																																																																																																					
<table><tr><th rowspan="2">Time</th><th rowspan="2">Field</th><th rowspan="2">Match</th><th rowspan="2">Status</th><th rowspan="2">Description</th><th colspan="3">Blue Alliance</th><th colspan="3">Red Alliance</th><th rowspan="2">Score</th><th rowspan="2">#</th></tr><tr><th>#</th><th>Score</th><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th></tr><tr><td>Sat 09:00:000</td><td>Primary</td><td>1</td><td>Played</td><td>Qualification 1</td><td>8</td><td>671</td><td>238</td><td>2423</td><td>88</td><td>6752</td><td>2389</td><td>88</td><td></td></tr><tr><td>Sat 09:04:000</td><td>Primary</td><td>2</td><td>Played</td><td>Qualification 2</td><td>55</td><td>14637</td><td>238</td><td>166</td><td>21417</td><td>671</td><td>2423</td><td>23</td><td></td></tr><tr><td>Sat 09:08:000</td><td>Primary</td><td>3</td><td>Played</td><td>Qualification 3</td><td>56</td><td>14638</td><td>76</td><td>49247</td><td>4762</td><td>6321</td><td>36</td><td>238</td><td></td></tr><tr><td>Sat 09:12:000</td><td>Primary</td><td>4</td><td>Played</td><td>Qualification 4</td><td>53</td><td>16</td><td>137</td><td>1766</td><td>14623</td><td>4669</td><td>76</td><td>56</td><td></td></tr><tr><td>Sat 09:16:000</td><td>Primary</td><td>5</td><td>Played</td><td>Qualification 5</td><td>28</td><td>6663</td><td>1036</td><td>1667</td><td>361</td><td>2712</td><td>1163</td><td>6</td><td></td></tr><tr><td>Sat 09:20:000</td><td>Primary</td><td>6</td><td>Played</td><td>Qualification 6</td><td>22</td><td>121</td><td>166</td><td>14638</td><td>4647</td><td>2342</td><td>76</td><td>26</td><td></td></tr><tr><td>Sat 09:24:000</td><td>Primary</td><td>7</td><td>Played</td><td>Qualification 7</td><td>65</td><td>24632</td><td>238</td><td>752</td><td>266</td><td>47623</td><td>4762</td><td>88</td><td></td></tr><tr><td>Sat 09:28:000</td><td>Primary</td><td>8</td><td>Played</td><td>Qualification 8</td><td>16</td><td>1667</td><td>671</td><td>11</td><td>2376</td><td>67</td><td>2423</td><td></td><td></td></tr><tr><td>Sat 09:32:000</td><td>Primary</td><td>9</td><td>Played</td><td>Qualification 9</td><td>14627</td><td>2373</td><td>2376</td><td>1766</td><td>4647</td><td>2669</td><td>1666</td><td></td><td></td></tr><tr><td>Sat 09:36:000</td><td>Primary</td><td>10</td><td>Played</td><td>Qualification 10</td><td>1762</td><td>24627</td><td>14623</td><td>16676</td><td>121</td><td>3621</td><td></td><td></td><td></td></tr><tr><td>Sat 09:40:000</td><td>Primary</td><td>11</td><td>Played</td><td>Qualification 11</td><td>4669</td><td>4762</td><td>4647</td><td>238</td><td>361</td><td>2669</td><td></td><td></td><td></td></tr><tr><td>Sat 09:44:000</td><td>Primary</td><td>12</td><td>Played</td><td>Qualification 12</td><td>76</td><td>6646</td><td>2373</td><td>127</td><td>16627</td><td>2342</td><td></td><td></td><td></td></tr><tr><td>Sat 09:48:000</td><td>Primary</td><td>13</td><td>Played</td><td>Qualification 13</td><td>1036</td><td>14627</td><td>1667</td><td>166</td><td>14638</td><td>671</td><td></td><td></td><td></td></tr><tr><td>Sat 09:52:000</td><td>Primary</td><td>14</td><td>Played</td><td>Qualification 14</td><td>66</td><td>1762</td><td>121</td><td>2376</td><td>2423</td><td>4669</td><td></td><td></td><td></td></tr><tr><td>Sat 09:56:000</td><td>Primary</td><td>15</td><td>Played</td><td>Qualification 15</td><td>4762</td><td>4647</td><td>361</td><td>4647</td><td>16</td><td>2669</td><td></td><td></td><td></td></tr><tr><td>Sat 10:00:000</td><td>Primary</td><td>16</td><td>Played</td><td>Qualification 16</td><td>4762</td><td>1766</td><td>238</td><td>166</td><td>466</td><td>2712</td><td></td><td></td><td></td></tr></table>						Time	Field	Match	Status	Description	Blue Alliance			Red Alliance			Score	#	#	Score	1	2	3	1	2	3	Sat 09:00:000	Primary	1	Played	Qualification 1	8	671	238	2423	88	6752	2389	88		Sat 09:04:000	Primary	2	Played	Qualification 2	55	14637	238	166	21417	671	2423	23		Sat 09:08:000	Primary	3	Played	Qualification 3	56	14638	76	49247	4762	6321	36	238		Sat 09:12:000	Primary	4	Played	Qualification 4	53	16	137	1766	14623	4669	76	56		Sat 09:16:000	Primary	5	Played	Qualification 5	28	6663	1036	1667	361	2712	1163	6		Sat 09:20:000	Primary	6	Played	Qualification 6	22	121	166	14638	4647	2342	76	26		Sat 09:24:000	Primary	7	Played	Qualification 7	65	24632	238	752	266	47623	4762	88		Sat 09:28:000	Primary	8	Played	Qualification 8	16	1667	671	11	2376	67	2423			Sat 09:32:000	Primary	9	Played	Qualification 9	14627	2373	2376	1766	4647	2669	1666			Sat 09:36:000	Primary	10	Played	Qualification 10	1762	24627	14623	16676	121	3621				Sat 09:40:000	Primary	11	Played	Qualification 11	4669	4762	4647	238	361	2669				Sat 09:44:000	Primary	12	Played	Qualification 12	76	6646	2373	127	16627	2342				Sat 09:48:000	Primary	13	Played	Qualification 13	1036	14627	1667	166	14638	671				Sat 09:52:000	Primary	14	Played	Qualification 14	66	1762	121	2376	2423	4669				Sat 09:56:000	Primary	15	Played	Qualification 15	4762	4647	361	4647	16	2669				Sat 10:00:000	Primary	16	Played	Qualification 16	4762	1766	238	166	466	2712			
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Sat 09:24:000	Primary	7	Played	Qualification 7	65	24632	238	752	266	47623	4762	88																																																																																																																																																																																																																																														
Sat 09:28:000	Primary	8	Played	Qualification 8	16	1667	671	11	2376	67	2423																																																																																																																																																																																																																																															
Sat 09:32:000	Primary	9	Played	Qualification 9	14627	2373	2376	1766	4647	2669	1666																																																																																																																																																																																																																																															
Sat 09:36:000	Primary	10	Played	Qualification 10	1762	24627	14623	16676	121	3621																																																																																																																																																																																																																																																
Sat 09:40:000	Primary	11	Played	Qualification 11	4669	4762	4647	238	361	2669																																																																																																																																																																																																																																																
Sat 09:44:000	Primary	12	Played	Qualification 12	76	6646	2373	127	16627	2342																																																																																																																																																																																																																																																
Sat 09:48:000	Primary	13	Played	Qualification 13	1036	14627	1667	166	14638	671																																																																																																																																																																																																																																																
Sat 09:52:000	Primary	14	Played	Qualification 14	66	1762	121	2376	2423	4669																																																																																																																																																																																																																																																
Sat 09:56:000	Primary	15	Played	Qualification 15	4762	4647	361	4647	16	2669																																																																																																																																																																																																																																																
Sat 10:00:000	Primary	16	Played	Qualification 16	4762	1766	238	166	466	2712																																																																																																																																																																																																																																																

The bottom of the Match Play interface has a display window with a number of tabs:

- *Schedule* - displays the currently active schedule
- *Score* - displays the counts for various scoring elements as they are entered by referees or collected from automated scoring components on the field (*score tab*)
- *Game Details* - displays detailed information specific to the game (if applicable, *game specific*)
- *Status* - displays connection information on all the robots current on the playing field (see *status tab*)
- *Video Switch* - manual interface used to control the Audience Display(s)
- *Message* - display messages on the Background of the Audience Display(s)
- *Options* - configuration options

Many of these tabs are described in detail below. Status and Score tabs are not described in this article but rather in later articles.

4.3.1 Schedule

Time	Field	Match	Status	Description	Blue Alliance				Red Alliance					
					#	Score	1	2	3	1	2	3	Score	#
Wed 09:00 AM	Primary	1	Played	Qualification 1		25	68	48	59	58	63	67	18	
Wed 09:07 AM	Primary	2	Played	Qualification 2		3	8	70	45	16	56	71	25	
Wed 09:14 AM	Primary	3	Played	Qualification 3		42	1	61	34	41	27	25	16	
Wed 09:21 AM	Primary	4		Qualification 4			20	51	69	60	21	31		
Wed 09:28 AM	Primary	5		Qualification 5			11	28		4	33	66		
Wed 09:35 AM	Primary	6		Qualification 6			45	59	67	1	41	56		
Wed 09:42 AM	Primary	7		Qualification 7			58	68	34	21	8	20		
Wed 09:49 AM	Primary	8		Qualification 8			16	60	66	33	63	28		
Wed 09:56 AM	Primary	9		Qualification 9			48	25	71	51	61	4		
Wed 10:03 AM	Primary	10		Qualification 10			27	70		69	11	31		

Currently active tournament level schedule, in match number order. To play a Match, click on it in the list (the list is disabled once Pre-Start is complete). The FCUI will automatically advance to the next unplayed Match at the conclusion of each Match (no need to “re-click” each time). To replay a Match, manually select it from the list and confirm the replay upon Prestart.

- Time - Date/time the Match is scheduled to begin
- Field - Field on which the Match is scheduled to be played

- Match - Number of the Match
- Status - Match Status of one of the following values:
 - Played - Match Complete
 - In Progress - Match Running (on any field)
 - Aborted - Match was canceled or E-stopped
 - (Blank) - Match not yet played
- Description - Short summary of the Match type
- Blue Alliance / Red Alliance:
 - Score - Alliance score (once Match is complete)
 - 1/2/3 - Team numbers in their matching stations

4.3.2 Video Switch

MATCH DISPLAYS

- ☐ Video Only ☐ Video and Score
- ☐ Match Preview ☒ Match Result

PLAYOFF DISPLAYS

- ☐ Alliance [Classic] ☐ Available Teams [Classic]
- ☐ Alliance Hybrid [New] ☐ Bracket ☐ Timeout

SPECIALTY DISPLAYS

- ☐ Qualification Rankings ☐ Award Assignment
- ☐ Award ☐ WiFi Reminder ☐ Background

The Video Switch tab is used to manually change the state of the Audience Display(s). See [Audience Display Screens](#) for more details on each option. Select on this interface, via the radio buttons, which screen to show to the Audience

(i.e. which screen is active in the Audience Display). It also informs which screen is currently being shown. Several displays are not selectable via this interface, but serve to inform the user when these are the current active screens (such as Match Results, which must be triggered through the FCUI or Match Review).

Note: Selecting a display here will make all instances of the Audience Display change

4.3.3 Message

The text that is entered below can be sent to the Audience screen and it will be display on the Background, Alliance or Available Teams displays. You can enter up to 120 characters of text.

Example Message to Audience
We will resume at 1:00pm
Enjoy your Lunch!

Send Message
Clear Message

Messages can be displayed on all Audience Display instances by typing a message and selecting *Send Message*. To remove the text from the Audience Display use the *Clear Message* button. Messages will be displayed on all instances of Audience Display running on the FMS Network.

4.3.4 Options

Auto Time

Teleoperated Time

Default Break Time

Auto Scoring Delay

Teleop Scoring Delay

Hide Scores ☒

↺ Restore Defaults
💾 Save

Force Cleanup Lights On [Purple]

Force Field Reset Lights On [Green + Playoff Timers]

Awards Mode

Force Event Database Backup

↺ Re-calculate Qual/Playoff Rankings

↺ Re-calculate District Rankings

✕ Clear Access Point



















Match timing can be adjusted from this screen, for use in such things as demo matches. Clicking *Restore Defaults* will return all three fields to their season-specific standards. Select *save* after any adjustments for the timing to take effect. Timing can only be changed prior to Prestart.

On the right side of the display there are options for some common operations:

- *Force Cleanup Lights On* - When not in-match, force the purple “cleanup” lights to illuminate and indicate field staff may begin clearing the field. Cannot be used once the green lights are on (or in games where cleanup lights are not applicable).
- *Force Field Lights On* - When not in-match, force the green field reset lights to illuminate and indicate to teams and field staff that the field is “safe to enter”

- *Awards Mode* - Change the state of lights and motors on the field into a photogenic mode worthy of the awards ceremony
- *Force Event Database Backup* - Force a copy of the event database to be made and written to the USB Drive specified in [Settings](#)
- *Re-calculate Current Rankings* - Runs all teams through the calculator for the given tournament phase
- *Re-calculate District Rankings* - Runs all teams through the calculator for the district rankings at the selected event
- *Clear Access Point* - Remove the team number programming from the AP (does not change the 2.4 GHz radio). Useful in situations where a team needs to connect to their machine, but the AP is currently programmed to their team number (such as between finals matches)

4.4 Status Tab

	DS	BWU	RADIO	roboRIO	Voltage	Status	Avg Trip	Packets
1 - 1		0.000			0.00		0	0
2 - 2		0.002			0.00	T	5	63296
3 - 78		15.057			12.23	A	5	2509
1 - 8724		0.072			12.43	A	5	65471
2 - 509		0.442			12.70	A	4	56114
3 - 166		0.144			12.3	A	7	26394

Arrows 1 through 10 point to the following elements in the table:

- Station and Team number
- DS icon
- BWU value
- RADIO icon
- roboRIO icon
- Voltage value and background waveform
- Status icon
- Avg Trip value
- Packets value
- Packet count (63296)

The Status tab shows detailed information for each robot linked to FMS; this information is also displayed on the Field Monitor used by the FTA and FTA Assistant (FTAA). The same data is collected for all stations.

1. Station and Team number (in the format station: team)
2. DS:
 - Red square - nothing connected
 - Green circle with X - Indicates if a DS is physically connected to the switch at the SCC
 - Solid green circle - DS is in FMS mode (i.e. connected to FMS)
3. BWU - Indicates the Bandwidth Utilization/Consumption for that particular team (should be under 2-3 for almost all teams, and FRC rules allow a maximum of 4)
4. Radio - Indicates that the DS is able to communicate with the radio on the robot
5. roboRIO - Indicates that the DS is able to communicate with the roboRIO on the robot
6. Voltage - Battery voltage reported by the Robot (12-13 is normally a fully charged battery, under ~9 may result in visible performance problems). The background of this cell will be a line indicating relative battery voltage over a short sample amount of time.
7. Enabled/Mode - The state and mode of the robot.
 - "A" - Autonomous

- “T” - Teleoperated
 - Red square - robot is disabled
 - Green circle - enabled
 - Black diamond “A” - Robot is A-Stopped
 - Black diamond “E” - Robot is E-Stopped
 - Blank - No Robot connected
8. Avg Trip - average time required to send a message to the robot and have the robot respond (this is basically a ping). Units are in milliseconds. Usually under 10 for most Robots.
9. Packets - indicates the number of packets dropped in the DS-to-Robot link. Typically there are some lost packets. In a very tame wireless environment, this number will be less than 100 (simulated environment results in large value in example photo)
10. Background Color of Row:
- “Clear” - Robot connected and ready (or running)
 - Yellow - Robot not connected (A-Stopped, E-Stopped, or any item on the row is “Red”, like DS)
 - Brown - Bypassed
 - Says “Move” - Team is in the wrong station and should “Move” (usually, stations 1 and 3 are reversed)
 - Says “Waiting” - Team is not in this match (“Wrong Match”) or the previous match has not been finalized and therefore the DS is “Waiting”

Note: It is important to remember that items can only “go green” if the items to the left of it are already “green.” For instance, a roboRIO will not be green unless the Radio is already green. This aids in the speed of troubleshooting.

4.5 Score Tab

Game specific field scoring and adjustments.

The Score Tab is the primary location used to confirm the score of the match prior to Commit Score. The information shown on this tab is input by the Referees using the Touchscreens or by the automated scoring system (except in FMS Off-Season). Scoring value can be manually edited through this interface. The total alliance score is automatically recalculated as these adjustments are made. Values are not editable until after the match is over, because values come from the Referees or automation during the match. In FMS Off-Season, values are editable during the match as there are no Referee panels or real time automation.

Note: Be careful if you elect to manually score, or edit scores, using the score tab. There’s no edit log until after the first time the score is committed.

At official *FIRST* events, all of the data on the score tab comes from automated hardware or certified Referees. The scorekeeper should not edit any values without the supervision and direction of the Head Referee.

Auto		Note Counts		Auto	Teleop	Amped
58	Leave: No	Speaker	0	2	0	
157	Leave: No					
1768	Leave: No	Amp	0	5		

Endgame		Spotlit		Note In Trap	
58	Stage Position: None	Stage Left	No	No	No
157	Stage Position: None	Center Stage	No	No	No
1768	Stage Position: None	Stage Right	No	No	No

Bonuses		Ensemble Progress		Cooperation Activated	
Melody Progress: 7 / 18		0 / 10		<input type="checkbox"/>	

Score		Rank Points		Penalties		Foul Points	
Auto Points	0	Teleop Points	9	Melody	No	G206	<input type="checkbox"/>
Leave	0	Notes	9	Ensemble	No	G408	<input type="checkbox"/>
Notes	0	Stage	0	Cooperation	No	G424	<input type="checkbox"/>
						Foul	2
						Tech Foul	0
						Adjust	0

Auto		Note Counts		Auto	Teleop	Amped
316	Leave: Yes	Speaker	4	14	0	
4909	Leave: No					
5422	Leave: No	Amp	0	0		

Endgame		Spotlit		Note In Trap	
316	Stage Position: None	Stage Right	No	No	No
4909	Stage Position: None	Center Stage	No	No	No
5422	Stage Position: None	Stage Left	No	No	No

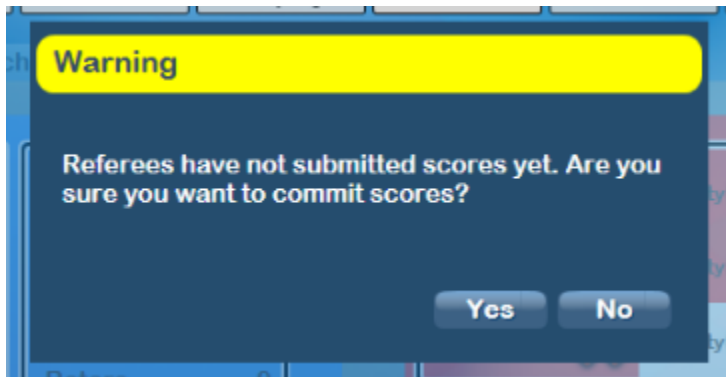
Bonuses		Ensemble Progress		Cooperation Activated	
Melody Progress: 18 / 18		0 / 10		<input type="checkbox"/>	

Score		Rank Points		Penalties		Foul Points	
Auto Points	22	Teleop Points	28	Melody	Yes	G206	<input type="checkbox"/>
Leave	2	Notes	28	Ensemble	No	G408	<input type="checkbox"/>
Notes	20	Stage	0	Cooperation	No	G424	<input type="checkbox"/>
						Foul	4
						Tech Foul	1
						Adjust	0

All input values are quantities, not points. It is not necessary for the Scorekeeper to know the underlying score calculations as FMS will automatically convert any quantity inputs to point values. For additional information about each scoring element please see the official game manual or consult your Head Referee at your event. The Ensemble and Melody Progress in the “Bonuses” section are read-only progression indicators relative to the associated ranking point.

Warning: Notice that Foul Pts are points credited to the alliance, which means they’re calculated off the other alliance’s violations. Changing the Foul/TechFoul counts on a given alliance will change the score of the *opposite* alliance.

4.5.1 Referee Completion Warning



If a Scorekeeper attempts to Commit a score before the Referees have completed their scoring of the match, a warning dialog will be presented.

4.5.2 Post-Match Comments

Scores were edited post-match, a Card has been issued, or you requested to enter comments.

Please provide a meaningful comment to associate with this commit for historical accuracy. You may optionally select one of the below buttons as a template for your comments.

Head Referee Request

Referee/Scorer Mistake

Post-Match Ref Discussion

Yellow/Red Card

Comments:

Return to Edit

Save and Continue

If a match is edited by the scorekeeper after the clock expires, or any cards were assigned in the match, a comment window is automatically opened when the Commit button is pressed on the FCUI. This box can be used for comments regarding why the score was edited after the match ended and these comments will be saved and available later, should a review be necessary. The box can also be manually requested using the dropdown arrow on the commit button in the FCUI.

4.6 Match Test

Event Wizard | Match Play | **Match Test** | Match Review | Field Test | Reports | Settings | About

NOT READY

Station Team Bypass DQ WPA DS Enabled Robot

1 Test 1 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

2 Test 2 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

3 Test 3 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

0

Test Match

0:00

0

Station Team Bypass DQ WPA DS Enabled Robot

3 Test 6 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

2 Test 5 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

1 Test 4 ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒

Prestart Enter Teams | Show Match Preview | Set Audience Display | **Match Start** | Commit | Post Results | Start Break

Schedule | Score | Status | Video Switch | Message | Options

The Match Test functionally is nearly identical to Match Play. When using Match Test FMS will automatically assigns

the match number to 999 (or 998 for multi-field events) and the team numbers to “Test 1” through 6 (unless changed in Settings) and no schedule is displayed. Match Test is used to verify all electrical and scoring components connected to the FMS are operating correctly.

Note that Match Test uses a specific set of WPA Keys for the corresponding Test Robots, but will use the corresponding WPA key for a team registered for the event when its number is entered into a Player Station. Note that alternate sets of test robots are available for events with multiple fields, such as the *FIRST* Championship, by contacting support.

The schedule tab will remain blank in Match Test.

Match Test cannot consume a schedule, and therefore cannot be used to play Matches that “count.” To play Matches in the Practice/Qual/Playoff tournament, Match Play must be used.

4.7 Game Detail Tab



The Game Detail Tab has detailed scoring and sensor information that doesn’t directly impact the points granted to an Alliance. It is not used in every season. It does not apply to the Off-Season FMS.

The Game Detail tab is not in use in 2024.

MATCH REVIEW

5.1 Match Review

5.1.1 Window

Blue Final	Red Final	Description	Match	Blue 1	Blue 2	Blue 3	Red 1	Red 2	Red 3
25	18	Qualification 1	1	68	48	59	58	63	67
3	25	Qualification 2	2	8	70	45	16	56	71
42	16	Qualification 3	3	1	61	34	41	27	25

Team 68 View Log Team 48 View Log Team 59 View Log	Auto: 12 Teleop: 13 Adjust: 0 Foul: 0 Total: 25	Team 67 View Log Team 63 View Log Team 58 View Log	Auto: 8 Teleop: 10 Adjust: 0 Foul: 0 Total: 18
---	---	---	--

Re-Post Match Result
Edit Match

The Match Review interface is used to review all match history for the currently active tournament level. Match Review allows the Scorekeeper to edit the results of matches to ensure team rankings and advancement are calculated correctly. The buttons and info on the lower portion of the display depend on the selected match. Click a match, or use the arrow keys, to change which match is currently selected.

[Green Indicator] Only completed matches are displayed, un-played or canceled matches are not visible in Match Review. Final scores, match info and team numbers are all available

[Pink Box] Pressing the “*View Log*” button under a given team will show their detailed statistics for that match

[Red Box] Re-posting the match result will trigger the Audience Display to show the results of the selected match (especially useful after making an edit)

[Gold Box] The *Edit Match* button, which should only be used under the guidance and supervision of FTA/Head Referee, edits all results from the selected match.

5.2 Edit Match

Adjust score details from a given match.

5.2.1 Match Edit

The screenshot displays the 'Match Edit' interface for 'Match 1'. The interface is split into two main sections: Blue Teams (top) and Red Teams (bottom). Each section includes a final score, team-specific score inputs with 'DQ' checkboxes, and a grid for fouls. The Blue section shows a final score of 25, while the Red section shows 18. To the right, a 'Changelog' section lists edits from 'Initial'. Below the changelog, there are fields for 'Edits' (showing 'No Changes Made') and 'Comments'. A red error message states 'Comment must be at least 15 characters to submit.' At the bottom right are 'Cancel and Close' and 'Save Edits and Comments' buttons.

Match Reviews' Edit Match functionality displays all the relevant information for a match; all scoring elements, total calculated score, foul points, etc. Check boxes indicate if the DQ option was used, and the color in the drop-down under each team number indicates if that team received a Yellow or Red Card during the match.

If editing is necessary, simply change values within the interface on the left side of the screen. The blue alliance scoring actions will always be on top, with a blue background. The red alliance scoring actions will always be on bottom, with a red background. The scores/rankings will be immediately recalculated on save. If any edits are made a comment with the reasons is required, and this information is reported to *FIRST* HQ for quality control.

On the right side of the screen, a history of edits is displayed. With the most recent on top, the "Changelog" will list all edits and comments as they were entered. If a comment was added before commit, it will be listed next to the "Edited Initial" purple title on the Changelog.

Changes made in Match Review take effect immediately once they are saved and cannot be reversed (without opening and manually undoing the edits based on the log). In the Playoffs, matches cannot be edited once that level of the Playoffs is over (i.e. if it would have affected which teams advanced to the next phase, if a match in that phase has been played).

Clicking Cancel will close with window with no changes being saved.

5.3 View Log

Match Log
Match 2 - Team 4 - Blue Station1

Timestamp	Time	Mode	DS Link	Enabled	Estop	Robot Lnk	Radio Lnk	RIO Lnk	Avg Trip	Missed Pkt	Bat V	SS	SQ	BWU
10:51:08 AM	5	TeleOp	True	False	False	False	False	False	2	1442	13.36	0	0	0.009
10:51:09 AM	5	TeleOp	True	False	False	False	False	False	2	1467	13.36	0	0	0.009
10:51:09 AM	5	TeleOp	True	False	False	False	False	False	2	1493	13.36	0	0	0.011
10:51:10 AM	5	TeleOp	True	False	False	False	False	False	2	1518	13.36	0	0	0.013
10:51:11 AM	5	TeleOp	True	False	False	False	False	False	2	1568	13.36	0	0	0.017
10:51:11 AM	5	TeleOp	True	False	False	False	False	False	2	1594	13.36	0	0	0.018
10:51:12 AM	5	TeleOp	True	False	False	False	False	False	2	1619	13.36	0	0	0.016
10:51:13 AM	5	TeleOp	True	False	False	False	False	False	2	1670	13.36	0	0	0.012
10:51:13 AM	5	TeleOp	True	False	False	False	False	False	2	1695	13.36	0	0	0.012
10:51:14 AM	5	TeleOp	True	False	False	False	False	False	2	1721	13.36	0	0	0.013
10:51:15 AM	5	TeleOp	True	False	False	False	False	False	2	1771	13.36	0	0	0.01
10:51:15 AM	5	TeleOp	True	False	False	False	False	False	2	1797	13.36	0	0	0.008
10:51:16 AM	5	TeleOp	True	False	False	False	False	False	2	1823	13.36	0	0	0.006
10:51:16 AM	5	TeleOp	True	False	False	False	False	False	2	1842	13.36	0	0	0.006
10:51:17 AM	5	TeleOp	True	False	False	False	False	False	2	1873	13.36	0	0	0.004
10:51:17 AM	4	TeleOp	True	False	False	False	False	False	2	1898	13.36	0	0	0.004
10:51:18 AM	4	TeleOp	True	False	False	False	False	False	2	1923	13.36	0	0	0.007
10:51:18 AM	3	TeleOp	True	False	False	False	False	False	2	1949	13.36	0	0	0.007
10:51:19 AM	3	TeleOp	True	False	False	False	False	False	2	1974	13.36	0	0	0.005
10:51:19 AM	2	TeleOp	True	False	False	False	False	False	2	2000	13.36	0	0	0.005
10:51:20 AM	2	TeleOp	True	False	False	False	False	False	2	2025	13.36	0	0	0.005
10:51:20 AM	1	TeleOp	True	False	False	False	False	False	2	2050	13.36	0	0	0.005
10:51:23 AM	5	TeleOp	True	False	False	False	False	False	2	2177	13.36	0	0	0.003
10:51:23 AM	5	TeleOp	True	False	False	False	False	False	2	2197	13.36	0	0	0.003
10:51:23 AM	5	TeleOp	True	False	False	False	False	False	2	2203	13.36	0	0	0.003
10:51:24 AM	5	TeleOp	True	False	False	False	False	False	2	2227	13.36	0	0	0.003
10:51:24 AM	4	TeleOp	True	False	False	False	False	False	2	2253	13.36	0	0	0.003
10:51:25 AM	4	TeleOp	True	False	False	False	False	False	2	2278	13.36	0	0	0.003
10:51:25 AM	3	TeleOp	True	False	False	False	False	False	2	2304	13.36	0	0	0.003
10:51:26 AM	3	TeleOp	True	False	False	False	False	False	2	2329	13.36	0	0	0.004
10:51:26 AM	2	TeleOp	True	False	False	False	False	False	2	2355	13.36	0	0	0.004

Close

Clicking on the “View Log” button below each team number opens a viewer which gives detailed logging information of the team during that particular match. FMS records data every 500ms for each team in each match. Details include Mode (Auto or Teleop), DS Link, E-stop condition, and if the robot was enabled or disabled, battery voltage, radio signal level, radio signal-to-noise ratio, and bandwidth usage.

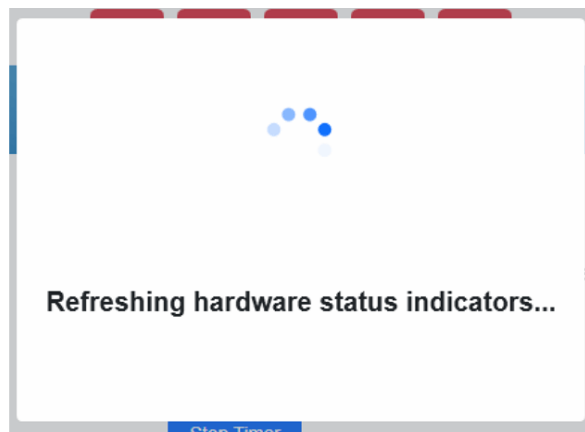
The same data is available via the [Match Logs and Scores](#) page of the Field Monitor, which is especially useful for allowing Field Staff to review data without interrupting match play.

Click Close to return to the Match Review screen.

FIELD TEST

6.1 Field Test

Field Test is used to confirm basic operation of all the LED Displays, Team Lights and scoring hardware. Field Test is also used to confirm the network connections to the Audience Screen and the Internet. After Field Test a full Match Test should be used to confirm all hardware is performing as expected in-match. In FMS Off-Season, the Field Test screen is not accessible.



On initial load, the screen will be temporarily blocked while the status of all hardware is updated.

6.1.1 Interface

A screenshot of the Field Test interface. At the top, there is a blue button labeled "Refresh All Field Test Indicators". Below this, the interface is divided into several sections. The "Field Hardware" section shows status indicators for Blue Alliance, Scoring Table, and Red Alliance. The "Referee Panels" section shows status indicators for Blue Near, Blue Far, Head Ref, Red Near, and Red Far. The "Field Lights and Signs" section shows controls for Arena Stack Mode Test, Team Light Mode Test, Timer Test, Team Sign Mode Test, and Team Sign Numbers Test. The "Game Specific" and "Network Communication" sections are also visible. The interface is color-coded with green for success, red for failure, and blue for active states.

[Green Box] Shows the connection status of the hardware at the corresponding areas of the playing field; Blue Alliance end, Scoring Table, and Red Alliance end. Green indicates a successful connection. Use “Refresh Indicators” to re-check the status.

[Red Box] Warnings about system configuration, as detailed below.

[Pink Box] Communication status between FMS and each referee panel. A successful connection is shown in green.

[Yellow Box] Shared hardware status area, detailed below

6.1.2 Lights and Signs

This panel is used to test the Stack Lights and team signs.

- Arena Stack Test - tests each light in the stack at the Scoring Table
- Team Light Test - tests each light in the player station (the stack lights by the team signs, not any light strings in the station)
- Timer Test - enter a time (in seconds) to manually run the timers on either end of the field
- Team Sign Test - tests the seven segment displays around the field
 - Awards displays the season
 - Test alternates between the station number and “8888”
 - Match displays the team numbers specied to the right of the dropdown (“Team Numbers Test”)
- Team Numbers Test - explicitly specify a team number to display on each team sign

Note: The Team Stack Light test this will not illuminate the amber lights (E-stop indicator). E-stop lights only turn on when the E-stop in the corresponding Player Station is pushed, or the Arena E-stop is pressed

6.1.3 Game Specific Field Test

Please see the next page for additional information.

6.1.4 Network Communication

Machine Name	Version	Volume	Network
WEBCAST14	11.0.2402.2301	7	Wired
WEBCAST14	11.0.2402.2301	7	Wired
FRCFIRS-8GE9IN6	11.0.2402.2301	26	Wired
FRCFIRS-8GE9IN6	11.0.2402.2301	26	Wired

- Internet - confirm an active connection to the Internet (specific ports and procedures)
- Audience Connectivity - test connection between FMS and the Audience Display program
 - The indicator turns green if **any** Audience Display is found on the network
 - Optionally, if the “play sound” box is checked, a sound is played on the located Audience Display(s)
- For each Audience Display located, a row is added to the “Displays Found” box on the right side. This display includes the name of PC running the program, the current version number and volume of the machine. Re-running the screen connectivity test will refresh the results in the box.

Note: At least one instance of the Audience Display program must be running for this to be successful. A connection made to **ANY** audience screen will provide a “success.” This *should not* be used as a sound test- use the audio test buttons within the Audience Display for sound tests.

6.1.5 Hardware Warnings

Any warnings detected during the hardware check will appear within the Field Test screen. Possible warnings include:

- Machine Firewall Enabled (pictured) - Having the firewall enabled can cause problems when FMS attempts to communicate status data to the Driver Stations. At an official event, contact support if this message is displayed.
- Spare Infrastructure Hardware on Network (not pictured) - The system has noticed spare hardware (e.g. SCC) on the network. No action needed.
- Spare Game-Specific Hardware on Network (not pictured) - The system has noticed spare game specific hardware (e.g. auxiliary control cabinet) on the network. No action needed.
- Spare Server on Network (not pictured) - It is believed that the backup (secondary) server may be on the network. Check if it is powered off, or contact support for assistance. Matches will not operate correctly with the secondary machine powered on.
- Access Point wrong Port (not pictured) - It is believed that the access point is in the wrong physical port on the scoring table

6.2 Game Specific

6.2.1 Field Test - Game Specific

The screenshot displays the 'Game Specific' section of the Field Test interface, which is divided into two panels for the 'Blue Alliance' and 'Red Alliance'. Each panel contains three columns for 'Amp', 'Speaker', and 'Subwoofer' status. The 'Amp' column includes an 'IO Block' status (green checkmark), 'Stack Lights' (All Off), 'Coop Button' (Not Pressed), and 'Amp Button' (Not Pressed). The 'Speaker' column includes a 'Counter Box' status (green checkmark), 'Lights' (On), and 'Motors' (On). The 'Subwoofer' column includes a 'Lights' status (green checkmark), 'Light Mode' (Off), and a 'Simulate Amp Timer' button. The interface also shows tabs for 'Field Lights and Signs', 'Game Specific', and 'Network Communication' at the top.

Amp, Speaker and Subwoofer Status blocks will be green or red to indicate whether they can be detected by FMS.

The Coop and Amp Buttons can be depressed to see the red/green indicator blocks display the state in realtime.

Stack lights and motors can be toggled on and off to test their connection and operation.

REPORTS

7.1 Reports

Retrieve event information through formatted reports.

7.1.1 Menu

Tournament Reports Reports customized to each level of the tournament. Available after schedule generation in each tournament level.		
Practice Matches <div>Schedule</div> <div>Bypass</div> <div>Cycle Time</div>	Qualification Matches <div>Schedule</div> <div>Schedule by Team</div> <div>Announcer's Report</div> <div>Match Results</div> <div>Ranking</div> <div>Bypass</div> <div>Cycle Time</div>	Playoff Matches <div>Schedule</div> <div>Bracket</div> <div>Announcer's Report</div> <div>Match Results</div> <div>Playoff Rankings</div> <div>Bypass</div> <div>Cycle Time</div>
FTA Reports Reports for FTA usage and monitoring <div>WPA Key Status Report</div> <div>FTA Team WPA Report</div> <div>WPA Test Pit Signs Report</div>	Head Referee Reports Reports for Head Referee tracking and monitoring <div>Tracking Sheet</div> <div>Qual. Cards Report</div> <div>Backup Pool Report</div> <div>Playoff Cards Report</div> <div>Playoff Coupons</div> <div>Lineup Cards</div>	Awards Reports Reports related to the awards ceremony and process for this event <div>Award List Report</div> <div>Award Eligibility Report</div> <div>Wildcards Script</div> <div>Award Script Day 1</div> <div>Award Script Day 2</div>
Other Event Reports Assorted reports specific to this event <div>Competing Teams List Report</div> <div>District Rankings For Event Report</div>	Season Reports Summary reports with data spanning the season <div>Event List Report</div> <div>Team List Report</div>	

The Reports screen is used to generate printable reports needed throughout the tournament. Printing options can be selected as well as a file-export options in Microsoft Excel, Word or PDF file formats.

7.1.2 Example Report

Back to Reports							
<div> </div>							
1 of 2 100%							
Qualification Match Schedule							
Manchester Regional							
Matches Per Team 10							
Time	Description	Blue 1	Blue 2	Blue 3	Red 1	Red 2	Red 3
Wed 9:00 AM	Qualification 1	68	48	59	58	63	67
Wed 9:07 AM	Qualification 2	9	70	45	16	56	71
Wed 9:14 AM	Qualification 3	1	61	34	41	27	25
Wed 9:21 AM	Qualification 4	20	51	69	60	21	31
Wed 9:28 AM	Qualification 5	11	28	23	4	33	66
Wed 9:35 AM	Qualification 6	45	59	67	1	41	56
Wed 9:42 AM	Qualification 7	58	68	34	21	8	20
Wed 9:49 AM	Qualification 8	16	60	66	33	63	28
Wed 9:56 AM	Qualification 9	48	25	71	51	61	4
Wed 10:03 AM	Qualification 10	27	70	23	69	11	31
Wed 10:10 AM	Qualification 11	67	41	16	59	66	20
Wed 10:17 AM	Qualification 12	28	8	1	51	48	21
Wed 10:24 AM	Qualification 13	25	69	56	58	71	61
Wed 10:31 AM	Qualification 14	31	70	33	60	11	68
Wed 10:38 AM	Qualification 15	45	63	27	34	4	23
Wed 10:45 AM	Qualification 16	28	41	69	56	8	58
Wed 10:52 AM	Qualification 17	21	71	11	48	16	1
Wed 10:59 AM	Qualification 18	20	4	68	61	59	33
Wed 11:06 AM	Qualification 19	66	27	67	23	31	51
Wed 11:13 AM	Qualification 20	70	60	63	34	25	45
Wed 11:20 AM	Qualification 21	33	20	11	71	69	1
Wed 11:27 AM	Qualification 22	51	16	58	4	59	41
Wed 11:34 AM	Qualification 23	56	28	34	68	67	70
Wed 11:41 AM	Qualification 24	66	25	21	31	48	45
Wed 11:48 AM	Qualification 25	63	23	61	27	60	8
	Lunch						

An example report, showing the qualification schedule for a demonstration regional. From here the report could be printed or saved using the buttons on the bar above the event title (in this example).

7.1.3 Available Reports

Tournament Reports:

- Practice Tournament
 - *Schedule* : Practice tournament match schedule (updated as teams are added or removed from matches)
 - *Cycle Time* : Shows the actual time between match starts
 - *Bypass* : Shows which teams have been Bypassed during which matches of the practice tournament
- Qualification Tournament
 - *Schedule* : Qualification match schedule
 - *Schedule By Team* : Qualification match schedule, sorted by team (lengthy report, not recommended for printing)
 - *Announcer's Report* : Detailed report of team details for reference by the announcers (one page per match)
 - *Match Results* : Final scores of all completed matches in the qualification tournament
 - *Ranking* : Current qualification ranking of all teams at the event (updates as matches are played or re-played)
 - *Bypass* : Shows which teams have been Bypassed during which matches of the qualification tournament
 - *Cycle Time* : Shows the actual time between match starts
- Playoff Matches
 - *Schedule* : Playoff match schedule
 - *Bracket* : Tournament bracket
 - *Announcer's Report* : Detailed report of team details for reference by the announcers (one page per alliance)

- *Match Results* : Final scores of all completed matches in the playoff tournament
- *Playoff Rankings Report* : Shows the playoff alliances in rank order within the current playoff level and with their ranking detail
- *Bypass* : Shows which teams have been Bypassed during which matches of the playoff tournament
- *Cycle Time* : Shows the actual time between match starts

FTA Reports:

- *WPA Key Status Report* : Shows if teams have linked or played in matches successfully
- *FTA Team WPA Report* : Same as *WPA Key Status Report* , but with WPA keys shown. Requires FTA password to run and should not be printed.
- *WPA Test Pit Signs Report* : Generates one page per team that has not yet connected to the field (to place in the team's pit or distribute as reminder to come do a connection test)

Head Referee Reports:

- *Tracking Sheet*: Used by Head Referees for tracking information throughout the event. Head Referee may request a copy from the Scorekeeper.
- *Qual. Cards* : Match schedule showing teams with assigned cards during the qualification tournament
- *Backup Robots* : For tracking teams as they accept or decline their position as a backup robot in the playoff tournament
- *Playoff Cards* : Match schedule showing alliances with assigned cards during playoff matches
- *Playoff Coupons* : Backup robot coupons for the playoff's tournament

Awards Reports:

- *Awards List* : Lists awards to be given out at the event. The winners are included if they have been assigned.
- *Awards Eligibility Report* : Lists all teams attending the event and their eligibility for certain awards (such as the Rookie All Star Award).
- *Wildcards Script* : Script for the Announcer to read should any Wildcards be generated at the event
- *Award Script Day 1* : Script for the Announcer to read for awards expected to be presented on the first day of the event
- *Award Script Day 2* : Script for the Announcer to read for awards expected to be presented on the second day of the event

Other Event Reports:

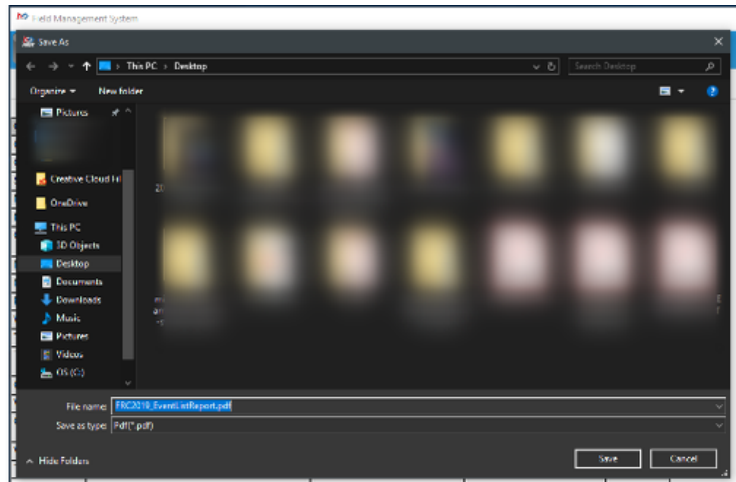
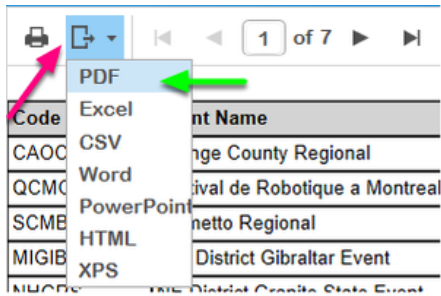
- *Competing Teams List Report* : Same as the season team list, but filtered to only the teams competing at the currently selected event
- *District Rankings for Event Report* : District rankings of eligible teams playing at the currently selected event. Not representative of overall district ranking, only position at the selected event.
- *Lineup Cards* : Lineup submission sheets for use during the playoff tournament

Season Reports:

- *Event List* : A complete list of all FRC events in the current season (including those manually added via FMS)
- *Team List* : A complete list of all registered FRC Teams for the given season

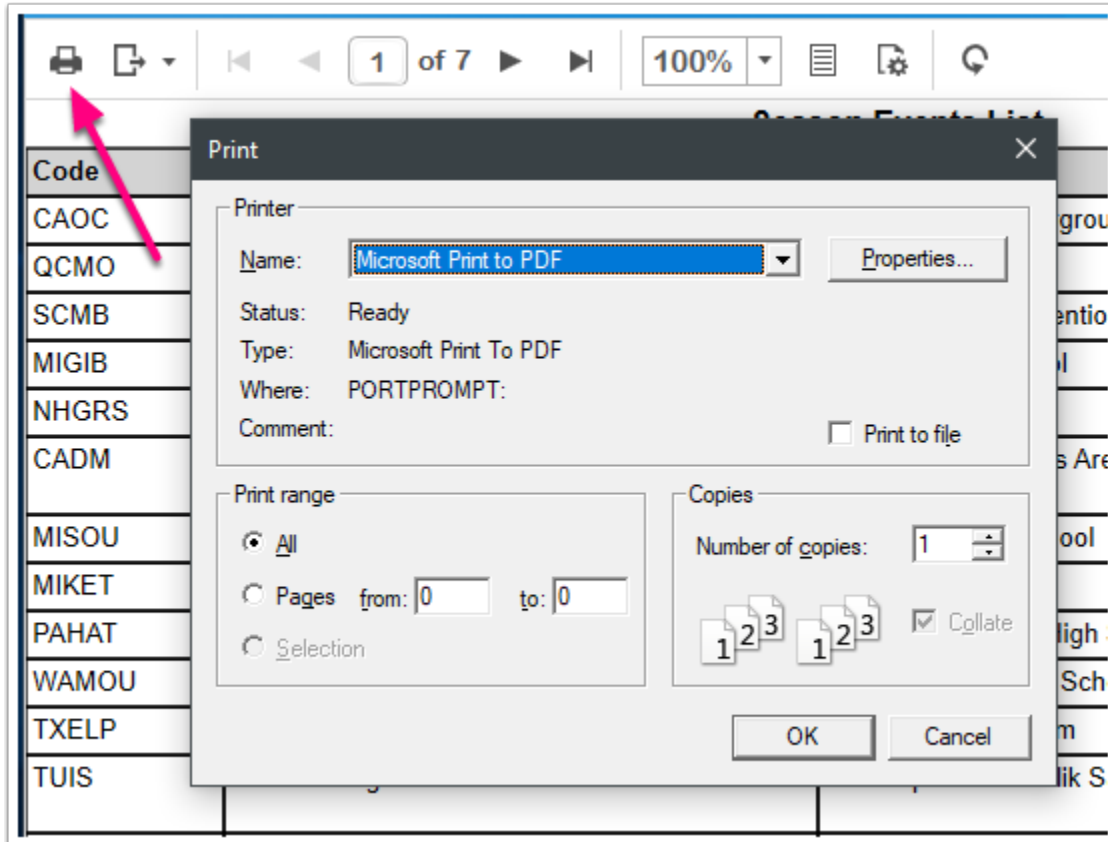
7.2 Report Operations

7.2.1 Exporting



To export a report (such as providing an Excel version to a Judge Advisor), first, select the export icon (pink arrow) on the bar above the report name. Second (green arrow) select the file format you wish to export. Selections include Microsoft Excel (Excel), Adobe PDF (PDF) or Microsoft Word (Word). This will (after a short “working” indicator) bring up the standard Windows save dialog (right) where you can select the location to export the report.

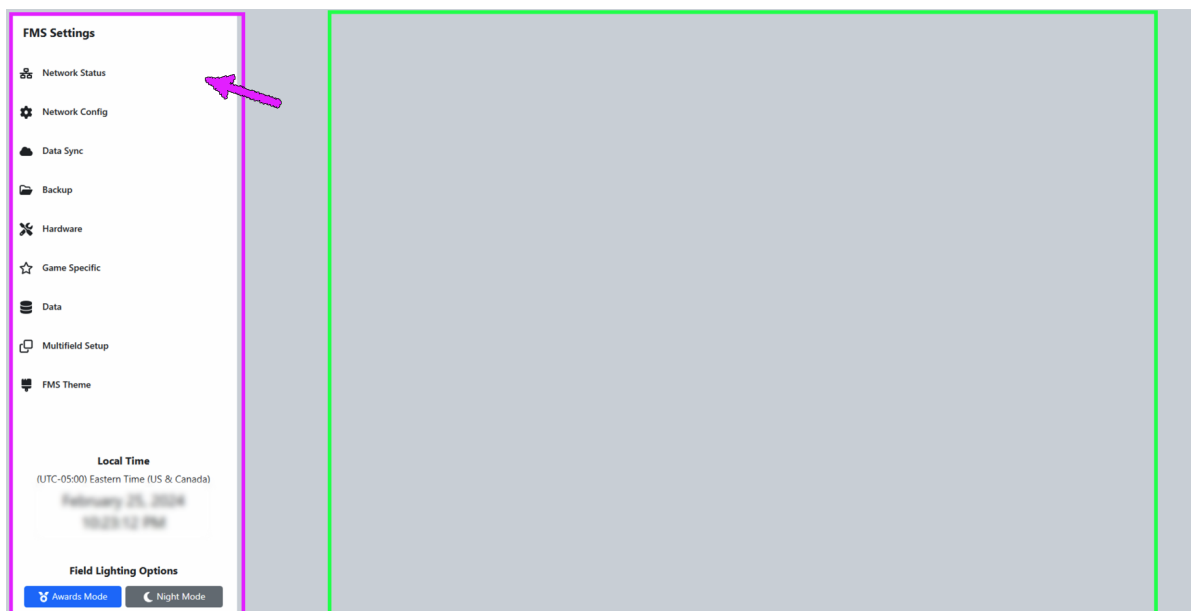
7.2.2 Printing



Print reports by selecting the printer icon on the bar above the report name. This will bring up the standard Windows print dialog where the report can be printed.

SETTINGS

8.1 Settings Menu



The Settings screen can be accessed from the Settings tab along the top of the window. This screen contains important global settings for network, hardware, backup, and data configurations within the FMS Software. Some items within the Settings screen may be used by Scorekeepers and FTAs, such as Backup Configuration, some network settings, spare hardware configuration, and others. However, some of the items are protected via a Settings Lock and can only be unlocked by FRC Engineering staff. These items are deemed “Critical” (as in the case of AP channel configuration or changing the Data Sync state) or “Experimental” (as in the case of purging tournament data). Items within the Settings page that are protected by the Settings Lock are followed by an asterisk (*). In the Off-Season version of the software the Settings are permanently unlocked though some features (such as hardware configuration or Data Sync) are disabled because they do not apply.

The left bar of the Settings Page (pink box) contains quick-access information and available tabs. Information also includes the current server time information and the currently active time zone. The bottom has buttons for Awards Mode (which will enable all LEDs on the field to match their alliance color) and display the current year on the Team Signs, whereas Night Mode will turn all LEDs on the Field off.

Important: It is critical that the time zone of the server be set correctly for the location the event is being held, especially if the event will have schedules and data available online.

Clicking the tabs on the left will change which data is available on the right side of the screen (green box). Information about each tab can be found in its associated documentation step.

8.2 Network Status

Network Status Summary

- Windows Network Adapter ✓
- Score Switch ✗
- Field Router ↻
- Smart Router
- External Web Access
- Field Access Point

✕ Cancel Refresh

← Hide Details

Windows Network Adapter ↻ Restore Defaults ↻ Refresh Status

Adapter Name	Field Network ✓
Link Status	Up (1000 Mbps) ✓
Mac Address	EC:E7:A7:00:42:76
IP Address	10.0.100.5 (Static) ✓
Subnet Mask	255.255.255.0
Gateway	10.0.100.1 ✓
Preferred DNS	10.0.100.5 ✓
Alternate DNS	

Score Switch ↻ Reset Port ↻ Refresh Status

✕ **Port 2 is in state: Connected**

Suggested next steps:

- Check which device is connected to port 2 of the score switch. If it is the backup server, please shut it down.

Firmware Version	C2960CX-UNIVERSALK9-M v.15.2(4)E1 ✓
IP Address	10.0.100.200 (Static) ✓
Port 1 (Gi0/1) - Primary Server	✓
Port 2 (Gi0/2) - Backup Server	✗
Port 3 (Gi0/3) - Admin Network	✓
Port 4 (Gi0/4) - Red SCC	✓

The Network Status tab on the Settings page contains all of the network status information that is queried from the FMS hardware and software. It has scrolling sections on the right for the six components it covers: Windows Network Adapter, Score Switch, Field Router, Smart Router, Ext Web Access, and Access Point. All data on this tab is “Read Only”, adjustments are made through “[Network Config](#)”

[*Red* - Overview] The components and their general status, the details of which can be viewed in the right side section

[*Green* - Detail] Detailed information for each tracked component

To change the type of Router or Access Point in use, visit the [Hardware](#) tab.

8.3 Network Config

The screenshot displays the Network Config page with four distinct sections, each highlighted by a colored border:

- Field Access Point (2.4 GHz) [Blue Border]:** Includes a toggle for 'Enabled' (selected) and 'Disabled'. Fields for 'SSID' (FIRSTRadio01) and 'WPA Key' (empty) are present. A 'Save 2.4 GHz Configuration' button is at the bottom. A 'Channel' dropdown is set to 'NoChannelSelected' with a 'Set 2.4 GHz Channel' button below it.
- Field Access Point (5 / 6 GHz) [Red Border]:** Includes a 'Channel Width' dropdown, 'Channel' dropdown (Channel_40), 'Min Rate' dropdown (Rate_6Mbps), and 'Test Robot Group' dropdown (TestRobotsGroup1_6). A 'Set AP Config' button is at the bottom.
- Field Router [Pink Border]:** Includes a toggle for 'DHCP' (Enabled) and 'Disabled'. Fields for 'IP Address', 'Subnet Mask', 'Gateway', 'DNS 1', and 'DNS 2' are present. A 'Save Router Configuration' button is at the bottom.
- Smart Router [Yellow Border]:** Includes a toggle for 'Venue DHCP' (Enabled) and 'Disabled'. A 'VPN' toggle is set to 'Disabled'. 'Truck Name' is TRUCK05. A 'Current VPN Profile' section is empty. Below is a 'VPN Profile' section with fields for 'IP Address', 'Subnet Mask', 'Gateway', 'DNS 1', and 'DNS 2'. A 'Save SmartRouter Configuration' button is at the bottom.

The Network Config tab on the Settings page contains all of the network settings that may be adjusted for the FMS hardware and software. It has four sections: Smart Router, Field Router and the Access Points.

[*Blue* - Access Point (2.4)] Contains functions for setting the Access Point configuration within the FMS Hardware set. Set Access Point can be used to configure the radio used on the Field. The SSID and WPA Key is configurable by the FTA without a password, but once set the WPA Key value will not persist once the software navigates away from the Settings page. If the WPA Key is forgotten, a new one must be set by the FTA.

[*Red* - Access Point (5/6)] Used to configure the Robot facing side of the radio network. Do not change the settings on the Router without FTA and/or FRC Engineering support. Additional options allow support staff to configure the minimum rate for operation of the robot facing side of the radio. For events with multiple fields, the “Group” option can be changed to avoid overlap in radio test groups across access points.

[*Pink* - Field Router] Provides functions for setting configuration information for the Router inside the #33 case. Set Router can be used to configure the router settings for venue-specific network access configuration. Do not change the settings on the Router without FTA and/or FRC Engineering support. In almost every case, the Field Router need not be adjusted, as the Smart Router would be updated to the venue-specific settings instead.

[*Yellow* - Smart Router] Contains functions for setting the Smart Router configuration within the FMS Hardware set. Set Router Configuration can be used to configure the router settings for venue-specific network access configuration. Do not change the settings on the Smart Router without FTA and/or FRC Engineering.

To change the type of Router or Access Point in use, visit the [Hardware](#) tab. For Status information visit the [Status](#) tab.

8.4 Data Sync

Sync Data Down	Sync Data Up	Scopes
<button>Update Base 🔒</button>	<button>Update FMSLogs 🔒</button>	<button>Drop System Scope 🔒</button>
<button>Update Events 🔒</button>	<button>Update Alliances 🔒</button>	<button>Drop Current Event Scope 🔒</button>
<button>Update Teams 🔒</button>	<button>Update Match Results 🔒</button>	<button>Reset FTApp Scopes 🔒</button>
<button>Update Registrations 🔒</button>	<button>Update Rankings 🔒</button>	
<button>Update Historical Data 🔒</button>	<button>Update Schedules 🔒</button>	
<button>Update Judge Data 🔒</button>	<button>Update Awards 🔒</button>	
	<button>Update Event Notes 🔒</button>	

Data Sync Configuration

Enabled

Disabled

Sync URL

https://frc-data.firstinspires.org

Sync Token

TRUCK05

Save Configuration 🔒

The Data Sync tab is used to monitor and control syncing tournament data to the *FIRST* servers; the functions and settings in this tab are protected using the Settings Lock. It is important to ensure that for off-season events not authorized to sync data to *FIRST* the Sync Setting is **DISABLED**. If this setting is **ENABLED**, CPU and network resources are consumed attempting to upload tournament data to *FIRST* servers and may cause delays or errors while running the event.

Beyond the enable checkbox, status information is displayed for use by FRC Engineering when performing advanced sync related tasks- it's not useful to (or available to) the end user.

8.5 Backup Config

USB Backup Folder

D:\WEEK0

Browse

There are 907,811.81 MB of space available on the USB Backup Drive.

Known Backups

USB Incremental

USB Event Full	02/17/2024 at 11:58 AM
<hr/>	
USB System Full	02/16/2024 at 07:05 PM
<hr/>	

Hard Drive Incremental

Hard Drive Full	02/17/2024 at 11:58 AM
<hr/>	
Hard Drive System Full	02/16/2024 at 07:05 PM

Force Event Backup

Force System Backup

The Backup Config tab provides facilities to set a data backup location and manually force backups to occur. Backups should be set to an off-system USB storage location using the “Browse” button (red arrow) to select the location. The currently selected location will be shown in the text box to the left of the Browse button.

The backup is used when uploading event archives to FIRST, so it’s important to check the backup location in the event of an upload failure (it may be a full location or unavailable). It’s also important to keep an eye on the indicator at the bottom of FMS that indicates the backup status; a gray or red status indicator shows that there’s a problem with the backup and should be corrected immediately, a gray status indicator shows the backup is working.

The “Force Event Backup” button (blue arrow) is used to manually force a backup for Event-Specific data (such as Match Results, Match Logs, and Tournament Progress). The “Force System Backup” button (green arrow) is used to manually force a backup for System-Specific data (such as Event Lists, Team Data, and system configuration data).

As backups are performed, the times of the latest of each type are shown next to their names.

8.6 Hardware

Field

Spare SCC

☒ None
☐ Blue
☐ Red

Practice Field Mode

Enabled

Disabled

i

Practice field mode removes the score validation that is done when clicking "Commit" and automatically sets all score data for both alliances to Zero. Practice field mode can only be used in Practice or Test matches. Practice field mode gets automatically disabled upon activating a Qualification or Playoff schedule.

Export Server Details

Networking

Network Config

Restore Defaults

Edit

Restart FMS Services

The Hardware tab is used to indicate the use of specific hardware provided for the field. Because configurations are different when using spare hardware, FMS needs to know the locations and other information of the hardware. Only one spare component of each type is allowed to be used on a field; the spare component is generally marked with White or Black gaffer's tape on the handle/front, whereas the normal component is generally marked with a Red or Blue (alliance-colored) piece of gaffer's tape. The layout of the tab is similar to the *Network Config* tab.

[Spare SCC] Contains configuration options for the Spare SCC (field ends or not in use).

[Practice Field Mode] Remove the commit-match score validation for faster use in situations like District Championships.

[Export Server Details] The Export Server Details button provides FRC Engineering with a full system configuration output to better help troubleshoot configuration problems.

[Network Config] Edit the underlying network configuration options in the FMS configuration. Requires the Engineering password.

[Restart Services] Click to reset the underlying FMS Services on the Server.

8.7 Data

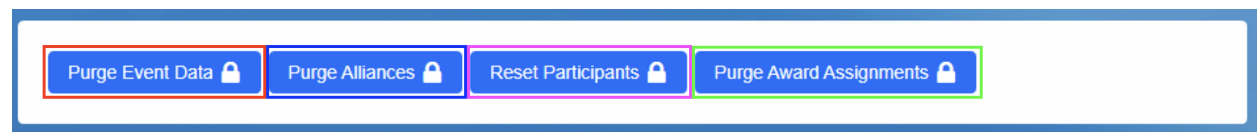
Experimental data manipulation options, which should only be executed under the supervision of FRC Engineering.

8.7.1 District Rankings



Force a recalculation of District Rankings.

8.7.2 Event Level



[*Red*] Purge an entire event, all match and alliance data.

[*Blue*] Purge just the alliances from an event.

[*Pink*] Undo any participants added manually, and return the registration list to its state as downloaded from HQ.

[*Green*] Undo all award assignments, return the awards to their default (unassigned) state.

8.7.3 Tournament Level

Level	Schedule Exists	Matches Played	# Ranking Records	Purge
Practice	No	0		Purge Practice
Qualification	Yes	0	0	Purge Quals
Playoffs	No	0	8	Purge Playoffs

[*Level Column*] The level being referenced by that data row.

[*Schedule Exists Column*] Yes/No of whether the schedule has been generated (schedule plus alliance pairings).

[*Matches Played Column*] Count of the number of matches played in that level.

[*# Ranking Records Column*] The number of Qualification ranking records that exist, or, for Playoffs, the number of alliance ranking records that exist.

[*Purge Column*] Purge the given level, such that all matches and logs are deleted. This cannot be undone.

8.7.4 Detail Level

Purge Individual Match
Purge Match Number

Reassign Match Result
Assign From to

Truncate Qual Schedule
Down to ___ Matches Per Team:

[*Purge Individual Match*] By selecting a tournament phase and entering a match number, dump only one specific match from a level (all plays lost).

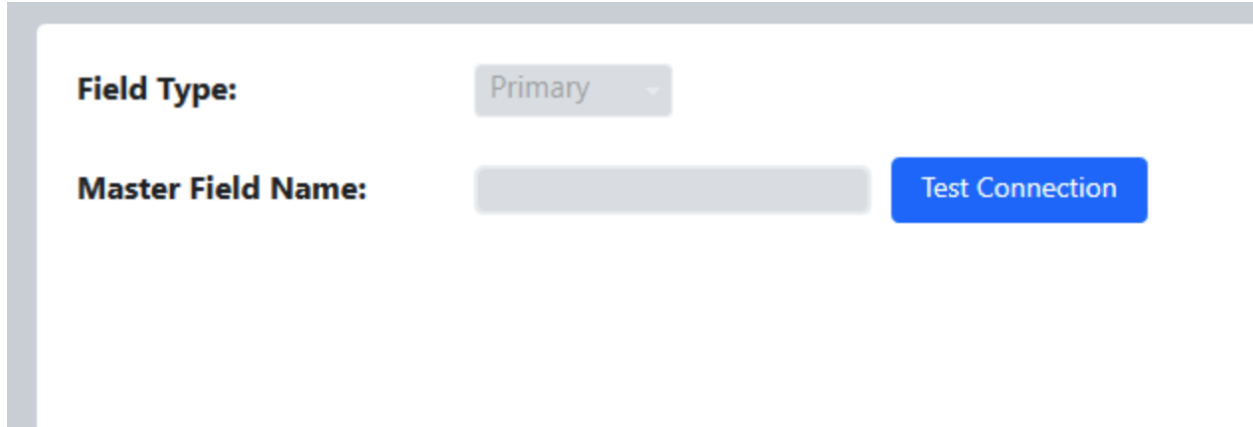
[*Reassign Match Result*] By selecting a test match and traditional match, the results can be overwritten from the test match to the traditional match. The original results of the traditional match will be lost, and replacement is only done on the most recent play.

[*Truncate Qual Schedule*] By entering a value here, the qualification schedule can be shortened, while maintaining equality for all teams (this is only for emergency use, such as acts of god or the direction of FIRST HQ). It requires the password of a support engineer.

8.8 Multi-field Setup

For events that have more than one playing field.

8.8.1 Setup

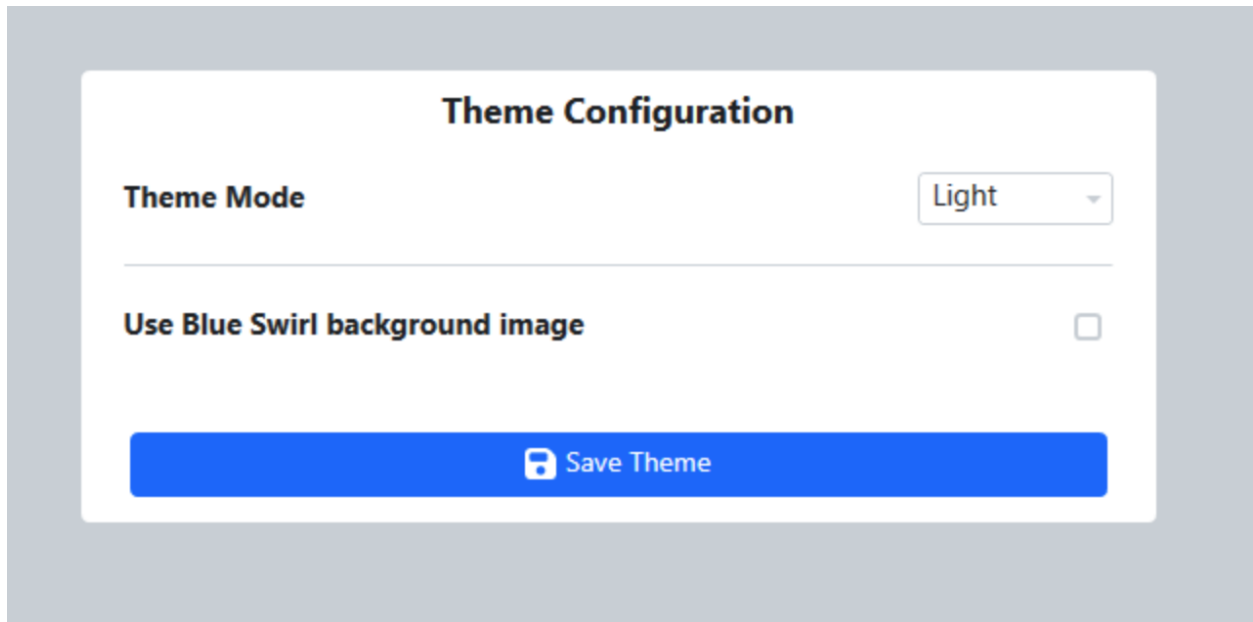


The screenshot shows a configuration window with two main sections. The first section, labeled 'Field Type:', contains a dropdown menu currently set to 'Primary'. The second section, labeled 'Master Field Name:', features a text input field and a blue button labeled 'Test Connection'.

Multi-field setup is used for configuring FMS for use at events with more than one active playing field. Do not modify anything within this tab without FRC Engineering support.

This mode is not available to events without coordination with *FIRST*. It is used at the *FIRST* Championship.

8.9 FMS Theme



The screenshot displays a 'Theme Configuration' window. It includes a 'Theme Mode' dropdown menu set to 'Light'. Below this is a checkbox labeled 'Use Blue Swirl background image', which is currently unchecked. At the bottom of the window is a large blue button with a save icon and the text 'Save Theme'.

The FMS Theme tab allows for the modification of the appearance of the FMS software.

[Theme Mode] Select from Light or Dark mode.

[Swirl] - Choose to use a solid color or the blue swirl background image.

Once configured, click on Save Theme to save the selections. A restart of FMS is required for theme settings to take effect.

Note: For those who wish to adjust the FMS Theme, please make your theme selections during event setup and do not change this setting while playing matches.

ABOUT TAB

9.1 About Tab

The Field Management System, or "FMS", is a comprehensive event management system developed exclusively for the FIRST® Robotics Competition ("FRC"). At official in-season FRC events, live support is provided remotely by FIRST HQ using tools installed on the event server. At off-season and unofficial events no live support is provided, but the software documentation is available via the FIRST website at the address below for reference.

MatchMaker scheduling software © 2007 Idle Loop Software Design, LLC. For more information visit <http://www.idleloop.com/matchmaker/>

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Rev: January 2018

www.firstinspires.org/robotics/frc

The "About" tab contains version information and software notices. 2024 versions of FMS will always have a Major Version of "11".

[Green] Build (revision) of the software currently installed

[Red] Build (revision) of the PLC software currently installed (not applicable in Off-Season builds)

[Blue] For traditional versions of FMS, check for available updated versions and initiate the install process

The EULA software license, which was agreed to upon installation of the software, is also available for review.

There is no built in update capability in the Off-Season version of the software. In the traditional version, once an update download has been initiated, download progress statistics will be displayed and the installation process will begin automatically.

10.1 FAQ

FAQ COMING SOON

FIELD SERVER WEB

11.1 Field Server Website

FIRST FMS Field Monitor Match Logs Manual Scoring Reports Pit Video Switch Downloads About

FMS Portal Home

Tournament Level Statuses	
Practice	InProgress
Qualification	InProgress
Playoff	NotStarted

The applications within this portal are aimed to assist you in managing a *FIRST* Robotics Competition event. Use the navigation bar on the top of the screen to switch between options.

Available Options:

- Field Monitor**
Keep up to date on the field status in real time.
- Match logs**
Analyze post match log data and graphs for completed matches.
- Pit Display**
Display the Team Rankings on a projector or monitor.
- Video Switch**
Remotely switch the different screens that are shown to the Audience.
- About**
Review version information and contact data.

Helpful Tips:

- Use full screen mode in the browser to maximize the viewing area, especially within the Field Monitor. For most browsers you may use **F11** to toggle in and out of full screen mode.
- Use your browsers zoom features to make the content fit on screen sizes that are non-standard.
- Use a hot key (ctrl + F4) to close the browser window.
- Open multiple browsers on the same machine or different machines to view more content at once.

FIRST ABOUT PRIVACY POLICY LEGAL NOTICES
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The website on the FMS Computer contains helpful resources for troubleshooting robot connectivity and reviewing event information.

[Green Marker] The navigation bar allows access to the server web resources

11.1.1 Field Server Web

- Field Monitor - Robot to field connectivity status, detailed *on this page*
- Match Logs - Match logs and scores, detailed *on this page*
- Manual Scoring - In some games, backup for the automated scoring hardware
- Reports - Similar functionality to the Reports tab in FMS, detailed *on this page*
- Pit - Qualification and Playoff ranking data, detailed *on this page*
- Video Switch - Change the graphic on the Audience Display(s), detailed *on this page*
- Downloads - Download commonly used tools and programs, detailed *on this page*
- About - Version and license information, shown below

About - Version 10.1.2.302 1003

The Field Management System, or "FMS", is a comprehensive event management system developed exclusively for the FIRST® Robotics Competition ("FRC").

The Field Management System portal, which you are viewing now, was designed using state of the art real time push technologies to achieve a rich interaction without refreshing the browser or waiting for data to be polled on a timer bases. The applications within this portal are aimed to assist you in managing an FRC tournament.

At official in-season FRC events, live support is provided remotely by FIRST HQ using tools installed on the event server. At off-season and unofficial events no live support is provided, but the software documentation is available via the FIRST website at the address below for reference.

Scoring System powered by [Rockwell Automation](#)

MatchMaker scheduling software © 2007 Idle Loop Software Design, LLC. For more information visit <http://www.idleloop.com/matchmaker/>

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Visit us on the web at www.FIRSTinspires.org/FRC

11.2 Field Reports

Reports		
Practice	Qualification	Playoffs
Schedule >	Schedule >	Schedule >
Bypasses >	Schedule By Team >	Bracket >
Cycle Times >	Announcers >	Announcers >
	Match Result >	Match Result >
	Rankings >	Rankings >
	Bypasses >	Bypasses >
	Cycle Times >	Cycle Times >
FTA	Head Referee	
WPA Key Status >	Tracking Sheet >	
WPA Test Pit Signs >	Qualification Cards >	
	Backup Robots >	
	Playoff Cards >	
	Playoff Coupons >	
Other	Season	
Competing Teams List >	Event List >	
District Rankings for Event >	Team List >	
Lineup Cards >		

Reports can be viewed from the field server similar to how they can be accessed via the *Reports tab* in FMS.

Click on a report to open it in the browser based viewer.

Report Viewer

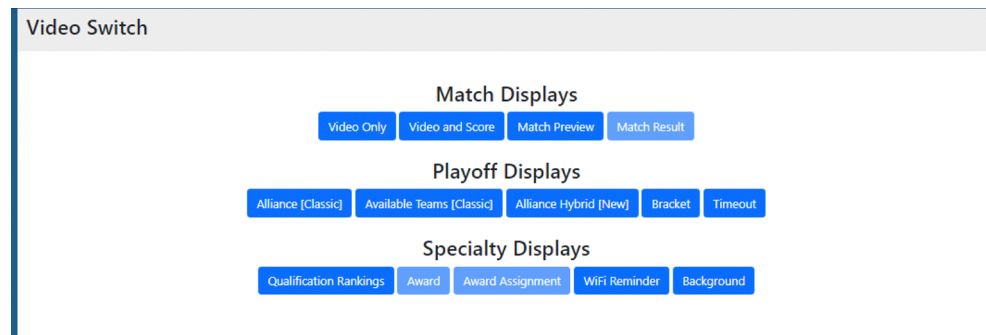
The screenshot shows a web browser window titled "Report Viewer". Inside the browser, there is a table titled "Season Events List". The table has five columns: Code, Event Name, Venue, Event Location, and Start Date. The table contains 12 rows of event data. The browser's address bar shows "1 / 7" and "100%".

Code	Event Name	Venue	Event Location	Start Date
DEMO	Manchester Regional		City, State/Prov Country	
ISDE1	ISR District Event #1	Metro West High School	Ra'anana, M Israel	
BCVI	Canadian Pacific Regional	Save-On-Foods Memorial Centre	Victoria, BC Canada	
MXMO	Regional Monterrey	ITESM Campus Monterrey - Arena Borregos	Monterrey, MEX Mexico	
MNDU2	Northern Lights Regional	DECC Arena/Edmund Fitzgerald Exhibit Hall	Duluth, MN USA	
ISDE2	ISR District Event #2	Metro West High School	Ra'anana, M Israel	
ARLU	Arkansas Regional	Harding University	Searcy, AR USA	
UTVW	Utah Regional	Maverik Center	West Valley City, UT USA	
MNDU	Lake Superior Regional	DECC Arena/South Pioneer Hall	Duluth, MN USA	
FLVP	South Florida Regional	Palm Beach Convention Center	West Palm Beach, FL USA	
IMFSC	FIM District Fscanaba Event	Fscanaba High School	Fscanaba, MI USA	

The browser viewer frame is nearly identical to the one inside FMS.

For additional operations, such as print or export, see the *Report Operations* page

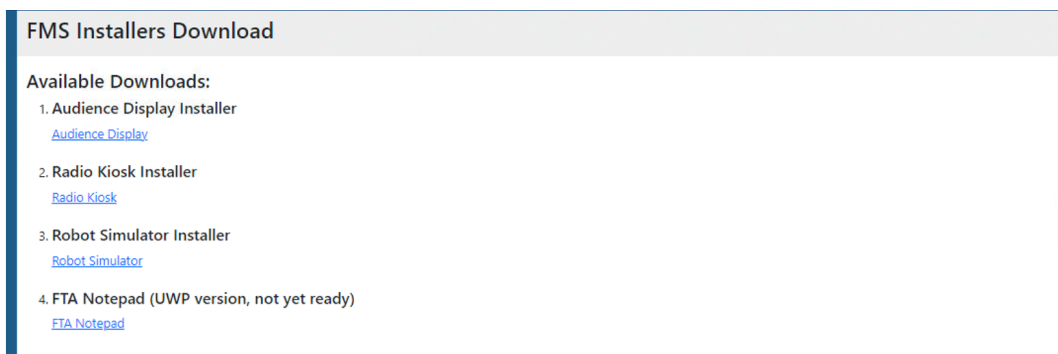
11.3 Video Switch



The output of the Audience Display(s) on the field network can be changed using the video switch buttons.

Messages cannot be displayed from the field server web, they must be displayed from within FMS.

11.4 Downloads



Several commonly downloaded programs are stored on the field server for quick access without requiring an internet connection (as not all events have internet access). It is recommended to download files to the server and place them on a USB Stick, or download the to a machine that is connected via Ethernet to the field network.

- Audience Display Download - exe installer to turn a target machine into a remote Audience Display
- Radio Kiosk Installer - exe installer to turn a target machine into a radio kiosk to program team radios for use on the playing field
- Robot Simulator Installer - exe installer to turn a target machine into a robot simulator to verify field access point operation
- FTA Notepad - mobile application for use of FTAs. Not yet available, and requires an FTA login username/password.

Warning: Do not install the Audience Display on the FMS Server's owned by FIRST HQ

ABOUT PIT DISPLAY

12.1 About Pit Display

Important: Please note that this section of the FMS documentation is *in progress* of being updated for 2023. Read at your own risk.

12.1.1 Introduction

Pit Display is a web based software program, built and distributed by *FIRST*®, that is used to relay rankings and tournament information from FMS to the spectators in the Pit at the venue. Pit Display can be run on a computer containing an internet browser (like Firefox or Chrome) and an ethernet port or wireless adapter. This manual will walk through the available data, configuration options, and best practices related to the Pit Display.

12.1.2 Wiring Pit Display

In order to connect to FMS, the Pit Display must have a wired or wireless connection to FMS. If wired, it needs to be on the same network as the FMS machine (10.0.100.X), and no additional LANs. For wireless access, if field wireless is available, connect to the appropriate wireless network and ensure the target machine receives an address of 10.0.100.X. Wireless networks for *FIRST* fields have different names from truck to truck, contact the FTA for additional information.

Whenever possible, the Pit Display should be on a wired Ethernet connection.

12.1.3 Opening Pit Display

To open the Pit Display, simply use a web browser (such as Chrome or Firefox) and open a new page/tab. Navigate to 10.0.100.5/Pit in your browser address bar, and the Pit display for the appropriate tournament level (Qual/Playoff) will open. If the display does not open, ensure your connection to FMS by using ping and (for Off-Season installations) making sure IIS is running on the FMS machine. (IIS will automatically be running on Official *FIRST* fields)

12.1.4 Event Setup Order

In order to properly synchronize with FMS, it is highly recommended that you do not run access the Pit Display program until after initial configuration of the event is complete through the Event Wizard and Practice matches are complete. Configuration information is downloaded by the program, and completing in this order should lead to the best experience.

12.1.5 Closing Pit Display

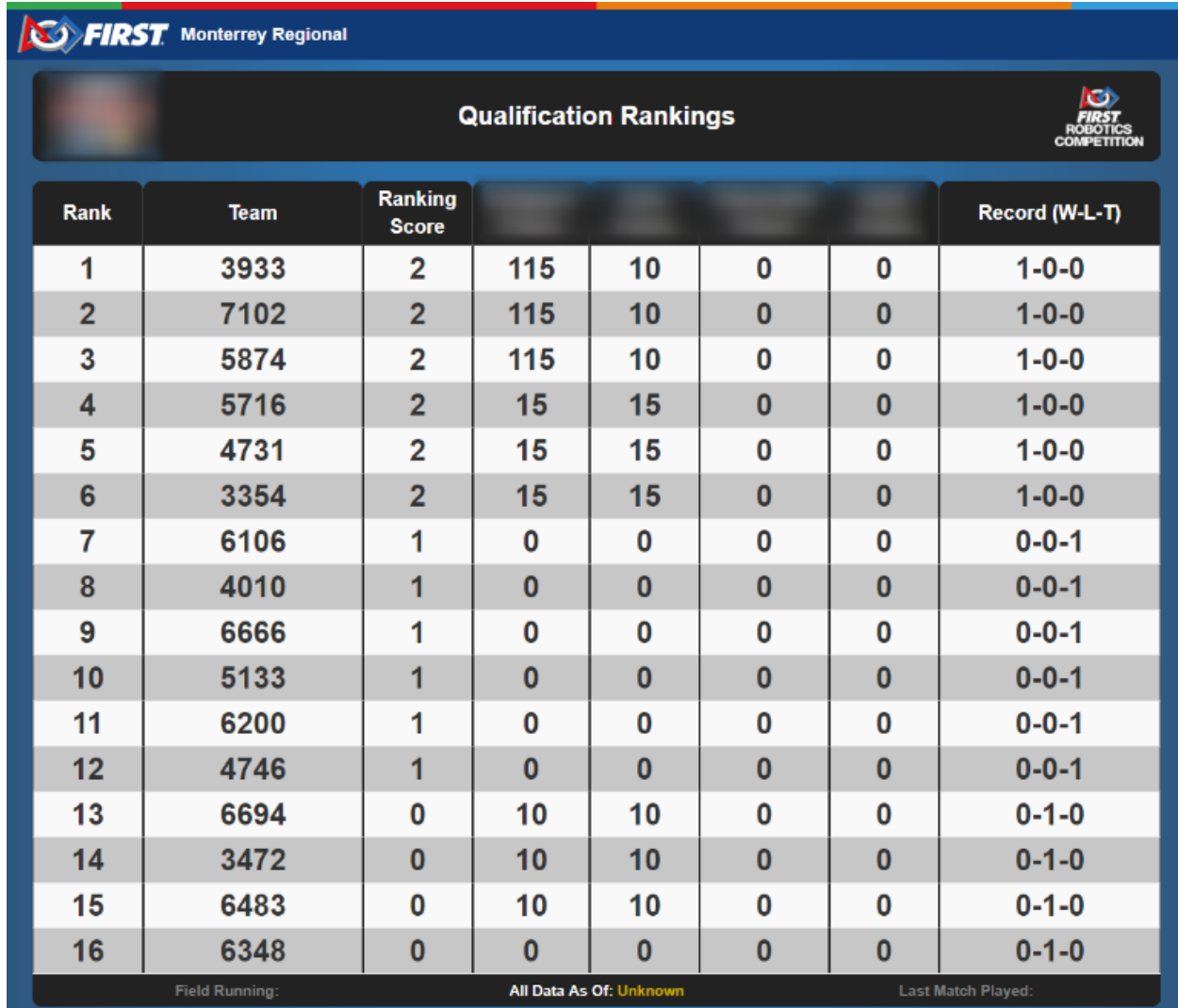
To close the software, simply close your web browser (or the Pit Display tab therein) or use the windows hotkey combination of ALT-F4.

13.1 Qualifications Pit Display

Important: Please note that this section of the FMS documentation is *in progress* of being updated for 2023. Read at your own risk.

Qualification Pit Display

13.1.1 Display



Rank	Team	Ranking Score					Record (W-L-T)
1	3933	2	115	10	0	0	1-0-0
2	7102	2	115	10	0	0	1-0-0
3	5874	2	115	10	0	0	1-0-0
4	5716	2	15	15	0	0	1-0-0
5	4731	2	15	15	0	0	1-0-0
6	3354	2	15	15	0	0	1-0-0
7	6106	1	0	0	0	0	0-0-1
8	4010	1	0	0	0	0	0-0-1
9	6666	1	0	0	0	0	0-0-1
10	5133	1	0	0	0	0	0-0-1
11	6200	1	0	0	0	0	0-0-1
12	4746	1	0	0	0	0	0-0-1
13	6694	0	10	10	0	0	0-1-0
14	3472	0	10	10	0	0	0-1-0
15	6483	0	10	10	0	0	0-1-0
16	6348	0	0	0	0	0	0-1-0

Field Running: All Data As Of: Unknown Last Match Played:

The standard Qualification Pit Display looks similar to the internet event results pages, but specially adapted for use on site at events in progress.

Across the bottom of the display are indicators of the last match played on the field, the time difference between that Published schedule and the actual times that match was played, and the last time the data was updated. Note: The “all data as of” marker is based on the Pit machine’s time, not the event server. Please make sure the Timezone is properly set on the Pit machine for timing to be accurate.

The remainder of the screen is dedicated to current rankings as of Last Match Played on the field, as indicated at the bottom of the screen.

Along with rank and team number detailed information related to that season’s game is displayed, based on the tie-breaking criteria shown in the game manual.

The Pit Display web page auto scrolls through the ranking list.

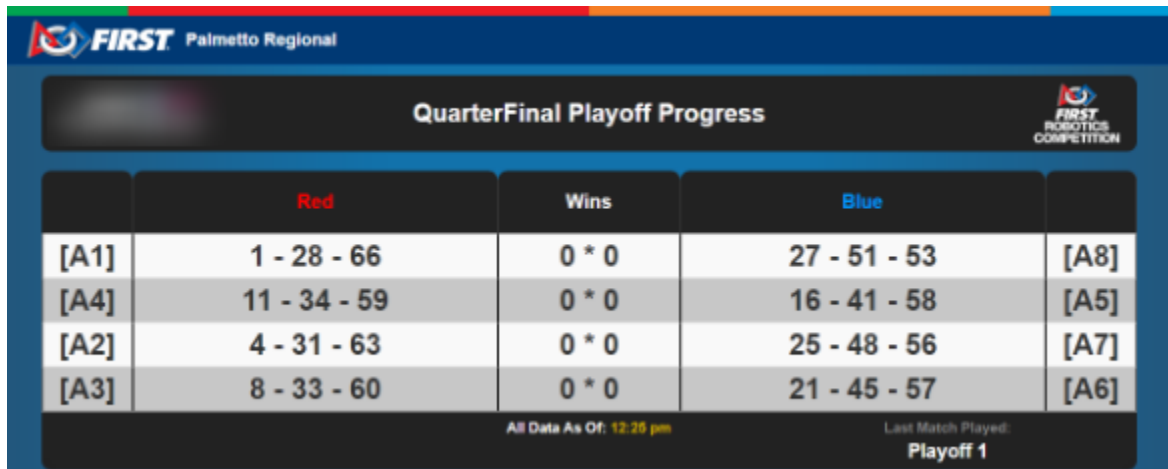
The Display will automatically advance to Playoffs once the schedule is activated.

13.2 Playoffs Pit Display

Important: Please note that this section of the FMS documentation is *in progress* of being updated for 2023. Read at your own risk.

Playoff Pit Display

13.2.1 Display



	Red	Wins	Blue	
[A1]	1 - 28 - 66	0 * 0	27 - 51 - 53	[A8]
[A4]	11 - 34 - 59	0 * 0	16 - 41 - 58	[A5]
[A2]	4 - 31 - 63	0 * 0	25 - 48 - 56	[A7]
[A3]	8 - 33 - 60	0 * 0	21 - 45 - 57	[A6]

All Data As Of: 12:26 pm

Last Match Played: Playoff 1

The Qualification and Playoff Pit Display look very similar, except that the detail of team-by-team ranking in Qualifications is replaced with a row-per-match type display.

Across the bottom of the display are indicators of the last match played on the field, and the last time the data was updated. Note: The “all data as of” marker is based on the Pit machine’s time, not the event server. Please make sure the Timezone is properly set on the Pit machine for timing to be accurate.

In each row, the [AX] number indicates the Alliance number, followed by the dash separated team numbers on the Alliance. The opposite exists on the blue alliance side of the display. In the middle is the number of wins each alliance has, red on the left and blue on the right.

The Display automatically advances between sublevels (QF, SF, F)

14.1 Live Monitor

The Field Monitor provides a live view of robot and field status. To view the Field Monitor, access the web interface at 10.0.100.5 and select Field Monitor from the navigation bar.

14.1.1 Basic Layout

M: 999		MATCH READY							
🔗 Logs		OS	SWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.066			13.39	A	4	13
2	2		0.069			13.35	A	2	9807
3	3		0.069			13.29	A	5	40442
1	4		0.047		B	0.00	A	0	0
2	5		0.048			13.43	A	136	10996
3	6		0.059			13.34	A	2	54315
M: 999		MATCH READY							

The Field Monitor program shows the same details as the Status tab available in Match Test and Match Play.

The match number and match status are displayed across the top and bottom of the Field Monitor screen. Occasionally, the top and bottom status bars will not display the same information, such as when the text is too large for one line (it will show part of the status on each line). In the middle are details about each team. From left to right, the details on the Field Monitor are:

- Player Station - The first number indicates the station, the second number is the team in that station. Example:
Team #6 is in station Red 3

- Example: Team #6 is in station Red 3

DS - DS is in FMS mode (i.e. connected to FMS) when a green circle is shown. A green circle with a black X indicates that the computer is plugged in but the DS software is not linked (full FMS only).

BWU - Indicates the Bandwidth Utilization/Consumption for that particular team

Radio - Indicates that the DS is able to reach the radio on the robot

Rio - Indicates that the DS is able to reach the roboRIO on the robot

Battery - Battery voltage reported by the Robot

Status - The state and mode of the robot. “A” indicates Autonomous, “T” indicates Teleoperated. A red square means the robot is disabled; a green circle is shown when enabled. A black diamond with an “E” is shown for an e-stopped robot

Avg Trip - The average time required to send a message to the robot and have the robot respond (this is basically like a ping.) Units are in milliseconds.

Packets - indicates the number of packets dropped in the DS-to-Robot link. Typically there are some lost packets. In a very tame wireless environment, this number will be less than 100. (Note: this number can “underflow” to ~65000 which does not indicate an issue)

Below are many potential Field Monitor states are shown (but not an exhaustive list)

14.1.2 Prior to Prestart

M: 999		READY TO PRE-START							
Logs		DS	BWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.000			0.00		0	0
2	2		0.000			0.00		0	0
3	3		0.000			0.00		0	0
1	4		0.000			0.00		0	0
2	5		0.000			0.00		0	0
3	6		0.000			0.00		0	0
M: 999		READY TO PRE-START							

Rows remain yellow until the DS and Robot have fully linked with FMS, at which point the row turns white. If the team is Bypassed, the row turns brown (see above).

14.1.3 Pre-Start Complete

M: 999		PRE-START COMPLETED							
Logs		DS	BWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.001			0.00		0	0
2	2		0.069			13.36		3	9807
3	3		0.069			13.29		5	40442
1	4		0.000			0.00		0	0
2	5		0.000			0.00		0	0
3	6		0.059			13.34		2	54312
M: 999		PRE-START COMPLETED							

Team 1 has something plugged in, but not a DS (or DS software is not yet open).

Team 5 is actually plugged into Team 4's Driver Station, and so a yellow "M" is shown on Team 4 which signifies that whoever there must "MOVE" (because it's not Team 4). The team's DS will indicate that they are plugged into the incorrect spot and should move to the correct Driver Station.

M: 999		PRE-START COMPLETED							
Logs		DS	BWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.001			0.00	A	0	0
2	2		0.069			13.36	A	3	9807
3	3		0.069			13.29	A	5	40442
1	4		0.000			0.00	A	0	0
2	5		0.000			0.00		0	0
3	6		0.059			13.34	A	2	54312
M: 999		PRE-START COMPLETED							

In this example, the team in Station 4 has a team number that is not one expected in the match. Teams expected are 1,2,3,4,5,6, and the team number plugged into Station 4 is Team 8. So this team gets a yellow “W” circle, that means, “Wrong Match.” This can also happen when a team for the next match plugs in to a Player Station prior to a prestart.

14.1.4 Match Ready

M: 999		MATCH READY							
Logs		DS	BWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.066			13.39	A	4	13
2	2		0.069			13.35	A	2	9807
3	3		0.069			13.29	A	5	40442
1	4		0.047		B	0.00	A	0	0
2	5		0.048			13.43	A	136	10996
3	6		0.059			13.34	A	2	54315
M: 999		MATCH READY							

Team 4 is Bypassed in this example.

14.1.5 Match Running




















M: 999		MATCH RUNNING (AUTO)							
Logs		DS	BWJ	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.068			13.38	A	4	0
2	2		0.068			13.34	A	8	65472
3	3		0.070			13.32	A	5	0
1	4		0.059			13.37	A	2	65535
2	5		0.044			13.45	A	82	65533
3	6		0.059			13.35	A	2	0
M: 999		MATCH RUNNING (AUTO)							

14.1.6 Match Running (Estop and Disconnect)

M: 999		MATCH RUNNING (TELEOP)							
Logs		DS	BWJ	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.066			13.39	T	5	0
2	2		0.064			13.35	T	2	65473
3	3		0.070			13.29	T	29	65534
1	4		0.059			13.35	E	2	65535
2	5		0.049			13.42	T	143	65532
3	6		0.058			13.34	T	2	0
M: 999		MATCH RUNNING (TELEOP)							

In this example, team 4 has pressed their Estop, and team 1 has dropped robot communication (and Radio communication).

14.1.7 Match Cancelled

M: 999		MATCH ABORTED							
Logs		DS	DWU	Radio	Rio	Battery	Status	Tip Time (ms)	Missed Packets
1	1		0.066			13.39		4	0
2	2		0.066			13.36		2	0
3	3		0.068			13.29		6	65535
1	4		0.059			13.37		2	0
2	5		0.051			13.45		38	2
3	6		0.059			13.34		2	0
M: 999		MATCH ABORTED							

Shown after a cancel match button is pressed, or the Arena Estop. It will return to “Ready for Prestart” promptly.

14.1.8 Match Over

M: 999		MATCH OVER							
Logs		DS	SWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		0.001			0.00		0	0
2	2		0.002			0.00		0	0
3	3		0.002			0.00		0	0
1	4		0.002			0.00		0	0
2	5		0.002			0.00		0	0
3	6		0.002			0.00		0	0
M: 999		WAITING FOR SCORES							



















All teams are dropped when the match finishes (in many cases, their DS would remain connected, hence the Green X marks)

FIELD CONNECTIVITY

15.1 Connectivity Guide

15.1.1 Introduction

When using the Field Monitor to diagnose connectivity issues, always work from left to right. All connection statuses are reported to the FMS by the Driver Station (DS). This means that regardless of true connection status, a Radio won't "go green" until the DS is fully connected. Additionally, a roboRIO won't "go green" unless the Radio is connected.

M: 1		MATCH NOT READY							
		DS	BWU	Radio	Rio	Battery	Status	Trip Time (ms)	Missed Packets
1	1		1.525			12.57	A	21	27
2	2		2.556			12.88	A	19	0
3	3		0.235			0.00	A	12	8043
1	4		0.000			0.00	A	0	0
2	5		0.000			0.00	A	0	0
3	6		0.000			0.00	A	0	0
M: 1		MATCH NOT READY							

In this example, all six teams have a varying connectivity state.

- Team 1: Fully connected and match-ready.
- Team 2: All green indicators, but yellow bar is still present. This state is generally the result of a robot code issue, and will prevent the field from “going green” until resolved.
- Team 3: No roboRIO connection.
- Team 4: No Radio connection. A green Radio connection is required in order to have a green roboRIO connection.
- Team 5: An ethernet cable is plugged in, but the DS isn’t properly communicating with the FMS.
- Team 6: Wrong station. Yellow “M” signifies that the team must “Move” to the correct station (in most cases, stations 1 and 3 are flipped). Yellow “W” signifies that the team has come up for the “Wrong Match” or has plugged in before the scoring table finalized the previous match, in which case their DS is “Waiting”.

Note: Reminder: When troubleshooting connectivity, always start with the DS and work your way from left to right on the Field Monitor.

15.1.2 Driver Station Troubleshooting

DS Ethernet

If the Field Monitor shows a DS ethernet connection, move on to **DS Software**.

1. Verify DS ethernet cable is securely plugged into the DS computer, making sure to check for worn out ethernet ports.
2. Verify the DS computer is turned on and logged in.
3. Verify the DS computer’s ethernet adapter is enabled and functioning. (Quickly access network adapters by typing “ncpa.cpl” into the start menu and pressing the return key).
4. If the adapter is found in step 3:
 - Disable/Re-enable the adapter.
 - Restart the DS Computer.
 - Verify the cable by connecting to a different device.
 - Use a USB to ethernet adapter.
 - Offer a loaner DS.
5. If no adapter is found in step 3:
 - Restart the DS computer.
 - Use a USB to ethernet adapter.
 - Offer a loaner DS.

DS Software

If the Field Monitor shows a fully green DS connection, move on to **Robot Troubleshooting**.

1. Confirm the DS software is running on the DS computer.
2. Confirm the team is in the correct station, and in practice matches, verify the correct number was entered prior to Prestart.
3. Disable all additional network adapters. (Quickly access network adapters by typing “ncpa.cpl” into the start menu and pressing the return key)
4. Verify the DS computer’s ethernet adapter is enabled and functioning.
5. If the adapter is found in step 4:
 - Verify the adapter is set to ‘Obtain an IP address automatically’ (DHCP).
 - Disable/Re-enable the adapter.
 - Restart the DS Computer.
 - Verify the cable by connecting to a different device.
 - Use a USB to ethernet adapter.
 - Offer a loaner DS.
6. If no adapter is found in step 4:
 - Restart the DS computer.
 - Use a USB to ethernet adapter.
 - Offer a loaner DS.
7. Restart the DS Software
8. Disable all three Windows Defender Firewall profiles (Domain, Public, Private) as well as any third-party firewall applications if present.
 - If the firewall cannot be disabled (often due to lack of admin access) consider using the loaner DS.
 - If the firewall can’t be disabled but allows for specified ports to be opened, create port exceptions for:

Ports	Service
UDP/TCP 1180-1190	Camera Data
TCP 1735	SmartDashboard
UDP 1130	DS-to-Robot Control Data
UDP 1140	Robot-to-DS Status Data
HTTP 80	Camera/Web Interface
HTTP 443	Camera/Web Interface Secure
UDP/TCP 554	RTSP for h.264 Camera Streaming
UDP/TCP 5800-5810	Limelight Camera or Team Use

9. Release/Renew the IP address.
10. If the DS still has not connected, look for other possible solutions. For example, check ethernet cable, check for odd DS configurations such as MacOS running a Windows virtual machine. flaky computer, weak battery, very high CPU usage, etc.
11. If the team still has not connected:

- Get an FTA involved.
- Offer a loaner DS.
- Follow up by working with the team to troubleshoot when time allows.

15.1.3 Robot Troubleshooting

Note: When troubleshooting a robot, a team-member should perform any actions which require contacting the robot. You should only contact a robot if the team directly asks for your assistance.

Robot Radio

If the Field Monitor shows a green Radio connection, move on to **roboRIO**.

1. Verify the robot is powered on. Locate the radio and check that it is receiving power. (~60 second boot time)
2. Verify the radio is in bridge mode and programmed for the event.
 - Green LED indicates the radio is in Bridge Mode and Linked. If the Field Monitor still does not show a Radio connected, verify firewalls are disabled on the DS.
 - Amber/Red LEDs indicate the radio is in AP Mode and has yet to be programmed. At the discretion of the FTA, the radio may be (re)programmed on the field.
3. If a radio is powered on and booted in bridge mode but does not link to the field:
 - Verify the radio has been programmed for the current event in progress. (Radios must be reprogrammed for each new event)
 - Check with the team to ensure they have no backup radios powered on in the venue.

roboRIO

1. Verify the roboRIO is receiving power.
2. Check for activity on the amber ethernet traffic light on the roboRIO. If there is no activity on the link light (not flashing, or flashing very slow):
 - Confirm the ethernet cable is fully seated on both ends.
 - Confirm the green ethernet link light on the roboRIO is illuminated. If it is not, the cable should be replaced.
 - Have the team move the cable to a different port on the radio, or directly into the radio if the roboRIO was connected through a switch.
 - Reset the roboRIO. (Circular blue button on the front panel)
 - Power Cycle the robot.
3. For roboRIO 2.0 models, verify the microSD card is present and fully seated.
4. Confirm that the yellow roboRIO status light is not on or blinking. If it is, the roboRIO must be re-imaged.
5. Verify all firewalls are disabled on the DS.
6. Reset the roboRIO. (Circular blue button on the front panel)
7. Power Cycle the robot.
8. Confirm the roboRIO is running the correct image.
9. If the Field Monitor shows a green connection with the roboRIO but the team's row has a yellow background:

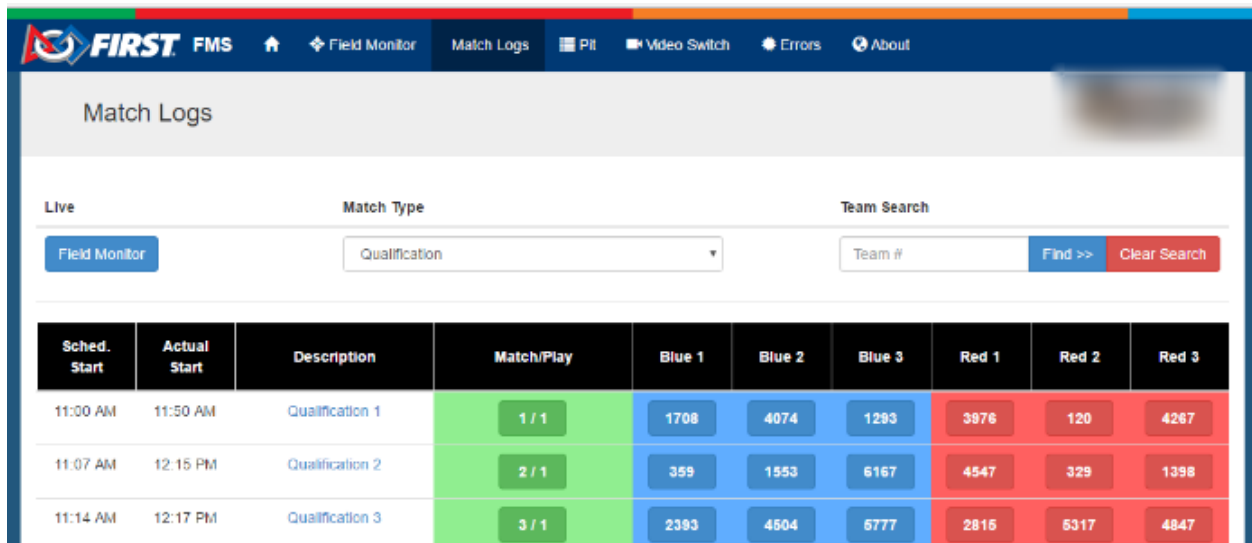
- Ask the team if code was changed between matches. (If yes, the team likely did not build/deploy correctly)
- For roboRIO 2.0 models, verify the microSD card is present and fully seated.
- Check the DS diagnostics tab for messages from the robot.
- Reset the roboRIO. (Circular blue button on the front panel)
- Power Cycle the robot.

LOGS AND SCORES

16.1 Match Logs and Scores

Important: Please note that this section of the FMS documentation is *in progress* of being updated for 2023. Read at your own risk.

16.1.1 Access

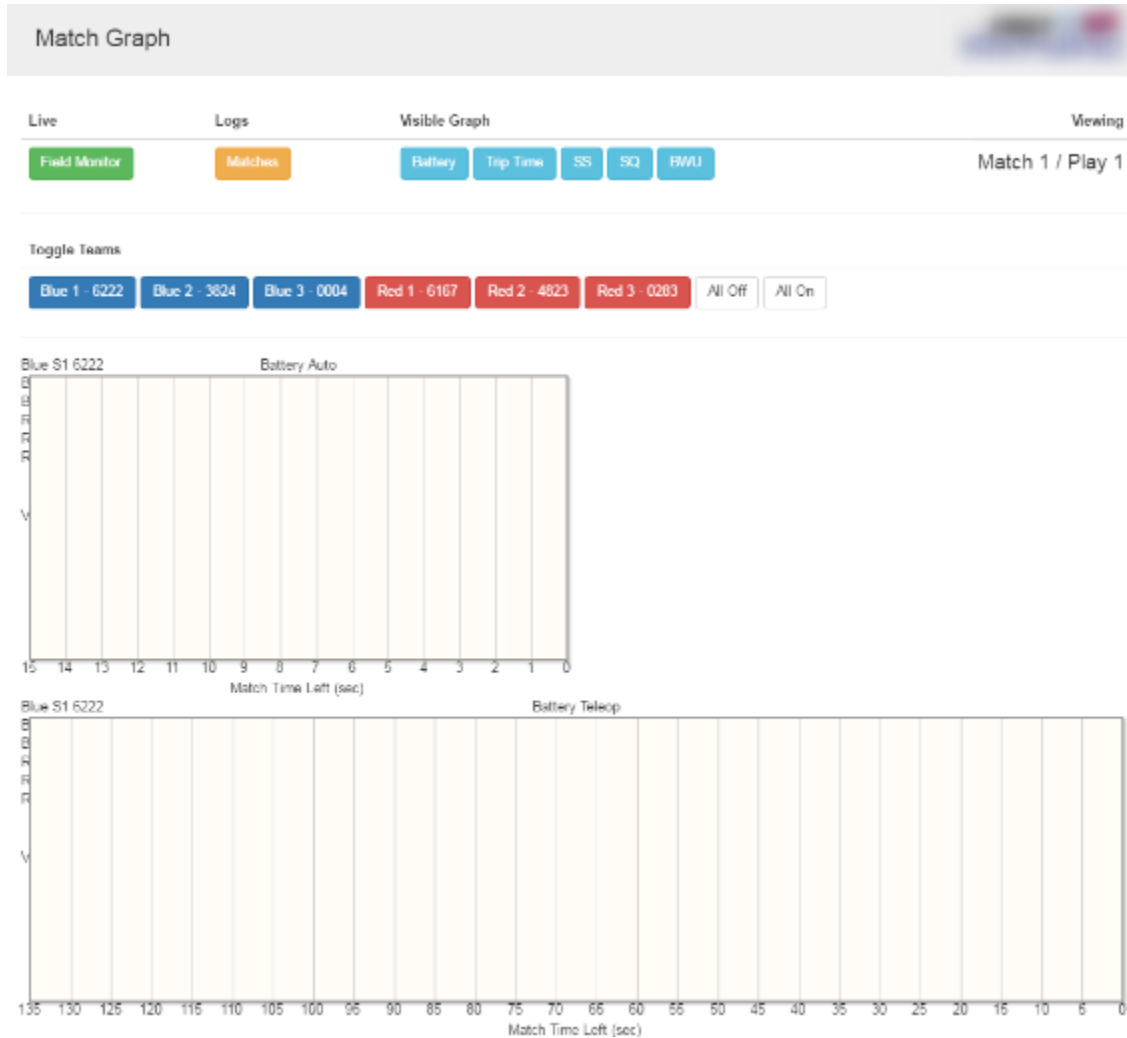


Sched. Start	Actual Start	Description	Match/Play	Blue 1	Blue 2	Blue 3	Red 1	Red 2	Red 3
11:00 AM	11:50 AM	Qualification 1	1 / 1	1708	4074	1293	3976	120	4267
11:07 AM	12:15 PM	Qualification 2	2 / 1	359	1553	6167	4547	329	1398
11:14 AM	12:17 PM	Qualification 3	3 / 1	2393	4504	6777	2815	5317	4847

Selecting the Logs button in the upper left hand corner of the Field Monitor changes the display to show a list of all completed matches. Users can select the Match Type using the dropdown box in the top center and then scroll to the desired match or search by team using the box in the top right. Clicking the green “Match/Play” button for a match will pull up the match graphs. Clicking an individual team button will pull up the station log for that match. Click the Field Monitor button to go back to the standard Field Monitor display.

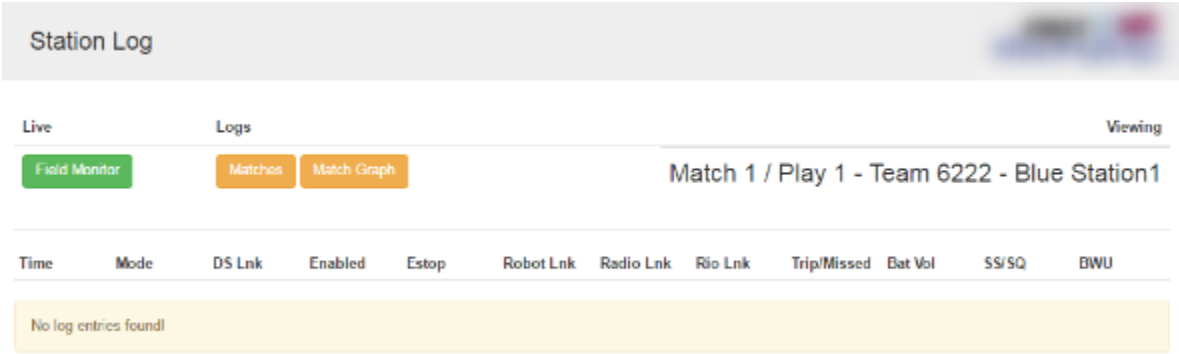
Clicking on the Match Description will bring up the scoring details, as described later.

16.1.2 Match Graph




Clicking a match number from the logs page will bring up the Match log page. The Match log page shows Battery Voltage and Trip Time for each team in a match on a graph. On a full FMS setup it will also display Signal Strength (SS), Signal Quality (SQ), and Bandwidth Utilization (BWU). Click the blue buttons in the top center to select the desired data, and then use the buttons in the second row to select the teams to display data for (each row can be toggled). The top chart shows data for the Auto period while the bottom chart shows Teleop. To return to the previous screen, click the yellow Matches button. To go back to the Field Monitor, press the Field Monitor button.

16.1.3 Station Log



Clicking a team number from the logs page will bring up the Station Log page. This page will show a table containing timestamped entries of the data shown on the Field Monitor during the match (+SS/SQ for a full field). This detail page is accessed by clicking the Team number (blue or red buttons) on the “Matches” page.

16.1.4 Score Detail

501 • 1153 • 190	Teams	3467 • 6153 • 3236
HabLevel2 • HabLevel1 • None	Pre-Match Robot Levels	HabLevel1 • HabLevel1 • HabLevel1
Yes • Yes • No	HAB Line in Sandstorm	No • Yes • Yes
9	Sandstorm Bonus Points	6
9	SANDSTORM	6
N • B • P B P N • N • B	Cargoships	P • B • P N N B • N • B
4	Hatch Panel Points	12
N • N N • N N • N	Scoring Table Side Rocket	P • N P • N P • P
N • N N • N N • N	Far Side Rocket	N • N N • P N • N
9	Cargo Points	9
In Sandstorm • In Sandstorm • No	HAB Line	In Teleop • In Sandstorm • In Sandstorm
HabLevel1 • HabLevel1 • None	HAB Endgame Climb	None • HabLevel1 • HabLevel1
6	HAB Climb Points	6
19	TELEOP	27
0 • 0	Fouls/Techs Committed	0 • 0
+0	Foul Points	+0
28	FINAL SCORE	33
0	Ranking Points	2
	Achievement Badges	
Return to Qualification Matches		

Scoring details can be viewed from the match logs interface, freeing the scorekeeper to continue running matches instead of entering Match Review. No edits can be made through the web. All information on the score detail page is considered “for reference only” and the only official source of information remains the scorekeeper.

The Score Detail shown here is in a slightly different format than the data shown on the frc-events website (to the public). This is also where FMS shows the string it transmitted to the Robots (in the blue box at the top of the page).

ABOUT AUDIENCE DISPLAY

17.1 About Audience Display

17.1.1 Introduction

Audience Display is a software program, built and distributed by *FIRST*® that is used to relay game and status information from FMS to the Audience at the venue and on the web (via the webcast, if applicable). The Audience Display can only be run as a standalone application on a separate machine connected to the field network via Ethernet, it cannot run on FIRST Servers. This manual will walk through the available displays, configuration options, and best practices related to the Audience Display.

Important: Please do not install the Audience Display on official *FIRST*® servers (“case 33”) - use the laptop marked for Audience Display use instead

17.1.2 Wiring Audience Display

In order to connect to FMS, the Audience Display must have a wired connection to FMS. The Audience Display needs to be on the same network as the FMS machine, and no additional LANs.

17.1.3 Opening Audience Display



To open the Audience Display, after installation, simply double-click on the television icon containing the *FIRST* logo. A splash screen will be displayed while background processes complete, and the display will go to either the Background, or, if instructions are actively being sent (such as during a match) will jump to the appropriate position for that point in time.

17.1.4 Audio Output

The game sounds commonly associated with FRC® events, such as the start of match ‘charge’ sound and the end of match buzzer, are processed by the Audience Display. On *FIRST* official fields, output is made available for the venue from either a standard 1/8” female connection (“headphone jack”) on a laptop that runs the Audience Display, or the HDMI connection (if using HDMI for video as well). Either audio configuration can be configured using Windows Audio configuration.

Note: In order to hear game sounds, the Audience Display program must be running

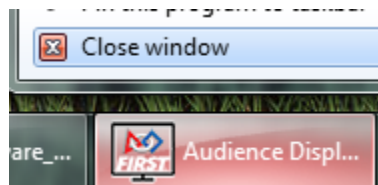
17.1.5 Event Setup Order

It is highly recommended that you do not run the Audience Display program until after initial configuration of the event is complete through the Event Wizard. Opening the programs out of order may result in freezing while event data is attempting to process.

17.1.6 Jump Menu

The Audience Display has a Jump Menu, accessible by right-clicking the Audience Display icon in the Taskbar. The Jump menu provides additional functionality not accessible anywhere else in the Audience Display. You can enable expanded options by clicking CTRL+SHIFT+D while the Audience Display is the active window. The Jump Menu may not be enabled if you are using Windows 10 Home Edition. Ask HQ Support for help if you need additional help using the Jump Menu.

17.1.7 Closing Audience Display



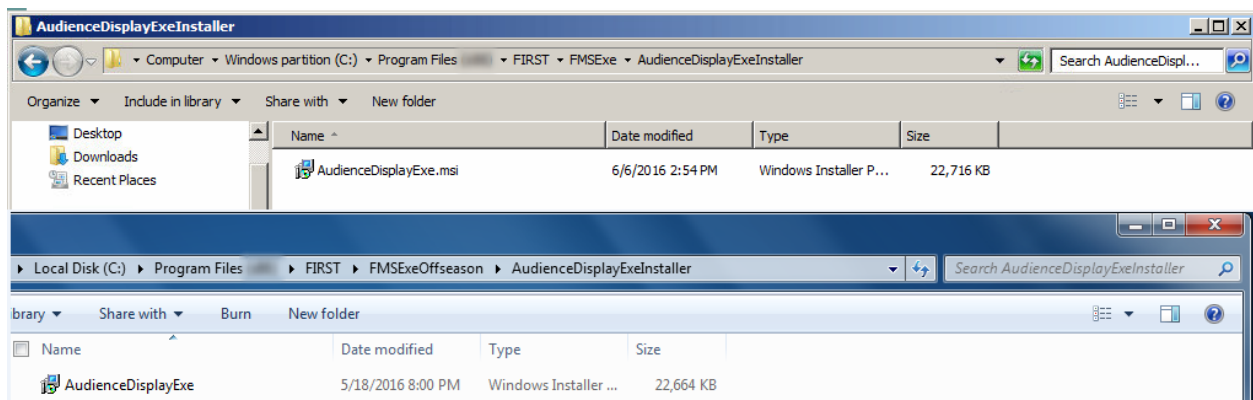
To close the software, either right-click on the taskbar icon and select ‘Close window’ or use the Windows hotkey combination of ALT-F4 (making sure the active window is the Audience Display)

CONFIGURATION

18.1 Installation

Important: Please do not install the Audience Display on official *FIRST*® servers (“case 33”) - use the laptop marked for Audience Display use instead

18.1.1 Installation Overview



The Audience Display is not supported on any platform other than Windows 10 or higher (64 Bit). The target machine must also have an Ethernet port and audio output device (headphone jack, HDMI port, etc).

The Audience Display installer can be found on the field server website downloads page, [as outlined here](#). Download the exe file, move it to the target machine (using a USB drive, for example) and run the installer in the same way that any other program would be installed on Windows.

18.1.2 Version Matching

The Audience Display will regularly verify itself against FMS to ensure the version numbers are the same. If they do not match, you'll see an "FMS Mismatch" watermark shown on top of all screens until the version is upgraded/downgraded to match the FMS version.

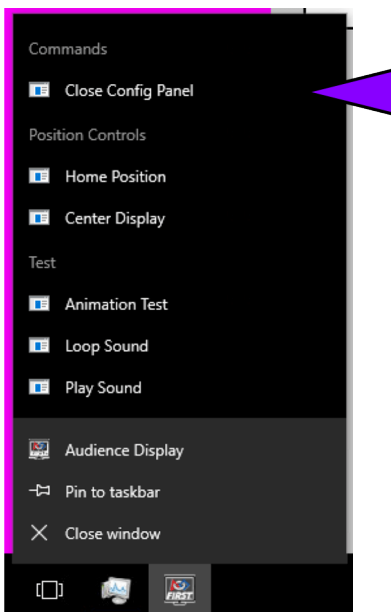
18.1.3 Communicating with FMS

The Audience Screen must be connected to the machine hosting the FMS software via Ethernet (such as through a switch or router). In addition, the Audience Display expects to find FMS at the IP of *10.0.100.5*. To verify connectivity from the Audience Display machine to the required IP address, consider using Windows Command Prompt to "ping" the address first.

It is recommended that there be no more than two (2) instances of the Audience Screen running on the FMS network at any given time. The software is not tested beyond this capacity.

18.2 Settings

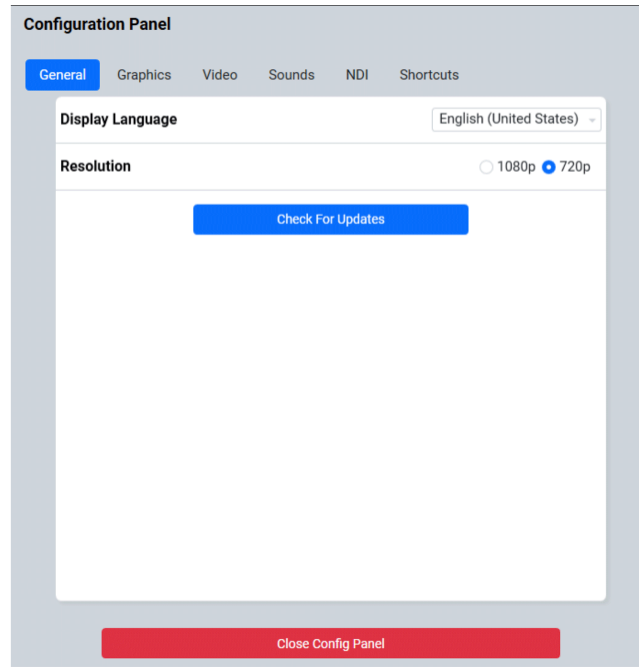
Customize the look and feel of the Audience Display via the configuration panel. Settings are specific to each instance.



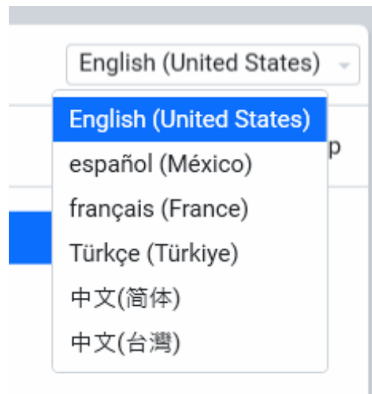
[Purple Marker] Access the settings by right clicking on the Audience Display tray icon and selecting "Open/Close Config Panel" or use the keyboard shortcut CTRL-SHIFT-C

18.2.1 General Settings

To close the settings panel at any time, click the “Close Config Panel” button on the bottom middle of the settings display.

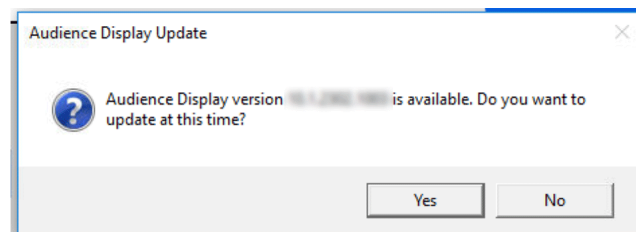


[*Display Language*] Audience Display is available in multiple languages- select a language from the dropdown



[*Resolution*] The Audience Display is available in 1280x720 (“720”) or 1920x1080 (“1080”) resolutions

[*Check for Updates*] Query FMS to see if an updated version is available. If so, a prompt will be presented.



After the update downloads and installs (which is automatic) the Audience Display will need to be re-launched.

18.2.2 Graphics Settings

Configuration Panel

General **Graphics** Video Sounds NDI Shortcuts

Display Types

Preset Types [Default] Main Display ▾

Real-Time Score Type: * [Default] Full Width ▾

FIRST Championship Center Screen: * ☐

Award Display Type: * [Default] Fullscreen ▾

Display Chroma

Graphics Background Style: Chroma Background ▾

Background Chroma Color: Fuchsia ▾

Alliance Hybrid View Chroma Display Mode: [Default] Show Chroma ▾

Real-Time Display Orientation

Real-Time Score Horizontal: [Default] Red on Left ▾

Real-Time Score Vertical: [Default] Bottom of Screen ▾

Close Config Panel

Display Types:

Note: Careful consideration should be used before changing these options as they can cause confusion for audience members who expect a traditional layout from year to year. For official FRC ® Events, if in doubt, contact your Engineering support contact.

[Preset Types]

- Main Display - Default singleton operation
- Web Display - Load the default settings for Audience Display instances being used on FIRST Webcast Units
- Champ Center Display - For use by FIRST HQ at Championship
- Custom Settings - Individually specified user settings

[Real-Time Score Types]

- Full Width - The traditional score bar that takes up the full bottom third or so of the Audience Display
- Center Third - Webcast versions as arranged with FIRST® HQ and provides an alternate view of the data in a more compact, centered display

[FIRST Championship Center Screen] Configuration options specific to the FIRST Championship. Please do not adjust these settings at any events except under the direction of FRC Support.

[Award Display Type]

- Full Screen - Show award names and award winners full screen without space for chroma (camera shots)
- Web Display - Show award names and award winners in a simplified web friendly display on top of the camera view

- Chroma - Show award names and award winners on top of chroma (camera shots) in a larger, venue friendly format

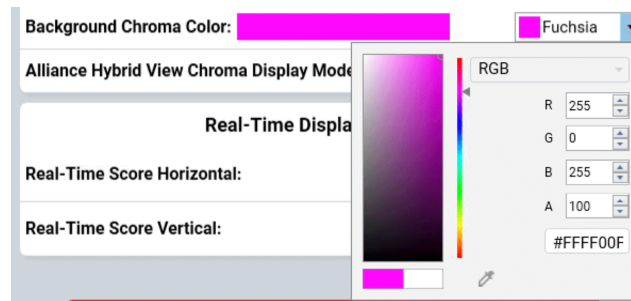
Display Chroma:

[*Graphics Background Style*]

- Chroma - Show the selected color in the area to be keyed (or cut) out and replaced with live event video from a camera or production feed. The actually “keying” process and mixing of video would need to be done through external software, not through FMS/Audience Display.
- Ranking Display - Removes the background screen color (Chroma) and shows a ranking screen in its place. The list automatically scrolls through all the ranked teams at the event, in rank order. Teams must have played one or more qualification matches to be included in the listings.

Note: Updates to the qualification rankings via out-of-band processes (such as Match Review) will not update the rankings if the rankings are on screen during the update process; to update rankings, the Video Switch must be used to select another view (such as “Background”) and then reload the desired view (“Video Only” or “Video and Score”). During Playoff matches, the rankings are replaced with the playoff bracket to show progression through the tournament.

[*Background Chroma Color*] Select the color to be used for the Chroma Key (if in Chroma mode). In most cases, the default “Fuchsia” should work great. The desired color will be dictated by the event’s production group. RGBA and Hex values are both accepted.



Warning: Avoid using common colors like “red” or “blue” as Chroma Key colors, as they will also cause portions of the other graphics (like the FIRST logo) to be keyed out.

[*Alliance Hybrid View Chroma Display*]

Real-Time Display:

Note: Careful consideration should be used before changing these options as they can cause confusion for audience members who expect a traditional layout from year to year. For official FRC ® Events, if in doubt, contact your Engineering support contact.

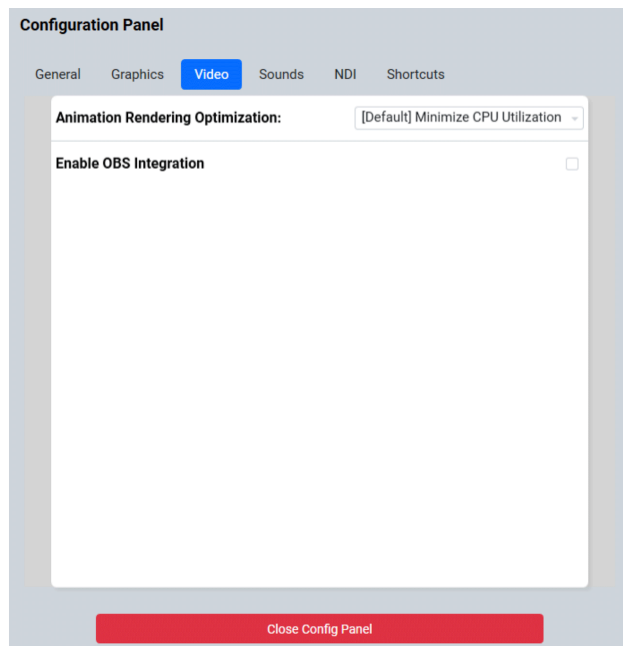


[*Real-Time Score Horizontal*] Traditionally, the red alliance is setup to the right side when sitting at the scoring table. As such, a projection screen mounted above the scoring table (viewed by the audience sitting across from it) would see the red alliance on the left side when viewing the field. However, some situations (such as webcasting) display the

view of the field from the same side as the scoring table. In these situations the horizontal orientation could be flipped so that the display will properly align overlaid elements with those seen on the live video feed.

[*Real-Time Score Vertical*] Move the real time score display to the bottom of the screen or to the top of the screen based on venue needs.

18.2.3 Video Settings

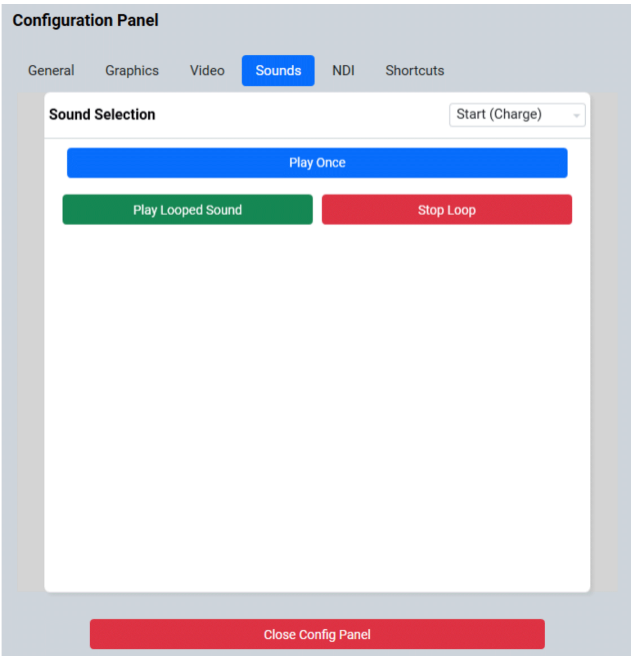


[*Animation Rendering*] The default of “Minimize CPU” should be sufficient for most users. The alternative of “Window Capture” may be needed for some broadcasting scenarios such as when using OBS or vMix. The “Allow Window Capture” option uses a lot of CPU resources and may result in choppy video when not using matching broadcast software.

Warning: If using the Minimal CPU option and using vMix or OBS to capture the Audience Display window, the animations will not capture in vMix or OBS.

[*Enable OBS Integration*] Instruct the Audience Display to issue commands that can be detected by OBS (a broadcast software). For more information see [this article](#)

18.2.4 Sound Settings

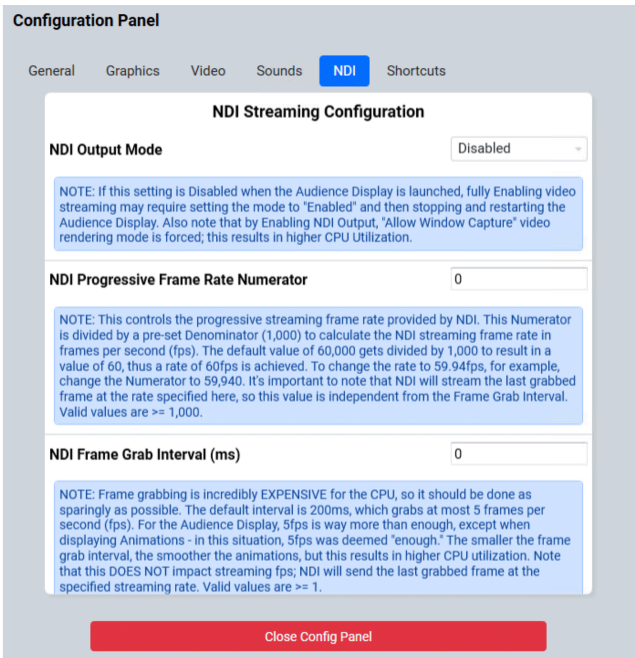


Select a sound from the “Sound Selection” dropdown.

[*Play Once*] Single play of the selected sound

[*Play/Stop Looped*] Start or stop playing the sound until the opposite button is clicked. Particularly helpful

18.2.5 NDI ® Settings



NDI Settings are for advanced users and are described in more detail within the software itself (in the corresponding blue boxes).

18.2.6 Shortcuts

Configuration Panel	
General Graphics Video Sounds NDI Shortcuts	
Open App Config Panel	CTRL+SHIFT+C
Close App Config Panel	CTRL+SHIFT+S
Move App to Output Display 1 and Center	CTRL+SHIFT+1
Move App to Output Display 2 and Center	CTRL+SHIFT+2
Move App to Output Display 3 and Center	CTRL+SHIFT+3
Nudge App 15 pixels	SHIFT+ARROWKEY
Nudge App 5 pixels	CTRL+ARROWKEY
Nudge App 1 pixel	CTRL+SHIFT+ARROWKEY
Reposition App (Mouse Drag)	CTRL+SHIFT+CLICK-DRAG
Force App to Show Background Screen	CTRL+SHIFT+F1
Force App to Show Real-Time Screen	CTRL+SHIFT+F2
Force App to Show Chroma Screen	CTRL+SHIFT+F3
Force App to Show Ranking Screen	CTRL+SHIFT+F4
Force App to Show Current FMS Screen	CTRL+SHIFT+F5
Close Config Panel	

Quick reference of the available shortcuts and actions in the Audience Display.

18.2.7 Resolution and Positioning

[Positioning] To quickly position the Audience Display on the monitor, click the “Center on Screen” button from the right-click menu of the taskbar. the placement on the screen. Alternatively, hold CTRL-SHIFT and CLICK-DRAG the mouse on the window to drag the window around.

To precisely position the Audience Display on the monitor, use CTRL-ARROW, SHIFT-ARROW, or CTRL-SHIFT-ARROW to move the display in the direction of the arrow. Each subsequent modifier (CTRL, SHIFT, CTRL-SHIFT) adjusts the display in the direction of the arrow key pressed a different incremental amount.

To precisely throw the audience display to another screen (centered) in one keystroke, use the CTRL-SHIFT-1, CTRL-SHIFT-2, and CTRL-SHIFT-3 keyboard shortcuts. These shortcuts will throw the Audience Display to Display 1, Display 2, and Display 3 as defined by Windows, respectively, and centered within the display.

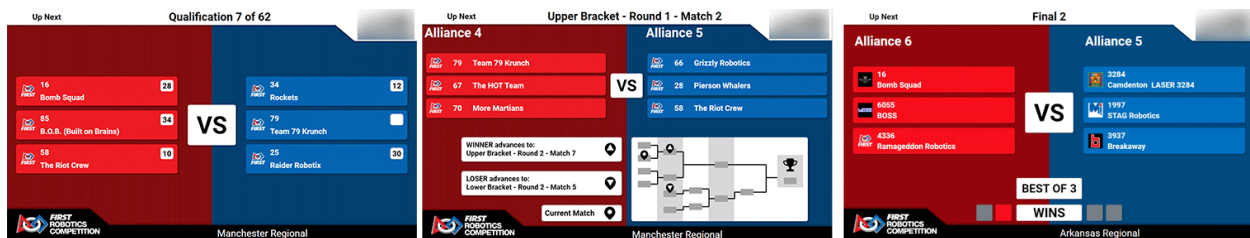
19.1 Match Flow

The typical display flow within a match, from pre-match to post-match.

19.1.1 Video Only

For details see *the specialty tab*

19.1.2 Match Preview



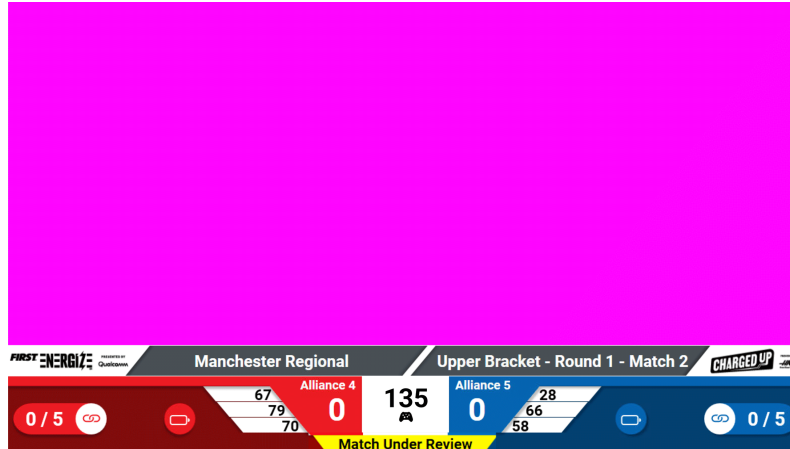
The Match Preview screen displays team names and rankings for the teams scheduled to compete in the next match. The Match Preview is a mandatory screen in the FCUI process and can even be selected again once the “Set Audience Screen” button has been pressed until the Match is started.

[Left] Qualification Matches - Team rankings are displayed next to their team name and avatar

[Middle] Playoff Matches Rounds 1-4 - Alliance affiliation information is added to the display, alongside bracket progression tracking

[Right] Playoff Matches Round 5 (Finals) - The bracket progression tracking is replaced with “best of 3” progression

19.1.3 Video and Score

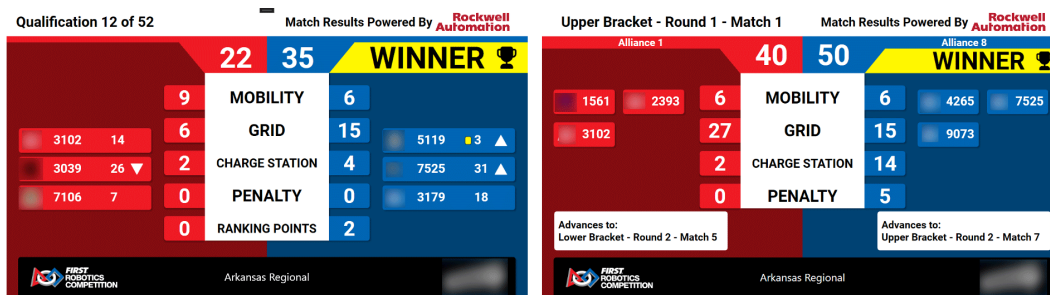


Video and Score is the display most typically used at an FRC® competition. Event Name, match time, score, game-specific details are overlaid on the “bottom third” of the screen. The *Match Under Review* icon is used to show that the Head Referee has marked the match for further review after completion- and indicated by a yellow message below the scores. If the event name is too long for the space provided, it will horizontally scroll continuously.

In Playoff matches, the Alliance number is displayed above the team numbers. The white box between the alliance scores will display the time remaining in the match and match phase (auto or teleop).

Traditionally, the Video and Score will have a space for chroma to add video or production data. If set to Rankings (see *Settings*) the upper portion of the screen will be replaced with current rankings or, in the case of the Playoff tournament, it will be black.

19.1.4 Match Result



Match results is used to show the audience the final results of the match they just witnessed. Team numbers, cards issued to the teams in the match, their new ranking, and how that rank changed are shown. Also shown are the scoring details for the match, as well as the match outcome (which alliance is victorious).

Also shown is a **HIGH SCORE** indicator if one or both of the teams broke the previous high score for the tournament (this is event specific, and checks both qual and playoff matches).

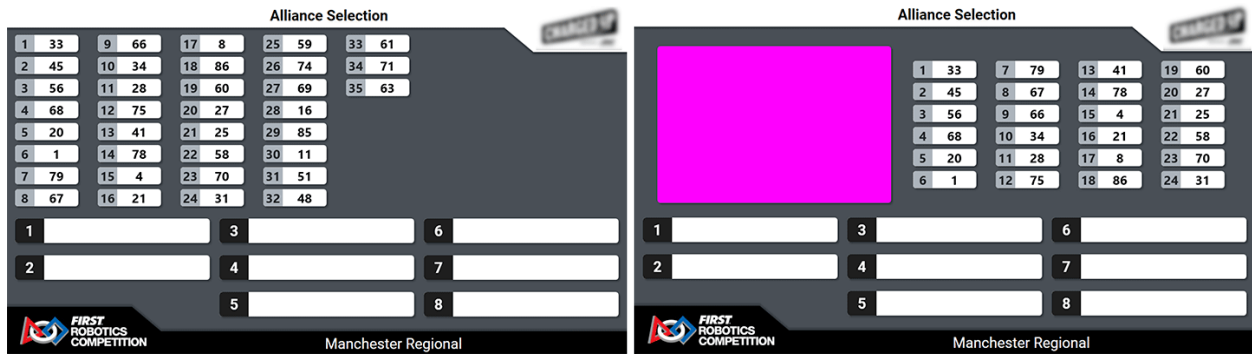
When the “Post Result” button is pressed to bring up this display, a short audio clip and video are played before the results are revealed.

In Playoff matches, an additional box indicates the next match in which the alliance will appear as a result of their performance (if applicable).

19.2 Playoff Specific

Screens available specifically for the Playoff process.

19.2.1 Alliance Selection

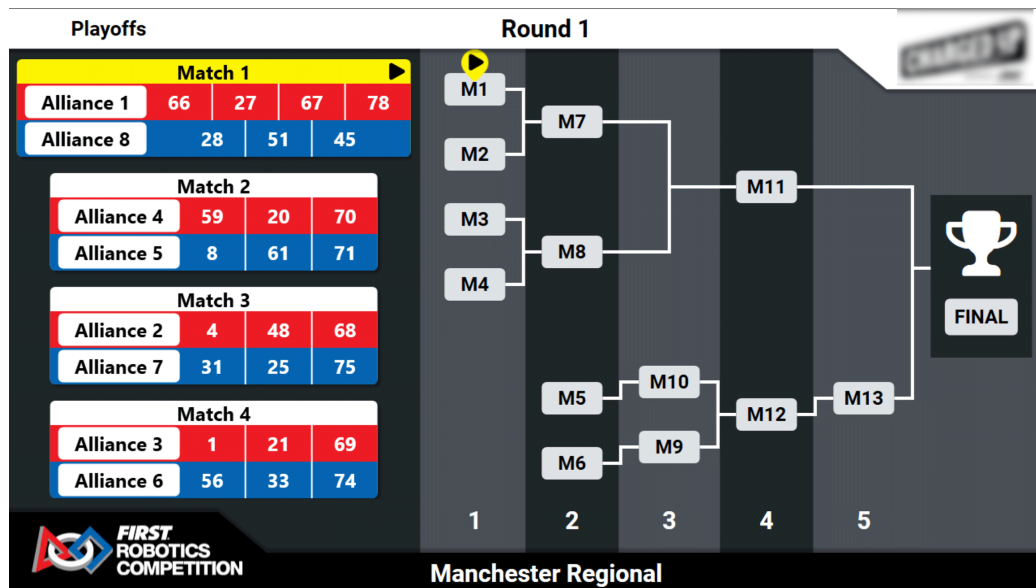


Guide teams and the audience through the alliance selection process. Views contain the alliances, which will populate with the team numbers of selected teams as entered by the Scorekeeper. Teams available for selection are displayed in rank order in the top section of the screen.

[Left] Alliance selection view without “Chroma” for live camera feed

[Right] Alliance selection view with space for a live camera feed

19.2.2 Bracket

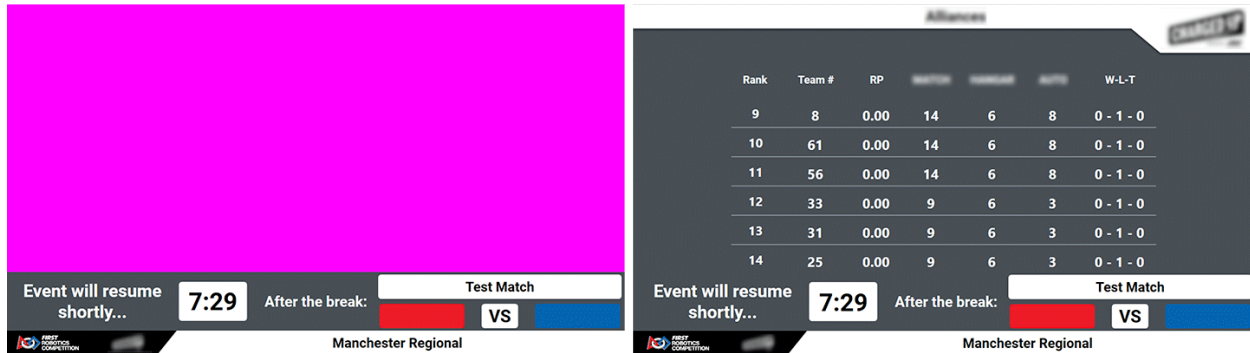


The bracket display is used during the Playoff tournament to guide teams and the audience through the playoff tournament.

Note: The double elimination bracket is new in 2023. The bracket view is critical to keeping everyone in the venue aware of the progression through the playoffs- please coordinate with the announcer/emcee to display the bracket at the

conclusion of each match.

19.2.3 Break



The break timing display is available during both Qualification and Playoff matches, though is typically only used in Playoffs when between matches. The display contains the match number or phase (e.g. “Test Match”) as well as the event name, time remaining and upcoming match data. Upon timer expiry/cancel, the “buzzer” sound will be played if “sound alerts” were enabled when the break was started by the scoring table.

[Left] Traditional timing screen

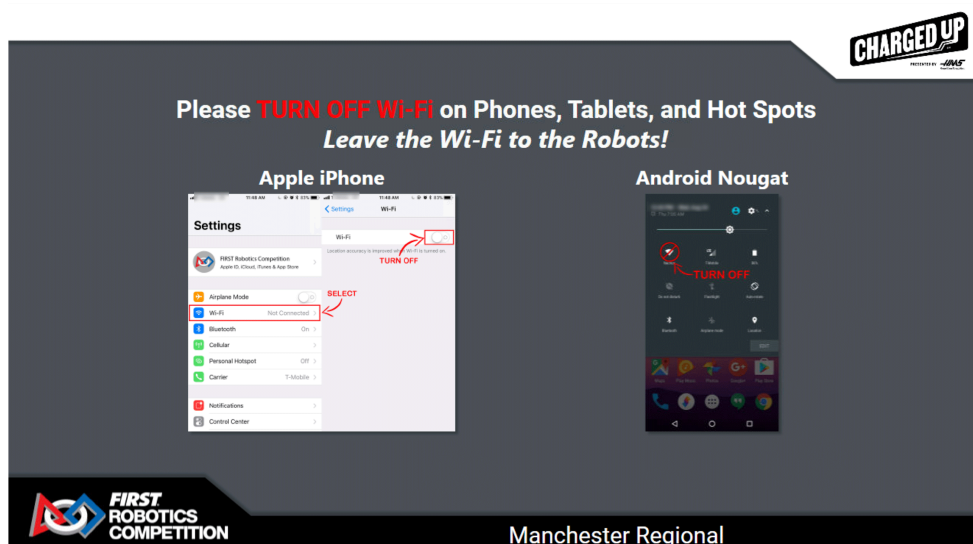
[Right] Alternative timing screen when “Graphics Background” setting is “Rankings”

19.3 Specialty

Additional screens available for event use.

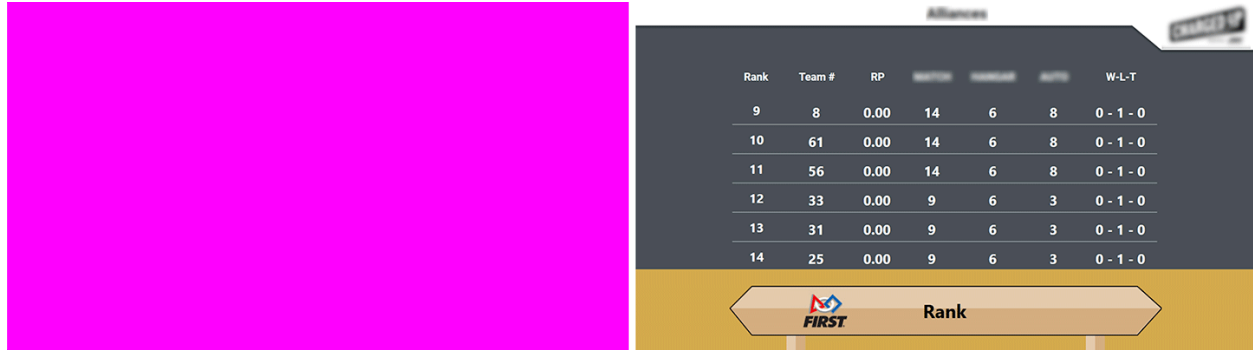
In all examples below, the Fuchsia pink color represents the “Chroma” and the color can be adjusted in the [Audience Display Settings](#).

19.3.1 WiFi Reminder



The WiFi Reminder is an image that the Scorekeeper can show at the request of venue personnel (usually the FTA) in order to remind those in the venue to disable the WiFi on their phones, tablets, and hotspots. This graphic is much more effective when accompanied by the Emcee in making an announcement alongside this image.

19.3.2 Video Only

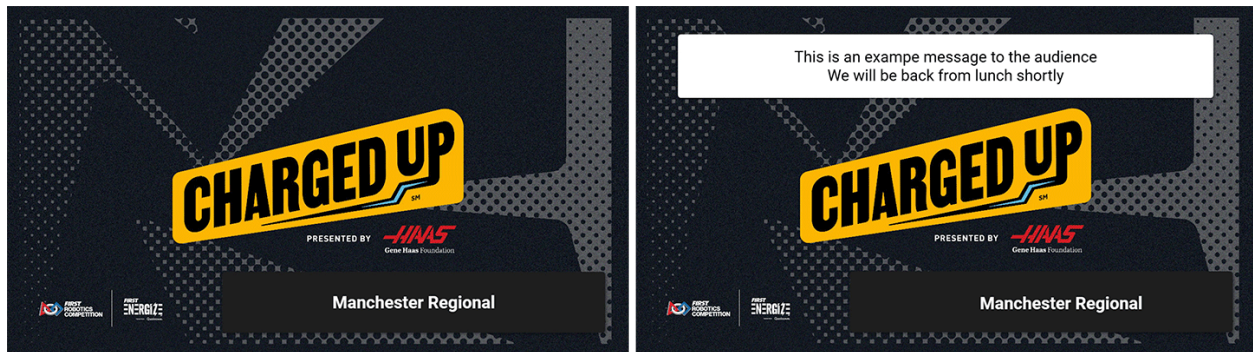


The Video Only audience screen is used when it is desirable to overlay no scoring, time, or match information on the screen.

[Left] Traditional Video Only screen

[Right] Alternative Video Only screen when “Graphics Background” setting is “Rankings”

19.3.3 Background

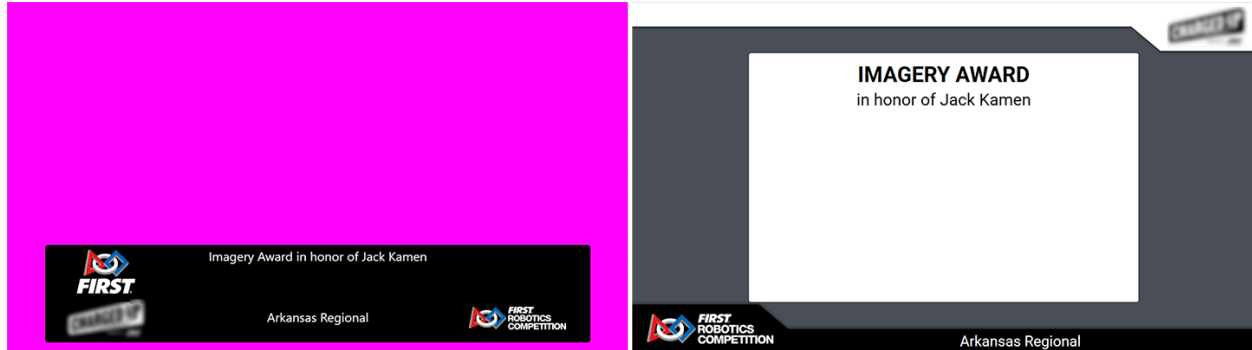


The background screen contains the game logo, and can be used during breaks or lunch as an alternative to video overlay (“Video Only”) or as a way to show the audience the game logo or a custom message.

[Left] Traditional Background screen

[Right] Background screen when a custom message has been displayed using the “Message” tab in *Match Test/Play*

19.3.4 Award

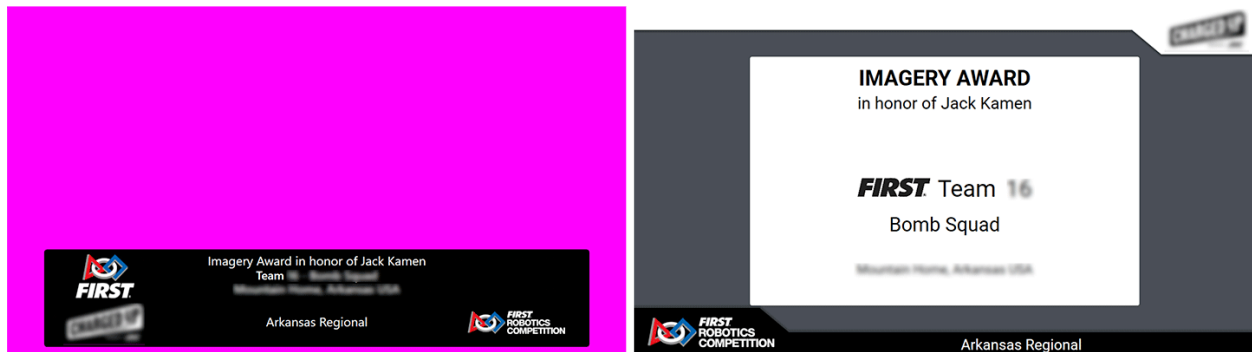


The “Display Award” screen in the award assignment steps of the wizard put the name of the award and event up on the screen.

[Left] Alternate version of the award display with chroma

[Right] Full screen version of the award display

19.3.5 Award Assignment

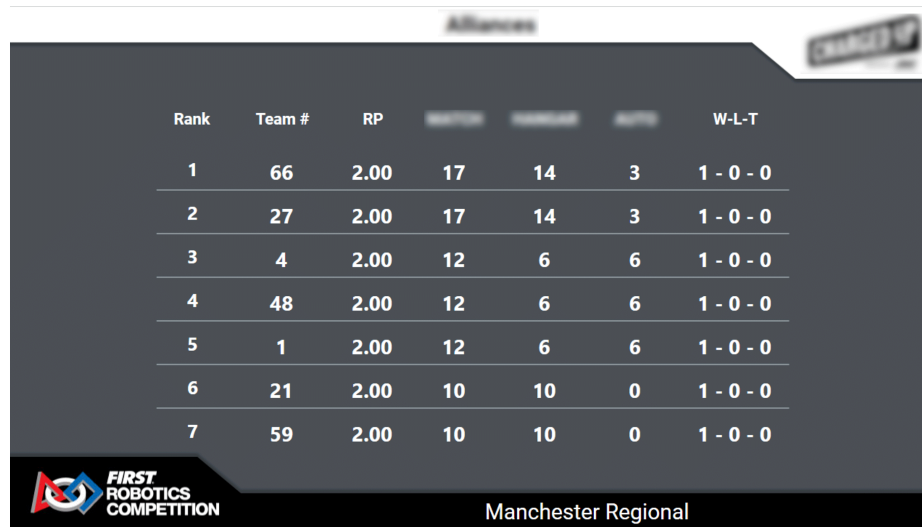


The “Display Award Winner” screen in the award assignment steps of the wizard adds the award winning team or person to the existing award data on the screen.

[Left] Alternate version of the award display with chroma

[Right] Full screen version of the award display

19.3.6 Qual Rank



Rank	Team #	RP	MATCHES	WINS	LOSSES	W-L-T
1	66	2.00	17	14	3	1 - 0 - 0
2	27	2.00	17	14	3	1 - 0 - 0
3	4	2.00	12	6	6	1 - 0 - 0
4	48	2.00	12	6	6	1 - 0 - 0
5	1	2.00	12	6	6	1 - 0 - 0
6	21	2.00	10	10	0	1 - 0 - 0
7	59	2.00	10	10	0	1 - 0 - 0

Manchester Regional

Display and scroll through the current rankings. In order for a team to appear in the list, they must have played at least one qualification match.

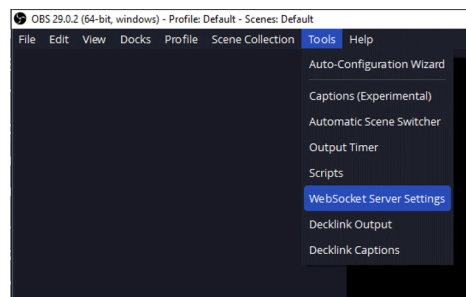
OBS INTEGRATION

20.1 OBS Websockets

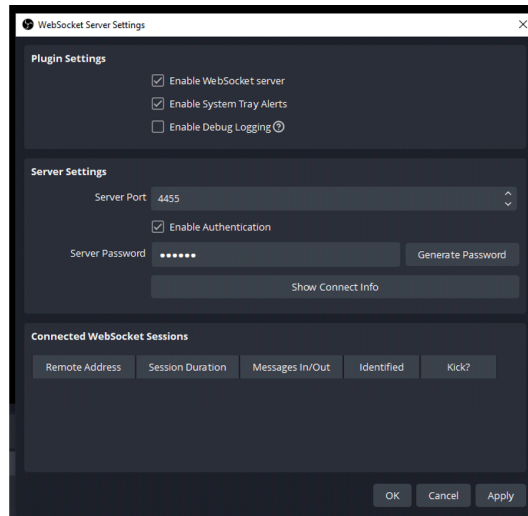
OBS Integration must be configured through the settings tab, and is considered an advanced feature. We recommend only using this feature after coordination with FRC® Event Support!

OBS Websockets / OBS Integration allows you to control your video feed (for use on a webstream, or potentially on a scoreboard at off-season events) via the free OBS Software and use of the *FIRST*® FMS Audience Display by automatically changing what the audience is seeing based on what is happening at the event without the need for an operator. To do so, configure the two required programs as outlined below.

20.1.1 OBS Setup and Installation



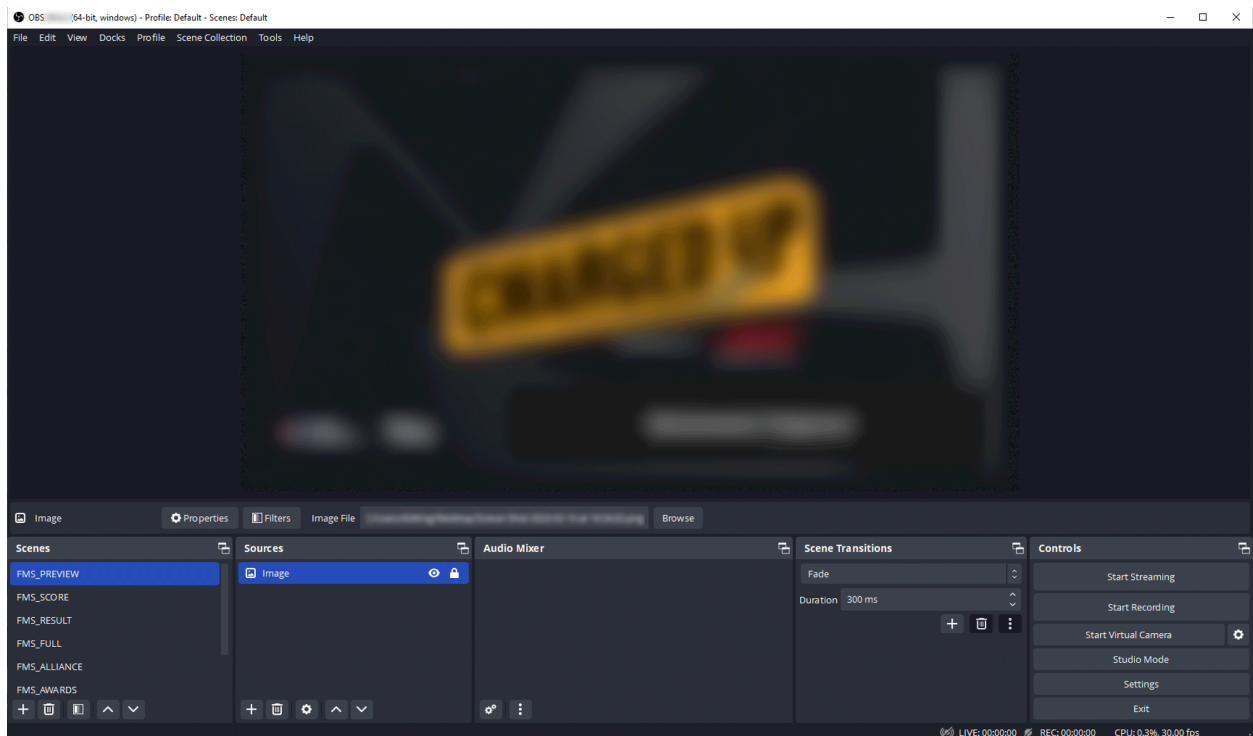
1. Install the desired version of OBS, a free open-source video streaming platform from their website at: <https://obsproject.com> Make sure to install version 29 or newer.
2. Run OBS and configure the desired scenes based on the below directions in the “OBS Scenes” section.
3. Open the Websockets Config panel in OBS under Tools
 - Make sure the Server Port is 4455 (or, if changing the default, note the selection for configuring the Audience Display)
 - Make sure the Enable authentication checkbox is on, and select a 6-digit code to encrypt the traffic.
 - It is recommended to keep System Tray Alerts on to see notifications if any connections are lost



Start the Websocket server by making sure the “Enable” checkbox is checked, then applying and closing the settings.

20.1.2 OBS Scene Configuration

The OBS Integration will tell the Audience Display to change scenes in OBS automatically as the match and event progress. In order to do so, it relies on Scenes to be named exactly as specified in this documentation. Using the Scenes area (marked above in pink) create the Scenes you are interested in using, detailed below. Two scenes minimum are required: FMS_FULL and FMS_HIDDEN in order for any operation to take place.



- FMS_PREVIEW - Scene for your desired output during Match Preview
- FMS_SCORE - Scene for your desired output during Match Play. It must, at minimum, show the score bar generated by FMS without any modification from how it is provided by *FIRST*. It should contain a Chroma filter

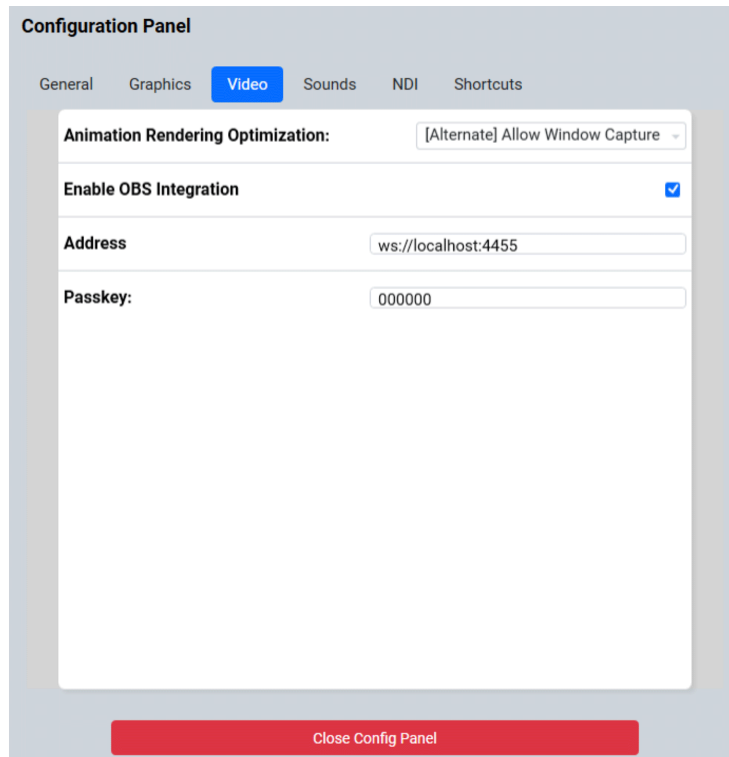
to remove the portions intended to be keyed out.

- **FMS_RESULT** - Scene for the desired output during the Post Result after a match. At minimum, it have room for the animation that plays when scores are being revealed, and the score detail as provided by the *FIRST* Audience Display.
- **FMS_FULL** - This scene is required. Used in place of any scene that is not implemented from the rest of this list. It should be configured for the desired output when a full-screen display is showing from FMS, such as the messages generated by the scorekeeper. It should contain a Chroma filter to remove the portions intended to be keyed out.
- **FMS_ALLIANCE** - The desired look during the Alliance selection process. It should contain a Chroma filter to remove the portions intended to be keyed out. Some versions of the audience display contain boxes that are meant to be keyed out in favor of a camera look. Not all displays will have a chroma element to remove.
- **FMS_AWARDS** - Scene for the output during Award Ceremonies. It should accommodate the lower third bar that shows the award being presented and the winning team or person. It should contain a Chroma filter to remove the portions intended to be keyed out.
- **FMS_HIDDEN** - Scene is required. Used whenever the FMS Audience Display is not supposed to be seen, or has finished showing data. For example, after showing match preview for enough time for users to read it FMS will transition to this scene to hide the display. This can be made up of cameras or other graphics that are not from the Audience Display output.

Note: Adding additional scenes beyond those listed is also fine, but FMS may transition away from it during match flow.

Warning: Don't forget to configure the audio the desired way in each scene, or globally!

20.1.3 Audience Display Settings



Important: Do not enable this feature without the corresponding setup in OBS as it may impact Match Play

Look for the OBS Integration options in the Video tab of the Audience Display settings. Only enable the feature after enabling Websockets in the OBS software. The default address should be sufficient for most use cases, and should contain the address (starting with WS) and including the port number (default of 4455). Select a passkey (consisting of 6 or more characters) to encrypt your connection.

There are no other settings to change in the Audience Display for this feature.

CONFIGURATION

21.1 About Off-Season FMS and Requirements

21.1.1 Overview

The Field Management System (FMS) is the electronics core of a *FIRST*® Robotics Competition (FRC®) playing field and encompasses both hardware and software components. The software package is used to control all the field electronics (LED Displays, Station Control Cabinets, E-stops, enable/disable of the Robots, network security, etc.) and is used to manage the event by creating match schedules, scoring the matches in real-time, and posting information to the Audience screen. The FMS Off-Season version is designed to work without the full set of FRC field electronics, but retain much of the functionality that remains useful to events without *FIRST* hardware.

Additional information about the software can be found in the other articles of this documentation.

21.1.2 Hardware Requirements

To run the Off-Season version the following minimum hardware items are required:

- Laptop or desktop computer with Ethernet Port
- WiFi Access Point (Linksys WRT610N or equivalent)
- Ethernet Switch (Unmanaged, 8 port, qty 3 recommended)

Other items, such as speakers or a projector, are recommended to supplement the user experience but not required for basic functionality.

21.1.3 Software Requirements

In order to install Off-Season FMS, the target machine must meet these minimum requirements:

- Operating System: Windows 10
- Processor Speed: 64 bit OS
- CPU: 2.0 GHz
- Memory: 2 GB RAM
- Hard drive: 1 GB free hard disk space
- Hardware: Ethernet and USB Port
- Resolution: 1920x1080 or higher for best visibility

21.1.4 Audience Display Requirements

The Audience Display program controls all audio and graphics intended for audience consumption. It can be run on the same machine as Off-Season FMS or on a separate Windows machine located on the same network as the FMS installation. The machine being used as the Audience Display must have a modern graphics card capable of running an extended monitor at 1280x720 or 1920x1080 with 100% scaling (based on the Windows scaling settings). For game sounds, the machine must have speakers or connect to a system capable of accepting the audio output of the machine (such as a 1/8" headphone jack). If using a secondary machine as the Audience Display, it should be connected via Ethernet, not wireless.

21.1.5 Important Off-Season Notes

Do not install FMS Off-Season on top of a previous installation of the software. It is safest to completely uninstall and remove any previous installations of FMS from your computer before installing a new version. For assistance in properly removing a previous version, please [see this article](#).

Note: Important: Do not install FMS Off-Season on machines that are school or business “owned” or controlled. These machines often include restrictive user accounts, additional firewall and security programs, etc, which are not tested by *FIRST* and may interfere with FMS’s ability to function properly.

21.2 Installation

21.2.1 Retrieve Installer

Note: FMS Off-Season should not be installed on top of a previous version. Please completely remove the old version before continuing. For help on doing this, please [see this article](#)

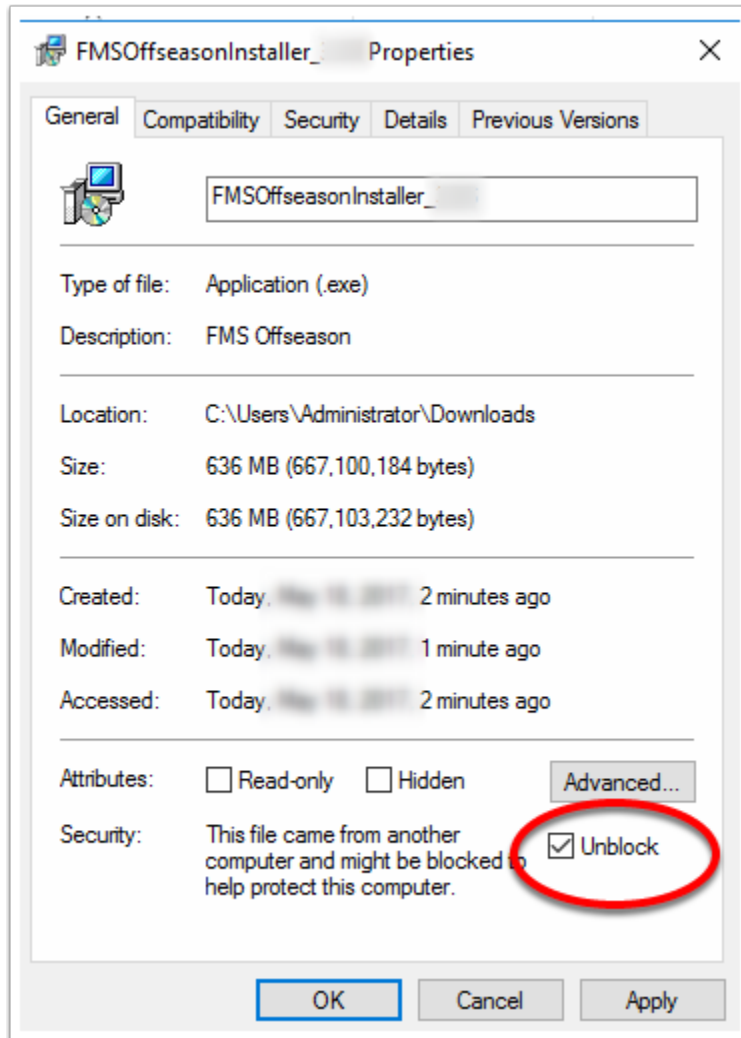
In order to install FMS Off-Season, download the EXE file from the *FIRST*® website. The file contains the necessary pre-requisites and is usually around 600 MB in size.

Access the Installer download [from this site](#) (look for the most recent available)

FMS require a 64 bit Windows OS. *FIRST* recommends Windows 10.

21.2.2 Installation Process

Depending on your machine settings, Windows may prevent the file from running since it was downloaded from the Internet. To do this, right click on the Installer file and select “Properties.” On the Properties menu, select “Unblock” and “OK.” Then, attempt to run the installer by double-clicking.



By default, FMS will utilize port 80 (localhost) for its Web Portal. If you need FMS Off-Season to operate on a different port, please see the section about using an alternate port. For most users, the normal installation instructions should be sufficient.

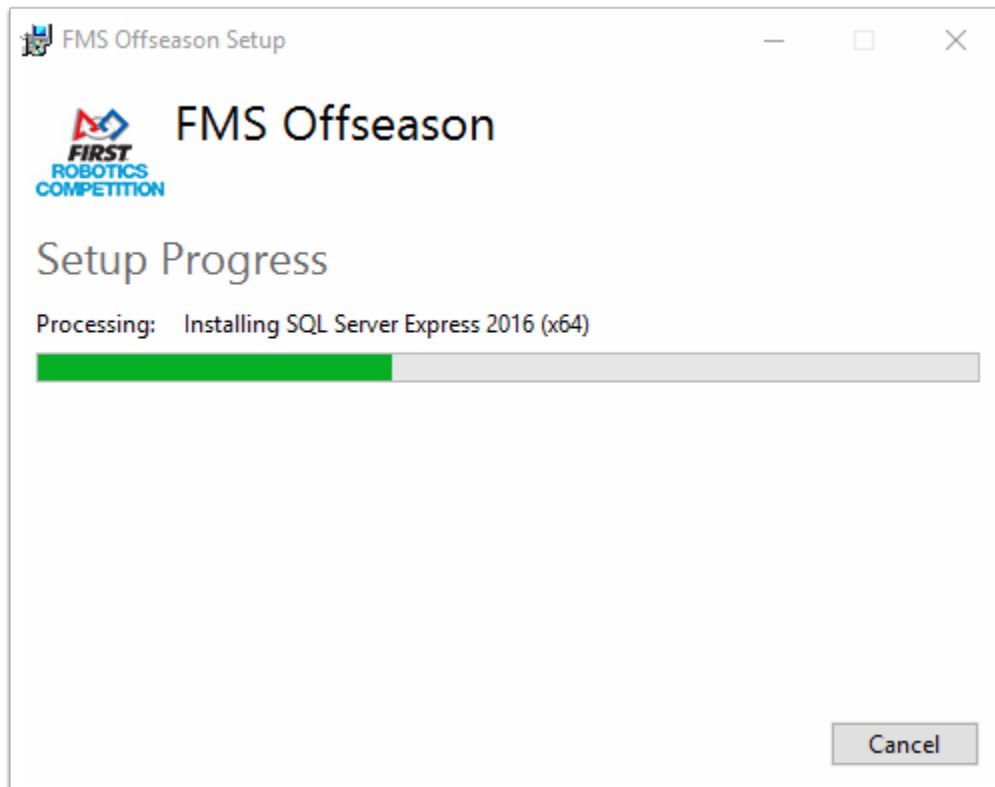
- Double-click the FMSOffSeasonInstaller_x.xx.exe to open the installation wizard.

Read the license terms. If you agree to the terms, click the box and select the Install option. You can specify the install path using the Options button. By default, the program will install in:

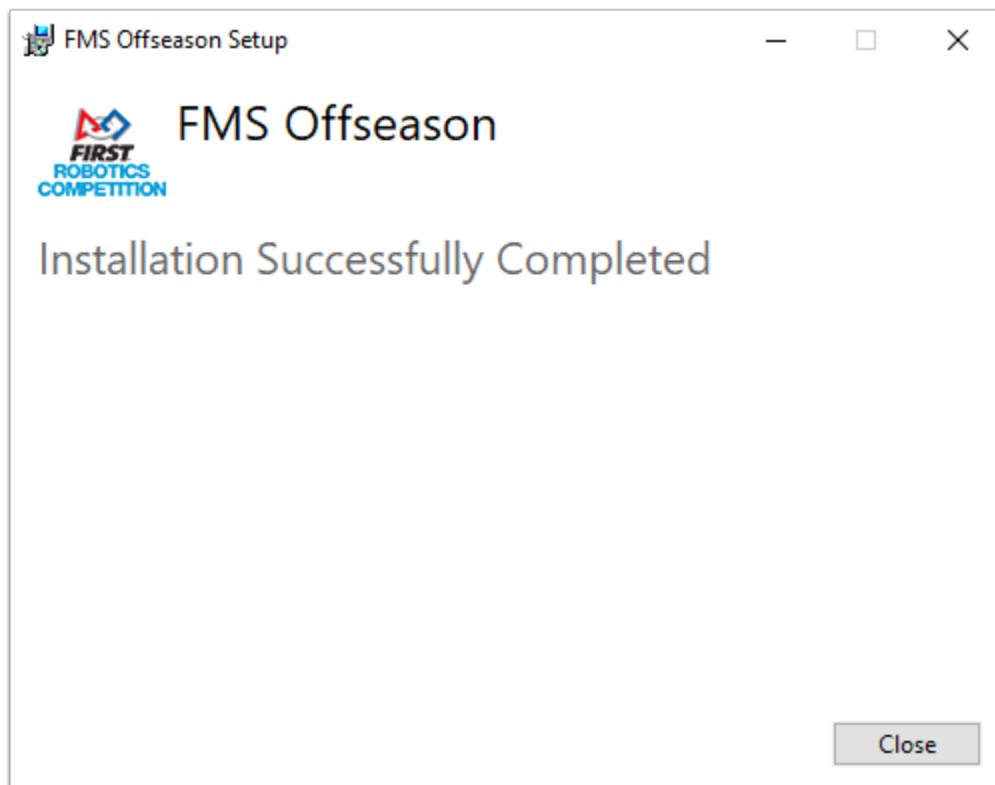
C:\Program Files\FIRST\FMSExeOffseason (64 bit OS)

The install button may bring up the User Account Control box depending on your version of Windows. If so, select Yes to grant FMS Off-Season access to install.

The FMS Off-Season installer will run and Windows will provide feedback on the progress.



When the installation finishes, you can close the installer.



21.2.3 Desktop Icons



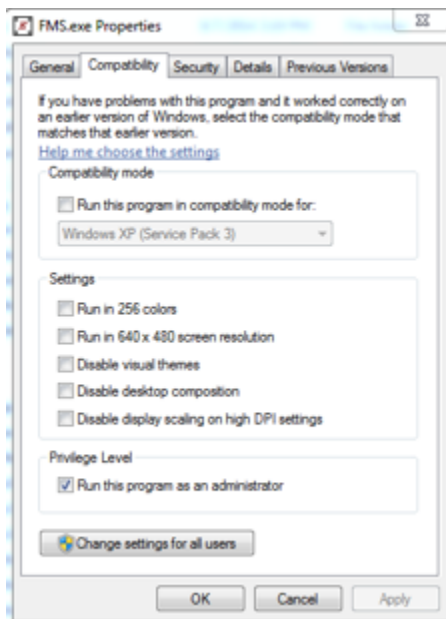
The installer will place an icon on the desktop. The FMS icon (red arrow) will open the Event Manager (which includes the wizard that walks through the event, the control to turn robots on and off, etc).

The Audience Display, which will display scores and team information (as well as playing game sounds), will additionally add an icon if you elect to install it. For more information, [see this article](#).

21.2.4 Uninstalling

To uninstall the software, use the Programs and Features option on the control panel and select “FMS Off-Season”, repair and uninstall options will be presented. SQL Server Express must be uninstalled separately if desired. Uninstalling and reinstalling FMS Off-Season will recreate the database. Be sure to create a backup of the database before uninstalling if you would like to retain the contents of the database.

21.2.5 Run as Admin

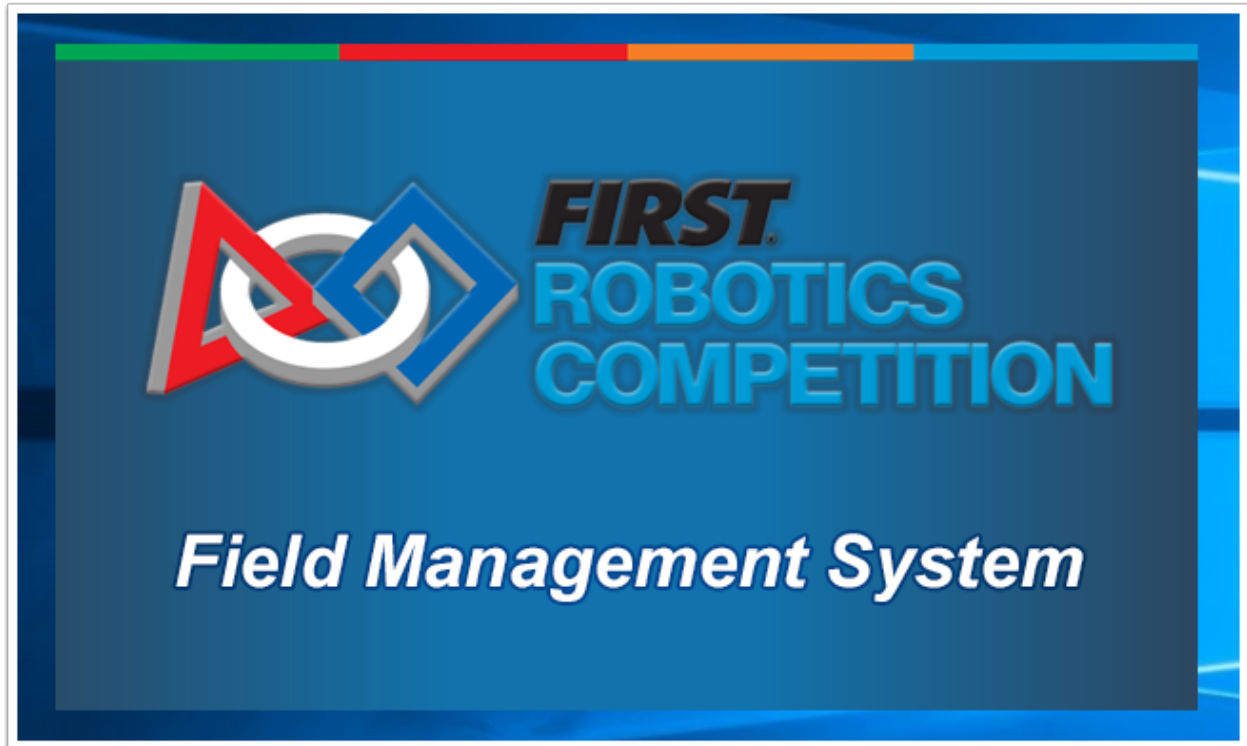


Right click on the FMS icon (red arrow) on the desktop and select Properties. Under the Compatibility tab, click the box next to “Run as an administrator” and select OK.

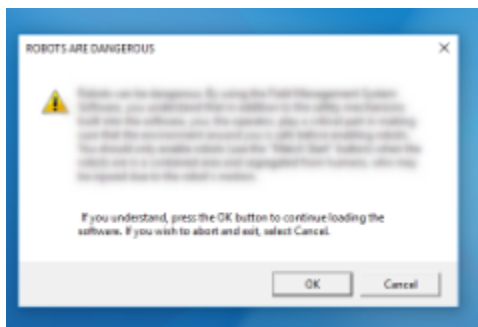
21.2.6 Launching FMS

Once FMS Off-Season is installed, you should see a shortcut on your desktop to “FMS”. FMS requires administrative privileges on the machine in order to run properly. Make sure you have configured administrative privileges as described previously for the FMS shortcut.

Launch FMS Off-Season by double-clicking on the FMS shortcut. If you are prompted by “User Account Control,” select Yes to give FMS access to run on your machine.



Once FMS is loaded you must agree to a safety warning. Beyond that, refer to the *FMS User's Guide* for additional operating instructions.



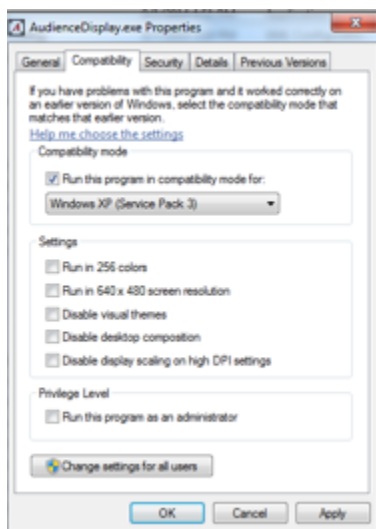
21.2.7 Launching Audience

Double click the “Audience Display” shortcut on your desktop to launch the Audience Display. The audience display will appear with the a background screen and game logo visible. Only open the Audience Display after configuring an event through FMS Event Wizard.

See the Audience Display information in the *Audience Display User’s Guide* documentation for additional details about using the Audience Display.

Note: Note: The Audience Display must be running in order to hear game sounds.

21.2.8 Audience Compatibility Mode



The Audience Display should run properly with no advanced configuration. You only need to follow these instructions if you encountered trouble running the program out of the box.

If you have trouble running the Audience Display in its default configuration, you may need to use compatibility mode. Open the location where you installed FMS, which is usually something similar to:

C:\Program Files (x86)\FIRST\AudienceDisplayExeOffseason (64 bit OS)

Right click on AudienceDisplay.exe and select Properties. Under Compatibility, select “Run this program in compatibility mode” and pick “Windows XP (Service Pack 3)” from the dropdown box.

Select OK. When you re-launch the Audience Display using the shortcut on your desktop, it should run properly.

If you wish to utilize a remote audience display, please see the appropriate configuration instructions in the User’s Guide. It is recommended to run no more than two (2) instances of the Audience Display at any given time.

21.2.9 Advanced Installation

By default FMS will use port 80 (localhost) for its Web Portal. However this can be changed if you need FMS to use another port. If you install on another port, you would need to change the references in the documentation to match.

Using a command line navigate to the folder which contains the FMS Off-Season Installer. The only user-configurable installation option for FMS is WebSitePort. Invoke the installer with the WebSitePort argument specifying the port you would like to use. For example, to invoke the installer with the default port (80) you would use the following command (you may need to change the name of the .exe file in this example):

```
FMSOffSeasonInstaller.exe WebSitePort=80
```

Proceed with the installation as described previously.

21.2.10 Shutting Down

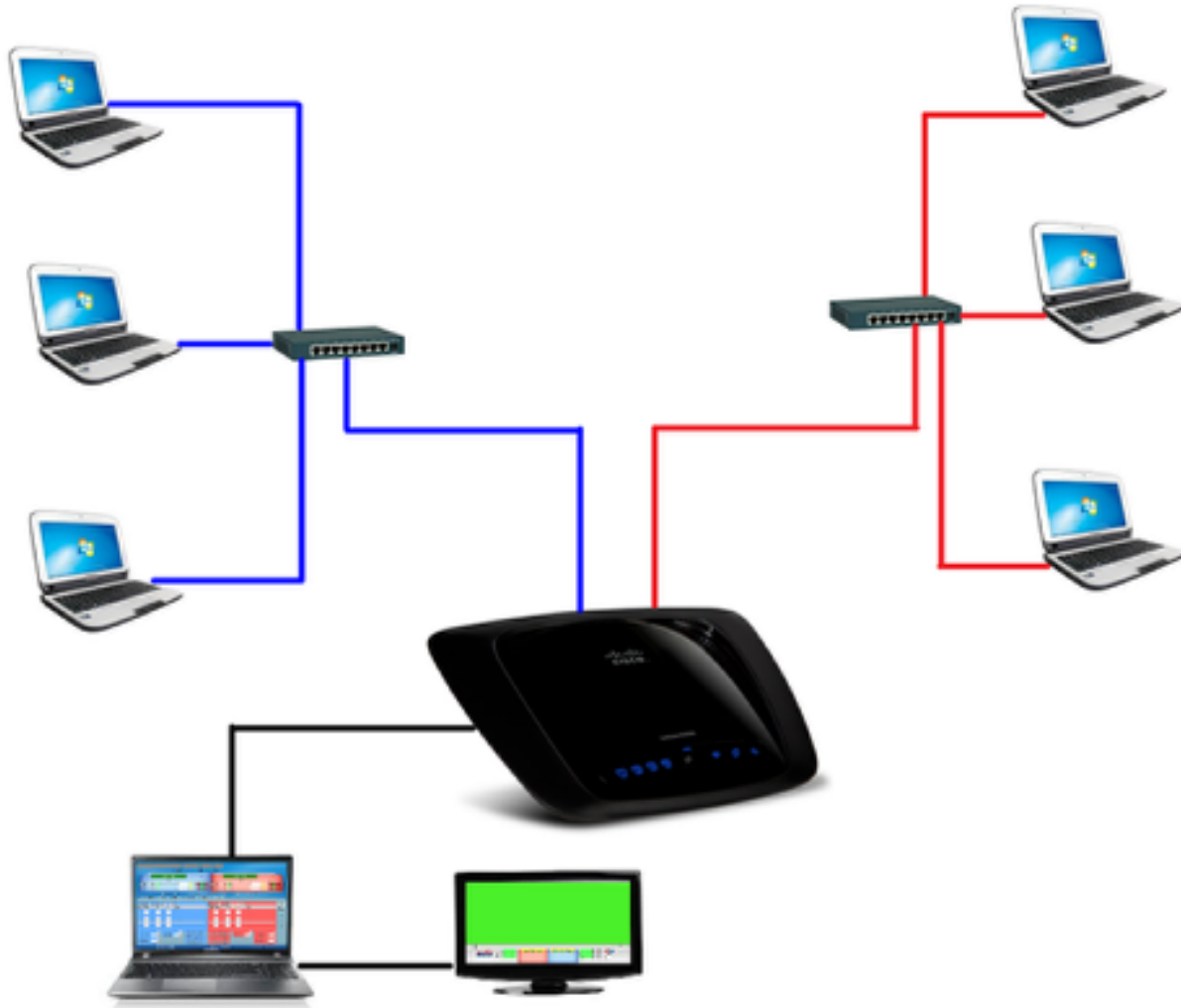
To shut down the FMS application, simply click the “X” in the upper right. Only do this if a match is not running.

To shut down the Audience Display application, simply click “Alt+F4” when the application is in the foreground. Alternately, right click on the icon in the taskbar and selecting “Close Window.”

21.3 Network Hardware Configuration

Preparing the network for Off-Season events

21.3.1 Layout



The typical FRC® field, electronics and hardware are not normally available at events utilizing FMS Off-Season. As such, the host team or organization will need to provide some basic network hardware in order to run the event. If you event has the full official electronics you should not use FMS Off-Season- you must use the official FMS build in order to talk to network hardware.

At a very basic level the Field Management System consists of a router, switches and a laptop/desktop with the FMS software. In the above diagram, the six driver station computers can be seen connected to switches on either side of the field (shown with red and blue lines). The switches are then connected to the router, which usually resides on the scoring table. In most scenarios, the red drivers should be on the right of the scorekeeper, as that is the way the software is configured to appear visually. In the above diagram, an external monitor (such as a projector or TV) is connected to the FMS machine and used to show the Audience Display. The Audience Display could also be run on a separate machine, in which case an additional Desktop/laptop would be included and connected to the router via Ethernet.

21.3.2 Wiring

In order to operate an event effectively you will need some basic cabling between the field hardware. The three driver station machines on each end of the field are connected to a switch, which is typically placed under the middle driver station, using CAT6 Ethernet cables. Depending on your venue, the cables may need to be 15-20 feet. Each switch, one for the red alliance and one for the blue alliance, will need a CAT6 Ethernet cable to run along the side of the field to the scoring table. These cables should be at least 50-75 feet in order to reach the full distance. The router will also need a CAT6 Ethernet cable to the machine that is running FMS Off-Season. An additional cable(s) is needed for a remote Audience Display.

While CAT6 cables are recommended, CAT5e also work.

21.3.3 Router and Computer Configuration

The router and FMS Computer must also be configured. See the next article for instructions.

21.4 Router Configuration

21.4.1 Router Notes

Your router will need to be configured in order to correctly communicate with robots that come to the field. Many different kinds of routers can be used, but a Linksys WRT610N or equivalent is recommended. The instructions in this documentation apply to many kinds of routers (WRT shown), but may be slightly different depending on the hardware you use.

- Open the router's web configuration, which is usually at an IP such as 192.168.1.1. You will also need to log in to the router administrative pages.

21.4.2 IP Address

LINKSYS[®] by Cisco Firmware Version: 1.00.00 B17

Setup Simultaneous Dual-Band Wireless Router WRT610N

Setup | **Wireless** | Security | Storage | Access Restrictions | Applications & Gaming | Administration | Status

Basic Setup | **DDNS** | MAC Address Clone | Advanced Routing

Language
Select your language: English

Internet Setup
Internet Connection Type: Automatic Configuration - DHCP

Optional Settings
(required by some Internet Service Providers)
Host Name:
Domain Name:
MTU: Auto Size: 1500

Network Setup
Router Address
IP Address: 10 . 0 . 100 . 1
Subnet Mask: 255.255.255.0
URL Address: http://WRT610N.com

DHCP Server Setting
DHCP Server: ☒ Enabled ☐ Disabled DHCP Reservation
Start IP Address: 10 . 0 . 100 . 50
Maximum Number of Users: 100
IP Address Range: 10 . 0 . 100 . 50 to 149
Client Lease Time: 10 minutes (0 means one day)
Static DNS 1: 0 . 0 . 0 . 0
Static DNS 2: 0 . 0 . 0 . 0
Static DNS 3: 0 . 0 . 0 . 0
WINS: 0 . 0 . 0 . 0

Time Settings
Time Zone: (GMT-05:00) Eastern Time (USA & Canada)
☒ Automatically adjust clock for daylight saving changes.

Save Settings Cancel Changes Reboot

CISCO

As shown in the diagram, set the IP address to 10.0.100.1 and the Subnet Mask to 255.255.255.0. Make sure you Enable the DHCP server with a Start IP Address of 50, Maximum Number of Users of 100, and Client Lease Time of 10 minutes. Save the settings, and the router will apply them. After about a minute, unplug the Ethernet from your computer and re-attach it to acquire a new IP address. In your browser, navigate and login to the router again (which is now at 10.0.100.1).

21.4.3 Wireless Configuration

LINKSYS[®] by Cisco Firmware Version: 1.00.00 B17

Simultaneous Dual-N Band Wireless Router WRT610N

Wireless | Setup | Wireless | Security | Storage | Access Restrictions | Applications & Gaming | Administration | Status

Basic Wireless Settings | Wireless Security | Wireless MAC Filter | Advanced Wireless Settings

Wireless Configuration

☒ Manual ☐ Wi-Fi Protected Setup™

5GHz Wireless Settings

Network Mode: Wireless-N Only

Network Name (SSID): FRC_OFFSEASON

Radio Band: Standard - 20MHz Channel

Wide Channel: Auto (DFS)

Standard Channel: 161 - 5.805GHz

SSID Broadcast: ☐ Enabled ☒ Disabled

2.4GHz Wireless Settings

Network Mode: Disabled

Network Name (SSID): linksys

Radio Band: Standard - 20MHz Channel

Wide Channel: Auto

Standard Channel: Auto

SSID Broadcast: ☒ Enabled ☐ Disabled

[Help...](#)

Save Settings **Cancel Changes**

CISCO

- Navigate to the Basic Wireless Settings for the router.

In Manual configuration, for 5GHz settings, select Network Mode of Wireless-N Only, Network Name of [*your event ssid*], Radio Band of Standard - 20MHz Channel, Standard Channel of [*your event channel*], and SSID Broadcast as Disabled.

For 2.4GHZ select setting for Network Mode of Disabled. Save the settings.

21.4.4 Security

The screenshot shows the Linksys by Cisco WRT610N router's configuration interface. The 'Wireless' tab is selected, and the 'Security' sub-tab is active. The '5GHz Wireless Security' section is expanded, showing the following settings:

- Security Mode: WPA2-Personal
- Encryption: AES
- Passphrase: ZZZ_123456
- Key Renewal: 3600 seconds

The '2.4GHz Wireless Security' section is also visible, showing the Security Mode set to Disabled. The page includes a 'Save Settings' button and a 'Cancel Changes' button at the bottom right.

- Navigate to the Wireless Security for the router.

For 5GHz select settings for Security Mode of WPA2-Personal, Encryption of AES, Passphrase of [*your event passphrase*], and Key Renewal of 3600.

For 2.4 GHz select settings for Security Mode of Disabled.

Save all your settings.

21.4.5 Note

You can adjust the settings as you see fit, but be sure to keep the teams and FTA at your event in the loop to assist with troubleshooting any problems you may run into. Example images and steps may not fit exactly with your router, but similar options should be available.

21.5 Configure Robot Radios

Get those bots ready for play!

21.5.1 Instructions

Teams should use the FRC® bridge configuration utility to program their robot radios for Off-Season use. Please see [this article](#) for instructions.

21.6 FMS Computer Configuration

Only complete these steps after completing the previous setup requirements.

21.6.1 Network Adapter

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 10 . 0 . 100 . 5

Subnet mask: 255 . 0 . 0 . 0

Default gateway: 10 . 0 . 100 . 1

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: 10 . 0 . 100 . 1

Alternate DNS server:

☐ Validate settings upon exit

Advanced...

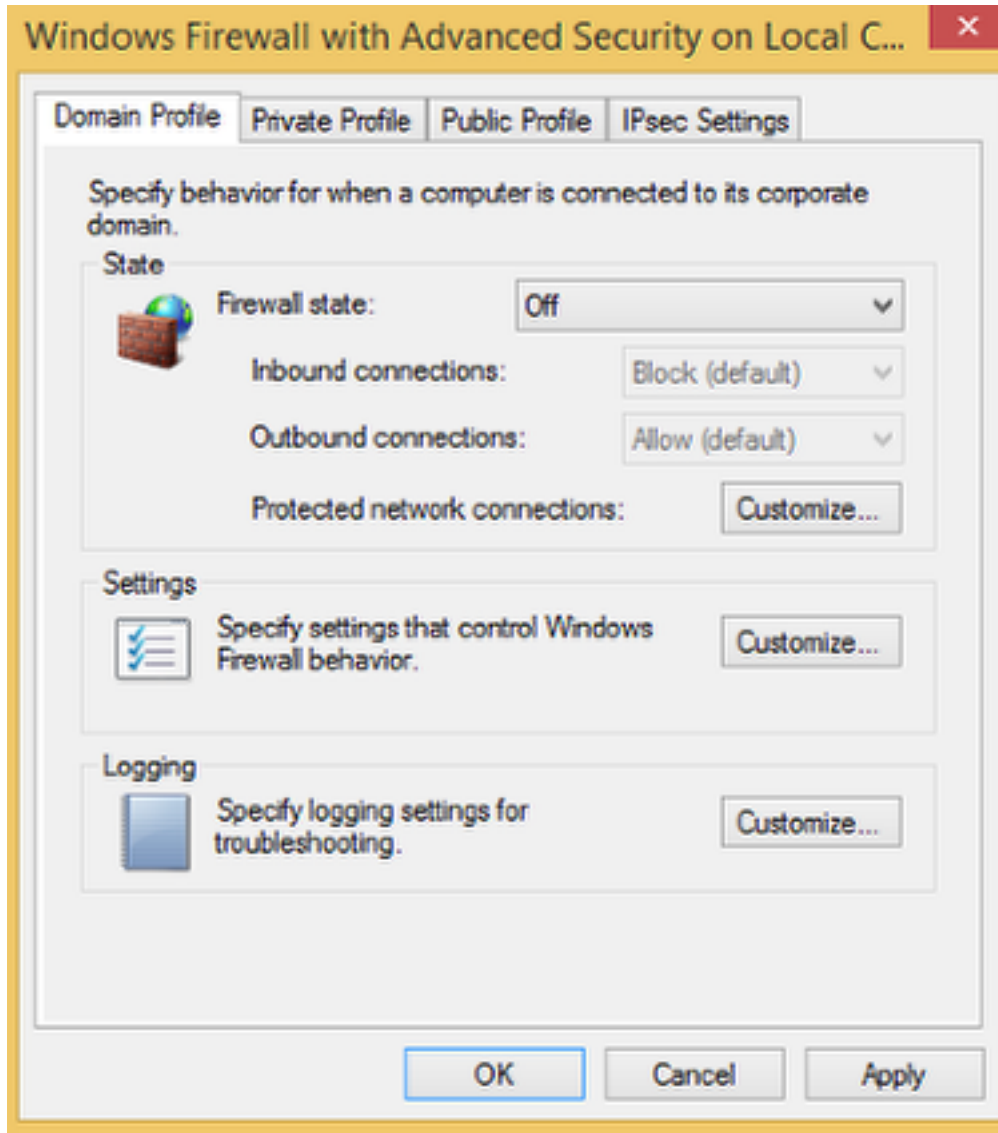
OK Cancel

Configure the network connections for the Ethernet port of the FMS computer.

Set the IP address to 10.0.100.5, Subnet mask to 255.0.0.0, Default gateway to 10.0.100.1, and Preferred DNS server to 10.0.100.1.

Disable the wireless adapter (bluetooth, WiFi, and any others) if installed.

21.6.2 Firewall



Disable all firewall settings on the FMS computer. Select Windows Firewall from the Control Panel; Advanced Settings; Windows Firewall Properties.

For Domain Profile, Private Profile, and Public Profile select Firewall state of Off.

21.6.3 Driver Stations and Robots

Robots and driver stations should be configured to use DHCP to obtain IP addresses.

21.7 Setting Up Your Event

This article is a supplement to the full documentation. See the full software documentation for detailed instructions about particular elements.

21.7.1 Basic Steps

- In the event wizard create a new Off-Season event. Select the playoff and event settings you desire.
- In the event wizard select the teams participating in the event. Additional teams may be added if necessary at a later time. Even though team WPA keys are not used click Generate Security Keys before leaving this step (Match Play will require keys to exist in the database)
- Continue with schedule creation and generation as at a regular event, using the FMS User's Guide for assistance as needed.

Since off season events are not using the full set of FMS electronics, the Field Monitor (Website) and Status (FMS) screens will always show Red for the DS-ETH state indicator (X) and 0.000 for the BWU value as they are not available.

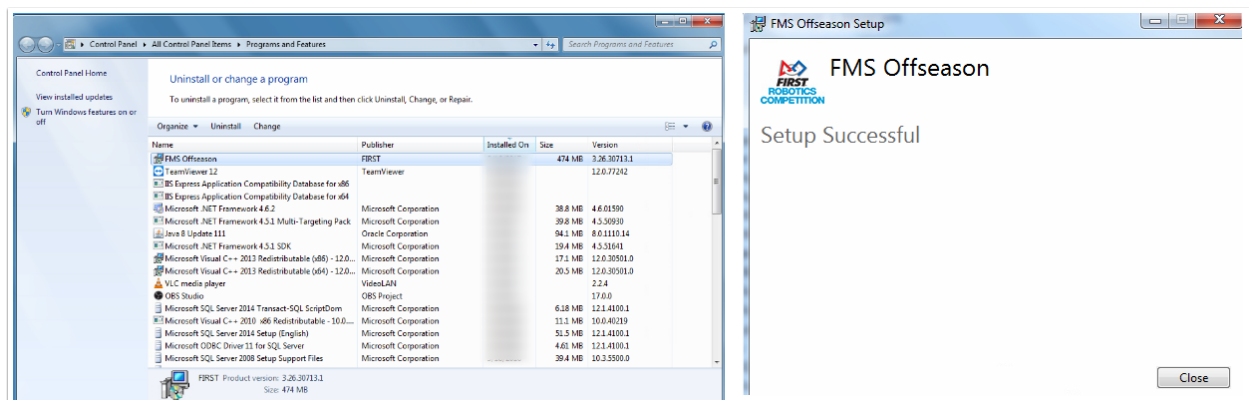
21.8 Upgrading from a previous edition of FMS Off-Season

In order to install an edition of Off-Season FMS on a machine that had a previous installation of FMS (any previous year to your target install), some changes must be made prior to running the installer.

If the target machine does not contain a previous version of FMS, Off-Season this article is not relevant.

Note: Running this process will delete all the match/scoring data from this machine. Proceed with caution.

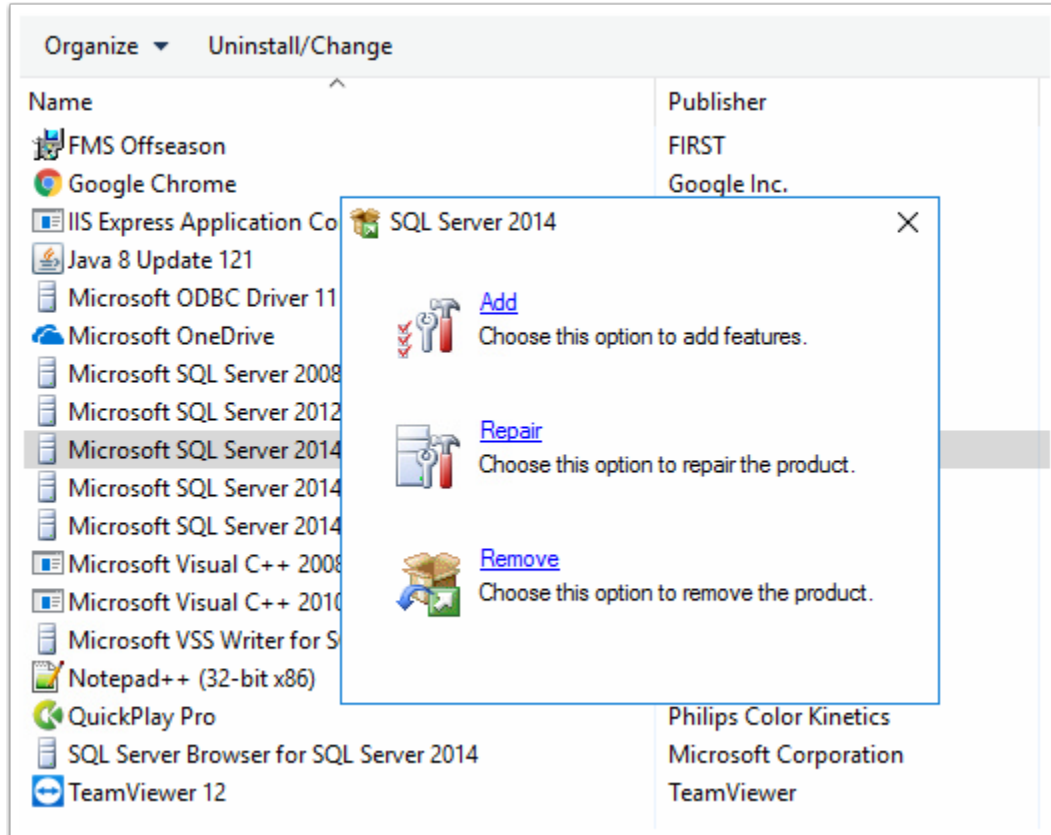
21.8.1 Uninstall the previous FMS Edition



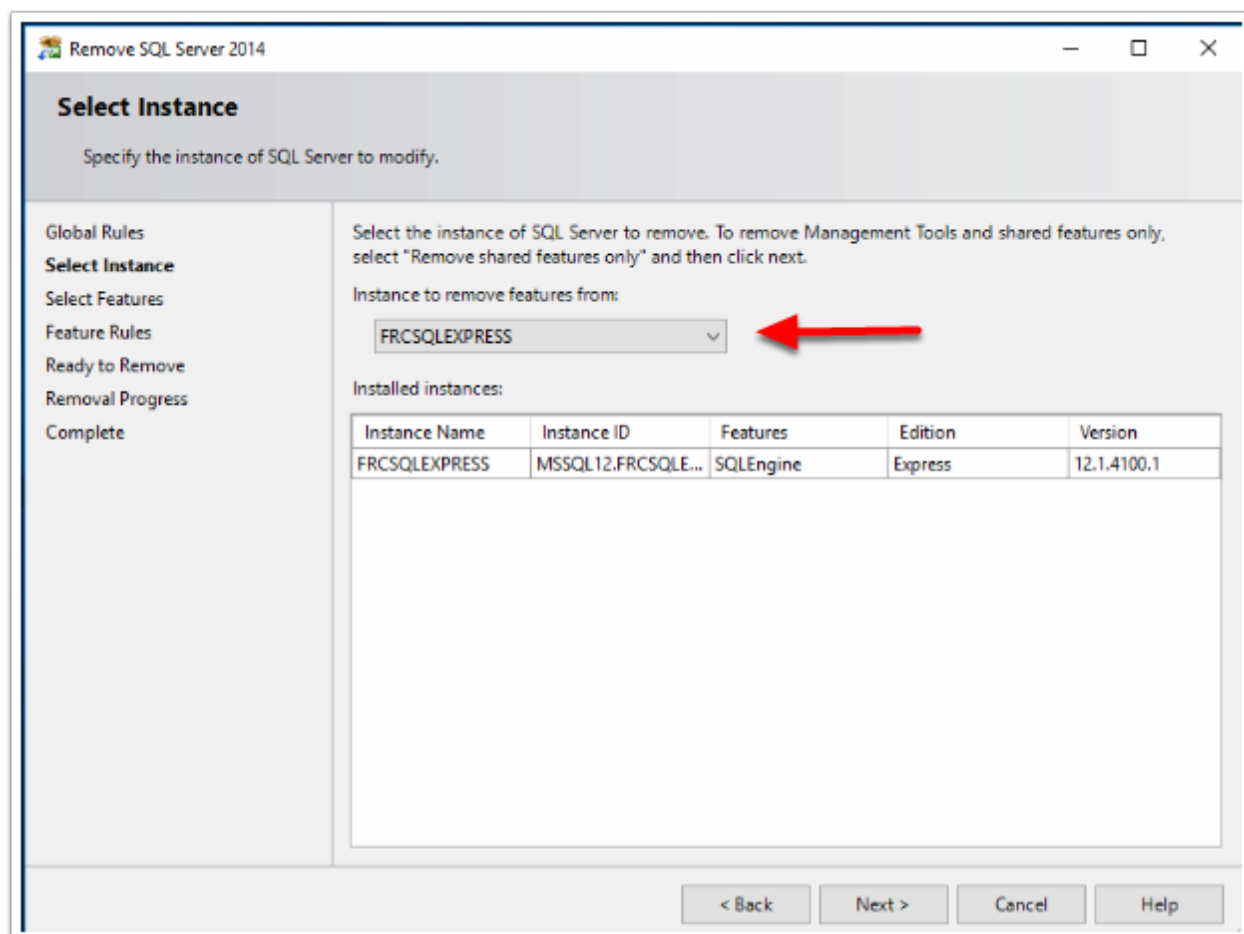
Using the machine's Control Panel, look for the previous edition of "FMS Off-Season" and select Uninstall. Upon successful uninstall, the screen at right will be shown.

21.8.2 Remove SQL Server 2014 (or 2016)

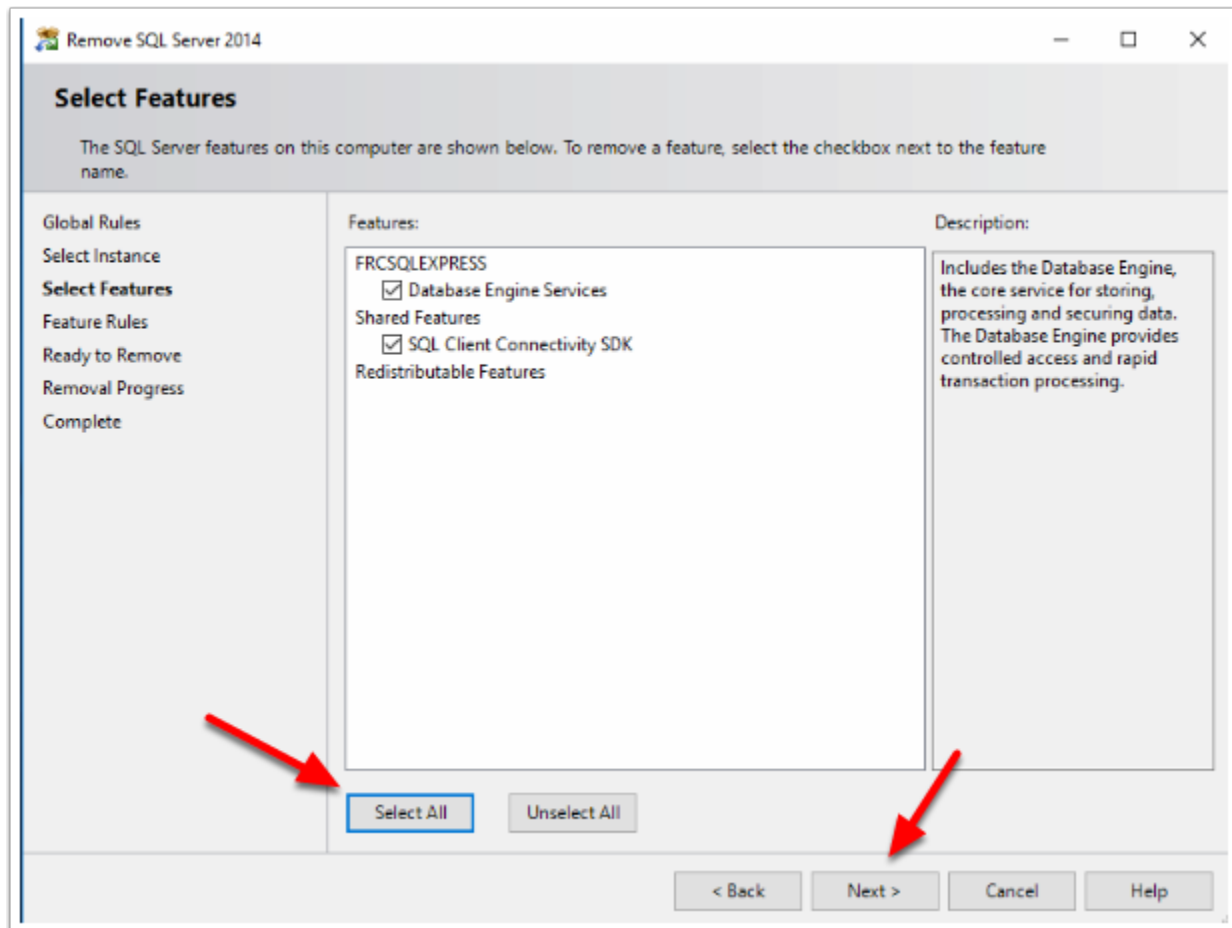
On your computer's Control Panel, navigate to Uninstall/Manage Programs, and find "Microsoft SQL Server 2014" in the list. Select "Uninstall/Change" and then "Remove" from the menu that appears. Depending on your machine, you may instead have Microsoft SQL Server 2016, but the same uninstall process should be followed.



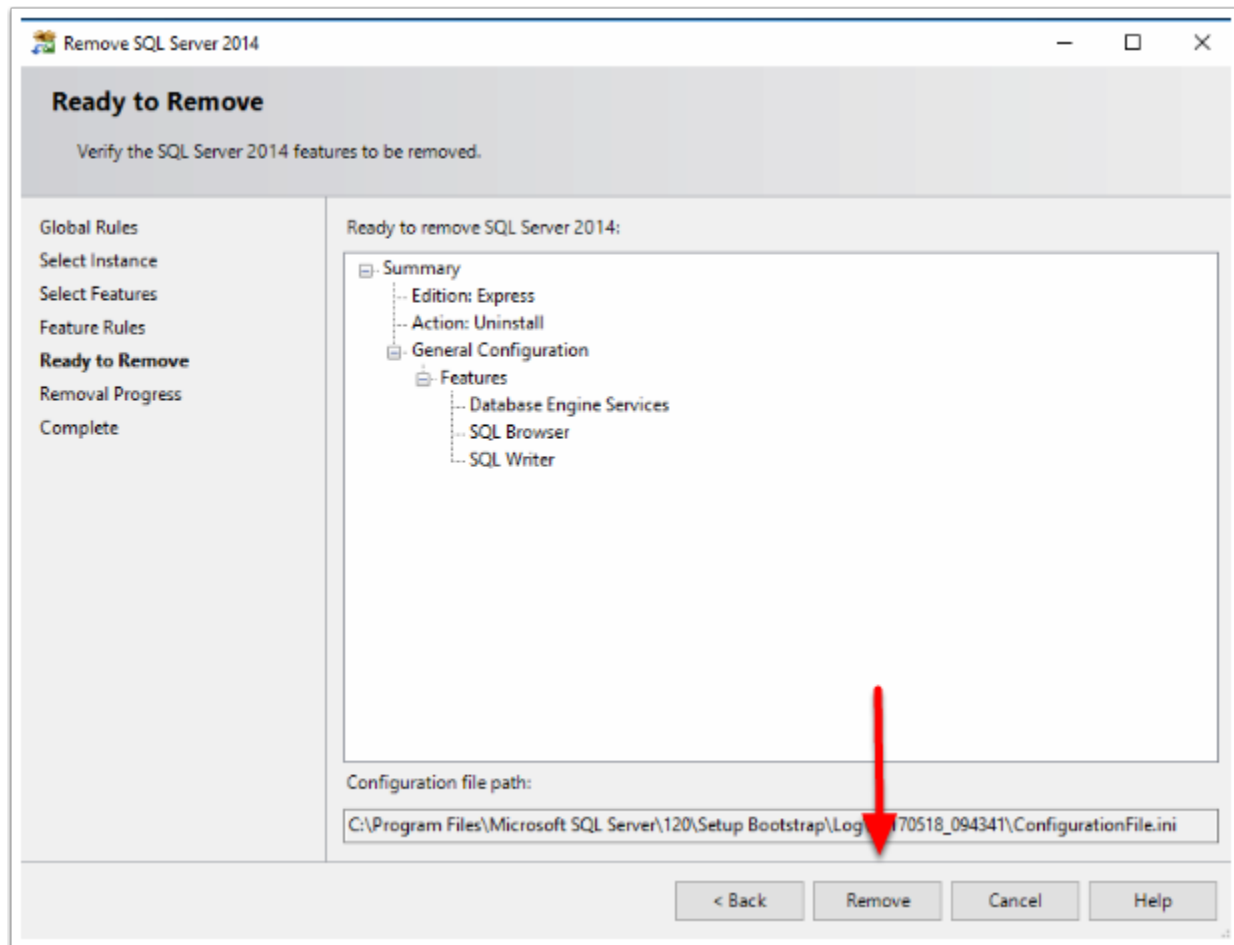
An instance selection panel will appear. Make sure "FRCSQLEXPRESS" is selected, then select "Next."



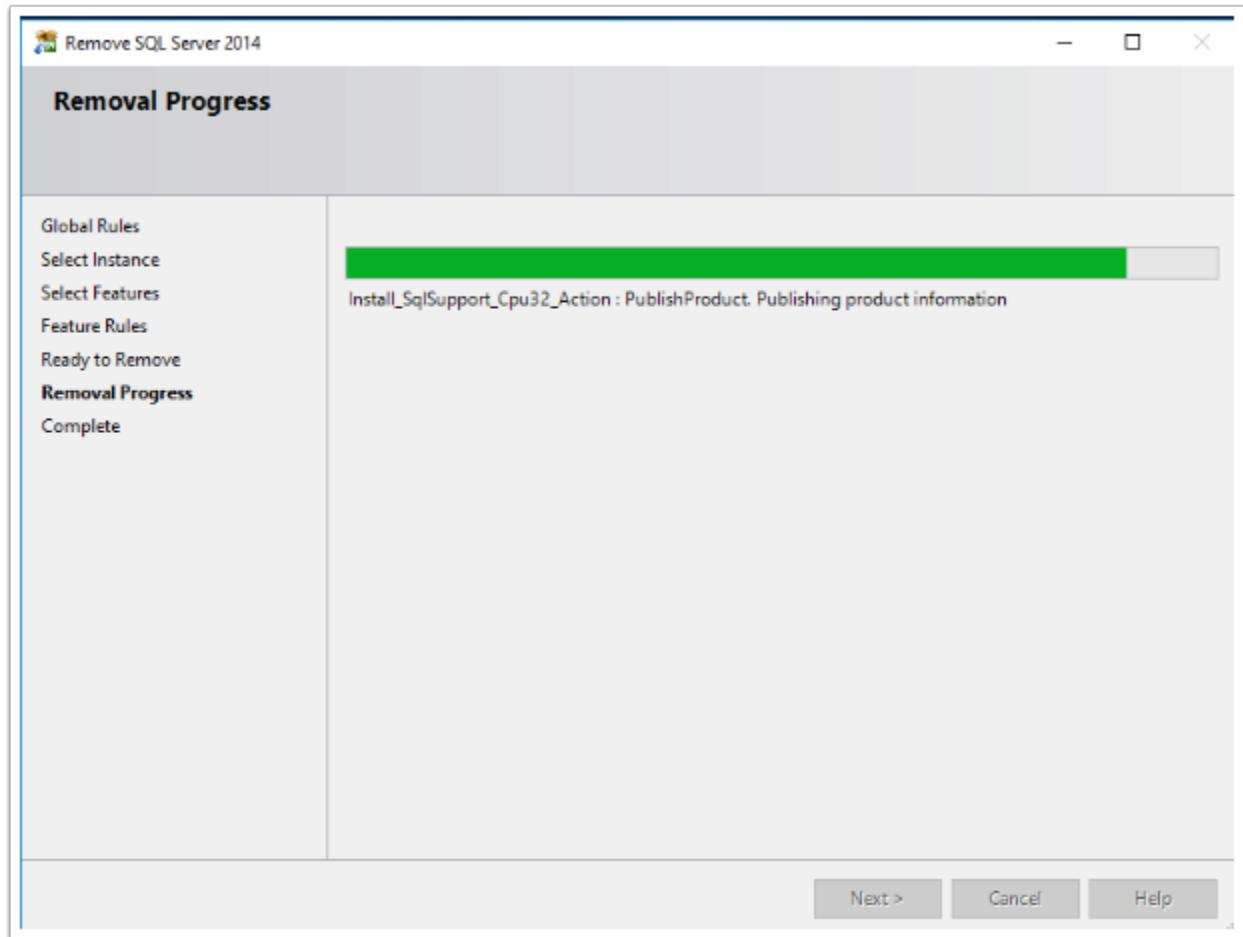
The Features menu will appear. Click the “Select All” button, then “Next.”



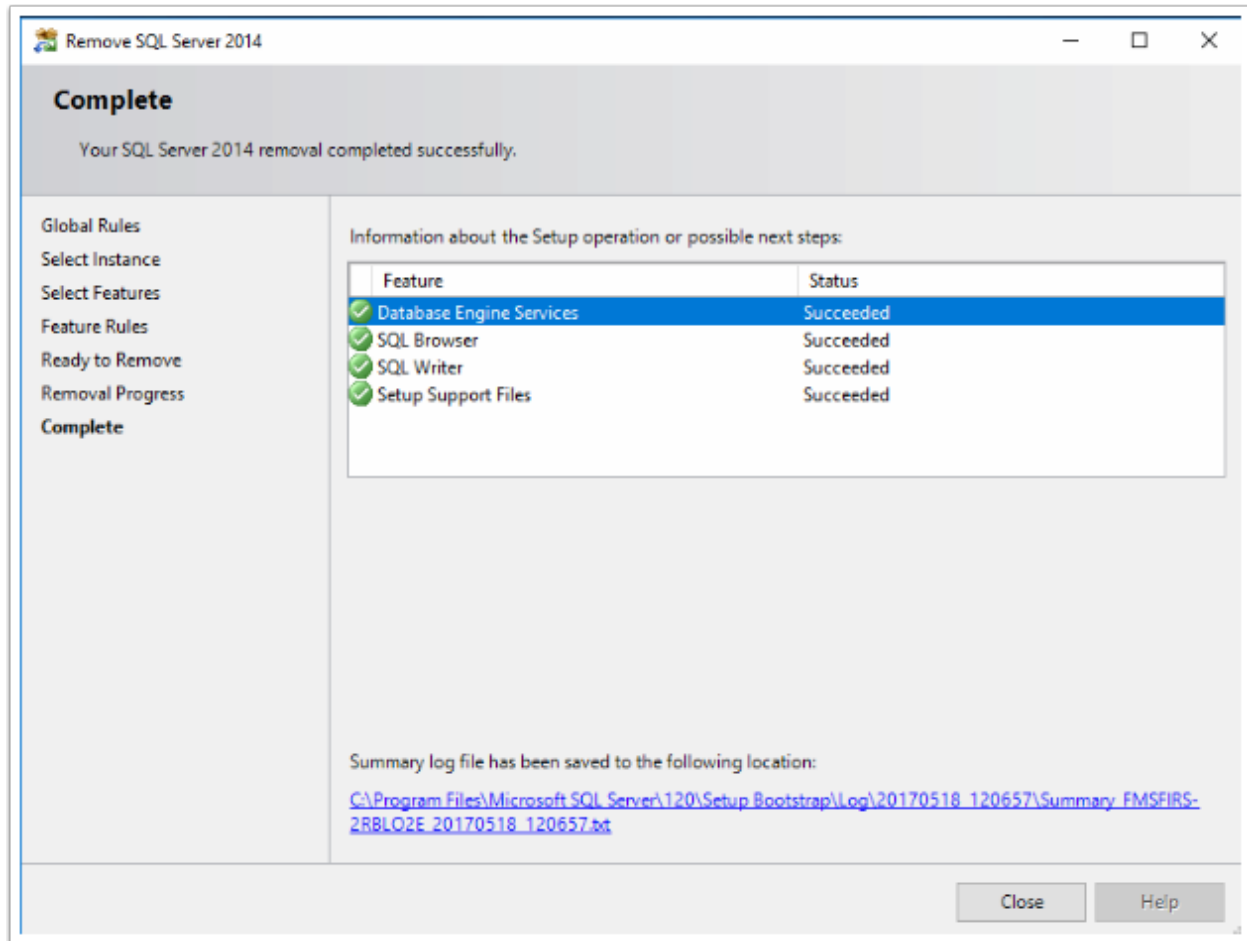
The confirmation screen will appear. Select “Remove” to begin the process.



Windows will configure the changes to remove the old FMS database installation.



When the changes are complete, you can click “Close.”



The FMS Off-Season installer will add the new version of the database to your machine as part of its standard installation process. There is no need to manually adjust other SQL settings prior to running the installer.

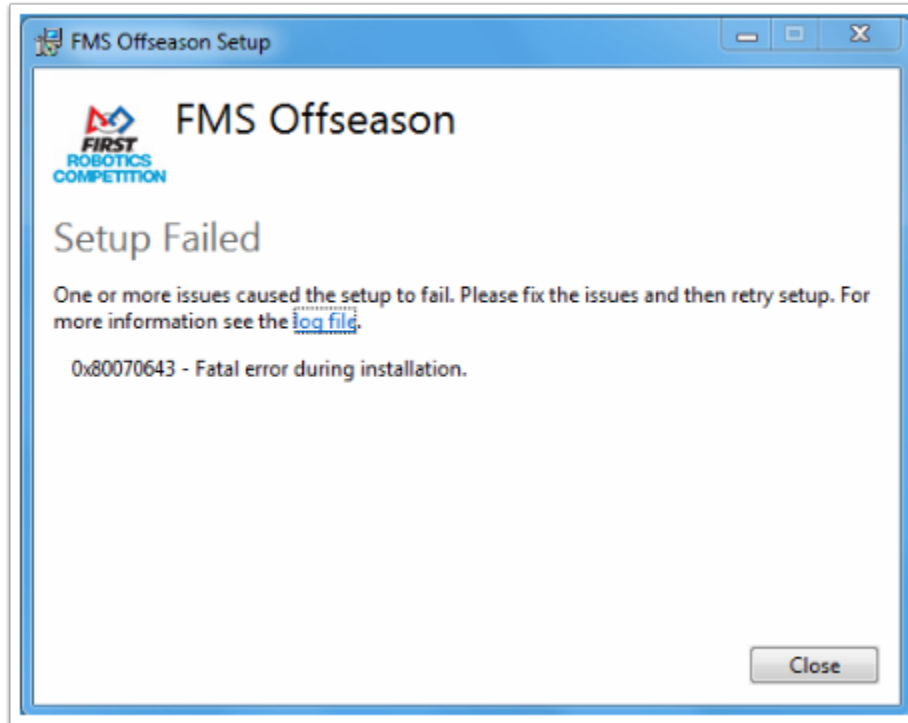
21.8.3 Reboot

Reboot the computer before continuing.

21.8.4 Installing FMS Off-Season

For information on installing the new version of FMS, please [go to this article](#).

21.8.5 Failed Installations



If your machine is not compatible, or the installer encounters other problems, you can review the log file for assistance. *FIRST*® HQ is not able to provide individual troubleshooting assistance.

SYNCING DATA WITH FIRST

22.1 Off-Season Availability

FIRST® allows Off-Season events (who meet requirements) to synchronize their data and results with *FIRST* HQ, similar to the way that *FIRST* posts results of official events during the competition season. Off-Season events that meet requirement criteria will be able to have their events included- meaning results will be posted to *FIRST* 's Event Results website (<https://frc-events.firstinspires.org/>) and API (<https://frc-api.firstinspires.org/v2.0/>). *FIRST* has many partners that use *FIRST* 's data to power their apps, such as The Blue Alliance or FRC® Spyder.

This is not available for versions of FMS installed on personal computers, our “FMS Off-Season” software. This is available only on official *FIRST* fields that were used at 2023 United States or Canadian competitions.

22.1.1 Requirements

The requirements for 2023 are still under development. Please come back as updates may be made before the off-season.

To apply and participate for the 2023 season, the Off-Season event must requirements that include:

- End before November 10th, 2023 and start after May 8th, 2023 (dates subject to change)
- Use an official *FIRST* field, with FMS and Electronics
- Have a 2023 certified *FIRST* Technical Advisor (FTA) present throughout the event
- Have a required minimum number of teams in attendance (read details on the application carefully, please)
 - Note that this process requires all teams participating at the event to have participated in the 2023 FRC Season. For “unofficial” teams (like a “pre-rookie” team or a “second robot” team), *FIRST* has reserved additional Team numbers, and they may be used to accommodate these teams. Off-Season events may not “take” a team’s number who isn’t attending the event*
 - * For example: If team 123 is not attending your event, but team 122 is, and brings a second robot, you cannot use team 123 for the second robot. This would miss-represent team 123’s record as they are not actually participating. Instead, team 122’s second robot could be any number in the reserved range of team numbers.*
- Steady wired (ethernet) internet must be available throughout the event, at the scoring table. This internet connection should have unrestricted/unfiltered access to ports 80 and 443 (data sync is not WiFi compatible, only hardline internet)
- *FIRST* Staff are not available for Support of Off-Season events, the FTA is the troubleshooting resource
- *FIRST* does not build custom software for specific Off-Season events, all scoring and software is written to match the most recent published version of the official Game Manual. Individual scoring point values are not adjustable.

Additional terms will be displayed on the application, and should be read in detail.

FIRST has additional information and policies regarding the rental and use of official fields for Off-Season events. They can be found in the Resource Library on the *FIRST* website.

22.1.2 Application

To apply for your Off-Season event to be included, please complete the following form at least 7 days before your event start date. Upon approval of your application, you can also add competing teams or adjust basic settings using information emailed to you by *FIRST* .

<https://frc-events.firstinspires.org/OffseasonEvent>

FIELD ACCESS POINT

23.1 Overview

The Wireless Access Point used at official FRC® competitions is the Linksys 1900ACS running customized OpenWRT firmware. In an attempt to provide a tested AP that can be used with FMS Off-Season, a modified version of the firmware used during the season has been released for teams or individuals to load on their devices.

This page provides an overview of the AP images. For download and installation information, please see [Loading OpenWRT](#)

While we have not yet had any issues with a device that could not be recovered using the [Recovery Procedure](#) in the 80+ devices we have flashed this season, please note that loading new firmware on a device or modifying device settings always carries some level of risk. Additionally, loading non-manufacturer provided firmware onto the device may invalidate your warranty.

The OpenWRT build used during the FRC season contained a specific set of drivers (including a specific patch developed to address an issue that was seen when used with the OM5P-AC) and modules that was tested to work with the OpenMesh OM5P-AN and OM5P-AC radios. This build also contained a set of default settings such as usernames and passwords, network configurations, and firewall configuration, that matched the desired configuration for the FRC season.

For offseason use, we are releasing 2 modified versions of our image that have been customized for specific use cases.

23.1.1 Off-Season Simple

The Off-Season Simple image has been modified to be used either standalone, or with FMS Offseason.

This image contains the same software used in the regular season image, but with the following modifications:

- Username and Password have been reset to the default of root/root
- Network configuration has been modified to a simplified, non-VLAN configuration
- Network configuration “flipped” (management network moved to single port) to better accomodate offseason or multi-computer use cases using the built-in switch.
- Wireless network has been simplified to a single SSID on each frequency (compared to 1 SSID per robot which is reconfigured each match)
- Firewall has been modified to allow access to the AP webpage/ssh from the single network and to allow the Non-FMS DS->Robot Control traffic through.

If you are looking for an image to use the Linksys 1900ACS with FRC robots and aren't sure which one you need, you very likely want Off-Season Simple.

23.1.2 Offseason VLAN

The Offseason VLAN image contains the same software used in the season image, but with the following modifications:

- Username and Password have been reset to the default of root/root

23.2 Loading OpenWRT

This article describes how to load the customized FRC® build of OpenWRT onto a Linksys 1900ACS wireless access point. This customized build contains versions of various components that have been tested to be (mostly) stable in the FRC use case. It also contains a default network setup (network and wireless configuration, firewall, DHCP, etc.) appropriate for many FRC use cases.

23.2.1 Acquiring the firmware

Go to one of the following locations to download a ZIP of the FRC firmware build.

[Off-Season Simple](#)

[Off-Season VLAN](#)

The filename of the image files will always be constructed using the following pattern:

frc-DESCRIPTOR-YEAR.MAJOR.MINOR-mvebu-armada-385-linksys-shelby-squashfs-IMAGETYPE

DESCRIPTOR is a description of the specific type of FRC image. “offseason_simple” is typically going to be the image you are looking for, this image removes all of the VLAN configuration from the network configuration and reverses the ports from the standard FRC image to allow the 4 ports on the AP to be used as a switch in offseason configurations. “offseason_vlan” is identical to the standard FRC image but with the username/password set to root/root and can only be effectively used with network hardware that is sending appropriately tagged packets over a VLAN trunk line plugged into the AP’s yellow port.

YEAR is the year of the firmware build

MAJOR is the major release number

MINOR is the minor release number. This is used for internal builds and should always be 0 on release builds

IMAGETYPE is the type of OpenWRT image. “factory.img” is the image that is used to switch to OpenWRT from the factory Linksys firmware. “sysupgrade.tar” is the image used to update an existing OpenWRT installation.

23.2.2 From Stock Firmware

The following section describes how to load the FRC OpenWRT image onto the device from the stock Linksys firmware.

Connecting to the AP (Default Linksys Image)

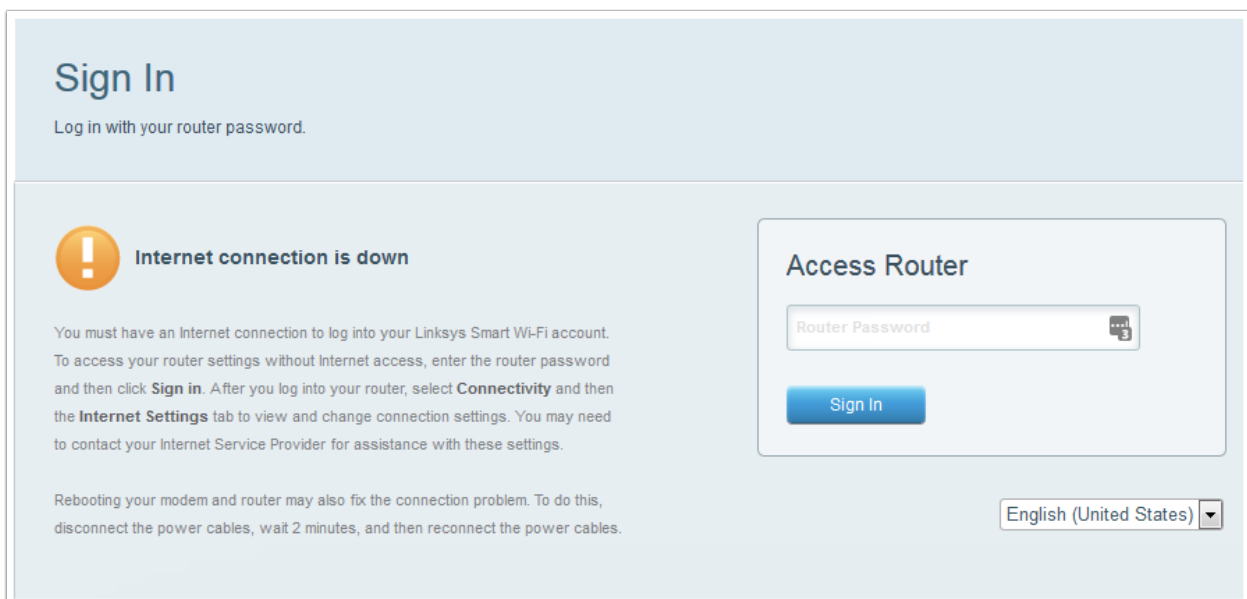


The most reliable way to connect to the AP is to set your computer to a static IP on the 192.168.1.* subnet. The AP is reachable at 192.168.1.1 so it is recommended to set your computer to 192.168.1.2 with a netmask of 255.255.255.0. Plug your PC into one of the 4 ports labeled “Ethernet” on the back of the AP.

Open a webbrowser and enter 192.168.1.1 into the address bar. The browser will automatically re-direct you to the Linksys setup page.

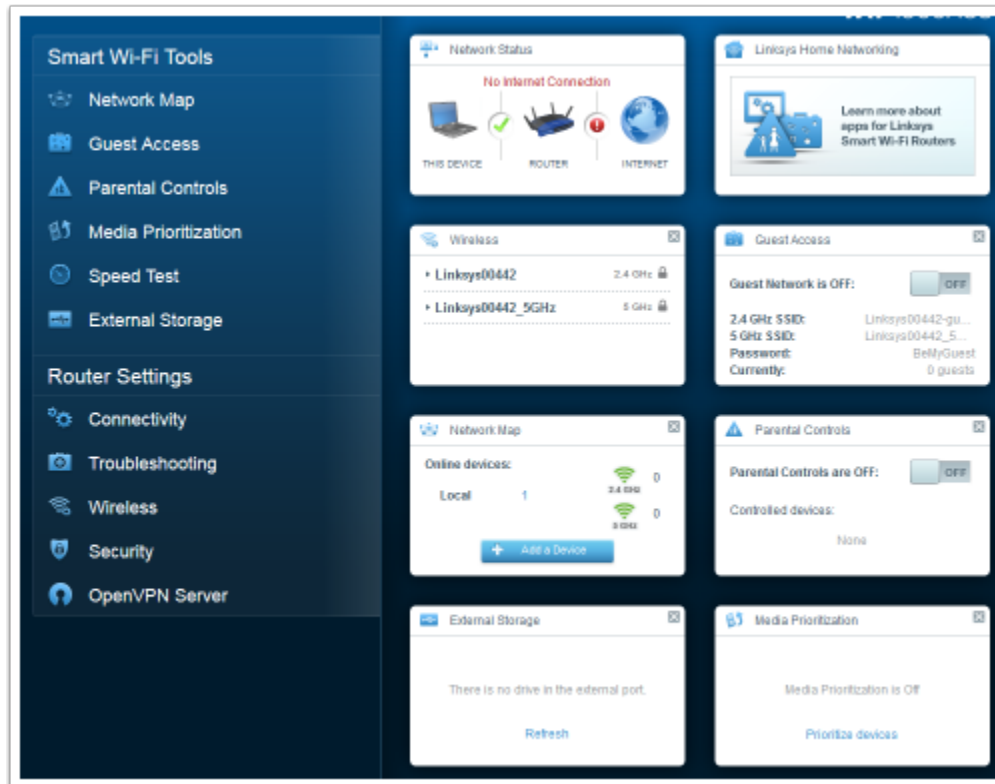
Check the top box to indicate that you accept the License, then click the Manual Configuration link the bottom left of the page.

Login



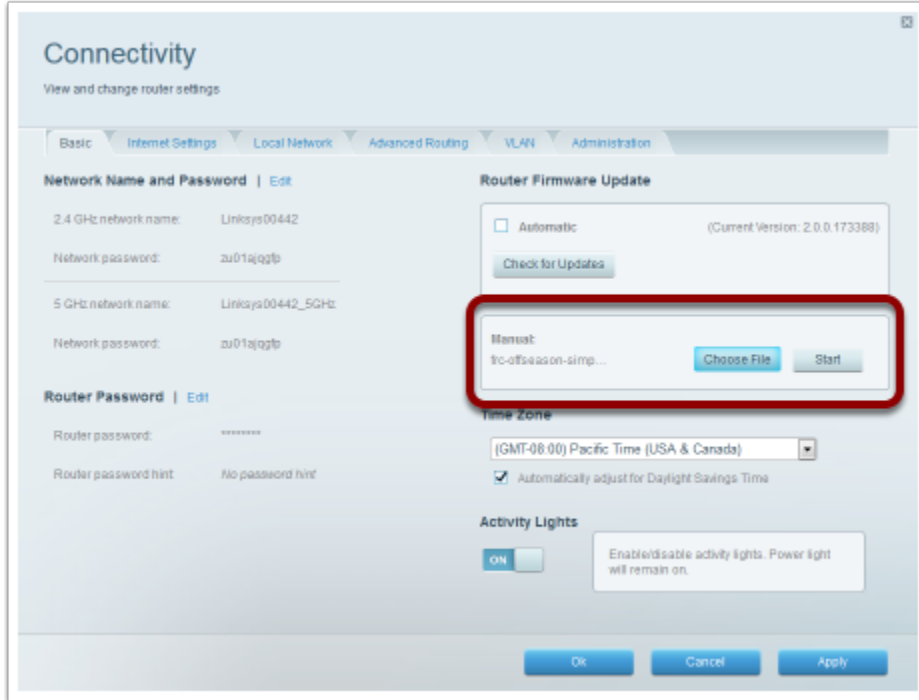
1. Wait for the internet connection attempt to time out, then click Login (screen not pictured).
2. Enter the default password “admin” and click Sign In.

Access flash page



Click on “Connectivity” in the navigation bar on the left side to access the firmware flash page.

Flash Firmware (Default Linksys)



1. In the Manual section, click Choose File and browse to the downloaded firmware image, the correct image should end in “factory.img”.
2. Click Start
3. In the dialog that pops up, click Yes.
4. In the next dialog that pops up, click Yes.
5. A progress bar will appear indicating firmware update progress. After it completes, click Ok.

To reconnect to the radio at the 192.168.1.1 address, you will need to move the Ethernet cable to the yellow “Internet” port on the AP. Alternately, you can change your computer back to DHCP to connect to the radio at 10.0.100.2

23.2.3 OpenWRT upgrade

The following section describes how to load the FRC OpenWRT image onto the device when OpenWRT has already been installed (including updating from previous FRC image).

Connecting to the AP (OpenWRT)

192.168.1.1/cgi-bin/luci

OpenWrt

Authorization Required

Please enter your username and password.

Username

Password

Powered by LuCI Master (git-16.237.78341-d5f8c9b) / FRC FieldAP 17.3.0 49928

For both a stock OpenWRT image and an FRC image, the most reliable way to connect to the AP is to set your computer to a static IP on the 192.168.1.* subnet. The AP is reachable at 192.168.1.1 so it is recommended to set your computer to 192.168.1.2 with a netmask of 255.255.255.0. If you are connecting to stock OpenWRT, plug your PC into one of the 4 ports labeled “Ethernet” on the back of the AP; if you are connecting to an FRC image, use the yellow port labeled “Internet”.

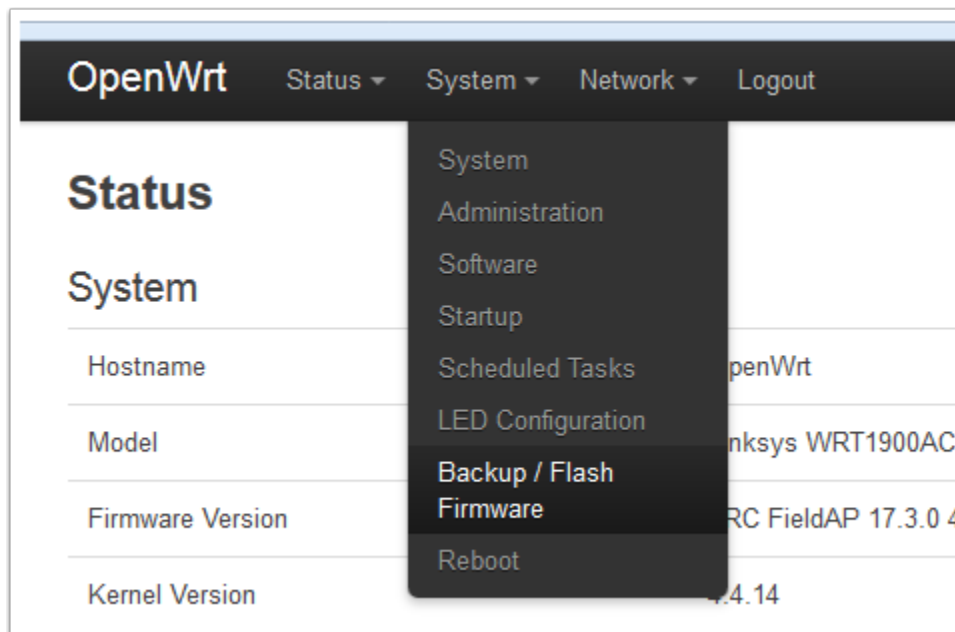
Open a webbrowser and enter 192.168.1.1 into the address bar. The browser will automatically re-direct you to the LuCI login page.

Username: root

Password: “root” (for an FRC image) or blank for default OpenWRT

Then click Login.

Flash firmware (OpenWRT)



From the System menu, select Backup / Flash Firmware

Flash new firmware image

Upload a sysupgrade-compatible image here to replace the running firmware. Check "Keep settings" to retain the current configuration (requires an OpenWrt compatible firmware image).

Keep settings: ☐

Image: No file selected.

1. Locate the Flash new firmware image section of the page
2. Uncheck the Keep settings box. This will erase any changes you have made to settings such as wireless network configuration, firewall, etc. but is required to get any updates to the FRC default settings.
3. Click Browse...
4. Locate the image file. The correct image will end in "sysupgrade.tar".
5. Click Flash image... and wait for the process to complete. If you are upgrading from a stock OpenWRT image, the page may never reconnect after the firmware flash. Wait about 5 minutes to be sure the process is complete, then change your connection to the yellow "Internet" port to reconnect on the 192.168.1.1 address or change your PC to DHCP to connect on the 10.0.100.2 address.

23.3 Default Settings

This article describes the default values of various settings in the FRC® Offseason Simple image for the Linksys WRT1900 ACS AP.

23.3.1 Network

Yellow "Internet" port: This port is configured with an IP of 192.168.1.1 (Note: The FRC Offseason Simple image is not intended to allow connectivity to the Internet from the field network by plugging an Internet connection into this port.). This port is intended as a maintenance connection in case any added firewall rules or network settings prevent access from the other interface.

4 "Ethernet" ports: These ports are bridged together and configured with an IP of 10.0.100.2

5GHz wireless: This network is bridged with the "Ethernet" network and accessible at the same 10.0.100.2 address

2.4GHz wireless: If enabled, this network is bridged with the "Ethernet" network and accessible at the same 10.0.100.2 address

23.3.2 DHCP

Yellow "Internet" port: DHCP disabled

4 "Ethernet" ports: DHCP enabled, will serve addresses on the 10.0.0.* subnet with a subnet mask of 255.0.0.0

5GHz wireless: same as "Ethernet"

23.3.3 Wireless

5GHz Wireless

SSID: OffseasonFMS

Encryption: WPA2 AES

Key: DefaultKey

Channel: Auto

Width: 20MHz

Hidden SSID: No

2.4GHz Wireless

DISABLED BY DEFAULT

SSID: OffseasonFMS24

Encryption: WPA2 AES

Key: DefaultKey

Channel: Auto

Width: 20MHz

Hidden SSID: No

23.3.4 Firewall

Firewall enabled by default with a default deny policy for traffic passing through. Allowed ports are the ports specified in the Game Manual, the network management ports allowed in the regular season firewall (e.g. ICMP, DHCP, etc.), plus the following additional ports:

- UDP 1110 - Used for DS->Robot traffic when not connected to FMS. This allows the AP to be used for non-FMS offseason scenarios

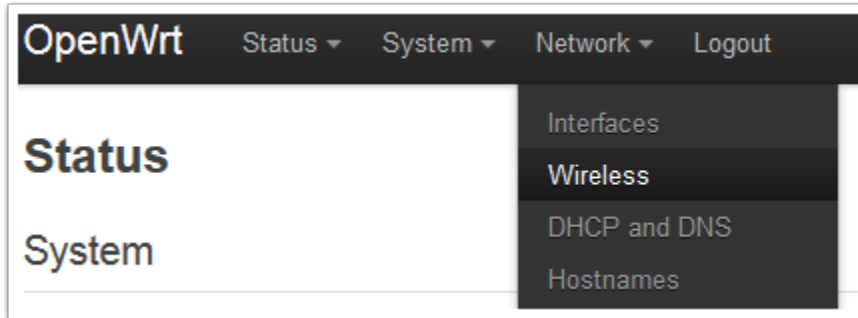
The default policy for traffic into/out of the AP (i.e. not through) is to allow. This allows you to connect to the AP webpage, SSH into the AP, etc.

This firewall policy means that many services will be blocked between the robot and DS such as SSH, code deploys, FMS controlling a DS connected wirelessly, etc.

23.4 Wireless Settings + Status

This article details how to view the wireless status and change the wireless settings for the FRC® OpenWRT image

23.4.1 Accessing the Wireless Overview



1. Using a web-browser, enter in the appropriate address based on how you are connected to the AP (192.681.1.1 for the “Internet” port, 10.0.100.2 otherwise). If the web page does not come up, make sure the AP is powered on (both plugged in and power switch turned on), and that your computer is set to an appropriate IP (192.168.1.* for the Internet port, DHCP otherwise).
2. Log in using the default username/password of root/root
3. From the AP home page, hover over the Network menu and select the Wireless entry to navigate to the Wireless Overview page.

23.4.2 Wireless Overview Page

 A screenshot of the 'Wireless Overview' page. At the top, it shows 'radio0: Master "OffseasonFMS"' and 'radio1: Master "FieldAdmin"'. The page title is 'Wireless Overview'. There are two main sections for radio interfaces.

 Radio 0 (radio0):

- Icon: 1
- Chipset: Marvell 88W8864 802.11nac (radio0)
- Channel: 157 (5.785 GHz) | Bitrate: 117 Mbit/s
- Buttons: Scan, Add
- Signal: 100%
- SSID: OffseasonFMS | Mode: Master
- BSSID: 62:38:E0:09:FE:82 | Encryption: WPA2 PSK (CCMP)
- Buttons: Disable (3), Edit (4), Remove

 Radio 1 (radio1):

- Icon: 5
- Chipset: Marvell 88W8864 802.11bgn (radio1)
- Channel: 11 (2.462 GHz) | Bitrate: ? Mbit/s
- Buttons: Scan, Add
- Signal: 0%
- SSID: FieldAdmin | Mode: Master
- BSSID: 62:38:E0:09:FE:83 | Encryption: WPA2 PSK (CCMP)
- Buttons: Disable, Edit, Remove

 Associated Stations (6):

	SSID	MAC-Address	Host	Signal / Noise	RX Rate / TX Rate
wlan0	OffseasonFMS	AC:86:74:39:EA:70	10.0.1.1	-10 / -94 dBm	130.0 Mbit/s, 20MHz, MCS 15 117.0 Mbit/s, 20MHz, MCS 14

The Wireless Overview page contains information about the status of the wireless adapters and networks of the AP as well as a few buttons to change settings:

1. 802.11nac radio: This section contains information on the status of the 5GHz adapter (channel and current bit rate)

2. **Wireless Network:** This section contains information on a specific wireless network on the adapter it is listed under. This information includes the SSID (network name) and encryption type
3. **Disable/Enable:** This button disables the particular network selected. If the network is currently disabled, this will change to an Enable button.
4. **Edit:** This button brings you to the Wireless Network page for the particular network where you can edit settings such as channel, SSID, security, etc.
5. **802.11bgn radio:** This section contains all of the same details as 1-4 above, but for the 2.4GHz adapter
6. **Associated Stations:** This section provides details on any clients currently connected to the AP wirelessly such as what SSID they are linked to, the client MAC address, the client IP address, the signal-to-noise ratio on frames recieved from the client and the RX rate (the bitrate the client is sending data at) and TX rate (the rate the AP is sending data to the client) of the client.

23.4.3 Wireless Network Page

Wireless Network: Master "OffseasonFMS" (wlan0)

The *Device Configuration* section covers physical settings of the radio hardware such as channel, transmit power or antenna selection which are shared among all defined wireless networks (if the radio hardware is multi-SSID capable). Per network settings like encryption or operation mode are grouped in the *Interface Configuration*.

Device Configuration

General Setup

Advanced Settings

Status

100%

Mode: Master | SSID: OffseasonFMS

BSSID: 62:38:E0:09:FE:82 | Encryption: WPA2 PSK (CCMP)

Channel: 157 (5.785 GHz) | Tx-Power: 23 dBm

Signal: -11 dBm | Noise: -94 dBm

Bitrate: 117.0 Mbit/s | Country: US

Wireless network is enabled

Disable

Operating frequency

Mode

Channel

Width

N

157 (5785 MHz)

20 MHz

Transmit Power

23 dBm (199 mW)

dBm

Interface Configuration

General Setup

Wireless Security

MAC-Filter

Advanced Settings

ESSID

OffseasonFMS

Mode

Access Point

Network

lan:

wwan:

create:

Choose the network(s) you want to attach to this wireless interface or fill out the *create* field to define a new network.

Hide ESSID

WMM Mode

Back to Overview

Save & Apply

Save

Reset

The Wireless Network page contains settings for the Wireless Adapter (top section) and specific wireless network (bottom section). Note that the Offseason image has 1 network per adapter by default.

- Operating Frequency: Contains the Channel and Channel Width settings for the wireless adapter. The image comes with this set to “auto” by default, but you may wish to do a channel scan (there are free applications available to do this on iOS, Android, PC, etc.) and choose the least congested channel. If you have at least 40MHz (2 channels) of clear space, you may wish to use this setting to minimize the chance of bandwidth issues.

Note: This AP image and the OpenMesh radio have only been tested using the Band 1 (36-48) and Band 3 (149-165) channels. Use of the Band 2 DFS channels is not recommended.

- **Transmit Power:** This setting is actually controlled by the legal limits embedded in the radio firmware and the setting on the web page has no effect.

Interface Configuration

- **Wireless Security Tab:** Clicking this tab will bring you to the Wireless Security settings (detailed below). Click General Setup to return to the pictured screen.
- **ESSID:** The SSID (network name) of the wireless network
- **Mode:** The mode the network is operating in. Should not be changed off of Access Point.
- **Network:** The OpenWRT “network” the Wireless Network is associated with. Should not be changed off of wwan
- **Hide ESSID:** Hides the SSID in the beacon frames. This means that this network will not show up or will be listed as “unknown” in the network listings of PCs, phones, etc. The OpenMesh radios are capable of connecting to the network even if the ESSID is hidden.
- **WMM mode:** Controls whether WMM is enabled or not. Leave this checked.

Note: After changing any settings on this page, you must click Save & Apply in order for the settings to be saved and loaded into the radio.

23.4.4 Wireless Security

The screenshot shows the 'Interface Configuration' page with the 'Wireless Security' tab selected. The 'General Setup' tab is also visible. The 'Wireless Security' tab contains three settings: 'Encryption' set to 'WPA2-PSK', 'Cipher' set to 'Force CCMP (AES)', and 'Key' set to a masked value (dots). A green double arrow icon is next to the 'Key' field. At the bottom, there are three buttons: 'Back to Overview', 'Save & Apply', 'Save', and 'Reset'.

The Wireless Security tab contains the settings for the security of the wireless network. To return to the general settings, click General Setup.

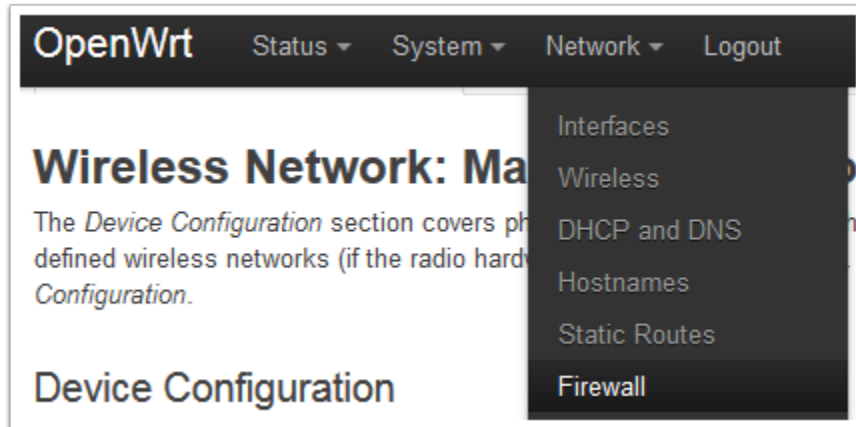
- **Encryption:** Controls the encryption scheme used for wireless security. It is recommended to set this to either Disabled (for no security) or WPA2-PSK (for enabling security)
- **Cipher:** Controls the cipher used with the selected security. Recommended to leave as Force CCMP (AES)
- **Key:** The encryption key used for the wireless security. Defaults to being displayed in dot-mode, click the green arrows to toggle to regular character display. TO change the key, enter the new key here and click Save & Apply below.

Note: After changing any settings on this page, you must click Save & Apply in order for the settings to be saved and loaded into the radio.

23.5 Firewall Settings

As detailed in the *Default Settings* article, the image comes with the firewall enabled by default. This article describes how to disable and re-enable the firewall. This article does not go into detail on how to add additional rules to the firewall, if you wish to do this, we recommend editing the `/etc/firewall` file directly (either via ssh or copying it off the device and then back on) and using the existing rules as a template.

23.5.1 Accessing the Firewall Page



1. Using a web-browser, enter in the appropriate address based on how you are connected to the AP (192.681.1.1 for the “Internet” port, 10.0.100.2 otherwise). If the web page does not come up, make sure the AP is powered on (both plugged in and power switch turned on), and that your computer is set to an appropriate IP (192.168.1.* for the Internet port, DHCP otherwise).
2. Log in using the default username/password of root/root
3. From the AP home page, hover over the Network menu and select the Firewall entry to navigate to the Firewall page.

23.5.2 Disabling the Firewall

General Settings
Port Forwards
Traffic Rules
Custom Rules

Firewall - Zone Settings

The firewall creates zones over your network interfaces to control network traffic flow.

General Settings

Enable SYN-flood protection ☒

Drop invalid packets ☒

Input

Output

Forward 1

Zones

Zone ⇒ Forwardings	Input	Output	Forward	Masquerading	MSS clamping	
lan: lan: ⇒ ACCEPT	<input type="text" value="accept"/>	<input type="text" value="accept"/>	<input type="text" value="accept"/>	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete
teams: wwan: ⇒ REJECT	<input type="text" value="accept"/>	<input type="text" value="accept"/>	<input type="text" value="reject"/> 2	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete

[Add](#)

3

[Save & Apply](#) [Save](#) [Reset](#)

To disable the firewall:

1. Set the default Forward rule to accept
2. Set the Forward rule for the teams zone to accept
3. Click Save & Apply

23.5.3 Re-enabling the Firewall

Firewall - Zone Settings
The firewall creates zones over your network interfaces to control network traffic flow.

General Settings

Enable SYN-flood protection ☒

Drop invalid packets ☒

Input: accept

Output: accept

Forward: accept **1**

Zones

Zone => Forwardings	Input	Output	Forward	Masquerading	MSS clamping	
lan: lan: => ACCEPT	accept	accept	accept	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete
teams: wwan: => ACCEPT	accept	accept	accept 2	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete

[Add](#)

3 [Save & Apply](#) [Save](#) [Reset](#)

To re-enable the firewall

1. Set the default Forward rule to reject
2. Set the teams zone forward rule to reject
3. Click Save & Apply

Warning: Setting other entries to reject may prevent you from accessing the AP web page and/or SSH. If this happens, you may be able to access the web page via the alternate address (192.168.1.1 on the Internet port vs 10.0.100.2 on the other ports.) If you are still unable to access the AP, you may need to perform the recovery procedure described in the [Recovery Procedure](#) article.

23.6 Recovery Procedure

In the event you are unable to access your AP that has been flashed with the FRC® OpenWRT firmware, there is a recovery procedure available to boot to the backup partition. This will restore all settings to the image defaults (as described in *Default Settings*) which should allow you to access the device again.

23.6.1 Recovery

1. Power off router with power switch.
2. Turn power back on and Power LED will light. As soon as all LEDs turn off (~2s), power off router with power switch
 - As soon as all LEDs turn off (~2s), power off router with power switch
3. Turn power back on and Power LED will light. As soon as all LEDs turn off (~2s), power off router with power switch
 - As soon as all LEDs turn off (~2s), power off router with power switch
4. Turn power back on and Power LED will light. As soon as all LEDs turn off (~2s), power off router with power switch
 - As soon as all LEDs turn off (~2s), power off router with power switch
5. Turn power back on and allow router to fully boot. It should now be booted to the alternate firmware partition
 - It should now be booted to the alternate firmware partition

OVERVIEW

The Scorekeeper Reference documentation IS NOT an exhaustive tome of all knowledge regarding Scorekeeper best practices, helpful life lessons, or anything you should take with you if you're ever trapped on a deserted island. Instead, this document is intended to provide some guidance and helpful reminders for completing your role as a Scorekeeper.

THANK YOU very much from all of us at *FIRST*® for volunteering your time and unique skills to guide our events!

24.1 Purpose

The purpose of this “Scorekeepers Reference” section (including the step-by-step) is to give FRC® Scorekeeping volunteers a handy reference guide and materials to supplement the more detailed information that can be found in the full User's Guide.

24.2 Usage

This guide may be of help to Off-Season events, but is designed for official in-season events.

In the Step-by-Step section, “Days” designated to specific steps are assuming a traditional regional schedule and may not apply to a condensed (district) schedule.

Prior to an event, Scorekeepers may find it helpful to export this documentation to be printed or saved on a personal device. To export, click on the ‘Read the Docs’ label in the bottom-left corner of the page to open the panel.

The screenshot shows the FMS Manual website. The left sidebar contains a navigation menu with the following items: **Field Management System Manual**, **FIRST ROBOTICS COMPETITION**, **latest**, **Search docs**, **OVERVIEW AND KEY TERMINOLOGY**, **Overview and Key Terminology**, **EVENT MANAGER (FMS)**, **Navigation and Indicators**, **Event Wizard**, **Match Play/Test**, **Match Review**, **Field Test**, **Reports**, **Settings**, **About Tab**, **FAQ**, **AUDIENCE DISPLAY**, **Configuration**, **Displays**, **OBS Integration**, and **Read the Docs** (highlighted with a red box). The main content area displays the **FMS Manual** title, an **Important** notice, and sections for **Overview and Key Terminology** and **Event Manager (FMS)**.

FMS Manual

Important

Please note that this FMS documentation is *in progress* of being updated for 2023. Read at your own risk.

Overview and Key Terminology

- Overview and Key Terminology
 - Disclaimer
 - About FMS Documentation and Notes
 - Terminology

Event Manager (FMS)

- Navigation and Indicators
 - Tab Navigation
 - Indicators
- Event Wizard
 - Event Wizard Navigation
 - Data Download
 - Event Selection
 - Team Selection
 - Build Schedule
 - Run Match Maker
 - Activate Schedule
 - Award Assignments
 - Alliance Selection
 - Alternate Substitution
 - Wildcards

In the panel you can select either a PDF or HTML version to download.

The screenshot shows the FMS Manual website. The sidebar on the left contains the following sections:

- Field Management System Manual** (with the FIRST Robotics Competition logo)
- latest
- Search docs
- OVERVIEW AND KEY TERMINOLOGY
 - Overview and Key Terminology
- EVENT MANAGER (FMS)
 - Navigation and Indicators
 - Event Wizard
- Read the Docs (v: latest)
 - Versions
 - latest
 - Downloads
 - PDF HTML
 - On Read the Docs
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The main content area on the right shows the following structure:

- FRC Game Manual FRC Game Q&A
- » FMS Manual [Edit on GitHub](#)
- FMS Manual**
- Important**

Please note that this FMS documentation is *in progress* of being updated for 2023. Read at your own risk.
- Overview and Key Terminology**
 - Overview and Key Terminology
 - Disclaimer
 - About FMS Documentation and Notes
 - Terminology
- Event Manager (FMS)**
 - Navigation and Indicators
 - Tab Navigation
 - Indicators
 - Event Wizard
 - Event Wizard Navigation
 - Data Download
 - Event Selection
 - Team Selection
 - Build Schedule
 - Run Match Maker
 - Activate Schedule
 - Award Assignments
 - Alliance Selection
 - Alternate Substitution
 - Wildcards

Note: Due to the dynamic nature of this documentation, for those that choose to download, it is recommended to check for updated documentation prior to each event.

24.3 FMS Overview

The Field Management System (FMS) is the electronics core of a *FIRST*® Robotics Competition (FRC) playing field and encompasses both hardware and software components. The software package is used to control all the field electronics (LED Displays, Station Control Cabinets, E-stops, enable/disable of the Robots, network security, etc.) and is used to manage the event by creating match schedules, scoring the matches in real-time, and posting information to the Audience screen. The Scorekeeper, with direction and guidance from the FTA, manages the FMS during an FRC event.

SCOREKEEPER STEP-BY-STEP

Note: This document may contain links that begin with “10.0.100.5” but look like traditional web links. These links will only work when attached to an FRC field.

Note: If you leave the FMS Computer unattended (such as for lunch break) please be sure to “Lock” it using the Windows Key + “L” to protect the scoring data.

25.1 Setup (Day 0)

For a three-day Regional event, setup is done on the day preceding the Practice matches; Program Delivery Partners can choose to also allow pit load-in during setup, but this does not affect setup activities. For a two-day District event, setup may happen on the same day as Practice matches and robot Inspection. For the purposes of this document, setup is just considered the “setup activity” and is not specific to event type.

25.1.1 Setup Process

1. Check in with your FTA and find out if the FMS System has been setup.
2. Launch the FMS Event Manager software (if not already loaded).
3. Check that the FMS is connected to the internet.
 - If the FMS does not have an internet connection, jump to the **Network Troubleshooting** section.
4. Once the FMS is set up and connected to the internet, contact FRC Support via Slack to determine if there are any updates or maintenance that needs to be done for your event.
 - It may be possible to perform a successful Data Download at this time, however, you should not update FMS or create the Event Database until FRC Support has approved these actions.
5. Once the Event Database has been created, start setting up the Audience Display.
 - If an FMS update was required, you will also need to update the Audience Display. This can be done using the “Check for Updates” button within the Audience Display configuration panel.
 - If the Audience Display application is not already on the computer, connect to the FMS Network and navigate to <http://10.0.100.5/FRCDownloads> where you can download the current Audience Display installer.
 - A/V or Webcast may need to run their own Audience Display. They can follow the same process to get an up-to-date version of the Audience Display

- Create a folder on the Desktop where you can store commonly accessed reports, like team lists and schedules.
6. Launch the Primary Audience Display software and configure the display(s) using the following hotkey combinations. Note that the Audience Display does not run on the FMS Server, but rather the laptop with the “Audience Display” sticker. At some events, the A/V department may be responsible for this setup.

CTRL-SHIFT-F12	Load Configuration Panel
CTRL-SHIFT-C	Load Configuration Panel
CTRL-SHIFT-1	Center AD on Primary Display
CTRL-SHIFT-2	Center AD on Secondary Display

7. Within the FMS Event Manager software, click the “Field Test” button at the top of the application and ensure all of the hardware is online.
 - All component LEDs should be Green. You may need to click “Refresh Indicators” to get updated information.
 - Any elements under “Field Hardware” that remain Red may need HQ Support to help troubleshoot.
 - The FTA should help troubleshoot all components of the Field.
8. Run Match Test to confirm that all field components operate correctly. This process should be coordinated with the FTA.

Note: You cannot access the Match Test area (the button will not become active) until the Data Download (Step 1) has been completed, an event is selected, and the database has been created (Step 2). Contact FRC Support for assistance if this has not been completed yet.

9. Coordinate with the FTA and A/V to ensure that all game sounds play correctly. You can use the “Test Sound” buttons within the Audience Display configuration panel, or use the continuous sound player in the Audience Display jump menu (right-click the Audience Display icon in the task bar).
10. Verify the printer is working correctly.
 - Locate and stage additional paper for easy access
 - If toner begins to run low (such as streaking or gaps on printed pages) open the printer and shake the cartridge, then re-install and attempt to print again. This often results in additional pages before swapping the toner.
 - When toner is replaced, place the old toner back in the box and clearly label is “USED” in Case 07. Be sure to ask your FTA to note this in their event report.
11. Complete the Practice Team Selection step in the Event Wizard. Check with Event Management to make any necessary changes (add/delete) to the list of participating teams.

Important: Verify with the FTA before making any changes.

12. Generate Practice Match schedules (be sure to use the Lunch checkbox if applicable) and activate the Practice schedule (Steps 3 through 6 in the Event Wizard) and print out sufficient copies to distribute to teams (from the “Reports” button at the top of the application). In some venues, the Pit Admin may only need a single copy of the schedule and they’ll go and make copies. Work with the Event Manager and the FTA to ensure that the Practice Match schedule works within the overall timeframe of the practice portion of the event.

13. Work with the FTA to determine if you need to print the Announcer's Report for practice matches. Often this is not necessary.
14. Work with the FTA to ensure that the WPA Kiosk(s) have been set up. The WPA key file can be imported to the kiosk via the FMS network or exported from the "Practice Team Selection" step from the Event Wizard. Most FTAs will prefer to import the key file over the network.
15. Ensure the Backup Configuration settings have been set.
 - Select "Settings", click on the "Backup" tab, and click "Browse" to set a backup location.
 - This MUST be on a thumbdrive or other external storage.
16. For events that move directly from Setup to Practice, go on to Practice. For all others, determine when you will be leaving for the evening.
 - When you leave for the evening, please put the field lighting into "Night Mode". You can access "Night Mode" from within the "Settings" page, the button marked "Night Mode" is under the button marked "Awards Mode" in the center top of the application.

25.1.2 Network Troubleshooting

Please consult with your FTA or seek advice from FRC Engineer via Slack if Network Troubleshooting is needed.

25.2 Practice (Day 1)

During Practice, teams will come to the Practice Field and run their robots according to a set Practice Schedule. The actual schedule isn't "set in stone", and different event types (Regional vs District) will run Practice differently. It's recommended to run all Practice matches within a Practice schedule to allow the FMS to log match data and robot data so that FTAs and HQ can examine robot and/or field problems through the match logs.

25.2.1 Practice Process

1. Check in with the FTA.
2. Launch the FMS Event Manager software (if not already loaded).
 - Check with HQ Support to determine if any FMS updates or other software updates/maintenance is required.
3. On the Audience Display Toughbook, load the Audience Display software (if not already loaded). For additional information about how to configure the Audience Display, see the corresponding section in the [the setup step](#)
4. Run a Test Match to confirm all field components operate correctly. This process should be coordinated with the FTA. This may be an abbreviated version of the test conducted during Setup depending on the time available and FTA preferences.
5. Check with Event Registration and make any necessary changes (add/delete) to the list of participating teams.
 - Regenerate the Practice Match schedule if there are any additions to the team list.
 - Deletions do not require a regenerated schedule for Practice Matches.

Important: Verify with the FTA before making any changes.

6. Ensure the Practice Schedule is Activated in the Event Wizard.

7. Field Calibration: Teams will be given an amount of time where they can come and take measurements or calibrate their sensors. This process is overseen by the FTA, but Scorekeeper presence for safety is appreciated.
 - The FTA should be overseeing this and handling Q/A about this time. For situational awareness: robots may be turned on - but may not drive, extend outside frame perimeter, or interact with field elements/notes. [Rule T301] Not required, but is nice to NOT have the field in night mode - so it is lit more like it will be during matches for those doing camera calibrations.
8. Lunch Break
9. Practice Matches
10. Generate a Qualification Match schedule using the corresponding steps in the Event Wizard.

Important: Verify the FMS Server is set to the correct timezone. FMS will warn you in the event of timezone irregularities, do not click through. If there is a timezone mismatch issue contact FRC Support immediately.

- Be sure to use the Lunch checkbox in the Schedule Break during the Lunch period!
 - Print out sufficient copies of the Qualification Schedule Report to distribute to teams. In some venues, the Pit Admin may only need a single copy of the schedule and they'll go and make copies.
 - Print out any copies needed for queuing and field staff
 - Work with the Event Manager and FTA to ensure that the Qualification Match schedule works within the overall timeframe of the event (start/end times, lunch period, etc.).
 - If you activated the Qualification Schedule as part of this process, but have not yet completed Practice Matches, return to the Event Manager and re-activate the practice match schedule. This is necessary in order to continue playing through the Practice schedule.
11. End of Practice
 - In the "Settings" view, using the "Backup" tab, use the "Force Event Backup" button to force a full event backup for the end of practice matches.
 - Work with your FTA and Pit Admin to encourage teams who were unable to attend their practice matches to come to the Field for a connection test. These are often held after the published Practice schedule or right before Qualification matches start. You can view teams who have not connected using the WPA Status report on the Reports tab.
 - If doing connection tests, note that the team will need to bring their DS and Robot, and the radio must be programmed for this event. They do not need to have passed inspection. You can perform their radio connection test using the Match Test interface.
 12. End of Day * Check with the FTA to determine if power will remain on or will be shut off overnight. If power to the field will be turned off, shutdown the Scorpion server with direction from the FTA. Otherwise, put the field in Night Mode.

25.3 Qualification (Day 2) and Alliance Selection (Day 3)

At most all events, Qualification occurs over more than one day; typically qualification runs for one full day and up through lunch on the second day. The Qualification Schedule is generated on the day preceding the beginning of Qualification, if possible. It is extremely important that all teams on the Qualification Schedule are present and will be participating in the Qualification matches. If one or more teams that are appearing on the Qualification Schedule leave the tournament prior to the start of the Qualification matches, the Qualification Schedule should be regenerated to remove the missing team(s). Work with your FTA to ensure all teams participating are present and ready.

25.3.1 Qualification

1. Check in with the FTA.
2. Launch the FMS Event Manager software (if not already loaded).
 - Check with HQ Support to determine if any FMS updates or other software updates/maintenance is required.
3. On the Audience Display Toughbook, load the Audience Display software (if not already loaded). For additional information about how to configure the Audience Display, see the corresponding section in the *the setup step*
4. Run a Test Match to confirm all field components operate correctly. This process should be coordinated with the FTA. This may be an abbreviated version of the test conducted during Setup depending on the time available and FTA preferences.
5. Make sure the Qualification Schedule is activated within the Event Wizard.
6. Export the Qualification Schedule in Excel format for the Match Observer judges. The Match Observer judges will bring a USB Flash Drive to the scoring table once the Qualification schedule has been created (likely before), please save a copy of the qualification schedule in Excel format to their USB Flash Drive.
7. Print a copy of the Award Eligibility Report for the judges.
8. Work with your FTA and Game Announcer to determine if the electronic GA Tool will be used.
 - If the GA Tool is not being used, generate and print the Announcer's Report for Qualification Matches.
9. Print the Qualification Match schedule, if not done already
10. It may be necessary to select the first Qualification Match in the schedule before prestarting the first match.
11. Once all robots link to the field, the green LEDs turn off only if you're in "Set Audience Display." "Set Audience Display" is also required in order for the Field Stack Light to turn Green.
12. Play the Qualification Schedule
13. When you reach the end of Qualification Day 1:
 - Use the "Settings" button, "Backup" tab, "Force Event Backup" button to ensure the event database is backed up.
 - For three-day Regional events only, load in the Friday Award winners.
 - Navigate to Step 11 in the Event Wizard
 - If the Judge Advisor has uploaded the awards, you can click "Download Judge's Award Assignments" otherwise you will need to enter the award assignments manually.
 - During the Awards Ceremony, put the field lights into "Awards Mode."
 - Check with the FTA to determine if power will remain on or will be shut off overnight. If power to the field will be turned off, shutdown the Scorpion server with direction from the FTA. Otherwise, put the field in Night Mode.

14. When you reach the end of Qualification Matches (and are headed into Alliance Selection):
 - Using the Optins tab in Match Play select “Recalculate Rankings” for the qualification matches
 - Use the “Settings” button, “Backup” tab, “Force Event Backup” button to ensure the event database is backed up.
 - Print the Qualifications Ranking report for the Announcer and Emcee as soon as the final qualification match has completed.
 - Use the Alliance Selection step in the Event Wizard to set alliances as they are picked.
 - Use the video switcher on the alliance wizard step to select the Hybrid Alliance display onto the audience screens during the Alliance Selection ceremony.
 - Verify what time the Playoff matches will start with your FTA so that the schedule can be constructed as soon as alliances have been selected
15. Immediately following the Alliance Selection process, quickly build the playoff schedule so that the Backup Robots report and Playoff Coupon report can be printed out. Verify that the cycle time is set to 9 minutes.
 - All that needs to be known is the time which Playoff matches will begin, and the number of matches in playoffs is always the same. Matchmaker is not used in Playoff Match Generation.
 - The Backup Robot report must go to the Head Referee immediately (so that they can hand it to another Referee or Queue staff to handle backup robot acceptance)
 - The Playoff Coupons and Lineups are to be distributed to alliance captains (via the Head Referee). They will need the following items (cut and ready for them): Playoff Coupons, Lineup Cards, 8 Schedules and 8 Brackets
 - Keep the Backup Robot report in a safe spot near you once it has been returned by the Referees (which may not be until after lunch)
 - Print some additional Brackets and Schedules for queuing and field staff
16. Activate the Playoff Match Schedule (Event Wizard Step 14).
17. Print Playoff Schedules and initial Announcer reports if the GA tool is not being used (save the paper if you can!)
18. Before you leave for lunch, use the video switcher to display the Bracket

25.4 Playoffs (Day 3)

Playoffs are a double-elimination tournament consisting of six rounds. After each round, new schedules (for queue staff) and Announcer report (unless the GA Tool is in use) should be printed.

25.4.1 Playoffs Process

Stay calm, stay hydrated, enjoy the matches. You’ve got the best seat in the house!

1. If the Announcer is not using the electronic GA Tool, Announcer Reports should be printed at the beginning of each round.
2. Limited numbers of schedules should be reprinted for queue staff and essential personnel at the beginning of each round.
3. Bracket Reports should be printed for the Head Referee and Game Announcer as needed.
4. Field Breaks should be employed between rounds as follows:

- 6-minute Break after rounds 3 and 4
 - 15-minute Awards Break after remaining rounds and between finals matches
 - Timers should start as soon as the field is cleared (or as soon as scores are posted if delayed by ref discussions)
 - Coordination may need to be organized between the scoring table and additional AV staff to make sure the timer bar is visible on screen when the timer is running.
5. Alliance Captains should be submitting lineup cards directly to the Head Ref (or their designee) more than 2 minutes before match start.
- The Head Ref should identify a lineup card designee to Alliance Captains during their meeting after alliance selection.
 - It is on the Alliance Captains to deliver them to the right person & one-time.
 - Head Ref display shows the countdown to 2-minute mark in the bottom right corner - and the accepting back-up robot coupon / lineup card boxes in the bottom right. As someone keeping an eye on match flow - it is good for scorekeepers to make sure the timer was started between matches.
 - Lineup Cards need to be kept confidential until Match Pre-Start occurs
 - If no lineup card was submitted in time for the next match - alliances default to their most recently submitted lineup card
 - If no lineup has yet been submitted in eliminations - default station positions are Station 1 - First Alliance Pick, Station 2 - Alliance Captain, Station 3 - Second Alliance Pick
 - Suggestions for keeping lineup cards organized are to keep one pile of most recent lineup cards (one per alliance) face down on desk. As teams submit new lineups or are eliminated the previous/no longer needed lineups can be folded or have a notch torn in them and placed in a second pile or paper clipped together. In case they need to be referenced later.
 - Also good idea to verify/add match# you first used it to each lineup card if the alliance captain wasn't clear in what they wrote.
6. If an Alliance submits a backup robot coupon - they get the first available robot that signed their agreement to be a backup bot.
- The backup robot coupon should come with a new lineup card and also be delivered to the Head Ref or their designee.
 - The Head Ref/FTA will probably ask about who is first on the list before the coupon is officially submitted to the scoring table for use.
 - Return to Event Wizard and Select Alliance Membership (Step 15) before prestarting the match where the new robot will be coming in.
 - Select radio button next to the team subbing out and enter the backup team number into the Round 3 / Backup slot.
 - Select "Save Alliances" and once you verify changes - return to match play.
7. In case of a tie during eliminations - the tiebreakers found in [Rule 10.6.2.1] should be utilized by the Head Ref
8. Awards will be announced during 15-minute awards breaks after round 4, 5, and between finals matches.
- Before leaving Match Play select "Start Break" on the FCUI, and make sure the audio is deselected (so it does not sound the horn during the awards ceremony)
 - Open the Event Wizard and navigate to the award assignment step
 - Set the field the Awards Mode

- Follow along with the Awards Ceremony and display awards accordingly
- Return Match Play after Awards are complete
- Note: FMS will automatically populate the Winners and Finalists once they have been determined

25.5 Awards

Awards are a key component of the *FIRST*® Robotics Competition and each event's Closing Ceremonies. Take care to maintain confidentiality throughout the awards processes.

25.5.1 Awards Process

1. Awards must be entered into FMS prior to the presentation of any awards. Navigate to Step 16 of the Event Wizard, where there are two methods for award entry.
 - The preferred and most common award entry method is through the Judge Advisor portal. If the Judge Advisor has submitted awards through the Portal, you can fetch the award assignments by clicking on "Download Judge's Award Assignments"
 - In the rare event that the Judge Advisor is unable to submit award assignments, you will have to revert to manual entry.

Important: Be careful to prevent wandering eyes from accessing the awards, make sure to pay attention to all warning boxes when entering or displaying awards, and do not post the awards nor submit them prior to their official announcement. awards that are submitted are immediately posted online and are available via the *FIRST*® API and online.

2. [Regional Events Only] Once all awards are entered move on to the Wildcard step and ensure that there are four (4) green checkmarks. Once verified, click "Calculate Wildcards" to allow the system to calculate wildcards.
 - If a Wildcard is generated, navigate to the Reports area and print the Wildcard Script via the "Wildcard Script" under "Other Event Reports".
3. [ALL EVENTS] Once ALL awards are complete, select the POST boxes next to each award and click "Upload Award Assignments."

25.6 Archive and Upload

This is the very last step you should perform on the server. Before doing this, ensure your awards are completed, you've checked with your FTA, and most importantly contact your HQ support person and ask if there's any other tasks to perform. Once you complete the upload step, it's difficult to go back and do anything else as this completes and closes out the event.

25.6.1 Event Upload Process

1. Check with Head Ref, FTA, and Event Manager to see if there are any files they need printed/saved before archiving the event.
2. If, and only if, the support person gives you the go-ahead, perform the “Upload Event Data” step by clicking the button.
3. Once the upload is showing completed, check in with your FRC Support person. The support team needs to verify that they received the upload. Support may need to remote into the system to perform a backup manually if the operation fails, so please stay near.
4. Once they’re done, and have verified that everything is good, you can close all applications and log off and shut down the server.
5. Assist with Field Teardown and Loadout, if possible.

25.6.2 Thank YOU!

THANK YOU AGAIN FOR VOLUNTEERING YOUR TIME WITH *FIRST*!

SOFTWARE UPDATES

26.1 Software Updates

26.1.1 Overview

The Field Management System (FMS) is the electronics core of a *FIRST*® Robotics Competition (FRC®) playing field and encompasses both hardware and software components. Updates are released periodically, some publicly and some privately to official *FIRST* events. For FRC Scorekeepers, please additionally consult your official training and discussion area for additional updates.

Notice: Not all updates are publicly available. For up-to-date public downloads, please visit this [page on TeamForge](#). For volunteers, additional downloads may be available from your *FIRST* point of contact.

FMS WHITEPAPER

The purpose of this document is to provide an insight to the functional structure and method by which the FIELD MANAGEMENT SYSTEM (FMS) is implemented on a typical FRC® field. All rules information should be directed to the season-specific FRC Game Manual, as that is the authoritative source for rules and regulations. This document is purely for informational purposes.

27.1 Role of the Field Management System (FMS)

The FIELD MANAGEMENT SYSTEM (FMS) is the electronics core responsible for controlling the *FIRST*® Robotics Competition (FRC) playing field. The FMS encompasses all field electronics, including the Field Management server, Referee Panels, Field Access Point, Team Stack Lights, Emergency Stops, etc. Additional hardware and software components may be added to the FMS for each years' challenges.

The FMS is also responsible for coordinating control of the Driver Stations and robots during a match, as well as providing the pipeline for them to communicate. The FMS also provides the infrastructure for real-time score-keeping, and logs diagnostic data during the event. Finally, the FMS provides data to the Audience and Pit Displays.

The FMS is based on Ethernet architecture. End devices such as the Driver Station, Referee Panels and other field components communicate over a wired Ethernet interface. Numerous other field electronics (such as Stack Lights and Emergency Stops) also connect to devices that, in the end, communicate over Ethernet to the rest of the network. Wireless communications (WIFI) is only used to communicate with the robots during a match.

Although the FMS Field Network is all on one physical network, this physical network is split into Virtual Networks (VLANs), to ensure each team's communications are independent from other teams, as well as the rest of the field electronics.

The goal of the FMS is to provide a unified, secure and robust solution to running FRC matches in a fair and consistent manner. Many protocols and procedures are put in place to ensure the FMS is operational and running to full capacity.

27.2 The Field Network

27.2.1 Components

The FMS is made of many components, all working together in unison to provide the full functionality of an FRC field. This section contains most, but not all, of the field electronic components and has been generalized to be season-agnostic.

The Smart Router

The Smart Router is located inside the FMS roadcase, and is the device that is presented to the venue internet. The Smart Router is used to reduce or eliminate IP address conflicts with the venue, simplify internet connectivity troubleshooting, and has a built-in VPN function which may be employed by FRC Engineering when venue content filtering prohibits mission-critical connections.

The Field Router

The Field Router is located inside the FMS roadcase, and is used to provide the FMS network with an internet uplink to the venue connection, route all cross-network traffic, and establish routing rules and VLAN configurations. The Field Router does not directly connect to any other member of the network other than the Score Switch. All active interfaces on the Field Router are 10/100/1000 Gigabit Ethernet.

The Score Switch

The Score Switch is located inside the FMS roadcase, and is the central point for all communications on the Field network. The Score Switch connects the Station Control Cabinets (SCCs), Field Access Point, FMS server and a secondary, unmanaged 10/100 Fast Ethernet switch, which connects to the Arena Stack Light and Programmable Logic Controller (PLC). All interfaces on the Score Switch are 10/100/1000 Gigabit Ethernet.

Another 10/100/1000 Switch is located external to the FMS roadcase, usually located on the scoring table. This switch connects to the Score Switch and is used to interconnect Referee Panels, Pit/Audience Displays and the *FIRST* Technical Advisor (FTA) Field Monitor.

The FMS Server

The FMS server runs the FMS software, and is connected directly to the Score Switch. The FMS server is responsible for managing field play, scoring, field control, as well as the Audience and Pit displays. It also provides the FMS graphic overlay used on the video displays at the event. The FMS also manages the Driver Stations of each alliance.

The FMS server does not communicate directly with the robots. All communication is between the FMS server and the Driver Station, including states (Enabled, Disabled, Teleop, Auto, etc), Emergency Stop status, Match Time, and more. If the Driver Station loses connection with the FMS software, the watchdog function onboard the robot halts control and disables the robot.

The FMS server also collects diagnostic status from Driver Stations, field electronics, robot radios, and the National Instruments roboRIO to diagnose issues and log match play. This data includes, but is not limited to, ping status, robot code status, packet trip time, bandwidth utilization and battery voltage. All robot data is first communicated from the robot to the driver station, and then from the driver station to the FMS server.

There is a second FMS server included with the field that can be swapped out as a spare at any time. The configurations for both are identical.

The Programmable Logic Controller (PLC)

The Rockwell Automation Programmable Logic Controller (PLC) is located inside of the FMS roadcase, and is responsible for keeping track of the field scoring equipment. Over Ethernet, the PLC communicates with other field electronics (many of which are season-specific) to keep score count, and update the FMS server. This offloads some of the work done by the FMS server and allows much more advanced control over other season-specific field electronics.

Station Control Cabinet (SCC)

Each alliance on the field, red and blue, has its own Station Control Cabinet (SCC). A 3rd, spare SCC is included with the field. There are 2 versions of the SCCs in use at FRC events, but the functionality is the same.

Version 1 contains a primary Ethernet switch connected to the Score Switch with a 10/100/1000 Gigabit Ethernet trunk line, and one secondary Power over Ethernet (PoE) 10/100 Fast Ethernet switch.

Version 2 contains one 10/100/1000 Gigabit Ethernet Switch capable of Power over Ethernet (PoE), connecting to the Score Switch with a 10/100/1000 Gigabit Ethernet trunk line. There is no secondary switch. Version 2 was introduced at the start of the 2017 season.

All switches in the SCC are managed switches.

Each Driver Station connects to a dedicated port on the “main” switch. Each of these ports is assigned its own VLAN interface. In Version 1, this is a 10/100 Fast Ethernet connection, in Version 2 the connection is 10/100/1000 Gigabit Ethernet.

On each SCC, a port on the primary switch is dedicated to the LED Team Signs (+ Timer LED Sign), as well as to the Rockwell Automation Armorpoint I/O device used to connect the Driver Station Stack Lights and Emergency Stop buttons.

Ports on the secondary switch (or main switch in version 2) are dedicated to other miscellaneous equipment, such as Referee Panels, lighting controllers, or MiniSCCs, used to control other field devices, such as scoring devices located in the Alliance Stations. Devices outside the core infrastructure of the playing field network are not discussed in this whitepaper.

The Field Wireless Access Point

The Field Wireless Access Point (WAP) broadcasts and receives wireless data from robots on the playing field. The Field WAP hosts a hidden SSID for each robot scheduled to play on the field, all of which are multiplexed over a single wireless interface. Each SSID is allocated a VLAN to the corresponding Driver Station.

The Field WAP connects to the Score Switch through a 10/100/1000 Gigabit Ethernet trunk line. The switch ports on the Field WAP are unused and unallocated, only the WAN (trunk) line is used.

The Field WAP uses the 802.11n Wi-Fi standard, and the 5GHz band is reserved exclusively for robots. The standard configuration employs a 20MHz channel, with the option for 40MHz, and employs WPA2/AES encryption with a unique key per team, per event.

Referee Panels

There are typically multiple Referee Panels located around the field. There is no standard configuration or location for these panels as it dictated by the season's game. It is common for there to be at least 5; 3 on one side, and 2 on the other. The panels are used to input fouls, tech fouls, yellow and red cards during the match, as well to award points that are not scored automatically.

The Head Referee panel includes controls for the LED light strings on the playing field, declaring when it is safe for field staff and team members to enter the field, and to initiate a referee review of the match.

Robots

Each robot contains, at minimum, a wireless radio and robot controller (roboRIO). The wireless radio is configured in bridge mode to communicate to the Field WAP using an assigned SSID and WPA Key, which then communicates with the robot controller and any other devices on the robot at the discretion of the team. At each event, each team is assigned a unique encryption key.

The robot radio is responsible for connecting to the field, as well as implementing the bandwidth limit. Each team must configure their radio at the event before it will successfully link with the Field WAP. Radio configuration kiosks are provided for this purpose.

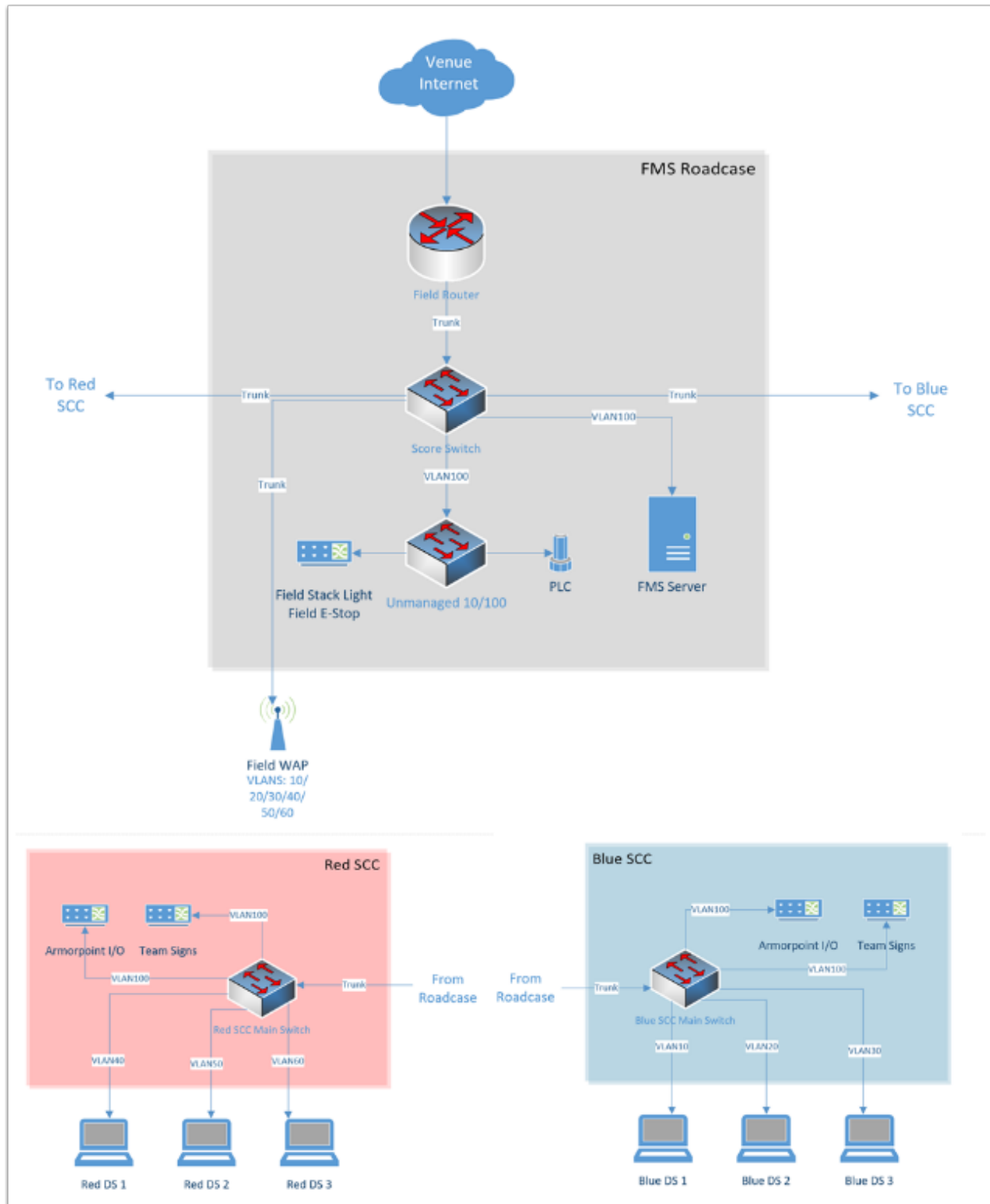
Additional Non-Field Components

Additional devices may be introduced to the Field Network at the FTA's discretion, such as a tablet or mobile device used by the FTA to view diagnostic information, logs, etc. while on the field prior to the start of a match. This is commonly used to monitor a robot's connection state, and is often used when troubleshooting a robot that does not connect to the field. It is also used during matches if a robot suddenly loses connection or experiences problems. The Game Announcer may also connect to the Field Network to access and provide up-to-the-minute team statistics to relay during the match.

These wireless devices operate only on the 2.4GHz wireless network and do not overlap with robot communications.

27.2.2 Field Network

The figure below shows a basic network diagram of the FMS field network setup. VLANs have been labelled to indicate how networks are separated. Robots and other equipment are excluded from this diagram.



27.2.3 VLANs and Network Policy

The FMS field network is split into multiple networks using VLANs, a method by which data is encapsulated on the trunk lines, and then distributed at the switch based on its configuration. This is employed on the field to ensure each teams' connection to their respective robot is private from other teams on the field.

The Field Router sets up the VLANs 10, 20, 30 (Blue), 40, 50, 60 (Red) and 100 (Admin). The switches (and Field WAP) then assign specific ports (or SSIDs, in the case of the Field WAP) to each VLAN, allowing that port to become isolated from the rest of the network. Each VLAN consists only of the Robot, the Driver Station, and the FMS server. The FMS server is a part of the Admin VLAN, but the Field Router is configured to permit its communication with the Driver Station of each VLAN.

The Admin VLAN is the only VLAN capable of reaching the venue Internet. This allows the FMS server to upload match results and awards information to *FIRST* servers, as well as download team information. The Admin VLAN is not accessible to robots and driver stations.

27.2.4 Addressing

The Field Router does not provide a DHCP server to the rest of the Field Network. Instead, this is handled by the FMS server, with 7 DHCP pools being allocated (one for each VLAN). The 6 team DHCP pools change depending on what teams are scheduled for that match (10.TE.AM.xx). The Admin VLAN has mostly statically addressed devices, with some, such as Referee Panels, running on DHCP.

Team IP addresses follow the 10.TE.AM.xx scheme, and are dynamically addressed with DHCP unless otherwise configured by the team. Prior to the beginning of the match, the FMS server sends new configuration parameters to the switches on the field, to reconfigure their VLAN settings to accept the new IP addresses. The Field Router and Field WAP are also reconfigured using this process. The Prestart process is described at length later in this paper.

27.2.5 Network Bandwidth

The FMS Field Network has limited bandwidth available. There is an imposed 4Mbit/s limit for each team via the robot radios to ensure no one team overloads the system, causing packets to drop for other teams. Given that each wireless SSID that the Field WAP handles is multiplexed, this adds up to a total of $4 \times 6 = 24$ Mbit/s for the Field WAP. All other traffic on the FMS Field Network is not limited by bandwidth.

The Robot Radio prioritizes certain communications over others. Driver Station control and status packets are the highest priority, followed by Network Tables, then all other traffic (e.g. video).

27.2.6 Driver Station and Robot Communications

The Driver Station to Robot Communication is identical to that of a system without the FMS in terms of packets. The only difference is that on an FMS network, the packets are routed through the FMS Field Network, then to the Robot. These packets include control data for your robot, telling it what state it should be in and what the values of the joysticks are. The FMS does not send any packets to your robot.

The following ports are opened for communication between your Robot and Driver Station. All other ports are blocked. All ports are bidirectional unless otherwise stated.

- UDP/TCP 1180 - 1190: Camera Data
- TCP 1735: SmartDashboard
- UDP 1130: DS-to-Robot control data
- UDP 1140: Robot-to-DS status data

- HTTP 80: Camera/web interface
- HTTP 443: Camera/web interface (secure)
- UDP/TCP 554: Real-Time Streaming Protocol for h.264 camera streaming
- UDP/TCP 5800-5810: Team Use

Teams are permitted to utilize ports 5800-5810 for their own purposes, or any other open ports (other than 1130 and 1140) if not already allocated.

Your robot will report data about itself to the Driver Station, which is then, in turn, forwarded to the FMS. This includes data about your robot including what motors are being used, what language it was programmed in, and other metadata. This is then forwarded to *FIRST* for statistical purposes. This process is known as “Usage Reporting”, and is discussed at length later in this whitepaper.

The FMS server communicates to the Driver Station through the Field Router, with a routing exception, allowing the FMS server to send data to the team VLAN. This includes critical data, such as what state the robot should be in, match time, and other details. The Driver Station also sends data back, such as battery voltage. Logging of data is discussed at length later in this whitepaper.

27.3 Logging and Data Collection

27.3.1 Robot and Driver Station Logging

During the match, the Robot forwards data about itself to the Driver Station, such as battery voltage. The Driver Station combines this with its own log data and forwards it to the FMS server. All this log information, along with diagnostic data from the field, is combined to produce a log that can be read by the FTA during, or after, a match in order to diagnose potential issues. Below is a list of all data that is logged by the FMS.

- Timestamp (local time)
- Match Number
- Team Number
- Match Time
- Alliance
- Mode (Auto/Teleop)
- DS in FMS Mode (yes/no)
- Robot Mode (enable/disable)
- Estop state (on/off)
- Robot Link (yes/no)
- Bandwidth consumption over the wireless link
- Strength of the signal transmitted by the robot radio
- Signal-to-Noise Ratio of the wireless link
- Average packet trip time between DS and Robot
- Number of missed packets between DS and Robot
- Total number of packets sent by DS to Robot
- Robot Battery Voltage

27.3.2 Usage Reporting

At the beginning of the match, the Robot forwards some Usage Reporting data to the Driver Station, which in turn reports it to the FMS server, which in turn reports that to *FIRST* HQ's servers. This data is collected throughout the season and usually released at the end of the season to give some statistics and insight into what teams are using. The data included in Usage Reporting is, but not limited to, the following:

- Motor Controllers used
- Programming Language
- Accelerometers / Gyros used
- Joysticks Used
- RobotDrive class used
- Smart Dashboard used
- Ultrasonic devices used
- I2C/SPI used

27.4 Field Status Indicators

27.4.1 Team Stack Lights

On the field are located 6 stack lights, one per team. Each stack light contains two LED sections equal to the alliance color (red or blue), and an additional amber LED used to indicate Emergency Stop status. Below is a table representing the state of the stack lights and what they indicate.

	Alliance Color	Amber Color
Flashing	No connection to robot or station bypassed	Astop pressed/enabled (during autonomous period)
Solid	Robot Enabled	Estop pressed/enabled
Off	Connection Established to Robot	Estop not pressed/disabled

27.4.2 Field Stack Light

The field has its own stack light that is typically used by the FTA and Field Staff to determine what state the field is in. There are 4 LEDs on the stack light, and a buzzer. Below is a table representing the state of the stack lights and what they indicate.

	Green LED	Red LED	Blue LED	Amber LED	Buzzer
Flash ing	Match Ready	N/A	N/A	<i>During Match:</i> Scoring malfunction (e.g. jammed, sensor blocked) <i>Post Match:</i> Waiting for Referee	Match Ready (single chime, coincides with green LED beginning to flash)
Solid	Match run-ning/Field enabled	Red Alliance not ready (e.g. not all robots connected)	Blue Alliance not ready (e.g. not all robots connected)	N/A	N/A
Off	Match not Ready	Red Alliance ready (all robots connected)	Blue Alliance ready (all robots connected)	<i>Pre-Match Start:</i> Referee Ready <i>Post-Match:</i> Referee Done	Waiting for Match Ready

27.5 The Match Play Process

27.5.1 Match Prestart

During Prestart, configurations are deployed to the networking systems that comprise the FMS to setup team-specific VLANs, IP addresses, security settings, etc. During this time, the LED signs on each Player Station are updated to reflect the teams configured to play in the upcoming match.

After Prestart, each Driver Station connected to the FMS displays “FMS Connected” on the dashboard software. If a team is located in the wrong Player Station, the dashboard software indicates the correct Player Station to which the team should move.

A match cannot start until the state of all Player Stations is known. The two states which permit a match to start are:

1. The Driver Station configured for the Player Station is connected and linked with the FMS and the corresponding robot is linked with the Driver Station
2. The Player Station is bypassed. The *FIRST* Robotics Game Manual outlines the specific rules outlining when a team is eligible to participate in a match. For the sake of this whitepaper, we are using the lower-case term bypass to define only the state of the Player Station from a software perspective.

27.5.2 Match Play

During Match Play robots are enabled, scoring mechanisms activated, Referee panels enabled, and the FMS audience screen is displayed. The scoring mechanisms communicate with the FMS server directly, or with the PLC located in the FMS roadcase, which in turn communicates with the FMS server.

A match is stopped by cancelling it via the FMS software interface or by pressing the Field Emergency Stop button located on the Scoring Table. When stopped, all robots are immediately disabled, scoring mechanisms stopped, and the foghorn sound played.

27.5.3 Match Scoring

Matches are scored via Rockwell Automation sensors and counters that link back into the PLC, which tells the FMS the counts and different game states. Other sensors may be used depending on the season's field configuration.

Once the FMS has received the final penalties/scoring, the scorekeeper waits for the head referee for any changes to the score last minute, and then submits the score.

27.5.4 Match Publishing

Provided an event has an internet connection available, the FMS server uploads match data upon completion of a match following the Match Scoring process to an Azure MS SQL Database.

If the event does not have Internet available, event data is backed up to a USB drive. The FTA at the event then uploads the event database as possible to HQ for posting to Azure.

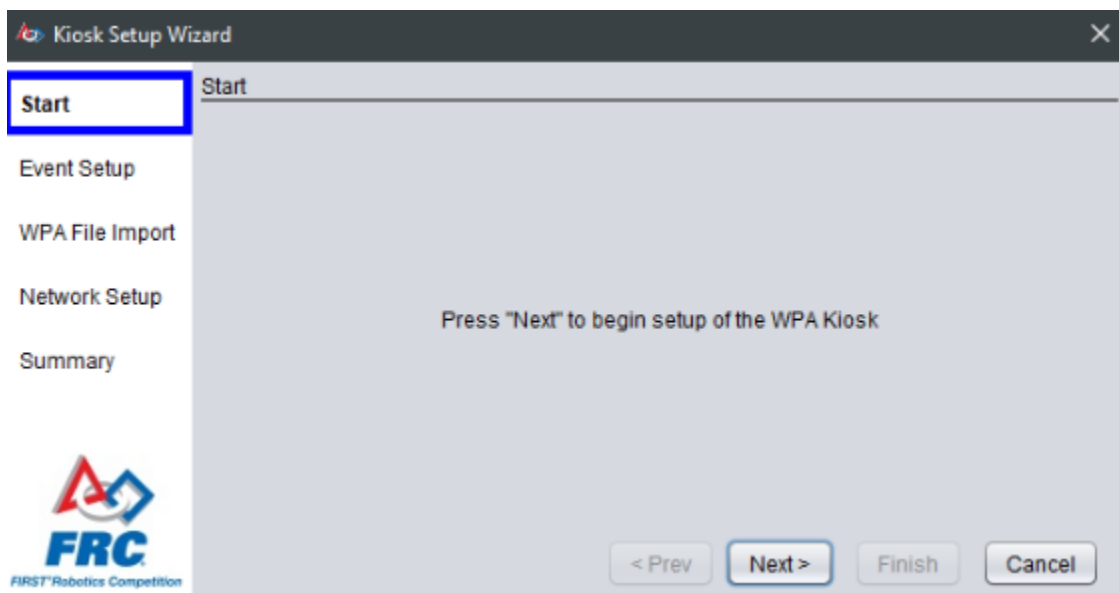
The database is queried via the FMS API (Documentation available here: <https://frc-events.firstinspires.org/services/api>) and is available to users who request access.

The data model is year specific, due to game scoring breakdowns being available.

28.1 WPA Kiosk

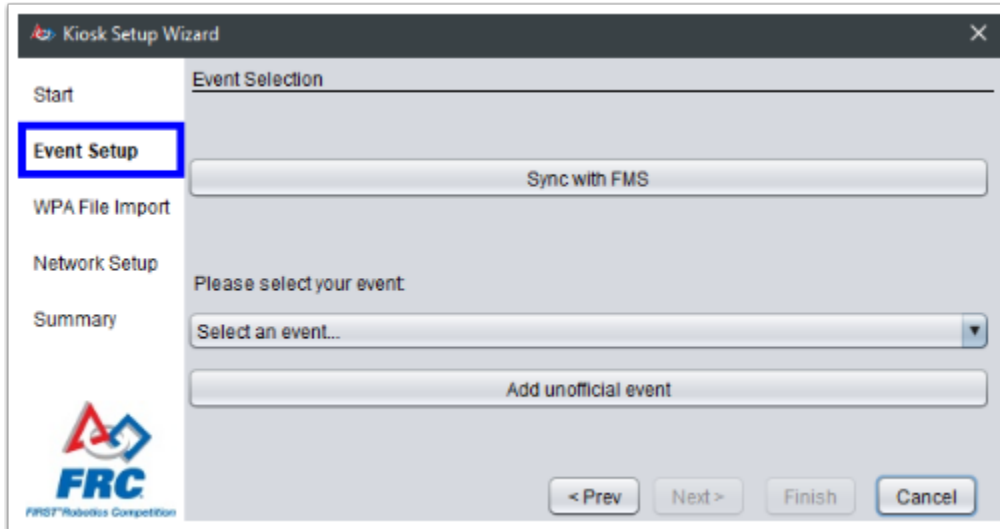
Navigation and use of the WPA Event Kiosk Program

28.1.1 Opening View

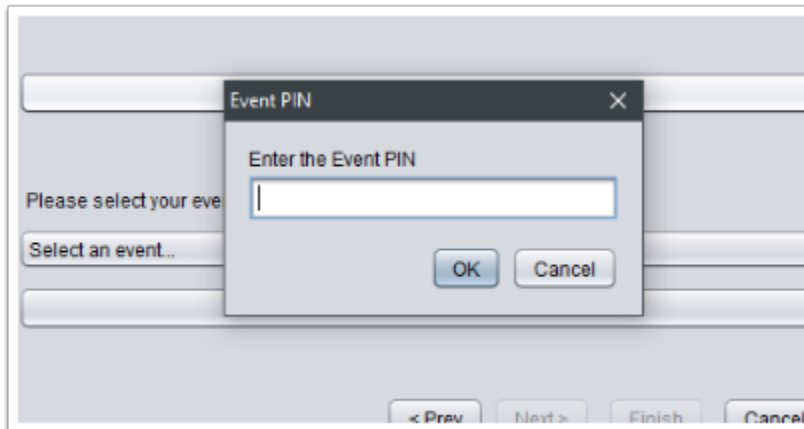


The WPA Kiosk has a very basic interface. All navigation is done using the buttons on the bottom right of the program. The setup wizard is available by default when launching the program.

28.1.2 Select Event / Keys using Sync with FMS

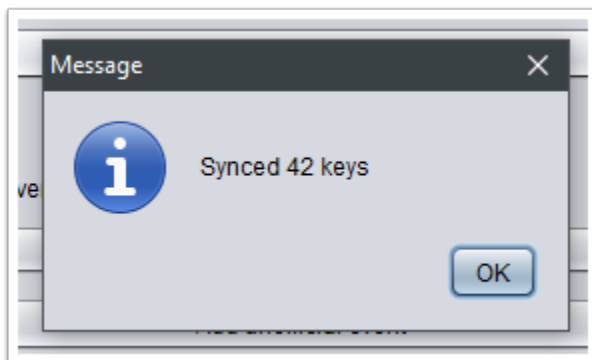


The preferred way to load an event and keys into the Kiosk is via “Sync with FMS.” Attach the machine running the program to the playing field to use this option. Select the “Sync with FMS” button.



The kiosk will prompt for the PIN number of the event currently active in FMS. This is available from the FTA. Enter the PIN and select OK.

Note: At an off-season event, use the code “0000” to bypass the FTA Authentication.

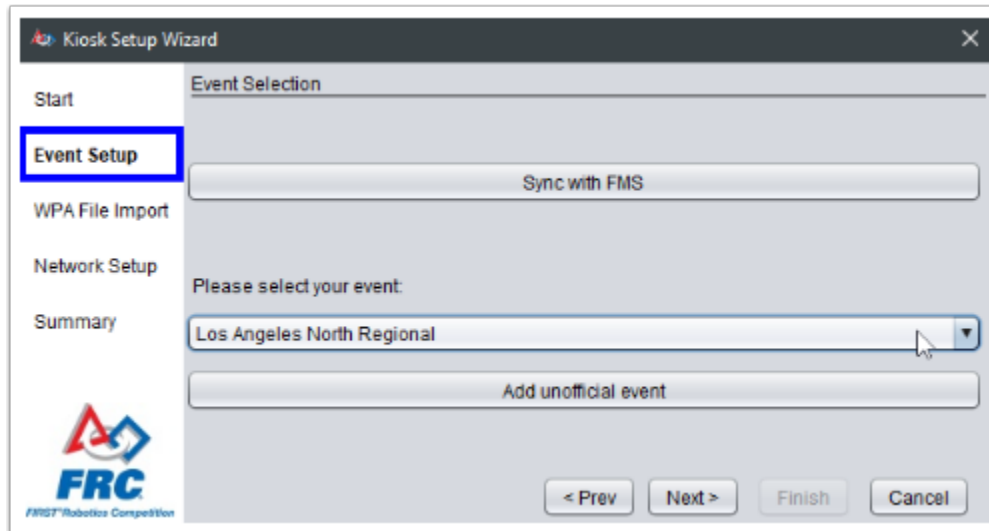


If correct, the number of keys retrieved will be displayed. When using Sync with FMS, simply skip the “WPA File

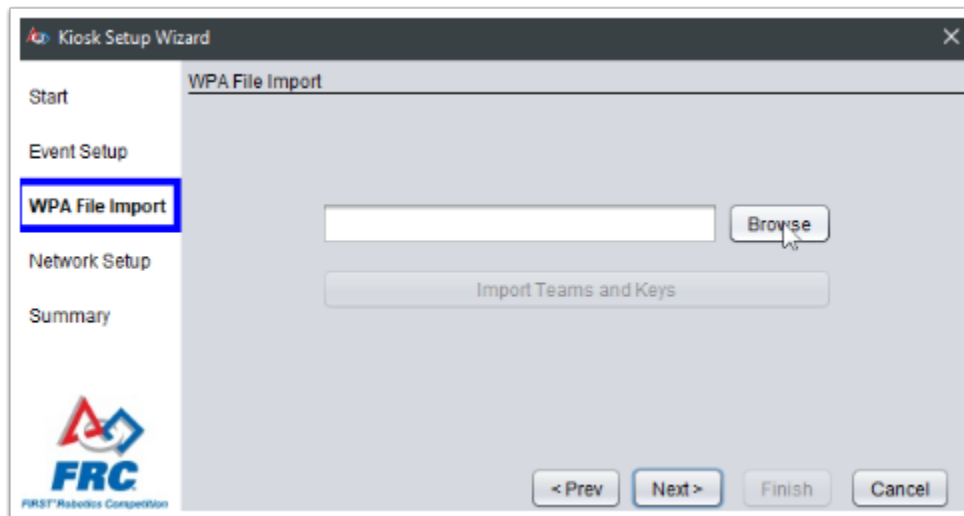
Import” step (after successful download) using the “Next” button on the bottom of the screen.

28.1.3 Select Event / Keys Manually

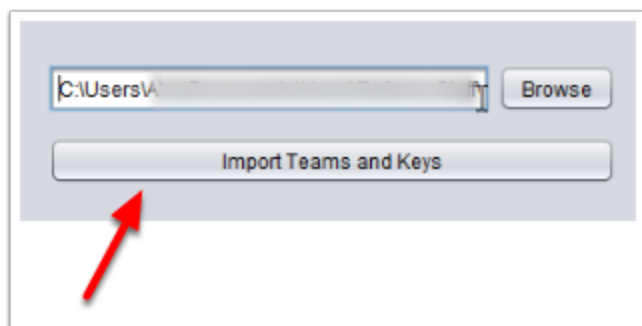
As an alternative, instead of Sync from FMS, the event can be manually selected using the provided dropdown menu, or by selecting “Add unofficial event” and enter the event information. There is no effect on the operation of the kiosk software for using Sync with FMS, selecting an event from the dropdown, or adding one manually. All result in the same team-facing experience.



If the event was selected or entered manually, keys must be provided using a Key file from FMS. This file can be uploaded on the “WPA File Import” page.

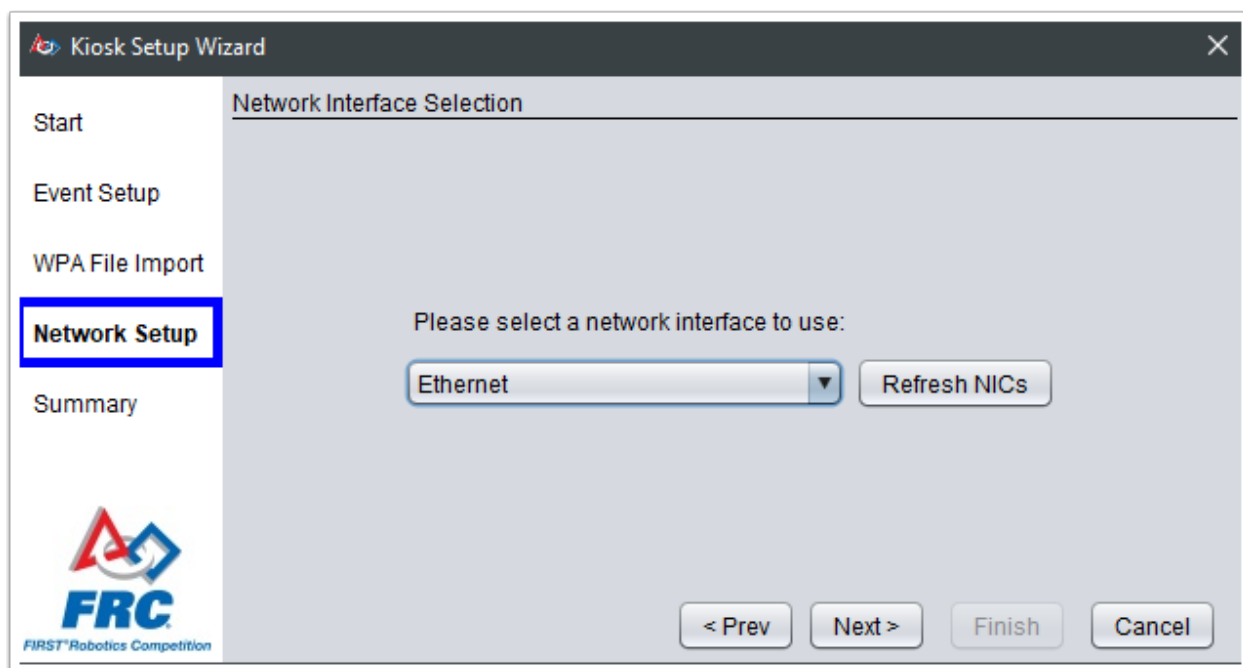


Select the key file generated by FMS from a USB drive used to transfer the file, but do not copy the file onto the machine. The contents will be loaded into memory, but storing the key file itself on the computer leaves the keys vulnerable.



After selecting the file, click “Import Teams and Keys” to move the data into the kiosk program. Without clicking this button, no data will be loaded into the kiosk.

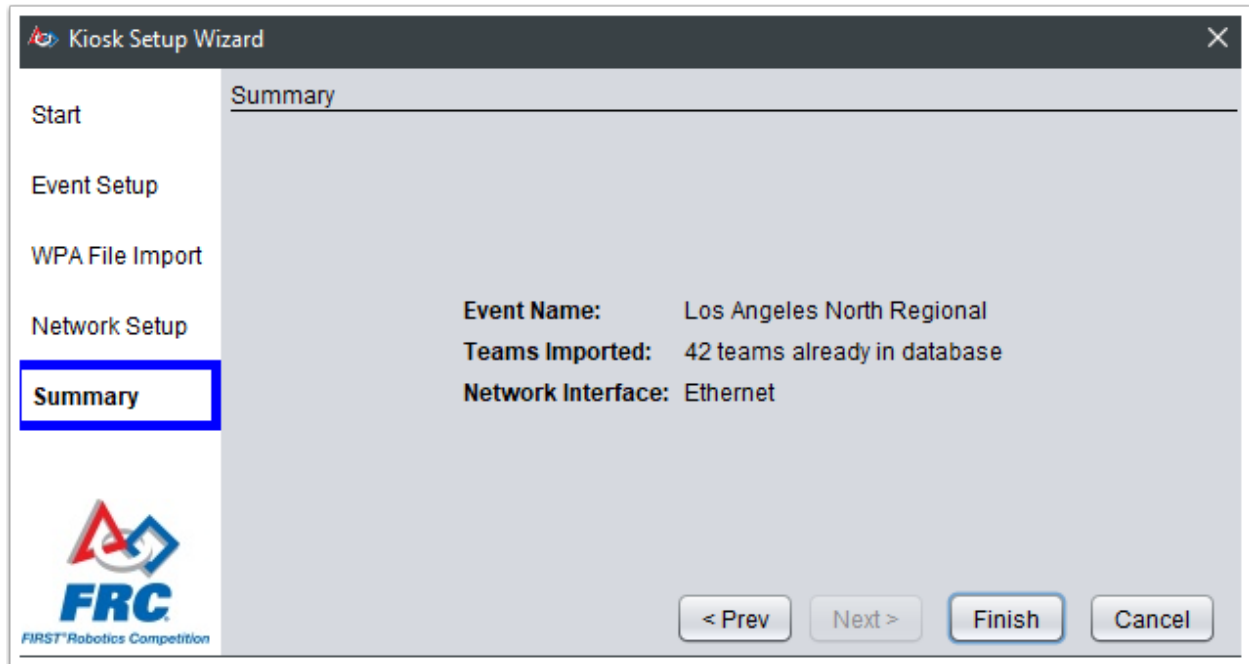
28.1.4 Network Setup



After selecting or loading the event and adding the keys, select the network interface to use for programming radios. In most cases, there will be a single Ethernet interface, which will work fine. Select “Next” to complete configuration.

28.1.5 Summary

The selected settings will be confirmed on the summary page. Select Finish to begin to program team radios. If the Kiosk was attached to the playing field to use Sync with FMS, it should be removed and placed in a location accessible for those needing to use it.

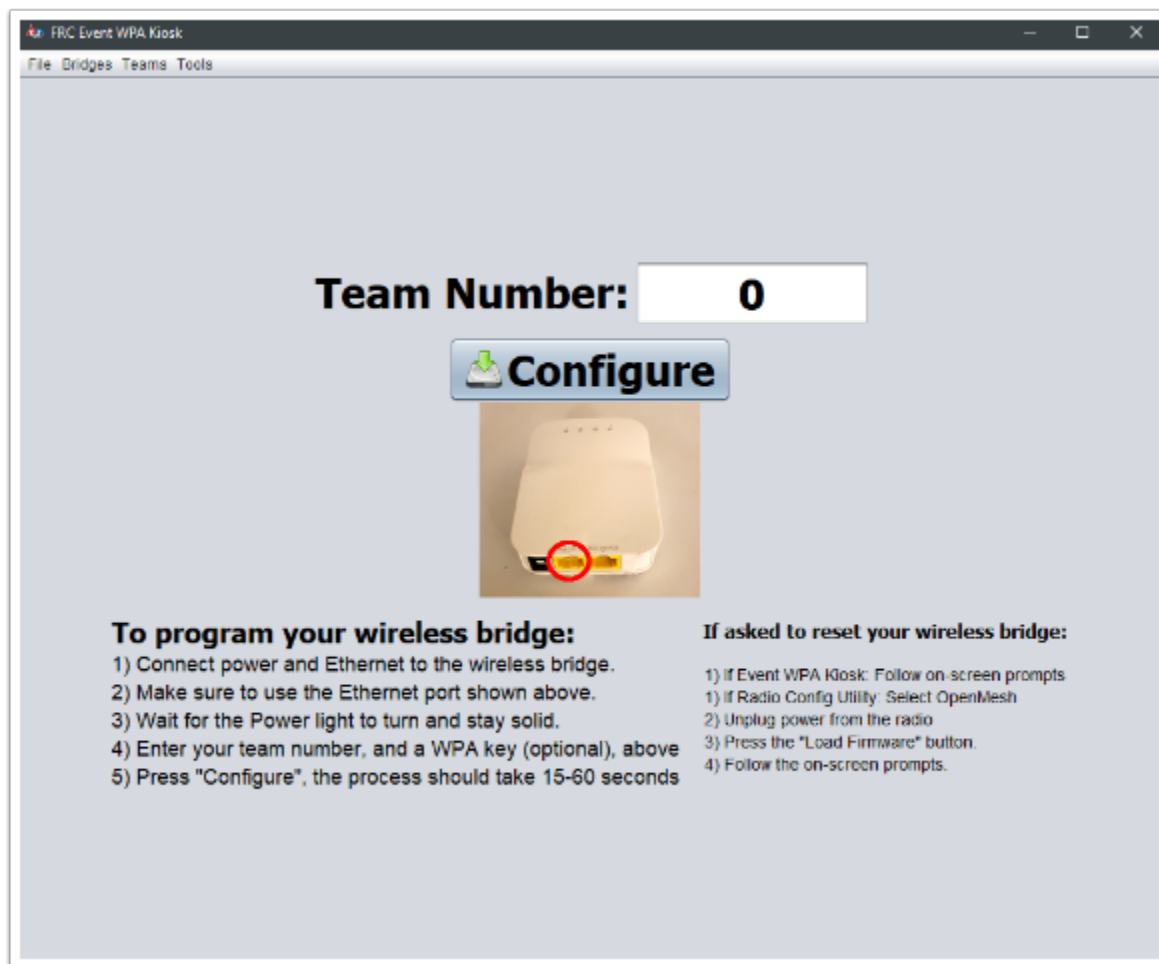


OPERATION

29.1 WPA Kiosk Operation

This article assumes the kiosk has been configured by event staff and is ready for team use. If not, please see the configuration article.

29.1.1 Enter Team and Program



A full-screen programming interface is available for programming team radios. Attach the radio to power and the Kiosk machine's Ethernet as shown in the steps on the Kiosk, enter the team number into the box, and select "Configure."