

OVERVIEW AND KEY TERMINOLOGY

Overview and Key Terminology

Table of Contents

Disclaimer	3
Disclaimer	4
Getting Started	5
Getting Started With the Screen Steps Documentation	6
About FMS and Documentation Notes	8
Terminology.....	10

Overview and Key Terminology

Disclaimer

Overview and Key Terminology

Disclaimer

WARNING

WARNING

Robot 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.

Overview and Key Terminology

Getting Started

Overview and Key Terminology

Getting Started With the Screen Steps Documentation

ScreenStepsLive is a new tool that FRC/WPI are using to create and present documentation. This document is a brief introduction to the ScreenStepsLive site and the documentation contained here.

What's Here?

The documentation on the ScreenStepsLive site encompasses a number of reference materials for teams, such as robot wiring and programming best practices. This section of the site, however, focused more specifically on the Field Management System (FMS) operation and notes for volunteers who interface with the software from event to event. The examples below were taken from a different project, and show Robot programming sections of WPILib, these example articles do not themselves appear in this portion of the site.

Navigating the Site

Navigating the Site

The documentation is organized into a hierarchy with Sections at the very top, followed by Manuals, Chapters, then Lessons. At any time while you are browsing through the documentation, you can use the navigation at the top of the screen to go back to the Manual or to the home screen. You can also use the navigation on the left side of the screen when viewing a Manual or Chapter to jump to a different Manual. Each article also has a Prev and Next link at the top and bottom of the article to take you to the previous article or next article in the Manual.

Using the Search

Using the Search

Overview and Key Terminology

A search bar is located at the top of each page which you can use to search the site. After entering a search query you will be brought to the search results page. From this page you can refine your query by selecting whether to "match any" or "match all" terms in the search. You can also narrow your search to specific manuals by checking them in the left pane.

Downloading PDFs

Downloading PDFs

For offline viewing, every Manual in the documentation can be downloaded as a PDF. From the manual page or from any of the Lessons within the manual you can download the manual PDF by clicking the link on the left side of the window. Additionally, some individual Lesson PDFs can be downloaded from the lesson pages.

Overview and Key Terminology

About FMS and Documentation Notes

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.

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](#).

Overview and Key Terminology

Current Revision



While every effort is made to update the documentation to remain instep with all current features and season information, it's not always possible. As best as possible, the documentation is accurate for the current *FIRST Robotics Competition* game (based on the logo shown).

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.

Overview and Key Terminology

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	Definition
	<i>FIRST</i>	
FRC	Robotics Competition	The original <i>FIRST</i> program, for high school students.
FMS	Field Management System	The software (provided by <i>FIRST</i>) 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 <i>FIRST</i> 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
	roboRIO	Control system "brain" manufactured by National Instruments and required on each FRC Robot
	Pit Display	A laptop, provided by <i>FIRST</i> that displays ranking information at each event to people not in the immediate area of the field
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
	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.
FCUI	Field Control User Interface	Formerly a piece of <i>FIRST</i> hardware, now refers to the match control bar within the Match Play interface.

EVENT MANAGER (FMS)

Event Manager (FMS)

Table of Contents

Disclaimer	5
Disclaimer	6
Navigation and Indicators.....	7
Tab Navigation	8
Indicators	9
Event Wizard.....	11
Navigation.....	12
Data Download	13
Event Selection.....	14
Team Selection.....	19
Build Schedule.....	23
Run Match Maker.....	31
Activate Schedule.....	38
Award Assignments.....	40
Alliance Selection	44
Alternate Substitution	45
Wildcards	47
Archive and Upload	49
Match Play/Test.....	51
Interface.....	52
Bypass vs DQ vs Red Card	58
Tabs	59

Event Manager (FMS)

Status Tab	64
Score Tab	66
Match Test	72
Game Detail Tab	73
Match Review	74
Match Review	75
Edit Match	76
View Log	78
Field Test	79
Field Test	80
Field Test (Game Specifics)	83
Reports	85
Reports	86
Settings	91
Settings Menu	92
Network Status	94
Network Config	96
Data Sync	98
Backup Config	99
Hardware	100
Data	101
Multi-field Setup	103
About Tab	104

Event Manager (FMS)

About Tab	105
FAQ and Appendix	106
FAQ	107
Appendix.....	110

Event Manager (FMS)

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Navigation and Indicators

Event Manager (FMS)

Tab Navigation

Navigating between the portions of the event manager

Opening View

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](#) - 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
- [Match Play](#) - 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
- [Settings](#) - Global settings for the software, as well as Administrative functions
- [About](#) - shows the current software version number, allows updates, and shows the EULA

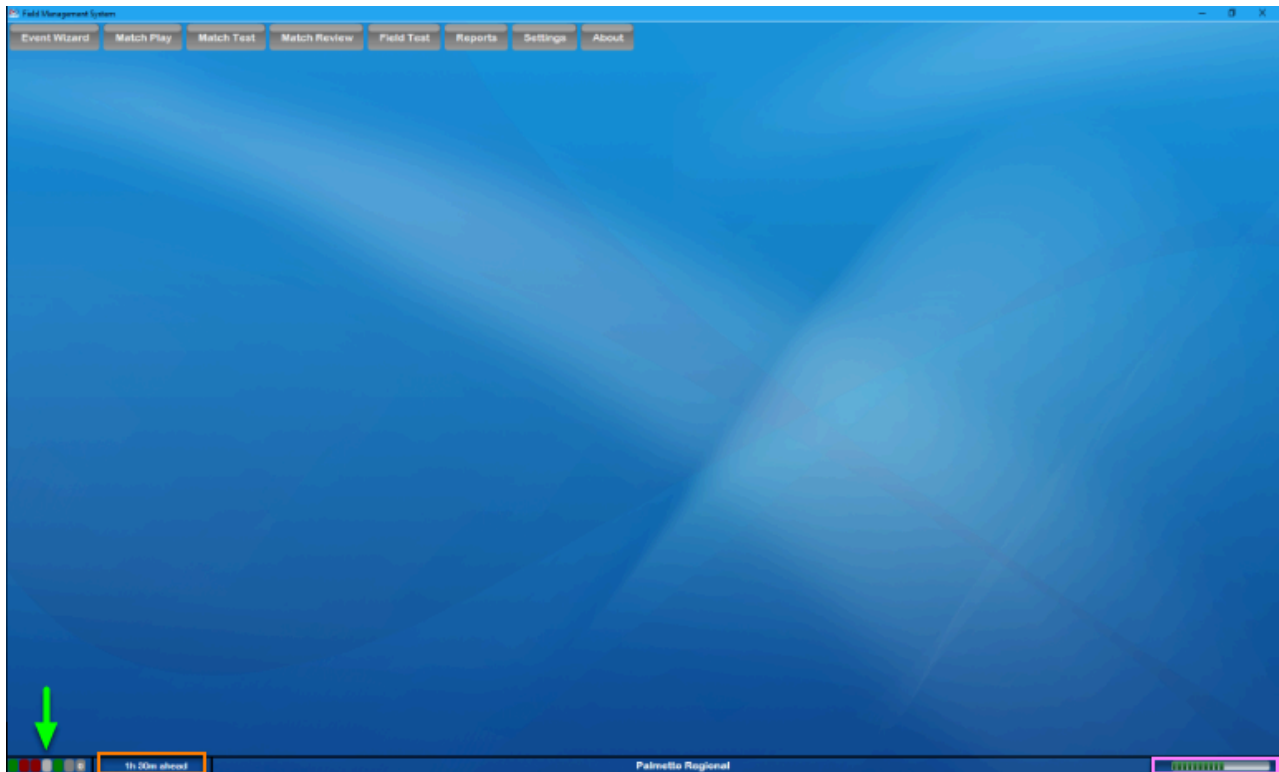
Further details on each function are detailed later in this User Guide.

Event Manager (FMS)

Indicators

Indicators around the main window of Event Manager

Lower bar Indicators



[Green Arrow] 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.* They are:

- SCC Status
- Cargoship Status (Game Specific)
- PLC Heartbeat (flashes at 1Hz)
- Referee screens (If red, the number of screens missing are displayed)
- Backup Status

Event Manager (FMS)

- Sync Status (if red, number of outstanding tasks)

Most items will have a "hover text" to explain the status shown. For most items, green means status is good, red means status is bad, and gray means status is unknown.

[**Orange** Box] The orange box represents the "ahead behind" timer. Once a match is started, the time difference between when the match was started, and when it was scheduled will be displayed here. Hover over this timer to see recent cycle times.

[**Middle Box**] The event name is displayed in the middle of the bottom bar.

[**Pink** Box] When a task that requires additional time is running (such as schedule generation) the "busy bar" will show in this location (example shown).

Event Manager (FMS)

Event Wizard

Event Manager (FMS)

Navigation

Event Wizard Navigation

Event Wizard Navigation

The Event Wizard is a tool 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.

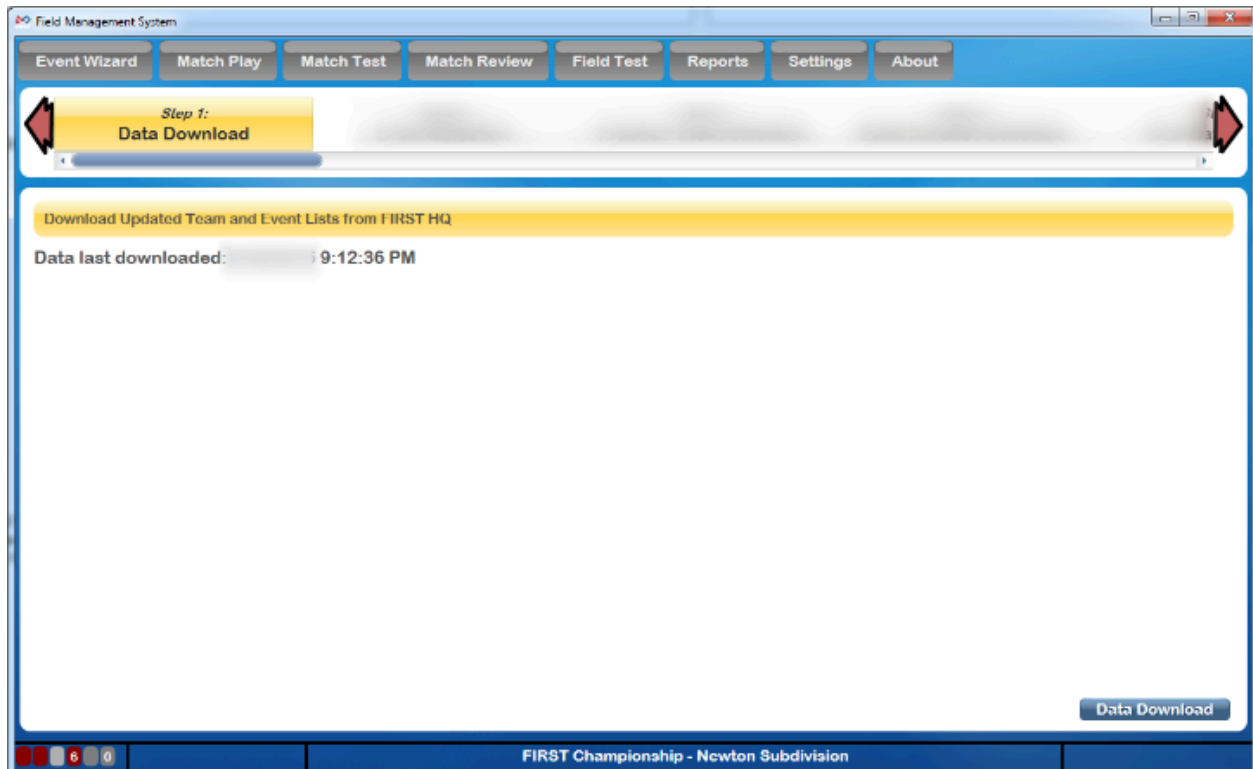
[Red - Navigation] Using the top portion of the screen, navigate between steps of the wizard by clicking the arrows on either side or directly on the step itself. Use the scroll bar to quickly zoom the view of the steps from one side to the other.

[Blue - Content] The lower portion of the screen will change to display the content based on the selection from the navigation portion of the display.

Event Manager (FMS)

Data Download

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 team may have made to their [Team Registration](#) profile.

When applicable, this also downloads all available Team Avatars.

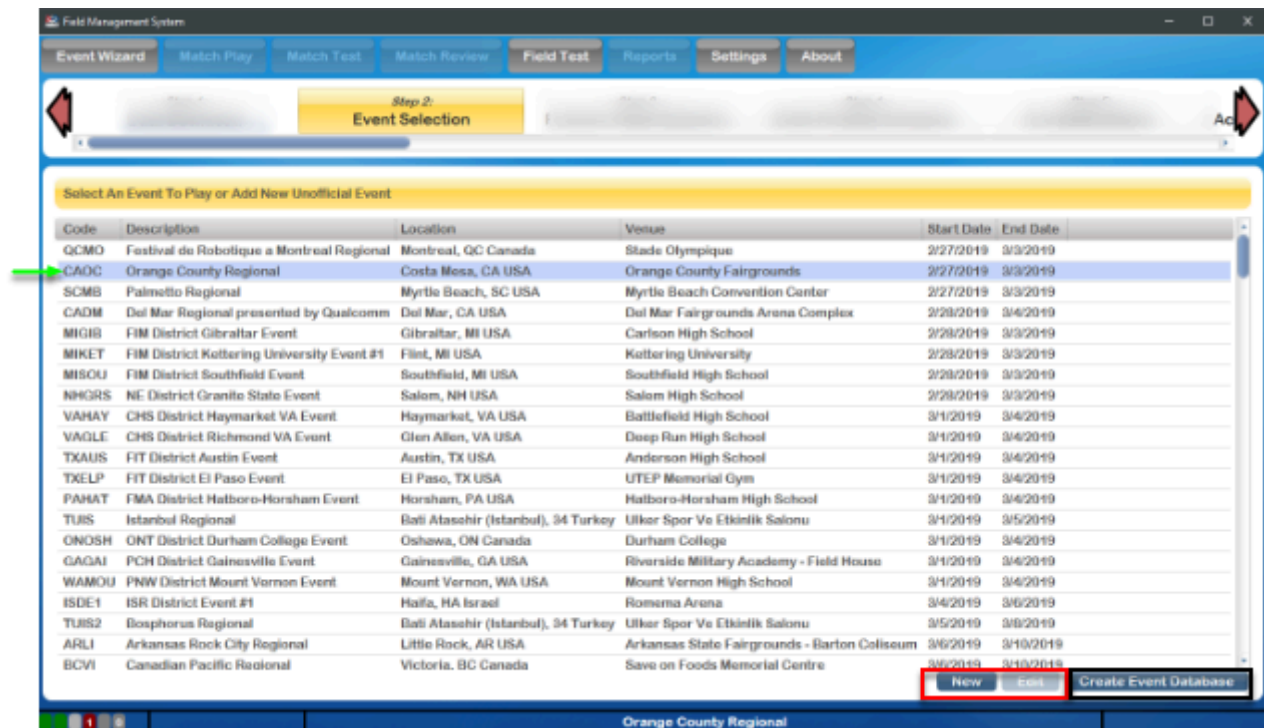
In FMS Off-Season, this step does not download anything, the software installation includes the complete registered team list from the current FRC season.

Event Manager (FMS)

Event Selection

Get your event started...

Selecting a Traditional Event



The Event Selection step of the Event Wizard displays the complete list of downloaded events from Data Download. On this step, select the event to be played. In this case, the San Diego Regional event is selected (highlighted blue background on the row).

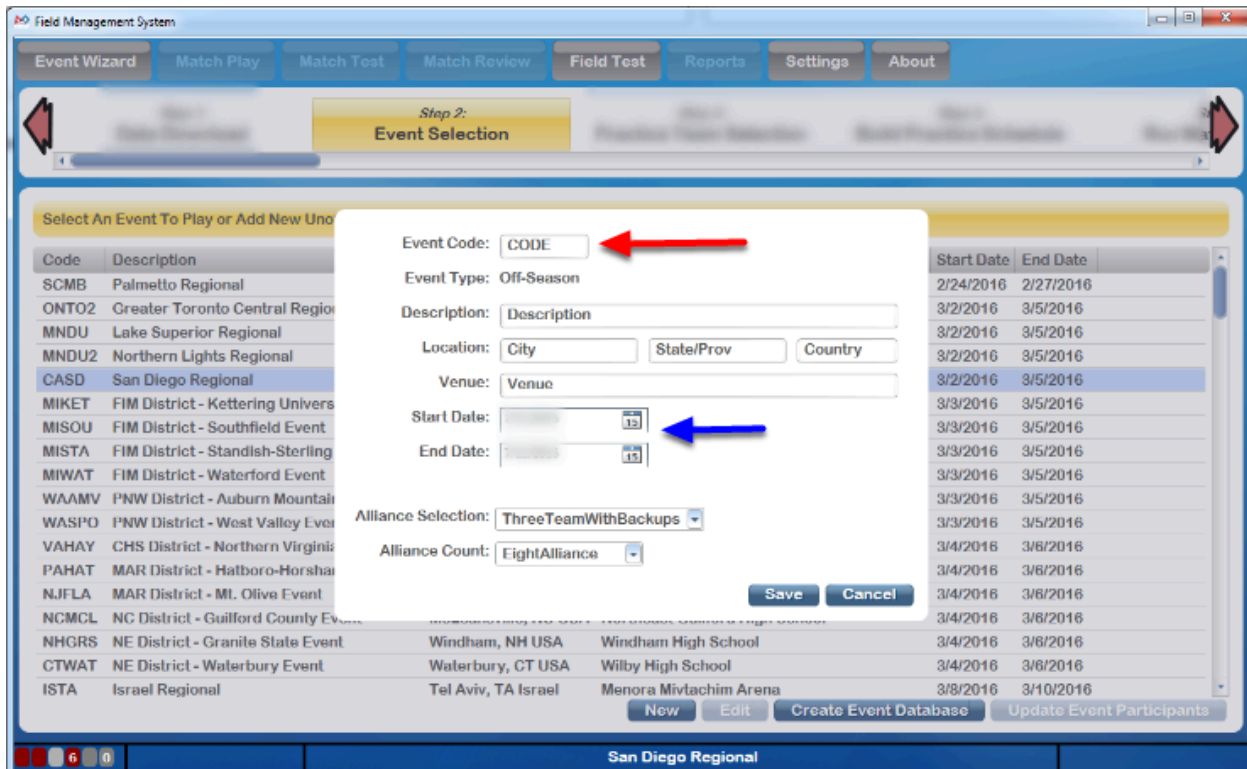
[Green Arrow] The currently selected event, if there is one, will be shown with a highlighted row background

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

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

Event Manager (FMS)

Creating an Off-Season Event (Optional)



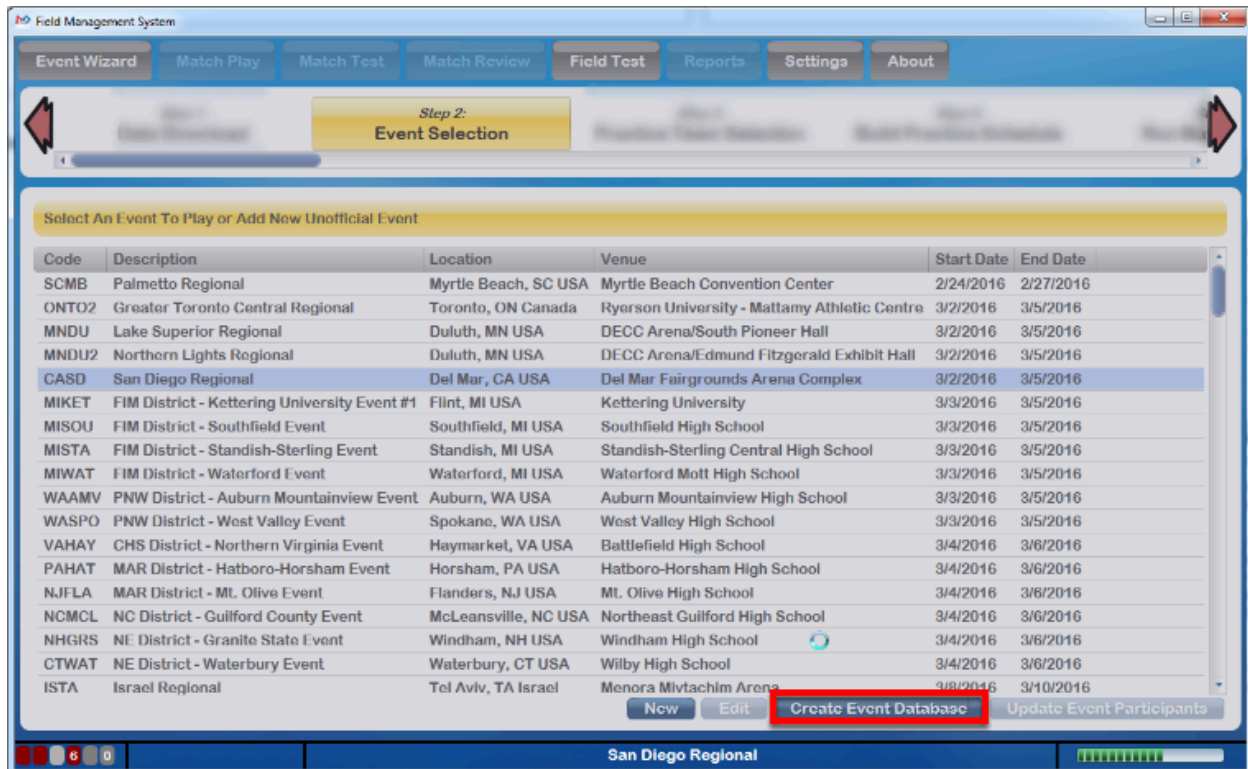
For FMS Off-Season, clicking “New” (in the red box above) will allow the addition of an unofficial (Off-Season) event. Only events added manually can be edited, those downloaded from *FIRST* are protected from edits.

The Event Code (red arrow) must be unique from any other events on the machine- regardless of whether they are official or not. Additionally, it's important to make sure the inclusive start and end dates (blue arrow) are marked properly, as they're used to validate schedules and could create problems in later steps if marked inaccurately.

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).

Event Manager (FMS)

Creating Event Database



Once the target event has either been selected (traditional event) or created (off-season event) it will need a database to store its results. To initiate this process, click the "Create Event Database" button (shown here in the red box). For an Off-Season event, the Database is automatically created. For a tradition event, an additional window(s) are displayed, as described in the next step.

Event Manager (FMS)

Event PINs

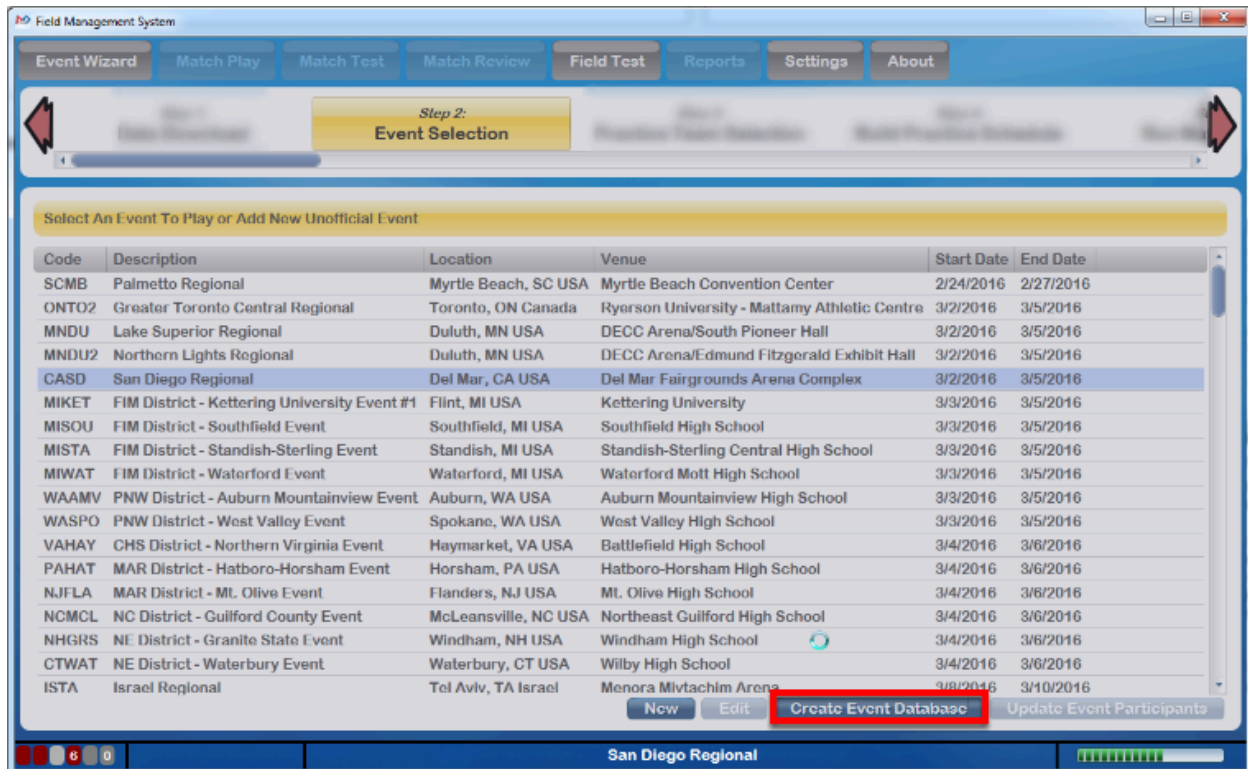


The screenshot shows a dialog box titled "Event Setup PIN" with a light green background. At the top, it displays "Lubbock, TX USA" and "Panhandle South Plains Fair". Below the title is a white text input field. Underneath the input field is a blue "Submit" button. At the bottom of the dialog is a blue "Cancel" button. The text "Please enter the event PIN to complete event setup." is centered on the dialog. The dialog is overlaid on a window showing a calendar view with days of the week (D, D, M, W, T, F, B, S, S, H, B, W, H, W) and location information "Widham, NJ USA" and "Widham High School".

For traditional events and Off-Season events that are Syncing data with FIRST, clicking "Create Event Database" will trigger the window shown above. On this screen, the FTA will need to enter the PIN number they were provided by *FIRST*. Upon doing so and pressing Submit, the creation process proceeds as described below.

Event Manager (FMS)

Event Database Creation in Progress



Once the target event has had the correct PIN entered, the system will create a location to store the event's results and data. This will temporarily disable the screen (as indicated by the working bar on the lower right) as the event database is created. This will populate registration information, template code and more.

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.

Event Manager (FMS)

Team Selection

Though only displayed here once, this step is the same for both the Practice and Qualification portions of the event.

View and Add Registrations

The screenshot shows the 'Practice Team Selection' step in the FMS. The table below represents the data displayed in the interface:

Team #	Team Name	Key Generated	Key Status	Rookie	Location	Robot Name	
<input type="checkbox"/>	1	The Juggernauts	False		1997	Pontiac, Michigan USA	Juggy
<input type="checkbox"/>	4	Team 4 ELEMENT	False		1997	Van Nuys, California USA	
<input type="checkbox"/>	8	Paly Robotics	False		1996	Palo Alto, California USA	Freya
<input type="checkbox"/>	11	MORT	False		1997	Flanders, New Jersey USA	MORT
<input type="checkbox"/>	16	Bomb Squad	False		1996	Mountain Home, Arkansas USA	Black Widow
<input type="checkbox"/>	20	The Rocketeers	False		1992	Clifton Park, New York USA	Scorpio
<input type="checkbox"/>	21	ComBBAT	False		1998	Titusville, Florida USA	Dragoslav
<input type="checkbox"/>	25	Raider Robotix	False		1997	North Brunswick, New Jersey USA	
<input type="checkbox"/>	27	Team RUSH	False		1997	Clarkston, Michigan USA	Gold RUSH
<input type="checkbox"/>	28	Pierson Whalers	False		1996	Sag Harbor, New York USA	Beast from the East
<input type="checkbox"/>	31	Prime Movers	False		1997	Jenks, Oklahoma USA	
<input type="checkbox"/>	33	Killer Bees	False		1996	Auburn Hills, Michigan USA	Buzz 20
<input type="checkbox"/>	34	Rockets	False		1997	Athens, Alabama USA	
<input type="checkbox"/>	41	RoboWarriors	False		1997	Warren, New Jersey USA	
<input type="checkbox"/>	45	TechnoKats Robotics Team	False		1992	Kokomo, Indiana USA	Sir Lance-a-Bot
<input type="checkbox"/>	48	Delphi E.L.I.T.E.	False		1998	Warren, Ohio USA	xtremachen19
<input type="checkbox"/>	51	Wings of Fire	False		1996	Pontiac, Michigan USA	Wings of Fire
<input type="checkbox"/>	56	R.O.B.B.E.	False		1997	Bound Brook, New Jersey USA	R.O.B.B.E.
<input type="checkbox"/>	58	The Riot Crew	False		1996	South Portland, Maine USA	TBD

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.

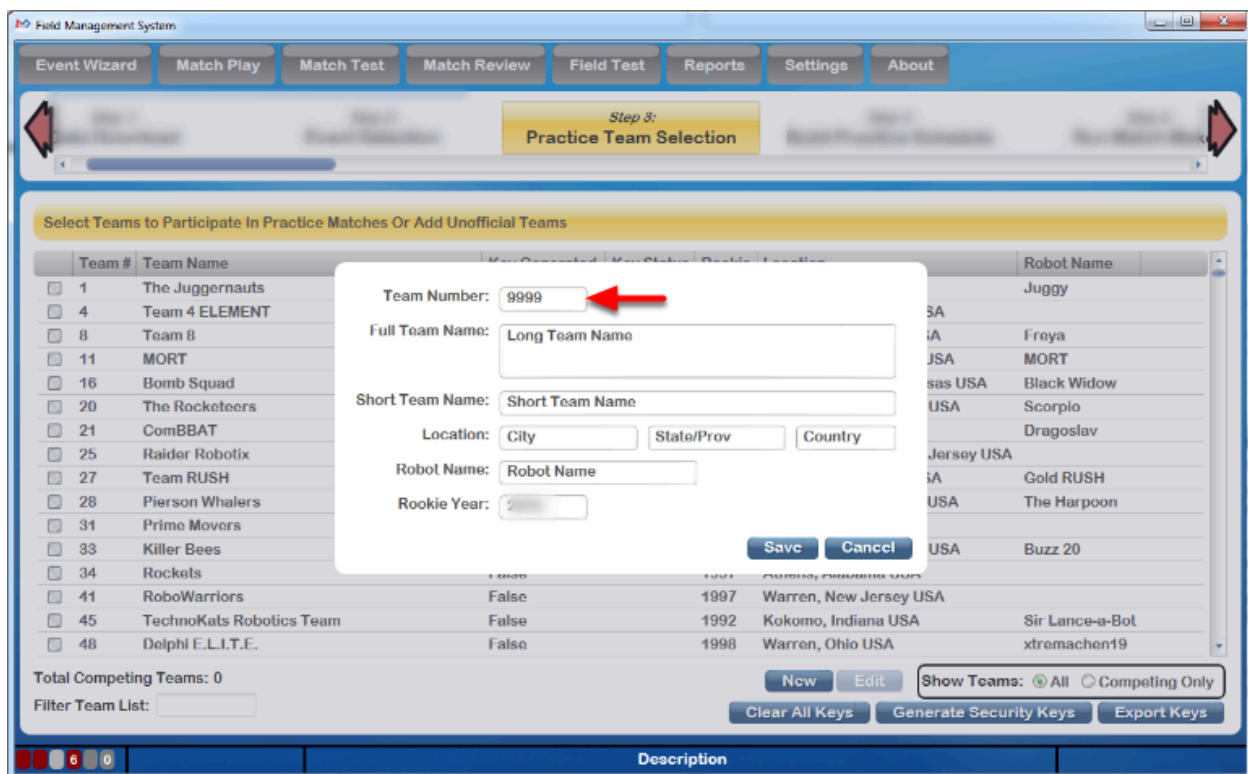
[Red] Checkboxes indicate the registration status of a particular team at a particular event. If the box is checked, the team on that row is set as "competing" for the event. Unchecked teams are not listed as competitors.

Event Manager (FMS)

[Green] The count of competing teams is shown (number of 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] The "new" and "edit" buttons can be used to add unofficial teams for Off-Season use. These are disabled at official events.

Adding Off-Season Teams (Optional)



If additional teams are needed at an off-season event, the "new" button (blue box above) can be used to create a custom team. The team number (red arrow) 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: Teams 9985 to 9999 are "pre-loaded" 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.

Event Manager (FMS)

Generate Security Keys

The screenshot shows the 'Practice Team Selection' step in the FMS. A table lists various teams with their respective key statuses. A green arrow points to the 'Key Generated' column, indicating that keys have been successfully generated for the selected teams. A black arrow points to the 'Generate Security Keys' button, which is used to generate keys for the selected teams. A blue arrow points to the 'Export Keys' button, which is used to save the key file. A red arrow points to the 'Clear All Keys' button, which is used to clear all keys for the selected teams. The 'Total Competing Teams' is displayed as 60.

Team #	Team Name	Key Generated	Key Status	Rookie	Location	Robot Name
399	Eagle Robotics	True	NotTested	2000	Lancaster, California USA	Chames
585	Cyber Penguins	True	NotTested	2001	Tehachapi, California USA	The Dark Knight
812	The Midnight Mechanics	True	NotTested	2002	San Diego, California USA	The Mid Knight
1148	WaffRobots	True	NotTested	2003	Studio City, California USA	Lewis
1157	Samona Rampage	True	NotTested	2003	Alhambra, California USA	
1197	Robots	True	NotTested	2003	Torrance, California USA	SanTor
1266	The DarkKnights	True	NotTested	2004	San Diego, California USA	Savage
1388	Eagle Robotics	True	NotTested	2004	Arroyo Grande, California USA	
1572	Hammer Heads	True	NotTested	2005	San Diego, California USA	
1622	Team Spyster	True	NotTested	2005	Poway, California USA	For Sale
1972	Searing Engineering	True	NotTested	2006	El Centro, California USA	Honey Badger
2162	Team Paradox	True	NotTested	2007	Encinitas, California USA	
2339	Robolopes	True	NotTested	2008	Lancaster, California USA	Sauron
2443	Blue Thunder	True	NotTested	2008	Kahului, Hawaii USA	Slitch
2445	RoboKAP	True	NotTested	2008	Kapolei, Hawaii USA	Sarah-Jane
2485	WARLords	True	NotTested	2008	San Diego, California USA	Orion

Once the teams competing at the event have all been selected, and proper number is displayed under "Total Competing Teams", security keys should be generated for use by the field. This is done using the "Generate Security Keys" (black arrow) button. Once keys are generated, a success message will be displayed and (green arrow) the "Key Generated" column will display the new status of "True".

If additional teams are added later, the same button 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.

As a backup, if the automatic download is unavailable, Select *Export Keys* (blue arrow) to save the key file needed to program the keys into the Radio Kiosk used by teams to program their robot radios. This should only be used by the FTA, as it requires their password to complete.

- After WPA security keys have been distributed to the teams, it is important to not require these codes to be redistributed and reprogrammed. Teams that already have a key do not receive a new one when the *Generate Security Keys* button is pressed.

The Qualification and Playoff 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 those steps of the Wizard.

Event Manager (FMS)

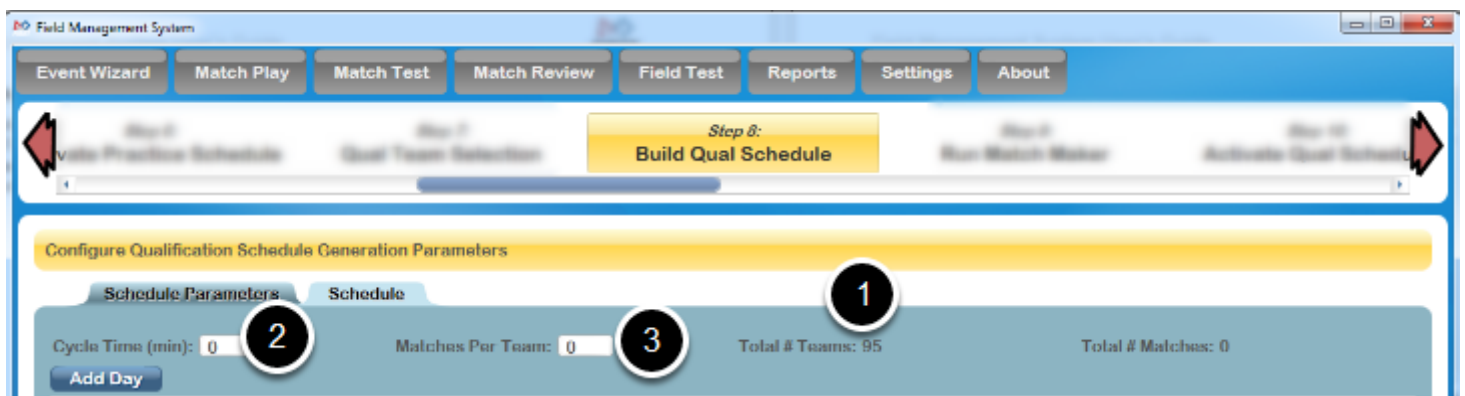
If necessary, the Clear All Keys button (red arrow) can be used to return all teams to their default, keyless, state. This should only be used carefully, as any programmed radios would need to be re-done. This action requires the FTA password.

Event Manager (FMS)

Build Schedule

Though only displayed here once, this step is the same for both the Practice and Qualification portions of the event.

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 start and stop times for the Day(s), the lunch period, number of matches per team, and match duration. In our example steps, we'll be building a two day qualification tournament.

- (1) Confirm the number of Teams matches the number expected (as defined in the [Team Selection](#) step)
- (2) Enter the Cycle Time (in minutes) for matches. This is the start-to-start time for matches
- (3) Enter the number of matches per team (which will usually be pre-populated with the number required by *FIRST* HQ)

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

Event Manager (FMS)

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 button marked in **Green** to add the number of days necessary to the list. If necessary, a Day (and any associated breaks) can be deleted by using the **Orange** marked button.

[Red] Confirm the start date and time for each day of the level. The day of the week is displayed in red next to the box, and is used to confirm the schedule day is entered correctly.

[Blue] Enter the approximate number of matches for each day of the level (estimates are fine, this may need adjustment as breaks 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

Event Manager (FMS)

Add Breaks

The screenshot shows the 'Field Management System' interface at 'Step 8: Build Qual Schedule'. The main area is titled 'Configure Qualification Schedule Generation Parameters'. It 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: 48', and 'Total # Matches: 80'. Below this is an 'Add Day' button. Two days are listed:

- Friday (03/01/2019 9:00 AM to 04:38 PM):**
 - 'Add Break' button (Green)
 - 'Add Cycle Change' button
 - Break 1: Description: Lunch (Red), After Match Number: 25 (Blue), Length (min): 60 (Pink), Break Start: 11:38 AM, Delete Break button (Orange)
- Saturday (03/02/2019 9:00 AM to 10:50 AM):**
 - 'Add Break' button (Green)
 - 'Add Cycle Change' button
 - Break 1: Description: Speaker (Red), After Match Number: 75 (Blue), Length (min): 15 (Pink), Break Start: 10:05 AM, Delete Break button (Orange)

At the bottom right, there are 'Clear Schedule Parameters' and 'Generate Schedule' buttons. The footer shows 'Orange County Regional'.

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. Press the *Add Break* (marked in Green) 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 *Delete Break* button shown in Orange. There is no limit to the number of breaks on a particular day. For each break, parameters must be defined:

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

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

[Pink] The length (in minutes) of the break before the next match should start

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

Event Manager (FMS)

Add Cycle Changes

The screenshot shows the 'Field Management System' interface at 'Step 8: Build Qual Schedule'. The main area is titled 'Configure Qualification Schedule Generation Parameters' and is divided into 'Schedule Parameters' and 'Schedule' tabs. Under 'Schedule Parameters', there are fields for 'Default Cycle Time (min): 7', 'Matches Per Team: 10', 'Total # Teams: 48', and 'Total # Matches: 80'. Below this, there are two main sections for 'Friday' (03/01/2019) and 'Saturday' (03/02/2019). Each day section includes an 'Add Day' button, a 'Day Start' field, 'Day Start Cycle (min): 7', 'How Many Matches', and 'Day End'. Under each day, there are match entries with columns for 'Description', 'After Match Number', 'Length (min)', 'Break Start', and 'Delete Break'. For Friday, a match 'Lunch' is shown with 'After Match Number: 25', 'Length (min): 60', and 'Break Start: 11:38 AM'. Below it, a 'Cycle Change' entry is shown with 'After Match Number: 8', 'Cycle Change +/- (min): -1', and 'New Cycle of 6:00 on Start of Match 9'. The 'Add Cycle Change' button is highlighted in green, and the 'Delete Cycle Change' button is highlighted in orange. Red and blue arrows point to the 'After Match Number' and 'Cycle Change +/- (min)' fields respectively. At the bottom, there are 'Clear Schedule Parameters' and 'Generate Schedule' buttons.

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. Press the *Add Cycle Change* (marked in Green) 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 *Delete Cycle Change* button shown in Orange. There is no limit to the number of cycle changes on a particular day, though *FIRST* HQ recommends no more than one change. For each change, parameters must be defined:

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

[Blue] The change that will happen. 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.

Event Manager (FMS)

Validation Messages

The screenshot shows the 'Build Qual Schedule' step in the Field Management System. The interface includes a navigation bar with tabs like 'Event Wizard', 'Match Play', 'Match Test', 'Match Review', 'Field Test', 'Reports', 'Settings', and 'About'. Below this is a progress indicator with steps: 'Build Qual Schedule', 'Qual Team Selection', 'Build Qual Schedule', 'Run Match Maker', and 'Audit Qual Schedule'. The main area is titled 'Configure Qualification Schedule Generation Parameters' and has two tabs: 'Schedule Parameters' and 'Schedule'. The 'Schedule' tab is active, showing a table of days and breaks. The table has columns for 'Day Start', 'Day End', 'How Many Matches', and 'Break Start'. The first row is for Friday, 03/02/2018, with 65 matches and a break starting at 11:55 AM. The second row is for Saturday, 03/03/2018, with 17 matches and a break starting at 10:10 AM. At the bottom left, a red message reads: '3/3/18: All breaks must have a length of one (1) minute or longer.' Two red arrows point from this message to the 'Generate Schedule' button, which is disabled. The 'Clear Schedule Parameters' button is also visible.

If any data entered is not valid, a message will appear on the bottom left and the *Generate Schedule* button will become disabled. The validation message will contain the date (when applicable) followed by the message text. All validation errors must be corrected before a schedule can be generated.

Event Manager (FMS)

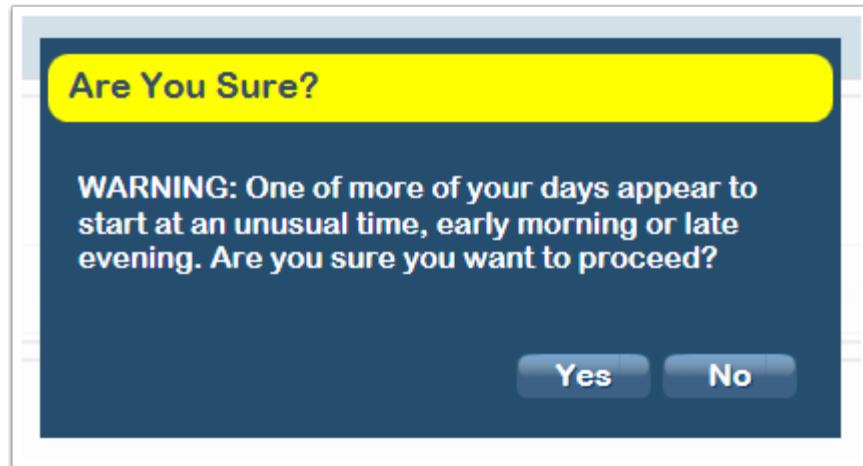
Confirm and Generate

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

If all information is accurate, click the *Generate Schedule* button marked with the Green arrow. While generating, the screen will turn gray and the "busy" indicator will show on the bottom right. A confirmation dialog will appear when the process completes. Messages may appear to provide warning about elements of the schedule, and off Yes/No selections before continuing to generate the schedule.

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.

Event Manager (FMS)



Review

Field Management System

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

Step 1: Build Qual Schedule Step 2: Qual Team Selection **Step 3: Build Qual Schedule** Step 4: Run Match Maker Step 5: Activate Qual Schedule

Configure Qualification Schedule Generation Parameters

Schedule Parameters **Schedule**

Description	Time	Match	Red 1	S	Red 2	S	Red 3	S	Blue 1	S	Blue 2	S	Blue 3	S
Qualification 1 (A)	2/26 09:00 AM	1	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 2 (A)	2/26 09:07 AM	2	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 3 (A)	2/26 09:14 AM	3	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 4 (A)	2/26 09:21 AM	4	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 5 (A)	2/26 09:28 AM	5	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 6 (A)	2/26 09:35 AM	6	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 7 (A)	2/26 09:42 AM	7	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Audience Selection			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Qualification 8 (A)	2/26 09:52 AM	8	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 9 (A)	2/26 09:59 AM	9	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 10 (A)	2/26 10:06 AM	10	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 11 (B)	2/26 10:13 AM	11	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 12 (B)	2/26 10:20 AM	12	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 13 (B)	2/26 10:27 AM	13	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 14 (B)	2/26 10:34 AM	14	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 15 (B)	2/26 10:41 AM	15	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>
Qualification 16 (B)	2/26 10:48 AM	16	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>	0	<input type="checkbox"/>

Clear Schedule Parameters Generate Schedule

Palmetto Regional

After generation, clicking the "Schedule" tab (marked with a red box) will present 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 redoing other steps

Event Manager (FMS)

(such as Match Maker) or losing match progress (if matches have been played) so it is important to have the schedule be accurate from the start.

Notes:

Note that these times are fixed and will not update, "*The Schedule is The Schedule*" so to speak.

The goal should be to play as close to the original published schedule as possible, without getting more than 4-5 minutes ahead. The timer on the bottom bar ([see here](#)) will display ahead/behind information.

It is recommended to not get too far ahead regardless of how well things are going as this can be confusing to teams, as well as parents, VIPs, sponsors, etc. who show up to see a particular team compete only to find out the match was played early.

Playoff Notes

Once the Alliance Selection has been completed, the next step in the Event Wizard is to configure the Playoff Tournament. In order to generate a Playoff Schedule, alliance selection must be complete. If it is not, an error message will be presented saying to complete the alliance selection process.

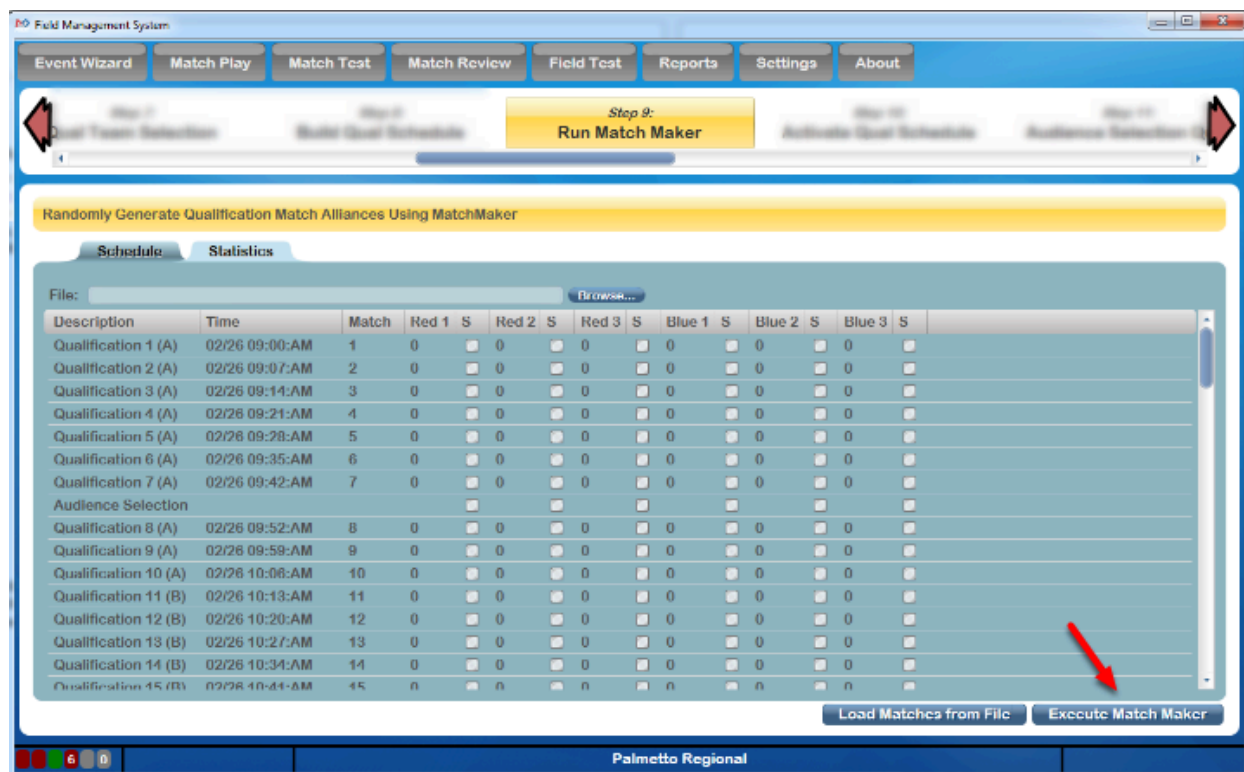
The FMS software will only populate the quarterfinal matches (or octofinals/semifinals for other size tournaments) initially in Playoffs. As alliances advance in the Playoff Tournament the software will automatically populate the next round as teams advance from the prior rounds.

Event Manager (FMS)

Run Match Maker

Though only displayed here once, this step is the same for both the Practice and Qualification portions of the event.

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 FRC Manual. Match Maker should only be run one time for the Practice schedule, and one time for the Qualification schedule. If for some reason it is believed that the schedule is not optimum, consult FRC Engineering for additional review. This process should be done with the FTA present.

Event Manager (FMS)

The schedule generated in the previous step will be present on the Match Maker step. To begin the pairing process, click the *Execute Match Maker* button (marked with the **Red** arrow). Confirmation will be required that new execution is requested, as any previous executions will be removed.

Match Maker In Progress

Description	Time	Match	Red 1 S	Red 2 S	Red 3 S	Blue 1 S	Blue 2 S	Blue 3 S
Qualification 1 (A)	02/26 09:00:AM	1	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 2 (A)	02/26 09:07:AM	2	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 3 (A)	02/26 09:14:AM	3	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 4 (A)	02/26 09:21:AM	4	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 5 (A)	02/26 09:28:AM	5	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 6 (A)	02/26 09:35:AM	6	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 7 (A)	02/26 09:42:AM	7	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audience Selection				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 8 (A)	02/26 09:52:AM	8	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 9 (A)	02/26 09:59:AM	9	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 10 (A)	02/26 10:06:AM	10	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 11 (B)	02/26 10:13:AM	11	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 12 (B)	02/26 10:20:AM	12	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 13 (B)	02/26 10:27:AM	13	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 14 (B)	02/26 10:34:AM	14	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualification 15 (B)	02/26 10:41:AM	15	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Upon execution, Match Maker will begin formulating the alliances. On the lower left, a progress message will indicate how much time (approximately) is remaining in the process. This process takes more time when more teams are involved- occasionally upwards of four minutes. The process should not be interrupted. Upon completion, a success (or failure) message will be presented. Match Maker can only run if the user has Administrator permissions on the server.

Event Manager (FMS)

Review Schedule

Field Management System

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

Step 1: Qual Team Selection Step 2: Build Qual Schedule **Step 3: Run Match Maker** Step 4: Activate Qual Schedule Step 5: Audience Selection

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule Statistics

File: Browse...

Description	Time	Match	Red 1 S	Red 2 S	Red 3 S	Blue 1 S	Blue 2 S	Blue 3 S
Qualification 19 (B)	02/26 11:12:AM	19	4748	<input type="checkbox"/> 1	<input type="checkbox"/> 1102	<input type="checkbox"/> 5022	<input type="checkbox"/> 1539	<input type="checkbox"/> 4847
Qualification 20 (B)	02/26 11:19:AM	20	6167	<input type="checkbox"/> 8	<input type="checkbox"/> 5410	<input type="checkbox"/> 4582	<input type="checkbox"/> 2393	<input type="checkbox"/> 21
Qualification 21 (C)	02/26 11:26:AM	21	16	<input type="checkbox"/> 4243	<input type="checkbox"/> 1758	<input type="checkbox"/> 1876	<input type="checkbox"/> 4098	<input type="checkbox"/> 5020
Qualification 22 (C)	02/26 11:33:AM	22	2614	<input type="checkbox"/> 5130	<input type="checkbox"/> 1296	<input type="checkbox"/> 5068	<input type="checkbox"/> 2172	<input type="checkbox"/> 4013
Qualification 23 (C)	02/26 11:40:AM	23	4823	<input checked="" type="checkbox"/> 2815	<input type="checkbox"/> 5777	<input checked="" type="checkbox"/> 4901	<input type="checkbox"/> 4083	
Qualification 24 (C)	02/26 11:47:AM	24	3824	<input type="checkbox"/> 4265	<input type="checkbox"/> 1539	<input type="checkbox"/> 2252	<input type="checkbox"/> 3976	<input type="checkbox"/> 2187
Qualification 25 (C)	02/26 11:54:AM	25	2393	<input type="checkbox"/> 3489	<input type="checkbox"/> 4073	<input type="checkbox"/> 5022	<input type="checkbox"/> 11	<input type="checkbox"/> 20
Lunch								
Qualification 26 (C)	02/26 01:01:PM	26	4243	<input type="checkbox"/> 5327	<input type="checkbox"/> 4075	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 5180
Qualification 27 (C)	02/26 01:08:PM	27	1553	<input type="checkbox"/> 4582	<input type="checkbox"/> 1398	<input type="checkbox"/> 4	<input type="checkbox"/> 1876	<input type="checkbox"/> 4902
Audience Selection								
Qualification 28 (C)	02/26 01:18:PM	28	1389	<input type="checkbox"/> 4098	<input type="checkbox"/> 2556	<input type="checkbox"/> 5898	<input type="checkbox"/> 6167	<input type="checkbox"/> 4547
Qualification 29 (C)	02/26 01:25:PM	29	5410	<input type="checkbox"/> 1287	<input type="checkbox"/> 4074	<input type="checkbox"/> 1102	<input type="checkbox"/> 16	<input type="checkbox"/> 2814
Qualification 30 (C)	02/26 01:32:PM	30	4504	<input type="checkbox"/> 4533	<input type="checkbox"/> 4748	<input type="checkbox"/> 4267	<input type="checkbox"/> 6222	<input type="checkbox"/> 4451
Qualification 31 (D)	02/26 01:39:PM	31	8	<input type="checkbox"/> 3490	<input type="checkbox"/> 4992	<input type="checkbox"/> 2386	<input type="checkbox"/> 5063	<input type="checkbox"/> 1758
Qualification 32 (D)	02/26 01:48:PM	32	5090	<input type="checkbox"/> 2200	<input type="checkbox"/> 5317	<input type="checkbox"/> 4847	<input type="checkbox"/> 5409	<input type="checkbox"/> 1488

Load Matches from File Execute Match Maker

Palmetto Regional

When the process is complete, the team numbers will be shown in place on the schedule. If any teams are playing as a Surrogate, the box to the right of the team number will be checked (shown with the Green arrow). The schedule (now showing the alliances) should match what was entered on the previous step.

Event Manager (FMS)

Review Statistics

Field Management System

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

Step #: Run Match Maker

Randomly Generate Qualification Match Alliances Using MatchMaker

Schedule | Statistics | Rounds

Team	Matches	Surrogates	# Partners	# Opponents	Alliance Partners	Opponents
3150	1	0	2	3	6210, 6965,	5087, 6407, 6607,
3354	1	0	2	3	4731, 5716,	6319, 6348, 6647,
3472	1	0	2	3	6483, 6694,	3933, 5874, 7102,
3478	1	0	2	3	3527, 4635,	4401, 6017, 6605,
3510	1	0	2	3	6010, 6170,	4782, 5696, 6983,
3522	1	0	2	3	3526, 6652,	5982, 6156, 6820,
3526	1	0	2	3	3522, 6652,	5932, 6156, 6820,
3527	1	0	2	3	3478, 4635,	4401, 6017, 6605,
3794	1	0	2	3	4775, 6676,	4584, 5844, 6507,
3933	1	0	2	3	5874, 7102,	3472, 6483, 6694,
4010	1	0	2	3	6200, 6666,	4746, 5133, 6408,
4401	2	1	4	5	5133, 6017, 6348, 6605,	3478, 3527, 4635(2), 5948, 6965,
4584	1	0	2	3	5844, 6507,	3794, 4775, 6676,
4635	2	1	4	5	3478, 3527, 5948, 6965,	4401(2), 5133, 6017, 6348, 6605,
4731	1	0	2	3	3354, 5716,	6319, 6348, 6647,
4746	1	0	2	3	5133, 6106,	4010, 6200, 6666,
4775	1	0	2	3	3794, 6676,	4584, 5844, 6507,
4782	1	0	2	3	5696, 6983,	3510, 6010, 6170,
5133	2	1	4	5	4401, 4746, 6408, 6605,	4401, 4635, 5948, 6965, 6965,

Load Matches from File | Execute Match Maker

Monterrey Regional

Definitions of the content in each column on the statistics tab is as follows:

- *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 for some reason you see a number greater than 1 in this column, click the *Generate Schedule* 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 in question will be on an alliance with team 812 twice over the course of all Qualification matches.

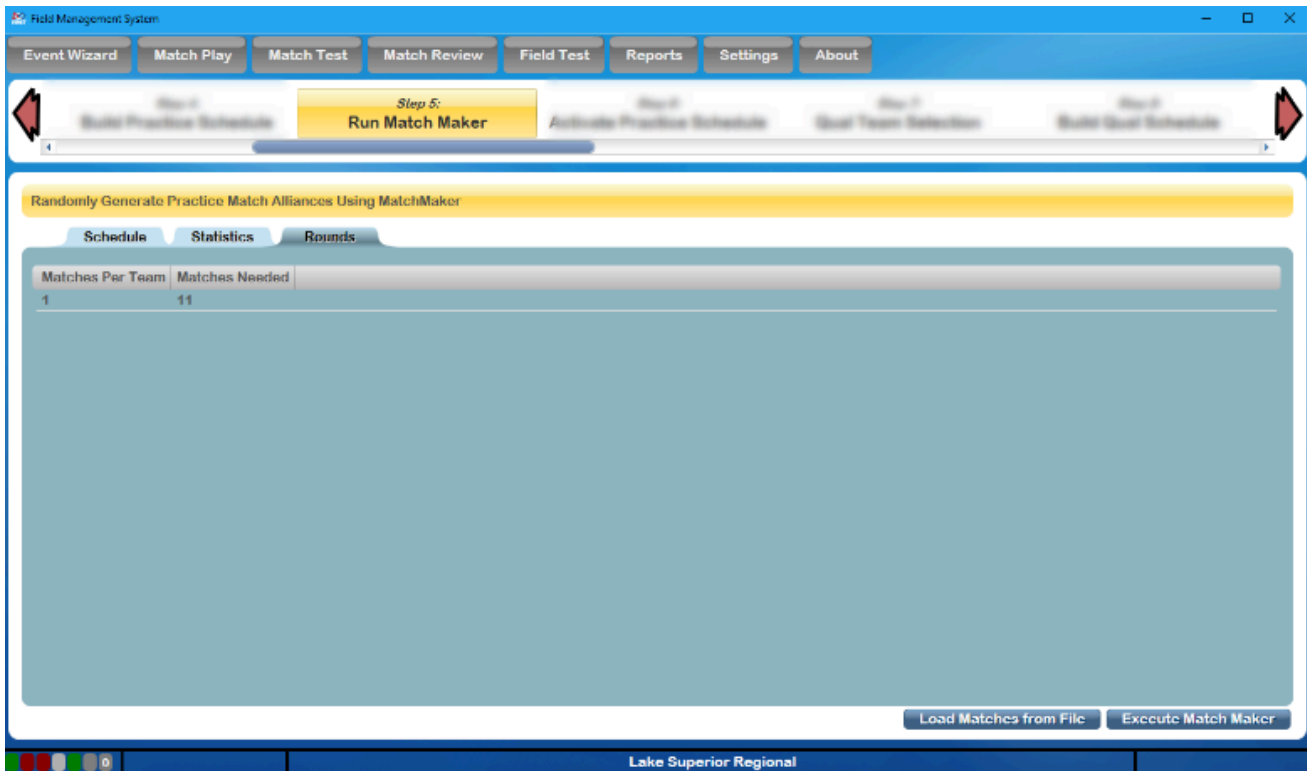
Event Manager (FMS)

- *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* 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 orange box above.

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

Rounds



The new "Rounds" tab displays information about the number of matches that must be played for a "round" to be completed (i.e. each team has played one additional match). 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.

Event Manager (FMS)

Alternate Alliance Pairing Method (Optional)



If an alternative Alliance Pairing Algorithm is desired for the Practice or Qualification Tournament, it can be imported into the FMS 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 FMS 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 (Each match is one line, for a total of 13 fields per line, tab delimited):

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

Event Manager (FMS)

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

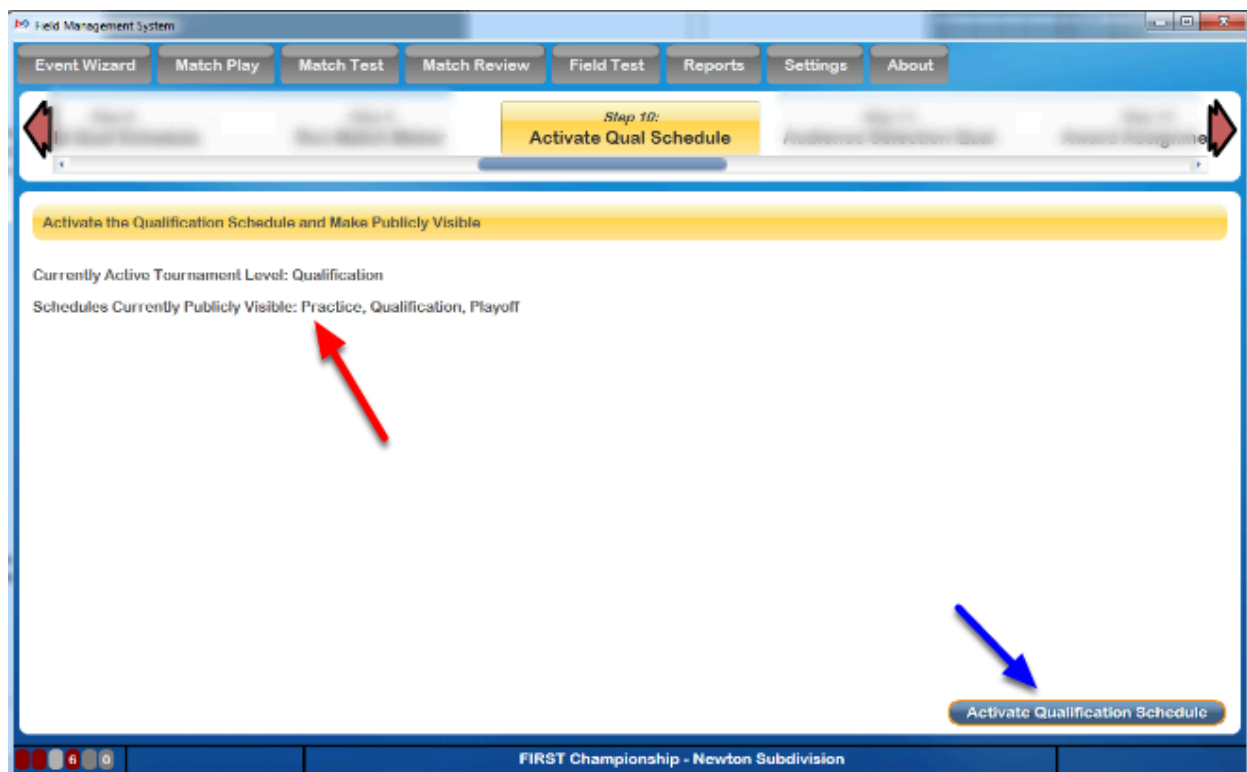
An example of this file can be found in the [Appendix](#).

Event Manager (FMS)

Activate Schedule

Though only displayed here once, this step is the same for both the Practice, Qualification and Playoff portions of the event.

Activate



After the match schedule has been generated and alliances defined, it must be activated in order to play Matches or appear on the web.

[Blue Arrow] Clicking the *Activate Practice Schedule* button will 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)

Event Manager (FMS)

[Red Arrow] The currently active tournament level, and all levels that are publicly visible, are displayed on the step.

Database Backup

Typically, after a tournament has been made active, the user will go to Match Play and play through the match schedule. The FMS 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.

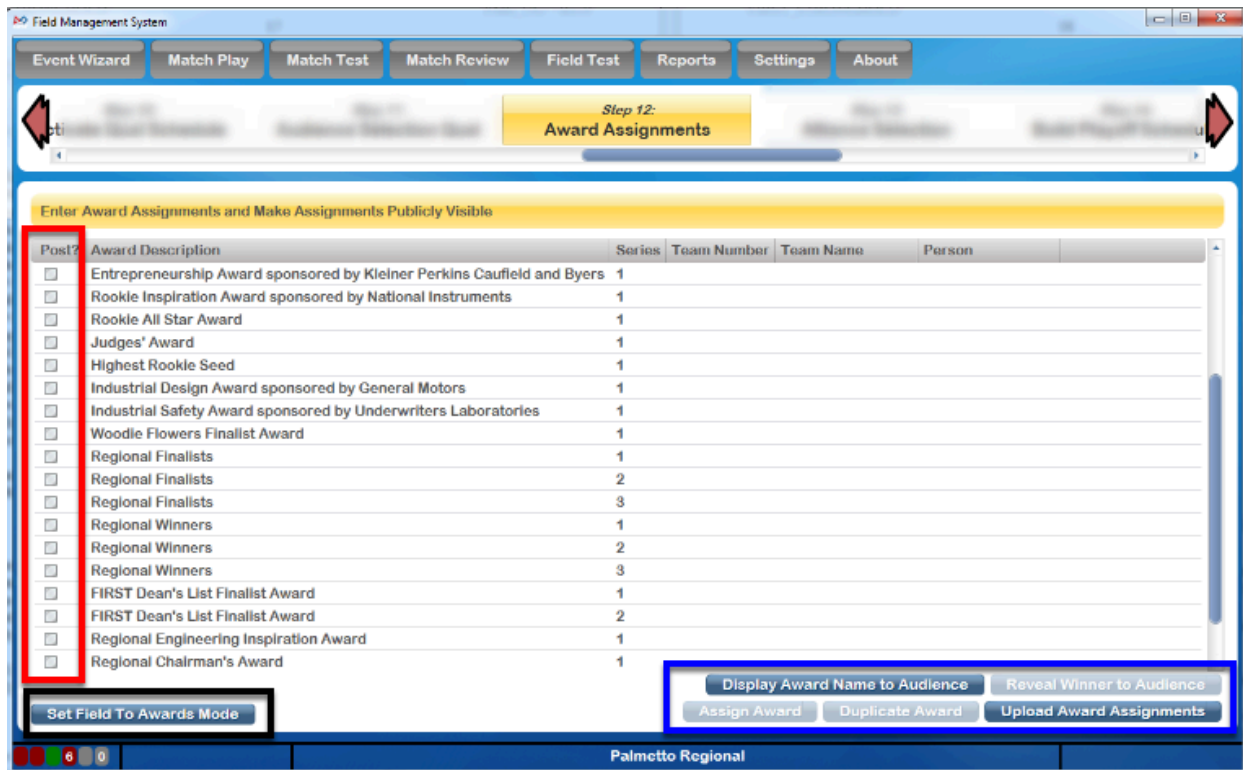
Full backups of the event database can be made by opening Match Play or Match Test and using the *Force Event Database Backup* button available on the *Options* tab in *Match Play*. Backups never hurt- and can be done as often as requested.

Event Manager (FMS)

Award Assignments

This step appears twice in the Event Wizard, but behaves similarly in both cases. For some events, like Districts, there are no awards on the first day (in which case the first Award Assignments step is simply not used).

Assignments



[Red] In order for an award to be visible on the web through the *FIRST* website, it must be marked as "Post" using the checkbox in that award's row.

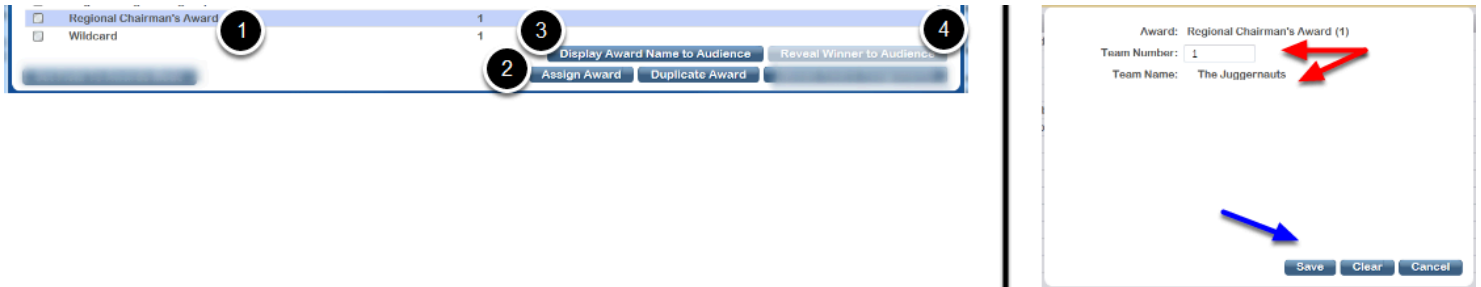
[Black] Using the *Set Field to Awards Mode* button the lights and team signs can be changed in the arena to a more universal look that's ready for the awards ceremony.

[Blue] Control buttons used to manage the award presentation process. Described below.

Event Manager (FMS)

After all awards for the day (or the event) have been presented, use the *Upload Award Assignments* button to send those assignments (if marked with Post) to the *FIRST* website.

Present an Award



To assign an award:

(1, left photo) Click on an Award to present (the background of the row will turn blue)

(2, left photo) Click *Assign Award* button to enter the winning team information

(Red, right photo) Type the team number of the winning team, and the team name will appear below as the team number is typed. If the award is presented to a team that's not competing (such as at District Championships) the number will show a red triangle "error" indicator, meaning the team did not compete at the event.

(Blue, right photo) After a team and/or person has been entered, the *Save* button commits this change. *Cancel* ignores the edits, *Clear* removes the award winner.

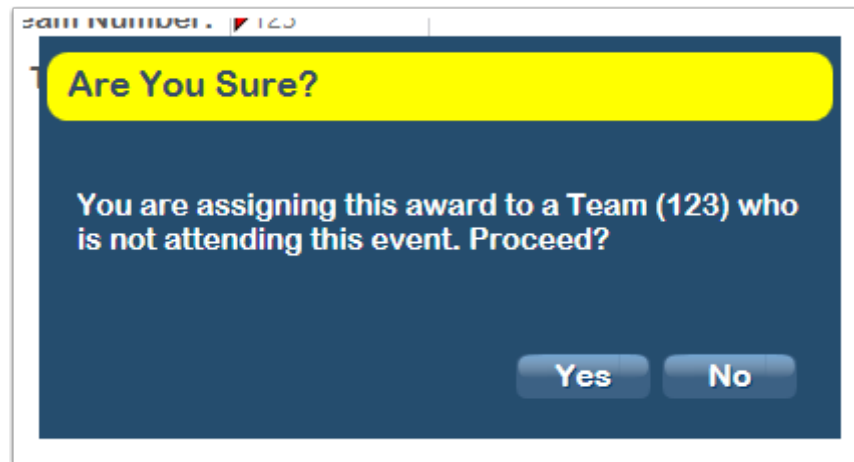
(3, left photo) The *Display Award Name to Audience* button displays a "frame" on the Audience Display informing them which award is being presented.

(4, left photo) **ONLY AFTER THE EMCEE HAS ANNOUNCED THE WINNING TEAM NUMBER** The *Reveal Winner to Audience* button displays the winning team's number and name to the Audience. See [Audience Screen](#) for examples of what these screens look like.

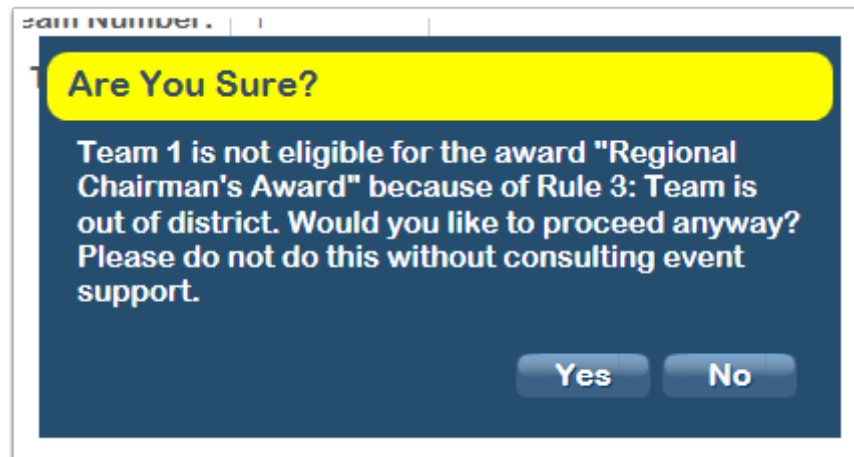
Award Assignment Confirmation Messages

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

Event Manager (FMS)



Awards can be assigned to any registered FRC Team in a given season, even if that team is not present at the event. This situation applies only to District Championship and FIRST Championship events, where a team does not always have to be competing at the event to win the award. If an attempt is made to assign an award to a team not competing, confirmation is required.



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 confirmation. Consult with the Judge Advisor for additional information.

Event Manager (FMS)

Award Assignment Notes

If more than one instance of an award is being presented, but not enough instance 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 on the bottom of the screen. A second instance (with "Series" 2) will be created and available for assignment.

FMS Off-Season does not support award distribution, and as such all buttons will be "grayed out" on the two award assignment wizard steps.

Event Manager (FMS)

Alliance Selection

Upon completion of the Qualification matches Alliance Selection is done in preparation for the Playoff Tournament

Alliance Pairing

Alliance Pairing

[Red] At all official FRC Events, the 8-alliance tournament is used, but smaller Off-Season events may use a 4-alliance playoff tournament. The current settings, as picked on the Event Selection step, are shown on the top of the screen.

[Blue] The list of available teams for selection is shown in the display box on the right hand side of the screen. As teams are selected from the pool of available teams, the corresponding team number is removed from the list of available teams. The list can be viewed sorted by Rank (default) or by team number (the "Team #" tab), and can be selected using the tabs shown by the blue arrow.

[Green] Use the Audience Video Control panel to select the Alliance (Pairing) screen to display to the audience. This can be used in conjunction with the Available Teams screen to inform the audience (and picking team) of which other teams remain available.

[Pink] The Scorekeeper populates the team numbers into this table. 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.

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

Event Manager (FMS)

Alternate Substitution

Substitution

The screenshot shows the 'Field Management System' window with the 'Alternate Substitution' step selected. The main area contains a table for substituting teams in a backup team during playoff rounds. The table has columns for 'Captain', 'Round 1', 'Round 2', and 'Backup'. A red box highlights the 'Backup' column, and a blue box highlights a team selection list on the right. A yellow dialog box asks for confirmation to substitute Team 4823 for Team 66.

Event Type: Regional	Playoff Type: ThreeTeamWithBackups, EightAlliance	Captain	Round 1	Round 2	Backup
Alliance 1		1	28	66	
Alliance 2		4	31	63	
Alliance 3		8	33	60	
Alliance 4		11	34	59	
Alliance 5		16	41	58	
Alliance 6		21	45	57	
Alliance 7		25	48	56	
Alliance 8		27	51	53	

Rank	Team
1	4823
2	6167
3	283
4	4074
5	4547
6	1553
7	6222
8	3824
10	4985
11	1102
12	4243

Confirmation Dialog: Are You Sure? Are you sure you would like to substitute Team 4823 for Team 66? This cannot be undone. [Yes] [No]

Playoff Tournament rules (other than events using 4-team alliances, such as the *FIRST* Championship) stipulate that if any member of an alliance becomes unable or unwilling to continue playing through the tournament, they can be replaced by the next highest-ranking team not selected during Alliance Selection. To add a backup team to an alliance:

(1) Type the new team number (incoming) into the "Backup" column on the corresponding alliance

- The incoming team should be the next team number on the list inside the blue box, as they would be the highest ranked unselected team. The only exception is if a team declines to be a backup, which they must have done before the Playoff tournament began.

(2) Click the radio button next to (right of) the outgoing team (being replaced)

(3) Click the *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.

- A confirmation dialog (shown on the right) will be presented and should be used to confirm the proper team numbers for incoming/outgoing.

Event Manager (FMS)

Un-doing Substitution

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, and scorekeepers should be double checking before entering substitute robots in the first place. To undo a substitution, click the red "X" next to the backup robot, as shown below with the green arrow. The software will confirm that you want to undo the backup robot, and at official FIRST events, require a password from event support before completing the process.

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

The screenshot shows the 'Field Management System' interface at 'Step 15: Alternate Substitution'. The main table displays robot assignments for eight alliances across three rounds (Captain, Round 1, Round 2) and a Backup column. A red 'X' icon is positioned next to the Backup robot number 5716 for Alliance 1, with a green arrow pointing to it. To the right, a 'Rank' table lists team numbers from 2 to 18. At the bottom, there are radio button options for 'Video Only', 'Alliance', 'Available Teams', 'Bracket', 'TimeOut', and 'Background', and another set for 'Video and Score', 'Match Preview', 'Rankings', 'Match Result', and 'Award Assignment'. A 'Save' button is located in the bottom right corner.

Event Type:	Regional			
Playoff Type:	ThreeTeamWithBackups, EightAlliance			
	Captain	Round 1	Round 2	Backup
Alliance 1	3158	3354	3510	5716
Alliance 2	3472	3478	3522	
Alliance 3	3526	3527	3794	
Alliance 4	3933	4010	4401	
Alliance 5	4584	4635	4731	
Alliance 6	4746	4775	4782	
Alliance 7	5133	5344	5696	
Alliance 8	5932	6010	6106	

Rank	Team #
2	7102
3	5874
9	6666
11	6200
13	6694
15	6483
16	6348
17	6319
18	6647

Event Manager (FMS)

Wildcards

Wildcards

Field Management System

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

Step 1: Wildcards

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

Wildcard Eligible Event Yes

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

Playoffs Complete No

Culture Awards Assigned No

Calculate Wildcards? [Calculate Wildcards](#)

Wildcard Assignments: No Wildcards To Award

#	Finalist Team #	Wildcard?	Generating Team	Generating Event	Generating Award

Orange County Regional

Per the rules outlined in the FRC Manual, under specific event conditions, Wildcards may be generated at Regional events, awarding the opportunity to attend the *FIRST* Championship to additional teams beyond the standard number. This step of the Wizard assists the user in determining if the event generated a Wildcard, and to which team the award should be given. Starting in 2017, all Regional events will have at least one Wildcard available.

Four prerequisites are required in order for the *Calculate Wildcards* button to become active:

1. *Wildcard Eligible Event*: Yes will be displayed if the current event is a Regional event. Wildcards are not generated at other events.
2. *FMS Data up-to-date*: The current FMS team list must have been downloaded within the last few days. If the data is old *Stale* will appear. Click *Data Download* to update the data if needed.
3. *Playoffs Complete*: All required Playoff matches have been played, i.e. there is a declared winner of the Playoff Tournament.

Event Manager (FMS)

4. *Culture Awards Assigned*: All the *FIRST* Championship qualifying awards must have been assigned and awarded.

Once all prerequisites are complete, the *Calculate Wildcards* button (5) can be pressed. If any Wildcards are generated at the event, the recipients will be listed in the area represented by the blue box. The accompanying script for the MC to read at the conclusion of the Awards Ceremony is available via [Reports](#) (Wildcard Script).

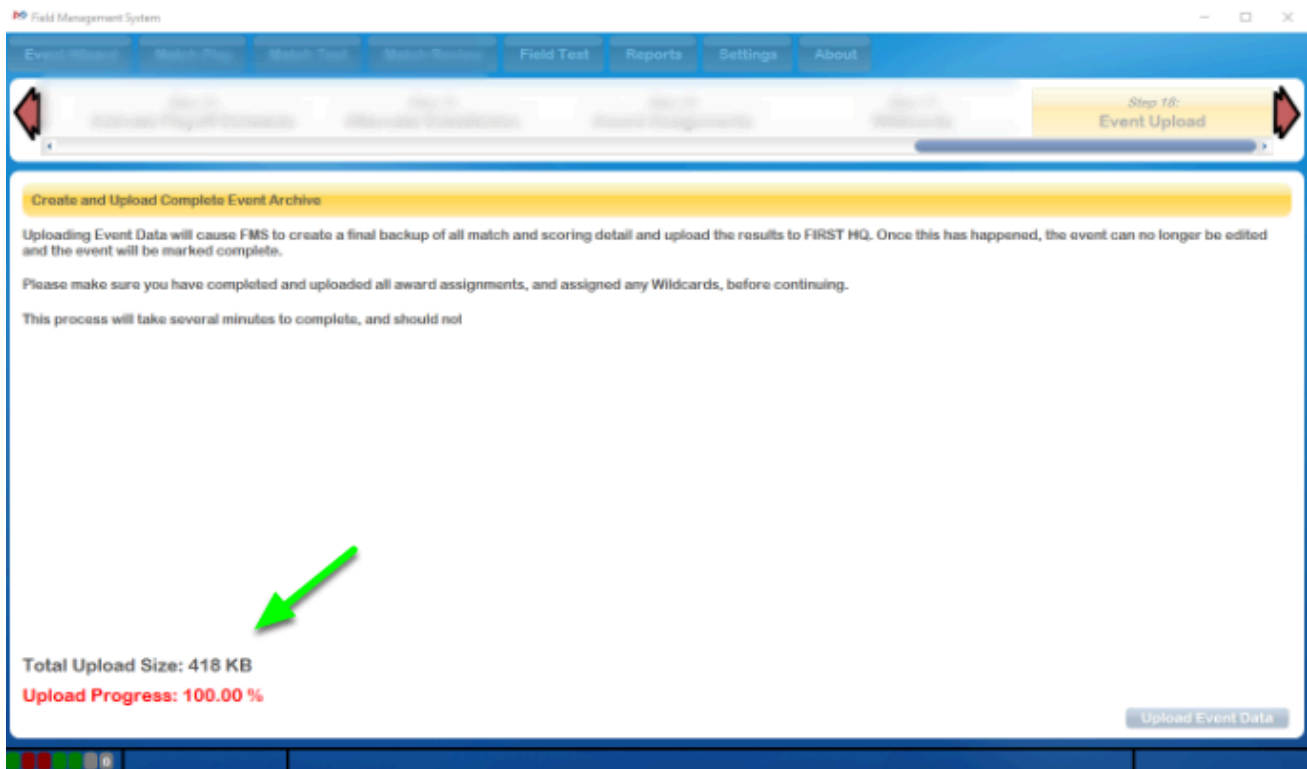
If any validation errors occur, or any status messages, they will appear in the spot shown by the **red** arrow. If no Wildcards are generated, the words *No Wildcards To Award* will appear under the status message area, to the right.

Event Manager (FMS)

Archive and Upload

At the end of the event, it's important to ensure that a backup is made of relevant tournament information to *FIRST* HQ.

Archive and Upload



The *Event Data Upload* step is used to do a complete backup of all tournament 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!

Event Manager (FMS)

Status information will be shown in the bottom left corner (**green arrow**) 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:

1. Ensure that the backup location is still present (didn't remove the USB drive, if applicable)
2. Ensure the backup location is set
3. 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 this step. Contact FRC Engineering before shutting down the server at the event, or if uploads are unsuccessful.

Event Manager (FMS)

Match Play/Test

Event Manager (FMS)

Interface

Match Play

Time	Field	Match	Status	Description	Blue Alliance			Red Alliance			Score	
					1	2	3	1	2	3		
03/02 11:00 AM	Primary	1	Played	Qualification 1	100	1708	4074	1293	3976	120	4267	88
03/02 11:07 AM	Primary	2	Played	Qualification 2	170	359	1553	6167	4547	329	1398	180
03/02 11:14 AM	Primary	3	Played	Qualification 3	150	2393	4504	5777	2815	5317	4847	88
03/02 11:21 AM	Primary	4	Played	Qualification 4	128	6222	1319	4075	1758	4823	4073	93
03/02 11:28 AM	Primary	5	Played	Qualification 5	0	4243	5020	4533	4451	4020	3489	0
03/02 11:35 AM	Primary	6	Played	Qualification 6	0	1102	3490	1369	4748	11	3651	0
03/02 11:42 AM	Primary	7	Played	Qualification 7	0	5063	5022	4965	5180	281	3008	60
03/02 11:49 AM	Primary	8	Played	Qualification 8	0	2187	1051	2614	283	6626	4265	60
03/02 12:56 PM	Primary	9	Played	Qualification 9	65	4575	343	1876	5327	6366	1539	76
03/02 01:03 PM	Primary	10	Played	Qualification 10	20	4582	6517	5898	4083	3140	342	243
03/02 01:10 PM	Primary	11	Aborted	Qualification 11		3824	1287	3651	6893	4073	120	
03/02 01:17 PM	Primary	12		Qualification 12		11	4451	4823	281	1293	8167	
03/02 01:24 PM	Primary	13		Qualification 13		4748	4267	3008	2187	1398	4075	
03/02 01:31 PM	Primary	14		Qualification 14		3976	1539	1102	5063	2393	4533	

The Match Play (and Match Test) environment is the tool that is open most often during an FRC event. The screen is used to start and stop matches, disable robots, and control the Audience Display.

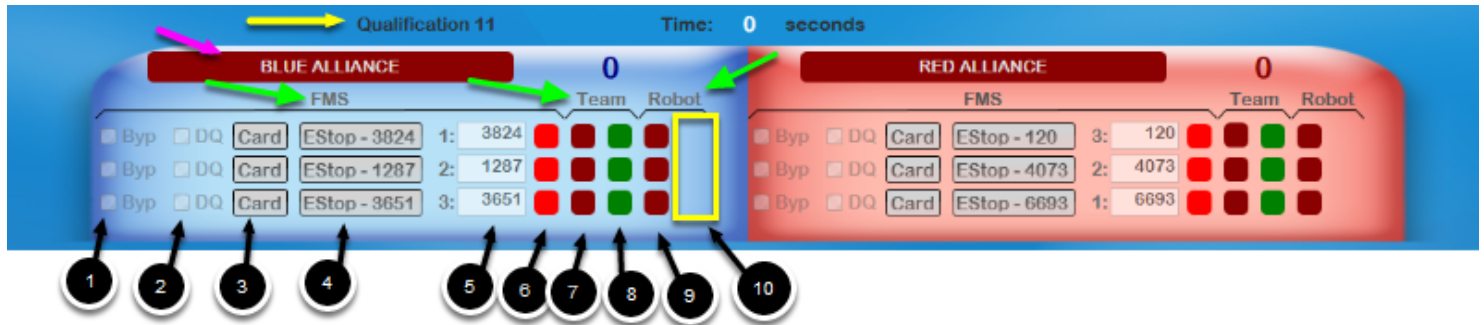
[Red] The top part of the screen shows the current match number, match time, score for the alliances and detail by station. Match time is updated in real time and will correspond with the same information shown on the LED Displays. The status of the robots at each end of the playing field is communicated 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 ([described later](#))

[White] Match Control is handled using the buttons in the center of the Match Play and Match Test screens ([described later](#))

Event Manager (FMS)

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

Station Status



Match number and timing information is shown at the very top of the display (yellow arrow), with time represented in total seconds (not min:sec) to match the timers on the field. The background of the "Blue Alliance" and "Red Alliance" fields (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 Alliance backgrounds must be Green (known state for all Robots on the Field).

Additionally along the top bar of Match Play is detailed station information- the background color indicates the alliance (Red or Blue) and the number near the textbox indicates the station (1 to 3). The information for each Alliance is broken down into three groups, FMS, Team, and Robot (based on the titles indicated by the green arrow). Markers in the graphic are shown for Blue Alliance, though the layout is the same for the Red Alliance.

FMS

Controls to inform FMS which robot in the indicated station position and how to handle it:

1. Byp - Select this box to bypass this particular station and force it to a ready (but disabled) state.
2. DQ - Select this box to indicate that the corresponding team has been DQ'd for this match (will also cause Bypass)
3. Card State (entered by Head Referee, can only be edited after Match is over):
 - 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 on its subsequent match, FMS will automatically change the red card to yellow

Event Manager (FMS)

4. Estop - used to Estop the robot during the match. This box also shows the team number that it will Estop, for quicker reference.
5. Team Number - 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.
6. WPA Key status:
 - Red - team has not been on the playing field
 - Yellow - has linked with the field, but has not played in a match
 - Green - the team has played in a match on the field

Team

Indicates the state of the DS:

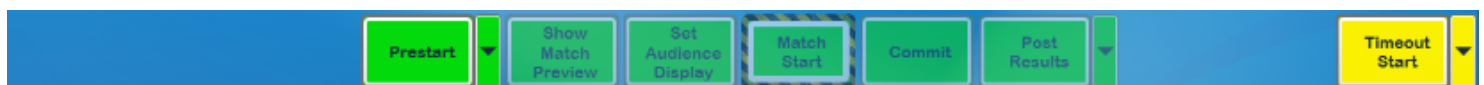
7. Left bubble - Indicates status of the FMS-to-DS link. If the team number and DS match, this bubble will be green.
8. Right bubble - Indicates status of the E-stop. If this light is green, the E-stop in the Team's Player Station is up. If it is red, the E-stop in the Player Station is down, or the Estop button on FMS has been pressed. An E-stop in the down position will cause the amber light in the Team Station to turn on.
 - All E-stops need to be in the up position to begin a match. Prestarting a match with any E-stop down will prompt a dialog box to be shown indicating in which Player Station the E-stop(s) are down.

Robot

Indicates the state of the Robot:

9. Left bubble - DS-to-Robot link status. If the DS and Robot are linked, this bubble will be green. If the station has been Bypassed, a "B" will appear in this bubble. If no link is established, the Team Light in the Player Station will flash at 1Hz (1 time per second) rate.
10. Right bubble - Indicator would display in yellow marked area, but only shows when a Robot is connected. Mode and System state of the Robot. "A" indicates Autonomous Mode, "T" indicates Teleoperated mode. If the Robot is disabled, the bubble is red, it will be green when the Robot is enabled by FMS.

Match Control (FCUI)

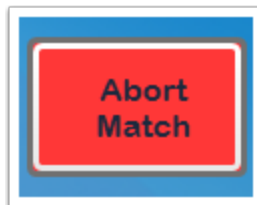


Event Manager (FMS)

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). Details on each button are as follows:

- *Prestart* - used to prep the field for the upcoming match. Prestart configures the field hardware for the six teams assigned in the Player Stations in the upper part of this screen.
 - *Prestart can be cancelled if necessary while it's running*
 - *Additional options are outlined below*
- *Show Match Preview* - displays the Match Preview screen with team names and current ranking data for teams in the upcoming match
- *Set Audience Display* - this button updates the Audience screen with the teams for the match
- *Match Start* - used to start the match (**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!**)
 - *Match Cancel* - use this same button to cancel a match in progress (button text changes after start)
- *Commit* - confirm the score of the match and write the details to the database
- *Post Results* - trigger the Audience screen and show the final scores and updated Rankings for the teams in the match
 - *Additional options are outlined below*
- *Timeout Start* - initialize or end a timeout and show the timing information on the Audience Display and on field LED displays. Length of a Timeout can be changed on the "Options" tab.
 - *Additional options are outlined below*

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.

Event Manager (FMS)

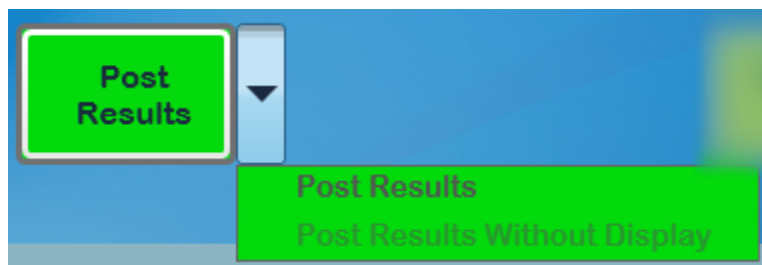
Prestart Dropdown



The Prestart button has additional options available via a dropdown. Details on each dropdown option are as follows:

- *Prestart* - this is 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" (In 2019, this avoids dumping Cargo out of the Cargoships when making network adjustments)
- *Reset Network With Team Change* - allows for re-programming of the field network hardware while also changing a team in one or more stations

Post-Results Dropdown

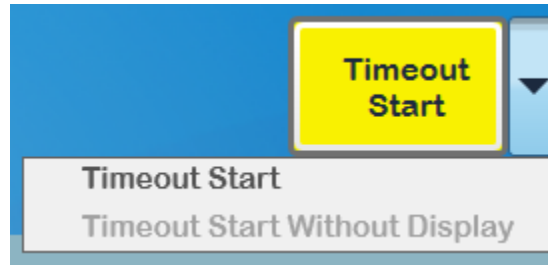


The Post-Results button has additional options available via a dropdown. Details on each dropdown option are as follows:

- *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

Event Manager (FMS)

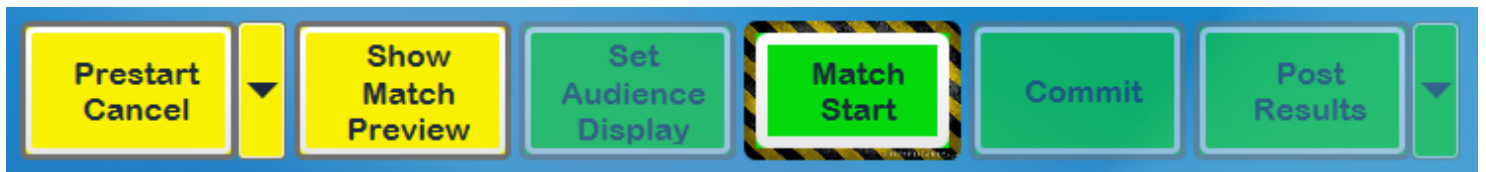
Timeout Dropdown



The Timeout button has additional options available via a dropdown. Details on each dropdown option are as follows:

- *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

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.

Event Manager (FMS)

Bypass vs DQ vs Red Card

Significance

Bypass and DQ essentially perform the same function to the Driver's Station, but have different outcomes with respect to 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 Player Station or with a Human Player. For this participation, the team is awarded full 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, 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) points for that match.

Event Manager (FMS)

Schedule

Time	Field	Match	Status	Description	Blue Alliance			Red Alliance			Score	
					Score	1	2	3	1	2		3
03/02 09:00 AM	Primary	1	Played	Qualification 1	131	2491	4674	3367	4539	2531	2823	92
03/02 09:07 AM	Primary	2	Played	Qualification 2	72	3754	877	2220	3275	3750	6047	83
03/02 09:14 AM	Primary	3	Played	Qualification 3	0	1986	1792	6056	7048	4181	2538	56
03/02 09:21 AM	Primary	4	Played	Qualification 4	0	5172	3298	3292	3883	3007	525	46
03/02 09:28 AM	Primary	5	Played	Qualification 5	85	5638	876	3277	2883	3134	5929	95
03/02 09:35 AM	Primary	6	Played	Qualification 6	139	2472	6175	6453	7235	3313	3102	15
03/02 09:42 AM	Primary	7	Played	Qualification 7	105	2500	4198	3	5576	4818	3300	76
03/02 09:49 AM	Primary	8	Played	Qualification 8	0	5658	4009	4239	7257	4360	3130	66
03/02 10:56 AM	Primary	9	Played	Qualification 9	0	3750	3277	3883	6056	2491	3275	40
03/02 11:03 AM	Primary	10	Played	Qualification 10	0	3313	2883	4539	1986	3754	5172	0
03/02 11:10 AM	Primary	11	Played	Qualification 11	5	4181	6047	2531	876	3300	2472	0
03/02 11:17 AM	Primary	12	Played	Qualification 12	0	4818	3292	5638	6453	3130	4009	0
03/02 11:24 AM	Primary	13		Qualification 13		3102	4239	3134	4198	3367	3298	
03/02 11:31 AM	Primary	14		Qualification 14		525	5929	4360	877	7048	2500	
03/02 11:38 AM	Primary	15		Qualification 15		2538	7257	7235	2823	2220	5576	
03/02 11:45 AM	Primary	16		Qualification 16		4674	5658	3007	1792	3	6175	

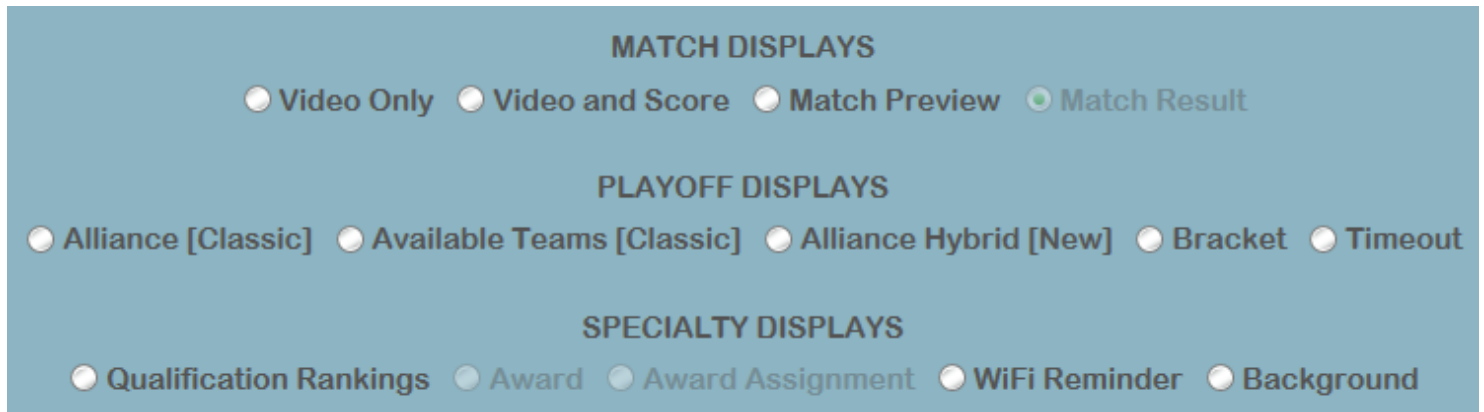
Currently active tournament level schedule, in match number order. To play a Match, click on it in the list (the list is disabled once Pre-Start is complete). The FCUI will automatically advance to the next unplayed Match at the conclusion of each Match (no need to "re-click" each time). To replay a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

The field are as follows:

- 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

Event Manager (FMS)

Video Switch



The screenshot shows a blue background with three sections of radio button options:

- 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
 - Award Assignment
 - WiFi Reminder
 - Background

Located on the Video Switch tab are the options to select what is displayed on the Audience Screen. See [Audience Display Screens](#) for more details on each option.

This interface allows the user to select, via the radio buttons, which screen to show to the Audience (i.e. which screen is active in the Audience program.) It also informs which screen is currently being shown.

Several options are not controllable through 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!

Event Manager (FMS)

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
Additional Content
Final Line of Text

Messages can be displayed on all Audience Display instances by entering them here and selecting the *Send Message* button. 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.

Options

<p>Auto Time <input style="width: 100px;" type="text" value="15"/></p> <p>Teleoperated Time <input style="width: 100px;" type="text" value="135"/></p> <p>Timeout Time <input style="width: 100px;" type="text" value="360"/></p> <p style="text-align: center;"> <input type="button" value="Save"/> <input type="button" value="Restore Defaults"/> </p>	<p style="text-align: center;"><input type="button" value="Force Cleanup Lights On"/></p> <p style="text-align: center;"><input type="button" value="Force Field Reset Lights On"/></p> <p style="text-align: center;"><input type="button" value="Force Event Database Backup"/></p> <p style="text-align: center;"><input type="button" value="Re-calculate Current Rankings"/></p> <p style="text-align: center;"><input type="button" value="Clear Access Point"/></p>
--	--

Match timing can be adjusted from this screen, for use in such things as test matches. Clicking *Restore Defaults* will return all three fields to their season-specific standards. After adjusting any times as necessary, select *Save* for the timing to take effect. These can only be changed prior to Pre-start.

On the right side of the display, there are options related to common actions that are more readily accessible:

Event Manager (FMS)

- *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.
- *Force Field Lights On* - When not in-match, force the green field reset lights to illuminate and indicate "safe to enter" state
- *Force Event Database Backup* - As the name suggests, forces 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 (i.e. Qualifications, QuarterFinals, SemiFinals, etc)
- *Clear Access Point* - Remove the team programming from the AP (does not changed 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)

Event Manager (FMS)

Status Tab

Status Tab

	DS	BWU	RADIO	roboRIO	Voltage	Status	Avg Trip	Packets
1 - 1	●	0.001	■	■	13.34	T	3	40213
2 - 2	⊗	0.000	■	■	0.00		0	0
3 - 3	●	0.000	■	■	8.82	T	3	57577
1 - 4	●	0.001	●	■	6.52	T	2	41870
2 - 5	⚠	0.062	●	●	13.44	T	10	38301
3 - 6	⚠	0.054	■	●	13.32	E	3	51632

Click on 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). Examples are for Blue Station 1 (team number 1 in this case) but the same data exists for all stations. The information for each team is:

- Station and Team number (in this case station 1, team number 1)
- 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)
- 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 7)
- Radio - Indicates that the DS is able to communicate with the radio on the robot
- roboRIO - Indicates that the DS is able to communicate with the roboRIO on the robot
- 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.
- Enabled/Mode - The state and mode of the robot.
 - "A" - Autonomous
 - "T" - Teleoperated
 - Red square - robot is disabled
 - Green circle - enabled.

Event Manager (FMS)

- Black diamond "E" - Robot is Estopped
 - 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 like 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 (Estopped, or any item on the row is "Red", like DS)
 - Brown - Bypassed
 11. The caution marker will appear next to teams that have out of date versions of hardware or software on their robot (such as old roboRIO firmware)

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.

Event Manager (FMS)

Score Tab

Game specific field scoring and adjustments.

Score Tab - Page 1

The screenshot displays the Score Tab interface for two teams: the home team (blue) and the opponent (red). The interface is divided into several sections:

- Robot Pre-Match Placement:** A 3x3 grid of options for robot placement. Each cell contains a robot icon and a selection button (None, Level 1, or Level 2). In the blue panel, the 'None' buttons are marked with a red 'X'. In the red panel, the 'None' buttons are marked with a red 'X'.
- Cargoship Pre-Match Placement:** A 3x3 grid of robot positions on a field. Each cell contains a robot icon and a selection button (None, Level 1, or Level 2). In the blue panel, the 'None' buttons are marked with a red 'X'. In the red panel, the 'None' buttons are marked with a red 'X'.
- Score Section:** A table of scores for various categories. The blue panel shows scores for Auto (0), Sandstorm (0), Teleop (0), Panels (0), Cargo (0), HAB Climb (0), Foul Pts (0), Rank Points (Rocket: No, HAB: No), and Opponent Rank Point Violations (G5-RemovePieces, G16-RocketTouch). The red panel shows scores for Auto (0), Sandstorm (0), Teleop (0), Panels (0), Cargo (0), HAB Climb (0), Foul Pts (0), Rank Points (Rocket: No, HAB: No), and Opponent Rank Point Violations (G5-RemovePieces, G16-RocketTouch).
- Navigation Bar:** A vertical bar on the left side of the interface with buttons for 'End Game', 'Match Play', 'Sandstorm', and 'Pre-Match'.

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).

Manually editing these values can be done 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 during the match come from the Referees or automation. In FMS Off-Season, values are editable during the match as there are no Referee panels or real time scores.

Event Manager (FMS)

Be careful if you elect to manually score, or edit scores manually, using the score tab!

Documentation will show the blue Alliance, but the functionality is the same for the red Alliance. 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.

Light Pink Box / Arrow - The area of the tab highlighted above in light pink is the score tab navigation. With the large amount of scoring data, multiple tabs are used to demonstrate various portions of the Match. Clicking a tab will change the visible page (each Alliance can be on a different tab).

Green Box - The area of the tab highlighted above in green is where Robot Pre-Match status will show. As referees input Pre-Match Levels, they will highlight here. Each team must have either "None" or "Level 1" or "Level 2" selected before starting a Match.

Yellow Box - The area of the tab highlighted above in yellow is the Cargoship Pre-Match. Each bay must have a Hatch Panel or a Cargo before starting a Match. The top Cargoship is data from the far side of the Field, the bottom Cargoship is data from the scoring table side of the Field. The Cargoship shown is from the perspective of the Referee entering the data.

Orange Box - The area of the tab highlighted above in orange is the score summary. All values in this box are in points, converted from the data in the other areas of the Alliance's score tab, **except for** the Foul/TechFoul boxes, which are counts. The ranking points area is always shown, but there are no ranking points in Practice/Playoff/Test matches, so they will always say No.

- Notice that Foul Pts, written in green, 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.
- The 2019 game has violations that result in the opposing Alliance receiving Ranking Points. These are shown through the "Opponent Rank Point Violations" checkboxes. The Ranking Point is credited to the Alliance where the checkbox is checked. For example, if the "G5-RemovePieces" is checked in the blue Alliance scoring area, blue Alliance will receive the Ranking Point (meaning red Alliance committed the violation).

Event Manager (FMS)

Score Tab - Page 2

The image shows two side-by-side screenshots of the FMS Score Tab. The left screenshot has a blue background and a green box highlighting the 'Robot Sandstorm' table. The right screenshot has a red background. Both screenshots show a table with columns for 'Never', 'During', and 'After' for three different teams. The blue panel shows team 1, 11, and 3. The red panel shows team 6, 5, and 4. To the right of each table is a 'Score' section with various categories and values.

Team	Never	During	After
1	✗	✓	✓
11	✗	✓	✓
3	✗	✓	✓

Team	Never	During	After
6	✗	✓	✓
5	✗	✓	✓
4	✗	✓	✓

The Score Tab is made up of four sub-pages. Some data is shared between sub-pages, see previous section for details on those portions of the tab.

Green Box - The area of the tab highlighted above in green is for Robot Sandstorm. The team number is shown on the left column, followed by options for whether the Robot crossed the HAB Line during Sandstorm ("During"), during Teleop ("After") or Never ("Never").

Event Manager (FMS)

Score Tab - Page 3

The screenshot displays the FMS Score Tab interface, which is divided into four main sub-panels. The top row contains two rocket bay panels: 'Far Side Rocket' (highlighted with a green border) and 'Scoring Side Rocket' (highlighted with a yellow border). Each rocket bay panel shows a grid of six bays with various icons representing different components. To the right of these panels is a central 'Score' panel with a blue background, listing various score categories and their values. The bottom row contains two 'Cargoship' panels: a blue one on the left and a red one on the right, each showing a grid of cargo ship components. A central 'Adjust' panel is also visible between the Cargoship panels.

Score Category	Value
Auto	0
Sandstorm	0
Teleop	0
Panels	0
Cargo	0
HAB Climb	0
Foul Pts	0
Rank Points	
Rocket	No
HAB	No
Opponent Rank Point Violations	
G5-RemovalPieces	
G16-RocketTouch	
Foul	0
Tech	0
Adjust	0

The Score Tab is made up of four sub-pages. Some data is shared between sub-pages, see previous section for details on those portions of the tab.

Green Box - The area of the tab highlighted above in green is Far Side Rocket data. Panels, Cargo+Panel and None are the potential options in each Rocket Bay. Empty bays show a purple box, matching the activity of the Referee panel. **Note:** Data in the Far Rocket is from the perspective of "facing" the Rocket (matching where the Scorekeeper is sitting), as demonstrated in the Rocket art.

Yellow Box - The area of the tab highlighted above in green is Scoring Side Rocket data. Panels, Cargo+Panel and None are the potential options in each Rocket Bay. Empty bays show a purple box, matching the activity of the Referee panel. **Note:** Data in the Scoring Side Rocket is from the perspective of "behind" the Rocket (matching the Scorekeepers perspective), as demonstrated in the Rocket art.

Event Manager (FMS)

The perspective changes between Scoring Side and Far Side Rockets are done to allow easier review for a Scorekeeper to see Game Pieces and Field Elements from their perspective while seated at the Scoring Table.

Orange Box - The area of the tab highlighted above in orange is the Cargoship data. Panels, Cargo+Panel and None are the potential options in each Cargoship Bay. Empty bays show a purple box, matching the activity of the Referee panel. The top Cargoship is data from the far side of the Field, the bottom Cargoship is data from the scoring table side of the Field. The Cargoship shown is from the perspective of the Referee entering the data.

Score Tab - Page 4

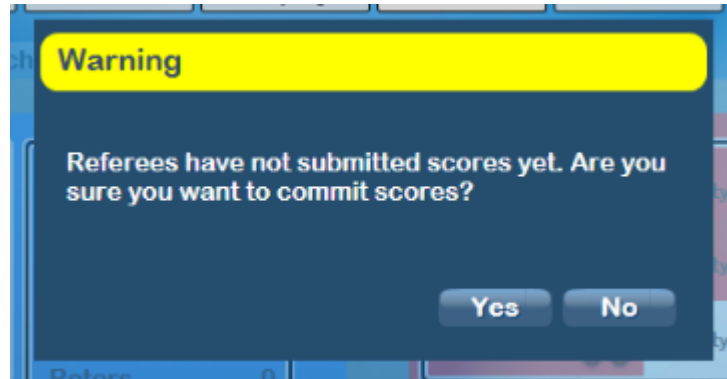
The screenshot displays two side-by-side panels of the Score Tab interface. The left panel has a blue background and the right panel has a red background. Both panels feature a table for 'End Game' scores with columns for 'None', 'Level 1', 'Level 2', and 'Level 3'. The left panel lists teams 1, 11, and 3, while the right panel lists teams 6, 5, and 4. To the right of the tables is a 'Score' section with various categories and their values (all 0). At the bottom, there is an 'Opponent Rank Point Violations' section with checkboxes for 'G5-RemovePieces' and 'G16-RocketTouch', and a table for 'Foul', 'Tech', 'Foul', and 'Adjust' scores.

The Score Tab is made up of four sub-pages. Some data is shared between sub-pages, see previous section for details on those portions of the tab.

Green Box - The area of the tab highlighted above in green is where Robot Endgame/HAB scores will show. Each team must have either "None" or "Level 1 to 3" selected before submitting scores. The left column shows the corresponding team number.

Event Manager (FMS)

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.

Post-Match Comments

A screenshot of a post-match comments dialog box. The text reads: "Scores were edited post-match. Please provide any comments you would like to associate with these edits." Below this is a text input field labeled "Comments:". At the bottom, there are two buttons: "Save and Continue" and "Return to Edit".

If a match is edited after the clock expires, either by Referees or the Scorekeeper, 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.

Event Manager (FMS)

Match Test

Differences between Match Play and Match Test

Match Test

Match Test

The Match Test functionally is nearly identical to Match Play. When using Match Test the FMS automatically assigns the match number to 999 (or 998 for multi-field events) and the team numbers to "Test Robot 1" through 6 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 Test Robots 1-6, but will use the corresponding WPA key for a team registered for the event when its number is entered into a Player Station.

The schedule tab will remain blank in Match Test.

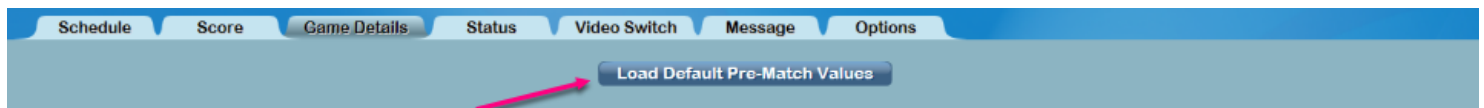
Match Test cannot consume a schedule, and therefore cannot be used to play Matches that "count." To play Matches in the Practice/Qual/Playoff schedule, Match Play must be used.

Event Manager (FMS)

Game Detail Tab

Game specific field scoring and adjustments.

Game Detail Tab



The Score Detail Tab has detailed scoring information that doesn't directly impact the points granted to an Alliance. It is not used in every season.

In 2019 a single button lives on the Game Details tab, shown here with a **pink arrow**. This button is only available in Test or Practice Matches, and skips the Pre-Match requirement for Referees to enter data, allowing for faster start of a Match (such as a Test Match when Referees may not be present).

This button should not be used if Referees are present, as it overrides their entries.

Data is not available from Match Start until the following Pre-Start is complete.

Event Manager (FMS)

Match Review

Event Manager (FMS)

Match Review

Window

Window

The Match Review interface is used to review all match history for the currently active schedule. 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.

[*Pink Arrow*] 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

[*Gold Arrow*] Pressing the "View Log" button under a given team will show their detailed statistics for that match

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

[*Orange Arrow*] Edit the selected match, should only be done under the guidance and supervision of FTA/Head Referee

Event Manager (FMS)

Edit Match

Fix scores from a given match.

Match Edit



Match Reviews' Edit Match functionality provides 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

Event Manager (FMS)

recalculated on save. If any edits are made, a comment with the reasons is required, and this information is reported to *FIRST* HQ.

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). In the Playoffs, matches cannot be edited once that level of the Playoffs is over (i.e. Quarterfinals are locked once the Semifinals have started).

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

Event Manager (FMS)

View Log

View detailed log information about a given team in a given match.

View Log

View Log

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. The FMS records data every 500ms for each team, during 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. Click Close to return to the Match Review screen.

Data shown in the viewer is the same as the data available through the FMS Web Portal.

Event Manager (FMS)

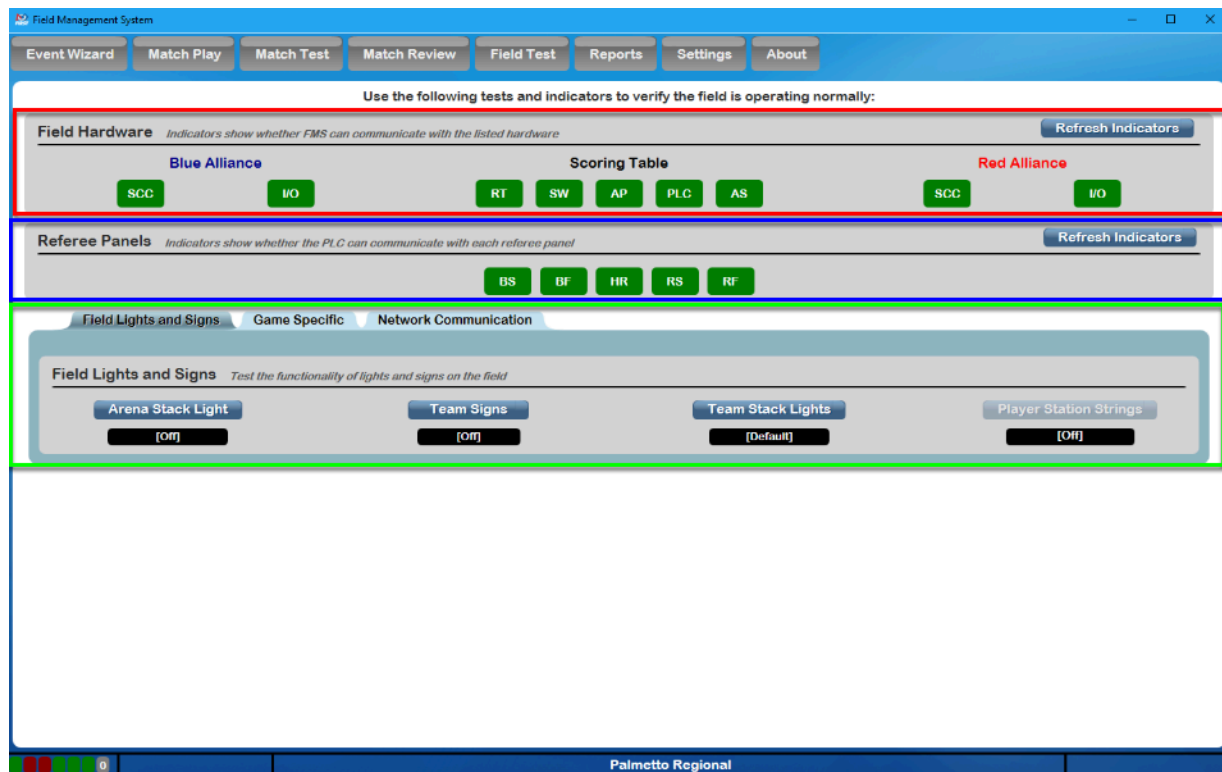
Field Test

Event Manager (FMS)

Field Test

Test the functionality of the field and preparedness for the event matches.

Field Test



Field Test is used as an initial basic test of the field electronics. Use this interface to verify that all the LED Displays, Team Lights, and scoring hardware are connected. Field Test is also used to confirm the network connection to the Audience Screen and to the Internet. After Field Test, a full Match Test should be used to confirm all elements are behaving as expected in-match. In FMS Off-Season, the Field Test screen is not accessible.

[Red - Field Hardware]

Event Manager (FMS)

This panel 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 update these indicators.

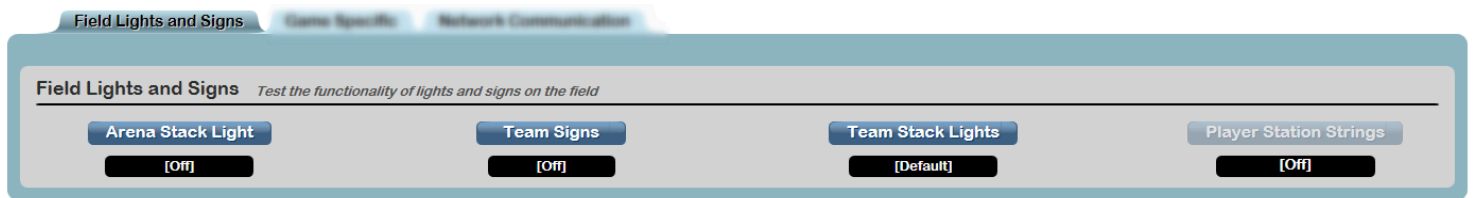
[Blue - Referee Panels]

This panel show the connection to each of the Referee touchscreens. A successful connection is shown via a green indicator.

[Green - Individual Hardware]

See Below

Field Test - Lights and Signs

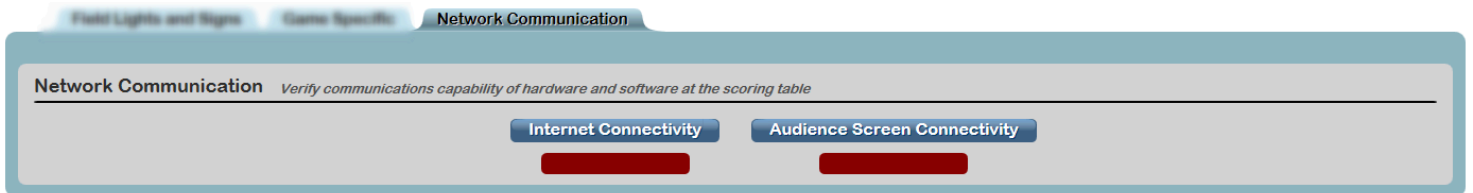


This panel is used to test the LED panels, the Stack Lights, and the LED light strings.

- Arena Stack Light tests each light in the stack at the Scoring Table
- Team Signs has two modes to test the connection to the LED displays in the Player Stations
 - Test Pattern alternates between the test values for Alliance Station number (Blue 1 = 1, Blue 2 = 2, Blue 3 = 3, Red 1 = 4, Red 2 = 5, Red 3 = 6) and Timer (9) and all “8888”.
 - Awards Mode all displays show current year
- Team Stack Lights turns on each Stack Light in the corresponding Player Station
 - *NOTE: this will not turn on the amber lights which indicate E-stop. E-stop lights only turn on when the E-stop in the corresponding Player Station is pushed, or the Arena E-stop is pressed*
- Player Station Strings will, if in use, cycle the possible lighting options of the strings as they appear in the game. These are not in use in 2017.

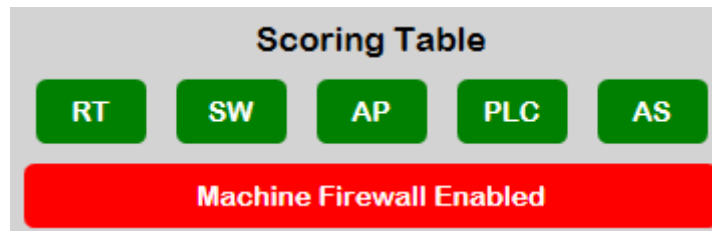
Event Manager (FMS)

Field Test - Network Communication



- Internet - confirm an active connection to the Internet (specific ports and procedures)
- Audience - test connection between FMS and Audience Screen program. The indicator turns green and the match start sound is played if the connection is made. The Audience Screen program must be running for this to be successful. A connection made to ANY audience screen will provide a "success" (such as if multiple are running on the network) and it is not guaranteed that all audience screen instances would play the sound. This SHOULD NOT be used as a sound test, use the audio test buttons within the [Audience Screen](#) for sound tests

Field Test - Hardware Warnings



Warnings can appear under the "Scoring Table" section near the top of the Field Test screen. There are three possible warnings:

- 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, just a warning.
- 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, just a warning.

Event Manager (FMS)

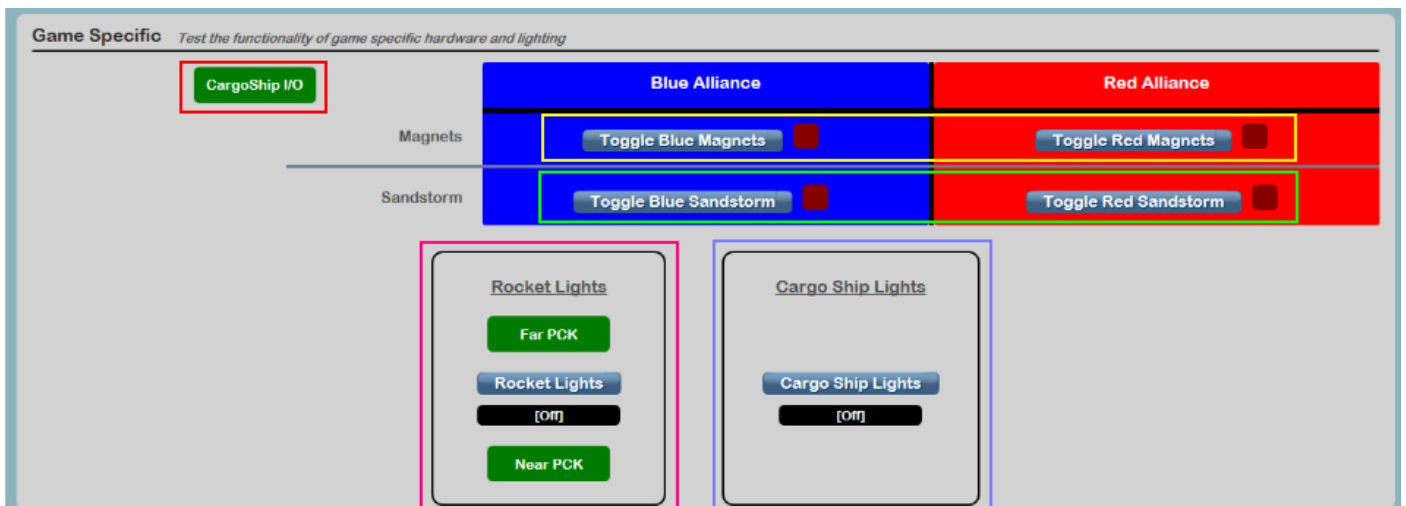
Field Test (Game Specifics)

Test the functionality of the field and preparedness for the event matches.

Field Test

Field Test is used as an initial basic test of the field electronics. Use this interface to verify that all the LED Displays, Team Lights, and scoring hardware are connected. Field Test is also used to confirm the network connection to the Audience Screen and to the Internet. After Field Test, a full Match Test should be used to confirm all elements are behaving as expected in-match. In FMS Off-Season, the Field Test screen is not accessible.

Field Test - Game Specific



You must use the "Refresh Indicators" button to update the colored status indicators on this tab.

[Magnets (Yellow Boxes)]

Pressing the "Toggle XX Magnets" button will toggle the state of the Magnetic floors in the corresponding Cargoship. The small square indicator to the right of the button will indicate the state, green meaning energized and red meaning not energized. Magnets will automatically turn

Event Manager (FMS)

off after a few minutes. **Note:** The stack lights will also illuminate when Magnets are energized, even outside of the Cargoship Lights test.

[Sandstorm (Green Boxes)]

Pressing the "Run XX Sandstorm" button will run the corresponding Sandstorm one time. The small square indicator to the right of the button will indicate the state, green meaning energized and red meaning not energized. Sandstorm motors will automatically turn off after a single run (approx. 2 seconds). **Note: Always use caution before running this test, make sure someone is in the area giving an "all clear" to run the motors.**

[Rocket Lights (Pink Box)]

- "Far" and "Near" - The background will turn Red when the far (audience side) and near (scoring table side) lighting controllers are detected (use the "Refresh Indicators" button on the top to update the status)
- Click the "Rocket Lights" button to toggle through the four Rocket Nosecone lights, the activated Nosecone will be written in the bar right below the button

[Cargoship Lights (Purple Box)]

Click the "Cargoship Lights" button to toggle through the two Cargoship stack lights, the activated light will be written in the bar right below the button.

Event Manager (FMS)

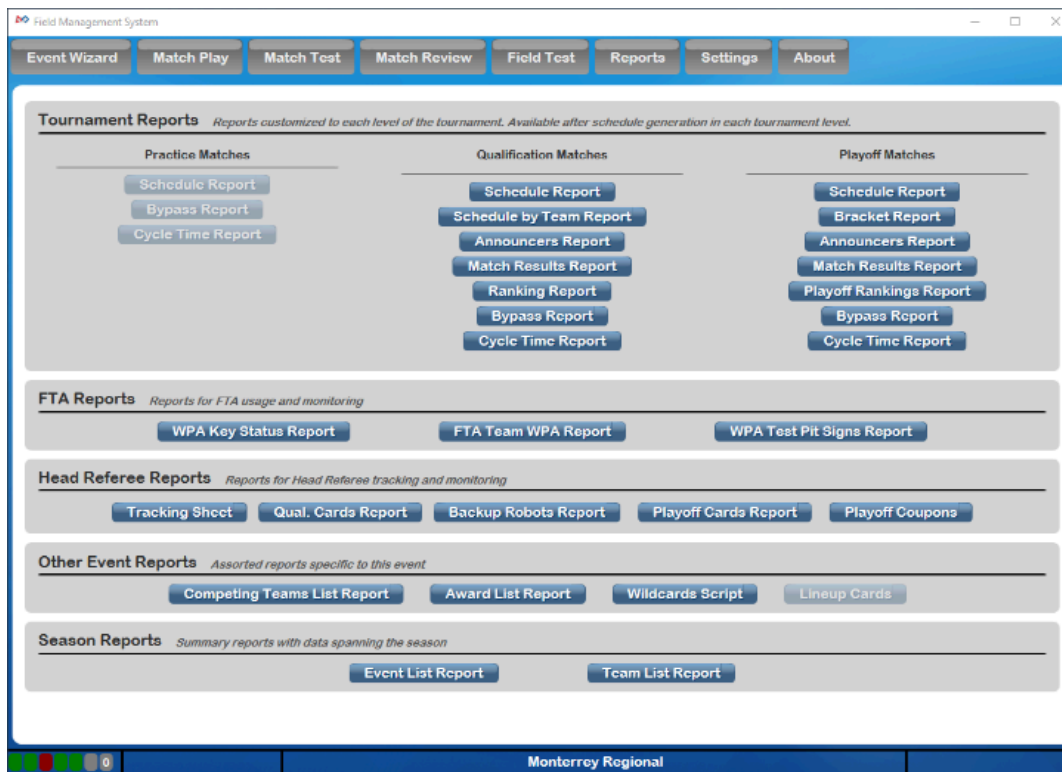
Reports

Event Manager (FMS)

Reports

Retrieve event information through formatted reports.

Menu



The Reports screen is used to generate printable reports needed throughout the tournament. Once a report has been generated, several options are available to the user. Printing options can be selected as well as a file-export feature. Reports can be exported in Microsoft Excel, Word, or PDF file formats.

Event Manager (FMS)

Example Report

Code	Event Name	Venue	Event Location	Start Date
CAOC	Orange County Regional	Orange County Fairgrounds	Costa Mesa, CA USA	2/27/2019
QCMO	Festival de Robotique a Montreal Regional	Stade Olympique	Montreal, QC Canada	2/27/2019
SCMB	Palmetto Regional	Myrtle Beach Convention Center	Myrtle Beach, SC USA	2/27/2019
MIGIB	FIM District Gibraltar Event	Carlton High School	Gibraltar, MI USA	2/28/2019
NHGRS	NE District Granite State Event	Salem High School	Salem, NH USA	2/28/2019
CADM	Del Mar Regional presented by Qualcomm	Del Mar Fairgrounds Arena Complex	Del Mar, CA USA	2/28/2019
MISDU	FIM District Southfield Event	Southfield High School	Southfield, MI USA	2/28/2019
MIKET	FIM District Kettering University Event #1	Kettering University	Flint, MI USA	2/28/2019
PAHAT	FMA District Hatboro-Horsham Event	Hatboro-Horsham High School	Horsham, PA USA	3/1/2019
WAMOU	PWN District Mount Vernon Event	Mount Vernon High School	Mount Vernon, WA USA	3/1/2019
TXELP	FIT District El Paso Event	UTEF Memorial Gym	El Paso, TX USA	3/1/2019
TUIS	Istanbul Regional	Ulker Spor Ve Etkinlik Salonu	Bağdat Caddesi (Istanbul), 34 Turkey	3/1/2019
ONDSH	ONT District Durham College Event	Durham College	Oshawa, ON Canada	3/1/2019
VAGLE	CHS District Richmond VA Event	Deep Run High School	Glen Allen, VA USA	3/1/2019
GAGAI	PCH District Gainesville Event	Riverside Military Academy - Field House	Gainesville, GA USA	3/1/2019
VAHAY	CHS District Haymarket VA Event	Battlefield High School	Haymarket, VA USA	3/1/2019
TXAUS	FIT District Austin Event	Anderson High School	Austin, TX USA	3/1/2019
ISDE1	ISR District Event #1	Romema Arena	Haifa, HA Israel	3/4/2019
TUIS2	Bosphorus Regional	Ulker Spor Ve Etkinlik Salonu	Bağdat Caddesi (Istanbul), 34 Turkey	3/5/2019
NYTR	New York Tech Valley Regional	Rensselaer Polytechnic Institute	Troy NY USA	3/6/2019
ISDE2	ISR District Event #2	Romema Arena	Haifa, HA Israel	3/6/2019
ILCH	Midwest Regional	UIC Pavilion	Chicago, IL USA	3/6/2019
MNDU2	Northern Lights Regional	DECC Arena/Edmund Fitzgerald Exhibit Hall	Duluth, MN USA	3/6/2019
CAFR	Central Valley Regional	Fresno Convention & Entertainment Center	Fresno, CA USA	3/6/2019
OKOK	Oklahoma Regional	Cox Arena - SMG Convention Center	Oklahoma City, OK USA	3/6/2019
ADLU	Adelphi Regional	Adelphi State Gymnasium	Adelphi, VT USA	3/7/2019

An example report, showing the event list. Report could be formatted (although default formatting should be sufficient) and then printed or saved from this interface using the buttons on the bar indicated above with the orange arrow.

Available Reports

Tournament Level Reports:

- Practice Tournament
 - *Schedule*: Current active match schedule
 - *Cycle Time*: This report shows the actual time between match starts
 - *Bypass*: This report shows which teams have been Bypassed during the currently active match schedule
- Qualification Tournament

Event Manager (FMS)

- *Schedule*: Current active match schedule
- *Schedule By Team*: Current active match schedule, sorted by team
- *Announcer's Report*: detailed report all team details for each match
- *Match Results*: Final scores of all completed matches in the currently active schedule
- *Ranking*: Current ranking of all teams as the event
- *Bypass*: This report shows which teams have been Bypassed during the currently active match schedule
- *Cycle Time*: This report shows the actual time between match starts
- Playoff Matches
 - *Schedule*: Current active match schedule
 - *Bracket*: Tournament bracket
 - *Announcer's Report*: detailed report all team details for each match
 - *Match Results*: Final scores of all completed matches in the currently active schedule
 - *Playoff Rankings Report*: Shows the playoff alliances in rank order within the current playoff level and with their ranking detail
 - *Bypass*: This report shows which teams have been Bypassed during the currently active match schedule
 - *Cycle Time*: This report 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 List WPA*: Same as *WPA Key Status Report*, but with WPA keys shown. Requires FTA password to run.
- *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

Head Referee Reports:

- *Tracking Sheet*: A 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 Qualification matches
- *Backup Robots*: Report for teams to accept or decline their position as a backup robot
- *Playoff Cards*: Match schedule showing alliances with assigned cards during Playoff matches
- *Playoff Coupons*: Timeout and Backup coupons for Playoffs (includes Team numbers)

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

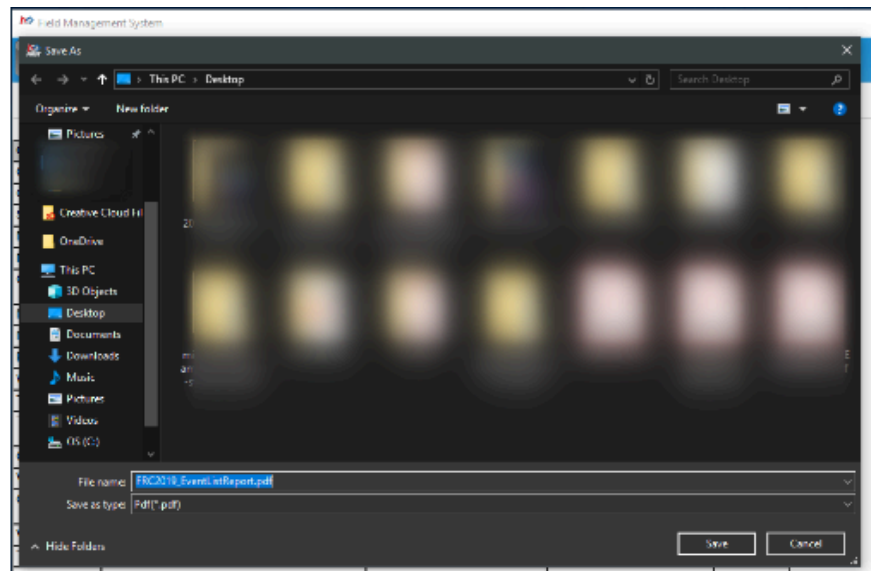
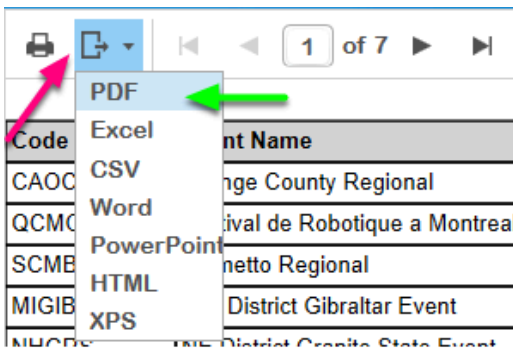
Event Manager (FMS)

- *Awards List*: A list of the awards to be given out at the event. The winners are included if they have been assigned.
- *Awards Eligibility Report*: A report listing all teams attending the event, and their eligibility for certain awards (such as Chairman's Award).
- *Wildcard Script*: Script for Announcer's should any team generate a Wildcard at the event
- *Lineup Cards*: Lineup sheets for events using the "4 team alliances" playoff style (*FIRST* Championship)

Season Reports:

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

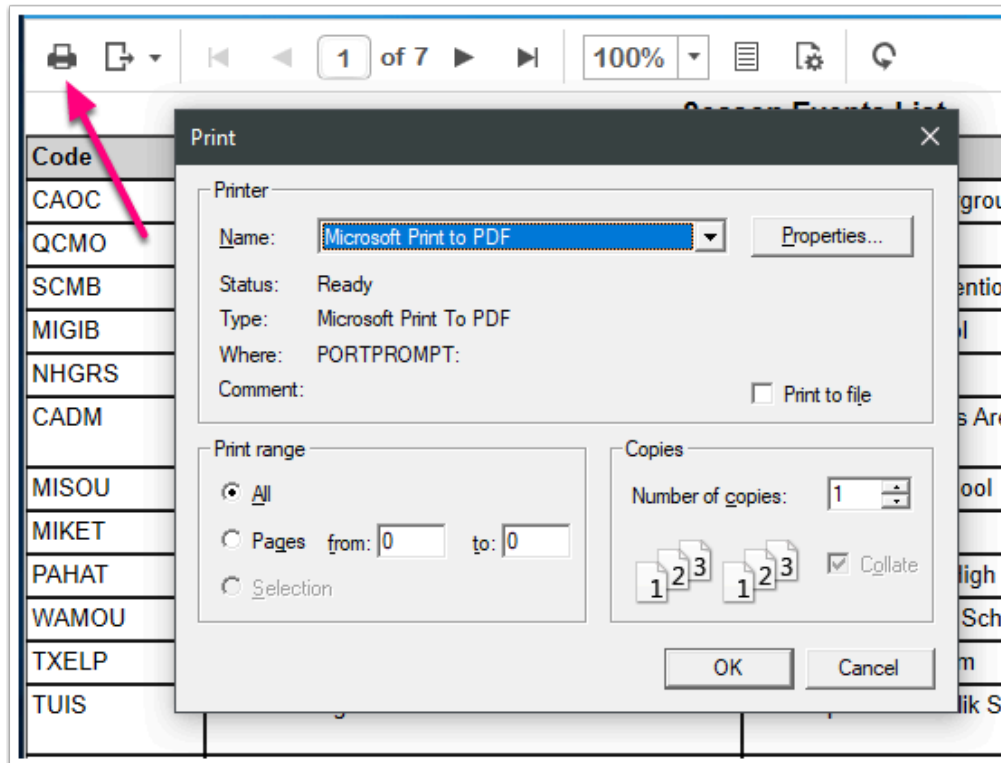
Exporting Reports



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.

Event Manager (FMS)

Printing Reports



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.

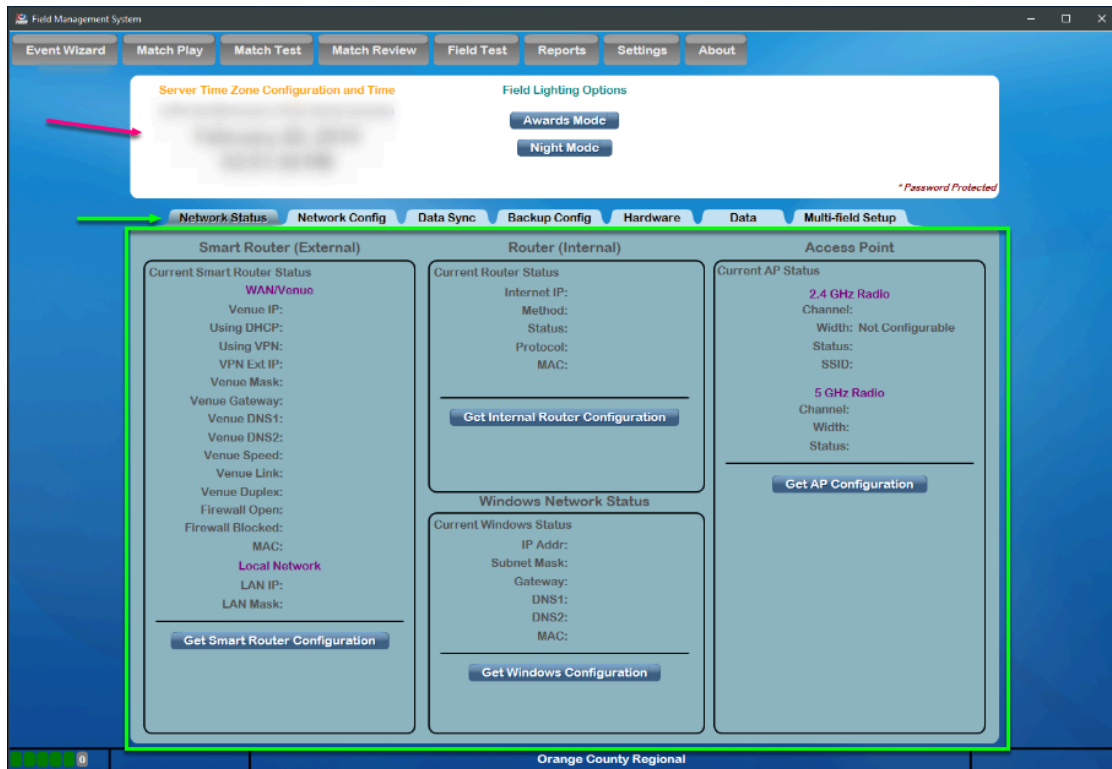
Event Manager (FMS)

Settings

Event Manager (FMS)

Settings Menu

Menu



The settings 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 top bar of the Settings Page (**pink arrow**), encompassed with a white background, contains quick-access information and commonly used tools. On the far-left is the current server time information, including the currently active time zone. It is important that the time zone of the

Event Manager (FMS)

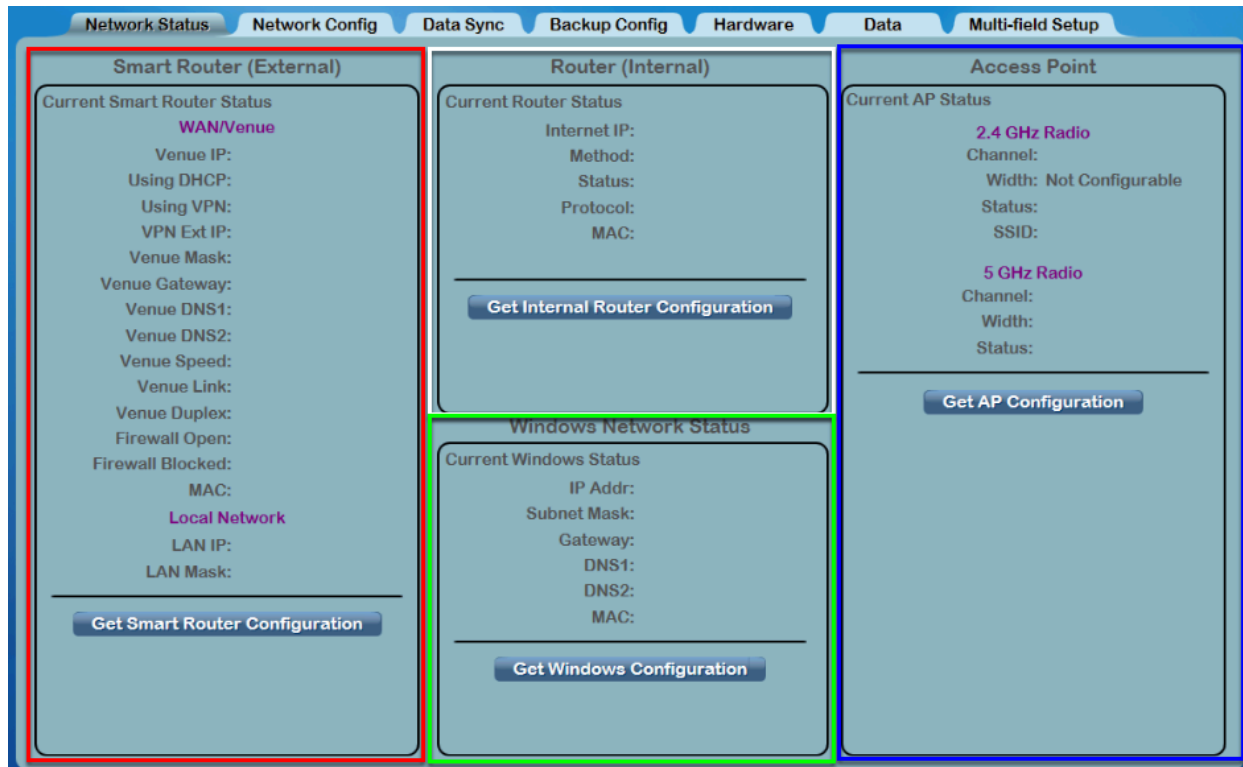
server be set correctly for the location the event is being held, especially if the event will have schedules and data available online. In the center are quick-access field lighting settings; Awards Mode will enable all LEDs on the field (to match their alliance color) and display the current year on the Team Signs, whereas Night Mode will turn all LEDs on the Field off.

Below the bar is a series of settings tabs (**green arrow**). Clicking these tabs will change which data is available on the lower portion of the screen (**green box**). Information about each tab can be found in its associated documentation step.

Event Manager (FMS)

Network Status

Status



The Network Status tab on the Settings page contains all of the network status information that is queried from the FMS hardware and software. The Network Status tab is the default tab on the Settings Page. It has three sections: Smart Router, Router, and Access Point. All data on this tab is "Read Only", adjustments are made through "[Network Config](#)"

[Red - Smart Router] Contains functions for getting the Smart Router configuration within the FMS Hardware set. Get Router Configuration will query the router settings from the built-in Smart Router within the FMS "Scorpion" server, and display them.

[White - Router] Contains functions for getting the Router configuration within the FMS Hardware set. Get Router Configuration will query the router settings from the built-in Router within the FMS "Scorpion" server, and display them.

[Green - Windows Settings] Displays the current Windows Network Settings and highlights any fields which do not contain the expected values.

Event Manager (FMS)

[**Blue** - Access Point] Provides functions for getting configuration information for the Access Point used by FRC. Get AP Configuration gets the current Access Point configuration and displays it.

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

Event Manager (FMS)

Network Config

Config

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

[Red - 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 support.

[White - 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.

Event Manager (FMS)

[**Green** - Windows Network] Used to reset the Windows Network settings to their default, expected values.

[**Blue** - Access Point] 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. Do not change the settings on the Router without FTA and/or FRC Engineering support. 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.

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

Event Manager (FMS)

Data Sync

Sync

Sync

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 toggle button, 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.

Event Manager (FMS)

Backup Config

Config

Config

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 (1) 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.

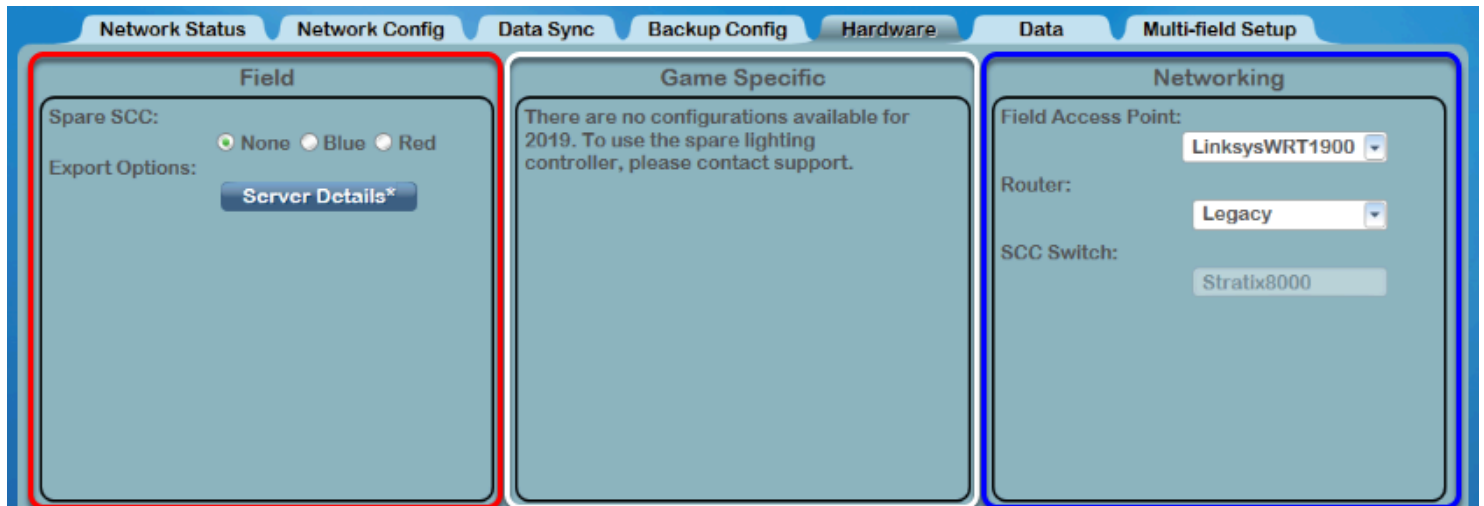
The “Force Event Backup” button (2) is used to manually force a backup for Event-Specific data (such as Match Results, Match Logs, and Tournament Progress). The “Force System Backup” button (3) is used to manually force a backup for System-Specific data (such as Event Lists, Team Data, and system configuration data).

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

Event Manager (FMS)

Hardware

Hardware



The Hardware tab is used to indicate the use of specific hardware provided for the field. Because configurations are different when using spare hardware, the 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.

[Red - Field] Contains configuration options for the Spare SCC (field ends or not in use). The Export Server Details button provides FRC Engineering with a full system configuration output to better help troubleshoot configuration problems.

[White - Game Specific] No game specific items in this season.

[Blue - Networking] Contains configuration options for the type of Access Points, Routers and SCC Switches in use (for FRC Engineering use)

- The "SCC Switch" displays the version of SCCs that are in use on the field. While not selectable, you may be asked by FMS Engineering to provide this information during troubleshooting. If this box says "Unknown", you'll be unable to run matches.

Event Manager (FMS)

Data

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

Event Level

Event Level

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

[*White*] Purge just the alliances from an event

[*Blue*] 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

Tournament Level

Tournament Level

[*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.

Event Manager (FMS)

Detail Level

Detail Level

[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.

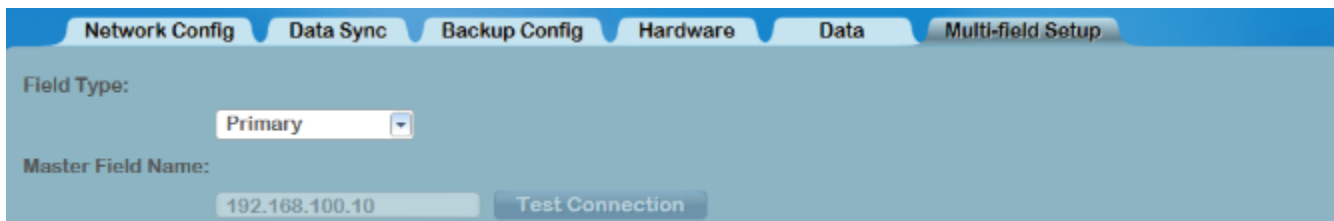
[Truncate Qual Schedule] By entering a value here, the qualification schedule can be shortened, while maintaining equality for all teams (this is only for emergency use, such as acts of god or the direction of FIRST HQ). It requires the password of a support engineer.

Event Manager (FMS)

Multi-field Setup

For events that have more than one playing field.

Setup



The screenshot shows the 'Multi-field Setup' tab selected in a navigation menu. The menu includes 'Network Config', 'Data Sync', 'Backup Config', 'Hardware', 'Data', and 'Multi-field Setup'. The main content area has a 'Field Type:' label with a dropdown menu set to 'Primary'. Below that is a 'Master Field Name:' label with a text input field containing '192.168.100.10' and a 'Test Connection' button.

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.

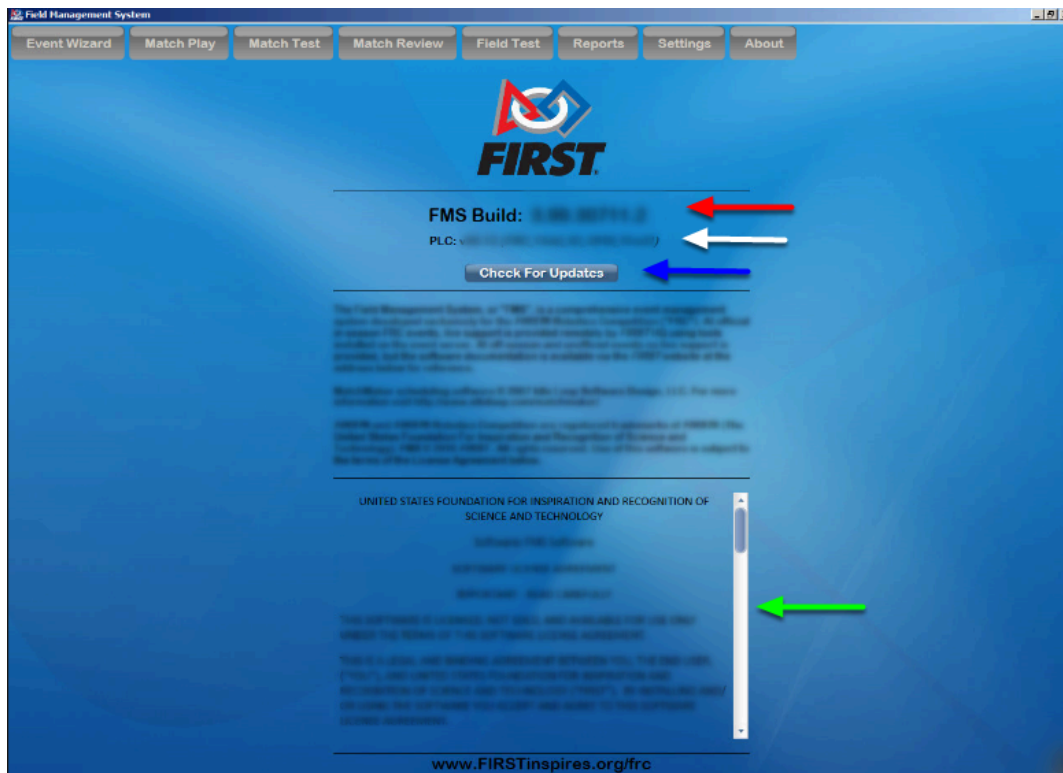
Event Manager (FMS)

About Tab

Event Manager (FMS)

About Tab

About



The "About" tab contains version information and software notices. 2019 versions of FMS will always have a Major revision of "6".

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

[White] Build (revision) of the PLC software currently installed. Current build should begin with v31.11 (Not applicable in Off-Season builds)

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

[Green] Current software license, which was agreed to upon installation of the software

In the traditional (non Off-Season) version of the software, once an update download has been initiated, the "Check for Update" button will be replaced with download progress statistics.

Event Manager (FMS)

FAQ and Appendix

Event Manager (FMS)

FAQ

How do I....

FAQ

Issue/Question	Solution
FMS software crashes	Most times, a crash will prompt you to save a log containing debug information. Save the log (support may ask for it). Reopen FMS. If behavior persists, contact FTA or FIRST Engineering.
How do I interpret the information on the Match Schedule Statistics Tab?	See the matching documentation under Event Wizard
Are the Awards, Match Results, and Rankings web pages stored locally? Where?	No, all pages are created dynamically from uploaded data to the FMS cloud database
I cannot start a match because one of the radio links keeps dropping in an out.	The FMS requires either a robot-ready condition or Player Station bypass to start. Speak with your FTA about how to correct this. Moving the radio on the robot into a more open location may help considerably.
I've skipped a match during the Practice Tournament because no teams were present, but it still is carried along in the Schedule. What's going on?	If you skip a match during the any phase of the Tournament, the system will still carry the match along in the Schedule. This is because it's still eligible to be played. Matches can be played in any order. The system only "removes" matches from the schedule that are Completed (the state column tells you the progress for each match)
How do I open the configuration screen on the Audience Display?	CTRL-SHIFT-F12 or CTRL-SHIFT-C
How do I close the Audience Display?	ALT-F4
6 teams showed up for the Practice match, but only 5 are the scheduled teams. How do I	Type the new team number into the box next to corresponding Player Station on the Match Play screen. The LED display with automatically update with this new team number. If the entered

Event Manager (FMS)

<p>change the team number on the LED Display so that all 6 team numbers are correct?</p>	<p>number does not match a registered team for the event, an error message will be given. THIS MUST BE DONE PRIOR TO PRESTART!</p>
<p>What is the password for the Event Server?</p>	<p>Ask your FTA to login</p>
<p>Can I view Reports/Match Review/etc. once I've Prestarted the match?</p>	<p>Yes, as long as no matches are running. Pro Tip: You can also save all reports to PDF and place them on the Desktop for printing anytime.</p> <ul style="list-style-type: none"> • Center Light <ul style="list-style-type: none"> • Solid Green = Power on, no device connected • Solid Blue = at least 1 device connected • Flashing = contact field support • Ethernet Light <ul style="list-style-type: none"> • flashes when there is network traffic • Radio Light <ul style="list-style-type: none"> • flashes when there is network traffic • Red Light <ul style="list-style-type: none"> • ON = Red Alliance not ready • OFF = Red Alliance ready • Blue Light <ul style="list-style-type: none"> • ON = Blue Alliance not ready • OFF = Blue Alliance ready • Amber Light <ul style="list-style-type: none"> • Not used prior to Match Start • Green Light <ul style="list-style-type: none"> • OFF = Blue or Red Alliance not ready • ON/Flashing = Field ready to start match • ON/Solid = Match is running • Red Light <ul style="list-style-type: none"> • Not Used
<p>What do the indicator lights on the Field Access Point mean?</p>	
<p>What do the lights on the Arena Status Light mean prior to Match Start?</p>	
<p>What do the lights on the Arena Status Light mean after the Match ends?</p>	<ul style="list-style-type: none"> • Blue Light <ul style="list-style-type: none"> • Not Used • Amber Light <ul style="list-style-type: none"> • ON/Solid = Waiting for Refs to Submit scores

Event Manager (FMS)

- ON/Flashing = Referees are late to Submit scores
- Green Light
 - Not Used, Match Over

Where is the WPA Key file?

With permissions, it can be retrieved from step 4 of the Event Wizard, select Export Keys

Can I save a schedule from one execution of MatchMaker and import it later?

No, not the schedule. FMS-generated Schedules cannot be imported into FMS. The only method of importing schedules is to import the externally-generated alliance pairings (see appendix).

Event Manager (FMS)

Appendix

Alliance Pairing Import Example

```

1 10 false 11 false 12 false 13 false 14 true 15 false 2 10 false 11 false 12 false 13 false 14 true 15
false 3 10 false 11 false 12 false 13 false 14 true 15 false 4 10 false 11 false 12 false 13 false 14 true
15 false 5 10 false 11 false 12 false 13 false 14 true 15 false 6 10 false 11 false 12 false 13 false 14
true 15 false 7 10 false 11 false 12 false 13 false 14 true 15 false 8 10 false 11 false 12 false 13 false
14 true 15 false 9 10 false 11 false 12 false 13 false 14 true 15 false 10 10 false 11 false 12 false 13
false 14 true 15 false 11 10 false 11 false 12 false 13 false 14 true 15 false 12 10 false 11 false 12
false 13 false 14 true 15 false 13 10 false 11 false 12 false 13 false 14 true 15 false 14 10 false 11
false 12 false 13 false 14 true 15 false 15 10 false 11 false 12 false 13 false 14 true 15 false 16 10
false 11 false 12 false 13 false 14 true 15 false 17 10 false 11 false 12 false 13 false 14 true 15 false
18 10 false 11 false 12 false 13 false 14 true 15 false 19 10 false 11 false 12 false 13 false 14 true 15
false 20 10 false 11 false 12 false 13 false 14 true 15 false 21 10 false 11 false 12 false 13 false 14
true 15 false 22 10 false 11 false 12 false 13 false 14 true 15 false 23 10 false 11 false 12 false 13
false 14 true 15 false 24 10 false 11 false 12 false 13 false 14 true 15 false 25 10 false 11 false 12
false 13 false 14 true 15 false 26 10 false 11 false 12 false 13 false 14 true 15 false 27 10 false 11
false 12 false 13 false 14 true 15 false 28 10 false 11 false 12 false 13 false 14 true 15 false 29 10
false 11 false 12 false 13 false 14 true 15 false 30 10 false 11 false 12 false 13 false 14 true 15 false
31 10 false 11 false 12 false 13 false 14 true 15 false 32 10 false 11 false 12 false 13 false 14 true 15
false

```

Example text file for the import file when using externally generated alliance pairings, instead of MatchMaker. Does not replace schedule generation, just pairing generation. One row per match, 13 fields per row (as [described here](#)) with each field tab-delimited.

Pairing Algorithm

The link below will connect you to the website detailing the algorithm used to generate alliances during the Practice and Qualification tournaments.

<http://www.idleloop.com/matchmaker>

AUDIENCE DISPLAY

Audience Display

Table of Contents

Disclaimer	3
Disclaimer	4
Configuration	5
About Audience Display	6
Installation	8
Settings.....	10
Displays	15
Match Flow	16
Playoff Specific	19
Ancillary.....	23

Disclaimer

Audience Display

Disclaimer

WARNING

WARNING

Robot 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.

Configuration

Audience Display

About Audience Display

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. Audience Display can only be run as a standalone application on a separate machine connected to the field network via Ethernet. This manual will walk through the available displays, configuration options, and best practices related to the Audience Display.

IMPORTANT: DO NOT INSTALL THE AUDIENCE DISPLAY ON OFFICIAL FIRST SERVERS ("SCORPION CASE #33") - USE ONLY THE REMOTE AUDIENCE DISPLAY MACHINE!

Wiring Audience Display

In order to connect to FMS, the Audience Display must have a wired connection to FMS. The target machine (if running a remote instance) needs to be on the same network as the FMS machine (10.0.100.X), and no additional LANs. While a wired Ethernet connection is **highly advised**, it's possible for the Audience Display to operate on a wireless connection. 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 Audience Display should be on a wired Ethernet connection.

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.

Audience Display

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

Event Setup Order

In order to properly synchronize with FMS, 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.

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)

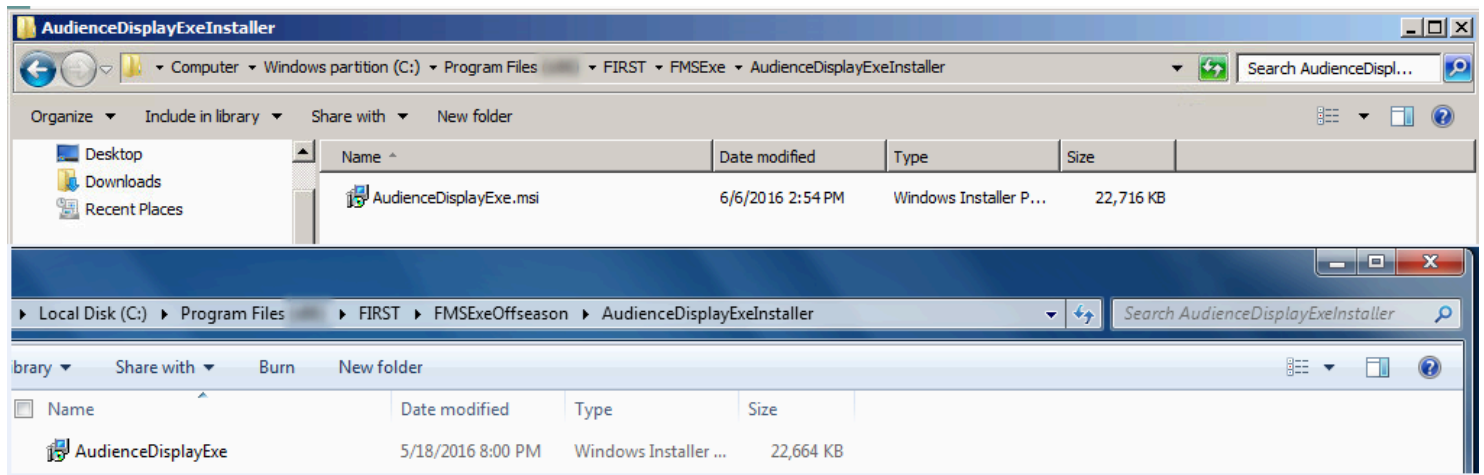
Audience Display

Installation

Running on Extended Displays

NEW FOR 2018: DO NOT INSTALL THE AUDIENCE DISPLAY ON OFFICIAL FIRST SERVERS ("SCORPION CASE #33") - USE ONLY THE REMOTE AUDIENCE DISPLAY MACHINE!

Installation on Remote Computers



The Audience Display version number 4.X and higher will not operate on Windows 7 machines. Windows 8.1 is not officially supported, though should operate properly. Windows 10 or higher is the recommended operating system for best performance. As noted later, the machine running a remote Audience Display must also have an Ethernet port.

The easiest way to obtain the Audience Display installer is to:

1. Ensure the remote Audience Display is on the FMS Network
2. Open a web browser (Chrome Preferred) to the following address:
 - <http://10.0.100.5/FRCDownloads>
 - This will open a browser page to select the available applications to download.
3. Select the Audience Display application to download.
4. Install the Audience Display application on the local computer.

NEVER RUN THE AUDIENCE SCREEN INSTALLER ON A FIRST SERVER

Audience Display

Version Matching

When running on a remote computer, the Audience Display instance will 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 updated/downgraded to match the FMS version.

Communicating with FMS

When using a remote installation, 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 installation will tell Audience Display to look for FMS at the IP of 10.0.100.5. It's recommended that you ping the FMS machine from the target remote Audience Display machine to make sure the Ethernet connection has been established properly.

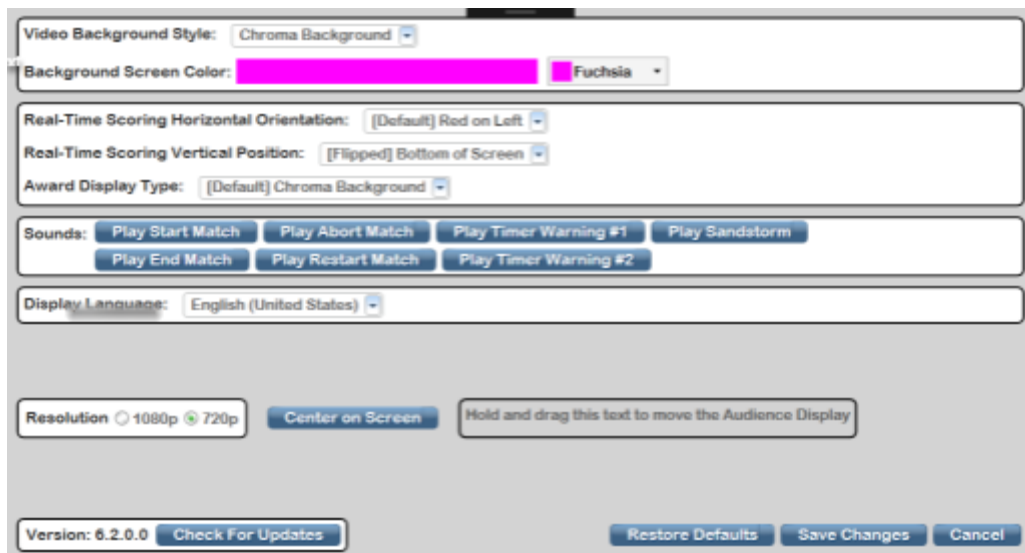
It is recommended that there be no more than two (2) instances of the Audience Screen running on the FMS network at any given time. The software is not tested beyond this capacity.

Audience Display

Settings

Details the options available through the configuration and setting panels within the Audience Display software.

Accessing Settings

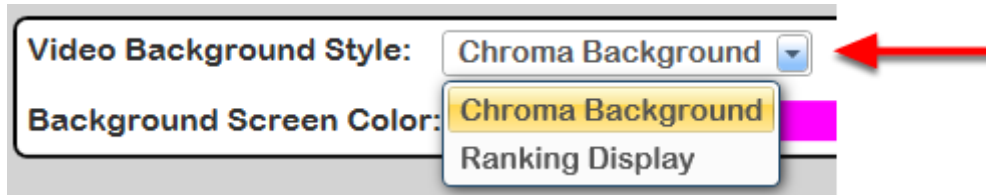


To **access** the settings panel, with the Audience Display open and running (see [About](#)) use the hotkey combination of CTRL-SHIFT-F12 (or, alternatively, CTRL-SHIFT-C). This will trigger the upper portion of the Audience Display (or Lower, depending on the Vertical Position setting) to flip to the settings pane as shown in the graphic.

To **close** the settings panel, either click the 'Save Changes' button (saves changes and closes) or the 'Cancel' button (does not save changes and closes). Note that hitting 'Cancel' will not undo any adjustments you may have made to the position of the window on the screen.

Audience Display

Video Background Style



The 'Video Background Style' option has two choices:

- Chroma Background
- Ranking Display

This selection will control the behavior of the upper "two thirds" of the screen in the "Video Only" and "Video and Score" modes.

Chroma Background:

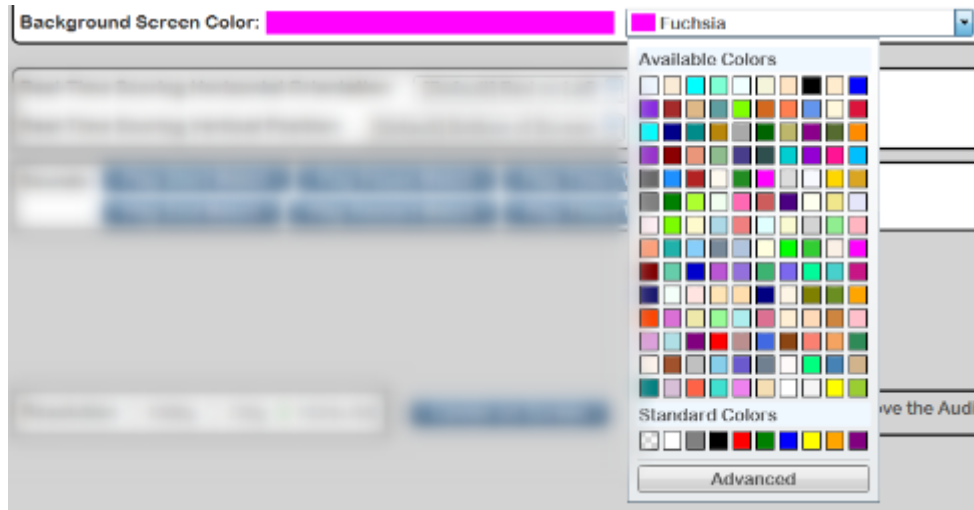
Show the selected color in the area, to be keyed (or cut) out and replaced with live event video from a camera or production feed. (The actually "keying" process and mixing of video would need to be done through external software, not through FMS/Audience Display)

Ranking Display:

Removes the background screen color (Chroma) and shows a ranking screen show 8 team rankings at a time. The list automatically scrolls through all the possible teams at the event, in rank order. Teams must have played one or more qualification matches to be included in the listings. Updates to the qualification rankings via out-of-band processes (such as Match Review) will not update the rankings if the rankings are shown 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 phase.

Audience Display

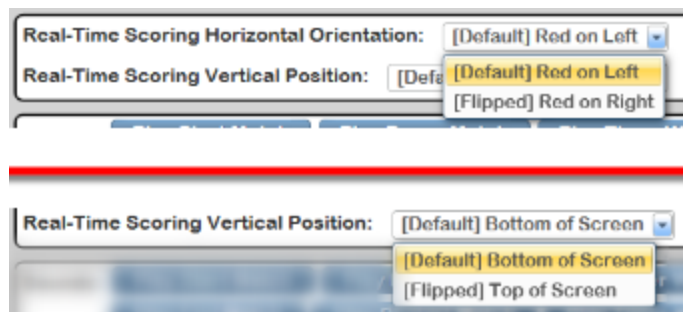
Background Screen Color



The Background Screen Color dropdown allows selection of the color which will be used for 'Chroma' process described previously. In the "Video Only" and "Video and Score" modes, the Chroma color is overlaid in the top "two thirds" of the screen to allow for video overlay. The Background Screen Color is not used if the "Video Background Style" is set to "Ranking Display" (the Background Screen Color would be hidden in this case).

In addition to the available colors in the dropdown, a specific RGB value can be specified via the "Advanced" button on the bottom. Occasionally, a production company or video software will specify a color to be used for the keying process most accurately. If no specific requests are made, the default value of "Fuchsia" or alternate of "LawnGreen" should be sufficient.

Real-Time Orientation



Audience Display

Careful consideration should be used before changing these options, and they may cause confusion for audience members who are "use to" a traditional layout from year to year. For official FRC Events, if in doubt, please contact your Engineering support contact.

[Above *Red Line*] The horizontal orientation of the real-time scoring screen can be modified through settings to select whether the red alliance is on the left, or the right, side of the screen. At a traditional FRC Event and setup, 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.

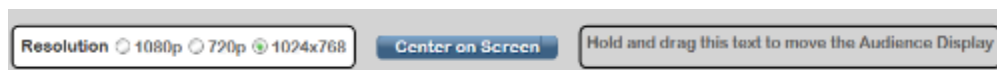
[Below *Red Line*] The vertical orientation allows for flipping of the "Video and Score" panel from the bottom of the Audience Display to the top. This is useful in situations where the venue has obstructed views, there is conflicting light, or it's more convenient for spectators. The only display affected by this setting is "Video and Score"- all others continue to behave the same way as they normally would.

Sounds



Using the third "bar" of the settings panel sounds can be force played to test the connection with the audio/video group. Depending on the season, one or more buttons may not trigger a sound to be played (2015 did not use "Warning #2" for example). Each sound plays once upon click. Additional game-specific sounds may also be present for testing as well.

Resolution and Positioning



[Resolutions] Audience Display is compatible with three (3) resolutions- 1024x768 (3:4 aspect ratio) and 1920x1080 / 1280x720 (16:9 aspect ratio). The resolution can be adjusted using the radio buttons, and takes effect upon clicking the "Save Changes" button. There are slight differences

Audience Display

between the display of data in the various resolutions- but the critical game data remains the same.

[*Positioning*] To **quickly** position the Audience Display on the monitor, either click the "Center on Screen" button or "Hold and drag" on the designated area to manually adjust the placement on the screen. The "Center on Screen" button will not properly align the Audience Display if it is being placed on a monitor that is to the left of the primary (and thus falls in "negative" coordinates). Either set the external monitor to the right, above, or below the primary screen (or use the manual adjustment).

To **precisely** position the Audience Display on the monitor (version 3.25 or higher), you can also 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.

Control Bar



On the bottom of the settings pane is the control bar. On the left is the version of the Audience Display software (which must match FMS, see [Installation](#)). On the right are options to Restore Defaults (return the Audience Display to its "out of the box" settings, colors, etc), Save Changes (save any changes made and close settings) and Cancel (don't save any changes, and close the settings panel). Note that "Cancel" does not undo any positioning changes made, either through centering or manual adjustments. Also to the right of the Version information is the "Check for Updates" button, which checks the LOCAL FMS installation for updates to the Audience Display application. This DOES NOT look for updates on the Web. You must update FMS before using this "Check for Updates" button.

Jump Menu

The Audience Display has a Jump Menu. More to come...

Audience Display

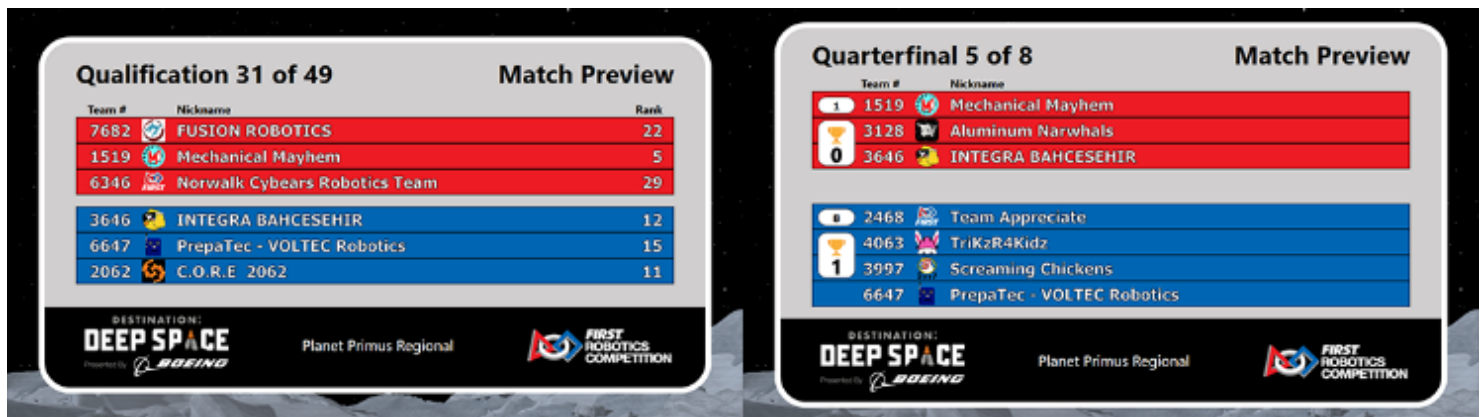
Displays

Audience Display

Match Flow

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

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 (it will turn YELLOW) once the "Set Audience Screen" button has been pressed until the Match is started.

[Qual] Team rankings are displayed next to their team name

[Playoff] Team rankings are replaced by a collective Alliance number next to the captain. Additionally, a small indicator is added below the alliance number to indicate the number of wins for the alliance.

Audience Display

Video and Score

Planet Primus Regional							
Rank	Team	RP	CARGO	HATCH_P	HAB_C	SNDSTRM	W-L-T
1	3284	4.00	120	72	57	24	2 - 0 - 0
2	2152	3.50	75	62	66	27	2 - 0 - 0
3	16	3.50	60	68	60	30	2 - 0 - 0
4	1011	2.50	60	50	36	12	1 - 1 - 0
5	2667	2.00	0	12	0	0	2 - 0 - 0
6	3952	2.00	0	12	0	0	1 - 0 - 0
7	578	2.00	0	12	0	0	2 - 0 - 0
8	156	2.00	0	9	0	0	1 - 0 - 0

FIRST		Qualification 8 of 49		Planet Primus Regional		DESTINATION: DEEP SPACE		SPONSORED BY BOEING	
6	ROCKET	2	4111	0	2783	5	ROCKET	6	1
6	ROCKET	3	1011	77	2040	6	ROCKET	6	3
			2667		2408				

Video and Score is the audience display most typically used at an FRC competition. Event Name, match time, score, game-specific details such as ROCKET and CARGO SHIP status, and match number information 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 referee icon appearing between the scores. If the event name is too long for the space provided, it will horizontally scroll to the right of the timer indicator.

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 the bracket (as shown above)

Audience Display

Match Result



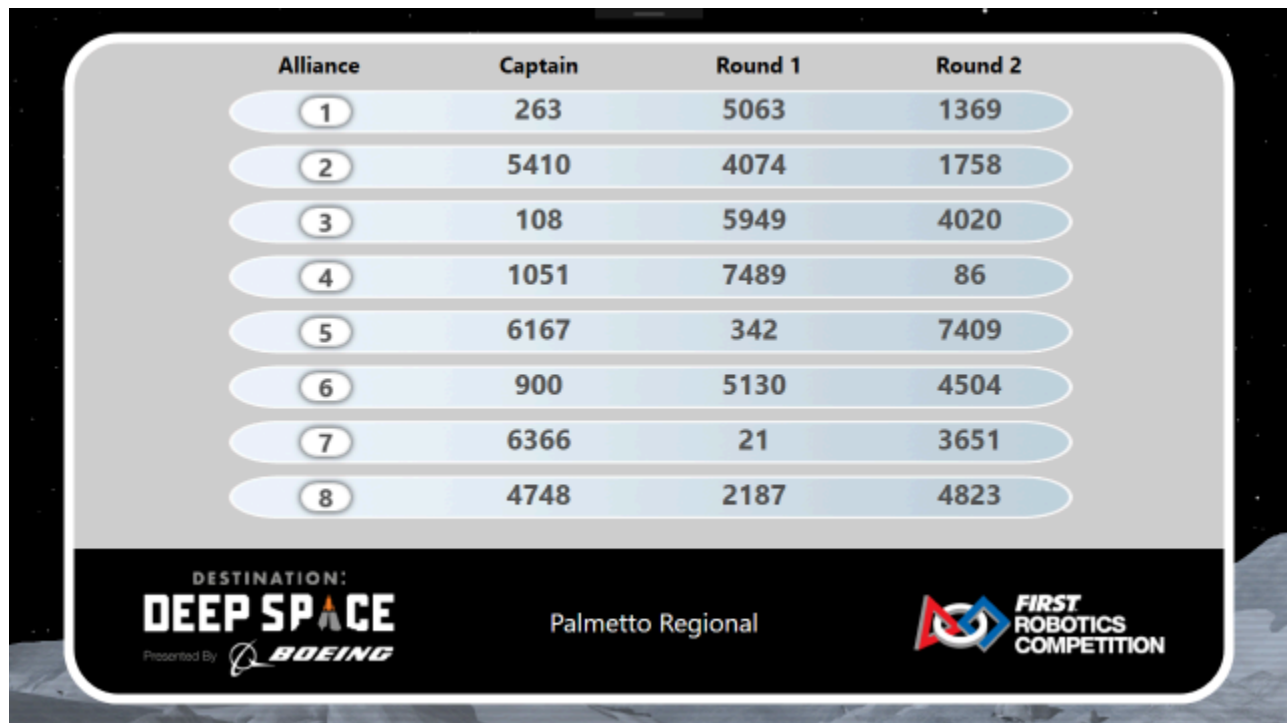
Match results is used to show the audience the final stats about the match they just witnessed. Teams, cards issued to the teams in the match, their new ranking, and how that rank changed are shown. Also shown are the scoring details for the match, as well as the match outcome (which alliance is victorious, or indicates a tied match). 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 counts on qual and playoff matches). It is accompanied by a short audio clip and the "background" screen prior to being displayed.

Audience Display

Playoff Specific

Screens available specifically for the Playoff process.

Alliance Selection



The image shows a digital display for the 'Alliance Selection' process. It features a table with four columns: Alliance, Captain, Round 1, and Round 2. The table lists eight alliances, each with a team number in a circle, a captain's name, and scores for Round 1 and Round 2. The display also includes logos for 'DESTINATION: DEEP SPACE' (Presented By BOEING), 'Palmetto Regional', and 'FIRST ROBOTICS COMPETITION'.

Alliance	Captain	Round 1	Round 2
1	263	5063	1369
2	5410	4074	1758
3	108	5949	4020
4	1051	7489	86
5	6167	342	7409
6	900	5130	4504
7	6366	21	3651
8	4748	2187	4823



Used in conjunction with the "Available Teams" display to guide Teams and the Audience through the alliance selection process. It shows the captains and each of their picks, as entered by the scorekeeper. Teams appear on the display once the scorekeeper loses focus on the box containing their team number (see Alliance Selection).

Audience Display


Available Teams

26 - 3490	36 - 3976	46 - 7107	56 - 6626
27 - 5327	37 - 5022	47 - 7072	57 - 2614
28 - 6961	38 - 7152	48 - 4073	58 - 2815
29 - 1398	39 - 1902	49 - 4847	59 - 5472
30 - 4451	40 - 5777	50 - 379	60 - 283
31 - 1539	41 - 4582	51 - 4243	61 - 6222
32 - 5317	42 - 4267	52 - 1553	62 - 1293
33 - 281	43 - 3824	53 - 1287	63 - 4005
34 - 7085	44 - 2393	54 - 4075	64 - 4187
35 - 3489	45 - 4965	55 - 3140	

Rank - Team #


 Presented By 

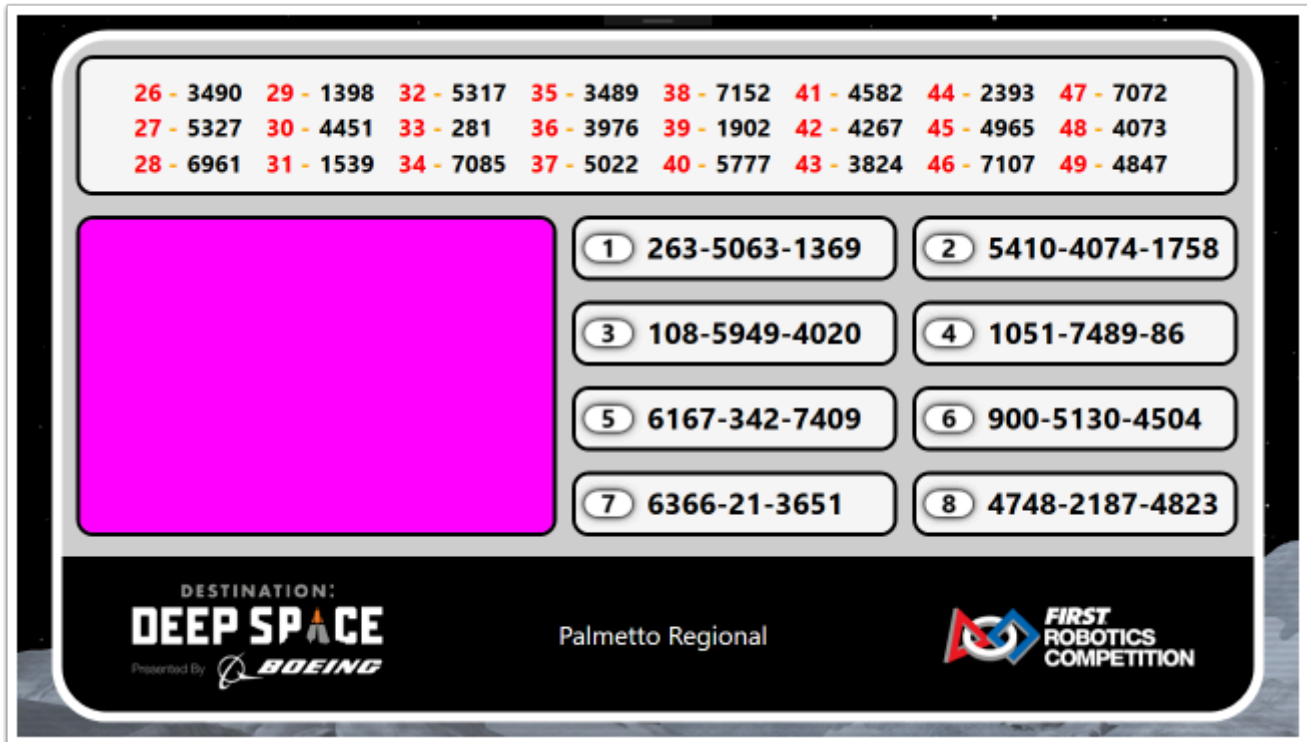
Palmetto Regional



Teams not yet selected during Alliance Selection are shown in the "Available Teams" display. Up to 70 teams are displayed in order of their Qualification rank. This display should be used in conjunction with the "Alliance Selection" view to assist Teams and the Audience in knowing who remains available for selection.

Audience Display

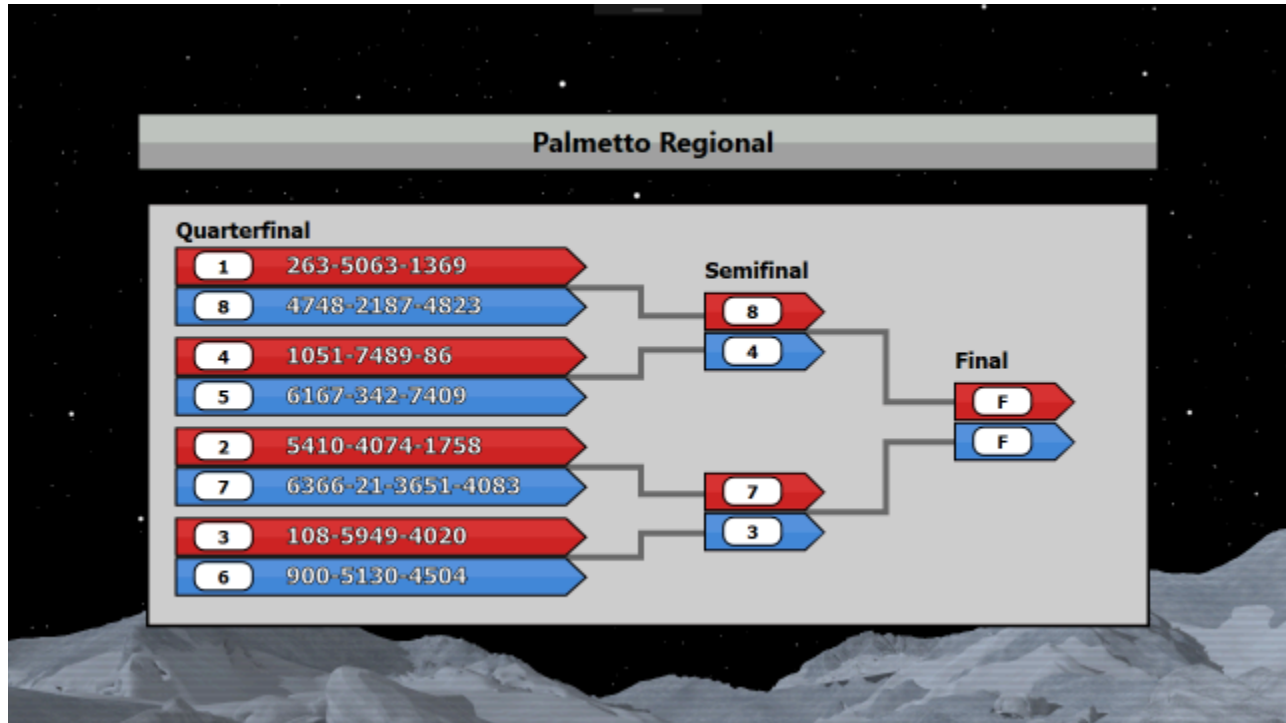
Hybrid



The Hybrid view is a combination view used to combine the Alliance Selection screen, Available Teams screen, AND a video chroma box so that this view can stay up without significantly impacting the video performance of the event.

Audience Display

Bracket



The bracket display is used during the Playoff tournament to indicate standings of all alliances. It is useful to show the Audience when an alliance advances from one level of the tournament to the next (e.g. Quarterfinals to Semifinals). Until a phase is complete (i.e. Quarterfinals) the bracket will continue to show the active phase with alliance numbers filled in on the following phase as applicable.

Audience Display

Ancillary

Additional screens available for event use.

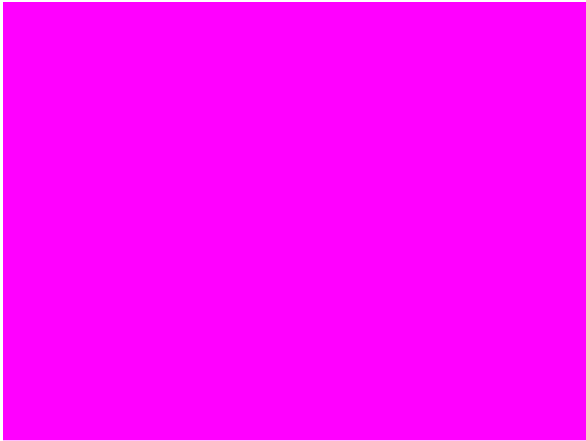
WiFi Reminder



The WiFi Reminder is an image that the Scorekeeper can show at the request of venue personnel (FTA, or related) in order to remind those in the venue to disable the WiFi on their Phones, Tablets, and Hot Spots. This carries a lot more "punch" and "weight" when announced by the Emcee in coordination with this image, which is why it is packaged along with the Audience Display instead of just packaged inside the mountains of slides that run within the venue.

Audience Display

Video Only



Palmetto Regional							
Rank	Team #	RP	(1)	(2)	(3)	(4)	W-L-T
9	7489	3.00	39	22	0	18	1 - 0 - 0
10	5949	3.00	36	24	0	18	1 - 0 - 0
11	4074	3.00	36	24	0	18	1 - 0 - 0
12	5063	3.00	36	24	0	18	1 - 0 - 0
13	4823	3.00	30	14	0	15	1 - 0 - 0
14	900	3.00	30	14	0	15	1 - 0 - 0
15	5130	3.00	30	14	0	15	1 - 0 - 0
16	3651	2.00	24	16	0	15	1 - 0 - 0

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

[Left] Full screen chroma for replacement with video or production information. Chroma color can be adjusted in [Settings](#).

[Right] Instead of chroma, display a full screen version of the current rankings (Qual) or bracket (Playoff). Mode depends on [Settings](#).

Background



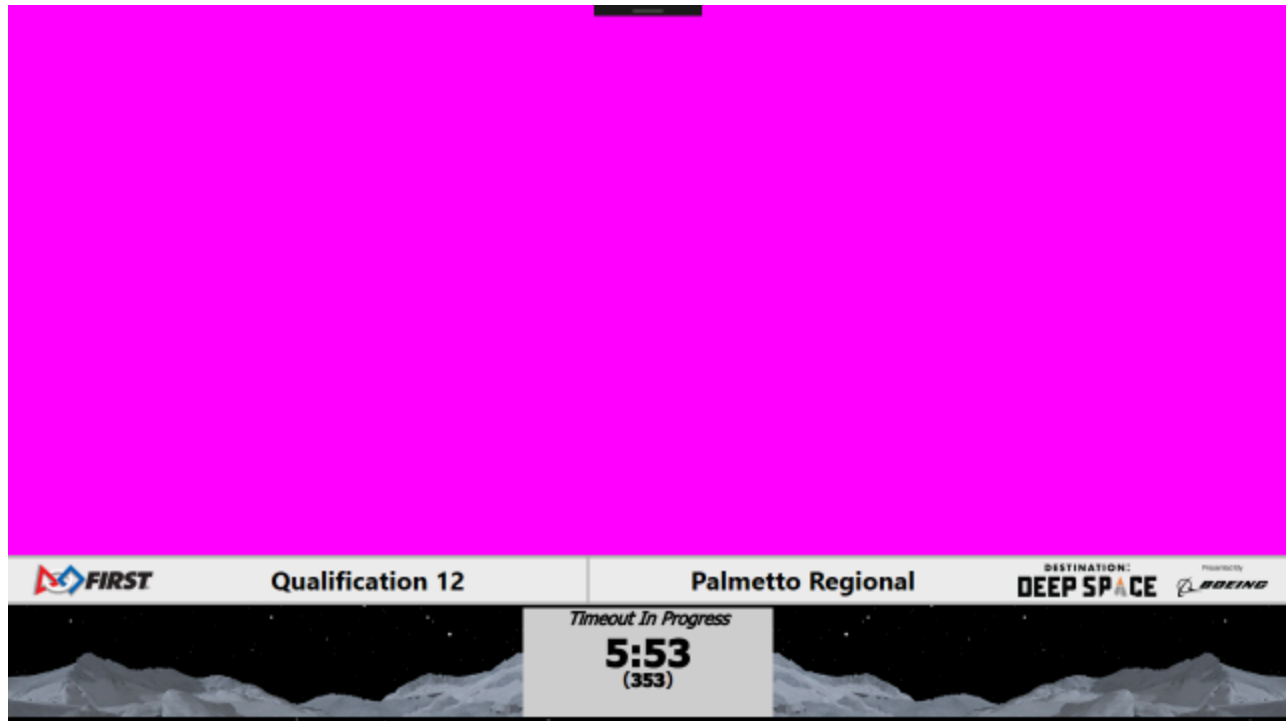
Audience Display

The background screen contains the game logo for the season, and can be used during breaks, lunch, etc as an alternative to video overlay ("Video Only") or as a way to show the audience the game logo.

[Left] The default Background containing the game logo and event name.

[Right] Optionally, the "Message" tab (Match Play/Match Test) can be used to add a banner message to the bottom of the display, such as important event announcements, notification of breaks, etc. These messages will appear on all instances of Audience Display, remote or local.

Timeout



The timeout display is available during both Qualification and Playoff matches, though is typically only used in Playoffs when back-to-back matches are necessary (or a Team calls a timeout). The display contains the match number or phase (e.g. "Test Match") as well as the event name and time remaining. Upon timer expiry/cancel, the "buzzer" sound will be played.

(Above) Traditional timeout display, with chroma available for video overlay.

If configured for Rankings (see [Settings](#)) instead of Chroma, the current rankings or bracket will be displayed in place of the Chroma.

PIT DISPLAY

Pit Display

Table of Contents

Disclaimer	3
Disclaimer	4
Configuration	5
About Pit Display.....	6
Displays	8
Qualifications	9
Playoffs.....	11

Disclaimer

Pit Display

Disclaimer

WARNING

WARNING

Robot 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.

Configuration

Pit Display

About Pit Display

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.

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.

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)

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.

Pit Display

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.

Displays

Pit Display

Qualifications

Qualification Pit Display

Display

Rank	Team	Ranking Score	Endgame Points	Auto Points	Ownership Points	Vault Points	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.

Pit Display

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, the following information is shown:

- Ranking Points - Cumulative earned Ranking Points
- Endgame Points - Cumulative earned Parking + Climbing Points
- Auto Points - Cumulative Sum of Alliance Autonomous points
- Ownership Points - Cumulative sum of Switch + Scale Ownership Points in Auto and Teleop
- Vault Points - Cumulative sum of Alliance points earned from Power Cubes in the Vault
- Record - Win/Loss/Tie record for the Team. Any match that a team plays as a Surrogate does not count towards the Record column.

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

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

Pit Display

Playoffs

Playoff Pit Display

Display

Display

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)

FIELD MONITOR

Field Monitor

Table of Contents

Disclaimer	3
Disclaimer	4
Live	5
Live Monitor	6
Match Logs	16
Viewing Match Logs	17

Disclaimer

Field Monitor

Disclaimer

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Field Monitor

Live

Field Monitor

Live Monitor

Watch robot status as it happens. The Field Monitor is part of the web interface, accessible through the webpage at 10.0.100.5 (normally)

Basic Layout

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							

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.

Field Monitor

- 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)

Field Monitor

Prior to Prestart

M: 999		READY TO PRE-START							
📄 Logs		DS	BRU	Radio	Ro	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).

Field Monitor

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	A	0	0
2	2	●	0.069	●	●	13.36	A	3	9807
3	3	●	0.069	●	●	13.29	A	5	40442
1	4	M	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							

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.

Field Monitor

M: 999		PRE-START COMPLETED							
Logs		DS	DWU	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, "Wait your Turn." This can also happen when a team for the next match plugs in to a Player Station prior to a prestart.

Field Monitor

Match Ready

M: 999		MATCH READY							
Logs		DS	DWU	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.

Field Monitor

Match Running

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

Field Monitor

























Match Running (Estop and Disconnect)

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

Field Monitor

Match Cancelled

M: 999		MATCH ABORTED							
Logs		DS	BWU	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.

Field Monitor

Match Over

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

Match Logs

Field Monitor

Viewing Match Logs

Access

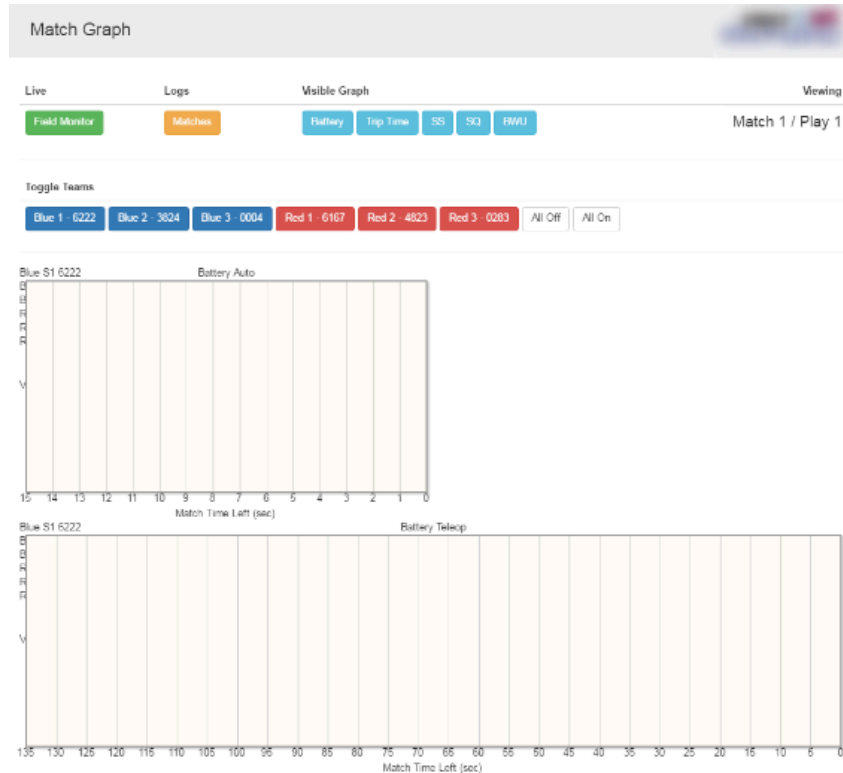
Sched. Start	Actual Start	Description	Match/Play	Blue 1	Blue 2	Blue 3	Red 1	Red 2	Red 3
11:00 AM	11:50 AM	Qualification 1	1 / 1	1708	4074	1293	3976	120	4267
11:07 AM	12:15 PM	Qualification 2	2 / 1	359	1553	6167	4547	329	1398
11:14 AM	12:17 PM	Qualification 3	3 / 1	2393	4604	5777	2815	5317	4847

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.

Field Monitor

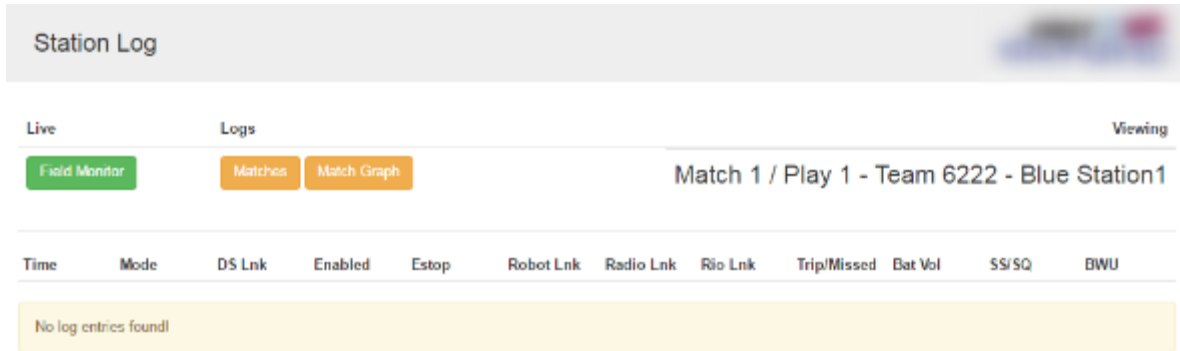
Match Graph



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.

Field Monitor

Station Log




The screenshot shows the 'Station Log' interface. At the top, there is a header 'Station Log' and a blurred logo. Below the header, there are two tabs: 'Live' and 'Logs'. Under the 'Live' tab, there is a green button labeled 'Field Monitor'. Under the 'Logs' tab, there are two orange buttons labeled 'Matches' and 'Match Graph'. To the right of these buttons, the text 'Match 1 / Play 1 - Team 6222 - Blue Station1' is displayed. Below this, there is a table with the following columns: Time, Mode, DS Lnk, Enabled, Estop, Robot Lnk, Radio Lnk, Rio Lnk, Trip/Missed, Bat Vol, SS/SQ, and BWU. The table content is currently empty, with a yellow message box stating 'No log entries found!'.

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.

Field Monitor

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).

OFF-SEASON FMS

Off-Season FMS

Table of Contents

Disclaimer	3
Disclaimer	4
Configuration	5
About Off-Season FMS and Requirements	6
Installation	8
Network Hardware Configuration	17
Router Configuration.....	19
Configure Robot Radios	21
FMS Computer Configuration	22
Setting Up Your Event	23
Upgrading from a previous edition of FMS Off-Season	24
Syncing Data with FIRST	32
Availability.....	33
Field Access Point.....	35
Overview	36
Loading OpenWRT	38
Default Settings.....	46
Wireless Settings\Status.....	48
Firewall Settings	53
Recovery Procedure	56

Disclaimer

Off-Season FMS

Disclaimer

WARNING

WARNING

Robot 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.

Off-Season Additional Disclaimer

The Off-Season version of the Field Management System (formerly "FMS Lite") is similar in operation to that of the one used at official district and regional competitions but specially adapted to better suit the needs of teams and volunteers who operate events throughout the off-season. As such, some of the buttons, features or options that appear in the regular competition season are not available in FMS Off-Season. In most cases, unavailable features are called out (as possible) in the FMS User's Guide and describe what may be different about the installation.

This document is a supplement to the official [FMS User's Guide](#) available on the *FIRST* website (and located on this same site). This document will outline the unique network configuration for off season events, while the FMS User's Guide details the software operation.

Configuration

Off-Season FMS

About Off-Season FMS and Requirements

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.

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.

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: 1280x1024 or higher for best visibility

Off-Season FMS

Audience Display Requirements

If you wish to run the Audience Display in addition to the Off-Season FMS, on the same computer, the target machine will need a modern video card and the machine must allow for it to be used as an extended display. The resolution should be either 1920 x 1080 or 1280 x 720 for the 16:9 Audience Display. For game sounds the target machine will need a sound card and, if desired, ability to output to a speaker system. The Audience Display can also be run on a separate machine, as long as they are on the same Ethernet network.

Important Off-Season Notes

Do not install FMS Off-Season on top of a previous installation of the software. Due to annual changes in areas such as the database, 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](#).

IMPORTANT: It is highly recommended that you do not install FMS Off-Season on machines that are school or business “owned” or controlled, as they 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.

Off-Season FMS

Installation

Retrieve Installer

FMS OFF-SEASON SHOULD NOT BE INSTALLED ON TOP OF A PREVIOUS FMS OFF-SEASON VERSION, YOU MUST COMPLETELY REMOVE THE OLD VERSION AND DELETE THE SQL INSTANCE BEFORE CONTINUING. For help on doing this, please [go to 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.

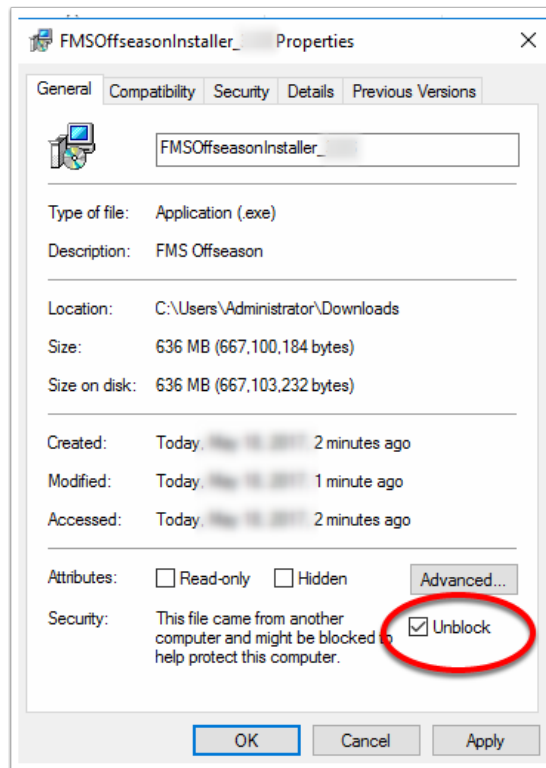
Access the Installer download [from this site](#) (look for the most recent available)

FMS (2017+) require a 64 bit OS. *FIRST* recommends Windows 10.

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.

Off-Season FMS



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.

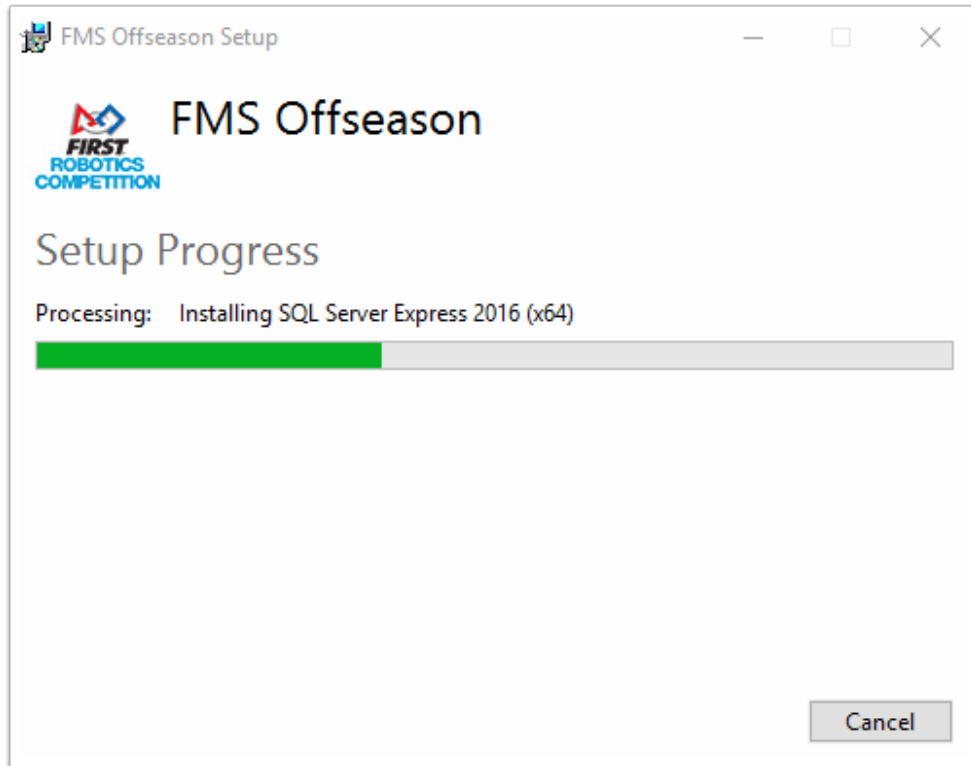
Read the license terms. If you agree to the terms, click the box and select the Install option. You can specify the install path using the Options button. By default, the program will install in:

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.

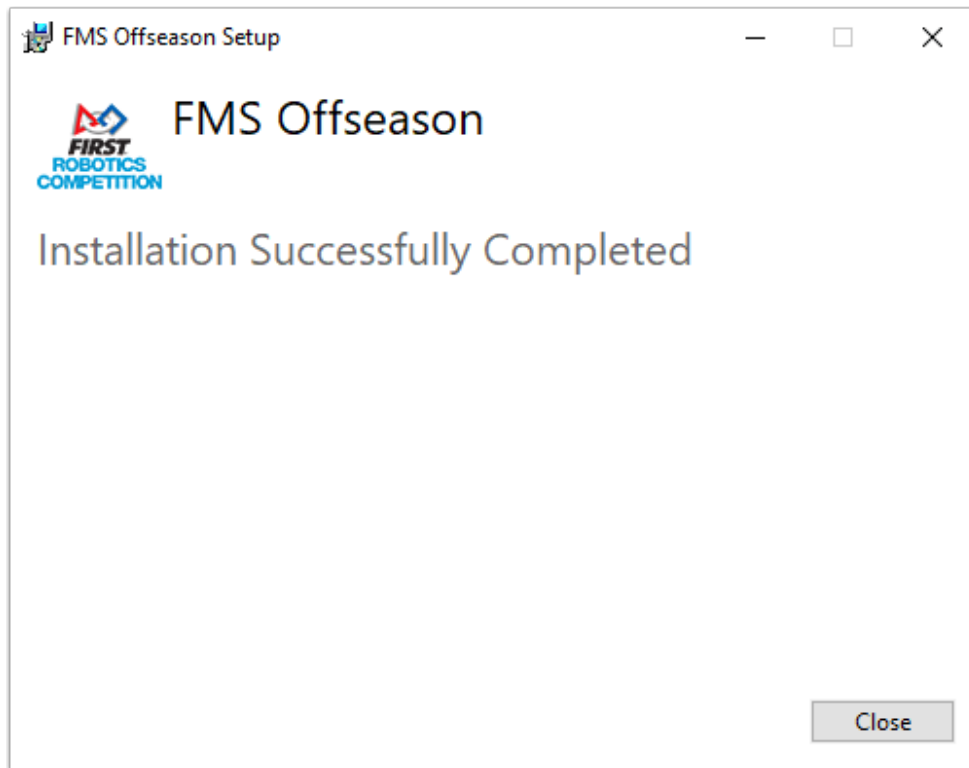
The FMS Off-Season installer will run and Windows will provide feedback on the progress.

Off-Season FMS



When the installation finishes, you can close the installer.

Off-Season FMS



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).

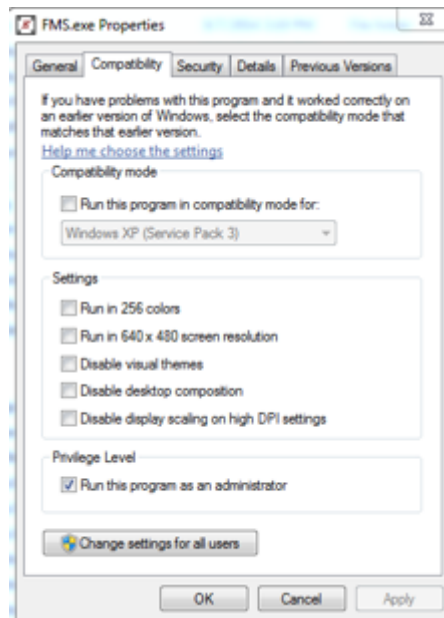
The Audience Display, which will display scores and team information (as well as playing game sounds), will additionally add an icon if you elect to install it. For more information, [see this article](#).

Off-Season FMS

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.

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.

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.

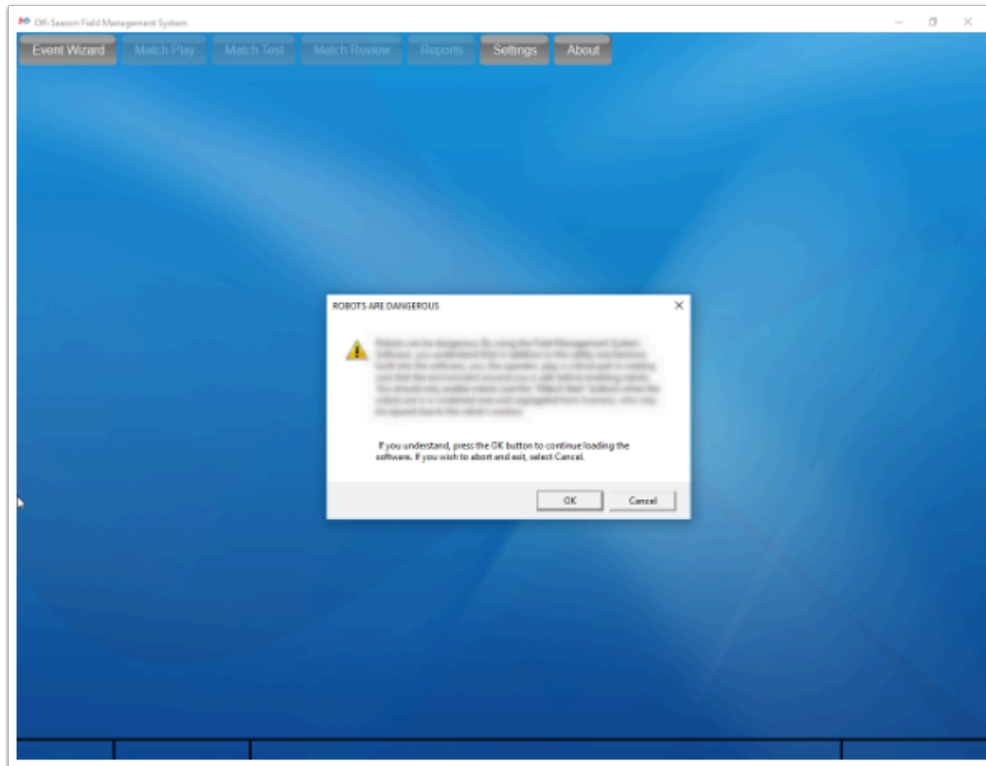
Off-Season FMS

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 will see the following screen must agree to the warning to get started. Beyond that, refer to the [User's Manual](#) for additional operating instructions.

Off-Season FMS



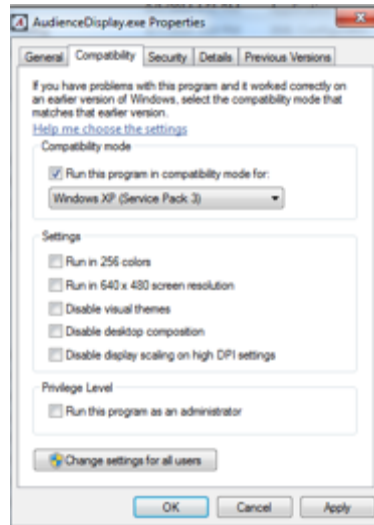
Launching Audience

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

See the Audience Display information in the [FMS User’s Guide](#) documentation for additional details about using the Audience Display. **Note:** The Audience Display must be running in order to hear game sounds.

Off-Season FMS

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.

It's also possible to run the audience display remotely. If you wish to do so, 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.**

Off-Season FMS

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. **Notice: The documentation references port 80 in examples. 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.

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."

Off-Season FMS

Network Hardware Configuration

Preparing the network for Off-Season events

Layout

Layout

Because FMS Off-Season is used at off-season events, the typical FRC field, electronics and hardware are not normally available. As such, the host team or organization will need to provide some basic network hardware in order to run the event. If your 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. See below for more details about the wiring.

Wiring

In order to operate an event effectively, you will need some basic cabling between the field hardware. Use the basic field diagram from the previous section as a reference. 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.

Off-Season FMS

While CAT6 cables are recommended, CAT5e also work.

Router and Computer Configuration

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

Off-Season FMS

Router Configuration

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.

IP Address

IP Address

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).

Wireless Configuration

Wireless Configuration

- 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.

Off-Season FMS

Security

Security

- 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.

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.

Configure Robot Radios

Get those bots ready for play!

Instructions

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

Off-Season FMS

FMS Computer Configuration

Only complete these steps after completing the previous setup requirements.

Network Adapter

Network Adapter

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.

Firewall

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.

Driver Stations and Robots

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

Off-Season FMS

Setting Up Your Event

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

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.

Off-Season FMS

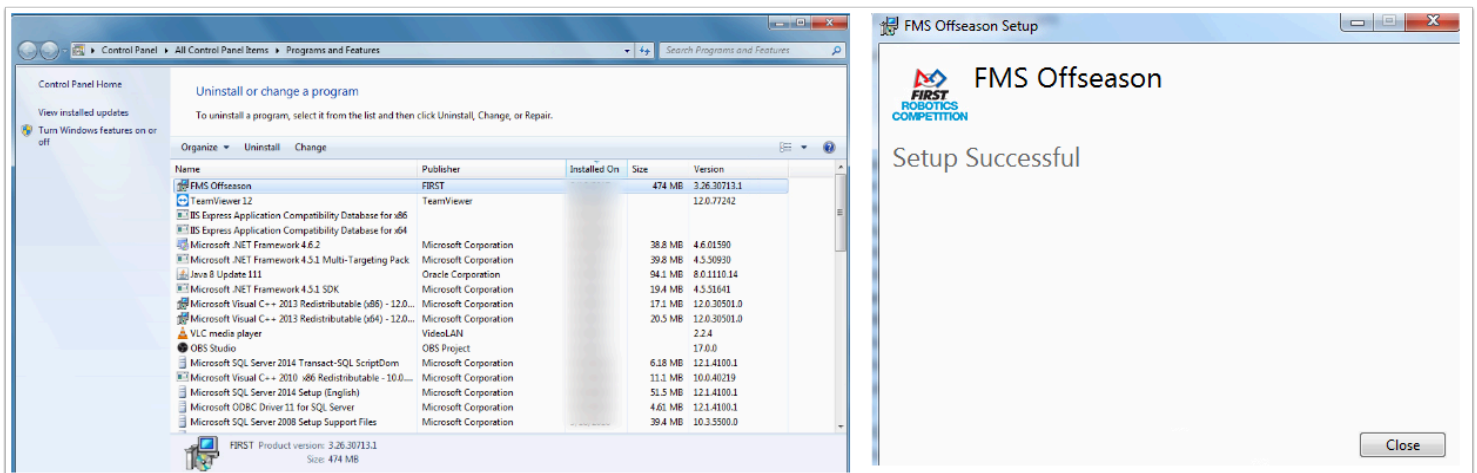
Upgrading from a previous edition of FMS Off-Season

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 did/does not contain a previous version of FMS, Off-Season this article is not relevant.

Heads Up! Running this process will delete all the match/scoring data from this machine, so only do this if you're sure you won't need that data!

Uninstall the previous FMS Edition

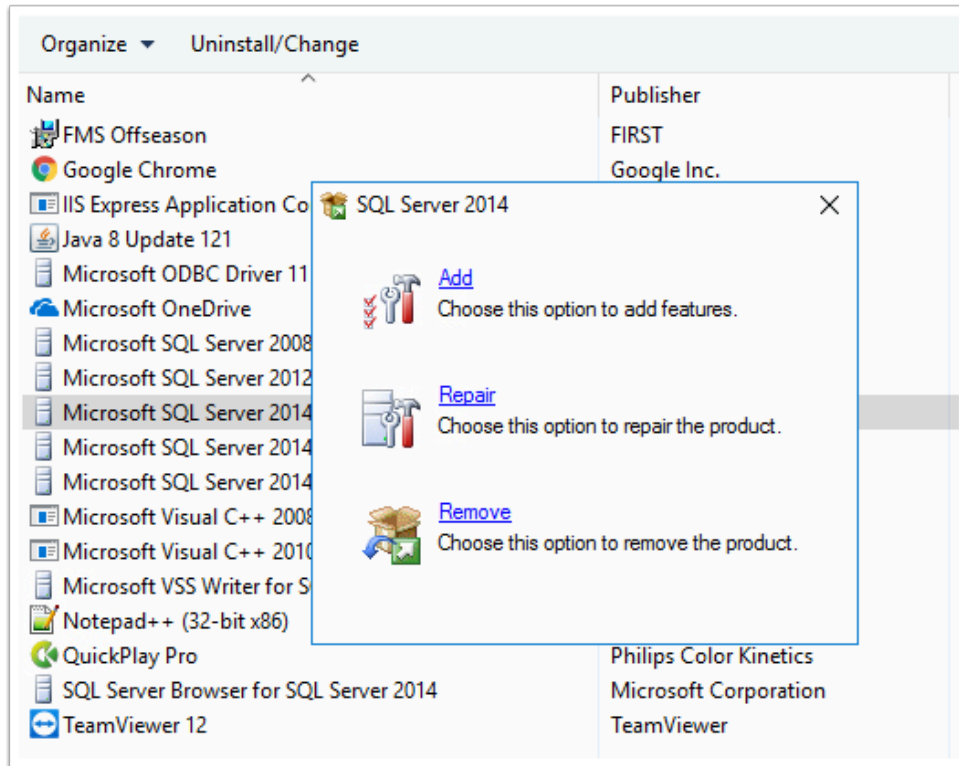


On your machine's Control Panel, look for the previous edition of "FMS Off-Season" and select Uninstall. Upon successful uninstall, the screen at right will be shown.

Remove SQL Server 2014 (or 2016)

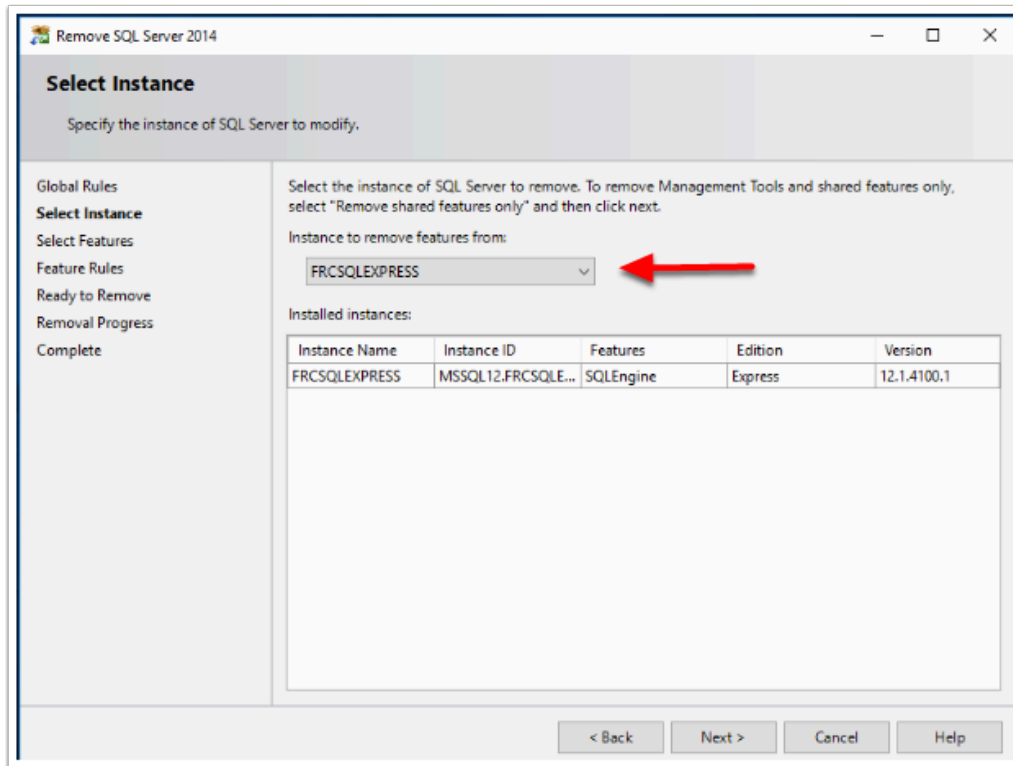
On your computer's Control Panel, navigate to Uninstall/Manage Programs, and find "Microsoft SQL Server 2014" in the list. Select "Uninstall/Change" and then "Remove" from the menu that appears. Depending on your machine, you may instead have Microsoft SQL Server 2016, but the same uninstall process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

Off-Season FMS



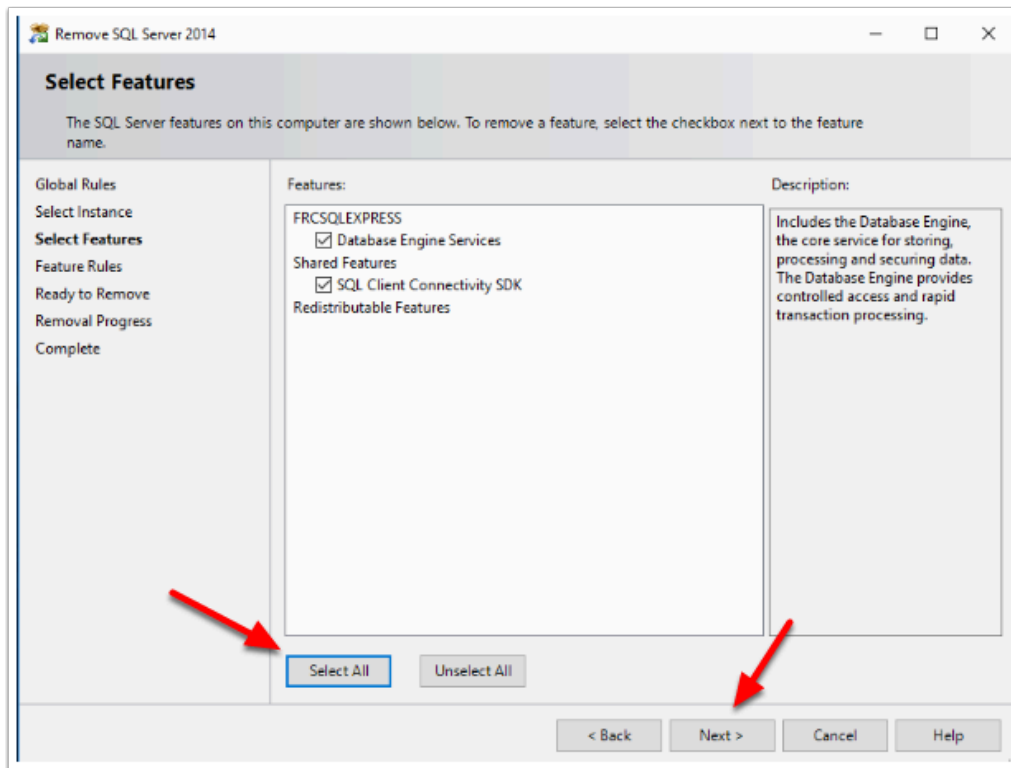
An instance selection panel will appear. Make sure "FRCSQLEXPRESS" is selected, then select "Next."

Off-Season FMS



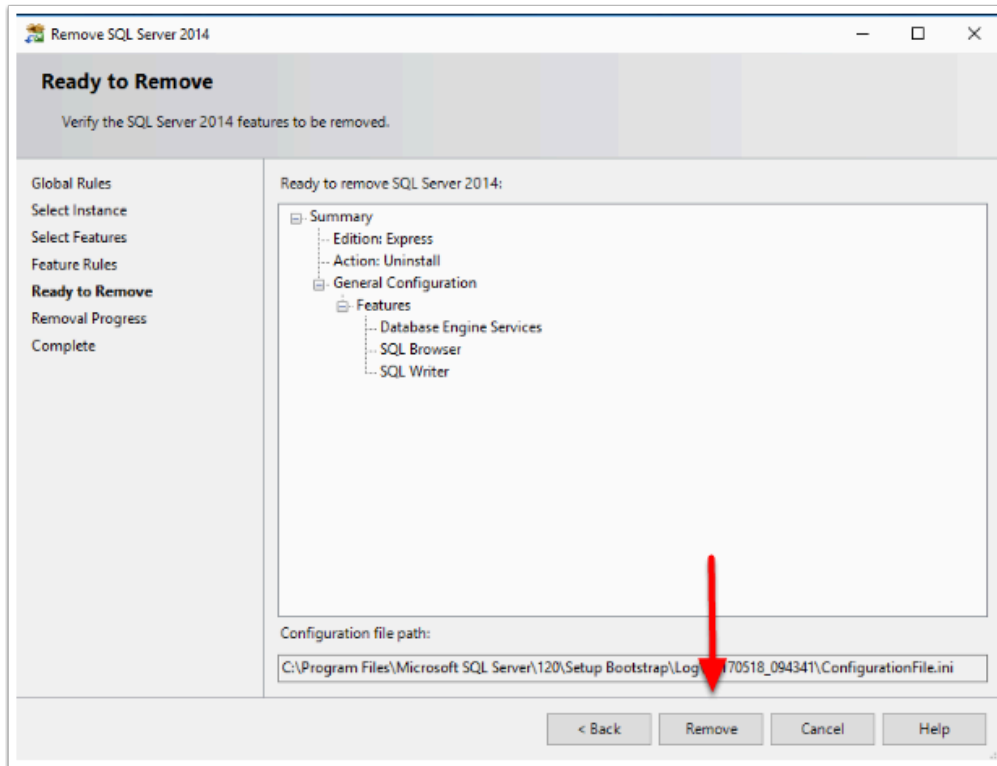
The Features menu will appear. Click the "Select All" button, then "Next."

Off-Season FMS



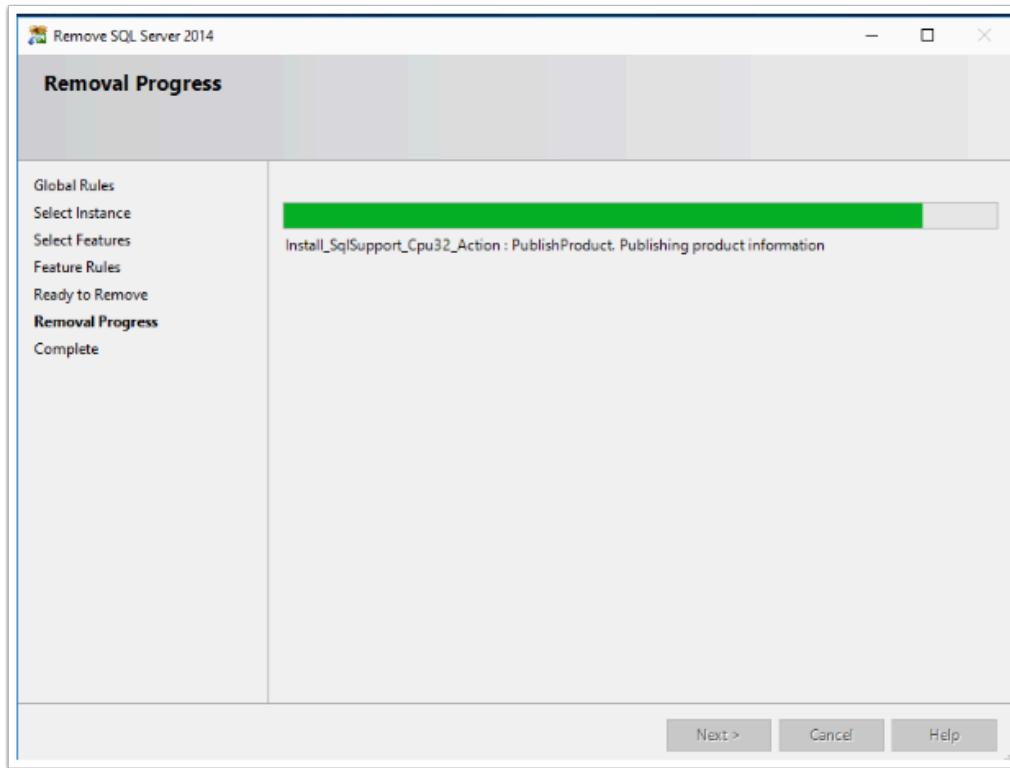
The confirmation screen will appear. Select "Remove" to begin the process.

Off-Season FMS



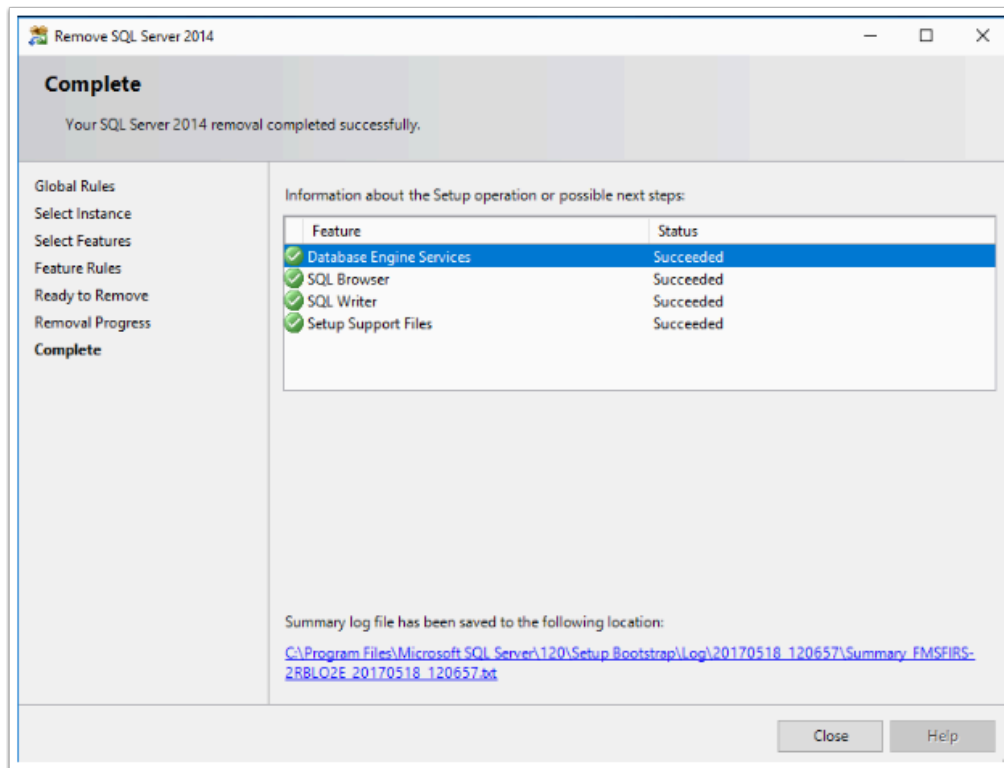
Windows will configure the changes to remove the old FMS database installation.

Off-Season FMS



When the changes are complete, you can click "Close."

Off-Season FMS



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.

Reboot

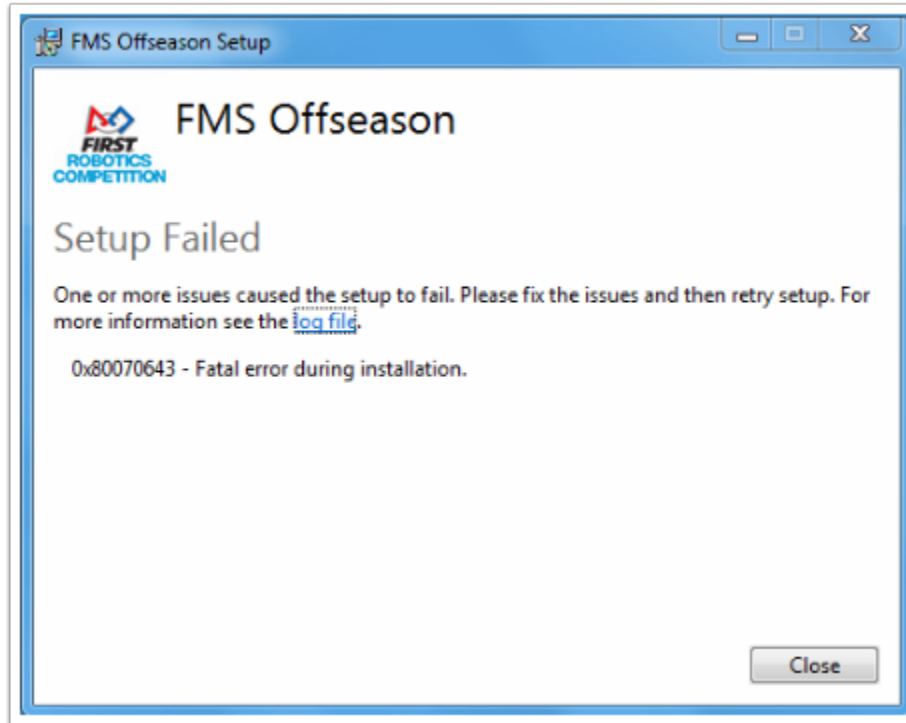
Reboot the computer before continuing.

Installing FMS Off-Season

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

Off-Season FMS

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

Off-Season FMS

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 Tracker.

Sync is no longer available for the 2019 DESTINATION: DEEP SPACE season.

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 2020 Continental United States competitions.

Requirements

To apply and participate for the 2020 season, the Off-Season event must requirements that include:

- End before November 8th, 2020
- Use an official *FIRST* field, with FMS and Electronics
- Have a 2020 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 2020 FRC Season. For "unofficial" teams (like a "pre-rookie" team or a "second robot" team), FIRST has reserved Team numbers 9985-9999, 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 9985-9999.*
- 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

Off-Season FMS

- *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 values or thresholds 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.

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:

<https://frc-events.firstinspires.org/services/OffSeasonEvent>

Field Access Point

Off-Season FMS

Overview

The Wireless Access Point used for 2017 FRC competitions was a Linksys 1900ACS running customized OpenWRT firmware. In an attempt to provide a tested AP that can be used with FMS Offseason, we are releasing a modified version of the firmware used during the season that teams or individuals could load on their own devices.

This page provides an overview of the 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 2017 FRC season.

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


Offseason Simple

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

This image contains the same software used in the 2017 season image, but with the following modifications:

Off-Season FMS

- 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 Offseason Simple.

Offseason VLAN

The Offseason VLAN image contains the same software used in the 2017 season image, but with the following modifications:

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

Off-Season FMS

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.

Aquiring the firmware

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

[Offseason Simple](#)

[Offseason 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.

Off-Season FMS

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



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 web browser and enter 192.168.1.1 into the address bar. The browser will automatically redirect 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.

Off-Season FMS

Login

Sign In

Log in with your router password.

**Internet connection is down**

You must have an Internet connection to log into your Linksys Smart Wi-Fi account. To access your router settings without Internet access, enter the router password and then click **Sign in**. After you log into your router, select **Connectivity** and then the **Internet Settings** tab to view and change connection settings. You may need to contact your Internet Service Provider for assistance with these settings.

Rebooting your modem and router may also fix the connection problem. To do this, disconnect the power cables, wait 2 minutes, and then reconnect the power cables.

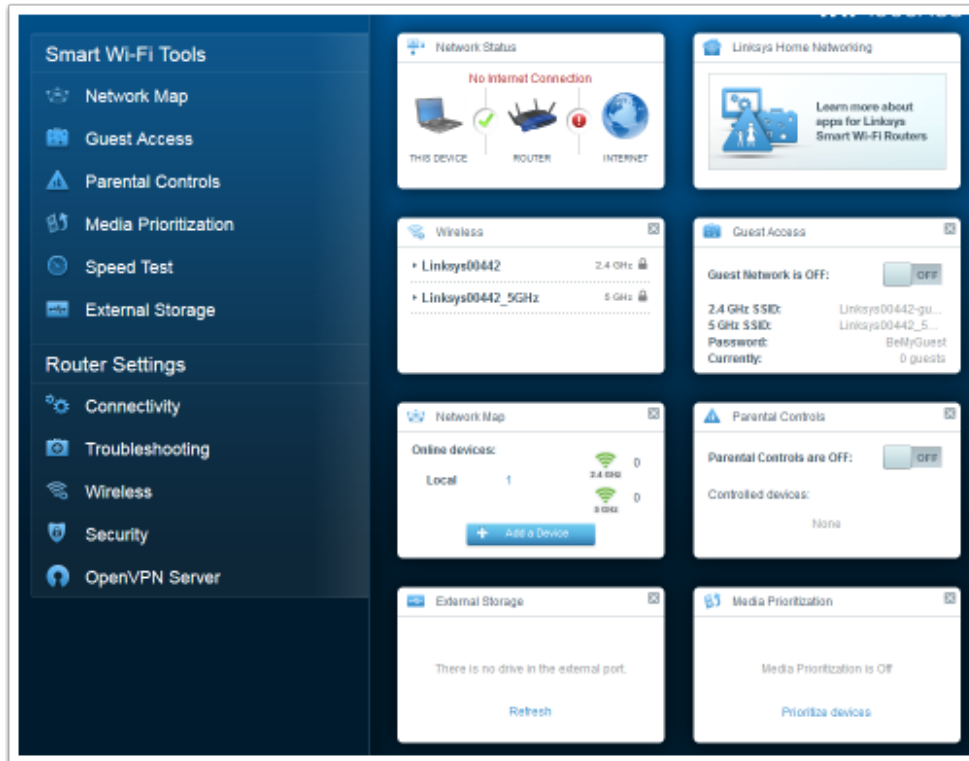
Access Router

English (United States) ▾

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**.

Off-Season FMS

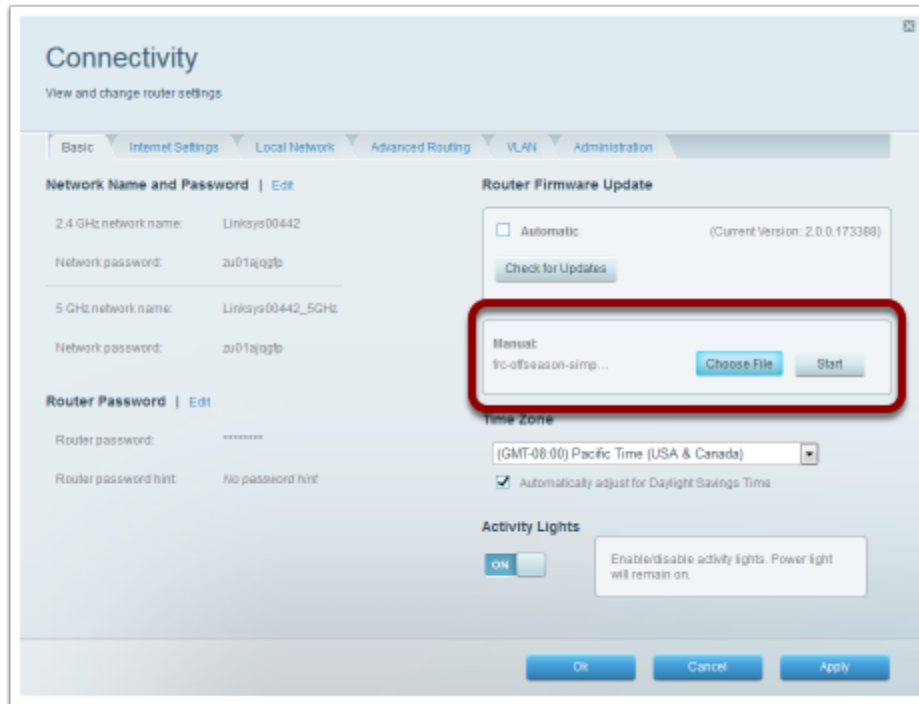
Access flash page



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

Off-Season FMS

Flash Firmware



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

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).

Off-Season FMS

Connecting to the AP

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.

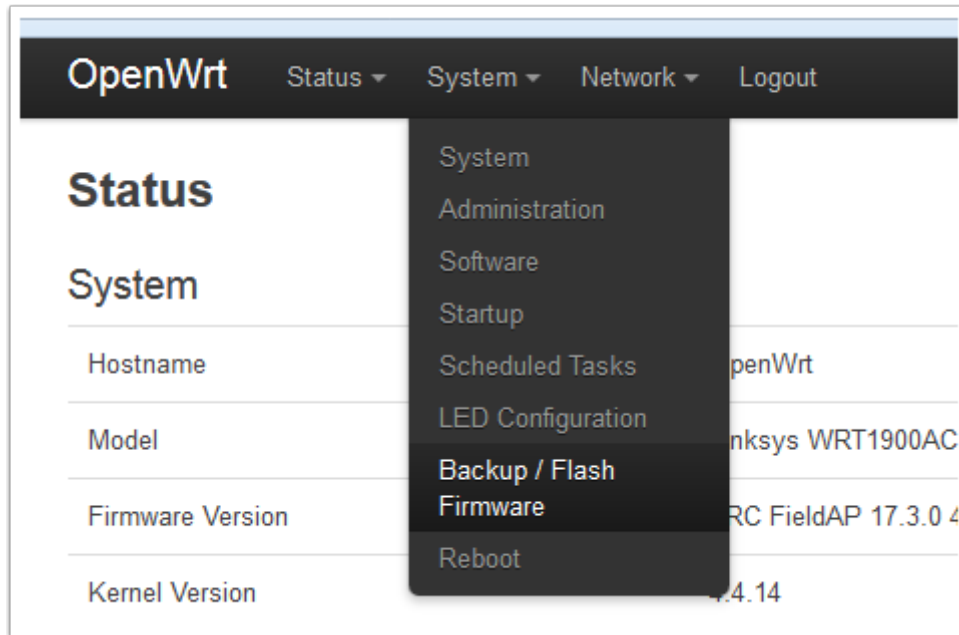
Username: root

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

Then click **Login**.

Off-Season FMS

Flash firmware



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

Off-Season FMS

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.

Off-Season FMS

Default Settings

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

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

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"

Wireless

5GHz Wireless

SSID: OffseasonFMS

Encryption: WPA2 AES

Key: DefaultKey

Off-Season FMS

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

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

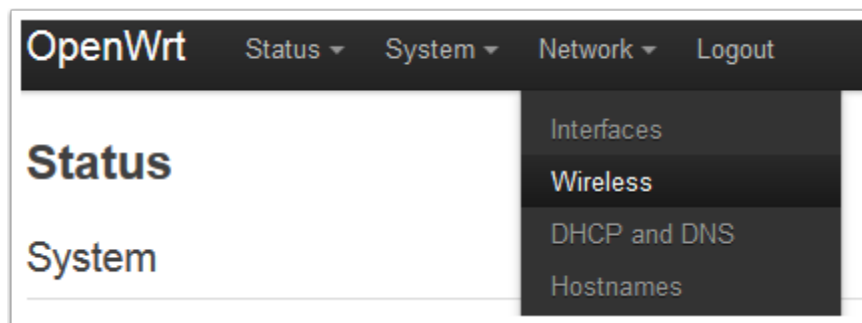
The default policy for traffic into/out of the AP (i.e. not through) is to allow. This allows you to connect to the AP webpage, SSH into the AP, etc.

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.

Wireless Settings\Status

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

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.

Off-Season FMS

Wireless Overview Page

The screenshot displays the 'Wireless Overview' page with the following components:

- radio0: Master "OffseasonFMS" radio1: Master "FieldAdmin"**
- Wireless Overview** section containing:
 - Marvell 88W8864 802.11nac (radio0)** (1): Channel: 157 (5.785 GHz) | Bitrate: 117 Mbit/s. Includes a 100% signal strength indicator, SSID: OffseasonFMS, Mode: Master, BSSID: 62:38:E0:09:FE:82, and Encryption: WPA2 PSK (CCMP). Buttons for Scan, Add, Disable (3), Edit (4), and Remove are present.
 - Marvell 88W8864 802.11bgn (radio1)** (5): Channel: 11 (2.462 GHz) | Bitrate: ? Mbit/s. Includes a 0% signal strength indicator, SSID: FieldAdmin, Mode: Master, BSSID: 62:38:E0:09:FE:83, and Encryption: WPA2 PSK (CCMP). Buttons for Scan, Add, Disable, Edit, and Remove are present.
- Associated Stations** (6) section containing a table of connected clients:

	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:

- 802.11nac radio:** This section contains information on the status of the 5GHz adapter (channel and current bit rate)
- 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
- Disable/Enable:** This button disables the particular network selected. If the network is currently disabled, this will change to an Enable button.
- 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.
- 802.11bgn radio:** This section contains all of the same details as 1-4 above, but for the 2.4GHz adapter
- 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,

Off-Season FMS

the signal-to-noise ratio on frames received 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.

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 Mode: Master | SSID: OffseasonFMS
100% 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 wlan 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

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.

Off-Season FMS

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.

Wireless Security

Interface Configuration

[General Setup](#) |
 [Wireless Security](#) |
 [MAC-Filter](#) |
 [Advanced Settings](#)

Encryption

Cipher


Key

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)

Off-Season FMS

- **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.

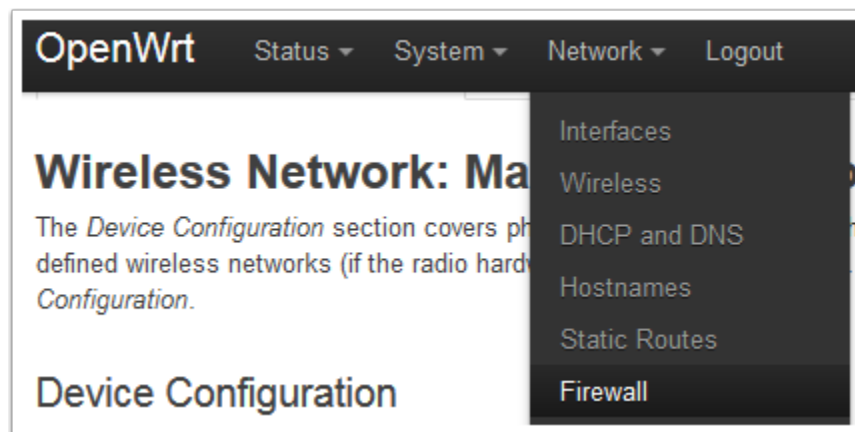
 **Note:** After changing any settings on this page, you must click **Save & Apply** in order for the settings to be saved and loaded into the radio.

Off-Season FMS

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.

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.

Off-Season FMS

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: accept

Output: accept

Forward: reject **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	REJECT	accept	accept	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**

Off-Season FMS

Re-enabling the Firewall

The screenshot shows the 'Firewall - Zone Settings' page. Under 'General Settings', 'Enable SYN-flood protection' and 'Drop invalid packets' are checked. The 'Input', 'Output', and 'Forward' rules are all set to 'accept'. A red circle with the number 1 is around the 'Forward' dropdown. Below, the 'Zones' table has two entries: 'lan: lan' and 'teams: wwan'. The 'Forward' rule for the 'teams' zone is set to 'accept' and is highlighted with a red circle and the number 2. At the bottom right, the 'Save & Apply' button is highlighted with a red circle and the number 3.

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	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete

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.

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.

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
3. **Turn power back on and Power LED will light.**
 - 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
5. **Turn power back on and allow router to fully boot.**
 - It should now be booted to the alternate firmware partition

SCOREKEEPER REFERENCE

Scorekeeper Reference

Table of Contents

Disclaimer	3
Disclaimer	4
Scorekeeper Step-by-Step	5
Overview	6
Setup (Day 0)	7
Practice (Day 1).....	10
Qualification (Day 2)	12
Playoffs (Day 3).....	15
Awards	16
Archive and Upload	17

Scorekeeper Reference

Disclaimer

Scorekeeper Reference

Disclaimer

WARNING

WARNING

Robot 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.

Scorekeeper Reference

Scorekeeper Step-by-Step

Scorekeeper Reference

Overview

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.

It may be of help to Off-Season events, but is designed for official in-season events.

"Days" designed are assuming a regional schedule (typical regional) and may not apply to a condensed (district) schedule.

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. This document 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!

Scorekeeper Reference

Setup (Day 0)

Prepare the field and arena for play

Setup

For a three-day Regional event, setup is done on the day preceding the Practice matches; Regional Directors 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.

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 to determine if the Internet Connection provided by the venue for FMS has an overlapping IP range by checking the Smart Router - the Smart Router is a device within the Scorpion that automatically handles issues between external venue and internal IP address conflicts. As such, issues with the Smart Router will be handled on an individual basis.
 - Launch the FMS Event Manager software, and click on the “Settings” button at the top of the application.
 - The “Network Status” tab in the resulting panel should be automatically selected. If not, please select this tab.
 - Click on the button marked, “Get Smart Router Configuration” under the “Smart Router (External)” heading.
 - If the “Venue IP” is marked as “unknown”, click the button again.
 - Determine if the “Venue IP” (first item in the “WAN/Venue”) and “LAN IP” (first item in the “Local Network”) are the same. If so, you may have an overlapping IP.
 - If the problem persists, the FTA should contact HQ Support.
 - If the venue requires a specific static IP address, uncheck “Use Venue DHCP” and enter the details in the “Venue Internet” section. This should only be done with your FTA.
4. Once the FMS System is setup, contact HQ support via Slack to determine if there are any FMS updates or maintenance that needs to be done for your event. It may not be possible for you to perform a successful Data Download without authorization from HQ support. Do not create the event database until HQ support ok’s you to complete this action.

Scorekeeper Reference

- If an update was required, you will also need to update the Audience Display toughbook. This can be done using the "Check for Updates" button within the Audience Display configuration panel or by copying the installer to a USB drive (ask the FTA for one).
 - Remember, DO NOT launch the Audience Display software until a database has been created for the event!
 - The easiest way to obtain the Audience Display installer (if the Audience Display Application is not already installed on the computer) is to:
 1. Ensure the remote Audience Display is on the FMS Network
 2. Open a web browser (Chrome Preferred) to the following address:
 - <http://10.0.100.5/FRCDownloads>
 - This will open a browser page to select the available applications to download.
 3. Select the Audience Display application to download.
 4. Install the Audience Display application on the local computer.
5. Load the Audience Display software on the Audience Display Toughbook ONLY if the event database has been created. Without an event database, the Audience Display may not load correctly.
- The Audience Display has two hotkey combinations to load its configuration panel.
 - CTRL-SHIFT-F12
 - CTRL-SHIFT-C
 - Use the hotkey CTRL-SHIFT-1 to move and center the audience display onto the primary monitor, or if using HDMI output use CTRL-SHIFT-2 to move and center the audience display to the secondary monitor.
 - A/V might want to run their own Remote Audience Screen. If so, let them follow the same process to get an updated version of the Audience Display.
6. 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. Some update via refresh, some only make you think they do.
 - 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.
7. Run Match Test and confirm that all field components operate correctly. This process should be coordinated with the FTA
- You cannot access the Match Test area (the button will not become active) until the Data Download step (Step 1) has been completed in the Event Wizard, an event is selected (Step

Scorekeeper Reference

- 2), and the database has been created. Contact HQ support for assistance if this has not been completed yet.
8. Coordinate with the FTA and A/V crew to ensure that all game sounds play correctly. You can use the “Test Sound” buttons within the Audience Display configuration panel to play test sounds, or use the continuous sound player in the audience screen’s Jump Menu (right-click the Audience Display icon in the task bar).
 9. Verify that the printer is working correctly.
 10. Set up event by using the “Event Wizard” at the top of the FMS Event Manager software. Check with Event Registration and make any necessary changes (add/delete) to the list of participating teams. Verify with the FTA before making any changes.
 11. Generate Practice Match schedules 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.
 12. Work with the FTA to determine if you need to print the Announcer’s Report for practice matches. Often this is not necessary.
 13. Work with the FTA to ensure that the WPA key file is transferred to the radio programming kiosk. The WPA key file can be imported to the kiosk via the FMS network, or exported from the “Practice Team Selection” step (Step 3) from the Event Wizard. Most FTAs will prefer to import the key file over the network, so exporting the file should be a rare requirement.
 14. Ensure the Backup Configuration settings have been set.
 - Select “Settings”, click on the “Backup Config” tab, and click “Browse” to set a backup location.
 - This MUST be on a thumbdrive or other external storage.
 15. 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.

Scorekeeper Reference

Practice (Day 1)

Prepare the teams for official matches

Practice

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.

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)
 - If required, you will also need to update the Audience Display toughbook using the "Check for Updates" button within the Audience Display config panel (use CTRL-SHIFT-C shortcut to open on display computer).
 - Use the hotkey CTRL-SHIFT-1 to move and center the audience display onto the primary monitor, or if using HDMI output use CTRL-SHIFT-2 to move and center the audience display to the secondary monitor
 - A/V might want to run a Remote Audience Screen -
 - The easiest way to obtain the Audience Display installer (if the Audience Display Application is not already installed on the computer) is to:
 1. Ensure the remote Audience Display is on the FMS Network
 2. Open a web browser (Chrome Preferred) to the following address:
 - <http://10.0.100.5/FRCDownloads>
 - This will open a browser page to select the available applications to download.
 3. Select the Audience Display application to download.
 4. Install the Audience Display application on the local computer.

Scorekeeper Reference

4. Run a Test Match and 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 are okay for practice schedules).
6. Ensure the Practice Schedule is Activated in the Event Wizard (Step 6).
7. **Lunch Break Practice Matches**

- Generate a Qualification Match schedule using steps 7-10 in the Event Wizard.

BE EXTRA CAREFUL TO VERIFY THE SCORPION IS SET TO THE CORRECT TIMEZONE - FMS WILL WARN YOU ABOUT TIMEZONE IRREGULARITIES, DO NOT CLICK THROUGH. IF THERE IS A TIMEZONE MISMATCH ISSUE, CONTACT FMS SUPPORT IMMEDIATELY.

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. 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.). Then be sure to eat! Volunteers only get a shirt and food for 3 days work!

- **Return to the Event Manager and re-activate the practice match schedule.** This is necessary in order to continue playing through the Practice schedule.

8. **End of Practice**

- In the "Settings" view, using the "Backup Config" tab, use the "Force Event Backup" button to force a full event backup for the end of practice matches.
- 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.

If power will remain on in the venu, put the field lights into Night Mode. Otherwise, shut down.

Scorekeeper Reference

Qualification (Day 2)

Determine seeding for Playoff matches

Qualification

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.

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)
 - If required, you will also need to update the Audience Display toughbook using the "Check for Updates" button within the Audience Display config panel (use CTRL-SHIFT-C shortcut to open on display computer).
 - Use the hotkey CTRL-SHIFT-1 to move and center the audience display onto the primary monitor, or if using HDMI output use CTRL-SHIFT-2 to move and center the audience display to the secondary monitor
 - A/V might want to run a Remote Audience Screen
 - The easiest way to obtain the Audience Display installer (if the Audience Display Application is not already installed on the computer) is to:
 1. Ensure the remote Audience Display is on the FMS Network
 2. Open a web browser (Chrome Preferred) to the following address:
 - <http://10.0.100.5/FRCDownloads>
 - This will open a browser page to select the available applications to download.
 3. Select the Audience Display application to download.
 4. Install the Audience Display application on the local computer.

Scorekeeper Reference

4. Run a Test Match and 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. **[NEW FOR 2019]** 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. **[NEW FOR 2019]** Print a copy of the Award Eligibility Report for the judges. This report can actually be printed at any time AFTER the schedule has been created, but it must be printed for the judges. The judges will come by the scoring table, and having it printed out ahead of time is a great way to say "thank you in advance for providing me a copy of the awards!"
8. 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 Qual match in the schedule before prestarting the first match. It's not that we don't trust you, but only Santa knows if you're being naughty or nice.
11. Once all robots link to the field, the Rocket Nosecones will 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.
 - Also note that the Referee input status will also affect the Stack Light; it will illuminate the amber LED if any of the referee panels have not yet submitted "pre-match conditions."
12. **End of Qualification Day 1**
 1. Use the "Settings" button, "Backup Config" tab, "Force Event Backup" button to ensure the event database is backed up.
 2. For three-day Regional events only, input Friday Award winners in the Event Wizard. To assign the award, click on the award and click "Assign Award" and complete the pop-up box. Once all awards are announced and entered, click the "Post" checkbox on each one modified and click "Upload Award Assignments" ONLY AWARDS WITH A CHECK MARK WILL BE POSTED ONLINE. Uploading will immediately post the awards to the web API, though there's a 10 minute cache on the website.
 1. During the Awards Ceremony, put the field lights into "Awards Mode."
 2. 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. If powered, put the field lights into "Night Mode."
13. **End of Qualifications (to Alliance Selection)**
 1. Use the "Settings" button, "Backup Config" tab, "Force Event Backup" button to ensure the event database is backed up.

Scorekeeper Reference

2. Print the Qualifications Ranking report for the Announcer as soon as the final qualification match has completed.
3. Use the Alliance Selection (Step 12) in the Event Wizard to set alliances as they are picked. Use the video switcher at the bottom of the screen to select between the "Alliance" and "Available Teams" audience screens during the Alliance Selection ceremony. Try not to roll your eyes too loudly when someone "graciously accepts."
4. Immediately following Alliance Selection process, the playoff schedule must be built VERY QUICKLY so that the Backup Robots report and Playoff Coupon report can be printed out. 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) and the Playoff Coupon report should be cut up along dotted lines so that the teams will have Timeout and Backup coupons.
 - Build the Playoff Schedule (Event Wizard Step 13). All that needs to be known is the time which Playoff matches will begin, and the number of matches in playoffs is always 21. Matchmaker is not used in Playoff Match Generation.
 - Activate the Playoff Match Schedule (Event Wizard Step 14).
5. Print Backup Robots Report, Playoff Schedules, Backup and Timeout coupons, and initial Announcer reports (only the pages that pertain to the Quarterfinals).
6. Before you leave for lunch, use the video switcher to either display the Quarterfinal bracket or use the Messages tab to put a lunch message (using the Background view).

Scorekeeper Reference

Playoffs (Day 3)

Determine the event champions

Playoffs

For 2019, Playoffs are best-of-3 matchups in three phases: Quarterfinals, Semifinals, and Finals. Each phase will play according to the bracket designed for each. After each phase new schedules (for queue staff) and Announcer report (only those pages pertaining to the next phase of competition) should be printed. Only print the report if the announcer needs it!

1. Announcer Reports (pertaining to the specific matches) should be printed at the beginning of each phase.
2. Limited numbers of schedules should be reprinted for queue staff and essential personnel at the beginning of each phase.
3. Bracket Reports should be printed for the Head Referee and Game Announcer at the beginning of each phase.
4. Field Timeouts should be performed (using the Timeout button) in the following instances:
 - Immediately Preceding Back-to-Back matches due to Tiebreaker Matches (all finals and overtime matches are back-to-back, and thus they all have field timeouts)
 - Immediately Preceding any Finals matches

Stay calm, stay hydrated, enjoy the matches, don't get caught up in the hype. Remember, you're not a Referee. Let them do the heavy lifting, only support their actions, don't try to direct them.

Scorekeeper Reference

Awards

Reward teams for their season of effort

Awards

[NEW IN 2019] Whether you're attending a DISTRICT or a REGIONAL event, the process is now the exact same!

1. **[NEW IN 2019]** Work with your Event Manager, Head Judge Advisor, and/or Emcee to get a copy of the awards before they are announced on the field during the Awards Ceremony. ALL awards are double-checked against eligibility criteria, which requires all awards to be entered into FMS prior to the Awards ceremony.
2. Enter awards in the event wizard, being careful to prevent wandering eyes from accessing the awards. Confidentiality is CRUCIAL in this step, but so is accuracy. MAKE SURE that you pay attention to all warning boxes, double-check the spelling of all names, and verify everything twice! **DO NOT post the awards nor submit them** - awards that are submitted are immediately posted online and are available via the FIRST API and online.
3. **[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.
 - In the Reports area, generate the Wildcards Script via the "Wildcards Script" under "Other Event Reports" and print it out. Hand this to the Emcee with our regards.
4. **[ALL EVENTS]** Once ALL awards are complete, select the POST boxes next to each award and click "Upload Award Assignments."

Scorekeeper Reference

Archive and Upload

Tell HQ you're done!

Finish Event

This is the very last step you should perform on the server, and it's the one step your HQ support person has probably been dying for you to do for the last half hour. Before doing this ensure your Awards are completed, and contact your HQ support person and ask if there's any other tasks to perform before completing the final Event Upload using the Event Wizard. Once you complete the upload step, it's a pain to go back and do anything else as this completes and closes out the event.

1. If, and only if, the support person gives you the go-ahead, perform the "Upload Event Data" step by clicking the button.
2. ***Hold on when it says it's done!!*** The HQ 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 don't run away and leave.
3. Once they're done, and have verified that everything is good, you can close all applications and log off and shut down the Scorpion server.
4. Assist with Field Pack-out, if possible.

Thank YOU!

THANK YOU AGAIN FOR VOLUNTEERING YOUR TIME WITH US!

FMS WHITEPAPER

FMS Whitepaper

Table of Contents

FMS Whitepaper.....	3
FMS Whitepaper.....	4

FMS Whitepaper

FMS Whitepaper

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.

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.

FMS Whitepaper

The Field Network

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 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.

FMS Whitepaper

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.

FMS Whitepaper

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.

FMS Whitepaper

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

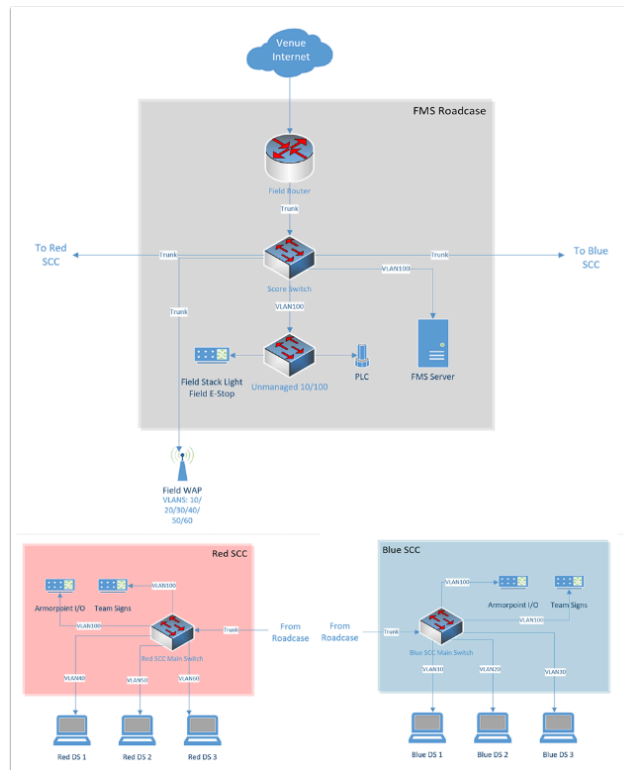
Additional devices may be introduced to the Field Network at the FTA's discretion, such as a tablet or mobile device used by the FTA to view diagnostic information, logs, etc. while on the field prior to the start of a match. This is commonly used to monitor a robot's connection state, and is often used 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.

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.

FMS Whitepaper



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 team's 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.

FMS Whitepaper

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.

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).

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

FMS Whitepaper

- 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.

Logging and Data Collection

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)

FMS Whitepaper

- 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

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

Field Status Indicators

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.

FMS Whitepaper

	Alliance Color	Amber Color
Flashing	No connection to robot or station bypassed	N/A
Solid	Robot Enabled	Estop pressed/enabled
Off	Connection Established to Robot	Estop not pressed/disabled

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
Flashing	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 running/ 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

FMS Whitepaper

The Match Play Process

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.

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.

FMS Whitepaper

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.

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://usfirst.collab.net/sf/projects/first_community_developers/) and is available to users who request access.

The data model is year specific, due to game scoring breakdowns being available.