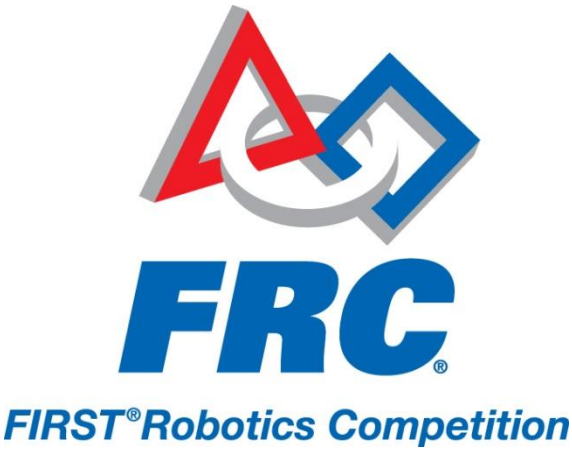


Field Management System User's Guide

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.

Table of Contents

Table of Figures

1 Overview

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

2 Definitions

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

FRC – *FIRST* Robotics Competition
FMS – Field Management System
SCC – Station Control Cabinet
DS – Driver Station, used by the teams to interface control devices to their robots.
Classmate – the netbook PC included in the Kit of Parts and used as the Driver Station
roboRIO – The main control device on the robot.
Event Server – The computer used to run the Event Manager and Audience software
Pit Display/Pit Laptop – The computer used to display match results and ranking information in the Pit.
PCK Light strings – A string of LED lights made by Philips Color Kinetics (PCK). One light string is installed in each Player Station.
DMX - a standard for digital communication networks that are commonly used to control stage lighting and effects.

3 Audience Display Screens

There are a number of available audience screens built into the FMS. Figure 1 to Figure 9 show all the options as well as a summary of each. There are some assumptions made within the Audience Display program: a typical FRC event has the scoring table on the opposite side of the playing field from the audience. In this case, the large projection screen is displayed above and behind the scoring table. As a result, the program is designed from the audience's point of view, i.e. with the Red Alliance to the left and the Blue Alliance to the right. This is the opposite view from the scoring table. This is hard-coded into the audience program, and should be taken into consideration when determining the layout for the venue.

The Audience Screen program must be running in order to hear game sounds.

Figure 1: Audience Display - Video Only

The Video Only audience screen shown in Figure 1 is used when it is desirable to overlay no scoring, time, or match information on the audience screen. Use the configuration screen (Figure 10) to select the appropriate color to use for Chroma-keying.

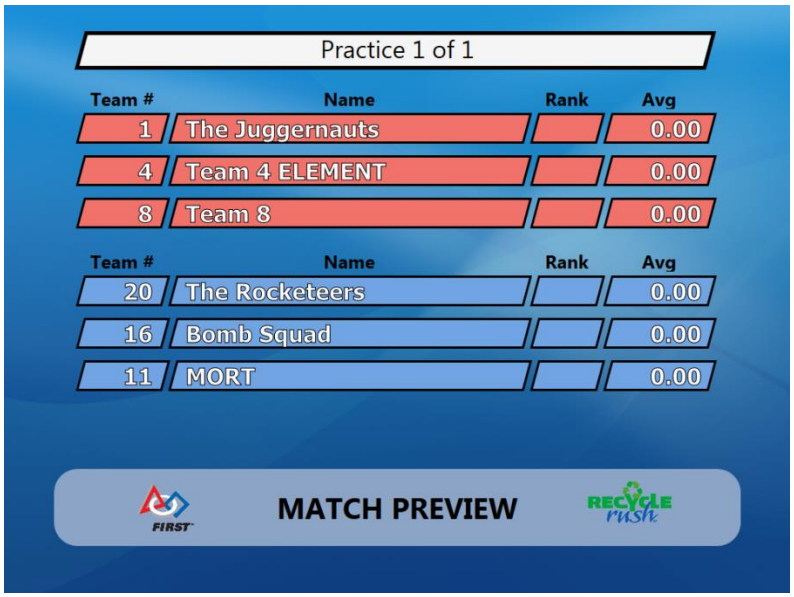


Figure 2: Audience Display - Match Preview

Figure 2: Audience Display - Match Previewshows the Match Preview screen, which displays team names and rankings for the teams scheduled to compete in the next match. The Match Preview is optional (and will always show "Yellow" in the FCUI bar) and unavailable once the "Set Audience Screen" button has been pressed.

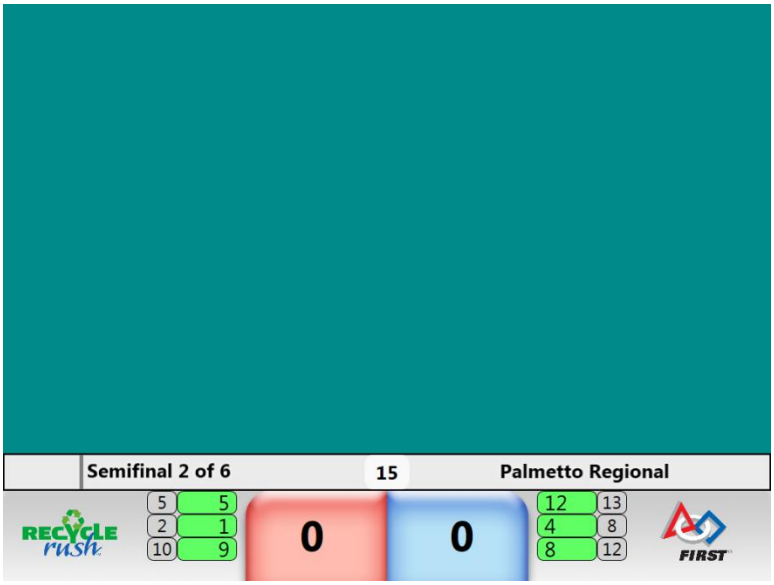


Figure 3: Audience Display - Score and Time

Figure 3 shows the audience display most typically used at an FRC competition. Event Name, Match time, Score, and Match number information is overlaid on the live video feed of the match. If the Event Name is too long for the space provided, it will horizontally scroll to the right of the timer indicator. Use the configuration screen to select the background color for Chroma-keying.

Figure 4: Audience Display - Bracket

The Playoff Bracket screen is shown in Figure 4, but is not in use for the 2015 season. This screen is used during the Playoff Tournament to indicate leaderboard standings of all teams. It is useful to show the audience when a team advances from one level of the tournament to the next (e.g. Quarterfinals to Semifinals).

Figure 5: Audience Display – Background

Figure 5 shows the Background screen with the *FIRST* RECYCLE RUSH logo. This screen is useful during breaks, such as lunch. It can be used in conjunction with the Message tab on the Match Play screen to post a message for all to see.

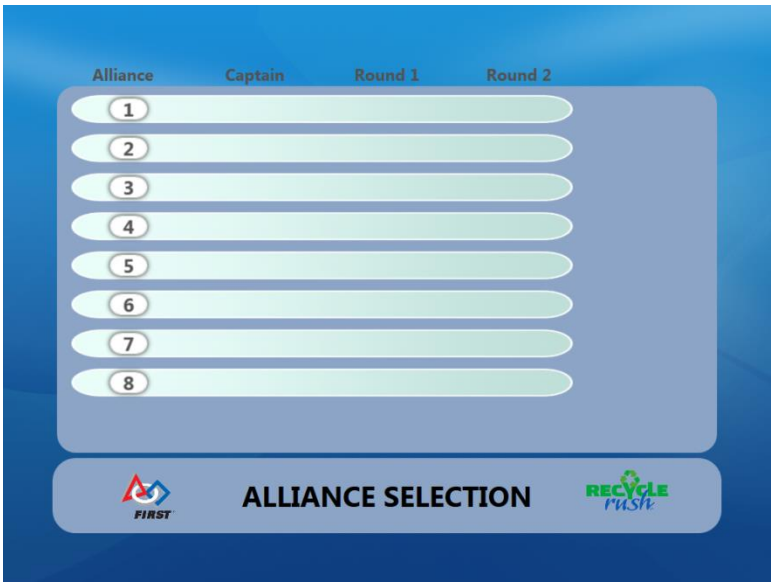


Figure 6: Audience Display - Alliance Selection for the Playoff Tournament

Figure 6 is used only during the Alliance Selection process and displays the Captain, first, and second picks.

Figure 7: Audience Display - Available Teams during Alliance Selection

The pool of teams not yet selected during Alliance Selection is show in Figure 7. Each team is listed in order of Rank.

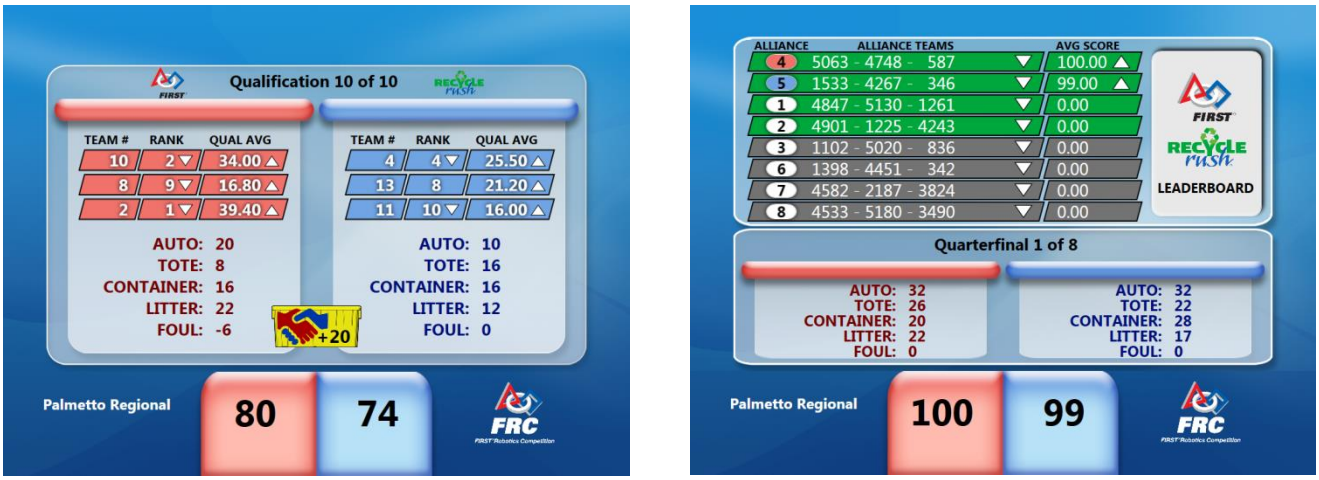


Figure 8: Audience Display - Sample Match Results (Left = Practice & Qualification, Right = Playoff Leaderboard)

Figure 8 is used to display match results to the audience. It is accompanied by a short audio clip prior to being displayed. There are 5 different variations of Match Results screens – Qualification, Quarterfinal, Semifinal, Final, and Practice/Match Test. Qualification and Practice/Match Test are similar, and the three playoff screens (Quarterfinals, Semifinals, and Finals) screens are similar, with minor variations between them.

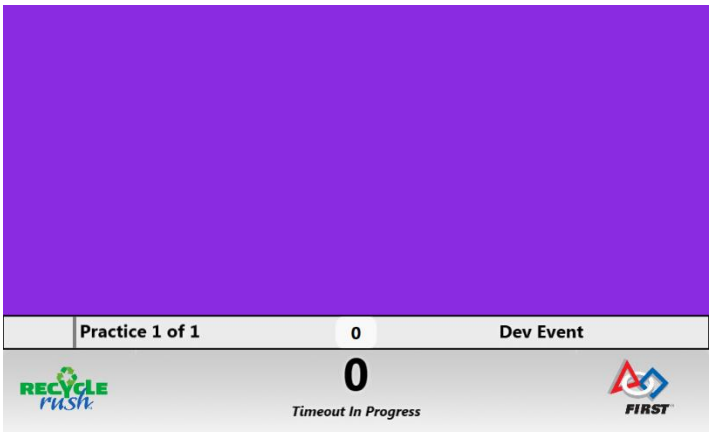


Figure 9: Audience Display - Timeout

Figure 9, the Timeout screen, is used during the Playoff matches when a timeout is called. It displays the name of the event, the current match number and the remaining time.

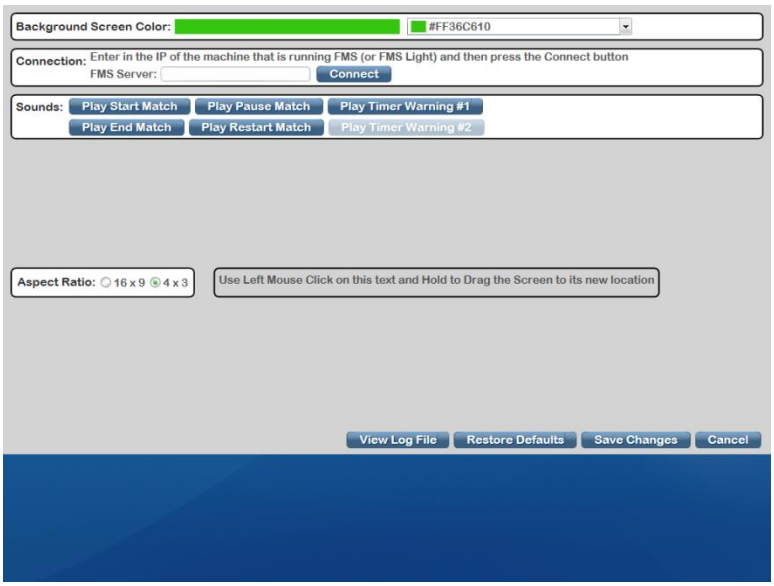
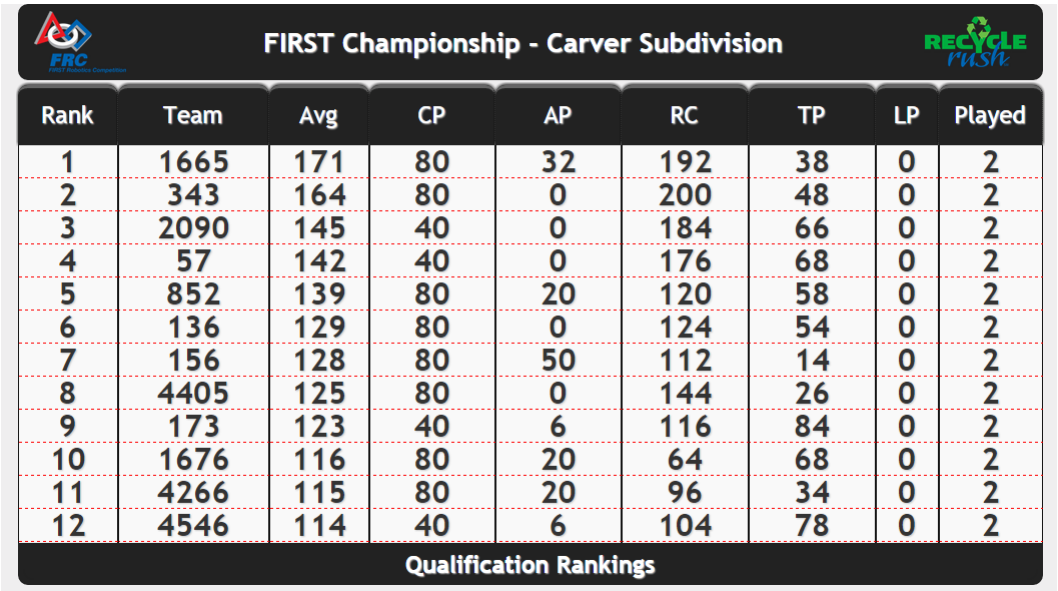


Figure 10: Audience Display - Configuring the Audience Screen

Figure 10 shows the configuration screen for the Audience display. **Enter this screen by pressing CTRL-SHIFT-F12**. Choose the screen aspect ratio, background color for Chroma-keying, and test the sounds used during the matches. The Connections area is ONLY used if the Audience Display is running on a remote machine than the server machine (this will NOT be typical) – this area is used to indicate the location of the Event Manager Program by IP, the default value is 10.0.100.5. **Please note that running the Audience Display on a remote machine (via IP address) is not currently supported**. Left-click and hold the button in the center of the screen to move the frame. To close the Audience Display, make sure to click the Audience Display with the mouse (to set as active) and then press Alt-F4.

4 Pit Display

The Pit Display is used to show ranking, and results information to teams in the Pit. Figure 11 below gives an example of the Pit Display.



FIRST Championship - Carver Subdivision

Rank	Team	Avg	CP	AP	RC	TP	LP	Played
1	1665	171	80	32	192	38	0	2
2	343	164	80	0	200	48	0	2
3	2090	145	40	0	184	66	0	2
4	57	142	40	0	176	68	0	2
5	852	139	80	20	120	58	0	2
6	136	129	80	0	124	54	0	2
7	156	128	80	50	112	14	0	2
8	4405	125	80	0	144	26	0	2
9	173	123	40	6	116	84	0	2
10	1676	116	80	20	64	68	0	2
11	4266	115	80	20	96	34	0	2
12	4546	114	40	6	104	78	0	2

Qualification Rankings

Figure 11: Pit Display

Across the bottom of the display are indicators of the last match played on the field and the time difference between that Published schedule and the actual times that matches are played. 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:

- Avg – Average Score over all matches played
- CP – Cumulative Sum of Coopertition Points
- AP – Cumulative Sum of Autonomous points
- RC – Cumulative sum of Recycling Container points
- TP – Cumulative sum of Teleop points
- LP – Cumulative sum of Litter points
- Played – Number of played matches. Any match that a team plays as a Surrogate does not count towards the total in the Played column.

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

5 Event Management

Figure 12 shows a screenshot of the Event Manager interface when opened for the first time. The different tools are accessed via the buttons 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, database backups, 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 FMS Off-Season version).
- *Reports* – generating printable reports such as match schedules, team lists, or printouts for Announcers are all handled through this interface.
- *About* – shows the current software version number and any applicable release notes.

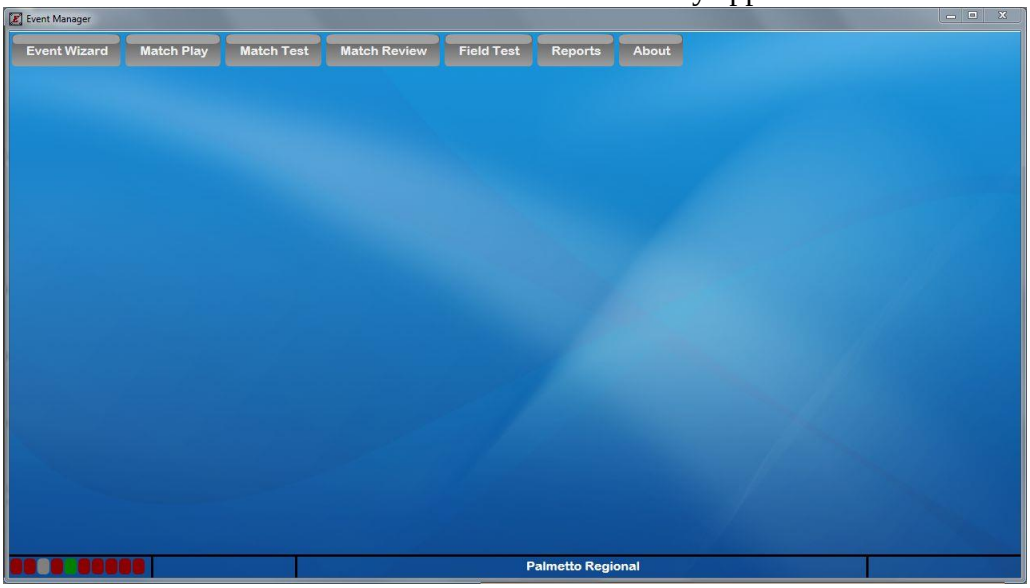


Figure 12: FMS - Event Management Main Page

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

Except in the FMS Off-Season version, the lower left hand corner tells the connection state of the field elements, from left to right the indicators are:

- Red SCC
- Blue SCC
- Spare SCC
- Arena Status Light (the tower light which sits on the scoring table)
- PLC Heartbeat (flashes at 1Hz)
- Referee screens (Blue Far, Blue Near, Head Ref, Red Far, Red Near)

5.1 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. In FMS Off-Season, the Field Test screen is not accessible.

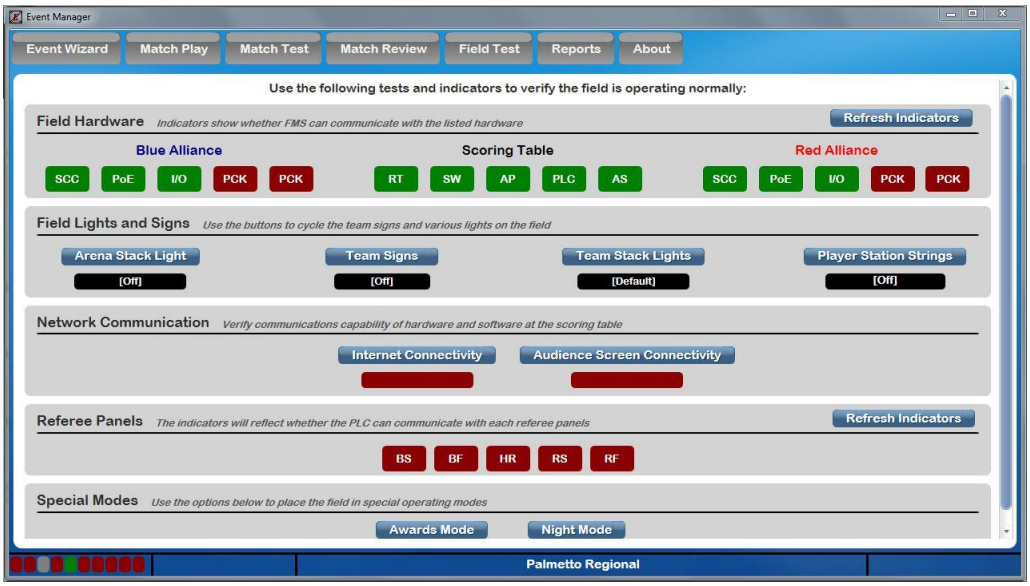


Figure 13: Field Test Interface

- *Field Hardware* – 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 this indicators.
- *Field Lights and Signs* – this panel is used to test the LED panels, the Stack Lights, and the LED light strings.
    - Arena Stack Light – this tests each light in the stack at the Scoring Table
    - Team Signs – 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 "2015"
    - 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 Estop is pressed*
    - Player Station Strings – turns on the LED light strings in the Player Stations to match the Alliance colors.
- *Network Communication*
    - *Internet* – confirm an active connection to the Internet.

    - *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*
- *Referee Panels* – this panel show the connection to each of the Referee touchscreens. A successful connection is shown via a green indicator.
- *Special Modes*
    - Awards Mode – LED strings a turned on to match Alliance color, LED signs display the year.
    - Night Mode – turns off all LED strings

5.2 Match Play

The Match Play environment is the tool that is open most often during an FRC event. The Match Play screen is used to start and stop matches, disable robots, and control the audience screen displays.

Figure 14 shows the standard Match Play interface. The top part of the screen shows the current match number, match time, and score for the alliances. Match time is updated in real time and will correspond with the same information shown on the LED Displays.

Figure 14: Match Play with active Schedule

The center of the screen indicates the status of the robots at each end of the playing field; this information 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.

Team numbers are automatically populated based on the schedule, but can be manually changed during the Practice Tournament to handle the situation where a scheduled team does not show but another team wishes to take their place (i.e the Filler Line).

The information for each Alliance is broken down into three groups, FMS, Team, and Robot.

- FMS – controls to inform FMS which robot in the indicated station position and how to handle it.
  - Byp – Select this box to bypass this particular station and force it to an enable state.
  - DQ: – Select this box to indicate that the corresponding team has been DQ'd for this match.
  - Card State:
    - Green = no card, team in good standing
    - Yellow – This team has been assigned a yellow card.
    - Red – team assigned a red card. 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.

- Estop – used to Estop the robot during the match
- 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.
- 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.
  - Left bubble – Indicates status of the FMS-to-DS link. If the team number and DS match, this bubble with be green.
  - 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 indicated in which Player Station the E-stop(s) are down.
- Robot – indicates the state of the Robot.
  - 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.
  - Right bubble – 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.

5.2.1 Bypass vs. DQ vs. Red Card

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.

5.2.3 Match Control

Match Control is handled using the buttons in the center of the Match Play and Match Test screens.

Figure 15: Match Control

The buttons are designed to progress from left to right throughout the Match. Details on each button are given below.

- *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*
- *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
    - *Match Cancel* – use this same button to cancel a match in progress.
- *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 6 teams in the match.

5.2.4 Match Tabs

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

- *Schedule*: displays the currently active schedule (Figure 14)
- *Video Switch*: manual interface used to control the Audience Screen (Figure 16).
- *Message*: Shown in Figure 17. This tab is used to display messages on the Background Audience Screen
- *Options*: Shown in Figure 18. This screen is used to program the default time (in seconds) for the Autonomous and Teleop periods as well as having the ability to force the field reset lights to green, recalculate the rankings and force FMS to complete a full backup to the USB backup location.

- *Score*: Figure 19. This screen displays the counts for various scoring elements as they are entered by referees or collected from automated scoring components on the field.
- *Status*: Figure 20. This is a detailed screen which displays information on all the robots current on the playing field.

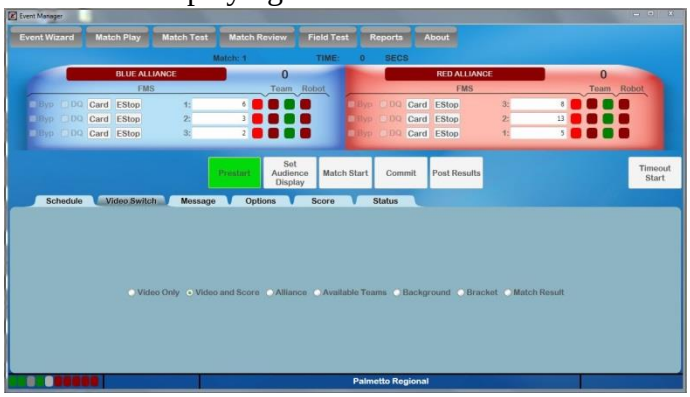


Figure 16: Match Play showing Video Switch

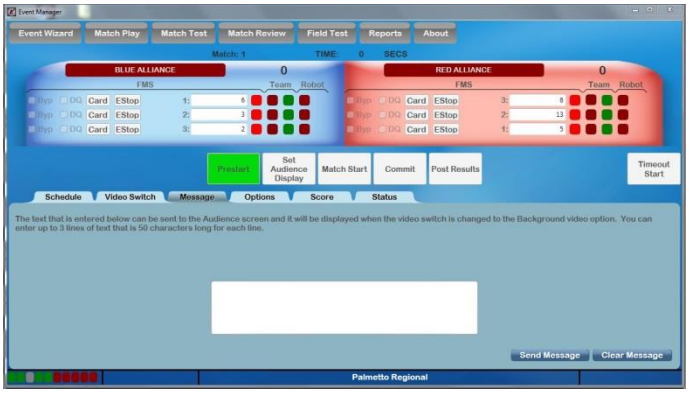


Figure 17: Match Play showing Message tab

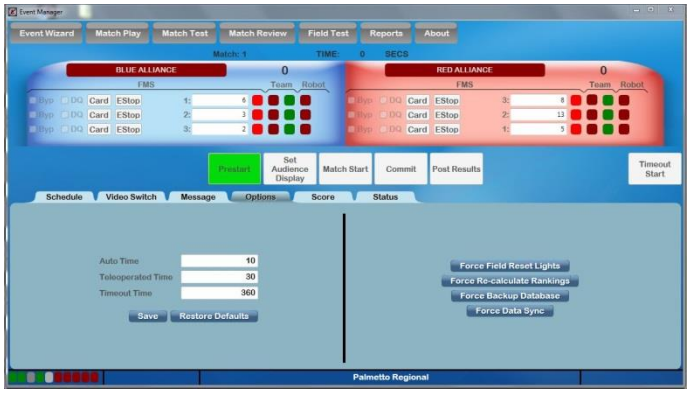


Figure 18: Match Play showing Options tab

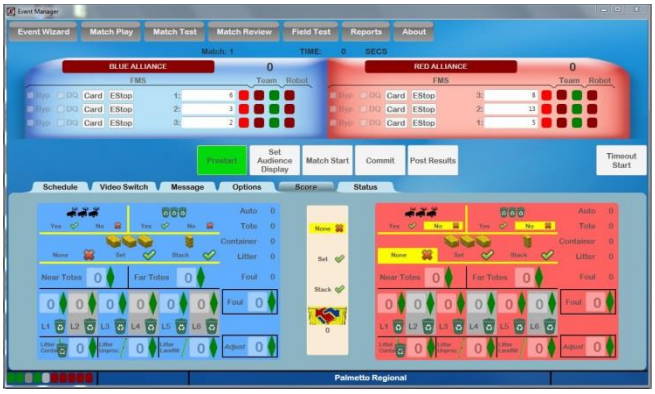


Figure 19: Match Play showing Score tab

Figure 20: Match Play showing Status Tab

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). The information for each team is:

- Station and Team number
- DS-ETH: Indicates if a DS is physically connected to the switch at the SCC
- DS: DS is in FMS mode (i.e. connected to FMS) when a green circle is shown.
- BWU: Indicates the Bandwidth Utilization/Consumption for that particular team
- 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
- Enabled/Mode: 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.
- 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.

5.2.5 Scoring/Score Tab

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.

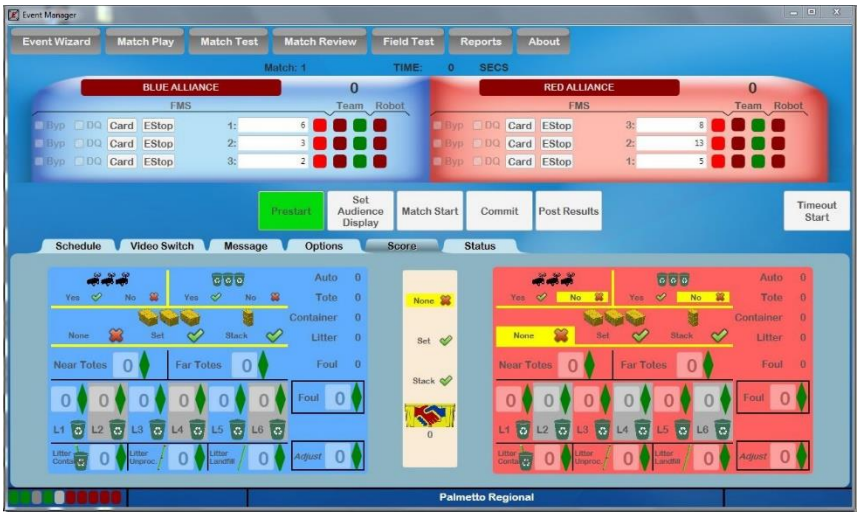


Figure 21: Score Tab showing Autonomous Scores

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, as values during the match come from the Referees. In FMS Off-Season, values are editable during the match as there are no Referee panels to enter real time scores.

5.2.6 Audience Screen Control

Located on the Video Switch tab are the options to select what is displayed on the Audience Screen. Select the corresponding box to display the various options. See Audience Display Screens for more details on each option.

The Bracket button is not used in 2015.

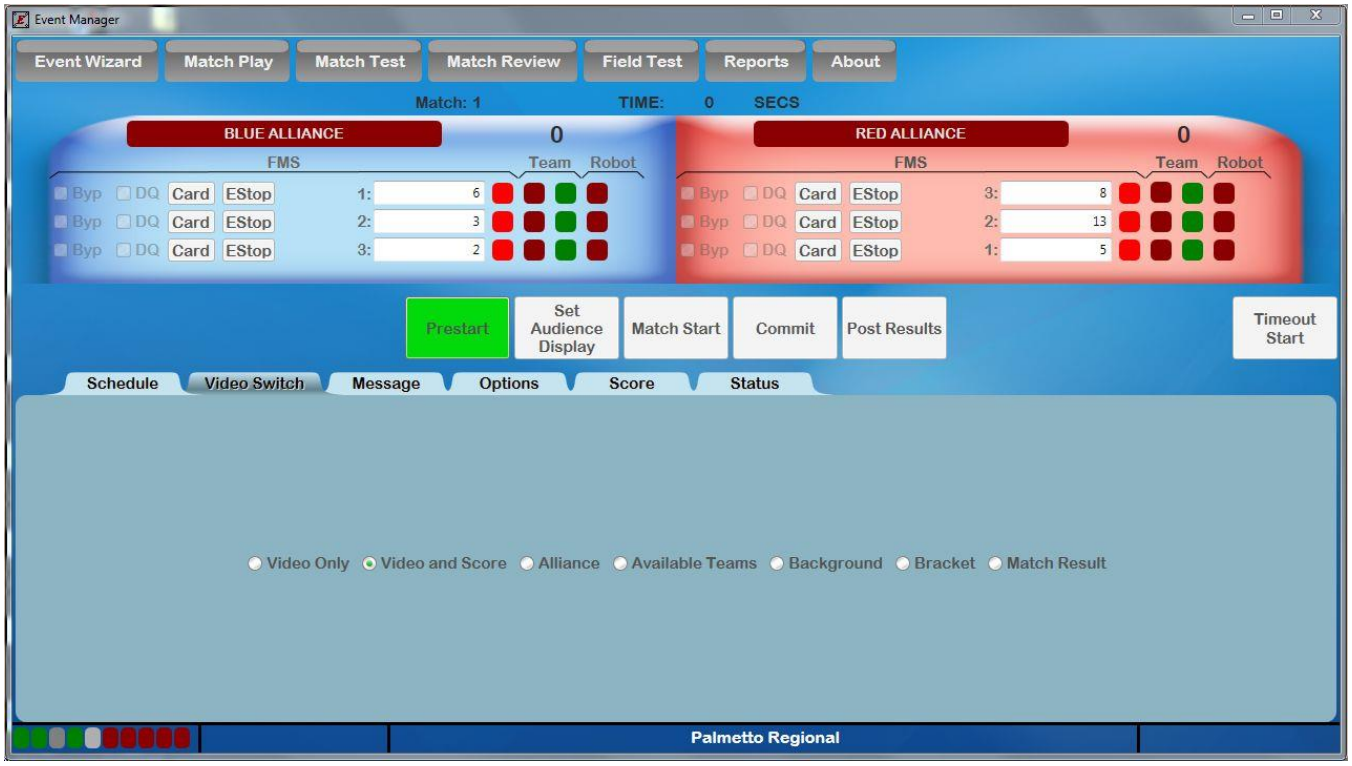


Figure 22: Audience Screen Control

5.3 Match Review

The Match Review interface (Figure 23) 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 are calculated correctly.

Figure 23: Match Review Interface

Only completed matches are displayed, un-played matches are not visible in match review.

Figure 24: Edit Match

Match Review 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 dropdown to the right of the team number indicates if that team received a Yellow or Red Card during the match.

If editing is necessary, simply select the box and change the value. The score will be immediately recalculated on save. Changes made in Match Review take effect immediately once they are saved. 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 on the "View Log" button below each team number opens a viewer which gives details on the connectivity 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. Figure 25 shows a sample of this viewer.

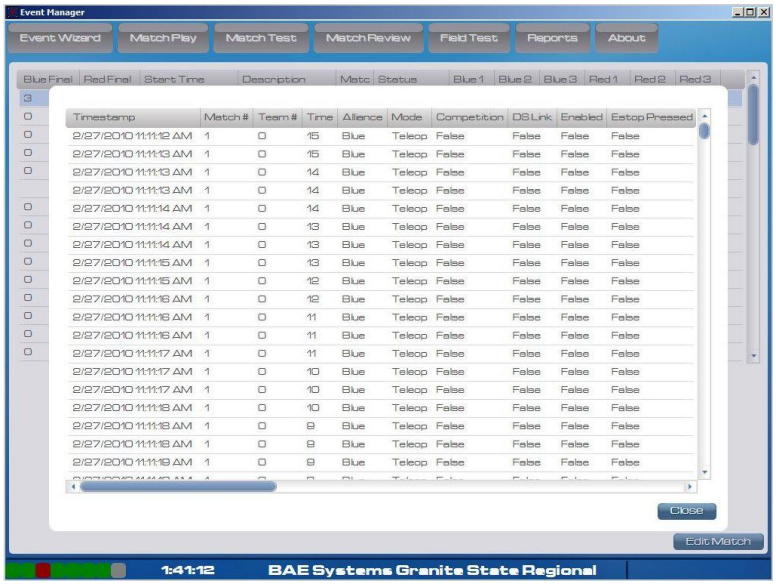


Figure 25: Match Review - Individual Team Match Log

5.4 Match Test

The Match Test screen is shown in Figure 26, its 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.

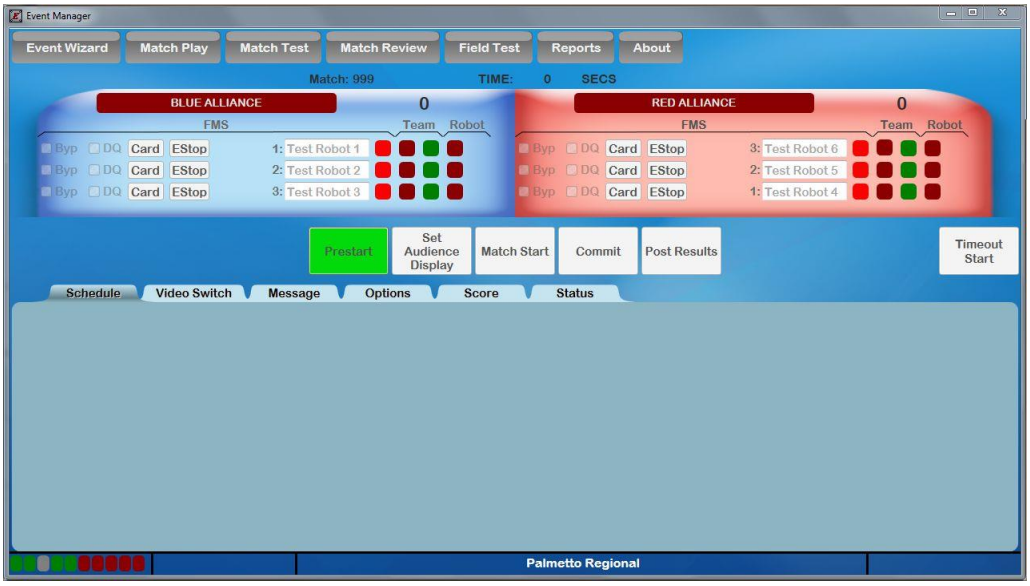


Figure 26: Match Test Interface

5.5 Reports

The Reports screen is used to generate printable reports needed throughout the tournament. The available reports are shown in Figure 27. 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 Adobe Acrobat file formats.

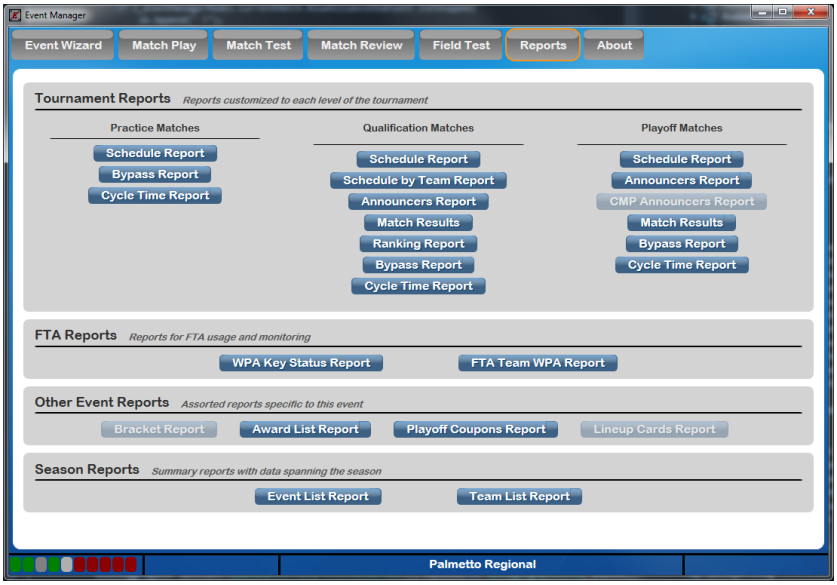


Figure 27: Report Interface

Figure 28: Awards Report Example

Tournament 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
  - *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
  - *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
- Playoff Matches
  - *Schedule*: Current active match schedule
  - *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
  - *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

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
- *WPA Test Pit Sings Report*: Generates one page per team that has not yet connected to the field, to place in the team's pit or distribute as reminders

Other Event Reports:

- *Bracket*: not used in 2015
- *Competing Teams List Report*: Same as the Season Team List, but filtered to only the teams competing at the currently selected event
- *Awards List*: A list of the awards to be given out at the event. The winners are included if they have been assigned.
- *Playoff Coupons*: Timeout and Backup coupons for Playoffs (includes Team numbers)
- *Lineup Cards*: Lineup sheets for events using the "4 team alliances" playoff style

Season Reports:

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

5.5.1 Exporting Reports as PDFs or Excel Spreadsheet

As an example, the Judge Advisor may come to the Scoring Table and ask for the *Match Schedule Report in Excel format*. This can easily be done by selecting the disc icon at the top of the screen and select Excel. It is also possible to export all reports in Word or PDF format.

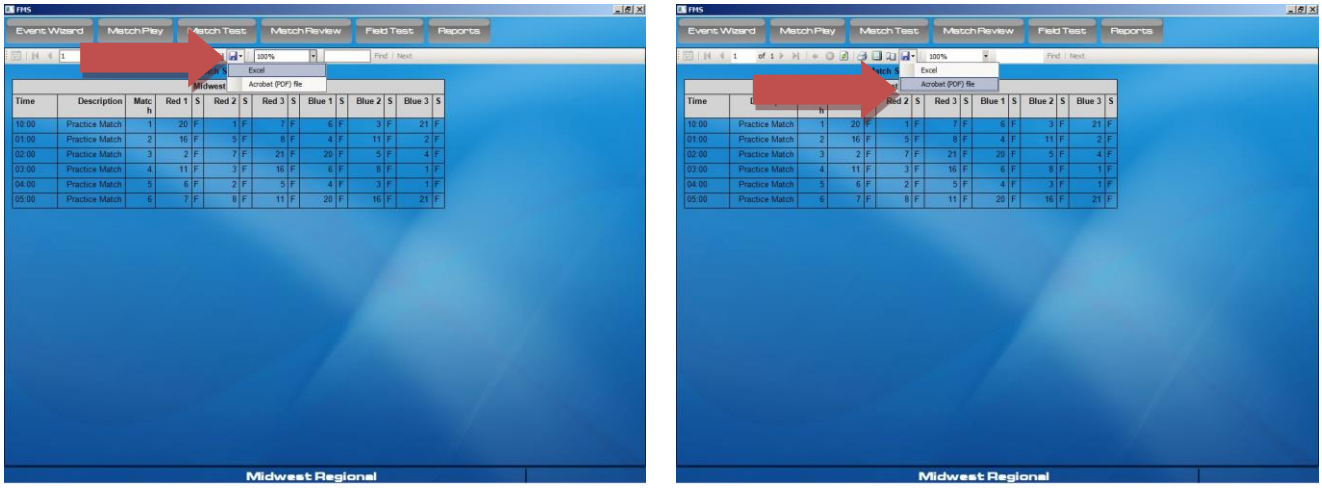


Figure 29: Exporting Reports

5.6 Event Wizard

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 can then return to the Event Wizard to configure the next part of the tournament. This process continues until the user completes the entire wizard.

Each screen of the Event Wizard is shown in this section along with a detailed description of the functionality found on each page.

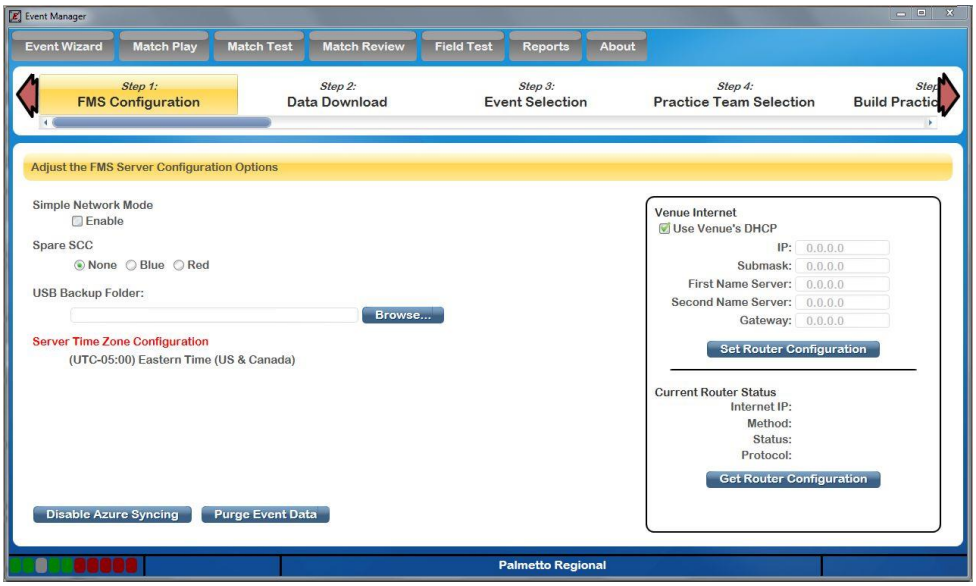


Figure 30: Event Wizard - Step 1 - Network Setup

The first page of the Event Wizard is shown in Figure 30. On this page the user is asked to configure how the FMS server. Several options are available on the left hand column of the page:

- *Simple Network Mode* – special mode for use on fields that are setup with the full FMS electronics, but need portions of the field network disabled
- *Spare SCC* – Indicate if the Spare Station Control Cabinet (SCC) is being used, and if so, on which end of the playing field it is located
- *USB Backup Folder* – In addition to storing the database backups on the Event Server hard drive, FMS can optionally backup to an external USB drive. Indicate the folder location here if using this feature. **IT IS HIGHLY RECOMMENED THAT AN EXTERNAL BACKUP LOCATION BE USED.** A location must be set before a full backup can be made from the Match Test or Match Play screens
- *Field Number* – At events with multiple fields, the field number selection will become active and tell FMS which field it is to behave as

Server Time Zone Configuration is provide to confirm that the time zone set on the server matches the time zone of the event.

Logged in as admin confirms that FMS is currently running with administrative privileges.

- *Disable Azure Syncing* – disable syncing of event data to the *FIRST*'s cloud database (always disabled in FMS Off-Season)
- *Purge Event Data* – erase all information in the database for the selected event (this cannot be undone)

The right hand column of Step 1 includes the details for configuring the Field Router for Internet access. The Field Router can operate with a static IP, or have its IP assigned dynamically via DHCP (default). These options are unavailable in FMS Off-Season.

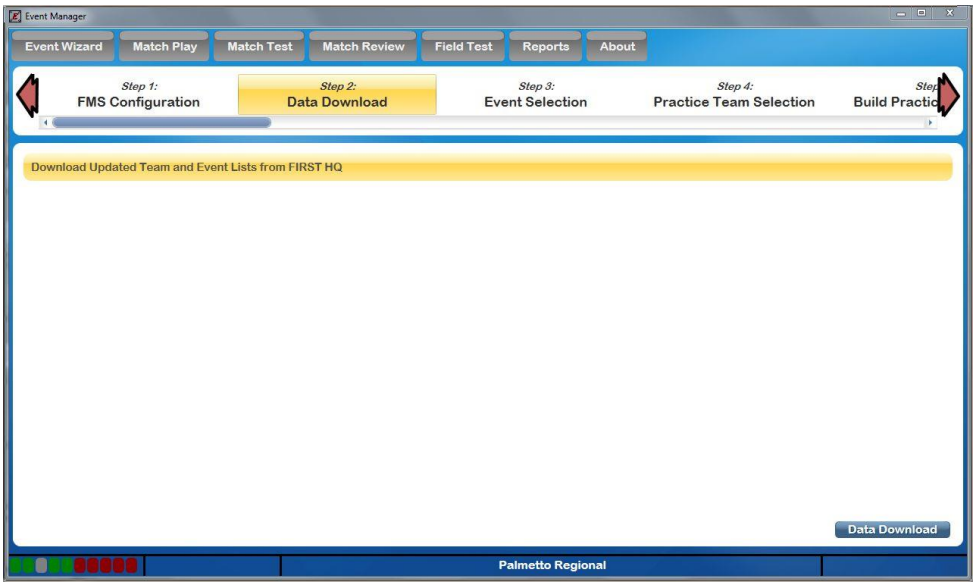


Figure 31: Event Wizard - Step 2 - Event Data Download

Step 2 of the Event Wizard (Figure 31) is used to download the complete event list of all official FRC Events and Teams. In FMS Off-Season, this step does not download anything, as the software installation includes the registered team list.

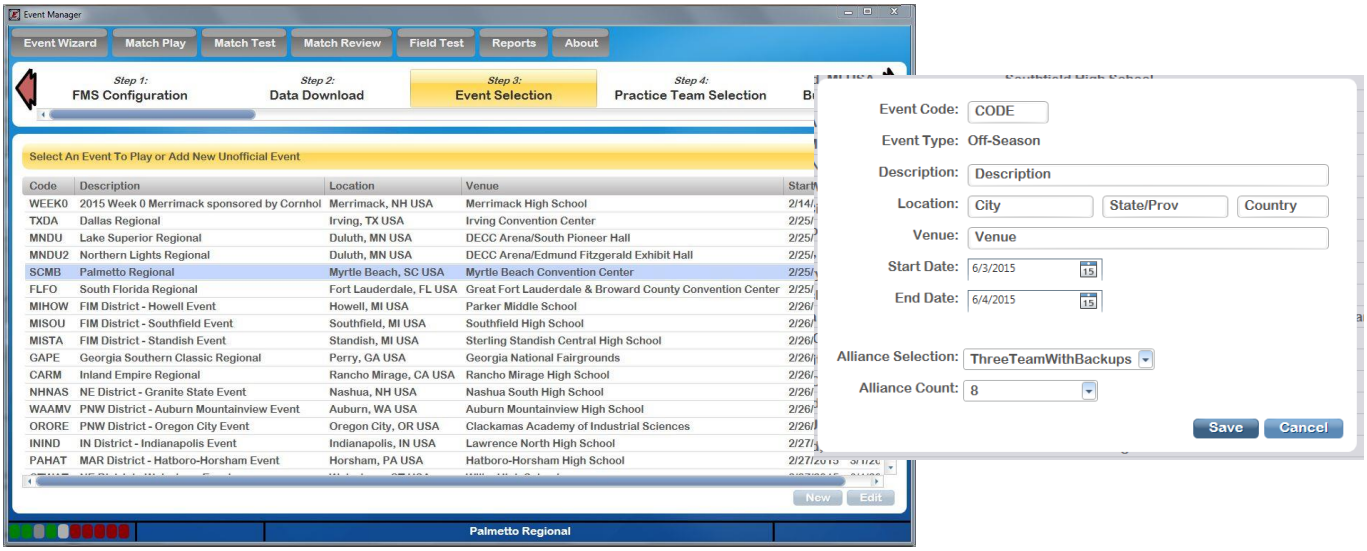


Figure 32: Event Wizard - Step 3 - Event Selection or addition

Step 3 of the Event Wizard (Figure 32 left) displays the complete list of downloaded events from page 2. On this page, the user selects the event they are setting up. In this case, the Palmetto Regional is selected. For FMS Off-Season, clicking "New" will allow the addition of an unofficial event (Figure 32 right). Only events added manually can be edited, those downloaded from FIRST are protected from edits.

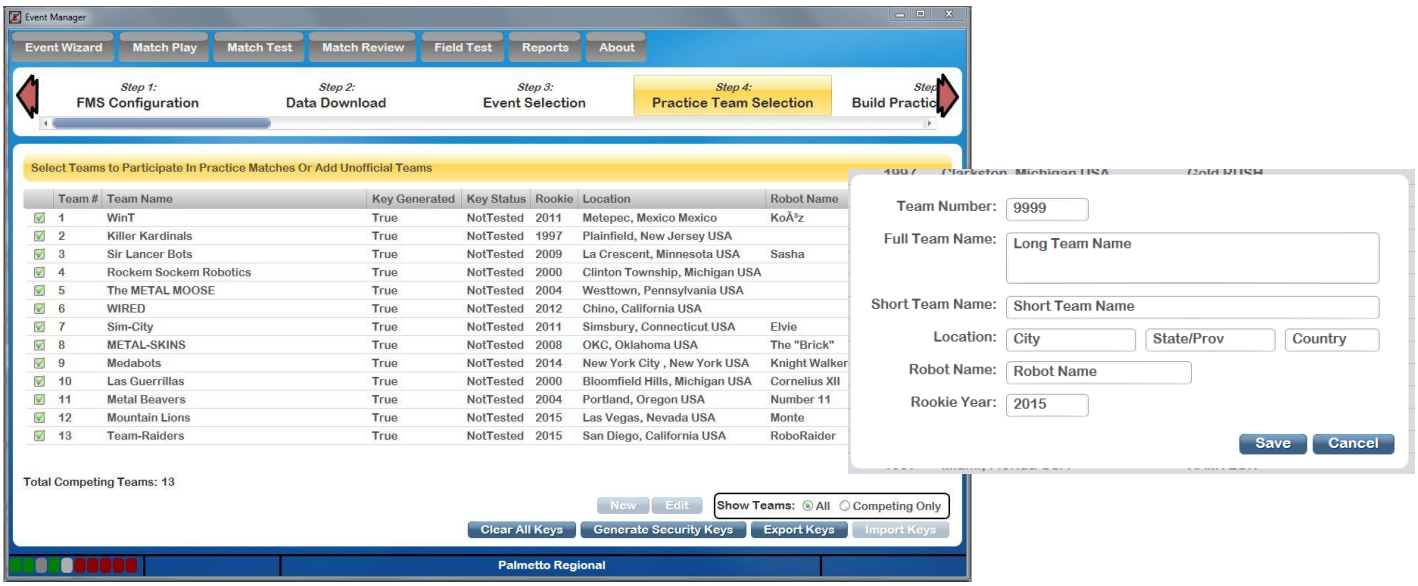


Figure 33: Event Wizard - Step 4 - Verify/Add/Remove Registered teams for event

Step 4 displays the downloaded list of registered FRC teams, with those registered for the event pre-selected. This list should be used to verify all the teams registered are actually present at the venue.

If a team is not displayed in the downloaded team list, but is registered (or for some other reason shows up at the event to participate) it's possible to add this team to the participant list for the event. This is done by selecting the "Show All Teams" button, the screen with change to display the complete list of all registered FRC Teams. From this screen, select the check box next to the team number to add them to the participant list for the event.

Once teams have been selected, click *Generate Security Keys* to define the WPA security keys each team will use to connect with the playing field wireless access point. This is also required in FMS Off-Season, where security keys will are not used.

Select *Export Keys* to save the key file needed to program the keys into the Radio Kiosk used by teams to program their robot radios.

Once network security keys have been distributed to the teams, it is important to not require these codes to be redistributed and reprogrammed. If a team arrives late to the event, or for whatever other reason a new security key is necessary, this can be done by selecting the team, and click *Generate Security Keys*. Teams that already have a key do not receive a new one when the 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, there is no option to generate keys in those steps of the Event Wizard.

Teams can also be added to FMS by selecting the "New" button on the bottom right (see the right side of Figure 33). Only teams added manually can be edited, those downloaded from FIRST are protected from edits.

5.6.1 Practice Tournament Configuration

The Practice Tournament is configured and managed in the next portion of the Event Wizard as seen in Figure 34 through Figure 39. Figure 34 shows the Event Configuration page for the Practice Tournament. This page is used to setup the start and stop times for Practice Day, the lunch period, number of matches per team, and match duration.

Validation errors appear here

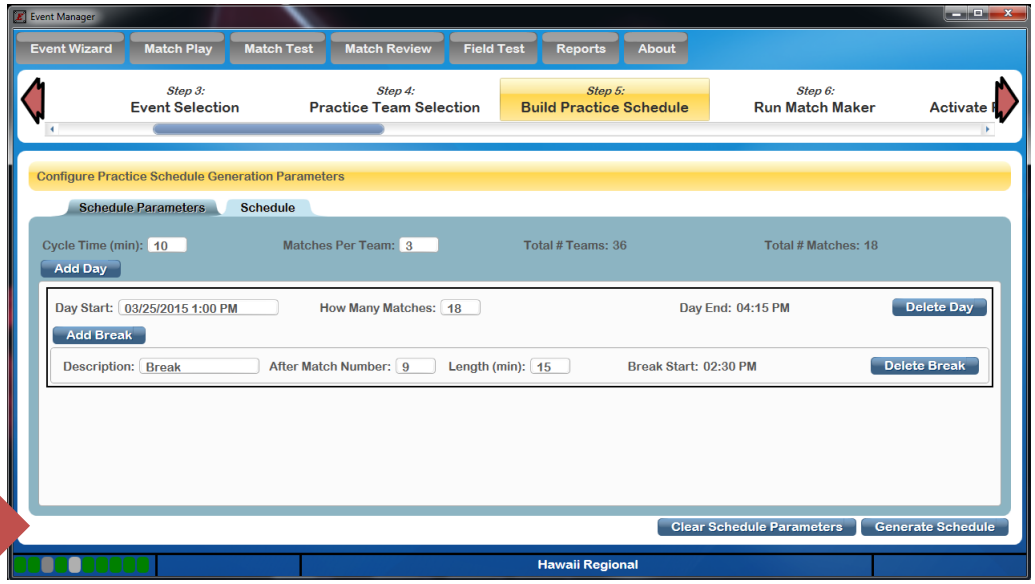


Figure 34: Event Wizard – Step 5 - Configuration of Practice Tournament Schedule

Follow this procedure to define the Practice Schedule Parameters:

1. *Cycle Time (min)*: Amount of time, start to start, between matches
2. *Matches Per Team*: Number of matches each team will play over the course of the entire Practice Tournament
3. Click *Add Day*
    a. Enter the start time and date for the first day of matches.
    b. Enter the number of matches to be played that day.
        i. *Day End* indicates the time the last match will be played given the *Cycle Time*.
    c. Select *Add Break* if there will be any planned breaks between matches during the Practice tournament. In the case of Figure 34, no breaks have been defined.
4. Repeat Step 3 if the Practice Tournament will last over more than one day.

Messages will appear in the area of Figure 34 marked with the red arrow when there are validation errors with the schedule. Whenever there is a validation error, the *Generate Schedule* option will be disabled. Following the validation messages will ensure the schedule is a playable, complete schedule.

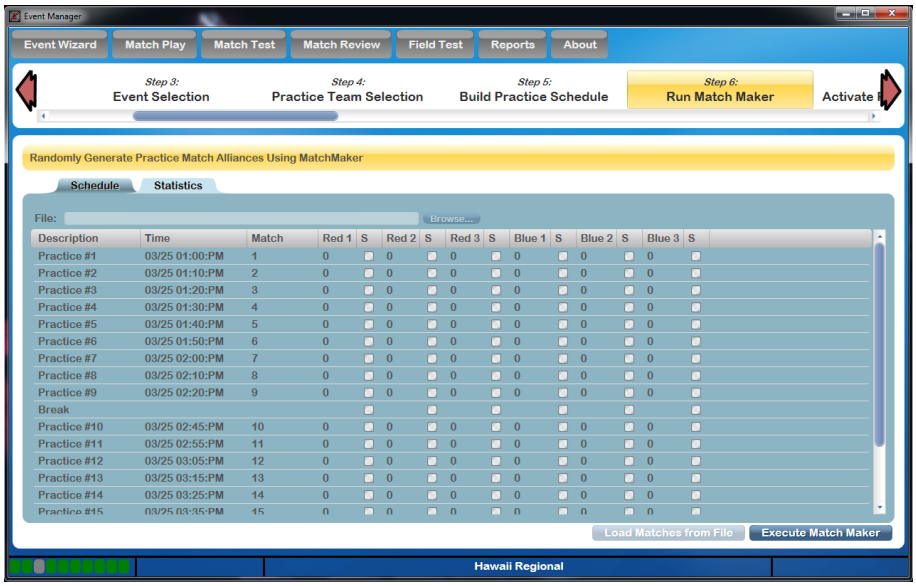


Figure 35: Event Wizard – Step 6 - Practice Schedule

Figure 35 shows a screenshot of the schedule after it's been generated. When reviewing this schedule, confirm that the Cycle Time between matches is correct and that any Breaks are after the correct matches.

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 2-3 minutes ahead**. The timer located in the bottom left of the Event Manager indicates how far behind or ahead matches are relative to the original schedule.

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.

5.6.2 Assigning Practice Alliances with MatchMaker

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. If for some reason it is believed that the schedule is not optimum, select *Generate Schedule* again for a new set of alliances to evaluate. This process should be done with the FTA present.

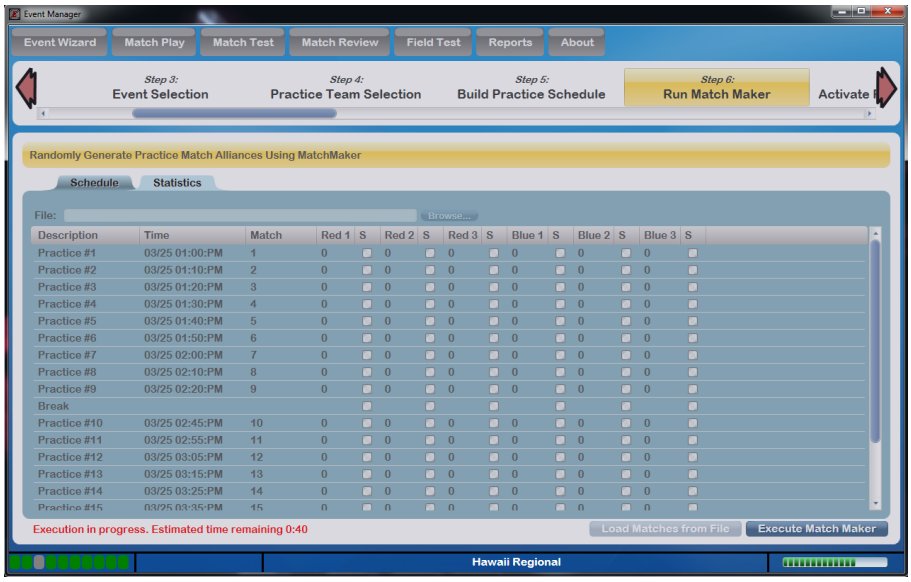


Figure 36: Event Wizard – Step 6 –Match Maker in Progress

To start the process of generating alliance pairing, select the *Execute Match* Maker button. In Figure 36**Error! Reference source not found.**, the Match Maker process is in progress. The text on the lower left will indicate the estimated amount of time remaining until the pairings will be available. The process will take up to 4 minutes for large events.

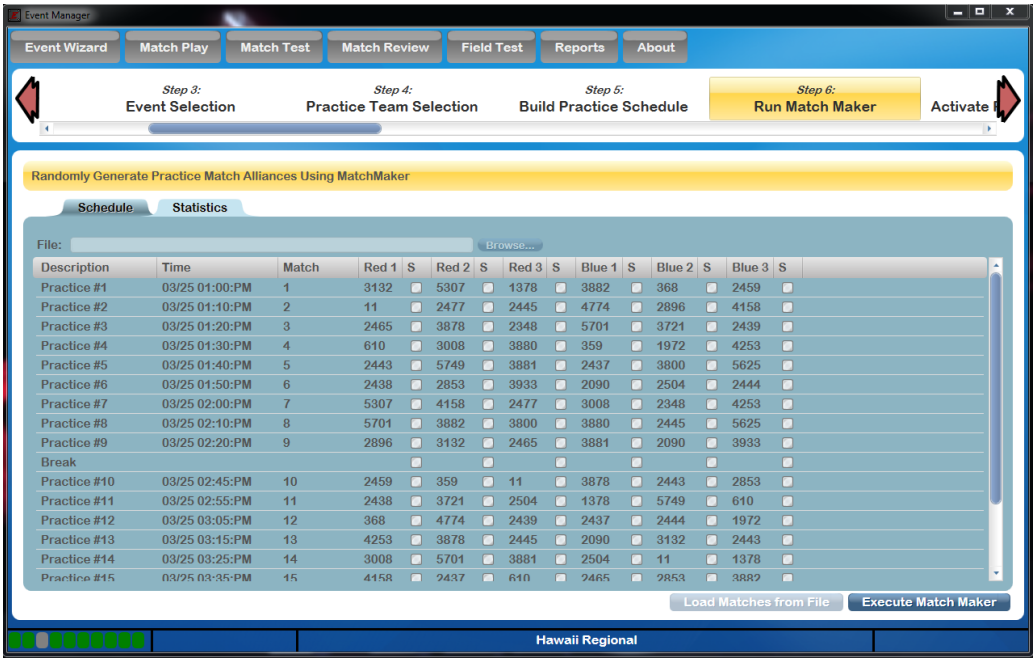


Figure 37: Event Wizard - Step 6 - Practice Tournament Alliances

When the process in 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.

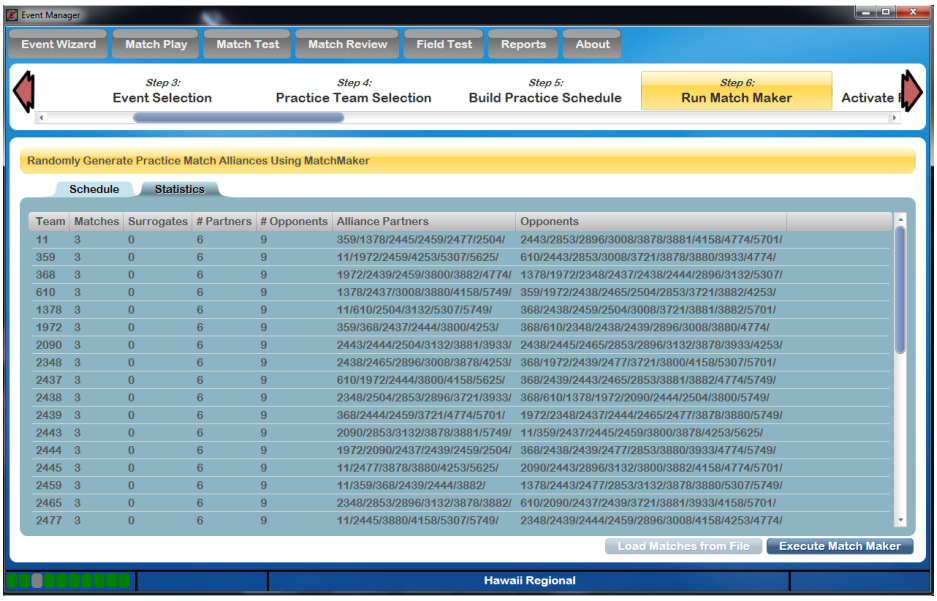


Figure 38: Event Wizard – Step 6 – Practice Schedule Statistics

Figure 38 shows the detailed breakdown of the alliances for the Practice Schedule. A complete discussion of the information on this screen is available in Section 5.6.5

5.6.3 Activating the Practice Match Schedule

After the match schedule has been generated and alliances defined, it must be activated in order to play Matches, as shown in Figure 39. Clicking the button to *Activate Practice Schedule* 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). The currently active tournament level is also displayed on this step.

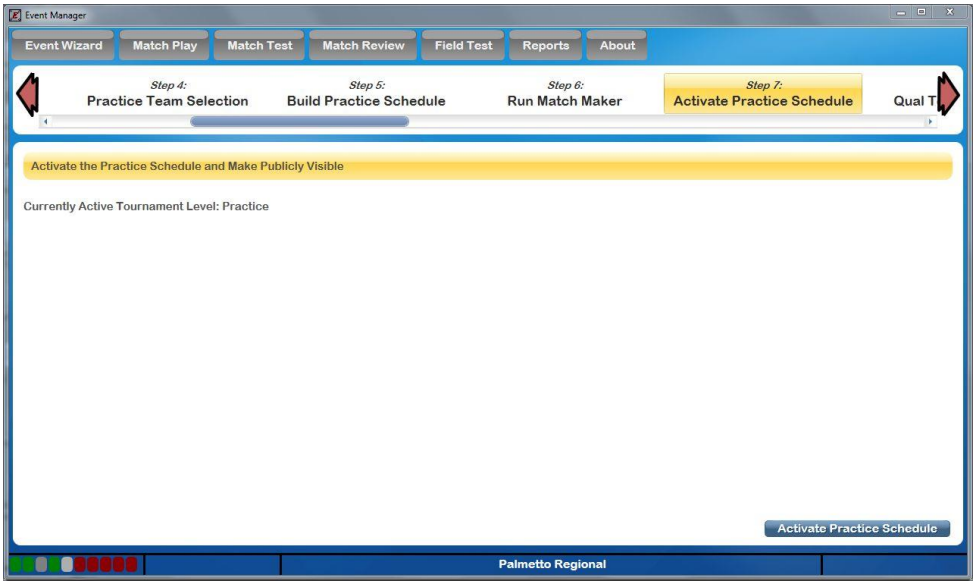


Figure 39: Event Wizard – Step 7 - Activate the Practice Schedule

5.6.4 Backing up the Practice Tournament Data

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 Step 1 of the Event Wizard) 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 Database can be made by opening Match Play or Match Test and using the corresponding button available on the *Options* tab as shown in *5.2: Match Play*.

5.6.5 Qualification Tournament Configuration

Configuration of the Qualification Tournament is very similar to configuring the Practice Tournament. Setup of the Qualification Tournament begins with Step 8 of the Event Wizard. This step is used to confirm the teams registered to play in the Qualification Tournament. In most cases there will be no modifications necessary on this page, since all the same teams from the Practice Tournament should be present, but if changes are necessary the functionality is provided. See Section 5.6.1 for details on adding/removing teams.

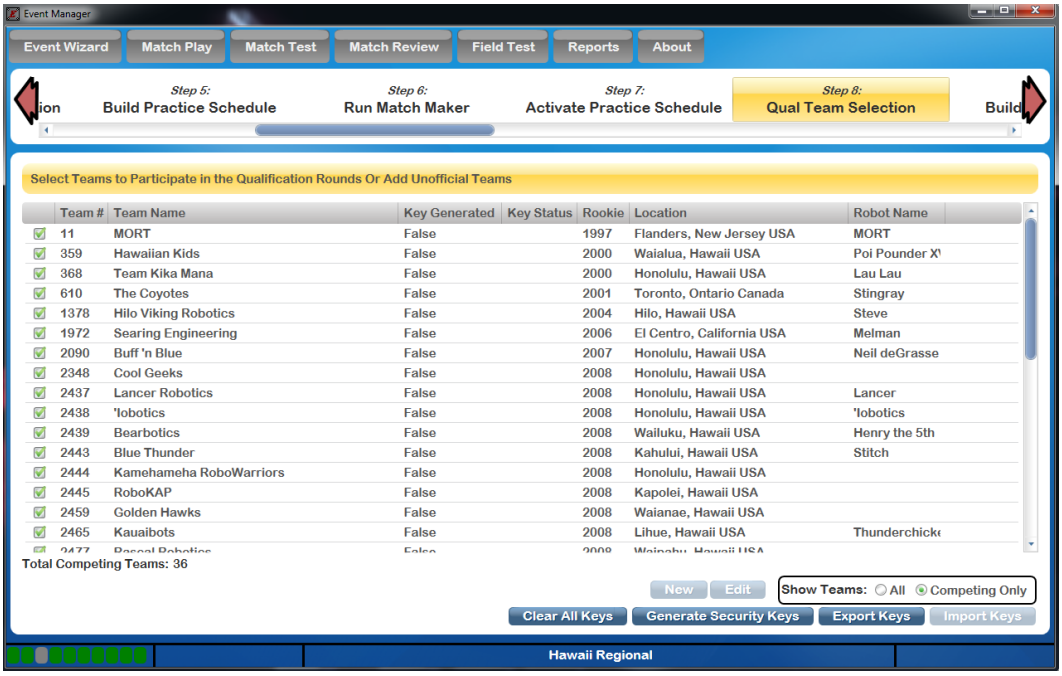


Figure 40: Event Wizard – Step 8 - Team Selection for Qualification Tournament

Validation errors appear here

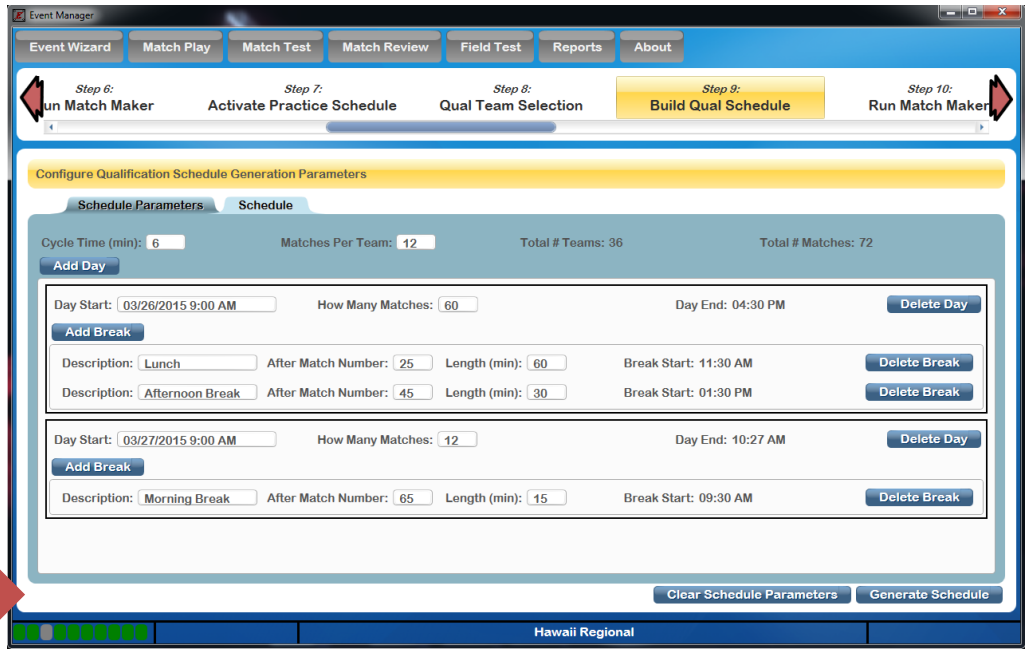


Figure 41: Event Wizard – Step 9 - Configuration of Qualification Tournament Schedule

As with the Practice Tournament, it is necessary to configure the schedule for the Qualification Tournament. The variables are outlined below.

1. *Cycle Time (min)*: Amount of time, start to start, between matches
2. *Matches Per Team*: Number of matches each team will play over the course of the entire Qualification Tournament
3. Click *Add Day*
    a. Enter the start time and date for the first day of matches.
    b. Enter the number of matches to be played that day.
        i. *Day End* indicates the time the last match will be played given the *Cycle Time*.
    c. Select *Add Break* if there will be any planned breaks between matches. The example in Figure 41 shows a break for Lunch after Match 35 which will last for 60 minutes.
4. Repeat Step 3 for any additional days.
    a. NOTE, the total number of matches over the course of the days must be the same as the *Total # Matches* shown at the top of the parameters window.

As with in the Practice Tournament, validation messages will appear on the bottom left of the screen. Any validation messages must be addressed before the *Generate Schedule* button will be available.

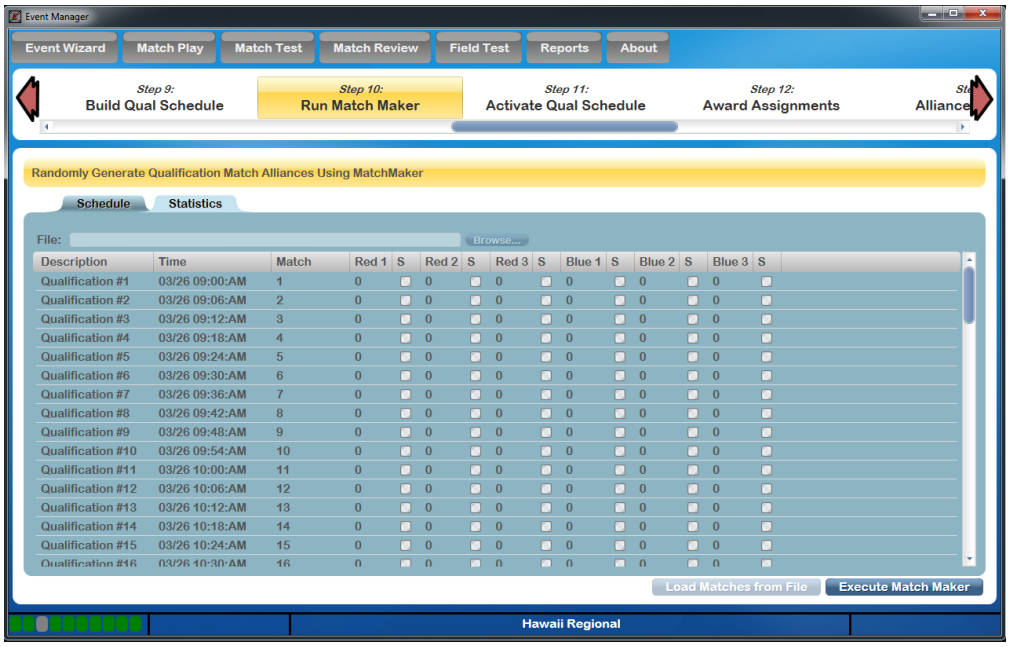


Figure 42: Event Wizard – Step 10 - Qualification Schedule

Figure 42 shows a screenshot of the schedule after it's been generated. When reviewing this schedule, confirm that the Cycle Time between matches is correct and that any Breaks are after the correct matches.

5.6.6 Assigning Qualification Alliances with MatchMaker

The process of generating alliances for the Qualification Tournament is the same as the Practice Tournament. For details and graphics, please see: *Practice Tournament Configuration* in 5.6.2.

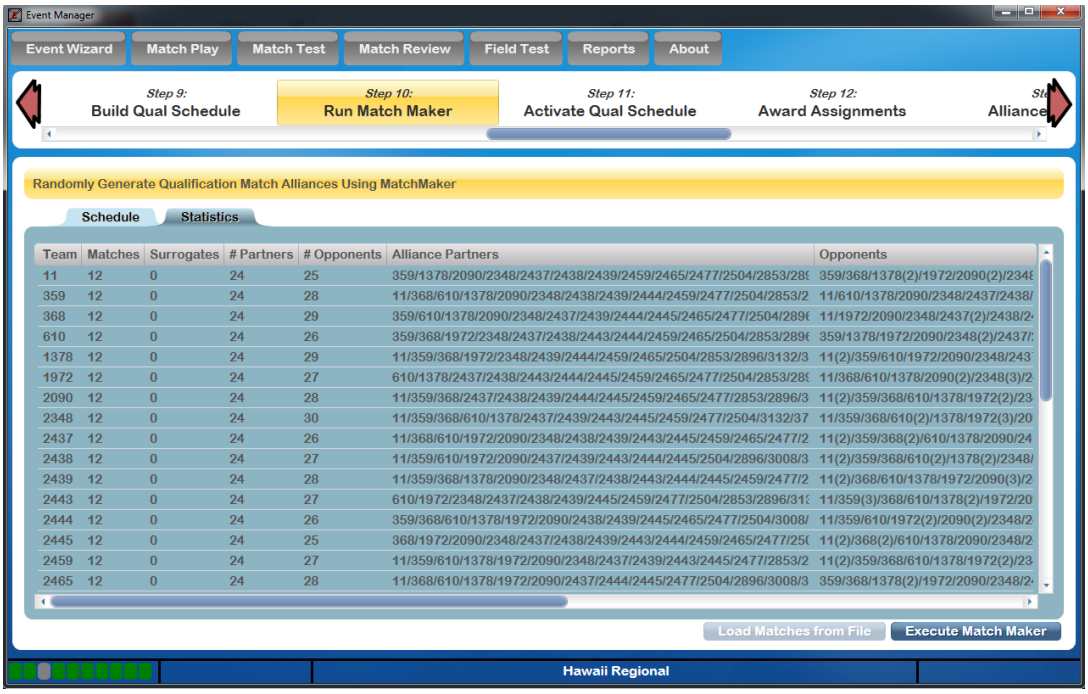


Figure 43: Event Wizard – Step 10 – Qualification Schedule Statistics

Figure 43 shows the detailed breakdown of the alliances for the Qualification Schedule. Definitions of the content in each column are given below.

1) *Team* = Team Number
2) *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 screen.
3) *Surrogates* = number of matches played in which this team is a surrogate. Teams should only play 1 surrogate match. 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.
4) *# Partners* = total number of different alliance partners. The total possible number of different alliance partners is the number of matches played * 2
5) *# Opponents* - total number of different opponents. The total possible number of different opponents is the number of matches played * 3.
6) *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.
7) *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 one team plays against another multiple times, or with the same alliance partner multiple times, you can use the *Execute Match Maker* option to generate a different schedule.

5.6.7 Using an alternative Algorithm to create Alliances

If an alternative Alliance Pairing Algorithm is desired for the Practice or Qualification Tournament, in can be imported into the FMS software. This is done on either Step 8 or Step 12 of the Event Wizard. Select the file, and click *Import Matchups*. The imported alliance pairings overwrite the alliances generated by the FMS software, but retain the scheduled match times. Follow the steps below to import externally generated alliance pairings.

1) Define the Match Schedule for the tournament.
2) Click the "…" button to open the .txt file which defines the alliance pairings. File format is TAB delimited data with 13 fields and a carriage return after each record. The fields are as follows:

Field 1 = Match Number - A number that represents the match number
Field 2 = Red Team 1 Number - A number that represents a team number
Field 3 = Red Team 1 Is Surrogate - true or false indicating that the team is a surrogate
Field 4 = Red Team 2 Number - A number that represents a team number
Field 5 = Red Team 2 Is Surrogate - true or false indicating that the team is a surrogate
Field 6 = Red Team 3 Number - A number that represents a team number
Field 7 = Red Team 3 Is Surrogate - true or false indicating that the team is a surrogate
Field 8 = Blue Team 1 Number - A number that represents a team number
Field 9 = Blue Team 1 Is Surrogate - true or false indicating that the team is a surrogate
Field 10 = Blue Team 2 Number - A number that represents a team number
Field 11 = Blue Team 2 Is Surrogate - true or false indicating that the team is a surrogate
Field 12 = Blue Team 3 Number - A number that represents a team number
Field 13 = Blue Team 3 Is Surrogate - true or false indicating that the team is a surrogate

An example file is given in the Appendix.

Please note that importing a schedule is not current available.

5.6.8 Activating the Qualification Match Schedule

After the match schedule has been generated and alliances defined, the user will move to the next step in the Event Wizard, shown in Figure 44. Clicking the button to *Activate Qualification Schedule* makes the Qualification matches playable in Match Play and available for viewing on the *FIRST* website (except in FMS Off-Season).

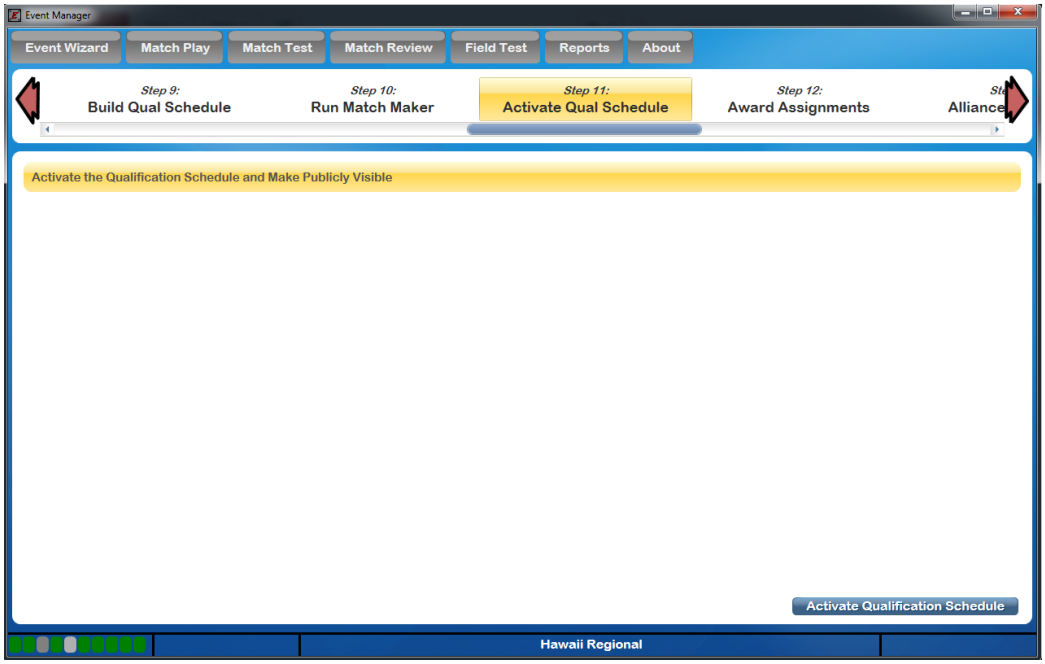


Figure 44: Event Wizard – Step 11 - Activate the Qualification Schedule

5.6.9 Backing up the Qualification Tournament Data

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 Step 1 of the Event Wizard) throughout the tournament, but it's also important to do a complete backup at the end of each stage as well.

Complete backups of the Event Database can be triggered using the button on the *Options* tab of Match Play or Match Test. See section *5.2: Match Play* for details.

5.6.10 Friday Awards

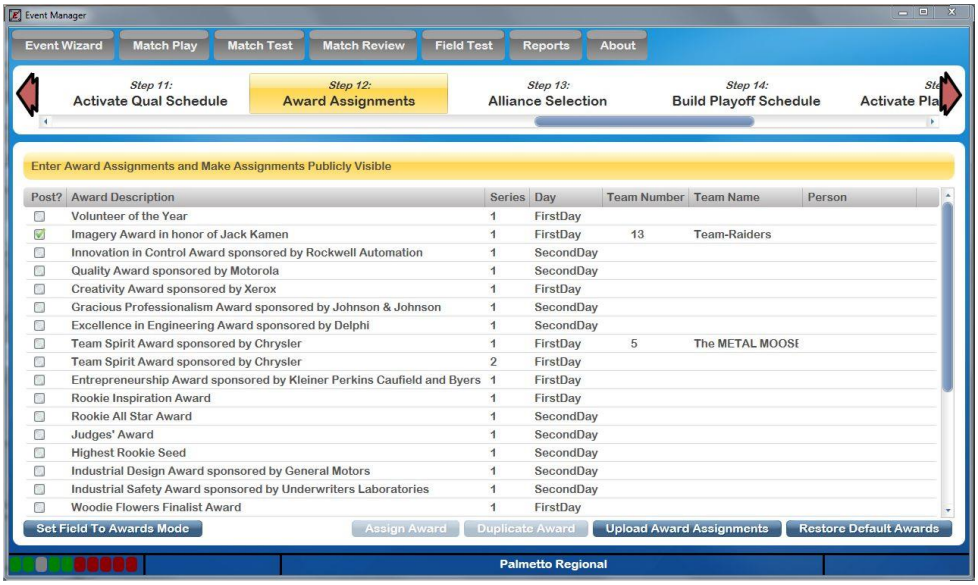


Figure 45: Event Wizard – Step 12 - Friday Awards

The winners from the awards given out on Friday are entered here.

- *Set Field to Awards Mode* – turn on LED strings in Player Stations to match Alliance color and show the year on all Team Signs.
- *Assign Award* - Select to assign an award to a Team or person
- *Duplicate Award* used to enter an additional instance of an award. For example, A second Volunteer of the Year or second Judges Award
- *Upload Award Assignments* – post award winners online
- *Load Available Awards* – populate the Awards list with the awards predefined for the current event.

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

5.6.11 Alliance Selection

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

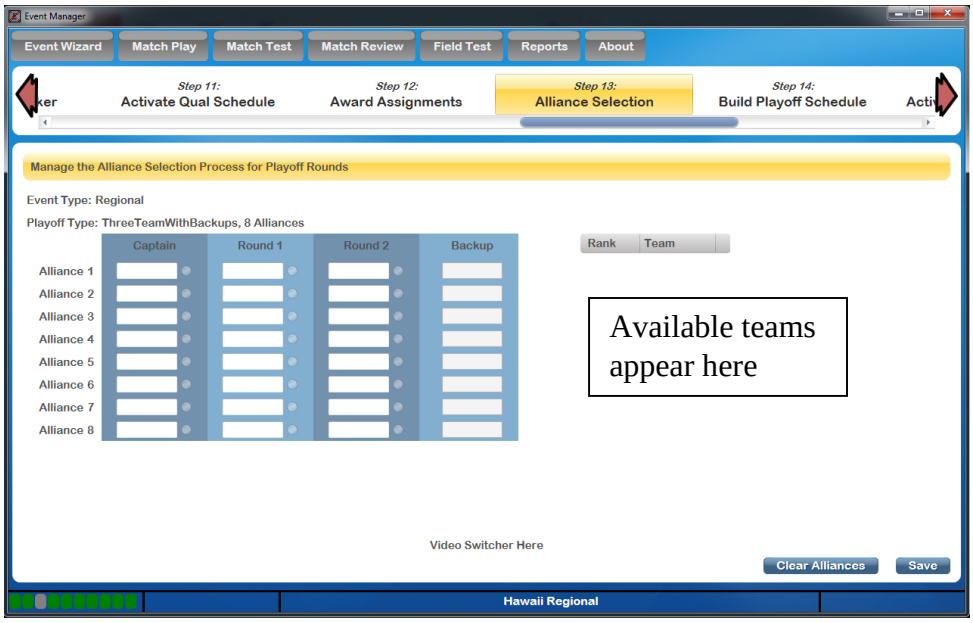


Figure 46: Event Wizard – Step 13 - Alliance Selection for an 8 Alliance Playoff Tournament

At all Official FRC Events, the 8-alliance tournament is used, but smaller Off-season events may use a 4-alliance playoff tournament. The list of available teams for selection, in order of ranking, is shown in the display box on the right hand side of the screen (*not pictured).* As teams are selected from the pool of available teams, the corresponding team number is removed from the list of available teams.

The Scorekeeper will need to manually populate the team numbers into the 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. 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.

Use the Audience Video Control panel to select the Alliance Pairing screen to display to the audience. The Alliance Selection screen is shown in Figure 6 and the list of Available Teams is shown in Figure 7.

5.6.12 Playoff Tournament Configuration

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, the message from Figure 47 will be presented.

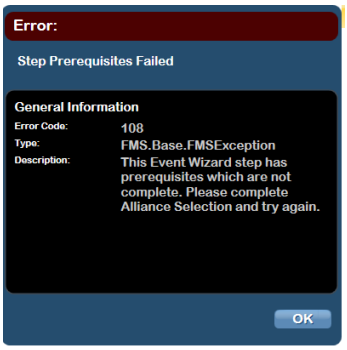


Figure 47: Event Wizard – Step 14 - Playoff Schedule Generation Unavailable

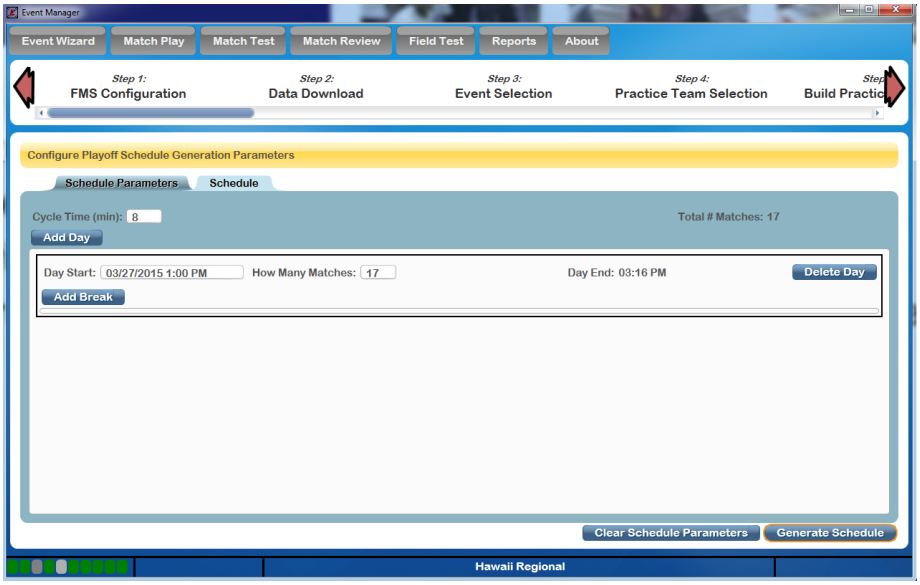


Figure 48: Event Wizard – Step 14 - Generate Playoff Schedule

Figure 48 shows Step 14 of the Event Wizard. This page is used to generate the Playoff Schedule. Configuration of the Playoff Tournament schedule is the same as Practice and Qualification schedules, except that there is no entry for matches per team. The number of required matches is pre-set based on the type of Playoff Tournament.

1. *Cycle Time (min)*: Amount of time, start to start, between matches
2. Click *Add Day*
    a. Enter the start time and date for the first day of matches.
    b. Enter the number of matches to be played that day.
        i. *Day End* indicates the time the last match will be played given the *Cycle Time*.
    c. Select *Add Break* if there will be any planned breaks between matches.

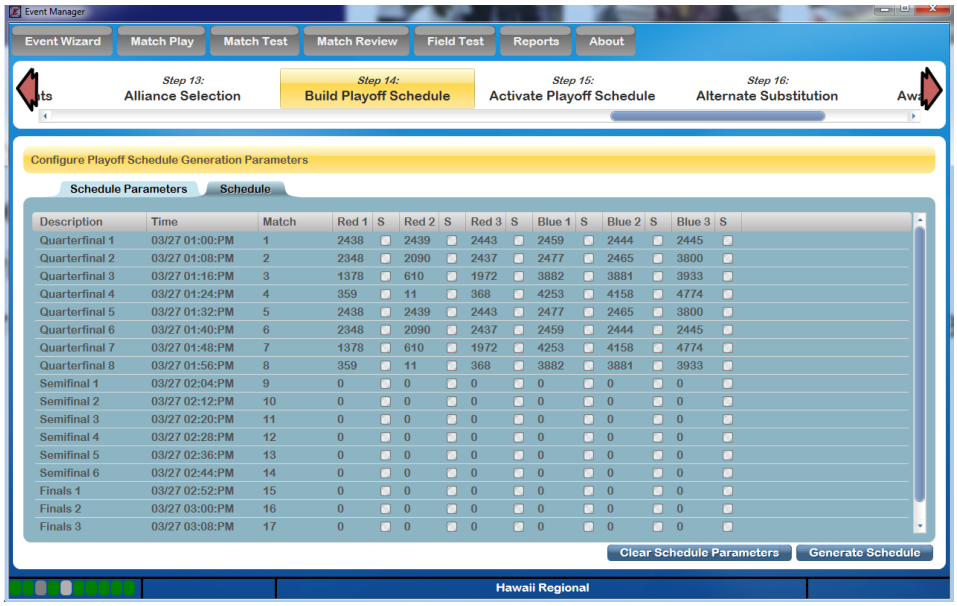


Figure 49: Event Wizard – Step 14 - Generate Playoff Schedule

The FMS software will only populate the quarterfinal matches initially. Alliances advance in the Playoff Tournament by have one of the highest average match score in a certain level of the tournament; the software will automatically populate the semi-final and final rounds as teams advance from the prior rounds.

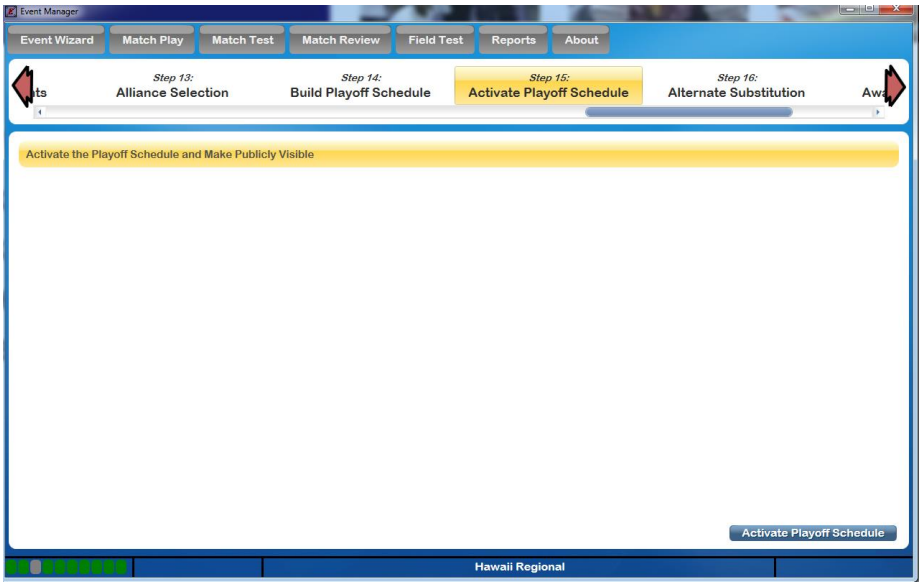


Figure 50: Event Wizard – Step 15 - Activate the Playoff Tournament

As with the Practice and Qualification rounds, it is necessary to activate the Playoff Tournament in order to play the matches.

5.6.13 Team Substitution

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. Figure 51 shows Step 16 in the Event Wizard allowing for the substitution of a team.

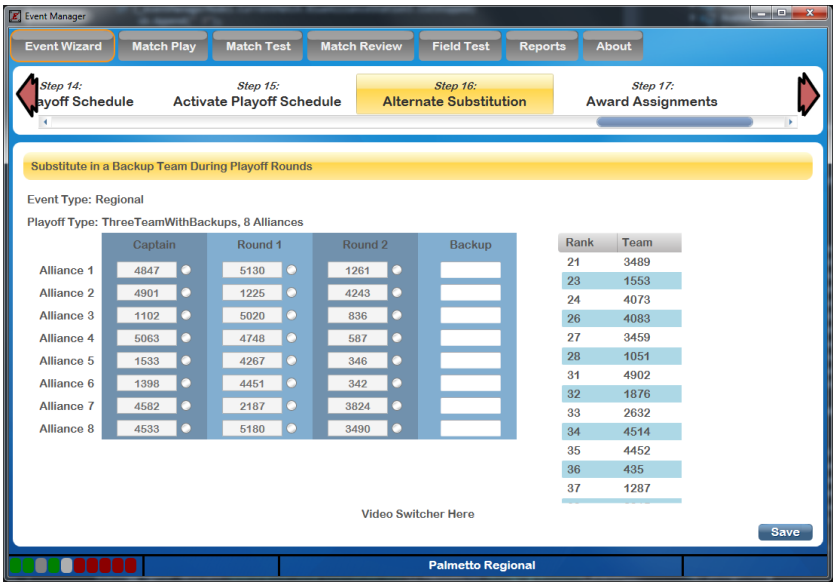


Figure 51: Event Wizard – Step 16 - Team Substitution during Playoff Tournament

Add the team number in the Alternate column for the corresponding Alliance, and then click the check box next to the team that will be replaced. Clicking "Save" will then update the match schedule with the original team replaced by the Alternate.

5.6.14 Saturday Awards

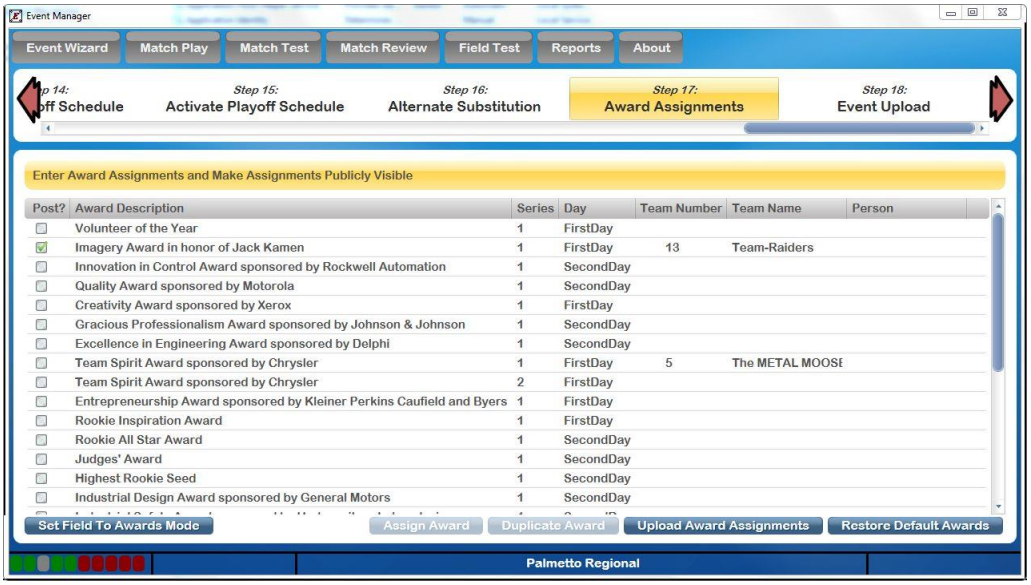


Figure 52: Event Wizard – Step 17 - Saturday Awards

The functionality of Step 17 is the same as Step 12. See 5.6.10 Friday Awards for more details

5.6.15 Event Data Archive and Upload

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

The *Event Data Upload* page shown in Figure 53 is used to do a complete backup of all tournament information. Copies are placed on the Event Server, USB drive (if 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 AND THE AMOUNT OF LOG DATA STORED, THIS STEP MAY TAKE SEVERAL MINUTES!!

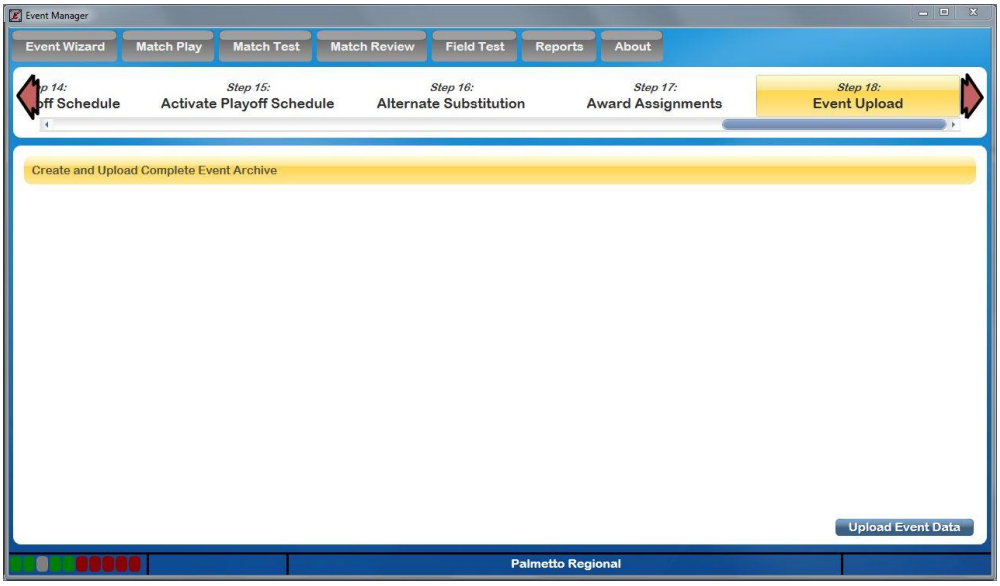


Figure 53: Event Wizard – Step 18 – Event Data Backup and Upload

6 Field Monitor

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

Figure 54: Field Monitor Interface

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. The team number is only populated once the DS has linked with FMS.
  - Example: Team #6 is in station Red 3
- DS-ETH: Indicates if a DS is physically connected to the switch at the SCCE
- DS: DS is in FMS mode (i.e. connected to FMS) when a green circle is shown.
- BWU: Indicates the Bandwidth Utilization/Consumption for that particular team
- 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 cRIO on the robot
- Voltage: Battery voltage reported by the Robot
- Enabled/Mode: 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.
- 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.

Rows remain yellow until the DS and Robot have linked with FMS, at which point the row turns white.

Figure 55: Prior to Prestart

Figure 56: Prestart Running

999	PRE-START COMPLETED								
MATCHES		DS-ETH	DS	BWU	Radio	cRIO	Voltage	Enabled/Mode	Average Trip (ms)	Missed Packets
1	1			0.706			13.0	A	13	10416
2	2			0.706			14.0	A	13	30849
3	3			0.859			15.0	A	8	6133
1	4			0.704			16.0	A	14	0
2	5			0.704			17.0	A	13	13214
3	6			0.706			18.0	A	14	25684
999	PRE-START COMPLETED								

Figure 57: Prestart Done

999	MATCH READY								
MATCHES		DS-ETH	DS	BWU	Radio	cRIO	Voltage	Enabled/Mode	Average Trip (ms)	Missed Packets
1	1			0.706			13.0	A	13	11466
2	2			0.706			14.0	A	13	31898
3	3			0.856			15.0	A	7	6132
1	4			0.704			16.0	A	13	0
2	5			0.702			17.0	A	12	14266
3	6			0.699			18.0	A	15	26751
999	MATCH READY								

Figure 58: Ready for Match to Start

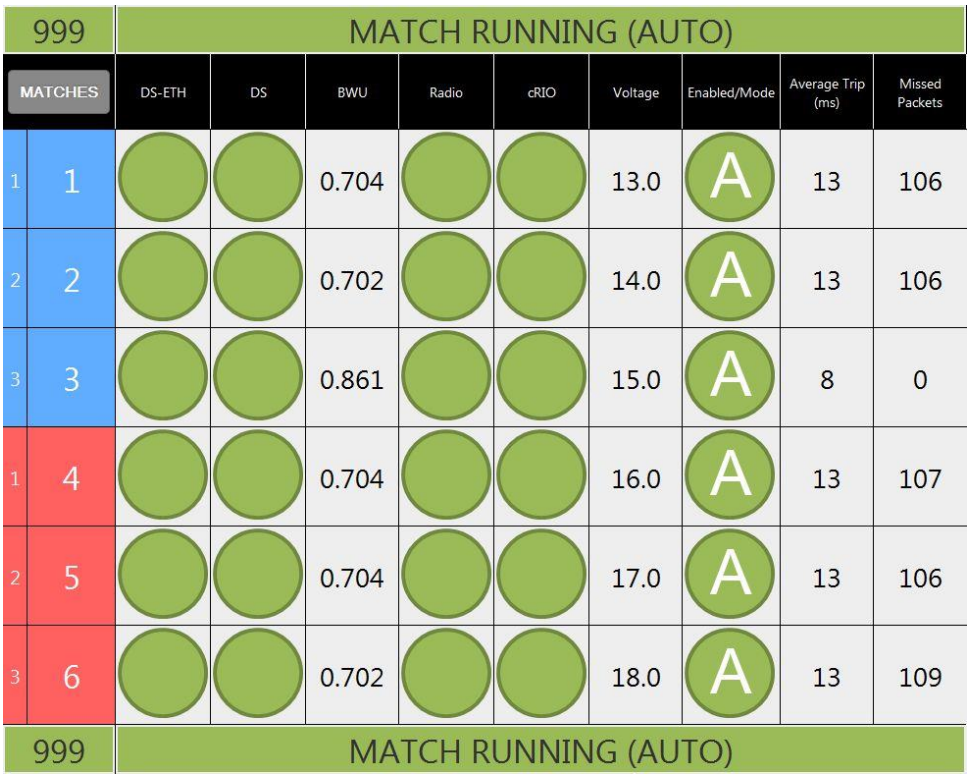


Figure 59: Match Running – Auto

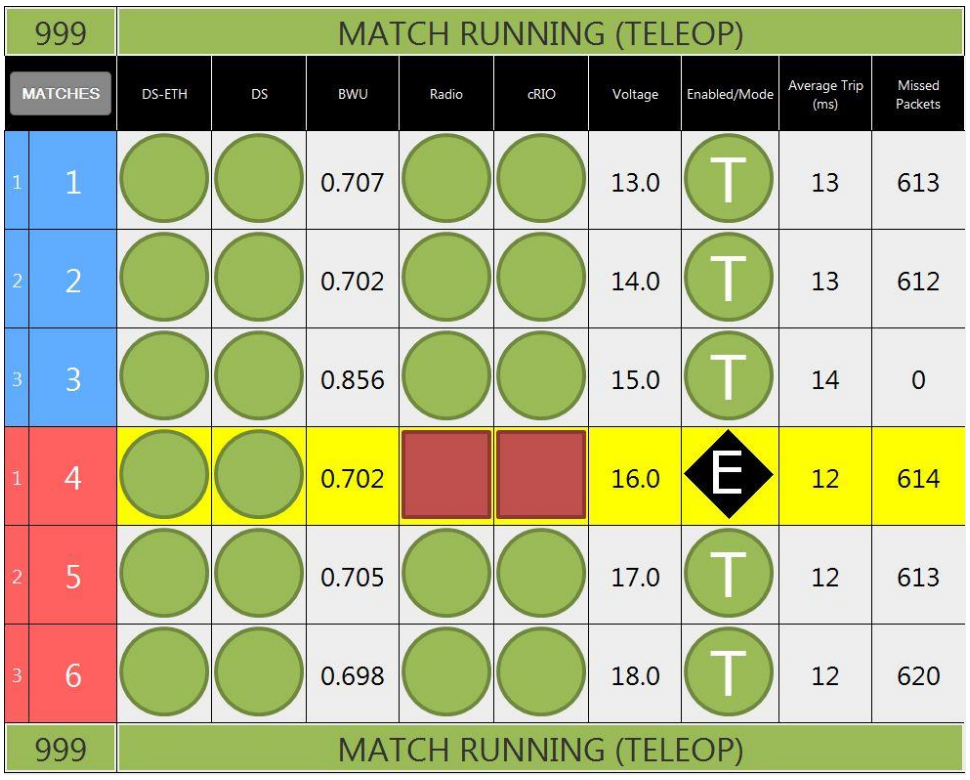


Figure 60: Match Running – Teleop, showing Estop indication

999	MATCH PAUSED (TELEOP)								
MATCHES	DS-ETH	DS	BWU	Radio	cRIO	Voltage	Enabled/Mode	Average Trip (ms)	Missed Packets
1 1			0.706			13.0	T	13	1695
2 2			0.706			14.0	T	13	1695
3 3			0.858			15.0	T	7	0
1 4			0.704			16.0	T	13	1699
2 5			0.702			17.0	T	13	1698
3 6			0.700			18.0	T	13	1748
999	MATCH PAUSED (TELEOP)								

Figure 61: Match Stopped – Teleop

999	MATCH OVER								
MATCHES	DS-ETH	DS	BWU	Radio	cRIO	Voltage	Enabled/Mode	Average Trip (ms)	Missed Packets
1 1			0.706			13.0	T	13	5274
2 2			0.704			14.0	T	12	5274
3 3			0.857			15.0	T	4	1
1 4			0.702			16.0	T	13	5289
2 5			0.702			17.0	T	12	5287
3 6			0.704			18.0	T	15	5407
999	MATCH OVER								

Figure 62: Match Done

Figure 63: Field Monitor – Matches Display

Selecting the Matches button in the upper right hand corner of the Field Monitor changes the display to show a list of all complete matches, most recent matches listed first. The user can then select any team in the match and be presented with the same log data as available in Match Review.

Select the Monitor button to go back to the standard Field Monitor display.

7 FMS – Pit Screen

Follow these steps to setup the Pit Screen

1. Boot the Pit Toughbook.

2. Select the Desktop shortcut to the FMS Portal, then select Pit from options at the top of the screen.

8 Frequently Asked Questions

	Issue/Question	Solution
1	FMS software crashes	No PLC detected. Verify PLC IP by opening a web browser and going to the following link: http://10.0.100.10 If the Rockwell Automation page does not come up, Contact FRC/FMS Support.
2	How do I interpret the information on the Match Schedule Statistics Tab?	Follow the steps and explanation in Section 5.6.5
3	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
4	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.
5	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 Practice 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*
6	How do I open the configuration screen on the Audience Display?	CTRL-SHIFT-F12
7	How do I close the Audience Display?	ALT-F4
8	6 teams showed up for the Practice match, but only 5 are the scheduled teams. How do I change the team number on the LED Display so that all 6 team numbers are correct?	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 number does not match a registered team for the event, an error message will be given. **THIS MUST BE DONE PRIOR TO PRESTART**
9	What is the password for the Event Server?	Ask your FTA to login
10	Can I view Reports/Match Review/etc. once I've Prestarted the match?	Yes *TIP: You can also save all reports to PDF and place them on the Desktop for printing anytime.*

11	What do the indicator lights on the Field Access Point mean?	Center Light: • Solid Green = Power on, no device connected • Solid Blue = at least 1 device connected • Flashing = contact field support Ethernet Light = flashes when there is network traffic Radio Light = flashes when there is network traffic
12	What do the lights on the Arena Status Light mean prior to Match Start?	Red Light: • ON = Red Alliance not ready • OFF = Red Alliance ready Blue Light: • ON = Blue Alliance not ready • OFF = Blue Alliance ready Amber Light: • Not used prior to Match Start Green Light: • OFF = Blue or Red Alliance not ready • ON/Flashing = Field ready to start match • ON/Solid = Match is running
13	What do the lights on the Arena Status Light mean after the Match ends?	Red Light: • Not used Blue Light: • Not used Amber Light: • Waiting for Refs to Submit scores Green Light: • OFF, match is done, field disabled
14	Where is the WPA Key file?	Step 4 of the Event Wizard, Select *Export Keys*

9 Appendix

9.1 Alliance Pairings import file example

Below shows the example text for the import file when using externally generated alliance pairings.

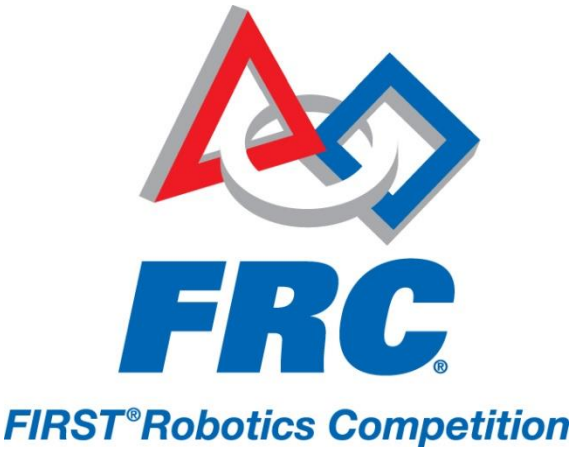
1	10	false	11	false	12	false	13	false	14	true	15	false
2	10	false	11	false	12	false	13	false	14	true	15	false
3	10	false	11	false	12	false	13	false	14	true	15	false
4	10	false	11	false	12	false	13	false	14	true	15	false
5	10	false	11	false	12	false	13	false	14	true	15	false
6	10	false	11	false	12	false	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

9.2 Alliance 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

10 Release Notes:

22 Feb 2015 – Rev0 – Initial Release
05 June 2015 – Rev1 – Addition details regarding Off-Season FMS
17 Sep 2015 – Rev2 – Warning messaging



Field Management System
Off-Season User's Guide Addendum

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 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 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. This document will outline the network configuration, while the FMS User's Guide details the software operation.

Table of Contents

Table of Figures

1 Overview

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

- Laptop computer running Windows 7 or 8.1
- Wifi Access Point (Linksys WRT610N or equivalent)
- Ethernet Switch (8 port)

See section 3 for more information regarding the network configuration.

2 FMS Off-Season Configuration

2.1 Minimum Requirements

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

Item	Requirement
Operating System	Windows 7 or Windows 8.1
CPU	2 GHz
Memory	2 GB RAM
Hard drive	1 GB free hard disk space
Hardware	Ethernet port and 1 USB drive

If you wish to run the Audience Display in addition to the Off-Season FMS, 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 1024 x 768 for the 4:3 Audience Display, 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.

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.

2.2 Installing FMS Off-Season

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

By default, FMS will utilize port 8085 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.

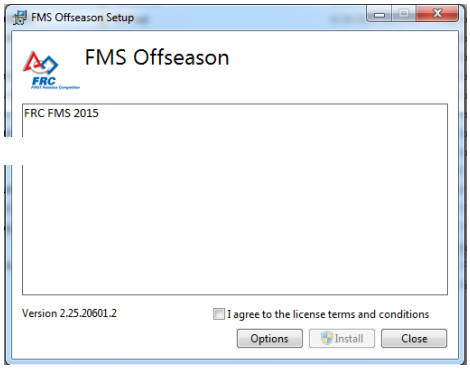


Figure 1- Installation Wizard

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 (x86)\FIRST\FMSExeOffseason** (64 bit OS) or **C:\Program Files\FIRST\FMSExeOffseason** (32 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.

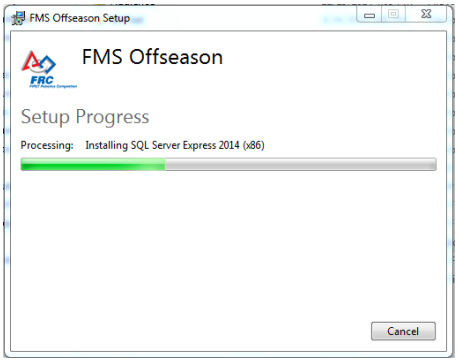


Figure 2 - Installation Progress

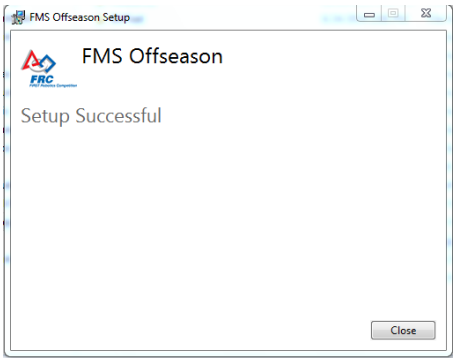


Figure 3 - Installation Complete

When finished, the above screen will appear.

2.3 Uninstalling FMS Off-Season

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.

2.4 Advance Installation Configuration

By default, FMS will use port 8085 for its Web Portal. However, this can be changed if you need FMS to use another port. **Notice: The documentation references port 8085 in examples. If you install on another port, the references in the documentation will be inaccurate.**

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 (8085) you would use the following command:

FMSOffSeasonInstaller.exe WebSitePort=8085

Proceed with the installation as described previously.

2.5 Configure FMS Software to Run as an Administrator

Right click on the FMS icon on the desktop and select Properties. Under the Compatibility tab, click the box next to "Run as an administrator" and select OK.

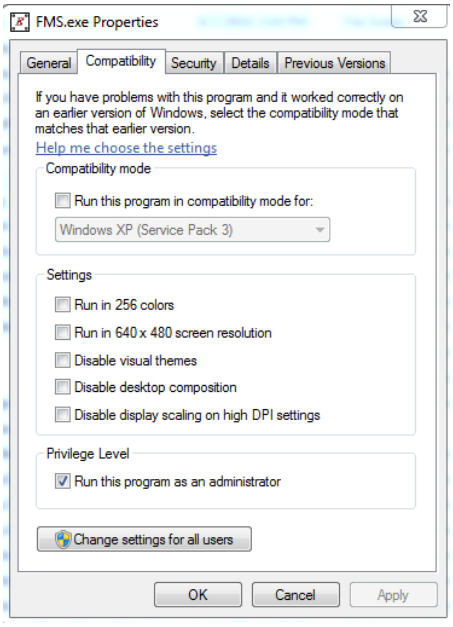


Figure 4 - FMS Run as an adminstrator

2.6 Configure FMS FieldServer Website to Run as an Administrator

Right click on the FMS FieldServer Website icon on the desktop and select Properties. Under the Compatibility tab, click the box next to "Run as an administrator" and select OK.

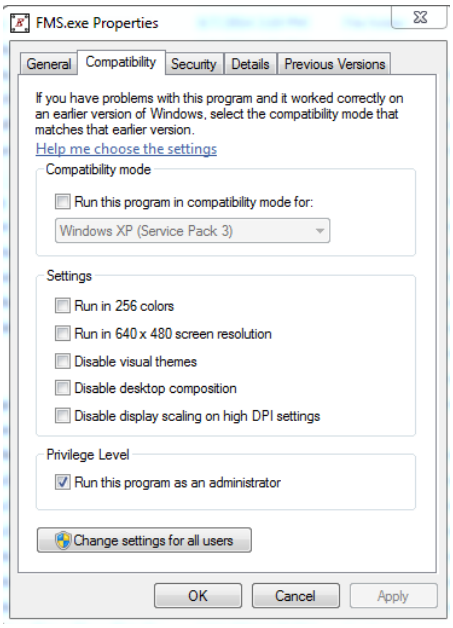


Figure 5 - Website run as an administrator

2.7 Launching the FMS Software

Once FMS Off-Season is installed, you should see shortcuts on your desktop to "FMS", "FMS FieldServer Website" and "Audience Display." FMS and FMS FieldServer Website require administrative privileges on the machine in order to run properly and will prompt you on launch if they do not have administrative privileges. Make sure you have configured administrative privileges as described previously. 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.

When you start the FMS FieldServer Website program, an IISExpress box will pop-up and look similar to the one below.

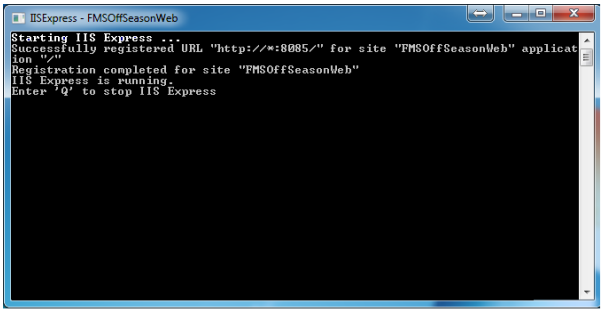


Figure 6 - IISExpress running

You must leave this running while you are using FMS Off-Season. To shut down the service, click the Q key while you are in the IISExpress window.

Once FMS is loaded you will see the following screen and can click the Event Wizard button to get started.

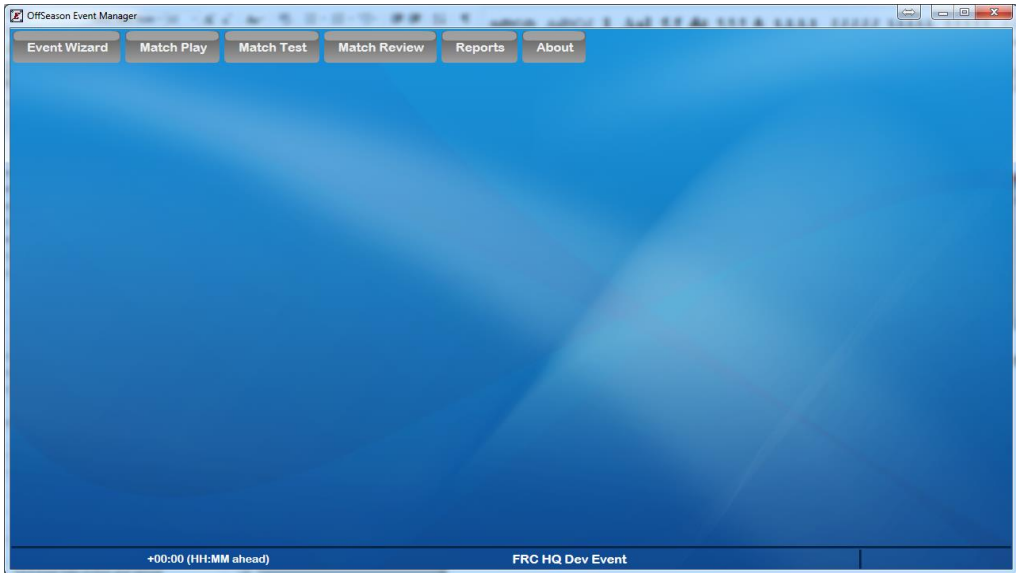


Figure 7 - FMS opening screen

2.8 Launching the Audience Display

Double click the "Audience Display" shortcut on your desktop to launch the Audience Display. The audience display will appear (the color may be different on your machine) as shown below.

Figure 8 - Audience opening screen

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.

2.9 Running the Audience Display in 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\FMSExeOffSeason (64 bit OS) or
C:\Program Files\FIRST\FMSExeOffSeason (32 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.

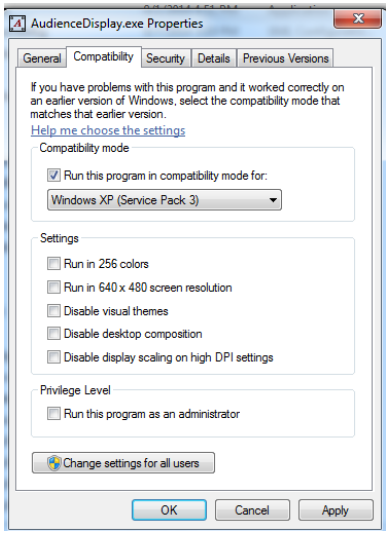


Figure 9 - Audience compatibility mode

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

3 Network Hardware Configuration

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 you event has the full official electronics, you should not use FMS Off-Season, you must use the official FMS build in order to talk to network hardware.

3.1 Basic Network Layout

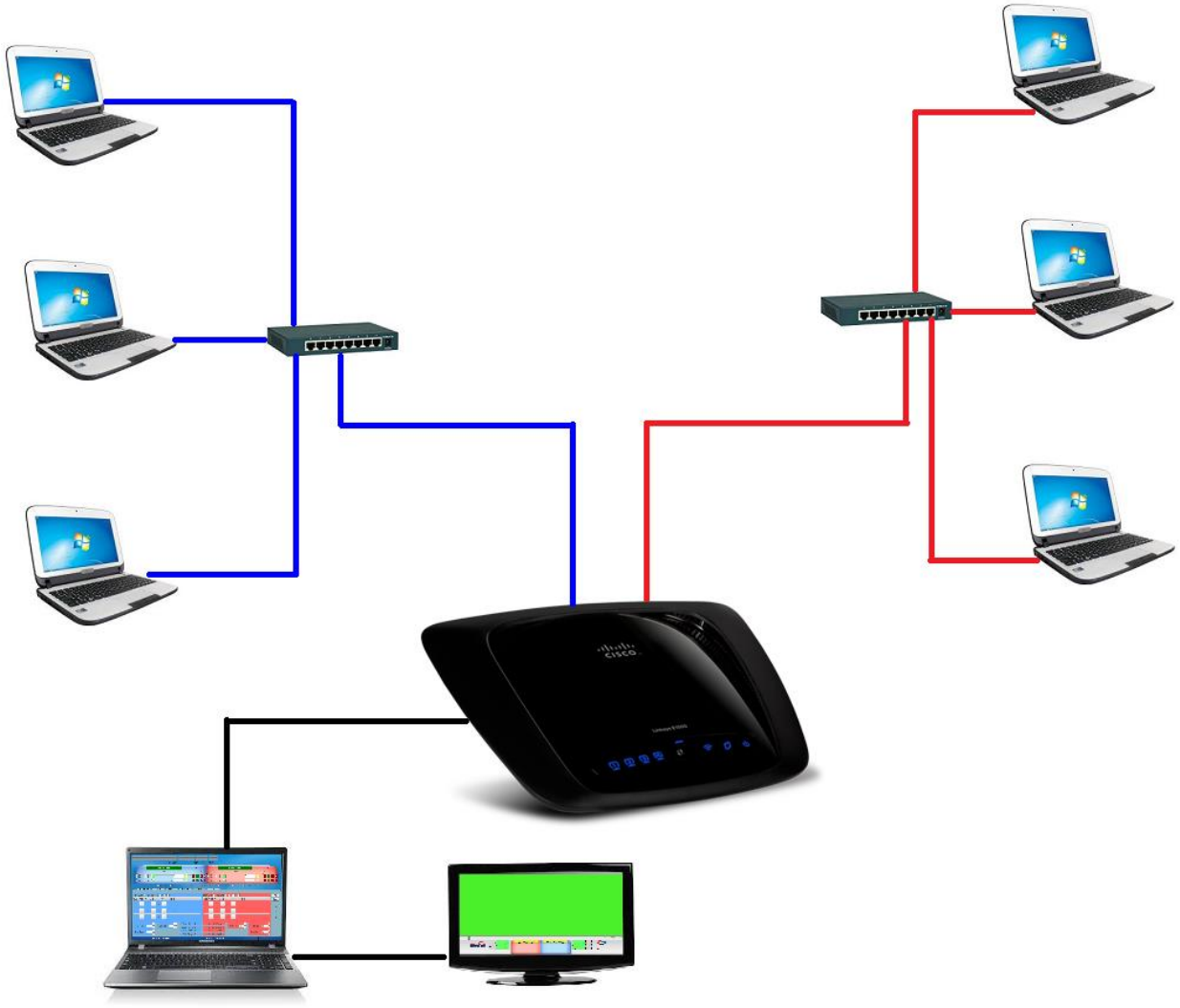


Figure 10 - Network layout

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. *Please note that the Audience Display cannot be run from a separate machine at this time, it must be on the same machine as the FMS software*. See below for more details about the wiring.

3.2 Wiring and Cables

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.

While CAT6 cables are recommended, CAT5e should also work.

3.3 Configuring the Router

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 below instructions apply to many kinds of routers, 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.

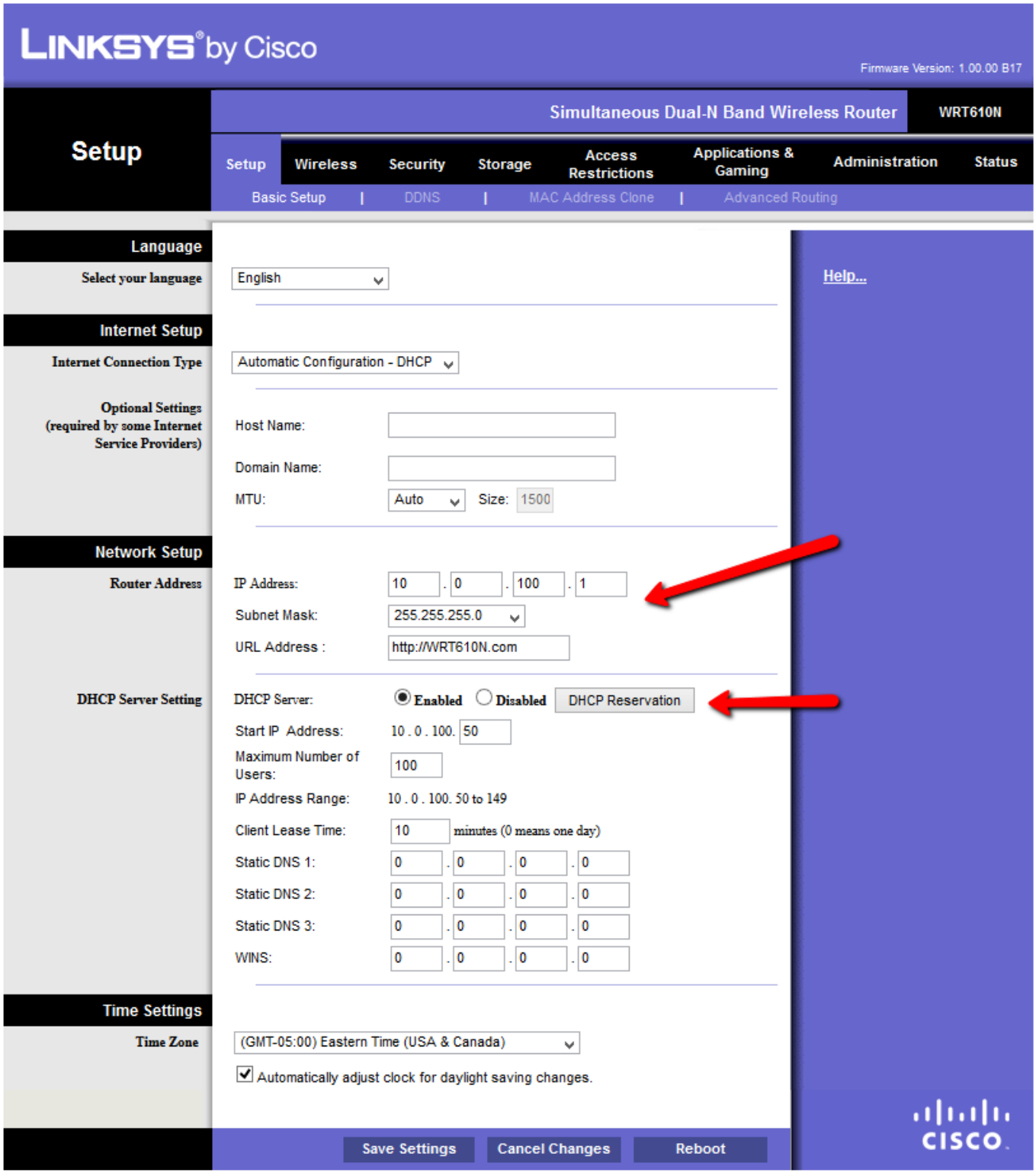


Figure 11 - AP Basic Setup

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.

Navigate to the Basic Wireless Settings for the router.

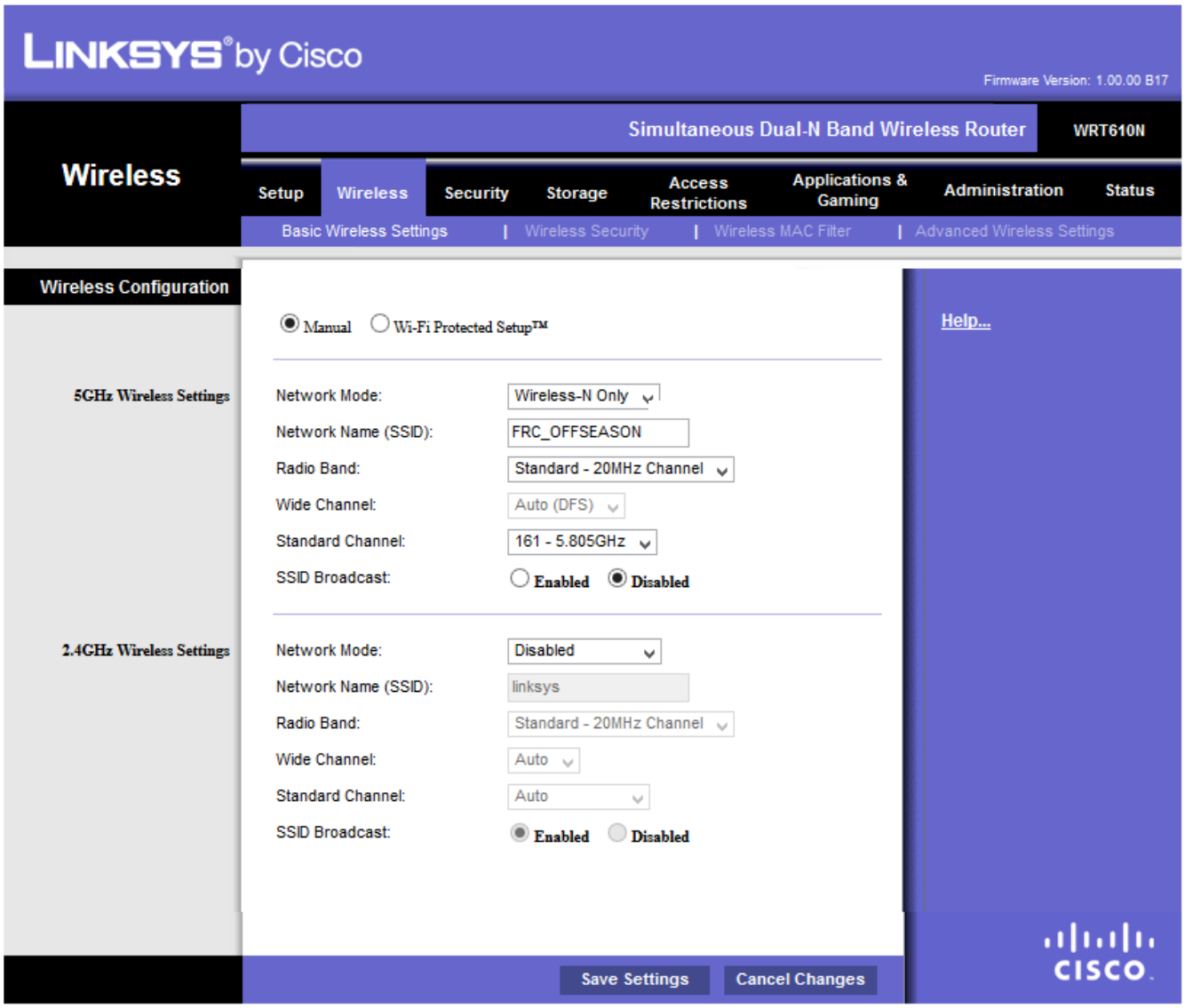


Figure 12 - AP Basic Wireless Settings

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.

Navigate to the Wireless Security for the router.

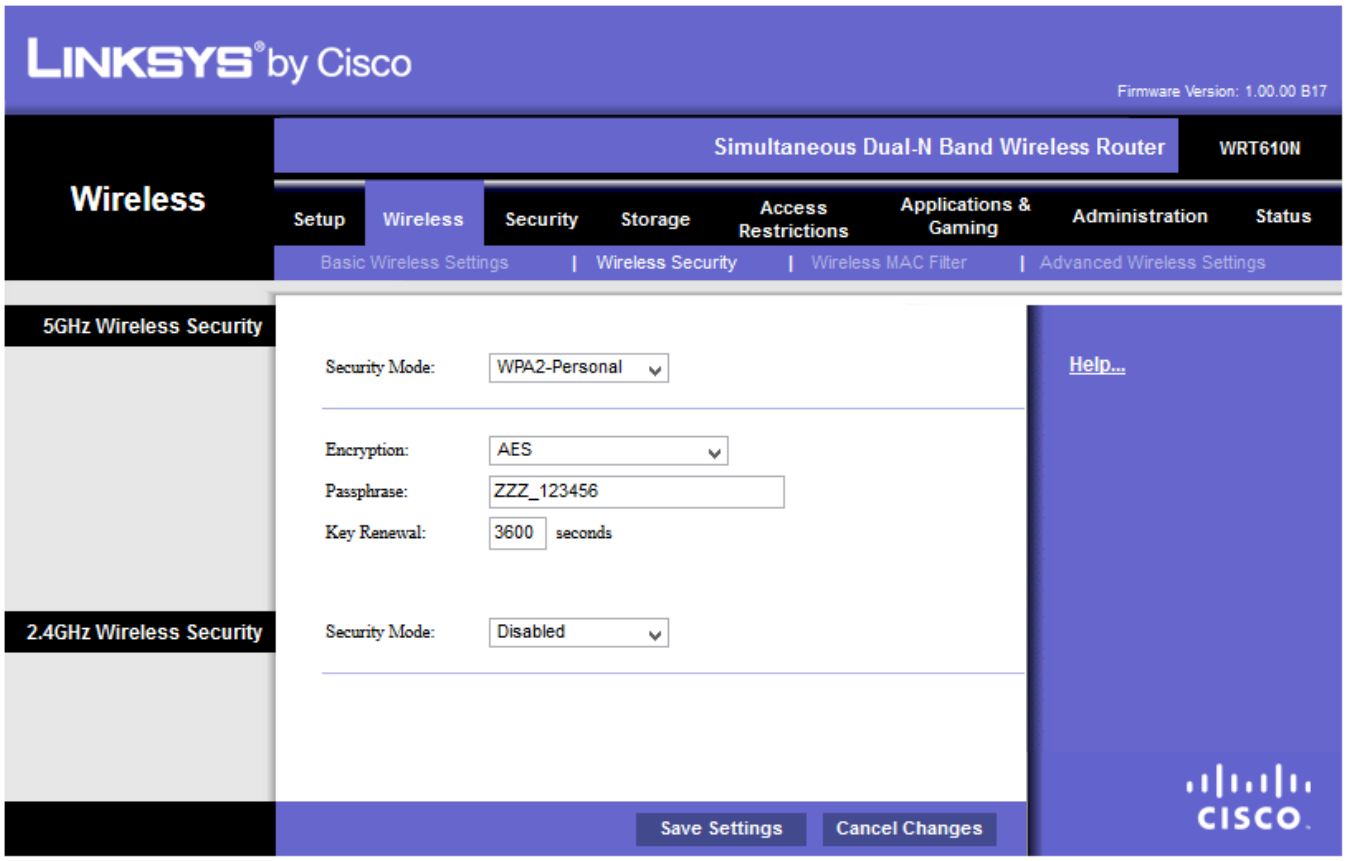


Figure 13 - AP Wireless Security Settings

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.

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.

3.4 Configuring the Robot Radios

Teams should use the FRC bridge configuration utility to program their robot radios for Off-Season use. The utility can be found at:
C:\Program Files (x86)\National Instruments\LabVIEW 2014\project\Bridge Configuration Utility\FRC Bridge Configuration Utility.exe

Before programming any radios click on the Tools menu and select FMS-Lite Mode to set the SSID and WPAKey to be used for your event.

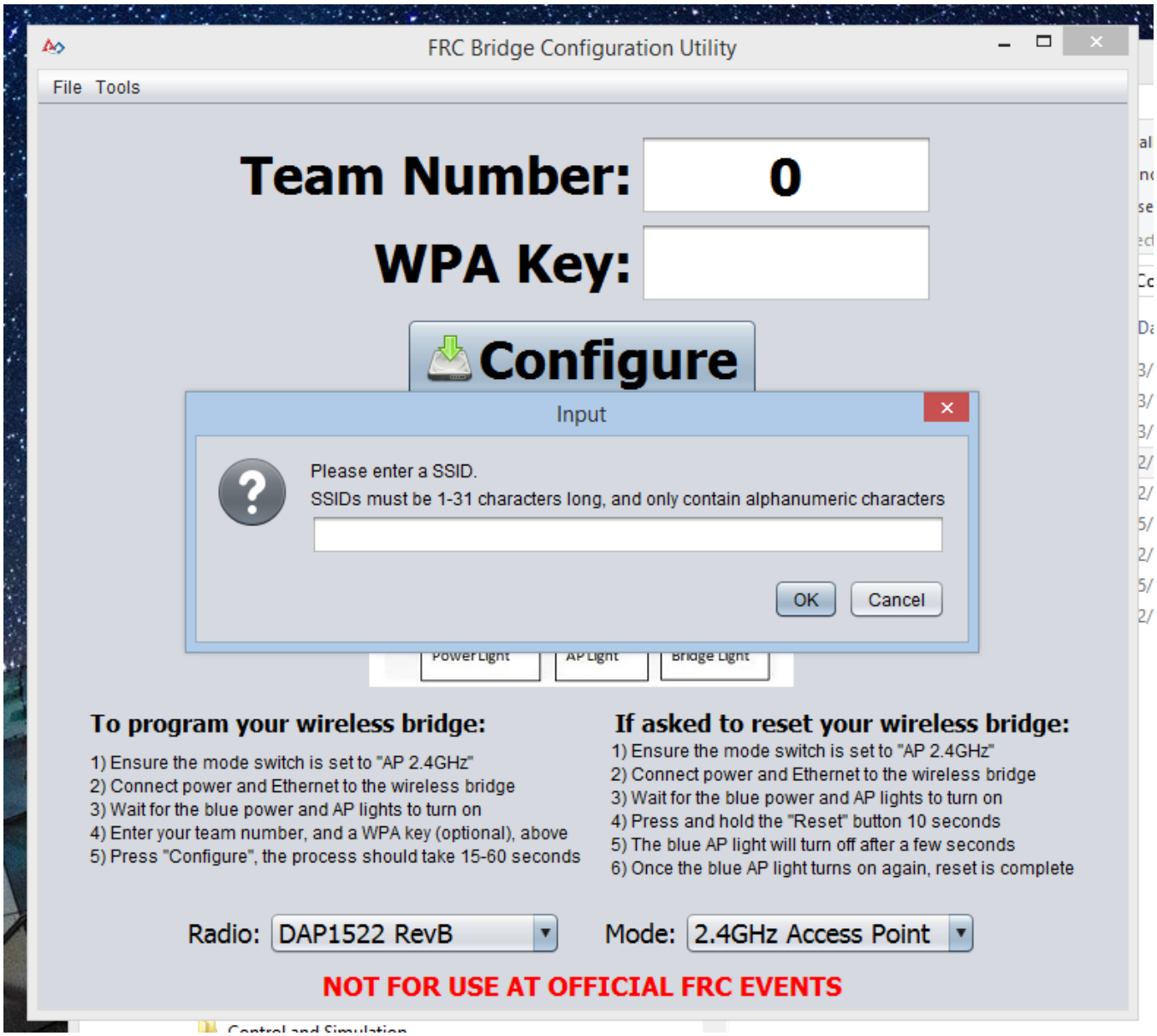


Figure 14 – Off-Season Kiosk SSID

Enter the event SSID and click OK. This should be the same SSID entered into the router in the earlier configuration step.

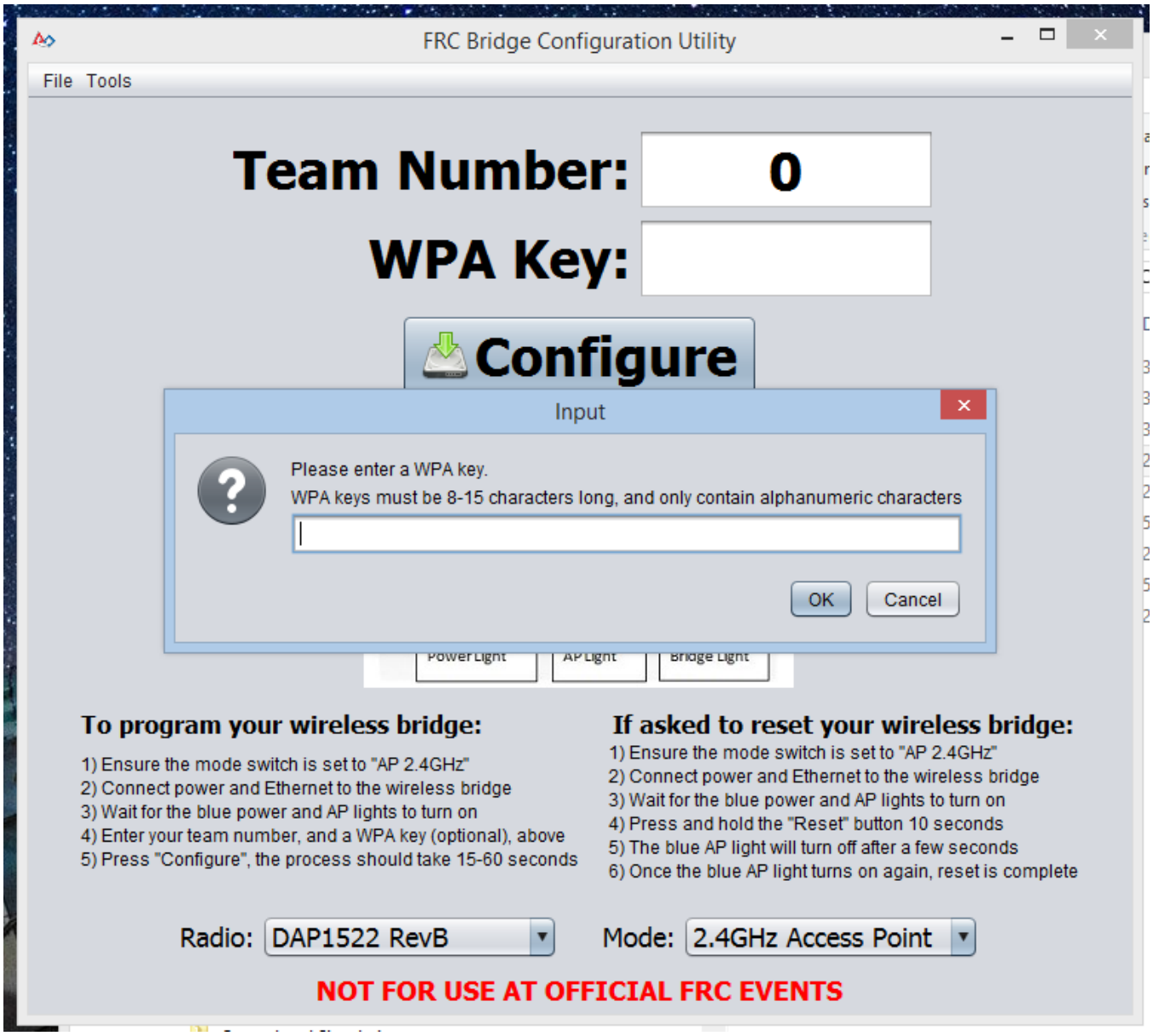


Figure 15 – Off-Season Kiosk WPA Key

Enter the event WPA Key and click OK. This should be the same WPA Key entered into the router in the earlier configuration step.

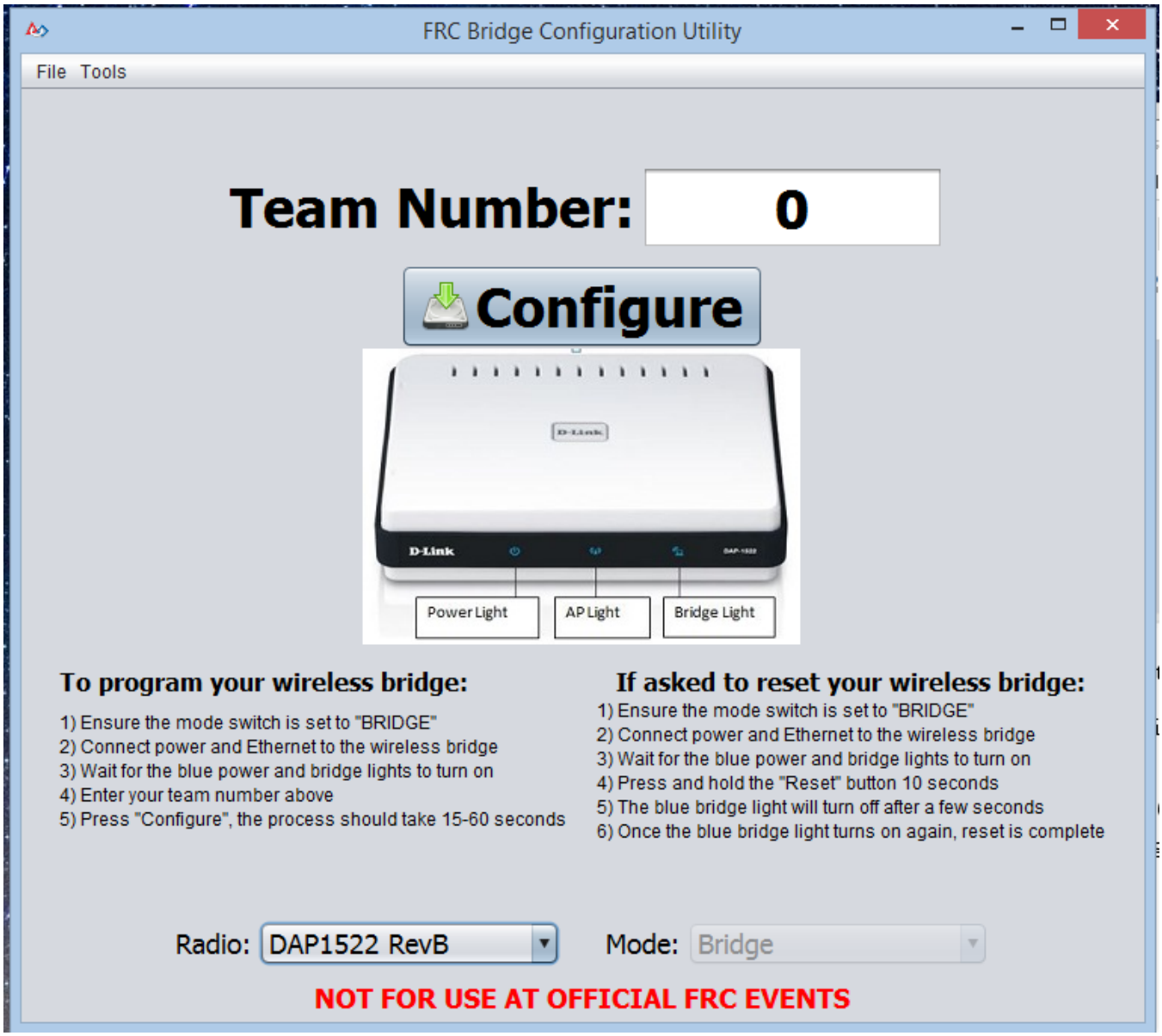


Figure 16 – Off-Season Kiosk

The kiosk software is now ready to program team radios.

3.5 Configuring the FMS Network Settings

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

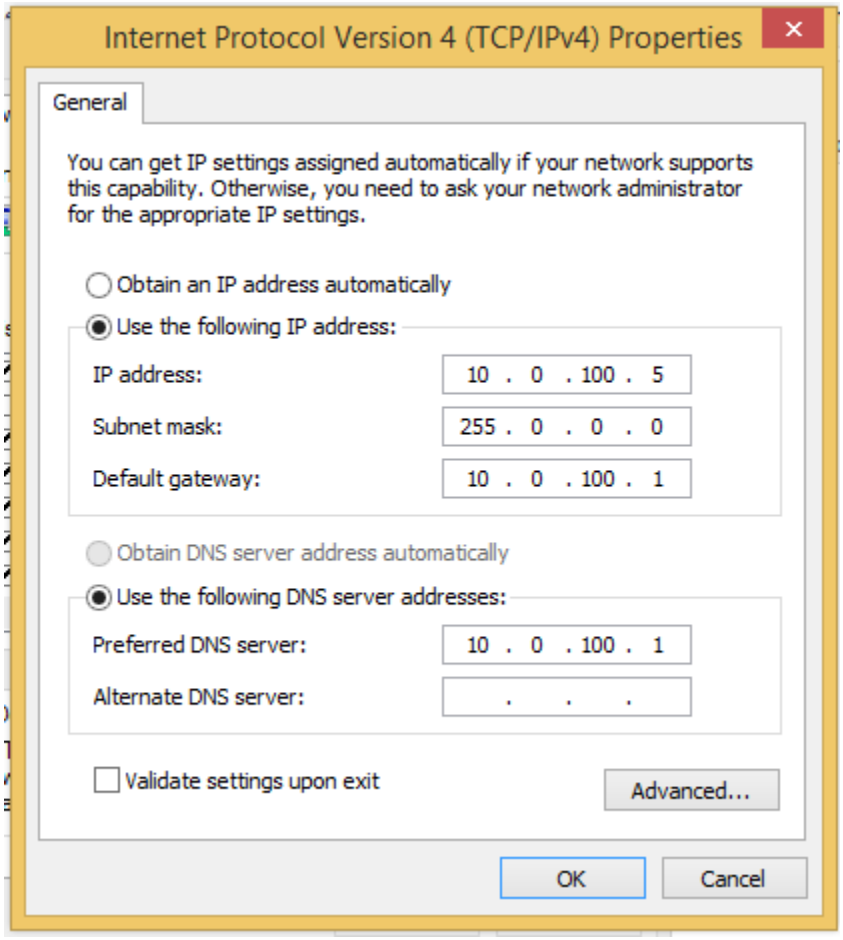


Figure 17 - FMS Network Settings

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 if one is installed.

3.6 Configure the FMS Firewall Settings

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

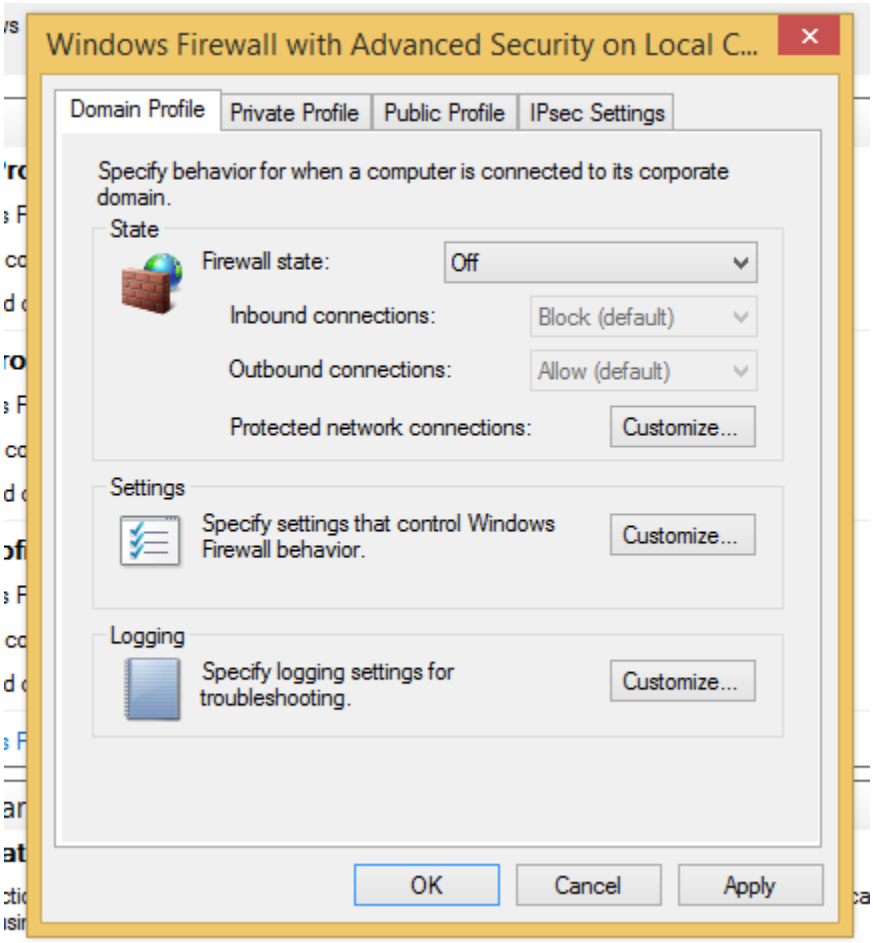


Figure 18 - FMS Firewall Settings

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

3.7 Driver Station and Robot Configuration

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

4 Setting Up Your Event

- In Step 3 of the event wizard create a new Off-Season event. Select the type of alliances you will use at your event (3 team with backup or 4 team) and the number of alliances (4 or 8)
- In Step 4 of the event wizard select the teams participating in the event. Additional teams may be added if necessary. 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 offseason 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 indicator and 0.000 for the BWU value as they are not available.

5 Release Notes

1 June 2015 – Rev0 – Initial Release Off-Season Addendum
5 June 2015 – Rev1 – Naming and convention changes
17 Sep 2015 – Rev2 – Warning messaging