

# BunnyBot 2011 Rules

## Version 2.1

Revised 11/7/11

The BunnyBot Scrimmage is an annual pre-season event designed by Catlin Gabel School Team 1540, the Flaming Chickens. Its purpose is to give new members of FRC teams a chance to get familiar with robot construction before the build season starts. This game is more relaxed than the FRC competitions and all in good fun.

### WHO'S INVITED

Team 1540 hosts a competition for Northwest teams. This is, however, designed to be an easy event to stage so teams in other regions are more than welcome to host one of their own. Let Dale Yocum [dale@yocum.com](mailto:dale@yocum.com) of team 1540 know if you are interested in doing this so we can share logistical details.

### HOW TO SIGN UP

We're requesting a \$75 per robot donation to help cover expenses. We'll wave the fee for teams who can't afford it. To register, send an email to Dale Yocum ([dale@yocum.com](mailto:dale@yocum.com)) to reserve your space indicating how many robots you'll be bringing and your team number. Space is limited so it's first come first served. Your space is not held until registration fees have been received or waved. You can see if you are signed up at <http://www.catlin.edu/bunnybots>.

Send registration fees, payable to Catlin Gabel, to:

Dale Yocum  
Catlin Gabel School  
8825 SW Barnes Rd.  
Portland, OR 97225

## THE GAME

As you'll see on Fig. 1 on page 4, two robots form an alliance on a full size 27' x 54' field (a change from the half size fields of previous BunnyBot competitions.) The field surface is standard industrial carpet identical to that used at FIRST competitions. The object of the game is for an alliance to collect more bunnies than their opponents while avoiding being tagged by Nerf darts.

## BUNNIES

There are twenty Bunnies on the field at the beginning of the match as shown in Fig 1. The Bunnies are stuffed animals 6-10" high with a rough diameter of 4-8". Robots intending to score with these should be able to handle a wide range of stuffed animals. Each Bunny is worth **three points** if it's in a particular alliance's half of the field at the end of the match. If it is breaking the plane of the middle field divider or touching the floor beyond the 4x4 field boundaries it is not counted for either alliance. The bunny can be in possession of either alliance's robot, inside or on top of a field structure such as the islands. If a bunny is in motion (but not being propelled by a robot) when the game buzzer sounds referees will wait for it to come to rest before determining it's scoring. Except for possession rules, it doesn't matter how the bunny was transported...it's the position of the bunny at the end of the match that matters.

## DARTS

Each robot can optionally have a single modified Nerf Swarmfire gun attached [http://www.amazon.com/Nerf-28509-Dart-Tag-Swarmfire/dp/B0043E8JKW/ref=sr\\_1\\_1?ie=UTF8&qid=1310956627&sr=8-1](http://www.amazon.com/Nerf-28509-Dart-Tag-Swarmfire/dp/B0043E8JKW/ref=sr_1_1?ie=UTF8&qid=1310956627&sr=8-1) . If a dart from one of these guns mounted on a robot tags another robot, **one point** is subtracted from the tagged alliance's score by the referees. We don't provide the Swarmfire guns because they may be modified by teams.

There two referees are assigned to each side of the field. When s/he notices a robot hit by a dart, they will press a button that increments a hit display on the tagged alliance's table (visible to the firing alliance.) The display background will flash for one second after the hit is recorded. During that time, no more hits are recorded on that entire alliance. Once the display stops flashing, the alliance is once again subject to being tagged.

Dart hits can come from an opposing robot, friendly fire from the other robot on the same alliance, or from the robot itself through a ricochet. It doesn't matter the source of the dart. If a dart hits the robot, and the tagged alliance is not already within one second of a previous hit, one point is deducted from that alliance's score. Firing at close range is a risky proposition because of ricochets.

Darts become dead once they hit the carpet and no longer count. Darts that bounce off or fall off of other objects like islands or other robots before hitting the carpet are still alive and count as a tag if they hit a robot.

This is a human scoring system and subject to all the usual errors associated with mere mortal referees. Just go with. The referees won't consider objections about the validity of a dart tag. The dart score is what the refs say it is in real time unless they note an error they made. By watching their opposing alliances hit display an alliance can see if the ref's noticed a hit. If they didn't, shoot 'em again. Note that it will be especially difficult for the referees to see dart tags that occur between the two islands. That's part of the game.

It's possible during the course of the game for an alliance to accumulate so many dart tags and lose so many bunnies that their score goes negative. When the score is tallied up at the end of the match, though, the final score for the alliance will not go below zero.

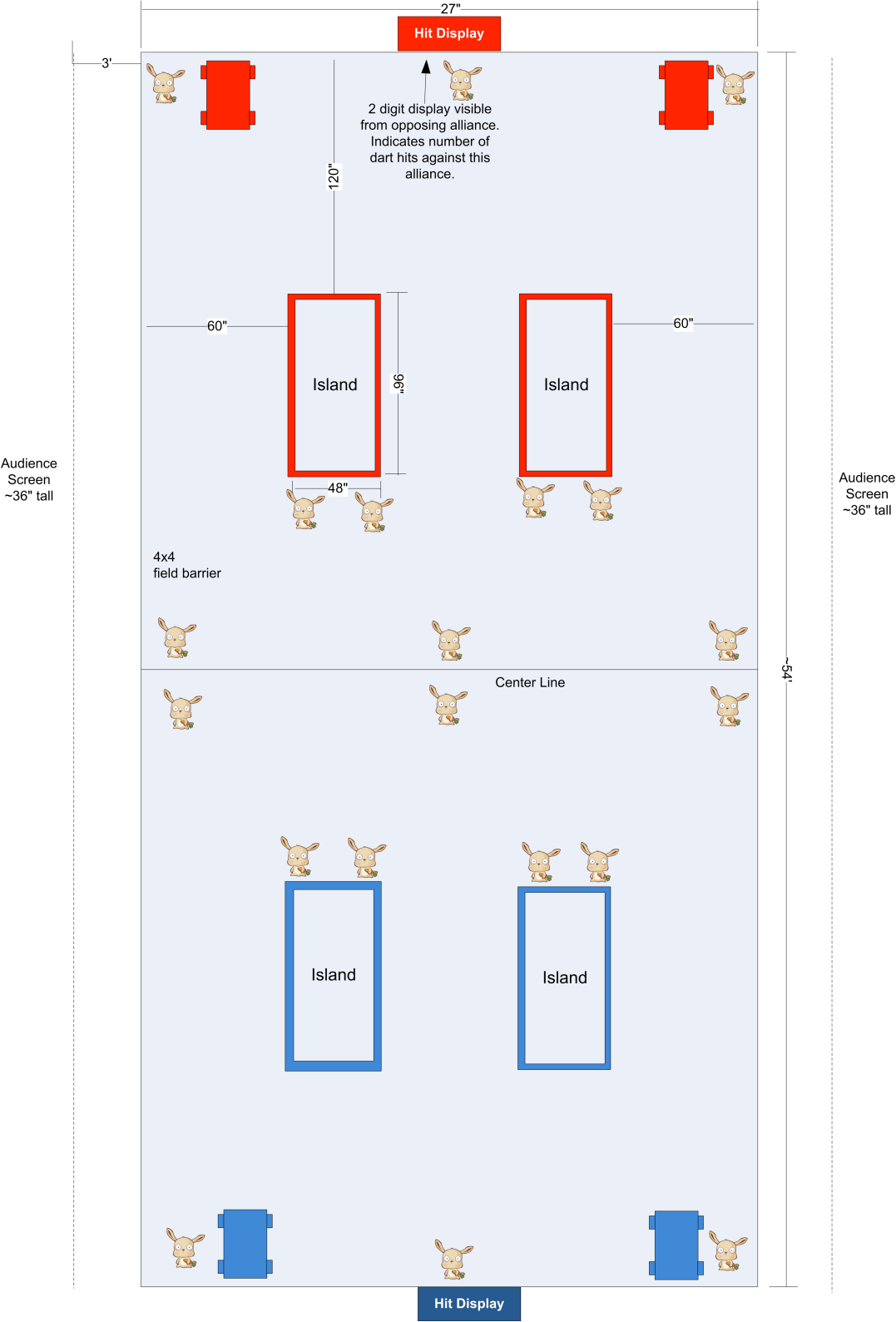
### **ISLANDS**

The islands on the field are 48"W x 96"L x 24"H square boxes made of ½" plywood and internal 2x4s and 4x4s for support. They are open on the top and solid on the bottom and are not designed to be moved. A bunny inside (or balanced on top) one of these islands counts just as much as one on carpet surface but, of course, it's much harder for an opposing alliance to steal. Robots may not intentionally move the islands.

### **ROBOT STARTING LOCATIONS**

Robots may start the match anywhere they like as long as some portion of the robot is touching the 4x4 wall nearest their operators.

FIELD DIAGRAM, FIGURE 1



## PENALTIES AND DISQUALIFICATIONS

1. A 10 point penalty is assessed for a robot that goes out of bounds (over the 4x4s). You are considered out of bounds if any portion of your robot touches the floor beyond the 4x4s. Once a robot is out of bounds, it is disabled, manually returned to the playing field, and re-enabled. Wise robot designers will make sure some portion of the robot or bumper contacts the 4x4s before its wheels do.
2. A 10 point penalty will be assessed for each dart that goes into the audience area. The audience will be behind a 36" high screen that is approximately three feet past the 4x4 field barrier. Teams should build safeguards into their robot design to insure darts will never go into this area. Robot inspectors will focus extensive attention on this area of robot design before the game starts. Be prepared to describe to the inspector how you are sure the darts will not enter the audience area.
3. Possession. A five point penalty will be assessed if a robot is in possession of more than one bunny. If the team doesn't focus its efforts on rectifying that situation, the referee may assess additional five point penalties until it does. **Teams shall never benefit from possessing multiple bunnies and will be penalized as needed to make sure that isn't a useful strategy.**

Possession is defined as holding a bunny in such a way that if the robot moves forward backward left or right the bunny will go with it. A simple bulldozer therefore is never in possession of the bunnies since if they were to back up, the bunnies would be left behind. **If multiple bunnies are being elevated by a robot it is inviting close attention from the referees and quite possibly a possession penalty. This is because there is likely a split second when the bunnies are supported in such a way that they would move in all four directions with the robot.**

4. Robots may not intentionally try to move the islands. Robots doing so will be disqualified.
5. BunnyBots is a contact sport and robots should be built to withstand significant pushing and shoving. A ten point penalty will be assessed for intentionally ramming another robot at high speed, however.
6. Teams may not intentionally damage another robot or engage in unsportsmanlike behavior. Penalties for this kind of thing are up the referees and can range from a warning to point penalties to disqualification.
7. Teams should keep in mind that spectators will be standing close of the field. Robots employing strategies that might harm people will be disqualified.

8. Robots may not pin other robots for more than five seconds. An alliance may not pin an opponent robot that is in contact with a field border or island for more than 5 seconds. A robot will be considered pinned until the robots have separated by at least 6 feet. The pinning robots must then wait for at least 3 seconds before attempting to pin the same ROBOT again. Violation: 10 points.

## RANDOM GAME DETAILS

1. The only state that matters is the condition of the field at the end of the match. For example, it's quite possible that a bunny might start out being completely on one side of the field but over the course of the match ends up getting knocked in such a way as to be partially out of bounds and hence no longer valid. That end state is what matters, not the fact that it used to be okay.
2. Any team can play with any scoring object on the field, including opposing alliance bunnies. It's expected that robots will steal bunnies from the opposing alliance.
3. Matches are 2.5 minutes long. There is no autonomous mode and no separate end game.

## QUEUES

Robots will fill positions on the field in more or less in the order they have registered at the game master desk. Teams may only add themselves to the queue or remove themselves from the queue because they aren't ready (and then add themselves to the end when they are). A computer will assign robots from the highest robots in the queue to alliances taking into account their qualification points (described later), frequency of playing with particular robots, etc. It will try to avoid situations where the same robots are playing with and against the same teams time after time and seek to create balanced matches. **Robots returning from matches will be inserted in the queue based on their playing history in an effort to give every team equal playing time and the opportunity to play with different teams. As a result, returning robots won't always be placed at the bottom of the queue.**

**REMOVED: The option to move your team in the queue twice during the game. This has been replaced with smarter software that attempts to balance and randomize the matches.**

If a robot isn't ready when called, that spot will go to another robot in the queue and your robot will be removed from the queue. It is therefore in a team's best interest to have a reliable robot so you are never displaced from your position in the queue. The more matches you play, the higher your potential score. You are on your honor that when your robot is placed on the field, you have every reason to think it works! We won't intentionally run matches with dead robots ... those will be swapped out for the next robot in the queue.

Each robot will have a pit area in the adjacent covered tennis court next to the arena. We will have an on-deck waiting area and an area where robots ready to play can wait until they are on-deck. You must be ready to go when you are called or you'll forfeit your place in the queue.

The field staff has the option to play one on one matches if there are no other robots ready to play.

## **QUALIFICATION POINTS AND FINAL MATCHES**

After playing a match teams earn qualifications points using the formulas below.

Winner Qualification Points =  $W + L/2$

Loser Qualification Points =  $L$

Tie Qualification Points =  $W$

Where  $W$  is the winner's score (or either robot's score in a tie),  $L$  is the loser's score. Neither  $L$  nor  $W$  is allowed to go negative.

At 3:30pm or as soon as the current match is concluded, the two robots with the highest accumulated qualification points become the alliance captains for the finale. They chose **two robots** each to play with them in the final matches in **FRC alliance selection fashion**. The team with the most qualification points picks first. The highest ranked team cannot pick the second highest ranked team to be their alliance partner. Those alliances **of three** play best two out of three matches. If a robot becomes disabled, the remaining teams can chose a replacement from the robots remaining to join their alliance.

## ROBOT RULES

All FRC robot rules (that aren't game specific) from 2011 apply

(<http://usfirst.org/roboticsprograms/frc/content.aspx?id=452>) with the following modifications:

- 1) Since the whole point of BunnyBots is to get new team members up to speed, robots should be built from scratch for the event, just like FRC. You can't use last year's FRC robot or Bunnybot with a few tweaks.
- 2) No more than four motors are allowed for propulsion of the robot. This is to keep the robots simple and avoids an undo advantage to veteran teams with their six motor shifting flux capacitor enhanced swerve drives.
- 3) Only one Nerf Swarmfire gun may be attached to the robot. No other model gun made by Nerf or its commercial competitors may be used.
- 4) Teams can build their own mechanism for shooting darts.
- 5) Teams may not design an automated system to reload their robot. Darts may only be reloaded by humans before the match begins.
- 6) No more than 20 darts can be onboard the robot at the beginning of the match.
- 7) The dart shooting mechanism (Swarmfire or otherwise) must be designed in such a way that the darts will never hit the audience. Note, there is a ten point penalty per dart if this happens.
- 8) Teams can modify the Nerf Swarmfire as they see fit.
- 9) The Swarmfire may be run off of 12v for this competition. Running the 9v Swarmfire off of 12v may decrease its lifespan so teams do so at their own risk. A speed controller would be one way of reducing the average current to the Swarmfire. (FYI: Many folks in the Nerf community run Swarmfires off of 15v batteries.) The voltage increase does not increase the distance the darts travel, just the rate of fire.
- 10) Only orange Nerf Dart Tag darts may be used such as [http://www.amazon.com/Nerf-Mega-Dart-Refill-36pk/dp/B002GPYHB0/ref=sr\\_1\\_12?s=toys-and-games&ie=UTF8&qid=1311015806&sr=1-12](http://www.amazon.com/Nerf-Mega-Dart-Refill-36pk/dp/B002GPYHB0/ref=sr_1_12?s=toys-and-games&ie=UTF8&qid=1311015806&sr=1-12). Beware ... there are many other styles of Nerf Darts, only the Orange Nerf Dart Tag darts are allowed at competition. These are the same darts that come with the Swarmfire. They may have orange heads or blue heads. Each team must bring at least 50 of these darts to the competition (and more is better). You will not get your own darts back at the end of each round as they will all go into one recycle box. You'll need at least two loads of darts available so you can reload the robot while the previous match's darts are being recovered. This is another reason all teams need to use the exact same darts. Expect to lose some darts or see them mangled over the course of the competition. When the competition is over we'll do our best to send each team home with what roughly what they came with. Make note of your dart count when you come.
- 11) Under no circumstances may the darts themselves be modified.
- 12) There are no limits to the number of non-drive system motors on a robot but they must have been legal in FRC sometime over the last five years. In addition you may use any motor currently being sold by BaneBots or AndyMark as well as the motor inside the Swarmfire.



- 13) No bumpers are required though they may be used if desired. If used, bumpers must be constructed according to 2011 robot rules R 4.3.2  
[http://www.usfirst.org/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2011\\_Assets/04%20-%20The%20Robot\\_RevL.pdf](http://www.usfirst.org/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2011_Assets/04%20-%20The%20Robot_RevL.pdf). The bottom of the bumpers must be at least 2.5" off the ground and the top no more than 8.5" off the ground. There is no requirement about how much of the perimeter of the robot you protect with bumpers, just that if you use them they be mounted at this height and constructed in the normal FRC fashion.
- 14) Robots in their starting configuration without their optional bumpers must fit within a rectangle of 28"x38" with a maximum height of 60". Once started, they may extend outside of those dimensions as much as they'd like.
- 15) Robots may not intentionally detach pieces of themselves. Accidentally having parts fall off is fine.
- 16) The maximum weight of a robot, without its battery is 120 lbs, excluding bumpers if used .
- 17) *FIRST electrical rules don't apply. This allows you to use any control system you like, the cRIO controller, 2008 and earlier controllers, vex controllers, RC controllers, etc. Use common sense and follow FIRST wiring guidelines when possible. Make sure your radio system doesn't interfere with FRC radios if you are using something different.*
- 18) Do not use anything that relies on normal WiFi 802.11B/G as experience has shown that to be unreliable. If you are using the 2011 FRC control system be sure you are using the 5GHz WiFi band because radio interference in the 2.4GHz band makes for very unreliable driving. Note, the standard Classmate laptop does NOT support the 5GHz band. Either use the router from 2009, a laptop that has dual band N wireless, or a separate dual band N network adapter. The TRENDnet TEW-684UB is one option for a dual-band N network adapter that has worked in testing. **Note that all of this must be battery powered; there is no AC at the driver's stations. This is so teams can sync their robots and laptops while in queue dramatically speeding up matches.**
- 19) **There is no limit to the equipment used in the driver's station though it must all be battery powered and quick to set up. In particular teams may want to use a stopwatch or smartphone to time their match as there is no centrally visible timer.**
- 20) There is no cost accounting for BunnyBots but common sense would say you don't want to spend too much money for BunnyBot parts you can't use again.
- 21) Any part that was legal for any previous FRC competition may be used.
- 22) Vex and FTC parts are allowed.
- 23) There is no requirement that parts used on your BunnyBot be available off the shelf. This allows you to use random parts you might have lying around the shop or that have been removed from other devices. The idea is for people to not spend too much money on this.
- 24) Batteries must have been FRC legal over the last 5 years. Only one battery can be on your robot at a time.
- 25) Each robot must have a place for an alliance flag to be easily inserted and removed. The flag holder should be roughly equivalent to the old FIRST design (12" ½ diameter Schedule 40 PVC

pipe capped at the end). The flag shaft will be approximately 5/16" in diameter. Dart hits to the flag or staff do not count.

- 26) Robots need team numbers. Each Robot must display the team number in 4" high or higher characters of a contrasting color on at least 2 opposing sides, four sides are preferable. Since bumpers aren't required the team number doesn't have to be on the bumpers. The robot will be announced in the form "Team 1234" by the announcer. If the robot has a name that may be announced as well if it's on the robot. If a given FRC team has more than one BunnyBot, they should be labeled 1234A (Alpha), 1234B (Bravo), 1234C (Charlie), etc. Including your school(s) name and sponsors on the robot would be good marketing but is not absolutely required. Colors and other graphics are up to you. The scoring system will be expecting the A, B, C suffix for teams with multiple robots so don't get creative with the numbering. Save the creativity for the name of your robot.

## THE VENUE

The remaining information applies only to the Oregon BunnyBot Competition. Competitions held elsewhere will have their own information here.

BunnyBots is played in covered Tennis Court 1 at Catlin Gabel School next to the Gym. Map and directions are at <http://www.catlin.edu/about/campus/map-and-directions> . Park in the main lot when not dropping off equipment in the circle by the Tennis Courts. The pit area will be in covered Tennis Court 2 next door.

The field will open for teams to practice at 10:00am Saturday, Dec 17th. The doors open at 9:00am for field setup and robot unloading. Teams are free to come anytime between 9:00am and 10:30am. We'll start the actual matches at 11:00am. We'll conclude around 4:00pm. Teams should bring their own lunches or they can buy pizza by the slice on site. There is no off-campus food to speak of within quick walking distance but there is a QFC Supermarket, Starbucks, and a Subway about a mile east on Barnes Road. We typically play through lunch to maximize playing time so taking lunch in shifts is advised.

There will be no AC at the driver's stations. Whatever driver's station solution you choose must be battery powered as must the laptop. This is to ensure that every robot can be turned on and synced with its driver's station while in queue speeding up the matches dramatically. Teams with laptops with poor batteries, or those using routers as their driver's station radios, may want to invest in an inexpensive inverter driven by a robot battery. A pre-made example is at <http://www.andymark.com/product-p/am-0626.htm> but you can wire your own from something like [http://www.amazon.com/Power-Bright-PW200-12-Inverter-Watt/dp/B000NP30HC/ref=sr\\_1\\_20?ie=UTF8&qid=1320689350&sr=8-20](http://www.amazon.com/Power-Bright-PW200-12-Inverter-Watt/dp/B000NP30HC/ref=sr_1_20?ie=UTF8&qid=1320689350&sr=8-20)

Teams can bring whatever tools and parts they like but they must take care not to damage the surface of the courts. Bring a tarp to put down in your pit area.

Historically we run out of battery power before we run out of fun. Bring as many charged batteries as you can. The rounds go quickly and the batteries sometimes don't have much time to recharge. If you are a new team, consider borrowing batteries and chargers from a team who isn't taking part or buy extras from AndyMark. The batteries do wear out after a few years so test them before putting them on the field. Bring as many 6 amp or lower battery chargers as you can to the event.

Each team should bring a 8.5" x 11" cardstock with their team number printed on it in **portrait orientation**. That team number should be at least 4" tall. This is used in lieu of spiffy electronic displays you'd find at a FIRST event and helps the announcer and spectators tell who's controlling what robot. There will be a place to put that card when the team comes to the driver's table. The card could also have the robot name on it if desired.

Bring a 100' of extension cord and a powerstrip. Power all comes from one place.

You will need to bring whatever remote control hardware you need. There is no field control system. Teams using the cRIO will need to operate in the 5Ghz "N" band using either a laptop with dual band N capability, the Linksys router used in 2009, or an aftermarket dual N network adapter plugged into a laptop (like the Classmate) without dual-band N. DO NOT expect to use a laptop with wireless G only as the interference will be extreme and your connection unreliable. The Classmate does not have dual band N capability. The router from 2010 is not a dual band N router, just N in the 2.4 Ghz band. It may be reliable or it may not. We have been using the TRENDnet TEW-684UB dual band N network adapter with good results ([http://www.amazon.com/TRENDnet-Wireless-Adapter-TEW-684UB-Black/dp/B004ZEZC0U/ref%3dsr\\_1\\_1?ie=UTF8&qid=1318121725&sr=8-1](http://www.amazon.com/TRENDnet-Wireless-Adapter-TEW-684UB-Black/dp/B004ZEZC0U/ref%3dsr_1_1?ie=UTF8&qid=1318121725&sr=8-1)) **Remember, there is no AC at the drivers stations so everything must be battery powered and be able to be powered up while in queue to sync the radios before entering the field.**

Bring some signage to identify your team's pit area. This doesn't need to be fancy but should be something that's able to support itself that indicates your team number and name to help other teams, queue staff, and refs find you.

No tables or chairs are provided in the pit areas. If you want either, bring them yourself.

Spectators should bring their own folding chairs for the field. There are no bleachers in these tennis courts. Unlike previous years there will be dense 36" high netting around the course to protect the audience from Nerf darts. That means sitting on the floor will be less satisfying.

The pit area size will be 10'x10'.

You'll want to bring your robot cart as the pit areas aren't in the same building as they were in previous years.

Catlin Gabel's robotics lab is nearby and is available to teams with major machining needs. That means you don't need to bring large power tools. Bringing a hand power drill is always a good idea, though.