

Bag and Tag Tips

Updated for 2012

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Bag and Tag events provide a new twist to the FRC experience by allowing individual teams to manage the quarantine and transport of their robots. While the bagged robot stays in the possession of the team there is still significant, albeit different, preparation that the team should conduct. During that last three years since Bag and Tag was reintroduced we have collected a number of practices that help avoid common problems and would like to share them.

DISCLAIMER: Nov. 26, 2011-Please note that this is not official information, and you should check the updated 2012 Administrative Manual for specifics from FRC.

Before Build Season

- Review Section 5 of the Administrative Manual for specifics regarding shipping the robot.
- Consider the order of your event and when you will have to bag and/or crate the robot. Make sure the entire team understands this order of events. Use the guidelines provided in [Bill's Blog](#) until the official rules come out. See *Appendix 2012: All US/Canadian events are B&T, except for CMP.*
- Determine if your Bag and Tag Competition events allow for unbag time. Be sure that the entire team understands your specific situation.
- Determine how your team will transport the robot for your Bag and Tag event. Options to consider include:
 - Use a team member's van or pick-up truck. *Be sure to allow for less than perfect weather conditions and be aware of potential wind damage to the bag if transporting in an open bed pickup.*
 - See if another team in your area is going to the same event and will allow you to transport with them.

- Rent a van, truck or trailer. *Consider splitting the cost with another team.*
- Contact Regional Director for assistance.
<http://www.usfirst.org/regionalcontact.aspx>

During Build Season, but Prior to Bagging

- Take more photos of the robot than seems reasonable. Make sure every element of the robot is photographed from at least two angles. If you can fit a tape measure in the shot it is even better. *These are to refer to during any additional work while the robot is bagged.*
- Have an established place to put your paperwork. Use a clear sleeve attached to the tag, outside the bag so inspectors can review it before the bag is opened.
- How will you lift the robot in the bag? Are there features on the robot that are large enough to grab through the bag? Does the robot need to go on a stand/fixture with handles to make this easier and/or safer?
- Determine if your events allow a 'Robot Access Period'. Not all events do and this may affect what you want to withhold. **2012:** Only MI and MAR events are two day events this year, so only teams attending those events get the 'Robot Access Period'.
- Make a checklist of all items to be removed from the robot as a part of your withholding allowance.
- Identify a person to sign off the Lock-Up form. This person needs to be 18 years or older and not a student member of the team. Make sure they will be available when you need to bag/unbag.

During Bagging

- Remove the battery prior to bagging. *The robot is heavy enough without it and it is easier to take a charged battery to events if it is not sealed in the bag.*
- Remove the bumpers from the robot prior to bagging. *If the bumpers are still on it becomes difficult to navigate doorways.* **2012:** Teams may now bag their bumpers separately from their main robot. See Section 5.5, item #2.

- Before sealing the bag check for any loose parts or tools that should not be sealed with the robot. *Loose items can damage robot components or wiring while being moved.*
- Remove any hold back items that you might want to work on. Have a checklist for these items so that nothing (like a cRio) is forgotten. *Rules permitting.*
- Put your completed paperwork in the location defined above.

While Bagged

- Lift by the robot - not the bag
- Consider how you will crate a bagged robot if you are mixing Bag & Tag with traditional events. See Appendix for event logistics details.
- Do not consider the bag to be environmental protection for the robot (e.g. rain protection). Robots have many pointy features to them that can easily puncture the bag. Basic handling will also do this eventually.

While Unbagging

- Find a Robot Inspector to sign open your bag before you break the tag.
- Don't tear the bag open! Take the robot out of the bag with as much care as when you put it in. *If you have to pull on the bag because it is caught remember, you're probably trying to pull a part off you robot.*
- Fold up the bag and put it away nicely; you're probably going to need it at the end of your event.

Robot Access Period

NOTE Only Michigan and Mid-Atlantic Region District Events have Shop Unbag Time in **2012**.

For the 2009 FRC season, the Michigan Pilot program re-instituted the Bag & Tag from the early days of FRC. In order to allow teams the equivalent time that Traditional FRC teams had for improvements on Thursday, Michigan Teams were allowed 8 hrs of "un bag" time during the week of a 2-day event. At that time, no limit was put on how the time was to be handled, and many strategies

were used. In 2010 the 2-day events were expanded beyond Michigan, but the overall time was reduced to 6 hours, and sessions were a minimum of 2 hours. This effectively limits out of bag usage to a maximum of 3 2-hour sessions. In order to get the most effective use of this time, teams should plan out the time and be prepared. See the 2011 Game Manual to determine the scheduling limits for the Robot Access Period.

When planning out strategic usage of the Bag & Tag time, plan for both the best and the worst-case scenarios. Brainstorm the goals and responsibilities and then prioritize these goals relative to the time at hand. In order to demonstrate this principle, I will walk a team through some possible improvements.

Situation:

Team 5555 had assembled a kit bot chassis with KOP wheels. They just managed to finish their bot and had very little time to test it, but they do know that it controls worked, and it did drive. Pushing is likely to be important this year, and the team ordered some High traction and Omni wheels for the robot, but they didn't come in until a day after the FRC build deadline. They would also like to test some Autonomous Code for their robot, and the drivers really need some practice. What should they do? With this particular team, the programmer is just a programmer.

Goals:

- Practice for drivers
- Autonomous code development
- Swap all 4 robot wheels

Assets:

- Tools
- 6 hrs of unbag time
- People
- Carpeted area to test robot

I will compare 3 different good strategies and then discuss the results. Without a strategy at all, the unbag time will fly by and your team will miss out on a lot of opportunities for improvement.

Strategy 1:

This strategy is all or nothing. The team agrees that they are going to use the entire time in 1 block. They all schedule 4pm to 10pm on a Wednesday to do this. The team shows up at 4pm, unbags the robot, and then discusses what to do first. After 15 minutes of discussion, they agree to swap the wheels, let the drivers practice, then work on Auto-code. The mechanical team gets their tools and begins to take the wheels off. Once the KOP wheels come off, they put on the new Traction and Omni wheels. These wheels are not the same width, so the team looks for some spacer material, and then measures and makes new spacers. The new wheels now fit, and they are only 2.5 hours into their session. It is 6:30, so the team stops for a Pizza break that includes 30 minutes of chit-chat. At 7:00pm the Drive team practices. They don't have a full field, so they head to the cafeteria and move a bunch of tables out of the way. They practice driving around stuff until the battery is dead. A team member heads back to the room to get a fresh battery. They then put a different battery in and practice some more. They continue until they have run down all 4 batteries. This takes about another 1.5 hours, and is now 8:30 pm. Everyone agrees then that the programmer can now test autonomous. The programmer then downloads the code, and presses go, and the robot does nothing. The programmer then spends 20 minutes digging through code to find an error that kept auto from running. Downloads the fresh code, and tires again at 9pm. This time, the robot starts buzzing, but still doesn't do anything. The programmer knows that the gains are too low for the motor controllers. They adjust the gains and download code again. This requires another 15 minutes, and now the robot goes too fast and overshoots all its points, and turns the wrong direction. The programmer adjusts the code again, but now the battery voltage is really low on the battery, and all the others are dead. There is still 30 minutes of unbag time left, but a dead battery cannot be used for auto-tuning or practice.

Overall, a lot of good was accomplished, but there are significant areas for improvement.

Outcomes:

- Wheels swapped
- 1.5 hours of driving on non-representative floor/field
- 3 iterations of auto-code (last iteration may or may not be right)
- -1 hour downtime at the end, and pizza time.

Strategy 2:

The team discusses ahead of time what needs to be done. Because they do not have a full practice field, and another team said they could use theirs, they decide to do 2 sessions. Session 1 will be swapping the wheels and testing Auto-code and will re-bag at 2 hours if possible. Session 2 will consist of practice at an associated field and further auto-code development. During the discussion, they plan out the wheels swap and realize they may need new spacers. They make a list of tools they will likely need. They all agree that they session will be on Tuesday. It will start at 4pm with pizza and getting the tools ready. They are hoping for a 2-hour out of bag time, and have agreed that it

will not go longer than 4 hours. Everyone sets aside a window of time from 4pm - 9pm. From 4-5pm, the team eats, discusses the goals, and preps the tools and materials. At 5 pm they unbag. As soon as the first wheel is off, one team member measures it relative to the others and begins making new spacers. The wheel swap takes 1.5 hours. During the last 30 minutes, the programmer tries the auto-code, and the robot doesn't respond. The programmer finds the error, and puts the new code in, but the gains are too low. It is now 5 minutes until the 2 hours are up, and the team decides to bag up the robot.

Wednesday, they pack up the robot and head to the other facility. They worked out a deal with the other team to be able to practice from 4:30-8:30 perfect for the 4-hour window). They unbag and 30 minutes into practice, they get in a pushing match with their friends a jump a chain. Better here than a regional, but they find they lost their master link, and the other team uses a different size of chain. Their mentor ran back to the shop and got the master link and chain tools. Unfortunately it was 30 minutes away, so the team lost about 1.5 getting the robot back to functioning. The drive team then practices driving for another hour and then turns it over to the programmer. During that last hour, the programmer is able to work through 4 iterations of auto-code. Since the initial bug was fixed, all iterations were productive steps in the right direction. With the 5 total iterations, the robot does basically what they want it to do.

Even with the 1.5 hours of down-time, this was an improvement over Strategy 1.

Outcomes:

- Wheels swapped
- 1 hour of practice on representative floor/field
- 5 iterations of auto-code (last iteration getting close to "good")
- 1 Failure found
- -1 hr down-time waiting on travel for master link.

Strategy 3:

Strategy 3 is the same as strategy 2, but with a few improvements. The team decides that they will do 2 sessions and make sure the robot is ready before heading over to the practice field. Also, before swapping the wheels, the team tests the auto-code to find it is non-functional. This allows the programmer to fix this problem while the others are working. This additional time up front means that the team finishes the wheel swap just a few minutes before the 2-hour mark. Instead of bagging it up though, they test the second iteration of code, and then let the drive team drive around a bit while the programmer adjusts the code. They then download and repeat for the next 1 hour, and they bag up the robot at the 3-hour mark. Afterward, they discuss the results, pack up the necessary tools, and material just like going to a competition in order to be ready for practice at the other facility. At the other facility, they agree to test the auto-code, and then drive around for 1 whole battery (about 5-10 minutes). During this time, they jump the chain, but now it is a 30-minute fix. After that, they begin practicing in 2-minute sessions. When new autocode is available, they download and try it at the start. When it is not available, they try different starting position and practice 2-minute drills. Due to

the number of 2-minute practice cycles, the team has also gotten some good experience learning what kind of scores they might expect to see.

Outcomes:

- Wheels swapped
- 1 hour of practice on non-representative floor/field
- 2 hours practice on representative field
- Multiple starting positions experienced
- 10+ iterations of auto-code (last iteration validated "good" repeatable code)
- 1 Failure found
- Some strategy practice/development.

Conclusions:

All three of these strategies had positive results, but with a little extra planning and foresight, the 3rd strategy yielded much better results.

The keys are:

- Decide what you want to do ahead of time
- Prepare before unbagging
- Find strategic use of otherwise downtime (apply decals, measure unknown parts, tune manipulators...)

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Appendix

Bagging vs. Crating Guidelines provided in Bill's Blog 9/28/2010 -

<http://frcdirector.blogspot.com/2010/09/things-you-should-know-before-you.html>

1st Event	2nd Event	Expected process	Implications for choosing your second play
Traditional	Traditional	<ul style="list-style-type: none"> • Crate and ship your robot on robot ship day. • Your robot is delivered to and from traditional events the way robot crates have always traveled. • If your team earns a berth at Championship the same rules will apply this year that applied last year regarding transportation to and from Championship 	As always, try to avoid back to back events. Back to back events will require special arrangements with Shepard Exposition Services and extra shipping expense for your team.
Bag & Tag	Bag & Tag	<ul style="list-style-type: none"> • Seal your robot in the bag on robot ship day as directed in the Game Manual. • Make your own arrangements to get your robot in the bag to and from both Bag & Tag events. You may not ship your robot directly to the venue (not even at your own expense). • If your team earns a berth at Championship while at a Bag & Tag event, present yourself to the Event Manager to receive shipping documents. You will have until the Tuesday after your final event to pack your robot in a crate and get it into the FedEx system. (You might want to have a crate on standby.) 	When choosing Bag & Tag events, don't forget you'll be bringing your robot with you. Consider travel time and load in and out when picking.
Traditional	Bag & Tag	<ul style="list-style-type: none"> • Crate and ship your robot on robot ship day. • Your robot is delivered to the traditional event the way robot crates have always traveled. • Before you leave the traditional event, you must bag and tag your robot and have the designated person at the event sign your paperwork. Pack the robot (still in the bag) into your crate for delivery back to your team's workshop location. • Open the crate and make your own arrangements to get your robot (still in its bag) to and from the Bag & Tag event. • If your team earns a berth at Championship while at a Bag & Tag event, present yourself to the Event Manager to receive shipping documents. You will have until the Tuesday after your final event to pack your robot in a crate and get it into the FedEx system. 	If your two events are more than one week apart, everything should work out fine. If your two events are one week apart and practically next door to one another, go ahead and register for both events, we'll work with you to overcome the logistical concerns.
Bag & Tag	Traditional	<ul style="list-style-type: none"> • Seal your robot in the bag on robot ship day as directed in the Game Manual. • Make your own arrangements to get your robot in the bag to and from the Bag & Tag event. You may not ship your robot directly to the venue (not even at your own expense). • Put the robot (still in the bag) into a crate and get it into the FedEx system by the Tuesday after the Bag & Tag event. • Your robot is delivered to and from the traditional event the way robot crates have always traveled. • If your team earns a berth at Championship at either event, the same rules will apply this year that applied last year regarding transportation to and from Championship because you will ship your robot to Championship from your second event in the traditional manner. 	If your two events are more than one week apart everything should work out fine. If your two events are one week apart and practically next door to one another, go ahead and register for both events, we'll work with you to overcome the logistical concerns.