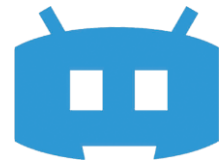


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Part 5: Packing for an Event



Your robot is (hopefully) done and it's time to pack your bags and make your way to the event. While it would be handy, there are quite a few impracticalities to bringing all of your tools and equipment with you. This means you'll need to bring a selection that at least should be enough to get you through the event without spending too much time scrambling for tools and borrowing other teams' gear.

This won't be talking about tools that are particularly specialized. If your machine needs any specific equipment for basic maintenance and repairs, those take priority. The following sections will cover tools that are almost universally useful in the pits during an event.

The Bare Essentials:

This section covers the smaller equipment that should be easily crammed into a relatively small toolbox.

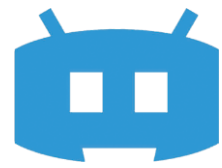
Improvised Repair Kit

At events, sometimes you'll end up with damage that isn't able to be properly repaired with the tools and materials you've got available. Having a selection of the following items can help make the best of a bad situation-

- Hot Glue Gun
- Epoxy
- Super Glue
- Zip Ties
- Duct Tape
- Goop/Shoe Goo/E-6000 silicone adhesive
- Velcro
- Electrical Tape

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Hex Keys



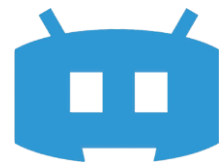
Most robots will have at least a few fasteners in them that need a hex key. Keep a nice set together so you don't spend half your repair time searching for the right sized key. In general the T handle style hex keys are more comfortable to use however it is highly likely that you'll run into situations where you'll need the shorter profile provided by L shaped keys. In addition to this, many commercially available power switches use hex keys for operation. For power switch activation either a T handle or screwdriver style hex key is a good option as they are available in long lengths which keep your hands away from the robot during power up. If possible, add a layer of heat shrink tubing to the majority of the key length to insulate it from the chassis and differentiate it from the rest of your keys. If you're looking for the luxury option when it comes to L shaped hex keys look at the inch and metric Wiha ErgoStar keys. (http://www.wihatools.com/600seri/669Chrom_mm.htm) They're a bit pricy as far as hex keys go, but they're a good quality steel and the case design makes it much easier to remove just the key you want.

Locking Pliers

A good set of locking pliers can be fairly versatile at an event. When paired with a vise or immovable slotted object they can quickly aid in the de-bending of damaged armor. If you strip the head of a screw, a few flats ground into it and you can use these to break it loose. If you're hammering something flat, these move your fingers further from the hammer. For such a basic tool, they're quite versatile and won't take up much space in the toolbox. There are a ton of options on the market to choose from. A traditional curved jaw plier will probably serve you better than a needle nose in most general applications so if you're in a spot where you have to choose one over the other that is where to start.

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Multi Tool



Exactly what you get here depends on the model, but you'll normally get at least a set of needle nose pliers, wire cutters, wire strippers, a knife and a screwdriver. In most tasks it's not as good as the tool it's replicating, however it makes for a compact way of having a spare of each of them. Multitools are rarely the right tool, but are often good enough to get the job done when you don't have the right tool handy.

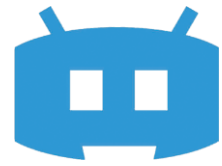
Small Hammer



A small hammer can do quite a lot in a small package. If you can find one, the ideal hammer for this purpose is fairly light, has interchangeable heads (often nylon, brass, or steel) and will normally be less than 12" long. The softer faces on this hammer allow for quite a bit of energy transfer while not doing much if any damage to the surface of the material you're hitting. This is particularly useful when flattening bent armor panels or pounding down gouged areas. If you're searching for one of these online, a search that turns up quite a few results is "interchangeable head hammer".

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Wire Strippers



It's tough to predict when you'll need them, but at some point you'll need a set of wire strippers in the pits at an event. If you don't already have a pair it won't be expensive to get a decent small pair for your toolbox.

Wire Snips



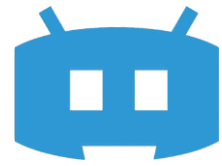
While having wire snips and strippers may seem redundant, often wire strippers have the cutter deep within the jaws of the stripper. The snips are only meant for cutting which means if you need to quickly extract some piece of electronics you won't be stuck trying to cut it out with a knife or awkwardly fumbling with wire strippers. These are also quite handy for quickly removing zip ties if you use them to keep the wiring in your machine in order.

Adjustable Wrench

If you can fit a full wrench set in your box, go for it. If not, an adjustable wrench is almost as good and takes up far less space. Even if you've managed to not use nuts anywhere on your machine, it can still come in handy as an additional de-bending or prying tool.

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Soldering Iron

If you have to do much of any electrical repair at an event, you're almost certainly sunk without one of these.

Rotary Tool

There's a good chance you've got one of these already and you already know how useful they are. The abrasive disks allow for shafts to be quickly cut down, lightening slots to be cut, stripped screws to be slotted, and wedges to be sharpened.

Sliding Clamps



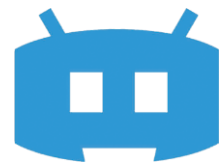
Whether you're using them to hold parts in place while you're de-bending them, using them as a weapon lock on a small robot (do test to make sure it will actually stop the weapon before assuming it's capable) or just using them as an extra hand in the pits these things always come in handy. If you can fit it, pack a few in different sizes.

1/4" Bit Set and Driver

A good bit set will make sure you've almost always got the screwdriver head on hand that you need. If you use the case, you'll have them all relatively neatly organized in one spot so when you need them you won't waste time digging.

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Luxury Items:

If you have more room for tools than just a small toolbox, there are quite a few handy things that you can bring with you. In general, these will allow for faster modifications or repairs during an event.

Cordless Drill

The big use of a cordless drill at an event is removing weight at the last minute. It's almost inevitable that someone will have finished their robot at the last minute and won't have gotten around to checking the weight until the day of the event. Whether it's you or someone else in the position, having a drill handy is a decent method of dealing with the problem.

Cordless Impact Driver

If you manage to make it toward the end of the bracket at an event, time starts getting quite tight. An impact driver combined with a bit set can dramatically speed up the removal and reinstallation of access panels between matches.

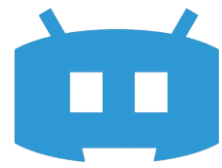
Angle Grinder



If you absolutely need to grind it flat, cut it off, or shave it down now, an angle grinder is the tool to use. You can get a wide range of wheels for them with grinding, cutting or sanding as the primary focus and when used properly it can do the job a rotary tool would do in a fraction of the time, just be careful with where the sparks or dust gets sprayed. Whenever possible, make sure to cover any openings into your machine with tape or similar to reduce the chances of metal shavings getting in and shorting something.

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Large Hammer

As with the angle grinder, a large hammer will often do the same job as the similar small tool but much faster. A large sledge or demolition hammer should be a tool of last resort, but when it is needed to fix the problem, there is no substitute.

Bench-top Shop Tools

Occasionally at an event a team will bring a drill press or other similar shop tool. If you've got the capability to bring one and are willing to allow other teams to use it as well, you'll rarely be alone at an event. Drill presses, bench-top mills and small lathes all allow for a fairly extreme amount of damage to be repaired at an event, often by frantically remaking the damaged part.

Welder

If you've welded a portion of your machine together and you're able to bring your welder, it's worth the hassle. You'll be quickly able to patch up damaged sections or repair broken welds and it can often be the difference between doing the repair correctly and using duct tape.

There are plenty of other tools that you can bring with you, but outside of necessary specialized tools, these are the first ones you should look at bringing to an event. While it's highly difficult to plan for every issue these tools should have you prepared for the majority of situations you'll run into at an event.

There will almost certainly be something that has been left off this list that will be useful to you. As a final step of the packing process you should take the time to walk around your work area and take a look at each of your tools and think about if it could come in handy during the event. If you think you'll need something and you've got the space and weight for it, bring it. Even if you don't end up using it, there's a good chance someone else will need one and your help could be the difference between someone making their next match or having to forfeit.