# FIRST Aid Kit

In effort to pass on MVRT's rich history and sustainability plan, MVRT developed its FIRST Aid Kit. The FRC Manual is designed to provide teams with support in all aspects of the FRC program, covering information from each of our six divisions as well preparing and competing at competitions. We hope that every FRC team can find some piece of useful information from this manual that will help them improve their sustainability and success.

## General Management

### Mentors

Mentors are very important for building a strong base for the team. Although some teams can survive with one main mentor, it is good to have several mentors specializing in different areas to help spread out the work load. Look for mentors in your school, at local community outreach events, or even a parent of a team member. A strong mentor base builds the stability of a team as well as a more widespread foundation of knowledge.

It's important to keep up strong communication with your mentors. As a simple form of communication, we suggest developing a Google Group for all of your mentors and advisors that includes your officer team as well. This allows teams to easily pass information within the leadership in order to keep people updated. Information like FIRST Official Updates and emails should be forwarded within the group along with officer meeting notes and upcoming events and programs.

A good way to scout out new mentors is often through your school itself. We suggest contacting your Industrial Technology, math, and science teachers, especially physics teachers, who may be interested in supporting your team. Emails are a nice way to contact them, but personal invitations to your team meetings and work sessions go a long way in developing a relationship with any mentor. Another source of mentors is often through sponsors or local business contacts. It's often difficult to get full-time professionals to spend a lot of time working on FRC, due to the large time commitment, but invite them to come for a few hours on the weekend. Team members' parents are good people to get involved as well. On the student registration form, be sure to include a space for parents' names, emails, and employer name. This helps the team not only with determining what fields of engineering they may be knowledgeable in but also provide business contacts for grants and other resources in the future. Some grants are only available if an employee volunteers with the team, and many ask how many employees are associated with the team.

Mentors and parents are busy people so you need to ensure you are making the best use of their time. Try to have tasks laid out so the mentors have designated areas that they may supervise. By having mentors continually inspect designs and oversee fabrication and assembly, the team can avoid costly mistakes. The team's overall management cannot be done without their support so be sure to include them on every team decision that needs to be made.

Be sure to be thankful for all the time and effort your mentors put in and respect their commitment as well. Do not expect more than you would expect of yourself and make sure to remind them how much you appreciate their help.

### Recruitment

The more dedicated members you have on your team, the more projects your team can accomplish. Starting teams may be a tough challenge, but once it gets started, it can grow quickly. MVRT started with only 12 founding members on the team. Since then, the team has grown to over 100 members on the team. The team may even start with only one member, but it could grow through word of mouth. Even with a mentor (Usually a Science or Math teacher) the team can start if the

mentor advertises the club in his or her classrooms. When it comes to recruitment, it is important to highlight the excitement of FRC, whether this may be videos of competition or demo-ing a robot.

Some of the recruitment ideas that MVRT has employed in the past have been

- Promotional Video: Videos can be taken from the FIRST website. Informational Meeting/Interest Meeting: The more people know about the team and what it does, the more their interest will spike.
- School Demo
- Fliers
- Talking in classrooms

Recruitment is a big priority for teams because a strong member base will be beneficial for the team.

## Publicity

**Get your team noticed!**
After you get your team on stable ground, try getting the team noticed by the outside community and your fellow robotics teams. Some advantages to getting your team noticed include getting outside support, opportunities for grants, favoritism during competitions, and an overall good image of the team.

**Attend local events**
MVRT goes to local events such as the Fall Festival and local school events to demo our robot and spread the message of FIRST. Email the event coordinator to see if you can get a booth to publicize your team.

**Volunteer at other competitions**
Many FTC and FLL competitions need a lot of volunteers to run smoothly. Email the region's coordinator to see what your team can do to help. This would allow the team to get recognition in many fields. MVRT has volunteered in many events including FLL competitions in the area.

**Demos**
MVRT demos our robot for many different reasons. We spread the message of FIRST, look for potential mentors and sponsors, and support our current sponsors. MVRT holds many demos throughout the year, including at the Tech Museum Robotics Week, the BAE Toys for Tots demo, and demos at the facilities of our sponsors. See what events are going on in your community and find out if a robotics demonstration would be appropriate.

**Help other teams**
MVRT helps mentor and start several teams in the California area. This earns you a lot of references that help you gain credibility. Reach out and email other teams in the area, especially rookie teams, to find out what your team can help with.

# Build

## What it should look like

| Week | What should be completed |
|---|---|
| Week 1 | Ideas/Prototyping |
| Week 2 | Prototyping/design review |
| Week 3 | CAD model/machining/finalize design |
| Week 4 | Assemble/troubleshoot any problems |
| Week 5 | Code/wire/program |
| Week 6 | Driver practice |

Ideally, the team should be working for about 16-20 hours a week; how to distribute that chunk of time will be up to the team and their mentors. Every day, all the different groups should be talking with each other. The space needs to be distributed between the different manipulators as well as the electrical components. When distributing space for electrical components, extra space should be left in between the different parts to make sure each part can be reached

easily once all the manipulators are put on. When designing the manipulators, there will be trade-offs on how much space can be given to each. In addition, you should include the sensors in your manipulator designs to save time in the long run.

**What to do if your team falls behind**
Behind is really defined by the team; however, if the team is lagging by two weeks or more, something should be done to get up to speed. One method is making compromises, such as taking out parts that are more time consuming than they are necessary. In addition to that, build hours should be extended daily so members have more time to work on the robot. If brainstorming for ideas is the reason that the team is behind, just stick to the kitbot; it's relatively easy to assemble so that will play a part in saving time as well.

**Mechanical**
- Keep the design simple
- Try your hardest to do a good 6WD. This will make you stand out from all the other teams. The kitbot is already set up for a 6WD with dropped center wheels.
- Don't go all out on a design, make sure you work towards consistently earning a medium amount of points for your team rather than inconsistently earning a higher amount of points.
- Finish the robot mechanically by week 4. Driver practice is 50% of how well you do at competition.
- **Get help from other teams.** Veteran teams and mentors are the best resource a rookie team has to being successful. Don't be shy because they're always willing to help.
- Mentors, mentors, mentors. A huge part of a rookie team's success is having mentor(s) who are knowledgeable in engineering, knowledgeable in FRC, or both. They will be seen as the authority figures so the team would have a strong leadership. These mentors and help from veteran teams are both very important.
- Use the stuff you get in the kit. You paid for it, and it works.
- Don't burn the team out. Work around 20 hours per week total and extend hours at the end. Be sure people get days off, especially if they are not needed on certain days. For example, a mechanical member can get time off after the robot is built while the electrical member programs the robot.
- Have a working driving base by the end of week 2
- For the first year, try to CAD everything, but ultimately, drawing parts is faster, especially if the part is really simple.

**Build Logs**
Build logs are notes that are taken at the end of every day of build to see how far the team has progressed, problems that the team encountered during the day, and where the team is at in the big picture.

**What needs to be noted**

- Progress on individual projects
- Parts that are needed
- Any issues surrounding personnel
- What is planned for the next day and for the next week
- If some compromises have to be made (This would be up to the officers and the mentors)

**Who should take notes and have access to this?**
Build logs should be written by the lead in charge of engineering and kept within the team, preferably between mentors and officers, because build logs sometimes contain sensitive details that teams don't necessarily want to post on their website. If the team wants to show where they are at to parents, sponsors, or members that regularly read their website, they can consider putting some general progresses and such on a blog or something of that sort on their website.

# Electrical

**Programming**
The first step in choosing which language to program your FRC robot is to find students and mentors with programming experience. If they have extensive experience in one of the languages supported by FRC, then that is probably the best one to choose.

**LabVIEW**
LabVIEW programs are collections of "virtual instruments," or vi's. Each vi consists of a front panel–with switches, knobs, graphs, and indicator lights—and a block diagram consisting of data wires that connect to basic logic elements and other vi's. Data flows into a vi, where it's modified, and flows out again.

- In general, easier to people who have not programmed because it presents the information graphically

| | |
|---|---|
| **Positive** | <ul><li>More user friendly for beginners</li><li>Adding even complex meters and controls to the front panel is easy.</li><li>Easy to debug</li><li>Real-time analysis without re-downloading the code</li><li>Data can be probed while running.</li><li>Example code for the sensors and motors includes wiring diagrams</li><li>Does not require a separate development environment. The vi is the development environment.</li><li>Is inherently multi-tasking. The user does not have to control threads.</li><li>Automatic memory management</li></ul> |
| **Downside** | <ul><li>Slow uploading time to the robot</li><li>Fewer people are familiar with LabVIEW and its dataflow computing than are familiar with C++ or Java.</li></ul> |
| **Resources** | <ul><li>National Instruments' FRC 2011 Training Material and Resources</li><li>Tutorials and videos for students and teachers: FRCMastery</li><li>MVRT Resources</li></ul> |

**C++**
C++ and Java are both derived from C. They are the most commonly used programming languages in the world.

| | |
|---|---|
| **Positive** | <ul><li>Fast uploading time to the robot</li><li>Familiar language to some people</li><li>Easy for experienced programmers to build sophisticated programs</li></ul> |
| **Downside** | <ul><li>The FRC C++ system uses the Eclipse/WindRiver development environment, which is extremely complicated. There is a steep learning curve required just to figure out how to use it.</li><li>Harder to debug</li><li>Hard to get data back in a visual format that is easy to understand</li><li>Debugging requires recompiling the code.</li><li>Multiple threads are controlled by the programmer rather than the system.</li><li>User must manage memory. Easy to have memory leaks.</li></ul> |
| **Resources** | <ul><li>C/C++ Getting Started Guide</li></ul> |

**Java**

| | |
|---|---|
| **Positive** | <ul><li>Fast uploading time to the robot</li><li>Familiar language to many people especially because of Computer Science classes provided in some schools</li><li>Easy for experienced programmers to build sophisticated programs</li><li>Automatic memory management</li></ul> |
| | <ul><li>Harder to debug</li></ul> |

| | |
|---|---|
| **Downside** | • Hard to get data back in a visual format that is easy to understand<br>• Easier to debug than C++<br>• Multiple threads are controlled by the programmer rather than the system. |
| **Resources** | • Getting Started with Java for FRC |

## Python

| | |
|---|---|
| **Positive** | • Familiar language to some people. Widely used in academic & scientific communities<br>• In many ways, it is easier to use than C++ or Java.<br>• Errors do not crash the robot. |
| **Downside** | • Need to write extra code for it because very little pre-written code<br>• Must be familiar with C++ in order to use some features and to modify code<br>• More obstacles to overcome and much more challenging because not an official language of FIRST |

## Other Factors

Consider what languages your team already knows and what computer & mentoring resources are available to you.

- Robot programming is different from other code so regardless of previous knowledge, there will be substantial learning involved.
- All robot programming involves working with hardware: reading sensors and running motors, cameras, & pneumatic solenoids. There is no "pure" programming.

# Parts

## Mechanical

There are FIRST sponsored vendors where you can buy most of the major mechanical components. Andymark is the vendor where you can buy several different types of motors as well as the gearboxes for those motors, but for general parts such a screws, nuts, and bolts you can either go to a local hardware store or you can use Macmaster-Carr where you can get exact dimensions needed for your part and be open to a larger variety of selection. Macmaster is useful for almost all the hardware you will need on your robot. For parts such as motors and gearboxes, remember that FIRST allows you to use only certain brands of motors and sometimes, specific gearboxes. Remember to consult with the rules before buying a specialty part. You can buy pneumatics from Bimba which is another FIRST sponsored company.

Grainger has local stores and a significant online presence. They have a huge selection, but be prepared to spend a fair amount of time at the counter when you order.

Everybody knows about Home Depot, Lowes, and Orchard Supply (OSH). Since the previous version of this document, OSH's hardware selection significantly declined and its prices have significantly increased. Local ACE and True Value hardware stores, by comparison, have become much better. Many of them have a larger selection than the big box stores, and they are better organized. But if you can, make larger orders of screws & nuts from McMaster.

Although we don't use them too much, Fastenal carries a large selection of nuts and bolts. They have stores all over the Bay Area, including San Jose, Fremont, and Palo Alto.

For weird and obscure hardware that you need immediately, Olander Hardware is the place to go. Their prices are high, but if you need something, they are likely to have it. Their address is 144 Commercial Street, Sunnyvale, CA 94086-5298. Commercial Street is off Kifer between Fair Oaks and Lawrence Expressway. The small sign near the side door of the warehouse is easy to miss. Their hours are M–F from 8AM–5PM.

We buy our aluminum and steel from either McMaster or Alan Steel. Alan Steel is has excellent prices and an incredible selection. 505 E Bayshore Rd Redwood City, CA 94063 (650) 369-2526. Hours are Mon-Fri 8 am - 4:30 pm.

We end up buying a lot of Lexan polycarbonate plastic sheeting. TAP Plastics carries an excellent selection, and will cut

sheets to size for no extra cost. Note: acrylic shatters, so you must use polycarbonate. There are retail locations all around, including San Jose and Fremont. They are closed on Sunday.

Port Plastics has lower prices on full sheets of polycarbonate. They also carry plastic tubing and cable management supplies. 550 E. Trimble Road #A, San Jose, CA 95131. As a normal industrial supplier, they are open M F.

## Electrical

AndyMark the company that hosts FIRST Choice, makes gear boxes and wheels for FIRST robots. It also supplies the miscellaneous electronic parts for FRC robots, such as the power distribution board and the digital sidecar. Their customer service is first-rate. If you decide to buy extra parts, however, order them as soon after kickoff as you can. They may run out.

The Jaguar motor controller is found here. In the past, TI has provided a link for FRC teams to buy Jaguars at discount (through Digi-Key). Remember, you need one controller per electric motor. Some teams prefer the simpler (and some say more robust) Victor 884 motor controllers. Many teams have found that each season they burn out at least one motor controller, so it is worthwhile to have a few spares.

Jameco Electronics runs both a mail order and a retail operation. If you're desperate, their retail store is open 8AM-5PM M-F. Their address is Jameco Electronics 1355 Shoreway Road, Belmont, CA 94002.

Fry's has a spotty selection of electronics, so we usually have to try other places for components and connectors. Likewise, RadioShack, but if there's one near you, it's open late, and it just might have that resistor or wire you need.

Anchor Electronics is a small store at 2040 Walsh Ave. in Santa Clara, just west of Scott Blvd. They have a large selection of components, switches, and connectors. Their hours are 7:30AM-4PM M-F & 10AM-3PM on Saturday.

If you like browsing surplus equipment, then HSC Electronics is the place for you. Open 8AM-7PM M-F & 9AM-5PM Sat. 3500 Ryder St. Santa Clara. Note that HSC advertises nationally, so presumably their parts are considered COTS parts.

Even stranger surplus electronics can be found at Weird Stuff Warehouse at 384 West Caribbean Drive in Sunnyvale. Open 9:30AM-6PM M-S & 11AM-6PM Sunday.

For mail order, both Mouser Electronics and Allied Electronics have huge selections and will regularly send you their large print catalogs. They ship promptly. Newark electronics and Arrow are also places to look for that special component. Note that priority shipping can be quite expensive.

Chief Delphi Swap—On the Chief Delphi website, a small button near the top says CD-Swap; click on this to see what equipment various teams are willing to swap.

The wires that go from the digital sidecar to the speed controllers are 3 wire flat cables called PWM cable (or servo wire). Hobby shops that specialize in radio-controlled cars & planes sell them as servo extensions. If you decide to make your own, hobby shops sell servo wire and servo connectors & crimps (get Hitec or universal, not Futaba). You can also get the connectors and pins at Jameco (part# 157383, Connector, 1",1RW,3PIN HSG) for less than the hobby shops sell them. These connectors will also work on miniature pins for connecting extra switches to the Driver Station.

FIRST has relaxed the rules for 2011 and you can now use any servo that does not exceed the power limitations. Our choice has been the Hitec HS-485B. California Hobbies carries them. They are located at 1702 Meridian Ave. Suite I San Jose, CA 95125 (408) 448-1449. Open 7 days a week. It also has a large selection of wires, screws, plastic, and aluminum hobby parts. Another good choice is Aero Micro Located at 2090 Duane Ave Santa Clara, CA 95054 (408) 496-6699. Open Tues. through Sun. Aero Micro specializes in radio controlled airplanes and helicopters, but it does not carry much in the way of general hobby supplies.

The digital sidecars have a more secure connection for PWM cables. If you want to use those, the connector is a Molex 22-01-2037 housing and crimp terminals, also available at Jameco. To connect either type of cables to the metal pins, you'll need a crimping tool, but you don't really need the $300 crimping tool listed for Molex.

An excellent description of how to crimp your own PWM cables is from Hansen Hobbies. They sell the wire, the connectors, and crimping tools.

The Sauro CTF040V8 connectors on the power distribution block and the cRIO are available from AndyMark. They also carry the Wago connectors needed for much of the control system components.

If you use the I2C port, for a Lego NXT compass, just buy the cables. You can get them from Lego or HiTechnic.

## General

We go through hundreds (maybe thousands) of zip ties each season. You will be repeatedly cutting them off & reinstalling them. We usually get them from Fry's Electronics.

We've used CPVC piping for prototyping, etc. It's smaller & lighter than regular PVC pipe, and it doesn't shatter. OSH and Lowe's carry it.

You will need lots of double-stick Velcro, both wide and narrow. OSH, Lowe's, Home Depot, & McMaster carry it. We use it to hold the robot controller, the Speed Controllers, the Spike Relays, and all sorts of other things.

Heat shrink tubing, available at Fry's & elsewhere, is great for insulating wire connections and providing a bit of extra protection. While you can use a miniature butane torch to heat it, a heat gun is a better bet.

Last year we started using red/black zip cord for robot wiring. The wires are bonded together, which makes routing and identification much easier. We also connect the wire to components with Anderson Powerpole connectors. Our source is Powerwerx in southern California. Shipping is prompt and reliable. Note that priority shipping for wire will cost more than the wire itself.

If you decide to use the window motors shipped in the kit of parts, you may want to know about the power plugs that aren't included. They are available at Mouser Electronics. They are Delphi Automotive Connectors: (Mouser part# 829-12129847-B) the Secondary lock (Mouser part# 829-12077904-B) and female crimps (Mouser part# 829-1212943). You need all three parts. Use a standard crimping tool for the crimps.

If you are interested in using Bosch aluminum extrusions, the local supplier is Valin. The local office is 555 E. California Ave. Sunnyvale, CA 94086. (408) 730-9850. For teams interested in using Bosch, we are willing to advise you on ordering a selection of extrusions and connectors to get you started. You can view the online Bosch catalog here. Note that there can be a 2 week lead time for Bosch orders.

You may need a 6 ft. folding table for competitions. Available at Home Depot, Office Depot, etc. You will also need a heavy-duty extension cord (and many people recommend a GFI as well) and at least 3 or 4 plug strips. You'll need them for battery chargers, the laptop, soldering irons, and the Operator Station.

### Batteries
12V battery. The kit-of-parts comes with only one battery. You will need two at an absolute minimum, and three would be better. Note that you must use the battery brand and model specified by FIRST. FIRST allows two different brands of batteries MK ES17-12 12VDC non-spillable lead acid battery, OR one EnerSys NP 18-12 (and only those brands and models). They are available through AndyMark.

Quick release battery connectors. The kit-of-parts provides two pairs of quick release connectors, but you will want to buy more, including one for the battery charger. These are Anderson Power Products SB50 power connectors. Part # 6331G1 from Allied Electronics or Powerwerx. You may also want some spare #6 contacts, part # 903G1. It will require soldering or a heavy-duty crimper.

### Computers
You pretty much have to have a laptop for programming the robot. It's much easier to get the laptop to the robot than getting a huge robot over to a desktop computer.

Note that the CompactRio has a DB9 serial connector on it for console output. If your laptop does not have a serial port, you'll need a USB to serial converter and a serial crossover cable. They're available at Fry's for about $20.

We do most of our testing through the Wi-Fi interface. Even so, you probably want to have at least one longish Cat 5 Ethernet cable for tethered testing.

## Chairman's Award
Chairman's is divided among three components. There is an essay submission, a presentation, and video submission. In order to compete for Chairman's, you are required to submit all three portions. In general, the essay will be due around the time of the Ship date, while the presentation and video need to be prepared by the Regional that you decide to submit Chairman's for. Chairman's can be submitted at only one regional and can be submitted through STIMS account that your team leader should have access to.

### Essay
The Chairman's essay is the most effective way at telling the judges a concise record of your team's accomplishments in the past year. We will generally start by developing a theme for our entire submission. In the past we have chosen themes such as "Students Learn, Teach, Give, and Spread" and broke up our essay into four components. In each component we

will explain the different aspects of our team that will fit inside it. For example, within the Students Learn component, we talk about our trainings, our mentors, and team structure and how students on the team learn through these aspects. After developing a theme, list all the events and aspects of your team that would like to talk about in the essay. Start to categorize them into each section of your theme and create a general outline. Remember while doing this, to mark references for all the events who you can talk to and get information and personal experiences from. This will help you write the essay from a personal point of view. Once a general outline has been complete, begin writing each section of your essay. Save your introduction and conclusion for the end. You will want to keep your word count in mind, but don't let it restrict you on your first draft. Keep in mind that this essay will require many edits from many different people before eventually being submitted. Once you have completed each of the sections within the essay, start working on the introduction and conclusion. Make sure that your introduction hooks the judges and gets them interested in your team and makes your theme very clear. After you have a working draft, start to cut sections to reduce your word count to below the maximum. Make sure that during the editing process, you get it read by mentors, alumni, and fellow members. Make sure you leave about two weeks before the deadline for editing and revisions. After submitting your essay it's time to move on to preparing for you presentation.

## Presenataion

At the regional that you submit Chairman's to, you are required to give a 5 minute presentation. Keep in mind that the 5 minutes you get start the moment you enter the room so don't attempt to bring in any material that would require you to spend more than a few seconds to set up. In the past, we have bought printed poster boards as visuals during our presentation. Make sure that you limit the information on your visuals and keep the judges interested in what you are saying rather than the visuals you have brought with you. Stick to your theme while presenting. Try to focus on the most important segments of your submission as five minutes is not enough time to cover everything that your team does. You are allowed three people in judging room so divide the speaking time as evenly as possible. If you are using boards, make sure you are rotating who is changing the boards/flipping to a new one, so that the same person who is speaking is not changing the boards. Try to include personal anecdotes while presenting as it adds depth to the presentation and shows how your team and its events and programs have impacted you and the people of your community. A good idea is to complete a working presentation about a week before the regional and present it to as many people as possible such as mentors and alumni, not only to gain feedback, but to gain practice presenting in front of people. You want to look as unpracticed as possible, while showing as little flaws as possible. In simple terms, being relaxed and comfortable while presenting gives the judges the best impression of you. Judges also like to ask questions to test that all the presenters know everything about the team. Sometimes they will ask questions to a presenter on what another presenter said. Make sure you know everything about your team forwards and backwards. At the end of the regional, you will receive a feedback sheet based on how you did. Use this as a building block for future years-it took us eleven years to win Chairman's; don't be discouraged if you don't win right away.

## Video

In addition to the presentation and essay, all teams are required to submit a video at the regional. You video adds depth to your entire submission as it will show the emotions of individuals through all the events that you do. It's important that your team makes a clear plan and timeline when creating the video. Scripting and storyboarding should take approximately two weeks, filming approximately two weeks, and editing 4 weeks. That will generally give you 8 weeks to complete your video which puts you right around the time of the regional that you might submit for Chairman's. Depending on the regional, you might have to adjust that timeline. Remember to be in line with the theme discussed in the essay. If at all possible, do interviews with an HD Camcorder and use a professional video editing software such as Adobe Premiere Pro CS5 to edit your videos. It will give you the best quality when exporting your videos and burning them onto the DVDs.

## Binder

In addition, MVRT creates a binder which comprises of everything that the team does. It includes all the manuals, award submissions for the year, event descriptions and pictures, letters of recommendations, and news articles that MVRT has been featured in. It is a record of the team's structure and history in a presentable binder. We hand the judges this binder as we present Chairman's as a supplement for them to review and consider while judging us.

# Finance

## Grants

### Step 1: Paperwork

To qualify for most grants, you must be a 501(c)(3) non-profit organization, and you must have a Federal Tax Identification number. Also, every US-based FRC team must fill out a W-9 to FIRST Finance annually in order to accept any funds on behalf of the team. You can find this form and who you should send it to on the FIRST website.

**Step 2: Finding Companies**
When searching for sponsors, it's ideal if you have a contact within the company. If someone you personally know works for the company, your chances of getting a sponsorship increase substantially.

Also, look around to see if the companies you're targeting support other FIRST teams. Technology based companies, for example, generally tend to cater their philanthropy department towards STEM (science, technology, engineering, math) programs such as FRC teams. There's a page on FIRST's website titled "FIRST Robotics Competition Team Sponsors" that has a comprehensive list of companies that support FRC teams. If the company isn't listed there, chances are, they won't sponsor you. Unless if, of course, you have a contact in the company. Also, research what types of FRC teams the companies tend to sponsor. NASA and JCPenney, for example, almost exclusively sponsor rookie teams.

Sometimes companies will even find you–they may send you a letter with an invitation code to their cybergrants page after competitions.

**Step 3: Writing the Grant**
First off, keep the deadlines in mind! The deadlines generally have no exceptions so make sure you turn in your grants on time. They're also usually towards the end of the calendar year because that's when companies have leftover money. Most companies have a mission statement that states they donate to nonprofit causes, because it is good publicity. In order to live up to this, these companies donate a certain percentage of their profits to philanthropic causes. This is why if you ask for funding from a new company, it is beneficial to ask at the end of each fiscal quarter. Keep the style of writing professional, and be sure to mention FIRST. Some grants will be done online; others must be submitted as a hard copy, and even some as both. As far as content goes, that's relative to what your team does and/or how long your team's been around.

Feel free to contact finance at mvrt for any help with grant editing.

## Sponsors

**Step 1: Maintaining Relationships with Sponsors**
You're obviously going to want to have sponsors come back next season and sponsor you again. Business thank you letters should be sent right after you receive any financial support. Since we live near many of our sponsors, we sometimes also go to the corporate sites of our sponsors (we toured Intuitive Surgical), volunteer at events they host (we volunteered at BAE Systems's Toys for Tots), or have them come in to give presentations (Lockheed Martin gave a career presentation to us).

At the end of an FRC season, you should send something out showing your appreciation. Aside from sending out a formal business thank you letter, we also include something like a yearbook signing page where members can write about how the company provided a unique opportunity for the members by sponsoring us, how the members will consider pursuing a STEM field in the future possibly working for said sponsor, etc. We also mail out our team's shirt because it has the sponsor's logo on the back.

Furthermore, most grants will ask you for a grant impact report—meaning you have to write about what you've accomplished the past season, obstacles you encountered, and how you plan to overcome them by making changes for the next season.

**Step 2: Sponsor Recognition**
Our team organizes our sponsors into sponsor levels, based on how much they donate to the team. The more money they donate, the more recognition they receive from MVRT.

| Level | Benefits |
| --- | --- |
| Bronze ($25+) | Your name/logo is shown on our award-winning website. |
| Silver ($100+) | Your name/logo appears on our t-shirts, which is worn by our 100+ members. |
| Gold ($500+) | Your name/logo appears on our banners, which are shown as backdrops at competitions. |
| Platinum ($1000+) | Your name/logo appears on our robot, which is used at competitions and community demos. |

| Level | Benefits |
|---|---|
| Diamond ($2000+) | Our team registers you as a major sponsor. |

**Finance Packet**

Be sure to check out the MVRT Finance Packet, which we present at competitions and demos to help people understand our team and how we budget everything within it. It's often useful to have a business plan and budget for grants and presentations as sponsors require or encourage you to submit them.

# Media

## Members

Media Divisions in FIRST teams historically have had logistics problems because of too little members. Although there's really no way you can force more members to join the Media Division, there are steps that you can take to make sure you can keep whoever you get.

Make sure trainings are hands-on. No one likes listening to hour-long lectures. If you're going to teach the whole time, at least make sure you get them on the computers so they can do it along with it.

Also, make sure you don't waste time during trainings. Have new members jump straight into the animation software as fast as possible, because then they'll see Media as much more exciting and cool and want to continue.

Don't forget to talk to the members and learn their names. It sounds stupid, but sometimes having that personal connection will cause new members to keep on going in a division.

## Animation

Here's a sample calendar of how to plan "animation seasons". The numbers in parenthesis are approximate numbers of hours that should be spent on each part of the Main Animation process. For the Safety Animation, simply halve the suggested time of each stage (except for the brainstorming part).

| Time Range | Tasks |
|---|---|
| First Day (2 hours) | Members meet, brainstorm, and plan a storyboard for the animation. Make sure the prompt is actually being followed. Then break down each scene in the animation into objects that have to be created for them, and assign those out to media members. |
| First to Third Weeks (9 hours) | Create the models. At the end of all of this, you should compile all of the objects into each scene of the animation. |
| Fourth Week (3 hours) | Animate/keyframe the models. |
| Last Week | Render the scenes, put the video together, and upload it to where it needs to go. Having one week to do all of this ensures that any hitches that have occurred will not prevent your animation from being submitted. |

**ABOUT**
About FIRST
History
Robots
Sponsors
Outreach

**MEMBERS**
Officers

Managers
Team
Mentors
Alumni

**EVENTS**
Calendar
Build Schedule

**RESOURCES**
Links
Breakout Boards
Trainings

**JOIN MVRT**

**CONTACT**

**FIRST**