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gm zero

**"Game Manual 0"
a guide for FTC teams
enjoy!**

Published on : September, 2019
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Are you a rookie team? Are you new to FTC®? Are you just looking for a refresher? Check out this section for a curated list of the most pertinent pages!

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Mission Statement Hello! Welcome and thank you for taking the time to read Game Manual 0, the premier resource for new and upcoming *FIRST*® Tech Challenge teams! If you are a rookie or a new team, we would especially like to welcome you to the FTC® community. We want to make your beginning steps and transition into FTC as seamless as possible, and offer some of our own experience and advice compiled over the years.

The goal of Game Manual 0 is to create a comprehensive guide for FTC teams. Physical resources for FTC are few and far between, and online resources are scattered across the interwebs. Typically, the largest inhibitor for newer teams is the lack of knowledge base, as robotics is a relatively new STEM field. New teams also have not made connections to experienced teams who might mentor or offer advice throughout the season. Thus, they are left in the dark to figure things out, seemingly with no way out. While the journey of learning cannot be shortcut, Game Manual 0 seeks to address these shortcomings by providing a starter's guide to the hardware and software in *FIRST* Tech Challenge.

When perusing this guide, it is important to keep in mind the authors' perspective. Many of the teams who contributed in the writing of this guide are veteran championship level teams in the upper echelon of FTC. **This means that most of our recommendations are almost solely from the competitive advantage standpoint.** For example, teams can learn just as much from using a Tetrix kit compared to a goBILDA kit. Just because there is a competitive advantage to one does not translate into a learning disadvantage for the other. The guide has a plethora of useful information and knowledge (such as FTC and basic engineering principles) for all teams, including teams which are primarily trying to learn rather than compete. However, do take our recommendations with a grain of salt. We want to help all teams in FTC, but as our experience has been on the competitive side of the fence, certain parts of the guide may not be very applicable to some teams.

Furthermore, the guide was originally written with a specific audience in mind - young teams who have recently begun their journey in FTC. Our recommendations are generally geared towards more inexperienced

teams. However, in the past couple years we have expanded the guide to provide more in-depth resources around more complex topics. In doing so, we hope that Game Manual 0 will be a useful resource to rookie and veteran teams alike.

Before diving in, a short disclaimer: **this guide is not "How to Build a Championship-Winning Robot."** The purpose of Game Manual 0 is simply to provide knowledge, advice, and tips on how to get started.

□□**:** It is of the utmost importance that all teams learn the proper way (by following the engineering design process), not by reading a step-by-step guide or instruction manual. Thus, while Game Manual 0 has plenty of advice, we do not have specific steps included. Good luck, and have fun in FTC!

--- Kleptomaniac

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So you want to start an FTC® team - here's how! Here's a few tips on how to get up and running. This article covers recruiting members and mentors, structuring your team, and pitching your budget.

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Chances are, if you're interested in robotics, you'll find quite a few people in your area interested in the same thing! Recruiting them is all about spreading your message and sparking interest in your team, and for that, advertising is everything. Make a catchy flyer and hold a couple interest meetings! A handy tip to get people to attend is to bring food - people love free food...

At these interest events, discuss how FTC is interesting and beneficial to those who participate. Make sure to have information for both parents and students! While you're recruiting, make sure to be inclusive - people may not have figured out that their passions lie within the scope of *FIRST®*, and they may do so in creative ways when given the opportunity!

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Make sure to get everyone's contact information so you can reach out to keep them interested.

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It's understandable if you have difficulty with this step, but it is critically important: good mentors can make the difference between a great season and a horrible one! Note the phrase mentors, rather than mentor. A strong structure of facilitators can assist you with the wide variety of the engineering and business problems you will be tackling throughout the season, while a single mentor can be a valuable asset but only has so much time and expertise to give.

Now, to find mentors: reaching out to STEM teachers in your area is a great way to find interest, but you can also reach out to local businesses to see if any of their employees would be interested in lending a hand! (See the email guide for more tips.) New recruits can ease this process a little, and if a new mentor knows a team member it'll make it easier for them to mesh with the rest of the team. Receiving mentorship over text and video is generally less recommended, as in-person mentors can communicate and demonstrate mechanical and software concepts more efficiently.

□□: To compete, teams are required to have at least two mentors over the age of 18. Additional mentors can be younger than 18. All mentors must pass the *FIRST* Youth Protection Screening, a once-per-year background check for mentors and volunteers. This is all handled by *FIRST*, and is free.

While parents and other family members can be helpful mentors in a pinch, it's important to have outside mentorship so that your team can survive even after you graduate.

Generally mentors fall into a few primary roles. Some mentors may be purely technical, offering advice on your robot and engineering documentation; some mentors focus on "soft skills" such as leadership, fundraising, marketing, and team logistics. Many mentors blur the lines between these roles, but some prefer to stick to one area or another.

□□□□: Don't be afraid to involve mentors who aren't self proclaimed as highly "technical". They're sometimes the best ones.

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For home teams, pitch to your parents or guardians! They'll probably be dealing with a majority of the headache anyways so be nice :)

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If you're pitching to a community nonprofit, make sure you highlight how *FIRST* will help them grow. Offer to volunteer your and your teammates' time to help the organization with their programs, especially STEM ones, to create a mutually beneficial relationship.

All 3 pitches should follow a similar structure; the easiest and most efficient involves a slide deck presentation. Make sure you highlight the value proposition (benefits that will be delivered) by starting an FTC team: educational experience, building future STEM professionals, increasing the potential of the area's technology economy, etc. You may not think it's important, but many decision-makers take these factors into account when deciding to approve your FTC team!

Don't underpitch your budget needs!

Here's a breakdown of a typical FTC season budget:

FIRST Registration is $295, and allows you to obtain your team number and compete.

Region and competition costs vary depending on your region, ranging from $250 to $800 or more. Check with your region's Program Delivery Partner for more information.

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The *FIRST* Control and Communication set will cost you $265, and their Electronics set will cost $282. Buying an additional Expansion Hub to maximize your robot's actuation will cost another $250. If you're careful, these are one-time purchases.

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Extra money for sensors and servos - each can run you up to $100 each! Assuming 2 servos and 3 sensors, that's $500.

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Fundraising and sponsorship are essential ways to ensure a team's survival. See the fundraising guide (coming soon) for more.

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You have your team, you have mentors, and you have a budget. Now it's time to be a team!

Team Organization

A group of individuals is nothing without structure and organization. Learning the individual strengths of each of your teammates to create robots together will turn you into a force fit to conquer even the toughest game challenges. This article covers team organization and collaboration, knowledge sharing, gracious professionalism, and fostering a safe team environment.

Team Structure

The first step to organizing a team is determining who does what. Generally, FTC® teams are organized into design, assembly / mechanical, software, and outreach squads, with different sub-squads for different tasks - for example, an outreach squad could have a sub-squad working on industry connections. In addition, your team will probably form cross-squad teams, such as your drive team and scouting team.

To effectively manage these squads, you will need to set a carefully chosen leadership structure - leads should possess good delegation skills and be willing to facilitate learning experiences for those assigned to their squad. Optionally, a captain can be chosen as well to oversee squad leads.

□□□□: Each individual member should decide which squad they would like to participate in, as people work better on tasks they care about! In addition, each member should be involved with outreach in some form, to get them involved in the community and teach them the importance of service. In addition, this will improve your judged presentations.

Finally, your team will need to decide when it meets. Week to week, this will largely depend on the amount of work that needs to get done, but it is recommended to schedule 1-2 mandatory meetings a week to facilitate collaboration.

Obtaining Knowledge

Teams should strive to increase their knowledge of FTC design, software, and outreach both before and during the season. The more you know and experience, the easier it will be to tackle engineering challenges you encounter.

Practice over the summer.

Summer projects are a great way to explore robot concepts and start outreach. For instance, your team could research different lift designs and create a decision matrix of strengths and weaknesses. More often than not, the designs you research will make it onto your competition robot in the upcoming season - and regardless, the mechanical techniques you learn will be helpful. Reaching out to STEM businesses before the season will help you gain insights that could be helpful for the upcoming year, and planning and implementing outreach initiatives in your community will give you a headstart for the season.

Create and utilize resources.

To start the learning process, Game Manual 0 may be useful! Have your team peruse the resources here, and use that as a starting point for your own knowledge base. Make sure to check out the *Useful Resources* (⬜⬜⬜ **??**) section, where other resources are cataloged. Additionally, compiling your own resources will allow your team to explore different techniques and materials, and provide useful documentation for future team members. You could create a library of FTC legal sensors and goBILDA kits. Make sure to include all your members in these processes.

Cross-train your members.

This is the most important knowledge-related pointer, in my opinion. Having all your members learn at least one skill outside of their expertise will go a long way towards increasing collaboration and efficiency. Programmers who CAD will be able to design and integrate their own sensor cases, reducing design team workload. Designers who know outreach will be able to write their parts and speak to their designs more effectively in judging. Outreach people who know the mechanical and software processes on their robot are more effective.

Create a training program for your recruits.

When new members join your team, some of them will probably not know how to build and program a robot, or may have experiences with different techniques and softwares. Document a specific onboarding program for your new members - what logins will you have to give them? What softwares will they need to learn? What are some design techniques they will have to learn? Assign dedicated members to teach younger members about these techniques and to share their knowledge.

Gracious Professionalism

Teams should be gracious and professional both at practice and events - stress to your members that each of them is a representative of your team. Encourage them to actively assist other teams both at events and online. Finally, keep an eye on your team and ensure everyone is getting along well and being respectful.

Fostering a Safe Environment

Your team should strive to be as inclusive as possible. Ensure other members are not making homophobic, sexist, racist and/or transphobic jokes, and educate them on why they should refrain from doing so. Be actively mindful to not create a "boys club" culture where women are objectified and sidelined, and make sure every member feels comfortable in their position. Everyone should feel comfortable in your team environment.

Team Identity

Create a logo design for your team, and a corresponding style guide on fonts and colors to keep consistency when creating marketing materials. This will make it easier for you to design posters, flyers, t-shirts, stickers, and even branded plates for your robot!