WELCOME TO FTC!

Rookie Workshop 2017

FTC Team 9901 Techie Titans

September 9, 2017

Manassas, VA

AGENDA

- FTC overview
- Season Calendar
- Resources
- Beyond Robot build
- Last season's FTC game video
- Tips & Lessons learned
- Q&A and Robot showcase

ABOUT US

Team 9901 “Techie Titans”

- A 3rd year FTC team from Nova Labs Robotics (Reston, VA)
- In both of our past 2 seasons, we competed at Super-Regionals
  - ***2015-16 rookie season:***
    - VA state - Inspire Award 2nd place
  - ***2016-17:***
    - VA state - Connect Award 1st place & Finalist Alliance (Division winner)

FTC OVERVIEW

- **FTC is more than robot build**
  - Designing, building, and programming robots
  - Outreach, documentation, fundraising, and connecting with others
  - Competition in alliance format
- **Age group:** grade 7-12
- **Team size:**
  - 2 - 15 students
  - Dividing the team in multiple subgroups help
- **Adult mentor/coach:**
  - 2 coach/mentor (both need to pass Youth Protection)
  - Additional mentors / parent volunteers for team support

SEASON CALENDAR

1. **FTC Kickoff:** Sept 9, 2017
2. **Team registration and tournament registration:** Sept - Oct
3. **Qualifying Tournaments:** Nov – Jan
   - You can go to multiple tournaments in VA (2, may be even 3)
   - Also to more than 1 State (VA, MD, PA, etc. - if the State allows)
   - Teams advance to State Championship (through robot game & award categories)
4. **State Tournament:** Feb (*Richmond, VA)
   - Teams compete to advance to SUPER-REGIONAL championship
5. **East Super-Regional:** March (*Scranton, PA)
   - Teams compete to advance to WORLD championship
6. **WORLD championship:** April (*Detroit, MI)

RESOURCES

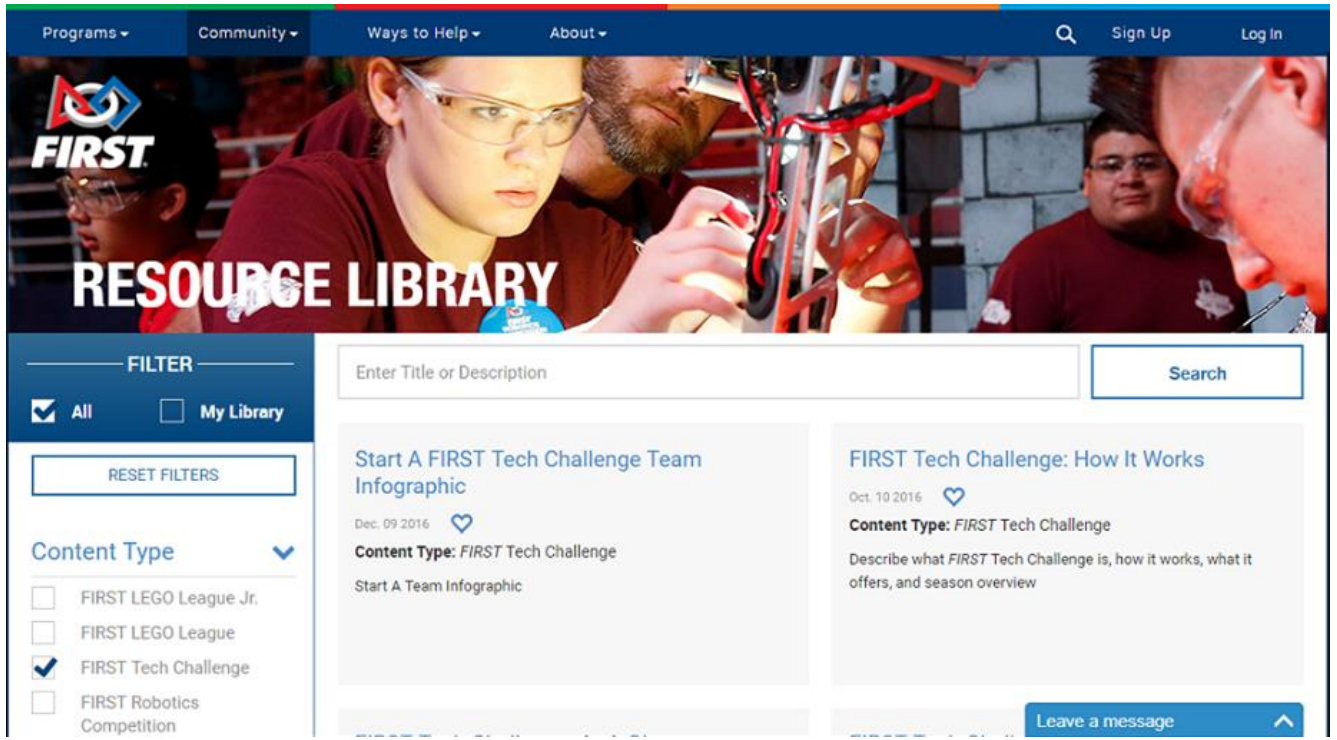
- ❑ **FTC Resource Library**
- ❑ **Mentor Manual**
- ❑ **Game Manual Part 1** (released already)
- ❑ **Game Manual Part 2** (released on Kickoff day)
- ❑ **Robot Wiring Guide**
- ❑ **FTC Forum**
- ❑ **PushBot Build Guide**

RESOURCES

FTC Resource Library

https://www.firstinspires.org/resource-library

- Game & Season Materials
- Team Management Resources
- Robot Building Resources
- Fundraising Resources
- Programming Resources
- Preparing for Competition



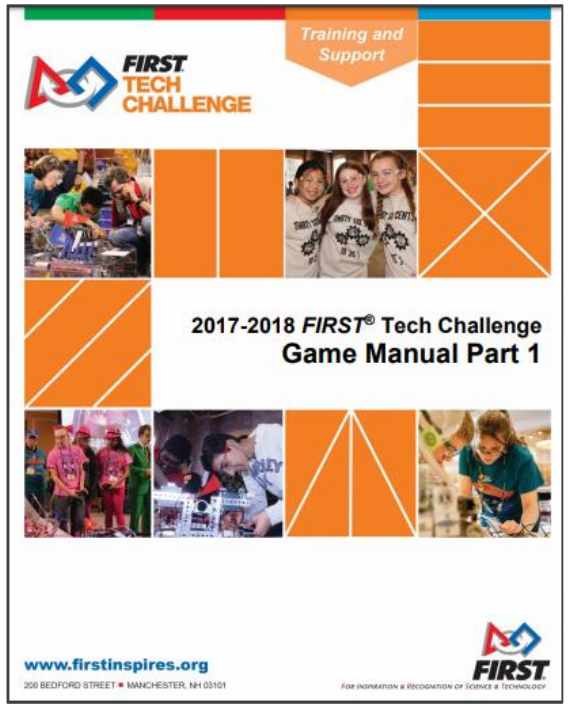
RESOURCES

Mentor Manual

- Mentor's role
- Registration
- Team meetings
- Student role and responsibilities
- Season Planning tool
- Building Robots
- Tournaments
- Judging & Awards
- Community Outreach

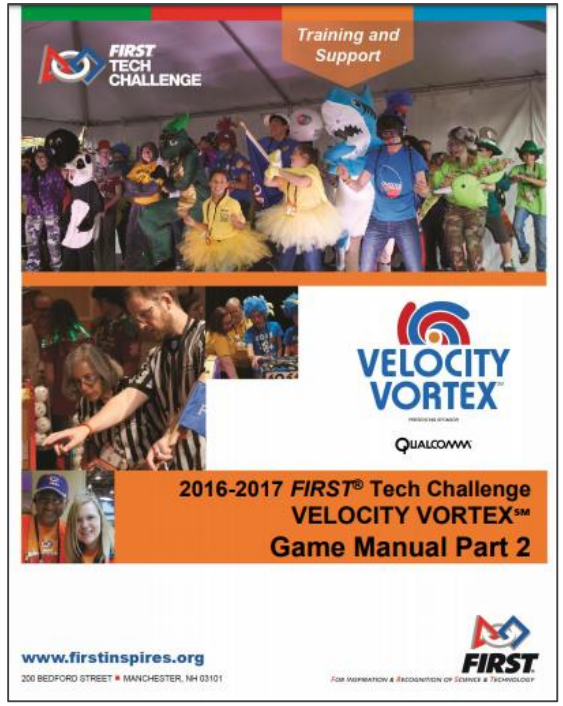
RESOURCES

Game Manual Part 1



- FTC Tournament - Definitions & rules
- Robot rules - Mechanical, Electrical, and Software
- Robot Inspection & Tournament day
- Judging & Awards - Engineering Notebook requirements

Game Manual Part 2

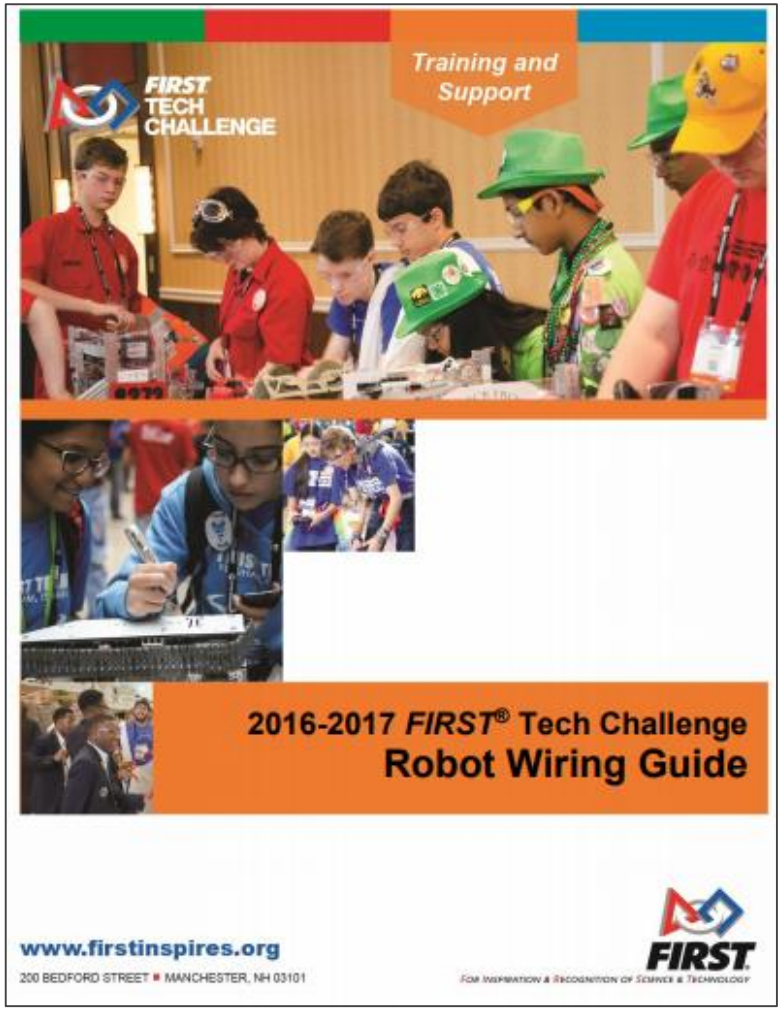


- Released on the Kickoff day
- Describes the FTC game for the season
  - Game description, Rules, Scoring, Penalties
- Also an "one page game description" - very helpful.

RESOURCES

Robot Wiring Guide

- Detailed instructions for properly wiring Robot
- Common problems
- Wire management tips

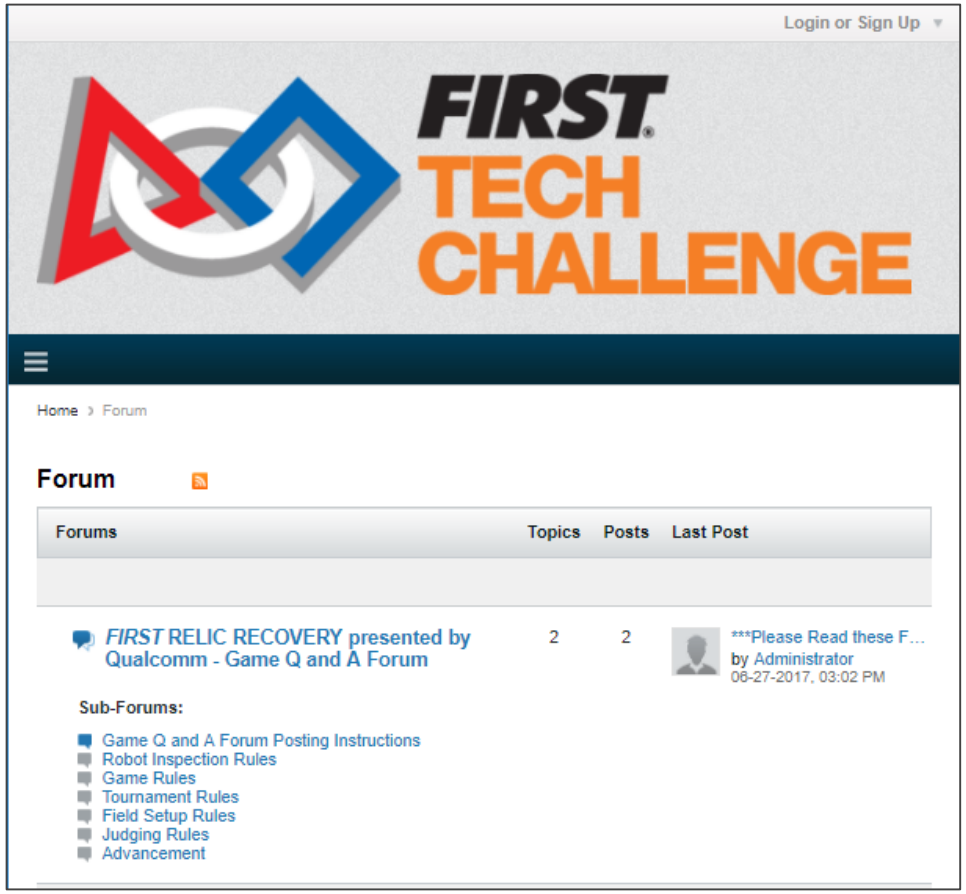


RESOURCES

FTC Forum Q&A

http://ftcforum.usfirst.org/forum.php

- Anyone may view questions and answer
- To submit a question, you must have a unique User Name & Password for your team



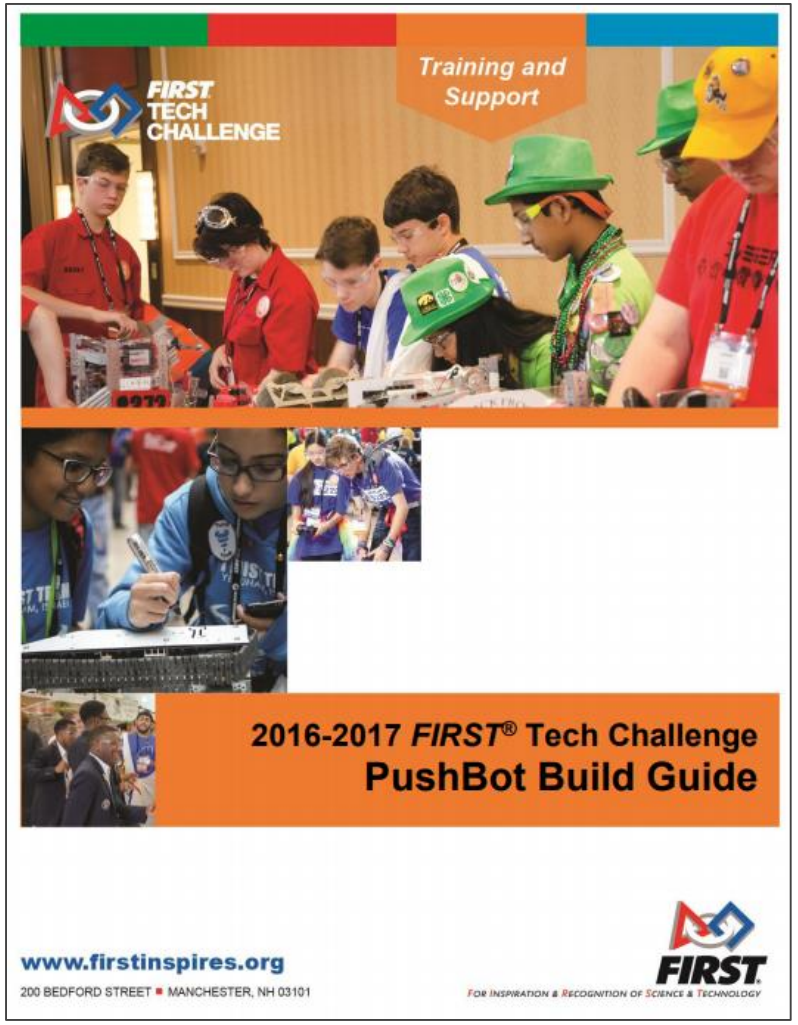
Unofficial forums:

- https://www.chiefdelphi.com/forums/ [Other -> FIRST Tech Challenge]
- https://www.reddit.com/r/FTC/

RESOURCES

PushBot build guide

- Intended for Rookie teams to build a simple competition-quality robot
- Provides simple, basic instructions and images -
  - to build the robot using Tetrix KOP & Electronics set
  - to configure phones
  - to set up Programming environment (Android Studio & Java)



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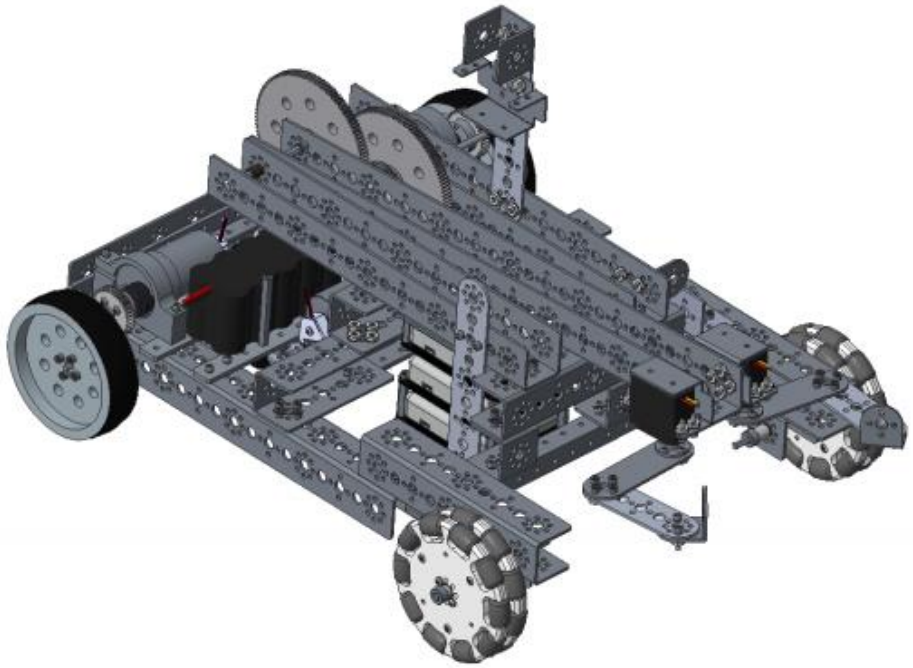
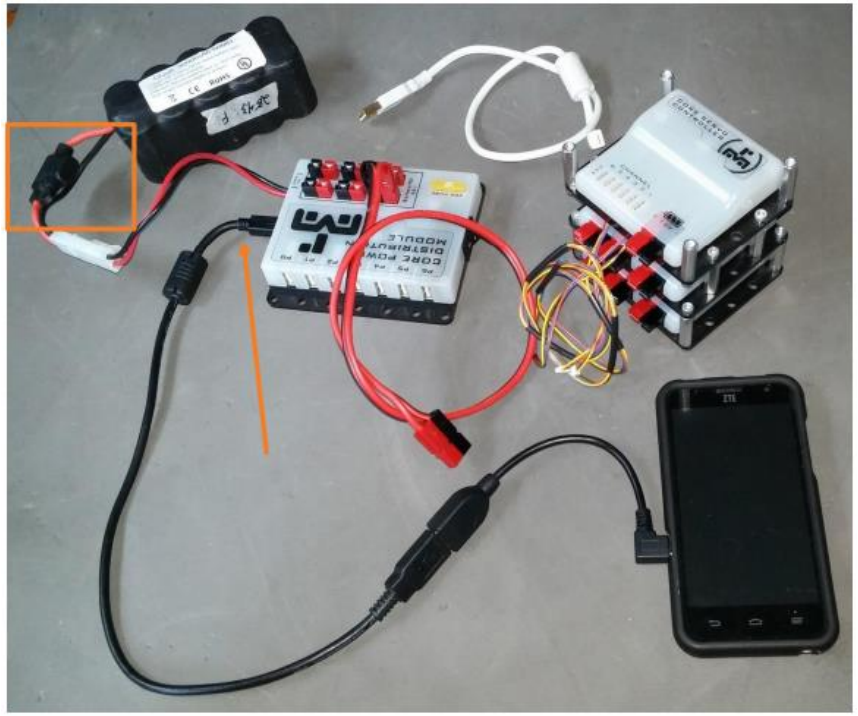
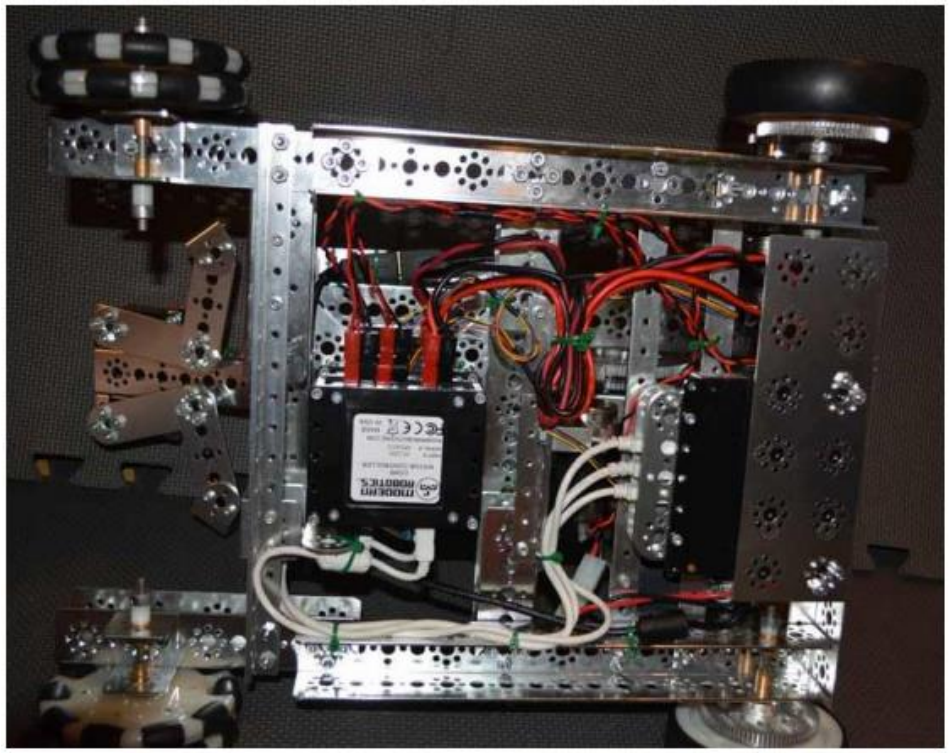
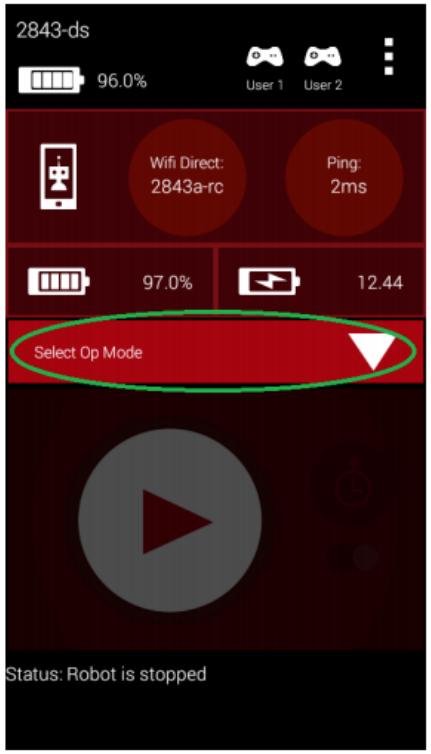




RESOURCES

PushBot build guide





ROBOT COMPONENTS

- **Mechanical**
  - Chassis/Drivetrain and Attachments/Manipulators
  - Parts options: Tetrix/Matrix/Actobotics/REV/Andymark
- **Electronics**
  - Electronics modules
    - Options: Modern Robotics / REV
  - Sensors
  - Control & Communication Sets
    - Gamepads and Phones
- **Software**
  - Android Studio (Java)
  - MIT App Inventor - a visual, blocks-based programming tool
  - FTC Blocks Programming - a visual, blocks-based programming tool

KITS & PARTS ORDER - FTC STOREFRONT

SUPPORT

FIRST TECH CHALLENGE

WELCOME | CONTROL SET | ELECTRONICS SET | COMPETITION SET | CHECKOUT

Choose a Control & Communication Set

$0 (USD) 0

The android cellphones in the Control & Communication Set transmit commands and serve as the Driver's Station and the Robot Controller. Each team will be allowed to purchase one Control & Communication Set for the 2017-2018 *FIRST*® Tech Challenge season.

Control & Communication Set 1

This set does **NOT** include the gamepads used to drive the robot.

Includes:

- Moto G Play phone (2)
- Moto G Play case (2)
- USB hub
- Micro USB OTG adapter (2)
- USB 2.0 Male to Mini-B 5-pin cable

View Larger Image

$225.00 (USD)

Order History:

Season Registration	Ordered 08/17/2017
Control Set*	(Not Ordered Yet)
Electronics Set*	(Not Ordered Yet)
Competition Set*	(Not Ordered Yet)

* While these items are necessary to build a functioning robot, teams are not required to purchase them in this Storefront (with the exception of season registration). Teams may reuse equipment from previous seasons or purchase components from other vendors.

CONTINUE

KIT AND PARTS ORDER

- **Tetrix/Pitsco:** Robot Kit and parts
- **Modern Robotics:** Electronics and sensors
- **REV Robotics:** Electronics and robot parts
- **Andymark:** Robot parts, FTC field
- **ServoCity:** Servo, Actobotics, robot parts
- **McMasterCarr:** Parts
- **Home Depot / local hardware store:** Parts

TETRIX COMPETITION SET

- Contains a large array of parts that enable teams to create competition-ready robots.
  - Structural, motion, and hardware elements (wheels, gears, channels, connectors, etc.)
  - DC motors, servo motors
  - Rechargeable battery pack and charger
  - Assembly tools

BUDGET

- FTC is expensive
- A typical rookie season budget can be about $3,000
  - More if team advances through tournaments (to State and beyond)
- See more at: https://www.firstinspires.org/robotics/ftc/cost-and-registration

Item	Amount
FIRST Registration	275
KOP: Competition Set	580
KOP: Control & Communication Set 2	265
KOP: Electronics Modules & Sensors Set	455
Tools	200
Misc Parts & Supplies	200
T-Shirts & Tournament prep	350
Tournament Registration * 2	300
State Championship Fee (if advances)	350
Gas & Food	300
Total	3275

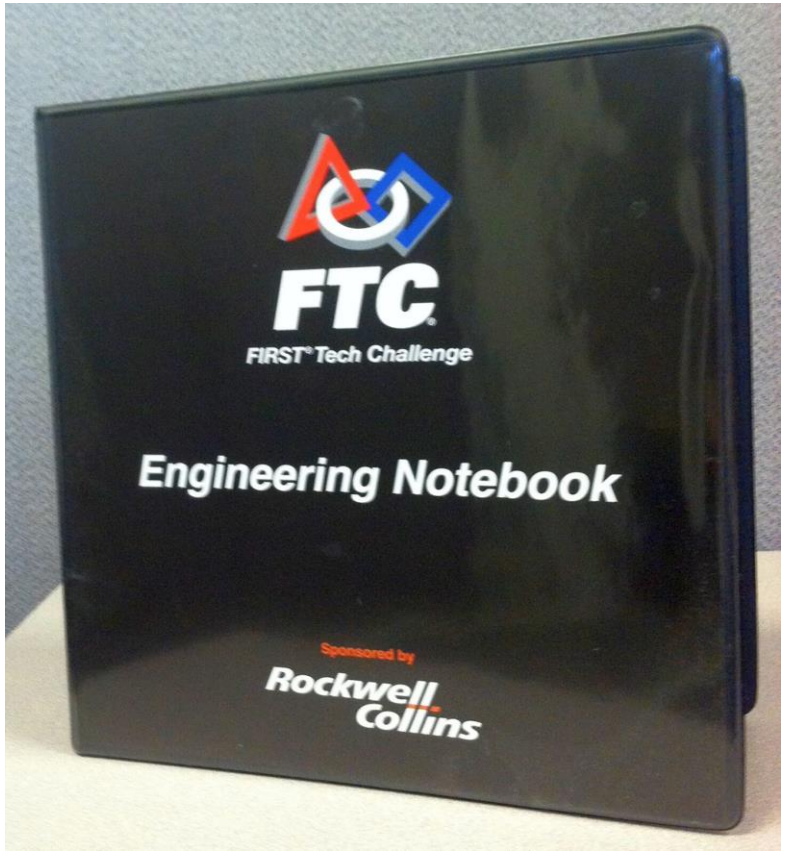
FUNDRAISING

- Rookie grant - $275 registration grant and another $275 for materials
- Grants and corporate sponsorships
  - Competitive grants:
    - Rockwell Collins, BAE Systems, United Therapeutics, PTC, and more
  - If a coach or mentor works for a company that
    - Supports FIRST or Employee volunteering

- Create a budget and justification for potential sponsors
  - Check https://www.firstinspires.org/resource-library/fundraising-toolkit
- Organizations generally give to nonprofits with 501(c)(3) status
- Fundraising activities (Donut sale and more)
- Attend the ***FUNDRAISING*** *session*

ENGINEERING NOTEBOOK

- Documents team's journey, story, problems and successes.
  - Can be electronic or handwritten.
  - Fill it with pictures, diagrams, detailed descriptions, pros and cons, and reflections.
- Required for judged awards
  - Each judged award comes with its own Engineering Notebook criteria
  - Check the *Guidelines* on the Game Manual Part 1
- Attend the ***Engineering Notebook*** *session*



OUTREACH

- Focus on connecting with other teams, local businesses and communities
- Volunteer and help others
- Attend Scrimmage (practice tournament)
- Document all your experiences in the Engineering Notebook

JUDGING & AWARDS

- Teams can get various awards in Robot game and Award category
- There is specific advancing criteria
- More details on the *Game Manual Part 1*
- Attend the ***AWARDS/JUDGING*** *session*

Award	Description
Inspire	Overall
Think	Engineering notebook
Connect	Working with community/business
Rockwell Collins Innovate	Creativity/uniqueness in robot
PTC Design	Industrial design, ideally with CAD
Motivate	Spirit/outreach
Control	Sensors/software
Promote/Compass/Judges	Optional

FTC game from last season

FTC game video from last season

https://www.youtube.com/watch?v=6Eyk5CJg41A

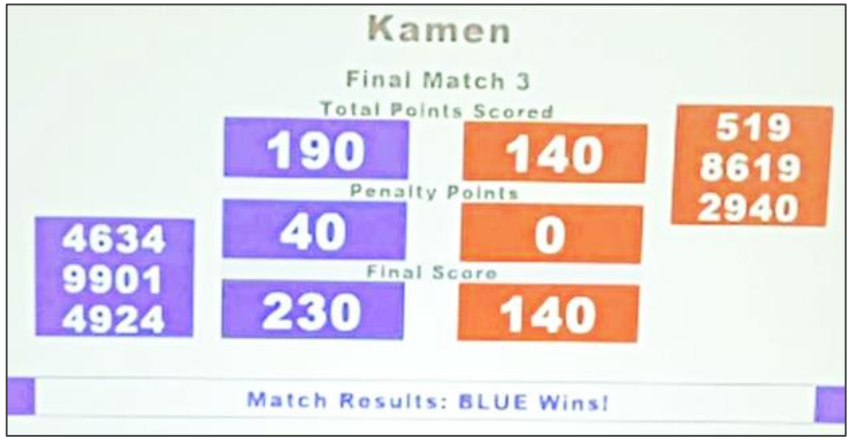
- General rules
- Season-specific game rules & Scoring
  - Autonomous period (first 30 sec)
  - Driver-controlled period (next 2 minute)
    - Last 30 seconds of driver-controlled period is End game

TIPS AND LESSONS LEARNED!

- **Safety first**
  - Power tools, heavy machines, and even untested robots can cause injury
  - Safety glasses
    - Wear them - during build, practice & tournaments
    - Enforce the rule
  - Watch for sharp edges and Pinch points
  - You are responsible for your own safety
  - Monitor safety practices & use common sense
  - Have a First-Aid kit handy

TIPS AND LESSONS LEARNED!

- **Understand the game requirements**
  - Scores
  - Penalties
- **Divide the team in sub-groups**
  - Manage your time effectively
  - It always take more time than you think
  - Not everyone builds the robot
  - Have a drive team
- **Build and Programming**
  - Build prototypes with cardboard, foamboard & plastic
  - Work on programming in parallel
  - Test incrementally



TIPS AND LESSONS LEARNED!

- **Design Considerations**
  - Do few things well in rookie season (or maybe just 1 thing)
  - Don't start with 18" cube frame
    - You'll need space for attachment and add-ons
  - Consider defensive bumper & side guards
    - Remember, there will be 3 other robots on the field
    - Game elements can go under your chassis
  - Think about Center of Gravity (COG)
    - COG will change if your robot extends itself or lift up something
  - Speed vs. Torque
    - Understand gear ratio
  - Think about reliability, consistency of performance, & maintainability also
    - Keep it simple and Keep important structure accessible for repair

TIPS AND LESSONS LEARNED!

- **Testing**
  - Test each assembly and then test the final robot
  - Test each modification
  - A small change can cause a big side-effect
    - Think about possible effects before making change
  - Practice in realistic environment (field, perimeter, game element)
    - Especially if you are running Autonomous
  - Attend Scrimmages if possible

TIPS AND LESSONS LEARNED!

- **Tools**
  - Invest on tools
  - Search online for “Tools for FTC robot”
  - Remember tool and part names
  - Organize tools and parts
    - Otherwise, you will waste lots of time looking for parts
  - Color code tools for different sizes
  - Label your tools with your team #
  - Power tools

TIPS AND LESSONS LEARNED!

- Basic Tools for FTC

Ball-Point Hex Driver

Balldriver Hex Keys

TETRIX Wrench Set

Multi-Nut Pliers

5/16" Nut Driver

Needle nose pliers

Hacksaw

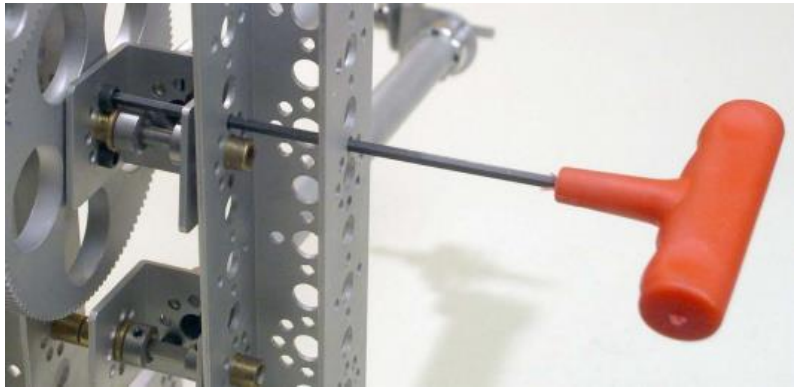
Metal File

Chain Breaker

Tube Cutter

TIPS AND LESSONS LEARNED!

- **Tools**
  - Long Allen wrenches can be very helpful for reaching tough places



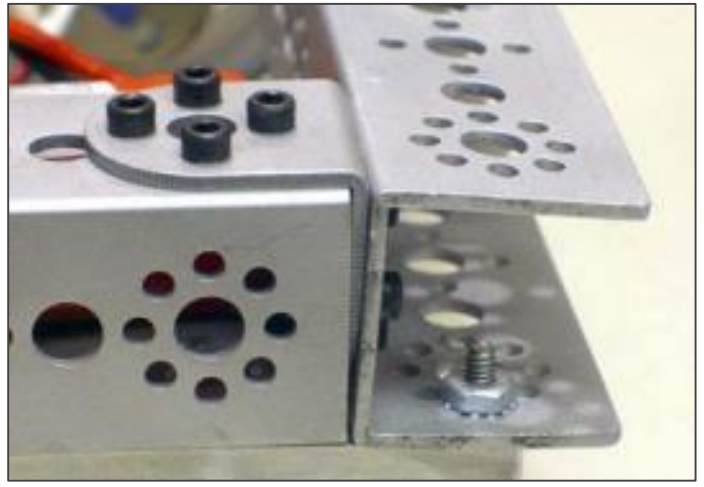
  - Tetrix/Pitsco “Multi-Nut Pliers” is very handy also

TIPS AND LESSONS LEARNED!

- **Robot Construction**
  - Make connections and joints strong
    - NOT using enough screws can bring more headache later

Courtesy: ORTOP.org

  - Avoid crooked construction
    - It looks sloppy, and unprofessional too



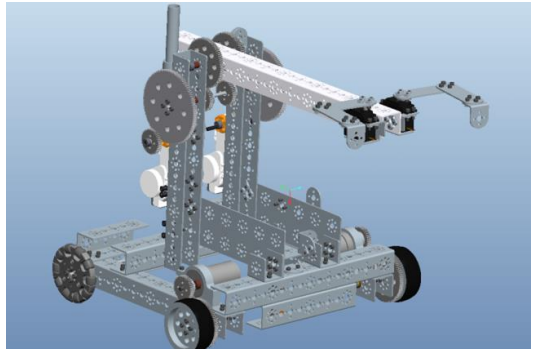
TIPS AND LESSONS LEARNED!

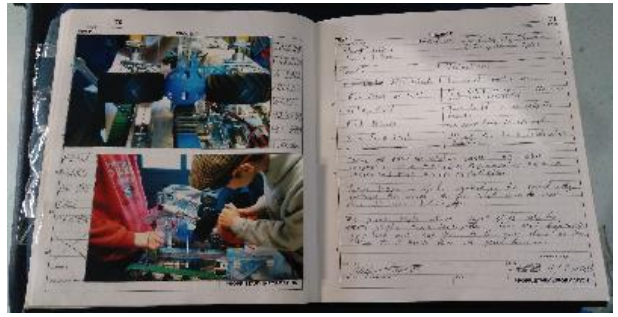
- **Kep Nuts**
  - ➢ *"Friends Don't Let friends Use Kep Nuts"* - Team #9929
  - ➢ Becomes loose easily with vibration/impact in competition
  - ➢ Ok for quickly building and attaching parts, but consider using *Nylon Lock* ("nyloc") before competition.

- **Managing ESD** (Electro-Static Discharge)
  - ➢ ESD can "freeze" your robot in competition
    - Other causes - loose Battery or Tamiya connections
  - ➢ Use ESD mitigation best practices and "Static spray"
  - ➢ Attend ***ELECTRONICS*** session

TIPS AND LESSONS LEARNED!

- Spend some time learning CAD
  - Get free copies of CAD software: PTC / SolidWorks / Autodesk Inventor
- Check the forum regularly for updates and tips!
  - Assign one person to check it weekly
- Update Engineering Notebook regularly
- Parts order
  - Think ahead. It takes time for shipping.
  - Can be out of stock also, especially in critical time





TIPS AND LESSONS LEARNED!

- **Tournaments**
  - Register ASAP when it opens
  - Consider competing in 2 tournaments
  - Leave time between them to revise your robot
  - Consider competing in other states (MD/PA) also
    - If time/budget permits

- **Rookie season target**
  - Focus on learning
  - Be practical based on your team's size, experience, and available time.

TIPS AND LESSONS LEARNED!

Competition Readiness

- Practice driving (a lot)
  - Again, have a drive team
- Practice Judging interview as well
- Attend Scrimmages
- Team Roster, Inspection checklist
- Make a checklist for parts and tools to pack
  - DON'T forget Engineering Notebook!
- Be on time to tournament
  - Remember, it's going to be a long day (7am-6pm)

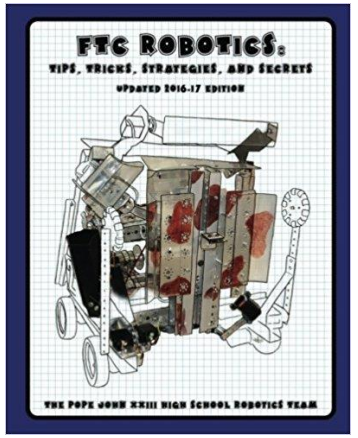
TIPS AND LESSONS LEARNED!

Have fun also

- Team theme, slogan, logo
- Have some fun at break-time
- Celebrate milestones and accomplishments
- Enjoy yourself at tournaments
- Have great team spirit always!

LINKS

- https://www.firstinspires.org/robotics/ftc/start-a-team
- https://www.firstinspires.org/robotics/ftc/game-and-season
- https://www.firstinspires.org/resource-library
- https://www.firstinspires.org/resource-library/ftc/game-and-season-info
- https://www.firstinspires.org/sites/default/files/uploads/resource_library/ftc/2016-2017-season/pushbot-build-guide.pdf
- https://www.tetrixrobotics.com/sharedimages/resources/TETRIX_FTC_Set_PartsTable.pdf
- http://ftcforum.usfirst.org/forum.php
- http://roboplex.org/ftc/ftc-tools-tips/
- Book: *FTC Robotics: Tips, Tricks, Strategies, and Secrets: Updated 2016-17 Edition*



Q&A and Robot Showcase