Building Tips & Tricks

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FTC Kits

	Actobotics	REV	Tetrix	Custom
Price for Starter Kit	$494 with team discount	$444	$532	~$1,000
Starter Kit Quality	Best	Good	Okay	No Starter Kit
Robot can be built to precise specifications	Good	Great	Good	Best
Build Materials are easy to use and learn	Great	Great	Best	Okay
Robot is easy to customize	Great	Great	Okay	Best
Will need access to tools such as bandsaws to use system most effectively	Sometimes	Often	Sometimes	Almost Always
Overall Score	Great	Great	Good	Great Recommended for Veteran Teams only

Building Tips and Tricks

- Do few things in rookie season but do them well (maybe just 1 thing)

- Don't start with 18" cube frame – allow for space

- Mount electronics under chassis

- COG

- Speed vs. Torque

  - Learn Gear Ratio

- Reliability, consistency, wiring

Building Tips and Tricks

- Measure twice cut once

- Design for easy repair

- Drill access holes

- Fasten nuts loosely

- Protect wheels if possible

  - Use Wheel Guards

  - Protective bumper

- Protect Wires

Building Tips and Tricks

- Make connections and joints strong
  - Use enough screws
- Avoid crooked construction
- Manage ESD (Electro-Static Discharge)
  - Static Spray or dryer sheets
  - Mount electronics on nonconductive material
- Protect Power/Kill Switch
- Protect top of robot from game elements

Build Tips and Tricks

- Use Metal Offsets for support
- Use Bronze Bushings for Axles
- Rubber Bands for Springs
- Use Nylocs for final design

Testing

- Test each assembly

- Test final robot

- Test each modification

- A small change can cause a big side-effect
  - Think about possible effects before making a change

- Practice on field with game elements

- Attend Scrimmages

Tools and Workshop

- Carpenter square plus a T-square
- Tackle Boxes
- Double-sided mobile rack
- Loose part container
- Testing/driving area

Suggested Tools

Tin Snips

Vise Clamp

Wire Cutter Pliers

Slip-joint Pliers

Wire Stripper

Multimeter

Metal Crimper

Phillips Screwdriver

More Tools

Ball-Point Hex Driver

Balldriver Hex Keys

TETRIX Wrench Set

Multi-Nut Pliers

5/16" Nut Driver

Needle nose pliers

Hacksaw

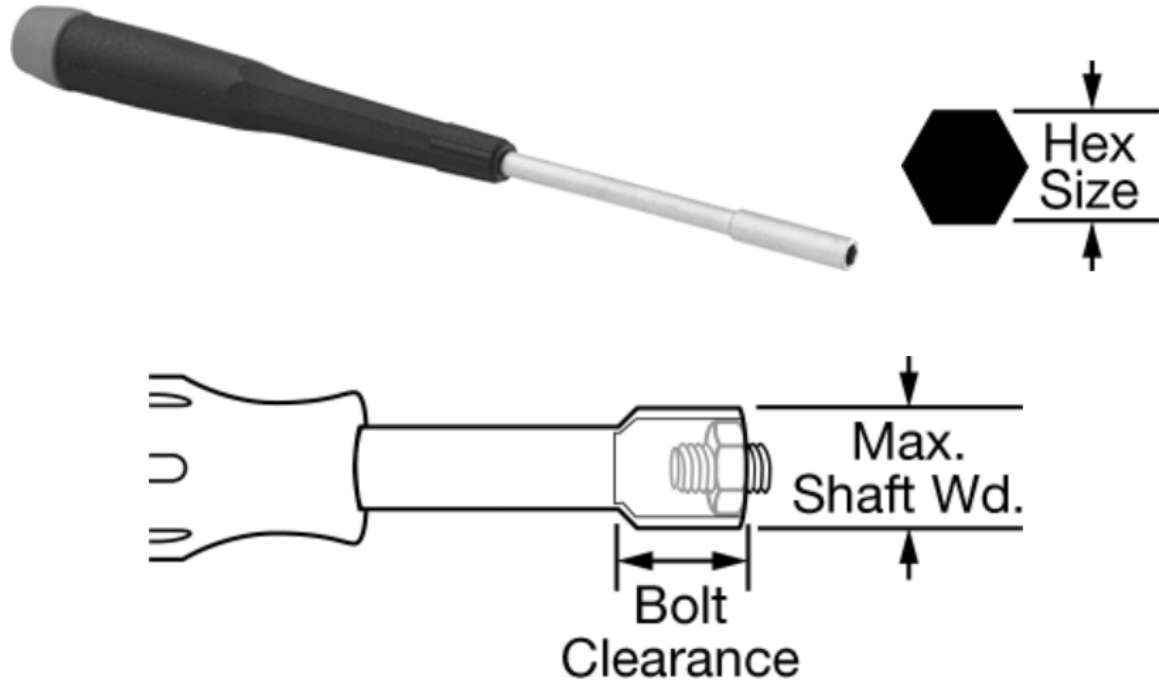**Metal File**

Chain Breaker

Tube Cutter

New Additions

McMaster-Carr Nut Driver

- Seem better than REV drivers

Chain Breaker #25

- Dark Soul Chain Breaker

- [DarkSoul](#)

Advanced Tools

- Electric Drill
- Drill Press
- Bench Grinder
- Jigsaw
- Rotary Tool (Dremel)
- Band Saw
- Magnetizer

▸ T-handle Hex Keys in Tetrix sizes
▸ T-handle 5/16" nut driver
▸ 5/16" open and closed end combo wrenches

Building Tools Links

- **Roboplex.org** is dedicated to furthering competitive robotics. The site is a collaborative workspace where robotics groups can information.

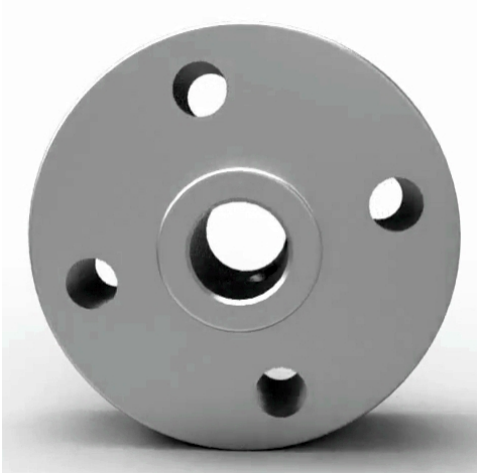- [FTC hardware, tools, and tips](#) – From Roboplex Team

Mark Tools

- Red = 7/64" (#6-32 socket cap screws)

- Green = 3/32" (hub set screws)

- Blue = 5/64" (button cap screws and TETRIX collars)

- Orange = 5.5mm/1.5mm (REV Robotics screws / nuts / collars)

Chassis and Structural

- Short Channels not L-Brackets
- Flat Metal great for connecting channels
- Center of Gravity Low
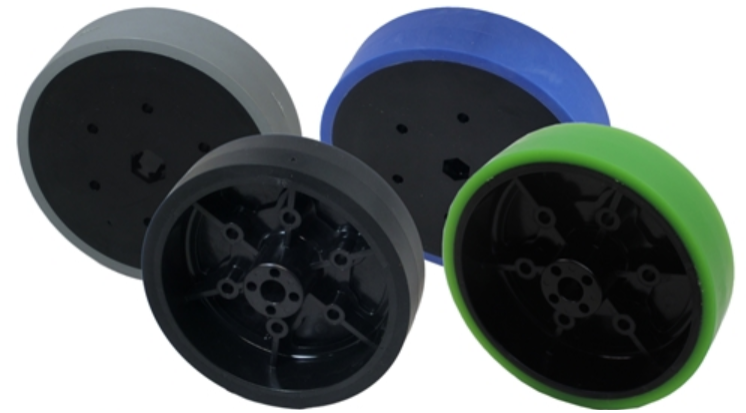- Axle Hub vs Motor Hub vs Collar Clamp

Axle Hub

Motor Hub

Collar Clamp

Types of Wheels

- Stealth
  - Great for traction/torque
  - Heavy duty
  - Tank drive – good driver

- Omni
  - Maneuverable
  - Light/small
  - Bad for traction

- Mecanum
  - Maneuverable
  - Traction okay not great
  - Torque is good

Miscellaneous Building Tips

- Make mini goals

- Keep Improving Robot All Season

- Test Each Element – Don't Wait

- Draw Sketches – label, date

- Do Notebook Every meeting (don't get behind)

- Neverest Motors over Tetrix Motors

- 2-3 Batteries – 1 robot, 1 charging, 1 spare

- 1 or 2 Extra Phones

Building Video Tips

- [REV Resources](#)

- [Hardware Tutorials from FIRST](#)

- [Tetrix PushBot](#)

- [REV PushBot](#)

Electrical Tips

- [Electronic Videos from FIRST](#)

- Label Wires – label maker

- Spare Fuses

- Power/Kill Switch Accessible

- Use proper gauge wire

- [FTC Wiring Guide](#)

Battery Tips

- Mark Batteries/Phones/Controllers with Team Number and Date Of Purchase

- Use Rubber Bands to Mark Batteries that are Charged vs. Not Charged

- Batteries keep at 14.0 V

- Swap Batteries after each Match

- Test Batteries with multimeter

Prevent Disconnects

- New USB Retention Mount $10

- http://www.revrobotics.com/rev-41-1214/

Stress Relief!

- Stress Relief 3D Parts

    - Design Your Own

    - Thingiverse

OTG Cable

- [MonoPrice OTG](#)

USB WiFi dongle

- Adapters provide computers with an additional wireless port

Programming Links and Tips

- Document your programming

- Use GitHub

- Programming Resources from FIRST
  - Blocks Programming Tutorial
  - OnBot-Java-Tutorial

- Java Beginning Tutorial Videos

- STEM Robotics Java 201

- Vuforia-VuMarks Tutorial

Help for FTC Teams

- Schoology
- Request for FTC Curriculum
- FTC Reddit
- FTC Forum
- Facebook – FIRST Tech Challenge
- Facebook – FTC Share and Learn

Connecting with Teams

- Facebook Account

- Twitter Account

- FTCTEC NETWORK
  - Discord
  - FTC Channel

Links/Discounts

- [Servocity – FIRST](#) – 25%, free part

- [Actobotics](#) Freebies Twitter
  - @Actobotics
  - [Actobotics Giveaways](#)

- [Modern Robotics](#)

- [Tetrix](#)

- [8020.net](#) – 40%

- [REV Discount](#) - $25

Credits

- This lesson was written by Patti Poston for FTCTutorials.com

- More lessons for FIRST Tech Challenge are available at www.FTCtutorials.com