2017 FLYSET FTC Workshop

Hosted by

technicbots

Hardware Topics Session

Evan / Abhishek

technicbots

contributed by

Austin / Derek
Melody / Audrey

from FTC team #12810

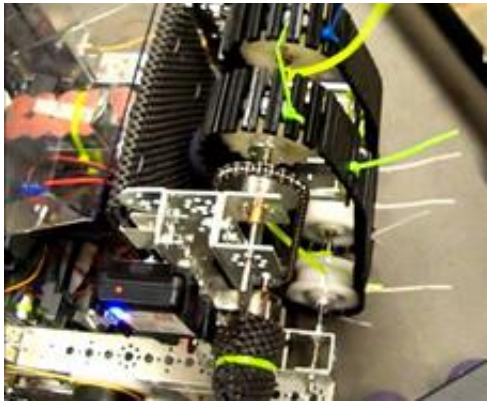
Agenda

- Harvester mechanism comparison
- Shooter mechanism comparison
- REV Robotics FTC Starter kit
- Actobotics FTC Competition kit
- Modern Robotics Linear Slide

Harvester Mechanisms

Introduction

Harvesters appear in almost any robot in almost any game. Its function is simple, yet it provides many methods of game component retrieval. We will be studying 3 main types of harvesters.



Zip-ties/Surgical Tubes

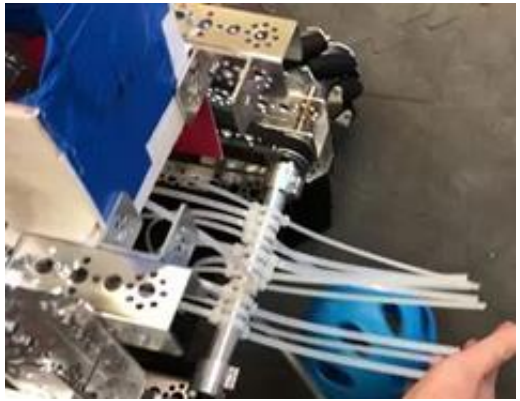
Pros:

- Easy to design and build
- Extremely versatile (can reach into difficult spots on the playing field)
- Quite cheap; the material can be found in any local Home Depot or Lowe's

Cons:

- Usually requires a double-decker harvester (two layers) in order to reach the robot storage
- It can get stuck onto field components
- Can be easily damaged (zip-ties snapping off or ripped holes in the surgical tubing)

Final Rating: Very efficient



Conveyor Belt/Urethane Belt

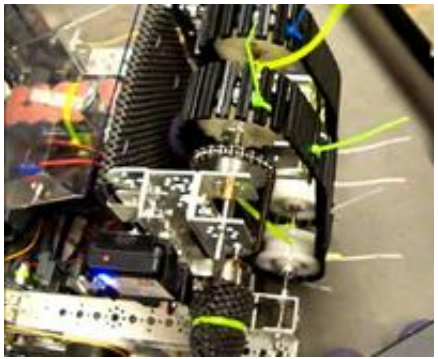
Pros:

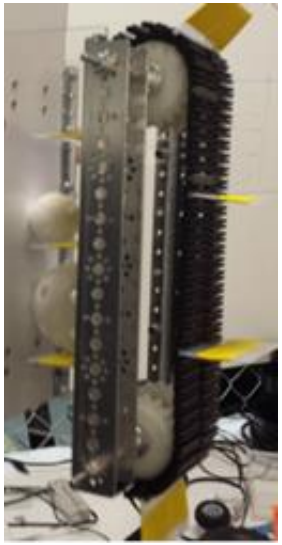
- Doesn't lose any game components while driving
- Able to control particle position
- Sweeps vertically = goes straight to the robot storage area

Cons:

- Slow
- Tedious process to build
- Heavy
- Costs a decent amount of money

Final Rating: Not the best idea





Paint Roller/Foam Wheels/Rubber Bands

Pros:

- Extremely fast
- Very lightweight
- Doesn't get damaged that easily
- Very cheap
- Not too hard to design or build

Cons:

- Needs a set height (no additional reach horizontally or vertically)
- It will need a second 'sweeper' in order to get the game component to the desired storage place

Final Rating: Very efficient

ALL World-Class teams, 2016-17

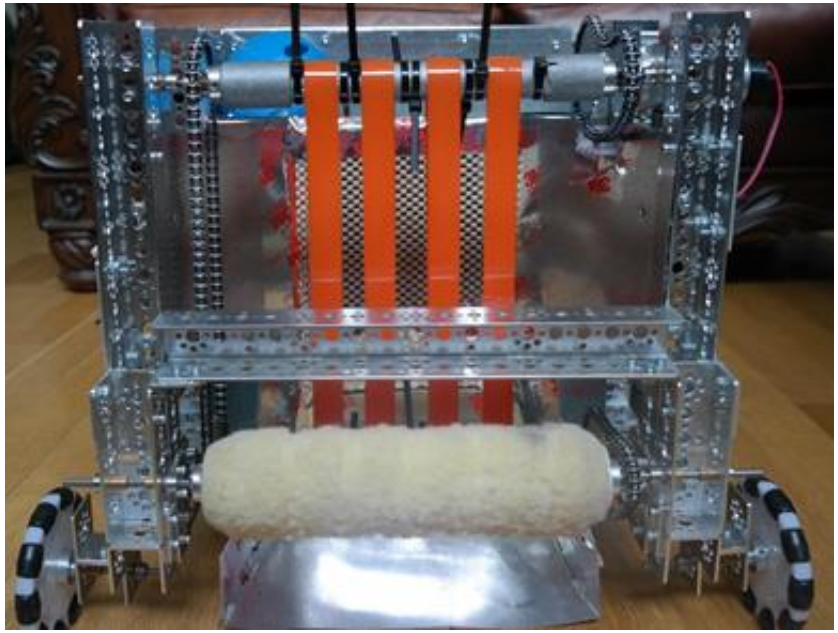
6299 QuadX

731 Wannabee Strange

8686 Height Differential

Our Harvester

We decided to make a robot with a complex harvester that uses a mix of all three! (zip-ties, paint roller, urethane belt)

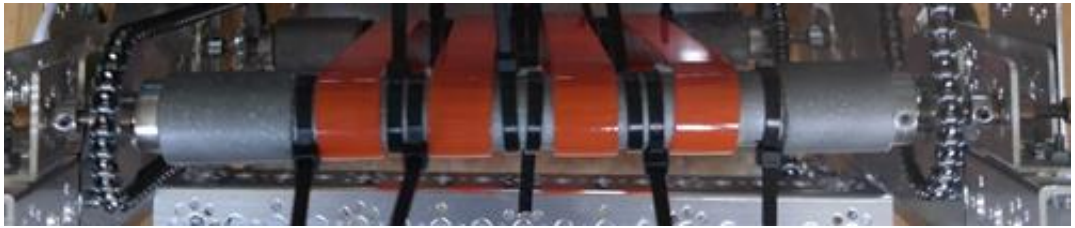


Harvester Robot Demonstration

Main Challenges and Fixes

- PVC pipe to all-wood pipe

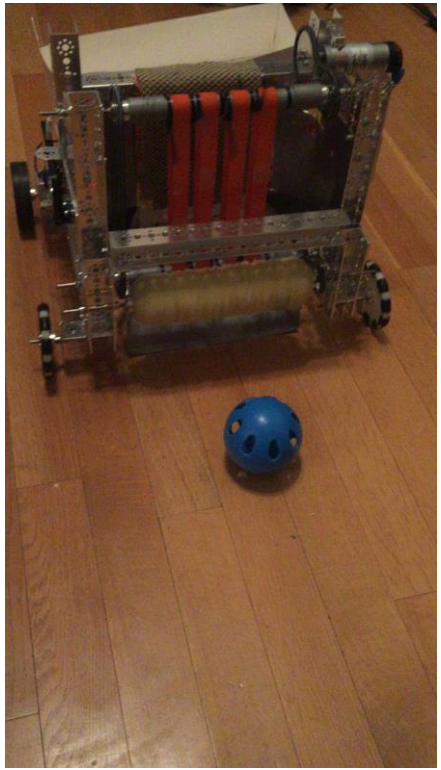
- Adding the zip-ties



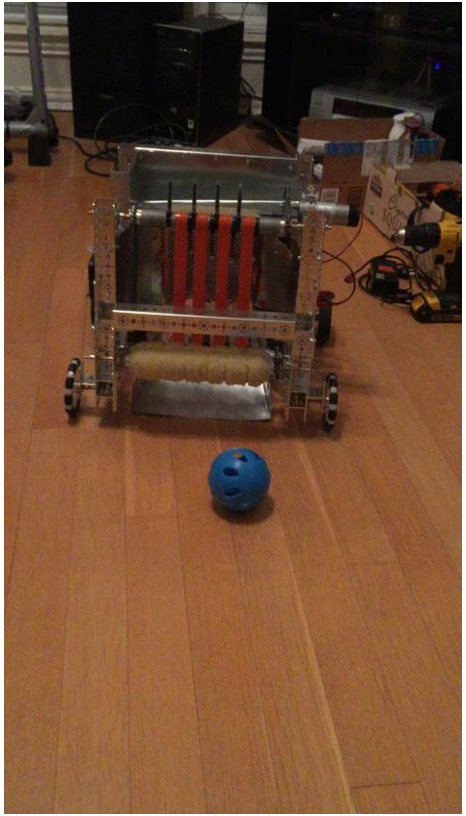
Harvester Robot Demonstration (cont.)

Making it faster:

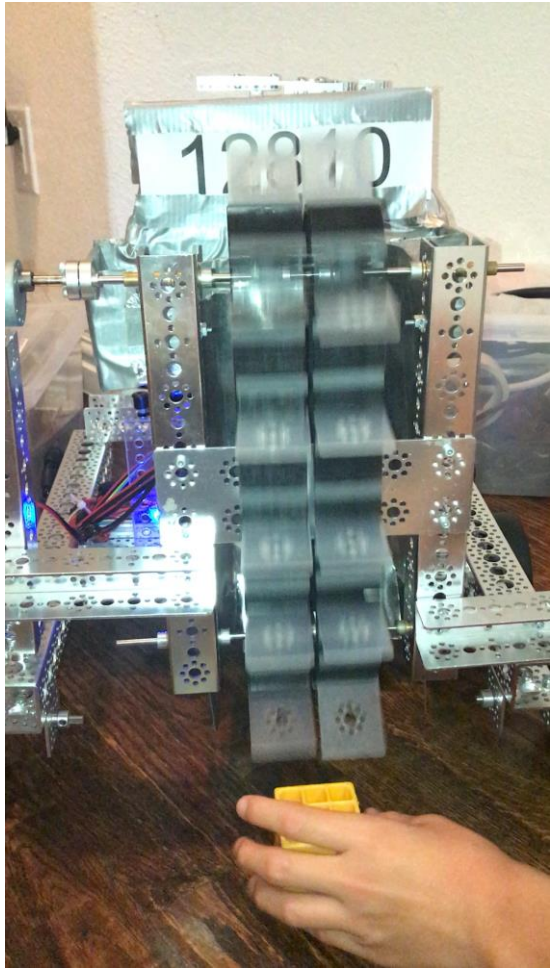
Old



New



Conveyor Belt Demo



Shooter Mechanisms

There were several shooter types to consider for last season's game:

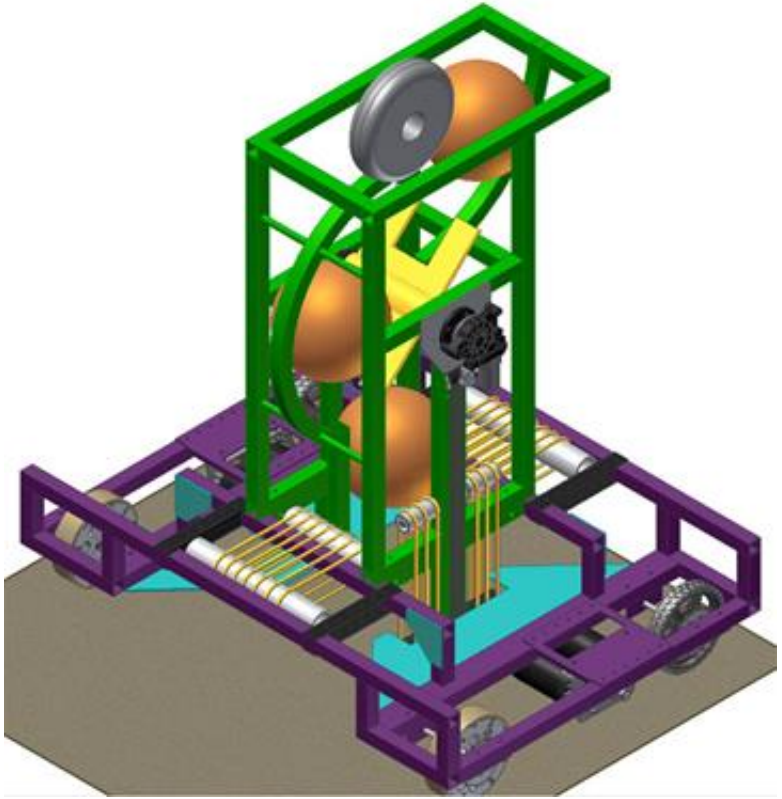
- Flywheel shooter
- Flickers
- Catapult like mechanisms

Flywheel shooters

This shooter is one that we did not attempt to use during our actual season, though we learned a lot from building our own:

Requires:

- The correct ratio of ball compression to speed
- The alternative is an inertia based model
- The high speed model is difficult to bring to a high enough speed.



Flicker shooters

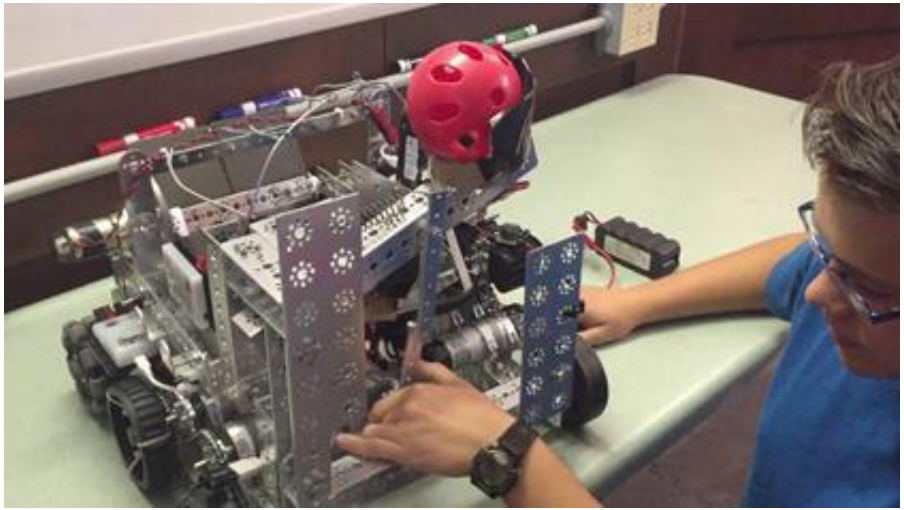
This shooter is a little more common than the other types, and more straightforward:

- The shooter uses a springy material (generally polycarbonate)
- The shooter also has a bar that the polycarbonate/flicker has to clear

Catapult-like mechanisms

This mechanism has a few aspects to it as well:

- The crank mechanism that pulls back the rod holding the ball.
- And a medium to induce tension such as a spring or surgical tubing.



Demo Robot with Flywheel Shooter

- Tip #1: Flywheel shooters take up a lot of time to perfect. The mechanism also requires time to speed up if using gearing(not recommended).
- Tip #2: It is important to understand the two different types of flywheel shooters in order to be able to build them.
  - Inertia based flywheel
  - High speed based flywheel

Demo Robot with Flywheel Shooter

- Tip #3: O-ring vs Chain

We used o-rings, which are rubber rings, rather than chains to speed up the motor dramatically. The difference was night day- it allowed for the motor to transfer much more energy than when using chains.

Live Demo for Shooter Robot

REV Robotics FTC Starter Kit

REV Robotics FTC Starter Kit Availability

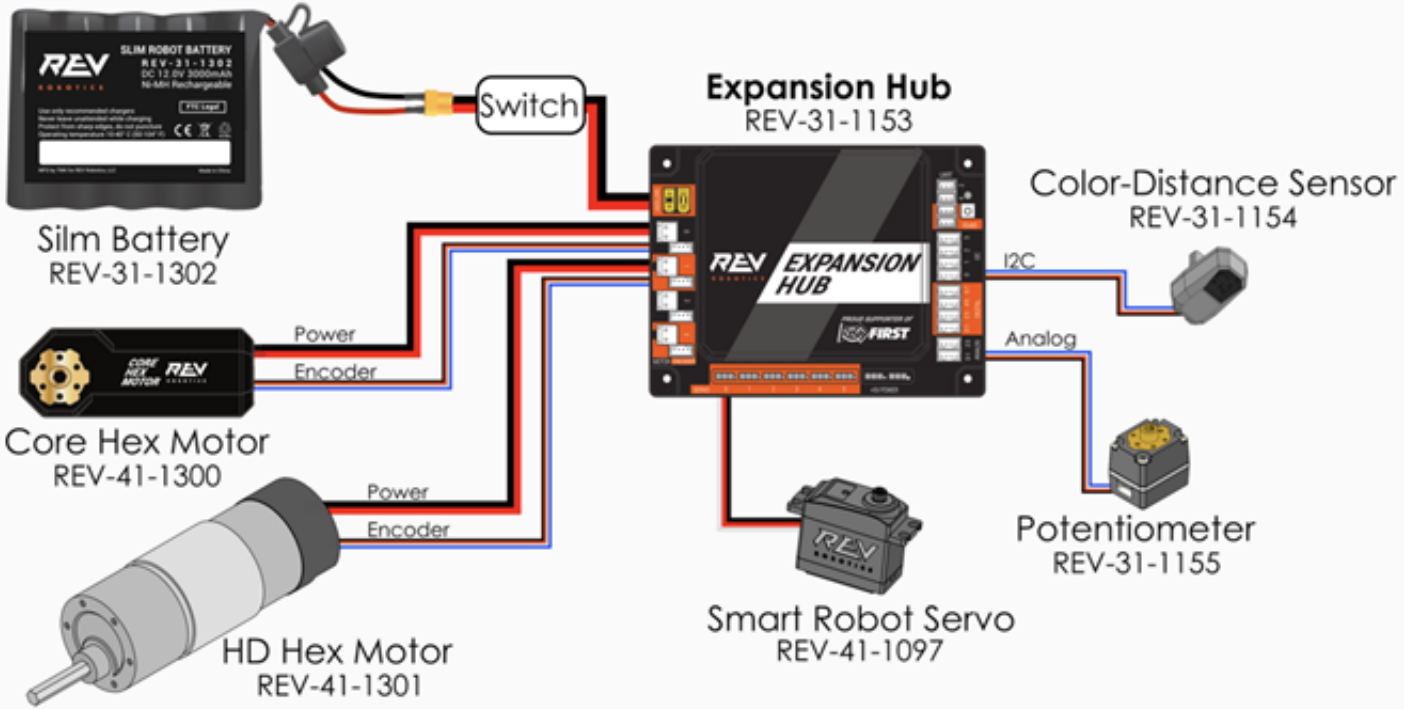
- Website: http://www.revrobotics.com/REV-45-1170/
- Cost: $475
- 1240 parts

REV Robotics Expansion Hub

- Official controller for 2017-2018 FTC season
- Cost: $175
- Conversion cables

REV Robotics Wiring Reference Sheet

The REV Robotics Expansion Hub is compatable with many other sensors and actuators. Visit our website for more informaiton!

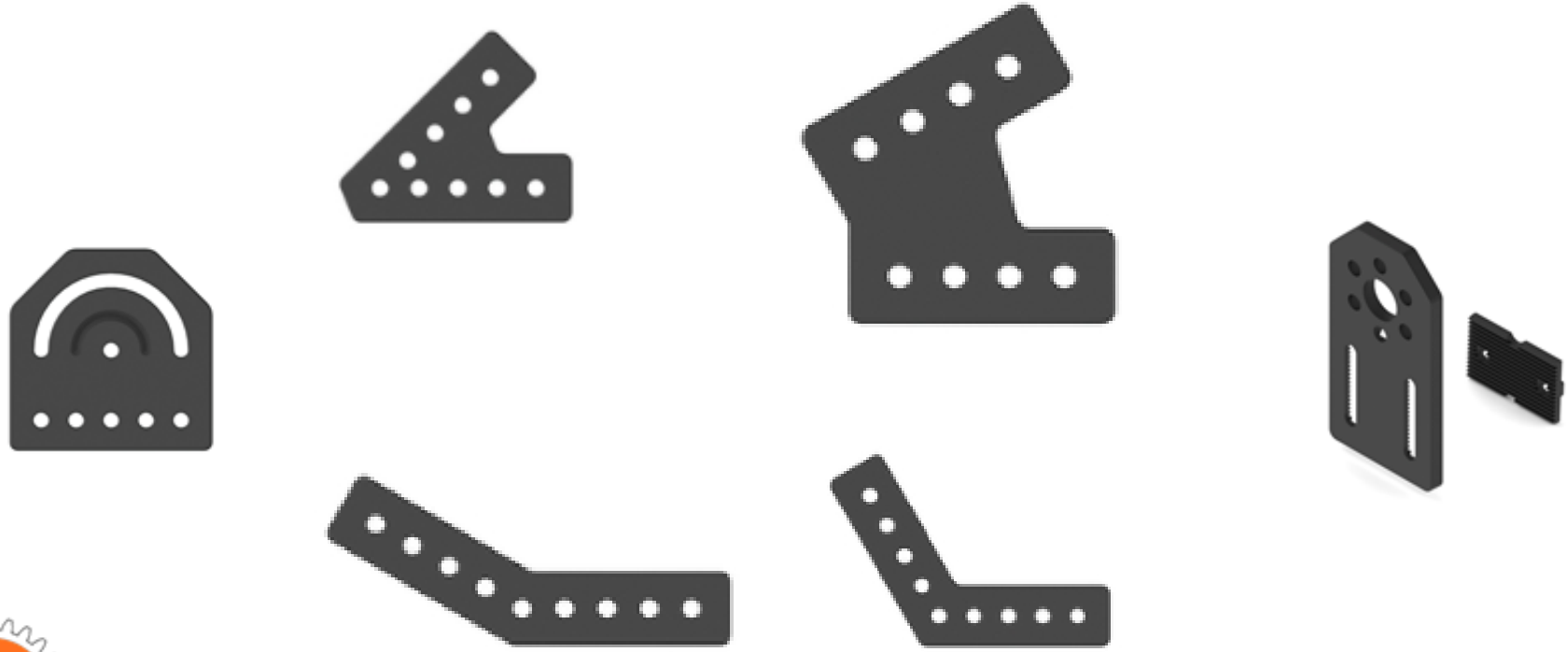


for more reference guides visit www.revrobotics.com/resources

REV Robotics FTC Starter Kit include

- Brackets
- Extrusions
- Hardware (M3)
- Adapters
- Bearings
- Wheels, gears and sprockets

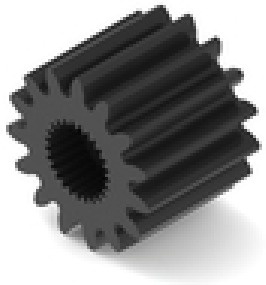
REV Robotics Brackets



REV Robotics Extrusions

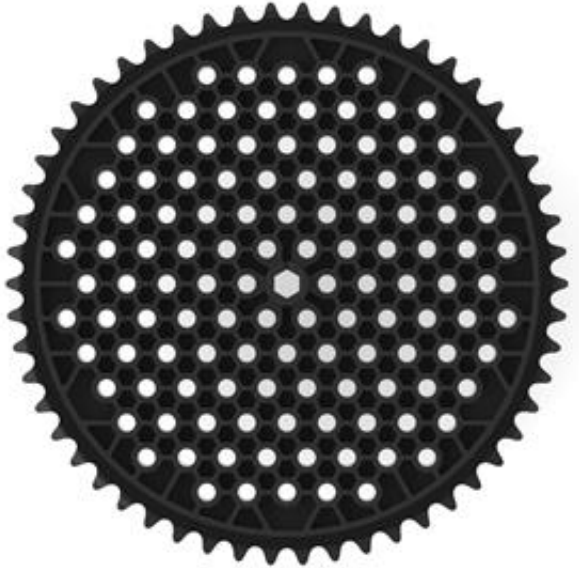
REV Robotics Hardware

REV Robotics Adapters



REV Robotics Bearings

REV Robotics Wheels, Gears, and Sprockets



REV Robotics Kit Advantages

- 15mm Extrusion based system (more flexible than fixed pitched system)
- Hex driving system (including wheels, motors, gears, etc.)
- Core Hex Motor (pro/con)

REV Robotics Smart Servo

- The servo serves as a standard angular servo, a custom angular servo, and a continuous rotation servo
- default range is 180°
- set angular limits using SRS Programmer
- can operate in continuous rotation mode using SRS Programmer


REV
ROBOTICS
REV-41-1097


OFF-ON
LEFT
PROGRAM
RIGHT
TEST
SRS Programmer
REV-31-1108
REV
ROBOTICS

REV Robotics SRS Programmer

- has 3 programming modes (continuous rotation, angular limits, and reset to default) and 2 test modes (automatic sweep and manual position/direction)
- use buttons to switch from continuous to servo and vice versa, set the smart servo to 0°, cycle through the test modes, etc.

Actobotics FTC Competition Kit

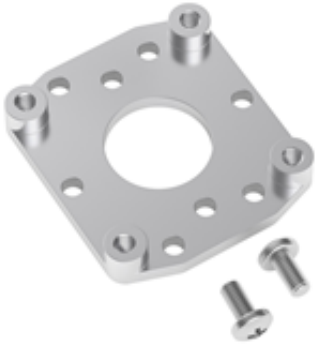
Actobotics FTC Competition Kit Availability

- Website: https://www.servocity.com/ftc-competition-kit
- Cost: $640
- 1251 parts

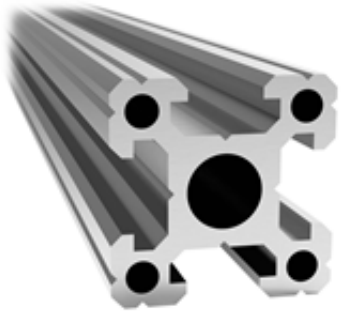
Actobotics FTC Competition Kit include

- Mounts
- Channel/plates/extrusion
- Hardware
- Adapters
- Bearings
- Hubs
- Wheels/Gears/Sprockets

Actobotics Mounts



Actobotics Channels/Plates/Extrusions



Actobotics Hardware

Actobotics Adapters

Actobotics Bearings

Actobotics Hubs

Actobotics Wheels/Gears/Sprockets

Actobotics FTC Competition Kit Advantages

- Large variety of parts (e.g., channels)
- Ball bearings for rotation
- Precision manufacturing
- Compatible
- Comes with Nyloc nuts
- Lots of resources (explanations, videos, pictures)

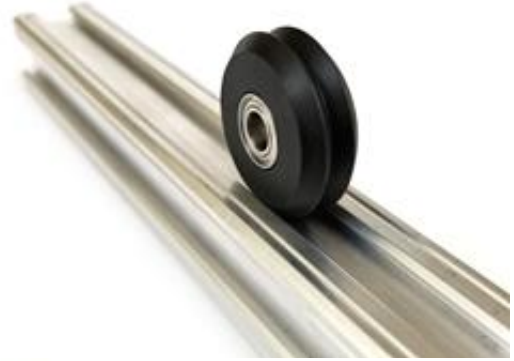
Modern Robotics Linear Slide Kit

Modern Robotics goBILDA Master FTC Kit

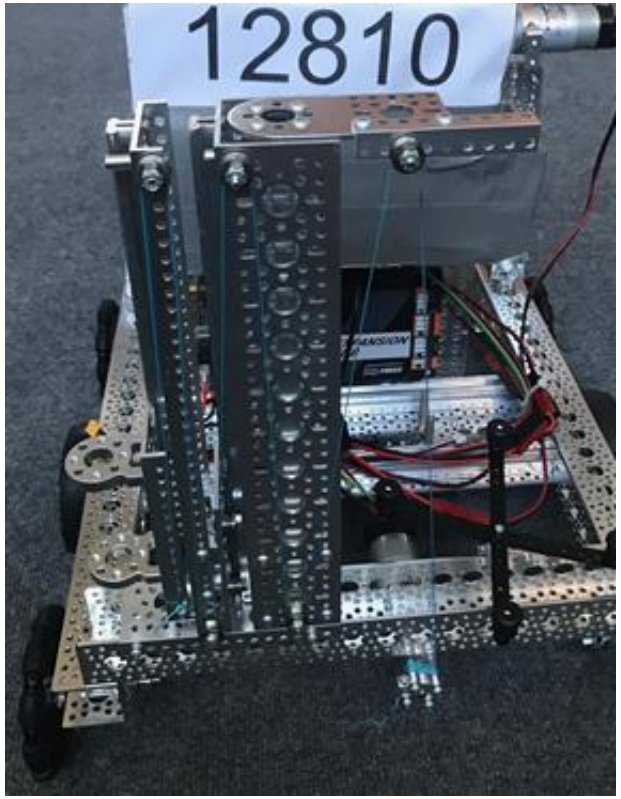
- Web site: http://www.modernroboticsinc.com/gobilda-master-ftc-kit
- Cost: $695 (out of stock)
- 900+ parts

Modern Robotics Linear Slide

Modern Robotics Linear Slide



Modern Robotics Linear Slide Demo



Modern Robotics Low Side U Channel