



# 2019-2020 Legal and Illegal Parts List

## Revision History




1	7/31/2019	Initial release
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## How To Use This Document:

The Legal and Illegal Parts List is intended to provide visuals of the most common legal and illegal parts. This document is to serve as a guide, however is **NOT** an all-inclusive list. teams and volunteers should be sure to read all of the robot build rules in the [Game Manual Part 1](#), and should always reference the [Game Q&A forum](#) for additional build rule clarifications.

Part Number	Description	Picture / Diagram
	<p>TETRIX® FIRST® Tech Challenge Competition Kit (Some components may not be shown in this illustration)</p> <p>Please see the <a href="#">Competition Kit Parts List</a> for full details of items included in this kit.</p>	

The following parts are **LEGAL** for the 2019-2020 *FIRST* Tech Challenge

	<p>REV Robotics Competition Kit</p> <p>Please see the <a href="#">Competition Kit Parts List</a> for full details of items included in this kit.</p>	 <p>A collection of various black and white plastic parts, gears, and electronic components laid out on a white surface. The REV Robotics logo is visible in the bottom right corner.</p>
	<p>MATRIX Base Set</p> <p>MATRIX Resource Set</p>	 <p>A collection of blue and white plastic parts, gears, and electronic components laid out on a white surface. A clear plastic storage bin is visible in the background.</p>
W40384	<p>TETRIX® Prime Starter Set</p> <p><b>EXCEPT</b> the items listed under the <b>ILLEGAL</b> Parts List</p>	 <p>A collection of red and black plastic parts, gears, and electronic components laid out on a white surface. A red remote control is visible. The TETRIX Prime Starter Set box is visible in the background.</p>

The following parts are **LEGAL** for the 2019-2020 *FIRST* Tech Challenge


	<ul style="list-style-type: none"> <li>• Android ZTE Speed</li> <li>• Motorola Moto G 2nd Generation</li> <li>• Motorola Moto G 3rd Generation</li> <li>• Motorola Moto G4 Play</li> <li>• Motorola Moto G5</li> <li>• Motorola G5 Plus</li> <li>• Google Nexus 5</li> <li>• Samsung Galaxy S5</li> <li>• Motorola Moto E4</li> <li>• Motorola Moto E5 Play</li> </ul>	
REV-31-1153	REV Expansion Hub	
REV-11-1144	REV servo Power Module	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

REV-31-1230	REV SPARK Mini Motor Controller	
AUA3030	Modern Robotics Core Device Interface Module	
AUM3020	Modern Robotics Core Motor Controller	
AUP3010	Modern Robotics Core Power Distribution Module	
AUS3015	Modern Robotics Core Servo Controller	





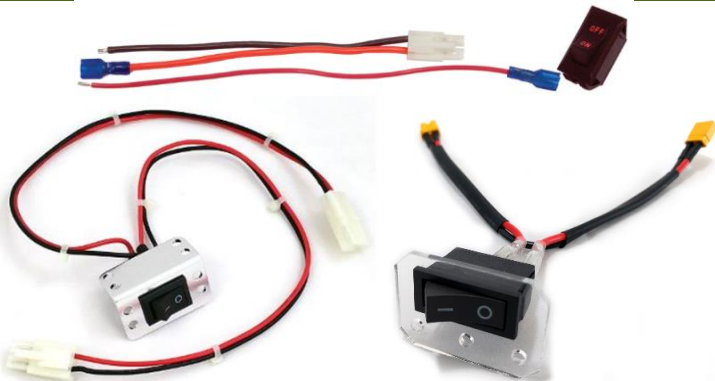


The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

	Mini USB to OTG (On-The-Go) Cable	
	OTG Adapter	
REV-31-1389	Logic Level Converter	
REV-35-1173	FTC Cable Conversion Kit	
	Logitech F310 Gaming Controller (Not to be used for robot construction)	


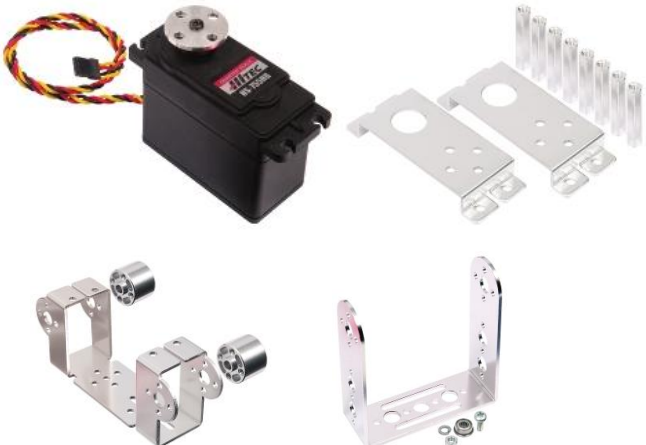



The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

	Xbox 360 Controller for Windows (Not to be used for robot construction)	
<a href="http://www.andymark.com/ftc">www.andymark.com/ftc</a>	AndyMark® parts EXCEPT those listed in the ILLEGAL section	  <p>NeverRest Series</p> <p>Robot Parts</p>
All part numbers	TETRIX® DC Motors	
All part numbers	Modern Robotics/MATRIX 12V DC Motors	
All part numbers	AndyMark® NeveRest Motor Series + encoder cables	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge






All part numbers	REV Robotics HD Hex Motor	
All part numbers	REV Robotics Core Hex Motor	
TETRIX W39129  MATRIX 50-0030  REV REV-31-1387	Power Switches	
W39197 (*) W39177 (*)	TETRIX® Servo TETRIX® Continuous Turn Servo (Total combined limit of 12 per robot)	
W39375 W39900 W39901	TETRIX® Worm Gear Box TETRIX® 10:1 Worm Gear Pack TETRIX® 20:1 Worm Gear Pack	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

W39300 W39282	TETRIX® Rack and Pinion Linear Slide Pack TETRIX® All-Terrain Tire	
(*) For MATRIX Motor/Servo Controllers, currently only MATRIX servos are compatible/allowed.		
W39904 W39380 W39383 W39594	TETRIX® HS-755HB Quarter-Scale Servo Motor with Horn TETRIX® Quarter-Scale Servo Front Mount Bracket TETRIX® Quarter-Scale Servo Frame Mounting Bracket TETRIX® Quarter-Scale Pivot Arm with Bearing Pack	
276-2177	VEX EDR 393 Motor (counted as a servo) Please see rule <RE10> for allowed configuration	
W39830 W39057	TETRIX® NiMh Battery Pack Charger (not to be used for robot construction) 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)	
14-0014	Modern Robotics 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)	





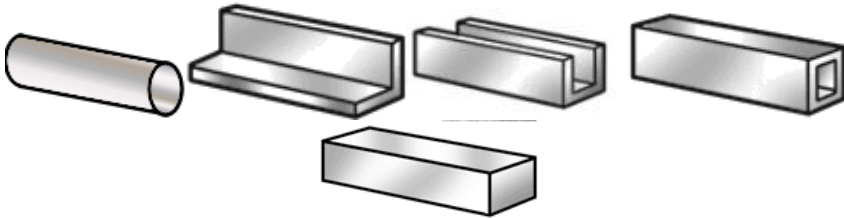


The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

REV-31-1302	12v Slim Battery	
REV-31-1269	Resistive Grounding Strap	
REV-31-1385	Anderson Power Pole to XT30 Adapter	
	Non-Metallic Cable Ties	
W39074 W39075 W39076 W39077 W39379 W39378 W39377	TETRIX® Tubes (80 mm) TETRIX® Tubes (145 mm) TETRIX® Tubes (220 mm) TETRIX® Tube Clamps TETRIX® Tubing Coupler TETRIX® Tubing Corner Block TETRIX® Tubing Anchor Block	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

W39193	TETRIX® Tube Plugs	
W38007 W38008	TETRIX® Bevel Gears & Delrin Bearings	
W39173 W39171 W39169 W39165	TETRIX® Chain with Links TETRIX® 32 tooth Sprocket Pack TETRIX® 24 tooth Sprocket Pack TETRIX® 16 tooth Sprocket Pack	
W35871	TETRIX® 250mm Axel	
	#25 Chain Half-Lengths #35 Chain Half-Lengths	
W39020	TETRIX® Servo Horn	
W36465	TETRIX® Thermal Fuse for DC Motor Protection	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

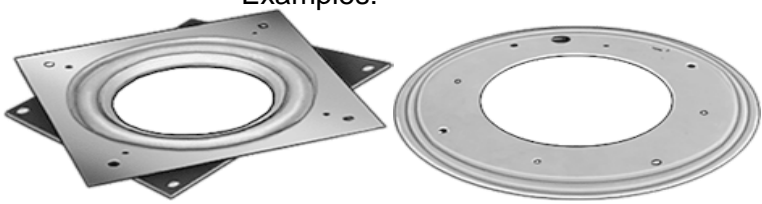




W20821	<p>Permatex Super Lube</p> <p>Note: Any type of COTS lubricant is allowed.</p> <p>(Only to reduce friction with the Robot. Lubricants are not allowed to contaminate the playing field or other robots).</p>	
Plastic Sheet	Any non-reinforced polymer-based plastic sheet material (e.g. polycarbonate, PVC, acrylic, ABS, Teflon, PETG, etc.) See <RM01>.	
Any metal or plastic flat sheet	<p>Both materials may be used on the robot.</p> <p>No limit to size or quantity.</p> <p>See &lt;RM01&gt;.</p>	
Any metal or plastic extruded shapes		
Rope	Rope, any size/length	
Non-Slip Pad	No size constraint	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

	Universal Security Clips	
45-2018	Modern Robotics Color Sensor	
REV-31-1537	REV Color Sensor	
REV-31-1425	REV Touch Sensor	
REV-31-1505	REV 2m Distance Sensor	
	UVC Compatible Camera	


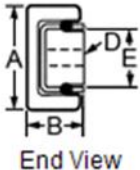

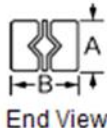
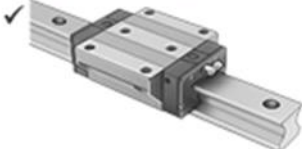





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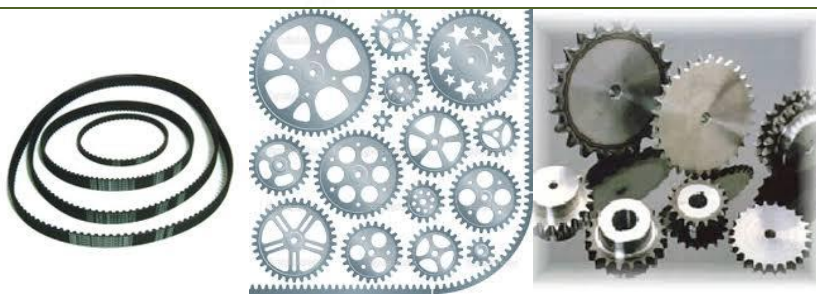


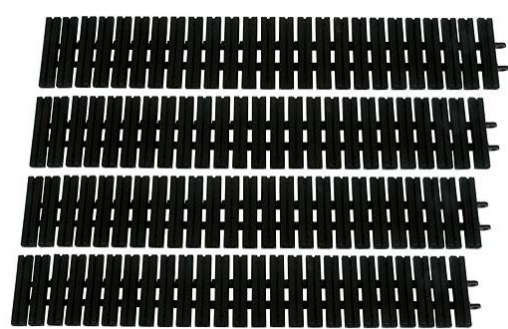
Non-Motorized Turntables and Lazy Susans		Examples: 
PVC Refer to Game Manual Rules See <R05> m.	PVC, CPVC, or ABS flexible or rigid piping (of any schedule), Commercial PVC couplings (i.e. Tee's, elbows, couplings, caps, etc.) are allowed.	
PVC cement and cleaner	Use only for gluing PVC. Use of PVC cements and cleaners may or may not be allowed in the pits at tournaments based on site-specific rules or requirements.	
Mechanical Fasteners	Compatible nuts, bolts, screws, etc.	
Loctite®	Or similar thread-locking product	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

	Plastic/Epoxy Glue or Cement	
Rubber Bands	Any size and quantity	
Surgical Tubing	No size or length limit	 Sample, color may vary
PWM Extension cable	Either purchased or fabricated by the team	
Threaded Rod	All-thread & lead-screw	
Power Distribution Panel/Splitter	This is an example. Similar parts are allowed.	
Anderson Powerpole connectors		


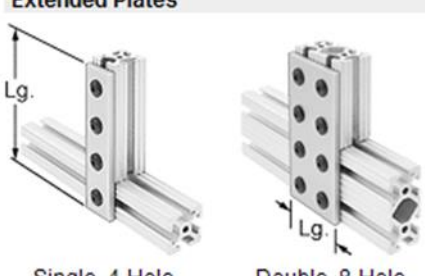
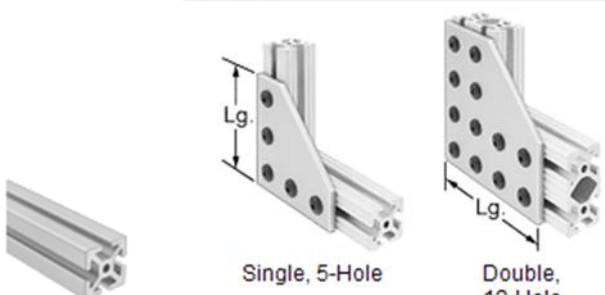
Linear Slides		<p>Telescopic Slides</p>   <p>End View</p> <p>Roller Bearing Slide Sets</p>   <p>End View</p> <p>Ball-Bearing Carriages and Guide</p>  <p>Through-Hole Carriage and Guide Rail (Sold Separately)</p>
Telescoping Rods		 
	Linear Actuator	

The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

Wago Connector	Series 222 Lever-Nuts	
	Timing Belts any size and pitch  Gears of any size and pitch  Sprockets of any size and pitch	
	Pulleys  Springs of any type used in a safe manner (Rules <RM01>, <RM02>)	
	Wheels of any type, and the manufacturer provided wheel hub used to mount the wheel to an axle EXCEPT AndyMark® AM-2256. Individual components of a legal wheel assembly can be used on the robot.	
	Tank Tread	










## The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

<p>T-Slot Aluminum</p>	<p>Extruded aluminum pieces from various manufacturers such as 80-20, McMaster-Carr, Macron, etc. All fasteners and compatible hardware are allowed</p>	<div> <div> <p>Plates</p>  <p>Single, 2-Hole      Double, 4-Hole</p> </div> <div> <p>Extended Plates</p>  <p>Single, 4-Hole      Double, 8-Hole</p> </div> <div> <p>90° Plates</p>  <p>Single, 5-Hole      Double, 12-Hole</p> </div> </div>
<p>MISC (No Images Available)</p>	<ul style="list-style-type: none"> <li>• Material strictly used for Light Sensor color filter.</li> <li>• Hook and loop - Velcro, 3M Dual Lock. (May not be used as tape).</li> <li>• Electrical Tape and Heat Shrink tubing for electrical insulation only <ul style="list-style-type: none"> <li>• Plastic Coated Wire Rope <ul style="list-style-type: none"> <li>• Electrical wire</li> </ul> </li> </ul> </li> <li>• Aluminum or Nylon/Plastic Pop Rivets <ul style="list-style-type: none"> <li>• Magnets</li> <li>• Washers</li> </ul> </li> <li>• Light Sources per rule &lt;RE12&gt;</li> </ul>	
<p>COTS Parts (No Images Available) &lt;RM01&gt;, &lt;RM02&gt;</p>	<p>Teams may use additional materials and COTS (Commercial Off The Shelf) components to construct their robots subject to the following restrictions:</p> <ul style="list-style-type: none"> <li>• All raw materials are allowed provided they are readily available to the majority of teams from standard distributors (e.g. McMaster-Carr, Home Depot, Grainger, AndyMark®, etc.).</li> <li>• All post-processed materials are allowed provided they are readily available to the majority of teams from standard distributors (e.g. McMaster-Carr, Home Depot, AndyMark®, etc.).</li> <li>• COTS parts and assemblies may only have a maximum of a single degree of freedom. It is the intent of <i>FIRST</i> that teams design and build their devices to achieve the game</li> </ul>	

## The following parts are LEGAL for the 2019-2020 *FIRST* Tech Challenge

	<p>challenge. Assemblies of COTS components, such as linear slides, and gearboxes are allowed while a pre-fabricated gripper assembly designed to grab the game elements is not. Holonomic wheels (omni or mecanum) are exempt from the one degree of freedom limitation.</p> <ul style="list-style-type: none"><li>• Raw materials, and COTS may be modified (e.g. drilled, cut, painted, etc.) provided no other rules are violated.</li></ul>
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**The following parts are ILLEGAL for the 2019-2020 *FIRST* Tech Challenge**

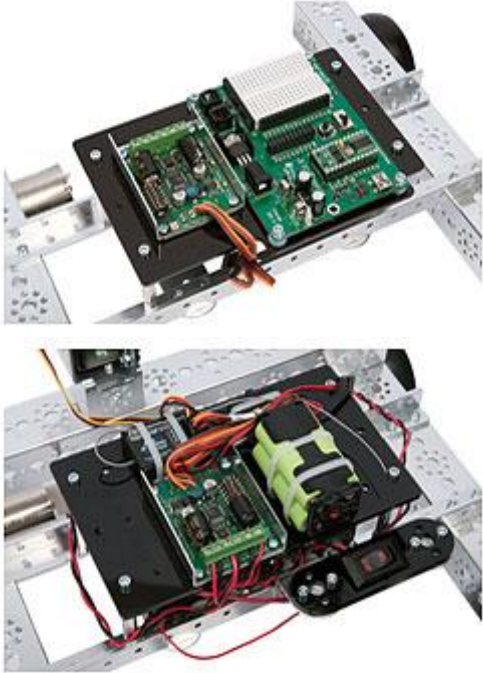


Part Number	Description	Picture / Diagram
AUL3025	Modern Robotics Core Legacy Module	
W991445 (*) W991444	HiTechnic Servo Controller HiTechnic DC Motor Controller	
	Legacy Sensors (LEGO and NXT)	
	Microprocessors such as Raspberry Pi or Arduino	
W34243 or W36117	TETRIX® R/C Controller	
W35496	TETRIX® R/C Receiver	
W34244	TETRIX™ DC Motor Speed Controller	

**The following parts are ILLEGAL for the 2019-2020 *FIRST* Tech Challenge**

Part Number	Description	Picture / Diagram
W991458	Infrared Electronic Ball	
W739136	TETRIX® Battery Holder	
W37291	TETRIX® Wireless Camera Kit	





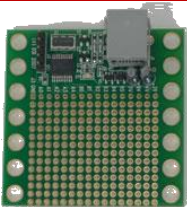

**The following parts are ILLEGAL for the 2019-2020 *FIRST* Tech Challenge**

Part Number	Description	Picture / Diagram
W37799 W37663	TETRIX® Autonomous Mounting Deck TETRIX R/C Mounting Deck	
W40234	TETRIX® Prime Gripper Arm Kit	
W44609	TETRIX® MAX Gripper Arm Kit	

**The following parts are ILLEGAL for the 2019-2020 *FIRST* Tech Challenge**

Part Number	Description	Picture / Diagram
W40235 <RE03>b.i.	TETRIX® Prime 6 V NiMH Battery Pack	
LEGO® # W778881 & W778878	LEGO® Power Function Battery Packs	
AndyMark® AM-2256	4 inch HiGrip Wheel	
	Rough top Tread	
	LEGO® EV3 or LEGO® NXT	

**The following parts are ILLEGAL for the 2019-2020 *FIRST* Tech Challenge**

Part Number	Description	Picture / Diagram
NSX2020	HiTechnic Sensor Multiplexer	
W778882 W979670 W978883	XL Power Function Motor E Power Function Motor M Power Function Motor	
NPT1050	HiTechnic Prototype Board - Solderable	
NPT1055	HiTechnic Prototype Board - Solderless	
SPR2010	HiTechnic Super Prototype Board	