

# 2021-2022 Legal and Illegal Parts List

## 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, it 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>	
	<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>	

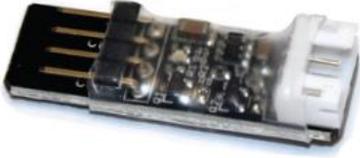
The following parts are LEGAL for the 2021-2022 FIRST Tech Challenge

<p>W40384</p>	<p>TETRIX® Prime Starter Set EXCEPT the items listed under the ILLEGAL Parts List</p>	
	<ul style="list-style-type: none"> <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>• Motorola Moto E4</li> <li>• Motorola Moto E5 Play</li> </ul>	
<p>REV-31-1153</p>	<p>REV Expansion Hub</p>	

The following parts are LEGAL for the 2021-2022 FIRST Tech Challenge

<p>REV-31-1595</p>	<p>REV Control Hub</p>	
<p>REV-31-1596</p>	<p>REV Driver Hub (Not to be used for robot construction)</p>	
<p>REV-11-1144</p>	<p>REV servo Power Module</p>	
<p>REV-31-1230</p>	<p>REV SPARK Mini Motor Controller</p>	
	<p>Mini USB to OTG (On-The-Go) Cable</p>	
	<p>OTG Adapter</p>	

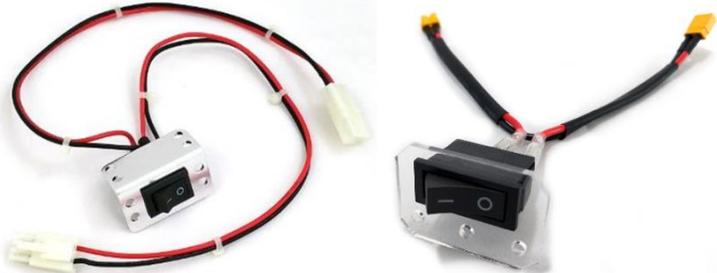
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<p>REV-31-1389</p>	<p>Logic Level Converter</p>	
<p>REV-35-1173</p>	<p>FTC Cable Conversion Kit</p>	
<p>Logitech F310 Gaming Controller (Not to be used for robot construction)</p>		
<p>Xbox 360 Controller for Windows (Not to be used for robot construction)</p>		
<p>Etpark Wired Controller for PS4 (Not to be used for robot construction)</p>		
<p>Sony DualShock 4 Wireless Controller for PS4 (Not to be used for robot construction)</p>		
<p>AndyMark® parts EXCEPT those listed in the ILLEGAL section <a href="http://www.andymark.com/ftc">www.andymark.com/ftc</a></p>		 <p style="text-align: center;"> <span>NeverRest Series</span> <span style="margin-left: 200px;">Robot Parts</span> </p>

The following parts are LEGAL for the 2021-2022 FIRST Tech Challenge

<p>All part numbers</p>	<p>TETRIX® DC Motors</p>	
<p>All part numbers</p>	<p>Modern Robotics/MATRIX 12V DC Motors</p>	
<p>All part numbers</p>	<p>AndyMark® NeveRest Motor Series + encoder cables</p>	
<p>All part numbers</p>	<p>REV Robotics HD Hex Motor</p>	
<p>All part numbers</p>	<p>REV Robotics Core Hex Motor</p>	
<p>TETRIX W39129 MATRIX 50-0030 REV REV-31-1387</p>	<p>Power Switches</p>	

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<p>W39197 (*) W39177 (*)</p>	<p>TETRIX® Servo TETRIX® Continuous Turn Servo (Total combined limit of 12 per robot)</p>	
<p>W39375 W39900 W39901</p>	<p>TETRIX® Worm Gear Box TETRIX® 10:1 Worm Gear Pack TETRIX® 20:1 Worm Gear Pack</p>	
<p>W39300 W39282</p>	<p>TETRIX® Rack and Pinion Linear Slide Pack TETRIX® All- Terrain Tire</p>	
<p>W39904 W39380 W39383 W39594</p>	<p>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</p>	

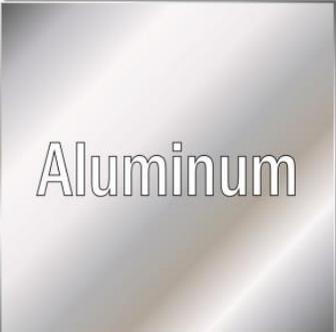
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<p>276-2177</p>	<p>VEX EDR 393 Motor (counted as a servo) Please see rule &lt;RE11&gt; for allowed configuration</p>	
<p>W39830 W39057</p>	<p>TETRIX® NiMh Battery Pack Charger (not to be used for robot construction) 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)</p>	
<p>14-0014</p>	<p>Modern Robotics 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)</p>	
<p>REV-31-1302</p>	<p>12v Slim Battery (Exactly 1 allowed)</p>	
<p>REV-31-1269</p>	<p>Resistive Grounding Strap</p>	
<p>REV-31-1385</p>	<p>Anderson Powerpole to XT30 Adapter</p>	

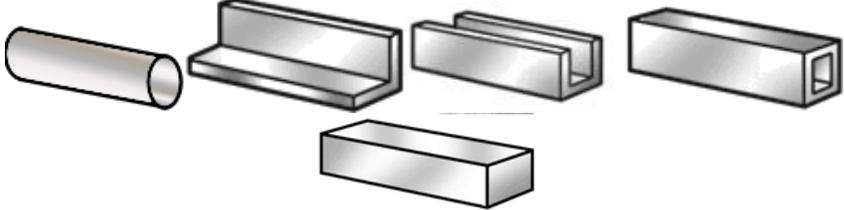
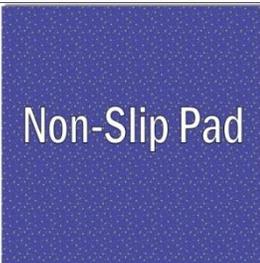
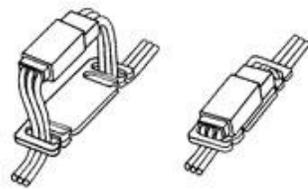
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	Non-Metallic Cable Ties	
W39074 W39075 W39076 W39077 W39379 W39378 W39377	TETRIX® Tubes (80 mm) TETRIX® Tubes (145 mm) TETRIX® Tubes (220 mm) TETRIX® Tube Clamps TETRIX® Tubing Coupler TETRIX® Tubing Corner Block TETRIX® Tubing Anchor Block	
W39193	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 Axle	

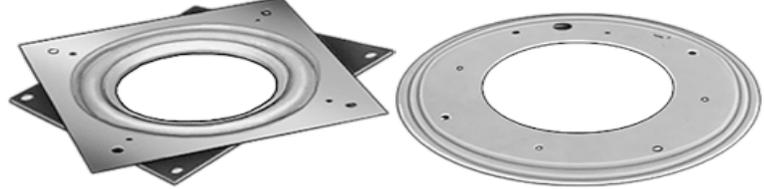
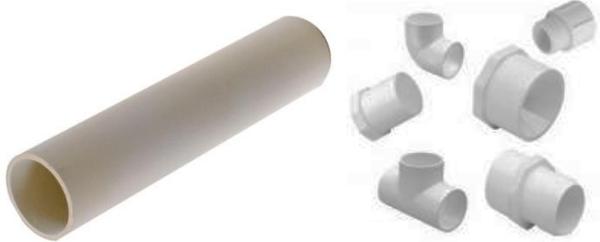
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	#25 Chain Half-Lengths #35 Chain Half-Lengths	
W39020	TETRIX® Servo Horn	
W36465	TETRIX® Thermal Fuse for DC Motor Protection	
W20821	Permatex Super Lube Note: Any type of COTS lubricant is allowed. (Only to reduce friction with the Robot. Lubricants are not allowed to contaminate the playing field or other robots).	
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 Both materials may be used on the robot. No limit to size or quantity. See <RM01>.	 

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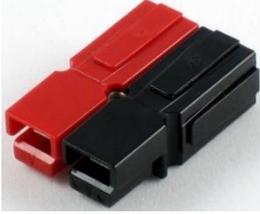
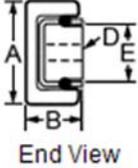
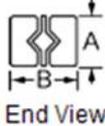
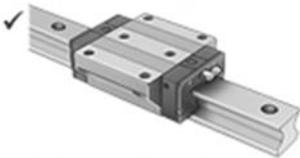
	Any metal or plastic extruded shapes	
	Rope, any size/length	
	Non-Slip Pad No size constraint	
	Universal Security Clips	
45-2018	Modern Robotics Color Sensor	
REV-31-1537	REV Color Sensor	
REV-31-1425	REV Touch Sensor	

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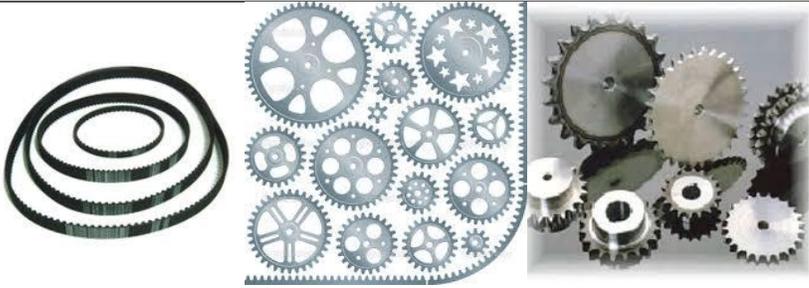
<p>REV-31-1505</p>	<p>REV 2m Distance Sensor</p>	
	<p>UVC Compatible Camera</p>	
	<p>Non-Motorized Turntables and Lazy Susans</p>	<p>Examples:</p> 
	<p>PVC, CPVC, or ABS flexible or rigid piping (of any schedule), Commercial PVC couplings (i.e. Tee's, elbows, couplings, caps, etc.) are allowed.</p>	
	<p>Use only for gluing PVC. Use of PVC cements and cleaners may or may not be allowed in the pits at competitions based on site-specific rules or requirements.</p>	
	<p>Mechanical Fasteners Compatible nuts, bolts, screws, etc.</p>	

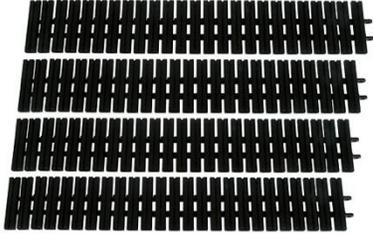
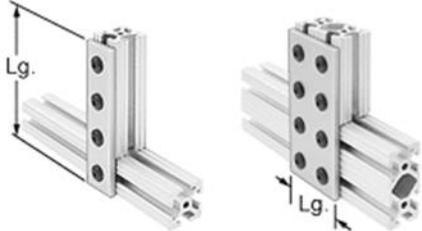
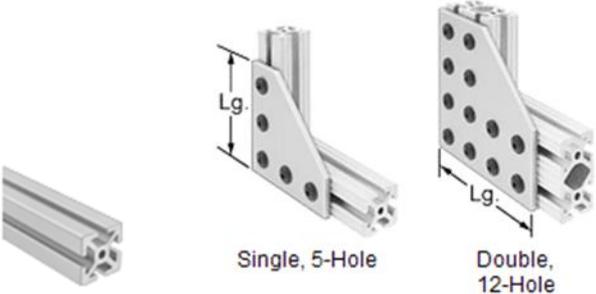
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	<p>Loctite® Or similar thread- locking product</p>	
	<p>Plastic/Epoxy Glue or Cement</p>	
	<p>Rubber Bands Any size and quantity</p>	
	<p>Surgical Tubing No size or length limit</p>	
	<p>PWM Extension cable Either purchased or fabricated by the team</p>	
	<p>Threaded Rod All-thread &amp; lead- screw</p>	
	<p>Power Distribution Panel/Splitter  This is an example. Similar parts are allowed.</p>	

	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	

The following parts are LEGAL for the 2021-2022 FIRST Tech Challenge

	<p>Linear Actuator</p>	
	<p>Wago Connector Series 222 Lever-Nuts</p>	
	<p>Timing Belts any size and pitch Gears of any size and pitch Sprockets of any size and pitch</p>	
	<p>Pulleys Springs of any type used in a safe manner (Rules &lt;RM01&gt;, &lt;RM02&gt;)</p>	
	<p>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.</p>	

	<p>Tank Tread</p>	
	<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>	<p><b>Plates</b></p>  <p>Single, 2-Hole      Double, 4-Hole</p> <p><b>Extended Plates</b></p>  <p>Single, 4-Hole      Double, 8-Hole</p> <p><b>90° Plates</b></p>  <p>Single, 5-Hole      Double, 12-Hole</p> 
<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> <li>• Aluminum or Nylon/Plastic Pop Rivets                 <ul style="list-style-type: none"> <li>• Magnets</li> <li>• Washers</li> </ul> </li> </ul> </li> <li>• Light Sources per rule &lt;RE13&gt;</li> </ul>	

The following parts are LEGAL for the 2021-2022 FIRST Tech Challenge

<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 all teams from standard distributors (for example, McMaster-Carr, Home Depot, Grainger, AndyMark<sup>®</sup>, etc.).</li><li>• All post-processed materials are allowed provided they are readily available to the majority of teams from standard distributors (for example, McMaster-Carr, Home Depot, AndyMark<sup>®</sup>, 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 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.</li><li>• Raw materials, and COTS may be modified (for example, drilled, cut, painted, etc.) provided no other rules are violated.</li></ul>
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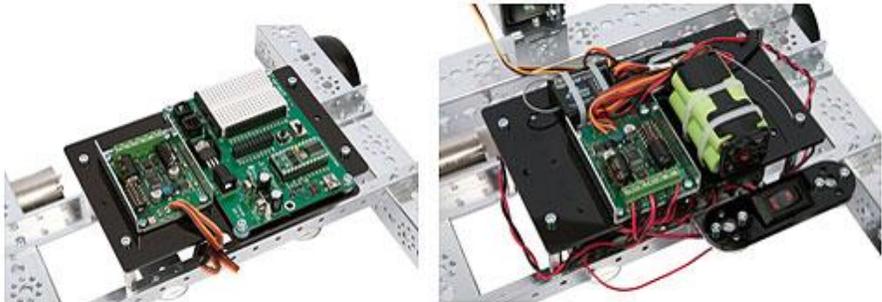
The following parts are ILLEGAL for the 2021-2022 FIRST Tech Challenge

Part Number	Description	Picture / Diagram
AUL3025	Modern Robotics Core Legacy Module	
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	
W991445 W991444	HiTechnic Servo Controller HiTechnic DC Motor Controller	

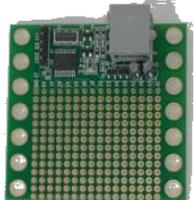
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Part Number	Description	Picture / Diagram
	Legacy Sensors (LEGO and NXT)	
	Microprocessors such as Raspberry Pi or Arduino	
W34243 or W36117	TETRIX® R/C Controller	
W35496	TETRIX® R/C Receiver	
W34244	TETRIX™ DC Motor Speed Controller	
W991458	Infrared Electronic Ball	
W739136	TETRIX® Battery Holder	

The following parts are ILLEGAL for the 2021-2022 FIRST Tech Challenge

Part Number	Description	Picture / Diagram
W37291	TETRIX® Wireless Camera Kit	
W37799 W37663	TETRIX® Autonomous Mounting Deck TETRIX R/C Mounting Deck	
W40234	TETRIX® Prime Gripper Arm Kit	
W44609	TETRIX® MAX Gripper Arm Kit	
W40235 <RE03>	TETRIX® Prime 6 V NiMH Battery Pack	
LEGO® # W778881 & W778878	LEGO® Power Function Battery Packs	

The following parts are ILLEGAL for the 2021-2022 FIRST Tech Challenge

Part Number	Description	Picture / Diagram
AndyMark® AM-2256	4-inch HiGrip Wheel	
	Rough top Tread	
	LEGO® EV3 or LEGO® NXT	
NSX2020	HiTechnic Sensor Multiplexer	
W778882 W979670 W978883	XL Power Function Motor E Power Function Motor M Power Function Motor	
NPT1050	HiTechnic Prototype Board - Solderable	

The following parts are ILLEGAL for the 2021-2022 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
NPT1055	HiTechnic Prototype Board - Solderless	 A green printed circuit board (PCB) with a white USB-A connector on the right side. It features several circular pads for components and a row of pins along the bottom edge.
SPR2010	HiTechnic Super Prototype Board	 A green PCB with two white USB-A connectors, one on the left and one on the right. It has a central microcontroller chip and various other electronic components. A row of pins is visible at the bottom.