


2015 – 2016 Legal and Illegal Parts List for *FIRST*® RES-QSM Robot Inspectors

Revision History		
1	9/24/2015	Initial release

Part Number	Description	Picture / Diagram
	<p>TETRIX™ FTC Competition Kit</p> <p>(Some components may not be shown in this illustration)</p>	

The following parts are **LEGAL** for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
	MATRIX Base Set MATRIX Resource Set	 A collection of electronic components and tools for the MATRIX Base Set. It includes a clear plastic storage bin, a blue motor, various breadboards, integrated circuits, resistors, jumper wires, and several sheets of printed circuit boards (PCBs) with components soldered onto them. Tools like screwdrivers and a soldering iron are also visible.
W40384	TETRIX Prime Starter Set EXCEPT the items listed under the ILLEGAL Parts List	 The TETRIX Prime Starter Set components, including a red and black motor, a red remote control, a black and red sensor, and a large assortment of black and red plastic parts like beams, pins, and wheels. There are also several red and yellow cones and a small red and black box labeled 'TETRIX'.
	Android ZTE Speed Phone	 A black ZTE Speed Phone, a smartphone with a large screen displaying the time 10:10 and various app icons.

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Part Number	Description	Picture / Diagram
 AUA3030	Modern Robotics Core Device Interface Module	
 AUL3025	Modern Robotics Core Legacy Module	
 AUM3020	Modern Robotics Core Motor Controller	
 AUP3010	Modern Robotics Core Power Distribution Module	
 AUS3015	Modern Robotics Core Servo Controller	

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Part Number	Description	Picture / Diagram
	Mini USB to OTG (On-The-Go) Cable	
	OTG Adapter	 
	Logitech F310 Gaming Controller (Not to be used for robot construction)	
www.andymark.com/ftc	AndyMark parts EXCEPT those listed in the ILLEGAL section	  <div> FTC NeveRest Series FTC Robot Parts </div>
 AM-2964, AM-3102, AM-3103, AM-3104	AndyMark NeveRest Motors + encoder cables	

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Part Number	Description	Picture / Diagram
 276-2177	VED EDR 393 Motor Please see rule <RE04> for allowed configuration	
W39103 W39102	TETRIX™ Stand-Off Posts (2") TETRIX™ Stand-Off Posts (1")	
W31903 W31903	TETRIX™ Motor Power Cable TETRIX™ DC Motor Power Cable	
W39025 W39055	TETRIX™ 3" Wheel TETRIX™ 4" Wheel	
W31132 W36466	TETRIX™ 3" Omni Wheels TETRIX™ 4" Omni Wheels	
W36468	TETRIX™ Tank and Conveyor Treads	





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Part Number	Description	Picture / Diagram
W39101 W39100 W39092 W39088	TETRIX™ Axle Spacers (3/8") TETRIX™ Axle Spacers (1/8") TETRIX™ Axle Set Collars TETRIX™ Axles	
W739094	Kep Nuts	
W39093	TETRIX™ Pivot Bearing	
W39111 W39098 W39097	Button Head Cap Screws Socket Head Cap Screws (5/16") Socket Head Cap Screws (1/2")	
W39129 W39176	TETRIX™ On/Off Switch TETRIX™ Switch Mount	


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Part Number	Description	Picture / Diagram
W39270 W39275 W39276 W39281 W39280 W39277 W39271, 72, 73, 74	<p>TETRIX Inside C Connector</p> <p>TETRIX Axle Shaft Coupler</p> <p>TETRIX Motor/Axle Shaft Coupler</p> <p>TETRIX Inside Corner Bracket</p> <p>TETRIX Adjustable Servo Bracket</p> <p>TETRIX Plastic Quick Rivets</p> <p>TETRIX Flats: 288mm, 160mm, 96mm, 64mm</p>	
W991445 (*) W991444	<p>HiTechnic Servo Controller</p> <p>HiTechnic DC Motor Controller</p>	
W39197 (*) W39177 (*)	<p>TETRIX™ Servo</p> <p>TETRIX™ Continuous Turn Servo</p> <p>Any hobby servo (standard size or smaller) rated at 800mA or less are allowed.</p> <p>(Total combined limit of 12 per robot)</p>	

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Part Number	Description	Picture / Diagram
W39375 W39900 W39901	TETRIX® Worm Gear Box TETRIX® 10:1 Worm Gear Pack TETRIX® 20:1 Worm Gear Pack	
W39300 W39282 W39381	TETRIX® Rack and Pinion Linear Slide Pack TETRIX® All-Terrain Tire TETRIX® Standard-Scale Servo Front Mount Bracket	
(*) 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	
W39830 W39057	NiMh Battery Pack Charger (not to be used for robot construction) 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)	




The following parts are LEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
W38000	TETRIX™ Motor Shaft Encoder Pack	
W39120	LEGO® Hard Point Connectors	
W58335	Non-Metallic Cable Ties	
W39070	TETRIX™ Flat Bars	
W39069 W39068 W39067 W39066 W39065	TETRIX™ Channel (416 mm) TETRIX™ Channel (288 mm) TETRIX™ Channel (160 mm) TETRIX™ Channel (96 mm) TETRIX™ Channel (32 mm)	

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Part Number	Description	Picture / Diagram
W39071 W39072	TETRIX™ Angles (288 mm) TETRIX™ Angles (144 mm)	
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	


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Part Number	Description	Picture / Diagram
W39073	TETRIX™ Flat Building Plates	
W39062 W39061 W39060 W39063 W39064	TETRIX™ L Brackets TETRIX™ Flat Brackets TETRIX™ Single-Servo Motor Brackets TETRIX™ Servo Joint Pivot Brackets TETRIX™ Dual-Servo Motor Bracket	
W38009	TETRIX™ Battery Clip	
W39028 W39086 W39085	TETRIX™ Gear (40-Tooth) TETRIX™ Gear (80-Tooth) TETRIX™ Gear (120-Tooth)	



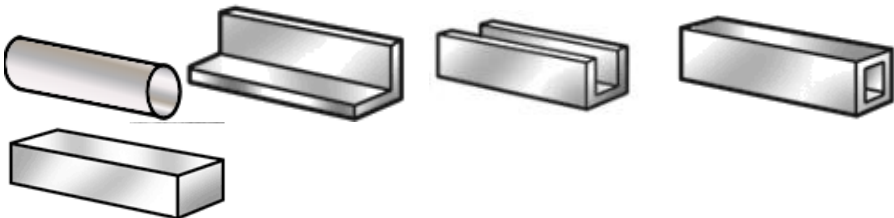

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Part Number	Description	Picture / Diagram
W38007 W38008	TETRIX™ Bevel Gears & Delrin Bearings	
W39091	TETRIX™ Bronze Bushings	
W39090	TETRIX™ Gear Hub Spacers TETRIX™ Flat Spacer	
W39089 W39376	TETRIX™ Motor Mount TETRIX® DC Motor Mount - 37 mm	
W39530	TETRIX™ DC Drive Motor (No more than 8 per robot)	
W39079 W39172	TETRIX™ Motor Hub TETRIX™ Axel Hub	

The following parts are LEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
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	
W39082	TETRIX™ Servo Y Connector	
W39081	TETRIX™ Servo Extension	
W39020	TETRIX™ Servo Horn	
W36465	TETRIX™ Thermal Fuse for DC Motor Protection	

The following parts are LEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
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 <R02> b1.	
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 <RM01>.</p>	
Any metal or plastic extruded shapes		
Rope	Rope, any size/length	

The following parts are LEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
Non-Slip Pad	No size constraint	
	Universal Security Clips	
 45-2018	Modern Robotics Color Sensor	
NSK1042	HiTechnic NXT IRSeeker V2	
NMS1035	HiTechnic NXT Magnet Sensor	
NEO1048	HiTechnic NXT EOPD	
9844	NXT Light Sensor	

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Part Number	Description	Picture / Diagram
NCO1038	HiTechnic Color Sensor	
NGY1044	HiTechnic NXT Gyro Sensor	
NIL1046	HiTechnic IRLink Sensor	
NIR1032	HiTechnic IR Receiver Sensor	
NAC1040	HiTechnic Acceleration Sensor	
NMC1034	HiTechnic Compass Sensor	

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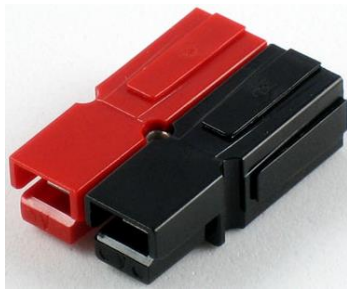
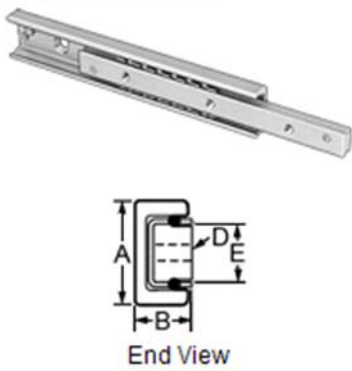
Part Number	Description	Picture / Diagram
9845	NXT Sound Sensor	
9843	NXT Touch Sensor	
9846	NXT Ultrasonic Sensor	
NAA1030	HiTechnic Angle Sensor	
NBR1036	HiTechnic NXT Barometric Sensor	
NCO1038	HiTechnic NXT Color Sensor V2	


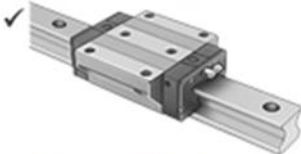



The following parts are LEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
NFS1074	HiTechnic NXT Force Sensor	
SB608SH SB609SH	ServoCity.Com Standard Servo Blocks	Example: 
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.	

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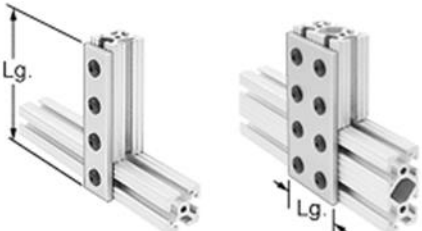
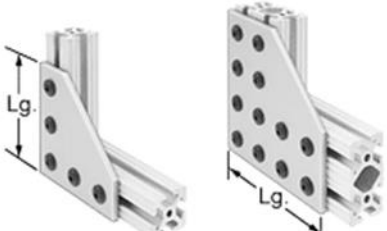

Part Number	Description	Picture / Diagram
Mechanical Fasteners	Compatible nuts, bolts, screws, etc.	
Loctite©	Or similar thread-locking product	
	Plastic/Epoxy Glue or Cement	
Rubber Bands	Any size and quantity	
Surgical Tubing	No size or length limit	 <p>Sample, color may vary</p>

Part Number	Description	Picture / Diagram
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>

Part Number	Description	Picture / Diagram
		<p data-bbox="613 342 1040 380">Roller Bearing Slide Sets</p>  <p data-bbox="613 667 1174 705">Ball-Bearing Carriages and Guide</p>  <p data-bbox="786 884 1040 968">Through-Hole Carriage and Guide Rail (Sold Separately)</p>
Telescoping Rods		
Wago Connector	Series 222 Lever-Nuts	
	<p data-bbox="310 1675 532 1738">Timing Belts any size and pitch</p> <p data-bbox="310 1829 540 1892">Gears of any size and pitch</p>	

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Part Number	Description	Picture / Diagram
	Sprockets of any size and pitch	
	Pulleys Springs of any type used in a safe manner (Rules <RG02>, <RG10>, <RG11>)	
	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. (Rule <RM01>d)	

Part Number	Description	Picture / Diagram
T-Slot Aluminum	<p>Extruded aluminum pieces from various manufacturers such as 80-20, McMaster-Carr, Macron, etc.</p> <p>All fasteners and compatible hardware are allowed</p>	<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> 
MISC (No Images Available)	<ul style="list-style-type: none">• Material strictly used for Light Sensor color filter.• Hook and loop (Velcro, 3M Dual Lock. (May not be used as tape).• Electrical Tape and Heat Shrink tubing for electrical insulation only• Plastic Coated Wire Rope• Electrical wire• Aluminum or Nylon/Plastic Pop Rivets• Magnets• Washers per rule See <RM01>.• Visible light LEDs per rule <RE03> g	
COTS Parts (No Images	Teams may use additional materials and COTS (Commercial Off The Shelf) components to construct their Robots subject to the following restrictions:	


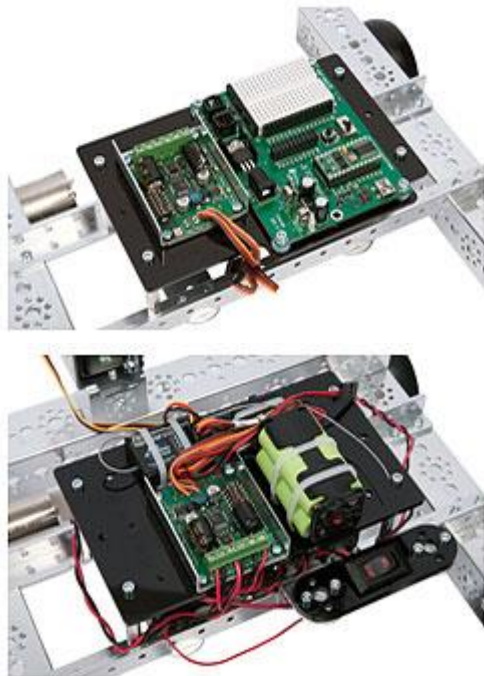

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Part Number	Description	Picture / Diagram
Available) <RM01>	<ul style="list-style-type: none"> • All raw materials are allowed provided they are readily available to the majority of teams from standard distributors (e.g. McMaster-Carr, Home Depot, Grainger, AndyMark, etc.). • 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.). • 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. • Raw materials, and COTS may be modified (e.g. drilled, cut, painted, etc.) provided no other rules are violated. 	

The following parts are ILLEGAL for the 2015-2016 *FIRST* Tech Challenge

Part Number	Description	Picture / Diagram
	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	






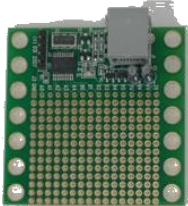



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Part Number	Description	Picture / Diagram
W37291	TETRIX Wireless Camera Kit	
W37799 W37663	TETRIX Autonomous Mounting Deck TETRIX R/C Mounting Deck	
W40234 <R 02 L>	TETRIX Prime Gripper Arm Kit	

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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	

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Part Number	Description	Picture / Diagram
W991446 	HiTechnic Sensor Multiplexer	
W991446	HiTechnic Touch 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	