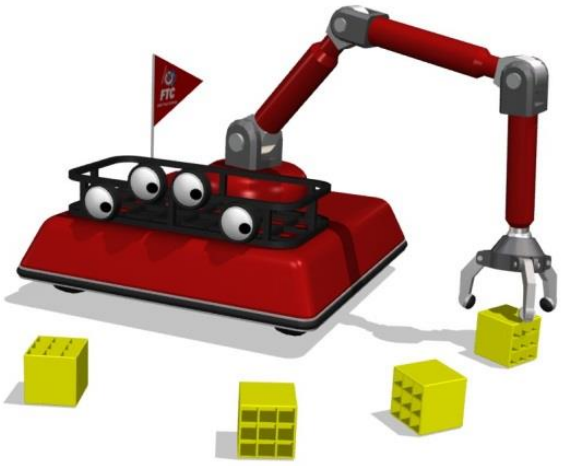
2013-2014 FTC BLOCK PARTY!sm

Hardware Inspection Manual



Note: This manual is solely for the training of Hardware Inspectors. Any other uses or distributions, including to other Volunteers, Coaches, or Teams is a violation of the Core Values of *FIRST*.

Thank you!

Thank you for taking the time to volunteer for a *FIRST* Tech Challenge Event. *FIRST* and FTC rely heavily on Volunteers to ensure Events run smoothly and are a fun experience for Teams and their families. These Events could not happen without people like you. With over 3,000 Teams competing annually, your dedication and commitment are paramount to the success of each Event and the FTC program. Thank you for your time and effort in supporting the mission of *FIRST*!

Revision History		
Revision	**Date**	**Description**
1	9/30/2013	Initial Release
1.1	10/7/13	Added *Gracious Professionalism™* Video link to Appendix A
1.2	10/15/2013	Added link to Training Video
1.3	11/8/2013	• Section 4.1 – Team Self Inspection Procedures added • Appendix D – Allowable Parts Document added
1.4	12/4/2013	Appendix C – Updated Inspection Checklist
1.5	12/9/2013	Appendix A - Added Phone number for monthly discussion calls

Contents

1. Introduction

The Inspection process involves filling out a checklist for every Robot and placing a label or other unique tag on the Robot after passing Inspection. The process is outlined below:

- Teams bring their Robot to the Inspection station for size Inspection. The Robot is placed inside an 18”x18”x18” sizing box. The Robot must fit into the sizing box without exerting any pressure on the walls of the sizing box. Robots are permitted to touch the side of the sizing box, as long as the box is not preventing the Robot from expanding beyond the size constraint. If any mechanism (rubber bands, string, zip ties, etc.) is used to keep the Robot within the 18”x18”x18” sizing box, they must NOT be removed for the Competition.
- Check for unsafe mechanisms on the Robot. These include (but are not limited to) those that can damage the playing Field Elements, can cause unnecessary risks of entanglement, or are designed to flip over other Robots.
- The Robot must pass a Software Inspection. Check with your Volunteer Coordinator or Lead Robot Inspector to see if you are assigned Hardware or Software Inspection, and then follow the instructions for the appropriate role. The focus of this guide is Hardware Inspection. Please refer to the Software Inspection manual for instructions and guidelines if your assigned role is Software Inspection.
- The Robot must pass a Field Inspection to ensure the Robot can connect to the FCS and that it behaves properly at the beginning and end of the autonomous and driver controlled periods.

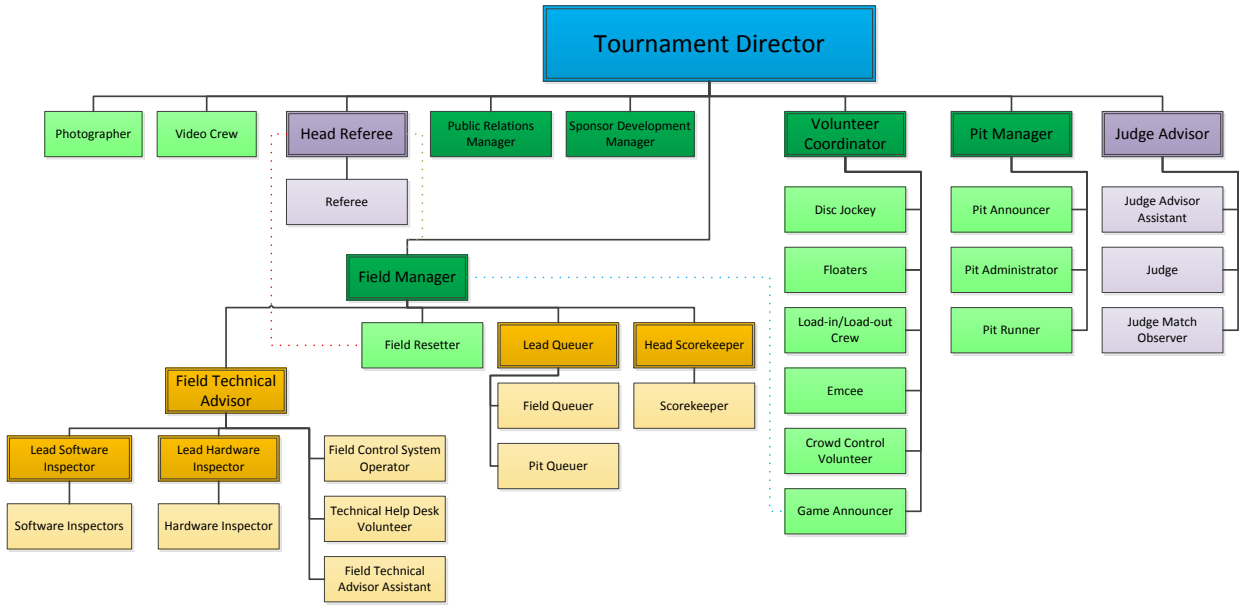
For the sake of Event consistency, Inspection rules must be enforced at every Official FTC Qualifier or Championship Event. Allowing a violation to pass at “just one Event” is not fair to the Teams that have taken the time and trouble to make sure their Robot does pass Inspection.

Note: The allowable/non allowable parts document will be released at a later date.

2. Organizational Chart

The Hardware Inspector reports to the Lead Hardware Inspector. Refer to the Organizational Chart below for the relationship between roles and Volunteer reporting at Tournaments

Suggested Tournament Organizational Chart



3. Role and Responsibility

It is the responsibility of the Hardware Inspector to:

- Asses the Team's Robot and point out anything that is not in compliance with the rules.
- Point out potential areas of entanglement (loose cables).
- Help the Team to be successful.
- Facilitate information sharing among Teams.
- Be fair and applies the same level of thoroughness for every Team.
- Treats all Teams with Gracious Professionalism.

3.1 Prior to the Event

Hardware Inspectors are required to participate in training prior to the Event. This training is provided by *FIRST* Headquarters. You will also be required to take a certification test prior to the Event.

Required reading before training/certification

- The Inspection Manual.
- Section 5 of Part 1 of the Game Manual.
- The Inspection checklist.

- Allowed parts document.
- Game Q&A – The Robot section.

It is important prior to the Event that the Hardware Inspector reviews these Manuals, and watches the pre-recorded Hardware Inspector Training video. Appendix A of this document provides you with the link to the training video, certification test, and a list of Q&A scheduled calls. The scheduled Q&A calls will give you an opportunity to ask questions, and even provide feedback to other Hardware Inspectors.

3.2 Day of the Event

Once you arrive at the Event you will be tasked with setting up the Inspection station. In your Inspection station you should have:

- Inspection checklist.
- Inspection manuals.
- Section 5 of Part 1 of the Game Manual.
- A printout of the relevant sections of the Game Design Forum (Forum responses are official and enforceable).
- Team list.
- Inspection stickers or other method of identifying Robots that have passed Inspection that can be placed onto the Robot.
- Moveable parts stickers.
- Pens.
- An 18”x18”x18” sizing box.
- Power.
- Chair.
- Flashlight.
- Yard stick.
- Safety glasses.
- Game Elements (if necessary)

4. Hardware Inspection Procedures

As a Hardware Inspector, you will probably be the first FTC Official that Teams will encounter at a Competition. It is important that you make the Teams feel at ease. They will normally be nervous about the upcoming day, so be friendly and have fun with them. Remember: your job is not to fail Teams for not passing inspection – it is to help Teams stay within the rules so that they can compete on the Field. Be kind and offer suggestions so that they can be in compliance with the inspection process. Be understanding if they question your interpretation of the rules and do not be afraid to ask for guidance from the lead Robot inspector and/or the Head Referee.

The easiest way to do the Hardware Inspection is to go through the Inspection Checklist from top to bottom. Please note: the Hardware Inspection checklist can be located in Appendix B of this document. This is a two page long document (usually printed front and back).

4.1 Team Self Inspection Procedures

A new rule has been added to the Game Manual Part 1 for the 2013-2014 season which stipulates that Teams are required to complete a self-inspection prior to attending an Event (reference RG02 and section 6.2 of Game Manual Part 1). The new rules stipulate that the Team must arrive at Hardware Inspection the day of the Event with:

- A Bill of Materials (BOM) listing all non-standard parts on their Robot.
- Corresponding Game Rule or Q&A post that allows the part.
- Completed Hardware Inspection checklist (from the Game Manual Part 1).

When a Team arrives at Hardware Inspection, they should be asked to provide the above materials. It is important not to turn Teams away that do not arrive at the Event with the required materials; rather they should be reminded by the Hardware Inspector that they will need to present these materials for future Events. Follow the Inspection process as you normally would, pay close attention for any illegal or non-standard parts on the Robot. Non-standard Robot parts do NOT include:

- Tetrix components
- Matrix components
- Lego Mindstorm components
- Fasteners

If any non-standard parts are located on the Robot, ask the Team to return to the Pit and create their Bill of Materials, outlining the list of non-standard parts, and the rule or game forum Q&A that allows that part.

Always keep in mind that as a Hardware Inspector your role is not to fail a Team. You are in a role to help a Team pass inspection while keeping within the rules so that they can compete.

4.2 Size Inspection

The Robot sizing box is the official gauge of whether a Robot has met the Match start size constraints of 18”x18”x18”. Slide the Robot into the open end of the sizing box. If there is no undue pressure on any of the wall sides or back and you can slide a flat plate or yardstick over the open front of the without hitting any part of the Robot, then the Robot passes the first part sizing constraint. Sometimes, a Team will need to turn the power on their Robot to “zero” the servos in order to fit into the sizing box. This is acceptable as long as they understand that they must do that for every Match. They will also need to place a “Moveable Parts” sticker on their Robot somewhere visible for the referees and other Game Officials for Match play.

4.3 Overall Inspection

The overall Inspection is very straightforward: Go through each item on the checklist. Check for these key inspection points that are commonly overlooked by Teams:

- Team number on two sides of the Robot.
- Robot has a flag holder.
- The NXT LCD is readily visible, with access to the Samantha USB port.
- The TETRIX power switch is easily accessible.

If the only thing wrong with the Robot is that the USB port is not easily accessible or the NXT battery is not easily removed, do not fail the Inspection, but recommend to the Team that they should try to make those items more accessible. Gently remind the Team that they should make the USB and NXT battery easily accessible for the next competition. If there are any issues with their Robot during a Match, the FTA will not be able to rectify the issue, and the Team may not be able to complete their Match.

To test for sharp objects, run your hands over all corners and cut pieces of the Robot. Make sure there are no sharp edges. If there are, ask the Team to file them down and smooth them out.

If the Robot has a launching mechanism, please follow the instructions below for a velocity test.

- In the Inspection area on the floor, mark off an area for the Team to place their Robot. Mark off a line on the floor 10 feet away (if you are near a wall, use the wall as the 10 foot mark).
- If the Team has a shooter mechanism, have them test launch two or three Game Elements toward the end of the 10 foot mark. Shooting mechanisms that can change their elevation should be tested at different elevation angles to ensure that height and distance restrictions are not violated.
- If the Game Element goes farther than the 10 foot mark, the Robot does not pass Inspection. Also, the Game Element may not travel more than 4 feet vertically above the Field. The apex measurement may have to be done visually; however you can also mark off the 4 foot mark on the wall and visually compare the apex of the flight with the mark on the wall.
- Another suggestion is to have a stick or board (1” x 1” or 2” x 2”) that is 4 feet long. Please the board vertically from the floor and make sure the apex of the flight is below the top of the board.

5. Parts and Additional Parts Inspection

Review all parts of the Robot and make sure that they are legal. An appendix to this document provides a pictorial guide of allowed parts, and pictures of the most common dis-allowed parts you might see on a Robot. Specific quantities, sizes, and parts are listed in the Inspection Checklist. Make sure that the Team is not using a 2nd Tetrix battery as ballast for weight. Make sure any heat shrinking tubing or electrical tape is only used for insulation of electrical components.

5.1 Rule Changes for 2013-2014

- **<RG02>** Teams must present a Bill of Materials (BOM) listing any parts used on their robot outside of the standard LEGO, TETRIX, or MATRIX parts.
- **<RG05>** Teams must affix a Main Robot Power label near the main power switch of the robot.
- **<R05>** The allowable list of COTS items have been expanded to include #35 chain and links, timing belts of any size and pitch, sprockets of any size and pitch, pulleys, springs that are used in a safe manner, and wheels of any type up to 4" diameter (provided that they do not cause field or game element damage).
- **<R08h>** Quarter-scale (HiTEC HS-755HB and HiTEC 785HB) servos can be used.
- **<R08y>** Video recording devices (e.g. GoPro) are allowed provided they are only used for non-functional post-match entertainment. Cameras must NOT have built-in wireless capability.

5.2 Construction Inspection

Verify that no electrical components have been modified from their original state except as specified in the rules. Also check that they are only using legal fasteners in the construction of the Robot as specified.

5.3 Software Inspection

Software Inspection is independent of Hardware Inspection. Teams may do Software Inspection first if they find the line too long at the Hardware Inspection station (and vice versa).

5.4 Field Inspection

Field Inspection occurs after Software Inspection, and may be completed prior to Hardware Inspection.

6. Appendix A – Resources and Certifications

Training video – https://usfirst.box.com/s/39cwdg1zgo9e016elsr6

Certification Test - http://www.classmarker.com/online-test/start/?quiz=f7p52330d34bc6b0

Note: It is best practice to copy this link and paste it into a new browser.

Password: hwcert

To access the Certification test you will have to fill out the required fields:

- Full name
- Email address
- Please indicate the city and state where you will act as a Hardware Inspector
- How many years have you filled the role as a Hardware Inspector?
- What is the date of the Event?

Game Forum Q&A - http://ftcforum.usfirst.org/forum.php

Volunteer Forum - The Volunteer Forum allows you to ask other Volunteers questions or share tips and best practices. In order to access the Volunteer Forum, you must register through the Game forum page. Please see Appendix B for instructions.

Game Manuals – Part 1 and 2 - http://www.usfirst.org/roboticsprograms/ftc/game

Monthly Hardware Inspector Discussion scheduled calls:

- Tuesday, December 10th, 2013
- Tuesday, January 14th, 2014
- Tuesday, February 11th, 2014

All Discussion calls will take place at 8:00 PM, EST.

Phone: 866-951-1151

Conference Room # 1066578

FIRST Headquarters Support

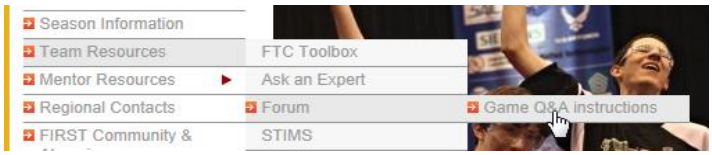
Phone: 603-206-2412

Email: FTCTeams@usfirst.org

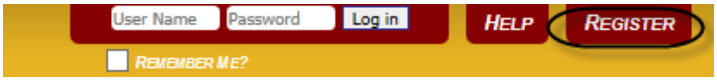
Gracious Professionalism Video - https://usfirst.box.com/s/hupdkypes5ph379a99be

7. Appendix B - FTC Volunteer Forum Registration Instructions

FTC Staff manually moderates the forums in order to weed out spam bots. We use various sections of the registration information (Location, Role, and Team Number) to help us decide that you aren't a bot spamming our account. We do this daily, so you will get a quick response once you submit your registration. Here's how you avoid registering (without being mistaken for a spam bot):
Go to the forum: Ftcforum.usfirst.org/forum.php You can get there by clicking on FTC at the usfirst.org website, hovering over "team resources" (in the left column), and selecting "forum".



Click the Forum Link. You will then see the following page, in which you should click "Register" at the upper right-hand corner of the page.



On the registration page fill out your full name, email address, and create a password. You will also be asked a question. The question field is one of the tools we use to weed out spammers, but if you do not know the answer, click your browser's refresh button and fill in the fields again and a new random question should appear.

The following fields must be entered as stated in this manual in order to be granted access to the forum:

- In the Location field, type **the city and state that you will be volunteering in**, ie: Manchester, NH
- In the Team Role field, type **the position you will hold at that event,** ie: Field Tech Advisor
- In the Team Number field, type **Event Volunteer** (the field will only permit Event Vo, but that works)

The last fields are optional, however you must check the box that says "**I have read, and agree to abide by the FTC Forum rules."**

Once all of these steps have been completed, click "Complete Registration". You will then receive an email from FTC Forums to complete the registration. Click the link in the email, and follow the instructions. This will activate your account, however you will still need to be granted access which is done manually.

Within one business day, you'll receive an email from our forum welcoming you officially. Now you will be able to post in the various forums, and you will see the Volunteer forums.

Use the Ask the Game Design Committee threads to post questions you would like the game design committee or FTC staff to answer.
Use the Best Practices threads to talk to other volunteers about your questions and experiences.

8. Appendix C – Inspection Checklist

Team	Inspector	General Robot Rules	Rule#
		Robot fits within the Sizing Box (18 x 18 x 18) without exerting force on box sides or top	RG4
		Robot does NOT contain any components that could damage the playing field or other robots	RG3a&b
		Robot does NOT contain hazardous materials	RG3C
		Robot poses NO obvious unnecessary risk of entanglement	RG3d
		Robot does NOT contain any sharp edges or corners	RG3e
		Robot Motion Warning Label is attached if servo motors move during the robot initialization routine	RG4b
		Main Power Switch(es) are installed properly, labeled, and readily accessible and visible to competition personnel	RG5, R8e
		All batteries are securely attached to the robot	RG6
		NXT Battery can be easily removed with minimal disassembly of the robot	RG7a
		NXT Controller and Samantha Module buttons and USB ports are readily accessible	RG7b
		NXT Controller liquid crystal display and Samantha LED's are readily visible	RG7c
		Electrical components are mounted such that they are protected from Robot-to Robot contact	RG7d
		Robot Flag Holder is present and adequately holds the flag during normal robot operation	RG8
		Team number is visible from at least 2 sides (180 deg. Apart), 3" tall, ½" stroke	RG9
		Game Elements launched by the robot do not exceed height and range constraints	R11
		Robot Parts and Materials Rules	
		All preformed components on the Robot are from the TETRIX, LEGO, and MATRIX robotic systems	R1, R2, R3
		Robot does NOT contain COTS assemblies other than those specifically allowed in the rules	R4, R5
		Robot does NOT contain additional mechanical parts other than the items listed in R6	R6
		Robot has exactly one (1) NXT controller and additional microprocessors comply with R8a	R8a
		Robot has one (1) official NXT rechargeable battery pack (AC or DC) or six (6) AA batteries (not both)	R8b
		Robot has exactly one (1) official TETRIX or no more than two (2) MATRIX main battery packs	R8c
		Exactly one (1) MATRIX Battery Box to power the Samantha Module (Only for MATRIX Robots)	R8d
		Only HiTechnic or MATRIX (not both) motor and servo controllers are used (any quantity is permitted)	R8f
		Maximum of eight (8) TETRIX or MATRIX motors and twelve (12) servos, all controlled by HiTechnic or MATRIX controllers	R8g&h
		Each NXT motor port (A, B or C controls nomore than: (i) one NXT Interactive servo Motor, or (ii) one XL Power Function Motor, or (iii) two E Power Function Motors, or (iv) two M Power Function Motors, or (v) one E plus one M Power Function Motors	R8i
		Robot has exactly one (1) Samantha module and one (1) USB cable (and optional pigtail)	R8j
		All sensors attached directly to the NXT, HiTechnic Sensor Multiplexor, or HiTechnic Touch Sensor Multiplexor are LEGO or HiTechnic products	R8k
		HiTechnic 9-volt Battery Box (if used) is only used as part of the NXT Sensor Multiplexor	R8m
		HiTechnic SuperPro Prototype Board and NXT Prototype Board comply with the specified constraints	R8n
		Only LEGO approved NXT extension and conversion cables are used	R8o&p
		Electrical connectors are Anderson PowerPole, crimp, or quick connect styles	R8q

		Power, motor control, servo and encoder wires are the correct size	R8r
		Only visible light LEDs are used and powered by either the main battery or no more than one battery of any type not to exceed 9 volt	R8s
		Robot contains only specifically allowed electrical components and the electrical components Have NOT been modified from their original state except as permitted by the rules	R8v&w
		Video recording devices, if used, are non-functional and don't have wireless communication capability	R8y
		LEGO Pneumatic Elements have NOT been modified to change their pressure limits	R9
		Decorative components used on the robot are constructed with allowed parts or they are non- functional. Decorations are in the spirit of Gracious Professionalism	R13

General Comments or Reason(s) for Failure (if any):

I hereby state that all of the above is true, and to the best of my knowledge all rules and regulations of the *FIRST* Tech Challenge have been abided by.

Hardware Inspector

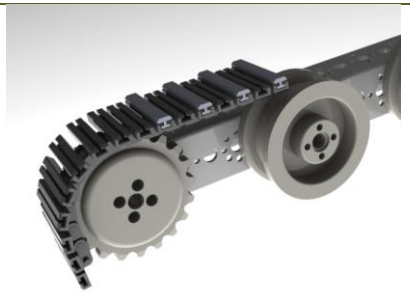
Team Student Representative

2013-2014 FTC BLOCK PARTY!^{sm}

Appendix D - Legal and Illegal Parts List for Hardware Inspectors

The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
Custom	TETRIX™ FTC Competition Kit (Some components may not be shown in this illustration)	
W739103 W739102	TETRIX™ Stand-Off Posts (2”) TETRIX™ Stand-Off Posts (1”)	
W739084 W731903	TETRIX™ Motor Power Cable TETRIX™ DC Motor Power Cable	

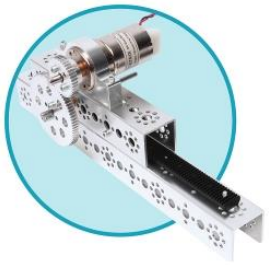
Part Number	Description	Picture / Diagram
W739025 W739055	TETRIX™ 3” Wheel TETRIX™ 4” Wheel	
W731132 W736466	TETRIX™ 3” Omni Wheels TETRIX™ 4” Omni Wheels	
W736468	TETRIX™ Tank and Conveyor Treads	
W739101 W739100 W739092 W739088	TETRIX™ Axle Spacers (3/8”) TETRIX™ Axle Spacers (1/8”) TETRIX™ Axle Set Collars TETRIX™ Axles	

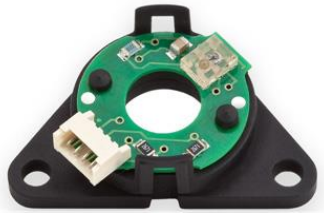
The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739094	Kep Nuts	
W739093	TETRIX™ Pivot Bearing	
W739111 W739098 W739097	Button Head Cap Screws Socket Head Cap Screws (5/16") Socket Head Cap Screws (1/2")	
W739129 W739176	TETRIX™ On/Off Switch TETRIX™ Switch Mount	

Part Number	Description	Picture / Diagram
(TBD) W739270 W739275 W732976 W739281 W739280 W739277 W739271, 72, 73, 74	TETRIX Linear Slide Motion Pack TETRIX Inside C Connector TETRIX Axle Shaft Coupler TETRIX Motor/Axle Shaft Coupler TETRIX Inside Corner Bracket TETRIX Adjustable Servo Bracket TETRIX Plastic Quick Rivets TETRIX Flats: 288mm, 160mm, 96mm, 64mm	
W991445 (*) W991444	HiTechnic Servo Controller HiTechnic DC Motor Controller	
W739197 (*) W739177 (*)	TETRIX™ Servo TETRIX™ Continuous Turn Servo Any hobby servo (standard size or smaller) rated at 800mA or less are allowed. (Total combined limit of 12 per robot)	

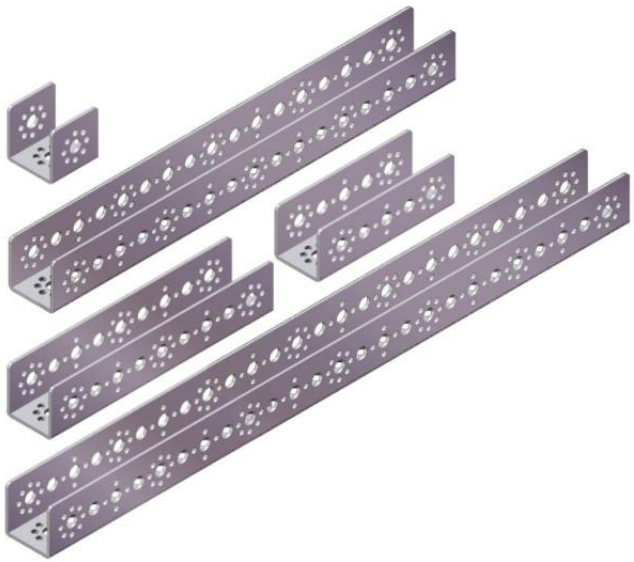
The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739375 W739900 W739901	TETRIX® Worm Gear Box TETRIX® 10:1 Worm Gear Pack TETRIX® 20:1 Worm Gear Pack	  
W739300 W739282 W739381	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.		
W739904 W739380 W739383 W739244	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	   

Part Number	Description	Picture / Diagram
W991446	HiTechnic Touch Sensor Multiplexer	
W991446	HiTechnic Sensor Multiplexer	
W739059 W739057	NiMh Battery Pack Charger (not to be used for robot construction) 12V Rechargeable NiMh Battery Pack (Exactly 1 allowed)	 
W739140	TETRIX™ Motor Encoder Pack (Improved Encoder mount, ships with the kit)	 

The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739115	Logitech Gaming Controller (Not to be used for robot construction)	
W739120	LEGO® Hard Point Connectors	
W758335	Non-Metallic Cable Ties	
W739070	TETRIX™ Flat Bars	

Part Number	Description	Picture / Diagram
W739069 W739068 W739067 W739066 W739065	TETRIX™ Channel (416 mm) TETRIX™ Channel (288 mm) TETRIX™ Channel (160 mm) TETRIX™ Channel (96 mm) TETRIX™ Channel (32 mm)	
W739071 W739074	TETRIX™ Angles (288 mm) TETRIX™ Angles (144 mm)	

The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739074 W739075 W739076 W739077 W739379 W739378 W739377	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	
W739193	TETRIX™ Tube Plugs	
W739073	TETRIX™ Flat Building Plates	

Part Number	Description	Picture / Diagram
W739062 W739061 W739060 W739063 W739064	TETRIX™ L Brackets TETRIX™ Flat Brackets TETRIX™ Single-Servo Motor Brackets TETRIX™ Servo Joint Pivot Brackets TETRIX™ Dual-Servo Motor Bracket	
W738009	TETRIX™ Battery Clip	
W739028 W739086 W739085	TETRIX™ Gear (40-Tooth) TETRIX™ Gear (80-Tooth) TETRIX™ Gear (120-Tooth)	
W738007 W738008	TETRIX™ Bevel Gears & Delrin Bearings	

The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739091	TETRIX™ Bronze Bushings	
W739090 W739251	TETRIX™ Gear Hub Spacers TETRIX™ Flat Spacer	
W739089 W739376	TETRIX™ Motor Mount TETRIX® DC Motor Mount - 37 mm	
W739083	TETRIX™ DC Drive Motor (No more than 8 per robot)	
W739078	TETRIX™ Split Clamps	

Part Number	Description	Picture / Diagram
W739079 W739172	TETRIX™ Motor Hub TETRIX™ Axel Hub	
W739173 W739171 W739169 W739165	TETRIX™ Chain with Links TETRIX™ 32 tooth Sprocket Pack TETRIX™ 24 tooth Sprocket Pack TETRIX™ 16 tooth Sprocket Pack Non-TETRIX #25 or #35 chain	
W735871	TETRIX™ 250mm Axel	
	#25 Chain Half-Lengths #35 Chain Half-Lengths	
W739082	TETRIX™ Servo Y Connector	

The following parts are considered LEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W739081	TETRIX™ Servo Extension	
W770323 W778886 W778871	NXT Conversion Cable	
W739020	TETRIX™ Servo Horn	
W736465	TETRIX ™ Thermal Fuse for DC Motor Protection	
	Samantha WiFi Module	

Part Number	Description	Picture / Diagram
W720821	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).	
W979841 W979798 W979693	NXT Intelligent Brick NXT Rechargeable Battery (AC) NXT Rechargeable Battery (DC) (Exactly 1 NXT controller must be used.) (NXT must be powered by either of the battery packs shown, or 6 AA batteries)	  
W991534	NXT Extended connector cable set	

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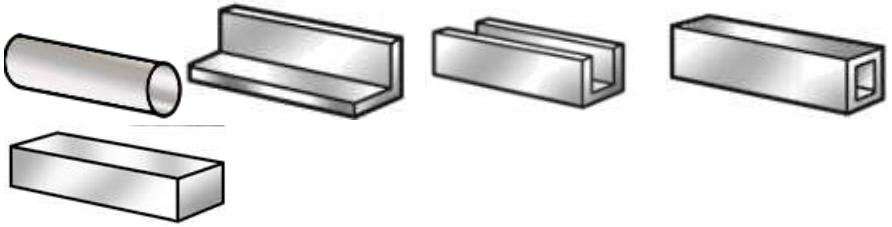
Part Number	Description	Picture / Diagram
W778882 W979670 W978883	XL Power Function Motor E Power Function Motor M Power Function Motor	
NEW For International Competitions and Piloted US Events	MATRIX Base Set MATRIX Resource Set	
Plastic Sheet	Any non-reinforced polymer-based plastic sheet material (e.g. polycarbonate, PVC, acrylic, ABS, Teflon, PETG, etc.) See <R02> b1.	

Part Number	Description	Picture / Diagram
Any metal or plastic Flat Sheet	Both materials may be used on the robot. No limit to size or quantity. See <R04> b1.	 
Any metal or plastic extruded shapes		
Rope	Rope, any size/length	
Non-Slip Pad	No size constraint	

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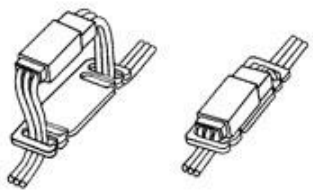
Part Number	Description	Picture / Diagram
	Universal Security Clips	
NSK1042	HiTechnic NXT IRSeeker V2	
NMS1035	HiTechnic NXT Magnet Sensor	
NEO1048	HiTechnic NXT EOPD	
W979844	NXT Light Sensor	

Part Number	Description	Picture / Diagram
W991348	HiTechnic Color Sensor	
W991380	HiTechnic NXT Gyro Sensor	
W991453	HiTechnic IRLink Sensor	
NIR1032	HiTechnic IR Receiver Sensor	

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Part Number	Description	Picture / Diagram
W991349	HiTechnic Acceleration Sensor	
W991324	HiTechnic Compass Sensor	
W979845	NXT Sound Sensor	
W979843	NXT Touch Sensor	
W979846	NXT Ultrasonic Sensor	

Part Number	Description	Picture / Diagram
NPT1050	HiTechnic Prototype Board - Solderable	
NPT1055	HiTechnic Prototype Board - Solderless	
SPR2010	HiTechnic Super Prototype Board	
NAA1030	HiTechnic Angle Sensor	

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Part Number	Description	Picture / Diagram
NBR1036	HiTechnic NXT Barometric Sensor	
NCO1038	HiTechnic NXT Color Sensor V2	
NFS1074	HiTechnic NXT Force Sensor	
SB608SH SB609SH	ServoCity.Com Standard Servo Blocks	Example: 

Part Number	Description	Picture / Diagram
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.	 Sample
Mechanical Fasteners	Compatible nuts, bolts, screws, etc.	 Sample – not limited to

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Part Number	Description	Picture / Diagram
Loctite©	Or similar thread-locking product	
Plastic Glue/Cement		
Rubber Bands	Any size and quantity	
Surgical Tubing	No size or length limit	 Sample, color may vary

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.	

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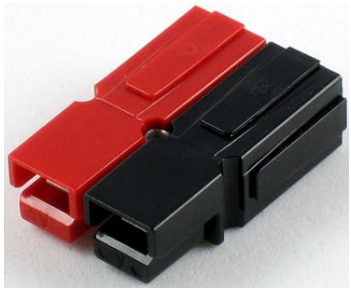
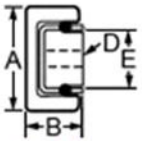
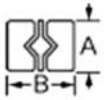
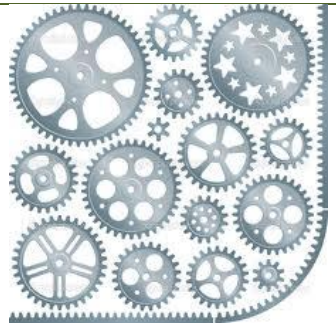
Part Number	Description	Picture / Diagram
Anderson Powerpole connectors		
Linear Slides		Telescopic Slides   End View Roller Bearing Slide Sets   End View Ball-Bearing Carriages and Guide  Through-Hole Carriage and Guide Rail (Sold Separately)

Part Number	Description	Picture / Diagram
NEW Wago Connector	Series 222 Lever-Nuts	
	Timing Belts any size and pitch Gears of any size and pitch Sprockets of any size and pitch # 25 and # 35 chain and associated links	  

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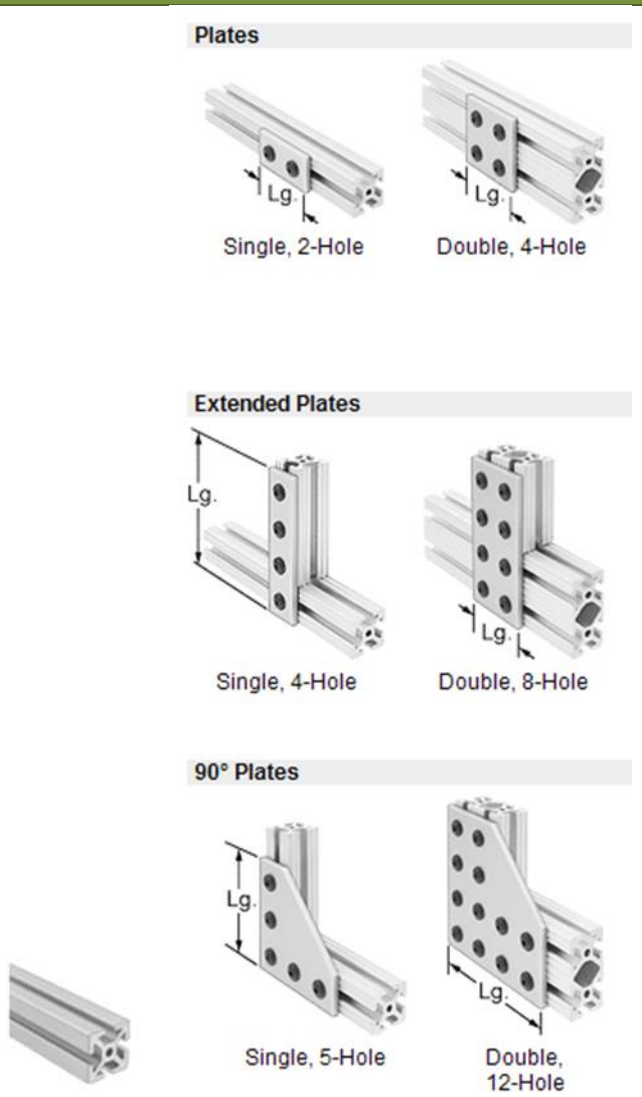
Part Number	Description	Picture / Diagram
	Pulleys Springs of any type used in a safe manner (Rules <RG03>, <RG10>, <RG11>)	 
	Wheels of any type, and the manufacturer provided wheel hub used to mount the wheel to an axle up to 4" diameter. Individual components of a legal wheel assembly can be used on the robot (as long as wheel and hub are 4" diameter or less). (Rule <R05>o)	 

Part Number	Description	Picture / Diagram
T-Slot Aluminum	Extruded aluminum pieces from various manufacturers such as 80-20, McMaster-Carr, Macron, etc. All fasteners and compatible hardware are allowed	

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Part Number	Description	Picture / Diagram
MISC (No Images Available)	• 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 • LEGO Pneumatics • NXT Motors • Aluminum or Nylon/Plastic Pop Rivets • Custom-made brackets for securing the encoder to the 12V DC drive motors • Washers per rule See <R05> k. • Visible light LEDs per rule <R08> s	

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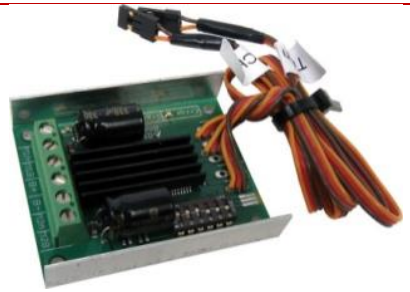
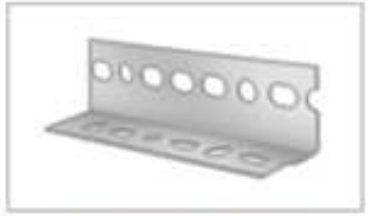
Part Number	Description	Picture / Diagram
W34243 or W36117	TETRIX™ R/C Controller	
W35496	TETRIX™ R/C Receiver	
W34244	TETRIX™ DC Motor Speed Controller	

The following parts are considered ILLEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
W991458	Infrared Electronic Ball	
W739136	TETRIX™ Battery Holder	

Part Number	Description	Picture / Diagram
W37291	TETRIX Wireless Camera Kit	
W37799 W37663	TETRIX Autonomous Mounting Deck TETRIX R/C Mounting Deck	 
LEGO® Power Function Battery Packs	LEGO # W778881 & W778878	 

The following parts are considered ILLEGAL for the 2013-2014 *FIRST* Tech Challenge, FTC Block Party!

Part Number	Description	Picture / Diagram
ALL	Vex Parts	
Extruded material with prefabricated holes or features.		 Framing Angles