

INSPECTING VEX ROBOTS FOR DUMMIES

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Change Up Edition

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Note: If you look next to an item on the checklist, there is a notation in the grey box (such as R4, G4) that denotes the rules applicable to the item. You can look these rules up in the game manual to help understand the context of the item.

Introduction

First off, thank you for volunteering to be an inspector. Volunteers are the grease of VEX tournaments all over the globe; they help run things as smoothly as possible. Without you, no tournament could ever occur and teams would not be able to display their design and compete. Your role as an inspector is to ensure that every team at the tournament is on a level playing field by checking to make sure that each robot meets the guidelines set forth by the VRC Game Manual.

If this is your first time inspecting a robot, do not worry! In this guide, I will explain the process of inspecting and go through each step of the inspection checklist, with a detailed explanation for each step. There will be a dedicated page in this guide for each step on the checklist.

SETUP

ITEM SETUP

- 1) To prepare for inspection, you will need the following items at minimum. Large events, such as signature events and state/regional/provincial championships, may require multiple teams of inspectors to handle the large volume of teams:
 - At least 3 inspectors. If there are multiple sets of sizing tools available, at least 3 inspectors can be recruited for every sizing tool set available at the tournament.
 - A table with enough room to fit 3 inspectors working together and the team being inspected. The table should also be durable enough to handle the flood of robots at inspection.
 - Enough inspection checklists for all teams at the tournament. There are two versions of the checklist, one for the Cortex and one for the V5 Brain. As of now, the vast majority of teams, depending on your region, will have V5s; Cortexes will be a rare sight. These are found online at <https://www.roboticseducation.org/documents/2019/05/vrc-robot-inspection-checklist.pdf/>
 - One 18" sizing tool. If a large amount of teams are competing (at least 24), a second sizing tool may be required to avoid bottlenecks.
 - A VEX Competition Switch (see page 40 for a picture of what it looks like) as well as an Ethernet cable preferably at least 3 feet in length. Again, there should be one in the event partner's custody. If there isn't one available, one of the teams may have a competition switch.

- A list of teams competing at the event.
 - A folder to store the inspection checklists.
 - Stickers to put onto the robot's ID plates to indicate the team has passed inspection. Zip ties (especially colored ones as well) will work as well.
 - A copy of the Game Manual. Make sure it is the most recent version available. For Change Up, the latest version is dated 12/1/2020.
- 2) In addition to the minimum items stated above, the following optional items can be used:
- A tape measure for precise measurements. The 18" tool should take care of your needs, but it doesn't hurt to be able to make custom measurements that the sizing tools can't.
 - A caliper to check plastic thickness
 - #32 and #64 rubber bands to compare with the robot, since only those two sizes are allowed for rubber bands.
 - A catalog of every VEX part known to man.
 - A laptop connected to Tournament Manager via which inspection statuses for each team can be updated as inspection proceeds.

TABLE SETUP

The inspector table should be set up as follows:

- There are three major portions of the checklist, thus the inspectors should divide themselves as follows:
 - 1 inspector should check for starting size and do the Overall Inspection on the checklist.

- 1 inspector, preferably one well-versed in the VEX part catalog, should do the Parts Inspection.
- 1 inspector should perform the Field Control Check and sign off on the inspection once each item has been completed.

PROCEDURE

Come up with your own procedure before inspections begin, but you should follow these tips:

- 1) It is recommended that each robot be inspected in each category in the order shown on the checklist, i.e. each robot should be first inspected for starting size, overall inspection, parts inspection, field control check, in that order.
- 2) If you've been furnished with the list of teams competing, you should come up with a method for indicating on the list which teams have been inspected and which have not. A two-check system, where the first check is awarded to a team for starting inspection, and the second check is awarded for completing inspection, is an excellent method to use.
- ~~3) Keep somehow a running tally of teams that may exceed the 36" horizontal limit during the match. Once inspections close, you should give the head referee this list of teams so that the referees are aware of these teams during the matches.~~
- 4) If a team does not pass an item on the checklist, but they can still proceed with the rest of the inspection, continue with the rest of the inspection, but send the team back to the pits to fix the offending component on the robot. They do not have to start a new inspection when they return; they can simply pick up where they left off.

- 5) Most events will have a display indicating which teams have completed inspection and which have not. Designate someone (not one of the inspectors) to shuttle back and forth between the inspection station and this display updating the list of teams as the process progresses. If a laptop is available at the inspectors' station, that person can simply collect the completed checklists and input them into the system.
- 6) Referees may, in response to violations committed during a match, order a robot to be inspected again. For this reason, after the inspection table closes, have one inspector on standby for the rest of the event to handle re-inspections.
- 7) Coordinate with the Event Partner and Head Referee to determine a time for when inspection closes. The Event Partner needs to know which teams have been inspected and which have not at time of closing so that the match schedule can be generated with the correct teams listed.
- 8) After inspection closes, give the sizing tools to the Head Referee at a designated location so that the tools are on hand should a measurement need to be made on-field.
- 9) **Helpful Tip:** If you look next to an item on the checklist, there is a notation (such as R4, G4) that denotes the rules applicable to the item. You can look these rules up in the game manual to read them for determining compliance.



Robot Inspection Checklist – V5



Team Number: _____ Division: _____

Size Inspection

<input type="checkbox"/> Robot fits within starting size restrictions (18" x 18" x 18"). Team ID Plates must be installed for sizing inspection.	R5
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Overall Inspection

<input type="checkbox"/> Team is only competing with ONE robot. They have no spare or replacement robots. Multiples of subsystem 3 is permitted.	R1
<input type="checkbox"/> Robot displays colored VEX Team Identification plates on at least (2) opposing sides, with only (1) color visible.	R27
<input type="checkbox"/> Robot does NOT contain any components which will be intentionally detached on the playing-field.	G5, R5
<input type="checkbox"/> Robot does NOT contain any components that could entangle or damage the playing-field or other robots.	R4
<input type="checkbox"/> Robot does NOT contain any sharp edges or corners.	R4
<input type="checkbox"/> Robot Brain power button is accessible without moving or lifting the robot.	R25
<input type="checkbox"/> Team testifies that the designing, building and programming of the robot was done only by the students on the team.	R2, G2, G6

VEX Parts Inspection

<input type="checkbox"/> ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com or materials used as color filters, minimal grease or lubricant, minimal anti-static compound, hot glue for cable connections, unlimited 1/8 th inch braided nylon rope, cable protection materials and tape for connections and labeling.	R6, R7, R8 R11, R12
<input type="checkbox"/> Robot does not use VEX products not intended for use as a robot component or any VEX packaging.	R6
<input type="checkbox"/> ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations	R13
<input type="checkbox"/> Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24".	R10
<input type="checkbox"/> Robot has only (1) VEX V5 Robot Brain	R16
<input type="checkbox"/> Robot utilizes the VEXnet wireless communication system.	R17
<input type="checkbox"/> None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug.	R17
<input type="checkbox"/> Total number of Smart Motors is not more than eight (8) without use of pneumatics or six (6) with use of pneumatics.	R18
<input type="checkbox"/> Robot contains no VEX 2-wire Motors.	R18
<input type="checkbox"/> Robot uses one (1) V5 Robot Battery Li-Ion 1100mAh.	R20
<input type="checkbox"/> Robot is controlled by no more than (2) V5 Controllers.	R21
<input type="checkbox"/> NO VEX electrical components have been modified from their original state.	R22
<input type="checkbox"/> NO Method of attachment NOT provided by the VEX Design System is used. (Welding, Gluing, etc.)	R23
<input type="checkbox"/> Robot uses a maximum of two (2) VEX pneumatic air reservoirs. (Maximum 100 psi per air reservoir)	R26
<input type="checkbox"/> Robot contains no Components obtained from the V5 beta program.	R6
<input type="checkbox"/> If any custom cables are used, they are made only with official V5 Cable Stock.	R24
<input type="checkbox"/> Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the V5 Vision Sensor.	R13
<input type="checkbox"/> Robot Brain has the latest firmware listed on VEX.com/firmware	R22
<input type="checkbox"/> If Vision sensor is used, it has been calibrated & tested on competition fields (this is not required to pass inspection)	Optional

Final Inspection *(Circle when passed)* Pass

Inspector Signature: _____

Student team member accepts these Inspection results and certifies that this robot was designed, built, and programmed by qualified students on this team with little to no assistance from the adult mentor(s):

Team Member Signature: _____



Robot Inspection Checklist – Cortex



Team Number: _____ Division: _____

Size Inspection

<input type="checkbox"/> Robot fits within starting size restrictions (18" x 18" x 18"). Team ID Plates must be installed for sizing inspection.	R5
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Overall Inspection

<input type="checkbox"/> Team is only competing with ONE robot. They have no spare or replacement robots. Multiples of subsystem 3 is permitted.	R1
<input type="checkbox"/> Robot displays colored VEX Team Identification plates on at least (2) opposing sides, with only (1) color visible.	R27
<input type="checkbox"/> Robot does NOT contain any components which will be intentionally detached on the playing-field.	G5, R5
<input type="checkbox"/> Robot does NOT contain any components that could entangle or damage the playing-field or other robots.	R4
<input type="checkbox"/> Robot does NOT contain any sharp edges or corners.	R4
<input type="checkbox"/> Robot on/off switch is accessible & Microcontroller lights are visible without moving or lifting the robot.	R25
<input type="checkbox"/> Team testifies that the designing, building and programming of the robot was done only by the students on the team.	R2, G2, G6

VEX Parts Inspection

<input type="checkbox"/> ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com or materials used as color filters, minimal grease or lubricant, minimal anti-static compound, hot glue for cable connections, unlimited 1/8 th inch braided nylon rope, cable protection materials and tape for connections and labeling.	R6, R7, R8 R11, R12
<input type="checkbox"/> Robot does not use VEX products not intended for use as a robot component or any VEX packaging	R6
<input type="checkbox"/> ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations	R13
<input type="checkbox"/> Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24"	R10
<input type="checkbox"/> Robot has only (1) VEX EDR Microcontroller.	R16
<input type="checkbox"/> Robot utilizes the VEXnet wireless communication system	R17
<input type="checkbox"/> None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug	R17
<input type="checkbox"/> Total number of Servos and Motors is not more than (12) without use of pneumatics or (10) with use of pneumatics	R18
<input type="checkbox"/> Robot uses (1) VEX 7.2V (Robot) Power Pack as the primary power source	R20
<input type="checkbox"/> If the Robot has a Power Expander, it has a 2nd 7.2V (Robot) Power Pack	R20
<input type="checkbox"/> Robot uses a maximum of (1) VEX Power Expander	R20
<input type="checkbox"/> Robot has a charged 9V Backup Battery connected	R20
<input type="checkbox"/> Robot is not controlled by more than (2) VEX hand-held transmitters	R21
<input type="checkbox"/> NO VEX electrical components have been modified from their original state	R22
<input type="checkbox"/> NO Method of attachment NOT provided by the VEX Design System is used (Welding, Gluing, etc.)	R23
<input type="checkbox"/> Robot uses a maximum of two (2) VEX pneumatic air reservoirs (Maximum 100 psi per air reservoir)	R26
<input type="checkbox"/> Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the V5 Vision Sensor.	R13

Final Inspection (Circle when passed): **Pass**

Inspector Signature: _____

Student team member accepts these inspection results and certifies that this robot was designed, built and programmed by qualified students on this team with little to no assistance from the adult mentor(s):

Team Member Signature: _____

V5 BRAIN INSPECTION

CATEGORY: Size Inspection, Item 1

Item: Robot fits within starting size restrictions (18" x 18" x 18") without touching walls or ceiling of the sizing tool. Team ID Plates must be installed for sizing inspection.

Explanation:

1) **18" check** - In VEX, at the beginning of the match, each robot has to fit itself within an imaginary 18" cube without any human assistance. Only the walls of the field and the floor of the field can help the robot stay in starting size. There are two sizing tools for you to use: the 18" one ~~and the 36" one~~. They are U-shaped, with an opening at the bottom. ~~The 36" tool is configurable to 18" as well, but due to the offset in the tool explained later below, the 18" tool is preferred for the starting size check.~~ Have the team fold the robot into starting size and place the robot on the table. Hold the sizing tool with the open side downwards toward the table, then sweep the tool around the robot two times in directions 90 degrees apart from each other. During each sweep, no part of the robot can touch the edges of the sizing tool at all, **no exceptions**; the whole robot should fit within the sizing tool without touching the edges. If there is something that is out of place (such as a protruding cable or zip-tie) and the team can fix it easily on the spot, let the team do so. If the offending part is something the team has to go back to the pits to fix, send them back. Once the robot passes the 18" check, ~~move on to the 36" check, detailed in the next paragraph.~~

2) ~~**36" check** — The rules this year require that during the match, no robot can exceed 36 inches horizontally in any dimension. Per official interpretations of this rule, if any two points on the~~

robot that are at the same height are more than 36" apart, the robot is in violation. How to check for this: First, place the 36" tool (which obviously should be at its 36" configuration) flat on the table, then ask the team to place the robot inside the tool and to mechanically expand the robot to its maximum possible horizontal expansion, regardless of any software limitations they have onboard. If it's obvious that the robot fits within 36", they pass. If it appears that they may be borderline at the limit, use the tool to confirm. If the team does go over the 36" limit, **they can still pass inspection, but will warrant close scrutiny by the referees during the match.** Keep a running tally somewhere of robots that go over 36 inches. The 36" tool is actually a little larger than 36" so that if the robot is over the tool, the referees and inspectors know for sure that the robot is in violation and that there is no ambiguity.

3) **Plates** - Per the last requirement in this item, the robot has to have at least 2 ID plates installed in their designated positions for inspections, **no exceptions**. The plates themselves must fit within the 18" limit. The plates themselves will be inspected later in the checklist.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 1

Item: Team is only competing with ONE robot. They have no spare or replacement robots.

Multiples of subsystem 3 are permitted.

Explanation:

This is self-explanatory. Teams are allowed parts to make repairs and replace defective parts on their robots, but they cannot have replacement robots for a competition, at least not at the venue.

Subsystem 3 is defined as follows: “Additional mechanisms (and associated motors) that allow manipulation of game objects or navigation of field obstacles.” Teams may have different mechanisms not present on the robot at inspection that they can interchange over the course of the tournaments. These parts must meet all sizing rules.

This item is something you ask the team about. Teams usually are pretty good about this provision. Any concerns should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 2

Item: Robot displays colored VEX Team Identification plates on at least two (2) opposing sides, with only (1) color visible.

Explanation:

The plates must be easily visible on at least two **opposing** sides, i.e. they are more or less 180 degrees apart from each other. It is up to you to determine whether the plate configuration meets the definition of being on opposing sides. Teams need to have 4 separate plates at inspections, 2 red, 2 blue. 2 of those plates must be mounted on the robot at the time of inspection. Some teams will have both plates mounted on the same part, but facing opposite directions. This is legal as long as both plates are on opposite sides of the same part and clearly visible from most angles of the robot.

If a robot has both red and blue plates on board (whether the plates are swappable or not) for a match, the unused color plates (Red if the robot is Blue and vice versa) must be obscured somehow to make it abundantly clear what alliance the robot belongs to. The main thing referees want with these plates' placement is not to see what team the robot belongs to, but rather to see which Red or Blue alliance the robot is part of on the field.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 3

Item: Robot does NOT contain any components which will be intentionally detached on the playing-field.

Explanation:

The robot cannot detach any parts intentionally during the match. If the detachment is accidental, that is fine as long as it is not done excessively during the match. Nuts and bolts shaking loose during a match are fine. If a part intentionally detaches partially, then as long as there is something (as little as a single thin rope will work) connecting that part to the rest of the robot, that will be legal. You most likely will encounter this with starting-size restraints and fold-out mechanisms. The restraints used to keep those mechanisms in starting position must stay attached.

Another case that could pop up would be a part that is not expressly designed to detach, but nevertheless is not securely attached to the rest of the robot and is very likely to fall off completely during the match.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 4

Item: Robot does NOT contain any components that could entangle or damage the playing-field or other robots.

Explanation:

This provision is most applicable to cable management. Cables must be adequately secured to the robot using zip-ties, tape, or other means and should not be splayed out, begging to entangle another robot.

The damage portion is probably most applicable to intake mechanisms that operate close to the floor.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 5

Item: Robot does NOT contain any sharp edges or corners.

Explanation:

To check this, lightly (to minimize risk of cuts) run your fingers about the robot's parts, and if you feel anything sharp, ask the team to file it down. They can continue the rest of the inspection, but will need to file the offending part down in order to pass. If you want to wear gloves to protect yourself, that is fine, as long as you are able to determine the sharpness of an edge or corner.

When determining if an edge or corner is too sharp, think about an unsuspecting person not well-versed in handling the team's robot. If the unsuspecting person is more likely than not to get injured, then the robot is likely not in compliance with this rule.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 6

Item: Robot on/off switch is accessible without moving or lifting the robot.

Explanation:

Ask the team to demonstrate this. Per the item, they should be able to do this without moving or lifting the robot. A picture of the V5 Brain is shown below with the on/off switch highlighted.

The switch is located next to the touchscreen on top.



V5 BRAIN INSPECTION

CATEGORY: Overall Inspection, Item 7

Item: Team testifies that the designing, building and programming of the robot was done only by the students on the team.

Explanation:

This states that the entire robot is solely the team's work, in the same sense that an essay written for school is supposed to be entirely the student's work, and not the work of their parent or anyone else not authorized by the student's teacher. Adults are permitted to give advice on design, building, and programming of the robot, but may not do the actual work; only the students on the team can do the design, building, and programming. Students are expected to "demonstrate an active understanding of their Robot's construction and programming to judges or event staff."

Essentially, the robot "must represent the skill level of the Team."

This is an item that you ask the team, and the team must truthfully state that the robot indeed is their work, otherwise they are subject to harsh penalties.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 1

Item: ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com or materials used as color filters, minimal grease or lubricant, minimal anti-static compound, hot glue for cable connections, unlimited 1/8th inch braided nylon rope, cable protection materials and tape for connections and labeling.

Explanation:

This pretty much says, with exceptions listed elsewhere in the game manual, that only VEX parts (or identical copies thereof) can be used for the robot. 3D parts are allowed as non-functional decorations, but not as functional components*. For the uninitiated inspector, who may not be familiar with VEX parts, all I can say is this: if something looks odd to you compared to everyone else's robots, ask the head inspector or someone who's experienced. Knowing what parts are VEX or not comes with experience. Per <R5a>, you have the right to request documentation from the team that proves that a certain part is legal within the parameters of the game manual.

There are a whole host of exceptions to the VEX-only rule, all of which are detailed primarily in rules <R6>, <R7>, <R8>, <R11>, and <R12> in the game manual, so look there first if there is a part that looks foreign to you.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 2

Item: Robot does not use VEX products not intended for use as a robot component or any VEX packaging.

Explanation:

This is self-explanatory. Examples of parts that are not allowed to be used as a result of this are trophies, Clawbot building instructions, documentation, packaging materials, merchandising, etc.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 3

Item: ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations.

Explanation:

The definition of NON-FUNCTIONAL is either:

- 1) The decoration doesn't have a function or
- 2) If the decoration serves a function, then there has to be a VEX part backing that decoration that serves the exact same function. For example, if a sticker is to prevent a ball from falling through, a VEX plate or something else that is VEX must also be behind that sticker and serve that same purpose. The sticker thus must not add significantly to the robot's performance, i.e. the robot will perform the same way without the decoration in question.

3D printed parts are allowed as non-functional decorations. The decorations are subject to the 18" starting size rule as well. The team's license plates themselves are considered non-functional decorations and therefore are subject to the same rules here.

Some teams, especially at Worlds, will have LED lighting strips on their robot for visual effects. This is legal provided the strips are powered by a separate battery.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 4

Item: Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24".

Explanation:

Teams are allowed to use a certain amount of plastic on their robot. This however should not be something to obsess over, for the sake of time. However, if the plastic used looks large, ask the team for a "cut-sheet", where they traced their shapes on a 12"x24" piece of paper before cutting. If they don't have it or some other way of proving that the material was indeed cut from a 12"x24" sheet, bring in the head inspector for a final determination. Acceptable plastics are polycarbonate (Lexan), acetel monopolymer (Delrin), acetal copolymer (Acetron GP), POM (acetal), ABS, PEEK, PET, HDPE, LDPE, Nylon (all grades), Polypropylene, FEP. **No shattering plastic** is allowed. The plastic can be heated to aid in mechanical bending, but cannot be cast, melted, or chemically treated.

If there is one available, you can use a caliper to measure the thickness of the plastic used. Per the rule, the plastic must not be thicker than 0.070", which is a little over 1/16ths of an inch.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 5

Item: Robot has only (1) VEX V5 Robot Brain.

Explanation:

Self-explanatory. The V5 Robot Brain is the brain of the robot, and is very hard to miss. Ask the team to show it to you. They either should have the Brain on the robot or there is something fundamentally wrong with the robot.

This is what the V5 Robot Brain looks like:



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 6

Item: Robot utilizes the VEXnet wireless communication system.

Explanation:

The V5 system has the VEXnet communication system built in, so if the team has the V5 on the robot, and they have the pictured device (a V5 Radio) on the robot, they automatically pass this item.



The Robot Radio looks similar in shape to the Robot Battery, but the Radio is much smaller than the Battery and has the red VEX logo on its flat side as opposed to the angled side for the Battery.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 7

Item: None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug.

Explanation:

This refers to both legacy electronics and other electronics VEX Robotics sells. A rewording of this item is that all the electronics come from only the VEX EDR line.

For the inexperienced inspector, again, if something looks odd, ask someone experienced or the head inspector.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 8

Item: Total number of Smart Motors is not more than eight (8) without use of pneumatics or six (6) with use of pneumatics.

Explanation:

This includes motors and servos that are not in use but are attached to the robot. Any motor or servo present qualifies. As stated above, there's a two-motor penalty for using pneumatics, so ask the team if they're using pneumatics or not. A large cylindrical metal tank on the robot should be a dead giveaway for pneumatics.

To check for compliance, ask the team to show each motor to you, counting aloud. There should be no more than 8 without pneumatics or 6 if pneumatics are in use.

The Smart Motor is different from that used with the Cortex, and is bigger than the 393 motor teams use for the Cortex. This is what the motor looks like:



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 9

Item: Robot contains no VEX 2-wire Motors

Explanation:

The 2-wire Motors are the motors used with the Cortex. Teams are not allowed to mix and match motors with the V5 system. For your reference, this is what the 2-wire Motors look like.



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 10

Item: Robot uses one (1) V5 Robot Battery Li-Ion 1100mAh.

Explanation: The V5 Robot Battery looks like this. It is similar in shape to the V5 Radio, but much bigger. Ask the team to show it to you. There must be exactly one present on the robot. Unlike the Cortex system, there is no Power Expander for the V5 system, so teams are not allowed to have a second V5 Robot Battery.



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 11

Item: Robot is controlled by up to two (2) V5 Controller.

Explanation: The V5 Controller looks like this:



Teams can use 2 of these tethered together for dual control, but only one is required for competition; the second controller is optional.

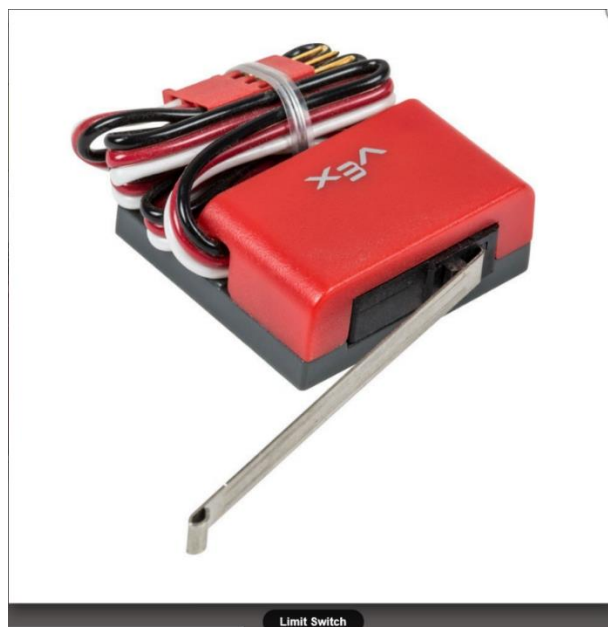
V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 12

Item: NO VEX electrical components have been modified from their original state.

Explanation: This is self-explanatory. This includes the motors, sensors, cortex, anything electronic, with a few exceptions:

- 1) Teams are allowed to repair broken motor and motor controller wires at their own risk.
- 2) External modifications to the V5 Joystick (those that do not penetrate the surface in any form or fashion) are permitted. You might even see a 3D-printed rig attached to a joystick that uses “paddle triggers”.
- 3) While the Limit Switch pictured below is considered an electronic, per a Game Design Committee ruling, the “arm” of the switch is designed to be bendable and can be legally bent.



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 13

Item: NO Method of attachment NOT provided by the VEX Design System is used. (Welding, Gluing, etc.)

Explanation:

What this means is that parts can be attached to each other only through mostly nuts and bolts. Welding and gluing parts together (except when permitted elsewhere in the manual) are not allowed. Heat treating of steel parts (to alter the material properties of such steel parts) is not allowed as well. The “VEX Design System” mainly involves the holes on the structural parts. Teams can customize parts by cutting, bending, and filing them subject to the other rules of the game manual. Zip ties are a legal means of attachment. If something looks weird to you, ask the head inspector for a ruling.

It is up to you to determine the team’s compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 14

Item: Robot uses a maximum of two (2) VEX pneumatic air reservoirs. (Maximum 100 psi per air reservoir)

Explanation:

This is applicable only if the team is using pneumatics. Otherwise, disregard this item and continue with the rest of the inspection.

This basically means that the team is allowed up to a maximum of 2 air tanks for their pneumatics, and the pressure within each tank cannot be greater than 100 psi. We usually don't check for pressure at this point, so you ask the team this. The pneumatic reservoirs look like this:



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 15

Item: Robot contains no Components obtained from the V5 beta program.

Explanation: A select few teams were given early access to the V5 system for testing and feedback before it was officially released to the public. These units were from a different production run and the way to tell if a V5 part is a beta part is if it has a lighter gray color instead of a black color. The first picture is a beta V5 Robot Brain and the second is the official V5 Robot Brain. Note the difference in color:



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 16

Item: If any custom cables are used, they are made only with official V5 Cable Stock.

Explanation:

Teams are allowed to make their own electronic cables instead of the VEX-supplied ones, but they have to be from official V5 Cable Stock. Their custom cables should look similar to what's pictured below:



V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 17

Item: Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the vision sensor.

Explanation:

This applies regardless of whether the robot has the Vision Sensor mounted or not. The Vision Sensor allows teams to see what's on these field and easily direct the robot to pick up game objects by tracking those objects. Because of the way the Vision Sensor works, other robots with decorations that look similar to game objects can be mistaken by the Vision Sensor for game objects and cause the robot to behave incorrectly, which can pose a danger to teammates or other robots. Teams may also try to intentionally exploit this and mess up other robots to their advantage, which is unfair and against the ethos of the game. This rule is meant to prevent both scenarios.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

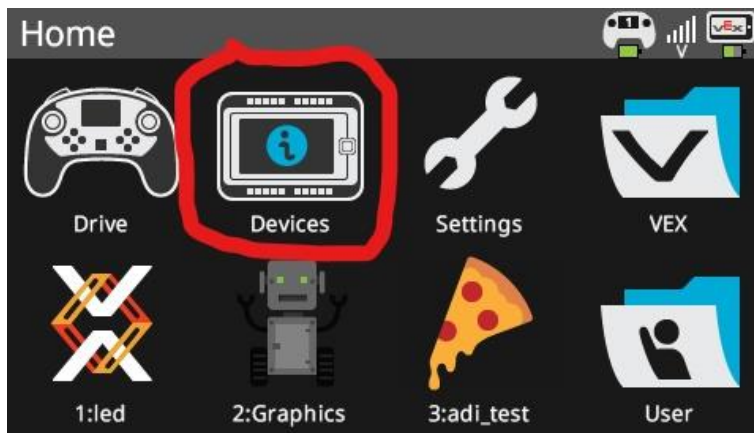
V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 18

Item: Robot Brain has the latest firmware listed on VEX.com/firmware

Explanation: Teams are required to have the latest VEXos firmware onboard. You can use the link to find out what the latest firmware is at this moment. To check the robot for the latest firmware, ask the team to power on the robot and give you access to the V5 Robot Brain's touchscreen. Here's how to check:

- 1) Make sure you're on the Home Screen. Go to Devices.



- 2) Tap on Brain icon, which should be in the top row and third from the screen's left edge.



- 3) The firmware version should be listed on the right half of the screen. Make sure that version matches what is listed on the VEX.com/firmware website.



If the firmware version displayed does not match what is listed on the website, send the team back to the pits to install the correct firmware version.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 19

Item: If Vision sensor is used, it has been calibrated & tested on competition fields or team accepts responsibility for doing so.

Explanation:

This is applicable only if the team has the Vision Sensor onboard, otherwise disregard this item and move on.

The Vision Sensor is a powerful part, but it can easily lead the robot astray if not programmed, tested, and calibrated correctly, which can cause damage to itself, the field, or other robots. This provision basically states that the team is aware of the Vision Sensor's risks, accepts those risks, and have managed those risks sufficiently.

This concludes the Parts Inspection. Move on to the next category on the checklist.

V5 BRAIN INSPECTION

CATEGORY: Field Control Check (not listed in checklist)

This is the last portion of the checklist. The Field Control Check ensures that the program loaded onto the team's V5 Robot Brain is proper for competition and allows the tournament's control system to halt and resume the robot's activities during a match. There are three items in this category of the checklist, but if you follow the procedure below, you'll be able to check off all three at once for the team.

For this check, you'll need the VEXnet Competition Switch and an Ethernet cable at least 3 feet long. Both are pictured below. The team also needs to have their joysticks with them.



The procedure for the Field Control Check is as follows:

1. Prepare the Competition Switch by plugging in one end of the Ethernet cable to any one of the 4 ports at the top of the switch, then set the left-hand switch to “Disable” and the right-hand switch to “Autonomous”.
2. Plug the other end of the Ethernet cable into the joystick. The cable should be plugged into the port labeled “Competition”. The Competition port is the widest port on the top of the joystick, between the two pairs of shoulder buttons. If the team is using a Partner Joystick, plug the Ethernet cable into the primary joystick, not the Partner Joystick.
3. Ask the team to turn on the robot and the joystick. Allow for the two to connect to each other.
4. Ask the team if they have an autonomous loaded onboard. If they do not, skip the next step and inform them that if they decide to put an autonomous on board, the team must return to the inspector to have the autonomous verified. Make a note on the inspection checklist.
5. Set the left-hand switch to “Enable” and verify the following:
 - The autonomous does run.
 - The driver CANNOT control the robot using the joystick. The robot only operates under the control of its pre-programmed autonomous instructions. Easy way to check is to have the team wiggle the sticks. The robot should not respond to that input.
6. Set the left-hand switch to “Disable”. Ask the team to wiggle their sticks again. The robot must not respond to that input or move any mechanism.

7. Set the right-hand switch to “Driver”.
8. Set the left-hand switch to “Enable” and verify the following:
 - The driver CAN control the robot using the joystick. Again, easy way to check is to have the team wiggle the sticks. The robot’s wheels should respond to that input.
9. Set the left-hand switch to “Disable” and allow the team to turn off the robot and joystick.
10. Disconnect the Ethernet cable from the joystick.

If all is well and you successfully complete the procedure, the team passes the Field Control Check and you may check off all three items in the Field Control Check category. If a problem arises, then repeat the problematic step. If the problem persists, it very likely is a programming error. Ask the team if they programmed the robot using a “competition template” in their programming software.

CORTEX INSPECTION

CATEGORY: Size Inspection, Item 1

Item: Robot fits within starting size restrictions (18" x 18" x 18") without touching walls or ceiling of the sizing tool. Team ID Plates must be installed for sizing inspection.

Explanation:

1) **18" check** - In VEX, at the beginning of the match, each robot has to fit itself within an imaginary 18" cube without any human assistance. Only the walls of the field and the floor of the field can help the robot stay in starting size. There are two sizing tools for you to use: the 18" one ~~and the 36" one~~. They are U-shaped, with an opening at the bottom. ~~The 36" tool is configurable to 18" as well, but due to the offset in the tool explained later below, the 18" tool is preferred for the starting size check.~~ Have the team fold the robot into starting size and place the robot on the table. Hold the sizing tool with the open side downwards toward the table, then sweep the tool around the robot two times in directions 90 degrees apart from each other. During each sweep, no part of the robot can touch the edges of the sizing tool at all, **no exceptions**; the whole robot should fit within the sizing tool without touching the edges. If there is something that is out of place (such as a protruding cable or zip-tie) and the team can fix it easily on the spot, let the team do so. If the offending part is something the team has to go back to the pits to fix, send them back. Once the robot passes the 18" check, ~~move on to the 36" check, detailed in the next paragraph.~~

2) **36" check** ~~— The rules this year require that during the match, no robot can exceed 36 inches horizontally in any dimension. Per official interpretations of this rule, if any two points on the~~

robot that are at the same height are more than 36" apart, the robot is in violation. How to check for this: First, place the 36" tool (which obviously should be at its 36" configuration) flat on the table, then ask the team to place the robot inside the tool and to mechanically expand the robot to its maximum possible horizontal expansion, regardless of any software limitations they have onboard. If it's obvious that the robot fits within 36", they pass. If it appears that they may be borderline at the limit, use the tool to confirm. If the team does go over the 36" limit, **they can still pass inspection, but will warrant close scrutiny by the referees during the match.** Keep a running tally somewhere of robots that go over 36 inches. The 36" tool is actually a little larger than 36" so that if the robot is over the tool, the referees and inspectors know for sure that the robot is in violation and that there is no ambiguity.

3) **Plates** - Per the last requirement in this item, the robot has to have at least 2 ID plates installed in their designated positions for inspections, **no exceptions**. The plates themselves must fit within the 18" limit. The plates themselves will be inspected later in the checklist.

CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 1

Item: Team is only competing with ONE robot. They have no spare or replacement robots.

Explanation:

This is self-explanatory. Teams are allowed parts to make repairs and replace defective parts on their robots, but they cannot have replacement robots for a competition, at least not at the venue.

This item is something you ask the team about. Teams usually are pretty good about this provision. Any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 2

Item: Robot displays colored VEX Team Identification plates on at least two (2) opposing sides.

Explanation:

The plates should be easily visible on at least two **opposing** sides, i.e. are not adjacent to each other and more or less 180 degrees from each other. It is up to you to determine whether the plate configuration meets the definition of being on opposing sides. Teams need to have 4 separate plates at inspections, 2 red, 2 blue. 2 of those plates must be mounted on the robot at the time of inspection. Some teams will have both plates mounted on the same part, but facing opposite directions. This is legal as long as both plates are on opposite places of the same part and clearly visible from most angles of the robot.

The main thing referees want with these plates' placement is not to see what team the robot belongs to, but rather to see which Red or Blue alliance the robot is part of on the field. If a robot has both red and blue plates on board (whether the plates are swappable or not) for a match, the unused color plates (Red if the robot is Blue and vice versa) should be obscured somehow to make it abundantly clear what alliance the robot belongs to.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 3

Item: Robot does NOT contain any components which will be intentionally detached on the playing-field.

Explanation:

The robot cannot detach any parts intentionally during the match. If the detachment is accidental, that is fine as long as it is not done excessively during the match. Nuts and bolts shaking loose during a match are fine. If a part intentionally detaches partially, then as long as there is something (as little as a single thin rope will work) connecting that part to the rest of the robot, that will be legal. You most likely will encounter this with starting-size restraints and fold-out mechanisms. The restraints used to keep those mechanisms in starting position must stay attached.

Another case that could pop up would be a part that is not expressly designed to detach, but nevertheless is not securely attached to the rest of the robot and is very likely to fall off completely during the match.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 4

Item: Robot does NOT contain any components that could entangle or damage the playing-field or other robots.

Explanation:

This provision is most applicable to cable management. Cables should be adequately secured to the robot using zip-ties or other means and should not be splayed out, begging to entangle another robot.

The damage portion is probably most applicable to intake mechanisms that operate close to the floor.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 5

Item: Robot does NOT contain any sharp edges or corners.

Explanation:

To check this, lightly (to minimize risk of cuts) run your fingers about the robot's parts, and if you feel anything sharp, ask the team to file it down. They can continue the rest of the inspection, but will need to file the offending part down in order to pass. If you want to wear gloves to protect yourself, that is fine, as long as you are able to determine the sharpness of an edge or corner.

When determining if an edge or corner is too sharp, think about an unsuspecting person not well-versed in handling the team's robot. If the unsuspecting person is more likely than not to get injured, then the team robot is likely not in compliance with this rule.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

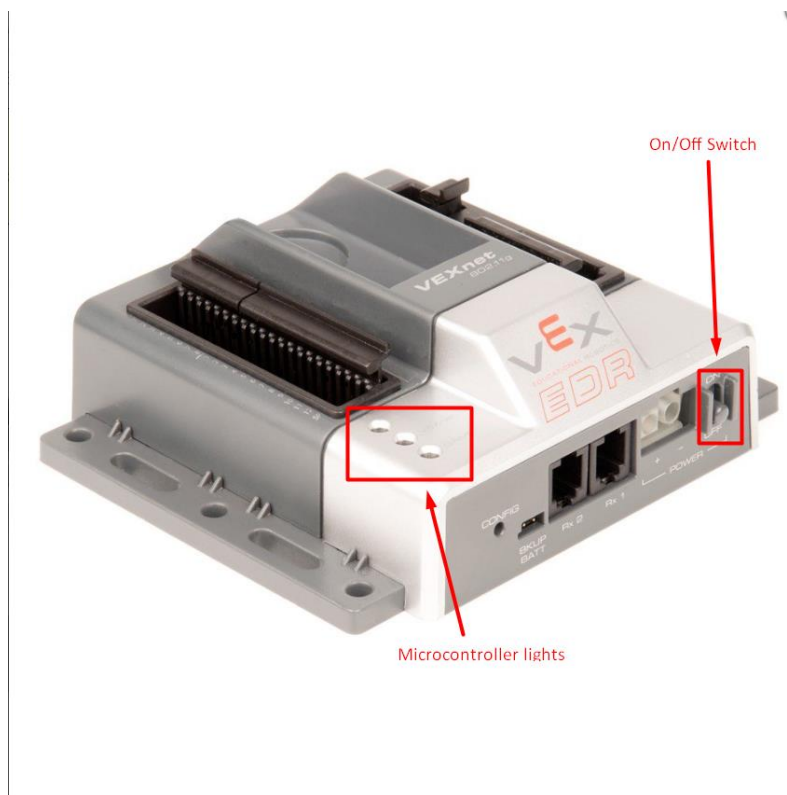
CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 6

Item: Robot on/off switch is accessible & Microcontroller lights are visible without moving or lifting the robot.

Explanation:

Ask the team to demonstrate this. Per the item, they should be able to do this without moving or lifting the robot. The lights should be visible as well. A picture of the Cortex is shown below with the on/off switch highlighted. The switch is located to the right of the battery port, so look to the right of where the battery is plugged in.



CORTEX INSPECTION

CATEGORY: Overall Inspection, Item 7

Item: Team testifies that the designing, building and programming of the robot was done only by the students on the team.

Explanation:

This states that the entire robot is solely the team's work, in the same sense that an essay written for school is supposed to be entirely the student's work, and not the work of their parent or anyone else not authorized by the student's teacher. Adults are permitted to give advice on design, building, and programming of the robot, but may not do the actual work; only the students on the team can do the design, building, and programming. Students are expected to "demonstrate an active understanding of their Robot's construction and programming to judges or event staff."

Essentially, the robot "must represent the skill level of the Team."

This is an item that you ask the team, and the team must truthfully state that the robot indeed is their work, otherwise they are subject to harsh penalties.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 1

Item: ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com or materials used as color filters, minimal grease or lubricant, minimal anti-static compound, hot glue for cable connections, unlimited 1/8th inch braided nylon rope, cable protection materials and tape for connections and labeling.

Explanation:

This pretty much says, with exceptions listed elsewhere in the game manual, that only VEX parts (or identical copies thereof) can be used for the robot. 3D parts are allowed as non-functional decorations, but not as functional components*. For the uninitiated inspector, who may not be familiar with VEX parts, all I can say is this: if something looks odd to you compared to everyone else's robots, ask the head inspector or someone who's experienced. Knowing what parts are VEX or not comes with experience. Per <R5a>, you have the right to request documentation from the team that proves that a certain part is legal within the parameters of the game manual.

There are a whole host of exceptions to the VEX-only rule, all of which are detailed primarily in rules <R6>, <R7>, <R8>, <R11>, and <R12> in the game manual, so look there first if there is a part that looks foreign to you.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 2

Item: Robot does not use VEX products not intended for use as a robot component or any VEX packaging.

Explanation:

This is self-explanatory. Examples of parts that are not allowed to be used as a result of this are trophies, Clawbot building instructions, documentation, packaging materials, etc.

This is something that you ask the team about. It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 3

Item: ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations.

Explanation:

The definition of NON-FUNCTIONAL is either:

- 1) The decoration doesn't have a function or
- 2) If the decoration serves a function, then there has to be a VEX part backing that decoration that serves the exact same function. For example, if a sticker is to prevent a ball from falling through, a VEX plate or something else that is VEX must also be behind that sticker and serve that same purpose. The sticker thus must not add significantly to the robot's performance, i.e. the robot will perform the same way without the decoration in question.

3D printed parts are allowed as non-functional decorations. The decorations are subject to the 18" starting size rule as well. The team's license plates themselves are considered non-functional decorations and therefore are subject to the same rules here.

Some teams, especially at Worlds, will have LED lighting strips on their robot for visual effects. This is legal provided the strips are powered by a separate battery.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 4

Item: Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24".

Explanation:

Teams are allowed to use a certain amount of plastic on their robot. This however should not be something to obsess over, for the sake of time. I'll tell you this, if the plastic used looks large, ask the team for a "cut sheet", where they traced their shapes on a 12"x24" piece of paper before cutting. If they don't have it or some other way of proving that the material was indeed cut from a 12"x24" sheet, bring in the head inspector for a final determination. Acceptable plastics are polycarbonate (Lexan), acetel monopolymer (Delrin), acetal copolymer (Acetron GP), POM (acetal), ABS, PEEK, PET, HDPE, LDPE, Nylon (all grades), Polypropylene, FEP. **No shattering plastic** is allowed. The plastic can be heated to aid in mechanical bending, but cannot be cast.

If there is one available, you can use a caliper to measure the thickness of the plastic used. Per the rule, the plastic must not be thicker than 0.070", which is a little over 1/16th of an inch.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 5

Item: Robot has only (1) VEX EDR Microcontroller.

Explanation:

This is self-explanatory. The Microcontroller (colloquially called the “Cortex”) is the brain of the robot, and is very hard to miss. Ask the team to show it to you. They either should have the Cortex on the robot or there is something fundamentally wrong with the robot. This is what the Cortex

looks like:



CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 6

Item: Robot utilizes the VEXnet wireless communication system.

Explanation:

To pass this, both the Cortex and the joystick should each have 1 white USB key attached to the USB port. For the Cortex, the USB port is on the top occupying the central third of the top surface, and for the joystick, the port should be on the underside. Ask the team to show both of them to you. This is what a VEXnet key looks like:



CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 7

Item: None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug.

Explanation: This refers to both legacy electronics and other electronics VEX Robotics sells. A rewording of this item is that all the electronics come from only the VEX EDR line.

For the inexperienced inspector, again, if something looks odd, ask someone experienced or the head inspector.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 8

Item: Total number of Servos and Motors is not more than twelve (12) without use of pneumatics or ten (10) with use of pneumatics.

Explanation:

This includes motors and servos that are not in use but are attached to the robot; any motor or servo present qualifies. As stated above, there's a two-motor penalty for using pneumatics, so ask the team if they're using pneumatics or not. A large cylindrical metal tank on the robot should be a dead giveaway for pneumatics.

To check for compliance, ask the team to show each motor to you, counting aloud. There should be no more than 12 without pneumatics or 10 if pneumatics are in use.

The motors usually have a green cap on them, but some motors, depending on the team, will have a thicker black cap. That cap houses a sensor called an Integrated Motor Encoder, or IME for short. That is legal for use in the competition.



CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 9

Item: Robot uses (1) VEX 7.2V (Robot) Power Pack as the primary power source.

Explanation:

A Power Pack is simply VEX Robotics's term for their batteries, shown below. The battery will be somewhere near the Cortex on the robot. You may see an extension cord attaching the battery to the Cortex, and that is legal. While you will usually see the first battery pictured, some teams will use a smaller pack pictured second. Both batteries are legal for competition, but teams have to use only the VEX-branded ones, even if there's another battery made by another company that is identical to what VEX sells. This limitation to the VEX-branded ones is so that the integrity and safety of the battery is assured.

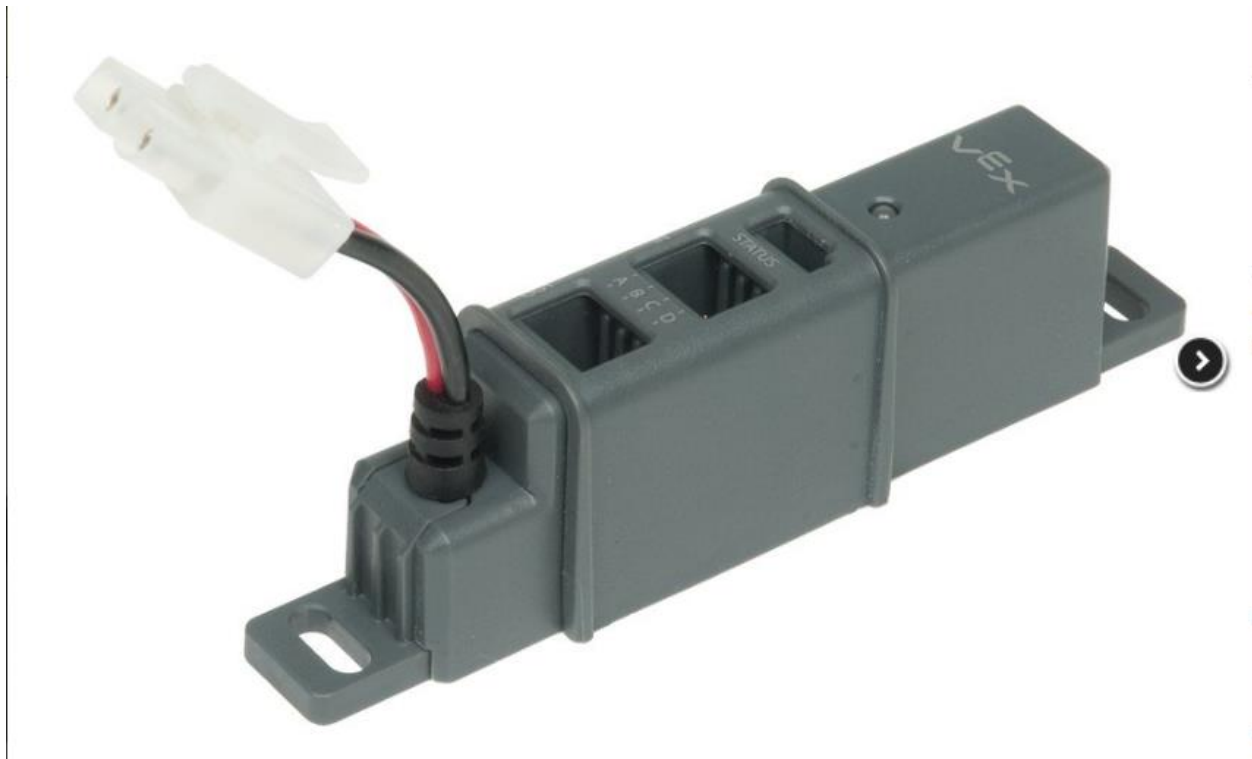


CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 10

Item: If the Robot has a Power Expander, it has a 2nd 7.2V (Robot) Power Pack.

Explanation: The VEX Power Expander looks like this:



If the above item is present, then a 2nd battery (pictured below) **must** be present.



This item is not applicable if there is no Power Expander on the robot. However, teams **may not** use a second VEX 7.2V battery if there is no Power Expander on board.

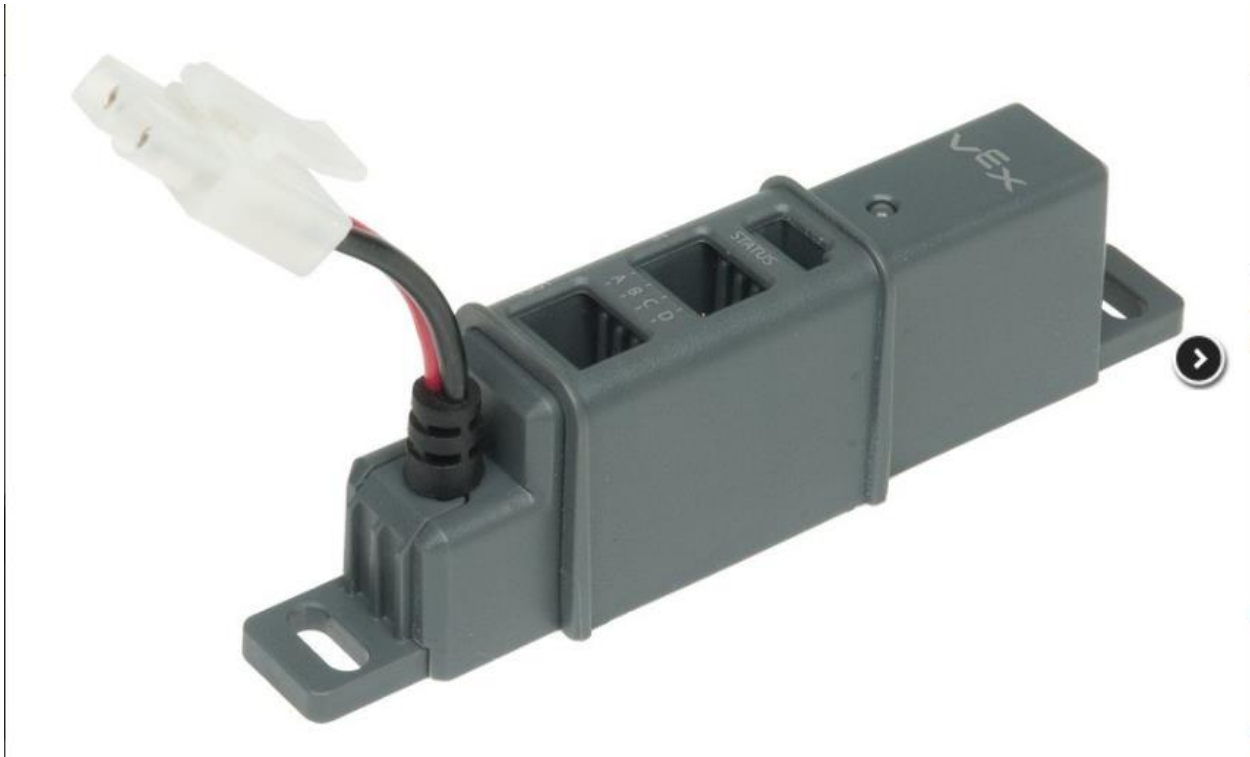
CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 11

Item: Robot uses a maximum of (1) VEX Power Expander.

Explanation:

The VEX Power Expander looks like this:



CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 12

Item: Robot has a charged 9V Backup Battery connected

Explanation: Teams, especially new ones, will frequently forget to have this on the robot. The **purpose of the backup battery** is to provide the Cortex with backup power in the event the primary battery is somehow disconnected (temporarily), usually due to an issue with the battery cable's connection to the Cortex. This is to allow the Cortex to remain under the tournament's control during the power interruption so that when the primary battery comes back online, the team can immediately resume controlling the robot. If this is not connected, the team will face having to reconnect their robot before resuming play. This is what the setup looks like.



If the team does not have a backup battery (especially if the team is new), work with the team to get a battery located and installed. It actually would help to bring a pack of 9V batteries to hand out to teams if they're caught without one. If the team cannot get a backup battery, and the rest of the inspection is good, you may, with the head inspector or event partner's permission, waive this item, but give the team a warning that the inspector at their next event may not be so gracious.

Note: Only the battery needs to be present and plugged in for inspection; the backup battery holder that is pictured holding the battery is not required to pass inspection.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 13

Item: Robot is not controlled by more than (2) VEX hand-held transmitters.

Explanation: This refers to the VEX Joystick, pictured first below:



Only the first joystick (pictured on the left) is required for competition. The second joystick is called the Partner Joystick, and is optional for competition. The Partner Joystick allows a second driver to control parts of the robot separately from the primary driver. If this second joystick is used, it will be tethered to the first joystick. Easy way to tell the difference between the two, as shown, is by checking the background on the VEX logo on the front. It'll be light gray on the primary joystick, and darker gray on the Partner Joystick.

The joystick **must be present** for inspection, as it will be used later on.

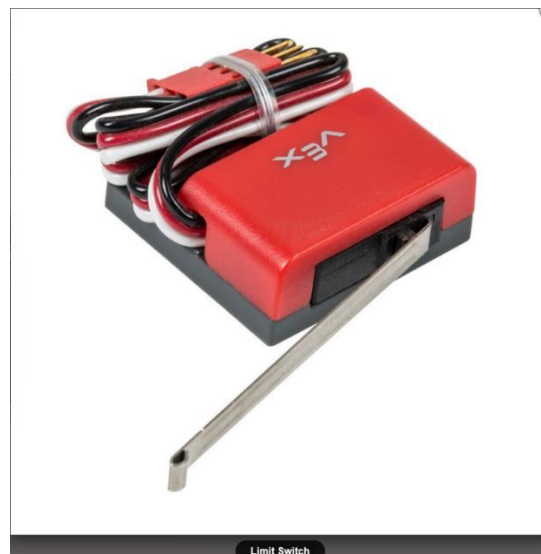
CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 14

Item: NO VEX electrical components have been modified from their original state.

Explanation: This is self-explanatory. This includes the motors, sensors, cortex, anything electronic, with a few exceptions:

- 1) Teams are allowed to repair broken motor and motor controller wires at their own risk.
- 2) Teams are allowed to plasti-dip their joysticks for decorative purposes and also attach structures to them, so as long as the integrity of the joystick itself is not compromised. In other words, modifications to the joystick are allowed so as long as they're external in nature only; no internal modifications (through or beneath the joystick's shell) are allowed.
- 3) While the Limit Switch pictured on the next page is considered an electronic, per a Game Design Committee ruling, the "arm" of the switch is designed to be bendable and can be legally bent.



CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 15

Item: NO Method of attachment NOT provided by the VEX Design System is used. (Welding, Gluing, etc.)

Explanation: What this means is that parts can be attached to each other only through mostly nuts and bolts. Welding and gluing parts together (except when permitted elsewhere in the manual) are not allowed. Heat treating of steel parts (to alter the material properties of such steel parts) is not allowed as well. The “VEX Design System” mainly involves the holes on the structural parts. Teams can customize parts by cutting, bending, and filing them subject to the other rules of the game manual. Zip ties are a legal means of attachment. If something looks weird to you, ask the head inspector for a ruling.

It is up to you to determine the team’s compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 16

Item: Robot uses a maximum of two (2) VEX pneumatic air reservoirs. (Maximum 100 psi per air reservoir)

Explanation:

This is applicable only if the team is using pneumatics. Otherwise, disregard this item and continue with the rest of the inspection.

This basically means that the team is allowed up to a maximum of 2 air tanks for their pneumatics, and the pressure within each tank cannot be greater than 100 psi. We usually don't check for pressure at this point, so you ask the team this. The pneumatic reservoirs look like this:



You are now done with the Parts Inspection. Continue to the next portion of the checklist.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 17

Item: Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the V5 Vision Sensor.

Explanation:

The V5 Vision Sensor is part of the V5 system only and is not compatible with the Cortex system. Nevertheless, this rule applies to all Cortex robots because most competitions will have at least 1 V5 Robot and the V5 robot might have a Vision Sensor onboard.

As previously stated in the explanation for item 17 of the V5 checklist, the Vision Sensor allows teams to see what's on these field and easily direct the robot to pick up game objects by tracking those objects. Because of the way the Vision Sensor works, other robots with decorations that look similar to game or field objects can be mistaken by the Vision Sensor for those objects and cause the Vision Sensor robot to behave incorrectly, which can pose a danger to teammates or other robots. Teams may also try to intentionally exploit this and mess up other robots to their advantage, which is unfair and against the ethos of the game. This rule is meant to prevent both scenarios.

It is up to you to determine the team's compliance with this rule, but any concerns or questions should be referred to the head inspector, event partner, or head referee.

CORTEX INSPECTION

CATEGORY: Field Control Check

This is the last portion of the checklist. The Field Control Check ensures that the program loaded onto the team's Cortex microcontroller is proper for competition and allows the tournament's control system to halt and resume the robot's activities during a match. There are three items in this category of the checklist, but I will not cover each item separately like the rest of the checklist. Instead, if you follow the procedure given below, you will check off all three items at once.

For this check, you'll need the VEXnet Competition Switch and an Ethernet cable at least 3 feet long. Both are pictured below. The team also needs to have their joystick with them.



The procedure for the Field Control Check is as follows:

1. Prepare the Competition Switch by plugging in one end of the Ethernet cable to any one of the 4 ports at the top of the switch, then set the left-hand switch to “Disable” and the right-hand switch to “Autonomous”.
2. Plug the other end of the Ethernet cable into the joystick. The cable should be plugged into the port labeled “Competition”. The Competition port is the widest port on the top of the joystick, between the two pairs of shoulder buttons. If the team is using a Partner Joystick, plug the Ethernet cable into the primary joystick, not the Partner Joystick.
3. Ask the team to turn on the robot and the joystick. Allow for the two to connect to each other.
4. VERIFY the following LED Lights on both the Cortex and the Joystick are flashing the appropriate colors:
 - Robot LED is Mostly Solid GREEN. If the LED on the Cortex is Fast Blinking RED, the backup battery is either not plugged in or is dead. If the backup battery is dead, have the team replace the battery. **Make sure you check for this one.**
 - VEXnet LED is Fast Blinking GREEN
 - Game LED is Fast Blinking YELLOW
 - Joystick LED (Joystick Only) is Solid GREEN
5. Ask the team if they have an autonomous loaded onboard. If they do not, skip the next step (Step 6) and inform them that if they decide to put an autonomous on board, the

team must return to the inspector to have the autonomous verified. Make a note on the inspection checklist that the team does not have an autonomous program.

6. Set the left-hand switch to “Enable” and verify the following:
 - The autonomous does run properly.
 - The driver CANNOT control the robot using the joystick. The robot only operates under the control of its pre-programmed autonomous instructions. Easy way to check is to have the team wiggle the two analog sticks. The robot must not respond to that input.
 - The Game LED on both Cortex and Joystick is now Fast Blinking GREEN
7. Set the left-hand switch to “Disable”. The Game LED on both units should revert to Fast Blinking YELLOW.
8. Have the team wiggle the analog sticks again. The robot again must not respond to that input.
9. Set the right-hand switch to “Driver”.
10. Set the left-hand switch to “Enable” and verify the following:
 - The driver CAN control the robot using the joystick. Again, easy way to check is to have the team wiggle the same two analog sticks. The robot should now respond to that input.
 - The Game LED should now be Fast Blinking GREEN.
11. Set the left-hand switch to “Disable” and allow the team to turn off the robot and joystick.
12. Disconnect the Ethernet cable from the joystick.

If all is well and you successfully complete the procedure, the team passes the Field Control Check and you may check off all three items in the Field Control Check category. If a problem arises, then repeat the problematic step. If the problem persists, it very likely is a programming error. Ask the team if they programmed the robot using a “competition template” in their programming software, and send them back to the pits to fix the problem.