INSPECTING VEX ROBOTS FOR DUMMIES

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Introduction

First off, thank you for volunteering to be an inspector. Volunteers are the grease of VEX tournaments all over the globe; we help run things as smoothly as possible. Without you, we would not be able to run the tournament. 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.

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:

- 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, at least the majority of teams, depending on your region, will have V5s. These are found online.
    - Cortex: https://www.roboticseducation.org/documents/2019/05/robot-inspection-checklist-cortex-2019-2020.pdf/
    - V5 Brain: https://www.roboticseducation.org/documents/2019/05/robot-inspection-checklist-v5-2019-2020.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 Tower Takeover, the latest version is dated August 16th 2019.

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 order of each category 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.
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.

Robot Inspection Checklist – Cortex

Team Number: _____ Division: _____

Size Inspection

☐	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.	R4, G4

Overall Inspection

☐	Team is only competing with ONE robot. They have no spare or replacement robots.	R1
☐	Robot displays colored VEX Team Identification plates on at least (2) opposing sides, with only (1) color visible.	R28
☐	Robot does NOT contain any components which will be intentionally detached on the playing-field.	G5
☐	Robot does NOT contain any components that could entangle or damage the playing-field or other robots.	R3
☐	Robot does NOT contain any sharp edges or corners.	R3
☐	Robot on/off switch is accessible & Microcontroller lights are visible without moving or lifting the robot.	R24

VEX Parts Inspection

☐	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.	R5, R6, R7 R10
☐	Robot does not use VEX products not intended for use as a robot component or any VEX packaging	R5
☐	ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations	R12
☐	Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24"	R9
☐	Robot has only (1) VEX EDR Microcontroller.	R15
☐	Robot utilizes the VEXnet wireless communication system	R16
☐	None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug	R16
☐	Total number of Servos and Motors is not more than (12) without use of pneumatics or (10) with use of pneumatics	R17
☐	Each 2-wire motor is plugged into its own 2-wire port or into a Model 29 motor controller	R18
☐	Robot uses a maximum of (1) Y-Cable per each 3-wire Motor Port (cannot "Y" off a 2-wire Motor Port or another "Y")	R18
☐	Robot uses (1) VEX 7.2V (Robot) Power Pack as the primary power source	R19
☐	If the Robot has a Power Expander, it has a 2nd 7.2V (Robot) Power Pack	R19
☐	Robot uses a maximum of (1) VEX Power Expander	R19
☐	Robot has a charged 9V Backup Battery connected	R19
☐	Team only utilize VEX Battery Chargers for charging VEX 7.2V Battery Packs	R19
☐	Robot is not controlled by more than (2) VEX hand-held transmitters	R20
☐	NO VEX electrical components have been modified from their original state	R21
☐	NO Method of attachment NOT provided by the VEX Design System is used (Welding, Gluing, etc.)	R22
☐	Robot uses a maximum of two (2) VEX pneumatic air reservoirs (Maximum 100 psi per air reservoir)	R26
☐	Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the V5 Vision Sensor.	R12

Field Control Check

☐	Robot successfully completes the "Field Control Check" Procedure. (The hand-held controller(s) cannot control the Robot when in autonomous mode or when disabled by the Competition Switch).	R29

Final Inspection Pass **Inspector Signature:** _____

(Circle when passed)

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 – V5

Team Number: _____ Division: _____

Size Inspection

☐ 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.	R4, G4

Overall Inspection

☐ Team is only competing with ONE robot. They have no spare or replacement robots.	R1
☐ Robot displays colored VEX Team Identification plates on at least (2) opposing sides, with only (1) color visible.	R28
☐ Robot does NOT contain any components which will be intentionally detached on the playing-field.	G5
☐ Robot does NOT contain any components that could entangle or damage the playing-field or other robots.	R3
☐ Robot does NOT contain any sharp edges or corners.	R3
☐ Robot on/off switch is accessible without moving or lifting the robot.	R24

VEX Parts Inspection

☐ 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.	R5, R6, R7 R10
☐ Robot does not use VEX products not intended for use as a robot component or any VEX packaging.	R5
☐ ALL Components on the Robot NOT meeting VRC Inspection Criteria are NON-FUNCTIONAL decorations	R12
☐ Any non-shattering plastic on the robot was cut from a single sheet of 0.070" material not larger than 12"x24".	R9
☐ Robot has only (1) VEX V5 Robot Brain	R15
☐ Robot utilizes the VEXnet wireless communication system.	R16
☐ None of the electronics are from the VEXplorer, VEXpro, VEX-RCR, VEX IQ, or VEX Robotics by Hexbug.	R16
☐ Total number of Smart Motors is not more than eight (8) without use of pneumatics or six (6) with use of pneumatics.	R17
☐ Robot contains no VEX 2-wire Motors.	R17
☐ Robot uses one (1) V5 Robot Battery Li-Ion 1100mAh.	R19
☐ Team only utilize VEX Battery Chargers.	R19
☐ Robot is controlled by no more than (2) V5 Controllers.	R20
☐ NO VEX electrical components have been modified from their original state.	R21
☐ NO Method of attachment NOT provided by the VEX Design System is used. (Welding, Gluing, etc.)	R22
☐ Robot uses a maximum of two (2) VEX pneumatic air reservoirs. (Maximum 100 psi per air reservoir)	R26
☐ Robot contains no Components obtained from the V5 beta program.	R5
☐ If any custom cables are used, they are made only with official V5 Cable Stock.	R23
☐ Any NON-FUNCTIONAL decorations do not imitate Game or Field objects as a distraction for the V5 Vision Sensor.	R12
☐ Robot Brain has the latest firmware listed on VEX.com/firmware	R21
☐ If Vision sensor is used, it has been calibrated & tested on competition fields (this is not required to pass inspection)	Optional

Field Control Check

☐ Robot successfully completes the "Field Control Check" Procedure. (The hand-held controller(s) cannot control the Robot when in autonomous mode or when disabled by the Competition Switch).	R22

Final Inspection Pass **Inspector Signature:** _____

(Circle when passed)

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: _____

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. You then hold the tool upright with the open side to the table (think upside down “U”) and sweep the tool across the robot two times in two directions 90 degrees from each other, i.e. once along the x-axis and once along the y-axis. 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 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 sides that are not adjacent to each other, i.e. the plates should be more or less 180 degrees from each other. Use your judgement as to 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, and 2 of those plates should 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.

Use your judgement on this one. Refer any questions to the head inspector.

(Insert Pictures)

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 size 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. For example, I had a case once where a robot, out of poor design consideration, had motors attached to the outer end of its wheel axles, with nothing else but the axle connecting it to the rest of the robot. The motors had nothing to react against, so they were ineffective. Every match, the motors would fall off onto the floor.

This is something that you ask the team about. Use your judgement on this one. Refer any questions to the head inspector.

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.

Use your judgement. Refer any questions to the head inspector.

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.

Use your judgement. Refer any questions to the head inspector.

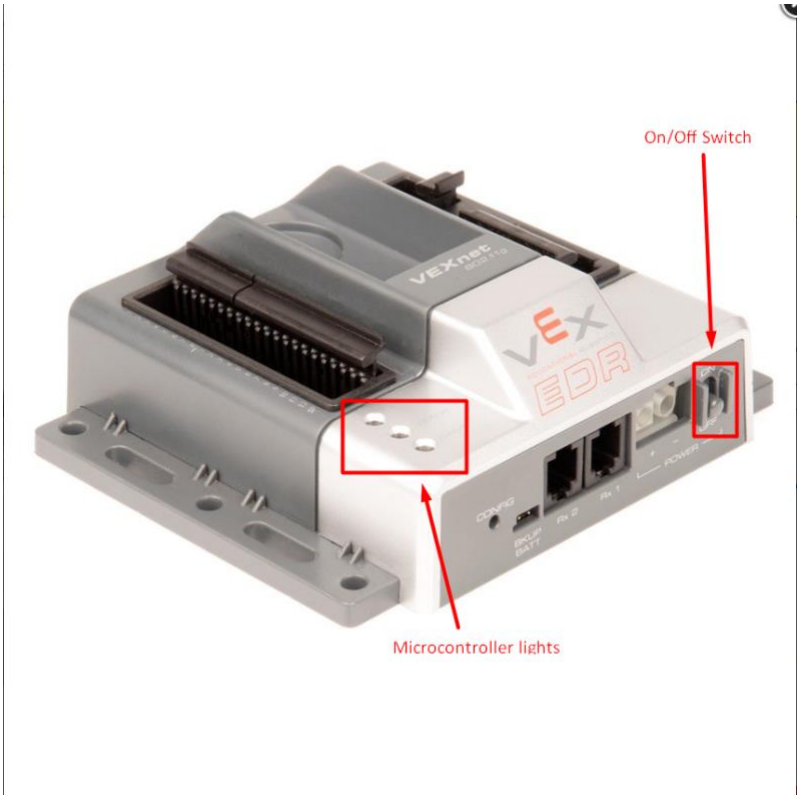
CORTEX INSPECTION

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: Parts Inspection, Item 1

Item: ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com (No 3D printed functional parts are allowed)

Explanation:

This pretty much says, with exceptions listed elsewhere in the game manual, that only VEX parts (or identical copies thereof. The copies legally may deviate in color.) can be used for the robot. 3D parts are allowed as non-functional decorations, but only at that. 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 <R7> 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. Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

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. Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

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.

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.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 4

Item: Any grease is used only in moderation on components that do not contact the field, objects, or other robots.

Explanation:

Ask the team if they have grease anywhere on their robot. If they use grease, ask the team to show you where it is. The grease must not be in a place where it can contact the field, game objects, or other robots. That includes transfer as well.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 5

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 $1/16^{th}$ of an inch.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 6

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

Explanation:

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 7

Item: Robot utilizes the VEXnet wireless communication system.

Explanation:

To pass this, both the Cortex and at least one 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 bottom. Ask the team to show both of them to you.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 8

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.

This is also something you can just ask the team about.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 9

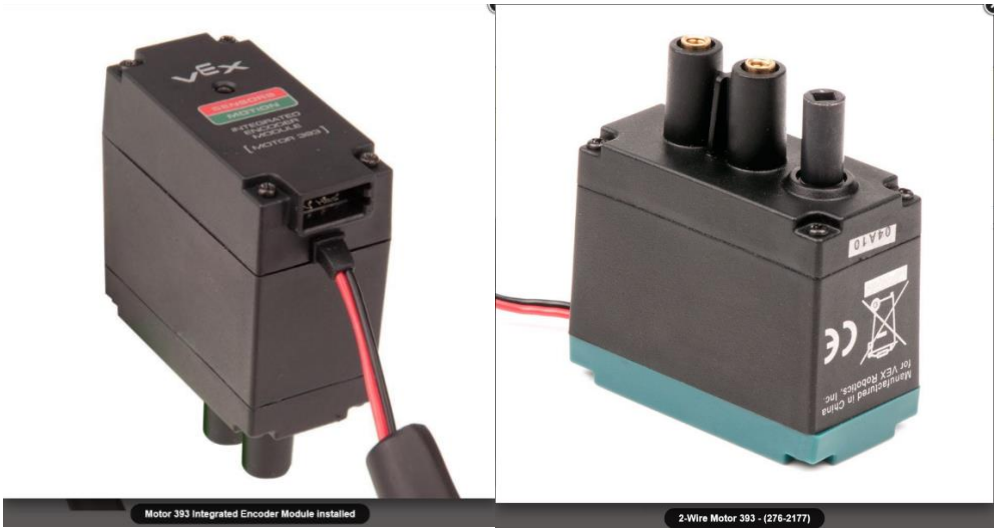
Item: Total number of Servos and Motors is not more than twelve (12) without use of pneumatics or ten (10) with use of pneumatics.

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.

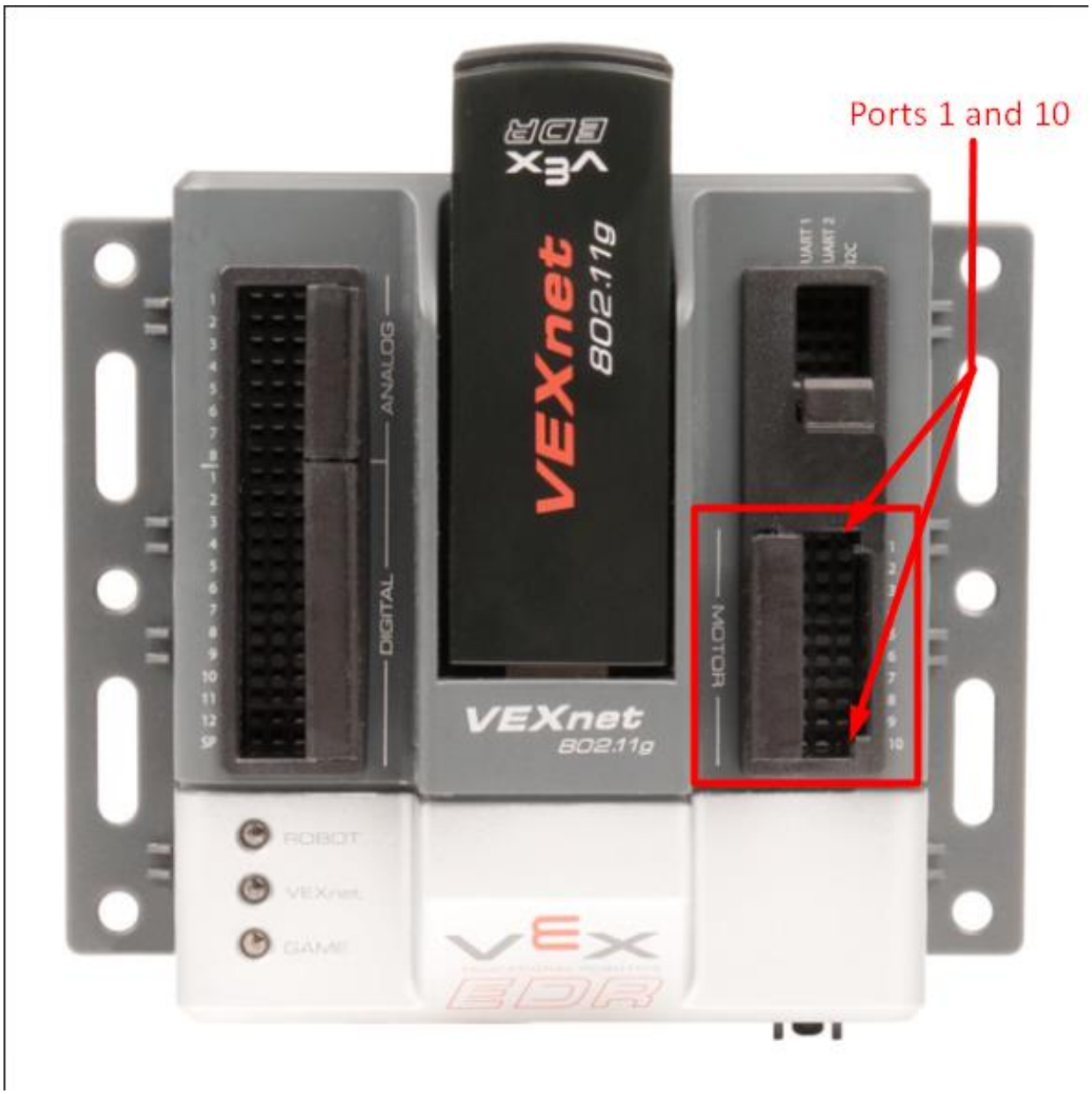


CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 10

Item: Each 2-wire motor is plugged into its own 2-wire port or into a Model 29 motor controller

Explanation: This is quite tricky to explain. Here is an image of the Cortex with the motor ports highlighted.



The 2-wire ports are the two ports on either end of the motor port bank, Ports 1 and 10. The rest of the ports in between are 3-wire ports. The deal with the 3-wire ports is that the motors are 2-wire and they don't exactly plug into those 3-wire ports, and that's where the Model 29 motor controller comes in, shown below:

The Model 29 motor controller basically serves as an adapter for those 2-wire motors to plug into the 3-wire ports. This is required; a team cannot plug a 2-wire motor directly into a 3-wire port. The middle wire of the Cortex-bound cable on the Model 29 motor controller is orange, and that's how you can easily verify that teams are complying with this rule. Just check the 3-wire ports for an orange cable coming out.

Extension cables can be used to connect motors in distant places, however the middle wire will be red instead of orange, so look elsewhere for the motor controller if that's the case.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 11

Item: A motor may only be controlled by a single controller port

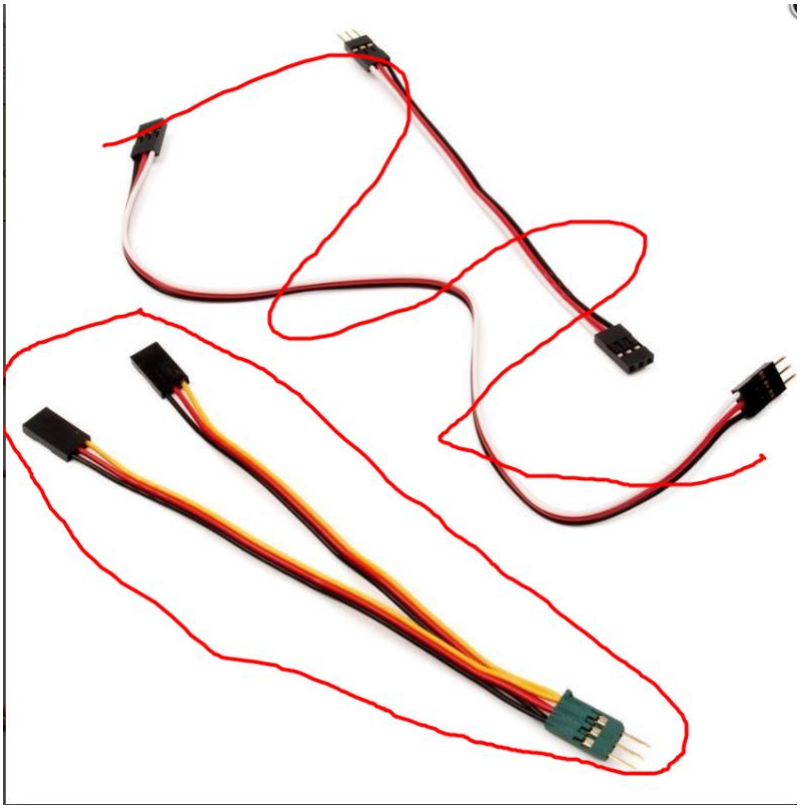
Explanation: What this rule means is that teams cannot somehow plug a motor into 2 ports. This is not something to obsess over usually and can be passed simply by asking the team this.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 12

Item: Robot uses a maximum of (1) Y-Cable per each 3-wire Motor Port (cannot "Y" off a 2-wire Motor Port)

Explanation: Teams are allowed up to 12 motors with the Cortex, but the Cortex only has 10 motor ports. If the Y-cable didn't exist, teams would only be able to use 10 motors. The Y-cable is how robots can power 12 motors off only 10 ports. It enables the Cortex to power and command 2 motors from the same port. The Y-cable is pictured below (Note: The yellow cable is white on some models).



This y-cable usually gets plugged into the 3-wire port and teams plug in their Model 29 controllers into the two ends at the top of the cable. What this rule is talking about is that teams cannot put another Y-cable into the Y-cable. The implication of this rule is that teams cannot power more than 2 motors off the same port. Teams also are not allowed to use y-cables on ports 1 and 10; only one motor can be powered off each.

Because cables usually are in a frenzy near the Cortex ports and for the sake of time, it would be best if you asked the team this question. If you feel the need, ask the team to show you all their Y-cables.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 13

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

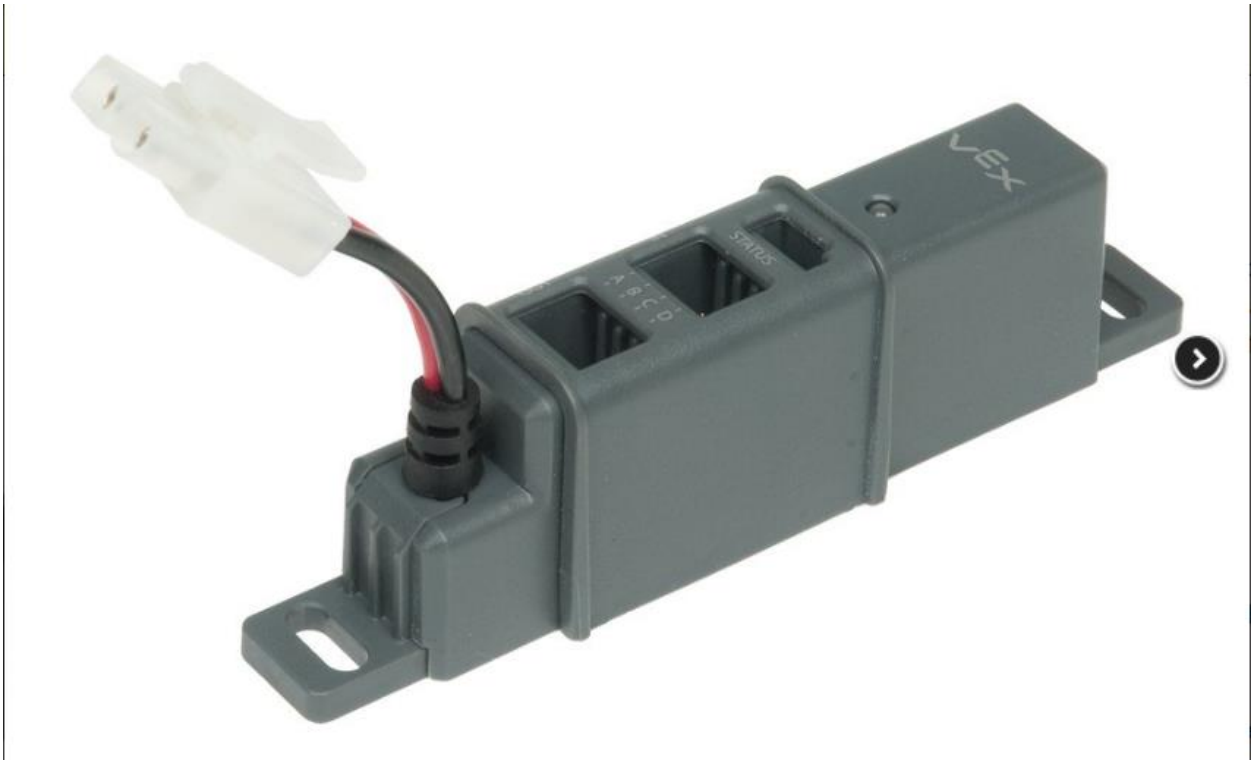
Explanation: Power Pack is just a term for the battery, and is that big blue battery that sits somewhere near the Cortex. While you will usually see the first battery pictured, some teams will use a smaller pack pictured second. Both batteries are legal for competition, but teams have to use the VEX-branded 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 likely so that the integrity and safety of the battery is not in question. You may see an extension cord attaching the battery to the Cortex.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 14

Item: Robot uses a maximum of (1) VEX Power Expander, with a 2nd 7.2V (Robot) Power Pack

Explanation: The VEX Power Expander looks like this:



The Power Expander allows teams to power up to 4 motors (and more if they Y-cable from the power expander) using a second 7.2V VEX Power Pack. For competitions, if the team is using this device, they **must** have that second battery onboard.

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 15

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 on (if it does), 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. 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 16

Item: Team only utilize VEX Battery Chargers for charging VEX 7.2V Battery Packs

Explanation: This is something you ask the team for the sake of time, as the chargers are located in the pits. VEX Battery Chargers look like this:

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 17

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. 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 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.

The Joystick needs to be present for inspection, as it will be used later on.

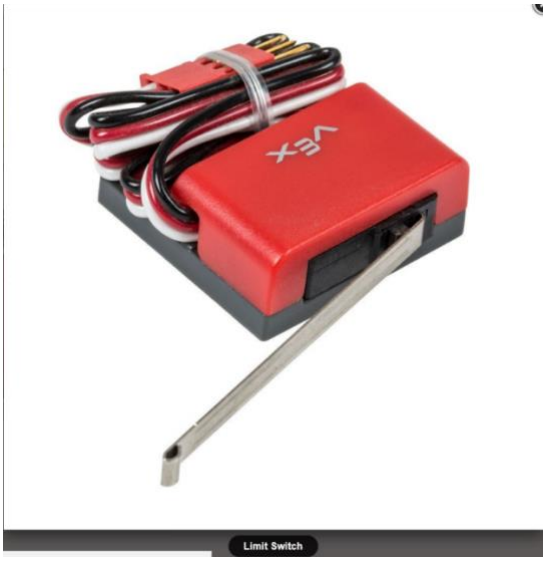
CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 18

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 19

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.

CORTEX INSPECTION

CATEGORY: Parts Inspection, Item 20

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: 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 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. 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, send the team for a new 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

6. 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 two analog sticks. The robot should 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. Set the right-hand switch to “Driver”.
9. 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’s wheels should respond to that input.
    - The Game LED should now be Fast Blinking GREEN.
10. Set the left-hand switch to “Disable” and allow the team to turn off the robot and joystick.
11. 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.

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. You will use the 18” tool to check the robot’s starting size. Have the team fold the robot into starting size and place the robot on the table. You then hold the tool upright with the open side to the table (think upside down “U”) and sweep the tool across the robot two times in two directions 90 degrees from each other, i.e. once along the x-axis and once along the y-axis. 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. 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. 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 obviously 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. Once again,~~ ~~**the robot CAN go over 36" during the inspection, just that it cannot do so during the match.**~~

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 itself will be inspected later in the checklist.

V5 BRAIN 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 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.

Explanation:

The plates should be easily visible on at least two sides that are not adjacent to each other, i.e. the plates should be more or less 180 degrees from each other. Use your judgement as to 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, and 2 of those plates should 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.

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”, 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 size 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. Use your judgement on this one. Refer any questions to the head inspector.

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 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.

Use your judgement. Refer any questions to the head inspector.

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.

Use your judgement. Refer any questions to the head inspector.

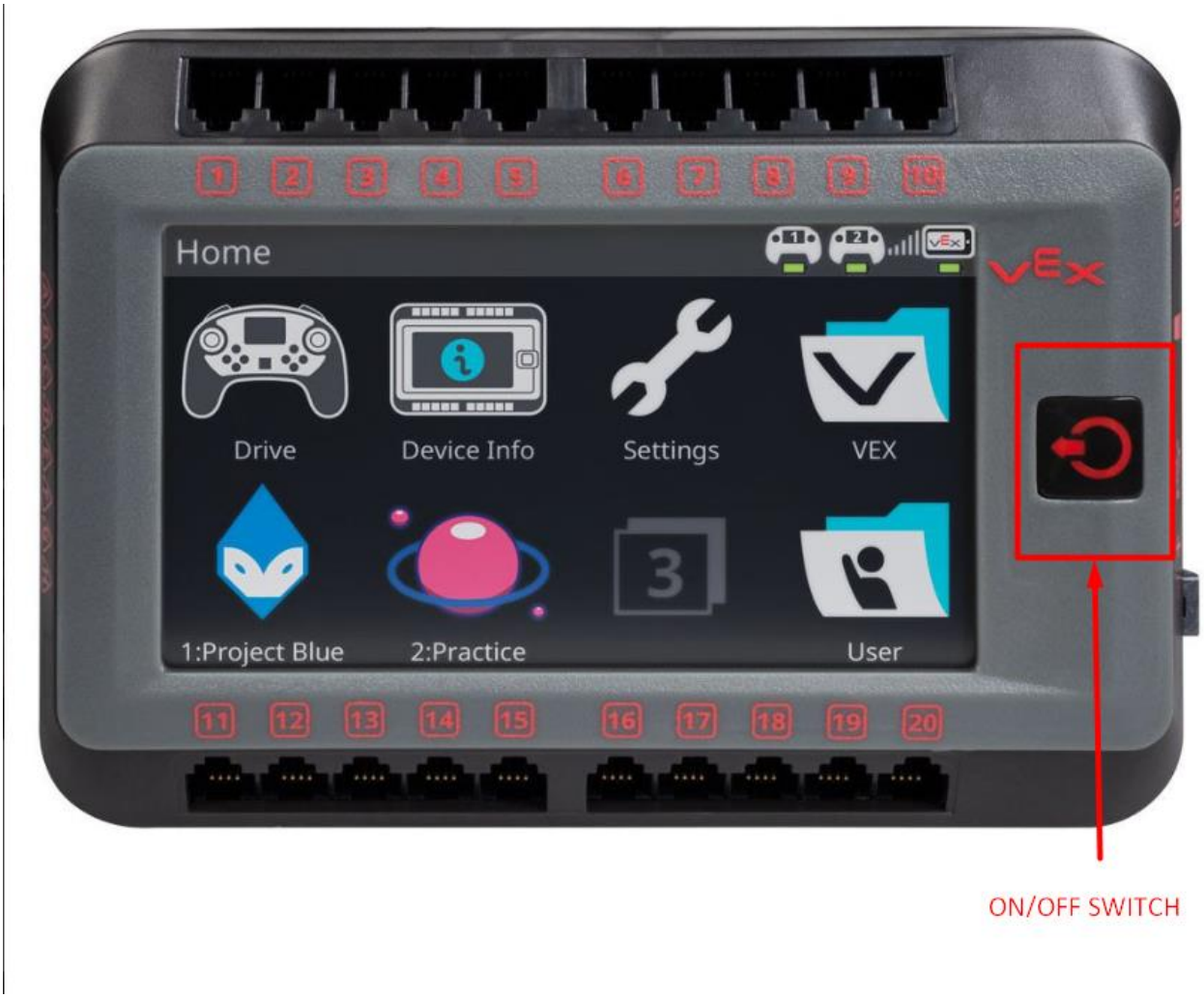
V5 BRAIN INSPECTION

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: Parts Inspection, Item 1

Item: ALL Robot components are (or are IDENTICAL to) OFFICIAL VEX Products as sold on VEXrobotics.com (No 3D printed functional parts are allowed)

Explanation:

This pretty much says, with exceptions listed elsewhere in the game manual, that only VEX parts (or identical copies thereof. The copies legally may deviate in color.) can be used for the robot. 3D parts are allowed as non-functional decorations, but only at that. 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, or by exhaustively studying the whole VEX EDR product line at www.vexrobotics.com. 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 <R7> 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. Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

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 VEX products that fall under this rule are packaging materials, trophy materials, any field component, etc. Only parts intended for use as robot parts are legal.

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.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 4

Item: Any grease is used only in moderation on components that do not contact the field, objects, or other robots.

Explanation:

Ask the team if they have grease anywhere on their robot. If they use grease, ask the team to show you where it is. The grease must not be in a place where it can contact the field, game objects, or other robots. That includes transfer as well.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 5

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 1/16ths of an inch.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 6

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 7

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 this device 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 8

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, again, if something looks odd, ask someone experienced or the head inspector. This is also something you can just ask the team about.

Use your judgement on this one. Give the robot a look also. Refer any questions to the head inspector.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 9

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 10

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 11

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

Explanation: The V5 Robot Battery looks like this. Ask the team to show it to you.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 12

Item: Team only utilize VEX Battery Chargers.

Explanation: This is something you ask the team for the sake of time, as the chargers are located in the pits. VEX Battery Chargers look like this:

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 13

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.

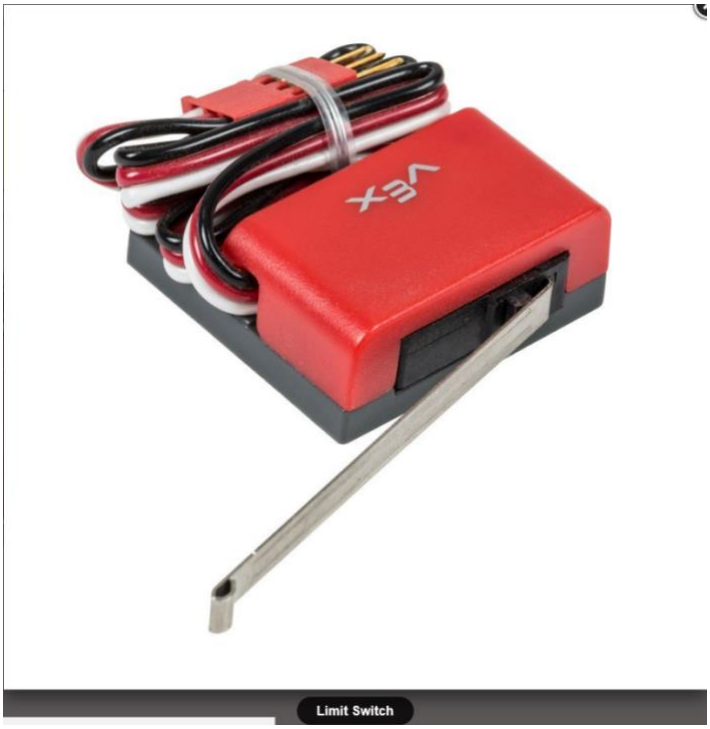
V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 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) 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 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. Teams can customize parts by cutting 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.

V5 BRAIN 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:

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 17

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

Explanation: A select few people were given early access to the V5 system for testing and feedback before it was officially released to the masses. These units given 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 18

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 19

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

Explanation: This applies regardless whether the robot has the Vision Sensor mounted or not. The Vision Sensor allows teams to see what's on the 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, during Autonomous mode, to behave incorrectly, which can at worst result in damage to the 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.

V5 BRAIN INSPECTION

CATEGORY: Parts Inspection, Item 20

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 21

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. Ask the team about this item to pass this item.

The Vision Sensor is a powerful part, but it can easily lead the robot astray if not programmed, tested, and calibrated correctly, potentially causing damage to self, 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

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”.
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.