

Q&A

VEX V5 Robotics Competition 2024-2025: High Stakes

Tagged: R20

Welcome to the official VEX V5 Robotics Competition Question & Answer system, where all registered teams have the opportunity to ask for official rules interpretations and clarifications. This Q&A system is the only source for official V5RC High Stakes rules clarifications, and the clarifications made here from the Game Design Committee (GDC) are considered as official and binding as the written [Game Manual](#) itself.

Please review the [Q&A Usage Guidelines](#) before posting. This system is only intended for specific V5RC High Stakes rules questions.

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 - For VEX technical support, contact support@vex.com or sales@vex.com.
- For game questions, suggestions, or concerns outside of specific and official rules questions, contact GDC@vex.com.

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708: <VUR6> Clarification

7-Dec-2020

R6 R7 R8 R10 R12 R20 R22 VUR2 VUR3 VUR5 VUR6 VUR8

In this previous ruling, it was determined that <VUR5> takes priority over <VUR6>:

<https://events.vex.com/VEXU/2020-2021/QA/674>

However, this is contradictory to every other instance of past rulings regarding <VUR6> and the wording of <VUR6> in the game manual.

?

For example, consider a typical custom sensor such as the pixy camera:

<https://www.robotshop.com/en/charmed-labs-pixy-2-cmucam5-image-sensor.html>

This sensor violates <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR8>.

VUR3 restricts the materials allowed, but this sensor violates the allowed materials.

VUR8 restricts the screw sizes allowed, but this sensor may have smaller screws than the allowed limit.

As another example, consider a vex IQ sensor: <https://www.vexrobotics.com/228-3014.html>

This sensor would violate <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR2b>.

<VUR2b> restricts teams from using any vex IQ electronics, which would include this sensor.

?

Because <VUR6> specifically states "There is no restriction on sensors and other additional electronics that Robots may use for sensing and processing" it has been understood by most VexU teams that <VUR6> takes priority over all the other rules in the game manual. Logically this would also mean <VUR6> would take priority over <VUR5>.

?

Several other Q/As over the years have verified this as correct as the wording on <VUR6> has not significantly changed since these rulings:

<https://www.vexforum.com/t/answered-vexu-speakers-as-part-of-custom-sensor/42312>

<https://www.vexforum.com/t/answered-vex-u-old-college-q-a-updates/23810>

<https://www.vexforum.com/t/answered-custom-sensor-housing/19582/2>

These three Q/As verify that <VUR6> would take priority over <VUR3> and <VUR8> as well as all the regular game manual rules mentioned above.

Furthermore, the following Q/A shows that <VUR6> would also take priority over <VUR5>:

<https://www.vexforum.com/t/answered-vex-u-non-vex-servo-motors-for-a-custom-sensor/35538>

This allowed external non vex motors used solely for manipulating custom sensors.

If this were the case, it would agree with the wording of <VUR6>. There are numerous sensors and processing boards that rely on motors to operate.

For example, many full field lidar systems such as:

<https://www.robotshop.com/en/rplidar-a1m8-360-degree-laser-scanner-development-kit.html>

rely on an integrated motor to spin the lidar enabling it to map the field. VexU teams have legally used similar lidar systems in the past and may plan to do so again this season.

Another example would be the Nvidia Jetson Xavier NX listed below:

<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-xavier-nx/>

This processing board has a built-in fan on its heatsink that is critical to its function as a processing unit.

A third example is the pixy tilt and pan kit: <https://pixycam.com/pixy2-pan-tilt-kit/> (ruled legal in the above Q/A linked).

Without these integrated motors, none of these sensors or processing units could function as intended.

?

Therefore, which rules, if any, restrict the "no restriction" clause of <VUR6>?

Furthermore, if <VUR5> does not apply to <VUR6>, then was the previous ruling in QA#674 an error?

If <VUR5> is applicable, are 360-degree Lidar sensors and the Nvidia Jetson processing boards also illegal? If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

Answered by committee

If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

Please see rule G3:

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX Robotics Competition.

The intent of the answer in the linked Q&A was to prohibit using VUR6 as a loophole to install cooling fans on a Robot.

Sensors containing an internal motor which is integral to their operation, such as a LIDAR or pan-tilt Pixy, would be permissible. It would not be feasible for an inspector to take apart a LIDAR module to see if there is a motor inside of it. It is, however, feasible for an inspector to check if a fan is being used to cool a V5 Smart Motor.

To prevent confusion, we would advise Teams with external processors that require thermal protection to utilize a [passive heat sink](#) instead of an active cooling fan.

3088: What is considered rope/string

10-Feb-2026

R20

A team used Yarn to crochet a net. Is yarn classified as rope or string? [<R20>](#) e. An unlimited amount of rope/string, no thicker than 1/4" (6.35mm).

Answered by committee

Yarn is considered legal string for use on Robots if it is no thicker than 1/4".

3028: Carbon Fiber Gel

9-Jan-2026

R20

[<R20>](#)

I have a team asking to be able to use a new gel that, as described to me, is the opposite of grease and will increase the friction of the material it is applied to. Now I am assuming that since this does not affect the field and or the play pieces, it is allowed, but I would like clarification before I tell the team one way or another. I have added a link to the Amazon store where you can buy this.

Thank you in advance.

<https://www.amazon.com/Finish-Carbon-Bicycle-Assembly-1-75-Ounce/dp/B0FD8MGRLR>

Answered by committee

The gel you describe is not a lubricant, and does not fall within the substances allowed by clause B of [<R20>](#) or any other rule. It is not legal for use in the VEX V5 Robotics Competition.

2990: Clarification on whether the presence of factory-applied lubricant in a new V5 Smart Motor cartridge under [<R17>](#) affects the interpretation of [<R20b>](#)

12-Dec-2025

[R17](#) [R20](#)

When motor cartridges are purchased from the VEX Robotics website, they contained oil (see photo). As the cartridges are used, the oil wears out making new cartridges perform better than used ones.

[<R17>](#) Robots are built from the VEX V5 system. Robots may be built ONLY using official VEX V5 components, unless otherwise specifically noted within these rules. Product pages on the VEX Robotics website should be used as the official definitive source for determining if a product is a "V5 component."

[<R20b>](#) Any non-aerosol-based grease or lubricating compound, when used in extreme moderation on surfaces and locations that do NOT contact the playing Field walls, foam Field tiles, Blocks, or other Robots. Grease or lubricant applied directly to V5 Smart Motors or Smart Motor cartridges is prohibited.

Given that new V5 Smart Motor cartridges come pre-lubricated from the factory. Per R17, does this make lubricated cartridges legal and does this have precedence over the conflicting rule R20b which prohibits lubricating them? Is it legal for teams to restore them to their factory state?

Thank you for your time to consider this clarification.



Answered by committee

Grease or lubricant applied directly to V5 Smart Motors or Smart Motor Cartridges is prohibited. This is not superseded by the fact that motor cartridges contain grease when purchased new, and is intended to prevent Teams from applying their own lubricants to the motor cartridges.

2955: <R20> Clarification and framework for enforcing/validating legal and illegal anti slip mat

1-Dec-2025

R20

Note: This question was modified by the GDC to remove a link that required login.

<R20>

Hello,

I am asking for some clarification and a follow up on a previous Q&A ruling: <https://events.vex.com/V5RC/2025-2026/QA/2817>. From this it is determined that anti-slip mat that is not purchased from VEX Robotics is not legal for competition use. However, at least in my region and at other events in other regions I've gone to, I've seen inconsistencies in this being applied.

A few questions I have:

- Is there a framework or set of guidelines for determining if anti slip mat is legal or not? Is it by feeling it, inspecting thickness, some other measurable property? Based on the age of the matting that teams use, this could change and have a lot of variance and doesn't strike me as a solid test.
- To be more concrete, I did a comparison of this anti slip mat here: <https://www.harborfreight.com/18-inch-x-72-inch-mesh-nonslip-drawer-liner-67055.html>, with the thick version of the VEX anti-slip mat, which is at a .125" thickness.
- It would be hard to distinguish for the untrained eye, and even the trained eye.

Answered by committee

Oscar,

Thanks for your question.

VEX anti slip mat is similar to many commercially available products, and because it does not have any distinct branding, printing, or logos, we understand it may be difficult to determine with absolute certainty whether a piece of anti slip mat used on a robot was purchased from VEX Robotics or not. As is the case with many other VEX legal parts and materials, identification relies on a reasonable assessment of the information you have available to you rather than a guaranteed verification.

Here are some practical indicators that can help referees and inspectors make an informed decision:

1. Color: VEX anti slip mat is only offered in black. If the material on a robot is any color besides black, it is NOT legal for use.
2. Surface Pattern & Thickness: The VEX anti slip mats have distinctive textures and thickness. Comparing material on a robot to a known legal sample is a reasonable way to spot discrepancies. If the pattern or profile is very obviously not a match to either VEX variant, or if the material feels noticeably different, it is likely not VEX anti slip mat.
3. Sheet Size: VEX anti slip mat is offered in sheets that measure 12" x 15". If material on a robot measures larger than this in one or both dimensions, without seams, it cannot originate from a VEX anti slip mat sheet, and is not legal for use.

Ultimately, teams and inspectors should think of anti slip mat similarly to how they know and understand VEX metal, structural components, and other parts are legal for use: "You generally know a part when you see it, and you generally know when something doesn't quite look right."

If a clear determination cannot be made, inspectors and referees should work with the team for further clarification, request reasonable purchasing/source documentation if possible, and/or guide the team towards a clearly legal alternative.

2906: Does basketball net comprised of rope that is less than 1/4" diameter comply with R20

10-Nov-2025

R20

<R20>

Does a commercially purchased basketball net comprised of rope or string that is less than 1/4" diameter meet the requirements of part e of R20? Or would a team have to take 'raw' rope and tie their own netting web?

Answered by committee

A commercially-produced basketball net is not a legal material for use on a V5RC Robot.

If a Team wants to include a net or other similar structure on their Robot (i.e., woven, crocheted, knotted, knitted, or otherwise connected rope or string) it must be created by Team members using rope/string no thicker than 1/4" without illegal materials (i.e., ropes/strings can't be taped or glued to other ropes/strings).

2895: Zipties

2-Nov-2025

R20

Note: This question was revised by the GDC for clarity and readability.

<R20> Certain non-VEX components are allowed. Robots are allowed the following additional "non-VEX" components: i. Zip ties with identical dimensions as those included in the VEX V5 product line, or their metric equivalents.

The VEX website (<https://www.vexrobotics.com/zip-ties.html>) lists the following:

- 4" Zip Ties - 4" x 0.100" x 0.042"
- 11" Zip Ties - 11" x 0.1875" x 0.055" When measured with digital calipers, the official zip ties were slightly smaller than the measurements listed.

Is there a tolerance level for zip ties?

When did the inspection process become so tedious that we are stopping matches to measure the length, width, and thickness of zip ties? A coach brought to my attention that their team did not pass inspection due to zip ties sizes, while I know that the zip ties I purchased were slightly smaller than the tolerance and my teams passed without question. Also, a match for one of their teams was stopped by the head ref to measure a zip tie to see if it was an 11 inch zip tie. The robot had already passed inspection and this was later in the day.

Thank you for your time in reviewing this question. I look forward to sharing your feedback with the coaches in our area.

Answered by committee

Hi, Margaret, and thanks for your questions.

The next game manual update will reflect that the sizes listed for V5 zip ties are nominal. In other words, the designated size of the product may differ slightly from the actual measurement. We cannot give a range of acceptable measurements, but negligible differences that could be a result of inaccurate or mis-calibrated measuring devices can be ignored.

The inspection process is the only way to ensure that Robots meet the requirements of the game manual, including checking that the Robot uses only legal materials. We do not expect Robot inspectors to measure every zip tie on a Robot; however, when an obviously non-compliant zip tie or other illegal part is noted (either during inspection or later during an event), the Team and volunteers must follow the guidelines in the game manual. If the issue is noted before a Match, clause D of rule <R3> applies. If the issue is noted during or immediately after a match, clause E of <R3> applies. See [this RECF Library article](#) for more information and edge cases; the R20j section includes three photos of visibly non-compliant zip ties, and the third image (taken at the UND signature event at the Mall of America) shows a clearly undersized and illegal zip tie.

Regarding your experiences at events, just because a Violation is missed by one inspector or one head referee doesn't mean it's not a Violation.

2832: Rubber bands

1-Oct-2025

R20

[<R20>](#) I ordered rubber bands from Robosource. They are size 64 but they are not orange- they are regular rubber band color. I just want to make sure that these are legal for VR5C.

Answered by committee

Hi, Team 13756A, and thanks for your question.

As described in clause G of rule [<R20>](#), "Rubber bands that are identical in length and thickness to those included in the VEX V5 product line (#32, #64, #170, and #117B)" are legal for use on V5RC Robots.

There is no restriction on rubber band color.

2820: Basket

26-Sep-2025
R20

Is it legal under the VEX Push Back competition rules to use the net material that was part of the VEX Over Under Field or Game Elements as a custom part (e.g., a basket or collector) on the Robot? Specifically, does this material qualify as a "non-VEX component" that is permitted under rules like ?R20? or is it prohibited as a Field Element from a past game?

Answered by committee

Thanks for your question!

No. Field Elements from previous seasons are in most cases not considered legal for use in Robot construction, as described in clause K of rule [<R19>](#). In cases where a Field Element includes some explicitly legal materials (e.g., screws, standoffs, nuts, or non-shattering plastic not larger than 4"x8"x0.070"), those legal portions CAN be detached and repurposed for use on competition Robots.

2817: <R20> Non-VEX components anti-slip matting and Latex Tubing

25-Sep-2025
R20

1. <https://kb.roboticseducation.org/hc/en-us/articles/13230666960407-VEX-V5-Robotics-Competition-Robot-Inspection-Details-and-Edge-Cases> Is it still valid?
2. For non-official anti-slip mats, as long as they are black and no larger than 12" x 15" per piece, is it considered compliant?
3. Must the latex tubing be purchased from VEX official? (Non-official rubber bands are acceptable as long as they are the same size. Does this also apply to latex tubing?)

Answered by committee

Hello, Team 7602K, and thanks for your questions.

1. Yes. This document is referenced in Section 3 of the game manual and is still valid.

2. Anti-slip matting purchased from sources other than VEX Robotics is not included in [<R20>](#), and is not a legal "non-VEX" component.
3. Latex tubing purchased from sources other than VEX Robotics is not included in [<R20>](#), and is not a legal "non-VEX" component.

2790: Clarification on Rope/String Thickness

15-Sep-2025

R20

[<R20e>](#) An unlimited amount of rope/string, no thicker than 1/4" (6.35mm).

When teams knot their rope/string together, it can be thicker than this limit while the stock itself never exceeds the limit. I have the following questions:

1. Does the thickness limit in [<R20e>](#) refer to the stock rope/string or the combined rope/string at all times such as when it is knotted?
2. If the thickness limit in [<R20e>](#) *does not* refer to the stock of the rope/string, how would an inspector go about measuring rope/string if there were an axle, screw, or other component(s) wrapped within any rope/string?

Answered by committee

Great questions, Karson. Thanks!

1. The stock rope/string.
2. N/A

2487: R20 and tape for tournament spot repairs

31-Jan-2025

R3 R9 R20

[<R20>](#)

Is the use of duct or gaffers tape (for example) forbidden for spot-repairing damage to a team's robot over the course of a tournament?

For example, many teams this year use plastic as a ramp into a conveyor mechanism from a ring intake. Over the course of battles over the positive corners and interactions with other robots and field elements, the plastic can snap or crack. In some instances we've seen mid tournament spot repairs of such damage with tape, because a team may not have had a spare piece of this plastic.

This does not appear to be a legal way to repair the damage after looking at:

[<R20>](#) A limited amount of tape is allowed. Robots may use a small amount of tape for the following purposes:

To secure any connection between the ends of two (2) VEX cables. To label wires and motors. To cover the backs of license plates (i.e., hiding the "wrong color"). To prevent leaks on the threaded portions of pneumatic fittings. This is the only acceptable use of Teflon tape. In any other application that would be considered a "non-functional decoration" per [<R9>](#). As an aglet at the end of rope/string to prevent fraying.

[<R9>](#) Decorations are allowed. Teams may add non-functional decorations, provided that they do not affect Robot performance in any significant way or affect the outcome of the Match

Clearly if holding the broken pieces of plastic together, the tape becomes functional. Not performing this sort of spot repair though could easily end the day for the damaged robot/team. It seems unlikely such a repair conveys a strategic advantage over the original piece of plastic.

What should referees do in this situation? Should robots with tape repairs like this be removed from the field, and the team told to find another legal repair method before they may return? Or do they be allowed to compete with the bandaged robot the rest of the day, given its likely not in as good a shape as it could have been with fully intact plastic?

Answered by committee

Is the use of duct or gaffers tape (for example) forbidden for spot-repairing damage to a team's robot over the course of a tournament?

Tape is illegal for uses beyond those described in [<R20>](#), including as a way to repair legal parts. Tape used for this purpose does not qualify as a non-functional decoration.

What should referees do in this situation? Should robots with tape repairs like this be removed from the field, and the team told to find another legal repair method before they may return?

Yes. Clauses C.i or E of rule [<R3>](#) would apply, and the Robot should not be allowed to participate in Matches until the Robot meets the requirements of all Robot rules.

1889: Regarding R20

23-Jan-2024

R20

[<R20>](#)

R20 says certain commercial screw can be used which doesn't prohibit nylon screw. So my question is whether the nylon screw from robosource can be legal or not? Thanks. Ref: <https://www.robosource.net/robot-parts/screws-hardware/nylon-screws-nuts/139-nylon-screw-0500>

Answered by committee

Rule [<R20>](#) permits the use of specific sizes of commercially-available hardware, but does not specify or restrict their material beyond the statement in the rule's red box regarding additional functionality. There is no rule that prohibits nylon screws that fall within the other constraints of rule [<R20>](#), therefore they are legal.

1660: R20 and use of threadlockers

23-Sep-2023

R20

[<R20>](#)

is the use of commercially available threadlocker (i.e. loctite blue) legal for use in securing nuts and bolts?

Answered by committee

Commercially-available threadlocker, including Loctite blue, is made legal for limited uses by clause F of rule [<R15>](#):

Mechanical fasteners may be secured using Loctite or a similar thread-locking product. This may ONLY be used for securing hardware, such as screws and nuts.

1565: <R20> Certain non-VEX fasteners are allowed. (Clarification of heed types).

20-Jun-2023

R20

<R20> Current content of first item (a): #4, #6, #8, M3, M3.5, or M4 screws up to 2.5" (63.5mm) long. Add/clarify that all types are permissible. Thought this seems obvious, flat heads are likely very important in the plastics, and should be called out: ADD: Head styles permitted include: Hex, pan, flat, round, oval, truss, socket and button. Drive types permitted include: Phillips, slotted, Ferson, Pozidriv, hex (aka, allen), square and star (aka, Torx). Washers permitted include: SAE, USS and Fender washers. Materials permitted include: Zinc-plated steel, Stainless steel, Chrome and nickel plated steel, brass, bronze and alloy steel.

Great reference: <https://www.boltdepot.com/fastener-information/Printable-Tools/Fastener-Basics.pdf>

Answered by committee

Please be sure to review the [Q&A Usage Guidelines](#) before posting, specifically note 1, "The Q&A system is for rules clarifications only." As noted, the Q&A platform is intended to be a communication channel for questions such as "Is this interpretation of a rule legal?", not a discussion forum to post questions such as "I disagree with this rule, can it be changed?" For those comments, please use the official [VEX Forum](#) or email GDC@vex.com.

1559: <R20>(b) shoulder screw constraints

19-Jun-2023

R20

<R20> There were some very specific constraints put on shoulder screws that don't make sense. Current text says: Shoulder screws cannot have a shoulder length over 0.20" or a diameter over 0.176". What was the logic in constraining shoulder screws?? The winch pulley system (part 276-1546) should be using a #6 with shoulder screws having shoulder dimensions slightly exceeding 0.160 by 0.325. Commercially available as "303 Stainless Steel, Star Head Shoulder Screw, 5/32 in. Dia. x 3/8 in. Long" would suffice (e.g., <https://www.ondrivesus.com/ST3-1537>) If constraining anything, limit the constraint to #6, #8, M3.5 or M4 threads, with maximum thread length, and recommend "star" or "Torex" sockets, for consistency.

Answered by committee

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1405: Wiring

23-Jan-2023

R20 R21 VUR10

Does there need to be a single continuous wire between a brain and a motor? As a VEXU team would it be legal to have two wires connected to each other as long as the wires are not connected using non legal parts?

Answered by committee

This system is only intended for specific VRC Spin Up rules questions. Because your question only pertains to VEX U and has no effect on VRC robots or rules, you will need to resubmit it in the [Official VEXU 2022-2023: Spin Up Q&A](#) for us to consider it. Thank you.

1381: String Question

12-Jan-2023

R7 R20

1. Can we use Vex electrical cable as the string/rope for the endgame?
2. If not, because it's too small, could we wrap it in string to make it size compliant?

Thank you for your help.

Answered by committee

V5 Smart Cables may only be used for connecting legal electronic devices to the V5 Robot Brain. This change was reflected in the scheduled game manual update on January 31, 2023.

1293: Pneumatic Alterations Clarification

9-Nov-2022

R4 R20

<R20> No modifications to electronic or pneumatic components are allowed. Motors (including the internal PTC or V5 Smart Motor firmware), microcontrollers (including V5 Robot Brain firmware), cables, sensors, controllers, battery packs, reservoirs, solenoids, pneumatic cylinders, and any other electrical or pneumatics component of the VEX platform may NOT be altered from their original state in ANY way.

[In this VEX Knowledge base article](#), it states the nut can be removed from the cylinder to reduce weight.

R20 states pneumatic cylinders, reservoirs, solenoids, etc. may not be altered from their original state in any way.

1. Is the removal of the nut on the bottom of the pneumatic **cylinder** (NCJ2D10-200S or NCJ2D10-200) considered to be an alteration from the original state?
2. Is the removal of the nut on the bottom of the pneumatic **reservoir** (US14227-S0400 or NCMZ5-U12001-320) considered to be an alteration from the original state?
3. Can either of these nuts by themselves be used in an end-game launcher's design if the head referee considers the mechanism to be safe per <R4d>
4. If the nut from the reservoir is used outside of the reservoir, is the nut considered to be only the "pneumatic reservoir nut" or is it considered to be an "an entire pneumatic reservoir that has been altered such that only the nut remains"?

Answered by committee

Thank you for your questions.

1. Is the removal of the nut on the bottom of the pneumatic **cylinder** (NCJ2D10-200S or NCJ2D10-200) considered to be an alteration from the original state?
2. Is the removal of the nut on the bottom of the pneumatic **reservoir** (US14227-S0400 or NCMZ5-U12001-320) considered to be an alteration from the original state?

These are both considered normal uses of the parts, and are not modifications of the pneumatic device.

3. Can either of these nuts by themselves be used in an end-game launcher's design if the head referee considers the mechanism to be safe per R4d
4. If the nut from the reservoir is used outside of the reservoir, is the nut considered to be only the "pneumatic reservoir nut" or is it considered to be an "an entire pneumatic reservoir that has been altered such that only the nut remains"?

Using either of these nuts as part of an Endgame expansion mechanism is allowed, provided no other rules are broken in the process. If used in this manner, the nut is considered to be a pneumatic reservoir nut and not a modified pneumatic device.

1292: Non-electric Motor Components

9-Nov-2022

R20

[<R20>](#)



Are we allowed

to make non-electrical modifications to the motor, such as what is shown above? When the cap is modified, "cart-less" motors will have less friction, as they wobble due to a lack of preciseness. Many motors on flywheels are also very likely to overheat, so the removal of the shell would reduce overheating. Can the posts of the cap also be shaven down in order to reduce motor stack height?

Answered by committee

Rule [<R20c>](#) provides an inclusive list of competition-legal modifications to the V5 Smart Motor, and [Q&A 1189](#) clarifies that shafts may be connected to internal components of the motor with legal parts other than standard cartridges.

| The modifications described and pictured in your question are **not permitted** in the Spin Up competition.