

Q&A

VRC 2023-2024: Over Under

Tagged: R14

Welcome to the official VEX 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 VRC Over Under 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 VRC Over Under 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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490: <R5>, <R14>Is it Legal to Use 393 Motor Refurb Gears and V5 Cartridges as Mechanical Components?

17-Jan-2020

R5 R14

Legality of part usage from 393 motor refurb kit and V5 Motor Cartridges as mechanical components?

In previous years it was ruled legal that 393 motor internal gears, sold in refurb kits, can be used outside of a motor as mechanical components, since they are sold as a separate item. <https://www.vexforum.com/t/answered-further-question-about-r15/23896/2> <https://www.vexforum.com/t/answered-is-it-legal-to-re-use-internal-motor-parts-outside-of-motors/30764>

Questions for the Tower Takeover Season: A. (R5) Does the above positive ruling still stand regarding the legal use of refurb kit gears? B. (R14) Additionally, are V5 Motor Cartridges legal to use as mechanical components external to the V5 motor?

Thank you from Vexmen Team 81K Magik

Answered by committee

A. (R5) Does the above positive ruling still stand regarding the legal use of refurb kit gears?

Yes, this is legal.

B. (R14) Additionally, are V5 Motor Cartridges legal to use as mechanical components external to the V5 motor?

There are no rules prohibiting this, thus it is legal. However, any modifications to the cartridge would be considered a violation of R22. Also, please bear in mind that there are no VEX-legal components that can interface with the internal half of the cartridge. Removing parts from a V5 Smart Motor to do so would also be considered a violation of R22.

1971: Mid-Event Firmware releases

26-Feb-2024

R14

<T6><R14>

<https://www.robotevents.com/VRC/2023-2024/QA/1968>

Given there are no exceptions to the rule requiring robots to be on the latest version of the firmware, how should events handle firmware releases mid-event?

For example, if teams have already been inspected, and matches are ongoing. A new version of the firmware was released as matches were being played but nobody in the venue was yet aware of it, but suddenly a team sees the forum thread. All robots who played matches between the release of the firmware and discovery of the update had illegal robots, correct? And if so, should they be retroactively DQ'd?

If not, I assume that all robots would then need to immediately be updated to the latest firmware. Since it is the responsibility of teams to show up to the field on time, should matches continue with teams sending representatives to 0v0 matches until the firmware update process is complete?

Answered by committee

In the case of a mid-event firmware update (which we do not anticipate happening again this season), Teams will only be required to run the latest firmware released prior to the start of that event. We anticipate that the rules regarding required firmware will be revised and made less restrictive for the 2024-2025 season.

1968: VEXos Version 1.1.3 for V5 issues

23-Feb-2024

R14

[<R14>](#)

Given reports, potentially unsubstantiated, of the firmware 1.1.3 that was released on 2/23/2024 just ahead of many Regional Qualifiers, is it possible to exempt use of this firmware for this weekend in order to give teams time to adjust, in particular, to potential changes in how current is directed to robots with 88 watts of motor power using more than 8 motors.

Answered by committee

Per clause B of rule [<R14>](#),

Teams must use the latest official VEXos firmware updates, found at <https://link.vex.com/firmware>. Custom firmware modifications are not permitted.

[Revised on 3/13 to reflect the answer for [Q&A 1971](#)] In the case of a mid-event firmware update (which we do not anticipate happening again this season), Teams will only be required to run the latest firmware released prior to the start of that event. We anticipate that the rules regarding required firmware will be revised and made less restrictive for the 2024-2025 season.

1964: R14e Clarification

21-Feb-2024

R14 R15

R14e states:

For the purposes of this rule, the V5 Smart Motor Cap is not considered “part of the motor.” Therefore, <R15> applies.

R15 states:

Most modifications to non-electrical components are allowed. Physical modifications, such as bending or cutting, of legal metal structure or plastic components are permitted.

- R14e states that R15 applies to the V5 Smart Motor Cap. Is it correct to say that R15 applies to the V5 Smart Motor Cap and that physical modifications to the cap, such as bending or cutting, are legal?
- R14e states that the V5 Smart Motor Cap is not considered part of the motor for its purposes. Therefore, is it correct to say that the absence of the V5 Smart Motor Cap would not be a violation of R14?

Thank you.

Answered by committee

R14e states that R15 applies to the V5 Smart Motor Cap. Is it correct to say that R15 applies to the V5 Smart Motor Cap and that physical modifications to the cap, such as bending or cutting, are legal?

Yes

R14e states that the V5 Smart Motor Cap is not considered part of the motor for its purposes. Therefore, is it correct to say that the absence of the V5 Smart Motor Cap would not be a violation of R14?

This is correct.

1947: R14c with EXP Smart Motors

9-Feb-2024

R14

According to [<R14c>](#), Teams may make the following modifications to the V5 Smart Motor's user-serviceable features. This list is all-inclusive; no other modifications are permitted. Where applicable, the components listed below (in the specific applications listed below) are permissible exceptions to [<R20>](#). ([<R14>?](#))

1. (does not apply to this Q&A)
2. Removing or replacing the screws from the V5 Smart Motor Cap (276-6780).
3. Removing or replacing the threaded mounting inserts (276-6781).
4. Aesthetic/non-functional labeling (e.g., markers, stickers, paint, etc.)

[<R14e>](#) also states "For the purposes of this rule, the V5 Smart Motor Cap is not considered "part of the motor." Therefore, [<R15>](#) applies."

Could you please clarify which (if any) of these rules also apply to the EXP smart motors?

Thank you

Answered by committee

The following points of rule [<R14c>](#) also apply to 5.5W Smart Motors, and are legal modifications.

2. Removing or replacing the screws from the V5 Smart Motor Cap (276-6780).
3. Removing or replacing the threaded mounting inserts (276-6781).
4. Aesthetic/non-functional labeling (e.g., markers, stickers, paint, etc.)

However, because VEX Robotics does not sell the 5.5W motor caps separately at this time, the motor cap for the 5.5W motor is considered part of the motor and cannot be modified.

1928: Shorten Pneumatic Cylinder base

4-Feb-2024

R14

[<R14>](#)

Is grinding a few millimeters of metal off of a pneumatic cylinder considered a modification? It is not improving performance in any way. I have read <R14> [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].

Is original state meant to include the base, which is just for attaching the pneumatic cylinder? I wouldn't see how grinding it provides an advantage. The new vex reservoirs take up more space than the previous version, so using the previous version provides advantages in terms of physical volume occupied.

Answered by committee

As stated in the first sentence of rule <R14>:

No modifications to electronic or pneumatic components are allowed.

The change you propose making to a pneumatic cylinder **is a modification** and is specifically disallowed by this rule.

1912: Are V5 Smart Motor Caps considered VEX Electronics

30-Jan-2024

R8 R14

Rule <R8> point C states that

c. VEX electronics may not be used as non-functional decorations.

Rule <R14> point E states that

e. For the purposes of this rule, the V5 Smart Motor Cap is not considered "part of the motor." Therefore, R15 applies.

Would motor caps be considered as a VEX electronic, or are they considered not "part of the motor" (and therefore not a VEX electronic). In other words, can motor caps be used as non-functional decorations?

Thank you!

Answered by committee

As stated in your post, R14 clarifies that V5 Smart Motor Caps are not considered "part of the motor", and are instead bound by rule R15, which refers to "non-electrical components".

For all intents and purposes, a V5 Smart Motor Cap is no different than any other plastic V5 component.

1851: R14 D

1-Jan-2024

R14

<R14>I just want to confirm that this rule makes it against the rules to directly drive a flywheel without a cartridge like many teams did last season.

Answered by committee

You are correct. Per clause D of rule [<R14>](#),

V5 Smart Motors (11W) **must** use an official VEX V5 gear cartridge.

179: Powering and using lights including LED light strings

12-Dec-2018

R8 R14

During Skyrise a battery source of power for LED light strips was not allowed by rule R13 (comparable to Turning Point R14). Obviously old Q&As don't directly apply to new games, but they often do provide insight into what has been allowed/disallowed in the past.

<https://www.vexforum.com/index.php/13041-answered-led-lights-for-decoration/0>

In light (no pun intended) of the recent Q&A answer <https://www.robotevents.com/VRC/2018-2019/QA/162> where LED lights are powered by a battery that isn't a V5 or Cortex battery...

Can a robot have LED lights powered by an external battery source (not Cortex or V5 battery) providing R8 isn't violated? or is it only small self contained objects that are allowed (that don't include external wiring)?

<R14> The only allowable source(s) of electrical power are as follows: a. If using a VEX ARM® Cortex®-based Microcontroller, robots may use (1) VEX 7.2V Robot Battery Pack of any type, and one (1) 9V backup battery. i. Robots utilizing the VEX Power Expander may use a second VEX 7.2V Robot Battery of any type.

b. If using a V5 Robot Brain, robots may use (1) V5 Robot Battery (276-4811).

<R8> Teams may add non-functional decorations, provided that they do not affect the robot performance in any significant way or affect the outcome of the match. g. Decorations that visually mimic field elements or could otherwise interfere with an opponent's Vision Sensor are considered functional and are not permitted. This includes lights, such as the VEX Flashlight.

Answered by committee

Thank you for pointing out this inconsistency. We will update the answer to the other Q&A post accordingly.

Powered non-functional decorations may only be powered by legal sources of electrical power as defined in <R14>.

1659: Motor Cartridge Legality when not being used in a motor

22-Sep-2023

R14

[<R14>](#)

Rule 14D states that " For the purposes of this rule, the gear cartridges found within the V5 Smart Motor are considered "part of the motor." Does this imply that when not used inside the motor the motor cartridge is not considered an electrical component and can therefore be modified? Can a team take apart a motor cartridge to take apart to use the internal parts for other parts of the robot?

Answered by committee

Clause D of rule [<R14>](#) defines gear cartridges as part of the motor which, per clauses C & D of rule [<R14>](#), cannot be modified. Taking apart a gear cartridge and using the internal parts elsewhere on the Robot would be considered a modification to the component, and is not allowed.

1647: Rule R14 & "Hot Swap" motors

12-Sep-2023

R14

[<R14>](#)[<R14>](#)[<R14>](#)

Rule R14.c.ii stipulates that "Removing or replacing the screws from the V5 Smart Motor Cap" is legal.

Is this action limited to doing so for the stated purposes of:

1 - Removing or replacing the V5 Smart Motor cartridge, &/or 2 - Removing or replacing the Threaded Mounting Inserts?

Can the motor screws be removed and **NOT** replaced, and the motor mounted to the motor cap using rubber bands, zip ties, or some other attachment method that facilitates the "hot swapping" of motors?

Or is this considered an alteration from their original state and not part of the exceptions carved out to address the user serviceable features of the V5 smart motor?

Answered by committee

As you quoted from clause cii of rule [<R14>](#), **removing** or replacing the screws from the V5 Smart Motor Cap is legal.

As stated on page 3 of the game manual,

Obviously, all Teams must adhere to these rules, and any stated intents of these rules. However, beyond that, there is no "right" way to play. There are no hidden restrictions, assumptions, or intended interpretations beyond what is written here.

There is no rule that requires that motor screws be replaced following removal, so the usage you've described is legal.

1620: R14 Cleaning Motor Cartridges

17-Aug-2023

R14

In Q&A 1609 (<https://www.robotevents.com/VRC/2023-2024/QA/1609>), it was ruled that it was illegal to disassemble and lubricate a motor cartridge, and that teams should instead buy a new cartridge from VEX.

Sometimes foreign debris gets stuck in the gear cartridge, or the grease gets goopy. From my understanding of the rules, it would be legal to disassemble a motor cartridge and remove any debris, and to clean off any goop. However, it would not be legal to add any lubricant back. Is this correct?

Answered by committee

| This is correct.

1609: Is adding lube to motor cartridges illegal?

8-Aug-2023

R14

R14 simply states:

No modifications to electronic or pneumatic components are allowed.

R14c states:

Teams may make the following modifications to the V5 / EXP Smart Motor user-serviceable features. This list is all-inclusive; no other modifications are permitted. Where applicable, the components listed below (in the specific applications listed below) are permissible exceptions to R20. >i. Replacing the gear cartridge with other official cartridges. >ii. Removing or replacing the screws from the V5 Smart Motor Cap (276-6780). >iii. Removing or replacing the threaded mounting inserts (276-6781). >iv. Aesthetic/non-functional labeling (e.g., markers, stickers, paint, etc.).

It is very clear that no modifications may be done to motors or motor cartridges except for the 4 things listed in the rulebook. However, I would like some clarification on whether or not adding any lube that is allowed by R7b, would be allowed for motor cartridges.

Motor cartridges come with some factory lube already applied, but I have had motor cartridges that due to how long they have been sitting around, the lube would dry up and impact the over all performance of the motors. Can we take apart the motor cartridge, clean the dried lube, re-lube the gears, then putting the cartridge back exactly how it came? Or are we expected to buy new cartridges when the old ones perform worse? Wouldn't this count as basic maintenance instead of modification? Thank you.

Answered by committee

Thank you for your question. Disassembling a motor cartridge and adding non-factory lubricant is considered a modification of the V5 Smart Motor and is prohibited by rule [<R14>-c](#).

Teams may make the following modifications to the V5 / EXP Smart Motor user-serviceable features. This list is all-inclusive; no other modifications are permitted.

Rule [<R7>-b](#) will be revised in a future update to the game manual to indicate that this is not a legal use of grease.

155: R14 b iii Controller Power Source

25-Nov-2018

R14

As per this Q&A: <https://www.robotevents.com/VRC/2018-2019/QA/42> it is legal to power a V5 Controller using an external battery pack.

This seems to imply that R14 b iii does not always apply. If this is correct, when **does** R14 b iii apply? Also, what is considered an acceptable external power source for the joystick? Here are a few examples, but more general language would be appreciated:

1. USB battery pack
2. USB wall plug
3. Laptop

4. Tablet
5. Phone
6. Solar (for trickle charging)

To be clear, the joystick would not be modified in any way; all devices would be external and power the joystick only through the micro USB port.

Answered by committee

These would all be acceptable, provided that they meet the requirements spelled out in the linked Q&A post (interface with the standard micro USB port on the Controller and do not involve any modification to the Controller).

G7 would also apply:

<G7> Only Drivers, and only in the Alliance Station. During a Match, all Drive Team Members must remain in their Alliance Station. Drive Team Members are not allowed to use any sort of communication devices during their Match. Devices with communication features turned off (e.g. a phone in airplane mode) are allowed.

If a laptop or tablet were to be used as an external power source for a Controller, it must do so with communication features disabled.

1379: Legality of RGB controllers for addressable LED light strips

11-Jan-2023

Robot Rules and Inspection R12 R14

[<R12b>](#) states

“Small cameras are permitted as non-functional decorations, provided that any transmitting functions or wireless communications are disabled. Unusually large cameras being used as ballast are not permitted.”

[<R12g>](#) states

“Decorations which provide visual feedback to Drive Team Members (e.g., decorative lighting) are permitted, provided that they do not violate any other rules and serve no other function (e.g., structural support).”

[<R14>](#) states

“Robots have one microcontroller. Robots must ONLY use one (1) VEX V5 Robot Brain (276-4810). Any other microcontrollers or processing devices are not allowed, even as non-functional Decorations. This includes microcontrollers that are part of other VEX product lines, such as VEX Cortex, VEX EXP, VEXpro, VEX RCR, VEX IQ, VEX GO, or VEX Robotics by HEXBUG. This also includes devices that are unrelated to VEX, such as Raspberry Pi or Arduino devices.”

Cameras contain microcontrollers and per [<R12b>](#) are legal for use as a non-functional decoration without an exception stated for [<R14>](#). [<R12g>](#) permits the use of LEDs and also does not contain an exception for [<R14>](#), however addressable LED light strips can use microcontrollers, such as the one in the picture below.



Scenario A: a robot uses an LED light strip with an RGB controller but without a remote, no wireless communication is used for the LEDs.

Scenario B: a robot uses an LED light strip with an RGB controller and with a remote. Wireless communication is used from the remote to the RGB controller.

Scenario C: a robot uses an LED light strip with an RGB controller that connects to both the LED light strip and the V5 brain through one or more 3-Wire ports. The V5 brain sends a signal to the RGB controller, which is used to set the LEDs.

Scenario D: a robot uses an LED light strip without an RGB controller and is connected directly to the V5 brain through one or more 3-Wire ports. The V5 brain is used to set the LEDs.

In which scenarios would LEDs be considered non-functional decorations?

Answered by committee

Cameras contain microcontrollers and per [<R12b>](#) are legal for use as a non-functional decoration without an exception stated for [<R14>](#). [<R12g>](#) permits the use of LEDs and also does not contain an exception for [<R14>](#), however addressable LED light strips can use microcontrollers, such as the one in the picture below.

These are all correct statements.

In which scenarios would LEDs be considered non-functional decorations?

Scenarios A, B, and C would all be considered violations of R14, since they include a microcontroller.

Scenario D is legal.

1008: R14 - non damaging and detachable parts

19-Jan-2022

R14

In the final moments of the match, before a low hang, a triangle plate on the robot would get intentionally knocked off of the robot by running into the low bar. This action would allow for the hanging mechanism to engage and work properly.

According to R14, the intentional detachment of the triangle plate would be legal because it is NOT prohibited. We have confirmed through testing that this action poses no risk of damage to field elements or balls, can not damage other robots and can not entangle other robots. Are we reading this correctly?

Further, according to inspection checklist, the R14 question asks if you have any intentionally detachable parts. By answering YES, would this FAIL INSPECTION or should this robot with the detachable (non damaging part) triangle plate be legal and pass inspection?

Answered by committee

R14 reads as follows:

<R14> Prohibited items. The following types of mechanisms and components are NOT allowed:

- a. Those that could potentially damage Field Elements or Balls.
- b. Those that could potentially damage other Robots.
- c. Those that pose an unnecessary risk of entanglement.

Please also see rule G13, quoted here for reference, with a portion bolded for emphasis:

<G13> Keep your Robot together. **Robots may not intentionally detach parts or leave mechanisms on the Field during any Match. If an intentionally detached component or mechanism affects game play, the Team may be Disqualified at the Head Referee's discretion.** Parts that become unintentionally detached from the Robot are no longer considered to be part of the Robot and can be either left on the Field, or collected by a Driver (utilizing <G18>).

Although detachable parts are not, by themselves, considered a violation of R14, this question is asked during the inspection process to assist Teams in identifying potentially illegal mechanisms before entering the field. A mechanism which detaches from the Robot in order to aid in Hanging would be considered "affecting gameplay", and therefore a violation of G13.