

# Team Update 11

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## General

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- **Note from the FRC Director:**

This update includes a significant change to R03. As written, it did not allow for 'minor protrusions' beyond the starting configuration, and we consistently answered Q&A questions to that effect. However, we have seen reports of group pre-inspections at which a significant percentage of teams did not realize this and built slightly oversized robots, leading to significant rework.

Many teams do not have access to these pre-inspections, and our concern is that many of them will arrive at their events with slightly oversized robots, resulting in a lot of frustration and a great deal of painstaking rework. To mitigate that, R03 now allows minor protrusions in the length and width dimensions. (Take note: not the height dimension).

This decision was not made lightly. While it does make the rule more forgiving, many teams understood the rules as written initially, and designed their robots with that understanding. Some teams caught the implications of the rule as it had been written later in the build season and invested time and resources in redesigning and reworking their robots to comply. For those teams, please accept my apologies. However, I do believe this change is better for the community because it will result in a better experience for more teams.

- **Drawing Updates:** [The Layout and Marking Diagram](#) has been updated with the following changes:
  - GE-18132 and GE-18133 have been added.
  - GE-18117 and GE-18116 have been removed.

The [Field Drawings – FIRST POWER UP specific](#) drawing package has been updated with the following changes:

- GE-18117 and GE-18116 have been removed.
- GE-18118 has been updated to accommodate the new cable protector design.
- GE-18120 has been updated to include GE-18131 and additional hardware.
- GE-18131, GE-18132 and GE-18133 have been added.

Unfortunately, the original cable protectors specified in the field drawings are prone to cracking when hit hard with non-rotating objects (anything other than wheels). To avoid field damage and delays in the match schedule, we are replacing the original cable protectors with flexible PVC cable protectors. These new cable protectors are similar in profile to the original ones, but will not crack during impact. While we feel that that these new protectors are easier for robots to cross, we apologize if they affect your robot design.

The addition of GE-18131 to GE-18120 is to help alleviate wear on the SCALE arm. The addition of this part will not alter the heights of the SCALE PLATE specified in [Section 3.3.1 SCALE PLATES](#).

- **Q&A Edits:** Answers to the following questions have been edited because of changes made in *Team Update 11*:
  - **Q139:** R01 defines the perimeter as the length of a string wrapped around the frame at the bumper zone. The answer to question 113 says "the exact size and shape of Frame Perimeter will vary from team to team. Are the measurements of 28 x 33 the hard maximum sizes? The perimeter of a 28 by 33 base would be 122 inches. Could we use a 30 inch square base which would have a perimeter of 120 inches?"

R01 defines the FRAME PERIMETER of a ROBOT. Further instances of FRAME PERIMETER in the Manual refer to this definition. R04 restricts ROBOT size in the STARTING CONFIGURATION ~~and does not refer to FRAME PERIMETER~~. A 30 in. square will not fit within the constraints of R04.

- **Q143:** Does the exclusion of minor protrusions in the starting configuration (R02) in the horizontal directions pertain to the vertical dimensions? For example, would a bolt head protruding above 55" be acceptable?  
No, the exception for minor protrusions in R02 applies to the determination of FRAME PERIMETER only ~~and does not apply to any of the dimensions in R03~~. ROBOTS must meet all STARTING CONFIGURATION size constraints in R03 with ~~no~~ its noted exceptions.
- **Q184:** In reference to R59, in section 8.7, it says that insulated copper wire is legal to use. Is copper clad aluminum wire legal to use?  
~~No~~ Unless used for SIGNAL LEVEL circuits, copper or tinned copper is the only wire permitted per R59. Aluminum and Copper Clad Aluminum wire are not capable of carrying the same current at the same gauge as copper wire.
- **Q190:** R03 doesn't say anything about Fasteners not counting in the Maximum Robot Size. So do fasteners on the outside of the frame count towards the measurement of the robot? Do the fasteners in the Kit of Parts for bumpers count against the size measurements during inspection?  
Yes Probably not, R03 has ~~no~~ exemptions for minor protrusions, ~~the entire ROBOT must fit in the size constraints~~. With respect to BUMPER fasteners, please see R30-G and the Blue Box below R29 for additional information about determining whether an item is part of a BUMPER or part of the ROBOT (and therefore subject to R03).
- **Q217:** If we were to go up from 6 gauge to 4 gauge using the Copper Cladded Aluminum Wire, would we be able to use it for our battery leads and main braker? This change would provide more current than the 6 gauge copper wire. The 4 gauge Copper Cladded Aluminum wire is rated at 10 amps more than the 6 gauge.  
No. Copper wire is the only wire allowed for non-SIGNAL LEVEL circuits per R59.
- **Q265:** If a robot has a frame perimeter of 28" x 33" and there are bolt heads that protrude beyond the 28" or 33" dimension, will a robot with the measurements listed above be allowed to compete? Will the conditions listed above cause the robot to fail inspection?  
~~A ROBOT with any part (including minor protrusions excluding BUMPERS) outside the dimensions listed in R03 when it's in STARTING CONFIGURATION does not comply with R03 and will not pass Inspection. Per R03, minor protrusions permitted in R01 and R02 (that are less than ¼ in. (-6.3 mm) such as bolt heads, fastener ends, weld beads, and rivets) are exempt from the 33 in. and 28 in. limits.~~
- **Q271:** In answer to Q265 you state "A ROBOT with any part (including minor protrusions, excluding BUMPERS) outside the dimensions listed in R03 when it's in STARTING CONFIGURATION does not comply with R03 and will not pass Inspection." This seems to contradict R02 which does allow for minor protrusions of bolt heads in the vertical perimeter. Can you please clarify? If the bolt heads on a lift mechanism extend beyond 28" frame perimeter would this fall within R02 and be allowable?  
R01 and R02 have exemptions for minor protrusions when determining FRAME PERIMETER and extension beyond the FRAME PERIMETER in STARTING CONFIGURATION. R03 also has ~~no such those~~ exemptions ~~and does not reference the FRAME PERIMETER~~. Any ROBOT part (excluding BUMPERS ~~and~~

said minor protrusions) outside of the dimensions in R03 when in STARTING CONFIGURATION is a violation of R03.

## Rules & Expectations for *FIRST* Robotics Competition Events

No changes.

### Game and Season Manual

#### Section 3.3 SCALE

There is one (1) SCALE centered in the FIELD, and oriented so that the SCALE arm is parallel to the ALLIANCE WALL. The SCALE features an arm, RUNGS, PLATES, OUTRIGGERS, PLATFORMS, and TOWER. All frame surfaces are covered in polycarbonate panels. A cable protector extends from the center of each side of the PLATFORM and is 2½ in. (~6 cm) 3 in. (~8 cm) wide and ¼ in. (~2 cm) high (Electriduct, Inc. CSX-3 Hubbell Inc. FloorTrak3 Floor Cable Cover FT3BK25, Grainger Item # 5D687, black). The cable protector is attached to the field with hook fastener, increasing the height to approximately ¾ in. (~2 cm). These cable protectors extend to the GUARDRAILS and the SWITCHES.

#### Section 4.6 Logistics

Once the MATCH is over, if the Head REFEREE determines that the FIELD is safe for FIELD STAFF but not safe for everyone (e.g. the SCALE is full of POWER CUBES that create a falling hazard for a DRIVE TEAM carrying a ROBOT), they will turn the LED lights on the PLATES purple. Once the FIELD is ready for DRIVE TEAM traffic, the Head REFEREE or their designee will change the LED lights to green and DRIVE TEAMS may retrieve their ROBOT in accordance with S02.

#### Section 8.2 General ROBOT Design

**R03.** In the STARTING CONFIGURATION, the maximum ROBOT size (excluding BUMPERS) must be constrained to a volume of 33 in. by 28 in. by 55 in. tall (~83 cm by ~71 cm by ~139 cm tall). Minor protrusions permitted in R01 and R02 (that are less than ¼ in. (~6.3 mm) such as bolt heads, fastener ends, weld beads, and rivets) are exempt from the 33 in. and 28 in. limits.

#### Section 8.7 Power Distribution

**R59.** All circuits shall be wired with appropriately sized insulated copper wire (SIGNAL LEVEL cables don't have to be copper):

Table 8-4: Wire sizes

Application	Minimum Wire Size
31 – 40A protected circuit	12 AWG (13 SWG or 4 mm <sup>2</sup> )
21 – 30A protected circuit	14 AWG (16 SWG or 2.5 mm <sup>2</sup> )
6 – 20A protected circuit	18 AWG
Between the PDP dedicated terminals and the VRM or PCM	(19 SWG or 1 mm <sup>2</sup> )
Compressor outputs from the PCM	22 AWG
Between the PDP and the roboRIO	(22 SWG or 0.5 mm <sup>2</sup> )
≤5A protected circuit	24 AWG
VRM 2A circuits	(24 SWG or .25mm <sup>2</sup> )
roboRIO PWM port outputs	26 AWG (27 SWG or 0.14 mm <sup>2</sup> )

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SIGNAL LEVEL circuits (i.e. circuits which draw  $\leq 1A$  continuous and have a source incapable of delivering  $>1A$ , including but not limited to roboRIO non-PWM outputs, CAN signals, PCM Solenoid outputs, VRM 500mA outputs and Arduino outputs)

28 AWG  
(29 SWG or .08 mm<sup>2</sup>)

Wires that are recommended by the device manufacturer or originally attached to legal devices are considered part of the device and by default legal. Such wires are exempt from R59.

**R61.** All non-SIGNAL LEVEL wiring with a constant polarity (i.e., except for outputs of relay modules, motor controllers, or sensors) shall be color-coded along their entire length from the manufacturer as follows:

- A. Red, yellow, white, brown, or black-with-stripe on the positive (e.g. +24VDC, +12VDC, +5VDC, etc.) connections
- B. Black or blue for the common or negative side (-) of the connections.

Wires that are originally attached to legal devices are considered part of the device and by default legal. **Ethernet cable used in POE cables may use a different color standard.** Such wires are exempt from R61.

