Team Update 16

General

Team Updates

Team Update 16 is the final Team Update of the season! Congratulations to all of the teams, volunteers, mentors, and coaches for a terrific INTO THE DEEP season!

Q&A Closed

The team Q&A system is now closed for the season.

Drivers' Meeting Questions

With the closing of the Team Q&A system, we would like to provide teams that are competing at the *FIRST* Championship an opportunity to submit questions which will be addressed at the Drivers' Meeting in Houston, Texas.

Competing teams may submit questions by emailing ftcteams@firstinspires.org with the subject title "*FIRST* Championship – Drivers' Meeting". Questions will be accepted via email until Thursday, April 10th.

Once on site in Houston, teams may submit questions directly to the pit administration desk located in the pit area in Hall A3. We will accept team questions on site at *FIRST* Championship until 12:00pm on Wednesday, April 16th.

Competition Manual

N/A

Team Update 15

General

FIRST Championship

For the 2025 *FIRST* Championship, additional SAMPLES will be added to the INTO THE DEEP game. Given the elevated level of gameplay we've seen at Regional Championship Tournaments, we feel this change will and allow teams competing in the *FIRST* Championship additional scoring opportunities.

Team Updates

Team Update 16 will be the last Team Update of the season and is scheduled for Thursday, April 3rd, 2025.

Q&A Closing

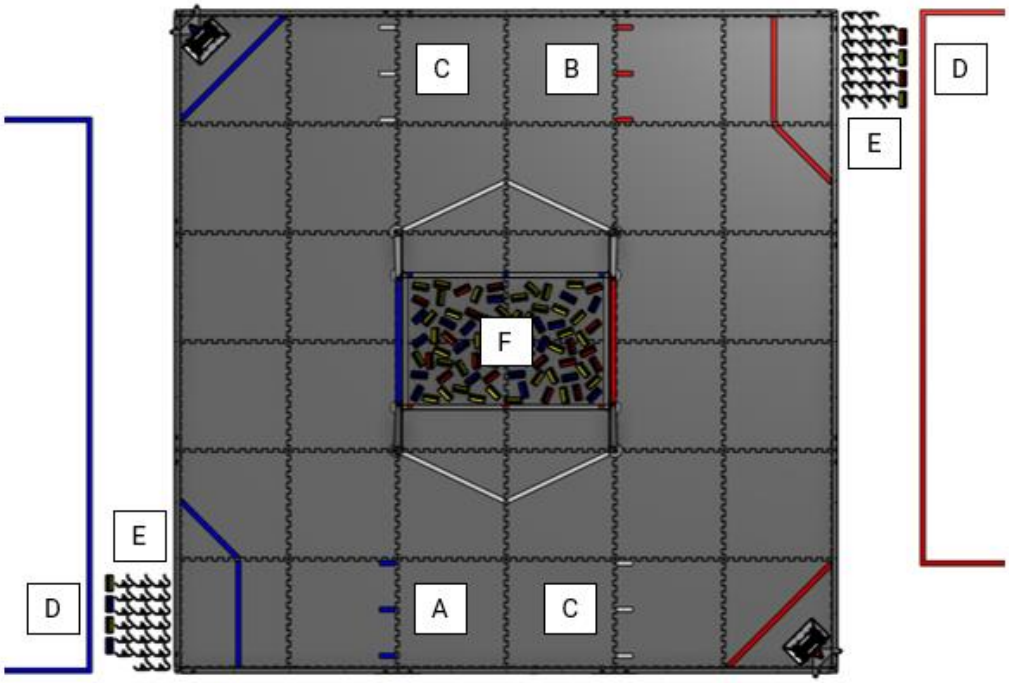
The team Q&A system will close on Thursday, April 3rd at 12:00pm eastern.

Competition Manual

Section 10.3.1 SCORING ELEMENTS

Before each MATCH begins, FIELD STAFF stage SCORING ELEMENTS according to Figure 0-1.

Figure 0-1: SCORING ELEMENTS staging positions



80 SAMPLES* (20 red, 20 blue, and 40 neutral) and 40 CLIPS that are staged as follows:

A. Blue ALLIANCE SAMPLES – 3 blue SAMPLES are placed on each of the 3 SPIKE MARKS on TILE B1
B. Red ALLIANCE SAMPLES – 3 red SAMPLES are placed on each of the 3 SPIKE MARKS on TILE E6
C. Neutral SAMPLES – 3 neutral SAMPLES are placed on each of the 3 SPIKE MARKS on TILES B6 and E1
D. 2 neutral SAMPLES and 2 corresponding ALLIANCE SPECIFIC SAMPLES are placed on the floor outside the FIELD wall between the ALLIANCE AREA and the wall
E. 20 CLIPS are placed on the floor outside the FIELD wall between the ALLIANCE AREA and the wall
F. SAMPLES inside the SUBMERSIBLE ZONE – 15 red SAMPLES, 15 blue SAMPLES, and 30 neutral SAMPLES are randomly placed inside the SUBMERSIBLE

From the SCORING ELEMENTS provided in D and E each ROBOT may be pre-loaded with either 1 SAMPLE or one SPECIMEN such that it is in contact with the ROBOT and not in the OBSERVATION ZONE or NET ZONE. SAMPLES or CLIPS not pre-loaded will remain in setup locations D and E.

*For SCORING ELEMENT quantities and placement at the *FIRST* Championship, please reference section 15.2 Game Modification.

Section 15.2 Game Modification

The number, type, and distribution of SCORING ELEMENTS may be adjusted for the *FIRST* Championship INTO THE DEEP tournament. Any game modifications will be published in or before the last regularly scheduled Team Update as described in section 1.9 Team Updates.

At the 2025 *FIRST* Championship, the following modifications will be made to the INTO THE DEEP game:

- 5 additional red SAMPLES (25 total)
- 5 additional blue SAMPLES (25 total)

The 10 additional SAMPLES will be added to the SUBMERSIBLE ZONE during pre-match setup. No additional CLIPS will be provided. This game modification is an exception to pre-match setup described in section 10.3.1 SCORING ELEMENTS and will only apply to the *FIRST* Championship.

Team Update 14

General

A message from the GDC: No team updates this week!

Figure 17-1: GDC (Game Dog Committee)

Competition Manual

n/a

Team Update 13

General

The Field Compliance Checklist is a new resource that will help ensure a consistent playing field for teams by enabling field staff to confirm that the most critical dimensions and measurements of the INTO THE DEEP Arena comply with minimum tolerance requirements. The tool serves as a quick guided check through tape line locations and measurements, basket heights, AprilTag locations, and submersible structure heights.

All events are expected to meet the minimum compliance requirements. The checklist must be completed once for a single day event, prior to the start of qualification matches. For multi-day events, the checklist must be completed prior to the start of the qualification matches for each day of the multi-day event.

The Field Supervisor is responsible for working with the teams to ensure the field is in the best condition possible for each match played and this new tool will help them validate that the field is within the proper specs. For events that do not staff a Field Supervisor, the checklist is the responsibility of the Head Referee.

This new tool serves as a way for all events to standardize arena element setup and to ensure that teams have a consistent and expected experience at any event they attend.

Competition Manual

Section 9 ARENA

The ARENA is modular and is assembled, used, disassembled, and transported many times during the competition season. It undergoes wear and tear. The ARENA is designed to withstand rigorous play and frequent reassembly. Every effort is made to ensure that ARENAS are consistent from event to event. However, ARENAS are assembled in different venues by different event staff and some small variations occur. For details regarding assembly tolerances, please refer to the ~~ARENA Layout and Marking Diagram~~ Field Compliance Checklist. Successful teams will design ROBOTS that are insensitive to these variations.

Illustrations included in this section are for a general visual understanding of the INTO THE DEEP ARENA, and dimensions included in the manual are nominal. Please refer to the official drawings for exact dimensions~~,~~ ~~tolerances~~, and construction details. The official drawings, CAD models, and drawings for low-cost versions of important elements of the INTO THE DEEP FIELD are posted on the Game and Season page on the *FIRST* website.

Section 11.4.3 SCORING ELEMENT

G408 ***Keep SCORING ELEMENTS in bounds.** A ROBOT may not intentionally eject a SCORING ELEMENT from the FIELD (either directly or by bouncing off a FIELD element or another ROBOT). SCORING ELEMENTS that leave the FIELD are not returned to gameplay except as allowed in rule G431.

Violation: MAJOR FOUL per SCORING ELEMENT.

Examples of SCORING ELEMENTS that leave the FIELD that are not considered intentional removal:

A. SCORING ELEMENTS removed from the FIELD while attempting to score ~~are not a violation of this rule, however, are not returned to the FIELD.~~
B. SCORING ELEMENTS that are removed/dropped by a ROBOT while attempting to collect them from the OBSERVATION ZONE

SCORING ELEMENTS that leave the FIELD are not returned by FIELD STAFF. The DRIVE TEAM may retrieve SCORING ELEMENTS outside of the FIELD and place them back into play via the HUMAN PLAYER as long as no other rules are violated.

Intentional ejection of SCORING ELEMENTS will be determined by the Head REFEREE. If an action is repeated throughout the MATCH, it is likely that a REFEREE may perceive this as intentional.

Section 12.5 Motors and Actuators

- Rule R501 orange box update:

Many legal gearmotors are sold with labeling based on the entire assembly. These motors may be used with or without the provided gearbox, and/or with any other compatible gearbox.

R504 ***Do not modify actuators unless explicitly allowed.** The integral mechanical and electrical system of any motor or servo must not be modified. Motors and servos used on the ROBOT shall not be modified in any way, except as follows:

E. the mounting brackets and/or output shaft/interface (including pinion gears) may be modified to facilitate the physical connection of the motor to the ROBOT and actuated part,
F. the electrical leads may be trimmed to length as necessary and connectors or splices to additional wiring may be added (per R503), and purely electrical enclosures can be substituted with functionally equivalent replacements,
G. servos may be modified as specified by the manufacturer (e.g., re-programming or modification for continuous rotation),
H. minimal labeling may be applied to indicate device purpose, connectivity, functional performance, etc. as long as the team applied label does not obstruct the markings used to identify the device,
I. insulation may be applied to electrical terminals,
J. repairs, provided the original performance and specifications are unchanged, and
K. maintenance recommended by the manufacturer.

Section 12.6 Power Distribution

R613 ***No high voltage allowed except for LEDs.** Any active electrical item that is not an actuator (specified in R501) or power regulation device (specified in R505) is considered a CUSTOM CIRCUIT. CUSTOM CIRCUITS shall not provide regulated output voltages exceeding 5V, except if solely used for powering LEDs, but may pass through unregulated battery voltage.

R619 ***Do not mix and match power on or between power regulation devices.** The following rules must be adhered to when using power on any power regulation device (per R505):

A. other than power used to energize the power regulation device (per R614) no power originating outside the power regulation device may be used on or with devices connected to the power regulation device. The only exceptions are connections intended for communication between devices (RS485/USB/PWM/etc.).

> Example 1: The +5V port on a REV Expansion Hub cannot be used to power devices connected to a REV Control Hub's I2C ports.
>
> Example 2: A regulated 5V output provided by a CUSTOM CIRCUIT cannot be used to power an I2C device connected to a REV Control Hub.

B. power originating from ports/connectors on power regulation devices may only be used for devices directly connected to that port/connector. The only exception to this is +5V power from the +5V power port on the REV Control Hub or REV Expansion Hub may be used in conjunction with any Analog, Digital, or I2C port on that device. In addition, the +5V power port may be used to power external devices.

> Example 1: The power provided by Digital Port 0-1 on a REV Control Hub should not be used to power devices connected to I2C Port 0. However, power provided by Digital Port 0-1 can be used to power devices connected to both signal channels N and N+1 on Digital Port 0-1.
>
> Example 2: The +5V power can be used to power external devices such as externally powered USB hubs (per **Error! Reference source not found.**).
>
> Example 3: The power provided by multiple servo ports cannot be combined into a single power bus for one or more servos.

C. 6V power provided by the REV Servo Power Module, REV Robotics Servo Hub, or Studica Servo Power Block may only be used for powering servos.

> 6V power provided by the REV Servo Power Module, REV Robotics Servo Hub, or Studica Servo Power Block may only be used for powering servos.

Team Update 12

General

N/A

Competition Manual

Section 6.1 Team Judges Awards Overview and Schedule

A101 ***Team PORTFOLIOS have limits.** Teams have the opportunity to submit a team PORTFOLIO to be used as part of the judging process. No other printed or digital content not directly included in this document will be collected by the JUDGES to consider during deliberations. PORTFOLIOS must meet the following requirements:

A. ……
B. ……
C. ……
D. ……
E. ……
F. ……

None of the content of the cover page will be used by JUDGES to evaluate any awards criteria. Any content beyond the allowed 15 pages will not be reviewed by the JUDGES.

The JUDGES use the cover page to identify the team associated with the PORTFOLIO. Teams who forget to include a cover page may be disqualified from judging if the JUDGES cannot determine what team the PORTFOLIO is associated with.

Font minimums are used to help ensure minimum readability. Teams should carefully consider font size, color, and graphic design when making their PORTFOLIO so that all JUDGES are able to read their submission. Teams whose design choices include small fonts or low contrast text on images will not be excluded from consideration but understand that JUDGES will not be able to use anything they cannot read.

JUDGES will not open, view, or use any included links to other documents, websites, or videos referenced to linked to from the PORTFOLIO. JUDGES may read additional information during pit interviews but will not bring back additional printed content to be referenced as part of the JUDGE deliberations.

Teams may use writing and research aids including Artificial Intelligence (AI) to help them compose their PORTFOLIOS. If AI or other resources are used, they must be credited via footnote or endnote.

The PORTFOLIO captures a team's progression through the current *FIRST* Tech Challenge season. A team may include anything in their PORTFOLIO which took

place after their final official event of the previous season. Off-season events are not a part of the official *FIRST* Tech Challenge event calendar may be included as part of the team's current season. A team may reference previous seasons (for example, in a team or organizational plan) to demonstrate growth, but the emphasis must be on the current season.

Section 9.10 Event Management System

Table 9-1 Audio cues

Event	Timer Value	Audio Cue
MATCH start	2:30	"Cavalry Charge"
AUTO ends	2:00	"Buzzer x 3"
AUTO to TELEOP Transition	0:07 to→ 0:01	"Drivers, pick up your controllers, 3-2-1"
TELEOP begins	2:00	"3 Bells"
Final 30 seconds	0:30	"Train Whistle"
MATCH end	0:00	"3-second Buzzer"
MATCH stopped	N/A	"Foghorn"

Section 11.2 Conduct

G210 ***Do not expect to gain by doing others harm.** Actions clearly aimed at forcing the opponent ALLIANCE to violate a rule are not in the spirit of *FIRST* Tech Challenge and not allowed. Rule violations forced in this manner will not result in an assignment of a penalty to the targeted ALLIANCE.

Violation: MINOR FOUL plus MAJOR FOUL if REPEATED. The ALLIANCE that was forced to break a rule will not incur a FOUL.

This rule does not apply for strategies consistent with standard gameplay, for example:

A. a red ALLIANCE ROBOT ASCENDING in their ASCENT ZONE in the final 30 seconds of the MATCH contacts a blue ALLIANCE ROBOT
B. a red ROBOT attempts to enter their NET ZONE to place a SPECIMEN and pushes a blue ROBOT that was less than 1 TILE away into the NET ZONE.

This rule requires an intentional act with limited or no opportunity for the team being acted on to avoid the penalty, such as:

A. trapping an opposing ALLIANCE ROBOT in your ALLIANCE'S ASCENT ZONE during the last 30 seconds of the MATCH.
B. pushing an opposing ALLIANCE ROBOT into your ALLIANCE'S OBSERVATION ZONE intentionally or from more than 1 TILE away.
C. placing your ALLIANCE SPECIFIC SAMPLE or SPECIMEN in an opposing ALLIANCE'S ROBOT.

D. a ROBOT becomes pinned in their opposing ALLIANCE'S OBSERVATION ZONE by the opposing ALLIANCE ROBOT

Section 11.3 Pre-MATCH

G301 ***Be prompt.** A DRIVE TEAM member may not cause significant delays to the start of their MATCH. Causing a significant delay requires both of the following to be true:

G. The expected MATCH start time has passed, and

During Qualification MATCHES, the expected start time of the MATCH is the time indicated on the MATCH schedule or ~3 minutes from the end of the previous MATCH on the same FIELD, whichever is later. If T206 is in effect, the expected MATCH start time is the later of the end of the T206 time or the time indicated on the schedule.

During playoff MATCHES, the expected start time of the MATCH is the time indicated on the MATCH schedule or 8 minutes from either ALLIANCE'S previous MATCH, whichever is later.

H. The DRIVE TEAM has access to the ARENA and is neither MATCH ready nor making a good faith effort, as perceived by the Head REFEREE, to quickly become MATCH ready.

Teams that have violated G207 or have 1 DRIVE TEAM member present and have informed event staff that their ROBOT will not be participating in the MATCH are considered MATCH ready and not in violation of this rule.

Violation: If a Qualification MATCH, ~~V~~verbal warning plus a MAJOR FOUL if subsequent violations occur within the tournament phase ~~(e.g., qualifications or playoffs)~~, and is applied to their upcoming MATCH. If the DRIVE TEAM is not MATCH ready within 2 minutes of the verbal warning/MAJOR FOUL and the Head REFEREE perceives no good faith effort by the DRIVE TEAM to quickly become MATCH ready, DISABLED. If a playoff MATCH, a verbal warning is issued to the ALLIANCE. For subsequent violations within the tournament phase, a MAJOR FOUL applied to the ALLIANCE'S upcoming MATCH. If the ALLIANCE is not MATCH ready within 2 minutes of the verbal warning/MAJOR FOUL having been issued, and the Head REFEREE perceives no good faith effort by the DRIVE TEAM(s) to quickly become MATCH ready, the offending team's ROBOT is DISABLED.

Section 12.6 Power Distribution

R617 ***Use specified wire colors.** All non-SIGNAL LEVEL wiring with a constant polarity (i.e., except for outputs of motor controllers, or sensors) must use ~~consistent~~ standard color-coding with different colors used for the positive (red, yellow, white, brown, or black with white stripe) and negative/common (black, blue) wires. Integrated wires originally attached to legal COTS devices or wires included/sold by the manufacturer are considered part of the device and by default legal. Such wires are exempt from this rule.

Team Update 11

General

N/A

Competition Manual

12.6 Power Distribution

R601 ***Battery limit – everyone has the same main ROBOT power.**

Table 12-1: Legal ROBOT Main Power Battery Packs

Battery Pack	Part Number	Notes
Matrix 12V 3000mAh NiMH	14-0014	May be labeled as "Modern Robotics"

R611 ***The ROBOT frame is not a wire.** All wiring and electrical devices shall be electrically isolated from the ROBOT frame. The ROBOT frame must not be used to carry electrical current. Electrically grounding the control system electronics to the frame of the ROBOT is only permitted such that all of the following conditions are met:

A. straps/cables used must ~~use one of~~ be from the following approved parts:

Table 12-2: Legal ROBOT Grounding Straps

Grounding Strap	Part Number
AndyMark Resistive Grounding Strap	am-4648a
REV Resistive Grounding Strap	REV-31-1269
Swyft Grounding Cable	SR-Ground-01

Team Update 10

General

A note to the Community about G427 changes

Rule G427 was originally written to clearly and unequivocally protect robots while they are ASCENDING (climbing), however due to the tight nature of the SUBMERSIBLE ZONE and the limited space for teams to collect SAMPLES and score SPECIMENS we have heard from many teams and volunteers (and seen ourselves) that this rule is not working as intended. Because of this, we are modifying the wording of G427 and adding an additional exception.

For the original G427, many teams who were genuinely just trying to continue to collect SAMPLES and score SPECIMENS and were not interfering with ASCENDING robots were penalized due to incidental contact, and we realized and were uncomfortable with the potential to attempt to gain benefit from forcing opponents to violate G427 which forces referees into the less comfortable, and less predictable, situation of having to rule on robot intent in regards to potential G210 violation.

The addition of exception ‘B’ to G427 is intended to further define a condition where we believe a robot is unlikely to be attempting to ASCEND and therefore does not need G427 protections. This exception will allow robots which wish to continue to collect SAMPLES and score SPECIMENS to continue doing those things in the last 30 seconds with lower risk of accidentally incurring G427 penalties, devalue strategies aimed at attempting to force a G427 violation, and reduce the number of subjective calls our referees are asked to make.

We know this change will not resolve all issues caused by the tight field layout, and there is no perfect fix, but we hope this change and this transparency behind the intent of the change will help teams and volunteers understand both what changed and why.

Competition Manual

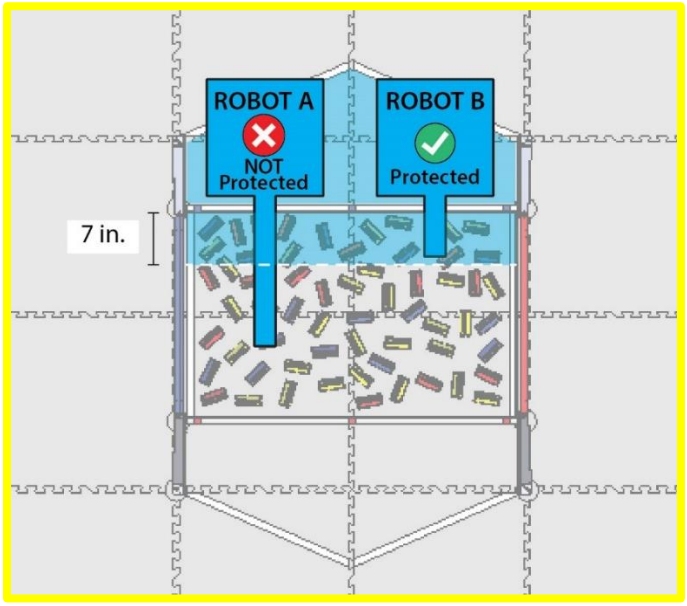
Section 11.4.5 ROBOT Interaction

G427 **Climbing ROBOTS are protected.** In the last 30 seconds of the MATCH, a ROBOT may not contact (either directly or transitively through a SCORING ELEMENT CONTROLLED by either ROBOT and regardless of who initiates contact) an opponent ROBOT if any part of either ROBOT is in the opponent's ASCENT ZONE. Exceptions to this rule are as follows:

A. Contact occurring while both ROBOTS have ~~achieved~~ met the scoring requirements to achieve LEVEL 2 or LEVEL 3 ASCENT.
B. Contact occurring with an opponent ROBOT who is extending more than approximately 7 inches (i.e. roughly the length of two SAMPLES) into the SUBMERSIBLE ZONE as measured from the barrier.

Violation: MAJOR FOUL plus the affected ALLIANCE ROBOT is awarded a LEVEL 3 ASCENT.

Figure 11-1 Protected and not protected ROBOTS



The intent of exception A is that teams should be aware that the SUBMERSIBLE ZONE is a constrained space and ROBOTS swinging during their ASCENT may contact each other and teams should design their ROBOTS to be resilient to incidental contact.

The intent of exception B is to allow minor extensions into the SUBMERSIBLE ZONE while attempting to ASCEND while also allowing incidental contact between longer mechanisms.

Figure 11-2 Examples of contact resulting in no violation to either ROBOT

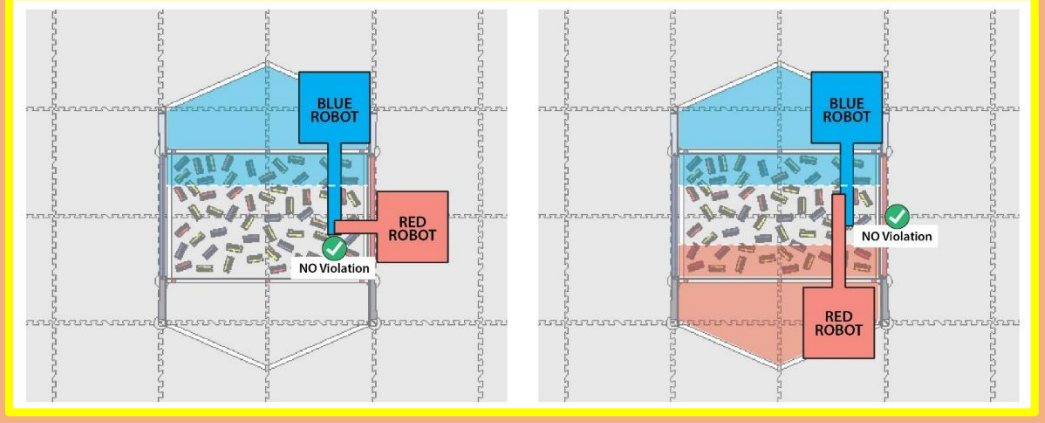
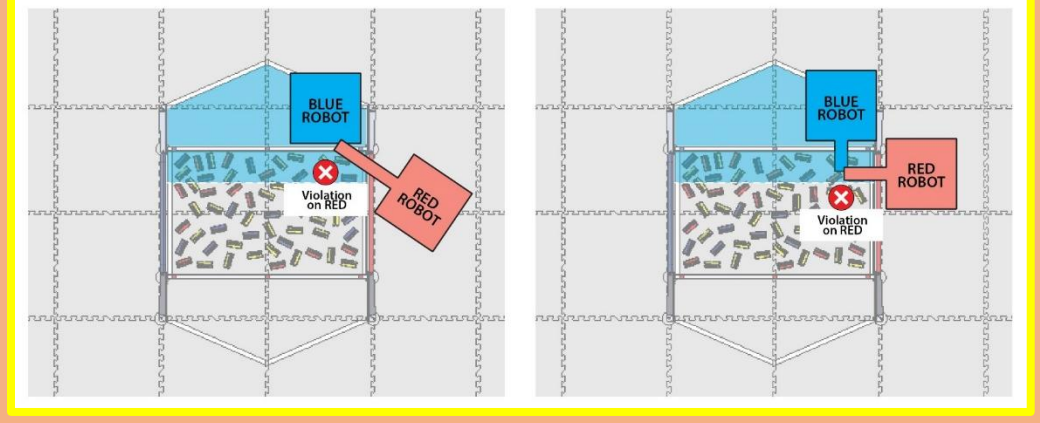


Figure 11-3 Examples of contact resulting in violations to offending ROBOT



ROBOTS that are attempting to play defense within the SUBMERSIBLE ZONE or the ASCENT ZONES during the last 30 seconds of the MATCH are likely to incur penalties.

Team Update 09

General

Competition Manual

Section 11.3 – Pre-MATCH

G303 ***ROBOTS on the FIELD must be set up to play a MATCH.** A ROBOT must meet all following MATCH-start requirements:

A. does not pose a hazard to humans, FIELD elements, or other ROBOTS.
B. has passed inspection, i.e., it is compliant with all ROBOT rules.
C. if modified after initial Inspection, it is compliant with I304.
D. is the only team-provided item left on the FIELD.
E. is fully contained within the FIELD and not in the NET ZONE or OBSERVATION ZONE.
F. touching the FIELD wall adjacent to the ALLIANCE AREA.
G. not attached to, entangled with, or suspended from any FIELD element.
H. confined to its STARTING CONFIGURATION (see R101 and R102).
I. in contact with no more than the allowed pre-load possession limit as described in section 10.3.1 SCORING ELEMENTS.
J. ROBOT SIGNS must indicate the correct ALLIANCE color (see R101).
K. ROBOT must be motionless following completion of OpMode initialization.

Section 12.7 – Control, Command & Signals System

R712 ***Only specified modifications to core control system devices permitted.** The DRIVER STATION device and software, Android-based ROBOT CONTROLLER device, main and secondary power switch(es), power regulation devices, fuses, and batteries shall not be tampered with, modified, or adjusted in any way (tampering includes drilling, cutting, machining, rewiring, disassembling, painting, removing enclosures and replacing with custom enclosures, etc.), with the following exceptions:

A. wires, cables, and signal lines may be connected via the standard connection points provided on the devices,
B. fasteners (including adhesives) may be used to attach devices to the OPERATOR CONSOLE or ROBOT or to secure cables to the device,
C. thermal interface material may be used to improve heat conduction,
D. labeling may be applied to indicate device identification, purpose, connectivity, functional performance, etc. as long as they do not cover labels or markings used to identify the product,
E. jumpers may be changed from their default location,
F. jumpers or switches may be moved to configure devices per the manufacturer's manual,
G. device firmware may be updated with manufacturer supplied firmware,
H. integral wires on motor controllers and batteries may be cut, stripped, and/or connectorized,
I. devices may be repaired, provided the performance and specifications of the device after the repair are identical to those before the repair,
J. add insulating material to exposed conductors, ~~and~~

K. tape may be applied for debris protection, and
L. Power switch mounting brackets can be modified or replaced

Team Update 08

General

Section 13.6.2 – 13.6.6

Typical timing brackets are examples of how interweaving awards and finals matches may be timed but will depend on the number of teams competing, the number of awards given, and the number of fields being used at the event. The scoring system will adjust to the number of fields configured at the event and will provide minimum timing guidance for field staff based on applicable Competition Manual rules. Events running on a single field will typically run slower than those running on multiple fields so actual cycle time will vary from the typical timing provided.

Section 11 – Rule Violation Updates

Throughout Section 11, many rule violations have had minor formatting changes, such as adding or removing punctuation. Other rule violations within section 11 have been edited for further clarity to assist teams and referees with a better understanding of the escalation of the violation. Violation changes that would impact team and referee understanding are outlined in a table in Section 11 – Game Rules

Competition Manual

Section 5.3 Wireless Communication

E302 ***Don't interfere with wireless networks.** Participants may not interfere, attempt to interfere, or attempt to connect with any other team or *FIRST* wireless network without expressed permission.

> Teams are encouraged to report suspected wireless security vulnerabilities to the *FIRST* Technical Advisor (FTA) or Event Director if at the event or to *FIRST* via ftctech@firstinspires.org to report a suspected issue after the event.

Violation: Verbal warning, plus subsequent and/or egregious violations may lead to dismissal from the event and/or legal action based on applicable laws.

Section 10.2 DRIVE TEAM

Table 10-1: DRIVE TEAM roles

Role	Description	Max./ DRIVE TEAM	Criteria
DRIVE COACH	a guide or advisor	1	any team member and may be an adult, must wear "DRIVE COACH" badge
DRIVER	an operator and controller of the ROBOT	2	STUDENT, must wear a "DRIVER" badge

Role	Description	Max./ DRIVE TEAM	Criteria
HUMAN PLAYER	a SCORING ELEMENT manager	1*	STUDENT, must wear a “HUMAN PLAYER” badge

*Only one HUMAN PLAYER will represent an ALLIANCE in a MATCH. If an ALLIANCE cannot agree on which team's HUMAN PLAYER will participate in a MATCH, The HUMAN PLAYER from the team listed as "Red 1" or "Blue 1" in the MATCH schedule will be used

Section 11 – Game Rules

The following rule violations have been updated for further clarity.

Rule Number	Violation Changes
G101	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G102	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G201	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event. Further violations of this rule are addressed in rule G211.*
G202	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G203	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G204	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G205	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G206	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G208	*Violation: Verbal warning~~,~~ plus RED CARD if not corrected.*
G301	*Violation: Verbal warning~~, or~~ plus a MAJOR FOUL if ~~a~~ subsequent violations occur within the tournament phase (e.g., qualifications or playoffs), ~~MAJOR FOUL~~ and is applied to their upcoming MATCH. If the DRIVE TEAM is not MATCH ready within 2 minutes of the verbal*

	warning/MAJOR FOUL and the Head REFEREE perceives no good faith effort by the DRIVE TEAM to quickly become MATCH ready, DISABLED.
G402	*Violation: MAJOR FOUL~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G403	*Violation: MINOR FOUL~~,~~ or MAJOR FOUL if actions result in a scoring achievement by the offending ROBOT.*
G405	*Violation: MAJOR FOUL~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G406	*Violation: MINOR FOUL~~,~~ or MAJOR FOUL if actions result in a scoring achievement by the offending ROBOT.*
G415	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur during the event.*
G419	*Violation: MINOR FOUL per occurrence plus YELLOW CARD if the ROBOT contacts the HUMAN PLAYER.*
G426	*Violation: MINOR FOUL~~,~~ plus MINOR FOUL for every 5 seconds the violation continues. Additional MINOR FOUL for every SCORING ELEMENT contacted inside the OBSERVATION ZONE.*
G428	*Violation: Verbal warning~~,~~ plus a MINOR FOUL if subsequent violations ~~receive a MINOR FOUL per occurrence~~ occur at any point during the event.*
G430	*Violation: MAJOR FOUL per occurrence~~,~~ plus YELLOW CARD if the DRIVE TEAM member contacts the ROBOT.*
G431	*Violation: MINOR FOUL per occurrence~~,~~ plus YELLOW CARD if the HUMAN PLAYER contacts the ROBOT.*
G432	*Violation: MINOR FOUL per occurrence~~,~~ plus YELLOW CARD if the HUMAN PLAYER contacts the ROBOT*
G501	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur at any point during the event.*
G502	*Violation: Verbal warning~~,~~ plus YELLOW CARD if subsequent violations occur at any point during the event.*

Team Update 07

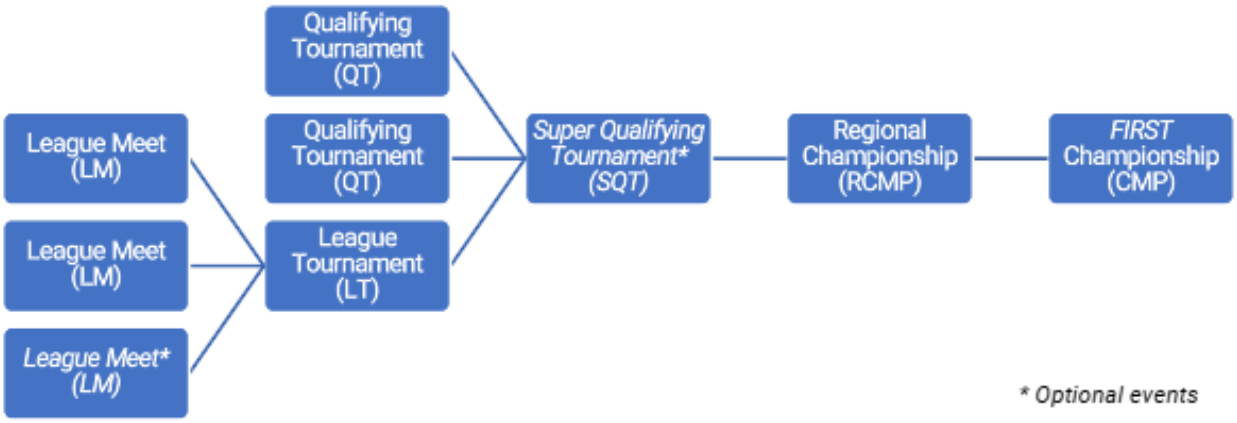
General

Competition Manual

Section 4 – Advancement

Corrected typo in Figure 4-2.

Figure 4-2: Tournament advancement structure



Section 11.2 Conduct

G209 ***Keep your ROBOT together.** A ROBOT may not intentionally detach or leave a part on the FIELD. ~~Tethered elements of the ROBOT are considered detached if either can move independently of the other~~.

Violation: RED CARD.

Section 11.3 Pre-MATCH

G302 ***You can only bring/use specific items to the MATCH.** The only equipment that may be brought to the ARENA for a MATCH is listed below. Regardless of if equipment fits criteria below, it may not be employed in a way that breaks any other rules, introduces a safety hazard, blocks visibility for FIELD STAFF or audience members, or jams or interferes with the remote sensing capabilities of another team or the FIELD.

A. the ROBOT
B. the OPERATOR CONSOLE
C. ROBOT carts (which may contain basic tools and supplies to maintain the ROBOT)
D. non-powered signaling devices
E. reasonable decorative items
F. special clothing and/or equipment required due to a disability
G. devices (e.g., laptop, tablet, phone, camera, etc.) used solely for planning, tracking, recording, and communicating strategy within the same designated area (e.g., ALLIANCE AREA)
H. ~~devices used solely to record gameplay~~ this letter intentionally left blank

I. non-powered Personal Protective Equipment (examples include, but aren't limited to, gloves, eye protection, and hearing protection)

Section 11.4.4 ROBOT

G417 **Stay in CONTROL of your SCORING ELEMENTS.** SCORING ELEMENTS may not be LAUNCHED.

Violation: MINOR FOUL per SCORING ELEMENT LAUNCHED.

This rule is intended to prevent designs which use LAUNCHING to strategically play the game. Actions that can be perceived as strategically playing the game include, but are not limited to:

A. Moving SCORING ELEMENTS from the ROBOT from outside of an AREA or ZONE to inside another AREA or ZONE with significant force/traveling more than a short distance.

This is not intended to penalize teams with active manipulators which are expelling SCORING ELEMENTS through normal operation, such as:

A. Running an intake in reverse causing a SCORING ELEMENT to travel a short distance from the ROBOT.

B. A ROBOT pushing a SCORING ELEMENT a short distance away in the process of herding it across the FIELD.

Section 11.4.6

G431 **HUMAN PLAYERS manipulate SCORING ELEMENTS within limits.** Only the HUMAN PLAYER may introduce SCORING ELEMENTS into or retrieve SCORING ELEMENTS from the OBSERVATION ZONE.

A. any number of SCORING ELEMENTS can be manipulated by the HUMAN PLAYER at a time.
B. SCORING ELEMENTS may be placed in any orientation and/or in contact with other SCORING ELEMENTS.
C. HUMAN PLAYERS may only place and/or retrieve SCORING ELEMENTS into the OBSERVATION ZONE during the AUTO and TELEOP periods of the MATCH.
D. HUMAN PLAYERS may not be in contact with a SCORING ELEMENT, either directly or transitively, that is possessed/controlled by a ROBOT.
E. HUMAN PLAYERS may reintroduce SCORING ELEMENTS to the OBSERVATION ZONE that have left the FIELD as a result of a ROBOT attempting to collect it from the OBSERVATION ZONE or FIELD wall within the OBSERVATION ZONE, as long as no other rules are violated (e.g. rule G428).
F. HUMAN PLAYERS may manipulate opposing ALLIANCE SCORING ELEMENTS that have been placed into their ALLIANCE'S OBSERVATION ZONE. The opposing ALLIANCE SCORING ELEMENTS may not be removed from the OBSERVATION ZONE, but may be moved within the OBSERVATION ZONE.

G432 **Watch out for ROBOTS.** A HUMAN PLAYER cannot break the vertical plane of the FIELD wall when a ROBOT is in the OBSERVATION ZONE. The only exceptions are:

A. The ROBOT in the OBSERVATION ZONE has been declared DISABLED by a REFEREE.

Violation: MINOR FOUL per occurrence. YELLOW CARD if the HUMAN PLAYER contacts the ROBOT.

G419, G431, and G432 do not stack. One FOUL should be called per occurrence of the violation per ALLIANCE. For example, two FOULS would be called in the case where the ROBOT and HUMAN PLAYER are on separate ALLIANCES.

ROBOT parts that have become detached from a ROBOT may be retrieved by a HUMAN PLAYER and removed from the FIELD.

Section 12.1 General ROBOT Design

- Rule R104 orange box update:

This rule is intended to limit the amount of floor area each ROBOT can cover with the maximum range of motion of all extensions; ~~(~~extensions may be software or hardware limited~~)~~. All possible movement of extensions outside the STARTING CONFIGURATION must be constrained within the horizontal size boundary.

Teams should be prepared to show compliance with this rule and demonstrate their ROBOT expansions during the inspection process. During inspection each ROBOT will be placed completely within a 20 in. x 42 in. taped box, with the position and orientation within the box chosen by the team. While keeping the ROBOT chassis stationary, the ROBOT must demonstrate that the full range of motion of all extensions outside of STARTING CONFIGURATION remain contained within the fixed 20 in. x 42 in. working area. This inspection verifies the ROBOT'S normal operating range, including software limits, as it would function during a typical MATCH. Additional software within the OpMode designed for emergency overrides, troubleshooting, or maintenance is acceptable and will not be evaluated as part of this compliance check.

Section 12.3 Fabrication

R307 ***COTS must be single DoF.** COTS COMPONENTS and MECHANISMS must not exceed a single degree of mechanical freedom (DoF). Examples of allowed COTS single degree of freedom MECHANISMS and COMPONENTS are as follows:

A. linear slide kit,
B. linear actuator kit,
C. single speed (non-shifting) gearboxes,
D. pulley,
E. turntable,
F. lead screw, and
G. single DoF gripper.

Allowed exceptions to this rule are:

H. ratcheting devices (wrenches, bearings, etc.),
I. holonomic wheels (omni or mecanum),
J. dead-wheel odometry kits, ~~and~~
K. universal joints

Section 13.6 Playoff MATCHES

T603 ***There are no ~~BACKUP TEAMS~~ backup teams in playoff MATCHES.** An ALLIANCE may not request a ~~BACKUP TEAM~~ backup team in a playoff MATCH.

> Teams are encouraged to consider reliability when selecting partners because all teams on an ALLIANCE must play in each round of the playoff tournament.

Section 13.6.3 2-ALLIANCE Bracket and Typical Timing

Table13-3: 2-ALLIANCE playoff bracket typical timing

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	**MATCH**	**Upper/ Lower**	**FIELD**	**Blue**	**Red**	**Blue**	**Red**	**Winner**	**Loser**	**Estimated Start (min)**
15-minute break			Judges' Choice* (1), Innovate/Design/Control Award (1)							0
Finals	1		1	A2	A1			M2	M2	15
15-minute break			Motivate/Connect Award (1)							18
Finals	2		1	A2	A1	0:15	0:15	M3*	M3*	33
10-minute break			Think Award (1)							36
Finals	3*		1	A2	A1	0:10	0:10			46
Awards: Compass*, Finalists, Winners, and Inspire Award (1)										49

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

Section 13.6.4 4-ALLIANCE Bracket and Typical Timing

Table13-4: 4-ALLIANCE playoff typical timing

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	**MATCH**	**Upper/ Lower**	**FIELD**	**Blue**	**Red**	**Blue**	**Red**	**Winner**	**Loser**	**Estimated Start (min)**
1	1	Upper	1	A4	A1			M4 (R)	M3 (R)	0
	2	Upper	~~2~~ 1	A3	A2			M4 (B)	M3 (B)	6
8-minute break										9
2	3	Lower	1	L2	L1	0:08	0:14	M5 (B)	4th	17
	4	Upper	~~2~~ 1	W2	W1	0:14	0:20	M6 (R)	M5 (R)	23
15-minute break			Judges' Choice* (1), Design Award (1), Motivate Award (1)							26
3	5	Lower	1	W3	L4	0:21	0:15	M6 (B)	3rd	41
15-minute break			Control Award (1), Innovate Award (1)							44
Finals	6		1	W5	W4	0:15	0:33	M7*	M7*	59
15-minute break			Connect Award (1), Think Award (1)							62
Finals	7*		1	W5	W4	0:15	0:15			77
Awards: Compass*, Finalists, Winners, and Inspire Award (2, 1)										80

*If Required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

Section 13.6.5 6-ALLIANCE Bracket and Typical Timing

Table13-5: 6-ALLIANCE playoff bracket typical timing

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	**MATCH**	**Upper/ Lower**	**FIELD**	**Blue**	**Red**	**Blue**	**Red**	**Winner**	**Loser**	**Estimated Start (min)**
1	1	Upper	1	A5	A4			M3 (B)	M6 (B)	0
	2	Upper	2	A6	A3			M4 (B)	M5 (B)	6
2	3	Upper	1	W1	A1	0:09		M7 (R)	M5 (R)	12
	4	Upper	2	W2	A2	0:09		M7 (B)	M6 (R)	18
3	5	Lower	1	L2	L3	0:15	0:09	M8 (B)	Tied 5th	24
	6	Lower	2	L1	L4	0:27	0:09	M8 (R)		30
4	7	Upper	1	W4	W3	0:15	0:21	M10 (R)	M9 (R)	36
	8	Lower	2	W5	W6	0:15	0:09	M9 (B)	4th	42
15-minute break			Judges' Choice* (1), Design Award (2, 1), Motivate Award (2, 1)							45
5	9	Lower	1	W8	L7	0:15	0:21	M10 (B)	3rd	60
15-minute break			Control Award (2, 1), Innovate Award (2, 1)							63
Finals	10		1	W9	W7	0:15	0:39	M11*	M11*	78
15-minute break			Connect Award (2, 1), Think Award (2, 1)							81
Finals*	11		1	W9	W7	0:15	0:15			96
Awards: Compass*, Finalists, Winners, and Inspire Award (3, 2, 1)										99

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

Section 13.6.6 8-ALLIANCE Bracket and Typical Timing

Table13-6: 8-ALLIANCE playoff bracket typical timing

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	**MATCH**	**Upper/ Lower**	**FIELD**	**Blue**	**Red**	**Blue**	**Red**	**Winner**	**Loser**	**Estimated Start (min)**
1	1	Upper	1	A8	A1			M7 (R)	M5 (R)	0
	2	Upper	2	A5	A4			M7 (B)	M5 (B)	6
	3	Upper	1	A7	A2			M8 (R)	M6 (R)	12
	4	Upper	2	A6	A3			M8 (B)	M6 (B)	18
2	5	Lower	1	L2	L1	0:15	0:21	M10 (B)	Tied 7th	24
	6	Lower	2	L4	L3	0:09	0:15	M9 (B)		30
	7	Upper	1	W2	W1	0:27	0:33	M11 (R)	M9 (R)	36
	8	Upper	2	W4	W3	0:21	0:27	M11 (B)	M10 (R)	42

3	9	Lower	1	W6	L7	0:15	0:09	M12 (B)	Tied 5th	48
	10	Lower	2	W5	L8	0:27	0:09	M12 (R)		54
4	11	Upper	1	W8	W7	0:15	0:21	M14 (R)	M13 (R)	60
	12	Lower	2	W9	W10	0:15	0:09	M13 (B)	4th	66
15-minute break			Judges' Choice* (1), Design Award (3,2,1), Motivate Award (3,2,1)							69
5	13	Lower	1	W12	L11	0:15	0:21	M14 (B)	3rd	84
15-minute break			Control Award (3,2,1), Innovate Award (3,2,1)							87
Finals	14		1	W13	W11	0:15	0:39	M15*	M15*	102
15-minute break			Connect Award (3,2,1), Think Award (3,2,1)							105
Finals*	15		1	W13	W11	0:15	0:15			120
Awards: Compass*, Finalists, Winners, and Inspire Award (3, 2, 1)										123

* if required
**Awards may be given out after the conclusion of the playoff bracket at the discretion of the Event Director.

Team Update 06

General

Minor formatting corrections to broken links within the document.

Competition Manual

Section 6.1 Team Judges Awards Overview and Schedule

A111 ***The number of awards given scales with event size.** Total number of awards given is based on the number of teams checked in at the event. Not all awards are given at every competition. Check the Judge and Judge Advisor Manuals for exact details.

Table 0-1: Total judged awards available based on all event participating teams

Total ~~Awards~~ Event Participating Teams					
Award		4-10 Teams	11-20 Teams	21-40 Teams	41-64 Teams
Inspire Award		1st Place	1st Place 2nd Place	1st Place 2nd Place 3rd Place	1st Place 2nd Place 3rd Place
Think Award		1st Place	1st Place	1st Place 2nd Place	1st Place 2nd Place *(3rd Place*)*
TA Awards	**Connect Award**	1st Place (1 TA award will be given)	1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Motivate Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
MCI Awards	**Design Award**	1st Place (1 MCI award will be given)	1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Innovate Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*
	Control Award		1st Place	1st Place *(2nd Place*)*	1st Place 2nd Place *(3rd Place*)*

Section 10.3.1 SCORING ELEMENTS

SAMPLES should be placed on SPIKE MARKS such that they are completely covering the SPIKE MARK. Teams may adjust the placement of SAMPLES on the SPIKE MARKS in front of their DRIVE TEAM as long as the SAMPLE completely covers the SPIKE MARK and there is no delay to the start of the MATCH.

> Where there is variance in the relatiave sizing of the SAMPLES and the SPIKE MARK, a best effort should be made to completely cover the SPIKE MARK.

Section 10.3.3 OPERATOR CONSOLES

10.3.3 OPERATOR CONSOLES

Removed repeated bullet points:

DRIVE TEAMS set up their OPERATOR CONSOLES as soon as they are staged in their ALLIANCE AREA. OPERATOR CONSOLES must be compliant with all relevant rules, specifically those in section 12.9 OPERATOR CONSOLE. A DRIVE TEAM obstructing or delaying OPERATOR CONSOLE set up is at risk of violating G301.

A. DRIVE TEAMS running an AUTO OpMode during the AUTO period must select an OpMode within their DRIVER STATION app with the 30 second timer enabled.
B. DRIVE TEAMS not running an OpMode during the AUTO period must select a TELEOP OpMode within the DRIVER STATION app.
C. the OpMode must be initialized by pressing the “INIT” button on the DRIVER STATION app.
~~D. DRIVE TEAMS running an AUTO OpMode during the AUTO period must select an OpMode within their DRIVER STATION app with the 30 second timer enabled.~~
~~E. DRIVE TEAMS not running an OpMode during the AUTO period must select a TELEOP OpMode within the DRIVER STATION app.~~
~~F. the OpMode must be initialized by pressing the “INIT” button on the DRIVER STATION app.~~

Section 10.5.3 ROBOT Scoring Criteria

> A ROBOT is considered ASCENDING once it is attempting to achieve an ASCENT LEVEL, and ASCENDED once it has achieved an ASCENT LEVEL.
>
> The intent of part B of this rule is for the ROBOT to start its ASCENT outside of the SUBMERSIBLE ZONE except for elements used by the ROBOT to contact the RUNG. Once ROBOTS start their ASCENT, parts of the CHASSIS may swing into the SUBMERSIBLE ZONE, which is not a violation of this rule.
>
> ROBOTS attempting a LEVEL 3 ASCENT which then violate C. i or ii, may still be eligible for lower LEVEL ASCENT points as long as all other lower LEVEL ASCENT criteria are met at the end of the MATCH period. In this scenario, if a ROBOT would like to reattempt a LEVEL 3 ASCENT they must disengage from the ~~HIGH RUNG~~ SUBMERSIBLE and attempt their LEVEL 3 ASCENT again.
>
> ROBOTS supported by an ALLIANCE partner ROBOT, SCORING ELEMENTS, other non-RUNG elements of the SUBMERSIBLE or the FIELD floor will not be awarded an ASCENT LEVEL 2 or 3.

Section 11.1 Personal Safety

G101 ***Humans, stay off the FIELD during the MATCH.** Other than actions explicitly allowed in sections 10.3.1 SCORING ELEMENTS and 11.4.6 HUMAN a DRIVE TEAM member may only enter the FIELD during pre-MATCH set-up to place their ROBOT or after a MATCH is over to collect their ROBOT when instructed to do so by the Head REFEREE or their designee.

Violation: Verbal warning, plus YELLOW CARD if subsequent violations during the event.

Section 11.4.2 TELEOP

G405 ***ROBOTS are motionless between AUTO and TELEOP.** Any powered movement of the ROBOT or any of its MECHANISMS is not allowed during the transition period between AUTO and TELEOP.

Violation: MAJOR FOUL, plus YELLOW CARD if subsequent violations during the event.

> Movement that occurs following the conclusion of an AUTO OpMode (due to inertia, gravity, or de-energizing of actuators, etc.) is not a violation of this rule.
>
> Teams may press buttons on their DRIVER STATION app to initialize or start a TELEOP OpMode during the AUTO to TELEOP transition period. If the INIT portion of the OpMode causes the ROBOT to violate this rule (actuators moving or twitching in any way) then the team should wait until the TELEOP period begins before pressing INIT.

Section 11.4.3 SCORING ELEMENT

G408 ***Keep SCORING ELEMENTS in bounds.** A ROBOT may not intentionally eject a SCORING ELEMENT from the FIELD (either directly or by bouncing off a FIELD element or another ROBOT). SCORING ELEMENTS that leave the FIELD are not returned to gameplay except as allowed in rule G431.

Violation: MAJOR FOUL per SCORING ELEMENT.

> SCORING ELEMENTS removed from the FIELD while attempting to score are not a violation of this rule, however, are not returned to the FIELD.

G410 **SAMPLE or SPECIMEN at a time.** A ROBOT may not CONTROL more than 1 SAMPLE or 1 SPECIMEN at a time, either directly or transitively through other objects. There is no limit to the number of CLIPS a ROBOT may possess.

A ROBOT is in CONTROL of a SAMPLE or SPECIMEN if:

A. the SAMPLE or SPECIMEN is fully supported by the ROBOT or
B. it intentionally pushes a SAMPLE or SPECIMEN to a desired location or in a preferred direction (i.e., herding, often with a concave surface)

Exceptions to this rule are as follows:

C. ROBOTS may MOMENTARILY exceed CONTROL limits while collecting SAMPLES that are in the SUBMERSIBLE ZONE.
D. scored SAMPLES or SPECIMENS for the corresponding ALLIANCE are exempt from the CONTROL limit.

Violation: MINOR FOUL per ~~SCORING ELEMENT~~ additional SAMPLE and/or SPECIMEN, plus YELLOW CARD if excessive.

Section 11.4.4 ROBOT

G418 **Horizontal expansion limit.** After the MATCH has started, ROBOTS may expand beyond the STARTING CONFIGURATION but are still subject to sizing constraints~~(per~~. The sizing constraints are specified in R401~~)~~.

G419 **Watch out for Humans.** A ROBOT may not:

A. enter the OBSERVATION ZONE while a HUMAN PLAYER is in the OBSERVATION ZONE.
B. contact a SCORING ELEMENT, either directly or transitively, that is controlled/possessed by a HUMAN PLAYER.

Violation: MINOR FOUL per occurrence. YELLOW CARD if the ROBOT contacts the HUMAN PLAYER.

G419, G431, and G432 do not stack. ~~Only~~ One FOUL should be called per ~~instance~~ occurrence of the violation per ALLIANCE. For example, two FOULS would be called in the case where the ROBOT and HUMAN PLAYER are on separate ALLIANCES.

Section 11.4.5 Opponent Interaction

G425 **NET ZONE Protection.** A ROBOT may not contact (either directly or transitively through a SCORING ELEMENT CONTROLLED by either ROBOT, regardless of who initiates contact) an opponent ROBOT if any part of either ROBOT is in the opponent's NET ZONE.

Violation: MAJOR FOUL per occurrence.

Section 11.4.6 HUMAN

G431 **HUMAN PLAYERS manipulate SCORING ELEMENTS within limits.** Only the HUMAN PLAYER may introduce SCORING ELEMENTS into or retrieve SCORING ELEMENTS from the OBSERVATION ZONE.

A. any number of SCORING ELEMENTS can be manipulated by the HUMAN PLAYER at a time.
B. SCORING ELEMENTS may be placed in any orientation and/or in contact with other SCORING ELEMENTS.
C. HUMAN PLAYERS may only place SCORING ELEMENTS into the OBSERVATION ZONE during the AUTO and TELEOP periods of the MATCH.
D. HUMAN PLAYERS may not be in contact with a SCORING ELEMENT, either directly or transitively, that is possessed/controlled by a ROBOT.
E. HUMAN PLAYERS may reintroduce SCORING ELEMENTS to the OBSERVATION ZONE that have left the FIELD as a result of a ROBOT attempting to collect it from the OBSERVATION ZONE or FIELD wall within the OBSERVATION ZONE, as long as no other rules are violated (e.g. rule G428).
F. HUMAN PLAYERS may manipulate opposing ALLIANCE SCORING ELEMENTS that have been placed into their ALLIANCE'S OBSERVATION ZONE. The opposing ALLIANCE SCORING ELEMENTS may not be removed from the OBSERVATION ZONE, but may be moved within the OBSERVATION ZONE.

Violation: MINOR FOUL per occurrence. YELLOW CARD if the HUMAN PLAYER contacts the ROBOT.

SPECIMENS hung from the FIELD wall in the OBSERVATION ZONE are still considered in the OBSERVATION ZONE and may be manipulated by the HUMAN PLAYER.

G419 and G431 do not stack. One FOUL should be called per occurrence of the violation per ALLIANCE. For example, two FOULS would be called in the case where the ROBOT and HUMAN PLAYER are on separate ALLIANCES.

G432 **Watch out for ROBOTS.** A HUMAN PLAYER cannot break the vertical plane of the FIELD wall when a ROBOT is in the OBSERVATION ZONE. The only exceptions are:

A. The ROBOT in the OBSERVATION ZONE has been declared DISABLED by a REFEREE.

Violation: MINOR FOUL per occurrence. YELLOW CARD if the HUMAN PLAYER contacts the ROBOT.

G419, G431, and G432 do not stack. ~~Only~~ One FOUL should be called per ~~instance~~ occurrence of the violation per ALLIANCE. For example, two FOULS would be called in the case where the ROBOT and HUMAN PLAYER are on separate ALLIANCES.

Section 12.5 Motors and Actuators

R504 ***Do not modify actuators unless explicitly allowed.** The integral mechanical and electrical system of any motor or servo must not be modified. Motors and servos used on the ROBOT shall not be modified in any way, except as follows:

A. the mounting brackets and/or output shaft/interface may be modified to facilitate the physical connection of the motor to the ROBOT and actuated part,
B. the electrical leads may be trimmed to length as necessary and connectors or splices to additional wiring may be added (per R503), and purely electrical enclosures can be substituted with functionally equivalent replacements,
C. servos may be modified as specified by the manufacturer (e.g., re-programming or modification for continuous rotation),
D. minimal labeling may be applied to indicate device purpose, connectivity, functional performance, etc. as long as the team applied label does not obstruct the markings used to identify the device,
E. insulation may be applied to electrical terminals,
F. repairs, provided the original performance and specifications are unchanged, and
G. maintenance recommended by the manufacturer.

Section 12.6 Power Distribution

R611 ***The ROBOT frame is not a wire.** All wiring and electrical devices shall be electrically isolated from the ROBOT frame. The ROBOT frame must not be used to carry electrical current. Electrically grounding the control system electronics to the frame of the ROBOT is only permitted such that all of the following conditions are met:

A. must use one of the following approved parts:

Table 0-2: Legal ROBOT Grounding Straps

Grounding Strap	Part Number
AndyMark Resistive Grounding Strap	am-4648a
REV Resistive Grounding Strap	REV-31-1269
Swyft Grounding Cable	SR-Ground-01

R618 ***Do not modify critical power paths.** CUSTOM CIRCUITS shall not directly alter the power or control pathways between:

A. the ROBOT battery and main power switch,
B. the main power switch and a power regulating device (per R609),
C. any two power regulating devices (per R613), or
D. power regulating devices and actuators.

Custom high impedance voltage monitoring or low impedance current monitoring circuitry connected to the ROBOT'S electrical system is acceptable if the effect on power pathways is inconsequential.

Altering a power pathway includes, but is not limited to, altering the voltage of the power pathway using a boost (DC voltage step-up) or buck (DC voltage step-down) converter or otherwise altering the natural variable DC voltage provided by the ROBOT battery to create a constant DC voltage.

Devices that modify actuator control signals or power (except those allowed by R505) are prohibited, such as the goBILDA Servo Travel Tuner.

Section 15 *FIRST* Championship

Award	Per Division	*FIRST* Championship
Inspire Award	1st, 2nd and 3rd Place	1st~~, 2nd and 3rd~~ Place
Dean's List	0	10
Compass Award	0	1

Team Update 05

General

The Team Updates – Combined document will now show the most current Team Update will show first in the document, with previous Team Updates documents following in order of newest release to oldest release.

Competition Manual

Section 6.1 Team Judged Awards Overview and Schedule

In addition to the specific information sources JUDGES use to evaluate teams, there are also sources of information which are specifically disallowed. JUDGES are strictly instructed to only consider information from the current event and the current season and cannot consider information from outside what they have seen or heard at the current event. This means that information like past performance (good or bad), personal knowledge of a team, and external sources like websites and social media are not considered. JUDGES also do not consider overall ROBOT performance in an award unless it is specifically listed as part of the required or encouraged evaluation criteria.

Section 10.5.3 ROBOT Scoring Criteria

Table 0-1: ASCENT LEVEL Criteria

ASCENT	Definition
LEVEL 1	ROBOT is in contact with the LOW RUNG at the end of a MATCH period (per section `10.5 Scoring` item A)
LEVEL 2	ROBOT is fully supported by the HIGH and/or LOW RUNGS at the end of the MATCH (per section `10.5 Scoring` item A)
LEVEL 3	ROBOT is fully supported by the HIGH RUNG and completely above the top of the LOW RUNG at the end of the MATCH (per section `10.5 Scoring` item A)

Lateral contact with non-RUNG elements of the SUBMERSIBLE is allowed for stabilization of the ROBOT while ASCENDING.

The intent of the use of “fully support” language is that the ROBOTS are solely supported by the RUNGS when the ASCENT is scored ~~using the RUNGS to climb~~. ROBOTS which make incidental contact (e.g. not used for ROBOT support or stabilization) to the non-RUNG ~~vertical~~ SUBMERSIBLE structural elements or ALLIANCE partner ROBOT as judged by the REFEREES, ~~during or~~ at the conclusion of their ASCENT are still eligible for ASCENT points.

Additionally, the following conditions must be met:

A. ROBOTS can only ASCEND their own ALLIANCE SPECIFIC RUNGS.
B. ROBOTS must start their ASCENT with their CHASSIS completely outside the SUBMERSIBLE ZONE.
C. for a LEVEL 3 ASCENT, ROBOTS may not contact the HIGH RUNG while:

i. supported by the TILES directly or transitively through another object (e.g., SCORING ELEMENTS or another ROBOT), or
ii. grasping ~~supported by~~ any other part of the SUBMERSIBLE structure except for the LOW RUNG

D. ROBOTS that are eligible for multiple ASCENTS or ASCENT and PARKING points only earn points for the highest value achievement.

If any of the above conditions are not met, it is not a valid ASCENT. If a ROBOT does not meet ASCENT criteria, the ROBOT may disengage from the SUBMERSIBLE and attempt the ASCENT again.

> A ROBOT is considered ASCENDING once it is attempting to achieve an ASCENT LEVEL, and ASCENDED once it has achieved an ASCENT LEVEL.
>
> The intent of part B of this rule is for the ROBOT to start its ASCENT outside of the SUBMERSIBLE ZONE except for elements used by the ROBOT to contact the RUNG. Once ROBOTS start their ASCENT, parts of the CHASSIS ~~ROBOT~~ may swing into the SUBMERSIBLE ZONE, which is not a violation of this rule.
>
> ROBOTS attempting a LEVEL 3 ASCENT which then violate C. i or ii, may still be eligible for lower LEVEL ASCENT points as long as all other lower LEVEL ASCENT criteria are met at the end of the MATCH period. In this scenario, if a ROBOT would like to reattempt a LEVEL 3 ASCENT they must disengage from the HIGH RUNG and attempt their LEVEL 3 ASCENT again.
>
> ROBOTS supported by an ALLIANCE partner ROBOT, SCORING ELEMENTS, other non-RUNG elements ~~sections~~ of the SUBMERSIBLE or the FIELD floor will not be awarded an ASCENT LEVEL 2 or 3.

Section 11.4.3 SCORING ELEMENT

- Rule G408 orange box update:

> SCORING ELEMENTS removed from the FIELD while attempting to score are not ~~subject to~~ a violation of this rule, however, are not returned to the FIELD.

- Rule G410 orange box update:

> Examples of interaction with a SAMPLE or SPECIMEN that are not "CONTROL" include, but are not limited to:
> A. PLOWING or "bulldozing" (inadvertent contact with a SAMPLE or SPECIMEN, typically via a flat or convex surface, while in the path of the ROBOT moving about the FIELD).
> B. "deflecting" (being hit by a SAMPLE or SPECIMEN that bounces off a ROBOT).
>
> Excessive violations of CONTROL limits include, but are not limited to, simultaneous CONTROL of 3 or more SAMPLES and/or SPECIMENS, or frequent, greater-than MOMENTARY CONTROL (i.e., more than twice in a MATCH) of 2 or more ~~SCORING ELEMENTS~~ SAMPLES and/or SPECIMENS. REPEATED excessive violations of this rule do not result in additional

YELLOW CARDS unless the violation reaches the level of egregious to trigger a G201 violation.

Section 11.4.4 ROBOT

- Rule G418 orange box update:

This rule is intended to limit the amount of floor area each ROBOT can cover with the maximum range of motion of all extensions. All possible movement of extensions outside the STARTING CONFIGURATION must be constrained as described in R104.

During the MATCH REFEREES may use ARENA elements to help gauge ROBOT expansion during the MATCH. For example:
A. TILES are approximately 24 in. (~61 cm)
B. The RUNGS on the SUBMERSIBLE are 44.5 in. (~113 cm) wide
~~REFEREES that observe ROBOTS that are in violation of this rule may request the ROBOT be reinspected.~~

G420 **No climbing on the inside.** ROBOTS must start their ASCENT with their CHASSIS completely outside the SUBMERSIBLE ZONE.

Violation: MAJOR FOUL, and team will not receive credit for ASCENT scoring outlined in section 10.5.3

The purpose of this rule is to limit how much of the ROBOT may be inside the SUBMERSIBLE ZONE before the ASCENT begins. ROBOT elements are allowed to reach into the SUBMERSIBLE ZONE while attempting to ASCEND, as long as the ROBOT CHASSIS remains completely outside the SUBMERSIBLE ZONE. It is expected that there will be some contact between opponent ROBOTS within the SUBMERSIBLE ZONE, and this is intended to minimize the extent of that contact.

Section 12.5 Motors and Actuators

Rule R502 orange box update:

Servos must meet both requirements to be legal for use. Refer to the ~~Legal and Illegal Parts List~~ Inspection Quick Reference document for a list of servos that are pre-approved, otherwise teams must be able to provide documentation verifying servo specifications. Use the online calculator to verify output power compliance.

If a manufacturer does not provide 6V specs, any specs for voltages that exceed 6V are allowed to be used.

Stall current is the maximum stall current possible for the device at the specified voltage, regardless of any user or VENDOR adjustable software limits that may be available within the servo.

It is important to ensure the voltage provided by the intended power regulation device is within the operating voltage range of the desired servo. The REV Control Hub and REV Expansion Hub provide 5V to servos, and the REV Servo Power Module, Studica Servo Power Block, and REV Servo Hub provide 6V to servos. While virtually all servos are compatible with 6V, servos with an operating voltage range of 6-8.4 DCV, for example, may not work properly when only provided 5V.

Team Update 04

General

N/A

Competition Manual

Section 11.4.4 ROBOT

Upon review of Team Update 03, an expedient update and release of Team Update 04 was necessary to ensure consistency of the Competition Manual rules, and the way they are enforced.

G420 **No climbing on the inside.** ROBOTS must start their ASCENT with their CHASSIS ~~be~~ outside the SUBMERSIBLE ZONE. ~~when they begin their ASCENT, except for minor elements used by the ROBOT to contact the RUNG.~~

Violation: MAJOR FOUL, and team will not receive credit for ASCENT scoring outlined in section 10.5.3

The purpose of this rule is to limit how much of the ROBOT may be inside the SUBMERSIBLE ZONE before the ASCENT begins. ROBOT elements are allowed to reach into the SUBMERSIBLE ZONE while attempting to ASCEND, as long as the ROBOT CHASSIS remains outside the SUBMERSIBLE ZONE. It is expected that there will be some contact between opponent ROBOTS within the SUBMERSIBLE ZONE, and this is intended to minimize the extent of that contact.

Team Update 03

General

- Minor formatting updates
- Updates to volunteer role capitalization throughout document
  - Example: ~~head Referee~~ > Head Referee

Competition Manual

Section 3.3

Link to inspection checklist added:

> An Inspection Checklist ~~will be~~ is available to help teams self-inspect their ROBOT before their event. Teams are strongly encouraged to self-inspect prior to their event.

Section 6.1 Team Judges Awards Overview and Schedule

A101 ***Team PORTFOLIOS have limits.** Teams have the opportunity to submit a team PORTFOLIO to be used as part of the judging process. No other printed or digital content not directly included in this document will be collected by the JUDGES to consider during deliberations. PORTFOLIOS must meet the following requirements:

A. must consist of 1 cover page including the team number and optionally: team name, PORTFOLIO table of contents, team organizations, sponsors, logo, motto, and picture of the ROBOT and/or team.
B. no more than 15 pages of judged content (if printing front and back, 8 sheets of paper, including the cover page)
C. use only US Letter (8.5” x 11”) or A4 (210 x 297 mm) size paper.
D. font minimum of 10 point or larger
E. if submitted digitally, the complete submission must be less than 15MB in size.
F. must only include progress, challenges, and accomplishments which take place during the current season and, for returning teams, after the conclusion of their last official event that they participated in.

> None of the content of the cover page will be used by JUDGES to evaluate any awards criteria. Any content beyond the allowed 15 pages will not be reviewed by the JUDGES.
>
> The JUDGES use the cover page to identify the team associated with the PORTFOLIO. Teams who forget to include a cover page may be disqualified from judging if the JUDGES cannot determine what team the PORTFOLIO is associated with.
>
> Font minimums are used to help ensure minimum readability. Teams should carefully consider font size, color, and graphic design when making their PORTFOLIO so that all JUDGES are able to read their submission. Teams whose design choices include small fonts or low contrast text on images will not be

excluded from consideration but understand that JUDGES will not be able to use anything they cannot read.

JUDGES will not open, view, or use any included links to other documents, websites, or videos referenced to linked to from the PORTFOLIO.

Teams may use writing and research aids including Artificial Intelligence (AI) to help them compose their PORTFOLIOS. If AI or other resources are used, they must be credited via footnote or endnote.

The PORTFOLIO captures a team's progression through the current *FIRST* Tech Challenge season. A team may include anything in their PORTFOLIO which took place after their final official event of the previous season. Off-season events are not a part of the official *FIRST* Tech Challenge event calendar may be included as part of the team's current season. A team may reference previous seasons (for example, in a team or organizational plan) to demonstrate growth, but the emphasis must be on the current season.

A108 ***One adult silent observer is welcome.** One adult mentor may attend the judging session and be present for any interaction between the JUDGES and the STUDENT team members. Adult mentor(s) may be present for any interactions between the JUDGES and the STUDENT team members outside of the formal scheduled interview. The adult observer and mentor(s) may not interact or coach actively during any interaction between the JUDGES and the STUDENT team members.

Section 6.2.1 Inspire Award

Table 0-1: Inspire Award Criteria

Inspire Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include engineering content, team information and a team plan. The PORTFOLIO must be high quality, thoughtful, thorough, and concise.
Required	2	The Inspire Award celebrates the strongest qualities of all the judged awards. A team must be a strong contender for at least one award in each of the following judged award categories: A. Machine, Creativity, and Innovation Awards, B. Team Attributes Awards, and C. Think Award
Required	3	~~Team judging interview session must be professional and engaging.~~ Team must be positive and inclusive, and each team member contribute to the success of the team.
Encouraged	4	The team should be able to discuss, demonstrate, display, document, or otherwise provide more detailed information to support the information in the PORTFOLIO.

Section 6.2.2 Think Award

This judged award is given to the team that best reflects the journey the team took as they experienced the engineering design process during the build season. The engineering content within the PORTFOLIO is the key reference for JUDGES to help identify the most deserving team. ~~The team's engineering content must focus on the design and build stage of the team's ROBOT.~~

The team ~~must~~ could share or provide additional detailed information that is helpful for the JUDGES. ~~This could include descriptions of the underlying science and mathematics of the ROBOT design and game strategies, the designs, redesigns, successes, or opportunities for improvement.~~

Table 0-2: Think Award Criteria

Think Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include engineering content which includes at least one of the following: A. evidence of use of the engineering process, B. lessons learned, C. trade off analysis /cost benefit analysis, and/or D. mathematical analysis used to make design decisions
~~**Required**~~ **Encouraged**	2	Team ~~must~~ should be able to ~~speak to~~ discuss, describe, display, or document the engineering content contained in their PORTFOLIO during the judging interview and/or pit interviews.
Encouraged	3	Team PORTFOLIO may include information about technical resources which includes any number of the following examples: A. how the team acquire new mentors, B. how the team learns from team mentors, and/or C. development plan for team members to learn new skills
Encouraged	4	PORTFOLIO information is organized in a clear and intuitive manner

6.2.3 Connect Award

Connecting the dots between the STEM community, FIRST, and the diversity of the engineering world.

This judged award is given to the team that connects with their local science, technology, engineering, and math (STEM) community. A true *FIRST* team is more than a sum of its parts and recognizes that engaging their local STEM community plays an essential part in their success. ~~The recipient of this award is recognized for helping the community understand *FIRST*, the *FIRST* Tech Challenge, and the team itself. The team that wins the Connect Award actively seeks and recruits engineers and explores the opportunities available in the world of engineering, science, and technology.~~ This team has a ~~clear~~ team plan and has identified steps to achieve their goals. A PORTFOLIO is not required for this award.

Table 0-3: Connect Award Criteria

Connect Award Criteria		
Required	1	Team must describe, display, or document a team plan that covers all of the following: A. The team's goals for the development of team member skills, and B. The steps the team has taken or will take to reach those goals

Connect Award Criteria		
Encouraged	2	Provide ~~clear~~ examples of developing in person or virtual connections with individuals in the engineering, science, or technology community.
Encouraged	3	Provide ~~clear~~ examples of how it actively engages with the engineering community ~~to help them understand *FIRST*, the *FIRST* Tech Challenge, and the team itself~~.

6.2.4 Motivate Award

This team embraces the culture of *FIRST* and ~~clearly~~ shows what it means to be a team. This team makes a collective effort to make *FIRST* known throughout their school and community and sparks others to embrace *FIRST*'s culture. A PORTFOLIO is not required for this award.

Table 0-4: Motivate Award Criteria

Motivate Award Criteria		
Required	1	Team must describe, display, or document an organizational plan which includes at least one of the following examples: A. team or organization goals, B. finances and financial sustainability plan, C. risk management planning, D. season timeline project planning, and/or E. outreach and service plan
Required	2	~~Explain~~ Discuss, describe, display, or document the individual contributions of each team member, and how these apply to the overall success of the team.
Encouraged	3	Is an ambassador for *FIRST* programs and successfully recruits people who were not already active within the STEM community.
Encouraged	4	Evidence of using lessons learned from outreach activities to improve future events.
Encouraged	5	Has a creative approach to materials that market their team and *FIRST*.

6.2.5 Innovate Award sponsored by RTX

The Innovate Award celebrates a team that thinks imaginatively and has the ingenuity, creativity, and inventiveness to make their designs come to life. This judged award is given to the team that has an innovative and creative ROBOT design solution to any specific components in the *FIRST* Tech Challenge game. Elements of this award include ~~elegant~~ design, robustness, and ~~'out of the box'~~ creative thinking related to design. This award may address the design of the whole ROBOT or of a ~~sub-assembly~~ MECHANISM attached to the ROBOT ~~The creative design element must work consistently, but a ROBOT~~ and does not have to work all the time during matches to be considered for this award. A PORTFOLIO is not required for this award.

Table 0-5: Innovate Award Criteria

Innovate Award Criteria		
Required	1	Team must describe, display, or document examples of the team's engineering content that illustrate how the team arrived at their design solution.
Required	2	ROBOT or ROBOT ~~sub-assembly~~ MECHANISM is creative and unique in its design.

Innovate Award Criteria		
Required	3	Creative design element must be stable, robust, and contribute positively to the team's game objectives most of the time.
Encouraged	4	Creative designs often come with additional risks, the team should document or describe how they mitigated that risk.

6.2.6 Control Award

The Control Award celebrates a team that uses sensors and software to increase the ROBOT'S functionality during gameplay. This award is given to the team that demonstrates innovative thinking and solutions to solve game challenges such as autonomous operation, improving mechanical systems with intelligent control, or using sensors to achieve better results. The ~~control component~~ solution(s) should work consistently during MATCHES. The team's PORTFOLIO must contain a summary of the software, sensors, and mechanical control but would not include copies of the code itself.

Table 6-7: Control Award Criteria

Control Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include all of the following: A. hardware and/or software control ~~components~~ COMPONENTS ~~and systems~~ on the ROBOT, B. which challenges each ~~component~~ COMPONENT or system is intended to solve, and C. how does each ~~component~~ COMPONENT or system work
Required	2	Team must use one or more hardware or software solutions to improve ROBOT functionality by using external feedback and control.
Encouraged	3	The control solution(s) should work consistently during most MATCHES.
Encouraged	~~3~~4	Team could describe, display, or document how the solution should consider reliability either through demonstrated effectiveness or identification of how the solution could be improved
Encouraged	45	Use of the engineering process to develop the control solutions (sensors, hardware and/or algorithms) used on the ROBOT includes lessons learned.

6.2.7 Design Award

The Design Award celebrates the team that demonstrates industrial design principles, striking a balance between form, function, and aesthetics. The design process used should result in a ROBOT which is ~~durable,~~ efficiently designed, and effectively addresses the game challenge. A PORTFOLIO is not required for this award.

Table 6-8: Design Award Criteria

Design Award Criteria		
Required	1	A team must be able to describe or demonstrate how their ROBOT is elegant, efficient (simple/executable), and practical to maintain.
Required	2	The entire machine design, or the detailed process used to develop the design, is worthy of this recognition, and not just a single ~~component~~ COMPONENT.
Encouraged	3	The ROBOT distinguishes itself from others by its aesthetic and functional design.
Encouraged	4	The basis for the design is well considered (that is inspiration, function, etc.).
Encouraged	5	Design is effective and consistent with team's game plan and/or ~~event~~ strategy.

Section 9.7.1 SAMPLES

A SAMPLE is a 3.5 in. (8.9 cm) long by 1.5 in. (3.8 cm) wide by 1.5 in. (3.8 cm) high rectangular prism shaped SCORING ELEMENT. There are forty (40) yellow SAMPLES, twenty (20) red SAMPLES, and twenty (20) blue SAMPLES. ~~A SAMPLE with a CLIP attached is no longer a SAMPLE and is now a SPECIMEN.~~ An ALLIANCE SPECIFIC SAMPLE with a CLIP attached is no longer a SAMPLE and is now a SPECIMEN. A neutral SAMPLE with a CLIP attached is ~~no longer~~ still considered a SAMPLE.

Section 10.5.3 ROBOT Scoring Criteria

Additionally, the following conditions must be met:

A. ROBOTS can only ASCEND their own ALLIANCE SPECIFIC RUNGS.
B. ROBOTS must start ~~ASCENDING from~~ their ASCENT with their CHASSIS outside the SUBMERSIBLE ZONE.
C. for a LEVEL 3 ASCENT, ROBOTS may not contact the HIGH RUNG while:
   i. supported by the TILES directly or transitively through another object (e.g., SCORING ELEMENTS or another ROBOT), or
   ii. supported by any other part of the SUBMERSIBLE structure except for the LOW RUNG
D. ROBOTS that are eligible for multiple ASCENTS or ASCENT and PARKING points only earn points for the highest value achievement.

If any of the above conditions are not met, it is not a valid ASCENT. If a ROBOT does not meet ASCENT criteria, the ROBOT may disengage from the SUBMERSIBLE and attempt the ASCENT again.

A ROBOT is considered ASCENDING once it is attempting to achieve an ASCENT LEVEL, and ASCENDED once it has achieved an ASCENT LEVEL.

The intent of part B of this rule is for the ROBOT to start its ASCENT outside of the SUBMERSIBLE ZONE except for ~~minor~~ elements used by the ROBOT to

contact the RUNG. Once ROBOTS start their ASCENT, parts of the ROBOT may swing into the SUBMERSIBLE ZONE, which is not a violation of this rule.

ROBOTS attempting a LEVEL 3 ASCENT which then violate C. i or ii, may still be eligible for lower LEVEL ASCENT points as long as all other lower LEVEL ASCENT criteria are met at the end of the MATCH period. In this scenario, if a ROBOT would like to reattempt a LEVEL 3 ASCENT they must disengage from the HIGH RUNG and attempt their LEVEL 3 ASCENT again.

ROBOTS supported by an ALLIANCE partner ROBOT, SCORING ELEMENTS, other sections of the SUBMERSIBLE or the FIELD floor will not be awarded an ASCENT LEVEL 2 or 3.

Section 11.4.4 ROBOT

This rule was reformatted, with B added.

G419 **Watch out for Humans.** A ROBOT may not:

A. enter the OBSERVATION ZONE while a HUMAN PLAYER is in the OBSERVATION ZONE.
B. contact a SCORING ELEMENT, either directly or transitively, that is controlled/possessed by a HUMAN PLAYER.

Section 11.4.5 Opponent Interaction

G421 ***This is not combat robotics.** A ROBOT may not deliberately damage or deliberately functionally impair an opponent ROBOT as perceived by a REFEREE.

Section 11.4.6 Human

G431 **HUMAN PLAYERS manipulate SCORING ELEMENTS within limits.** Only the HUMAN PLAYER may introduce SCORING ELEMENTS into or retrieve SCORING ELEMENTS from the OBSERVATION ZONE.

A. any number of SCORING ELEMENTS can be manipulated by the HUMAN PLAYER at a time.
B. SCORING ELEMENTS may be placed in any orientation and/or in contact with other SCORING ELEMENTS.
C. HUMAN PLAYERS may only place SCORING ELEMENTS into the OBSERVATION ZONE during the AUTO and TELEOP periods of the MATCH.
D. HUMAN PLAYERS may not be in contact with a SCORING ELEMENT, either directly or transitively, that is possessed/controlled by a ROBOT.

Violation: MINOR FOUL per ~~SCORING ELEMENT~~ occurrence.

Section 12.1 General ROBOT Design

Added link to orange box of rule R104.

Please see the R104 and R418 Recap Video for helpful visuals to help teams comply with this rule.

Section 12.5 Motors and Actuators

Motor Name	Part Numbers Available	Notes
AndyMark NeveRest 12V DC	am-3104, am-3104b	
AndyMark NeveRest Hex 12V DC	am-3104c	
goBILDA Yellow Jacket 520x Series 12V DC	5201-0002-0026, etc.	5201, 5202, 5203, and 5204 series
Modern Robotics / MATRIX 12V DC	5000-0002-0001	
REV Robotics HD Hex 12V DC	REV-41-1291	
REV Robotics Core Hex 12V DC	REV-41-1300	
Studica Robotics Maverick 12V DC	75001	
TETRIX MAX 12V DC	739530, 39530	Discontinued
TETRIX MAX TorqueNADO 12V DC	W44260	
VEX EDR 393	276-2177	Counts as a servo for R503
Factory installed vibration and autofocus motors resident in COTS computing devices (e.g., rumble motor in a smartphone); can only be used as part of the device and cannot be removed and/or repurposed. These motors do not count toward the limit in R503.		
Motors integral to a COTS sensor (e.g., LIDAR, scanning sonar), provided the device is not modified except to facilitate mounting. These motors do not count toward the limit in R503.		

Section 13.7.1 - Dual Division Playoffs

Added breaks for awards

						Gap (min)		Next MATCH (MATCH # (ALLIANCE color))		
Round	MATCH	Upper/ Lower	FIELD	Blue	Red	Blue	Red	Winner	Loser	Estimated Start (min)
1	1	Upper	1	A5	A4			M3 (B)	M6 (B)	0
	2	Upper	2	A6	A3			M4 (B)	M5 (B)	6
2	3	Upper	1	W1	A1	0:09		M7 (R)	M5 (R)	12
	4	Upper	2	W2	A2	0:09		M7 (B)	M6 (R)	18
3	5	Lower	1	L2	L3	0:15	0:09	M8 (B)	Tied 5th	24
	6	Lower	2	L1	L4	0:27	0:09	M8 (R)		30
4	7	Upper	1	W4	W3	0:15	0:21	M10 (R)	M9 (R)	36
	8	Lower	2	W5	W6	0:15	0:09	M9 (B)	4th	42

8-minute break										45
5	9	Lower	1	W8	L7	0:08	0:14	M10 (B)	3rd	53
8-minute break										56
Finals	10		1	W9	W7	0:08	0:25	M11*	M11*	64
8-minute break										67
Finals*	11		1	W9	W7	0:08	0:08			75
End of Divisional Playoffs/15 Minute Break Design Award, (2, 1), Motivate Award (2, 1)										78
Evt Fin	13		1	DivA	DivB	0:15	0:15	M14	M14	93
~~8~~ **15-minute break**		**Control Award (2, 1), Innovate Award (2, 1)**								96
Evt Fin	14		1	DivA	DivB	0:08	0:08	M15*	M15*	~~104~~ 111
~~8~~ **15-minute break**		**Connect Award (2, 1), Think Award (2, 1)**								~~107~~ 114
Evt Fin	15*		1	DivA	DivB	0:08	0:08			~~115~~ 129
Awards: Remaining awards, Finalists, Winners, and Inspire Award										~~118~~ 132

Section 16 – Glossary

Added Judge Definition:

JUDGE - Judges meet with teams to learn about and celebrate the unique journey and accomplishments of each team and evaluate these against award requirements. Judges interact with students during the interview process and in the pits. As a group, Judges determine the teams that receive awards at events

Team Update 02

General

General formatting fixes.

Competition Manual

Section 6.2.2 Think Award

Think Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include engineering content ~~including~~ which includes at least one of the following: A. evidence of use of the engineering process, B. lessons learned, C. trade off analysis /cost benefit analysis, and/or D. mathematical analysis used to make design decisions
Required	2	Team must be able to speak to the engineering content contained in their PORTFOLIO during the judging interview and/or pit interviews.
Encouraged	3	Team PORTFOLIO may include information about technical ~~skill~~ resources ~~including~~ which includes any number of the following examples: A. how the team acquire new mentors, B. how the team learns from team mentors, and/or C. development plan for team members to learn new skills
Encouraged	4	PORTFOLIO information is organized in a clear and intuitive manner

Section 6.2.3 Connect Award

Connect Award Criteria		
Required	1	Team must describe, display, or document a team plan that covers all of the following: A. The team's goals for the development of team member skills, and B. The steps the team has taken or will take to reach those goals

Section 6.2.4 Motivate Award

Motivate Award Criteria		
Required	1	Team must describe, display, or document an organizational plan ~~including~~ which includes at least one of the following examples: A. team or organization goals, B. finances and financial sustainability plan, C. risk management planning, D. season timeline project planning, and/or E. outreach and service plan

Section 6.2.6 Control Award

Control Award Criteria		
Required	1	Team must submit a PORTFOLIO. The PORTFOLIO must include all of the following: A. hardware and/or software control components and systems on the ROBOT, B. which challenges each component or system is intended to solve, and C. how does each component or system work

Section 9.7.1 SAMPLES

- A SAMPLE is a 3.5 in. (8.9 cm) long by 1.5 in. (3.8 cm) wide by 1.5 in. (3.8 cm) high rectangular prism shaped SCORING ELEMENT. There are forty (40) yellow SAMPLES, twenty (20) red SAMPLES, and twenty (20) blue SAMPLES. A SAMPLE with a CLIP attached is no longer a SAMPLE and is now a SPECIMEN. An ALLIANCE SPECIFIC SAMPLE with a CLIP attached is no longer a SAMPLE and is now a SPECIMEN. A neutral SAMPLE with a CLIP attached is no longer a SAMPLE.

Section 9.7.2 CLIP

- The CLIP is a black plastic SCORING ELEMENT which is designed to be connected to an ALLIANCE SPECIFIC SAMPLE by a HUMAN PLAYER or ROBOT to create a SPECIMEN. The CLIP is a 2.5 in. (~6.4 cm) high by ~3.2 in. (~8.1 cm) long by 1 in. (~2.5 cm) wide .

Section 10.3.1 SCORING ELEMENTS

- From the SCORING ELEMENTS provided in D and E each ROBOT may be pre-loaded with either 1 SAMPLE or one SPECIMEN such that it is in contact with the ROBOT and not in the OBSERVATION ZONE or NET ZONE. SAMPLES or CLIPS not pre-loaded will remain in setup locations D and E.

Section 10.5 Scoring

- All accomplishments are tracked live by FIELD STAFF and certified at the end of the MATCH. Accomplishments are officially scored at the end of ~~the~~ each MATCH period based on the status of the FIELD, when all ROBOTS and SCORING ELEMENTS have come to rest, except as follows:

Section 10.5.1 SAMPLE Scoring Criteria

- A neutral SAMPLE with a CLIP attached in the NET ZONE or either the LOW or HIGH BASKETS have no score value.

Section 10.5.3 ROBOT Scoring Criteria

Additionally, the following conditions must be met:

A. ROBOTS can only ASCEND their own ALLIANCE SPECIFIC RUNGS.
B. ROBOTS must start ASCENDING from outside the SUBMERSIBLE ZONE.
C. for a LEVEL 3 ASCENT, ROBOTS may not ~~initiate~~ contact ~~with~~ the HIGH RUNG while:
   i. ~~still~~ supported by the TILES directly or transitively through another object (e.g., SCORING ELEMENTS or another ROBOT), or
   ii. supported by any other part of the SUBMERSIBLE structure except for the LOW RUNG
D. ROBOTS that are eligible for multiple ASCENTS or ASCENT and PARKING points only earn points for the highest value achievement.

If any of the above conditions are not met, it is not a valid ASCENT. If a ROBOT does not meet ASCENT criteria, the ROBOT may disengage from the SUBMERSIBLE and attempt the ASCENT again.

A ROBOT is considered ASCENDING once it is attempting to achieve an ASCENT LEVEL, and ASCENDED once it has achieved an ASCENT LEVEL.

The intent of part B of this rule is for the ROBOT to start its ASCENT outside of the SUBMERSIBLE ZONE except for minor elements used by the ROBOT to contact the RUNG. Once ROBOTS start their ASCENT, parts of the ROBOT may swing into the SUBMERSIBLE ZONE, which is not a violation of this rule.

ROBOTS attempting a LEVEL 3 ASCENT which then violate C. i or ii, may still be eligible for lower LEVEL ASCENT points as long as all other lower LEVEL ASCENT criteria are met at the end of the MATCH period. In this scenario, if a ROBOT would like to reattempt a LEVEL 3 ASCENT they must disengage from the HIGH RUNG and attempt their LEVEL 3 ASCENT again.

ROBOTS supported by an ALLIANCE partner ROBOT, SCORING ELEMENTS, other sections of the SUBMERSIBLE or the FIELD floor will not be awarded an ASCENT LEVEL 2 or 3.

Section 11.3 Pre-MATCH

G303 ***ROBOTS on the FIELD must be set up to play a MATCH.** A ROBOT must meet all following MATCH-start requirements:

A. does not pose a hazard to humans, FIELD elements, or other ROBOTS.
B. has passed inspection, i.e., it is compliant with all ROBOT rules.
C. if modified after initial Inspection, it is compliant with I304.
D. is the only team-provided item left on the FIELD.
E. is fully contained within the FIELD and not in the NET ZONE or OBSERVATION ZONE.
F. touching the FIELD wall adjacent to the ALLIANCE AREA.

G. not attached to, entangled with, or suspended from any FIELD element.
H. confined to its STARTING CONFIGURATION (see R101 and R102).
I. in contact with no more than the allowed pre-load possession limit as described in section 10.3.1 SCORING ELEMENTS.
J. ROBOT SIGNS must indicate the correct ALLIANCE color (see R402).

Section 11.4.1 AUTO

G404 **No AUTO opponent interference.** FIELD columns A, B, C constitute the blue side of the FIELD, and columns D, E, F (Figure 9-4) institute the red side of the FIELD. During AUTO ROBOTS may not:

A. contact an opposing ALLIANCE'S ROBOT which is completely within the opposing ALLIANCE'S half of the FIELD.
B. contact a pre-set SAMPLE on the opposing ALLIANCE'S half of the FIELD.
C. move SCORING ELEMENTS onto the opposing ALLIANCE'S half of the FIELD outside of the SUBMERSIBLE ZONE.

Section 11.4.3 SCORING ELEMENT

G406 ***ROBOTS are motionless at the end of TELEOP**. ROBOTS must no longer be actively controlled by DRIVERS after the end of the TELEOP period. This can be done by a DRIVE TEAM member pressing the (■) stop button on the DRIVER STATION app or by discontinuing any operation of the ROBOT by the end of the MATCH period.

G411 **ROBOTS may not CONTROL the opposing ALLIANCE'S SPECIFIC SAMPLES or SPECIMENS.** ROBOTS may only have MOMENTARY CONTROL of opposing ALLIANCE SPECIFIC SAMPLES or SPECIMENS.

Violation: MINOR FOUL per SCORING ELEMENT, plus an additional MINOR FOUL per opposing SCORING ELEMENT for each 5-second interval that the situation continues. A MAJOR ~~PENALTY~~ FOUL is applied for each SCORING ELEMENT that is scored while in CONTROL.

Section 11.4.4 ROBOT

G418 **Horizontal expansion limit.** After the MATCH has started, ROBOTS may expand beyond the STARTING CONFIGURATION but are still subject to sizing constraints (per. The sizing constraints are specified in R104.

Violation: if more than MOMENTARY, MINOR FOUL, or MAJOR FOUL if the over-expansion is used for strategic benefit, including if it impedes or enables a scoring action.

This rule is intended to limit the amount of floor area each ROBOT can cover with the maximum range of motion of all extensions. All possible movement of extensions outside the STARTING CONFIGURATION must be constrained ~~within the horizontal size boundary assuming a stationary DRIVETRAIN resting normally on a flat surface~~ as described in R104.

During the MATCH REFEREES may use ARENA elements to help gauge ROBOT expansion during the MATCH. For example:
A. TILES are approximately 24 in. (~61 cm)
B. The RUNGS on the SUBMERSIBLE are 44.5 in. (~113 cm) wide

REFEREES that observe ROBOTS that are in violation of this rule may request the ROBOT be reinspected.

Section 11.4.6 Human

G431 **HUMAN PLAYERS manipulate SCORING ELEMENTS within limits.** Only the HUMAN PLAYER may introduce SCORING ELEMENTS into or retrieve SCORING ELEMENTS from the OBSERVATION ZONE.

A. any number of SCORING ELEMENTS can be manipulated by the HUMAN PLAYER at a time.
B. SCORING ELEMENTS may be placed in any orientation and/or in contact with other SCORING ELEMENTS.
C. HUMAN PLAYERS may only place SCORING ELEMENTS into the OBSERVATION ZONE during the AUTO and TELEOP periods of the MATCH.

Section 11.5 Post-MATCH

G502 ***Stop ROBOTS before entering the FIELD.** DRIVE TEAM members may not enter the FIELD to recover ROBOTS until:

A. the head REFEREE has signaled it is okay to enter the field and
B. the DRIVE TEAM has pressed the (■) stop button on their DRIVER STATION app

Violation: Verbal warning plus YELLOW CARD if subsequent violations at any point during the event.

Section 12.1 General ROBOT Design

R104 **There is a horizontal expansion limit.** After the MATCH has started, ROBOTS may expand beyond the STARTING CONFIGURATION but are still subject to sizing constraints. The sizing constraints are:

A. there is no vertical height limit relative to the TILE floor for ROBOT extensions,
B. the horizontal size boundary is a 20 in. x 42 in. (50.8 cm x 106.7 cm) rectangle measured parallel (coplanar) to the TILE floor,
C. the horizontal size boundary translates and rotates ~~with the overall configuration of~~ parallel (coplanar) to the TILE floor, with the CHASSIS of the ROBOT, which is the structural frame or base of a ROBOT that allows it to move and maneuver.
D. the maximum extent of all extensions of the ROBOT must be confined to the horizontal size boundary, with the ROBOT chassis remaining in the same relative location within the horizontal size boundary at all times (the location and orientation of the chassis within the horizontal size boundary is determined by the team), and
E. the horizontal size boundary as described in B is always parallel (coplanar) to the TILES, so ROBOTS which change orientation (drive, tip, roll, etc.) during the MATCH are still subject to the horizontal expansion limit measured parallel (coplanar) to the TILES.

Section 12.6 Power Distribution

R616 ***Use specified wire colors.** All non-SIGNAL LEVEL wiring with a constant polarity (i.e., except for outputs of motor controllers, or sensors) must use consistent color-coding with different colors used for the positive (red, yellow, white, brown, or black with white stripe) and negative/common (black, blue) wires. Integrated wires originally attached to legal COTS devices or wires included/sold by the manufacturer are considered part of the device and by default legal. Such wires are exempt from this rule.

Section 12.7 Control, Command & Signals System

R718 ***Configure Android devices appropriately.** ROBOT CONTROLLER and DRIVER STATION Android devices (smartphones, REV Control Hub, REV Driver Hub) must additionally be configured in the following ways:

A. REV Control Hub users must change the Wi-Fi password to a non-default password,
B. smartphone users must enable Airplane Mode,
C. on ROBOT CONTROLLER and DRIVER STATION Android devices, Wi-Fi must be enabled and Bluetooth must be disabled,
D. on smartphones and REV Driver Hub, remove all remembered Wi-Fi Direct Groups and Wi-Fi connections, leaving only the ROBOT CONTROLLER Wi-Fi connection.

Team Update 01

General

The Q&A system is now open for questions. As a reminder, each team has one account that can be used to ask questions on the Q&A. Please reference the Team Q&A Registration Instructions document to access your team's account.

Competition Manual

Section 1.10 Question and Answer System

- Moderators will answer team questions beginning each Monday, and close on Thursday at 12:00pm ET.

Section 9.7 SCORING ELEMENTS

- There are two different physical elements used in INTO THE DEEP: the SAMPLE and the CLIP. Red or blue ALLIANCE SPECIFIC SAMPLES can be combined ~~by a HUMAN PLAYER~~ with a CLIP to create a SPECIMEN. The SAMPLE and the SPECIMEN can be used to score points.

Section 9.7.2 CLIP

- The CLIP is a black plastic SCORING ELEMENT which is designed to be connected to a SAMPLE by a HUMAN PLAYER or ROBOT to create a SPECIMEN. The CLIP is a 2.5 in. (~6.4 cm) high by ~3.2 in. (~8.1 cm) long by 1 in. (~2.5 cm) wide .

Section 10.3.1 SCORING ELEMENTS

- From the SCORING ELEMENTS provided in ~~E~~ D and ~~F~~ E each ROBOT may be pre-loaded with either 1 SAMPLE or one SPECIMEN such that it is in contact with the ROBOT. SAMPLES or CLIPS not pre-loaded will remain in setup locations ~~E~~ D and ~~F~~ E.

Section 10.5.3 ROBOT Scoring Criteria

Additionally, the following conditions must be met:

- ROBOTS can only ASCEND their own ALLIANCE SPECIFIC RUNGS.
- ROBOTS must start ASCENDING from outside the SUBMERSIBLE ZONE.
- ROBOTS may not initiate contact with the HIGH RUNG while:
  - still supported by the TILES directly or transitively through another object (e.g., SCORING ELEMENTS or another ROBOT), ~~and~~ or
  - supported by any other part of the SUBMERSIBLE structure except for the LOW RUNG
- ROBOTS that are eligible for multiple ASCENTS or ASCENT and PARKING points only earn points for the highest value achievement.

If any of the above conditions are not met, it is not a valid ASCENT. If a ROBOT does not meet ASCENT criteria, the ROBOT may disengage from the SUBMERSIBLE and attempt the ASCENT again.

Section 11.4.2 TELEOP

G406 ***ROBOTS are motionless at the end of TELEOP**. ROBOTS must no longer be actively controlled after the end of the TELEOP period. This can be done by a DRIVE TEAM member pressing the (■) stop button

on the DRIVER STATION app or by discontinuing any operation of the ROBOT by the end of the ~~buzzer sound~~ MATCH period.

Violation: MINOR FOUL, MAJOR FOUL if actions result in a scoring achievement by the offending ROBOT

DRIVE TEAMS should make their best effort to stop gameplay immediately ~~when the end of the period game sound begins~~ at the end of the MATCH period. The end of MATCH period buzzer audio cue is approximately 3 seconds long and is used as an unofficial indicator to teams and REFEREES that the MATCH has ended.

Section 11.4.3 SCORING ELEMENT

G410 **1 SAMPLE or SPECIMEN at a time.** A ROBOT may not CONTROL more than 1 SAMPLE or 1 SPECIMEN at a time, either directly or transitively through other objects. There is no limit to the number of CLIPS a ROBOT may possess.

A ROBOT is in CONTROL of a SAMPLE or SPECIMEN if:

- the SAMPLE or SPECIMEN is fully supported by the ROBOT or
- it intentionally pushes a SAMPLE or SPECIMEN to a desired location or in a preferred direction (i.e., herding, often with a concave surface)

Exceptions to this rule are as follows:

- ROBOTS may MOMENTARILY exceed CONTROL limits while collecting SAMPLES that are in the SUBMERSIBLE ZONE.
- scored SAMPLES or SPECIMENS for the corresponding ALLIANCE are exempt from the CONTROL limit.

Violation: MINOR FOUL per SCORING ELEMENT, plus YELLOW CARD if excessive.

Examples of interaction with a SAMPLE or SPECIMEN that are not “CONTROL” include, but are not limited to:

A. PLOWING or “bulldozing” (inadvertent contact with a SAMPLE or SPECIMEN, typically via a flat or convex surface, while in the path of the ROBOT moving about the FIELD).

B. “deflecting” (being hit by a SAMPLE or SPECIMEN that bounces off a ROBOT).

Excessive violations of CONTROL limits include, but are not limited to, simultaneous CONTROL of 3 or more ~~SCORING ELEMENTS~~ SAMPLES and/or SPECIMENS, or frequent, greater-than MOMENTARY CONTROL (i.e., more than twice in a MATCH) of 2 or more SCORING ELEMENTS. REPEATED excessive violations of this rule do not result in additional YELLOW CARDS unless the violation reaches the level of egregious to trigger a G201 violation.

G411 **ROBOTS may not CONTROL the opposing ALLIANCE'S SPECIFIC SAMPLES or SPECIMENS.** ROBOTS may only have MOMENTARY CONTROL of opposing ALLIANCE SPECIFIC SAMPLES or SPECIMENS.

Violation: MINOR FOUL per SCORING ELEMENT, plus an additional MINOR FOUL per opposing SCORING ELEMENT for each 5-second interval that the situation continues. A MAJOR PENALTY is applied for each SCORING ELEMENT that is scored while in CONTROL.

Section 12.3 Fabrication

R307 ***COTS must be single DoF.** COTS COMPONENTS and MECHANISMS must not exceed a single degree of mechanical freedom (DoF). Examples of allowed COTS single degree of freedom MECHANISMS and COMPONENTS are as follows:

A. linear slide kit,
B. linear actuator kit,
C. single speed (non-shifting) gearboxes,
D. pulley,
E. turntable,
F. lead screw, and
G. single DoF gripper.

Allowed exceptions to this rule are:

H. ratcheting devices (wrenches, bearings, etc.),
I. holonomic wheels (omni or mecanum), and
J. dead-wheel odometry kits.

The general test for a single degree of freedom MECHANISM is whether the orientation and position of each COMPONENT in the MECHANISM can be generally predicted based on the orientation and position of a single COMPONENT (such as the input) of the system.

Example 1: A mecanum drivetrain is made up of four independent drive modules, each with a single DoF (ignoring the DoF of the mecanum wheels as allowed by this rule), attached to a common structure (e.g., chassis). The overall MECHANISM is still a single DoF.

Example 2: Dead wheel odometry modules, allowed by this rule, are typically composed of a 1 DoF wheel (ignoring the effect of the holonomic wheel) providing forward/backwards motion and a spring force providing an additional unique rotational or vertical motion, creating a two DoF system.

Example 3: Simple gripper claws, comprised of a single actuator moving two gripper jaws simultaneously or double actuators each controlling an independent gripper jaw, are by and large a single DoF. However, grippers that incorporate additional actuators providing additional twisting and/or bending actions (like a wrist) add degrees of freedom that are prohibited in COTS MECHANISMS.

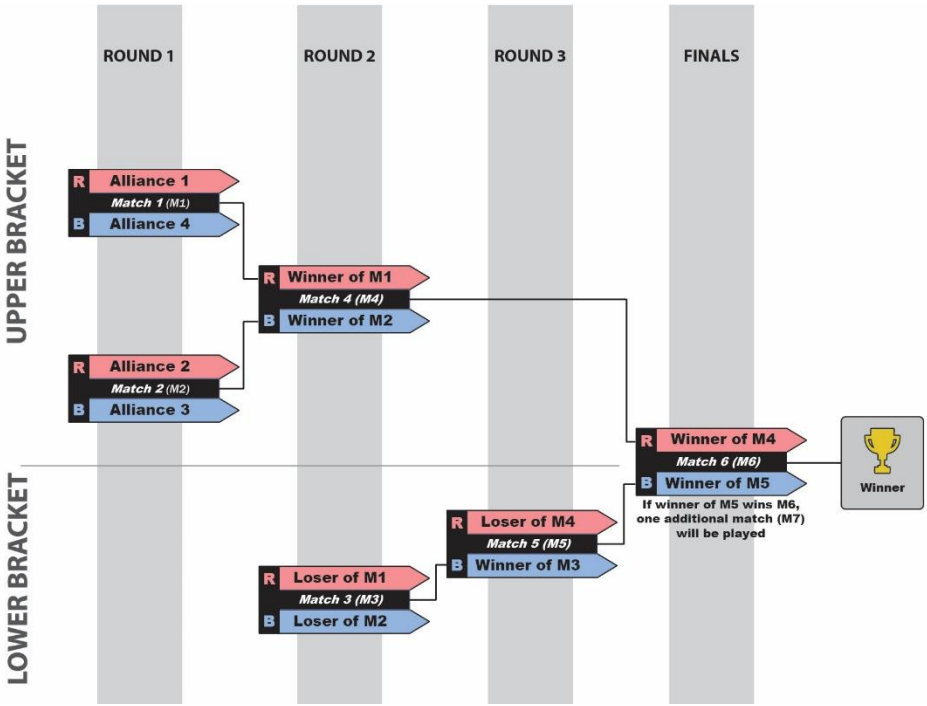
Section 12.4 ROBOT SIGNS

R402 ***ROBOT SIGNS indicate your ALLIANCE.** Each ROBOT SIGN must contain a 6.5 in. by 2.5 in. (16.5 cm by 6.4 cm) rectangle with a solid red or blue opaque background to indicate their ALLIANCE color (Figure 12-4), as assigned in the MATCH schedule at the event. Visible markings on ROBOT SIGNS when installed on the ROBOT, other than the following, are prohibited:

A. those required per R403,
B. solid white *FIRST* logos no larger than 1.5 in. (3.8 cm) in height (Figure 12-5)
C. small amounts of hook-and-loop tape, hard fasteners, or functional equivalents,
D. narrow areas of differing colors exposed at corners, folds, or cutouts,
E. dark narrow markings on background solely for template purposes,
F. cannot be powered or rely on power from any sources to illuminate/reveal ALLIANCE color

Section 13.6.4 4-ALLIANCE Bracket and Typical Timing

Correction to Match 5 lower bracket, loser of M4 plays winner of M3.



Team Update 00

The FIRST® Tech Challenge Competition Manual has undergone significant reorganization and modification since the 2023-2024 season. The Competition Manual is the ultimate source for rules and will be updated throughout the season to reflect any clarifications or changes. High level changes to the format of the manual were addressed in this blog post.

When reading the Competition Manual, avoid making any assumptions based on previous year's rules or prior interpretations. It's important to read the whole manual at least once and become an expert on sections of the manual that directly relate to your role and responsibilities on your team.

Teams are welcome to view existing questions and answers and to ask thoughtful and informed questions through the official Q&A system opening at September 16, 2024, 12:00p.m. ET. Before asking a question, please review section 1.10 in the Competition Manual for information on what types of questions should be asked.

Content Changes

A summary of **major content changes** made since the preview version of the manual (V0) was released in July can be found below. In addition to what is listed below, other editorial changes to verbiage, and modifications to figures and examples have been made. Be sure to read the current version of the competition manual in its entirety to see all updates and changes.

Section 1 Introduction

Added more precision to metric dimensions as described in section 1.7.

- Imperial dimensions are followed by comparable metric dimensions in parentheses to provide metric users with the approximate size, mass, etc. Metric conversions (e.g., dimensions) round to the nearest tenths, e.g., "17.5 in. (~44.5 cm)."

Section 5 Event Rules

Multiple rules have added text for clarity in this section. Make sure to read the updated section for the most current wording.

E702 ***Pit person limit during ceremonies is 5.** No more than 5 team members may be in the pits during ceremonies outside of playoff MATCHES. Each team must have at least 1 representative observing ceremonies to be responsible to relay important information to the entire team.

Section 12 ROBOT Construction Rules

R104 **There is a horizontal expansion limit.**

Horizontal expansion limit rules have been updated for clarity with:

- *revised wording to the rule text*
- *additions to the orange box text*
- *updated figure 12-1 Expansion Limits*
- *new figure 12-2 Expansion Limit Examples*

R402 ***ROBOT SIGNS indicate your ALLIANCE.**

E. cannot be powered or rely on power from any sources to illuminate/reveal ALLIANCE color

R504 ***Do not modify actuators unless explicitly allowed.**

B. the electrical leads may be trimmed to length as necessary and connectors or splices to additional wiring may be added, and purely electrical enclosures can be substituted with functionally equivalent replacements,

R505 ***All actuators must be powered from approved devices.**

Table 12 3: Power Regulators and Limits

Power Regulating Device	Part Number	Load Limit per Device
REV Robotics Servo Hub	REV-11-1855	2 Servos per Port

Additionally, references to the REV Robotics Servo Hub have been added to relevant tables in R614, R619, R713.

R609 ***Connect the ROBOT battery safely though the Main Power Switch.**

Table 0-1: Legal Power Switches

Power Switch	Part Number
Studica On/Off Power Switch Kit	70182

R702 ***Teams may not alter coprocessor software.** Modifying software on coprocessors, unless explicitly permitted in this rule or rule R703, is not allowed by teams. Firmware updates in binary form provided by the manufacturer may be applied as directed by the manufacturer.

The following are examples of allowed devices:

Example 1: The Adafruit BNO055 Absolute Orientation Sensor is an IMU package with an onboard ARM Cortex-M0 based coprocessor to crunch sensor data and produce composite output. Its coprocessor contains software that is not intended by the manufacturer to be modified by users.

Example 2: The SparkFun Optical Tracking Odometry Sensor is a laser and IMU tracking device that uses an onboard microcontroller to perform complex calculations and produce simplified results. SparkFun does provide the source code and toolchain for advanced users to modify/update the software, which is not permitted by this rule. Firmware updates provided by SparkFun are allowed to be applied to the device.

Example 3: The Digital Chicken Labs OctoQuad FTC Edition is an 8-channel encoder/PWM interface, utilizing a Raspberry Pi Pico coprocessor. Teams are not permitted to modify software running on the device, including replacing the software with their own. Updates provided in binary form by the manufacturer (Digital Chicken Labs) may be applied to the device.

R703 ***Some vision coprocessors can be programmed.** Programmable vision coprocessors that are natively supported by the FTC SDK may be programmed. The programmable vision coprocessors that are supported are:

Table 0-2: Supported programmable vision coprocessors

Device	Part Number
Limelight Vision Limelight 3A	LL_3A

Example 1: Optical Flow sensors are an example of a sensor that utilizes a vision coprocessor that is treated no differently than other coprocessors per R702.

Example 2: The DFRobot HuskyLens and the Charmed Labs Pixy2 are examples of vision coprocessors that are configurable but not programmable and are treated no differently than other coprocessors per R702.

Example 3: The OpenMV Cam, Luxonis OAK-1, and LimeLight Vision Limelight 3G are examples of programmable vision coprocessors that are prohibited.

See R715 for more information regarding vision coprocessor support.

R706 ***Bandwidth is restricted.** While in the ARENA and MATCH queue devices on the ROBOT network are limited to only the ROBOT CONTROLLER device and the DRIVER STATION device, and communication between the ROBOT CONTROLLER and the DRIVER STATION device is limited to ROBOT command data from the DRIVER STATION app, debugging data and telemetry from the ROBOT CONTROLLER app to the DRIVER STATION app, and single frame images used during ROBOT set-up pre-MATCH. When not in the ARENA or MATCH queue, additional devices (including, but not limited to, programming computers) may also communicate on the ROBOT network and teams must be careful to limit Wi-Fi streaming bandwidth between devices.

R710 ***Use assigned Wi-Fi bands and/or channels if requested.** Teams may be asked by the event director to use a specific Wi-Fi frequency band or channel on the day of competition. If requested, teams are required to do so. Teams may work with the FTA or wireless technical advisor (WTA) to find an alternate frequency band or channel if the suggested band/channel is deemed problematic by the FTA or WTA.

R710-R717 *Rules from R710 to R717 have been renumbered to make room for R710*

R715 ***Use only supported USB vision.** Only single image sensor vision devices that are natively supported by the ROBOT CONTROLLER app are allowed to connect to USB (stereoscopic cameras are not allowed). This includes the following:

A. all UVC compatible USB webcams (Logitech C270, and related), and
B. Vision coprocessors allowed per R703.

> To request support (or to provide sample drivers) for alternate USB vision devices for inclusion in future *FIRST* Tech Challenge seasons, please use the Part Suggestion Form.
>
> UVC compatible USB webcams may only use the UVC provided stream / data. No other interfaces or data provided by the webcam may be used.