**Team Update 07**

**General**

n/a

**Game Manual**

**Section 7.1 Personal Safety**

**G104** *Teams may not enable their ROBOTS on the FIELD.* Teams may not tether to the ROBOT while on the FIELD except in special circumstances (e.g. after Opening Ceremonies, before an immediate MATCH replay, etc.) and with the express permission from the FTA or a REFEREE.

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

- Teams are encouraged to consider this rule when developing their ROBOTS.
- FMS will not enable ROBOTS after the conclusion of the MATCH.
- **Tethering** *For the purposes of this rule, tethering* includes any wired or wireless connection used to electrically energize and/or control elements on the ROBOT.
- The safety of teams and volunteers in close proximity to ROBOTS and ARENA elements on the FIELD is of the utmost importance, therefore ROBOTS or ROBOT COMPONENTS may not be enabled in any way on the FIELD before or after the MATCH.
- ROBOTS need to be safely transported off the FIELD and back to the pits after the MATCH, and there may be bystanders, doorways, or height restrictions along the route.

**Depluralization**

There are many rules in the 2024 Game Manual where plural nouns are used arbitrarily. In some instances, the plural noun makes the rule or the assignment of the violation ambiguous (e.g. if a rule says HIGH NOTES cannot be entered into the FIELD before the final 20 seconds of a MATCH, and a violation results in a FOUL, does that mean it’s a FOUL per HIGH NOTE entered prematurely, or a FOUL for entering any number of HIGH NOTES prematurely?) The edits below bring the language of each rule into parity with the intended violation assignment and the language at the start of Section 6.6. Violations (“Upon any instance of a rule violation, unless otherwise noted, 1 or more of the penalties listed in Table 6-3 are assessed.”) These edits are considered “housekeeping,” and don’t change the original intent of any of the rules or their violations.

**G101** *Humans, stay off the FIELD until green.* Team members A team member may only enter the FIELD if FIELD lighting (SUBWOOFER and FIELD facing side of the team signs and timers) is green, unless explicitly instructed by a REFEREE or an FTA.

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

**G102** *Never step over the guardrail.* Team members A team member may only enter or exit the FIELD through open gates.
Violation: Verbal warning, plus YELLOW CARD if subsequent violations during the event.

G103 *Be careful what you interact with.* Team members are prohibited from the following actions with regards to interaction with ARENA elements.

A. climbing on or inside,
B. hanging from,
C. manipulating such that it doesn't return to its original shape without human intervention, and
D. damaging.

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

G202 *Don't bang on the glass.* Team members may never strike or hit the DRIVER STATION plastic windows.

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

G207 *Don't abuse ARENA access.* Team members (except DRIVERS, HUMAN PLAYERS, and COACHES) granted access to restricted areas in and around the ARENA (e.g. via TECHNICIAN button, event issued Media badges, etc.) may not assist or use signaling devices during the MATCH. Exceptions will be granted for inconsequential infractions and in cases concerning safety.

Violation: YELLOW CARD.

G210 *Keep it together.* ROBOTS may not intentionally detach or leave parts on the FIELD.

Violation: RED CARD.

G211 *Don't expect to gain by doing others harm.* Strategies clearly aimed at forcing the opponent ALLIANCE to violate a rule are not in the spirit of FIRST Robotics Competition and not allowed. Rule violations forced in this manner will not result in an assignment of a penalty to the targeted ALLIANCE.

Violation: FOUL, plus TECH FOUL if REPEATED.

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

A. The expected MATCH start time has passed, and
B. The DRIVE TEAM has access to the FIELD and is neither MATCH ready nor making a good faith effort, as perceived by the Head REFEREE, to quickly become MATCH ready.

Violation: Verbal warning, or if a subsequent violation within the tournament phase (i.e. Qualifications or Playoffs), TECH FOUL applied to their upcoming MATCH. If the DRIVE TEAM is not MATCH ready within 2 minutes of the verbal warning/TECH FOUL and the Head REFEREE perceives no good faith effort by the DRIVE TEAM to quickly become MATCH ready, DISABLED.

G401 *Behind the lines.* In AUTO, DRIVE TEAM members staged behind a STARTING LINE may not contact anything in front of that STARTING LINE, unless for personal or equipment safety, to press the E-Stop or A-Stop, or granted permission by a Head REFEREE or FTA.

Violation: FOUL, regardless of the number of items contacted.

G402 *Let the ROBOT do its thing.* In AUTO, DRIVE TEAMS may not directly or indirectly interact with ROBOTS unless for personal safety, OPERATOR CONSOLE safety, or pressing an E-Stop or A-Stop.

Violation: FOUL and YELLOW CARD
G403 **1 NOTE at a time.** In AUTO, **ROBOTS** a **ROBOT** may not CONTROL more than 1 NOTE at a time, either directly or transitively through other objects.

A ROBOT is in CONTROL of a NOTE if:

A. the NOTE is fully supported by the ROBOT or
B. it intentionally pushes a NOTE to a desired location or in a preferred direction (i.e. herding).

Violation: **TECH FOUL per additional NOTE.**

G405 **Limited AUTO opponent interaction.** In AUTO, a **ROBOT** whose BUMPERS have completely crossed the CENTER LINE (i.e. to the opposite side of the CENTER LINE from its ROBOT STARTING ZONE) may contact neither an opponent ROBOT nor NOTES a NOTE staged in the opponent’s WING.

Violation: **TECH FOUL.**

G406 **ROBOTS: use GAME PIECES as directed.** ROBOTS **A ROBOT** may not deliberately use **GAME PIECES** a **GAME PIECE** in an attempt to ease or amplify challenges a **challenge** associated with **FIELD elements** a **FIELD element.**

Violation: **TECH FOUL per NOTE.**

G407 **Keep NOTES in bounds.** ROBOTS **A ROBOT** may not intentionally eject NOTES a NOTE from the FIELD (either directly or by bouncing off a FIELD element or other ROBOT) other than through their SPEAKER or AMP.

Violation: **TECH FOUL per NOTE.**

G408 **ROBOTS, no HIGH NOTES.** ROBOTS **A ROBOT** may not cause HIGH NOTES a **HIGH NOTE** to leave the FIELD (including through an AMP or SPEAKER), score on a MICROPHONE, or enter a TRAP.

Violation: **TECH FOUL per HIGH NOTE.** If a ROBOT scores a HIGH NOTE on a MICROPHONE, its ALLIANCE is ineligible for the ENSEMBLE RP.

G410 **Don’t abuse GAME PIECES.** **Neither a ROBOTS and nor a HUMAN PLAYERS** may not damage **a GAME PIECES.**

Violation: Verbal warning, plus TECH FOUL if REPEATED. If via a ROBOT and the Head REFEREE determines that further damage is likely to occur, DISABLED. Corrective action (such as eliminating sharp edges, removing the damaging MECHANISM, and/or re-inspection) may be required before the ROBOT may compete in subsequent MATCHES.

G411 **ROBOTS must be safe.** A **ROBOT** may not pose an undue hazards to humans a **human**, ARENA elements **an ARENA element**, or other ROBOTS **another ROBOT** in the following ways:

A. the ROBOT or anything it CONTROLS, e.g. a NOTE, contacts anything outside the FIELD except for either of the following:
   a. MOMENTARY contact inside the CHUTE and
   b. contact with a surface inside the AMP via a NOTE
B. its BUMPERS fail such that a segment completely detaches,
C. a corner (as defined in **R401**) of its FRAME PERIMETER is exposed,
D. its team number or ALLIANCE color are indeterminate,
E. its BUMPERS leave the BUMPER ZONE REPEATEDLY or for more than a MOMENTARY amount of time, or
F. its operation or design is dangerous or unsafe.

Violation: **DISABLED.**
G414  **No full-court shots.** A ROBOT with any part of its BUMPERS in their opponent’s WING may not cause a NOTE to travel into or through their WING.

Violation: FOUL, plus TECH FOUL for subsequent violations in the MATCH.

G415  **Watch your ARENA interaction.** A ROBOT may not damage an ARENA element. ROBOTS are prohibited from the following interactions with ARENA elements, except chain (see G416) and GAME PIECES (see Section 7.4.2 GAME PIECES).

- A. grabbing,
- B. grasping,
- C. attaching to (including the use of a vacuum or hook fastener to anchor to the FIELD carpet),
- D. becoming entangled with, and
- E. suspending from.

Violation: TECH FOUL, plus YELLOW CARD if REPEATED or longer than MOMENTARY. If the Head REFEREE infers that damage is likely, DISABLED. Corrective action (such as eliminating sharp edges, removing the damaging MECHANISM, and/or re-inspection) may be required before the ROBOT will be allowed to compete in subsequent MATCHES.

G420  **There’s a 5-count on PINS.** ROBOTS may not PIN an opponent’s ROBOT for more than 5 seconds. A ROBOT is PINNING if it is preventing the movement of an opponent ROBOT by contact, either direct or transitive (such as against a FIELD element). A PIN count ends once any of the following criteria below are met:

- A. the ROBOTS have separated by at least 6 ft. (~183 cm) from each other for more than 5 seconds,
- B. either ROBOT has moved 6 ft. from where the PIN initiated for more than 5 seconds, or
- C. the PINNING ROBOT gets PINNED.

For criteria A and B, the PIN count pauses once ROBOTS are separated by 6 ft. until either the PIN ends or the PINNING ROBOT moves back within 6 ft., at which point the PIN count is resumed.

Violation: FOUL, plus an additional TECH FOUL for every 5 seconds in which the situation is not corrected.

G425  **No wandering.** DRIVE TEAMS must remain in their designated areas as follows:

- A. DRIVERS may not contact anything outside the area in which they started the MATCH (i.e. the ALLIANCE AREA or SOURCE AREA),
- B. DRIVERS must use the OPERATOR CONSOLE in the DRIVER STATION to which they are assigned, as indicated on the team sign,
- C. HUMAN PLAYERS may not contact anything outside the area in which they started the MATCH (i.e. the ALLIANCE AREA or SOURCE AREA),
- D. COACHES may not contact anything outside the ALLIANCE AREA or in front of their COACH LINE, and
- E. TECHNICIANS may not contact anything outside their designated area.

Exceptions are granted in cases concerning safety and for actions that are inadvertent, MOMENTARY, and inconsequential.

Violation: FOUL

G427  **DRIVE TEAMS, watch your reach.** DRIVE TEAM members may not extend into the CHUTE.
Violation: FOUL.

G428 *Humans: use GAME PIECES as directed.* DRIVE TEAM members, A DRIVE TEAM member may not deliberately use GAME PIECES a GAME PIECE in an attempt to ease or amplify challenges a challenge associated with FIELD elements a FIELD element.

Violation: TECH FOUL per GAME PIECE.

G429 *NOTE delivery.* NOTES A NOTE may only be introduced to the FIELD through the SOURCE.

Violation: TECH FOUL per NOTE

G430 *HIGH NOTE delivery.* HIGH NOTES A HIGH NOTE may only be entered on to the FIELD during the last 20 seconds of the MATCH by a HUMAN PLAYER in front of the COACH LINE.

Violation: FOUL.

G501 *Leave promptly.* DRIVE TEAMS A DRIVE TEAM member may not cause significant or multiple delays to the start of a subsequent MATCH, scheduled break content, or other FIELD activities.

Violation: Verbal warning plus YELLOW CARD if subsequent violations at any point during the event.
Team Update 06

General

KitBot

The KitBot Java Code Zip had code updated to disable the formatting check when building.

Playoff Tournament Information

The Playoff Alliance Communication document is published in the Additional Season Material section of the CRESCENDO – Season Materials page.

Game Manual

Section 7.4.3 ROBOT

**G411  *ROBOTS must be safe.** A ROBOT may not pose undue hazards to humans, ARENA elements, or other ROBOTS in the following ways:

A. the ROBOT or anything it CONTROLS, e.g. a NOTE, contacts anything outside the FIELD (except for either of the following:
   a. MOMENTARY contact inside the CHUTE), and
   b. contact with a surface inside the AMP via a NOTE

B. ...

**G413  Expansion limits.** A ROBOT may not expand beyond either of the following limits:

A. its height, as measured when it’s resting normally on a flat floor, may not exceed 4 ft. (~122 cm) or
B. it may not extend more than 1 ft. (~30 cm) from its FRAME PERIMETER.

Overexpansion due to damage, provided the expansion isn’t leveraged for strategic benefit, is an exception to this rule. If the over-expansion is due to damage and not used for strategic benefit, as perceived by a REFEREE, it is an exception to this rule, and no penalty is imposed.

Violation: FOUL, or TECH FOUL if the over-expansion is used for strategic benefit, including if it impedes or enables a scoring action.

...
parks such that its extension blocks opponent ROBOTS from reaching their PODIUM. A TECH FOUL is issued.

C. a latch restraining a shooter MECHANSIM from extending above the limit defined in A breaks, allowing the MECHANSIM to shift such that it’s above the plane of other ROBOTS. The ROBOT uses this new height to get above a defender and score NOTES in their SPEAKER. A TECH FOUL is issued.

Section 7.4.3 ROBOT

G415 Watch your ARENA interaction. A ROBOT may not damage an ARENA element. ROBOTS are prohibited from the following interactions with ARENA elements, except chain (see G416) and GAME PIECES (see Section 7.4.2 GAME PIECES).

A. grabbing,
B. grasping,
C. attaching to (including the use of a vacuum or hook fastener to anchor to the FIELD carpet),
D. becoming entangled with,
E. damaging, and
F. suspending from.

Section 8.2 ROBOT Safety & Damage Prevention

R201 *No digging into carpet. Traction devices must not have surface features that could damage the ARENA (e.g. metal, sandpaper, hard plastic inflexible studs, cleats, hook-loop fasteners or similar attachments).
Team Update 05

General

Field Assets

- The Layout & Marking Diagram is updated to reflect the width of the AMP ZONE as measured from the guardrail plastic instead of the guardrail metal.
- TE-24300 SPEAKER ReadMe document V2 removes a duplicate Row C from the Example Cut List section.

FIRST Impact Award

The FIRST Impact Award Eligibility section of the Submitted Awards webpage is updated as follows:

Teams are eligible for the FIRST Impact Award at each Regional or District event at which they compete. District Teams are not eligible to win, nor can they interview for the FIRST Impact Award at Regional events or inter-district events. Teams will be restricted to earning this award once at each level of competition and once they have won, they cannot interview. In other words, once a team has earned the FIRST Impact Award at a Regional or District event, they may not interview for or earn it again that season at a later Regional or District Event.

KitBot

The KitBot Java code in this .zip and Java Code Guide is updated to add missing subsystem requirements in the auto example.

WPILib

An update for C++\Java WPILib (2024.2.1) has been released, fixing a number of bugs discovered since Kickoff. More details and upgrade instructions can be found on the WPILib Releases page.

Game Manual

Section 11.1.3 Playoff Performance

This attribute measures team performance as part of an ALLIANCE.

Teams earn points based on how far their ALLIANCE advances in the Playoff MATCHES and the percentage of MATCH wins in which the team participated (i.e. was on the LINEUP for that MATCH). The ALLIANCE Advancement points are shown that advance to at least MATCH 12 earn Double Elimination (DE) Points per the formula below, where $\beta$ is defined in Table 11-4.
### District Playoff Performance

#### Double Elimination Points, β values

<table>
<thead>
<tr>
<th>ALLIANCE Finish</th>
<th>ALLIANCE Advancement Points</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finals MATCH wins 1st Place</strong> (Winners)</td>
<td>5 20</td>
<td></td>
</tr>
<tr>
<td><strong>2nd Place (Finalists)</strong></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>3rd Place (loser of MATCH 13)</strong></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>4th Place (loser of MATCH 12)</strong></td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

In most cases, unless a BACKUP is recruited, a team plays in 100% of the Playoff **DE MATCHES** won by their **ALLIANCE**, thus their **Playoff Performance points** **DE Points** simply equals their **ALLIANCE Advancement points** **β**. If a team does not play 100% of the Playoff DE MATCHES won by their **ALLIANCE**, their **Playoff Performance points** **DE Points** equals their **ALLIANCE Advancement points** earned during the double-elimination portion of the Playoffs (i.e., MATCHES 1-13) **β value** multiplied by the percentage of Playoff DE MATCHES won by their ALLIANCE in which that team was a participant, plus points earned per Finals MATCH participated. If the result is not a whole number, the value is rounded up to the nearest integer.

Teams on the winning **ALLIANCE** are awarded additional **Finals Points**, which are 5 points for each Finals MATCH won and in which the team participated, up to a maximum of 10 points.

For example, if Team X’s **ALLIANCE** wins the event, but Team X only played in 2 MATCHES won by their **ALLIANCE**, MATCH 13 and Final 1, Team X’s **Playoff Performance points** are 20 * (1/5) + 5 = 9 points. If the result is not a whole number, the value is rounded up to the nearest integer.

The maximum **ALLIANCE Advancement points** **number of Playoff Performance Points** a team can earn is 30 (20 points from the double-elimination tournament **DE points** + 10 in Finals **MATCHES Points**).
Team Update 04

General

Official Q&A

**Question 23** in the FIRST Robotics Competition Q&A led to a good discussion among the folks who answer those questions. The answer is nuanced, and we'd like to use this Team Update to bring attention to it.

Game Manual

**Section 5.7 GAME PIECES**

NOTES undergo wear and tear during a competition. Generally, a NOTE that still appears to look approximately like a NOTE is considered a NOTE for the purposes of rule evaluation and scoring, whether damaged or not. Small chunks of a NOTE are not considered a NOTE.

**Section 6.5.4 SPOTLIGHTING**

ALLIANCES may SPOTLIGHT ROBOTS by scoring a HIGH NOTE on a MICROPHONE. A HIGH NOTE is scored on the MICROPHONE if the NOTE surrounds, i.e. encircles, the MICROPHONE.

**Q70** has been updated to reflect this edit.

**Section 6.8 Other Logistics**

NOTES that leave the FIELD are not returned to game play by FIELD STAFF.

**Section 7.4.3 ROBOT**

**G415** Watch your ARENA interaction. ROBOTS are prohibited from the following interactions with ARENA elements, except chain (see **G416**) and GAME PIECES (see **Section 7.4.2 GAME PIECES**).

- A. grabbing,
- B. grasping,
- C. attaching to (including the use of a vacuum or hook fastener to anchor to the FIELD carpet),
- D. becoming entangled with, and
- E. damaging, and
- F. suspending from.

Violation: TECH FOUL, plus YELLOW CARD if REPEATED or longer than MOMENTARY. If the Head REFEREE infers that damage is likely, DISABLED. Corrective action (such as eliminating sharp edges, removing the damaging MECHANISM, and/or re-inspection) may be required before the ROBOT will be allowed to compete in subsequent MATCHES.
Section 10.5.3 Qualification Ranking

Table 10-1 Qualification MATCH ranking criteria

<table>
<thead>
<tr>
<th>Order Sort</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th</td>
<td>Average ALLIANCE PARK, ONSTAGE, and NOTE in TRAP STAGE points</td>
</tr>
</tbody>
</table>

Section 10.6.2.1 Playoff MATCH Ties

Table 10-3 Playoff MATCH Tiebreaker Criteria

<table>
<thead>
<tr>
<th>Order Sort</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd</td>
<td>ALLIANCE PARK, ONSTAGE, and NOTE in TRAP STAGE points</td>
</tr>
</tbody>
</table>

Section 11.2 District Championship Eligibility

Table 11-5 2024 District Championship Capacities

<table>
<thead>
<tr>
<th>District Championship</th>
<th>Capacity</th>
<th>Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST Chesapeake District Championship</td>
<td>64 54</td>
<td>1</td>
</tr>
</tbody>
</table>
Team Update 03

General

KitBot
The KitBot Build Instructions now include a troubleshooting tip regarding current limits.

NOTE Availability

FIRST and AndyMark are working with the manufacturer on a second production run of NOTES. We expect a second order to be manufactured by January 25, and it will be sent to AndyMark in Indiana by air.

AndyMark expects to be able to accept new orders the week of February 5. The actual date will be announced as soon as shipping details are confirmed. To receive this notification, enter your preferred email address on AndyMark’s Note Product page.

Existing backorders will receive (up to) an additional 24 notes. New orders are still capped at 6 per team.

We apologize for the inconvenience and appreciate your patience as we worked through this challenge.

Team Versions

• TE-24316 Speaker Top Side Panel, Rev A repositions a dimension on p2 from B3 to B4.

• The ReadMe document for TE-24200, V3 updates the length of TE-24211 in the example cut list from 56¼ in. to 52⅜ in.

Game Manual

Section 5.6.1 SPEAKER

ALLIANCE colored lights in the SUBWOOFER turn on when AMPLIFICATION starts and recede, second by second, as AMPLIFICATION progresses, and if AMPLIFICATION ends before the countdown completes (because the maximum number of NOTES have been scored), the SUBWOOFER and SPEAKER lights turn off.

Section 7.2 Conduct

G206  *Don't violate rules for RPs. A team or ALLIANCE may not collude with their opponent to each purposefully violate a rule in an attempt to earn each ALLIANCE a Ranking Point.

Violation: YELLOW CARD and the ALLIANCE is ineligible for MELODY and ENSEMBLE RPs.
can contact Team F in their STAGE ZONE leading in both ALLIANCES being awarded the ENSEMBLE RP.

Section 11.2 District Championship Eligibility

Table 11-5 2024 District Championship Capacities

<table>
<thead>
<tr>
<th>District Championship</th>
<th>Capacity</th>
<th>Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST Israel District Championship</td>
<td>40 45</td>
<td>1</td>
</tr>
</tbody>
</table>
Team Update 02

General

KitBot
- The CAD and Drawings Zip package and the Onshape model posted on the KitBot webpage are updated to reflect the correct location for 2 of the “long churros.”
- The following translated materials are now available on the KitBot webpage:
  - KitBot Enhancement/Iteration Guide in Chinese
  - KitBot LabVIEW Code Guide in French
  - KitBot C++ Code Guide in French
- The axis cubing examples in the C++ and Java Code Guides are updated to reflect that the inputs are already squared.

Q&A
The answer to Q9 has been revised as follows:

We cannot comment absolutely on hypothetical scenarios. The ultimate decision would be determined by the REFEREES at your event, with the final call made by the Head REFEREE. However the intent of CONTROL is not considered when determining violations of G403 (part A or a NOTE lodged in a ROBOT) and G409.

Game Manual

Section 5.2 Areas, Zones, & Markings
- SPIKE MARK: 1 of 11 1 ft. 1 in. (33 cm) marks used to identify placement of NOTES before the MATCH.

Section 6.3.4 GAME PIECES
NOTES on SPIKE MARKS are staged such that each NOTE covers the opposite ends of each SPIKE MARK.

Section 6.5.2 ROBOT Scoring Criteria
To qualify for ONSTAGE points, a ROBOT may only be contacting:

A. their truss legs (pink shaded elements in Figure 6-3) via ROBOT BUMPERS,
B. GAME PIECES,
C. chain-facing vertical surfaces of their core or the nearest flap (with regards to the chain used by the ONSTAGE ROBOT, green shaded elements in Figure 6-3),
D. carpet facing surfaces of their core (blue shaded elements in Figure 6-3), and
E. a single STAGE chain (on their STAGE) (highlighted in orange in Figure 6-3),
F. another ROBOT qualified for ONSTAGE points,
G. another ROBOT awarded the ENSEMBLE RP because of a G424 infraction, and
H. an opponent ROBOT.

Figure 6-3 is updated to reflect the edit to C above.
Section 6.5.3 AMPLIFICATION

AMPLIFICATION increases the number of MATCH points awarded for NOTES scored in a SPEAKER per Table 6-2. To AMPLIFY, an ALLIANCE must have at least 2 NOTES through their AMP. Once this criterion is met, the HUMAN PLAYER may press the AMP button which AMPLIFIES their SPEAKER for 10 seconds or until 4 NOTES are scored in that SPEAKER, whichever comes first. Due to NOTE transit time from the SPEAKER opening to the sensor array, there is a 3-second extension on the end of the nominal AMPLIFICATION time in account for NOTES that entered the SPEAKER within 10 seconds of the AMP button being pressed but haven’t yet been processed. An ALLIANCE must collect another 2 NOTES through their AMP after AMPLIFICATION ends before they are able to AMPLIFY their SPEAKER again. While NOTES delivered through the AMP after the 2-NOTE threshold is reached or during AMPLIFICATION do not contribute to the next AMPLIFICATION or Cooperition requirement, they do earn MATCH points (in other words, and ALLIANCE can only “bank” up to 2 NOTES at a time toward AMPLIFICATION or Cooperition).

Section 7.4.2 GAME PIECES

G408 ROBOTS, no HIGH NOTES. ROBOTS may not cause HIGH NOTES to leave the FIELD (including through an AMP or SPEAKER), score on a MICROPHONE, or enter a TRAP.

Violation: TECH FOUL per HIGH NOTE. If a ROBOT scores a HIGH NOTE on a MICROPHONE, its ALLIANCE is ineligible for the ENSEMBLE RP.

Section 7.4.4 Opponent Interaction

G424 STAGE protection. A ROBOT may not contact (either directly or transitively through a NOTE and regardless of who initiates contact) an opponent ROBOT if either of the following criteria are met:
A. the opponent ROBOT has any part of its BUMPERS in its STAGE ZONE and it is not in contact with the carpet or

B. any part of either ROBOT'S BUMPERS are in the opponent's STAGE ZONE during the last 20 seconds of the MATCH.

Section 8.4 BUMPER Rules

R409  *Fill BUMPER corners.

*Figure 8-7 has been updated to improve conceptual clarity...*

---

**Section 14 Glossary**

*Only edited rows shown below.*

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHUTE</td>
<td>a 50° sloped tunnel that leads to the opening in the SOURCE wall</td>
</tr>
<tr>
<td>MICROPHONE</td>
<td>a vertical post centered above each TRAP and mounted to top of core structure</td>
</tr>
</tbody>
</table>
Team Update 01

General

NOTE Availability

Due to NOTE demand exceeding inventory, FIRST and AndyMark are capping the quantity of NOTES shipping to teams. Orders placed before NOTES went out of stock will ship, however not with more than 24 NOTES (e.g. an order of 10 will get 10, and order of 30 will get 24). For teams with more than 24 NOTES on their order, AndyMark will “backorder” the extra NOTES and work closely with customers to determine future NOTE shipments, based on availability. NOTE sales will reopen at noon (Eastern) on Wednesday, January 10, 2024, and orders will be capped at 6 per team.

We apologize for underestimating the number of NOTES teams would require, regret the inconvenience and frustration this is causing, and hope to remedy the situation soon (we are working with the manufacturer to explore having additional NOTES produced quickly).

Thank you for your patience.

Team Field Versions

The ReadMe file for the STAGE, TE-24200 is updated to exclude internal editorial comments.

FIRST Championship Radios

The plan is to use the next generation of ROBOT radio at the 2024 FIRST® Championship, assuming the devices successfully pass decision gates over the next 3 months. For more information, please see this recent blog.

Kit of Parts

The Kickoff Kit Checklist for Season Specific Box is updated to correct the number of participation pins in each box (correct amount is 30).

Game Manual

Section 5.1 FIELD

This edit is replicated in the definition of the FIELD in Section 14 Glossary.

Each FIELD for CRESCENDO is an approximately 26 ft. 11¼ in. (~802 821 cm) by 54 ft. 3¾ in. (~1654 cm) carpeted area bounded by inward facing surfaces of the ALLIANCE WALLS, SOURCES, AMPS and AMP pocket walls, and guardrails.
Section 5.6.1 SPEAKER

The opening is 3 ft. 5¾ in. (~105 cm) wide and extends 1 ft. 16 6 in. (~46 cm) into the FIELD.

Section 5.9 The FIELD Management System

Table 5-1 Audio cues

<table>
<thead>
<tr>
<th>Event</th>
<th>Timer Value</th>
<th>Audio Cue</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATCH start</td>
<td>0:15 (for AUTO)</td>
<td>“Cavalry Charge”</td>
</tr>
<tr>
<td>AUTO ends</td>
<td>0:00 (for AUTO)</td>
<td>“Buzzer”</td>
</tr>
<tr>
<td>TELEOP begins</td>
<td>2:15</td>
<td>“3 Bells”</td>
</tr>
<tr>
<td>Final 20 seconds</td>
<td>0:20</td>
<td>“Guitar Riff”</td>
</tr>
<tr>
<td>MATCH end</td>
<td>0:00</td>
<td>“Buzzer”</td>
</tr>
<tr>
<td>MATCH stopped</td>
<td>n/a</td>
<td>“Foghorn”</td>
</tr>
</tbody>
</table>

Section 6.5.3 AMPLIFICATION

This edit is to remedy an accidental omission; the content was meant to be in the original manual release.

Once this criterion is met, the HUMAN PLAYER may press the AMP button which AMPLIFIES their SPEAKER for 10 seconds or until 4 NOTES are scored, whichever comes first.

Section 7.4.1 AUTO

G404 Only close shots in AUTO. In AUTO, a ROBOT whose BUMPERS are completely outside their WING may not cause a NOTE to travel into or through their WING such that the NOTE enters the WING while not in contact with that ROBOT.

Violation: TECH FOUL.
Section 7.4.2 GAME PIECES

G408  ROBOTS, no HIGH NOTES. ROBOTS may not cause HIGH NOTES to leave the FIELD (including through an AMP or SPEAKER), score on a MICROPHONE, or enter a TRAP.

Violation:  TECH FOUL per HIGH NOTE.

Section 7.4.3 ROBOT

G413  Expansion limits. A ROBOT may not expand beyond either of the following limits:

A.  its height, as measured when it's resting normally on a flat floor, may not exceed 4 ft. (~122 cm) or

B.  it may not extend more than 1 ft. (~30 cm) from its FRAME PERIMETER.

Overexpansion due to damage, provided the expansion isn’t leveraged for strategic benefit, is an exception to this rule.

Violation: FOUL, or TECH FOUL if the over-expansion impedes or enables a scoring action.

Height is intended to be measured as if the ROBOT is resting on a flat floor, not relative to the height of the ROBOT from the FIELD carpet. For example, a ROBOT that is attempting to get ONSTAGE may actually exceed the height limit when compared to the carpet of the FIELD.

Figure 7-3 ROBOT height elaboration
Section 7.4.5 HUMAN

G426 *COACHES and other teams: hands off the controls. A ROBOT shall be operated only by the DRIVERS and/or HUMAN PLAYERS of that team. A COACH activating their E-Stop or A-Stop is the exception to this rule.

Violation: TECH FOUL, plus RED CARD if greater-than-MOMENTARY.

Exceptions may be made before a MATCH for major conflicts, e.g. religious holidays, major testing, transportations issues, etc.

Section 8.5 Motors & Actuators

R503 *Don’t modify motors (mostly).

H. Any number of #10-32 plug screws may be removed from the Falcon 500 and the Kraken X60.
*Don’t overload controllers.*

Table 8-2 Power regulating device allotments (edited rows only)

<table>
<thead>
<tr>
<th>Electrical Load</th>
<th>Motor Controller</th>
<th>Relay Module</th>
<th>Pneumatics Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>AndyMark RedLine Motor</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Banebots</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>CIM</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>REV Robotics NEO Brushless</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>REV Robotics NEO 550</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>REV Robotics NEO Vortex</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VEX Mini-CIM</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>WCP Kraken X60</td>
<td></td>
<td>(integrated controller only)</td>
<td>No</td>
</tr>
<tr>
<td>WCP RS775 Pro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTR Electronics/VEX Falcon 500</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Nidec Dynamo BLDC Motor w/ Controller</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Playing With Fusion Venom</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>WCP Kraken X60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section 8.7 Control, Command & Signal Systems

R701  *Control the ROBOT with a roboRIO.* ROBOTS must be controlled via 1 programmable NI roboRIO or roboRIO 2.0 (P/N am3000 or am3000a, both versions referred to throughout this manual as “roboRIO”), with image version 2024_v3.1 2024_v2.1 or later.

There are no rules that prohibit co-processors, provided commands originate from the roboRIO to enable and disable all power regulating devices. This includes motor controllers legally wired to the CAN bus.

Section 8.9 OPERATOR CONSOLE

R901  *Use the specified Driver Station Software.* The Driver Station Software provided by National Instruments (install instructions found here) is the only application permitted to specify and communicate the operating mode (i.e. AUTO/TELEOP) and operating state (Enable/Disable) to the ROBOT. The Driver Station Software must be version 24.1 24.0 or newer.

Teams are permitted to use a portable computing device of their choice (laptop computer, tablet, etc.) to host the Driver Station Software while participating in MATCHES.
Section 11.2 District Championship Eligibility

Table 11-5 2024 District Championship Capacities (edited rows only)

<table>
<thead>
<tr>
<th>District Championship</th>
<th>Capacity</th>
<th>Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indiana State Championship</td>
<td>32 38</td>
<td>1</td>
</tr>
</tbody>
</table>
Team Update 00

The **FIRST® Robotics Competition Game Manual** has undergone significant reorganization and modification since the 2023 season. Because of the degree of the changes, red-line coverage of the changes would be extensive and difficult to parse. As a result, the approach taken in this Team Update 00 is to describe changes to content only. Editorial changes to verbiage (e.g. improving explanation language like in the blue box for G419), rule and section references, game specific examples that relate to evergreen content, and formatting changes are not described.

As always, 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. As always, you’re welcome to ask (thoughtful, informed) questions through the official Q&A system, opening at noon (Eastern time) on Wednesday, January 10, 2023.

**Organizational Changes**

Changes that relate to the layout and order of the document’s contents are described in the list below:

- Some content formerly presented as a rule is now presented as a process description or in a list of prerequisites. For example, the requirement that DRIVE TEAMS in the ALLIANCE AREA start behind the STARTING LINE is now presented in a list of requirements for a MATCH to being instead of as a rule with a violation imposed if broken.

- Some rules are combined.

- Some rules or parts of rules are broken up and distributed to other rules, process descriptions, or stand alone.

- The Event Manual is incorporated into the end of the document.

**Content Changes**

Changes to evergreen content (i.e. rules with green headlines) are described below. Sections are presented according to the 2024 manual presentation, and rule references present the 2023 rule number first followed by the 2024 rule number.

**Section 7 Game Rules**

- **G103 ⇒ G412**, Keep your BUMPERS low.

  Because the reference to REPEATED and greater than MOMENTARY violations of the BUMPER ZONE is in G411, the violation omits

  *If REPEATED or greater than MOMENTARY, DISABLED*

- **G202 ⇒ G420**, There’s a 5-count on PINS.

  The description of the procedural PIN count and PIN count suspension is promoted from the Blue Box to the rule itself.
- **G204 ⇒ G417**, Stay out of other ROBOTS.

  The reference to contact within a BUMPER opening is omitted.

- **G205 ⇒ G418**, This isn’t combat robotics.

  Part B omits

  *Contact between the ROBOT’S BUMPERS or COMPONENTS inside the ROBOT’S FRAME PERIMETER and COMPONENTS inside an opening of an opponent’s BUMPERS or in the space above the BUMPER opening are exceptions to this rule.*

- **G401 ⇒ G407**, Keep NOTES in bounds.

  The violation changed from

  *FOUL*

  to

  *TECH FOUL*

- **H101 ⇒ G201**, Be a good person.

  Violation language changed from

  *Behavior will be discussed with team or individual. Violations of this rule are likely to escalate to YELLOW or RED CARDS rapidly (i.e. the threshold for egregious violations is relatively low.)*

  to

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

- **H102 ⇒ G209**, Enter only 1 ROBOT.

  Violation language changed from

  *Verbal warning. Egregious or subsequent violations at any point during the event will be addressed by the Head REFEREE, the Lead ROBOT INSPECTOR (LRI), and/or Event Management.*

  to

  *Verbal warning.*

- **H105 ⇒ G203**, Asking other teams to throw a MATCH – not cool.

- **H106 ⇒ G204**, Letting someone coerce you into throwing a MATCH – also not cool.

- **H107 ⇒ G205**, Throwing your own MATCH is bad.

  Violation language changed from
Behavior will be discussed with team or individual. Violations of this rule are likely to escalate rapidly to YELLOW or RED CARDS and may lead to dismissal from the event (i.e. the threshold for egregious violations is relatively low.)

to

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

- **H109 → G103**, Be careful what you interact with.

Rule language omits

*Temporary deformation of a GAME PIECE (e.g. to pre-load a ROBOT) is an exception to this rule.*

Item A omits

*(unless instructed by FIELD staff)*

Item C was changed from deforming to

manipulating such that it doesn’t return to its original shape without human intervention.

- **H202 → Q101**, 1 STUDENT, 1 Head REFEREE.

The blue box language incorporates language related to recording conversations published in [2023 Team Update 21](#).

- **H302 → G104**, Teams may not enable their ROBOTS on the FIELD.

Violation language changed from YELLOW CARD to

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

- **H305 → G208**, Show up to your MATCHES.

Violation language changed from RED CARD to

DISQUALIFIED

Image 7-1 reflects the change described above and removes the reference to an uninspected team competing in Playoff MATCHES.
− **H501 ⇒ G426**: COACHES and other teams: hands off the controls.

Violation language changed from

**DISABLED**


to

**TECH FOUL, plus RED CARD if greater-than-MOMENTARY.**

− **H503 ⇒ n/a**, COACHES, GAME PIECES are off limits.

Removed

### Section 8 ROBOT Construction Rules

− **R203 ⇒ R203**, General safety.

Blue Box item C changes vision target reference to 36h11 AprilTags.

− **R401 ⇒ R401**, BUMPERS all around.

Headline changed from

**BUMPERS should protect all corners.**

to

**BUMPERS all around.**

Rule language updated to require BUMPERS around the full FRAME PERIMETER.

− **R406 ⇒ R406**, Team number on BUMPERS.

Rule language listing requirements for team number visibility adds

*from as far as approximately 60 ft. (1829 mm)*

and new item C states that team numbers

*must not split individual digits by more than 2 in. (~5 cm),*

− **R408 ⇒ R408**, BUMPER construction.

The Blue Box below item C changes lower limit of measured pool noodle diameter from

2¼ in. (~57 mm)

to

2½ in. (~54 mm).

The Blue Box below item D adds

*Non-woven materials such as leather or pleather are not considered cloth.*

Table 8-1 includes the West Coast Products’ Kraken x60 and the REV Robotics NEO Vortex and their respective available part numbers. (along with Table 8-2 updated accordingly).

The language describing permitted electric solenoid actuators is changed from

_Electrical solenoid actuators, no greater than 1 in. (nominal) stroke and rated electrical input power no greater than 10 watts (W) continuous duty at 12 volts (VDC)_

to

_Electrical solenoid actuators or electromagnets with rated electrical input power no greater than 50 watts (W) continuous duty at 12 volts (VDC)_

- n/a ⇒ R502, Only 4 propulsion motors.

Added, and additional context is available in [this August 2022 blog](#).

- R503 ⇒ R504, Power (most) actuators off of approved devices.

Item A adds subitem e

_Spark Flex Motor Controller (P/N REV-11-2159, am-5276)_

Item A, subitem h adds alternate part number for the Talon FX Motor Controller

_WCP-0940_

- R602 ⇒ R602, Other batteries for cameras or computers only.

The battery pack max output per port is increased from

2.5 Amps

to

5 Amps

and rule language listing permitted batteries adds

_or coin cell batteries used to power CMOS/RTC features_

- R604 ⇒ R604, Charge batteries at a safe rate.

The type of charge current limit changes from

_peak_

to

_average_

- R621 ⇒ R621, Protect circuits with appropriate circuit breakers.

Rule language adds
...with the exception of devices downstream of a Kraken X60 Powerpole adapter board (WCP-1380).

- **R622** ⇒ **R622**, Use appropriately sized wire.

  Table 8-4 adds

  *Kraken X60 Powerpole Adapter protected circuit*

- **Section 8.8 Pneumatic System** includes comparable Bar units for pressure measurements.


  Rule language adds

  *Additional regulators may be located downstream of the single primary regulator.*

- **R810** ⇒ **R810**, Pressure gauges must be visible.

  The list of approved units for displaying pressure adds

  *Bar*

- **R814** ⇒ **R814**, Don't connect solenoid outputs together.

  Rule language changes from

  *The outputs from multiple solenoid valves must not be plumbed together.*

  to

  *The output air from multiple solenoid valves must not be combined.*

  A new Blue Box states

  *Manifolds, shuttle valves, and other devices which do not combine output airflow, even though it may be plumbed into the same device, are not violations of this rule.*

- **R901** ⇒ **R901**, Use the specified Driver Station Software.

  Changes Driver Station Software version requirement from

  23

  to

  24.1

**Section 9 Inspection & Eligibility**

Introductory language adds

*A safe ROBOT has functional BUMPERS that approximately meet the required coverage (R401), height (R402), and cross section (R408) requirements.*
Section 10 Tournaments

- Section 10.2 MATCH Replays adds item G
  
a ROBOT radio disconnect that impairs operation of other ROBOTS on the FIELD for more than 8 seconds.

The following Blue Box adds item E

scenario G occurring before the last 20 seconds of the MATCH.

- Section 10.6.2 Playoff MATCH Bracket, Table 10-2 is updated per this August blog post.
  
The new table

  o increases the cycle time to 9 minutes,
  o removes the break between rounds 1 and 2,
  o removes the break between rounds 2 and 3,
  o decreases the break length between rounds 3 and 4 to 6 minutes,
  o specifies which awards are presented in which breaks.

Section 13 Event Rules

- E115, E117, E605, and E606 are new.

- E301, No wireless communication.

  The prohibited wireless network list changed from

  802.11a/b/g/n/ac/ax (2.4GHz or 5GHz)

  to

  802.11a/b/g/n/ac/ax/be