

ARC Championship Events Manual

Season 2

2026 – 2027

V1.0

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Release Notes

Date	Version	Release Notes
November 1, 2026	1.0	Initial Release

Intellectual Property Statement

ARC Robotics encourages and promotes technical innovation and open-source technology by respecting the intellectual property rights of participants. All rights related to the intellectual property developed for the purpose of ARC events are owned by the individual teams that developed it. ARC Robotics will not participate in the handling of intellectual property disputes amongst or within teams. The participating teams must properly handle all aspects of intellectual property rights among internal school members, company members, and other members of the team.

While using the RoboMaster Referee System and other supporting materials provided by the RoboMaster Organizing Committee, teams should respect all intellectual property owned by DJI and RoboMaster. Teams are also prohibited from engaging in any behavior that violates intellectual property rights, including but not limited to reverse engineering or replication. Any behavior that may infringe upon the intellectual property rights of event organizers beyond acceptable fair use indicated in official competition manuals and technical documentation for the competition will be investigated, and the infringer will be held legally liable in strict accordance with the law. For suggestions on open-source materials, please refer to https://forums.arc-robotics.org.

Using this Manual

The ARC Championship (ARCC) is a robotics event aimed at cultivating young engineers. Documents related to the competition may contain sensitive terms, names, events, and technical content. These do not reflect any existing technologies or actions in reality, nor do they intend to involve any specific country, organization, or individual. This manual is intended solely to explain the rules of the ARC Robotics Championship and must not be used for any other purposes.

 This symbol denotes Hints and Tips

1. Foreword

1.1 About Rules Manuals

The ARC Championship Manuals, consisting of the Site Manual, Events Manual, Participant Manual, and Robot Building Specifications are applicable to all participants, referees, competition staff, and involved parties. All manuals can be found on the ARC Robotics Website. Only the Season 2 versions of these manuals and the Season 2 ARCC Q&A apply to ARCC Season 2. Manuals and Q&A answers from previous seasons do not apply, even where a rule appears unchanged.

ARC Robotics may update the manual periodically up to and including the duration of ARC Championship Season 2.

ARC Robotics reserves the sole right of final interpretation of all Rules Manuals, Q&A, and other released content. ARC Robotics may refer to specific versions of RoboMaster Manuals and documentation as applicable. In the event of an internal conflict between multiple ARC-published sources, the following hierarchy shall be obeyed:

1. On-site Captain's meeting or announcements published by ARC
2. ARCC Q&A answers
3. ARCC Site Manual
4. ARCC Events Manual
5. ARCC Participant Manual
6. ARCC Robot Building Specifications

1.2 Q&A

Shall a question arise about the interpretation of rules, teams should first check the Q&A tables. If no answer for the question can be found, the question shall be submitted to the Q&A. Links to both can be found on arc-robotics.org/participants/2027-manuals. Official RoboMaster Q&A from any season, including 2027, does not apply to ARCC Season 2.

2. Key Terms

Table 2-1: Key Terms

Term	Definition
ARC Robotics / ARC	Governing and Organizing body for ARC Championships.
ARC Championship / ARCC	Annual Collection of Events.
Robot	
Robot Main States	• **Alive**: The Referee System Main Control Module successfully connects to the Referee System server and the robot's HP is not zero. • **Defeated**: The robot's HP drops to zero. This can be caused by Armor Modules suffering damage from attack or collision, abnormal disconnection of the robot, Referee System module disconnection, and robot ejection. • **Ejected**: A robot is issued a Red Card. • **Abnormal Disconnection**: The Referee System Main Control Module is unable to connect to the Referee System server during a game, due to a power outage on the robot or other reasons. *Note: After a robot is defeated, the Referee System will cut off the power supply to the robot (except for the Mini PC).*
Referee System	The Referee System consists of a set of onboard modules, the server, and the player client software installed on a PC. It controls and monitors robot power, projectile launches and damage, and it automatically enforces game rules.
Inter-Robot Communication	An interactive method for robots to communicate with one another through the Referee System serial port.
Robot Chassis	The primary structural frame that carries a robot's propulsion system and accessories.
Chassis Power	The electrical power input to the propulsion system that enables the robot's horizontal movement and rotation. For details, please refer to the definition of chassis power in the "Referee System Mounting Specifications" chapter of the Robot Building Specifications.

Term	Definition
Launching Mechanism	A mechanism capable of launching a projectile from a robot on a fixed trajectory and at a certain initial speed. When the Launching Mechanism is “Locked,” it is powered off and the Ammo Booster port on the PMM does not provide any 24V output. When the Launching mechanism is “Unlocked,” the PMM provides 24V of power through Ammo Booster, and can be powered on or off depending on its projectile allowance.
Launch	A robot’s action of releasing projectiles. “Launch” mentioned in the following “Competition Mechanism” section is considered valid when a launch action is detected by the Referee System.
Projectile Speed	The velocity detected by the relevant modules of the Referee System after a projectile has completed its acceleration.
Barrel Heat	Barrel heat accumulates as a robot launches projectiles. It is used to limit continuous projectile firing.
Projectile Allowance	The quantity of projectiles each robot is currently allowed to launch.
Maximum HP	The maximum value to which a robot’s HP (Health Points) can be restored. A robot starts each Battle with its Maximum HP.
Invincible	A state in which a robot is immune to damage from Attack or Collision.
Attack	Describes the behavior of a robot when launching projectiles at a target.
Destruction	Where a robot attacks the Armor Module of the opponent’s robot until the latter’s HP drops to zero.
Occupation	When an alive robot has reached an area such as its Resupply Zone, its RFID Interaction Module has detected the RFID Interaction Module Card in the area or has met other conditions, and it has obtained certain special effects.
Entanglement	Mechanisms of robots are entangled with one another during a game, i.e. one robot remains connected to the other robot and is pulled with said robot whichever direction it moves.
Collision	An active act of collision by a robot during a game.
Battlefield	

Term	Definition
Penalty Zone	An area of the Battlefield where a robot must not stay for more than 3 seconds. For details, see “10.2.3.2 Interactions between Robots and Battlefield Components”.
Battlefield Component	Composite elements of the Battlefield.
Scoring Area	An area of the 3v3 Battlefield belonging to one team, in which that team scores Objective A and Objective C. For details, see “3.2.4 Scoring Area and Objectives”.
Pipe Chute	An opening on the perimeter wall of the 3v3 Battlefield, behind each team’s Scoring Area, where Objective B pipes are turned in. For details, see “3.2.4.3 Objective B: Pipes”.
Personnel	
Arbitration Committee	A body consisting of the VP of Competition, Head Referees, and Head Inspector, which has final interpretation over competition regulations and makes rulings on Appeals.
VP of Competition	Role is defined in the ARC Robotics Directory. Serves as a member of the Arbitration Committee.
Head Referee	The lead referee responsible for maintaining the order of the event and enforcing its rules.
Head Inspector	The referee responsible for leading and assigning Inspection tasks, with the final right of interpretation over the Inspection standards.
Referee	Personnel responsible for maintaining the order of the competition and enforcing its rules, such as Field Referee or Inspector.
Participating Team	Team that has registered and been recorded in the registration system for the current competition season.
Participant	Individual who is a member of a Participating Team.
Pit Crew Member	Participant who may take the robot through Inspection and onto the field to participate in a Match. Pit crew members may be permitted to enter Inspection, the Staging areas and the Competition Area.
Pilot	Pit Crew Member responsible for controlling a robot during a game.
Offending Team	A Participating Team that violates the competition rules.

Term	Definition
Offender	Participant that violates the competition rules.
Competition Process	
Match	Depending on whether it is BO2, BO3 or BO5, a match may contain several games.
Game	A complete cycle of the Setup Period, the Referee System Initialization Period, the 5-Second Countdown, and the Battle.
Official Timeout	A Timeout initiated by the Head Referee during the Setup Period or Referee System Initialization Period.
Team Timeout	A Timeout requested by a Participating Team during the Setup Period.
Regular Battle Damage	During a Setup Period between games or during a game of a match, a Referee System Onboard Module experiences a fault.
Factors Determining the Game Outcome	
Victory Points (VP)	Points a team earns during a 3v3 Battle by scoring Objectives and defeating opponent robots. Victory Points determine the winner of a 3v3 Battle. For details, see “3.3.4 Victory Point Mechanism”.
Attack Damage	The HP a robot loses when it is hit by projectiles. *Note: HP lost due to penalties applied to a robot is counted as attack damage from the opposing team.*
Non-attack Damage	HP lost as a result of collision on an Armor Module, Referee System module disconnection, or abnormal disconnection of the robot.
Total Remaining HP	The total remaining HP of one side’s alive robots at the end of each game.

3. 3v3 Tournament

During a five-minute Battle, both teams control their robots to engage in tactical combat in the core competition area — the Battlefield. Teams earn "Victory Points" by scoring Objectives and defeating opponent robots. The first team to reach 300 Victory Points wins. If neither team reaches 300 Victory Points before the Battle time expires, the team with more Victory Points wins.

3.1 Robot and Pilot

ARCC requires robots to fight together as a team with good coordination and teamwork. For the robot building specifications, please refer to the ARCC Season 2 Robot Building Specifications. The maximum robot and pilot lineup is as follows:

Table 3-1: Maximum Robot and Pilot Lineup for the 3v3 Tournament

Robot Type	ID No.	Fielded Quantity	Pilot Lineup
Hero	1	1	1 Pilot/Robot
Engineer	2	1	1 Pilot/Robot
Sentry	7	1	0 Pilots/Robot

- The minimum lineup for the first game of each match is two robots.
- At the end of each game, the Pilot can be replaced by another member of the pit crew of the current match.

3.1.1 Hero

The Hero is the only robot that can launch 42 mm projectiles on the Battlefield.

Table 3-2: Key Features of Hero

Key Features	Descriptions
Operating Mode	No restrictions. Up to one remote controller and one custom controller.
Inter-Robot Communication	Allowed
Launching Mechanism	1x 42mm Launching Mechanism
Projectile Speed Limit (m/s)	15
Performance	• Maximum HP: 350 • Chassis Power Limit (W): 80 • Maximum Barrel Heat: 200 • Barrel Heat Cooling Rate: 24/s

Key Features	Descriptions
HP Loss and Penalty for Exceeding Limit	• Exceeding the Projectile Speed Limit: Applicable • Exceeding Barrel Heat Limit and Cooling: Applicable • Chassis Power Overlimit: Applicable • Attack Damage and Collision: Applicable • Referee System Disconnection: Applicable • Penalty Damage: Applicable For details, see “3.3.1 HP Loss and Penalty for Exceeding Limit.”
Projectile Loading	• During the Three-Minute Setup Period, 42 mm projectiles can be preloaded. • The Initial Projectile Allowance is 0.

3.1.2 Engineer

The Engineer does not have a Launching Mechanism.

Table 3-3: Key Features of Engineer

Key Features	Descriptions
Operating Mode	No restrictions. Up to one remote controller and one custom controller.
Inter-Robot Communication	Allowed
Launching Mechanism	None
Projectile Speed Limit (m/s)	Not applicable
Performance	• Maximum HP: 600 • Chassis Power Limit (W): 80
HP Loss and Penalty for Exceeding Limit	• Exceeding the Projectile Speed Limit: Not applicable • Exceeding Barrel Heat Limit and Cooling: Not applicable • Chassis Power Overlimit: Applicable • Attack Damage and Collision: Applicable • Referee System Disconnection: Applicable • Penalty Damage: Applicable For details, see “3.3.1 HP Loss and Penalty for Exceeding Limit.”
Projectile Loading	Not applicable

3.1.3 Sentry

The Sentry must operate fully autonomously. It can launch 17 mm projectiles.

Table 3-4: Key Features of Sentry

Key Features	Descriptions
Operating Mode	Autonomous, up to one remote controller for debugging
Inter-Robot Communication	Not Allowed
Launching Mechanism	1x 17mm Launching Mechanism
Projectile Speed Limit (m/s)	25
Performance	• Maximum HP: 400 • Chassis Power Limit (W): 80 • Maximum Barrel Heat: 260 • Barrel Heat Cooling Rate: 30/s
HP Loss and Penalty for Exceeding Limit	• Exceeding the Projectile Speed Limit: Applicable • Exceeding Barrel Heat Limit and Cooling: Applicable • Chassis Power Overlimit: Applicable • Attack Damage and Collision: Applicable • Referee System Disconnection: Applicable • Penalty Damage: Applicable For details, see “3.3.1 HP Loss and Penalty for Exceeding Limit.”
Projectile Loading	• During the Three-Minute Setup Period, 17 mm projectiles can be preloaded. • The Initial Projectile Allowance is 750. It cannot be increased during the game.

3.2 Competition Area

3.2.1 Battlefield

• Unless otherwise stated, the dimension error margin of all Battlefield components described herein is within ±10%, and within ±5 mm for dimensions under 100 mm. The angle error margin is within ±3° for the Battlefield’s structure and within ±1° for Battlefield Components. The unit for the size parameters on the Battlefield drawings is mm.
• The Battlefield has a mirrored layout about the central line. All descriptions and illustrations of Battlefield modules in this text will be based on the Red Team but will apply equally to the Blue Team.
• The Battlefield has a complex environment that may feature non-uniform magnetic fields, winds, venue lighting effects, and other environmental conditions that are not fully symmetrical.

The core competition area of the 3v3 Tournament is called the Battlefield. The Battlefield is 12 m x 8 m (L x W) in size. Each team has a Resupply Zone and a Scoring Area. Objectives are placed on the Battlefield for teams to score.

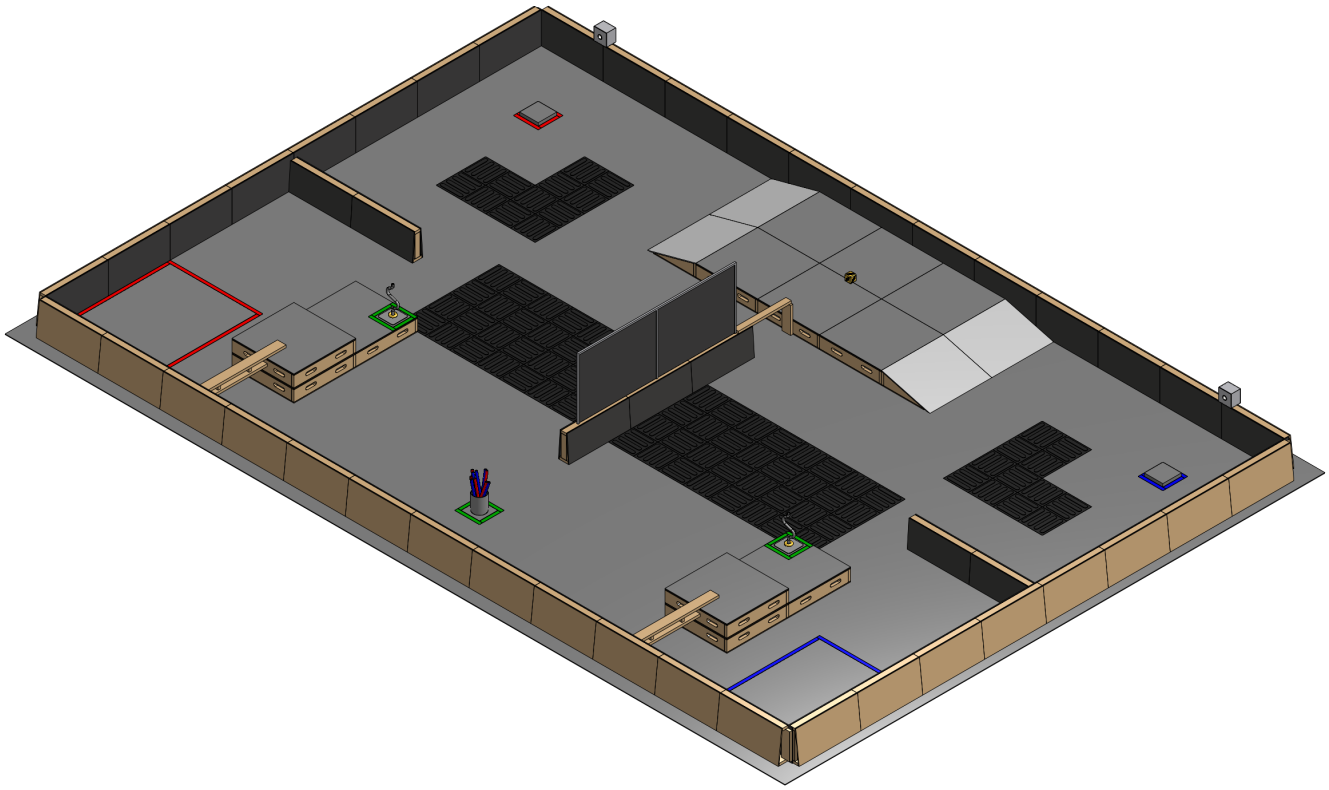
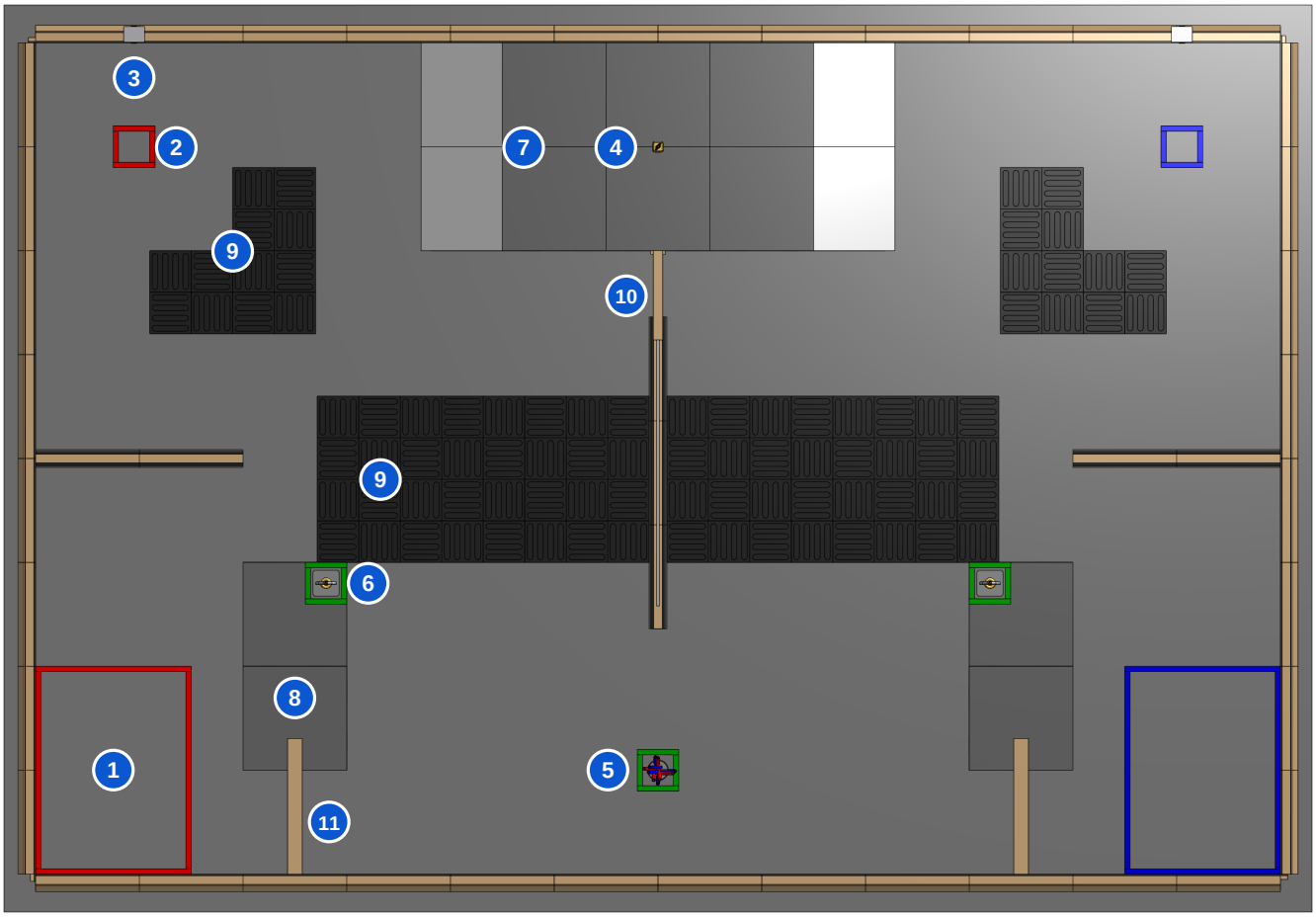


Figure 3-1: Isometric View of 3v3 Battlefield



[1] Starting Zone and Resupply Zone
[2] Scoring Area
[3] Pipe Chute (Objective B)
[4] Objective A (cube) starting position
[5] Objective B (bucket of pipes) starting position
[6] Objective C (donut) starting position
[7] Central High Ground
[8] Side High Ground
[9] Bumpy Road
[10] Central Limbo Bar
[11] Side Limbo Bar

Figure 3-2: Zones of 3v3 Battlefield

Figure 3-3 gives the position of each element on the Battlefield, dimensioned on the Red Team's side. The Battlefield is mirrored about the dashed central line. Objective A, Objective B, the Central Wall, the Central Limbo Bar, the Bumpy Road, and the Central High Ground are centered on it.

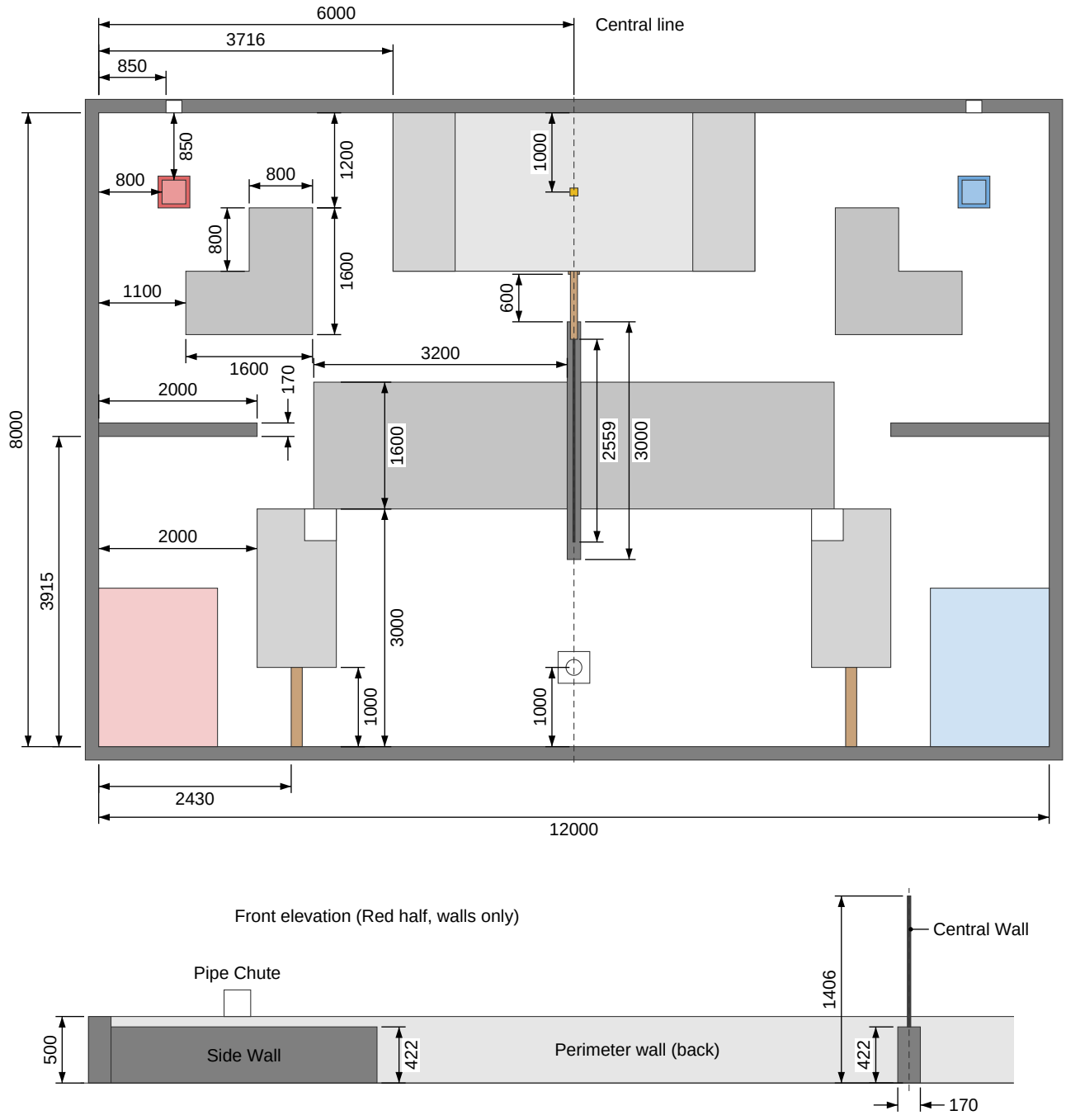


Figure 3-3: Dimensions of 3v3 Battlefield

3.2.2 Starting Zone and Resupply Zone

The Starting Zone is where robots are placed before a game. The Starting Zone is also used as the Resupply Zone, an important area for projectile purchasing and robot HP recovery, and is inlaid with RFID Interaction Module Cards. Each team's Starting Zone is a 1500 mm × 2000 mm area in the team's corner of the Battlefield, measured to the outer edge of its boundary tape.

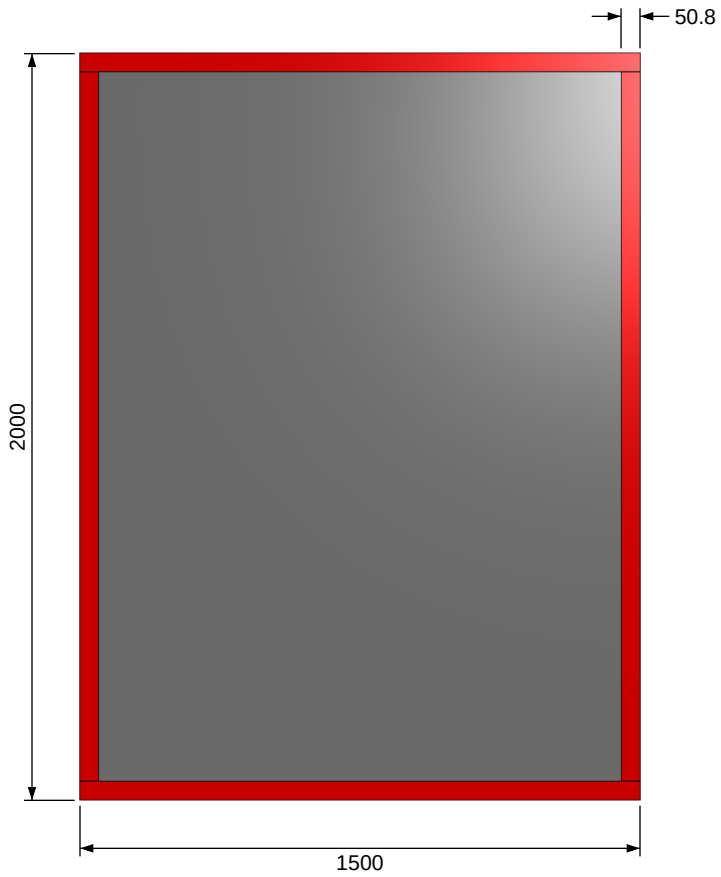


Figure 3-4: Starting Zone and Resupply Zone

The Resupply Zone of one team is a Penalty Zone for the opponent's robots (see "10.2.3.2 Interactions between Robots and Battlefield Components").

There may be dead zones within the RFID Interaction Module Cards across the Battlefield. Teams are responsible for adapting to these conditions during gameplay.

3.2.3 High Ground

The Battlefield has one Central High Ground and two Side High Grounds. Heights are measured from the Battlefield floor to the top surface.

- The Central High Ground is a 3000 mm × 2000 mm platform, 210 mm high, centered on the central line against the perimeter wall opposite the Resupply Zones. It has a ramp at each end, inclined at 15° and 784 mm long measured horizontally.
- Each Side High Ground is a 1000 mm × 2000 mm structure beside the team's Resupply Zone, with two tiers: a lower tier 210 mm high and an upper tier 410 mm high.

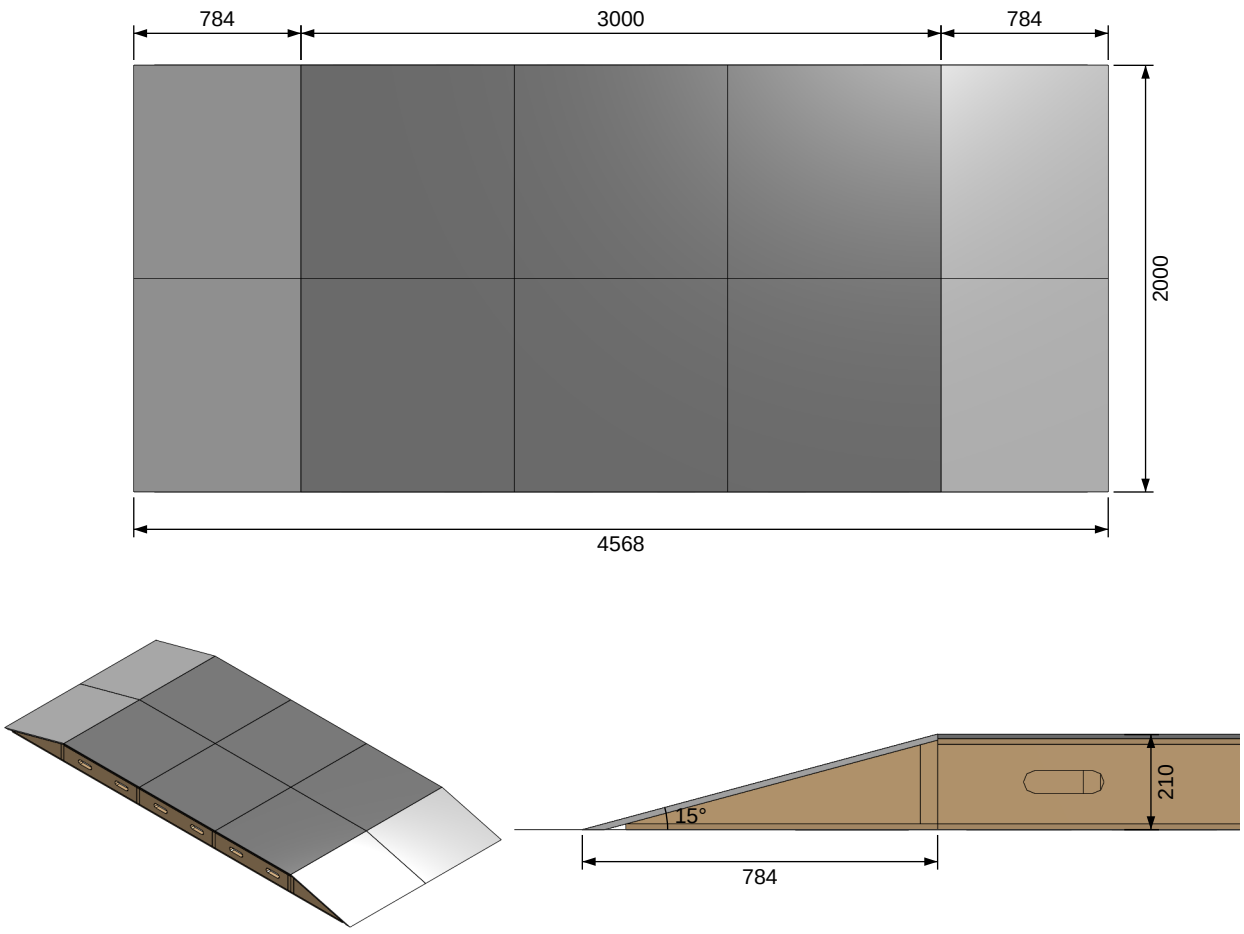


Figure 3-5: Central High Ground

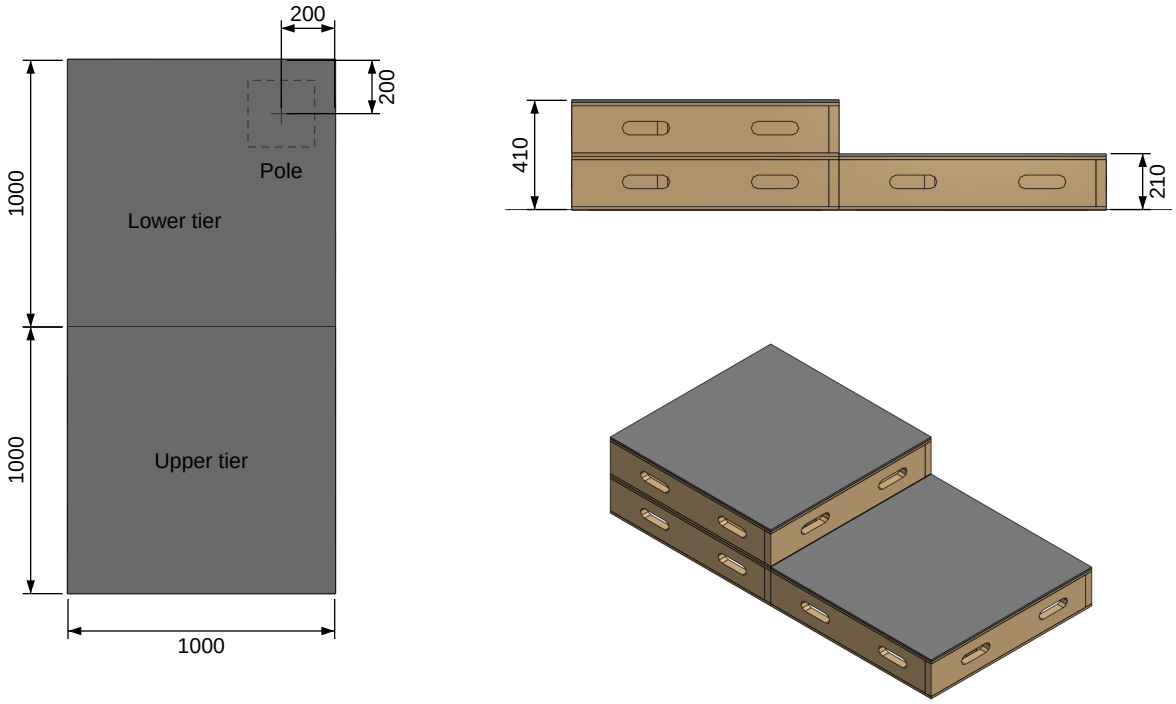


Figure 3-6: Side High Ground

3.2.4 Scoring Area and Objectives

Teams score Victory Points by bringing Objectives to designated areas of the Battlefield. For the Victory Points awarded for each Objective, see “3.3.4 Victory Point Mechanism”.

Pipes that have been turned in leave play and are not reintroduced for the remainder of the Battle.

An Objective in a Scoring Area is scored while it lies flat directly on the platform’s top surface. A cube lies flat when one of its faces is on the surface; a donut lies flat when it lies on its side, with its hole facing up.

Objectives in a Scoring Area that are not lying flat directly on the platform (for example a cube balanced on an edge or a donut resting on another Objective) are not guaranteed to be detected or to score Victory Points.

3.2.4.1 Scoring Area

Each team has a Scoring Area, where Objective A and Objective C are scored. The Scoring Area is a 300 mm × 300 mm platform, 50 mm high, outlined with tape. Each Scoring Area, including its tape outline, is a Penalty Zone for the robots of both teams (see “10.2.3.2 Interactions between Robots and Battlefield Components”). The Pipe Chute, where Objective B pipes are turned in, is on the perimeter wall directly behind the Scoring Area.

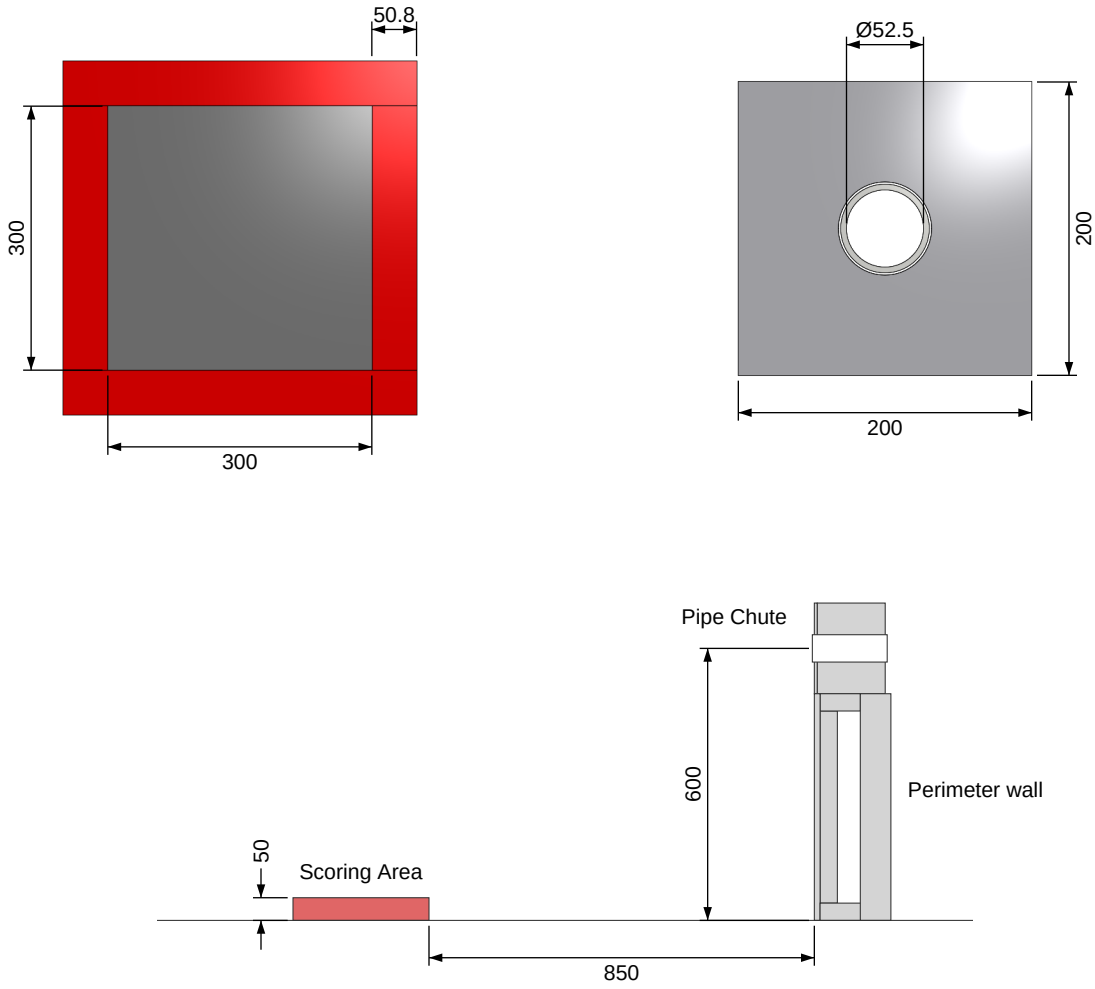


Figure 3-7: Scoring Area and Pipe Chute

3.2.4.2 Objective A: Cube

Objective A is a single cube measuring 100 mm × 100 mm × 100 mm. It starts at the center of the Central High Ground. Objective A is scored in a team's Scoring Area.

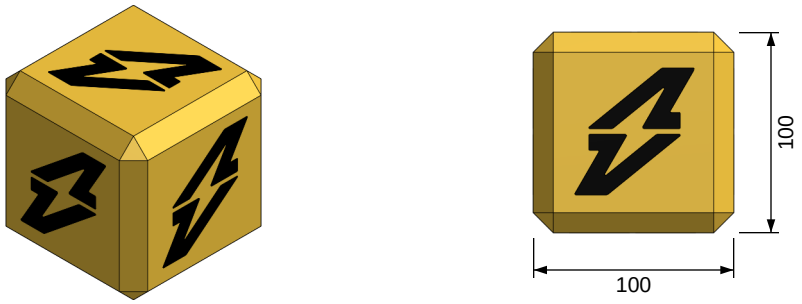


Figure 3-8: Objective A (Cube)

3.2.4.3 Objective B: Pipes

Objective B is a bucket of pipes containing 5 red pipes and 5 blue pipes. The bucket is a cylinder 200 mm in diameter and 250 mm tall. It starts on the central line of the Battlefield, on the same side as the Resupply Zones, and is not affixed to the floor. Each pipe is a 500 mm length of 3/4 in Schedule 40 PVC pipe, with an outer diameter of 26.7 mm.

Pipes are scored by turning them in at any Pipe Chute. A Pipe Chute is a round opening 52.5 mm in diameter, mounted on top of the perimeter wall directly behind a team's Scoring Area, with its center 600 mm above the Battlefield floor.

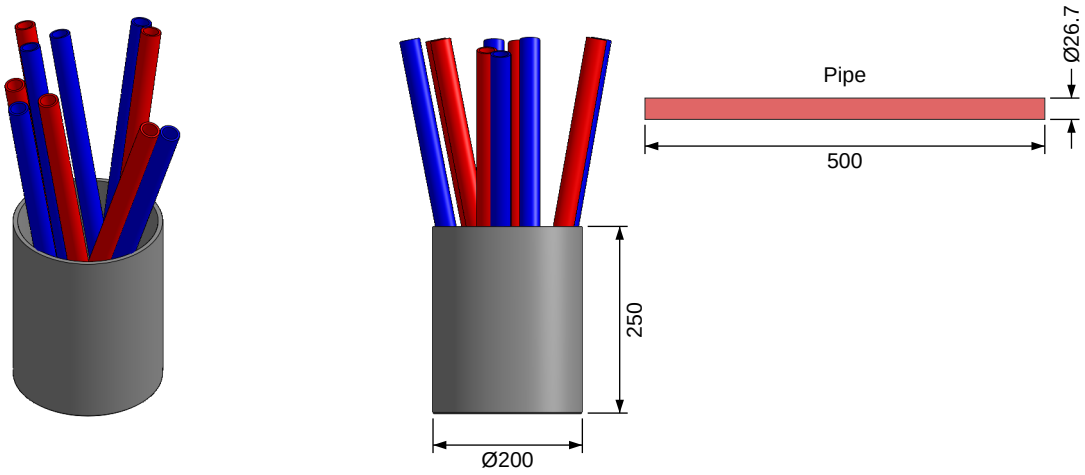


Figure 3-9: Objective B (Bucket of Pipes)

3.2.4.4 Objective C: Donuts

Objective C consists of 2 donuts. Each donut is a ring with an outer diameter of 100 mm, an inner diameter of 50 mm, and a thickness of 25 mm. Each donut starts around the base of a 456 mm tall zig-zag pole on the lower tier of each Side High Ground. Each donut is scored in a team's Scoring Area.

Additional details about the zig-zag pole will be announced in a future release.

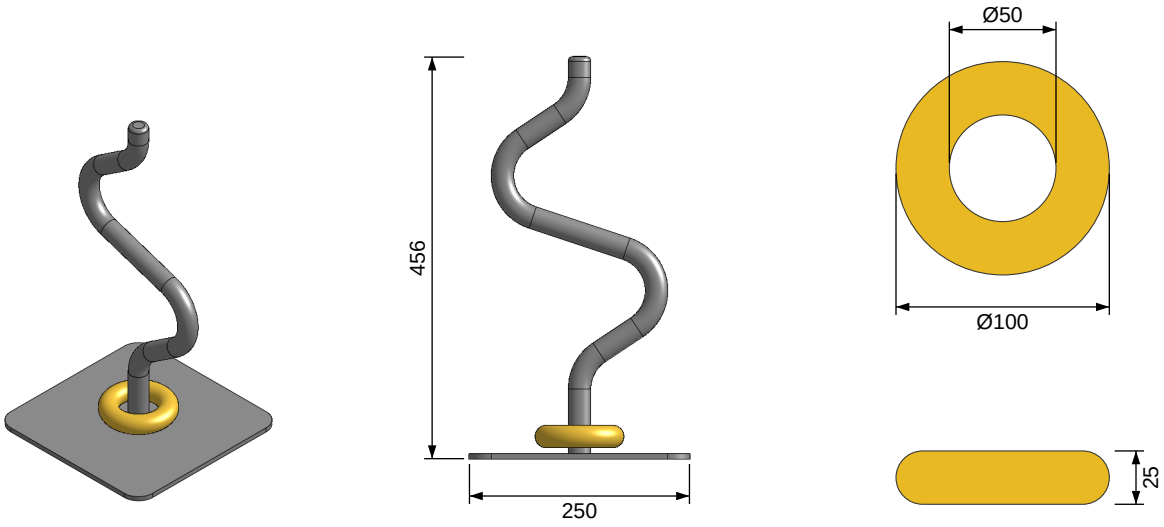


Figure 3-10: Objective C (Donut)

3.2.4.5 Controlling Objectives

A robot Controls an Objective if either of the following applies:

(a) Any part of the robot is directly above the Objective, or the robot blocks the Objective from sliding away on more than one side.
(b) The robot supports any of the Objective's weight while the Objective is not touching the Battlefield.

When a robot drives over or stops on a pipe, (a) does not apply to that pipe.

- Only Engineers may Control Objectives.
- Within 1 second of being defeated or abnormally disconnected, an Engineer must stop Controlling all Objectives.

A defeated Engineer's mechanisms are powered off, so any mechanism that can Control an Objective must release it on its own, for example a claw that springs open when it loses power.

3.2.5 Bumpy Road

The Bumpy Road is made of Polyvinyl Chloride tiles, each 400 mm × 400 mm and 2.5 mm thick. Each tile has four evenly spaced bumps, raised a further 1.2 mm above its surface, as shown below.

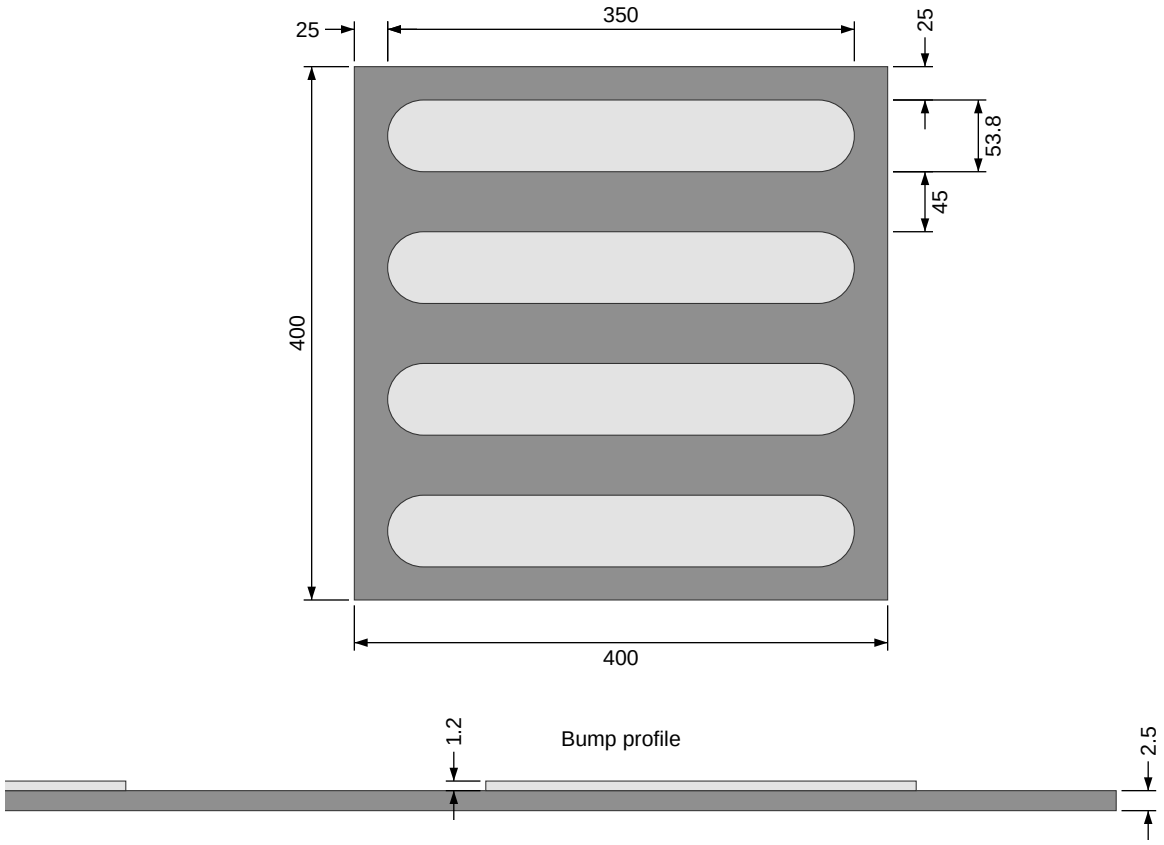


Figure 3-11: Bumpy Road

3.2.6 Limbo Bars

Limbo Bars are horizontal bars that limit the height of robots passing beneath them.

Table 3-5: Limbo Bar Dimensions

Limbo Bar	Clearance Height	Opening Width
Central Limbo Bar	420 mm	600 mm
Side Limbo Bar	300 mm	1000 mm

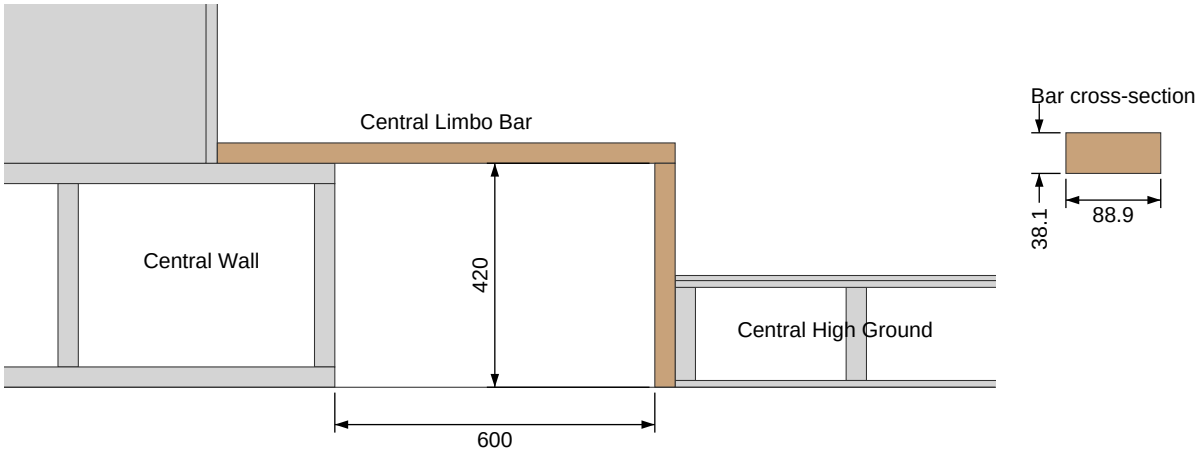


Figure 3-12: Central Limbo Bar

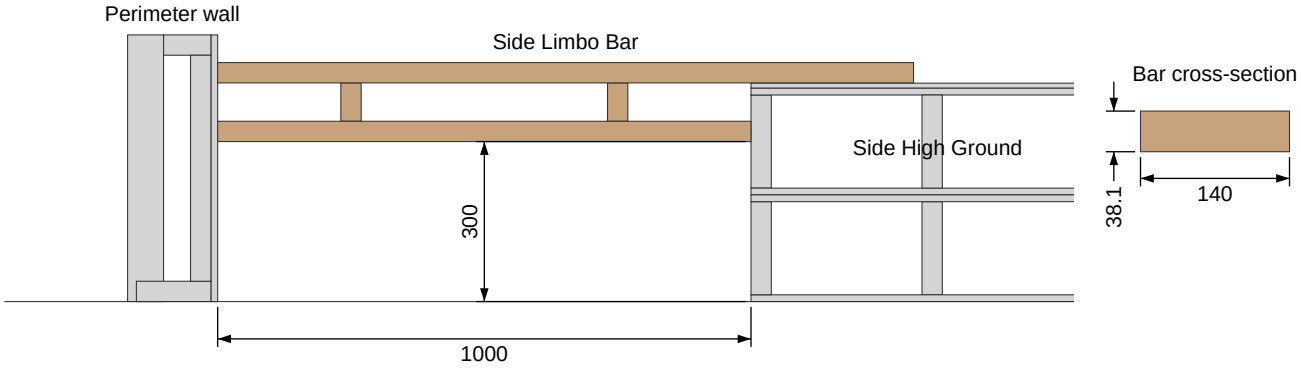


Figure 3-13: Side Limbo Bar

3.2.7 Miscellaneous

3.2.7.1 Projectiles

Robots deal damage by firing projectiles to attack Armor Modules. The parameters of the projectiles used in the competition are as follows:

Table 3-6: Projectile Parameters

Type	Appearance	Color	Dimensions	Weight	Shore Hardness	Material
42 mm projectile	Similar to a golf ball	White	42.5 mm ± 0.5 mm	41 g ± 1 g	90 ± 5 A	TPE Plastic

Type	Appearance	Color	Dimensions	Weight	Shore Hardness	Material
17 mm projectile	Sphere	Yellow-green	16.8 mm ± 0.2 mm	3.2 g ± 0.1 g	90 ± 5 A	TPU Plastic

3.2.7.2 Pilot Room

The Pilot Room lies outside the Battlefield and is the area for Pilots during a game. Each Pilot Room is equipped with a corresponding number of computers, each with official equipment: a monitor, mouse, keyboard, a USB Type-A hub with 2 ports for a keyboard and mouse, a Camera Video Transmission Module (receiver) on a stand, and one 1 GbE (RJ45) network port. The stand is fixed to the desk, and Pilots may operate the receiver within the stand's range of movement. A custom controller can connect to the Referee System server through the RJ45 port, and all custom controllers in a Pilot Room may be wired to each other.

- Removing the Camera Video Transmission Module (receiver) from its stand is prohibited. The team bears any consequences of doing so.
- Robots that enter the Battlefield connect automatically to the receivers in the Pilot Room; receivers brought by teams will not work. Each receiver's joystick is centered and its switch is in position C by default.

3.3 Competition Mechanism

3.3.1 HP Loss and Penalty for Exceeding Limit

3.3.1.1 Attack Damage or Collision

Robots may lose HP when their Armor Modules are attacked or collide with other objects. The mechanisms are as follows:

An Armor Module detects projectile attacks through pressure sensors and the vibration frequency on the armor panel. The shortest detection interval for an Armor Module is 50 ms (when an Armor Module is hit with a 42 mm projectile, the detection interval is extended to a maximum of 200 ms).

The projectile needs to come into contact with the impact surface of the Armor Module at a certain speed in order to be successfully detected. The speeds at which Armor Modules can effectively detect projectiles are as follows:

Table 3-7: Speed Range of Projectiles for Effective Detection by Armor Modules

17mm Projectile	42mm Projectile
Higher than 12 m/s	Higher than 8 m/s

- In an actual match, the normal speed of a projectile that touches the Armor Module attack surface is different from its Projectile Speed due to the projectile's speed decay and its incident angle not being normal to the Armor Module attack surface. Damage detection is based on the normal component of the projectile's speed upon contact with the Armor Module attack surface.
- If a Hero does not launch a 42 mm projectile for four consecutive seconds, the Armor Modules of the opponent's robots will become immune to 42 mm projectile damage until the Hero launches a 42 mm projectile again.
- The Referee System will round the HP loss to the nearest integer when calculating the HP.

The Armor Modules of a robot can possibly register collision as projectile damage. However, causing damage through collision (including ramming with robots or throwing objects) is not allowed.

Table 3-8: HP Loss Mechanism for Attack Damage

42 mm Projectile	17 mm Projectile	Collision
200	20	2

3.3.1.2 Exceeding the Projectile Speed Limit

The Launching Mechanism of a robot will be locked for a certain duration if the robot exceeds the Projectile Speed Limit. The duration does not accumulate.

Locks and unlocks due to exceeding the Projectile Speed Limit are independent from locks and unlocks caused by other reasons. Assume the Projectile Speed limit is V_0 (m/s), and the actual speed detected by the Referee System is V_1 (m/s). The specific lock durations are shown in the table below.

Table 3-9: Penalty for Exceeding the Projectile Speed Limit

17 mm Projectile	42 mm Projectile	Lock Duration
$0 < V_1 - V_0 < 5$	$V_0 < V_1 \leq 1.1 * V_0$	15 seconds
$5 \leq V_1 - V_0 < 10$	$1.1 * V_0 < V_1 \leq 1.2*V_0$	20 seconds
$10 \leq V_1 - V_0$	$1.2*V_0 < V_1$	The remainder of the current game

3.3.1.3 Exceeding Barrel Heat Limit and Cooling

The Launching Mechanism of a robot will be locked when the robot exceeds its Barrel Heat Limit. Locks and unlocks due to exceeding the Barrel Heat Limits are independent from locks and unlocks caused by other reasons. The mechanisms are as follows:

Set Q_0 as the Barrel Heat Limit and Q_1 as the current Barrel Heat. For each 17 mm projectile detected by the Referee System, the current Barrel Heat Q_1 is increased by 10 (regardless of the 17 mm projectile's initial speed). For each 42 mm projectile detected, the current Barrel Heat Q_1 is increased by 100 (regardless of the 42 mm projectile's initial speed). The Barrel Heat cools at a frequency of 10 Hz. The cooling value per detection cycle is equal to the cooling rate/10.

When $Q_2 \geq Q_1 > Q_0$, the video feed of the robot pilot's First-Person View (FPV) is cut off, and the Launching Mechanism of the robot is locked. When $Q_1 = 0$, the FPV video feed returns and the Launching Mechanism is unlocked.

When $Q_1 > Q_2$, the Launching Mechanism of the robot will be locked for the remainder of the current game.

For a Launching Mechanism (17 mm projectile), $Q_2 = Q_0 + 100$.

For a Launching Mechanism (42 mm projectile), $Q_2 = Q_0 + 200$.

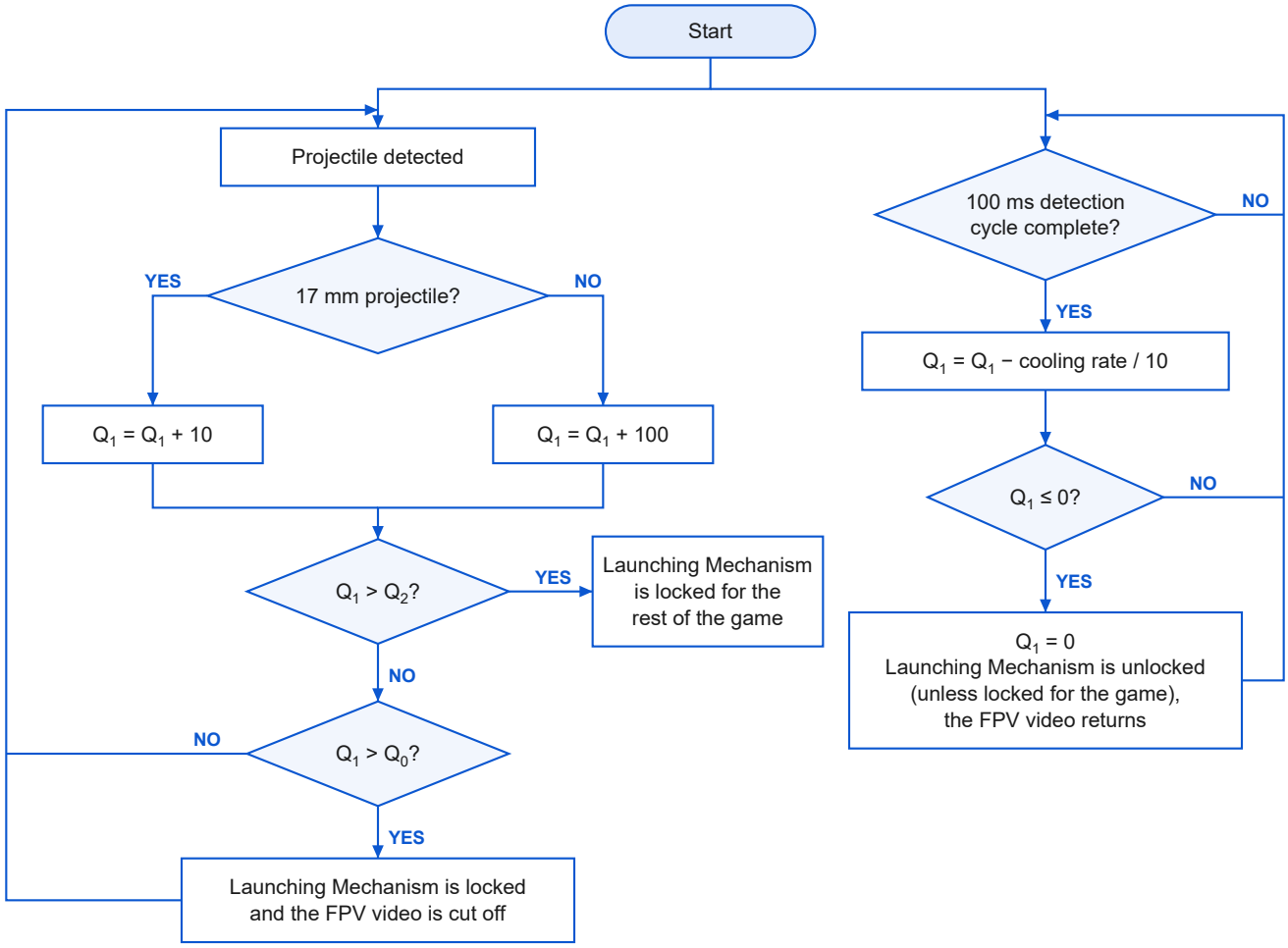


Figure 3-14: Barrel Heat Penalty and Cooling Mechanism

3.3.1.4 Exceeding Chassis Power Limit

The chassis power of robots will be continuously monitored by the Referee System, and the robot chassis needs to run within the Chassis Power Limit. Robots will have their buffer energy deducted when they exceed the Chassis Power Limit. Upon the exhaustion of buffer energy, if the chassis power is still above the limit, the chassis will be powered off for 5 seconds. The Referee System calculates chassis power consumption at a frequency of 10 Hz.

Set Z as the buffer energy, Q as the Buffer Energy Limit (60 J), P_r as the instantaneous chassis output power, and P_l as the power limit.

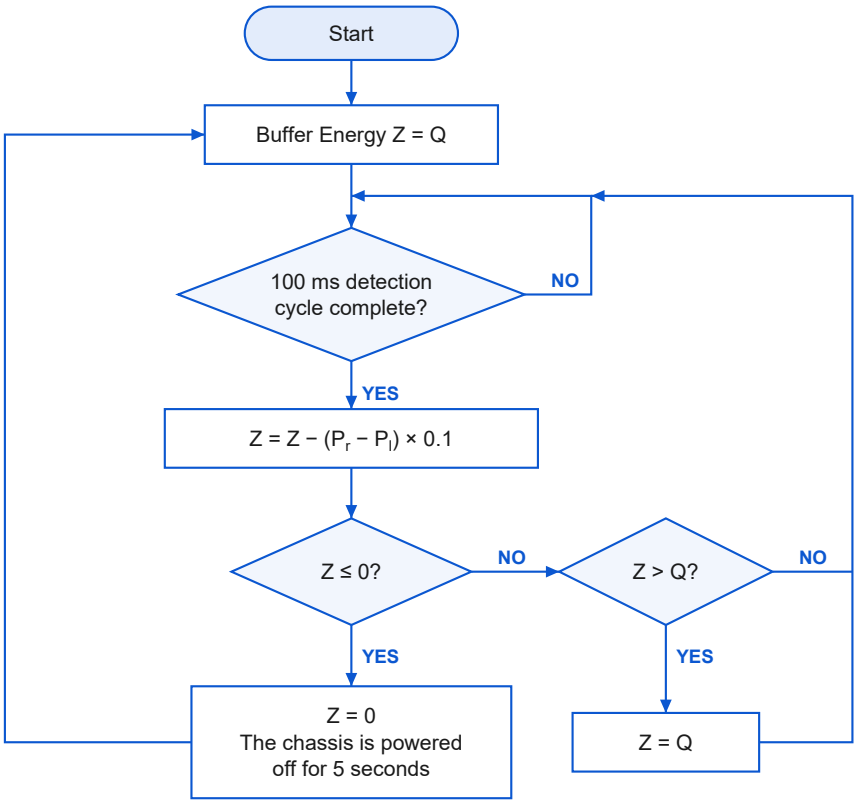


Figure 3-15: Robot Chassis Power Detection and Penalty for Exceeding Limit

3.3.1.5 Referee System Disconnection

Participating teams must mount the corresponding Referee System modules on their robots in accordance with the requirements of the ARCC Season 2 Robot Building Specifications, and ensure stable connection between each module of the Referee System and the server throughout each game. The Referee System server detects the connectivity of each module at a frequency of 2 Hz.

3.3.1.5.1 Abnormal Disconnection

If the robot's Main Control Module goes offline during the game, it enters an "Abnormal Disconnect" state, but can reconnect to the game.

Table 3-10: Robot Abnormal Disconnection Penalty

Robot Type	Consequences of Abnormal Disconnection
All robots	• The Launching Mechanism (if present), Gimbal, and Chassis are powered off. • 5% of the Maximum HP is lost for each second elapsed until it drops to zero. • The RFID Interaction Module is disabled. • The robot no longer detects any damage caused by collision, projectile hits, or any other form of HP loss. • The respawn process stops. • The inter-robot communication disconnects.

3.3.1.5.2 Armor Module or Supercapacitor Management Module Disconnection

If the design or structural design of a robot causes the disconnection of an Armor Module or the Supercapacitor Management Module, the robot will lose HP. The Referee System checks these modules every 500 ms, and at each check the robot loses 4 HP for each disconnected Armor Module or Supercapacitor Management Module.

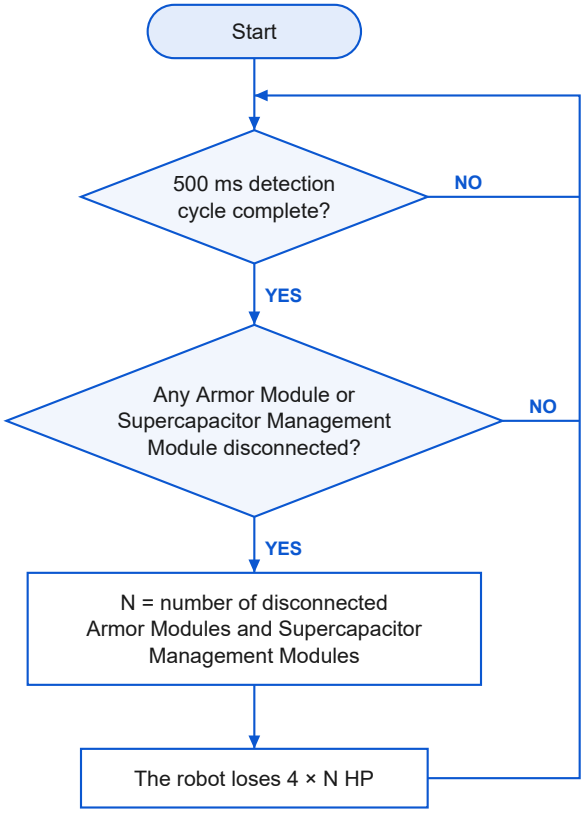


Figure 3-16: HP Loss Mechanism When Armor Module or Supercapacitor Management Module Is Disconnected

3.3.1.5.3 Speed Monitor Module Disconnection

If the 17 mm or 42 mm Speed Monitor Module goes offline, the robot's corresponding Launching Mechanism will immediately lose power. It regains power when the Speed Monitor Module reconnects to the server.

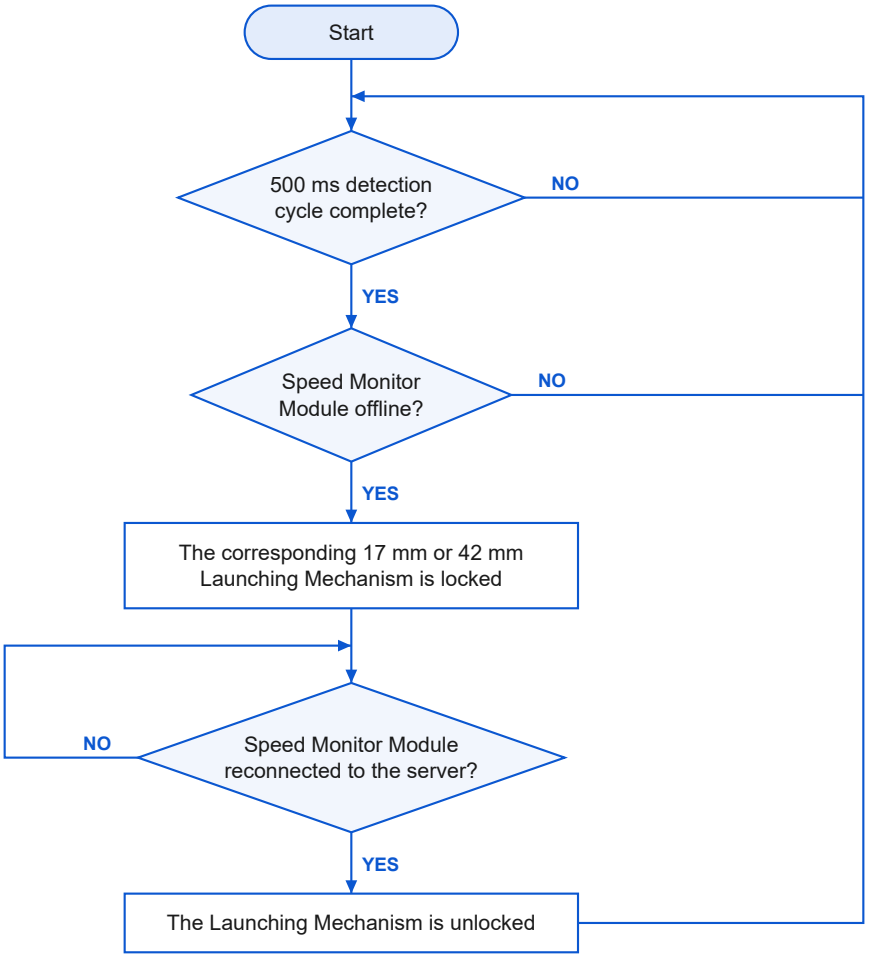


Figure 3-17: Mechanism for Speed Monitor Module Disconnection and Launching Mechanism Power-Off

3.3.1.6 Penalty Damage

When a robot receives penalties such as a Yellow Card or Red Card, the robot may lose HP. For details, refer to "10.1 Penalty System".

3.3.2 HP Recovery and Respawn Mechanism

All robots can recover their HP and respawn unless they are ejected or Abnormally Disconnected.

3.3.2.1 HP Recovery Mechanism

When occupying their side's Resupply Zone, the Hero, Engineer, and Sentry restore 25% of maximum HP per second.

3.3.2.2 Respawn Mechanism

Robots respawn automatically upon being defeated, with the following logic:

- The first time a robot respawns it will take 5 seconds.
- Each subsequent time a robot is defeated, respawning takes an additional 5 seconds.

Upon being defeated, robot Barrel Heat resets to 0 and Buffer Energy is reset to its upper limit. After respawning, robots will:

- Have 20% of their maximum HP
- Become Invincible for 10 seconds
- Enter the Weakened state. Weakened Robots:
    - Have their Launching Mechanism locked
    - Engineers have their Gimbal powered off

Upon occupying the Resupply Zone, the "Weakened" and "Invincible" states are removed.

3.3.3 Economy System

Both teams will receive Gold Coins regularly during a game. Gold Coins can only be exchanged for Projectile Allowance.

At the start of a Battle, each team receives a certain quantity of initial Gold Coins. As the game progresses, both sides passively gain Gold Coins as detailed in the table below.

Table 3-11: Schedule of Passive Gold Coins Gains

Remaining Game Time	Red Team	Blue Team
04:59	80 (initial)	80 (initial)
03:59	80	80
02:59	80	80
01:59	80	80
00:59	120	120

When the difference between two teams' Victory Points reaches 100 or 200 for the first time, the team with fewer Victory Points will receive 80 Gold Coins. A team can gain a maximum of 160 Gold Coins per game via this mechanism. For details about the Victory Point mechanism, see "3.3.4 Victory Point Mechanism."

Table 3-12: Rules for Exchange

Exchange Item	Exchange Ratio
42 mm Projectile	10 Gold Coins/1 projectile

For every projectile fired by a robot, the Projectile Allowance corresponding to the type of projectiles fired is reduced by one.

In the following special circumstances, the Armor Modules of the opponent's robots will become immune to 42 mm projectile damage until the Hero is alive and has a Projectile Allowance greater than 0:

1. Three seconds after the Hero becomes defeated or abnormally disconnected.
2. When the Hero launches a 42 mm projectile despite having a Projectile Allowance of 0 (it launches more projectiles than its allowance).
3. After the Hero launches the third 42 mm projectile after it is defeated.

17 mm projectile damage is never blocked.

While the Hero has occupied its team's Resupply Zone, its Pilot may exchange Gold Coins for 42 mm Projectile Allowance via the Referee System player client.

3.3.4 Victory Point Mechanism

The Scoring Areas and Objectives are described in "3.2.4 Scoring Area and Objectives".

Both teams start each Battle with 0 Victory Points. Victory Points are awarded as follows:

Table 3-13: Victory Point Awards

Action	Victory Points	Awarded To
Objective A is scored in a team's Scoring Area	1 per second	The team whose Scoring Area contains Objective A
An Objective B pipe is turned in	30 per pipe	The team whose color matches the pipe
An Objective C donut is scored in a team's Scoring Area	5 per second per donut	The team whose Scoring Area contains the donut
A robot is defeated	20	The opposing team of the defeated robot

When a team reaches 300 Victory Points, the Battle ends immediately.

3.3.5 Game Winning Criteria

The format of the 3v3 Tournament is described in the ARCC Site Manual.

The winning criteria for a single Battle are as below:

1. When one team reaches 300 Victory Points, the Battle ends immediately, and that team is the winner.
2. When the duration of a Battle elapses, if neither team has reached 300 Victory Points, the team with the higher Victory Points is the winner.
3. When the duration of a Battle elapses, if the two teams tie on Victory Points, the team that inflicts greater total Attack Damage is the winner.
4. When the duration of a Battle elapses, if the two teams tie on Victory Points, and if the two have inflicted the same Attack Damage, the team with higher Total Remaining HP is the winner.
5. If neither fulfills these criteria, the game is considered a draw. A draw in the Elimination Stage leads to an immediate tie-breaker game until a team wins.

4. 1v1 Tournament

During a two-minute Battle, Infantry from both teams engage in a shooting battle on the Battlefield. The team that defeats the other team's robot wins the game.

4.1 Robot and Pilot

The maximum robot and pilot lineup is as follows:

Table 4-1: Maximum Robot and Pilot Lineup for the 1v1 Tournament

Robot Type	ID No.	Fielded Quantity	Pilot Lineup
Infantry	3	1	1 Pilot/Robot

- At the end of each game, the Pilot can be replaced by another member of the pit crew of the current match.

4.1.1 Infantry

Table 4-2: Key Features of Infantry

Key Features	Descriptions
Operating Mode	No restrictions. Up to one remote controller and one custom controller.
Inter-Robot Communication	Not applicable
Launching Mechanism	1x 17mm Launching Mechanism
Projectile Speed Limit (m/s)	25
Performance	• Maximum HP: 200 • Chassis Power Limit (W): 120 • Maximum Barrel Heat: 80 • Barrel Heat Cooling Rate: 12/s
HP Loss and Penalty for Exceeding Limit	• Exceeding the Projectile Speed Limit: Applicable • Exceeding Barrel Heat Limit and Cooling: Applicable • Chassis Power Overlimit: Applicable • Attack Damage and Collision: Applicable • Referee System Disconnection: Applicable • Penalty Damage: Applicable For details, see "3.3.1 HP Loss and Penalty for Exceeding Limit."
Projectile Loading	• During the Two-Minute Setup Period, 17 mm projectiles can be preloaded. • The Initial Projectile Allowance is 200. It cannot be increased during the game.

Key Features	Descriptions
HP Recovery and Respawn Mechanism	• HP Recovery: Applicable (see “4.3.2 HP Recovery Mechanism”) • Respawn: Not applicable

4.2 Competition Area

The core competition area of the 1v1 Tournament is called the Battlefield. The Battlefield is 5 m × 5 m in size.

• Unless otherwise stated, the dimension error margin of all Battlefield components described herein is within ±10%, and within ±5 mm for dimensions under 100 mm. The angle error margin is within ±3° for the Battlefield’s structure and within ±1° for Battlefield Components. The unit for the size parameters on the Battlefield drawings is mm.
• The Battlefield has a complex environment that may feature non-uniform magnetic fields, winds, venue lighting effects, and other environmental conditions that are not fully symmetrical.

For more details about projectiles and the Pilot Room, see “3.2.7.1 Projectiles” and “3.2.7.2 Pilot Room”.

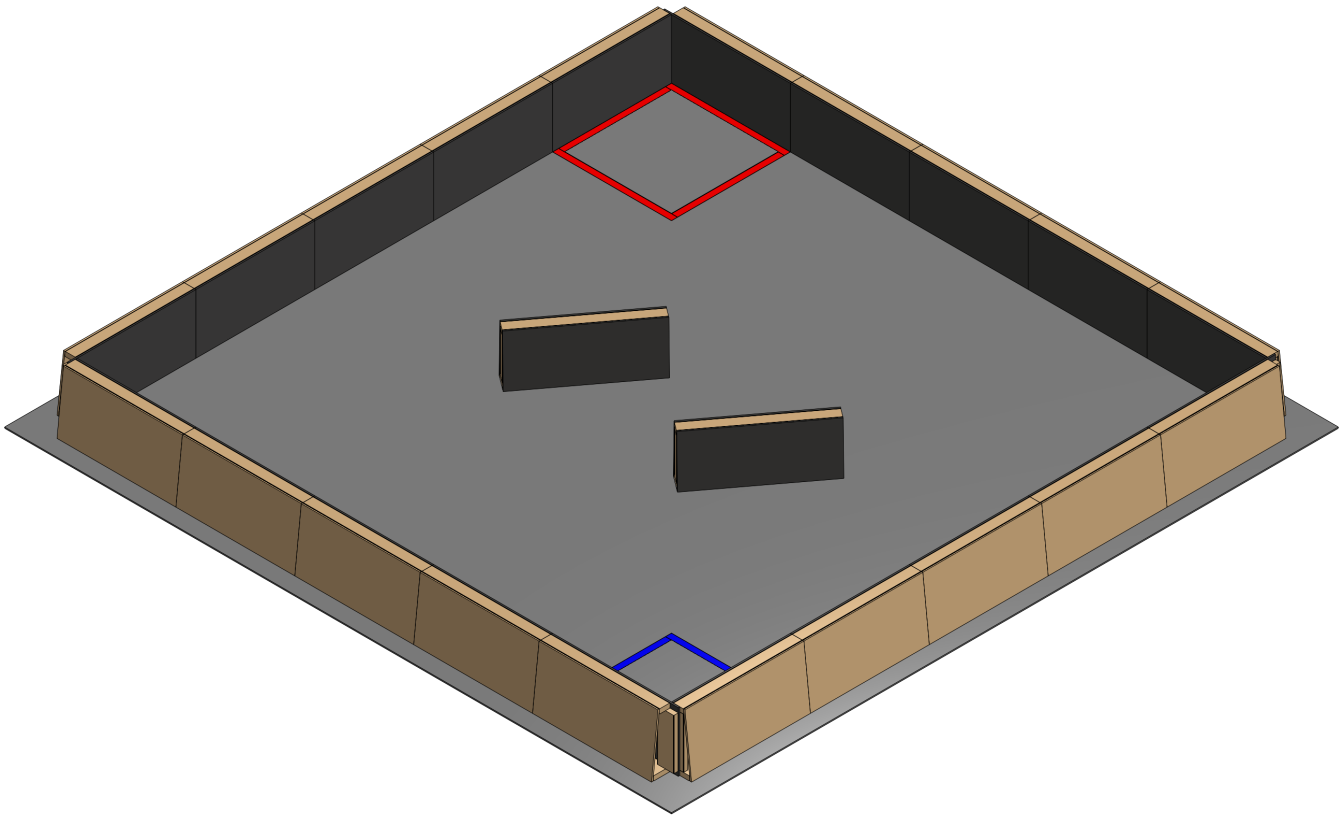
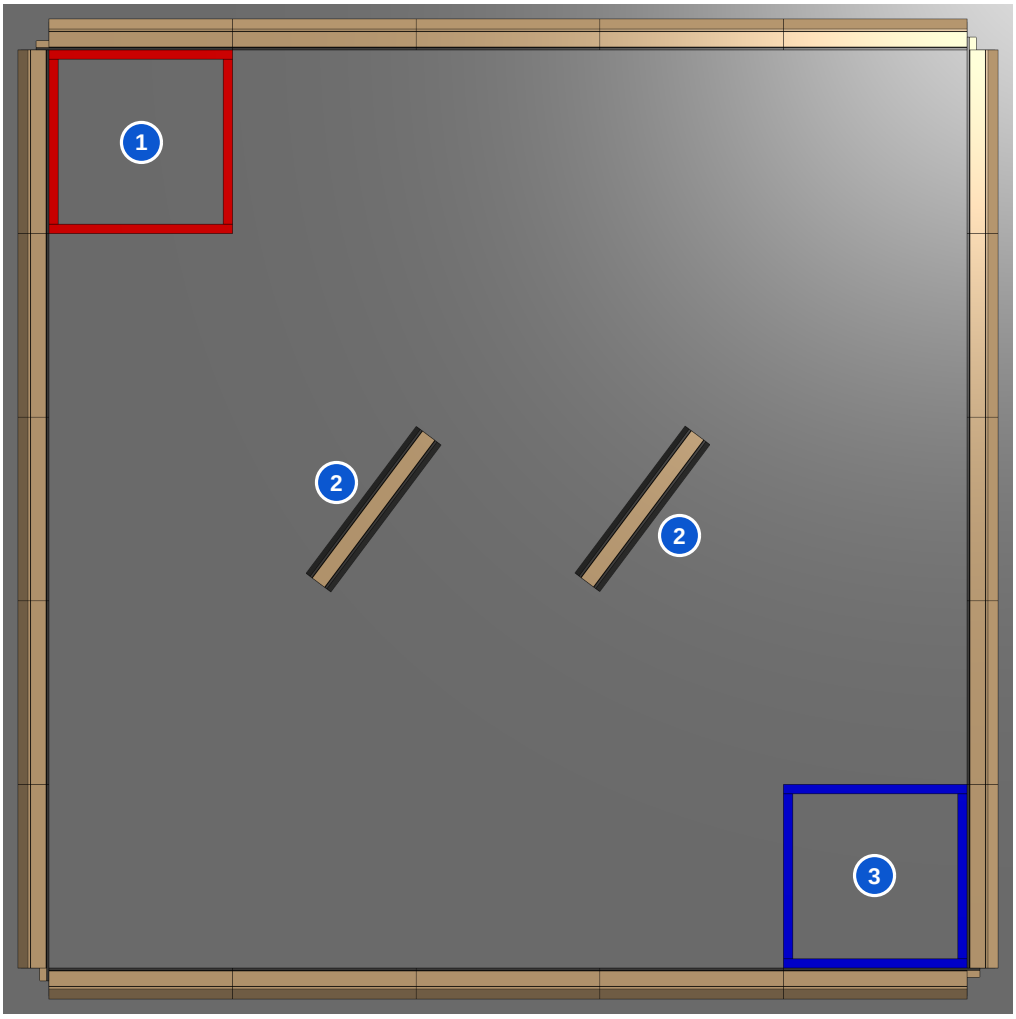


Figure 4-1: Isometric View of 1v1 Battlefield



[1] Red Team's Starting Zone

[2] Bunker

[3] Blue Team's Starting Zone

Figure 4-2: Top View of 1v1 Battlefield

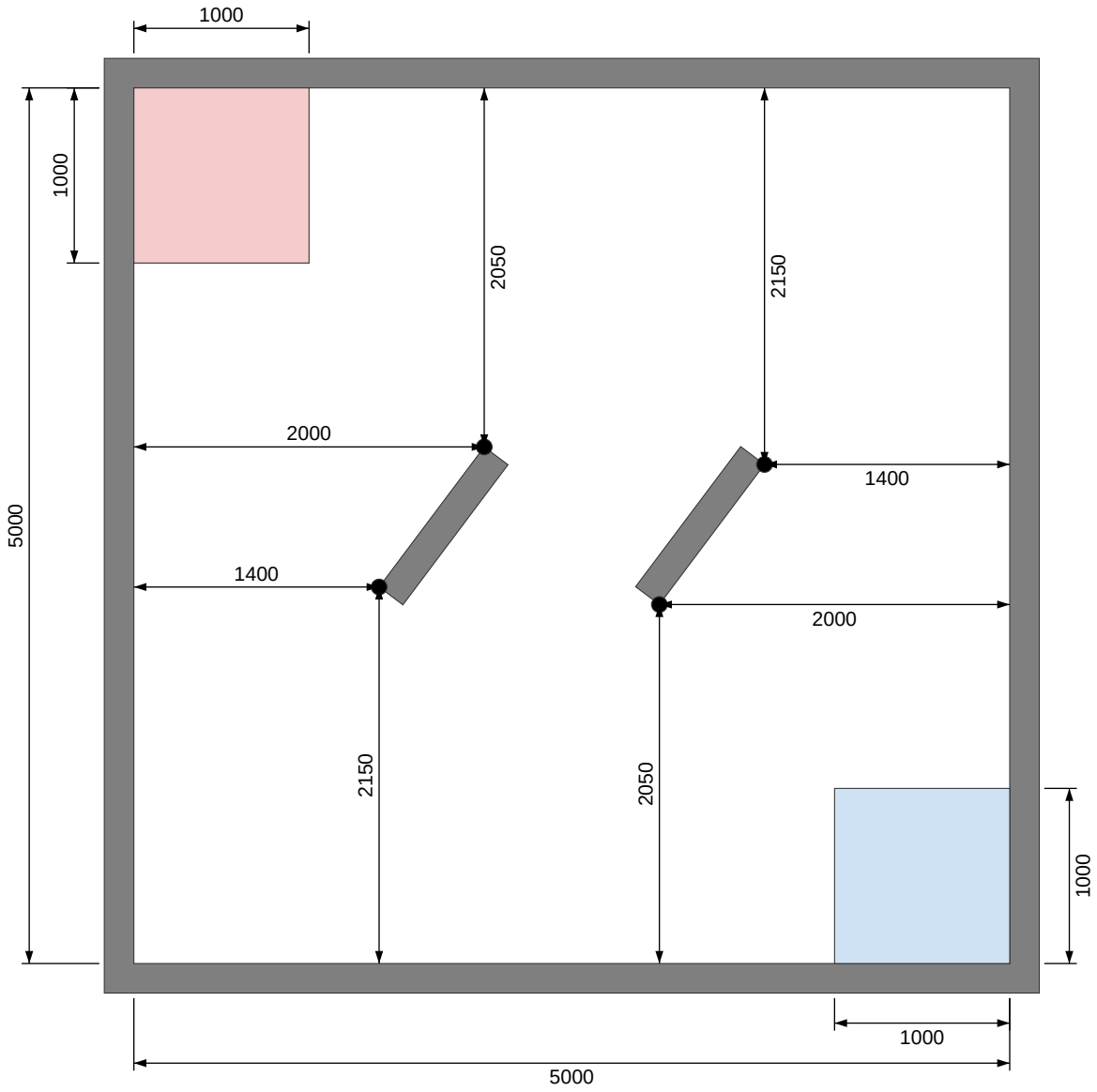


Figure 4-3: Dimensions of 1v1 Battlefield

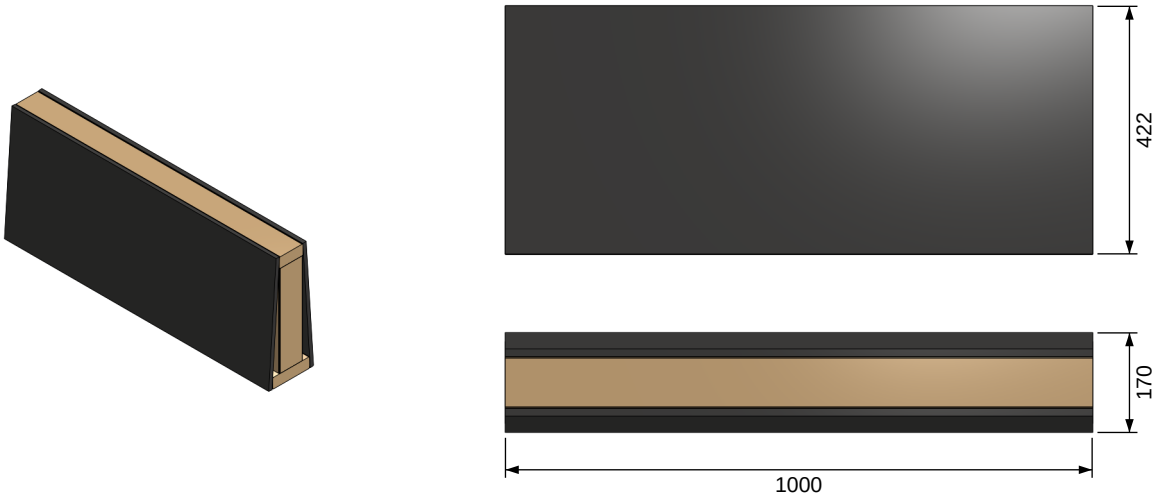


Figure 4-4: Bunker

4.3 Competition Mechanism

4.3.1 HP Loss and Penalty for Exceeding Limit

For details, see “3.3.1 HP Loss and Penalty for Exceeding Limit”.

4.3.2 HP Recovery Mechanism

Each time a robot deals projectile damage to the opponent’s robot, it recovers HP equal to 50% of the damage dealt.

4.4 Game Winning Criteria

The format of the 1v1 Tournament is described in the ARCC Site Manual. The winning criteria follow the below order to determine a winner.

1. During the game, a robot attacks the Armor Modules of the opponent robot until its HP drops to zero.
2. If neither robot is defeated within the time limit, the team with more remaining HP wins.
3. If neither robot is defeated within the time limit, and have equal remaining HP, the team who does not take the first damage of the game wins.
4. If both robots have full HP when the game time expires, the team with the higher total number of shots fired wins.
5. If both robots have full HP when the game time expires, and both teams have fired the same number of shots, the side that fired first wins.
6. If both robots have full HP when the game time expires, and neither team has fired any shots, then the robot with less weight wins.

The weight of the robot is measured during Inspection.

7. If a tie still occurs, the game is considered a draw. A draw in the Elimination Stage leads to an immediate tie-breaker game until a team wins.

5. Sentry Tournament

During a two-minute Battle, Sentries from both teams engage in a shooting battle on the Battlefield. The Sentry Tournament follows the same rules as the 1v1 Tournament, with a Sentry in place of the Infantry. The team that defeats the other team's robot wins the game.

5.1 Robot and Pilot

The maximum robot and pilot lineup is as follows:

Table 5-1: Maximum Robot and Pilot Lineup for the Sentry Tournament

Robot Type	ID No.	Fielded Quantity	Pilot Lineup
Sentry	7	1	0 Pilots/Robot

5.1.1 Sentry

The Sentry has the same Key Features as in the 3v3 Tournament (see "3.1.3 Sentry"), except for those listed below.

Table 5-2: Key Features of Sentry Changed from the 3v3 Tournament

Key Features	Descriptions
Performance	Chassis Power Limit (W): 120 (other Performance values are unchanged)
Projectile Loading	• During the Setup Period, 17 mm projectiles can be preloaded. • The Initial Projectile Allowance is 250. It cannot be increased during the game.
HP Recovery and Respawn Mechanism	• HP Recovery: Applicable (see "4.3.2 HP Recovery Mechanism") • Respawn: Not applicable

5.2 Competition Area

The Sentry Tournament uses the same Battlefield as the 1v1 Tournament. For details, see "4.2 Competition Area".

5.3 Game Winning Criteria

The format of the Sentry Tournament is described in the ARCC Site Manual. The Sentry Tournament uses the same winning criteria as the 1v1 Tournament. For details, see "4.4 Game Winning Criteria".

6. Drone Challenge

The Drone Challenge features one Drone. The Drone is always on the Red team and the Base is always on the Blue team. In the Drone Challenge, the Drone has three minutes to take off, launch projectiles at the Base, and land.

6.1 Robot and Pilot

The maximum robot and pilot lineup is as follows:

Table 6-1: Maximum Robot and Pilot Lineup for the Drone Challenge

Robot Type	ID No.	Fielded Quantity	Pilot Lineup
Drone	6	1	2 Pilots/Robot

The Drone has two Pilots: one operates the flight controls from a third-person perspective, and the other operates the Gimbal and Launching Mechanism using the first-person Client.

The Drone must have at least 1 Pilot operating the flight controls.

6.1.1 Drone

Table 6-2: Key Features of Drone

Key Features	Descriptions
Initial Zone	Drone Starting Zone
Operating Mode	No restrictions. Up to two remote controllers and one custom controller.
Inter-Robot Communication	Not applicable
Launching Mechanism	1x 17mm Launching Mechanism
Projectile Speed Limit (m/s)	25
Performance	• Maximum Barrel Heat: 200 • Barrel Heat Cooling Rate: 100/s
HP Loss and Penalty for Exceeding Limit	• Exceeding the Projectile Speed Limit: Applicable • Exceeding Barrel Heat Limit and Cooling: Applicable • Chassis Power Overlimit: Not applicable • Attack Damage and Collision: Not applicable • Referee System Disconnection: Applicable • Penalty Damage: Not applicable For details, see “3.3.1 HP Loss and Penalty for Exceeding Limit.”

Key Features	Descriptions
HP Recovery and Respawn Mechanism	Not applicable
Projectile Loading	• During the Setup Period, 17 mm projectiles can be preloaded. • During the Battle, the Initial Projectile Allowance is 500 and cannot be increased.

6.2 Competition Area

The competition area of the Drone Challenge comprises a Base and the Drone Starting Zone.

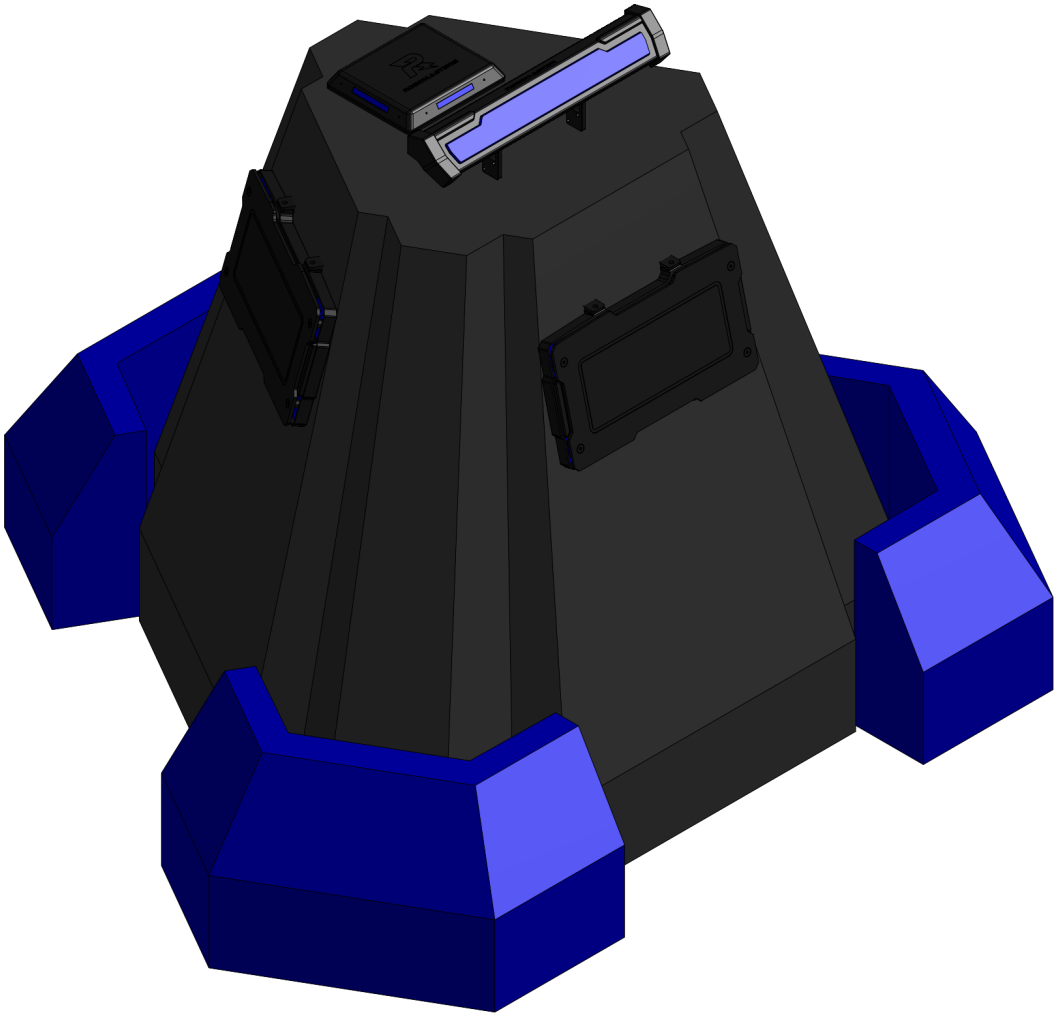


Figure 6-1: Base Isometric View

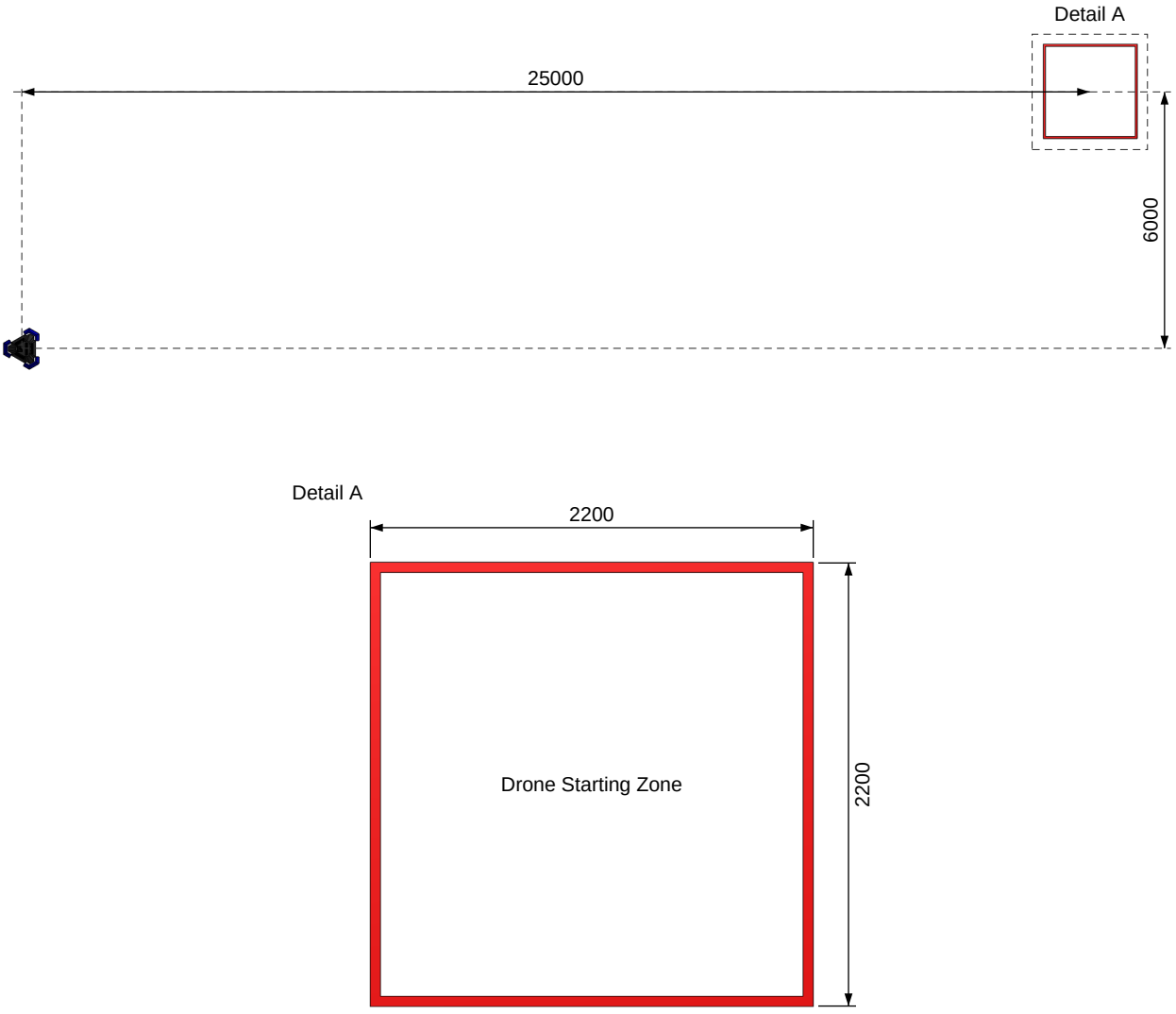


Figure 6-2: Drone Field Layout

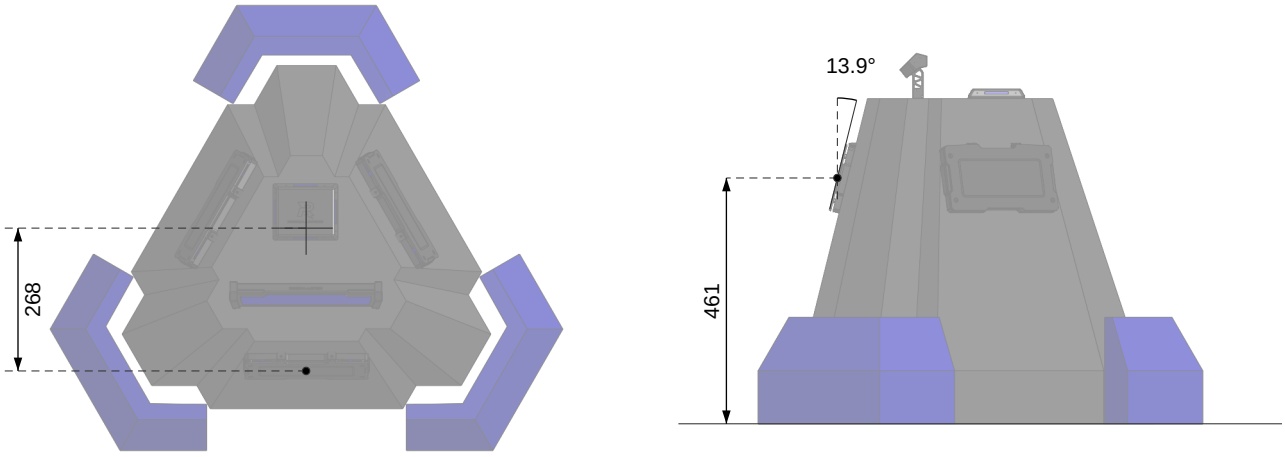


Figure 6-3: Base Armor Module Locations

6.3 Competition Mechanism

6.3.1 Damage to the Base

Each projectile that hits any of the Base's Armor Modules deals 10 damage to the Base. The Initial HP of the Base is 2000.

6.3.2 Scoring

Teams will be scored on the following criteria, with tiebreaks applied in the following order:

1. Amount of Base HP remaining.
2. In the event of equal Base HP (or if the Base was destroyed), the number of projectiles launched, with fewer projectiles ranking higher.
3. In the event the same number of projectiles were launched, the time from the start of the Battle to when the Drone lands.

7. Dart Challenge

The Dart Challenge features one Dart System. The Dart System is always on the Red team and the Base is always on the Blue team. In the Dart Challenge, the Dart System has three minutes to launch Darts at the Base.

7.1 Robot and Pilot

The maximum robot and pilot lineup is as follows:

Table 7-1: Maximum Robot and Pilot Lineup for the Dart Challenge

Robot Type	ID No.	Fielded Quantity	Pilot Lineup
Dart Launcher	8	1	1 Pilot/Robot
Dart	8	4	0 Pilots/Robot

The Dart System comprises one Dart Launcher and up to 4 Darts. The Dart Launcher has one Pilot, who enables the Dart System to launch during the Battle.

7.1.1 Dart System

Table 7-2: Key Features of Dart System

Key Features	Descriptions
Initial Zone	Dart System Starting Zone
Operating Mode	No restrictions. Up to one remote controller.
Inter-Robot Communication	Not applicable
Launching Mechanism	Not applicable
Projectile Speed Limit (m/s)	No limit
Performance	Not applicable
HP Loss and Penalty for Exceeding Limit	Not applicable
HP Recovery and Respawn Mechanism	Not applicable
Projectile Loading	During the Setup Period, Darts can be preloaded.

7.2 Competition Area

The competition area of the Dart Challenge comprises a Base and the Dart System Starting Zone. For details about the Base, see “6.2 Competition Area”.

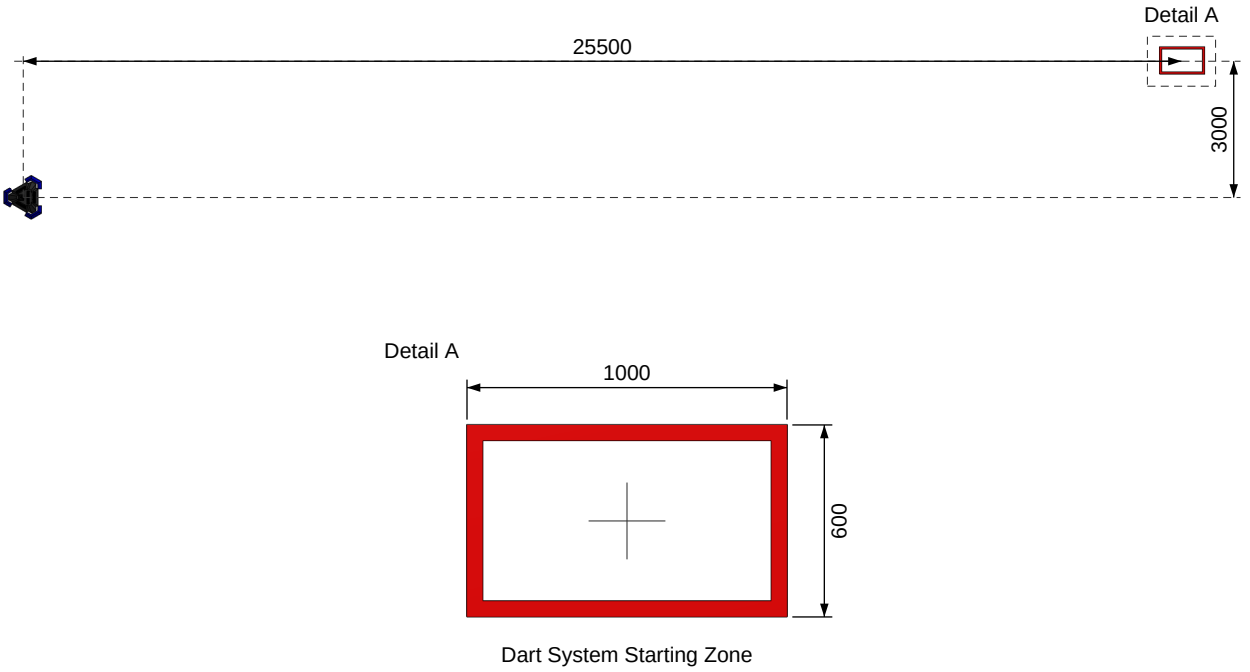


Figure 7-1: Dart Field Layout

7.3 Competition Mechanism

7.3.1 Hits

A Dart that hits any of the Base's Armor Modules (see Figure 6-3) counts as a hit if the Armor Module registers it, whether as a 17 mm or a 42 mm impact. Glancing impacts that register as a collision, or that do not register at all, do not count as hits. The total number of hits on the Base will be recorded.

7.3.2 Scoring

Teams will be scored on the following criteria, with tiebreaks applied in the following order:

1. Number of hits.
2. In the event of an equal number of hits, the time from the start of the Battle to when the final Dart is launched.

8. ARC Technical Innovation Conference [ARCTIC]

ARCTIC submission periods and notification dates are listed in “Table 2-1: Season Schedule” in the ARCC Season 2 Participant Manual.

8.1 Introduction and Goals of ARCTIC

The ARC Technical Innovation Conference is a competitive forum to share technology and learnings made for ARCC. The goals of ARCTIC are as follows:

- To encourage innovation in the ARC community by rewarding those who present.
- To share novel / uncommon / strange technologies within the ARC community.
- To prevent teams from going down costly R&D routes that other teams know are dead ends by sharing research experiences.
- To create high-quality open-source materials in English, which new and existing teams can use and build upon.
- To create an open portfolio of materials that teams can use to show sponsors and other stakeholders how ARC is creating opportunities for students to learn and innovate.
- To create another avenue for skill expression in ARCC.

Each team is allowed to submit up to **three** different Submissions.

Between each stage of submission, presentations are not guaranteed to pass and be accepted into the next phase. Submissions should not be low-effort, hastily assembled, or non-serious.

8.2 Scoring

Scoring is done on the Final Submission only. The Intent to Submit and Initial Submission are pass/fail and serve to provide feedback for submitters to iterate their submissions.

Scoring is done by a panel of three non-ARC-affiliated robotics experts based on the criteria in “8.6 Review Guidelines for the ARC Technical Innovation Conference”. After the conference, aggregate statistics for acceptance/rejection/scoring decisions will be released.

8.3 What to Submit

ARCTIC Submissions have 4 steps:

1. Intent to Submit
2. Initial Submission
3. Final Submission
4. Live Presentation (see “8.7 ARCTIC Presentation”)

Please refer to “Appendix C: ARCTIC Submission Checklists”.

8.4 FOSS Requirements

These requirements are the minimum that submissions must disclose to be accepted. Additional materials may be submitted beyond the requirements. All the below materials with the exception of code must be provided under a CC-BY-4.0 or CC0 license.

Not following these requirements for the final materials submission will result in your acceptance being revoked. Please ensure your final materials conform to these requirements. In exceptional circumstances, please contact ARC Robotics.

8.4.1 Mechanical Contributions

If the proposal focuses on the design/production of a specific mechanical/mechatronic system, a 3D STEP file of the system OR a simplified version must be provided. This simplified version is not required to be manufacturable, well-designed, or have extraneous details like electronics mounting as long as it has the key dimensions and ideas of the mechanism.

8.4.2 Electrical Contributions

If the proposal focuses on the design/production of a specific PCB for ARC, a schematic of the board OR a simplified schematic that retains the underlying functionality must be provided. Layout is NOT required. The schematic should be exported from EDA software in PDF format; a diagram created in another non-EDA software is not acceptable.

8.4.3 Software Contributions

Non-trivial: This is a disclosure requirement meant to reduce writing of simple code for the submission. Example: a non-feedforward PID controller to actuate a pitch mechanism would be considered as trivial. However, unique or innovative implementation details for trivial software cannot be waived.

If the proposal has a **non-trivial** software component that is key to the functionality of the system, you must disclose code that can be used for this component. Code can be simplified and does not have to be verbatim code deployed on fielded robots, but it must be functional. The code disclosure must be structured as follows:

- The code is disclosed as a Git repo on GitHub or GitLab and will be mirrored at a later date. There is no requirement to retain the commit history.
- The code must compile and run an understandable and explicit example that showcases its use case.
- There must be detailed instructions on how to build and run the code with the example above in a README (in English).
- The code **must** be permissively licensed under an OSI-approved license. If your code does not already have a license, please use MIT. We understand that this is not possible in all cases, for example, code based on Taproot or HuskyBot must be GPLv3 or AGPLv3.

8.4.4 Manufacturing Contributions

If your proposal focuses on a manufacturing technique, you must provide a detailed written example procedure (PDF) that you used to produce a real part described in your presentation. This procedure can

describe how to manufacture some test geometry with your technique, as long as the same manufacturing technique is used and the procedure produces a real and successful part. Pictures are not required but are appreciated.

8.4.5 Design Contributions

If your proposal focuses on approaches to the design of parts, whether that be CAD or EDA, an example file that shows the design techniques must be provided. For instance, if you highlight length matching as a technique in PCB design, you must provide a PCB layout file that has some length-matched traces. If your presentation references a technique, but that technique is not the main focus of your presentation, there is no need for such a design file. A design file can contain multiple techniques.

8.4.6 Other Topics

If your presentation describes something not covered under these cases, please contact ARC Robotics for more details.

8.5 ARCTIC Desk Rejection Guidelines

ARC Robotics reserves the right to desk reject submissions that are extremely weak, or for the sake of Conference event capacity.

8.5.1 Multiple Proposals From a Team

If a team submits multiple proposals, we will use the criteria in “8.6.3 Contribution to ARC Community” to rate them. Proposals may be rejected to meet event capacity constraints based on this ranking. Each team will have at least 1 submission not rejected for this purpose.

8.5.2 Out-of-Scope Topics

The following types of submissions will not be accepted:

- General Robotics Work (Unrelated to ARC rules or competition)
    - Example: “Our custom omni-wheel drive – no ARCC context.”
- Software Tutorials Without Practical ARCC Application
    - Example: “Nav2 for Dummies” (without ARCC-specific scenarios)
- Non-Practical or Excessively Expensive Manufacturing Techniques
    - Example: “Our school used a $30,000 wire EDM – not feasible for most ARCC teams.”
    - Example: “We made this part out of plastic—just don’t shoot it with a 42 mm.”
- Design Techniques Unrelated to ARCC
    - Example: “How to Use SolidWorks” (without ARCC-specific applications)

8.6 Review Guidelines for the ARC Technical Innovation Conference

Each submission will be evaluated based on the following criteria:

8.6.1 Technical Soundness

Prompt: *Please assign a numerical rating on the following scale to assess the soundness of the technical claims, experimental methods, and research methodologies. Consider whether the core claims of the presentation are well-supported with evidence.*

Table 8-1: Technical Soundness Scoring Rubric

Points	Technical Soundness
4 (Excellent)	The technical content is rigorous, well-validated, and thoroughly supported by experiments or research.
3 (Good)	The claims are generally sound, with minor limitations or gaps in validation.
2 (Fair)	The presentation has notable weaknesses in methodology or lacks sufficient supporting evidence.
1 (Poor)	The technical content is flawed, misleading, or lacks adequate justification.

8.6.2 Presentation Quality

Prompt: *Please assign a numerical rating based on the clarity, structure, and writing style of the presentation. Consider how well the material is explained and contextualized relative to prior ARC work.*

Table 8-2: Presentation Quality Scoring Rubric

Points	Presentation Quality
4 (Excellent)	The presentation is well-structured, highly readable, and effectively communicates complex ideas.
3 (Good)	The material is clear and well-organized but could be refined for better readability or flow.
2 (Fair)	The explanation is somewhat unclear, disorganized, or missing key context.
1 (Poor)	The presentation is difficult to follow, poorly structured, or lacks coherence.

8.6.3 Contribution to ARC Community

Prompt: *Please assign a numerical rating to evaluate the significance of the work in advancing ARC. Consider whether the presentation introduces novel ideas, shares valuable research experiences, or helps teams avoid unnecessary R&D pitfalls.*

Table 8-3: ARC Community Contribution Scoring Rubric

Points	Contribution to the ARC Community
4 (Excellent)	The work presents innovative ideas, valuable insights, or impactful lessons for the ARCC community.
3 (Good)	The presentation is useful and relevant but may not introduce significantly novel concepts.
2 (Fair)	The contribution is somewhat useful but has limited applicability or originality.
1 (Poor)	The presentation does not offer meaningful insights or contributions to ARCC.

8.7 ARCTIC Presentation

8.7.1 Presentation Requirements

The ARCTIC Presentations will occur during ARCC. For each accepted presentation, up to 3 presenters may present. Each presentation will be allotted 30 minutes total including Q&A. It is recommended that teams allocate 20 minutes for the presentation and 10 minutes for Q&A. Presenters do not need to fill their entire time slot, but they may not exceed it. Presenters will present a slideshow to a live audience of participants and guests, a panel of judges, and online viewers via the event livestream.

8.7.2 Format

Presentations will occur using a classroom-style projector screen or TV display. The presentation computer will be provided by ARC Staff. ARC Staff will pre-load your Final Submission presentation for you.

A wireless presentation remote will be provided, though presenters may bring their own laser pointers, clickers, or other presentation aids themselves. At least 1 USB-A port will be made available for interfacing.

Presenters may also choose to bring physical hardware or props to accompany their presentation. Audience interaction is not prohibited, but presenters should carefully consider the impacts to presentation quality.

9. Competition Process

The competition process in this chapter applies to all robot competition events. Values that differ between events are listed in Table 9-2.

In the following section the below terminology is used to describe the pre-match locations.

Table 9-1: Match Location Definitions

Name	Location	Description
L3	After Inspection	Teams who have completed Inspection wait in L3 to be escorted to L2.
L2	Near the Battlefield	Occupied by multiple teams queued up for upcoming matches
L1	Adjacent to Battlefield Entrance	Occupied by the team playing/about to play the current match.

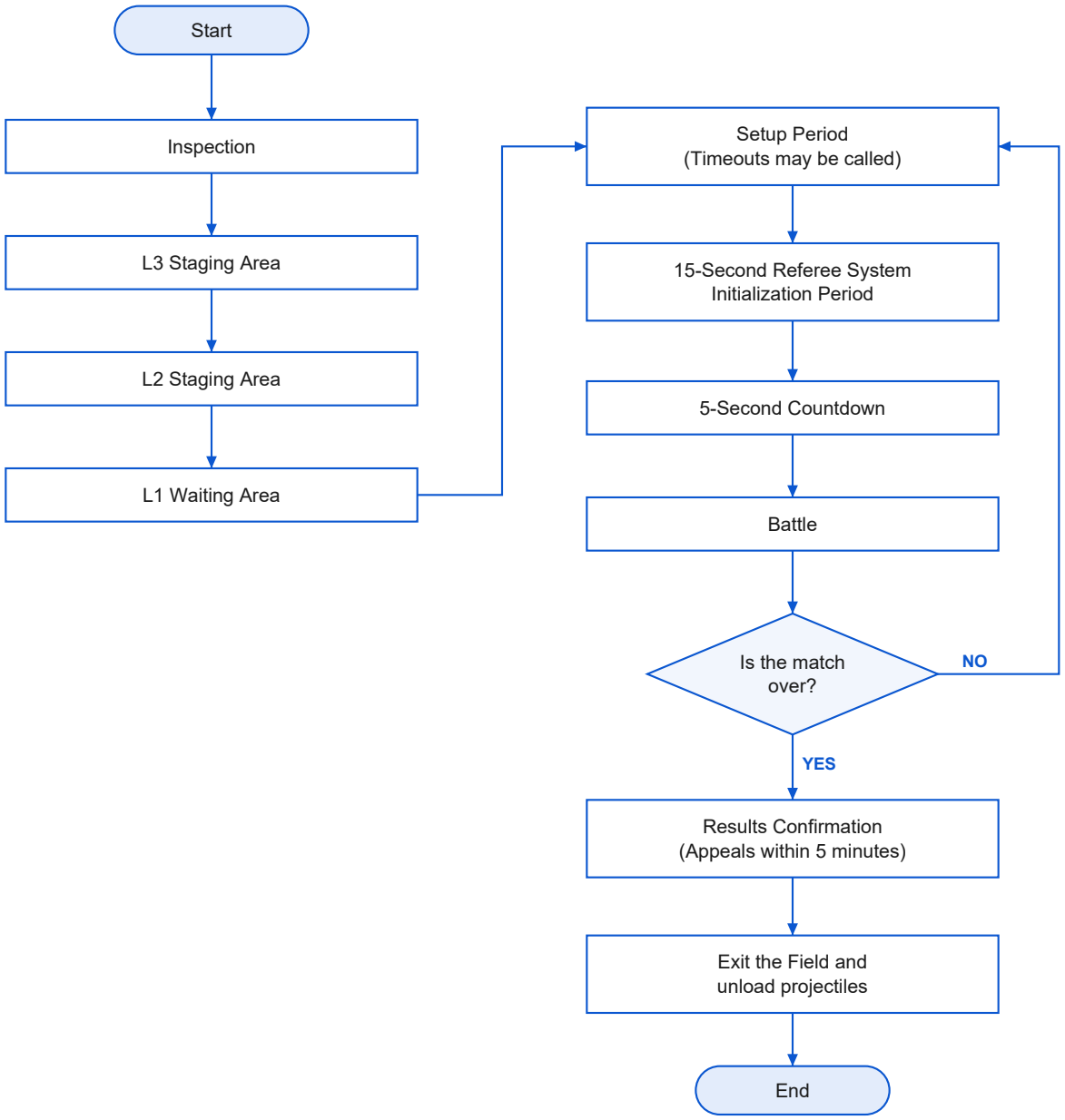


Figure 9-1: Process of a Single Match

Table 9-2: Competition Process Parameters by Event

Event	Members Allowed in Inspection	Total Pit Crew Members	Arrival at Inspection	Robots Allowed at Inspection	Setup Period	Team Timeouts per Event
3v3 Tournament	4	8	60 minutes before the match	3	3 minutes	2x two-minute

Event	Members Allowed in Inspection	Total Pit Crew Members	Arrival at Inspection	Robots Allowed at Inspection	Setup Period	Team Timeouts per Event
1v1 Tournament	2	4	40 minutes before the match	1	2 minutes	2x two-minute
Sentry Tournament	2	4	40 minutes before the match	1	2 minutes	1x two-minute
Drone Challenge	3	3	40 minutes before the match	1	2 minutes	1x two-minute
Dart Challenge	2	2	40 minutes before the match	1	2 minutes	1x two-minute

9.1 Pit Crew Allowances

The total number of team members allowed into the Inspection Area shall not exceed the limit outlined in Table 9-2. The extra Pit Crew Members shall travel immediately to the L3 Staging area and wait for their team to complete Inspection. Once a team and robot enters Inspection, no further team members may join, nor any further equipment may be given to the team.

The total number of Pit Crew Members allowed in the L3 staging area through to Projectile Return is outlined in Table 9-2.

Captain Badge: Any Pit Crew Member that wears the Captain Badge performs the Captain role during the match. The Captain is responsible for leading the team in the competition process, confirming results, and requesting timeouts, appeals, etc.

Starting from Inspection until the team leaves the Competition Area, one Pit Crew Member should wear the Captain Badge and undertake the Captain's role. At check-in, teams will be issued Captain, Pit Crew, and Pilot badges corresponding to their registered events. Participants who are not wearing the proper badge in the required areas will be asked to leave.

- Pilots and Captains count toward Pit Crew allowance.

9.2 Inspection

• Teams must pass Inspection before each match.
• Passing Inspection only means that the robot meets the standards at the time of Inspection. Teams are required to ensure that their robots fulfill the requirements of the ARCC Season 2 Robot Building Specifications at all times.
• During Inspection, teams must actively demonstrate all of their robot's functions to the Inspectors.

In order to make sure that the robots built by participating teams conform to the requirements in the ARCC Robot Building Specifications, teams must arrive at the Inspection Area no later than the time listed in Table 9-2. If the team does not arrive at Inspection with at least the aforementioned time before their match, they shall bear all consequences.

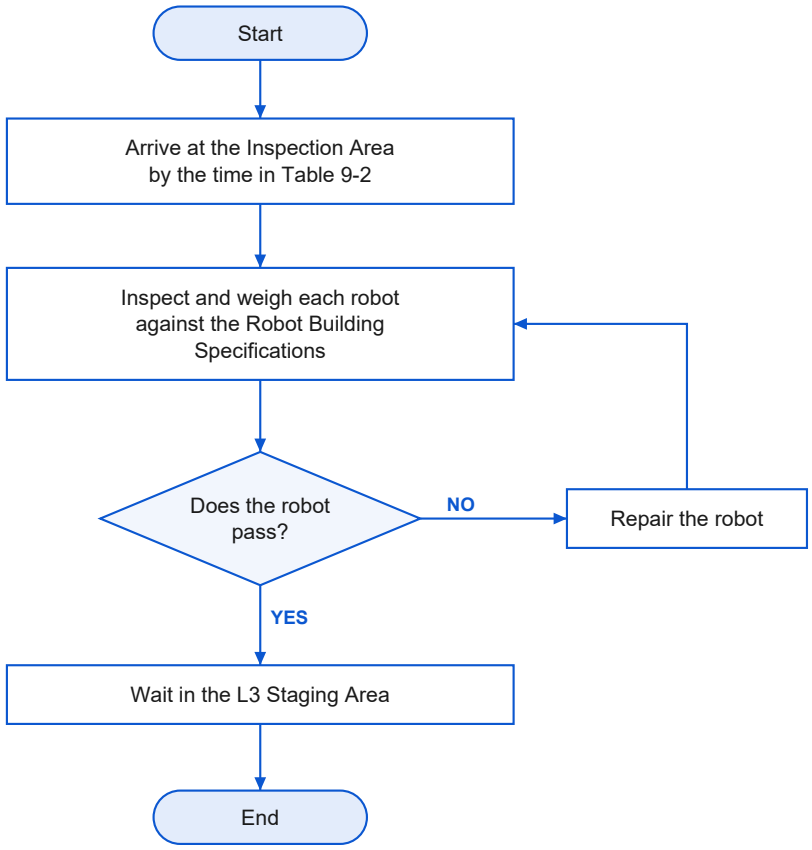


Figure 9-2: Inspection Process

Each team can bring no more than the number of robots listed in Table 9-2 to Inspection.

9.3 L3 and L2 Staging Areas

After Inspection, the Pit Crew Members and Robots must wait in the L3 Staging Area. They will be escorted, once per match as a team, by staff from the L3 Staging Area to the L2 Staging Area. Neither Pit Crew Members nor Robots may leave either the L3 or L2 Staging Area without explicit permission from a Referee.

If any team needs to repair its robots inside the L3 or L2 Staging Area, they must obtain permission from Inspection staff or a referee. A robot may leave a Staging Area for repair only after the staff at the Staging Area have revoked the Inspection status of the robot. When repair is finished, the robot needs to be brought back to repeat Inspection before re-entering a Staging Area. If the team is unable to arrive at the Staging Area in time as a result of this delay, the robot will not be able to enter the match, and the team will bear the consequences.

At the direction of the Field Referee, the Pit Crews will enter the L1 waiting area to place their robots. The Pit Crews will wait at the entrances of the Battlefield with their robots for further instructions. Pit Crew Members should not enter the Battlefield or commission their Robots without explicit direction from the Field Referee. The referees will open the doors and lead the Pit Crews into the competition area. The countdown for the Setup Period will begin when the doors are opened.

9.4 Setup Period

The length of the Setup Period for each event is listed in Table 9-2. During the Setup Period, Pit Crew Members need to place their robots in their team's Starting Zone, check whether their Referee Systems are operating normally, and if applicable, pre-load the robots with projectiles. Pit Crew Members may repair robots or replace equivalent parts, provided the requirements of the specifications documents are met. Pit Crew Members are required to commission their robots within their team's Starting Zone. Robots are not allowed to leave the Starting Zone. Pit Crew Members must remain within their team's half of the Battlefield or their L1 Waiting Area.

- Equivalent parts: Standard modules or components having the same material, form and functions, for example, motors of the same model and self-built friction wheel modules. The main structure supporting the robot's body, such as a robot's chassis or the body of a Drone, cannot be replaced as equivalent parts.
- If the equivalent part includes the Referee System Module, the participating team must ensure that the Referee System Onboard Module works properly, including version number, sensor calibration, and Mounting Specifications. If the Referee System Module(s) in the equivalent part experiences an abnormality, it will not trigger an Official Timeout.

90 seconds before the Setup Period ends, the pilot(s) are advised to enter the Pilot Room to complete commissioning for the keyboard and mouse (both can be brought by the pilots), and double-check whether the robot controls and official equipment are operating properly. USB Keyboards and Mice connected to the Pilot Room computers must be produced by legitimate manufacturers with valid manufacturer certifications and no modifications. All keyboards and mice must comply with the USB HID protocol without any computer-side firmware or software. If any official equipment does not operate normally, the Pit Crew Members must raise the issue before entering the final 15 seconds of the Setup Period. Otherwise, no timeouts will be allowed by the referee. Only pilots from the team are allowed into the Pilot Room, Pit Crew Members must remain outside.

When the Setup Period is down to 30 seconds, all robots in the Battlefield must be powered up, robots that are not powered up must be removed from the Battlefield, and the staff in the Battlefield should leave the Competition Area in an orderly manner. After the end of the Setup Period, Pit Crew must place the remote controller of each Sentry in the designated area for the event.

9.4.1 Official Timeout

During the Setup Period, if the Referee System or equipment inside the Pilot Room malfunctions (for details, see the table below), or the robot needs additional Inspection, the Head Referee can announce an Official Timeout and pause the setup countdown. The starting time of the Timeout is decided by the Head Referee based on the situation.

During an Official Timeout, Pit Crew Members cannot fix the malfunctions of the Referee System or other official equipment unless the fix is required by the referee. If a replacement is needed for a malfunctioning Referee System, replace the Referee System Onboard Modules within the time limit specified in the ARCC Season 2 Robot Building Specifications. When the relevant malfunctions of the Referee System or official equipment have been eliminated and the Head Referee has resumed the countdown, Pit Crew Members are required to follow the set procedures for the Setup Period and leave the Battlefield within the specified time.

Table 9-3: Malfunctions

No.	Description
1	A fault occurs with the official equipment in the Pilot Room, or any key competition component in the Battlefield experiences structural damage or functional irregularity
2	During the Setup Period of the first game, a Referee System Onboard Module experiences faults, such as damage to the Armor Module, Speed Monitor Module disconnection, etc.
3	During the Setup Period, the Main Control Module of the Referee System is unable to connect to the server or a robot cannot transmit images to the Pilot Room.
4	Other situations where the Head Referee deems it necessary to call an Official Timeout.

As it is impossible to determine whether the malfunction stems from the Referee System module itself, flaws in the robot's electrical or structural design, or damage caused during previous matches, an Official Timeout will not be called for regular battle damage, except for the situation described in Malfunction 3 above. The referee will provide backup Referee System modules. Participating teams may request a "Team Timeout" to repair their robots.

If the referee determines that the malfunction referred to in Malfunctions 2 and 3 above is caused by the team, the referee will explain the situation and end the Official Timeout.

9.4.2 Team Timeout

If the mechanical structure of a robot, a software system, the keyboard or mouse brought by the team in the Pilot Room or other team equipment experiences any faults, the team Captain may make a request to the referee in the Battlefield or Pilot Room for a "Team Timeout" only before the 15-second countdown in the Setup Period, and indicate the requested timeout length and reasons for the request. Once a Team Timeout is requested and conveyed to the Head Referee it cannot be canceled or revised.

After the Team Timeout is confirmed by the Head Referee, the Referee will notify both teams at the same time regardless of which team initiated the timeout. Both teams are then permitted to use the full duration of the timeout as they see fit.

The Head Referee may end the Team Timeout once they determine that the teams are ready. Even if the participating team does not enter the Battlefield or ends the Timeout early, the timeout opportunity is still consumed.

To ensure that subsequent matches begin on time, only one Team Timeout is allowed in each Setup Period on a first-come, first-served basis. The Timeout usage is recorded in the Match Results Confirmation Form.

Each team has the Team Timeout opportunities listed in Table 9-2 for each event. A team cannot request Team Timeout once their opportunities have been used up.

9.5 15-Second Referee System Initialization Period

After the Setup Period, the game enters a 15-Second Referee System Initialization Period. During the Initialization Period, the Referee System server automatically detects the connection status of the Referee System player's client, the status of Referee System Onboard Modules, and reset the HP of all robots to ensure their HP is full when the game officially begins.

9.6 5-Second Countdown

After the 15-Second Referee System Initialization Period, the game enters a 5-Second Countdown. At this time, the Referee System player's client will not respond to control commands from robots (including Custom Controllers). Once the countdown ends, the keyboard is unlocked and the Battle starts.

9.7 Battle

Robots compete on the Battlefield, the core competition area, according to the rules of the event.

9.8 End of Game

When the time of the Battle runs out or a team meets the winning criteria of the event, the game ends. The match is over when a winner has emerged or all games have ended.

9.9 Results Confirmation

During a match, the referee will record on the Match Results Confirmation Form the penalties issued for each game, the key competition data at the end of the match, the winning teams, the use of Timeout opportunities by the teams, and other relevant details.

If the team Captains do not agree with the match results and wish to launch an Appeal, they must do so within 5 minutes of the end of the match (starting from the beginning of the 'Exit the Field' period of the final game). Once 5 minutes have elapsed, it is assumed that both Teams accept the match results. Team Captains may verify the match result at the Referee desk, but no confirmation action is required.

9.10 Exit the Field

After a Match, teams must power off all their robots and remove them from the Battlefield. Teams must then proceed to the Projectile Unloading Area to unload their projectiles. At the Projectile Unloading Area, teams

must follow the instructions of the staff to empty the projectiles in their robots, and return all projectiles used in the competition.

10. Violations and Penalties

In order to ensure the fairness of the competition and maintain competition discipline, the participating teams, participants, and participating robots must strictly follow the competition rules. If there is a violation, the referee will give a corresponding penalty for the violation. Some violation penalties issued before the official start of the competition will be enforced after the official start of the competition. All serious violations and all appeals in the competition will be publicized.

Penalty for violations stated in this chapter will be determined by the Head Referee according to the actual situation. If an event that affects competition fairness happens during the competition but it does not involve penalty rules or serious violations, the Head Referee will make a decision based on the actual situation.

> If a team's actions have directly caused the other team to commit a violation, the other team is not penalized but must cease its violating behavior immediately

10.1 Penalty System

10.1.1 Forms of Penalties

During a match, the referee may issue penalties against participants and robots that have failed to comply with competition rules. The forms of penalties are as follows.

Table 10-1: Forms of Penalties

Form of Penalty	Description
Automatic penalties by the Referee System	All HP losses in "3.3.1 HP Loss and Penalty for Exceeding Limit", except those caused by attacks or collision and the penalty damage, are automatic penalties by the Referee System.
Manual penalties through the Referee System	Penalties issued by the referee through the server against robots for violation of rules.
Manual penalties by human referees	Where penalties cannot be issued through the Referee System, for example issuing a verbal warning or disqualifying a team.

10.1.2 Types of Penalties

The types of manual penalties are as shown below:

Table 10-2: Types of Penalties

Type of Penalties	Description
Verbal Warning	• A Referee verbally explains the situation and cause of the penalty. • A Referee gives instructions on what to do to resolve the penalty-causing behavior.
Yellow Card	• One team receives a Yellow Card: ◦ If the offending robot is a Sentry, its chassis will be powered off for 2 seconds while the operating interface of other alive robots will be obstructed for 2 seconds. ◦ If the offending robot is not a Sentry, the operating interface for the offending robot is blocked for 5 seconds and those of other robots are blocked for 2 seconds. ◦ The Referee System will automatically deduct the offending robot's HP by 15% of its Maximum HP, while the remaining alive robots will have their HP deducted by 5% of their Maximum HP. If the robot receives a Yellow Card again within 30 seconds after it receives a Yellow Card, the percentage of their current Maximum HP lost will be doubled that of the previous loss for that robot, and 5% for the other alive robots on the team. ◦ In each Battle, a robot that has been issued three Yellow Cards in total will receive a Red Card. • Both teams receive a Yellow Card: ◦ The operating interfaces of all pilots are blocked for 2 seconds and all robots lose 5% of their maximum HP, without taking into account the cumulative number of Yellow Cards received by one robot.

Type of Penalties	Description
Red Card (Ejection)	• Ejecting a robot ◦ If a robot is ejected before entering the 15-Second Referee System Initialization Period, the offending robot will not be allowed to enter and must be removed from the Battlefield. It cannot be replaced by other robots in any game of the current match. ◦ If a robot is ejected during the 15-Second Referee System Initialization Period, the Red Card should be issued after the Battle starts. ◦ If a robot is ejected during the Battle, its HP immediately drops to 0, its video feed is cut off, its inter-robot communication is disconnected, and it cannot respawn. • Ejection of Pit Crew Members: ◦ Pit Crew Members ejected by a referee must leave the Competition Area immediately and cannot be replaced by other Pit Crew Members for all games in the current match. All robots controlled by an ejected Pilot must also be ejected for the current Battle, and will not be allowed to join the Battlefield nor can they be replaced by other robots for all games in the current match.

Type of Penalties	Description
Involuntary Forfeiture	• If a Forfeiture is issued for a game (hereinafter referred to as “Game Forfeiture”), the forfeiting team loses the game and the following rules shall apply. Rules for Victory Points apply only to events that use Victory Points. ◦ If a Forfeiture is issued before the Battle (including during the Setup Period and Referee System Initialization Period), the forfeiting team’s Victory Points will be zero, the rule-violating robot’s HP will be zero, and the forfeiting team’s other robots will be at full HP. The opposing team’s Victory Points will be 300, and its robots’ HP will be full. ◦ If a Forfeiture is issued during the Battle, the Battle will end immediately. The forfeiting team’s Victory Points will be zero. All robots’ HP and the opposing team’s Victory Points will be recorded as they are when the Battle ends. ◦ If a Forfeiture is issued after the Battle, the forfeiting team’s Victory Points will be zero. All robots’ HP and the opposing team’s Victory Points will be recorded as they were when the Battle ended. • If a Forfeiture is issued in a match (hereinafter referred to as “Match Forfeiture”), it applies to all games in the match, and the Victory Points and HP for each Battle should be calculated according to the above descriptions.
Exclusion from Awards	• Participants are excluded from awards. • Robots are excluded from awards. • Participating teams are excluded from awards.
Disqualification	• The team member is disqualified from the current competition season • The team is disqualified from the current season, but its results in the season will be maintained as a basis for other teams’ advancement.

• If a robot receives successive Yellow Cards, the time that the pilot’s interface is blocked will add up accordingly. The 30-second period will be reset.
• If a robot’s remaining HP is less than or equal to that which needs to be deducted from the penalty, this robot’s HP reduces to 1.
• Penalty durations resulting from rule violations (ex: chassis power-off, UI blackout) operate independently of issued yellow cards and do not stack.

10.2 Penalty Rules

This section explains the penalty rules. The R# rules clearly indicate the rules that Participating Teams, Participants, and robots must follow.

10.2.1 Participants

10.2.1.1 General Rules

R1. Participating teams are required to meet the requirements listed in ARCC Participant Manual.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R2. Participants and their actions must not interfere with the normal operation of the official equipment, competition processes, and the normal work of Competition Staff.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R3. Teams must not set up their own wireless equipment or communicate with team members using walkie-talkies in the relevant competition areas, including but not limited to the Preparation Area, Inspection Area, Staging Areas, and Competition Area.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R4. Teams must not damage any official equipment, including but not limited to equipment in the Competition Area, Staging Areas, Preparation Area and Inspection Area.
Penalty: The highest penalty that can be imposed on the offending team is disqualification and compensation as per the price.

R5. Apart from Pit Crew Members who have entered the Staging Areas and Competition Area due to match-related reasons, no participants are allowed inside either area without special reasons.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R6. Any Pit Crew Member who has entered the Staging Area and Competition Area for competition may not leave either area or be replaced by another Pit Crew Member without the permission of the referee.
Penalty: Offenders are not allowed to enter the Staging Area and Competition Area. The highest penalty that can be imposed on the offending team is disqualification.

R7. Once a team has entered the Staging Area, no external equipment, including tools, spare parts, batteries, and robot components, may be brought in or handed to Pit Crew Members without the permission of a referee.
Penalty: Confiscation of the equipment and Verbal Warning. If the Verbal Warning is ineffective, the highest penalty that can be imposed on the offending team is a Match Forfeiture.

R8. When waiting in the L3 Staging Area, L2 Staging Area, or the L1 Waiting Area, team members are not allowed to bring robots out of the Staging Area without permission.
L3 Penalty: Verbal Warning. If the warning is ineffective, the Inspection result will be voided and the robot must repeat Inspection.
L2 Penalty: Verbal Warning. If the warning is ineffective, the offenders and robots will be issued a Red Card, with the highest penalty being disqualification.
L1 Penalty: Verbal Warning. Robots will be issued a Red Card, with the highest penalty being disqualification.

R9. Participating teams are not allowed to bring their own projectiles into the Inspection Area, Staging Area, or Competition Area.

Penalty: Confiscation of projectiles and Verbal Warning. If the Verbal Warning is ineffective, the highest penalty that can be imposed on the offender is disqualification.

R10. After a match is over, Pit Crew Members must power off all their robots, remove them from the competition area and empty all projectiles inside the robots at the Projectile Unloading Area.
Penalty: The offending robot will be detained in the Projectile Unloading Area, until its projectiles are cleared.

R11. After a match ends, Pit Crew must return all projectiles used in the competition to the Projectile Unloading Area.
Penalty: Confiscation of projectiles and disqualification of the offender from subsequent matches held at the same competition site. The highest penalty that can be imposed on the offender is disqualification.

R12. Except for emergency situations, teams must be present at the Inspection Area before the start of each match for Inspection. The team must stand by at the L2 Staging Area 10 minutes before each match.
Penalty: The highest penalty is a Match Forfeiture.

R13. Without the permission of the referee, a team may not power on and commission or repair a robot in areas outside the Battlefield from the time the robot passes an Inspection to the end of a match.
Penalty: The highest penalty is a Match Forfeiture.

R14. The identities and number of personnel of each team entering designated areas such as the Preparation, Inspection, Staging, and Competition Areas must meet the relevant requirements.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R15. One member of a Pit Crew must wear the Captain Badge, which must not be covered. All Pit crew Members must wear the Pit Crew Badge, which must not be covered. All Robot Pilots must wear the Pilot Badge, which must not be covered.
Penalty: The highest penalty that can be imposed on the offender is disqualification.

R16. Without the permission of the referee, Pit Crew Members entering the Battlefield must not communicate with anyone from the outside.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the highest penalty that can be imposed on the offender is disqualification.

R17. Pit Crew Members are not allowed to power their equipment using the power supply for official equipment in the Competition Area. However, they may bring their own power supply.
Penalty: Verbal Warning. If Verbal Warning is ineffective, the offenders will be issued a Red Card. The highest penalty that can be imposed on the offending team is disqualification.

R18. Pit Crew Members must wear appropriate Personal Protective Equipment (PPE) in the Inspection Area and the Competition Area.
Penalty: The maximum penalty that can be imposed on the offender is a Red Card.

R19. The team that makes an appeal must provide valid evidence or the specifications or rules in the official documents they are citing.
Penalty: The highest penalty that can be imposed on the offender is disqualification.

R20. The Team Captain is responsible for management of their team throughout the competition, ensuring that:

- All competition robots pass Inspection and comply with open-source robot usage guidelines.

- All team personnel, including but not limited to Advisors, Friends and Family, Alumni, and all other support staff do not commit any rule violations.
- Any other violations are stopped promptly.

Penalty: The Captain's managerial responsibility is determined according to the nature and severity of any violations. The offender may be disqualified as the highest penalty, but may also be subject to all applicable local Laws and Regulations.

10.2.1.2 Battlefield Specifications

R21. During an Official Timeout, Pit Crew Members are not allowed to fix faults other than those in modules related to the Referee System.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offender will be issued a Red Card.

R22. After the end of the Setup Period, Pit Crew Members must return to the designated area outside the Battlefield. During a game, Pit Crew Members are not allowed to leave the area without the permission of the referee.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offender will be issued a Red Card.

R23. At all times before, during, and after the Match, no team members shall approach the Head Referee Desk unless they are wearing the Team Captain Badge and verifying the result of the match or filing an Appeal.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offender will be issued a Red Card.

R24. After the end of the Setup Period, Pit Crew Members must place the Commissioning Remote Controller for the Sentry in the designated area (see "9.4 Setup Period"). The Remote Controller cannot be used to commission the Sentry once the 5-Second Countdown has started.
Penalty: If the violation is committed before the Battle, a Verbal Warning will be issued. If the Verbal Warning is ineffective, the offending robot will be issued a red card; if it is during the Battle, the offending robot will be issued a red card.

R25. After the 5-Second Countdown, the Pit Crew must not operate remote controllers located outside the Pilot Room that correspond to deployed robots.
Penalty: The offending robot will be issued a Red Card, with the highest penalty being a Game Forfeiture.

R26. Pit crew Members must ensure their robots are operating safely and will not cause harm to any person or equipment in the Competition Area.
Penalty: The offending team must bear the relevant responsibility.

10.2.1.3 Pilot Room Requirements

R27. Except for the Pilots of the robots on the Battlefield, the rest of the Pit Crew Members are not allowed in the Pilot Room. Pit Crew Members are not allowed to open the curtain to look inside of the Pilot Room.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offender will be issued a Red Card.

R28. Pilots must operate the relevant robot control equipment in the relevant Pilot Room during the 15-Second Referee System Initialization Period and the Battle, and must remain in their location after the Setup Period, unless otherwise permitted by the referee.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offender will be issued a Red Card.

R29. During a game, each pilot is equipped with at most one remote controller and one custom controller.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offending pilot will be issued a Red Card.

R30. Pilots are not allowed to use their own headphones or computers in the Pilot Room, other than their custom controller.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the team will be issued a Game Forfeiture.

R31. USB keyboards and mice must be manufactured by authorized vendors and be compliant with USB HID protocol specifications.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offending pilot will be issued a Red Card.

R32. Each Pilot Room computer's USB hub may only be used for keyboards and mice, and its RJ45 network port only for a custom controller.
Penalty: Verbal Warning, and the offending equipment may not be used. If the equipment affects official equipment, the highest penalty that can be imposed on the offending team is disqualification.

10.2.2 Robots

R33. Robots and Custom Controllers to be deployed in a match must pass Inspection.
Penalty: Game Forfeiture.

R34. In the first game of a match, the robots must meet the minimum battle team lineup.
Penalty: Match Forfeiture.

R35. Robots must meet the requirements in the ARCC Season 2 Robot Building Specifications.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

- Staff may conduct random checks on robots.
- Any report made against a robot for not complying with the robot building specifications manual must be supported by the relevant evidence.
- During the Match, improper installation of Speed Monitor Modules or Armor Modules may result in the module being deemed offline.

R36. Robots must be free of safety issues including but not limited to short circuits, crashing, creating fumes or lighting flames, falling to the ground, and gas cylinder explosions. If a safety issue is identified or presents itself, team members must execute the relevant operations in accordance with the referee's instructions.
Penalty: If it happens before the start of a match, the Pit Crew need to resolve the safety issue as required by the referee, otherwise the offending robot will not be allowed to appear on the Battlefield. If it is during a game, a Verbal Warning will be issued. If the Verbal Warning is ineffective, the offender or the offending robot will be issued a Red Card. Any incident involving serious safety hazards must be handled by the Head Referee in accordance with "11. Irregularities".

R37. Robots are not allowed to launch projectiles continuously off the Battlefield.
Penalty: The highest penalty imposed on the offending robot is a Red Card.

R38. During the Setup Period, the 15-Second Referee System Initialization Period and the 5-Second Countdown, robots in the Battlefield are not allowed to leave their team's Starting Zone.
Penalty: The highest penalty imposed on the offending robot is a Red Card.

R39. If any projectile needs to be launched during the Setup Period, it must be launched into a projectile clearance bag or net.
Penalty: The highest penalty imposed on the offender and the offending robot is a Red Card.

R40. A Robot which is not powered on within the final 30s of the setup period must be removed from the Battlefield.
Penalty: Verbal Warning. If the Verbal Warning is ineffective, the offending robot will be issued a Red Card upon beginning of the Battle.

R41. During a game, the robot is not allowed to disintegrate into sub-robots or sub-systems connected by multiple flexible cables, and must not cast or launch their own parts.
Penalty: The offending robot will be issued a Red Card.

R42. During a game, alive robots are not allowed to block any of their Armor Modules with their body or transform beyond their Maximum Expansion Size. Objectives that a robot Controls count as part of its body, except that they may block one of its Armor Modules: however many Objectives a robot Controls, at most one of its Armor Modules may be blocked by them at a time.
Penalty: Yellow Card. Verbal Warnings are issued against the offending team based on their subjective intention. If the Verbal Warning is ineffective, a Red Card will be issued.

R43. During the Setup Period, the replacement modules and parts used on robots must meet the requirements for “equivalent parts” as stated in “9.4 Setup Period”.
Penalty: The highest penalty imposed on the offending robot is a Red Card.

R44. For the duration of the 5-Second Countdown, robots may not exceed their Maximum Storage Size.
Penalty: The offending robot will be issued a Red Card.

10.2.3 Interactions

10.2.3.1 Interactions between Robots

R45. A robot may not use any of its body structures to strike an opponent robot in collision. If a defeated robot is blocking a key path, the robot can be slowly pushed away.

In any collision between robots, the offending robot will be deemed by the referee as the initiator.

Penalty: Warnings are issued against the offending robot based on the pilot’s subjective intention and the degree of collision.

Table 10-3: Penalties for Collision Violations

Violation Level	Description
Yellow Card	• Actively causing frontal and high-speed collision • Active pushing that causes the other team’s robot to move noticeably • Active pushing that impedes the normal movement of the other team’s robot

Violation Level	Description
Red Card	• Actively causing high-speed, repeated, and intense frontal collision • Active pushing that causes the other team's robot to move for a longer distance • Active pushing that seriously impedes the normal movement of the other team's robot

If a collision causes serious damage to the opponent's robot or compromises the fairness of the match, then in the next match of the same competition stage the offending robot (i.e., the specific robot number only) is prohibited from competing, and no other robot is allowed to substitute for it.

R46. A robot must not get stuck together with any other robot due to active interference, blocking, or collision.
Penalty: Counting from when an entanglement is determined, warnings should be issued against the offending robot based on the length of the violation. If it exceeds 10 seconds, a first Yellow Card will be issued. Thereafter, each 20 seconds will incur a further Yellow Card. This should carry on until the offending robot is ejected. Regardless of whether the offending robot is alive, if the violation lasts longer than 90 seconds, the highest penalty that can be imposed on the offending team is a Game Forfeiture, based on their subjective intention.

R47. A robot must not interrupt any opponent robot's HP recovery by any means of contact.
Penalty: The offending robot will be issued a Yellow Card.

10.2.3.2 Interactions between Robots and Battlefield Components

To ensure the fairness of the competition and that robots in the Battlefield are able to resupply and score effectively, some areas of the Battlefield are Penalty Zones, where the robots of one or both teams may only stay briefly:

- The Resupply Zone of one team is a Penalty Zone for the other team's robots.
- Each Scoring Area, including its tape outline, is a Penalty Zone for the robots of both teams.

A robot is in a Penalty Zone when any part of it is on or directly above the zone.

R48. Any robot may briefly enter a Penalty Zone, but must not stay in it for more than 3 seconds.
Penalty: When a robot has stayed in a Penalty Zone for more than 3 seconds, the first Yellow Card is issued. Thereafter, each 10 seconds will incur a further Yellow Card. This carries on until the robot leaves the Penalty Zone, is defeated, or is disconnected abnormally. An offending robot that causes serious damage to an opponent robot by remaining in a Penalty Zone will be issued a Red Card.

R49. Teams must not bring wireless debuggers, or their own Objectives, into the Competition Area. During the competition, robots may only use the official projectiles and Objectives provided by Competition Staff in the Competition Area.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R50. During a game, robots must not damage Battlefield Components, Objectives or projectiles, nor affect the normal function of Battlefield Components.
Penalty: The highest penalty that can be imposed on the offending team is disqualification.

R51. Only Engineers may Control Objectives.
Penalty: Yellow Card. Thereafter, each 10 seconds the violation continues will incur a further Yellow Card.

R52. Within 1 second of being defeated or abnormally disconnected, an Engineer must stop Controlling all Objectives.
Penalty: Yellow Card. Thereafter, each 10 seconds the violation continues will incur a further Yellow Card.

R53. Robots must not cause an Objective to leave the Battlefield, except for Objective B pipes turned in through a Pipe Chute.
Penalty: The offending robot will be issued a Red Card. The highest penalty that can be imposed on the offending team is disqualification.

10.3 Serious Violations

The following actions are considered serious violations of rules. The highest penalty Competition Staff may impose on an offending team for serious violations is disqualification. In the event of any violation of local laws and regulations, Competition Staff will fully cooperate with the relevant authorities to hold the offender legally responsible.

Table 10-4: Categories of Serious Violations

No.	Type
1	Malicious destruction of the Battlefield, Battlefield Components, other Official Equipment, or the robots or equipment of other teams.
2	Falsification, assumption of a false identity, or any other behavior determined as cheating.
3	Tampering with or damaging the Referee System, or interfering with any detecting function of the Referee System through technical means.
4	Circumstances that violate the specifications documents and are determined by the Arbitration Committee as a serious violation.
5	Disobedience over penalties, refusal to cooperate, deliberate delay, disrupting the competition, forfeiting without valid reasons, boycotting, or other behavior that hinders the competition.
6	Playing passively, without a genuine effort to compete.
7	No Match Fixing for any reasons, which may include providing property to others, illegally soliciting or accepting property from others, or any other act for the purpose of obtaining an unjust competition outcome or improper benefits.

No.	Type
8	Uncivilized and immoral conduct involving defamation, verbal abuse, rude gestures, malicious heckling, or malicious throwing of objects.
9	Publishing, spreading, or disseminating to the media false or irresponsible remarks.
10	Deliberately attacking or colliding with others in a manner that endangers themselves or others.
11	Carrying hazardous items or contraband.
12	Other behaviors that violate the spirit of the competition and are deemed a serious violation.

11. Irregularities

There will be a certain delay in the referee's manual penalties and handling of abnormal situations. If it has a major impact on the result of the competition, the Arbitration Committee will determine the final result according to the actual situation

If any of the following anomalies occur during a game, it will be handled according to the corresponding process, to which both teams cannot object. The handling process is as follows:

- When a serious safety hazard or irregularity has occurred, such as: a battery explosion, stadium power outage, explosion of a compressed gas cylinder, or interpersonal conflict, the Head Referee will notify both teams' Captains after discovering and confirming the emergency, and eject all robots through the Referee System. The result of the game will be invalidated. The game will restart after the safety hazard or exception has been eliminated. While handling an irregular situation, the Competition Staff will prioritize safety issues and make every effort to protect robots within feasible means. However, there is no guarantee that robots will remain completely unaffected. Any consequences arising from the handling process shall be borne by the participating teams.
- If non-key Battlefield Components are damaged during a match (e.g., damage to the flooring) and the damage does not affect the fairness of the match, the match will proceed as usual.
- The game will carry on despite any anomaly with a robot's armor light effects or light indicator effects.
- If key Battlefield Components experience logical or structural faults, for example, where the network connections are disrupted causing a robot to disconnect or a Battlefield Component does not operate normally, the referee will solve the problem manually through the Referee System. If the failure cannot be dealt with manually, the referee will notify the pilots of both sides and eject all robots at the same time. The game will end immediately, and the result of the game will be invalid. When problems are solved, there will be a replay.
- If there is structural damage or malfunction of Battlefield Components that potentially affects the outcome of a game that was not previously noticed, the Head Referee may decide to replay that game within 5 minutes after the match ends. If the issue is not noticed within this period, the results of the game will be deemed valid.
- In the case of a serious violation that would clearly have triggered a penalty of forfeiture where the Head Referee did not confirm and execute it before the end of the game, the Head Referee may issue the offending team a forfeiture within 5 minutes after the game ends.
- During a game, if any situation has occurred that may affect the fairness of the game, the Head Referee shall notify the Captains of both teams of the situation and suspend the results confirmation process within five minutes after the end of the match, and shall make a determination within 60 minutes and notify both Captains of the final course of action. The handling outcome is final and cannot be challenged by both teams.

12. Appeals

Each team has one opportunity to Appeal in each Event during ARCC Season 2. Such opportunities cannot be accumulated.

Table 12-1: Appeal Definitions

Key Terms	Description
Appealing Team	Team whose Captain submits the intent to Appeal Team from which the Appeal attempt is consumed
Defendant Team	The Appealing Team's Opponent in the Match being Appealed

If an appeal is successful, the Appealing Team retains their opportunity to Appeal in future matches. If it is unsuccessful, the team will have exhausted its one opportunity to Appeal. When a team has exhausted its opportunity to appeal, the Arbitration Committee will no longer accept any Appeals from that team.

Once an Appeal is accepted, the Arbitration Committee will deliberate on the appeal materials and relevant evidence. The Arbitration Committee has the right to final interpretation of the appeal decision. No investigation or deliberation shall begin by any member of Staff until an appeal is officially launched.

The following situations do not constitute a basis for appeal and will be immediately rejected, consuming the opportunity for Appeal:

- Verbal Warnings, Yellow Cards, and Red Cards issued as penalties for violations.
- The types and processes of Timeouts initiated.
- "Regular battle damage" occurred at the Referee System Onboard Modules.

No appeals are allowed more than five minutes after the end of the match (see "9.9 Results Confirmation").

12.1 Appeal Process

Teams wishing to file an appeal should follow the procedure below:

Table 12-2: Appeal Process

Step	Description
1. Team submits Appeal	Within 5 minutes of the end of the match, only the Team Captain may indicate their intent to submit an Appeal to the Head Referee, who records it on the Match Results Confirmation Form. The subject of the appeal may be on any played game of the Match, but must be submitted at the end of all games of the Match. Any team member who does not wear the Team Captain badge will not be allowed to submit an appeal. If additional team members beyond the Team Captain are present then the appeal will not be accepted. Note: If the subject of the Appeal involves robots from one or more teams, the Arbitration Committee may detain all relevant robots for the duration of the investigation. Robots will be released to teams no later than the announcement of the outcome.
2. Team completes Appeal form Team collects and submits evidence and supporting material	After the Team Captain indicates intent to Appeal to the Head Referee AND the Head Referee accepts the appeal, the Team Captain will be given the Appeal Form. The blank Appeal Form can be found in Appendix B. The Team Captain may then return to their team (robots may be withheld by referees based on the situation), complete the form and gather evidence. At this time, the Match is concluded and teams will not be permitted to access the Battlefield. The Team Captain must return the appeal form to the Head Referee within 30 minutes of the written appeal submission time. If the appeal form is not returned within the allocated time, the appeal is lost.
3. Appeal outcome announced	After the Arbitration Committee makes its decision, both relevant Teams' Captains will be notified to a private meeting with the Arbitration Committee. Two additional members from each relevant team are permitted to attend the meeting. The Arbitration Committee will then explain the outcome of the Appeal and the supporting facts and evidence for the decision. The outcome of an Appeal as stated in the meeting will be Final and both teams are expected to graciously accept the decision. Following the Appeal outcome meeting, the Arbitration Committee will announce the outcome of the Appeal publicly.

Step	Description
4. Execute Appeal decision	If the match or a game is to be replayed, both teams will be notified during the Appeal outcome meeting when the replay is scheduled. In the event that the original appealing team files a new Appeal against a game of the replay, they are ineligible to receive their Appeal opportunity regardless of the outcome, since the combination of both appeals would significantly disrupt the tournament schedule. Note: It is possible that the replay will be immediately following the meeting, using robots which were previously detained. In this event, robots do not need to re-perform Inspection

12.2 Appeal Materials

Appeal materials include but are not limited to the following:

- Physical:
  - Observation of a physical object: Robots, Battlefield elements
  - A physical object: unofficial projectiles, wireless routers
  - Physical documents: printed pictures, written notes
- Electronic:
  - Digital records of a physical object/event: Digital images, videos
  - Digital records of a communication: emails, chat history, voice recordings
  - Digital information about a physical object: 3D models, electrical schematics

12.3 Appeal Outcomes

Appeal outcomes include but are not limited to:

- Upholding the original Match results
- Loss for the Defendant Team
  - Match results will be invalidated and the Match will be counted as a Forfeiture by the Defendant Team.
- Replay of a full Match or Replay of a Game
  - A single-Game replay will be treated as a BO1 in the schedule.

⚡ • Successful Appeal: Loss for the Defendant team; Replay of Match or Game.
• Unsuccessful Appeal: Upholding the original Match results

If the Arbitration Committee orders a replay but both parties refuse to participate, the appeal is deemed Unsuccessful and the original results are maintained.

- As best as possible, replayed matches and games will be scheduled after all matches on the same day.
- All standard rules regarding schedule, Inspection, and competition flow apply to the Rematch unless the Head Referee indicates otherwise.

If only one Game is replayed, the standings of the match shall be re-determined.

Example: In a BO3 where Red wins Game 1, and Blue wins Game 2 and 3, Red appeals Game 2. The Appeal outcome is to replay Game 2. If Red wins the replay, the final standing is Red 2:0, since Red wins Game 1 and 2, and Game 3 (though previously won by Blue) is not played due to BO3 ending when one team reaches 2 points. If Blue wins the replay, the match statistics will be updated, but the final standing remains Red 1:2.

Appendix A: References

This chapter contains ARCC-related references.

Table A-1: Overview of References

Category	Download Links and Documents List
Rules Manuals	Download at https://www.arc-robotics.org/participants/2027-manuals • Site Manual (Coming Q2 2027) • Events Manual • Participant Manual • Robot Building Specifications
Referee System Related	Download at https://www.robomaster.com/en-US/products/components/referee • Referee System User Manual • Referee System Serial Port Protocol Appendix • User Manuals of Referee System Modules • FAQ • Referee System Player's Client Interface Instructions • Referee System Referee's Client Interface Instructions

Appendix B: Appeal Form

THIS SECTION TO BE FILLED OUT BY HEAD REFEREE

Description	Appealing Team Information
Team Name	
School Name	
Match No. & Color	
Date & Time of Appeal Initiation	
Appeal Outcome	

ABOVE SECTION TO BE FILLED OUT BY HEAD REFEREE ONLY. DO NOT WRITE ABOVE

1. **Summarize the grounds of the appeal, and the justification for why the results of the Match are invalid.**

2. **State the desired outcome of the appeal:**
   Example: Replay Game, Replay Match, Disqualification

3. **List all evidence supporting your appeal.**
   If any evidence is digital (photos, videos), please contact a member of the Arbitration Committee for instructions on how to share them. You may attach additional pages and documents to this form.

Appendix C: ARCTIC Submission Checklists

For each stage of Submission, the following are the bare minimum requirements to pass.

C.1 Intent to Submit

C.1.1 Materials List

- Full author list
- Short paragraph, 200-500 words, describing your presentation topic.

C.1.2 Submission Checklists

- Short paragraph
  - ☐ Is the paragraph 200-500 words?
  - ☐ Does the paragraph tell the prospective reader what the article is about, in language appropriate to the field?
  - ☐ Does the paragraph state the principal results and conclusions of the article? (When they are of a nature that permits brief statement)
  - ☐ Does the paragraph clearly describe how the contribution is connected to ARC?
  - ☐ Does the paragraph describe a technology that has been successfully implemented for your robot(s) or a non-technical contribution used in your team?

C.2 Initial Submission

The initial submission does not have to be complete, as long as it states main points and lays a path forward to completion (for instance if you haven't run an experiment but plan to show a video of it by the final submission).

C.2.1 Materials List

- Short paragraph
- Presentation in .pptx format

C.2.2 Submission Checklists

- Presentation
  - ☐ Is the presentation no more than 20 minutes?
  - ☐ Is the presentation exported as a .pptx? Is it 16:9?
  - ☐ Do all the figures and text use colors that show up well on a projector? (thick lines, high color contrast)
  - ☐ Does the presentation effectively communicate technical ideas?
  - ☐ Does the presentation have sufficient detail on the slides/speaker notes for the reviewer to make an admission decision?

    - ☐ Are the speaker notes visible in the .pptx file?
  - ☐ How completed are the initial submission slides? Is there a planned path to the final presentation if not in a final state?
- Short paragraph
  - ☐ You can update it if you want at this point

C.3 Final Submission

C.3.1 Materials List

- Short paragraph
- Presentation
- Related materials as described in “8.4 FOSS Requirements”

C.3.2 Submission Checklists

- Presentation
  - ☐ Has the presentation integrated feedback from the review process?
  - ☐ Includes all items from Section C.2.2
- Short paragraph
  - ☐ Has the short paragraph integrated feedback from the review process?
  - ☐ Includes all items from Section C.1.2
- Related materials
  - ☐ Have the related materials integrated feedback from the review process?
  - ☐ Do the materials meet the requirements in “8.4 FOSS Requirements”?



ARC Robotics 2027

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