

V1.1

Using a 32-bit motor driver chip and
PID controller, RoboMaster RS200 Brushless DC Motor Speed
Controller enables precise control over motor torque.



ROBOMASTER

Exclusively designed for the RoboMaster
RS200 Brushless DC Motor and
C950 Brushless DC Motor Speed Controller,
this M809 Accessory Kit includes several
switches and a horned lever.

Referee System Specification Manual,
Referee System User Manual, Introduction
of Referee System Module

See M809 Accessory Kit includes several
switches and a horned lever for fast
independent switch.

ROBOMASTER 2020

ROBOTICS COMPETITION

RULES MANUAL

Prepared by the RoboMaster Organizing Committee

Updated on **December, 2019**

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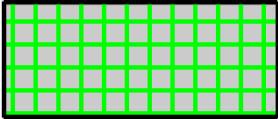
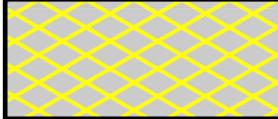
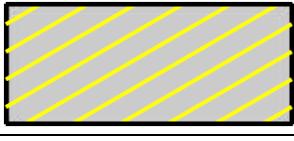
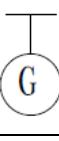
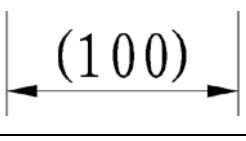
Relevant suggestions for open source materials can be found in this link: <https://bbs.robomaster.com/thread-7026-1-1.html>.

Using this Manual

Legend

 Prohibition	 Important note	 Hints and tips	 Definition and reference
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Legend for Battlefield Drawings

		
Buff Point for both sides	Buff Point for one side	Penalty Zone for both sides
		
Penalty Zone for one side	The plane on which the Battlefield is located is its lowest plane	Dimensions are for reference only

Release Notes

Date	Version	Changes
2019.12.31	V1.1	<ol style="list-style-type: none">1. Add legend for Battlefield drawings and update Competition area description and drawings.2. Update competition mechanisms.3. Update Penalty System and competition rules.
2019.10.15	V1.0	First Release

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1. Introduction

The core form of the RoboMaster 2020 Robotics Competition (“RM2020 Robotics Competition”) is a shootout between robots that are either remotely operated or fully-automated, where projectiles are launched to attack the opponent’s robots, Outpost or Base to win the competition. Teams are required to design, develop and create multiple robots to form a battle team to participate in the competition.

1.1 Main Changes to New Competition Season

The following are the new changes made to the RM2020 Robotics Competition compared to RM2019:

Robot

- Add Dart System and Radar and update robot lineup and numbering
- Update basic information such as robot parameters
- Adjust Level Up Mechanism for Hero and Standard
- Engineer can revive Standard and Hero by swiping the RFID card and supply projectiles via the Official Projectile Supplier
- Add new mechanism related to Outpost
- Add a new mobile 17mm Launching Mechanism is added

Competition Area

- Redesign the Battlefield, with a greater drop height
- Add new Battlefield Components such as Outpost, Dart Launching Station and Radar Base

1.2 Robot and Operator

RoboMaster requires robots to fight together as a team with good coordination and teamwork. Building specifications for robots can be found in the RoboMaster 2020 Robot Building Specification Manual.

1.2.1 Robot Lineup

The robot lineup for the RM2020 Robotics Competition is as follows:

Table 1-1 Robot Lineup

Type	Numbering	Full Team Size (Units)	Competition Stage
Hero	1	1	China Regional Competition, International Regional Competition, Wild Card Competition and Final Tournament
Engineer	2	1	

Type	Numbering	Full Team Size (Units)	Competition Stage
Standard	3/4/5	2	Regional Competition
		3	International Regional Competition, Wild Card Competition and Final Tournament
Aerial	6	1	
Sentry	7	1	China Regional Competition, International Regional Competition, Wild Card Competition and Final Tournament
Dart System	8	1	
Radar	9	1	

Minimum lineup for the first round of each match: Except for Radar, four robots.

1.2.2 Basic Robot Information

The basic robot information for the RM2020 Robotics Competition is as follows:

Table 1-2 Basic Robot Information

Type	Objects	Initial Projectile (round)	Maximum Chassis Power Consumption (W)	Initial HP	Maximum HP	Initial Firing Speed Limit (m/s)	Barrel Heat Limit	Barrel Cooling Value per Second	Value of Experience Points	Projectile Launch Speed (round/s)	Initial Position
Hero	Enemy units except Aerial, Radar and Dart Launcher	0	Correlated to the robot's current level and performance level - refer to Table 3-9 and Table 3-10	For the buffer energy correlated to the maximum chassis power consumption - refer to 3.2.3 Chassis Power Consumption Exceeds the Limit	refer to 3.2.3 Chassis Power Consumption Exceeds the Limit	Starti ng Zone					

Type	Objects	Initial Projectile (round)	Maximum Chassis Power Consumption (W)	Initial HP	Maximum HP	Initial Firing Speed Limit (m/s)	Barrel Heat Limit	Barrel Cooling Value per Second	Value of Experience Points	Projectile Launch Speed (round/s)	Initial Position
Engineer	Except for Aerial, Radar and Dart Launcher	0	No limits	500	500	See Table 1-4			5	refer to 3.2.3 Chassis Power Consumption Exceeds the Limit	Starting Zone
Standard	Enemy units except Aerial, Radar and Dart Launcher	0				Correlated to the robot's current level and performance level - refer to Table 3-7 and 3-8				refer to 3.2.3 Chassis Power Consumption Exceeds the Limit	Starting Zone
Aerial	Enemy units except Aerial, Radar and Dart Launcher	250	-	-	-	30	-	-	-	No limits	Landng Pad

Type	Objects	Initial Projectile (round)	Maximum Chassis Power Consumption (W)	Initial HP	Maximum HP	Initial Firing Speed Limit (m/s)	Barrel Heat Limit	Barrel Cooling Value per Second	Value of Experience Points	Projectile Launch Speed (round/s)	Initial Position
Sentry	Enemy units except Aerial, Radar and Dart Launcher	500	30	600	600	30	320	100	7.5	refer to 3.2.2 Barrel Heat Exceeds the Limit and Cooling	Sentry Rail
Dart System	Base, Outpost	-	-	-	-	18	-	-	-	-	Dart Launching Station
Radar	-	-	-	-	-	-	-	-	-	-	Radar Base



- Robot chassis: A mechanism that carries and has mounted a robot propulsion system and its accessories.
- Chassis power consumption: The power propulsion system that enables a robot to move horizontally, excluding the power used for special tasks (e.g., power consumption for functional movements such as moving the upper mechanical structure).
- Initial Firing Speed: The speed detected by the relevant modules of Referee System after a projectile or dart has completed its acceleration.

1.2.3 Operator Lineup

The Operator lineup is as follows:

Table 1-3 Operator Lineup

Type	Robot Operated	Full Team Lineup Size
Ground Robot Operator	Hero	1
	Standard	<ul style="list-style-type: none"> ● Regional Competition: 2 ● International Regional Competition, Wild Card Competition and Final Tournament: 3
	Engineer	1
Aerial Gimbal Operator	Aerial, Dart System, Radar	1
Pilot	Aerial	1



Ground Robots: Hero, Engineer and Standard, collectively.

1.2.4 Mobile 17mm Launching Mechanism

A mobile 17mm Launching Mechanism can be mounted on any Ground Robot. The mobile 17mm Launching Mechanism can be equipped with a laser sight.

For example, a participating team can mount a mobile 17mm Launching Mechanism on a Standard as required. The Robot will then be equipped with two 17mm Launching Mechanisms.

The barrel heat of the mobile 17mm Launching Mechanism shall be calculated separately from the existing Launching Mechanism. Its Initial Firing Speed limit shall be consistent in level with that of the existing Launching Mechanism. If the mobile 17mm Launching Mechanism is mounted on Standard, except Initial Firing Speed limit, the Barrel Heat limit and Barrel Cooling Value per Second shall be consistent with those of the existing Launching Mechanism.

For example, a participating team mounts the mobile 17mm Launching Mechanism on Hero. According to 3.8.1 Performance System, when Hero has reached Level 2, the Operator may use 2 performance points to upgrade its Initial Firing Speed limit from Level 0 to Level 2, which increases the Initial Firing Speed limit of the mobile 17mm Launching Mechanism to 18 m/s, its barrel heat to 180, and Barrel Cooling Value per Second to 30. The Initial Firing Speed limit of a 42mm Launching Mechanism will be increased to 12 m/s, its barrel heat to 300, and barrel cooling rate to 40.

Table 1-4 Mobile 17mm Launching Mechanism

Type	Initial Firing Speed Limit (m/s)	Barrel Heat Limit	Barrel Cooling Value per Second
Hero	See Table 3-8		See Table 1-5

Type	Initial Firing Speed Limit (m/s)	Barrel Heat Limit	Barrel Cooling Value per Second
Standard	See Table 3-7		
Engineer	15	200	35

Table 1-5 Barrel Heat Attribute of Hero with the Mobile 17mm Launching Mechanism

Hero Level	Barrel Heat Limit	Barrel Cooling Value per Second
1	120	20
2	180	30
3	240	40

1.3 General Competition Rundown

Before each match begins, all robots need to pass the Pre-match Inspection performed by the RMOC, which is to ensure that all robots fulfill the technical specifications set by the RMOC for fairness. After completing the Inspection, team members need to go to the Staging Area with robots to sign the Staging Area Statement, and wait in the Competition Area for the match.

Before the start of each match, all teams must be guided by staff to enter the Competition Area from the Staging Area. Each round consists of a Three-Minute Setup Period and a Seven-Minute Round Period. Between the two periods, there is a 20-Second Referee System Initialization Period.

By the end of each match, teams must clean up projectiles left in the magazine and Launching Mechanism of each robot, return them to the designated area and leave the Competition Area.

2. Competition Area

2.1 Overview



- The error margin for the dimensions of all battlefield components described in the document is $\pm 5\%$. The dimension parameter unit is mm.
- A buff point is an area where robots can receive buffs of a certain nature. Please refer to [3.6 Battlefield Buff Mechanism](#) for details on the buff point mechanism for the relevant areas mentioned in this chapter.
- A penalty zone is an area that designated robots are forbidden from entering. Please refer to [5.2.3.2 Interaction between Robots and Battlefield Components](#) for the penalty zone debuff rules for the relevant areas mentioned in this chapter.

The core Competition Area for the RoboMaster 2020 Robotics Competition is called the “Battlefield”. The Battlefield is an area with the size of 28m x 15m, consisting mainly of Base Zone, Elevated Zone, Resource Island, Supplier Zone, Flight Zone, etc.

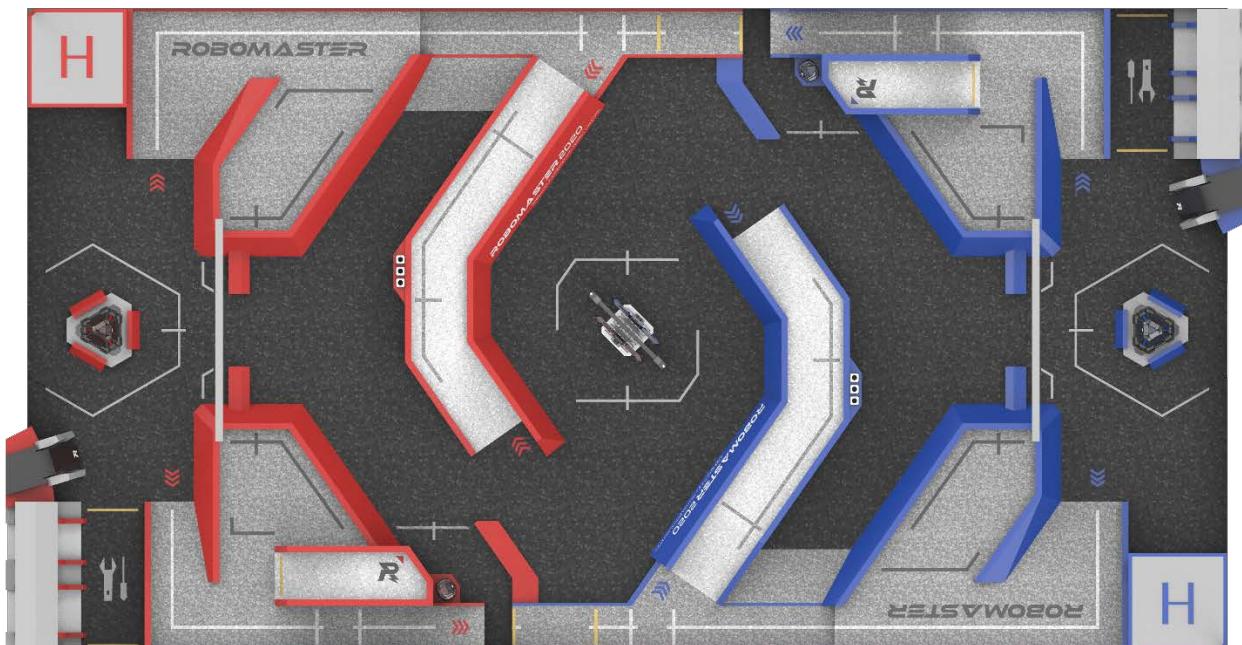


Figure 2-1 Top-view rendering of the Battlefield

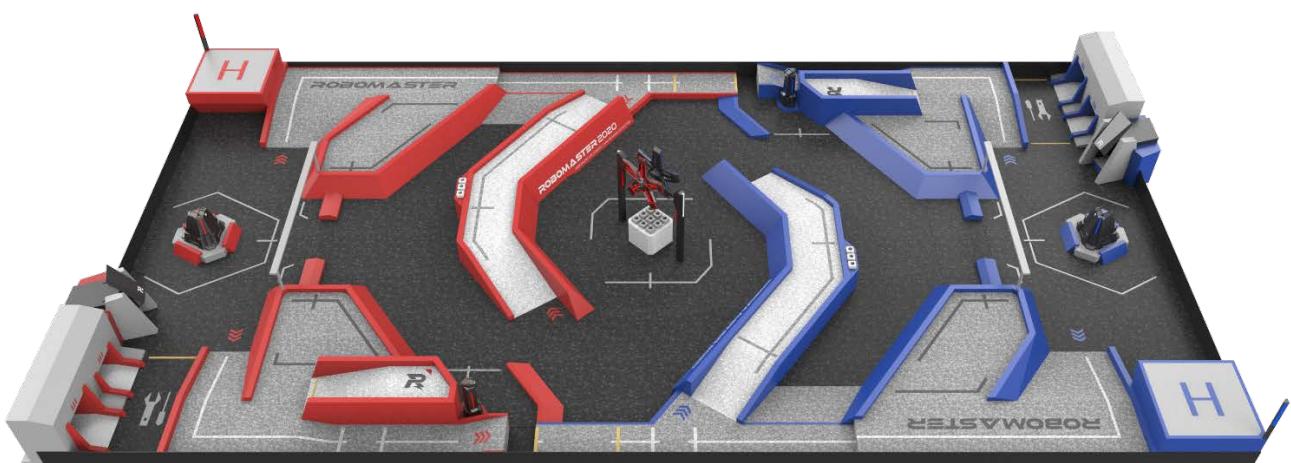
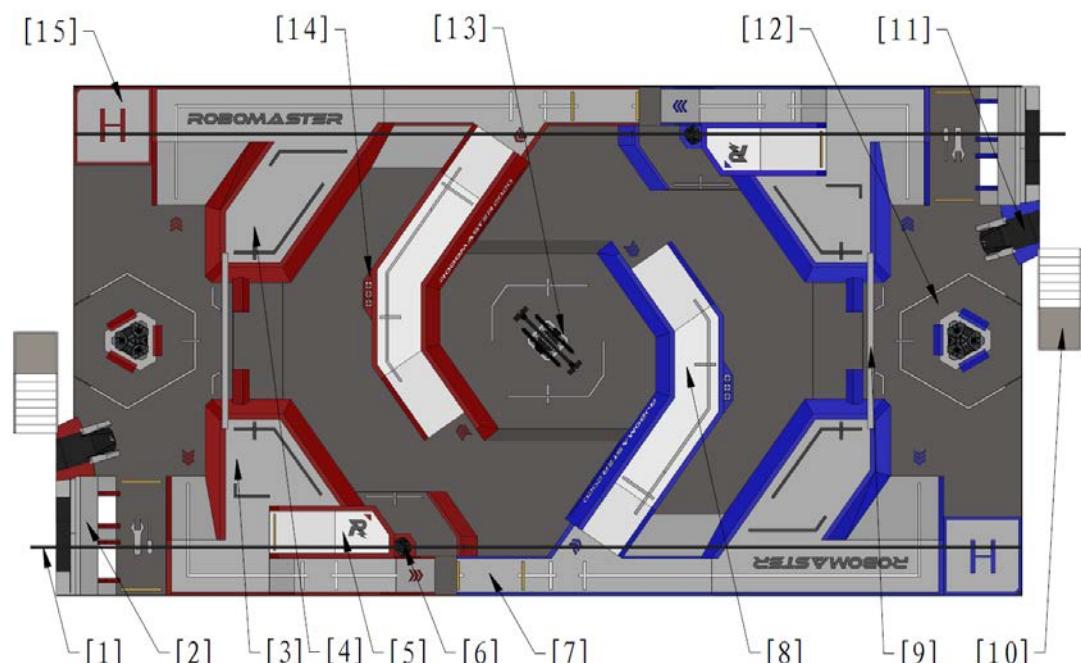


Figure 2-2 Oblique-view rendering of the Battlefield



Figure 2-3 Axonometric rendering of the Battlefield



- | | | | | | | | | |
|------|------------------------|-----------------------|-----------------------|--------------|----------------------------------|------------------------|--------------------------------|-----------------------------|
| [1] | Aerial Safety Rope | [2] | Supplier Zone | [3] | Trapezoid-shaped Elevated Ground | [4] | Diamond-shaped Elevated Ground | |
| [5] | Power Activation Point | Rune Activation Point | [6] | Outpost Zone | [7] | Road | [8] | Ring-shaped Elevated Ground |
| [9] | Sentry Rail | | [10] | Radar Base | [11] | Dart Launching Station | [12] | Starting Zone |
| [13] | Resource Island | [14] | Small Resource Island | [15] | Landing Pad | | | |

Figure 2-4 Battlefield Modules

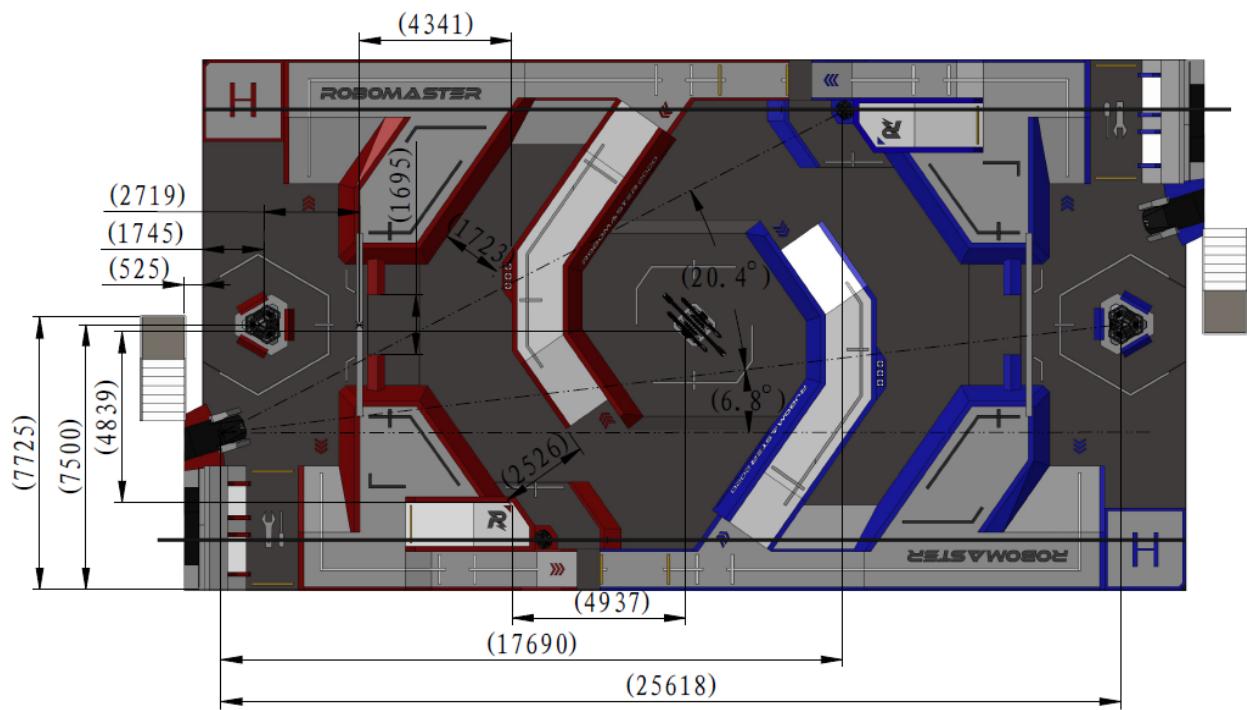
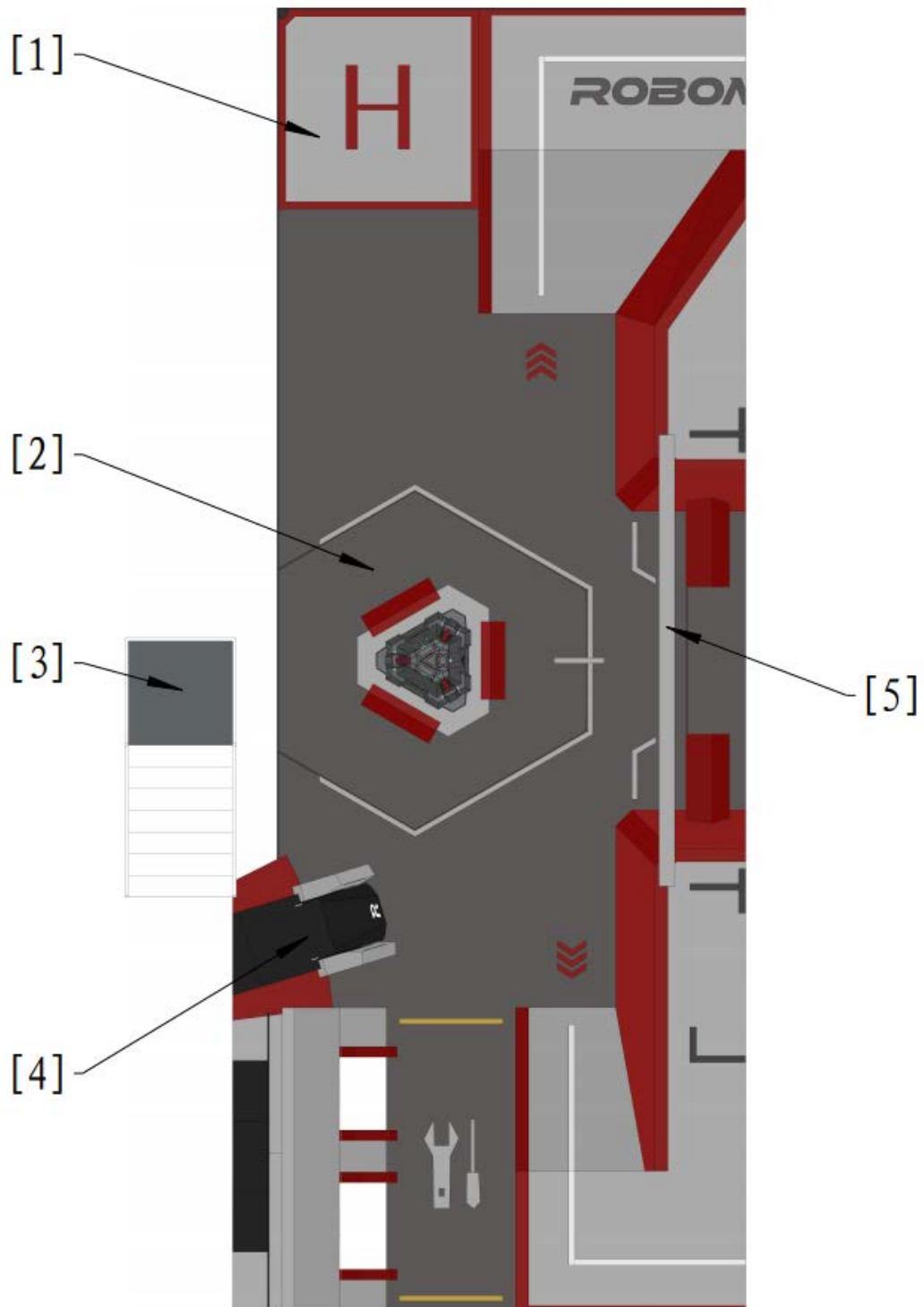


Figure 2-5 Localization Dimensions for Battlefield Modules

2.2 Robot Initialization Area

The Robot Initialization Area is where robots are placed before a match, which includes the Landing Pad, Starting Zone, Radar Base, Dart Launching Station and Sentry Rail. The Starting Zone is the hexagonal area near the base, while the Landing Pad, Radar Base, Dart Launching Station and Sentry Rail are located around the Starting Zone.

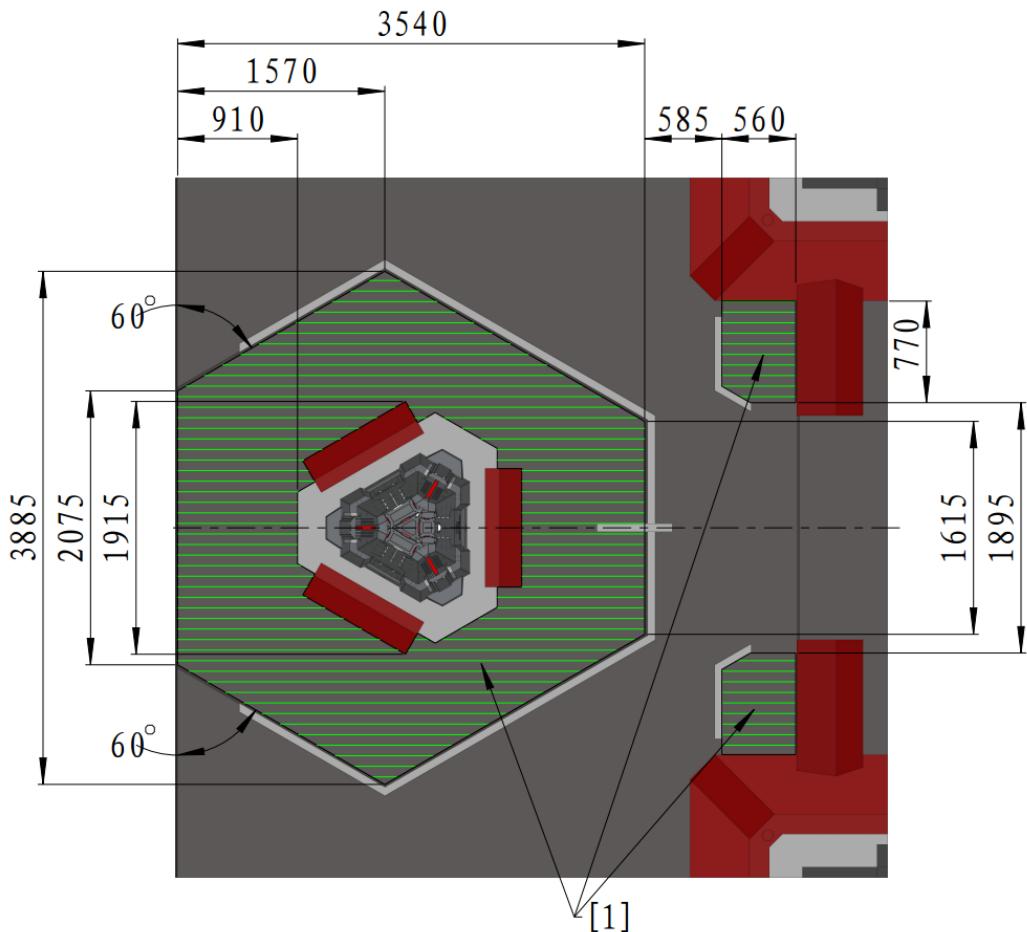


[1] Landing Pad [2] Starting Zone [3] Radar Base [4] Dart Launching Station [5] Sentry Rail

Figure 2-6 Robot Initialization Area

2.2.1 Starting Zone

The Starting Zone is the hexagonal area near the base, where robots are placed before the start of a match. The plane of the Starting Zone is about 12 mm from the Battlefield ground.



[1] Base Zone Buff Point

Figure 2-7 Robot Starting Zone

Base Zone Buff Point

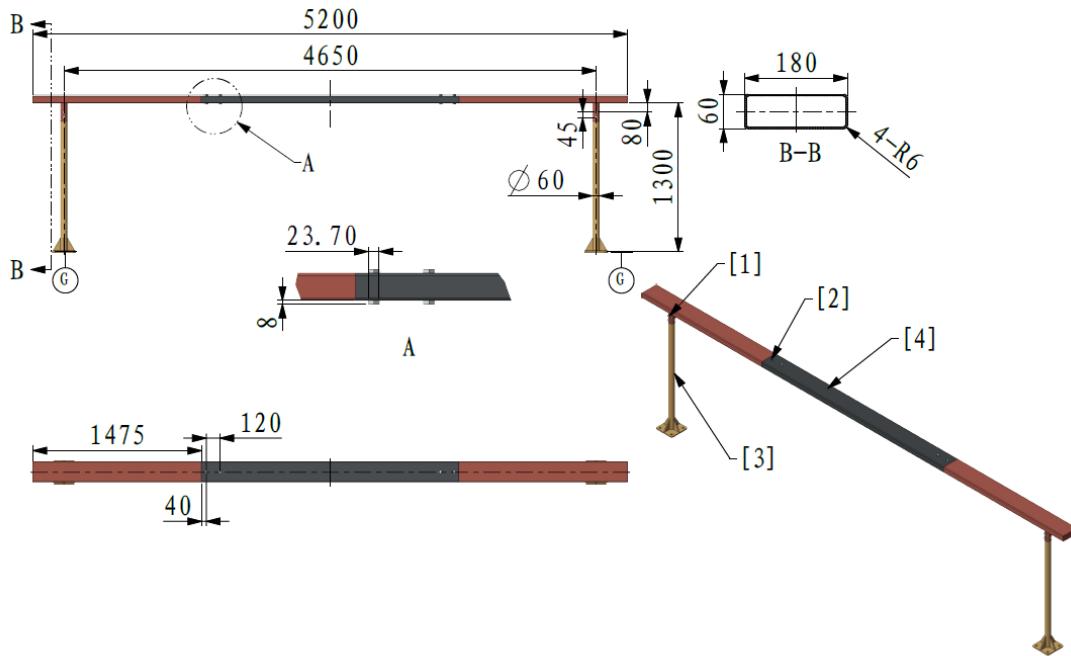
The Base Zone Buff Point consists of three locations including the hexagonal area near the base and the area behind the lower bunker of the Sentry Rail.

2.2.2 Sentry Rail



- The parts in the same color represent the same component. Connection and height gaps exist in the assemblage of different components.
- The hexagonal angles of the bolt head are not definite and are for reference only.

The sentry rail is the only area where a Sentry can be active. It is located near the Starting Zone, including the body of the rail and its supporting structure, the surface of which is painted. The distance between the lower surface of the Sentry Rail and the Battlefield ground is 1300 mm. However, due to the weight of the rail itself and other factors, a certain altitude difference will occur between the middle and the ends of the Sentry Rail. Therefore, the actual distance between the lower surface of the Sentry Rail and the Battlefield ground is 1250-1300 mm.



[1] M8bolt [2] M16bolt [3] Rail Support [4] Main Body of the Rail

Figure 2-8 Sentry Rail Graph

2.2.3 Dart Launching Station

A Dart Launching Station is where a Dart Launcher is placed.

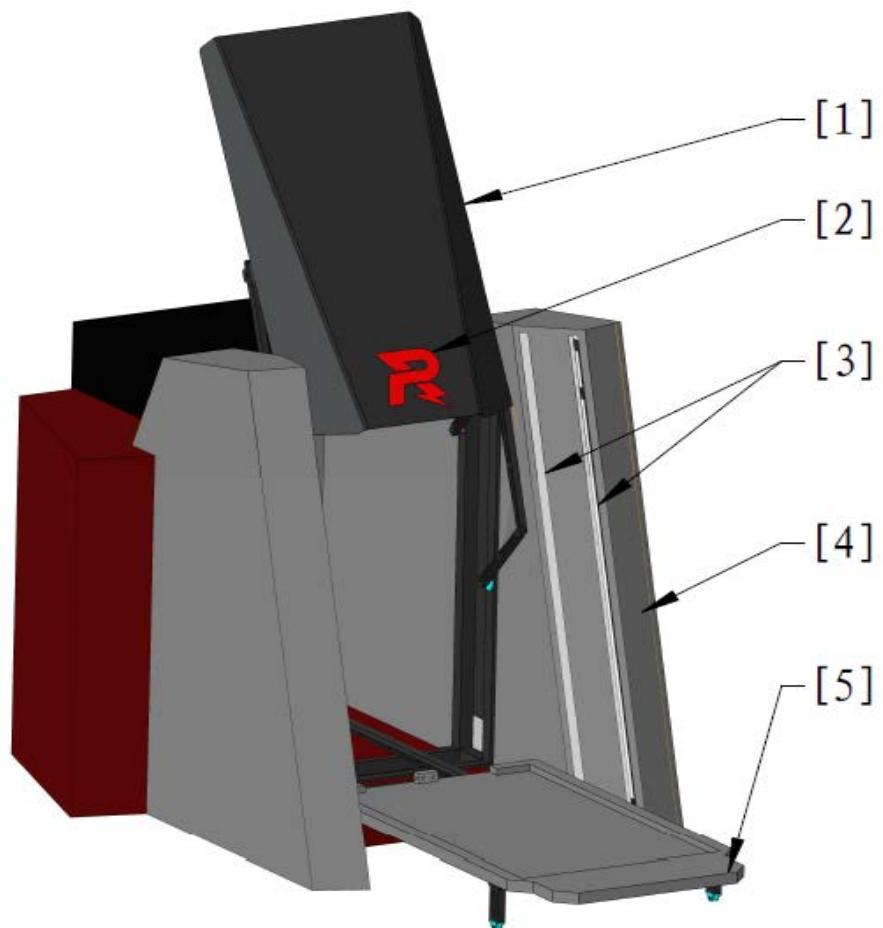
The Dart Launching Station consists of the main body of the station, the gliding platform and the gate.

The body of the Dart Launching Station has two layers of grating that detect the time interval of a dart as it passes through the grating. The gliding platform can glide forward and backward for easy placing of a Dart Launcher. The gate is opened and closed using motor power.

During the 3-minute preparation stage, the gate of the Dart Launching Station is active, and a team member will pull out the gliding platform and place the Dart Launcher within the square area on the platform. When the Dart Launcher is connected to the server, the letter “R” status light in the middle of the gate will light up with the color of the relevant team. After checking that the Dart Launching Station is in proper working condition, the gliding platform will be pushed back into the body of the Station and the platform will be locked shut automatically. Before the start of a match, the gate will close automatically.

After a match has started, the operator will operate on the client interface using a keyboard and mouse, and activate the gate of the Dart Launching Station and launch darts.

It takes 5 seconds for the gate to open fully. The window period for launching darts is 15 seconds after the gate is fully opened. Darts can be launched during the window period, at the end of which the gate will close automatically.



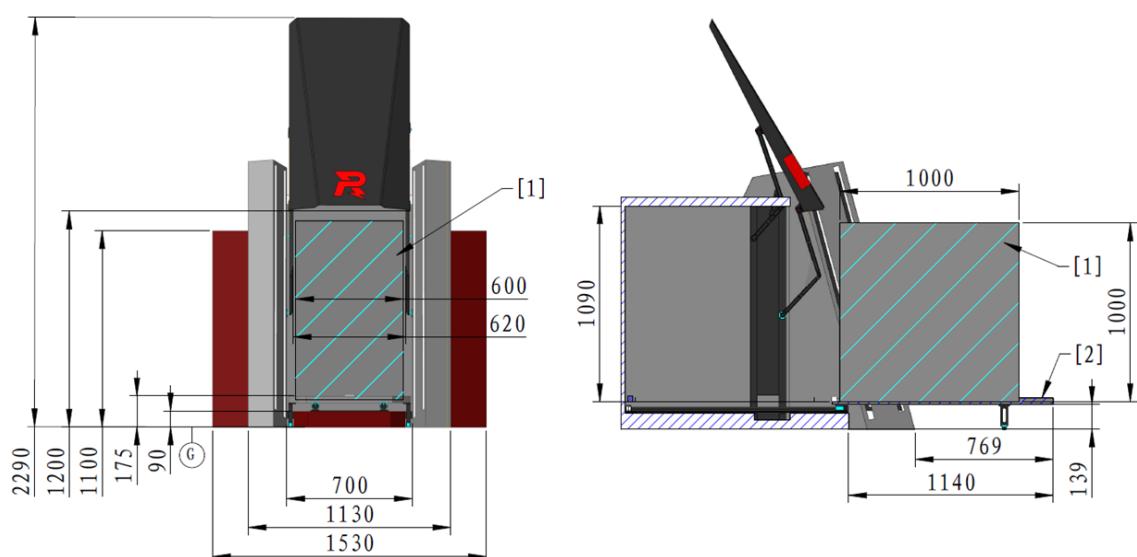
[1] Gate

[2] Status Light

[3] Grating Speed Measuring Device

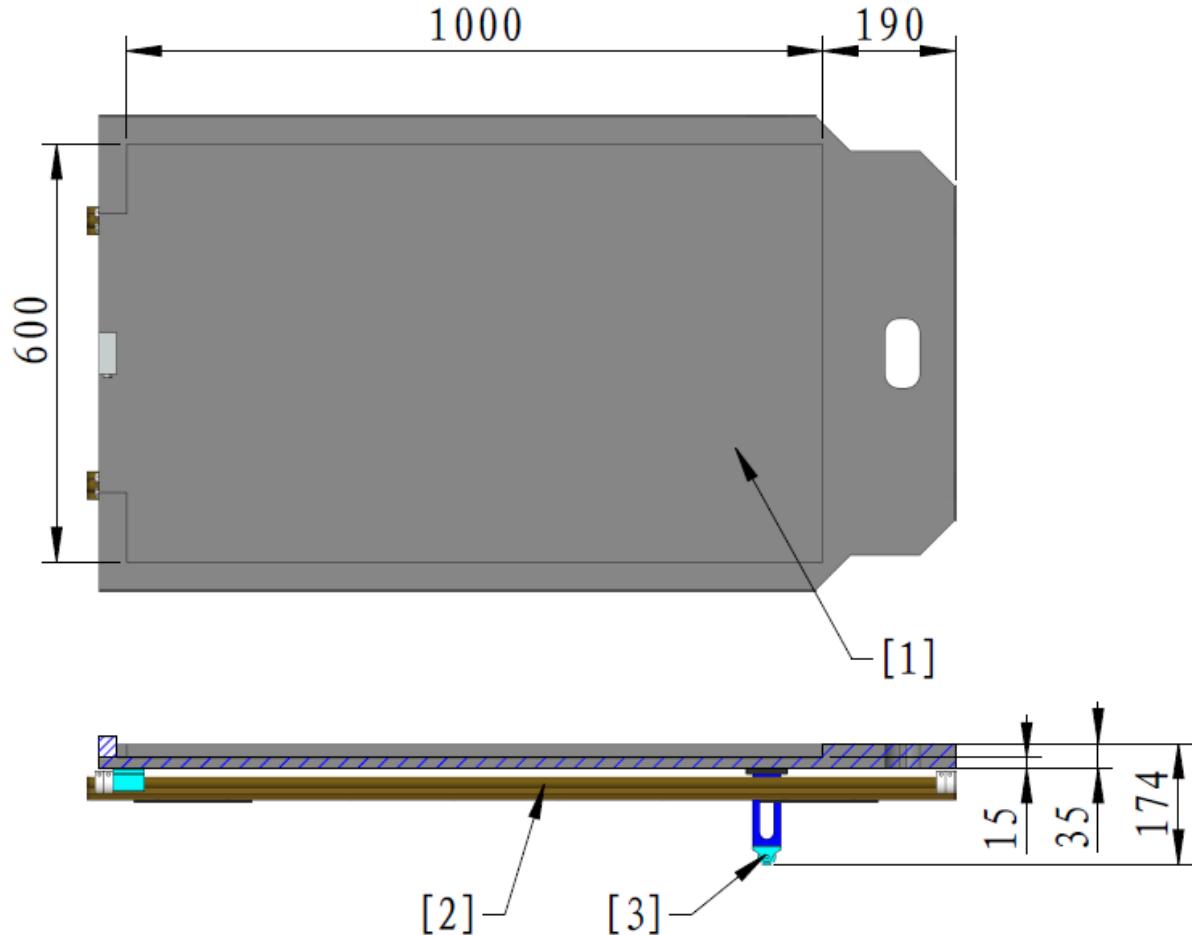
[4] Main Body of Dart Launching Station [5] Gliding Platform

Figure 2-9 Dart Launching Station



[1] Setting Position of Dart Launcher [2] Gliding Platform

Figure 2-10 Gliding Platform Slides Out

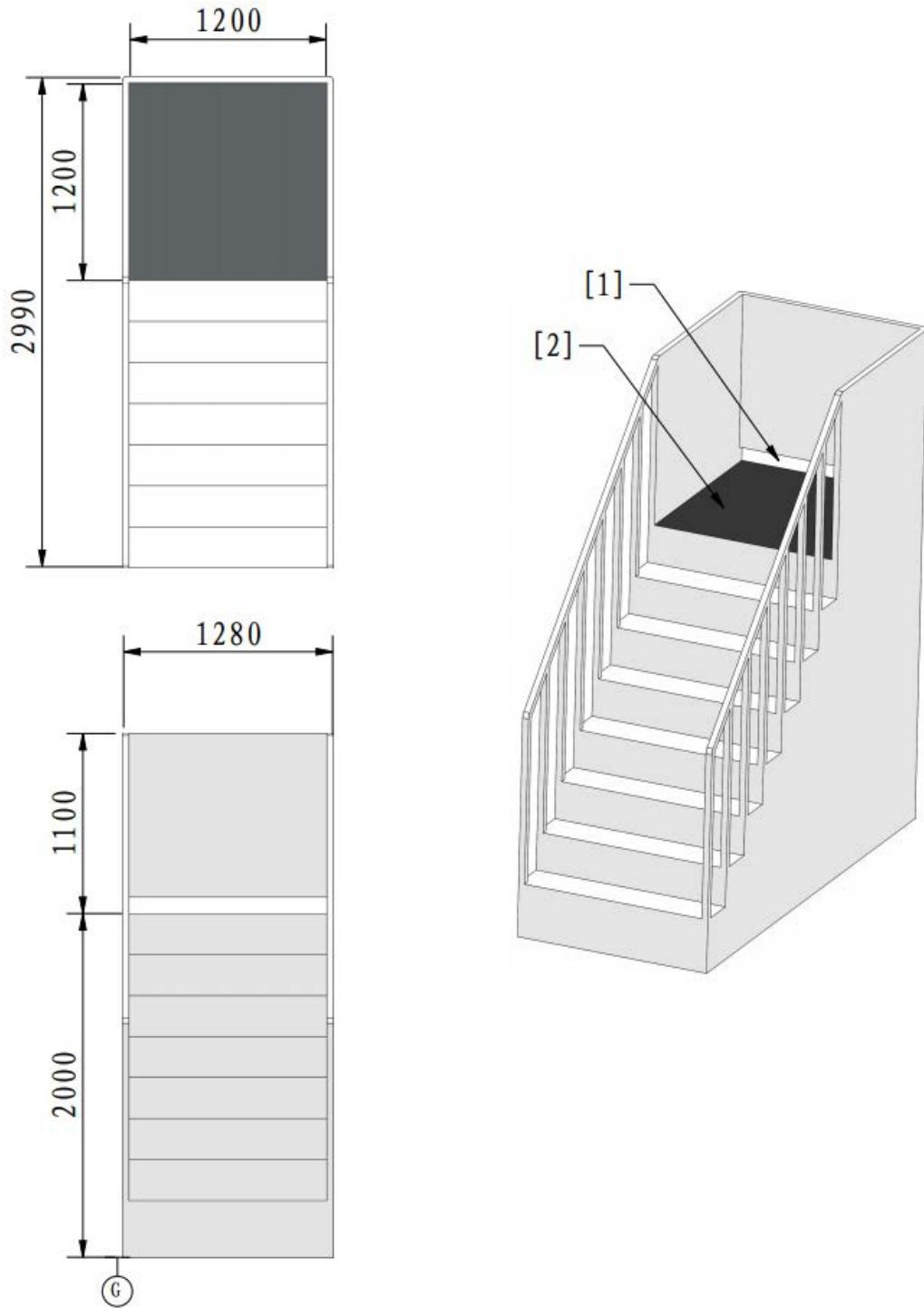


[1] Setting Plane of Dart Launcher [2] Gliding Platform Rail [3] Supporting Wheel

Figure 2-11 Dimensions for Gliding Platform

2.2.4 Radar Base

A Radar Base is the platform for placing a radar sensor. At its top is a platform with a surface area 1200*1200 mm, made of iron panel material (that can be attracted to a magnet). The distance from the plane of the platform to the Battlefield ground should be 2000 mm, and non-transparent perimeter walls at a height of 1100 mm should be present around it.



[1] Sensor Data Cable Slot [2] Iron Panel Material

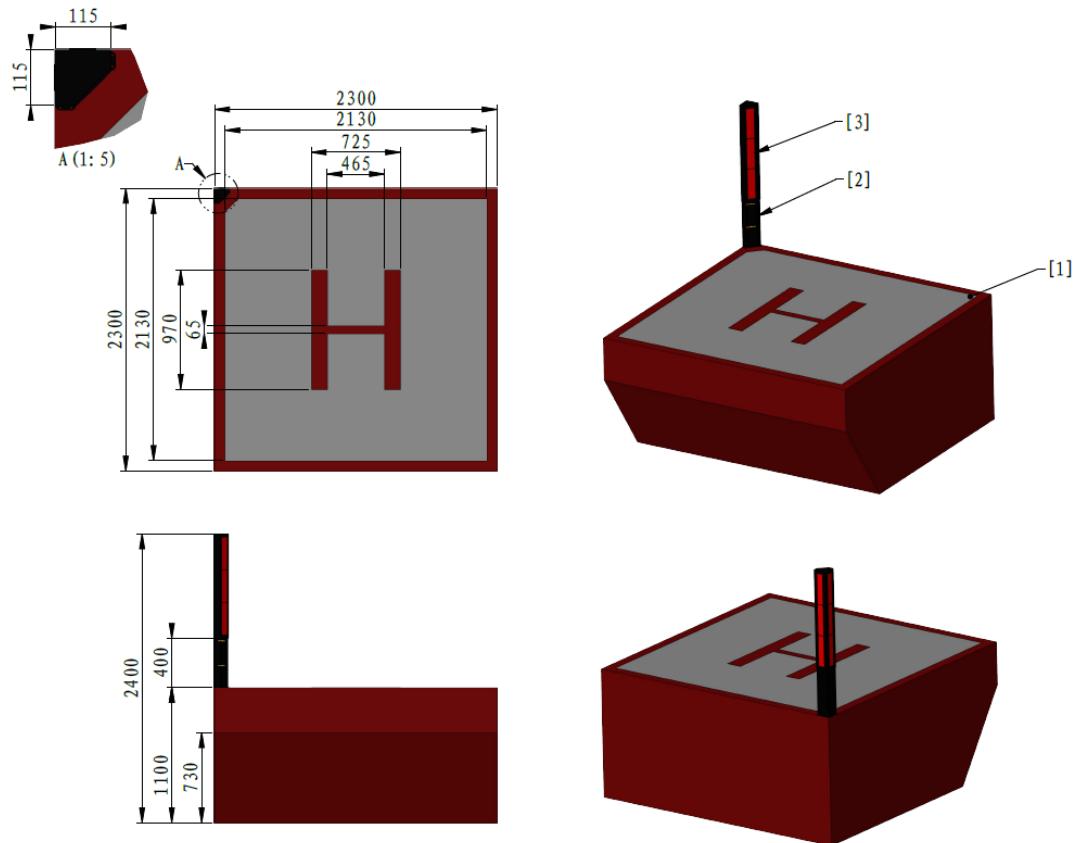
Figure 2-12 Radar Base

2.2.5 Landing Pad

A Landing Pad is the initialization area where an Aerial takes off. Before the start of a match, Aerial should be placed in the Landing Pad area.

As shown below, the detection device of the Aerial should be placed at one corner of a perimeter wall near the battlefield of the Landing Pad, in which two LiDAR devices at different heights are installed. The LiDAR devices

are used to detect the flight and landing status of an Aerial. When the two LiDAR devices detect an Aerial for longer than 2 seconds, the Aerial is deemed as having landed. The energy column of the Aerial is placed at the top of its detection device, to display the current energy value of the Aerial in real time.

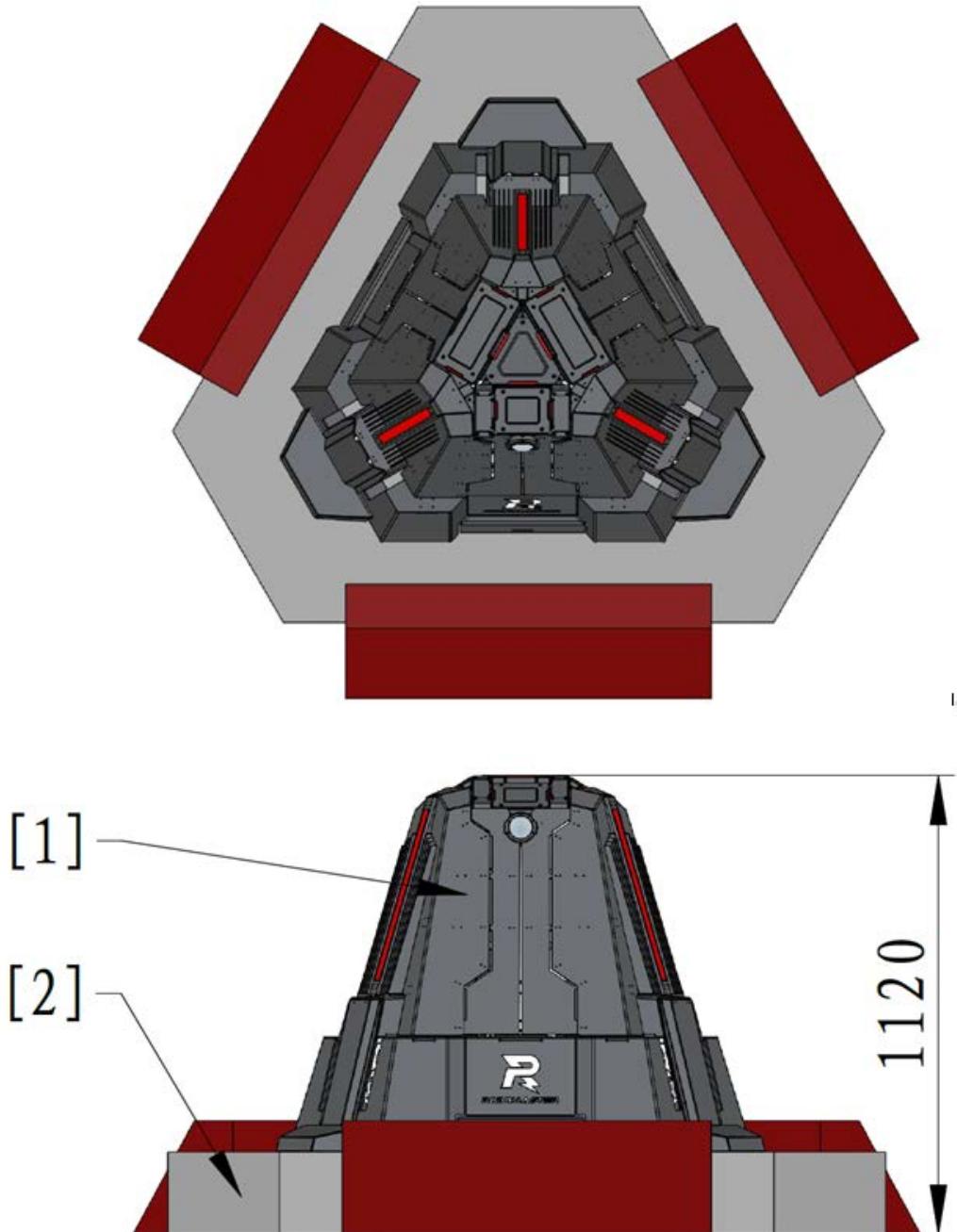


[1] Landing Pad Platform [2] Aerial's Detection Device [3] Aerial's Energy Column

Figure 2-13 Landing Pad

2.3 Base Zone

A Base Zone is where the Base Foundation is placed, and is located in the center of the Starting Zone.

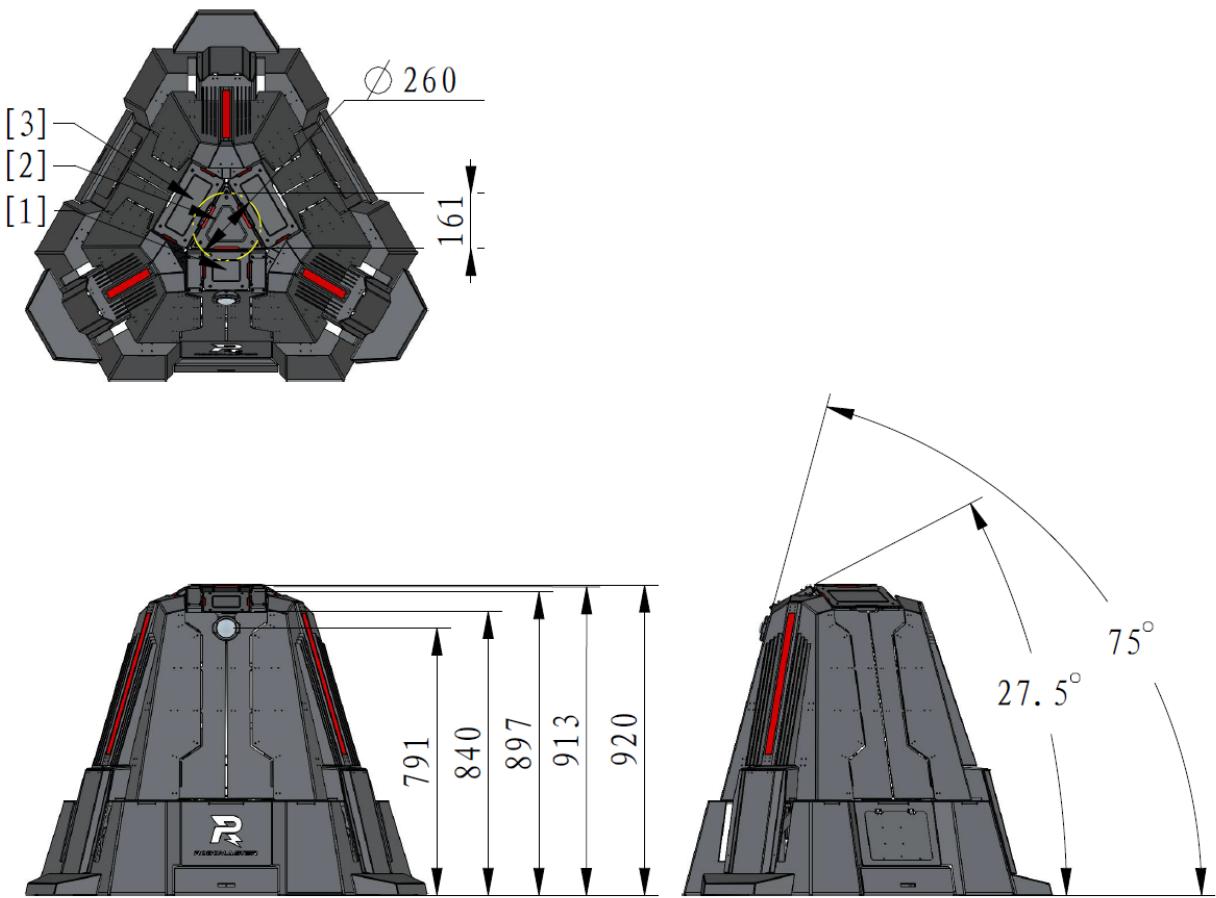


[1] Base [2] Base Foundation

Figure 2-14 Base Zone

2.3.1 Base

A Base is the central tool in the competition and the offensive and defensive core of both sides. It is placed on the Base Foundation in the Base Zones of both teams. A Base consists of the body of the Base, Armor Modules, Dart Detection Module, Base Protective Armor, etc. The Base Protective Armor can either be in a closed or expanded state.



[1] Dart Detection Module [2] Triangular Armor [3] Large Armor Module

Figure 2-15 Closed state of Base Protective Armor

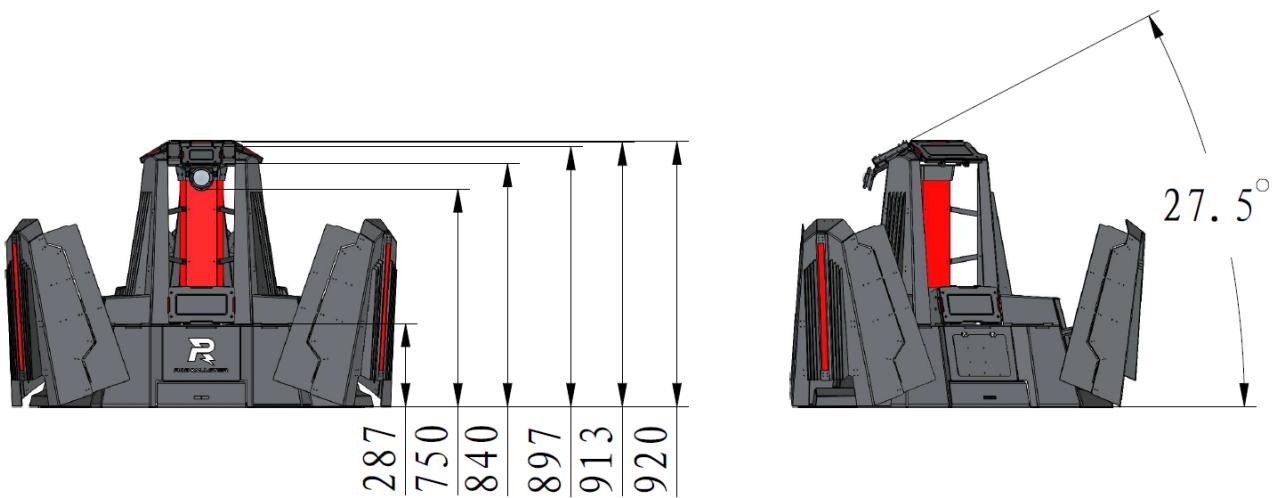
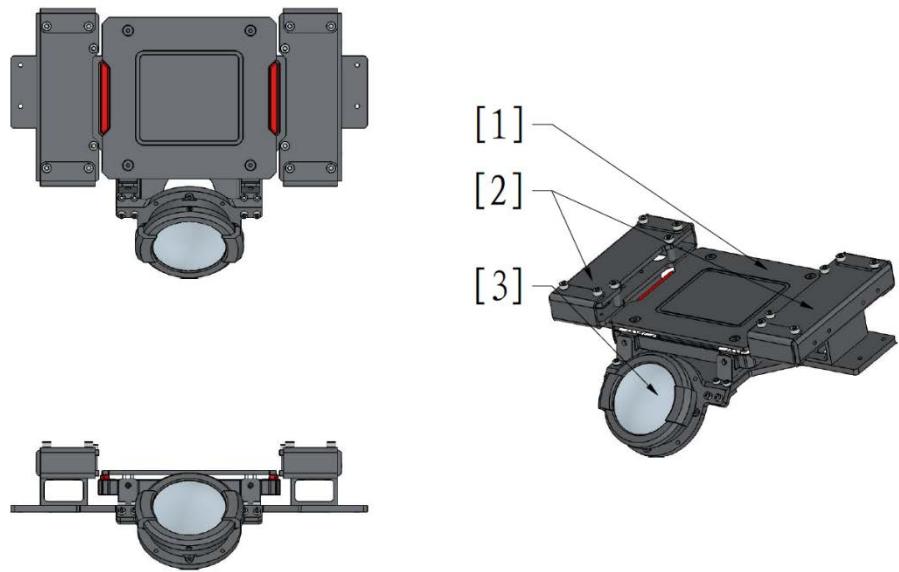


Figure 2-16 Expanded state of Base Protective Armor

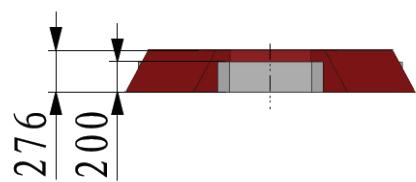
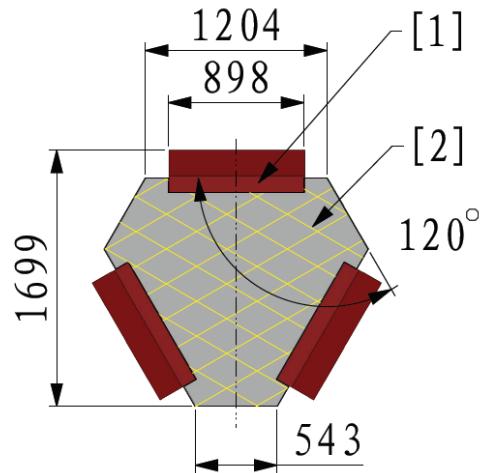


[1] Small Armor Module [2] Dart Detection Sensor [3] Dart Guiding Light

Figure 2-17 Dart Detection Module

2.3.2 Base Foundation

The Base Foundation is where the Base is placed, and is located in the Base Zone. The area above the Base Foundation is a Base Penalty Zone.



[1] Base Foundation [2] Base Penalty Zone

Figure 2-18 Base Foundation

2.4 Supplier Zone



Since the opening of the Projectile Outlet is large, teams are advised to enlarge the Projectile Loading Ports of robots and use buffer materials for the internal walls of magazines to prevent projectiles from scattering on the ground when they are loaded into a robot's magazine.

A Supplier Zone is an important area for robots to reload projectiles, revive defeated robots and restore HP. A Supplier Zone consists of a Restoration Zone and an Official Projectile Supplier.

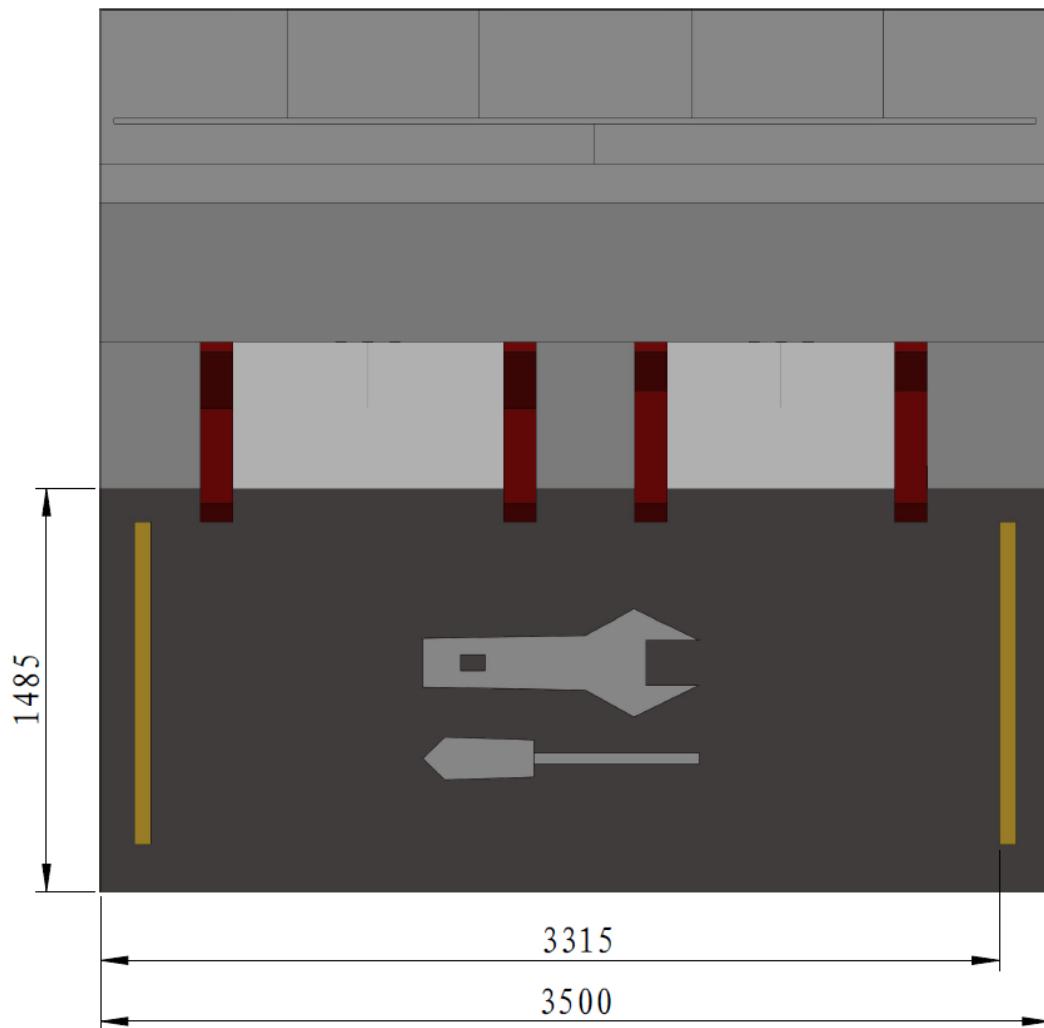


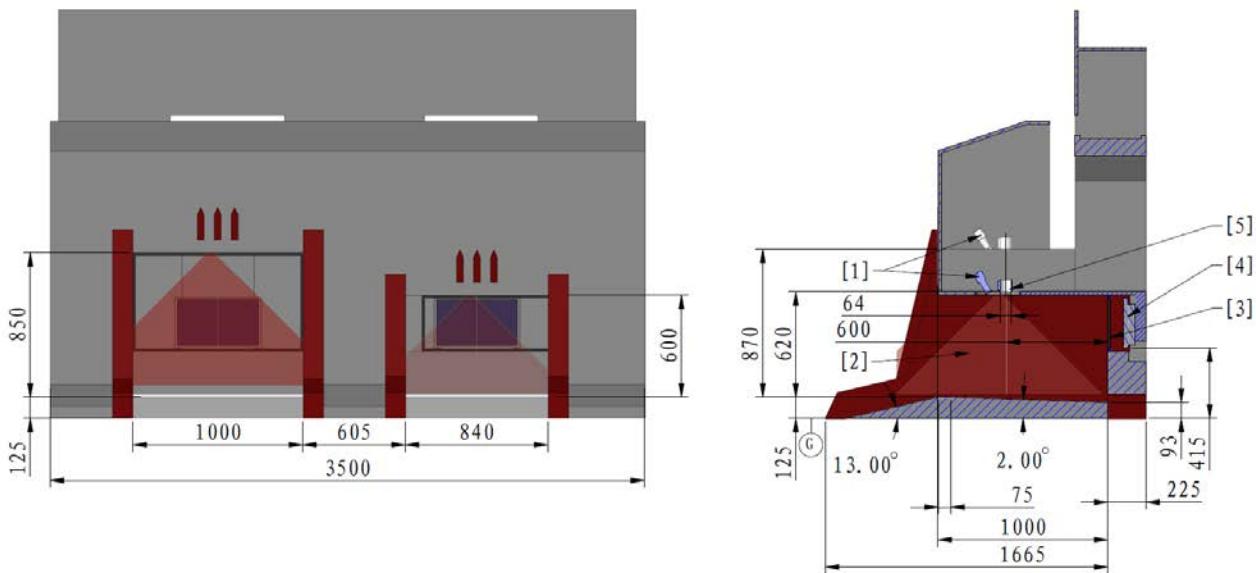
Figure 2-19 Supplier Zone

2.4.1 Official Projectile Supplier



Cross laser light: Formed by two horizontal laser lights intersecting at the circular center of the Projectile Outlet.

An Official Projectile Supplier provides 17mm projectiles during matches and consists of a Projectile Outlet, an auxiliary alignment laser sight, a camera and a monitor.



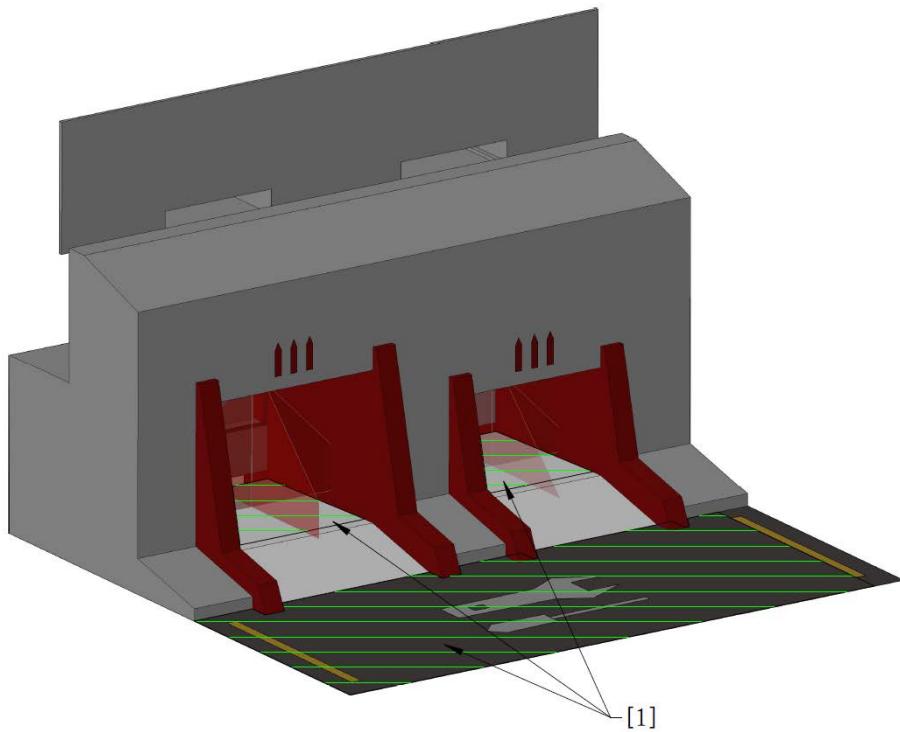
[1] Camera [2] Laser Light Path [3] Steel Wire Mesh [4] Monitor [5] Projectile Outlet

Figure 2-20 Official Projectile Supplier

The operator reloads projectile supply through the client interface using a keyboard and mouse. Robots can only reload projectile supply after a match round has started. The camera of the projectile outlet will capture real-time images of the robot's magazine and display them on the front monitor. The operator can adjust the position of the robot through the laser projected by the cross laser light. This allows the operator to determine whether to supply projectiles. If the Operator decides to supply projectiles, he or she should press the "O" key on the keyboard. If a team has remaining projectiles and their robot has detected an RFID Interaction Module Card below the Supplier Zone, the projectile reload quantity can be selected directly on the reload panel to complete the reloading process. If a team has remaining projectiles but their robot has not detected any RFID Interaction Module Card below the Supplier Zone, projectiles can be reloaded by initiating the "force projectile reload" command.

2.4.2 Restoration Zone

A Supplier Zone has three Restoration Zones, with the size of 1485*3410mm, 1000*925mm and 840*925mm, respectively.

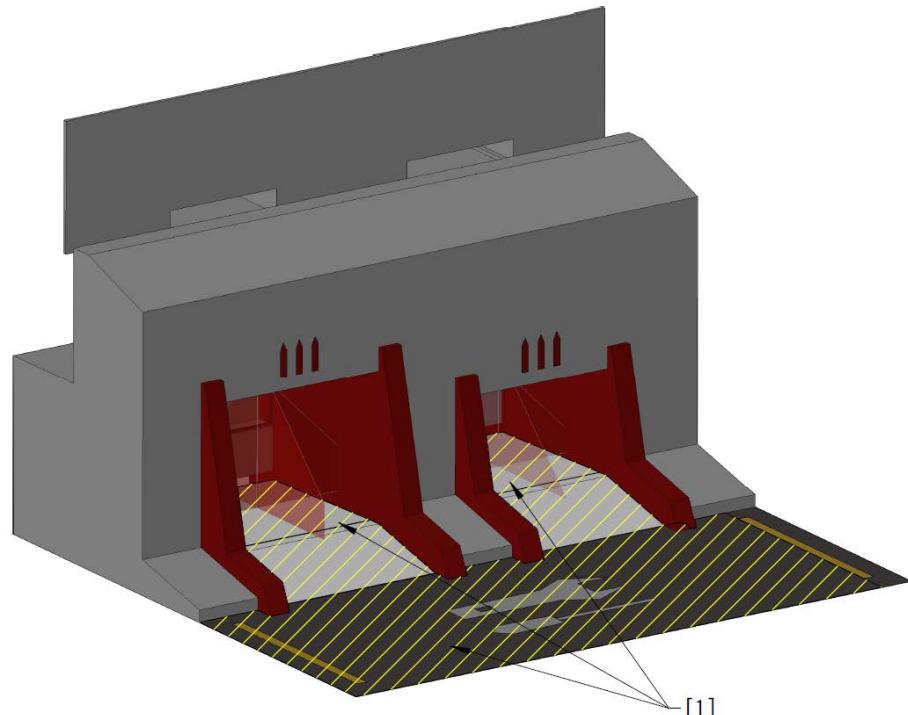


[1] Restoration Zone

Figure 2-21 Restoration Zone

2.4.3 Supplier Penalty Zone

The Supplier Penalty Zone is located within the Supplier Zone as shown below:



[1] Supplier Penalty Zone

Figure 2-22 Supplier Zone

2.5 Elevated Zone

An elevated ground is an area higher than the flat ground of the Battlefield. Each side has three elevated grounds that divide the Battlefield into different zones and create a three-dimensional space for the Battlefield. Elevated grounds include the diamond, trapezoid and ring-shaped elevated grounds.

2.5.1 Diamond-shaped Elevated Ground

The diamond-shaped elevated ground is situated near the Landing Pad, at a height of 400 mm above ground, and the height of its perimeter walls is 135 mm.

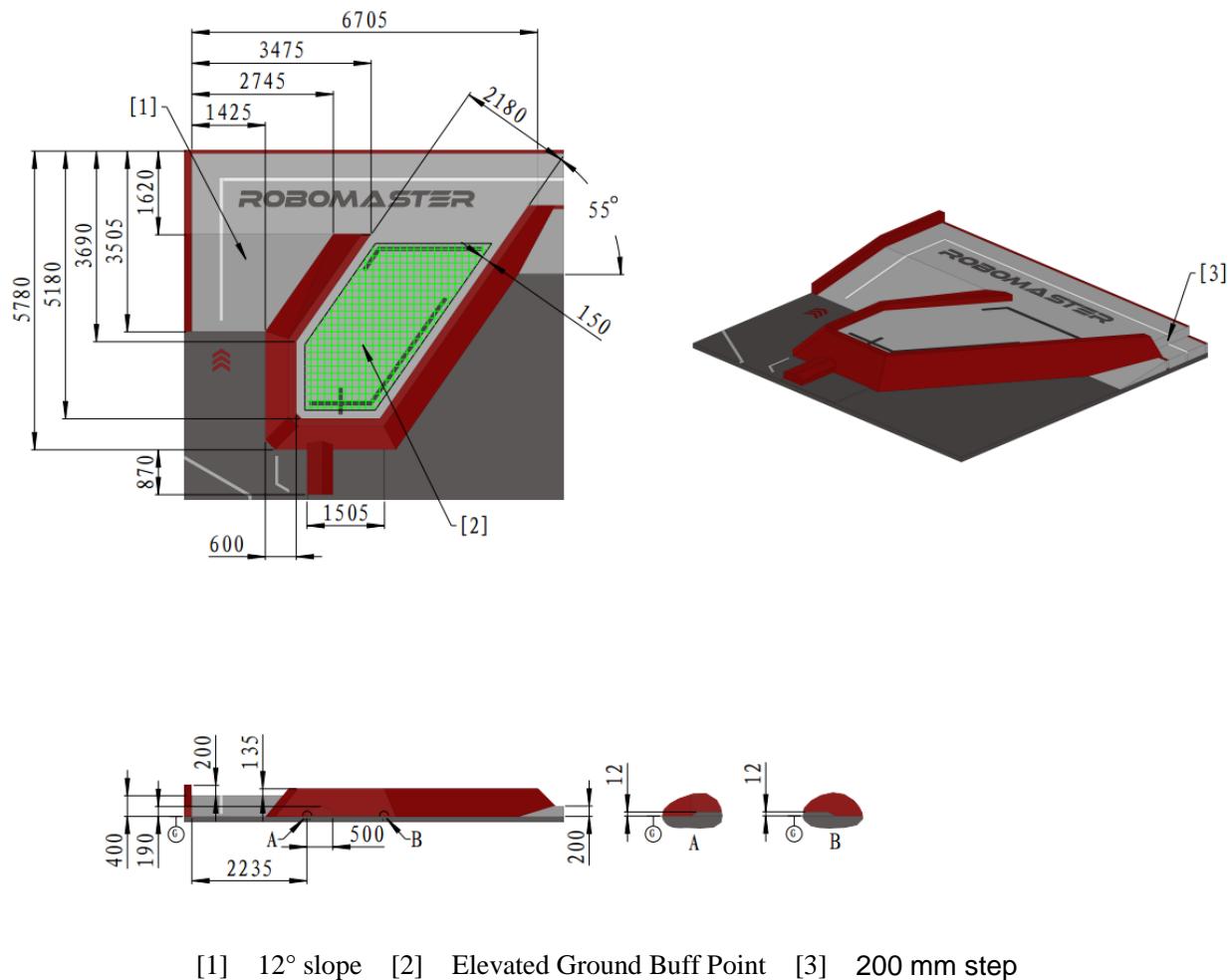


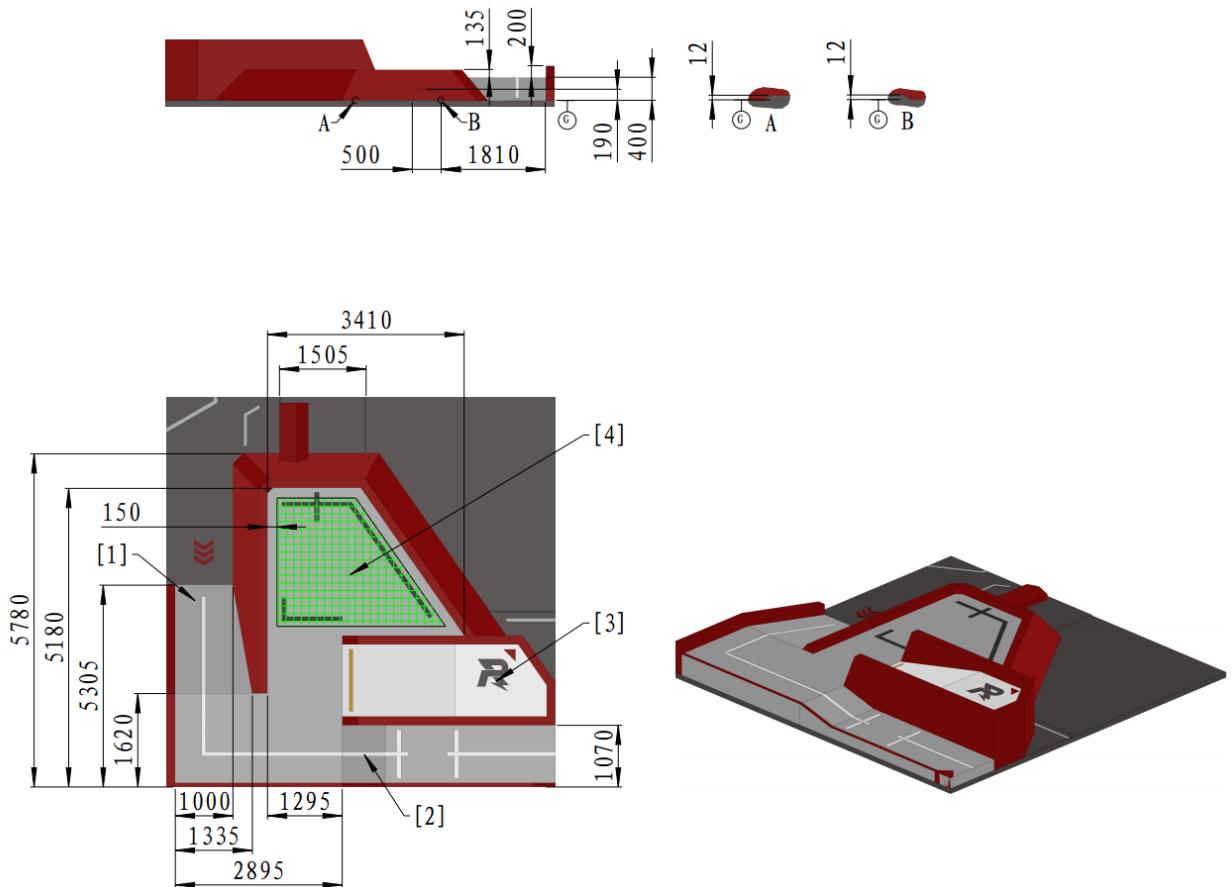
Figure 2-23 Diamond-shaped Elevated Ground

Diamond-shaped Elevated Ground Buff Point

A diamond-shaped elevated ground has one buff point.

2.5.2 Trapezoid-shaped Elevated Ground

The trapezoid-shaped elevated ground is located near the Supplier Zone, at a height of 400 mm above ground, and the height of the perimeter walls is 135 mm.



[1] 12° slope [2] 15° slope [3] Power Rune Activation Point [4] Elevated Ground Gain Zones

Figure 2-24 Trapezoid-shaped Elevated Ground

2.5.2.1 Trapezoid-shaped Elevated Ground Buff Point

A trapezoid-shaped elevated ground has one buff point.

2.5.2.2 Power Rune Activation Point

The Power Rune Activation Point is where a robot hits to activate the Power Rune, and is located on the trapezoid-shaped elevated ground. The activation point is connected to the trapezoid-shaped elevated ground through the slope.

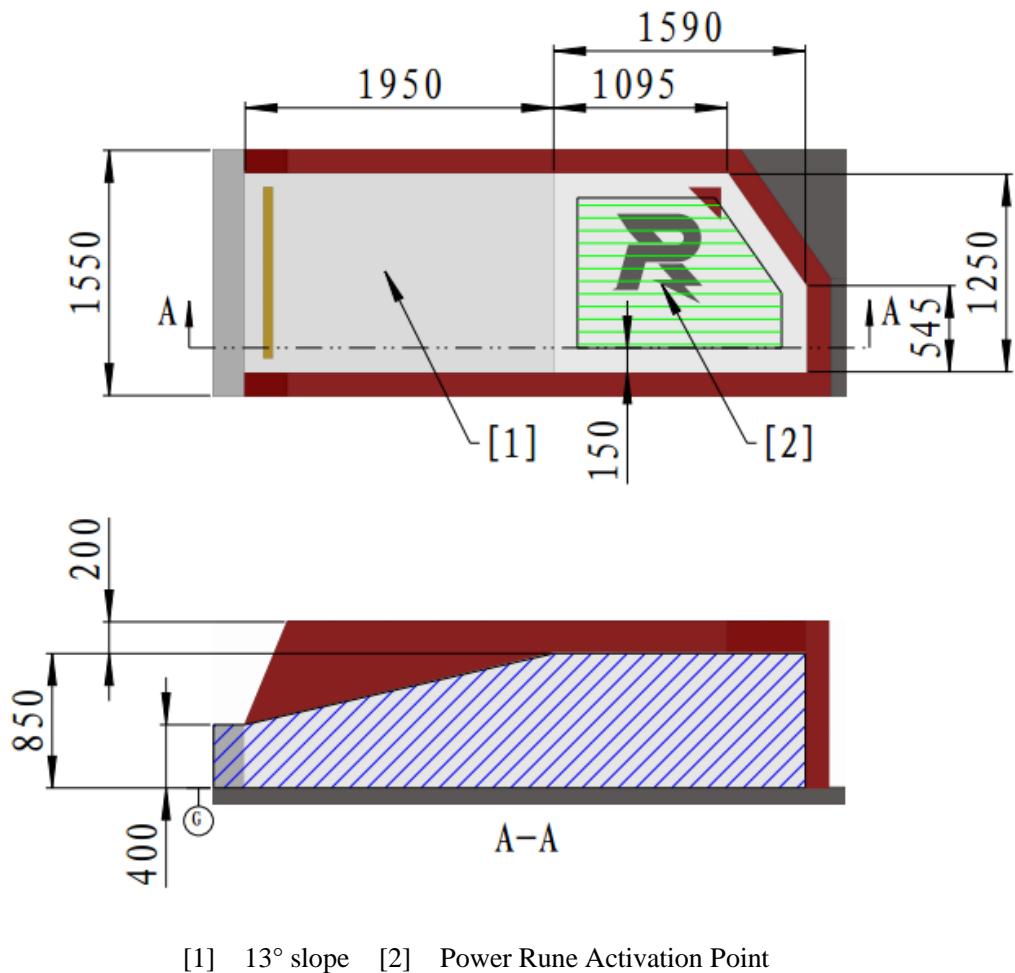


Figure 2-25 Power Rune Activation Point

2.5.2.3 Power Rune Activation Point Penalty Zone

The Power Rune Activation Point and its connecting slope constitute the Power Rune Activation Point Penalty Zone.

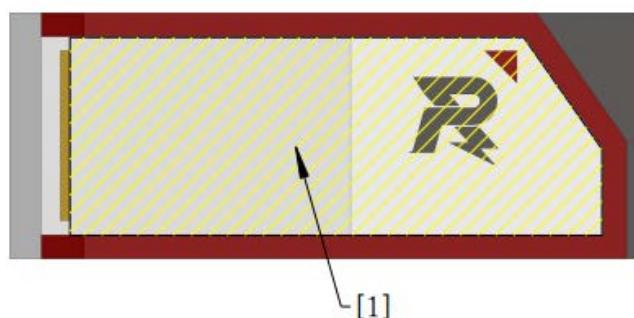
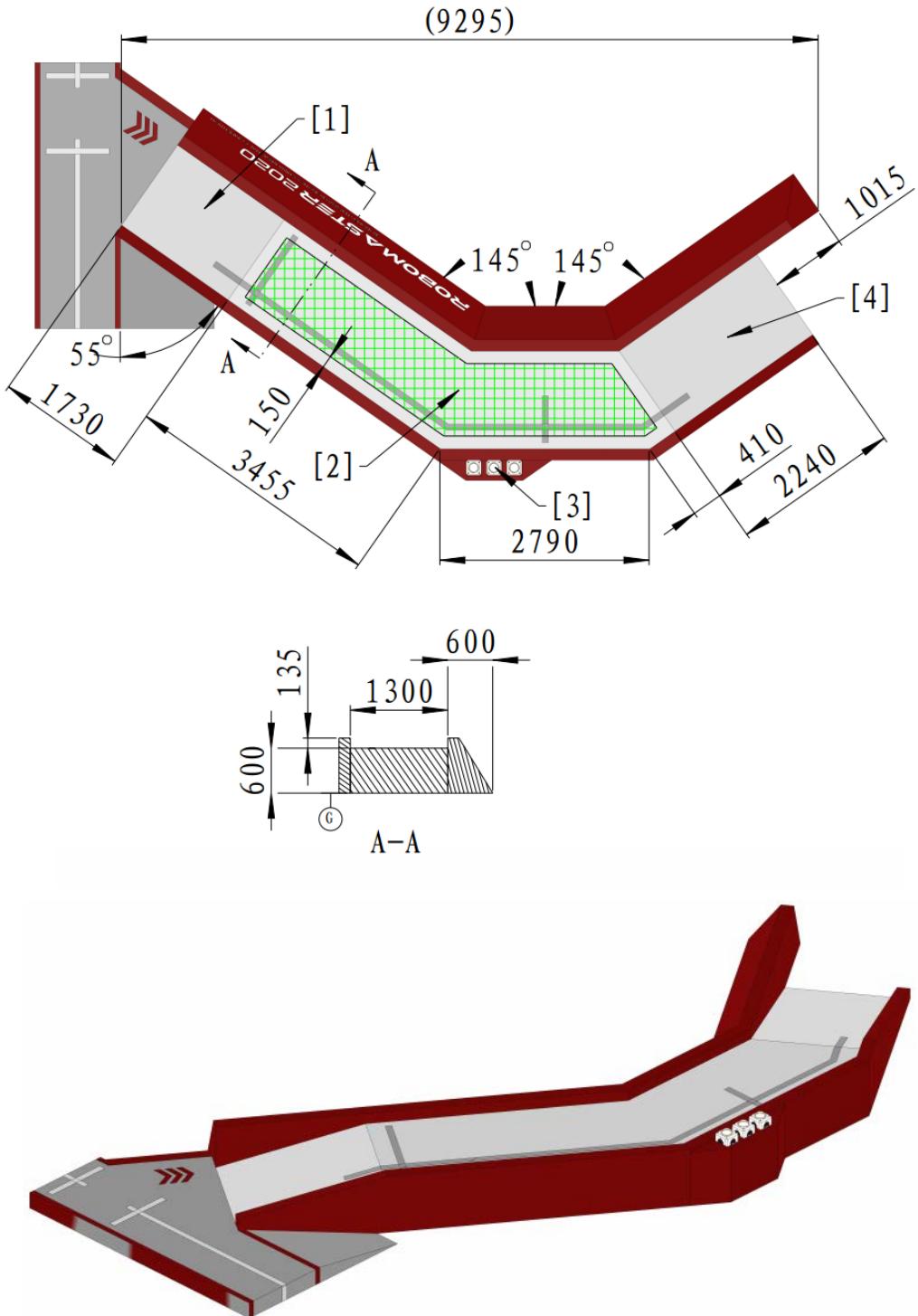


Figure 2-26 Power Rune Activation Point Penalty Zone

2.5.3 Ring-Shaped Elevated Ground

The ring-shaped elevated ground is located around the Resource Island Zone, with one end connected to the road through the slope. The Small Resource Island is adjacent to the ring-shaped elevated ground, and is located outside

the protective perimeter wall.



[1] 13° slope [2] Elevated Ground Gain Zones [3] Small Resource Island [4] 15° slope

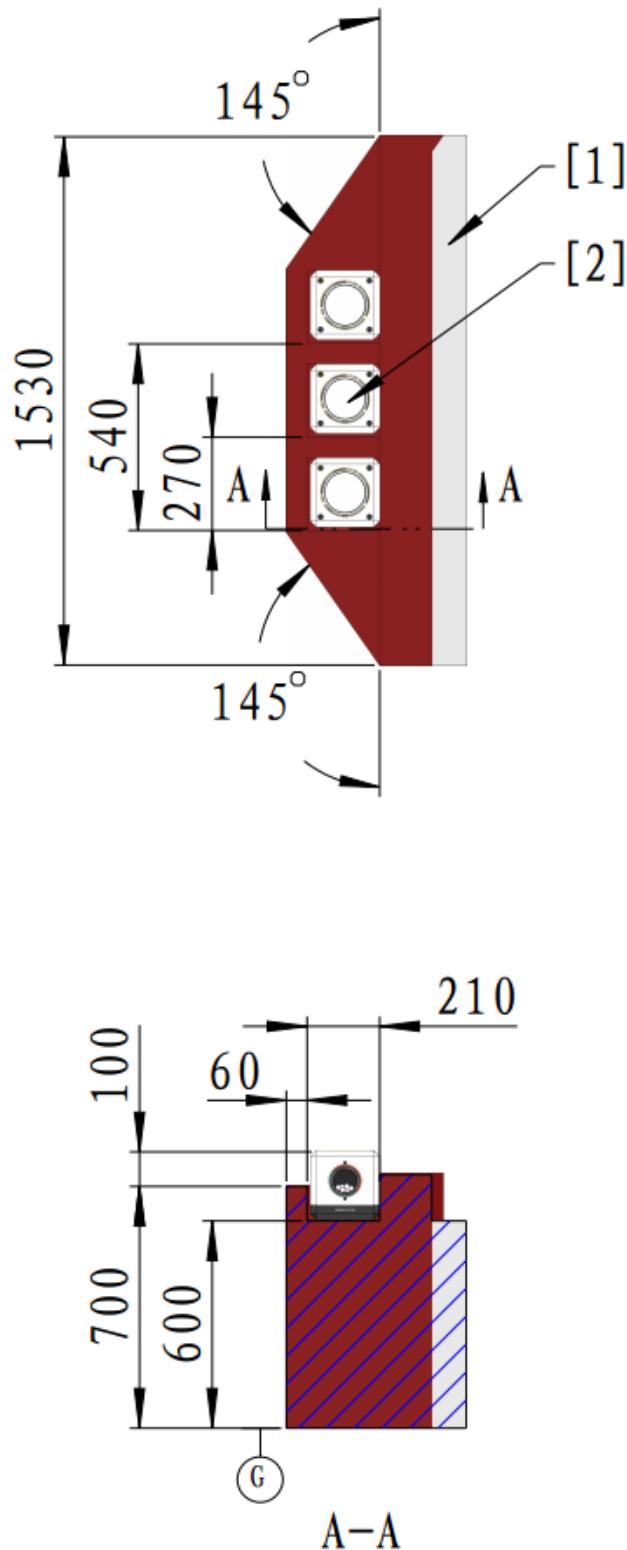
Figure 2-27 Ring-shaped Elevated Ground

2.5.3.1 Ring-shaped Elevated Ground Buff Point

A ring-shaped elevated ground has one buff point.

2.5.3.2 Small Resource Island

The Small Resource Island is adjacent to the ring-shaped elevated ground and located outside the protective perimeter wall. It has three grooves for Projectile Containers.



[1] Ring-shaped Elevated Ground [2] Small Resource Island Projectile Container

Figure 2-28 Small Resource Island

2.6 Outpost Zone

The Outpost Zone is located near the Resource Island Zone in the center of the Battlefield. It includes the Outpost, Outpost Base and Outpost Bunker.

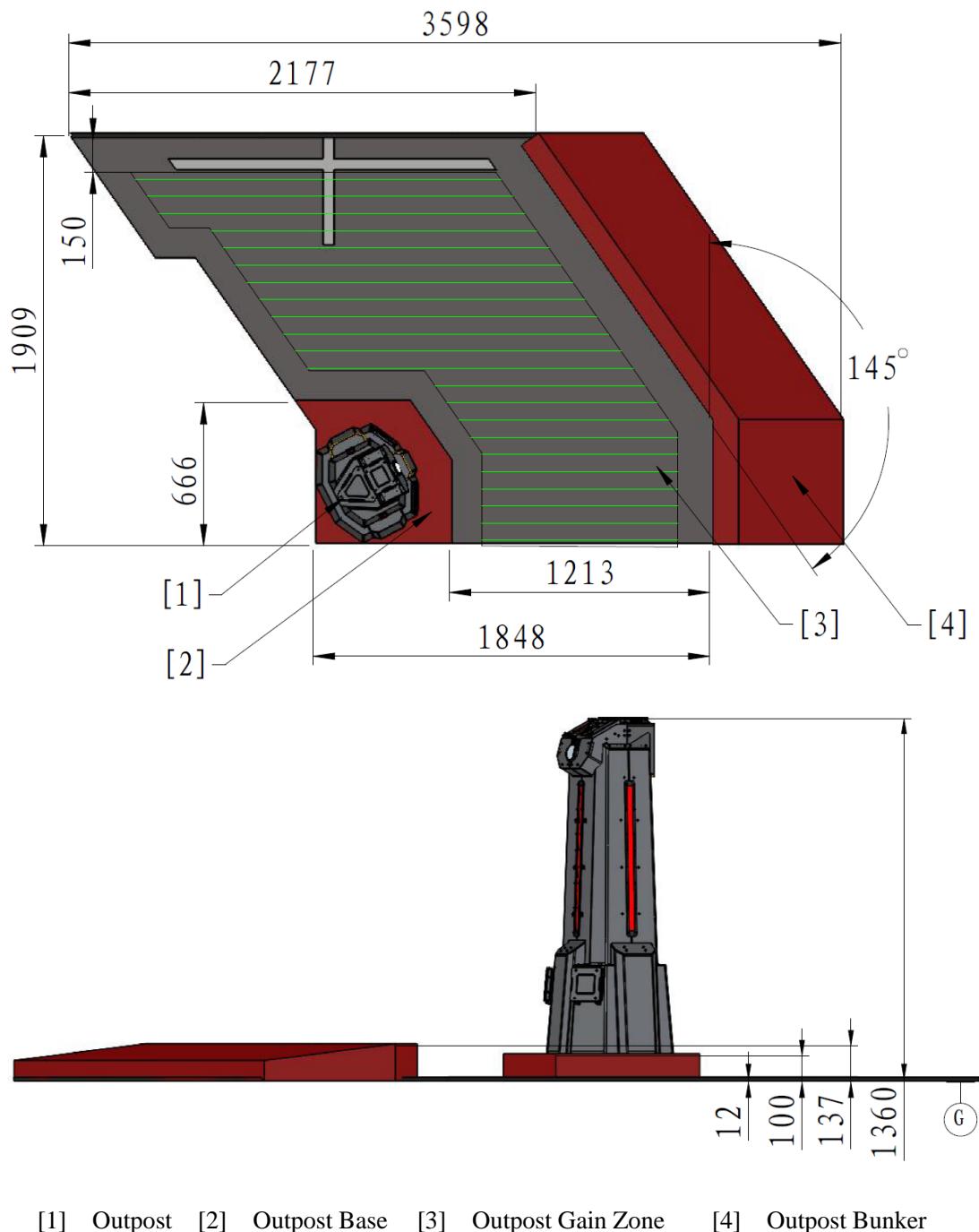
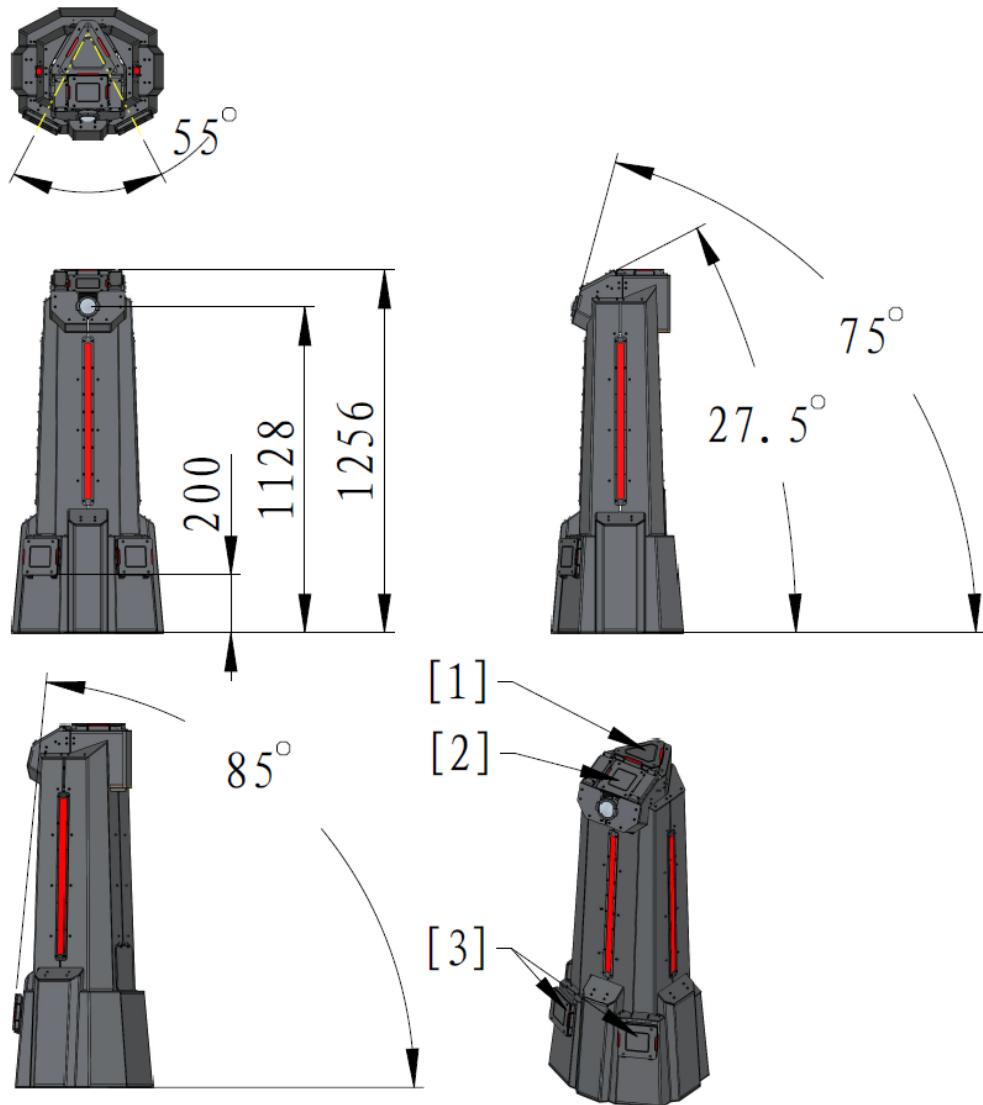


Figure 2-29 Outpost Zone

2.6.1 Outpost

The outpost is placed on the Outpost Base and is located on the edge of the Outpost Zone near the Launch Ramp on the road. The outpost consists of the body of the Outpost, Armor Module, Dart Detection Module and other components. You can refer to [Figure 2-17](#) for drawings of the Dart Detection Module.



[1] Triangular Armor Module [2] Dart Detection Module [3] Small Armor Module

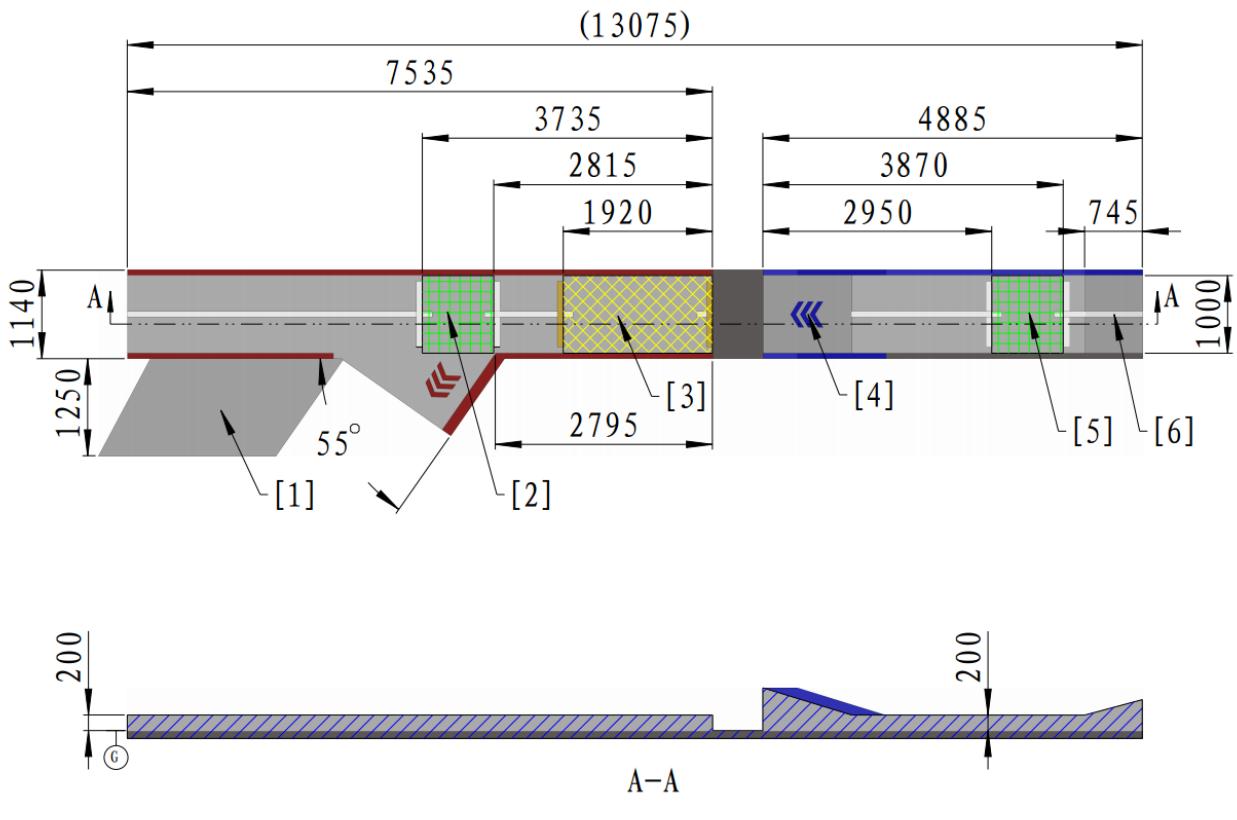
Figure 2-30 Outpost

2.6.2 Outpost Buff Point

The Outpost Buff Point is located behind the outpost bunker, and the buff point area is about 12 mm above the Battlefield ground.

2.7 Road Zone

The Road Zone connects the trapezoid-shaped elevated ground of one side and the diamond-shaped elevated ground of the other side. The road surface is 200 mm above ground. The Road Zone includes the road and the Launch Ramp.



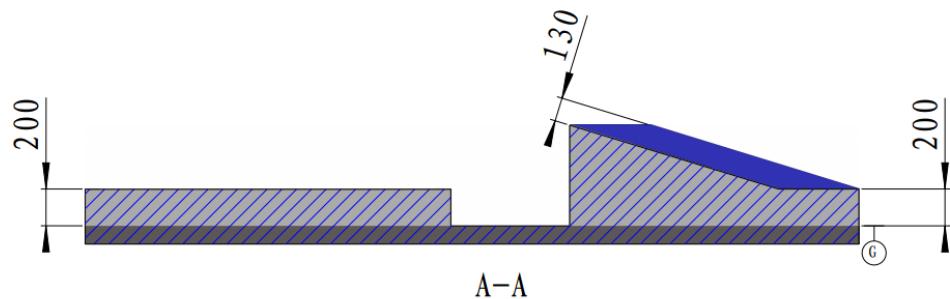
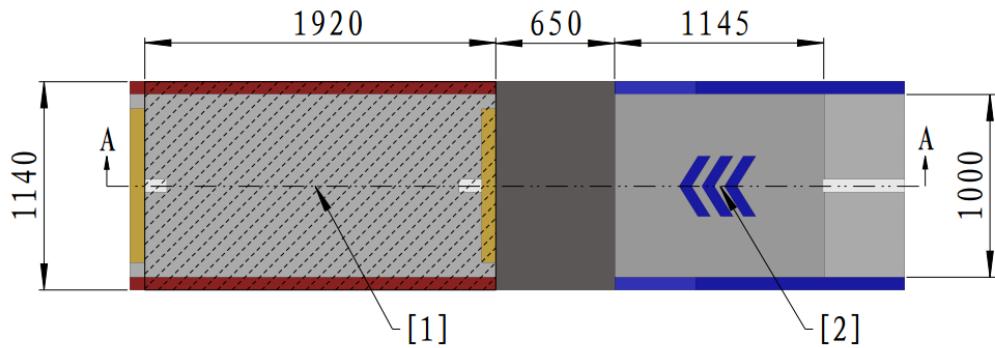
[1] 9° slope [2] Launch Ramp Buff Detection Point 1 [3] Road Penalty Zone

[4] 17° slope [5] Launch Ramp Buff Detection Point 2 [6] 15° slope

Figure 2-31 Road Zone

2.7.1 Launch Ramp

The Launch Ramp is located on the Road Zone, with which robots can fly over the ravine and reach the territory of the other team quickly. The Road Zone that is 1920 mm from the edge of the ravine is the Buffer Zone. EVA foam rubber with a thickness of 100 mm and hardness of 25 HC should be placed under the road surface.



[1] Buffer Zone [2] 17° slope

Figure 2-32 Launch Ramp

2.7.2 Launch Ramp Buff Detection Point

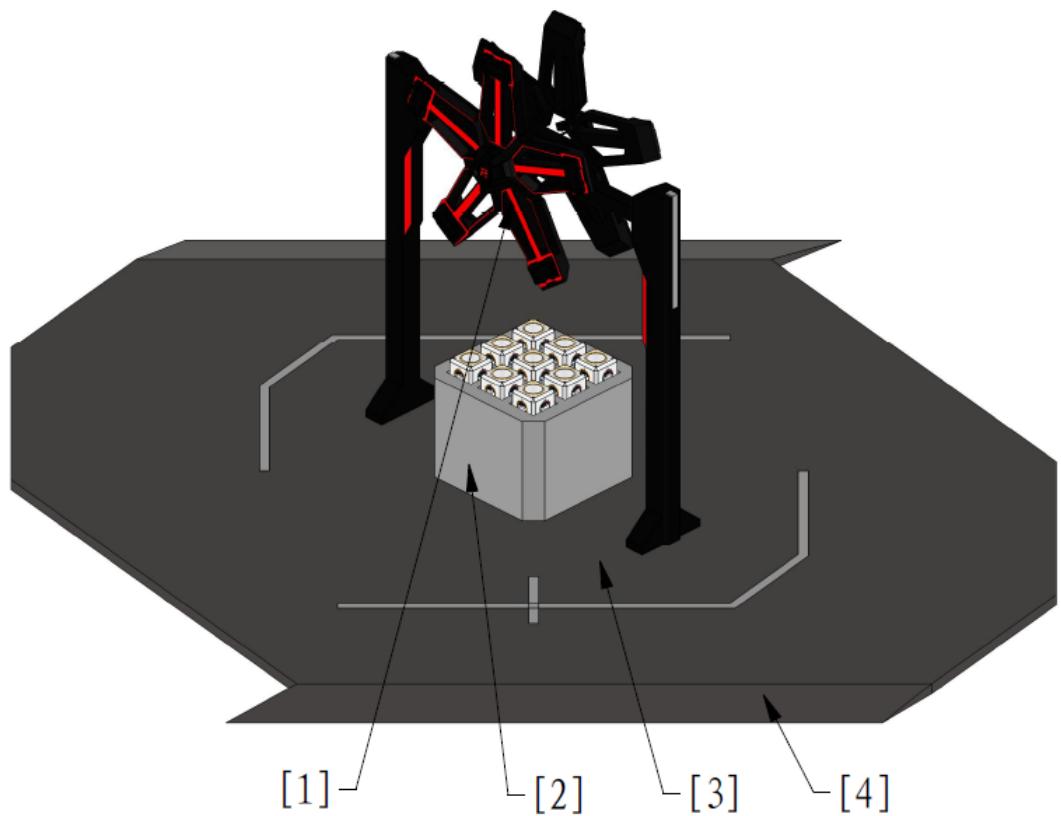
Each road has two Launch Ramp Detection Points, which are located respectively on the roads in front of and behind the Launch Ramp.

2.7.3 Road Penalty Zone

The Buffer Zone on the road is a Road Penalty Zone. Except for using the Launch Ramp, the robots of both sides are forbidden from entering the zone.

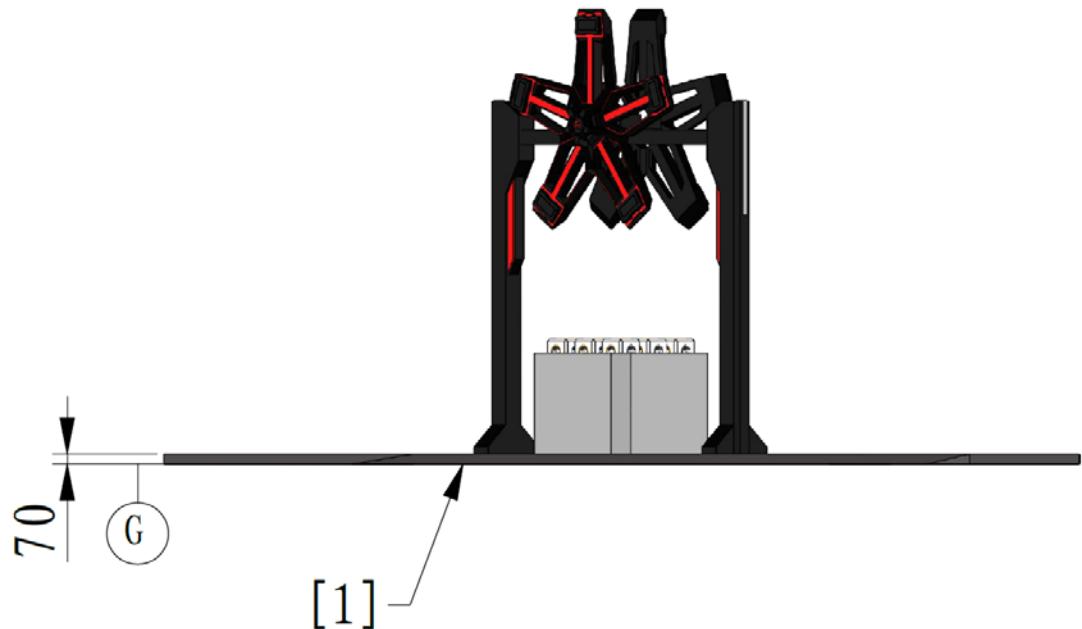
2.8 Resource Island

The Resource Island Zone is located in the center of the Battlefield. The Resource Island Zone includes the Resource Island, Power Rune and Resource Island Buff Point.



[1] Power Rune [2] Resource Island [3] Resource Island Buff Point [4] 12° slope

Figure 2-33 Axonometric view of the Resource Island Zone



[1] 70 mm Platform Ground

Figure 2-34 Main View of Resource Island

2.8.1 Resource Island

The Resource Island is located in the center of the Resource Island Zone and directly under the Power Rune. It has nine grooves for Projectile Containers.

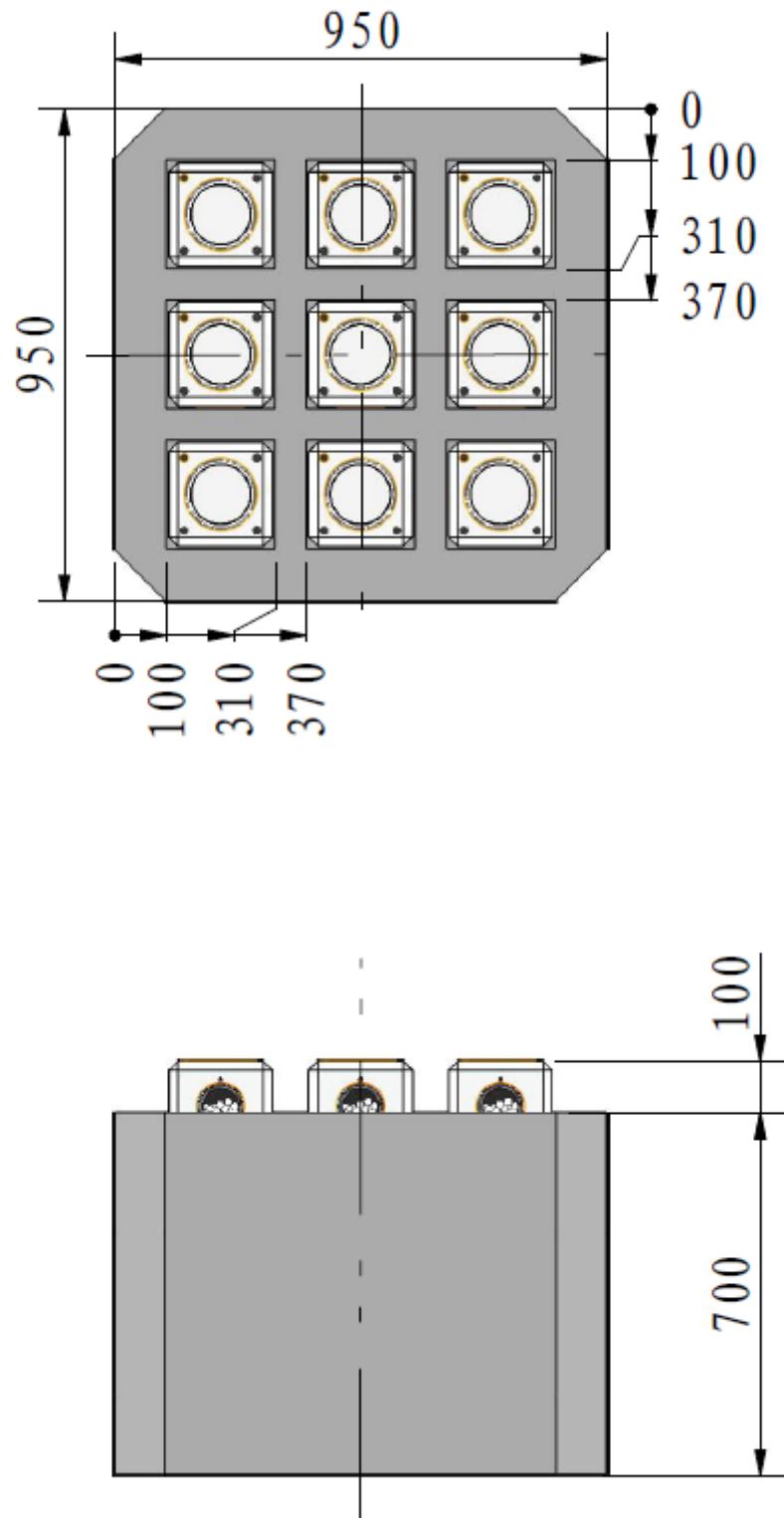


Figure 2-35 Dimensions of the Resource Island

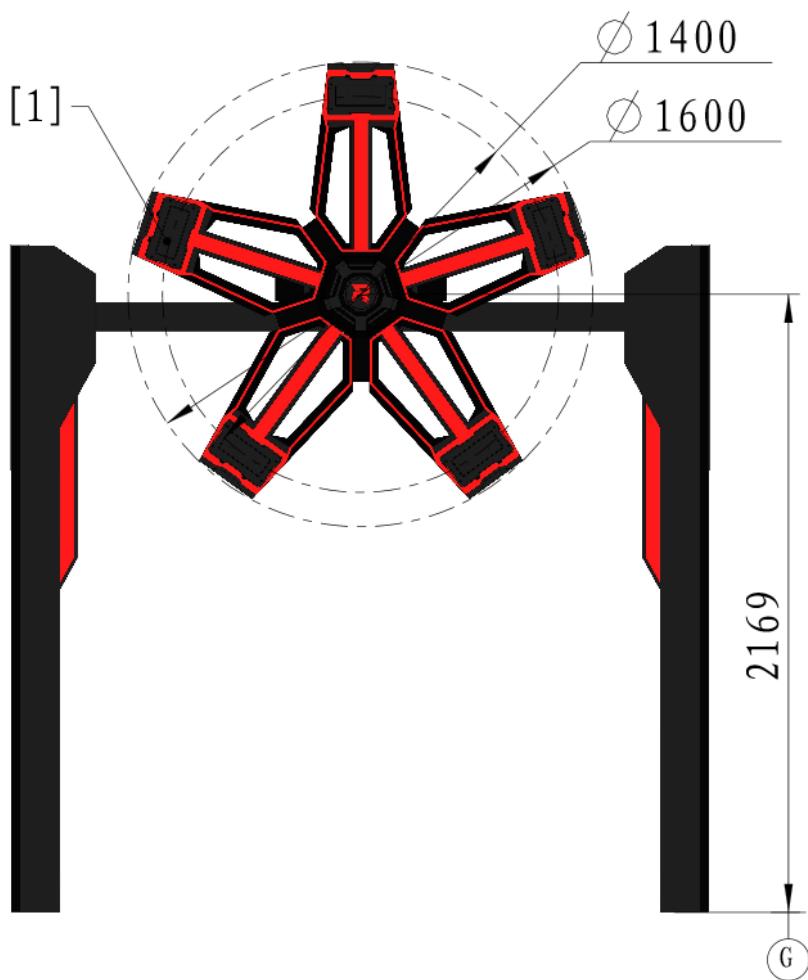
2.8.2 Power Rune



- The Power Rune will have a slight dip in the middle due to its weight. The dip is around 0~50 mm.
- Due to the viewing angle and transmission gap, a team may see parts of the Power Rune of the other side when observing its own Power Rune.

The Power Rune is located directly above the Resource Island. The Power Rune is powered by the motor and rotates at a regular rhythm. A robot needs to occupy the Power Rune Activation Point to activate the Power Rune. The Power Rune of the red team is located one side and that of the blue team are located on the other. The Power Runes of both teams rotate on the same axis.

A Power Rune has five mounting brackets that are distributed evenly. The end of each mounting bracket is installed with a Large Armor Module. The specific location and dimensions of the Large Armor Module are as follows:



[1] Large Armor Module

Figure 2-36 Power Rune

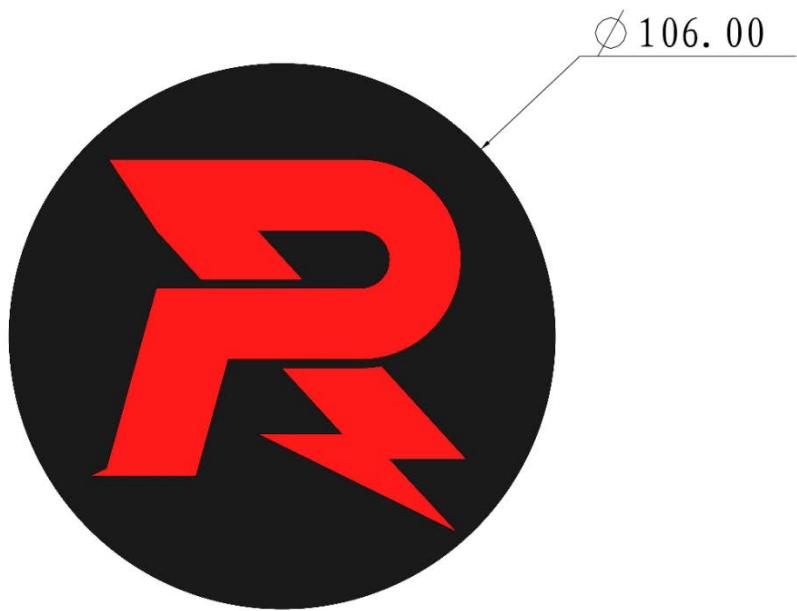
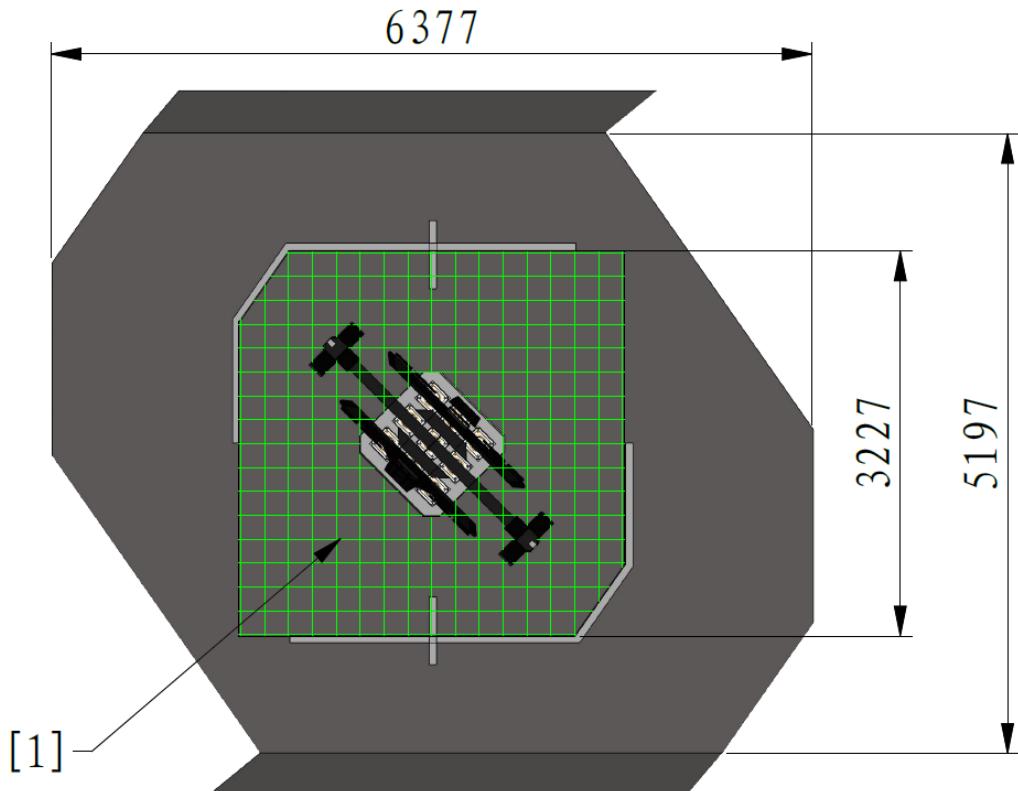


Figure 2-37 Central logo of the Power Rune

2.8.3 Resource Island Buff Point

The Resource Island Buff Point is located around the Resource Island.



[1] Resource Island Buff Point

Figure 2-38 Resource Island Buff Point

2.9 Flight Zone

The Flight Zone is the flight area for Aerial Robots. It includes the Landing Pad and the air space above it as well as the air space above the road connected to the diamond-shaped elevated ground of one's team.

Aerial Safety Rope

Aerial must be attached with an Aerial Safety Rope during a match to ensure the robot's safety. The robot's flight distance is restricted by the snap ring of the Aerial Safety Rope. The maximum total travel distance is 16 m.

2.10 Miscellaneous

2.10.1 Projectile

Robots attack the Armor Modules of enemy robots by launching projectiles, causing damage to their HP so as to ultimately defeat them. The parameters and scenarios of use for projectiles in the competition are as follows:

Figure 2-1 Projectile Parameters and Scenarios of Use

Type	Appearance	Color	Size	Weight	Shore Hardness	Material	Scenarios of Use
42mm projectile	Similar to a golf ball	White	42.5 mm ± 0.5 mm	41 g ± 1 g	90 A	Plastic (TPE)	China Regional Competition, Wild Card Competition
17mm projectile	Spherical	Yellow-green	16.8 mm ± 0.2 mm	3.2 g ± 0.1 g	90 A	Plastic (TPU)	Whole course of RM2020 Robotics Competition

2.10.2 Projectile Container



The graphics on the outside of Projectile Containers will be changed and updated subsequently.

A Projectile Container is a 200*200*200 mm cube. Its six faces are chamfered and it is made out of EVA. The top side of a Projectile Container has a hole with a diameter of 115 mm. The hole depth for different types of Projectile Containers is different. The depth of the Projectile Containers in the middle of the Resource Island is 150 mm, and the depth of the Projectile Containers on a Small Resource Island is 70 mm.

Projectile Containers on the Small Resource Island:

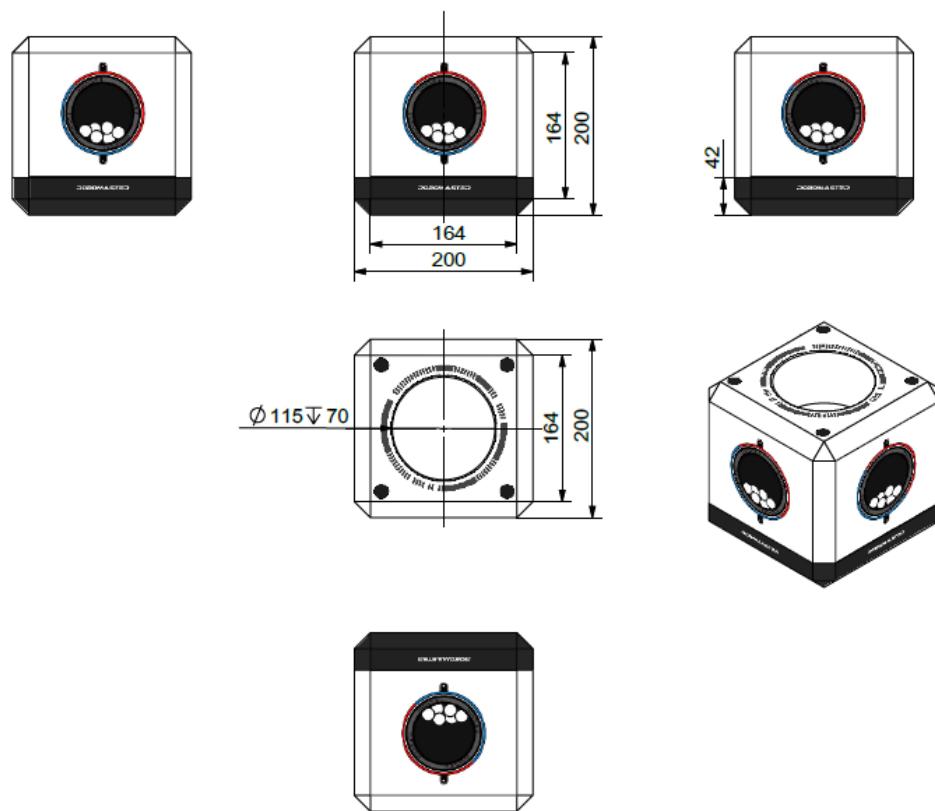


Figure 2-39 Projectile Containers on the Small Resource Island

Projectile Containers on the Resource Island:

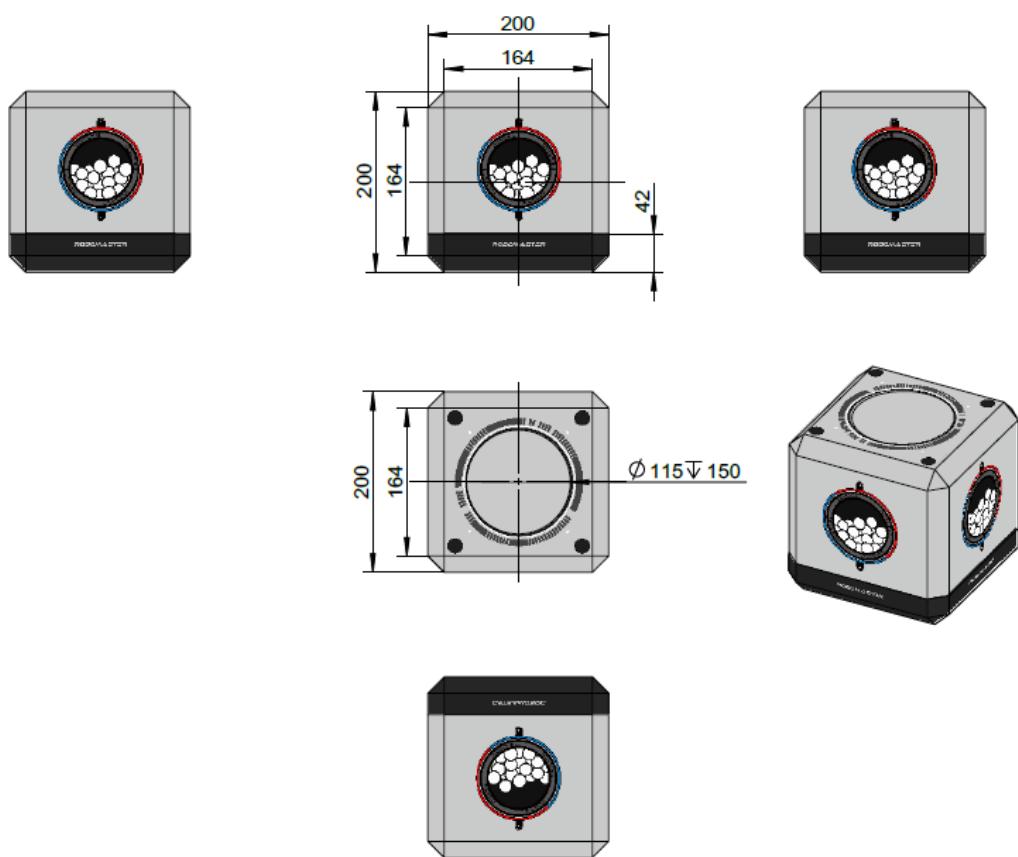


Figure 2-40 Projectile Containers on the Resource Island

2.10.3 Operator Room

Operator Room lies outside the Battlefield and is an area for Operators during the competition. Operator Room consists of Main Operator Room and Pilot Room. Each Operator Room shall be equipped with a corresponding number of computers, each connected to its corresponding official equipment such as a monitor, mouse, keyboard, USB hub and wired headset. An Aerial Gimbal Operator shall be allocated two monitors. Pilot Room lies outside the Battlefield and near the Landing Pad.

3. Competition Mechanism

3.1 Robot Status and Buff Types

Robots will display the following statuses during the competition as shown below:

Figure 3-1 Robot Status

States	Definition
Survive	Robot's HP is not zero.
Defeated	Where a robot's HP drops to zero after its Armor Module has been attacked or hit, it has exceeded its chassis power consumption limit, initial firing speed limit or barrel heat limit, its Referee System module has gone offline, etc.
Ejected	Where a robot is ejected directly by the Referee System due to penalty of Level 4 Warning or the violation score has reached 9 points.
Destroyed	Where a robot attacks the Armor Module of an enemy robot until the latter's HP drops to zero. The destroy of a robot is determined in one of the following two ways: <ul style="list-style-type: none">Where a robot defeats an enemy robot with a critical hit, it is considered destroyedIf a robot is attacked by multiple enemy robots within 10 seconds before its destroy or ejection, then the last of the enemy robots to attack the defeated robot will be deemed the destroying robot

Robots can earn buffs by completing specific missions. The types of buffs are as follows:

Table 3-2 Robot Buffs

Type	Definition
Attack Buff	Increases the damage caused by a projectile attack.
Defense Buff	Reduces the damage suffered from a projectile attack or impact.  Defense buffs are not applicable to HP deductions caused by penalties, the Referee System going offline, exceeding limits, etc.
Barrel Heat Cooling Buff	Increases the barrel heat cooling rate per second.
Buffer Energy Buff	Receives extra buffer energy for chassis power.
HP Recovery Buff	The robot restores its HP by a certain amount each second, until it reaches its Maximum

Type	Definition
	HP.

3.2 HP Deduction Mechanism

The HP of ground robots and Sentry will be deducted in any of the following situations: the Barrel Heat limit, Initial Firing Speed limit or Maximum Chassis Power Consumption of a Launching Mechanism is exceeded; an Armor Module is attacked by a projectile or strike; an important module of the Referee System goes offline; penalty for violation of rules; etc.

The Referee System will round down the HP deduction and keep the integer when calculating the HP.

3.2.1 Initial Firing Speed Exceeds the Limit

Set the Initial Firing Speed limit as V_0 (m/s), the actual initial speed detected by the Referee System as V_1 (m/s).

When $V_1 > V_0$, if it's 17mm projectile, the deducted HP = Maximum HP * L%. If it's 42mm projectile, the deducted HP = Maximum HP * M%. The values of L% and M% are correlated to the margin of excess. The larger the margin of excess, the greater the values of L% and M%.

Table 3-3 Penalty Mechanism for Exceeding the Initial Firing Speed Limit

17mm projectile	L%	42mm projectile	M%
$0 < V_1 - V_0 < 5$	10%	$V_0 < V_1 \leq 1.1 * V_0$	10%
$5 \leq V_1 - V_0 < 10$	50%	$1.1 * V_0 < V_1 \leq 1.2 * V_0$	20%
$10 \leq V_1 - V_0$	100%	$1.2 * V_0 < V_1$	50%

3.2.2 Barrel Heat Exceeds the Limit and Cooling

Set the Barrel Heat limit as Q_0 , the current barrel heat as Q_1 , for each 17mm projectile detected by the Referee System, the current barrel heat Q_1 is increased by 10 (regardless of its initial speed) For each 42mm projectile detected, the current barrel heat Q_1 is increased by 100 (regardless of its initial speed). The barrel cools at a frequency of 10 Hz. The cooling value per detection cycle = cooling value per second / 10.

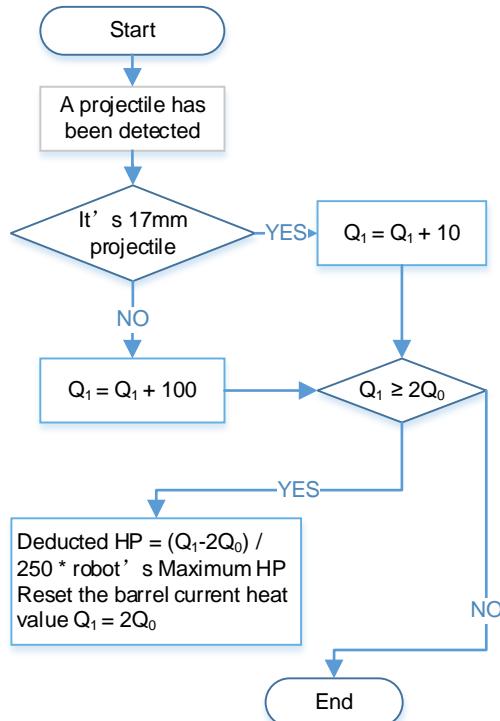
- A. and when $Q_1 > Q_0$, the first-person-view (FPV) visibility on the robot Operator's screen is reduced. The FPV will only return to normal when $Q_1 < Q_0$. The FPV for the client is as follows:



Figure 3-1 FPV of Client

- B. When $2Q_0 > Q_1 > Q_0$, the deducted HP for every 100 ms = $((Q_1 - Q_0) / 250) / 10 * \text{Maximum HP}$. After the HP deduction, the barrel cooling will be calculated.
- C. When $Q_1 \geq 2Q_0$, the immediate deducted HP = $(Q_1 - 2Q_0) / 250 * \text{maximum HP}$. After deducting HP, set $Q_1 = 2Q_0$.

The below shows the HP deduction and cooling logic when the Barrel Heat limit is exceeded:



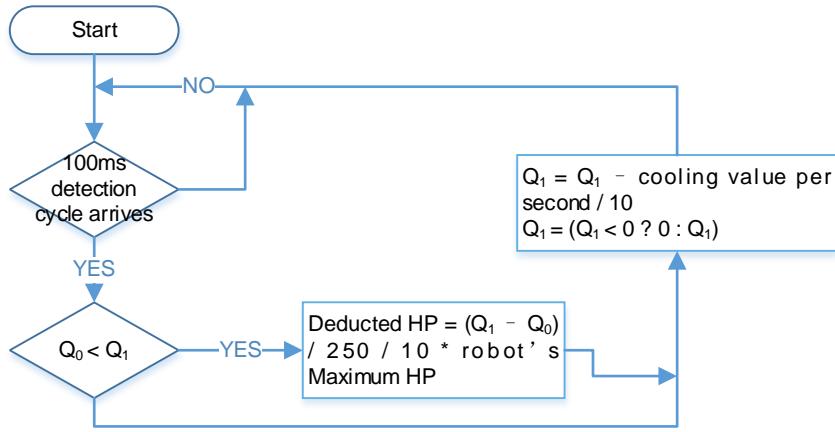


Figure 3-2 (Above) HP Deduction logic and (Below) cooling logic when Barrel Heat limit is exceeded

3.2.3 Chassis Power Consumption Exceeds the Limit

The chassis power consumption of robots will be continuously monitored by the Referee System, and the robot chassis needs to run within the chassis power consumption limit. Considering it is difficult for a robot to control instantaneous output power when in motion, a buffer energy (Z) has been defined in order to avoid the penalty that accompanies.

The buffer energy (Z) of Sentry is 200J; while the Z values of Standard or Hero may differ according to these two scenarios:

- If Standard or Hero has not triggered the Launch Ramp Buff, its buffer energy limit is 60J.
- If Standard or Hero has triggered the Launch Ramp Buff, its buffer energy limit increases to 250J. If the buffer energy is subsequently consumed to below 60J, it can be restored to no more than 60J. Refer to [3.6.3 Launch Ramp Buff](#).

The Referee System monitors chassis power consumption at a frequency of 10 Hz.

Excess Percentage: $K = (Pr - Pl) / Pl * 100\%$, where Pr is the instantaneous chassis power consumption output and Pl is the power consumption limit.

Table 3-4 Penalty Mechanism for Chassis Power Consumption Exceeds the Limit

K	N%
$K \leq 10\%$	10%
$10\% < K \leq 20\%$	20%
$K > 20\%$	40%

Standard and Hero:

After the exhaustion of buffer energy, when the Chassis Power Consumption of Standard or Hero exceeds the limit,

in each detection cycle the deducted HP = Maximum HP * N% * 0.1.

For example: If the Maximum Chassis Power Consumption of Hero is upgraded to 80W, Maximum HP to 350, and it has a continuous power output of 140W under the situation that it has not triggered the Launch Ramp buff, then 60J of energy will be consumed after each second. The excess percentage that can be calculated in the next 100 ms detection cycle, $K = (140 - 80) / 80 * 100\% = 75\%$. Since $K > 20\%$, the deducted HP = $350 * 40\% * 0.1 = 14$.

The logic graph for chassis power consumption detection and HP deductions for Standard or Hero is shown below:

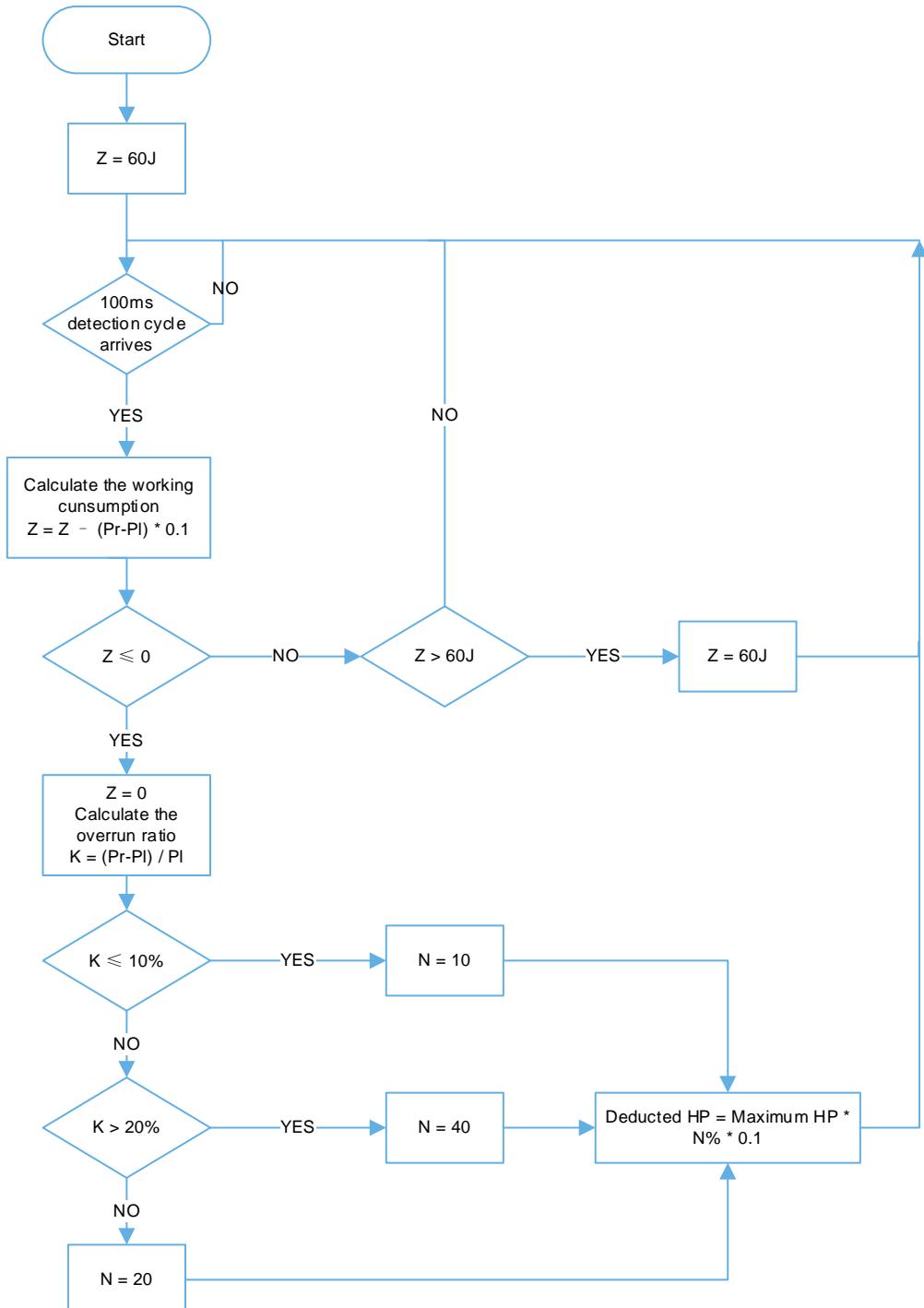


Figure 3-3 Chassis Power Consumption Detection and HP Deduction Logic of Standard and Hero

Sentry:

After the exhaustion of buffer energy, when the Chassis Power Consumption of Sentry exceeds the limit, its chassis will be powered off.

The logic graph for chassis power consumption detection of Sentry and chassis power-off is shown below:

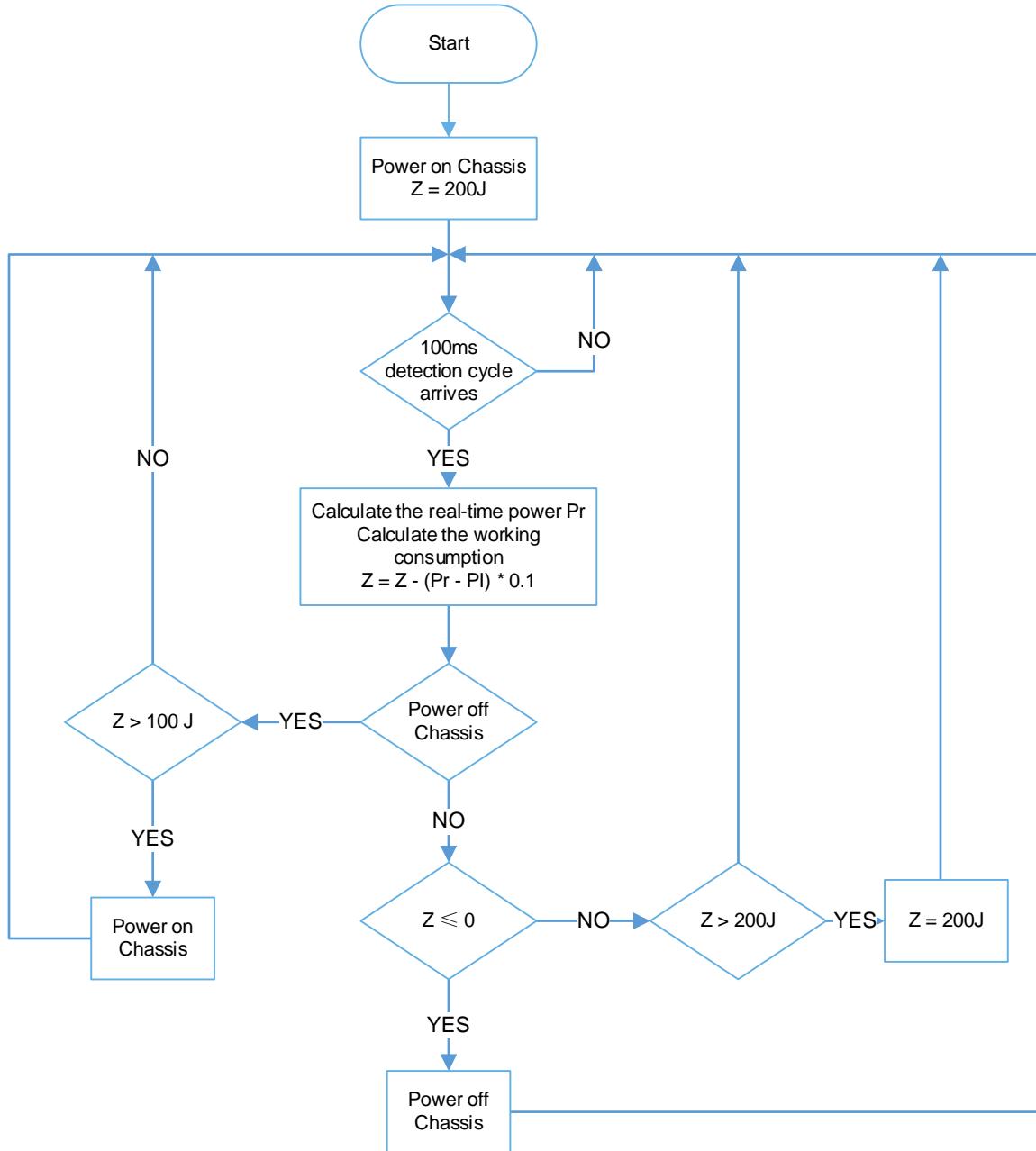


Figure 3-4 Chassis Power Consumption Detection and Chassis Power-off Logic of Sentry

3.2.4 Attack Damage



In an actual match, the normal speed of a projectile that touches the Armor Module attack surface is different from its initial firing 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.

A robot is only allowed to inflict damage on the enemy unit using projectiles and Darts.

An Armor Module detects projectile attacks using the pressure sensor combined with the Armor's vibration frequency. A Dart Target detects dart attacks using the Armor Module combined with the phototube.

The smallest detection interval for an Armor Module is 50 ms (when hitting an Armor Module using a 42mm projectile, the detection interval can be 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 velocity range for the detection of different projectile types by an Armor Module is as follows:

Table 3-5 An Armor Module's detection speed for different projectile types

Armor Module	17mm projectile	42mm projectile
Large Armor Module, Small Armor Module	Higher than 12 m/s	Higher than 8 m/s
Triangular Armor Module	Not detected	Higher than 6 m/s

A robot will also experience damage when its Armor Module is struck. However, a robot cannot cause HP damage to the other side's robots through striking (including collision with the robots or launching objects).

Below are HP deductions in situations of no buff:

Table 3-6 HP deduction Mechanism for Attack Damage

Damage Type	HP Damage Value
42mm projectile	<ul style="list-style-type: none">Robot's Armor Module: 100Base and Outpost Armor Modules: 200Triangular Armor Module of Base and Outpost: 300
17mm projectile	<ul style="list-style-type: none">Robot's Armor Module: 10Base and Outpost Armor Modules, Base Virtual Shield: 5
Collision	2
Darts	1/5 of the Maximum HP of Base or Outpost

3.2.5 Referee System Going Offline

According to the latest version of the RoboMaster 2020 Robot Building Specification Manual, robots must be mounted with their corresponding Referee System modules, and each Referee System module must have a stable connection to its server throughout the competition. The Referee System server detects the connectivity of each module at a frequency of 2Hz. If important Referee System modules such as a Speed Monitor Module, Positioning System Module or Armor Module goes offline due to design or structural problems, then the HP of the corresponding ground robots and Sentry will be deducted.

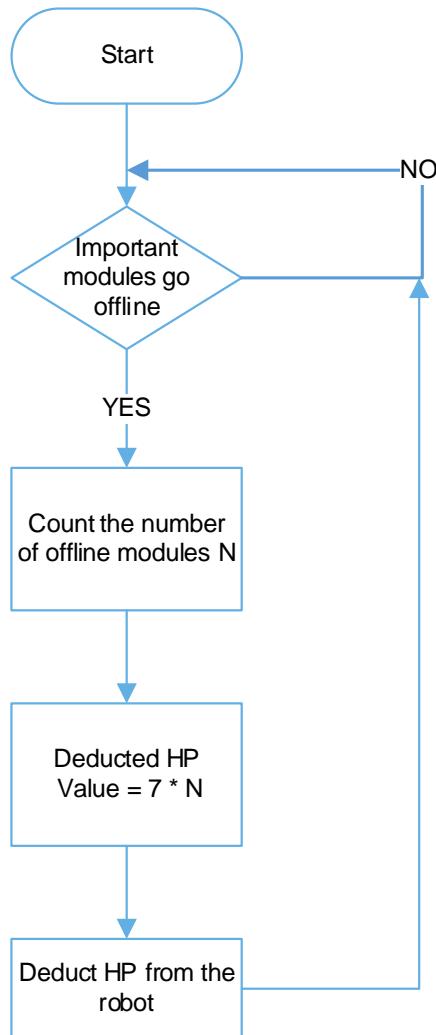


Figure 3-5 HP Deduction Mechanism for Important Referee System Modules Going Offline

3.3 Battlefield-related Mechanism

3.3.1 Base and Outpost HP

Base HP is 5000. Outpost HP is 2000.

3.3.2 Supply Strategies for Official Projectile Supplier

Robots can enter into the Official Projectile Supplier to reload 17mm projectiles during a match.

Both sides will have 200 rounds of launchable 17mm projectiles at the start of a match. For every 30 seconds after that, 100 rounds of 17mm projectiles will be added until five and a half minutes after the start of the match (countdown at 1:29). Six minutes after the start of the match (countdown at 0:59), both sides will receive 200 additional rounds of 17mm projectiles.

3.3.3 About Projectile Containers



When a robot strikes the Power Rune, the 17mm projectile may fall into the Projectile Container in the Resource Island.

The Resource Island has nine fixed grooves for Projectile Containers, which are placed on the grooves. Each Projectile Container carries 20 rounds of 24mm projectiles. Each Small Resource Island has three fixed grooves for Projectile Containers, which are placed on the grooves. Each Projectile Container carries 5 rounds of 42mm projectiles. Engineer Robots can obtain projectiles from Projectile Containers that are completed raised.

The Projectile Containers in the Resource Island are raised twice, the first time at the start of the match, and the second time three minutes into the match (i.e. countdown at 3:59). At the first time, the five Projectile Containers aside from those in the four corners of the Resource Island are raised. The four Projectile Containers in the four corners of the Resource Island are raised at the second time. They are illustrated below:

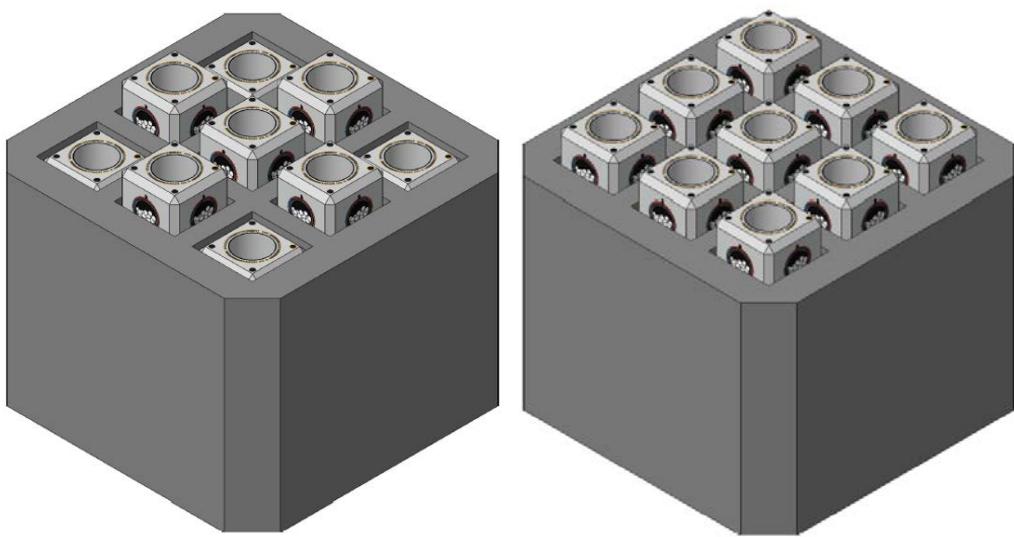


Figure 3-6 Raising and Lowering of Projectile Containers in a Resource Island

The Projectile Containers in the Small Resource Island remain in a raised status.

3.3.4 Power Rune Mechanism



After successfully activating the Power Rune, the HP damage value of darts (see [Table 3-6](#)) remains unchanged.

3.3.4.1 Mechanism Overview

The Power Rune is located in the center of the Battlefield. It can be activated by hitting it with a projectile. The whole team will receive a certain buff amount after successful activation.

The Red Team can only activate the Red Team's Power Rune while the Blue Team can only activate the Blue Team's Power Rune. Both sides can strike the Power Rune at the same time. If one side's Power Rune has entered the active state, the other side's Power Rune becomes unavailable.

The Power Rune consists of two stages: the Small Power Rune and Large Power Rune

- Small Power Rune: One minute into the match until the fourth minute (i.e., countdown at 5:59-4:00), the Power Rune starts rotating and becomes available. After the robot from one side successfully activates the Small Power Rune, all robots of the side gain a 1.5-time attack buff.
- Large Power Rune: Four minutes into the match (i.e. countdown at 2:59), the Power Rune starts rotating and becomes available. After the robot from one side activates the Large Power Rune, all robots of the side gain a double attack buff and 50% defense buff.

The duration of the Power Rune's buff effect is 45 seconds. After the buff effect of the Power Rune has lapsed, the Power Rune will enter into an unavailable state for 30 seconds. The unavailable state of a Small Power Rune after its buff effect has lapsed will not affect the Large Power Rune entering the available state.

3.3.4.2 Rotation Strategy

The Power Runes of both teams rotate on the same axis, i.e. the red team's Power Rune rotates in the clockwise direction while the blue team's Power Rune rotates in the counterclockwise direction (as per the rotation direction when facing the respective team's Power Rune). Before the start of a match, the Power Rune rotates in a random direction. During the match, the Power Rune rotates in a consistent direction.

The rotating speed of a Small Power Rune is set at 10 rpm.

The rotating speed of a Large Power Rune is based on the cyclical change of a trigonometric function. The target function for speed is: $spd = 0.785 * \sin(1.884 * t) + 1.305$, the unit for spd is rad/s, and the unit for t is s. The speed tracking for the Power Runes will be updated.

3.3.4.3 States

Power Runes can display five states: Unavailable, Available, Activating, Activated and Activation Failed.

1. Unavailable

Within the first minute of the match (i.e. countdown at 7:00-6:00), the fourth minute of the match (i.e. countdown at 3:59-3:00) and the 30 seconds after each lapse of the Power Rune buff effect, the Power Rune is unavailable as shown below:

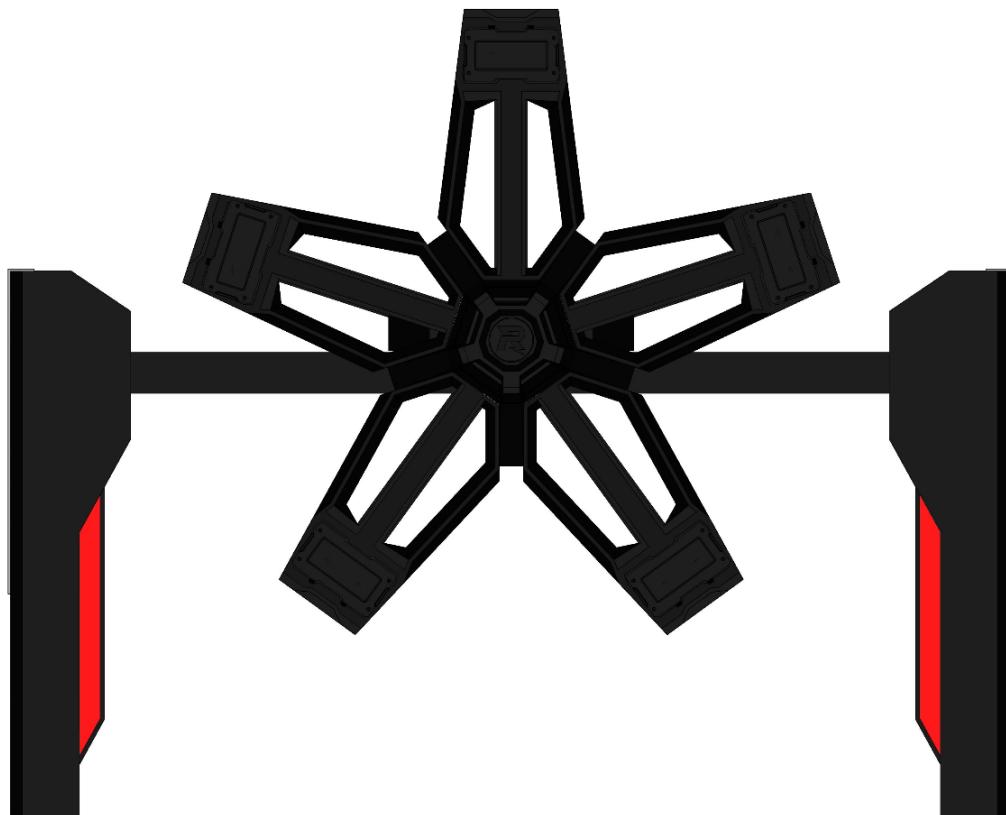


Figure 3-7 Power Rune When Unavailable

2. Available

After the first minute until the third minute of the match (i.e. countdown at 5:59-4:00) and four minutes into the match (i.e. countdown at 2:59), the Power Rune enters the available state as shown below:

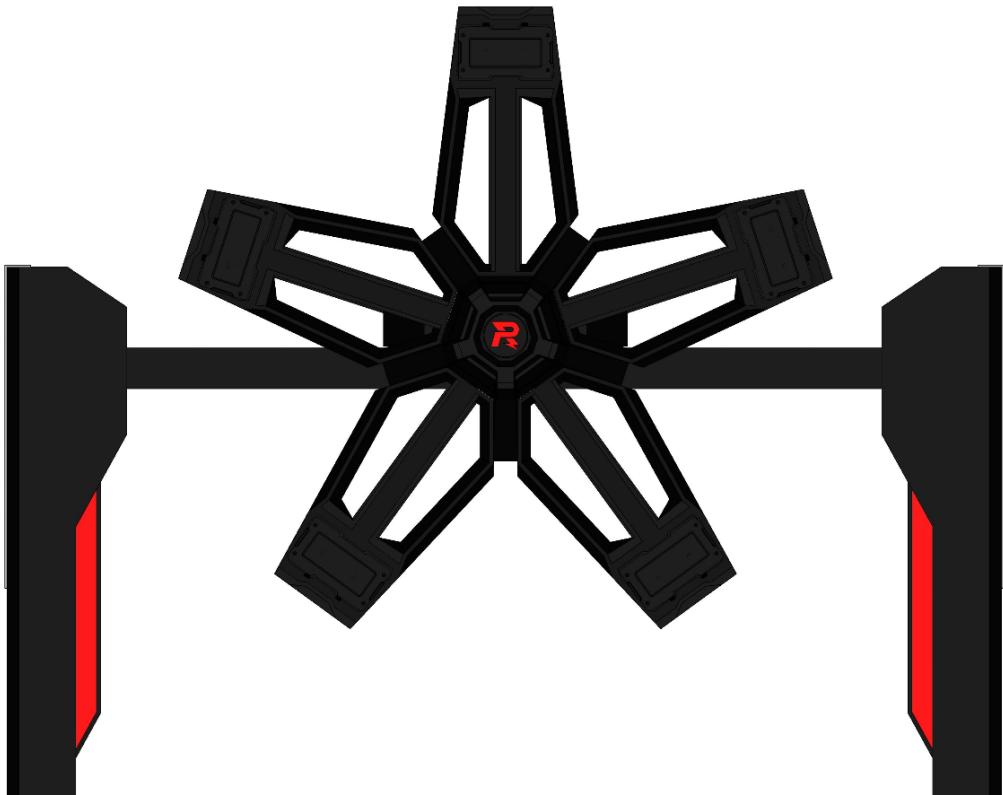


Figure 3-8 Power Rune When Available

3. Activating

When the Power Rune is activating, if a projectile hits the Armor Module with flowing arrow lights on the central axis of the mounting bracket within 2.5 seconds, the bracket will be fully illuminated. At the same time, the Power Rune will randomly illuminate one of the remaining four Armor Modules, and so on and so forth, as shown below:

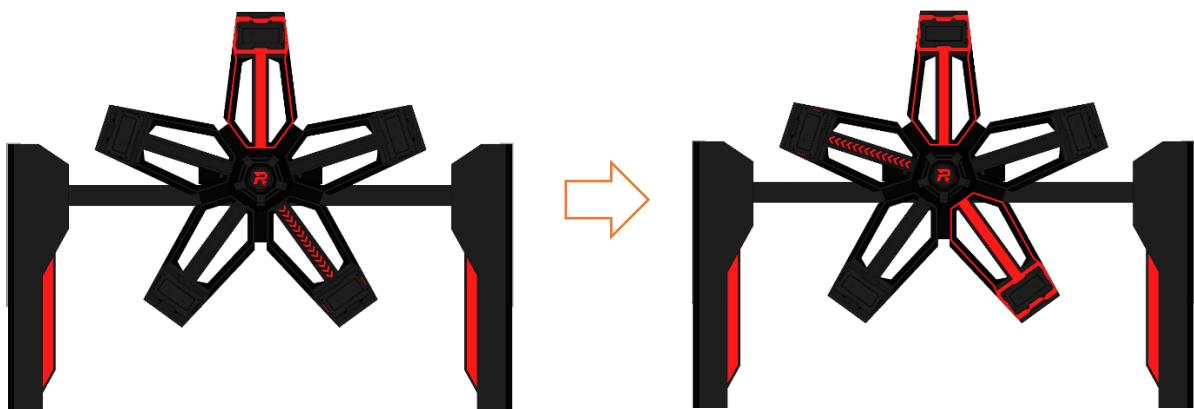


Figure 3-9 Power Rune When Activating

4. Activated

If all five mounting brackets are illuminated, the Power Rune is then activated as shown below:

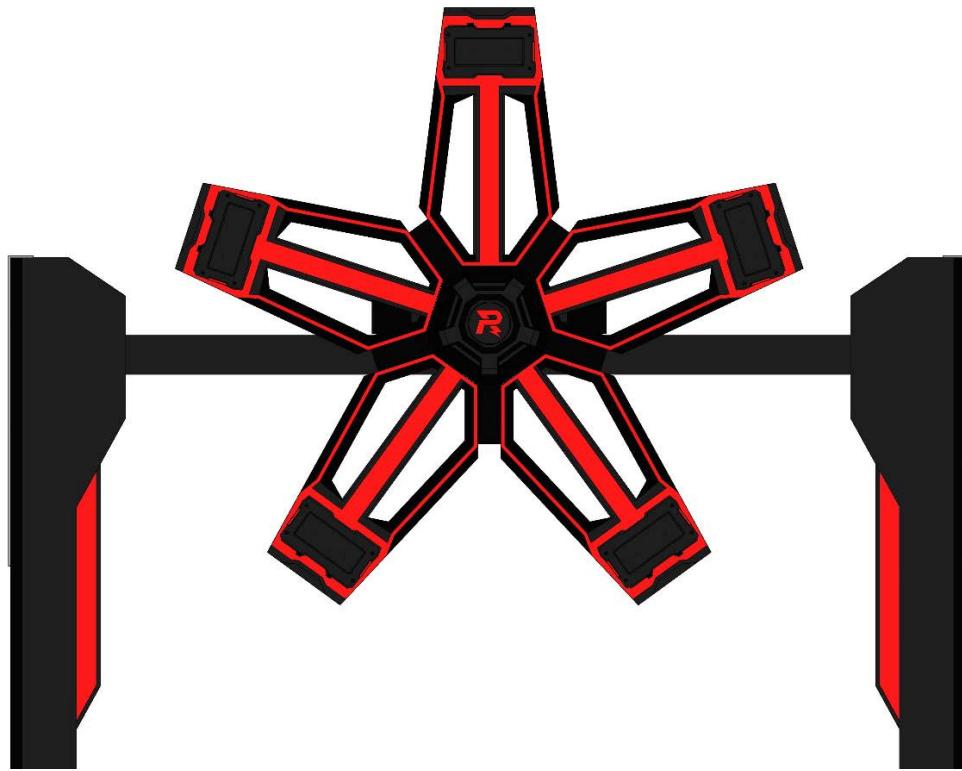


Figure 3-10 Power Rune When Activated

5. Activation Failed

If any of the following conditions occur during a shooting, the activation fails and the Power Rune becomes available for activation again. Situations causing activation to fail:

- Failure to hit a randomly lit Armor Module within 2.5 seconds
- A non-randomly lit Armor Module is hit

3.4 Relationships between Sentry, Outpost and Base

If the Outpost of one side has been destroyed, 100% of the defense buff of its Sentry and the Invincible status of its Base will be disabled, and the Virtual Shield will be activated.

Where an Outpost has been destroyed, and if the Sentry have not entered the Battlefield, been destroyed or ejected, the Armor of their Base will be expanded and the Virtual Shield will be disabled.

3.5 Virtual Shield Mechanism



The HP of Virtual Shield cannot be restored, and Virtual Shield's HP deducted from being attacked will be included in the HP Deduction of the other team.

After the Invincible status of Base has been removed and Sentry of this side still survives, the Virtual Shield of the

Base will be enabled and have 500 HP. When a robot attacks the enemy's Base, the HP of its Virtual Shield will first be deducted. If the Virtual Shield's HP has reduced to zero, the Base's HP will be deducted.

3.6 Battlefield Buff Mechanism



Occupied: When a robot has reached a Buff Point area and its RFID Interaction Module has detected the RFID Interaction Module Card in the area.

All Buff Point areas in the Battlefield are shown below:

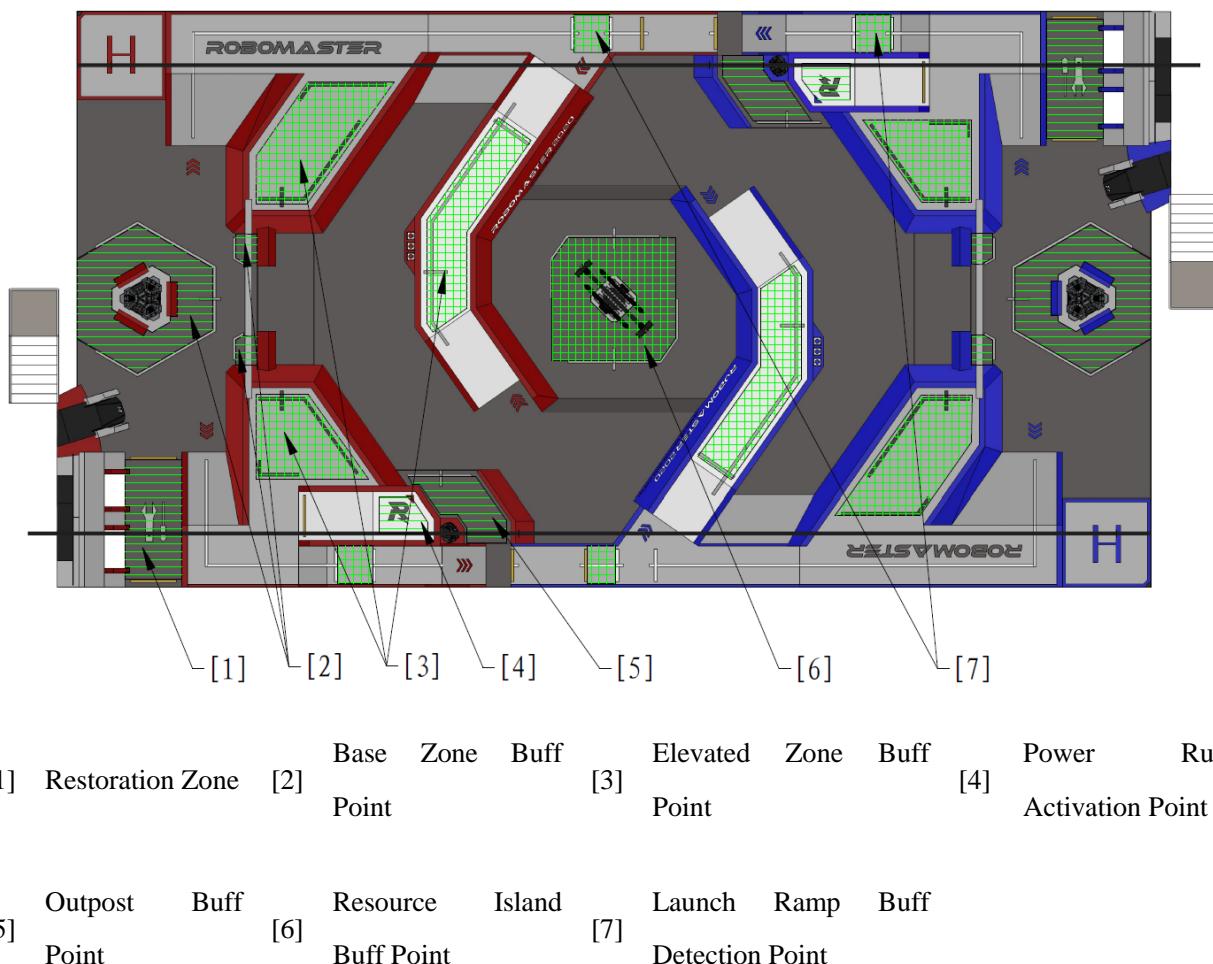


Figure 3-11 Battlefield Buff Point Area

All Buff Point areas are laid with multiple RFID Interaction Module Cards. A Buff Point area can be occupied at the same time by multiple robots. There may be a 2-second delay in the taking effect and expiration of occupation. If the occupying robot has been defeated, the buff gained will expire.

Except buff of the Restoration Zone, Engineer gains no other Battlefield buffs.

3.6.1 Base Zone Buff Point

Base Buff Points are located in the hexagonal area around the Base and the area behind the Bunker under the Sentry Rail.

- Robots that occupy the hexagonal area around their own Base will gain a 50% defense buff and 3-time barrel heat cooling buff.
- Robots that occupy the area behind the Bunker under the Sentry Rail will gain a 5-time barrel heat cooling buff.

After a Dart has hit the Base, the buff gained at the Base will disappear temporarily for 30 seconds.

3.6.2 Elevated Ground Buff Point



The occupied status of the Elevated Ground Buff Points of different zones are completely independent of and unrelated to one another.

Elevated Ground Buff Points are present on diamond, trapezoid and ring-shaped elevated grounds. A robot that occupies an Elevated Ground Buff Point gains a 5-time barrel heat cooling buff. If a robot of one side occupies an Elevated Ground Buff Point of one zone, no robots of the other side are allowed to occupy it at the same time.

3.6.3 Launch Ramp Buff

There are two Launch Ramp Buff Detection Points on the respective roads for each team. A robot must detect the RFID Interaction Module Card of the two Launch Ramp Buff Detection Points of its team within 10 seconds, in order to trigger the buff from the Launch Ramp. A robot that triggers a buff from the Launch Ramp gains:

- 50% defense buff for 20 seconds
- 250J buffer energy buff (please refer to [3.2.3 Chassis Power Consumption Exceeds the Limit](#) for details on buffs for buffer energy).
- 3-time barrel heat cooling buff lasting 20 seconds

3.6.4 Outpost Buff Point

Robots that occupy an Outpost Buff Point area will gain a 5-time barrel heat cooling buff.

After a Dart has hit the Outpost, the buff gained at the Outpost will disappear temporarily for 30 seconds.

3.6.5 Resource Island Buff Point

Resource Island Buff Points are inactive during the first minute of the competition (countdown at 7:00-6:00), and

no robots can occupy them during this time.

At one minute into the competition (countdown at 5:59), the Resource Island Buff Points becomes active. Any robot that occupies a Resource Island Buff Point will earn 10 energy points for its team each second. The energy received by a team will be stored once every time 50 energy points are reached. Both teams can occupy the Resource Island Buff Points at the same time.

The energy received by any ground robot that is attacked while occupying a Resource Island Buff Point will be deducted: For every round of 17mm projectile detected, 2 energy points will be deducted, and for every round of 42mm projectile detected, 20 energy points will be deducted, until the unstored energy is reduced to zero.

For example, a robot has received 110 energy points after occupying a Resource Island Buff Point. It then gets hit by a round of 42mm projectile launched by the other team's Hero. Since 100 energy points have been stored, so only 10 energy points are deducted from the robot.

If a robot has received 200 energy points from occupying a Resource Island Buff Point, the buff point will be immediately deactivated, and the Aerial of the team will receive 200 energy points. The other team will only retain the energy that has been stored. The deactivated status of the Resource Island Buff Point will last for 120 seconds. After 120 seconds, the Resource Island Buff Point will be reactivated.

If the team originally occupying a Resource Island Buff Point has ceased occupying it, the energy will stop accumulating, but any energy already received will be maintained. Once the team's robot reoccupies the Resource Island Buff Point, the energy will continue to accumulate.

For example, the red team's robot has received 170 energy points after occupying a Resource Island Buff Point, and the blue team has received 200 energy points, then the Aerial of the blue team receives 200 energy points. At this time the Resource Island Buff Point is deactivated, so the 20 energy points not stored by the red team will be deducted immediately, while its stored 150 energy points will be maintained, and can continue to accumulate the next time the team occupies a Resource Island Buff Point.

3.6.6 Power Rune Activation Point

When a team's Power Rune is in available status, and any of its robots occupies its own Power Rune Activation Zone for 3 seconds, the Power Rune will enter activating status (see [Figure 3-9](#)) and the robot occupying the zone will receive a 5-time buff for barrel heat cooling rate.

3.6.7 Restoration Zone

A robot that occupies its team's Restoration Zone can receive buffs for reviving defeated robots or recovering the HP of surviving robots. For their actual implementation and values please refer to [3.9 HP Recovery and Revival Mechanism](#).

3.7 First Blood Mechanism

When the first robot in a match is defeated, if the destroying robot is Hero or Standard, it will receive an extra 5 Value of Experience Points. Otherwise the 5 Value of Experience Points will be evenly distributed among the surviving Hero and Standard of the side gaining the First Blood. The average is rounded up and shall be accurate to one decimal place.

3.8 Level Up Mechanism

3.8.1 Experience System



Assist: Where a robot (except the destroying robot) that inflicts damage on the destroyed robot or Outpost within 10 seconds before its destroy.

At the beginning of the match, Standard and Hero are both at Level 1, and their performance level is zero. They upgrade themselves by gaining Value of Experience Points. The Experience Value of Outpost is 5.

The Level Up mechanism during a match works as follows:

- If a robot or Outpost from one side is destroyed and the destroying robot is detected as Hero or Standard, the destroying robot will gain the Value of Experience Points in the corresponding Experience Value of the defeated robot, and any assisting Hero or Standard will gain 25% of the Value of Experience Points in the corresponding Experience Value of the destroyed robot. The average is rounded up and shall be accurate to one decimal place.

For example, when a Level 1 Standard has been destroyed, and if the destroying robot is Hero or Standard, it will gain 2.5 Value of Experience Points directly. Each assisting Hero or Standard will gain $2.5 * 25\% = 0.6$ Value of Experience Points.

- If a robot or Outpost from one side has been destroyed and no destroying robot has been detected or the destroying robot is Engineer, Sentry or Aerial, the Value of Experience Points in the corresponding Experience Value of the defeated robot will be evenly distributed among the surviving Hero and Standard of the enemy side. The average is rounded up and shall be accurate to one decimal place.

In addition, a Standard gains 0.2 Value of Experience Points every 12 seconds, and Hero gains 0.4 Value of Experience Points every 12 seconds. If a Standard or Hero have been destroyed, their original Value of Experience Points will remain the same, but they will no longer gain any automatic Value of Experience Points during the time they are destroyed. Any excess Value of Experience Points after leveling up will be counted towards the next level.

3.8.2 Performance System

After leveling up, the Barrel Heat limit, the Barrel Cooling Value per Second and the respective Experience Value of Standard and Hero will increase accordingly.

Performance Points can be used to boost the performance of robots. Before the start of the competition, the performance points of Standards and Heroes are 0. After the start of the competition, the performance points of Standards and Heroes will increase to 3. When a Standard or Hero is upgraded to Level 2, 1 point will be added to its original performance point. When a Standard or Hero is upgraded to Level 3, 2 performance points will be added.

The Operator may choose from Maximum HP, Chassis Power Consumption and Initial Firing Speed limit, and grant the robot any of the disposable Performance Point(s). Once Performance Points have been used, they cannot be revoked.

For example, a Standard gains 3 Performance Points after the start of a match. The Operator chooses to use 1 Performance Point to increase its Maximum HP to Level 1 at 150 points. The Standard receives 2 Performance Points after leveling up, and the Operator chooses to use 3 Performance Points to increase its Initial Firing Speed limit to Level 3 at 30 m/s.

Table 3-7 Standard Level

Level	Barrel Heat Limit	Barrel Cooling Value per Second	Cumulative Disposable Performance Points	Value of Experience Points Required for Leveling Up	Value of Experience Points
1	180	30	3	3	2.5
2	240	40	4	6	5
3	300	50	6	/	7.5

Table 3-8 Standard Performance Level

Performance Level	Maximum HP	Maximum Chassis Power Consumption (W)	Initial Firing Speed Limit (m/s)
0	100	50	12
1	150	60	15
2	200	70	18
3	300	100	30



During a match, when Standard's HP is less than 20% of Maximum HP, it gains a double barrel heat cooling buff.

Table 3-9 Hero Level

Level	Barrel Heat Limit	Barrel Cooling Value per Second	Cumulative Disposable Performance Points	Value of Experience Points Required for Leveling Up	Value of Experience Points
1	200	20	3	8	7.5
2	300	40	4	12	10
3	400	60	6	/	15

Table 3-10 Hero Performance Level

Performance Level	Maximum HP	Maximum Chassis Power Consumption (W)	Initial Firing Speed Limit (m/s)
0	150	60	8
1	250	80	10
2	350	100	12
3	500	120	16

3.9 HP Recovery and Revival Mechanism



If Engineer is destroyed, its RFID Interaction Module Card will be deactivated.

Only the ground robot is qualified for HP recovery and revival, except for ejected robots.

3.9.1 HP Recovery Mechanism

- Engineer: If Engineer is not damaged for 30 seconds or after being revived from a destroy during a round of match, it will receive an HP recovery buff at 2% per second.
- Ground Robots: If an RFID Interaction Module Card of one's own team is detected at the Restoration Zone, the robot will receive an HP recovery buff of 5% per second.
- If Engineer is not mounted with a mobile 17mm Launching Mechanism, and Standard or Hero detects an RFID Interaction Module Card carried by the Engineer of its team, the Standard or Hero will receive an HP recovery buff of 10% per second. If Engineer or the robot recovering its HP is attacked during this time, the HP recovery

process will be interrupted. If Engineer or the robot recovering its HP is not attacked within 5 seconds, the HP recovery process will resume.

3.9.2 Revival Mechanism

Destroyed ground robots must complete the revival process to achieve revival. Different robots execute their revival process in different ways:

- If a ground robot detects an RFID Interaction Module Card at the Restoration Zone, the revival progress increases by 2 points per second.
- If a Standard or Hero detects an RFID Interaction Module Card carried by its own team's Engineer, the revival progress increases by 1 point per second.
- During the automatic revival of Engineer (without detecting any RFID Interaction Module Card), the revival progress increases automatically by 1 point per second.

The length of revival processes for different robots on their first destroy are shown as follows:

Table 3-11 The length of revival processes for different robots on their first destroy

Robot Type	Revival Process Length
Standard	10
Hero	20
Engineer	20

The revival process length for the same robot increases by 10 after each destroy.

A revived robot will maintain its level, performance points and experience points from before its defeat, and its HP will be restored to 20% of the Maximum HP. A revived robot will gain a 100% defense buff lasting for 10 seconds.

3.10 Mechanism Related to Sentry

3.10.1 HP Gain Mechanism

Sentry will receive HP Gain, which is calculated in real-time, from attacking ground robots of the enemy side. HP Gain for Sentry = HP Deduction by Sentry * 0.2.

3.10.2 Projectile Launching

The barrel heat of Sentry's two 17mm Launching Mechanisms shall be calculated separately. When the total number of projectiles launched by two Launching Mechanisms has reached 500, the Launching Mechanism will be powered

off.

3.11 Mechanism Related to Aerial

3.11.1 Energy Mechanism

Aerial is required to accumulate energy to exchange attack opportunities. If any important module of Referee System of Aerial goes offline, energy accumulation process suspends.

3.11.1.1 Energy Accumulation

Aerial may accumulate energy through the following methods:

- When Aerial lands stably on the Landing Pad, it gains one point of natural increase energy per second. If Aerial leaves the Landing Pad, natural increase energy will be paused but its accumulated energy will not be cleared to zero. Aerial continues to accumulate natural increase energy when it has returned and landed stably on the Landing Pad.
- When robot of one's own side occupies the Resource Island Buff Point and has triggered buff effect, Aerial will gain occupy buff energy correspondingly. For details please refer to [3.6.5 Resource Island Buff Point](#).
- If robot of one's own side is destroyed by the enemy, Aerial of the destroyed side will gain destroy buff energy. Aerial's Destroy Buff Energy = Value of Experience Points of the destroyed robot * 5. Destroy buff energy are rounded up and shall be accurate to one decimal place.

3.11.1.2 Projectile Launching

At the start of the match, Aerial's energy $E = 0$.

When $E < 300$, the Launching Mechanism is powered off and Aerial cannot launch projectiles. When $E \geq 300$ and Aerial leaves the Landing Pad, the Aerial Gimbal Operator can choose whether to power up the Launching Mechanism. When the Launching Mechanism of Aerial is powered up, 300 energy will be consumed and Aerial gains 30 seconds of attack time. During the 30 seconds, Aerial can launch projectiles at any firing speed but not exceeding the Initial Firing Speed limit of 30 m/s.

For example: After the start of a match, the Aerial of the red team lands on the Landing Pad and takes off after 85 seconds. At this time $E = 85$. During the match, a Level-2 Standard of the red team is defeated by the other team, at which point the energy of the red team's Aerial becomes: $E = 85 + 5 * 5 = 110$. Subsequently, the red team occupies the Resource Island and triggers the buff effect. The energy of the red team's Aerial becomes: $E = 110 + 200 = 310$. The Aerial Gimbal Operator decides to power up the Launching Mechanism of the Aerial. The energy of the red team's Aerial is now: $E = 10$.

After its Launching Mechanism has been powered off, Aerial will start accumulating energy again after it has returned to and landed stably on the Landing Pad. If Aerial returns to the Landing Pad before its 30 seconds of attack time has elapsed, the remaining attack time will continue the countdown until it has run out before the robot can begin accumulating energy again.

The logic graph for Aerial's energy mechanism is as follows:

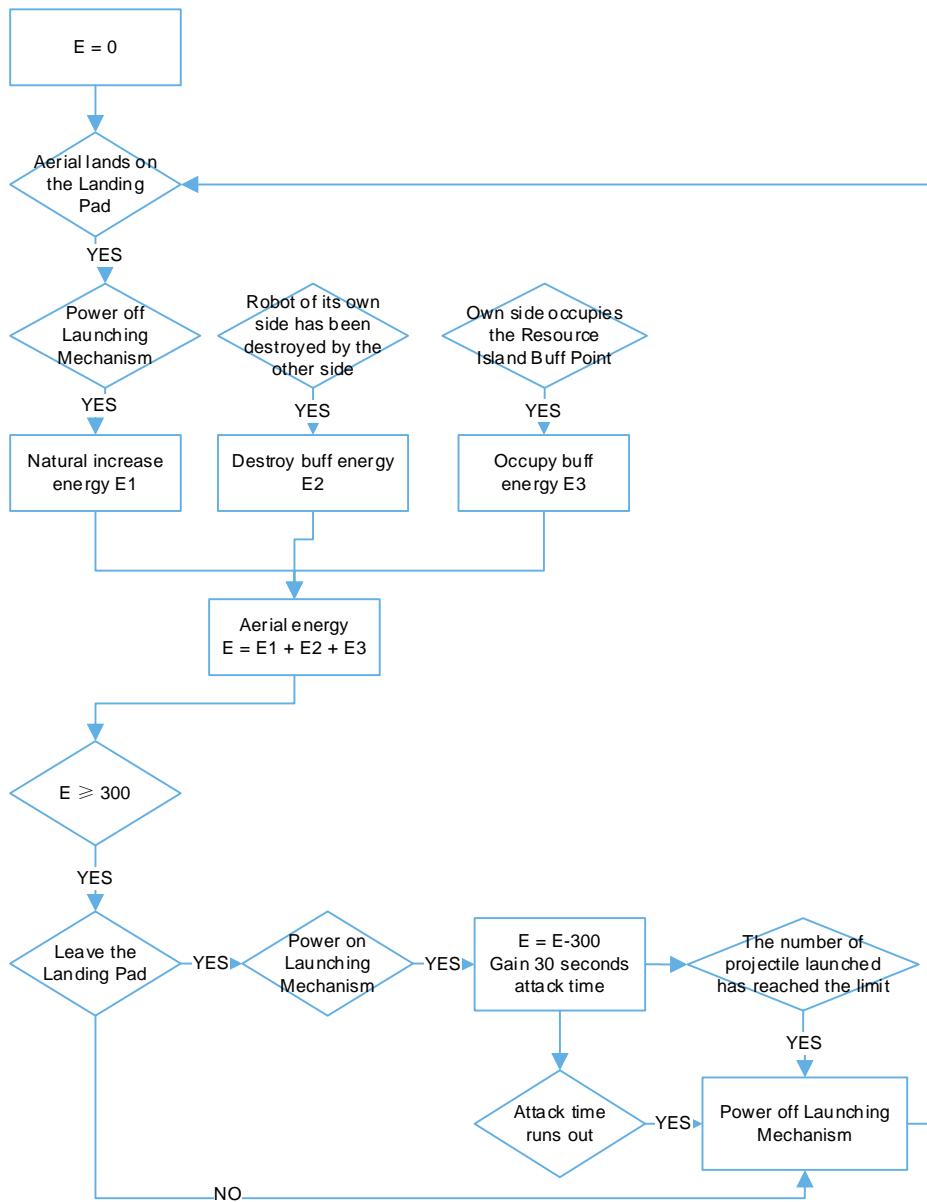


Figure 3-12 Energy Mechanism

3.11.2 Attack Deductions

3.11.2.1 Initial Firing Speed Exceeds the Limit

If the Referee System detects that the projectile of Aerial exceeds the Initial Firing Speed limit, the attack time of

Aerial will be reduced. If the current attack time is about to expire, the time deduction will be applied to the next attack time. Attack time reductions will be accumulated in the case of multiple times of excess.

Assume Aerial's current Initial Firing Speed is V_1 and the Initial Firing Speed limit is 30 m/s, when the Referee System's Speed Monitor Module detects one 17mm projectile that its Initial Firing Speed V_1 exceeds 30 m/s, the Aerial's attack time will be reduced by: $t = 0.5 (V_1 - 30)^2$ s, keeping the integer.

3.11.2.2 Modules Going Offline

If an important module of Referee System of Aerial goes offline while it is accumulating energy, the energy increase will be paused. If an important module goes offline during the attack time, the number of disposable projectiles of Aerial will be reduced. The correlation between the number of important module gone offline (M) and the number of projectiles reduced per second (N) is: $N = 25 * M$.

3.12 Dart Launching Mechanism

During each match, the gate of a Dart Launching Station can be opened twice. The Aerial Gimbal Operator can decide whether and when to use them.

If the Aerial Gimbal Operator opens the gate of the Dart Launching Station, the Station's light indicator will light up when the gate is fully opened and a prompt will appear on the client interface of the Referee System. The Aerial Gimbal Operator can then launch darts by controlling the Dart Launcher. The gate of a Dart Launching Station stays fully open for 15 seconds. When the gate of the Dart Launching Station is closed, the light indicator will go off and a prompt will appear on the client interface of the Referee System. The Aerial Gimbal Operator will no longer be able to launch darts.

3.12.1 Detection Window Period

When the Dart Launching Station of one team detects a dart, the Dart Detection Module on the outpost or base of the other team will update the detection window period, for a period of 5 seconds. The launched dart needs to hit the Dart Detection Module within the detection window period, or the attack will be void.

3.12.2 Invalid Attacks

During the same opening time of the gate, if a Dart has exceeded its speed limit, its damage on an Outpost or Base will be invalid, so will any damage by any Dart launched subsequently on the Outpost or Base.

For example: When an Aerial Gimbal Operator opens the gate of the Dart Launching Station for the first time, where it launches a Dart at 25 m/s hitting the Outpost, and then launches a Dart at 15 m/s hitting the Outpost again, the damage by both Darts on the Outpost will be invalid.

3.13 Logic of Mechanism Overlap

When a robot gains more than one buffs of the same type, the maximum buff effect will be recorded. Buffs include attack, defense, HP recovery, and barrel heat cooling.

For example, if Engineer has not suffered any damage for 30 seconds, it will recover its HP at 2% of its Maximum HP per second. If the Engineer is in its team's HP Recovery and Revive Zone, its HP will recover at 5% of its Maximum HP per second.

4. Competition Process

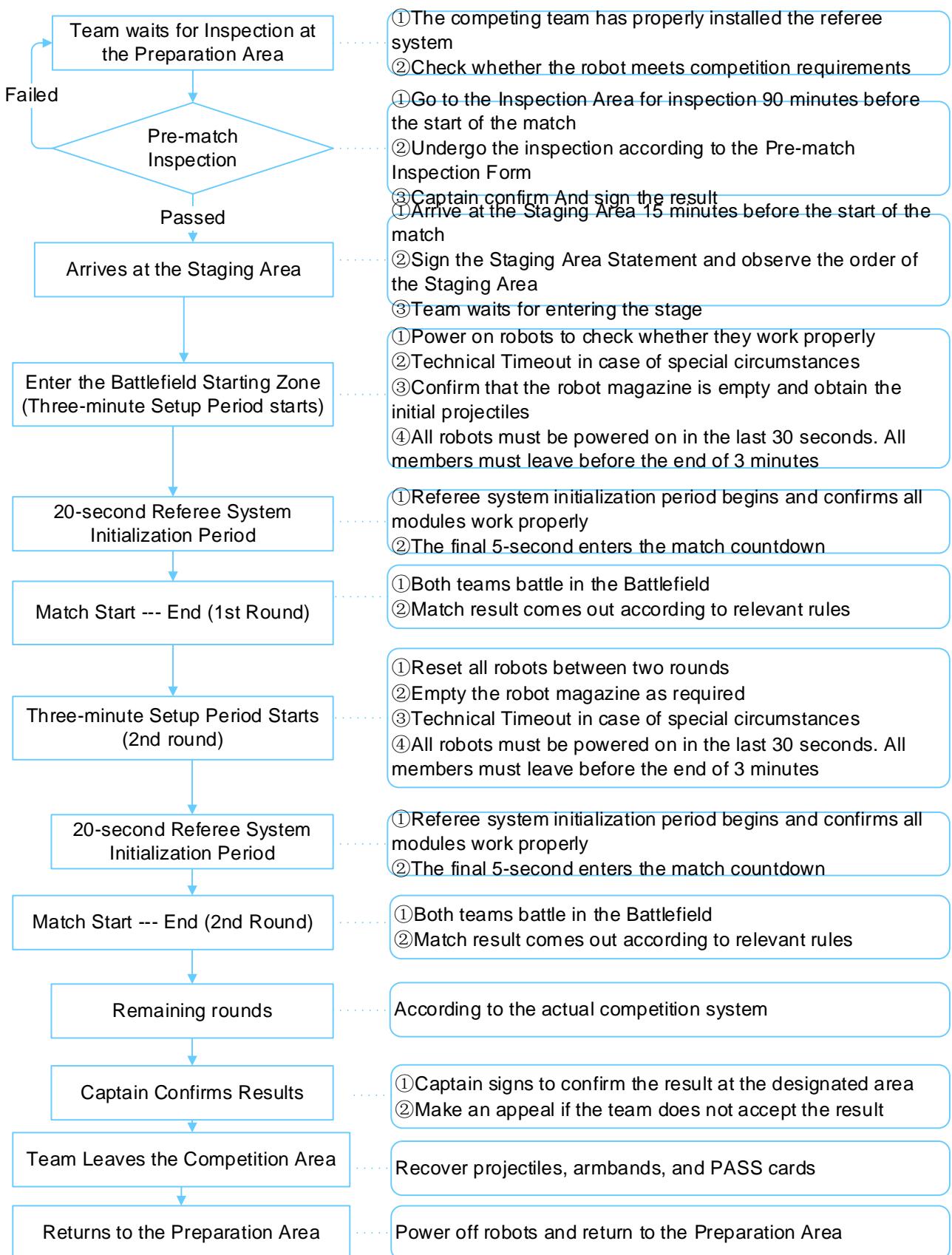


Figure 4-1 Process of A Single Match

4.1 Pre-Match Inspection

To ensure that robots meet the required unified specifications, each team must undergo Pre-Match Inspection in the Inspection Area 90 minutes before the start of each match. For requirements of Pre-Match Inspection, please refer to RoboMaster 2020 Robot Building Specification Manual.

Except for each Standard brought into the Inspection Area by one team member, each of the other robots must be brought into the Inspection Area by no more than two team members, and another team member will be responsible for coordinating during the Pre-Match Inspection. Without the permission of the Head Inspector, other team members are not allowed to enter the Inspection Area. Team members are prohibited from entering the Inspection Area before their robots have entered the Inspection Area.

During Pre-Match Inspection, inspectors will stick a Pass Card on robots that have passed the Inspection. Only robots with a Pass Card that is fully marked can enter the Staging Area and Competition Area. Teams must modify their non-qualifying robots in the Preparation Area until they meet the inspection requirements, before they can enter the match.

When Pre-Match Inspection is complete, the team Captain must sign the inspection form to confirm the inspection results. After the team Captain has signed and confirmed, no objections may be raised to the inspection results.

Each team can have a maximum of two backup robots (one backup Dart Launcher is seen as one backup robot) for each match. A maximum of 4 backup darts are allowed in the BO2 and BO3 Competition Systems, while a maximum of 8 backup darts are allowed for the BO5 Competition System. Team members are required to declare the types of backup robots they are carrying during Pre-Match Inspection. Backup Hero, Standard and Engineer must be attached with armor stickers in the Inspection Area. If backup Standard is needed on the field, Pit Crew Member must obtain the corresponding armor sticker from the referee. The attachment of armor stickers must follow the requirements stated in the RoboMaster 2020 Robot Building Specification Manual.

After passing the Pre-Match Inspection, backup robots cannot be replaced without permission. In the Mock Inspection stage, the RMOC will issue Referee Systems to backup robots that have passed Pre-Match Inspection. Teams can borrow the Referee Systems of at most two backup robots. Teams need to immediately return the Referee Systems of backup robots after finishing its competitions in the division.

4.2 Staging Area

After completing the Pre-Match Inspection, each team must be at the Staging Area at least 15 minutes before the start of the match. Staff at the Staging Area will check the status of the participating robots and the information of Pit Crew and Supervisor. The team needs to sign the Staging Area Statement after confirmation.

If any team needs to repair its robots after entering the Staging Area, it must obtain the permission of the staff at the

Staging Area. Only when staff at the Staging Area has removed the Pass Card on the robot and the Staging Area Statement originally signed become invalidated can a robot leave the Staging Area for repair. When repair is finished, the robot needs to be brought back to the Inspection Area for another Pre-Match Inspection before re-entering the Staging Area, and the team Captain must sign a new Staging Area Statement. If a Staging Area Statement cannot be signed in time as a result of this delay, the robot will not be able to enter the match, and the team will bear its own consequences.

After leaving the Staging Area, the participating teams will enter the waiting area of the Competition Area to place their robots. When the previous match has ended and with the permission of the referee, the next pair of participating teams will wait at the entrance of the Battlefield with their robots for further instructions. After the referee has confirmed that both teams are ready, he or she will open the door and lead the team members into the Competition Area. The countdown for the 3-minute Setup Period will begin when the door opens.

4.3 3-Minute Setup Period



After the end of the second and fourth round of a BO5 match, both teams have ten minutes to work on their robots. When ten minutes run out, the 3-minute Setup Period of the next round begins.

During the 3-minute Setup Period, Pit Crew will place robots on their respective initialization area, check whether Referee Systems are operating normally, load Aerial and Sentry with initial projectiles, mount dart on Dart Launcher, and place Radar on Radar Base.

When the Setup Period is left with one and a half minutes, the Operator should preferably enter the Operator Room to complete the debugging for the keyboard and mouse (you can bring your own), and double-check that the robot controls and official equipment are operating normally. If equipment in the Operator's Room cannot operate normally, the Operator must raise the issue before the Setup Period is left with 15 seconds. Otherwise, referee will not announce technical timeout.

When the Setup Period is left with 30 seconds, all robots in the Battlefield must be powered up, and the staff in the Battlefield should leave the Competition Area in an orderly manner. Pit Crew must place the Sentry's remote controller in the designated area at the Battlefield entrance.

4.3.1 Official Technical Timeout

During the 3-minute Setup Period, if a Referee System, equipment inside the Operator Room or other modules related to a Referee System experience any faults (for details see [Table 6-1](#)), the Head Referee can announce an Official Technical Timeout and pause the setup countdown.

During an Official Technical Timeout, team members can only cooperate with the referee in eliminating the faults of the relevant Referee System modules and cannot repair other breakdowns. After the faults in the relevant Referee

System modules have been eliminated and the Head Referee has resumed countdown, the team must comply with the specifications for the 3-minute Setup Period and leave the Battlefield at the designated time.

4.3.2 Team Technical Timeout

If the mechanical structure of a robot, a software system, the keyboard or mouse in the Operator's Room or other equipment experiences any faults, the team Captain may make a request to the referee in the Battlefield or Operator's Room for "Team Technical Timeout" before the 15-second countdown in the 3-minute Setup Period, and indicate the requested timeout length and reasons for the request. Once a Team Technical Timeout request has been made and conveyed to the Head Referee, the Technical Timeout cannot be revoked or revised.

After a team's Technical Timeout has been allowed by the Head Referee, the Head Referee will inform both teams of the timeout regardless of which team requested the Team Technical Timeout. Pit Crew Members can enter the Battlefield to inspect and repair robots, while members of both teams can only inspect, repair and debug their own robots in their Starting Zone, Landing Pad, Dart Launching Station or Radar Base, respectively.

Even if the team did not enter the Battlefield or ended the Technical Timeout early, the opportunity used will still be the opportunity corresponding to the timeout length indicated by the team during its request. At this time, the Head Referee will continue the countdown of the Technical Timeout, or the Head Referee may end the Technical Timeout early after confirming that both teams are ready.

To ensure that subsequent matches begin on time, only one Team Technical Timeout is allowed per the three-minute Setup Period on a first-come-first-served basis. After the match, the Match Results Confirmation Form will state whether Technical Timeout opportunities have been used during the match. The type of Technical Timeout allowed is determined by the Head Referee based on the request of the team. The team cannot dispute the type of Technical Timeout allowed, and the Technical Timeout process cannot be the basis for any appeal after the match.

A team cannot request for more Team Technical Timeout opportunities once they have been used up. The Team Technical Timeout arrangements for different competition stages are as follows:

Table 4-1 Team Technical Timeout Arrangement

Competition	Arrangement
China Regional Competition, International Regional Competition, Final Tournament	<ul style="list-style-type: none">● Group Stage: Two Technical Timeouts for 2 minutes each● Knockout Stage: One Technical Timeout for 3 minutes <p>Technical Timeout opportunities not used in Group Stage can be carried over to the Knockout Stage</p>
Wild Card Competition	Two Technical Timeouts for 2 minutes each

4.4 Referee System Initialization Period

After the 3-minute Setup Period, the match enters a 20-second Referee System Initialization Period. During the Initialization Period, the competition server will automatically detect the connection status of the client, the Referee System module status of the robot, the status of Battlefield Components and restore the HP of all robots, ensuring their HP are full when the match officially begins.

If in the first round of the match a robot experiences Referee System technical fault, which causes the initialization countdown to stop, a maximum of two Pit Crew Members for the team are allowed to enter the Battlefield to check on the fault.

When the Referee System Initialization Period is left with 5 seconds, a clear countdown sound effect and live animation will be played. At this time, the keyboard connected to the computer in the Operator Room will be locked. When the countdown finishes and the keyboard unlocks, the match starts immediately.

4.5 7-Minute Round

During the 7-Minute Round, robots from both teams will engage in tactical combat on the Battlefield – the core Competition Area.

During the round, Aerial gains one opportunity to reload 500 rounds of projectiles when it uses one energy unit. The Pilot can request for projectile supply reload from the Pilot Referee. After the Referee has approved the reload, the Pilot has 30 seconds to reload the Aerial with projectiles. The 30 seconds for projectile supply reload starts counting when the Pilot opens the projectile supply reloading outlet.

During the round, when the gate of the Dart Launching Station opens, the Aerial Gimbal Operator can launch darts. For more details, please refer to [3.12 Dart Launching Mechanism](#).

4.6 End of Competition

A round ends either when time has elapsed or one team has fulfilled the conditions for winning. When a round ends, the match immediately enters the 3-Minute Setup Period for the next round. The match is over when the winner has been determined or all rounds are ended.

4.7 Match Results Confirmation

During a match, the referee will record on the Match Results Confirmation Form the penalties issued for each round and the HP Deduction of both sides at the end of the rounds, the Remaining HP of each Base, Outpost and Sentry, the winning teams, the use of Technical Timeout opportunities by teams, and other relevant details. After the end of each match, team Captains need to be at the Referee Area to confirm the results.

Within five minutes after a match ends, Captains of both teams must confirm the match results by signing at the Referee Area. If a team Captain is not at the Referee Area within five minutes to sign and confirm the results and has not requested an appeal, it is deemed that the team agrees with the match results.

The referee will not entertain any request for appeals on match results between rounds of an individual match.

Once a team Captain has signed and confirmed the results, no further appeals can be made.

5. Competition Rules



Any penalty issued before the start of a competition will be executed after the competition officially starts.

Penalty of violation stated in this chapter will be determined by the Head Referee according to the actual situation.

To ensure the fairness of the competition and uphold discipline in the competition, participating teams and robots are required to adhere strictly to the Competition Rules. Referee will issue the appropriate penalty against any violation of rules.

Serious violations and appeals in the competition will be publicized.

5.1 Penalty System

Before the start of each round of match, the violation score of each robot will be clear to zero. During the match, robot will be recorded 2 scores when receives a Level 2 Warning and 4 scores for Level 3 Warning.

- When a robot has 4 violation scores, a yellow exclamation point will be displayed on the robot's avatar on the robot server client interface
- When a robot has 7 violation scores, a red exclamation point will be displayed on the robot's avatar on the robot server client interface
- When a robot has 9 violation scores, the robot is ejected for this round of match

The details of penalty system for the RM2020 Robotics Competition are as follows:

Table 5-1 Penalty System

Penalty	Description
Verbal Warning	The referee will give an indication and warning on the violation of a team member or robot.
Level 1 Warning	When a warning is issued, the operation interface of all Operators from the offending team will be blocked for one second
Level 2 Warning	<ul style="list-style-type: none">● The operation interface of all Operators from the offending team will be blocked for five seconds● The Referee System will automatically deduct 5% of the current maximum HP from all surviving robots of the offending team● The offending robot will be recorded with 2 violation scores
Level 3 Warning	<ul style="list-style-type: none">● The operation interface of the offending Operator will be blocked for ten seconds, and that of other Operators in the offending team will be blocked for five seconds

Penalty	Description
	<ul style="list-style-type: none"> ● The current maximum HP of the offending robot will be deducted by 50%, and those of other surviving robots will be deducted by 5% ● The offending robot will be recorded with 4 violation scores
Level 4 Warning (Ejection)	<ul style="list-style-type: none"> ● The offending robot is ejected: In the round of the match, ground robots and Sentry are immediately ejected by the Referee System (deduct all HP). Aerial will have its Launching Mechanism (including the loading mechanism and friction wheel) powered off and its VTM disconnected and must immediately land on the Landing Pad. ● The Operator or other team members are ejected: Members ejected by the referee must immediately leave the Competition Area and no substitute Operators or Pit Crew are allowed in the remaining rounds of the match. The robot operated by the ejected Operator will be ejected for this round and at the start of all rounds of the current match.
Level 5 Warning (Forfeiture)	<ul style="list-style-type: none"> ● If a Forfeiture is issued before the start of the match (not including the 3-Minute Setup Period), the Pit Crew of the offending party must all leave the Competition Area. The offending party's Base, Outpost and Sentry HP are deducted to zero, and all the robots' HP of the offending party is full. The opposing team's Base and Outpost HP and their robots' HP remain full ● If a Forfeiture is issued during a match (including the 3-minute Setup Period), the round ends immediately. The offending team's Base, Outpost and Sentry HP are deducted to zero, and all their robots maintain their HP level at the end of the round. The opposing team's Base and Outpost HP and their robots' HP remain at the level when the round ended ● If a Forfeiture is issued after a match (due to an appeal for arbitration), the offending team's Base, Outpost and Sentry HP are deducted to zero, and all their robots maintain their HP level from the end of the round. The opposing team's Base and Outpost HP and their robots' HP remain at the level when the round ended

Some violations will directly trigger a Level 4 or Level 5 Warning, while the penalties for some violations will increase gradually from a Verbal Warning. A Verbal Warning, Level 1 Warning, Level 2 Warning, Level 3 Warning or Level 4 Warning cannot be used by any team as the basis for an appeal. The Chief Referee will reject an appeal immediately if it is made by any team on this basis.

If a robot's remaining HP is less than that needs to be deducted from penalty, this robot's HP reduces to 1.

During the competition, the Chief Referee has the final right of interpretation on the Competition Rules. Any questions related to the Competition Rules must be referred to the Chief Referee only.

5.2 Rules

This chapter sets out the Competition Rules and defines the relevant measures to be taken by the referee after issuing penalties. Rules with a serial number R# are rules that must be adhered to by participating teams, team members and robots.

5.2.1 Personnel Rules

5.2.1.1 Participating Teams/Personnel

R1 Participating teams must adhere to the following rules when forming their teams:

R1.1 A participating team must be attached to a university or college, and must meet the role, number and identity requirements for personnel stated in the Chapter 3 of the RoboMaster 2020 Robotics Competition Participant Manual.

R1.2 In principle, only one team per university/college is eligible to participate in the competition. Institutions having multiple campuses in different cities, making it difficult for certain students to compete as a team, are allowed to have a team with members from different campuses provided it has been verified by the RMOC. Teams must obtain authorization from their university or college to participate in the competition and submit the proof to the registration system. Refer to the registration system for the authorization letter template. The first precondition for a team's registration for the competition is to obtain a stamped authorization from its university or college (or its campus). The applicant must ensure that its registration information is complete and accurate, and that it will undertake the corresponding responsibilities. The applicant must bear all consequences caused by any missing or inaccurate information. For special circumstances, the applicant may contact the RMOC, which will handle the case based on actual circumstances. The RMOC reserves the right of final interpretation.

R1.3 The team name must be in the format of "XXX-Team" ("-" is only a separator and should not appear in the actual team name), in which "XXX" is the personalized name of the team. The total length of the team name should not exceed 16 character units (each Chinese character is considered 2 character units, while each English letter is 1 character unit). The team name must not include the university/college name or its abbreviation in Chinese/English, or such Chinese characters as “队”, “团队” and “战队” (which mean "team" in English) or other special symbols such as “*/-+”. The team name must reflect the proactive spirit and motivation of the team and comply with relevant national laws and regulations.

R1.4 Two to five universities/colleges that do not have their own separate, individual teams can form an intercollegiate team

- A. Before establishing an Intercollegiate Team, members must consider all their respective circumstances and communicate with each other thoroughly about team planning. Any operating and R&D costs, personnel arrangements or disputes arising therefrom must be handled by the Intercollegiate Team itself, for which the RMOC bears no responsibility.
- B. After an Intercollegiate Team has been established, it can only participate in the RoboMaster 2020 Robotics Competition in the name of the Intercollegiate Team. If an Intercollegiate Team is disbanded after passing the registration review, the team will be deemed to have voluntarily dropped out of the competition.
- C. The registered team name shall be “Intercollegiate Team” instead of “Team”. An Intercollegiate Team Statement must be issued by the universities or colleges represented by the Intercollegiate Team, and must be submitted to the registration system. Refer to the registration system for the template of the Intercollegiate Team Statement.
- D. For an Intercollegiate Team consisting of Hong Kong, Macau, Taiwan and overseas team members, if more than 50% of the total number are regular members from Hong Kong, Macau, Taiwan and overseas, the Intercollegiate Team shall be categorized as a Hong Kong, Macau, Taiwan and Overseas team and must participate in the International Regional Competition. Otherwise, the Intercollegiate Team shall be categorized as a Mainland China team and must participate in the China Regional Competition.

R1.5 Any participating team member can only participate in one team during the RM2020 Robotics Competition period.

Penalties:

- The RMOC will reject the registration of any team that does not meet any of R1.1-R1.4. The registration can be resubmitted after the team has amended it to meet the requirements.
- If any member of a team does not meet the identity requirements stated in R1.1, a Verbal Warning will be given to the team. If the Verbal Warning is ineffective, according to the seriousness of the situation, the highest penalty that can be given to the offending party is disqualification.
- If R1.5 is not met, the highest penalty that can be given to the offender and offending team is disqualification.

R2 Teams must not set up their own wireless networks or communicate with team members using walkie-talkies in the relevant competition zones (including but not limited the Preparation Area, Inspection Area, Staging Area and Competition Area).

Penalties: The highest penalty that can be given to the offending party is disqualification.

R3 Except for emergencies, teams must be at the Inspection Area at least 90 minutes before the start of a match to undergo the Pre-Match Inspection.

Penalties: Forfeiture of the current match.

R4 Team members must wear protective goggles when entering official designated areas such as the Preparation Area, Staging Area and Competition Area.

Penalties: The offender will be prevented from accessing the area.

R5 Except for emergencies, team Captains must sign the Staging Area Statement 10 minutes before the start of each match.

Penalties: Forfeiture of the current match

R6 Team members must not turn on the power and debug or repair their robots in the Staging Area.

Penalties: Verbal Warning If the Verbal Warning is ineffective, the team shall be issued a Forfeiture of the match.

R7 Except Pit Crew that are about to start the next match, other team members are not allowed to enter competition zones such as the Staging Area and Competition Area.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offending team member shall be disqualified.

R8 Except projectiles preset in the Inspection Area, teams must not bring their own projectiles into the Inspection Area, Staging Area or Competition Area, and also must not take official projectiles away from the Competition Area.

Penalties: The staff confiscate the projectiles.

R9 Teams must not damage any official equipment (including but not limited to equipment in the Competition Area, Staging Area, Preparation Area and Inspection Area).

Penalties: Verbal Warning, and the offending party is required to pay compensation as per the price.

R10 Team members are not allowed to leave the Staging Area or Competition Area without permission.

Penalties: Offender is forbidden from entering the Competition Area.

R11 Team members are not allowed bring wireless headsets into the Operator Room.

Penalties: Verbal Warning If the Verbal Warning is ineffective, the team shall be issued a Forfeiture of the match.

R12 During the 3-minute Setup Period, team members may debug Aerial near the Landing Pad but must not start its propellers. They can only launch projectiles into the projectile storage bag.

Penalties: Verbal Warning If the Verbal Warning is ineffective, the offending party shall be issued a Level 2 Warning.

R13 During 3-minute Setup Period, team members must ensure their robots are operating safely and will not cause harm to any person or equipment in the Competition Area.

Penalties: The offending party must bear the relevant responsibility.

R14 After a match is over, members from both teams must power off all their robots, remove them from the Competition Area and empty all projectiles inside the robots at the Projectile Unloading Area.

Penalties: The offending robot is detained at the Projectile Unloading Area.

R15 In the lighting on a dart's triggering device malfunctions, such as when a light bead is damaged and unable to light up normally, team members will need to replace the dart's triggering device.

Penalties: Base and Outpost will not be able to detect the damage inflicted by the dart.

5.2.1.2 Pit Crew



- Pit Crew: Regular member and Supervisor who have registered for this Season and have been entered into the registration system, can walk into the Preparation Area and Competition Area.
- Captain Armband: Any regular member that wears the 'Captain' armband performs the Captain role during the match. Captain needs to control the team's competition schedule, confirms result, raises Team Technical Timeout and appeal.

R16 Each team can have up to 17 Pit Crew Members and one Supervisor in the Competition Area. There should be one Pit Crew Member wearing Captain armband to perform the Captain role.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the team shall be issued a Forfeiture of the match.

R17 Pit Crew Members must meet the identity requirements.

Penalties: Verbal Warning If the Verbal Warning is ineffective, the team shall be issued a Forfeiture of the match.

R18 Pit Crews must wear armbands which must not be covered. The "Captain" sign of the Captain's armband must face the front.

Penalties: Verbal Warning

R19 Except for Radar, team 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.

Penalties: Verbal Warning If the Verbal Warning is ineffective, offender shall be ejected from the Competition Area.

R20 Pit Crew entering the Competition Area must not communicate with the outside world.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the team shall be issued a Forfeiture of the match.

R21 During the final 30 seconds of the 3-minute Setup Period or the final 20 seconds of a Team Technical Timeout, Pit Crew must leave the Battlefield as quickly as possible.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offender shall be issued a Level 4 Warning. If the team does not obey the penalty order, it shall be issued a Forfeiture of the match.

R22 After the end of the 3-minute Setup Period, Pit Crew must return to the designated area outside the Battlefield.

Penalties: The offender is issued a Level 4 Warning. If the offender does not obey the penalty order, the team shall be issued a Forfeiture of the match.

R23 Pit Crew may debug the fully automated Sentry using a remote controller before entering the Referee System Initialization Period.

Penalties: Forfeiture of the round.

R24 During the match, other Pit Crew apart from the Operators must remain in the Pit Area of the Competition Area unless otherwise permitted by the referee.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offender shall be issued a Level 4 Warning. If the offender does not obey the penalty order, the team shall be issued a Forfeiture of the match.

5.2.1.3 Operator

 An Operator can be substituted after each round.

R25 The number requirements for Operators stated in [Table 1-3](#) must be met.

Penalties: Forfeiture of the round.

R26 The use of one's own computers is prohibited in the Operator's Room.

Penalties: Forfeiture of the round.

R27 During the Referee System Initialization Period and the 7-minute Match, Operators must remain in the relevant Operator's Room to operate the relevant computers, and remain in position after a match has started, unless otherwise permitted by the referee.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offender shall be issued a Level 4 Warning. If the offender does not obey the penalty order, the offending party shall be issued a Forfeiture of the match.

R28 During the competition, Operators must wear headsets, equipped with at most one remote controller.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offender and the robots operated by the offender shall be issued a Level 4 Warning. If the offender does not obey the penalty order, the offending party shall be issued a Forfeiture of the round.

R29 The Pilot must wear a long-sleeved top, a safety helmet and pilot goggles.

Penalties: Forbidden from supplying projectiles for Aerial during the match.



- The safety helmet and pilot goggles are placed in the Pilot Room.
- Since the helmet and headset cannot be worn at the same time, Pilot needs to take off the headset before wearing the helmet.

R30 Pilot can connect his phone to the remote controller to check the status of the Aerial, but he is not allowed to use the video transmitter function of the remote controller.

Penalties: Forfeiture of the round.

R31 A single projectile supply time for Pilot during the match cannot exceed 30 seconds.

Penalties: Verbal Warning, and the Pilot is required to return to the Pilot Room. If the Verbal Warning is ineffective, the offender shall be issued a Level 4 Warning.

5.2.2 Robot Rules

5.2.2.1 General

R32 Robots entering a match must pass Pre-Match Inspection.

Penalties: Forfeiture of the round.

R33 At least four robots must enter the stage in the first round of a match.

Penalties: Forfeiture of the current match.

R34 Robots must be attached with their corresponding armor stickers that meet the specifications.

Penalties: Before the start of the competition, offending robot is not allowed to enter the stage. During the competition, the highest penalty that can be given to the offending party, according to the seriousness of the situation, is a Level 4 Warning.

R35 Robot is not allowed to leave the Staging Area without permission.

Penalties: Verbal Warning. If a Verbal Warning is ineffective, the highest penalty that can be given to an offending robot is ejection.

R36 Robot must not carry or present safety issues including but not limited to short circuits, crashing and falling to the ground. If safety issues are present or have arisen, the relevant personnel must execute the relevant

operations in accordance with the referee's instructions.

Penalties: Before the start of the competition, Pit Crew must resolve the safety issue as required by the referee. Otherwise the offending robot will not be allowed to enter the stage, and the relevant Operator will not be allowed to enter the Operator's Room, and must return to the Pit Area. Verbal Warning given during the competition. If the Verbal Warning is ineffective, a Level 4 Warning shall be issued to the offender and the robot operated by him/her or the offending robot.

R37 During the 5-second countdown in the Referee System Initialization Period, robot is not allowed to transform beyond their Maximum Initial Size.

Penalties: After the start of the competition, the offending party is issued a Level 2 Warning.

R38 During the competition, 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.

Penalties: The offending robot is issued a Level 4 Warning.

R39 Except for reloading projectiles and rescuing other robots, a robot is not allowed to cover its Armor Module during a match by transforming to deflect the attacks from other robots. Robot is also not allowed to transform beyond the Maximum Expansion Size during a match.



- Any action that meets the following criteria constitutes a rescue.
 - The robot being rescued has been defeated.
 - The mechanisms of the rescuing robot and the robot being rescued must be connected, i.e. the rescuing robot remains connected to the robot being rescued whichever direction the rescuing robot moves towards.
 - The rescuing robot and the robot being rescued are moving towards their team's Restoration Zone (through the shortest route on the Battlefield).

Any action other than the above is not considered a rescue. The act of pushing by any robot is not considered a rescue.

- A rescuing robot that is moving towards its team's Restoration Zone during a rescue has priority passage and cannot be blocked.

Penalties: An X-level warning will be issued against the offending party according to the length of time (T seconds) of its robot's blockage or transformation beyond the Maximum Expansion Size.

Table 5-2 Penalties for Blockage or Transformation

T Second(s)	Level X Warning
$3 < T \leq 10$	2
$10 < T \leq 30$	3

T Second(s)	Level X Warning
T > 30	4

R40 During the competition, if the gas cylinders are found to have safety hazards (such as damage to the external protection device, hidden dangers arising from aging, etc.), the participating members must follow the instructions of the referee to deal with the safety hazards.

Penalties: Robot with safety hazards will not be allowed to enter the stage.

5.2.2.2 Ground Robots

R41 During the 3-minute Setup Period, ground robots in the Battlefield are not allowed to leave their team's Starting Zone.

Penalties: Based on their subjective intention and the influence caused to the match, the offending party or robot is issued a Level 2 or Level 4 Warning.

R42 During the 3-minute Setup Period for each round, ground robots must empty their projectiles until they are no longer able to launch any projectiles. Among them, Engineer needs to empty 42mm projectiles. If Engineer does not have a mounted 17mm Launching Mechanism, it also needs to empty 17mm projectiles.

Penalties: If the competition has yet to start, Pit Crew must empty the projectiles in compliance with the referee's instructions. Otherwise the offending robot will not be allowed to compete in the round. If it occurs during competition, the offending robot shall be issued a Level 4 Warning.

R43 During the competition, Engineer is not allowed to use supplement lights except for procuring Projectile Containers.

Penalties: Verbal Warning. If the Verbal Warning is ineffective, the offending party shall be issued a Level 2 Warning.

R44 During the competition, no robot of a side is allowed to attack its enemy's Aerial.

Penalties: The offending robot is issued a Level 4 Warning.

R45 During a match, each team can have not more than one robot installed with a mobile 17mm Launching Mechanism.

Penalties: During the 3-minute Setup Period, if any team in the Battlefield has multiple robots installed with mobile 17mm Launching Mechanism, the Pit Crew must remove the excess robots from the Battlefield as required by the rules. At the Referee System Initialization Period, any excess robots will be ejected by the Referee System's server from the robot with the biggest serial number to the smallest.

For example, if a team's Hero and Engineer are found to be installed with mobile 17mm Launching Mechanisms during the Initialization Period, the Referee System's server will eject the Engineer.

5.2.2.3 Aerial

R46 During the 3-minute Setup Period, Aerial is not allowed to start its propellers and leave the Landing Pad.

Penalties: The offending robot is ejected from the match, Pit Crew must remove Aerial from the Battlefield, and its Pilot and Aerial Gimbal Operator must return to the Pit Area.



If the team's Dart Launching System or Radar enters the stage, the Aerial Gimbal Operator can stay in the Operator Room.

R47 The Safety Rope of Aerial must be hooked onto the rigid ring.

Penalties: The offending robot is not allowed to enter the round.

R48 During a match, the distance between the lowest point of Aerial and the ground of the field shall not be less than 1300 mm, and the plane of the propeller shall not exceed the highest point of the Perimeter Wall of the Flight Zone.

Penalties: The Head Referee or Pilot Referee issues a warning to the Pilot, reminding the Pilot to adjust the flight altitude. If a warning is ineffective, the offending robot shall be issued a Level 4 Warning and forbidden from entering any rounds in the same match.

R49 During the competition, Aerial is forbidden from flying outside the Competition Area.

Penalties: The offending robot is issued a Level 4 Warning and forbidden from entering any rounds in the same match.

R50 If Aerial experiences technical faults, or is damaged due to the unreasonable design of the propulsion system or power supply system during the competition, it must be checked by the referee and must be cleared by the Head Referee as hazard-free before it can be allowed to return to the match.

Penalties: The offending robot is not allowed to enter the other rounds in the same match.

5.2.3 Interaction Rules

5.2.3.1 Interaction between Robots

R51 Engineer of one team is not allowed to interfere with the other team's Engineer when it is procuring Projectile Containers within the Resource Island Buff Point.

Penalties: Based on the degree of interference, the offending party is issued a warning from Level 2 to 4.

Table 5-3 Penalties for Interference

Degree of interference	Description
Level 2	Minor collision
Level 3	High-speed collision, or active pushing causing the other team's Engineer to move
Level 4	High-speed repeated collision, or active pushing causing the other team's Engineer to move across a longer distance

R52 Except for slowly pushing away a destroyed robot that is obstructing the path, a robot must not use any of its structures to collide with the enemy's robots.

Penalties: Based on their subjective intention and the degree of collision, the offending party or robot is issued a warning from Level 1 to 4.

Table 5-4 Penalties for Collision

Degree of collision	Description
Level 1	Actively causing front collision
Level 2	Actively causing high-speed front collision, active pushing causing the other team's robot to move, or impeding the normal movement of the other team's robot
Level 3	Actively causing high-speed and repeated front collision, active pushing causing the other team's robot to move across a longer distance, or impeding the normal movement of the other team's robot for a long period of time
Level 4	Actively causing high-speed, repeated and intense front collision, or engaging in active high-speed collision for a long period of time causing the robot to move across a longer distance

R53 If Aerial collides with a ground robot when flying, the referee will consider Aerial a malicious collision.

Penalties: The offending party is issued a Level 3 Warning.

R54 To ensure that Sentry is fully capable of moving along its Rail, any part of a robot that attacks the opposing team's Sentry, either intentionally or unintentionally, will be deemed as violation.

Penalties: Refer to penalties for collision, see [Table 5-4](#).

R55 A robot must not stick itself to any enemy robot through active interference, blocking or collision.

Penalties: An X-level warning will be issued against the offending party according to the length of time of sticking together T second(s) and the impact on the competition.

Table 5-5 Penalties for Sticking Together

T Second(s)	Level X Warning
$T \leq 10$	1
$10 < T \leq 30$	2
$30 < T \leq 60$	3
$60 < T \leq 90$	4
$T > 90$	5

R56 A team's robots must not prevent an enemy robot from engage in rescue operations through acts such as blocking and collision.

Penalties: An X-level warning will be issued against the offending party according to the length of blocking time T second(s).

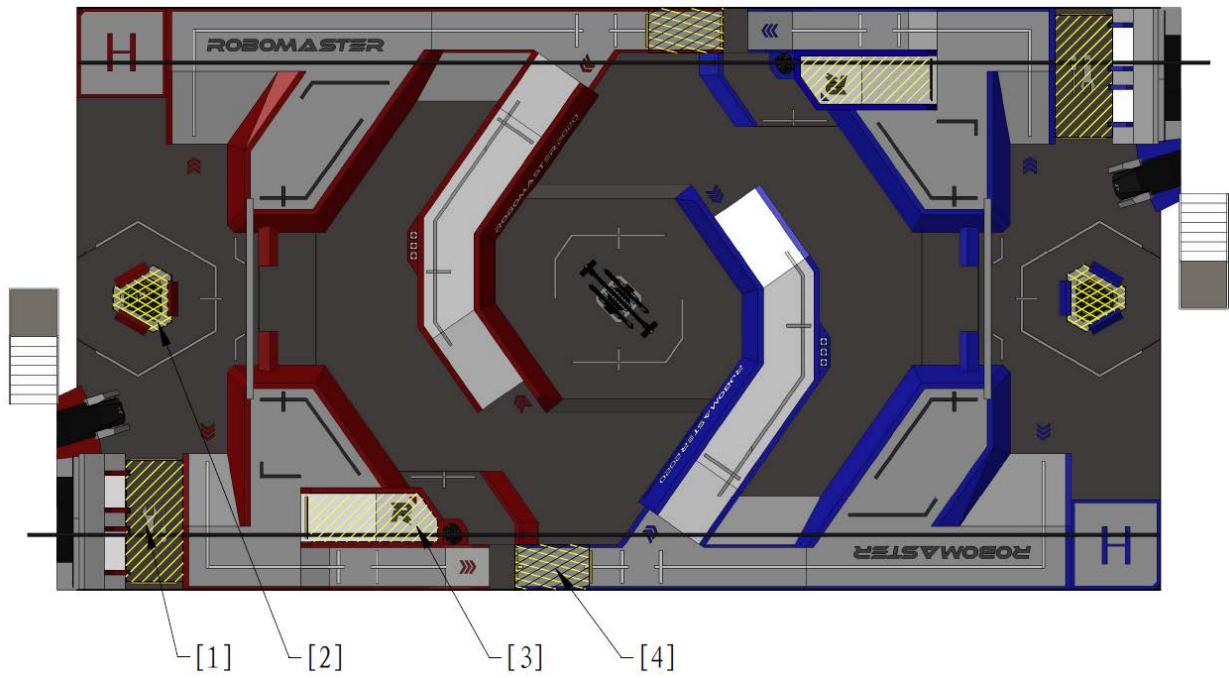
Table 5-6 Penalties for Blocking Rescue

T Second(s)	Level X Warning
$3 < T \leq 10$	2
$10 < T \leq 30$	3
$T > 30$	4

R57 A team's robots must not interfere with an enemy robot during a regular projectile supply reload, HP recovery or revival.

Penalties: The offending party is issued a Level 3 Warning.

5.2.3.2 Interaction between Robots and Battlefield Components



[1]	Supplier Zone	Penalty	[2]	Base Zone	Penalty	[3]	Power Rune Penalty Zone	Rune	Activation Point	[4]	Road Zone	Penalty
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Figure 5-1 Battlefield Penalty Zones

R58 Robots are not allowed to enter the Base or Launch Ramp Penalty Zone.

Penalties: Based on the length of time the robot was in the Penalty Zone, the offending party is issued a warning from Level 2 to 3.

Table 5-7 Penalties for Stay

T Second(s)	Level X Warning
$3 < T \leq 10$	2
$T > 10$	3

⚠ If a team's robot is in the Launch Ramp Penalty Zone or a road trench, and an enemy robot collides severely with and damages the structure of the offending robot during its flight, the offending team shall bear the relevant consequences. If the enemy robot suffers serious structural damage, the referee shall issue the offending robot a Level 4 Warning.

R59 Robots must not place any Projectile Containers in the Launch Ramp Penalty Zone.

Penalties: The offending party is issued a Level 2 Warning.

R60 Robot of one side is not allowed to enter the Supplier Penalty Zone or Power Rune Activation Point Penalty Zone, or any part to gain contact with the opposing side's Official Projectile Supplier, and also not allowed to block an enemy robot from entering into the Supplier Zone or Power Rune Activation Point Zone.

Penalties: Based on the length of time the robot was in the Penalty Zone, the situation of gaining contact with the Official Projectile Supplier and the degree of blocking, the offending party is issued a warning from Level 2 to 5.

Table 5-8 Penalties for Stay, Contact and Blocking

T Second(s)	Level X Warning
$T \leq 3$	2
$3 < T \leq 10$	3
$10 < T \leq 30$	4
$T > 30$	5
Block near the Penalty Zone, so that the enemy robot cannot receive regular projectile supply or strike the Power Rune	5

During any match in RM2020, participating robots can only use projectiles supplied by the RMOC.

Penalties: Verbal Warning If the Verbal Warning is ineffective, according to the seriousness of the situation, the highest penalty that can be given to the offending party is disqualification.

R61 Robots may not obtain projectiles from Sentry or Aerial of its own side.

Penalties: The offending robot is issued a Level 4 Warning.

R62 Robots are not allowed to procure projectiles that have fallen to the ground.

Penalties: The offending robot is issued a Level 4 Warning.

R63 Standard and Hero are not allowed to directly procure projectiles from Projectile Containers on the Resource Island.

Penalties: The offending robot is issued a Level 4 Warning.

R64 Engineer is not allowed to grab more than one Projectile Container once or procure projectiles from more than one Projectile Container. Only when one Projectile Container has completely left the groove of the Resource Island can the next Projectile Container be taken.

Penalties: The offending robot is issued a Level 4 Warning.

R65 Engineer is not allowed to grab Projectile Container that has not completely left the groove of the Resource Island or procure its projectiles.

Penalties: The offending robot is issued a Level 4 Warning.

R66 Engineer must not use adhesive materials to collect or place any projectile or Projectile Container.

Penalties: The offending robot is issued a Level 4 Warning.

R67 Robot of one side is not allowed to actively attack the Dart Launcher of the other side.

Penalties: The offending robot is issued a Level 4 Warning.

R68 During the competition, the movements of robots must not cause any damage to the core components of the Competition Area.

Penalties: If the fault has been confirmed, the round ends and the offending party is issued a Forfeiture for the round.

5.3 Serious Violations

The following actions are considered serious violations of rules. Any serious violation by an individual or a team will lead to a maximum penalty of disqualification from the competition. The team will be prohibited from participating in the current competition season and receiving any awards. The match results of this team will still be documented as reference for the other teams' advancement in the competition.

Table 5-9 Categories of Serious Violations

Rule	Type
1.	Violating rules mentioned in this chapter and refusing to accept penalties, for example a Pit Crew Member interfering with the regular work process of a referee.
2.	Situations have occurred in the Competition Area that violate Pre-Match Inspection requirements
3.	Causing delays deliberately or refusing to immediately leave the Competition Area after a match has ended, thereby disrupting the schedule of the competition
4.	Installing explosives or other prohibited materials on robots
5.	Team members using robots to collide with or attack other people deliberately, putting themselves and other people at risk of injury
6.	Team members deliberately damaging the opponent's robots, Battlefield Components and related equipment.
7.	Serious verbal or physical conflicts between team members and the staff of the RMOC, other participating teams, audience, etc.

Rule	Type
8.	Team members do not cooperate in inspections or cause delays deliberately when the RMOC is handling an appeal
9.	Other serious actions that disrupt the competition's schedule and violate the spirit of fair competition will be penalized accordingly by the Head Referee and Chief Referee based on to the actual acts of violation
10.	In respect of any violation of local laws and regulations occurring inside the Competition Area, Audience Area, dormitories or other relevant competition zones during the competition, the RMOC, apart from issuing the most severe penalty of "disqualification", will fully cooperate with the relevant authorities to pursue appropriate legal actions against the offenders
11.	Tampering with or damaging the Referee System, or interfering with any detecting function of the Referee System through technical means.
12.	Any other behavior that seriously violates the spirit of competition or has been determined by the Chief Referee as a serious violation

5.4 Winning Criteria

The official matches of RM2020 consist of the Group Stage and the Knockout Stage. The competition system for the Group Stage is BO2. Except for the Semifinals and the Championship Match which are BO5, the competition system for all other Knockout Stages is BO3.

The following are the criteria for winning in a single round:

1. When the Base of one team is destroyed, the round ends immediately and the team with the surviving Base wins.
2. When the duration of a round has elapsed and if the Bases of both teams have survived, the team with the higher Remaining HP is the winner.
3. If a round has ended and the remaining Base HP of both teams are the same and the Outposts of both teams have been destroyed, the team with the higher Remaining Sentry HP is the winner.
4. If a round has ended, and the remaining Base HP of both teams are the same, the team with the higher remaining Outpost HP is the winner.
5. If a round has ended and the Bases of both teams have not been destroyed and the remaining Outpost HP of both teams are the same, the team with the higher HP Deduction is the winner.

6. If a round has ended and the Bases of both teams have not been destroyed, the remaining Base, Outpost and Sentry HP of both teams are the same, and the total HP Deduction of both teams is the same, the team with the higher total Robot Remaining HP is the winner.

If neither team fulfills these criteria, the round is considered a draw. A draw in the Knockout Stage leads to an immediate tie-breaker round until a team wins.

Group Stage

Below shows the points for Group Stage:

Table 5-10 Points for Group Stage

Competition System	Competition Result	Points	Notes
BO2	2:0	3:0	Winner of two rounds gains 3 points
	1:1	1:1	One point for each team
	1:0	1:0	(draw for one round): The team winning one round gains 1 point
	0:0	0:0	(draw for two rounds): Each team gains 0 point

The ranking for the Group Stage is determined by the total points for each match. Teams are ranked based on the following order, in descending order of priority:

1. The team with the higher total match points ranks higher.
2. If the total match points of teams are the same, the team with the higher total Net Base HP from all rounds ranks higher.
3. If the total Net Base HP of teams are the same, the team with the higher total Net Outpost HP from all rounds ranks higher.
4. If the total Net Outpost HP of teams are the same, the team with the higher total Net Sentry HP from all rounds ranks higher.
5. If the total Net Sentry HP are the same, the team with the higher total HP Deduction ranks higher.

If two or more teams are still tied for the same place according to these criteria, the RMOC will arrange a playoff match on the basis of two extra rounds.



- HP Deduction: The total damage accrued by a team at the end of each round from successfully hitting the Armor Modules of enemy robots or Base, Base Virtual Shield leading to HP deductions in the enemy robots, Base or Virtual Shield.

-
- HP deducted as a result of exceeding the Initial Firing Speed limit, Barrel Heat limit and Maximum Chassis Power Consumption and of the Referee System going offline are not counted as HP Deduction.
 - HP deducted from violations and penalties (Level 2 to 5 Warnings) determined by the referee will be counted as the enemy's HP Deduction.
 - The amount of HP deducted from a Virtual Shield from attacks will be counted as the enemy's HP Deduction.
 - Net Base HP: The remaining HP of a team's Base subtracted by the remaining HP of the enemy's Base at the end of a round.
 - Net Outpost HP: The remaining HP of a team's Outpost subtracted from the remaining HP of the enemy's Outpost at the end of a round.
 - Net Sentry HP: The remaining HP of a team's Sentry subtracted from the remaining HP of the enemy's Sentry at the end of a round.
 - Total Remaining HP: The total value of the remaining HP of a team's surviving robots at the end of a round.
-

Knockout Stage

A team wins the Knockout Stage if it has won the most number of rounds: BO3 requires the winning of two rounds while BO5 requires the winning of three rounds.

6. Technical Fault or Exception

6.1 Technical Fault

The faults that will trigger an Official Technical Timeout during the 3-minute Setup Period are set out as follows:

Table 6-1 Descriptions of Technical Fault

Rule	Description
1	The official equipment inside the Operator's Room malfunctions.
2	During the 3-minute Setup Period of the first round, the Referee System module on a robot fails, for example where the robot is unable to transmit images back to the Operator's Room normally or connect to the Referee System server.
3	Structural damage or malfunctions of key Battlefield Components, for example: where a Base cannot open its shield normally; a Base Armor Module shifts, drops off or cannot detect hit damage; a Power Rune cannot be hit and triggered normally; the Aerial Safety Rope breaks or is worn out; the Official Projectile Supplier is unable to supply projectiles normally.
4	Other situations determined by the Head Referee as requiring an Official Technical Timeout.

If the malfunction referred to in Rule 2 occurs during a 3-minute Setup Period between rounds or during a 7-minute match, it will be categorized as “regular battle damage”, as it cannot be determined whether the malfunction was caused by the Referee System module, a flaw in the robot’s mechanical or electrical system designs, or robot combat from previous matches. Regular battle damage will not trigger an Official Technical Timeout. Referees will provide backup Referee System modules. Teams can request for a Team Technical Timeout to repair their robots.

6.2 Exception

Any exception that occurs during the competition should be handled as follows:

- When a robot safety hazard or exception in a robot has occurred on the Battlefield, such as battery explosion, Aerial breaking an Aerial Safety Rope, stadium power outage, explosion of a compressed gas cylinder, or interpersonal conflict), the Head Referee will notify both teams’ Operators after discovering and confirming the emergency, and eject all robots through the Referee System. The result of the round will be invalidated. The round will restart after the safety hazard or exception has been eliminated.
- If the general Battlefield Components are damaged during a match (damage to the ground rubber surface, ground lighting, or Base lighting), the match will proceed as usual. In the event of structural damage or a malfunction of a key Battlefield Component, for example: where a Base or Outpost Armor Module shifts,

drops off or cannot detect hit damage; a Power Rune cannot be hit and triggered normally; Official Projectile Supplier cannot supply projectiles normally; the Aerial Safety Rope breaks or is worn out, the Head Referee will notify both teams' Operators after discovering and confirming the emergency, and eject all robots through the Referee System. The result of the round will be invalidated. Referees will enter the Battlefield to perform repairs. The round will restart once the Battlefield Component resumes its normal function.

- If certain Battlefield Components experience logical or structural faults that are not caused by participants in the process of the match, for example where no bonus is gained after a Power Rune is hit or a Base cannot open its shield normally, the Referee will solve the problem manually through the Referee System. If the problem cannot be solved manually through the Referee System and after determining that the issue cannot be eliminated, the Referee will notify both teams' Operators and eject all robots through the Referee System. The round ends immediately and its result is invalidated. The round will restart after the issue has been solved.



Resolving issues manually will cause delays, and the RMOC will not be responsible for any resulting consequences.

- During a match, if the fairness of a match has been affected by the malfunction or structural damage of a key Battlefield Component, and the Head Referee did not confirm the situation and end the game in time, causing a round that should have been ended to continue and thereby produce a winner, the result of the round will be deemed invalid once confirmed by the Chief Referee, and one rematch will be given.
- If a serious violation has taken place that clearly warrants a Level 5 Warning but the Head Referee did not confirm the situation and did not issue a Level 5 Warning in a timely manner, the original match result will be deemed invalid once confirmed by the Head Referee or an appeal has been allowed after the match, and the offending team will be given a Level 5 Warning and penalty.
- If an issue has occurred during the competition that affects the fairness of the competition, the Chief Referee will make a determination according to the actual situation.

7. Appeal

Each team has the right to one appeal during the China Regional Competition, Wild Card Competition, International Regional Competition, and Final Tournament. However, opportunities to appeal cannot be accumulated across competitions. If an appeal is successful, the team involved retains its right to appeal again 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 RMOC will no longer accept any appeal from the team. When processing an appeal, an Arbitration Commission will be formed by the Head Referee and heads of the RMOC. The Arbitration Commission has the final right of interpretation on all appeal decisions.

7.1 Appeal Process

Teams filing an appeal must follow the procedure below:

1. Within five minutes after a match ends, the appealing team's Captain submits an appeal request and signs an Appeal Form at the Referee Area. If the reason for the appeal is related to the robots of any team in the competition, the appealing party needs to propose that the relevant robots be isolated and tested, which will be implemented after being confirmed by the Arbitration Commission. By signing, the appealing party confirms that it is initiating the appeal process, and the Appeal Form cannot be modified after it has been signed. Any appeal made five minutes after a match has ended will be deemed invalid. No appeals are allowed before and during the competition.
2. The Captains of both teams will be brought by the staff to the Arbitration Room. The Arbitration Commission will determine whether the appeal request can be accepted.
3. If either team needs to collect evidence or defense materials, the period of time granted is one hour. The materials collected will need to be submitted to the Arbitration Commission, which will further communicate with the team members involved in the appeal. If neither side needs to collect evidence or defense materials, proceed to the next step.
4. After the Head Referee has accepted the appeal request, the staff will invite the Captain of both teams to meet in the Arbitration Room. Each team can only send three members to the Arbitration Room, and they must be regular members or the Supervisor. The presence of either the Captain or the Project Manager is mandatory.
5. The Arbitration Commission will make a final decision, and the Captain of both teams will sign the Appeal Form to confirm the decision. Once signed, both teams cannot question the appeal decision any further.
6. If a rematch has occurred for a round due to an arbitration decision requiring a "Rematch between Both Teams", both teams can appeal again after the rematch. In this scenario, if the original appealing team appeals again (known as a "Continued Appeal"), the team's opportunity to appeal will be exhausted regardless of whether

the appeal is successful. As a continued appeal will cause serious delays to the competition schedule, the continued appeal must be initiated together by both the team Captain and Supervisor within five minutes after the match ends (both signing on the Appeal Form at the same time).

The time for submission of evidence and materials is shortened to within 30 minutes of making the appeal. The RMOC will announce the outcome of the appeal on the Appeal Form within 60 minutes of the continued appeal being made.

7.2 Appeal Validity

Teams must file their appeal within the validity period. Below are the appeal validity periods for different stages:

- Validity period for appeal requests: Appeals must be made within five minutes after the end of a match and recorded on the Appeal Form. The Arbitration Commission will not accept any appeal request that has exceeded the validity period.
- Validity period for both teams to meet at the Arbitration Room: Within 30 minutes of being notified by the Arbitration Commission. If a team is absent during the validity period for both teams to meet at the Arbitration, the absent team is deemed to have given up its right to the arbitration. If more than three members of a team are present at the Arbitration Room or the attendees do not meet the specified identity requirements, the team is also deemed to have given up its right to the arbitration.
- Validity period for submission of evidence or defense materials: Within 60 minutes of making an appeal (30 minutes of making a Continued Appeal). The Arbitration Commission will not accept any new materials beyond this 60-minute limit.

7.3 Appeal Material

Appeal materials submitted by teams must follow the below specifications:

- Material type: Only materials stored on a USB flash drive and the robots themselves will be accepted as appeal materials. Materials submitted in other forms will not be accepted by the Arbitration Commission.
- USB flash drives: The edited video (the video materials should be prepared by the team itself) and the text files for the appeal should be placed according to the directory.
- Material format: Each video cannot exceed one minute in length or 500MB in size. The name of the video must indicate the specific Round of the match and the time it was taken. Videos should be compatible with the latest version of Windows Media Player, photos must be in JPG format, and text documents must be in MS Word format and not exceed 1,000 words in length.
- Material naming: The file name of each video and photo must be within 30 Chinese characters.

- Text requirements: One text file can only correspond to one video or a photo, which must be indicated in the text. Text files only need to explain the violations reflected in the corresponding materials.
- Robot evidence: The Arbitration Commission has the authority to isolate any relevant robot from both teams after an appeal has been made. These robots will not be isolated for more than three hours and will be returned to the teams latest when the arbitration decision is announced.

7.4 Appeal Decision

The Arbitration Commission will provide its final arbitration decision on the Appeal Form, which both team Captains must sign within an hour of the decision has been announced. If a team does not sign the Appeal Form, it is deemed to have accepted the appeal decision. The arbitration decisions that can be made include: Maintaining the original match results; a forfeiture issued against the respondent; a rematch between both teams. Neither team may appeal against the final decision of the Arbitration Commission.

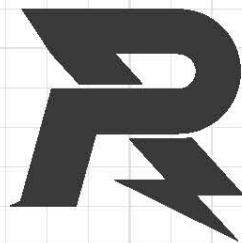
If the Arbitration Commission requires both teams to hold a rematch, the Organizing Committee will inform both teams of the rematch time when the arbitration decision is announced. If both teams refuse to hold a rematch, the appeal is deemed failed and the original match results are maintained. If only one team refuses the rematch, the refusing team is deemed to have forfeited and lost the round.

Appendix 1 Safety Instruction

Every team member participating in the RoboMaster 2020 must fully understand and accept that safety is the most important issue for the sustainable development of the RoboMaster Competition. In order to protect the rights and interests of all team members and the event organizers, and according to relevant laws and regulations, all team members who have registered for RM2020 will be deemed to have acknowledged and agreed to abide by the following safety terms:

1. All team members who have registered to take part in the RoboMaster 2020 Competition confirm that they possess the full capacity for civil conduct and can independently create and operate robots. All team members further confirm that, before using any products of the competition organizer SZ DJI Technology Co., Ltd., to create any robots, they will read in detail the RoboMaster 2020 Robotics Competition registration guide, competition regulations, and other important documents containing rules and regulations related to the competition.
2. During the competition, all participants should make sure that their actions including the creation, testing, and use of robots will not cause any injury or damage to his or her teammates, members of the opposing teams, staff, audience, equipment, or the competition venue.
3. All teams must ensure that the structural design of their robots will not hinder safety inspection during Pre-Match Inspection, and agree to fully cooperate in the Pre-Match Inspection carried out by RoboMaster's organizers.
4. All teams guarantee that they will not use any internal combustion engines, explosives, or high-pressure gas as working gas, or any dangerous materials.
5. During any stage of the R&D, preparation or competition period, all team members must be fully aware of any potential safety issues, and the team's Supervisor is responsible for instructing and supervising the team on safety issues.
6. All teams must guarantee the safety of all robots. This includes ensuring the projectile launchers installed on robots are safe, and that they will not cause any harm either directly or indirectly to any Operator, referee, staff member or audience member.
7. All teams will take sufficient and necessary safety measures during the R&D, training and competition periods regarding any hazardous situations that may occur. These include but are not limited to: preventing the control system from becoming unstable; anticipating every operation step prior to execution to avoid errors or collisions between team members or between robots and team members; prohibiting team members from engaging in solo training and making sure personnel are available as emergency responders to any situation; wearing goggles and helmets; applying the spotlight lock function and adding an emergency stop function other measures in a robot during debugging.

8. Teams will be held responsible for all accidents and losses resulting from the technical faults of robots, loss of control of UAVs or any other unexpected circumstances.
9. The materials bought from or provided by the organizer SZ DJI Technology Co., Ltd., such as batteries and the Referee System, must be used in accordance with their instructions. SZ DJI Technology Co., Ltd. will not be held responsible for any injuries that arise from improper use of these materials. Teams will be held responsible for any injuries caused to their own members or any third party and for any property loss arising from creating and operating any robots.
10. All team members must remain in strict compliance with the laws and regulations of the country or region. All team members pledge that their robots will only be used for the RoboMaster competitions and that their robots will not be illegally modified or used for any illicit purpose.



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