

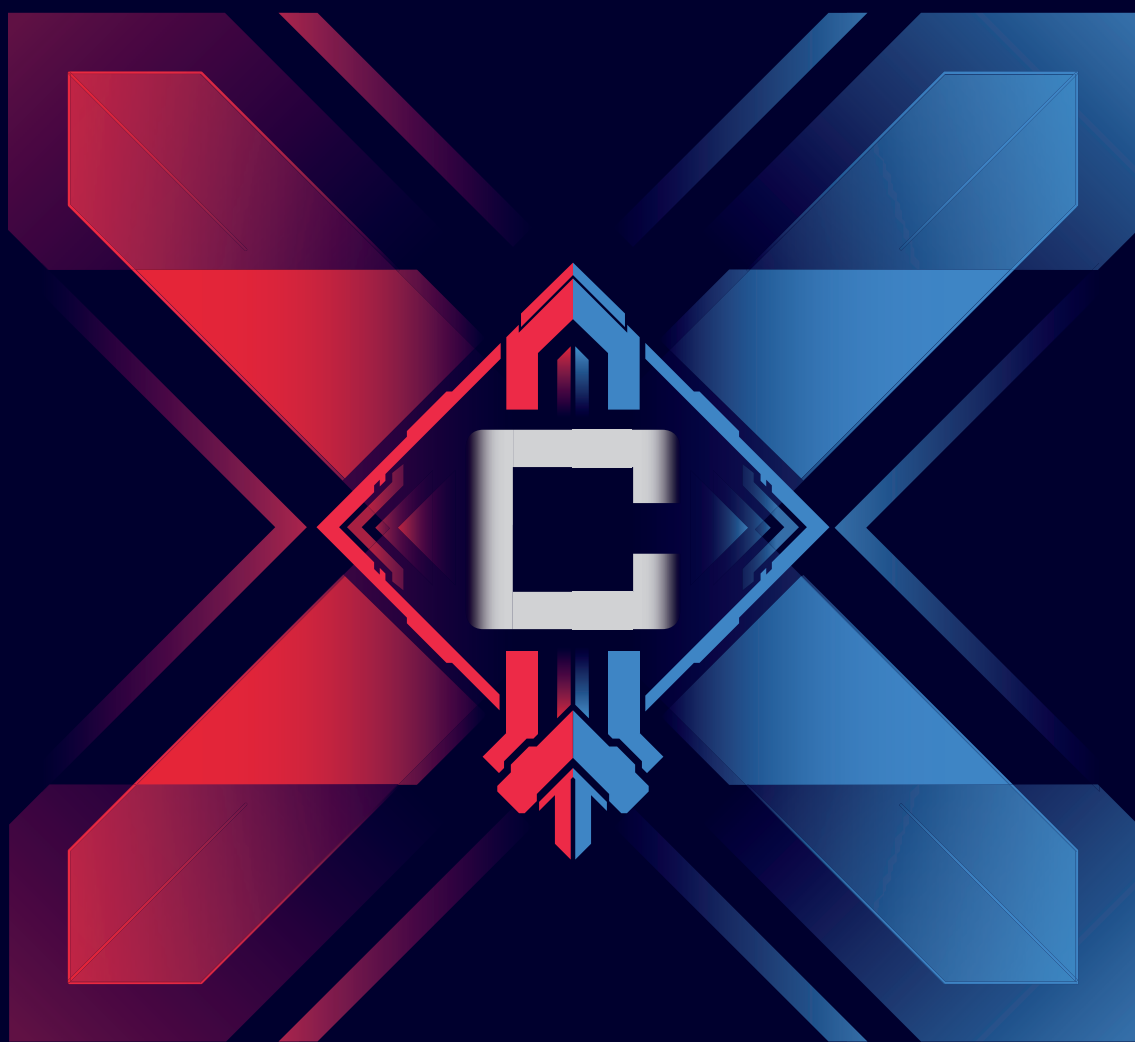
· 2019 ·

MAKEX

MakeX Robotics Competition

Courageous Traveler

Technical Guide **V1.1**



Updates:

Date	Version	Modifications Record
2019.01.23	1.0	Courageous Traveler Technical Guide First Published
2019.04.30	1.1	Additional Explanation to the Age of the Contestant
		Optimized Definition of Partially In, and Additional Definition to the Size of the Flag
		Adjustments of the Figures in Chapter 3.1 and 3.2
		Adjustments of the Chapter Orders in 3.6 and 3.7, and Optimized Explanation to the Scoring Detail, such as the Knock-down State
		Operation R34 Add the Use of Bluetooth Controller
		Arena not Restored in R37, Added Section R38 on Maliciously Interfering Opponents to Insert Their Flag

MAKE X

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MAKE X

1. Introduction

1.1 About MakeX

MakeX is a platform of robotic competitions for guiding the growth of young people. It aims at inspiring people's enthusiasm for creativity, sharing, and collaboration by Robotics Competition, STEAM Carnival, etc.

MakeX Robots Competition is hosted by the MakeX Robotics Competition Committee, organized by Shenzhen Hulu Maker Co., Ltd. and supported by Shenzhen Makeblock Co., Ltd. As the core activity of MakeX, it aims that through the competition, young people will discover the spirit of creativity, teamwork, fun and sharing. It is committed to promoting innovation in science, technology, education through high-level competition events, guiding young people to learn Science (S), Technology (T), Engineering (E), Art (A) and Mathematics (M) and apply such knowledge in solving practical problems through the exciting and challenging competitions.

1.2 MakeX Spirit

Creativity: we advocate curiousness and innovation, encourage all contestants to create unique high-tech works with their talent, and challenge themselves for continuous progress!

Teamwork: we advocate solidarity and friendship, encourage all contestants to develop a sense of responsibility and enterprising spirit, and sincerely work with their partners for win-win development!

Fun: we encourage contestants to build a positive, healthy mindset in the competition. Enjoy the journey and grow in the process.

Sharing: we encourage contestants to have an open mind as a maker and share their knowledge, responsibility and joy with everyone including their teammates and competitors.

MakeX spirit is the cultural cornerstone of the MakeX Robotics Competition. We hope to provide a platform for all contestants, mentors and industry experts to exchange ideas, study and grow up, and help young people acquire new skills

during creation, learn to respect others in teamwork, gain an enjoyable life experience in the competition, take delight in sharing with the society their knowledge and responsibility, and work hard to achieve their grand aspiration of changing the world and creating the future !

1.3 About 2019 Season

In 2019 season, MakeX will hold regional Robotics competition in more than 30 countries and regions around the world and will launch MakeX competition courses and organize various competition activities, worldwide spreading STEAM education among the teenagers.

Qualified teams can enter into 2019 MakeX World Championship and compete for the 2019 MakeX World Champion.

The theme of MakeX Challenge for the 2019 season is Courageous Traveler, which mainly tests the contestants' engineering technology, strategic teamwork and tactical execution.

In the cities where we live, there always have various safety problems that endanger people's safety, such as terrorist attacks that threaten national safety and food quality problems. To protect everyone on Earth, a group of Courageous Travelers will embark on a journey to protect human's life.

1.4 Participation Requirements

MakeX Robotics Competition is dedicated to providing young people with a high-quality, high-impact and impressive viewing experience platform for Robotics competitions. Young people aged 11 to 18 (including) can register through the official website. The requirements are as follows:

Each team consists of 2 to 8 contestants and 1 to 2 mentors. Each team must have a competition number as the unique identification symbol of the team. The competition number will be automatically generated after registration.

For the contestants who have participated in the 2018 MakeX Robotics Competition Challenge Interstellar Exploration, but are under the age of 11, they are permitted to participate in the 2019 MakeX Robotics Competition Challenge Courageous Traveler. The MakeX Robotics Competition system will determine whether the contestant has participated in the 2018 MakeX Robotics Competition Challenge Interstellar Exploration according to its database.

2. Terms

2.1 Arena

- Arena element: It refers to all parts and components that make up the competition arena. It is a general term that includes, but is not limited to mats, arena frame, arena props and so on.
- Storage basket: An iron basket placed on an arena frame for storing the controller in the competition.
- Arena frame: constructed by flat beam and octagonal pillar.
- Guide line: The white lines and the red (blue) color ribbons in the competition mat that can be used to guide the robots forward.
- Mat: Color spraying with necessary information such as competition mission, guideline and so on.
- Ground: It refers to the upper surface of the mat. Can be used to guide the robots forward.
- Operation area: The area where the operation teams are allowed to stay.

2.2 Roles

- Referee: A person who is responsible for managing the order of the competition, enforcing the competition rules and maintaining the spirit of the competition with a neutral manner.
- **Working staff:** Personnel who are responsible for maintaining the normal operation of the competition.
- Contestant: contestant who registered and participated in the MakeX 2019 Robots Competition Challenge Courageous Traveler.
- Mentor: Mentor who registered and participated in the MakeX 2019 Robots Competition Challenge Courageous Traveler.
- Team: Team are composed of contestants and mentors, who registered participating in the 2019 MakeX Robots Competition Challenge Courageous Traveler.
- Captain of Alliance: The two teams that form the alliance shall designate one of the contestants on the venue as the captain of their alliance.

- Operator: Contestants who operate the robots, which 2 operators from each alliance and 2 teams of the same alliance.
- Observer: Contestants who assist operators in observing the props' state and giving advice, which 2 operators of each alliance are from 2 teams of the same alliance.

2.3 Refereeing

- Competition system: Both the hardware and software are developed to ensure fair and honest competition.
- Completely In: The vertical projection of props or robots are completely located in the designated area.
- Partially In: The vertical projection of props or robots is partially located in the designated area or have contact with the designated area.
- Completely Out: The vertical projection of props or robots are completely outside the designated area.



3. The Competition

3.1 Introduction

Single-match time: 4 minutes and 30 seconds.

Red and blue alliances play against each other in each match. Each alliance consists of two teams.

The competition is divided into four stages: Automatic stage, Manual Stage, Modification Stage and Final Stage. In the competition, contestants will control robots to move the yellow bottles which symbolizing significant safety threat to the Safe Zone in their camp. They will use the ball to eliminate all safety threats (i.e., knock down any color bottle) in the opponent's camp. In the competition, the flag symbolizing a safety signal can be inserted into the Signal Transmitting Area during the final stage, and the robot can back to the Returning Area before the end of the competition to get corresponding points. After the end of the competition, the automatic scoring and manual scoring will be aggregated to judge the match outcome for both sides. If all the opponent's bottles are knocked down, it will be deemed as KO, and the competition will end ahead of time.

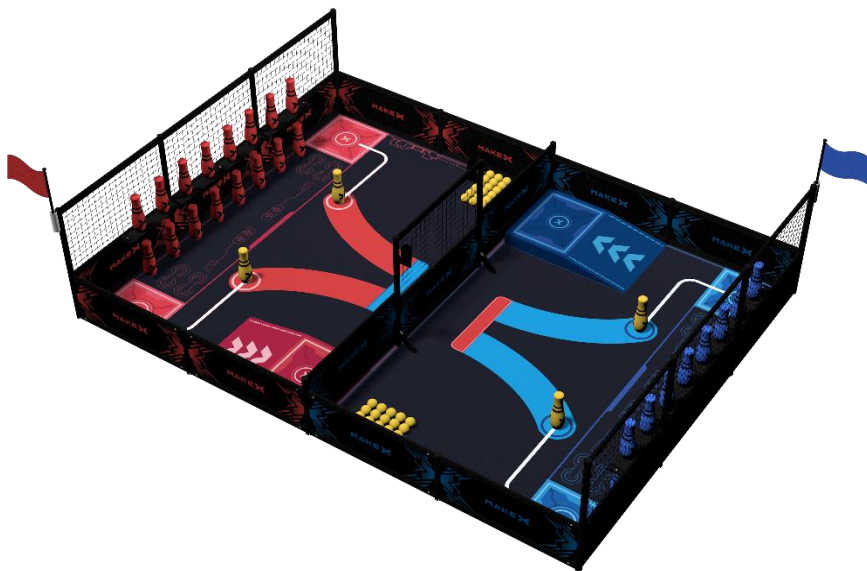


Fig 3.1 Isometric View of the Arena

3.2 Arena

The rectangular area with a size of 3000 mm* 4400 mm, (for the official competition arena of 2019 MakeX Robotics Competition Challenge Courageous Traveler), mainly includes Starting Area, Highland, Ammunition Area, Central Barrier, Urban Living Area, Returning Area, Safe Zone and Signal Transmitting Area.

The Central Barrier divides the arena into two parts: Red Camp and Blue Camp. Robots from both sides can only compete in their own camp. Before the start of the match, the initial positions of the props are shown in Fig 3.3 (not including the flag).

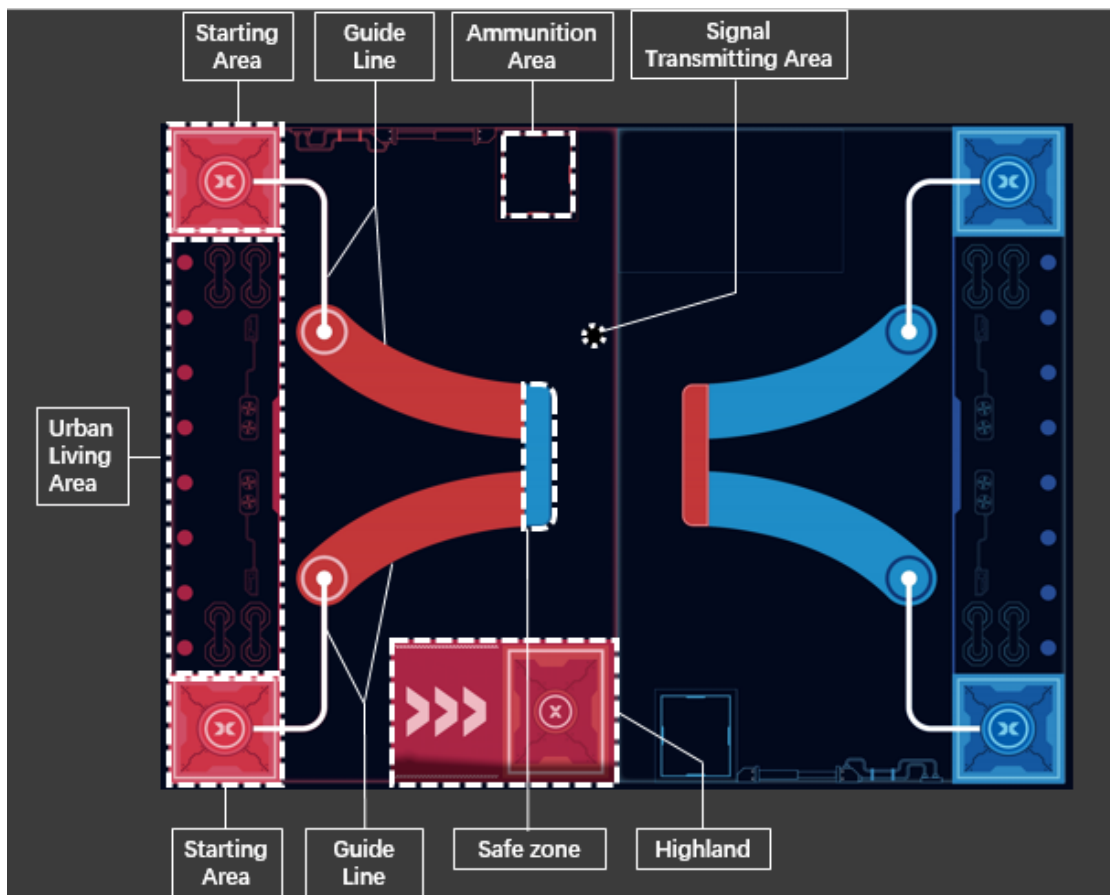


Fig 3.2 Functional Area of the Arena

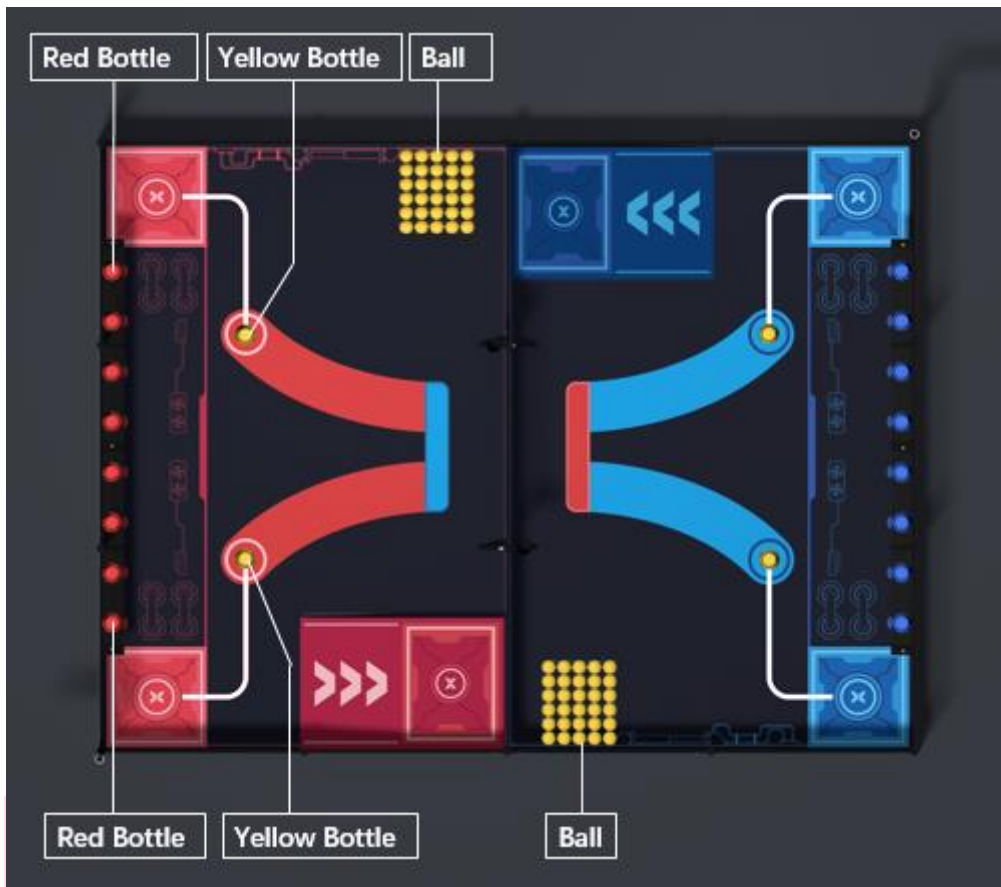


Fig 3.3 Props Allocation of the Arena

- **Starting Area:** Four areas in the arena are used for starting or stopping the motion of the robot in the competition. The dimension of the outer rims is 500mm * 500mm.

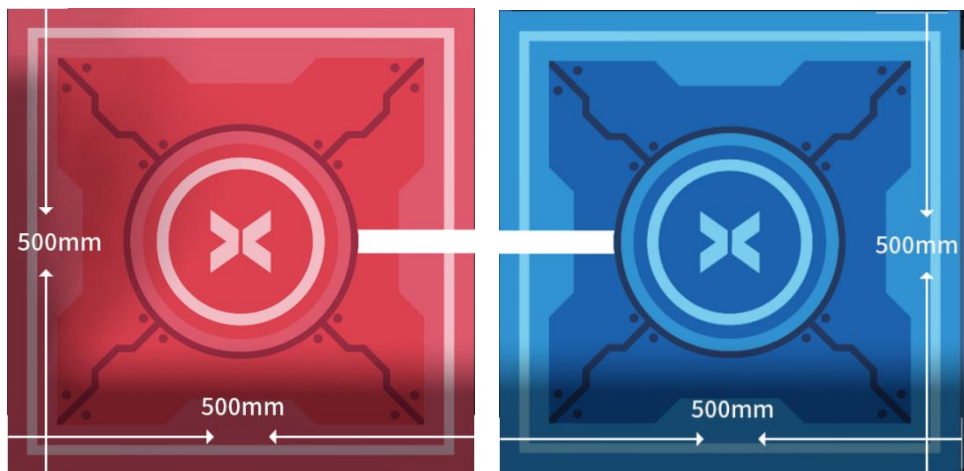


Fig 3.4 Starting Area

- **Highland:** Each camp has a Highland, and the Highlands are central-symmetric. The Highland consists of slope and platform. The size of the platform is 650mm * 500 mm, the vertical height is 100mm from the ground, and the length of the bottom floor of the Highland is 1000 mm.

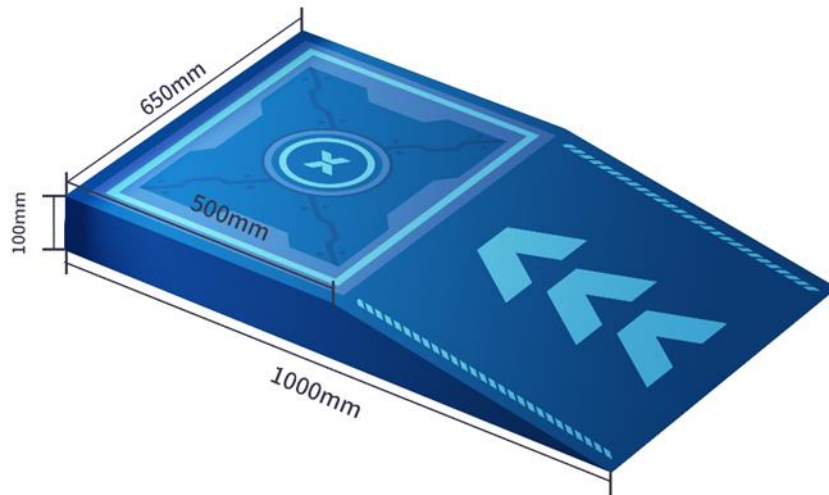


Fig 3.5 Highland

- **Ammunition Area:** There is an Ammunition Area on both sides of the camps of the red alliance and blue alliance, which consists of a rectangular area enclosed by Hook&Loop pasted on the competition mat. 5 rows, 6 columns, a total of 30 balls are placed in this area.

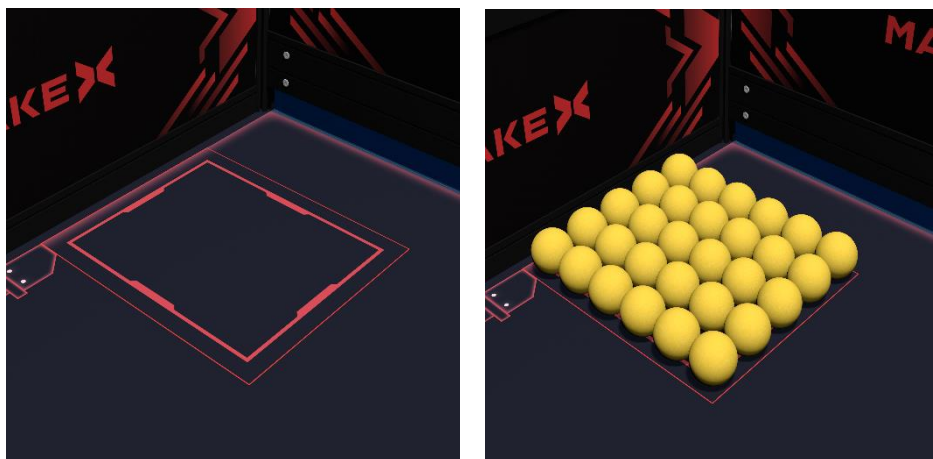


Fig 3.6 Ammunition Area

- **Central Barrier:** Located in the center of the arena, partitioned the arena as red and blue camps. The Central Barrier is built by flat beam, octagonal pillar, metal net and PVC board. The height of Central Barrier are 960 mm, 500 mm and 500 mm respectively.

(respect to Fig 3.7)

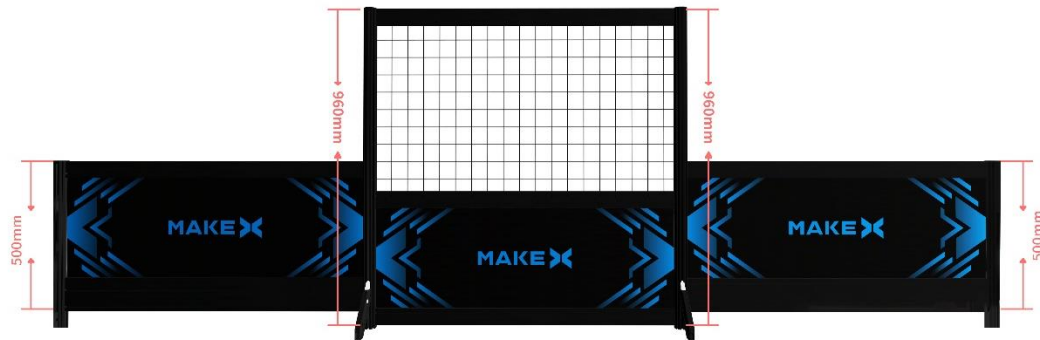


Fig 3.7 Central Barrier

- **Urban Living Area:** The area where blue or red bottles are placed.

The Urban Living Area is divided into upper and lower floors. The upper floor is composed of board and some arena frames, and the lower floor has a rectangular area of 1985mm* 500mm. There are 8 bottles on each floor, totaling 16.

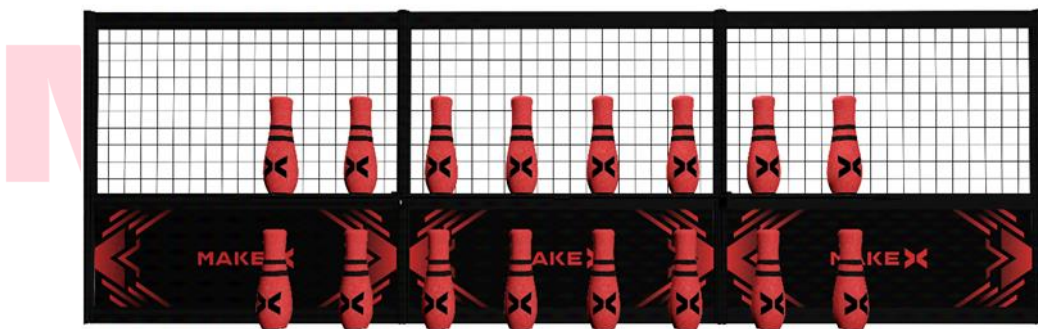


Fig 3.8 Front view of Urban Living Area

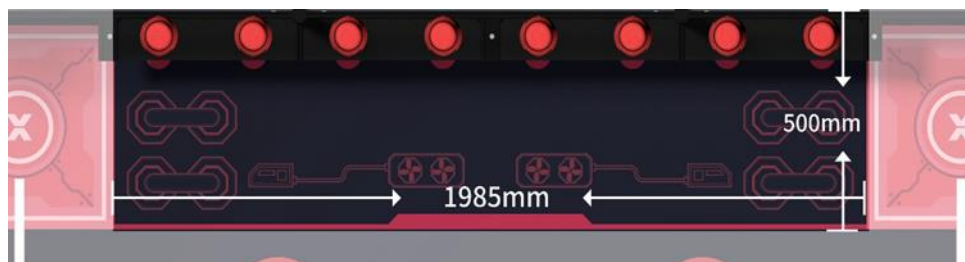


Fig 3.9 Top view of Urban Living Area

- **Safe Zone:** The length and width of the rounded rectangular area near the Central Barrier is 660mm * 150 mm, which is used for placing the yellow bottles.

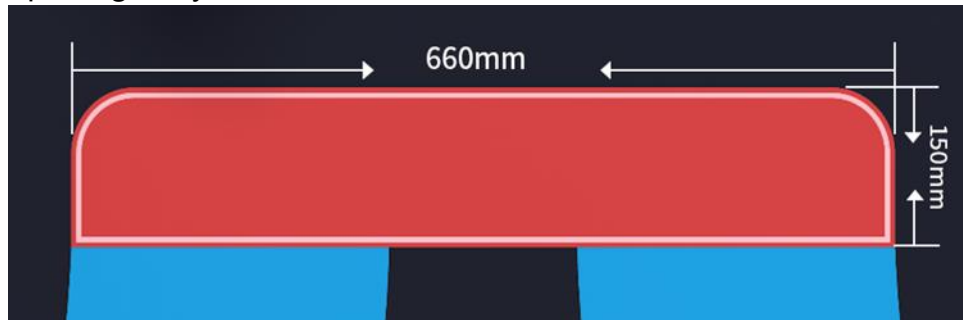


Fig 3.10 Safe Zone

- **Signal Transmitting Area:** The shape is a hollow cylindrical barrel structure, with an inner diameter of 68 mm and a barrel depth of 100 mm, which is fitted with 92mm flat beam on a 960 mm octagonal pillar. The vertical distance between its top and the ground is 960 mm. Each camp has one and arranged in central symmetric, which is used to insert the flag symbolizing its own safety signal at the Final Stage.

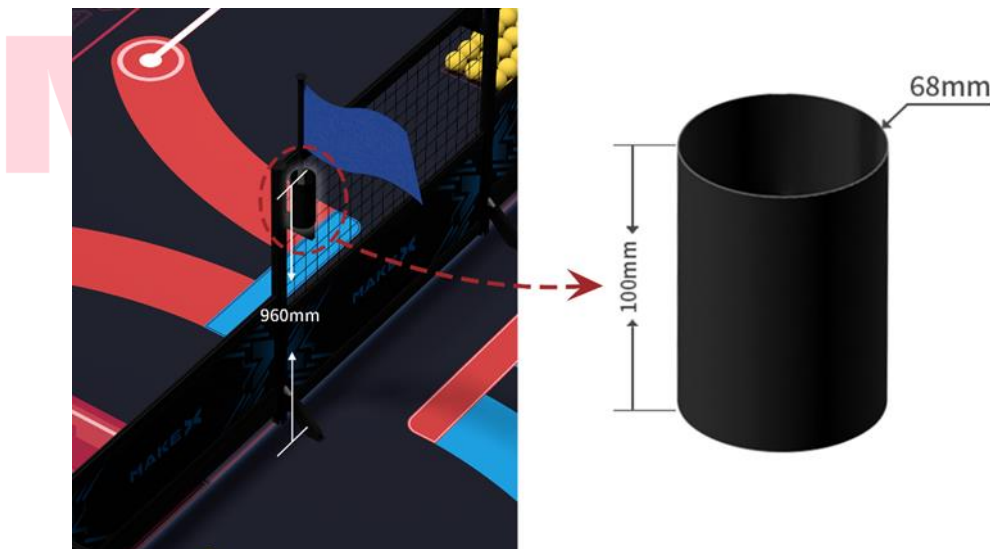


Fig 3.11 Signal Transmitting Area

- **Guide line:** As shown in Fig 3.3, it is composed of white lines and the red (blue) color ribbons, whose widths are 25mm and 260mm respectively.
- **Returning area:** Random determining 2 from 4 options from its own "2 Starting Areas + 1 Ammunition Area + 1 Highland (platform part)" as the Returning Area of the Final Stage, it will be determined and announced before the competition.

3.3 Props

- **Ball:** The ball is a yellow EVA ball with a diameter of 70 mm. It can be used for hitting the opponent's bottles through the robot, there are 30 balls for the red alliance and for the blue alliance respectively, totaling 60 balls. Before the competition, they will be placed in the Ammunition Area of both camps.



Fig 3.12 Ball

- **Bottle:** There are red (blue) and yellow EVA bottles in each alliance camp, which symbolize safety threats and significant safety threats respectively. There are 18 bottles for each side, among which 16 red (blue) bottles in the Urban Living Area and 2 yellow bottles in their initial positions respectively. Dimensions: 280 mm high, 70 mm for bottom diameter, 100 mm for maximum diameter. The red, blue and yellow bottles will be used for reference below.



Fig 3.13 Bottle

- **Flag:** Alliance's flag is composed of flag surface and flagpole, which is made by the team itself. Throughout the whole match, the length of the flagpole is limited to 260-400 mm, and the diameter is limited to 6~21 mm (both solid and hollow are acceptable). The flagpole cannot be bent (The flagpole must be able to fit into a 21mm-diameter, 400mm-length hollow cylinder when checking-in). The flag surface must be rectangular; the length should within 180~240 mm and the width should within 120mm~160mm. Before the match, the flag must be placed in the operation area of alliance' s own camp.

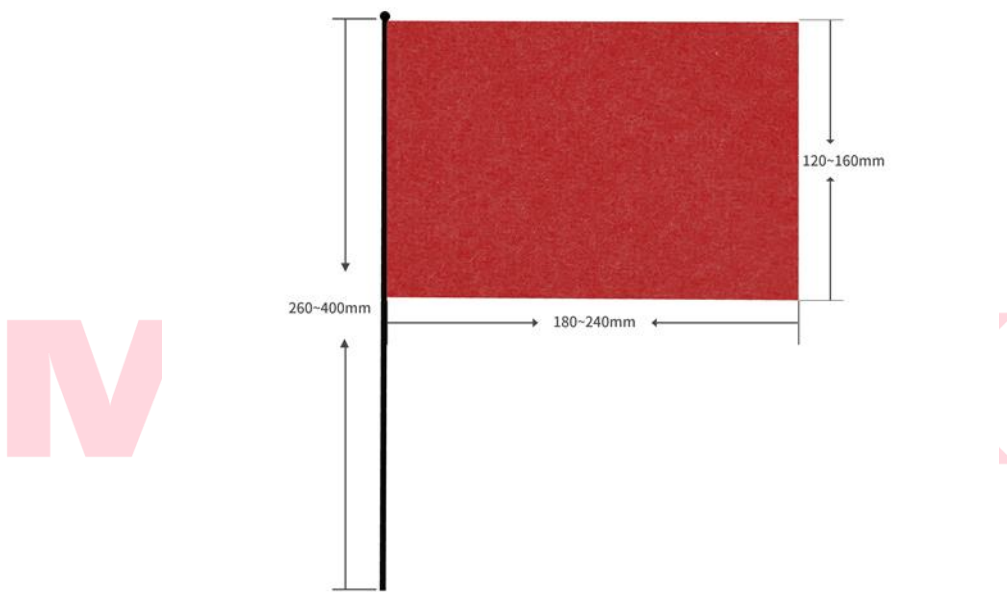


Fig 3.14 Flag

(Note: All arenas and props have a certain tolerance. If there are other adaptable props on site, contestants can apply for replacement before the competition)

3.4 Missions

Automatic Stage

The Automatic Stage is 30 seconds.

To ensure the fairness of the competition, during the countdown of 5 seconds, before the start of the competition, the robots in the Starting Area will cooperate with the competition system to cut off their powers. After the countdown, competition system will power on the robots, and the robots will run the automatic program.

At this stage, the robot can score through the following ways:

(1) The yellow bottles are successfully moved from the initial position to the Safe Zone.

(2) Automatically pick up the balls in the Ammunition Area to knock down the red (blue) bottles in the opponent side's Urban Living Area.

Before the end of the Automatic Stage, the competition system counts down 5 seconds. At the end of the Automatic Stage, the competition system will automatically cut off the power supply of the robots.

Robots can use the guideline in the arena to score at the Automatic Stage. In actual competition, the guide line partially uses the white lines in the black background. The arena is illuminated normally. The contestants can calibrate the sensor's parameters. The Committee does not guarantee that the light of the arena will never change. With the progress of the competition, the light of the arena may change.

Manual Stage

The Manual Stage is 90 seconds.

After the scoring and state are confirmed for the Automatic Stage, the Manual Stage starts. After 5 seconds countdown of the competition system, the robots will be powered on and the 90-second Manual Stage starts. In this stage, the operators can use the controller to operate the robots manually. The operator can manually control the robots to pick up the balls to hit all the opponent's bottles from his own camp. (including the Highland).

Before the end of the Manual Stage, the competition system counts down 5 seconds and then it will automatically cut off the power supply of the robots.

Modification Stage

The Modification Stage is 60 seconds.

When the Manual Stage is over, the competition moves to the Modification Stage. Contestants can withdraw the robots which is already returned to the Starting Area before the Modification Stage starts. The flag of the alliance must not be attached to the robots before this stage. The length and width of the modified robot must conform to the size requirements, but the height is not limited.

When there are 30 seconds left in the Modification Stage, the competition system will notify the contestants. Before the end of the modification, there will be 10 seconds' countdown. Before the countdown finishes, contestants have to put the robot back in the Starting Area.

Note: Before the modification, contestants must take out all the balls stored in the robot and return them to their own camp at this stage. When the modification is finished, the robot shall return in the Starting Area and is not allowed to carry any ball.

Final Stage

The Final Stage is 90 seconds.

When the contestants are ready and the state is confirmed, the competition moves to the Final Stage. After the 5 seconds' countdown, the 90-second Final Stage will begin. The competition system will power on the robot and the robot will run the manual program.

In the Final Stage, except for continuing to hit the bottles to score, the alliances can also score via the following two ways:

- (1) Control the robot to successfully insert one flag of its own alliance into the Signal Transmitting Area, and the corresponding points can be scored.
- (2) At the end of the Final Stage, each alliance's robots will score the corresponding points for moving to the Returning Area.

At the end of the Final Stage, the competition system will cut off the power supply of the robots, and the referee will confirm the scoring. All contestants should put the controllers into the storage basket and clearly stand far away from the arena's frame. Contestants should not be in contact with the arena.

3.5 Single-match Competition Process Chart

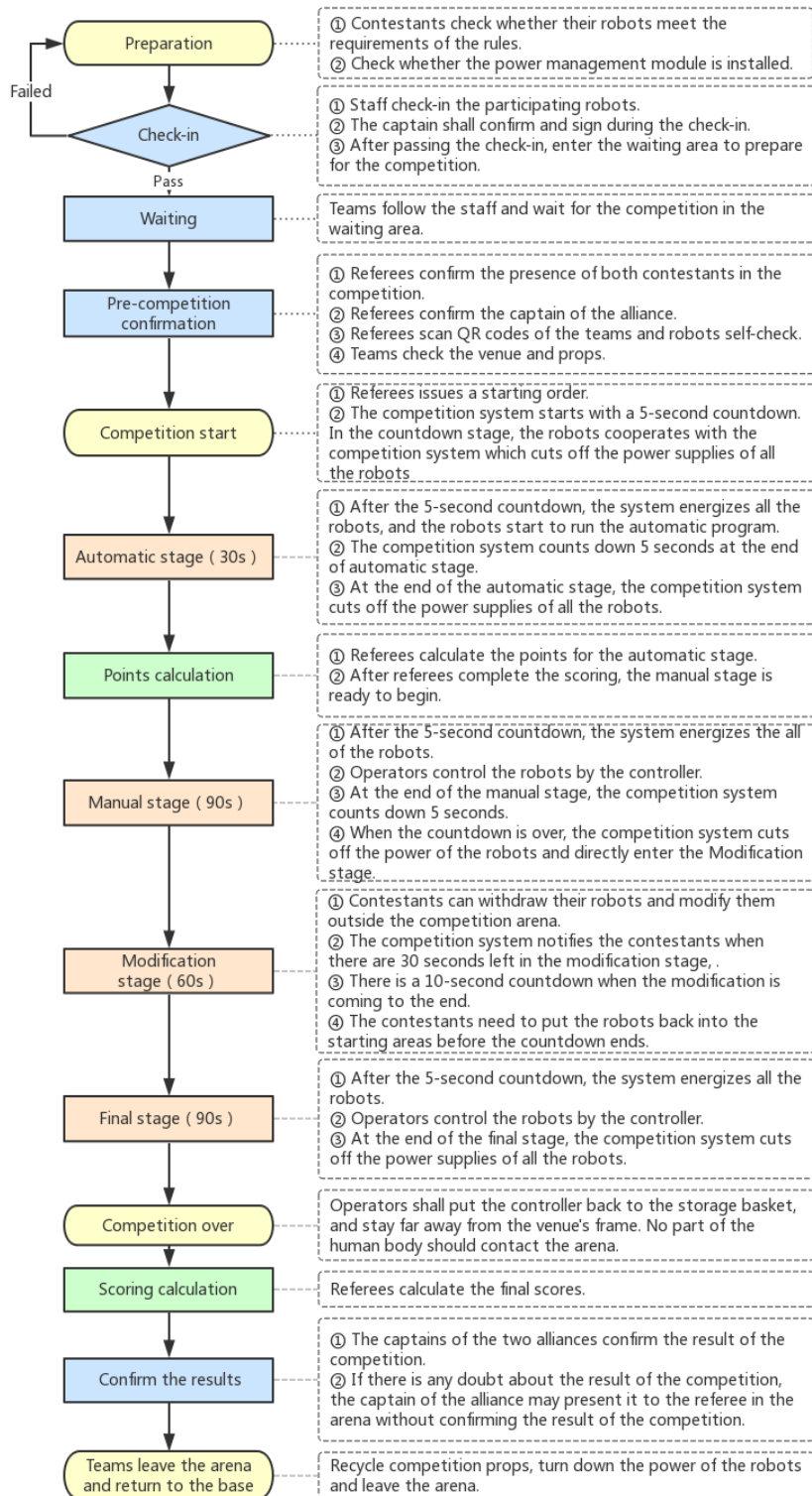
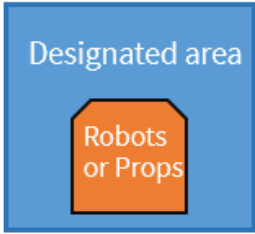
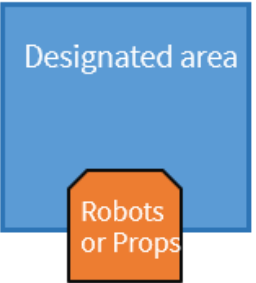
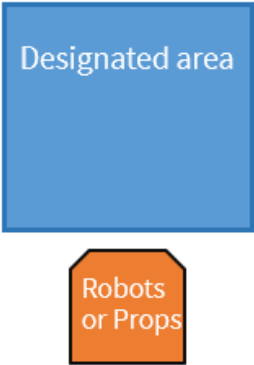


Fig 3.15 Single-match Competition Process Chart

3.6 State Judgment

Boundary State Judgment

- E01.** During the whole competition, when the position state of the robots or props are not very clear, the following statement can be used to judge:

<i>Status</i>	<i>Completely In</i>	<i>Partially In</i>	<i>Completely out</i>
<i>Explanation</i>			

Upright or Knocked-down State of Bottles

- E02.** If the bottom of the bottle is fully in contact with the ground or the surface of the upper floor of Urban Living Area, it will be deemed as an upright state.
- E03.** A bottle that has not been identified as an upright state by **E02** is considered to be knocked-down state (regardless of the cause of this state).

Threat State of Yellow Bottles

- E04.** If the state of the yellow bottle is upright and the bottom is Completely In the Safe Zone, it will be considered that the threat is cleared.
- E05.** If the yellow bottle was already knocked-down, or be in contact with the robot, or its bottom is Partially In or Completely Out of the Safe Zone, it will be considered that the bottle is in threat state.

KO State Judgment

- E06.** During the competition, if one side has obtained every possible point from knocking down all the bottles of the opposite alliance, it will be deemed as KO state, so that the competition will be ended in advance.
- E07.** The KO state can only happen in the Manual Stage and the Final Stage.

State of Robot's Entry into the Starting Area Judgment

- E08.** The vertical projection of the robot should be Completely In the Starting Area before the start of the competition.
- E09.** At the end of the Manual Stage, in other words, at the start of the Modification Stage, if subsystem 1 of the robot is Partially In the Starting Area, it will be considered that the robot is inside the Starting Area.
- E10.** The vertical projection of the robot should be Completely In the Starting Area at the start of the Final Stage.

Contact State Judgment

- E11.** If the prop is in contact with the robot, it will not be counted when the referee calculates the score.

3.7 Scoring Details

The referees calculate the Automatic Points at the end of the Automatic Stage and the Manual Points at the end of the Final Stage respectively. The scoring details are as follow:

Automatic Points

- E12. Points of red or blue bottles:** At the end of the Automatic Stage, if the red or blue bottles from the opposite alliance are satisfies any of the following conditions, the alliance will score 10 points for each bottle, knocking down the yellow bottle will not be counted in the Automatic Stage.
 - (1) The bottle on the lower floor of Urban Living Area was knocked-down, or it's bottom completely out of the lower floor of Urban Living Area.
 - (2) There is no contact between the bottle and the upper floor of Urban Living Area.
 - (3) The bottle is in contact with the robot.
- E13. Successful Movement Points of Yellow Bottle:** At the end of the Automatic Stage, the alliance will score 20 points by moving each yellow bottle (the bottle is not in contact with the robot) completely in the Safe Zone, so that they are not in Threat State.

Manual Points

- E14. Points of red or blue bottles:** At the end of the Final Stage, if the red or blue bottles from the opposite alliance are satisfies any

of the following conditions, the alliance will score 20 points for each bottle:

- (1) The bottle on the lower floor of Urban Living Area was knocked-down, or it's bottom completely out of the lower floor of Urban Living Area.
- (2) There is no contact between the bottle and the upper floor of Urban Living Area.
- (3) The bottle is in contact with the robot.

E15. Points of Yellow Bottles: At the end of the Final Stage, the alliance will score 50 points for each yellow bottle from the opposite alliance which is still in Threat State, or the yellow bottle is still in contact with the opposite alliance' s robot.

E16. Successful Flag Insertion Points : When the alliance's robots successfully insert the flag into Signal Transmitting Area, that is, when the referee calculate the points , the flag does not need any external force to support it to stay inside the cylinder barrel.(the flag is also not contact the robot) 80 points will be scored for successful flag insertion (one flag is enough, no extra points for the second insertion)

E17. Successful Return Points : At the end of the Final Stage, once the Subsystem 1 of the robot is Partially In or Completely In the Returning Area, that is, it has returned successfully and will be deemed as the Scoring State. 20 points will be scored for each robot that has successfully returned.

- (1) If the Ammunition Area is selected, the boundary of the Ammunition Area is the outer white rim of the Ammunition Area (shown in fig 3.16).

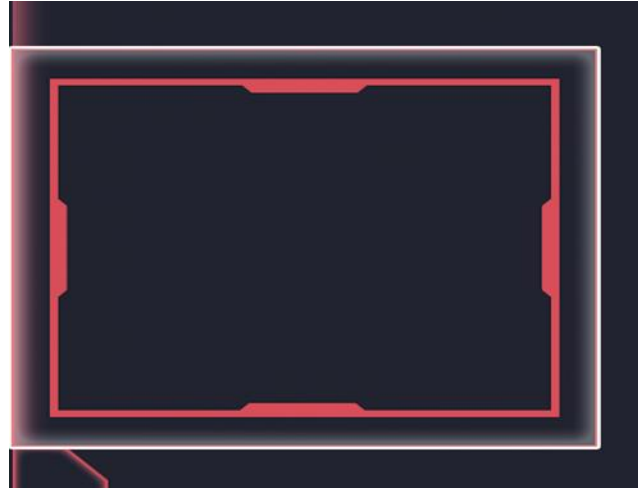


Fig 3.16 the boundary of Ammunition Area

- (2) If the Highland is selected, the boundary of the Highland is the external square on the platform of Highland. (shown in fig 3.17)

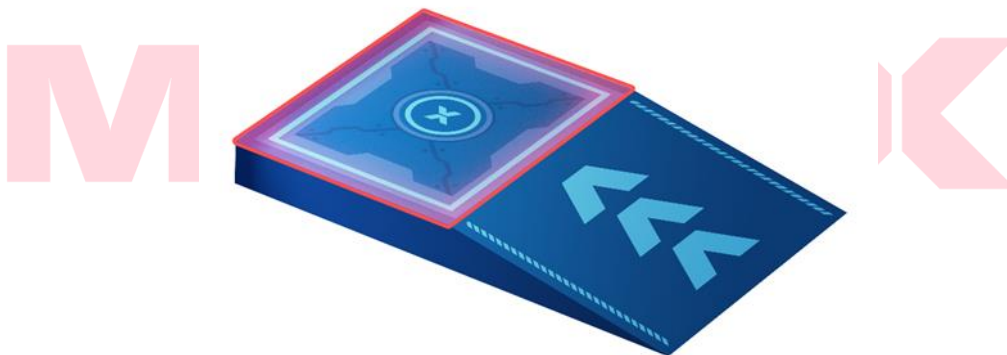


Fig 3.17 the boundary of Highland

Single-match Points

- E18. Automatic Points** = Successful Movement Points + Points of red or blue bottles. The Automatic Points are calculated at the end of the Automatic Stage.
- E19. Manual Points** = Points of red or blue bottles + Points of Yellow Bottles + Successful Flag Insertion Points + Successful Return Points. Manual Points are calculated at the end of the Final Stage.
- E20. Single Match Points** = **Automatic Points** + **Manual Points**

4. Robot Technical Requirements

When the teams are designing their robots to participate in the 2019 MakeX Robotics Competition Challenge Courageous Traveler, they shall comply with the following technical requirements. It is suggested that the teams shall read and get familiar with all the Technical Requirements before designing and constructing their robots. The Technical requirements provide a fair and safe competition standard for all teams and encourage teams to make innovative designs of their robots on the prerequisites of meeting technical requirements.

4.1 Robot General Technical Requirements

The General Technical Requirement explains and defines the requirements of quantity, size and weight for the Subsystems of the robot.

Subsystem of the Robot

- T01.** Subsystem 1: The mainboard and mobile robot chassis (including wheels, tracks or other mechanisms) that enables the robots to move on the flat surface. For a stationary robot or a robot without any moving mechanism, the structure which has direct contact with the Competition Mat is deemed as Subsystem1.
- T02.** Subsystem 2: The power system includes the motors or servos which empowers the Subsystem 1 and the battery that supplies energy to power system.
- T03.** Subsystem 3: The function system includes the functional structure of the robots, including but not limited to the function as identification of the external environment, operation for competition props, crossing of obstacles. Subsystem 3 includes mechanical parts and electronic parts.
- T04.** In case a Subsystem has the functions of multiple Subsystems, it will be deemed to be the Subsystem with highest level. The hierarchy of the Subsystem levels from high to low is Subsystem 1, Subsystem 2 and Subsystem 3.

Numbers of the Robots

- T05.** Each team is allowed to use only one robot to participate in the

competition. Teams can only modify the Subsystems 2 and 3 of the robot during the competition and the Subsystem 1 cannot be modified. In case a team modifies the Subsystem 1, it will be deemed as the team uses the second robot. The team will be disqualified.

- T06.** In case the replacement of the same part is caused by the failure of parts (such as wheels defect, motors defect, etc.), it will not be deemed as replacing the Subsystem.
- T07.** One team can only use one robot in the competition. It is not allowed to use one robot to compete in the arena, while another robot is being assembled or modified outside the arena.
- T08.** Teams are not allowed to use multiple robots alternatively during the competition.
- T09.** Teams are not allowed to use multiple robots alternately in one Regional Competition, Points Race or MakeX World Championship.
- T10.** Robots are not allowed to have a structure which can be separated on purpose. During the competition, all Subsystems of the robots need to be connected directly.

Size of the Robot

- T11.** The size of the robot is defined by its length, width and height. The vertical projection of the robots on the horizontal plane must not exceed the specified dimension of the square area, and the height of the robots must not exceed the specified dimension. This is considered that the robot's size conforms to the Robot Size Requirements. Robot's height is measured from the horizontal plane of the arena (contact with robots) to the furthest structure of the robot with respect to the arena plane.
- T12.** Robot's length and width are defined in the Inspection and are not allowed to be redefined after Inspection.
- T13.** During the competition, the maximum initial size means that the size of the robot must not exceed the limit during the competition and before the Modification Stage.
- T14.** During the competition, the maximum modification size means that the robot's size must not exceed the limit after the Modification Stage.
- T15.** If the robot uses flexible materials (including but not limited to cable ties, stickers, foam or Team Number), the flexible materials must comply to the size requirements of the robot without being

affected by external forces when measuring the size of the robot.

T16. The following table presents the Robot Size Requirements:

	Requirements	Remarks
Maximum Initial Size	500 mm (Length) 500 mm (Width) 500 mm (Height)	1. The height should not exceed 500 mm and the vertical projection of the robot on the arena should not exceed 500 mm by 500 mm square area. 2. Before the Modification Stage starts, the robot' s size must comply with the Maximum Initial Size requirement.
Maximum Size after Modification	500 mm (Length) 500 mm (Width) Unlimited (Height)	1. There is no limitation on height and the vertical projection of the robot on the arena should not exceed 500mm by 500mm square area. 2. After the Modification Stage, the robot' s size must comply with the maximum size requirement after modification.

Weight of the Robot

T17. Weight of the robot refers to the net weight of the robot at any time during the competition (the combined weight of Subsystem excluding the props from the arena).

T18. Weight of the robot must be less than 8 KG.

Notice for Construction

T19. The teams should take into account the allocation of internal structure during the robot construction to ensure the operation of the robot Subsystem 2.

4.2 Electrical Requirements for Robot

The Electrical Requirements for Robot applies to the mainboard, sensors, batteries, or other part which has electronic signals transmission with the

mainboard. (Not apply to motor, servo or other kinds of actuator)

Power System

- T20.** Teams can only use Li-Po battery from competition kits or the Li-Po batteries with the same parameters (3S Li-Po Battery, Output Voltage: 11.1v, Discharge Rate: 30c).
- T21.** Except for the laser aiming devices, the robot's power system can only use one battery. The battery shall be securely fixed inside the robot. The battery should not collide with any structure (the robot itself or the arena) during the robot's operation.
- T22.** Battery must not detach from the robot when the robot is inclined or moving. Installation of battery should not offset the center of the gravity and lead to inclined.
- T23.** Power cord should be kept intact. Cracks or leakage of cover is not allowed, and the core metal conductors should not be exposed.
- T24.** The power cord and other electrical wire should be completely electrical isolated with the robot's structure. The robot's structure should not be used for electrical power or signal transmission.
- T25.** Teams should pay attention to the safety instruction when using the battery during the preparation and the competition process. Battery should not be placed in the humid or high-temperature environment. Batteries should not be overcharged or over-discharged. Details for battery usage and safety instruction, please read the Appendix 3.
- T26.** The team can prepare extra batteries for backup. To avoid unexpected accidents, appropriated battery charger can be used in the designated area to charge and discharge in the right way.
- T27.** In case unexpected accidents emerged due to the quality of batteries or chargers purchased by the team themselves and improper use of batteries or charger, the responsibility shall be borne by the team themselves.

Mainboard

- T28.** Robots should use the specific mainboard (NovaPi, manufactured and sold by Shenzhen Makeblock Co., Ltd., Quantity: Maximum 1) to prevent the teams from using the high-efficiency

mainboards to affect the fairness of the competition.

- T29.** Teams need to optimize the arrangement of wiring between the mainboard and electrical devices. Labeling each wire can highly improve the efficiency of the testing, maintenance and also facilitate the inspection process.

Electronic Sensor

- T30.** Robots should use the specific electronic sensors (electronic sensors manufactured and sold by Shenzhen Makeblock Co., Ltd, Quantity: not limited) to prevent the teams from using some high-precision sensors to affect the fairness of the competition.

Wireless-Control

- T31.** The robot should use the specific wireless-control equipment (Bluetooth Controller, manufactured and sold by Shenzhen Makeblock Co., Ltd., Quantity: 1).

4.3 Mechanical Requirements for Robot

Actuator System

- T32.** The actuator system contains all motors or servos used by the robot, including but not limited to chassis, mechanical arms, etc.
- T33.** The robot should use the specific motors (37 DC Motor and 180 Smart Encoder Motor, manufactured and sold by Shenzhen Makeblock Co., Ltd, Quantity: Maximum 12) to ensure the fairness of the competition.
- T34.** The teams can only use the motor from the competition kit, or the same type of motor manufactured and sold by Shenzhen Makeblock Co., Ltd.
- T35.** The robot should use the specific servo motors (MS-12A Smart Servo manufactured and sold by Shenzhen Makeblock Co., Ltd, Quantity: Maximum 6) to ensure the fairness of the competition.
- T36.** The teams can only use MS-12A Smart Servo from the competition kit, or the same type of Smart Servo manufactured and sold by Shenzhen Makeblock Co., Ltd.

Mechanical Parts

Mechanical parts contain the parts that form the structure of a robot but without power generation.

- T37.** The team can use partially customized or purchased mechanical parts, but the purchasing channels must be open and transparent for everyone to ensure that the other team can also access.
- T38.** The team can modify the physical property of mechanical parts (beam, plate, self-made parts, etc.) by drilling or painting without violating any other rules.
- T39.** The team cannot perform any chemical treatment on mechanical parts, including but not limited to melting, casting or other chemical treatments.
- T40.** The team can use the self-made or purchased parts from the following materials: 3D printing pieces, metal (can be magnetic), wood, plastic, rubber, standard sheets, standard profiled extrusions, etc.
- T41.** Teams can only use an integrate commercial products with one degree of freedom, such as hinges, sprockets and roller chains, pulleys, etc.
- T42.** Teams are not allowed to use an integrate commercial products with more than one degree of freedom for competition, including but not limited to mechanical arms or manipulators with multi degree of freedom.
- T43.** Teams can use lubricant to protect the parts but notice that the lubricant should not leak and pollute the competition arena.
- T44.** The team should pay attention to the safety when using parts or tools. High-power machines or tools should be used under the guidance from the mentor.

4.4 Other Technical Requirements

Non-Electrical Energy

- T45.** Except for electrical energy, other source of energy which empowers the operation of robots is considered as non-electrical energy. The non-electricity energy used by the robots must only come from the following sources:
- (1)The energy stored by changing the robot's or part's center of gravity;
 - (2)The energy stored by the deformation of the robot's parts;

Sounds and Lights

- T46.** Robot are not allowed to use any electronic device generating sounds, including but not limited to the buzzers or the ultrasonic sensors.
- T47.** The lights generated by the robot can only be from the power indicator light of the mainboard, sensor and laser aiming device which comply the technical requirements. Robots should not have other light sources because it contains potential risk for the teams or audiences and interferes with the operation of the robot.
- T48.** In case the robot uses a laser aiming device, the power should be less than or equal to 5mW (below 3a/R level). Only one laser aiming device can be installed for one robot.
- T49.** In case the robot uses a laser aiming device, they need to explain to the **working staff** and show the specification sheet of the device during inspection.
- T50.** In case the robots use laser aiming device, it is strictly prohibited to aim at the human eye and cause unnecessary injury.
- T51.** In case the team modifies the laser pointer and uses it as the laser aiming device, the power source of the laser aiming device must be the same with the original device and this power source must not transfer energy to another robot structure.

Team Number

- T52.** The team number is the only way to identify the team and their robot during competition. The team number needs to be printed and attached on the side of the robot (with a frame or a specially designed structure).
- T53.** Team number's printed font should be Times New Roman, black, bold, size: 140 (or height of single character must higher than 3.5 cm) and the background should be in light color.
- T54.** The visible range of the robot's Team Number should not less than 270 degrees. A flat plane has 180 degrees of visible range.
- T55.** The Team Number of the robot must be firmly fixed on the robot and able to sustain the impact during the competition.
- T56.** Robots that do not conform to this requirement will not be allowed to participate in the competition.
- T57.** The team can use the sample version of the team number provided by the MakeX Robotics Competition Committee. Detailed

information can be downloaded from the official BBS. The example diagram is as follows:



Fig 4.1 Team Number

5. Competition Rules

5.1 Safety

Dangerous Structure

R01. When the robot is not started, if a certain part of the robot is loose and may cause injury to people, it must be taken the safety precautions.

- ⊙ The team who is against this rule will be warned. The contestant needs to correct the robot. Otherwise, the robot will be suspended.

Violating Materials

R02. Robots are strictly prohibited from having the following materials or parts:

- Flammable gas, fire or smoke generating equipment, hydraulic oil or hydraulic components, switches or contactors containing Mercury;
- Hazardous materials (such as lead);
- Any material processed in any manner during the competition;
- Ballasts and counterweights that do not guarantee safety, such

as sand, may be scattered in the competition;

- Materials that may cause unnecessary entanglement of the robot;
 - Material with sharp edges and angles that can easily cause injury;
 - Use materials made from animals (for health and safety reasons);
 - Materials containing liquids or gelatinous substances (except glue or lubricating oil that meets the requirements);
 - Materials that may delay the competition once being released, (e.g., coffee beans, soybeans, rice, etc.)
 - Any spare part that the electric current on the robot may be conducted to the arena.
- ⊙ The robot who is against this rule will be suspended. It needs to be modified and inspected before it can be back to the competition. Repeated against this rule twice will result in disqualification.

Damage or Contamination of Arena

R03. Robots should not make malicious "climbing" and "bumping" movements to the boundary of the arena and the Central Barriers during the competition. They should not cause the missing of any element in the arena, otherwise they will be considered unsafe for the arena. At any time, the referees judge that they are unsafe or have damaged the arena or other robots.

- ⊙ The team who is against this rule will be warned. The contestant needs to correct the robot. Otherwise, the robot will be suspended.

R04. Under the preconditions without contaminating the arena and other robots, glue, adhesive tape and lubricating oil can be used. In the case of contamination, the robot will be judged as unsafe. Robots should not use double-sided adhesive tape or glue to paste the arena elements throughout the whole competition.

- ⊙ The robot who is against this rule will be suspended. The robot needs to be modified and inspected before it can be back to the competition. Repeated against this rule twice will result in disqualification.

Damage Other Robots

R05. At any time, the referees can decide that the robots are unsafe

such as have damaged other robots on the arena or not.

- ⊗ The robot who is against this rule will be suspended. The robot needs to be modified and inspected before it can be back to the competition. Repeated against this rule twice will result in disqualification.

Robots Out of bound

R06. During the competition, no part of the robot can be out of the boundary of the arena.

- ⊗ The robot who is against this rule will be suspended. The robot needs to be modified and inspected before it can be back to the competition. Repeated against this rule twice will result in disqualification.

Other Unsafe Factors

R07. In addition to the above issues, the referees are entitled to decide whether a specific robot is safe or not.

- ⊗ The robot who is against this rule will be suspended. The robot needs to be modified and inspected before it can be back to the competition. Repeated against this rule twice will result in disqualification.

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5.2 Operation Rules

Operation Team

R08. Each team sends one operator and one observer for competition. Each side's operation team includes two operators and two observers, one of the operators or the observer will be the captain of the alliance.

R09. The robots are operated by their operators to complete the mission for each competition.

R10. The operator and the observer can freely switch the roles during the competition.

Contestants' Requirements

R11. Contestants should wear goggles during the preparation of the competition, debugging robots, and on-arena competition.

R12. In the links such as preparation for the competition, debugging robots, on-arena competition, contestants who have long-haired

should be tied up. Contestants should not wear toe-proof shoes to enter the arena.

Contestants' Standing Position

R13. The activities range of the contestants during the competition shall be inside the operating area, as shown in the following figure:

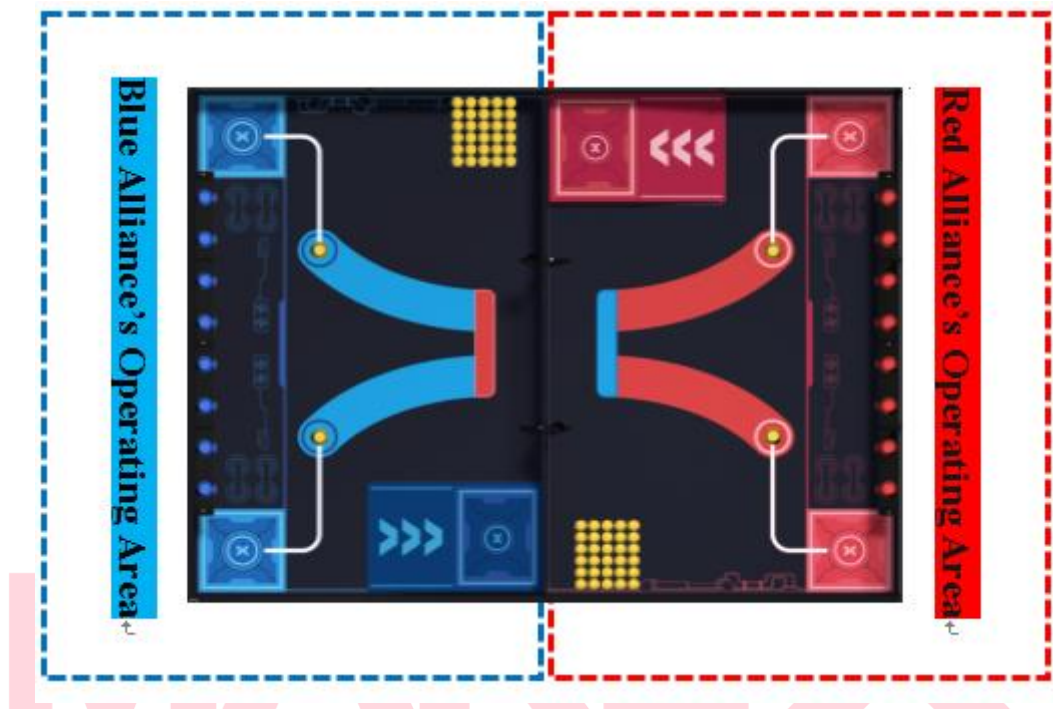


Fig 5.1 Figure of Operating Area

Violation of the Competition Requirements

R14. Contestants violate the competition requirements at the competition arena.

- ⊙ The team will receive a violation for the second time.

Elimination Tournament

R15. During three sessions of the single match, it is not allowed to substitute the operator and the observer.

- ⊙ The team who is against this rule will be given a Red Card.

R16. Each alliance has 5 minutes for adjustment after the end of per session, no timeout allowed.

- ⊙ The team will receive a Warning for the first time, Yellow Card will be given at the second time.

Radio Interference

R17. Except for the electronic communication devices that allowed in

the competition, other electronic communication devices shall not be enter the competition arena (mobile phones, transceiver wireless devices, wireless networks, etc.).

- ⊙ The team will receive a violation for the first time, Yellow Card will be given at the second time.

Robot starts in advance

R18. Robots shall not be started until the Referee announce the start of the competition.

- ⊙ The team will receive a violation for the first time, Yellow Card will be given at the second time.

Delayed end of the competition

R19. At the end of the Automatic Stage, Manual Stage and the Final Stage, the operator shall stop operating the robot or stopping the motion program of the robot (except for the motion caused by the inertia of the robots).

- ⊙ The team will receive a violation for the first time, Yellow Card will be given at the second time. If the delayed end of the competition brings the offender an advantage in the competition, the referee shall judge an invalid scoring and try to reset the original state of the arena.

Violating contact

R20. Except the Modification Stage, the contestants should not touch such arena elements as the scoring props, the arena's frame and the robots etc. during the competition, including but not limited to the cases where the operator leans on the fence and the contestants pushing the robot position. In case the contacts occur outside the arena due to the normal movement of ammunition and other props, they are not bound by this rule.

- ⊙ The team will receive a violation at the first time. In case of the scoring due to the violation contacts or the impact on the progress of the competition, the team will receive a Yellow Card.

Physical Affects the Competition

R21. During the competition, the operation team should keep its body projection out of the arena, so as to avoid possible obstruction of the opponent's robot attack route and other factors affecting the progress of the competition. Except the action of moving robots in and

out of the arena during the Modification Stage.

- ⊗ The team will receive a violation for the first time, Yellow Card will be given at the second time.

Use Remote Control in Automatic Stage

R22. Bluetooth controller or other ways shall not be used to manually control the robots during the Automatic Stage.

- ⊗ The team will receive a Red Card for the first time.

Operate Suspend Robot

R23. When the robot is suspended, the operation teams cannot continue to control it.

- ⊗ The team will receive a violation at the first time. In case a serious situation will received a Yellow Card. Depending on how serious of the situation the team may receive disqualification.

Robot Left-Behind Parts

R24. During the competition, the robots cannot be detached (Detachment refers to the detachment from the main body of the robot, which it is not under control) their parts or mechanical devices left behind in the competition arena. Except that the disconnections caused by collisions of opponent's robot or contact of other robots.

- ⊗ The team will receive a violation in case it affects the progress of the competition. Yellow Card will be given at the second time.

Violation Attacking

R25. Robots are not allowed to project the arena elements from the above of its own arena to the other arena. (This rule will be violated by projecting an alliance flag or a ball bottle, etc.)

- ⊗ The team will receive a Yellow Card.

Maliciously Interfering Opponents to Insert Their Flag

R26. In the Final Stage, after the opponent robot has successfully inserted their flag, it is not allowed for the robot to use any of its own subsystem to intervene or damage the opponent' s flag.

- ⊗ The team will receive a Red Card.

Separate Arena Elements and Robots

R27. Robots should be designed to easily remove the competition elements from any mechanical structure of grabbing, containing or holding. Even if under the circumstance that the power supply is

disabled or cut off, the robot should be taken out of the arena without damaging the arena.

- ⊗ The team will need to modify the robots. Disqualification will be received at second time.

Completely In the Opponent's Arena

R28. In the process of competition, the whole Subsystem 1 of the robot cannot enter the opponent's arena through the hollow part under the Central Barriers, nor can the whole body extend into the vertical projection plane of the opponent's arena; this rule does not penalize the robot that part of the body enters the opponent's arena.

- ⊗ The team will receive a Yellow Card at the first time.

Restrict the Movement of the Opponent's Robot

R29. Robots should not keep back the opponent's alliance robots from moving in all directions or from touching the arena elements.

- ⊗ The team will receive a violation at the first time. In case serious violation the team will receive Yellow Card.

R30. As part of the body of the robot or Subsystem 1 enters the opponent's area, the opponent's alliance robot is pinned or held, the referees may suspend the competition as the case may be and warn the vehicles of two sides to separate as soon as possible. If one of the robots is found to have deliberately pinned the other's robot, the offender will commit a violation, and he will receive a yellow card.

- ⊗ The team will receive a violation at the first time. In case serious violation the team will receive Yellow Card.

Mentoring in Violation

R31. Throughout the whole process of the competition, no relevant person except the contestants of the team, including but not limited to the parents or mentors of the contestants, cannot enter the competition area by any means and give any form of mentoring. In case of the mentoring in violation, the referees are entitled to disqualify the team on the spot.

- ⊗ The team will receive a Warned at the first time. In case serious situation the team will receive a violation. Depending on how serious of the situation the team may receive disqualification.

Contact out of Arena

R32. During the competition, contestants are not allowed to have any direct contact with off-arena people and audiences, including but not limited to the delivery of the parts and remote-control handles.

- ⊖ The team will receive a Warning for the first time, violation will be given at the second time.

Rude Action

R33. It will be deemed as the Rude Action when such cases for the operation team, the contestants and the mentor show up, including but not limited to the impolite behavior, seriously affecting the arena and the safety of the audience, leading to the failure of the normal progress of the competition. Rude actions are including but not limited to: serious violations of the spirit of competition, side-line mentoring, repeated or blatant violations; uncivilized acts against operators, coaches, **working staff** or contestants; repeated or blatant violations of safety, etc.

- ⊖ The team will receive a Warning for the first time, violation will be given at the second time. Depending on how serious of the situation the team may receive disqualification.

Uncivilized Participation

R34. In participating in the activities such as the technology sharing, robotic exhibition, observation of competition, contestants and mentors should ensure respect for other teams, maintain the neatness and order of the arena, and show the action principles in good images of the MakeX competition.

- ⊖ Depending on how serious of the situation the team may receive disqualification.

5.3 Modification Stage Rules

The Robot does not Enter the Starting Area Before Modification Stage

R35. At the end of the Manual Stage, the robot needs to be taken out from the Starting Area for Modification Stage. In case the robot does not Enter into the Starting Area, it will not be allowed to perform any operations during the Modification Stage.

- ⊖ The team who modifies the robot that does not enter into the Starting Area will receive a red card.

Modify Outside the Designated Area

R36. The team can only modify the robot after the vertical projection of the robot is completely outside the Arena. Any modification cannot start when the robot is lifted just above the Arena.

- ⊗ Team who is against this rule will receive a violation.

Change State of the Arena Elements

R37. Contestants should not change the state of the Arena Elements on purpose or touch the props when they are taking out the robot. The Arena Elements taken out by robots is not included, but they need to be put back into the Arena according to instruction.

- ⊗ The team who is against this rule will receive a violation. If the state changing brings scoring advantage in the competition, the referee can withdraw the scoring and reset the arena state before the violation.

Indirect Contact

R38. When contestant taking out the robot, if the robot has contact with the props on the Arena in any form, it will be deemed as the Indirect Contact with the props, and the contacted props will be deemed as the invalid Scoring State.

- ⊗ The team who is against this rule will receive a violation. If the indirect contact brings scoring advantage in the competition, the referee can withdraw the scoring.

The Robot does not Enter the Starting Area After Modification Stage

R39. The robot should be placed in their own Starting Area before the end of the Modification Stage. The robot should not contain any Arena Elements.

- ⊗ The robot who against this rule will be suspended.

Robot's Requirements after Modification

R40. The robot after the Modification Stage should conform with the modification state at the time of inspection, including but not limited to the Maximum Modification Size. (The height of Robot is not limited.)

- ⊗ The team who against the rule will receive a Red Card.

5.4 Abnormal Situation

When something unexpected happens, the referee has the right to pause the

competition and take action. Including but not limited to following situation:

Potential safety Risk

- E21.** The competition venue emerges problems that might affect the safety of teams or robot.

Uncontrollable Technical Issues

- E22.** The competition cannot continue because the robots or competition systems in the Arena is interfered by radio wave or other uncontrollable technical issues.

Damage of Arena or Prop

- E23.** The props or arena are damaged accidentally, and the competition cannot continue.

Re-competition

- E24.** Referees have the right to discuss and determine if a Re-competition is necessary according to the actual situation. The reason for Re-competition may because of the error of competition process or unexpected situation.
- E25.** During the Automatic Stage, if the competition is paused, Re-competition will be arranged to keep fairness.
- E26.** The abnormal situation is caused by the team themselves such as low battery life, failure of robot's parts, communication errors or the defect of Power Management Module will not lead to Re-competition. (Power Management Module check point is set near the Arena for team to verify the function of Power Management Module) Other defects of the robot itself will not lead to re-competition.

Abnormal Change of Arena Elements

- E27.** During the competition, the state of the Arena Elements is changed because of an abnormal action such as the effects from outside of the arena.

Resume from Pause

- E28.** After the Abnormal Situation is solved, the paused competition can be resumed from the time of pause.
- E29.** Contestants should keep positive attitude after the competition pause. If they cannot continue the competition due to unexpected reason, they should sign and confirm in the Arena or inform the MakeX Robotics Competition Committee by other means. The other

teams need to continue that competition normally.

5.5 Punishment

Warning

- E30.** The referee gives the team an oral notice, Warning, and requires the team to stop violating the rules and obey the referee's instructions. During the Warning, the competition will be timed normally.

Violation

- E31.** When referee discovers that the team has violated the rules, the violation notice will be given immediately and 20 points will be deducted to the alliance. During the violation, the competition will be timed normally.

Yellow Card

- E32.** When the contestant's or related person's action that seriously affect the fairness of the competition or violate the safety principle, the alliance will receive a Yellow Card with 60 points deduction for both alliances.

- E33.** Accumulation of Yellow Card: In Qualification Round, the accumulation of Yellow Card for each Single Match is counted for one team. If one team receives two Yellow Card, it will be upgraded to Red Card. In the Elimination Tournament, the accumulation of Yellow Card for each Session is counted for one alliance. If one alliance receives two Yellow Cards, it will upgrade to Red Card for the alliance.

Red Card

- E34.** When the contestant's or related person's action that extremely affect the fairness of the competition or violate the safety principle, the alliance will receive a Red Card with 120 points deduction for both alliance teams. The robot will be suspended. During the Automatic Stage, if a team receives a Red Card, the team's robot must be taken out from the Arena after the Automatic Stage.
- E35.** Object of Punishment: In the Qualification Round, the Red Card will be given to team only. When a team received a Red Card, the team will be deducted for 120 points and their robot will be suspended but the competition will continue normally. In case both

teams from one alliance receive red card, the alliance will directly be Loss and record the final points at that time. (After deduction, if the point of the losing alliance is higher than that of the winner alliance, the final points will change to winner alliance has 10 points advantage than losing alliance)

In the Elimination Tournament, the Red Card will be given to alliance only. When a team received a Red Card, their alliance will directly be Loss and record the final points at that time. (After deduction, if the point of the losing alliance is higher than that of the winner alliance, the final points will change to winner alliance has 10 points advantage than losing alliance)

Suspend

E36. If the robot is defect (such as parts falling) or violating of safety principles, the robot will be suspended by stop movement and remain still on Arena until the end of the competition. During the Automatic Stage, if a robot is suspended, it must be taken out from the Arena after the Automatic Stage.

During the Modification Stage, if a robot is suspended outside the Arena, it must not be put back in the Arena.

When the defected robot may against the rules such as "Damaging the Arena", the contestants can apply to the referee for Suspend their robot. The referee has the right to use Suspend according to the actual situation on the Arena.

Disqualify

E37. Team's action which serious violates the safety rules, the spirit of the competition or etc. will result in disqualify for competition awarding but points will be kept. In the Qualification Round, if two teams from same alliance are disqualified, the competition will proceed as usual. In the Elimination Tournament, if two teams from same alliance are disqualified, the other alliance will win the competition.

5.6 Explanations

R41. To ensure fair and high-quality competition experience, MakeX Robotics Competition Committee has the right to update this Guide regularly, and to publish and implement necessary changes before the

competition.

R42. During the competition, all matters not specified in the Technical Guide can be decided by the referee team.

R43. This Technical Guide is the reference for the referee. During the competition, the referee has the right to give final decision.

6. Technical Guide Statement

The official language for MakeX is Chinese. English translation is prepared to facilitate the team's preparation process. All documents translated to English are for reference only.

The MakeX Robotics Competition Committee reserves the final interpretation of MakeX Robotics Competition - Technical Guide for Courageous Traveler.

7. Disclaimer

All contestants in 2019 MakeX Robotics Competition shall fully understand that safety is the most important issue for the sustainable development of MakeX Robotics Competition. To protect the rights and interests of all contestants and organizers, according to relevant laws and regulations, all contestants registered for the 2019 MakeX Challenge - Courageous Traveler, shall acknowledge and abide by the following safety provisions:

Contestants shall take adequate safety precautions when constructing the robotics, and all parts used for constructing the robotics shall be purchased from legal manufacturers.

Contestants shall ensure that the structural design of the robotics takes into account the convenience of the inspection and actively cooperate with the host of the competition.

When modifying and using the parts with potential safety hazards for the robotics, it must conform to the national laws, regulations and quality & safety standards. Those operations shall be manufactured and operated by persons with relevant professional qualifications.

During the competition, the teams shall ensure that all the actions such as

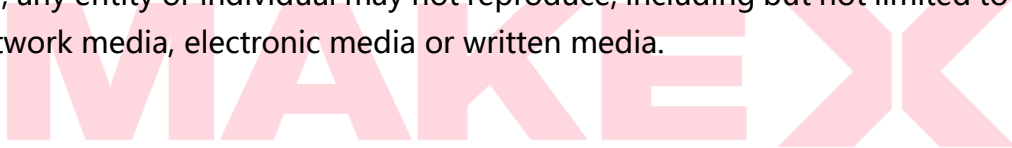
construction, testing and preparation will not do harm to their own team and other team, referees, staff, audiences, equipment and arenas.

In the process of construction and competition, if any action that may violate the national laws, regulations or standards occur, all consequences will be borne by the contestants themselves.

The competition kits and parts sold and provided by the supporter, Shenzhen Makeblock Co., Ltd., shall be used in accordance with the instructions. Shenzhen Makeblock Co., Ltd., Shenzhen Hulu Maker Co., Ltd. and MakeX Robotics Competition Committee will not be responsible for any injury or loss of property caused by improper use.

8. Copyright Declaration

Shenzhen Hulu Maker Co., Ltd. reserves the copyright of this Technical Guide. Without the written consent or authorization from Shenzhen Hulu Maker Co., Ltd, any entity or individual may not reproduce, including but not limited to any network media, electronic media or written media.



Appendix 1: Competition Resources

MakeX Official Website: <http://www.makex.io/en>

Any Feedback & Question Please Sent to:
info@makex.cc

Additional Information:
<http://www.makex.io/information/download/>



Appendix 2: MakeX Challenge

Robot Self-check List (Courageous Traveler)

MakeX Challenge Robot Self-Check List (Courageous Traveler)			
Size and Weight of Robots			
SN	Items	Specific Requirements	State
1	Size	<p>The initial size is the size that the robots are in a stationary state before the start of the competition.</p> <p>Maximum size refers to the size of the robot moving to the limit state during operation.</p> <p>The initial size requirement of the robot at the start of the competition is 500 mm (long) x 500 mm (wide) x 500 mm (high).</p> <p>After intensified modification, the initial size of the robot before restarting is required to be 500 mm (long) x 500 mm (wide) x unlimited (high).</p>	
2	weight	<p>The weight of the robot is less than 8 KG. (Including the weight after the</p>	

		modification; the weight after the installation of batteries).	
Safety			
3	Risks structure	Safety protection is required for the structures that may cause injury to people in the process of clamping, handling and using the machines.	
4	Damaged arena	In the process of loading, unloading, handling and using the machine, there shall be no act of the obvious damage to the arena.	
5	High power tools	No high-power equipment during loading, unloading and operation.	
6	Unsafty energy storage equipment	In the process of using the unsafety energy storage equipment (springs, etc.), safety shall be ensured.	
8	People's safety	In the competition, contestants shall wear goggles; long hairs shall be tied up; contestants are prohibited from wearing toe-baring shoes into the competition arena.	
9	Banned substance	Robots are not allowed to use the flammable gases, fire or smoke generating equipment, hydraulic components, Mercury-containing switches, exposed	

		hazardous materials, unsafe counterweights, designs that may cause entanglement and competition delays, sharp edges and angles, materials containing liquids or gelatinous substances, and any part that the electric current on the robot may be conducted to the arena.	
Robot's Modules			
10	Flag	The flagpole is limited 260-400 mm, and the diameter is 6-21 mm (both solid and hollow are acceptable). The flag surface must be regular rectangular; the length should within 180~240 mm and the width should within 120mm~160mm.	
11	Controller	The competition shall specify the controller to be used, and it is only be used by the operator.	
12	Mainboard	The required mainboard shall be used by the competition, and there is only one receiving module matched to use by the mainboard and the remote control.	
13	Power supply	Batteries with specified parameters are used as power supply and shall be securely fixed inside the robots. Each robot can only use one battery (In addition	

		to the required laser sight devices). Detailed parameters are: 3S Li-Po batteries, output voltage: 11.1v, discharge rate: 30c.	
14	Battery Management Module	Battery management module can run in a supporting way according to the requirements of the competition system: supporting to complete three actions: support completing the power on, power cut and starting the automatic program.	
15	Self-customized parts and accessories	Self-customized parts can be used: plates, profiled materials, 3D printing pieces, metals, wood, plastics, rubber, magnets; Auxiliary materials' use requirements: It is allowed to use the ropes, cables, wires, springs, rubber bands, leather hoses, surgical tubing, punched sheets, injection molded products; It can use a single-freedom complete commercial products package and system wheels; It is not allowed to use the multi-freedom commercial products package.	

16	Sounds and Lights	<p>There is no light source except the laser sight device and the indicator light self-contained of the mainboard or the sensor with its power less than 5 mW (Limited to only one);</p> <p>No other sound generating device is allowed except the buzzer on the mainboard.</p>	
		<p>In case it requires the independent power supply when the teaching laser pen is used to be modified into the laser sight device, it can only use the configured batteries (such as dry batteries) of the device, and the batteries cannot transmit energy for the power system of the robot. If it is not a common laser sight device, please provide the corresponding model and parameters for query and verification.</p>	
17	Smart Servo	<p>The teams can only use the smart servo equipped with the official equipment package or the same type of smart servo (MS-12A), the maximum number of servo available on a robot is 6 pieces.</p>	
18	Motor	<p>The robot shall use the required DC Motors ,Optical Encoder</p>	

		Motors(37 DC Motor, 180 smart Motors manufactured and sold by Shenzhen Makeblock Co., Ltd.) ;and the maximum number of them is 12) to ensure the fairness of the competition.	
19	Robot angle-wrapping	The exposed sharp edges of the robots have to be wrapped with sponge strips.	
20	Separation/abscission	It is not allowed that there are parts detached from the main body of the robots in the completion. The arena parts may be detached from the robots.	
21	Interference	Cannot interfere with the electronics and sensors of other robots.	
22	Team Number	Team number's printed font should be Times New Roman, black bold, size: 140 (or height of single character must higher than 3.5 cm) and the background should be in light color.	
23	Project note submission	Submit project notes containing the source code of the robot control before the competition.	
24	Arena contamination	Lubricating oil etc. used by robots shall not contaminate the venue or other robots.	

Appendix 3: List of Violations and Penalties

scope	Items	Generalization	Violation	Yellow card	Red card	Suspended.	Disqualification
Check-in rules	Use the robots that unqualified of the check-in status.	The contestants have to modify the robots that unqualified until pass the check-in.					✓
	Risks structure	In case it is found that the structure of the robots may injure human, they should be modified immediately after warning.				✓	
Safety rules	Damaging arenas or other robots	Two or more violations will be disqualified				✓	✓
	Use banned substances	In case it is found that the use of the banned substances by contestants, it will be prohibited, and two or more violations will be disqualified.				✓	✓
	Contaminating of arena	Under the preconditions without contaminating the arena, the glue, adhesive tape and				✓	✓

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		lubricating oil can be used by the robots; In case it is found violated with this rule, they will be prohibited to use, and second violation will be disqualified.					
	Robots Out of bounds	No part of the robot can be out of the boundary of the arena.				✓	
	Other unsafe factors	In case the referees find the other unsafe factors of the robots, they are entitled to request the contestants not to use such robots and make modifications. Second violations will be disqualified.				✓	✓
Operati on rules	Bring electronic communication devices	Two violation may be penalized by showing a yellow card.	✓	✓			
	Delayed end of the competition	The corresponding score will be deducted.	✓				
	Violating contact	A yellow card will be received if it affects the score or the progress of the competition.	✓	✓			
	The human body is not allowed to	A yellow card will be given for two violations	✓	✓			

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	extend into the arena to affect the opponent to score.						
	Manual control at the Automatic Stage.	In the Automatic Stage, the controller should be placed in the storage basket.			✓		
	Robots leave behind the spare parts in the arena	Giving violations according to the seriousness of the circumstances, a yellow card will be given for two violations.	✓	✓			
	Remove the arena elements from the arena.	The scoring behavior is not included.	✓				
	Projecting the arena elements that are not allowed to be projected to the opponent's camp	In case of resulting in the change of elements in the opponent's camp, it should be suspended for restoration.		✓			
	Arena elements are difficult to remove from robots.	Repeated violations affecting the progress of the competition will be disqualified.					✓

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	Completely in the opponent's camp	If it fails to return to its own camp after a penalty, it will be penalized by a red card.		✓	✓		
	Pinning or holding opponent's robots	A penalty will be given for deliberately holding the opponent' s robot.	✓	✓	✓	✓	✓
	Operating prohibited robots	Please don't operate the robots that have been prohibited. For the first time, offenders will be penalized for violations. For serious violation, a yellow card will be given until the disqualifications of the competition.	✓	✓	✓	✓	✓
	Overdone act	Overdone acts are including but not limited to: repeated or blatant violation, Impolite behaviors to the operators, referees, working staff , or contestants; Repeated or blatant violations of safety; Two violations will be penalized and disqualified.	✓	✓	✓	✓	✓
	Mentoring in Violation	The team will receive a Warned at the first time. In case serious situation the team will	✓	✓	✓	✓	✓

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		receive a violation. Depending on how serious of the situation the team may receive disqualification.					
	Contact and exchange parts outside the arena	It is strictly prohibited to take place during the competition.	✓	✓	✓	✓	✓
Modification Rules	Forced modification without entering the Starting Area	Entering the Starting Area is subject to the contact of the bottom of the robot with the Starting Area.			✓		
	Modification in the arena	Contestants have to modify outside the arena.	✓				
	Initiatively change the competition arena elements in the Modification Stage	The arena elements removed from the robots will not affect the state changes of the other of elements as they are placed in the arena.	✓	✓			
	Failure to enter the arena before the end of the Modification Stage	The robot can't enter the arena anymore.				✓	
	After modification, bring arena elements into the arena	Robots carrying arena elements are not allowed to enter the arena.				✓	

	Incompatible the check-in status after modification	If there are any major changes, they should declare to the referees for inspection after being put into the arena.			✓		
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Appendix 4: Instructions for Li-Po Battery

To ensure the safety of Li-Po battery, each team should designate a person to supervise the safe use of Li-Po battery and to popularize the knowledge of the safe use of Li-Po battery to teammates. In the process of use, the following issues should be noted:

- Please use the Li-Po battery while ensuring that you carefully read and understand the guidelines for safe use of it.
- Safely charging and discharging
 - Only to use the special charger for Li-Po battery matched by the manufacturer and scrutinize the Guide for the use of the charger. Please make sure that someone is nearby during charging. In order to deal with emergencies immediately, please do not overcharge or over-discharge. A single battery cell with 4.2V is overcharge, and cell with less than 3.0V is over-discharge. Overcharge may cause the explosion of the Li-Po battery. Over-discharge can easily damage the battery and shorten the service life of it.
 - Please check the battery's voltage and quantity of electricity carefully before charging or using.
 - Please charge the battery at 0-45 °C.
 - Safe storage
 - The battery cannot be overheated any time. When the temperature of the battery cell is as high as 60°C, there will be potential safety hazards, even burning.
 - When charging, the battery should not be closely or placed directly on flammable materials (paper, plastic, etc.). If conditions

permit, it is best to charge it in a fire-proof safe box.

- Do not put batteries near liquids, open fire or heaters. Place batteries out of reach by kids.
- Do not open and restructure the batteries arbitrarily or change its wiring, do not self-assemble the batteries privately, open and restructure the old batteries cells, or restructure one of the opened battery cells with another battery pack. This act is risky (without the particular assembly instrument, it can easily cause short-circuit combustion).
- In case the collision occurs during use, please remove the battery. Please carefully check whether the battery and connector are normal, just in case. (Note: Batteries may be overheated with high temperature.)
- Do not spill electrolyte on eyes or skin. In case it spills inadvertently, please wash it with clean water immediately. In case it is serious, please seek medical attention immediately.
- No short circuit is allowed (positive and negative poles are connected).
- Do not directly contact the leaked battery.
- About the long-term unused battery, please ensure a charge-discharge activation within 3 months to maintain the stability of it.
- During the storage and transportation of Li-Po battery, please place them in the special fire-proof safety bags or safety boxes.

Appendix 5: Instructions for Power Management Module

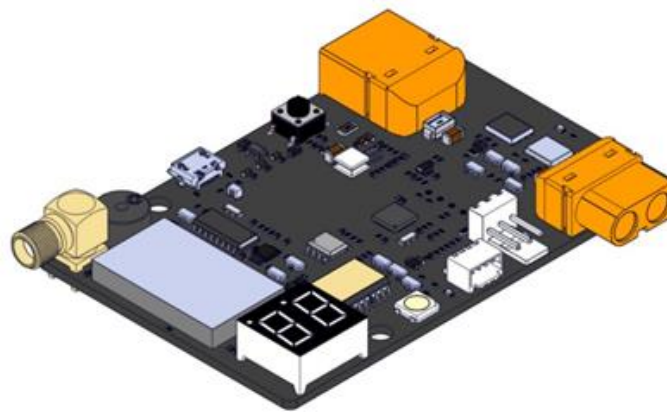
Instructions

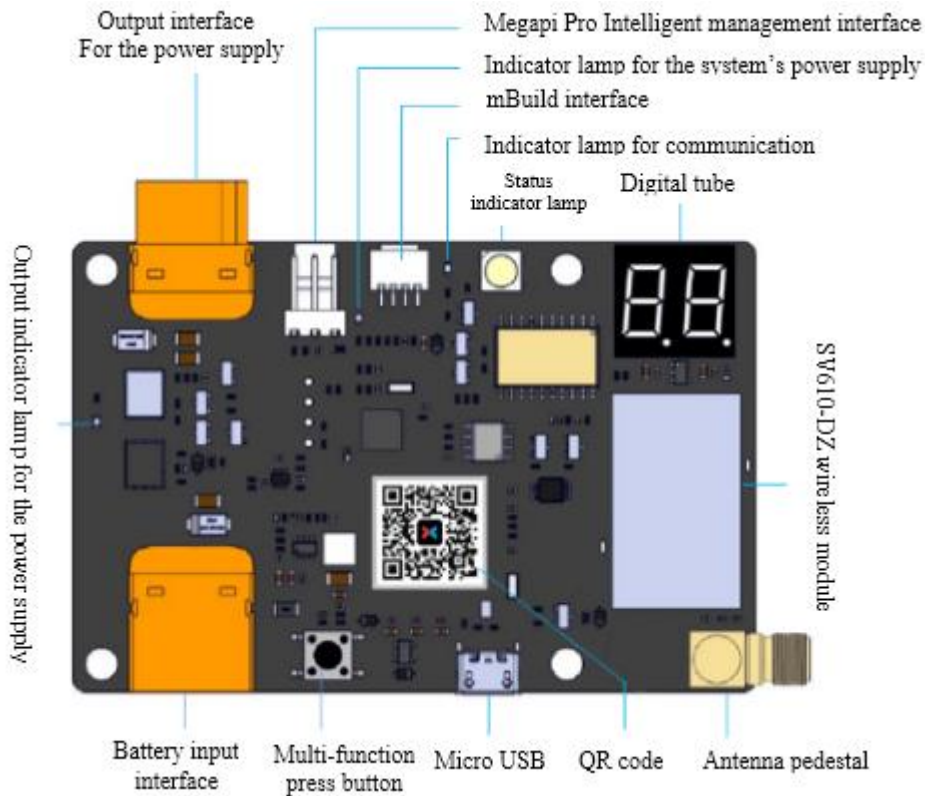
The power management module is used in coordination with the mainboard (NovaPi), which is a necessary electronic device to participate in the competitions of Courageous Traveler and Strong Alliance, 2019 Season.

During the competition, the power management module is wirelessly connected with the MakeX competition system, so that the MakeX competition system can control the power supply of the teams' robots, as well as switch between automatic and manual programs.

Module's size: 85mm x 56mm x 11.5mm;

Working voltage: 6V - 12V;





On-board LED Lamp

The LED light includes a power supply output indicator lamp, system power supply indicator lamp and communication indicator lamp.

- Power supply output indicator lamp: When the power supply has output, the red indicator lamp is always on, and when the power supply is disconnected, the red indicator lamp is off.
- System power supply indicator lamp: The red indicator lamp of the system power is always on when the module is working.
- Communication indicator lamp: The blue communication indicator lamp flash when the module updates his firmware;

Status indicator lamp (RGB lamp)

The status indicator lamp is mainly divided into four statuses: off, red, green and blue.

- Off: The Bluetooth module is tested after the power management module is powered on. When the Bluetooth module cannot be detected, the RGB lamp is off;

- Red: After normal power-on, click the button and the RGB lamp flashes red one time;
- Green: In the Manual Stage of the competition;
- Blue: In the Automatic stage of the competition.

Digital tube

The two-digit digital tube is mainly used to display the current channel number and an abnormal state of the wireless communication module.

- In the normal state, the channel number of the current wireless communication module is displayed by the two-digit digital tube. The channel number of the wireless communication module is 1~40, so that the number displayed by the digital tube is 1~40. If the current channel is 16 channels, the two-digit digital tube displays the number "16".
- The power management module detects the wireless communication module when it is powered on. When the wireless communication module cannot be detected, the two-digit digital tube displays the letter "Er", meaning "error" .
- When the battery is low power, the two-digit digital tube displays the symbol "-" and the current channel number alternately.

Buzzer

The buzzer output reminding and warning sounds.

- The module will shortly buzz when the module is normally powered on and be detected, and the wireless communication module is online.
- When the power management module is reset, the buzzer will sound for 2 seconds;
- When the wireless communication module cannot be detected after power-on, the buzzer rings three times continuously.

How to use

Multifunctional button

Multifunctional button has four modes: Reset, Click, double-click and Long-press.

- Reset: Firstly, press the multi-function button and insert the Li-

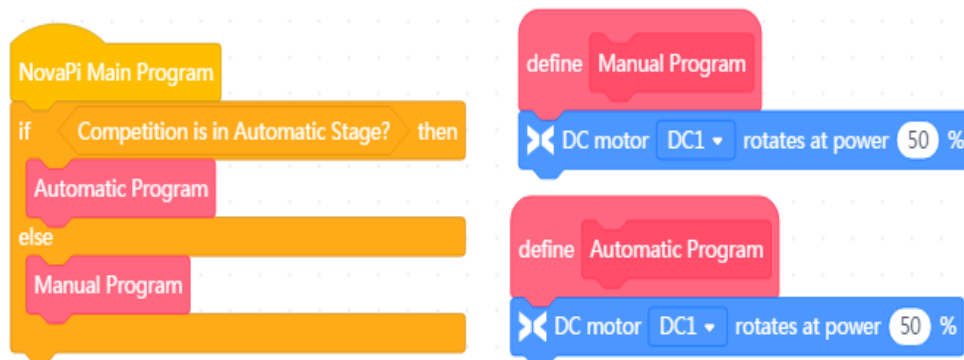
Po battery into the power management module at the same time. The power management module restores the default configuration parameters. The buzzer sound for 2 seconds and the nixie tube display the number "20";

- Click: Click the multi-function button one time, the power management module reports the Bluetooth module UID one time, and the RGB lamp flash red one time.
- Double-click: Double click the multi-function key once, the power management module will delay 3 seconds and switch between the automatic program and manual program (It can be observed whether the state switch is successful through the RGB indicator, the RGB blue lamp is always on during the automatic competition, the RGB green lamp is always on during the manual competition, and the RGB lamp flashes during the delayed switching). Double-click function is only valid when the Bluetooth module is defaulted to "20" channel (that is, only when the nixie tube displays the number "20";
- Long-press: Long press the multi-function key (2-3 sec.) to switch the output state of the power supply. That is if the current power supply is disconnected, the power supply connects after long pressing, the power supply output indicator lamp becomes red. If the power supply is connected, after long pressing, the power supply is disconnected, the power supply output indicator lamp turns off.

Signal Identification Code of Automatic Program starting

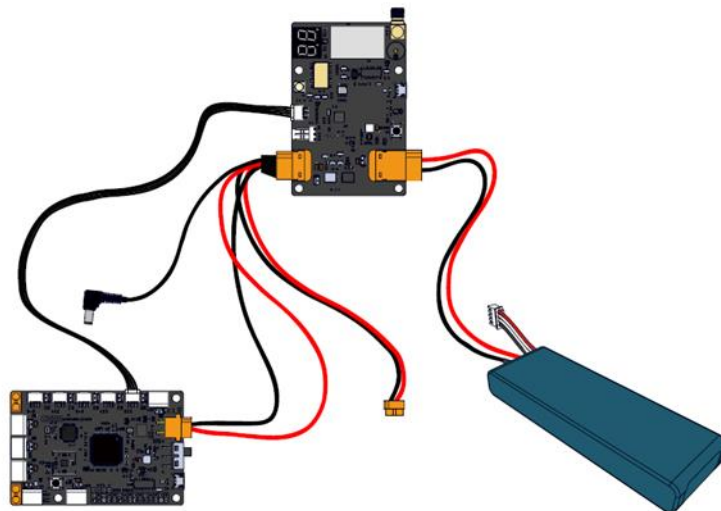
In the Automatic Stage, the competition system sends relevant instructions to the power management module of the robot, to shield the controller signal and start the automatic program of the robot. To start the automatic program on the mainboard normally, it is necessary to insert a fixed code into the program to identify the instruction to start the automatic program sent by the competition system (please put the program in the Manual Stage and the

Automatic Stage into the corresponding positions).



Suggestions for Installation and Use

- The power management module is a necessary electronic component for the competition. Please make sure that it is securely fixed, and cables are tightly connected. For protection, it is suggested to use an acrylic box for the power management module;
- The data cables leading to the mainboard must be connected firmly as the following picture:



- Adjust the position of the antenna to prevent it from interfering with the movement of other moving devices, and try to avoid the antenna too close to the large area of metal materials;
- The power management module must be fixed on the surface of the robot and be accessible to scan (power management module ID);
- The following operations are not allowed at any stage after the

start of the competition, especially during the Modification Stage:

- ⊗ The replacement of Li-Po battery or re-unplugging and re-plugging of the Li-Po battery.
- ⊗ Press the reset button of the power management module (any operation of the power management module is prohibited).
 - When the competition is finished, the robot needs to be re-powered by itself, and the power supply can be restored by unplugging and plugging the Li-Po battery;
 - The power management module corresponds to the teams' information in the competition system one by one. Please do not replace that module without authorization. If it needs to be replaced, please contact the **working staff**. Any problems caused by an unauthorized replacement of the power supply module shall be borne by the team.



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MAKE X

Official website: www.makex.io

E-mail: info@makex.cc

Facebook: MakeX

Instagram: makexofficial

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MakeX Robotics Competition Committee