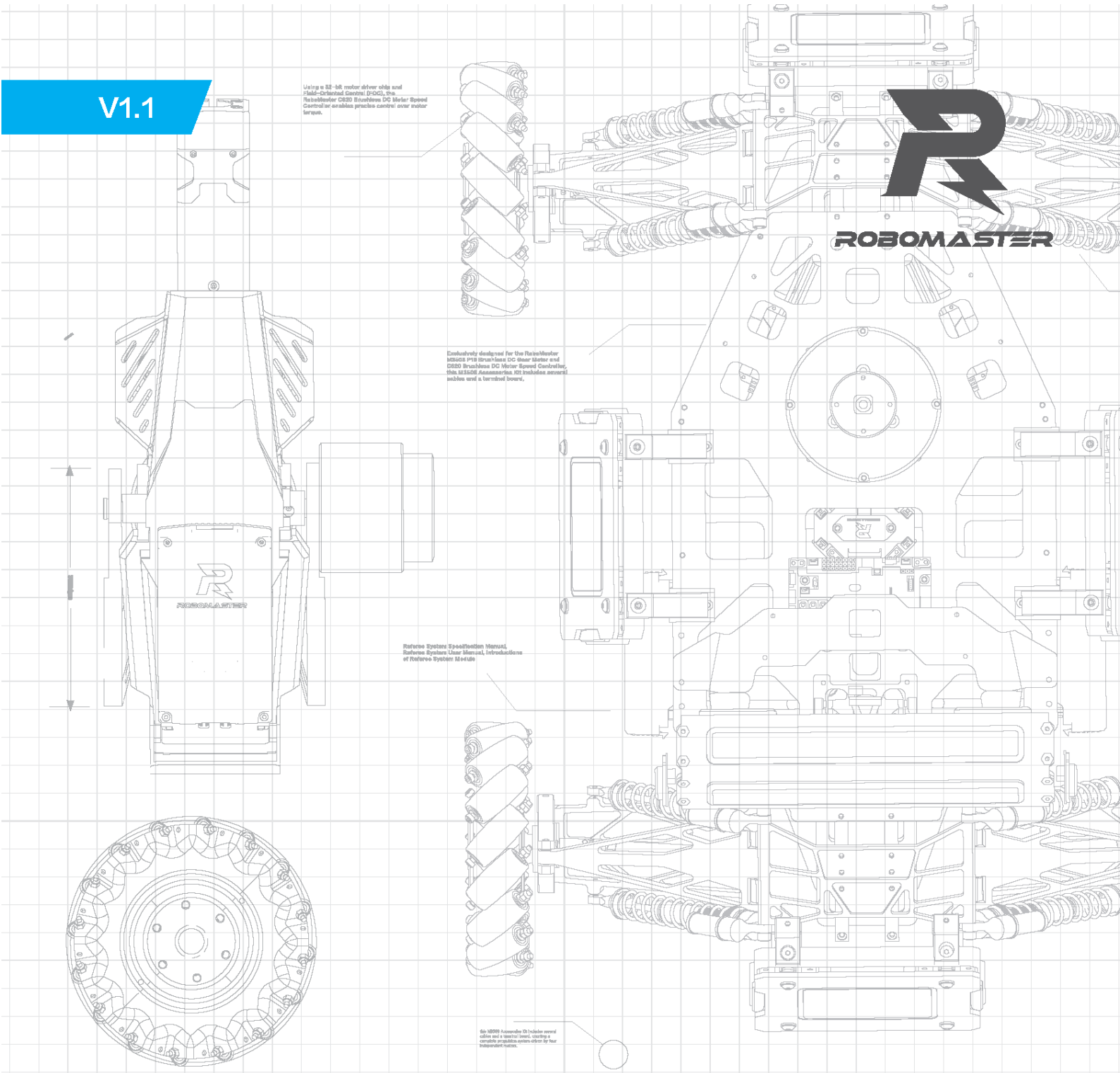
V1.1



ROBOMASTER

UNIVERSITY AI CHALLENGE

# REFEREE SYSTEM INSTRUCTIONS

Prepared by the RoboMaster Organizing Committee

Updated on February 2022

# Contents



# 1. Overview

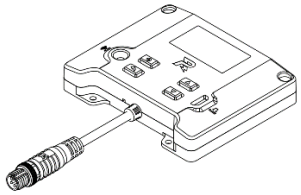
In RoboMaster University AI Challenge (RMUA), the Referee System in AI robots is an electronic penalty system for the robotic competition that integrates computing, communication, and control. It has functions such as detecting attacks by projectiles, and displaying the current HP and status of the robot. Users can use multiple Referee Systems to form a multi-robot combat system.

The Referee System in the AI robot consists of the following two parts:

1. The robot side modules of the Referee System (hereinafter referred to as “Robot Side”)
2. The PC server (hereinafter referred to as “Server”)

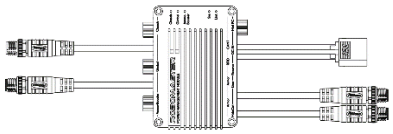
# 2. Robot Side

1） Main Controller Module (MC02): The Main Controller Module is the core control module of a Referee System. It can monitor the operation of the entire system, and integrates functions such as human-machine interaction, wireless communication and status display.



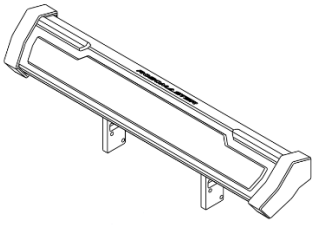
Main Controller Module

2） Power Management Module (PM02): The Power Management Module functions control power to the chassis, gimbal, and launching mechanism, transmit data, detect the chassis power consumption, and automatically cut off power supply for propulsion when a robot's HP drops to zero.



Power Management Module

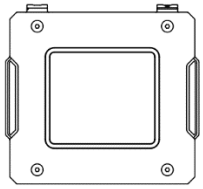
3） Light Indicator Module (LI01): The Light Indicator Module displays the robot's current HP and status. By observing the status of the light indicator, you can identify the remaining HP and status of your robot.



Light Indicator Module

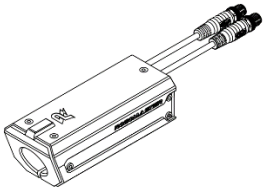
 

4） Armor Module (AM02): The Armor Module detects attacks by projectiles and collisions. An AI robot is equipped with four Small Armor Modules.



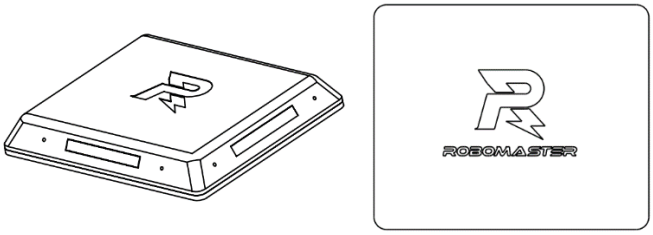
Armor Module

5） Speed Monitor Module (SM01): The Speed Monitor Modules detect the robot's initial firing speed and launch speed. An AI robot launches 17mm projectiles, so it is equipped with a 17mm Speed Monitor Module.



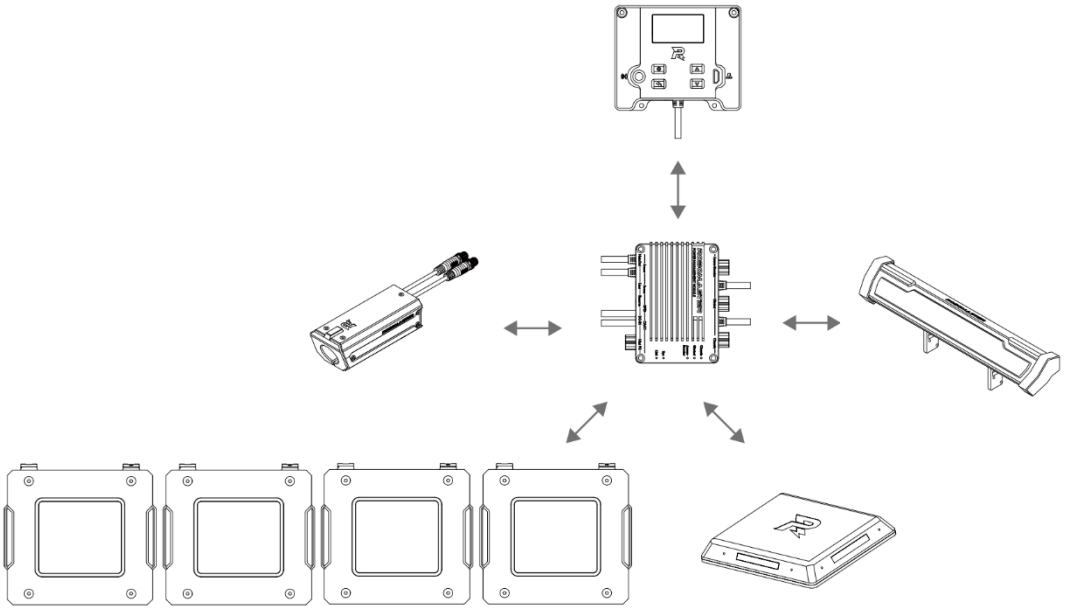
Speed Monitor Module

6） RFID Interaction Module (FI02): This module enables the Robot Side to interact with the battlefield.




RFID Interaction Module　　RFID Interaction Card

The connection diagram of the Referee System modules on the Robot Side is shown below:



Connection of Referee System modules on the Robot Side

# 3. Server

The Server is the control center of the referee system. It collects data from all robots and battlefield components during the competition, presents them to the referees in a visualized way, and automatically defers the competition outcome. To implement such functions, please download the RMUA server in the server PC.

# 4. Referee System Quick Start Guide

## 4.1 Robot Side Configuration

Refer to the "Description of Robot Side Functions" section of the RoboMaster Referee System User Manual to familiarize yourself with the interaction with the Main Controller Module of the Robot Side of the Referee System and check the functions of the Robot Side.

Notes:

1. When you use the system for the first time, make sure that all modules are properly connected and that the Armor Module ID is set correctly (**front armor: 0**, **left armor: 1, rear armor: 2, right armor: 3).**
2. For the RMUA, the AI robot serial number should be No. **1/2** of the **Red Team/Blue Team**, and the robot type should be Standard.
3. If the robot is not connected to the competition server, the offline mode must be set to supply power to the robot chassis, gimbal and the launching mechanism. Otherwise, the AI robot cannot be controlled remotely.
4. Since the AI robot's Referee System does not include the Positioning System Module, Video Transmission Module and Capacitor Module, you do not need to configure the above three modules, and it is normal to display the offline notifications of the above modules in offline mode.
5. After the function check, use RoboMaster Tool 2 to upgrade the Robot Side firmware:

| Referee System Modules | Module Firmware Versions |
|---|---|
| **Main Controller Module** | E7.0.0.18 |
| **Power Management Module** | E7.0.0.2 |
| **Light Indicator Module** | The latest version |
| **Armor Module** | The latest version |
| **Speed Monitor Module** | The latest version |
| **RFID Interaction Module** | The latest version |

If the firmware on the RFID Interaction Module of an AI robot 2019 cannot be upgraded to the latest version, there is no need to upgrade it and it will not affect the competition.

## 4.2 Setting up a LAN and the Server

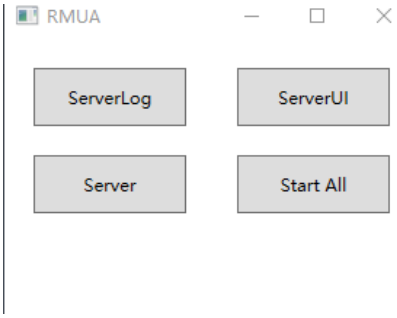
When the Main Controller Module on the Robot Side and the Server are using the same LAN, the Robot Side can be connected to the server for online combat. The following steps demonstrate how to set up a LAN:

1. Use a 2.4G (Referee System only supports 2.4G) wireless router with a LAN port (home router can be used), set its IP address to 192.168.1.1, set SSID to custom, set password to 12345678, select WPA2 for encryption, and turn on the DHCP function.
2. Run the host of RoboMaster Server and connect it to the wireless AP via a network cable and set the static IP address of the host as 192.168.1.2.
3. Power a robot on to supply power to the Referee System. Refer to "Wi-Fi Settings > UI Function Descriptions > Description of Robot Side Functions", so that the Main Controller Module of the Robot Side scans the corresponding SSID and connects to the target wireless router. After the connection is established, the Robot Side will be in the same LAN as the server through Wi-Fi.
4. Run the RoboMaster Server through the Server PC. You may check the connection status of the robot on the Server. If a LAN is set up, you can check related data on the Server side.

## 4.3 Server Configuration and Usage

The Server is the control center of the entire Referee System. It collects data from all robots during the competition and visualizes it for users, and automatically determines the outcome of the competition.

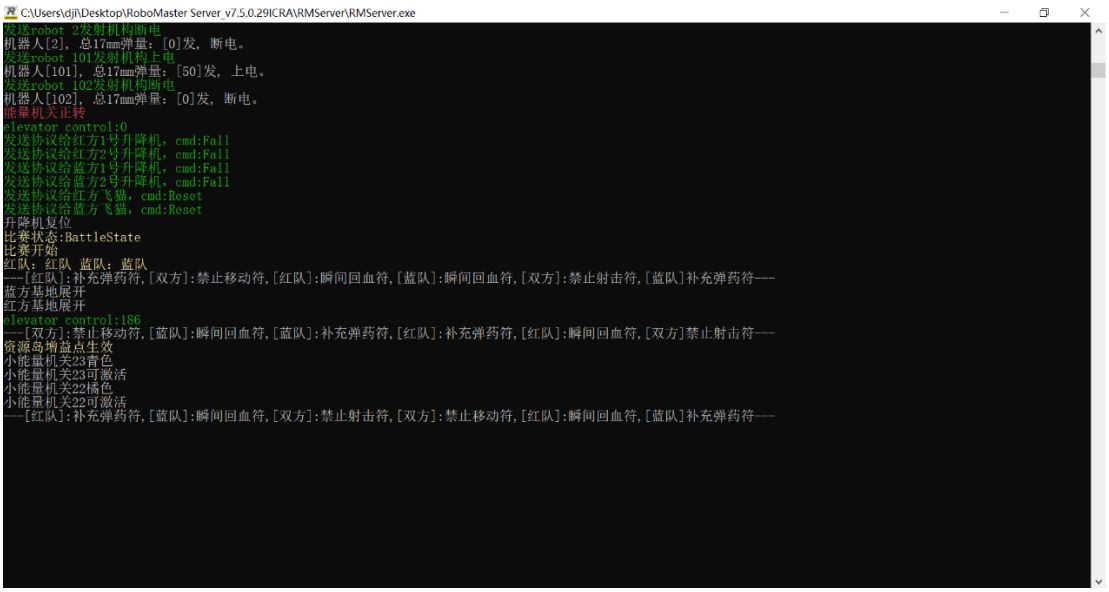
1. Network configuration check: Connect the Server PC and the router to the same LAN and confirm that the current IP address of the Server PC is 192.168.1.2.
2. Download the latest version of Server to the Server PC, unzip the corresponding folder and run "RMStart.exe" to display the following interface:




Click the "ServerLog" button to open the log system, click "Server" to open the server background (command line interface), and click the "ServerUI" button to open the server UI; or only click the "Start All" button, to open the above three modules at the same time. (When opening it for the first time, you need to allow the application to go through the firewall, otherwise the server cannot be successfully created.)

The Server module runs the core competition logic and functions, as shown in the figure below:




The ServerLog is used to refresh the data updates of each referee system module on the battlefield in real time. The target information can be filtered through the buttons on the page, and is generally used for pre-match joint commissioning and post-match abnormalities positioning, as shown in the figure below:

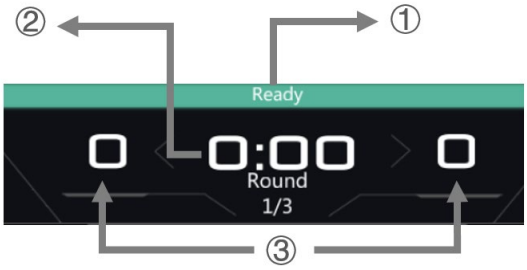

The ServerUI displays and controls the progress of the competition and the status of the robot through the interaction interface. The layout is shown in the figure below:


The main interface consists of ①Competition Status Panel, ②Competition Control Panel, ③ Referee System Status Panel, and ④/⑤ Red and Blue Team Robot Status Panel.

## 4.4 Introduction to the Server UI

1. The Competition Status Panel displays the competition progress and the time information of the corresponding status, as well as the score information of the round.



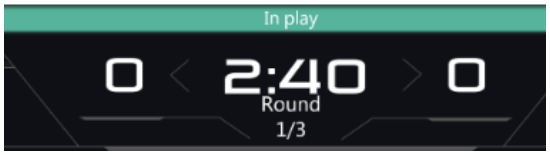

① Competition Period


5-Minute Setup Period


Technical Timeout at the Setup Period


15-Second Referee System Initialization Period


5-Second Countdown Period



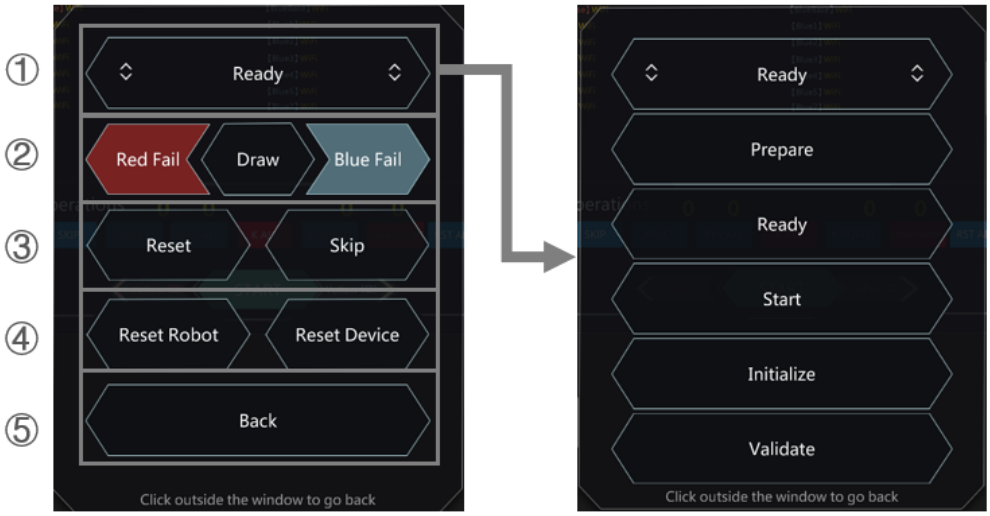

3-Minute Competition Round


Match Complete

② Competition Time Information

③ Scores of Red and Blue Teams

Left click the Competition Status Panel to configure the competition period and relevant parameters.




① Click to switch competition periods from the drop-down menu.

Prepare: 5-Minute Setup Period

Ready: Pre-Match Period

Start: 5-Second Countdown Period

Initialize: 15-Second Referee System Initialization Period

Validate: Manually end the competition

② Manually end the competition and set the competition result

③ Quickly switch the competition period:

Reset: Reset the competition to the pre-match period

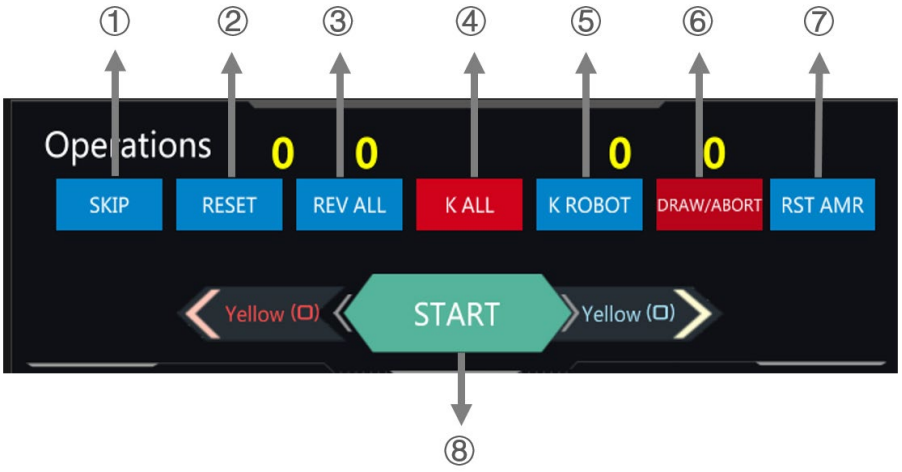
Skip: Skip to enter the 5-second countdown period

④ Reset Robot: Reset the robot connection status

⑤ Back: Return to the main interface

2. Competition Control Panel




① SKIP: Skip the 5-Second Countdown Period during commissioning. It will not be used during the competition

② RESET: Reset the competition status, including resetting the status of all robots. It will not be used during the competition

③ REV ALL: Revive all robots. It will not be used during the competition

④ K ALL: Kill all robots. It will not be used during the competition

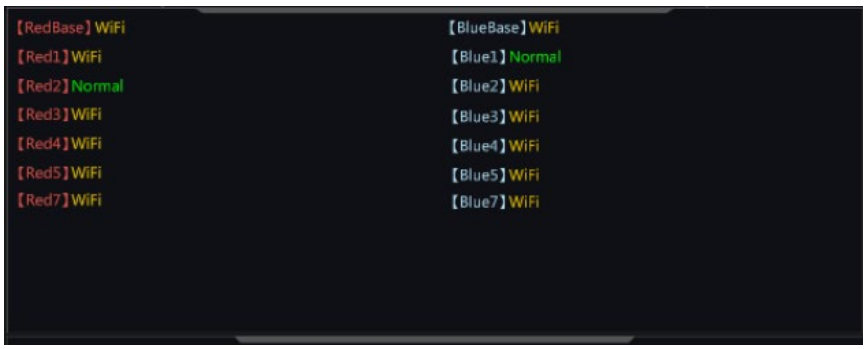
⑤ K ROBOT: Disconnect the robot from the server. This operation is usually required at the end of a round

⑥ DRAW/ABORT: If abnormalities occur, such as an abnormal Battlefield Component, a potential hazard, click “DRAW/ABORT” to end the competition after synchronizing the information

⑦ RST AMR: Reset all the Armor Modules of the Battlefield Components. It will not be used during the competition

⑧ START: Switch the competition status (start/pause)

3. Robot Referee System Control Panel




Display format: [Robot number] Referee System status

Example:

[Red2] “Normal” represents the Referee System of Red Team’s No. 2 robot is in normal state

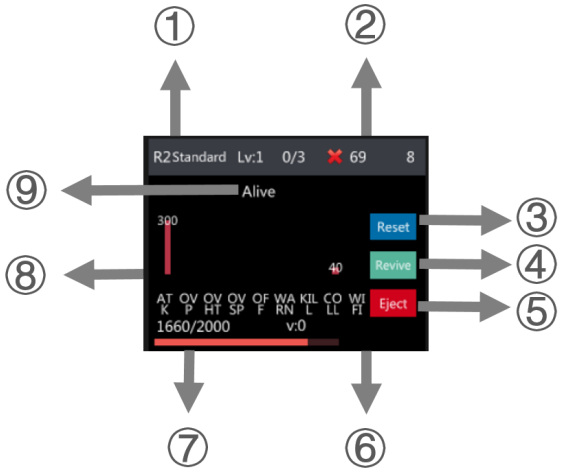
[Red1] “Wi-Fi” represents the Referee System of Red Team’s No. 1 robot is not connected to Wi-Fi

The abnormal modules are shown in the figure below:

| Abbreviations | Full Names |
|---|---|
| **Wi-Fi** | Wi-Fi Module |
| **Armor** | Armor Module |
| **Speed Mon** | Speed Monitor Module |
| **Light Ind** | Light Indicator Module |
| **RFID** | RFID Interaction Module |

4. Robot Status Panel




① Robot number and type

② Wi-Fi signal

③ Reset: Reset the robot to full HP

④ Revive: Revive the robot

⑥ Eject: Eject the robot. An ejected robot cannot be revived and can only be reset

⑦ Display the robot's additional status

⑦ Display the current HP/HP limit

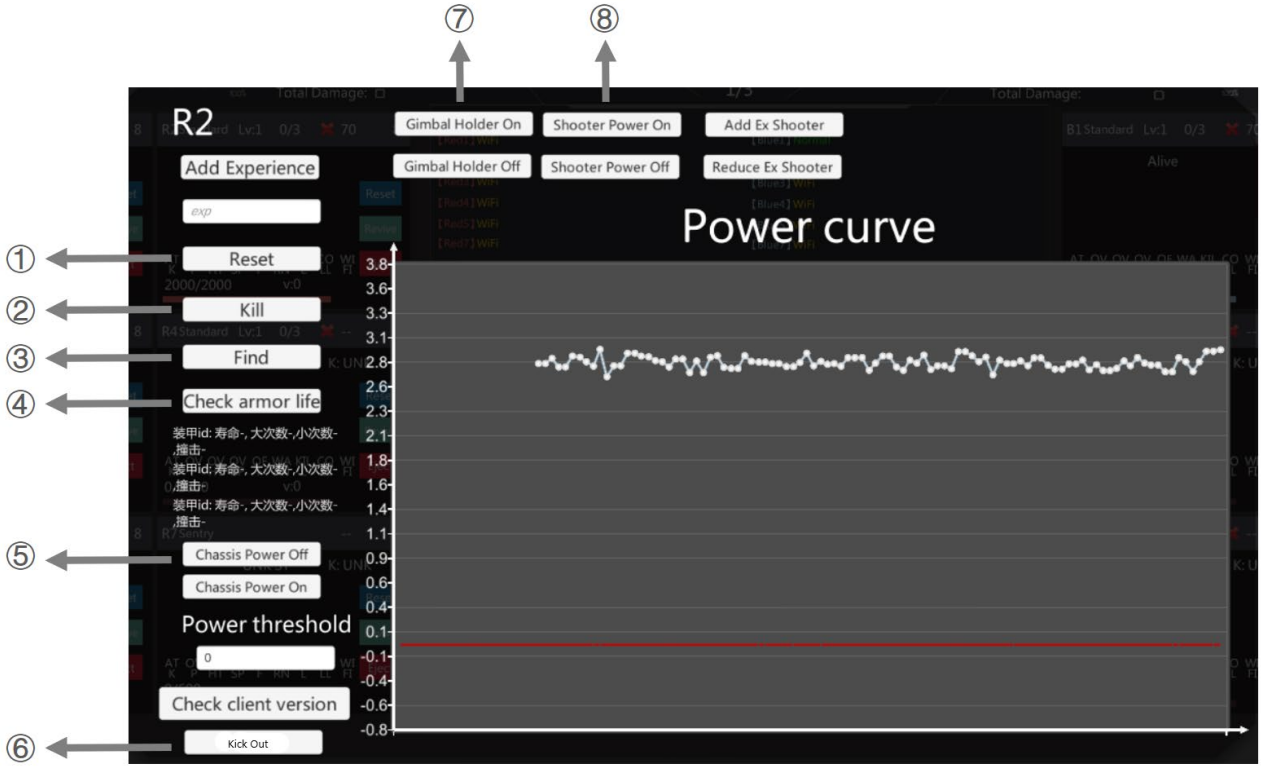
⑧ Robot HP deduction and type:

| Abbreviations | Full Names |
|---|---|
| **ATK** | Attacked |
| **OVP** | Overpower |
| **OVHT** | Overheat |
| **OVSP** | Over-speed |
| **OFF** | Modules going offline |
| **WARN** | Warning |
| **KILL** | Killed by the server |
| **COLL** | Collision |

| Abbreviations | Full Names |
|---|---|
| **Wi-Fi** | Wi-Fi offline |

Click the Robot Status Panel to enter the Sub-page of Robot Status.




① Reset: Reset the robot

② Kill: Kill the robot

③ Find: Find the robot; the light indicator flashes green

④ Check armor life: Check the service life of the armor

⑤ Chassis Power On/Off: Control the power on/off of the chassis of the Referee System's Power Management Module

⑥ Kick Out: Kick out the robot

⑦ Gimbal Power On/Off: Control the power on/off of the gimbal of the Referee System's Power Management Module

⑧ Shooter Power On/Off: Control the power on/off of the launching mechanism of the Referee System's Power Management Module

5. Competition Result Settlement Panel

After the competition is over, it will enter the competition result settlement panel, which automatically determines the winner and loser of the Red Team and Blue Team and the specific damage values according to the rules.

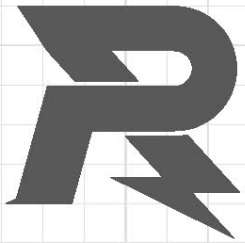

# 5. Read-in of the RFID Interaction Card ID

Users can use the Main Controller Module and RFID Interaction Module of the Robot Side to write the RFID Interaction Card ID to the buff and debuff zones for testing.

Notes:

1. Ensure that the Main Controller Module is correctly connected to the RFID Interaction Module and power on the robot.
2. Press and hold “OK” to enter the robot’s function module. Select “Debug Option” - “Ext Module Setup” - “RFID Module Setup” - “ICRA RFID Card Write”.
3. Place the RFID Interaction Card under the RFID Interaction Module, and select the RFID Card type “ICRA Function Card [Serial Number]” to write the card (serial numbers 1-6 are respectively corresponding to buff and debuff zones 1-6 in the battlefield). The RFID Interaction Module’s light flashing indicates that the RFID Interaction Card has been recognized, and the issuance of white light indicates the successful writing of the card (the writing time is within 0.5 seconds after the key is pressed).



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