




# RoboMaster 2021 University AI Challenge User Guide

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## RoboMaster 2021 University AI Challenge User Guide



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### Overview

In RoboMaster 2021 University AI Challenge (RMUA), the Referee System in AI robots is an electronic penalty

system for the robot 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. A user can use multiple Referee Systems to form a multi-robot combat system.

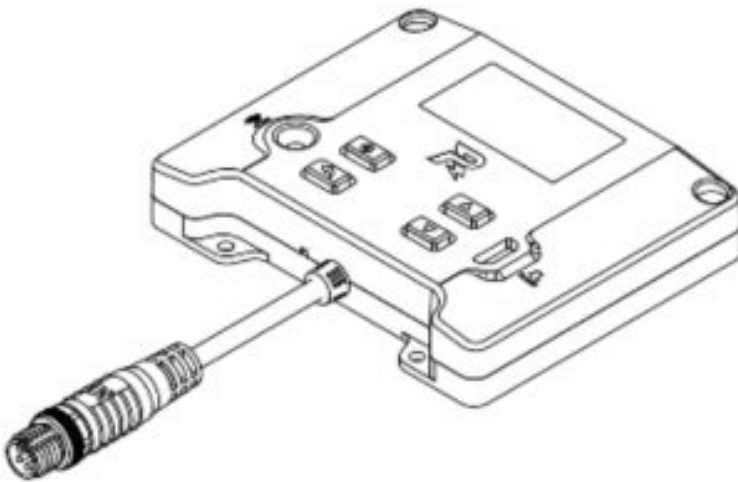
The Referee System in the AI robot consists of the following two parts:

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

## Introduction to the Robot Side

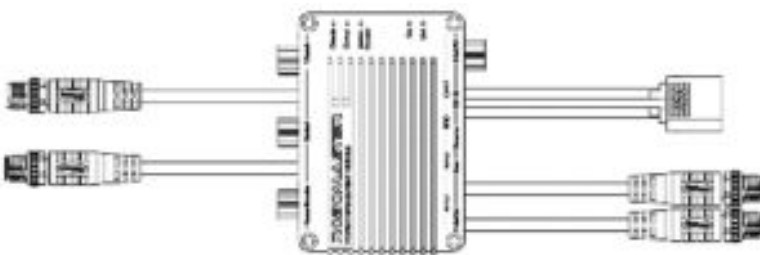
1. Main controller module (MC02): The Main Controller Module is the core control module of a Referee System. It can monitor the operation of the entire system, and integrates functions such as human-machine interaction, wireless communication and status display.

Main Controller Module



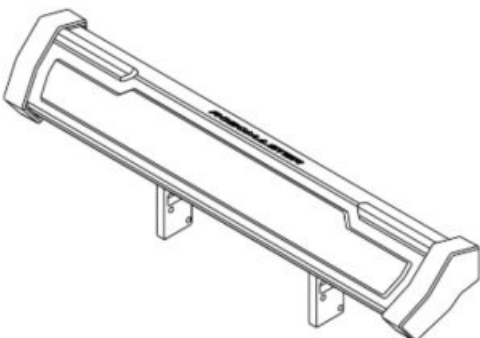
2. Power Management Module (PM02): The Power Management Module’s functions include: control the chassis, gimbal, and power supply for the Launching Mechanism of a robot; transmit data; detect chassis power; automatically cut off power supply for propulsion when a robot’s HP drops to zero; etc.

Power Management Module



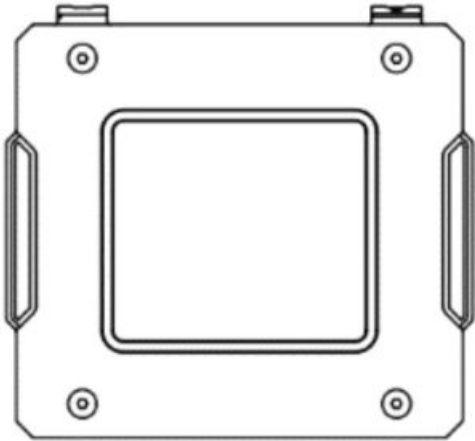
3. Light Indicator Module (LI01): The Light Indicator Module displays the robot’s current HP and status. By observing the status of the light indicator, you can identify the remaining HP and status of your robot.

Light Indicator Module

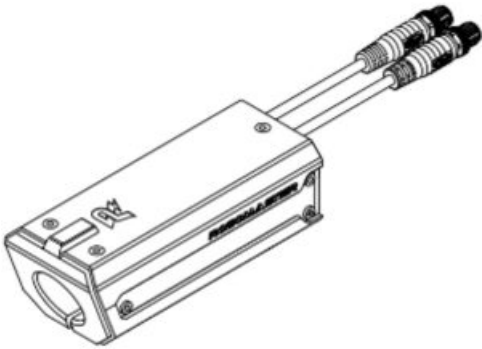


4. Armor Module (AM02): The Armor Module is used to detect attacks by projectiles and collisions. An AI robot is equipped with four small Armor Modules.

Armor Module

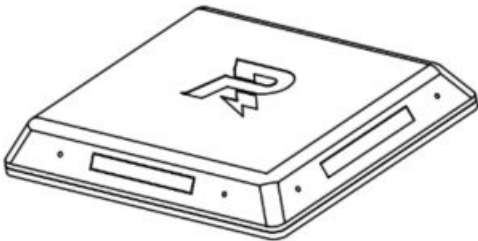


5. Speed Monitor Module (SM01): The Speed Monitor Module is used to test the initial speed and launch speed of projectiles launched by the robot. An AI robot launches 17mm projectiles, so it is equipped with a 17mm Speed Monitor Module.



6. RFID Interaction Module (FI02): The RFID Interaction Module is used for data interaction between the Robot Side and the Battlefield.

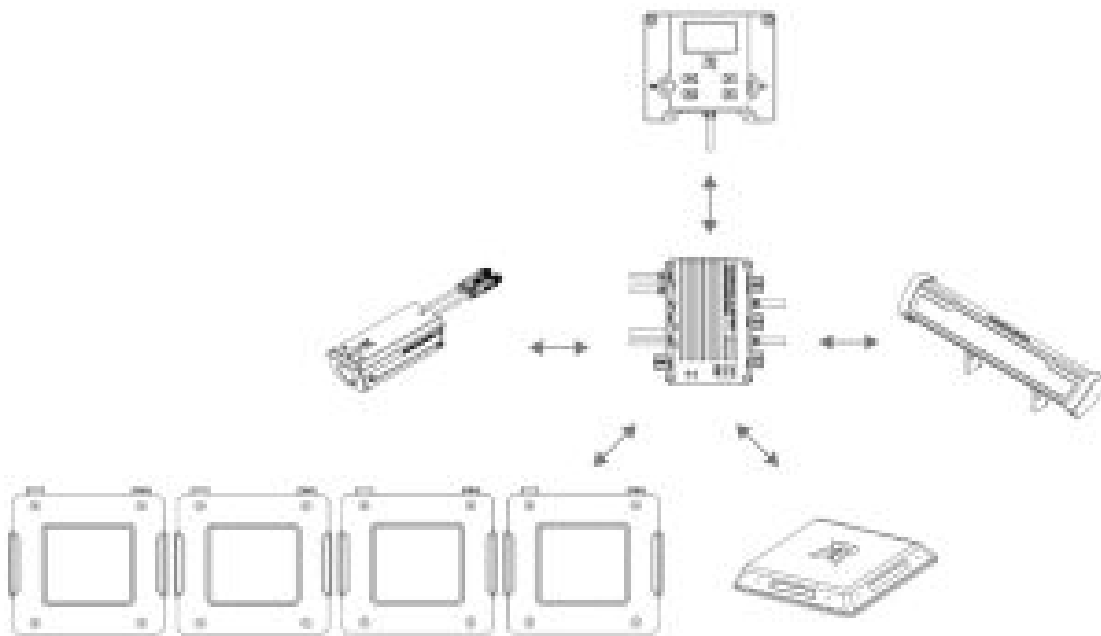
RFID Interaction Module



RFID Interaction Card



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



## Connection of Referee Systems on the Robot Side

### Introduction to the Server

The server of RMUA 2021 is the control center of the referee system. It collects data from all robots and competition battlefield institutions during the competition, presents them to the referees in a visualized way, and automatically handles the identification logic to defer the competition outcome. To implement such functions, please download the RMUA server in the server PC.

## Quick Start Guide to the Referee System

### Configuration of the Robot Side of the Referee System

Refer to the “Functional Description of the Robot Side” section of the RoboMaster 2020 Referee System User Manual V1.2 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.

Note:

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 (the setting rule is front armor: 0, left armor: 1, rear armor: 2, right armor: 3).
2. For the RMUA 2021 scenario, 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 port. Otherwise, the AI robot cannot be controlled remotely.
4. Since the AI robot's Referee System does not include the Positioning System Module, Camera Image 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 is accurate, use RoboMaster Tool 2 to upgrade the Robot Side firmware (note that the main controller module and the power management module are only compatible with the specific firmware version):

Referee System Modules	Module Firmware Versions
Main Controller Module	E7.0.0.7
Power Management Module	E6.1.0.12
Light Indicator Module	The latest version
Armor Module	The latest version
Speed Monitor Module	The latest version
RHO 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 normal competition.

## Setting up a LAN and Competition Server

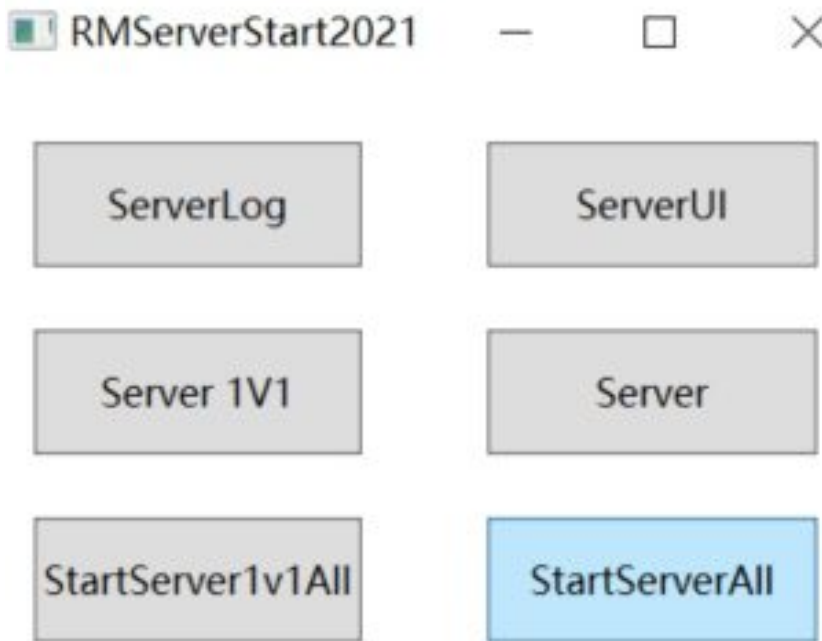
When the Main Controller Module on the Robot Side and the Server are using the same LAN, the Robot Side can be connected to the server for online combat. The following steps demonstrate how to set up a LAN:

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. Connect the host on which RoboMaster Server is running 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 Connection Settings” in the “Description of Robot Side Functions” section of the “RM 2020 Referee System User Manual V1.2”, 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. The RoboMaster Server runs on the Server PC. You may check the connection status of the robot on the Server side. If a LAN is set up, you can check Robot Side related data on the Server side.

## 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 competition 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 “RMStart2021.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 interface; or only click the “StartServerAll” 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 module 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 page buttons, and is generally used for pre-match joint debugging and post-match abnormal problem positioning, as shown in the figure below:



The ServerUI module 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 Competition Status Panel, Competition Control Panel, Robot Referee System Status Panel, and / Red and Blue Team Robot Status Panel.

## Introduction to Each Module in the Server Interface

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

Legends of the competition status panel (competition preparation period)



1. Competition Status Period  
5-minute Setup Period



Technical Timeout at the Setup Period



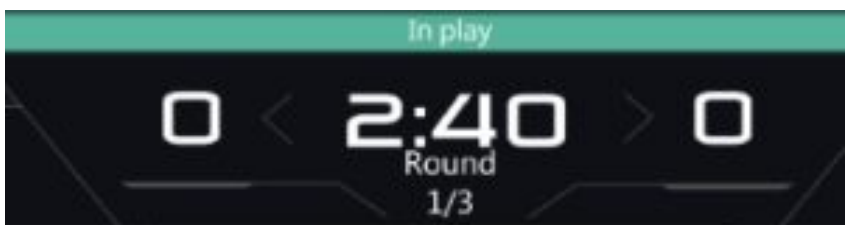
15-second Referee System Initialization Period



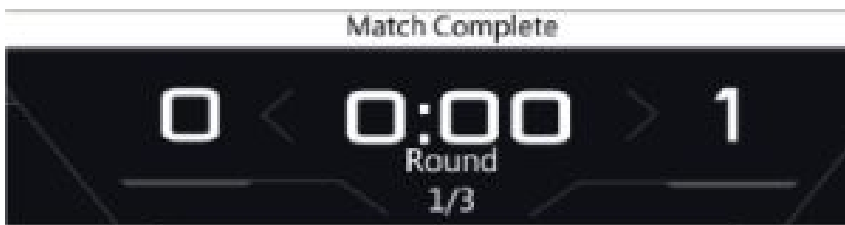
5-second Countdown Period



3-minute In-Play Period



Match Complete Period

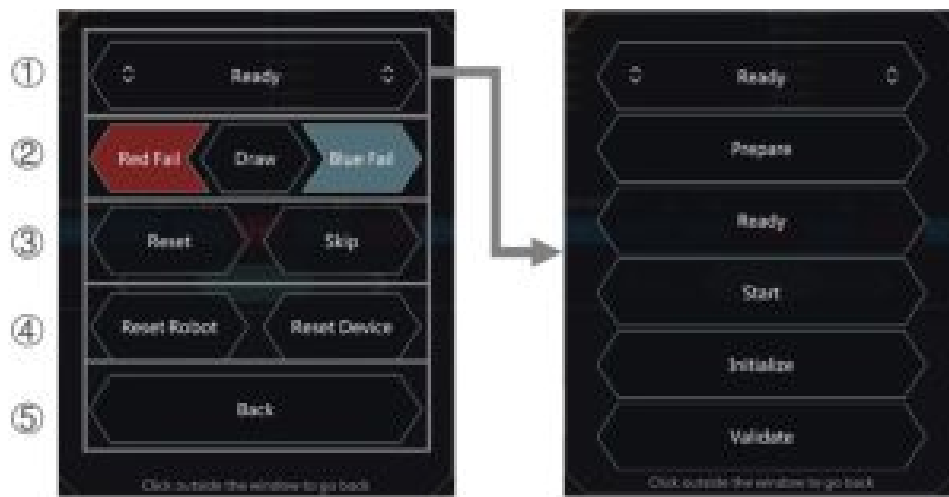


2. Competition Status Time Information

3. Scores of Red and Blue Teams

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





1. Click to enter the “Slide” bar and select a different competition status. Prepare: 5-minute Setup Period

Ready: Competition Preparation Period

Start: 5-second Countdown Period

Initialize: 15-Second Referee System Initialization Period

Validate: Manually end it after the competition starts

2. Manually end the competition and set the competition result

3. Quickly switch the competition status:

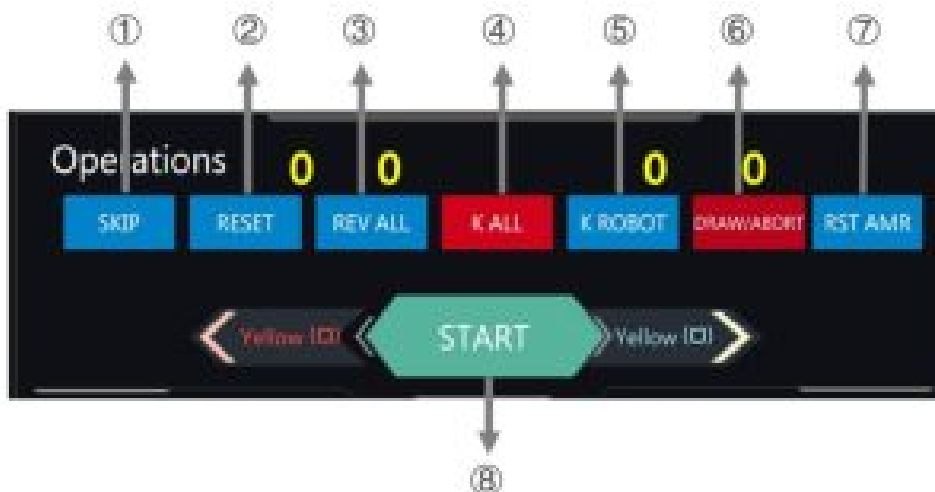
4. Reset: Reset the competition to the preparation period

5. 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: Use it to skip the start during debugging. 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 the competition is abnormal, such as an abnormal Battlefield Component, a potential hazard, etc., click “Abnormality” to finish the competition after synchronizing the information

7. RSTAM R: 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

For example: [Red2] Normal represents the Red Team's No. 2 robot Referee System is in normal state

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

The abnormal modules are shown in the figure below:

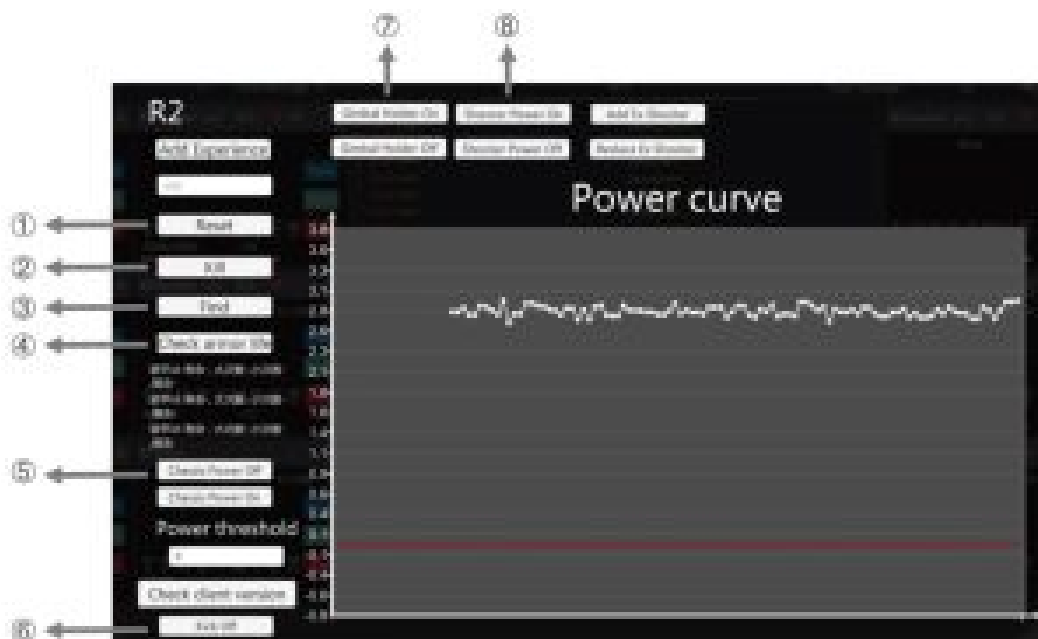
Abnormal module display term	English representations of abnormal modules
Wi-Fi	Wi-Fi Module
Armor	Armor Module
Speed Mon	Speed Monitor Module
Light Ind	Light Indicator Module
RFID	FtFID Interaction Module

### 4. Robot Status Panel

1. Robot number and type
2. W i-Fi signal Reset:
3. Reset the robot to a state of full HP
4. Revive: Revive the robot
5. Eject: Eject the robot. A n ejected robot cannot be revived and can only be reset
6. Display the robot's add-on status, such as the launching heat cooling reduction status
7. Display the current H P/H P limit
8. Robot HP deduction quantity and type:

IIP deduction type display terms	English representations of HP deduction types
AI K	Attacked
OVP	Overpower
OVHT	Overheat
OVSP	Exceeded launch speed
OFF	Modules going offline
WARN	Warning
KILL	Killing the server
COLL	Collision
Wi-Fi	Wi-Fi offline

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



1. Reset: Reset the robot kill:
2. Kill the robot
3. Find: Find the robot; the light bar 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 mechanism of the Referee System's power management module
6. Kick Off: Kick off the robot
7. Gimbal Power On/Off: Control the power on/off of the gimbal mechanism 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

## 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.



## Instructions for Flashing RFID Interaction Card ID on the Robot Side of the Referee System

You can use the Main Controller Module and RFID Interaction Module of the Robot Side of the Referee System to flash the RFID Interaction Card ID of the RMUA 2021 buff and debuff zones to assist in the competition test.



In this scenario, the Main Controller Module of the Robot Side of the Referee System needs to flash the RMUA Flash-specific Main Controller Firmware (not available for official competition). The version is E7.0.0.6, which is not compatible with the competition server. Therefore, the Main Controller Firmware of version E7.0.0.7 needs to be flashed back for the competition scenario.

1. Ensure that the Main Controller Module of the Referee System 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 "Commissioning Settings" – "Other Module Settings" – "RFID Module Settings" – "ICRA RFID Card Write".
3. Place the RFID Interaction Card under the RFID Interaction Module, and select the RFID card flash type "ICRA Function Card [Serial Number]" to flash 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 flashing of the card (the card write time is within 0.5s after the key is pressed).

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Documents / Resources

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