

ARC Championship Robot Building Specifications

Season 2

2026 – 2027

V1.0

Table of Contents

Release Notes 4

1. Foreword 5

2. Technical Specifications 6
   - 2.1 General Technical Specifications . . . 6
     - 2.1.1 Energy Source . . . 6
     - 2.1.2 Communication Equipment . . . 7
     - 2.1.3 Optical Features . . . 10
     - 2.1.4 Visual Features . . . 10
     - 2.1.5 Aesthetic Design . . . 10
     - 2.1.6 Launching Mechanism . . . 12
     - 2.1.7 Custom Controller . . . 12
     - 2.1.8 17 mm Fluorescent Energy Charging Device . . . 13
     - 2.1.9 Miscellaneous . . . 16
   - 2.2 Specifications on the Use of Open-Source Designs . . . 16
   - 2.3 Definition and Scope of Third-Party Components . . . 16
   - 2.4 Robot Technical Specifications . . . 17
     - 2.4.1 Hero Robot . . . 18
     - 2.4.2 Engineer Robot . . . 19
     - 2.4.3 Infantry Robot . . . 19
     - 2.4.4 Sentry Robot . . . 20
     - 2.4.5 Drone . . . 21
     - 2.4.6 Dart System . . . 24

3. Referee System Mounting Specifications 31
   - 3.1 Overview of the Referee System . . . 31
   - 3.2 Referee System Modules . . . 33
   - 3.3 Main Control Module . . . 33
     - 3.3.1 Installation Steps . . . 34
     - 3.3.2 Installation Requirements . . . 35
   - 3.4 Power Management Module . . . 36
     - 3.4.1 Installation Steps . . . 37
     - 3.4.2 Installation Requirements . . . 39
   - 3.5 Light Indicator Module . . . 41
     - 3.5.1 Installation Steps . . . 41
     - 3.5.2 Installation Requirements . . . 42
   - 3.6 Armor Module . . . 42
     - 3.6.1 General Specifications . . . 43
     - 3.6.2 Installation Steps . . . 46
     - 3.6.3 Installation Requirements . . . 48
   - 3.7 Speed Monitor Module . . . 50
     - 3.7.1 Installation Steps . . . 51
     - 3.7.2 Installation Requirements . . . 56
   - 3.8 RFID Interaction Module . . . 57

3.8.1 Installation Steps 57
3.8.2 Installation Requirements 58
3.9 Camera Video Transmission Module (Sender) 59
3.9.1 Installation Steps 60
3.9.2 Installation Requirements 60
3.10 Camera Video Transmission Module (Receiver) 61
3.10.1 Installation Requirements 62
3.11 Supercapacitor Management Module 62
3.11.1 Installation Steps 62
3.11.2 Installation Requirements 63

Appendix A. 17 mm Speed Monitor Module Adapter Engineering Drawing **65**

Release Notes

Date	Version	Release Notes
November 1, 2026	1.0	Initial Release

1. Foreword

ARC Robotics participating teams shall develop and build their robots themselves. Participating robots shall meet all specifications described in this document. All event staff will spot-check robots according to the rules in this document. In addition, participating robots shall comply with applicable laws and regulations and shall not pose safety hazards. If a safety incident occurs due to a violation, ARC Robotics may pursue the legal liability of the violating party in accordance with the law. If there is a dispute over this specification, the interpretation of the Head Referee or the Head Inspector shall prevail.

If a rule is violated, ARC Robotics has the right to refuse the robot's participation, require rectification within a time limit, or directly determine that the robot loses eligibility to compete. The specific handling depends on the nature of the violation.

2. Technical Specifications

2.1 General Technical Specifications

2.1.1 Energy Source

S1 The forms of energy that a robot may use are limited to electrical power and pneumatic power.

S2 For a robot restricted by chassis power limits, the power source for horizontal movement of its chassis is limited to electrical power only.

- The use of fuel-driven combustion engines, explosives, and hazardous chemical materials is prohibited.
- The use of mains electricity in the competition area is prohibited.
- The use of hydraulic or other potentially polluting power methods is prohibited.

2.1.1.1 Electrical Power

S3 The battery shall be installed stably on the battery frame. Batteries shall be reasonably protected by the robot structure and not exposed to physical damage.

- Battlefield terrain is complex. It is recommended that batteries be given protection and support against shock and vibration.

S4 The types of batteries that a robot may use are limited to the following table.

Table 2-1: Summary of Battery Types

Robot/module	DJI (Shenzhen DJI Innovations) batteries	Other dry cells	Other lithium batteries
Hero	Allowed	Allowed	Not allowed
Engineer	Allowed	Allowed	Not allowed
Infantry	Allowed	Allowed	Not allowed
Drone	Allowed	Allowed	Not allowed
Sentry	Allowed	Allowed	Not allowed
Dart Launcher	Allowed	Allowed	Not allowed
Dart	Allowed	Allowed	Allowed
Custom Controller	Allowed	Allowed	Allowed

Commercial off-the-shelf (COTS) devices, such as action cameras, that are entirely unconnected to the robot's other systems may contain and be powered by their internal batteries.

In this subsection, the following rules involving requirements for Supercapacitor Modules apply only to Supercapacitor Modules that participate in chassis power.

S5 Only Hero, Engineer, Infantry, and Sentry Robots may install a Supercapacitor Module. Each robot is allowed to install at most 1 Supercapacitor Module.

S6 The total nominal energy of a single Supercapacitor Module of a ground robot shall not exceed 2000 J, and the total measured energy shall not exceed 2200 J. The formula for calculating the nominal energy of a single capacitor module is E = (1/2)*C*U^2 (U is the withstand voltage of the capacitor, C is the capacitance).

S7 For the chassis power source of a robot restricted by power limits, the sum of the nominal capacitance of capacitors that are connected to the Chassis port but do not participate in chassis power shall not be greater than 10 mF.

- If capacitor banks used in a Supercapacitor Module do not participate in chassis power, the corresponding schematic diagrams shall be brought to Inspection as supporting evidence.

2.1.1.2 Pneumatic Power

S8 The pressure of the compressed gas stored in a gas cylinder shall not be greater than 20 MPa. The nominal pressure resistance of the gas cylinder shall not be less than 30 MPa. A double-gauge regulator shall be installed directly at the outlet of the gas cylinder. The working pressure shall not be greater than 0.8 MPa.

S9 The working gas shall be air or nitrogen.

S10 Any mechanism that uses or stores gas (gas cylinder, pneumatic cylinder, air spring, and the like) shall have an approval certificate or a nameplate stamp from its original manufacturer. During Inspection, the approval certificate or nameplate stamp shall be easy to view.

S11 If a gas cylinder is still within its service life, it shall be returned to the factory for maintenance within the period specified by the user manual or the nameplate, and proof of maintenance shall be provided.

S12 The gas cylinder shall have a certification certificate issued by a certification body officially recognized by the country of origin.

S13 The gas cylinder shall be installed on the robot body safely and firmly. The cylinder body shall have at least 2 fixed points more than 1/5 of the cylinder length apart, or must have a fixed surface greater than 1/5 of the cylinder length. The gas cylinder and gas pipes shall be protected to prevent damage caused by the robot tipping over, colliding, rotating, or by faults of moving parts. The cylinder opening shall not be exposed, so as to prevent damage from being struck by projectiles. To ensure safety, the cylinder opening must be kept horizontal or facing upward.

S14 The gas cylinder shall be installed so that, if the robot rolls to any angle, neither the gas cylinder nor the gas pipes contact the ground.

S15 Gas pipes and fittings shall be rated for at least 2x the maximum working pressure the system may have.

- It is recommended that a safety relief valve be installed on the low-pressure gas circuit.
- It is recommended that any flammable materials be avoided within 50 mm of the gas cylinder.

2.1.2 Communication Equipment

The competition venue and surrounding environment are complex. ARC Robotics cannot guarantee that the wireless environment in the competition area will not interfere with participating equipment. Each participating team shall adapt itself to the wireless environment at the competition venue.

S16 The control methods specified for this season are as shown in the table below.

Table 2-2: Summary of Control Methods

Data link	Information transmitted
Remote controller	Remote-controller stick data
Camera Video Transmission Module (Receiver)	Keyboard and mouse commands, remote-controller stick data
Video-transmission link	Custom Controller information
Referee System serial port	Inter-robot communication

- The RMOC recommends that participating teams use the video-transmission link or the Camera Video Transmission Module (Receiver) to control robots.
- The Camera Video Transmission Module (Receiver) itself has remote-control data transmission functionality (when used with the player client, it can send keyboard and mouse data at the same time). For protocols related to the Camera Video Transmission Module (Receiver), please refer to the *Camera Video Transmission Module User Manual*.
- The video-transmission link refers to the data-transmission link that uses the Camera Video Transmission Module. For protocols related to the video-transmission link, please refer to the *RoboMaster 2027 University Series Communication Protocol*.

S17 During Inspection, a robot shall be equipped with a remote controller that meets the requirements, for debugging, so that functions such as projectile launching, chassis motion, and gimbal motion can be demonstrated during Inspection.

S18 The designated remote controllers for this season are shown in the table below. Other models of the same style shall not be used. Only remote controllers whose frequency band is 2.4 GHz are allowed. The RMOC does not guarantee their stability.

The Camera Video Transmission Module (Receiver) has remote-controller functionality, but it is not regarded as a remote controller. During a game, ARC Robotics only guarantees the stability of the Camera Video Transmission Module (Receiver) located in the Pilot Room. During Inspection, teams may use a Camera Video Transmission Module (Receiver) to meet the requirement of S17.

Table 2-3: Summary of Remote Controllers

Name	Picture (for reference only)
DT7	

Name	Picture (for reference only)
FS-i6X	
WFLY ET08, WFLY ET08A	
WFLY ET16S, WFLY ET16	

- Given the complex wireless environment at the competition venue, the above remote controllers may still be subject to interference. It is recommended to carry multiple redundant control methods to avoid loss of control.
- Robots entering the Battlefield will automatically connect to the Camera Video Transmission Module (Receiver) in the Pilot Room. A Camera Video Transmission Module (Receiver) brought by the participating team will be unusable. The default state of the sticks of the Camera Video Transmission Module (Receiver) in the Pilot Room is: centered (return-to-center). The default state of the switches is: position C.

S19 Except for Drones, each remote controller shall correspond one-to-one with a receiver.

S20 Modification of the radio-frequency portion of a remote controller is not allowed. Adjustment of the antenna mounting method, antenna damage, and repair of the antenna through official after-sales channels are not regarded as modification.

S21 Except for visible-light communication, a robot shall not carry wireless communication equipment other than remote controllers and the Referee System. Visible-light communication is limited to between participating robots. Any wireless hardware that cannot be removed (for example, a Wi-Fi antenna in an SoC) shall be disabled so that it does not transmit. The maximum penalty for illegal wireless communication with a robot during the competition is Disqualification.

S22 Equipment carried by a robot shall not generate wireless-signal interference in 0.428–0.438 GHz, 2.3–2.55 GHz, 3.75–4.75 GHz, or 5–7.5 GHz.

- It is recommended that all functions of the robot be enabled, and that a spectrum analyzer be used in close proximity to equipment that may generate wireless-signal interference for measurement.

2.1.3 Optical Features

S23 Except for Custom Controllers, a robot may be fitted with a display no larger than 7 inches. The illuminance measured within 40 mm of the display shall not be greater than 300 lux. The luminous surface of the display shall be more than 100 mm from the Armor Module.

S24 Unless otherwise noted, a robot shall not be fitted with obvious visible-light or invisible-light emitting equipment.

- Light sources of the robot-status-indicator type, and infrared sensors, are not regarded as obvious light-emitting equipment.
- Sensors such as LIDAR are not regarded as obvious light-emitting equipment.

S25 Laser products shall not be modified. Determination of the safety standard of a laser product shall refer to the following data, taking the highest value:

- The values on the safety nameplate of the laser product, or relevant proof issued by the manufacturer/distributor.
- The actual power measured by Inspection personnel using a laser power meter held close to the laser product.

S26 Any optical means used by a robot shall not cause physical harm to any person.

S27 All robots are only allowed to install invisible laser products whose laser safety specification is Class I, and shall not install visible laser products.

2.1.4 Visual Features

The environment of the Battlefield and its surroundings is relatively complex. ARC Robotics cannot guarantee that visual features at the competition venue will not cause visual interference. Vision algorithms should adapt to changes in field lighting and to other possible interference around the venue.

The following specifications shall be followed when designing a robot:

S28 Do not simulate visual features, or maliciously attempt to disrupt others' visual feature recognition.

S29 Do not use any means to change robot visual features.

- The hit face of a Referee System Armor Module is a dot-matrix screen. The hit face can display the corresponding robot number or a pattern (the specific style will be updated later).
- Robot visual features: the content displayed by the Armor Module and its appearance.

2.1.5 Aesthetic Design

To prevent the aesthetic design of a robot from affecting shooting confrontations on the Battlefield and the spectator experience, the following specifications shall be followed when designing and producing a robot's exterior.

2.1.5.1 Basic Requirements

S30 A robot's cables shall be neat, with no exposed metal conductors. Unavoidably exposed cables shall be protected with materials such as drag chains and cable managers.

S31 Materials that obviously affect aesthetics shall not appear in a robot's exterior, such as washbasins, plastic bottles, corrugated paper, bed sheets, white foam boards, bubble wrap, and the like.

S32 Sharp structures shall not be designed or used, so as to prevent damage to the field and injury to personnel.

S33 For a ground robot, within the height range of 0–400 mm from the ground, all exposed structural edges that may come into direct contact with the detection face of another robot's Armor Module shall be filleted. The fillet radius shall not be less than 10 mm.

2.1.5.2 Gloss

S34 The gloss of any exterior area of a robot larger than 10 mm*20 mm shall not be greater than 30 Gs. Items that cannot be used after gloss is reduced, such as optical shafts and camera lenses, are excepted, but the shortest straight-line distance between such items and the left and right edges of the Armor Module shall be greater than 100 mm.

2.1.5.3 Colors

- It is recommended that the exterior style of all of a team's robots be coordinated and consistent.

S35 The protective-shell color of a Red Team robot may use the red spectrum; a Blue Team robot may use the blue spectrum. A robot may have at most 4 areas of the opposing team's color, and the area of a single such region shall not exceed 60 mm*60 mm.

- When designing a robot, it is recommended to avoid using red-spectrum or blue-spectrum accessories as much as possible.

S36 Inkjet prints or stickers of school badges and team badges shall not affect robot visual features, and shall not be luminous.

2.1.5.4 Mounting of Protective Shells

- It is recommended that participating teams use tough materials that are not easily damaged to make the protective shell, and that they conduct reliability tests on the protective shell, so as to avoid a violation caused by damage to the protective shell from confrontations on the Battlefield.

2.1.5.5 Decoration Requirements

S37 The distance between any logo or sticker (team/school logos, sponsor logos) and the light strips on either side of the Armor Module shall be greater than 30 mm. If the exterior does not meet the specifications, Inspection staff will require the position of the logo to be corrected.

S38 All decals shall not affect robot visual features, and shall not be luminous.

S39 ARC Robotics will not restrict the number or size of advertising spaces. However, the Head Inspector reserves all rights to determine if any graphical design interferes with the regular visual indicators of Armor Modules or stickers.

- It is recommended that school badges, team badges, and advertising spaces be converted to grayscale to avoid potential conflicts during Inspection. The Head Inspector makes the final determination on whether colors are acceptable.

Teams may be asked to remove inappropriate or distracting imagery at the discretion of the Head Inspector and Head Referees.

2.1.6 Launching Mechanism

Launching Mechanism: a mechanism capable of causing a projectile to leave the robot in a set direction at a certain initial speed.

S40 The acceleration length of a pneumatic launcher shall not be greater than 200 mm (acceleration shall be completed before the projectile enters the Speed Monitor Module).

S41 A robot's Launching Mechanism shall be able to launch 10 rounds of 17 mm projectiles or 5 rounds of 42 mm projectiles stably.

S42 Each Launching Mechanism shall have the corresponding Speed Monitor Module installed in accordance with the specifications.

2.1.7 Custom Controller

The Custom Controller is a multi-purpose device made by the participating team. It is used as a multi-purpose controller to control robot actions or to monitor robot motion and status, to receive match-related information and robot video-transmission images sent by the Referee System match-engine server, and to send match-specific interactive commands to the match-engine server.

S43 The production parameters of a Custom Controller shall meet the following requirements:

Table 2-4: Custom Controller Production Parameters

Item	Limit	Remarks
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the module relative to the battery negative terminal shall not be greater than 30 V
Maximum Storage Size (mm, L*W*H)	600*600*600	-
Maximum Expansion Size (mm, L*W*H)	Unlimited	Consequences such as inconvenience of use or inability to compete normally due to size issues shall be borne by the participating team
Data transmission	Video-transmission image information: UDP Match-related data: MQTT+ProtoBuf	-
Protocol	See the *Communication Protocol*	-

2.1.7.1 Mounting Requirements

S44 Double-sided tape, screws, or other adhesive or sharp objects shall not be used in contact with the Pilot Room desktop. Teams will be held responsible if they cause any damage to the Pilot Room equipment, or cause a delay due to dismounting/cleanup.

S45 A Custom Controller shall not have live conductors directly exposed.

2.1.7.2 How to Use

The Pilot Room provides an RJ45 Ethernet port, which may be used to connect Custom Controller signals. The Pilot may connect it independently.

S46 Before use, the Custom Controller shall be connected to the data interface provided in the Pilot Room, and tested to confirm that it works normally.

S47 A Custom Controller shall not use a wireless transmit/receive device.

2.1.8 17 mm Fluorescent Energy Charging Device

Using the dimensions of the official 17 mm Fluorescent Energy Charging Device shown in Figure 2-1 as a reference, reserve mounting holes at the specified position on the robot.

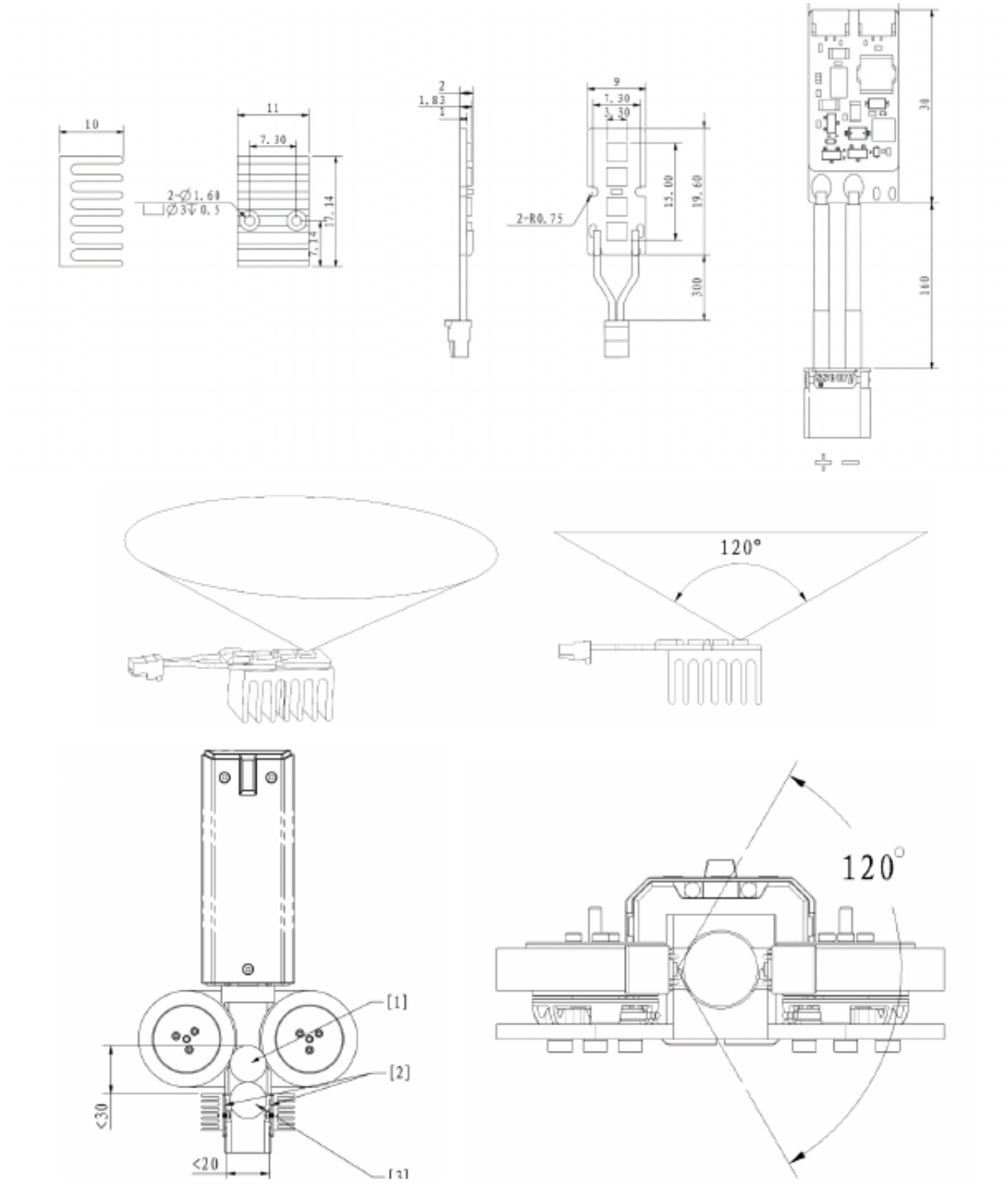


Figure 2-1: Installation Schematic of the Official 17 mm Fluorescent Energy Charging Device. [1] Launching-state projectile. [2] Official 17 mm Fluorescent Energy Charging Device. [3] Standby projectile.

A launching-state projectile is the projectile at the position shown in the figure at the instant it contacts the friction wheels or other launching structure. A standby projectile is the projectile immediately before the

launching-state projectile in the feeding path.

S48 All robots that launch 17 mm projectiles are required to install a 17 mm fluorescent energy-charging device. The installed device need not be the official 17 mm Fluorescent Energy Charging Device shown in Figure 2-1. Its charging power will be tested during Inspection.

2.1.8.1 Installation Steps

1. Install the UV light panels at the specified position on the robot. The installed light panels shall be parallel and placed symmetrically about the center plane of the projectile channel. The distance between the upper surfaces of the LED beads of the two light panels shall be less than 20 mm. The distance from the frontmost end face of a light panel to the front end of the launching-state projectile shall be less than 30 mm. Each LED bead shall have a 120° illumination FOV. The installation position is as shown in the figure above.
2. If the installed projectile-supply tube is metal, maximize the contact area between the projectile-supply tube and the light panels, and tighten the screws to aid heat conduction. A non-metal projectile-supply tube must have a heat sink installed.
3. After wiring of the UV light panels is completed, the XT30 port may be connected to a 12 V or 24 V supply.

2.1.8.2 Installation Requirements

- It is recommended that the LED-bead face of a UV light panel be installed in close contact with metal parts of the launcher, and that the back of the LED beads be in close contact with the heat sink. At least 20 mm of clearance shall be left outside the heat sink, so that flowing air can contact the heat sink directly.
- It is recommended that conductive materials be kept clear of the light-panel power-wire pads, to prevent short circuits.
- It is recommended that the back of a UV light panel or the surface of a heat sink not be covered with tape, plastic, or other parts that affect heat dissipation.
- During use, check whether dirt is blocking the LED beads or whether LED beads are damaged. If so, replace them promptly, so as to avoid affecting Inspection.

S49 Installation of the UV light panels shall ensure that there is no obvious light leakage, so as to prevent ultraviolet light from causing injury to the human body.

S50 The arrangement direction of the UV light-panel LED beads shall be consistent with the direction of projectile travel in the path, with no structure blocking the LED beads from illuminating the projectiles, so as to ensure the projectile charging effect.

S51 During Inspection of the 17 mm fluorescent energy-charging device, the robot shall fire projectiles at the game-condition firing rate or at the Launching Mechanism's maximum firing rate.

S52 If the official 17 mm Fluorescent Energy Charging Device shown in Figure 2-1 is used, the matching heat sink and its matching components shall be used.

S53 A self-made UV light panel shall use UV LED beads with a wavelength of 390–410 nm.

Recommendations for self-made UV light panels:

- It is recommended that the LED-bead emission angle be 120°.

- It is recommended that the total luminous power of a single light panel be 3 W (two light panels totaling 6 W).
- It is recommended that the circuit-board material be an aluminum substrate or a copper substrate.
- Heat-sink specifications, LED-bead spacing, total light-panel length, and the like are recommended to follow the official 17 mm Fluorescent Energy Charging Device shown in Figure 2-1.

2.1.9 Miscellaneous

S54 In the design and production of a robot, materials that are fragile, easy to fall off, and difficult to clean shall not be used, such as feathers and cotton. Glue or adhesive materials shall not be used to connect a robot to the Battlefield or to Battlefield components.

- If the market definition of a material's fragile or easy-to-fall-off nature is ambiguous, a participating team may use such a material in competition only after ensuring its strength and with the permission of Inspection referees.
- To avoid potential risks arising from an ambiguous definition of material properties, for example that a robot may be unable to take the field normally, participating teams are advised not to use materials whose nature as described above is ambiguously defined.

S55 When acquiring or assembling objectives, a robot shall not leave obvious marks on or cause damage to the objectives.

- Grabbing a Referee System module by a robot may severely affect the functionality of the module. Consequences arising therefrom will be borne by the offending team.

S56 Except for a Dart Launcher in the Dart System launching Darts, a robot shall not disassemble into sub-robots or into multiple subsystems connected by flexible cables, and shall not actively throw or launch its own parts.

2.2 Specifications on the Use of Open-Source Designs

See the *ARCC Events Manual* for ARC Robotics' intellectual property policy. Teams may not use open-source robot designs, subassemblies, or code verbatim. Concepts, architectures, key dimensions or subcomponents, and algorithms may be incorporated. Any use of an open-source design must be disclosed during Inspection.

S57 ARC Robotics is entitled to launch investigations and inquiries to any participating teams regarding the use of open-source material. Any confirmed verbatim use of an open-source robot design, subassembly, or code, in violation of the restriction above, is subject to disqualification.

2.3 Definition and Scope of Third-Party Components

S58 Unless otherwise specified, participating teams are prohibited from using third-party subsystems when building robots.

- Third party: an entity other than ARC Robotics, DJI RoboMaster, and the participating team itself.
- Disallowed Component Examples: Suspension modules, Launching Mechanism, Gimbal Mechanism, Supercapacitor Control Board, Feeding mechanism, Robotic Arm
- Allowed Component Examples: Generic Commercial-Off-The-Shelf (COTS) devices, such as NVIDIA Jetson, STM32, LIDAR modules, 3D Cameras

Commercial Off the Shelf Hardware

COTS products must meet the following criteria:

- Public-sale requirements
  - Produced or sold by a retail company.
  - Already sold to the public through the enterprise website, e-commerce platforms, distributors, or other channels before the registration deadline, not limited to ARC Robotics or RoboMaster participating teams, or to specific competition-related channels.
- Generic use requirements
  - The product is mainly intended for general industrial, robotics, research, educational, or consumer-market use.
  - The product's promotional materials shall not take ARC Robotics, RoboMaster or any other single competition as the sole or primary use scenario.
  - A product that is clearly function- or specification-customized for ARC Robotics, RoboMaster or another specific competition, or that is sold only through competition channels, is not regarded as a generic use product.

Compliance certification

- Electronic and electrical products should meet the basic safety and electromagnetic-compatibility specifications typically required by the US market.
- UL safety certifications.
- FCC electromagnetic-compatibility / radio certifications.

ARC Robotics reserves the right of final interpretation and ruling on whether a product qualifies as COTS.

2.4 Robot Technical Specifications

- Maximum Storage Size: The robot shall meet the Maximum Storage Size limit in the powered-on state, including the Referee System and all brackets.
- Maximum Expansion Size: The robot's maximum size limit at any moment, based on the extreme pose to which the robot's mechanical structure can expand, including the Referee System and its bracket. During Inspection, the team shall actively demonstrate all mechanical-structure deformations. Before, during, and after deformation, no form of the robot may exceed the Maximum Expansion Size requirement. Software limitations to prevent exceedance are not sufficient to meet this requirement.
- In this section, the robot's length, width, and height correspond to the lengths along the X-axis, Y-axis, and Z-axis of the body coordinate system, respectively. For the Drone, the X-axis and Y-axis directions may be chosen freely, and the Z-axis is perpendicular to the placement plane. Coordinate-system specifications do not apply to the Dart System.

S59 Except for the Custom Controller, a robot shall not be split into independent units when its size changes. At the same time, connecting structures shall meet the following requirements:

- Mechanical hinges or ball joints are allowed (for example: hinges, shafts, ball-end bearings, linear guides), as are other movable connections that interlock through the solid body structure.
- Flexible traction connections are prohibited (for example: cables, ropes, chains, belts), as are connections that rely on adsorption or friction to be maintained (for example: suction cups, magnetic attraction, connections that rely only on friction).

Tightening or loosening of screws, cable ties, and similar parts without removing them is not treated as splitting into independent units. Removal of zip ties or pins to transition between Storage and Expansion size does constitute splitting into multiple parts and is not permitted.

S60 All projectiles must be able to be removed from the robot prior to and after Inspection, and prior to and after Matches. Any 'dead' projectiles that are part of the feeder design must be able to be removed to meet this criterion. It is recommended to have an easy method of projectile unloading that does not involve disassembly of the robot, as that could invalidate the inspection status.

2.4.1 Hero Robot

S61 A Hero Robot shall have the functions of horizontal movement and launching 42 mm projectiles.

S62 The design of a Hero Robot shall meet the following requirements.

Table 2-5: Hero Robot Specifications

Item	Limit	Remarks
Operating Mode	No restrictions. Up to one remote controller and one Custom Controller may be configured.	-
Maximum Power Capacity (Wh)	300	-
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 30 V.
Launching Mechanism	One 42 mm Launching Mechanism	The launcher shall be attached to the robot.
Maximum Weight (kg)	39	Including the weight of the battery and the Referee System.
Maximum Storage Size (mm, L*W*H)	The robot has one powered-on state in which it does not exceed 800x800x800.	
Maximum Expansion Size (mm, L*W*H)	In any case, the robot's length, width, and height shall not be greater than 1200*1200*1200.	
Referee System	* 42 mm Speed Monitor Module * Armor Module * Camera Video Transmission Module (Sender) * Light Indicator Module * Main Control Module * Power Management Module * RFID Interaction Module * Supercapacitor Management Module	Weight: 4.21 kg

2.4.2 Engineer Robot

S63 An Engineer Robot shall have the functions of horizontal movement, grabbing objectives, and depositing objectives.

S64 The design of an Engineer Robot shall meet the following requirements.

Table 2-6: Engineer Robot Specifications

Item	Limit	Remarks
Operating Mode	No restrictions. Up to one remote controller and one Custom Controller may be configured.	-
Maximum Power Capacity (Wh)	300	-
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 30 V.
Launching Mechanism	A Launching Mechanism is not allowed to be installed.	-
Maximum Weight (kg)	39	Including the weight of the battery and the Referee System.
Maximum Storage Size (mm, L*W*H)	The robot has one powered-on state in which it does not exceed 600x600x600.	-
Maximum Expansion Size (mm, L*W*H)	In any case, the robot's length, width, and height shall not be greater than 1200*1200*1100.	
Referee System	* Armor Module * Camera Video Transmission Module (Sender) * Light Indicator Module * Main Control Module * Power Management Module * RFID Interaction Module * Supercapacitor Management Module	Weight: 3.04 kg

2.4.3 Infantry Robot

S65 An Infantry Robot shall have the functions of horizontal movement and launching 17 mm projectiles.

S66 The design of an Infantry Robot shall meet the following requirements.

Table 2-7: Infantry Robot Specifications

Item	Limit	Remarks
Operating Mode	No restrictions. Up to one remote controller and one Custom Controller may be configured.	-
Maximum Power Capacity (Wh)	300	-
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 30 V.
Launching Mechanism	One 17 mm Launching Mechanism	-
Maximum Weight (kg)	28	Including the weight of the battery and the Referee System.
Maximum Storage Size (mm)	The robot has one powered-on state in which it does not exceed 600x600x600.	-
Maximum Expansion Size (mm)	In any case, the robot's length, width, and height shall not be greater than 800*800*800.	-
Referee System	* 17 mm Speed Monitor Module * Armor Module * Camera Video Transmission Module (Sender) * Light Indicator Module * Main Control Module * Power Management Module * RFID Interaction Module * Supercapacitor Management Module	Weight: 3.25 kg

2.4.4 Sentry Robot

S67 A Sentry Robot shall have the functions of horizontal movement and launching 17 mm projectiles.

S68 The design of a Sentry Robot shall meet the following requirements.

Table 2-8: Sentry Robot Specifications

Item	Limit	Remarks
Operating Mode	Fully autonomous. Up to one remote controller may be configured for debugging.	-
Maximum Power Capacity (Wh)	300	-

Item	Limit	Remarks
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 30 V.
Launching Mechanism	One 17 mm Launching Mechanism	-
Maximum Weight (kg)	28	Including the weight of the battery and the Referee System.
Maximum Storage Size (mm)	The robot has one powered-on state in which it does not exceed 600x600x600.	-
Maximum Expansion Size (mm)	In any case, the robot's length, width, and height shall not be greater than 800*800*800.	-
Referee System	* 17 mm Speed Monitor Module * Armor Module * Camera Video Transmission Module (Sender) * Light Indicator Module * Main Control Module * Power Management Module * RFID Interaction Module * Supercapacitor Management Module	Weight: 3.25 kg

2.4.5 Drone

S69 A Drone shall have the function of sustained flight for at least 10 seconds. The team shall demonstrate this capability during the Final Assessment. Failure to demonstrate controlled flight may result in disqualification.

- The robot in the video must clearly be the same robot as the one under Inspection.
- The video shall show the Drone flying for at least 10 seconds, and shall include proof of when it was recorded and that it is genuine, such as a timestamp and a photo of the robot and the Pilot together.

S70 The design of a Drone shall meet the following requirements.

Table 2-9: Drone Specifications

Item	Limit	Remarks
Operating Mode	No restrictions. Up to two remote controllers and one Custom Controller may be configured.	-
Maximum Power Capacity (Wh)	900	-

Item	Limit	Remarks
Maximum operating voltage (V)	52	-
Launching Mechanism	One 17 mm Launching Mechanism	-
Maximum Weight (kg)	13	Including the battery. Not including the Referee System.
Maximum Expansion Size (mm, L*W*H)	In any case, the robot's length, width, and height shall not be greater than 1700*1700*1100.	The orthographic projection of the robot on the ground shall not exceed a 1700x1700 square, and the highest point of the robot shall not be more than 1100 mm from the ground.
Referee System	* 17 mm Speed Monitor Module * Camera Video Transmission Module (Sender) * Main Control Module * Power Management Module	Weight: 0.66 kg

S71 Drones may operate in indoor spaces, with limited GNSS/GPS connectivity. Designs that rely on GNSS for stable flight should be tested carefully for operation indoors.

S72 A Drone shall be fitted with a fully enclosed propeller guard, and the propeller blades shall not be exposed. The Drone shall strike a rigid plane at a horizontal speed of (1.2 ± 0.1) m/s without obvious damage.

- A fully enclosed propeller guard is a structure that fully protects each propeller blade.

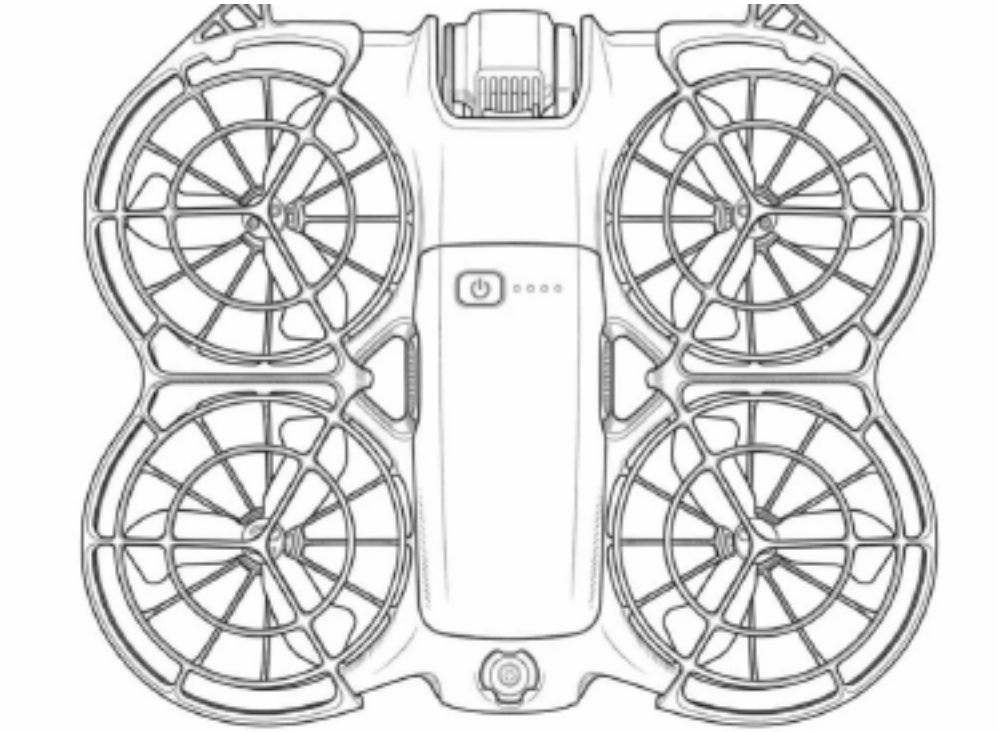


Figure 2-2: Fully Enclosed Propeller Guard.

S73 When any part of the fully enclosed propeller guard is subjected to a force of 20 N, it shall not deform into contact with a propeller blade or interfere with normal blade rotation. During Inspection, staff apply 20 N at any position with a 2 mm-diameter object. After that force, the guard shall still meet this rule.

- If the guard needs an opening for maintenance, the team shall design an opening mechanism that still meets this rule.

S74 When a Drone flies toward a vertical cylinder of any diameter, from any angle and at a horizontal speed, the propeller guard shall keep the blades from touching the cylinder, and the guard shall not deform obviously.

S75 The team shall test whether the propulsion system and the power supply can carry the robot and support its flight during a game, so that a safety incident does not occur.

S76 The team may install indicator lights that show flight status. There shall be no more than 6 such lights. The maximum illuminance of each light at 100 mm shall not be greater than 3500 lux. The lights shall not disturb the game (for example, a high-power LED aimed into the Battlefield).

S77 The team shall design and install external navigation lights so that the top projection of the Drone can be observed. The requirements are:

- The lights shall be light strips firmly attached to the Drone, with a total length greater than 1500 mm. They shall not be installed on the propeller blades, and the layout shall be symmetrical.
- The lights shall face upward. Side-facing or downward installation is not allowed. The lights shall switch between red and blue, and the RGB values shall be close to the Referee System light-bar colors for that team.

- The illuminance of the navigation light in a single area, measured 40 mm away, shall be 150–1500 lux.

S78 The battery and battery frame shall be fixed by a mechanical structure. After they are fixed, the battery shall not wobble.

S79 The Drone shall constrain projectiles in the magazine. Projectiles shall not fall out of the magazine during flight.

S80 The remote controller used by the Drone shall have an emergency propeller-stop function, so that the propellers can be stopped immediately in an emergency.

2.4.6 Dart System

The Dart System consists of the Dart and the Dart Launcher. The Dart Launcher serves as the carrier of Darts and provides them with initial propulsion.

S81 A Dart shall have the functions of locating the Dart Detection Module, controlling its flight direction, and striking the Dart Detection Module to produce a hit. The design of a Dart shall meet the following requirements.

Table 2-10: Dart Production Parameters

Item	Limit	Remarks
Maximum Power Capacity (Wh)	4	-
Maximum operating voltage (V)	8.4	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 8.4 V.
Maximum Weight (kg)	0.3915	Including the Dart trigger device.
Maximum Expansion Size (mm, L*W*H)	250*250*150	* The Dart's length in the flight direction is not greater than 250. * The Dart's wingspan is not greater than 250.

Using the forward direction of the Dart trigger device as the Dart's flight direction, the y and z directions in the figure are the Dart's wingspan and height.

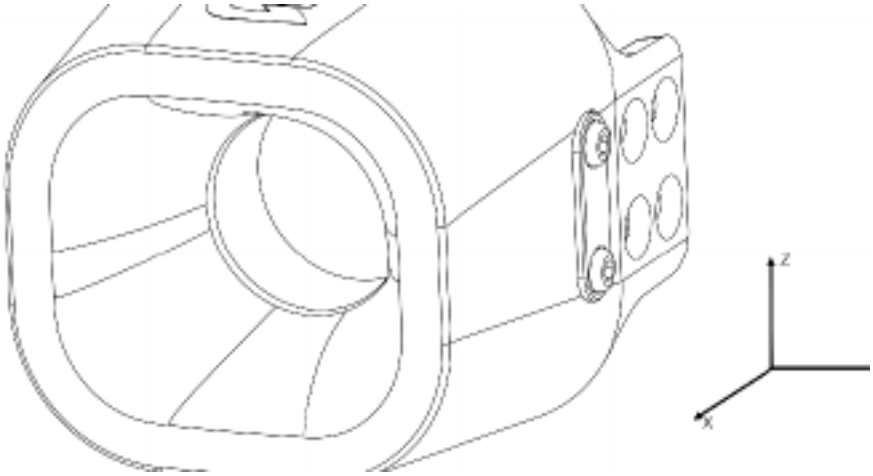


Figure 2-3: Dart Flight Direction.

S82 A Dart Launcher shall have the functions of loading Darts and launching Darts more than 5 m. The design of a Dart Launcher shall meet the following requirements.

Table 2-11: Dart Launcher Production Parameters

Item	Limit	Remarks
Operating Mode	No restrictions. Up to one remote controller may be configured.	Use of the Referee System serial port is recommended.
Rotation Angle (°)	* Yaw-axis angle: no restrictions * Pitch-axis elevation angle: 25–45	-
Maximum Power Capacity (Wh)	300	-
Maximum operating voltage (V)	30	At any time, the voltage at any point inside the robot relative to the battery negative terminal shall not be greater than 30 V.
Maximum operating power (W)	No restrictions	-
Maximum Dart load	4	-
Dart initial speed	No restrictions	When the Dart's initial speed exceeds 25 m/s, the Referee System may fail to detect the Dart.
Maximum Weight (kg)	25	Including the weight of the battery and the Referee System. Darts need not be loaded when measuring maximum weight.

Item	Limit	Remarks
Maximum Expansion Size (mm, L*W*H)	1000*600*1000	* Maximum Expansion Size is the size of the Dart Launcher after it is loaded with 4 Darts. * In any case, the orthographic projection of the Dart System on the ground does not exceed a 1000*600 square, and the highest point of the Dart System is not more than 1000 from the ground. * The orthographic projection of the Dart Launcher and the Dart to be launched on the ground shall at any time not extend beyond the outermost edges of the bottom frame of the Dart System. The ground-contact portion of the outermost edges of the Dart System's bottom frame shall be a closed rectangle measuring 950*550, with an assembly tolerance of ±50 mm permitted, as shown in "Figure 2-4 Dart System size limit".
Referee System	* Main Control Module * Power Management Module	Weight: 0.22 kg

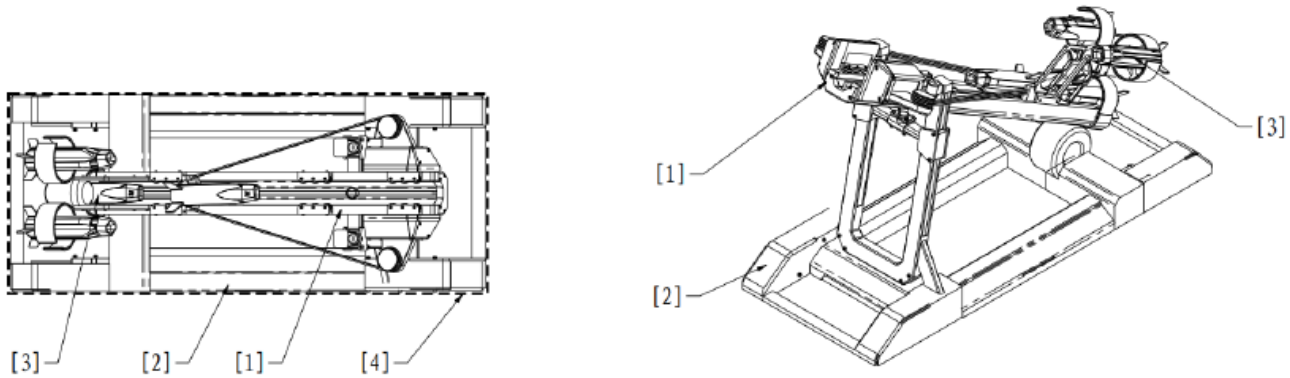


Figure 2-4: Dart System Size Limit. [1] Dart Launcher. [2] Bottom of the Dart System. [3] Dart body. [4] Outermost edges of the contact plane.

S83 Darts shall be fitted with a Dart trigger device. At Inspection, the team shall provide a video of the Dart System launching Darts more than 5 m.

S84 A Dart shall control its flight direction by a propeller (a maximum of one is allowed), control surfaces,

air jets, or similar means. The thrust-to-weight ratio of the Dart shall be less than 1.

S85 When a Dart is launched, the Dart trigger device shall light up, and when the Dart System is observed from above there shall be no exposed light source other than the Referee System and the Dart trigger device.

> If the Dart trigger device does not light up when a Dart is launched, the Referee System will not be able to detect the Dart's release normally.

S86 The Dart trigger device has built-in red-blue dual-color LED beads, which are set to the corresponding color according to the team's Red or Blue side during the game.

> * After a Dart is launched it may land in the Battlefield and may be struck or run over by other robots. In addition, a Dart receives a rather large impact when it hits a target. Teams are advised to design for strength and cushioning to avoid damage to Darts.
> * If the Dart trigger device shows an alternating red-blue flashing effect, damaged beads, or another abnormal condition, the trigger device is damaged, and the Base and the Outpost may be unable to detect Dart hits. Replace it with a spare Dart trigger device. Otherwise all resulting losses are borne by the team.

S87 Pneumatic launching of Darts (using compressed gas as the energy source that accelerates the Dart) is prohibited.

S88 The Dart System may be energized to the ready-to-launch state only during games.

> Ready-to-launch state: the energy-storage element used to give a Dart its initial kinetic energy is in a tensed, inflated, or rotating state. Energy-storage elements include but are not limited to elastic bands, springs, and friction wheels.

2.4.6.1 Mounting Specifications

S89 A Dart shall be fitted with the official designated Dart trigger device.

> The Dart trigger device designated for this season is "Dart trigger device 2".

The mass of the Dart trigger device is about 39.5 g ± 2 g. Its form and dimensions are shown below.

Reserve mounting holes at the Dart head according to the dimensions of the Dart trigger device.

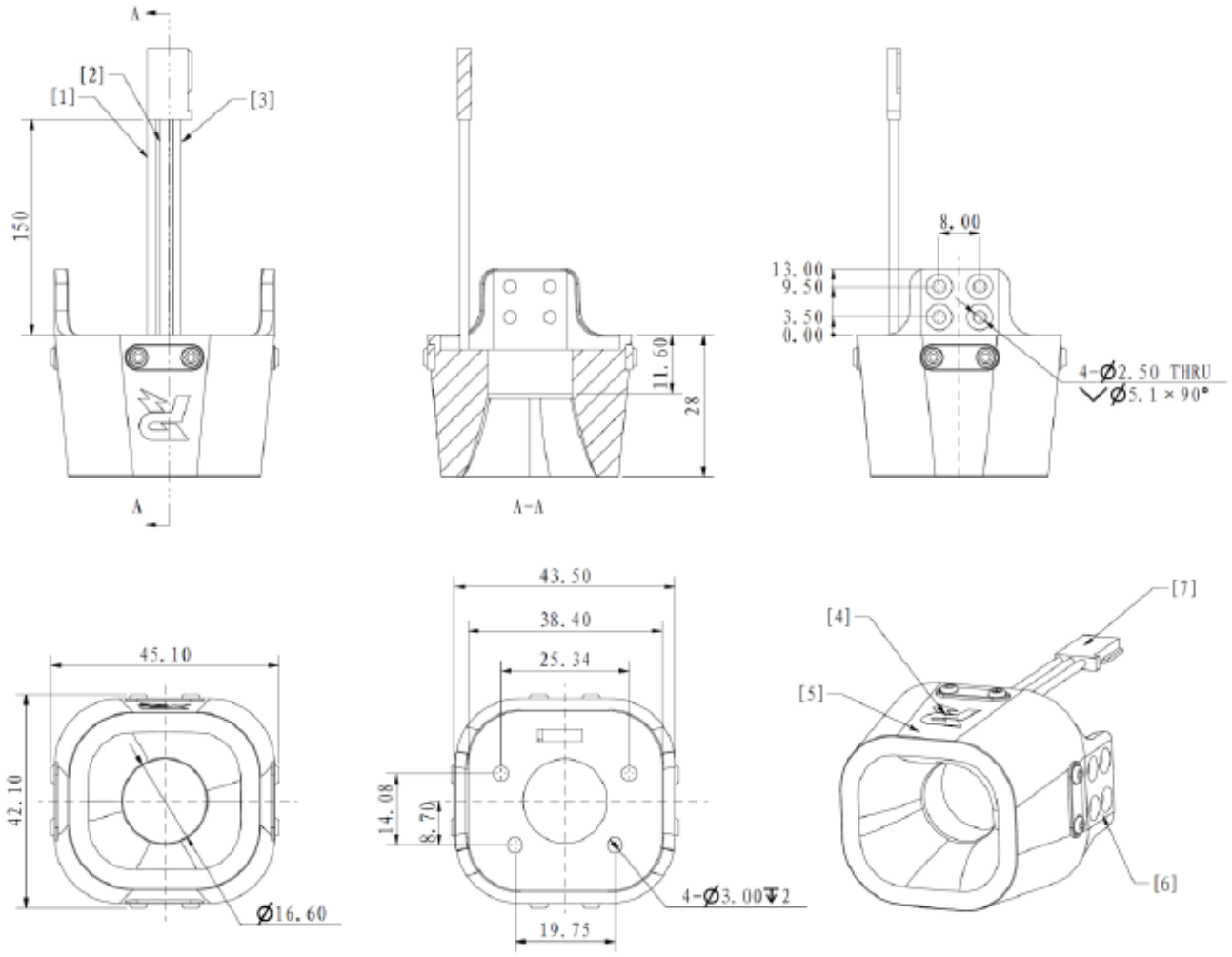


Figure 2-5: Dart Trigger Device. [1] Power-supply negative. [2] Power-supply positive. [3] Serial-port cable. [4] Logo. [5] Dart trigger device. [6] Installation lug. [7] 3P 2.54 mm cable.

2.4.6.1.1 Installation Steps

1. Fasten the Dart trigger device at the Dart head with 8 M2.5 countersunk screws and 4 locating pins.
2. Connect the power port of the Dart trigger device to a 5 V supply.

2.4.6.1.2 Installation Requirements

S90 When battery voltage is low, the Dart trigger device becomes dim. The team shall ensure that the battery voltage used by Darts during a game is at least 4 V. If the actual operating voltage of the Dart trigger device is lower than 4 V, the Base and the Outpost may be unable to detect Dart hits.

S91 After the Dart trigger device is installed, its top, bottom, left, and right shall not be blocked by the Dart structure. Within the upper hemisphere of radius 125 mm centered at the center of the bottom face of the Dart trigger device, there shall be no obstruction, as shown below.

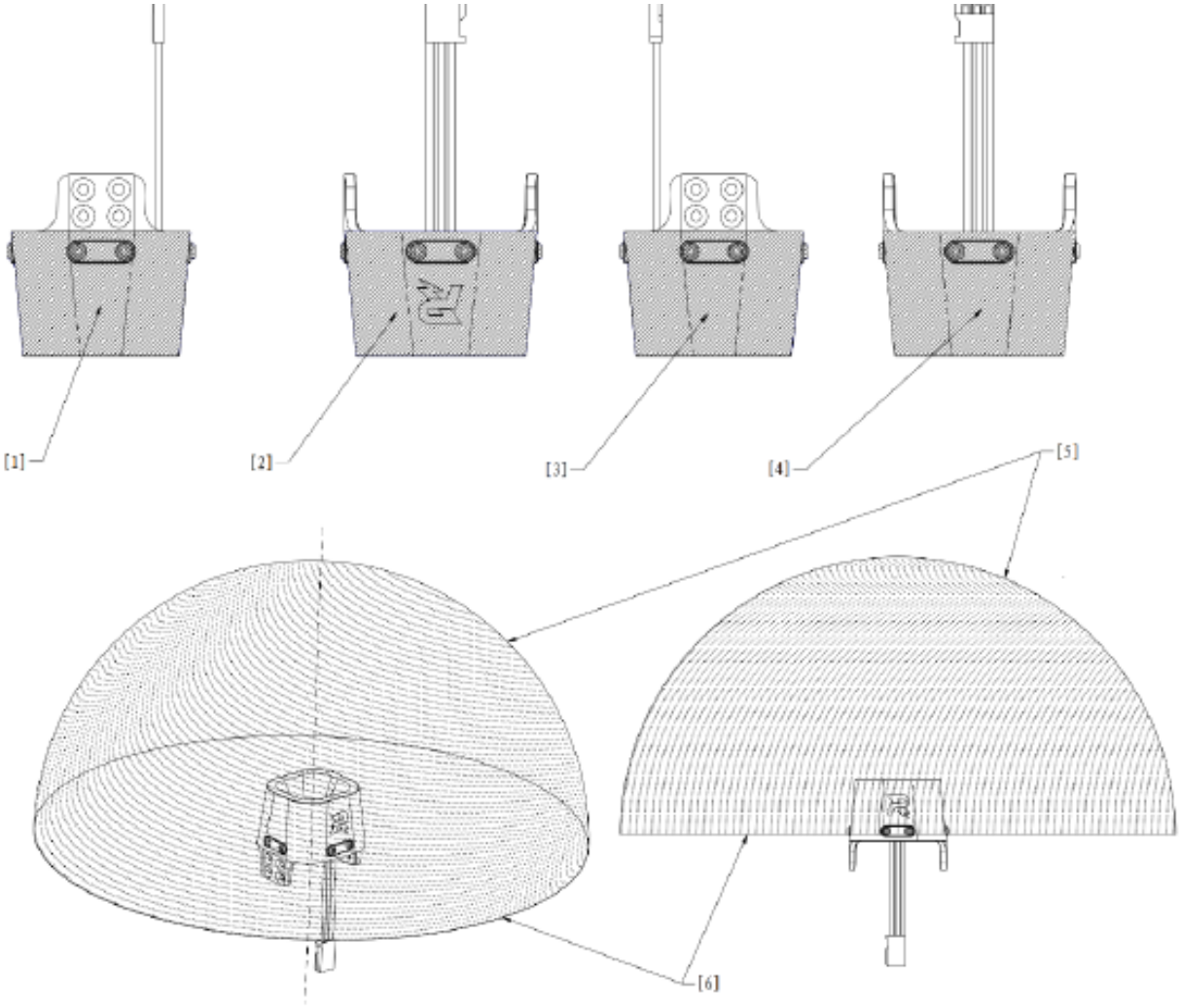


Figure 2-6: Region Around a Dart Trigger Device that Shall Not Be Obstructed. [1] Left side. [2] Top. [3] Right side. [4] Bottom. [5] Region that shall not be obstructed. [6] Unrestricted region inside the Dart trigger device.

S92 A Dart camera or other device may be installed in the internal cavity of the Dart trigger device. The mounting area shall not exceed the shaded region shown below.

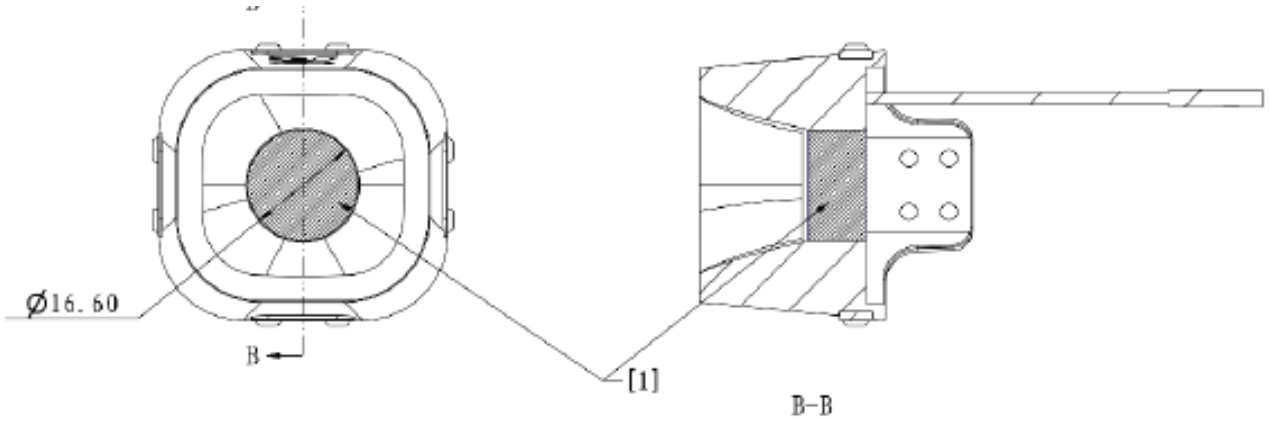


Figure 2-7: Internal Cavity of a Dart Trigger Device. [1] Shaded region.

2.4.6.2 Visual Feature

The visual feature used to assist aiming of the Dart System shall be the vertical lights located on the sides of the Armor Module.

3. Referee System Mounting Specifications

It is recommended that users first read the manual of each Referee System module, to learn what each module does and how it is installed. After the modules are installed correctly, read the *Referee System User Manual* to learn the functions of the Referee System as a whole.

Download address: https://bbs.robomaster.com/wiki/20204847/804050?source=7

When installing and using the Referee System, follow these recommendations:

- While a robot is running, no Referee System module shall collide with, rub against, or otherwise interact with the ground, a wall, or any other object in a way that could damage the module.
- Each Referee System module shall be connected in the way specified in its instruction manual, and the connection shall be protected so that it stays secure.

S93 Except for the installation methods stated in this manual, disassembly or modification of the Referee System Modules is prohibited.

S94 Robots may be fitted with either team-owned or loaner referee systems. All Main Control Modules used must be the ones loaned by ARC Robotics for the Championship. Teams will be liable for all anomalies resulting from the use of team-owned modules.

S95 When a Referee System Module is replaced during a game or during Inspection, the time limits below shall be met. Time spent upgrading firmware is not included.

Table 3-1: Maximum Replacement Time for Each Referee System Module

Module	Maximum replacement time (minutes)
Main Control Module	5
Power Management Module	10
Light Indicator Module	5
Armor Module	2
Armor Support Frame	7
Camera Video Transmission Module (Sender)	5
RFID Interaction Module	7
17 mm Speed Monitor Module	7
42 mm Speed Monitor Module	7
Supercapacitor Management Module	3

S96 While a robot is overturned, if it does not conform to the building specifications, the referee may waive the penalty according to the actual situation. Any state that the robot enters on its own will not be considered an abnormal operating condition.

3.1 Overview of the Referee System

Robots designed by a team shall reserve the mechanical and electrical interfaces, follow the specifications in this section, and install each Referee System module correctly.

- The RoboMaster Organizing Committee (RMOC) provides the Referee System on loan to ARC Robotics. ARC Robotics then loans the Referee System to ARCC participating teams.
- Chassis power: power consumed by a mechanism that, based on rotary motion and relying on friction with the ground, does work to translate or rotate the robot horizontally on a plane. For example, the steering motor of a swerve module, the joint motors of a legged robot, and a track mechanism used only to climb steps or cross obstacles are not counted in chassis power.
- No device used by a team may interfere with normal operation of the Referee System. If interference exists, the team shall adjust the source until it no longer interferes.
- While a robot passes through a Limbo Bar, the Speed Monitor Module may be blocked briefly. The Main Control Module, the Camera Video Transmission Module (Sender), and the Light Indicator Module may also be blocked briefly, but any resulting malfunction or interference is borne by the team. Every other module shall still meet its own installation requirements.

The modules that make up the Referee System are as follows.

Table 3-2: Modules that Make Up the Referee System

Module	Description
Main Control Module	The core control unit of the Referee System. It monitors the operating state of the whole system and integrates human-machine interaction, wireless communication, and status display.
Power Management Module	Controls power to the robot Chassis, Gimbal, and Launching Mechanism; forwards data; and measures chassis power.
Light Indicator Module	Uses LED light bars to indicate red/blue side, HP, buffs, module-offline state, and similar status.
Armor Module	Detects projectile hits on the robot and collisions.
Speed Monitor Module	Detects the muzzle velocity and firing heat of the robot's projectiles. It is divided into a 17 mm Speed Monitor Module and a 42 mm Speed Monitor Module.
RFID Interaction Module	Exchanges information with an RFID Interaction Module Card on the field or on a robot, and thereby carries out the corresponding function.
Camera Video Transmission Module	Divided into a Sender, installed on the robot, and a Receiver, installed on the client in the Pilot Room. The camera captures the view in front of the robot in real time and sends that first-person image back to the display in the Pilot Room. It can also be used to operate the robot remotely.
Supercapacitor Management Module	Measures energy into and out of the supercapacitor bank.

3.2 Referee System Modules

The Referee System Module configuration of each robot is as follows.

Table 3-3: Referee System Module Configuration

Module	Hero Robot	Engineer Robot	Infantry Robot	Drone	Sentry Robot	Dart System
Main Control Module	1	1	1	1	1	1
Power Management Module	1	1	1	1	1	1
Light Indicator Module	1	1	1	0	1	0
Armor Module	4	4	4	0	4	0
Camera Video Transmission Module (Sender)	1	1	1	1	1	0
RFID Interaction Module	1	1	1	0	1	0
17 mm Speed Monitor Module	0	0	1	1	1	0
42 mm Speed Monitor Module	1	0	0	0	0	0
Supercapacitor Management Module	1	1	1	0	1	0

3.3 Main Control Module

Reserve mounting holes at the specified position on the robot, using the dimensions of the Main Control Module as the reference.

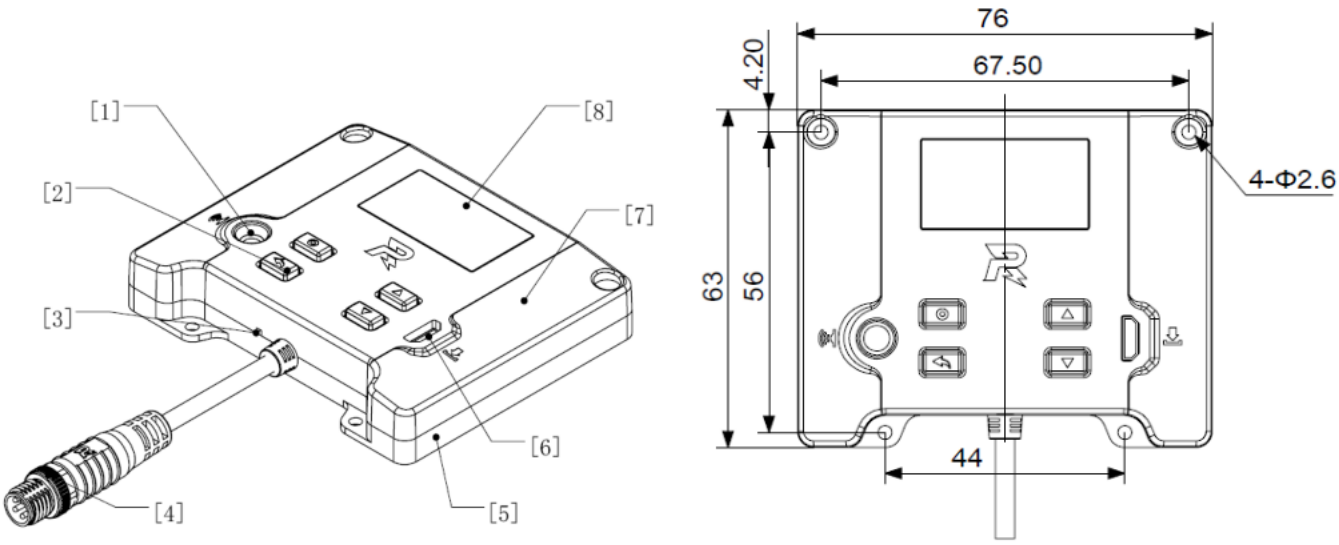


Figure 3-1: Main Control Module. [1] Infrared receiver. [2] Button. [3] Power indicator. [4] Aviation-connector port with a black metal ring. [5] Metal lower shell. [6] Upgrade port. [7] Plastic upper shell. [8] Screen.

3.3.1 Installation Steps

1. Fasten the Main Control Module to the specified position on the robot with 4 M2.5 screws.

> Installation reference: a team may design its own part, and shall fit non-metal shields around the module so that projectiles do not strike it.

2. Using the aviation adapter cable supplied in the package, connect the Main Control Module to the aviation-connector port with the black metal ring on the Power Management Module.

> When the Main Control Module is connected to the Power Management Module, no other Referee System Module may be connected in series between them.

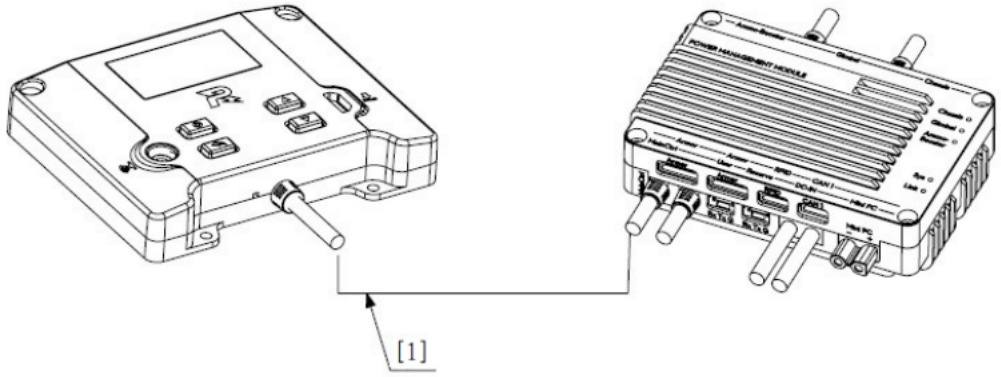


Figure 3-2: Main Control Module Wiring. [1] Aviation adapter cable.

3.3.2 Installation Requirements

Installation of the Main Control Module shall meet the following requirements. Otherwise the robot may be unable to connect to the competition server, or the connection may be unstable.

- While the robot is in its operating state, the top surface of the Main Control Module shall face horizontally upward. Taking the center of each antenna as the apex, there shall be at least one cone with a cone angle of 60° (solid angle $\pi(2-\sqrt{3})$ sr) that extends without limit and contains no conductive material, or an equivalent space that does not interfere with wireless-signal transmission. It shall be the same cone, and the generating lines of the complete cone, after adjustment, shall lie in the upper hemisphere, as shown below.

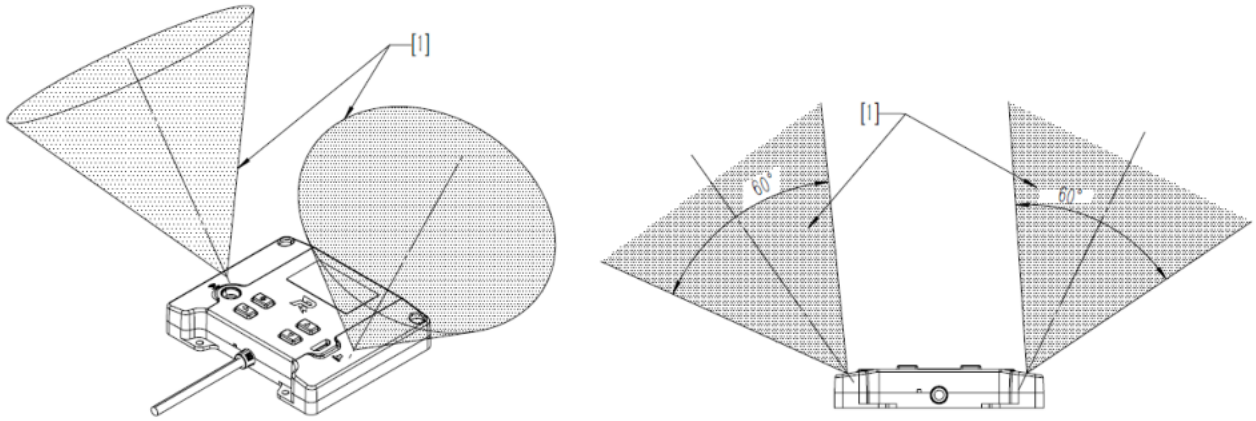


Figure 3-3: Region Around the Main Control Module that Shall Not Be Obstructed. [1] Region that shall not be obstructed.

- The Main Control Module shall be installed where cooling is good. Otherwise it is very likely to malfunction during a game because it cannot shed heat.
- Nothing shall obstruct the screen, buttons, ports, or infrared receiver of the Main Control Module. A protective cover shall be transparent and easy to open. If it cannot be opened, the screen, buttons, ports, and infrared receiver shall be fully exposed. Obstruction may make it impossible to connect to the competition server or to diagnose a fault.
- Within the upper hemisphere of radius 70 mm, centered at the point 8.5 mm directly below the center of the Logo, avoid conductive materials, electromagnetic-absorbing materials, and any other part that may interfere with the Wi-Fi signal.

If electromagnetic shielding or electromagnetic-interference equipment carried by a Gimbal, a manipulator, or a similar mechanism passes through this region while it moves, the Wi-Fi signal may be disturbed.

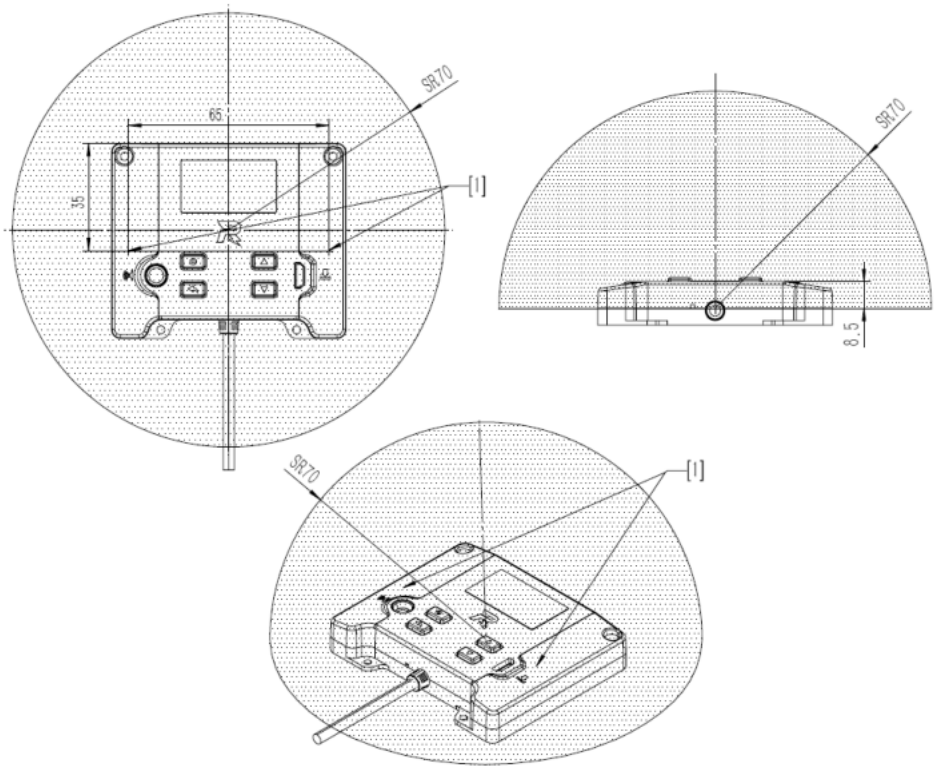


Figure 3-4: Main Control Module Installation Position. [1] Antenna center.

3.4 Power Management Module

Reserve mounting holes at the specified position on the robot, using the dimensions of the Power Management Module as the reference.

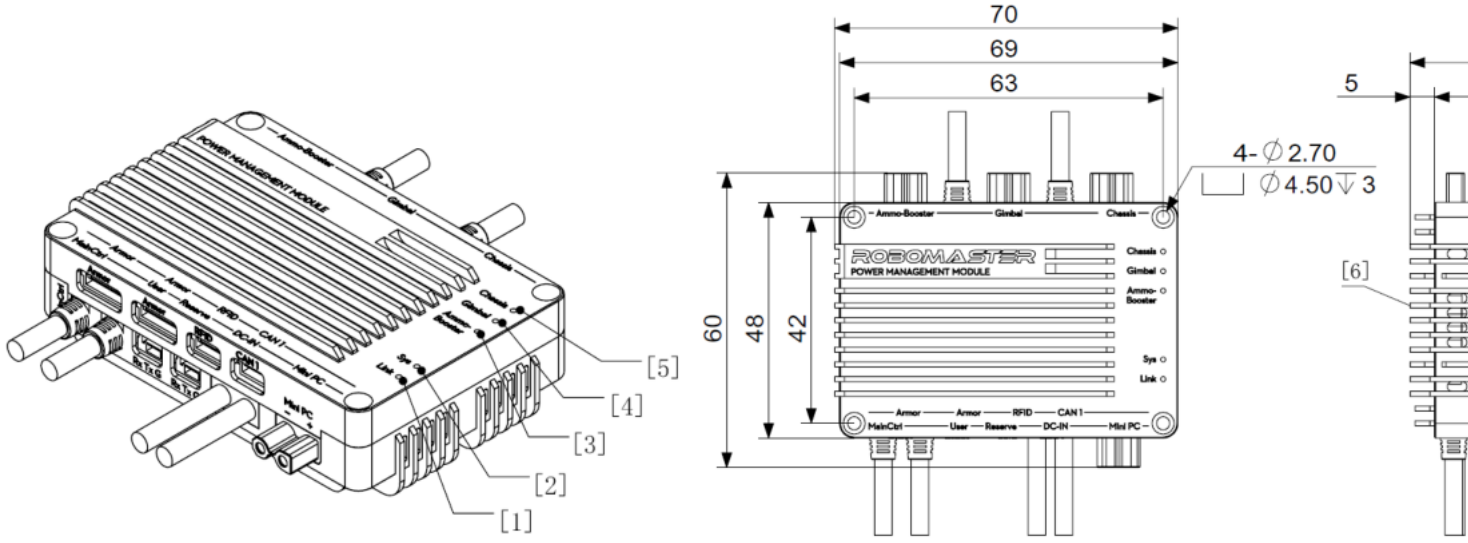


Figure 3-5: Power Management Module. [1] Connection-status indicator. [2] System-status indicator. [3] Launching Mechanism power-output indicator. [4] Gimbal power-output indicator. [5] Chassis power-output

indicator. [6] Bottom mounting face.

3.4.1 Installation Steps

> The aviation-connector ports of the Light Indicator Module, the Camera Video Transmission Module (Sender), and the Speed Monitor Module are equivalent ports and may be connected in series with one another.

Fasten the Power Management Module to the robot with 4 M2.5 screws.

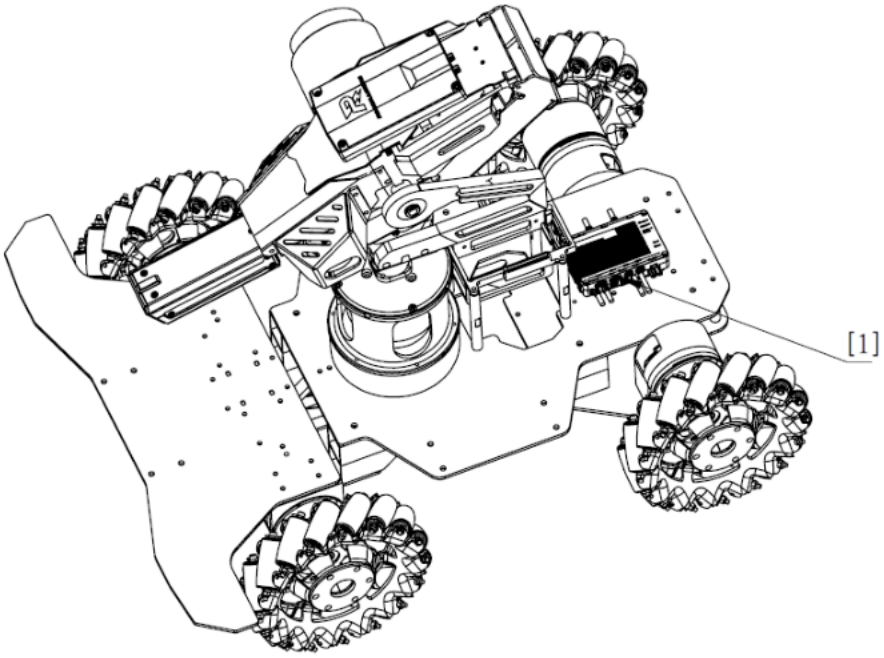


Figure 3-6: Power Management Module Installation. [1] Power Management Module.

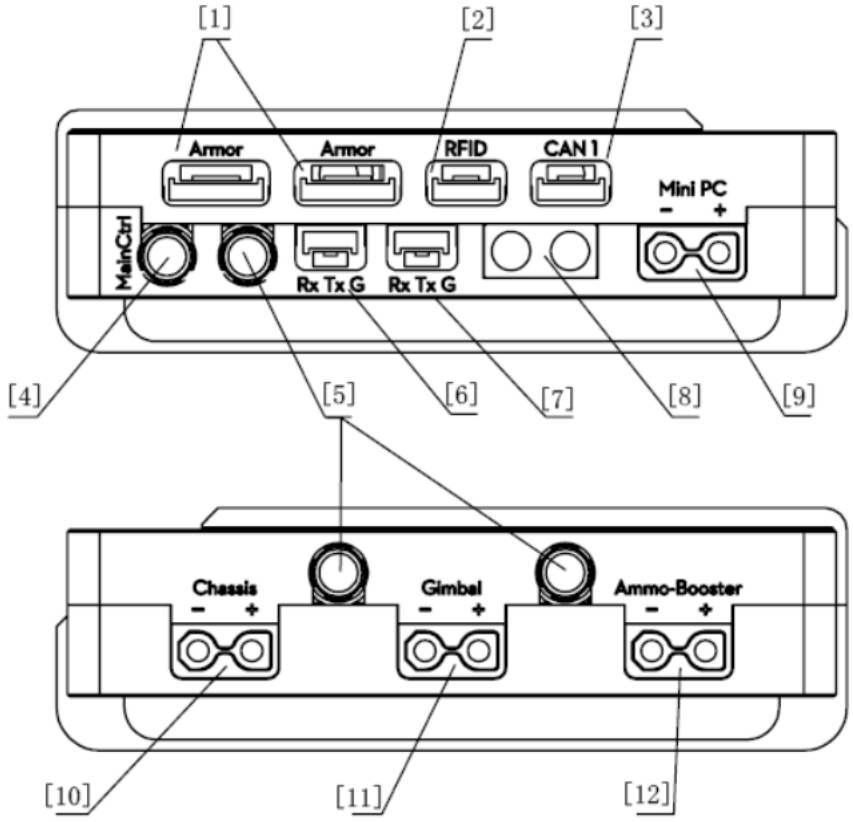


Figure 3-7: Power Management Module Ports. [1] Armor Module SM06B-GHS-TB port. [2] RFID Interaction Module SM04B-GHS-TB port. [3] Supercapacitor Management Module SM04B-GHS-TB port. [4] Main Control Module port (the metal ring of this aviation connector is black). [5] Port for the other Referee System Modules (Speed Monitor, video transmission, and Light Indicator; the metal ring of this aviation connector is silver). [6] Referee System serial port, SM03B-GHS-TB. [7] System-upgrade SM03B-GHS-TB port. [8] Referee System power XT60 port (input). [9] Mini PC power XT30 port (output). [10] Referee System power XT30 port (output), connected to the Chassis. [11] Referee System power XT30 port (output), connected to the Gimbal. [12] Referee System power XT30 port (output), connected to the Launching Mechanism.

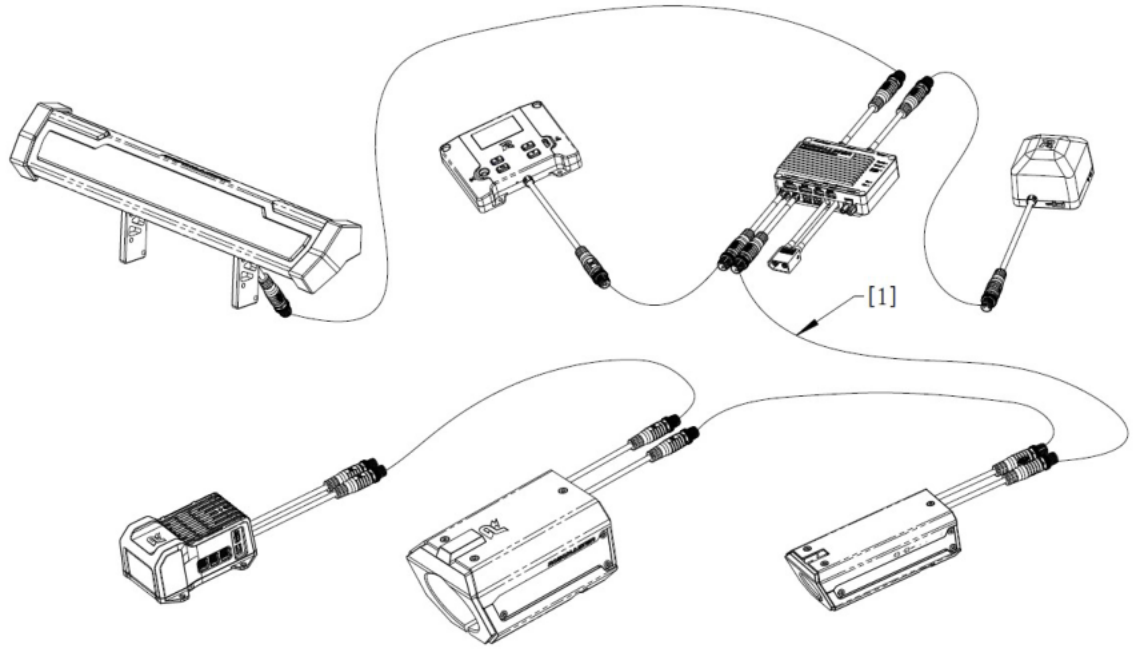


Figure 3-8: Power Management Module Wiring. [1] Aviation adapter cable.

3.4.2 Installation Requirements

Installation of the Power Management Module shall meet the following requirements.

> The Power Management Module shall be fixed firmly to a heat-resistant material and placed where cooling is good, and each port shall be protected. The Power Management Module heats up in use. Fixing it with double-sided tape or another adhesive is very likely to let it fall off and create a safety hazard. Consequences caused by fixing the Power Management Module poorly, or by poor cooling, are borne by the team.

S97 For a robot that has a chassis-power limit, the electrical energy used by a mechanism that must be counted in chassis power shall not bypass monitoring by the Power Management Module.

S98 Distinguish the ports of the Power Management Module carefully and wire them correctly. Power for the robot's mechanisms shall follow Table 3-4.

> Except for the Chassis power of a ground robot, and in order to keep the robot's other power-supply ports stable (for example Gimbal power and 42 mm Launching Mechanism power), those supply ports may be powered by the battery and controlled by a relay or another means. They shall still be switched through the corresponding Power Management Module port in the table below. For example, if the Gimbal port of the Power Management Module is switched off, all devices (even those switched by a relay and connected directly to the battery) must lose power immediately; otherwise, it is considered cheating.

- A load connected to a Power Management Module supply port shall lose power immediately when that supply port is switched off.

- If the Dart Launcher needs a 24 V supply port, it may be powered from the Power Management Module “Mini PC” port or directly from the battery.
- Power Management Module input-voltage requirement: 22 V–26 V. Power-output ports 10, 11, and 12 in Figure 3-7 may be connected and disconnected by the Referee System.
- For the load threshold of each port of the Power Management Module, see the *Power Management Module Manual*.
- When the system load fluctuates greatly, the voltage of power-output ports 9 through 12 fluctuates. Teams should regulate the supply of voltage-sensitive loads, such as a Mini PC.

Table 3-4: Power Management Module Port Assignment

Robot	Chassis	Gimbal	Ammo-Booster	Mini PC
Hero Robot	Chassis power	Gimbal power	42 mm Launching Mechanism power	Mini PC power
Engineer Robot	Chassis power	Manipulator / gimbal power	Not powered	Mini PC power
Infantry Robot	Chassis power	Gimbal power	17 mm Launching Mechanism power	Mini PC power
Drone	Not powered	Not powered	17 mm Launching Mechanism power	Mini PC power
Sentry Robot	Chassis power	Gimbal power	17 mm Launching Mechanism power	Mini PC power
Dart Launcher	Not powered	Not powered	Not powered	Mini PC power

S99 When the Ammo-Booster port of the Power Management Module on a robot that has a Launching Mechanism is switched off, the Launching Mechanism (friction-wheel motors, feeder motor, solenoid valves, and the like) shall be switched off at the same time.

S100 The circuit boards and wiring of a robot that has a chassis-power limit shall meet the following requirements:

- Circuit boards related to Chassis power shall be independent of the Gimbal supply and the Launching Mechanism supply. A circuit board powered from the Power Management Module “Chassis” port shall not also be connected to another supply port of the Power Management Module.
- Every wire related to the robot Chassis shall be clear. Referees may spot-check robots at any time. The team shall cooperate, take the relevant parts apart, and show the wiring. Consider that spot check when designing and routing wires. Time lost in preparation because the robot has to be taken apart for a wiring check is borne by the team.
- Between a circuit board connected to the Power Management Module “Chassis” port (that is, a circuit board related to Chassis power) and a circuit board connected to any other supply port of the Power Management Module, the only connection shall be cable of 24 AWG or smaller, used only for communication, and the total current through it shall be less than or equal to 50 mA.

S101 When the Chassis port of the Power Management Module is disabled, all chassis motors’ motor controllers must immediately lose power. Power is not allowed to pass from stored energy in the supercapacitor bank to the Chassis devices. Software disabling of chassis motors is not sufficient.

3.5 Light Indicator Module

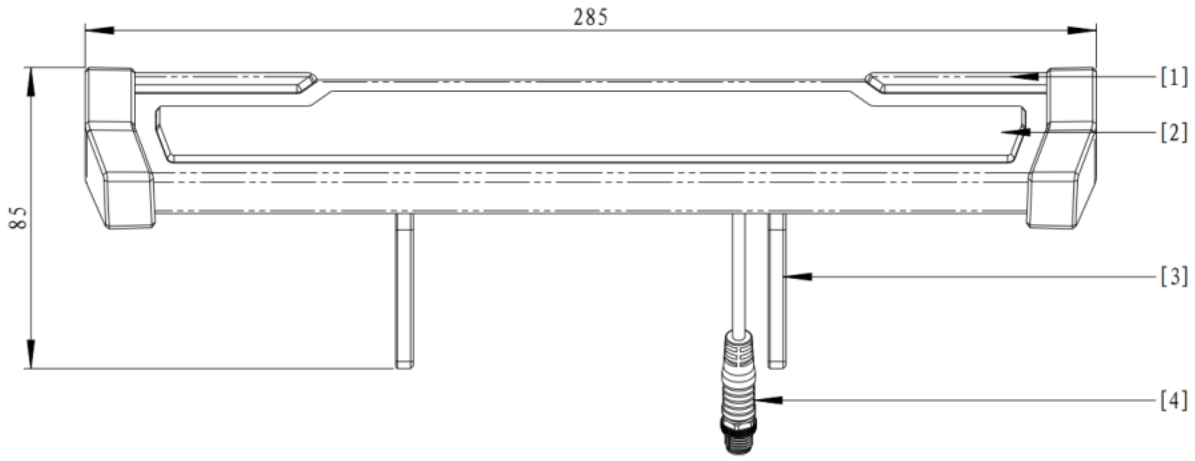


Figure 3-9: Light Indicator Module. [1] Auxiliary light bar. [2] Main light bar. [3] Mounting bracket. [4] Aviation-connector port.

3.5.1 Installation Steps

1. Optional: the Light Indicator Module may be fixed by the screw holes on the bottom of its bracket and installed at a suitable position on the robot. The brackets may not be removed from the Light Indicator Module.

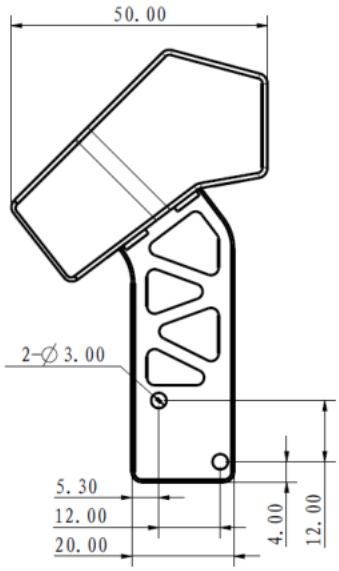


Figure 3-10: Screw Installation Positions of the Light Indicator Module.

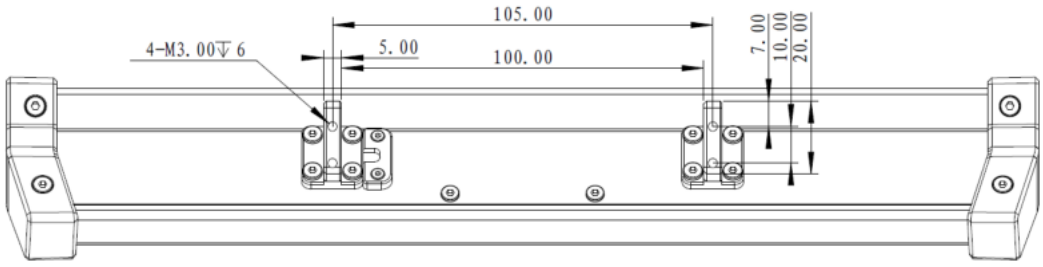


Figure 3-11: Bottom of the Light Indicator Module.

2. Using the aviation adapter cable supplied in the package, connect the Light Indicator Module to the aviation-connector port with the silver metal ring on the Power Management Module.

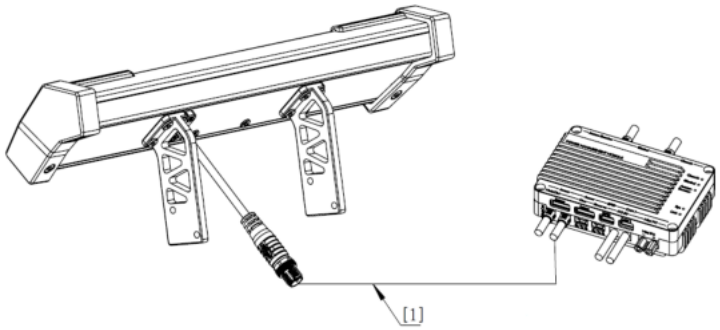


Figure 3-12: Light Indicator Module Wiring. [1] Aviation adapter cable.

3.5.2 Installation Requirements

Installation of the Light Indicator Module shall meet the following requirements.

S102 The long axis of the Light Bar shall be parallel to the ground.

Install the Light Indicator Module so that the main light bar and the auxiliary light bars can be seen completely when looking straight at the robot from at least one horizontal direction, with an up-and-down tilt of 45°.

3.6 Armor Module

The Armor Module shall be installed on the robot through the designated Armor Support Frame.

S103 The Armor Support Frame may be mounted on the robot Chassis using only the rear mounting face or the bottom mounting face.

S104 Only the official Armor Support Frame may be used to install an Armor Module. Modifying or damaging the Armor Support Frame is prohibited.

The shape of the designated Armor Support Frame is shown below.

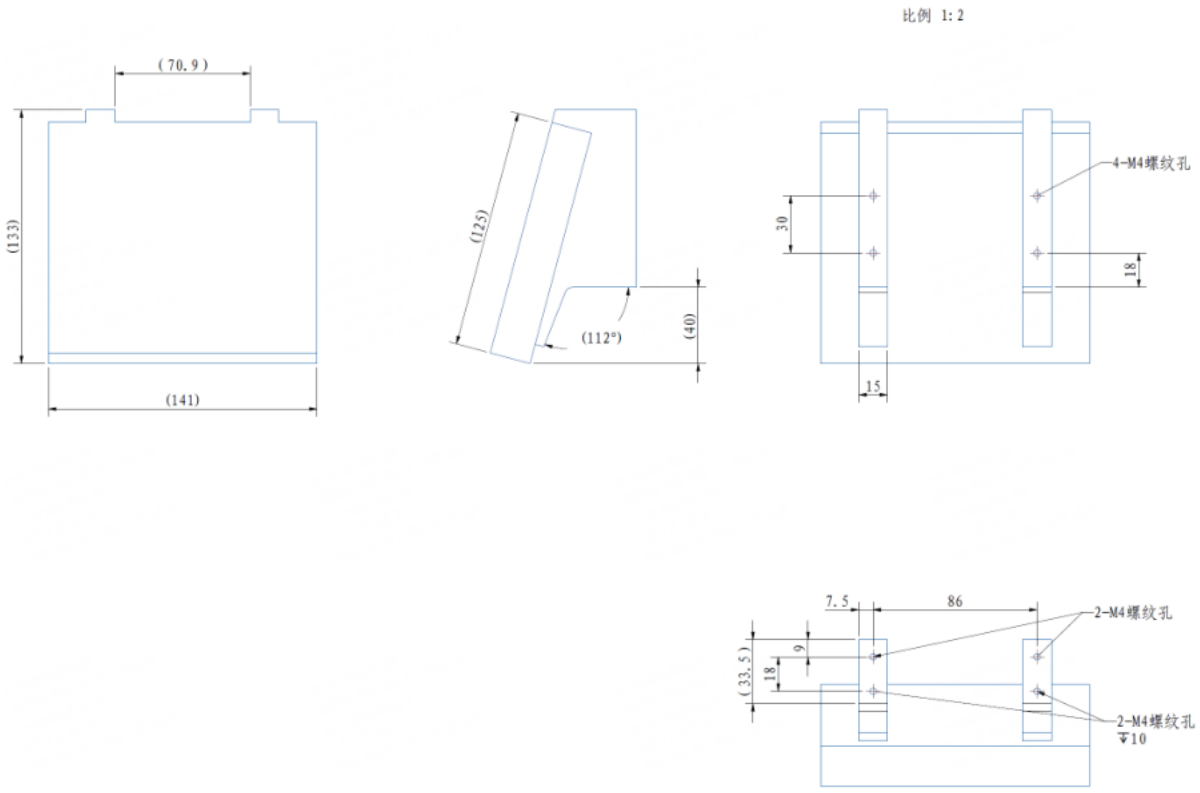


Figure 3-13: Designated Armor Support Frame.

S105 Do not modify or decorate an Armor Module in any way.

3.6.1 General Specifications

> Robot Chassis: the mechanism that carries the robot's power system and its attached parts; the mechanism that supports the robot body.

The robot-body coordinate system is a standard X, Y, Z Cartesian coordinate system. The origin is the robot's center of mass. Following the Armor Module installation requirements for ground robots, the robot coordinate system is established with the theoretical direction of maximum efficiency of the chassis configuration the robot uses as the robot's X-axis, and with the positive Z-axis pointing toward the center of the Earth. If a special chassis configuration (for example a swerve chassis) has more than one direction of maximum efficiency, any one of those directions may be chosen as the X-axis. The X-axis of several chassis forms is defined in the figure below.

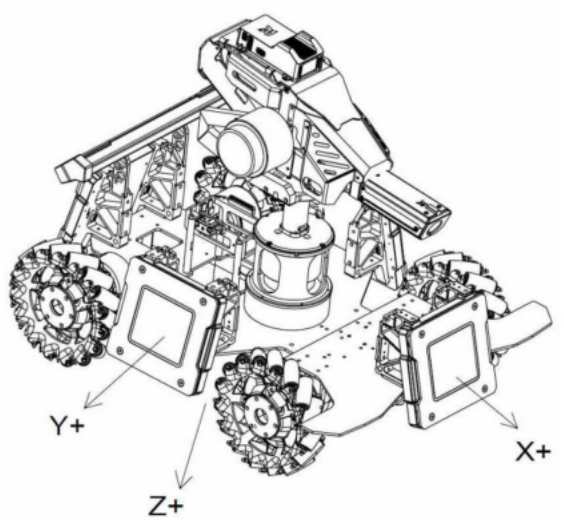


Figure 3-14: Robot Coordinate System.

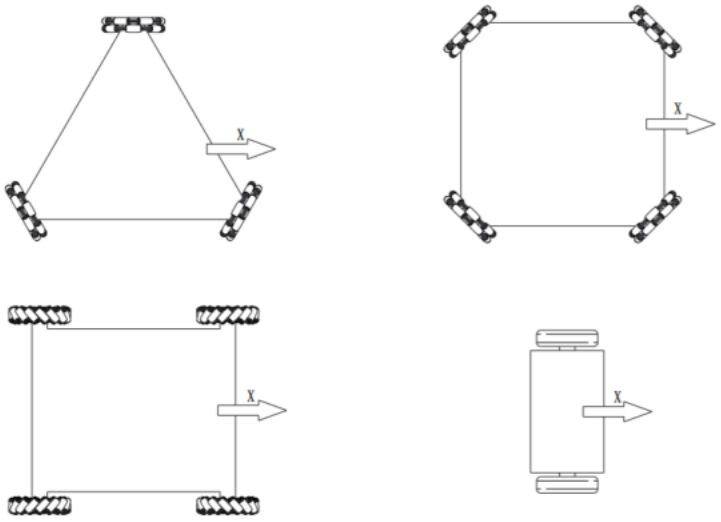


Figure 3-15: X-axis of Different Chassis Forms.

3.6.1.1 Armor Module Installation

S106 When Armor Modules are installed, the Armor Module and the Armor Support Frame shall be firmly connected. The bottom connection face of the Armor Support Frame shall be parallel to the XY plane, so that the acute angle between the line of the normal vector of the plane of the Armor Module force-bearing face and the line of the negative Z-axis is 75°. The two edges of the Armor Module that do not carry side lights shall form an angle of less than 5° with the XY plane. The projection, onto the XY plane, of the normal vector of the attack surface of an installed Armor Module — the normal that forms an acute angle with the negative Z-axis — is defined as that Armor Module's direction vector. The direction vectors of the 4 Armor Modules shall correspond one-to-one with the positive X-axis, the negative X-axis, the positive Y-axis, and the negative Y-axis of the robot-body coordinate system. The angular error between a direction vector and the corresponding coordinate axis shall not exceed 5°.

S107 The robot's own kinematic equations shall also be established in the body coordinate system above. Armor Module installation shall share the same reference coordinate system as the robot's structural characteristics or kinematic characteristics. The line through the geometric centers of the Armor Modules installed on the X-axis and the line through the geometric centers of the Armor Modules installed on the Y-axis shall be perpendicular to each other. After an Armor Module installed on the Y-axis is offset, the component along the X-axis of the offset of its geometric center relative to the robot's geometric center shall not exceed 50 mm. The same limit applies to an Armor Module installed on the X-axis.

3.6.1.2 Rigid Connection

S108 The installed Armor Module and Armor Support Frame shall be rigidly connected to the Chassis. During a game, the Armor Module and the Chassis shall not move relative to each other. Rigid connection is defined in the figure below: when a vertically upward force of 60 N is applied at the midpoint of the lower edge of the Armor Module, the change in the attack-surface angle α shall not be greater than 2.5°.

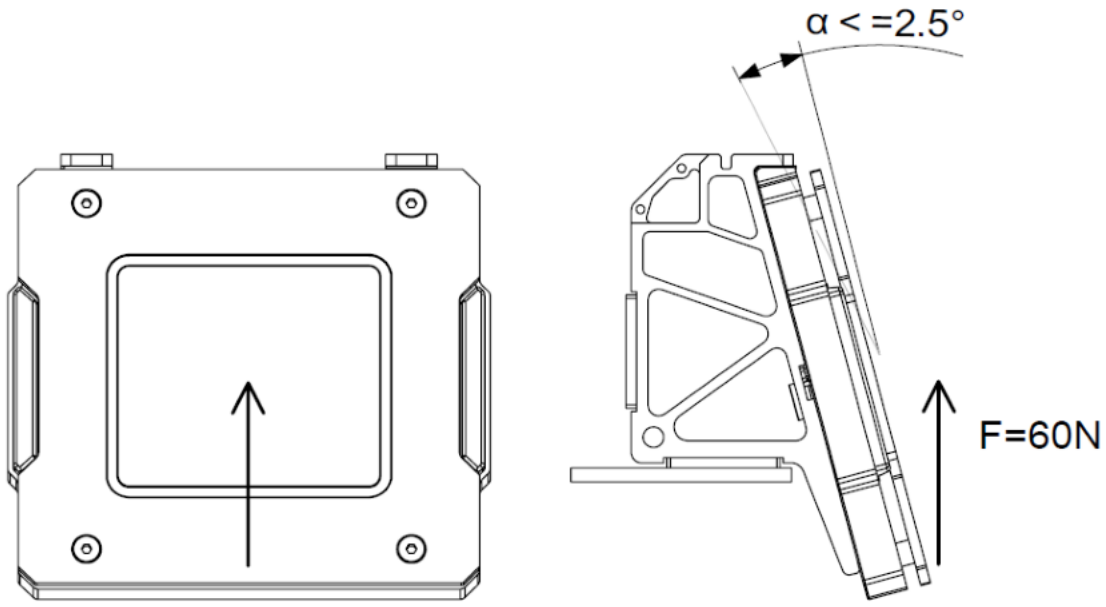


Figure 3-16: Force Applied to an Armor Module.

3.6.1.3 Robot Deformation

S109 In principle, after a game starts, no Armor Module may actively move relative to the center of mass of the robot as a whole. If a competing robot is deformable because its structure requires it, its Armor Modules shall satisfy the following: at any time, no Armor Module may move continuously, back and forth, and rapidly relative to the robot Chassis. Rapid movement means a speed above 0.5 m/s.

S110 The difference in lower-edge height between any two Armor Modules of a ground robot shall not exceed 100 mm. While the robot is crossing terrain, it may briefly fail to meet this rule.

S111 For a ground robot, before, during, and after deformation, the height of the lower edge of an Armor Module above the ground shall not exceed 400 mm, and the lower edge of an Armor Module shall not touch the ground directly.

When the plane that supports the robot body is not the ground, Armor Module installation height shall be measured from the highest plane that supports the robot body. If the robot has no supporting plane (i.e., the robot is airborne), this requirement does not apply.

3.6.1.4 Armor Module Protection

S112 Teams shall design a bumper for a ground robot, to reduce damage caused by Armor Module impacts.

S113 When any side of the robot is pressed against a vertical rigid plane on level ground, the Armor Module shall not touch that rigid plane directly, as shown below.

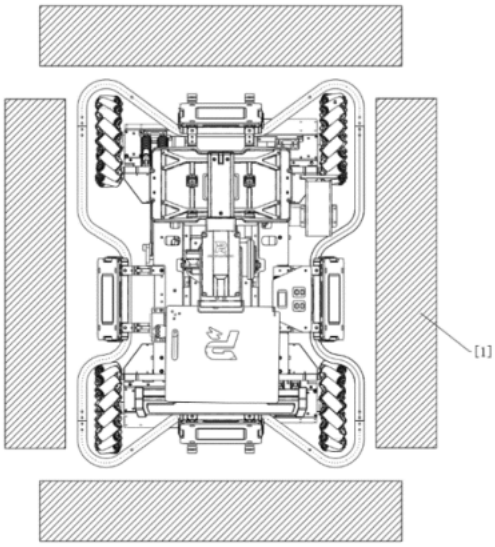


Figure 3-17: Robot Protection. [1] Wall.

S114 Except for the Armor Support Frame, no structure may touch an Armor Module.

3.6.2 Installation Steps

The Armor Module installation steps are the same for all ground robots. An Infantry Robot Armor Module is used below as the example. The steps use only the bottom mounting face of the Armor Support Frame.

1. Reserve 4 sets of mounting holes on the Chassis. Each Armor Module has one set, and the size and relative position of the 4 holes in every set shall be the same.
2. Fasten each Armor Support Frame to the Chassis with at least 2 M4 screws. The result is shown below.

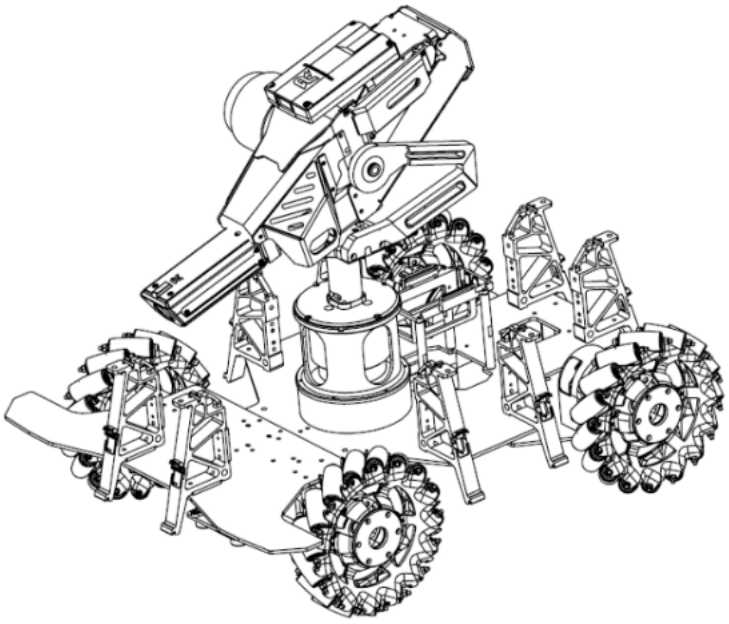


Figure 3-18: Armor Support Frame Installation.

3. Install the Armor Module on the Armor Support Frame and fasten it with an M4 screw for each frame. The steps are as follows.
    1) Fit the slot on the lower part of the Armor Module onto the catch on the lower part of the Armor Support Frame.
    2) Fit the upper end face of the Armor Module into the catch on the upper part of the Armor Support Frame.
    3) Install the fastening screws.

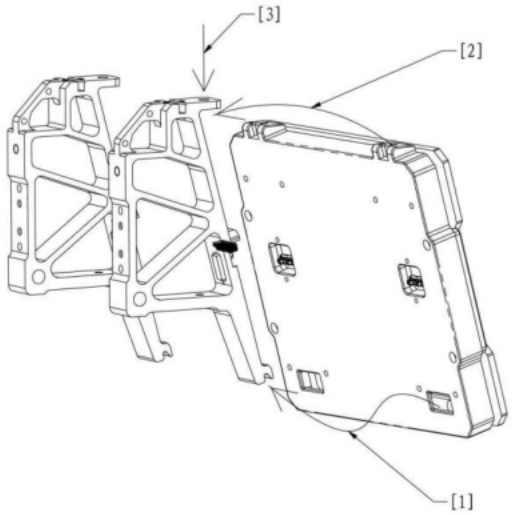


Figure 3-19: Armor Module Installation.

4. Using the 6-pin cable supplied in the package, connect the Armor Modules in series to the Armor Module port of the Power Management Module. The two 6-pin ports on the Armor Support Frame are equivalent.

Route the cable to suit the robot, keep the connection secure, and avoid damaging the cable. When connecting, it is recommended to split the Armor Modules as evenly as practical between the two 6-pin ports of the Power Management Module, so that the current of that port is shared.

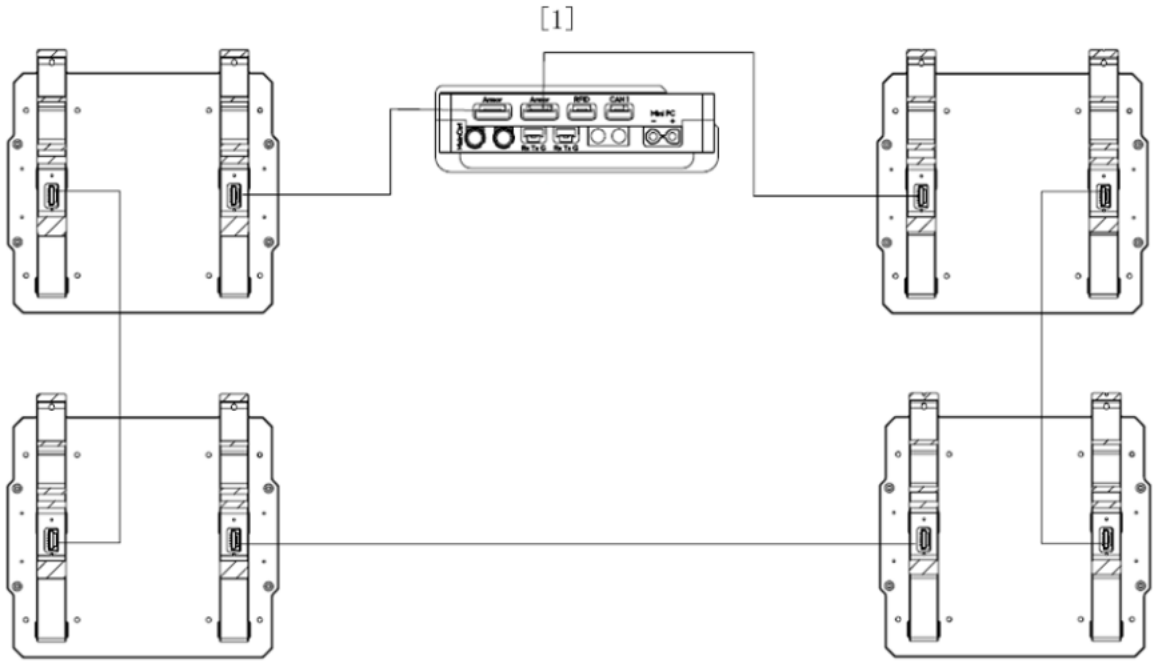


Figure 3-20: Armor Module Wiring. [1] Power Management Module.

The detailed installation steps are subject to a later update.

3.6.3 Installation Requirements

S115 For Infantry, Hero, and Sentry Robots, the Armor Module attack surface shall not be obstructed within 105° of the lower edge, within 120° of the upper edge, or within 145° of the left and right edges.

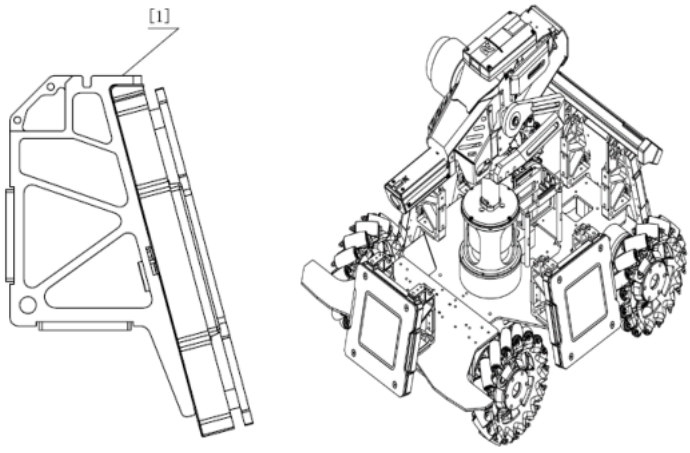


Figure 3-21: Armor Module Installation Specification. [1] Fastened at the top with an M4 screw.

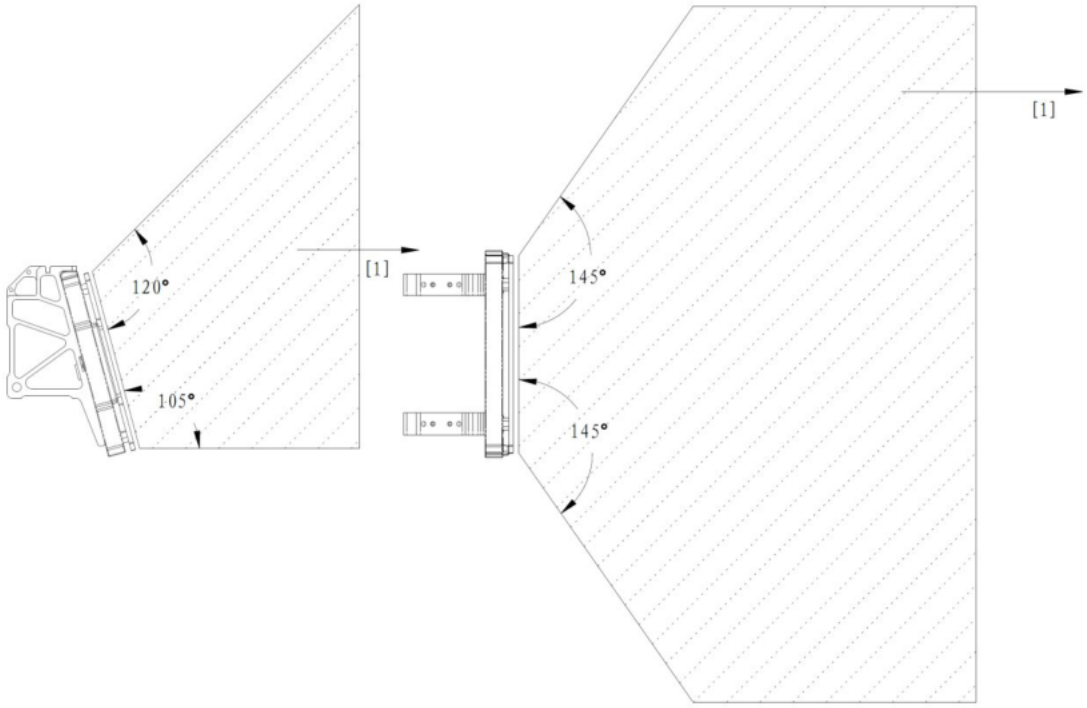


Figure 3-22: Region Around Infantry, Hero, and Sentry Armor Modules that Shall Not Be Obstructed. [1] Extends without limit.

S116 For an Engineer Robot, the attack surface of every Armor Module shall not be obstructed within 105° of the lower edge. At least 3 of the 4 Armor Modules shall not be obstructed within 120° of the upper edge or within 145° of the left and right edges. At most 1 Armor Module may be obstructed, under a condition, within 120° of the upper edge of the attack surface and within 145° of the left and right edges. The condition is: obstruction is allowed on the plane of that Armor Module's attack surface where the distance from the upper edge of the Armor Module is greater than 150 mm, or the distance from the left or right edge is greater than 170 mm. The shaded region in the figure below shall not be obstructed.

⚡	The region that this subsection prohibits obstructing extends without limit inside the robot's Maximum Expansion Size.

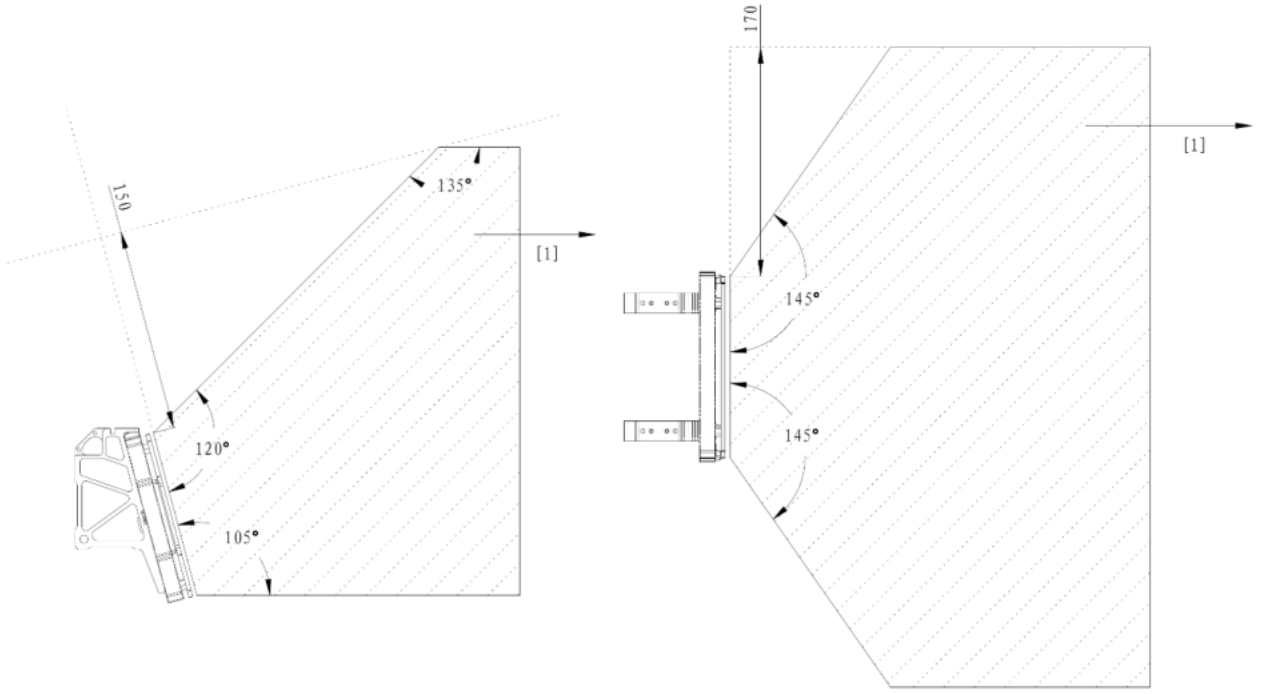


Figure 3-23: Region Around Engineer Robot Armor Modules that Shall Not Be Obstructed. [1] Extends without limit.

3.7 Speed Monitor Module

There are two types of Speed Monitor Module: the 17 mm Speed Monitor Module and the 42 mm Speed Monitor Module.

17 mm Speed Monitor Module:

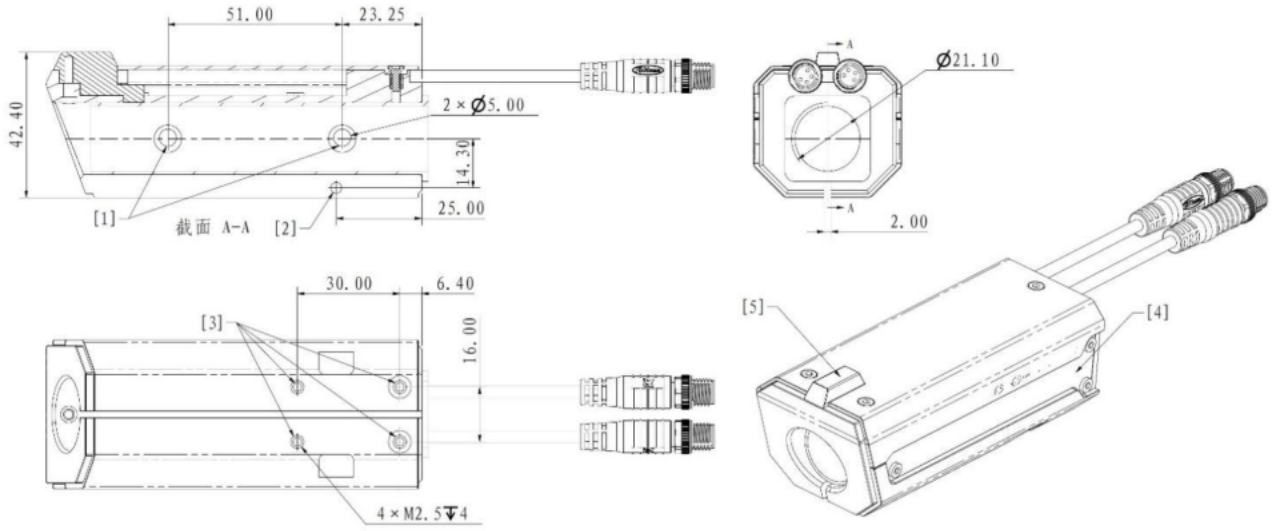


Figure 3-24: 17 mm Speed Monitor Module. [1] Photoelectric sensor. [2] Speed Monitor Module clamping

screw hole. [3] M2.5 mounting screw hole. [4] LED light bar. [5] Sight.

42 mm Speed Monitor Module:

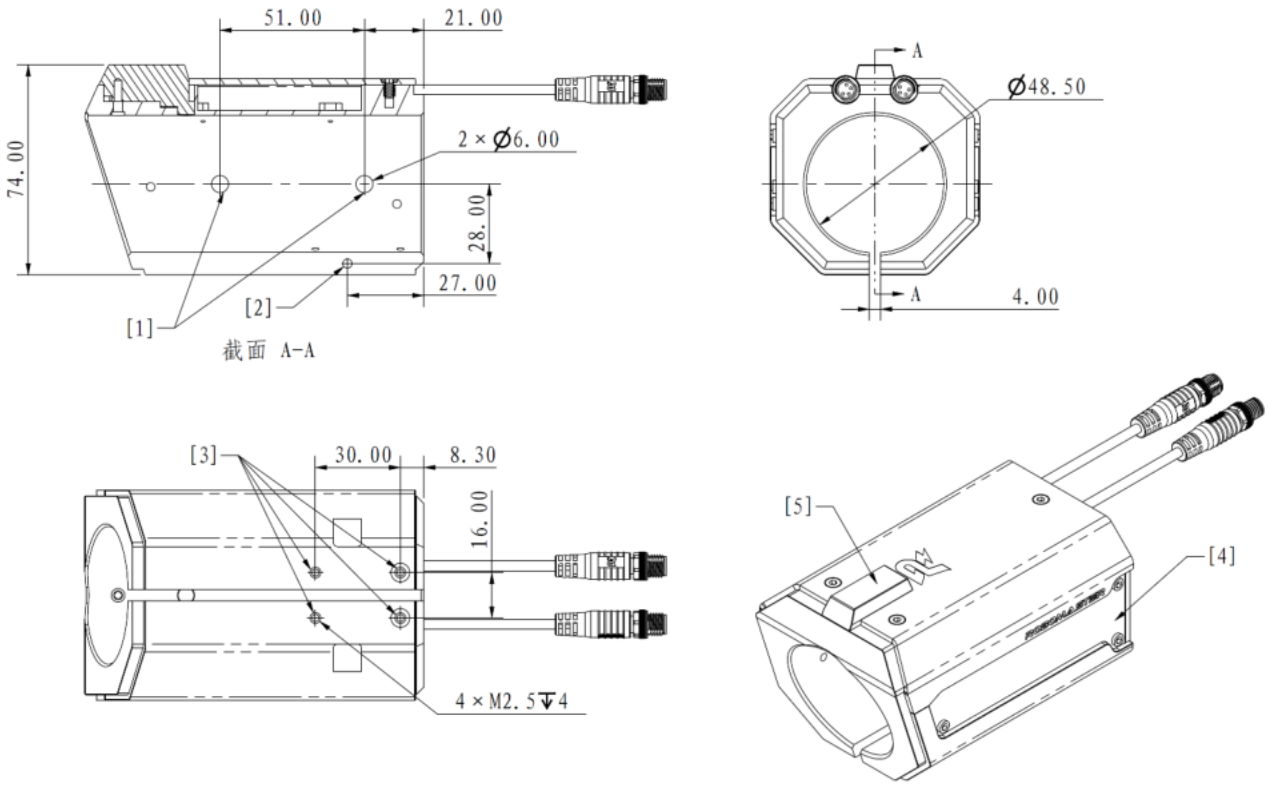


Figure 3-25: 42 mm Speed Monitor Module. [1] Photoelectric sensor. [2] Speed Monitor Module clamping screw hole. [3] M2.5 mounting screw hole. [4] LED light bar. [5] Sight.

S117 Removing the sight of a Speed Monitor Module is prohibited.

3.7.1 Installation Steps

The 17 mm Speed Monitor Module has 3 recommended fastening schemes. All 3 meet the Referee System installation specification for the 17 mm Speed Monitor Module. The team chooses one of them.

3.7.1.1 17 mm Speed Monitor Module, Fastening Scheme 1

17 mm barrel dimensional limits:

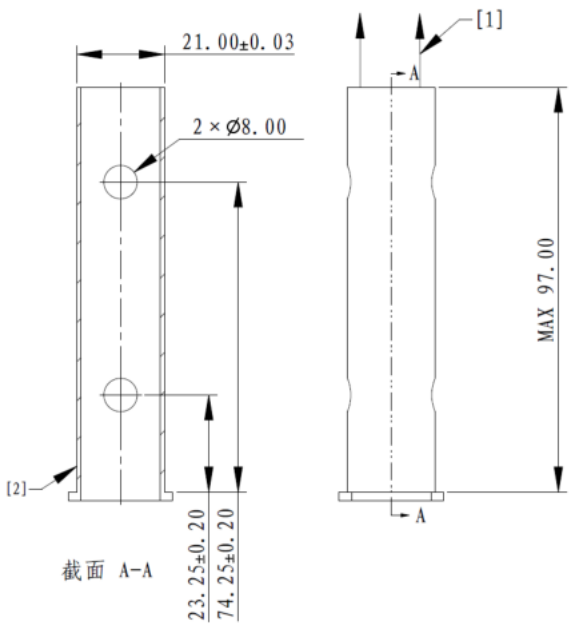


Figure 3-26: 17 mm Barrel. [1] Toward the muzzle. [2] Recommended wall thickness not less than 1 mm. Dimensions printed on the drawing are part of the requirement.

Requirements for making the 17 mm barrel:

S118 The photoelectric sensor shall not be obstructed.

S119 Transparent material and luminous material are prohibited, and infrared sensors near the barrel are prohibited.

S120 The inner wall of the barrel shall not be a strongly reflective material, so that it does not disturb the Speed Monitor Module.

⚡	It is recommended to frost or matte the inner wall of the barrel.

Installation steps for fastening scheme 1:

1. Slide the Speed Monitor Module onto the barrel.
2. Pass an M3 screw through the clamping screw hole of the Speed Monitor Module and clamp the barrel.
3. Connect the aviation-connector port of the Speed Monitor Module to the aviation-connector port of the Power Management Module with an aviation adapter cable.

⚡	After installation, the barrel shall not rotate or shift in a way that obstructs the photoelectric sensor.

The result after installation is shown below.

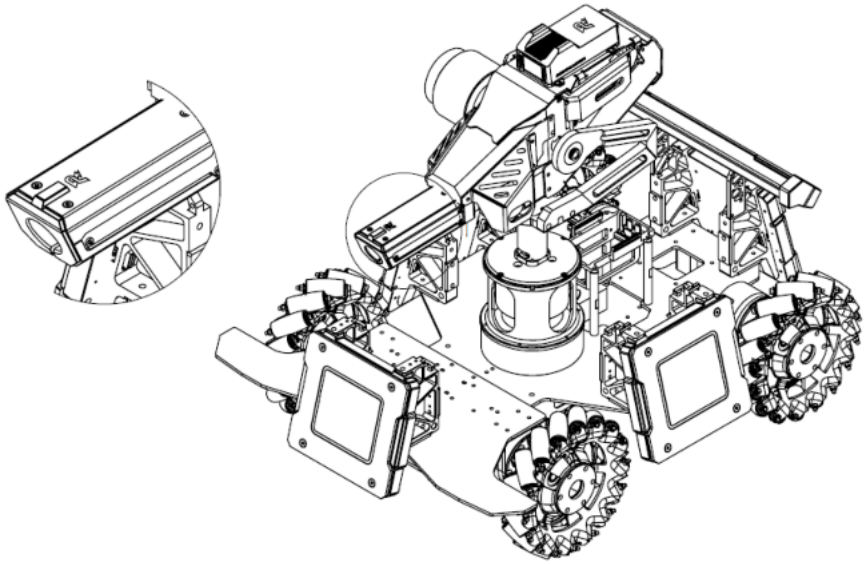


Figure 3-27: Speed Monitor Module Installation.

3.7.1.2 17 mm Speed Monitor Module, Fastening Scheme 2

The team designs and makes an adapter part that connects the 17 mm Speed Monitor Module to the Launching Mechanism.

The detailed engineering drawing of the adapter part is in Appendix A. The 3D model can be downloaded from the Speed Monitor Module product page on the official RoboMaster website, for reference only.

The adapter part is shown below for reference.

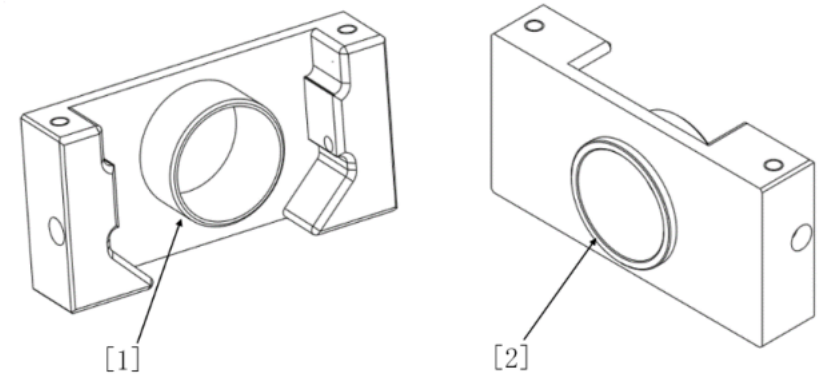


Figure 3-28: 17 mm Adapter Part. [1] Front boss. [2] Rear boss.

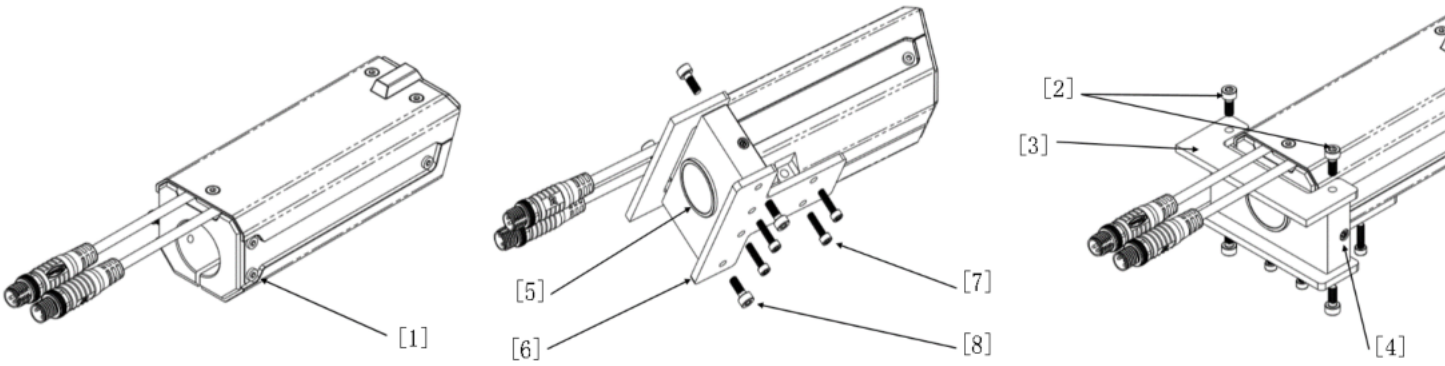


Figure 3-29: How the 17 mm Adapter Part Is Fastened. [1] LED light-bar fastening screw, M2.5. [2] M3 screw. [3] Team-made part 1. [4] Side fastening hole. [5] Rear boss. [6] Team-made part 2. [7] M2.5 screw. [8] M3 screw.

Installation steps for fastening scheme 2:

1. Remove 1 M2.5 screw that fastens the LED light bar on each of the left and right sides of the Speed Monitor Module. One of those positions is [1] in the figure. Removing any other LED light-bar fastening screw of the Speed Monitor Module is prohibited.
2. Through the side fastening holes on the left and right (one of those positions is [4] in the figure), fasten the adapter part to the Speed Monitor Module with 2 M2.5×14 screws.
3. Fasten team-made part 1 to the upper end of the Speed Monitor Module with 2 M3 screws.
4. Fasten team-made part 2 to the lower end of the Speed Monitor Module with 2 M3 screws and 4 M2.5 screws.
5. Connect the aviation-connector port of the Speed Monitor Module to the aviation-connector port of the Power Management Module with an aviation adapter cable.

Except for the two screws in step 1, no other screw on the Speed Monitor Module may be removed or installed without authorization. Doing so is treated as damage to the Referee System.

3.7.1.3 17 mm Speed Monitor Module, Fastening Scheme 3

The team designs and makes a barrel part that connects the 17 mm Speed Monitor Module to the Launching Mechanism.

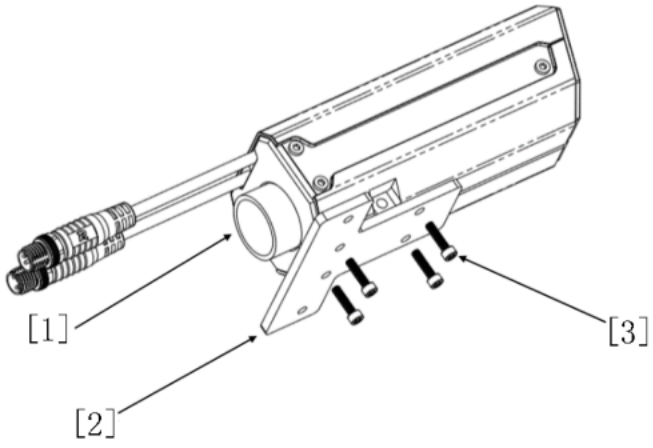


Figure 3-30: 17 mm Short-barrel Installation. [1] Barrel. [2] Team-made part 1. [3] M2.5 screw.

Installation steps for fastening scheme 3:

1. Insert the Speed Monitor Module into the short barrel.
2. Fasten team-made part 1 to the lower end of the Speed Monitor Module with 4 M2.5 screws.
3. Connect the aviation-connector port of the Speed Monitor Module to the aviation-connector port of the Power Management Module with an aviation adapter cable.

The length of the barrel that enters the Speed Monitor Module shall be no greater than 23 mm, so that it does not obstruct the Speed Monitor Module photoelectric sensor. The outer diameter of the barrel should be between 21.00 mm and 21.05 mm. If the barrel diameter is too small, the gap between the outer wall of the barrel and the inner wall of the Speed Monitor Module becomes large, and the projectile dispersion area increases. Because this scheme does not locate the Speed Monitor Module relative to the Launching Mechanism parts, the axis of the Speed Monitor Module may not coincide with the projectile launch axis, and some projectiles may touch the inner wall of the Speed Monitor Module. The team may then add shims between team-made part 1 and the Speed Monitor Module, as needed, to adjust the installation angle between them.

3.7.1.4 42 mm Speed Monitor Module Fastening Scheme

The 42 mm Speed Monitor Module fastening scheme may follow the 3 fastening schemes of the 17 mm Speed Monitor Module.

42 mm barrel dimensional limits:

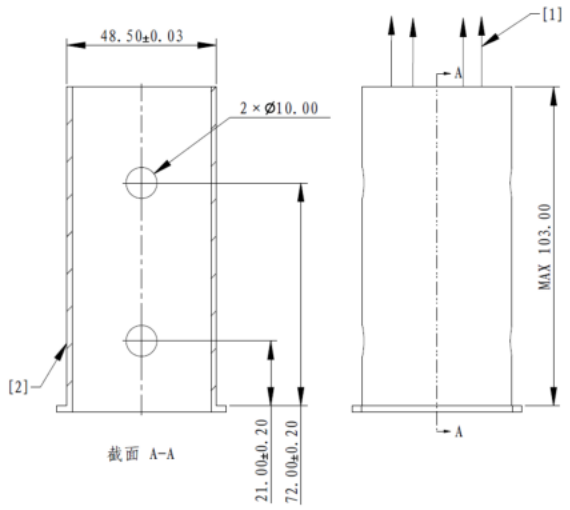


Figure 3-31: 42 mm Barrel. [1] Toward the muzzle. [2] Wall thickness shall not be less than 1 mm. Dimensions printed on the drawing are part of the requirement.

Requirements for making the 42 mm barrel:

S121 The photoelectric sensor shall not be obstructed.

S122 Transparent material and luminous material are prohibited, and infrared sensors near the barrel are prohibited.

S123 The inner wall of the barrel shall not be a strongly reflective material, so that it does not disturb the Speed Monitor Module.

> It is recommended to frost or matte the inner wall of the barrel.

Installation steps for the fastening scheme:

1. Slide the Speed Monitor Module onto the barrel.
2. Pass an M3 screw through the clamping screw hole of the Speed Monitor Module and clamp the barrel.
3. Connect the aviation-connector port of the Speed Monitor Module to the aviation-connector port of the Power Management Module with an aviation adapter cable.

3.7.2 Installation Requirements

Installation of the Speed Monitor Module shall meet the following requirements.

> It is recommended that the normal of at least one light-emitting face of each Speed Monitor Module light bar lie in the hemisphere above the horizontal plane, and that an inspector, 1 m from the Speed Monitor Module and looking straight at the light bar perpendicular to its light-emitting face, can see 80% of the light-bar area. Otherwise, information carried by the light-bar effect may be lost during a game, and finding and handling an abnormal condition may be delayed.

S124 The Speed Monitor Module shall be installed at the end of the Launching Mechanism, so that a projectile enters the Speed Monitor Module only after it has been fully accelerated.

S125 When the Speed Monitor Module is installed, the intersection of the face perpendicular to the projectile launch direction and the Logo face shall stay parallel to the ground, as shown below. This requirement shall be kept at all times while projectiles are being launched. A tilt of up to 5° relative to the ground is allowed.

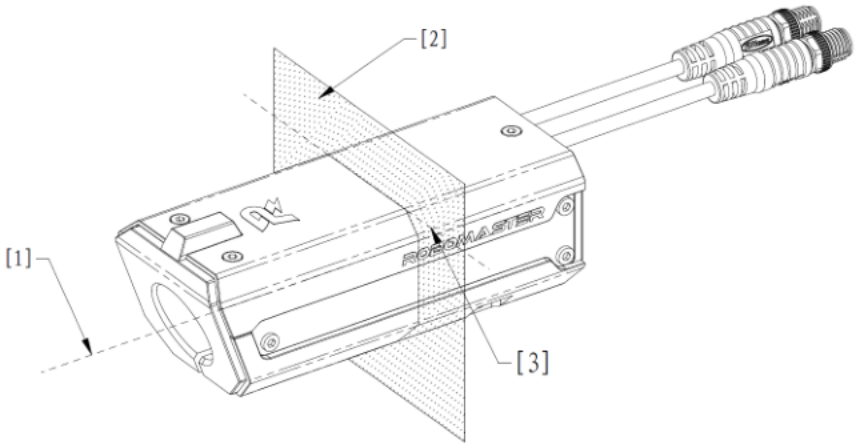


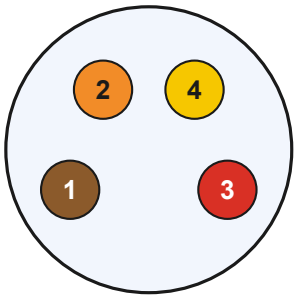
Figure 3-32: Speed Monitor Module Installation Orientation. [1] Projectile direction. [2] Plane perpendicular to the projectile direction. [3] Intersection of the Logo face and [2].

S126 When the Speed Monitor Module is leveled horizontally, the Logo face shall face upward.

S127 The Speed Monitor Module shall be fixed firmly. It shall not actively move relative to the preloaded projectile that is next to the projectile being launched inside the Launching Mechanism.

Provide 4 M2.5 threaded holes. Do not obstruct the photoelectric-sensor holes, or the Speed Monitor Module self-test will fail. The aviation cable of the Speed Monitor Module is close to the friction wheels; protect the cable from wear in use.

The Referee System's 4-pin aviation connectors use the wire sequence below.



Pin	Wire	Signal
1	Brown	GND
2	Orange	CAN_L
3	Red	12 V
4	Yellow	CAN_H

Figure 3-33: Referee System Wire Sequence.

3.8 RFID Interaction Module

Reserve mounting holes on the robot Chassis according to the structural dimensions and mounting interface of the RFID Interaction Module.

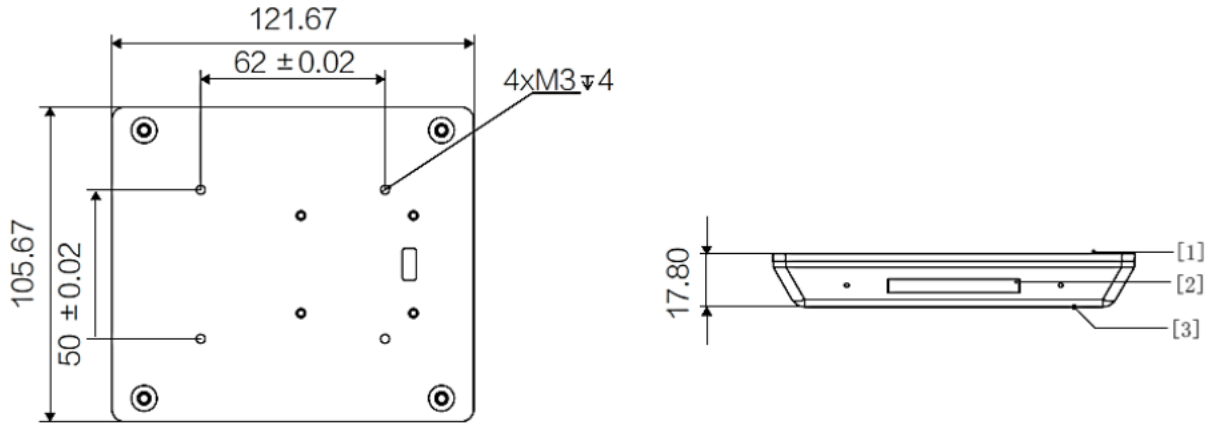


Figure 3-34: RFID Interaction Module. [1] Back. [2] LED light bar. [3] Front.

3.8.1 Installation Steps

1. Using the 4-pin cable supplied in the package, connect the RFID Interaction Module to the RFID port on the Power Management Module.

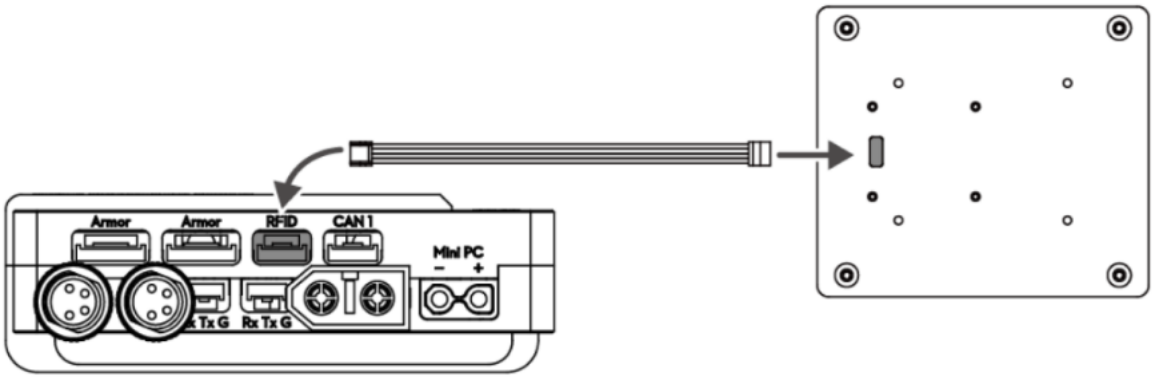


Figure 3-35: RFID Interaction Module Wiring.

2. Fasten the RFID Interaction Module to the Chassis with M3 screws. Do not pinch the cable during installation, and keep a suitable distance between the RFID Interaction Module and the ground.

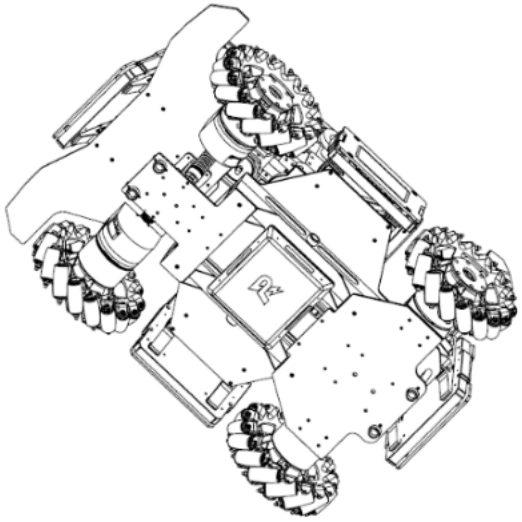


Figure 3-36: RFID Interaction Module Installation.

3.8.2 Installation Requirements

Installation of the RFID Interaction Module shall follow the specifications below. Otherwise detection quality may fall. Consequences caused by installation that does not meet the specification are borne by the team.

- Avoid installing a large area of conductive material near the RFID Interaction Module, and avoid large-current or high-frequency signal interference (such as motor wires, power distribution boards, CAN wires, and the supercapacitor).
- The front and the back of the RFID Interaction Module shall not be obstructed by conductive material. The back shall keep at least 30 mm from conductive material such as metal plate or carbon plate.

S128 The RFID Interaction Module shall not extend beyond the outermost extent of the rectangle formed by the Armor Modules. In addition, while the robot is deforming, this module may move relative to the Chassis only along the Z-axis, and shall not move relative to the Chassis in any other direction.

The effective detection distance of the RFID Interaction Module is 100 mm (±5%). After installation, the actual detection distance is determined by test. If the effective detection distance becomes shorter, or the module does not work normally, check whether the installation is reasonable. Because the electromagnetic environment inside a robot is complex, test the effective detection distance while every module of the robot is working normally (for example while the supercapacitor and drive motors are all working). If the robot has more than one operating condition (such as capacitor charging and discharging, or a motor changing speed and running at constant speed), also test the effective detection distance in those conditions.

3.9 Camera Video Transmission Module (Sender)

Video-link data is output from the UART serial port of the Camera Video Transmission Module (Sender). That UART serial port supports 3.3 V TTL. The UART serial port is RX, TX, and GND. Do not connect the positive side of a power supply to the UART serial port.

Reserve mounting holes at the specified position according to the structural dimensions and mounting interface of the Sender.

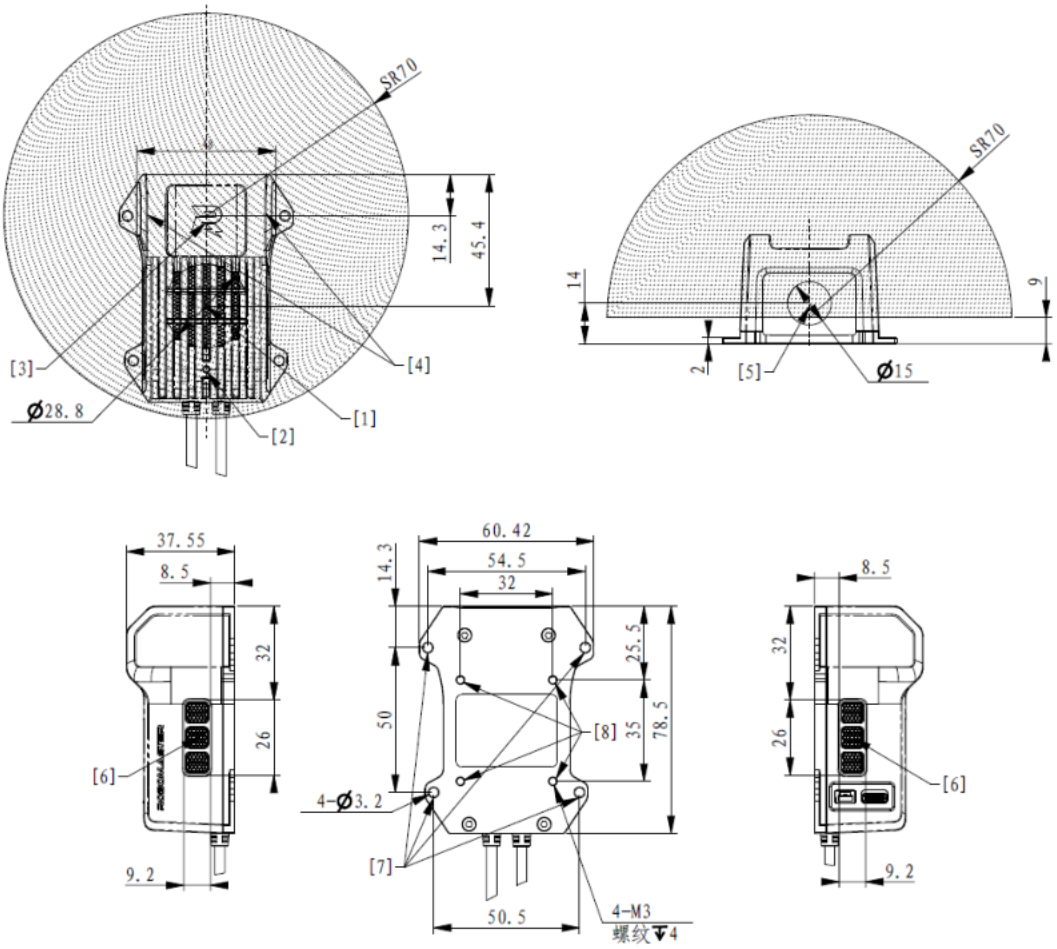


Figure 3-37: Camera Video Transmission Module (Sender). [1] Air inlet. [2] Indicator. [3] Sphere-center position. [4] Antenna. [5] Camera. [6] Air outlet. [7] Mounting through-hole. [8] Mounting threaded hole.

The Camera Video Transmission Module (Sender) in the figure above is authoritative. The Camera Video Transmission Module (Sender) shown in any other drawing is for reference only.

3.9.1 Installation Steps

1. Fasten the Sender to a suitable position on the robot with 4 M3 screws.

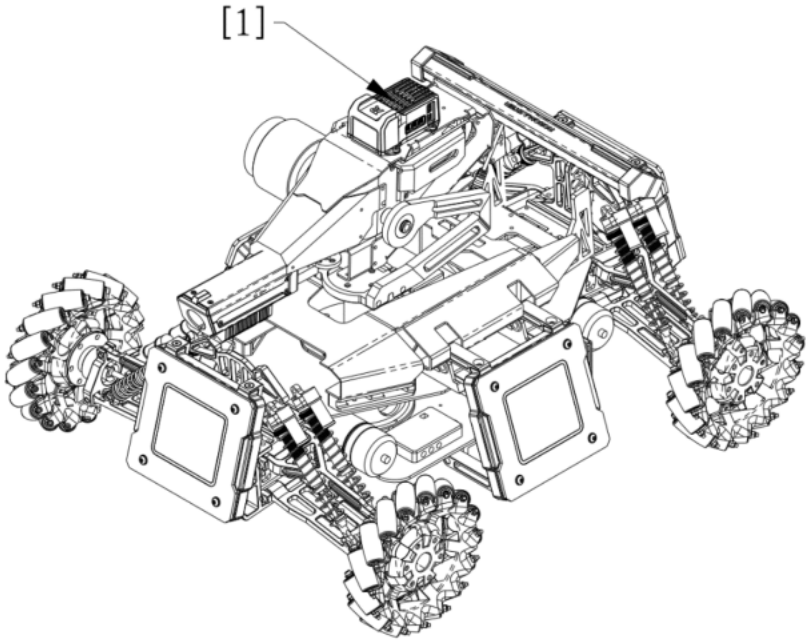


Figure 3-38: Camera Video Transmission Module (Sender) Installation. [1] Camera Video Transmission Module (Sender).

2. Using an aviation adapter cable, connect the aviation-connector port of the Camera Video Transmission Module (Sender) to the aviation-connector port with the silver metal ring on the Power Management Module.

3.9.2 Installation Requirements

Installation of the Camera Video Transmission Module (Sender) shall meet the following requirements. Otherwise image quality may fall, video-link transmission may be unstable, or the robot may go offline abnormally.

- Avoid obstructing the indicator of the Camera Video Transmission Module (Sender).
- Taking the center of the bottom face of the Camera Video Transmission Module (Sender) as the apex, there shall be a cone whose generating line is parallel to the bottom face of the Sender and lies directly in front of the camera, with a cone angle of 60° (solid angle $\pi(2-\sqrt{3})$ sr), extending without limit and containing no conductive material, as shown below.

S129 The air inlet and the air outlet of the Camera Video Transmission Module (Sender) shall not be obstructed. Any image quality degradation, failure to establish the video link, or failure of the Module resulting from overheating shall be borne by the team.

It is recommended that there be no obstruction within 150 mm of each air inlet and air outlet.

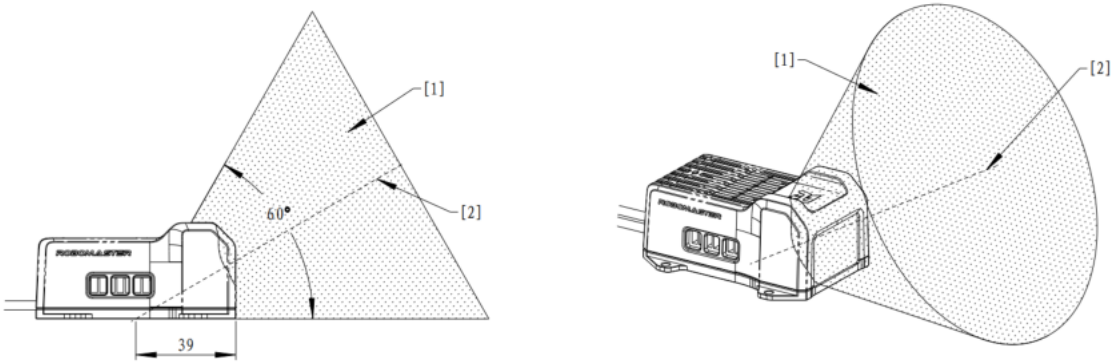


Figure 3-39: Region Around the Camera Video Transmission Module (Sender) that Shall Not Be Obstructed. [1] Region that shall not be obstructed. [2] Axis of the region.

- Within the upper hemisphere of radius 70 mm, centered at the midpoint of the line joining the bottoms of the antennas of the Camera Video Transmission Module (Sender), there shall be no conductive material, electromagnetic-absorbing material, or other part that may produce wireless-signal interference, as shown in Figure 3-37.
- If the video link is used, protect the UART serial-port portion of the Camera Video Transmission Module (Sender), for example with foam or a non-metal shield.
- The ports and the indicator of the Camera Video Transmission Module (Sender) shall not be obstructed.

3.10 Camera Video Transmission Module (Receiver)

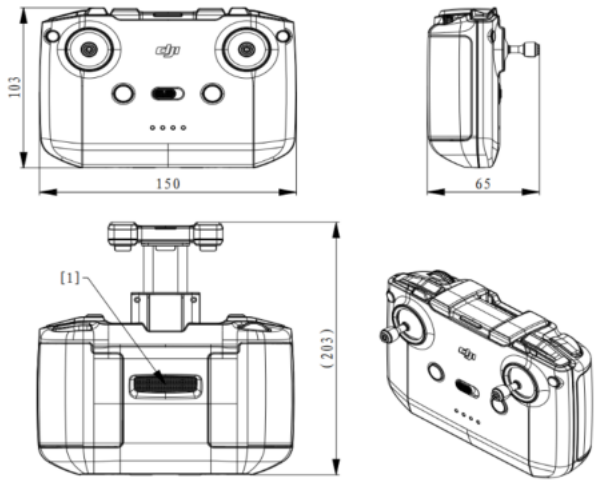


Figure 3-40: Camera Video Transmission Module (Receiver). [1] Cooling opening.

3.10.1 Installation Requirements

Use of the Camera Video Transmission Module (Receiver) shall meet the following requirements. Otherwise its image quality may fall, remote-control data may stutter, or it may malfunction.

S130 Metal obstruction near the Camera Video Transmission Module (Receiver) shall be avoided.

S131 The cooling opening shall not be obstructed.

3.11 Supercapacitor Management Module

The Supercapacitor Management Module measures the capacitance of the supercapacitor bank and the energy of the supercapacitor bank during a game. The dimensions of the Supercapacitor Management Module are 60 mm × 30 mm × 7.5 mm (L × W × H). Heat-shrink tubing is the outer protection of the module.

The hardware interface includes 1 XT30 male connector, 2 XT30 female connectors, and 1 Supercapacitor Management Module communication port.

> The XT30 female connector model is XT30PW-F. The XT30 male connector model is XT30PW-M.

3.11.1 Installation Steps

> The power-control board is the module that regulates output power of the Power Management Module Chassis port, and input power and output power of the supercapacitor bank, so that the power limit in the rules is met. The team builds this module.

1. Install the Supercapacitor Management Module between the output port of the supercapacitor bank and the input port of the power-control board.
2. Connect the supercapacitor bank to the Supercapacitor Management Module with a cable that has an XT30 connector.
3. Connect the power-control board to the Supercapacitor Management Module with a cable that has an XT30 connector.
4. Connect the communication port of the Supercapacitor Management Module to the CAN1 port of the Power Management Module with a 4-pin cable.

The Supercapacitor Management Module is wired as shown below.

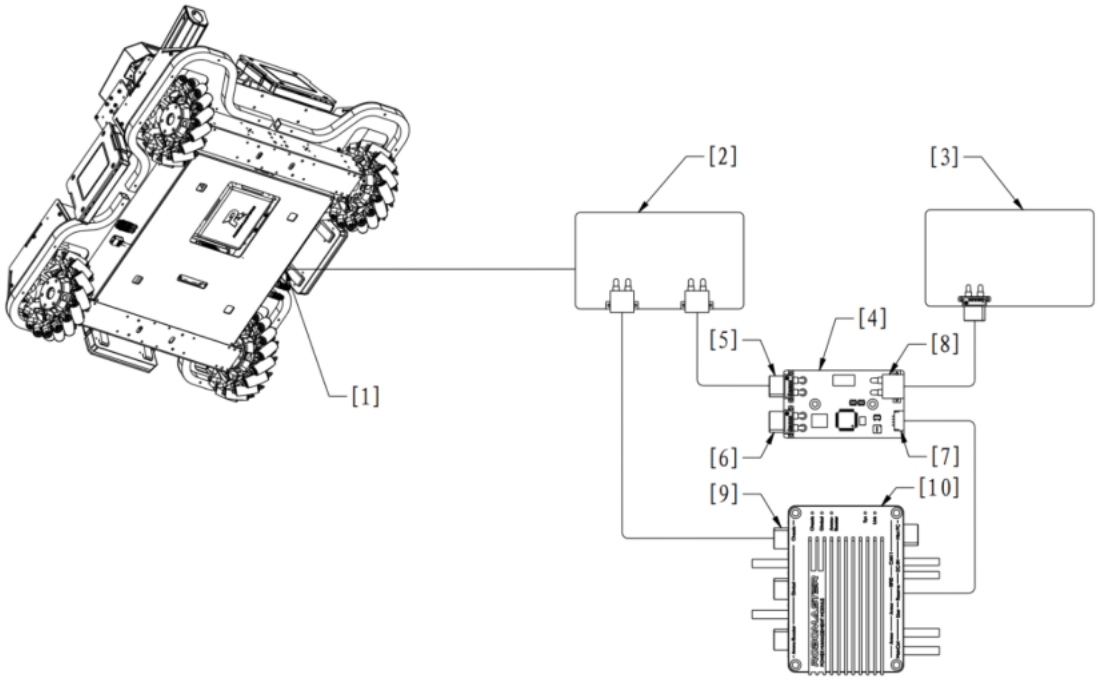


Figure 3-41: Supercapacitor Management Module Wiring. [1] Robot Chassis supply port. [2] Power-control board. [3] Supercapacitor bank. [4] Supercapacitor Management Module. [5] Supercapacitor Management Module port (output, XT30 female), connected to the power-control board. [6] Supercapacitor Management Module Inspection port (output, XT30 female), used only for Inspection. [7] Supercapacitor Management Module communication port (CAN, SM04B-GHS-TB), connected to the Power Management Module. [8] Supercapacitor Management Module port (input, XT30 male), connected to the supercapacitor bank. [9] Chassis output port of the Power Management Module. [10] Power Management Module.

3.11.2 Installation Requirements

The communication port of the Supercapacitor Management Module shall be connected to the CAN1 port of the Power Management Module. Otherwise it cannot be used normally. During Inspection, staff check the supercapacitor-bank installation against the wiring diagram. After the check, they stick an Inspection-passed mark on the module and on the capacitor bank. Teams should design the structure so that the mark is easy to see, and so that the robot structure does not have to be taken apart repeatedly during Inspection.

S132 The peak current and the maximum continuous current of the XT30 ports of the Supercapacitor Management Module shall not be greater than 15 A.

S133 Capacitor voltage needs to be reduced from full charge to below 1 V. If the voltage drops abnormally quickly, or a similar phenomenon appears, the robot cannot pass Inspection.

S134 The Inspection port of the Supercapacitor Management Module shall lead out a cable, at least 100 mm long, that ends in a female XT30 connector.

S135 A Hero Robot, an Engineer Robot, an Infantry Robot, and a Sentry Robot shall all install a Super-capacitor Management Module. If the robot has no supercapacitor bank, the team must still connect the

Supercapacitor Management Module to the Power Management Module with a 4-pin cable.

S136 The Supercapacitor Management Module shall be installed where it is easy to operate, so that it can be operated during Inspection.

S137 The supercapacitor bank may use only one supply port. It shall be connected as in Figure 3-41, and it shall not be connected to any other circuit on the robot.

Appendix A. 17 mm Speed Monitor Module Adapter Engineering Drawing

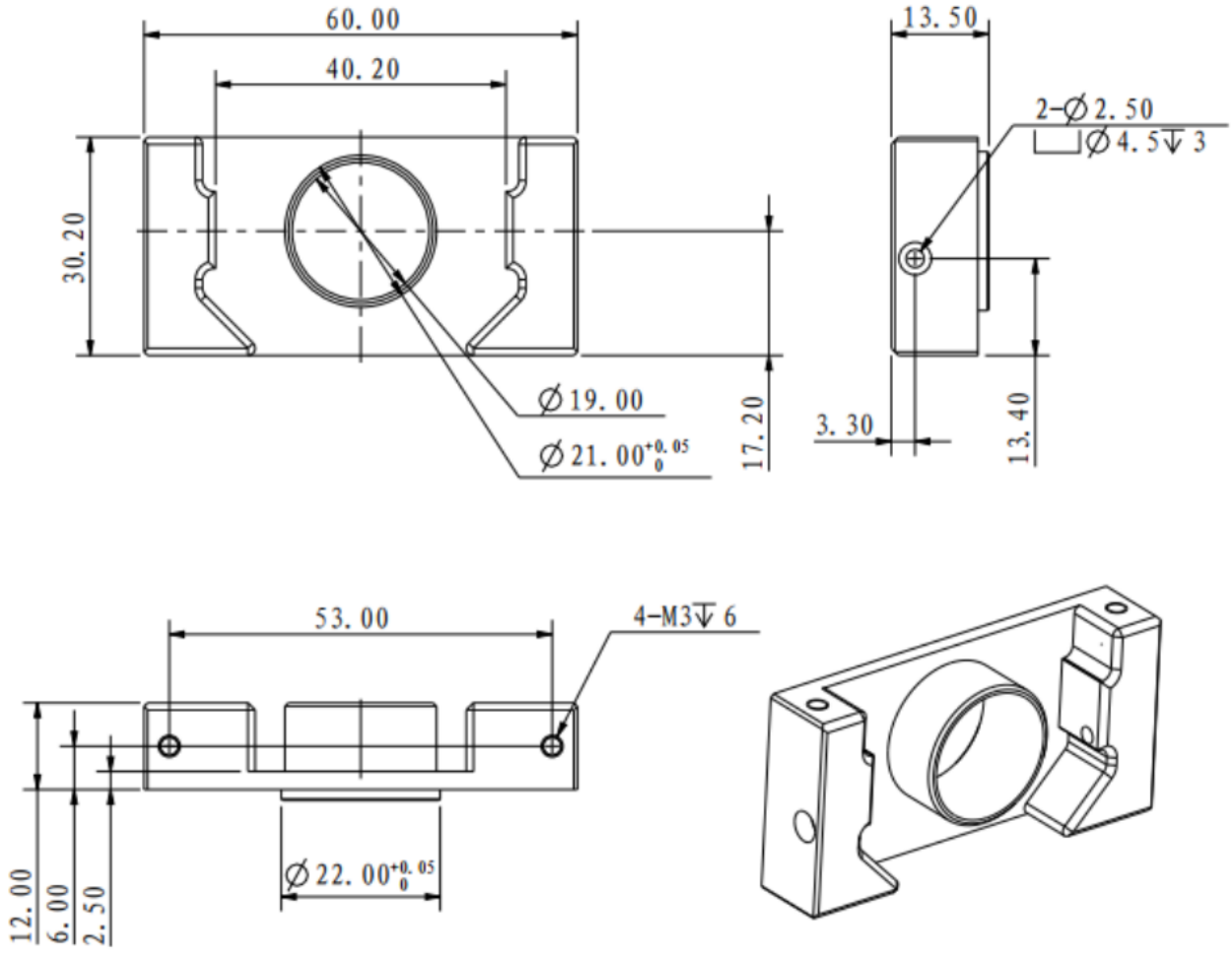


Figure A-1: 17 mm Speed Monitor Module Adapter-part Engineering Drawing.



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