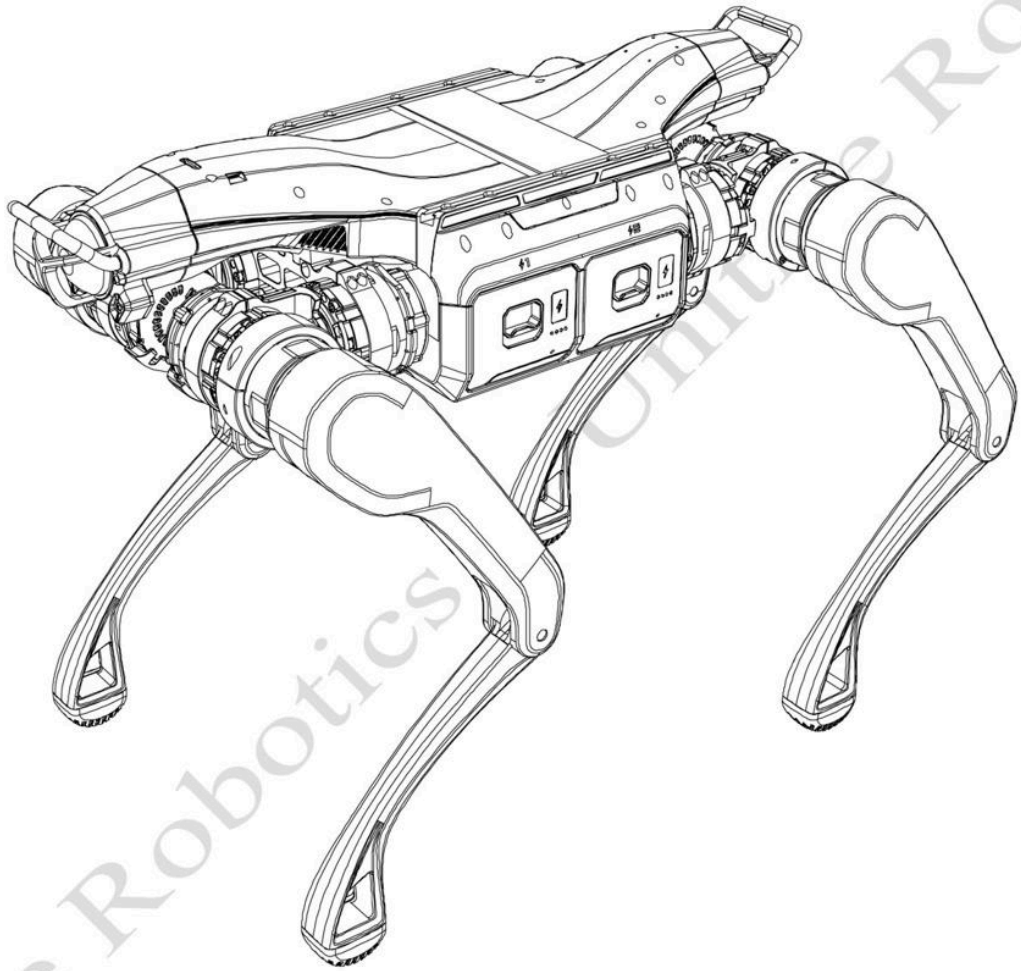
A2

User Manual V1.7



Unitree

This product is a civilian robot. We kindly request that all users refrain from making any dangerous modifications or using the robot in a hazardous manner.

Please visit Unitree Robotics Website for more related terms and policies, and comply with local laws and regulations.

Unitree Robotics

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Disclaimer

To avoid illegal behavior, potential harm, and loss, it is essential to adhere to the following regulations:

1) Please be sure to read this article carefully before using the product, understand how to use the product correctly and your legitimate rights, responsibilities, and safety instructions. Otherwise, it may bring property damage, safety accidents and personal safety hazards. Once used this product, you are deemed to have carefully read, understood, recognized, and accepted all the terms and contents of this article. Users untaken to be responsible for their actions and all consequences therefrom. Users undertake to use this product only for legitimate purposes and agree with these terms and any relevant policies or guidelines that Unitree may establish.

2) The laws of some countries may prohibit the exemption of guarantee clauses, so your relevant rights may vary in different countries.

3) Subject to legal compliance, Unitree reserves the right of final interpretation of the above terms. Unitree has the right to update, amend or terminate this term without prior notice.

4) Unitree Robotics does not provide any explicit or implied commercial and technical guarantees not involved in this article.

5) Unitree Robotics does not guarantee that the products / services provided are completely free from defects and fully meet the customer's requirements. It also does not guarantee that Unitree Robotics can completely repair these defects.

6) In any case, Unitree Robotics shall not bear legal liability for direct or indirect economic losses to the customers due to this service specification, and the maximum compensation amount of Unitree Robotics for losses to the customers caused by its own product liability shall not be higher than the amount paid by the customers for the products/services.

7) The purchased parts are not within the scope of services included in this service specification.

8) No on-site services are provided for terminal products and accessories. The maintenance service provided by Unitree Robotics for more than one year is an optional service. The customers can choose whether to purchase related services and choose when to terminate them. If the customers choose to purchase related services, it means that the customer allows Unitree Robotics to access, collect and process information related to faults, detection, positioning and debugging when providing services. Unitree Robotics will access and process relevant information in accordance with the customers' request under the premise of the customers' consent, and the information will only be used to provide maintenance services. Since the users are the controller of such information, Unitree Robotics cannot confirm whether such information contains customers' confidential information or personal data, and the customers shall guarantee that it will obtain or retain all necessary consents, licenses, authorizations ("Agree") is used to allow Unitree Robotics to provide this service, so that Unitree Robotics will not violate applicable legal requirements, the customers' privacy policy, or the agreement between the customer and the user when providing related services. Unitree will take reasonable

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measures to ensure the security of such users information, but Unitree Robotics is not responsible for direct or indirect responsibility for the act of obtaining and processing such information in the process of providing services.

Safety Instructions

The A2 is a quadruped robot designed for industrial-grade applications, featuring a medium-sized stature, multidimensional precise perception, all-terrain adaptability, multi-scenario coverage, and open, flexible expandability. It provides you with more efficient and intelligent solutions.

1) This product is not a toy and is not intended for use by persons under the age of 18. Keep out of reach of children and be careful when operating in the presence of children.

2) You are obliged to be aware of the laws in your area and to comply with relevant laws and regulations.

3) This chapter is an introductory chapter for new users to manipulate robots. New users can quickly master how to use the Remote Control to control the robot to show excellent movement performance by reading this section. This chapter is also a chapter that old users often need to refer to. Old users can read this chapter repeatedly to grasp the essentials of operating the robot, and then they can draw inferences from case, and know what kind of movements are not recommended.

4) When the users run the program developed by themselves in the developer mode: The remote control commands are still valid when the high-level (application layer) is developed. At this time, if the high-level API commands and the remote control commands are sent to the robot, both commands will be executed by the robot. It may cause the robot to become unstable. Please be sure to judge whether the users need to use the remote control according to the running state of the robot. Remote control commands fail during low-level development.

5) When using, please control the robot within sight, keep a certain safe distance from the robot, and do not touch the robot with your hands after the robot is powered on.

6) The A2 automatically stands up after startup. Maintain a safe distance from the quadruped robot!

7) When using complex remote control commands, ensure that there are no obstacles (especially no people) within a 2-meter-diameter semicircle in front of the robot dog. In the event of personal injury, death, or property damage resulting from non-compliant operations, Unitree Technology assumes no responsibility for any resulting losses or consequences.

8) Instructions for mode switching: When using motion control switching functions, ensure that the robot dog is first in a prone or damping mode, and that there are no people within a 1-meter diameter range. After a successful mode switch, the robot dog will automatically stand up. In the event of personal injury, death, or property damage resulting from non-compliant operations, Unitree Technology assumes no responsibility for any resulting losses or consequences!

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9) Safety instructions for recovering to a standing position: Recovering to a standing position requires space for flipping. Ensure that there are no people or objects within a 2-meter-diameter circle around the robot dog. This is to prevent unnecessary personal injury, death, or property damage. Otherwise, Unitree Technology assumes no responsibility for any resulting losses or consequences

10) When the battery level is low, promptly stop and shut down the robot. Remove the battery for charging to prevent the robot from losing power and falling, which could cause damage.

11) When replacing the battery, the robot dog should remain stationary and not be subjected to external disturbances (such as kicking the robot or adding loads to it, etc.). After the battery replacement is complete (i.e., 3 seconds after the battery is fully inserted into the battery compartment), the robot can be used normally.

12) When the robot is operating in single-battery mode or in dual-battery blue-light standby mode, exercise caution when performing vigorous movements (such as flips, rapid climbing, rapid descending, etc.), as such operations can significantly shorten the battery's lifespan.

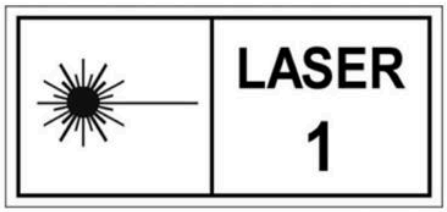
13) This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This product is a consumer laser product.

CLASS 1 LASER PRODUCT

CONSUMER LASER PRODUCT

EN 50689:2021



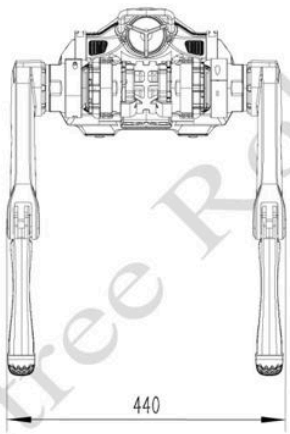
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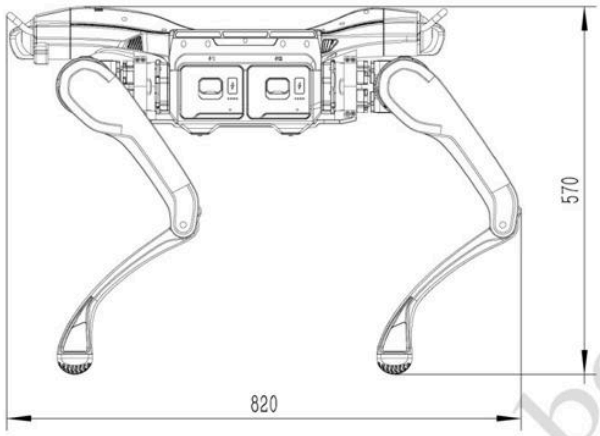
Product Overview

Introduction

Unitree A2 Stellar Explorer is an agile, lightweight, and long-endurance industrial-grade quadruped robot. Its main body structure is constructed from aviation-grade aluminum alloy and high-strength engineering plastics, with a self-weight of only 42kg, yet it delivers robust load-bearing and mobility capabilities, reaching a maximum running speed of approximately 5m/s (extreme speed). All connection structures are made of 6061-T6 aluminum alloy, with key components utilizing 7075-T6, enabling it to withstand impact from falls. Equipped with front and rear dual LiDAR, a high-definition camera, and fill lights, it achieves seamless, precise perception. Combined with intelligent algorithms, it easily handles complex scenarios such as logistics, inspection, and rescue operations. The standard configuration includes an 8-core high-performance CPU (for platform functions) and an Intel Core i7 processor (for user development), with an optional high-computing module available. With its medium-sized stature delivering powerful industrial-grade performance, it is an ideal choice for operations in extreme environments.

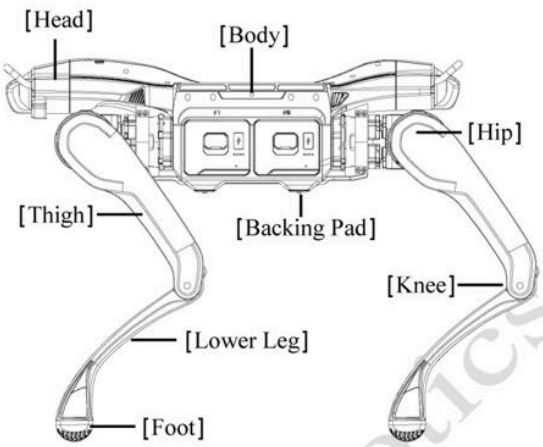
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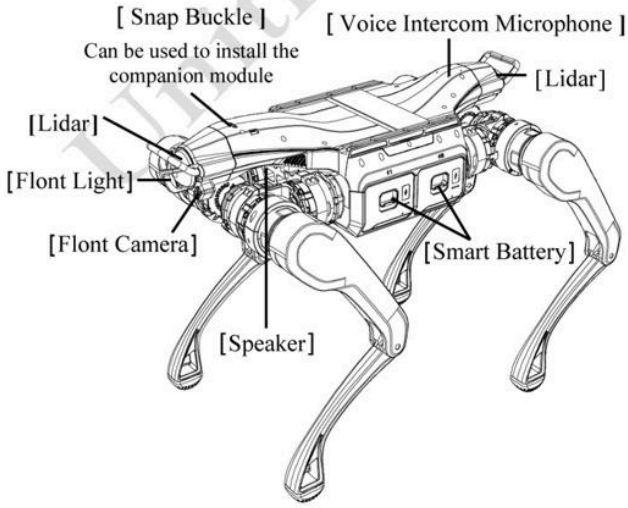


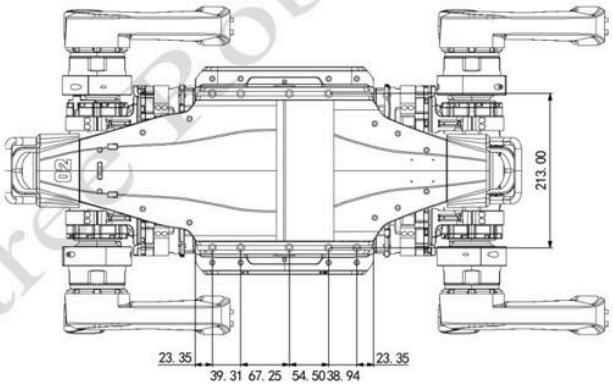


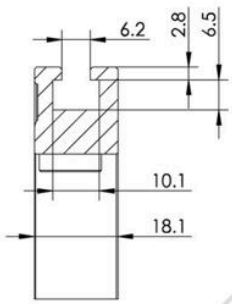
Parts Name

The main body of the A2 quadruped robot is as shown in the following diagram. Please refer to the actual product for accuracy.









Unit：mm

Note: The radar used here is based on lidar technology, which uses infrared emission, not radio wave emission.

- A2 Standard Edition comes with 1 LiDAR as standard, while the A2 PRO version comes with 2 LiDARs as standard.

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Function Highlights

1) Strong Payload, Industry Expert

A2 possesses outstanding load-bearing capacity, with a continuous walking payload of 25kg and a maximum static standing payload of 100kg. It can meet diverse load requirements in scenarios such as logistics transportation and equipment handling, making it a reliable "strongman" for complex tasks.

2) Ultra-Long Endurance, Continuous Operation

A2 adopts a dual-battery system with a hot-swappable parallel architecture. Each battery has a capacity of 9000mAh, providing a combined capacity of 18000mAh. The batteries utilize high-performance cells and an advanced Battery Management System (BMS) independently developed by Unitree. The robot can walk continuously for 5 hours/20km under no load and 3 hours/12km under full load. With seamless battery swapping, missions remain uninterrupted, ensuring robust power support for long-duration operations.

3) Exceptional Power, Agile Mobility

A2 achieves a running speed of 5m/s, with a maximum step-climbing height of 30cm and a maximum slope angle of 45°. It combines speed with obstacle-crossing capabilities, enabling rapid response to mission demands and effortless handling of complex terrain challenges.

4) IP56-Level Protection, Reliable and Durable

A2 achieves an IP56 protection rating. Its body structure and key components are specially treated to effectively resist dust ingress and high-pressure water jets. It can operate reliably in extreme temperatures ranging from -20℃ to 55℃, ensuring all-weather performance.

5) Open Platform, Flexible Expandability

A2 comes standard with an 8-core high-performance CPU (for platform functions) and an Intel Core i7 processor (for user development), with an optional high-computing module available. It provides multiple expansion interfaces, including RS485 x2, CAN x2, Gigabit Ethernet x2, USB 3.0 Type-C x2, supporting the integration of various peripherals. With its medium-sized form factor and powerful dynamic system, it supports rapid development for multiple industry scenarios (such as logistics, inspection, and rescue), making it a formidable choice for industrial-grade applications.

Specification Comparison

MODEL	A2	A2-PRO
Size (Standing)	820mmx440mmx570mm	820mm x 440mmx570mm
Size (Lying Prone)	720mmx550mmx220mm	720mmx550mmx220mm
Material	Aluminum Alloy + High-Strength Engineering Plastic	Aluminum Alloy + High-Strength Engineering Plastic

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Weight (With Battery)	About 42kg	About 42kg
Weight (Without Battery)	About 35kg	About 35kg
Degrees Of Freedom (Joint Motors)	12	12
Joint Bearings	Industrial-grade crossed roller bearings (high precision, high load capacity)	Industrial-grade crossed roller bearings (high precision, high load capacity)
Joint Motors	Low-inertia, high-speed inner rotor PMSM (enhanced response & heat dissipation)	Low-inertia, high-speed inner rotor PMSM (enhanced response & heat dissipation)
Max Joint Torque	About 180 N.m	About 180 N.m
Range Of Motion	body:-58~58° thigh:-134°~180°/-89°~225° shank:-158°~-30°	body:-58~58° thigh:-134°~180°/-89°~225° shank:-158°~-30°
Supply Voltage	50.4V	50.4V
Joint Encoder	Dual encoders	Dual encoders
Cooling System	Local air Cooling	Local air Cooling
Power Supply	Dual slots, dual batteries	Dual slots, dual batteries
Battery Capacity	Single Battery 9000mAh(453.6Wh) Dual Batteries 18000mAh(907.2Wh)	Single Battery 9000mAh(453.6Wh) Dual Batteries 18000mAh(907.2Wh)
Wi-Fi 6, Bluetooth 5.2	YES	YES
Speaker	YES	YES
Microphone	Microphone array	Microphone array
Front Light	YES	YES
Wireless Vector Follow Module	/ (Optional)	YES(Expanded)
Gps	/ (Optional))	YES(Expanded)
4g	/ (Optional)	YES(Expanded)
Sensor	LiDAR×1+HD Camera×1	LiDAR×2+HD Camera×1
Control & Compute	Standard: 8-Core high-performance CPU (platform) + Intel Core i7 (user development)	Standard: 8-Core high-performance CPU (platform) + Intel Core i7 (user development)

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		Optional: high computing power expansion dock
External Interfaces	RS485 x 2 CAN x 2 Gigabit Ethernet x 2 USB3.0-TypeC(8-Core CPU) x 2 USB3.0-TypeC (Intel Core i7)x2 Power Output:12V / 24V / BAT	RS485 x 2 CAN x 2 Gigabit Ethernet x 2 USB3.0-TypeC(8-Core CPU) x 2 USB3.0-TypeC (Intel Core i7)x2 Power Output:12V / 24V / BAT
Operating Temperature	-20℃~55℃	-20℃~55℃
Battery Life	No Load:>5hours continuous walking, approx. 20km With 25kg Load:>3 hours continuous walking, approx. 12.5km	No Load:>5hours continuous walking, approx. 20km With 25kg Load:>3 hours continuous walking, approx. 12.5km
Max Standing Load	About 100kg	About 100kg
Continuous Walking Load	About 25kg (Ideally, it can reach approximately 35 kg.)	About 25kg (Ideally, it can reach approximately 35 kg.)
Slope Walking Capability	About 45°	About 45°
Stair Climbing Capability	Max Step Height: 30cm	Max Step Height: 30cm
Max Climb Height	About 0.5~1m	About 0.5~1m
Speed	0–3.7 m/s (Up to ~5 m/s)	0–3.7 m/s (Up to ~5 m/s)
Replace Wheel-Leg	Optional	Optional
Ingress Protection Rating	IP56	IP56
Smart Ota Upgrade	Continuous Upgrades	Continuous Upgrades
Secondary Development	Supported	Supported
Warranty	12 Months	12 Months

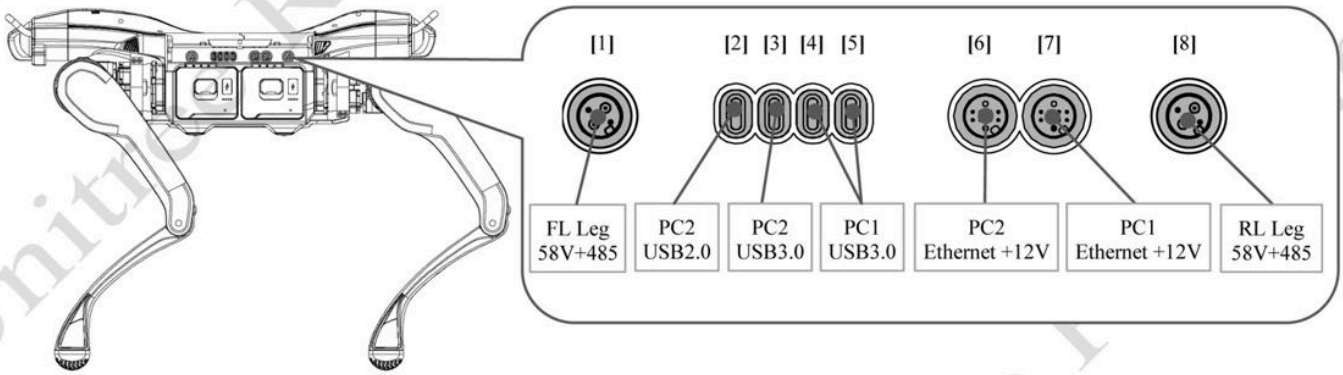
● Please visit the Unitree documentation center to obtain the A2 secondary development guide.

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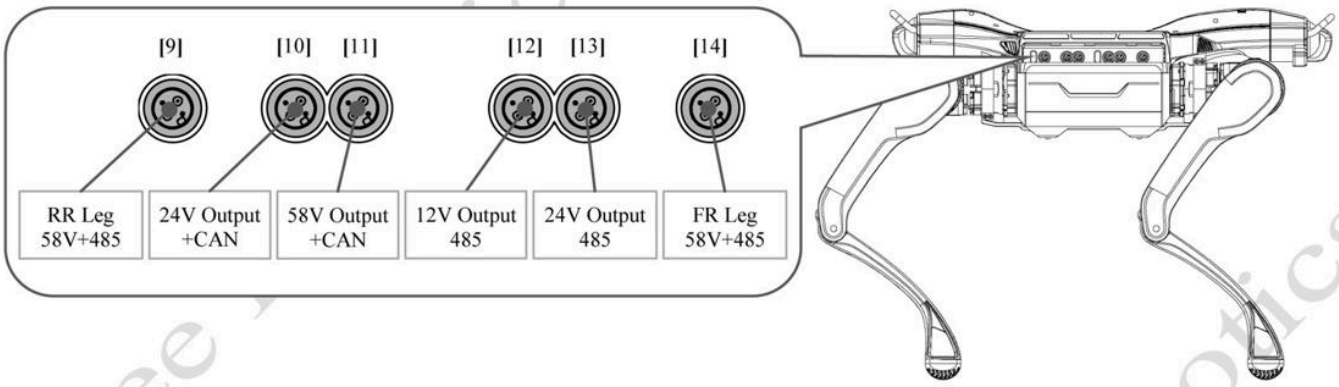
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Interface Description

A2 provides SDK expansion ports on both sides of the body, allowing developers to extend more functional development, as shown in the figure below.



Number	Interface Type	Interface Name	Interface Specifications
[1]	RS485 2+2 PIN Aviation Plug	Left Front Leg Power Cable	58V
[2]	USB 2.0 Type-C	PC2 USB 2.0	Supports PD, limited power 20W
[3]	USB 3.0 Type-C	PC2 Standard USB Port	Current limited to 1A
[4]	USB 3.0 Type-C	PC1 USB Port	Individual current limited to 2A
[5]	USB 3.0 Type-C	PC1 USB Port	Individual current limited to 2A
[6]	T568 8+2 PIN Aviation Plug	PC2 Switch Ethernet Port	12V
[7]	T568 8+2 PIN Aviation Plug	PC1 Switch Ethernet Port	12V
[8]	RS485 2+2 PIN Aviation Plug	Left Rear Leg Power Cable	58V



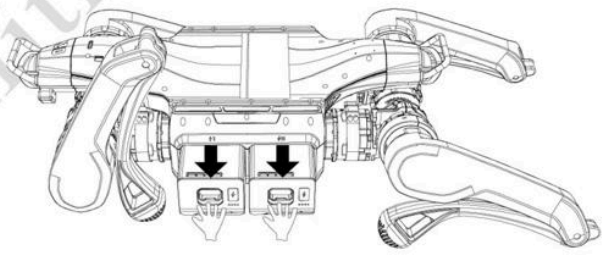
Number	Interface Type	Interface Name	Interface Specifications
[9]	RS485 2+2 PIN Aviation Plug	Right Rear Leg Power Cable	58V
[10]	CAN 2+2 PIN Aviation Plug	Regulated Power Supply Output	24V 5A
[11]	CAN 2+2 PIN Aviation Plug	Battery Power Supply Output	Battery voltage (58V)
[12]	RS485 2+2 PIN Aviation Plug	Regulated Power Supply Output	12V 6A
[14]	RS485 2+2 PIN Aviation Plug	Regulated Power Supply Output	24V 5A
[15]	RS485 2+2 PIN Aviation Plug	Right Rear Leg Power Cable	58V

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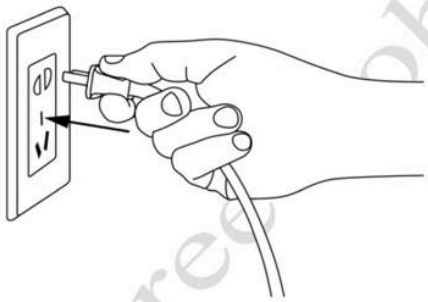
How to charge

Due to factors such as battery self-discharge during transportation and storage, it is normal for the battery to have low or no power when first used. You can charge it as follows.

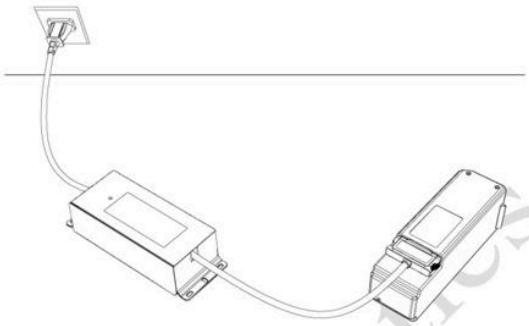
Charge the battery



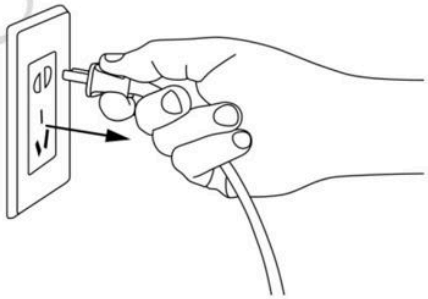
1) Remove the battery from the A2 body
(Press the battery latch)



2) Charger input AC power
(100-240V, 50/60Hz)



3) Connect the A2 battery



4) Manually disconnect the power when fully charged

1) Connect the charger to an AC power source (100-240V, 50/60Hz). It must be ensured that the external power supply voltage matches the rated input voltage of the charger before connecting. Otherwise, the charger will be damaged (the rated input voltage of the charger is marked on the nameplate of the charger).

2) Plug in the input AC power first before charging the battery, then connect the charger to the battery.

3) Before charging the battery, ensure that the battery pack is switched off. Otherwise, the battery and charger may be damaged.

4) The users need to remove the battery pack from the robot itself when charging the battery pack.

5) In the charging state, the battery indicator of battery pack will flash at a frequency of 1Hz (1 second/time) and indicate the current battery.

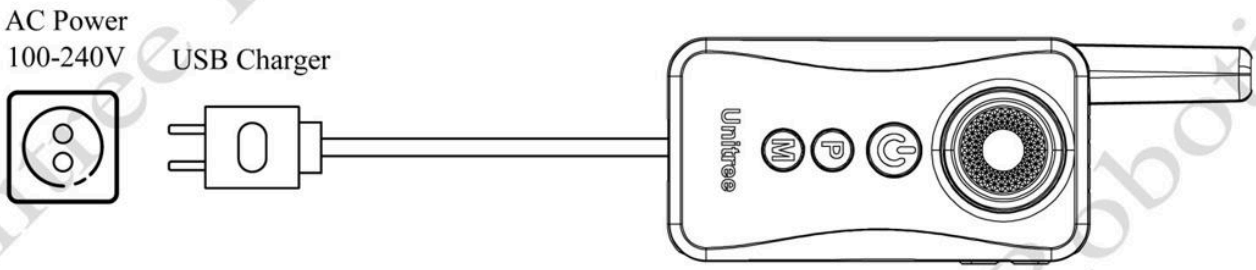
6) If the battery indicator is off, the battery pack is fully charged. Please remove the battery pack and charger to finish charging.

7) After the robot has finished operating, the battery pack temperature may be high. The battery pack must be allowed to cool down to room temperature before charging.

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Companion Remote Control Charging

When the battery indicator light of the companion remote control shows that the battery is low, you should connect the companion remote control to the charger as shown in the figure below:



1) We recommend you to use a 5V/1A USB charger which meets FCC/CE standard.

2) The power indicator light will flash at 1Hz (1 second/time) in charging status and indicate the current power level.

3) When the power indicator light is all off, it means the battery pack is full, please remove the charger to finish charging.

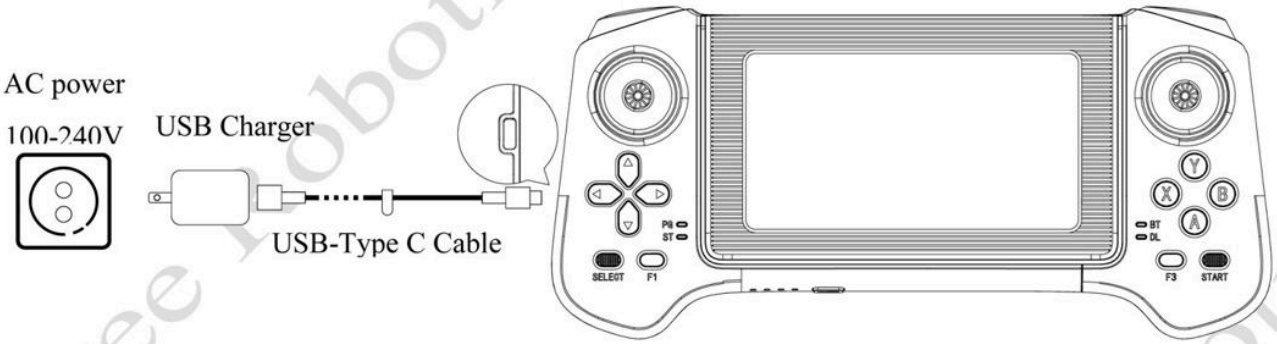
Charging Indicator Light				
LED1	**LED2**	**LED3**	**LED4**	**Current Battery**
☼	○	○	○	0%-25%
☼	☼	○	○	25%-50%
☼	☼	☼	○	50%-75%
☼	☼	☼	☼	75%-100%
○	○	○	○	Full Charged

Remote Control Charging

When the battery indicator light of the companion remote control shows that the battery is low, you should connect the companion remote control to the charger as shown in the figure below:

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1) We recommend you to use a 5V/2A USB charger which meets FCC/CE standard.

2) Ensure that handheld remote control is switched off before charging it.

3) The power indicator light will flash at 1Hz (1 second/time) in charging status and indicate the current power level.

4) When the power indicator light is all on it means the battery pack is full, please remove the charger to finish charging.

Charging Indicator Light				
LED1	**LED2**	**LED3**	**LED4**	**Current Battery**
☼	○	○	○	0%-25%
☼	☼	○	○	25%-50%
☼	☼	☼	○	50%-75%
☼	☼	☼	☼	75%-100%
☼	☼	☼	☼	Full Charged

Instructions for use

Operation Environment Requirement

1) This product is intended to be used in industrial, commercial and other similar scenarios.

2) Run the robot in -20℃ -55 ℃ with good weather condition. Do not operate in bad weather, such as lightning and tornado weather. When operating in water, the users need to be sure to comply with the requirements described in the IP67 Protection level instructions.

3) Please keep it under control in the users' view when using the robot and keep the robot maintain a safe distance of at least 2 meters from obstacles, complex ground, crowds, water, and other objects.

4) Please do not run the robot in an electromagnetic interference environment. Sources of electromagnetic interference include but are not limited to: high-voltage power lines, high-voltage transmission stations, mobile phone base stations, and television broadcast towers.

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5) Please do not run the robot in the WiFi signal interference environment. WiFi signal interference is usually caused by co-channel interference. In case of interference, be sure to turn off some or all WiFi signal sources of other wireless devices before using the remote control to operate the robot.

6) Due to varying levels of proficiency among actual operators, for the sake of reliability and safety, please use the robot in an open, unobstructed, and flat ground environment. When operating the robot, be mindful to avoid steps higher than 30cm, slopes steeper than 45°, and obstacles that may cause the robot to fall. When the robot is walking on complex ground or terrain with some unevenness and slopes, the operator should reduce the robot's walking speed and operate with caution to prevent the robot from tripping over obstacles.

7) Legged robots have certain requirements for the walking surface. Do not use the robot on surfaces with very low friction, such as ice. Do not use the robot on soft surfaces, such as thick foam flooring. If used on relatively smooth surfaces, such as glass, ceramic tiles, etc., carefully and gently maneuver the robot, avoid sudden movements, and reduce the robot's walking speed to prevent the robot's feet from slipping and causing a fall.

Unpacking

Place the box on a flat surface according to the placement requirements (with the front side up), then open the top of the box and lift the robot out in its entirety. Remove the quadruped robot, the remote control, the charger, etc. from the box separately, place the quadruped robot flat on the flat surface, and then prepare to power it on.

Scan the QR code to download and install the Unitree Explore App.

Check before Power on

1) Only Use Unitree Robotics authentic parts and ensure that all parts are in good working condition.

2) Ensure that the firmware has been updated to the latest version.

3) The users ensures that he or she is not operating the robot while intoxicated, under the influence of drugs, and unable to concentrate.

4) Be familiar with the characteristics of each gait mode. Be familiar with the emergency braking method of the robot in case of instability / loss of control.

5) Ensure that there are no foreign matters (such as water, oil, sand, soil, etc.) inside the robot and its components.

6) Ensure that the remote control module and battery pack are fully charged.

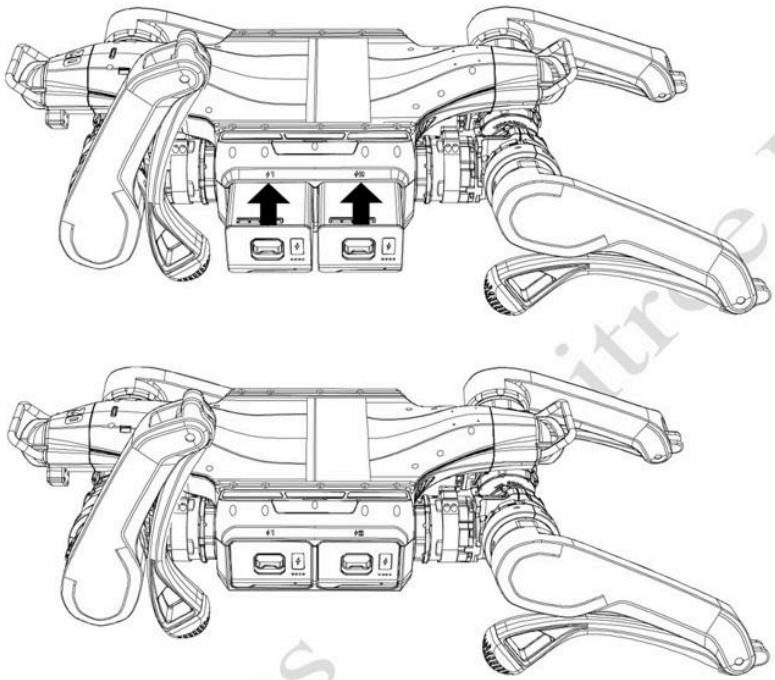
7) If the expansion interface is used, check whether the cable connection is correct.

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Preparation before Power on

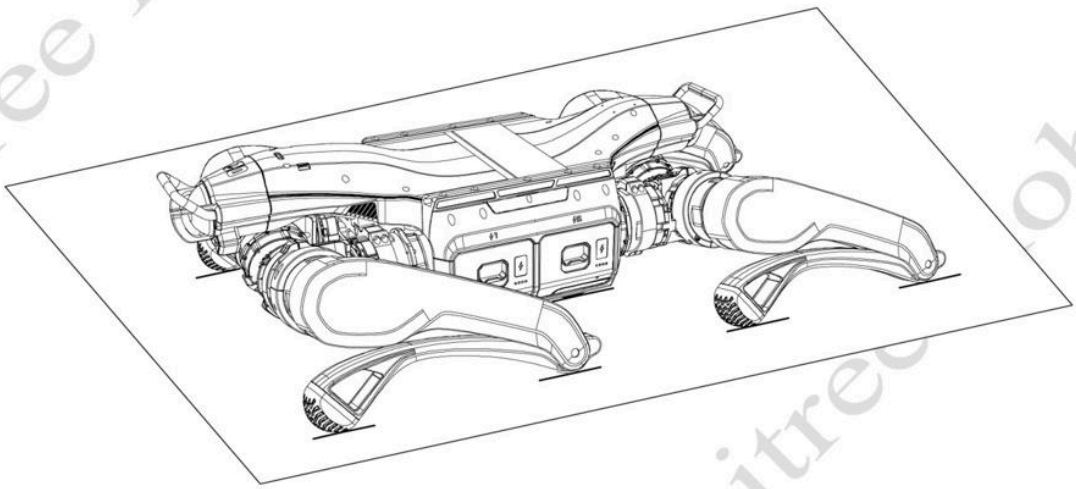
1) Installing Battery Packs

Place the A2 on a flat surface. Insert the battery pack into the battery slot from the side of the robot, paying attention to the installation direction as shown in the figure. If the battery pack cannot be fully inserted, adjust its orientation. Do not force it, to avoid damaging the battery interface and latch. When a "click" sound is heard, the battery pack installation is complete. Ensure the latch is securely engaged!



2) Body Placement (Important Steps !!!)

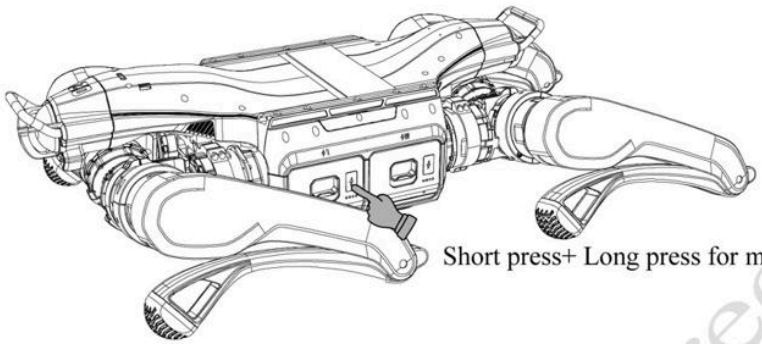
Horizontal type startup: please make sure that the robot dog is placed on a flat ground before startup and operation. The belly support pad of the robot dog should be flat against the ground. The machine body should lie on the ground horizontally without tilting. The legs of the robot dog should be fully retracted (as shown in the figure below). The four knee joints and foot ends should be flat on the ground to ensure that neither the thighs nor the legs of the robot dog are pressed by the machine body.



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Start up A2

After the robot completes the pre-startup check and is positioned according to the pre-startup preparation requirements, follow the steps below to power it on: First, briefly press the power switch once, then press and hold the power switch for more than 3 seconds to turn on the battery. After the battery starts, wait for 2 minutes. The robot will automatically stand up, with its body parallel to the ground, indicating a successful startup.



Short press+ Long press for more than 3 seconds

- When two batteries are inserted in the A2 battery compartment, it is only necessary to power on one of the batteries via the button; there is no need to power on both batteries simultaneously using the buttons.
- When powered by a single battery, the startup indicator light is green.
- When both batteries are powered on, or when an additional battery is inserted into a robot operating on a single battery, the indicator light will turn blue. In this state, only one battery is discharging, while the other is in standby mode. When both batteries are discharging simultaneously, the indicator light will turn green. This allows the machine to output maximum power. The condition for simultaneous discharge is that the voltages and charge levels of the two batteries are essentially equal.
- When both batteries are operating normally inside the battery compartment (with a blue or green light on), removing one battery from the compartment will cause an immediate shutdown. Reinserting the battery will cause an immediate startup. If a battery is manually powered off via its button, that battery will not be awakened by the battery compartment for 15 seconds. It will require manual startup or must wait for more than 15 seconds to be awakened by the battery compartment.

- If the starting up fails, please check the placement of the body!
- The upper leg being extended outward or the lower leg being pressed inward may cause the A2 to fail to start up.
- Be careful of pinching hands at the motion joints. Exercise caution!
- After the A2 starts up successfully, it will automatically stand up. Please maintain a safe distance!
- When replacing the battery, the robot dog should remain stationary and not be subjected to external disturbances (such as kicking the machine or adding loads to it, etc.). After the battery replacement is complete (i.e., 3 seconds after the battery is fully inserted into the battery compartment), the robot can be used normally.
- When the robot is operating in single-battery mode or in dual-battery blue-light standby mode, exercise caution when performing vigorous movements (such as flips, rapid climbing, rapid descending, etc.), as such operations can significantly shorten the battery's lifespan.

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Operate your A2

1) Use remote control to control

Power on the A2 robotic dog. Once powered on successfully, the robotic dog will automatically stand up. You can then use the companion remote controller to operate it. The specific steps are as follows:

Step 1: Start the Companion Remote Controller (Default: Joystick Mode)

a) Briefly press the power button on the companion remote controller. When the indicator light stays steady, startup is complete. The robotic dog will issue a corresponding voice prompt. At this point, the companion remote controller has been successfully connected to the robotic dog, defaulting to joystick mode.

b) Use the joystick to control the movement of the robotic dog.



Figure 1

Step 2: Wear and Activate Companion Mode (Important step!)

a) Attach the companion remote controller to the right side of your waist belt. Stand directly to the left of the robotic dog, ensuring that your body's orientation aligns with the robotic dog's facing direction. Refer to Figure 1 for the relative position diagram.

b) When wearing it, ensure the side with the joystick faces to the right, pointing toward the robotic dog. Keep the antenna vertically upright while wearing it on the right side of your waist. Alternatively, you can hold it in your right hand, also ensuring the joystick side faces right and the antenna remains vertical. Do not grip the antenna directly.

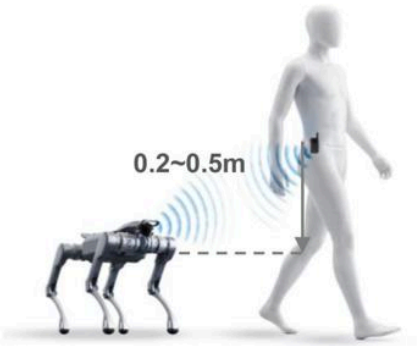


Figure 2

c) Confirm that the robotic dog is positioned to the right of the companion remote controller and that the distance between the remote controller and the top of the robotic dog's head is less than 2.4 meters. Briefly press the M function button; the robotic dog will enter Companion Mode and emit a voice prompt.

d) If the robotic dog emits a voice prompt indicating the distance is too far, it means the distance between the remote controller and the robotic dog exceeds 2.4 meters, exceeding the companion range. Move closer and repeat Step 3.

Step 3: Exit Companion Mode

a) Press the P button on the companion remote controller or move the joystick. The robotic dog will exit Companion Mode, enter Joystick Mode, and emit a voice prompt.

b) Place the companion remote controller horizontally, or tilt it at an angle greater than 40° compared to its activated state. The robotic dog will exit Companion Mode, enter Joystick Mode, and emit a voice prompt.

c) Press any button on a two-handed remote controller or move the joystick. The robotic dog will exit Companion Mode, enter Joystick Mode, and emit a voice prompt.

d) Press and hold the power button on the companion remote controller for 2 seconds to turn it off, exiting Companion Mode. Restarting the remote controller will automatically re-enter Companion Mode.

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Additional Operating Instructions

a) Joystick Control: After the companion remote controller enters Joystick Mode, you can control the robotic dog's movements via the joystick. While in joystick control mode, you may remove the remote controller from the waist belt for operation. To resume Companion Mode, reattach the remote controller to the waist belt before activating companion mode again.

b) In Companion Mode, the device achieves following functionality based on the relative position between the remote controller and the robotic dog. Therefore, ensure the companion remote controller moves along with the wearer's torso. Do not hold it and wave it around arbitrarily.

Companion Mode Precautions:

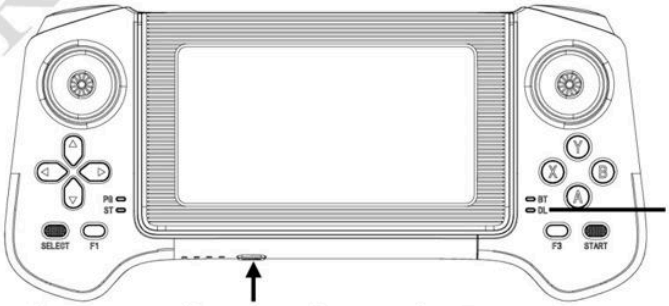
- Do not use in narrow indoor spaces or areas with dense metal reflective surfaces.
- Ensure that before entering or exiting Companion Mode, the button side faces to the right and the antenna points vertically upward.
- The maximum operating distance in Joystick Mode for the companion remote controller is approximately 15 meters.
- When Companion Mode is active, ensure the distance between the robotic dog and the remote controller does not exceed 2.4 meters. Excessive distance may cause signal interruption, loss of control, or other malfunctions.
- When Companion Mode is active, do not run quickly. Maintain a steady walking speed of no more than 2 m/s. Rapid movement can easily result in loss of remote control signals and loss of control over the robotic dog, leading to potential safety hazards.
- The optimal height difference between the companion remote controller and the robotic dog's head should be maintained between 0.2m and 0.5m, as shown in Figure 2.
- In Companion Mode, the optimal straight-line distance between the remote controller and the robotic dog's head is approximately 0.8 meters.
- In Companion Mode, the following function is achieved through the relative position of the remote controller and the robotic dog. Therefore, ensure the companion remote controller moves along with the wearer's torso. Do not hold it and wave it around arbitrarily.
- When walking, try to proceed on flat, open ground without obstacles to prevent the robotic dog from colliding with environmental obstacles during companion mode.
- Do not use the Companion function on special terrains such as stairs or steep slopes. Such environments are prone to rollovers, falls, and other issues that could damage the robotic dog.

2) Use remote control to control

First, briefly press the remote control power switch once, then press and hold the power switch for more than 2 seconds. When you hear a "beep" sound, the remote control is turned on. The remote control will

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automatically connect once powered on. After successfully connecting with the A2, the right DL indicator light will illuminate, which means the remote control is connected to the A2's data transmission module. At this point, you can choose to use the control commands on the remote control overlay to make the robot dog perform corresponding actions.



● Please control according to the remote control commands indicated on the remote control overlay.

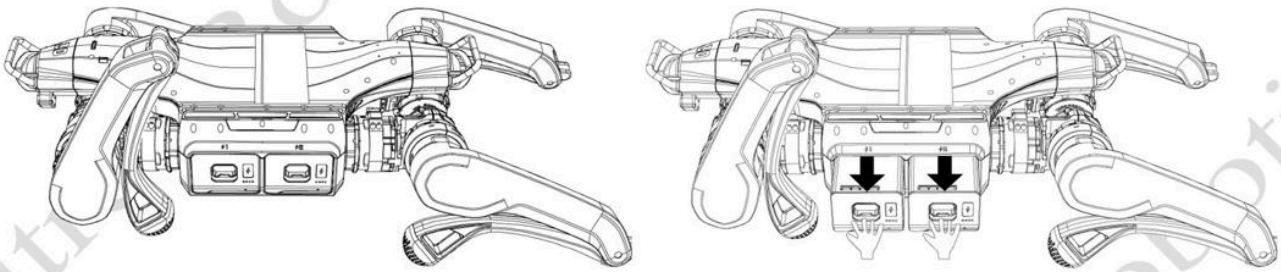
Switching off A2

Before shutting down, ensure the robot is standing on flat ground and is in a static standing state (the robot's body position is at the initial state after powering on and standing up, with the body level, no joystick input, and in a static standing posture).

1) Press the L2+A buttons twice. The robot will complete joint locking and lying down actions in sequence.

2) After the robot enters the lying-down state, shut down one of the batteries by pressing the power button briefly once, then pressing and holding the power button for more than 3 seconds.

After shutdown, arrange the robot's upper legs, lower legs, and hip joint positions according to the body placement requirements to prepare for the next startup. If the A2 will not be used for an extended period, promptly remove the battery pack.



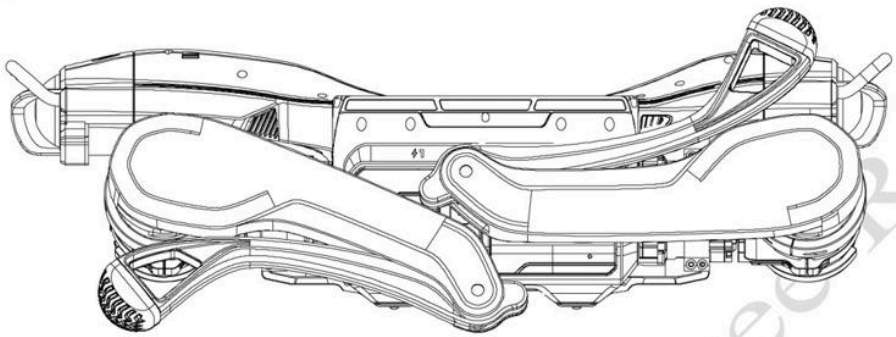
● Please make sure that the robot turned off in a damping state, otherwise the robot will fall heavily on the ground after it is turn down and powered off, which may cause damage to the robot body and certain potential hidden dangers!

● Be careful to avoid pinching your hands at the moving joints. Please proceed with caution!

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Packing

Preparation for packing: Rotate the legs of the quadruped robot to the position shown in the picture (rear leg retracted step: rotate the rear leg hip motors so that the rear thighs are placed in the position as the picture shows, and at the same time retract the rear lower legs to the position shown in the picture.



After completing the pre-packing preparations, first place the quadruped robot into the lower part of the transportation case. After the quadruped robot is placed in the lower part of the case, put the accompanying remote control, charger, etc. into their respective positions inside the transportation case to ensure that none of the above items will fall out when the upper part of the case is closed.

Abnormal Condition Description

When using the A2 quadruped robot, the robot may be abnormal. Most abnormal situations are controllable (there are solutions). The users should not panic when encountering these problems. Read the following contents in detail and solve the problems step by step.

If you have any questions, please contact Unitree Robotics official technical support: https://global-serviceconsole.unitree.com/#/work-order

1) Startup Self-Check Unsuccessful

If the robot lies on the ground during startup and does not stand up after waiting for 2 minutes, it indicates that the startup self-check has failed, and the robot cannot stand up. In this case, it is necessary to recheck the robot according to the "Pre-startup Check" and "Pre-startup Preparation" steps and try again.

2) Robot Fall Self-Protection

When using the official Unitree motion control program (controlling the robot with the remote control), if the robot loses balance and falls due to external environmental reasons (e.g., insufficient ground friction) or

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improper user operation, the robot will automatically switch to self-protection mode, and the robot's motors will automatically engage the brake state to protect the components.

3) How to Shut Down the Robot When the Remote Control Module Fails

When the remote control module fails (e.g., due to depleted battery), making it impossible to use the remote control to put the robot into a lying standby state, you can only force a shutdown by pressing the battery power button.

Forced Shutdown: Maintain a safe distance of at least 2 meters between the robot and obstacles, complex terrain, crowds, water surfaces, etc. Lift the robot's head and tail, briefly press the power switch once, then press and hold the power switch for more than 3 seconds to turn off the power. After the robot powers off, slowly place it on the ground.

4) Robot Prone to Falling, Unable to Stand After Startup

Incorrect startup posture may cause errors in the robot's motor angles. Use the correct startup posture and restart the robot. If restarting the robot does not resolve the issue, please contact Unitree official technical support.

5) How to Achieve Long-Term Standby

If long-term standby is required, control the robot into a lying posture (press L2+B to enter damping mode) to prevent the robot from automatically shutting down due to low battery and falling, which could cause damage!

⚠ ● Attention! When lifting the robot, do not place your hands on the joints, such as the hip joint, to avoid pinching. If the robot is forced to shut down while standing without protection, it will fall flat on the ground after losing power.

Precautions

1) Ensure the robot is in a prone position before shutting it down. Otherwise, when the robot powers off, it will fall heavily to the ground, which may cause damage to the body and pose safety hazards!

2) When standing, if the ground friction is insufficient or the robot's feet do not have reliable support, do not violently adjust the robot's posture (including pitch, roll, yaw, or body height adjustments), as this may cause the robot to lose balance and fall.

3) Operate the robot to walk on flat, stable terrain. When walking on surfaces with low friction, avoid operating the robot violently, as this may cause the feet to slip, leading to instability and falls.

4) **Regarding Endurance:** The robot's comprehensive operational endurance is approximately 3–5 hours. When carrying a 25kg load, the operating time is about 3 hours, with a range of approximately 12.5km. Under no load, the continuous walking time is about 5 hours, with a range of about 20km. Actual endurance depends

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on the robot's operating conditions, such as extended high-speed walking, prolonged and violent posture adjustments while standing, standing with bent legs, carrying loads, walking at a low body height, and navigating terrain with moderate unevenness or slopes. These conditions will reduce endurance. (When the body height is low and the knee joints are significantly bent, the motors bear a heavier load, which noticeably increases power consumption and generates motor heat.)

5) **Regarding Steps and Uneven Terrain:** Due to varying skill levels among operators, for reliability and safety, it is currently not recommended for users to navigate steps exceeding 30cm in height, as improper operation may cause the robot to trip. When encountering uneven ground, operators should proceed with caution and reduce the robot's movement speed.

6) **Regarding Slope Climbing:** The rated forward climbing angle is less than or equal to 45°. When climbing at larger angles (approximately equal to or greater than 45°), the robot's body may drift sideways. Turning directly on steep slopes may cause the robot to lose balance. When climbing slopes, reduce walking speed and ensure proper operator control.

7) **Regarding Speed:** Under stable operation on flat ground, the speed ranges from approximately 0 to 3.7 m/s, with a maximum of about 5 m/s.

8) **Regarding Foot Components:** The robot's foot components are consumables. We provide spare foot components with the product. Wear can be significant, especially when operating on rough surfaces. If noticeable wear or damage to the foot pads is observed, or if the impact noise during walking increases significantly, replace the foot components promptly to prevent abnormal robot movement or damage due to worn foot components.

9) **Regarding IP56 Protection Level:** Before use, ensure the battery interface, battery compartment interface, battery surface, and battery compartment surface are dry and free of moisture before inserting the battery into the robot.

10) Do not touch the robot while it is in motion! Be cautious of pinching at the joints, such as the knee joints.

⚠ ● Maximum running speed of 5m/s, realized in special configurations, in practice there is a speed limit for security purposes

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Daily Maintenance

Whole Machine Clean

1) Clean

When the A2 is used in harsh environments (rainy, dusty, wet), please clean the surface of the robot body in time.

Before cleaning the robot body, please turn off the power, use a clean, soft cloth to wipe the body, especially pay attention to whether the camera is wiped clean. It is strictly forbidden to use metal brushes, sandpaper, etc. to clean to avoid scratching the surface of the parts. After cleaning, dry the body with a soft cloth. After drying, use a fan or air gun to dry the accumulated water on the surface of the robot and the joint gap to avoid leaving water marks.

⚠ ● Be careful! The whole A2 robot (including battery pack) has IP56 waterproof. Do not remove the battery pack when cleaning!

2) Storage

The A2 should be stored in a dry and cool room and away from the sun and rain to avoid the corrosion of parts and shorten the service life span. Take out the battery pack when storing for a long time.

Inspection and Maintenance

Carrying out routine inspection before and after operation can greatly improve the reliable performance of products, reduce potential safety hazards and extend the service life span.

Uncharged checklist

Type	Main points
Appearance of the whole robot	1) Check whether the body's appearance is clean, and free of damage or deformation marks. 2) Whether the lens on the camera surface has foreign matters. 3) Check if there are any obstructions around the head-mounted LiDAR.
Structure	1) Visually and touch to check whether the body, joints, connections, and foot end parts are in good condition. If there are cracks or damages, replace them in time and contact Unitree Robotics after-sales service. 2) Ensure that the screws of all connecting parts are locked, especially the screws of joint connectors and battery locking knobs. 3) Check for any obstructions in the intake and exhaust of the cooling fan.
Foot end parts	Check whether there is obvious foot pad damage. If there is damage, please replace it in time.
Battery packs	1) Check the battery pack interface of the body for foreign matters and deformation. 2) Whether the battery pack is installed reliably to ensure that it will not loosen during operation. 3) Check whether the battery pack shell is obviously damaged. The battery pack with obvious damage is forbidden to be used.

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Remote Control	1) Whether the remote control rocker is in the middle position and whether the rocker enters sand and other foreign matters. 2) Check whether each key of the remote control is lagged.

Uncharged checklist

Type	Main points
Remote control	1) Confirm whether the basic operation function of the rocker is normal. 2) Confirm whether the current power is sufficient
Battery	Confirm whether the current power is sufficient.
Cooling fan	Listen carefully with ears to confirm that the cooling fan works normally and there is no sound such as scratching.

Battery pack maintenance

1) Never charge the battery pack in an environment where the temperature is too high or too low

2) Never store the battery pack at room temperatures above 40°C.

3) Do not overcharge the battery pack as this will cause damage to the cells.

4) If you do not use the battery for a longer period of time, please check the remaining battery power regularly, if the power is less than 30%, please charge the battery to 70% before continuing to store. So as not to over-discharge the battery and damage the battery.

- It is recommended to do the above inspection before each use!
- If any parts are damaged and need to be replaced, please contact Unitree Robotics after-sales service in time!

Interface_Sensors Description

Network Interfaces & Services:

Network Interface	Network Service	Description
WLAN Interface	HTTP web service on port 9991.	Save as signal server for webrtc connection
BLE Interface	BLE one to one link between a mobile and our robot.	Enable mobile app connection for wlan network configuration
LoRaWAN Interface	One to one LoRaWan between our remote controller and our robot	Enable remote controller connection for controlling the robot.

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UWB	UWBcapability for robot-side positioning of users equipped with UWB receivers.	The UWB system is configured with the base station on the robot and the tag on the handheld device, facilitating mutual data exchange.

Environment Sensors:

Sensor Name	Quantity	Function description	Sensing capabilities
Microphone	1	The function of microphone is to record the voice command of users to realize the functionality of voice control	1.5 meters in circle.
LiDAR	1 (A2) 2 (A2-PRO)	Two LiDAR sensors are installed at the front and rear ends	Channels:128 Horizontal FOV: 360° x 189°Ranging Capability:40m (at 10% reflectivity, all channels) Effective Point Rate:single return is 1,152,000 pts/s and dual return is 2,304,000 pts/s.
Speaker	1	The speaker outputs sound externally.	5 meters in circle

Company Information:

YuShuTechnologyCo.,Ltd.

306 Room, Building 1, 88 Dongliu Rd, Xixing Street, Binjiang District, Hangzhou, 310000 Zhejiang P.R. China.

Industry Canada

This device complies with Industry Canada licence-exempt RSS standard(s):

Operation is subject to the following Two conditions:(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux

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appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi,même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

RESTRICTIONS IN THE 5 GHZ BAND

Within the 5.15 to 5.25 GHz band, UNII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel Mobile Satellite System (MSS) operations.

RESTRICTIONS DANS LA BANDE DE 5 GHZ

Dans la bande de 5,15 à 5,25 GHz, les appareils UNII seront restreints aux opérations intérieures pour réduire toute possibilité d'interférence pouvant nuire aux opérations du Système satellite mobile dans le même canal(MSS).

RF Exposure

RF Radiation Exposure Statement Caution: This Transmitter must beinstalled to provide a separation distance of at least 20 cm from all persons.

Déclaration d'exposition Attention: Cet émetteur doit être installé pour fournir une distance de séparation d'au moins 20 cm de toute personne.

FCC Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the Federal Communications Commission (FCC) rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the Party responsible for compliance could void the user's authority to operate the equipment.

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This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Privacy of communications may not be ensured when using this device.

General Information

RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.

Radio Frequency Specifications

Specifications

2.4GHz Wi-Fi (2412-2472MHz): 20dBm (EIRP)

Bluetooth(2402-2480MHz): 20dBm (EIRP)

2.4GHz SRD (2400.8-2480MHz) : 14dBm (EIRP)

Sub 1GHz Bands (865-868, 868-868.6, 869.4-869.65, 869.7- 870MHz): 14dBm (ERP)

5GHz Wi-Fi: 5150-5250MHz: 23dBm (EIRP) 5250-5350MHz, 5470-5725MHz: 20dBm (EIRP) 5725-5850MHz: 14dBm (EIRP)

Wi-Fi 5150-5350MHz frequency range is limited to indoor use in all EU/EFTA member states and Turkey.

RF exposure:

The equipment complies with radiation exposure limits set for an uncontrolled environment. To avoid the possibility of exceeding radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm during normal operation. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.



BE	BG	CZ	DK	DE	EE
IE	EL	ES	FR	HR	IT
CY	LV	LT	LU	HU	MT
NL	AT	PL	PT	RO	SI
SK	FI	SE	UK (NI)	TR	NO
CH	IS	LI			

Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

The appliance is only to be used with the power supply unit provided with the appliance.

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ANATEL Res. 680 RF warning sentence

The equipment complies with radiation exposure limits set for an uncontrolled environment. To avoid the possibility of exceeding radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm during normal operation. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

ANATEL website:

Para maiores informações, consulte o site da ANATEL http://www.gov.br/anatel/pt-br.

Revision History

Edition	Date	Modify Content
1.7	September 16, 2026	Feature Highlights Chapter Update
1.6	June 16, 2026	Add accompanying remote control usage content
1.5	June 15, 2026	Add product warning language
1.4	May 26, 2026	Parts name content update
1.3	May 14, 2026	Added: "Laser Safety Class"
1.2	April 27, 2026	Add content to "Specifications"
1.1	April 20, 2026	Interface description content update
1.0	December 24, 2025	Initial Version

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