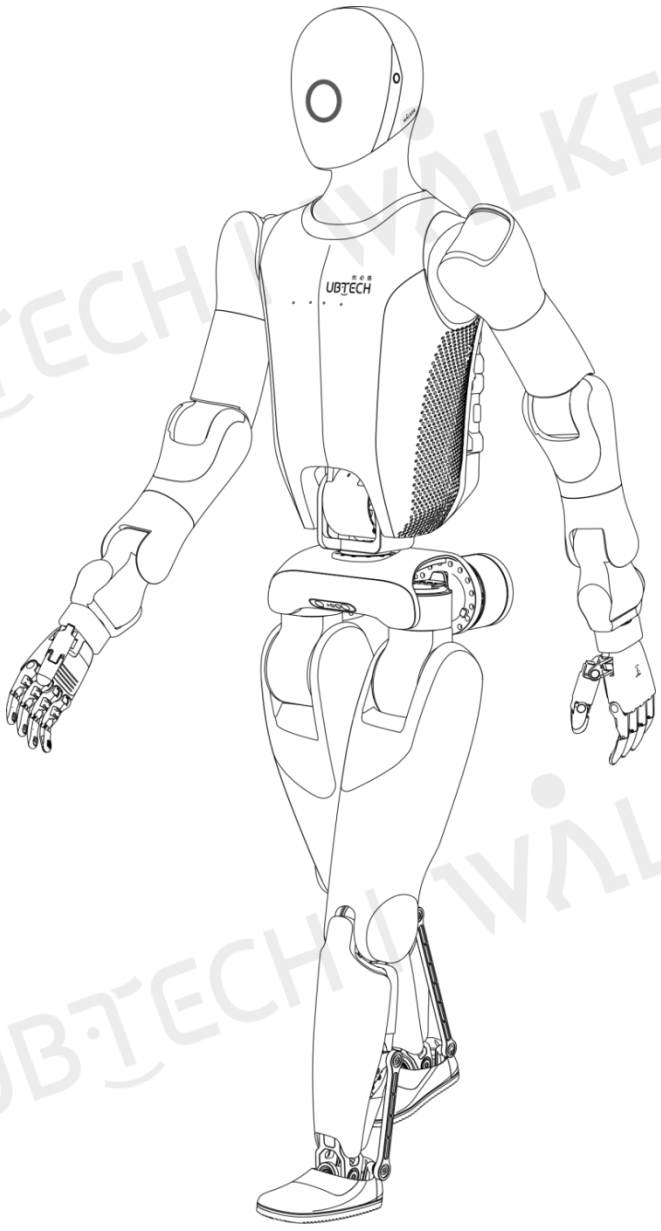
Walker S2 Product Manual

WALKER S2



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1. Disclaimer

1. This instruction manual is only a guidance document for the operation and maintenance of the Walker S2 industrial humanoid robot (hereinafter referred to as the "Robot") of Shenzhen Ubtech Robotics Joint Stock Company (hereinafter referred to as "Ubtech"). All content is compiled based on the hardware configuration, software version, and technical parameters of the Robot at the time of factory shipment. If subsequent product updates involve hardware modification, software upgrade, or parameter adjustment to the Robot, the official updated instruction manual document of Ubtech shall prevail.
2. The robot is suitable for specified tasks in industrial scenarios (such as box handling, quality inspection, bolt tightening, parts installation, SPS sorting, etc.), and is strictly prohibited from being used in non-industrial scenarios such as medical and military applications. UBTECH Joint Stock Company shall not assume any liability for any personal injury or property damage caused by misuse of the scenario.
3. The robot must be operated strictly in accordance with this manual and the requirements of UBTECH official training. If equipment malfunctions, production accidents, or personal injuries occur due to non-compliant operations (such as failure to follow the safety distance, unauthorized modification of core parameters, failure to perform maintenance on time, etc.), UBTECH shall not be liable for compensation.
4. Robots may experience performance fluctuations or functional abnormalities in complex industrial environments (such as strong electromagnetic interference, extreme temperatures, severe vibrations, etc.). UBTECH only provides relevant maintenance services in accordance with the official after-sales policy of the robot for the normal operation of equipment that meets the requirements of the operating environment. For equipment issues caused by the user's operating environment not meeting the requirements, the user shall bear the cost of repair or replacement on their own.

2. Safety Instructions

2.1 Personnel Safety

1. When the robot is in operation, standing, staying, or placing unrelated items within its active range (especially in the operating areas of both arms, both feet, and dexterous hands) is prohibited to avoid collision injuries caused by mechanical movement; during operation, a safe distance of at least 1.5 meters from the robot must be maintained.
2. Non-professionals are strictly prohibited from disassembling core components such as the robot's housing, battery, sensors, or servo drives. Maintenance or servicing must be performed by UBTECH-certified engineers to prevent safety accidents caused by electric shock or component damage.
3. When robots perform high-risk tasks, they must be equipped with dedicated protective devices (such as anti-corrosion shells, torque overload protection), and operators must wear protective equipment such as chemical protective suits and safety helmets, and monitor the operating status of the equipment in real time.

2.2 Equipment Safety

1. The maximum load capacity of the robot's dual arms is 15kg. Overloading is strictly prohibited to avoid damage to the joint motors due to overloading or damage to equipment caused by falling heavy objects.
2. When charging, use only UBTECH's self-developed intelligent charging pile or battery swapping cabinet. Do not use third-party charging equipment to prevent battery overcharging and short circuits that may lead to fires;
3. The emergency stop switch (marked in a prominent position on the body) is a forced shutdown device for emergency situations, to be used only when the robot is out of control, there is a risk of collision, or personnel are in distress, and it is prohibited to be triggered casually during daily operations.

2.3 Environmental Safety

1. The robot's working area must maintain a flat floor, free of standing water and oil stains, to avoid the robot slipping while walking due to a slippery floor; at the same time, obstacles such as cables and tools within the area must be cleared to prevent the robot's feet from getting entangled or tripping.

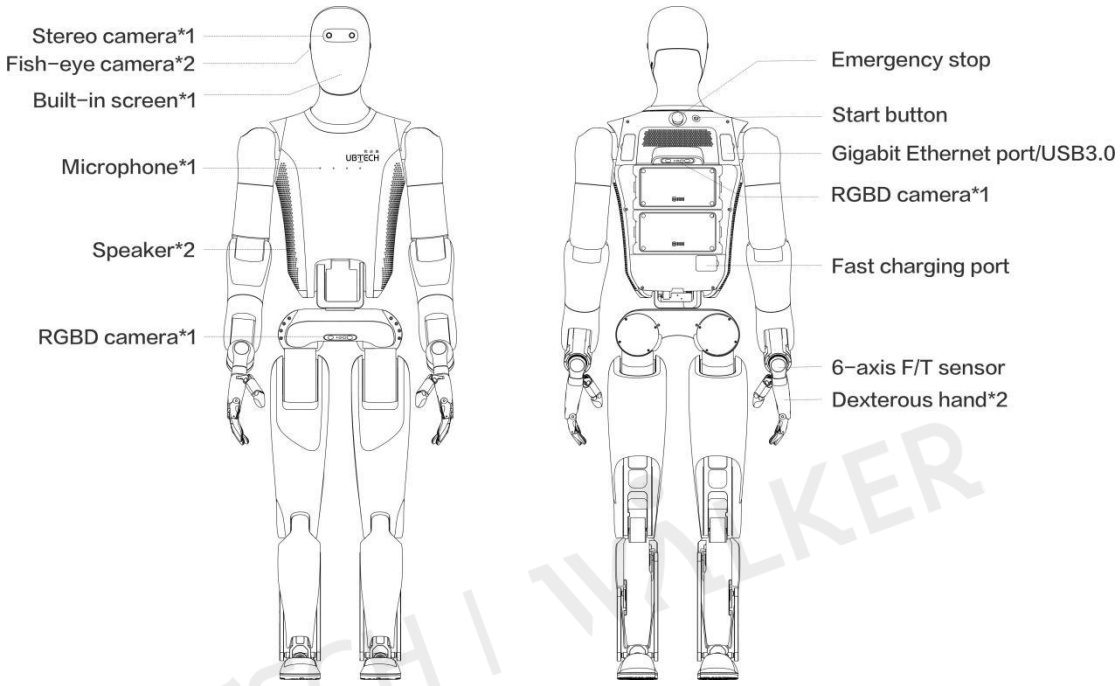
2. It is prohibited to use the robot in flammable and explosive environments (such as warehouses storing alcohol or gasoline) or strong electromagnetic interference environments (such as near large transformers or high-frequency welding equipment) to prevent equipment out of control caused by fire, explosion, or sensor signal disorder.

3. Product Overview

3.1 Product Introduction

- Walker S2 is a new generation of industrial humanoid robot developed by UBTECH based on full-stack humanoid robot technology, integrating key embodied intelligence technologies such as MultiModal Machine Learning planning large model, semantic VSLAM, and learning-based motion control, and featuring humanoid form, high load capacity, autonomous navigation, and multi-scenario adaptability.
- The robot, with the core objective of "alleviating the contradiction between labor supply and demand in the manufacturing industry", can adapt to unstructured industrial environments, perform highly repetitive and high-risk tasks (such as moving boxes, quality inspection, painting, etc.), and can collaborate with unmanned logistics vehicles, unmanned forklifts, and intelligent manufacturing management systems to promote the flexible unmanned upgrade of industrial scenarios and contribute to the development of new industrialization.

3.2 Introduction to Key Components



(Figure 3-2-1)

3.3 Specification Parameters

Parameter Category	Specific Parameters
Height	176cm
Armspan	177cm (excluding the dexterous hand)
Weight	70kg (excluding dexterous hand)
Single Leg Degrees of Freedom	6
Waist Degree of Freedom	2
Single-hand degrees of freedom (excluding dexterous hands)	7

Head Degree of Freedom	2
Load Capacity	Maximum load capacity of both arms is 15kg
Computing Power Configuration	X86 + NVIDIA Jetson Orin
Sensor Configuration	Depth Camera, Six-Axis Force Sensor, IMU, Fisheye Camera
Display Interaction	4-inch circular interactive screen, battery status indicator, Microphone Array, speaker
Power Supply Mode	Lithium Battery DC 48V
Battery charging voltage/current	Voltage: DC 54V Current: 8A
Comprehensive Range	2.5h
Intelligent OTA Upgrade	has
Operating System	Ubuntu + ROSA 2.0

4. Instructions for Use

4.1 Environmental Requirements for Use

1. Space Environment

- Work area size: It shall meet the robot's range of motion, with the minimum working space for a single robot not less than 4 ㎡ (L2m x W2m), and equipment intersection passages (width ≥ 1.5m) shall be reserved for collaborative operation scenarios.

- Ground Conditions: The ground is level, with a flatness error ≤ 5mm/㎡, free of standing water, oil stains, or sharp debris; the ground bearing capacity ≥ 150kg/㎡ (to prevent ground depression when the robot is moving).

2. Temperature, Humidity, and Lighting

- Temperature range: 0~40°C. Avoid using in environments below 0°C or above 40°C, as using outside this temperature range will degrade battery performance and also affect battery lifespan.
- Humidity range: 20% - 80% (non-condensing). Dehumidification equipment must be installed in humid environments to prevent fogging of sensor lenses or corrosion of metal components.
- Lighting Conditions: The illumination intensity in the working area shall be ≥ 200 lux, avoiding direct strong light (such as direct sunlight on the camera lens) or excessively dim light to ensure the accuracy of visual positioning and recognition.

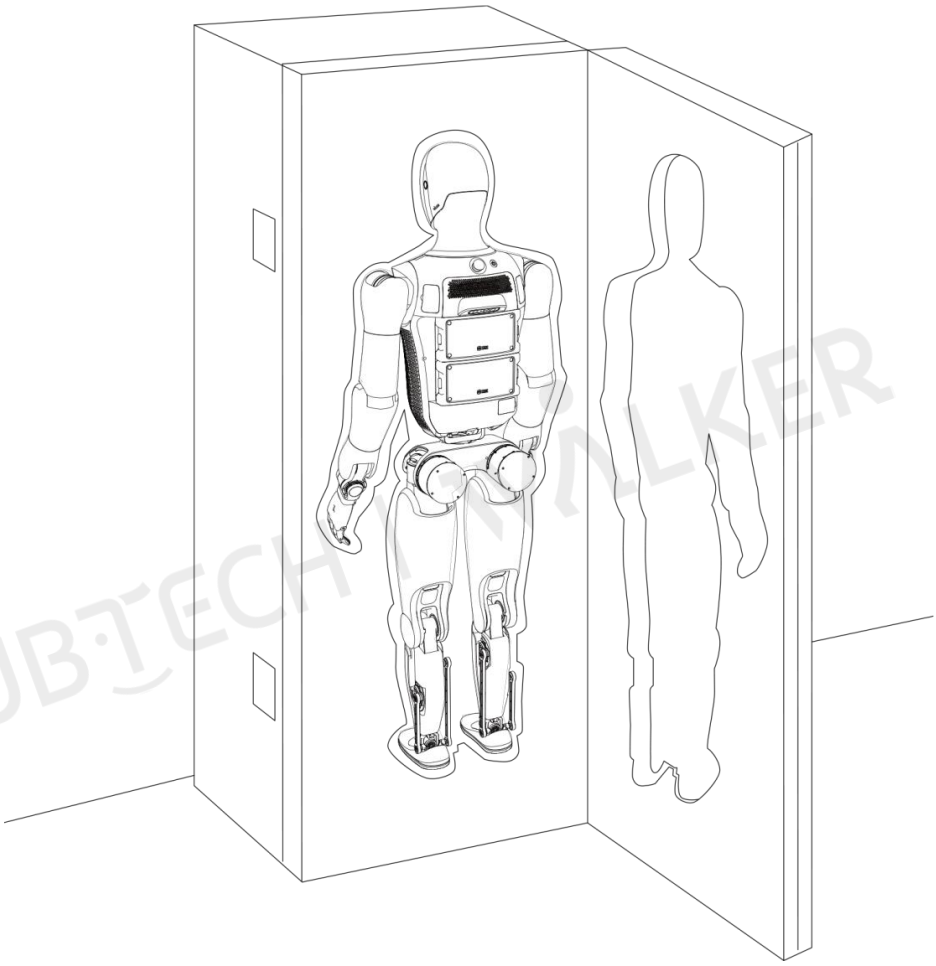
3. Electromagnetic and Network Environment

- Electromagnetic interference: Keep away from strong electromagnetic radiation sources (such as high-frequency welding machines and large transformers), and the electromagnetic compatibility level shall comply with the GB/T 17626.2-2018 standard to prevent sensor signal disorder.
- Network Requirements: Support Gigabit Ethernet, with network latency ≤ 100ms and packet loss rate ≤ 1%, to ensure real-time data transmission between the robot, the cloud, and collaborative devices.

4.2 Unboxing operation

- Place the aviation case horizontally and lock the wheels.

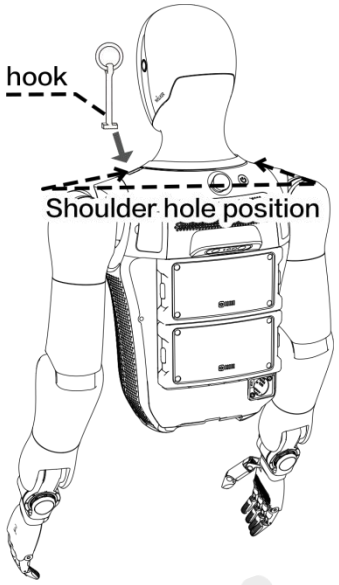
- Stand up the aviation case (lean it against the wall as much as possible to prevent it from tipping over), and open the case door. (See Figure 4-2-1)



(Figure 4-2-1)

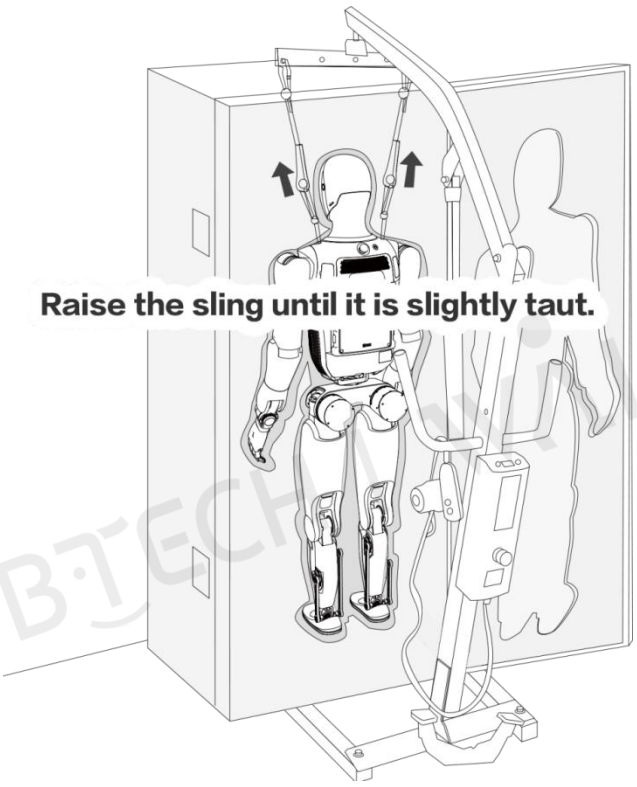
- Rotate the red of the rotating display stand controller to turn on the power of the display stand, push the display stand under the aviation case, lower the hanging rope to an appropriate height, and insert the hook into the hole on the robot's shoulder;

✧ **Instructions:** Insert the hook into the shoulder hole, press down and rotate it 90 degrees clockwise, and the hook will snap into the spring slot to ensure that the hook does not come loose from the shoulder hole. (See Figure 4-2-2)



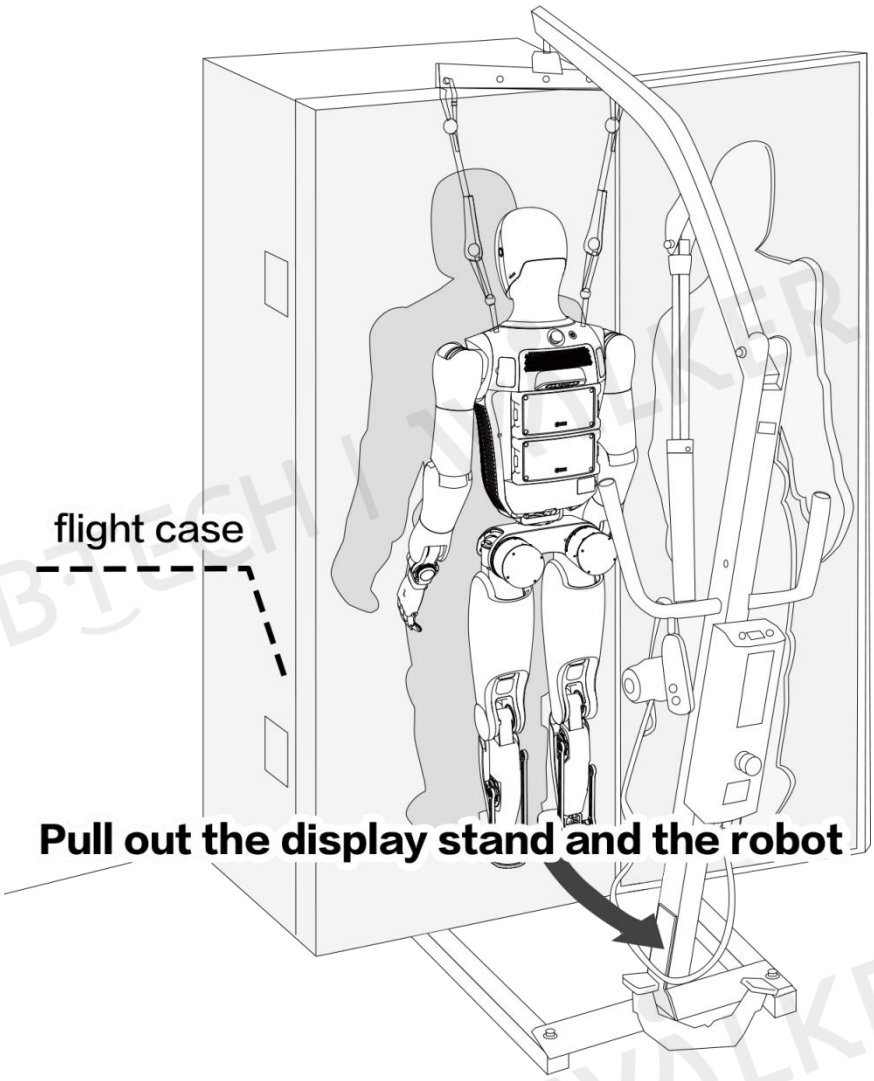
(Figure 4-2-2)

- Click the button on the display rack controller, raise the hanging rope until it is slightly taut, then stop (see Figure 4-2-3), and then loosen the waist screw with an Allen wrench.



(Figure 4-2-3)

- Pull out the display stand and the robot, unscrew and remove the waist fixing part, place it in the aviation case, take out the remote control and power supply of the model aircraft, close the case door to complete the unpacking operation. (See Figure 4-2-4)



(Figure 4-2-4)

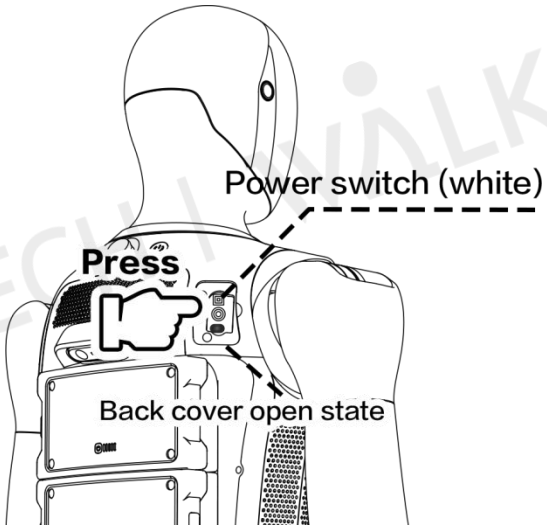
4.3 Power on, power off, and emergency stop operations

4.3.1 Power-on operation

- Before powering on, ensure the robot is hung on the support: the robot's

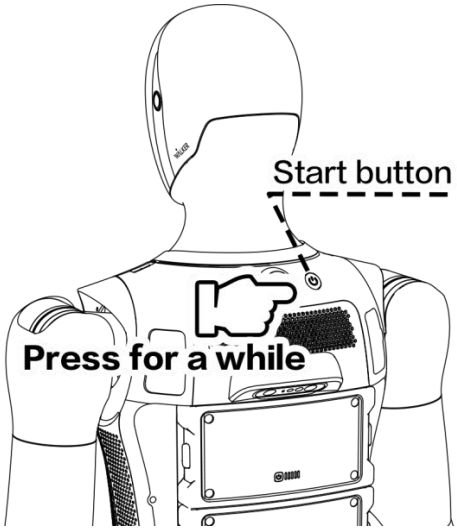
feet hang naturally, the display stand is raised to the highest position to ensure that the soles of the feet do not touch the ground or other objects during the leg reset process. Ensure that the robot's arms hang naturally, with the inner sides of the elbows and the palms facing forward, the head facing downward and forward, the emergency stop button on the back in the released state, and the battery properly inserted.

- Open the back cover of the robot and press the power switch on the back of the robot. (See Figure 4-3-1)



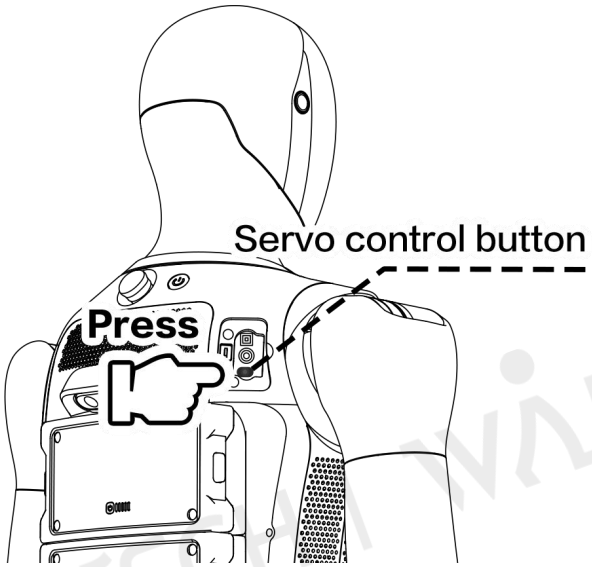
(Figure 4-3-1)

- Long press the start button on the back of the robot. After seeing the display screen on the robot's head light up, it indicates that the robot has started, and the startup time is approximately 1 minute. (See Figure 4-3-2)



(Figure 4-3-2)

- Press the servo control button on the back of the robot, the LED lights on the legs will light up, and the robot will complete the startup process. (See Figure 4-3-3)

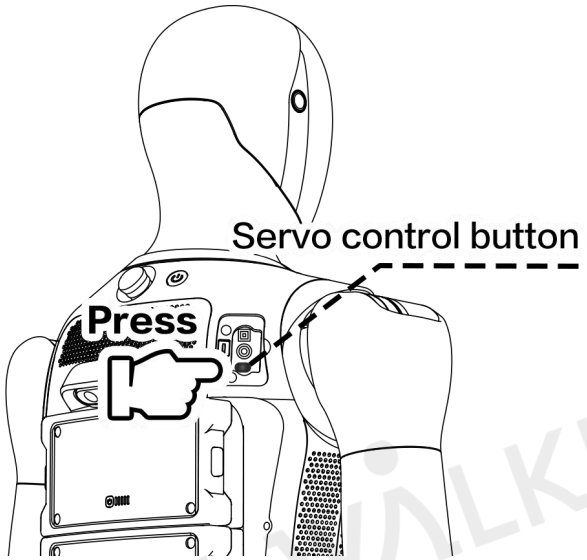


(Figure 4-3-3)

4.3.2. Shutdown Operation

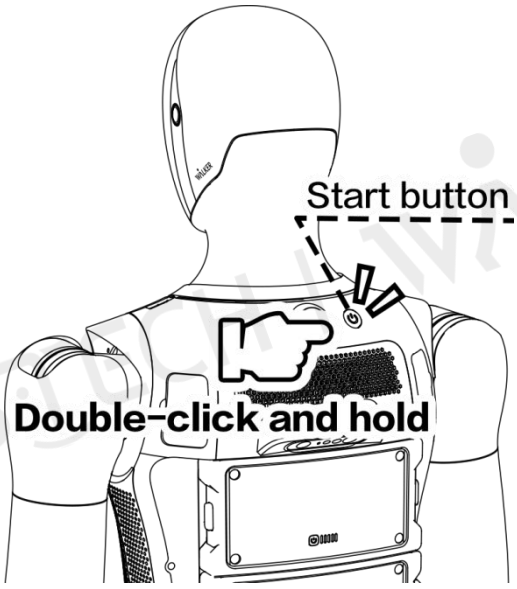
- The robot is in damping mode.
- Hang the robot with a display stand to ensure the soles are off the ground.

- Open the back cover of the robot, press the servo control button, and the LED lights on the legs will turn off. (See Figure 4-3-4)



(Figure 4-3-4)

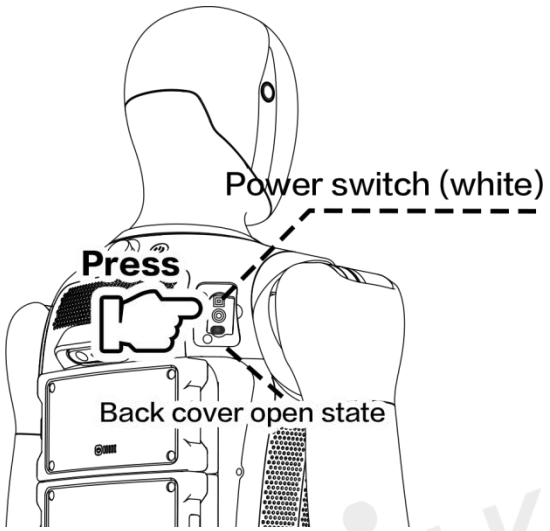
- Double-click and hold the power button on the back of the robot, maintain this state for 5 seconds, the robot will remind that it is about to shut down, keep holding and the robot will enter the shutdown procedure, and after waiting for the robot's screen and lights to go out, the robot will be in the shutdown state. (See Figure 4-3-5)



(Figure 4-3-5)

- Open the back cover of the robot, press the power switch at the lower rear,

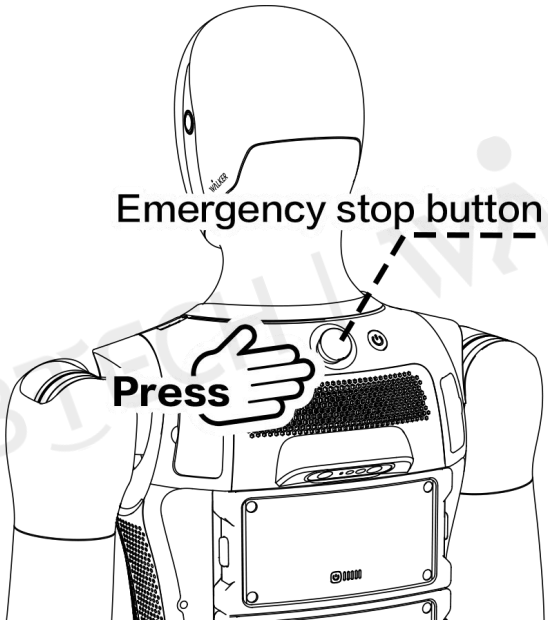
and the entire machine will be powered off. (See Figure 4-3-6)



(Figure 4-3-6)

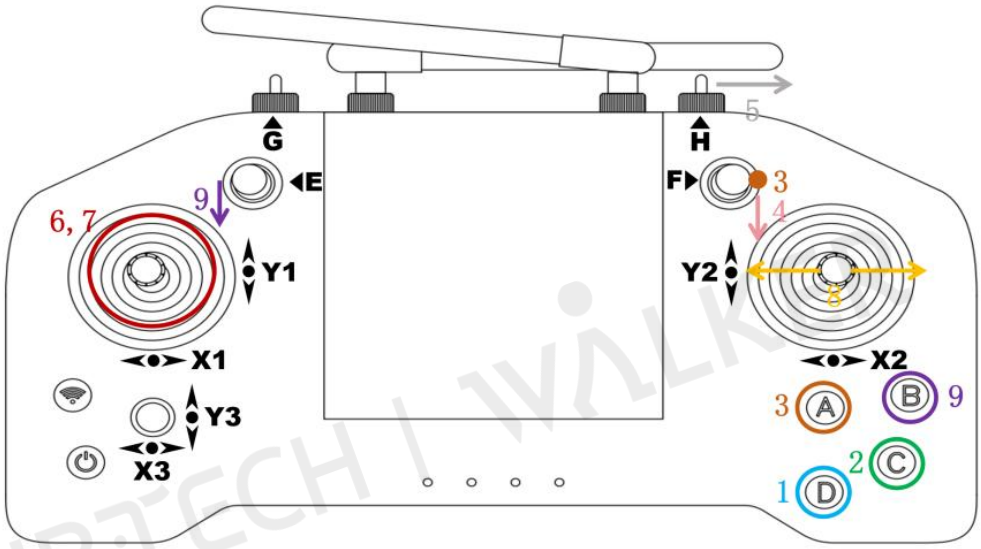
4.3.3. Emergency Stop Operation

In case of an emergency requiring the robot to stop immediately, press the emergency stop button on the back of the robot. At this time, all motors of the robot will be locked, i.e., in the "wooden man state", and will no longer accept external command information. (See Figure 4-3-7)



(Figure 4-3-7)

4.4 Remote operation



(Figure 4-4-1)

Remote Control Button Function Description			
serial number	**Function**	**Button**	**Remarks**
1	Return to Zero + Retract Leg	Press F key down + D	The joint hardens from softness and enters the locked position mode, allowing the sling to be released.
2	Locking Mode	F key up + C	Robot's whole body joints are stiff, in wooden man mode (Note: the robot can stand, but will fall over with a touch)
3	Damping Mode	F key down + C	According to Tiangong and Unitree, it is necessary to develop a damping mode, which is entered

			from the control mode before lifting. The damping mode does not mean being completely unable to stand still, nor does it mean being completely able to stand on its own, and requires human assistance.
4	Force-controlled standing mode	H - Middle Dial Lever +A	1. In this mode, it is not allowed to push the robot to walk. 2. In this mode, the robot can stand autonomously and will balance itself after being pushed. 3. During the task flow, the force control mode can be entered to interrupt the task flow. 4. After the robot returns to the force control standing mode, the task flow is reset to its initial state. 5. Only the standing mode can enter the locked position mode.
5	Walking mode (start stepping, respond to speed commands)	H - Move the lever to the left and then reset it (reset: move the lever to the middle)	Pre-state reserved for running mode, preprocessing stage, can push the handlebar to walk
6	Running	H - Move the lever to the right and then reset it	Tip: To stop running, you need to first switch to walking mode (treadmill state), then press the "H left toggle and then reset" button, then press A to stop. You can push the handlebar to walk.
7	Move left and right	X1 - Left Joystick: Left/Right	The distance of the putter and the magnitude of the speed are mapped proportionally

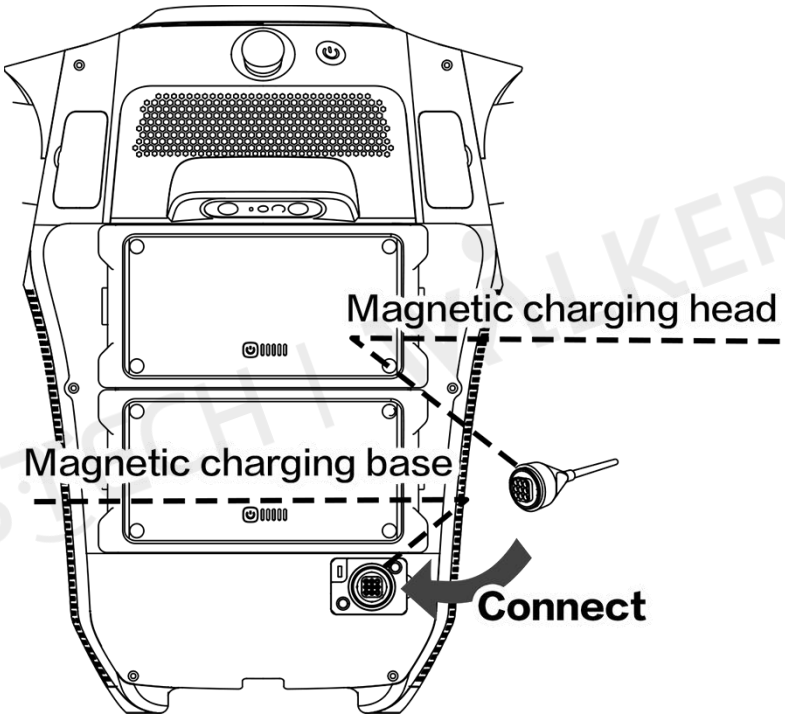
8	Move forward and backward	Y1 - Left Joystick: Up and Down	
9	Turn counterclockwise, turn clockwise	X2 - Right Joystick: Left and Right	Left - Counterclockwise Right - Clockwise
10	Task Flow	E - Up lever (perform the previous action) E - In the middle (execute the current action) E - Down lever (perform the next action) G - Push the lever to the right (start performing the action)	Only the force control mode can enter the task flow mode Press E a few times, and it will skip several processes
11	Power On	Power On: When the D-leg is bent, the machine can be lowered. Please hold the machine firmly and stand still for 20 seconds (check if stillness is required), then press H middle +**A Stand**; Shutdown: After securing the ropes during the racking process**, first press F ↓+C**. At this time, the machine will lose its center of gravity, so please make sure to hold the machine firmly, and then the machine can be lifted.	After the rope is properly fixed, be sure to**press C**, otherwise the machine leg will shake, which will in turn affect the detection of IMU data.

4.5 Charging operation

1. Connect the charger to an AC power source (100-240V, 50/60Hz). Before connecting, ensure that the external power supply voltage matches the charger's rated input voltage; otherwise, it may cause damage to the charger (the charger's rated input voltage is marked on the charger's

nameplate).

2. Check whether there are foreign objects on the magnetic head of the charger and the magnetic head of the robot charging dock.
3. Connect the magnetic head of the charger to the magnetic charging dock on the back of the robot for charging. (See Figure 4-5-1)



(Figure 4-5-1)

4. When all battery level indicators are lit, it indicates that the battery is fully charged and charging is complete. Please remove the charger.

Battery Charge Status Indicator		
Serial Number	**Indicator Status**	**Electricity**

1	5 LED lights stay blue and constantly lit	100% — 90%
2	4 LED lights are constantly lit in blue, and 1 LED light is in blue breathing state	90% — 80%
3	3 LED lights are constantly lit green, and 1 LED light is in a green breathing state	80% — 60%
4	2 LED lights are constantly lit green, and 1 LED light is in a green breathing state	60% — 40%
5	One LED light is constantly lit green, and one LED light is in a green breathing state	40% — 20%
6	1 LED light in red breathing state	20% — 0%

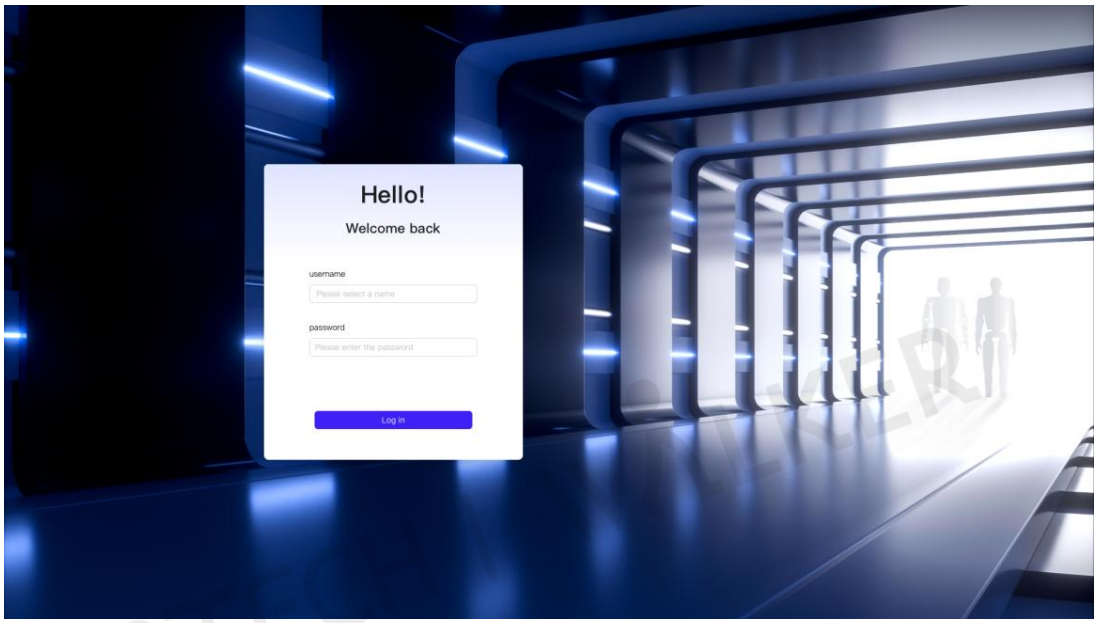
Note: The battery will have firmware upgrades, and the status indicator light shall be subject to the physical product.

4.6 WiFi network configuration operation

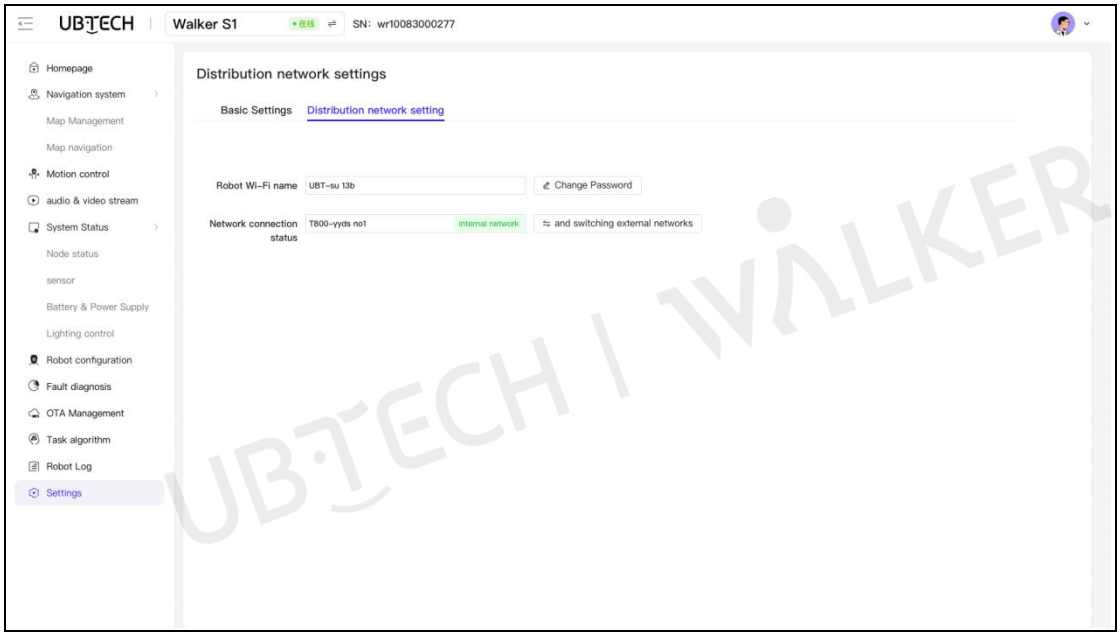
Process of configuring the extranet for the robot on the web client:

- Step 1: After turning on the robot, the computer needs to connect to the robot's hotspot WiFi.

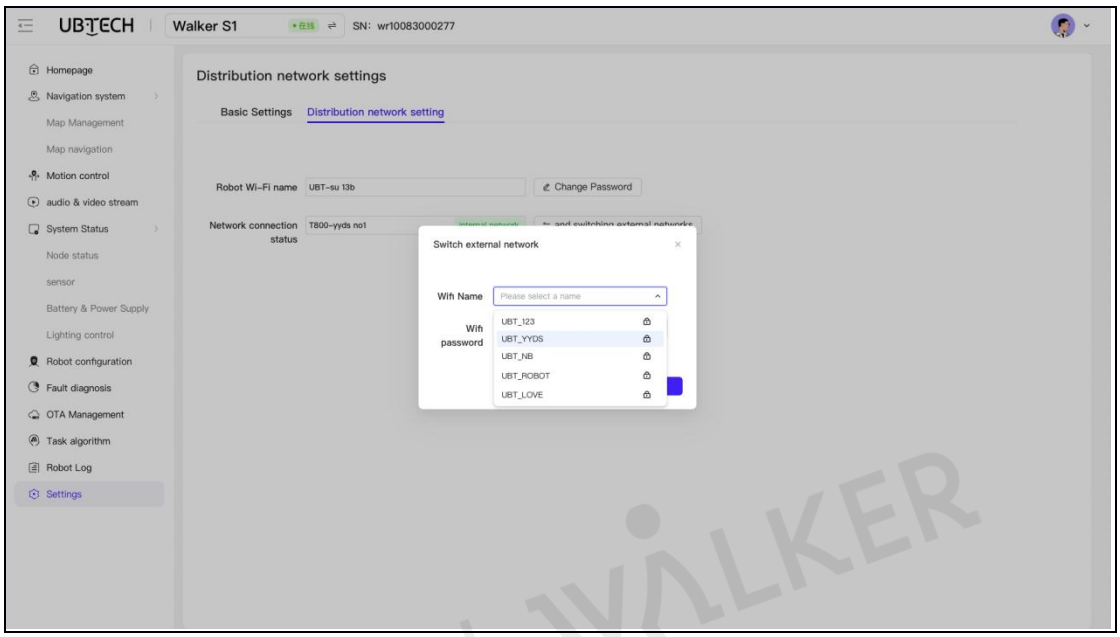
- Step 2: After successfully connecting to the robot's hotspot WiFi, open the Web URL on your computer:http://192.168.11.3, and enter your username and password.



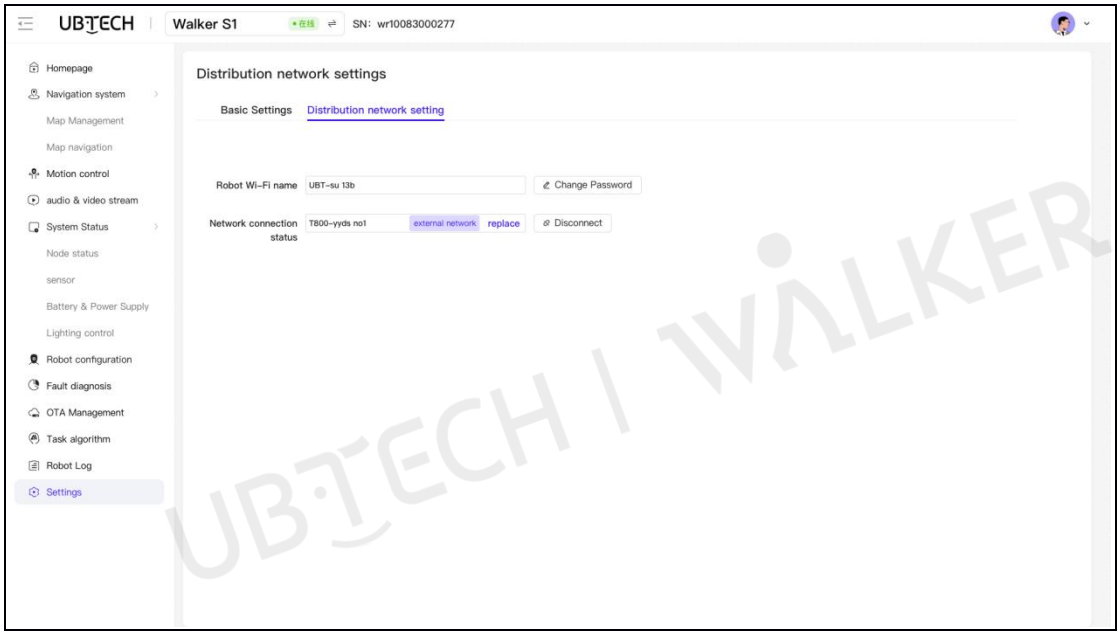
- Step 3: On the Web page - Settings, click the "Switch to Extranet" button to configure external WiFi for the robot.



- Step 4: Enter the external WiFi to which the robot will connect.



- Step 5: Complete the external network configuration operation of the robot.



4.7 Common Faults and Handling Methods

Possible issues	Solution
Unable to start	· Check if the bottom power button is loose or abnormal; · Check whether the power on/off button on the back is loose or abnormal; ·The battery may be low. Please insert the charger to charge for 10 minutes, then turn on the device.
Unable to charge	·If the problem persists, please contact the UBTECH Technical Support Center. · Is the charger plugged into a power outlet? · Whether the charger is properly connected to the Walker. · Charger LED indicator lights up: ·Green solid: Battery fully charged or charger plugged in but not connected to Walker ·Solid red: The charger is charging.
Charger temperature is too high	·If the charger temperature is too high, this may be caused by a malfunction; ·Please quickly disconnect the charger from the wall socket and contact the UBTECH Technical Support Center.
Six-dimensional force anomaly	·The machine is hoisted to the highest position, press the emergency stop button, and then restart it after 10 seconds.

4.8 Daily maintenance and upkeep

4.7.1 Overall Machine Cleaning:

- After using the Walker S2, if there are stains on the surface, please clean the surface of the device promptly. Before wiping, please turn off the power first, and use a dry and clean soft cloth to wipe the device, paying particular attention to whether the camera surface has been wiped clean.

4.7.2 Inspection and Maintenance:

- Visually and physically inspect the fuselage, each joint, and connection for integrity; if there are cracks or damage, they shall be replaced promptly;
- Check whether the screws of each connecting component are tightened, with particular attention to the locking screws of the joint connectors;
- Check if there are any foreign objects blocking the ventilation openings;
- Check if the cooling fan is working properly and there are no sounds such as scraping.
- Check for foreign objects or deformation in the battery compartment interface;
- Check whether the battery case has obvious damage. Battery packs with obvious damage are prohibited from use;
- Check whether all the joysticks of the remote control are in the neutral position, and whether there are foreign objects such as sand in the joystick gaps;
- Check if each button on the remote control is laggy.

5. Precautions

5.1 Operating Specification

- Operators must undergo official training from UBTECH, be familiar with the robot's functions, safety instructions, and emergency response procedures, and it is prohibited for uncertified personnel to operate.
- When modifying robot parameters (such as load threshold, walking speed), prior reporting and recording are required. After modification, testing and verification must be conducted, and only after confirming that there are no issues can it be put into use. Random modification of core parameters is prohibited.
- Before the robot executes a new task (such as a part installation task that has not been trained), it is necessary to first test in the simulation environment and then conduct a trial operation on the real machine to avoid equipment failure caused by direct execution.
- Any personal injury or property damage caused by the user's violation of operating specifications shall be the sole responsibility of the user.

5.2 Equipment Storage

- When the robot is out of use for an extended period (more than 1 month), it is necessary to turn off the power, remove the battery, store the robot in a dry, well-ventilated environment with a temperature of 0~30℃, and avoid direct sunlight or humid conditions.
- Batteries shall be stored separately in a fireproof and anti-fall battery box, with a storage temperature of 0~25°C, humidity of 30%~60%, and the battery charge shall be checked once a month to ensure it remains between 50%~80%.

5.3 Accident handling

- When the robot malfunctions, it is necessary to first record the fault phenomena (such as screen prompts, abnormal noise locations, fault time), then contact the

UBTECH official service team, and it is prohibited to disassemble or repair core components without authorization.

- In the event of an emergency such as equipment collision or battery fire, the emergency stop switch must be immediately triggered, personnel must be organized to evacuate, and a dry powder fire extinguisher must be used to extinguish the fire (using water to extinguish the fire is prohibited).

5.4 Intellectual Property

- Intellectual property rights such as the hardware design, software programs, and control algorithms of the robot belong to UBTECH. Unauthorized copying, modification, or dissemination of relevant technical materials is prohibited. Violators will bear legal liability, and users will be obliged to compensate for any losses caused to UBTECH in this regard.
- Reverse engineering or cracking of the robot is prohibited to prevent the leakage of core technologies; if any infringement is discovered, UBTECH will pursue legal liability, and the user shall fulfill the obligation to compensate for any losses caused to UBTECH.

6. Version Revision History

Version	Date	Modified content
V1.0	2025/9/23	Initial Version