

LimX Luna User Manual

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Version	Date	Revision Details	Compatible Software (If incompatible, update to the latest version via the Official Download Center)
V1.0	2026.06.05	Initial Release	V1.0.29 or later
V1.1	2026.07.16	Added instructions for main controller software upgrade	V1.0.36 or later

Disclaimer

- To reduce the risk of legal liability, personal injury, or property damage, please read and fully understand the following terms and conditions before using this product.
- Use and Acceptance:** Use of this product constitutes acceptance of this manual and all applicable terms, conditions, and instructions. The user assumes all risks arising from improper or unauthorized use.
 - Safety Distance:** DO NOT use this product in crowded areas. Maintain a minimum safety distance of at least 1m between any person and the device. LimX Dynamics disclaims all liability for injuries or damages resulting from failure to follow safety requirements.
 - Environmental Restrictions:** DO NOT operate this product in extreme or unsuitable environments, including but not limited to high or low temperatures, highly corrosive conditions, or strong magnetic fields. LimX Dynamics shall not be liable for any damage, malfunction, or abnormal performance esulting from operation under such environmental conditions.
 - Normal Wear and Tear:** Performance degradation resulting from natural wear, battery aging, or reasonable component depreciation is not considered a product defect and is not covered under warranty.
 - Product Updates:** This product is subject to continuous optimization and upgrades. The appearance, features, and configurations are subject to change. The actual product shall prevail.
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 - Right to Interpret and Modify:** LimX Dynamics reserves the right of final interpretation and revision of this disclaimer and the terms of use.

Safety Precautions

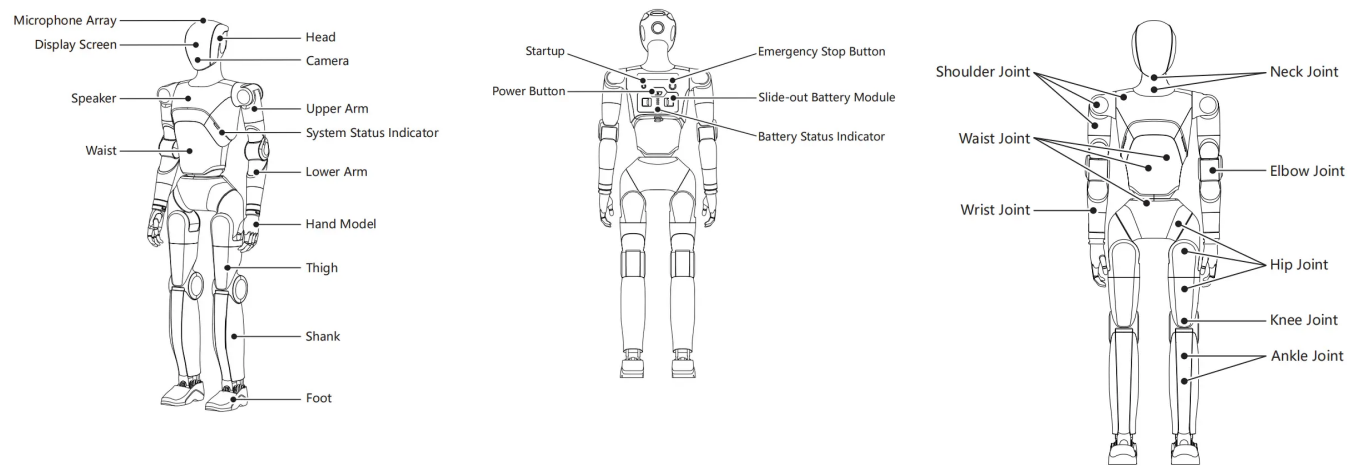
- This product is a professional-grade device and is not recommended for independent use by individuals under 18 years of age. Users should possess the appropriate operational knowledge prior to use, or operate the device under the supervision or guidance of qualified personnel.
- Keep this device out of reach of children. When operating the product in environments where children are present, exercise heightened caution and ensure that the device remains in a safe and controlled state at all times.
- DO NOT directly touch any joints, moving parts, or actuators during transportation or after the device is powered on, as this may result in unintended pinching, impact, or other injuries.
- Ensure the device remains within the operator's line of sight at all times, and maintain a minimum safety distance of 1m between the operator and the device during operation.
- Ensure the surrounding area is clear of obstacles and within the operator's visual range during operation. When necessary, use auxiliary safety measures such as tethering or securing devices to prevent accidental movement, tipping, or injury to personnel.

LimX Luna Overview

1.1 Component Description

LimX Luna is a highly dynamic, full-sized humanoid robot standing approximately 160 cm tall and weighing around 56 kg. Engineered with human-like anatomical proportions, the robot features an enclosed structural design for its primary joints, perfectly balancing sleek aesthetic appeal with robust mechanical protection.

Equipped with 27 active Degrees of Freedom (DoF) across the entire body, LimX Luna is capable of rich, expressive human-like movements and high-performance, dynamic motion control. Furthermore, its modular, quick-release design streamlines transportation, simplifies maintenance, and allows for rapid component replacement, significantly enhancing operational and maintenance efficiency.

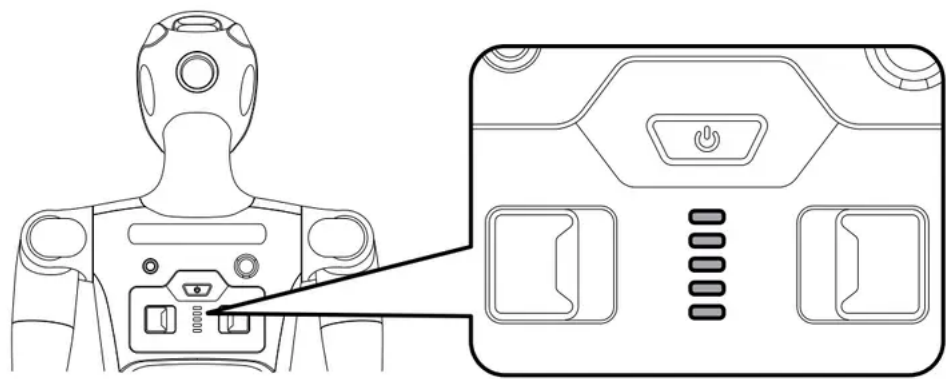


1.2 Onboard Computer

LimX Luna is equipped with 1 「Perception Computing Unit」 and 1 「Motion Control Computing Unit」 as standard.

Parameters	Perception Computing Unit
Model	RK3588
CPU	64-bit Octa-Core Processor: 4 × ARM Cortex-A76 + 4 × ARM Cortex-A55
GPU	ARM Mali-G610 MC4 GPU with Integrated High-Performance 2D Graphics Acceleration Engine
NPU	Triple-Core NPU, Supporting INT4 / INT8 / INT16 / FP16 / BF16 / TF32 Precision
Maximum CPU Frequency	Cortex-A76: Up to 2.4 GHz; Cortex-A55: Up to 1.8 GHz
Vision Accelerator	48MP ISP, Supports HDR and 3DNR Image Processing
Memory	LPDDR4 / LPDDR4x / LPDDR5, 64-bit Memory Bus, Up to 32 GB Capacity

1.3 Battery Status Indicator

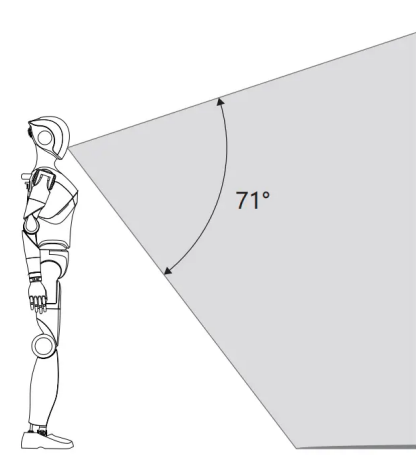


Battery Status Indicator (Discharge)	Battery Level	Description
5 green LEDs on	100%	Fully charged
4 green LEDs on, 1 half-lit	81%-99%	Sufficient power
3 green LEDs on, 1 half-lit	61%-80%	Sufficient power
2 green LEDs on, 1 half-lit	41%-60%	Moderate power
1 green LED on, 1 half-lit	21%-40%	Low power, check battery
1 red LED blinking slowly	10%-20%	Insufficient power, recharge soon
1 red LED blinking rapidly	0%-10%	Critically low power, recharge immediately

Battery Status Indicator (Recharge)	Battery Level	Description
1 green LED blinking rapidly	0%-10%	Initial Charging Stage (Critical Battery Level)
1 green LED blinking slowly	10%-20%	Initial Charging Stage (Low Battery Level)
1 green LED on, 1 blinking slowly	21%-40%	Low power; not recommended to disconnect
2 green LEDs on, 1 blinking slowly	41%-60%	Moderate power, suggested continuing charging
3 green LEDs on, 1 blinking slowly	61%-80%	Sufficient power, suggested continuing charging
4 green LEDs on, 1 blinking slowly	81%-99%	Sufficient power, suggested continuing charging
5 green LEDs on	100%	Fully charged, safe to disconnect power.

1.4 Field of View of Cameras

Luna is equipped with a monocular camera in its head, providing the robot with excellent visual perception capabilities.



1.5 Joint Index and Joint Limits

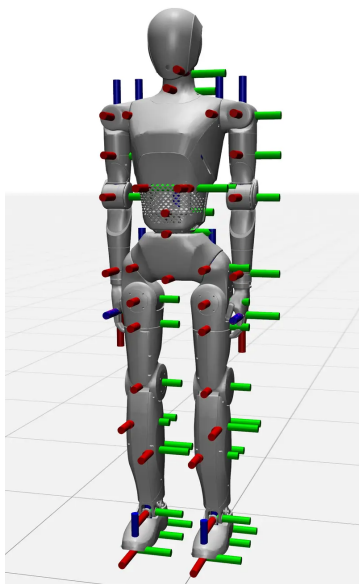
Joint Index	Joint Name	Limit (rad)
1	left_hip_pitch_joint	-3.0543 ~ 1.5708
2	left_hip_roll_joint	-1.0472 ~ 1.5708
3	left_hip_yaw_joint	-1.5708 ~ 1.5708
4	left_knee_joint	-0.0873 ~ 2.4435
5	left_ankle_pitch_joint	-1.0123 ~ 0.6109
6	left_ankle_roll_joint	-0.4363 ~ 0.4363

Joint Index	Joint Name	Limit (rad)
7	right_hip_pitch_joint	-3.0543 ~ 1.5708
8	right_hip_roll_joint	-1.5708 ~ 1.0472
9	right_hip_yaw_joint	-1.5708 ~ 1.5708
10	right_knee_joint	-0.0873 ~ 2.4435
11	right_ankle_pitch_joint	-1.0123 ~ 0.6109
12	right_ankle_roll_joint	-0.4363 ~ 0.4363
13	waist_yaw_joint	-1.5708 ~ 1.5708
14	waist_roll_joint	-0.5236 ~ 0.5236
15	waist_pitch_joint	-0.5236 ~ 0.7854
16	head_yaw_joint	-0.7854 ~ 0.7854
17	head_pitch_joint	-0.5236 ~ 0.5236
18	left_shoulder_pitch_joint	-3.0543 ~ 1.0472
19	left_shoulder_roll_joint	-0.0873 ~ 1.9199
20	left_shoulder_yaw_joint	-2.5307 ~ 1.5708
21	left_elbow_joint	-2.3911 ~ 0.5236
22	left_wrist_yaw_joint	-1.5708 ~ 1.5708
23	right_shoulder_pitch_joint	-3.0543 ~ 1.0472
24	right_shoulder_roll_joint	-1.9199 ~ 0.0873
25	right_shoulder_yaw_joint	-1.5708 ~ 2.5307
26	right_elbow_joint	-2.3911 ~ 0.5236
27	right_wrist_yaw_joint	-1.5708 ~ 1.5708

1.6 Coordinate Systems, Joint Rotation Axes, and Joint Zero Points

When all joints are at 0°, the coordinate systems are shown below.

The **red**, **green**, and **blue** axes represent the **X**, **Y**, and **Z** axes, respectively.



1.7 Specifications

Model	LimX Luna
Mechanical Parameters	
Height	160cm
Shoulder Width	47cm
Arm Length	69cm (including hand model)
Weight (Battery Included)	56kg
Active DoF (Total)	27
Single Leg DoF	6
Single Arm DoF	5
Waist DoF	3
Neck DoF	2
Handle	
Handheld remote control (with charging cable)	✓
Tablet	✓
End effector	
Palm-shaped hand model	✓
Fist-shaped hand model	✓
5-finger dexterous hand (6 DoF)	0
Joint Range of Motion	
Neck Joint	P±30°、Y±45°
Shoulder Joint	P-60°~175°、R-5°~110°、Y-90°~145°
Elbow Joint	P-30°~137°
Wrist Joint	Y±90°
Waist Joint	P-45°~30°、R±30°、Y±90°
Hip Joint	P-90°-175°、R-60°~90°、Y±90°
Knee Joint	P+5°-140°
Ankle Joint	P-35°~58°、R±25°
Thermal Management	
Air-Cooled Main Control Area	✓
Communication Interfaces	
WiFi 6	✓
Bluetooth	✓
Perception sensors	
Self-developed IMU	6-axis
RGB camera	✓
Battery	

Slide-Out Battery Module	✓
Battery Capacity	10,000mAh
Battery Life	About 4H
Recharging method	Supports direct charging and battery swapping
Charging time	About 1 h
Charging input voltage	110V-220V
Charger output	58.8V 10A
Capability	
Maximum Load Capacity (Single Arm)	3kg
Maximum Moving Speed	5km/h
Maximum Joint Torque [1]	200N·m
Computing Configuration	Motion Control: - RK3588 SoC + 16G RAM + 256G Storage Perception: - RK3588 SoC + 8G RAM + 32G Storage
Interactive Modules	
Facial Interaction Screen	✓
Microphone	✓
Speaker	✓
Status Indicator Light	✓
Software	
LimX UP[2]	✓
Content Development Expansion Kit [3]	✓
OTA Updates	✓
Dances	20
Motions	20
LimX Studio[3]	✓
Cloud-Based Motion Capture Training Platform	✓ (Subscription Required)
COSA System	✓
Other Features	
Warranty Period	12 Months
Special Edition Skin	✓
Portable Carrying Case	✓

Note:
Products are continuously iterated and optimized; appearance and configuration are subject to change. Please refer to the actual product received.

[1] The maximum torque differs among motors. The value shown represents the maximum torque of the highest-torque motor.

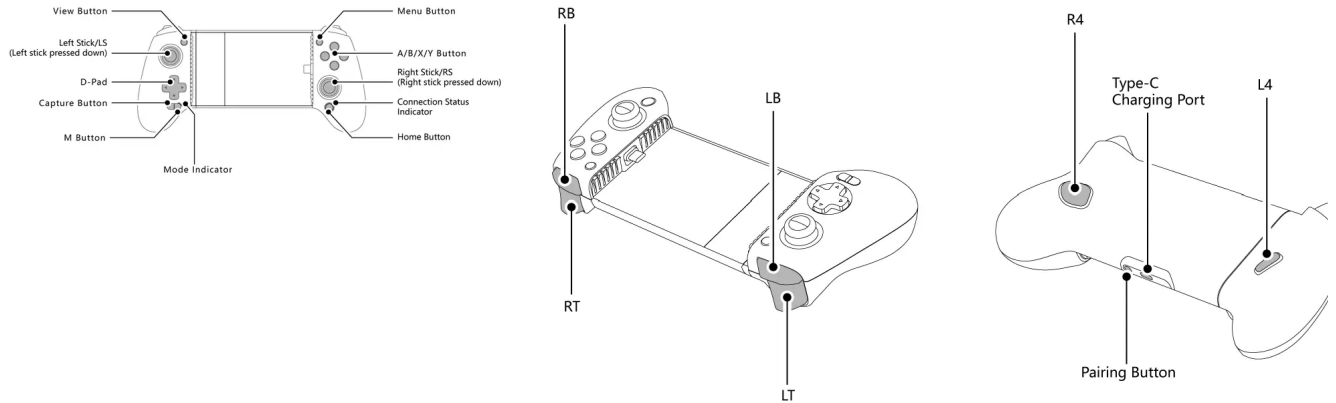
[2] Includes basic functions such as account login, device connection, basic control, and status switching.

[3] In addition to basic functions, it also supports video imitation, manual teaching, choreography, intelligent tasks, group control, and other functions.

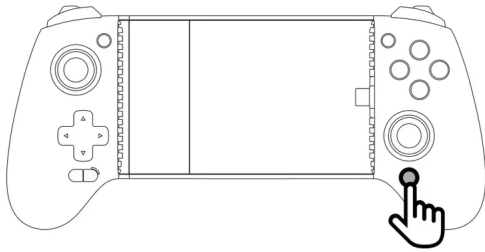
*The data above was measured in the LimX Dynamics laboratory. Actual results may vary depending on environment, usage, device status, and software version. Please refer to the actual operating performance.

2 Remote Controller Description

2.1 Component Description



2.2 Power On/Off Operation



- Power On:
 - Method 1: Press and hold the [Home button] for 1 second or longer
 - Method 2: Pull out the handle to power on automatically
- Power Off:
 - Method 1: Press and hold the [Home button] for 5 seconds or longer
 - Method 2: Fold the handle to power off automatically

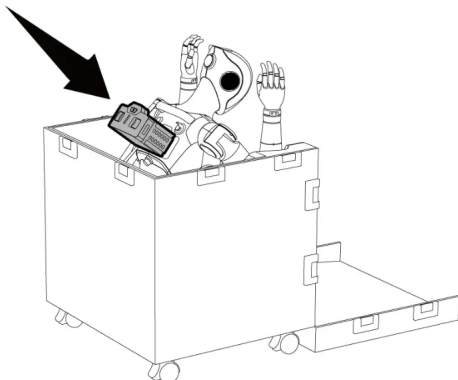
3 Operation Guide

3.1 Startup Procedure

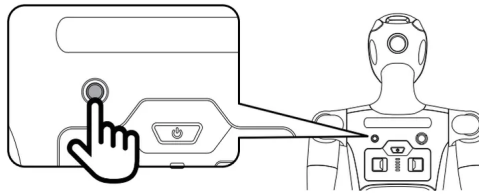
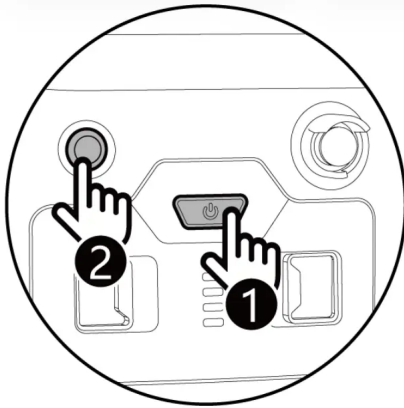
3.1.1 Powering On in Packing Posture

Step 1: Powering On

1. Insert one battery from the accessory layer into Luna.



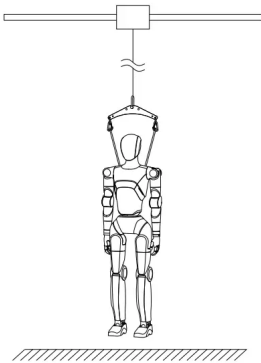
1. Briefly press and release the Power Button, then press and hold it for 2 seconds to power on. Next, press the Startup button to start the device (First-time setup only).



1. When the system status indicator turns solid white, Luna enters Zero-Torque Mode:

- a. Using the Remote Controller to start:
 - i. Press [R1 + Left] to switch to damping mode
 - ii. Press [L2 + Y] to switch to standing posture
- b. Using the App to start:
 - i. Connect to the device, then select the Hanging Position to start

Step 2: Suspend the Robot



Suspend Luna using the protective frame, ensuring the feet are at least 15 cm above the ground. Then carefully lift Luna out of the packaging box.

Step 3: Lower the Suspension Rope

After Luna enters the Standing State, gradually lower the suspension rope until both feet are firmly on the ground.

Step 4: Release the Suspension Rope

Once Luna maintains stable motion, carefully detach the suspension rope. Luna is now ready for operation.

Note:

If Luna encounters an unexpected condition, press [**Left + Right**] to switch to Damping State. Luna will gradually fall to the ground. This operation may damage the device and should **only be used in an emergency**

3.2 Remote Control Operation

3.2.1 Control Methods

3.2.1.1 Remote control

Once the device is powered on, use the remote controller to control Luna's basic movements

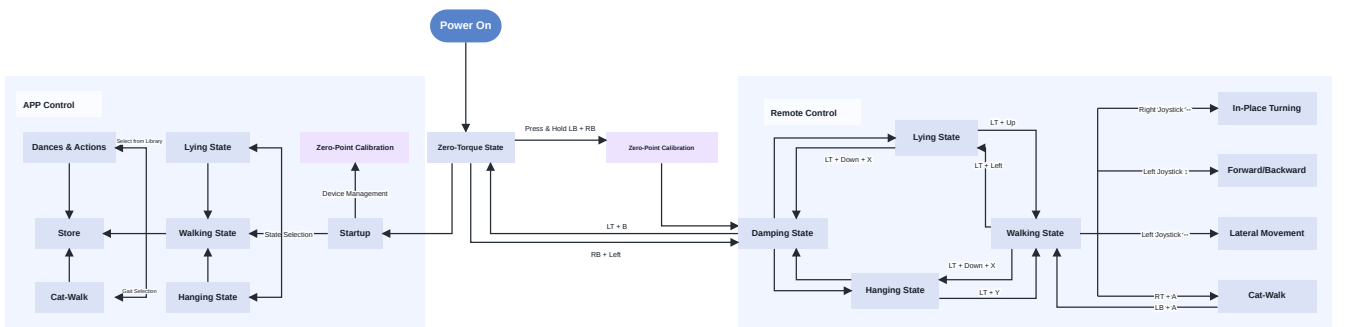
3.2.1.2 App control

Once connected using the supplied tablet, you can control Luna using the app

Note :

More features are available via the Limx Studio App on the supplied tablet.

3.2.2 State switching



Note:
Please operate the robot on a flat, level surface when performing forward/backward movement, lateral movement, or in place turning to prevent potential

Please operate the robot on a flat, level surface when performing forward/backward movement, lateral movement, or in-place turning to prevent potential damage.

3.2.3 Button Functions

Type	Mode/Action	Description	Button	Prerequisite States
State Switching	Zero-Torque State	All joints are torque-free and can be manually adjusted.	LT + B	Damping State
	Zero-Point Calibration	Resets all joints to their mechanical zero positions.	Press & Hold L1 + R1	Zero-Torque State
	Damping State	Applies damping torque to the joints, allowing slow movement while preventing free swinging.	RB + Left	Zero-Torque State
	Lying State	The robot transitions to a lying posture after receiving the command.	LT + Left	Walking State
	Standing State	Engages preload torque, maintains balance, and awaits control commands.	- L2 + Y - L2 + Up - L1 + A	- Hanging State - Lying State - Cat-Walk State
Movement Control	Move Forward/Backward	Moves the robot forward or backward via the controller.	Left Joystick ↵	Standing State
	Lateral Movement	Moves the robot left or right via the controller.	Left Joystick ↔	Standing State
	In-Place Turning	Rotates the robot on the spot via the controller.	Right Joystick ↔	Standing State
	Cat-Walk State	Switches the robot to a cat-walk gait after receiving the command.	RT + A	Standing State
Safety Protection	Emergency Stop	Immediately cuts off joint power. The robot will not respond to any motion commands.	Press Left + Right Joystick	-
	Release Emergency Stop	Re-enables power and returns the robot to the Zero-Torque State.	Press Right Joystick	Emergency Stop State

Prerequisite States: Indicates that switching to a new action or state is only permitted when the robot is in the required preceding state.

Emergency stop activation is a high-risk operation and may cause the robot to lose balance and fall. Before activation, ensure that a clear area with a minimum radius of **2m** around the robot is free of personnel and obstacles to avoid personal injury or property damage.

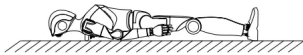
3.2.4 Motion Control Status, Chest Light Bar Display

Status Category	Operating Status / Mode	Indicator Status
Basic State	Zero-Torque / Damping / Standing / Walking	Solid White

Safety / Fault	Emergency Stop	● Solid Red
	Abnormal Warning	● Slow Flashing Red
Functional State	Dance / Automation Execution / Motion Teaching	● Solid Light Purple
	Voice Interaction Active	● Breathing Sky Blue
	Fleet Control Active	Solid Light Pink
System Process	Powering On	● Single-Side White Flow
	Calibration in Progress	● Breathing White
	OTA Update in Progress	● Symmetric White Back-and-Forth Flow
Battery	Low Battery Warning (Battery $\leq$ 20%)	● Slow Flashing Yellow
	Critical Battery Warning (Battery $\leq$ 10%)	● Fast Flashing Yellow
Low-Power Mode	Low-Power Mode	LED Off

3.3 Shutdown Procedure

3.3.1 Shutdown in Lying Position



Step 1: State Adjustment

1. Press [**L2 + Left**] to switch Luna from standing to lying position
2. Press [**L2 + Down + X**] to enter damping state

Step 2: Power Off

- After Luna has entered the **Damping State**, briefly press and release the power button, then press and hold for **2 seconds** to shut down.

3.3.2 Shutdown in Hanging Position

Step 1: Posture Adjustment

Suspend Luna using the lifting frame, then press [**L2 + Down + X**] to switch Luna from a standing posture to a damped state

Step 2: Power Off

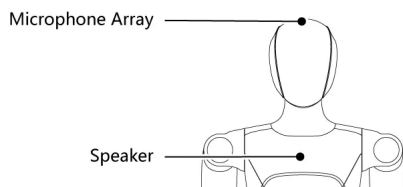
- After **Luna** has entered the **Damping State**, briefly press and release the power button, then press and hold for **2 seconds** to shut down.

Note:

The robot automatically shuts down when the battery level falls below 1%. Recharge the battery before it drops below **20%** to ensure normal operation.

3.4 Voice Interaction Instructions

Once connected to the Internet, the voice interaction feature enables conversational control and action execution. If the network connection fails, offline dialogue mode remains available.



3.4.1 Voice Activation and Deactivation

- **Enable:** Voice interaction is enabled automatically when the device is powered on. Before activation, the system remains in sleep mode until it is woken up

- **Disable:** Voice interaction can be disabled in the app. When disabled, Luna will no longer respond to voice commands. You can re-enable the feature at any time in the app

When voice interaction is disabled or the system is in sleep mode, audio recording is stopped. No audio is recorded during these states, helping protect your privacy.

3.4.2 Wake-up Methods

- **Wake word:** "Hello Zhuji" - The wake word can be customized via the app
- **Wake-Up feedback:** Luna will automatically turn toward the speaker and respond "I'm here, go ahead", and the system status indicators will display a breathing sky blue effect

3.4.3 Conversation Mode

- **Continuous conversation:** After a successful wake-up, Luna supports continuous, multi-turn conversations. The dialogue will automatically end if no voice input is detected for **15 seconds**, requiring a re-wake-up.

3.4.4 Voice Motion Control

- **Sequential Commands:** Supports issuing multiple voice commands in a single request.
 - **Command Limit:** Maximum of **5** commands per request.
 - **Execution Feedback:** After receiving commands, Luna will parse them and provide a voice prompt before executing the actions.

Notes:

1. In noisy environments, if the system status indicator does not display a blue breathing light while speaking, it indicates a failed voice reception. In this case, please move closer to the robot and speak again.
2. If the battery level drops below 10% during the execution of action commands, Luna will no longer carry out the remaining instructions.

3.4.5 Multilingual Switching

- **Supported languages:** Supports recognition and responses in Chinese, English, and Korean.
- **Language switching:** Automatically switches based on the detected language or via voice commands (e.g., "Switch to English").

3.5 Main Controller Software Upgrade

3.5.1 Preparation Before Upgrade

Before upgrading, ensure the following conditions are met:

- Ensure the robot battery level is at least 60% (80% or higher is recommended).
- Keep the robot connected and powered on during the entire upgrade process. Do not disconnect the robot or turn off the power.

3.5.2 Upgrade Procedure

1. Open the App and navigate to 「Me」 → 「Device Management」
2. Select the robot to be upgraded and tap 「Download Installation Package」
3. The App will automatically check for and download the latest software installation package
4. After the download is complete, follow the on-screen instructions to start the installation
5. Wait until the upgrade is complete. The robot will restart or complete the upgrade automatically. After completion, go to 「Device Information」 to verify the current software version.

Notes:

1. To access the latest features, improve product performance, and fix known issues, keep the main controller software updated to the latest version.
2. During the upgrade process, ensure sufficient battery power and a stable network connection.

3.6 App Upgrade

1. Open the App and navigate to 「My」 → 「Settings」 → 「About App」
2. On the 「About App」 page, you can view the current App version information
3. When a new version is available, tap 「Download Installation Package」 and follow the on-screen instructions to complete the installation

Notes:

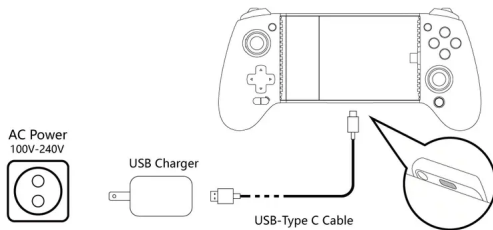
1. We recommend keeping the App updated to the latest version to access the newest features and enjoy an improved user experience.

4 Care and Maintenance

4.1 Power and Charging Management

4.1.1 Remote Controller Charging

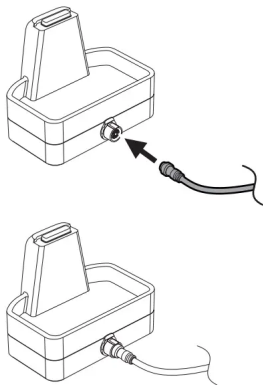
- Remote control low battery indicator: **[M Button]** indicator light flashes red slowly
- When the battery level is low, use the supplied Type-C charging cable to connect the controller to a power adapter for charging (as shown below).



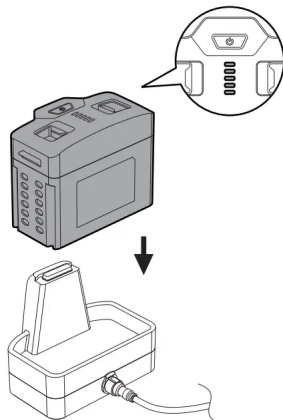
4.1.2 Robot Charging

4.1.2.1 Battery Charging

1. Connect the charging dock to the power source.

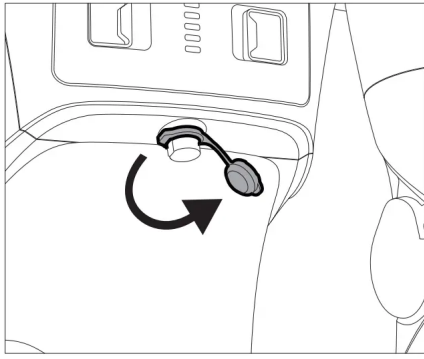


2. Insert the battery into the charging dock. A flashing green indicator light indicates that charging has started.

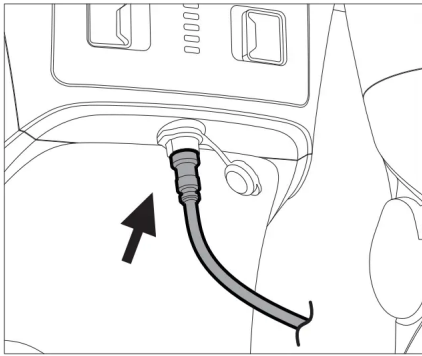


4.1.2.2 Direct Charging via Robot Charging Port

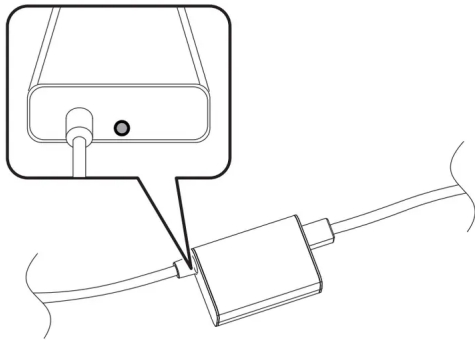
1. Open the charging port cover and ensure the port is dry and clean.



2. Align the aviation connector with the guide slot and insert it securely into the charging port.



3. Plug the power adapter into an appropriate AC outlet (refer to adapter rating label).

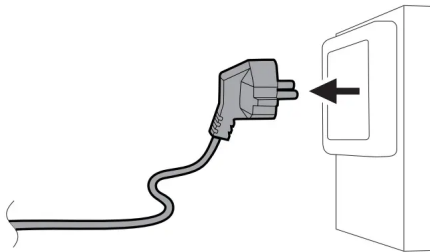


Note:

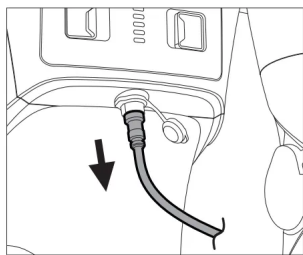
When charging through the onboard charging port, avoid pulling or tugging on the power cable while operating the robot.

4.1.3 Stop Charging

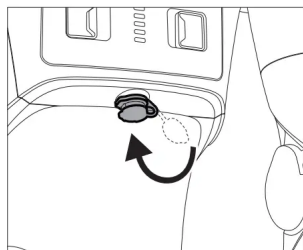
1. Unplug the power adapter from the outlet to disconnect the power supply.



2. Carefully remove the charging connector.



3. Close the charging port cover to prevent dust or foreign objects from entering.



4.1.4 Battery and Charging Maintenance

1. Do not power on or operate the device while charging via the robot's charging port. This ensures a safe and stable charging process.
2. While charging the battery, ensure that the power adapter is not subjected to pressure, stepping, tipping, or frequent movement, and keep it placed on a stable surface.
3. If the system indicates that the battery level is critically low, **promptly power off the device and recharge the battery** to prevent system abnormalities caused by sudden power loss.
4. Before long-term storage, maintain the battery level at **50%–60%** (avoid storing the battery fully charged or fully discharged). During storage, perform a full charge–discharge cycle every **three months**, then restore the battery level to **50%–60%** to help minimize performance degradation over time.
5. **Do not plug or unplug the battery while the robot is powered on or in operation.** This prevents burn damage to the power connector pins and damage to the interface circuit.
6. When plugging or unplugging the battery, apply steady, even force perpendicular to the interface. **Do not pry with uneven force, pull violently, or wiggle the connector**

4.2 Exterior and Structural Maintenance

1. Regularly clean dust from the robot's exterior surfaces and joint areas, and verify that all screws and fasteners are securely tightened.
2. If the robot is used in dusty environments, promptly wipe the housing with a clean microfiber cloth.

4.3 Storage and Transportation

1. Use a transport case specifically designed for the robot during storage and transportation to minimize impact and vibration.
2. When storing the remote controller, avoid applying external pressure to the joysticks and ensure that all ports remain clean.

4.4 Software and System Maintenance

1. Regularly update the official firmware to resolve potential system issues and optimize motion control algorithms.
2. If the device remains powered on but unused for an extended period, enable mechanical or software-based "suspension protection" to prevent unintended movement.

5 FAQ

Issues Category	Issue Description	Possible Causes	Troubleshooting & Solutions
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Power Related	Failure to Power On	- Depleted battery - Emergency stop button pressed	- Check the battery level and choose to replace the battery or plug in the power supply. - Ensure the emergency stop button is released
	Sudden Motor Shutdown	- Safety protection triggered - Loose connection - Power supply abnormality	- Check whether it is in an emergency stop state or whether the app has displayed a fault pop-up window - Reconnect the power cable or check connectors - Restart the system.
	Failure to Charge	- Incorrect connection sequence - Adapter malfunction - Loose connection	- Insert the aviation plug first, then power on. - Check the indicator light (Red = Charging, Green = Full) - Tighten screw sleeve, check contact
Control & Execution	Remote Controller Unresponsive	- Pairing unsuccessful - Remote control signal disconnected - Remote controller low battery - Severe wireless interference	- Re-pair the remote control - Move closer to the robot and wait for the remote to reconnect automatically - Charge the remote control - Move away from strong interference environments
	App cannot control the robot	- Disconnected from the robot - Conflict with remote control operation	- Wait for automatic reconnection or manually reconnect to the robot hotspot - Can resume once the remote control stops operating
	Zero Calibration Failure	- Restricted space - Incorrect posture - Command not sent successfully	- Ensure no obstacles within 2m/6' 6.74" - Operate in a naturally suspended state - Check whether the remote control button operations are correct
Communication & Network	Unable to configure WiFi network	- Weak signal - Incorrect password - Network error	- Switch to a WiFi network with stronger signal strength - Check whether the WiFi password is correct - Try another available WiFi network
	Unable to connect to the robot hotspot	- Weak signal - Incorrect password - Module malfunction	- Move closer to the robot and reconnect. - Verify the password is `12345678` - Restart the robot