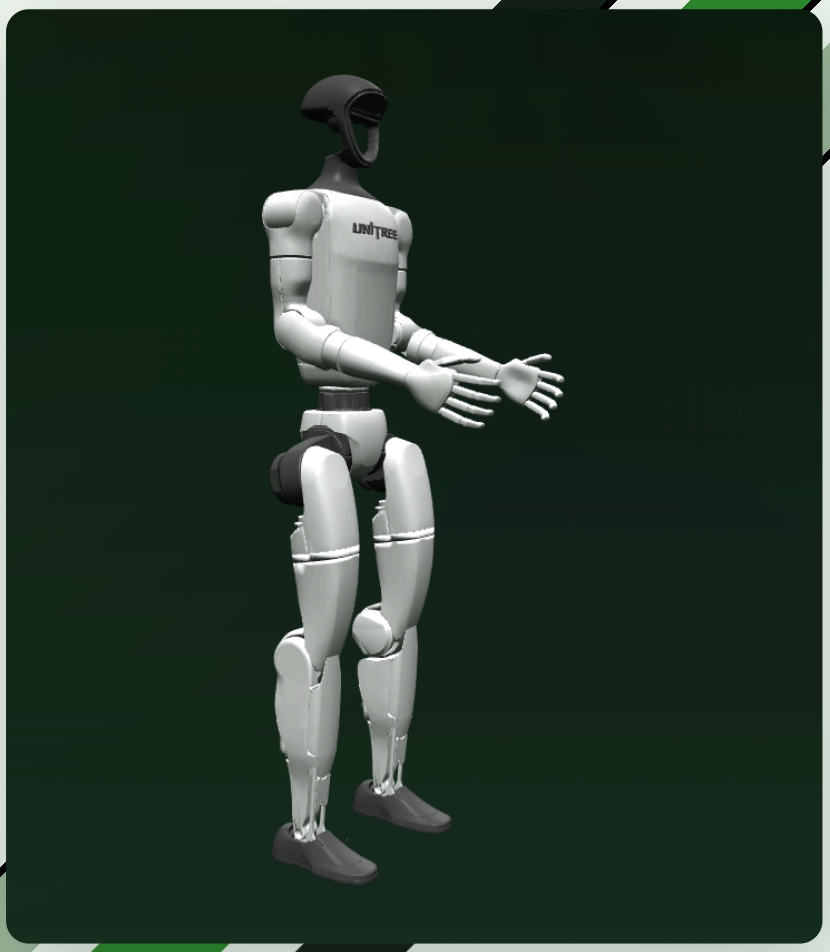
MYBOTSHOP

QUADRUPED ROBOTICS

Unitree G1

User Manual



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Contents

1 Attention

Attention: Read this document carefully. In case of doubt, it is essential to consult specialists, experts, or the manufacturer (Unitree Robotics) or distributor (MYBOTSHOP / QUADRUPED Robotics) of the assemblies used. The robot must not be put into operation before clarification. Contact information is available in Chapter 10, Getting Help & RMA.

Do not allow persons who are not familiar with the robotics or these instructions to operate the robot. Robots are dangerous in the hands of untrained users.

Do not operate the robot if you are intoxicated, under the influence of drugs, or unable to concentrate. Familiarize yourself with the characteristics of each gait mode and the emergency braking method (Chapter 5, Emergency Stop) before switching the robot on.

Caution: The current walking mode of the G1 robot does not support stair climbing. Avoid attempting to climb stairs to prevent damage. Starting in lying or squatting positions is only suitable for flat and hard ground – uneven surfaces may cause instability and damage. If equipped with dexterous hand equipment, avoid starting in lying or squatting positions to prevent damage to delicate components.

2 Disclaimer

The G1 robot documented here is sold and supported by *MYBOTSHOP / QUADRUPED Robotics* as the German distributor for Unitree Robotics. Basic ROS 2 understanding is required to operate the software stack covered in this manual — if you are not familiar with ROS 2, we recommend checking the ROS 2 documentation first.

The client acknowledges and agrees that any information or materials provided by MYBOTSHOP / QUADRUPED Robotics are for R&D and development purposes only. Any services are provided "AS IS" and without any representation or warranty of any kind, express or implied, including but not limited to any warranty of merchantability, fitness for a particular purpose, non-infringement, or any other warranty.

This product is intended for civilian use only. Users should avoid making dangerous modifications or using the robot in hazardous ways. Some features described in this manual may still be under development or testing on a given firmware version — where this manual documents two firmware revisions (V1.0.2 and V1.0.4), always confirm which is installed on your unit before following a button-mapping procedure. For terms, policies and compliance with local laws and regulations, refer to the Unitree Robotics website and the RMA/support process in Chapter 9.

MYBOTSHOP / QUADRUPED Robotics shall not be liable for any damages, including but not limited to direct, indirect, special, incidental, or consequential damages, arising out of or in connection with the use or inability to use the information or materials in this document. This limitation on liability shall apply regardless of the form of action, whether in contract, tort, or otherwise.

3 About the G1

Robot Tutorial

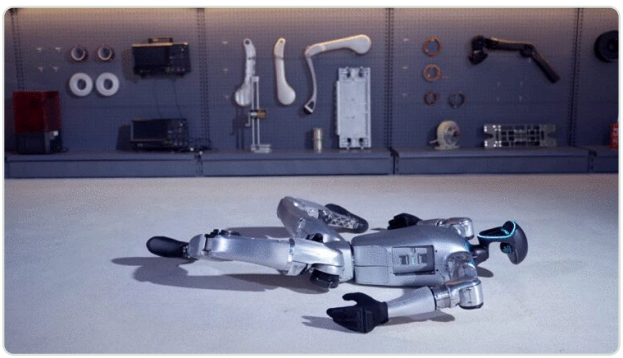
The provided tutorial will assist you with setting up and operating your G1 bi-pedal robot. The tutorial topics are listed in the left column and presented in the suggested reading order.

H1 Robot

The Unitree G1 is a groundbreaking quadruped robot engineered for superior agility, versatility, and durability. Designed by Unitree Robotics, the G1 is equipped with advanced sensors, high-performance computing, and a robust modular design, making it ideal for a wide range of applications including industrial inspection, search and rescue, surveillance, and academic research. Whether navigating complex terrains or performing intricate tasks, the G1 combines cutting-edge technology with unparalleled functionality, setting a new standard in the world of robotics.

Superior Joint Mobility

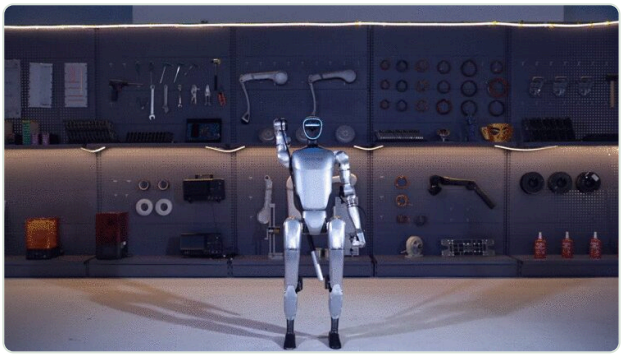
The Unitree G1 is engineered with an impressive range of joint movement, boasting 23 to 43 joint motors that provide extraordinary flexibility. This extensive joint mobility enables the G1 to execute complex maneuvers with precision, surpassing the capabilities of conventional robots. Whether navigating challenging terrains or performing intricate tasks, the G1's advanced articulation ensures optimal performance. Its design allows for fluid, human-like movements, making it ideal for applications that require agility and adaptability in diverse environments. The G1 sets a new standard for robotic flexibility and functionality.



H1 Robot

AI-Driven Learning and Adaptation

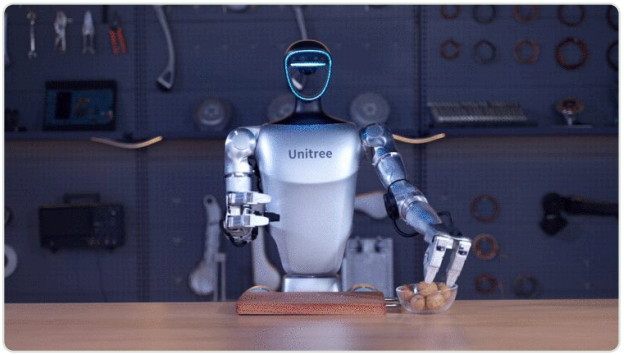
Harnessing advanced AI technologies, the Unitree G1 is driven by imitation and reinforcement learning. This cutting-edge approach enables the G1 to continuously evolve and improve its performance. By observing and mimicking human actions, the G1 refines its abilities, learning to execute tasks with greater efficiency and precision over time. Reinforcement learning further enhances this process by allowing the G1 to learn from its successes and errors, adapting to new challenges dynamically. This makes the G1 exceptionally powerful and versatile in ever-changing environments, capable of tackling complex tasks with increasing proficiency. The continuous improvement cycle facilitated by AI ensures that the G1 remains at the forefront of robotic innovation, providing reliable and intelligent solutions for a wide range of applications.



H1 Robot

Cutting-Edge Dexterous Hand Technology

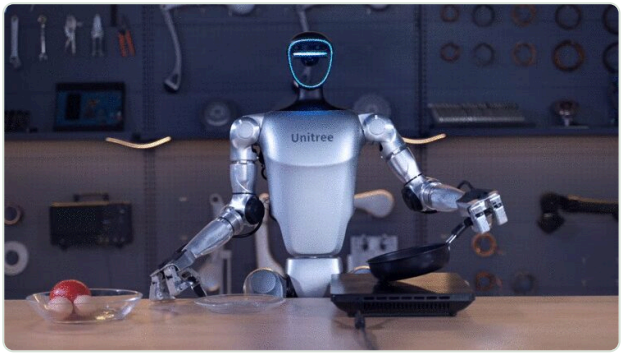
The G1 introduces an advanced three-fingered dexterous hand (Dex3-1) equipped for precise manipulation tasks. Powered by a state-of-the-art force-position hybrid control system, this hand mirrors human dexterity, excelling in intricate and complex operations. The thumb boasts three active degrees of freedom, while the index and middle fingers each feature two, enabling delicate and sensitive object handling with remarkable precision. This technology sets new standards in robotics, offering unparalleled capabilities for a wide range of applications from manufacturing to healthcare and beyond.



H1 Robot

Revolutionizing Robotics with UnifoLM

Unitree invites collaboration in utilizing the Unified Large Model (UnifoLM), an innovative robot world model set to transform the realm of intelligent robotics. This cutting-edge platform empowers users to co-create and harness its capabilities, promising significant advancements in collective robotic functionalities across diverse applications. From revolutionizing autonomous systems to enhancing human-robot interactions, UnifoLM represents a pivotal leap forward in the evolution of intelligent robotics solutions.



H1 Robot

Technical Specifications

Body and Dimensions
Weight: 35 kg
Height: 1270 mm
Total Degrees of Freedom: Up to 43
Max Joint Torque: 120 N.m

Perception and Sensing
360° Detection: Equipped with 3D LIDAR and depth camera.
Cameras: Intel RealSense D435 for depth sensing.
LIDAR: LIVOX-MID360 for precise mapping.

Mobility and Power
Movement Speed: Up to 2m/s
Battery Life: Approx. 2 hours with a 13-string lithium battery.
Quick Release Battery: Long-lasting power and easy replacement.

Model Variants

G1: Standard model with 23 degrees of freedom.

G1 EDU: Educational model offering similar features with additional development support.

The G1 EDU: model is available in the following versions:

- Base: Non-programmable, controllable only via a remote controller.
- U1: Equipped with 40 TOPS (Tera Operations Per Second) of computing power.
- U2: Includes an expansion dock with 100 TOPS of computing power.
- U3: Features upgraded waist freedom, increasing degrees of freedom from 1 to 3. Additionally, the single arm degrees of freedom are upgraded from 5 to 7, with upgrades applied to both arms.
- U4: Equipped with two Dex3-1 force-controlled, three-finger dexterous hands for advanced manipulation tasks.

Model	G1	G1 EDU
Mechanical Dimensions		
Height, Width and Thickness (Stand)	1270x450x200mm	1270x450x200mm
Height, Width and Thickness (Fold)	690x450x300mm	690x450x300mm
Weight (With Battery)	About 35kg	About 35kg+
Total Degrees of Freedom (Joint Freedom)	23	23 - 43
Single Leg Degrees of Freedom	6	6
Waist Degrees of Freedom	1	1+(Optional 2 additional waist degrees of freedom)
Single Arm Degrees of Freedom	5	5
Single Hand Degrees of Freedom	/	7 (+2 wrist degrees): Optional three-fingered Dex3-1 hand with tactile sensors.
Maximum Torque of Knee Joint	90N.m	120N.m
Arm Maximum Load	About 2Kg	About 3Kg
Calf + Thigh Length	0.6M	0.6M
Arm Span	About 0.45M	About 0.45M
Extra Large Joint Movement Space Waist joint: Knee joint: Hip joint: Wrist joint:	Z±155° 0~165° P±154°, R-30~+170°, Y±158° /	Z±155°, X±45°, Y±30° 0~165° P±154°, R-30~+170°, Y±158° P±92.5°, Y±92.5°
Electrical Characteristics		
Full Joint Hollow Electrical Routing	YES	YES
Joint Encoder	Dual encoder	Dual encoder
Cooling System	Local air cooling	Local air cooling
Power Supply	13 string lithium battery	13 string lithium battery

Basic Computing Power	8-core high- performance CPU	8-core high- performance CPU
Sensing Sensor	Depth Camera+3D LiDAR	Depth Camera+3D LiDAR
4 Microphone Array	YES	YES
5W Speaker	YES	YES
WiFi 6, Bluetooth 5.2	YES	YES
Accessories		
High Computing Power Module	/	NVIDIA Jetson Orin (optional)
Smart Battery (Quick Release)	9000mAh	9000mAh
Charger	54V 5A	54V 5A
Manual Controller	YES	YES
Others		
Battery Life	About 2h	About 2h
Upgraded Intelligent OTA	YES	YES
Secondary Development	/	YES

Important: The maximum torque of the joint motors varies across different joints. The value listed is the maximum torque for the largest joint motor. The arm's maximum load capacity varies significantly depending on the arm's extension posture. The parameters listed above may change depending on the configuration and scenario. Please refer to the actual conditions. The humanoid robot has a complex structure and powerful capabilities. Users are advised to maintain a safe distance from the robot. Use with caution. If there are any changes in the product's appearance, please refer to the actual product. Some features mentioned on this page are still under development and testing. They will be made available to users in the future. This product is intended for civilian use only. Users should avoid making dangerous modifications or using the robot in hazardous ways. For more information on terms, policies, and compliance with local laws and regulations, please visit the Unitree Robotics website.

4 Quick Start – Network, SSH & Webserver

Pre-requisites

- Power On Powering On .
- Network Interface Network Interface .
- Installation Robot Installation .

> **Attention:** Read this document carefully! In case of doubt, consult specialists, experts, or manufacturers of the assemblies used. The robot must not be operated before all uncertainties are clarified. For further assistance, refer to the guides below or contact a specialist. Important : Contact information is available in the RMA/ Support Section. Warning : Do not allow untrained individuals or those unfamiliar with robotics or these instructions to operate the robot. Improper use of robots is dangerous.

This guide will walk you through the process of setting up and configuring the Unitree G1 robot, including network configurations, SSH access, internet setup, software installation and various operational controls. Follow the steps below carefully to ensure proper operation.

Network Interface

Static Network Connection

For first-time setup, you need to connect via LAN cable to configure the robot's network.

On your PC (Ubuntu):

1. Navigate to Settings → Network .
2. Click on the "+" icon to create a new connection.
3. In IPv4 Settings , set the connection method to Manual .
4. Enter the following details: Address IP : 192.168.123.51 Netmask : 24
5. Save and restart your network.

After a successful connection, check the host PC's local IP:

```
ifconfig
```

Ping the robot to verify connectivity:

```
ping 192.168.123.164
```

Access the robot via SSH:

```
ssh -X unitree@192.168.123.164
```

Default password:

```
123
```

Network Table

IP Address	Device	Username	Password
192.168.123.161	G1 MCU	x	x
192.168.123.164	G1 Auxiliary PC 2	unitree	123
192.168.123.164:9000	G1 Webserver MBS	x	mybotshop
192.168.123.120	Mid360 Lidar	x	x

Note: Do not set your PC IP as any of the G1 IP addresses listed below.

Enable Internet LAN

This enables LAN via the ethernet cable. Ensure the cable is connected to a router with internet access.

```
sudo ip link set eth1 down && sudo ip link set eth1 up
sudo dhclient eth1
sudo date -s "$(wget --method=HEAD -qSO- --max-redirect=0 google.com 2>&1 | sed -n 's/^
*Date: *//p')"
ping google.com
```

Enable Internet WiFi (Recommended)

You can attach a hub and WiFi via a hub. A link to a cost-effective hub and WiFi stick is provided in Enhancements.

```
sudo ip link set eth0 down && sudo ip link set eth0 up
sudo dhclient eth0
```

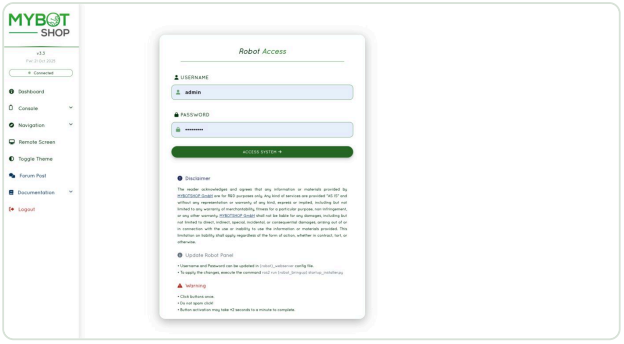
Autostart

Webserver

G1 Webserver

This module should come pre-installed for heavy integration projects. It should be accessible directly at http://192.168.123.164:9000/ or the WiFi ip to which the robot is connected. The G1 webserver can be configured via the config file in g1_webserver ros2 package located in /opt/mybotshop/src/mybotshop/g1_webserver/config/robot_webserver.yaml

Login



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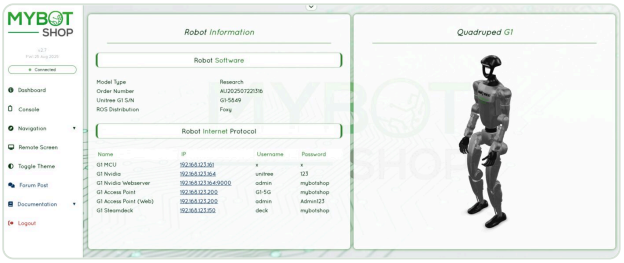
Dashboard

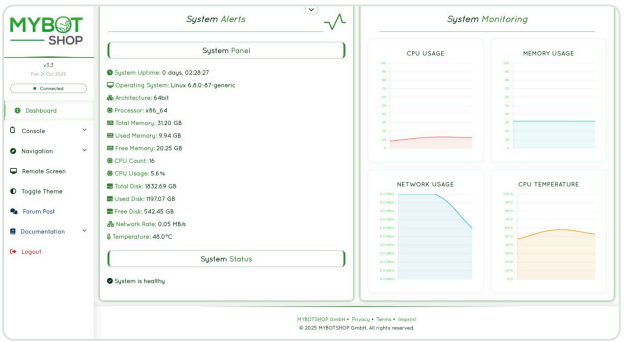
- Enable the G1 ROS2 Services
- Disable the G1 ROS2 Services
- Record System G1 logs



_images/web_dashboard.png

System

- View G1 external PC system status.
- The battery only runs if the ROS2 drivers are enabled from the dashboard

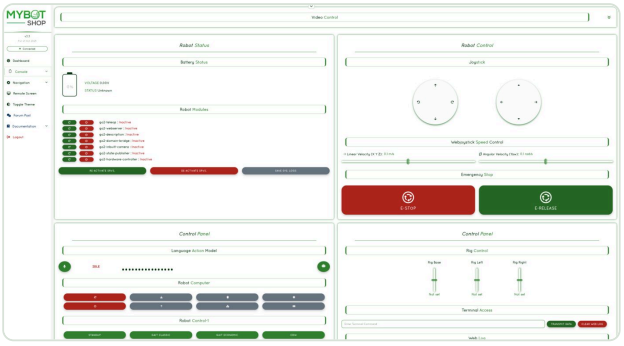


_images/web_system.png

Console

- Movement of the Unitree G1
- Switch between Gaits
- Adapatable to new ros2 services

- Record ROS2 bags
- Access G1 external speaker if available
- The console only works if the ROS2 drivers are enabled from the dashboard



_images/web_console.png

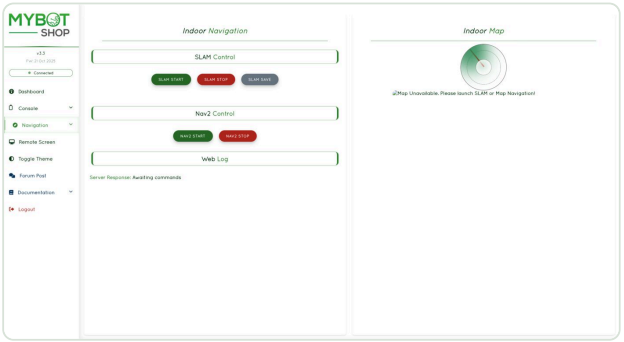
Remote Desktop

- On-board screen of the Unitree G1's computer

_images/web_vnc.png

Navi Indoor

- Disabled



_images/web_nav_indoor.png

Navi Outdoor

- Disabled

5 Operation – Firmware V1.0.4 (Current)

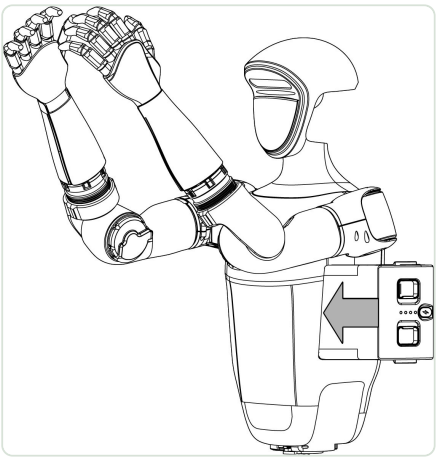
Controls (Firmware V1.0.4)

Powering On

Attention: If the G1 enters an unexpected state, press L2 + B . The robot will enter damping mode and slowly fall to the ground .

Installing Battery Pack

1. Insert the battery into the battery compartment on the side of the robot.
2. Ensure the power switch faces the back of the robot.
3. If the battery does not fully insert, adjust its direction. Do not forcefully press it to avoid damaging the battery interface and buckle.
4. Listen for a “click” sound, indicating the battery is securely installed. Verify the buckle is in place.

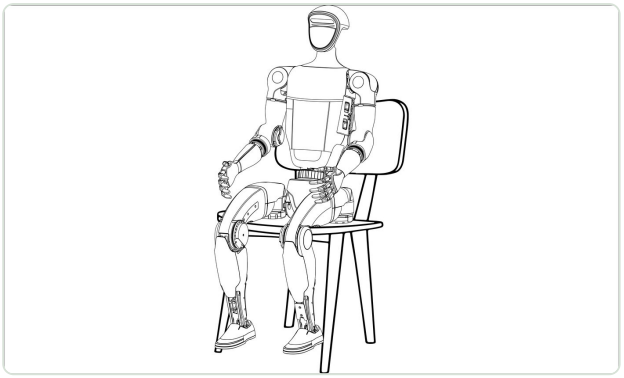


G1 Battery Insert

Sit & Power On [Method 1]

Preparation Before Startup

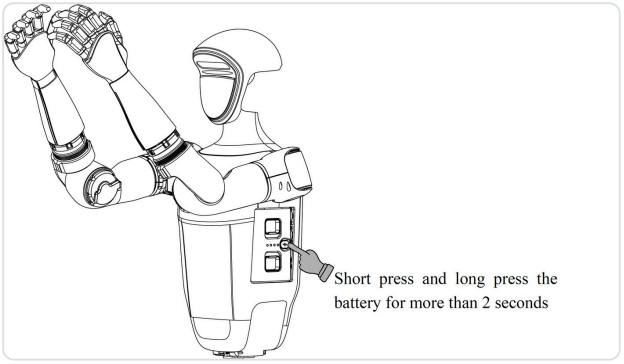
If conditions permit, G1 supports booting while seated. Place G1 on a chair with arms and legs positioned naturally, as shown in the following image.



G1 Sitiing

Powering On

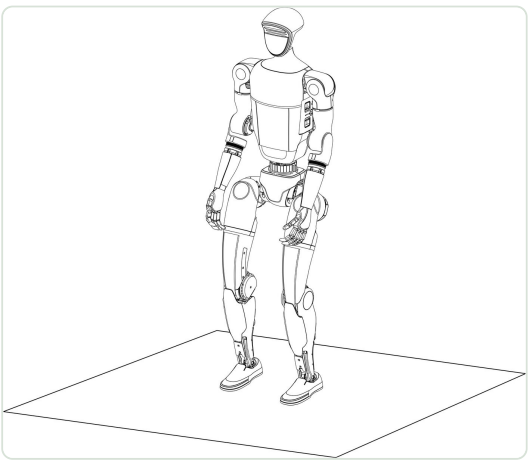
1. Short-press the power button on the battery once.
2. Press and hold the power button for more than 2 seconds to power on the battery.



G1 Power On

Successful Boot

1. Wait approximately 1 minute for the G1 to enter the zero torque state .
2. Press L2 + B to enter damping mode.
3. Hold the G1's shoulder and press L2 + UP to help it enter the ready state.
4. Once G1 straightens and stands, you can press: R2 + A to enter operation control state.



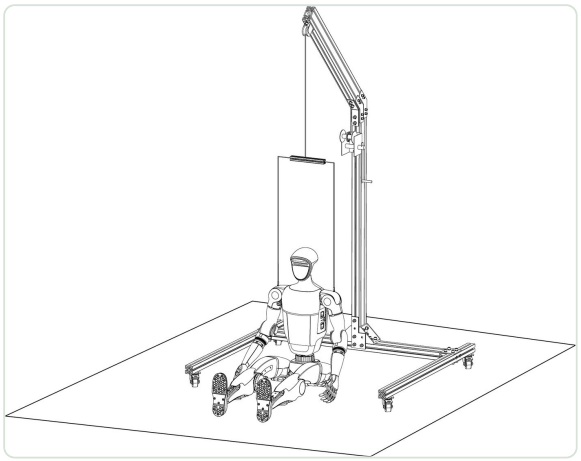
G1 Boot Up

Hang & Power On [Method 2]

The following steps guide you through the process of hanging, preparing, and powering on the Unitree G1 Humanoid Robot.

Preparation Before Startup

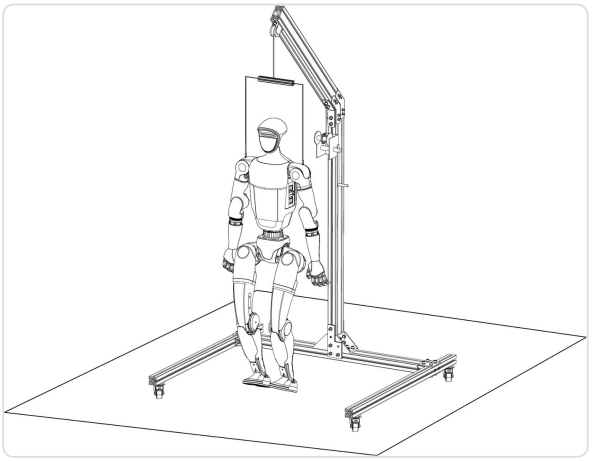
1. Place the G1 steadily on the ground.
2. Thread a rope through the special suspension buckles located on both shoulders of the robot. Tie the rope securely with a dead knot.
3. Attach the rope to the suspension buckle of the protective frame.
4. Gradually raise the G1 by adjusting the support, ensuring the robot's body is fully suspended and its feet do not touch the ground.



G1 Hang Setup

Body Placement

- While hanging, position the robot's arms and legs naturally.
- Ensure the joints are not entangled before proceeding.

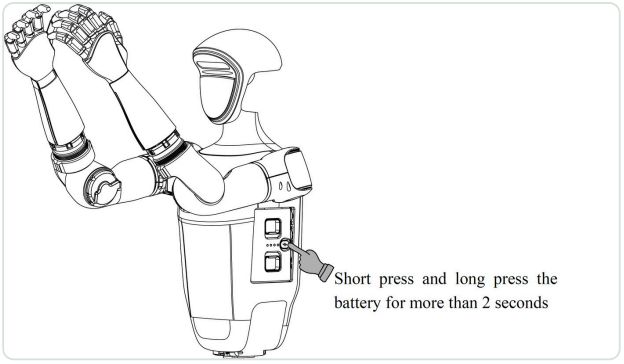


G1 Hang Pose

Starting Up the Robot

1. Short-press the power button on the battery once.

2. Press and hold the power button for more than 2 seconds to power on the battery.

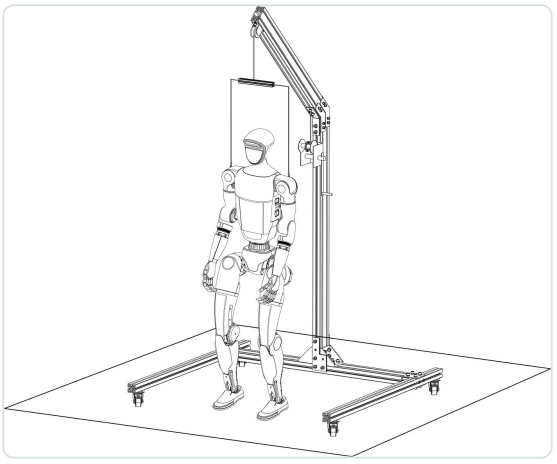


G1 Power On

Boot Process

- The boot process takes approximately 1 minute .
- When all joints enter the zero torque state , the initialization is successful.

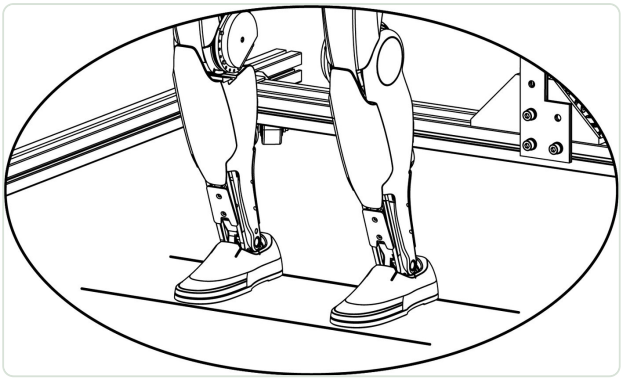
1. Use the remote control: Press L2 + B to enter damping mode and unlock control. Press L2 + UP to enter the ready state. The G1 will assume a neutral posture, as shown in the following image.



G1 Hang On

Lowering and Activating the Robot

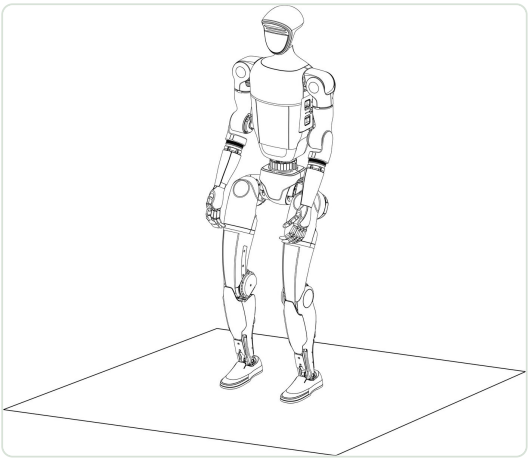
1. Gradually lower the suspension rope until the G1's feet touch the ground.
2. Press R2 + A on the remote control. The control program will start, transitioning G1 from the ready state to the motion state.
3. Allow the robot to stabilize its movement.



G1 touch Down

Unlocking the Hanging Rope

- Once the G1 is stable, fully release the suspension hook.
- Use the left and right joysticks on the remote control to control the G1's movements.
- Press START on the remote to switch between standing and walking states.



G1 Ready

Start from Ground [Method 3]

Follow these steps to safely start up the G1 robot from a grounded position.

Preparation Before Startup

- Place the G1 steadily on the ground Facing Up.
- Ensure the joints are not entangled before proceeding.
- Always ensure the robot is on a stable, non-slippery surface to prevent accidental falls or damage.

Starting Up the Robot

1. Short-press the power button on the battery once.
2. Press and hold the power button for more than 2 seconds to power on the battery.

Boot Process

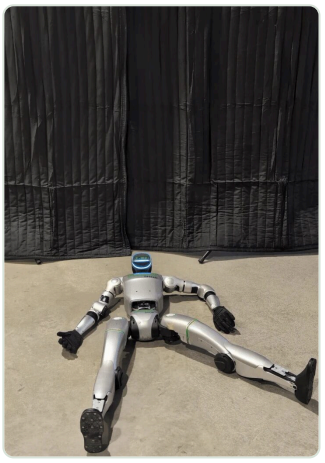
- The boot process takes approximately 1 minute .
- When all joints enter the zero torque state , the initialization is successful.

Using the Remote Control

1. Press L2 + B to enter damping mode and unlock control.
2. Press L2 + X to activate the Lying Down and Standing Up Mode .

> **Attention:** Maintain a safe distance as the robot will start to get up on its own.

The G1 will rise from the ground, as illustrated in the following GIF:



G1 Wake Up Process

Emergency Stop

If the G1 enters an unexpected state, press L2 + B . The robot will enter damping mode and slowly fall to the ground .

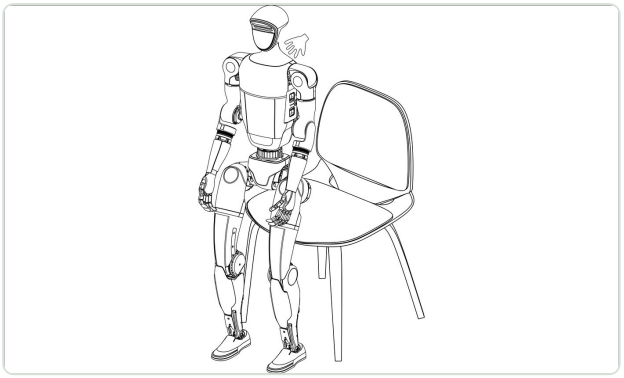
> **Attention:** Always ensure the suspension setup is stable and secure to prevent damage or accidents during operation.

Switching Off

Follow these procedures to safely switch off the G1 robot in various scenarios.

Sitting Shutdown [Method 1]

1. Stand behind the chair to assist the G1 robot in sitting, while the robot stands in front of the chair facing away from it. Ensure the robot remains stationary.
2. Hold the back of the shoulders and press L2 + LEFT on the remote control to help G1 sit down.
3. Perform the following steps to power off: Press L2 + B to enter damping mode. Press and hold the battery power switch key for more than 2 seconds to shut down.



G1 Sitting Turning Off

After shutting down:

- Arrange the robot's arm and foot joint limits according to body placement requirements.
- If the G1 will not be used for a long time, remove the battery pack: Hold down the battery pack clip with both hands and gently remove the battery.

Hanging Shutdown [Method 2]

1. Resuspend G1 on the protective frame to ensure it is stationary. The rope should maintain tension on the robot.
2. Perform the following steps to power off: Press L2 + B to enter damping mode. Press and hold the battery power switch key for more than 2 seconds to shut down.

After shutting down:

- Arrange the robot's arm and foot joint limits for proper storage.
- Remove the battery pack as described above if G1 will not be used for a long time.

Standing Shutdown [Method 3] (Not Recommended)

Danger: This method is not recommended as it can pose safety risks. Ensure caution to avoid injury or damage.

1. Hold G1 securely: One hand should be positioned between the legs. The other hand should hold the bracket on the back of the shoulders.
2. With assistance, press L2 + B to enter damping mode. The robot will lose balance ; carefully lower it to the ground.
3. Ensure the entire body is lying flat on the ground.
4. Press and hold the battery power switch key for more than 2 seconds to shut down.

After shutting down:

- Arrange the robot's arm and foot joint limits for proper storage.
- Remove the battery pack as described above if G1 will not be used for a long time.

Attention: Always shut down G1 in a sitting or suspended position to avoid sudden falls and potential damage. Avoid placing your hands near the robot's movement joints to prevent injury.

Basic Operation

Remote Control

The R3 remote control is part of the G1 remote control module, equipped with a digital transmission module and a Bluetooth module . Using the Unitree Explore App, the robot and remote control can be bound for seamless connection upon powering on.

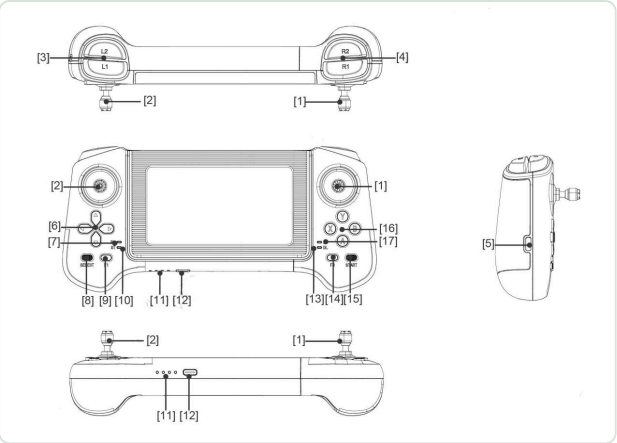
Features:

- 3-axis posture and position stability control.
- Movement capabilities include: Forward, backward, left, right, turn in place. Walking in predefined patterns: straight line, circular, linear, rectangular. Navigation on flat surfaces, slopes, and steps.
- Ergonomic design for improved grip and comfort.

Key Components

The remote control consists of the following key parts:

- [1] Right Rocker
- [2] Left Rocker
- [3] Key L1 / L2
- [4] Key R1 / R2
- [5] Type C Charging Interface
- [6] Arrow Keys
- [7] Power Connect Indicator
- [8] SELECT Key
- [9] F1 (Function Setting Key)
- [10] Charging Status Indicator
- [11] Power Connect Indicator
- [12] Power Button
- [13] Data Transmission Indicator Light
- [14] F3 (Function Setting Key)
- [15] START Key
- [16] Action Keys
- [17] Bluetooth Signal Indicator Light



Remote Control Labels

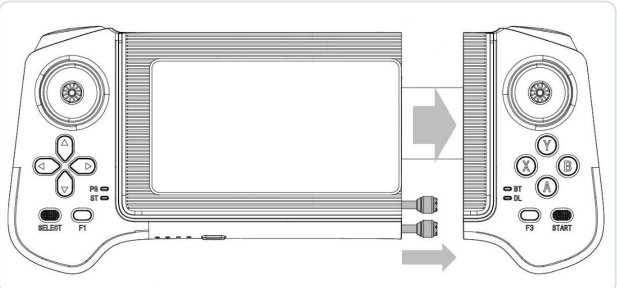
Technical Specifications

Parameter	Specification
Charging Voltage	5.0V
Charging Current	700mA
Battery Capacity	780mAh Lithium Battery
Communication Mode	Data Transmission, Bluetooth
Running Time	5 hours
Remote Control Range	Above 100m (open environment)

Installation and Calibration

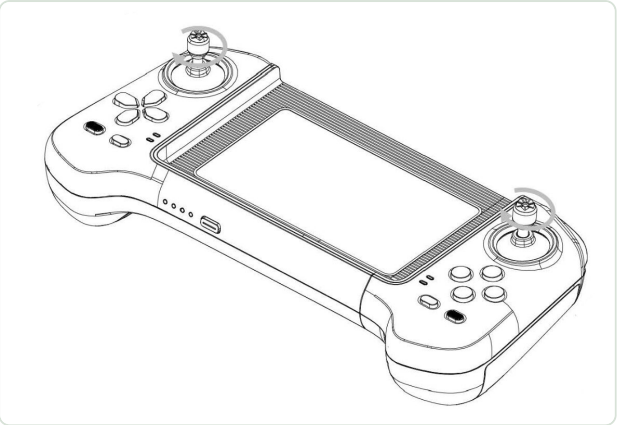
Installing the Joystick

1. Remove the joystick : Pull out the remote control from the storage slot. Remove the two joysticks.



Joystick Remove

1. Install the joystick : Secure each joystick by rotating it clockwise until tight.



Joystick Installation

Rocker Calibration

1. Hold the remote control without touching the rocker.
2. Press F1 and F3 simultaneously to enter calibration mode . The remote will emit a continuous “beep-beep” sound (1 beep/second).
3. Rotate the left and right rockers to full rudder several times.
4. When the beeping stops, press F3 once to save the calibration.

Attention: Do not touch the rockers before entering calibration mode. Move the rockers only after calibration mode is active.

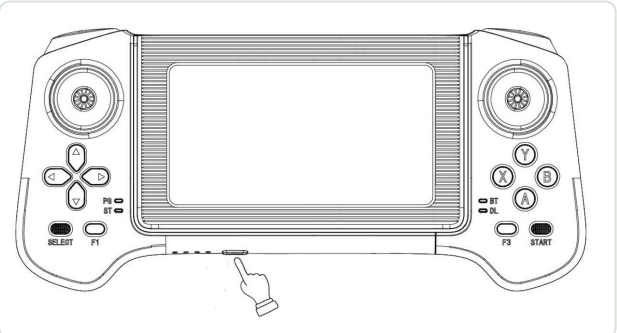
Powering On/Off

Turning On

1. Short-press the power button once.
2. Long-press the power button for 2+ seconds until you hear two “beeps.”

Turning Off

1. Short-press the power button once.
2. Long-press the power button for 2+ seconds until you hear three “beeps.”



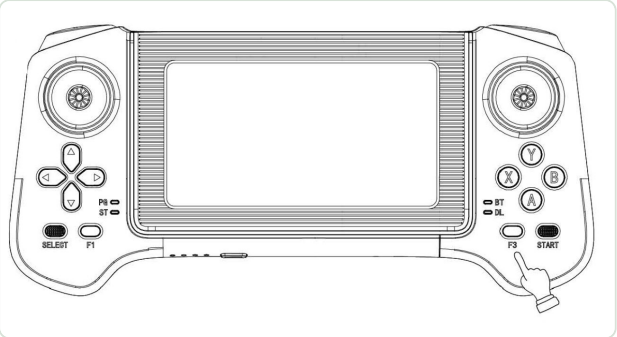
Joystick Installation

Tip: The sequence is short press + long press for 2 seconds or more for both turning on and off.

Vibration and Sound Settings

Vibration/Sound Toggle

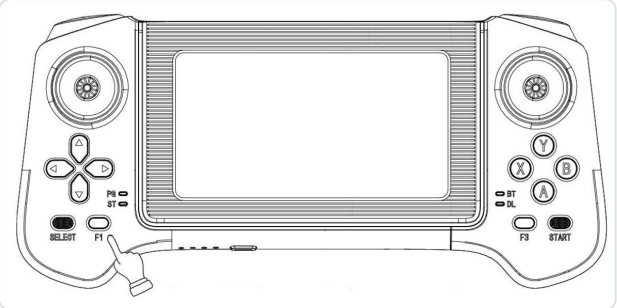
- Switching vibration : Quickly press F3 3 times to switch to vibration mode.
- Switch sound : Quickly press F3 3 times to switch to sound mode.



Joystick Operation

Vibration/Sound Switch

- Turn off vibration/sound : Quickly press F1 3 times to turn off vibration/sound.
- Turn on vibration/sound : Quickly press F1 3 times turn on vibration/sound.



Joystick Operation

Save Feedback Settings

- To save vibration/sound settings for the next startup: - Hold down the F1 button during shutdown.

Attention: By default, feedback settings (vibration/sound) are not saved after modifying.

Important: Always ensure to follow the correct steps to avoid damaging the remote control or affecting calibration accuracy.

Remote Control Binding

First-Time Use: Binding the Remote Control

To use the remote control for the first time:

1. Open the Unitree Explore App and Select “Device”.
2. Go to the “Data” Section.
3. Select “RemoteControl Binding”
4. Tap “Change” and enter the corresponding remote control code.

Navigate to “Device”	Access the “Data” Tab
Open “RemoteControl Binding”	Select “Change”

Once the remote control is bound to the digital transmission module on the robot, it can connect automatically in subsequent uses.

Verifying Connection

- When the remote control is powered on and successfully connected to G1, the right DL indicator light will turn on.
- This indicates the remote control is linked to the G1 digital transmission module, and you can now operate G1 using the remote control.

Remote Control Basic Operation

When using the remote control to maneuver the G1 robot with joysticks, follow these control methods:

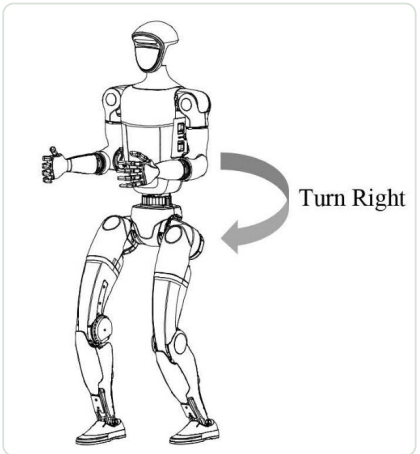
Left Joystick

- Push Forward:

- Push Backward:

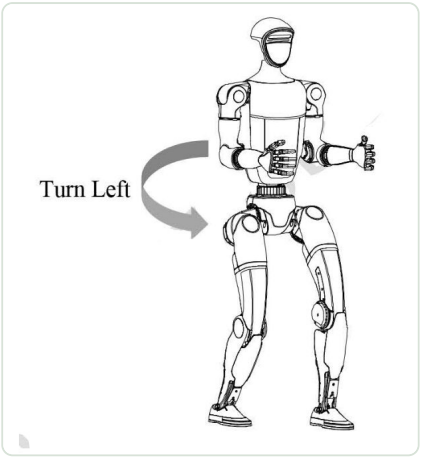
Right Joystick

- Right Turn: Push Joystick towards Right



G1 Right

- Left Turn: Push Joystick towards Left



G1 Left

Concept Descriptions

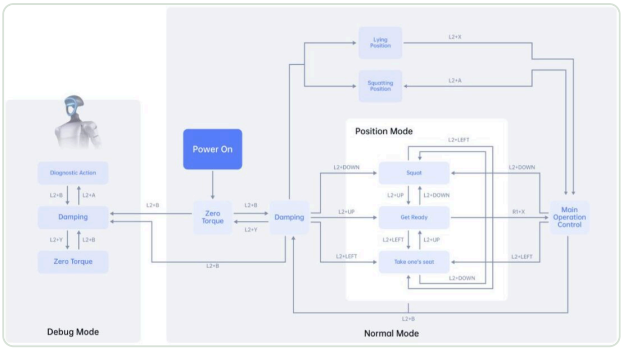
The G1 robot features several operational modes. Below is a detailed explanation of each mode:

Mode	Description
Zero Torque Mode	All motors stop active motion; no damping is felt when the robot is moved manually.
Damping Mode	Motors stop active motion but provide resistance, allowing transition to ready mode.
Ready Mode	The robot assumes a preparatory posture for motion within 5 seconds.
Squat Mode	The robot slowly transitions to a squat position (no balance control).
Seating Mode	The robot assumes a seated position (no balance control).
Motion Mode	Enables motion control via the remote control.
Continuous Walking Mode	The robot continuously steps without stopping.
Standing Mode	Robot maintains balance; it steps if the joystick is engaged or balance is disturbed.
Debug Mode	Used for SDK development. Motion control is paused to prevent command conflicts.

Important: The current walking mode of the G1 robot does not support stair climbing. Avoid attempting to climb stairs to prevent damage.

Mode Switching

The robot allows seamless transitions between modes using specific commands:



G1 Mode Switch

Important: To switch back to Main Operation Control mode after using the squatting position (L2 + A), follow these steps: Enter damping mode using L2 + B . Switch to Main Operation Control mode using L2 + A .

Key Descriptions

Posture Modes

Use the following button combinations to switch between various posture modes:

Mode	Button Combination	Description
Debug Mode	Hold L2 + Click R2	Enter debug mode for testing and development.
Zero Torque Mode	Hold L2 + Click Y	Switch to zero torque mode.
Damping Mode	[1] Hold L2 + Click B	Activate damping mode for smooth motion.
Lock Stand	[2] Hold L2 + Click UP	Lock the robot in a standing posture.
Seated Mode	[4] Hold L2 + Click LEFT	Switch to seated posture.
Lying and Standing	[5] Hold L2 + Click X	Switch between lying and standing positions.
Squat Switch	[6] Hold L2 + Click A	Alternate between squatting postures.

Interactive Functions

The G1 robot supports various interactive gestures. Use the table below for guidance:

Gesture	Button Combination	Description
Wave Hand	Hold SELECT + Click Y	Robot waves its hand.
Handshake	Hold SELECT + Click A	Robot performs a handshake gesture.
Turn Around and Wave Hand	Hold SELECT + Click X	Robot turns and waves at the user.

G1 Handshake	G1 Turn Around And Wave Hand

G1 Wave Hand Right	G1 Wave Hand Left

[3] R2 + A(Run Control)	Button Combination
Slow Running	R2 + Down
Fast Running	R2 + Up
Forward Lean	Hold Start + Hold Up
Backward Lean	Hold Start + Hold Down

[7] R1 + X (Main Operation Control)	Button Combination
Keep stepping (not recommended)	Double Click START
Standing	Click START
Low speed mode	Double-Click L2
High speed mode	Double-Click L1
Offset Compensation	Left Offset:Hold R1 + Click - → Right Offset: Hold R1 + Click - ← Forward Offset: Hold R1 + Click ↓ Backward Offset Hold R1 + Click ↑

G1 Low Speed Mode	G1 High Speed Mode

[8] R1 + Y (Only Used For 3-DOF Waist Structure)	Button Combination
Keep stepping (not recommended)	Double Click START
Standing	Click START
Low speed mode	Double-Click L2
High speed mode	Double-Click L1
Offset Compensation	Left Offset:Hold R1 + Click - → Right Offset: Hold R1 + Click - ← Forward Offset: Hold R1 + Click ↓ Backward Offset Hold R1 + Click ↑

Important: Starting in lying or squatting positions is only suitable for flat and hard ground . Using these modes on uneven surfaces may lead to instability and potential damage. If equipped with dexterous hand equipment, avoid starting in lying or squatting positions to prevent damage to delicate components.

Boot Processes

Regular Boot Process

1. Boot -> [1] -> [2] -> [3] -> Demo -> [4] (Chair Seat) -> Turn off.

Lying Boot Process

1. Ensure the boot device crotch is flat against the ground.
2. Boot -> [1] -> [5] -> Demo -> [6] -> Turn off.

Squatting Boot Process

1. Start in a squatting posture.
2. Boot -> [1] -> [6] -> Demo -> [6] -> Turn off.

3-DOF Waist structure

- [7],[8] Only Used For 3-DOF Waist structure, recommended to use R1 + Y mode

Remote Control Timeout

- If the R3 remote control is not connected to the robot or phone after turning on, the robot will automatically shut down within 10 minutes of inactivity. To reconnect, power the robot on again.

6 Operation – Firmware V1.0.2 (Legacy)

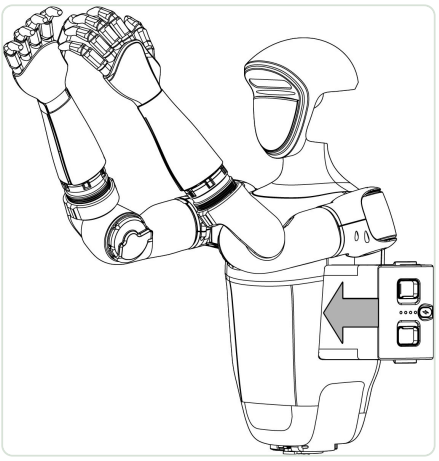
Controls (Firmware V1.0.2)

Powering On

Attention: If the G1 enters an unexpected state, press L1 + A . The robot will enter damping mode and slowly fall to the ground .

Installing Battery Pack

1. Insert the battery into the battery compartment on the side of the robot.
2. Ensure the power switch faces the back of the robot.
3. If the battery does not fully insert, adjust its direction. Do not forcefully press it to avoid damaging the battery interface and buckle.
4. Listen for a “click” sound, indicating the battery is securely installed. Verify the buckle is in place.

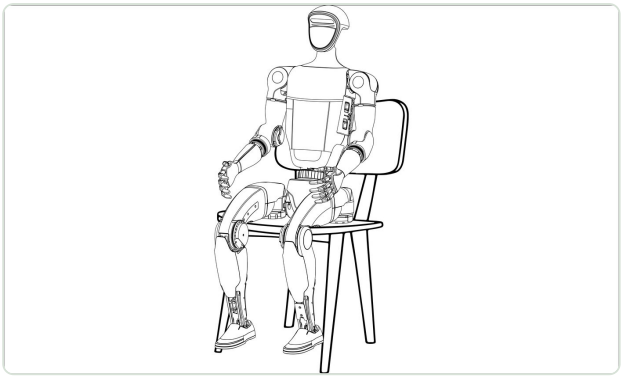


G1 Battery Insert

Sit & Power On [Method 1]

Preparation Before Startup

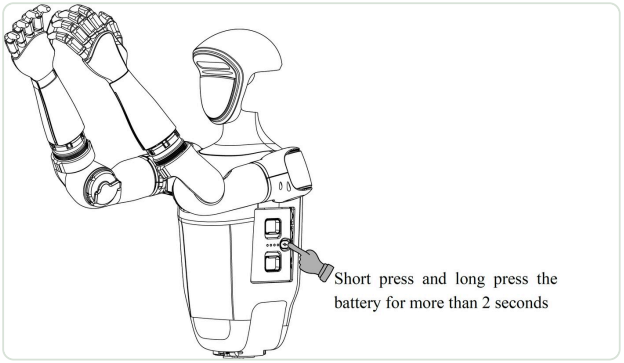
If conditions permit, G1 supports booting while seated. Place G1 on a chair with arms and legs positioned naturally, as shown in the following image.



G1 Sitiing

Powering On

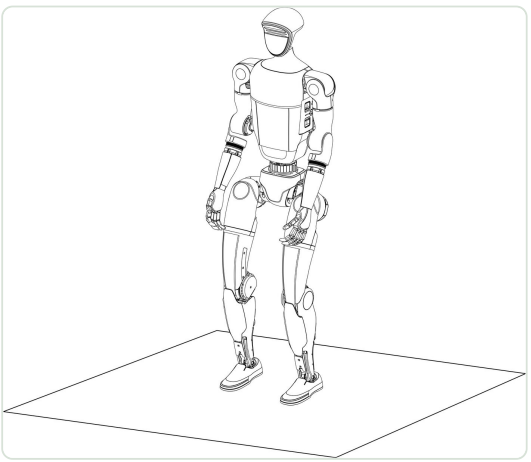
1. Short-press the power button on the battery once.
2. Press and hold the power button for more than 2 seconds to power on the battery.



G1 Power On

Successful Boot

1. Wait approximately 1 minute for the G1 to enter the zero torque state .
2. Press L1 + A to enter damping mode.
3. Hold the G1's shoulder and press L1 + UP to help it enter the ready state.
4. Once G1 straightens and stands, you can press: R1 + X or R2 + X to enter operation control state.



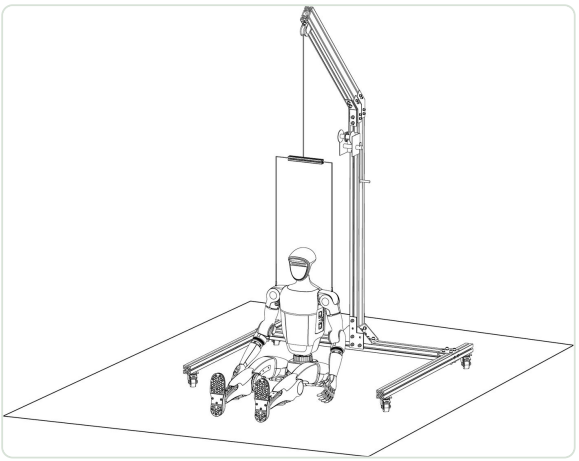
G1 Boot Up

Hang & Power On [Method 2]

The following steps guide you through the process of hanging, preparing, and powering on the Unitree G1 Humanoid Robot.

Preparation Before Startup

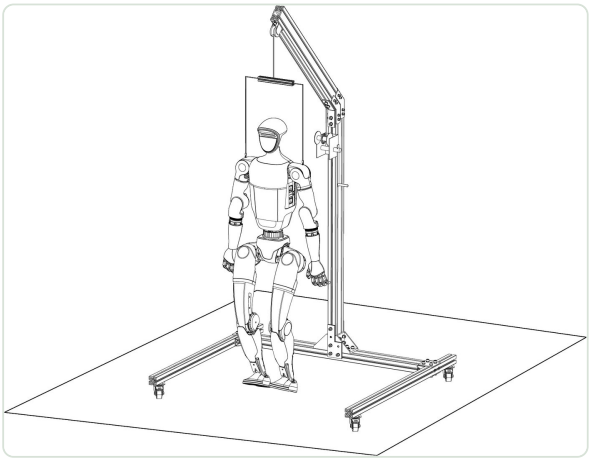
1. Place the G1 steadily on the ground.
2. Thread a rope through the special suspension buckles located on both shoulders of the robot. Tie the rope securely with a dead knot.
3. Attach the rope to the suspension buckle of the protective frame.
4. Gradually raise the G1 by adjusting the support, ensuring the robot's body is fully suspended and its feet do not touch the ground.



G1 Hang Setup

Body Placement

- While hanging, position the robot's arms and legs naturally.
- Ensure the joints are not entangled before proceeding.

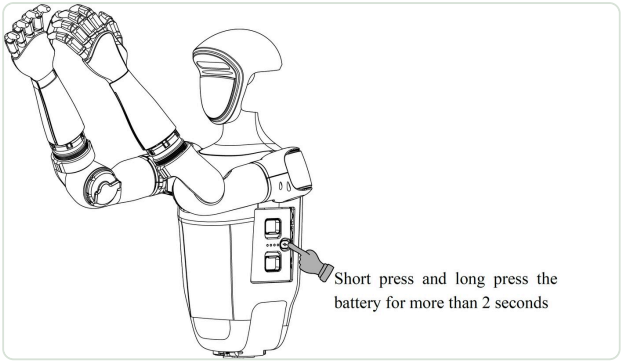


G1 Hang Pose

Starting Up the Robot

1. Short-press the power button on the battery once.

2. Press and hold the power button for more than 2 seconds to power on the battery.

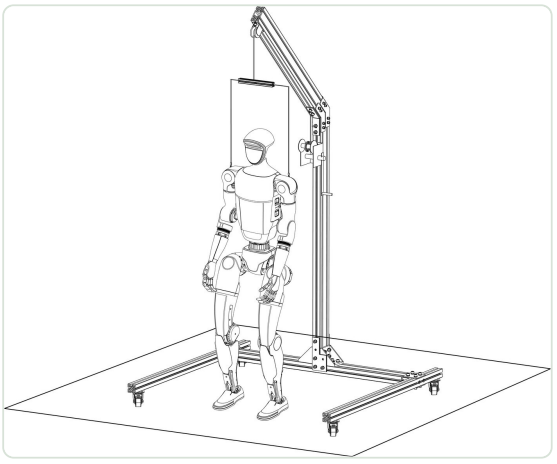


G1 Power On

Boot Process

- The boot process takes approximately 1 minute .
- When all joints enter the zero torque state , the initialization is successful.

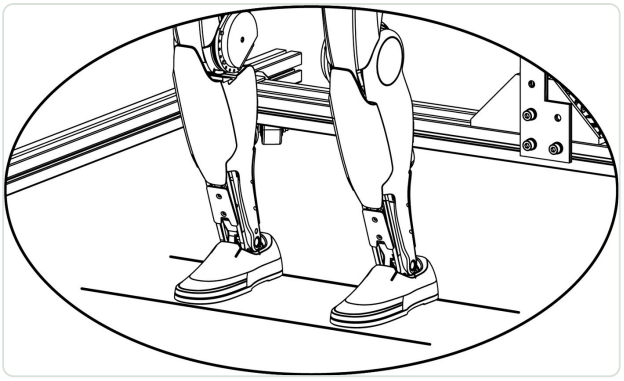
1. Use the remote control: Press L1 + A to enter damping mode and unlock control. Press L1 + UP to enter the ready state. The G1 will assume a neutral posture, as shown in the following image.



G1 Hang On

Lowering and Activating the Robot

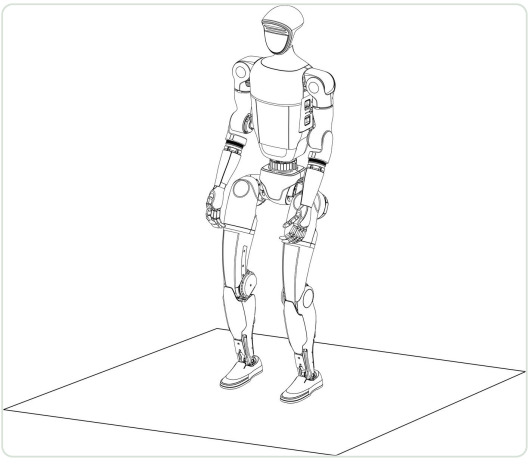
1. Gradually lower the suspension rope until the G1's feet touch the ground.
2. Press R1 + X on the remote control. The control program will start, transitioning G1 from the ready state to the motion state.
3. Allow the robot to stabilize its movement.



G1 touch Down

Unlocking the Hanging Rope

- Once the G1 is stable, fully release the suspension hook.
- Use the left and right joysticks on the remote control to control the G1's movements.
- Press START on the remote to switch between standing and walking states.



G1 Ready

Start from Ground [Method 3]

Follow these steps to safely start up the G1 robot from a grounded position.

Preparation Before Startup

- Place the G1 steadily on the ground Facing Up.
- Ensure the joints are not entangled before proceeding.
- Always ensure the robot is on a stable, non-slippery surface to prevent accidental falls or damage.

Starting Up the Robot

1. Short-press the power button on the battery once.
2. Press and hold the power button for more than 2 seconds to power on the battery.

Boot Process

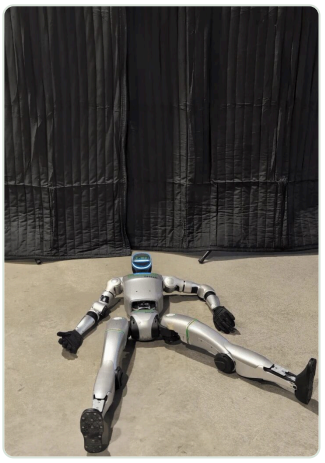
- The boot process takes approximately 1 minute .
- When all joints enter the zero torque state , the initialization is successful.

Using the Remote Control

1. Press L1 + A to enter damping mode and unlock control.
2. Press L1 + X to activate the Lying Down and Standing Up Mode .

> **Attention:** Maintain a safe distance as the robot will start to get up on its own.

The G1 will rise from the ground, as illustrated in the following GIF:



G1 Wake Up Process

Emergency Stop

If the G1 enters an unexpected state, press L1 + A . The robot will enter damping mode and slowly fall to the ground .

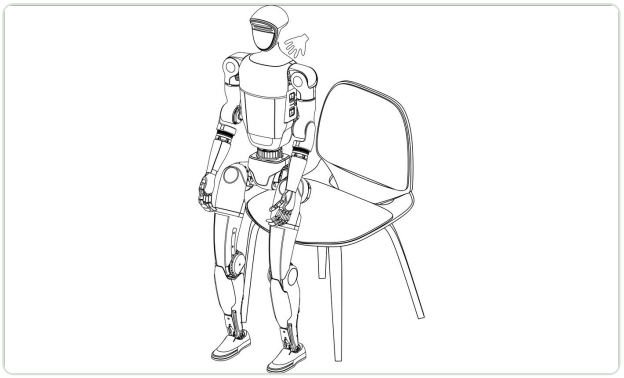
> **Attention:** Always ensure the suspension setup is stable and secure to prevent damage or accidents during operation.

G1 Switching Off

Follow these procedures to safely switch off the G1 robot in various scenarios.

Sitting Shutdown [Method 1]

1. Stand behind the chair to assist the G1 robot in sitting, while the robot stands in front of the chair facing away from it. Ensure the robot remains stationary.
2. Hold the back of the shoulders and press L1 + LEFT on the remote control to help G1 sit down.
3. Perform the following steps to power off: Press L1 + A to enter damping mode. Press and hold the battery power switch key for more than 2 seconds to shut down.



G1 Sitting Turning Off

After shutting down:

- Arrange the robot's arm and foot joint limits according to body placement requirements.
- If the G1 will not be used for a long time, remove the battery pack: Hold down the battery pack clip with both hands and gently remove the battery.

Hanging Shutdown [Method 2]

1. Resuspend G1 on the protective frame to ensure it is stationary. The rope should maintain tension on the robot.
2. Perform the following steps to power off: Press L1 + A to enter damping mode. Press and hold the battery power switch key for more than 2 seconds to shut down.

After shutting down:

- Arrange the robot's arm and foot joint limits for proper storage.
- Remove the battery pack as described above if G1 will not be used for a long time.

Standing Shutdown [Method 3] (Not Recommended)

Danger: This method is not recommended as it can pose safety risks. Ensure caution to avoid injury or damage.

1. Hold G1 securely: One hand should be positioned between the legs. The other hand should hold the bracket on the back of the shoulders.
2. With assistance, press L1 + A to enter damping mode. The robot will lose balance ; carefully lower it to the ground.
3. Ensure the entire body is lying flat on the ground.
4. Press and hold the battery power switch key for more than 2 seconds to shut down.

After shutting down:

- Arrange the robot's arm and foot joint limits for proper storage.
- Remove the battery pack as described above if G1 will not be used for a long time.

Attention: Always shut down G1 in a sitting or suspended position to avoid sudden falls and potential damage. Avoid placing your hands near the robot's movement joints to prevent injury.

G1 Basic Operation

Remote Control

The R3 remote control is part of the G1 remote control module, equipped with a digital transmission module and a Bluetooth module . Using the Unitree Explore App, the robot and remote control can be bound for seamless connection upon powering on.

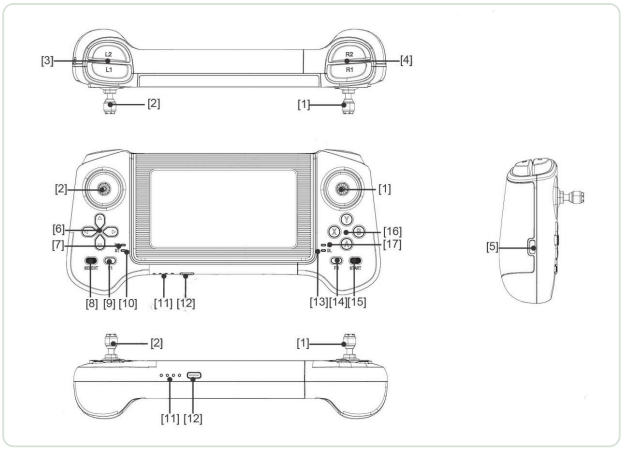
Features:

- 3-axis posture and position stability control.
- Movement capabilities include: Forward, backward, left, right, turn in place. Walking in predefined patterns: straight line, circular, linear, rectangular. Navigation on flat surfaces, slopes, and steps.
- Ergonomic design for improved grip and comfort.

Key Components

The remote control consists of the following key parts:

- [1] Right Rocker
- [2] Left Rocker
- [3] Key L1 / L2
- [4] Key R1 / R2
- [5] Type C Charging Interface
- [6] Arrow Keys
- [7] Power Connect Indicator
- [8] SELECT Key
- [9] F1 (Function Setting Key)
- [10] Charging Status Indicator
- [11] Power Connect Indicator
- [12] Power Button
- [13] Data Transmission Indicator Light
- [14] F3 (Function Setting Key)
- [15] START Key
- [16] Action Keys
- [17] Bluetooth Signal Indicator Light



Remote Control Labels

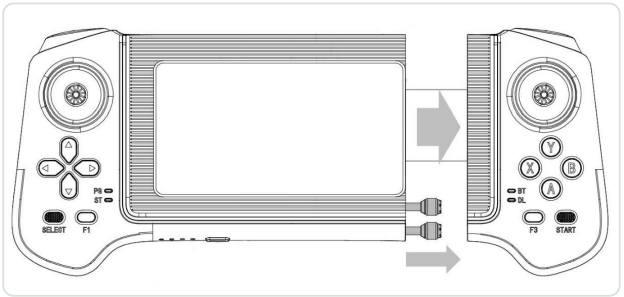
Technical Specifications

Parameter	Specification
Charging Voltage	5.0V
Charging Current	700mA
Battery Capacity	780mAh Lithium Battery
Communication Mode	Data Transmission, Bluetooth
Running Time	5 hours
Remote Control Range	Above 100m (open environment)

Installation and Calibration

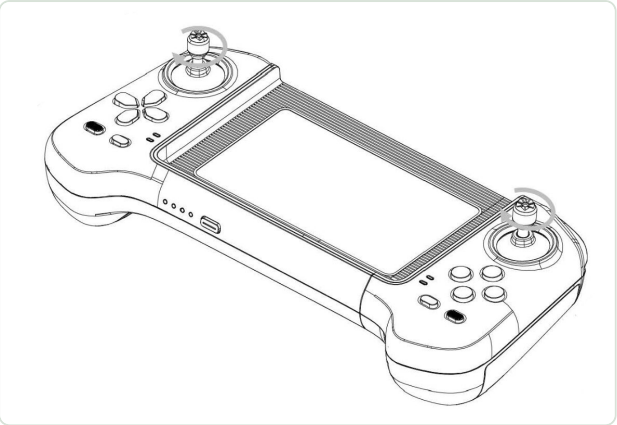
Installing the Joystick

1. Remove the joystick : Pull out the remote control from the storage slot. Remove the two joysticks.



Joystick Remove

1. Install the joystick : Secure each joystick by rotating it clockwise until tight.



Joystick Installation

Rocker Calibration

1. Hold the remote control without touching the rocker.
2. Press F1 and F3 simultaneously to enter calibration mode . The remote will emit a continuous “beep-beep” sound (1 beep/second).
3. Rotate the left and right rockers to full rudder several times.
4. When the beeping stops, press F3 once to save the calibration.

Attention: Do not touch the rockers before entering calibration mode. Move the rockers only after calibration mode is active.

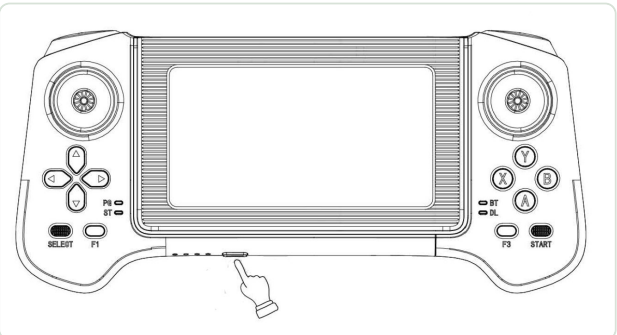
Powering On/Off

Turning On

1. Short-press the power button once.
2. Long-press the power button for 2+ seconds until you hear two “beeps.”

Turning Off

1. Short-press the power button once.
2. Long-press the power button for 2+ seconds until you hear three “beeps.”



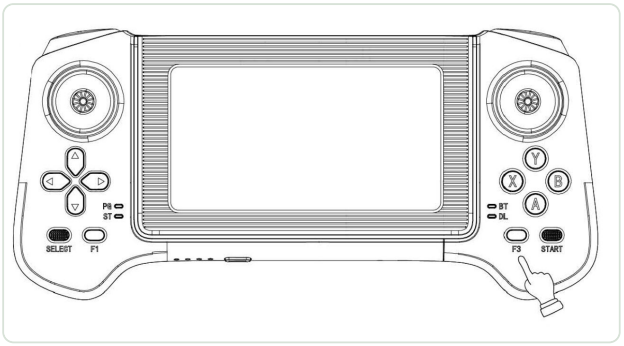
Joystick Installation

Tip: The sequence is short press + long press for 2 seconds or more for both turning on and off.

Vibration and Sound Settings

Vibration/Sound Toggle

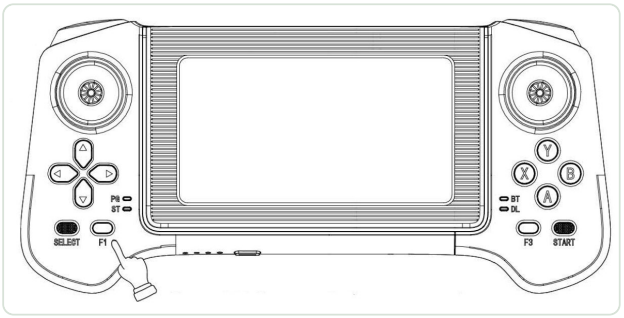
- Switching vibration : Quickly press F3 3 times to switch to vibration mode.
- Switch sound : Quickly press F3 3 times to switch to sound mode.



Joystick Operation

Vibration/Sound Switch

- Turn off vibration/sound : Quickly press F1 3 times to turn off vibration/sound.
- Turn on vibration/sound : Quickly press F1 3 times turn on vibration/sound.



Joystick Operation

Save Feedback Settings

- To save vibration/sound settings for the next startup: - Hold down the F1 button during shutdown.

Attention: By default, feedback settings (vibration/sound) are not saved after modifying.

Important: Always ensure to follow the correct steps to avoid damaging the remote control or affecting calibration accuracy.

Remote Control Binding

First-Time Use: Binding the Remote Control

To use the remote control for the first time:

1. Open the Unitree Explore App and Select “Device”.
2. Go to the “Data” Section.
3. Select “RemoteControl Binding”
4. Tap “Change” and enter the corresponding remote control code.

Navigate to “Device”	Access the “Data” Tab
Open “RemoteControl Binding”	Select “Change”

Once the remote control is bound to the digital transmission module on the robot, it can connect automatically in subsequent uses.

Verifying Connection

- When the remote control is powered on and successfully connected to G1, the right DL indicator light will turn on.
- This indicates the remote control is linked to the G1 digital transmission module, and you can now operate G1 using the remote control.

Remote Control Basic Operation

When using the remote control to maneuver the G1 robot with joysticks, follow these control methods:

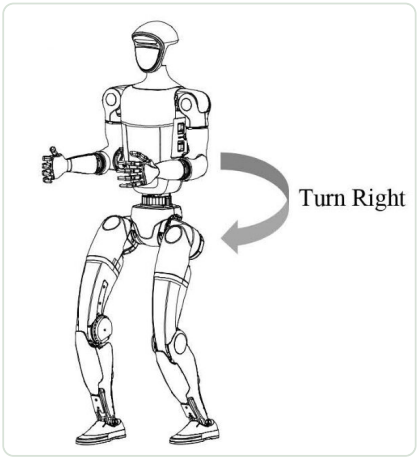
Left Joystick

- Push Forward:

- Push Backward:

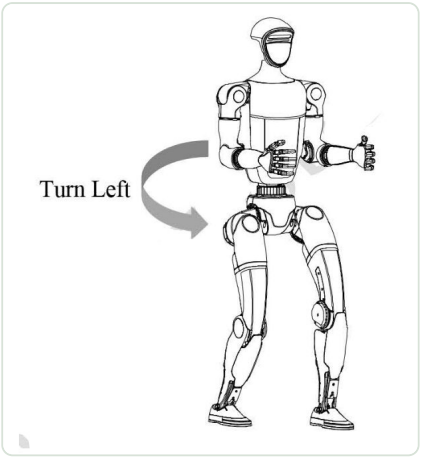
Right Joystick

- Right Turn: Push Joystick towards Right



G1 Right

- Left Turn: Push Joystick towards Left



G1 Left

Concept Descriptions

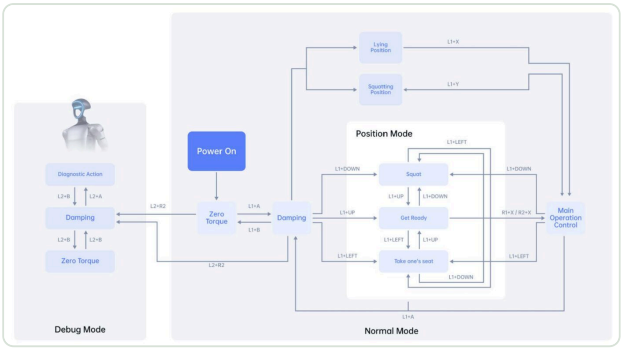
The G1 robot features several operational modes. Below is a detailed explanation of each mode:

Mode	Description
Zero Torque Mode	All motors stop active motion; no damping is felt when the robot is moved manually.
Damping Mode	Motors stop active motion but provide resistance, allowing transition to ready mode.
Ready Mode	The robot assumes a preparatory posture for motion within 5 seconds.
Squat Mode	The robot slowly transitions to a squat position (no balance control).
Seating Mode	The robot assumes a seated position (no balance control).
Motion Mode	Enables motion control via the remote control.
Continuous Walking Mode	The robot continuously steps without stopping.
Standing Mode	Robot maintains balance; it steps if the joystick is engaged or balance is disturbed.
Debug Mode	Used for SDK development. Motion control is paused to prevent command conflicts.

Important: The current walking mode of the G1 robot does not support stair climbing. Avoid attempting to climb stairs to prevent damage.

Mode Switching

The robot allows seamless transitions between modes using specific commands:



G1 Mode Switch

Important: To switch back to Main Operation Control mode after using the squatting position (L1 + Y), follow these steps: Enter damping mode using L1 + A . Switch to Main Operation Control mode using L1 + Y .

Key Descriptions

Posture Modes

Use the following button combinations to switch between various posture modes:

Mode	Button Combination	Description
Debug Mode	Hold L2 + Click R2	Enter debug mode for testing and development.
Zero Torque Mode	Hold L1 + Click B	Switch to zero torque mode.
Damping Mode	[1] Hold L1 + Click A	Activate damping mode for smooth motion.
Lock Stand	[2] Hold L1 + Click UP	Lock the robot in a standing posture.
Seated Mode	[4] Hold L1 + Click LEFT	Switch to seated posture.
Squat Mode	Hold L1 + Click DOWN	Transition to squat posture.
Lying and Standing	[5] Hold L1 + Click X	Switch between lying and standing positions.
Squat Switch	[6] Hold L1 + Click Y	Alternate between squatting postures.

Interactive Functions

The G1 robot supports various interactive gestures. Use the table below for guidance:

Gesture	Button Combination	Description
Wave Hand	Hold SELECT + Click Y	Robot waves its hand.
Handshake	Hold SELECT + Click A	Robot performs a handshake gesture.
Turn Around and Wave Hand	Hold SELECT + Click X	Robot turns and waves at the user.

G1 Handshake	G1 Turn Around And Wave Hand
G1 Wave Hand Right	G1 Wave Hand Left

[3] R2 + X(Run Control)	Button Combination
Increase the lift height	Click B
Decrease leg lift height	Click A
Increase standing height	Click Y
Decrease standing height	Click X
Slow Running	R1 + left rocker
Fast Running	R2 + left rocker

[3] R1 + X (Main Operation Control)	Button Combination
Keep stepping (not recommended)	Double Click START
Standing	Click START
Low speed mode	Double-Click L2
High speed mode	Double-Click L1
Offset Compensation	Left Offset:Hold R1 + Click - → Right Offset: Hold R1 + Click - ← Forward Offset: Hold R1 + Click ↓ Backward Offset Hold R1 + Click ↑

G1 Low Speed Mode	G1 High Speed Mode

[7] R1 + Y (Only Used For 3-DOF Waist Structure)	Button Combination
Keep stepping (not recommended)	Double Click START
Standing	Click START
Low speed mode	Double-Click L2
High speed mode	Double-Click L1
Offset Compensation	Left Offset:Hold R1 + Click - → Right Offset: Hold R1 + Click - ← Forward Offset: Hold R1 + Click ↓ Backward Offset Hold R1 + Click ↑

[8] R2 + Y (Only Used For 3-DOF Waist Structure)	Button Combination
Increase the lift height	Click B

Decrease leg lift height	Click A
Increase standing height	Click Y
Decrease standing height	Click X
Keep stepping (not recommended)	Click START
Waist Control	Hold SELECT + Right Rocker

Important: Starting in lying or squatting positions is only suitable for flat and hard ground . Using these modes on uneven surfaces may lead to instability and potential damage. If equipped with dexterous hand equipment, avoid starting in lying or squatting positions to prevent damage to delicate components.

Boot Processes

Regular Boot Process

1. Boot -> [1] -> [2] -> [3] -> Demo -> [4] (Chair Seat) -> Turn off.

Lying Boot Process

1. Ensure the boot device crotch is flat against the ground.
2. Boot -> [1] -> [5] -> Demo -> [6] -> Turn off.

Squatting Boot Process

1. Start in a squatting posture.
2. Boot -> [1] -> [6] -> Demo -> [6] -> Turn off.

3-DOF Waist structure

- [7],[8] Only Used For 3-DOF Waist structure, recommended to use R1 + Y mode

Remote Control Timeout

- If the R3 remote control is not connected to the robot or phone after turning on, the robot will automatically shut down within 10 minutes of inactivity. To reconnect, power the robot on again.

7 Preparation, Transport & Charging

Manuals

_images/g1_possing.jpg

The following text contains hyperlinks. Click on them to be redirected to the websites.

- Unitree Documentation

Mobile Apps

The QR codes for Android and iOS to download the G1 app are provided below. Please scan the respective QR code to access the download link.

Scan to download for Android	Scan to download for iOS

Itinerary and Transport

The G1 humanoid robot is designed with a compact and lightweight structure, making it easy to transport and handle. Its foldable design allows it to be neatly stored in the provided suitcase, which includes the Unitree G1 humanoid robot, a remote controller, and a charger. While the suitcase ensures convenience, its built-in wheels are not suitable for outdoor use. Therefore, it is recommended to use an additional trolley for enhanced mobility, particularly in outdoor environments. This combination of thoughtful design and practical packaging ensures that the G1 stands out as a highly portable option compared to other humanoid robots, offering both ease of transport and reliable protection for its components.

G1 Trolley

G1 Trolley for Easy Transport

> **Note:** Always handle the suitcase with care to prevent damage to the robot and accessories during transport.

Charging

Proper charging procedures are essential to ensure the safe and efficient operation of your Unitree G1 Humanoid Robot. Follow the guidelines below for charging the main battery and the companion remote control.

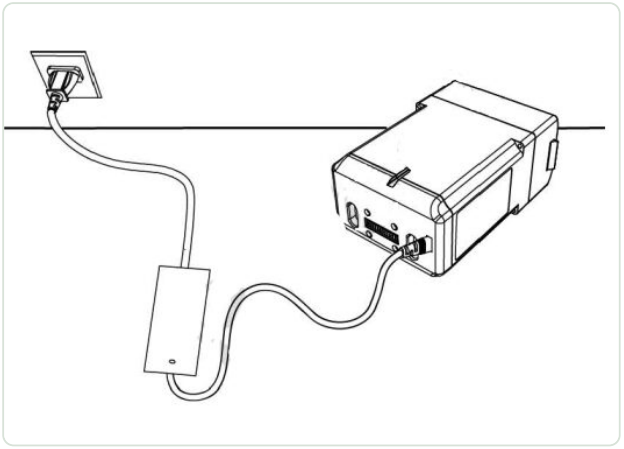
Battery Charging

Due to self-discharge during transportation and storage, the battery may have low or no power initially. Use the following steps to charge the main battery:

1. Remove the battery : Detach the battery from the G1 body. Ensure the battery pack strap is pulled out.

battery_removal

1. Prepare the charger : Connect the charger to an AC power source (100-240V, 50/60Hz). Verify that the external power supply voltage matches the charger's rated input voltage (marked on the charger's nameplate). Failure to match voltages may damage the charger.
2. Connect the battery : Plug the charger into the AC power supply first. Ensure the battery pack is switched off before connecting it to the charger to avoid damage.



G1 Charging

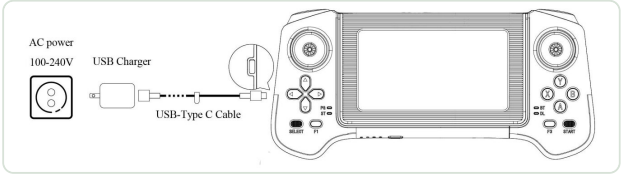
1. Monitor charging status : During charging, the battery indicator on the battery pack will flash at a frequency of 1Hz (once per second), displaying the current charge level. When fully charged, the battery indicator will turn off. Manually disconnect the charger and battery to complete the process.
2. Temperature precautions : Allow the battery to cool to room temperature before charging if it is warm from recent use.

Warning: Only use official chargers to charge the G1 battery. Using unofficial chargers may cause damage or safety hazards.

Remote Control Charging

The companion remote control requires proper charging to maintain functionality. Follow these steps:

1. Use a 5V/2A USB charger that meets FCC/CE standards.
2. Ensure the remote control is switched off before charging.
3. Connect the remote control to the charger using a USB-Type C cable.
4. Observe the charging indicator light: - The power indicator will flash at 1Hz (once per second) during charging, showing the current charge level. - When the indicator turns off, charging is complete. Disconnect the charger.



G1 Remote Charge

Remote Charging Indicator

The charging indicator lights display the current charge level as shown in the table below:

Indicator Lights	Current Battery	Description
LED1	0%-25%	Lowest battery level
LED1, LED2	25%-50%	Partial charge
LED1, LED2, LED3	50%-75%	Moderate charge
All LEDs	75%-100%	Fully charged

Note: For optimal battery life, avoid overcharging and ensure all devices are disconnected after charging.

Unpacking and Initial Setup

Follow the steps below to properly unpack and prepare the Unitree G1 Humanoid Robot for operation.

Unpacking

1. Place the box on a flat surface with the front side facing up.
2. Open the top of the box and carefully lift the robot out in its entirety.
3. Remove all components, including the robot, remote control, charger, and accessories.
4. Place the robot flat on a stable surface in preparation for powering it on.

Important: Handle all components with care to avoid damage during unpacking.

Pre-Power-On Checklist

Before powering on the G1, ensure the following:

1. Use only authentic Unitree Robotics parts and confirm that all parts are in good working condition.
2. Do not operate the robot if you are intoxicated, under the influence of drugs, or unable to concentrate.
3. Familiarize yourself with: Characteristics of each gait mode. The emergency braking method in case of instability or loss of control.
4. Check that there are no foreign objects (e.g., water, oil, sand, or soil) inside the robot or its components.

5. Ensure the remote control and battery pack are fully charged.

Packing

Packing Steps from Hanging Position

Important: Be careful to avoid pinching your hands at movement joints during the packing process.

1. Hang G1 vertically using the suspension system.
2. Lift the robot's legs and fold them back until the waist is level, ensuring proper direction.
3. Slowly lower the suspension rope to guide the robot's rear into the transport box.
4. Place G1 head and chest down, lying flat in the box, ensuring correct orientation.
5. Position the robot's arms along its sides, rotating the wrists vertically to fit into the box.
6. Fold the legs back towards the body and ensure they fit snugly against the lining.
7. Add protective buffers to prevent collisions, place accessories (remote control, charger, etc.), and secure the square lining in the middle of G1.

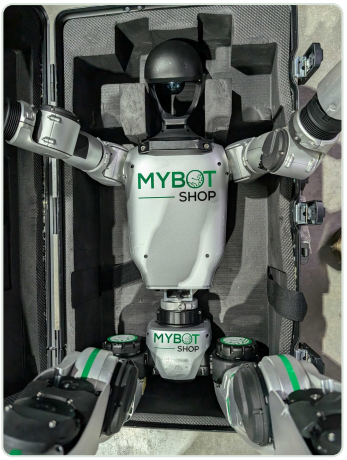
Packing Steps from a Lying Position on the Ground

Caution: This process requires two persons for safe handling.

1. Place G1 head and chest down, lying flat on the ground, ensuring proper orientation.

G1 Face Down

1. Prepare the transport box next to the robot.
2. Lift G1's legs and arms and carefully place it into the box with its head and chest down.



G1 Box Placement

1. Twist and fold the arms as shown in the provided GIFs:

Left Arm Folding	Right Arm Folding

1. Fold the legs back towards the body and ensure they fit snugly against the lining.

1. Add protective buffers, include accessories (remote control, charger, etc.), and secure the square lining in the middle of G1.

G1 Packed

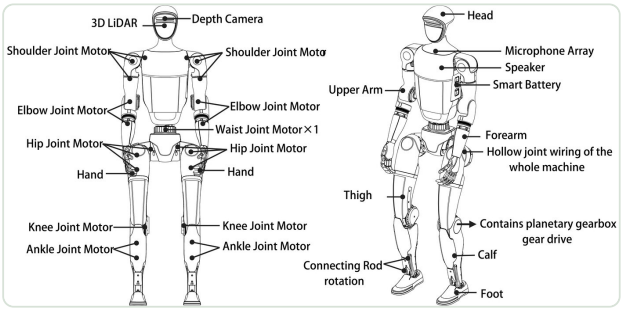
8 Hardware Overview & Specification

Overview

G1 Robot

The G1 robot is divided into upper and lower bodies, each featuring multiple degrees of freedom. The single arm has five degrees of freedom, including the shoulder, upper arm, and elbow joints. The single leg features six degrees of freedom, comprising the hip, leg, knee, and ankle joints. The waist includes one degree of freedom, namely the lumbar joint.

The G1 basic version offers 23 degrees of freedom in total, allowing for precise motion and posture control through joint motors.

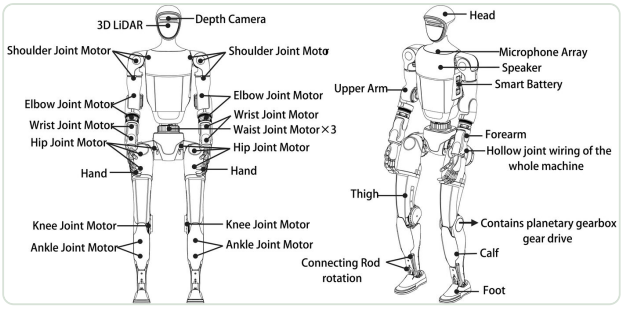


H1 Robot

Edu Variant

The G1-EDU version builds upon the G1 basic model, expanding its capabilities for educational and research applications. It offers the same foundational configuration but includes options for additional degrees of freedom.

Optional upgrades include a dexterous hand with seven degrees of freedom and two additional wrist degrees of freedom, enhancing its manipulation abilities. The waist can also be upgraded with two extra degrees of freedom for advanced flexibility. Depending on the configuration, the G1-EDU can have up to 43 degrees of freedom, making it highly versatile for complex tasks.



H1 Robot

Three-Fingered Dex Hand

G1 Robot

Parameter	Specification
Rendering Image	4
Operating Voltage	12-58 V
Range of Perception	10 g - 2500 g
Degrees of Freedom	Total: 7 - Thumb: 3 active degrees of freedom - Index Finger: 2 active degrees of freedom - Middle Finger: 2 active degrees of freedom
Angle of Joint	Thumb: 0°~+100°, -35°~+60°, -60°~+60° Index Finger and Middle Finger: 0°~+90°, 0°~+100°
Number of Array Sensors	9

Five-Fingered Dex Hand

The RH56 series Inspire robotic hands, comprising the RH56BFX and RH56DFX models, are designed for seamless integration with humanoid robots like the G1. With support for the RS485 communication interface, these hands are fully compatible with popular robotics platforms, including ROS (Robot Operating System). Their precise control, 6 degrees of freedom, and 12-joint design allow for high-performance dexterity suited for tasks requiring precision and adaptability. The RH56 series ensures reliable operation with features like consistent repeatability (±0.20mm),

adjustable grip force, and flexible motion ranges, making them an ideal choice for humanoid robotics and other advanced robotic systems.

G1 Robot

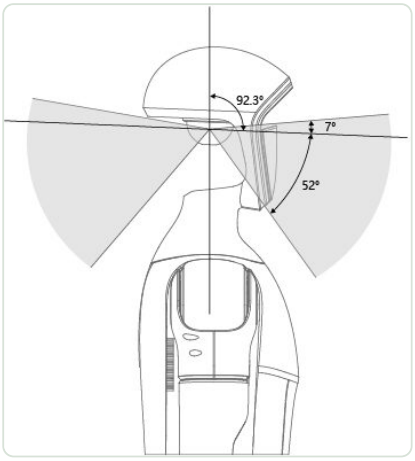
Parameter	RH56BFX Specification	RH56DFX Specification
Control Interface	RS485	RS485
Degrees of Freedom	6	6
Number of Joints	12	12
Weight	540g	540g
Operating Voltage	DC24V±10%	DC24V±10%
Quiescent Current	0.20A	0.20A
Peak Current	2A	2A
Repeatability	±0.20mm	±0.20mm
Maximum Thumb Grip	6N	15N
Maximum Palm Finger Grip	4N	10N
Force Resolution	0.50N	0.50N
Thumb Lateral **Rotation Range	> 65°	> 65°
Thumb Lateral **Rotation Speed	235°/s	107°/s
Thumb Bend Speed	150°/s	70°/s
Palm Finger Bend Speed	570°/s	260°/s

Radar and Camera FOV

The G1 robot is equipped with advanced sensory systems, including the LIVOX-MID360 laser radar and the D435i depth camera, which work in unison to provide superior environmental perception and spatial awareness.

LIVOX-MID360 Laser Radar

The LIVOX-MID360 laser radar is integrated into the G1 head, offering exceptional environmental sensing capabilities. This lidar employs omnidirectional and full-angle scanning technology, achieving a horizontal field of view (FOV) of up to 360° and a maximum vertical angle of 59°. These features enable the G1 to acquire precise, real-time environmental data and generate high-resolution point cloud information. The system rapidly detects and measures objects in its surroundings, ensuring accurate and comprehensive spatial awareness.

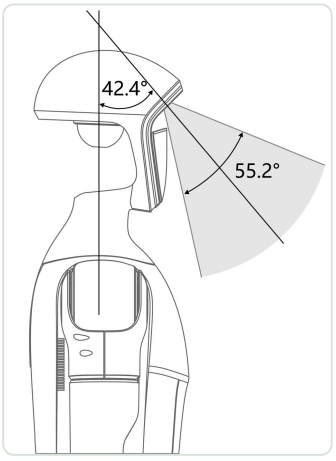


MID360 Laser Radar FOV

MID360 Laser Radar FOV

D435i Depth Camera

The G1 is also equipped with the D435i depth camera, enhancing its visual perception capabilities. This camera allows the robot to perceive and interpret its environment with greater accuracy, enabling precise spatial awareness and obstacle detection. These features facilitate intelligent and flexible interactions with the environment, allowing the G1 to adapt effectively to various scenarios.

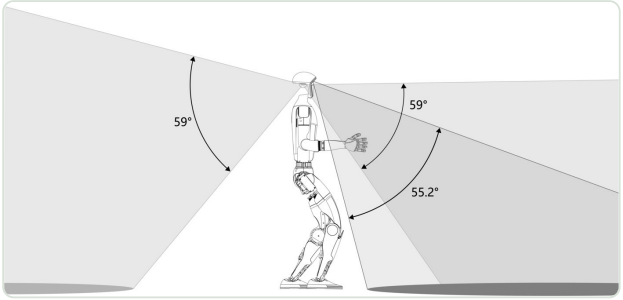


D435i Depth Camera FOV

D435i Depth Camera FOV

Combined FOV of MID360 and D435i

The integration of the LIVOX-MID360 laser radar and the D435i depth camera provides a merged field of view, enabling the G1 robot to achieve unparalleled environmental perception and adaptability. Together, these sensors ensure the G1 can operate effectively across diverse tasks and dynamic environments.



MID360 + D435i Merged FOV

MID360+D435i Merged FOV

Installation Holes

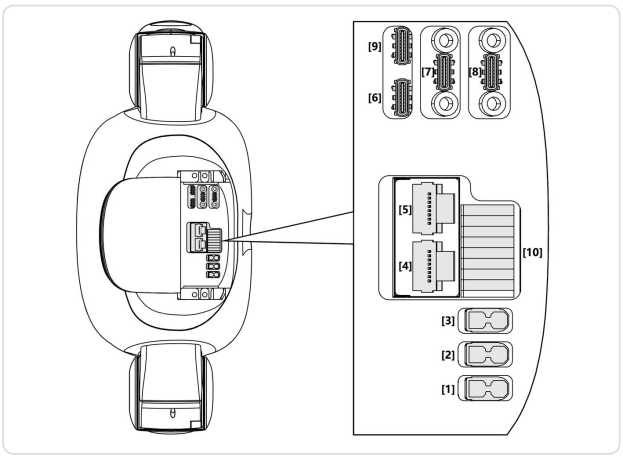
Unit: mm

To utilize the G1 mounting holes, ensure the label covering the holes is removed before installation.

G1 Mounting Holes Front	G1 Mounting Holes Back

Electrical Interface

The back of the G1 robot's neck is equipped with a range of electrical interfaces designed for connecting body joint motors, sensor peripherals, network ports, and more. This design simplifies debugging, troubleshooting, and secondary development, making the system highly versatile and user-friendly.



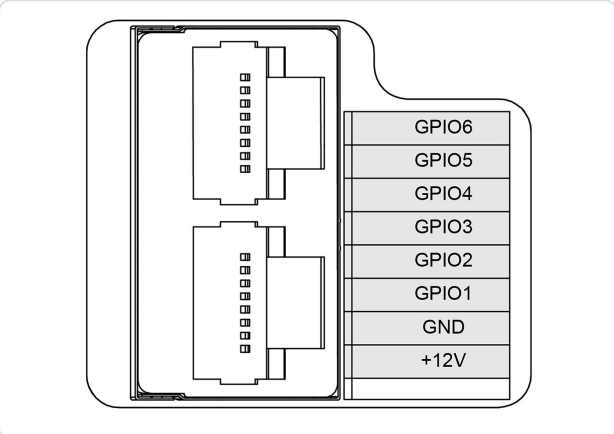
Top View of G1 Electrical Interface

Top View of G1 Electrical Interface

Below is a description of the connectors and their respective interface specifications:

No	Connector Name	Interface Description (Short)	Interface Specification
1	XT30UPB-F	VBAT	Battery power output (direct connection to battery)
2	XT30UPB-F	24V	24V/5A power output
3	XT30UPB-F	12V	12V/5A power output
4	RJ45	1000 BASE-T	Gigabit Ethernet (GbE)
5	RJ45	1000 BASE-T	Gigabit Ethernet (GbE)
6	Type-C	Type-C	Supports USB3.0 host, 5V/1.5A power output
7	Type-C	Type-C	Supports USB3.0 host, 5V/1.5A power output
8	Type-C	Type-C	Supports USB3.0 host, 5V/1.5A power output
9	Type-C	Alt Mode Type-C	Supports USB3.2 host and DP1.4
10	5577	I/O OUT	12V/3A power output

GPIO Details



G1 RJ45 and the IO Interface

G1 RJ45 and the IO Interface

Refer to the following table for GPIO configurations:

GPIO Number	NX Pin Number	Multiplexing Relationship	Debugfs File System Pin Name
GPIO1	203	UART1_TXD	GPIO3_PR.02
GPIO2	205	UART1_RXD	GPIO3_PR.03
GPIO3	232	I2C2_SCL	GPIO3_PI.03
GPIO4	234	I2C2_SDA	GPIO3_PI.04

GPIO5	128	GPIO	GPIO3_PCC.02
GPIO6	130	GPIO	GPIO3_PCC.03

Note: NVIDIA GPIO operations can be performed in various ways. For more information on NVIDIA GPIO definitions and usage, refer to the following documentation: NVIDIA Jetson Developer Guide .

On-Board Computer

The G1-EDU onboard system is equipped with one standard operation and control computing unit, along with one development computing unit.

Development Computing Unit (PC 2)

Parameter	Specification
Model	Jetson Orin NX
CPU	Arm® Cortex®-A78AE
Number of Cores	8
Number of Threads	8
Maximum Clock Speed	2 GHz
Graphics Memory	16 GB
Total Memory	16 GB
Cache	2 MB L2 + 4 MB L3
Storage	2 TB
Intel® Image Processing Unit	Not Present
GPU	1024 NVIDIA Ampere Architecture GPUs with 32 Tensor Cores
Maximum GPU Frequency	918 MHz
Gaussian and Neural Accelerator	3.0
Intel® Deep Learning Boost	Yes
Intel® Adaptix™ Technology	Yes
Intel® Hyper-Threading Technology	Yes
Instruction Set	64-bit
OpenGL	4.6
OpenCL	3.0

DirectX	12.1
IP Address	192.168.123.164

Attention: The Operation and Control Computing Unit is exclusively dedicated to the Unitree motion control program and is not accessible for public use. Developers are only permitted to utilize the Development Computing Unit for secondary development purposes. For access to the initial user password, please see FAQ. In the table, the PC2 [Development Computing Unit] is assigned the IP address 192.168.123.164 . Please note that the CPU modules may be shipped with a more advanced version, but the performance will meet or exceed the specifications listed above.

Joint Motor

The G1 joint motor utilizes a self-developed Unitree motor that demonstrates exceptional performance and characteristics. With a maximum torque of 120 N·m, the motor features a hollow axis design, contributing to a more compact and lightweight structure. Additionally, the motor is equipped with dual encoders, enabling precise position and velocity feedback, which is essential for high-precision control requirements.

Joint Serial Number and Limits

The following table provides the joint indices, names, and respective joint limits in radians:

Index	Joint Name	Limit (rad)
0	L_LEG_HIP_PITCH	-2.5307 ~ 2.8798
1	L_LEG_HIP_ROLL	-0.5236 ~ 2.9671
2	L_LEG_HIP_YAW	-2.7576 ~ 2.7576
3	L_LEG_KNEE	-0.087267 ~ 2.8798
4	L_LEG_ANKLE_PITCH	-0.87267 ~ 0.5236
5	L_LEG_ANKLE_ROLL	-0.2618 ~ 0.2618
6	R_LEG_HIP_PITCH	-2.5307 ~ 2.8798
7	R_LEG_HIP_ROLL	-2.9671 ~ 0.5236
8	R_LEG_HIP_YAW	-2.7576 ~ 2.7576
9	R_LEG_KNEE	-0.087267 ~ 2.8798
10	R_LEG_ANKLE_PITCH	-0.87267 ~ 0.5236
11	R_LEG_ANKLE_ROLL	-0.2618 ~ 0.2618
12	WAIST_YAW	-2.618 ~ 2.618
13	WAIST_ROLL	-0.52 ~ 0.52

14	WAIST_PITCH	-0.52 ~ 0.52
15	L_SHOULDER_PITCH	-3.0892 ~ 2.6704
16	L_SHOULDER_ROLL	-1.5882 ~ 2.2515
17	L_SHOULDER_YAW	-2.618 ~ 2.618
18	L_ELBOW	-1.0472 ~ 2.0944
19	L_WRIST_ROLL	-1.9722 ~ 1.9722
20	L_WRIST_PITCH	-1.6144 ~ 1.6144
21	L_WRIST_YAW	-1.6144 ~ 1.6144
22	R_SHOULDER_PITCH	-3.0892 ~ 2.6704
23	R_SHOULDER_ROLL	-2.2515 ~ 1.5882
24	R_SHOULDER_YAW	-2.618 ~ 2.618
25	R_ELBOW	-1.0472 ~ 2.0944
26	R_WRIST_ROLL	-1.9722 ~ 1.9722
27	R_WRIST_PITCH	-1.6144 ~ 1.6144
28	R_WRIST_YAW	-1.6144 ~ 1.6144

Reference Frame, Joint Axes, and Zero Position

When all joints are in their zero positions, the coordinate systems for the joints are as follows:

- The X-axis is represented in red .
- The Y-axis is represented in green .
- The Z-axis is represented in blue .

G1 23 DOF	G1 29 DOF

9 ROS 2 Package Reference

Packages

ROS2 Modules for G1

> **Note:** Please ensure that the arms are straight down when you power on the robot. If the orientation is different, it will affect the ROS2 control operation.

The ROS2 modules start drivers for operating G1 in high-level mode for legs and arms.

> **Important:** During initialization, the arms will move such that the forearms will face forward .

Launch G1 ROS2 Driver

The driver includes the following modules:

- Domain Bridge
- Joint States
- Robot Description
- Arm Control
- Leg Control (High-level)
- Inertial Measurement Unit Publisher
- Sensor Fusion
- Twist Mux
- Logitech F710 Control
- D435i Depth Camera Driver
- Livox Mid360 Lidar Driver

These modules can also be viewed, activated, or deactivated from the Webserver .

```
ros2 launch g1_platform highlevel_ros.launch.py
```

Core Launch Files

These launch files can also be managed from the webserver. Ensure the Webserver is running. Follow the installation procedure first.

```
ros2 launch g1_platform highlevel_ros.launch.py
ros2 launch g1_platform domain_bridge.launch.py
ros2 launch g1_platform state_publisher.launch.py
ros2 launch g1_webserver webserver.launch.py
ros2 launch g1_control twistmux.launch.py
ros2 launch g1_lidar livox_mid360.launch.py
```

```
ros2 launch g1_platform audio.launch.py
ros2 launch g1_platform led.launch.py
ros2 launch g1_platform videostream.launch.py
```

Arms 7Dof Core Launch Files

```
ros2 launch g1_description g1_29_description.launch.py
ros2 launch g1_platform arm_7dof.launch.py
```

Arms 5Dof Core Launch Files

```
ros2 launch g1_description g1_23_description.launch.py
ros2 launch g1_platform arm_5dof.launch.py
```

G1 Modes Selection

Posture & State Commands

The table below lists commands for controlling the robot's posture and state:

Command	Description
damp	Set all motors to damping mode.
start	Start locomotion control.
squat	Transition to squat posture.
sit	Sit down.
stand_up	Stand up from sitting/squatting.
zero_torque	Disable torque on all motors.
stop_move	Stop all motion immediately.
high_stand	Stand at high position.
low_stand	Stand at low position.
balance_stand	Stand with balance mode active.
shake_hand	Perform handshake sequence (auto-start and stop).
wave_hand	Perform wave motion.
wave_hand_with_turn	Wave hand and turn simultaneously.

Setter Commands (Change Robot State)

Command	Parameters
set_fsm_id=<id>	Integer FSM ID to switch to.

set_balance_mode=<0/1>	Enable (1) or disable (0) balance mode.
set_swing_height=<value>	Set swing height in meters.
set_stand_height=<value>	Set stand height in meters.
set_velocity="vx vy ω [duration]"	Set velocity (m/s, m/s, rad/s, [duration in s]).
move="vx vy ω"	Command motion without duration.
set_task_id=<id>	Set active task ID.
set_speed_mode=<mode>	Change locomotion speed mode.

Getter Commands (Query Current Robot State)

Command	Returns
get_fsm_id	Current finite state machine ID.
get_fsm_mode	Current FSM mode.
get_balance_mode	Current balance mode (0/1).
get_swing_height	Current swing foot height.
get_stand_height	Current standing height.
get_phase	Current gait phase vector.

Toggle Commands

Command	Parameters	Description
continous_gait=<true/false>	bool	Enable or disable continuous gait mode.
switch_move_mode=<true/false>	bool	Switch between movement mode and standing mode.

G1 Mode Examples

Start the robot

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "start"}'
```

Shake hand

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "shake_hand"}'
```

Wave hand

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "wave_hand_with_turn"}'
```

Set swing height

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "set_swing_height=0.12"}'
```

Move forward

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "set_velocity=0.3 0.0 0.0 2.0"}'
```

Query current FSM mode

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "get_fsm_mode"}'
```

Enable continuous gait

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware_modes g1_interface/srv/G1Modes \
'{"request_data": "continous_gait=true"}'
```

G1 LED Selection

Set color

```
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=green'}"
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=red'}"
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=white'}"
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=blue'}"
```

Set color with hex and brightness

```
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=#00a0a0;brightness=60'}"
```

Set color with RGB

```
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'color=rgb(128,32,200)'}"
```

Query LED state

```
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'get_brightness'}"
ros2 service call /g1_unit_001/hardware/led g1_interface/srv/G1Modes "{request_data:
'get_color'}"
```

G1 Audio Selection

Set volume

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/audio g1_interface/srv/G1Modes "
{request_data: 'volume=80'}"
```

Speak English

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/audio g1_interface/srv/G1Modes "
{request_data: 'speak=Hello from MY BOT SHOP'}"
```

Volume + Text

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/audio g1_interface/srv/G1Modes "
{request_data: 'volume=100;speak= Hello from my bot shop. My name is Danny'}"
```

Get current volume

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/audio g1_interface/srv/G1Modes "
{request_data: 'get_volume'}"
```

Self Intro

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/audio g1_interface/srv/G1Modes "
{request_data: 'volume=100;speak= Hello from my bot shop. I am Danny, a compact humanoid
robot for research and education. My height is 1.32 meters, and my weight is 35 kg. I walk
up to 2 meters per second, climb stairs, and keep balance. Hehehe climbing stairs not
really. My base model has 23 degrees of freedom where as my educational + version has 43
degrees of freedom. I have 3D liDAR specifically Livox Mid360 and depth camera Intel
RealSense D435i. Battery lasts about 2 hours +'}"
```

Note: More info on these commands is available in the Unitree documentation.

Robot Description

The G1 robot description package is named g1_description . It contains the URDF and mesh files necessary to visualize and simulate the G1 robot in various ROS2 tools.

Twist Mux

The twist mux package for the G1 is named g1_control . It manages multiple velocity command inputs and prioritizes them to ensure smooth and safe robot operation.

EKF Localization

The Extended Kalman Filter (EKF) localization package for the G1 is named g1_control . It fuses sensor data to provide accurate and reliable robot pose estimates.

Teleoperation

Command Line Interface

This requires installation of the ROS2 modules on G1. If not installed, please follow the G1 Auxiliary PC Installation guide.

```
ROS_DOMAIN_ID=10 ros2 run teleop_twist_keyboard teleop_twist_keyboard --ros-args --remap
cmd_vel:=/$G1_NS/hardware/cmd_vel
```

Steamdeck

1. Please follow the instructions carefully in here to start the G1 Steamdeck .
2. Connect to the custom router of the G1, it may take a few minutes on startup of the robot.

- The IP of the steamdeck is 192.168.123.150
- The IP of the router is 192.168.123.100
- The IP of the Unitree G1 is 192.168.123.18

1. Once the joystick is opened hold L1 and use the left and right joystick to move the robot.
2. The web browser will automatically open and take you to https://192.168.123.18:9000 .
3. The drivers on G1 are off by default. You can click on restart all to start all ROS2 services enabling control via the steamdeck+ros2 .

Visualization

RViz2

You can view the G1's current state by entering the following command in one of the SSH sessions:

```
ros2 launch g1_viz view_robot.launch.py
```

Manipulation

G1 Arm ROS2 Control

Start the arms (Mandatory)

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/control/arm_dof7/start
std_srvs/srv/Trigger {}
```

Stop the arms (Mandatory)

```
ROS_DOMAIN_ID=10 ros2 service call /g1_unit_001/hardware/control/arm_dof7/stop
std_srvs/srv/Trigger {}
```

Move dual arms

Will wave on spot — clear the area around the G1.

```
ROS_DOMAIN_ID=10 ros2 action send_goal /g1_unit_001/dual_arm/follow_joint_trajectory
control_msgs/action/FollowJointTrajectory "{
  trajectory: {
    joint_names: [
      \"left_shoulder_pitch\",\"left_shoulder_roll\",\"left_shoulder_yaw\",
      \"left_elbow\",\"left_wrist_roll\",\"left_wrist_pitch\",\"left_wrist_yaw\",
      \"right_shoulder_pitch\",\"right_shoulder_roll\",\"right_shoulder_yaw\",
      \"right_elbow\",\"right_wrist_roll\",\"right_wrist_pitch\",\"right_wrist_yaw\"
    ],
    points: [
      { positions: [0.0, 0.2, 0.0, 1.57, 0.0, 0.0, 0.0,   0.0, -0.2, 0.0, 1.57, 0.0, 0.0,
0.0],
        time_from_start: {sec: 2, nanosec: 0} },
      { positions: [0.0, 1.57, 1.57, -1.57, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.57, 0.0,
0.0, 0.0],
        time_from_start: {sec: 4} },
      { positions: [0.0, 1.57, 1.57, -1.0, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.0, 0.0,
0.0, 0.0],
        time_from_start: {sec: 6} },
      { positions: [0.0, 1.57, 1.57, -1.57, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.57, 0.0,
0.0, 0.0],
        time_from_start: {sec: 8} },
      { positions: [0.0, 1.57, 1.57, -1.0, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.0, 0.0,
0.0, 0.0],
        time_from_start: {sec: 10} },
      { positions: [0.0, 1.57, 1.57, -1.57, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.57, 0.0,
0.0, 0.0],
        time_from_start: {sec: 12} },
      { positions: [0.0, 1.57, 1.57, -1.0, 0.0, 0.0, 0.0,   0.0, -1.57, -1.57, -1.0, 0.0,
0.0, 0.0],
        time_from_start: {sec: 14} },
      { positions: [0.0, 0.2, 0.0, 1.57, 0.0, 0.0, 0.0,   0.0, -0.2, 0.0, 1.57, 0.0, 0.0,
0.0],
        time_from_start: {sec: 16, nanosec: 0} }
    ]
  }
}"
```

Move left arm

```
ROS_DOMAIN_ID=10 ros2 action send_goal /g1_unit_001/left_arm/follow_joint_trajectory \
  control_msgs/action/FollowJointTrajectory \
  "{trajectory: {
      joint_names: [
        left_shoulder_pitch, left_shoulder_roll, left_shoulder_yaw,
        left_elbow, left_wrist_roll, left_wrist_pitch, left_wrist_yaw
```

```
      ],
      points: [
        {positions: [0.0, 0.2, 0.0, 1.57, 0.0, 0.0, 0.0],
         time_from_start: {sec: 2, nanosec: 0} }
      ]}}"
```

Move right arm

```
ROS_DOMAIN_ID=10 ros2 action send_goal /g1_unit_001/right_arm/follow_joint_trajectory \
  control_msgs/action/FollowJointTrajectory \
  "{trajectory: {
      joint_names: [
        right_shoulder_pitch, right_shoulder_roll, right_shoulder_yaw,
        right_elbow, right_wrist_roll, right_wrist_pitch, right_wrist_yaw
      ],
      points: [
        {positions: [0.0, -0.2, 0.0, 1.57, 0.0, 0.0, 0.0],
         time_from_start: {sec: 2, nanosec: 0}}
      ]}}"
```

Navigation

Simultaneous Localization and Modulation

Ensure g1_bringup is running, then launch:

```
ros2 launch g1_navigation slam.launch.py
```

Begin mapping using teleop at 2 m/s. Once mapping is complete, save the map:

```
ros2 run nav2_map_server map_saver_cli -f map_
```

Rebuild workspace:

```
colcon build --symlink-install --cmake-args -DCMAKE_BUILD_TYPE=Release
```

Odometry Navigation

The odometry-based navigation is launched by executing:

```
ros2 launch g1_navigation odom_navi.launch.py
```

Map Navigation

The map-based navigation is launched by executing also ensure a map is generated and built in the ROS package, then launch:

```
ros2 launch g1_navigation map_navi.launch.py
```

Sensors

Depth Cameras

Intel Realsense D435i

- The D435i is launched by default with the G1 bringup. To launch the Realsense D435i separately, execute: ros2 launch g1_depth_camera realsense_d435i.launch.py
- Test the native driver via:

```
ros2 launch realsense2_camera rs_launch.py depth_module.depth_profile:=1280x720x30
pointcloud.enable:=true
```

Lidars

Livox Mid360

- The Mid360 is launched by default with the G1 bringup. To activate the Mid360 Lidar, execute: ros2 launch g1_livox system.launch.py

Simulation

Gazebo

Work in progress: Gazebo simulation for G1 is under development and will be available soon.

Isaac Sim

Available in Isaac Lab directly.

Debugging

Debugging Tips

When running RQt GUI with multiple robots in the same network, it's important to set a unique ROS_DOMAIN_ID for each robot to avoid communication conflicts. You can do this by exporting the ROS_DOMAIN_ID environment variable before launching RQt GUI. For example, to set the domain ID to 10, use the following command:

```
ROS_DOMAIN_ID=10 ros2 run rqt_gui rqt_gui --ros-args --remap tf:=/$g1_ns/tf --ros-args --
remap tf_static:=/$g1_ns/tf_static
```

This command ensures that RQt GUI communicates with the robot assigned to domain ID 10, preventing interference from other robots on the network.

Dynamic Reconfigure

To adjust parameters on-the-fly using dynamic reconfigure, you can use the following command:

```
ROS_DOMAIN_ID=10 ros2 run rqt_reconfigure rqt_reconfigure --ros-args --remap tf:=/$g1_ns/tf
```

```
--ros-args --remap tf_static:=/$g1_ns/tf_static
```

TF Tree

To visualize the TF tree of the G1 robot, you can use the following command:

```
ROS_DOMAIN_ID=10 ros2 run rqt_tf_tree rqt_tf_tree --force-discover --ros-args --remap
tf:=/$g1_ns/tf --ros-args --remap tf_static:=/$g1_ns/tf_static
ROS_DOMAIN_ID=10 ros2 run tf2_tools view_frames.py --force-discover --ros-args --remap
tf:=/$g1_ns/tf --ros-args --remap tf_static:=/$g1_ns/tf_static
```

Video stream

To view the video stream from the G1's camera, you can use the following command:

```
gst-launch-1.0 udpsrc address=230.1.1.1 port=1720 multicast-iface=eth0 ! \
      application/x-rtp, media=video, encoding-name=H264 ! \
      rtph264depay ! queue max-size-buffers=1 ! h264parse ! queue ! avdec_h264 ! \
      videoconvert ! autovideosink
```

Miscellanious

Computer - Robot Synchronization

```
rsync -avP -t --delete -e ssh src unitree@192.168.123.164://opt/mybotshop
```

Low-Level Control

The low-level control for the G1 can be directly accessed via Unitree's provided examples in their documentation . Running the provided qre_g1 driver with the low-level commands from Unitree examples should work concurrently.

Installation

Installation Robot

> **Note:** This repository should already be available and built on the G1's Nvidia board if it has been configured by the MYBOTSHOP team.

1. Clone this repository into the G1's Nvidia board.
2. Run the bash install script.
3. Build the repository by executing the following command: colcon build --symlink-install && source install/setup.bash
4. After building, remember to source the install/setup.bash . Ensure you add the source command to your workspace in the .bashrc file.

Installation External

Note: Important: This process is necessary to enable Unitree SDK's DDS topics to appear. Without these steps, only the MYBOTSHOP package ROS2 topics will be visible. You can skip this procedure if you do not need the Unitree topics.

Part 1

1. Navigate to the unitree_sdk2 folder inside the thirdparty directory and execute the installation script: cd thirdparty/unitree_sdk2 sudo bash install.sh
2. Build the examples: rm -rf build && mkdir build && cd build && cmake .. && make
3. You can now directly run high-level and low-level examples as explained in the Unitree G1 SDK documentation.

Part 2

Requirements: ROS2 Foxy on Ubuntu 20.04 .

1. Install the necessary dependencies: sudo apt install ros- $ROS_DISTRO -rmw-cyclonedds-cpp ros- $ROS_DISTRO -rosidl-generator-dds-idl -y
2. Unsource ROS Foxy in the terminal (i.e., by commenting out the sourcing command in the .bashrc file).
3. Build Cyclone DDS: colcon build --packages-select cyclonedds
4. Install other dependencies by running the provided install script: sudo chmod +x g1_install.bash && ./g1_install.bash
5. Source the environment: source install/setup.bash source /opt/ros/foxy/setup.bash
6. Build the repository: colcon build --symlink-install

Network Setup

1. Connect to the 123 network using a static IP (No DHCP, as it disrupts the network).
2. Note down the network interface name (e.g., eth0).
3. Edit and source the g1_bringup/config/setup.bash file with the corrected network interface. For example: #!/bin/bash echo "Setup Unitree ROS2 environment" source /opt/ros/foxy/setup.bash source $HOME /ros2_ws/install/setup.bash export RMW_IMPLEMENTATION = rmw_cyclonedds_cpp export CYCLONEDDS_URI = '<CycloneDDS><Domain><General> <Interfaces> <NetworkInterface name="eth0" priority="default" multicast="default" /> </Interfaces></General></Domain></CycloneDDS>'
4. Add the above to your .bashrc file for persistence.

Verification

1. Check the available ROS2 topics: ros2 topic list
2. Echo a specific topic (e.g., /lowstate): ros2 topic echo /lowstate

10 Getting Help & RMA

RMA / Support

How to Raise a Return Merchandise Authorization (RMA) Case

At QUADRUPED Robotics, we are committed to providing excellent support to ensure your issues are resolved promptly. If you encounter any problems with our products, please follow the steps below to raise a Return Merchandise Authorization (RMA) case:

Step 1: Open a Topic in Our Forum

1. Visit MYBOTSHOP Forum .
2. Open a new topic describing your issue in detail. Our support team and community members will attempt to assist you in resolving the problem remotely.

Step 2: Contact Support for RMA Number

If the issue cannot be resolved remotely through our forum:

1. Email us at support @ quadruped . de .
2. Provide a detailed description of the issue and include any troubleshooting steps already taken.
3. Our support team will evaluate your case and, if necessary, issue a RMA number along with a return address or a shipping label.

Important Shipping Information

Note: Please note: All goods must be sent back to the following address: QUADRUPED Robotics GmbH c / o MYBOTSHOP GmbH Willy - Messerschmitt - Strasse 12 50126 Bergheim Germany Do not ship goods without obtaining a RMA number. Parcels sent without a RMA number will be declined and returned to the sender. Do not ship goods to QUADRUPED Robotics GmbH Office in Leverkusen!

Help Resources

In case of any issues, help can be taken from any of the following forums/resources:

1. MYBOTSHOP Forum : The forum is actively monitored by support teams at MYBOTSHOP GmbH .
2. Github Issues : Issues can be reported in the repository.
3. Online QA Sites: Questions can be asked on any of the QA sites like StackOverflow and Answers ROS .

11 Getting Involved

Getting Involved

The software provided are Opensource, so contributions from community are welcome on our Github repository

12 FAQ

Frequently Asked Questions

(Coming Soon)