

TRON 2 Autonomous Charging Dock User Manual

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Revision History

Version	Date	Author	Change Description
v1.0	2026-09-03	Yuna	First draft

Safety and Responsibility Guidelines

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To avoid illegal acts, possible injury, and losses, please strictly observe the following requirements:

1. Read this manual carefully before using the product. Make sure you understand the safety information and your responsibilities as an operator.
2. By using this product, you acknowledge that you have read and understood these requirements. Always operate the product in accordance with this manual and applicable laws.
3. This product is not a toy and is not intended for use by anyone under 18 years of age. Keep it out of the reach of children.
4. During docking, keep hands, feet, and foreign objects out of the docking area. To the fullest extent permitted by applicable law, LimX Dynamics is not liable for injury or loss caused by misuse or failure to follow these instructions.
5. Installation, wiring, and maintenance of the charging dock must be performed by qualified personnel. Do not disassemble the enclosure, circuitry, or internal components unless you are authorized and qualified to do so. Unauthorized disassembly, modification, or repair may result in injury or damage, may void the warranty, and, to the fullest extent permitted by applicable law, is performed at the user's own risk.
6. Use only the original power cord and adapter. Verify that the supply voltage is within the rated input range of 100–240 V AC. Do not short-circuit, disable, or bypass this safety mechanism. Reverse polarity, short-circuit, overvoltage, and overcurrent protection automatically disable the output when a fault is detected. If you notice smoke, an unusual odor, overheating, or enclosure damage, disconnect the power immediately, stop using the product, and contact LimX Dynamics Customer Support.
7. Do not use or store the product in extreme temperatures or in areas exposed to corrosive chemicals, standing water, excessive humidity, flammable or explosive materials, or strong electromagnetic

interference. Install the charging dock indoors on a dry, level, stable, and non-slip surface, and secure it in place. Do not move the dock while it is operating. Disconnect the power before moving it. Avoid prolonged storage or operation in direct sunlight. Damage caused by use or storage outside these conditions may not be covered by the warranty, except where coverage is required by applicable law.

8. Keep the charging contacts clean and dry. Do not allow metal objects or standing water to contact them, as this may cause a short circuit. Do not cover the Status Indicator Light or QR Codes.
9. Do not use the charging dock with any device other than a TRON 2 robot in the Wheeled-legs Configuration.
10. Normal wear of components and charging contacts, and normal battery aging, are not considered product defects and are not covered by the warranty unless otherwise required by applicable law.
11. Do not use this product for any unlawful or prohibited end use, including support for terrorism; use in nuclear facilities; or the research, development, production, design, or use of chemical, biological, or other weapons of mass destruction.
12. Do not purchase, receive, or use this product where doing so is prohibited by applicable trade restrictions or sanctions.
13. Comply with all laws, regulations, and other requirements that apply where the product is installed or used.
14. Do not export, re-export, or transfer this product, its software, or related technology in violation of applicable export control laws and regulations.
15. Use this product only for lawful and legitimate purposes.
16. LimX Dynamics may revise this manual and these terms from time to time. Any revision applies only to the extent permitted by applicable law. Nothing in this manual excludes or limits rights or remedies that cannot lawfully be excluded or limited.

1 Product Overview

1.1 Introduction

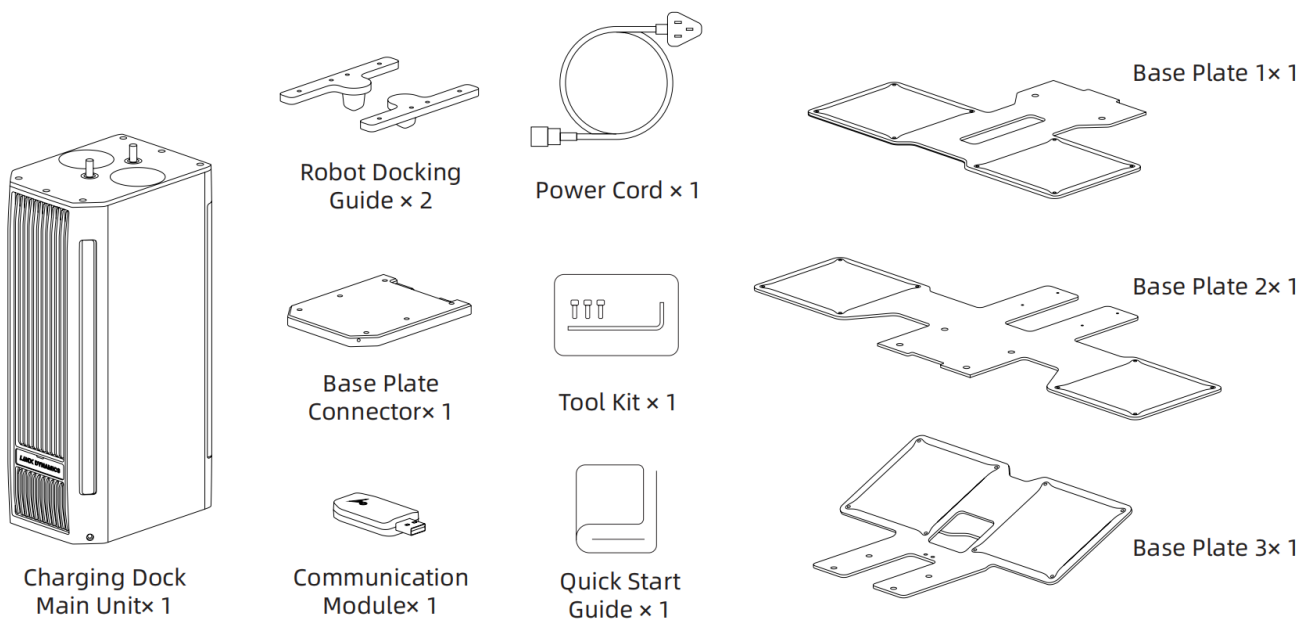
The TRON 2 Autonomous Charging Dock is a contact-based charging solution for the TRON 2 robot in the Wheeled-legs Configuration. It combines dock hardware, near-field autonomous docking, charge management, and SDK interfaces, allowing the robot to complete the entire return, docking, charging, and undocking cycle without manual connection of a charging cable.

1.2 Features

- Contact-based charging: the charging contacts on top of the dock align with the contacts on the underside of the robot.
- Uses guide slots, rails, and other physical guidance structures to help the robot align precisely.

- Near-field Autonomous Charging Algorithm: within 200–650 mm in front of the dock, the robot autonomously detects, locates, approaches, and docks with the charging dock.
- Supports Low-Light Charging; the dock's illumination lights assist when needed and turn off automatically once docking is complete.
- Monitors charging status and detects faults throughout the charging process. Charging stops automatically when the battery is full, and the dock maintains a full charge while the robot remains docked.
- Provides comprehensive electrical safety features, including Anti-Arc Protection, Output Short-Circuit Protection, Reverse Polarity Protection, Output Overvoltage Protection, Output Overcurrent Protection, and protection against charging devices other than TRON 2.
- Provides SDK interfaces for starting a charging cycle, canceling a charging cycle, leaving the dock, querying battery information, querying charging status, and reporting faults.
- Uses a Bluetooth ID pairing mechanism to precisely target a specific dock in multi-dock environments.

1.3 Packing List



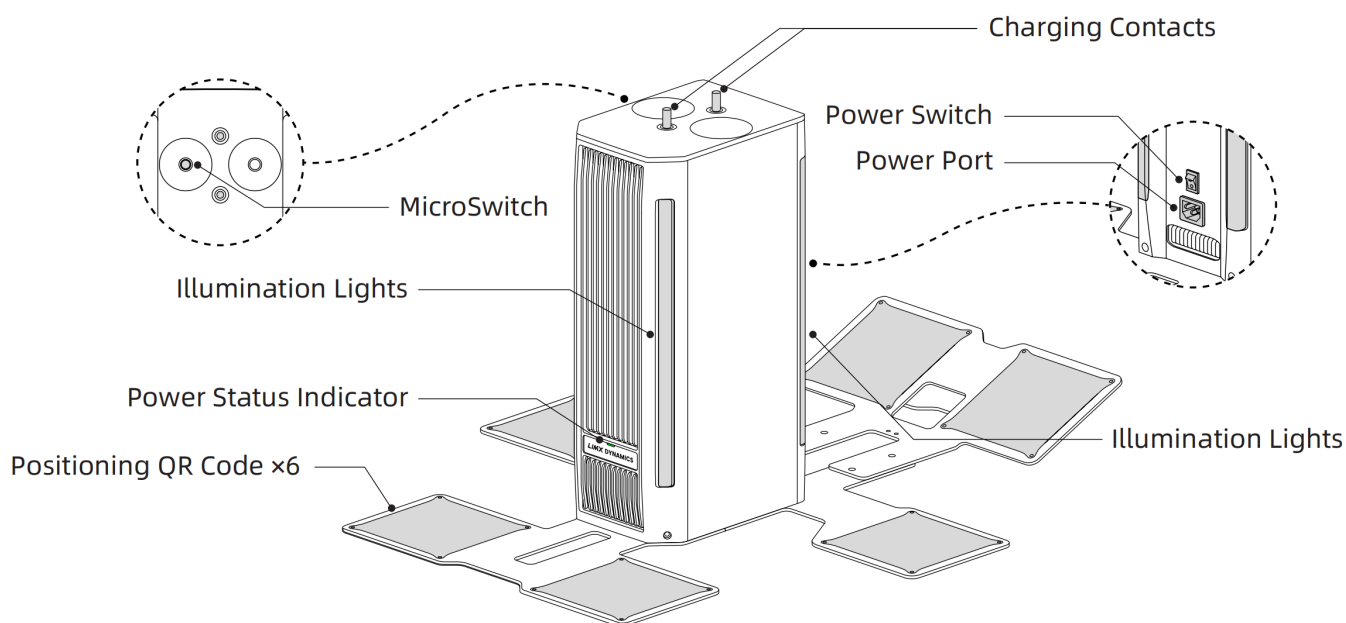
Refer to the packing list included in the box for the actual contents. After unpacking, check the contents; if anything is missing or damaged, contact customer support.

1.4 Specifications

Category	Item	Specification
General Information	Compatible Model	TRON 2 robot in the Wheeled-legs Configuration only
	Applicable Ground	Flat, level ground
	Overall Dimensions	600 × 721 × 423 mm
	Dimensions with Robot Docked	600 × 721 × 692 mm
	Material	Steel, aluminum alloy, copper, engineering plastic
Features & Performance	Autonomous Charging Algorithm	Supported
	Low-Light Charging	Supported
	Effective Docking Range	Distance: 200–650 mm Angle: within the 180° area in front of the charging dock
	Average Docking Time	≤ 30 s
	SDK Interfaces	Provides interfaces for starting a charging cycle, leaving the dock, battery information, charging status, and fault reporting
Electrical Parameters	Rated Input Voltage	100–240 V AC
	Maximum Input Current	8 A
	Maximum Output Voltage	54.2 V
	Maximum Output Current	10 A
	Charging Time (tested at an ambient temperature of 15–25 °C)	20% → 80%: approx. 31 min 20% → 100%: approx. 66 min

Category	Item	Specification
Safety Protections	Reverse Polarity Protection	The charger automatically shuts off if the battery's positive and negative terminals are connected in reverse to the charger output
	Output Short-Circuit Protection	The charger automatically shuts off if the output is short-circuited
	Output Overvoltage Protection	The charger shuts off the output when the DC output voltage exceeds $1.05 \times V_{out}$
	Output Overcurrent Protection	The charger shuts off the output when the output current exceeds $1.1 \times I_{out}$
	Anti-Arc Protection	The charging contacts are energized only after the MicroSwitch confirms that they are properly engaged
Other	Warranty Period	12 months

1.5 Dock Components and Interfaces



2 Installation Guide

Follow the installation video below to install the charging dock and the robot-side accessories.

3 Operating Status

3.1 Power Indicator Light

The front of the charging dock has a power indicator that shows the dock's current operating status.

Indicator Status	Meaning
Steady green	Powered on and idle; or the robot is docked and the battery is fully charged
Steady orange	Charging in progress
Flashing red	Dock fault detected

3.2 Illumination Lights

Four illumination lights on the front of the charging dock assist the robot's visual positioning. They light up only during the Docking and Undocking processes and stay off at all other times.

- Once docking is complete and the robot enters the Docked Charging state, the lights turn off automatically.
- They light up again when undocking begins, then turn off once the robot has left the dock.

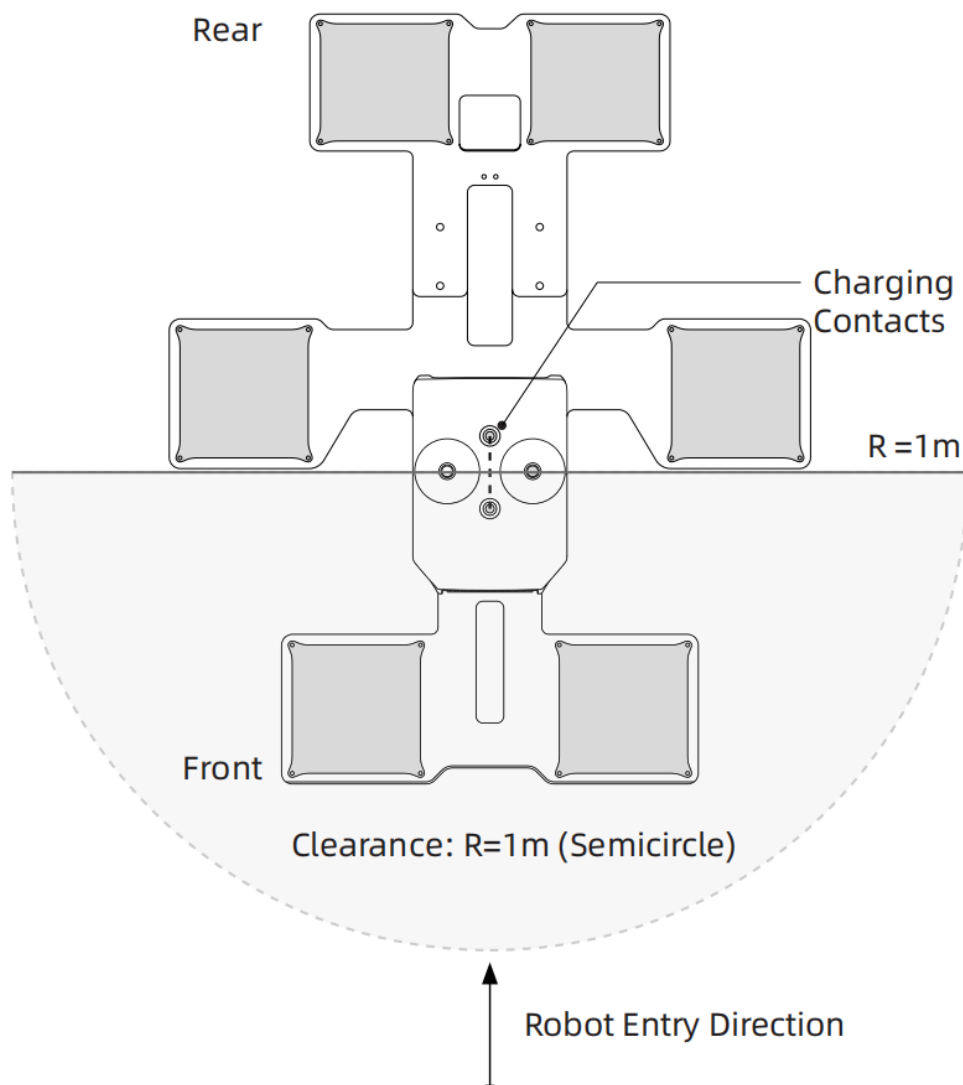
4 Usage Instructions

4.1 Preparation Before Use

4.1.1 Environment Requirements

To ensure a high docking success rate and safe operation, the location where the dock is installed must meet the following spatial and environmental requirements.

- **Space requirements:** Keep the 1 m-radius semicircular area in front of the dock clear, using the center of the charging contacts as the center of the semicircle. Do not place boxes, equipment, cables, or other obstacles in this area, as they may obstruct the robot's navigation and docking path.



- **Floor requirements:** The installation floor must be flat and solid, dry, free of standing water or oil stains, with nothing wedged between the base plates and the floor.
- **Lighting requirements:** The docking system operates reliably in dim or low-light conditions. Strong direct light, including direct sunlight or high-intensity lighting, may interfere with visual localization and cause docking to fail. Install the charging dock away from strong direct light.

4.1.2 First-Time Setup

1. **Power on the dock:** Confirm that the charging dock has been installed, secured, and wired, and that it is powered on (the indicator shows steady green).
2. **Prepare the robot:** Confirm that the robot has sufficient battery charge and is powered on, and that the Bluetooth communication module on its back is installed and the robot is ready to receive remote-control or API commands.
3. **Position the robot:** Move the robot to a location 200–650 mm in front of the charging dock, within 180° of the dock's front face.

4. **Charging Dock Spacing:** Adjacent docks must be at least 1.1 m apart laterally and 1.4 m apart longitudinally, measured center to center between the Charging Contacts.

4.2 Getting the Charging Dock's Bluetooth ID

Each charging dock has a unique Bluetooth ID in the format `TR0N2A_DOCK_XXXX`. You can obtain it by scanning the QR Code on the back of the dock or the QR Code on the device nameplate.

4.3 Docking and Undocking

The charging cycle consists of docking and undocking. During docking, the robot autonomously approaches the charging dock, aligns itself, and lowers itself onto the dock to enter the **Docked Charging** state. During undocking, the robot rises, leaves the dock, and returns to a standing position on level ground. Both actions can be triggered using the remote controller or API.

Two trigger methods

- **Remote controller trigger:** Used for on-site demonstrations, manual intervention, and manual testing. The operator triggers it directly by pressing buttons on the handheld remote controller.
- **API trigger:** Used for 24/7 autonomous inspection. Triggered by the customer's inspection/dispatch platform or by the robot's own logic, in scenarios such as low battery, task completion, or remote recall.

4.3.1 Triggering via Remote Controller

Use the remote controller buttons to start docking or undocking. Docked Charging begins automatically after docking and does not require a separate button command.

Action	Buttons	Screen Display	Description
Docking	L2 + X	Docking	The robot autonomously approaches the dock, moves into position, and slowly lowers itself onto the physical guide structure for final alignment. Before docking, position the robot 200–650 mm in front of the charging dock.
Docked Charging	—	Charging	The charging dock indicator shows steady orange
Undocking	L2 + □	Undocking	The robot stands up and leaves the charging dock. Once finished, it stands in place awaiting further commands.

Tip: After pressing a remote controller button, if nothing seems to happen right away, wait a few seconds.

When multiple charging docks are present, triggering a charge via the remote controller automatically connects to the paired default dock. If no default dock has been set, the robot may connect to the wrong dock; pair the dock in Studio first.

The visual Bluetooth pairing panel in Studio is currently under development and will be available in an upcoming release.

4.3.2 Triggering via API

Recharging commands can be sent through the SDK or API. Each command must include the target dock's Bluetooth ID in the format `TRON2A_DOCK_XXXX`, allowing the robot to identify and activate the correct dock.

For the full list of interfaces and typical use cases, see the [TRON 2 SDK Development Guide](#) and look for the section on the charging dock.

4.4 Docked Charging

1. Once the robot has successfully docked with the charging dock, the charger begins delivering power and charging starts.
2. After charging begins, the leg motors enter the Damping State, allowing the robot to settle naturally onto the dock.
3. Charging stops when the battery reaches 100%. While the robot remains docked, the charging system maintains a full charge automatically.

5 FAQ and Troubleshooting

Symptom	Possible Cause	Recommended Action
Robot does not detect the charging dock	The robot has not navigated into the 200–650 mm zone in front of the dock; something is blocking the line of sight between the dock and the robot; the dock is not powered on	Check the robot's starting position and remove any obstruction between the robot and the dock; confirm the dock is powered on (green indicator)
Robot loses track of the dock	Direct sunlight; sensor malfunction	Improve the lighting conditions and avoid direct sunlight; contact customer support if the issue persists

Symptom	Possible Cause	Recommended Action
Docking fails or the robot keeps readjusting	Uneven floor, dock misalignment, or obstructed positioning QR Codes	Check that the floor is level and the dock is securely fixed; clean the charging contacts; recalibrate the dock position
Indicator does not light up	Power is not connected; circuit breaker has tripped	Check the power wiring and circuit breaker; verify that the input voltage is within the rated range
Indicator flashes red	The charging dock has detected a fault	Disconnect the power and identify the cause before restoring power; contact Customer Support if the issue persists

6 Service, Warranty, and Maintenance

6.1 Routine Care

- When the enclosure is dirty, wipe it with a clean soft cloth. Do not use chemical cleaners or sprays, and always disconnect the power before cleaning.
- Inspect the charging contacts regularly. Keep them clean and free of corrosion and debris. Before cleaning, disconnect the power, then use a dry, soft cloth or a suitable electrical contact-cleaning tool.
- Before long-term storage, disconnect the power, clean the unit, and store it indoors in a dry environment free of corrosive gases and away from direct sunlight.

6.2 Warranty

Warranty period: 12 months from the date of purchase.

Warranty coverage: Defects in materials or workmanship that occur under normal use during the warranty period, subject to the applicable warranty terms.

Not covered by the warranty: Damage caused by unauthorized disassembly, modification, or installation of devices not approved by LimX Dynamics; failure to provide valid proof of purchase; or alteration or removal of product labels.

If a fault occurs, contact LimX Dynamics Customer Support and follow the instructions provided by the technical support team.