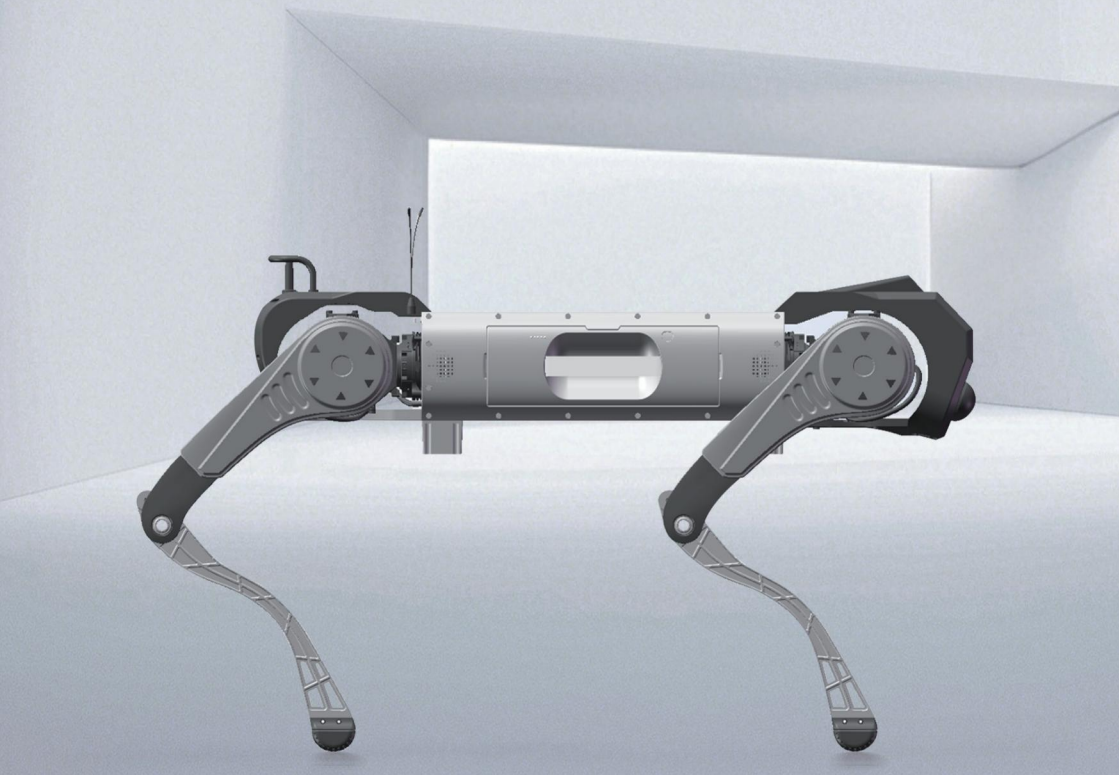
智元机器人

智元 D1 MaxPro

产　品　说　明　书



目录

法律声明

在使用本产品前，请用户务必仔细阅读本产品使用说明书,并严格按照本手册内容操作本产品。任何违反本手册内容使用而导致的财产损失或人身伤害，本公司概不负责。本产品由多个零部件构成，请确保儿童无法接触本产品，以避免意外发生。本产品仅限 18周岁以上人士使用。为延长产品使用寿命，请勿在高温、高压环境中使用。本手册尽可能包含本产品的功能介绍和使用说明，但由于功能不断完善和设计变更等原因，实物与手册内容可能存在偏差。如实物与本手册在颜色、外观等方面有出入，请以实物为准。

产品概述

D1 MaxPro（产品型号ZYCXD150M）是一款行业应用级四足机器人底盘，每条腿上有 3 个电机，共有 12 个自由度，具备行走、小跑、爬楼梯，跨壕沟等运动能力。本产品的主要特点是负载能力强，续航长，复杂地形的适应能力强。

A.负重能力：

主打大负重特性，平地长时负重可达 50 公斤，（爬楼梯、废墟场景、爬陡梯等非典型场景除外）站立负重更是高达 100 公斤，负重能力相较于前代提升 2.5 倍，能够满足诸如物资运输、工业搬运等重载需求场景。

B.自主巡逻与环境感知：

可依赖激光雷达实现自主巡逻功能，同时集成了激光雷达、头部摄像头、IMU 以及 GPS 等丰富传感器，能够在复杂环境下进行全方位的环境感知，构建地图并规划路径，适应如公安巡逻、水务巡检、石油巡检等不同场景的应用。

C.运动性能：

具备出色的运动灵活性，能灵活上下 45° 的楼梯，稳健攀爬镂空工业楼梯，越障能力突出，可跨越单台阶 30cm 的障碍。摔倒恢复机制成熟，摔倒爬起时间小于 20 秒，能在复杂地形或意外状况下快速恢复作业状态。其空载速度达到 3m/s ，可快速响应突发任务需求，深入复杂场景与作业盲区。

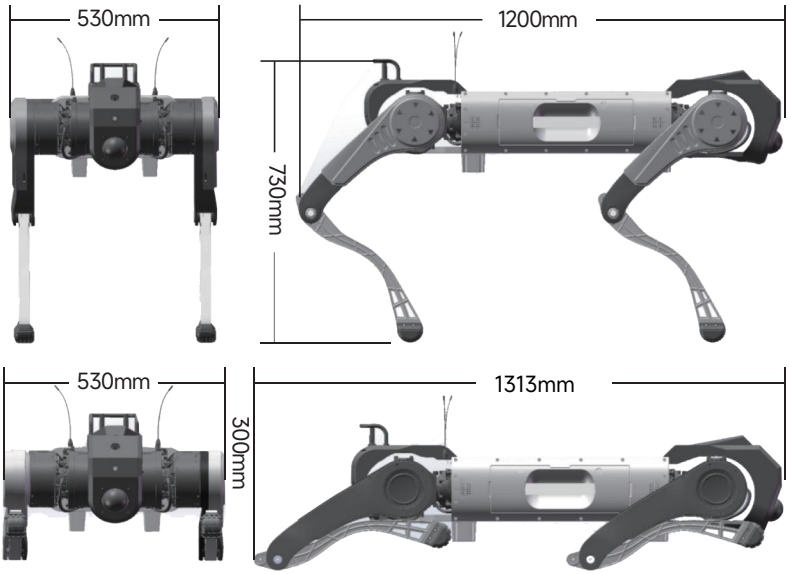
D.环境适应性：

拥有 IP67 工业级防护，能在 - 20°C至 55°C的宽泛温度区间以及涉水深度 20cm 的环境下正常作业，无惧极寒酷暑、风雨天气，保证在多种恶劣自然条件下稳定运行。

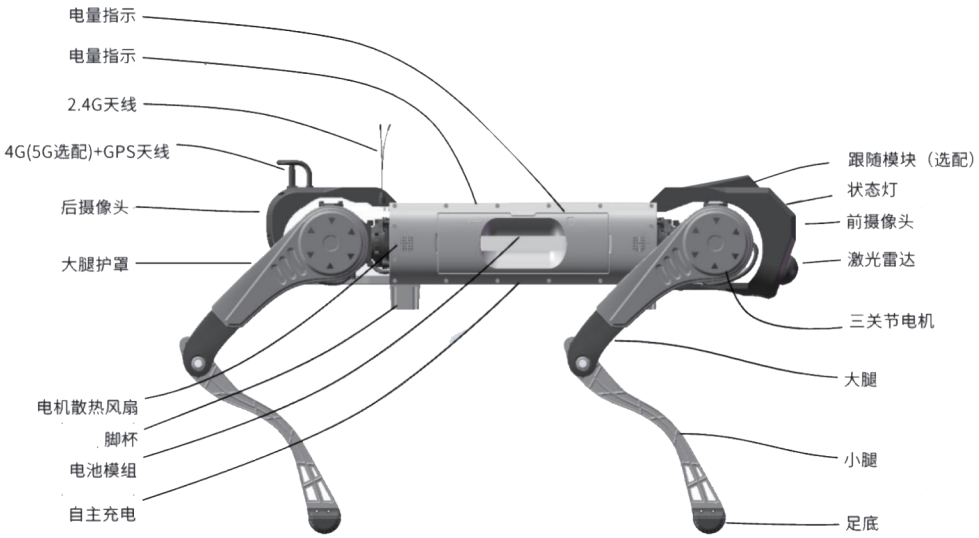
E.续航保障：

电池电量为 2160Wh ，负载续航时间提升 28%，且电池支持现场快速拆换，为特殊任务以及行业应用中的紧急情况提供有力续航保障，减少停机时间，提升工作效率。

产品尺寸


530mm
1200mm
730mm
530mm
1313mm
300mm

产品详情


电量指示
电量指示
2.4G天线
4G(5G选配)+GPS天线
后摄像头
大腿护罩
电机散热风扇
脚杯
电池模组
自主充电
跟随模块（选配）
状态灯
前摄像头
激光雷达
三关节电机
大腿
小腿
足底

产品参数

分类	规格	说明
基本参数	产品名称	D1 MaxPro
	站立尺寸（长宽高）	1200*530*730mm
	趴下尺寸（长宽高）	1313*530*300mm
	整机重量	68kg
	防尘防水	IP67
	工作温度	-20~55°C
电气参数	电池电量	2160Wh
	额定电压	48V
	电池容量	45Ah
	充电时间	4.5h（可选配 2h）
	快速换电	支持
	自主充电	选配
运动参数	持续行走速度	1.5m/s
	冲刺速度	3m/s
	持续行走续航（空载）	5.5h
	持续行走续航（负载）	2.5h
	持续负载	50kg
	可攀爬台阶高度	30cm
	可攀爬角度	45°

注释说明：

(1)充电时长数据为在标准环境温度 25°C 下测得；

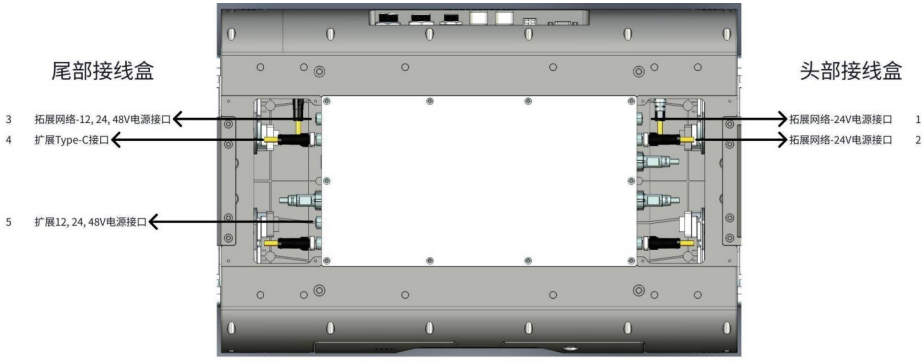
(2)续航里程数据为在速度1m/s，无负载工况下测得；

(3)功能拓展接口使用说明，详见拓展说明手册；

(4)详细的保修条款，详见产品保修手册；

(5)以上参数为实验室测试数据，实际表现可能因使用环境、操作方式等因素有所差异，请以实际为准。

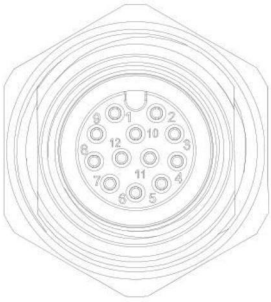
背部接口布局定义



备注：背部接口主要有两个模块，头部通讯接线盒和尾部电源接线盒

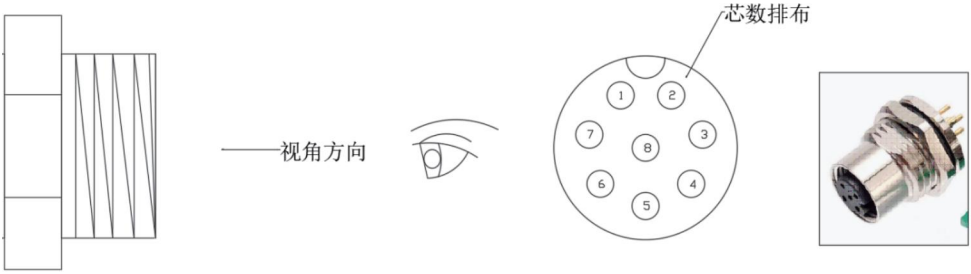
序号	接口	接口型号	对插型号	数量	功能
1	拓展网络接口	M12A-12P母头	M12A-12P公头	1	接头部双光云台通讯等+24V/3A 电源
2	拓展网络接口	M12A-8P母头	M12A-8P公头	1	接上装激光雷达通讯等+24V/3A 电源
3	扩展网络接口	M12A-17P母头	M12A-17P公头	1	接扩展网线 +24V/3A 电源
4	扩展 Type-C接口	Type-C 防水插座	USB Type-C	1	扩展 USB 3.1 10Gbps 接口
5	扩展 Type-C接口	M12K 母头	M12K 公头	1	给上装设备电源 12,24,48V/15A输出

头部接线盒 M12A-12P 母头航插接口定义



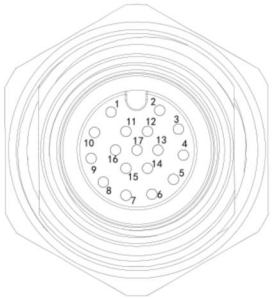
M12A 母头序号	定义	网线水晶头序号	功能
1	24V 正		24V 电源正极
2	24V 负		24V 电源负极
3	24V 负		24V 电源负极
4	RX+	1	数据接收正端
5	RX-	2	数据接收负端
6	TX+	3	数据发送正端
7	TX-	6	数据发送负端
8	空		
9	24V 正		24V 电源正极
10	空		
11	12V 正		12V 电源正极
12	12V 正		12V 电源正极

头部接线盒 M12A-8P 母头航插接口定义



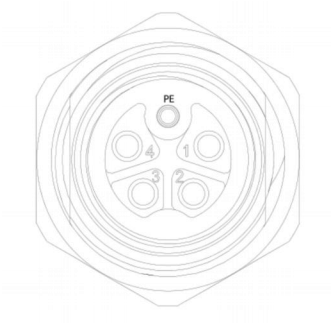
M12A 母头序号	定义	网线水晶头序号	功能
1	24V 正		24V 电源正极
2	RX+	1	数据接收正端
3	RX-	2	数据接收负端
4	TX+	3	数据发送正端
5	TX-	6	数据发送负端
6	空		
7	空		
8	24V 负		24V 电源负极

尾部接线盒 M12A-17P 母头航插接口定义



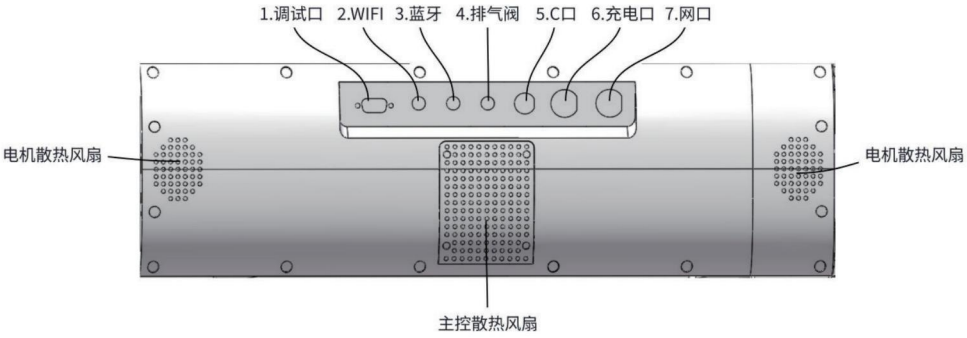
M12A 母头序号	定义	网线水晶头序号	功能
1	48V 正		48V 电源正极
2	RX+	1	数据接收正端
3	RX-	2	数据接收负端
4	TX+	3	数据发送正端
5	TX-	6	数据发送负端
6	12V 正		12V 电源正极
7	12V 负		12V 电源负极
8	12V 正		12V 电源正极
9	12V 负		12V 电源负极
10	24V 正		24V 电源正极
11	24V 负		24V 电源负极
12	24V 正		24V 电源正极
13	24V 负		24V 电源负极
14	48V 正		48V 电源正极
15	48V 负		48V 电源负极
16	48V 正		48V 电源正极
17	48V 负		48V 电源负极

尾部电源 M12K 接口定义



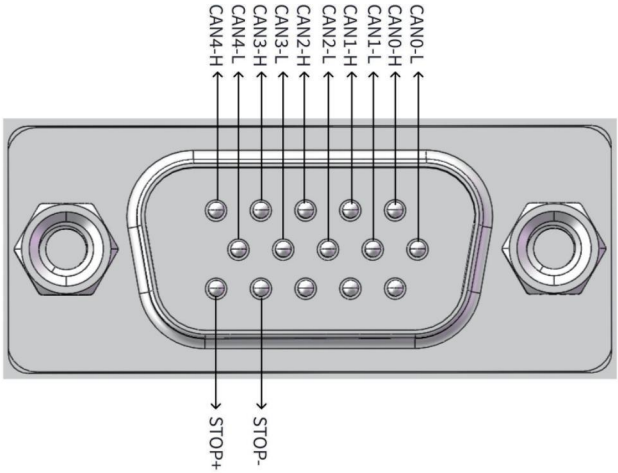
M12A 母头序号	定义	功能
1	48V 正	48V 电源正极
2	48V 负	48V 电源负极
3	24V 正	24V 电源正极
4	24V 负	24V 电源负极
5	12V 正	12V 电源正极

左侧接口布局定义

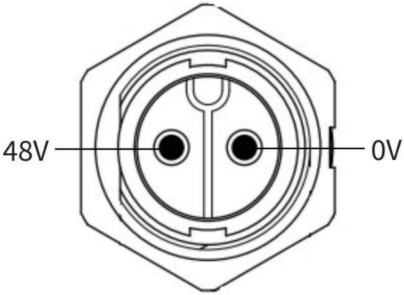


序号	器件名称	型号	数量	功能
1	调试接口	DB15 母头	1	电机 CAN 诊断，电池 CAN 诊断，调试急停
2	Wi-Fi 天线	2.4G	1	无线 Wifi 和主控板通讯
3	蓝牙天线	蓝牙5.2	1	无线蓝牙和主控板通讯
4	气压平衡阀	M12	1	平衡内外气压
5	Type-C 接口	E10T-FT3-PWF/MT3-NWA-xxFPC	1	Type-C 接口和主控板通讯
6	充电口	E13T-P2B-PPF-01		48V 充电口
7	网口	E13T-FR5-PRF-180		百兆网口/调试网口

调试口接口定义



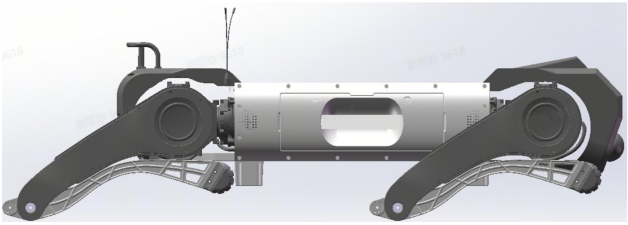
充电口接口定义



开箱

请注意，头部激光雷达护罩与尾部天线护罩严禁承受外力！

先将机器狗四肢展开，手持其小腿部位，平稳将机器狗从包装箱中取出。机器狗四肢展开，将机器狗放置到平地，小腿尽量靠近机身，参考下图。



开机

长按电池开关，如下图，过程中 LED 灯会从右往左亮灯（从红灯亮起直到绿灯亮完），直至所有 LED 灯都亮了就可以把手松开，这样电池就已经激活放电功能，电池给主控板供电后就自动开机。

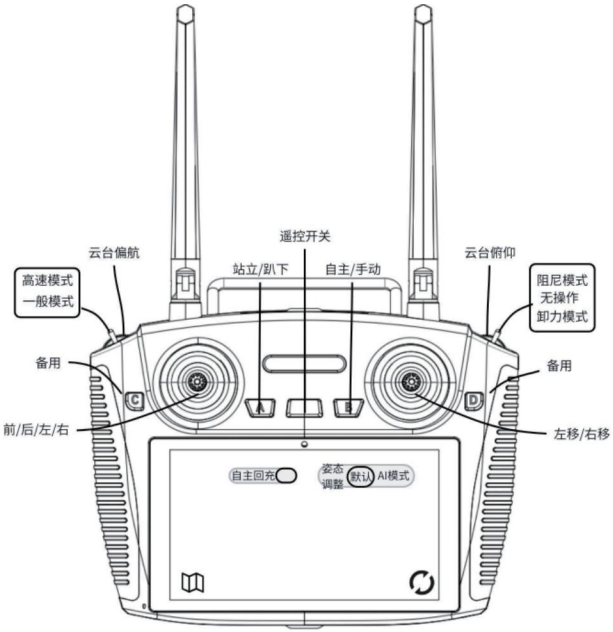
等待 40s 后，指示灯会亮绿灯，表示机器狗在可以控制状态。

关机

机器狗需要确保处于趴下姿态，然后长按启动按钮，过程中 LED 灯会从左往右灭灯（从绿灯灭起直到红灯灭完）电池上的所有 LED 灯都灭完了后，进入关机状态。如果要重新启动，机器狗需要按照准备工作和开机启动操作一遍。

手柄布局和操作

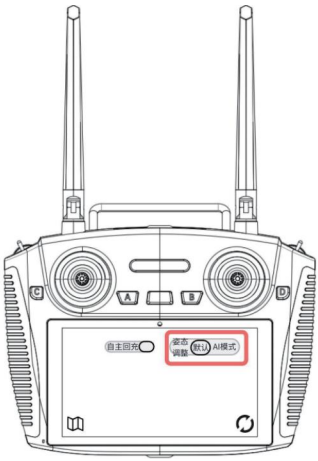
备注：遥控器充电状态下无法操作机器狗！！！



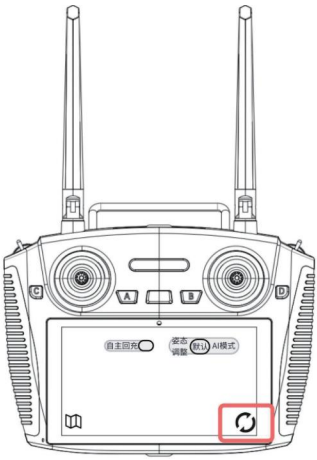
动作状态	型号	功能
站立	A键	开机第一次站立需要连续按键 4 次，后续待机情况下连续按键 2 次可实现站立
趴下	A键	需要在站立状态，连续按键 2 次可实现趴下
阻尼	右侧拨杆拨到右侧	无论什么状态下，拨杆拨到对应状态，可进入阻尼模式
卸力	右侧拨杆拨到左侧	先切换到阻尼模式，拨杆再拨到对应位置，可进入卸力模式

控制模式	操控方式	操控需求
一般模式	左侧拨杆在中间	动作状态需要在站立状态
高速模式	左侧拨杆拨到右侧	动作状态需要在站立状态

特殊功能	操控方式	操控需求
AI 模式（上下楼梯，越障使用 AI 模式）	屏幕上的触摸按键	控制模式需要在一般模式动作状态需要在站立状态
姿态调整（内部工程使用）	屏幕上的触摸按键	控制模式需要在一般模式或高速模式动作状态需要在站立状态；



姿态调整、默认、AI 模式：点击屏幕，高亮显示为选中状态



屏幕显示前、后图像切换操作

在前摄像头显示画面中，点击屏幕循环按键，切换为后摄像头显示图片

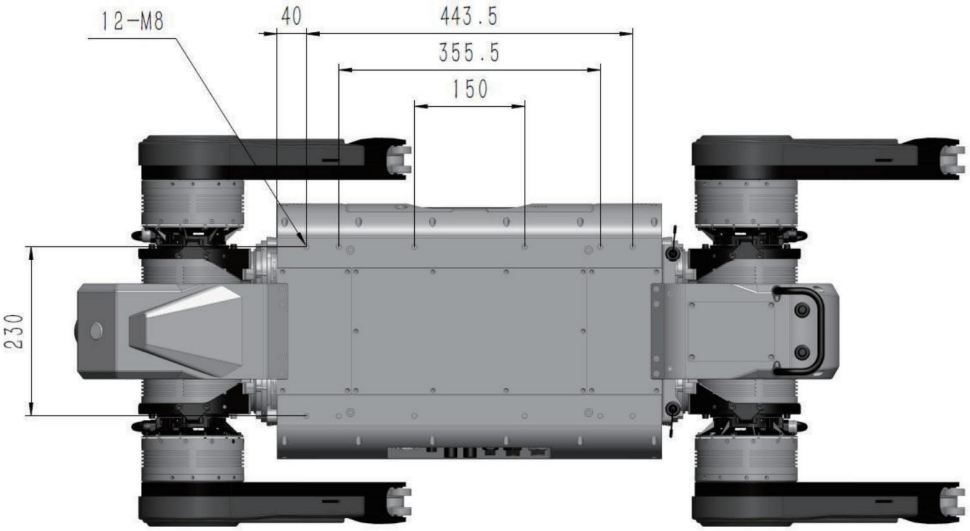
指示灯状态

序号	指示灯	灯语
1	常亮绿灯	可控制状态
2	常亮黄灯	电池 SOC 小于 20%或者电机高温和预警/异常
3	常亮红灯	电池 SOC 小于 5%或者电机故障
4	不亮灯	线路出问题

负载加装

机器狗具备自适应负载功能，加装负载范围为 0 ~ 50kg；具体操作：加装负载需要让机器狗处于趴下的状态，把负载加装上去，固定稳固后，让机器狗在站立状态下，它会自动识别负载重量，等待 3s 后负载重量识别完成，可以进行其他操作。

机器狗机身上有相应的螺丝孔，用户可以根据螺丝孔自己制作工装，用来固定上装设备。



应急操作

如果在操作过程中出现关节甩打的情况，请立即按阻尼模式（拨杆 F 向右拨），阻尼模式能减轻关节因为摔倒导致的伤害。

电源适配器介绍

输入参数	AC 200-240V
输出参数	DC 54.6V
充电电流	10A

充电器上有两个 LED 提示灯（LED1，LED2），当充电器接上 220V 后，LED1 亮红灯；接上充电口后，LED2 亮红灯，充满或者没有充上 LED2 亮绿灯，充电器灯状态如下表：

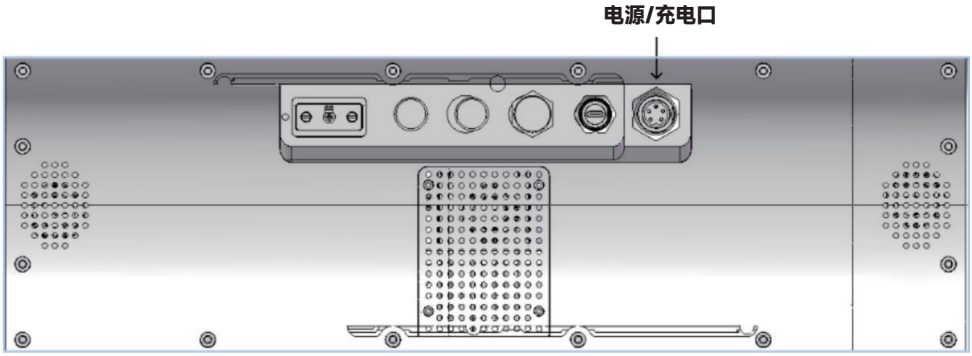
序号	状态	描述
1	正常充电	散热风扇启动，LED1 亮红灯，LED2 亮红灯
2	充电完成或者因某些因素充不上电	散热风扇关闭，LED1 亮红灯，LED2 亮绿灯

充电中

充电完成

充电

机器狗的充电方式为直插充电，使用的是三元锂电池。使用配送的充电器，一头为三孔插接头（与交流 220V 电源对接），另一端为两孔插头（与机器狗机身的充电口对接），充电口位于机身左侧，如下图，充电器插上充电口后电器设备会自动启动，这是正常现象，遥控手柄不能控制机器狗。



查看电量

手动按一下电池启动键，LED 灯就会显示电量，共有 5 个 LED 灯，每个灯代表 20%电量。

充电注意事项

- 确保机器狗处于关机状态
- 先接电池充电口端，再接 220V 插头。

注意事项

场景	注意事项
增加负载	机器狗本身带质量估计功能，往机器狗上加负载时，建议让机器狗处于趴下的状态下加负载。
斜坡地形	坡度不超过 45°。 上斜坡：将屏幕 AI 模式档位打开。 下斜坡：将屏幕默认按钮拨到中间档。
草地，沙地地形	建议使用 **AI 模式**，特殊地形路面需要慢慢行走。
楼梯地形	使用机器狗爬上下楼梯或者台阶时，机器狗需要在楼梯或者台阶前停止，点击遥控器屏幕 **AI 模式**按键，切换至 **AI 模式**； 楼梯台阶每一节高度不超过 30cm，整个台阶地形的角度不超过 45°; 下完楼梯或者台阶之后进入平地地形，在机器狗完全停止后，通过屏幕切换回**默认模式** 适用于平地走。

自主回充

当机器人头部朝向充电桩且与充电桩距离为 0.5 ~ 1 米时，操作步骤如下：

A.点击屏幕上的自主回充按键，该按键将以高亮状态显示选中；

B.按下手柄的 B 键，启动自主回充功能；

C.机器人开始自主回充。

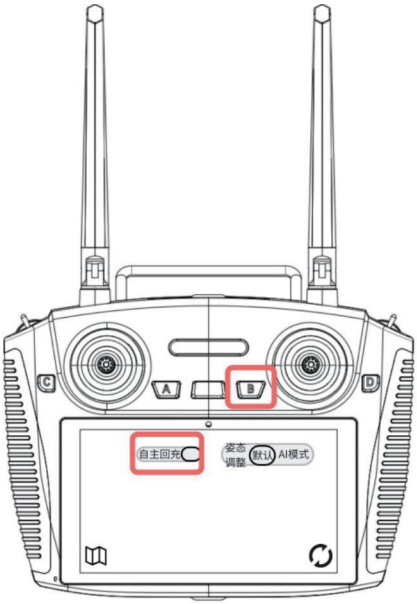
充电完成后，操作步骤如下：

A.点击屏幕上的自主回充按键，该按键将以置灰状态显示未选；

B.按下手柄的 B 键，关闭自主回充功能；

C.机器人解除自主回充功能；

D.此时可对机器人进行正常遥控操作。



机器人端

1.终端输入

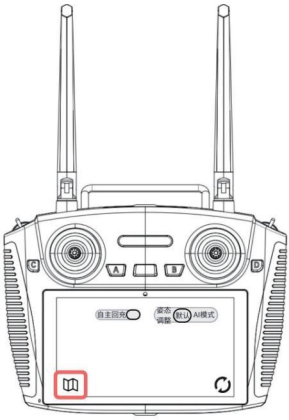
```
Plain Text
vim ~/linx/catkin_nav/a02/autow2/src/robot_bringup/param/task/task.yaml
```

2.保存退出，确保机器狗在趴下状态，重启机器才能生效；

3.开始建图

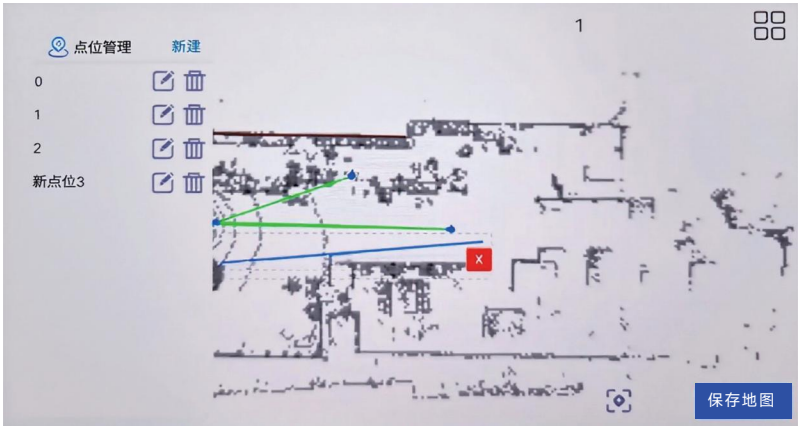
遥控器端

点击屏幕地图按键，进入导航功能界面。



进入导航功能后，系统默认展示点位管理界面。

界面中各类元素的标识规则如下：绿色实线代表导航路径，蓝色圆圈标识机器人当前所处位置，蓝色水滴状图标代表已创建的任务点，灰色实线代表虚拟墙。

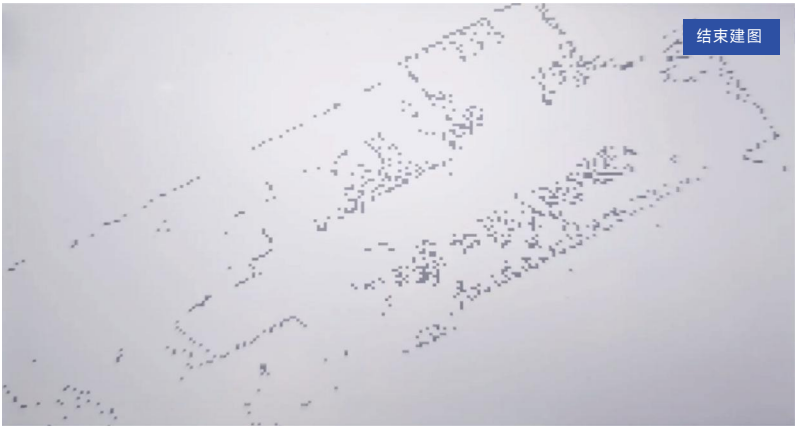


建图导航

新建地图功能操作流程如下：

点击“新建地图”功能按钮后，通过遥控器操控机器人在待建图场景内完成一次完整巡航；

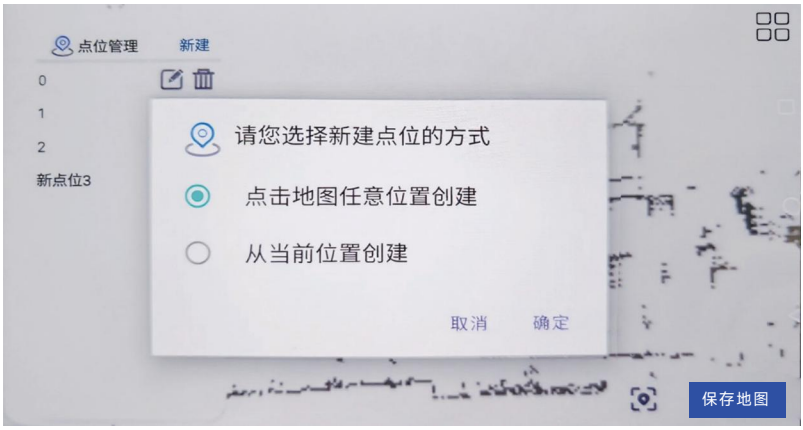
在此过程中，地图点云数据将实时采集并动态追加至地图界面，确保场景空间信息完整呈现。



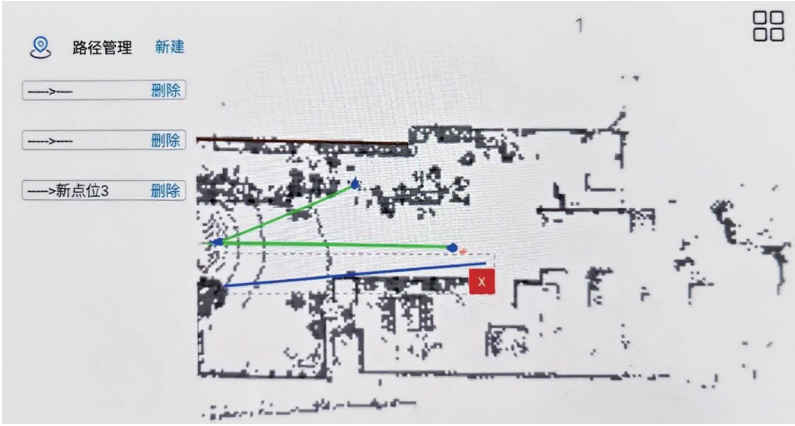
在点位管理界面中，可执行任务点添加操作，具体方式有以下两种：

1.在地图中任意选定位置作为任务点；

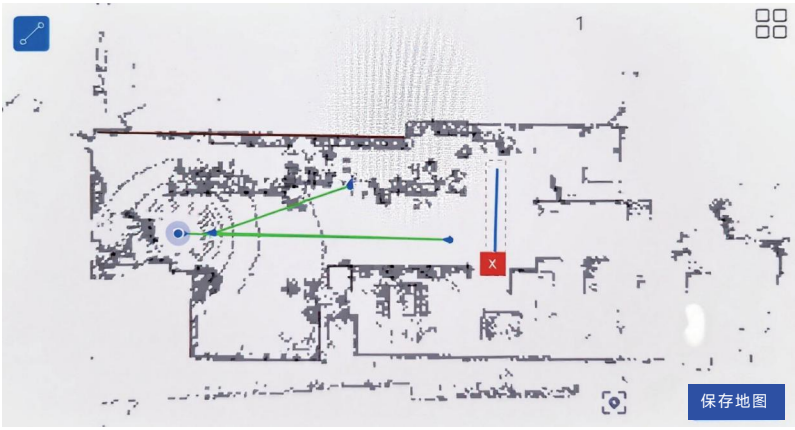
2.以机器人当前所处位置创建任务点。



路径管理功能：可通过已添加的任务点规划并添加导航路径。



虚拟墙管理功能支持在地图中添加虚拟墙，机器人将无法进入虚拟墙所划定的区域。
虚拟墙以不同颜色区分状态：其中，蓝色标识为新增状态的虚拟墙，灰色标识为已完成添加的虚拟墙。
针对已添加的虚拟墙，可通过点击操作触发删除或位置移动功能，实现虚拟墙的灵活管理。



二次开发SDK实现功能

- 现阶段 SDK 已实现的功能如下:
- 基础动作：站立、趴下
- 运动控制：前后左右移动、向上向下转向（固定）、停止运动、将速度指令置零、持续移动、前后移动指定距离 、左右移动指定距离、结束移动动作
- 特殊模式：0 力矩模式、阻尼模式、参数调整模式
- 状态获取：机器运动状态、速度、倾斜角度、本体高度、左右移动距离、前后移动距离、机器狗状态、机器狗 x、 y、z 轴速度及角速度、SDK 版本号
- 参数设置：本体高度、速度

智元机器人

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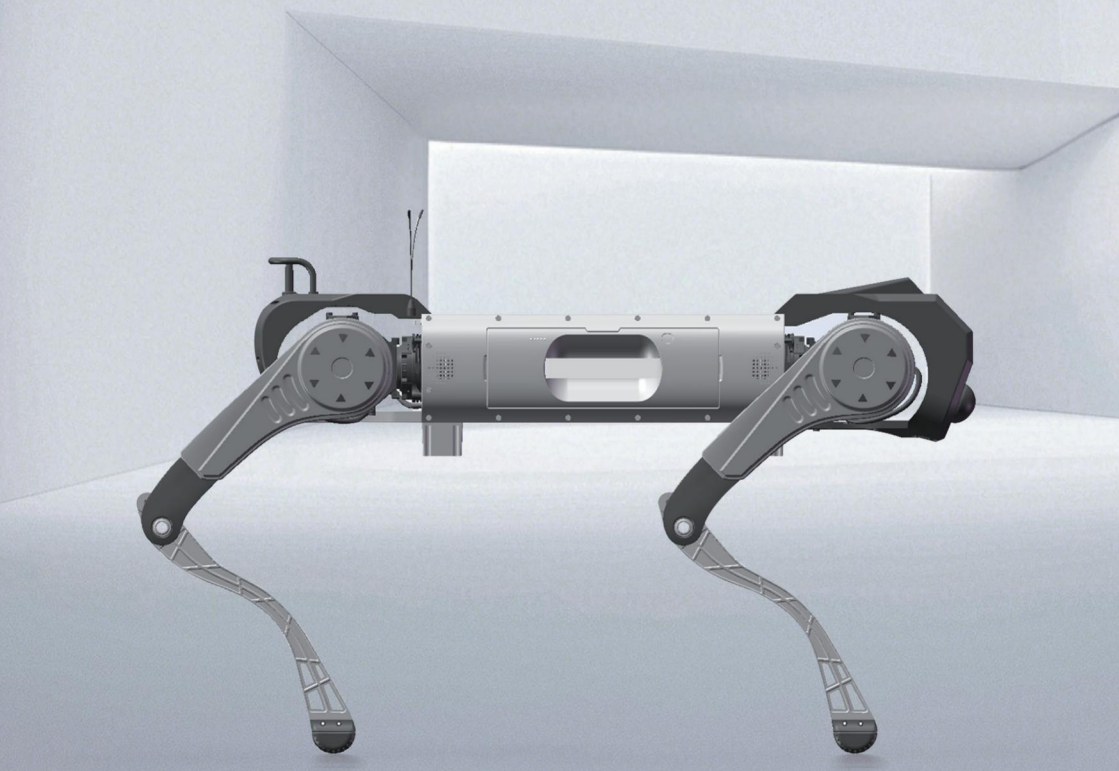
AGIBOT D1 MaxPro

User Manual



Content

Legal Statement

NOTE Equipment meeting Class A requirements may not offer adequate protection to broadcast services within a residential environment.

Before using this product, users must carefully read the User Manual and operate the product strictly in accordance with the contents of this Manual. The company shall not be liable for any property damage or personal injury caused by use that violates the contents of this Manual. This product is composed of multiple components; ensure that children cannot access this product to avoid accidents. This product is intended for use only by persons aged 18 years or older. To extend the product service life, do not use it in high-temperature or high-pressure environments. This Manual attempts to include the product's functional descriptions and usage instructions, but due to ongoing feature enhancements and design changes, the actual product may differ from the Manual. If there are discrepancies between the physical product and this Manual regarding color, appearance, or other aspects, the physical product shall prevail.

Product Overview

The AgiBot D1 MaxPro (Product model ZYCXD150M) is an industrial-grade quadruped robotic chassis. Each leg is equipped with three motors, totaling 12 degrees of freedom, enabling locomotion such as walking, trotting, stair climbing, and trench crossing. The main features of this product include high payload capacity, long endurance, and strong adaptability to complex terrains.

A.Payload Capacity:
Designed for heavy-load applications, the AgiBot D1 MaxPro supports a sustained payload of up to 50 kg. Compared with the previous generation, the payload capability has been increased by 2.5 times, meeting the demands of heavy-duty scenarios such as material transport and industrial handling.

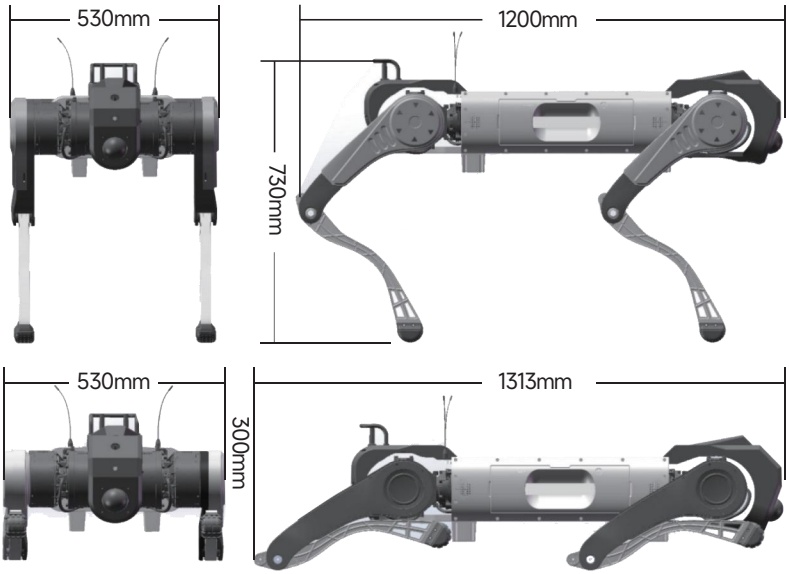
B.Autonomous Patrol and Environmental Perception:
Equipped with a LiDAR system, the robot is capable of autonomous patrol, and supports remote deployment and real-time video transmission via 4G/5G networks. Integrated with LiDAR, head-mounted camera, IMU, and GPS, it achieves comprehensive environmental perception in complex surroundings, enabling map construction and path planning. The system is adaptable to various industry applications such as public security patrols, water utility inspection, and petroleum pipeline inspection.

C.Motion Performance:
The AgiBot D1 MaxPro offers outstanding mobility. It can smoothly ascend and descend 45° staircases, stably climb open-frame industrial stairs, and overcome obstacles up to 30 cm high. The self-righting mechanism is highly reliable, allowing the robot to recover from a fall within 20 seconds, ensuring quick resumption of operations under complex terrain or unexpected conditions. With a no-load speed of 3 m/s, it can rapidly respond to emergent tasks, operating efficiently in complex or restricted environments.

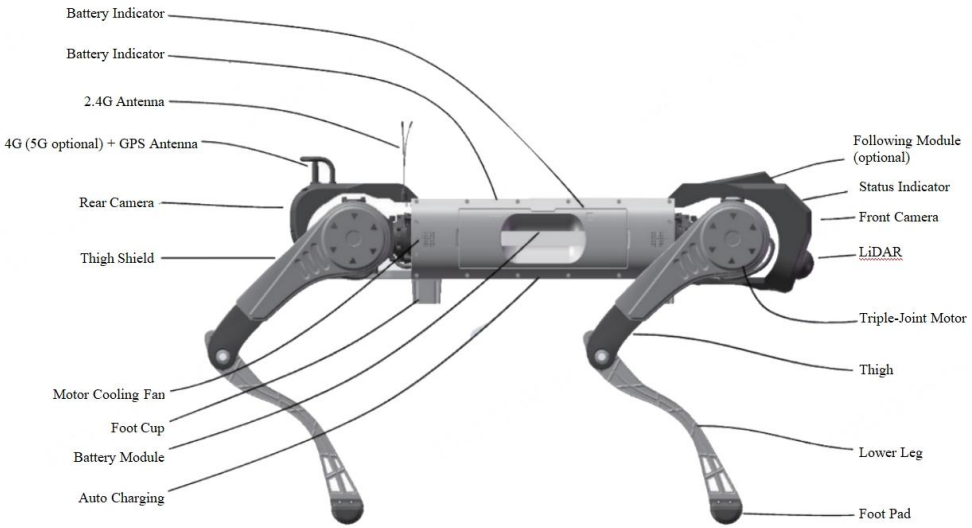
D.Environmental Adaptability:
With an IP67 industrial-grade protection rating, the robot functions reliably in ambient temperatures ranging from -20°C to 55°C and can operate in water up to 20 cm deep. It is designed to withstand extreme cold, heat, rain, and other harsh conditions, ensuring stable performance in diverse and demanding environments.

E.Endurance Assurance:
The 2160 Wh battery pack provides 28% longer endurance under load, and supports rapid field replacement, ensuring uninterrupted power supply for special missions and critical industry applications. This design significantly reduces downtime and improves operational efficiency.

Product Dimensons



Product Details



Product Parameter

Category	Specification	Description
Basic Information	Material	Aluminum alloy with high-strength engineering plastic
	Standing Dimensions (L × W × H)	1230 mm × 530 mm × 730 mm
	Lying Down Dimensions (L × W × H)	1313 mm × 530 mm × 300 mm
	Total Weight (with battery)	68kg
	Operating Temperature	-20°C ~55°C
	Ingress Protection Rating	IP67
	Battery module	Rated capacity: 45 Ah, Voltage:48 V
	Charging Duration	4.5 h (with optional 2 h fast charge)
	Battery Life (Operating time)	5.5 h at no-load, 2.5 h at full-load
	Operating Range	13.5 km at full load
Performance Parameters	Continuous walking speed	1.5 m/s
	Maximum Speed	3 m/s
	Effective Payload	50kg
	Continuous Stair-Climbing Height	30 cm
	Maximum Climbing Angle	45°
Electrical Parameters	Battery module	Rated capacity: 45 Ah, Voltage:48 V
	Charging Duration	4.5 h (with optional 2 h fast charge)
	Battery Life (Operating time)	5.5 h at no-load, 2.5 h at full-load
	Operating Range	13.5 km at full load

Notes:

(1) Charging time is measured at a standard ambient temperature of 25°C;

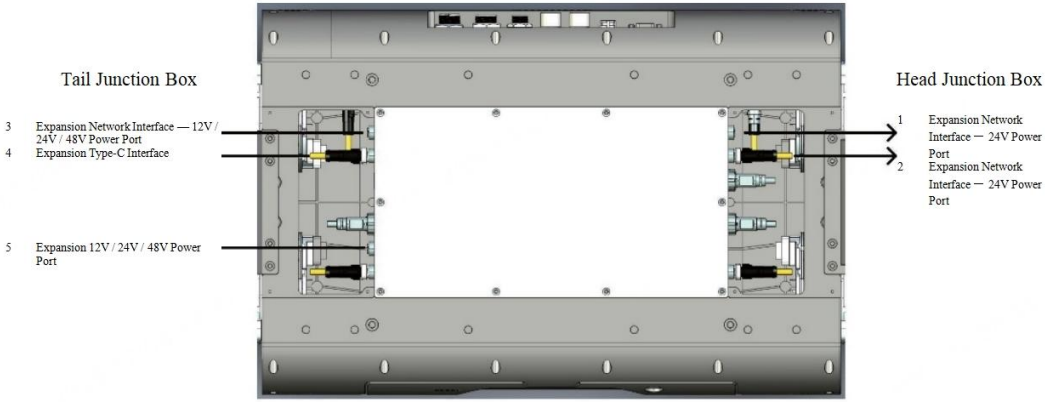
(2) Operating range is measured at 1.5 m/s speed under no-load conditions;

(3) For details on the expansion interface usage, refer to the Expansion Interface Manual.

(4) For warranty terms, please refer to the Product Warranty Manual;

(5) All parameters are based on laboratory test data. Actual performance may vary depending on environment and operating conditions.

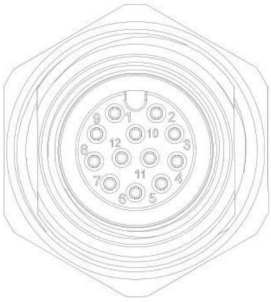
Rear Interface Layout Definition



Note: The rear interface consists of two main modules — the head communication junction box and the tail power junction box.

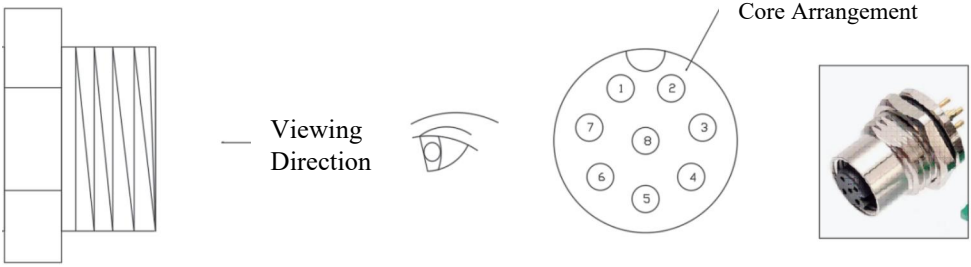
No.	Interface	Connector Model	Mating Connector	Quantity	Function
1	Expansion Network Interface	M12A-12P Female	M12A-12P Male	1	For head-mounted dual-spectrum gimbal communication and +24V/3A power supply
2	Expansion Network Interface	M12A-8P Female	M12A-8P Male	1	For upper-mounted LiDAR communication and +24V/3A power supply
3	Expansion Network Interface	M12A-17P femalF	M12A-17P Male	1	For extended network cable connection and +24V/3A power supply
4	Expansion Type-C Interface	Type-C Waterproof Socket	USB Type-C	1	Extended USB 3.1 10 Gbps interface
5	Expansion Type-C Interface	M12K Female	M12K Male	1	Power output for upper-mounted equipment (12V/24V/48V, 15A output)

Head Junction Box — M12A-12P Female Aviation Connector Pin Definition



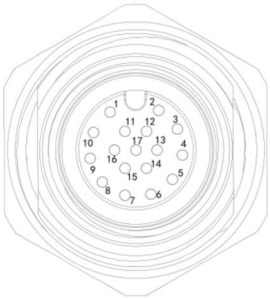
M12A Female Pin No.	Definition	RJ45 Pin No.	Function
1	24V +		24V Power Positive
2	24V -		24V Power Negative
3	24V -		24V Power Negative
4	RX+	1	Data Receive Positive
5	RX-	2	Data Transmit Negative
6	TX+	3	Data Transmit Positive
7	TX-	6	Data Transmit Negative
8	NC		
9	24V +		24V Power Positive
10	NC		
11	12V +		12V Power Positive
12	12V +		12V Power Positive

Head Junction Box — M12A-8P Female Aviation Connector Pin Definition



M12A Female Pin No.	Definition	RJ45 Pin No.	Function
1	24V +		24V Power Positive
2	RX+	1	Data Receive Positive
3	RX-	2	Data Transmit Negative
4	TX+	3	Data Transmit Positive
5	TX-	6	Data Transmit Negative
6	NC		
7	NC		
8	24V -		24V Power Negative

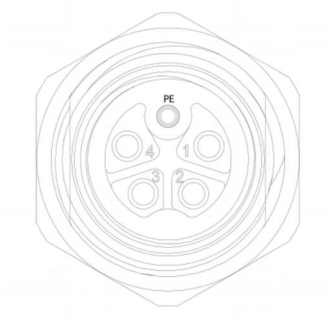
Tail Junction Box — M12A-17P Female Aviation Connector Pin Definition



M12A Female Pin No.	Definitions	RJ45 Pin No.	Function
1	48V +		48V Power Positive
2	RX+	1	Data Receive Positive
3	RX-	2	Data Transmit Negative
4	TX+	3	Data Transmit Positive
5	TX-	6	Data Transmit Negative
6	12V +		12V Power Positive
7	12V -		12V Power Negative
8	12V +		12V Power Positive
9	12V -		12V Power Negative
10	24V +		24V Power Positive
11	24V -		24V Power Negative
12	24V +		24V Power Positive
13	24V -		24V Power Negative
14	48V +		48V Power Positive
15	48V -		48V Power Negative
16	48V +		48V Power Positive
17	48V -		48V Power Negative

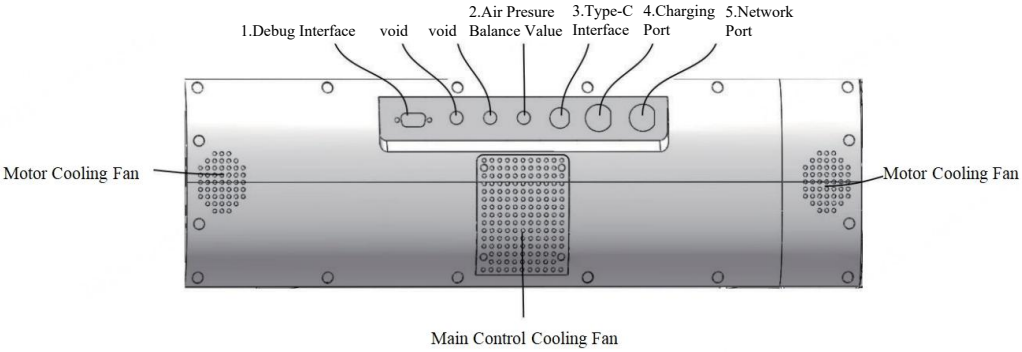
Electrical Interface

Tail Power M12K Interface Definition



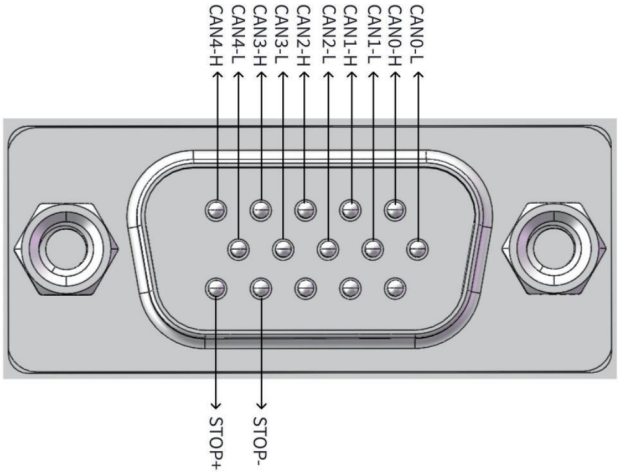
M12A Female Pin No.	Definition	Function
1	48V +	48V Power Positive
2	48V -	48V Power Negative
3	24V +	24V Power Positive
4	24V -	24V Power Negative
5	12V +	12V Power Positive

Left-Side Interface Layout Definition

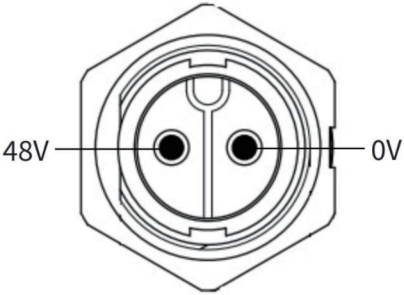


No.	Device Name	Model	Quantity	Function
1	Debug Interface	DB15 Female	1	Motor CAN diagnosis, Battery CAN diagnosis, Debug Emergency Stop
2	Air Pressure Balance Valve	M12	1	Balances internal and external air pressure
3	Type-C Interface	E10T-FT3-PWF / MT3-NWA-xxFPC	1	Type-C interface communication with main control board
4	Charging Port	E13T-P2B-PPF-01		48V charging port
5	Network Port	E13T-FR5-PRF-180		100M Ethernet port / Debug network port

Debug Port Interface Definition

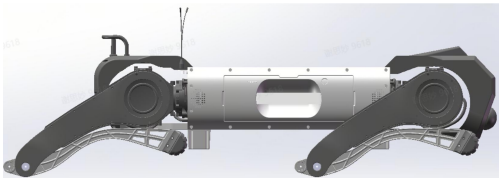


Charging Port Interface Definition



Unboxing

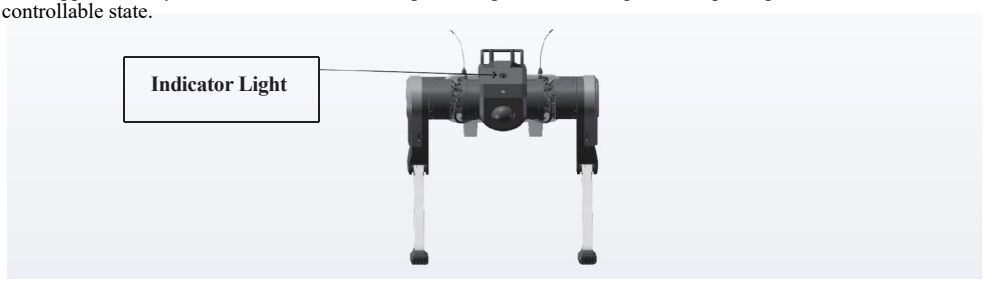
Please note the front LiDAR shield and rear antenna shield must not be subjected to external force!
First, extend the robot dog's limbs. Hold it by the lower legs and carefully lift it out of the packaging box. With all limbs extended, place the robot dog on a flat surface, positioning the lower legs as close to the body as possible, as shown in the illustration below.



Power On

Press and hold the battery power switch as shown below. During the startup process, the LED indicators will light sequentially from right to left (starting from red to green). When all LED lights are fully illuminated, release the button. At this point, the battery discharge function is activated, and once the main control board receives power, the system automatically powers on.

After approximately 40 seconds, the indicator light turns green, indicating that the quadruped robot is now in a controllable state.

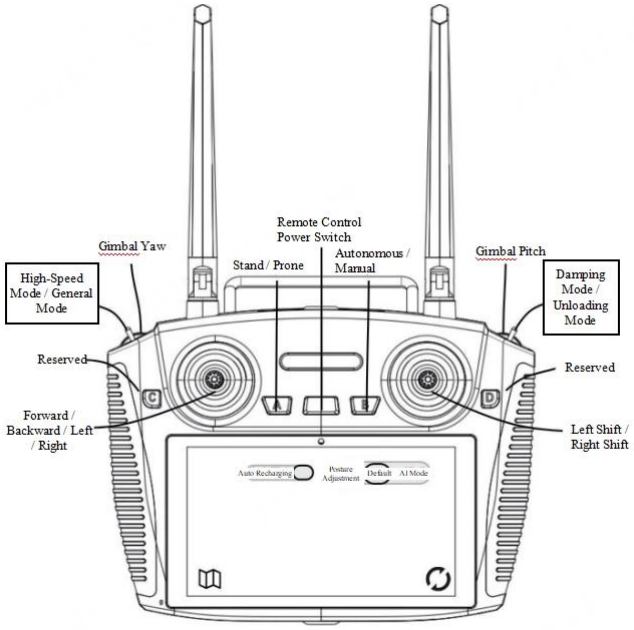


Power Off

Before powering off, ensure that the quadruped robot is in the prone position. Press and hold the power button; during this process, the LED indicators will turn off sequentially from left to right (starting from green to red). Once all LEDs on the battery are completely off, the robot enters the shutdown state. To restart, perform the preparation (Section 2.1) and power-on (Section 2.2) procedures again.

Controller Layout and Operation

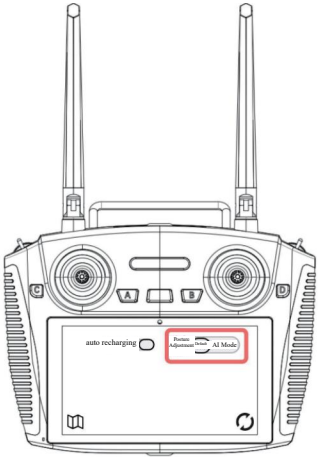
Note: The quadruped robot cannot be operated while the remote controller is charging!



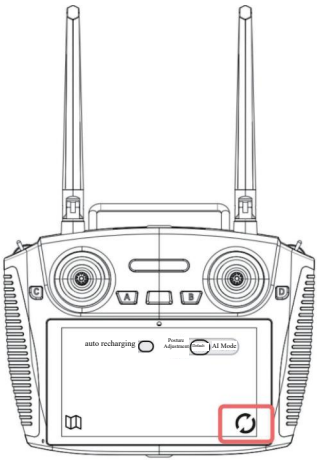
Action State	Model	Function
Standing	Button A	During the first startup, press the button 4 times continuously to make the robot stand up. In standby mode, press 2 times continuously to enter standing posture.
Prone	Button A	While in the standing posture, press 2 times continuously to make the robot lie down.
Damping	Right Toggle Switch to Right Position	In any state, toggle to this position to enter Damping Mode.
Unload	Right Toggle Switch to Left Position	Switch to Damping Mode first, then toggle to this position to enter Unloading Mode.

Control Mode	Opertion Mode	Requirements
General Mode	Left toggle switch in the middle position	Action state must be **Standing**
High-Speed Mode	Left toggle switch to the right position	Action state must be **Standing**

Special Function	Opertion Mode	Requirements
AI Mode (for stair climbing and obstacle crossing)	Touch button on the screen	Control mode must be in General Mode. Action state must be **Standing**
Posture Adjustment (for internal engineering use)	Touch button on the screen	Control mode must be in General or High-Speed Mode and action state must be Standing



For Posture Adjustment, Default, and AI Mode: tap the on-screen button — when highlighted, it indicates the mode is selected.



Screen Display — Front/Rear Camera Switching Operation.
In the front camera display interface, tap the screen cycle button to switch to the rear camera view.

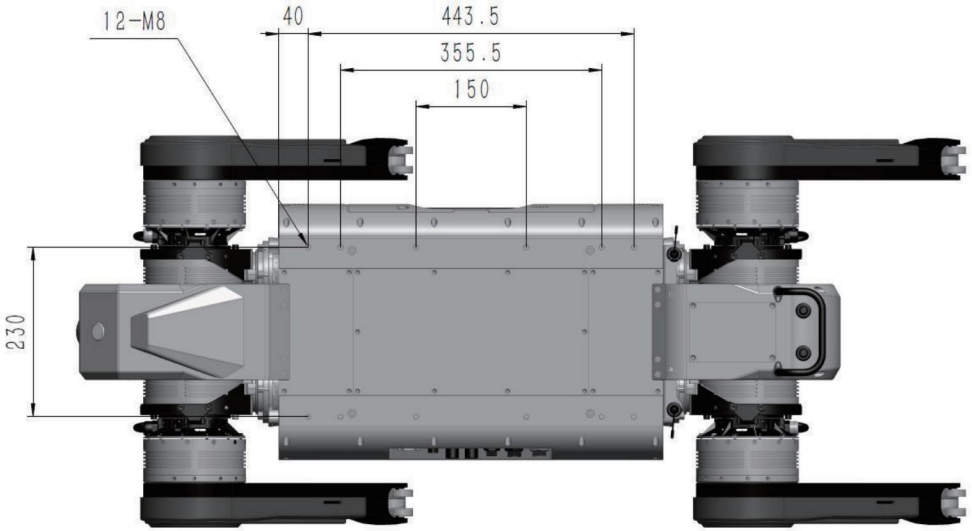
Indicator Light Status

No.	Indicator Light	Indication
1	Solid Green	Controllable state
2	Solid Yellow	Battery SOC below 20%, or motor overheating / warning / anomaly
3	Solid Red	Battery SOC below 5%, or motor fault
4	Off	Circuit malfunction

Payload Installation

The quadruped robot features adaptive payload functionality, supporting a load range of 0–50 kg. Operation Procedure: When installing a payload, ensure the robot is in the prone position. Securely mount and fasten the payload, then switch the robot to the standing position. The robot will automatically detect the payload weight, completing the identification process after approximately 3 seconds, after which normal operation can continue.

The robot chassis is equipped with predefined screw holes. Users can design and install custom fixtures based on these screw holes to mount upper-level devices.



Emergency operation

If any joint swinging or striking occurs during operation, immediately activate the Damping Mode (move toggle switch F to the right). The Damping Mode helps reduce joint damage that may occur due to a fall or impact.

Battery Adapter Introduction

Input Parameters	AC 200-240V
Output Parameters	DC 54.6 V
Charging Current	10A

The charger is equipped with two LED indicators (LED1 and LED2): When the charger is connected to 220 V AC, LED1 lights red. When connected to the charging port, LED2 lights red during charging. When fully charged or not charging, LED2 lights green. The charger light status are as follows:

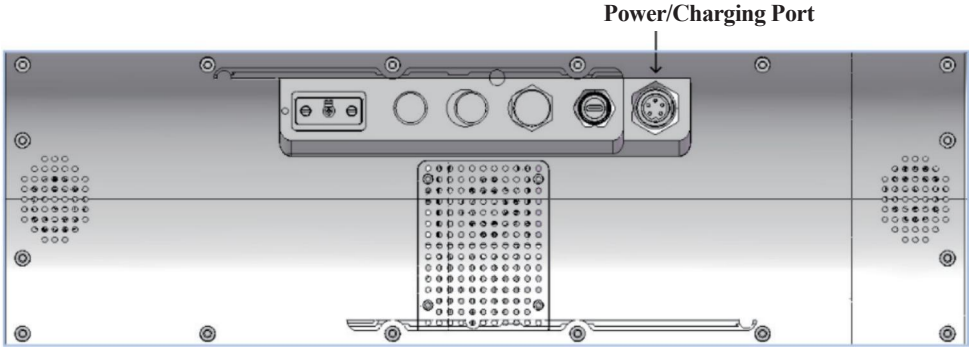
No.	Status	Description
1	Normal Charging	Cooling fan activated; LED1 Red, LED2 Red
2	Fully Charged or Not Charging	Cooling fan off; LED1 Red, LED2 Green

Charging in Progress

Charging Completed

Charging

The quadruped robot adopts a direct plug-in charging method and is powered by a ternary lithium battery. Use the supplied charger, which has a three-pin AC plug (for connection to a 220V AC outlet) and a two-pin DC plug (for connection to the robot's charging port). The charging port is located on the left side of the body, as shown below. Once the charger is connected to the charging port, the electrical system automatically powers on, which is normal behavior. During charging, the remote controller cannot control the robot.



Checking Battery Level

Press the battery power button once manually — the LED indicators will display the remaining battery level. There are five LED lights, and each light represents 20% of total battery capacity.

Charging Precautions

- Ensure the quadruped robot is powered off before charging
- Connect the battery charging port first, and then plug in the 220V AC power.

Precautions

Scenario	Precautions
Adding Payload	The robot features a mass estimation function. When adding payload, ensure the robot is in the prone position.
Sloped Terrain	Slope angle must not exceed 45°. When ascending, enable AI Mode via the screen. When descending, set the screen's Default Mode button to the middle position.
Grassland / Sandy Terrain	It is recommended to use **AI Mode**. On irregular terrain, move slowly and steadily.
Stairs / Steps	When climbing or descending stairs, stop the robot in front of the stairs, then tap the **AI Mode button** on the remote control screen to switch to **AI Mode**. Each stair or step should not exceed a height of 30 cm, and the total slope angle should not exceed 45°. After finishing stair climbing and returning to flat ground, ensure the robot comes to a complete stop, then switch back to **Default Mode** for normal walking.

Auto Recharging

When the robot's head is facing the charging dock and is positioned 0.5–1 meter away, follow the steps below:

A.Tap the Auto Recharging button on the screen — the button will be highlighted to indicate selection;

B.Press the B button on the remote controller to initiate the auto recharging function; c. The robot will begin autonomous docking and recharging.

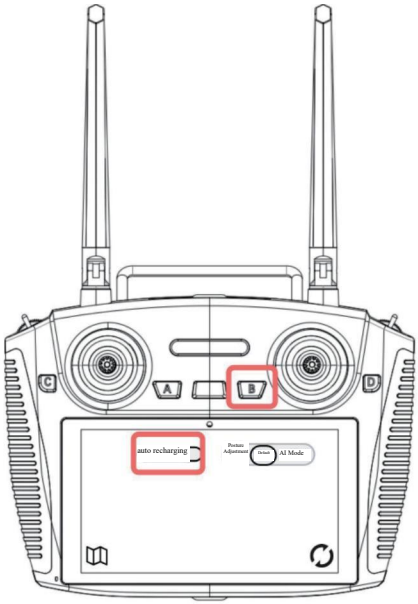
After charging is completed, follow these steps:

A.Tap the Auto Recharging button again — the button will turn gray to indicate deselection;

B. Press the B button on the remote controller to deactivate the auto recharging function;

C.The robot exits the auto recharging mode;

D.The robot can now be operated normally via remote control.



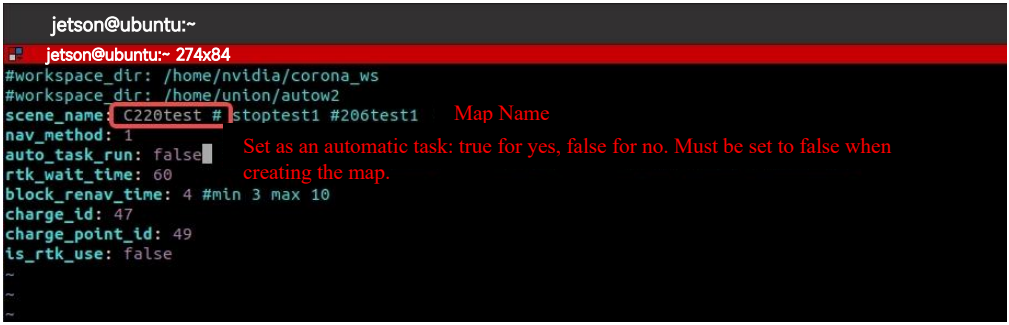
Robot Side

1.Terminal Input

```
Plain Text
vim ~/linx/catkin_nav/a02/autow2/src/robot_bringup/param/task/task.yaml
```

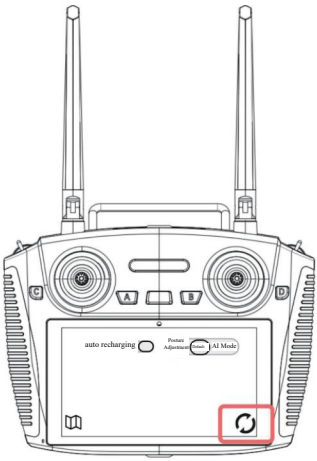
2.Save and exit. Ensure the quadruped robot is in the prone position, then reboot the robot for the configuration to take effect.

3.Start Mapping.

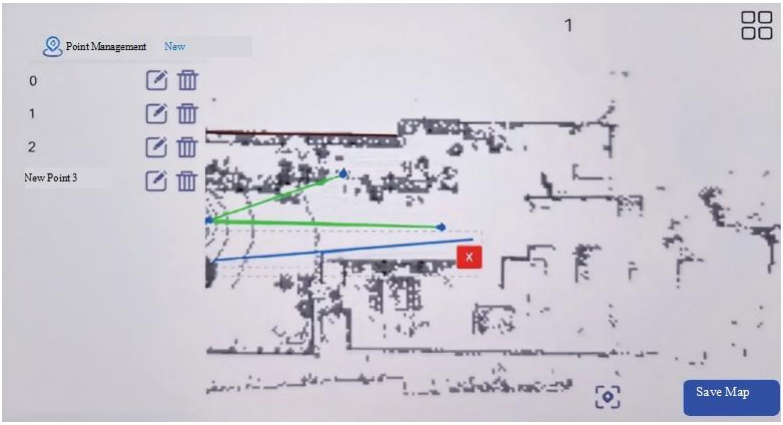


Remote Control Side

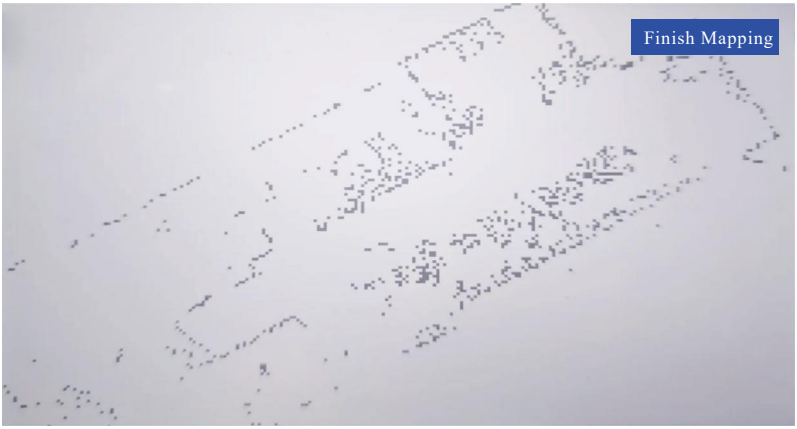
Tap the Map button on the remote controller screen to enter the Navigation Function Interface.



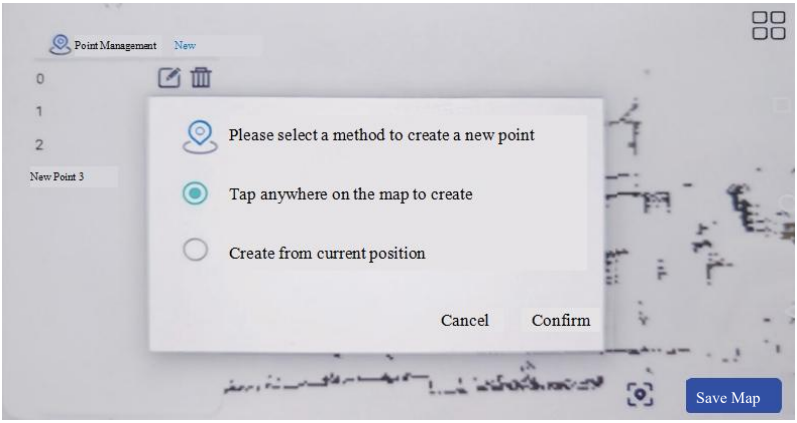
After entering the navigation interface, the system displays the Point Management Interface by default.
The symbols and colors in the interface are defined as follows: Green solid line: Navigation path; Blue circle: Current robot position; Blue droplet-shaped icon: Created task point; Gray solid line: Virtual wall.



Creating a New Map — Operation Procedure:
After tapping the “New Map” button, operate the robot via the remote controller to perform a complete patrol within the mapping area;
During this process, point cloud data will be collected in real time and dynamically appended to the map interface, ensuring comprehensive spatial information representation of the environment.

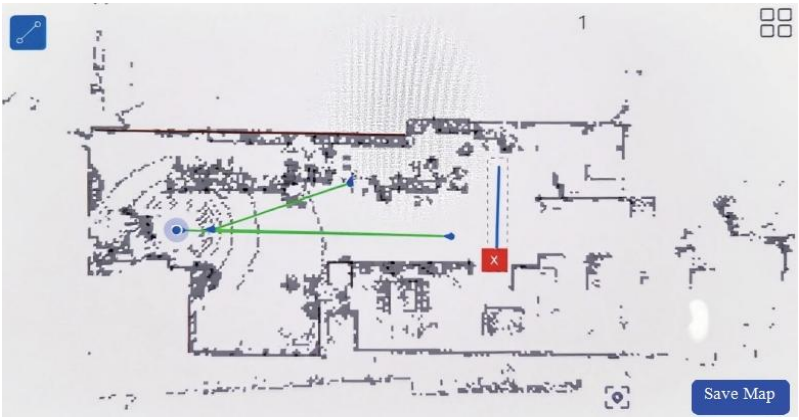


In the Point Management Interface, task points can be added in two ways:
a. Select any position on the map as a task point;
b. Create a task point based on the robot’s current position.



Path Management Function: Allows users to plan and add navigation paths based on the previously added task points.

Virtual Wall Management Function: Supports the addition of virtual walls within the map, which define restricted areas that the robot cannot enter.
Virtual walls are color-coded to indicate their status: Blue: Newly added virtual wal; Gray: Completed virtual wall. For existing virtual walls, users can tap to delete or reposition them, enabling flexible management and customization of restricted areas.



Secondary Development SDK Implemented Functions

- The SDK currently supports the following functions:
- Basic Actions: Standing, Prone
- Motion Control: Forward / backward / lateral movement, upward / downward rotation (fixed), stop motion, set velocity to zero, continuous movement, move specified distance forward / backward, move specified distance laterally, end motion command
- Special Modes: Zero Torque Mode, Damping Mode, Parameter Adjustment Mode
- State Acquisition: Motion state, velocity, tilt angle, body height, lateral and longitudinal displacement, robot status, velocity and angular velocity along X/Y/Z axes, SDK version number
- Parameter Settings: Body height, velocity

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