Vacuum 40

Working Principles Manual

Technical support & operation center | Zhuang Wenming | 2022.06.24

行无界 智无限

Keep Exploring Keep Innovating

Document History

Edition	Contents	Author	Date	Approved	Approver	Approve Date
EN_V1.0	First release	Zhuang Wenming	Jun 2022	Yes	Hu Wenjie	Jul 2022

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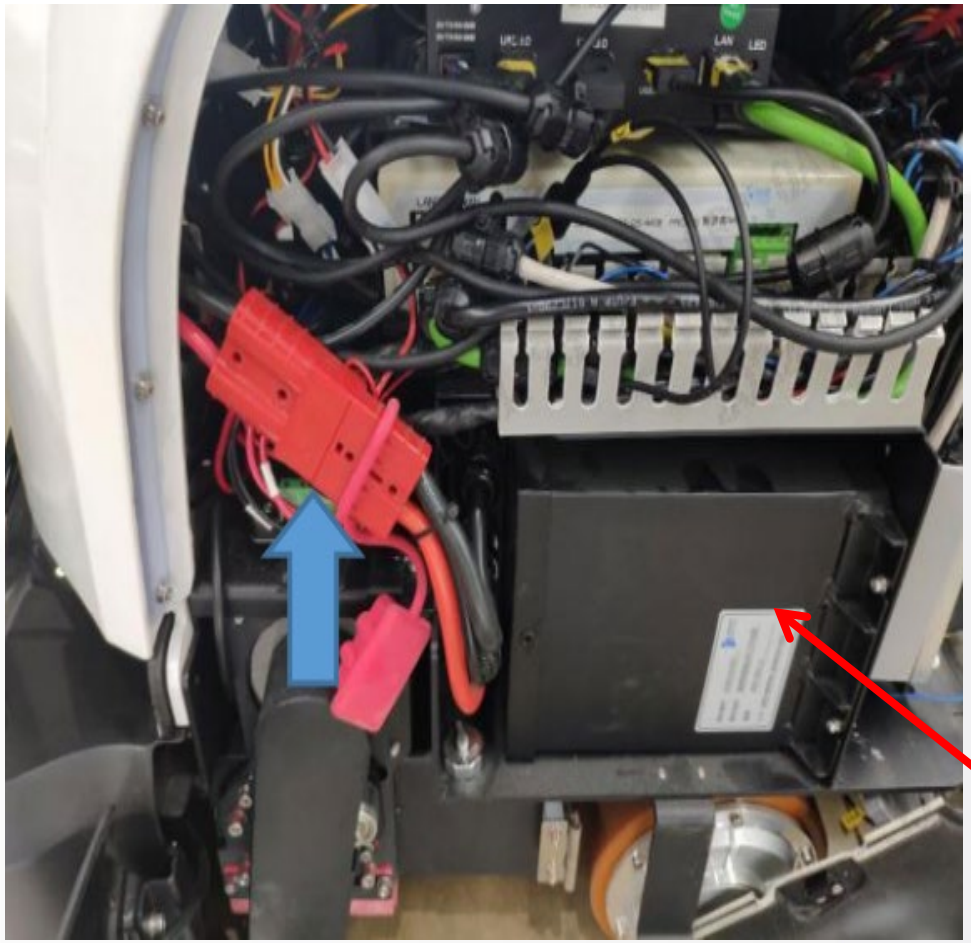
1. Battery
2. Charging socket
3. Main power distribution

1. Battery



Position: Remove left shell to get access to the battery.

Function: Store power, and power supply to the whole machine.

Specification: 24V

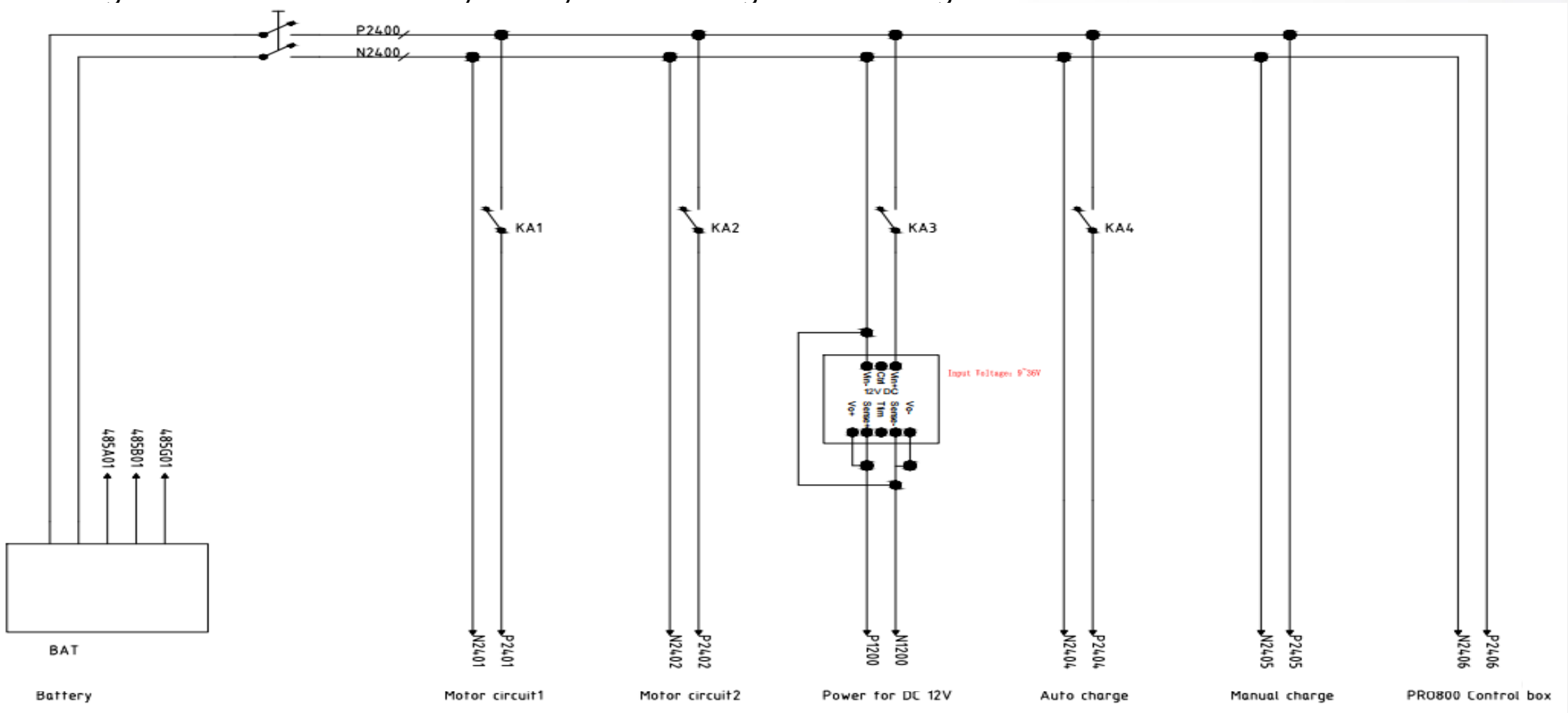
2. Charging Socket

Position: Placed in right lower shell.

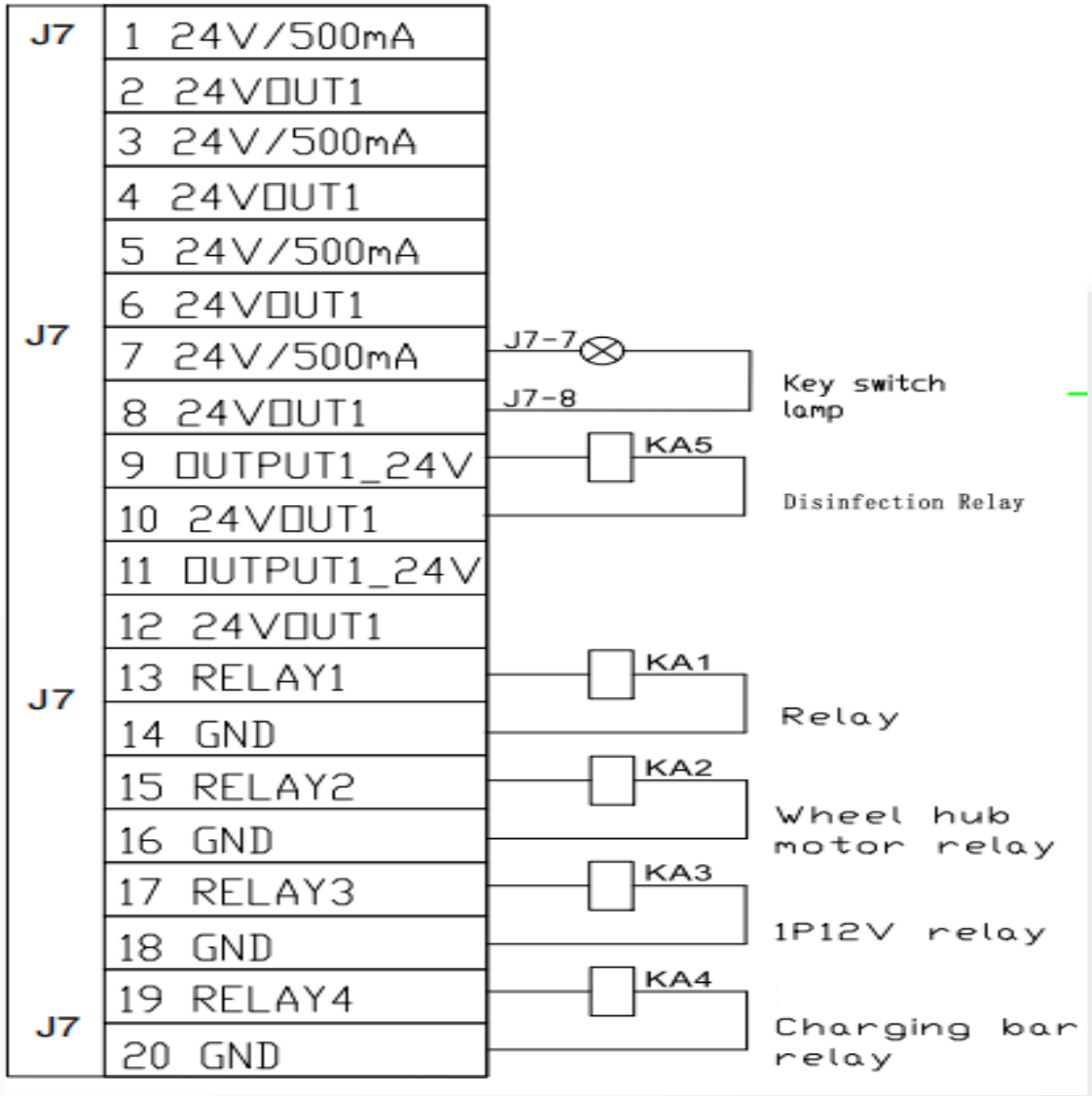
Function: For manually charging, manually charging works no matter robot is on or off.

3. Main power distribution

Main 24V power is distributed from battery to 4 components
(1) Control box (lower computer), 12VDC power supply, Motor circuit-1, Motor circuit-2. The last 3 are controlled by specific relays. Control box connect to battery directly, it is always on as long as the air switch is turned on.
(2) There is a KA4 between battery & auto charge ports. KA4 will be activated as long as robot meet condition of auto-charging. Manual charge socket connects to battery directly. Manual charge works as long as main air switch was turned on.



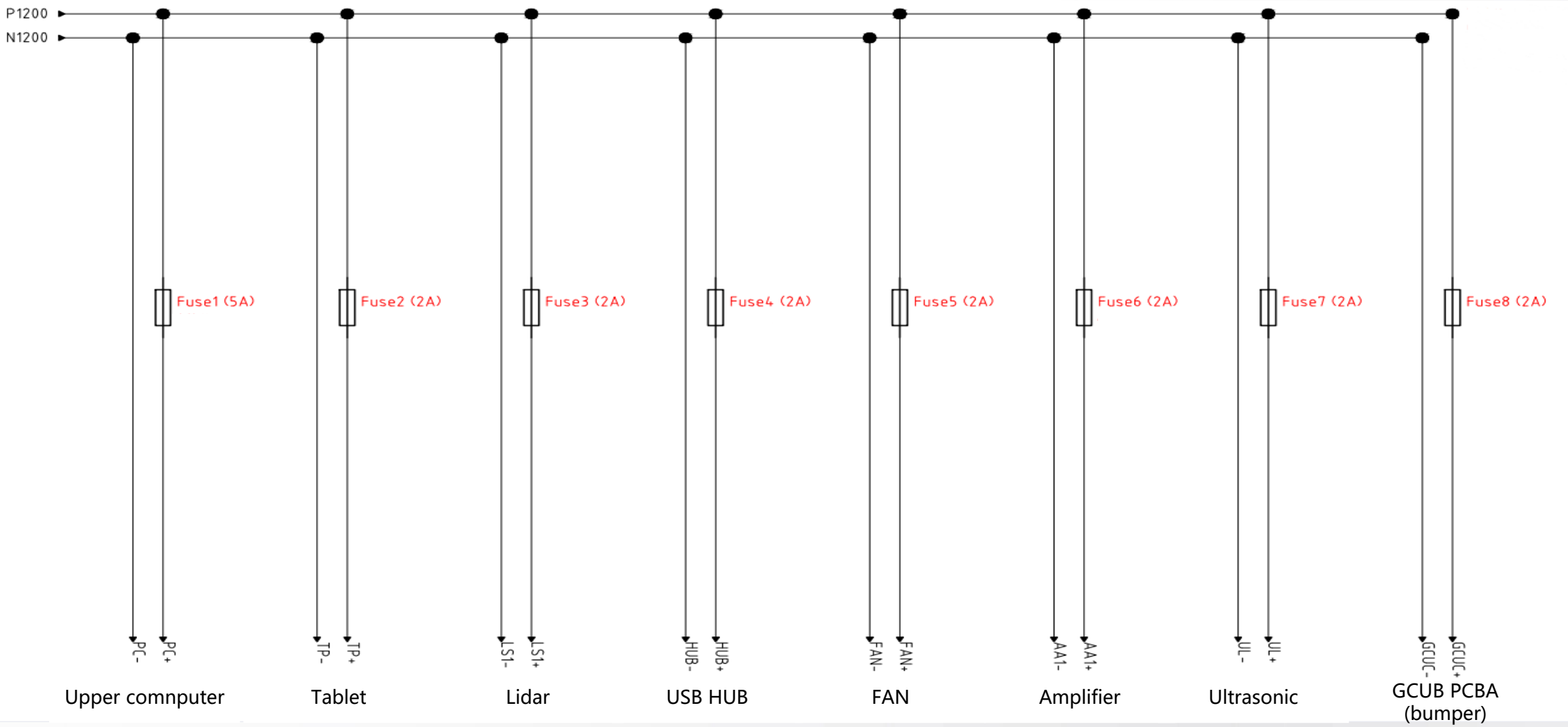
3. Main Control Circuit



When the key switch is turned on, lower computer will activate KA1 & KA3, then other components will get 24/12VDC power supply and boot sequence starts.

3. 12VDC Power Distribution

There are 8 fuses to prevent from overcurrent. Except the 5Amps fuse for upper computer, others are 2 amps fuses.
Do not mix them up when doing replacement.



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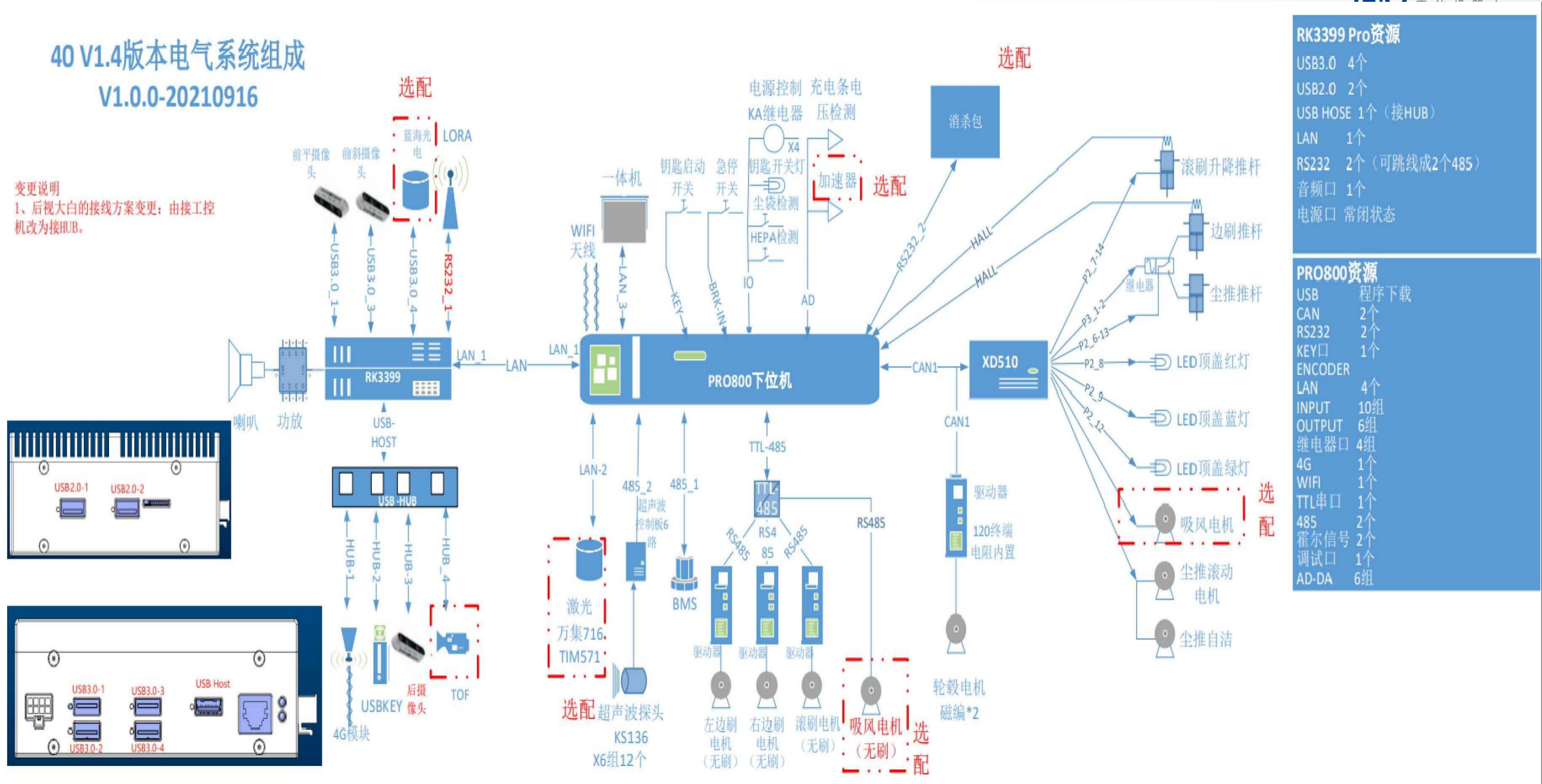
1.整机网络拓扑图



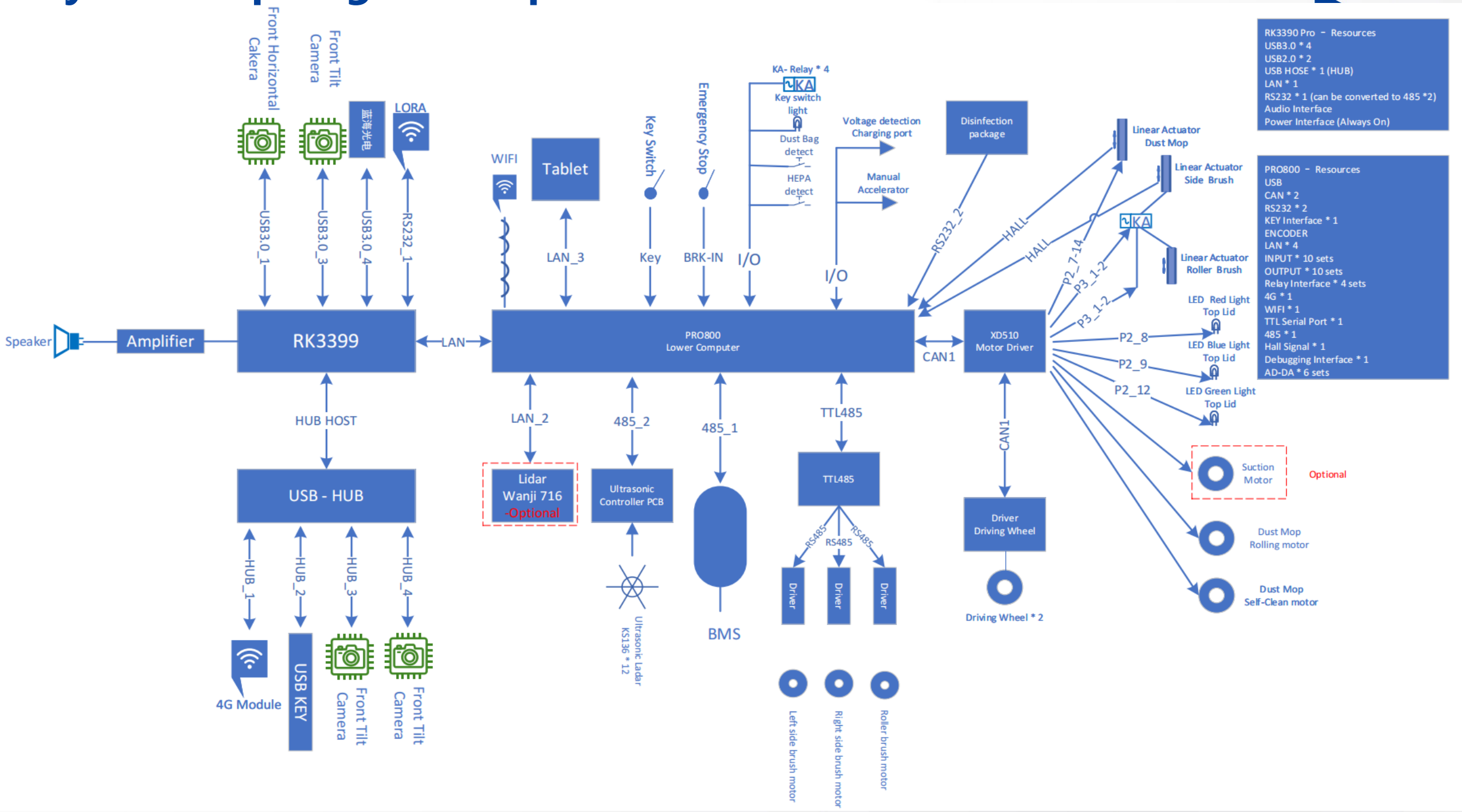
RK3399 Pro资源

USB3.0	4个
USB2.0	2个
USB HOSE	1个（接HUB）
LAN	1个
RS232	2个（可跳线成2个485）
音频口	1个
电源口	常闭状态

PRO800资源

USB	程序下载
CAN	2个
RS232	2个
KEY口	1个
ENCODER	
LAN	4个
INPUT	10组
OUTPUT	6组
继电器口	4组
4G	1个
WIFI	1个
TTL串口	1个
485	2个
霍尔信号	2个
调试口	1个
AD-DA	6组

1. System Topological Graph

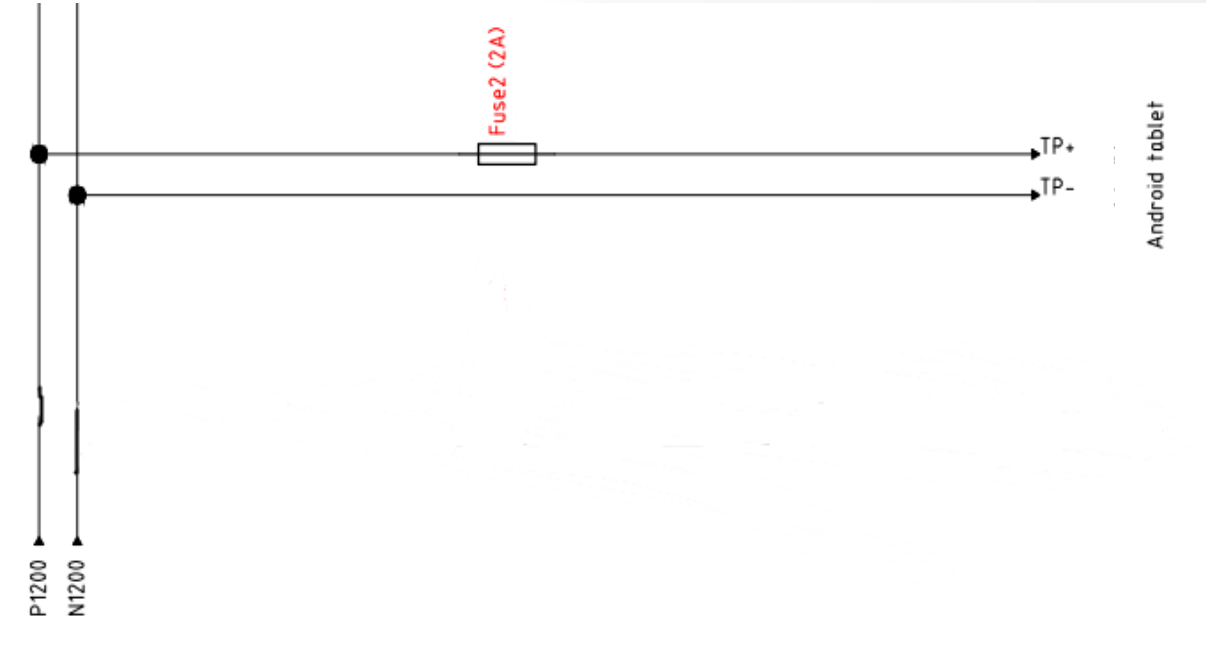


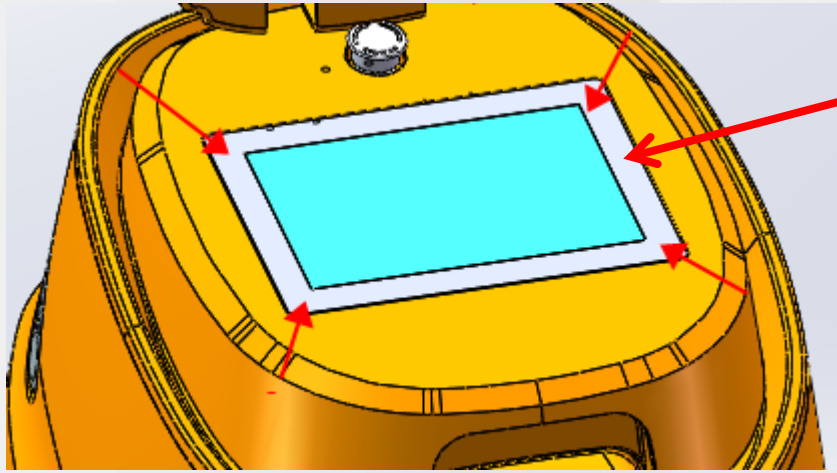
2. Control Module|Tablet

Position: In the center of top lid

Function: For robot operation, config adjustment, as well as sending specific instructions.

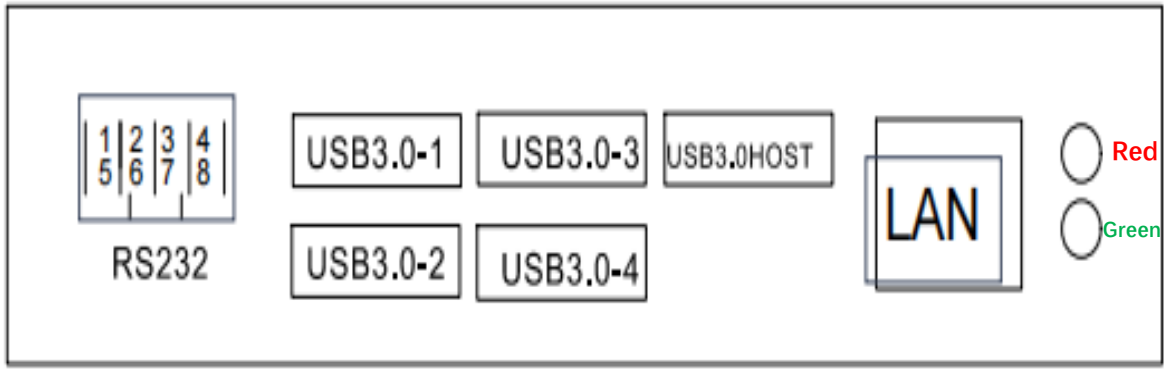
Circuit diagram: Tablet communicate to upper computer, lower computer, Wanji 716 laser, Can communication board via LAN cable. Tablet uses 12VDC power and is protected by a 2A fuse. (Use the right circuit diagram based on robot version accordingly)





2. Control Module|Upper Computer

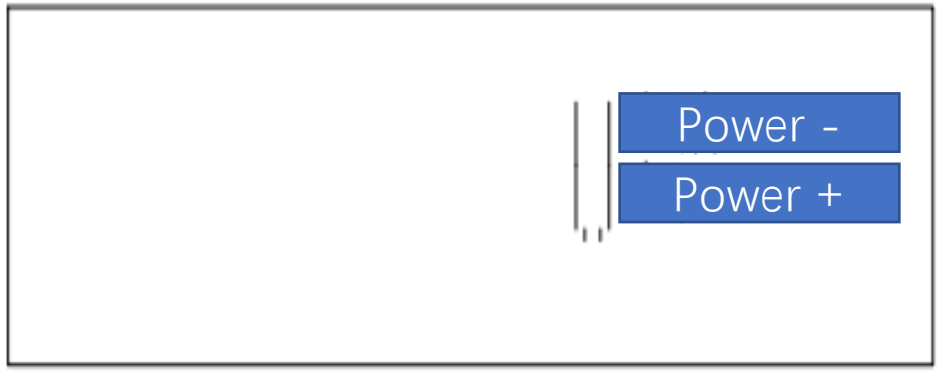
Front Side of Upper Computer



Rear side of Upper Computer

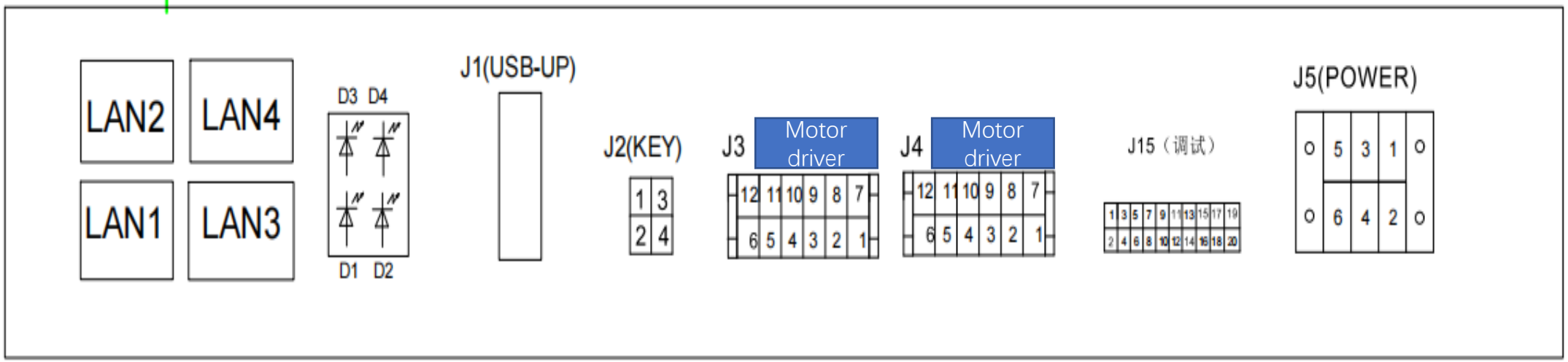
Left Side of Upper Computer

Left Side of Upper Computer

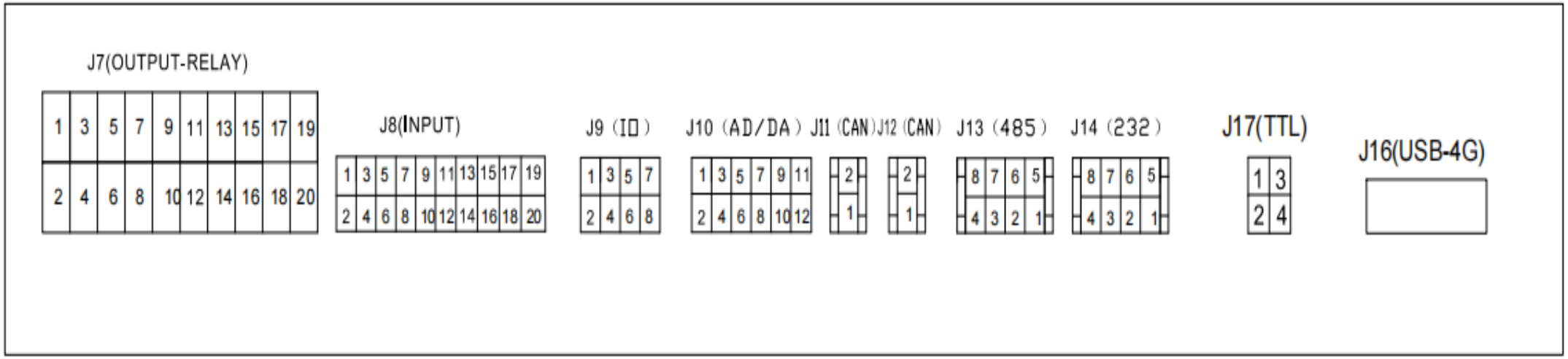


2. Control Module | Lower Computer

Lower Computer
-PRO 800
Front Side

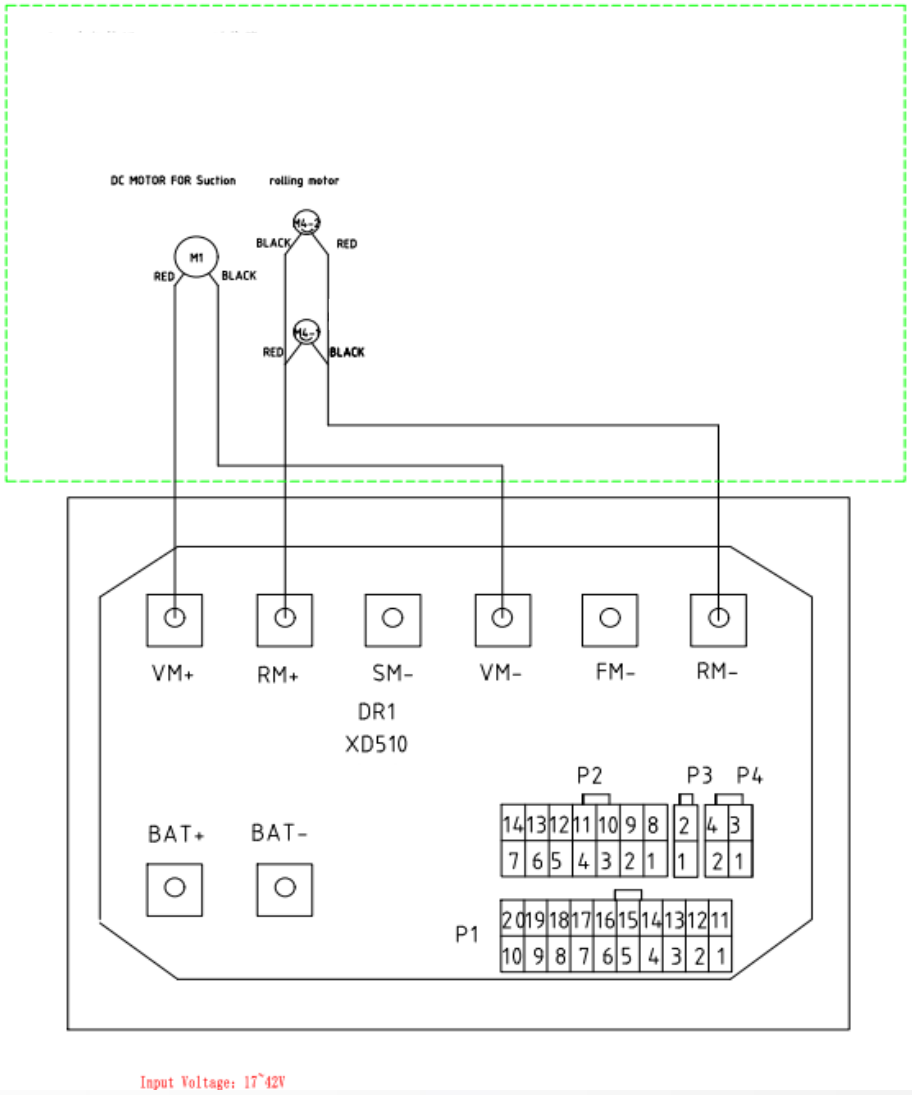


Lower Computer
-PRO 800
Back Side



2. Control Module|Motor Driver（xd510)

Optional

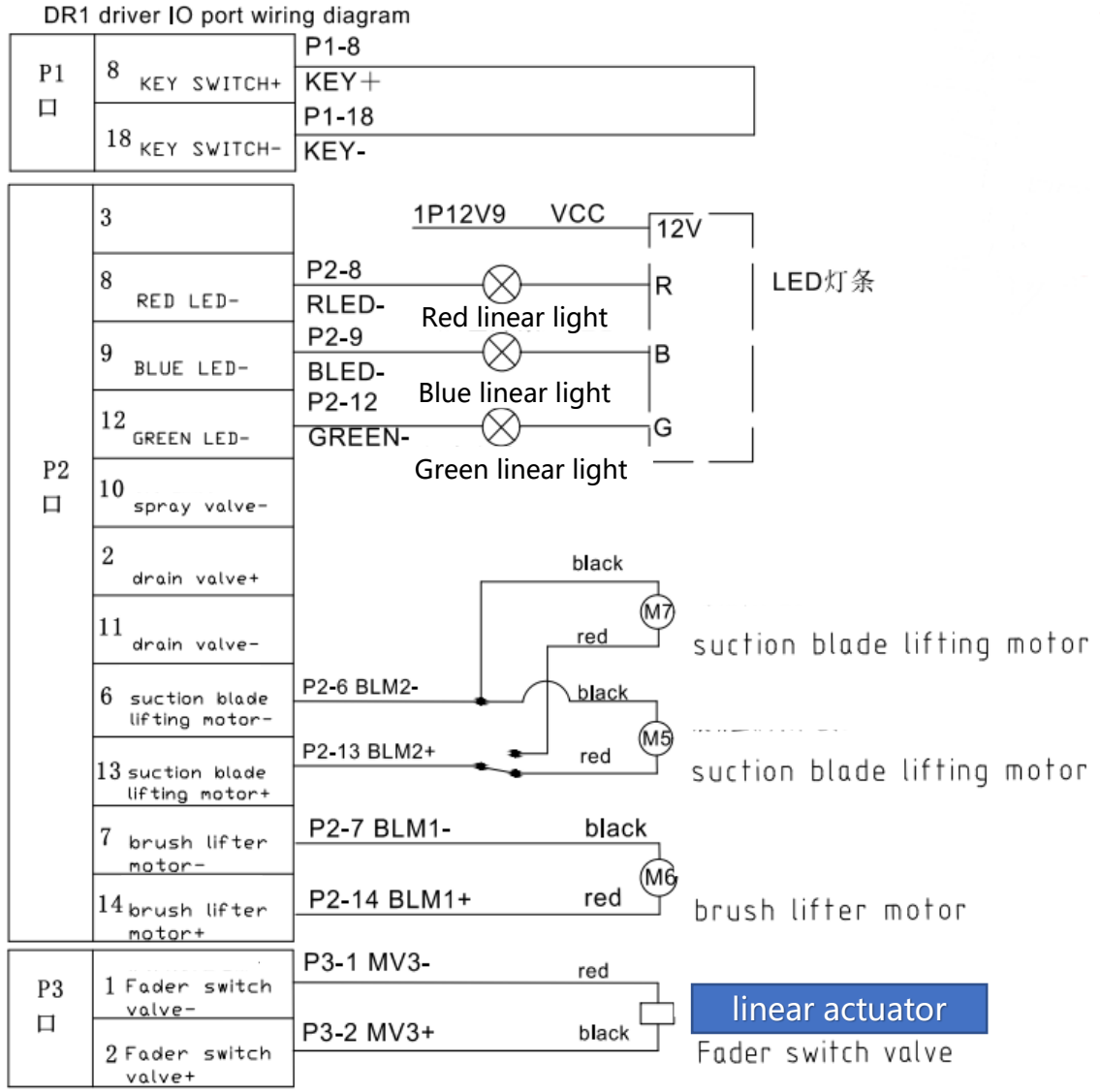


Position： Open rear shell to get access to it.

Function： Drive all motors, such as suction motor, disk brushes, lifting/push-pull motors.

Power supply： Battery provides 24VDC power to motor driver via BAT ports. Refer to circuit diagram for detailed I/O.

2. Control Module | Motor Driver （xd510)



P1 is the switch loop for xd510, it is bypassed, means it is always on as long as there is 24VDC power supply.

P2 is for linear lights, suction blade lifting motor & brush lifter motor

P3 is for the relay of linear actuator

P4 is debugging port

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1. Sensor - Function & Features
2. Sensor - Type

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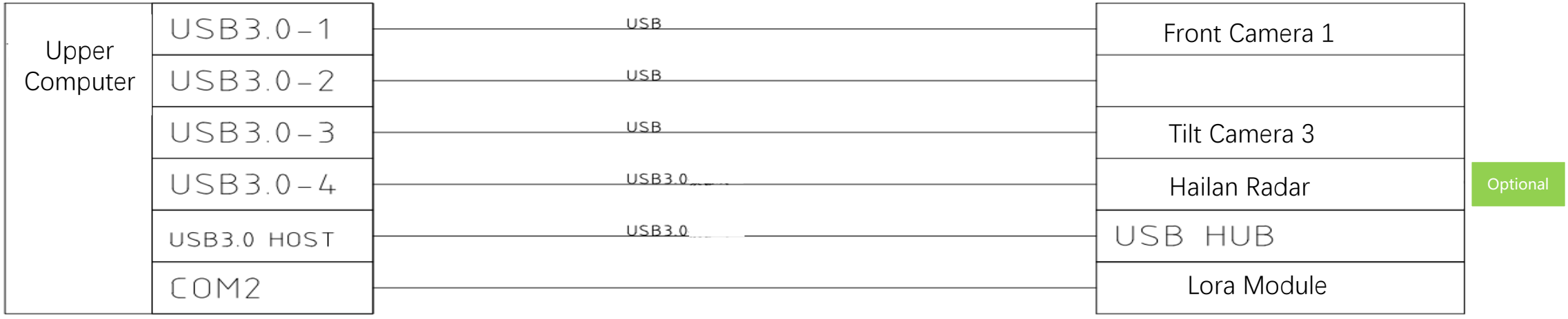
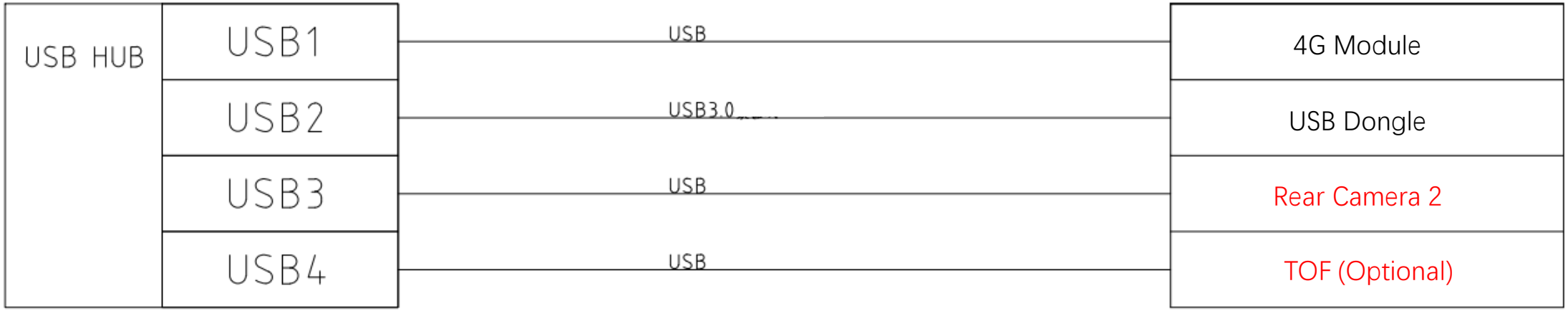
Ⅵ. Sweep System

Ⅶ. Disinfection System

2. Sensor - Diagram

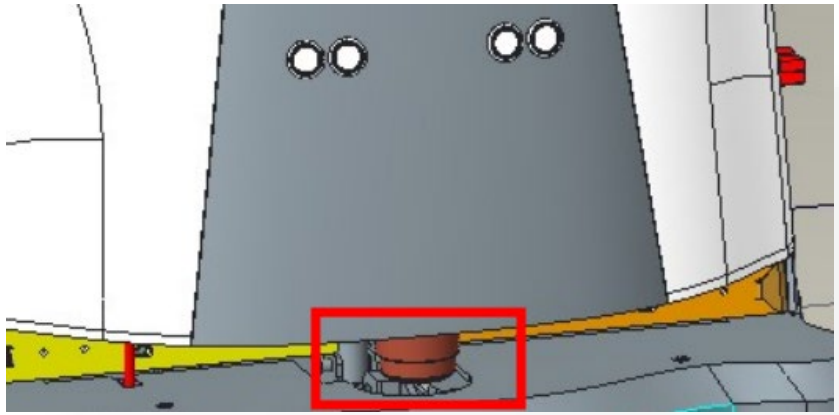




2. Sensor - Laser

Position：Lower front of robot

Function：Map scanning, robot locating



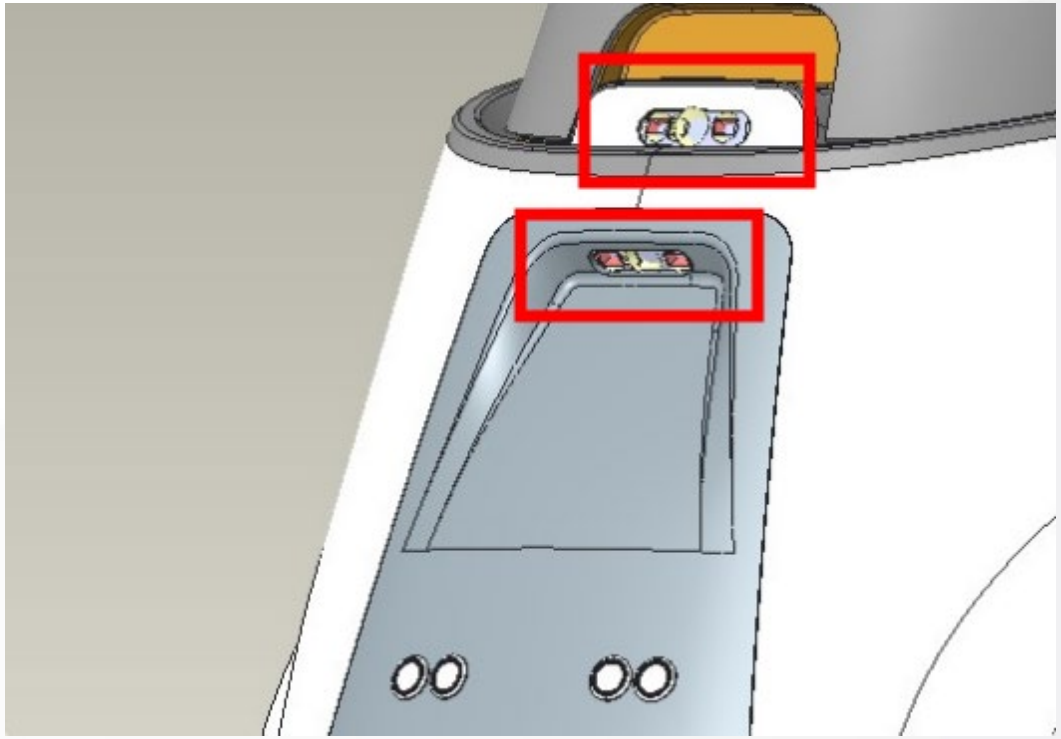
IP - Horizontal Laser	10.7.5.100
Repitation	Single pulse
Wavelenght	905nm
Ranging capability	25m (8m@10% remission)
Accuracy (typical)	max ±20mm(0.05m~8m@ 10% NIST)
Scanning range	270°
Divergence	0.33°

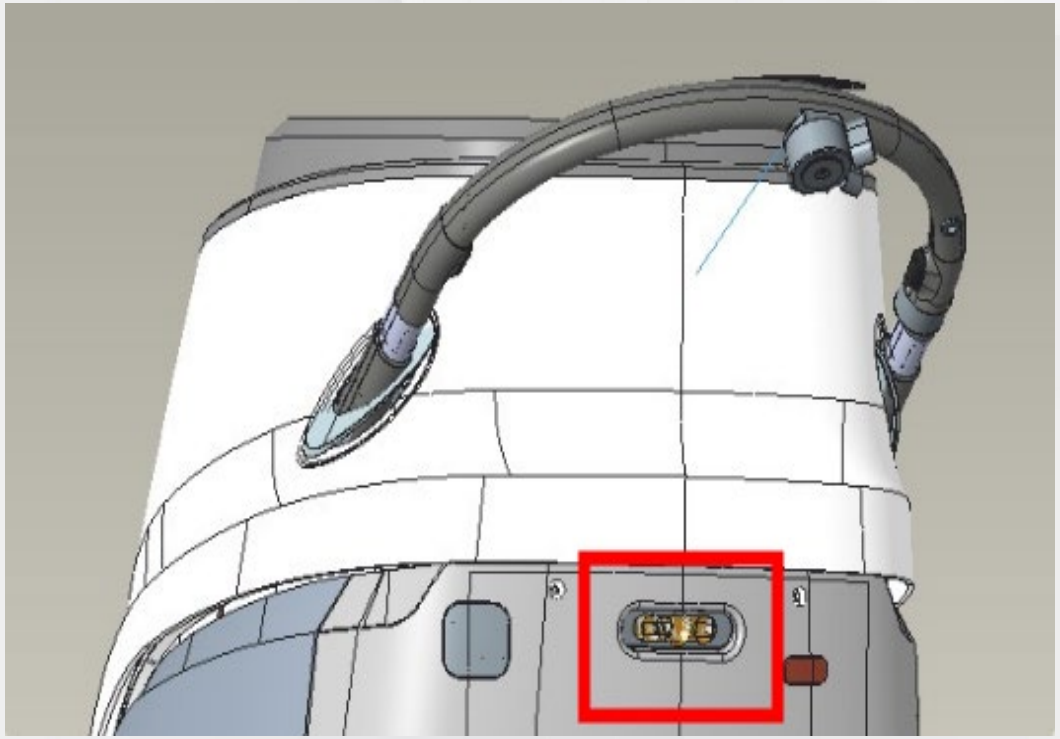
Frequency	15Hz
Data communication via Ethernet cable	network interface (TCP/IP, 10OM Bit/s)
Power rate	3W
Working temperature	-25°C ~ +50°C
Safety classification	Class 1 eye-safe
Ingress protection	IP66

2. Sensor - Camera

Position：two in the front, one in the rear.

Function：recognize obstacles and avoid them. Recognize reflective stickers & infrared stickers

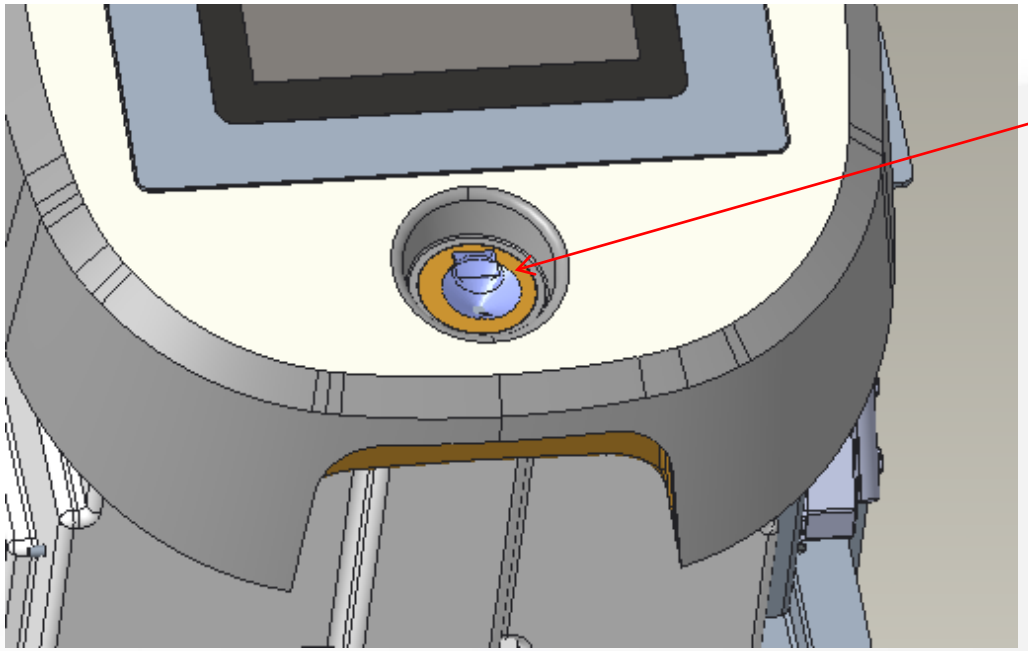




3. Sensor - Top camera(tof)

Position：on top lid

Function：assist locating



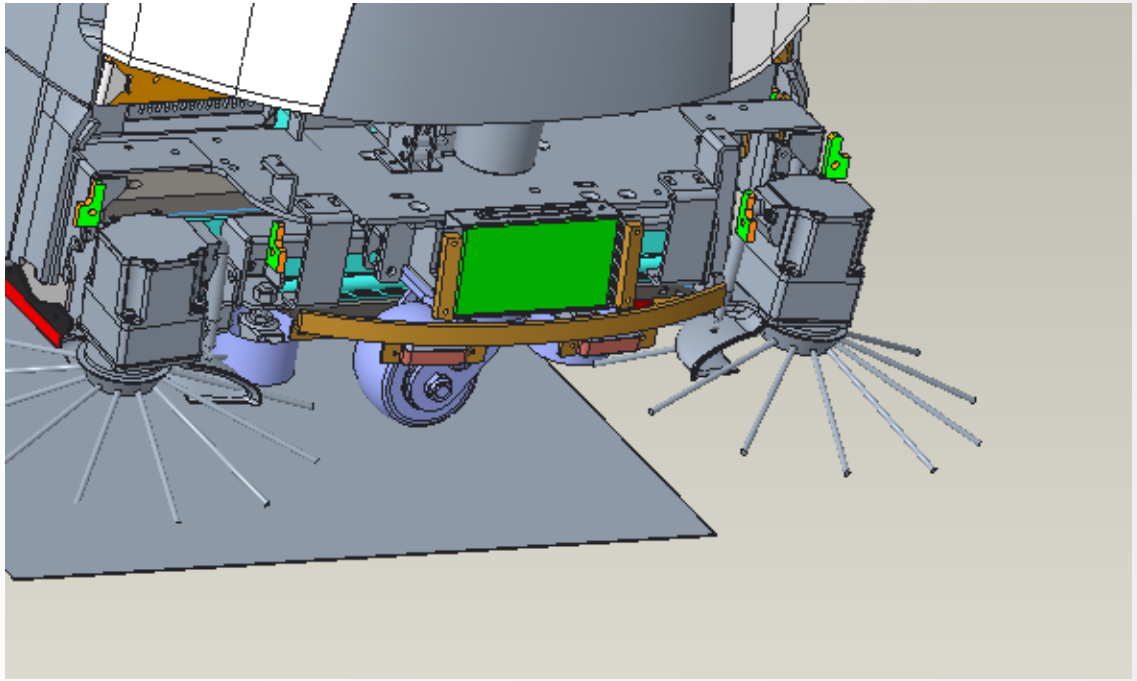
Top camera, for assisting locating.

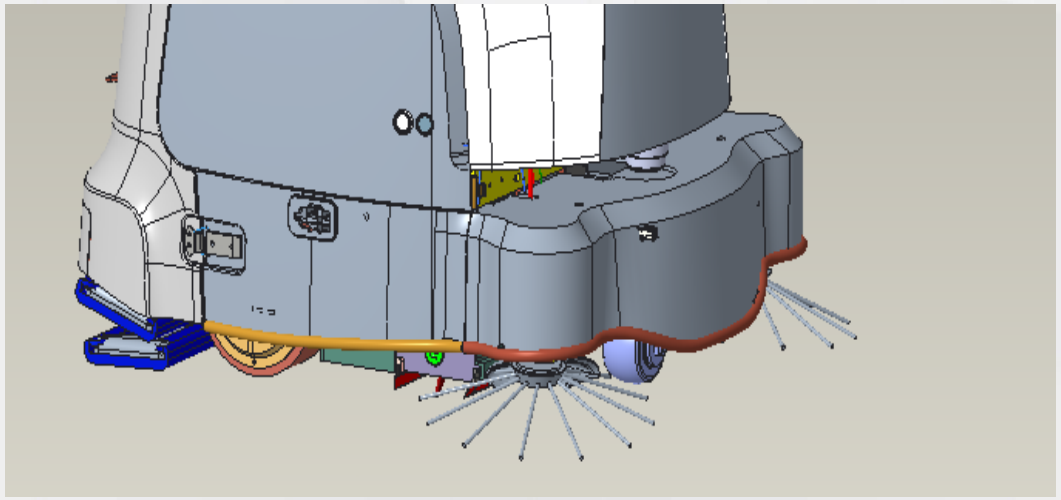
It is applicable for indoor scenarios with ceilings up to 5m high and distinct geometric or textural features.

3. Sensor - bumper

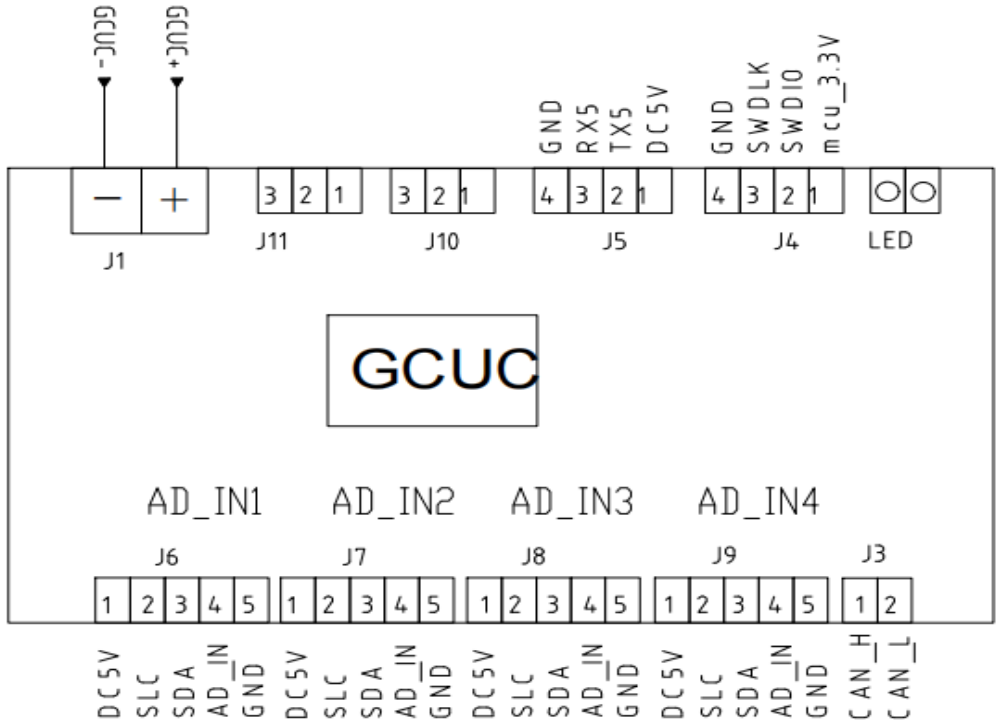
Position：the buttom rubber skirt

Function：works as the buffer for protection when there is a collision

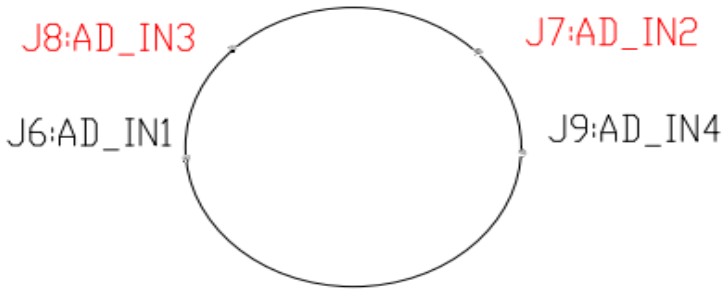




3. Sensor - Bumper Diagram



Sensor position illustration



PIN-1	红	+5V
PIN-2	白	OUT
PIN-3	蓝	GND

Anti-collision sensor

PIN-1	红	DC5V
PIN-2	白	SCL
PIN-3	蓝	SDA
PIN-4	红	AD_IN
PIN-5	红	GND

I/O Board

Anti-collision sensor

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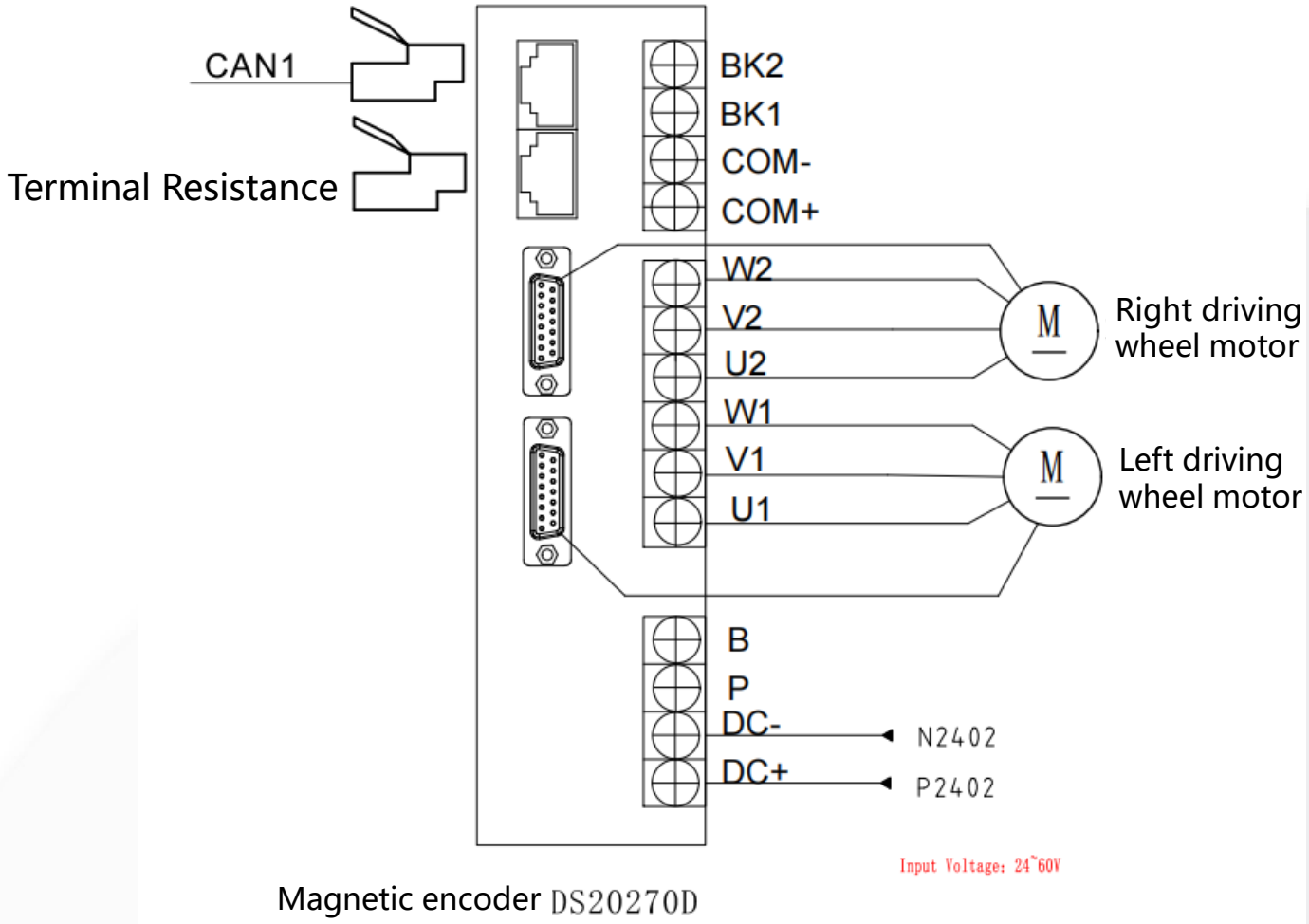
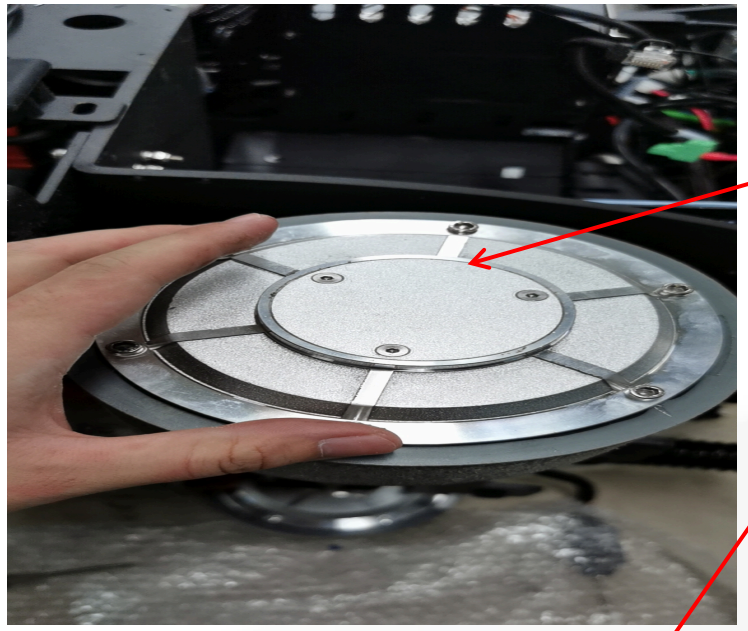
1. System Constitution|Driving Wheel motor



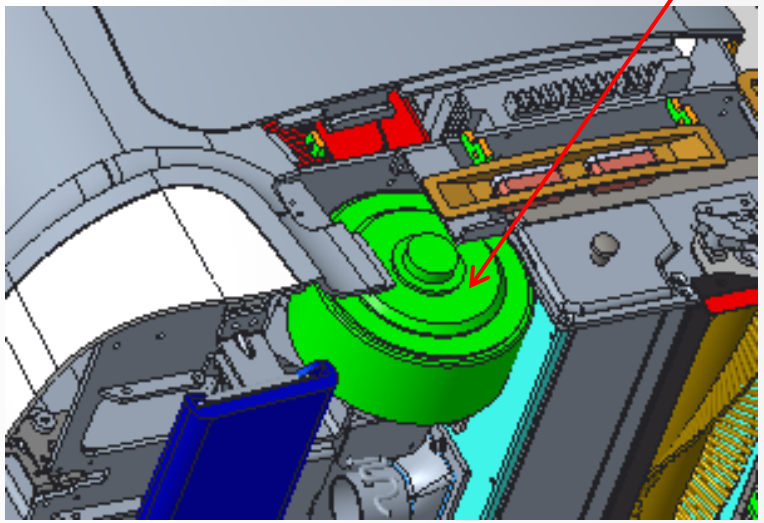
Position：Lower left/right of robot

Function： Driving wheel motor provides traction and is controlled by motor driver.

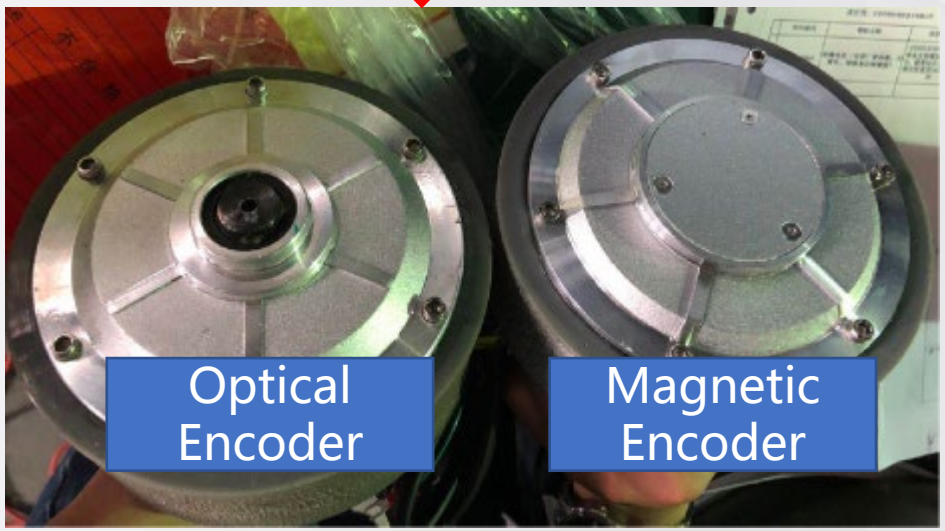
1. System Constitution|Driving Wheel motor



Driving wheel motor



Notice：optical encoder and magnetic encoder are not universal, neither does the value of sensor_type



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2. System Constitution

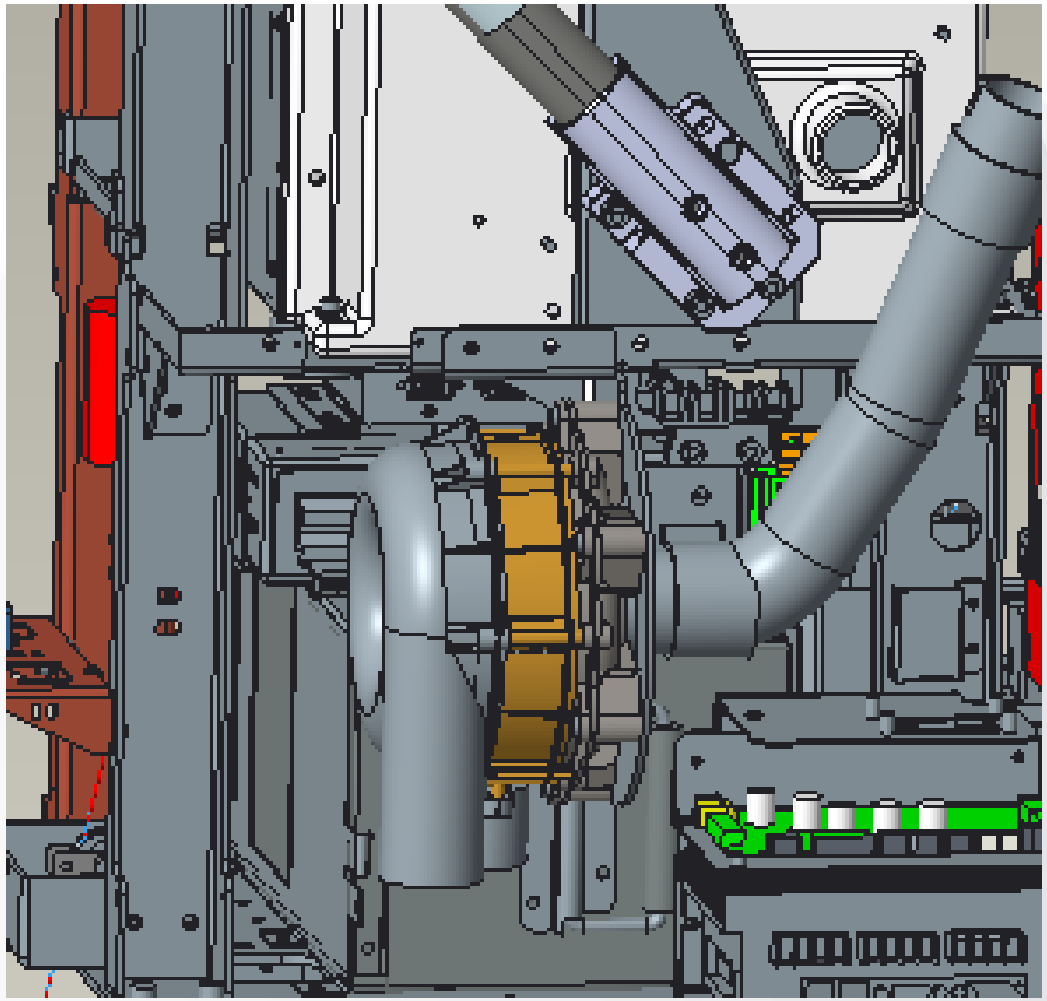
1. System Function

Function of suction system:

The main function of suction system is to absorb the ground particle wastes into dust bag, so as to enhance the cleaning effect.

2. System Constitution

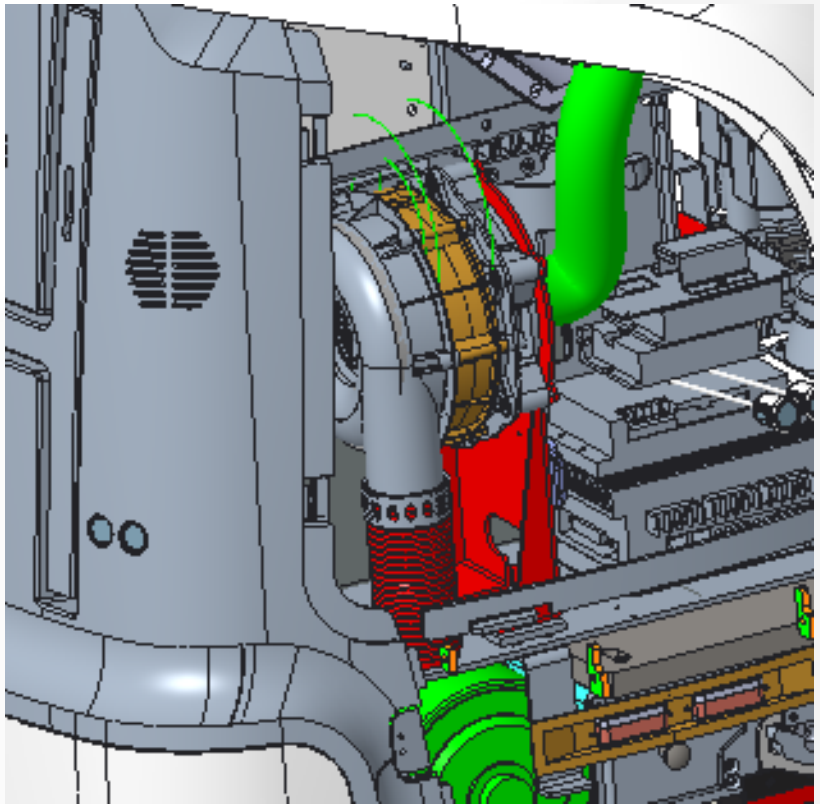
Suction system composition: suction motor, roller brush motor, side brush motor

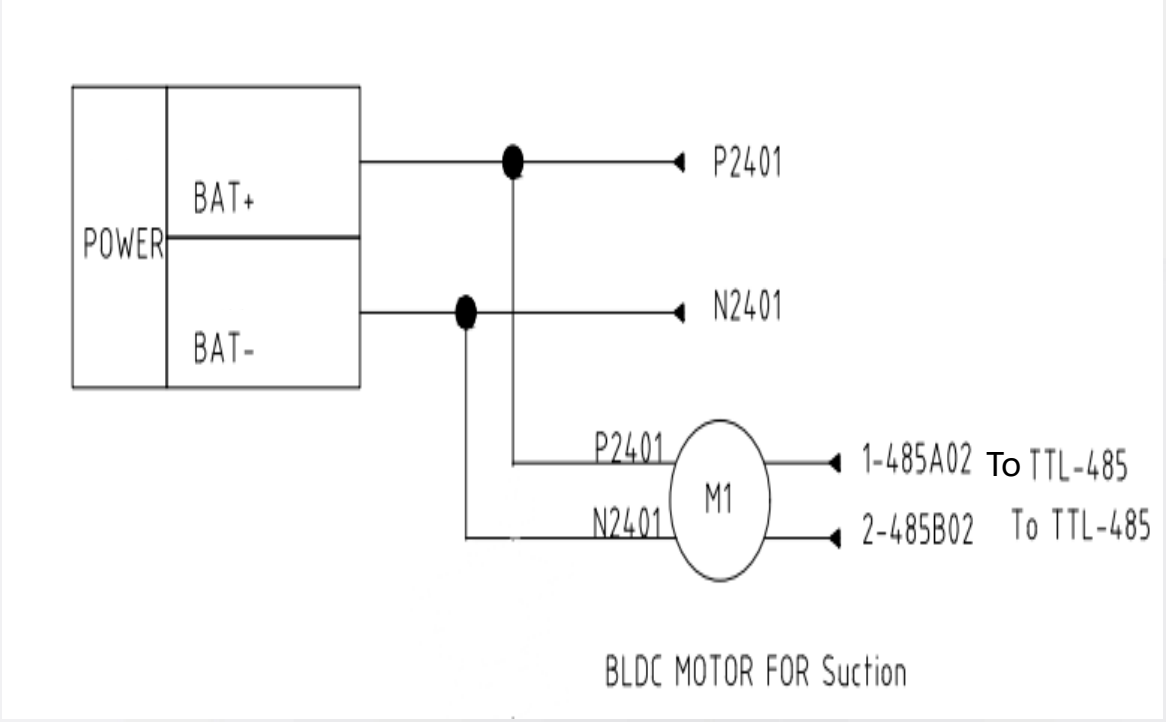


2. System Constitution|Suction motor

Function: Suction motor is to generate vacuum to absorb particle wastes on the ground. It is similar to household vacuum cleaner.

Circuit diagram: gets 24VDC power supply from motor driver directly.





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1. Sweep System Function

It is mainly for sweep the garbage on the ground.

2. Sweep System Constitution

Sweep system is consisted with tablet, lower computer, motor driver, roller brush, side brush and other components, etc.

2. Sweep System Constitution|Roller/side brush motor

Position： Roller brush motor is underneath of chassis, side brush motors are placed at L/R side.

Function： Adjust the rotation speed of roller & side brush based on the cleaning mode or custom config.

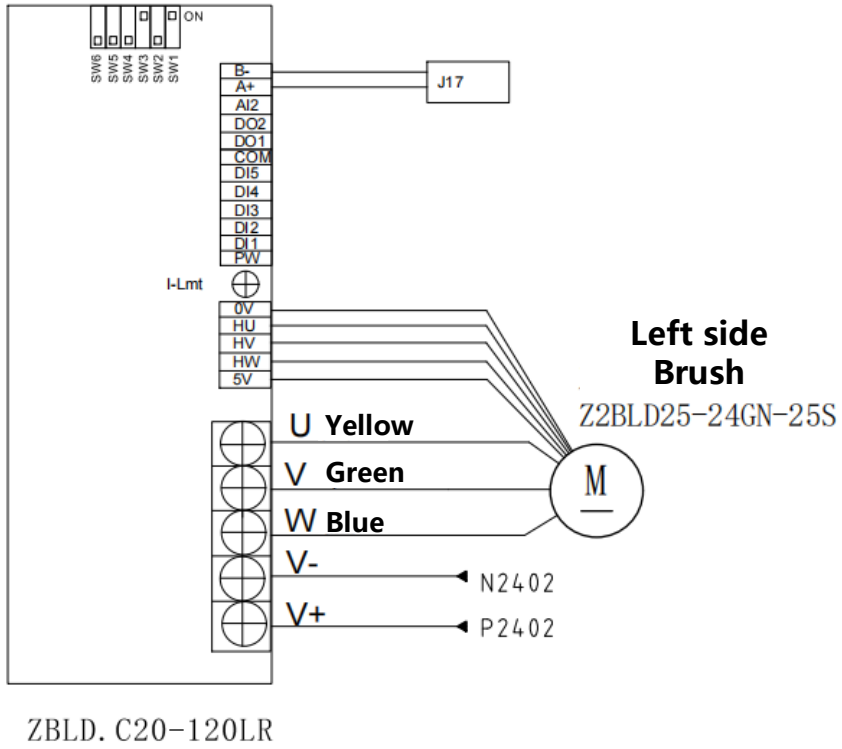
2. Sweep System Constitution|Side brush motor

Circuit diagram: Side brush is controlled by motor driver (SDR3 & SDR4)

Lower computer - J17 → Side brush motor driver (SDR3 & SDR4) → Side Brush

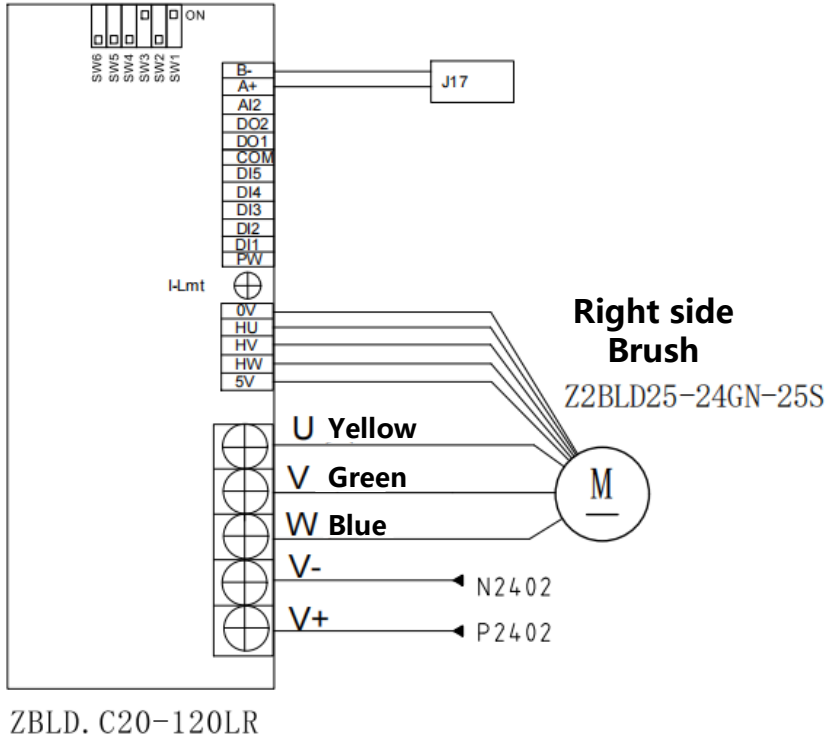
Brushless motor driver SDR3

1. I-Lmt to set value of current
2. Set SW1, SW1 to ON
3. Config address of 485, left side brush: 3, Baud rate: 57600, Parity bit: NONE



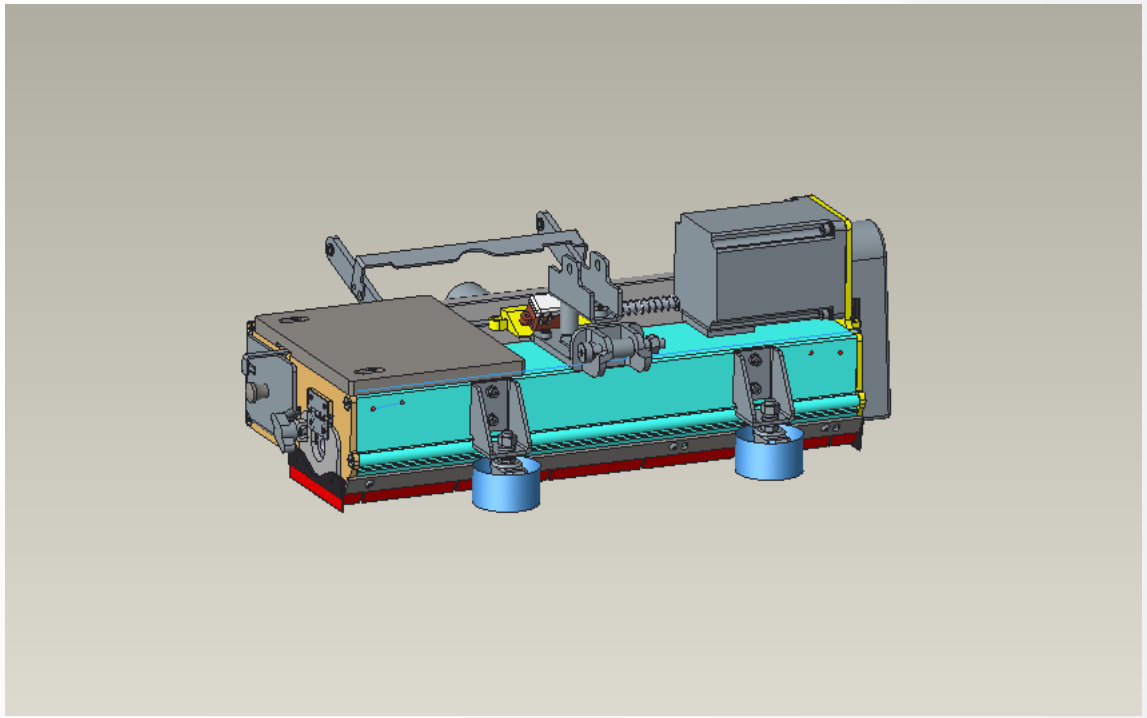
Brushless motor driver SDR4

1. I-Lmt to set value of current
2. Set SW1, SW1 to ON
3. Config address of 485, left side brush: 3, Baud rate: 57600, Parity bit: NONE



2. Sweep System Constitution|Roller brush motor

Circuit Diagram: 滚Roller brush motor is controlled by xd510 motor driver.



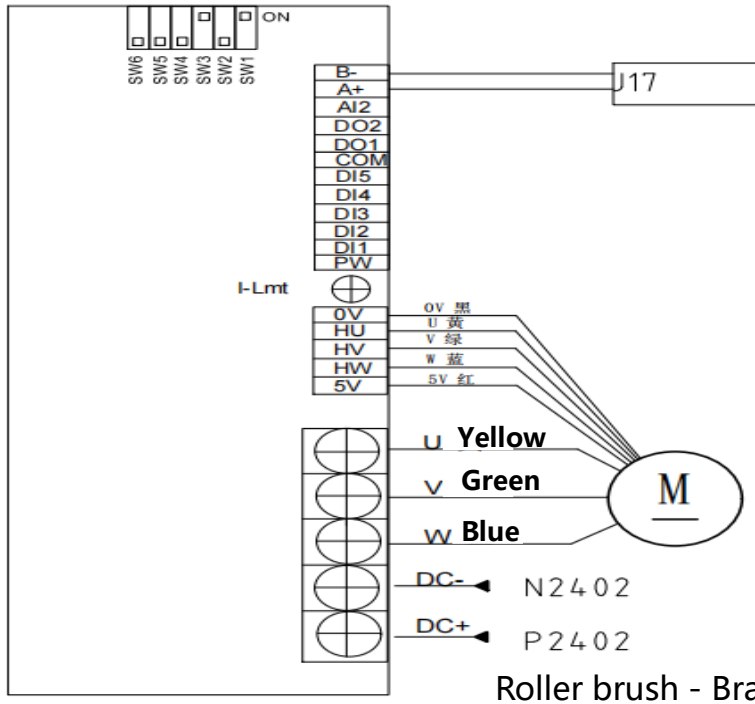
2. Sweep System Constitution | Roller brush motor

Circuit diagram: Roller brush motor is controlled by brushless motor driver - SDR2

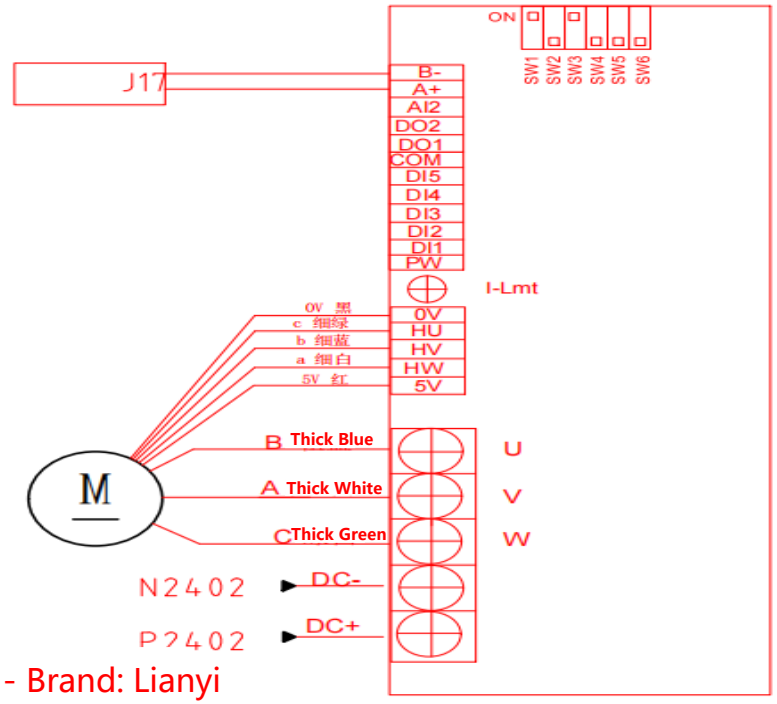
Lower Computer - J17 → Brushless motor driver - SDR2 → Roller brush

Brushless motor driver SDR3

1. I-Lmt to set value of current
2. Set SW1, SW1 to ON
3. Config address of 485, left side brush: 3, Baud rate: 57600, Parity bit: NONE



Roller brush - Brand: Taihe
86BLF06K, 150W



Roller brush - Brand: Lianyi
80ZWN24-150-08

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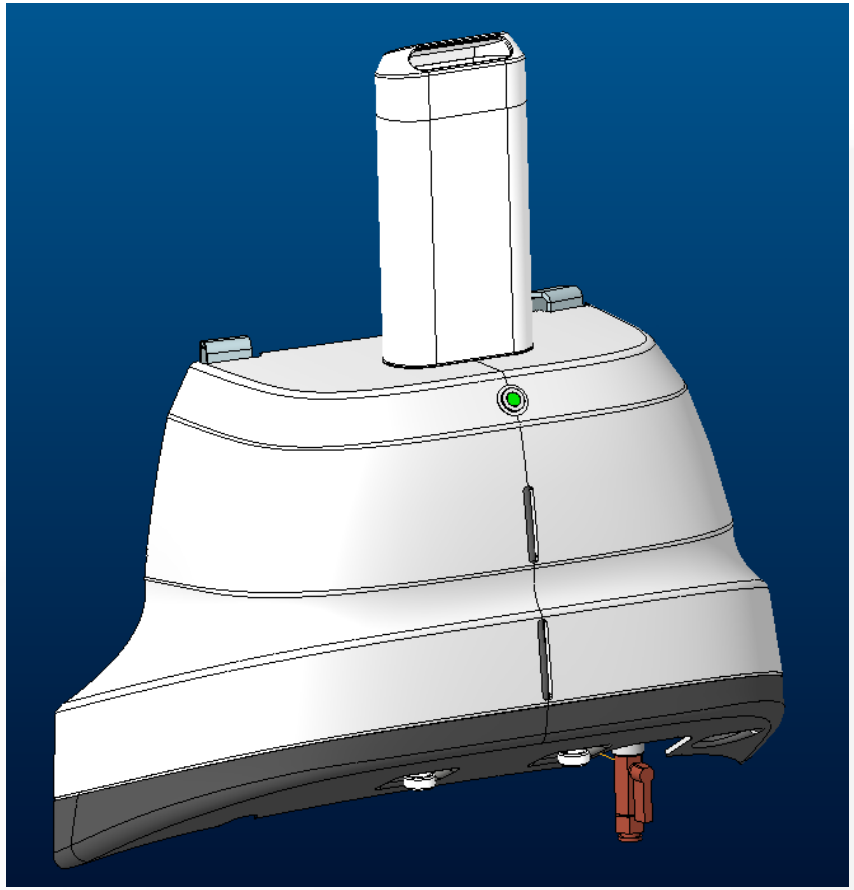
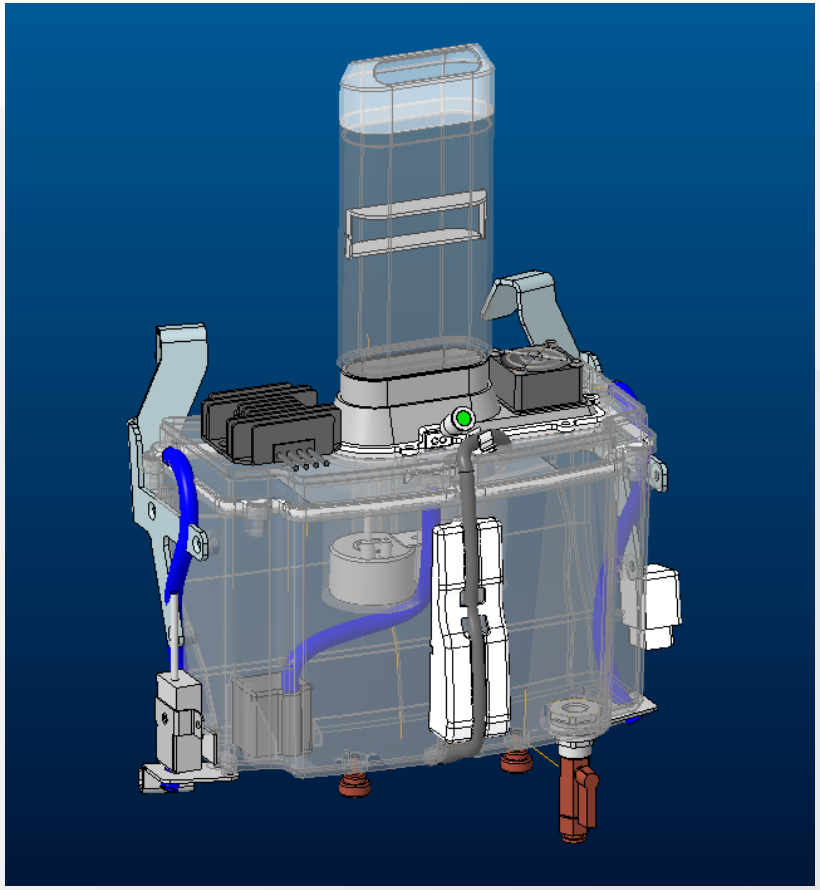
1. Disinfection System Function

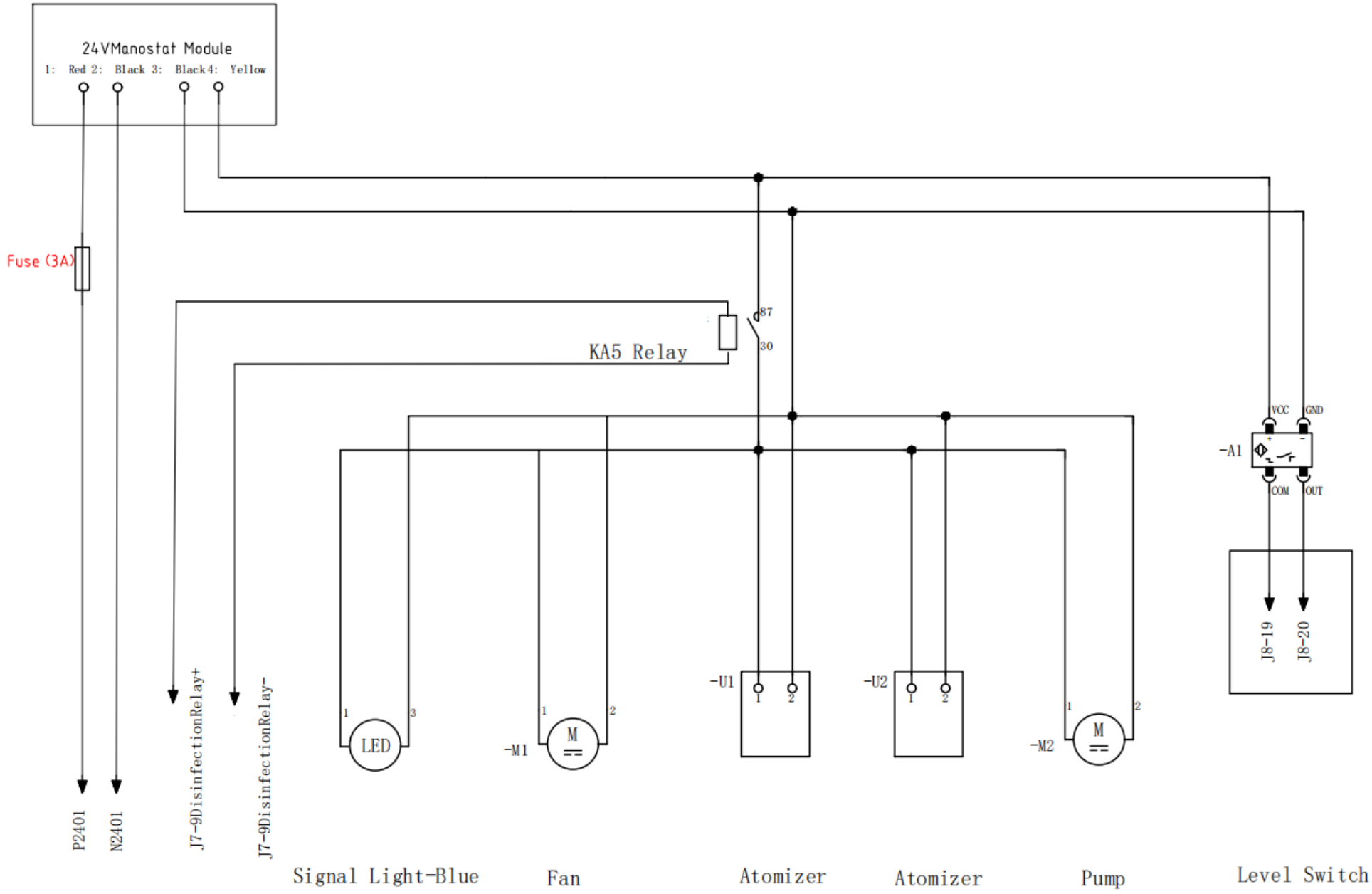
1. System|Disinfection Package

There is a control PCB placed at left side of disinfection package, controlling spray, liquid level and alarms.





1. System|Circuit diagram



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