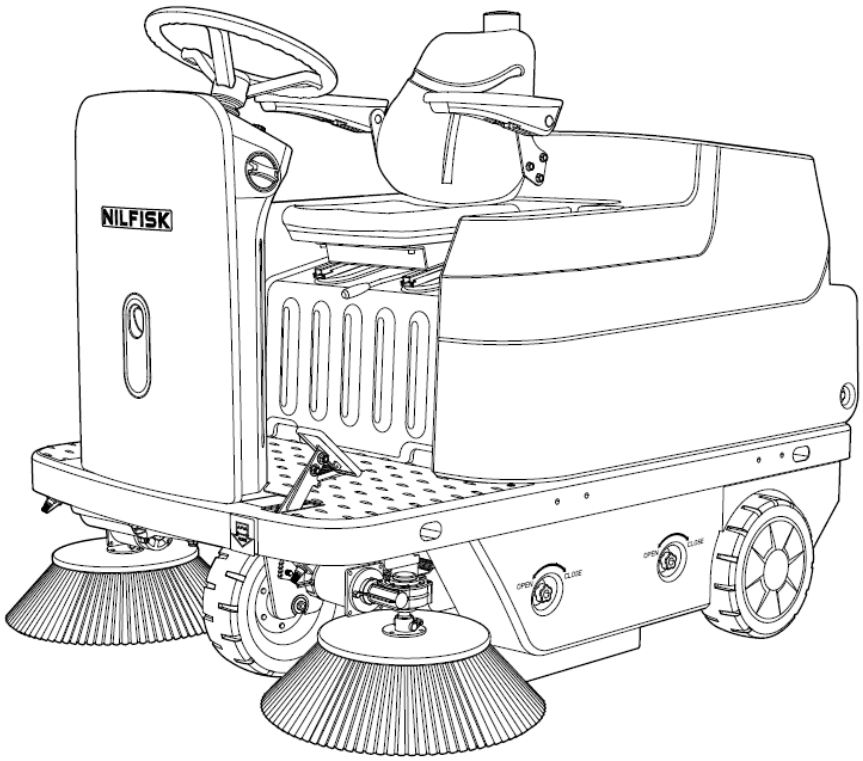
SW3000 ***Service Manual***



SW3000

50000740 50000741 50000742 50000743 50000758

English

06/2025 (Rev.01) Form No. 559504932

Contents

03 General Information

Machine General Description

The SW3000 is a ride on commercial floor sweeping machine designed to sweep commercial floors. The machine is powered by on-board batteries. The machine is equipped with two side brooms and main broom, a spraying system, a rear hopper, and vacuum suction. The machine also has a standard solution tank and an extra solution tank.

Service Manual Purpose and Field of Application

This Service Manual is a technical resource intended to aid service personnel in maintaining and repairing the SW3000 to ensure optimum performance and long service life. Please read this manual carefully before performing any maintenance and repair procedure on the machine

Other Reference Manuals

Document name	Document number	Document type
SW3000 Instructions for Use	559504940	Instructions for Use
SW3000 part list	55946457	part list

These manuals are available at:
- Local Nilfisk Retailer
- https:// www.nilfisk.com/

Conventions

Front, rear, right or left are intended with reference to the operator's seat position.

Service and Spare Parts

Service and repairs must be performed only by authorized personnel or Service Centers. The authorized personnel must be trained directly by the manufacturer and use original spare parts and accessories. Customers can find the Model No. indicated on the label to order spare parts.

(Retailer label here)

Serial Number Label

The Model No. and Serial No. are shown on the back of solution tank. This information is needed when ordering repair parts. Use the following table to write down machine identification data.

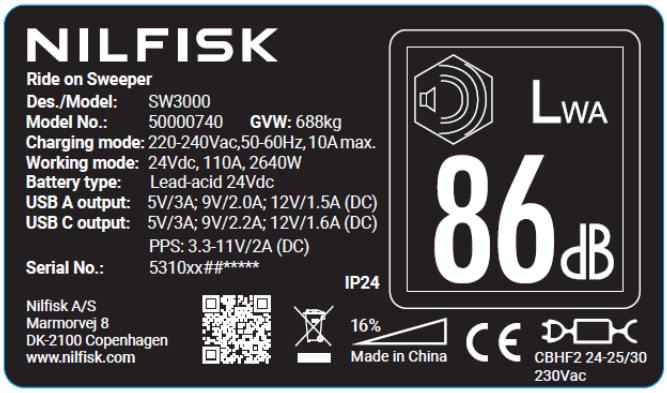


Figure 1

MODEL NUMBER _____

SERIAL NUMBER _____

Safety

Symbols

It is important to read this manual before servicing the machine. It contains information for safety protection and preventive action. The symbols below are used to help you recognize this information.

Warning: ***Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.***

Caution: ***Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.***

Caution: ***When used without the Safety Alert Symbol, indicates a potential situation which, if not avoided, could result in property or machine damage.***

Note: ***Indicates the important information.***

General Safety Instructions

These safety instructions are included to warn you of potential body injury or property damage.

Caution! ***Read and understand all the safety warnings and instructions. Failure to follow them may result in electric shock, fire, and/or serious injury.***

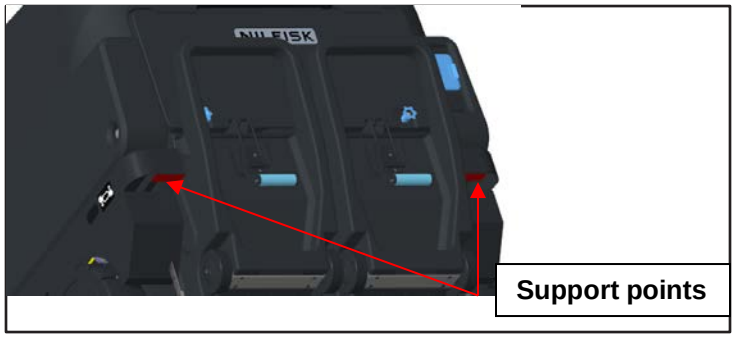
- ***To avoid personal injury, this machine should be used only by properly trained and authorized persons.***
- ***Do not operate the machine near toxic, dangerous, flammable and/or explosive materials. This machine is not suitable for collecting dangerous or hazardous materials.***
- ***In case of fire, use a powder fire extinguisher, not a water-based extinguisher.***
- ***Do not use on surfaces having a gradient exceeding what is marked on the machine. While on ramps, avoid sudden stops if loaded. Avoid abrupt sharp turns.***
- ***Disconnect the power source and/or batteries before servicing electrical components.***
- ***Never work under a machine without safety blocks or stands supporting the machine.***
- ***Do not dispense flammable cleaning agents, operate the machine on or near these agents, or operate in areas where flammable liquids exist.***
- ***When using floor cleaning detergents, follow all safety and handling instructions of their respective manufacturer.***
- ***Battery charging may produce highly explosive hydrogen gas. Charge the batteries only in well-ventilated areas and away from ignition sources or naked flames.***
- ***When operating this machine, ensure that third parties, particularly children, are not endangered.***
- ***Take precautions to prevent hair, jewelry, or loose clothing from being caught by moving parts.***

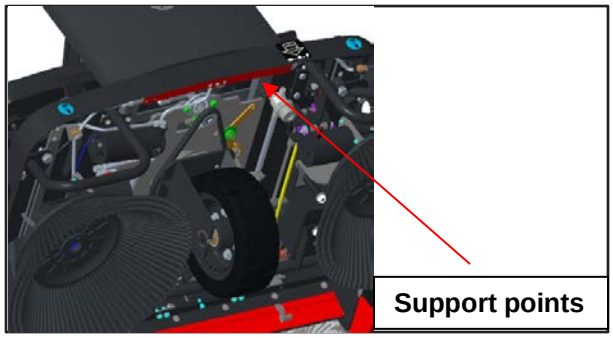
Property Damage Messages

- ***Storage and operation temperature must be above 0°C and humidity must be between 30% and 95%, non-condensing.***
- ***Before use, all doors and hoods should be properly latched.***
- ***This machine is not approved for use on public paths or roads.***
- ***This machine is only approved for use on hard surface.***
- ***Use brooms supplied with the machine or those specified in the User Manual. Using other brooms could reduce safety.***
- ***Do not wash the machine with direct or pressurized water jets, or with corrosive substances.***
- ***Do not allow the brooms to operate while the machine is stationary to avoid damaging the floor.***
- ***Use only factory authorized parts and accessories.***
- ***This machine must be properly disposed of in accordance with local laws and regulations.***

Lifting Machine

Caution! ***Never work under a machine without safety stands or blocks supporting the machine. The support points were provided under the chassis (see pictures).***

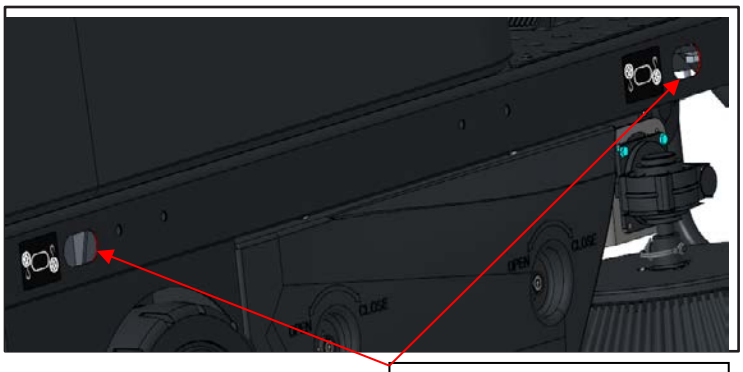




Transporting Machine

Caution! ***Before transporting the machine on an open truck or trailer, make sure that . . .***

- ***All covers are closed***
- ***Batteries (if equipped) are disconnected***
- ***The machine is securely fastened to the means of transport.***
- ***There are tie down locations (see pictures).***



Technical Data

Technical Parameters	**Value**
Machine length	1620 mm/63.8 Inches
Machine width (without side brooms)	1055 mm/41.5 Inches
Machine height	1260 mm/49.6 Inches
Machine height with overhead guard	1986mm/78.2 Inches
Working width (without side brooms)	700 mm/27.6 Inches
Working width (with two side brooms)	1130 mm /53.1 Inches
Minimum ground clearance (excluding blades)	60 mm/2.4 Inches
Main broom size (diameter x length)	300x700 mm/11.8x27.6 Inches
Side broom size (mm/Inches)	500 mm/19.7 Inches
Main broom speed (rpm)	600 rpm
Side broom speed (rpm)	0~98rpm
Front wheel ground pressure per unit area (N/mm²)	0.88 N/mm²
Rear wheel ground pressure per unit area (N/mm²)	0.6 N/mm²
Machine weight (without battery) (kg)	361 kg
Machine gross weight (GVW) (kg) without operator	563 kg
Hopper volume (l)	100L
Main broom motor	Input 624W Output 500W
Side broom motor	Input 280W Output 100W x 2
Drive motor	Input 936W Output 650W
Suction Motor	Input 168W
Water pump	Input 30W
Actuator	Input 60W x 2
Filter shaker motor	Input 144W
Others	Input 58W
Rated power	2640W
Power consumption	948W/1.3HP(Lead-acid) 823W/1.1HP(Li-ION)
Noise level (ISO 11201, ISO 4871) (LpA)	72±3 dB(A)
Sound power (ISO 3744, ISO 4871) (LwA)	86 dB(A)
Vibration level at the operator's arms (ISO 5349-1) (*)	<2.5m/s²
Vibration level at the operator's body (ISO 2631-1) (*)	<0.5 m/s²
Motor protection rating	IP24
(*) Performance parameters under normal working conditions on a flat asphalt surface	
Performance	**Value**
Maximum driving speed	8 km/h
Maximum reverse speed	4 km/h
Gradeability	16% (L=140 meters)
Minimum turning radius width	2550 mm
Battery	**Value**
Battery voltage	24 V
Battery compartment dimensions (length x width x height)	770 x 340 x 300 (mm)
Dust collection and filtration	
Dust filter size	3.5 m²
Main broom compartment vacuum	8.8 mm H2O
Filter shaker	Electric

Maintenance Schedule

WARNING!

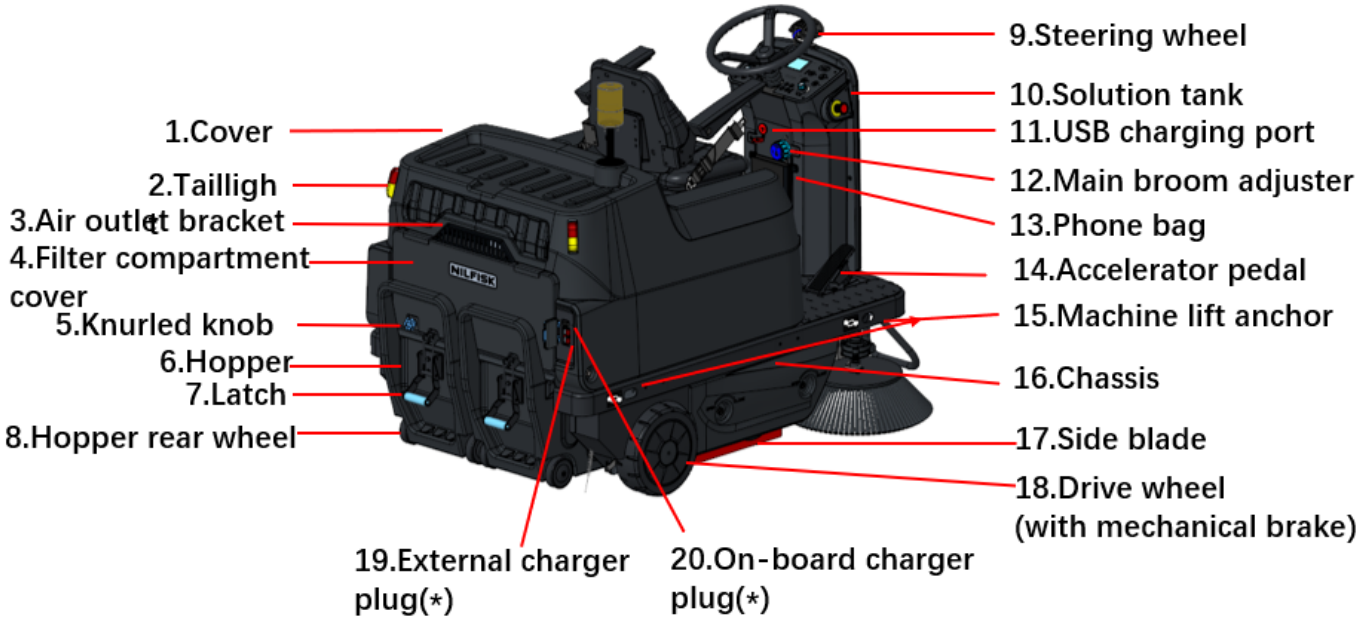
Maintenance procedures must be performed after the machine is turned off and the battery charger cable is disconnected. In addition, carefully read the safety chapter in this instruction.

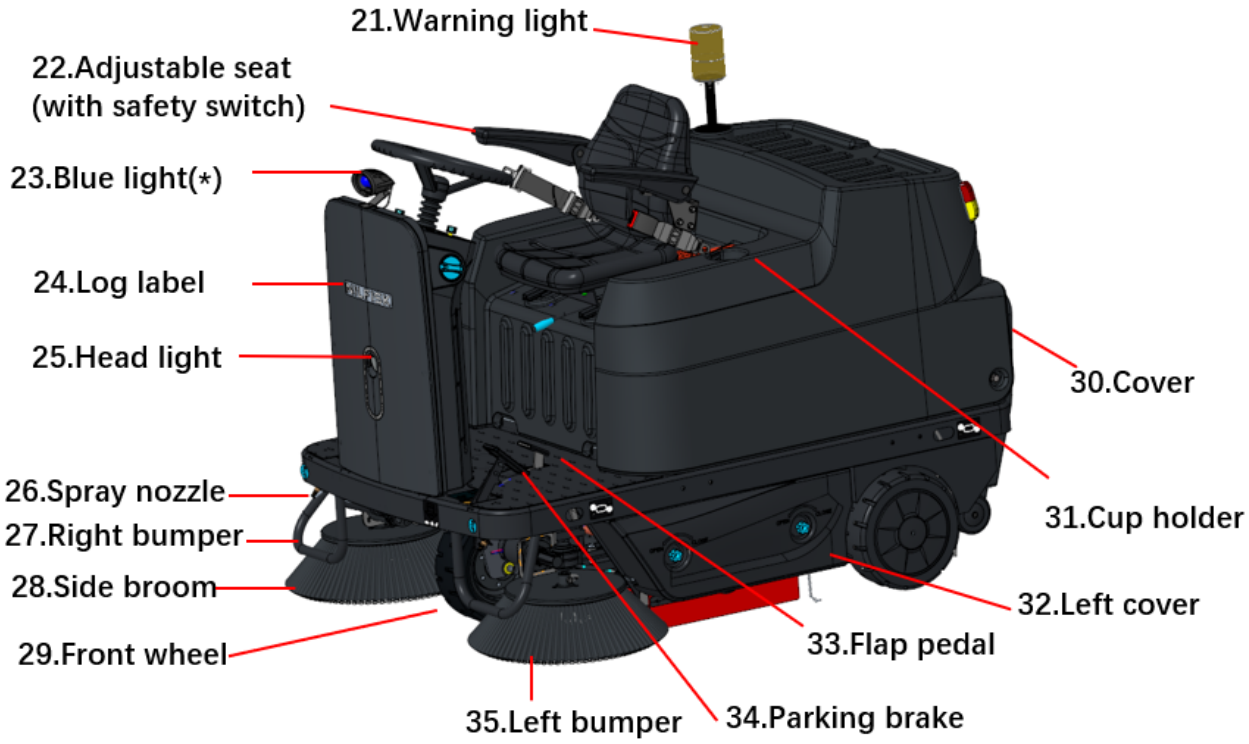
SCHEDULED MAINTENANCE TABLE

Procedure	Upon delivery	Every 10 hours	Every 50 hours	Every 100 hours	Every 200 hours	Every 400 hours
Battery charging						
Battery (WET) electrolyte level check		(2)				
Main broom cleaning						
Side and main broom height check and adjustment						
Dust filter cleaning and integrity check		(3)				
Skirts height and operation check						
Filter shaker operation check			(*)			
Main broom drive belt visual inspection			(*)			
Flap pedal check and adjustment				(*) (4)		
Steering chain check and cleaning					(*)	
Main broom drive belt replacement					(*)	
Main broom motor and drive system motor carbon brushes check or replacement						(*)

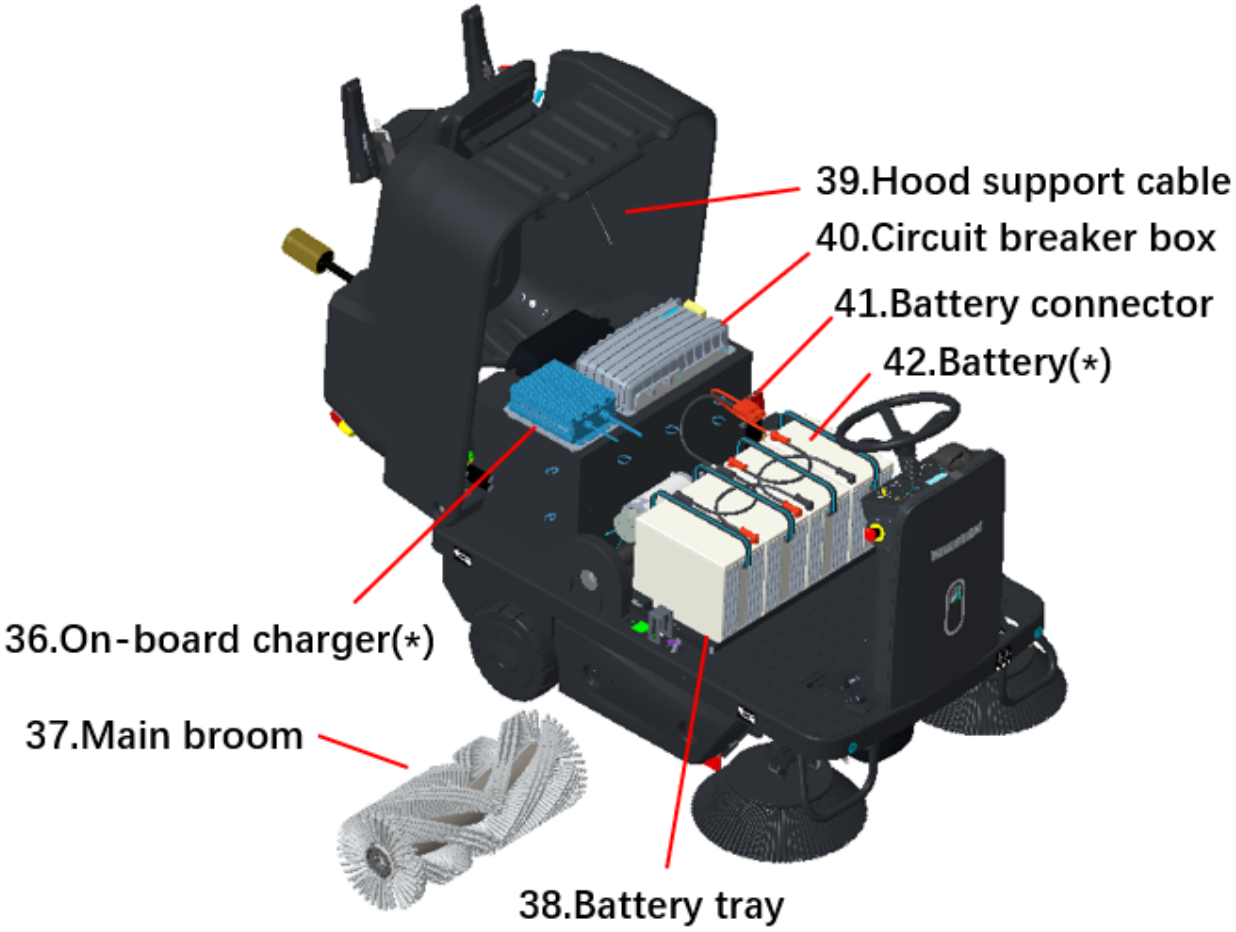
1. (*) For relevant procedures, refer to the Service Manual.
2. Daily or after using the machine.
3. Or before machine start-up.
4. Or more frequently in dusty areas.

Machine Structure



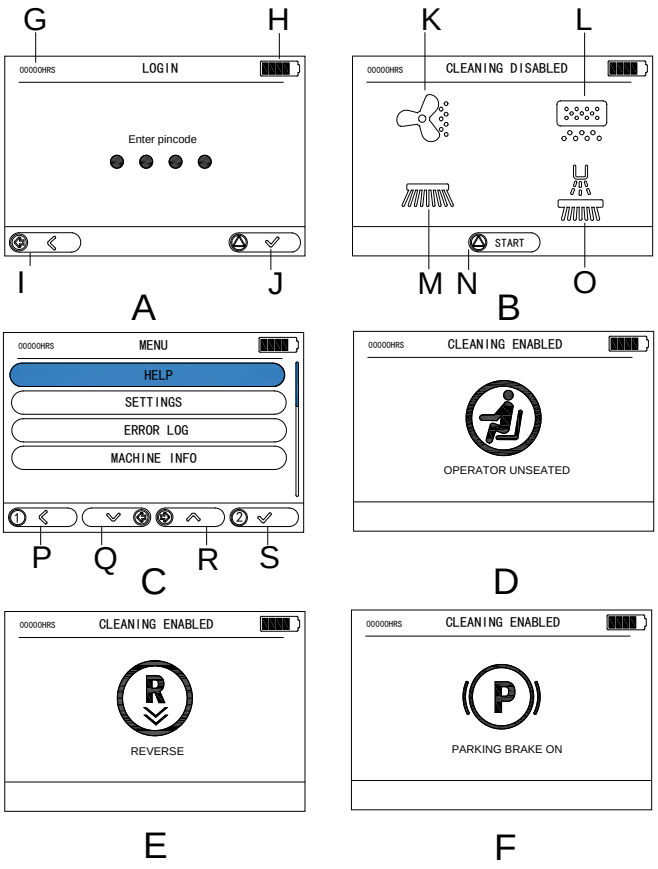


Machine Structure (continues)



UI Panel

46. Multifunction display
Items displayed:
A) Login screen
B) Home screen
C) Menu screen
D) Safety stop mode
E) Reverse mode
F) Brake mode
G) Operating time
H) Battery level
I) On the login screen, use the indicator left button (56) to delete the incorrect password
J) On the login screen, use the start button (47) to confirm the password.
K) Dust fan status
L) Filter shaker status
M) Side broom status
N) Press the start button (47) to enable cleaning mode.
O) Dust guard spray status.
P) On the menu screen, short press ① to return to the previous page.
Q) On the menu screen, short press the indicator left button (56) to scroll down the menu.
R) On the menu screen, short press the indicator right button (57) to scroll up.
S) On the menu screen, short press ② to confirm the option.
47. Start button
Turn on/off cleaning mode, turning on cleaning mode will automatically activate the main broom, side broom and dust fan.
48. Dust fan button
49. Filter shaker button
· Enable/Disable dustproof function.
· Press for 2 seconds to active automatic mode (Filter shaker LED flashes), press for 2 seconds again to exit the automatic mode.
50. Side broom button
51. Dust guard spray button.
52. Side broom speed dial
53. Power button
54. 4-digit pin pad
55. Machine speed dial
56. Indicator left button
57. Indicator right button
58. Reverse button
59. Headlight button
60. Horn button

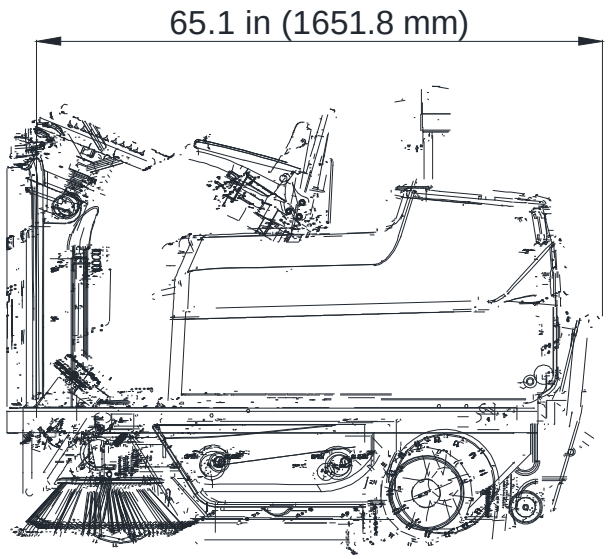


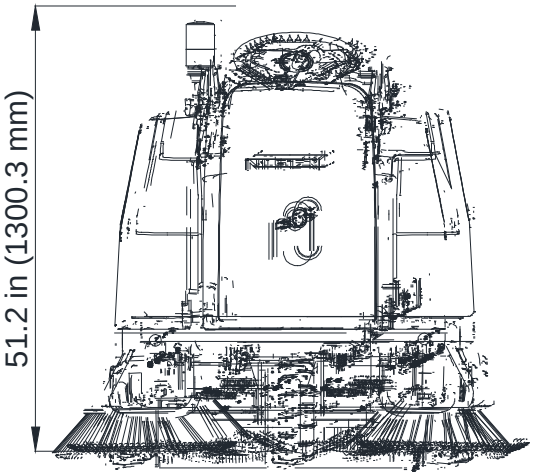
Service and Diagnostic Equipment

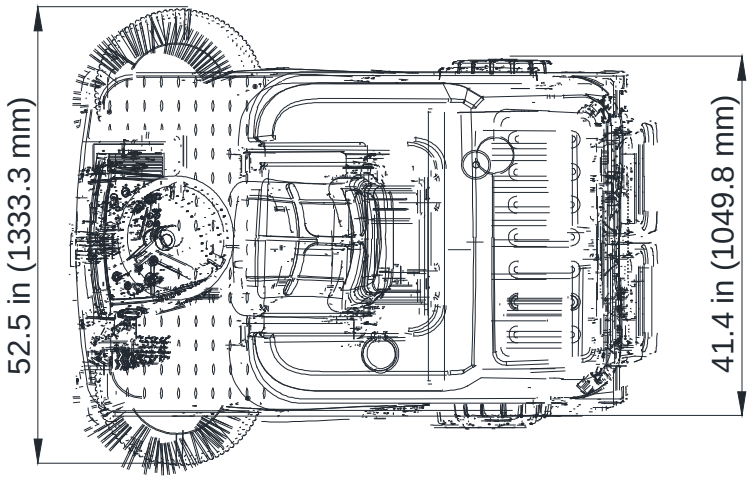
Besides a complete set of standard tools, the following instruments are necessary to perform quick check and repairs on machines:

- Digital Voltmeter (DVM)
- Amp clamp with possibility of making DC measurements
- A copy of the User Manual and Spare Parts List of the machine to be serviced.

Dimension







04 Control System

Functional Description

The electronic control system is composed of a Main machine controller (EB1), a Drive controller (EB2), and a User Interaction (UI) Panel.

UI Panel consists of UI controller (EB3), an LCD controller (EB4), and a Membrane (EB5), they are assembled. Membrane (EB5) contains almost all the buttons. Software updates for EB3 and EB4 are separate.

The Main machine controller (EB1) manages the following components directly:

- Main broom motor (M1)
- Suction motor (M2)
- Side broom motors (M3A) or (M3B)
- Filter shaker motor (M4)
- Main broom actuator (M6)
- Side broom actuator (M5)
- Water pump (M7)
- Seat signal switch (SW3)

EB2 manages the drive system directly:

- Drive motor (M8)
- Accelerator pedal
- Electronic brake (BK1)
- Turn signal switch (SW5)
- Brake signal switch (SW6)

When operator presses the buttons on the Membrane (EB5), the signal will be sent to UI controller (EB3), it handles the input then sends command to the Main machine controller (EB1) and Drive controller (EB2) using CAN BUS, UI controller (EB3) also receives command from Main machine controller (EB1) and Drive controller (EB2), which will change the LCD display and the light status on the Membrane(EB5).

LCD controller (EB4) includes a 3.5-inch LCD screen, it stores the images needed for user interaction, UI controller (EB3) sends command to LCD controller (EB4) via serial port communication, LCD controller (EB4) shows different screens according to the command.

Functional Block Diagram

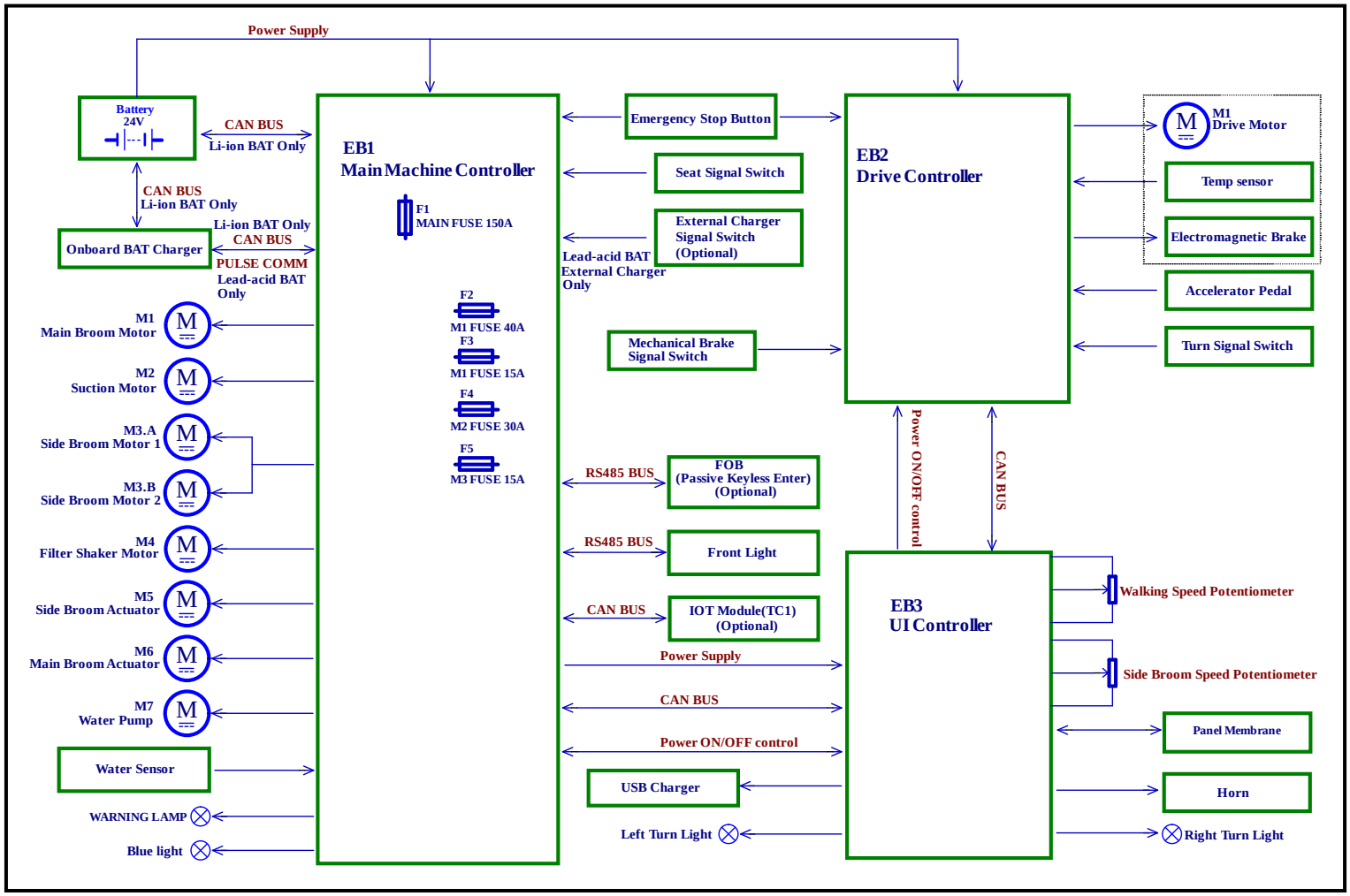
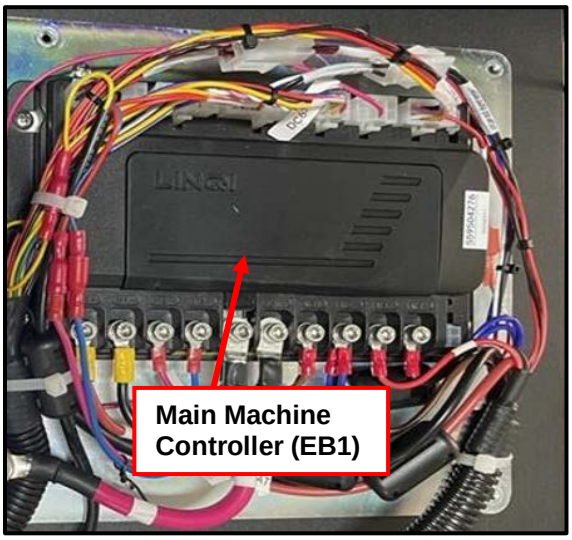


Figure 2

Component Locations

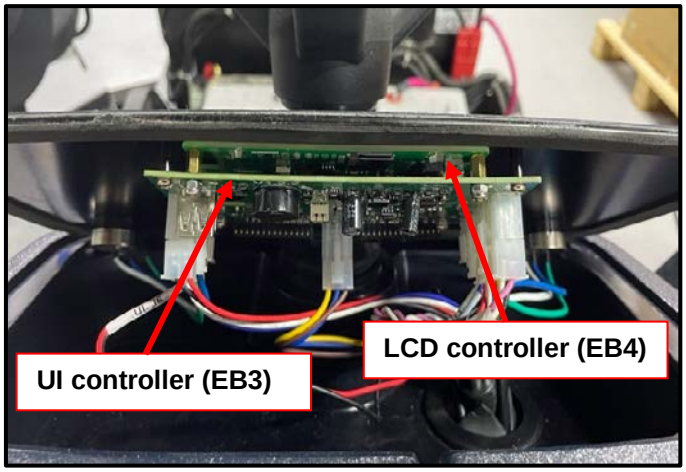
- Main Machine Controller (EB1)
- Drive Controller (EB2)
- UI Panel (EB3 & EB4 & EB5)
- USB charger
- Warning light
- Main ground lug
- Main +24V lug

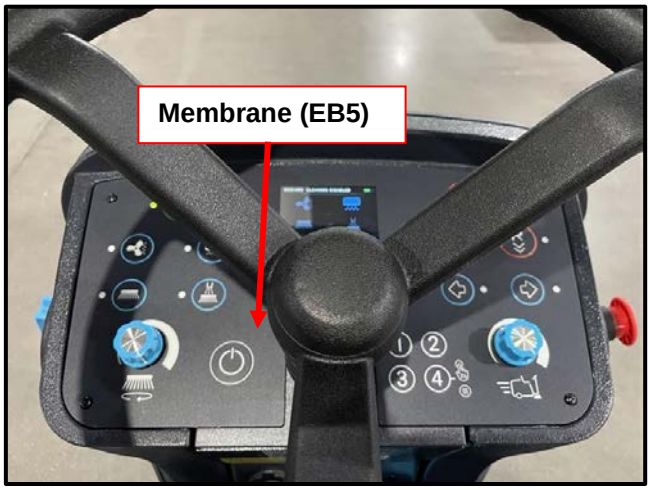
Main Machine Controller (EB1)



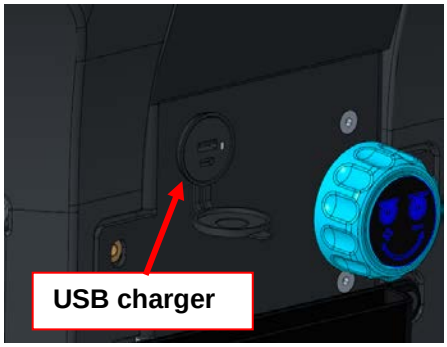
Drive Controller (EB2)

UI Panel (EB3 & EB4 & EB5)



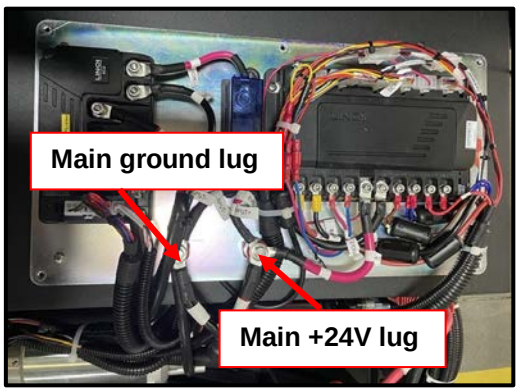


USB Charger



Warning light

Main ground lug & Main +24 lug



Maintenance and Adjustments

Firmware Update

Software update toolkit

1. USB 2.0 flash drive, formatted as FAT16 or FAT32, capacity not more than 2GB.
It's used to update EB1 Main controller, EB2 Drive controller, EB3 UI controller.

2. TF card, capacity not more than 8GB
It's used to update EB4 LCD controller.

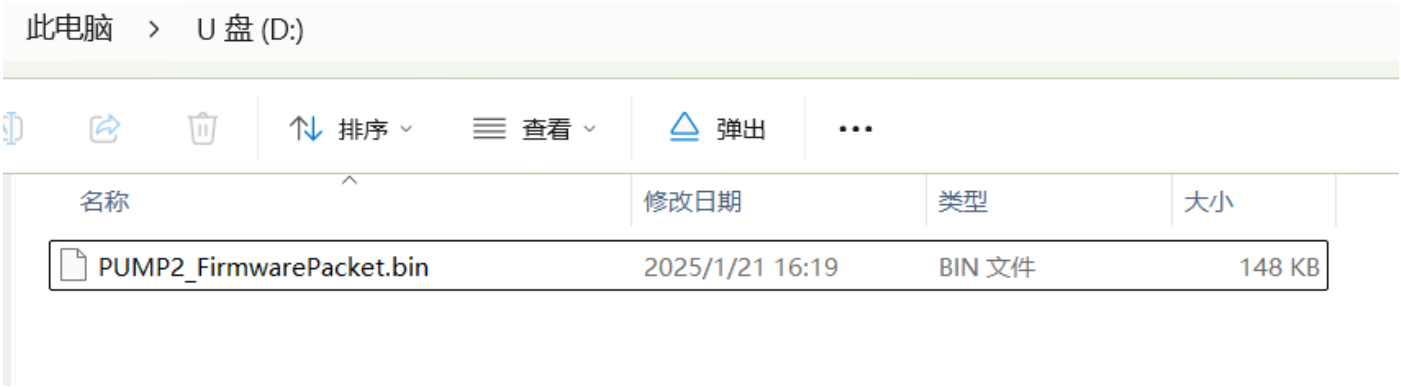
3. TF card reader
Write firmware to TF card.

4. TF card storage box
TF card storage box, to prevent loss or damage of TF card.

Software update

EB1/2/3 controller update

Step 1: Copy the firmware files to a blank USB 2.0 flash drive, formatted as FAT16 or FAT32.
Firmware file named PUMP2_FirmwarePacket.bin

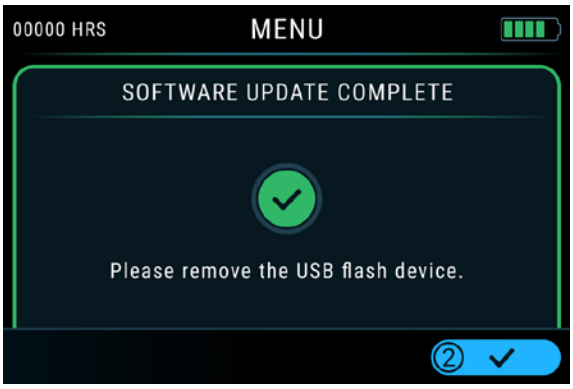


Step 2: Power off the machine.
Step 3: Use a screwdriver to loosen the screws on the UI panel.

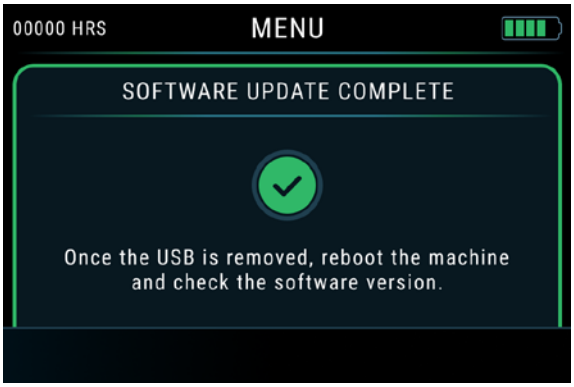
Step 4: Insert the USB flash drive in the USB connector on the UI board.

Step 5: Power on the machine, the LCD will show the update progress.

Step 6: When the update is finished, there is a message to remind the user to remove the USB flash device. Remove the USB flash device as instructed.

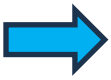


Step 7: Reboot the machine and check the software version.



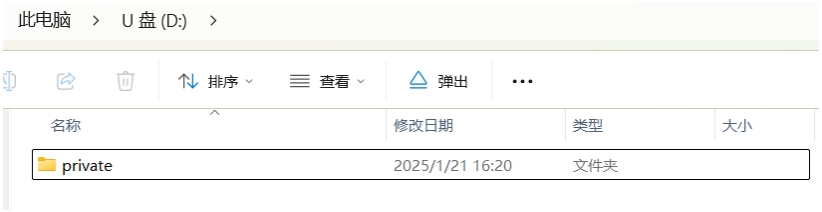
EB4 LCD controller update

Step 1: Put a TF card into a TF card reader.



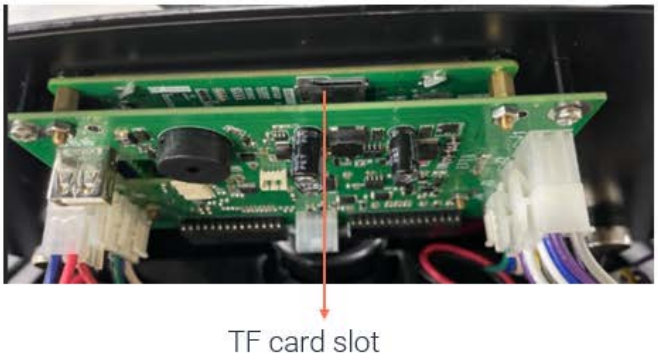
Connect the TF card reader to PC.

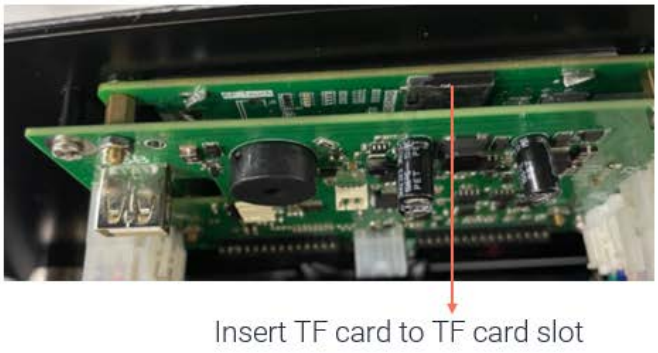
Copy the Private folder to the TF card, then take out the TF card.



Step 2: Power off the machine.

Step 3: Insert the TF card into TF card slot on the UI board.





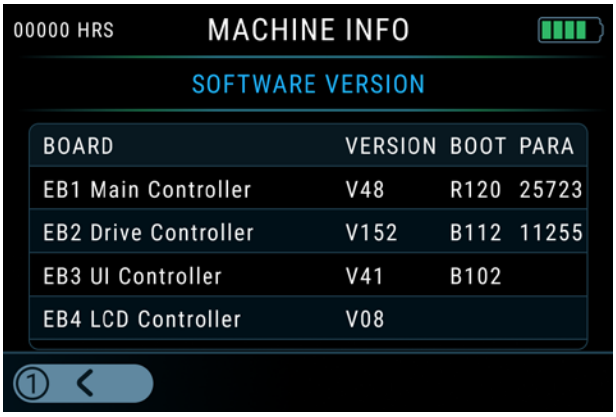
Step 4: Power on the machine.

Step 5: Wait until the update is finished, the machine will bootup automatically, it will move to NILFISK screen or LOGIN screen.

Step 6: Press Power button to turn off the machine, then take out the TF card.

Check the software version

Login with 444444, then hold button ④ for 2 seconds, the screen will move to MENU, select MACHINE INFO, and move to SOFTWARE VERSION.



Warning: The software of EB1, EB2, EB3 and EB4 controllers are used together, please don't mix them. For example, EB1 software version is V47, EB2 software version is V147, EB3 software version is V30, EB4 software version is V05, the system can work normally when use the controllers with the above software, if EB1 Main Controller with software version V46 is used, the system can't work normally.

Factory reset

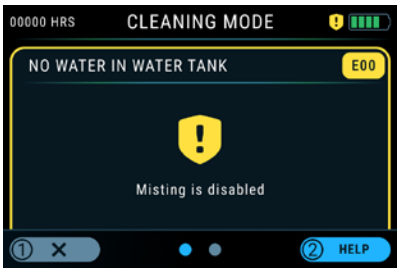
(1) Factory reset won't change the ACCESSORY STATUS, BATTERY TYPE, OPERATION TIME, ERROR HISTORY, but it will set the values to default in SETTINGS (except the BATTERY TYPE), including the password.
(2) After FACTORY RESET, when the machine is turned on for the first time, First Time Use will be shown.
(3) If the machine version is V47_V147_V30_V05, when it's updated, FACTORY RESET will be done automatically after software updates.

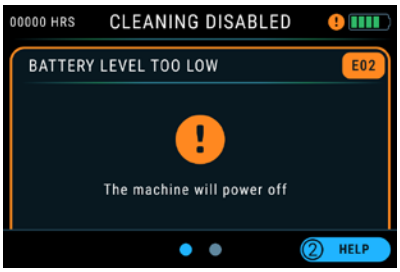
Troubleshooting

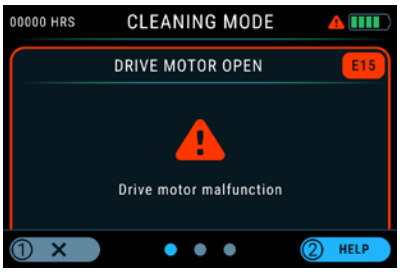
Alram Codes

The UI controller (EB3) indicates a series of alarms in case of malfunction and abnormal conditions detected, which includes Main machine controller (EB1), Drive controller (EB2), UI controller (EB3), Lithium ACE battery, and onboard charger.

The alarms include Notification (Yellow), Warning (Orange), Error (Red), the interface are shown on the LCD as below.







For service, press ① will dismiss the error, press ② will show the trouble shooting steps.

The status light shows white steady on when there is no warning or error, it shows orange as below if there is a warning, and it shows red for error.

General/Notification

Warning lighting

Error lighting

If the alarm category is Notification or Warning, both operator and service have access to troubleshooting steps.

If the alarm category is Error, only service have access to the troubleshooting steps.

Alarm Codes

Alarm code	*Description*	*Category*	*Condition*	*Effects*	*Troubleshooting steps*
E00	**No water in water tank**	Notification	1. No water in water tank. 2. Connection error. 3. Water tank float switch is broken.	The misting will be disabled.	Add water to the water tank. Then: Need to provide confirmation to machine. If E00 Notification can't be removed after providing confirmation and restarting the machine, it will escalate to E131 Error.
E01	**Battery level is low**	Notification	Lead-acid battery level is lower than 20%, Lithium battery level is lower than 8%	The cleaning mode is disabled.	Charge the battery.
E02	**Battery level is too low**	Warning	Lead-acid battery level is 0%, Lithium battery level is 0%	The machine will be powered off.	Charge the battery.
E03	**EB2 controller overheat**	Warning	High current of the drive motor causes the EB2 controller to overheat. Temperature > 90℃	EB2 Drive controller will shut down the drive motor until the controller cools down.	Wait for the controller to cool down (e.g. 10 mins), then continue to operate the machine. If E03 can't be removed after restarting the machine, it will escalate to E106.

E05	**Drive motor overheat**	Warning	1. High current of the drive motor causes the drive motor to overheat. Temperature >=150℃ or the DRIVE MOTOR TEMP value in SETTTINGS. 2. The drive motor temperature sensor is shorted.	Drive motor will be stopped	1. Wait for the drive motor to cool down (e.g. 10 mins), then continue to operate the machine. 2. Check if the machine is used for a long time on the ramp. If E05 can't be removed after restarting the machine, it will escalate to E107.
E07	**Main broom circuit overheat**	Warning	High current of the main broom causes the controller to overheat. Temperature > 85℃	The current of main broom will be reduced.	1. Check if the ground is too rough or the main broom is too low to ground. 2. Wait for the main broom to cool down (e.g. 10 mins), then continue to operate the machine. If E07 can't be removed after restarting the machine, it will escalate to E108.
E09	**Side broom circuit overheat**	Warning	High current of the side broom causes the controller to overheat. Temperature > 85℃	The current of side broom will be reduced.	1. Check if the ground is too rough or the side broom is too low to ground. 2. Wait for the side broom to cool down (e.g. 10 mins), then continue to operate the machine. If E09 can't be removed after restarting the machine, it will escalate to E109.
E11	**Filter shaker circuit overheat**	Warning	High current of the filter shaker motor causes the controller to overheat. Temperature > 85℃	The current of filter shaker will be reduced.	Wait for the filter shaker motor to cool down (e.g. 10 mins), then continue to operate the machine. If E11 can't be removed after restarting the machine, it will escalate to E110.
E13	**Suction circuit overheat**	Warning	High current of the suction motor causes the controller to overheat. Temperature > 85℃	The current of suction motor will be reduced.	Wait for the suction motor to cool down (e.g. 10 mins), then continue to operate the machine. If E13 can't be removed after restarting the machine, it will escalate to E111.
E14	**EB2 Temp. high**	Notification	High current of the drive motor causes the controller to high temperature. 85℃ < temperature < 90℃	The current of drive motor will be reduced, so drive motor speed will be reduced, if it is climbing, it may fail to climb the slope.	Wait for the controller to cool down (e.g. 10 mins), then continue to operate the machine.
E15	**Drive motor open**	Error	1. The connection of drive motor failed. 2. Drive motor is broken.	No function for the drive motor.	1. Check the drive motor connection. 2. Check if the drive motor is good. 3. Replace EB2 controller.
E16	**Drive motor short**	Error	1. Traction motor+ to Ground short. 2. Controller fault.	No function for the drive motor.	1. Check the drive motor connection. 2. Check if the drive motor is good. 3. Replace EB2 controller.

E18	**Electric brake open**	Error	Electric Brake circuit is open.	No function for the drive motor.	1. Check the connection between electric brake and EB2 controller. 2. Check/replace the electric brake. 3. Replace EB2 controller.
E19	**Electric brake short**	Error	Electric Brake is shorted.	No function for the drive motor.	1. Check if the electric brake is short. 2. Replace EB2 controller.
E20	**Drive pedal connection error**	Error	Drive pedal connection error	No drive/cleaning function.	1. Check the drive pedal connection. 2. Check if the drive pedal is good. 3. Replace EB2 controller.
E21	**Please release the drive pedal**	Warning	Accelerator pedal is not in rest position when login successfully.	No drive/cleaning function.	Please release the drive pedal. If E21 can't be removed after restarting the machine, it will escalate to E113.
E22	**CAN COMM. error between EB2 and EB3**	Error	1. The CAN bus wiring has failed. 2. Battery voltage < 15V, EB2 can't power on. 3. Controller error.	EB2 Drive controller can't work normally.	1. Check the CAN connection between EB2 and EB3. 2. Check if the battery voltage is ok. 3. Replace EB3 controller. 4. Replace EB2 controller.
E23	**EB2 controller pre-charge error**	Error	1. Controller is damaged 2. Motor or electronic brake have a negative short circuit to the battery.	EB2 Drive controller can't work normally.	1. Remove the drive motor and electronic brake, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if drive motor and electronic brake are good. ->If the error is still there, replace EB2 controller.
E24	**EB2 PVDD voltage high**	Error	1. PVDD voltage > 34V 2. Controller error	EB2 Drive controller can't work normally.	1. Check if the battery voltage is ok. 2. Replace EB2 controller.
E25	**EB2 PVDD voltage low**	Error	1. PVDD voltage < 17V 2. Controller error	EB2 Drive controller can't work normally.	1. Check if the battery voltage is ok. 2. Replace EB2 controller. 3. Analyze with other errors
E26	**EB2 controller error**	Error	Controller internal error	EB2 Drive controller can't work normally.	Replace EB2 controller.
E27	**EB2 KEY-IN voltage high**	Error	1. KEY_IN input voltage > 34V 2. Controller error	EB2 Drive controller can't work normally.	1. Check KEY_IN input voltage. 2. Replace EB2 controller.

E28	**EB2 KEY-IN voltage low**	Error	1. KEY_IN input voltage < 17V 2. Controller error	EB2 Drive controller can't work normally.	1. Check KEY_IN input voltage. 2. Replace EB2 controller.
E29	**EB2 Battery voltage low**	Error	Battery voltage < 17V.	EB2 Drive controller can't work normally.	1. Check the connection between battery and EB2. 2. Check the connection between battery and OBC (on board charger). 3. Replace the battery. 4. Replace the charger.
E31	**EB2 Battery voltage high**	Error	Battery voltage > 34V.	EB2 Drive controller can't work normally.	1. Check if the batteries voltage is correct or not (correct range: 22V~30V). 2. Replace the batteries with the same specification. 3. Replace EB2 controller.
E32	**EB2 Battery voltage very high**	Error	1. Battery voltage > 36V. 2. Controller error	EB2 Drive controller can't work normally.	1. Check battery input voltage. 2. Replace EB2 controller.
E33	**EB2 Internal relay broken**	Error	High current breaks the relay.	EB2 Drive controller can't work normally.	Replace EB2 controller.
E34	**EB2 Temp. sensor error**	Error	The temperature sensor inside the controller is damaged.	EB2 Drive controller can't work normally.	Replace EB2 controller.
E35	**EB2 MOS voltage error**	Error	1. Drive motor is shorted externally. 2. Drive motor is abnormal, such as excessive motor toners. 3. Controller is damaged	EB2 Drive controller can't work normally.	1. Remove the drive motor, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if the drive motor is good. ->If the error is still there, replace EB2 controller.
E36	**Side broom and filter shaker pre-charge error**	Error	1. Side broom and filter shaker motor are shorted externally. 2. Controller is damaged.	EB1 Main controller can't work normally.	1. Remove the side broom and filter shaker motor, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if the side broom and filter shaker motor are good. ->If the error is still there, replace EB1 controller.

E37	**Main broom and suction pre-charge error**	Error	1. Main broom and suction motors are shorted externally. 2. Controller is damaged.	EB1 Main controller can't work normally.	1. Check if there is suction motor short. 2. Remove the main broom and suction motor, then reboot the machine. 3. When step 1 and step 2 are done. ->If the error disappears, check if the main broom and suction motor are good. ->If the error is still there, replace EB1 controller.
E38	**EB1 Temp. sensor error**	Error	The temperature sensor inside the controller is damaged.	EB1 Main controller can't work normally.	Replace EB1 controller.
E39	**Drive motor Temp. sensor open**	Error	The temperature sensor wire of the drive motor is disconnected.	The max speed is limited to 30%, the max current of drive motor is limited to 90A with 20 seconds, if the current is more than 90A for 20 seconds, the drive motor will be stopped.	1. Check the temperature sensor connection. 2. Check if the temperature sensor is good, if not, replace drive motor. 3. Replace EB2 controller.
E40	**Drive motor Temp. sensor short**	Error	1. Traction motor temperature sensor connection fault. 2. Controller fault.	As the temperature is above 150℃ when the drive motor temperature sensor is short, so ' E05 Drive motor overheart' will pop up.	1. Check the temperature sensor connection. 2. Check if the temperature sensor is good, if not, replace drive motor. 3. Replace EB2 controller.
E41	**Main broom MOS voltage error**	Error	1. Main broom is shorted externally. 2. Controller is damaged	EB1 Main controller can't work normally.	1. Remove the main broom, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if the main broom is good. ->If the error is still there, replace EB1 controller.
E42	**Side broom MOS voltage error**	Error	1. Side broom is shorted externally. 2. Controller is damaged	EB1 Main controller can't work normally.	1. Remove the side broom, then reboot the machine. 2. When step 1 is done. ->If the error disappears, check if the side broom is good. ->If the error is still there, replace EB1 controller.
E43	**Filter shaker MOS voltage error**	Error	1. Filter shaker motor is shorted externally. 2. Controller is damaged	EB1 Main controller can't work normally.	1. Remove the filter shaker motor, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if the filter shaker is good. ->If the error is still there, replace EB1 controller.

E44	**Suction motor MOS voltage error**	Error	1. Suction motor is shorted externally. 2. Controller is damaged	EB1 Main controller can't work normally.	1. Remove the suction motor, then reboot the machine. 2. when step 1 is done. ->If the error disappears, check if the suction motor is good. ->If the error is still there, replace EB1 controller.
E45	**Main broom open**	Error	Main broom circuit is open.	No function for main broom.	1. Check the main broom motor connection. 2. Check if the main broom motor is good. 3. Replace EB1 controller.
E46	**Main broom short**	Error	1. Main broom motor+ to Ground is shorted. 2. Controller fault.	No function for main broom.	1. Check the main broom motor connection. 2. Check if the main broom motor is good. 3. Replace EB1 controller.
E47	**Main broom overload**	Warning	The main broom current > 39A or the MAIN BROOM MAX CURRENT in SETTINGS.	Main broom motor stops working.	Restart the machine. If E47 can't be removed after restarting the machine, it will escalate to E114.
E48	**Side broom open**	Error	The side broom circuit is open.	No function for side broom.	1. Check side broom motor connection. 2. Check if side broom motor is good. 3. Replace EB1 controller.
E49	**Side broom short**	Error	1. Side broom motor+ to Ground is shorted. 2. Controller fault.	No function for side broom.	1. Check side broom motor connection. 2. Check if the side broom motor is good. 3. Replace EB1 controller.
E50	**Side broom overload**	Warning	The side broom current > 30A	Side broom motor stops working.	Restart the machine. If E50 can't be removed after restarting the machine, it will escalate to E115.
E51	**Filter shaker motor open**	Error	Filter shaker motor circuit is open.	No function for filter shaker.	1. Check filter shaker motor connection. 2. Check if filter shaker motor is good. 3. Replace EB1 controller.
E52	**Filter shaker motor short**	Error	1. Filter shaker motor+ to Ground is shorted. 2. Controller fault.	No function for filter shaker.	1. Check filter shaker motor connection. 2. Check if filter shaker motor is good. 3. Replace EB1 controller.
E53	**Filter shaker motor overload**	Warning	The filter shaker current > 9A	Filter shaker motor stops working.	Restart the machine. If E53 can't be removed after restarting the machine, it will escalate to E116.

E54	**FOB status error**	Error	FOB is set to ON in ACCESSORY STATUS, but the FOB receiver is not installed correctly.	FOB can't work. (Maybe there is no FOB installed, or maybe the FOB is not installed correct)	1. Check the FOB status in ACCESSORY STATUS, if FOB is installed, it should be set to ON, else set it to OFF. 2. Check the connection of FOB receiver. 3. Replace FOB receiver. 4. Replace EB1 controller.
E55	**Suction motor short**	Error	1. Suction motor+ to Ground is shorted. 2. Controller fault.	No function for suction motor.	1. Check suction motor connection. 2. Check if suction motor is good. 3. Replace EB1 controller.
E56	**Suction motor overload**	Warning	The suction motor current > 10.5A.	Suction motor stops working.	Restart the machine. If E56 can't be removed after restarting the machine, it will escalate to E117.
E57	**Warning light short**	Error	Warning light is shorted.	No function for warning light	1. Check warning light connection. 2. Check if warning light is good. 3. Replace EB1 controller.
E58	**Blue light open**	Error	Blue light circuit is open	No function for blue light	1. Check blue light connection. 2. Check if blue light is good. 3. Replace EB1 controller.
E59	**Blue light short**	Error	Blue light is shorted.	No function for blue light	1. Check blue light connection. 2. Check if blue light is good. 3. Replace EB1 controller.
E60	**Water Pump open**	Error	Water pump motor circuit is open.	No function for water pump.	1. Check water pump motor connection. 2. Check if water pump motor is good. 3. Replace EB1 controller.
E61	**Water Pump short**	Error	1. Water pump motor+ to Ground is shorted. 2. Controller fault.	No function for water pump.	1. Check water pump motor connection. 2. Check if water pump motor is good. 3. Replace EB1 controller.
E62	**COMM. error between EB1 and headlight**	Error	1. The headlight wiring has failed. 2. Headlight module fault. 3. Low battery voltage caused controller malfunction.	No function for headlight.	1. Check headlight conneciton. 2. Check if headlight is good. 3. Check if the battery voltage is ok. 4. Replace EB1 controller.
E63	**Headlight overheat**	Warning	The temperature of headlight is above 75℃.	Headlight stop working.	Turn off headlight, then wait for the headlight to cool down. If E63 can't be removed after restarting the machine, it will escalate to E118.
E64	**CAN COMM. error between EB1 and EB3**	Error	The CAN bus wiring has failed.	The machine cannot work.	1. Check the CAN connection between EB1 and EB3. 2. Replace EB3 controller. 3. Replace EB1 controller.
E65	**Emergency stop pressed**	Warning-Blocked	Emergency stop button is pressed	The machine can't work untill the emergency button is released and rebooted.	Release the emergency button and reboot.

E66	**EB1 BAT fuse broken**	Error	Current is too high.	EB1 Main controller can't work normally.	1. Check if there is short. 2. Replace the EB1 BAT fuse.
E67	**Main broom motor fuse broken**	Error	The working current of main broom motors is too high, or main broom motor output circuit is shorted.	No function for main broom.	1. Check if there is main broom blockage. 2. Check if the connection of main broom motor is shorted. 3. Check if main broom motor is good. 4. Find out the reason to fuse broken and resolve it, then replace the fuse with the same specification.
E68	**Side broom motor fuse broken**	Error	The working current of side broom motors is too high, or side broom motor output circuit is shorted.	No function for side broom.	1. Check if there is side broom blockage. 2. Check if the connection of side broom motor is shorted. 3. Check if side broom motor is good. 4. Find out the reason to fuse broken and resolve it, then replace the fuse with the same specification.
E69	**Filter shaker motor fuse broken**	Error	The working current of filter shaker motors is too high, or filter shaker motor output circuit is shorted.	No function for filter shaker.	1. Check if there is filter shaker blockage. 2. Check if the connection of filter shaker motor is shorted. 3. Check if filter shaker motor is good. 4. Find out the reason to fuse broken and resolve it, then replace the fuse with the same specification.
E70	**Suction motor fuse broken**	Error	The working current of suction motor is too high, or suction motor output circuit is shorted.	No function for suction motor.	1. Check if there is suction motor blockage. 2. Check if the connection of suction motor is shorted. 3. Check if suction motor is good. 4. Find out the reason to fuse broken and resolve it, then replace the fuse with the same specification.
E71	**EB1 POWER output fuse broken**	Error	High current	Power on/off button can't work.	1. Check if there is short external. 2. Replace EB1 controller.
E72	**EB1 12V output fuse broken**	Error	P3-11 12V output is overloaded or shorted.	Seat switch can't work.	1. Power off the machine, wait for the controller to cool down, then check if the 12V output terminal to GND is shorted. 2. If it's not shorted, restart the machine. 3. If shorted, need to find out which component is shorted, resolve it, then power on the machine. When the controller cools down, the fuse can recover.
E73	**RS485 12V output fuse broken**	Error	RS485 12V output overload or shorted	FOB can't work.	Power off the machine, and wait for the controller to cool down, then check if the terminal P8-4 to GND is shorted. When the controller cools down, the fuse can recover.
E74	**USB power supply output fuse broken**	Error	Excessive USB power supply current causes fuse to blow	USB charging port can't work.	1. Check if there is short. 2. Replace the EB1 controller.

E76	**TC1 power supply fuse broken**	Error	Power supply for TC-1 is overload or shorted	No power to TC-1 module.	Disconnect the cables of TC-1 module from EB1, and check if P4-6 to P4-2 is shorted on the cable connector. When the controller cools down, the fuse can recover.
E77	**Battery type setup error**	Warning	1. Battery type set to LITHIUM ACE when lead acid batteries are used. 2. The CAN connection between lithium ACE battery and controller is not good. 3. Battery type set to lead acid when lithium ACE batteries are used.	Cleaning / Charging disabled.	1. Set the battery type according to the battery used. 2. Restart the machine. If E77 can't be removed after restarting the machine, it will escalate to E119.
E78	**Charger CAN COMM. error**	Error	The CAN bus wiring between charger and EB1 controller has failed.	No function for Charger.	1. Check the connection of CAN communication. 2. Check if EB1 is working properly. 3. Replace CAN communication. 4. Replace Li-ION charger.
E79	**Side broom speed limit adjust error**	Error	1. The side broom speed potentiometer is broken. 2. The side broom potentiometer connection is loose. 3. EB3 controller is damaged.	Side broom speed can't be adjusted	1. Check the connection of potentiometer. 2. Check if the potentiometer is good. 3. Replace EB3 controller.
E80	**Machine speed limit adjust error**	Error	1. The machine speed potentiometer is broken. 2. The machine speed potentiometer connection is loose. 3. EB3 controller is damaged.	Traction speed can't be adjusted	1. Check the connection of potentiometer. 2. Check if the potentiometer is good. 3. Replace EB3 controller.
L3-W	**Regenerative voltage error**	Warning	Too much regenerative charge during dynamic braking on a slope with fully charged batteries.	The battery can't work normally, maybe shutdown.	Use the machine only on the allowed slope and don't push it manually. If possible, turn on the broom and suction to consume some charge. The error is latching, machine reboot required after the conditions normalized. If L3-W warning can't be removed after restarting the machine, it will escalate to L3-E error.
L4	**Li-battery CAN bus connection error**	Error	CAN wiring/contact error or bad Node-ID configuration	Error message flashing. If the CAN connection between the battery and charger is functioning, the charging can continue.	1. Turn off the machine, then check the CAN connections. 2. Machine reboot required after the conditions normalized.
L5	**Li-battery over charging**	Error	Overcharge detected or too much regenerative charge during dynamic braking on a slope with fully charged batteries.	Charging stopped.	Use the machine only on the allowed slope and don't push it manually. If possible, turn on the broom and suction to consume some charge. The error is latching, machine reboot required after the conditions normalized.
L6	**Li-battery short circuit**	Error	Short circuit detected	Charging stopped.	1. Turn off the machine, then check the battery connections. 2. Restart the machine. If the error still exists, replace the battery.

L7	**Li-battery Mosfet error**	Error	Internal failed FET detected.	Charging stopped.	1. Restart the machine. 2. If the error still exists, replace the battery.
L8	**Li-battery over current**	Error	Overcurrent detected.	Charging stopped.	1. Turn off the machine, then check the battery connections. 2. Reduce the load, then check the free rotation of the wheels and broom.
L9-W	**Li-battery undercharged**	Warning	Battery is undercharged.	The machine will be powered off.	Turn off the machine and recharge the batteries. If L9-W warning can't be removed after restarting the machine, it will escalate to L9-E error.
L10-W	**Li-battery over/under Temp.**	Warning	Over- or under temperature warning during charging or discharging.	The charging will be stopped and will be automatically resumed when the temperature is within specified limits.	When the machine is in use, try to reduce the load and wait for the battery to cool down (e.g. 10 mins). Pay attention to the normal operation temperatures. If L10-W warning can't be removed after restarting the machine, it will escalate to L10-E error.
L11	**Li-battery module defected**	Error	One or more modules defected.	The charging of the operational modules can continue.	1. Restart the machine. 2. If the error exists, replace the defected modules. Note: If the machine is equipped with more than 1 battery module and they are fully operational, the machine can be used, but the error message is always on the LCD.
D1	**Charger Internal error**	Error	Internal charger fault	No function for Li-ION Battery charger.	1. Disconnect the AC for minimum 30 seconds. 2. If the error still exists, replace the battery charger.
D2	**Battery over voltage**	Error	Battery voltage is too high.	No function for Li-ION Battery charger.	Check the battery status LED, disconnect the AC, then check the battery cable connections.
D3	**Charging time out error**	Error	Charge time limit exceeded.	No function for Li-ION Battery charger.	Check the battery status LED, disconnect the AC, turn off the battery, then check the battery cable connections.
D4	**Battery DC connection error**	Error	Insufficient battery DC connection.	No function for Li-ION Battery charger.	Disconnect the AC and check the battery cable connection.
D5	**AC input over voltage**	Error	The AC voltage is too high.	No function for Li-ION Battery charger.	Disconnect the AC input, then check the AC connections and the power grid. Please be aware that the charger works in 85-270V AC range.

D6	**AC input under voltage**	Error	The AC voltage is too low.	No function for Li-ION Battery charger.	Disconnect the AC input, then check the AC connections and the power grid. Please be aware that the charger works in 85-270V AC range.
D7	**Charger-battery COMM. error**	Error	Communication error between the charger and the battery.	No function for Li-ION Battery charger.	Disconnect the AC and check the communication cable connections.
C1	**Charger-battery connection fails**	Error	Connection between charger and battery failed.	No function for Lead acid Battery charger.	Disconnect the AC, turn off the machine, then check the charger and battery cable connections.
C2	**Battery polarity reversed**	Error	The polarity of battery to charger reversed.	No function for Lead acid Battery charger.	Swap the polarity from the charger to the battery.
C3-W	**Charger overheat**	Warning	Battery charger internal temperature over high	No function for Lead acid Battery charger.	Stop charging and wait for the charger to cool down to room temperature. If C3-W warning can't be removed after restarting the machine, it will escalate to C3-E error.
C4-W	**Battery under voltage**	Warning	Battery voltage is below 10V.	No function for Lead acid Battery charger.	Disconnect and reconnect the battery charger. If C4-W warning can't be removed after restarting the machine, it will escalate to C4-E error.
C5-W	**Battery over voltage**	Warning	Battery voltage is above 31V.	No function for Lead acid Battery charger.	Disconnect and reconnect the battery charger. If C5-W warning can't be removed after restarting the machine, it will escalate to C5-E error.
C6-W	**Charging time out on I-phase**	Warning	The charging time of constant current is too long.	Stop charging.	Restart the charger to charge the battery again. If C6-W warning can't be removed after restarting the machine, it will escalate to C6-E error.
C7-W	**Charger AC input under voltage**	Warning	The AC voltage is too low.	No function for Lead acid Battery charger.	Disconnect AC input, then check the AC connections. Please be aware that the lead acid charger works in 100-240V AC range. If C7-W warning can't be removed after restarting the machine, it will escalate to C7-E error.

C8-W	**Charging curve is inhibited**	Warning	1. The charging curve provided by the UI controller (EB3) is not supported by the charger. 2. Communication failure caused by wiring abnormality.	No function for Lead acid Battery charger.	1. Stop charging, when the machine powers off automatically, check if the battery type setting is correct. 2. Charge again. If C8-W warning can't be removed after restarting the machine, it will escalate to C8-E error.
E106	**EB2 controller overheat**	Error	High current of the drive motor causes the EB2 controller to overheat. Temperature > 90℃	EB2 Drive controller will shut down the drive motor until the controller cools down.	1. Wait 10 minutes, check if the controller can cool down. 2. Replace EB2 controller.
E107	**Drive motor overheat**	Error	1. High current of the drive motor causes the drive motor to overheat. Temperature >=150℃ or the DRIVE MOTOR TEMP value in SETTTINGS. 2. The drive motor temperature sensor is shorted.	Drive motor will be stopped	1. Wait 10 minutes, check if the drive motor can cool down, if not, check if the drive motor temperature sensor is shorted. 2. Replace EB2 controller. 3. Replace drive motor. 4. If this error occurs frequently, check if there is drive motor blockage or the machine is used for a long time on ramp.
E108	**Main broom circuit overheat**	Error	High current of the main broom causes the controller to overheat. Temperature > 85℃	Main broom will be stopped	1. Check if the ground is too rough or the main broom is too low to ground. 2. Check if there is main broom blockage. 3. Check if the main broom is good. 4. Replace EB1 controller.
E109	**Side broom circuit overheat**	Error	High current of the side broom causes the controller to overheat. Temperature > 85℃	Side broom will be stopped	1. Check if the ground is too rough or the side broom is too low to ground. 2. Check if there is side broom blockage. 3. Check if the side broom is good. 4. Replace EB1 controller.
E110	**Filter shaker circuit overheat**	Error	High current of the filter shaker motor causes the controller to overheat. Temperature > 85℃	Filter shaker will be stopped	1. Check if there is filter shaker motor blockage. 2. Check if the filter shaker is good. 3. Replace EB1 controller.
E111	**Suction circuit overheat**	Error	High current of the suction motor causes the controller to overheat. Temperature > 85℃	Suction motor will be stopped.	1. Check if there is suction motor blockage. 2. Check if the suction motor is good. 3. Replace EB1 controller.
E112	**Drive motor overload**	Error	The operation current of the traction motor is too high （Current >160A, Time >20 seconds）	Drive motor max speed will be reduced, if it is climbing, it may fail to climb the slope. Because drive motor max current is reduced.	1. Check if the machine is used a long time on the ramp. 2. Check if there is drive motor blockage. 3. Replace EB2 controller.

E113	**Please release the drive pedal**	Error	Accelerator pedal is not in rest position when login successfully.	No drive/cleaning function.	1. Release the drive pedal. 2. Check if the pedal can move freely/correctly. Lubricating if necessary.
E114	**Main broom overload**	Error	The main broom current > 39A or the MAIN BROOM MAX CURRENT in SETTINGS.	Main broom motor stops working.	1. Restart the machine. 2. Check if there is main broom motor blockage. 3. Replace EB1 controller.
E115	**Side broom overload**	Error	The side broom current > 30A	Side broom motor stops working.	1. Restart the machine. 2. Check if there is side broom motor blockage. 3. Replace EB1 controller.
E116	**Filter shaker motor overload**	Error	The filter shaker current > 9A.	Filter shaker motor stops working.	1. Restart the machine. 2. Check if there is filter shaker motor blockage. 3. Replace EB1 controller
E117	**Suction motor overload**	Error	The suction motor current > 10.5A.	Suction motor stops working.	1. Restart the machine. 2. Check if there is suction motor blockage. 3. Replace EB1 controller
E118	**Headlight overheat**	Error	The temperature of headlight is above 75℃.	Headlight stops working.	1. Turn off headlight, wait for the headlight to cool down. 2. Check if the headlight is good. 3. Replace EB1 controller.
E119	**Battery type setup error**	Error	1. Battery type set to LITHIUM ACE when lead acid batteries are used. 2. The CAN connection between lithium ACE battery and controller is not good. 3. Battery type set to lead acid batteries when lithium ACE batteries are used.	Cleaning / Charging disabled.	1. Set the battery type according to the battery used. 2. If lithium ACE batteries are used, check/replace the CAN connections between batteries and EB1. 3. Replace EB1 controller.
L3-E	**Regenerative voltage error**	Error	Too much regenerative charge during dynamic braking on a slope with fully charged batteries.	The battery can't work normally, maybe shutdown.	Use the machine only on the allowed slope and don’t push it manually. If possible, turn on the broom and suction to consume some charge. The error is latching, machine reboot required after the conditions normalized.
L9-E	**Li-battery undercharged**	Error	Battery is undercharged.	The machine will power off.	1. Turn off the machine and recharge the batteries. 2. Check if the batteries are good.

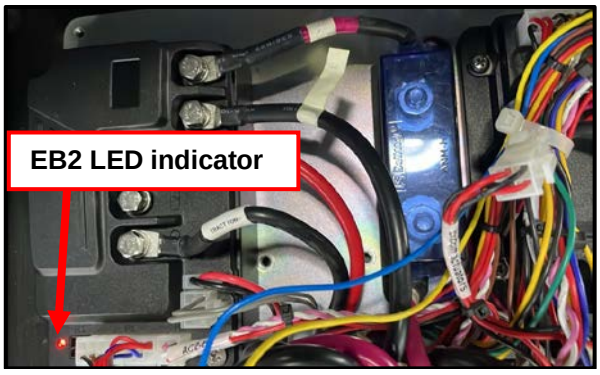
L10-E	**Li-battery over/under Temp.**	Error	Over- or under temperature warning during charging or discharging.	The charging will be stopped and will be automatically resumed when the temperature is within specified limits.	1. When the machine is in use, try to reduce the load and wait for the battery to cool down (e.g. 10 mins). Pay attention to the normal operation temperatures. 2. Check if the batteries are good.
C3-E	**Charger overheat**	Error	Battery charger internal temperature over high	No function for Lead acid Battery charger.	1. Check if the charger can cool down to room temperature. 2. Replace the charger.
C4-E	**Battery under voltage**	Error	Battery voltage is below 10V.	No function for Lead acid Battery charger.	1. Check the connections and voltage of the batteries. 2. Disconnect and reconnect the battery charger. 3. Replace with available batteries.
C5-E	**Battery over voltage**	Error	Battery voltage is above 31V.	No function for Lead acid Battery charger.	1. Check the connections and voltage of the batteries. 2. Disconnect and reconnect the battery charger. 3. Replace with available batteries.
C6-E	**Charging time out on I-phase**	Error	The charging time of constant current is too long.	Stop charging.	1. Check if the battery state is normal. 2. Restart the charger to charge the battery again.
C7-E	**Charger AC input under voltage**	Error	The AC voltage is too low.	No function for Lead acid Battery charger.	Disconnect AC input, then check the AC connections. Please be aware that the lead acid charger works in 100-240V AC range.
C8-E	**Charging curve is inhibited**	Error	1. The charging curve provided by the UI controller (EB3) is not supported by the charger. 2. Communication failure caused by wiring abnormality.	No function for Lead acid Battery charger.	1. Stop charging, when the machine powers off automatically, check if the battery type setting is correct. 2. Check the charger and battery connections. 3. Replace the onboard charger. 4. Replace EB3 controller.
E129	**Charging curve is wrong**	Warning	Charging curve does not match with the battery type.		1. Stop charging, when the machine powers off automatically, check if the battery type setting is correct. 2. Charge again. If E129 warning can't be removed after restarting the machine, it will escalate to E130 error.
E130	**Charging curve is wrong**	Error	Charging curve does not match with the battery type.		1. Check the battery type setting. 2. Restart the machine. 3. Replace EB3 controller. 4. Replace the lead-acid charger.

E131	**No water in water tank**	Error	1. No water in water tank. 2. Connection error. 3. Water tank float switch is broken.	The misting will be disabled.	1. Check if there is water in the tank. 2. Check if the float switch connection is good. 3. Check/replace the water tank float switch.
E132	**Charging COMM. timeout**	Warning	Controller didn't receive COMM command from controller within 10 seconds	The charging curve may be wrong	Stop charging, when the machine power off automatically, charge again. If E132 warning can't be removed after restarting the machine, it will escalate to E132 error.
E133	**Charging COMM. timeout**	Error	Controller didn't receive COMM command from controller within 10 seconds	The charging curve may be wrong	1. Check the Charger COMM connection between EB3 and charger. 2. Check the Charger output connection. 3. Replace EB3 controller. 4. Replace lead-acid charger.

EB1 and EB2 Red LED indicator

Main Machine Controller (EB1) and Drive Controller (EB2) have a red LED to indicate the machine status.

1. When the controller is working normally, the LED is always on.
2. When there is a fault, the LED is flashing as below.
   Flash slowly: The red LED is on for 1 s and off for 0.3 s.
   Flash quickly: The red LED is on for 0.3 s and off for 0.3 s.
   The red LED is off for 2.5 s between each alarm.
3. When the machine software is updating, the red LED is on for 0.1s, off for 0.1s.

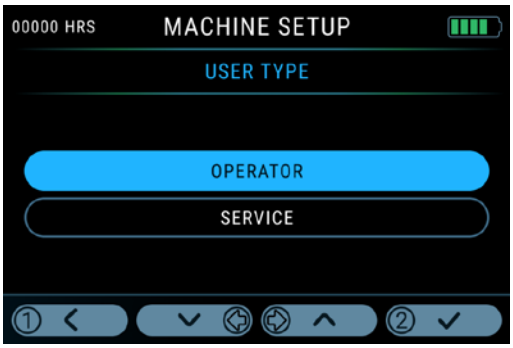


Display, First Time Use Interface

First time use will be shown when the machine is turned on for the first time or factory reset is done, it is used to guide the user on how to operate the machine.

USER TYPE has OPERATOR and SERVICE, OPERATOR login with 4-digit password, the password can be changed.

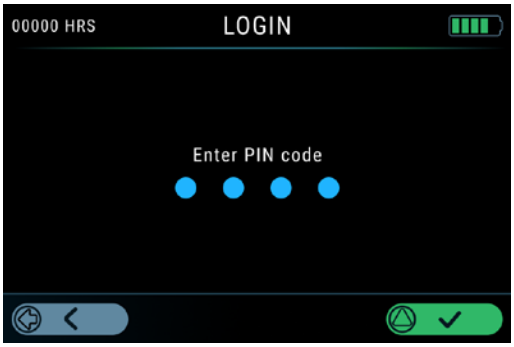
SERVICE login with 6-digit password, the password is 444444, it can't be changed.



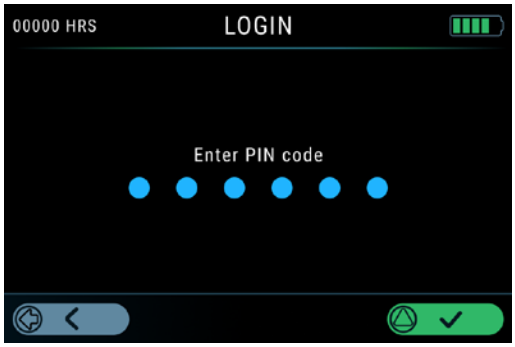
Display, LOGIN Interface

After starting the machine, the machine will enter the LOGIN interface.

OPERATOR LOGIN



SERVICE LOGIN



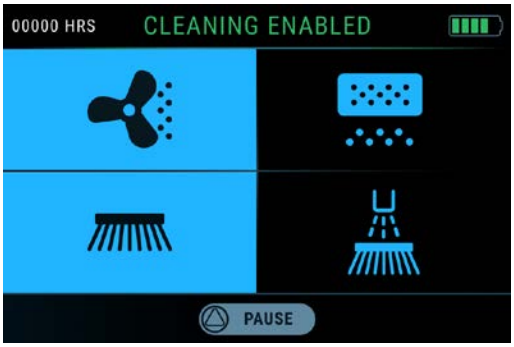
Press Indicator Left Button can delete the wrong password, after 6-digit password is inputted, press Start Button can confirm the password to login.

Display, HOME Interface

Home interface will be shown after login successfully, cleaning mode is disabled by default, press Start button will enable the cleaning mode, the main broom, side broom and dust fan will be turned on automatically.

CLEANING DISABLED

CLEANING ENABLED

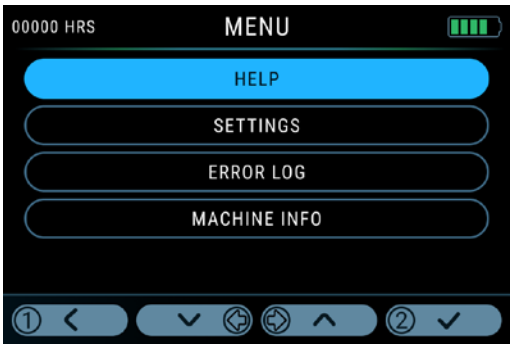


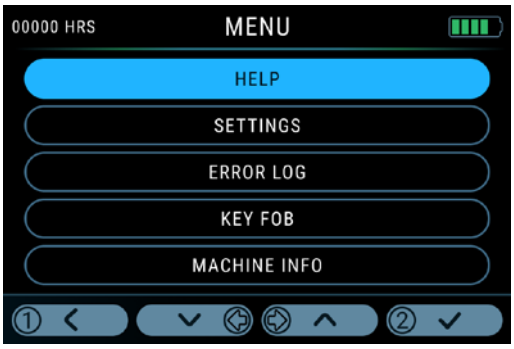
Display, MENU Interface

Press and hold button ④ for 2 seconds, it will move to MENU screen.

As for OPERATOR, the drive motor will stop when the LCD moves to MENU, it's for safety reasons, to avoid OPERATOR staring at the screen all the time while driving the machine. Operator MENU includes HELP, SETTIGNS, ERROR LOG, MACHINE INFO.

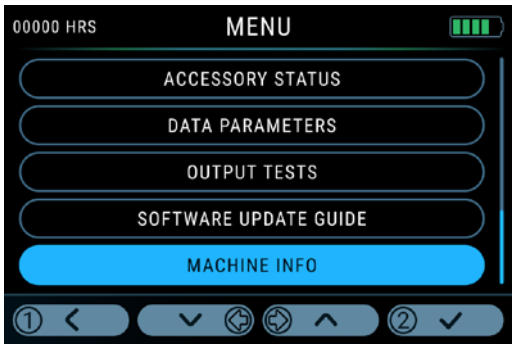
If FOB kit is installed, it will also include KEY FOB.





As for SERVICE, the machine works normally when the LCD moves to MENU, which makes it easier for service to repair or adjust parameters. In the MENU interface, it includes SETTINGS, ERROR LOG, ACCESSORY STATUS, DATA PARAMETERS, OUTPUT TEST, SOFTWARE UPDATE GUIDE, MACHINE INFO.

If FOB kit is installed, it will also include KEY FOB.



Press button ① to go back to the previous menu, press Indicator Left Button to scroll down, press Indicator Right Button to scroll up, press button ② to confirm the selection.

Display, ERROR LOG Interface

ERROR LOG includes ACTIVE ERRORS and ERROR HISTORY.

ACTIVE ERRORS show active notification, warning and errors.

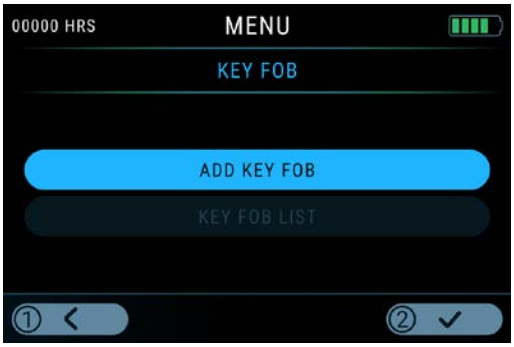
ERROR HISTORY shows the history list of notification, warning and errors, because of the memory limitations, a maximum of 90 errors can be stored, if there are more than 90 error messages, the oldest errors will be deleted and the newest errors will be added to the list.

Display, ACCESSORY STATUS Interface

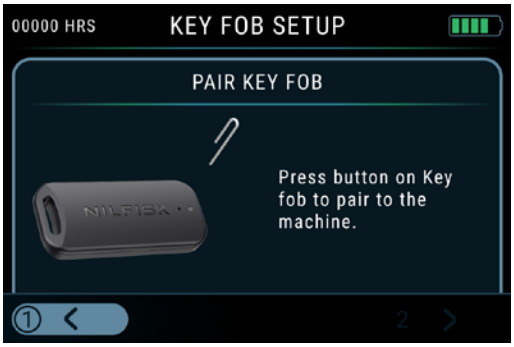
In ACCESSORY STATUS interface, the default status of FOB, TC1, Blue Light, IoT-CN is OFF, if they are installed, set them to be ON by pressing button ②.

Display, KEY FOB Interface

KEY FOB includes ADD KEY FOB and KEY FOB LIST, if KEY FOB LIST is empty, it can't be selected.



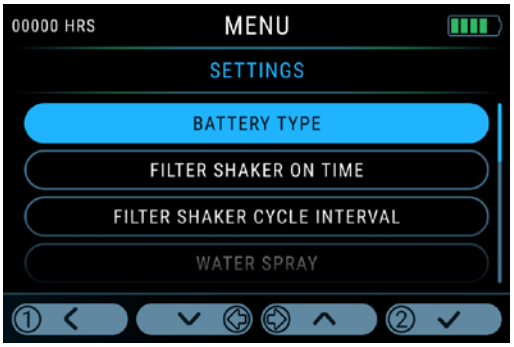
If ADD KEY FOB is selected and confirmed, it will move to the PAIR KEY FOB screen, pair the Key fob as the instruction, after pairing successfully, the LEVEL is set according to the USER TYPE, if user login with 4-digit password, the LEVEL will be set to OPERATOR, if user login with 6-digit password, the LEVEL will be set to SERVICE.



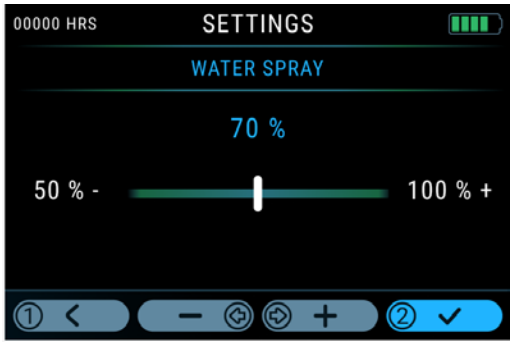
KEY FOB LIST shows the Key FOB ID that has been paired, one machine can pair up to 2 Key FOB, if a third key is to be paired, it will indicate that the limit has been reached, you can UNPAIR the key by pressing button ②.

Display, SETTINGS Interface

The SETTINGS of operator and service are different, service SETTINGS has 27 parameters that can be set, operator SETTINGS has 7 parameters.



Press button ① to go back to the previous menu, press Indicator Left Button to scroll down, press Indicator Right Button to scroll up, press button ② to confirm the selection, such as select WATER SPRAY, it will move to WATER SPRAY screen as below.



Press button ① to go back to the previous menu without updating the parameter, press Indicator Left Button to decrease the value, press Indicator Right Button to increase the value, press button ② to confirm and update the change.

Service Parameter Setting

The parameters whose serial numbers with "*" in the parameter setting tables can be modified. Do not change any of the other parameters unless specifically directed by an authorized factory representative.

Service Parameter Setting

No.	Parameter Name	Default Value	Range	Unit	Comment
1*	BATTERY TYPE	GEL-AGM/GENERIC	1-GEL-AGM/GENERIC 2-WET/EXIDE 3-GEL/EXIDE 4-AGM/LEOCH 5-AGM/US BATTERY 6-WET/US BATTERY 7-AGM/FULLRIVER 8-TPPL/ENERSYS 9-LITHIUM ACE	N/A	Battery type
2*	FILTER SHAKER ON TIME	5	1 - 30	Second	The time for Filter shaker motor turn on
3*	FILTER SHAKER CYCLE INTERVAL	10	1 - 60	Minute	Filter shaker cycle interval.
4*	WATER SPRAY	70	50 - 100	%	Water spray
5*	INACTIVITY TIME	5	0 - 10	Minute	If there is no operation for INACTIVITY TIME minutes, the machine will be shut down. If INACTIVITY TIME is set to 0, the machine will be on always.
6*	EMERGENCY MOVE TIME LIMIT	30	20 - 60	Second	The time limit for emergency move.
7*	LOGIN PIN CODE	RESET	BACK/RESET	N/A	Reset to default operator pincode.
8*	SUCTION OFF DELAY	3	1-10	Second	Suction motor off delay
9	MAX SPEED - FORWARD	100	50 -100	%	Max. forward transportation speed
10	MAX SPEED - REVERSE	50	10 - 70	%	Max. reverse transportation speed
11	ACCELERATION RATE - FORWARD	2	1 - 8	Second	Acceleration rate of forward
12	ACCELERATION RATE - REVERSE	3.5	1 - 8	Second	Acceleration rate of reverse
13	DECELERATION RATE - FORWARD	2	1 - 5	Second	Deceleration rate of forward
14	DECELERATION RATE - REVERSE	2	1 - 5	Second	Deceleration rate of reverse
15	TURN SPEED DECELERATION	1	0.1 - 5	Second	Transportation mode, turn speed deceleration rate

16	TURNING SPEED	65	30 - 80	%	Transportation mode, turn speed deceleration percentage
17	SWEEP TURN SPEED DECELERATION	1	0.1 - 5	Second	Cleaning mode, turn speed deceleration rate
18	SWEEP TURNING SPEED	65	30 - 80	%	Cleaning mode, turn speed deceleration percentage
19	MINIMUM TURNING SPEED	30	20 - 50	%	Minimum turning speed
20	MAIN BROOM MAX SPEED	24	12 - 28	V	Main broom max. speed limit
21	SIDE BROOM MAX SPEED	24	12 - 28	V	Side broom max. speed limit
22	FILTER SHAKER MAX SPEED	24	12 - 28	V	Filter shaker max. speed limit
23*	SWEEP SPEED	80	50 -100	%	Cleaning mode speed (Must be multiplied by MAX SPEED)
24	DRIVE MOTOR TEMP	149	135-149	℃	Drive motor max. temperature
25	MAIN BROOM MAX CURRENT	39	30-39	A	The max. current of main broom,rating is 26A
26	MACHINE SPEED OF KNOB MIN	5	0 - 30	%	The machine speed when the machine speed dial is set to minimum.
27	FACTORY RESET	CANCEL	CANCEL / RESET	N/A	Reset all parameters to default values (except for BATTERY TYPE)

Operator Parameter Setting

The operator can change the parameters in the table below.

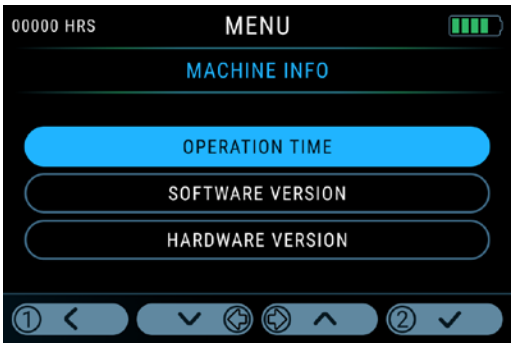
Operator Parameter Setting

NO.	Parameter Name	Value	Range	Unit	Comment
1	LOGIN PIN CODE	1234	1-4	N/A	Login password
2	SELECT LANGUAGE	ENGLISH	ENGLISH GERMAN FRENCH ITALIAN SPANISH	N/A	Select Language
3	BATTERY TYPE	GEL-AGM/GENERIC	1-GEL-AGM/GENERIC 2-WET/EXIDE 3-GEL/EXIDE 4-AGM/LEOCH 5-AGM/US BATTERY 6-WET/US BATTERY 7-AGM/FULLRIVER 8-TPPL/ENERSYS 9-LITHIUM ACE	N/A	Battery type
4	FILTER SHAKER ON TIME	5	1-30	Seconds	The time for Filter shaker motor turn on

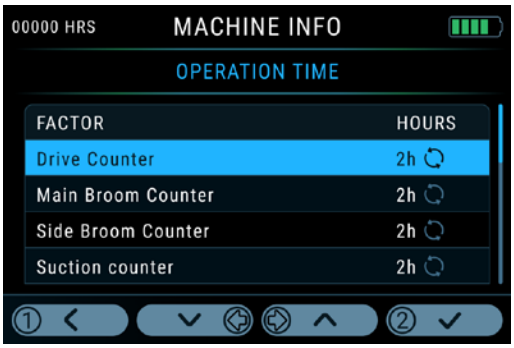
5	FILTER SHAKER CYCLE INTERVAL	10	1-60	Minute	Filter shaker cycle interval.
6	WATER SPRAY	70	50-100	%	Water spray
7	INACTIVITY TIME	5	0 - 10	Minute	If there is no operation for INACTIVITY TIME minutes, the machine will be shut down. If INACTIVITY TIME is set to 0, the machine will be on always.
8	EMERGENCY MOVE TIME LIMIT	30	20 - 60	Second	The time limit for emergency move.

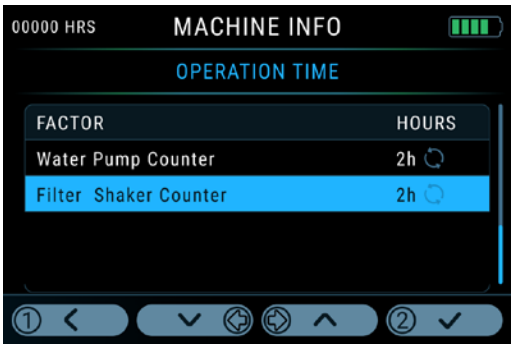
Display, MACHINE INFO Interface

MACHINE INFO includes OPERATION TIME, SOFTWARE VERSION and HARDWARE VERSION.



OPERATION TIME shows the working time of Drive motor, Main Broom motor, Side Broom motor, Suction motor, Water Pump motor and Filter Shaker motor.



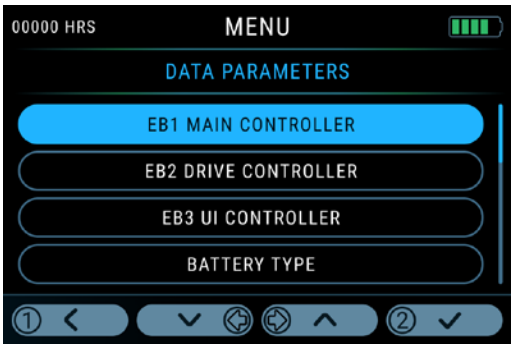


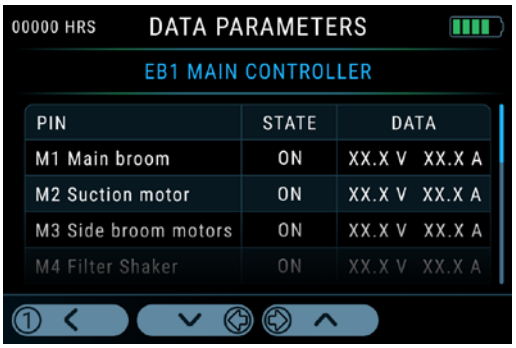
The working time can be reset by press button ②, for example, select Drive Counter, then press button ②, the below interface will pop up.

Press button ① can move to the previous interface, press button ② will confirm the operation, the Drive motor counter will be reset.

Display, DATA PARAMETERS Interface

DATA PARAMETERS screen is as below, it shows the status of some electronic components, such as EB1 MAIN CONTROLLER shows the status of Main broom, suction motor, side broom motors and so on.





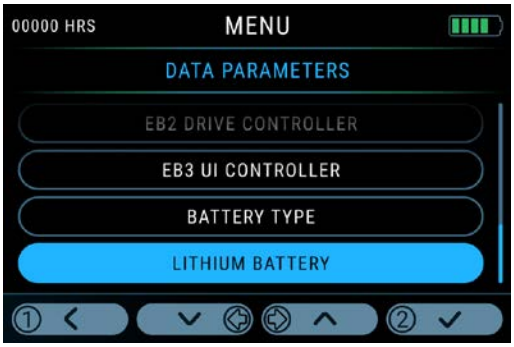
EB1 MAIN CONTROLLER			
PIN	**State**	**Data**	
M1 Main broom	ON/OFF	XX.X V	XX.X A
M2 Suction motor	ON/OFF		XX.X A
M3 Side broom motors	ON/OFF	XX.X V	XX.X A
M4 Filter shaker	ON/OFF	XX.X V	XX.X A
P1-1 Main broom actuator	OFF/UP/DOWN	XX.X V	XX.X A
P1-2 Side broom actuator	OFF/UP/DOWN	XX.X V	XX.X A
P3-1 & 9 Water Pump	ON/OFF	XX.X V	
P4-5 TC-1 KEY IN	ON/OFF	XX.X V	
P6-9 Emergency Button	OPEN/CLOSE	XX.X V	
P3-4 Solution switch	ON/OFF	XX.X V	
P3-12 Seat switch	ON/OFF	XX.X V	
P1-3 & 10 Warning light	ON/OFF		
Headlight	ON/OFF		
Headlight Temp.		XX ℃	
P1 -5 & 12 Blue light	ON/OFF		
P7-2 LI-CH OBC	ON/OFF		
B+ voltage		XX.X V	

EB2 DRIVE CONTROLLER			
PIN	**State**	**Data**	
Drive Motor	Forward/Backward/OFF	XX.X V	XX.X A
Drive Motor Temp.		XX ℃	
P3-1&2 E-Brake	ON/OFF	XX.X V	
P1-15 Accel. move enable	ON/OFF	XX.X V	

P1-5 Accel. POT wiper	0-100%	XX.X V	
P1-7 Emergency Button	OPEN/CLOSE		
P1-6 Mech. brake signal	ON/OFF	XX.X V	
P1-14 Turn signal	Straight/Turn	XX.X V	

EB3 UI CONTROLLER		
PIN	State	Data
H1-1 LA-CH OBC	ON/OFF	
J7 Horn	ON/OFF	
J5-2 Speed POT		XX.X V
J4-2 Side broom POT		XX.X V
J3 Left indicator	ON/OFF	
J6 Right indicator	ON/OFF	
P1-7 Start switch	ON/OFF	
P1-6 Suction switch	ON/OFF	
P1-5 Water pump switch	ON/OFF	
P1-4 Side broom switch	ON/OFF	
P1-3 Filter shaker switch	ON/OFF	
P1-2 Power switch	ON/OFF	
P2-9 Horn switch	ON/OFF	
P2-8 Headlight switch	ON/OFF	
P2-7 Reverse switch	ON/OFF	
P2-6 Indicator left switch	ON/OFF	
P2-5 Indicator right switch	ON/OFF	
P2-4 No. "1" switch	ON/OFF	
P2-3 No. "2" switch	ON/OFF	
P2-2 No. "3" switch	ON/OFF	
P2-1 No. "4" switch	ON/OFF	

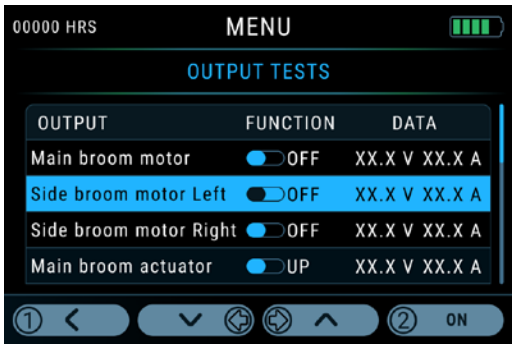
If BATTERY TYPE is Lithium ACE, LITHIUM BATTERY will be shown in the DATA PARAMETER, and it shows the ACE battery information as the table below.



LITHIUM BATTERY	
PIN	STATE
SOC	XX%
Remaining Capacity	XXXXX mAh
Full Charge Capacity	XXXXX mAh
Battery Current	XXXXX mA
Battery Voltage	XXXXX mV
Cycle Count	XXXXX
FW Version	X X(Eg.A1)
Cell Max. Temp	XX ℃
Cell Max. Voltage	XXXX mV
SOH	XX%

Display, OUTPUT TESTS Interface

In OUTPUT TESTS interface, press button ② can turn on or turn off the selected component.

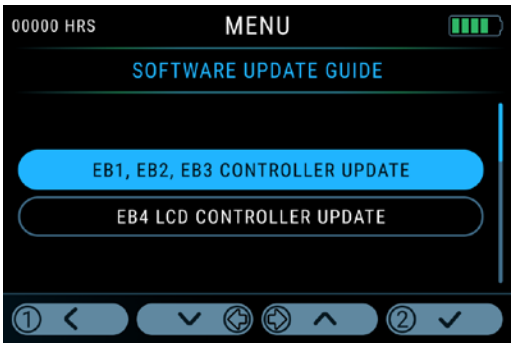


OUTPUT TESTS			
Output	**Function**	**Data**	
Main broom motor	ON/OFF	XX.X V	XX.X A
Side broom motor Left	ON/OFF	XX.X V	XX.X A
Side broom motor Right	ON/OFF	XX.X V	XX.X A
Main broom actuator	DN/UP	XX.X V	XX.X A
Side broom actuator	DN/UP	XX.X V	XX.X A
Suction motor	ON/OFF	XX.X V	XX.X A
Water Pump	ON/OFF	XX.X V	
Filter shaker motor	ON/OFF	XX.X V	XX.X A
E-Brake	ON/OFF	XX.X V	
Headlight	ON/OFF	XX.X V	XX.X A
Blue light	ON/OFF	XX.X V	
Horn	ON/OFF	XX.X V	

Left- turn light	ON/OFF	XX.X V	
Right- turn light	ON/OFF	XX.X V	

Display, SOFTWARE UPDATE GUIDE Interface

SOFTWARE UPDATE GUIDE includes the guide of EB1, EB2, EB3 CONTROLLER UPDATE and EB4 LCD CONTROLLER UPDATE.



Removal and Installation

Warning! This procedure must be performed by qualified personnel only.

UI Board (EB3 & EB4)

1. Prepare necessary tools.
2. Open the machine cover, disconnect the battery cable connection to the machine (Figure 3).
3. Remove 4 screws on UI Panel, detach UI Panel (Figure 4).
4. Disconnect all terminals connected to UI Panel, then take out UI Panel (Figure 5).
5. Disconnect the connection between UI Board (EB3 & EB4) and Membrane (EB5) (Figure 6).
6. Remove 4 screws on UI Panel, take out UI Board (EB3 & EB4) (Figure 7).
7. Assemble components in reverse order of disassembly.

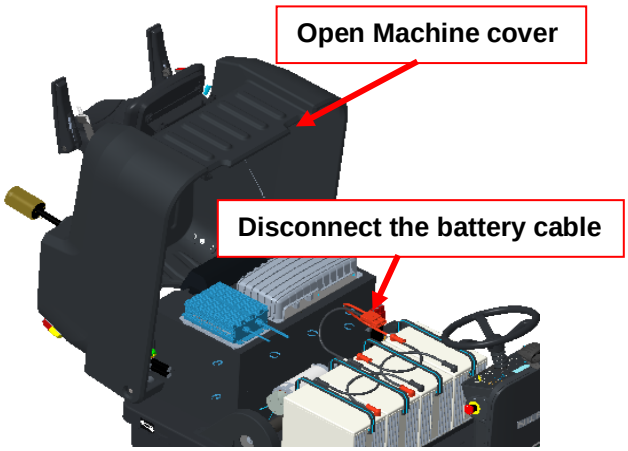


Figure 3

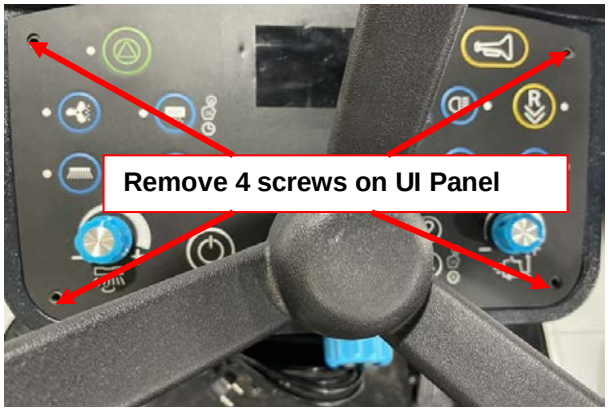


Figure 4

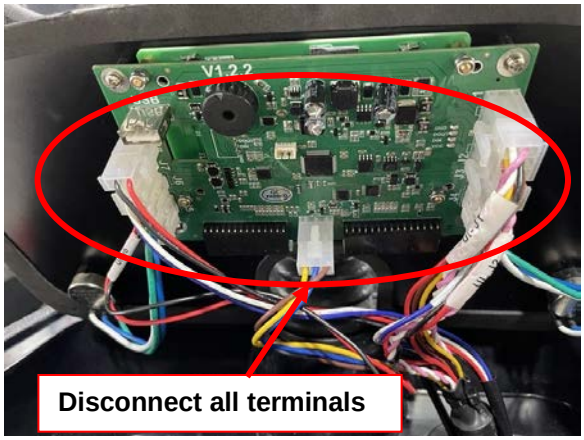


Figure 5

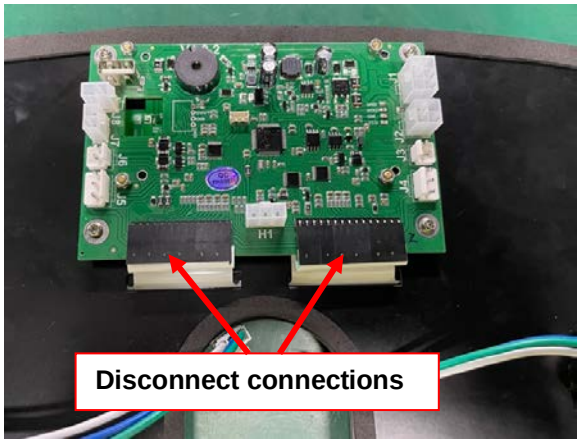


Figure 6

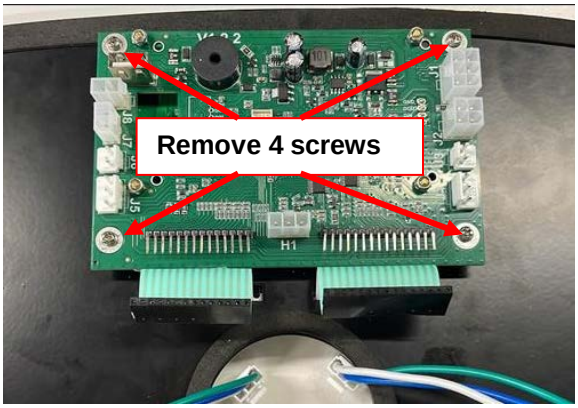


Figure 7

Main Controller (EB1)

1. Prepare necessary tools.
2. Open the machine cover, then disconnect battery power (Figure 8).
3. Remove 5 screws that are used to fix Controller cover (Figure 9).
4. Disconnect all harnesses and terminals connected to Main Controller (EB1) (Figure 10).
5. Remove 4 screws that are used to fix Main Controller (EB1) and take out Main Controller (Figure 11).
6. Assemble components in reverse order of disassembly to assemble Main Controller (EB1).

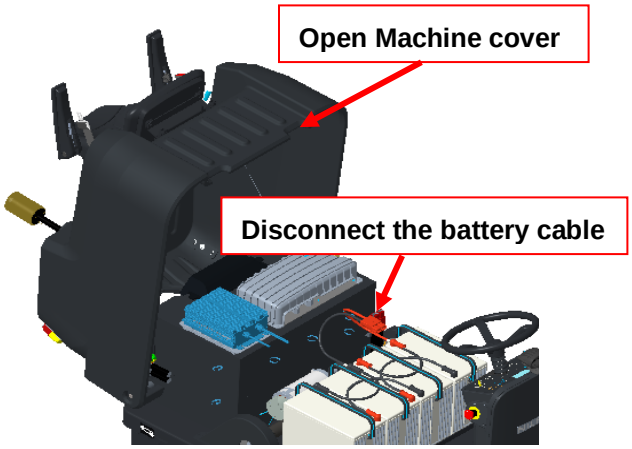


Figure 8

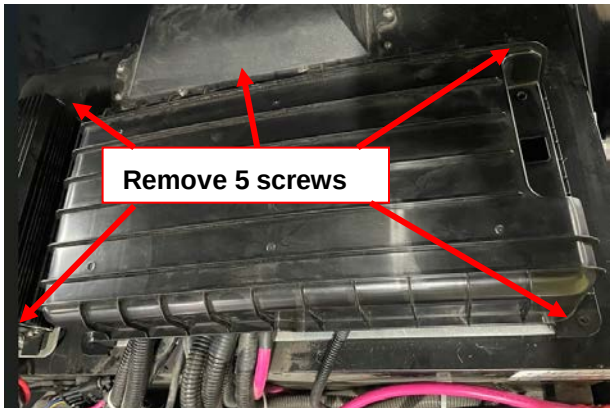


Figure 9

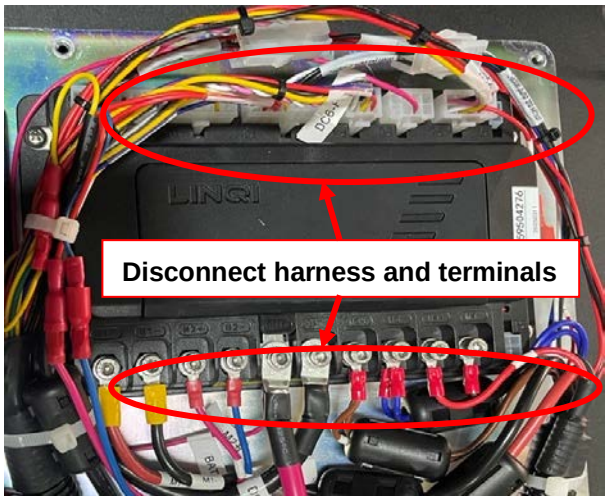


Figure 10

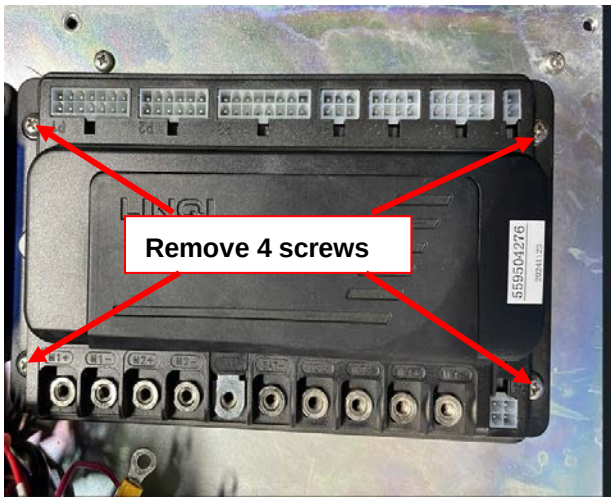


Figure 11

Drive Controller (EB2)

1. Prepare necessary tools.
2. Open the machine cover, then disconnect battery power (Figure 12).
3. Remove 5 screws that are used to fix Controller cover (Figure 13).
4. Disconnect all harnesses connected to Drive Controller (Figure 14).
5. Remove 2 screws that are used to fix Drive Controller and take out Drive Controller (Figure 15).
6. Assemble components in reverse order of disassembly to assemble Drive Controller (EB2).

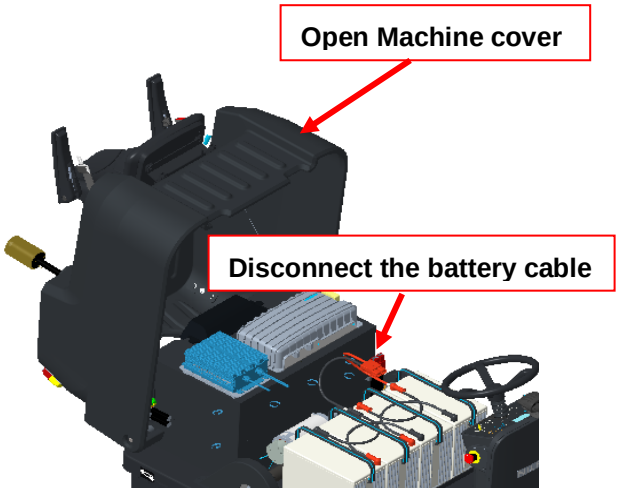


Figure 12

Figure 13

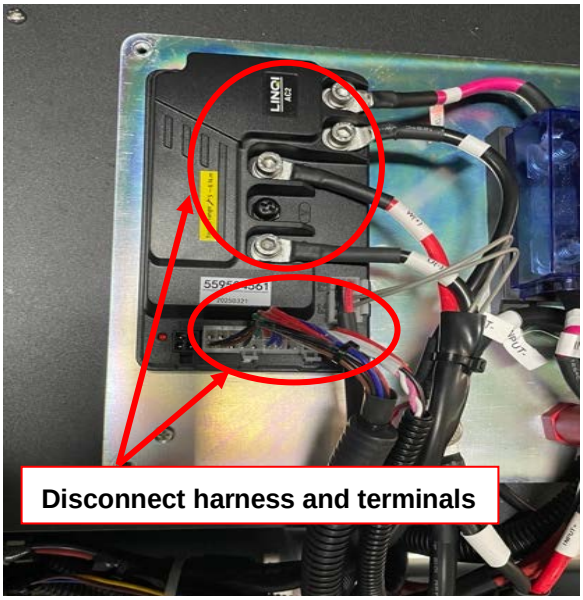


Figure 14

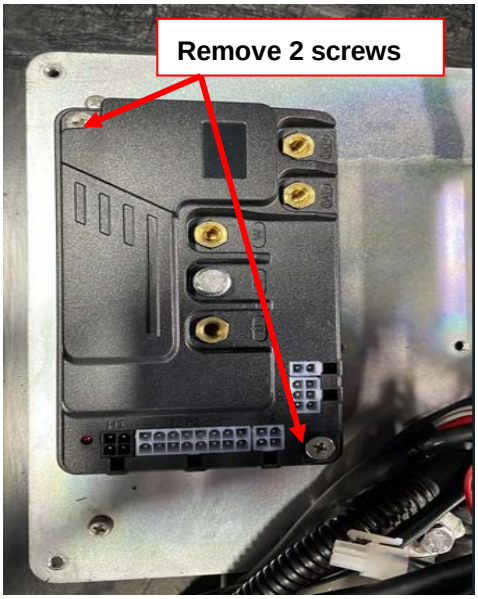


Figure 15

Specifications and Shop Measurements

The following tables contain some “real world” shop voltage measurements to help you recognize what “normal” looks like. All voltage values were measured with the black (Negative) voltmeter lead connected to the main battery negative unless otherwise specified.

Shop Measurements - Main machine controller (EB1)

Battery volts at battery, power on = 26.28V.

Power Supply

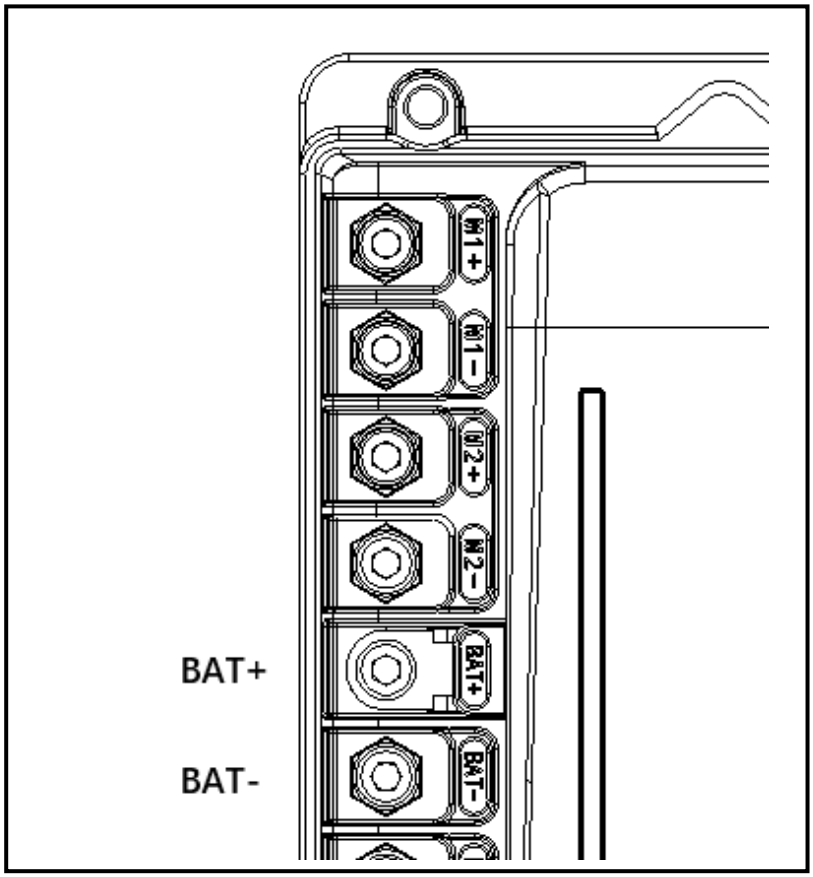


Figure 16

PIN	Color	Description	Measured	I max	Comments
BAT+	Red	Main machine controller power supply +	26.2V	150A	
BAT-	Black	Main machine controller power supply -	0V	150A	

Main Broom Motor

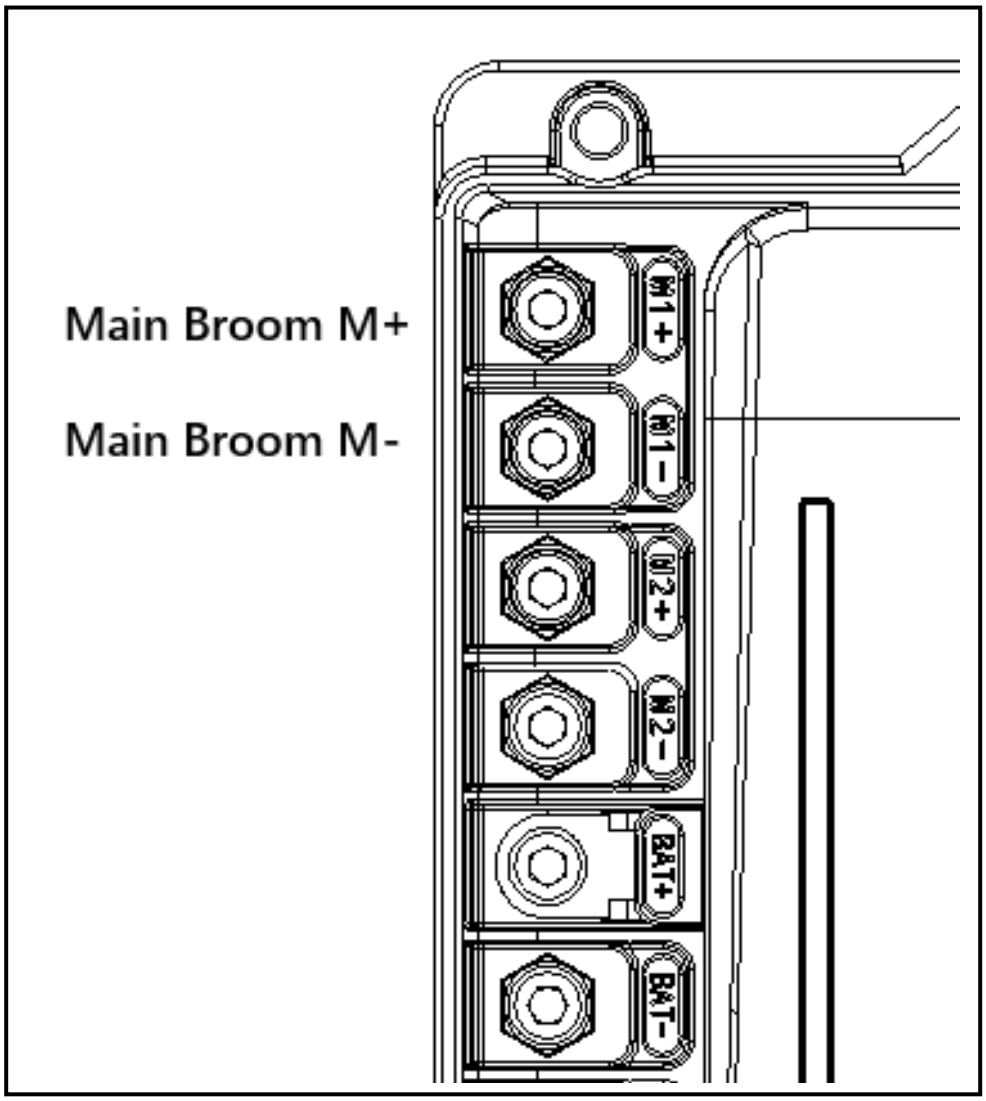


Figure 17

Pin	Color	Description	Measured	I Max	Comments
M1+	Red	Main broom motor M1+	=23.75V motor on =0 V motor off	40A	Measured the voltage between M1+ and M1-
M1-	Black	Main broom motor M1-		40A	

Suction Motor

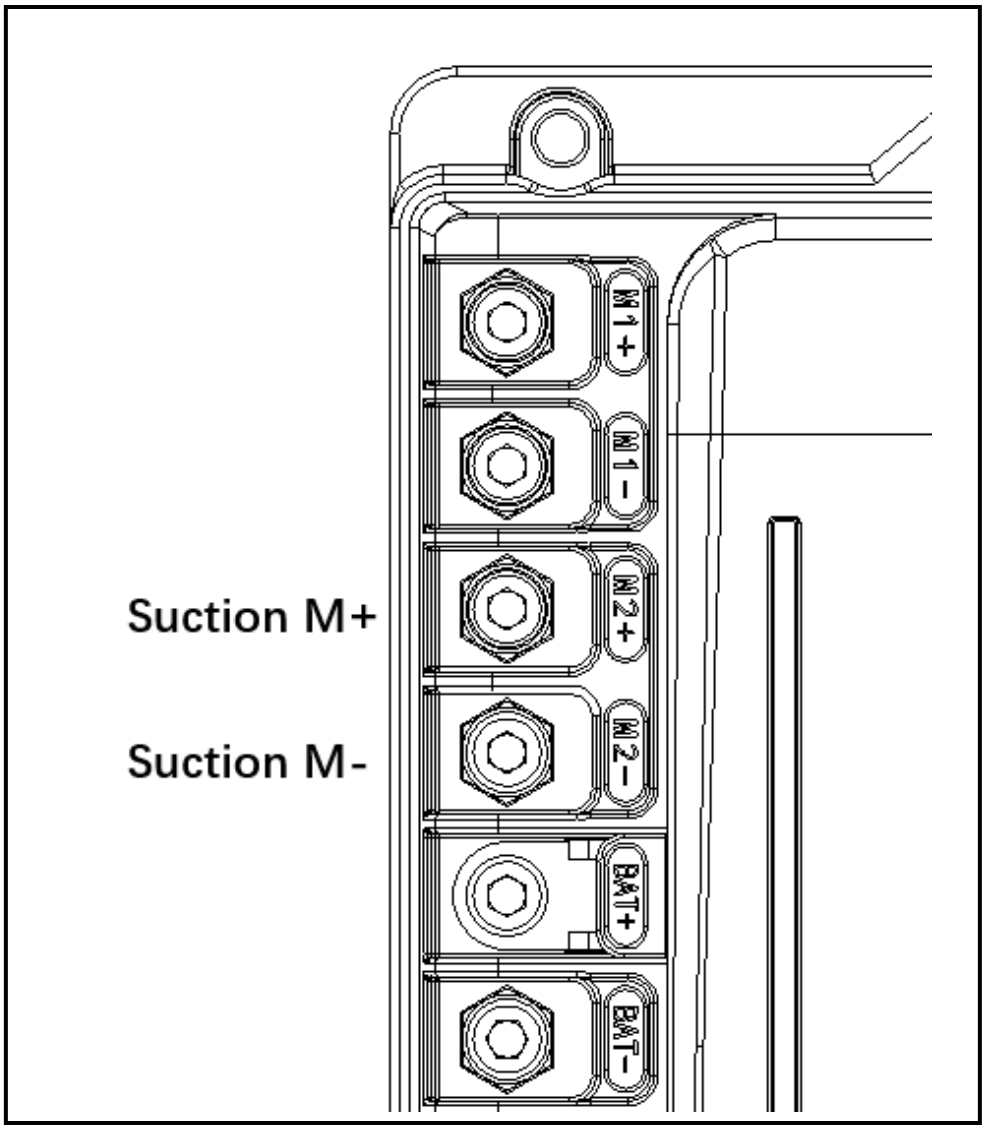


Figure 18

Pin	Color	Description	Measured	I Max	Comments
M2+	Red	Suction motor M2+	25.52V	15A	Measured the voltage between M2+ and M2-
M2-	Black	Suction motor M2-		15A	
P1-14	Yellow	Suction motor PWM in	=25.6V motor on =0V motor off	3A	

Side Broom Motors

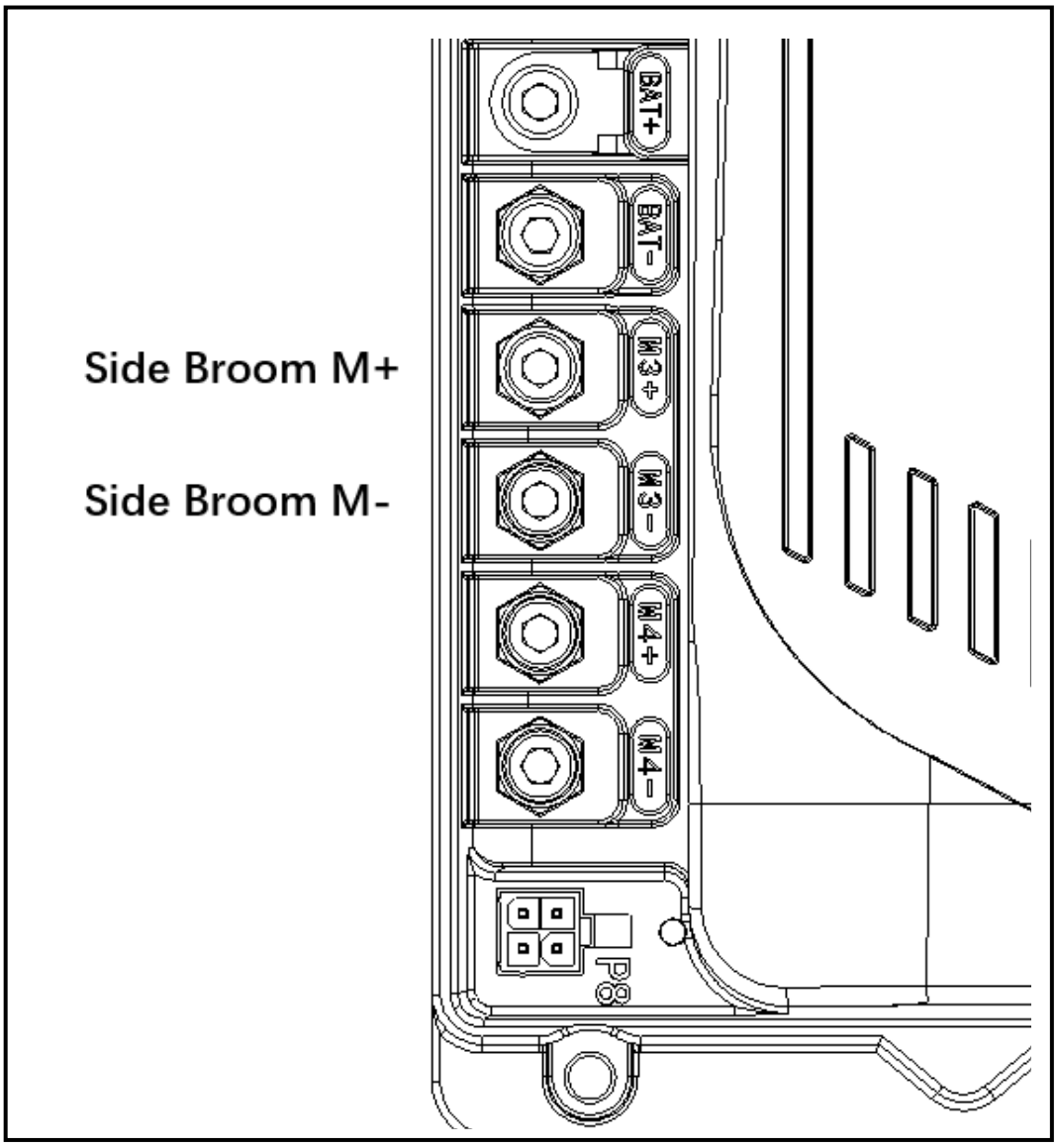


Figure 19

Pin	Color	Description	Measured	I Max	Comments
M3+	Brown	Side broom motor M3+	=3.51V ~ 23.71V motor on =0V motor off	30A	Measured the voltage between M3+ and M3-
M3-	Blue	Side broom motor M3-		30A	

Filter Shaker Motor

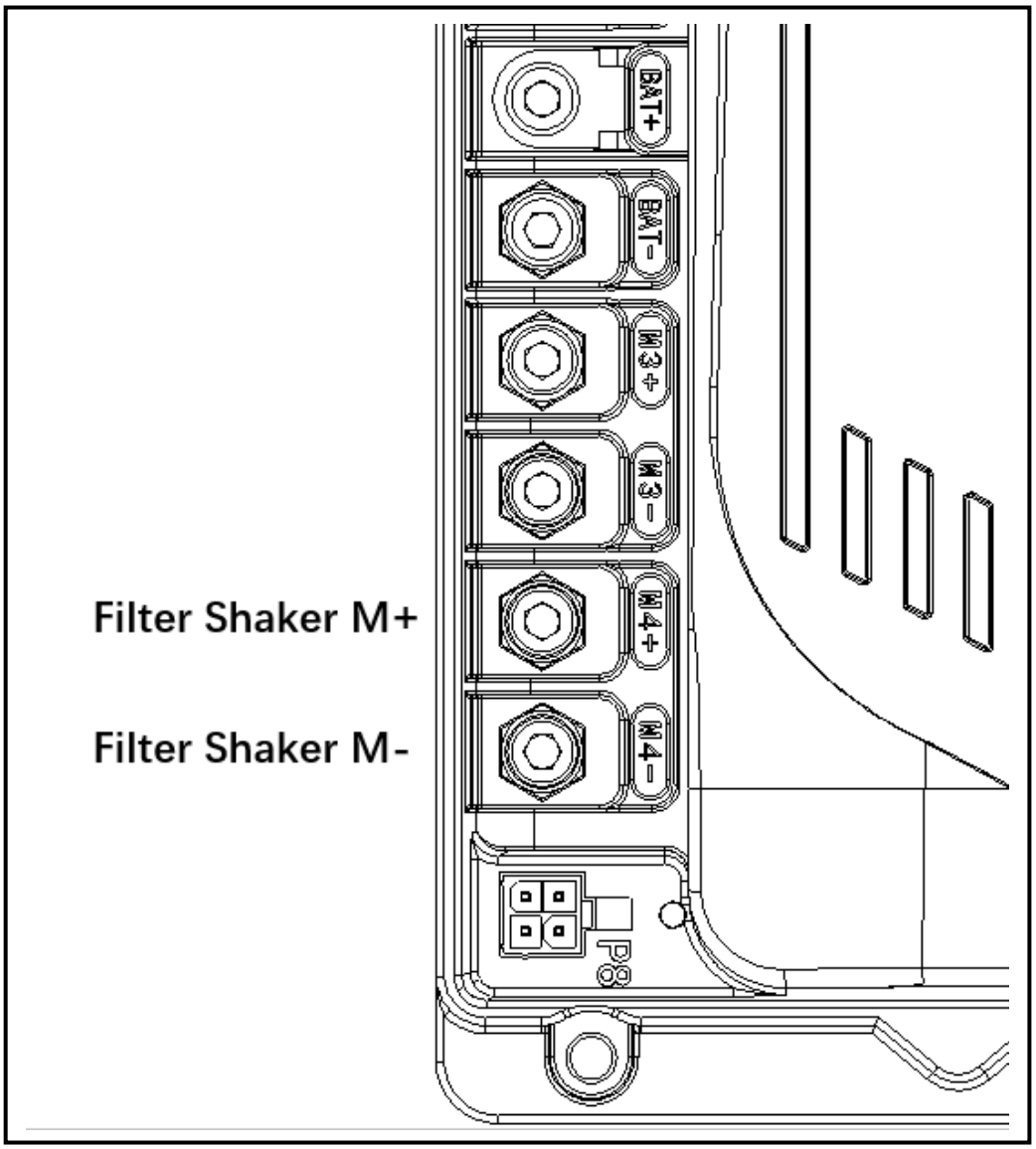


Figure 20

Pin	Color	Description	Measured	I Max	Comments
M4+	Red	Filter shaker motor M4+	=23.52V motor on =0V motor off	15A	Measured the voltage between M4+ and M4-
M4-	Black	Filter shaker motor M4-		15A	

P1-14 ways

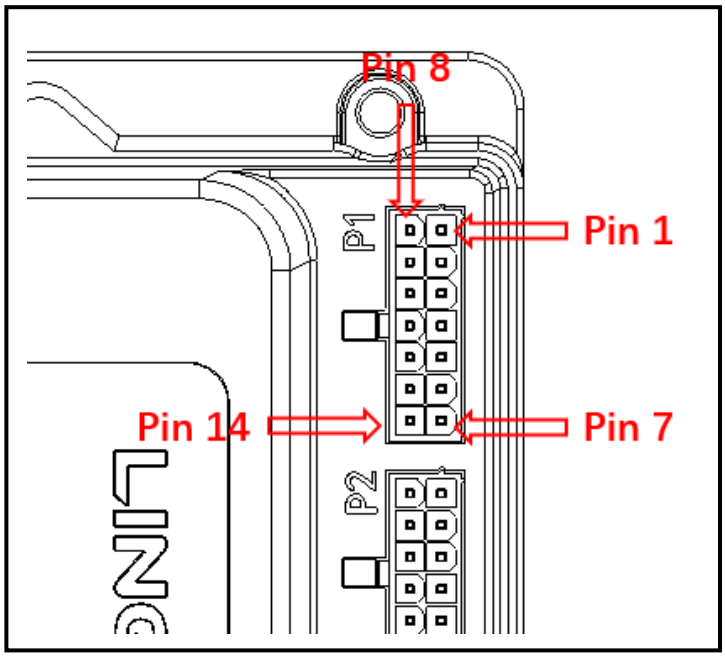


Figure 21

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Red	Main broom actuator power supply +/-	=0.44V off =-24.5V down =24.5V up	7.5A	
2	Red	Side broom actuator power supply -/+	=0.44V off =-24.5V down =24.5V up	7.5A	
3	Black	Warning lamp power supply -	0V	2A	
4	N/A	N/A	N/A	N/A	N/A
5	Black	Blue light power supply -	0V	2A	
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	Black	Main broom actuator power supply -/+	=0.44V off =24.5V down =-24.5V up	7.5A	
9	Black	Side broom actuator power supply -/+	=0.44V off =-24.5V down =24.5V up	7.5A	
10	Brown	Warning lamp power supply +	25.92V	2A	
11	N/A	N/A	N/A	N/A	N/A
12	Red	Blue light power supply +	=1.51V off =25.84V On	2A	
13	N/A	N/A	N/A	N/A	N/A
14	Yellow	Suction motor PWM in	25.6V	3A	

P2-12 ways

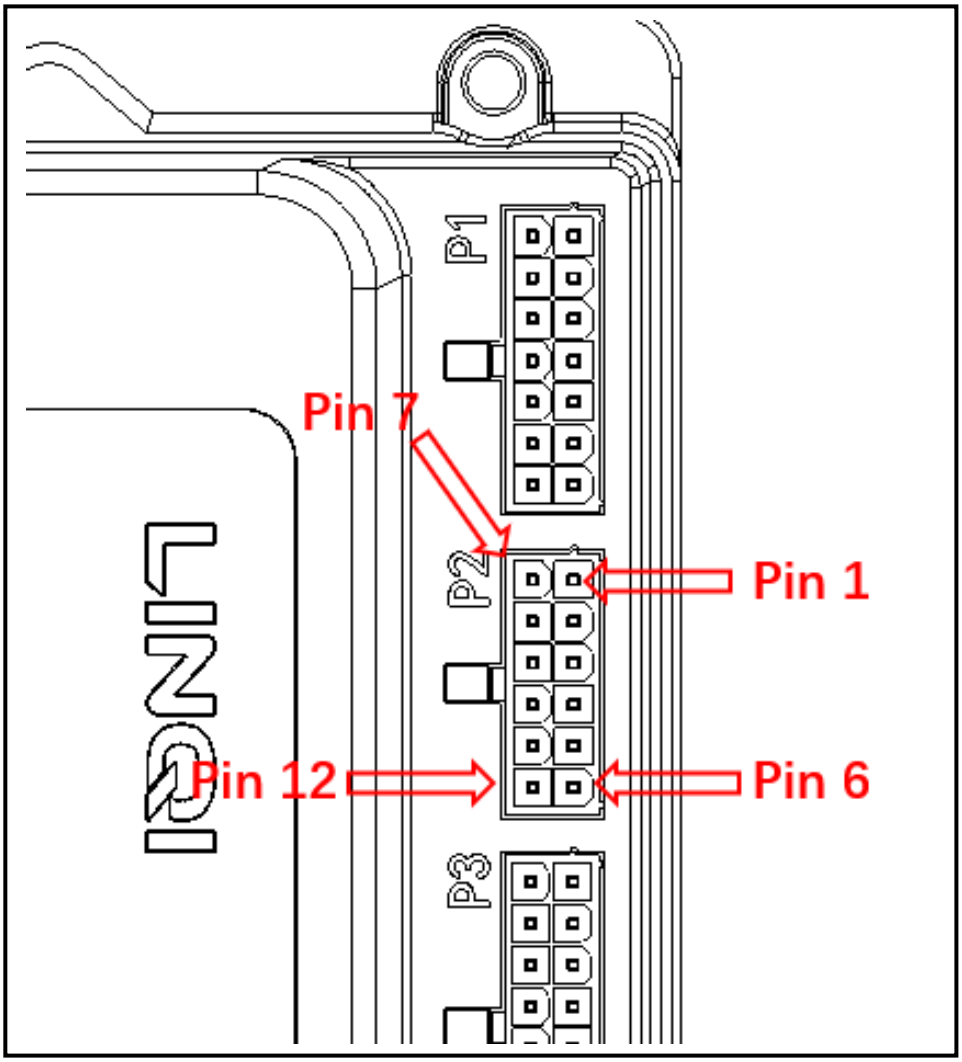


Figure 22

PIN	Color	Circuit Description	Measured	I Max	Comments
1	Green	RS485 A	2.06V	0.1A	
2	Black	Front Light Power Supply -	N/A	4A	
3	N/A	N/A	N/A	N/A	
4	N/A	N/A	N/A	N/A	
5	N/A	N/A	N/A	N/A	
6	Blue	B-	0V	0.1A	
7	Yellow	RS485 B	1.97V	0.1A	
8	N/A	N/A	N/A	N/A	
9	N/A	N/A	N/A	N/A	
10	N/A	N/A	N/A	N/A	
11	Yellow	External charge signal	=13.34V discharge	0.1A	
			=0V charge		
12	N/A	N/A	N/A	N/A	

P3-16 ways

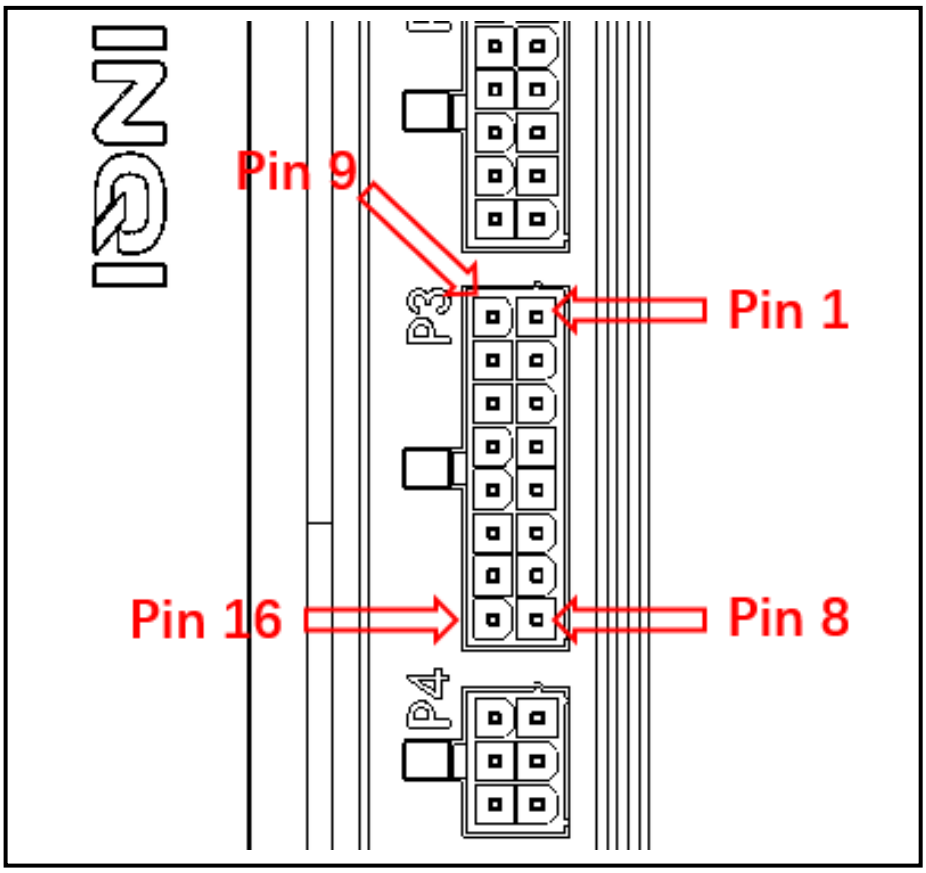


Figure 23

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Blue	Water pump power supply -	0V	4A	
2	N/A	N/A	N/A	N/A	
3	Black	Water sensor power supply +	11.8V	0.35A	
4	Black	Water sensor output signal	=0V Tank no empty =11.8V Tank empty	0.1A	
5	N/A	N/A	N/A	N/A	
6	N/A	N/A	N/A	N/A	
7	N/A	N/A	N/A	N/A	
8	N/A	N/A	N/A	N/A	
9	White	Water pump power supply +	17.7V	4A	
10	Red	Front Light Power Supply +	25.8V	4A	
11	Red	Seat sensor power supply +	11.8V	0.35A	
12	Yellow	Seat sensor output signal	=11.8V seated =0V unseated	0.1A	
13	N/A	N/A	N/A	N/A	
14	N/A	N/A	N/A	N/A	
15	N/A	N/A	N/A	N/A	
16	N/A	N/A	N/A	N/A	

P4-6 ways

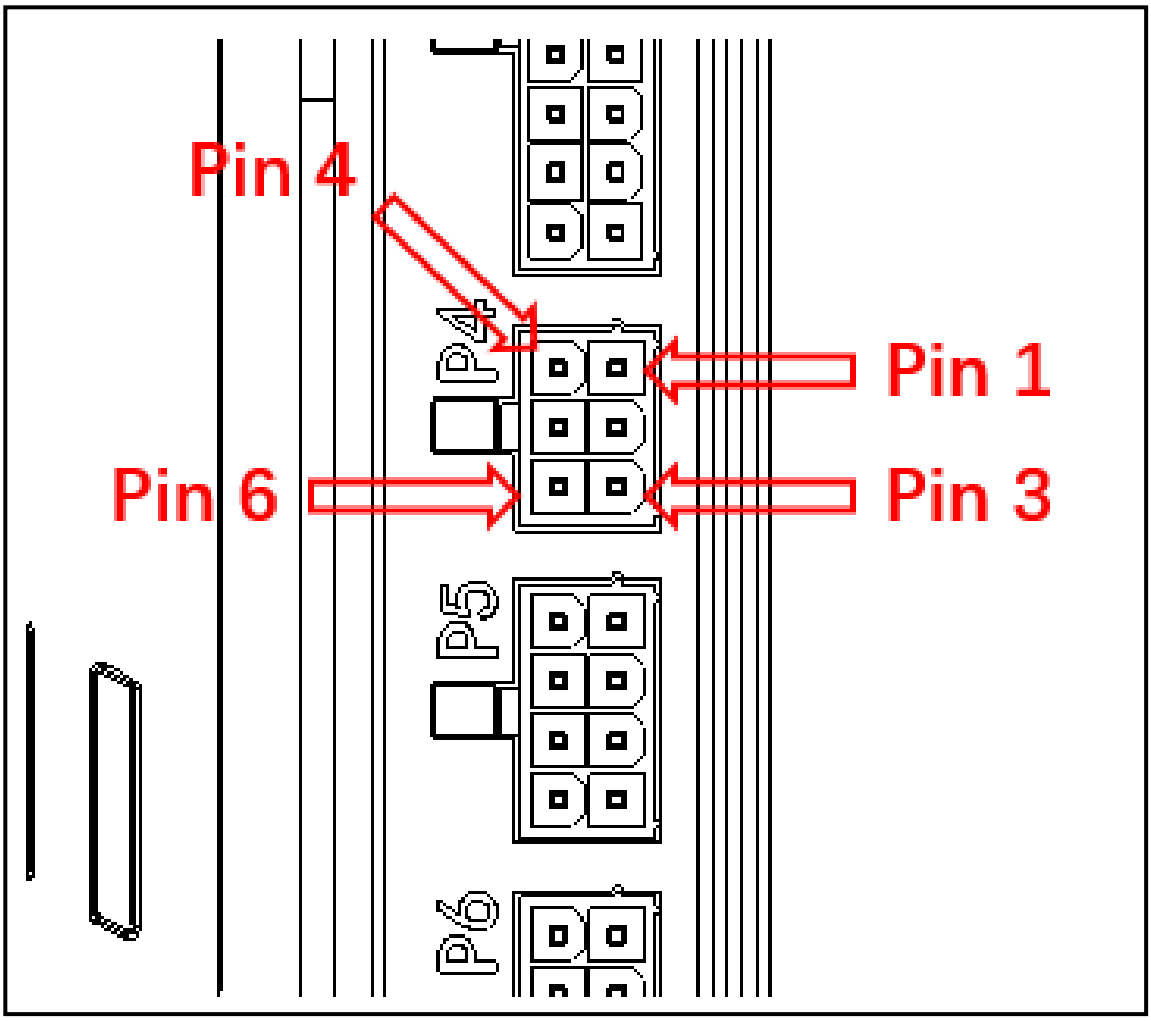


Figure 24

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Pink	CAN-L	2.42V	0.1A	
2	Black	IOT module power supply -	0V	1.1A	
3	Blue	Battery on/off control by IOT module	0.014V	0.1A	
4	White	CAN-H	2.61V	0.1A	
5	Yellow	KEY switch input signal for IOT module	25.55V	0.5A	
6	Red	IOT module Power supply +	25.83V	1.1A	

P5-8 ways

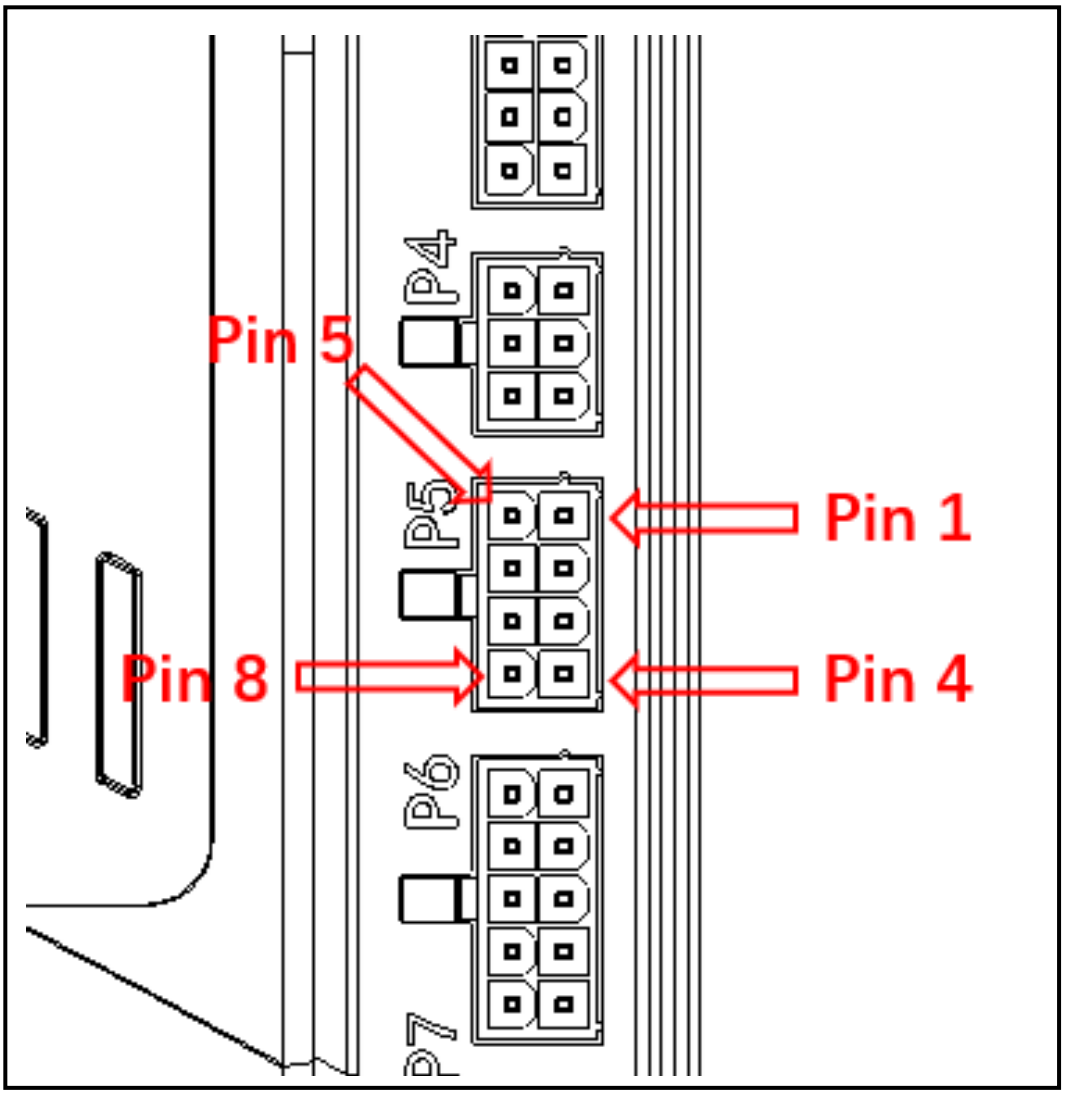


Figure 25

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Pink	CAN-L	2.42V	0.1A	
2	N/A	N/A	N/A	N/A	
3	Red	Lithium-ion Battery ON/OFF	0.05V	0.1A	
4	N/A	N/A	N/A	N/A	
5	White	CAN-H	2.61V	0.1A	
6	N/A	N/A	N/A	N/A	
7	Red	Power supply+ for MMC control circuit	25.82V	5A	
8	N/A	N/A	N/A	N/A	

P6-10 ways

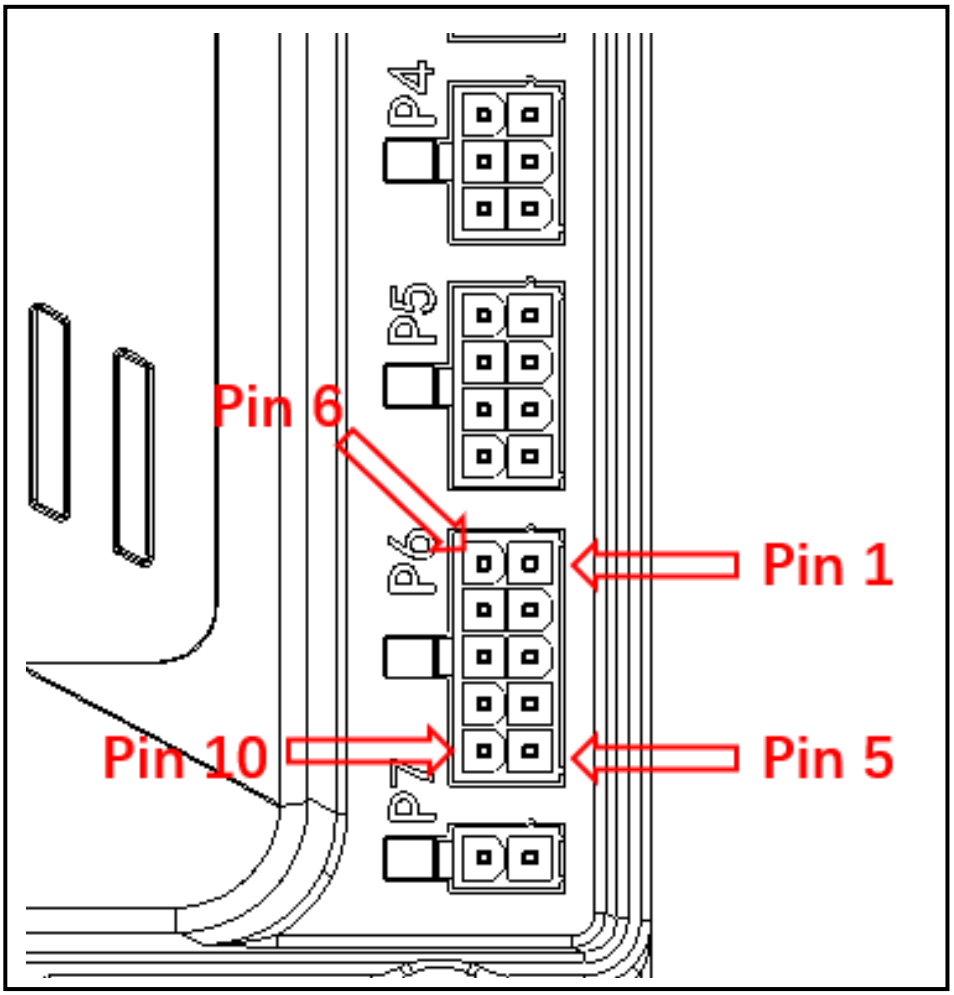


Figure 26

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Pink	CAN-L	2.42V	0.1A	
2	Black	UI board (EB3) power supply -	0V	1A	
3	Brown	UI board on/off switch	=0.25V while on/off switch is pressed =25.5V while on/off switch is released	0.1A	
4	Red	Emergency switch -	0V	0.1A	
5	N/A	N/A	N/A	N/A	
6	White	CAN-H	2.61V	0.1A	
7	Yellow	MMC(EB1) power on signal for UI board	25.8V	0.2A	
8	Red	UI board (EB3) power supply +	25.55V	1A	
9	Red	Emergency switch signal output	=0V while emergency switch is released. =13.3V while emergency switch is pressed.	0.1A	
10	N/A	N/A	N/A	N/A	

P7-2 ways

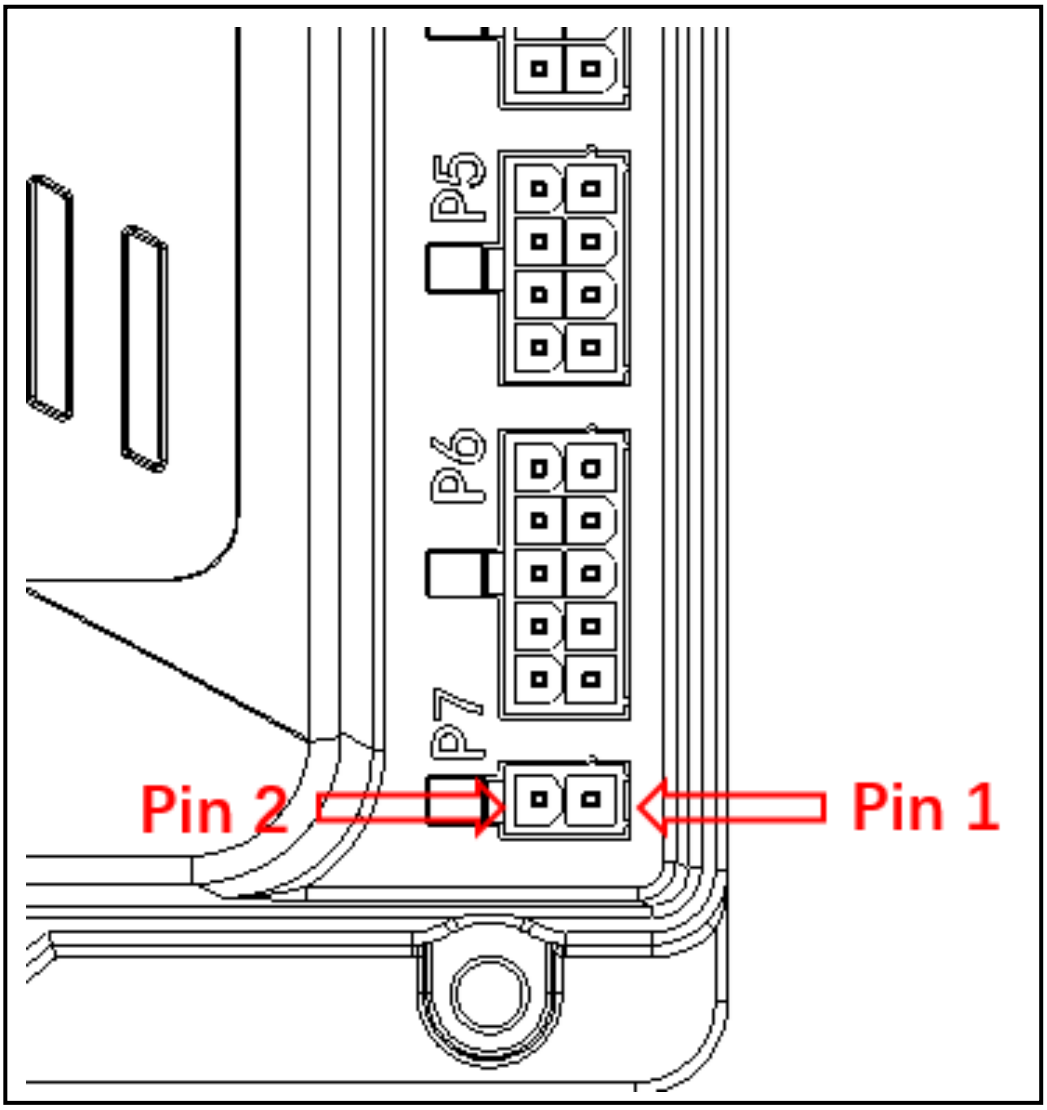


Figure 27

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Brown	Battery -	0V	0.1A	
2	Yellow	Charger power on signal	=0V while battery charging =3.12V while battery no charging	0.1A	

P8-4 ways

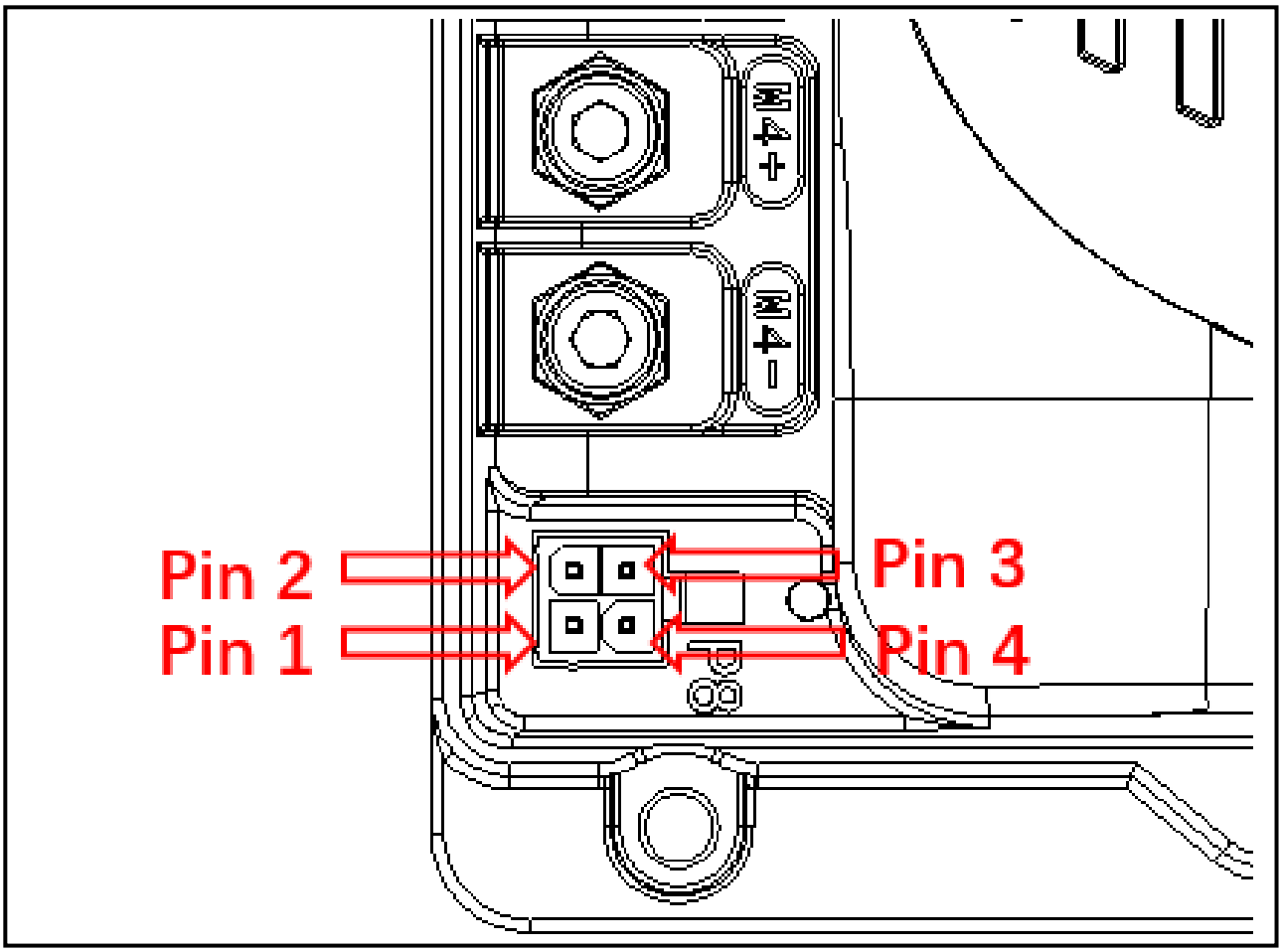


Figure 28

Pin	Color	Circuit Description	Measured	I max	Comments
1	Green	RS485 A	1.76V	0.1A	
2	Black	FOB power supply -	0V	0.35A	
3	Yellow	RS485 B	1.68V	0.1A	
4	Red	FOB power supply +	11.7V	0.35A	

Shop Measurements - Drive controller (EB2)

Battery volts at battery, power on = 26.08V.

Power Supply

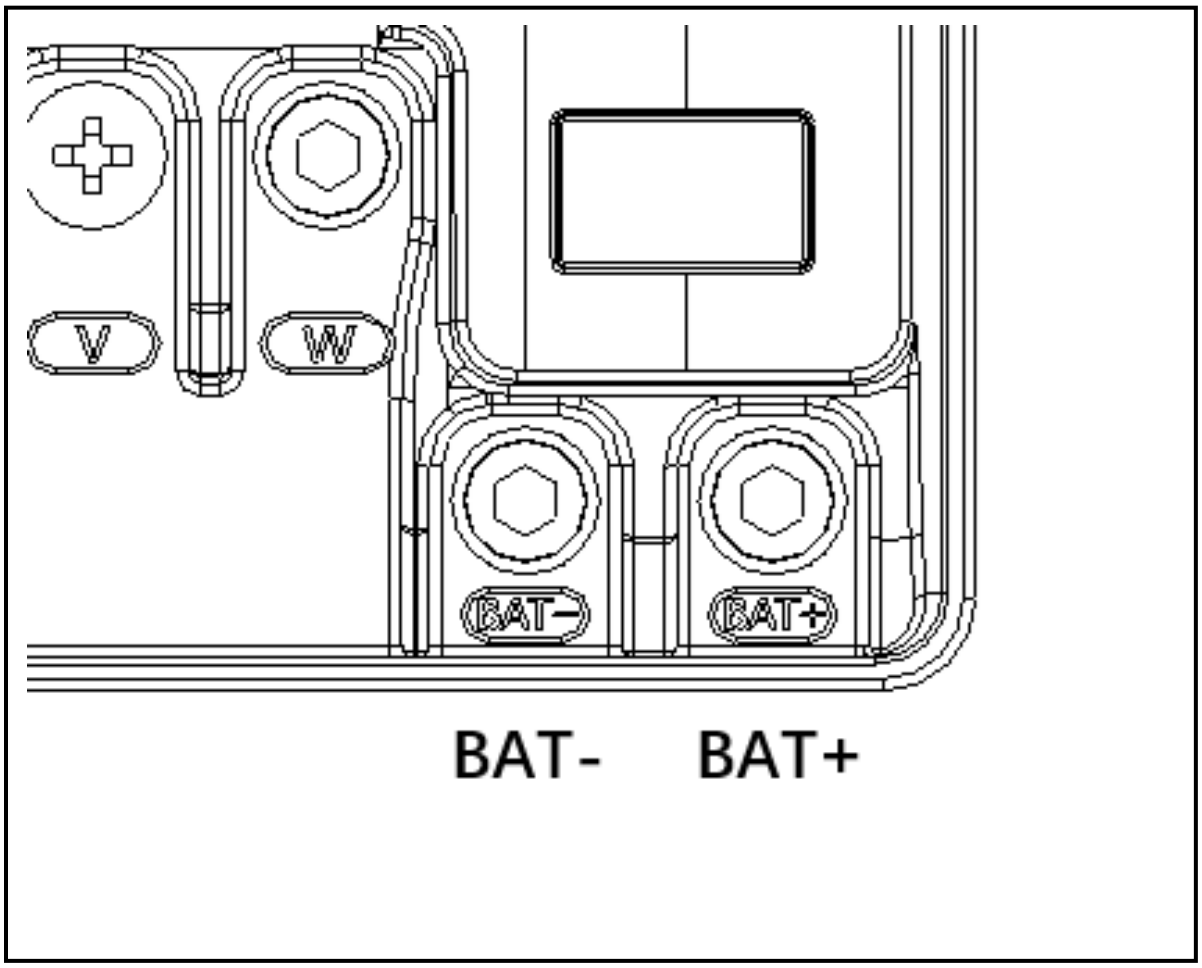


Figure 29

PIN	Color	Description	Measured	I max	Comments
BAT+	Red	Main machine controller power supply +	25.88V	150A	N/A
BAT-	Black	Main machine controller power supply -	0V	150A	N/A

Drive Motor

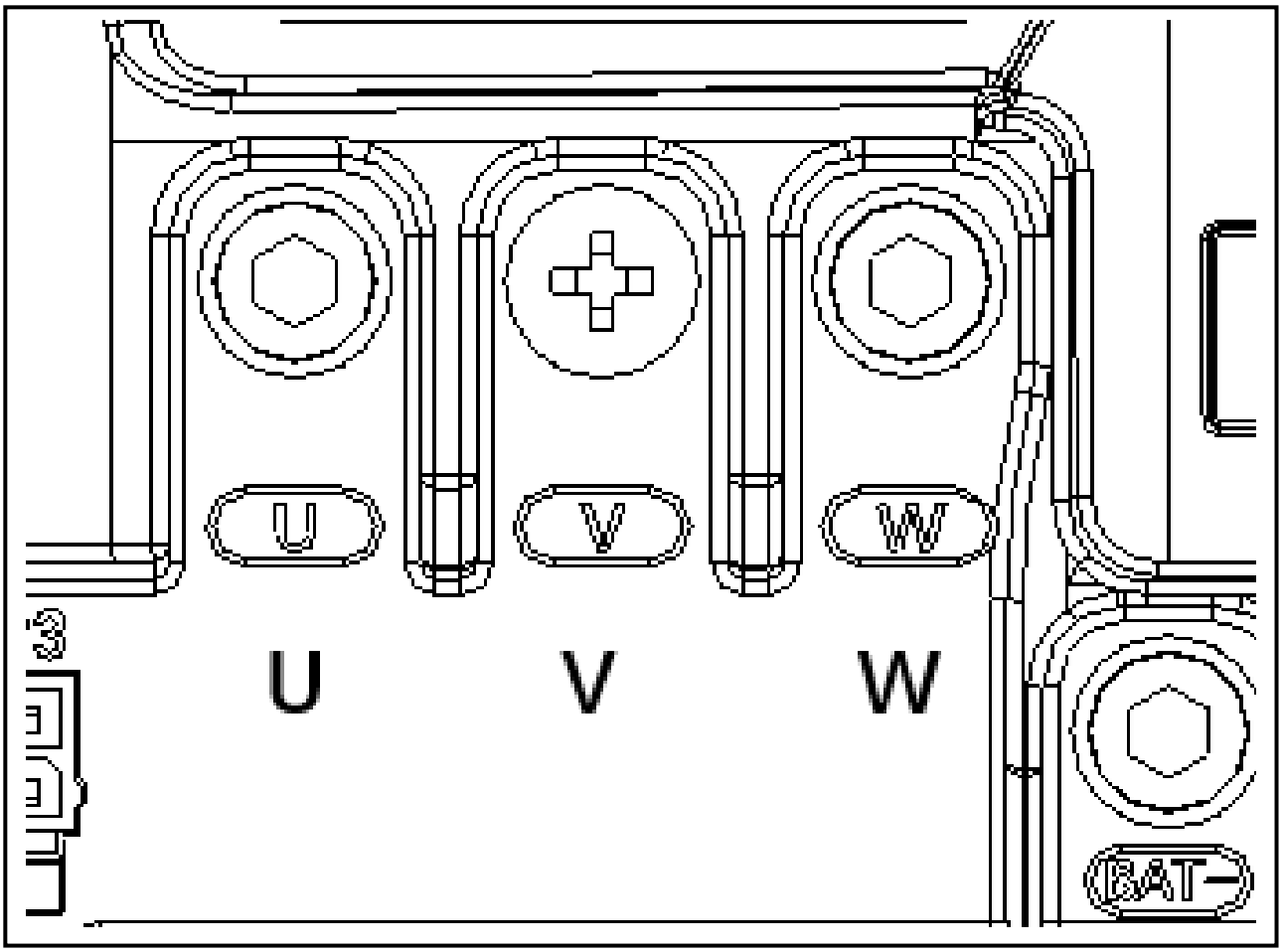


Figure 30

PIN	Color	Description	Measured	I max	Comments
U	Black	Traction Motor power supply -	0.1V	150A	N/A
V	N/A	N/A	N/A	N/A	N/A
W	Red	Traction Motor power supply +	=0~23.1V transport mode & forward	150A	Measured the voltage between pin "U" and pin "W"
			=-12.3V~0V transport mode & backward		
			=0~19.4V working mode & forward		
			=-12.3V~0V working mode & backward		

H1-4 ways

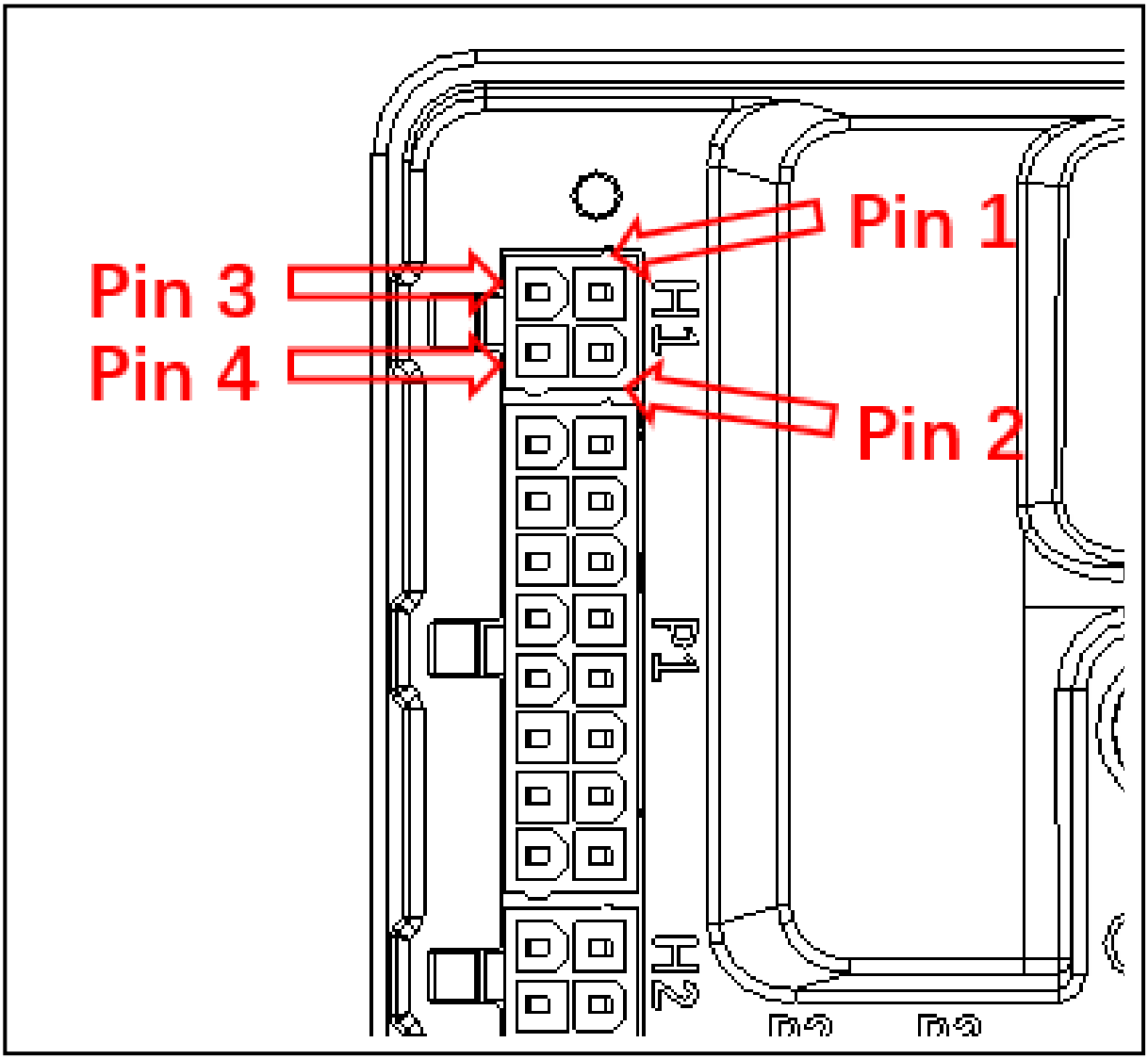


Figure 31

Pin	Color	Circuit Description	Measured	I max	Comments
1	N/A	USART-RXD	0V	0.01A	
2	N/A	B -	0V	0.5A	
3	N/A	USART-TXD	0V	0.01A	
4	N/A	Power supply +	25.8V	0.01A	

H2-4 ways

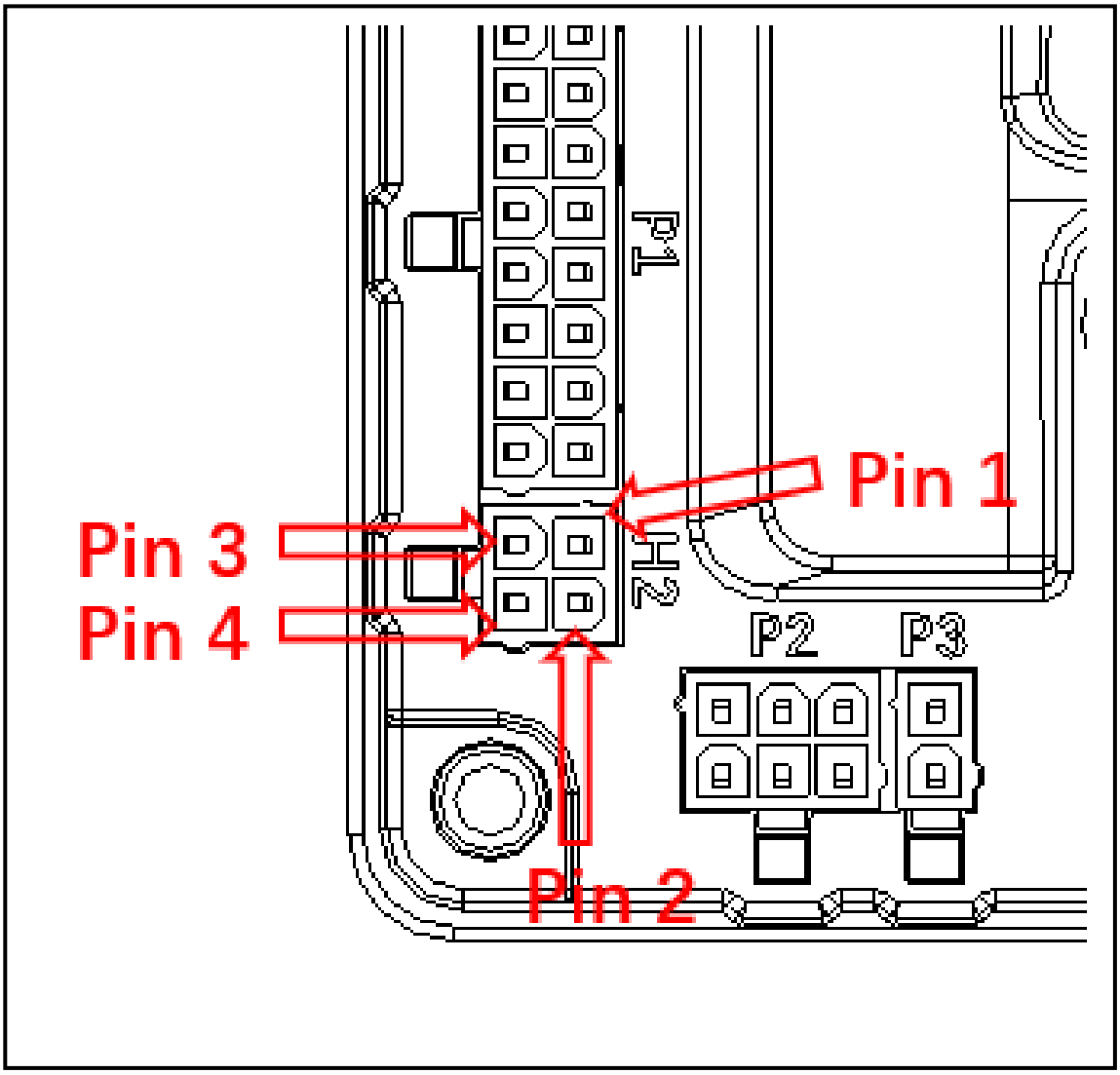


Figure 32

Pin	Color	Circuit Description	Measured	I max	Comments
1	Pink	CAN-L	2.42V	0.1A	
2	Black	B -	0V	1A	
3	White	CAN-H	2.61V	0.1A	
4	Red	Key_in	25.84V	0.5A	

P1-16 ways

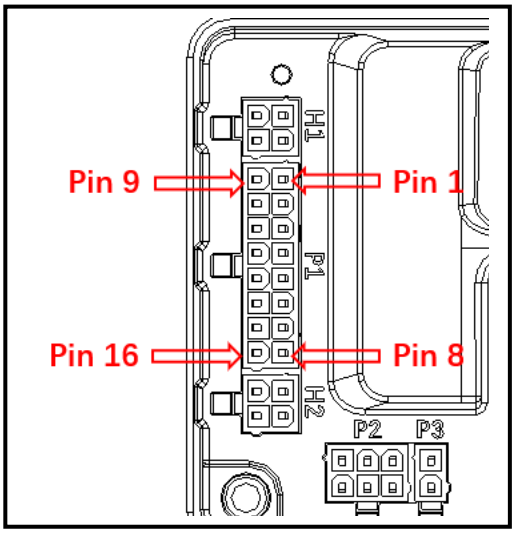


Figure 33

Pin	Color	Circuit Description	Measured	I Max	Comments
1	N/A	N/A	N/A	N/A	
2	N/A	N/A	N/A	N/A	
3	N/A	N/A	N/A	N/A	
4	N/A	N/A	N/A	N/A	
5	Green	Accelerator pot wiper	=0.036V released	0.01A	Measured the voltage between P1-5 and P1-12
			=0.867V min output to make the machine move	0.01A	
			=4.85V max output	0.01A	
6	Red	Mechanical brake switch output	=13.3V while Mechanical brake is released.	0.01A	
			=0V while Mechanical brake is pressed.	0.01A	
7	Red	Emergency switch signal output	=0V while emergency switch is released.	0.01A	
			=13.3V while emergency switch is pressed.		
8	Red	Accelerator power supply +	25.22V	0.01A	Measured the voltage between P1-8 and P1-12
9	Black	Mechanical brake switch power supply -	0V	0.01A	
10	Brown	Turning signal switch power supply -	0V	0.01A	
11	N/A	N/A	N/A	N/A	
12	Black	Accelerator power supply -	0.556V	0.01A	
13	N/A	N/A	N/A	N/A	
14	Blue	Turning signal output	=13.27V straight	0.01A	
			=0V turning	0.01A	
15	Blue	Accelerator moving enable signal	=13.30V while accelerator is released	0.01A	
			=25.75V while accelerator is pressed		
16	N/A	N/A	N/A	N/A	

P2-6 ways

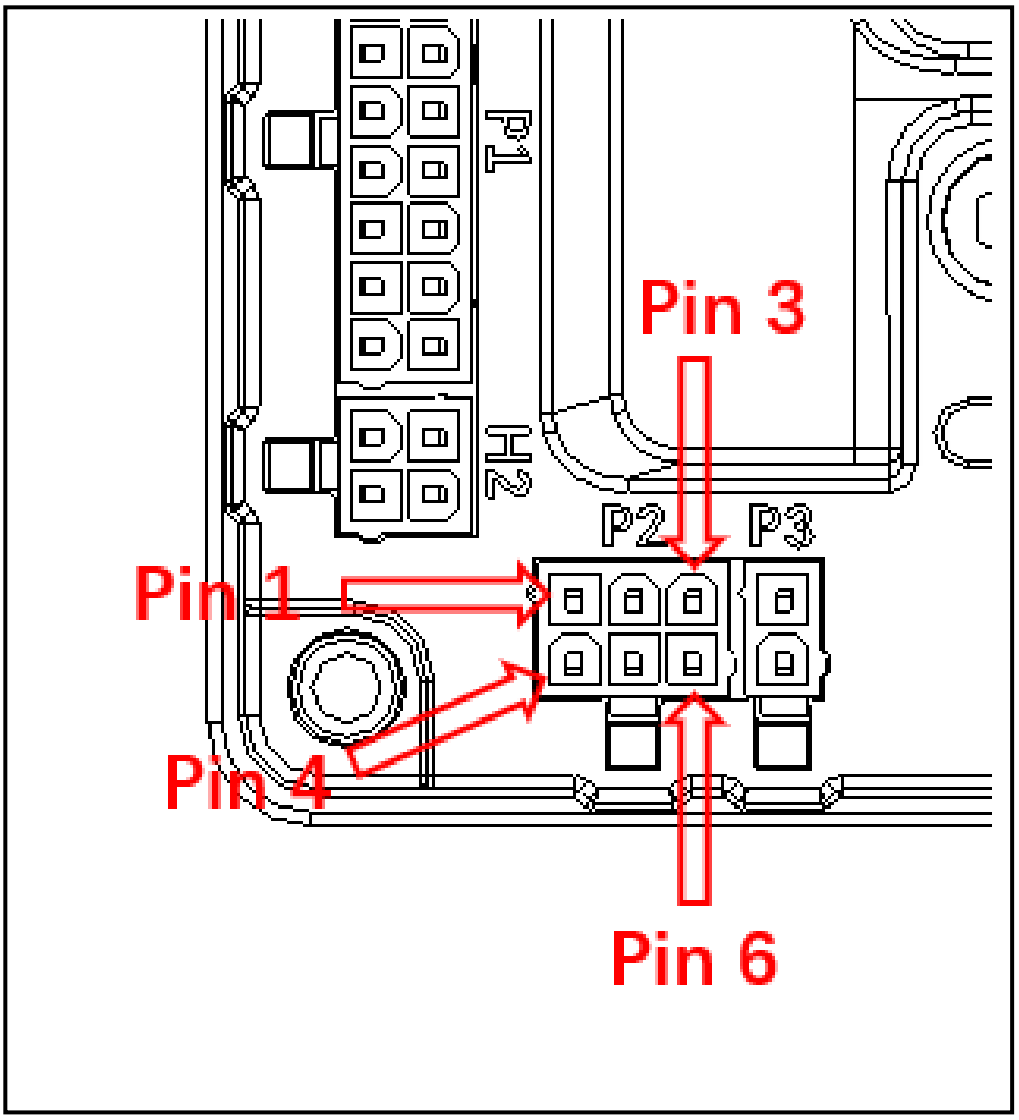


Figure 34

Pin	Color	Circuit Description	Measured	I max	Comments
1	N/A	N/A	N/A	N/A	
2	N/A	N/A	N/A	N/A	
3	N/A	N/A	N/A	N/A	
4	N/A	N/A	N/A	N/A	
5	Gray	Temperature sensor power supply -	0V	0.01A	
6	Gray	Temperature sensor output	0.2V~4.48V (output decreases as temperature increases)	0.01A	

P3-2 ways

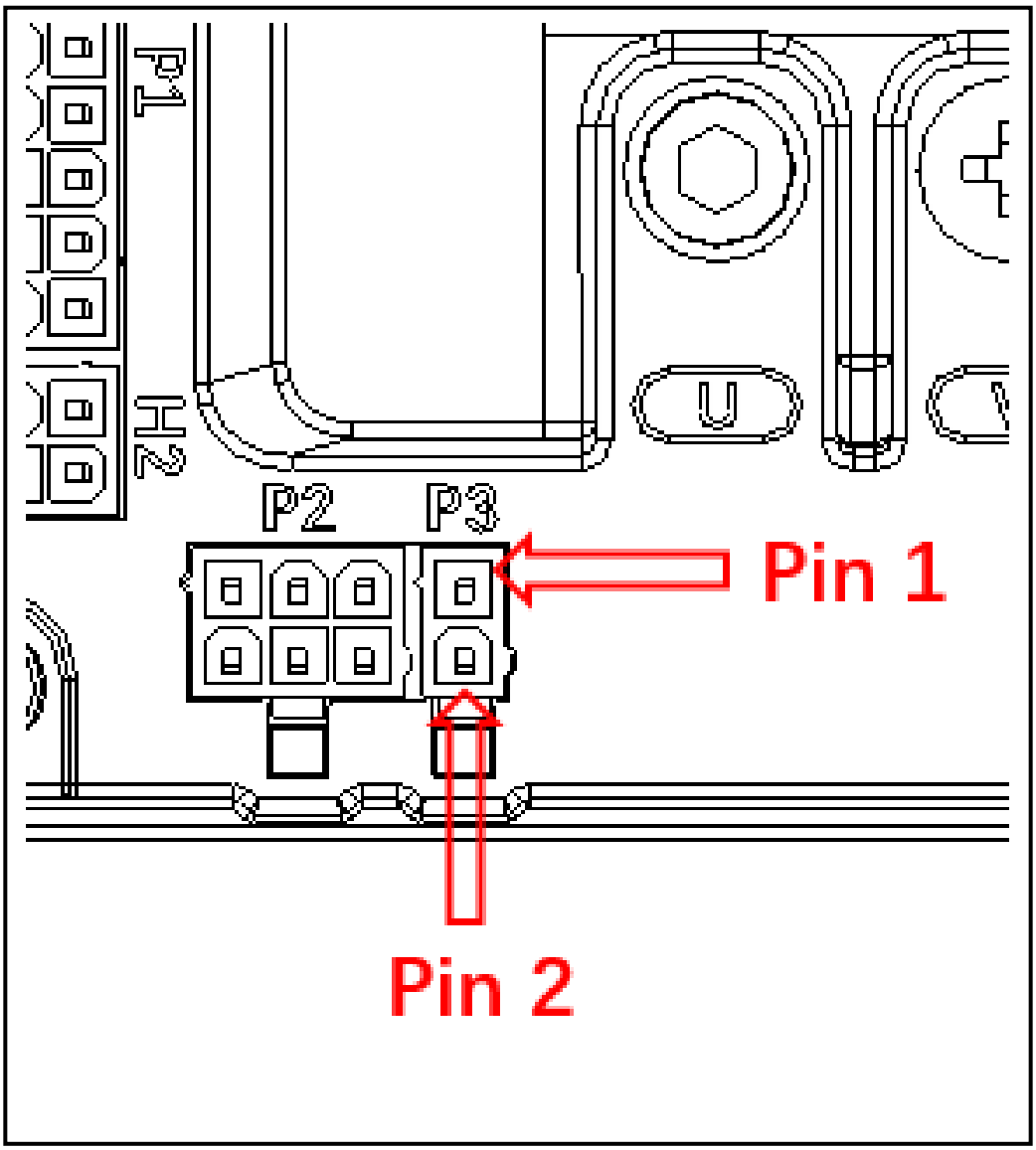


Figure 35

Pin	Color	Circuit Description	Measured	I max	Comments
1	Black	Electrobrake power supply +	23.84V	2A	
2	Red	Electrobrake power supply -	0V	2A	

Shop Measurements - UI controller (EB3)

Battery volts at battery, power on = 26.08V.

J1-6 ways

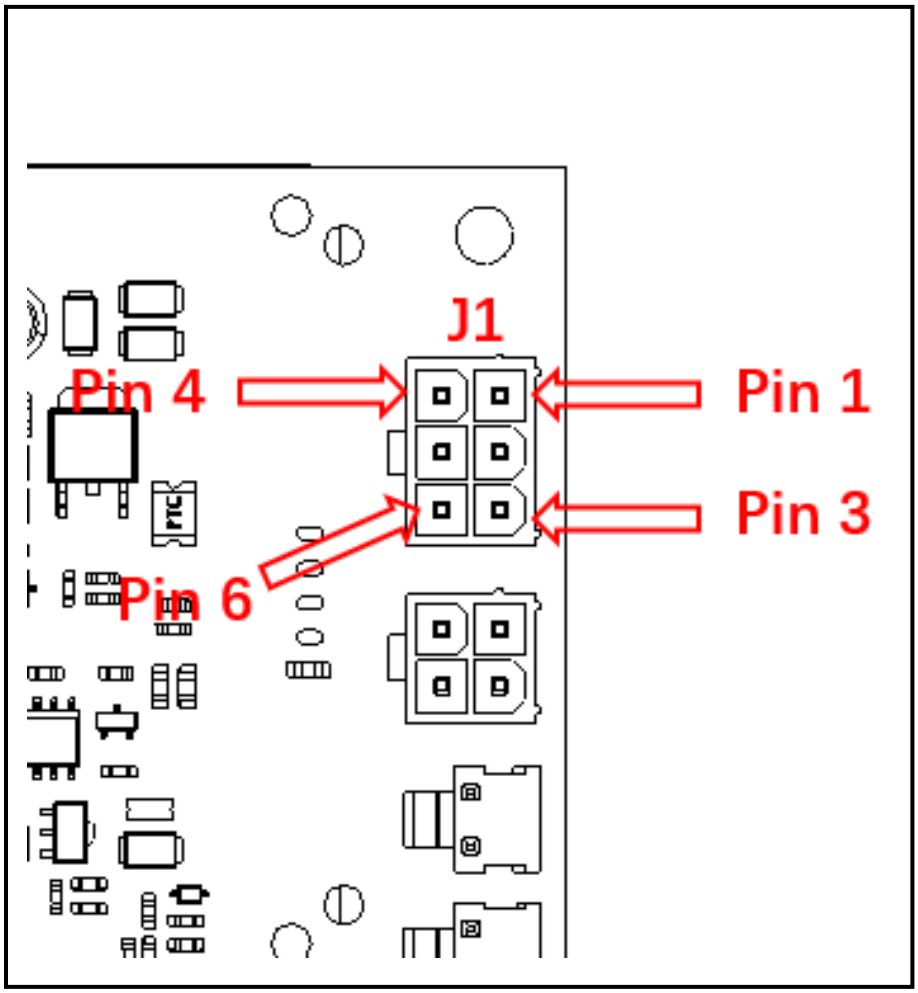


Figure 36

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Pink	CAN-L	2.43V	0.1A	
2	Black	UI board power supply -	0.003V	1A	
3	Brown	UI board on/off button	=25.63V machine off = 0.253V machine on	0.01A	
4	White	CAN-H	2.6V	0.1A	
5	Yellow	MMC(EB1) power on signal for UI board	25.98V	0.2A	
6	Red	UI board power supply +	26.19V	1A	

J2-4 ways

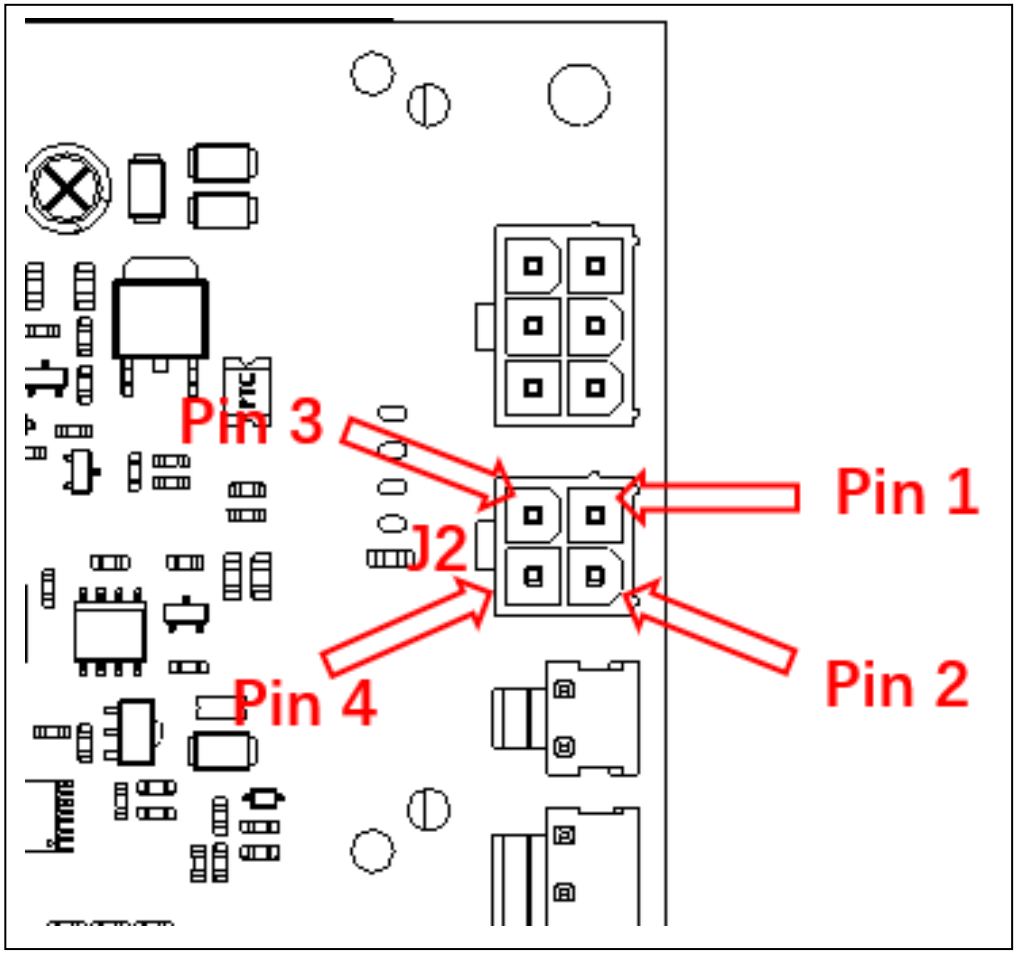


Figure 37

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Pink	CAN-L	2.42V	0.1A	
2	Black	B -	0.003V	1A	
3	White	CAN-H	2.60V	0.1A	
4	Red	Key_in	26.16V	1A	

J3-2 ways

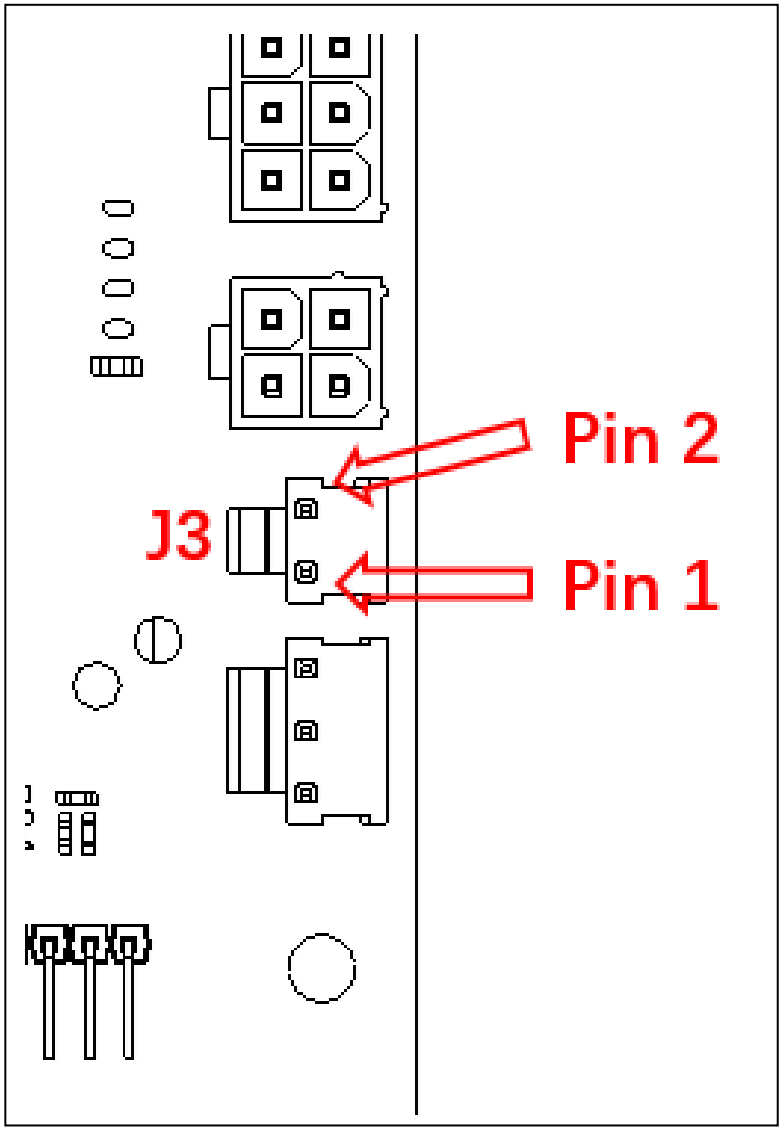


Figure 38

Pin	Color	Circuit Description	Measured	I Max	Comments
1	White	Left_turn indicator power supply +	11.9V	0.35A	
2	Blue	Left_turn indicator power supply -	4.61V	0.35A	

J4-3 ways

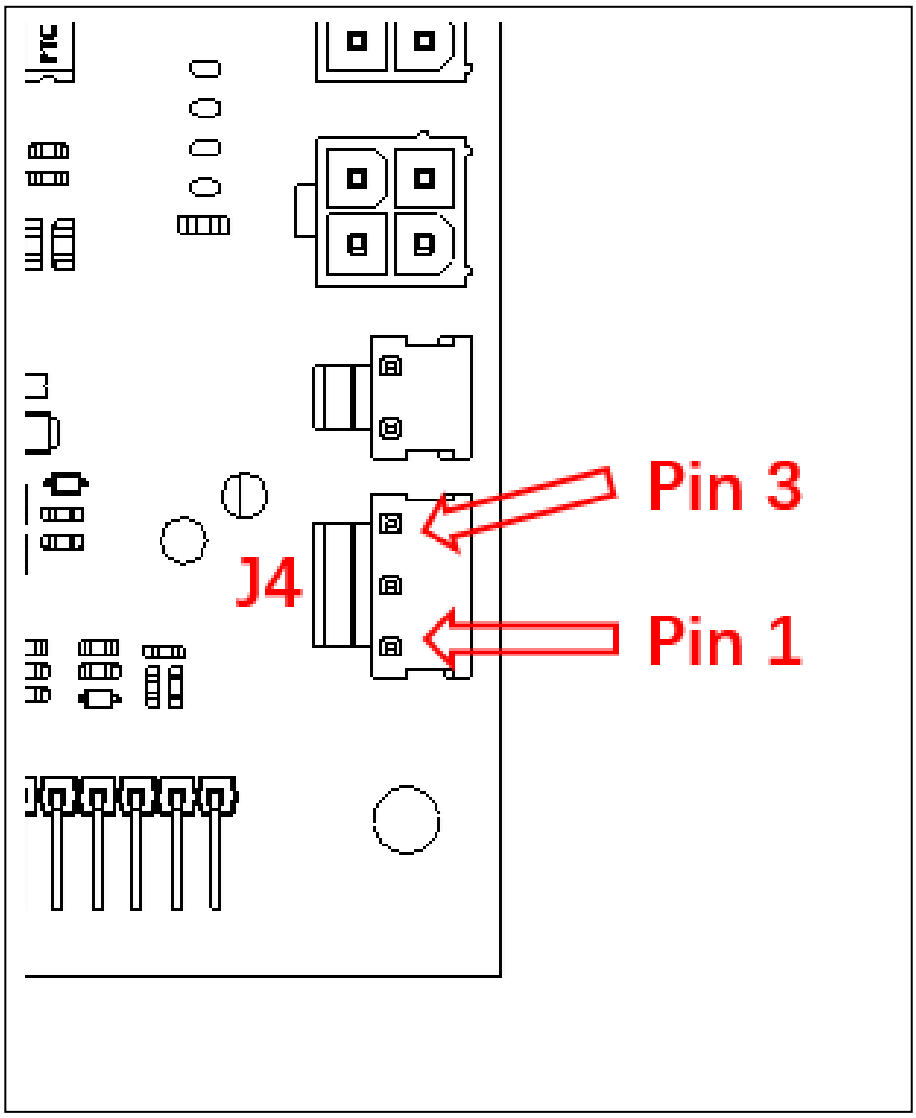


Figure 39

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Green	Pot_high	4.62V	0.35A	
2	Blue	Side broom ADJ	=4.61V min speed =0.435V max speed	0.001A	
3	White	Pot_low	0.434V	0.35A	

J5-3 ways

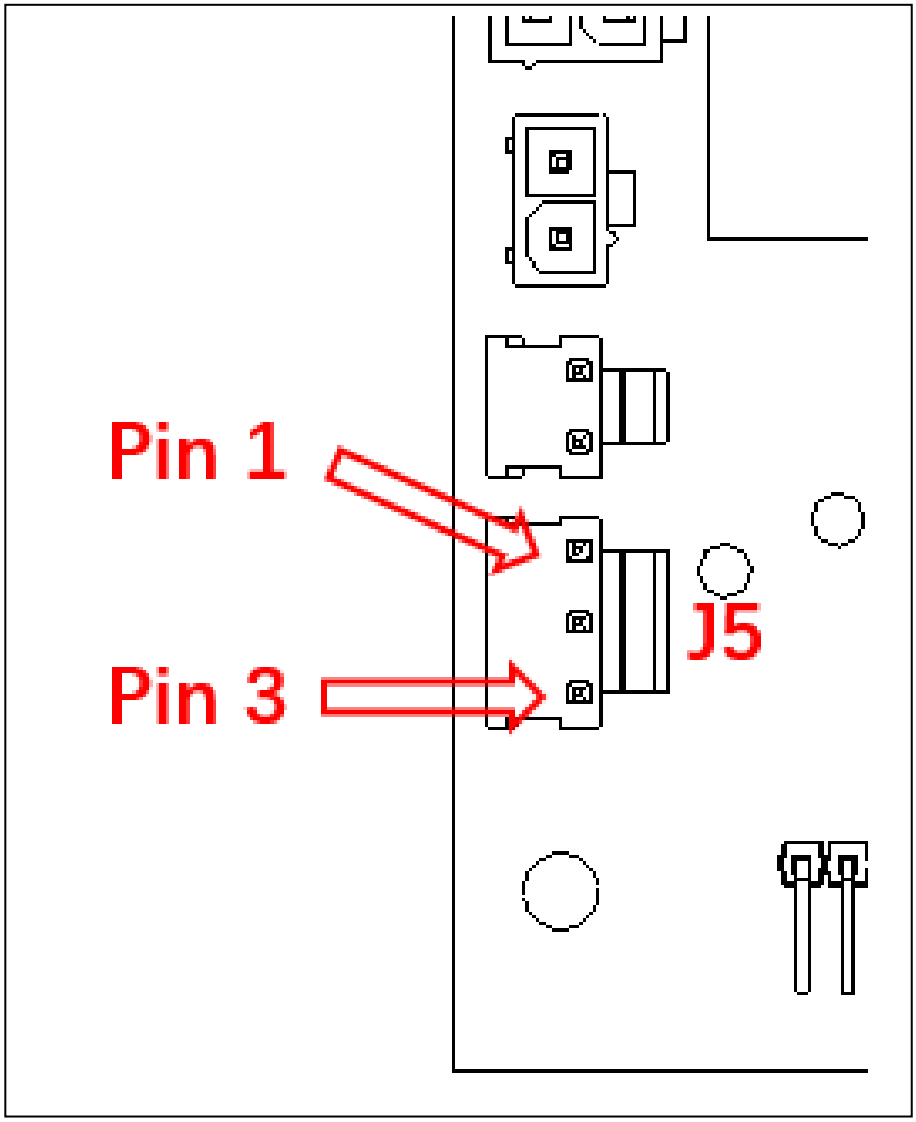


Figure 40

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Green	Pot_high	4.62V	0.35A	
2	Blue	Walking speed limit ADJ	=4.61V min speed =0.435V max speed	0.001A	
3	White	Pot_low	0.432V	0.35A	

J6-2 ways

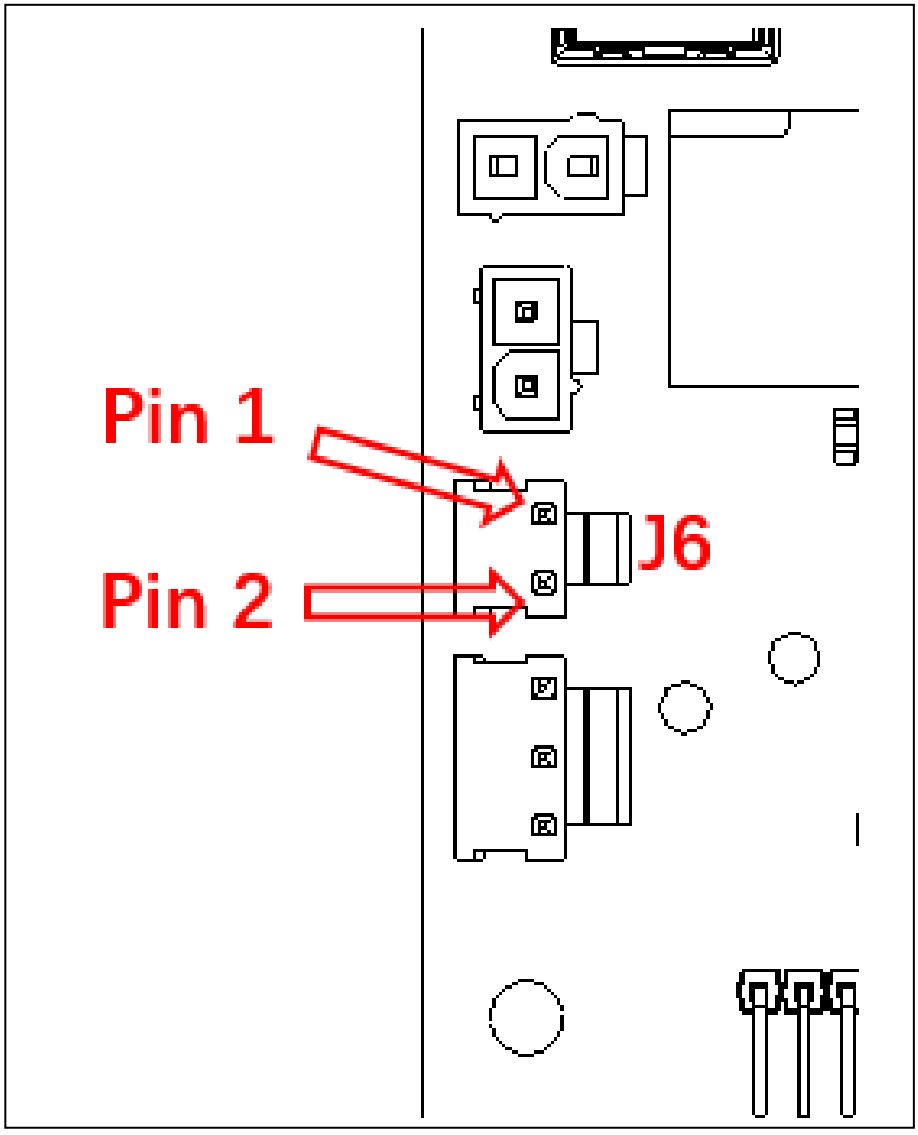


Figure 41

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Red	Right_turn indicator power supply +	11.9V	0.35A	
2	Black	Right_turn indicator power supply -	4.61V	0.35A	

J7-2 ways

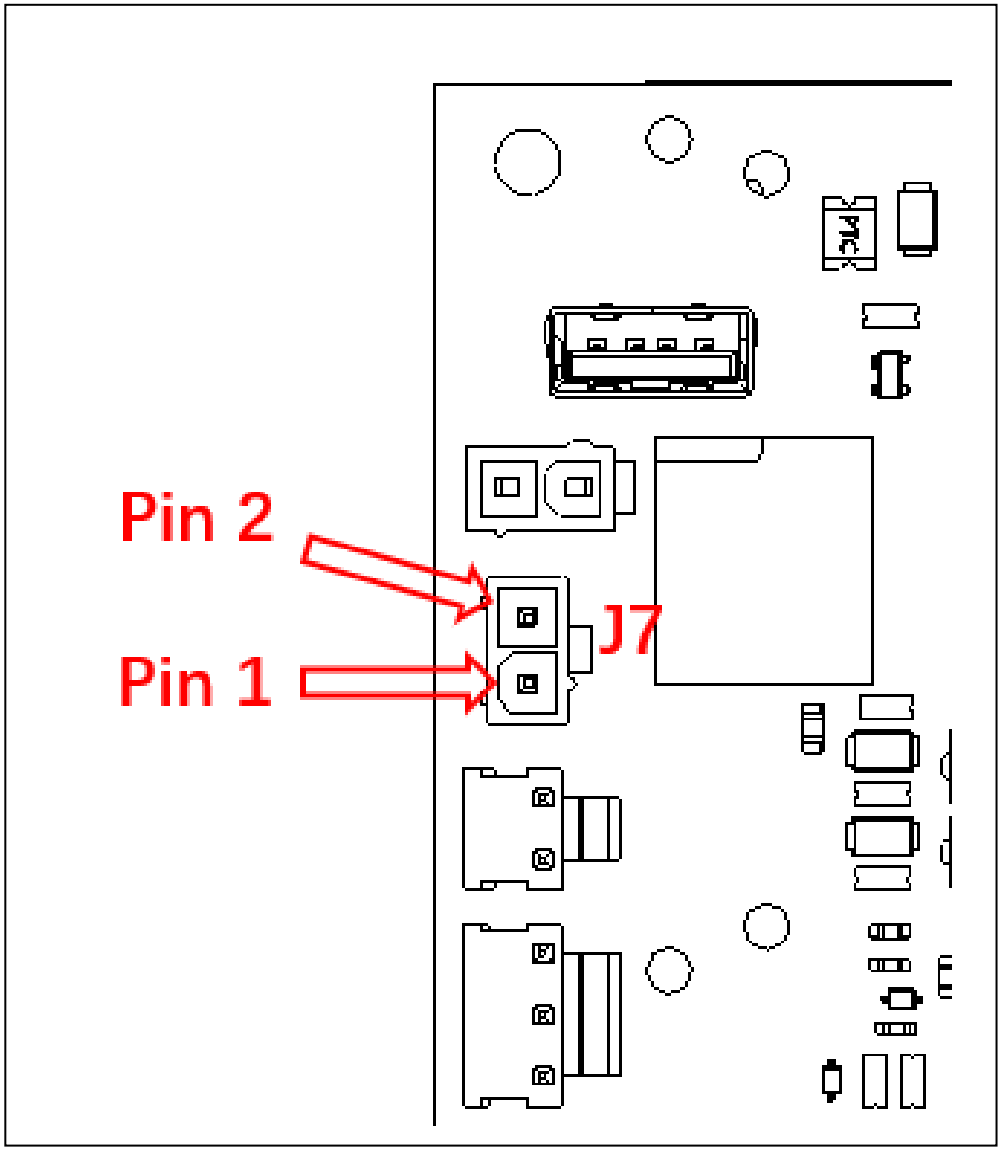


Figure 42

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Blue	Horn power supply -	=0.46V on =22.09V off	0.35A	
2	White	Horn power supply +	25.66V	0.35A	

J8-2 ways

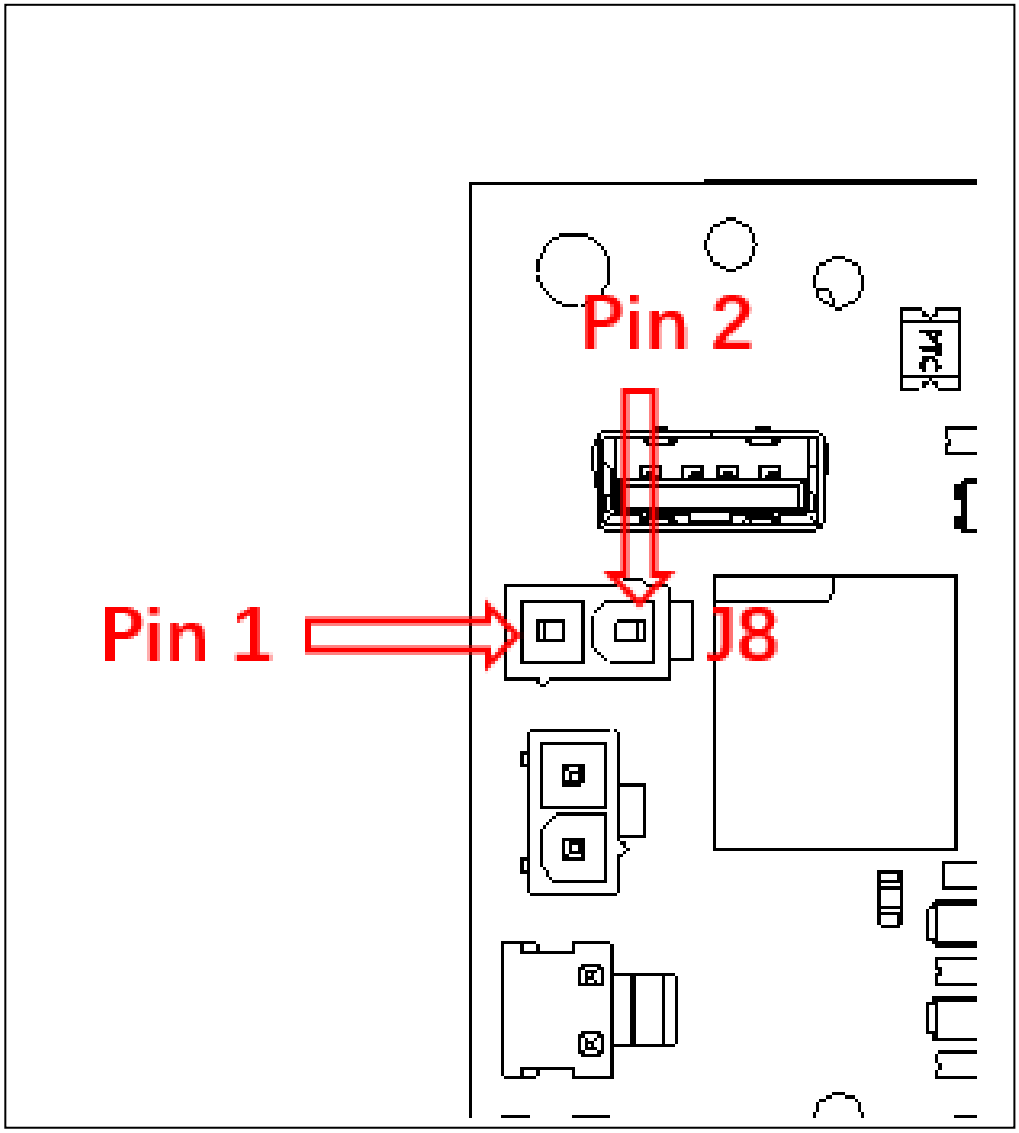


Figure 43

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Black	USB charger Power supply-	0V	1.5A	
2	Red	USB charger Power supply+	26.14V	1.5A	

H1-3 ways

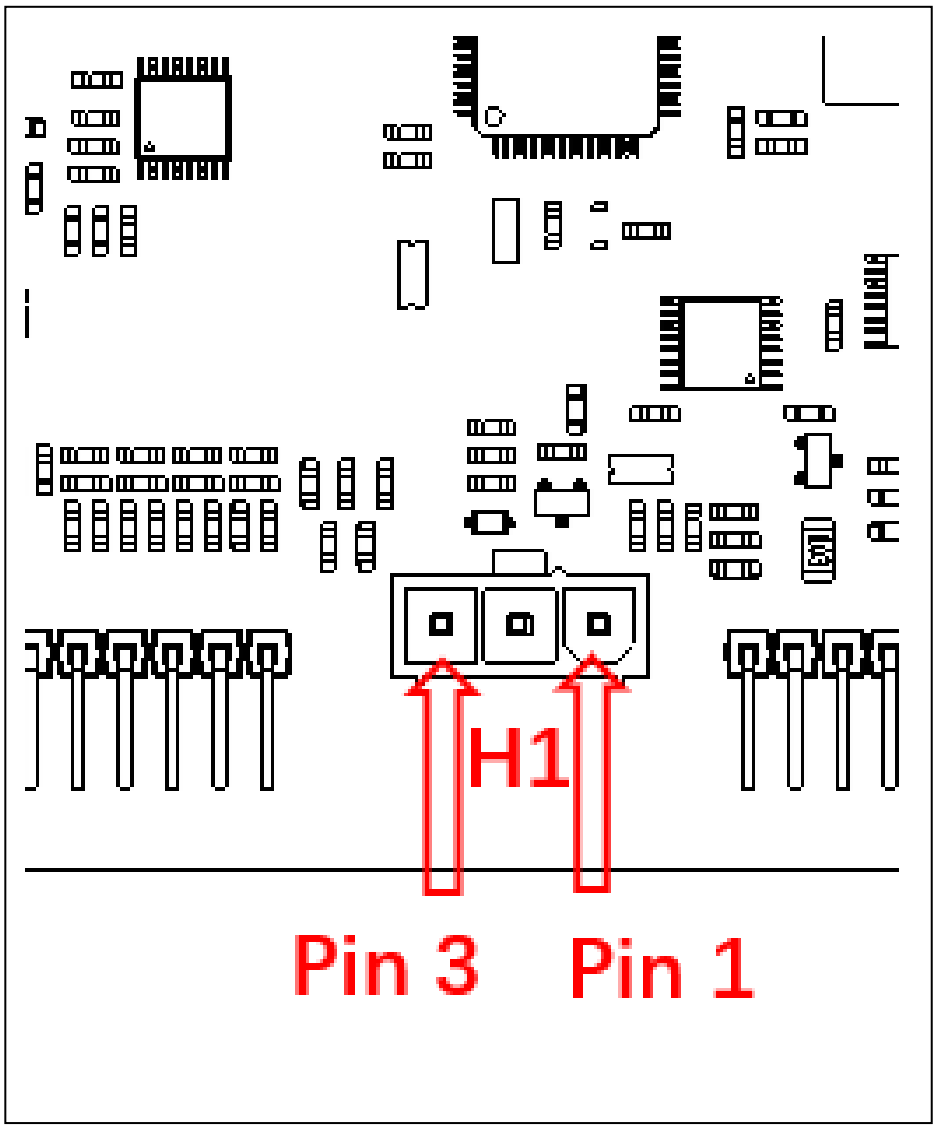


Figure 44

Pin	Color	Circuit Description	Measured	I Max	Comments
1	Brown	Charge_in	=0.365V discharge =25.8V charge	0.01A	
2	Blue	B+	26.12V	0.01A	
3	Yellow	Lead-acid battery communication	N/A	0.35A	

P1-15 ways

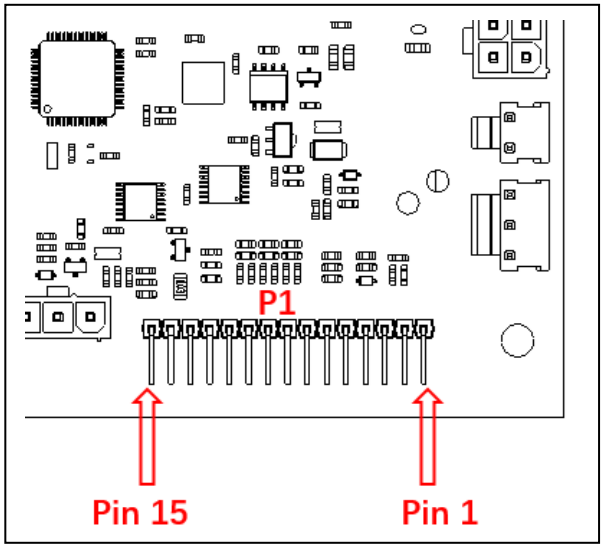


Figure 45

Pin	Color	Circuit Description	Measured	I Max	Comments
1	N/A	GND	0V	0.35A	
2	N/A	Power switch	=25.26V machine off =3.08V machine on	0.0015A	
3	N/A	Filter shaker motor function switch	=5.10V pressed =0V released	0.0015A	
4	N/A	Side broom motors function switch	=5.10V pressed =0V released	0.0015A	
5	N/A	Water pump function switch	=5.10V pressed =0V released	0.0015A	
6	N/A	Suction motor function switch	=5.10V pressed =0V released	0.0015A	
7	N/A	Start switch	=5.10V pressed =0V released	0.0015A	
8	N/A	Filter shaker motor function switch indicator power supply -	=1.27V on =3.29V off	0.0015A	
9	N/A	Side broom motors function switch indicator power supply -	=1.27V on =3.29V off	0.0015A	
10	N/A	Water pump function switch indicator power supply -	=1.27V on =3.29V off	0.0015A	
11	N/A	Suction motor function switch indicator power supply -	=1.26V on =3.29V off	0.0015A	
12	N/A	Start switch indicator	=1.25V on =3.29V off	0.0015A	
13	N/A	VCC2 for switch indicators	3.30V	0.35A	
14	N/A	Start switch back indicator	=0.57V on =2.85V off	0.1A	
15	N/A	VCC3	5.10V	0.35A	

P2-14 ways

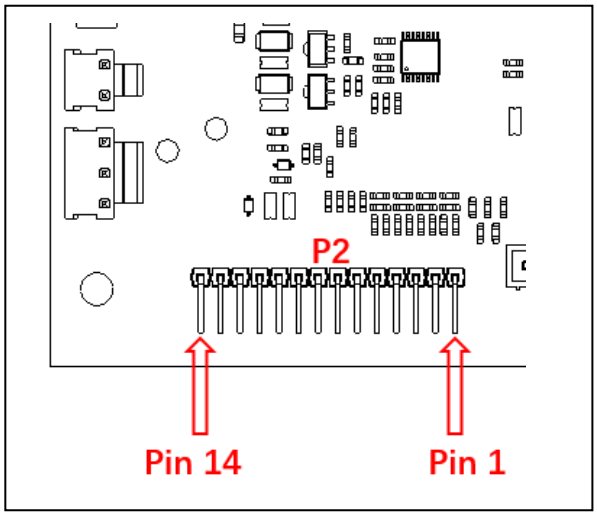


Figure 46

Pin	Color	Circuit Description	Measured	I Max	Comments
1	N/A	Number "4" switch	=5.10V pressed =0V released	0.001A	
2	N/A	Number "3" switch	=5.10V pressed =0V released	0.001A	
3	N/A	Number "2" switch	=5.10V pressed =0V released	0.001A	
4	N/A	Number "1" switch	=5.10V pressed =0V released	0.001A	
5	N/A	Right-turn switch	=5.10V pressed =0V released	0.001A	
6	N/A	Left-turn switch	=5.10V pressed =0V released	0.001A	
7	N/A	Reverse switch	=5.10V pressed =0V released	0.001A	
8	N/A	Front & Blue light function switch	=5.10V pressed =0V released	0.001A	
9	N/A	Horn switch	=5.10V pressed =0V released	0.001A	
10	N/A	VCC1	5.11V	0.35A	
11	N/A	Right-turn switch indicator	=1.34V on =3.29V off	0.0015A	
12	N/A	Left-turn switch indicator	=1.34V on =3.29V off	0.0015A	
13	N/A	Reverse switch indicator	=1.32V on =3.29V off	0.0015A	
14	N/A	Front & Blue light function switch indicator	=1.33V on =3.29V off	0.0015A	

USB Charger

The USB Charger is use for charging the mobile phone when the machine is turned on. There are two USB ports. Type A and Type C. The output voltage and current as shown in below table.

USB Port	Charging protocol	Output
Type A	DCP/QC2.0/QC3.0/FCP/AFC	5V/3A,9V/2.0A, 12V/1.5A max.
Type C	DCP/QC2.0/QC3.0/FCP/AFC/PD3.0/PPS	5V/3A,9V/2.2A, 12V/1.6A, PPS 3.3-11V/2A max.

10 Chassis System

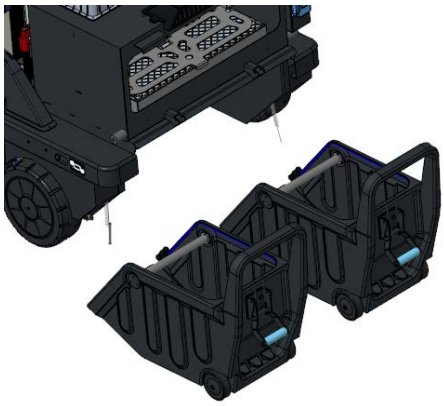
Functional Description

The chassis is a welded steel framework that provides the backbone structure on which the rest of the machine components are mounted.

The chassis itself doesn't require any specific maintenance but is discussed here simply to describe mounting dependencies.

Due to the concentrated weight, the battery tray mounts directly to the chassis, for stability and support.

The hopper is mounted at the end of the chassis.



The vibration motor is mounted behind the chassis.

The main broom is mounted at the bottom of the chassis and side brooms are installed in the front of it.

14 Wheel System

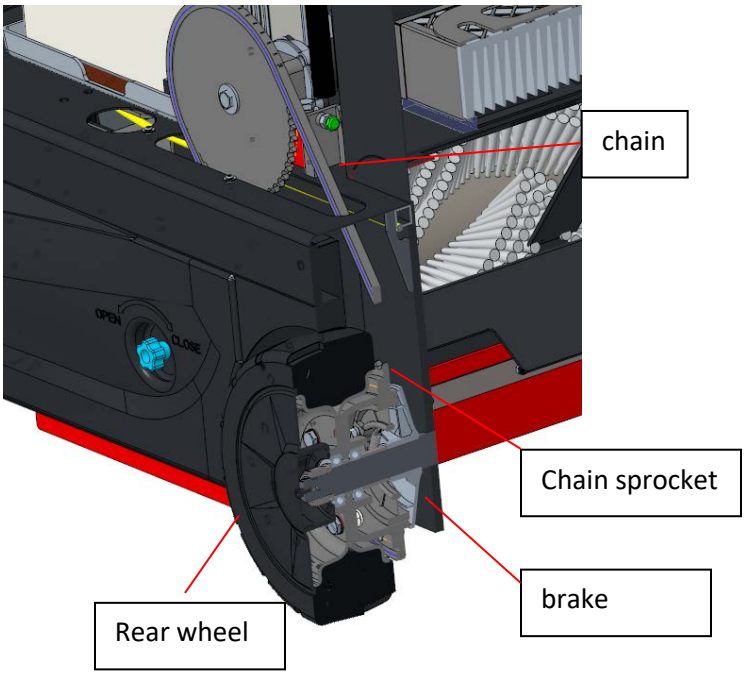
Functional Description

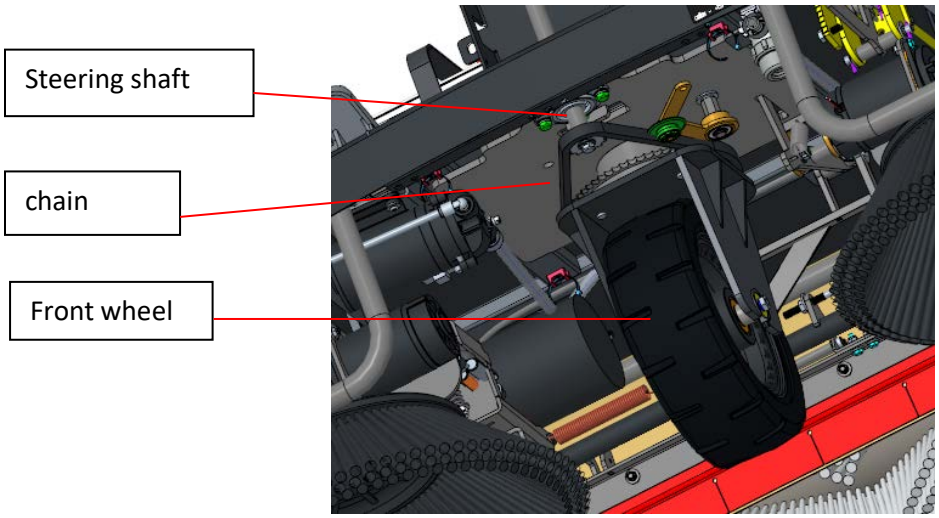
The machine is propelled by the rear drive wheel, which is chain-driven from the drive motor, which were assembled two chain sprockets on the two side.

Drive wheels (rear wheels) is supported in the back of chassis with sealed bearings and breaks. They were connected by bolts and nuts.

Front wheel is supported in the front of chassis with a support plate and sealed bearings. It was connected to steering shaft by chain, bolts, and nuts.

Brake was assembled in wheel shaft of chassis, and it was connected on the rear wheel.



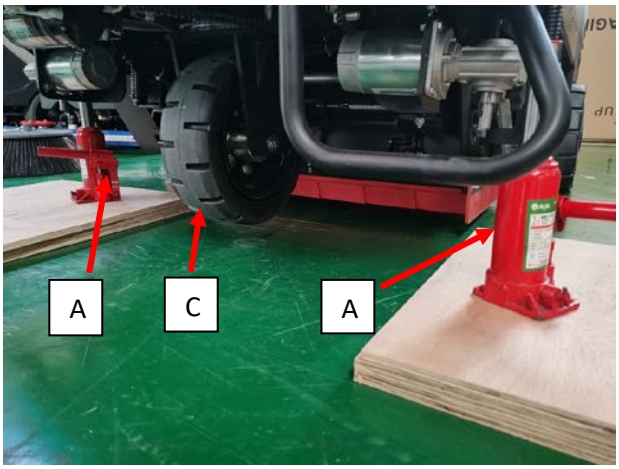


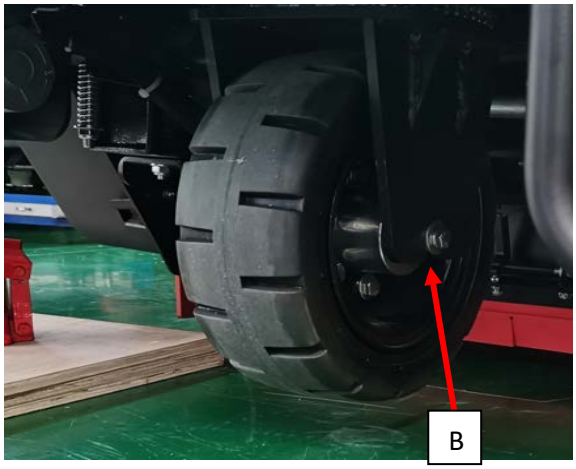
Removal and Installation
Front Wheel
Removal

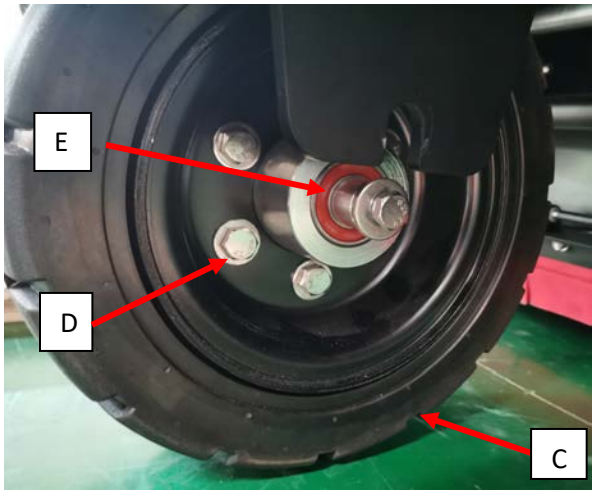
1. Park machine on level ground.
2. Turn off machine.
3. Lift front wheel (C) about 2cm off ground to enable wheel to turn freely.
4. Use supporting tool jack (A) to support machine.
5. Loosen the screw (B) with a wrench and the front wheel falls off naturally to the ground
6. Use a wrench to loosen 6 screws (D).
7. Take off front wheels (C).
8. Unscrew the screw (B), the bearings were taken off, when the bearings were broken.

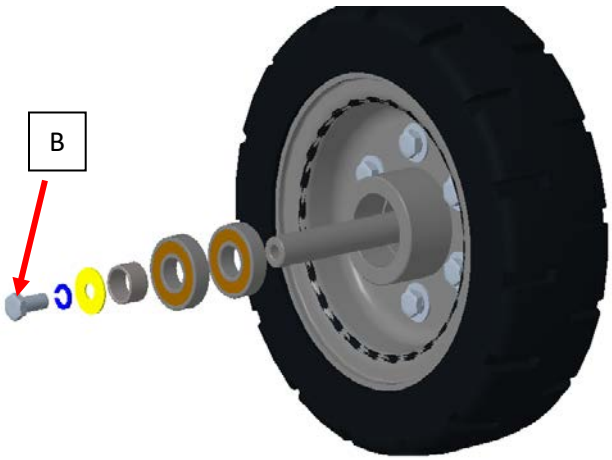
Installation

Assemble components in reverse order of disassembly. Please pay attention to installation position of bushing (E).









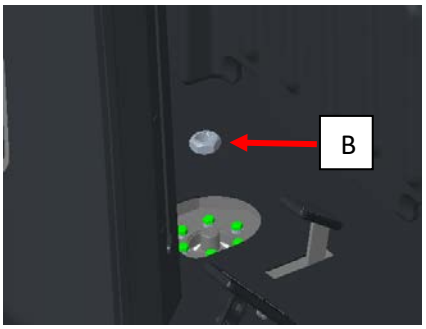
Front Wheel Component

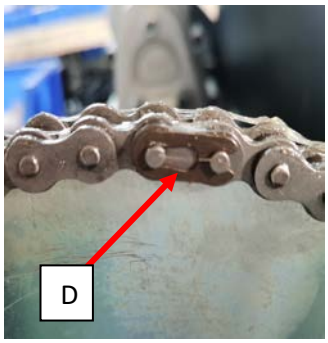
Removal

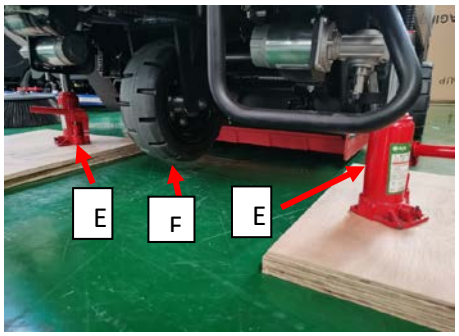
1. Park machine on level ground and switch off machine.
2. Take off the bolts and foot plate antiskid(A).
3. Loose the nut(B) and washer(C).
4. Unlock the master link clip and take off the chain(D).
5. Use supporting tool jack (E) to support machine.
6. Hit the top of axle(H) with a rubber hammer, until the front wheel component(F) falls off.
7. We can change the angular contact ball bearing (For short ACBB),
8. Notice: There are two different sides on the ACBB. You must assemble them as shown.
   (View M: show D1 and d1, View N: show D2 and d2, D1<D2, d1>d2)

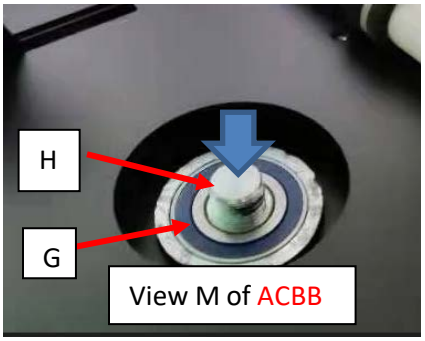
Installation

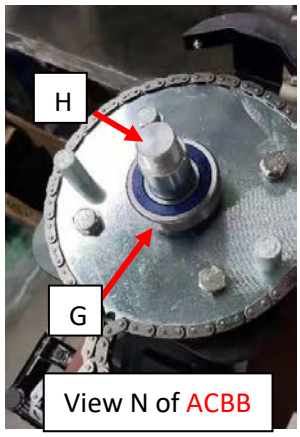
Assemble components in reverse order of disassembly. Please pay attention to installation position of bushing (E).

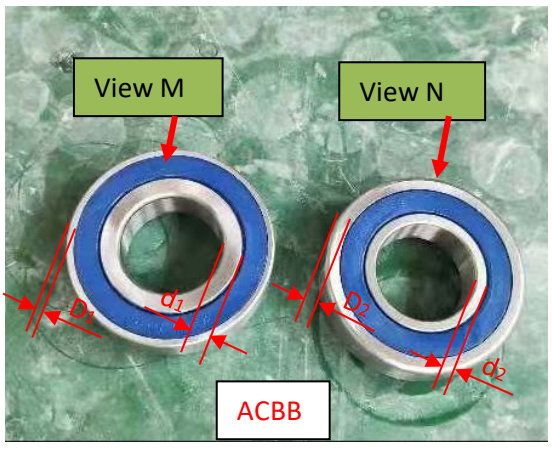


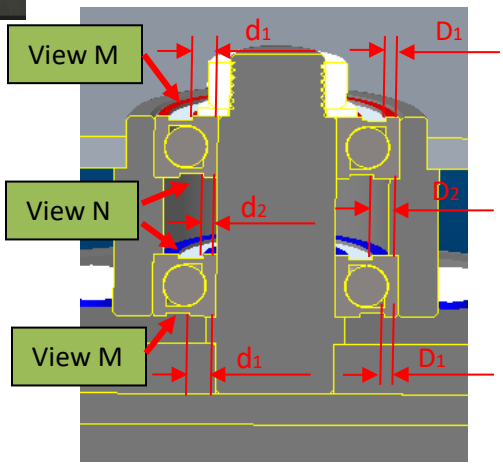












Rear Wheels

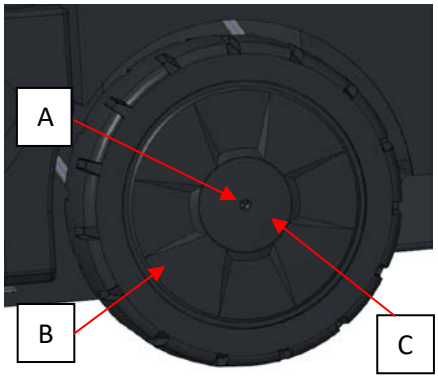
Removal

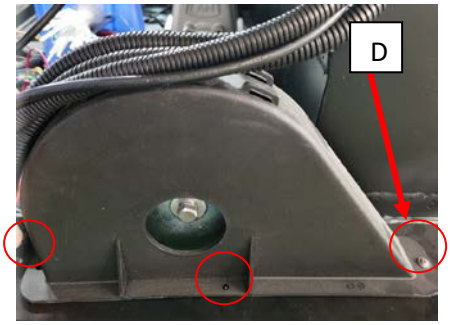
1. Park machine on level ground.
2. Switch off machine.
3. Lift rear wheel about 1cm off ground to enable it to turn freely.
4. Use supporting tool jack (F) or adequate blocking to support machine.
5. Unscrew the screw (A) and then remove rear wheel cover (B and C).
6. Unscrew the screw (D) and take off the cover.
7. Unlock the master link clip (E), to take off the chain.
8. Remove nut (H), and then remove plain washer (J) and spring washer (I). the bearings were taken off when the bearings were broken.
9. Take off rear wheel with the drum with sprocket (K).
10. Remove the six screws (M) and then take off the wheel.
11. Remove the six nuts (N), and then take off the sprocket (K).

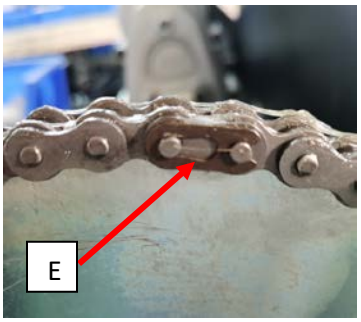
NOTE: Do Not press brake pedal during removal and installation.

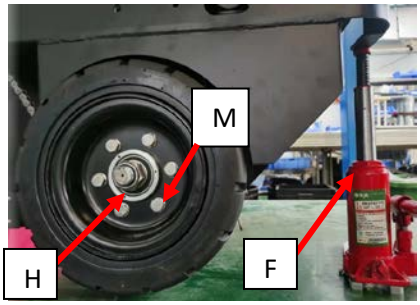
Installation

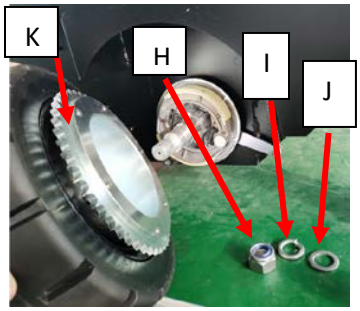
Assemble components in reverse order of disassembly.

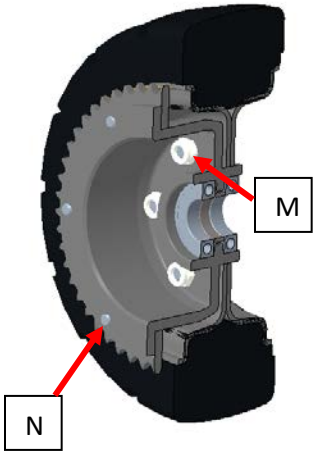












20 Drive system

Functional Description

Machine movement is provided by the drive motor (M8), When the motor starts, it drives two rear wheels connected by the chain, which makes the machine move.

There is a seat signal switch (SW3) on Main Machine Controller (EB1), which will be sent to Drive Controller (EB2) via CAN bus, when it's activated and accelerator pedal is pressed, the machine can move. The voltage of seat signal switch is 0 V when it's inactivated, its voltage changes to 11.4 V when it's activated.

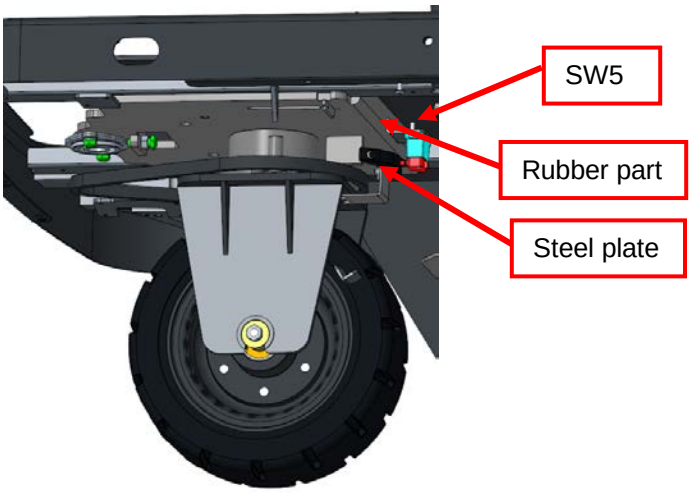
When the reverse button on Membrane (EB5) is pressed, UI controller (EB3) will send the reverse command via CAN bus to Drive Controller (EB2), then Drive Controller (EB2) will reverse the output voltage to drive motor terminals so that the machine can reverse, when the reverse button is released, drive motor will move straightly.

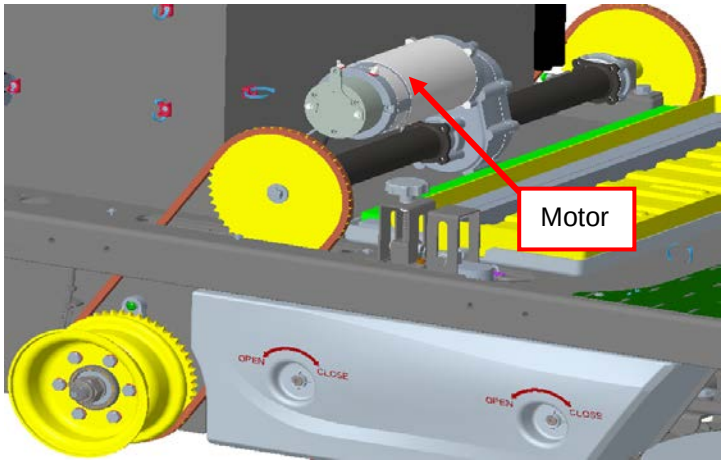
Machine speed can be adjusted with the accelerator pedal and machine speed dial (J5-2). The machine speed dial (J5-2) enables the operator to adjust the maximum speed of machine at its full throttle, when the machine speed dial (J5-2) is adjusted, UI controller (EB3) will send the new value to Drive Controller (EB2) via CAN Bus. The voltage range of the speed potentiometer is 0.43V ~ 4.61V, the lower the voltage of the potentiometer, the higher the speed.
The voltage range of the accelerator pedal is 0V ~ 5.37V, the dead band voltage range is 0V ~ 1.4V, when the voltage is above 1.4V, the machine starts to move, the heavier the accelerator pedal is pressed, the higher the voltage is.

Then Drive Controller (EB2) controls the electric brake (BK1) to enable the drive motor to run or stop.
If the brake signal switch (SW6) is activated, the machine will show PRAKING lighting, and the machine can't move.

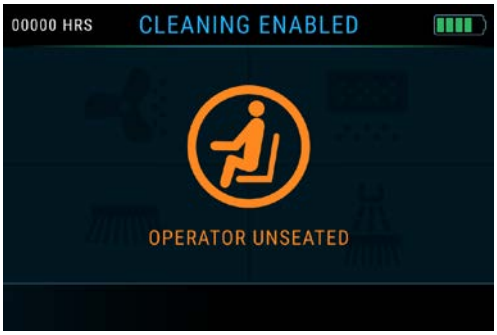
There is a temperture sensor in drive motor, it's connected to Drive controller (EB2), when the temperature is over 150℃, Drive controller (EB2) will shut down the output of drive motor, it will recover to work after the drive motor cools down. If the current of the drive motor is higher than 160A for 20 seconds, the drive controller will reduce the current to 120A, if it continues to run at 120A, the motor will eventually stop due to overheating.

There is a turn signal switch (SW5) to detect the machine is turning or not, the machine slows down when turning.
The operating mechanism of the turn signal switch (SW5) is as follows, when the machine runs straight, the rubber part is always pressing the bar of SW5 to keep it contacting with rubber part, output to Drive Controller (EB2) is 13.3V. when the front wheel turning left or right angle is more than 16 degrees, the Rubber part disconnects with the bar of SW5, output changes to 0V.

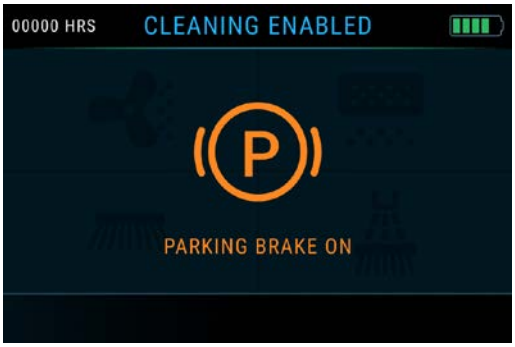




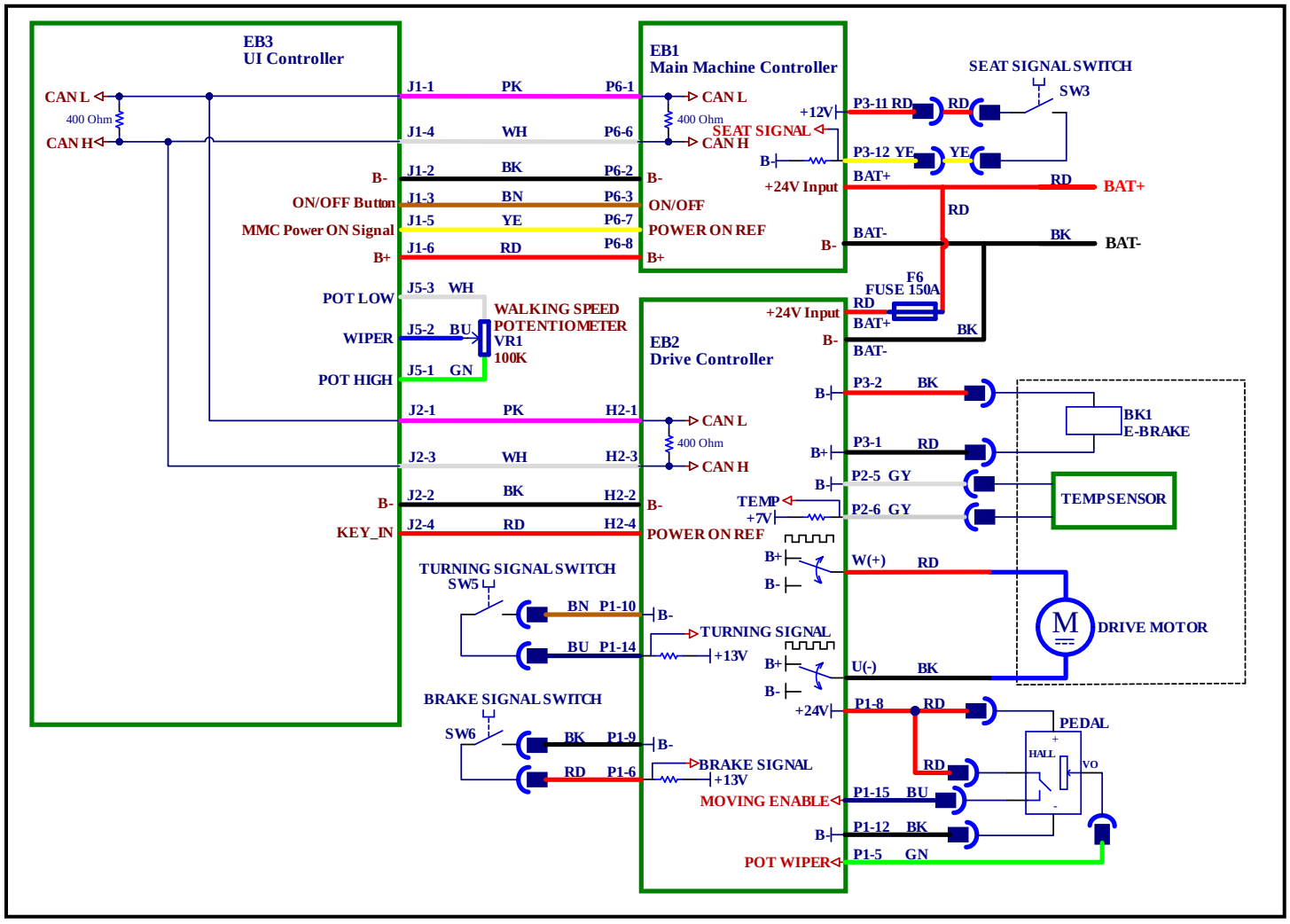
When seat signal switch (SW3) is not activated, LCD will display “OPERATOR UNSEATED”, and drive motor will be disabled.



When brake signal switch (SW6) is activated, LCD will display “PARKING BRAKE ON”, and drive motor will be disabled.



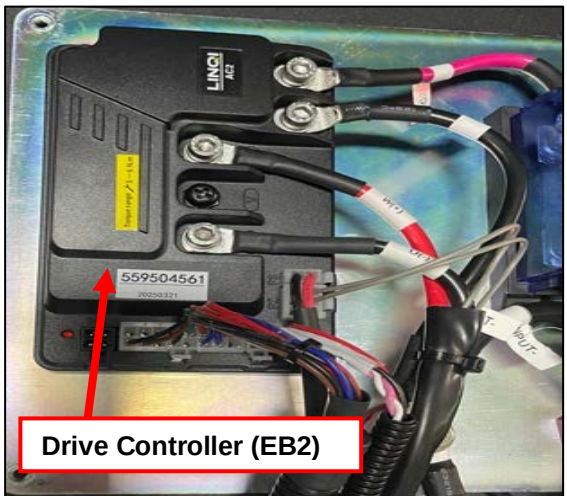
Wiring Diagram



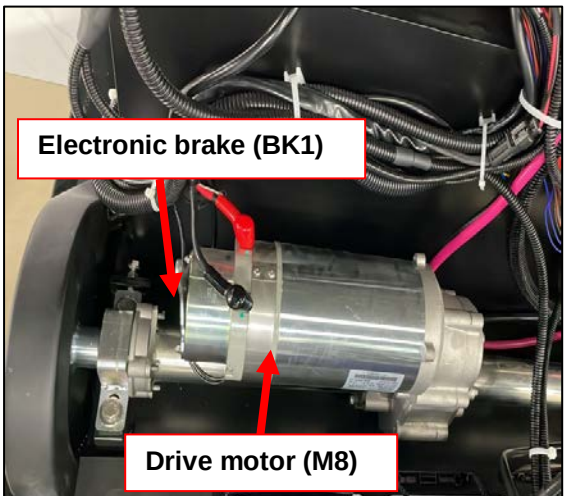
Component Locations

- Drive controller (EB2)
- Drive motor (M8)
- Electronic brake (BK1)
- Seat signal switch (SW3)
- Turn signal switch (SW5)
- Brake signal switch (SW6)
- Accelerator pedal
- Machine speed dial

Drive Controller (EB2)

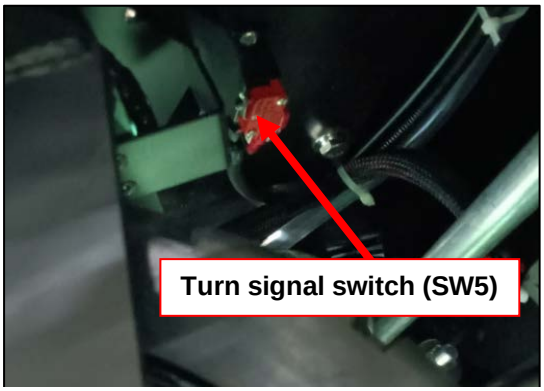


Drive motor (M8) & Electronic brake (BK1)



Seat signal switch (SW3)

Turn signal switch (SW5)



Brake signal switch (SW6)

Accelerator pedal

Machine speed dial

Troubleshooting

Trouble	Possible causes	Remedy
The machine can't move	Emergency stop button is pressed	Release the emergency stop button
	OPERATOR login, and enter MENU	Return to Home screen when accelerator pedal is pressed.
	Battery level is too low	Charge the battery.
	Drive motor overheat	Wait for the drive motor to cool down.
	Drive controller (EB2) overheat	Wait for the drive controller to cool down.
	MACHINE SPEED OF KNOB MIN is 0%, and speed knob is minimum	1. Check if the MACHINE SPEED OF KNOB MIN is 0%. 2. Adjust the machine speed dial.
	Drive motor wire harness fault	Check drive motor wire harness.
	Drive motor fault	1. Check drive motor amperage 2. check drive motor resistance 3. Replace drive motor
	Drive controller (EB2) fault	Replace the drive controller (EB2).
	CAN communication error between Drive controller (EB2) and UI controller (EB3)	1. Check the CAN connection between Drive controller (EB2) and UI controller (EB3) 2. EB2 didn't turn on because the battery voltage is below 15V.
	UI controller (EB3) fault	Replace UI controller (EB3)
	Electronic brake (BK1) fault	Check coil resistance/replace brake
	Mechanical brake is pressed, or mechanical brake sensor switch is stuck	Release mechanical brake or check mechanical brake sensor switch
	The accelerator pedal is pressed before logging in successfully.	Release the accelerator pedal.

	Accelerator pedal fault	Replace accelerator pedal
The machine moves slowly	Machine speed dial can't work normally.	1. Check if the machine speed dial is low. 2. Replace the machine speed dial.
	The speed-related parameters are not set properly.	Check the below parameter in SETTINGS. 1. MAX SPEED – FORWARD 2. MAX SPEED – REVERSE 3. SWEEP SPEED
	Turn signal switch (SW5) can't work normally.	1. Check the connection of turn signal switch (SW5). 2. The output of SW5 is 13.3V when the machine is not turning, If the output voltage is wrong, replace SW5.
	Accelerator pedal can't work normally.	1. Check the connection of accelerator pedal. 2. Check if the maximum output voltage of accelerator pedal is about 5V, if not, replace accelerator pedal.
	Drive motor fault	1. Check drive motor amperage 2. check drive motor resistance 3. Replace drive motor
	Drive motor temperature sensor is open	Check the drive motor temperature sensor wire connection.

Drive Motor Amperage Check

Warning! This procedure must be performed by qualified personnel only.

1. Park machine on flat ground.
2. Lift drive motor about 2cm off ground so that it can turn freely.

Warning! Pay attention to the rotation of driving wheel when performing following steps.

1. Apply amp clamp (A, Figure 47) to positive wire of drive motor wiring harness (B, Figure 47).
2. Turn on machine and activate forward drive at its maximum speed via accelerator pedal. Check whether the current is between 8A and 22A when voltage is at 24V.
3. Release accelerator pedal.
4. If the amperage is higher than 22A, perform following procedures to determine cause and correct abnormal amperage.
   - Check if the electronic brake (BK1) can release properly.
   - Disassemble the motor and check the condition of all components and wiring, repair or replace them if necessary.
5. If the above procedures can't get amperage correct, it is necessary to replace the drive motor.

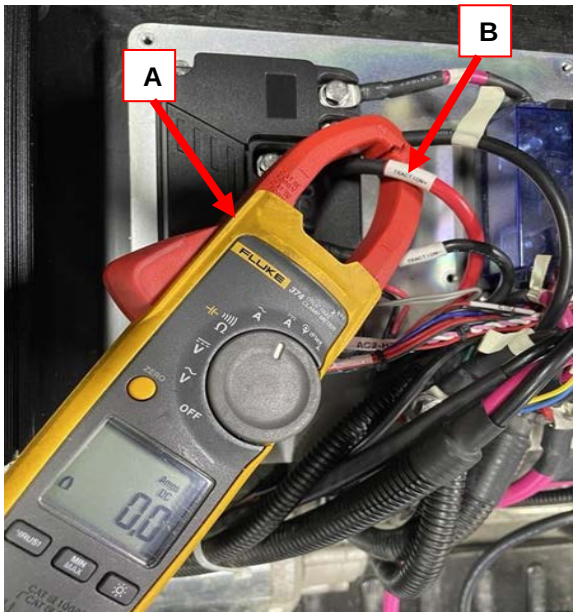
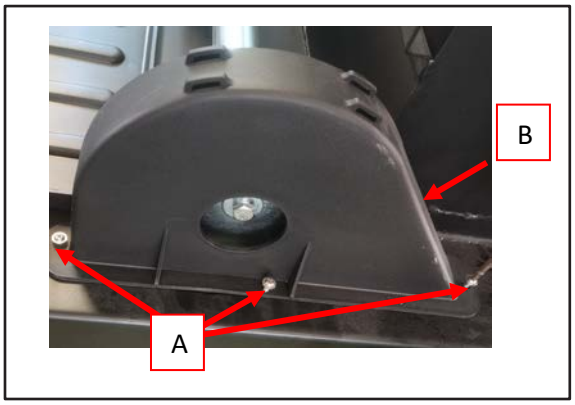


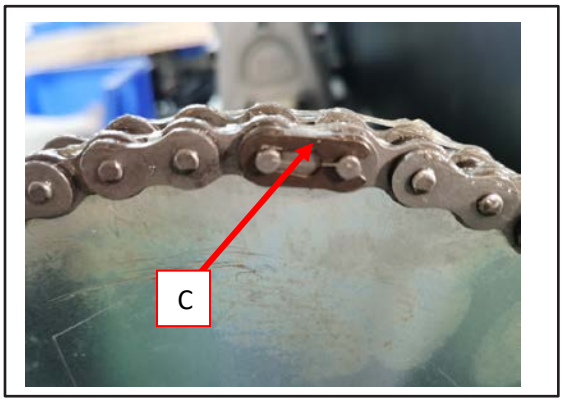
Figure 47

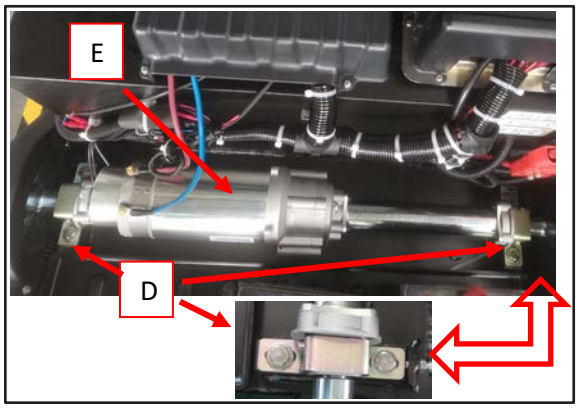
Removal and Installation
Drive Motor (M8)

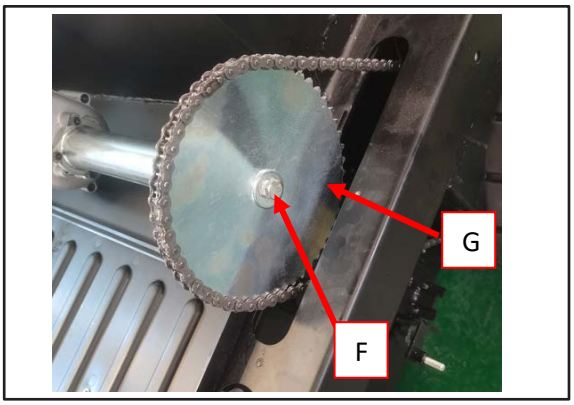
Removal

1. Open the cover.
2. Unscrew the three screws (A) and then take off the cover(B)
3. Remove the master link clip (C) and the master link from both chains. Then remove the chains.
4. Unscrew the four screws (D).
5. Unscrew the two screws (F) of each end.
6. Remove both chain sprockets (G) .
7. Remove drive motor (E).





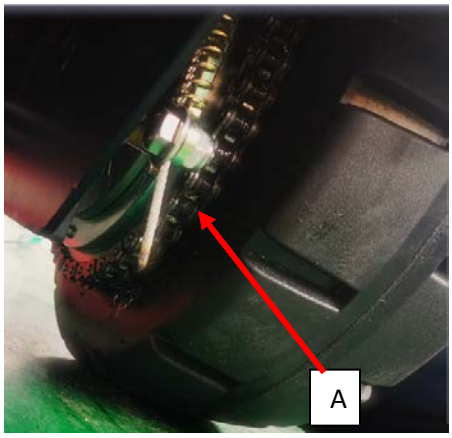


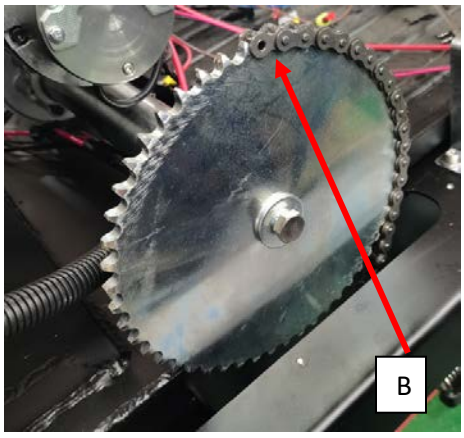


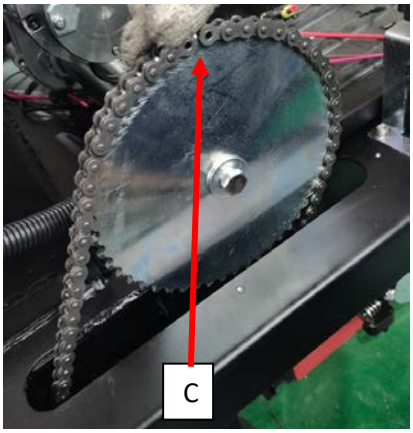
Installation

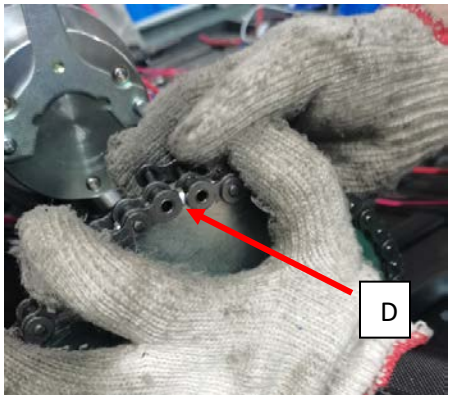
Assemble components in reverse order of disassembly. Follow the below steps to assemble chain:

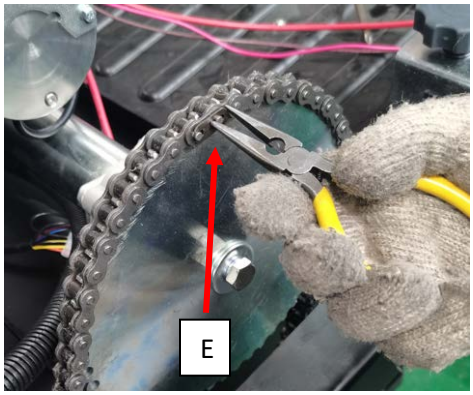
1. Let chain was installed on the chain sprocket of bottom as picture (A).
2. Put half of the chain on the top chain sprocket as picture（B）.
3. Hang the other half of the chain on top chain sprocket using the tension of the sprocket teeth as picture（C）.
4. Stick both ends of the chain by hand and insert the master link into the hole as picture (D).
5. Clamp the chain clamp into the master link clip with pliers and installed the chain (E).
6. To make the chain tension suited, adjust the screw as picture (F).

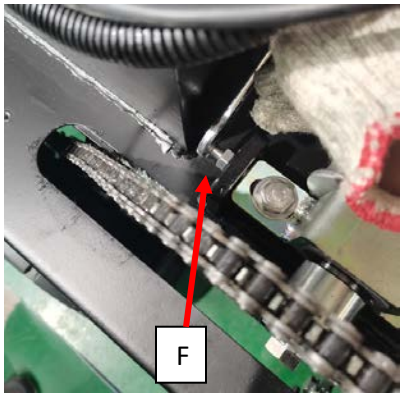












Specifications

Description	Unit	Value
Drive Motor Rated Input Power	W	936
Drive Motor Rated Input Voltage	V	24
Drive Motor Rated Input Current	A	39
Drive Motor Allowed Over Current (less than 1 minute)	A	150
Drive Motor Normal Current (drive motor lifted)	A	10-20
Drive Motor Rotor Winding Resistance at 25℃	Ω	<0.09
Electromagnetic Brake Coil Resistance at 25℃	Ω	50
Speed Limit Potentiometer Coil Resistance at 25℃	Ω	100K
Vehicle Forward Maximum Speed	Km/h	7.5

24 Electrical System

Functional Description

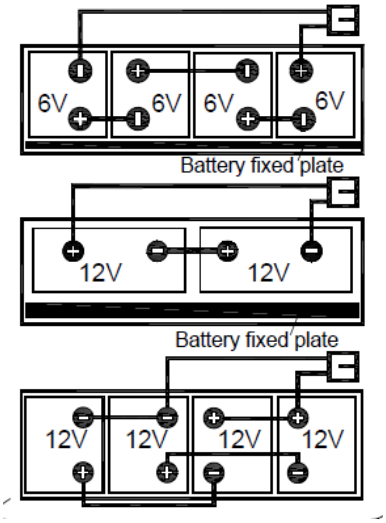
The electrical system mainly describes the power control and overload protection circuit of the machine, including power supply and power control components, switches, and fuses, etc.

Lead-acid battery and onboard charger are optional, Lithium ACE battery and onboard charger are installed in factory.

Lead-acid

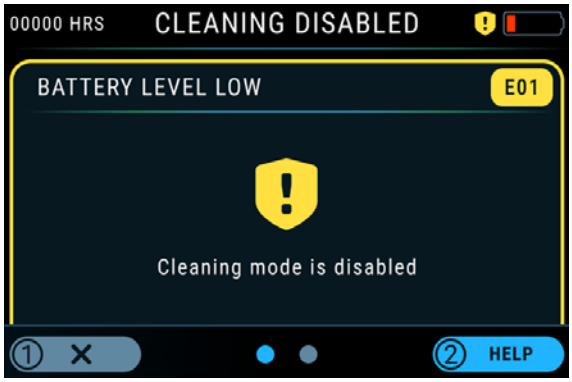
Battery

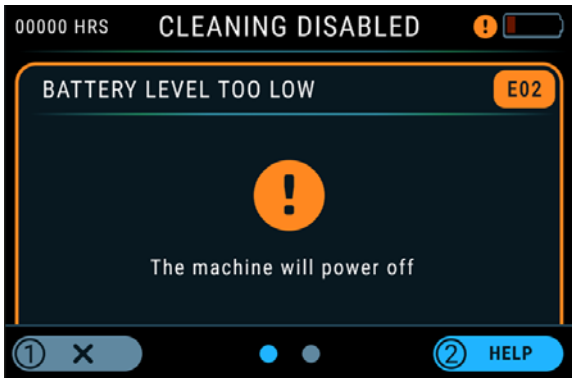
If lead-acid batteries are used, the power supply is made up of two 12-volt or four 6-volt batteries in series, and the TPPL (thin plate pure lead) battery is made up of four 12-volt batteries in series/parallel.



When battery voltage is low, LCD will pop up the notification ‘E01 Battery level is low’, cleaning mode is disabled, drive motor can still work, if the user press button ② for HELP, LCD will show the message prompts user to charge.

If the battery voltage is below the cutoff voltage, LCD will pop up the warning ‘E02 Battery level is too low ‘, then the machine will be stopped after about 15 seconds.





To prolong the battery lifespan, when the machine has ‘E01 Battery level is low’ or ‘E02 Battery level is too low’, those two messages won’t disappear until the batteries are charged with the onboard charger for at least two hours or the

battery voltage reaches 24.5V.

Different lead-acid battery types have different cut-off voltages, the values are as below. If the batteries used are changed, the BATTERY TYPE in SETTINGS must be changed accordingly.

Battery Type		Description	Cleaning disabled	Drive system off	Cut off output voltage
Lithium	ACE	Lithium ion	SOC<=8%	SOC=0%	20.0V
Lead-Acid	GEL-AGM/ GENERIC	Generic GEL or AGM batteries	<=21.6V	<=20.6V	N/A
	WET/EXIDE	EXIDE® brand WET batteries	<=20.4V	<=19.4V	N/A
	GEL/EXIDE	EXIDE®/Sonnenschein brand GEL batteries	<=21.6V	<=20.6V	N/A
	AGM/LEOCH	LEOCH® brand AGM batteries	<=21.6V	<=20.6V	N/A
	AGM/US BATTERY	US BATTERY® brand AGM batteries	<=21.6V	<=20.6V	N/A
	WET/US BATTERY	US BATTERY® brand WET batteries	<=20.4V	<=19.4V	N/A
	AGM/FULLRIVER	FULLRIVER® brand AGM batteries	<=21.6V	<=20.6V	N/A
	TPPL/ENERSYS	ENERSYS brand TPPL batteries	<=22.7V	<=21.8V	N/A

Onboard Charger for lead-acid batteries (Optional)

When AC input is connected to the charger, CHARGER_IN (H1-1) will be pulled to low, LCD will show the charging screen as Figure 48, and the UI Controller (EB3) will send the charging curve command to charger via COMM (H1-3), the charging curve corresponds to BATTERY TYPE in SETTINGS.

Status light shows slow pulse white when the battery is charging, it changes to green when fully charged, as Figure 49.

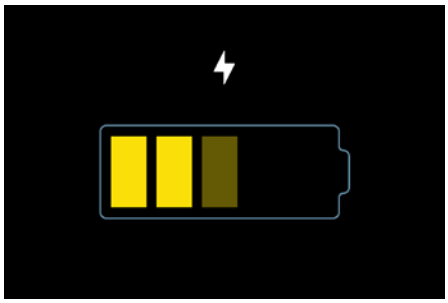


Figure 48

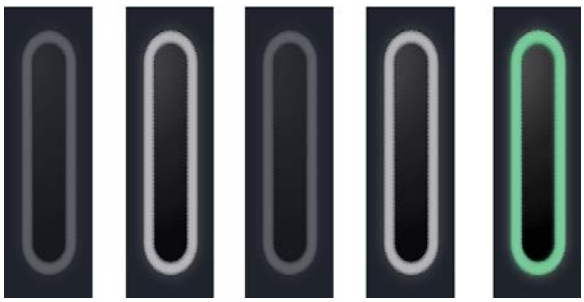


Figure 49

External Charger for lead-acid battery

When the external charger is inserted, the charger switch (SW4) will close, if the machine is on at this time, LCD will be off. If the user presses the Power button, LCD will show the the screen as Figure 50, then LCD is off automatically.

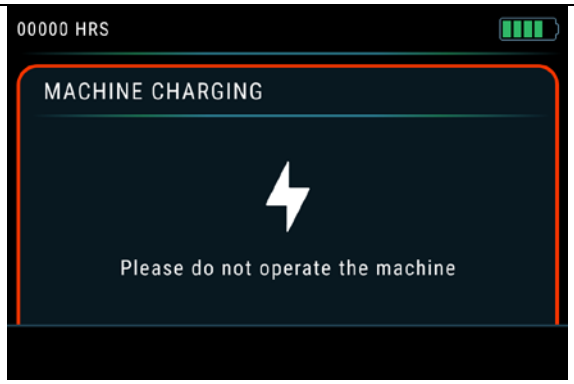


Figure 50

Lithium

If Lithium ACE batteries are used, the power supply is made up of 3 pieces of ACE batteries in parallel by default, the voltage of ACE battery is 25.6V.

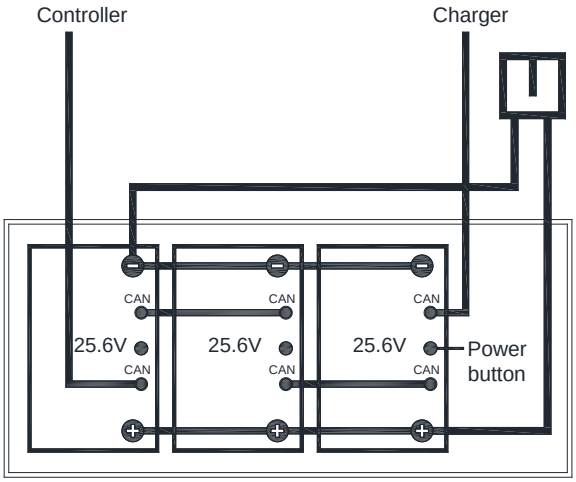


Figure 51

Onboard Charger for Lithium ACE batteries

When AC input is connected to the charger, CHARGER_IN (P7-2) will be pulled to low, LCD will show the charging screen as Figure 52, and the UI Controller (EB3) will send the charging curve command to charger via COMM (H1-3), the charging curve corresponds to BATTERY TYPE in SETTINGS.

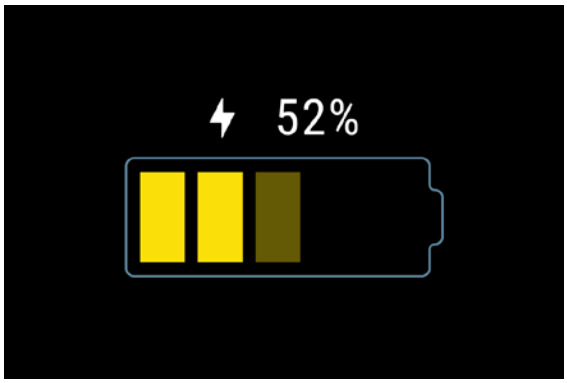


Figure 52

Fuses

F5 (150A) fuse is on the Main machine controller (EB1), it is used to protect the Main machine controller (EB1).
F6(150A) fuse in series between the battery and Drive Controller (EB2), as the Drive controller overcurrent protection.

Emergency stop

The emergency stop switch (SW1) connected to Main Machine Controller (EB1) and Drive Controller (EB2), when emergency stop switch is pressed, all functions will be disabled, reboot is required after the emergency stop switch is released.

Wiring Diagram

Lead-acid

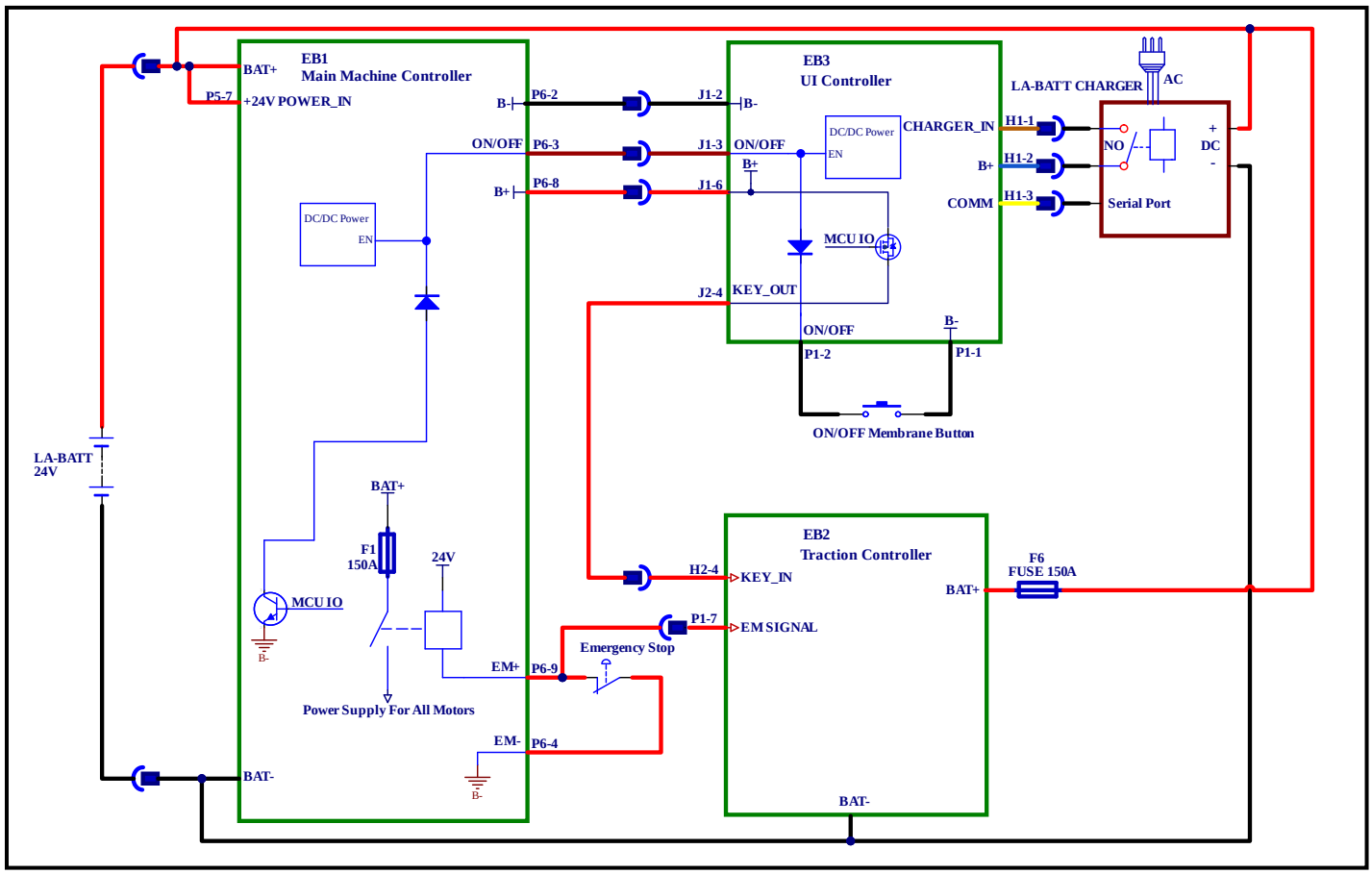


Figure 53

Lithium

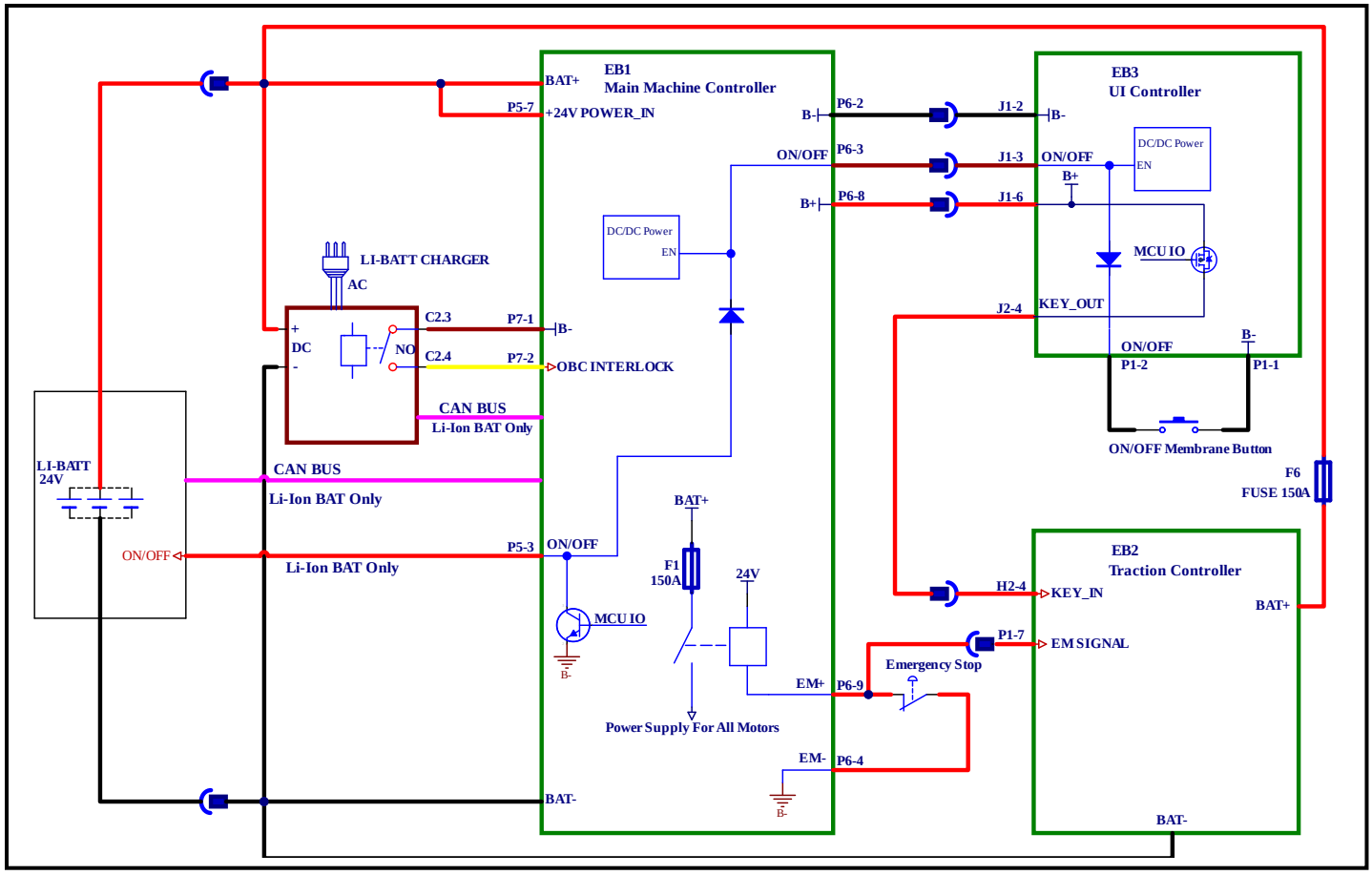
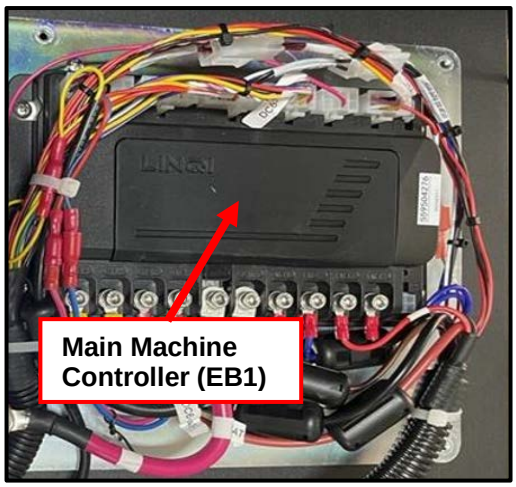


Figure 54

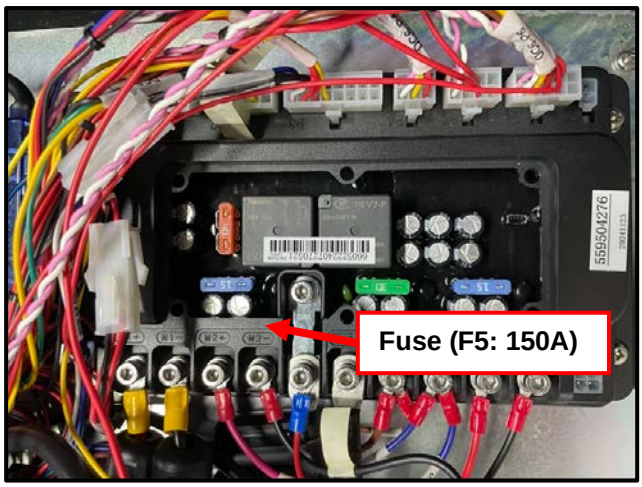
Component Locations

- Main Machine Controller (EB1)
- Main Machine Controller Fuse (F5: 150A)
- Drive Controller (EB2)
- Drive Controller Fuse (F6: 150A)
- UI Panel (EB3 & EB4 & EB5)
- Battery (BAT)
- Battery connector
- Emergency stop switch (SW1)
- USB charger
- External charger connector
- External Charger sensor switch (SW4)

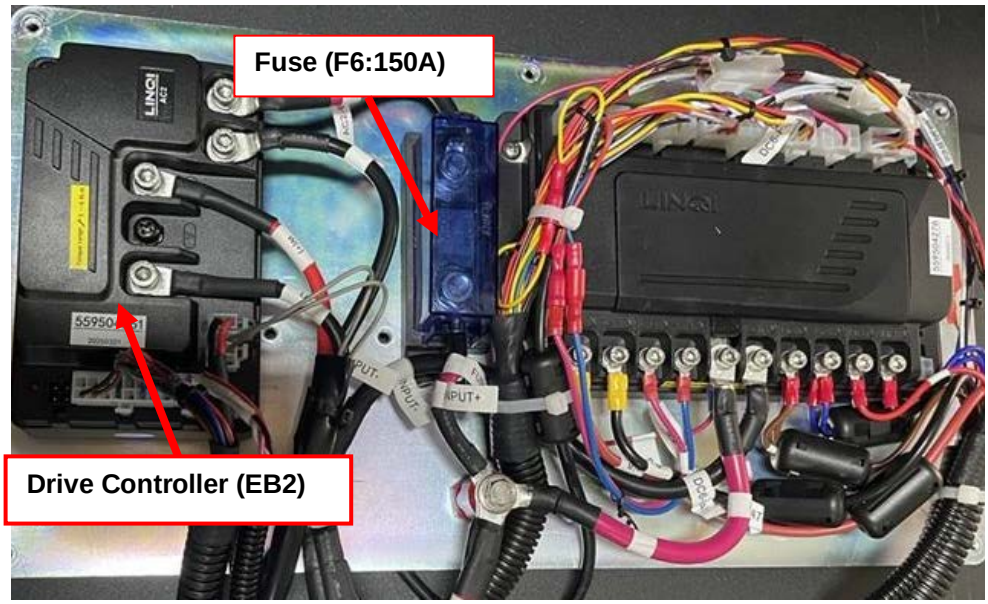
Main Machine Controller (EB1)



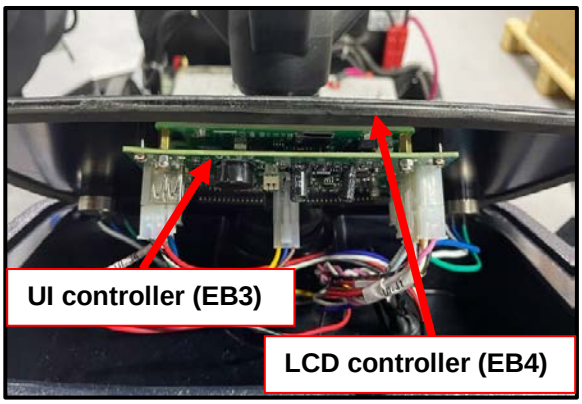
Main machine controller Fuse (F5: 150A)

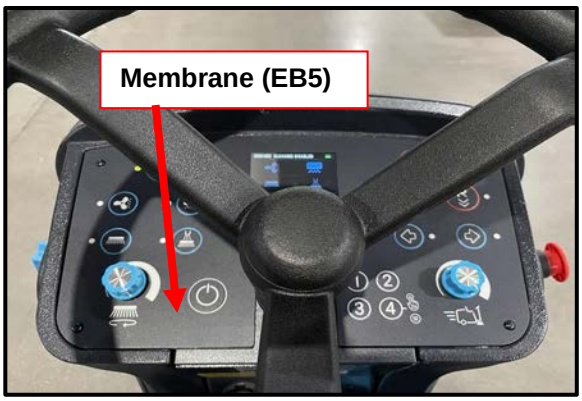


Drive Controller (EB2) & Drive Controller Fuse (F6: 150A)

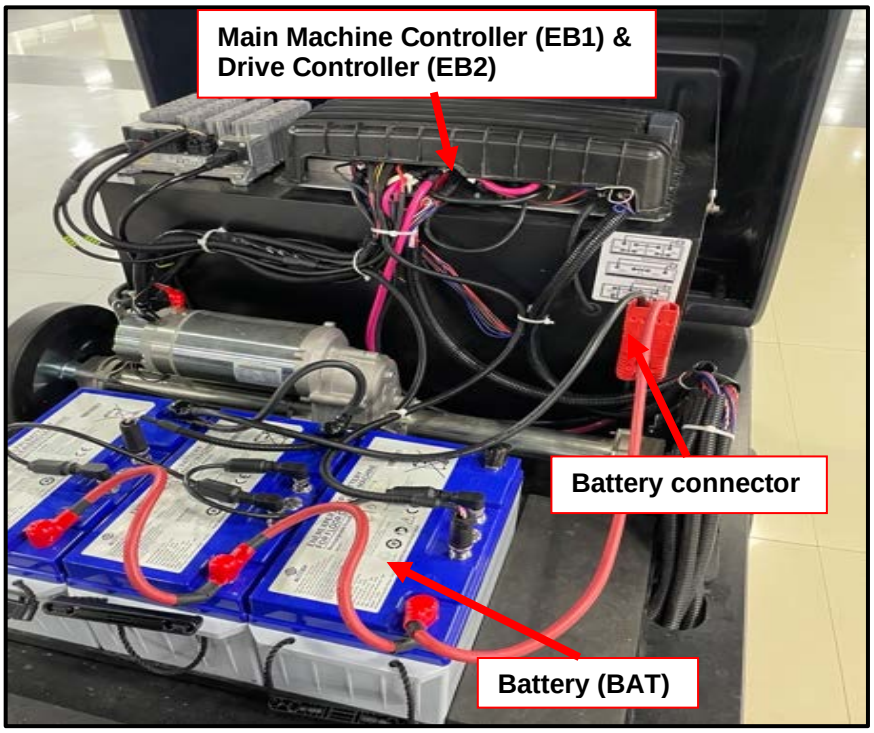


UI Panel (EB3 & EB4 & EB5)



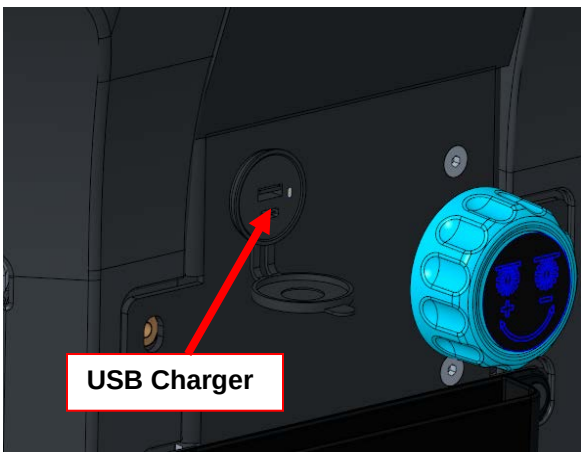


Battery (BAT) & Battery connector



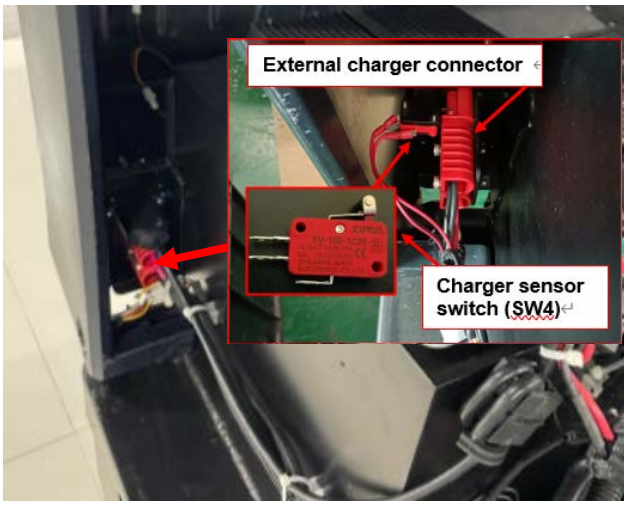
Emergency stop switch (SW1)

USB charger



External charger connector

Charger sensor switch (SW4)



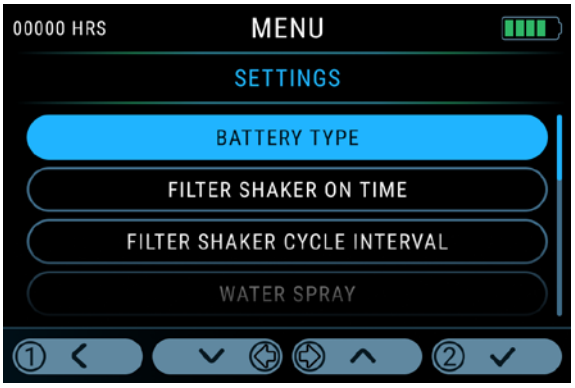
Maintenance and Adjustment

Setting Installed Battery Type

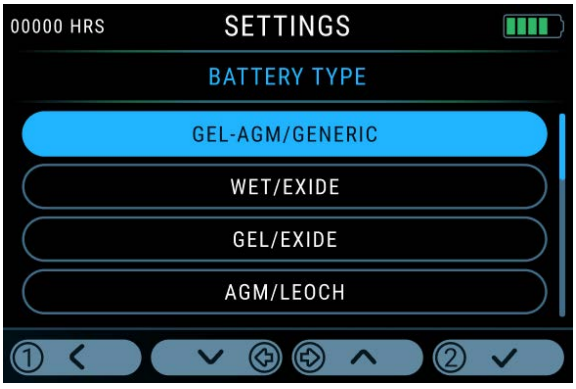
Battery type includes AGM/GEL/WET/TPPL/LITHIUM ACE, it can be set as below:

1. Power on the machine, login with the password 444444, press and hold button ④ for 2 seconds, move to MENU screen.

2. In the MENU interface, press button ① to go back to the previous menu, press indicator left button to scroll down, press indicator right button to scroll up, select "SETTINGS", then press button ② to confirm the selection and enter the SETTINGS interface.



3. In the SETTINGS interface, select BATTERY TYPE to enter the BATTERY TYPE settings interface.



4. Press indicator left button to scroll down, press indicator right button to scroll up, choose the battery type according to the batteries are installed, then press ② button to update the change.

Battery Type		Description	Cleaning disabled	Drive system off	Cut off output voltage
Lithium	ACE	Lithium ion	SOC<=8%	SOC=0%	20.0V
Lead-Acid	GEL-AGM/ GENERIC	Generic GEL or AGM batteries	<=21.6V	<=20.6V	N/A
	WET/EXIDE	EXIDE® brand WET batteries	<=20.4V	<=19.4V	N/A
	GEL/EXIDE	EXIDE®/Sonnenschein brand GEL batteries	<=21.6V	<=20.6V	N/A
	AGM/LEOCH	LEOCH® brand AGM batteries	<=21.6V	<=20.6V	N/A
	AGM/US BATTERY	US BATTERY® brand AGM batteries	<=21.6V	<=20.6V	N/A
	WET/US BATTERY	US BATTERY® brand WET batteries	<=20.4V	<=19.4V	N/A
	AGM/FULLRIVER	FULLRIVER® brand AGM batteries	<=21.6V	<=20.6V	N/A
	TPPL/ENERSYS	ENERSYS brand TPPL batteries	<=22.7V	<=21.8V	N/A

Lead-acid Battery Installation

1. Make sure that the machine power off and the parking brake is engaged.
2. open the machine cover (A, Figure 55) carefully.
3. The machine is equipped with battery cables suitable for installing 4 x 6V batteries. Carefully put the batteries into the compartment, then install the battery cable as Figure 56, tighten the nut on each battery terminal carefully.
4. Place the protection cap on each terminal, then connect the battery connector to the connector on the machine.
5. Turn back the cover carefully.

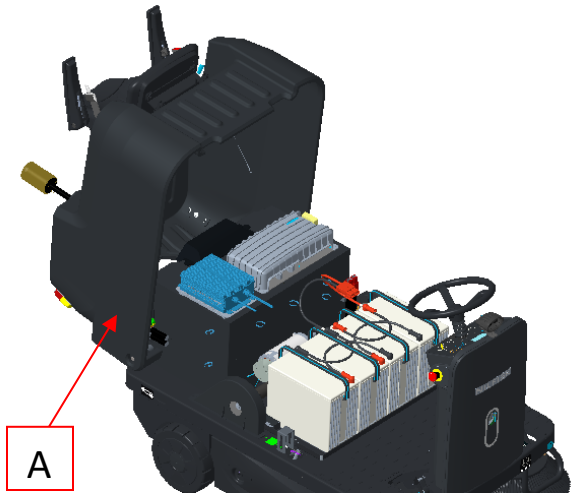


Figure 55

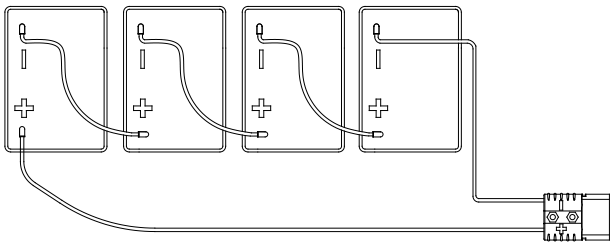
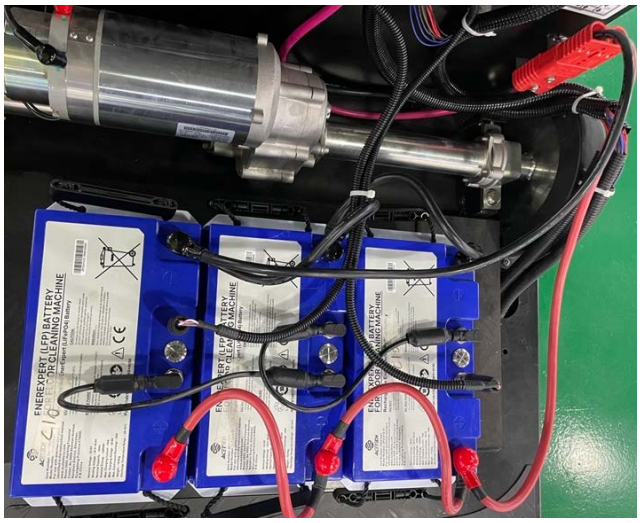


Figure 56

Lithium ACE Battery Installation

1. Make sure that the machine power off and the parking brake is engaged.
2. open the machine cover (A, Figure 55) carefully.
3. The machine is equipped with battery cables suitable for installing 3 or 4 pieces ACE batteries. Carefully put the batteries into the compartment, then install the battery cable as Figure 57, tighten the nut on each battery terminal carefully.
4. Place the protection cap on each terminal, then connect the battery connector to the connector on the machine.
5. Turn back the cover carefully.



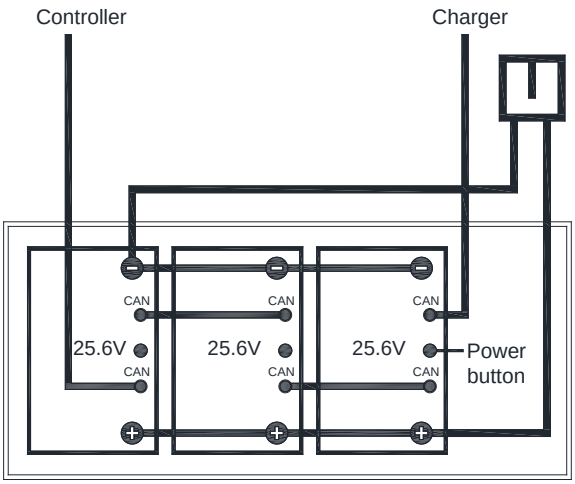


Figure 57

Troubleshooting

Trouble	Possible causes	Remedy
Machine can't power on	Power button is damaged	Replace the membrane
	Battery polarity is reversed.	Swap the battery polarity
	External Charger switch (SW4) is activated	Repair/replace
	USB Charger is short	Replace
	Battery level is too low, or battery is damaged.	Charge/replace the battery
	UI Controller (EB3) is damaged	Replace
Warning light doesn't work	Wiring loose	Check the wiring connection
	Waring light is shorted	Check the wiring connection
	Warning light is damaged	Replace
Headlight doesn't work	Wiring loose	Check the wiring connection
	Headlight overheat	Wait for the headlight to cool down
	Headlight is damaged	Replace
Indicate Left and right light doesn't work	Wiring loose	Check the wiring connection
	Indicate Left or right light is damaged	Replace
LCD is still on when charging with external charger	Wiring loose	Check the wiring connection
	External Charger sensor switch (SW4) is damaged	Replace

Removal and Installation

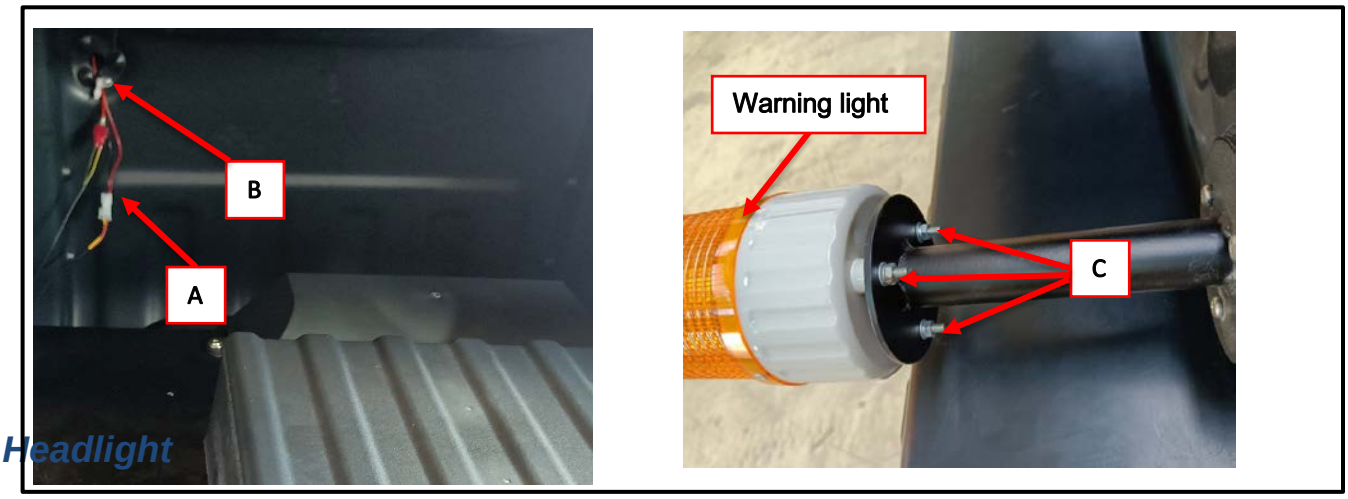
Warning Light

Removal

1. Remove connector (A), ribbon (B), 3 nuts (C).
2. Remove warning lamp assembly.

Installation

Assemble components in reverse order of disassembly.



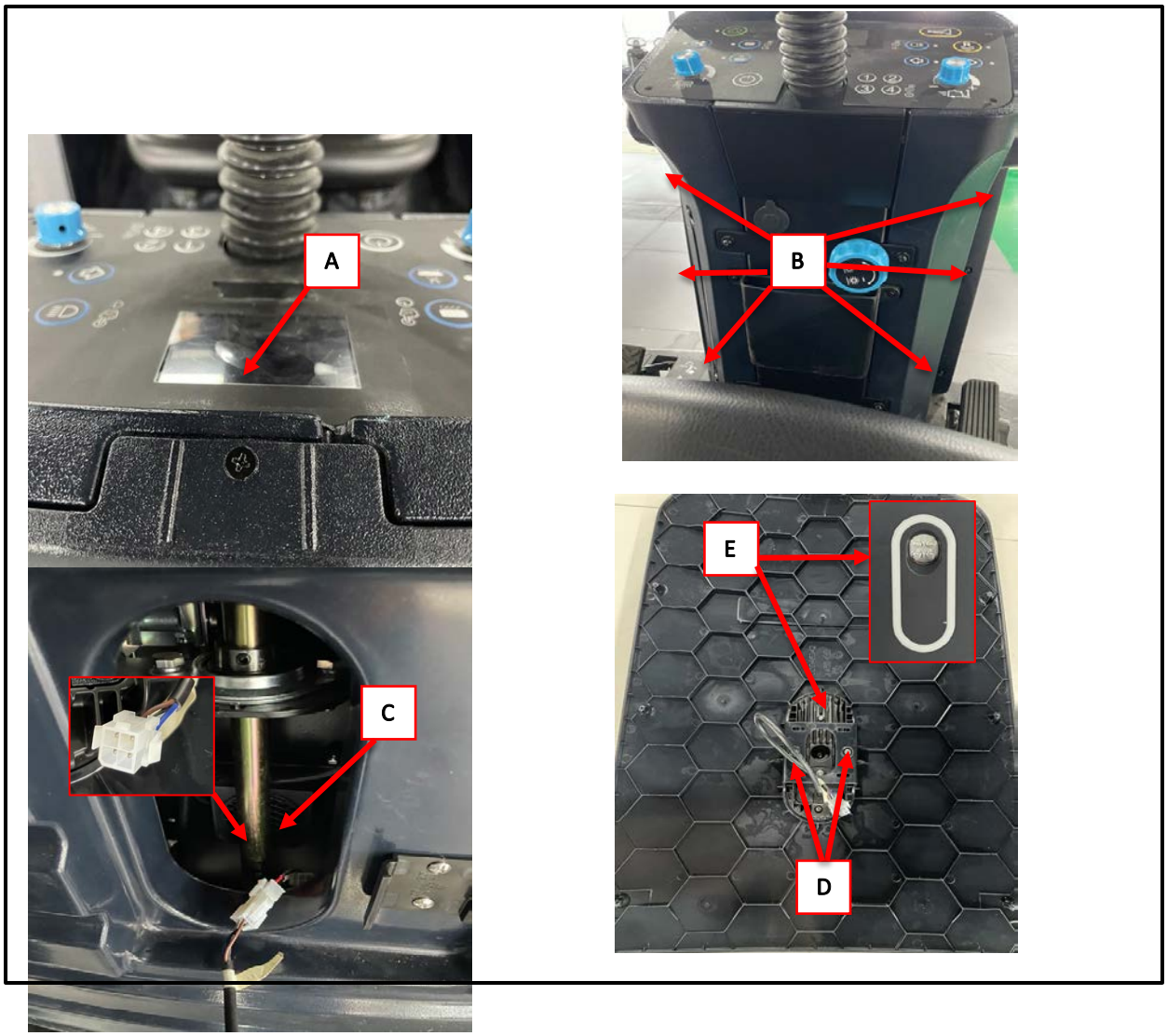
Headlight

Removal

1. Remove 1 screws (A).
2. Remove the 6 screws on solution tank (B).
3. Open the front cover and disconnect the headlight terminal (C).
4. Remove solution tank, Remove 2 screws (D).
5. Take out headlight (E).

Installation

Assemble components in reverse order of disassembly.



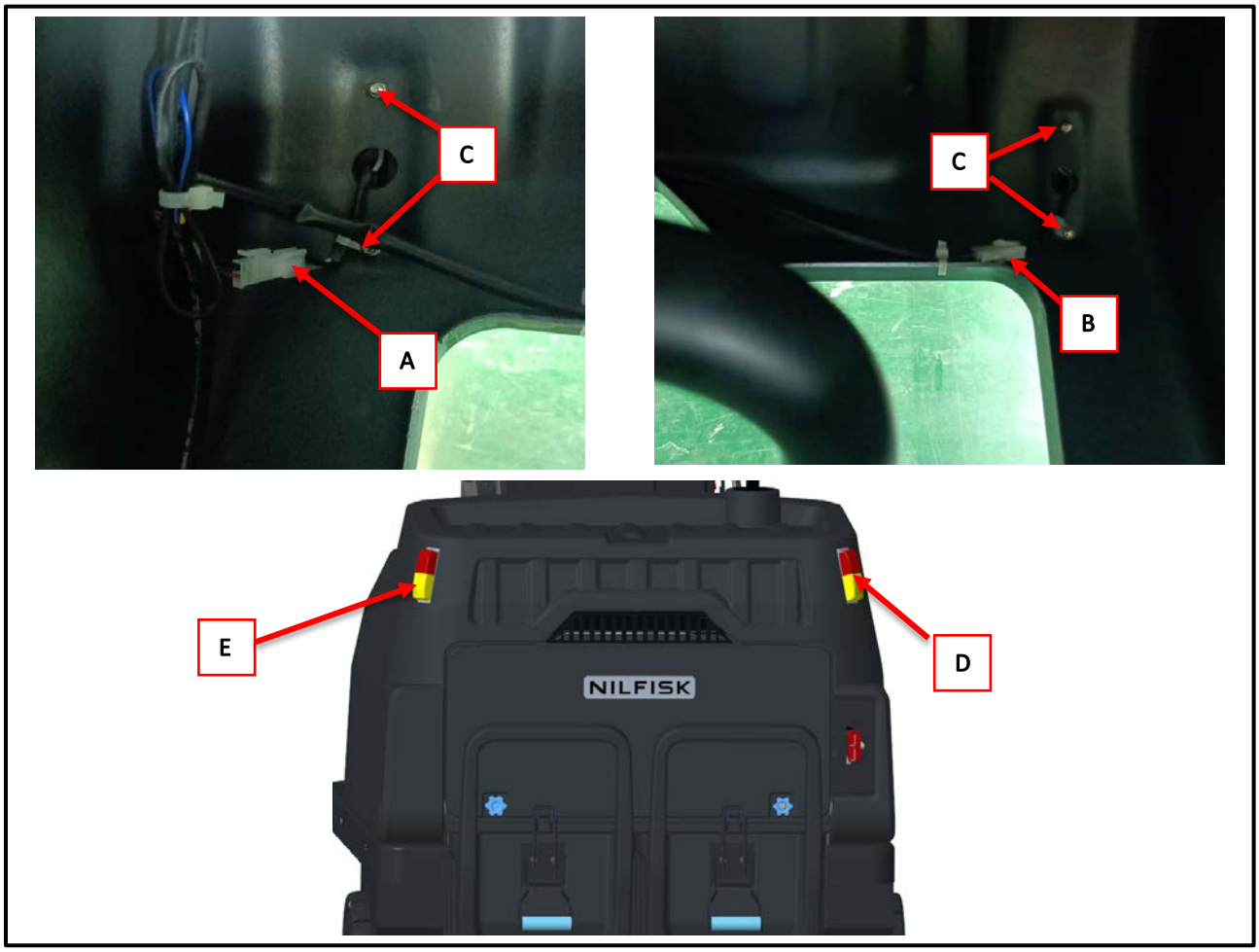
Left and Right Taillight

Removal

1. Remove connectors (A: Right or B:Left), screws (C).
2. Remove lamp assembly (D: Right or E:Left).

Installation

Assemble components in reverse order of disassembly.

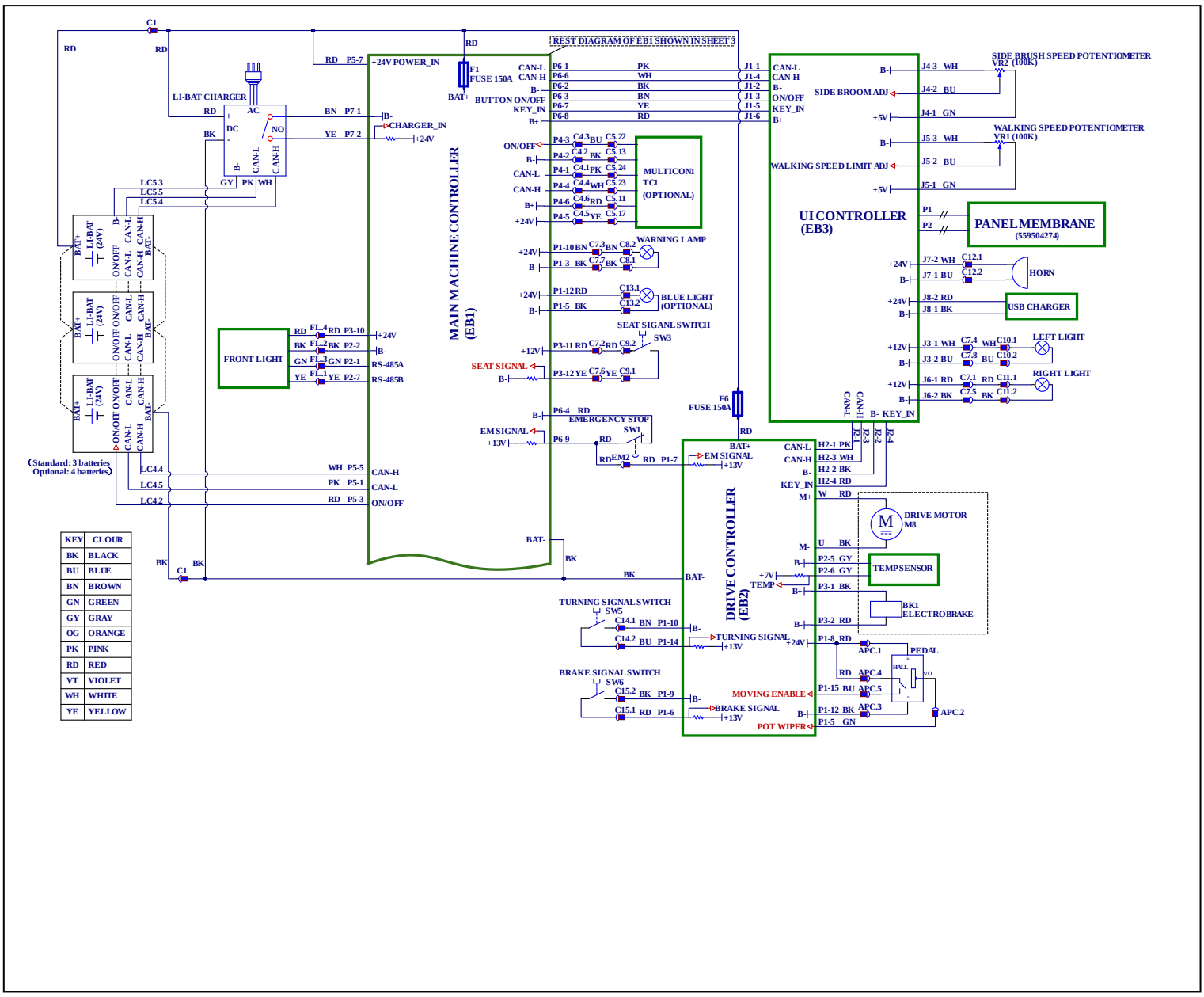


Specifications

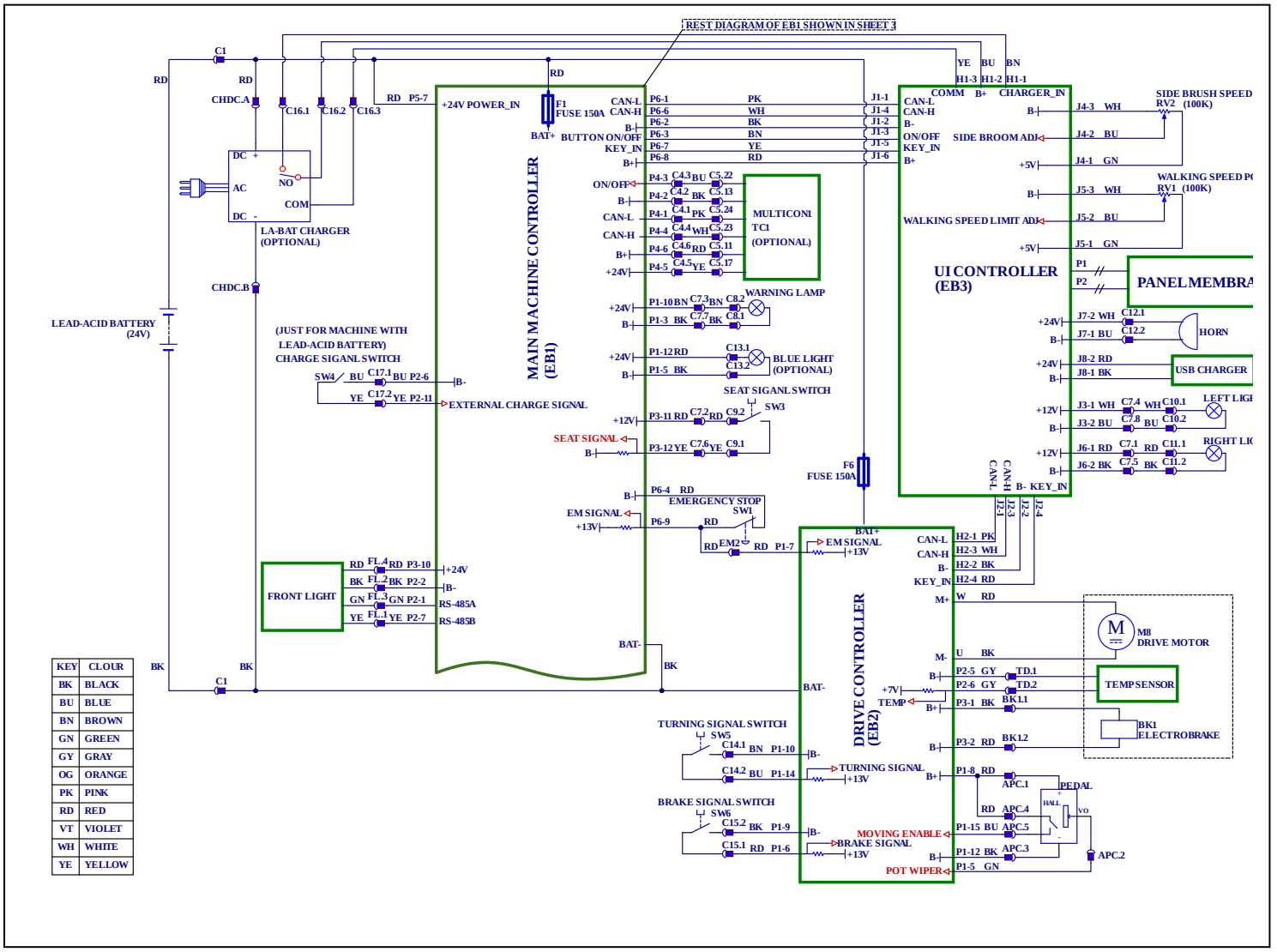
Electrical Parameters

Description	Unit	Value
Battery Voltage	V	24
External Battery Charger Voltage	V	24
USB Charger	N/A	5V/0.8A
Warning Light	N/A	24V / 0.1A
LED Headlight	N/A	10-30VDC / 5W
Taillight	N/A	12.8V/0.09A

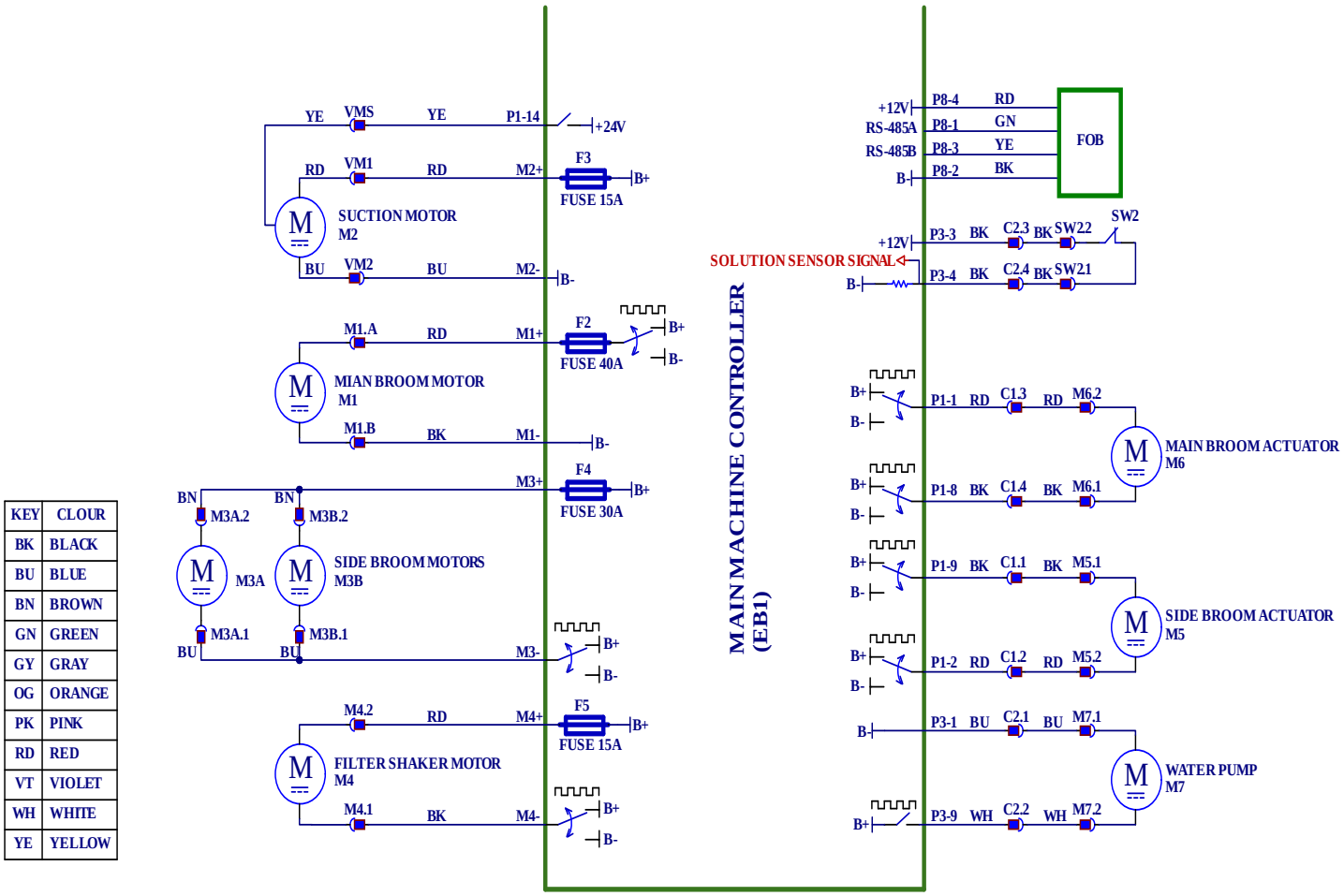
General Wiring Diagram LI-ION Version (559506572 Rev.A)—Sheet 1


REST DIAGRAM OF EB1 SHOWN IN SHEET 3
MAIN MACHINE CONTROLLER (EB1)
DRIVE CONTROLLER (EB2)
UI CONTROLLER (EB3)
PANEL MEMBRANE (559504274)
MULTICON1 TC1 (OPTIONAL)
LI-BAT CHARGER
CHARGER_IN
+24V POWER_IN
FRONT LIGHT
WARNING LAMP
BLUE LIGHT (OPTIONAL)
SEAT SIGANL SWITCH
EMERGENCY STOP
TURNING SIGNAL SWITCH
BRAKE SIGNAL SWITCH
SIDE BRUSH SPEED POTENTIOMETER VR2 (100K)
SIDE BROOM ADJ
WALKING SPEED POTENTIOMETER VR1 (100K)
WALKING SPEED LIMIT ADJ
HORN
USB CHARGER
LEFT LIGHT
RIGHT LIGHT
DRIVE MOTOR M8
TEMP SENSOR
BK1 ELECTRO BRAKE
PEDAL
MOVING ENABLE
POT WIPER
(Standard: 3 batteries Optional: 4 batteries)
KEY | CLOUR
BK | BLACK
BU | BLUE
BN | BROWN
GN | GREEN
GY | GRAY
OG | ORANGE
PK | PINK
RD | RED
VT | VIOLET
WH | WHITE
YE | YELLOW

General Wiring Diagram LEAD-ACID Version (559506572 Rev.A) —Sheet 2



General Wiring Diagram LEAD-ACID&LI-ION Version (559506572 Rev.A) —Sheet 3



30 Solution System

Functional Description

The solution system is used to reduce the dust caused by side broom sweeping. The manual valve at the bottom of the water tank is the valve that closes the water supply during maintenance. The solution flows from the water tank into the faucet, passes through the filter, high-pressure switch and water pump (M7), and finally flows into the nozzle. The water pump (M7) and the high-pressure switch can only operate when they are fully turned on.

- Lead-acid battery capacity >20%, Lithium ACE battery level > 8%
- Side broom function is enabled.
- Solution sensor (SW2) is not activated.
- The operator sits on the seat correctly.
- The accelerator pedal is pressed.

Wiring Diagram

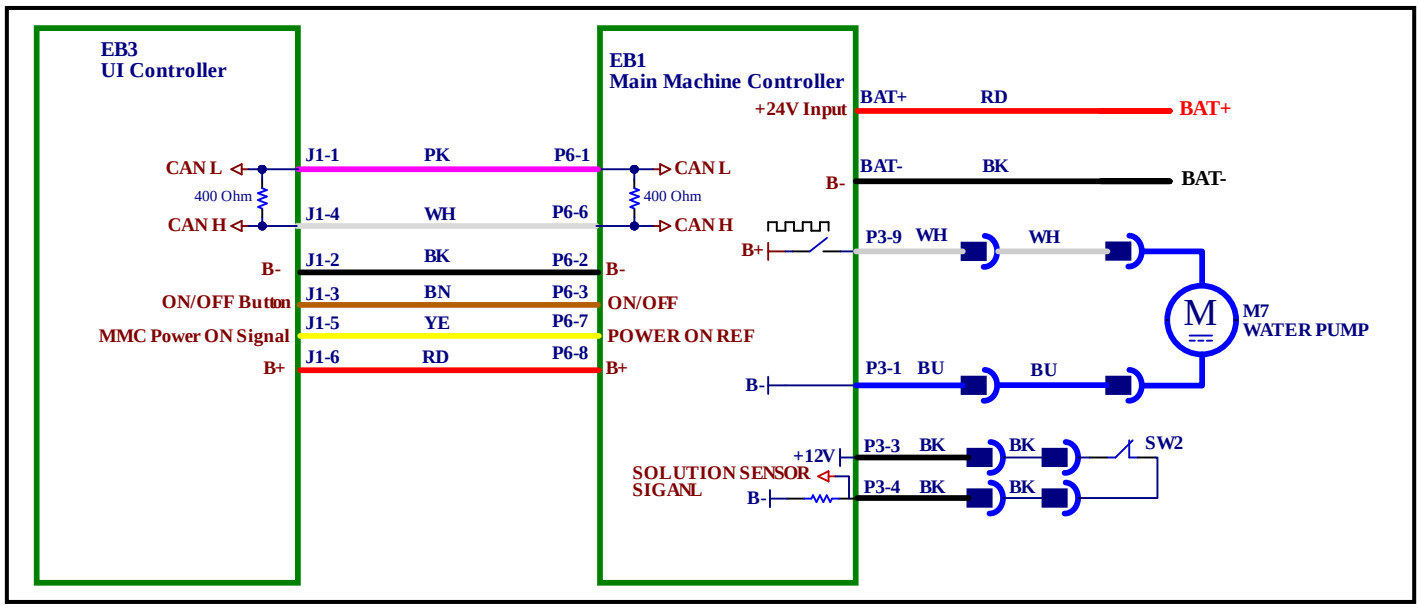
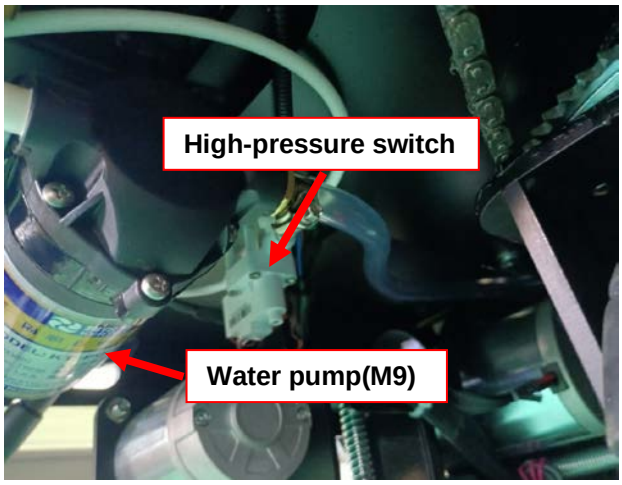
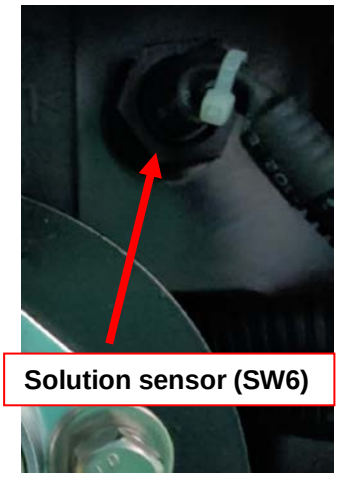


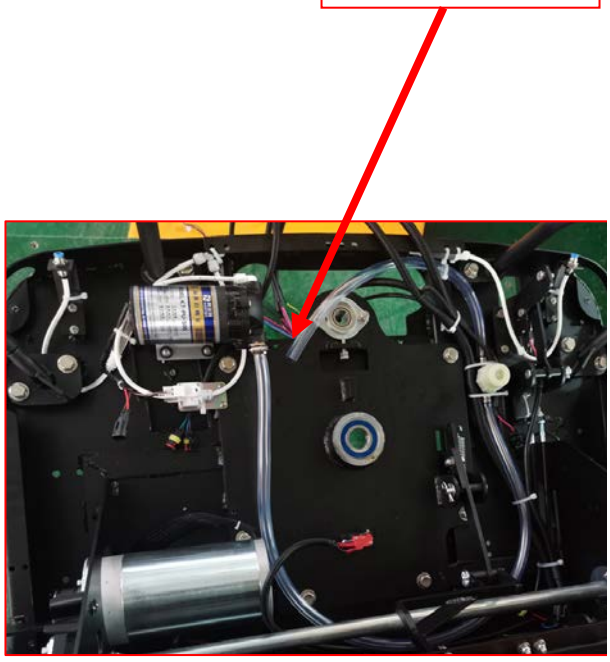
Figure 58

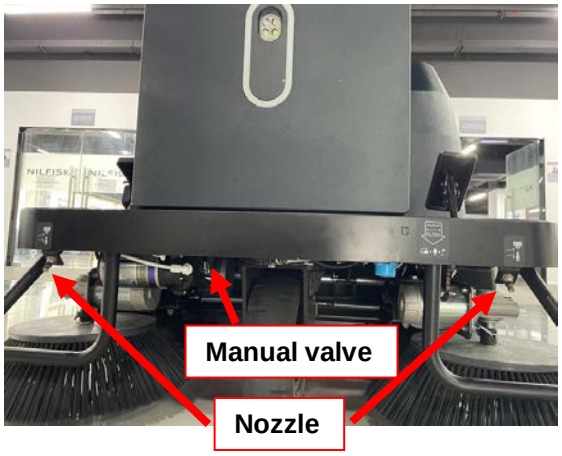
Component Locations

- Water pump (M7)
- Solution sensor (SW2) / Solution tank
- High-pressure switch
- Nozzle
- Manual valve









Removal and Installation

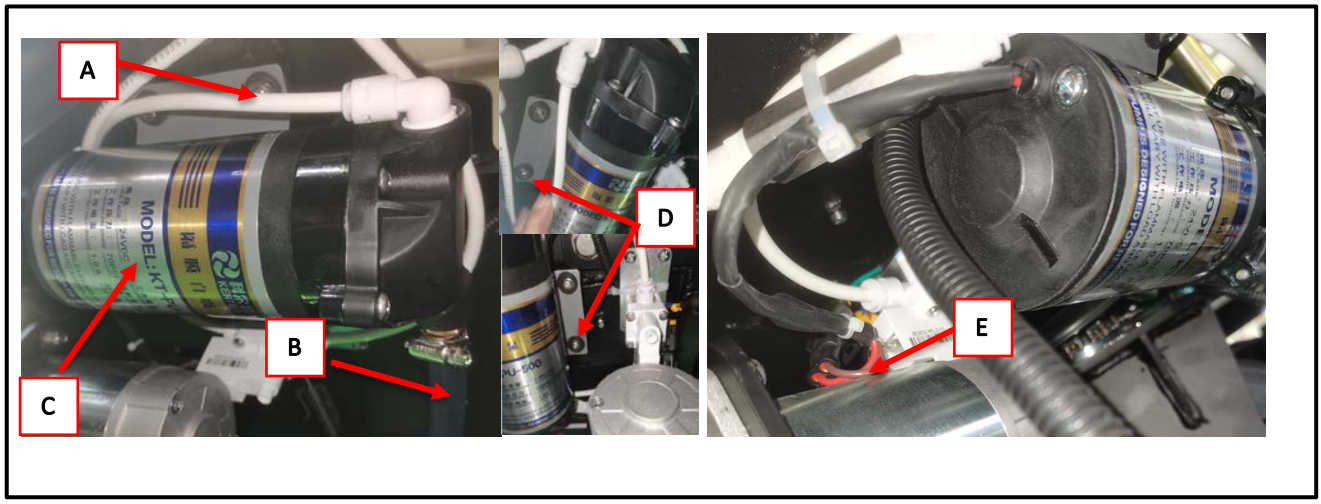
Water pump *(M7)*

Removal

1. Disconnect hoses (A, B) from diaphragm pump (C).
2. Disconnect electrical connectors (E) on diaphragm pump (C).
3. Remove four screws (D).
4. Remove diaphragm pump (C).

Installation

Assemble components in reverse order of disassembly.



Troubleshooting

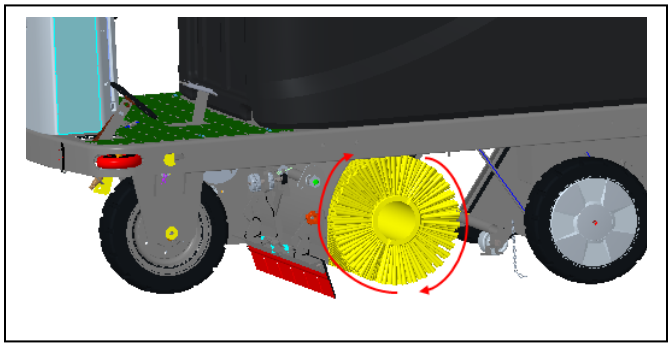
Trouble	Possible causes	Remedy
No water or less water comes out	Solution filter is clogged/full of dirt	Clean
	High-pressure switch fault or electrical connector damaged	Replace High-pressure switch or repair electrical connector
	There is dust/debris in the tank or in the detergent hose, obstructing solution flow	Clean tank/hoses
	Solution tank is empty	Fill up solution tank with water
	Water pump electrical connector is broken	Repair
	UI Panel (EB3 & EB4 & EB5) fault	Replace
Water comes out when the machine is off	Water pump fault	Replace

Specifications

Description	Unit	Value
Water pump maximum input current	A	1.2
Water pump normal current	A	0.3-0.6
Water pump rated voltage	V	24

42 Main Sweeping System

Functional Description



The main components of main sweeping system are the main broom motor and the main broom.

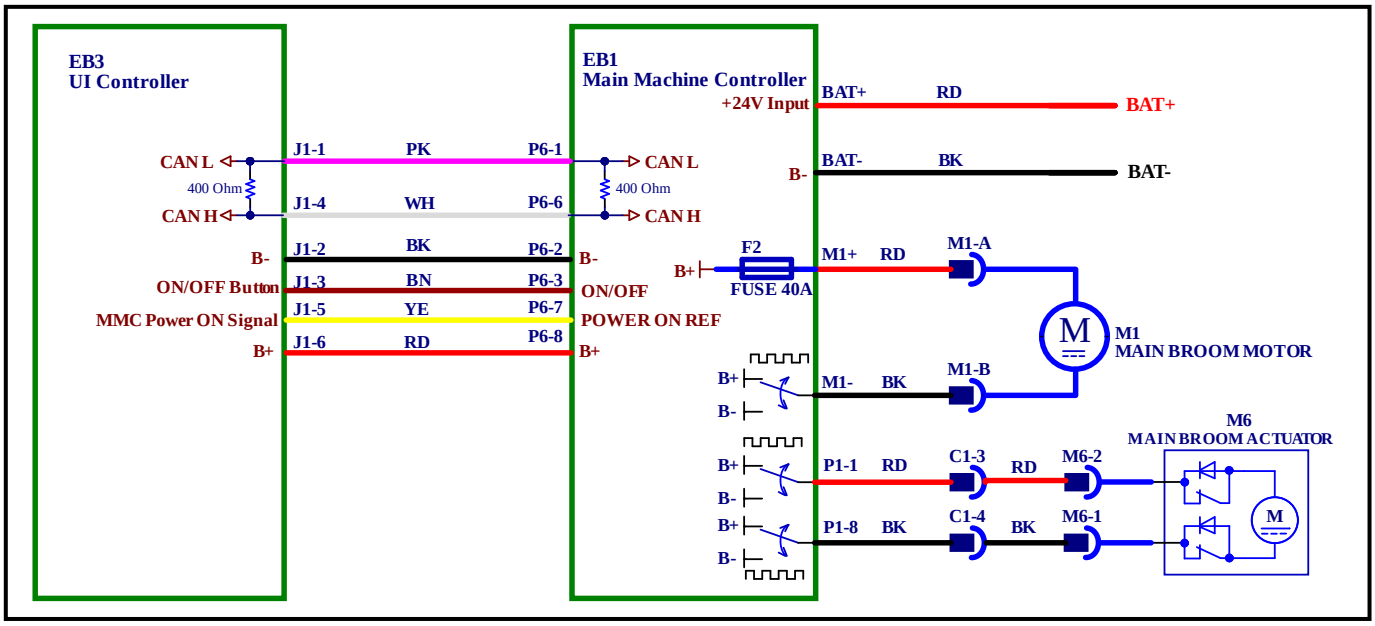
Press the Start button to enable the cleaning mode, the main broom actuator lowers the main broom to the ground, press the accelerator pedal and the main broom will work, release the accelerator pedal, the main broom will stop within 5 seconds.

If main broom motor is overloaded, fuse (F6: 40A) will stop it.

To work properly, main broom motor (M1) needs to meet all the following inputs/conditions:

- Lead-acid battery capacity >20%, Lithium ACE battery level > 8%.
- Main broom function is enabled.
- The operator sits on the seat correctly.
- Accelerator pedal is pressed.

Wiring Diagram



Main Broom Actuator System

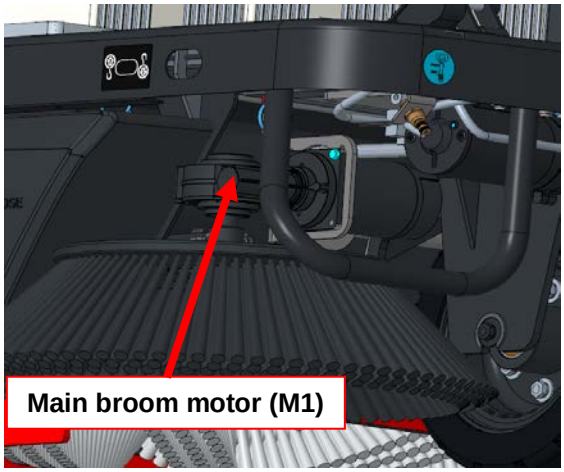
The main broom actuator (M1) is controlled directly by the Main Machine Controller (EB1).

The actuator does not require adjustment, when the machine is turned on the actuator is powered to move upwards for several seconds until the cam on the actuator opens the travel limit switch, giving it time to reach the fully retracted position. Once the travel limit switch is opened, the controller can identify that the actuator has reached this position, which is also defined as the home position.

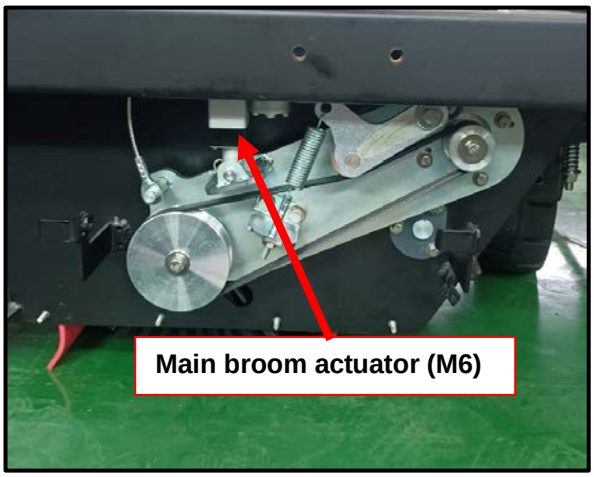
Component Locations

- Main broom motor (M1)
- Main broom motor terminal (M1+, M1-)
- Main broom Fuse (F7: 40A)
- Main broom actuator (M6)

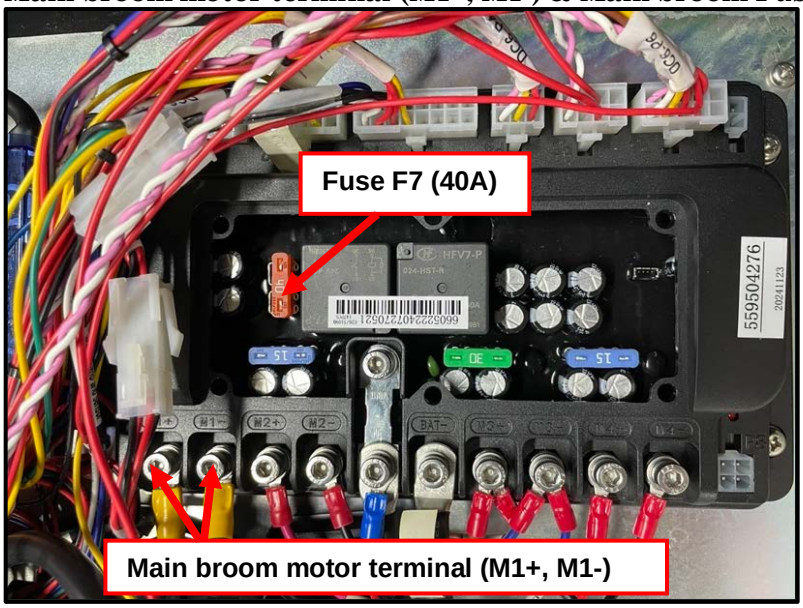
Main broom motor (M1)



Main broom actuator (M6)



Main broom motor terminal (M1+, M1-) & Main broom Fuse (F7: 40A)

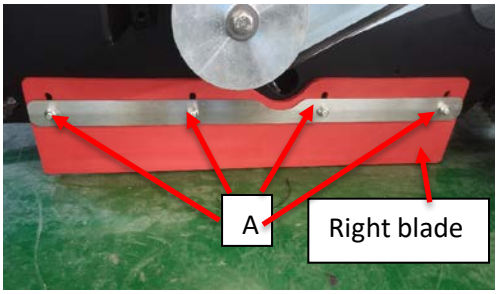


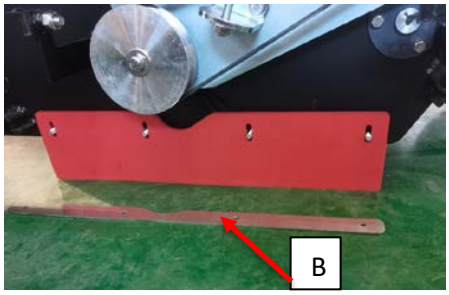
Maintenance and Adjustment

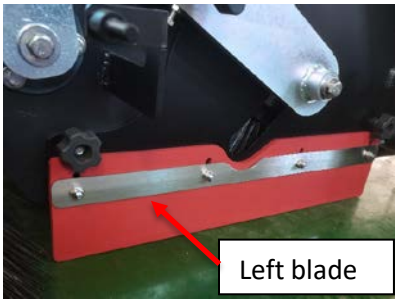
Side Blade Changing

The left and right blades need to be changed periodically. The blades can be flipped or reversed to a new edge for up to 3 times before replacement is required. During replacement, it is important that the blades be installed flat without waves and adjusted to be laid flat against the floor.

1. First remove the right cover plate (see figure 6, page 58) and then unscrew the nut (A).
2. Remove the side blade(B), then remove right blade for replacement.
3. The replacement method for left blade is same as the right blade.

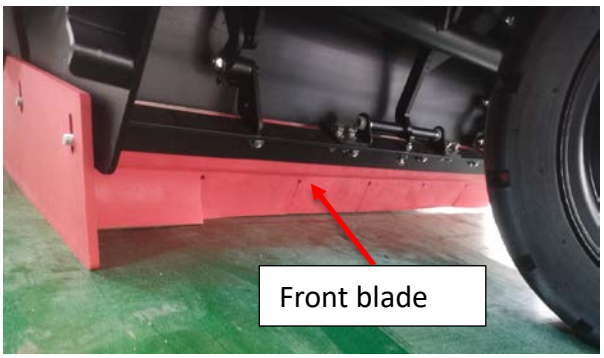


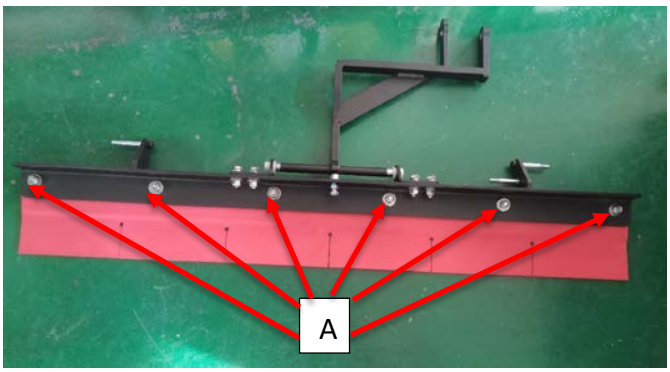




Front Blade Changing

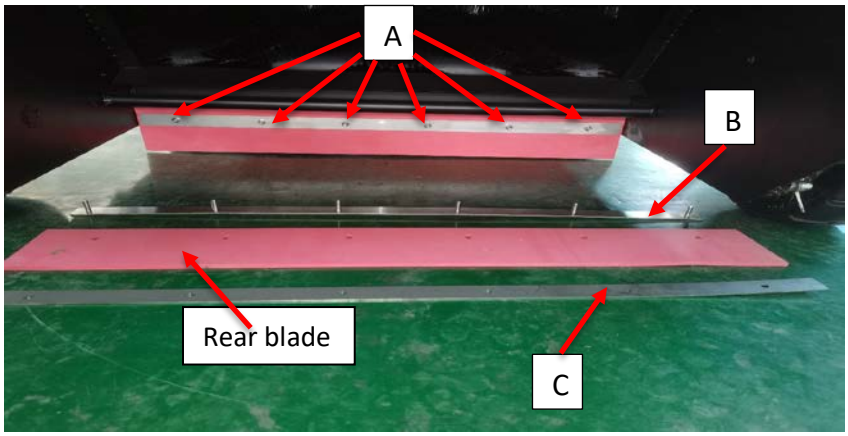
1. Remove 2 side brooms first (see Figure 7 on page 71), then unscrew the nut (A).
2. Remove the front strap then remove front blade.





Behind Blade Changing

1. First take down dustbin, then remove nuts(A).
2. Remove strap(B)and(C), then take down the rear blade for replacement.



Troubleshooting

Trouble	Possible causes	Remedy
Main broom can not clean properly	Main broom is excessively worn	Replace
The main broom can't rotate	Main broom motor carbon brooms worn	Replace
	Presence of mass debris or strings around main broom or between main broom and attachment flange	Remove main broom and clean it
	Wiring damaged	Repair/replace
	Main broom motor damaged	Repair/replace
	Fuse F7 is opened	Replace
	Main Machine Controller (EB1) damaged	Replace
Can't raise/lower main broom	Main broom actuator overloaded	Check if main broom actuator is stuck
	Main broom actuator (M6) damaged	Replace
	Wiring damaged	Repair/replace
	Machine machine controller (EB1) fault	Replace
	UI board (EB3 & EB4) fault	Replace
	Membrane (EB5) fault	Replace

Main Broom Motor Amperage Check

Warning! This procedure must be performed by qualified personnel only.

1. Park the machine on flat ground.
2. Apply amp clamp (A, Figure 59) to one of the main broom motor wires (B, Figure 59).
3. Press Power button to turn on the machine, input correct password to login successfully.
4. Press Start button to enable cleaning mode, the main broom is automatically lowered to the ground.
5. Activate main broom by pressing accelerator pedal, check if current of main broom motor is between 6A and 16A at 24V.
6. If amperage is higher than 16A, perform following procedures to determine cause and correct abnormal amperage:
   - Check and clean it if there are debris wrapped around the shaft.
   - Remove motor and check t condition of all components, repair or replace them if necessary.
7. If above procedures can't get amperage correct, it is necessary to replace broom motor.

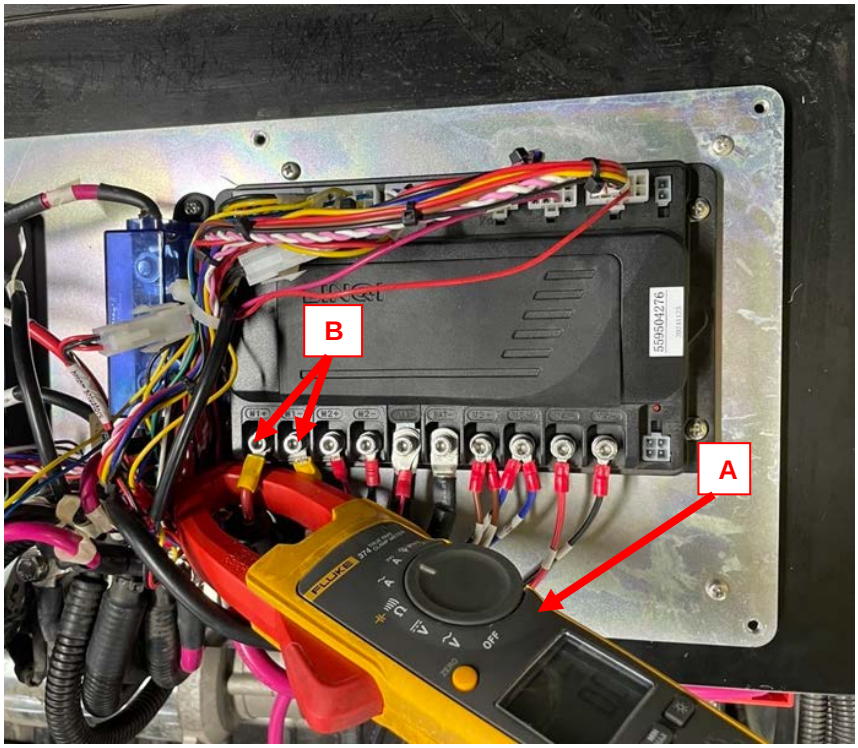


Figure 59

Removal and Installation

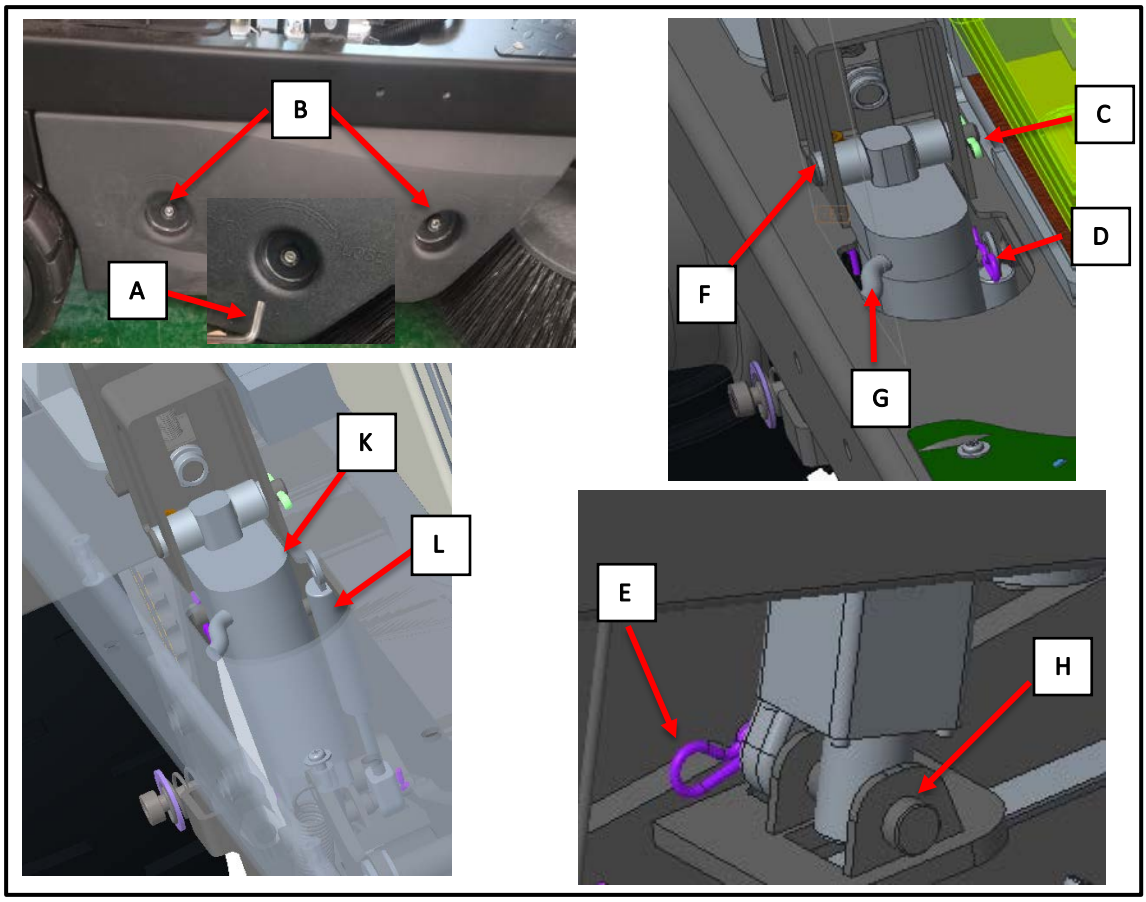
Main Broom Actuator(M6)

Removal

1. Unscrew the screw (B) with an external hexagonal wrench (A) and remove the right cover.
2. Pull out the cotter (C, D, E). and pin (F, H).
3. Cut off the nylon cable tie and unplug the cable (G).
4. Remove air spring (L) and remove the actuator (K) for replacement.

Installation

Assemble components in reverse order of disassembly. When assemble shaft (F) and plug cable(G), turn on power switch and press One-button start button, then actuator will extend. When it extends to the lowest position, the rest parts can be assembled. The actuator doesn't require adjustment of extend and/or retract limits.



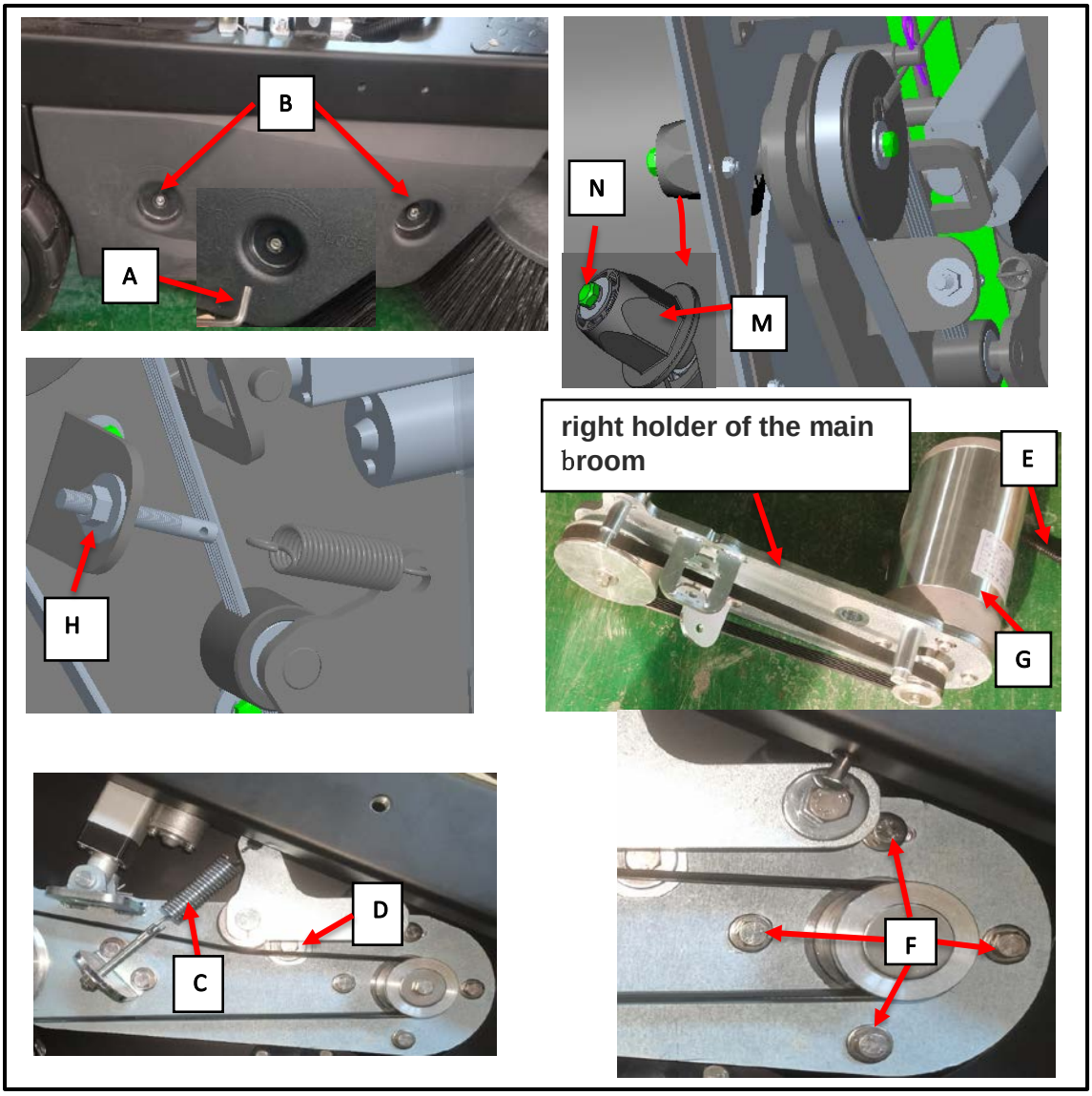
Main Broom Motor (M1)

Removal

1. Unscrew the screw (B) with an external hexagonal wrench (A) and remove the right cover.
2. Unscrew the nut (H), let spring is free.
3. Remove the spring (C) and unscrew the bolt (D) and bolt (N). take off the hub (M). remove the right holder of the main broom.
4. Cut off the nylon tie and unplug the cable (E).
5. Unscrew the bolt, washer, and spring washer (F), remove the main brush motor (G) and replace it

Installation

Assemble components in reverse order of disassembly.



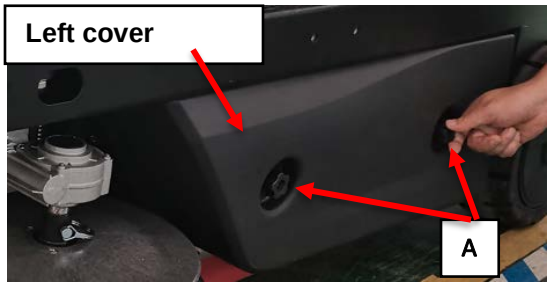
Main Broom

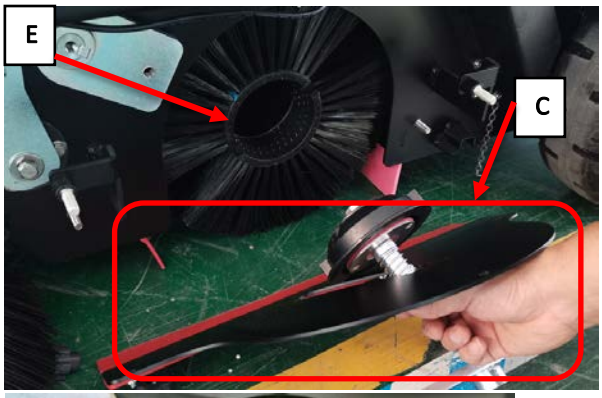
Removal

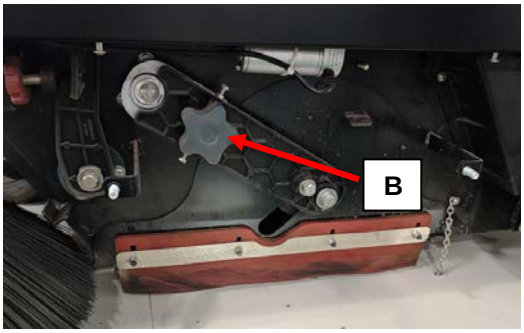
1. Unscrew the knob bolt (A) and remove the left cover.
2. Unscrew knurled knob (B) .
3. Remove the fixed plate assembly (C).
4. Take out the roller broom (E) and replace.

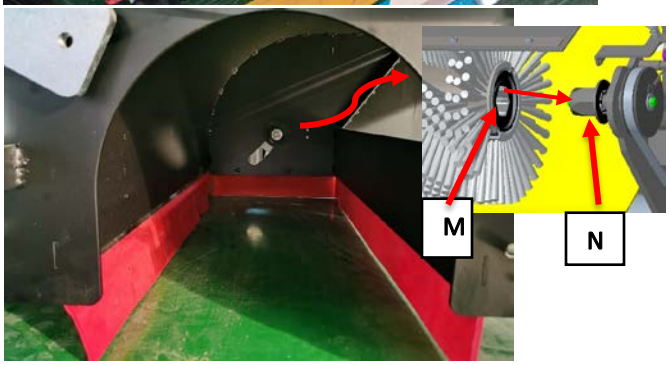
Installation

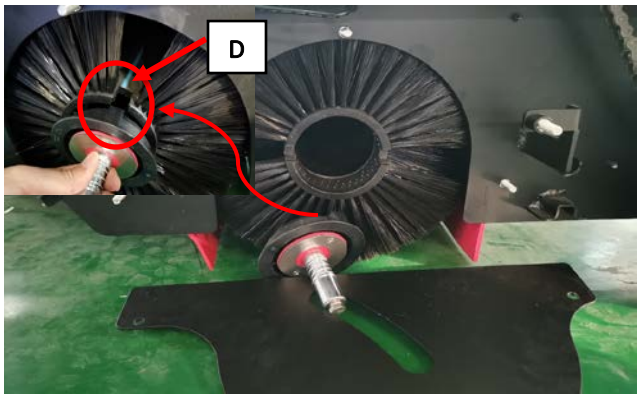
1. Assemble components in reverse order of disassembly. Caution: First let broom's side with hub that has hexagonal hole(M)put on the hub(N). and then use hand lift another side of broom, let shaft with hub(C) put in groove of broom(O)











Specifications

Description		Unit	Value
Main broom motor technical data	*Output power*	W	500
	Input power	W	624
	Voltage	V	DC 24
	Normal current	A	8-10
	Rotation speed	RPM/Min	1300
	Insulation class	/	H
	Protection class	/	IP44
Main broom actuator technical data	Max load	N	550
	Stroke	mm	55
	Rated voltage	V	24
	Protection class	N/A	IP44
	Insulation class	N/A	B
	Normal current	A	0.6-0.8

48 Side Sweeping System

Functional Description

The side sweep system cleans up the garbage on both sides of the machine that the main broom cannot sweep. The main components of side sweeping system are two side broom motors, side brooms, side broom actuator, and a speed potentiometer.

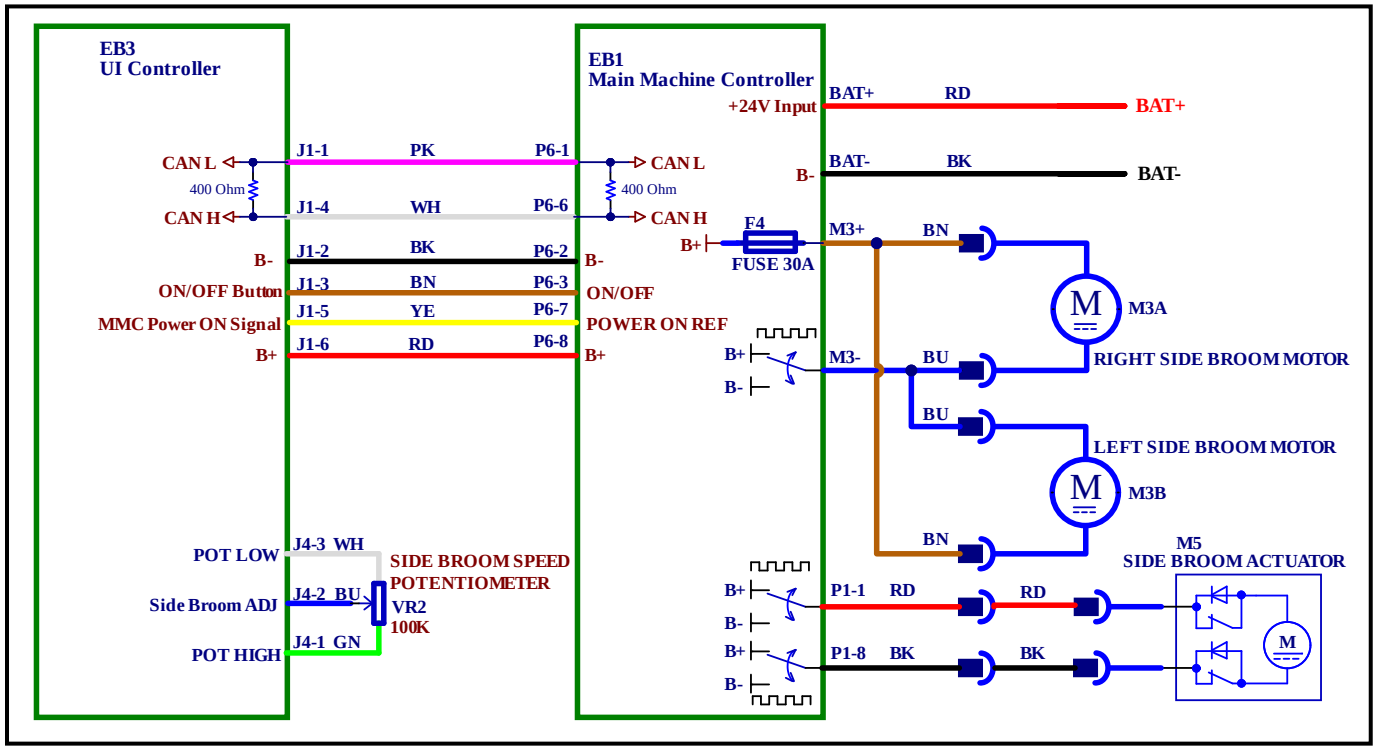
The side broom rotates only when the driver presses the accelerator pedal, its rotating speed can be adjusted by the side broom speed knob, the potentiometer input range is: 0.4V (high speed) ~ 4.6V (low speed). When pedal is released, broom motors will stop within five seconds.

If side broom motors are overloaded, fuse (F8: 30A) will stop it.

To work properly, Side broom motors (M5&M6) need to meet all the following inputs/conditions:

- Lead-acid battery capacity >20%, Lithium ACE battery level > 8%.
- Side broom function is enabled.
- The operator sits on the seat correctly
- Accelerator pedal is pressed

Wiring Diagram



Side Broom Actuator System

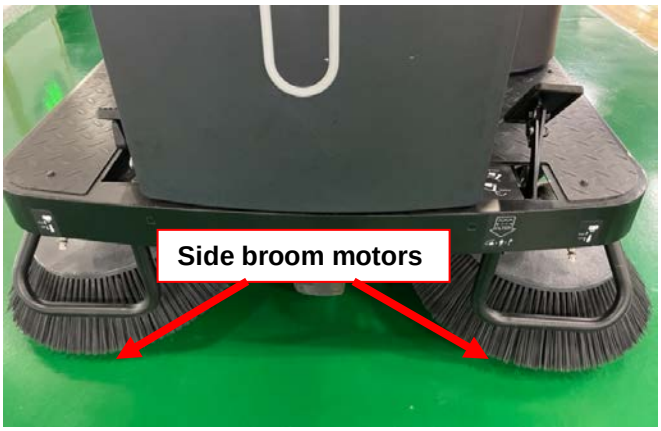
The side broom actuator (M5) is controlled directly by the Main Machine Controller (EB1).

The actuator does not require adjustment. When the machine is turned on the actuator is powered to move upwards for several seconds until the cam on the actuator opens the travel limit switch, giving it time to reach the fully retracted position. Once the travel limit switch is opened, the controller can identify that the actuator has reached this position, which is also defined as the home position.

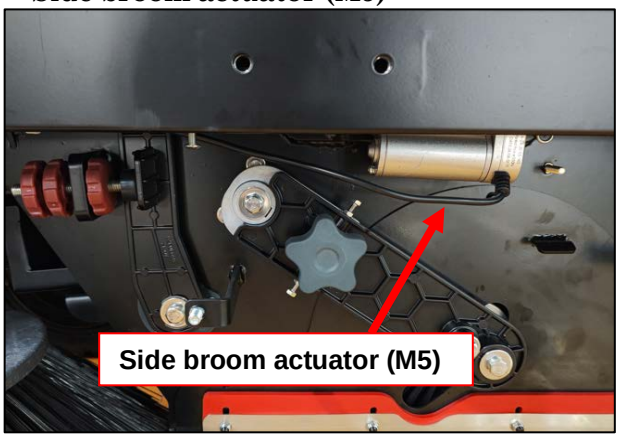
Component Locations

- Side broom motors (M3A & M3B)
- Side broom actuator (M5)
- Side broom motors terminal (M3+, M3-)
- Side Broom Fuse (F8: 30A)
- Side broom speed knob

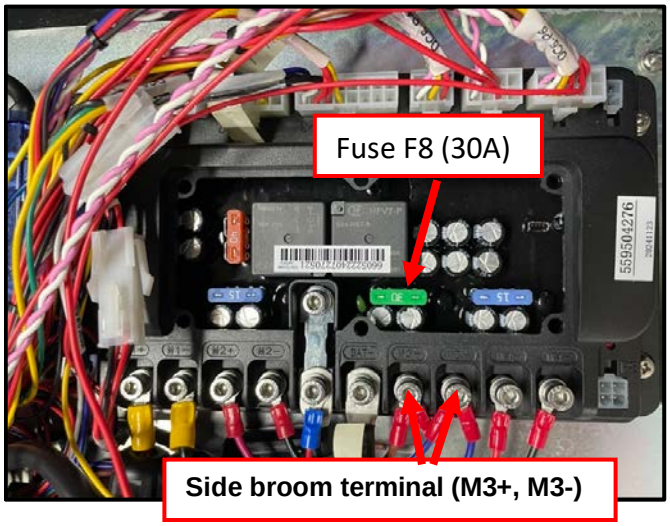
Side broom motors (M3A & M3B)



Side broom actuator (M5)



Side Broom Fuse (F8: 30A)



Side broom speed dial

Troubleshooting

Trouble	Possible causes	Remedy
Side broom can not clean properly	Side broom is excessively worn	Replace
Only one side broom rotates	Side broom motor carbon brushes worn	Replace
	Presence of mass debris or strings around side broom or between side broom and attachment flange	Remove side broom and clean it
	Side broom motor damaged	Repair/replace
	Wiring damaged	Repair
	Fuse F8 is opened	Replace
Can’t raise/lower side brooms	Wiring damaged	Repair/replace
	Main machine controller (EB1) fault	Replace
	Side broom actuator (M5) fault	Repair/replace
	UI board (EB3 & EB4) fault	Replace
	Membrane (EB5) fault	Replace

Side Broom Motors Amperage Check

Warning! This procedure must be performed by qualified personnel only.

1. Park machine on flat ground.
2. Apply amp clamp (A, Figure 59) to one of the side broom motor wires (B, Figure 59).
3. Press Power button to turn on the machine, input correct password to login successfully.
4. Press Start button to enable cleaning mode, the side brooms are automatically lowered to the ground.
5. Activate side broom by pressing accelerator pedal, check if the current of side broom motors is between 6A and 12A at 24V (Both side broom motor).
6. If amperage is higher than 12A, perform following procedures to determine cause and correct abnormal amperage:
   - Check and clean it if there are debris wrapped around the shaft.
   - Remove motor and check the condition of all components, repair or replace them if necessary.
7. If above procedures can't get amperage correct, it is necessary to replace side broom motor.

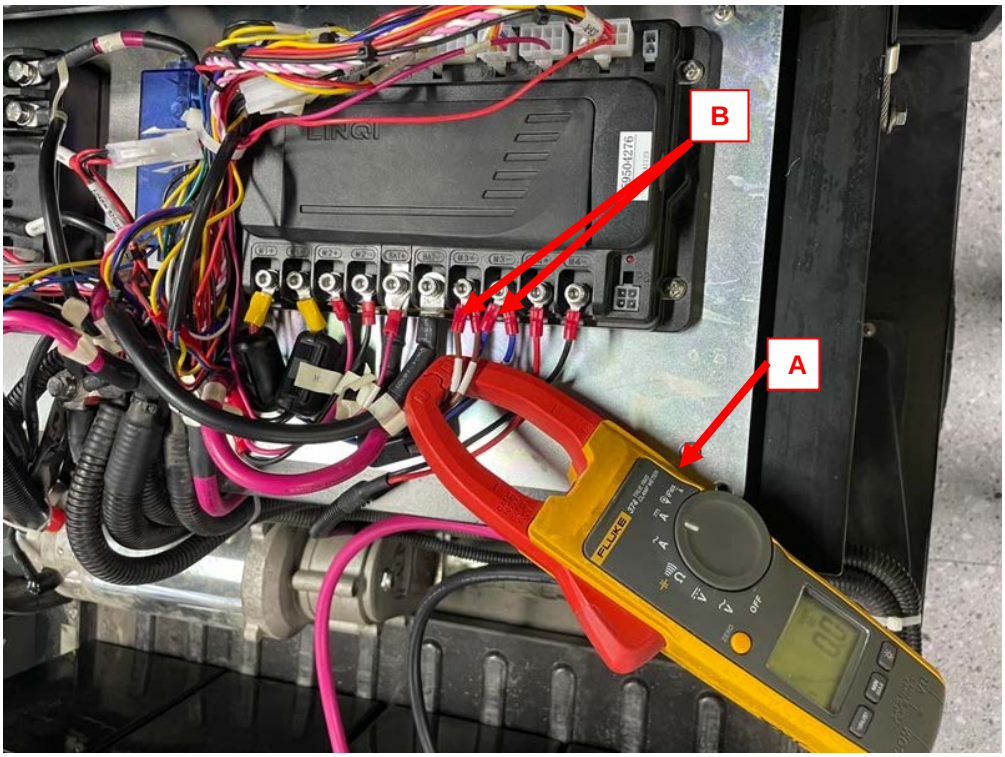


Figure 59

Removal and Installation

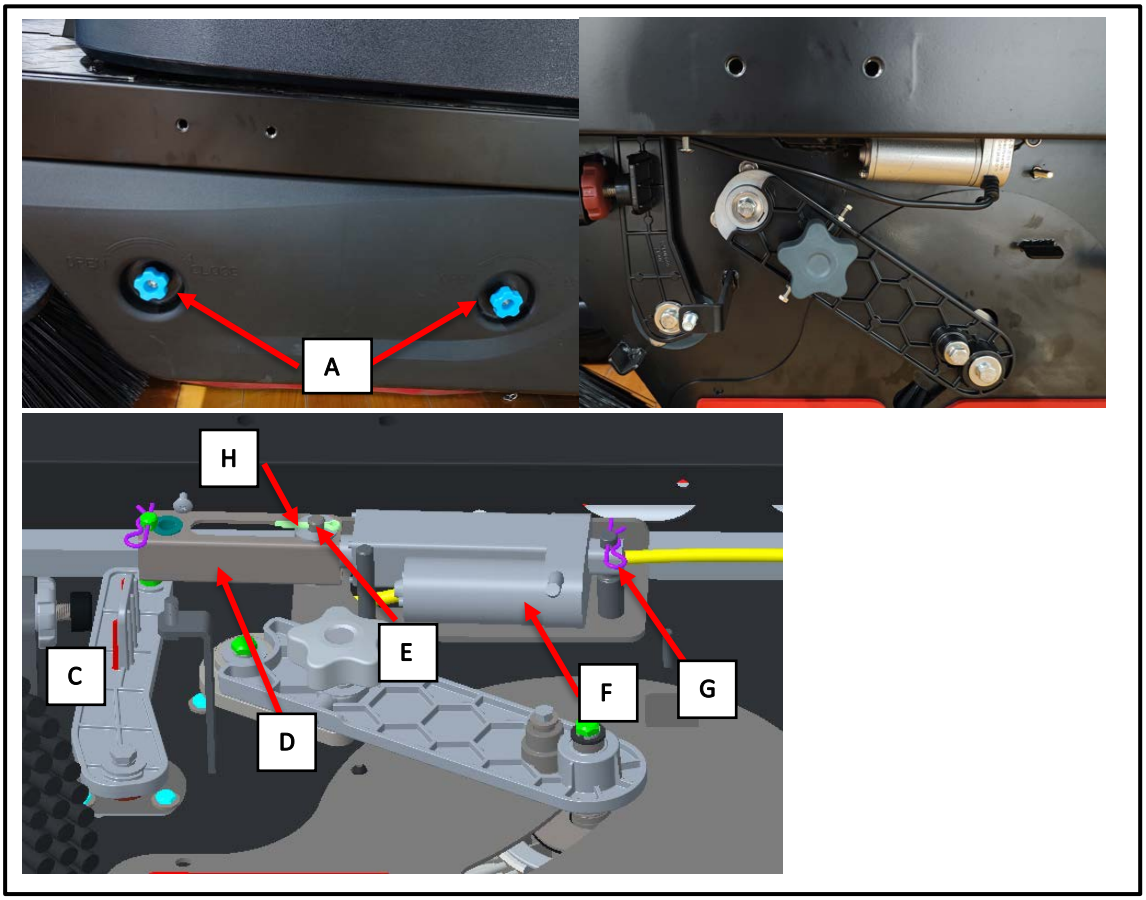
Side Broom Actuator(M5)

Removal

1. Unscrew the knob screw (A) and remove the left cover plate.
2. Cut off the nylon cable tie and unplug the cable (B).
3. Pull out the cotter (C, G) and take off the bracket and actuator (F)
4. Pull out the cotter (E) and pin (H) and remove the actuator (F) for replacement

Installation

Assemble components in reverse order of disassembly .



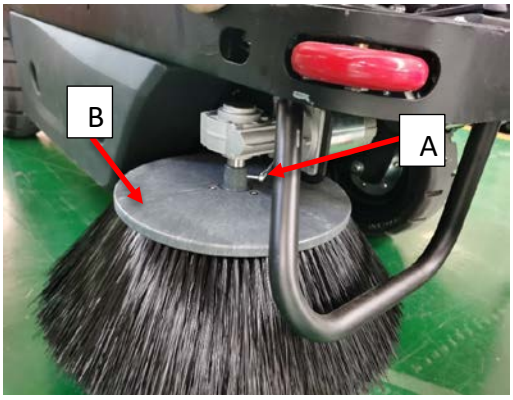
Side Broom Motors (M3A & M3B)

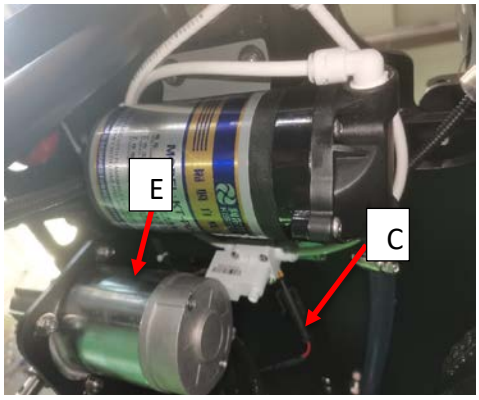
Removal

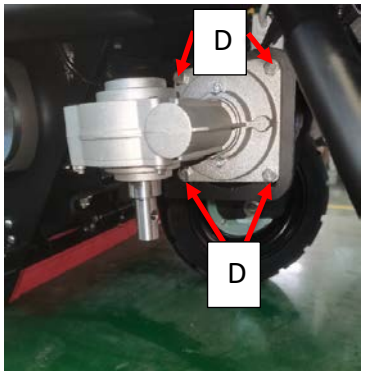
1. Pull out the pin (A) and remove the side broom (B).
2. Cut off the nylon cable tie and remove the cable (c).
3. Unscrew the bolt (D) and remove the side broom motor (E) for replacement.

Installation

Assemble components in reverse order of disassembly.







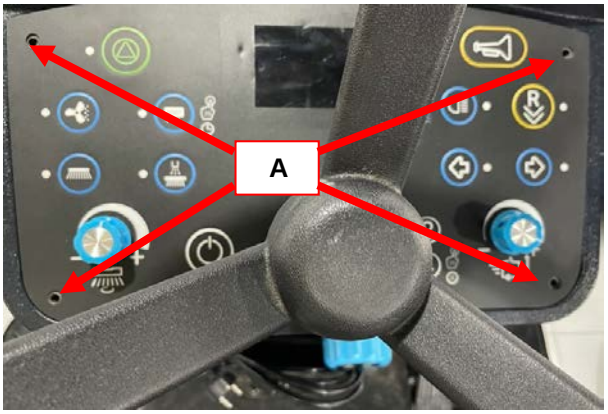
Side broom speed potentiometer

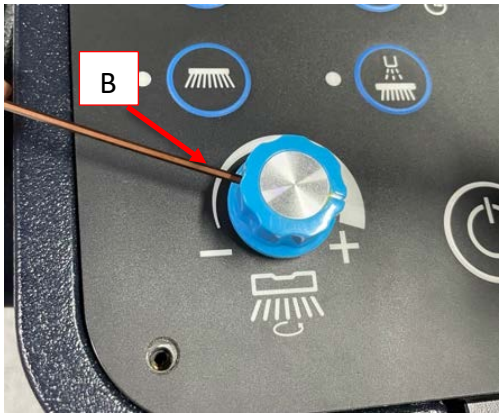
Removal

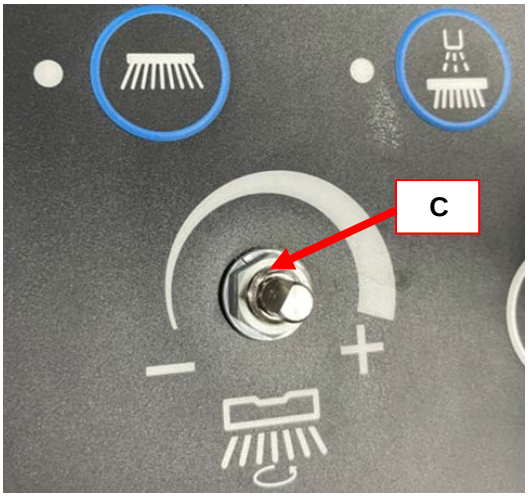
1. Unscrew the 4 screws (A) on UI Panel.
2. Use an Allen screwdriver to take off the screw (B) inside the side broom speed potentiometer.
3. Unscrew the knob and take off, then unscrew the nut (C).
4. Unplug terminal J4 (D), take off speed potentiometer.

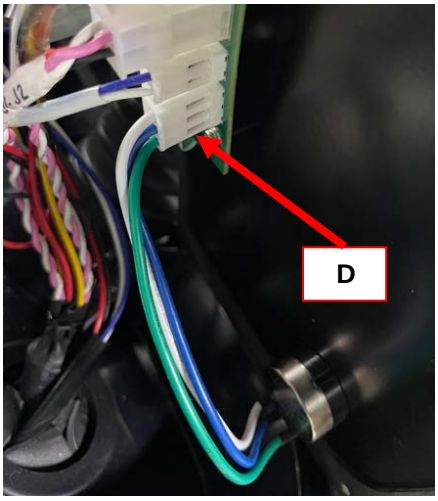
Installation

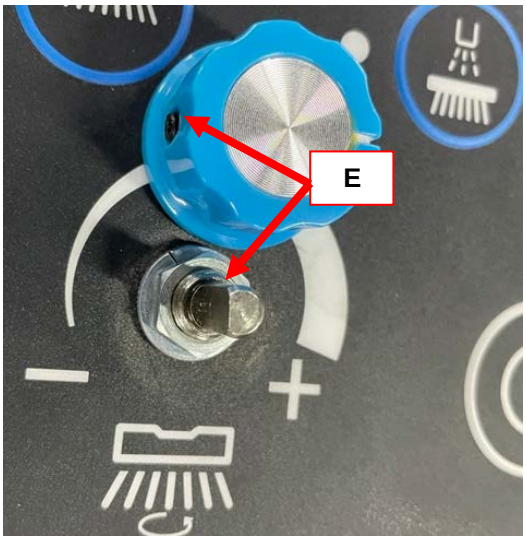
Assemble components in reverse order of disassembly, the screw holes of cover should be in the direction of the cutout (E).









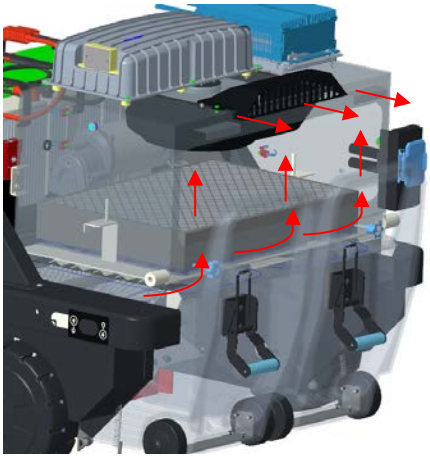


Specifications

Description		Unit	Value
Side broom motor technical data	Output power	W	100
	Input power	W	280
	Voltage	V	DC 24
	Normal current	A	3-4
	Rotation speed	RPM/Minute	0-100
	Insulation class	/	F
	Protection class	/	IP44
Side broom actuator technical data	Max load	N	550
	Stroke	mm	55
	Rated voltage	V	24
	Protection class	N/A	IP44
	Insulation class	N/A	B
	Normal current	A	0.6-0.8

50 Dust Control System

Functional Description



The dust control system is designed to reduce dust when the machine sweeps, by controlling the air flow from around the main broom area and drawing it through a filter where the dust is captured and contained along with other swept up debris inside the hopper.

When cleaning mode is enabled, suction motor (M2) will be turned on automatically, users can also press Dust Fan button to turn on or turn off it.

The suction motor (M2) controls the air flow of the sweeping area, capturing the dust and debris to the filter.

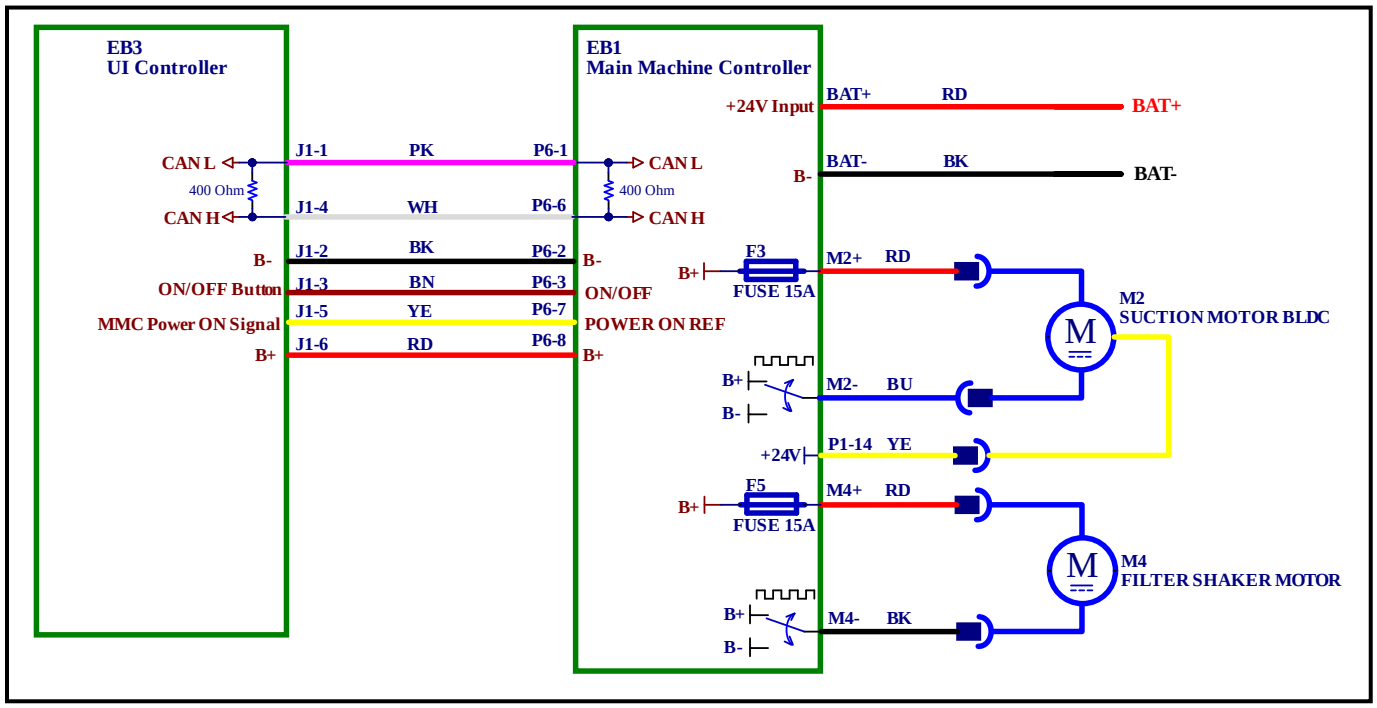
Filter shaker motor (M4) can shake the dust accumulated on the filter net, it can work regardless of whether the cleaning mode is enabled or not.

If the working current is less than 1A, then it's judged to be motor circuit open.

Pressing Filter shaker button can turn on the filter shaker motor (M4), it works once and then stops, its working time is FILTER SHAKER ON TIME, the default value is 5 seconds, it can be adjusted in SETTINGS.

Press and hold Filter Shaker button for 2 seconds, filter shaker motor will work in Automatic mode, it works repeatedly at regular intervals, its working time is FILTER SHAKER ON TIME, the default value is 5 seconds, its interval is FILTER SHAKER CYCLE INTERVAL, the default value is 10 minutes, they can be adjusted in SETTINGS.

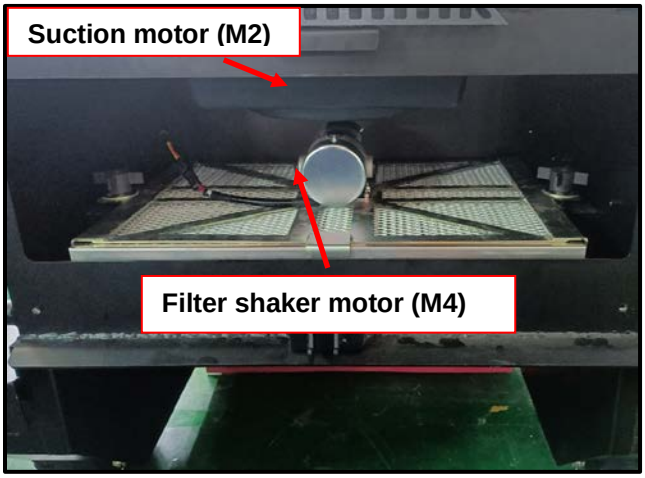
Wiring Diagram



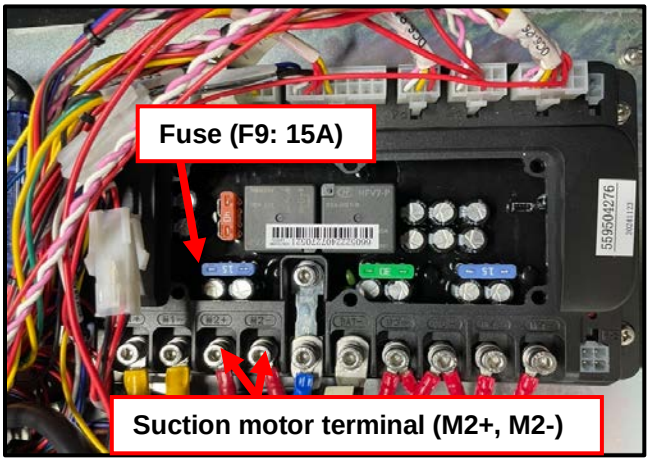
Component Locations

- Suction motor (M2)
- Filter shaker motor (M4)
- Suction motor terminal (M2+, M2-, P1-14)
- Filter shaker motor terminal (M4+, M4-)
- Suction motor Fuse (F9: 15A)
- Filter shaker Fuse (F10: 15A)

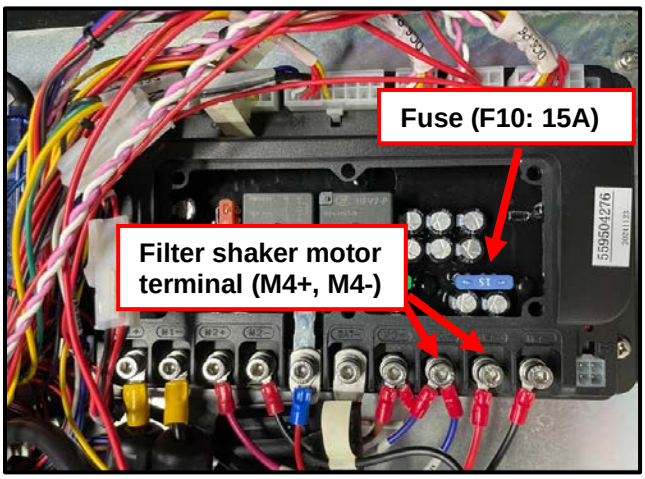
Suction motor (M2) & Filter shaker motor (M4)



Sction motor terminal (M2+, M2-) & Suction motor Fuse (F9: 15A)



FIter shaker motor terminal (M4+, M4-) & Filter shaker Fuse (F10: 15A)



Troubleshooting

Trouble	Possible causes	Remedy
The Suction motor can't be turned on	Cleaning mode is disabled	1. Press Start button to enable cleaning mode. 2. If cleaning mode is disabled due to other reasons, please follow the troubleshooting steps to resolve the issue.
	Battery level is low	Charge the batteries
	Wiring damaged	Repair/replace wire
	Main controller (EB1) fault	Replace EB1
	UI controller (EB3) fault	Replace EB3
	Suction motor damaged	Check/replace suction motor
	Fuse (F9: 15A) fault	Replace
Filter shaker motor can't be turned on	Battery level is low	Charge the batteries
	Wiring damaged	Repair/replace
	Main Controller (EB1) fault	Replace
	Filter shaker motor damaged	Check the amperage/replace
	Fuse (F10: 15A) fault	Replace

Filter Shaker Motor Amperage Check

Warning! This procedure must be performed by qualified personnel only.

1. Apply amp clamp (A, Figure 60) to one of the filter shaker motor cables (B, Figure 60).
2. Press Power button to turn on the machine, input correct password to login successfully.
3. Pressing filter shaker button to turn on filter shaker motor.
4. Check if current of motor is between 2A and 8A at 24V.
5. If amperage is higher than 8A, perform following procedures to determine cause and correct abnormal amperage:
   - Check and clean it if there are debris wrapped around the shaft.
   - Remove filter shaker motor and check condition of all components, repair or replace them if necessary.

If above procedures can't make amperage correct, replace filter shaker motor.

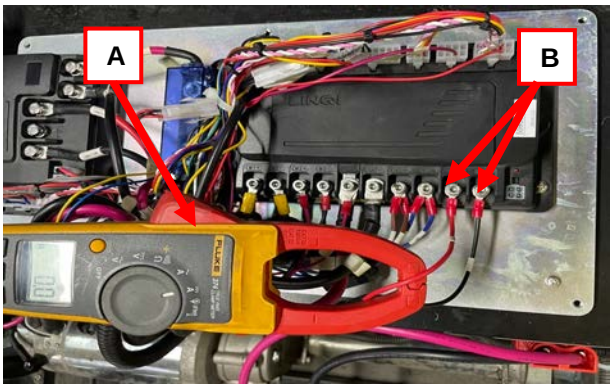


Figure 60

Suction Motor Amperage Check

Warning! This procedure must be performed by qualified personnel only.

1. Apply amp clamp (A, Figure 61) to one of the suction motor cables (B, Figure 61).
2. Press Power button to turn on the machine, input correct password to login successfully.
3. Press Start button to enable cleaning mode, suction motor will be turned on automatically.
4. Check if current of suction motor is between 3A and 8A at 24V.
5. If amperage is higher than 8A, perform following procedures to determine cause and correct abnormal amperage:
    - Check and clean it if there are debris wrapped around the shaft.
    - Remove suction motor and check condition of all components, repair or replace them if necessary.

If above procedures can't make amperage correct, replace suction motor.

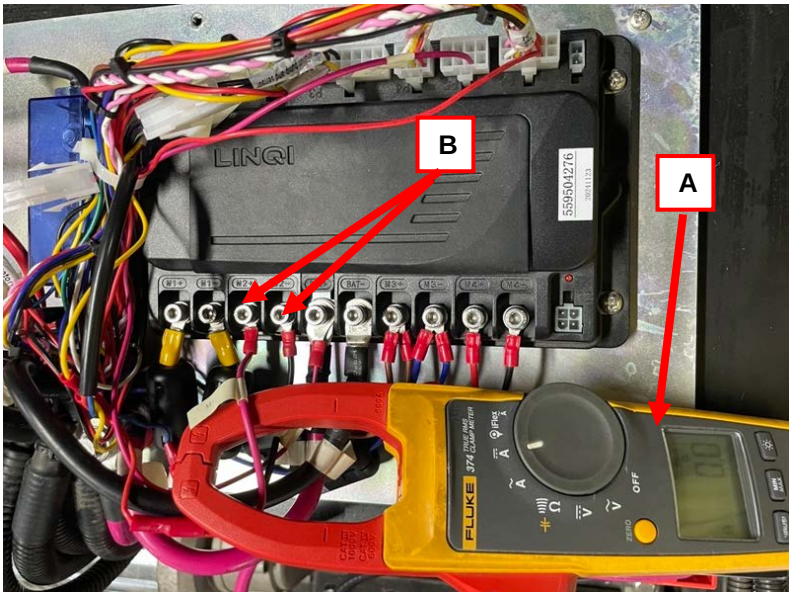


Figure 61

Removal and Installation

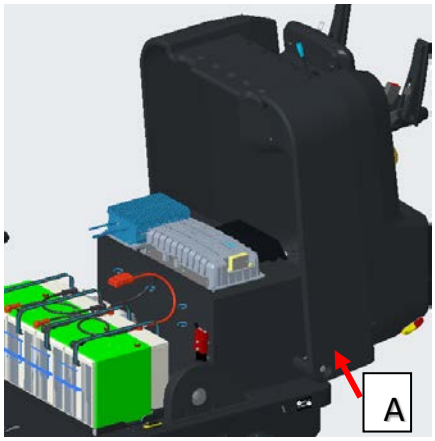
Suction Motor (M2)

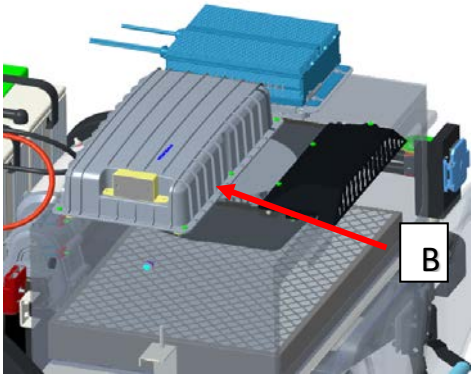
Removal

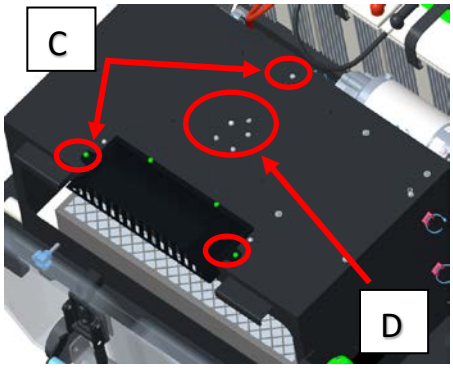
1. Drive the machine to level ground and engage the parking brake.
2. Turn the ignition key to “O”.
3. Open the cover A. Take off the cover (B).
4. Unscrew the screw (C&D). Take of the suction Motor(E) and cover (F)

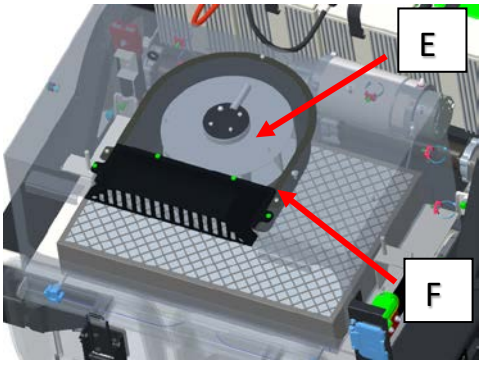
Installation

Assemble components in reverse order of disassembly.









Filter Shaker Motor (M4)

Removal

1. Drive the machine onto level ground and engage the parking brake.
2. Turn off the power.
3. Remove the cover (A, Figure 62)
4. Disengage the latch (F, Figure 62) by pulling its lower end.
5. Remove the hopper (E, Figure 62) by disengaging it from the inner guides with the handle (C, Figure 62).
6. Unscrew the knobs (D, Figure 62) and remove the filter compartment cover (B, Figure 62).
7. Unscrew the knobs (A, Figure 63).
8. Disconnect the filter shaker motor (C, Figure 63) connector (B, Figure 63).
9. Remove the dust filter fixing frame (D, Figure 63).
10. Remove the dust filter (E, Figure 63).
11. Unscrew the screw (F, Figure 63) and nut (H, Figure 63)

Installation

Assemble components in reverse order of disassembly.

Figure 62

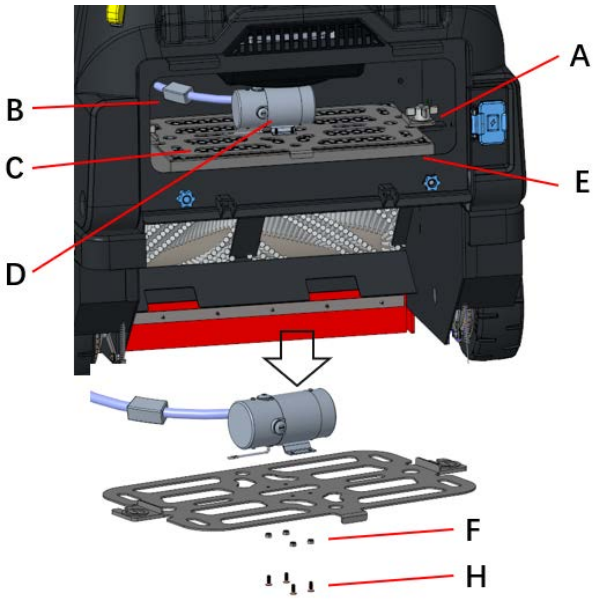


Figure 63

Specifications

Description		Unit	Value
Filter shaker motor technical data	Output Power	W	100
	Input Power	W	144
	Voltage	V	DC 24
	Normal current	A	4-6
	Speed	RPM	6300±10%
	Insulation	N/A	F
	Protection class	N/A	IP54
Suction motor technical data	Power	W	168
	Voltage	V	DC 24
	Normal current	A	6-8
	Speed	RPM	2630
	Air Flow	M^3/ H	1650
	Noise Level	dB_A	72