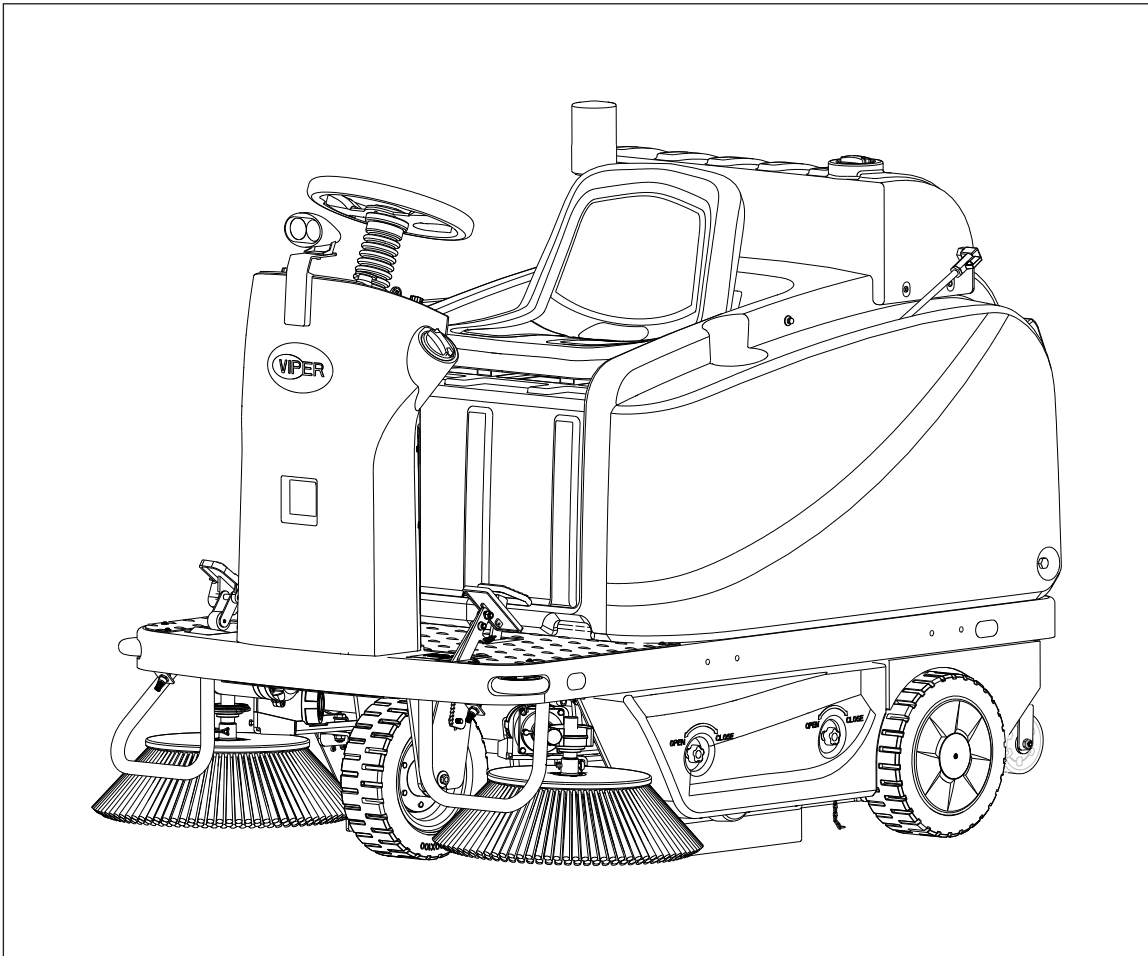


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# ROS1300 *Service Manual*

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**ROS1300** 50000605/ 50000606/ 50000607

# Contents

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Contents .....	i
03 General Information .....	5
Machine General Description .....	5
Service Manual Purpose and Field of Application .....	5
Other Reference Manuals .....	5
Conventions .....	5
Service and Spare Parts .....	6
Serial Number Label .....	6
Safety .....	7
General Safety Instructions .....	7
Lifting Machine .....	8
Transporting Machine .....	8
Technical Data .....	9
Maintenance Schedule .....	10
Machine Structure .....	11
Machine Structure (continues) .....	12
Control Panel .....	13
Service and Diagnostic Equipment .....	14
Dimensions .....	15
04 Control System .....	16
Functional Description .....	16
Component Locations .....	18
Maintenance and Adjustments .....	19
Troubleshooting .....	22
Removal and Installation .....	24
Specifications .....	26
10 Chassis System .....	31
Functional Description .....	31
14 Wheel System .....	32
Functional Description .....	32
Removal and Installation .....	33

---

20 Drive system .....	35
Functional Description.....	35
Wiring Diagram.....	36
Component Locations.....	37
Troubleshooting .....	38
Removal and Installation .....	40
Specifications.....	42
24 Electrical System.....	43
Functional Description.....	43
Wiring Diagram.....	44
Component Locations.....	45
Maintenance and Adjustment.....	47
Setting Installed Battery Type .....	47
Troubleshooting .....	48
Removal and Installation .....	48
Specifications .....	51
Electrical Wiring Diagram(55942189 Rev_B).....	56
30 Solution System .....	57
Functional Description.....	57
Wiring Diagram.....	57
Component Locations.....	58
Removal and Installation .....	59
Troubleshooting .....	60
Specifications.....	60
Rear tank installation.....	61
42 Main Sweeping System.....	62
Functional Description.....	62
Wiring Diagram.....	62
Main Broom Actuator System .....	63
Component Locations.....	63
Maintenance and Adjustment .....	64
Troubleshooting .....	65
Removal and Installation .....	67

---

Specifications.....	70
48 Side Sweeping System .....	71
Functional Description.....	71
Wiring Diagram.....	71
Side Broom Actuator System.....	72
Component Locations.....	72
Troubleshooting .....	73
Removal and Installation .....	75
Specifications.....	77
50 Dust Control System .....	78
Functional Description.....	78
Wiring Diagram.....	78
Component Locations.....	79
Troubleshooting .....	80
Removal and Installation .....	82
Specifications.....	84

## 03 General Information

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### Machine General Description

The ROS1300 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 ROS1300 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
ROS1300 Instructions for Use	55940916	Instructions for Use
ROS1300 part list	55940910	part list

These manuals are available at:

- Local Nilfisk Retailer
- [https:// www.nilfisk.com/](https://www.nilfisk.com/)

### Conventions

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

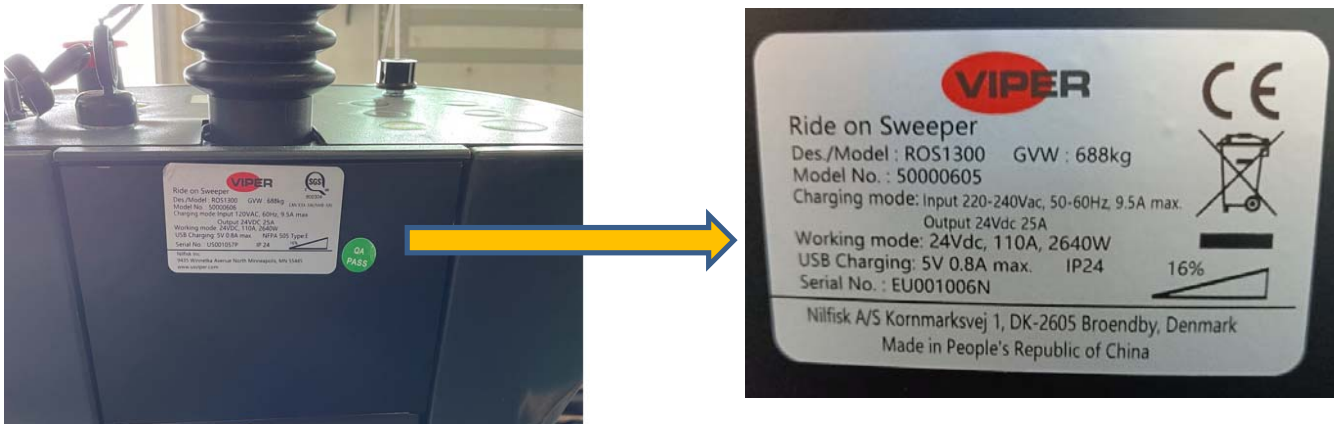
## Service and Spare Parts

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 seat. 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.*

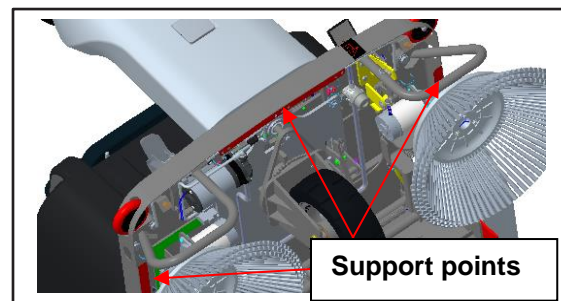
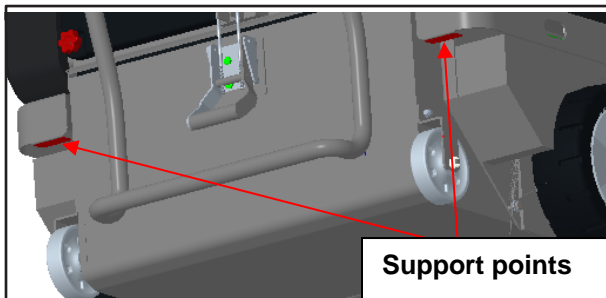
- *To avoid personal injury, this machine should be used only by properly trained and authorized persons.*
- *Do not operate the machine near toxic, dangerous, flammable and/or explosive materials. This machine is not suitable for collecting dangerous or hazardous materials.*
- *In case of fire, use 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.

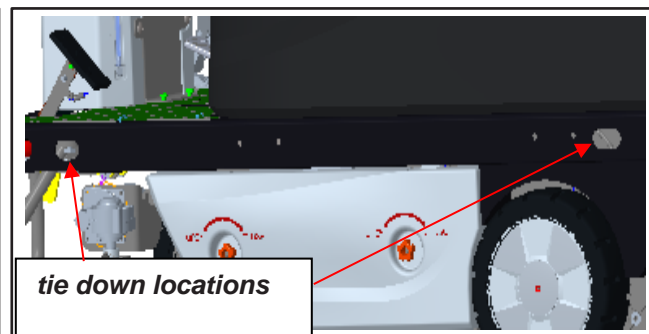
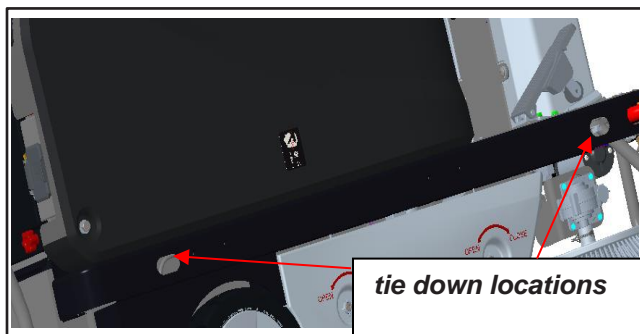
**Lifting Machine****Caution!**

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

Parameter	Value
Machine length	1,680 mm /66.1Inches
Machine width (without side brooms)	1,055 mm /41.5 Inches
Machine maximum height	1,300 mm /51.2 Inches
Cleaning width (without side brooms)	700 mm /27.6 Inches
Cleaning width (with two side brooms)	1,350 mm /53.1 Inches
Minimum distance from the floor (blades not included)	60 mm/2.4 Inches
Main broom size (diameter x length)	300x700 (mm) / 11.8x27.6 (Inches)
Side broom diameter	500 mm/19.7 Inches
Main broom speed	600 rpm
Side broom speed	0~98 rpm
Front wheel specific pressure on the floor	0.88 N/mm <sup>2</sup>
Rear wheel specific pressure on the floor	0.6 N/mm <sup>2</sup>
Machine weight (without batteries)	361 kg/794.2 Lbs.
Gross vehicle weight (GVW)	688 kg/1516.8Lbs.
Shipping weight	495 kg/1089 Lbs.
Shipping size	1810x1180x1500(mm) / 71.3x46.5x59.1(Inches)
Hopper capacity	130 L/34.3 Gal.
Main broom motor	Input 624 W Output 500 W / Input 0.85 HP Output 0.68 HP
Side broom motors	Input 280 W Output 100 W / Input 0.38 HP Output 0.14 HP
Drive system motor	Input 936 W Output 650 W / Input 1.2 HP Output 0.88 HP
Vacuum system motor	Input 168 W Output 139 W/ Input 0.23 HP Output 0.19 HP
Filter shaker motor	Input 144 W Output 100 W / Input 0.2 HP Output 0.14 HP
Rated Power	2640 W/3.6 HP
Power consumption	950 W/1.3 HP
Sound pressure level at workstation (ISO 11201, ISO 4871) (LpA)	72 ± 3 dB(A)
Machine output acoustic power (ISO 3744, ISO 4871) (LwA)	86 ± 3 dB(A)
Vibration level at the operator's arms (ISO 5349-1) (*)	<2.5 m/s <sup>2</sup>
Vibration level at the operator's body (ISO 2631-1) (*)	<1.5 m/s <sup>2</sup>
IP protection class	IP 24

(\*) Under normal working conditions, on a level asphalt surface.

Performance	Value
Maximum forward speed	8 km/h /5 Miles per hour
Maximum reverse speed	4 km/h / 2.5 Miles per hour
Gradeability (transport mode only) Max.	20%
Gradeability (working mode) Max.	16%
Min. turn-around aisle width	2550 mm/100.4 Inches

Battery	Value
Battery voltage	DC 24 V
Battery compartment inner size (length x width x height)	762 x 330 x 370 (mm)/ 30x13x14.6 (Inches)

Vacuuming and filtering	Value
Dust filter	3.5 m <sup>2</sup> / 37.7 ft <sup>2</sup>
Main broom compartment vacuum	8.8 mm H <sub>2</sub> O
Filter shaker	Electric

(\*): Optional

## Maintenance Schedule



### WARNING!

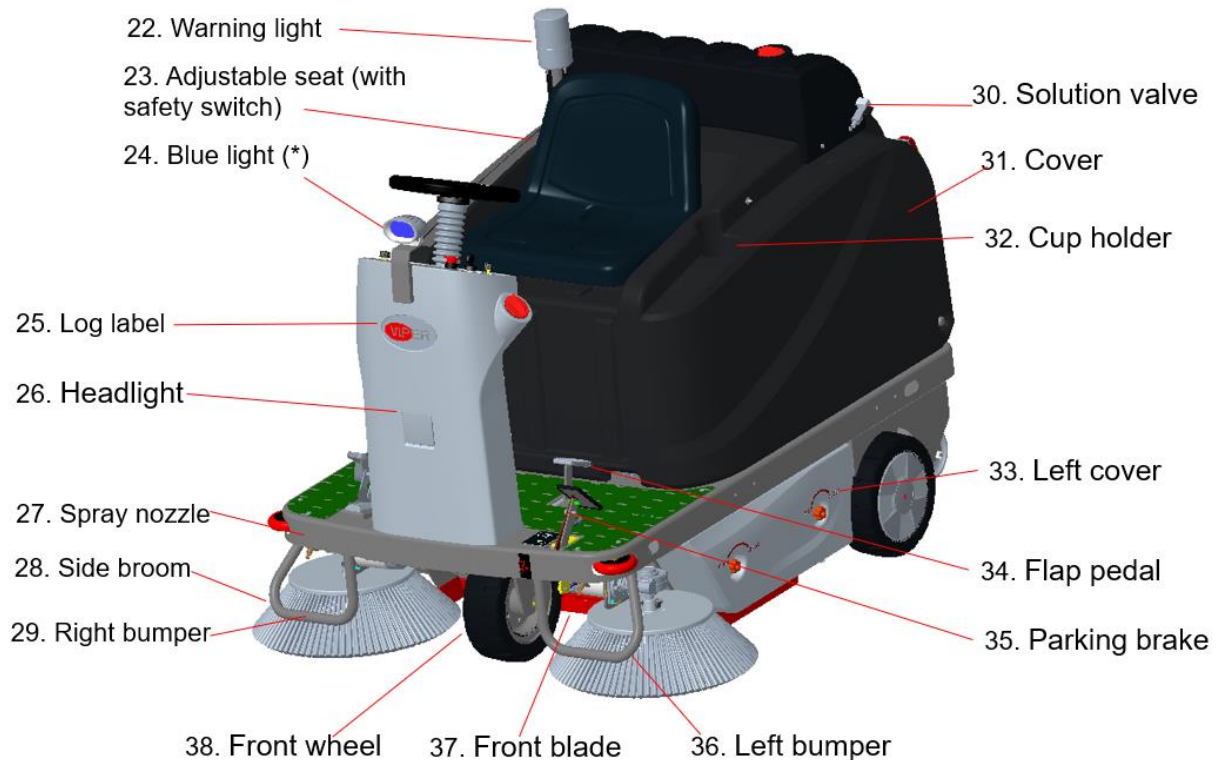
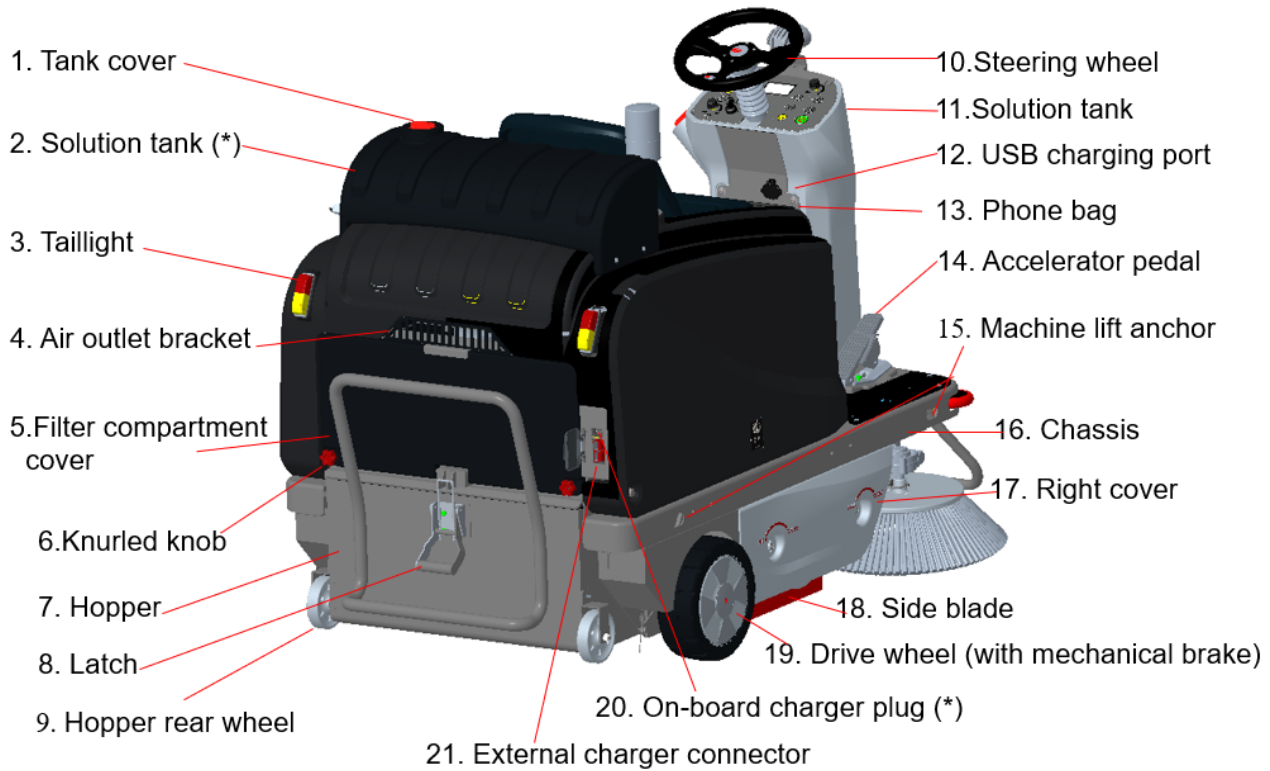
Maintenance procedures must be performed after the machine is turned off and the battery charger cable is disconnected. In addition, carefully read the safety chapter in this instruction.

### SCHEDULED MAINTENANCE TABLE

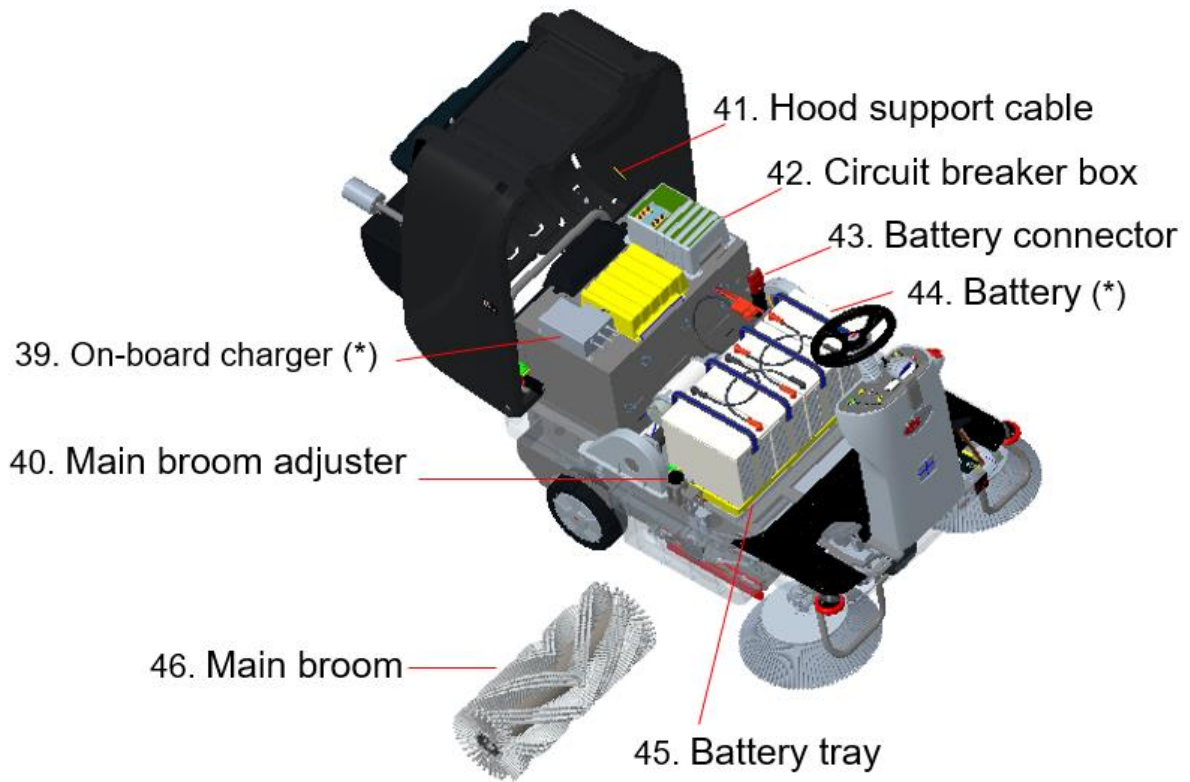
Procedure	Upon delivery	Every 10 hours	Every 50 hours	Every 100 hours	Every 200 hours	Every 400 hours
Battery charging						
Battery (WET) electrolyte level check		(2)				
Main broom cleaning						
Side and main broom height check and adjustment						
Dust filter cleaning and integrity check		(3)				
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)

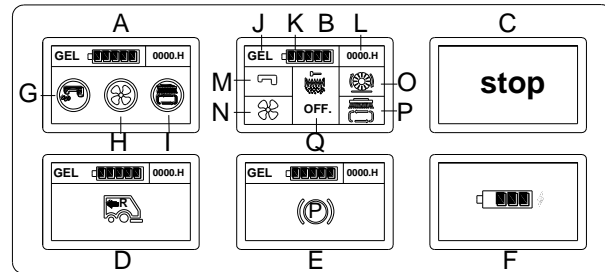


# Control Panel

47. Multifunction display

Items displayed:

- A) Pump/Vacuum motor/Side-broom separate running mode
- B) One-button start mode
- C) Safety stop mode (seat safety switch off)
- D) Reverse mode
- E) Braking/parking mode
- F) Battery charging mode
- G) Pump working
- H) Vacuum motor working
- I) Side broom working
- J) Battery type
- K) Battery level
- L) Runtime (Hour meter)
- M) Pump off-working
- N) Vacuum motor working
- O) Main broom working
- P) Side broom working
- Q) Filter shaker off-working



48. Speed adjusting knob

49. Vacuum button

- Turn on/off the vacuum motor

50. Pump button

- Turn on/off the pump

51. Side broom button

- Turn on/off the side broom

52. Filter shaker button

- Turn on/off the filter shaker
- Press for 1 second to switch on Auto cleaning mode (LED of filter shaker flashes) and press for 1 second again to exit.

53. One-button start button

- Turn on/off all vacuum motor, main broom, and side brooms

54. Forward-reverse button

55. Horn button

56. Ignition key (I=ON, O=OFF)

57. Side broom speed adjusting knob

58. Headlight button

- Turn on/off the headlight
- Press for 1 second to turn on/off the blue light (if equipped)

59. Left-turn indicator button

60. Right-turn indicator button

61. Emergency stop button

62. F8 side broom (L) motor circuit breaker (10A)

63. F9 side broom (R) motor circuit breaker (10A)

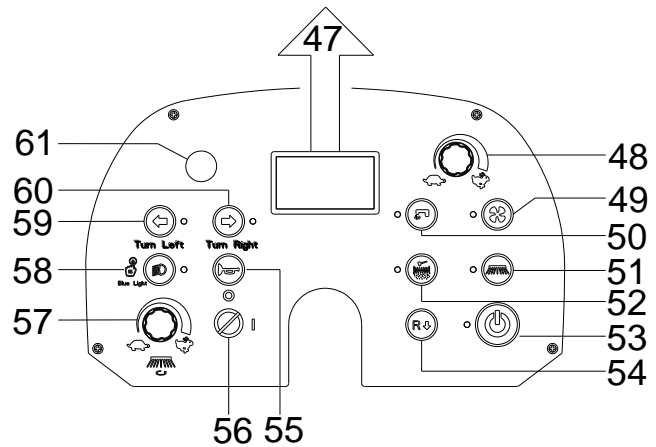
64. F7 main broom motor circuit breaker (30A)

65. F11 vacuum motor circuit breaker (10A)

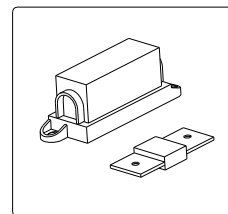
66. F6 main controller circuit breaker (5A)

67. F10 filter shaker motor circuit breaker (10A)

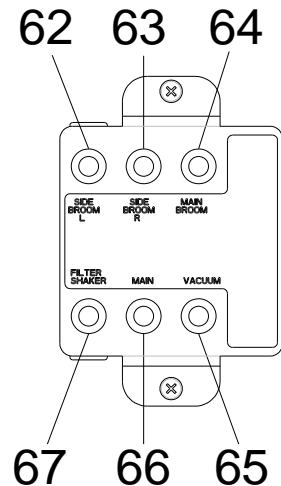
68. F5 controller power fuse (150A/70VDC)



62 63 64



68



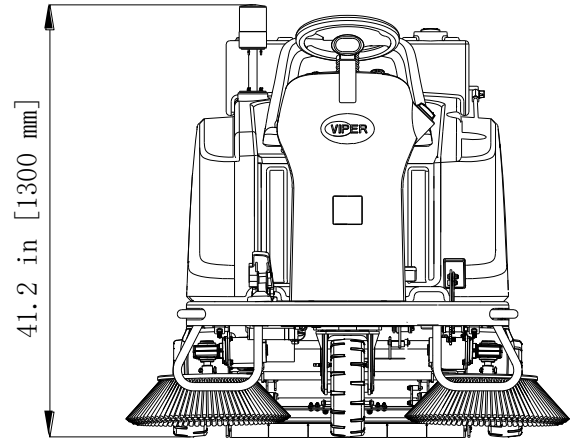
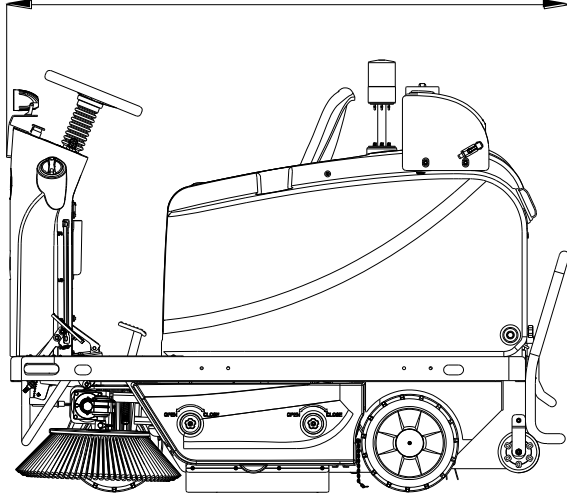
## ***Service and Diagnostic Equipment***

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

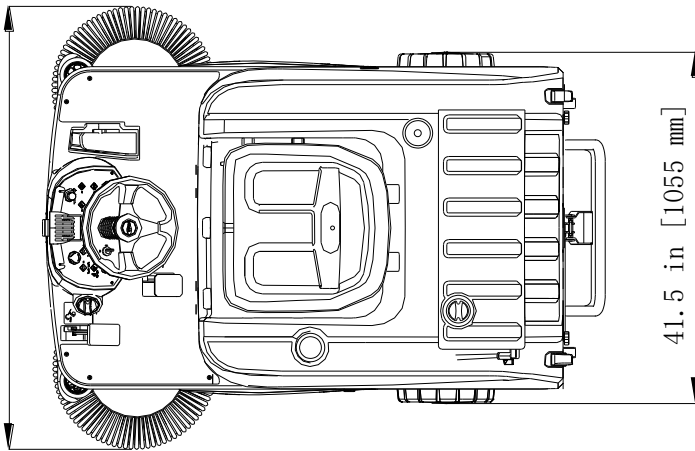
- Digital Voltmeter (DVM)
- Amp clamp with possibility of making DC measurements
- A copy of the User Manual and Spare Parts List of the machine to be serviced.

## Dimension

66.1 in [1680 mm]



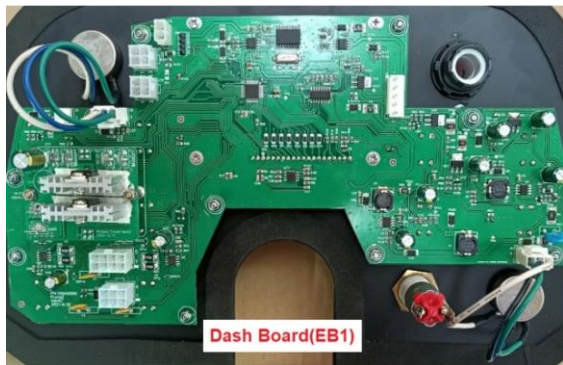
53.1 in [1350 mm]



41.5 in [1055 mm]

## 04 Control System

### Functional Description



The machine utilizes a Dash Board (EB1) to turn on various machine functions and a Main Controller (EB2) to control outputs. When Dash Board (EB1) receives inputs from operator, it activates various components and functions accordingly.

- Main broom motor (M4)
- Side broom motors (M5&M6)
- Suction motor (M8)
- Main broom actuator (M1)
- Side broom actuator (M2)
- Traction motor (M3)
- Water pump (M9)
- Filter shaker motor (M7)
- Headlight (LED1)

- Blue light(LED2(Optional))
- Left-turn LED3& Right-turn LED4
- Battery type setting

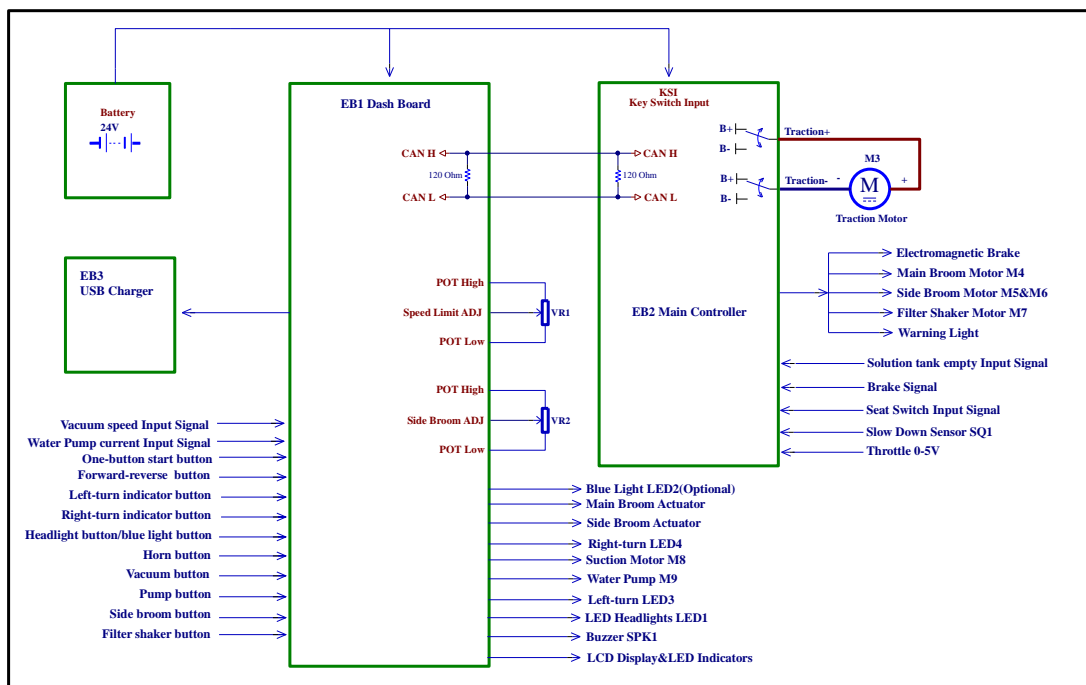
The Dash Board (EB1) also shows battery capacity, running time, and error messages on LCD monitor. Error codes (refer to error codes chapter) will show on the screen when there is a fault. Nothing shows on the screen after trouble solved.

The USB charger for mobile phone (EB3) can provide 5V/0.8A DC power.

The warning light is always on when machine is powered on.

The communication protocol between Dash Board (EB1) and Main Controller (EB2) is CAN protocol.

### Block Diagram





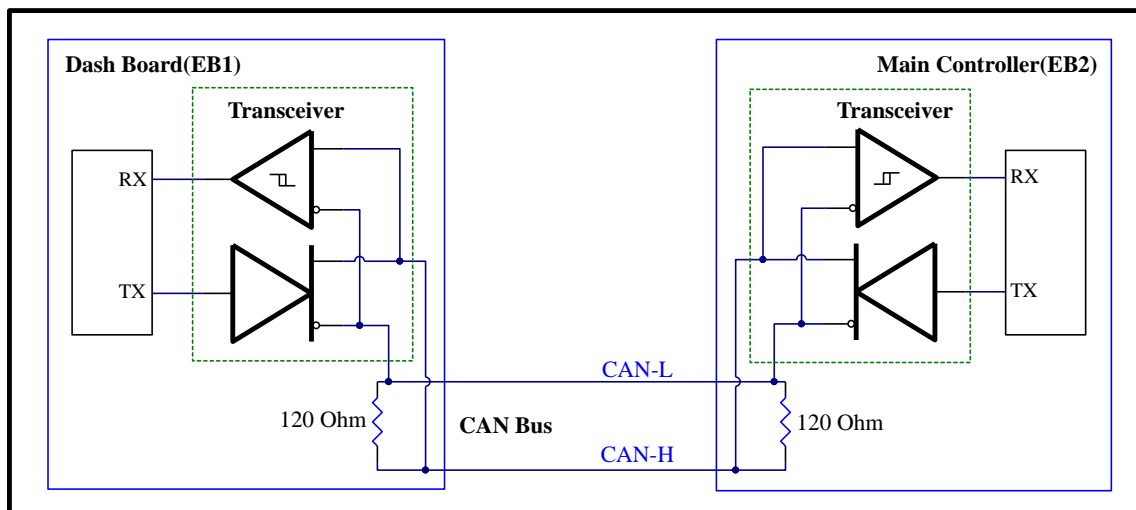
## CAN Bus Communication

CAN Bus communication was originally created for the automotive industry to allow distributed modules (Nodes) throughout the vehicle to communicate with each other over a single serial channel without any single Node being the Master of the communication channel. This means that each module broadcasts what it has to say, and all other modules on the CAN Bus see the message but pay attention only to those messages they need to know about.

The ROS1300 has 2 CAN Bus Nodes as Dash Board (EB1) and Main Controller (EB2). Dash Board (EB1) receives commands from operator and then transmit this information to Main Controller (EB2) through CAN Bus to perform them accordingly.

The CAN bus has one wire being low and the other wire high, voltage-wise. To send a data bit, the module pulls the high and low wires apart, voltage-wise. Both modules monitor this to detect a communication message, which is a string of low and high binary pulses. However, the binary logic states are reverse of typical, in that a logic-1 is recessive, and the difference between CANH and CANL is low (near zero). A logic-0 is the dominant bit, and the difference between CANH and CANL is high (approximately 2.5V).

Because none of the modules represent the Master of the bus system, any of the modules can initiate a bus transmission any time there is not already traffic on the bus. When the module detects inactivity on the bus, it transmits a dominate bit, and begins sending the message priority level bits. But at the same time, it is also monitoring the bus itself to detect if a higher priority message was being initiated at the same time. The message with the higher priority level will have the bus high for the longest period, and therefore, that module knows that it is sending the highest priority message. The other module ceases its transmission and waits until the bus is available again.



## Component Locations

- Dash Board (EB1)
- Main Controller (EB2)
- USB charger (EB3)
- Main contactor (K1)
- Warning light
- Main ground lug
- Main +24V lug

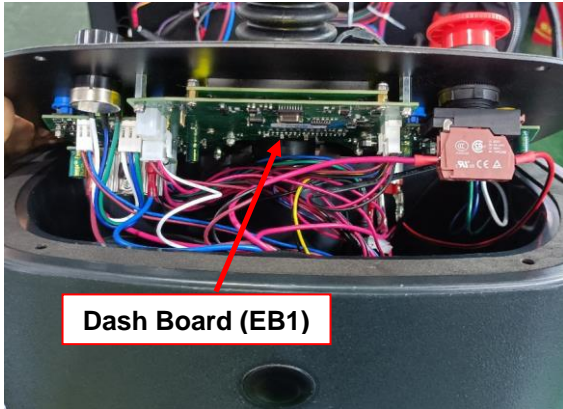


Figure 1

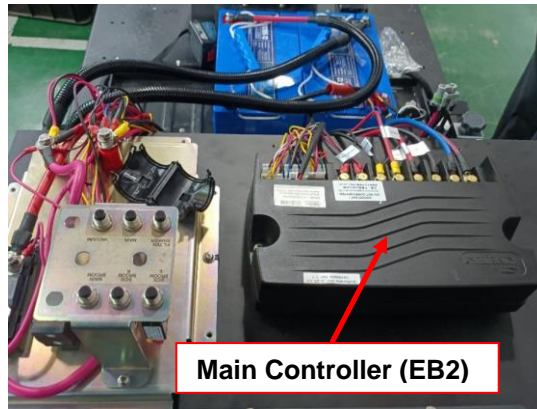


Figure 2

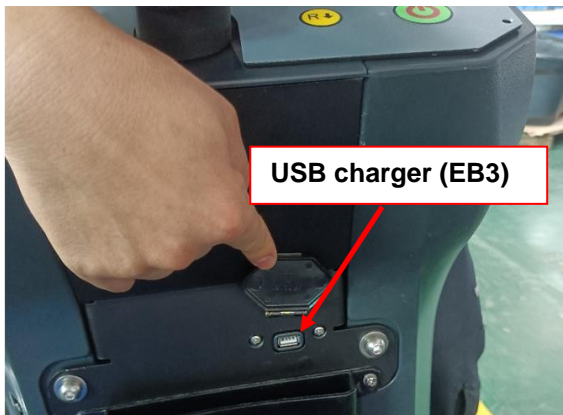


Figure 3

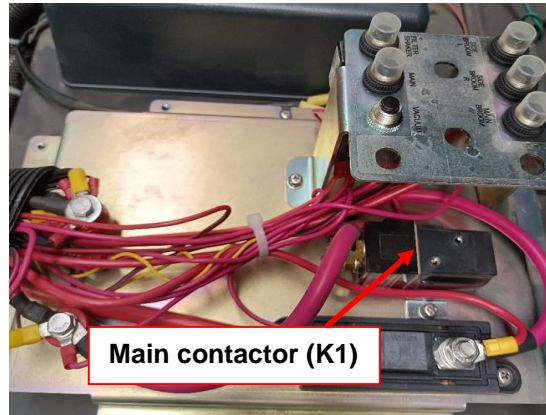


Figure 4



Figure 5

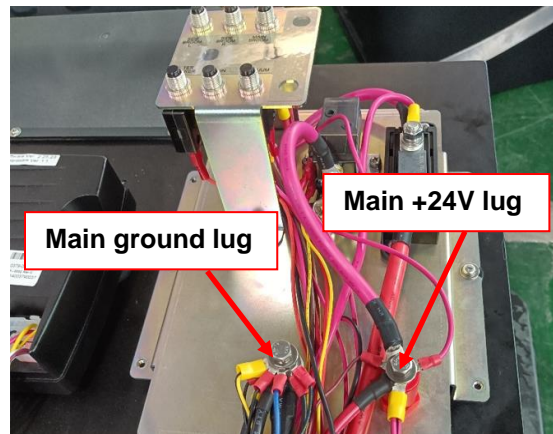
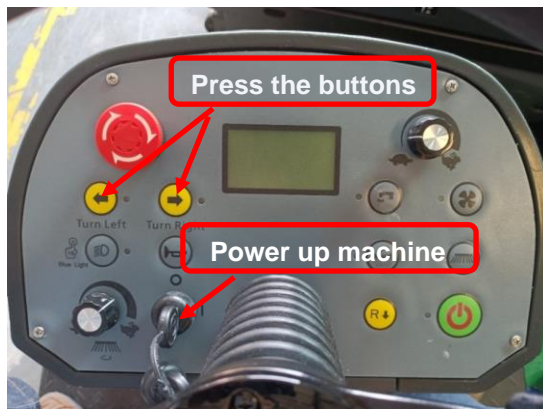


Figure 6

# Maintenance and Adjustments

## Access to Parameter Setting

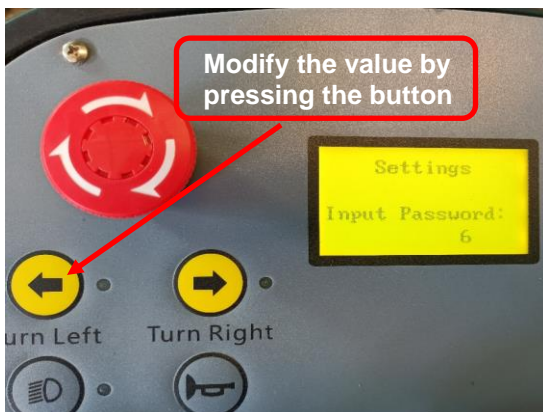
1. Power off the machine. Press “Turn Left” and “Turn Right” button at the same time and power on the machine (Figure 1).
2. LCD will display “Input password” in 2 seconds, then release the two buttons (Figure 2).
3. Input the first digit of the password “661” by pressing “Turn Left” button (Figure 3).
4. Confirm the first digit by pressing “Turn Left” and “Turn Right” buttons at the same time. LCD will display the input status of the second digit (Figure 4).
5. Input the second digit by pressing “Turn Left” button and confirm it. Input the third digit and confirm it. LCD will display “\*\*\*\*” (Figure 5).
6. Confirm the password by pressing “Headlight” button. LCD will display the first parameter of “Param Setting” (Figure 6).
7. Press “Turn Left” or “Turn Right” button to select parameter (Figure 7).
8. Press the “Pump” or “Vacuum” button to change parameter value (Figure 8).
9. Confirm the parameter value by pressing “Headlight” button. Then LCD will display “Update OK” (Figure 9)



**Figure 1**



**Figure 2**



**Figure 3**



**Figure 4**



Figure 5

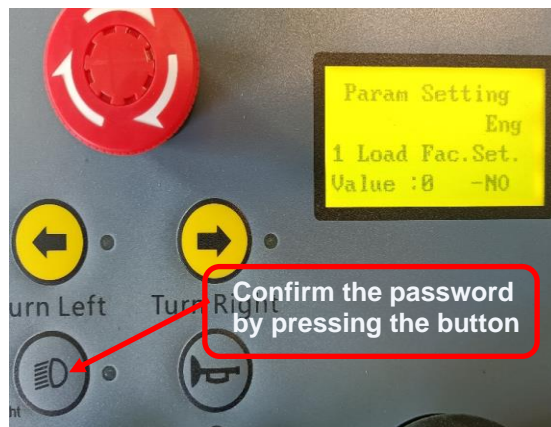


Figure 6



Figure 7



Figure 8



Figure 9

## Dash Board (EB1) and Main Controller (EB2) Parameter Setting

The password to parameter setting of Dash Board (EB1) is "661". Please refer to "Access to Parameter Setting" section (on page 19) for detailed description of 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. Please refer to following steps to set the parameters:

Parameter Setting					
NO.	Parameter Name	Default Value	Range	Unit	Comment
1*	Load Fac. Set.	0	0-1	N/A	Reset to default setting,0-NO/1-YES
2*	LCD Contrast	20	1-30	N/A	LCD display contrast
3	Password(1st)	6	0-9	N/A	Password(first)
4	Password(2nd)	6	0-9	N/A	Password(second)
5	Password(3rd)	1	0-9	N/A	Password(third)
6*	Vac Off Delay	3	1-10	Seconds	Vacuum off delay time
7*	Battery Type	4	0-7	N/A	0-WET/1-EXI/2-FUL/3-DIS/4-GEL/5-OPT/6-TPPL/7-AGM
8*	Filter C. ON T.	5	1-60	Seconds	Filter shaker motor running time of a startup
9*	Filter Auto T.	10	1-60	Minute	Filter shaker motor Automatic start interval time
10*	BAT Compensate	0	-0.5to+0.5	V	Offset voltage
11	Work Mode Spd	100	1-100	%	One-button Start Mode or side broom starts, walking speed limit set parameters (Must be multiplied by the value of ITEM14(forward) and ITEM15(reverse))
12	PUMP current	2	1-5	A	The over-current protection setting of the pump
13	Load Cont. Def	0	0-1	N/A	Reset to default setting, 0-NO/1-YES
14	Tra Fwd H Spd	90	1-100	% BAT	Max. forward transportation speed
15	Tra Rvs H Spd	50	1-100	% BAT	Max. reverse transportation speed
16	Tra Acc Rate F	2	1-10	Seconds	Accelerate rate of forward
17	Tra Acc Rate R	3.5	1-10	Seconds	Accelerate rate of reverse
18	Tra Dec Rate F	1.5	1-10	Seconds	Reduction rate of forward (Not completely loosen the accelerator)
19	Tra Dec Rate R	2	1-10	Seconds	Reduction rate of reverse (Not completely loosen the accelerator)
20	Tra NoStSW DEC	2	0.1-10	Seconds	Reduction rate of loosen the accelerator1
21	ACC-R Dec Rate	2	1-10	Seconds	Reduction rate of loosen the accelerator2
22	Turn Spd Decel	2	0.1-10	Seconds	Turn reduction rate (non-work state)
23	Trun Spd Perc	65	1-100	%	Turn reduction percentage (non-work state) (Must be multiplied by the value of ITEM14 or ITEM15)
24	Scr TrdSpd Dec	2	0.1-10	Seconds	Turn reduction rate (work state)
25	Scr TrdSpd Red	65	1-100	%	Turn reduction percentage (work state) (Must be multiplied by the value of ITEM11 and ITEM14/ITEM15)
26	Min TraSpd Dec	9	0.1-17	V	Minimum turning speed
27	M_Brm Topspeed	24	0-40	V	The maximum speed limit of main Broom
28	S_Brm Topspeed	24	0-40	V	The maximum speed limit of side Broom
29	FilterC Topspd	24	0-40	V	The maximum speed limit of filter shaker motor
30	Tmotor Temp EN	4	0-4	N/A	Traction motor temperature detection opening or closing
31	Tmotor Protect	150	/	°C	Only read

## Troubleshooting

### Error Code List

When an error message is detected by system, the LCD monitor on Dash Board will display the corresponding error number and description. After the problem is corrected, the display will disappear automatically. There is no history function to display error history at present.

Error#	Error Description	Set conditions	Description	Initial action
Error-01	Battery Vol Low	Voltage<19V	Battery voltage low	Check battery voltage, charge battery.
Error-02	Controller Traction Motor Overload	Current>150A, Time>15 seconds	Traction Motor Overload	<ul style="list-style-type: none"> <li>•Traction motor or Main Controller (EB2) or wiring short circuit.</li> <li>• Physical resistance to machine movement such as a dragging brake or going up a steep incline.</li> </ul>
Error-03	Main Broom Overload	Current >30A, Time>8 seconds	Main Broom motor Overload	<ul style="list-style-type: none"> <li>• Main broom motor or Main Controller (EB2) or wiring short circuit.</li> <li>•Physical resistance to motor rotation such as debris wrapped around broom motor shaft</li> </ul>
Error-04	Side Broom Overload	Current >20A, Time>3 seconds	Side Broom motor Overload	<ul style="list-style-type: none"> <li>• Side broom motors or Main Controller (EB2) or wiring short circuit.</li> <li>•Physical resistance to motor rotation such as debris wrapped around broom motor shaft.</li> </ul>
Error-05	Filter Clean Motor Overload	Current >4A, Time>5 seconds	Filter shaker motor Overload	<ul style="list-style-type: none"> <li>•Filter Shaker motor or Main Controller (EB2) or wiring short circuit.</li> <li>•Physical resistance to filter Shaker motor.</li> </ul>
Error-06	Pump Overload	Current >1.5A, Time>2 seconds	Pump Overload	<ul style="list-style-type: none"> <li>•Check if water pump wiring is short circuit and working properly.</li> <li>•Replace water pump.</li> </ul>
Error-07	Charger communication Error	/	Charger charging communication Error	<ul style="list-style-type: none"> <li>•Check if CAN communication lines are broken</li> <li>•Check if order of connection of CAN communication lines is correct.</li> <li>•Check if Dashboard (EB1) is working properly.</li> </ul>
Error-08	Charger to controller connect Error	/	Connection between charger to controller is wrong	<ul style="list-style-type: none"> <li>•Check wire harness in Charger and Main Controller (EB2).</li> </ul>
Error-09	Charger Temp High	Temperature >80°C	Charger temperature is high	<ul style="list-style-type: none"> <li>•Pull out the plug, until the charger cools down.</li> <li>•Replace the charger.</li> </ul>
Error-10	Battery charging Low voltage	Voltage <10V	Battery charging voltage is low	<ul style="list-style-type: none"> <li>• Check batteries</li> <li>•Check/Replace the charger.</li> </ul>
Error-11	Battery Reversed	/	The battery is reversed connected to charger's output.	connect the battery wire correctly
Error-12	Battery Charging High Vol	Voltage >30V	Battery charging voltage is high	<ul style="list-style-type: none"> <li>• Check batteries</li> <li>•Check/Replace the charger.</li> </ul>
Error-13	CC Charging Timeout	Time>720 minutes	Charger constant current charging timeout	<ul style="list-style-type: none"> <li>• Check batteries</li> <li>•Check/Replace the charger.</li> </ul>

Error#	Error Description	Set conditions	Diagnostics	Initial action
Error-14	AC power low	Voltage <95V	Charger's input voltage is low	<ul style="list-style-type: none"> <li>• Check if the supply voltage is normal, try plugging into another power outlet.</li> <li>• Replace the charger.</li> </ul>
Error-15	TPPL Bat. Charger match Error	/	Charger cannot charge TPPL battery.	Use charger that it's suitable for charging TPPL battery.
Error-16	Please release the drive pedal	/	Press accelerator pedal by mistake before turning on ignition key	Release accelerator pedal before turning on key switch.
Error-17	Electric Brake Failure	/	Electric Brake is open-circuit.	Check wire harness in Electric Brake and Main Controller (EB2).
Error-18	Spray Water Depleted	/	The spray water in solution tank depleted	Add water into solution tank
Error-19	Side Broom open_circuit	Low voltage on the side broom negative terminal when the motor is switched off	Side broom is open-circuit.	<ul style="list-style-type: none"> <li>•Check wire harness of side broom motor and Main Controller (EB2).</li> <li>•Check circuit breaker (F8, F9) and side broom motor</li> </ul>
Error-20	Main Broom open_circuit	Low voltage on the main broom negative terminal when the motor is switched off	Main broom is open-circuit.	<ul style="list-style-type: none"> <li>• Check wire harness in main broom motor and Main Controller (EB2).</li> <li>• Check circuit breaker (F7).</li> <li>• Check main broom motor</li> </ul>
Error-21	Pump Motor open_circuit	Low voltage on the pump negative terminal when the motor is switched off	Pump motor is open-circuit.	<ul style="list-style-type: none"> <li>•Check wire harness in pump motor and Dash Board (EB1).</li> <li>•Check circuit breaker (F4).</li> <li>•Check pump motor</li> </ul>
Error-22	Filter Motor open_circuit	Current <1A	Filter shaker motor is open-circuit.	<ul style="list-style-type: none"> <li>• Check wire harness in filter shaker motor and Main Controller (EB2).</li> <li>• Check circuit breaker (F10)</li> <li>•Check filter shaker motor.</li> </ul>
Error-23	Tract Motor over-temperature	Temperature >150°C	Traction motor over-temperature protection	<ul style="list-style-type: none"> <li>• Stop working until it's cold.</li> <li>• Physical resistance to machine movement such as a dragging brake or going up a steep incline.</li> </ul>
Error-24	Rmotor THERMO-SENSOR open	/	The temperature probe of the traction motor is disconnected.	<ul style="list-style-type: none"> <li>• Check wire harness in Temp Sensor and Main Controller (EB2).</li> <li>• Check temperature sensor.</li> </ul>
Error-25	Vacuum Motor open_circuit	Lost speed pulse signal	Vacuum Motor is open-circuit.	<ul style="list-style-type: none"> <li>•Check if the speed pulse wire between the suction motor and Dash Board is open.</li> <li>•Check circuit breaker (F11).</li> <li>•Check suction motor and wire.</li> </ul>
Error-26	Side Broom Speed Limit ADJ ERR	/	The speed adjusting button for side broom is wrong	<ul style="list-style-type: none"> <li>•Check the connections between side broom speed adjusting button (VR2) and Dashboard (EB1)</li> <li>•Check side broom speed adjusting button (VR2)</li> </ul>
Error-27	Tract Speed Limit ADJ ERR	/	The speed adjusting button for traction motor is wrong	<ul style="list-style-type: none"> <li>•Check the connections between traction motor speed adjusting button (VR1) and Dashboard (EB1)</li> <li>•Check traction motor speed adjusting button (VR1)</li> </ul>

## Removal and Installation



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

### Dash Board (EB1)

1. Disconnect the battery cable connection to the machine (Figure 1).
2. Prepare necessary tools, cross screwdriver, and socket spanner.
3. Remove 4 screws on Dash Board, detach Dash Board (Figure 2).
4. Disconnect all harnesses and terminals which are used for connecting Dash Board, then take out Dash Board (Figure 3).
5. Use wrench to take out 10 screws which are used for fastening PCBA (Figure 4).
6. Assemble components in reverse order of disassembly.

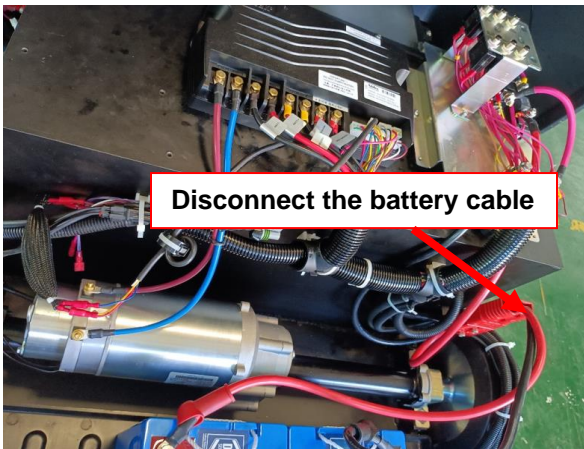


Figure 1



Figure 2

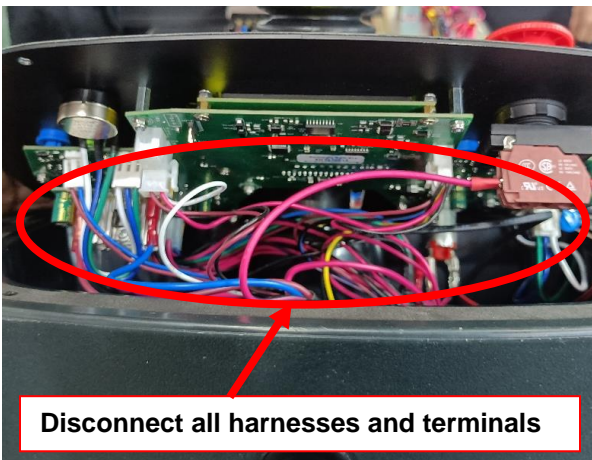


Figure 3

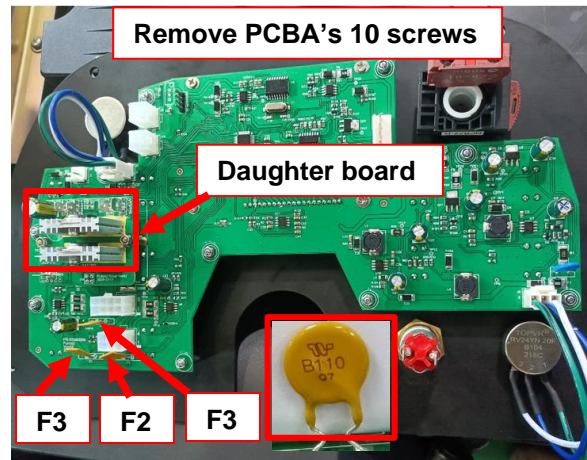


Figure 4



## Main Controller (EB2)

1. Prepare necessary tools, cross screwdriver.
2. Open the cover (Figure 1).and then disconnect battery power (Figure 4).
3. Disconnect all harnesses connected to Main Controller (Figure 2).
4. Remove 2 screws that are used for fixing Main Controller and take out Main Controller (Figure 3).
5. Assemble components in reverse order of disassembly to assemble Main Controller (EB2).



Figure 1

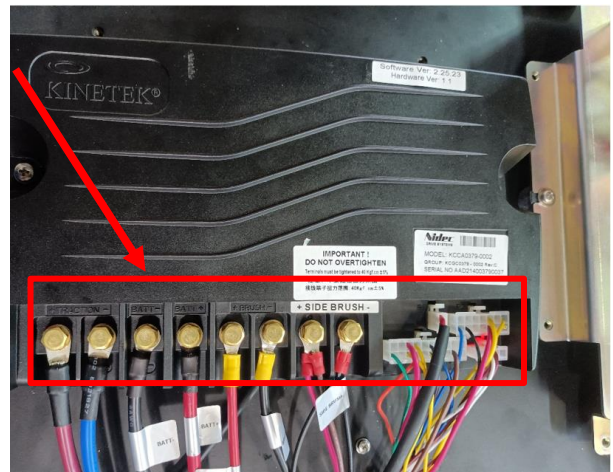


Figure 2

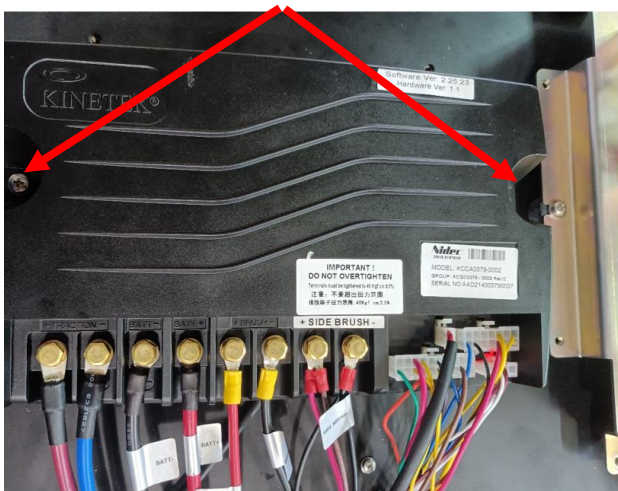


Figure 3

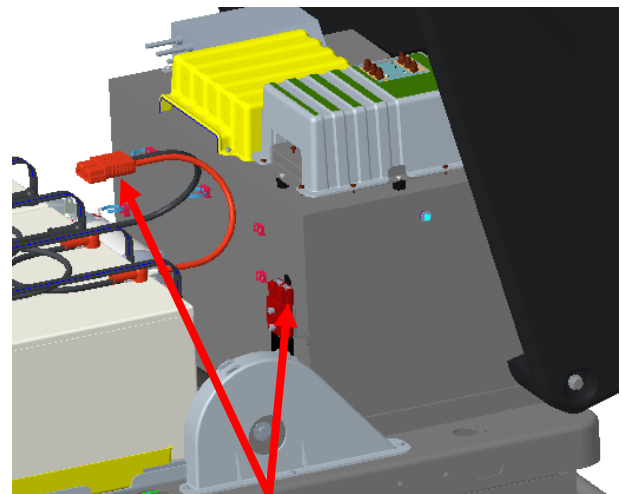


Figure 4

## Specifications

### Sample Shop Voltage Measurement

The following tables contain some “real world” shop voltage measurements to help you recognize what “normal” looks like.

- Unless otherwise noted, all voltage readings are referenced to the main ground lug in the electrical bay.
- Some pin numbers are listed out of sequence when measurements require pin-to-pin voltage references instead of the main ground lug.
- Values of “≈24V” represent full battery voltage, regardless of the circuit path.

Please refer to Figure 1 and Figure 2 for connectors location on Dash Board (EB1) and Main Controller (EB2).



Figure 1. Connectors on Dash Board (EB1)

Dash Board (EB1) J2 Connector				
Pin#	Color	Function	Condition	Value
1	RED	Broom actuator Power+		24V
2	PUR	Charger signal	when the charger is NOT plugged in	3.6V
			when the charger is plugged in	24V
3	RD-BK	Water pump Power+		24V
4	BLK	Side broom actuator out1 +/-	Raise, Ref 8 to 4	+24v
			Lower, Ref 8 to 4	-24V
8	RED	Side broom actuator out2 +/-	At rest, Ref 8 to 4	0V
5	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A
7	BLK	Water pump GND		0V

Dash Board (EB1) J4 Connector				
Pin#	Color	Function	Condition	Value
1	BLK	Headlight &Blue Light GND		0V
2	YEL	Headlight power + output	Headlight On	≈24V
			Headlight Off	0V
3	RED	Blue Light power + output	Blue Light On	≈24V
			Blue Light Off	0V
4	BU-BK	Left LED power + output	Left LED on	≈12V
			Left LED Off	0V
5	BRN	Right LED power + output	Right LED on	≈12V
			Right LED Off	0V

Dash Board (EB1) J5 Connector				
Pin#	Color	Function	Condition	Value
1	BLK	Ground		0V
2	BRN	CAN-H		≈2.56V
3	WHI	CAN-L		≈2.54V
4	RED	Power Input 24V	Key switch on	≈24V
			Key switch off	0V

Dash Board (EB1) J6 Connector				
Pin#	Color	Function	Condition	Value
1	BRN	Buzzer power + output	Buzzer On	≈24V
			Buzzer Off	≈24V
2	BLU	Buzzer power - output	Buzzer On	0V
			Buzzer Off	≈24V

Dash Board (EB1) J7 Connector				
Pin#	Color	Function	Condition	Value
1	BLU	Main broom actuator out1 +/-	Raise, Ref 1 to 4	-24V
			Lower, Ref 1 to 4	+24V
4	BRN	Main broom actuator out2 +/-	At rest, Ref 1 to 4	0V
2	N/A	N/A	N/A	N/A
3	GRN	Water pump out+	Water pump on(70%)	≈15.6V
			Water pump Off	0V
5	RED	USB +24V out		24V
6	BLK	USB GND		0V

Dash Board (EB1) J8 Connector				
Pin#	Color	Function	Condition	Value
1	WHI	Side broom pot high		2.2V
2	BU-BK	Side broom pot in	Max. speed	2.1V
			Min. speed	0.8V
3	GR-BK	Side broom pot low		0.8V

Dash Board (EB1) J9 Connector				
Pin#	Color	Function	Condition	Value
1	WHI	Speed limit pot high		2.2V
2	BU-BK	Speed limit pot in	Max. speed	2.1V
			Min. speed	0.8V
3	GR-BK	Speed limit pot low		0.8V

Dash Board (EB1) J20 Connector				
Pin#	Color	Function	Condition	Value
1	N/A	N/A	N/A	N/A
2	WHI	Speed pulse	Active	2.5V
			Inactive	13V

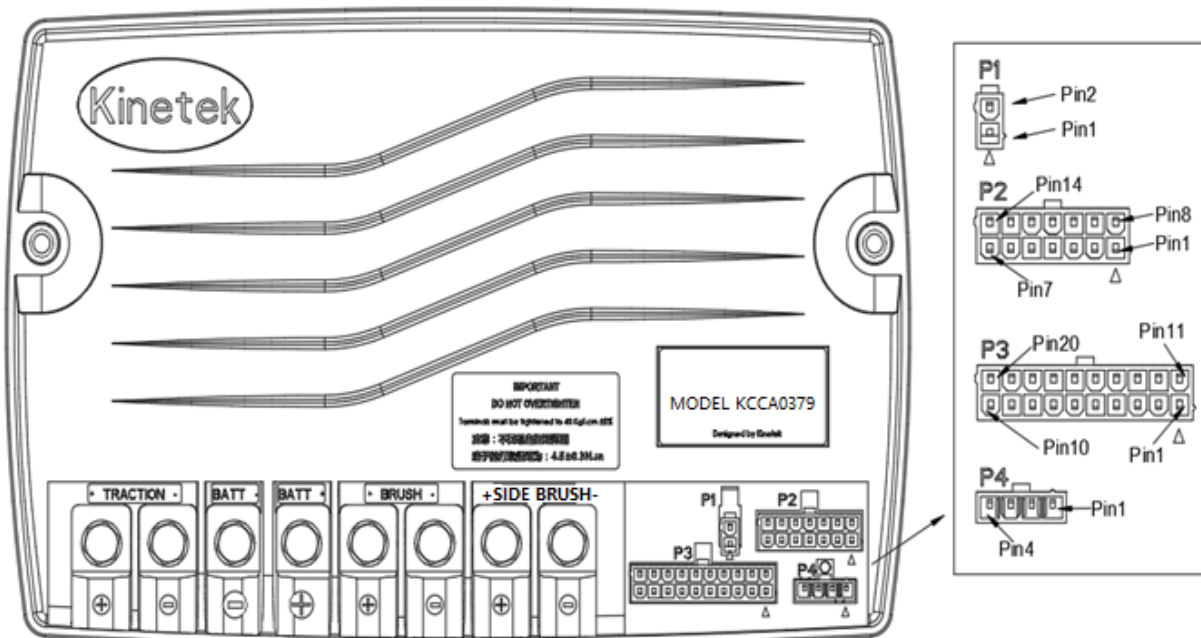


Figure 2. Connectors on Main Controller (EB2)

Main Controller (EB2) P1 Connector				
Pin#	Color	Function	Condition	Value
1	BLK	Electromagnetic Brake+	Inactive, Brake set	≈24V
			Active, Brake released	≈24V
2	RED	Electromagnetic Brake-	Inactive, Brake set	≈24V
			Active, Brake released	≈1.3V

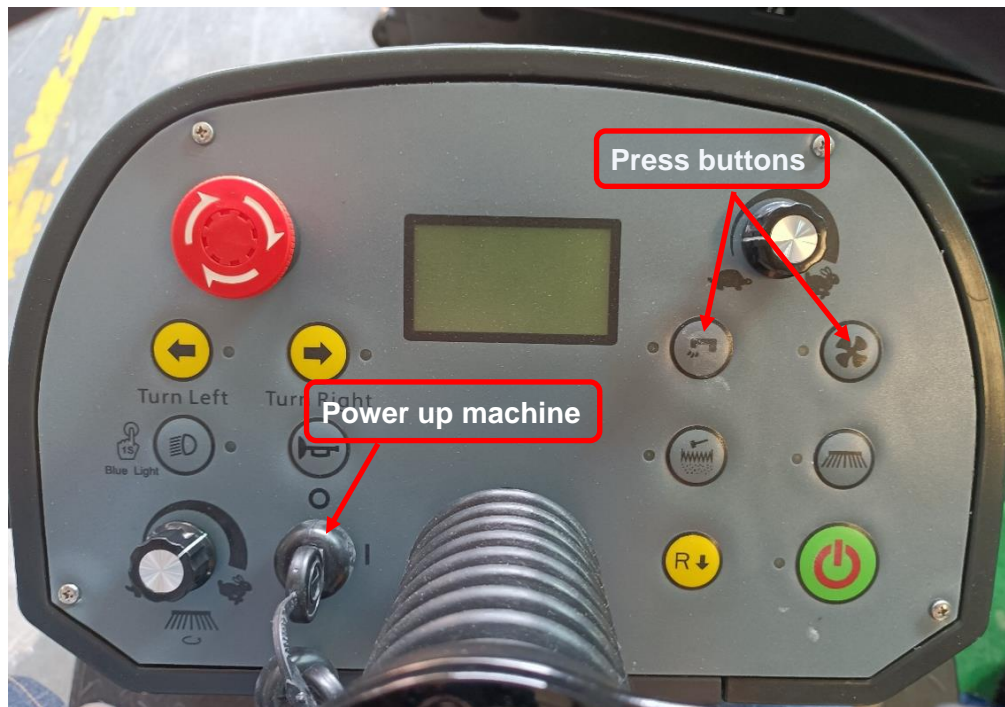
Main Controller (EB2) P2 Connector				
Pin#	Color	Function	Condition	Value
1	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A
3	RED	Filter shaker motor out1 +/- Filter shaker motor out2 +/-	Work, Ref 3 to 10	24V
10	YEL		At rest, Ref 3 to 10	0V
4	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A
6	BLK	Slow down sensor 1 input	Active	0V
			Inactive	24V
7	BLU	Pedal inner relay switch in	Pedal at rest	≈13V
			Pedal pressed	0V
8	YEL	24V Output		≈24V
9	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A
14	GRY	Temp sensor	At 25°C	11.8V

Main Controller (EB2) P3 Connector				
Pin#	Color	Function	Condition	Value
1	N/A	N/A	N/A	N/A
2	BLK	Solution sensor input	Solution tank is empty	0V
			Solution tank is not empty	≈13V
3	N/A	N/A	N/A	N/A
4	BU-BK	Mechanical brake sensor input	Pressed	0V
			Released	≈13V
5	YE-BK	Seat sensor input	Seat active	0V
			Seat inactive	≈13V
6	N/A	N/A	N/A	N/A
7	ORG	Warning light output	Key switch on	≈0.2V
			Key switch off	Drop to 0V
8	YEL	24V Output	Key switch on	≈24V
			Key switch off	Drop to 0V
9	N/A	N/A	N/A	N/A
10	GRN	Accelerator wiper	Pressed (Max)	≈5V
			Released	0V
			Dead band	0-1.5V
11	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A
15	PUR	Charger signal	active	24V
			inactive	≈3.6V
16	N/A	N/A	N/A	N/A
17	YEL	Main contactor(K1) output	Active	≈0.9V
			Inactive	≈24V
18	RED	Key switch input	key switch on	≈24V
			key switch off	0V
19	N/A	N/A	N/A	N/A
20	N/A	N/A	N/A	N/A

Main Controller (EB2) P4 Connector				
Pin#	Color	Function	Condition	Value
1	N/A	N/A	N/A	N/A
2	BRN	CAN-H		≈2.5V
3	WHI	CAN-L		≈2.5V
4	N/A	N/A	N/A	N/A

### Parameter Setting Without Password

Some parameters in following table can be set without password. Please refer to following steps to set the parameters. Power down the machine. Press “pump” button and “vacuum” button at the same time. Meanwhile power up the machine. See figure below. LCD will display the first parameter in 4 seconds, then release the two buttons. 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.



Parameter Setting Without Password					
NO.	Parameter Name	Value	Range	Unit	Comment
1*	Battery Type	4	0-7	N/A	0-WET/1-EXI/2-FUL/3-DIS/4-GEL/5-OPT/6-TPPL/7-AGM
2*	LCD Contrast	20	1-30	N/A	LCD Contrast
3*	Filter C. ON T.	5	1-60	Seconds	Filter motor turn on time
4*	Water Spray Spd	70	1-100	%	Water spray speed setup
5*	Filter Auto T.	10	1-60	Minute	Filter auto turn on Cycle. Range(1~60Minute), 1Minute per step.

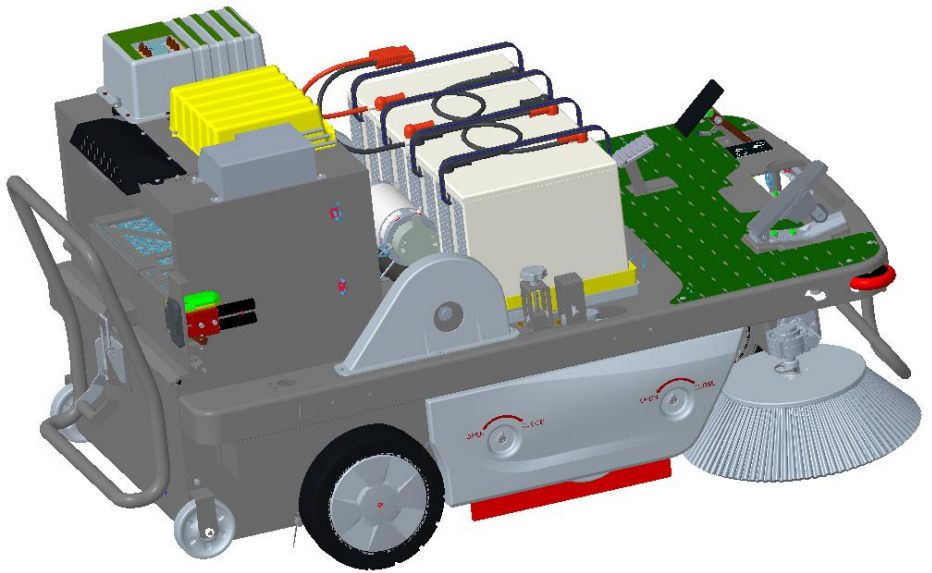
## 10 Chassis System

### Functional Description

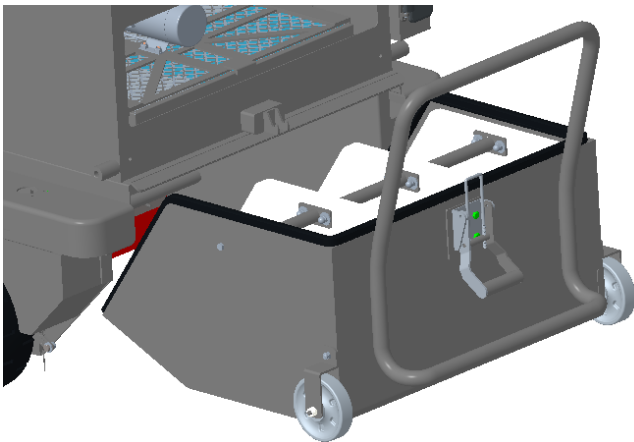
The chassis is a welded steel framework that provides the backbone structure on which the rest of the machine components are mounted.

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

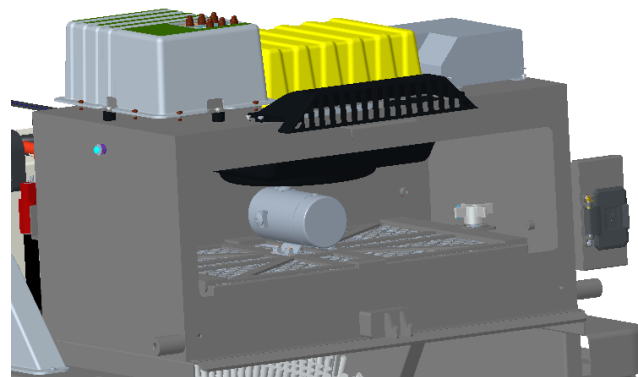
Due to the concentrated weight, the battery tray mounts directly to the chassis, for stability and support.



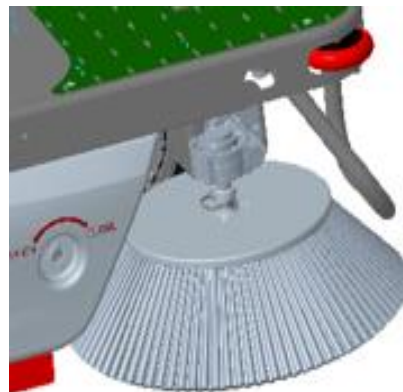
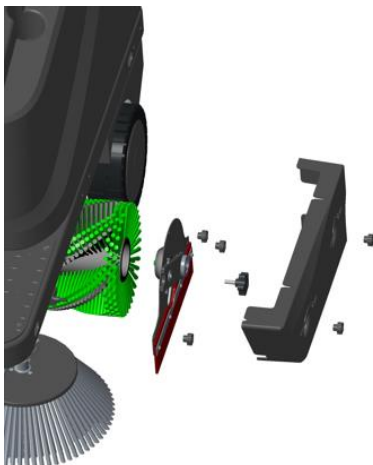
The hopper is mounted at the end of the chassis.



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

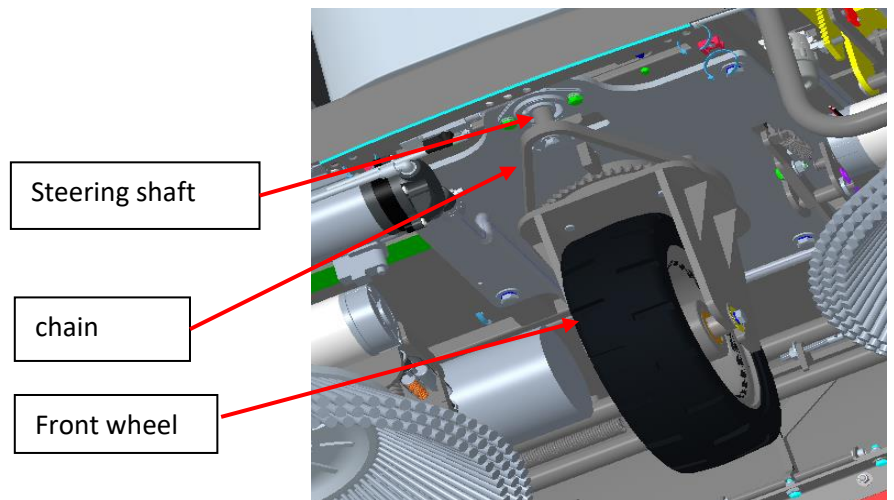
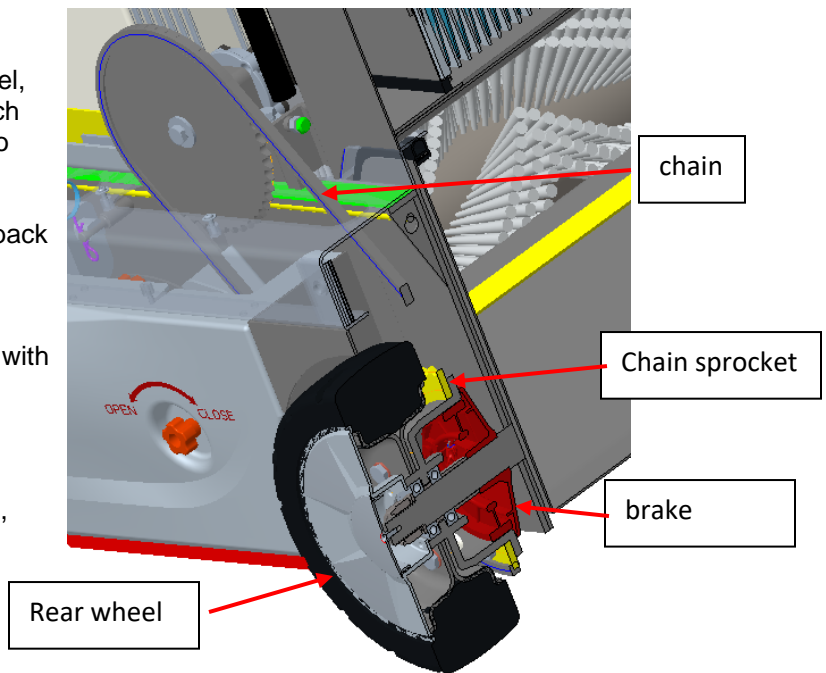
### Functional Description

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.





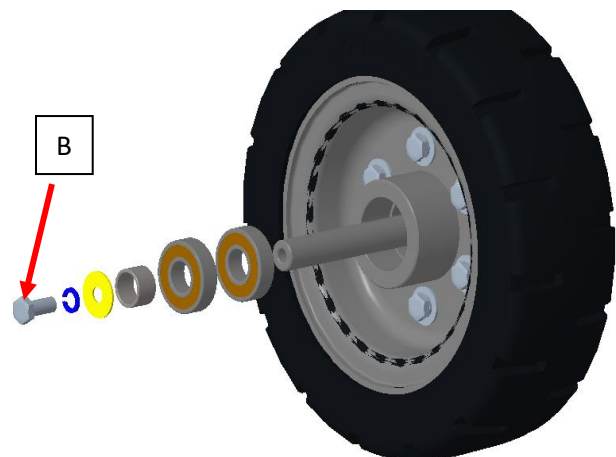
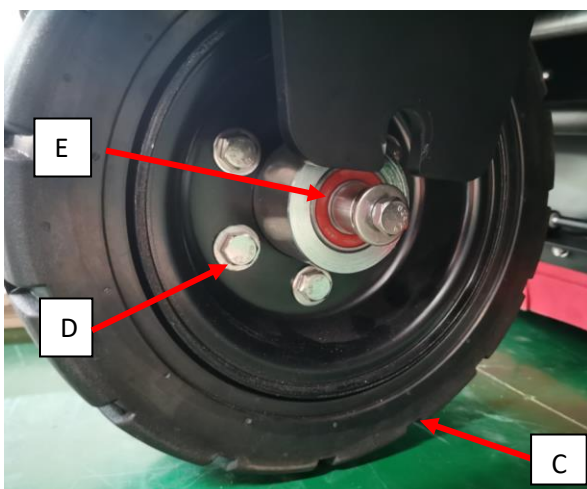
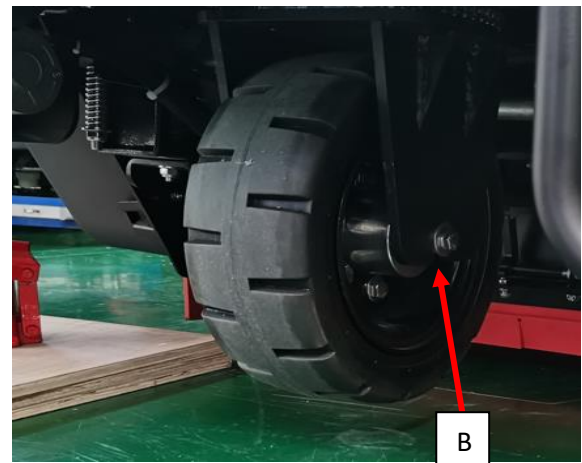
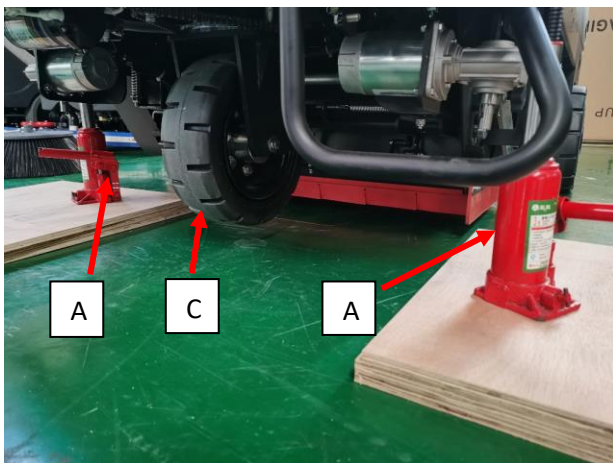
## Removal and Installation Front Wheel

### Removal

1. Park machine on level ground.
2. Switch 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).



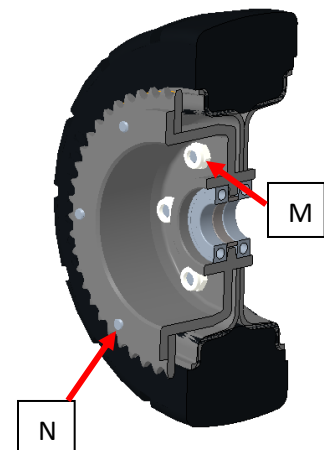
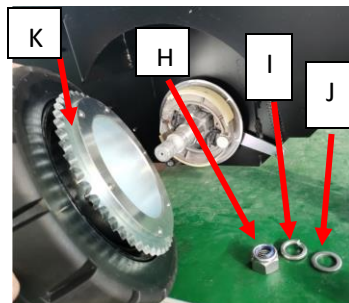
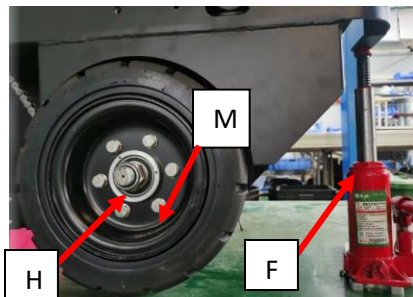
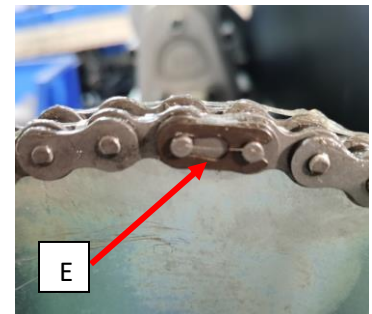
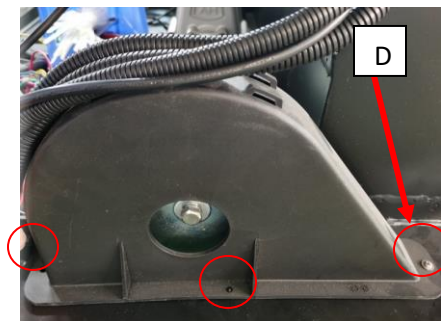
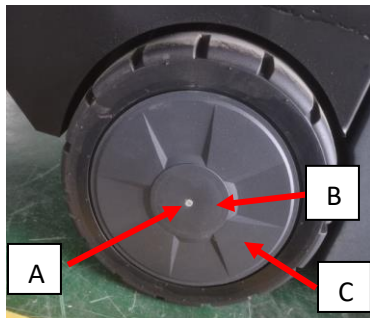
## Rear Wheels

### 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.

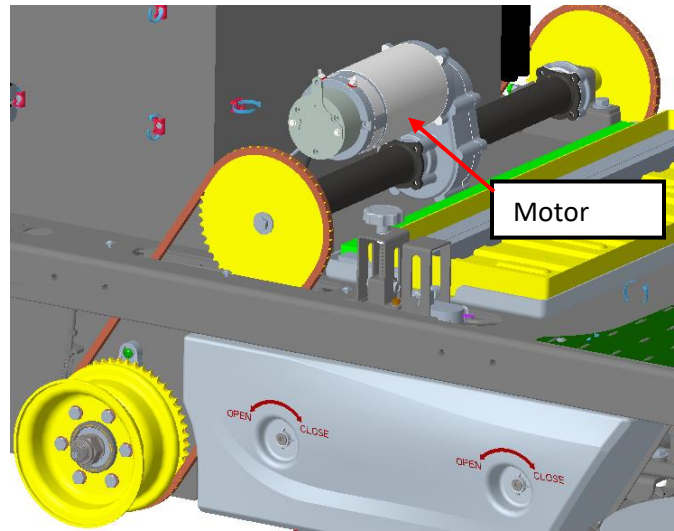


## 20 Drive system

The traction motor (M3) drives the rear wheels of machine. When the motor starts, it drives two chain discs, which drive the two rear wheels connected by the chain. Make the machine to propel. This is the drive wheel system.

The speed limit potentiometer (VR1) enables operator to adjust the maximum forward and reverse speed of machine at its full throttle. The speed of traction motor is controlled by throttle pedal. When Dash Board (EB1) receives information from speed limit potentiometer (VR1) it will transmit it to Main Controller (EB2) via CAN Bus. The higher voltage the pedal outputs, the faster the speed is. The pedal has a micro-switch that are activated when pedal is first pressed. When pressing pedal, the input of P2-7 change from 13V to 0V. Then Main Controller (EB2) controls the electric brake (KA1) to enable motor to run. The dead band voltage range of pedal output is 0-1.5V. The machine will not begin to move until the pedal output voltage is above 1.5V. The turning radius of the 2 rear wheels are different which achieves turning through differential.

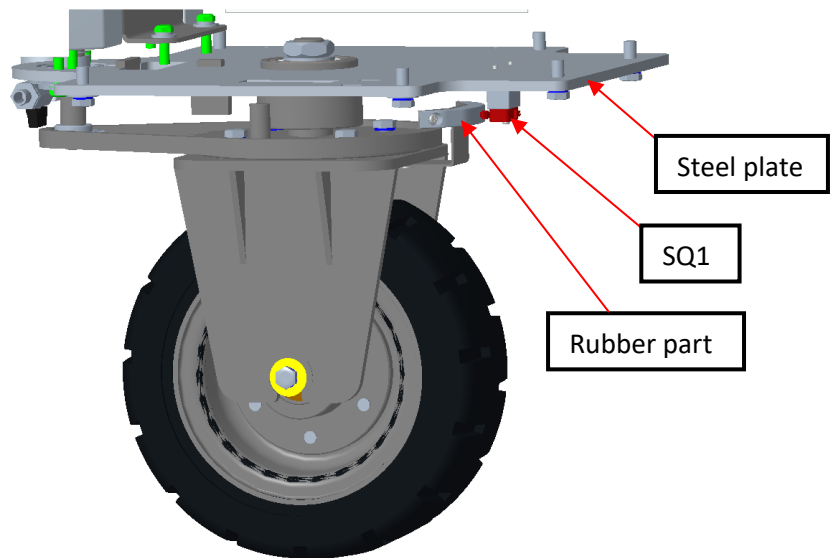
### Functional Description



There is a reverse button on Dash Board (EB1). When it is pressed, the buzzer sounds and Dash Board (EB1) will send the reverse command via CAN-BUS to Main Controller (EB2), then the output voltage of Main Controller (EB2) to both ends of traction motor will be reversed, thus achieving reverse operation of traction motor.

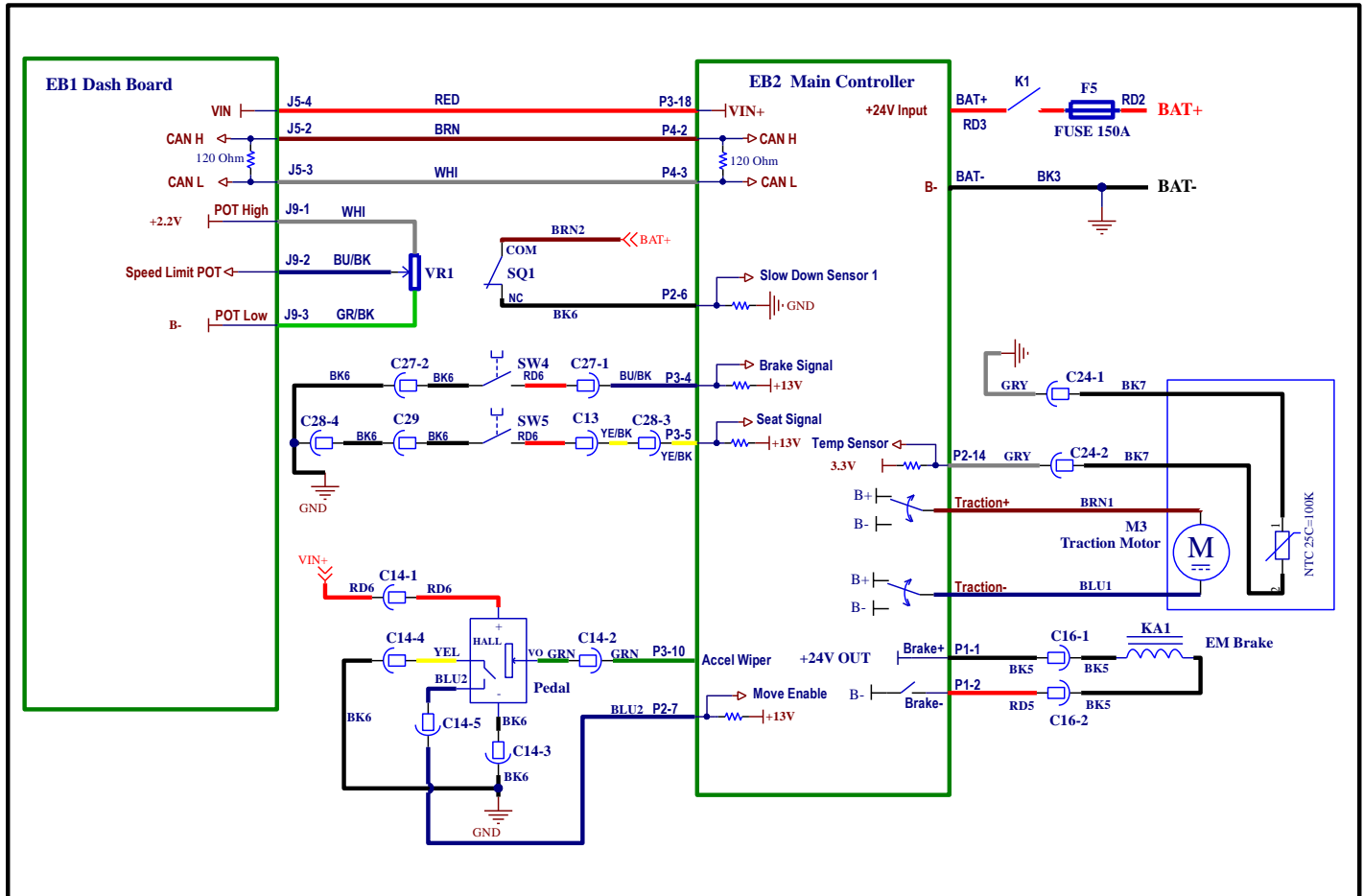
There is a Micro-switch (SQ1) monitor the deflection of the front wheels. See SQ1 assembly diagram below.

SQ1 is to slow down walking speed when turning. When walking straight, the Rubber part is always pressing the bar of SQ1 to keep it contacting with rubber part, output to Main Controller (EB2) is 24V. when the front wheel turning left or right angle is more than 16 degrees, the Rubber part disconnects with the bar of SQ1, output changes to 0V. Thus, walking speed turns to 65% of the max speed.



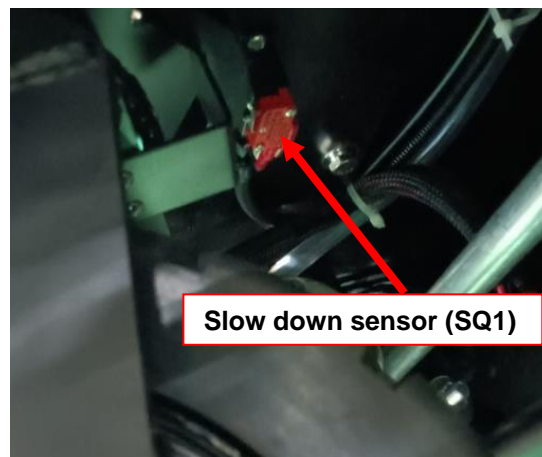
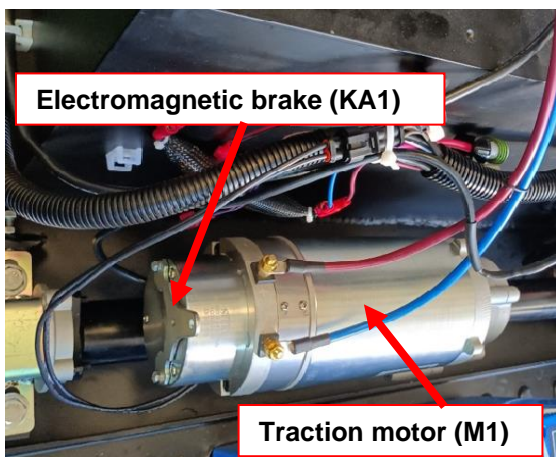
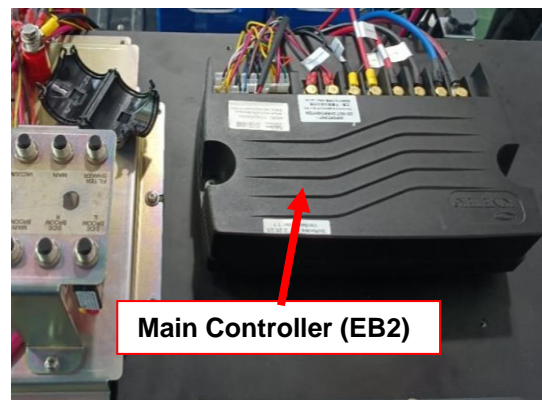
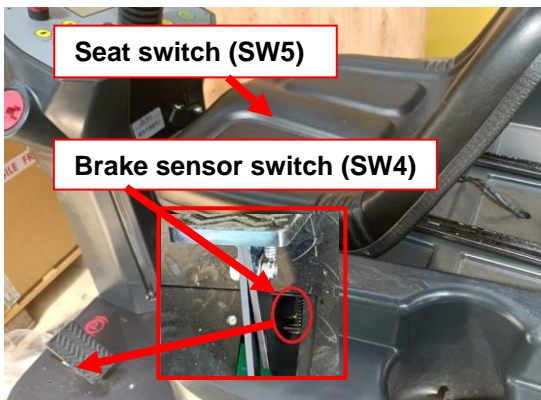
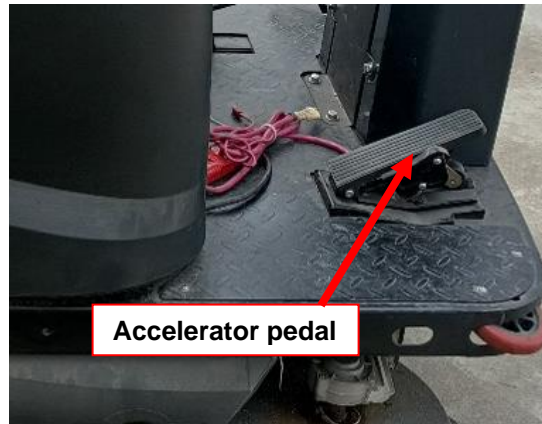
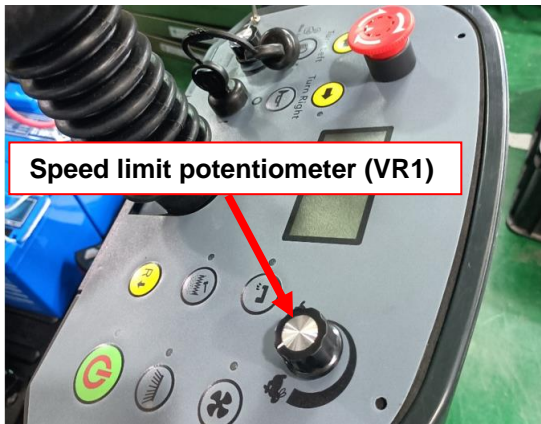
When seat switch (SW5) is off, LCD will display “stop”, and traction motor will be disabled.  
 When brake switch (SW4) is on, LCD will display “brake Icon”, and traction motor will be disabled.

# Wiring Diagram



## Component Locations

- Speed limit potentiometer (VR1)
- Accelerator pedal
- Brake sensor switch (SW4)
- Traction motor (M1)
- Slow down sensor (SQ1)
- Seat switch (SW5)
- Main Controller (EB2)
- Electromagnetic brake (KA1)



## Troubleshooting

Trouble	Possible causes	Remedy
The machine can't move	Traction motor wire connection fault	Check wire harness
	Traction motor fault	Check motor amperage/check motor resistance /replace motor
	Driving wheel controller fault	Check Main Controller (EB2) wire harness/replace Main Controller (EB2)
	Dash Board (EB1) fault	Check Dash Board (EB1) wire harness/replace Dash Board (EB1)
	Electromagnetic brake (KA1) 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
	Throttle pedal fault	Replace throttle pedal
The machine moves slowly	Check wiring of sensor SQ1	Power supply of SQ1 is 24V. When machine is not turning output is 24V. If output voltage is wrong, replace SQ1
	Check if installation of SQ1 is loose	Readjust installation site of SQ1
	Check speed limit potentiometer (VR1)	Replace speed limit potentiometer (VR1)
	Check if maximum output voltage of throttle pedal is about 5V	Replace throttle pedal

## Traction Motor Amperage Check



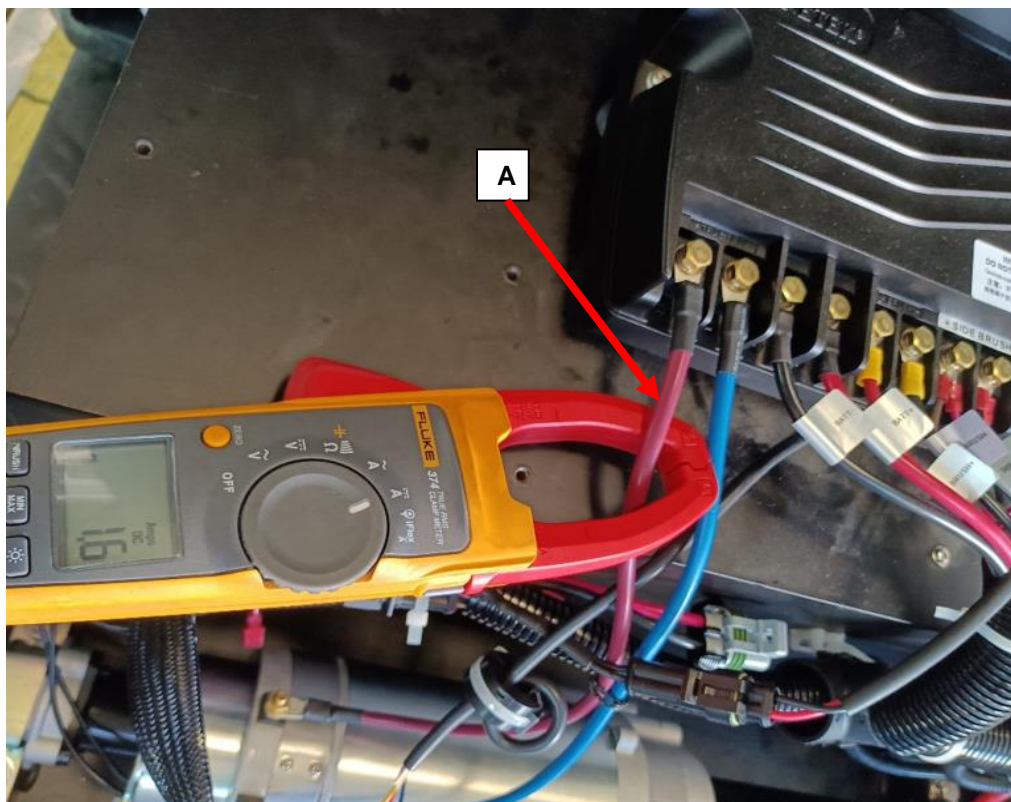
**Warning!** This procedure must be performed by qualified personnel only.

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



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

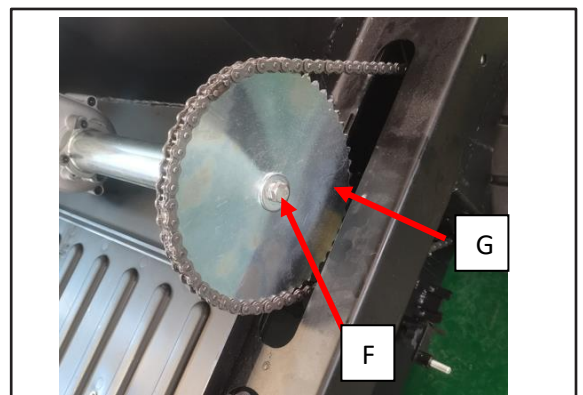
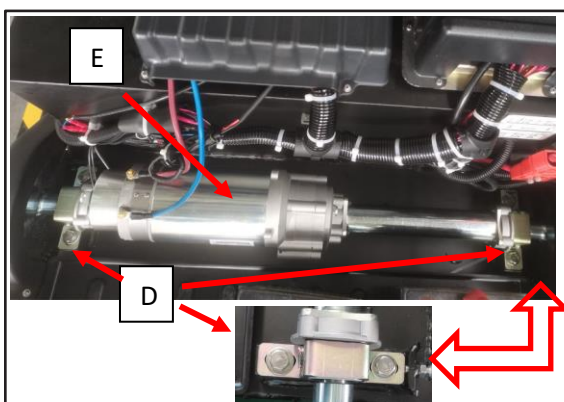
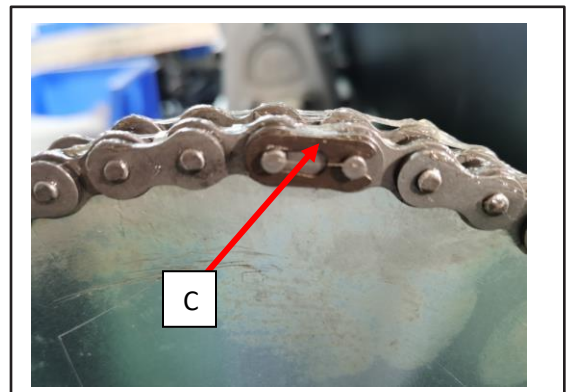
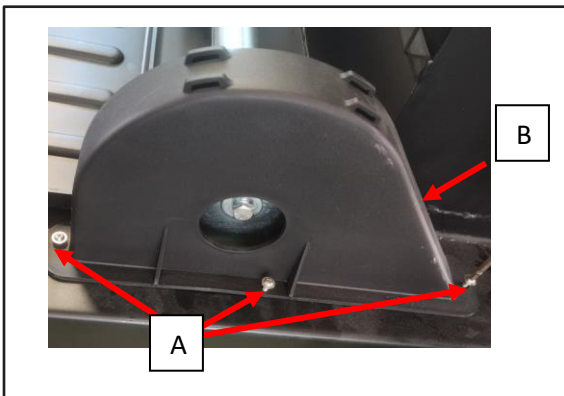
1. Apply amp clamp to positive wire (A, Figure) of traction motor wiring harness.
2. Turn on machine and activate forward drive at its maximum speed via throttle pedal. Check whether current draw is between 8A and 22A when voltage is at 24V.
3. Release throttle pedal.
4. If amperage is higher than 22A, perform following procedures to determine cause and correct abnormal amperage.
  - Check and make sure electromagnetic brake (KA1) can release properly.
  - Disassemble motor and check condition of all components and wiring, repair or replace them if necessary.
5. If above-mentioned procedures can't get amperage correct, it is necessary to replace traction motor.



## Removal and Installation Traction Motor (M1)

### 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 traction motor (E).

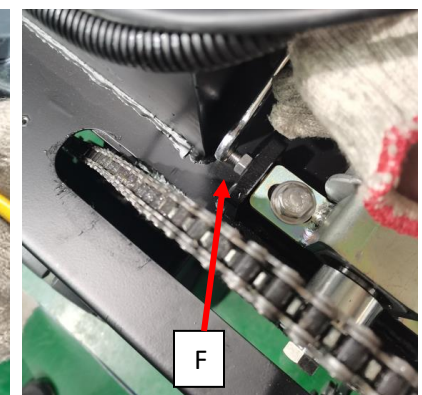
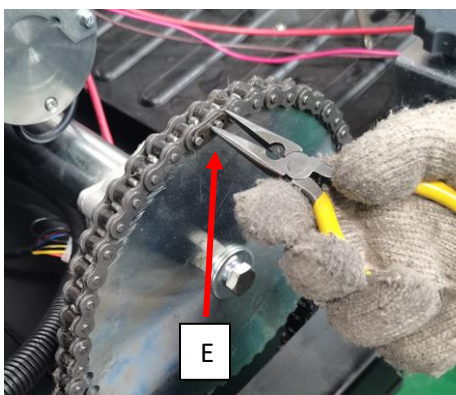
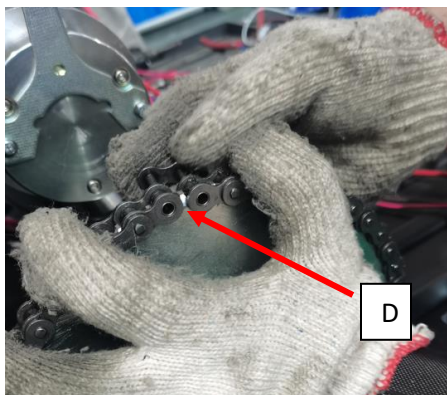
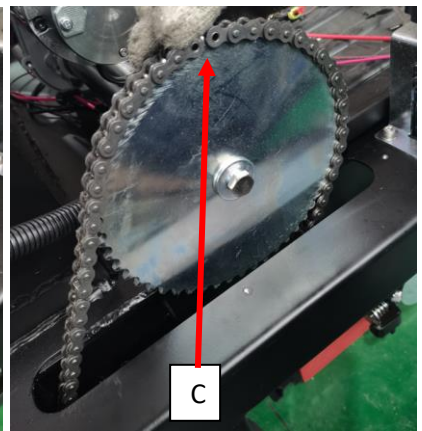
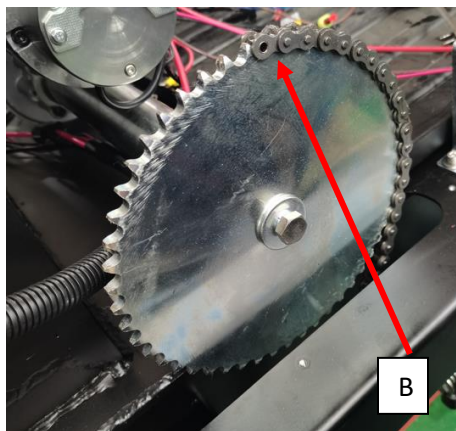
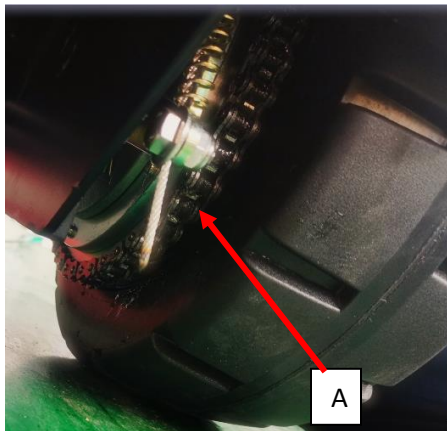




## Installation

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

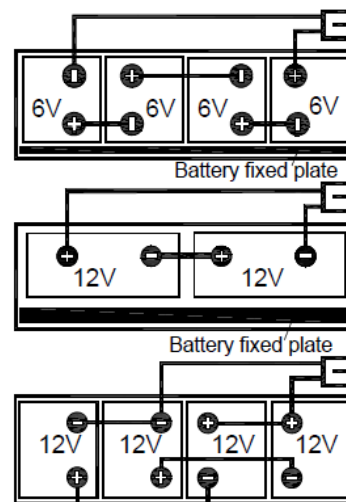
Description	Unit	Value
Traction Motor Rated Input Power	W	936
Traction Motor Rated Input Voltage	V	24
Traction Motor Rated Input Current	A	39
Traction Motor Allowed Over Current (less than 1 minute)	A	150
Traction Motor Normal Current (traction motor lifted)	A	10-20
Traction Motor Rotor Winding Resistance at 25°C	Ω	<0.09
Electromagnetic Brake Coil Resistance at 25°C	Ω	50
Speed Limit Potentiometer (VR1) Coil Resistance at 25°C	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. Includes power supply and power control components, switches, and fuses, etc.

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 (as shown on the right).



#### K1 Contactor and SW3 Switch

When charger is inserted, charger sensor switch (SW3) will close. If key switch is on at this time, LCD will be off. And at the same time Main Controller (EB2) will disconnect K1 and prevent any output. When fully charged and voltage is more than 24V, LCD will display full battery power status in battery power icon after unplugging charger and turning on key switch.

#### Fuses and Circuit Breaker

F5(150A) fuse in series between the battery and Main Controller (EB2), as the Main circuit overcurrent protection; F6 (5A) circuit breaker is mainly to protect the Dash Board (EB1).

#### SW1 and SW2 Switch

The emergency switch (SW1) and key switch (SW2) are connected in series, which are used to power Dash Board (EB1) and Main Controller (EB2). When one of the switches is opened, all machine functions will be disabled.

Only when both the key switch (SW2) and emergency switch (SW1) are switched on can USB charger (EB3) charge the phone.

To prolong battery lifespan, the machine has low voltage cut-off function. When battery voltage is low, the battery power icon on LCD flashes to remind operator to charge. Broom motor and vacuum motor can't work normally until the battery is fully charged and the battery power icon displays full battery power status.

Different battery type settings are of different low voltage cut-off thresholds. See corresponding voltage values in table below. If the type of battery is changed, the battery type parameter must be updated. See section "Parameter Setting Without Password" (on page 30).

Battery Type	WET	EXI	FUL	DIS-EV	GEL	OPT	ENE	AGM
LVC Voltage (V)	19.4	20.6	20.6	21.8	20.6	20.6	21.8	20.6
Reset Voltage (V)	24.0	24.1	24.1	25.3	24.1	24.1	25.1	24.1

# Wiring Diagram

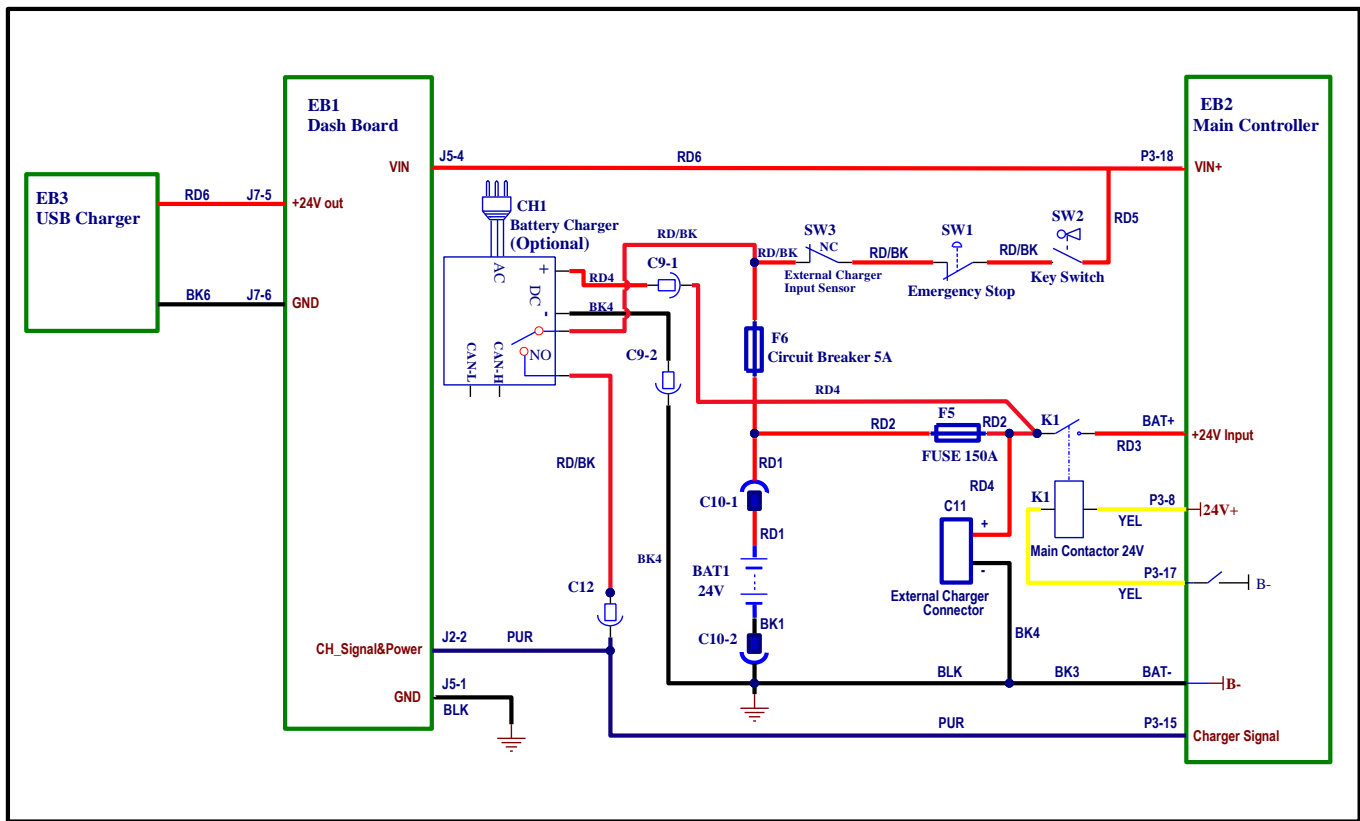


Figure 1

## Component Locations

- Dash Board (EB1)
- Battery (BAT)
- Battery connector
- Main controller (EB2)
- Circuit breaker (F6:5A) & FUSE (F5:150A)
- Main contactor(K1)
- External charger connector (C11)
- Key switch (SW2)
- Emergency switch (SW1)
- Charger sensor switch (SW3)
- USB charger (EB3)

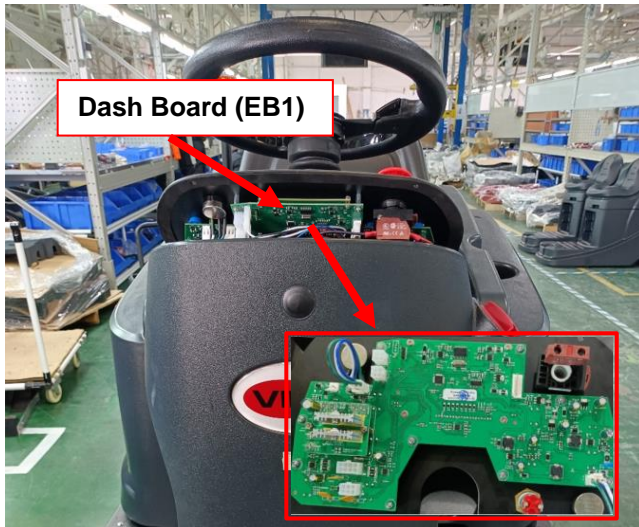


Figure 2

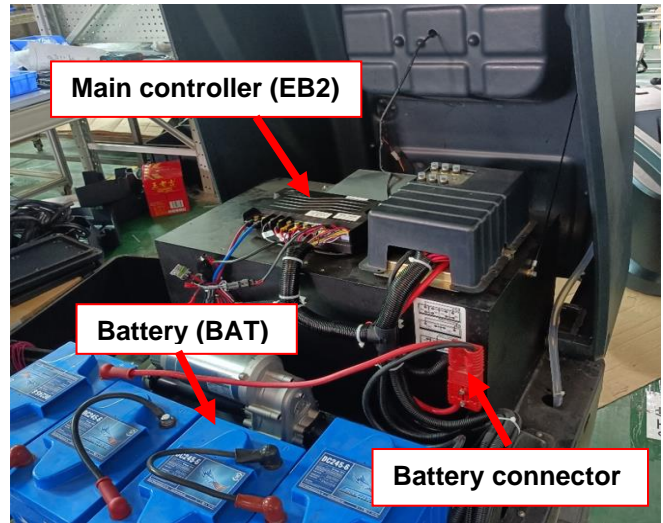


Figure 3

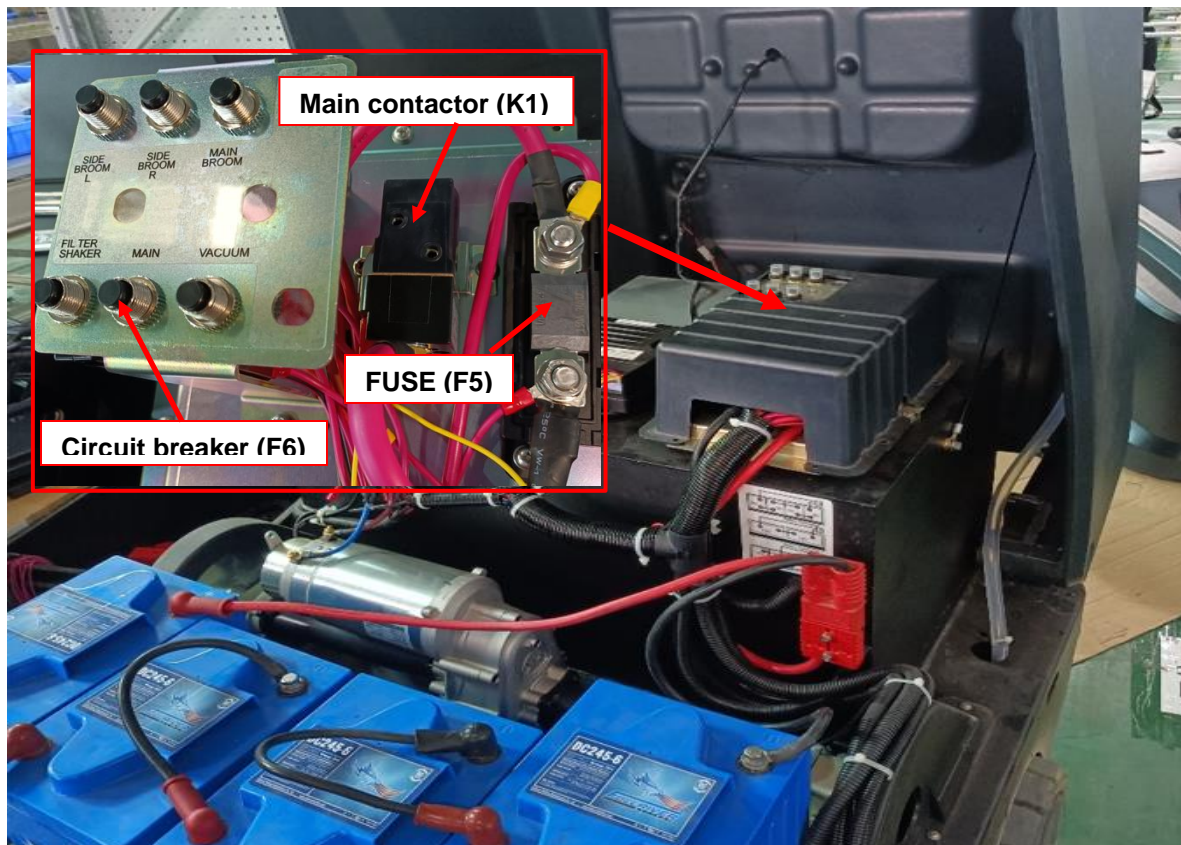


Figure 4

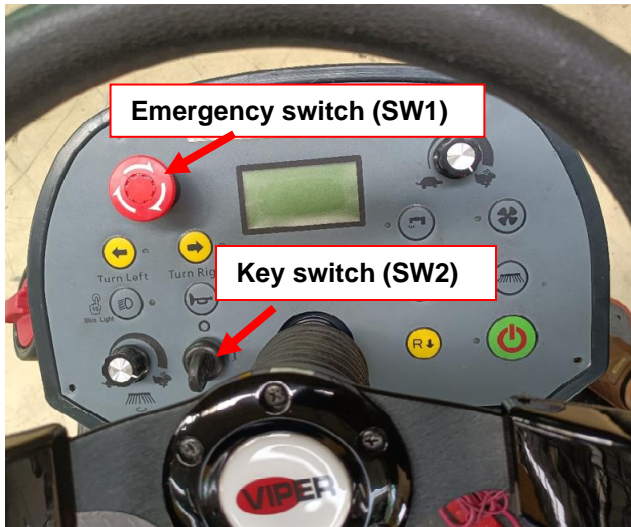


Figure 5



Figure 6

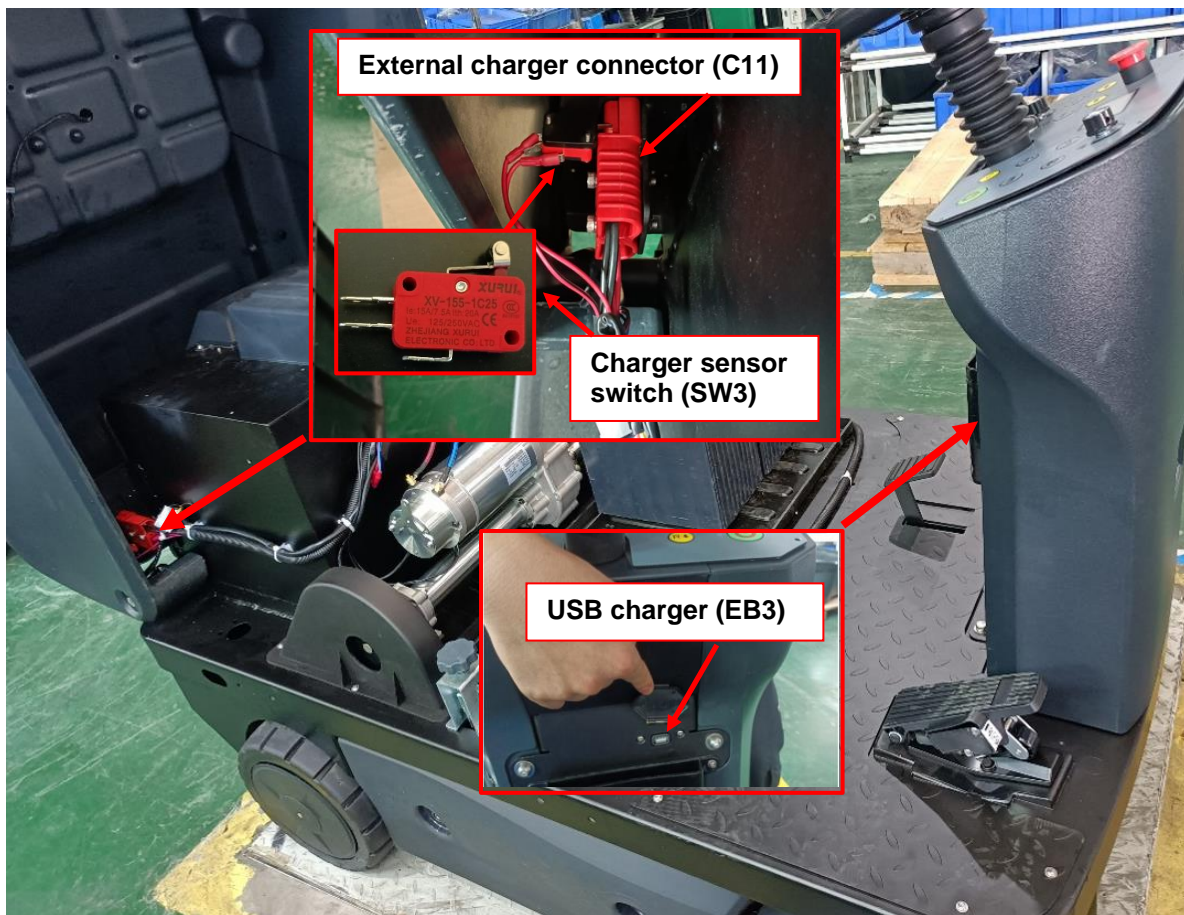


Figure 7

## Maintenance and Adjustment

### Setting Installed Battery Type

According to the type of batteries (WET/GEL/AGM/DIS/EXI/FUL/OPT/ENE(TPPL)), set up the machine as follows:

1. Press vacuum button (A, Figure 8) and pump button (B, Figure 8) at the same time.
2. Insert ignition key (C, Figure 8) and turn it to "I".
3. Several seconds later the system enters select battery mode (Figure 8).
4. Release both vacuum button (A, Figure 8) and pump button (B, Figure 8).
5. Press vacuum button (A, Figure 8) or pump button (B, Figure 8) to select battery type (E, Figure 8).
6. Press headlight button (D, Figure 8), about 1 second later the screen displays "Update OK", indicating that battery type is set up, then restart machine. (C, Figure8).

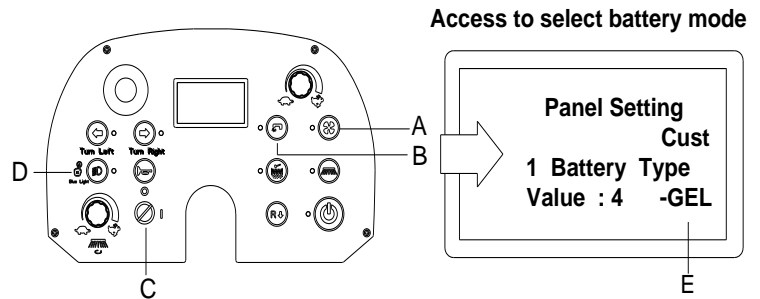


Figure 8

### Battery Installation

1. Make sure that the machine is turned off with the ignition key and the parking brake is engaged.
2. open the cover (A, Figure 9) carefully.
3. The machine is equipped with battery cables suitable for installing 4X6V batteries. Carefully put the batteries into the compartment, then install them correctly.
4. Route and install the battery cables (connect the battery negative cable to the machine power cable last and disconnect it first as shown in Figure 10), then carefully tighten the nut on each battery terminal.
5. Place the protection cap on each terminal, and then connect the battery connector to the connector on the machine.
6. Turn back the cover carefully.

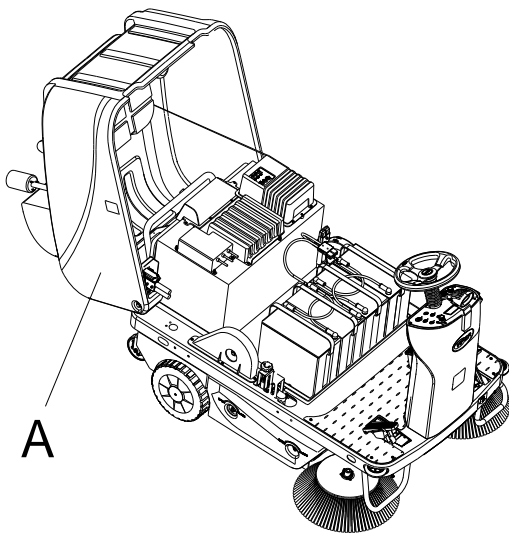


Figure 9

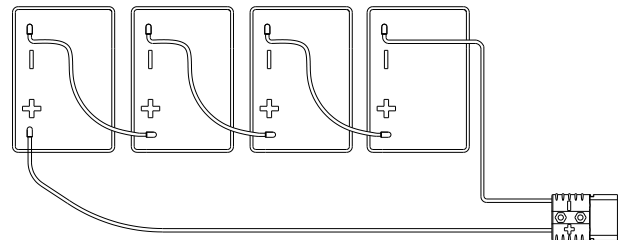


Figure 10

## Troubleshooting

Machine can't be turned on	Key switch (SW2) is damaged	Repair/replace
	Circuit breaker (F6) is opened	Reset circuit breaker
	Emergency switch (SW1) is opened or damaged	Close SW1/repair/replace
	Charger sensor switch (SW3) is activated	Repair/replace
	Wiring loose	Repair/replace
Warning light doesn't work	Warning light is damaged	Repair/replace
	Wiring loose	Repair/replace
Headlight doesn't work	Headlight is damaged	Repair/replace
	Wiring loose	Repair/replace
Left and right taillight doesn't work	Left and right taillight is damaged	Repair/replace
	Wiring loose	Repair/replace
LCD display still on when charging	Charger sensor switch (SW3) is damaged	Repair/replace
	Wiring loose	Repair/replace

## Removal and Installation

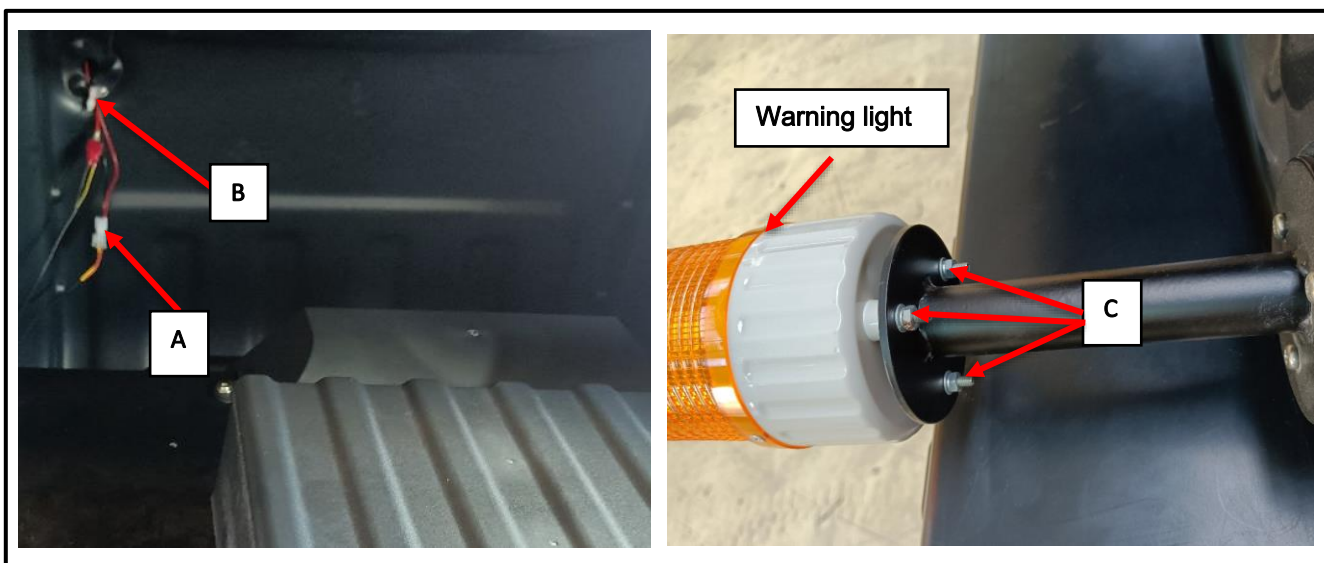
### Warning Light

#### Removal

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

#### Installation

Assemble components in reverse order of disassembly.





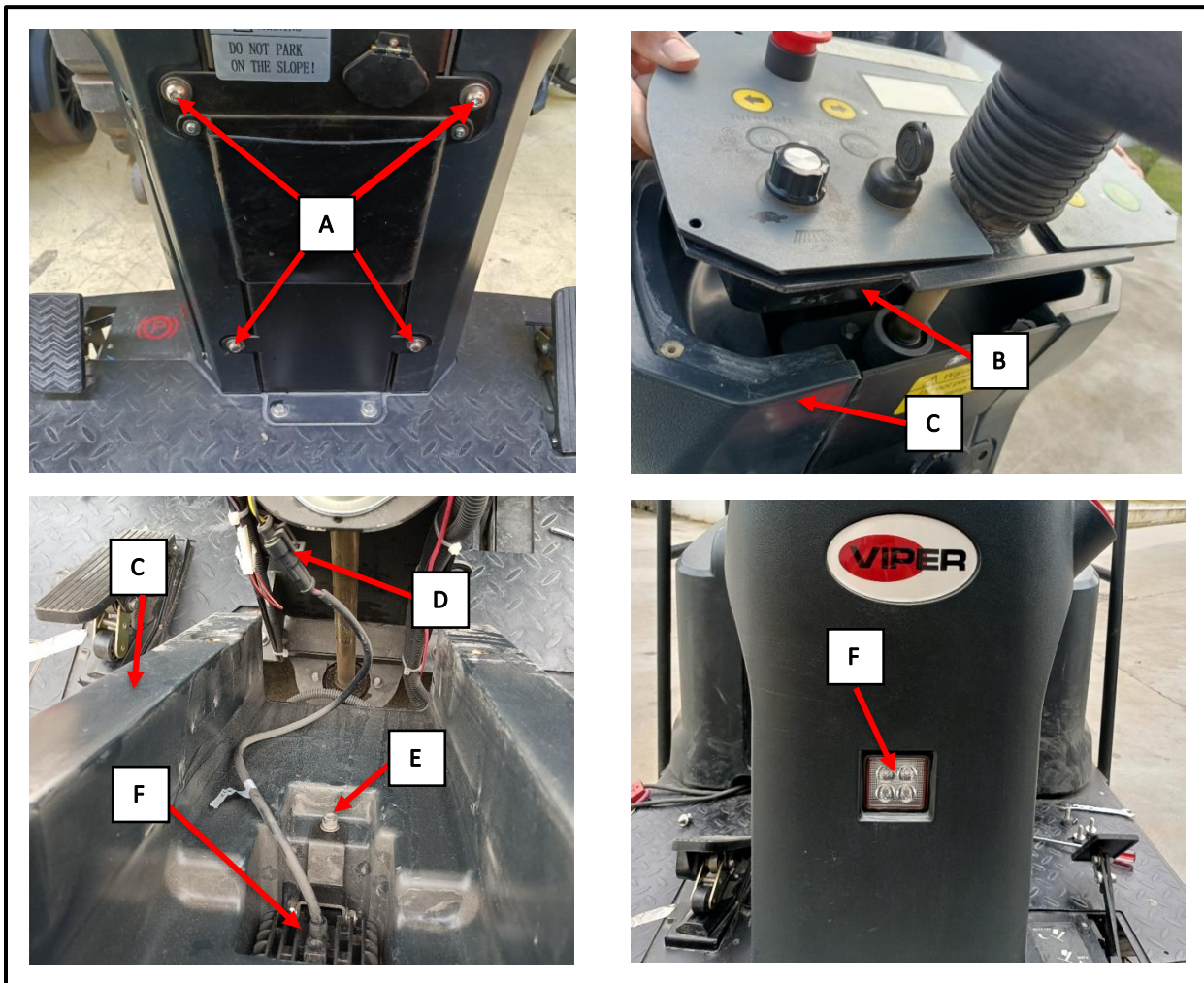
## Headlight

### Removal

1. Remove screws (A).
2. Remove the screws on panel and lift the panel (B)
3. Remove solution tank (C).
4. Disconnect the harnesses (D).
5. Remove screw (E).
6. Take out headlight (F)

### Installation

Assemble components in reverse order of disassembly.



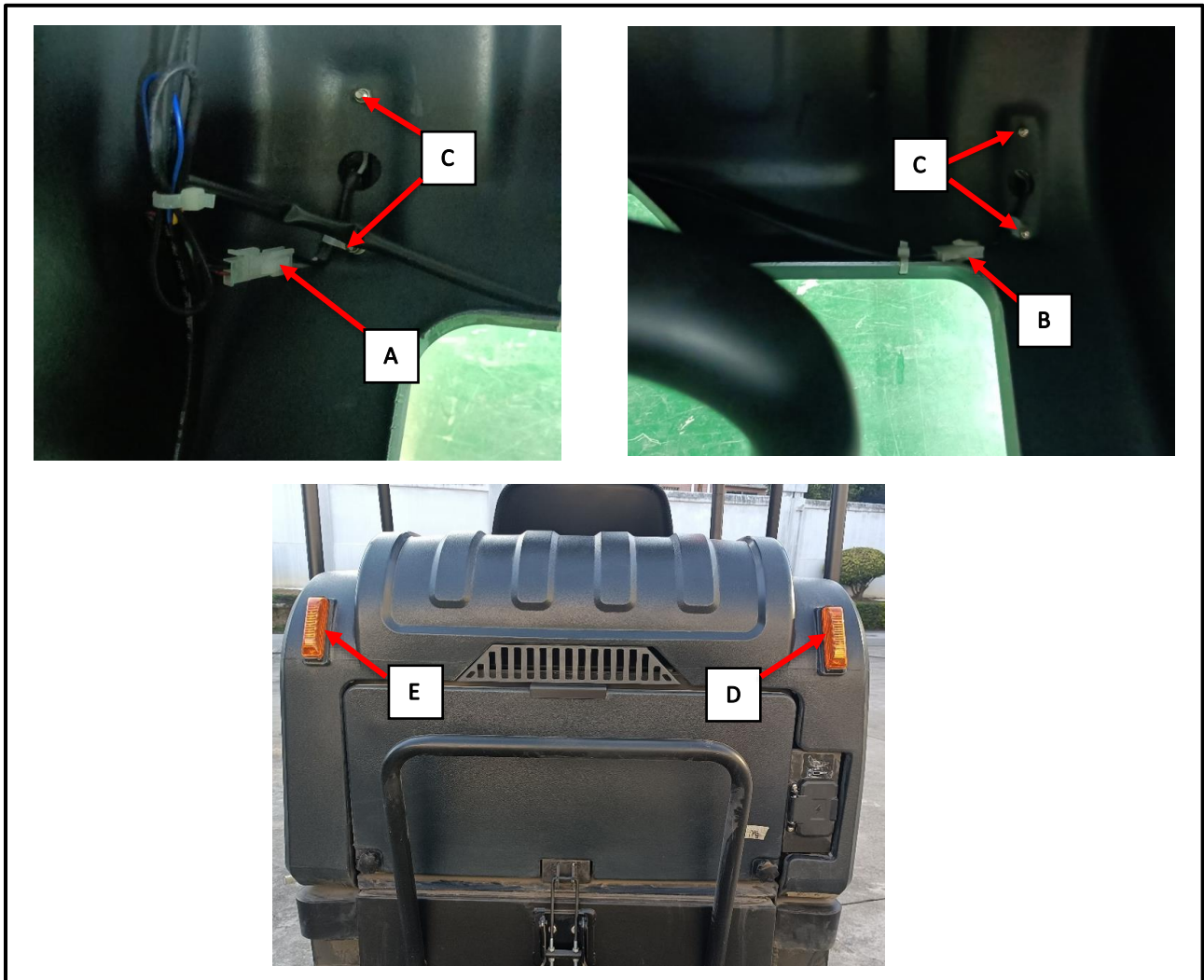
## Left and Right Taillight

### 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.



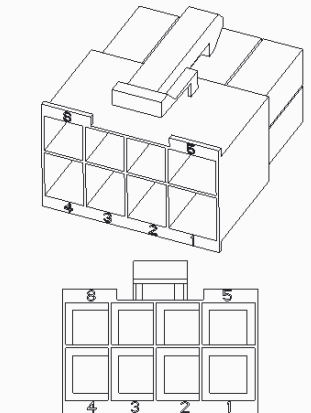
## Specifications

### Electrical Parameters

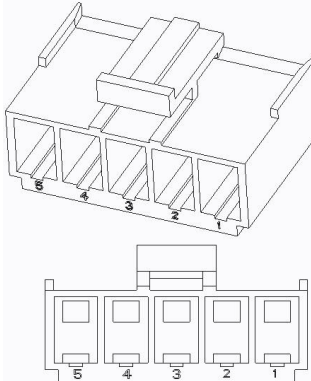
Description	Unit	Value
Battery Voltage	V	24
External Battery Charger Voltage	V	24
USB Charger (EB3)	N/A	5V/0.8A
Main Contactor (K1) Coil Resistance	$\Omega$	110
Warning Light	N/A	24V / 0.1A
LED Headlight	N/A	10-30VDC / 5W
Taillight	N/A	12.8V/0.09A

### Connector Pinout

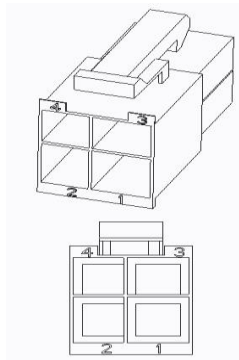
Dash Board (EB1) J2 Connector		
Pin#	Name	Color
1	Broom actuator Power+	RED
2	Charger signal	PUR
3	Water pump Power+	RD-BK
4	Side broom actuator out1 +/-	BLK
5	N/A	N/A
6	N/A	N/A
7	Water pump GND	BLK
8	Side broom actuator out2 +/-	RED

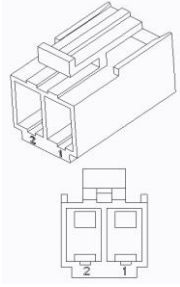


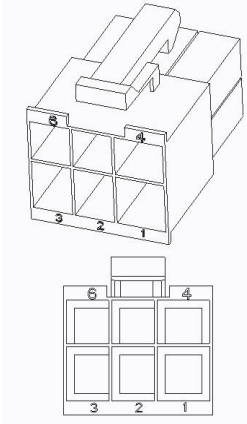
Dash Board (EB1) J4 Connector		
Pin#	Name	Color
1	Headlight & Blue Light GND	BLK
2	Headlight power + output	YEL
3	Blue Light power + output	RED
4	Left LED power + output	BU-BK
5	Right LED power + output	BRN

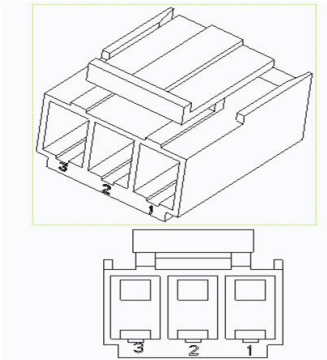


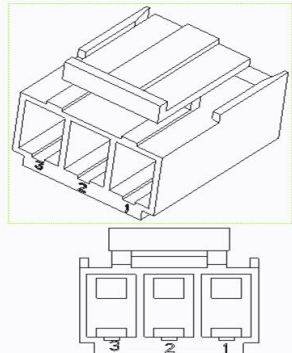
Dash Board (EB1) J5 Connector		
Pin#	Name	Color
1	Ground	BLK
2	CAN-H	BRN
3	CAN-L	WHI
4	Power Input 24V	RED

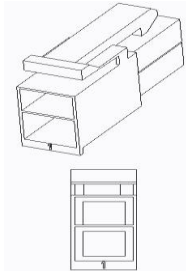


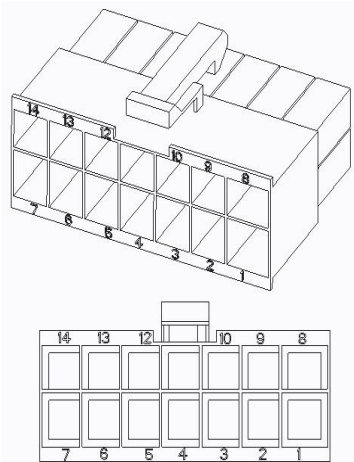
Dash Board (EB1) J6 Connector			
Pin#	Name	Color	
1	Buzzer power + output	BRN	
2	Buzzer power - output	BLU	

Dash Board (EB1) J7 Connector			
Pin#	Name	Color	
1	Main broom actuator out1 +/-	BLU	
2	N/A	N/A	
3	Water pump out+	GRN	
4	Main broom actuator out2 +/-	BRN	
5	USB +24V out	RED	
6	USB GND	BLK	

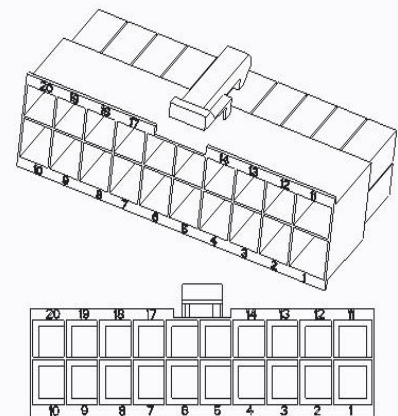
Dash Board (EB1) J8 Connector			
Pin#	Name	Color	
1	Side broom pot high	WHI	
2	Side broom pot in	BU-BK	
3	Side broom pot low	GR-BK	

Dash Board (EB1) J9 Connector			
Pin#	Name	Color	
1	Speed limit pot high	WHI	
2	Speed limit pot in	BU-BK	
3	Speed limit pot low	GR-BK	

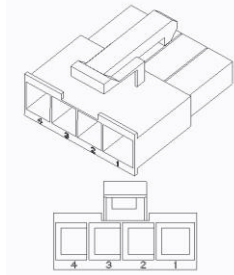
Main Controller (EB2) P1 Connector			
Pin#	Name	Color	
1	Electromagnetic Brake+	BLK	
2	Electromagnetic Brake-	RED	

Main Controller (EB2) P2 Connector			
Pin#	Name	Wire Color	
1	N/A	N/A	
2	N/A	N/A	
3	Filter shaker motor+	RED	
4	N/A	N/A	
5	N/A	N/A	
6	Slow down sensor 1 input	BLK	
7	Pedal inner relay switch in	BLU	
8	24V Output	YEL	
9	N/A	N/A	
10	Filter shaker motor-	YEL	
11	N/A	N/A	
12	N/A	N/A	
13	N/A	N/A	
14	Temp sensor	GRY	

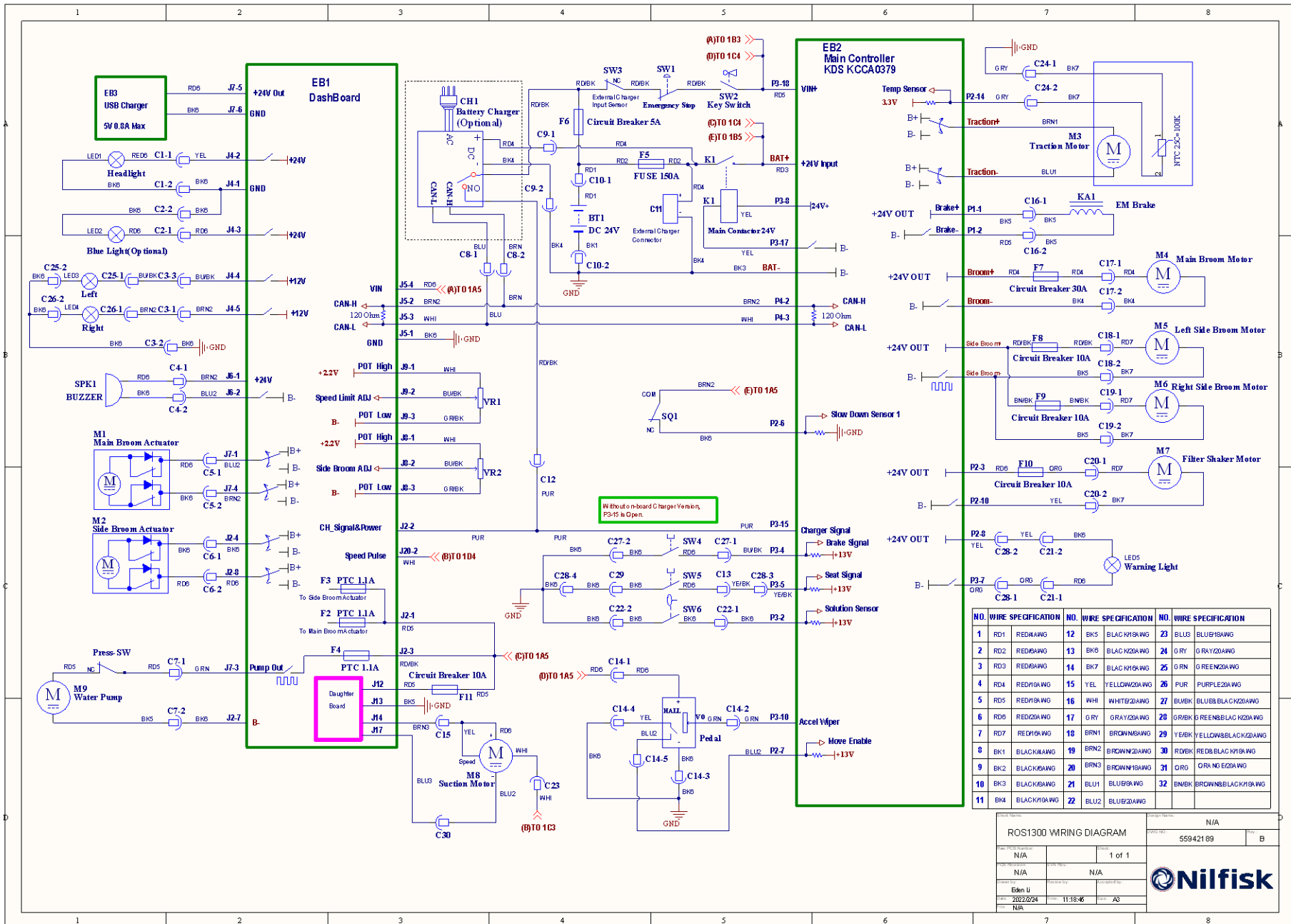
Main Controller (EB2) P3 Connector		
Pin#	Name	Wire Color
1	N/A	N/A
2	Solution sensor input	BLK
3	N/A	N/A
4	Mechanical brake sensor input	BU-BK
5	Seat sensor input	YE-BK
6	N/A	N/A
7	Warning light output	ORG
8	24V Output	YEL
9	N/A	N/A
10	Accelerator wiper	GRN
11	N/A	N/A
12	N/A	N/A
13	N/A	N/A
14	N/A	N/A
15	Charger signal	PUR
16	N/A	N/A
17	Main contactor(K1) output	YEL
18	Key switch input	RED
19	N/A	N/A
20	N/A	N/A



Main Controller(EB2) P4 Connector		
Pin#	Name	Color
1	N/A	N/A
2	CAN-H	BRN
3	CAN-L	WHI
4	N/A	N/A



# Electrical Wiring Diagram(55942189 Rev.B)





## 30 Solution System

### Functional Description

The solution system is used to reduce the dust that swept by the side broom when sweeping. The solution tank is also the main body. The manual valve in the lower right of the tank is to close water supply when performing maintenance. The solution flows from tank to tap, through the filter, High-pressure switch (Press-SW) and water pump (M9) and then to nozzle.

The water pump (M9) and High-pressure switch (Press-SW) can only operate when all following inputs/conditions are met:

- Broom function is enabled
- The throttle pedal is pressed
- Battery capacity >10%
- Solution sensor (SW6) is not activated

### Wiring Diagram

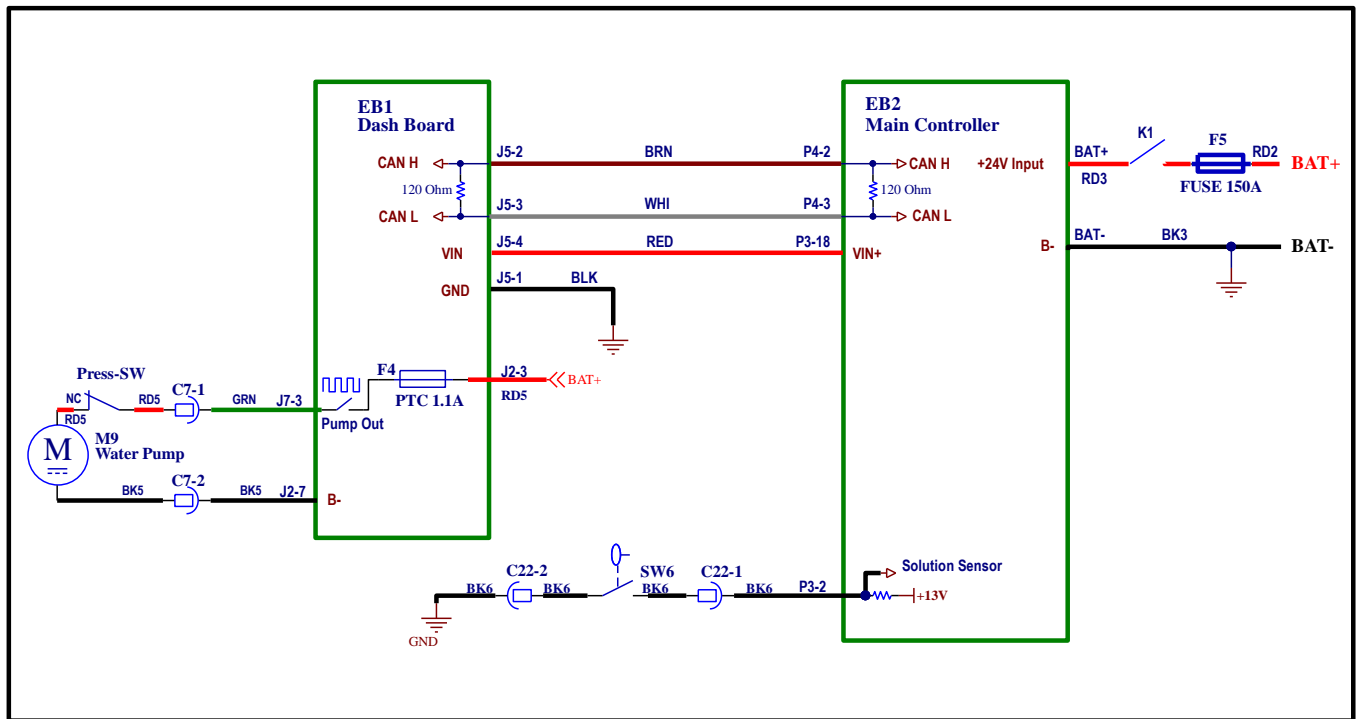


Figure 1

## Component Locations

- Water pump (M9)
- Solution sensor (SW6) / Solution tank
- Press-SW
- Nozzle
- Manual valve

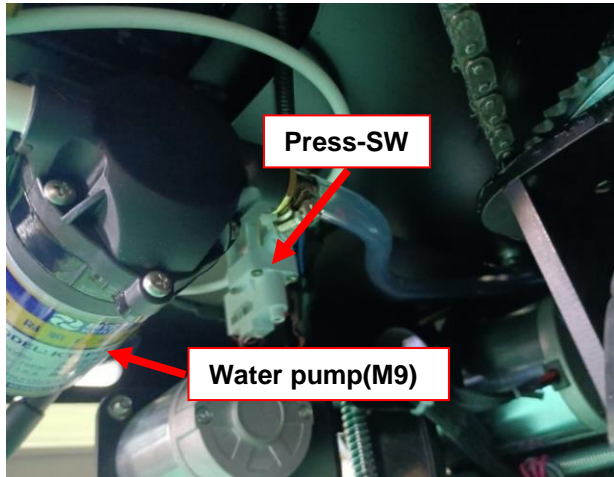


Figure 2

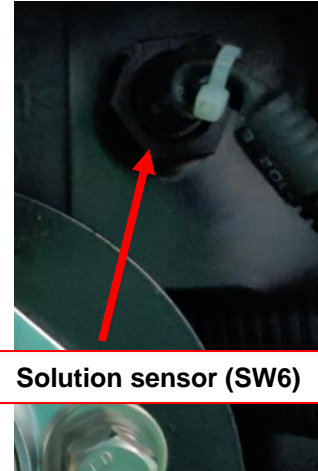


Figure 3

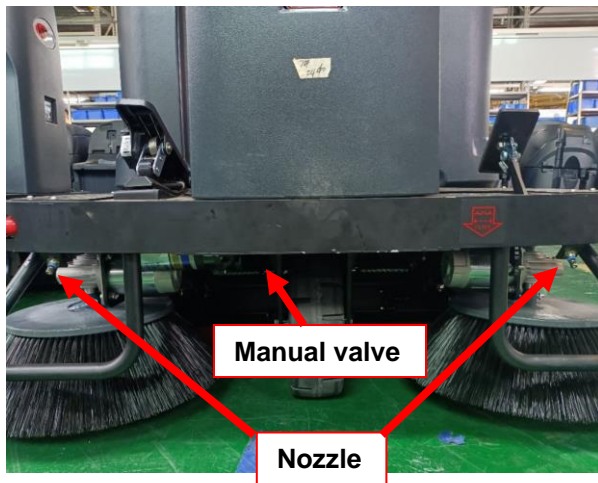
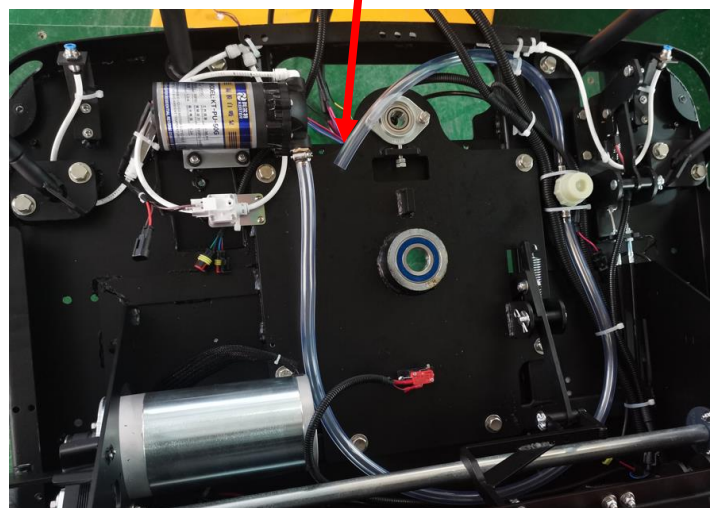


Figure 4



## Removal and Installation

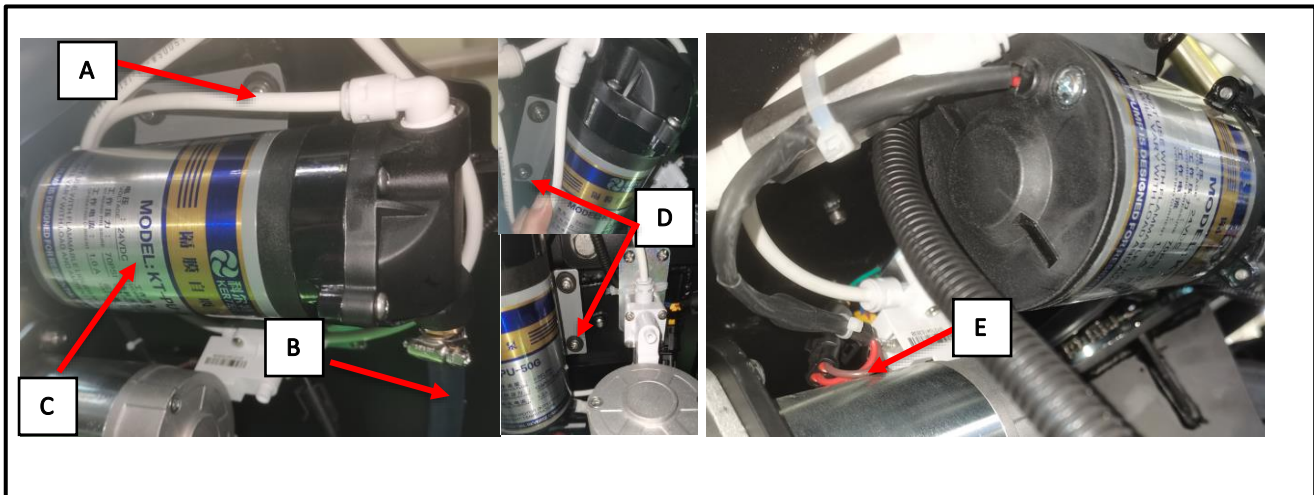
### Water pump (M9)

#### 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(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 hoses, obstructing solution flow	Clean tank/hoses
	Solution tank is empty	Fill up solution tank with water
	Water pump electrical connector is broken	Repair
	Dash Board (EB1) fault	Replace
Water comes out when 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

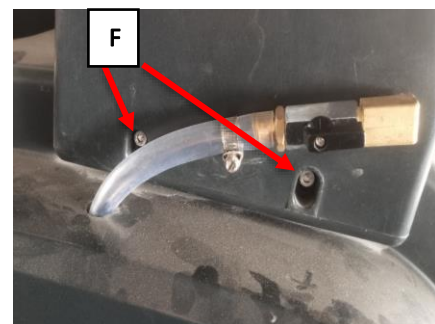
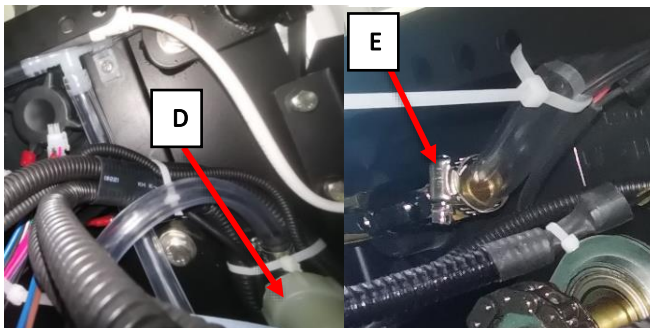
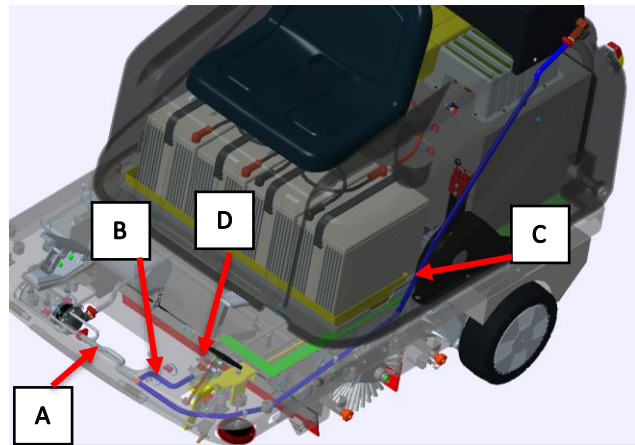
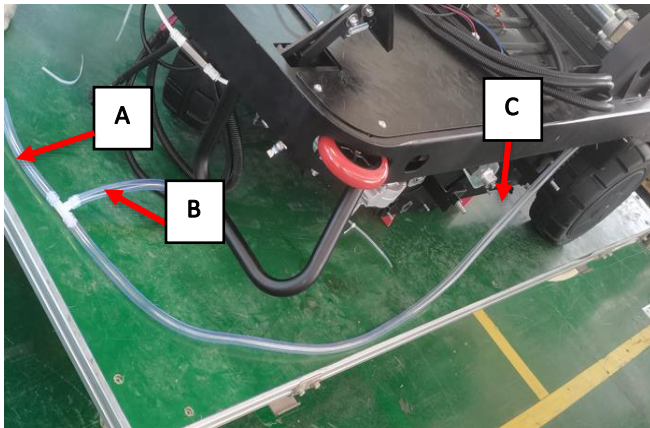
## Rear tank installation

### Functional Description

To increase water capacity according to customer's requirement, add a rear solution tank.

### Installation

1. Open the cover.
2. Use a tie to keep the hose(C) inside the chassis. The hose (A) connects to solution tank. The hose (B) connects to filter (D).
3. First disconnect the old hose connecting to filter, then connect the hose(B) to filter.
4. Remove bumper bracket, then install the hose (A).
5. Use a tie to fix hose.
6. Other side of hose (A) connects to the rear solution tank, use clamp (E) to fasten connector.
7. Install 4 screws (F) on the solution tank and connect them to the cover.
8. The rear solution tank installation complete.



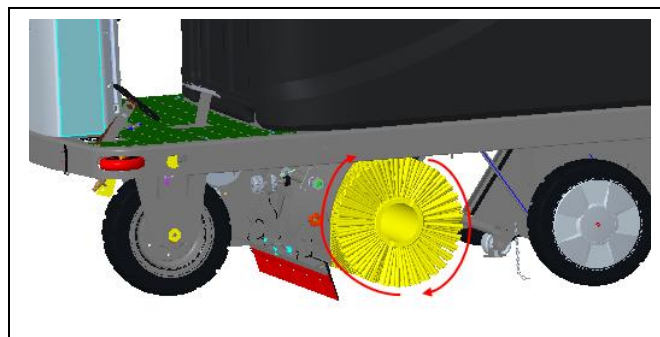
## 42 Main Sweeping System

### Functional Description

The main sweeping system is controlled by operator. The rotating broom system can clean the surface of floor.

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

This is an overthrow sweeper. The broom rotates only when the driver presses throttle pedal. When pedal is released, broom motors will stop within five seconds.

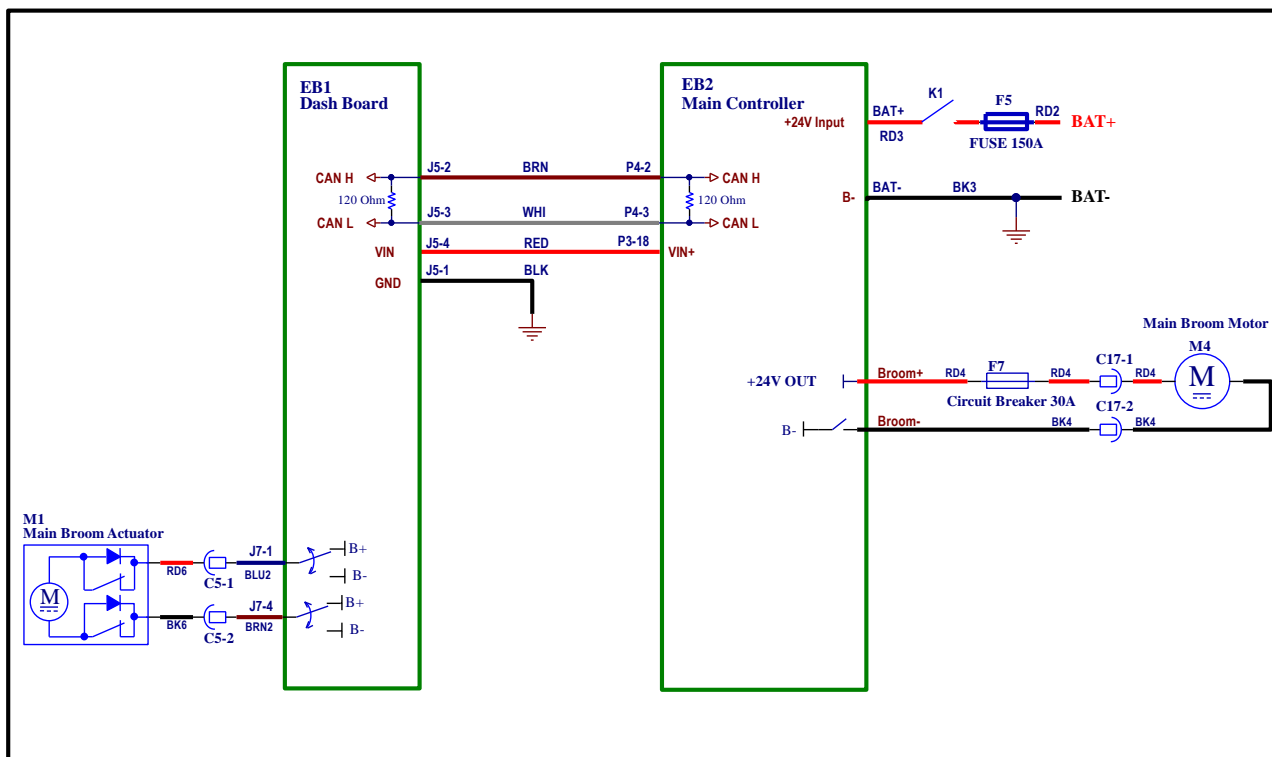


If main broom motor is overloaded, circuit breaker (F7) will stop it. To start sweeping again after broom stop due to overloaded, turn off machine, reset circuit breaker and then turn on machine.

To work properly, main broom motor (M4) needs to meet all the following inputs/conditions:

- Main broom function is enabled
- Throttle pedal is pressed
- Battery capacity >10%.

### Wiring Diagram



## Main Broom Actuator System

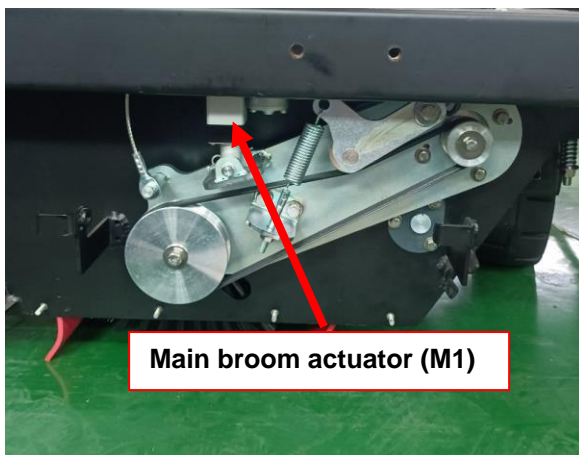
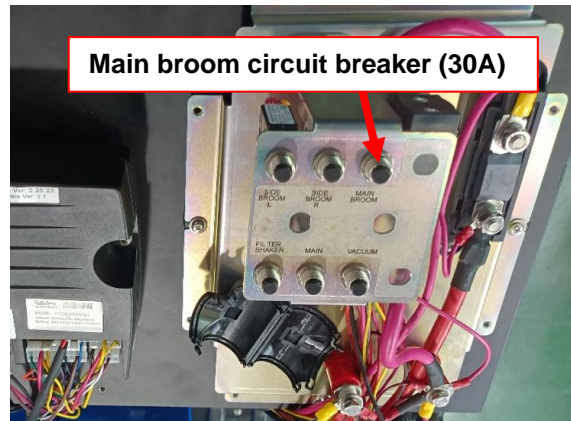
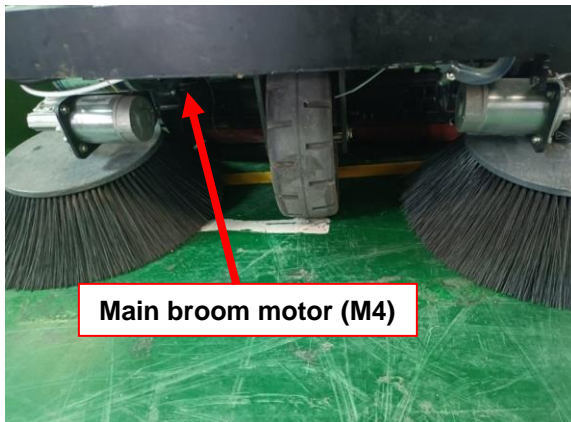
The main broom actuator (M1) is controlled directly by the Dash Board (EB1).

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 (M4)
- Main broom circuit breaker (F7)
- Main broom actuator (M1)

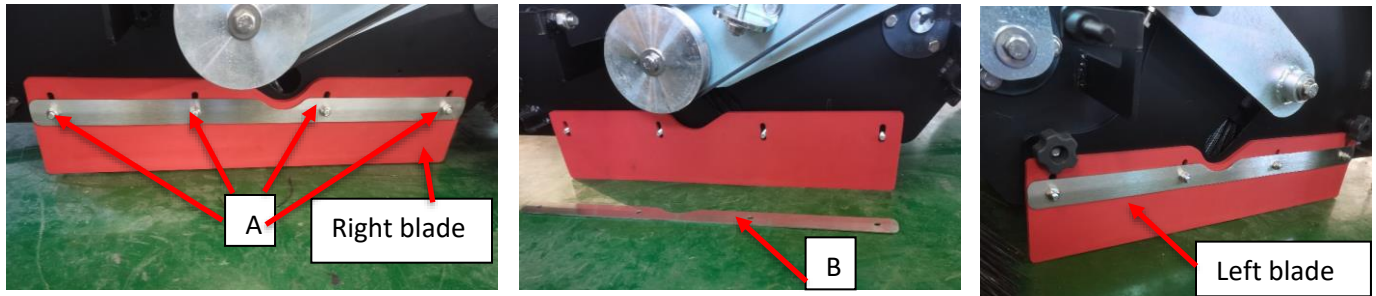


## Maintenance and Adjustment

### Side Blade Changing

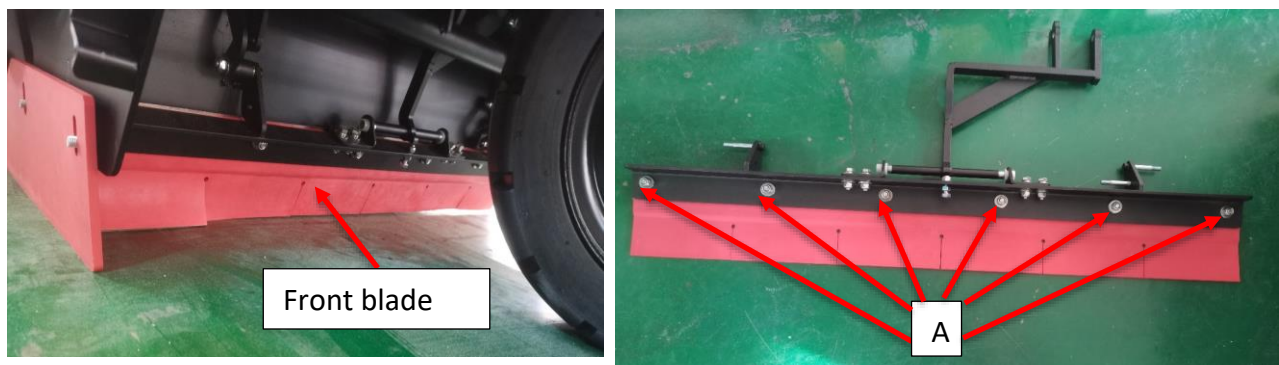
The left and right blades need to be changed periodically. The blades can be flipped or reversed to a new edge for up to 3 times before replacement is required. During replacement, it is important that the blades be installed flat without waves and adjusted to be laid flat against the floor.

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

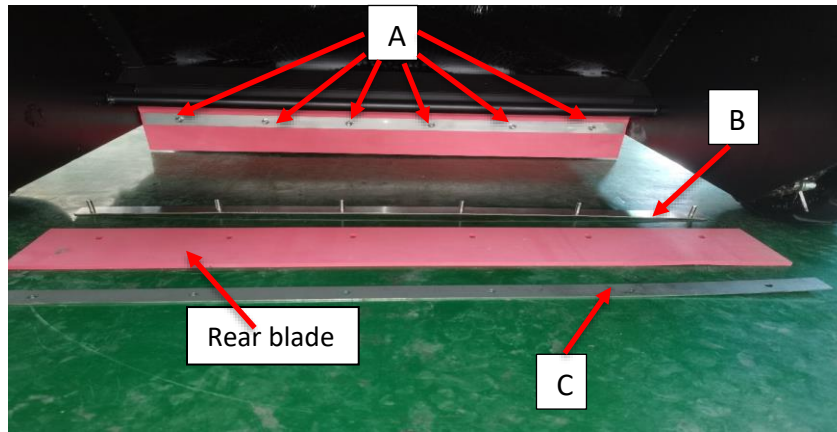
1. Remove 2 side brooms first (see Figure 7 on page 71), then unscrew the nut (A).
2. Remove the front strap then remove front blade.





## 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

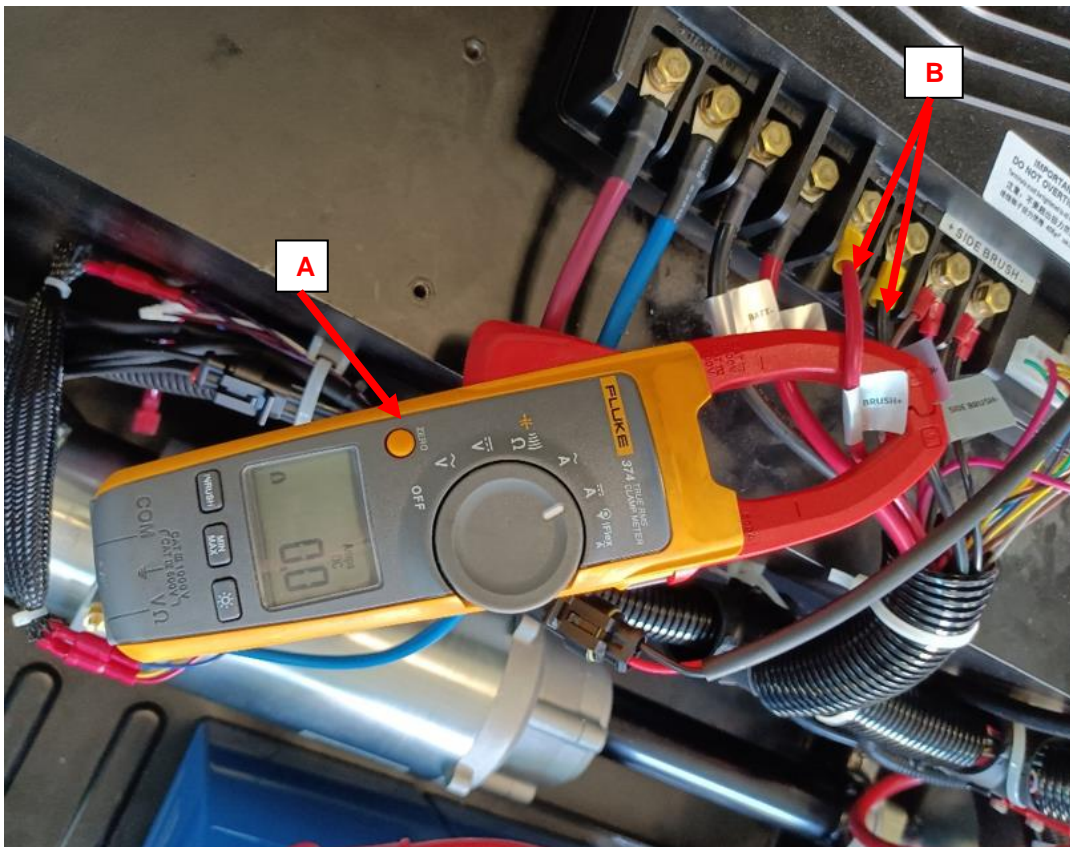
Trouble	Possible causes	Remedy
Broom does not clean properly	Broom is excessively worn	Replace
The main broom can't rotate	Broom motor carbon brooms worn	Replace
	Presence of mass debris or strings around broom or between broom and attachment flange	Remove broom and clean it
	Wiring damaged	Repair/replace
	Broom motor damaged	Repair/replace
	Circuit breaker (F7) is opened	Reset circuit breaker
	Main Controller (EB2) damaged	Repair/replace
Can't raise/lower main broom	Broom actuator overloaded	Check if broom actuator is stuck
	Main broom actuator (M1) damaged	Replace
	Wiring damaged	Repair/replace
	Dashboard (EB1) fault	Replace

## Main Broom Motor Amperage Check



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

1. Park machine on level ground.
2. Apply amp clamp (A, Figure) to one of the motor wires (B, Figure).
3. Insert ignition key to switch on machine.
4. Press one-button start button to lower the main broom.
5. Activate broom by pressing throttle pedal and check if current draw of each motor is between 6A and 13A at 24V.
6. If amperage is higher than 13A, 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 condition of all components, repair or replace them if necessary.
7. If above-mentioned procedures can't get amperage correct, it is necessary to replace broom motor.



## Removal and Installation

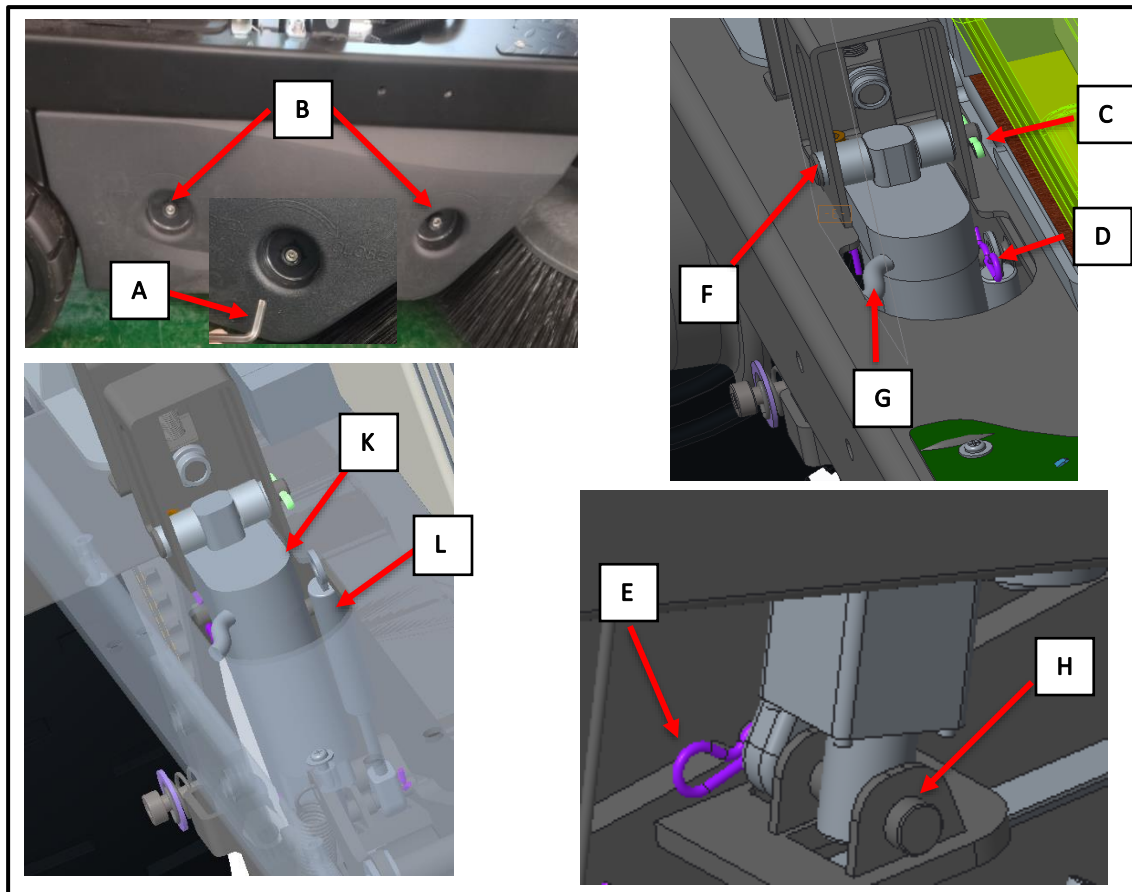
### Main Broom Actuator(M1)

#### 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.



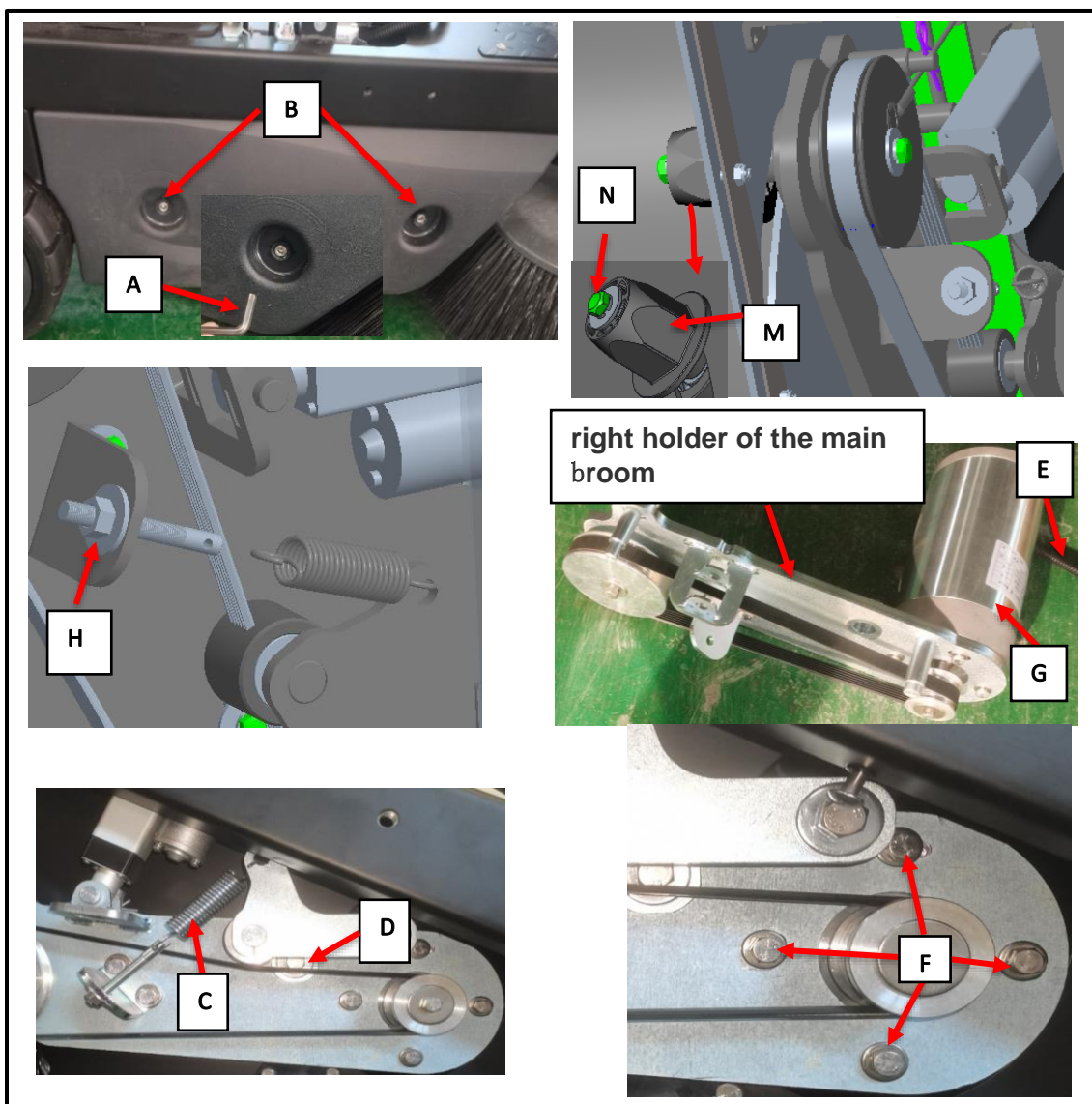
## Main Broom Motor (M4)

### 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.



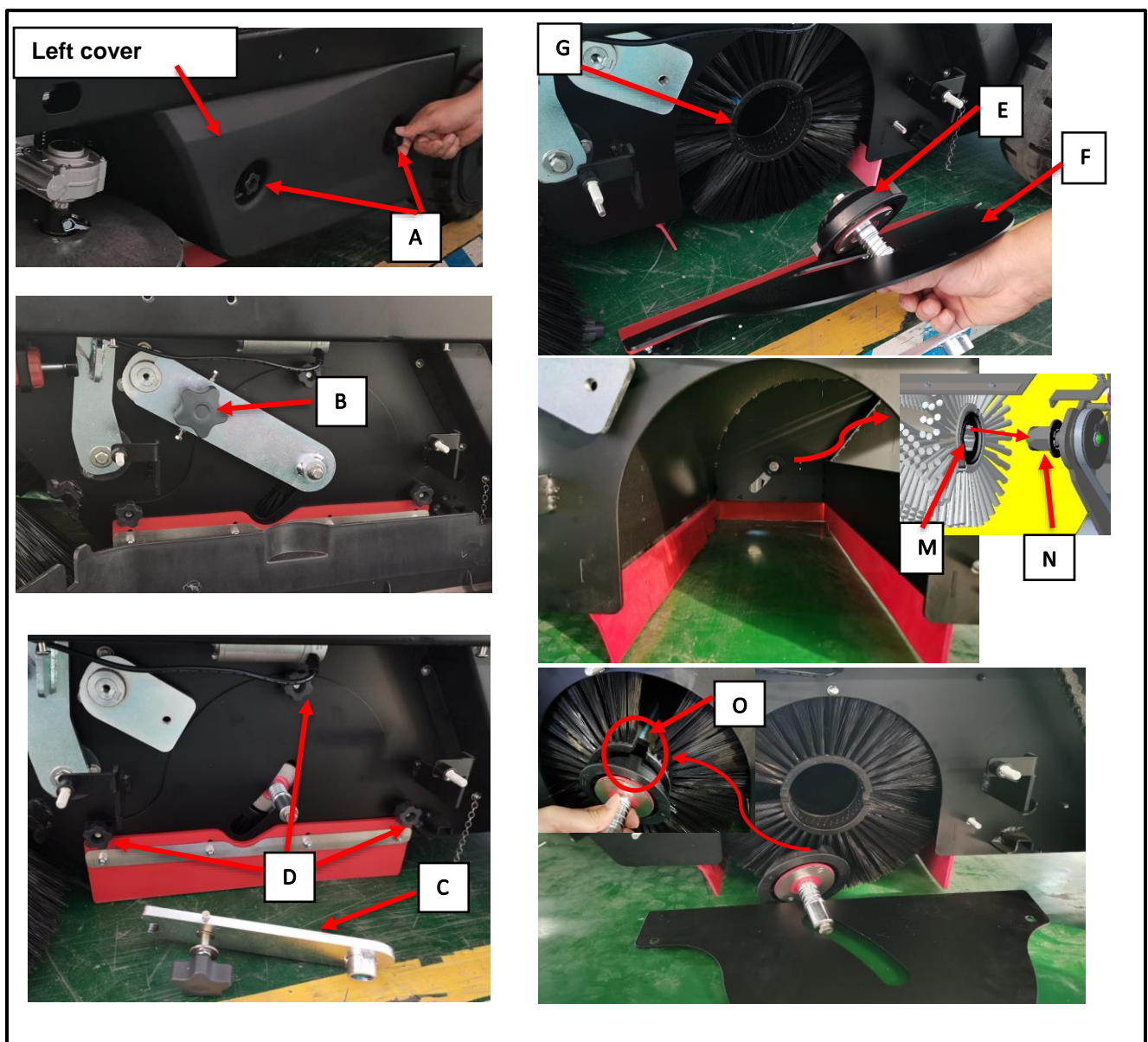
## Main Broom

### Removal

1. Unscrew the knob bolt (A) and remove the left cover.
2. Unscrew knurled knob (B) and then remove the bracket (D).
3. Unscrew knurled knob(C) and then remove the fixed plate (F) and shaft with hub(E).
4. Take out the roller broom (G) 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(E) put in groove of broom(O)



## Specifications

Description	Unit	Value	
<i>Main broom motor technical data</i>	<i>Output power</i>	W	500
	<i>Input power</i>	W	624
	<i>Voltage</i>	V	DC 24
	Normal current	A	8-10
	<i>Rotation speed</i>	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 is to concentrate the garbage on both sides of the machine that cannot be swept by the main broom into the scope that can be swept by the main broom.

The main components of side sweeping system are two side broom motors and brooms and a speed potentiometer.

The broom rotates only when the driver presses throttle pedal. Its rotating speed (0-100RPM) is controlled through speed potentiometer (VR2), the potentiometer input range is: 0.8V (low speed) ~ 2.2V (high speed), typical potentiometer is around 1.4V. When pedal is released, broom motors will stop within five seconds.

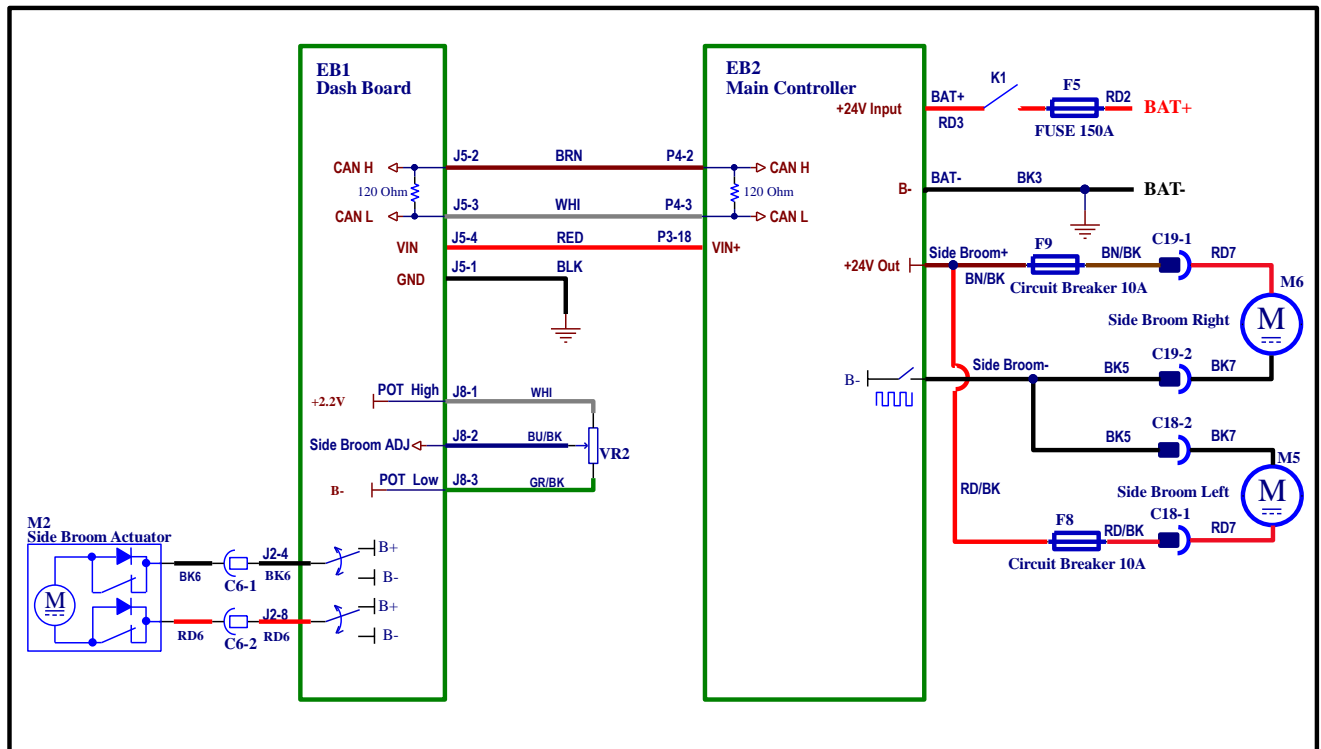
If side broom motors are overloaded, circuit breakers (F8&F9) will stop it. To start sweeping again after brooms stop due to overloaded, turn off machine, reset circuit breaker and then turn on machine.

The main controller measures how much current is flowing through its internal switch when it turns on the side broom motors. When it exceeds a certain threshold it will set an error code. The main controller also monitors the voltage on the side broom motor negative terminal. When the motor is off, it expects to see approximately 24 voltage on the terminal. If the voltage is significantly less than expected, it concludes that the side broom motor circuit is open and will set an error code.

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

- Side broom function is enabled
- Throttle pedal is pressed
- Battery capacity >10%

### Wiring Diagram



## Side Broom Actuator System

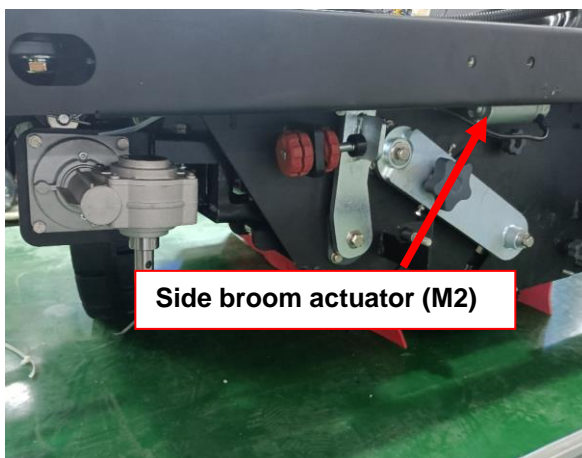
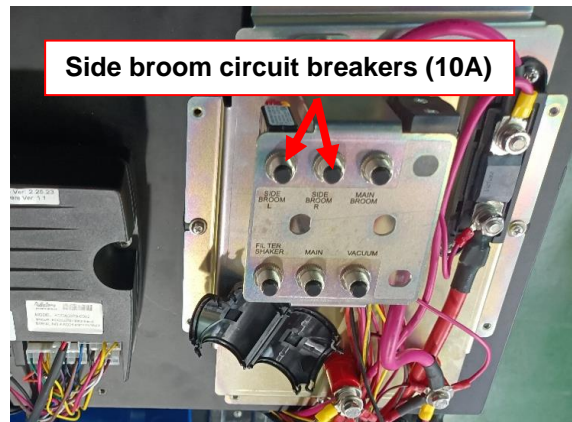
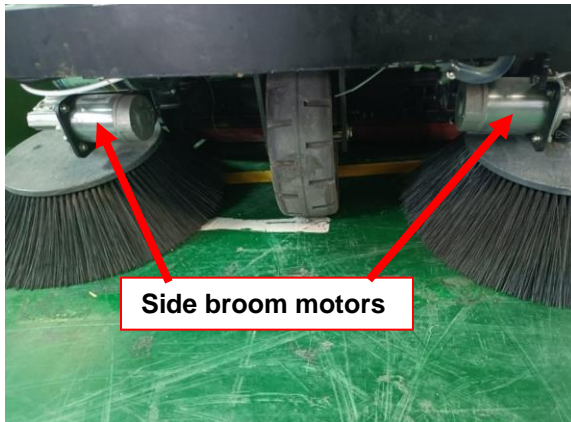
The side broom actuator (M2) is controlled directly by the DashBoard (EB1).

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. To achieve the correct working position, the actuator motor is driven in the extend direction until the internal travel limit switch opens.

### Component Locations

- Side broom motors (M5&M6)
- Side Broom circuit breakers (F8&F9)
- Side broom actuator (M2)
- Side broom potentiometer (VR2)





## Troubleshooting

Trouble	Possible causes	Remedy
Broom does not clean properly	Broom is excessively worn	Replace
Only one broom rotates	Side broom motor carbon brushes worn	Replace
	Presence of mass debris or strings around broom or between broom and attachment flange	Remove broom and clean it
	Side broom motor damaged	Repair/replace
	Wiring damaged	Repair
	Circuit breaker (F8 or F9) is opened	Reset circuit breaker
Can't raise/lower side brooms	Wiring damaged	Repair/replace
	Dashboard (EB1) fault	Replace
	Side broom actuator (M2) fault	Repair/replace

## Side Broom Motors Amperage Check



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

1. Park machine on level ground.
2. Apply amp clamp (A, Figure) to one of the motor wires (B, Figure).
3. Insert ignition key to switch on machine.
4. Press one-button start button to lower the side brooms.
5. Activate broom by pressing throttle pedal and check if current draw of each motor is between 2A and 5A at 24V (single side broom motor).
6. If amperage is higher than 5A, 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-mentioned procedures can't get amperage correct, it is necessary to replace side broom motor.



## Removal and Installation

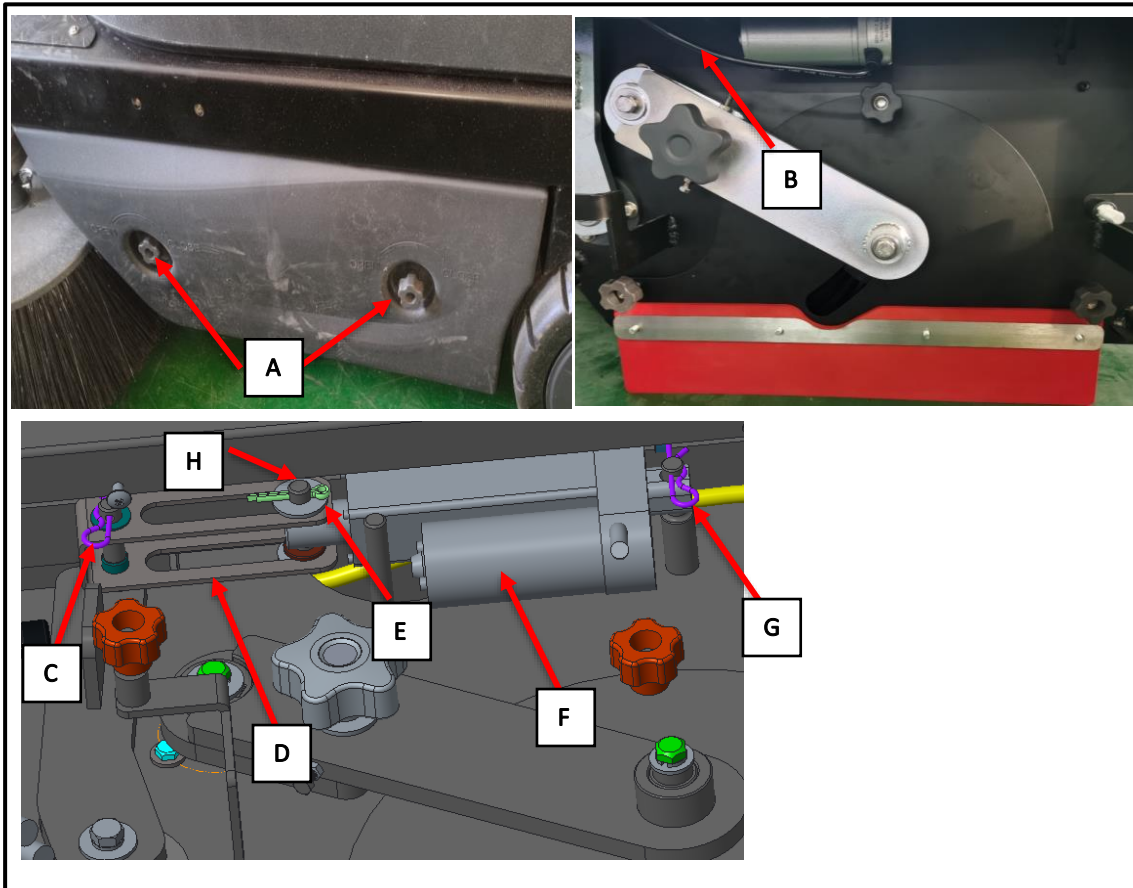
### Side Broom Actuator(M2)

#### 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 .



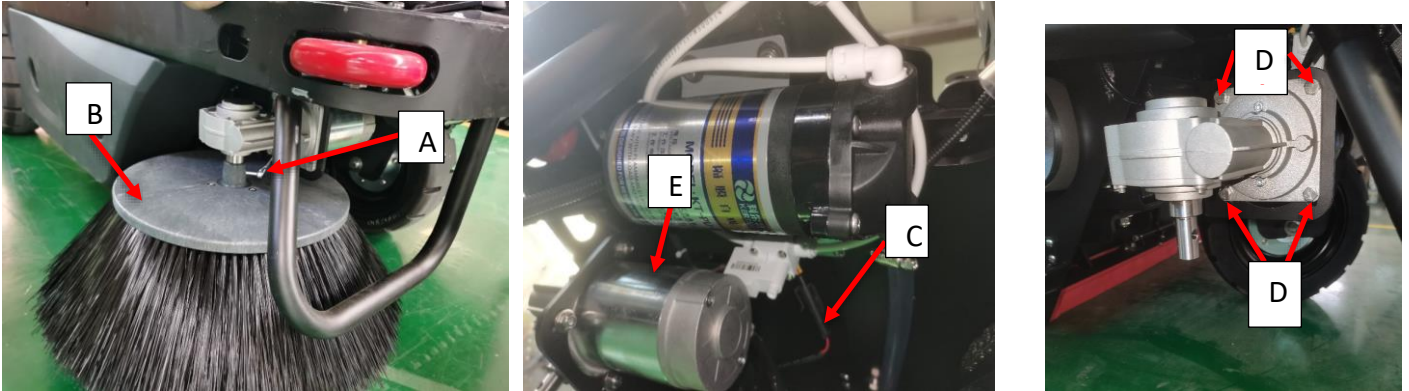
## Side Broom Motors(M5&M6)

### 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.



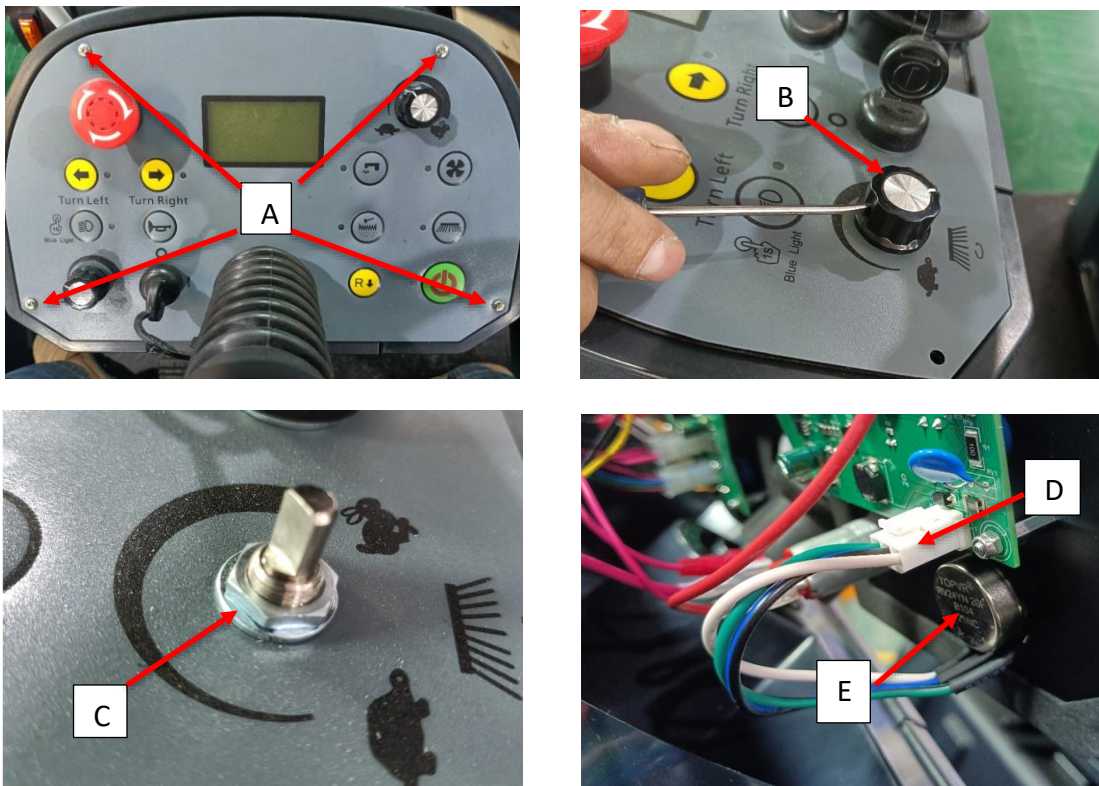
## Side broom speed potentiometer (VR2)

### Removal

1. Unscrew the 4 screws (A) on DashBoard (EB1).
2. Use straight screwdriver to take off the screws (B) inside the speed potentiometer.
3. Unscrew nut and take off (C).
4. Unplug terminal cable (D), take off speed potentiometer (E).

### Installation

Assemble components in reverse order of disassembly.



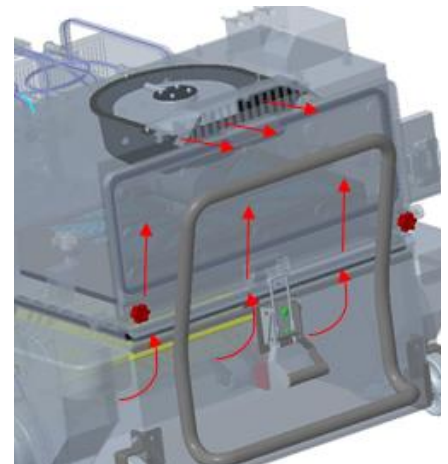
## Specifications

	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 clouds on sweeping machines 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. The vacuum motor (M8) controls the air flow of the sweeping area by pressing vacuum button, captures the dust and debris to the filter, and the air flow continues to enter the vacuum fan and exhaust machine.



When The Vacuum motor (M8) runs normally, the Hall sensor inside the motor outputs a single square wave signal to the DashBoard (EB1), which acts as the Speed Pulse to monitor whether the motor is open circuit or not turning.

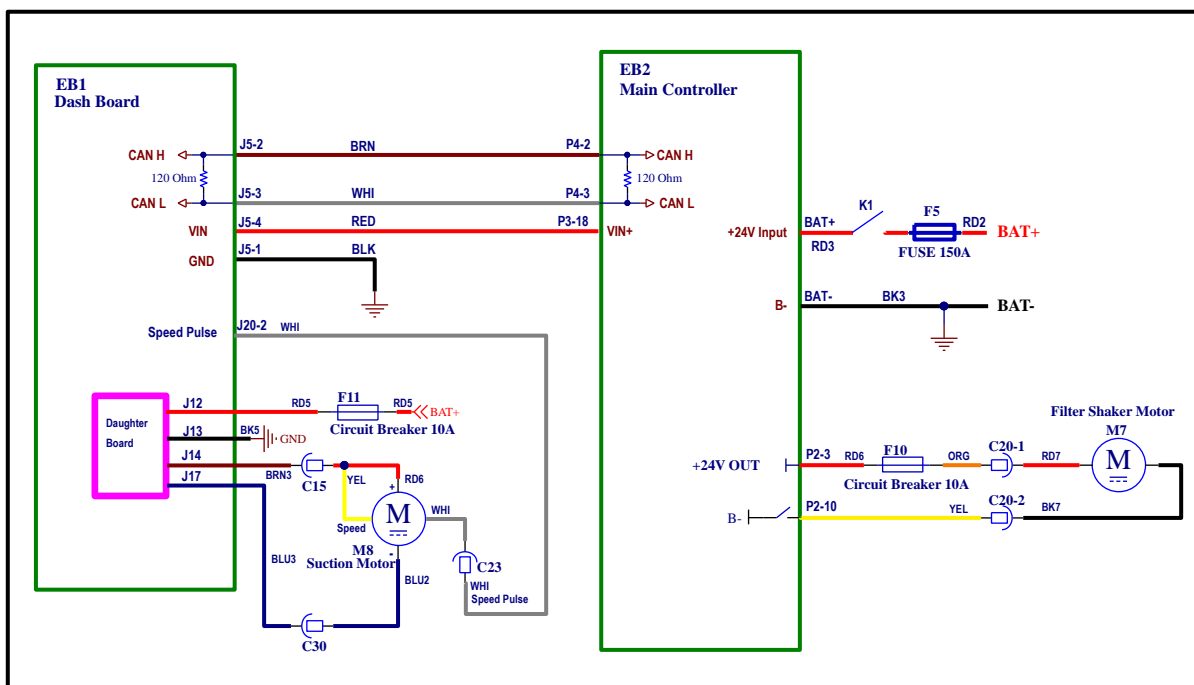
The speed pulse is used to monitor whether the motor is open circuit or not turning. It is a single square wave signal. If the signal is cut off, the screen will display Error-25, motor will not rotate. If the suction motor doesn't work, it may be caused by the loss of speed pulse.

By starting the filter shaker motor (M7) to shake the dust accumulated on the filter net to clean the filter net. If the working current is less than 1A, then it's judged to be motor circuit open. It is controlled by the independent Filter Shaker button. When long pressing for 1S, the motor switches between automatic (indicator light flashing) and manual function.

Manual function: The motor will shut down automatically after working for a period every time it is turned on. (Working time refers to the value on page 21 parameter setting item8)

Automatic function: filter shaker motor automatically resumes working at intervals (interval: refer to item 9 in Parameter Setting table on page 21.

### Wiring Diagram



## Component Locations

- Filter shaker motor (M7)
- Suction motor (M8)
- Suction motor circuit breaker (10A) (F11)
- Shaker motor circuit breaker (10A) (F10)
- Shaker motor connecting terminals
- Suction motor connecting terminals

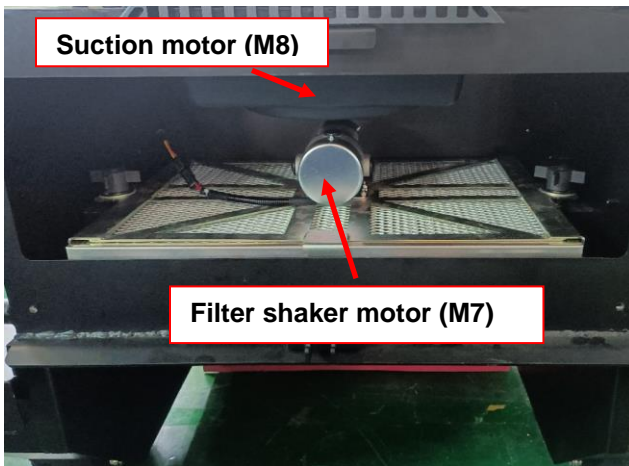


Figure 1

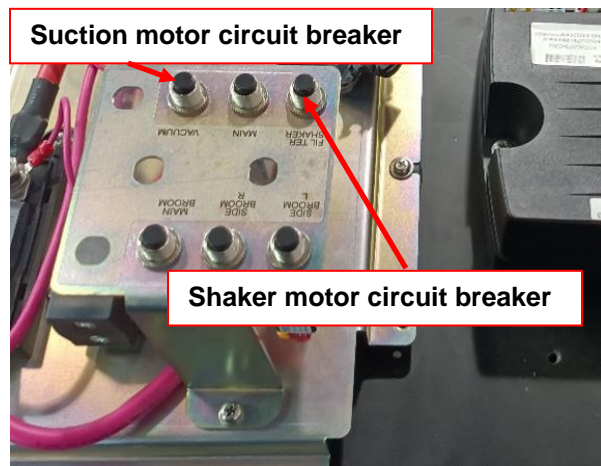


Figure 2

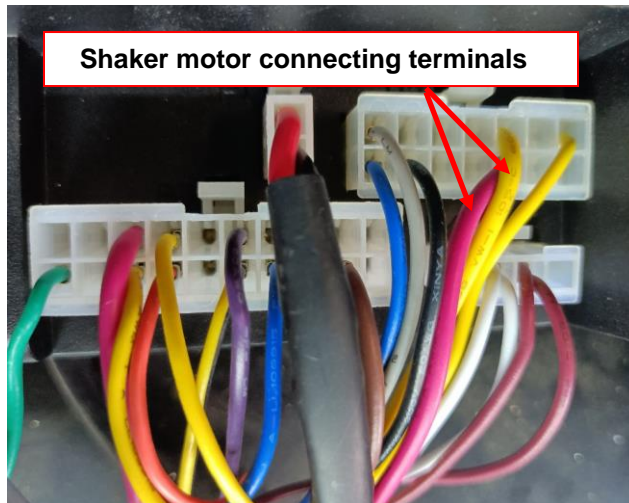


Figure 3

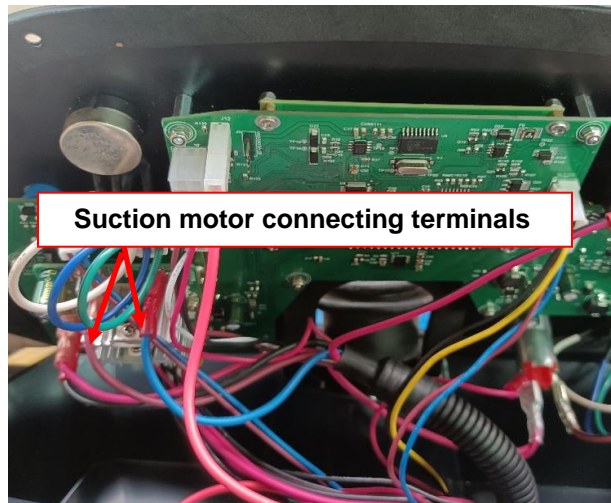


Figure 4

## Troubleshooting

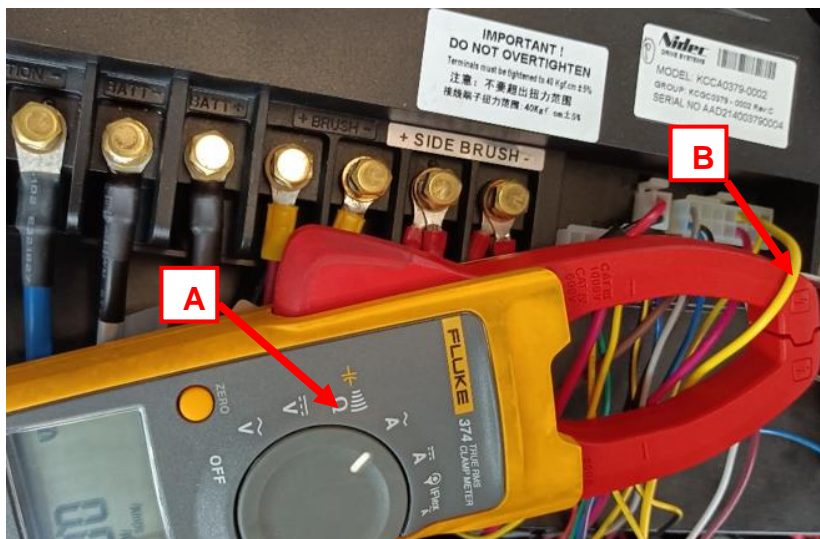
Trouble	Possible causes	Remedy
The Suction motor can't be turned on	Wiring damaged	Repair/replace
	Dash Board (EB1) fault	Replace
	Suction motor damaged	Check the amperage/replace
	Circuit breaker (F11) is opened	Reset the circuit breaker
Filter shaker motor can't be turned on	Wiring damaged	Repair/replace
	Main Controller (EB2) fault	Replace
	Filter shaker motor damaged	Check the amperage/replace
	Circuit breaker (F10) is opened	Reset the circuit breaker

### Filter Shaker Motor Current Draw Test



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

1. Apply amp clamp (A, Figure) to one of the filter shaker motor cables (B, Figure).
  2. Insert ignition key to switch on machine.
  3. Start filter shaker motor by pressing filter shaker button.
  4. Check if current draw of motor is between 4A 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-mentioned procedures can't get amperage correct, it is necessary to replace filter shaker motor.



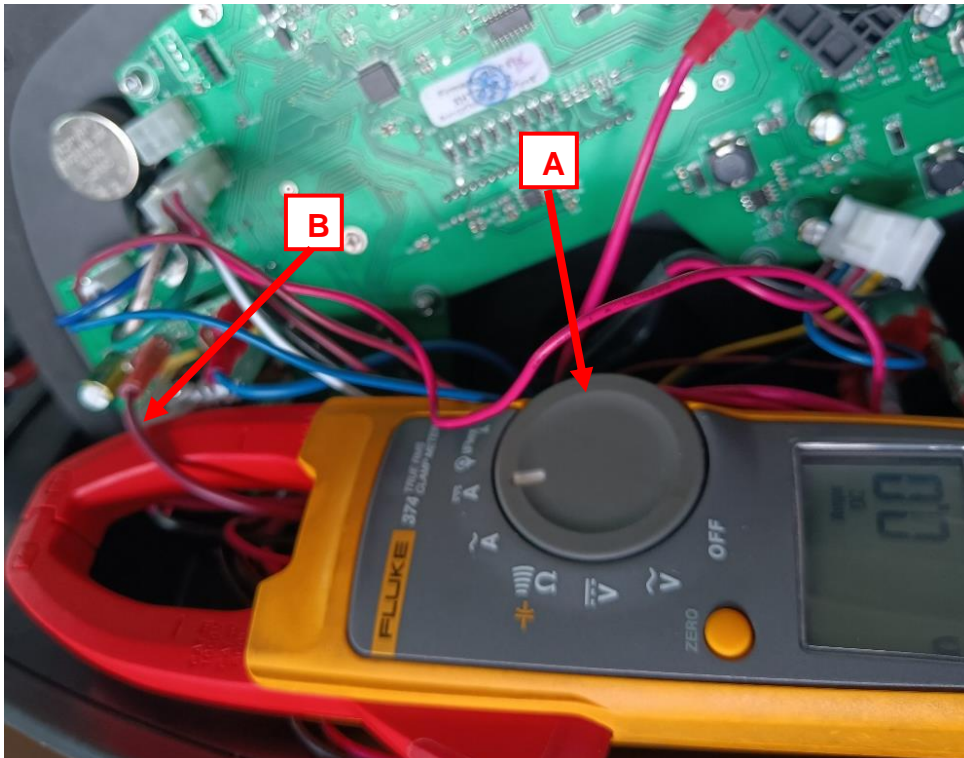


## Suction Motor Current Draw Test



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

1. Apply amp clamp (A, Figure) to one of the suction motor cables (B, Figure).
  2. Insert ignition key to switch on machine.
  3. Start suction motor by pressing vacuum button.
  4. Check if current draw of motor is between 6A and 8A at 24V for one vacuum system.
  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-mentioned procedures can't get amperage correct, it is necessary to replace suction motor.



## Removal and Installation

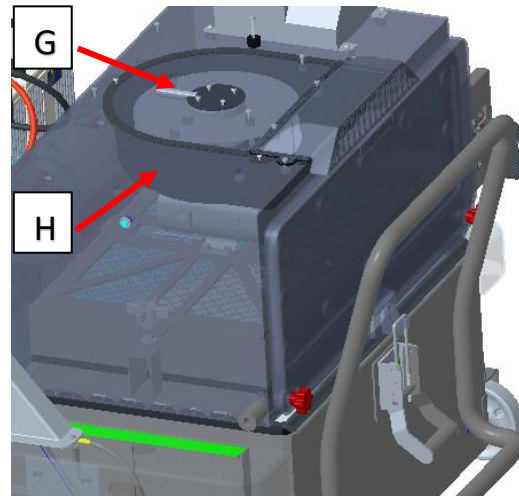
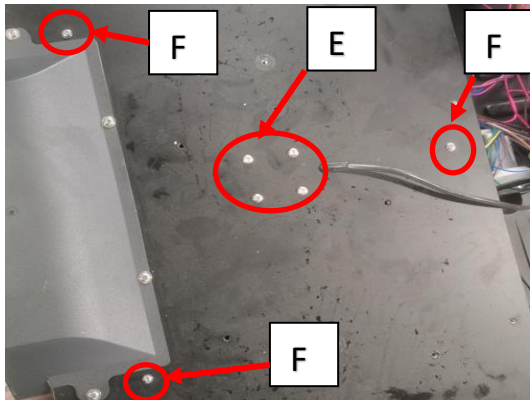
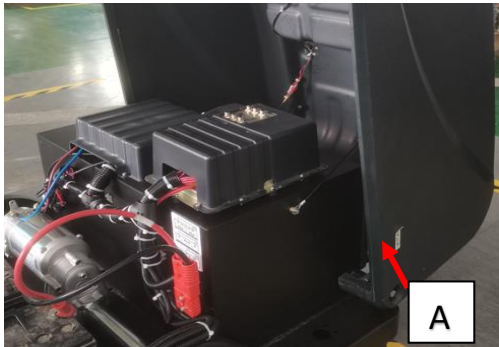
### Suction Motor (M8)

#### 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&C).
4. Unscrew the screw (E&F). Take of the suction Motor(G) and cover (H)

#### Installation

Assemble components in reverse order of disassembly.



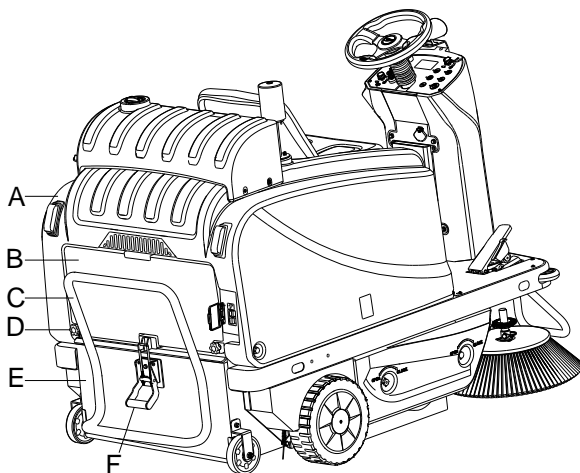
## Filter Shaker Motor (M7)

### Removal

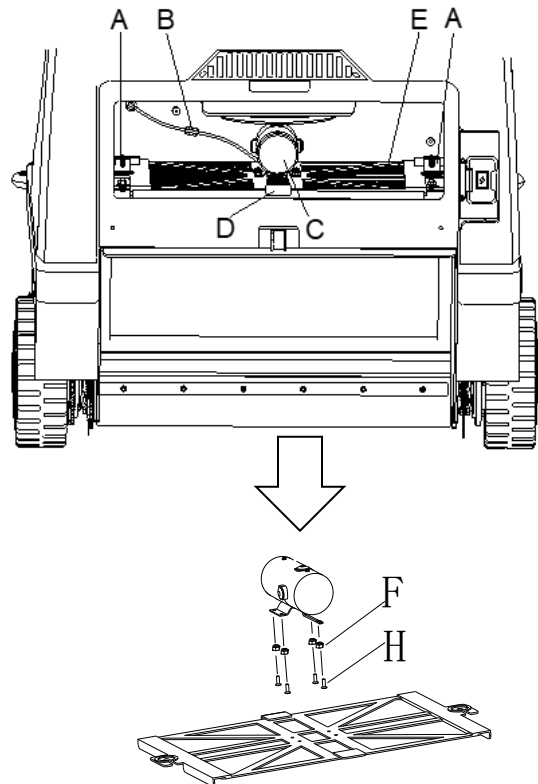
1. Drive the machine onto level ground and engage the parking brake.
2. Turn the ignition key to "O".
3. Remove the cover (A, Figure 5)
4. Disengage the latch (F, Figure 5) by pulling its lower end.
5. Remove the hopper (E, Figure 5) by disengaging it from the inner guides with the handle (C, Figure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

### Installation

Assemble components in reverse order of disassembly.



**Figure 5**



**Figure 6**

## 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 <sup>3</sup> / H	1650
	Noise Level	dB_A	72