

# SC500

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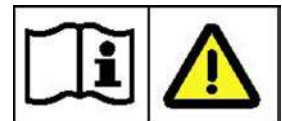
## ***Service Manual***

### **Advance Model Numbers:**

9087352020 SC500 X20 B  
9087353020 SC500 X20R B  
9087354020 SC500 20D B  
9087403020 SC500 X20 B V  
9087405020 SC500 X20R B V  
9087404020 SC500 20D B V

### **Nilfisk Model Numbers:**

9087350020 SC500 53 B FULL PKG  
9087351020 SC500 53 B  
9087355020 SC500 53R B  
9087400020 SC500 53 B FULL PKG V  
9087401020 SC500 53 B V  
9087402020 SC500 53R B V



English

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## 03 - General Information

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### Machine General Description

The SC500 is a “walk-behind” industrial machine designed to wash and dry floors in one pass. The machine is powered by on-board batteries, models can be equipped with EcoFlex system. The machine features variable floor pressure disc brush or REV system, controlled detergent solution dosing and a rear squeegee with rubber blades that vacuums and dries the floor.

### Service Manual Purpose and Field of Application

The Service Manual is a technical resource intended to help service technicians when carrying out maintenance and repairs on the SC500, to guarantee the best cleaning performance and a long working life for the machine.

Please read this manual carefully before performing any maintenance and repair procedure on the machine.

### Other Reference Manuals

Model	Form No.
Instructions for Use, Advance Brand	9099980000
Instructions for Use, Nilfisk Brand	9099974000
Parts List, Advance Brand	9099981000
Parts List, Nilfisk Brand	9099975000
Nilfisk Lithium-Ion Battery Module Service Manual	56043180

Assembly Instructions	Instruction Code	Machines concerned
EcoFlex Kit	9100000923	SC500 Nilfisk
Battery charger kit	9100000924	SC500 Nilfisk
Vacuum system motor kit	9100000753	All SC500
TrackClean	9100000057	All SC500
Lithium-Ion Battery Module Kit	9100003105	SC500 with magnetic key

These manuals are available at:

- Local Advance or Nilfisk retailer
- Advance website: [www.advance-us.com](http://www.advance-us.com)
- Nilfisk website: [www.nilfisk.com](http://www.nilfisk.com)
- EZ-Data application

## Conventions

Forward, backward, front, rear, left or right are intended with reference to the operator’s position, that is to say in driving position.

## Name Plate

Reference to Figure 1

The machine serial number and model name are marked on the plate (see the example to the side).

Model number and year of production (Date code: A17, as January 2017) are marked on the same plate.

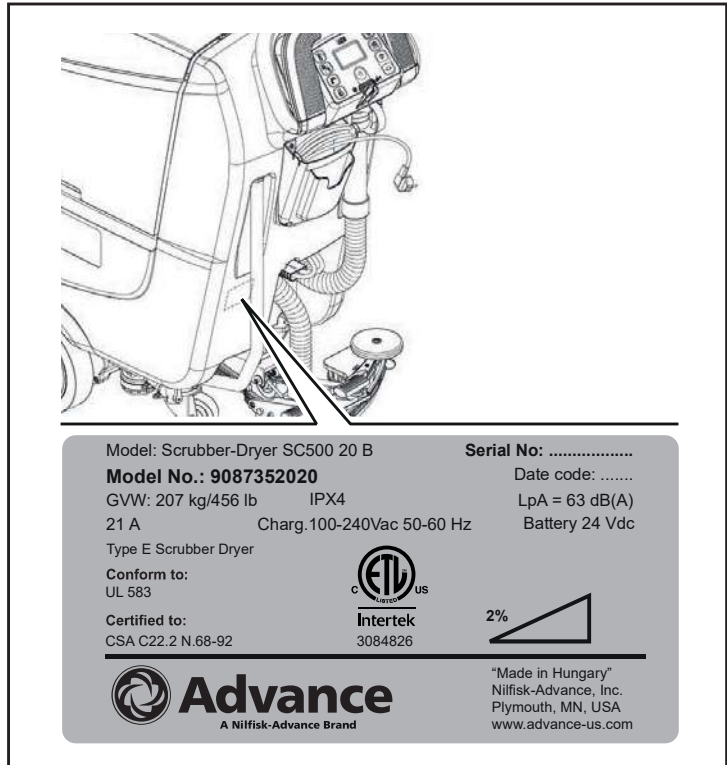
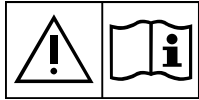


Figure 1:

## Safety

The following symbols indicate potentially dangerous situations. Always read this information carefully and take all necessary precautions to safeguard people and property.

### Visible Symbols on the Machine



**WARNING:** Carefully read all the instructions before performing any operation on the machine.



**WARNING:** Do not wash the machine with direct or pressurized water jets.



**WARNING:** Do not use the machine on slopes with a gradient exceeding the specifications.

### Symbols

The following symbols are used to help you recognize the information concerning the safety and the prevention of problems.



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



**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.



**Note:** Indicates an important informational message.



## General Safety Instructions

Specific warnings and cautions to inform about potential damages to people and machine are shown below.



**DANGER:** Before performing any maintenance, repair, cleaning or replacement procedure, remove the ignition key and disconnect the battery connector).

- This machine must be used by properly trained operators only.
- Do not wear jewels when working near electrical components.
- Do not work under the lifted machine without supporting it with safety stands.
- Do not operate the machine near toxic, dangerous, flammable and/or explosive powders, liquids or vapors: This machine is not suitable for collecting dangerous powders.
- When using lead (WET) batteries, keep sparks, flames and smoking materials away from the batteries. During the normal operation explosive gases are released.
- When using lead (WET) batteries, battery charging produces highly explosive hydrogen gas. During battery charging, lift the recovery tank and perform this procedure in well-ventilated areas and away from naked flames.



**CAUTION:** Carefully read all the instructions before performing any maintenance/repair procedure.

- The machine ignition key has a built-in magnet. Do not place objects having magnetic bands (such as credit cards, electronic keys, phone cards) near the key. The built-in magnet can damage or erase the data stored on the magnetic bands.
- Before using the battery charger, ensure that frequency and voltage values, indicated on the machine serial number plate, match the electrical mains voltage.
- Do not pull or carry the machine by the battery charger cable and never use the battery charger cable as a handle. Do not close a door on the battery charger cable, or pull the battery charger cable around sharp edges or corners. Do not run the machine on the battery charger cable.
- Keep the battery charger cable away from heated surfaces.
- Do not charge the batteries if the battery charger cable or the plug are damaged.
- To reduce the risk of fire, electric shock, or injury, do not leave the machine unattended when it is plugged in. Before performing any maintenance procedure, disconnect the battery charger cable from the electrical mains.
- Do not smoke while charging the batteries.
- To avoid any unauthorized use of the machine, remove the ignition key.
- Do not leave the machine unattended without being sure that it cannot move independently.
- Always protect the machine against the sun, rain and bad weather, both under operation and inactivity condition. Store the machine indoors, in a dry place: This machine must not be used or stored outdoors in wet conditions.
- Before using the machine, close all doors and/or covers as shown in the User Manual.

- *This machine is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the machine by a person responsible for their safety.*
- *Children should be supervised to ensure that they do not play with the machine.*
- *Close attention is necessary when used near children. Use only as shown in this Manual. Use only Nilfisk or Advance recommended accessories.*
- *Check the machine carefully before each use, always check that all the components have been properly assembled before use. If the machine is not perfectly assembled it can cause damages to people and properties.*
- *Take all necessary precautions to prevent hair, jewels and loose clothes from being caught by the machine moving parts.*
- *Do not use the machine on incline.*
- *Do not tilt the machine more than the angle indicated on the machine itself, in order to prevent instability.*
- *Do not use the machine in particularly dusty areas.*
- *Use the machine only where a proper lighting is provided.*
- *While using this machine, take care not to cause damage to people or objects.*
- *Do not bump into shelves or scaffoldings, especially where there is a risk of falling objects.*
- *Do not lean liquid containers on the machine, use the relevant can holder.*
- *The machine operating temperature must be between 32°F and 104°F (0°C and +40°C).*
- *The machine storage temperature must be between 32°F and 104°F (0°C and +40°C).*
- *The humidity must be between 30% and 95%.*
- *When using floor cleaning detergents, follow the instructions on the labels of the detergent bottles.*
- *To handle floor cleaning detergents, wear suitable gloves and protections.*
- *Do not use the machine as a means of transport.*
- *Do not allow the brush/pad to operate while the machine is stationary to avoid damaging the floor.*
- *In case of fire, use a powder fire extinguisher, not a water one.*
- *Do not tamper with the machine safety guards and follow the ordinary maintenance instructions scrupulously.*
- *Do not allow any object to enter into the openings. Do not use the machine if the openings are clogged. Always keep the openings free from dust, hairs and any other foreign material which could reduce the air flow.*
- *Do not remove or modify the plates affixed to the machine.*
- *When the machine is to be pushed for service reasons (missing or discharged batteries, etc.), the speed must not exceed 2.5 mi/h (4 km/h).*

- *This machine cannot be used on roads or public streets.*
- *Pay attention during machine transportation when temperature is below freezing point. The water in the recovery tank or in the hoses could freeze and seriously damage the machine.*
- *Use brushes and pads supplied with the machine or those specified in the User Manual. Using other brushes or pads could reduce safety.*
- *In case of machine malfunctions, ensure that these are not due to lack of maintenance. If necessary, request assistance from the authorised personnel or from an authorised Service Center.*
- *If parts must be replaced, require ORIGINAL spare parts from an Authorised Dealer or Retailer.*
- *To ensure machine proper and safe operation, the scheduled maintenance shown in the relevant chapter of this Manual, must be performed by the authorised personnel or by an authorised Service Center.*
- *Do not wash the machine with direct or pressurised water jets, or with corrosive substances.*
- *The machine must be disposed of properly, because of the presence of toxic-harmful materials (batteries, etc.), which are subject to standards that require disposal in special centres.*

### **Lithium-Ion Battery Module Safety Instructions**

Specific warnings and cautions to inform about potential damages to people and machine are shown below.



**DANGER:** Before performing any maintenance, repair, cleaning or replacement procedure on the cleaning machine turn off the battery pack by taking off the reader key and disconnect the battery pack using the large power connector.

- *Do not wear jewelry when working near electrical components.*
- *Read all safety warnings and all instructions. Failure to follow the warnings and instructions may result in electrical shock, fire and/or serious injury.*



**CAUTION:** Carefully read all the instructions before performing any maintenance/repair procedure.

- *Do not use any other type of batteries; only use the one supplied with the machine or its original spare part.*
- *Before each use, check if it's damaged.*
- *Do not soak in liquids.*
- *Recharge only with the charger specified by the manufacturer. A charger that is suitable for one type of battery pack may create a risk of fire when used with another battery pack.*
- *Under abusive conditions, liquid may be ejected from the battery; avoid contact. If contact accidentally occurs, flush with water. If liquid contacts eyes, additionally seek medical help. Liquid ejected from the battery may cause irritation or burns.*
- *When battery pack is not in use, keep it away from other metal objects, like paper clips, coins, keys, nails, screws or other small metal objects that can make a connection from one terminal to another. Shorting the battery terminals together may cause burns or a fire.*

- *Do not use a battery pack or appliance that is damaged or modified. Damaged or modified batteries may exhibit unpredictable behavior resulting in fire, explosion or risk of injury. Follow all charging instructions and do not charge the battery pack or appliance outside of the temperature range specified in the instructions. Charging improperly or at temperatures outside of the specified range may damage the battery and increase the risk of fire.*
- *Do not expose a battery pack or appliance to fire or excessive temperature. Exposure to fire or temperature above 130°C may cause explosion.*
- *Have servicing performed by a qualified repair person using only identical replacement parts. This will ensure that the safety of the product is maintained.*
- *Do not modify or attempt to repair the the battery pack.*
- *Do not store, use or recharge in environments with a temperature higher than 45°C.*
- *Do not recharge with temperatures lower than 0°C.*
- *Due to the risk of short-circuit, do not store the battery with metal objects.*
- *If the battery is damaged, take it to a Nilfisk Service Centre.*
- *Before decommissioning the machine, remove the battery.*
- *Store the battery charger in a dry place.*
- *If the battery charger or the cable are wet, do not use it.*
- *Do not use the battery charger in environments where there are flammable powders and/or explosive materials.*
- *Only handle the loose battery charger by its lifting handle.*
- *Do not cover the battery charger.*
- *Always use the battery charger supplied with the machine or the original spare part.*
- *Disconnect the battery pack from the appliance before making any adjustments, changing accessories, or storing appliance. Such preventive safety measures reduce the risk of starting the appliance accidentally.*
- *Use appliances only with specifically designated battery packs. Use of any other battery packs may create a risk of injury and fire.*
- *Keep the battery pack, including the ventilation channels and contact areas clean from dirt and moisture. Avoid that dirt and moisture is getting inside the battery pack during cleaning.*

## **Lifting The Machine**



**WARNING:** Do not work under the lifted machine without supporting it with safety stands.

## **Transporting The Machine**



**WARNING:** Before transporting the machine, make sure that:

- All covers are closed.
- The recovery tank and the detergent tank are empty.
- The batteries are disconnected.
- The ignition key is removed.
- The machine is securely fastened to the means of transport.

## Technical Specifications

Description / Model	SC500	
	DISC	REV
Solution tank capacity	12 US gal (45 liters)	
Recovery tank capacity	12 US gal (45 liters)	
Machine length	50.3 in (1277 mm)	51.2 in (1302 mm)
Machine width with squeegee	28.3 in (720 mm)	
Machine width without squeegee	21 in (532 mm)	21.2 in (538 mm)
Machine height	41.8 in (1063 mm)	
Cleaning width	20 in (530 mm)	
Driving wheel diameter	7.8 in (200 mm)	
Driving wheel specific pressure on the floor (*)	101 psi (0.7 N/mm <sup>2</sup> )	
Rear wheel diameter	3.1 in (80 mm)	
Rear wheel specific pressure on the floor (*)	304 psi (2.1 N/mm <sup>2</sup> )	
Brush/pad diameter	20 in (530/508 mm)	
Brush pressure with extra-pressure function turned off	33 lb (15 kg)	49 lb (22 kg)
Brush pressure with extra-pressure function turned on	66 lb (30 kg)	66 lb (30 kg)
Solution flow values	0.75 cl/m / 1.5 cl/m 3.0 cl/m / 2.8 l/min	0.38 cl/m / 0.75 cl/m 1.5 cl/m / 2.8 l/min
EcoFlex system detergent percentage	Ratio 1:400 ÷ 1:33 (0.25% ÷ 3%)	
Sound pressure level at workstation (ISO 11201, ISO 4871, EN 60335-2-72) (LpA)	63 ± 3 dB(A)	65 ± 3 dB(A)
Sound pressure level at workstation in silent mode (LpA)	60 ± 3 dB(A)	61 ± 3 dB(A)
Machine sound power level (ISO 3744, ISO 4871, EN 60335-2-72) (LwA)	81 dB(A)	83 dB(A)
Vibration level at the operator's arms (ISO 5349-1, EN 60335-2-72)	< 98.4 in/s <sup>2</sup> (< 2.5 m/s <sup>2</sup> )	
Maximum gradient when working	2%	
Drive system motor power	0.27 hp (200 W)	
Drive speed (variable)	0 - 3.1 mi/h (0 - 5 km/h)	
Vacuum system motor power	0.37 hp (280 W)	
Vacuum system circuit capacity	29.9 in H <sub>2</sub> O (760 mm H <sub>2</sub> O)	
Brush motor power	0.6 hp (450 W)	0.9 HP (670 W)
Brush rotation speed	155 rpm	-
Total power draw (EN 60335-2-72)	0.7 hp (500 W)	
IP protection class	X4	
Protection class (electric)	III (I for the battery charger)	

Description / Model	SC500	
	DISC	REV
Battery compartment size	13.7x13.7x10.2 in (350x350x260 mm)	
System Nominal Voltage	24V	
Standard batteries (2)	12V 105 AhC5	
Lithium Ion battery (1- 3 modules)	24V,64 Ah, 1554 Wh (Each module)	
Battery charger	24V 13A	
Operating time (standard batteries) (EN 60335-2-72)	3.5 hour	
Operating time (Lithium-Ion batteries)	3 hours and 30 mins /module	
Weight without batteries and with empty tanks	187 lb (85 kg)	194 lb (88 kg)
Gross vehicle weight (GVW) (standard batteries)	456 lb (207 kg)	463 lb (210 kg)
Weight of Lithium Ion battery kit with one module	92.6 lb (42 kg)	
Shipping weight (standard batteries)	256 lb (116 kg)	262 lb (119 kg)
Shipping weight (Lithium-Ion batteries)	280 lb (127 kg)	287 lb (130 kg)

(\*) Machines have been tested under the following conditions:

- Battery maximum size
- Maximum brush and squeegee size
- Full detergent tank
- Optional equipment installed
- Wheel weight checked
- Print on the floor checked on cement for each single wheel
- Result expressed as maximum value for both front and rear wheels

## Maintenance Schedule

Procedure	Daily, after use	Weekly/ Monthly	Every 6 Months	Annually
Battery charging				
Squeegee cleaning				
Brush/pad cleaning				
Recovery tank and debris tray cleaning, and cover gasket check				
EcoFlex system cleaning and draining				
Squeegee blade check				
Solution Filter Cleaning				
Battery (WET) fluid level check				
Squeegee blade replacement				
Brush motor carbon brush check or replacement				
Drive system motor carbon brush check or replacement				
Brush deck vibration-damper replacement (only for REV version)				



## Know Your Machine

### Control panel Disc deck (Model No.: 9087352020, 9087354020, 9087350020, 9087351020)

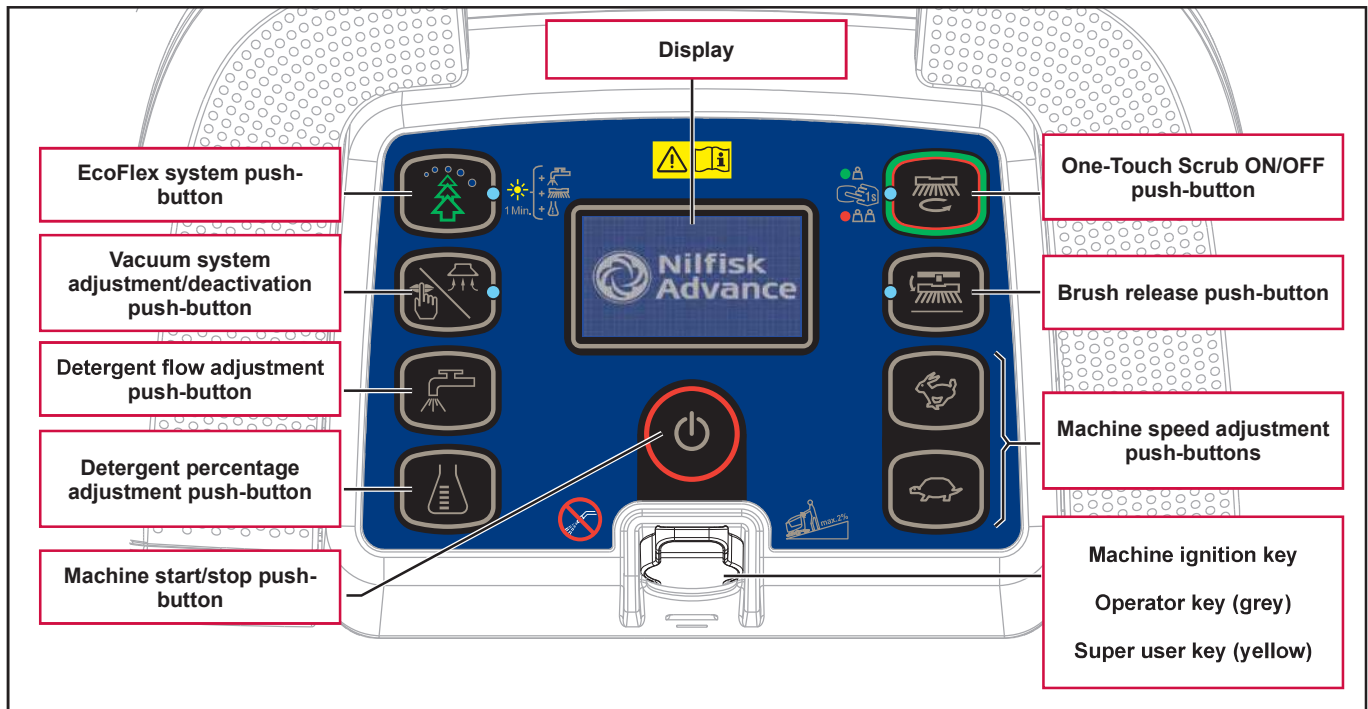


Figure 2:

### Control panel REV deck (Model No.: 9087353020, 9087355020)

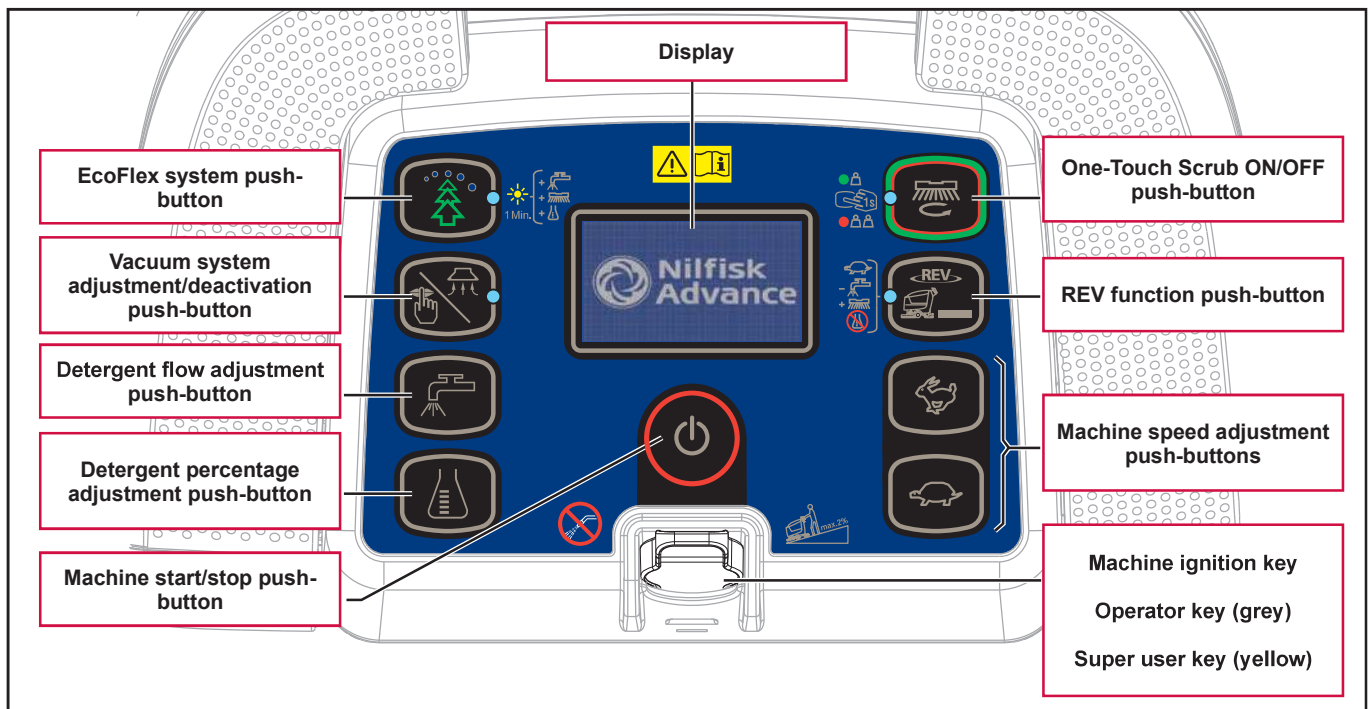


Figure 3:

**Control panel Disc deck (Model No.: 9087403020, 9087404020, 9087400020,9087401020)**

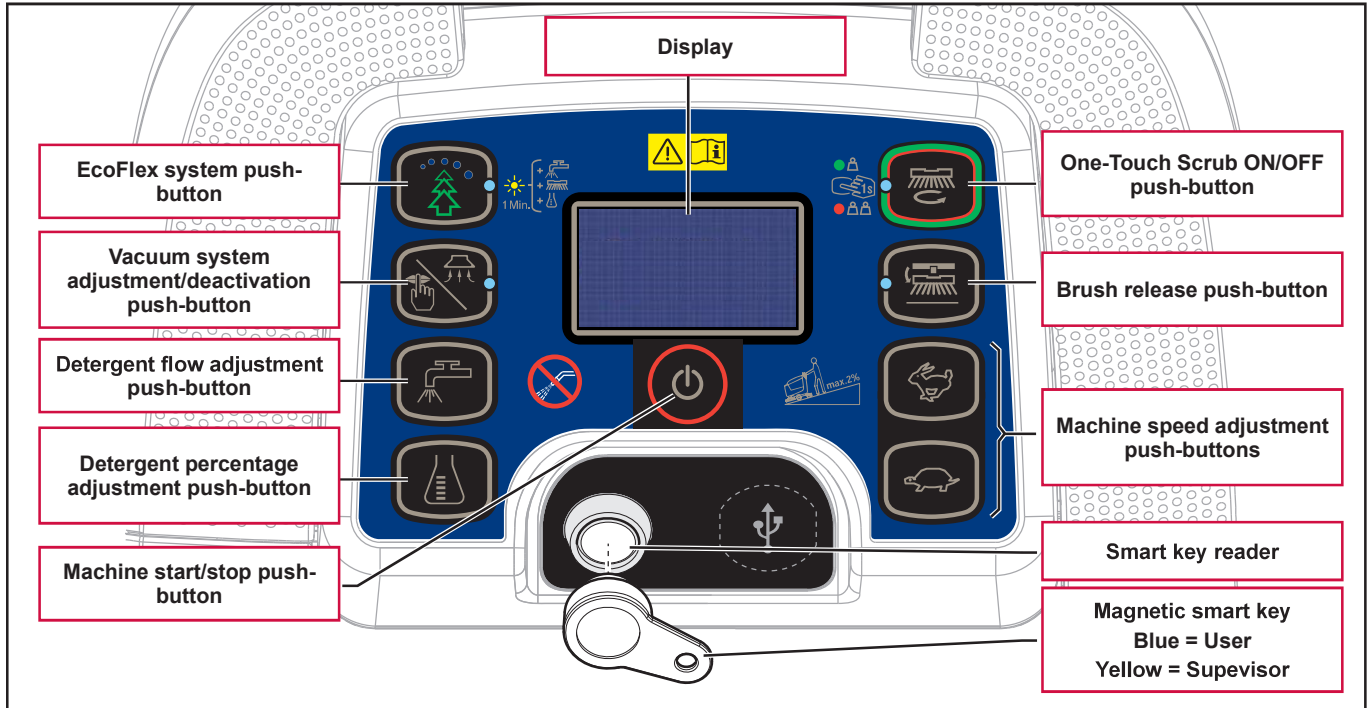


Figure 4:

**Control panel REV deck (Model No.: 9087405020, 9087402020)**

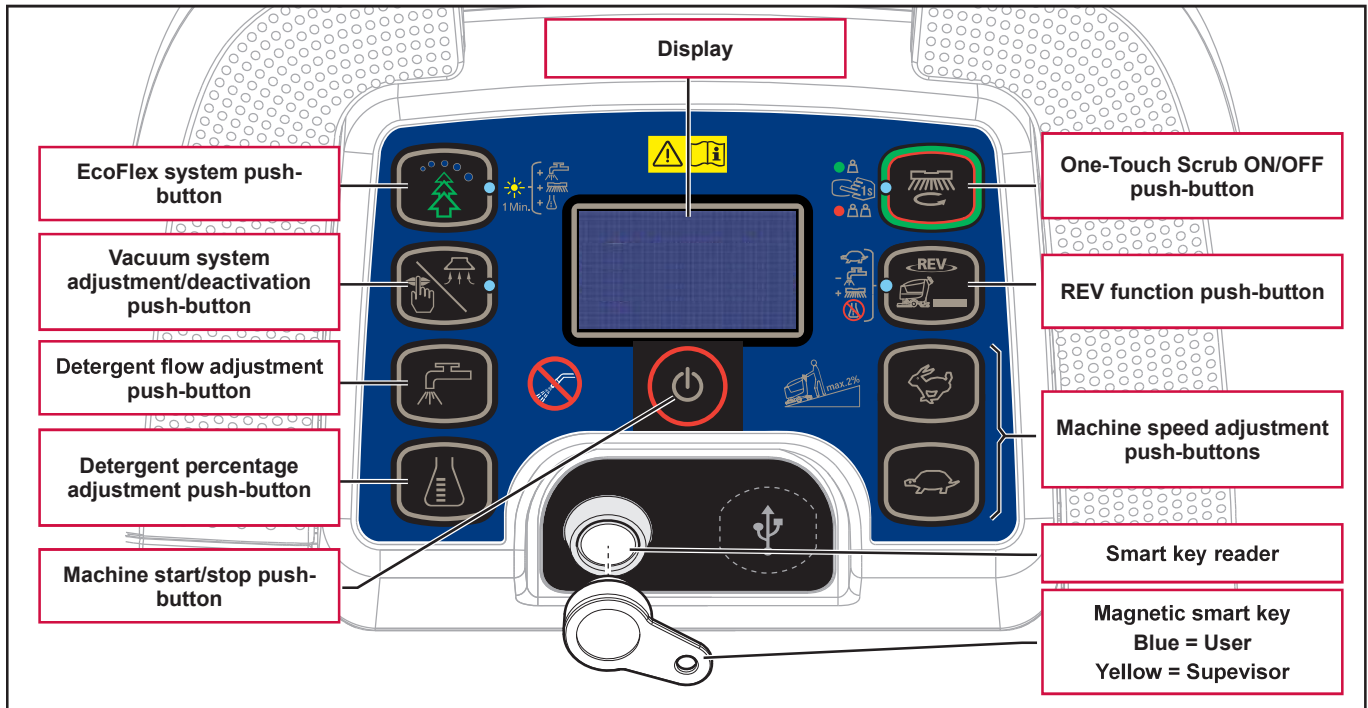


Figure 5:

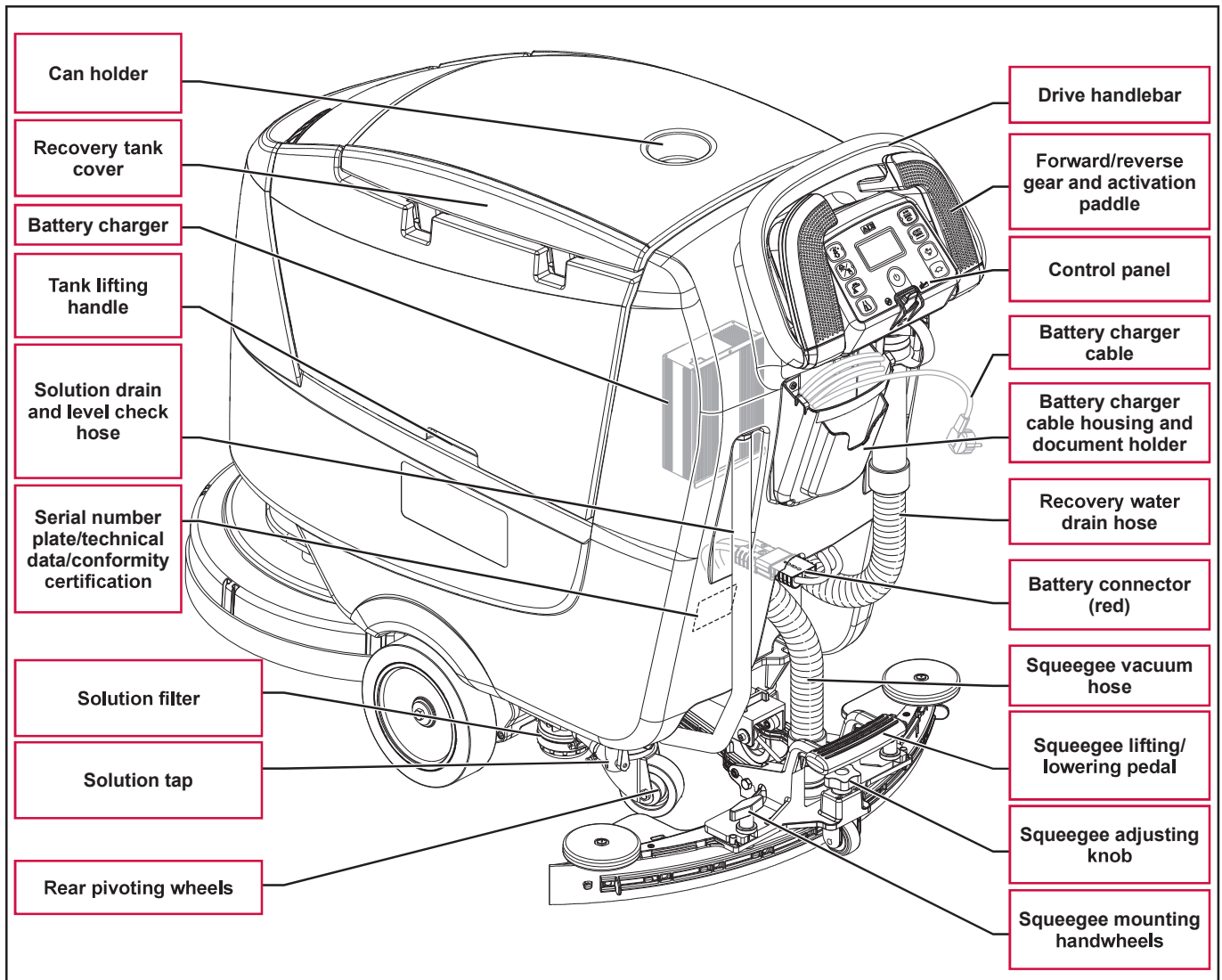


Figure 6:

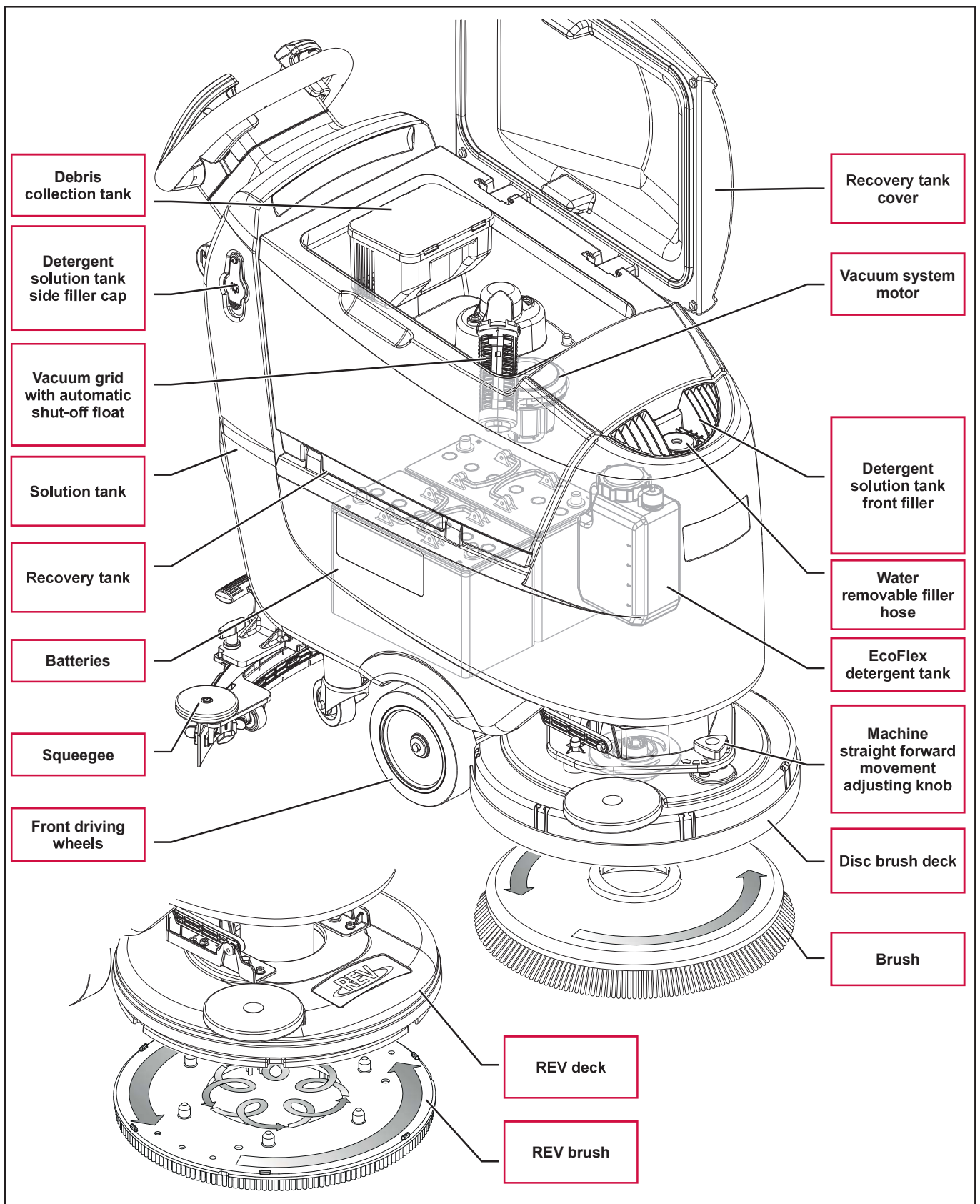


Figure 7:

## Service and Diagnostic Equipment

Besides a complete set of standard meters, the following instruments are necessary to perform fast checks and repairs on Nilfisk machines:

- Laptop computer charged with the current version of EzParts, Adobe Reader and (if possible) Internet connection
- Digital Volt Meter (DVM)
- Amp clamp with possibility of making DC measurements
- Hydrometer
- Battery charge tester to check 12V batteries
- Static control wrist strap
- Dynamometric wrench set
- A copy of the Instructions for Use Manual and Spare Parts List of the machine to be serviced (provided with the machine or available at [www.advance-us.com](http://www.advance-us.com) or other Nilfisk websites).

The following equipment is also available at Nilfisk or Advance Centers:

- Vacuum water lift gauge, P/N 56205281

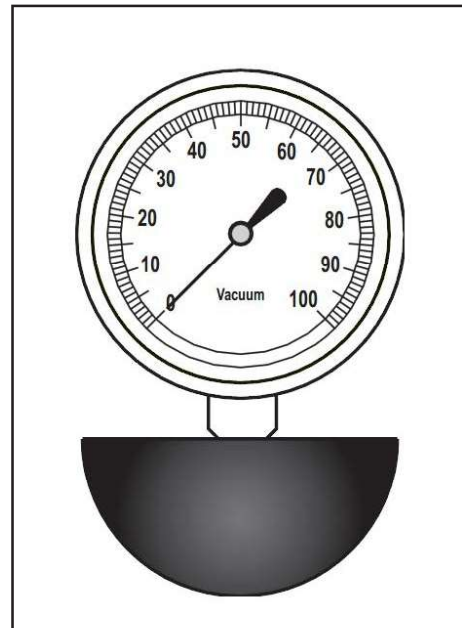


Figure 8:

## Dimensions

### SC500 Disc

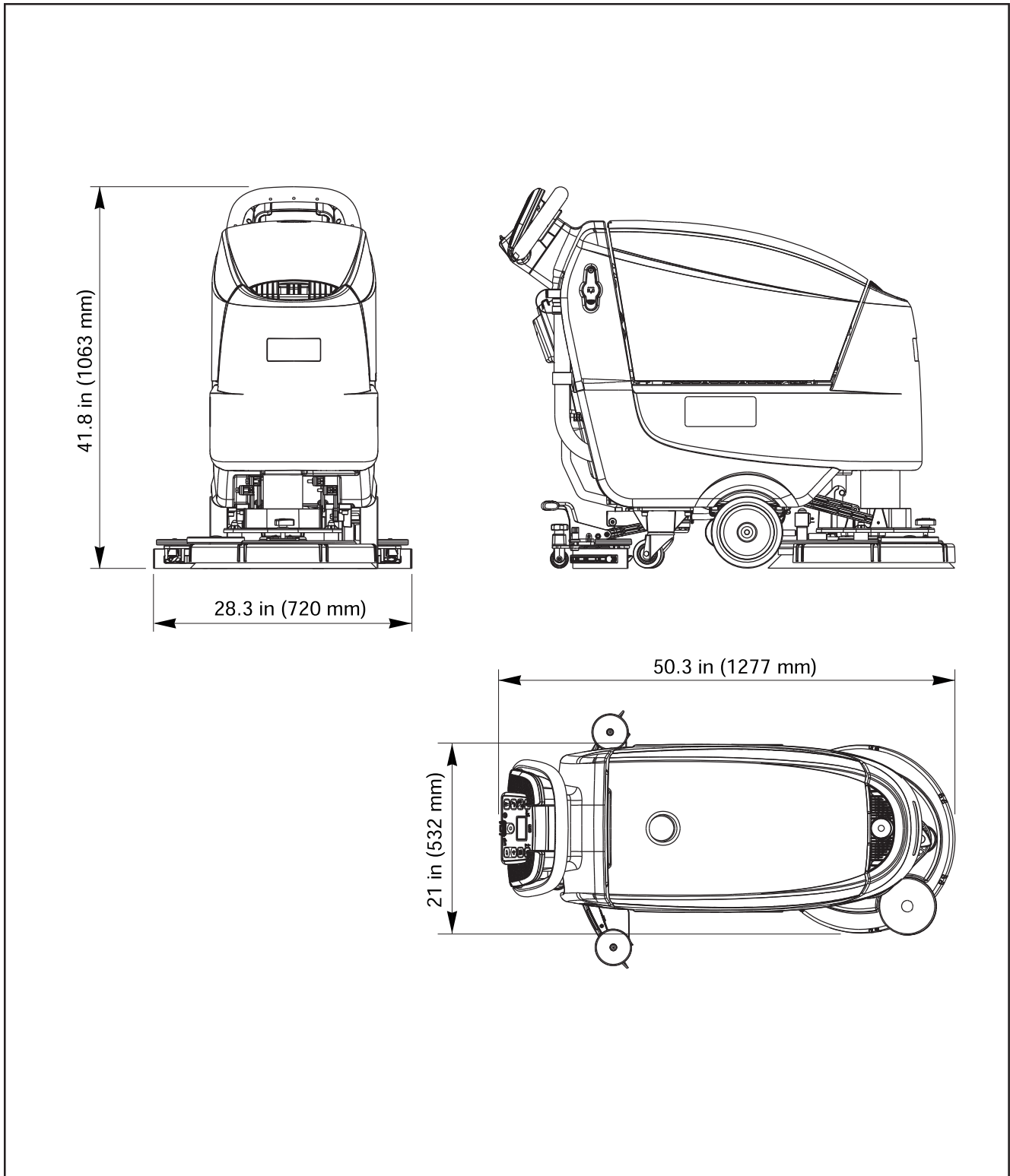


Figure 9:

### SC500 REV

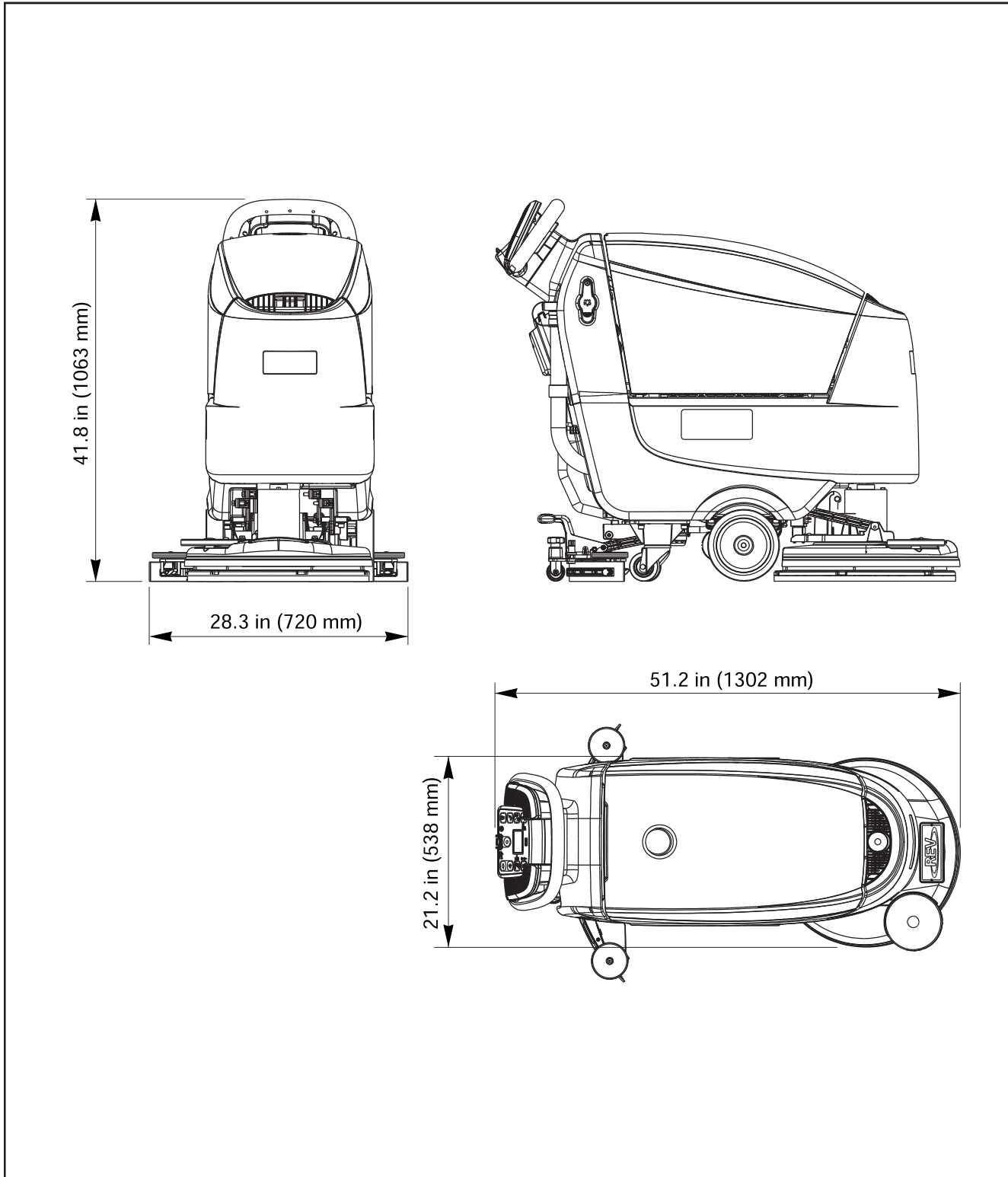


Figure 10:

## 04 - Control System - models with key slot

**Model No.: 9087352020, 9087354020, 9087350020, 9087351020, 9087353020, 9087355020**

### Functional Description

The architecture of the electronic control system for the machine's electrical components is composed of a Main machine controller (EB1) and a Display controller (EB2), in turn connected to a User interface controller (EB3) which represents the main user interface.

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

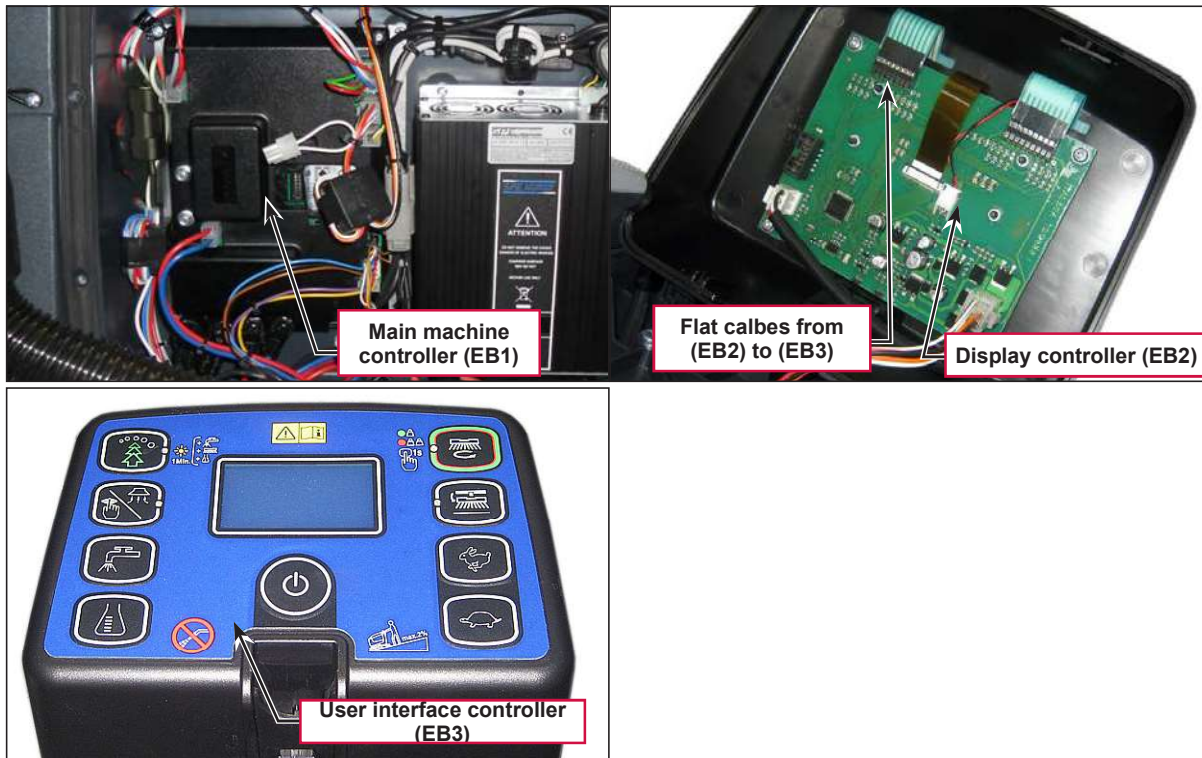
- Drive system motor (M3)
- Vacuum system motor (M2)
- Deck actuator (M5)
- Brush motor (M6)
- Solution flow solenoid valve (EV1)
- Detergent pump (M4)

The Display controller (EB2) serves mainly as an aggregator for all input signals (buttons) and outputs (LEDs) from the User interface controller (EB3), which it is connected to via 2 flat cables.

Mounted on the Display controller (EB2) is also the LCD display and the 2 sensors which detect the presence and type of magnetic key inserted in the Main machine controller.

The Display controller (EB2) sends all the input and output signals of these components to the Main machine controller (EB1) using 2-wire 2-way serial communications protocol.

The system is completed by the on-board battery charger which also uses a proprietary serial protocol to communicate with the Main machine controller (EB1), in order to display its operating status (charging phase) to the operator on the LCD display.





# Wiring Diagram

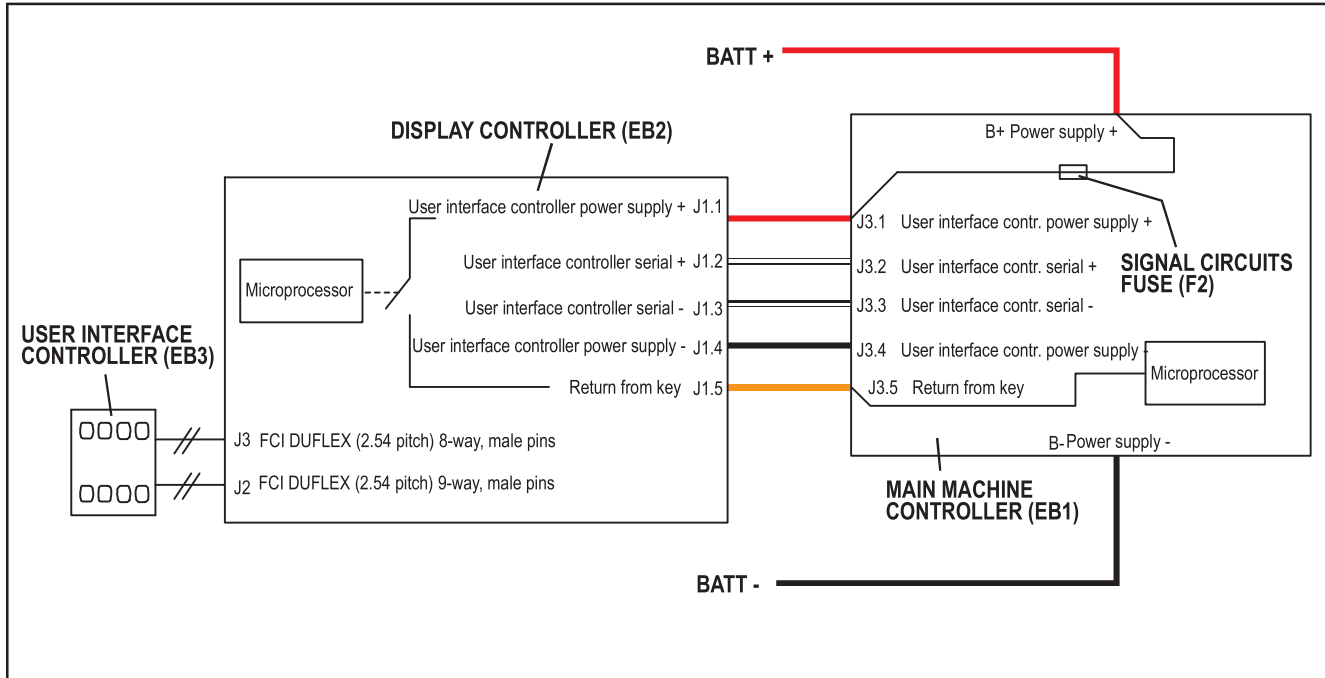


Figure 1:

### Component Locations

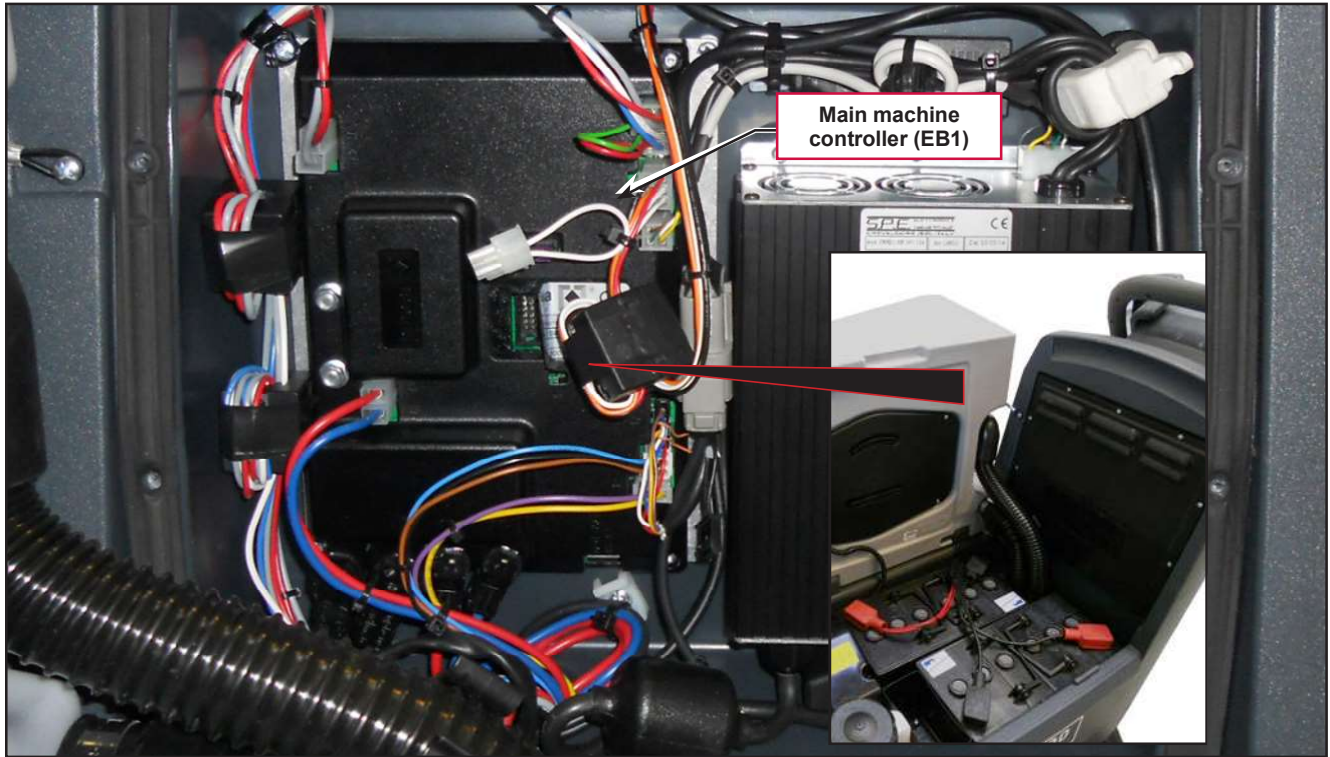


Figure 2:

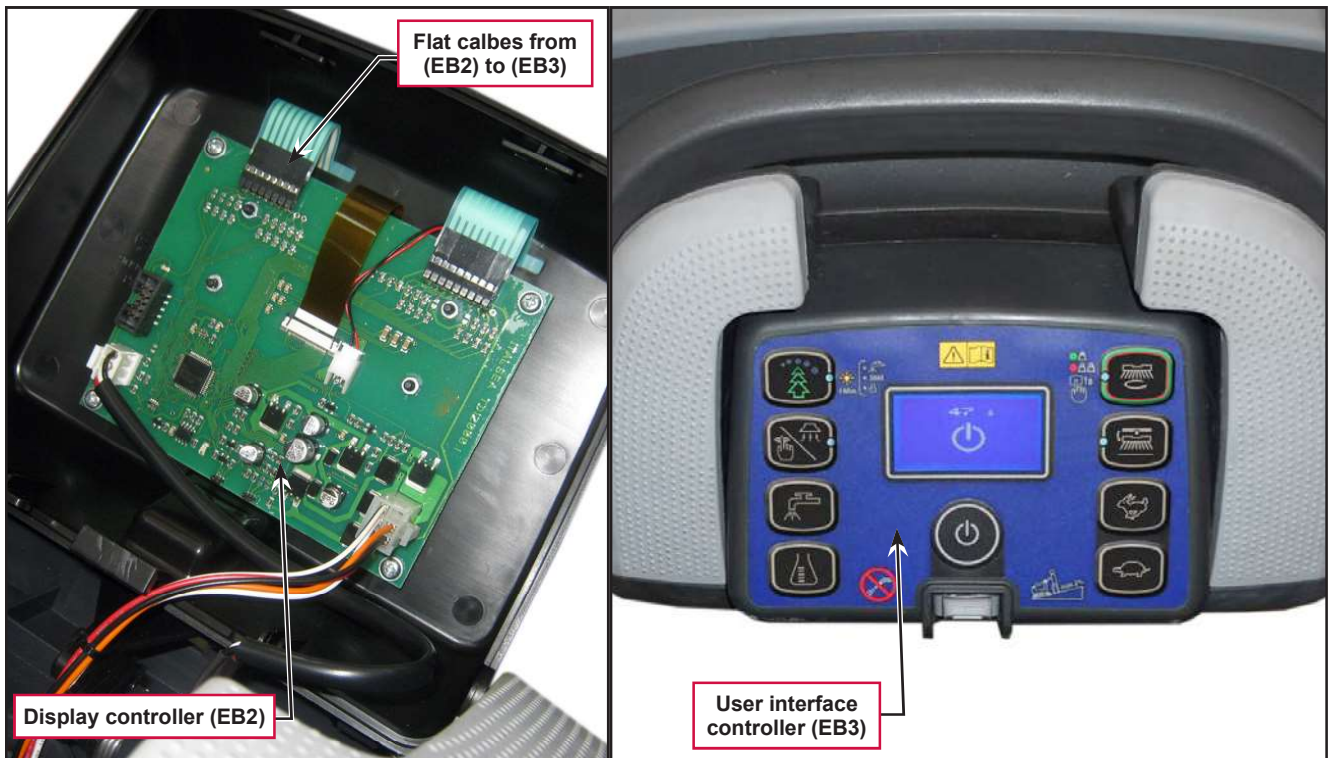


Figure 3:

## Troubleshooting

### Main machine controller (EB1) Alarm Codes

The Main machine controller indicates a series of alarms in case of malfunction of one or more systems, and in case of abnormal conditions detected in the input signals.

The alarms are shown on the display in the following format: ALARM <XX> <DESCRIPTION> (Figure 4).



Figure 4:

In case the display is malfunctioning, the alarms are also repeated by the yellow and red diagnostic LEDs (Figure 5) on the Main machine controller (EB1), as indicated in the following tables.

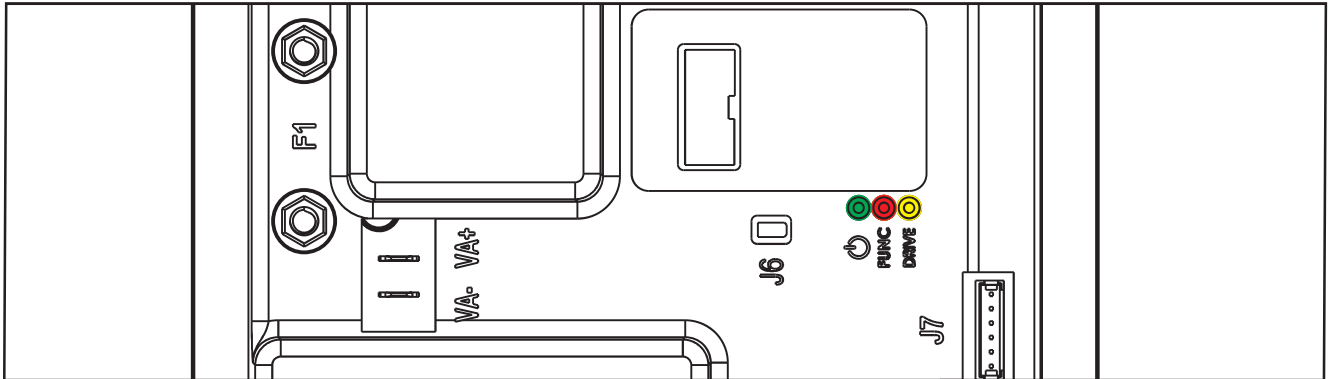


Figure 5:

General alarms					
Alarm on Main machine controller - FLASHING YELLOW + RED LEDES					
Alarm code	No. Flashes	Meaning	Condition	Effect	Service Suggestions
Description					
G2  EEPROM ERROR	2	EEPROM error	EEPROM error	Function block + Default setting reset	If the machine continues to function after G2 has been displayed, this may have been caused by a significant external electromagnetic disturbance.  1. Check that the settings and parameters (see pages 34 - 35) are correct (they may have returned to their defaults). If the error persists, the Main machine controller must be replaced.

<b>General alarms</b>					
<b>Alarm on Main machine controller - FLASHING YELLOW + RED LEDS</b>					
<i>Alarm code</i>	<i>No. Flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
<b>G3</b>  <b>MAIN FUSE FAILURE</b>	3	Blown F1 fuse.	Blown F1 fuse.  Broken battery.	Function block.	F1 is a safety fuse primarily included to prevent a short circuit or serious damage to the Main machine controller causing currents such as to melt cables and/or cause smoke or fire. If F1 has blown, this is usually indicative of serious damage to the Main machine controller.  1. Removing the cover should allow you to understand the extent of the damage, but the solution in any case should be to replace the Main machine controller. 2. Try replacing fuse F1 only if there is no clear damage to the Main machine controller and wiring. 3. Ensure you tighten the fuse contacts correctly.  It could happen also if a battery is broken:  Check the battery voltage under load.
<b>G4</b>  <b>BATTERY LOW VOLTAGE</b>	4	Undervoltage.	The battery voltage remains below 18.4V for over 10 seconds (for WET CELL batteries, 19.6V for GEL-AGM batteries).	Function block.	1. Check the battery voltage under no-load conditions and under load. Replace the faulty battery/batteries if necessary. 2. Recharge the batteries by performing a complete charging cycle.
<b>G5</b>  <b>BATTERY OVERVOLTAGE</b>	5	Excessive battery voltage.	Battery voltage over 32V.	Function block.	Check the voltage of the installed batteries and that the terminals are correctly tightened.
<b>G6</b>  <b>HARDWARE FAILURE</b>	6	Serial communication error with the User interface controller.	No signal or error in communications decoding between the Main machine controller (EB1) and the Display controller (EB2).	No block.	1. Check the 5 cables from the 6-way User interface controller connector to connector J3 pins 1, 2, 3, 4. 2. If there is continuity, the User interface controller must be replaced.
<b>G7</b>  <b>HARDWARE FAILURE</b>	7	General relay fault.	Relay closes or closed at start-up.	Function block.	Replace the Main machine controller.

<b>Main machine controller alarms</b>					
<b>Alarm on Main machine controller - FLASHING RED LED</b>					
<i>Alarm code</i>	<i>No. flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
F2 ----- BRUSH MOTOR OVERLOAD	2	BRUSH motor amperometric protection.	The motor current is greater than the value of the parameter (see page 35) VS1	Brush motor output stop.	Check the current draw of the brush motor. It should remain below the value set in the parameter "VS1" during operation.
F3 ----- VACUUM MOTOR OVERLOAD	3	VACUUM SYSTEM amperometric protection.	The current draw of the vacuum motor is greater than 30A for over 10 seconds.	Vacuum system block.	1. Check for any debris in the vacuum motor. 2. Check that the motor rotor turns freely. 3. Replace the vacuum motor if necessary.
F4 ----- DECK ACTUATOR FAILURE	4	DECK ACTUATOR overcurrent.	Current greater than 4A detected for more than 1 second.	Brush function block.	1. Check that there is no friction on the brush deck linkage; lubricate if necessary. 2. Check that the actuator and deck travel is not blocked by mechanical obstructions. 3. If the problem persists, replace the actuator.
F5 ----- HARDWARE FAILURE	5	Short circuit on the vacuum or brush motor drive MOSFET.	MOSFET short circuit.	Function block.	1. Check that there are no short circuits in the motor wiring. 2. Replace the Main machine controller.
F6 ----- PRESSURE GAUGE FAILURE	6	PRESSURE GAUGE FAILURE  (Not used)	-	-	-
F7 ----- OVERHEATING	7	Motor drive section thermal cut-out.	The heatsink on the Main machine controller has reached a temperature of 194°F (90°C).	Function block.	Check the vacuum and brush motor power draw and that the openings of the electrical compartment are not blocked.
F8 ----- BRUSH MOTOR FAILURE	8	Brush motor output short circuit.	$I > 150A$ for 20μsec.	Function block.	Check for short circuits in the wiring or motor.
F9 ----- VACUUM MOTOR FAILURE	9	Vacuum motor output overcurrent.	$I > 150A$ for 20μsec.	Function block.	Check for short circuits in the wiring or motor.

<b>Drive system alarms</b>					
<b>Alarm on Main machine controller - FLASHING YELLOW LED</b>					
<i>Alarm code</i>	<i>No. flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
<b>T2</b> ----- <b>DRIVE MOTOR OVERLOAD</b>	2	Amperometric protection intervention.	Drive motor current draw greater than the parameter (see page 35) "INOM" for more than the parameter (see page 35) "TMAX".	Drive blocked.	Check the current draw of the drive motor (this should be around 6-8amps without load and remain below 10-12amps during operation).
<b>T3</b> ----- <b>RELEASE THE PADDLE !</b>	3	Paddle not in rest position when the machine is turned on.	Voltage on J1.2 of the Display controller (EB2) out of range 1.29V - 1.49V with respect to - BAT.	Drive blocked.	Check that the paddle moves correctly, lubricating if necessary; check the linkage and potentiometer.
<b>T4</b> ----- <b>PADDLE INPUT FAILURE</b>	4	Incorrect voltage measured at the paddle potentiometer input.	Voltage on J1.2 of the Display controller (EB2) above 3V.	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check the connection of the potentiometer to the Display controller.</li> <li>2. Replace the potentiometer.</li> <li>3. Replace the Display controller (EB2).</li> </ol>
<b>T5</b> ----- <b>HARDWARE FAILURE</b>	5	Drive system power section damage	MOSFET short circuit.	Drive blocked.	Disconnect M1 and M2 from controller, press the pedal <ol style="list-style-type: none"> <li>1. If the alarm persist replace the controller</li> <li>2. If not, check the cables of the gear motor and motor itself for a short circuit</li> </ol>
<b>T6</b> ----- <b>DRIVE MOTOR FAILURE</b>	6	Overcurrent (motor D.C.)	Drive motor current draw greater than 1.5 times the value of the parameter (see page 35) "IMAX".	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check that the gear motor cables are not short circuited</li> <li>2. Check that the motor of the gear motor unit is not short circuited (the impedance of the motor should be around 0.6 – 0.8 Ohm)</li> <li>3. If necessary, replace the gear motor unit motor</li> </ol>
<b>T7</b> ----- <b>OVERHEATING</b>	7	Drive motor drive section thermal cut-out.	The heatsink on the Main machine controller has reached a temperature of 194°F (90°C).	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check the drive motor power draw and that the openings of the electrical compartment are not blocked.</li> <li>2. If everything is within normal parameters, this may simply have been caused by extreme working conditions such as: Ambient temperature over 86°F (&gt;30°C), sloping working sections. Simply leave the system to cool and turn the machine back on.</li> </ol>

All alarms of the drive system operate by cutting the power supply to the gear motor unit motor until the KEY input is reset (with the exception of alarm T3 which is reset as soon as the input voltage of the paddle potentiometer returns within the values corresponding to "machine stopped"). In case of simultaneous errors, the one with greater priority is shown first (priority order is opposite to the number of flashes).

<b>On-board Battery Charger Alarms</b>				
<i>Alarm code</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>				
<b>C1</b> ----- <b>CHARGER COMMUNICAT.</b>	Communication problem between the battery charger and the Main machine controller.	No signal from battery charger via gate J4.4 for over 3 seconds.	The battery charger is performing the standard recharging cycle for generic GEL/AGM batteries.	Check the wiring between the battery charger and the Main machine controller.
<b>C2</b> ----- <b>BATTERY OVERVOLTAGE</b>	Battery overvoltage.	Battery voltage over 32V.	Battery charger block.	1. Check the connections of the batteries and the voltage of the installed batteries. 2. Disconnect and reconnect the battery charger.
<b>C4</b> ----- <b>CHARGING TIME I EXPIRED</b>	Charging phase I expired.	Battery excessively discharged or at end of life cycle.	Battery charger block.	If the problem persists, replace the batteries.
<b>C5</b> ----- <b>CHARGING TIME II EXPIRED</b>	Charging phase II expired.	Battery excessively discharged or at end of life cycle.	Battery charger block.	If the problem persists, replace the batteries.
<b>C6</b> ----- <b>CHARGER FAULT</b>	Battery charger internal short circuit.	Battery charger internal short circuit.	Battery charger block.	Replace the battery charger.

### Black-box: Recording of Alarms, Parameters (see pages 34-35), Partial Operating Time Counter

The alarms activated during normal machine operation are stored and can be read in the corresponding log (Alarm Log Screen).

#### Display, Main Screen

1. Insert the Super User (yellow) key in place of the operator (grey) key (Figure 6) to access the main screen (Figure 7) of the display.



Figure 6:






2. Press One-Touch  push-button to change the machine settings (see Machine Settings Screen section).
3. Press the brush release button  or REV button  to check for any stored machine alarms (see Alarms Log Screen section).
4. Press the “hare” button  to check the machine’s hours of operation (see Operating Time Counter Screen section).
5. Press the “tortoise” button  to exit service mode and return to operator mode.



Figure 7:



### Display, Alarms Log Screen

The alarms log screen (Figure 8) function allows you to check any alarms stored on the machine.

To return to the main screen (Figure 6), press the One-Touch button  repeatedly.



Figure 8:

Each alarm (See table of alarms in the Main machine controller Alarm Codes section) is stored along with the working hour (machine operating time counter) at which it occurred and all alarms are recorded in the order in which they occurred, from the most recent to the oldest.

The memory holds up to 20 alarm records, after which the oldest are overwritten when new alarms occur.

Improper uses of the batteries or battery charger are also recorded, as in the following table:

On-board Battery Charger Alarms			
Alarm code	Meaning	Condition	Effect
Description			
<b>GB-N</b> ----- <b>CONTINUOUS LOW BATTERY VOLTAGE</b>	Time of continuous use with discharged batteries	“N” is the number of hours from key on to off when the battery level is below 20.4V for WET CELL (21.6 for AGM) batteries. This event is not recorded if the usage time is below 10 minutes.	Incorrect use by customer. Risk of reduced battery life.
<b>GC</b> ----- <b>CHARGER DISCONN BEFORE END CYCLE</b>	Charging cycle interrupted before completion	Disconnection of battery charger before stage IV = battery symbol with 3 segments lit steadily.	Incorrect use by customer. Risk of reduced battery life.
<b>GD-N</b> ----- <b>CHARGING TIME LESS THAN 4 HOURS</b>	Charging phase duration	N = Number of hours from battery charger connection to completion of PHASE II (red LED on) if < 4	Incorrect use by customer. Risk of reduced battery life.

## Display, Machine Settings Screen

The machine settings screen (Figure 9) functions allow you to customise some parameters described in the following table of modifiable parameters.





1. Press the “hare” button  to increase the value of the current parameter.
2. Press the “tortoise” button  to decrease the value of the current parameter.
3. Press the One-Touch button  to move to the next parameter.
4. To return to the main screen (Figure 6), press the brush release button .




Figure 9:

Modifiable Parameters					
Code	Description	Min. Value	Factory Setting	Max. Value	
CHM1	Detergent concentration level 1	1:400 (0.25 %)	<b>1:400 (0.25 %)</b>	1:33 (3 %)	
CHM2	Detergent concentration level 2	1:400 (0.25 %)	<b>1:125 (0.80 %)</b>	1:33 (3 %)	
P1/P3	Level 1 solution flow rate in relation to level 3 (see section “System for Flow Rate Regulation as Function of Speed”)	0 %	<b>25 %</b>	100 %	
P2/P3	Level 2 solution flow rate in relation to level 3 (see section “System for Flow Rate Regulation as Function of Speed”)	0 %	<b>50 %</b>	100 %	
P3	Level 3 solution flow rate	DISC	1.0 cl/m	<b>3.0 cl/m</b>	5.0 cl/m
		REV	1.0 cl/m	<b>1.5 cl/m</b>	5.0 cl/m
P4	Level 4 solution flow enabling (2.8 l/min regardless of speed)	OFF	<b>OFF</b>	ON	
SPT	EcoFlex function timer	0 (disabled)	<b>60 sec.</b>	300 sec.	
XPRES	Brush deck extra pressure enable	OFF	<b>ON</b>	ON	
FVMIN	Minimum forward speed	0 %	<b>25 %</b>	100 %	
FVMAX	Maximum forward speed	10 %	<b>100 %</b>	100 %	
RVMAX	Maximum reverse speed	10 %	<b>30 %</b>	50 %	
BAT	Installed battery type	0	<b>1</b>	5	
TOFF	Automatic shut-off time	0 (disabled)	<b>300 sec.</b>	600 sec.	
BRGH	Display contrast	5	<b>20</b>	50	
VRID	Vacuum power in silent mode	1	<b>1</b>	5	
RPM (*)	Reduced brush rpm activation threshold	5	<b>9</b>	20	
RESET (**)	Restore factory settings for all parameters	OFF	<b>OFF</b>	ON	

(\*) Increase the value of this parameter to reduce the brush motor speed in a wider range of applications and vice versa

(\*\*) The RESET function acts only on “MODIFIABLE PARAMETERS” and not on “HIDDEN PARAMETERS”.

The following parameters are displayed only when, on reaching the last parameter RESET, the One-Touch button  is pressed together with the EcoFlex  and vacuum  buttons.

If the One-Touch button  is not pressed, the system will return to the first parameter CHM1.

Hidden Parameters					
Code	Description	Min. Value	Factory Setting	Max. Value	Meaning
TSERV	Service advisory timer	0	0	1000	Set to a value X greater than 0 if you wish the "Service Advisory" icon to be displayed every X hours of machine running time (according to the main operating time counter). To reset the hour counter for the icon display countdown (until the next service advisory), press the BURST and vacuum buttons for 10 seconds with the display on the "SERVICE MENU" page.
AR	Maximum acceleration ramp (sec.)	0.5 sec.	1.5 sec.	5 sec.	Increase to obtain a less abrupt response when accelerating, and vice versa.
DR	Maximum deceleration ramp (sec.)	DISC	0.5 sec.	1.5 sec.	Increase to obtain a less abrupt response when decelerating, and vice versa. <b>WARNING: increasing this value increases the braking distance.</b>
		REV	0.5 sec.	2.5 sec.	
IR	Maximum deceleration ramp in reverse (sec.)	0.5 sec.	0.5 sec.	5 sec.	This is the maximum current which can be supplied to the disc brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VS1	Brush 1 motor protection threshold	20A	30A	50A	This is the maximum current which can be supplied to the disc brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VS2	Brush 2 motor protection threshold	20A	40A	50A	This is the maximum current which can be supplied to the cylindrical brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VDEAD	Paddle potentiometer dead zone	0.0V	0.1V	1.0V	Increase if the alarm T3 appears in the rest position and it is not possible to adjust the system's mechanics. (Speed regulation will, however, be more difficult to modulate)
INOM	Nominal drive current	10A	15A	15A	This is the maximum continuous current which can be supplied to the electric wheel drive unit. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>
IMAX	Maximum drive current	10A	45A	45A	This is the maximum instantaneous current which can be supplied to the electric wheel drive unit. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>
TMAX	Protection trip time for IMAX	0 sec.	12 sec.	60 sec.	This is the reaction time of the electric wheel drive unit protection device when overloaded: this parameter is used in conjunction with IMAX to obtain the most appropriate response curve for the overload protection motor actuation system. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>

### Display, Operating Time Counter Screen

The operating time counter screen (Figure 10) function allows you to check the total accumulated hours of work for each machine subsystem:





- (A) TOTAL counter (machine running time): same counter display on screen after starting machine.
- (B) DRIVE counter (drive system usage time).
- (C) BRUSH counter (brush rotation system usage time).
- (D) VACUUM counter (vacuum system usage time).




Figure 10:

### Time Counter Reset

To reset the time counter see the table below for the procedure:

PUSH-BUTTON (> 10 SEC.)	TIME COUNTER RESET
	(A) TOTAL counter (*)
	(B) DRIVE counter
	(C) BRUSH counter
	(D) VACUUM counter

(\*) When the TOTAL counter is reset, it is automatically reset also all partial ones (B, C, D) and deleted all LOG memory.

To return to the main screen (Figure 7), press the One-Touch button .

## System for Flow Rate Regulation as Function of Speed

Solution flow levels 1, 2 and 3 regulate the flow of detergent solution on the basis of the machine speed so as to keep the quantity of solution dispensed per square metre of floor treated constant.

The reference flow level is level 3: based on the setting of the corresponding parameter P3, the opening time of the solenoid valve (and of the detergent pump when fitted) is regulated so that the quantity of solution in centiliters per metre travelled by the machine is constant and equal to the value set in the parameter.

For example, for  $P3 = 3.0$ , the machine will dispense 3 centiliters of solution per metre travelled, which equates (for the standard deck width of 530 mm) to 5.7 centiliters per square metre of floor treated.

Levels 1 and 2 are defined via the corresponding parameters P1 and P2 as a % of level 3.

For example, for  $P1 = 25$  and  $P2 = 50$ , P1 and P2 are respectively  $\frac{1}{4}$  (25%) and  $\frac{1}{2}$  (50%) of the reference flow rate P3.

The default values (the same as in the example above) are summarized in the table, with the corresponding flow rate values in liters per minute, dependent on machine speed, given as a reference.

<b>SC500 DISC detergent flow (as a function of speed) (standard setting)</b>			
	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>
Liters/minute @ 1 km/h	0.2	0.3	0.5
Liters/minute @ 3 km/h	0.4	0.8	1.5
Liters/minute @ 5 km/h	0.6	1.3	2.5
Centiliters per metre cleaned (constant)	0.75	1.5	3
Centiliters per meter <sup>2</sup> cleaned (Ø530 deck)	1.4	2.8	5.7

Level 4 (when enabled) is independent of any parameter and supplies the maximum possible quantity of solution as it keeps the solenoid valve of the supply system constantly open (with the brush rotating).

<b>SC500 DISC detergent flow rate</b>	
	<i>Level 4</i>
Liters/minute - Tank full	3.5
Liters/minute - Average	2.5

## Removal and Installation

### Main machine controller (EB1)

1. Drive the machine on a level floor, remove the ignition key, and disconnect the red battery connector.
2. Lift the recovery tank.
3. Remove the 7 screws and remove the electronic component compartment cover.
4. Disconnect the following connections sequentially (Figure 11):
  - (A) and (B) Main machine controller power supply connection (B+) and (B-).
  - (C) and (D) Brush motor connection (BR+) and (BR-).

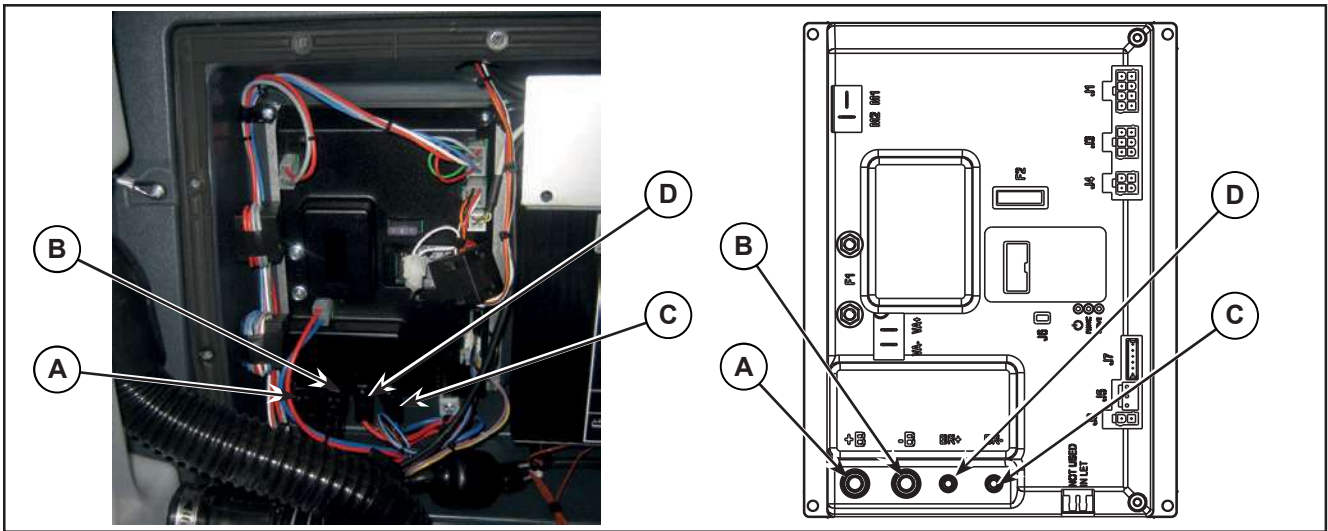


Figure 11:

5. Disconnect the following connections sequentially (Figure 12):
  - (E) and (F) Drive system motor connection (M1) and (M2).
  - (G) and (H) Vacuum motor connection (VA+) and (VA-).

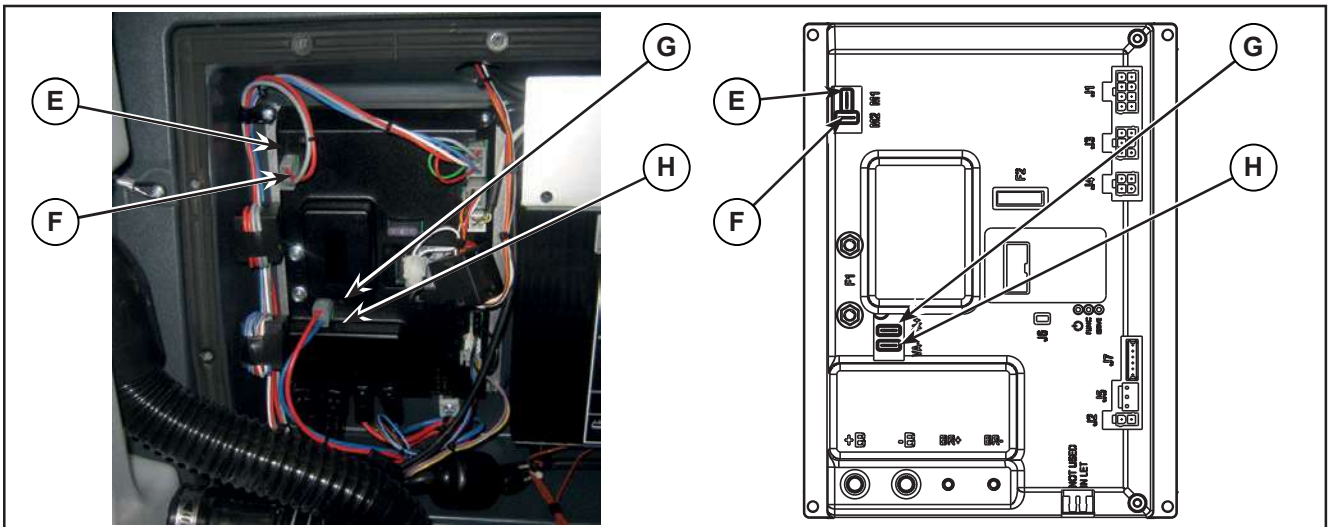


Figure 12:

6. Disconnect the following connections sequentially (Figure 13):

- (I) Deck actuator and detergent pump connection (J1).
- (J) Solenoid valve connection (J2).
- (K) Display controller connection (J3).
- (L) Battery charger connection (J4).
- (M) Detergent level sensor connection (J5).
- (N) Connection (J6).

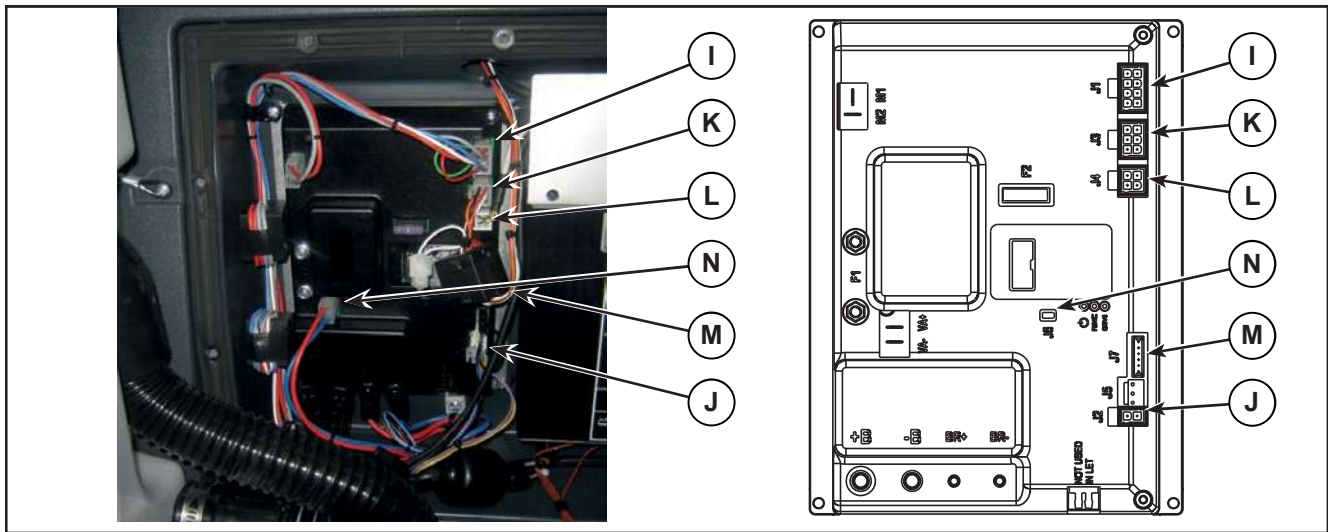


Figure 13:

7. Unscrew the 4 retaining screws (O) and carefully remove the Main machine controller (Figure 14).

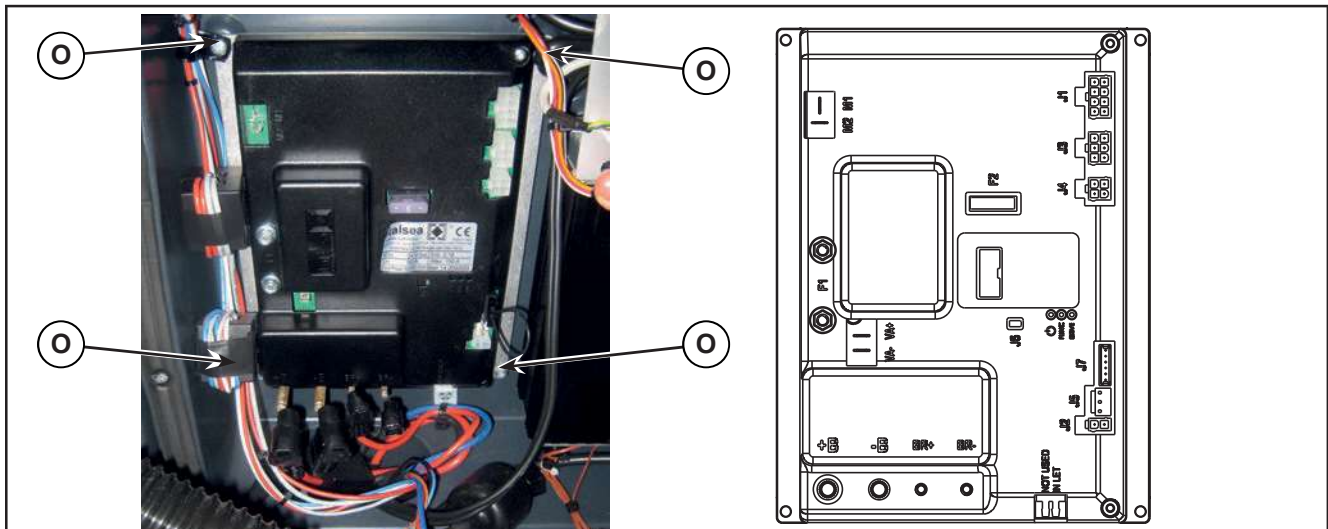


Figure 14:

8. Assemble the components in the reverse order of disassembly.

## Display Controller (EB2) and User interface controller (EB3)

### Display Controller (EB2)

1. Drive the machine on a level floor.
2. Remove the ignition key.
3. Disconnect the red battery connector.
4. Unscrew the 2 screws (A) (Figure 15).
5. Release the retaining tab (B), then lift up and remove the Main machine controller cover (C).

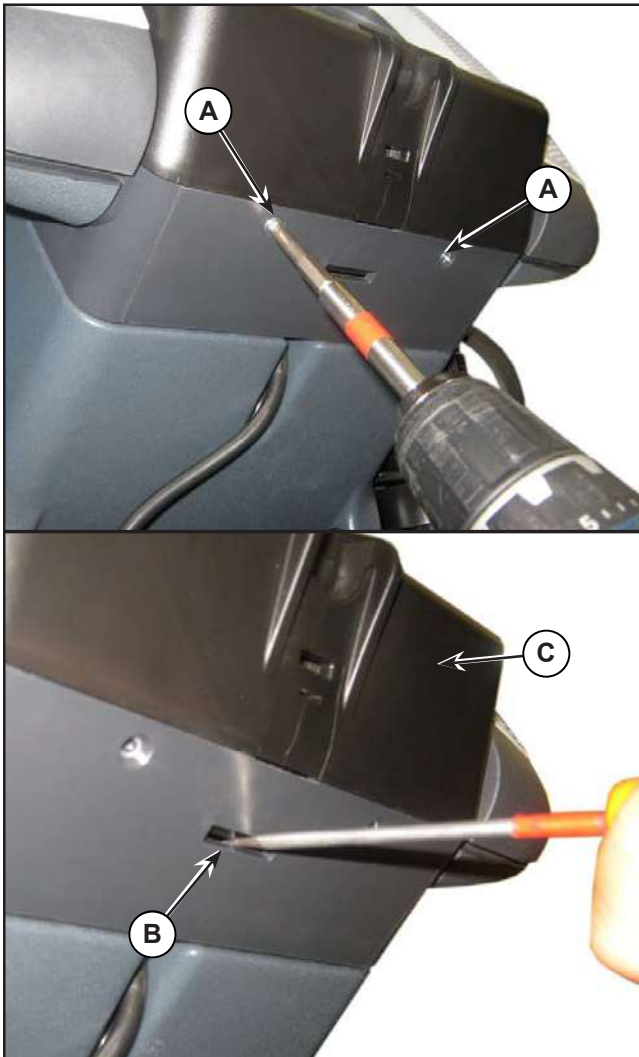


Figure 15:

6. Disconnect the following connections sequentially (Figure 16):
  - (A) Speed potentiometer connection (J4).
  - (B) Display controller power supply connection (J1).
  - (C) Flat connection (J2).
  - (D) Flat connection (J3).
7. Unscrew the 4 screws (E), then remove the display controller (F).

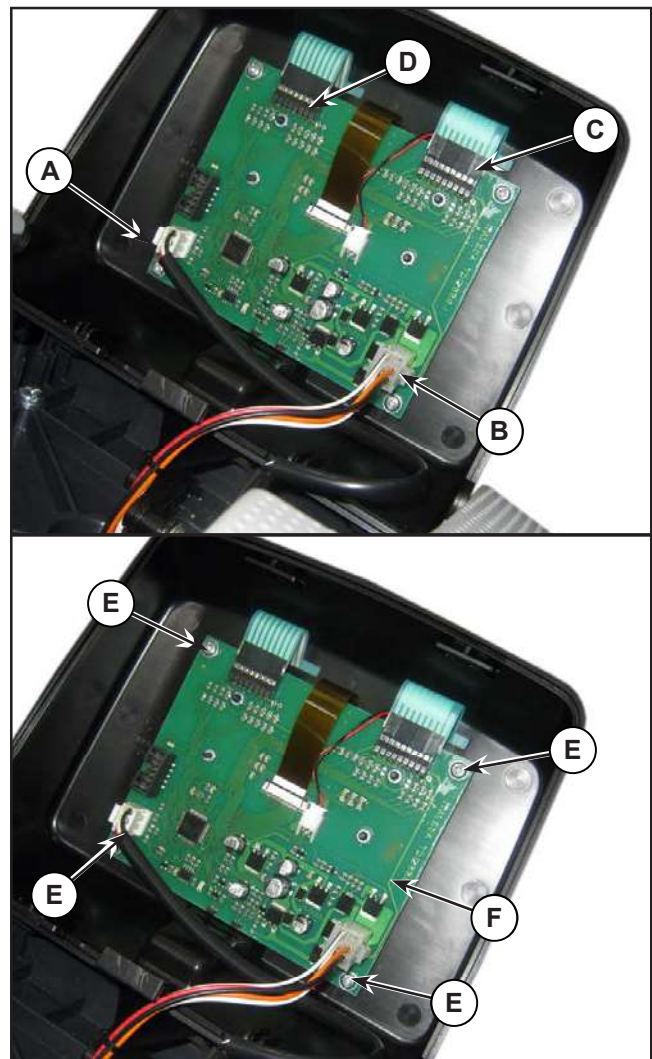


Figure 16:



**User interface controller (EB4)**

8. Perform points 1 to 5 for removal of the display controller.
9. Disconnect the following connections sequentially (Figure 17):
  - (A) Flat connection J2.
  - (B) Flat connection J3.
10. Carefully raise the User interface controller (C), detaching it from the cover (D).

**Assembly**

11. Assemble the components in the reverse order of disassembly and note the following:
  - Before fastening the User interface controller (C), ensure that the flat connections (A) and (B) are correctly run through the slots in the cover (D), then glue the User interface controller to the cover itself.

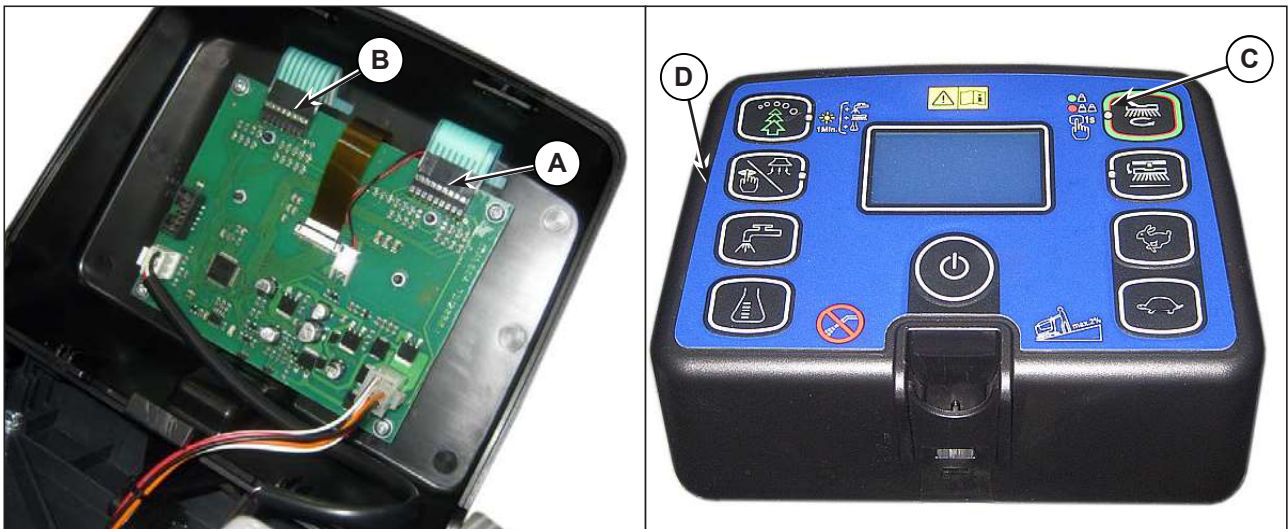


Figure 17:

## Specifications

### Main machine controller (EB1) Connectors

(Figure 18) Power connections (Ø6mm male RADSOK terminals - AMPHENOL SK 200800532 101 or equivalent)

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>B+</b>	Main machine controller power supply +	in	24V	125A	BAT+
<b>B-</b>	Main machine controller power supply -	in	24V	125A	BAT-

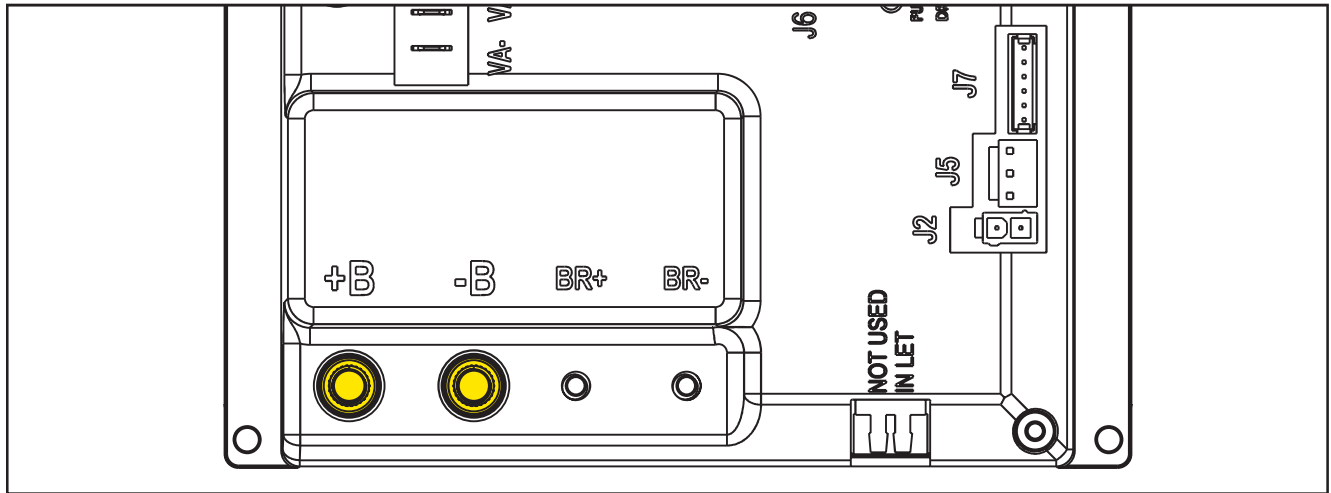


Figure 18:

(Figure 19) Drive connections (Ø3.6mm male RADSOK terminals - AMPHENOL P/N N01 036 6501 001 or equivalent)

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>BR+</b>	Brush motor +	out	24V	50A	M1+
<b>BR-</b>	Brush motor -	out	24V	50A	M1-

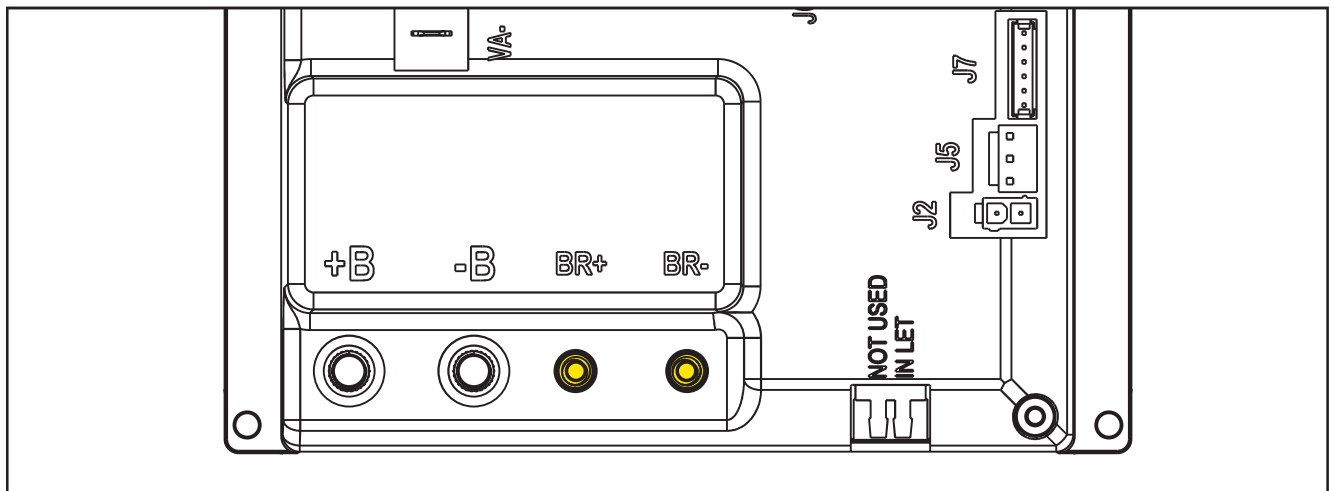


Figure 19:

**(Figure 20) Drive connections (2-way male faston T-connectors, 6.3x0.8 – spacing 7.4mm)**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>M1</b>	Drive system motor +	out	0-24V	45A	M3+
<b>M2</b>	Drive system motor -	out	0-24V	45A	M3-



Figure 20:

**(Figure 21) Vacuum connections (2-way male parallel faston connectors, 6.3x0.8 – spacing 6.5mm)**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>VA+</b>	Vacuum system power supply +	out	10-24V	30A	M2+
<b>VA-</b>	Vacuum system power supply -	out	0V	30A	M2-

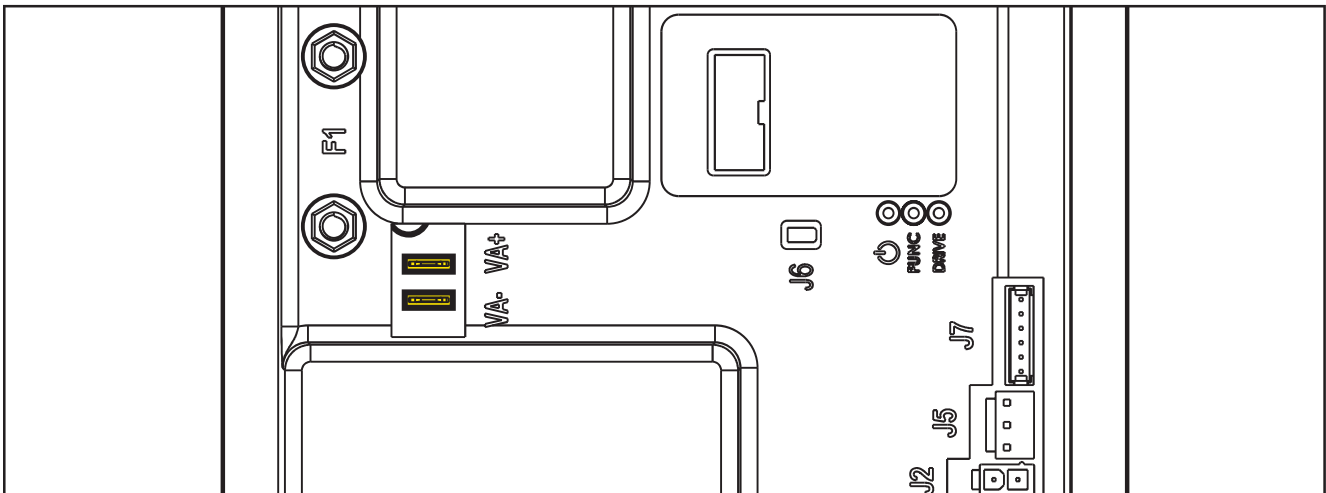


Figure 21:

**(Figure 22) J1: MOLEX MINIFIT type, 8-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Detergent pump power supply +	out	24V	<1A	M4
2	Detergent pump power supply -	out	0V	<1A	M4
3	Deck actuator power supply +/-	out	0/24V	8A	M5
4	Deck actuator power supply -/+	out	0/24V	8A	M5
5	Power supply for ADV versions configurator	out	0V	<1A	J1.6
6	ADV versions configurator return	in	0V	<1A	J1.5
7	Power supply for deck configurator	out	0V	<1A	J1.8
8	Deck configurator return	in	0V	<1A	J1.7

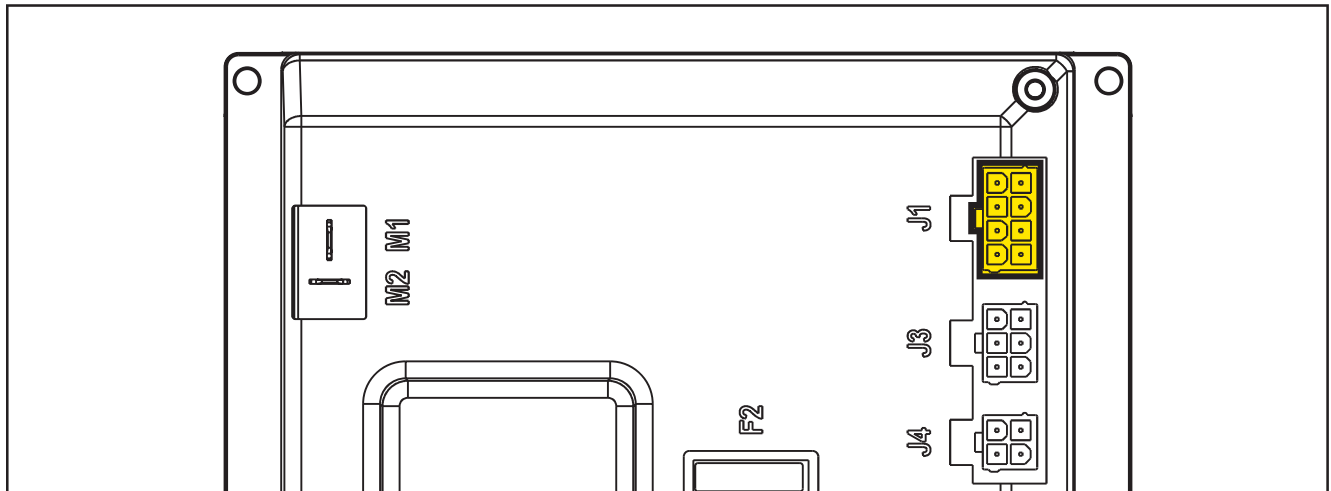


Figure 22:

**(Figure 23) J2: MOLEX MINIFIT type, 2-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Solenoid valve power supply +	out	24V	1A	EV1
2	Solenoid valve power supply -	out	0V	1A	EV1

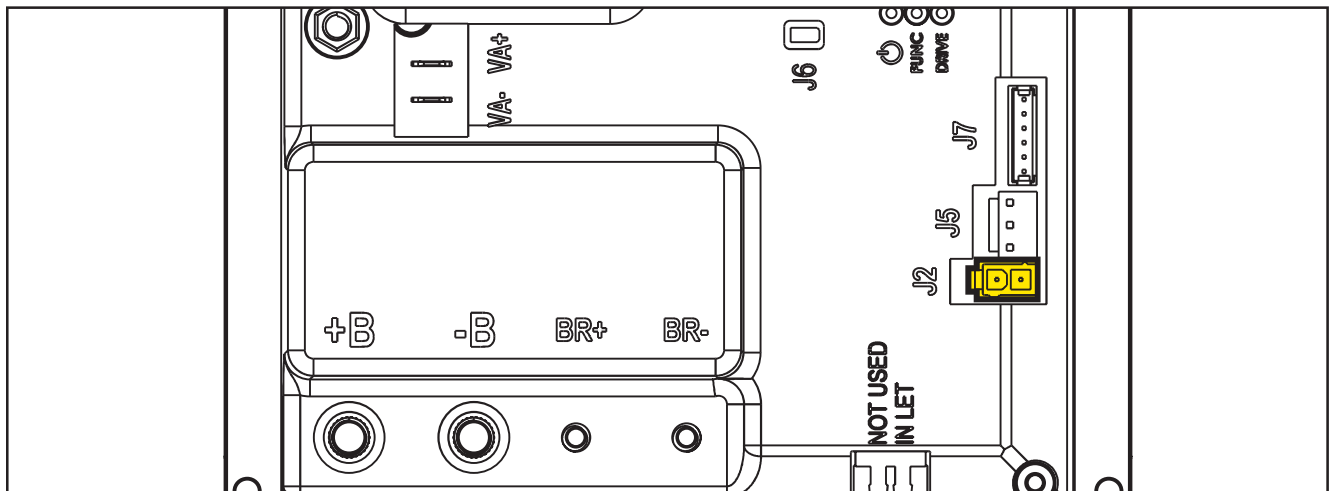


Figure 23:

**(Figure 24) J3: MOLEX MINIFIT type, 6-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	User interface controller power supply +	out	24V	<1A	EB2.1
2	User interface controller serial +	in/out	5V	<1A	EB2.2
3	User interface controller serial -	in/out	0V	<1A	EB2.3
4	User interface controller power supply -	out	0V	<1A	EB2.4
5	Return from key	in	24V	<1A	EB2.5
6	Return from key (repetition)	out	24V	<1A	-



Figure 24:

**(Figure 25) J4: MOLEX MINIFIT type, 4-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Enabling from battery charger	in	24V	<1A	CH.1
2	Power supply from battery charger	in	24V	<1A	CH.2
3	Battery charger enabling power supply	out	24V	<1A	CH.3
4	Battery charger data communication	In/out	5V	<1A	CH.4

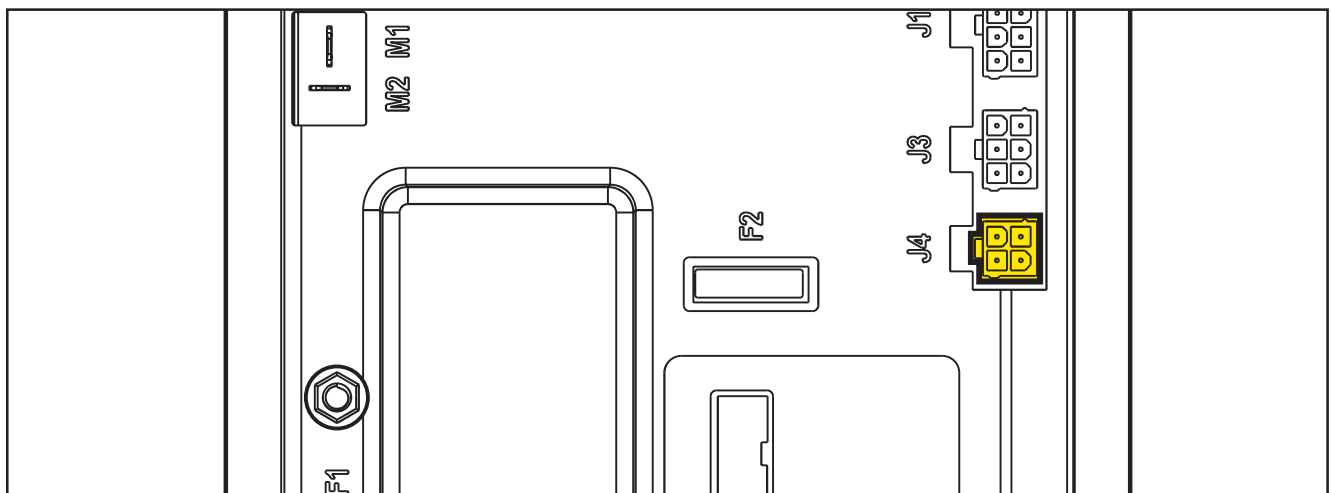


Figure 25:

**(Figure 26) J5: JST VHR-3N vertical 3-way**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Power supply for water level sensor +	out	24V	<1A	S1.1
2	Water level sensor return	in	0V	<1A	S1.2
3	Power supply for water level sensor -	out	0V	<1A	S1.3

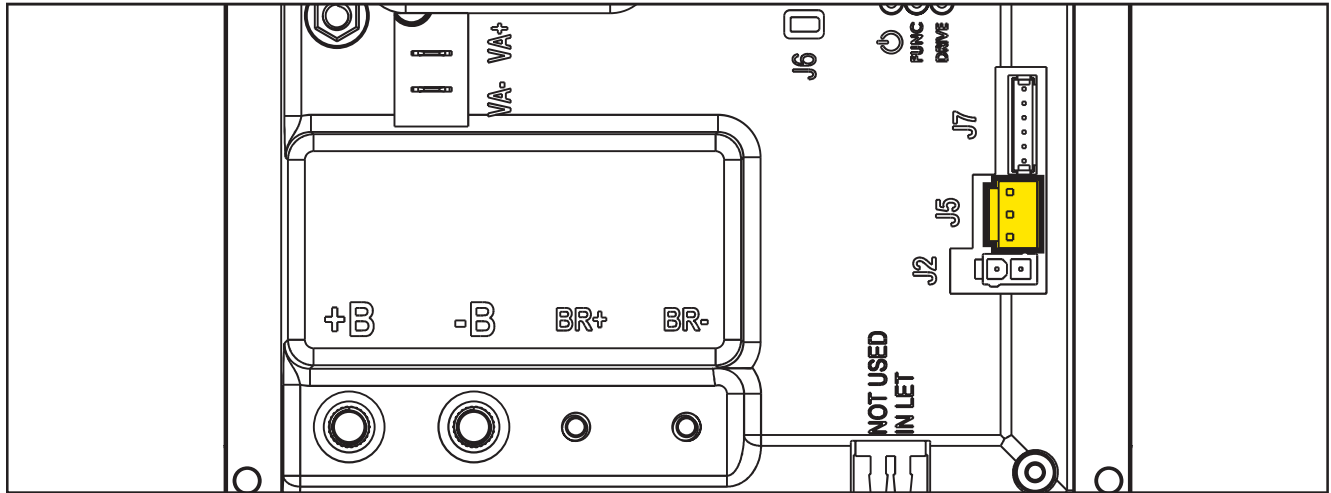


Figure 26:

**(Figure 27) J6: JUMPER, 2-ways vertical**

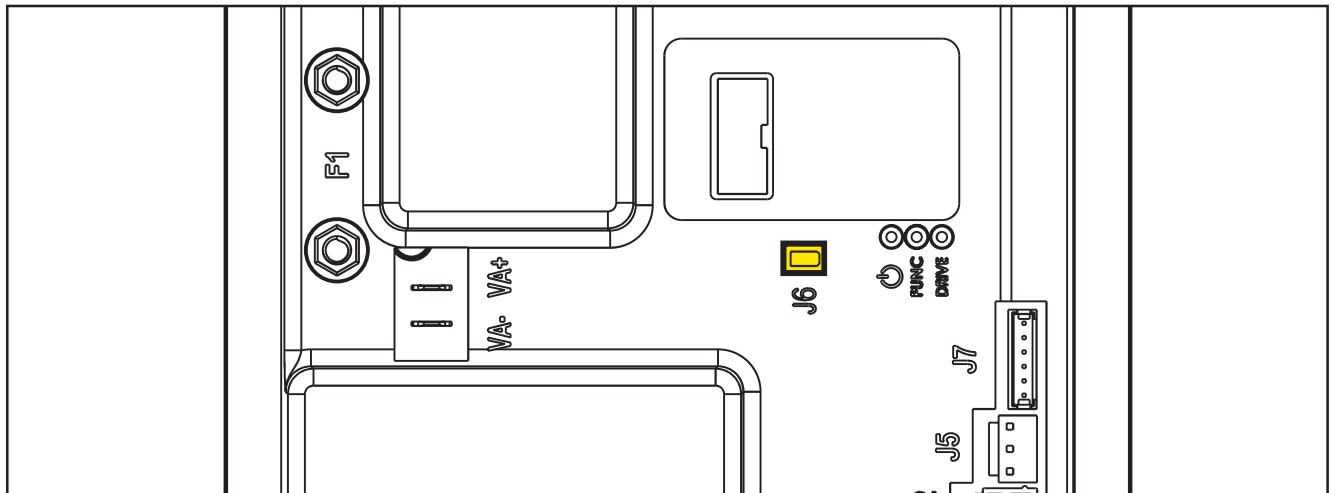


Figure 27:

**(Figure 28) J7: TYCO MODU II vertical 6-way**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	+24V power supply	out	24V	<1A	TRK.RD
2	+5V power supply	out	5V	<1A	-
3	iButton input (CAN H channel)	In (Out)	0V (0-5V)	<1A	TRK.YE
4	Ext. operating time counter enable (CAN L channel)	(In) Out	0V (0-24V)	<1A	TRK.WH
5	Power supply -	out	0V	<1A	TRK.BU
6	Machine on signal	out	24V	<1A	TRK.BN

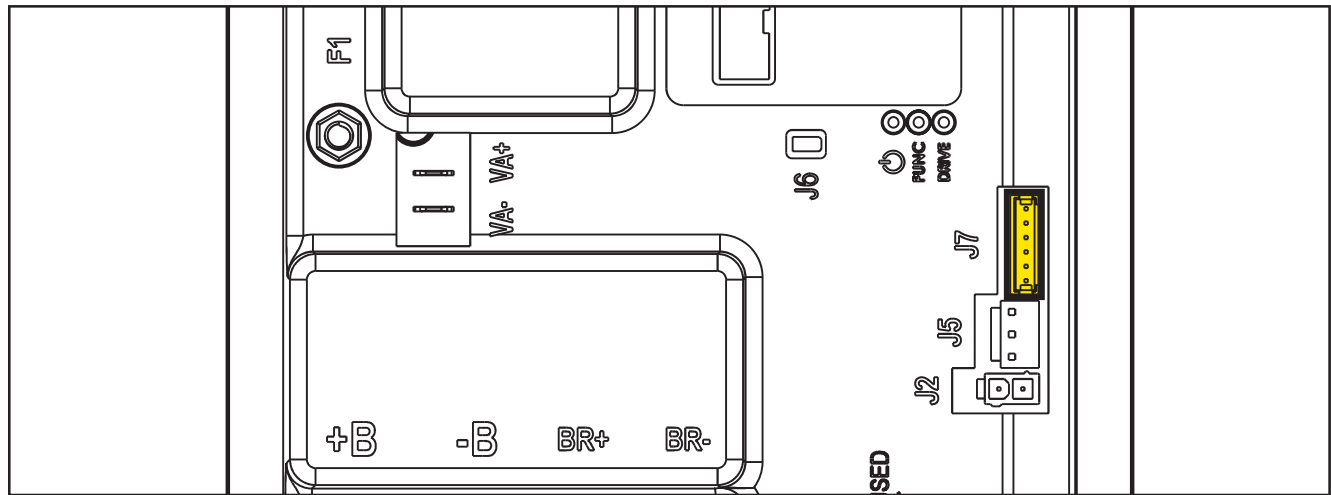


Figure 28:

### Connectors of the Display Controller (EB2)

**(Figure 29) J1: MOLEX MINIFIT type, 6-ways vertical**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
1	Power supply +	in/out	24V	<1A	CFD12.J3.1
2	Main machine controller serial +	in/out	5V	<1A	CFD12.J3.2
3	Main machine controller serial -	in	0V	<1A	CFD12.J3.3
4	Power supply -	out	0V	<1A	CFD12.J3.4
5	Key signal return (KEY0)	out	24V	<1A	CFD12.J3.5
6	Key signal return (KEY0)	in	24V	<1A	-

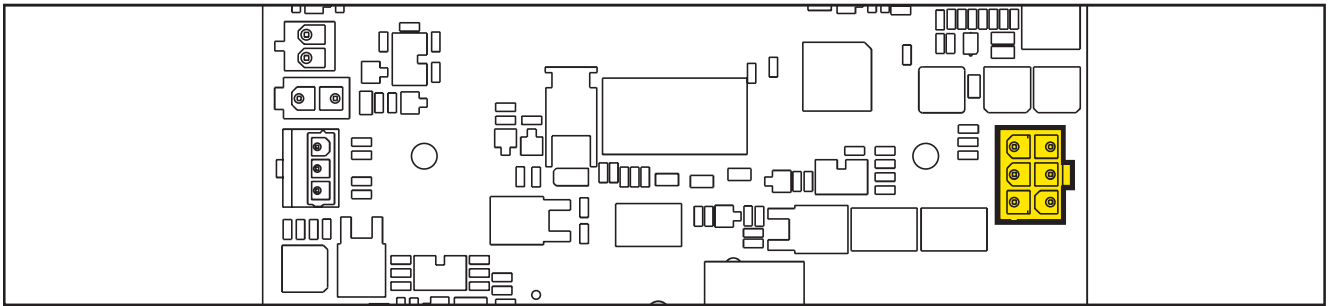


Figure 29:

**(Figure 30) J2: FCI DUFLEX (2.54 pitch) 9-way, male pins**

Ref.	Description	Controller in/out	V ref.	I max.	
1	Power supply - common	out	0V	<1A	
2	ON/OFF button (P0)	in	0V	<1A	
3	DETERGENT MIX button (P4)	in	0V	<1A	
4	EDS button (P3)	in	0V	<1A	
5	VACUUM button (P2)	in	0V	<1A	
6	VACUUM function LED (LD2)	out	5V	<1A	
7	SPOT function LED (LD1)	out	5V	<1A	
8	SPOT button (P1)	in	0V	<1A	
9	DS versions configurator	in	0V	<1A	

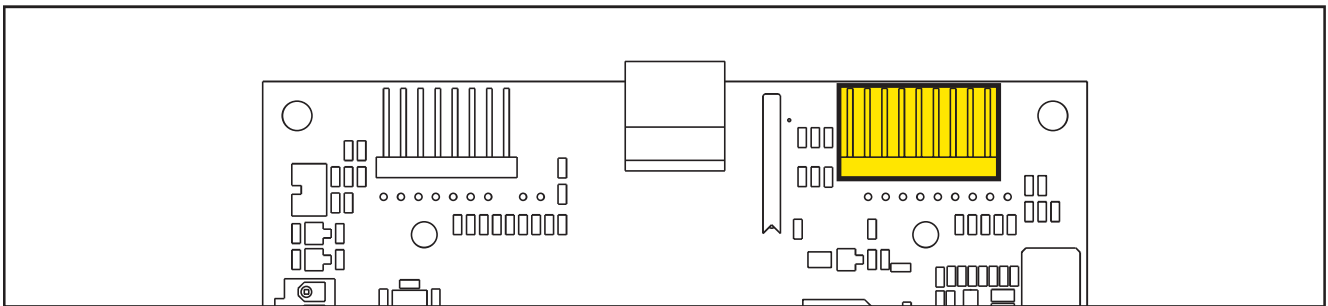


Figure 30:



**(Figure 31) J3: FCI DUFLEX (2.54 pitch) 8-way, male pins**

Ref.	Description	Controller in/out	V ref.	I max.	
1	Power supply - common	out	0V	<1A	
2	SP / EXTRAPR function LED (red) (LD3R)	out	5V	<1A	
3	SP / EXTRAPR function LED (green) (LD3V)	out	5V	<1A	
4	BRUSH RELEASE function LED (LD4)	out	5V	<1A	
5	BRUSH RELEASE switch (P6)	in	0V	<1A	
6	INCREASE SPEED button (P7)	in	0V	<1A	
7	DECREASE SPEED button (P8)	in	0V	<1A	
8	ONETOUCH / EXTRAPR. button (P5)	in	0V	<1A	

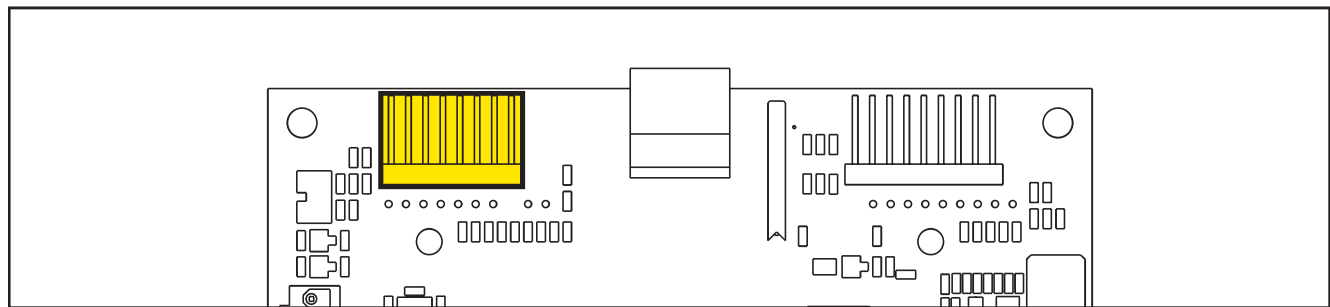


Figure 31:

**(Figure 32) J4: JST VH vertical, 3-way (B 3P-VH)**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	VR1 potentiometer power supply +	Out	3V	<1A	VR1.1
2	VR1 potentiometer return	In	0-3V	<1A	VR1.2
3	VR1 potentiometer power supply -	out	0V	<1A	VR1.3

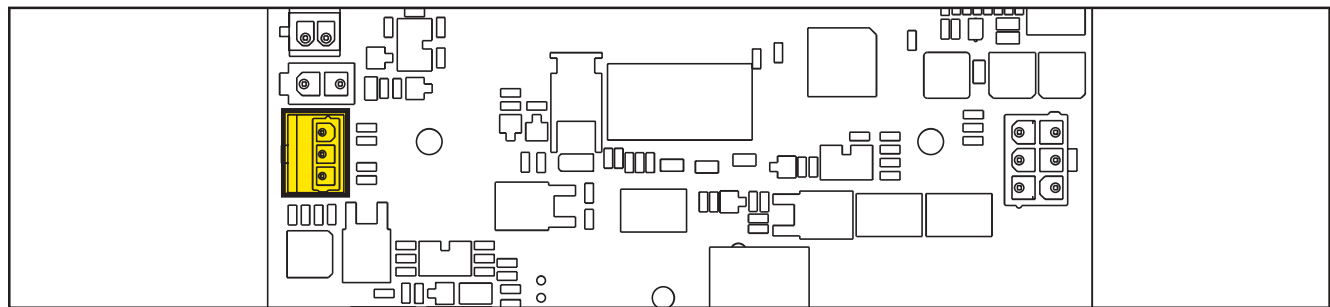


Figure 32:

## Shop Measurements

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

### Shop Measurements - Main machine controller (EB1)

Battery volts at battery, key on = 25.03V

#### Power Supply

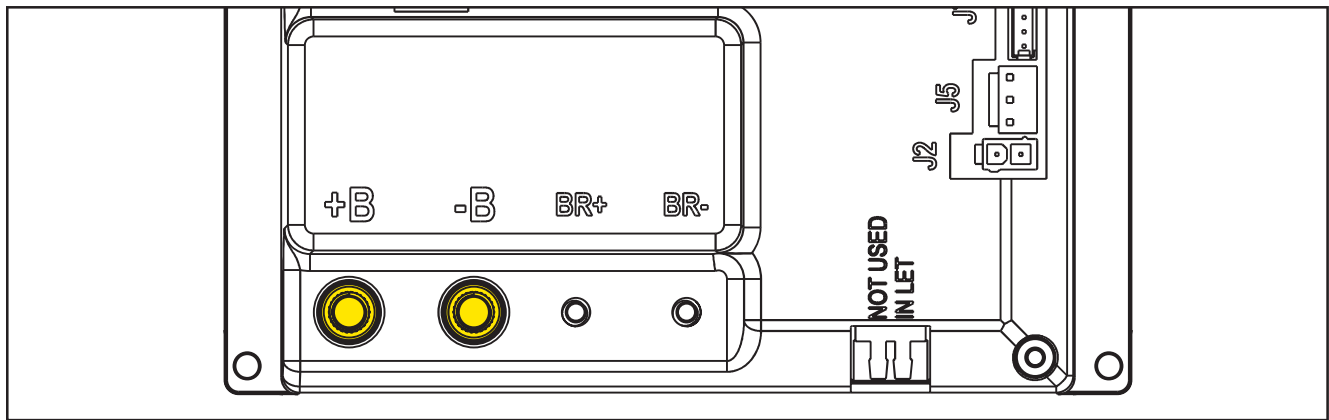


Figure 33:

PIN	Color	Description	Measured	Comments
B+	Red	Main machine controller power supply +	24.5v	Vacuum on
B-	Black	Main machine controller power supply -	0.035vV	Vacuum on

**Brush Motor**

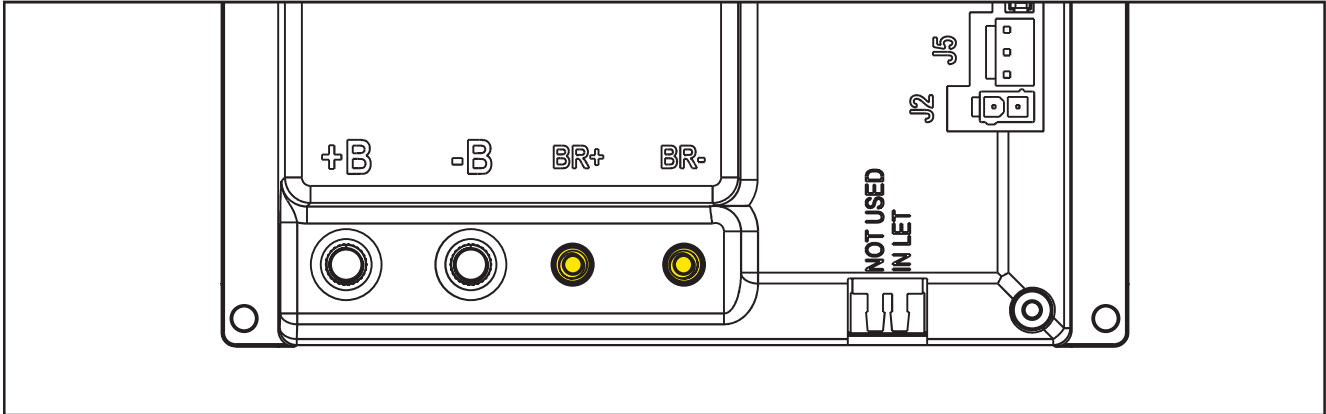


Figure 34:

PIN	Color	Description	Measured	Comments
BR+	Red	Brush motor +	24.4V (off), 24.2V (on)	Constant Positive
BR-	Blue	Brush motor -	24.4V (off), 0.15v (on without RPM control activated) 5.8v (on with RPM Control Active – set at 20)	PWM Battery Negative

**Drive System Motor**

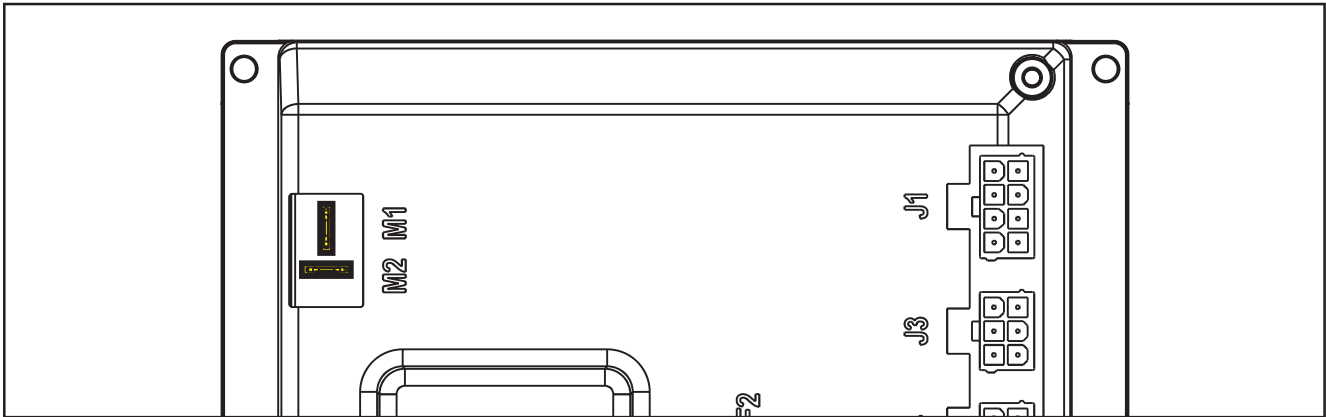


Figure 35:

PIN	Color	Circuit Description	Measured				
			Neutral	Fwd - Initial	Reverse - Initial	FWD Max	REV Max
M1	Red	Drive system motor +	5.62v	12.7v	10.9v	21.8v	8.7v
M2	Gray	Drive system motor -	5.61	1.95	16.00	8.9v	13.5v
M1 to M2			0.001v	6.1v	-2.5v	22.6	-7.4

Vacuum Motor

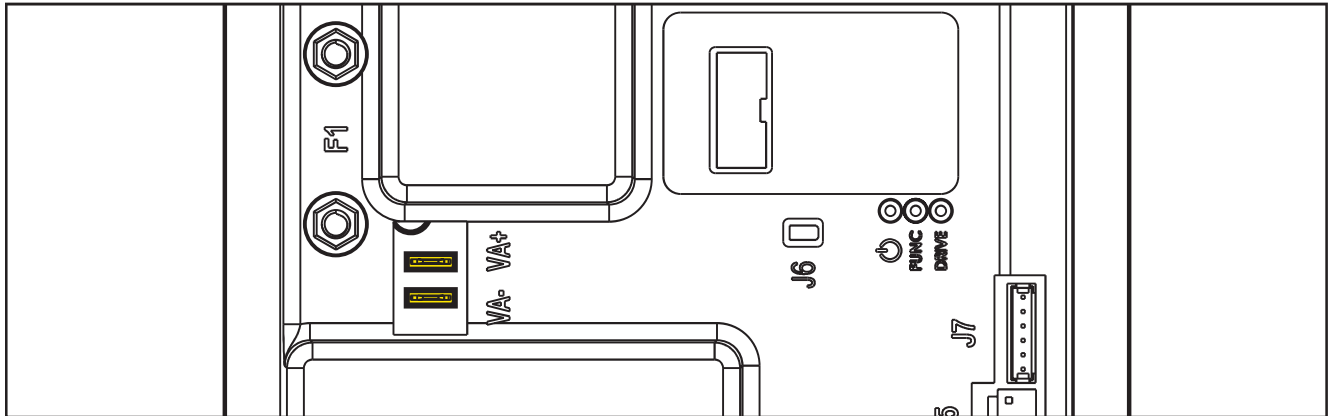


Figure 36:

PIN	Color	Description	Measured	Comments
VA+	Red	Vacuum system power supply +	24.8v (off) 24.4v (on)	Constant Positive
VA-	Blue	Vacuum system power supply -	24.56 (off) 1.36v (on High) 9.69v (on Quiet mode VRID parameter = 1)	1.02 Running, 9.56 Quiet Mode

J1 - 8 Ways

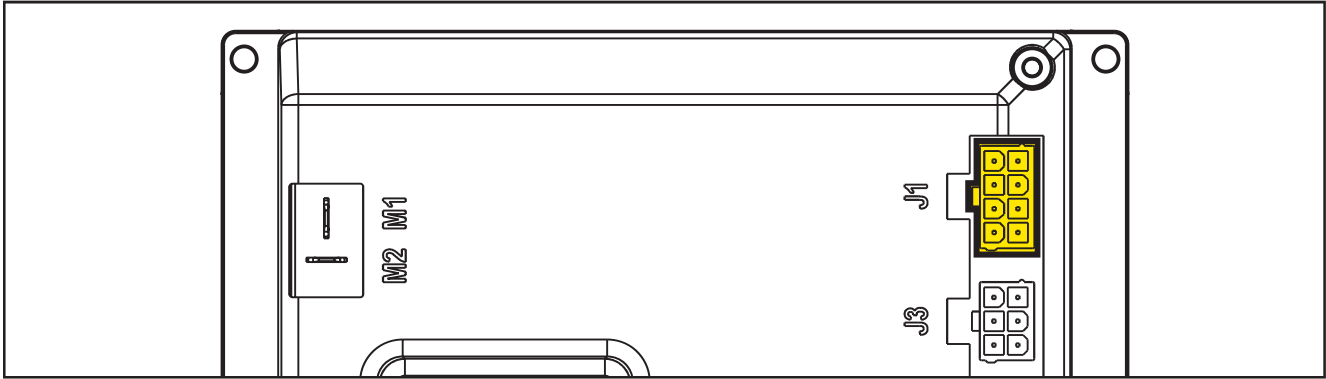


Figure 37:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Detergent pump power supply +	24.9v (off)	No change seen on voltmeter when the pump pulsed.
2	Gray	Detergent pump power supply -	24.9v (off) Momentary drop to 0 when on.	Voltmeter reading momentarily jumped. Too fast to settle into a range and value.
3	White	Deck actuator power supply +/-	24.8v (Stationary)	Reference to J1.3
			0.18v (going up) 12v (going up near top) 24.8v (going down to scrub or Ex press) 12.6v (Reset Up)	
4	Blue	Deck actuator power supply +/-	Stationary: 0v	
			Transport to Scrub: 24.8v Scrub to Ex Press: 24.8v then 12v near end of travel. Ex Press to Scrub: -24.8v Scrub to Transport: -24.8v then -12v near end of travel Reset to transport:-12.5v entire range	
5	Green	Power supply for ADV versions configurator	24.8v (stationary)	
			0.03v (Transport to scrub) Scrub to EX Press – Initial 0.03v then 12v near bottom 24.8v( Ex press to scrub) Scrub to Transport – 24.8v	
6	Green	ADV versions configurator return	0.001 (Loop not cut) 4.98v (Open loop)	Loop not cut
7	Red	Power supply for deck configurator	0.001	
8	Red	Deck configurator return	0.001 (Loop not cut) 4.98v (Open loop)	Loop not cut

**J2 - 2 Ways**

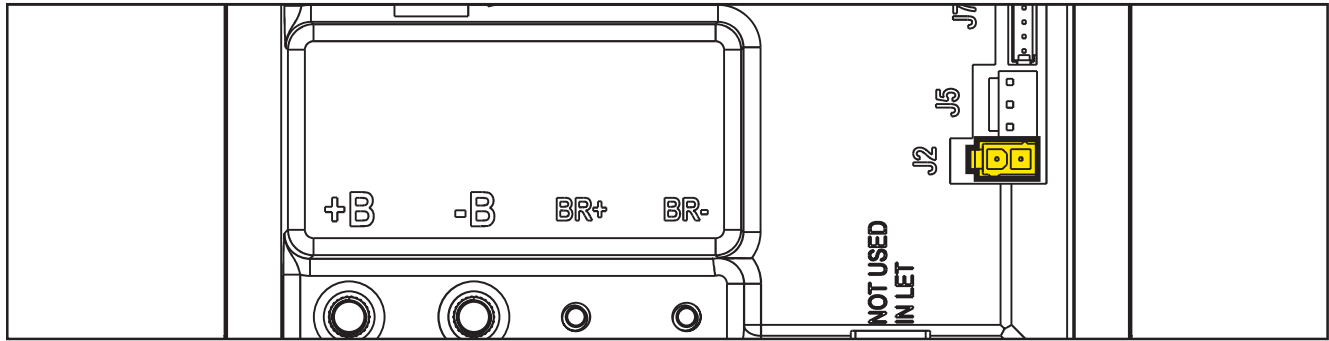


Figure 38:

PIN	Color	Circuit Description	Measured	Comments
1	Yellow	Solenoid valve power supply +	24.4 (Off and On)	
2	Purple	Solenoid valve power supply -	24.4 (off) Momentary drop (on)	Momentarily drops to 0v when on but it is too fast for a DVOM to read. The value just momentarily changes.

**J3 - 6 Ways**

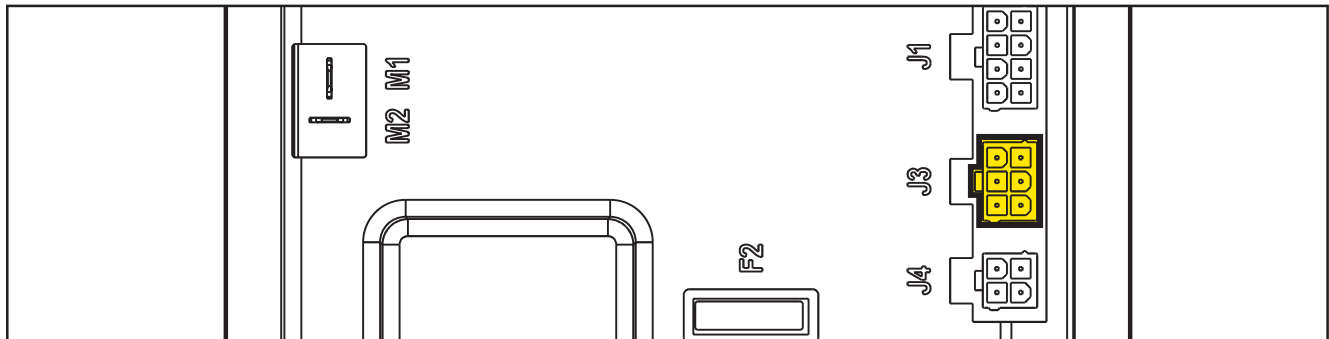


Figure 39:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Main machine controller power supply +	24.9v	On or Off
2	White	Main machine controller serial +	4.62v key on 0v key off	
3	Blk/Wh	Main machine controller serial -	4.13v key on 0v key off	
4	Black	Main machine controller power supply -	0.001v key on	
5	Orange	Return from key	24.3v key inserted and power "on"	Either the yellow or gray key has the same result. Note: if no key, jumping +24v here turns the machine on.
6	Empty			

**J4 - 4 Ways**

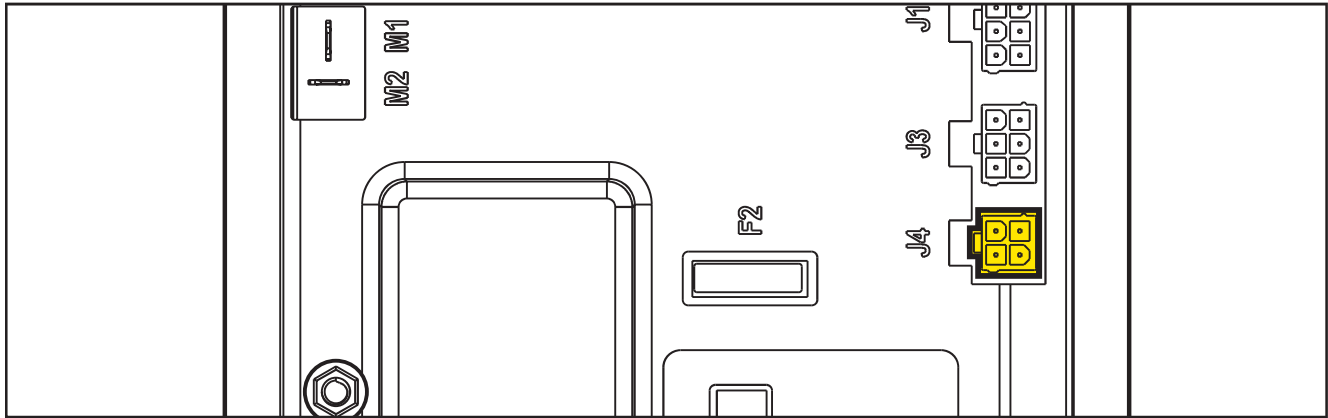


Figure 40:

PIN	Color	Circuit Description	Measured	Comments
1	White	Enabling from battery charger	24.8v Not Charging	May see residual voltage back-feeding from the main controller here when charging.
2	Yellow	Power supply from battery charger	0.136v Not charging 26.1v Charging	
3	Brown	Battery charger enabling power supply	24.8v key on or off	Constant power whether charging or not. Key on or off.
4	Green	Battery charger data communication	4.98v when charger is first plugged in. Then dropped to 4.6	

**J5 - 3 Ways**

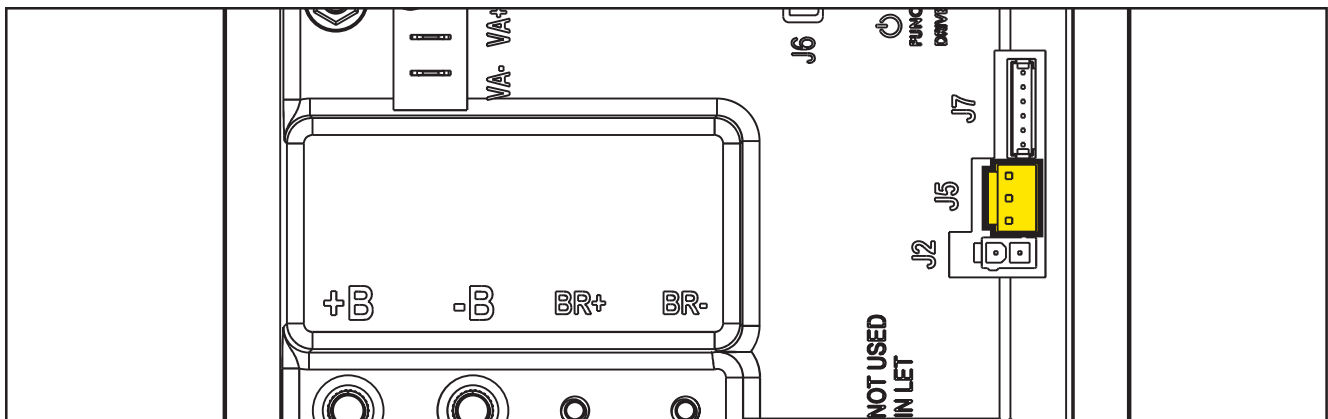


Figure 41:

PIN	Color	Circuit Description	Measured	Comments
1	Brown	Power supply for water level sensor +	24.7v	Key on
2	Black	Water level sensor return	4.98 0.03v	Tank < ½ full Tank > ½ full
3	Blue	Power supply for water level sensor -	0.001	

J6

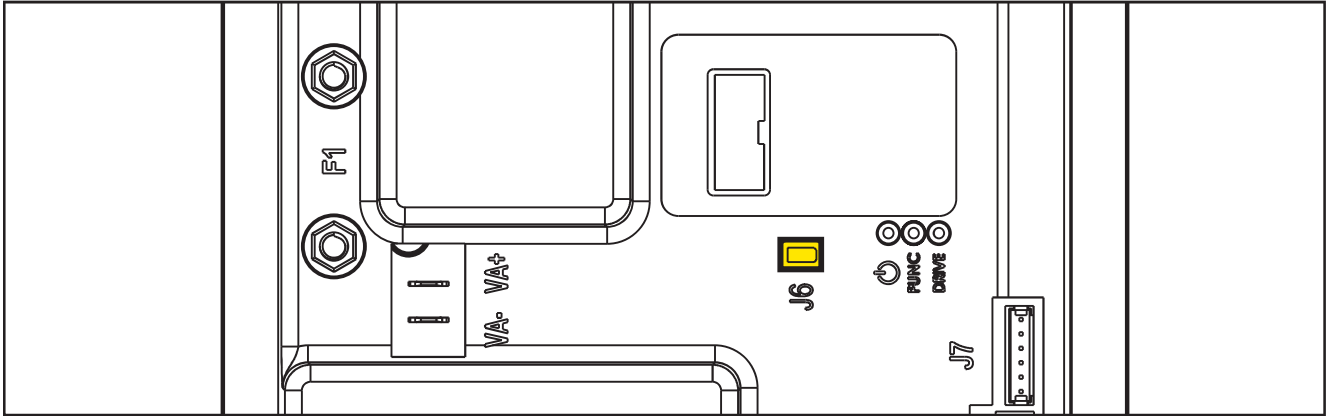


Figure 42:

Two way vertical jumper.

- What is this for? The J6 Jumper is used to configure the Main machine controller for the EcoFlex option.
- What does it mean if it is jumped? The Main machine controller is set for no EcoFlex
- What does it mean if it is open? The Main machine controller is set for EcoFlex
- Is there a measurable voltage on either of the pins when not jumped? Yes. 4.98v on pin near the LEDS on the Main machine controller.

J7 - 6 Ways

Measured machine did not have a wiring connector. Measurements were taken at each pin on the Main machine controller.

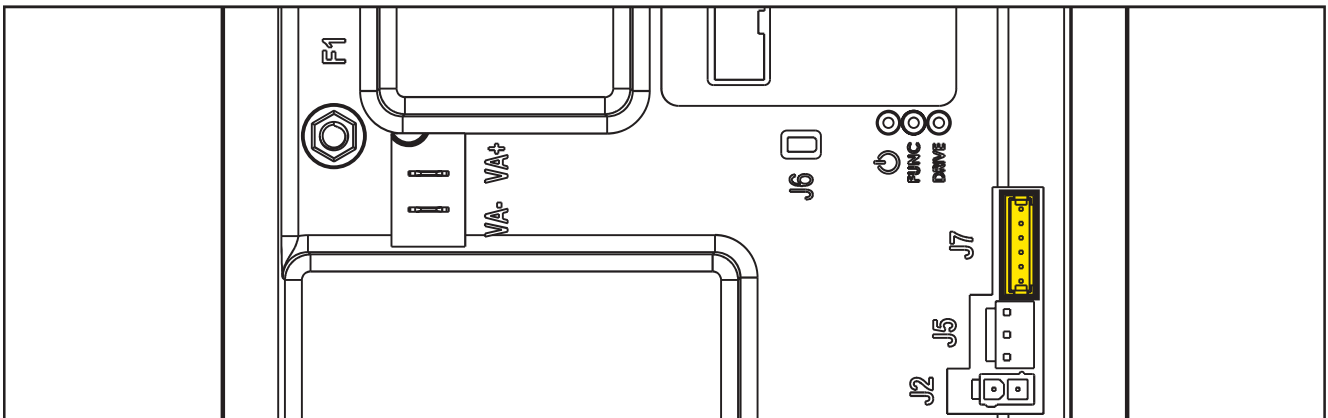


Figure 43:

PIN	Color	Circuit Description	Measured	Comments
1		+24V power supply	24.6	
2		+5V power supply	5.00	
3		iButton input (CAN H channel)	4.98	
4		Ext. operating time counter enable (CAN L channel)	24.6	
5		Power supply -	0.001	
6		Machine on signal	23.68	



### Shop Measurements - Display Controller (EB2)

Measure and record the voltage at each of the Main machine controller pins. Always use battery negative as your reference point for your black voltmeter lead.

#### J1 - 6 Ways

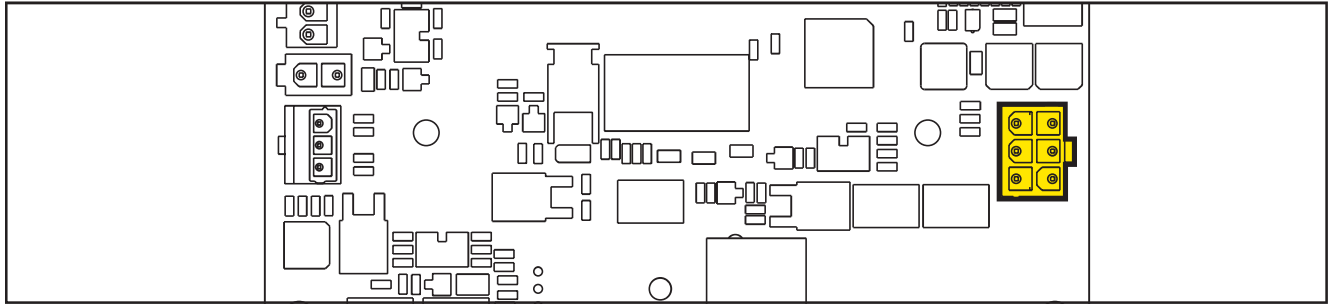


Figure 44:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Power supply +	24.6	
2	White	Main machine controller serial +	4.62	
3	Blk/Wh	Main machine controller serial -	4.12	
4	Black	Power supply -	0.003	
5	Orange	Key signal return (KEY0)	24.23	
6				

**J2 - 9 way ribbon connector**

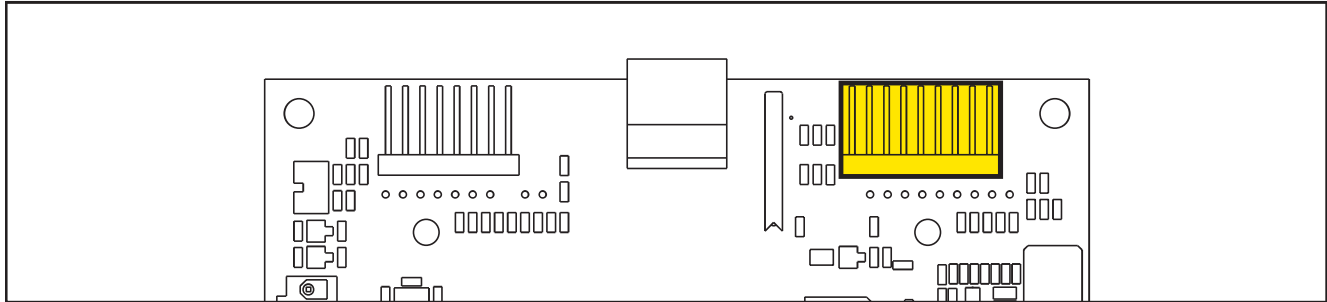
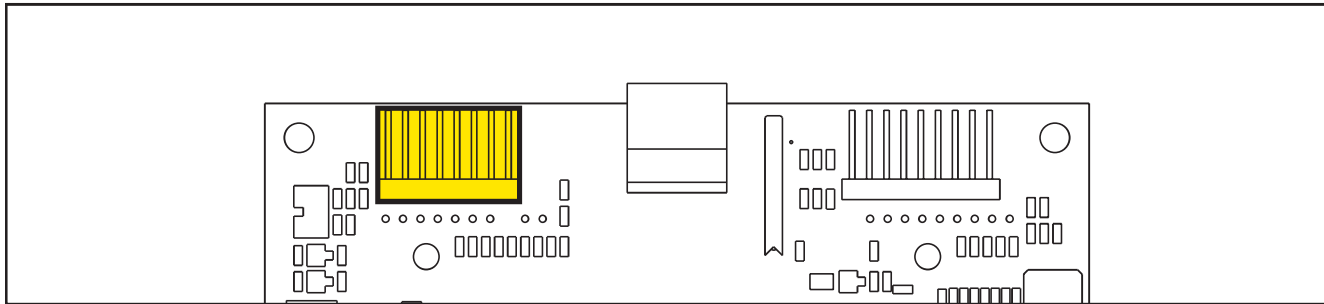


Figure 45:

PIN	Color	Circuit Description	Measured	Comments
1		Power supply - common	0.003v	
2		ON/OFF button (P0)	24.2v	Key off or key on
3		DETERGENT MIX button (P4)	3.14v Not pressed 0.02v pressed	
4		EDS button (P3) (Solution Button)	3.14v Not pressed 0.02v pressed	
5		VACUUM button (P2)	3.14v not pressed 0.05v pressed	
6		VACUUM function LED (LD2)	0.007v LED off	
7		SPOT function LED (LD1)	0.007v LED off	
8		SPOT button (P1) (EcoFlex – Burst of power)	3.14v Not pressed 0.02v pressed	
9		DS versions configurator	3.14v	

**J3 - 8 Ways ribbon connector**



**Figure 46:**

PIN	Color	Circuit Description	Measured	Comments
1		Power supply - common	0.003v	
2		SP / EXTRAPR function LED (red)(LD3R)	1.78v Red LED on 0.032v Red LED off	
3		SP / EXTRAPR function LED (green) (LD3V)	1.95v Grn LED on 0.032v Grn LED off	
4		BRUSH RELEASE function LED (LD4)	0.07v LED off Pulsing when flashing	
5		BRUSH RELEASE switch (P6)	3.14v not pressed 0.03v pressed	
6		INCREASE SPEED button (P7)	3.14v not pressed 0.02v pressed	
7		DECREASE SPEED button (P8)	3.14v not pressed 0.02v pressed	
8		ONETOUCH / EXTRAPR. button (P5)	3.16v not pressed 0.04v pressed	

**J4 - 3 Ways Potentiometer Connector**

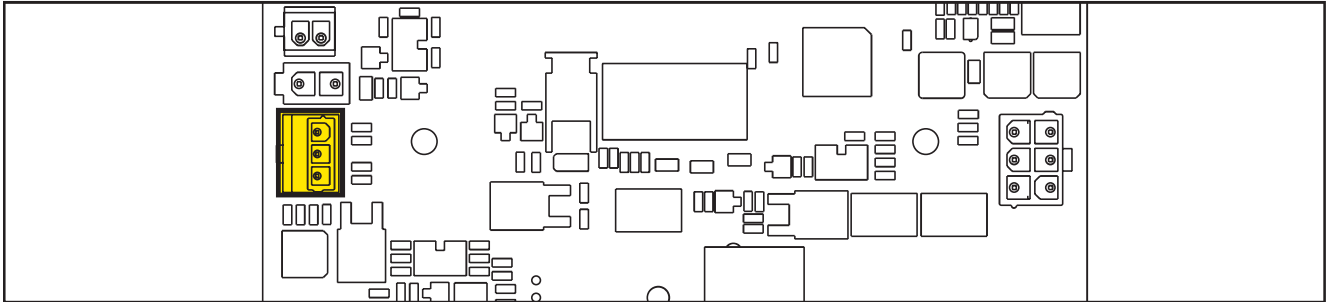


Figure 47:

PIN	Color	Circuit Description	Measured	Comments
1	Red	VR1 potentiometer power supply +	2.675	
2	White	VR1 potentiometer return	1.45 (Neutral)	2.48 (Full Fwd Pin 2), 0.44 (Full Rev Pin 2)
3	Black	VR1 potentiometer power supply -	0.41 (Ground)	

## 05 - Control System, Models with magnetic smart key

**Model No.: 9087403020, 9087404020, 9087400020, 9087401020, 9087405020, 9087402020**

### Functional Description

The architecture of the electronic control system for the machine's electrical components is composed of a Main machine controller (EB1) and a Display controller (EB2), in turn connected to the User interface controller (EB3) which represents the main user interface.

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

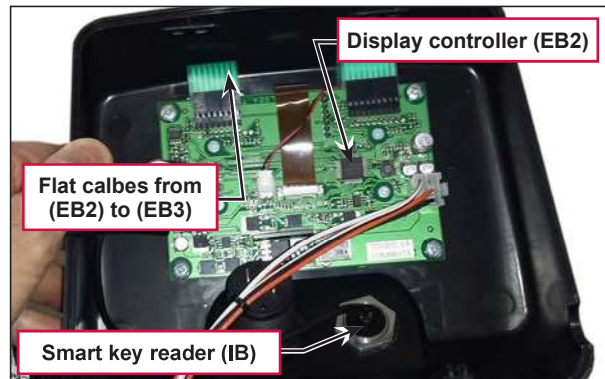
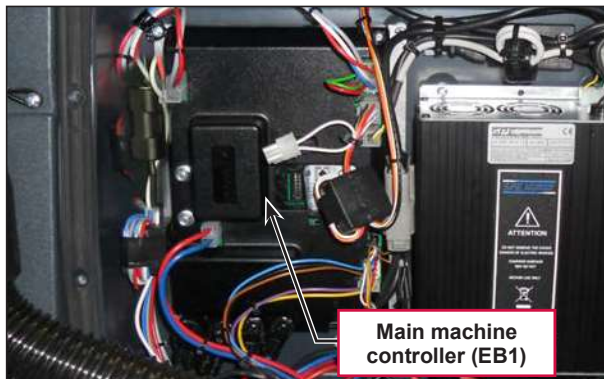
- Drive system motor (M3)
- Vacuum system motor (M2)
- Deck actuator (M5)
- Brush motor (M6)
- Solution flow solenoid valve (EV1)
- Detergent pump (M4)

The Display controller (EB2) serves mainly as an aggregator for all input signals (buttons) and outputs (LEDs) from the User interface controller (EB3), which it is connected to via 2 flat cables.

The Magnetic key reader (IB) is connected to the Display controller (EB2). The display controller (EB2) check the presence of the Magnetic smart key and drive the switch on/off of the system accordingly.

The Display controller (EB2) sends all the input and output signals of these components to the Main machine controller (EB1) using 2-wire 2-way serial communications protocol.

The system is completed by the on-board battery charger which also uses a proprietary serial protocol to communicate with the Main machine controller (EB1), in order to display its operating status (charging phase) to the operator on the LCD display.



### Wiring Diagram

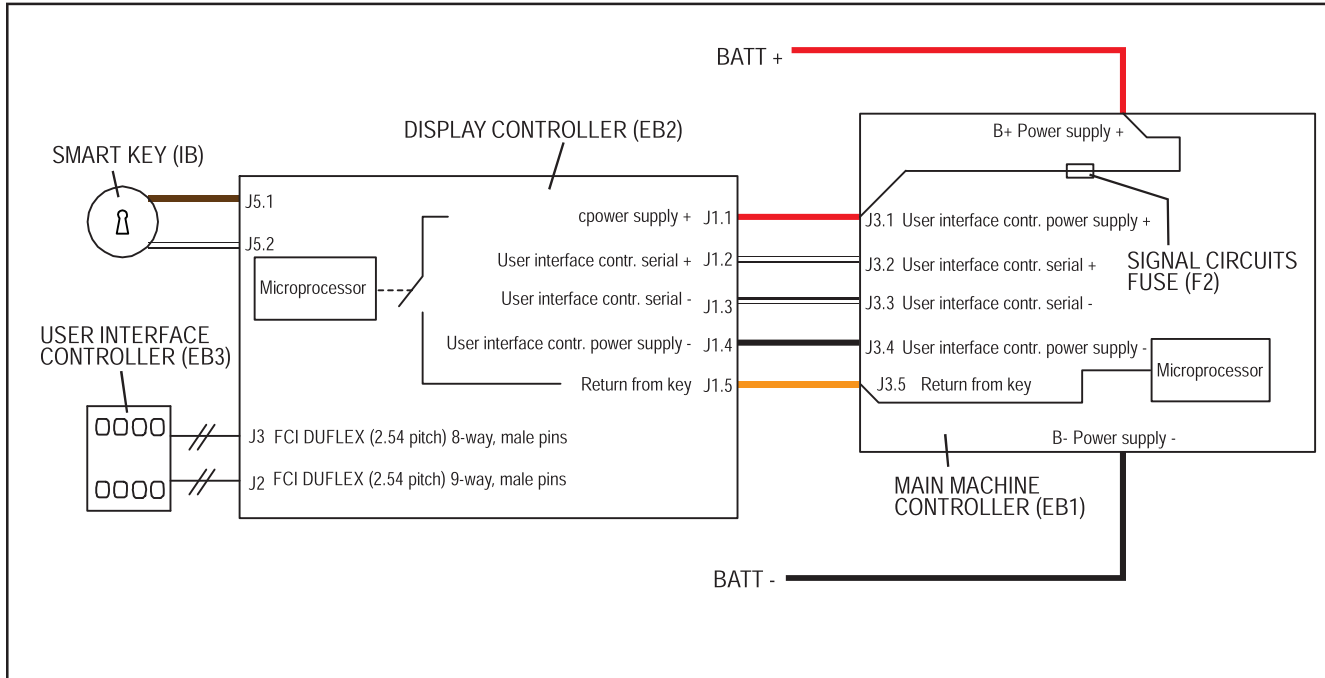


Figure 1:

## Component Locations

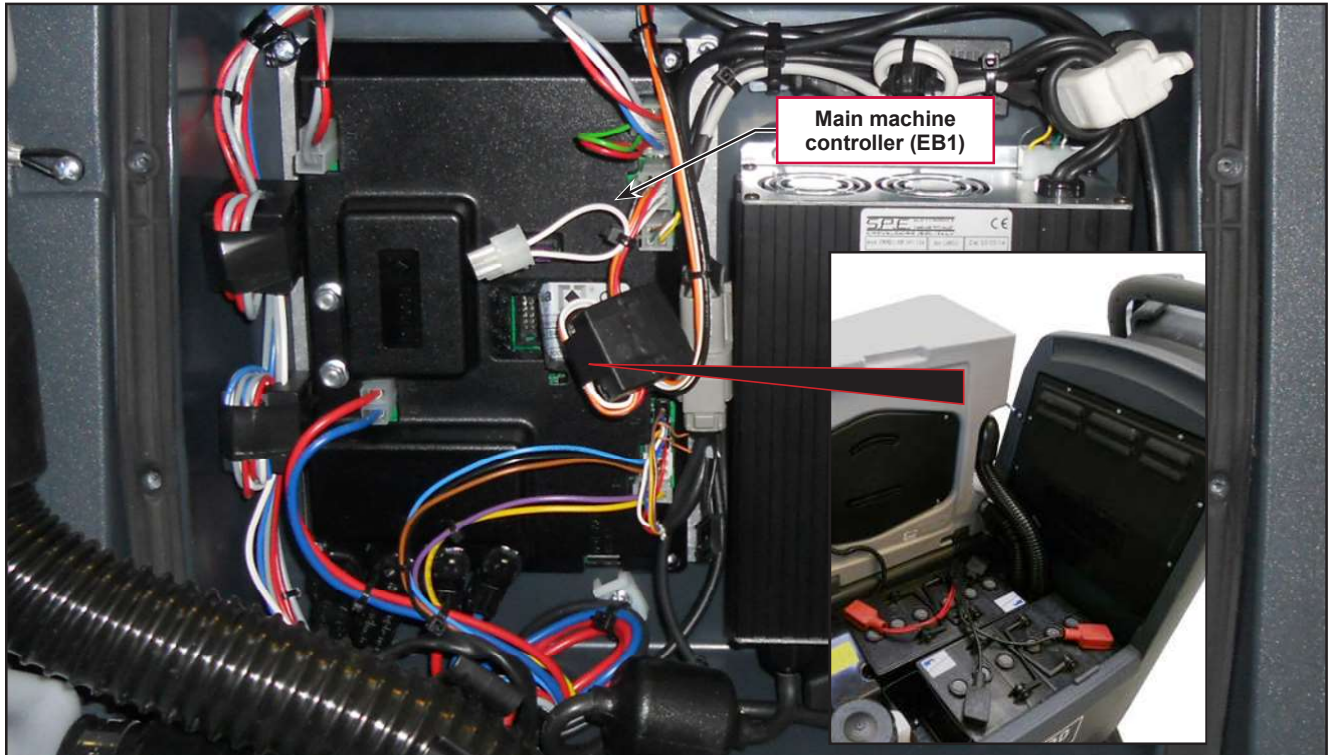


Figure 2:

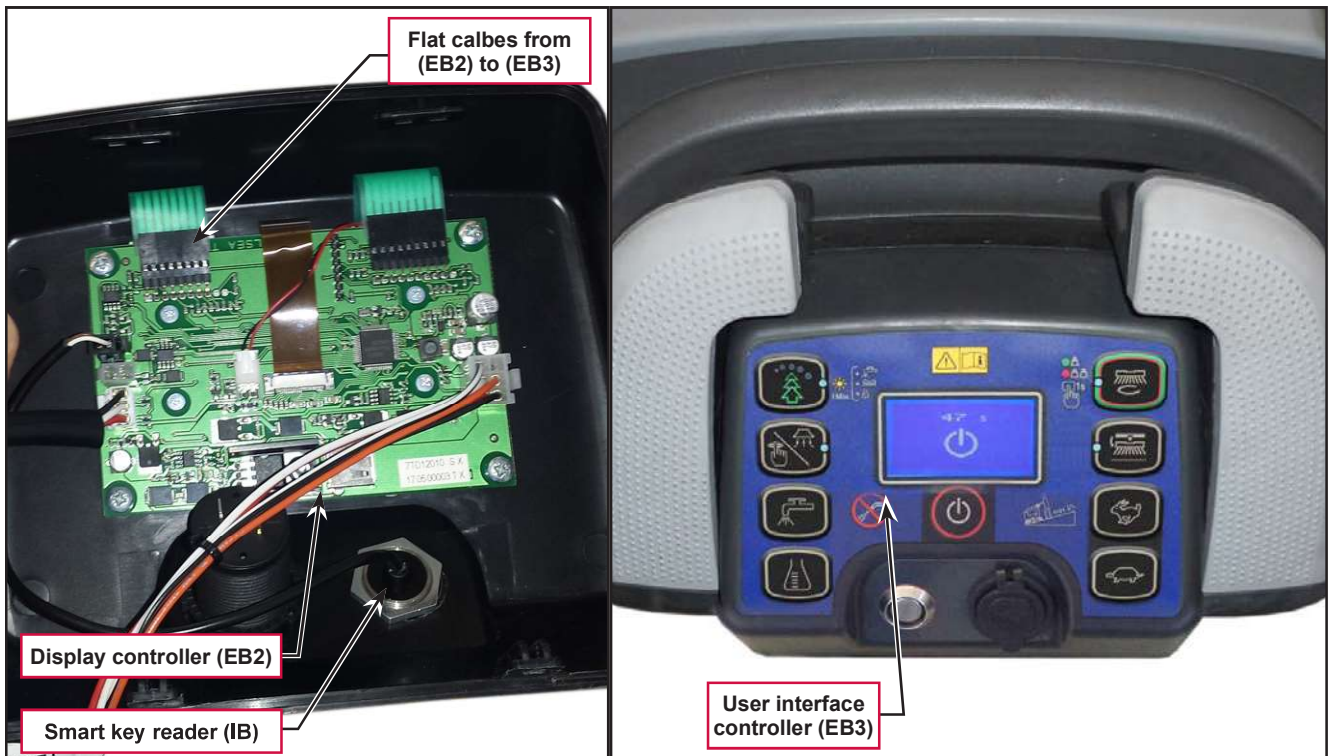


Figure 3:

## Troubleshooting

### Main machine controller (EB1) Alarm Codes

The Main machine controller (EB1) indicates a series of alarms in case of malfunction of one or more systems, and in case of abnormal conditions detected in the input signals.

The alarms are shown on the display in the following format: ALARM <XX> <DESCRIPTION> (Figure 4).



Figure 4:

In case the display is malfunctioning, the alarms are also repeated by the yellow and red diagnostic LEDs (Figure 5) on the Main machine controller (EB1), as indicated in the following tables.

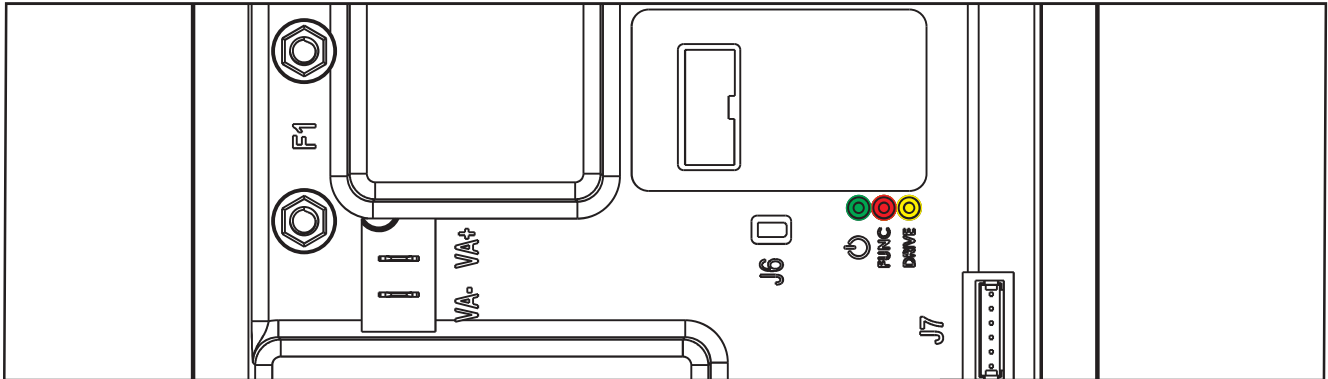


Figure 5:

General alarms					
Alarm on Main machine controller - FLASHING YELLOW + RED LEDs					
Alarm code	No. Flashes	Meaning	Condition	Effect	Service Suggestions
Description					
G2	2	EEPROM error	EEPROM error	Function block + Default setting reset	If the machine continues to function after G2 has been displayed, this may have been caused by a significant external electromagnetic disturbance.  1. Check that the settings and parameters (see pages 71 - 72) are correct (they may have returned to their defaults). If the error persists, the Main machine controller must be replaced.
EEPROM ERROR					



<b>General alarms</b>					
<b>Alarm on Main machine controller - FLASHING YELLOW + RED LEDS</b>					
<i>Alarm code</i>	<i>No. Flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
<b>G3</b>  <b>MAIN FUSE FAILURE</b>	3	Blown F1 fuse.	Blown F1 fuse.  Broken battery.	Function block.	F1 is a safety fuse primarily included to prevent a short circuit or serious damage to the Main machine controller causing currents such as to melt cables and/or cause smoke or fire. If F1 has blown, this is usually indicative of serious damage to the Main machine controller.  1. Removing the cover should allow you to understand the extent of the damage, but the solution in any case should be to replace the Main machine controller. 2. Try replacing fuse F1 only if there is no clear damage to the Main machine controller and wiring. 3. Ensure you tighten the fuse contacts correctly.  It could happen also if a battery is broken:  Check the battery voltage under load.
<b>G4</b>  <b>BATTERY LOW VOLTAGE</b>	4	Undervoltage.	The battery voltage remains below 18.4V for over 10 seconds (for WET CELL batteries, 19.6V for GEL-AGM batteries).	Function block.	1. Check the battery voltage under no-load conditions and under load. Replace the faulty battery/batteries if necessary. 2. Recharge the batteries by performing a complete charging cycle.
<b>G5</b>  <b>BATTERY OVERVOLTAGE</b>	5	Excessive battery voltage.	Battery voltage over 32V.	Function block.	Check the voltage of the installed batteries and that the terminals are correctly tightened.
<b>G6</b>  <b>HARDWARE FAILURE</b>	6	Serial communication error with User interface controller.	No signal or error in communications decoding between the Main machine controller (EB1) and the Display controller (EB2).	No block.	1. Check the 5 cables from the 6-way User interface controller connector to connector J3 pins 1, 2, 3, 4. 2. If there is continuity, the User interface controller must be replaced.
<b>G7</b>  <b>HARDWARE FAILURE</b>	7	General relay fault.	Relay closes or closed at start-up.	Function block.	Replace the Main machine controller.

<b>Main machine controller alarms</b>					
<b>Alarm on Main machine controller - FLASHING RED LED</b>					
<i>Alarm code</i>	<i>No. flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
<b>F2</b> ----- <b>BRUSH MOTOR OVERLOAD</b>	2	BRUSH motor amperometric protection.	The motor current is greater than the value of the parameter (see page 72) VS1	Brush motor output stop.	Check the current draw of the brush motor. It should remain below the value set in the parameter "VS1" during operation.
<b>F3</b> ----- <b>VACUUM MOTOR OVERLOAD</b>	3	VACUUM SYSTEM amperometric protection.	The current draw of the vacuum motor is greater than 30A for over 10 seconds.	Vacuum system block.	1. Check for any debris in the vacuum motor. 2. Check that the motor rotor turns freely. 3. Replace the vacuum motor if necessary.
<b>F4</b> ----- <b>DECK ACTUATOR FAILURE</b>	4	DECK ACTUATOR overcurrent.	Current greater than 4A detected for more than 1 second.	Brush function block.	1. Check that there is no friction on the brush deck linkage; lubricate if necessary. 2. Check that the actuator and deck travel is not blocked by mechanical obstructions. 3. If the problem persists, replace the actuator.
<b>F5</b> ----- <b>HARDWARE FAILURE</b>	5	Short circuit on the vacuum or brush motor drive MOSFET.	MOSFET short circuit.	Function block.	1. Check that there are no short circuits in the motor wiring. 2. Replace the Main machine controller.
<b>F6</b> ----- <b>PRESSURE GAUGE FAILURE</b>	6	PRESSURE GAUGE FAILURE  (Not used)	-	-	-
<b>F7</b> ----- <b>OVERHEATING</b>	7	Motor drive section thermal cut-out.	The heatsink on the Main machine controller has reached a temperature of 194°F (90°C).	Function block.	Check the vacuum and brush motor power draw and that the openings of the electrical compartment are not blocked.
<b>F8</b> ----- <b>BRUSH MOTOR FAILURE</b>	8	Brush motor output short circuit.	$I > 150A$ for 20μsec.	Function block.	Check for short circuits in the wiring or motor.
<b>F9</b> ----- <b>VACUUM MOTOR FAILURE</b>	9	Vacuum motor output overcurrent.	$I > 150A$ for 20μsec.	Function block.	Check for short circuits in the wiring or motor.

## Drive System Alarm Codes

<b>Drive system alarms</b>					
<b>Alarm on Main machine controller - FLASHING YELLOW LED</b>					
<i>Alarm code</i>	<i>No. flashes</i>	<i>Meaning</i>	<i>Condition</i>	<i>Effect</i>	<i>Service Suggestions</i>
<i>Description</i>					
<b>T2</b>  <b>DRIVE MOTOR OVERLOAD</b>	2	Amperometric protection intervention.	Drive motor current draw greater than the parameter (see page 72) "INOM" for more than the parameter (see page 72) "TMAX".	Drive blocked.	Check the current draw of the drive motor (this should be around 6-8amps without load and remain below 10-12amps during operation).
<b>T3</b>  <b>RELEASE THE PADDLE !</b>	3	Paddle not in rest position when the machine is turned on.	Voltage on J1.2 of the Display controller (EB2) out of range 1.29V - 1.49V with respect to - BAT.	Drive blocked.	Check that the paddle moves correctly, lubricating if necessary; check the linkage and potentiometer.
<b>T4</b>  <b>PADDLE INPUT FAILURE</b>	4	Incorrect voltage measured at the paddle potentiometer input.	Voltage on J1.2 of the Display controller (EB2) above 3V.	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check the connection of the potentiometer to the Display controller.</li> <li>2. Replace the potentiometer.</li> <li>3. Replace the Display controller.</li> </ol>
<b>T5</b>  <b>HARDWARE FAILURE</b>	5	Drive system power section damage	MOSFET short circuit.	Drive blocked.	Disconnect M1 and M2 from controller, press the pedal <ol style="list-style-type: none"> <li>1. if the alarm persist replace the controller,</li> <li>2. if not, check the cables of the gear motor and motor itself for a short circuit</li> </ol>
<b>T6</b>  <b>DRIVE MOTOR FAILURE</b>	6	Overcurrent (motor D.C.)	Drive motor current draw greater than 1.5 times the value of the parameter (see page 72) "IMAX".	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check that the gear motor cables are not short circuited</li> <li>2. Check that the motor of the gear motor unit is not short circuited (the impedance of the motor should be around 0.6 – 0.8 Ohm)</li> <li>3. If necessary, replace the gear motor unit motor</li> </ol>
<b>T7</b>  <b>OVERHEATING</b>	7	Drive motor drive section thermal cut-out.	The heatsink on the Main machine controller has reached a temperature of 194°F (90°C).	Drive blocked.	<ol style="list-style-type: none"> <li>1. Check the drive motor power draw and that the openings of the electrical compartment are not blocked.</li> <li>2. If everything is within normal parameters, this may simply have been caused by extreme working conditions such as: Ambient temperature over 86°F (&gt;30°C), sloping working sections. Simply leave the system to cool and turn the machine back on.</li> </ol>

All alarms of the drive system operate by cutting the power supply to the gear motor unit motor until the KEY input is reset (with the exception of alarm T3 which is reset as soon as the input voltage of the paddle potentiometer returns within the values corresponding to "machine stopped"). In case of simultaneous errors, the one with greater priority is shown first (priority order is opposite to the number of flashes).

## On-Board Battery Charger Alarm Codes

### SPE Charger

On-board Battery Charger Alarms - SPE Charger				
Alarm code ----- Description	Meaning	Condition	Effect	Service Suggestions
<b>C1</b> ----- <b>CHARGER COMMUNICAT.</b>	Communication problem between the battery charger and the Main machine controller.	No signal from battery charger via gate J4.4 for over 3 seconds.	The battery charger is performing the standard recharging cycle for generic GEL/AGM batteries.	Check the wiring between the battery charger and the Main machine controller (EB1).
<b>C2</b> ----- <b>BATTERY OVERVOLTAGE</b>	Battery overvoltage.	Battery voltage over 32V.	Battery charger block.	1. Check the connections of the batteries and the voltage of the installed batteries. 2. Disconnect and reconnect the battery charger.
<b>C4</b> ----- <b>CHARGING TIME I EXPIRED</b>	Charging phase I expired.	Battery excessively discharged or at end of life cycle.	Battery charger block.	If the problem persists, replace the batteries.
<b>C5</b> ----- <b>CHARGING TIME II EXPIRED</b>	Charging phase II expired.	Battery excessively discharged or at end of life cycle.	Battery charger block.	If the problem persists, replace the batteries.
<b>C6</b> ----- <b>CHARGER FAULT</b>	Battery charger internal short circuit.	Battery charger internal short circuit.	Battery charger block.	Replace the battery charger.

### DeltaQ Chargers - IC650 and RC1000?

On-board Battery Charger Alarms - Delta-Q IC and RC series		
Alarm code ----- Description	Cause	User Action
<b>D1</b> ----- <b>charger int. error</b>	Internal charger fault.	Disconnect the AC and turn off the battery (remove the iButton key) for minimum 30 seconds. If the error comes again, please contact Nilfisk service.
<b>D2</b> ----- <b>battery overvoltage</b>	Battery voltage is too high.	Check the battery status LED, disconnect the AC, turn off the battery (remove the iButton key) and check the accessible battery cable connections. If the error comes again, please contact Nilfisk service.

On-board Battery Charger Alarms - Delta-Q IC and RC series		
Alarm code	Cause	User Action
Description		
D3 ----- charge timeout	Charge time limit exceeded.	Check the battery status LED, disconnect the AC, turn off the battery (remove the iButton key) and check the accessible battery cable connections. If the error comes again, please contact Nilfisk service.
D4 ----- battery conn. error	Insufficient battery DC connection	Disconnect the AC, turn off the battery (remove the iButton key) and check the accessible battery cable connections. If the error comes again, please contact Nilfisk service.
D5 ----- AC overvoltage	The AC voltage is too high	Disconnect the AC and check the AC connections and the power grid. Please be aware that the charger works in 85-270V AC range.
D6 ----- AC undervoltage	The AC voltage is too low.	Disconnect the AC and check the AC connections and the power grid. Please be aware that the charger works in 85-270V AC range.
D7 ----- charger comm. error	Communication error between the charger and the battery.	Disconnect the AC, turn off the battery (remove the iButton key) and check the accessible communication cable connections. If the error comes again, please contact Nilfisk service.
D8 ----- charger fan error	The fan of the charger is blocked or broken. Only related to RC1000 charger.	Check the condition and clogging of the fan. If necessary, clean it with compressed air and/or fine brush. If the error comes again, please contact Nilfisk service.

### Nilfisk Lithium-ion Battery Alarm Codes



**Note: Machines with 1 module:** In some battery-related error conditions, the output of the module is disabled and the machine will switch off, error messages will not appear on the display. Please check the LEDs on the battery modules. RED LED = battery output disabled. Refer to the “Nilfisk Lithium-Ion Battery Module” service manual form number 56043180.

**Note: Machines with more than 1 module installed:** If the conditions allow, only the defective module(s) will switch off. The other modules can supply the voltage for the machine and it can continue to operate or show the error messages.

<b>Nilfisk Lithium-ion Battery Module Alarms</b>				
<i>Alarm code</i> ----- <i>Description</i>	<i>Cause</i>	<i>Machine Action During Use</i>	<i>Machine Action During Charging</i>	<i>User Action</i>
<b>L2</b> ----- <b>Battery temp error</b>	Over- or under temperature warning during charging or discharging.	Error message flashes, the machine switches off after 5 seconds	The charging will be stopped and will be automatically resumed when the temperature is within specified limits.	When the machine is in use, try to reduce the load. Pay attention to the normal operation temperatures. Check the cooling fan inlet of the battery and clean if it necessary.
<b>L3</b> ----- <b>Recuperation Alarm</b>	Too much regenerative charge during dynamic braking on a slope with fully charged batteries.	Error message flashing, traction disabled, other functions (brush, vacuum) can work. SC2000: the magnetic brake activated.	Not applicable	Use the machine only on the allowed slope and don't push it manually. If possible, turn on the brush and vacuum to consume some charge. The error is latching, machine reset required after the conditions normalized.
<b>L4</b> ----- <b>CAN error/fail</b>	CAN wiring/contact error or bad Node-ID configuration	Error message flashing, machine completely disabled	Error message flashing. If the CAN connection between the battery and charger is functioning, the charging can be continued.	Turn off the machine, check the accessible wires/connections. In other case, contact Nilfisk service.
<b>L8</b> ----- <b>over current error</b>	Overcurrent detected	Error message flashes, machine disabled. In the overcurrent condition, the battery will disable its output after 5 seconds and the machine will switched OFF. SC2000: magnetic brake activated.	Charging stopped.	Turn off the machine, check the accessible wires/connections. Reduce the load, check the free rotation of the wheels and brush, Please do a "Battery reset". If this error comes again, contact Nilfisk service.
<b>L9</b> ----- <b>undercharge error</b>	Battery is undercharged.	Error message flashes, machine disabled. In the undercharge condition, the battery will disable its output after 5 seconds and the machine will switched OFF. SC2000: magnetic brake activated.	Not applicable.	Turn off the machine and recharge the batteries.
<b>L11</b> ----- <b>module defect error</b>	One or more modules defective.	Error message flashes, no other action on machine side. If the battery module have a serious error, the output of the whole battery pack can be disabled, in this case the machine is OFF. SC2000: magnetic brake activated.	The charging of the operational modules can continue.	Please do a "Battery reset". If the error exists, contact Nilfisk service. Note: If the machine is equipped with more than 1 modules and they are fully operational, you can use the machine but the error message is always on the LCD.

## Black-box: Recording of Alarms, Parameters (see pages 71-72), Partial Operating Time Counter

The alarms activated during normal machine operation are stored and can be read in the corresponding log (Alarm Log Screen).






press the the button  to access the main screen (Figure 7) of the display.

### Display, Main Screen

1. Place the Supervisor key (yellow) (Figure 6), then



Figure 6:

2. Press One-Touch  push-button to change the machine settings (see Machine Settings Screen section).
3. Press the brush release button  or REV button  to check for any stored machine alarms (see Alarms Log Screen section).
4. Press the “hare” button  to check the machine’s hours of operation (see Operating Time Counter Screen section).
5. Press the “tortoise” button  to manage the magnetic smart keys..

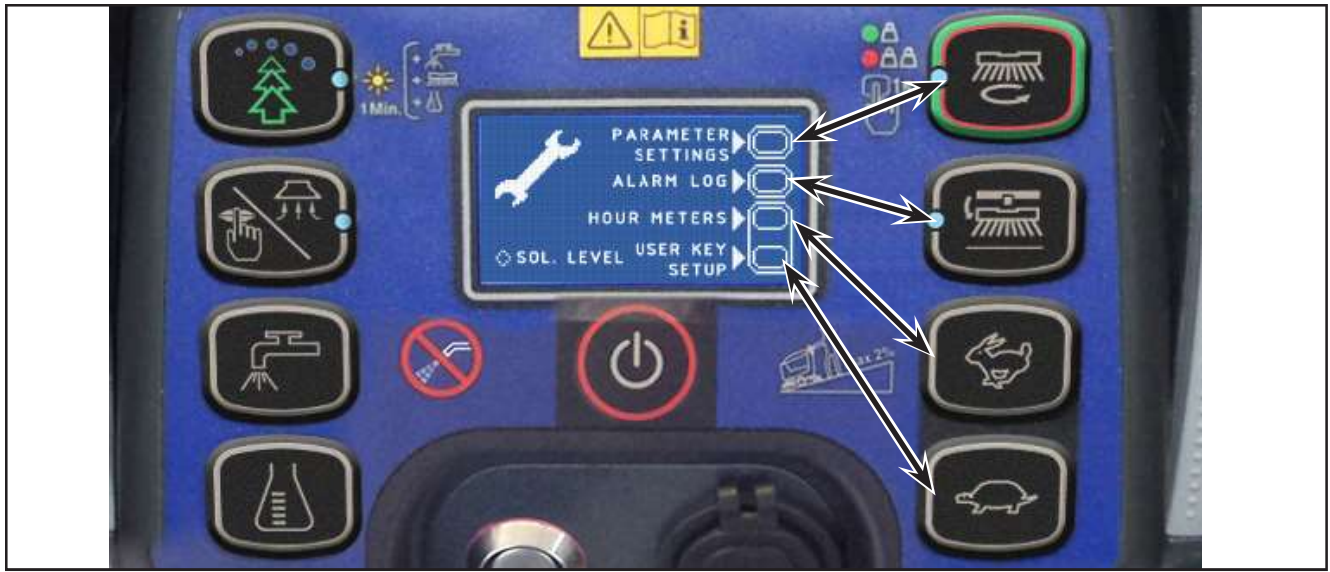


Figure 7:



### Display, Alarms Log Screen

The alarms log screen (Figure 8) function allows you to check any alarms stored on the machine.

To return to the main screen (Figure 6), press the One-Touch button  repeatedly.



Figure 8:

Each alarm (See table of alarms in the Main machine controller Alarm Codes section) is stored along with the working hour (machine operating time counter) at which it occurred and all alarms are recorded in the order in which they occurred, from the most recent to the oldest.

The memory holds up to 20 alarm records, after which the oldest are overwritten when new alarms occur.

Improper uses of the batteries or battery charger are also recorded, as in the following table:

On-board Battery Charger Alarms			
Alarm code	Meaning	Condition	Effect
Description			
<b>GB-N</b> ----- <b>CONTINUOUS LOW BATTERY VOLTAGE</b>	Time of continuous use with discharged batteries	“N” is the number of hours from key on to off when the battery level is below 20.4V for WET CELL (21.6 for AGM) batteries. This event is not recorded if the usage time is below 10 minutes.	Incorrect use by customer. Risk of reduced battery life.
<b>GC</b> ----- <b>CHARGER DISCONN BEFORE END CYCLE</b>	Charging cycle interrupted before completion	Disconnection of battery charger before stage IV = battery symbol with 3 segments lit steadily.	Incorrect use by customer. Risk of reduced battery life.
<b>GD-N</b> ----- <b>CHARGING TIME LESS THAN 4 HOURS</b>	Charging phase duration	N = Number of hours from battery charger connection to completion of PHASE II (red LED on) if < 4	Incorrect use by customer. Risk of reduced battery life.

### Display, Machine Settings Screen

The machine settings screen (Figure 9) functions allow you to customise some parameters described in the following table of modifiable parameters.





1. Press the “hare” button  to increase the value of the current parameter.
2. Press the “tortoise” button  to decrease the value of the current parameter.
3. Press the One-Touch button  to move to the next parameter.
4. To return to the main screen (Figure 6), press the brush release button .




Figure 9:

Modifiable Parameters					
Code	Description		Min. Value	Factory Setting	Max. Value
CHM1	Detergent concentration level 1		1:400 (0.25 %)	<b>1:400 (0.25 %)</b>	1:33 (3 %)
CHM2	Detergent concentration level 2		1:400 (0.25 %)	<b>1:125 (0.80 %)</b>	1:33 (3 %)
P1/P3	Level 1 solution flow rate in relation to level 3 (see section “System for Flow Rate Regulation as Function of Speed”)		0 %	<b>25 %</b>	100 %
P2/P3	Level 2 solution flow rate in relation to level 3 (see section “System for Flow Rate Regulation as Function of Speed”)		0 %	<b>50 %</b>	100 %
P3	Level 3 solution flow rate	DISC	1.0 cl/m	<b>3.0 cl/m</b>	5.0 cl/m
		REV	1.0 cl/m	<b>1.5 cl/m</b>	5.0 cl/m
P4	Level 4 solution flow enabling (2.8 l/min regardless of speed)		OFF	<b>OFF</b>	ON
SPT	EcoFlex function timer		0 (disabled)	<b>60 sec.</b>	300 sec.
XPRES	Brush deck extra pressure enable		OFF	<b>ON</b>	ON
FVMIN	Minimum forward speed		0 %	<b>25 %</b>	100 %
FVMAX	Maximum forward speed		10 %	<b>100 %</b>	100 %
RVMAX	Maximum reverse speed		10 %	<b>30 %</b>	50 %
BAT	Installed battery type		0	<b>1</b>	<b>7</b>
TOFF	Automatic shut-off time		0 (disabled)	<b>300 sec.</b>	600 sec.
BRGH	Display contrast		5	<b>20</b>	50
VRID	Vacuum power in silent mode		1	<b>1</b>	5
RPM (*)	Reduced brush rpm activation threshold		5	<b>9</b>	20
RESET (**)	Restore factory settings for all parameters		OFF	<b>OFF</b>	ON

(\*) Increase the value of this parameter to reduce the brush motor speed in a wider range of applications and vice versa  
 (\*\*) The RESET function acts only on “MODIFIABLE PARAMETERS” and not on “HIDDEN PARAMETERS”.

The following parameters are displayed only when, on reaching the last parameter RESET, the One-Touch button  is pressed together with the EcoFlex  and vacuum  buttons.

If only the One-Touch button  is pressed, the system will return to the first parameter CHM1.

Hidden Parameters					
Code	Description	Min. Value	Factory Setting	Max. Value	Meaning
TSERV	Service advisory timer	0	0	1000	Set to a value X greater than 0 if you wish the "Service Advisory" icon to be displayed every X hours of machine running time (according to the main operating time counter). To reset the hour counter for the icon display countdown (until the next service advisory), press the BURST and vacuum buttons for 10 seconds with the display on the "SERVICE MENU" page.
AR	Maximum acceleration ramp (sec.)	0.5 sec.	1.5 sec.	5 sec.	Increase to obtain a less abrupt response when accelerating, and vice versa.
DR	Maximum deceleration ramp (sec.)	DISC	0.5 sec.	1.5 sec.	Increase to obtain a less abrupt response when decelerating, and vice versa. <b>WARNING: increasing this value increases the braking distance.</b>
		REV	0.5 sec.	2.5 sec.	
IR	Maximum deceleration ramp in reverse (sec.)	0.5 sec.	0.5 sec.	5 sec.	This is the maximum current which can be supplied to the disc brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VS1	Brush 1 motor protection threshold	20A	30A	50A	This is the maximum current which can be supplied to the disc brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VS2	Brush 2 motor protection threshold	20A	40A	50A	This is the maximum current which can be supplied to the cylindrical brush deck. <b>WARNING: increasing this value increases the risk of the motors overheating.</b>
VDEAD	Paddle potentiometer dead zone	0.0V	0.1V	1.0V	Increase if the alarm T3 appears in the rest position and it is not possible to adjust the system's mechanics. (Speed regulation will, however, be more difficult to modulate)
INOM	Nominal drive current	10A	15A	15A	This is the maximum continuous current which can be supplied to the electric wheel drive unit. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>
IMAX	Maximum drive current	10A	45A	45A	This is the maximum instantaneous current which can be supplied to the electric wheel drive unit. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>
TMAX	Protection trip time for IMAX	0 sec.	12 sec.	60 sec.	This is the reaction time of the electric wheel drive unit protection device when overloaded: this parameter is used in conjunction with IMAX to obtain the most appropriate response curve for the overload protection motor actuation system. <b>WARNING: increasing this value increases the risk of the motor overheating.</b>

### Display, Operating Time Counter Screen

The operating time counter screen (Figure 10) function allows you to check the total accumulated hours of work for each machine subsystem:





- (A) TOTAL counter (machine running time): same counter display on screen after starting machine.
- (B) DRIVE counter (drive system usage time).
- (C) BRUSH counter (brush rotation system usage time).
- (D) VACUUM counter (vacuum system usage time).




Figure 10:

### Time Counter Reset

To reset the time counter see the table below for the procedure:

PUSH-BUTTON (> 10 SEC.)	TIME COUNTER RESET
	(A) TOTAL counter (*)
	(B) DRIVE counter
	(C) BRUSH counter
	(D) VACUUM counter

(\*) When the TOTAL counter is reset, it is automatically reset also all partial ones (B, C, D) and deleted all LOG memory.

To return to the main screen (Figure 7), press the One-Touch button .

## Display, Magnetic Smart Keys Management Screen

The Magnetic Smart Keys Management Screen (Figure 11) allows you to define if the machine can be used with whatever user key (factory setting) or only with one or more specific user keys.

To switch on the operator mode press the “hare” button



### Identify a specific user key to be used for the machine:

1. Remove the supervisor key (if present) from the key reader.

2. Place the user key on the key reader, then press the One-Touch button



### Remove a specific user key from the list of the keys to be used for the machine:

1. Remove the supervisor key (if present) from the key reader.

2. Place the user key on the key reader, then press the brush release button



### Replace the factory setting (whatever user key can be used for the machine):

1. Remove the supervisor key (if present) from the key reader.

2. Press the brush release button



3. Confirm the command pressing the One-Touch button



Figure 11:

To return to the main screen (Figure 7), press the “tortoise” button



## System for Flow Rate Regulation as Function of Speed

Solution flow levels 1, 2 and 3 regulate the flow of detergent solution on the basis of the machine speed so as to keep the quantity of solution dispensed per square metre of floor treated constant.

The reference flow level is level 3: based on the setting of the corresponding parameter P3, the opening time of the solenoid valve (and of the detergent pump when fitted) is regulated so that the quantity of solution in centiliters per metre travelled by the machine is constant and equal to the value set in the parameter.

For example, for P3 = 3.0, the machine will dispense 3 centiliters of solution per metre travelled, which equates (for the standard deck width of 530 mm) to 5.7 centiliters per square metre of floor treated.

Levels 1 and 2 are defined via the corresponding parameters P1 and P2 as a % of level 3.

For example, for P1 = 25 and P2 = 50, P1 and P2 are respectively  $\frac{1}{4}$  (25%) and  $\frac{1}{2}$  (50%) of the reference flow rate P3.

The default values (the same as in the example above) are summarized in the table, with the corresponding flow rate values in liters per minute, dependent on machine speed, given as a reference.

<b>SC500 DISC detergent flow (as a function of speed) (standard setting)</b>			
	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>
Liters/minute @ 1 km/h	0.2	0.3	0.5
Liters/minute @ 3 km/h	0.4	0.8	1.5
Liters/minute @ 5 km/h	0.6	1.3	2.5
Centiliters per metre cleaned (constant)	0.75	1.5	3
Centiliters per meter <sup>2</sup> cleaned (Ø530 deck)	1.4	2.8	5.7

Level 4 (when enabled) is independent of any parameter and supplies the maximum possible quantity of solution as it keeps the solenoid valve of the supply system constantly open (with the brush rotating).

<b>SC500 DISC detergent flow rate</b>	
	<i>Level 4</i>
Liters/minute - Tank full	3.5
Liters/minute - Average	2.5

## Removal and Installation

### Main machine controller (EB1)

1. Drive the machine on a level floor, remove the ignition key, and disconnect the red battery connector.
2. Lift the recovery tank.
3. Remove the 7 screws and remove the electronic component compartment cover.
4. Disconnect the following connections sequentially (Figure 12):
  - (A) and (B) Board power supply connection (B+) and (B-).
  - (C) and (D) Brush motor connection (BR+) and (BR-).

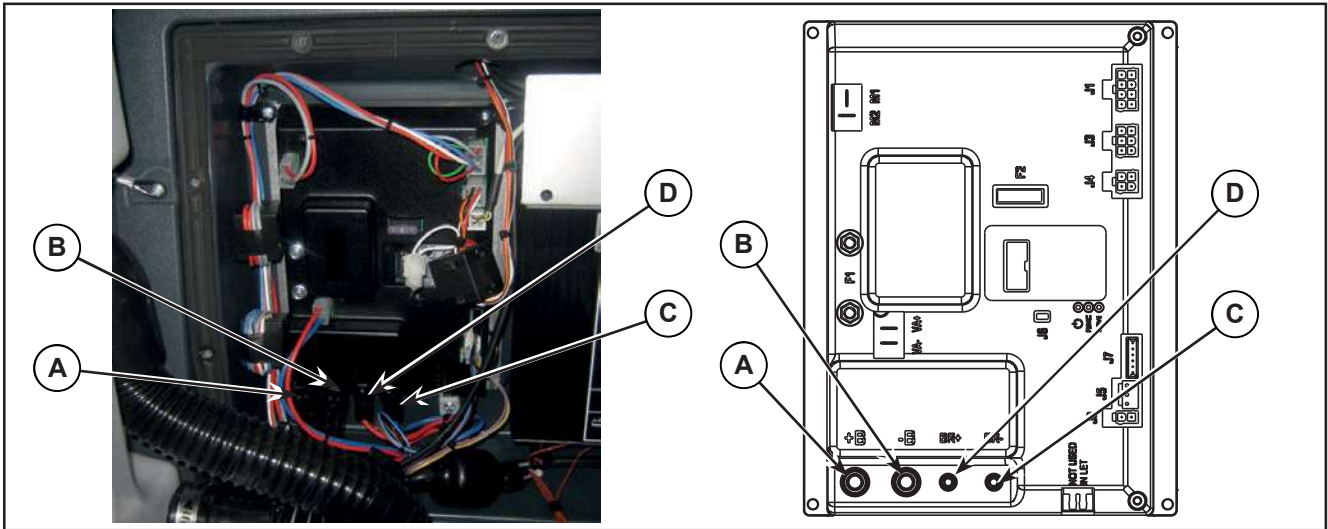


Figure 12:

5. Disconnect the following connections sequentially (Figure 13):
  - (E) and (F) Drive system motor connection (M1) and (M2).
  - (G) and (H) Vacuum motor connection (VA+) and (VA-).

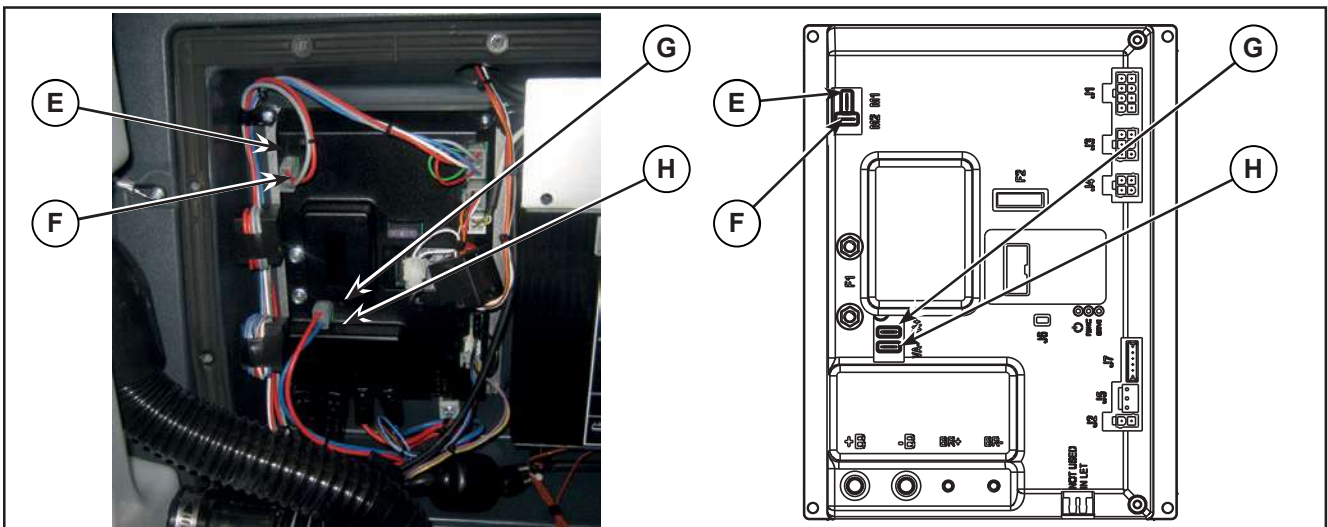


Figure 13:

6. Disconnect the following connections sequentially (Figure 14):

- (I) Deck actuator and detergent pump connection (J1).
- (J) Solenoid valve connection (J2).
- (K) Display controller connection (J3).
- (L) Battery charger connection (J4).
- (M) Detergent level sensor connection (J5).
- (N) Connection (J6).

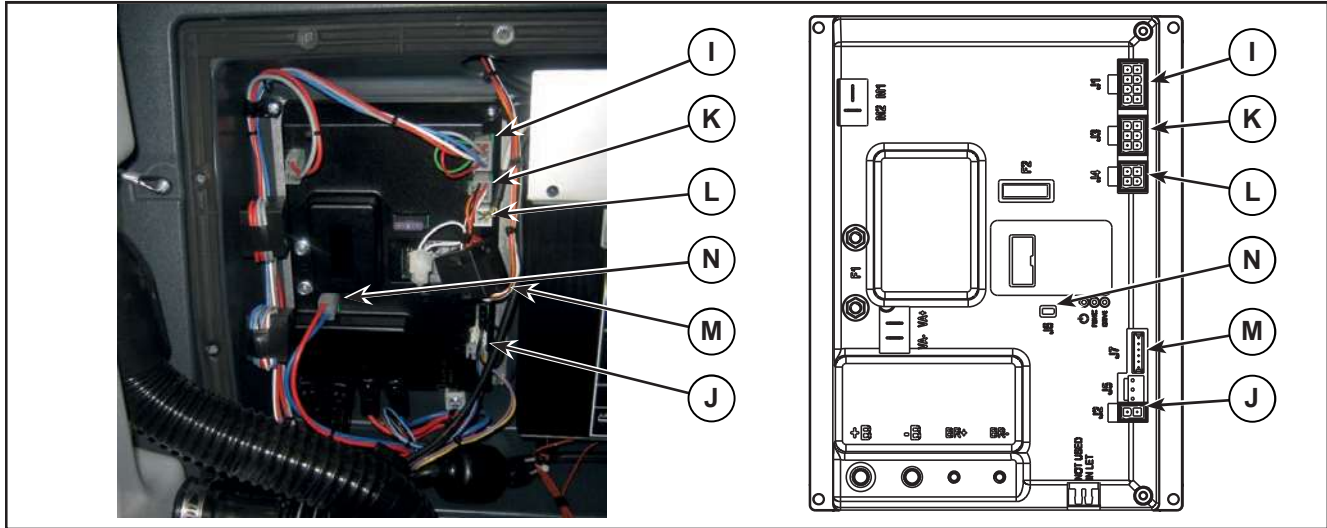


Figure 14:

7. Unscrew the 4 retaining screws (O) and carefully remove the Main machine controller (Figure 15).

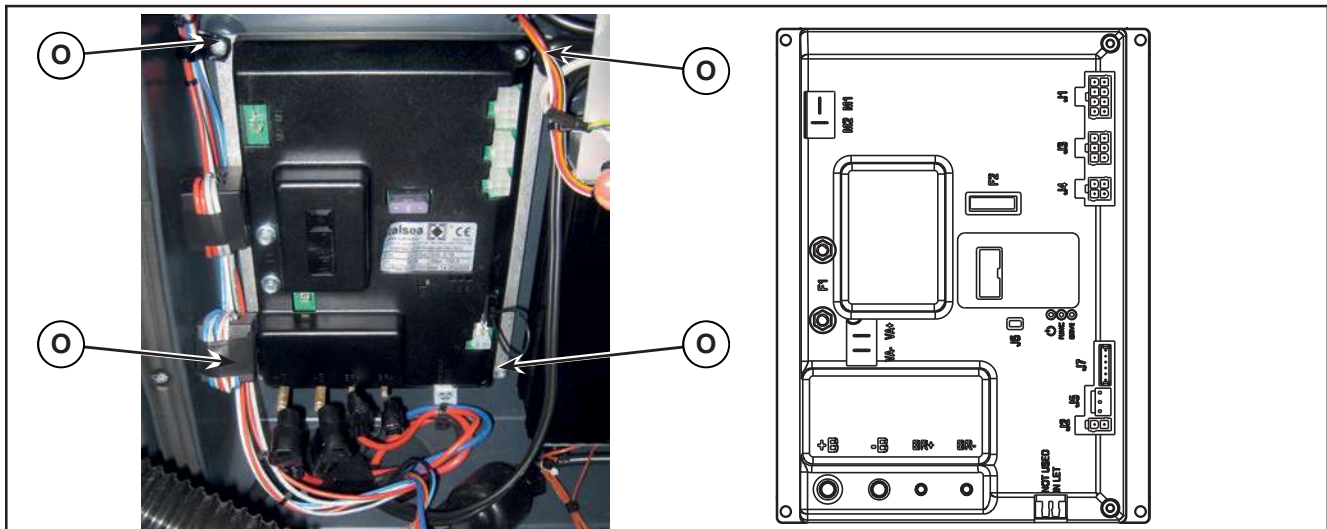


Figure 15:

8. Assemble the components in the reverse order of disassembly.



## Display Controller (EB2), User interface controller (EB3) and Smart Key Reader (IB)

### Display Controller (EB2)

1. Drive the machine on a level floor.
2. Remove the ignition key.
3. Disconnect the red battery connector.
4. Unscrew the 2 screws (A) (Figure 16).
5. Lift up and remove the User interface controller cover (B).



Figure 16:

6. Disconnect the following connections sequentially (Figure 17):
  - (A) Speed potentiometer connection J4.
  - (B) Display controller power supply connection J1.
  - (C) Smart key connection J6.
  - (D) Flat connection J2.
  - (E) Flat connection J3.
7. Unscrew the 4 screws (F), then remove the Display controller (G).

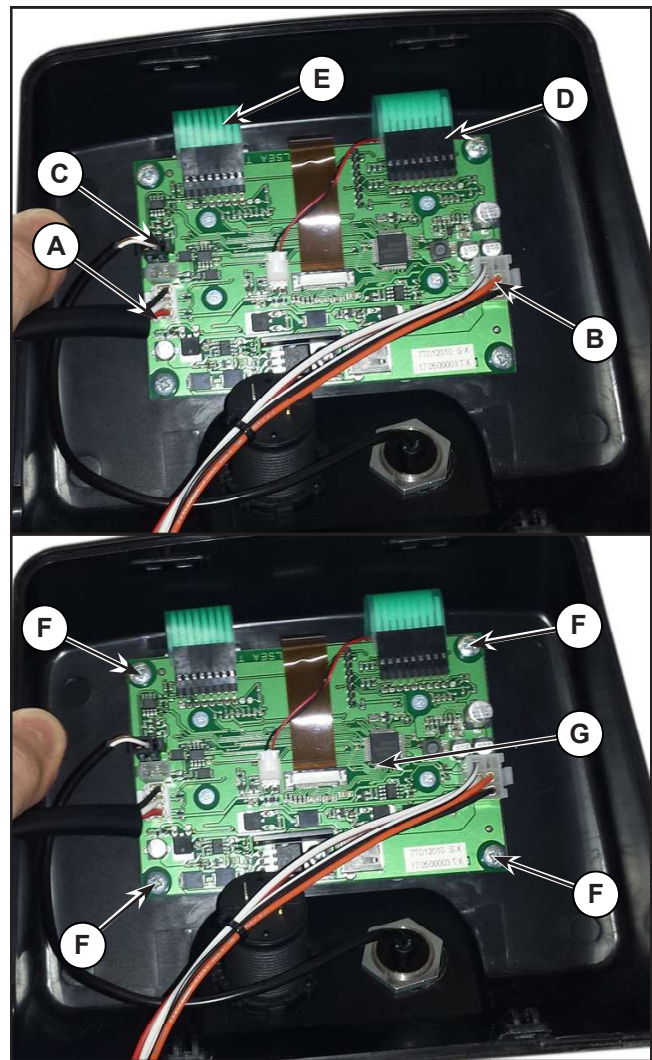


Figure 17:

### User interface controller (EB4)

8. Perform points 1 to 5 for removal of the Display controller.
9. Disconnect the following connections sequentially (Figure 18):
  - (A) Flat connection J2.
  - (B) Flat connection J3.
10. Carefully raise the User interface controller (C), detaching it from the cover (D).

### Smart Key Reader (IB)

11. Perform points 1 to 5 for removal of the Display controller.
12. Disconnect the Smart key reader connection J6 (E).
13. Loosen the exagon (F) then remove the Smart key reader (G).

### Assembly

14. Assemble the components in the reverse order of disassembly and note the following:
  - Before fastening the User interface controller (C), ensure that the flat connections (A) and (B) are correctly run through the slots in the cover (D), then glue the User interface controller to the cover itself.

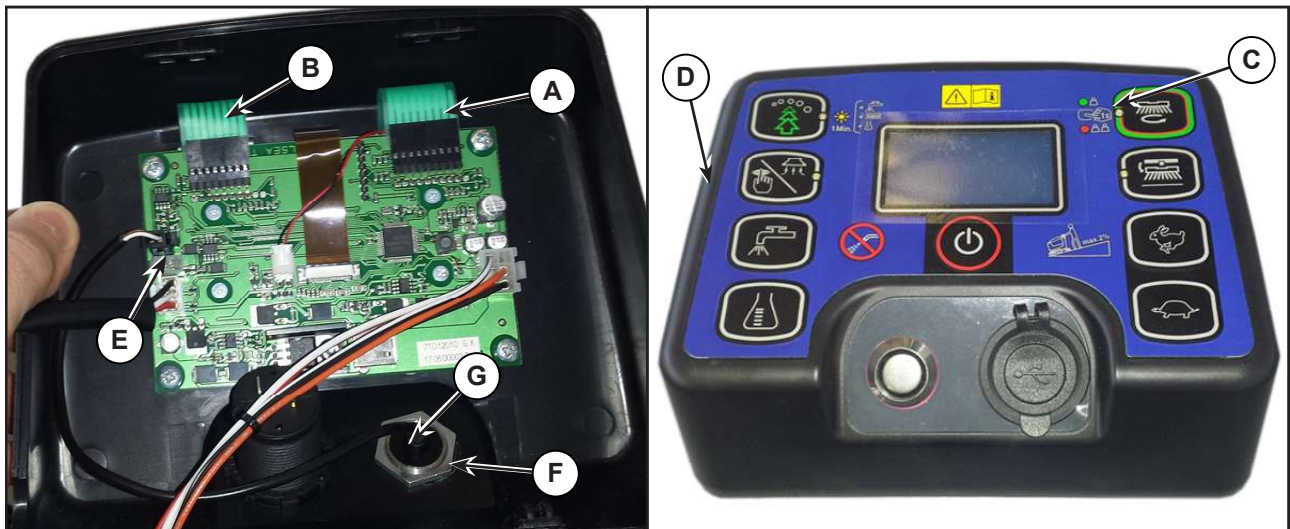


Figure 18:

## Specifications

### Main machine controller (EB1) Connectors

(Figure 18) Power connections (Ø6mm male RADSOK terminals - AMPHENOL SK 200800532 101 or equivalent)

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>B+</b>	Main machine controller power supply +	in	24V	125A	BAT+
<b>B-</b>	Main machine controller power supply -	in	24V	125A	BAT-

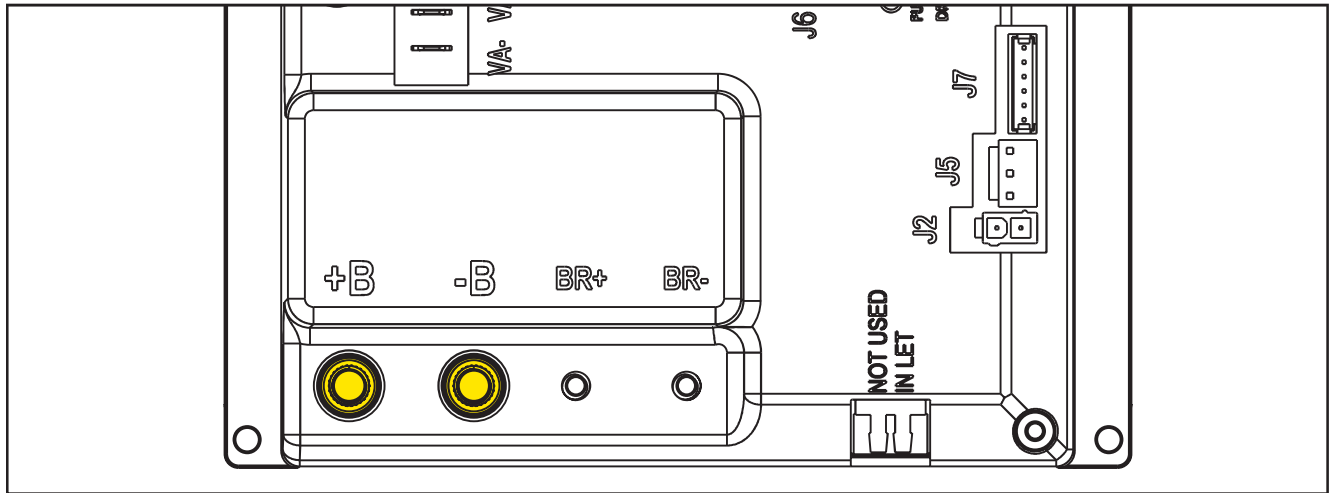


Figure 19:

(Figure 19) Drive connections (Ø3.6mm male RADSOK terminals - AMPHENOL P/N N01 036 6501 001 or equivalent)

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>BR+</b>	Brush motor +	out	24V	50A	M1+
<b>BR-</b>	Brush motor -	out	24V	50A	M1-

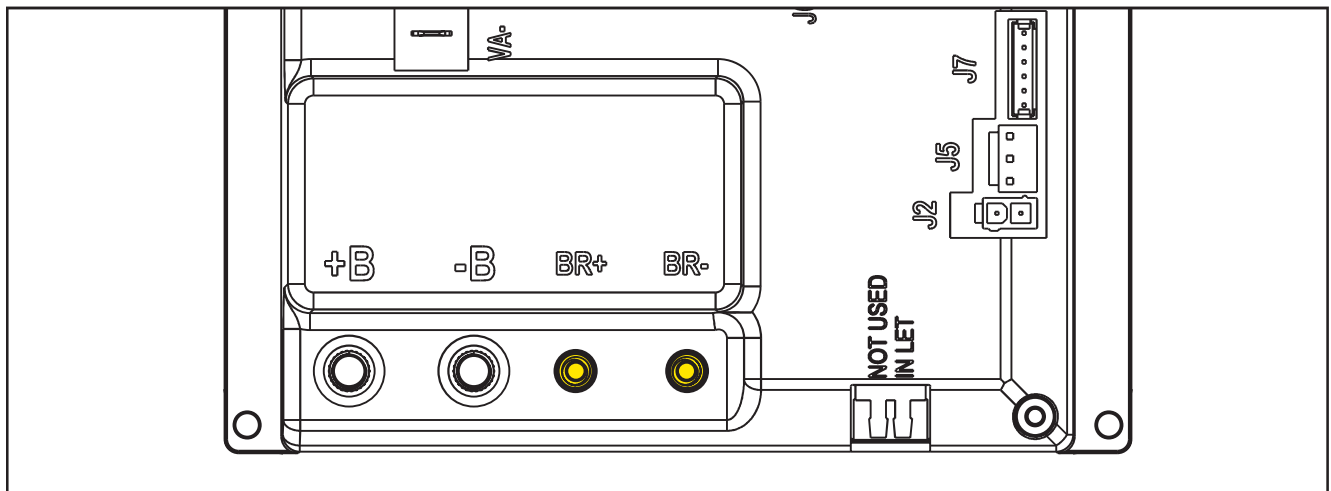


Figure 20:

**(Figure 20) Drive connections (2-way male faston T-connectors, 6.3x0.8 – spacing 7.4mm)**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>M1</b>	Drive system motor +	out	0-24V	45A	M3+
<b>M2</b>	Drive system motor -	out	0-24V	45A	M3-



Figure 21:

**(Figure 21) Vacuum connections (2-way male parallel faston connectors, 6.3x0.8 – spacing 6.5mm)**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
<b>VA+</b>	Vacuum system power supply +	out	10-24V	30A	M2+
<b>VA-</b>	Vacuum system power supply -	out	0V	30A	M2-

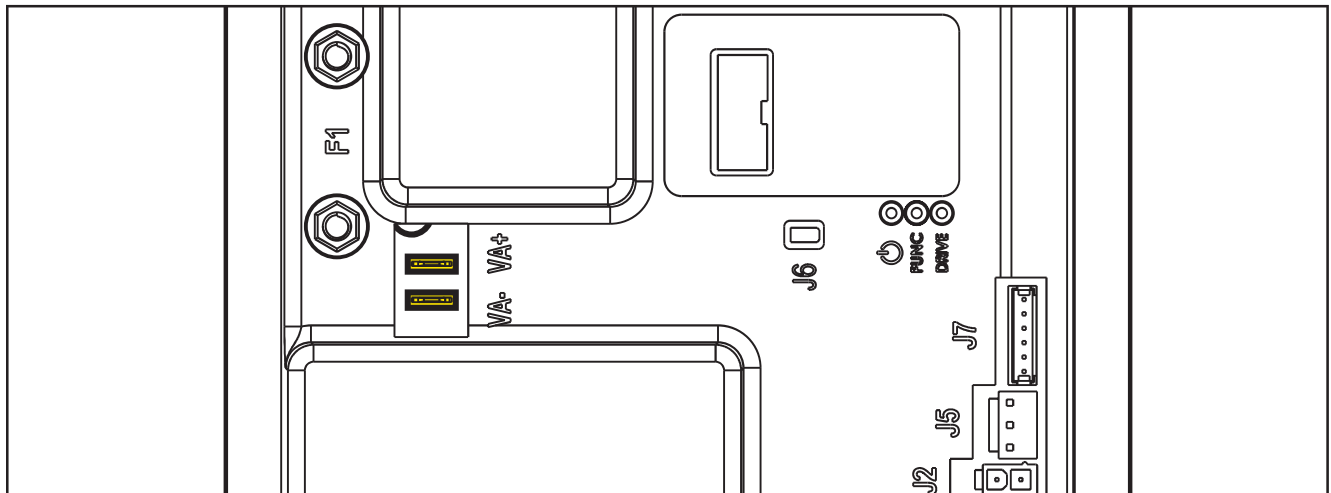


Figure 22:

**(Figure 22) J1: MOLEX MINIFIT type, 8-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Detergent pump power supply +	out	24V	<1A	M4
2	Detergent pump power supply -	out	0V	<1A	M4
3	Deck actuator power supply +/-	out	0/24V	8A	M5
4	Deck actuator power supply -/+	out	0/24V	8A	M5
5	Power supply for ADV versions configurator	out	0V	<1A	J1.6
6	ADV versions configurator return	in	0V	<1A	J1.5
7	Power supply for deck configurator	out	0V	<1A	J1.8
8	Deck configurator return	in	0V	<1A	J1.7

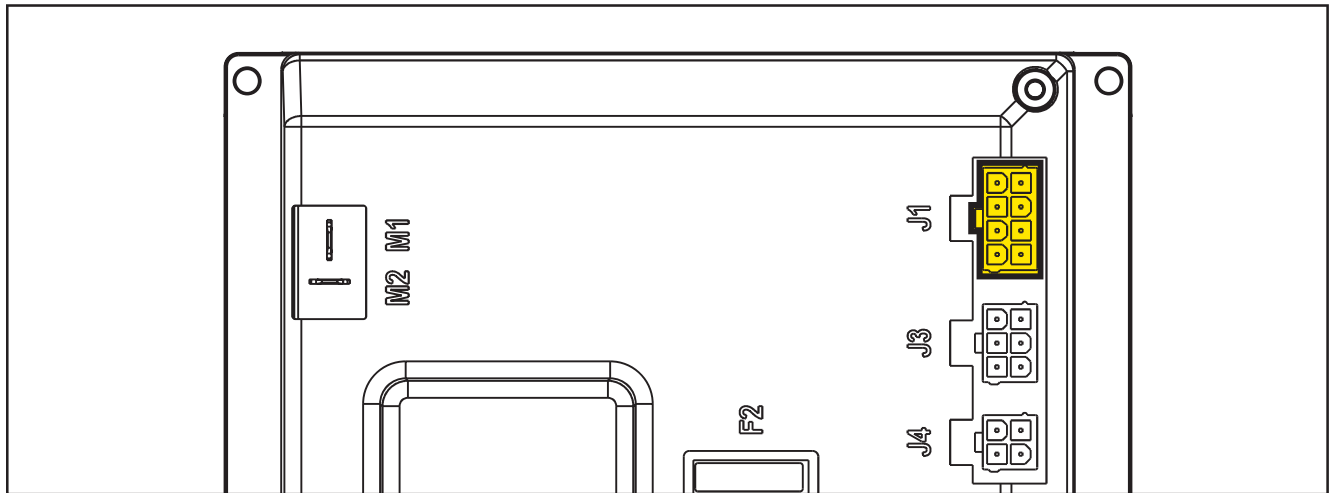


Figure 23:

**(Figure 23) J2: MOLEX MINIFIT type, 2-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Solenoid valve power supply +	out	24V	1A	EV1
2	Solenoid valve power supply -	out	0V	1A	EV1

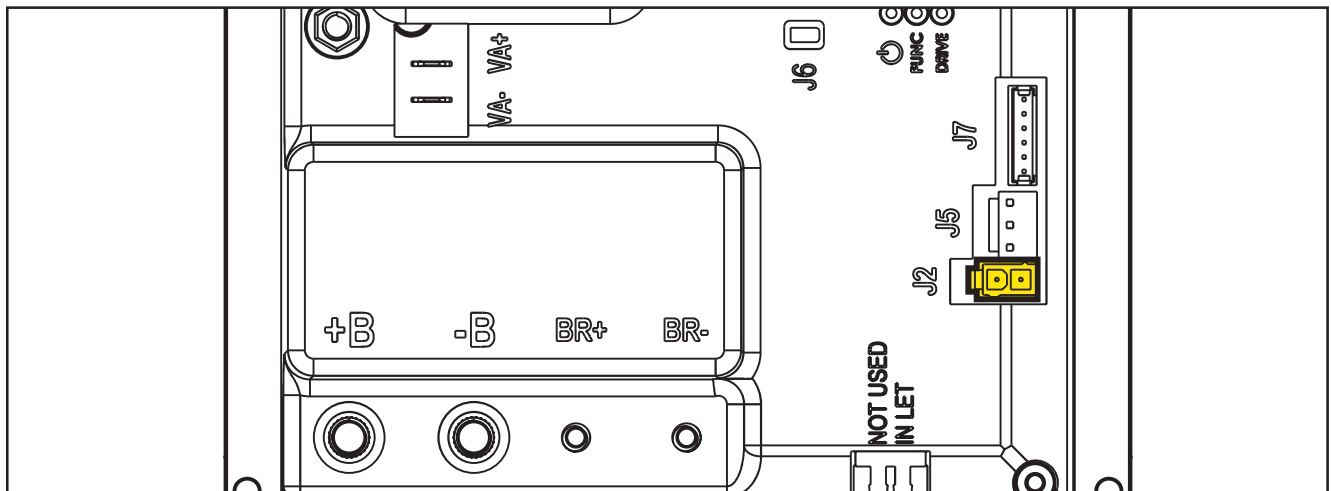


Figure 24:

**(Figure 24) J3: MOLEX MINIFIT type, 6-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	User interface controller power supply +	out	24V	<1A	EB2.1
2	User interface controller serial +	in/out	5V	<1A	EB2.2
3	User interface controller serial -	in/out	0V	<1A	EB2.3
4	User interface controller power supply -	out	0V	<1A	EB2.4
5	Return from key	in	24V	<1A	EB2.5
6	Return from key (repetition)	out	24V	<1A	-



Figure 25:

**(Figure 25) J4: MOLEX MINIFIT type, 4-ways vertical**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Enabling from battery charger	in	24V	<1A	CH.1
2	Power supply from battery charger	in	24V	<1A	CH.2
3	Battery charger enabling power supply	out	24V	<1A	CH.3
4	Battery charger data communication	In/out	5V	<1A	CH.4

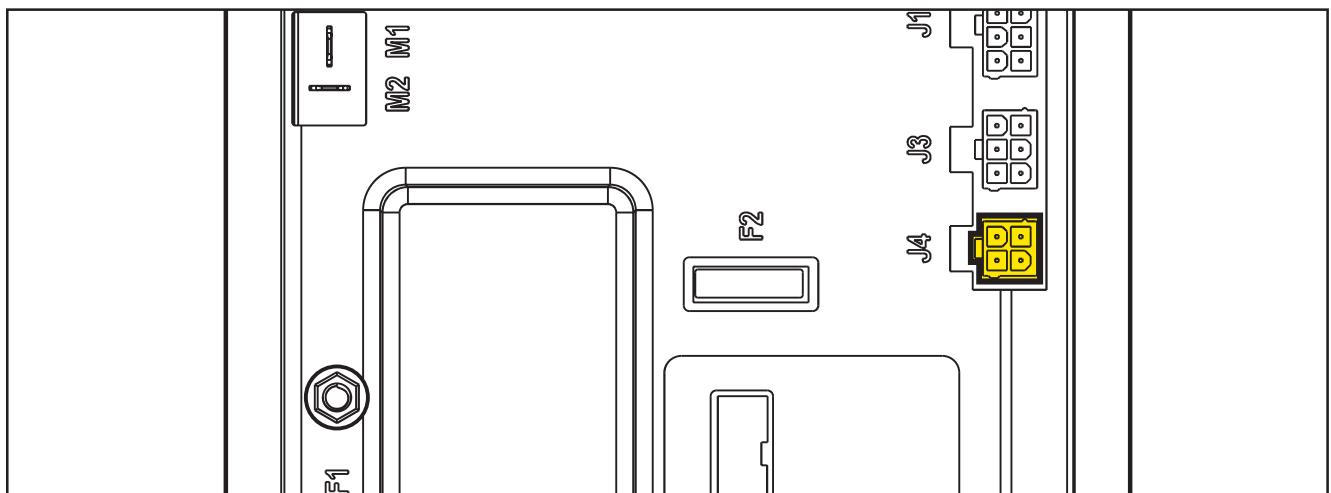


Figure 26:

**(Figure 26) J5: JST VHR-3N vertical 3-way**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Power supply for water level sensor +	out	24V	<1A	S1.1
2	Water level sensor return	in	0V	<1A	S1.2
3	Power supply for water level sensor -	out	0V	<1A	S1.3

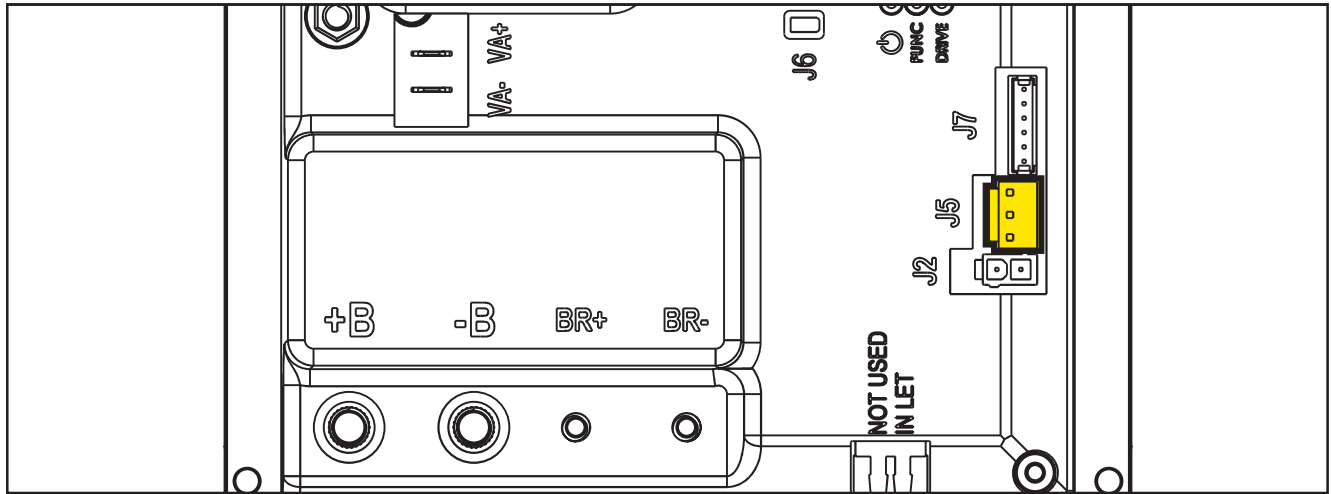


Figure 27:

**(Figure 27) J6: JUMPER, 2-ways vertical**

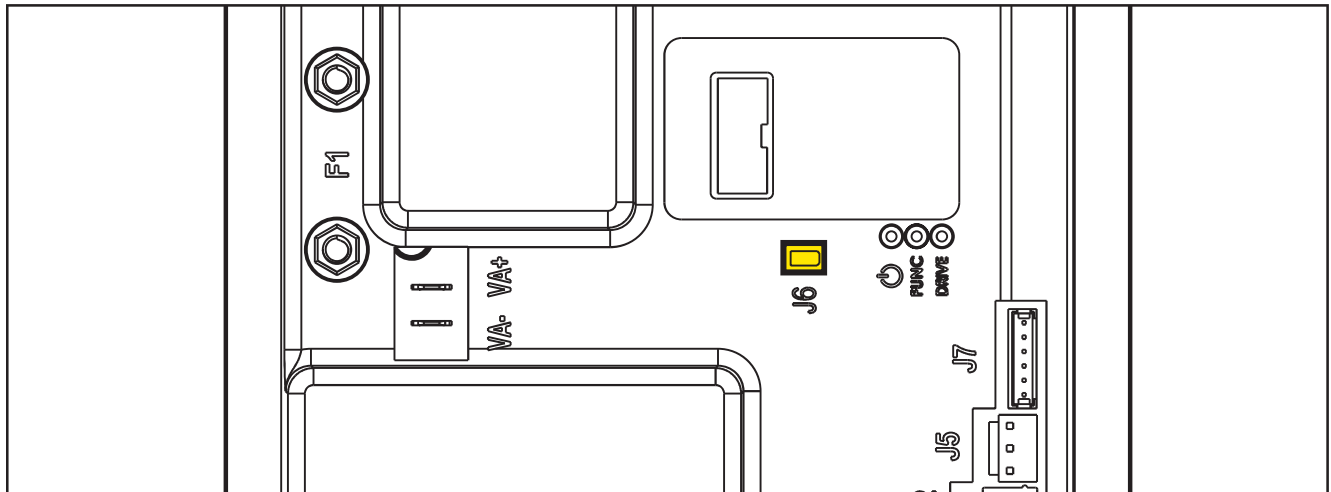


Figure 28:

**(Figure 28) J7: TYCO MODU II vertical 6-way**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	+24V power supply	out	24V	<1A	TRK.RD
2	+5V power supply	out	5V	<1A	-
3	iButton input (CAN H channel)	In (Out)	0V (0-5V)	<1A	TRK.YE
4	Ext. operating time counter enable (CAN L channel)	(In) Out	0V (0-24V)	<1A	TRK.WH
5	Power supply -	out	0V	<1A	TRK.BU
6	Machine on signal	out	24V	<1A	TRK.BN

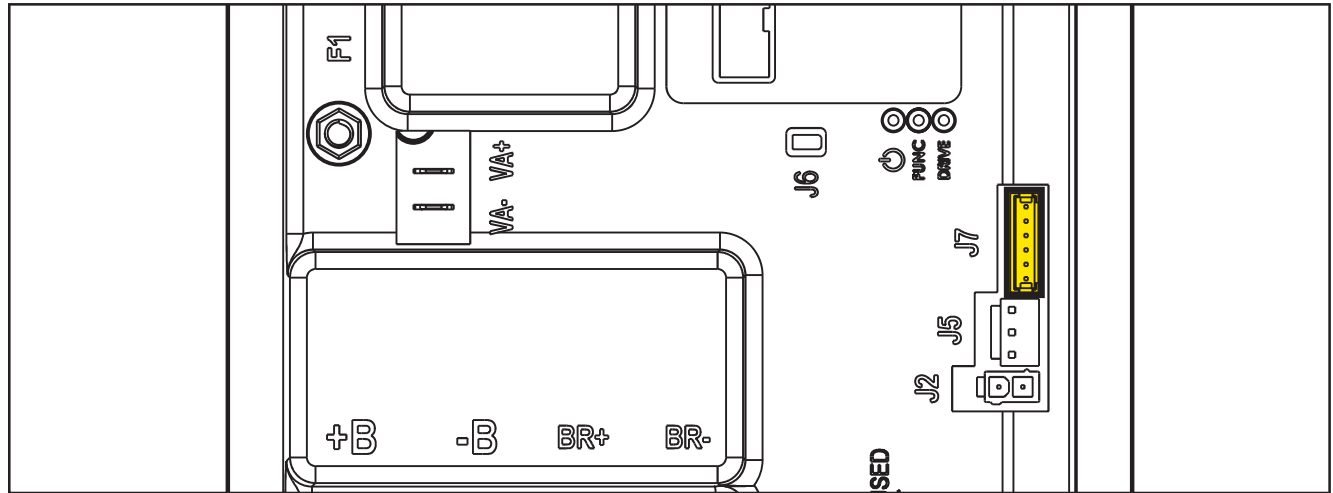


Figure 29:



### Connectors of the Display Controller (EB2)

**(Figure 29) J1: MOLEX MINIFIT type, 6-ways vertical**

Ref.	Description	Controller in/out	V ref.	I max.	Connected to
1	Power supply +	in/out	24V	<1A	CFD12.J3.1
2	Main machine controller serial +	in/out	5V	<1A	CFD12.J3.2
3	Main machine controller serial -	in	0V	<1A	CFD12.J3.3
4	Power supply -	out	0V	<1A	CFD12.J3.4
5	Key signal return (KEY0)	out	24V	<1A	CFD12.J3.5
6	Key signal return (KEY0)	in	24V	<1A	-

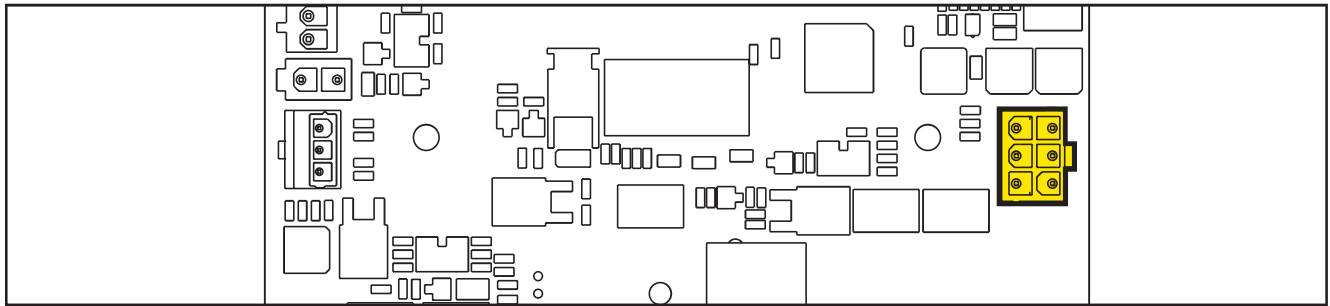


Figure 30:

**(Figure 30) J2: FCI DUFLEX (2.54 pitch) 9-way, male pins**

Ref.	Description	Controller in/out	V ref.	I max.	
1	Power supply - common	out	0V	<1A	
2	ON/OFF button (P0)	in	0V	<1A	
3	DETERGENT MIX button (P4)	in	0V	<1A	
4	EDS button (P3)	in	0V	<1A	
5	VACUUM button (P2)	in	0V	<1A	
6	VACUUM function LED (LD2)	out	5V	<1A	
7	SPOT function LED (LD1)	out	5V	<1A	
8	SPOT button (P1)	in	0V	<1A	
9	DS versions configurator	in	0V	<1A	

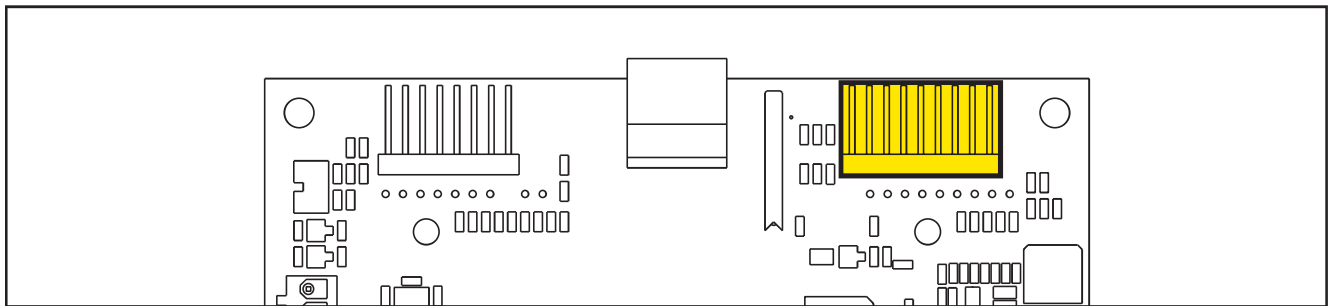


Figure 31:

**(Figure 31) J3: FCI DUFLEX (2.54 pitch) 8-way, male pins**

Ref.	Description	Controller in/out	V ref.	I max.	
1	Power supply - common	out	0V	<1A	
2	SP / EXTRAPR function LED (red) (LD3R)	out	5V	<1A	
3	SP / EXTRAPR function LED (green) (LD3V)	out	5V	<1A	
4	BRUSH RELEASE function LED (LD4)	out	5V	<1A	
5	BRUSH RELEASE switch (P6)	in	0V	<1A	
6	INCREASE SPEED button (P7)	in	0V	<1A	
7	DECREASE SPEED button (P8)	in	0V	<1A	
8	ONETOUCH / EXTRAPR. button (P5)	in	0V	<1A	

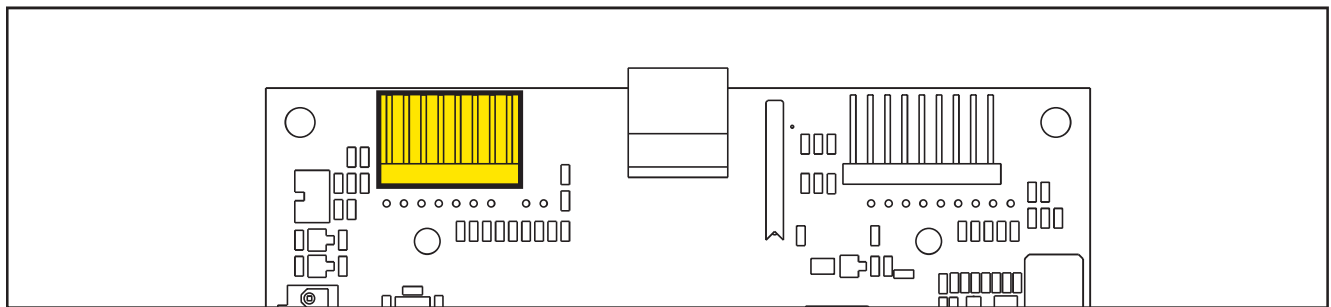


Figure 32:

**(Figure 32) J4: JST VH vertical, 3-way (B 3P-VH)**

PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	VR1 potentiometer power supply +	Out	3V	<1A	VR1.1
2	VR1 potentiometer return	In	0-3V	<1A	VR1.2
3	VR1 potentiometer power supply -	out	0V	<1A	VR1.3

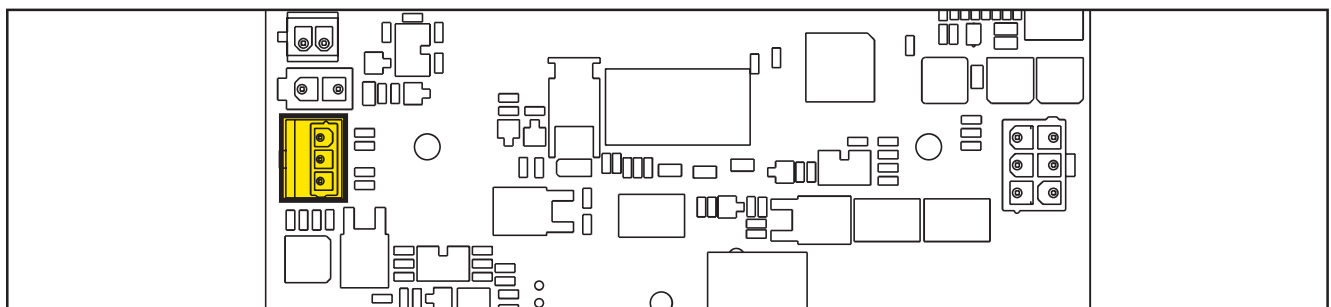


Figure 33:

<b>(Figure 34) J5: MOLEX MICROFIT vertical, 2 ways</b>					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Smart Key reader signal GND	In/Out	0V	<1A	KEY.1
2	Smart key reader signal IN/OUT	In/Out	0-3V	<1A	KEY.2

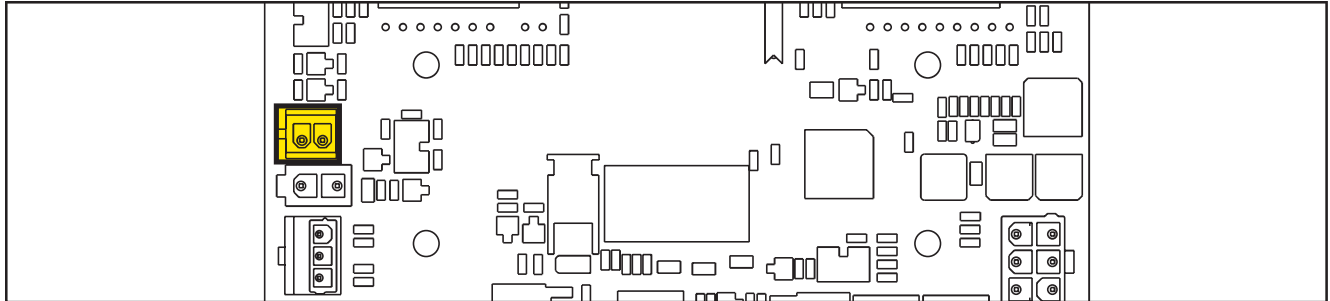


Figure 34:

<b>(Figure 35) J6: MOLEX MINIFIT vertical, 2 ways</b>					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	CAN H	In/Out	0-5V	<1A	TRACK.WH
2	CAN L	In/Out	0-5V	<1A	TRACK.PK

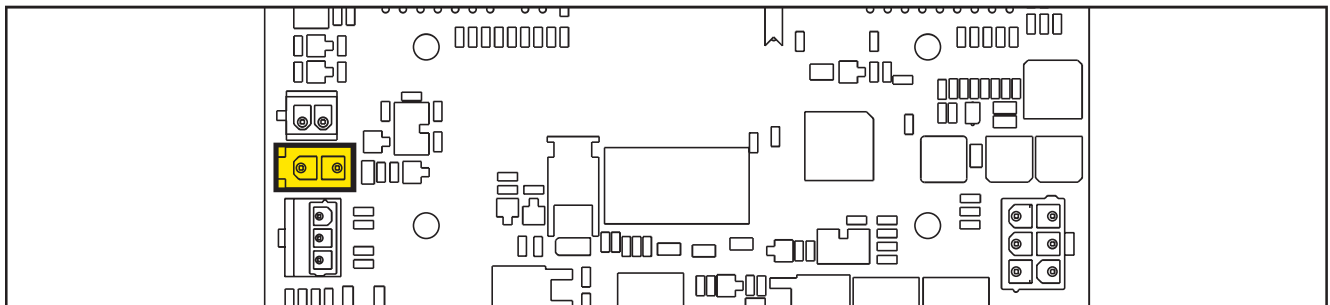


Figure 35:

## Shop Measurements

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

### Shop Measurements - Main machine controller (EB1)

Battery volts at battery, key on = 25.03V

#### Power Supply

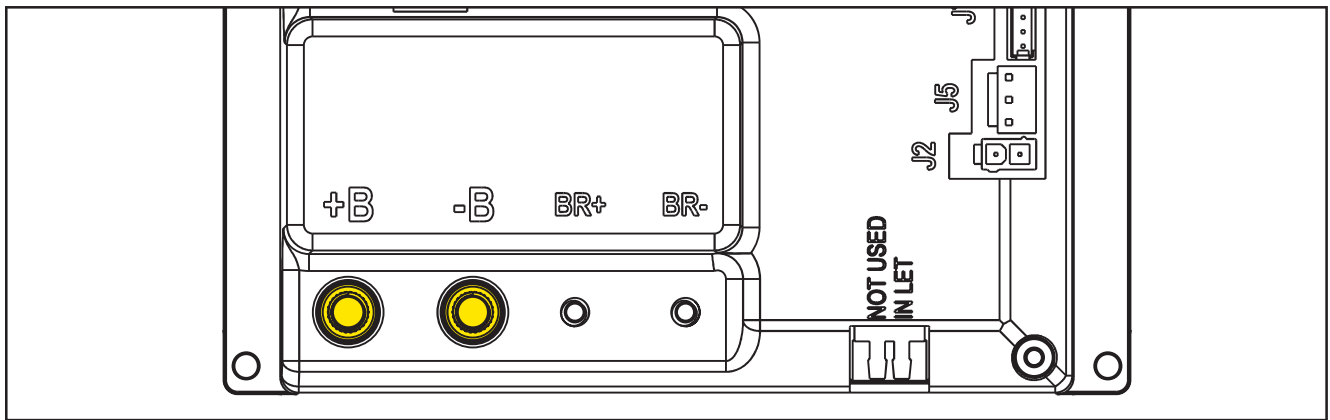


Figure 36:

PIN	Color	Description	Measured	Comments
B+	Red	Main machine controller power supply +	24.5v	Vacuum on
B-	Black	Main machine controller power supply -	0.035vV	Vacuum on

**Brush Motor**

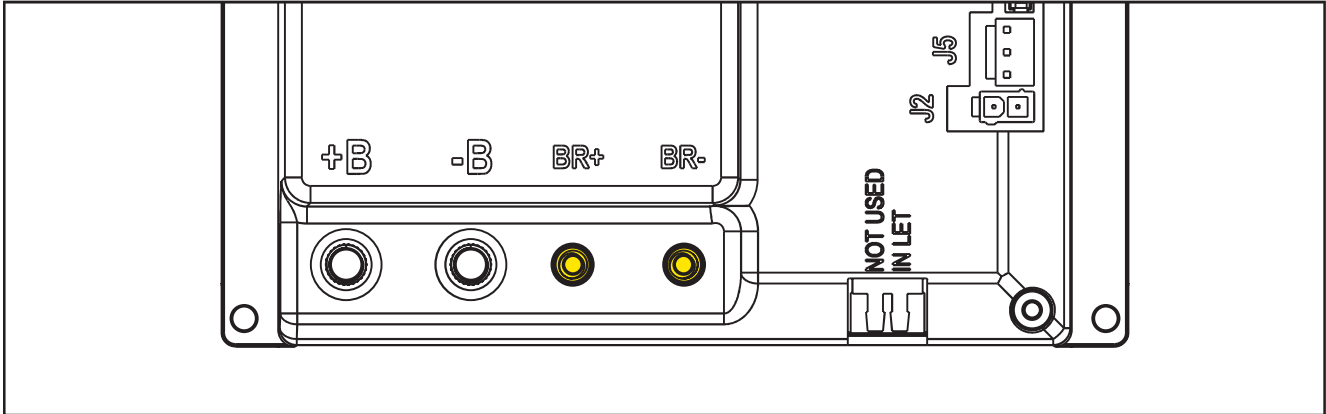


Figure 37:

PIN	Color	Description	Measured	Comments
BR+	Red	Brush motor +	24.4V (off), 24.2V (on)	Constant Positive
BR-	Blue	Brush motor -	24.4V (off), 0.15v (on without RPM control activated) 5.8v (on with RPM Control Active – set at 20)	PWM Battery Negative

**Drive System Motor**

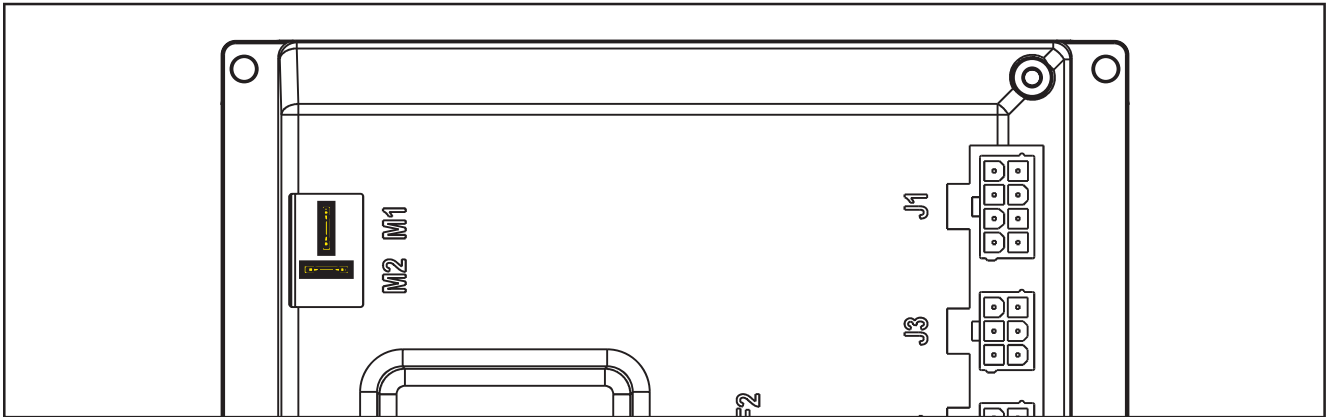


Figure 38:

PIN	Color	Circuit Description	Measured				
			Neutral	Fwd - Initial	Reverse - Initial	FWD Max	REV Max
M1	Red	Drive system motor +	5.62v	12.7v	10.9v	21.8v	8.7v
M2	Gray	Drive system motor -	5.61	1.95	16.00	8.9v	13.5v
M1 to M2			0.001v	6.1v	-2.5v	22.6	-7.4

Vacuum Motor

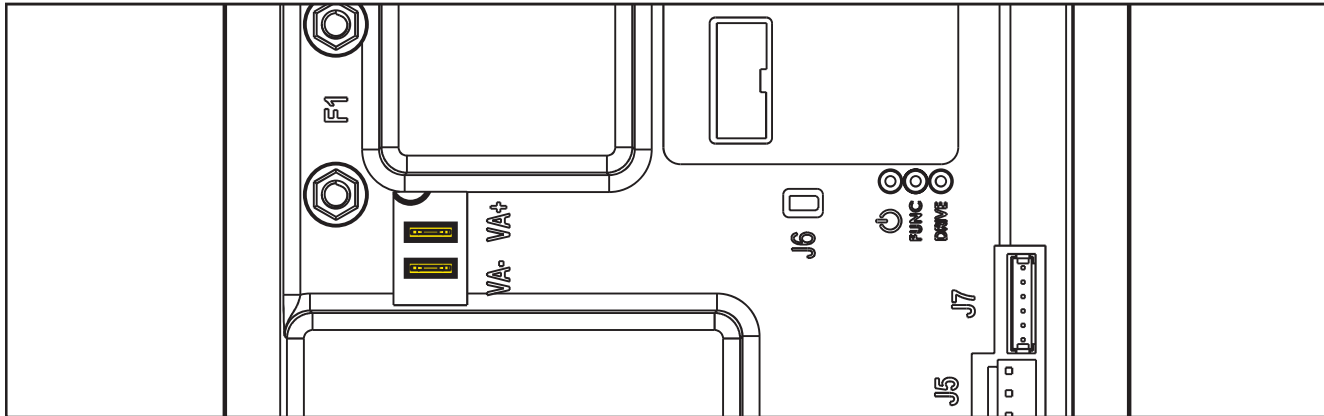


Figure 39:

PIN	Color	Description	Measured	Comments
VA+	Red	Vacuum system power supply +	24.8v (off) 24.4v (on)	Constant Positive
VA-	Blue	Vacuum system power supply -	24.56 (off) 1.36v (on High) 9.69v (on Quiet mode VRID parameter = 1)	1.02 Running, 9.56 Quiet Mode

J1 - 8 Ways

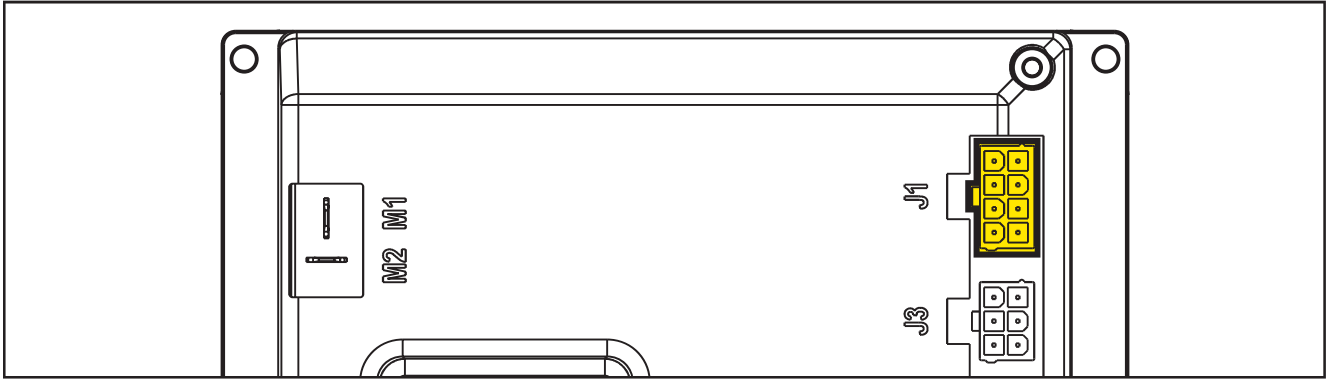


Figure 40:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Detergent pump power supply +	24.9v (off)	No change seen on voltmeter when the pump pulsed.
2	Gray	Detergent pump power supply -	24.9v (off) Momentary drop to 0 when on.	Voltmeter reading momentarily jumped. Too fast to settle into a range and value.
3	White	Deck actuator power supply +/-	24.8v (Stationary) 0.18v (going up) 12v (going up near top) 24.8v (going down to scrub or Ex press) 12.6v (Reset Up)	
			Stationary: 0v Transport to Scrub: 24.8v Scrub to Ex Press: 24.8v then 12v near end of travel. Ex Press to Scrub: -24.8v Scrub to Transport: -24.8v then -12v near end of travel Reset to transport:-12.5v entire range	Reference to J1.3
4	Blue	Deck actuator power supply +/-	24.8v (stationary) 0.03v (Transport to scrub) Scrub to EX Press – Initial 0.03v then 12v near bottom 24.8v( Ex press to scrub) Scrub to Transport – 24.8v	
5	Green	Power supply for ADV versions configurator	0.001	
6	Green	ADV versions configurator return	0.001 (Loop not cut) 4.98v (Open loop)	Loop not cut
7	Red	Power supply for deck configurator	0.001	

8	Red	Deck configurator return	0.001 (Loop not cut) 4.98v (Open loop)	Loop not cut
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**J2 - 2 Ways**

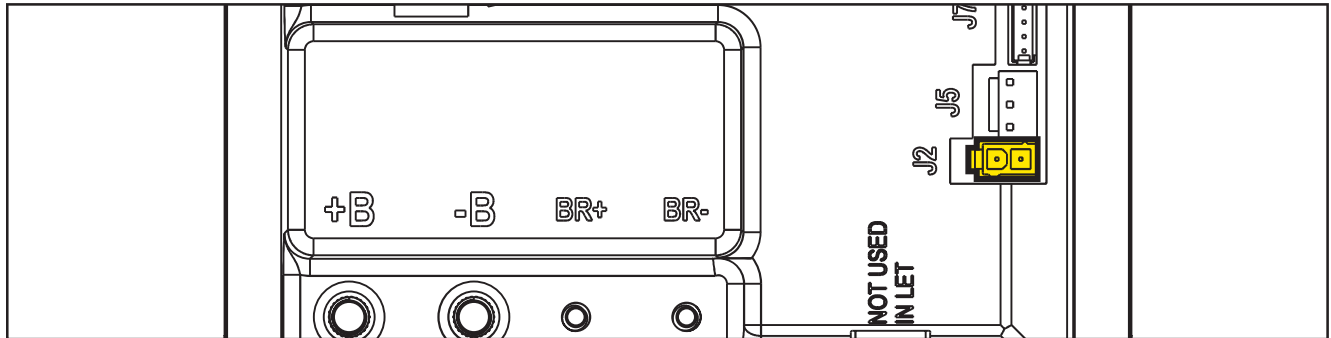


Figure 41:

PIN	Color	Circuit Description	Measured	Comments
1	Yellow	Solenoid valve power supply +	24.4 (Off and On)	
2	Purple	Solenoid valve power supply -	24.4 (off) Momentary drop (on)	Momentarily drops to 0v when on but it is too fast for a DVOM to read. The value just momentarily changes.

**J3 - 6 Ways**

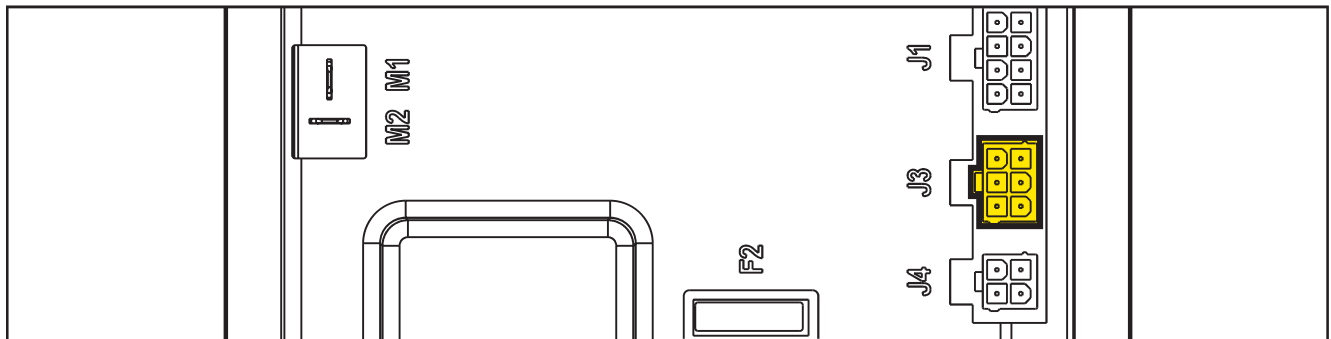


Figure 42:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Main machine controller power supply +	24.9v	On or Off
2	White	Main machine controller serial +	4.62v key on 0v key off	
3	Blk/Wh	Main machine controller serial -	4.13v key on 0v key off	
4	Black	Main machine controller power supply -	0.001v key on	



5	Orange	Return from key	24.3v key inserted and power "on"	Either the yellow or gray key has the same result. Note: if no key, jumping +24v here turns the machine on.
6	Empty			

**J4 - 4 Ways**

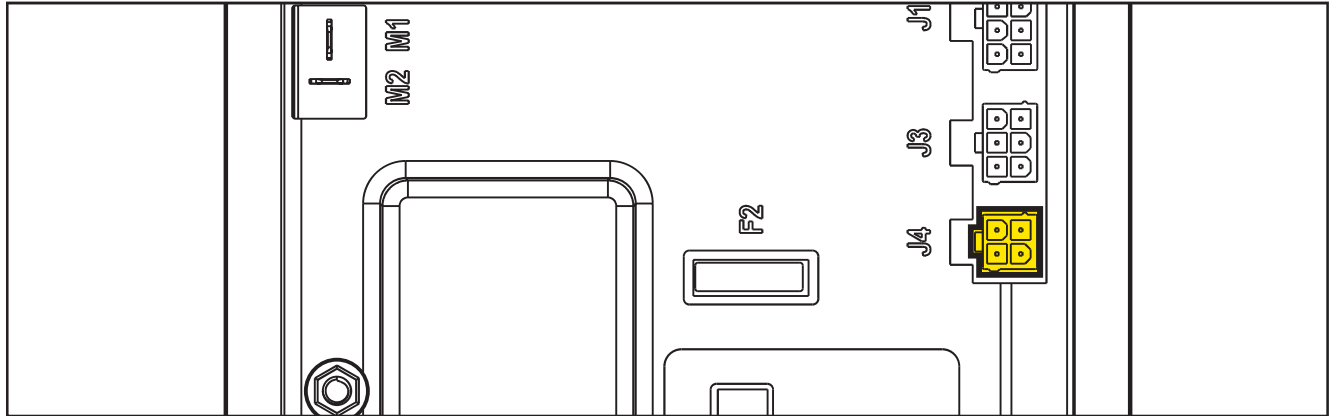


Figure 43:

PIN	Color	Circuit Description	Measured	Comments
1	White	Enabling from battery charger	24.8v Not Charging	May see residual voltage back-feeding from the main controller here when charging.
2	Yellow	Power supply from battery charger	0.136v Not charging 26.1v Charging	
3	Brown	Battery charger enabling power supply	24.8v key on or off	Constant power whether charging or not. Key on or off.
4	Green	Battery charger data communication	4.98v when charger is first plugged in. Then dropped to 4.6	

**J5 - 3 Ways**

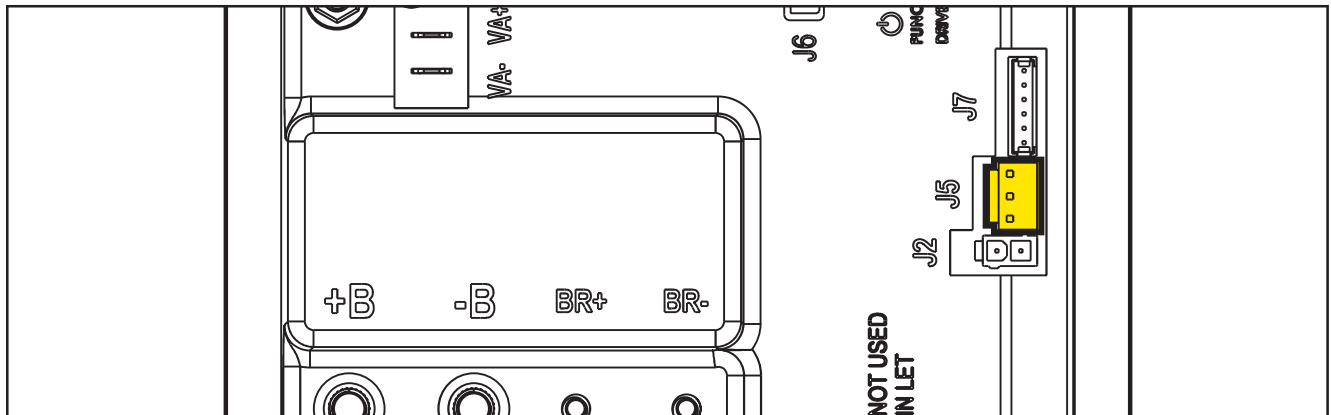


Figure 44:

PIN	Color	Circuit Description	Measured	Comments
1	Brown	Power supply for water level sensor +	24.7v	Key on
2	Black	Water level sensor return	4.98 0.03v	Tank < ½ full Tank > ½ full
3	Blue	Power supply for water level sensor -	0.001	

**J6**

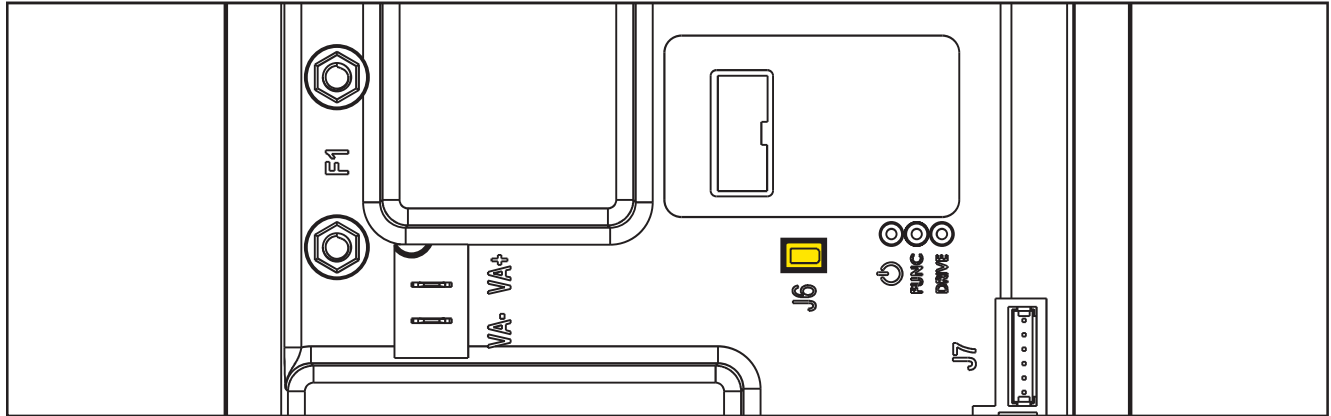


Figure 45:

Two way vertical jumper.

- What is this for? The J6 Jumper is used to configure the Main machine controller for the EcoFlex option.
- What does it mean if it is jumped? The Main machine controller is set for no EcoFlex
- What does it mean if it is open? The Main machine controller is set for EcoFlex
- Is there a measurable voltage on either of the pins when not jumped? Yes. 4.98v on pin near the LEDS on the Main machine controller.

**J7 - 6 Ways**

Measured machine did not have a wiring connector. Measurements were taken at each pin on the Main machine controller.

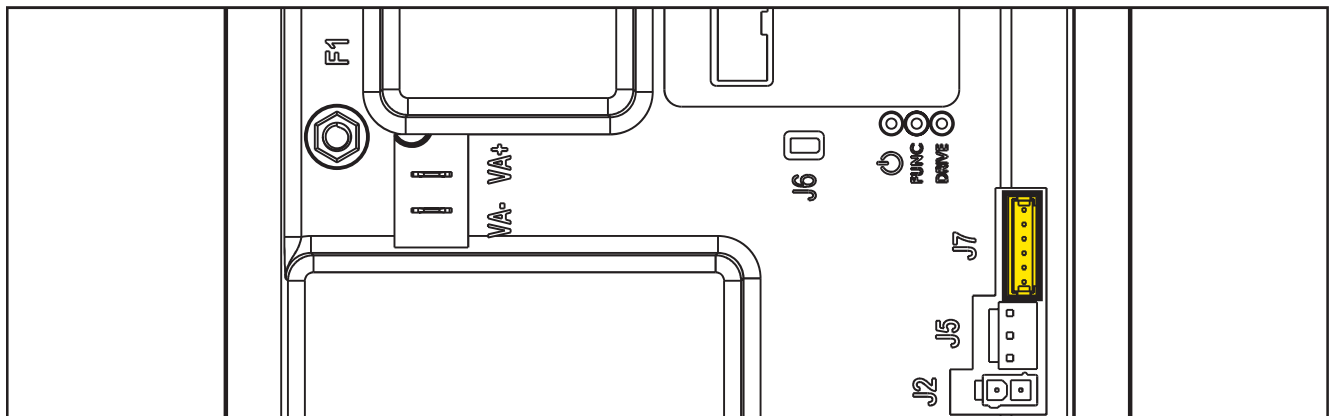


Figure 46:

PIN	Color	Circuit Description	Measured	Comments
1		+24V power supply	24.6	
2		+5V power supply	5.00	
3		iButton input (CAN H channel)	4.98	
4		Ext. operating time counter enable (CAN L channel)	24.6	
5		Power supply -	0.001	
6		Machine on signal	23.68	

### Shop Measurements - Display Controller (EB2)

Measure and record the voltage at each of the Main machine controller pins. Always use battery negative as your reference point for your black voltmeter lead.

#### J1 - 6 Ways

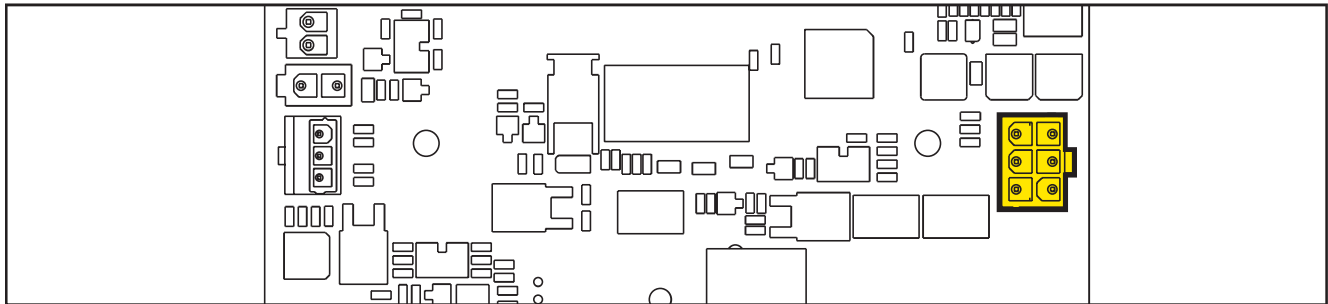


Figure 47:

PIN	Color	Circuit Description	Measured	Comments
1	Red	Power supply +	24.6	
2	White	Main machine controller serial +	4.62	
3	Blk/Wh	Main machine controller serial -	4.12	
4	Black	Power supply -	0.003	
5	Orange	Key signal return (KEY0)	24.23	
6				