



Electronic Service Manuals

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Serving the Cleaning Industry Since 1922

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Clarke MA50 15B™



Service Manual

Model Numbers:

Clarke MA50 15B

Clarke®

English

03/2016 - Form No. 56043172

Contents

Service Manual	1
General Information	4
Machine Description	4
Service Manual Purpose	4
Revision History	4
Other Reference Manuals	4
Diagnostic and Service tools	4
Conventions	5
Parts and Service	5
Modifications	5
Machine Lifting	5
Machine Transportation	5
General Safety Instructions	5
Nameplate	6
Machine Specifications	6
Component Locations	7
Preventative Maintenance	10
Options and Accessories	11
Pad Driver	11
Squeegee Blades	11
Control System	12
Functional Description	12
Component Locations	12
Maintenance and Adjustment	16
Electrical System	17
Functional Description	17
Component Locations	18
Wiring Harness Diagram	20
Battery Connections	21
Battery Charging	21
Battery Charging Procedure	21
Battery Charging Notes	22
Removal and Installation	22
On-Board Charger	22
Control PCB	24
Basic Troubleshooting	26
Troubleshooting Tips	26
Shop Measurements	26
Handle System	29
Functional Description	29
Component Locations	29
Removal and Replacement	33
Switch PCB	33
Triggers and Trigger Switch	35
Handle Adjust Cable and Gears	37
Recovery System	44
Functional Description	44
Circuit Description	44
Component Locations	44
Maintenance and Adjustment	48

Check ball-float operation . . . . .	.48
Troubleshooting . . . . .	.48
Poor pick-up at squeegee . . . . .	.49
Removal and Installation . . . . .	.49
Vacuum motor . . . . .	.49
Removal: . . . . .	.49
Installation: . . . . .	.52
Vacuum Seals . . . . .	.53
Vacuum Motor Switch . . . . .	.54
Control PCB . . . . .	.54
Specifications . . . . .	.54
Shop Measurements . . . . .	.54
Scrub System	55
Functional Description. . . . .	.55
Circuit Description . . . . .	.55
Component Locations . . . . .	.55
Troubleshooting . . . . .	.60
Removal and Installation . . . . .	.60
Drive Belt . . . . .	.60
Brush Motor . . . . .	.61
Shop Measurements . . . . .	.65
Solution System	66
Functional Description. . . . .	.66
Circuit Description . . . . .	.66
Component Locations . . . . .	.67
Maintenance and Adjustment . . . . .	.69
Flushing Solution Tank . . . . .	.69
Troubleshooting . . . . .	.69
Removal and Installation . . . . .	.70
Solution Solenoid . . . . .	.70
Solution Flow control valve . . . . .	.72
Solution Switch . . . . .	.72
Control PCB . . . . .	.73
Squeegee System	76
Functional Description. . . . .	.76
Maintenance and Adjustment. . . . .	.79
Adjusting the Squeegee down pressure. . . . .	.79
Removal and Installation . . . . .	.80
Squeegee Lift Cable . . . . .	.80
Squeegee Blades . . . . .	.84
Troubleshooting . . . . .	.86

General Information

Machine Description

The CLARKE MA50 15B is a battery powered walk-behind automatic floor scrubber. It is intended for use in small to medium size commercial facilities such as retail stores.

The CLARKE MA50 15B is equipped with a rotating brush to provide a 15 inch cleaning path.

The machine has (2) 12 volt AGM batteries connected in series to provide 24 volts DC to the vacuum motor, brush motor and other systems.

The CLARKE MA50 15B is equipped with an on-board charger for the batteries. No external charger is required.

Service Manual Purpose

The service manual is a resource for professional service technicians. It provides information for understanding how the machine operates, where components are located, basic troubleshooting, maintenance, and mechanical service operations.

Revision History

Date	Revisions
3/16	Initial publication

Other Reference Manuals

Operators manual (Includes Parts List Information) - Form number VF89027

Diagnostic and Service tools

In addition to a full set of metric and standard tools, the following are required to successfully and quickly troubleshoot and repair CLARKE commercial floor cleaning equipment.

- Digital Voltmeter (DVM) with current clamp
- Battery load tester for checking batteries
- Vacuum water lift gauge - Nilfisk p/n 56205281

Conventions

Forward, backward, front, rear, left or right are intended with reference to the operator's position. That is to say, in the driving position, holding onto the handles on the control housing.

Parts and Service

Repairs should be performed by an Authorized Nilfisk Service Center that employs factory-trained service personnel and maintains an inventory of Nilfisk original replacement parts and accessories.

Call the Nilfisk Dealer for repair parts or service. Please specify the Model Number (same as the Part Number) and Serial Number when discussing your machine.

Modifications

Modifications and additions to the cleaning machine which affect capacity and safe operation shall not be performed by the customer or user without prior written approval Nilfisk Inc. Unapproved modifications will void the machine warranty and make the customer liable for any resulting accidents.

Machine Lifting

The Clarke MA50 15B weighs 124 pounds with the batteries installed. Use (2) people to lift and/or carry the machine. The Clarke MA50 15B should not be lifted by any other means (i.e. dolly, forklift).

Machine Transportation

The Clarke MA50 15B should only be rolled on smooth floors. Do not roll the machine down stairs or curbs.

Warning: Damage to the machine will occur if it is rolled down stairs or curbs !

General Safety Instructions

Warning! Be sure to follow these safety precautions to avoid situations that could cause severe personal injury.

- This machine should only be used by properly-trained and authorized personnel.
- This machine is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.
- Turn the machine "OFF" and disconnect the batteries before servicing electrical components.
- Do not dispense flammable cleaning agents, operate the machine on or near these agents, or operate in areas where flammable liquids exist.
- Do not clean this machine with a pressure washer.

Nameplate

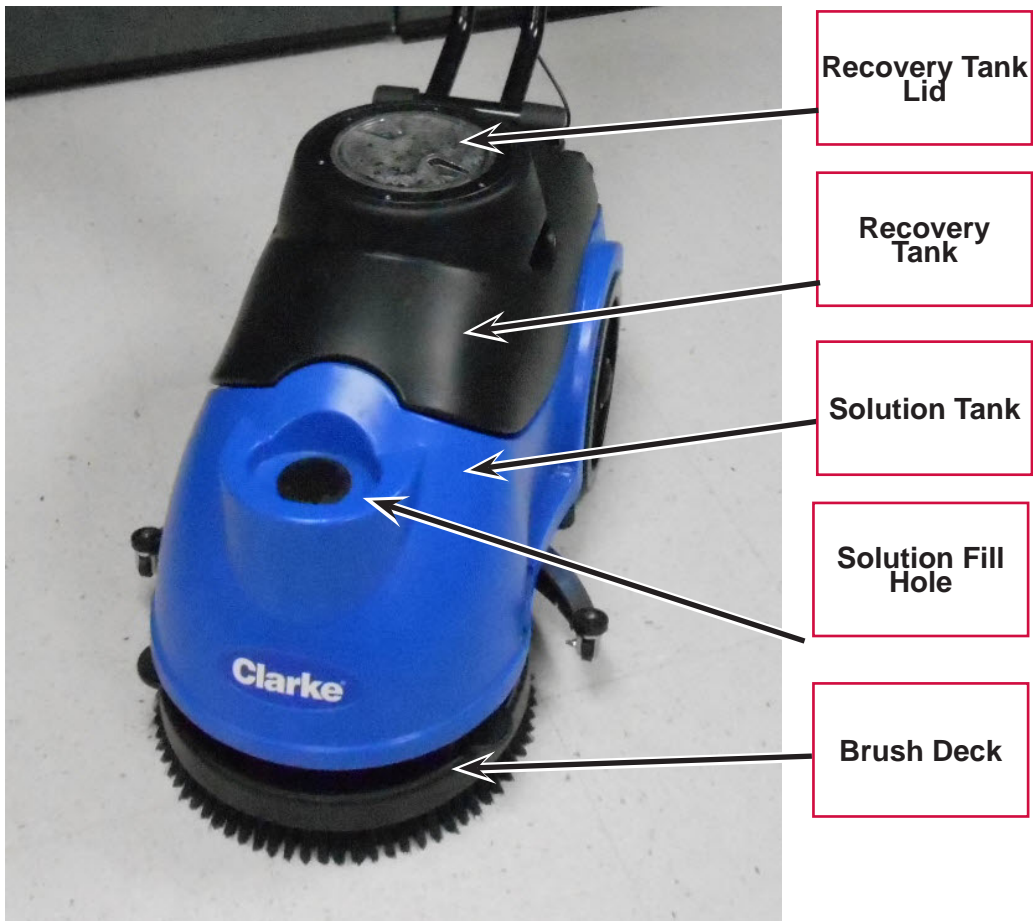
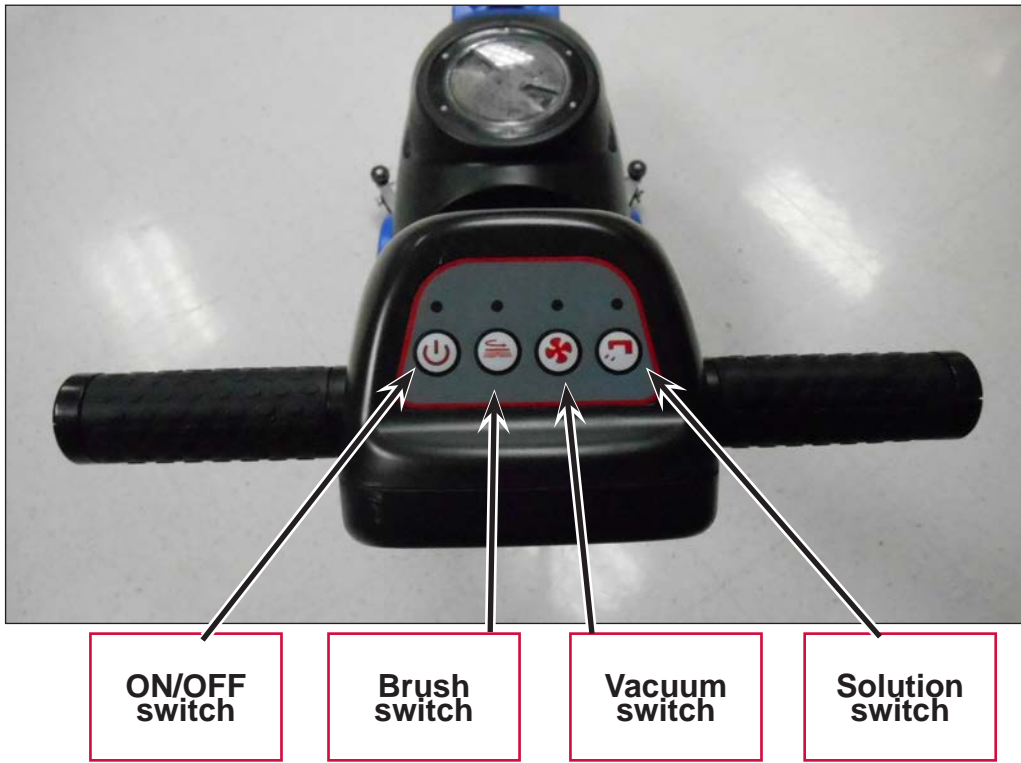
The nameplate contains important identification information which will be needed when ordering parts: Model number, Description, and Serial number.

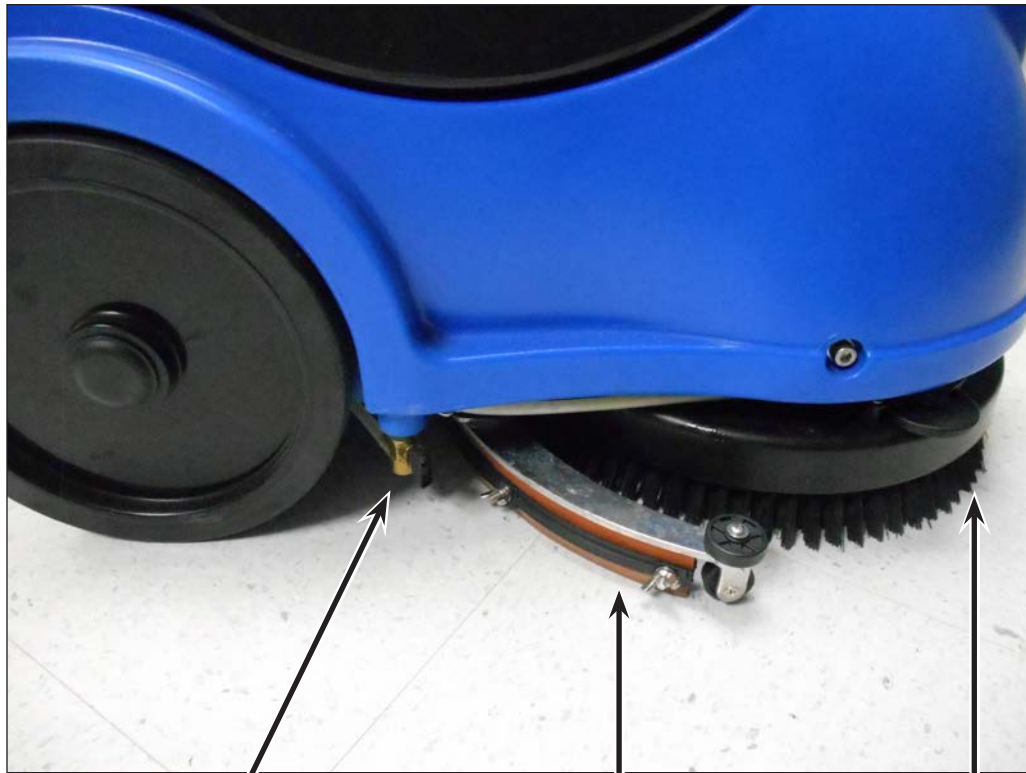


Machine Specifications

Specification	USA	Metric
Cleaning Path	15 Inches	380 Cm
Solution Tank	3.5 Gallons	13.5 Liters
Recovery Tank	3.5 Gallons	13.5 Liters
Brush/Pad Pressure	44.5 Pounds	20 Kg
Squeegee	20 Inches	51 Cm
Drive System	Pad Assist	Pad Assist
Brush Motor, RPM Speed	1/3 H.P., 150 RPM	.25Kw, 150 RPM
Vacuum Motor, Waterlift	1/3/ H.P., 40 Inches waterlift	.25 Kw, 100 Cm waterlift
Sound Level	70 dba	70 dba
Batteries, Sealed, AGM	(2) 12 volt, 33 amp/hour	(2) 12 volt, 33 amp/hour
Charger, On-Board	24 volts DC, 5 amp	24 volts DC, 5 amp
RunTime per Charge	Up to (2) hours	Up to (2) hours
Machine Weight	124 Pounds	56 Kg
Machine Dimensions	30 In x 20 In x 21.7 In	77 cm x 50 cm x 55 cm

Component Locations





Solution Control Valve

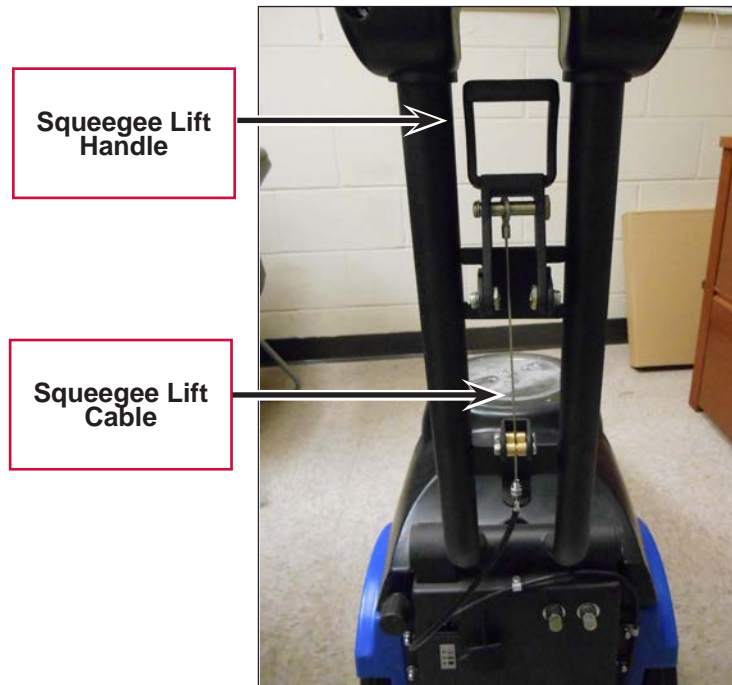
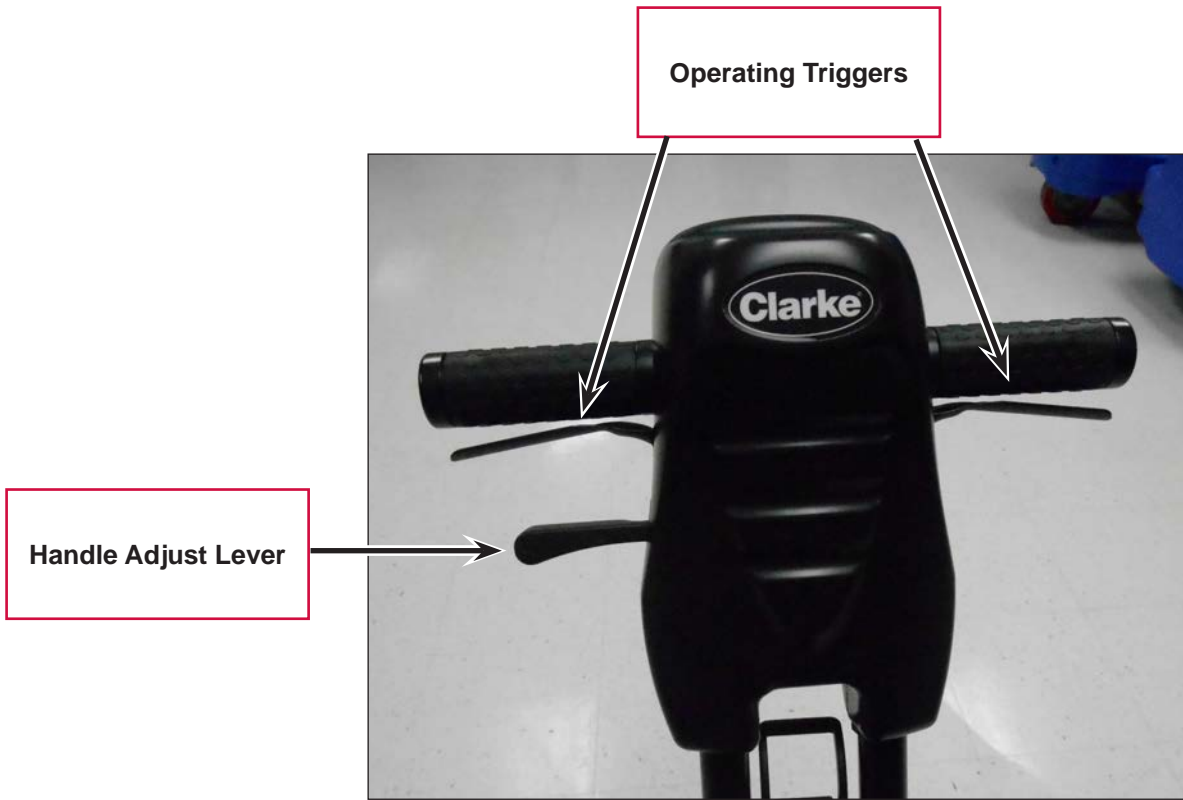
Squeegee Assembly

Brush



Solution Tank Drain Cap

Recovery Tank Drain cap



Preventative Maintenance

	DAILY	WEEKLY	MONTHLY
Recharge Batteries	X		
Remove and clean Pad driver/ Brush	X		
Drain and rinse recovery tank. Check for solid debris	X		
Remove squeegee assembly, and wipe it down with a damp cloth	X		
Remove the float shut-off and rinse thoroughly	X		
Clean off the machine with a damp towel	X		
Check batteries for loose or corroded connections		X	
Check Squeegee blades for wear and/or damage		X	
Check machine for leaks and loose fasteners			X
Lubricate all pivot points with a silicone Spray			X
Thoroughly flush the solution tank, drain hose, and vacuum hose with hot water			X

Options and Accessories

Pad Driver

The Clarke MA50 15B comes standard with a medium duty brush. An optional pad driver can be ordered through your Nilfisk dealer.



Squeegee Blades

The Clarke MA50 15B comes standard with neoprene rubber squeegee blades. Optional polyurethane blades can be ordered through your Nilfisk dealer.

Polyurethane Front Blade



Polyurethane Rear Blade



Control System

Functional Description

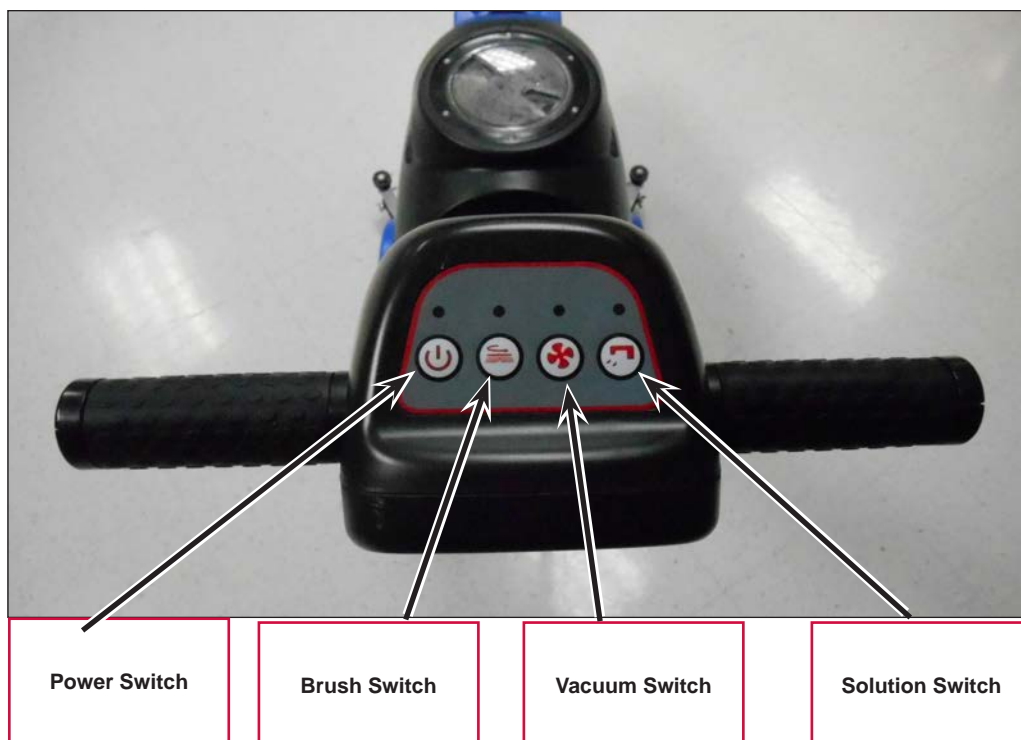
The CLARKE MA50 15B has (1) Control PCB for the vacuum and brush circuits, and for the on-board charger interlock system. The Control PCB gets input from the batteries, the on-board charger, and the switch PCB. Outputs from the Control PCB are to the vacuum and brush motors, the solution valve, the on-board charger, and the indicator LED's on the switch panel.

The solution flow is controlled by a manually adjusted valve.

The Vacuum motor and Brush motor are each protected by a circuit breaker.

Component Locations

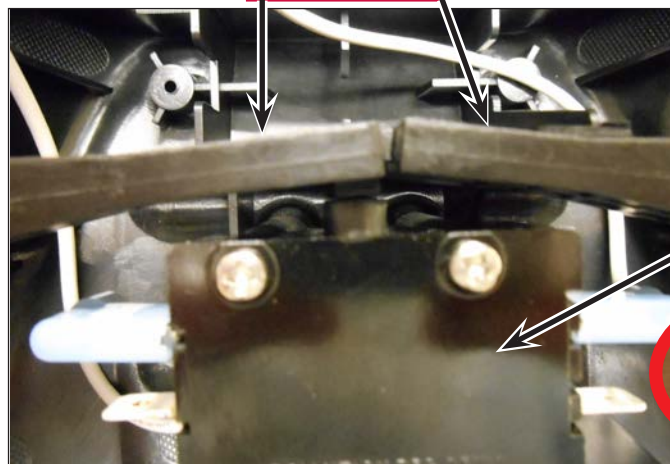
- System Switches
- Triggers and Trigger switch
- Solution Control Valve
- Solution Solenoid
- Circuit breakers
- On-Board Charger Plug socket and LED display lights
- On-Board Charger and Control PCB



Triggers



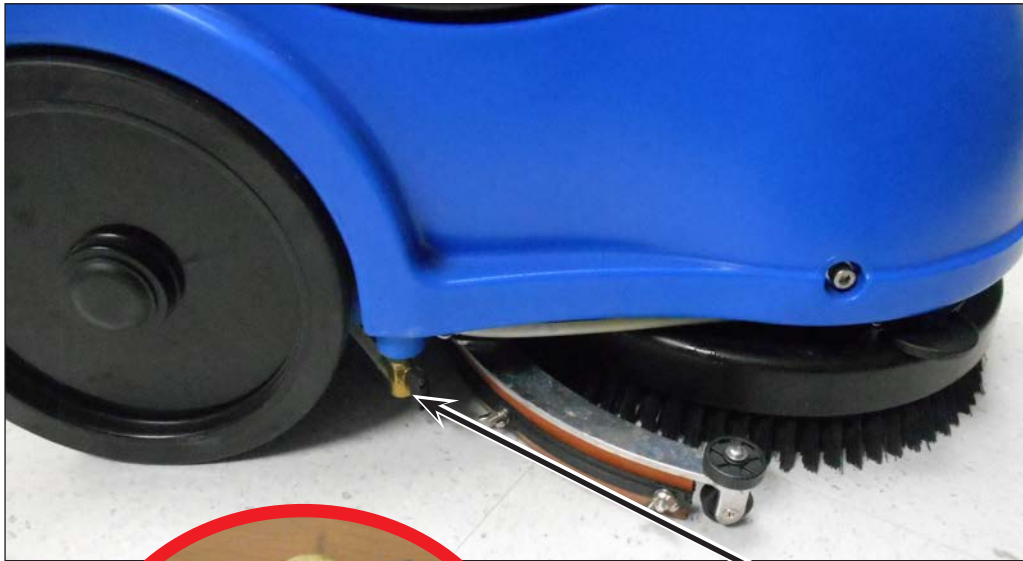
Triggers



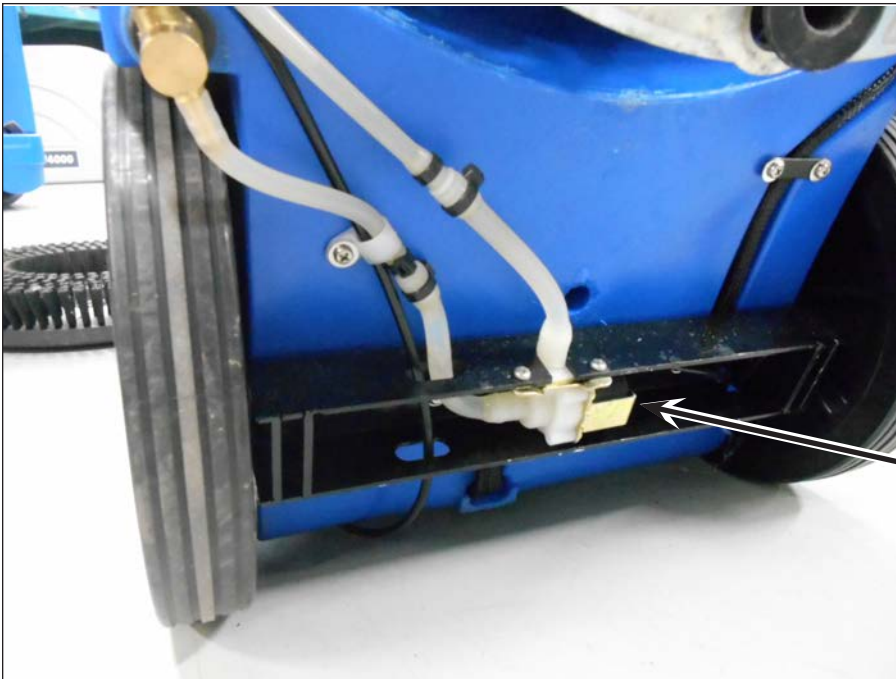
Trigger switch



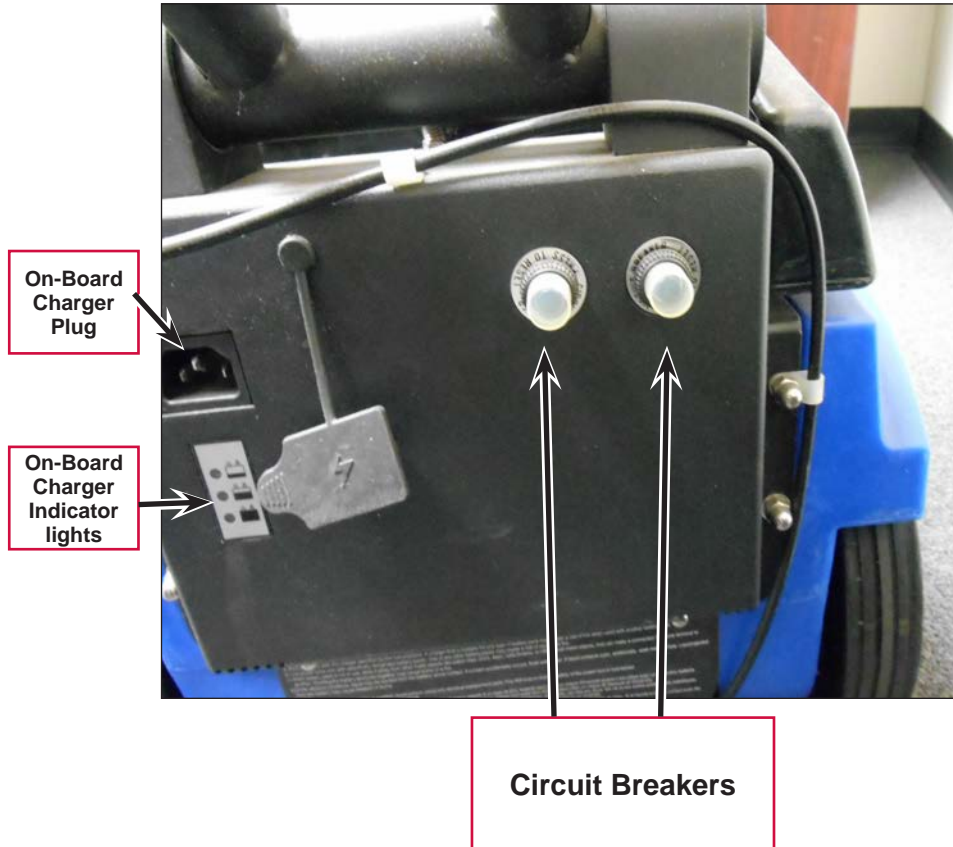
Viewed inside control housing



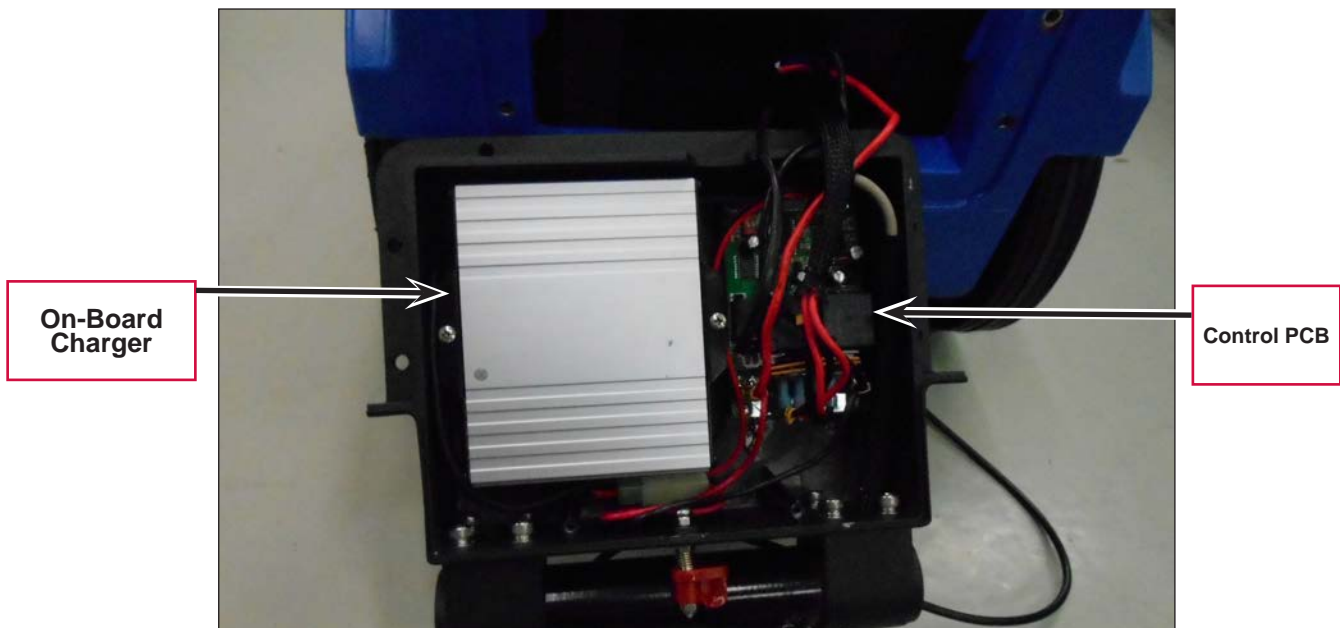
Solution Control Valve



Solution Solenoid



Shown with Handle removed from machine, and cover removed from Circuit box



Maintenance and Adjustment

No maintenance or adjustment is required for the control system

Electrical System

Functional Description

The electrical system consists of a switch panel, and a control PCB to operate the vacuum and brush motors and solution solenoid. There are also (2) circuit breakers which are used to protect the vacuum and brush motor from excessive current.

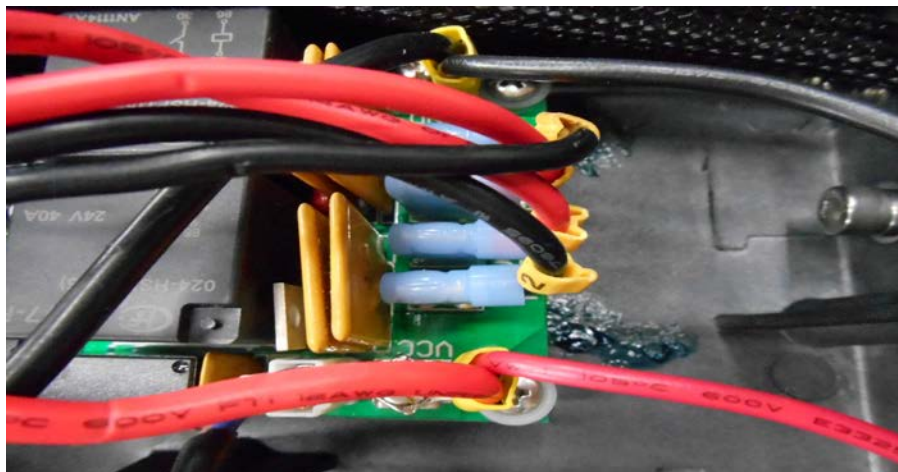
The battery charger is an “on board” style charger which is 24 volts DC, and has an output of 5 amps maximum.



The electrical system is powered by (2) 12-volt batteries for a total of 24 volts. Heavy wires connect the batteries in series. The battery charger has an interlock to prevent charging when the machine is powered up. There is no need to dis-connect the batteries for charging.

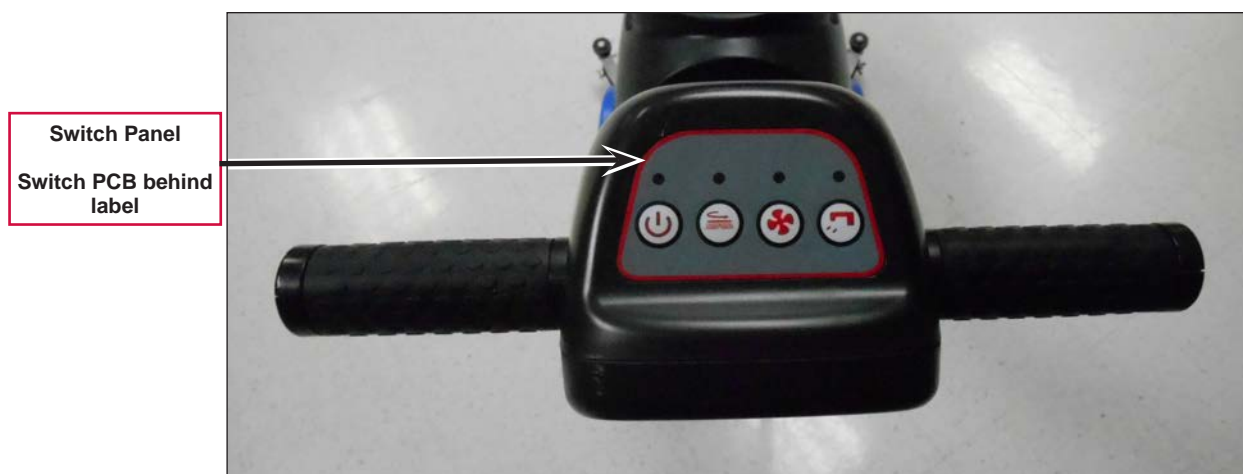
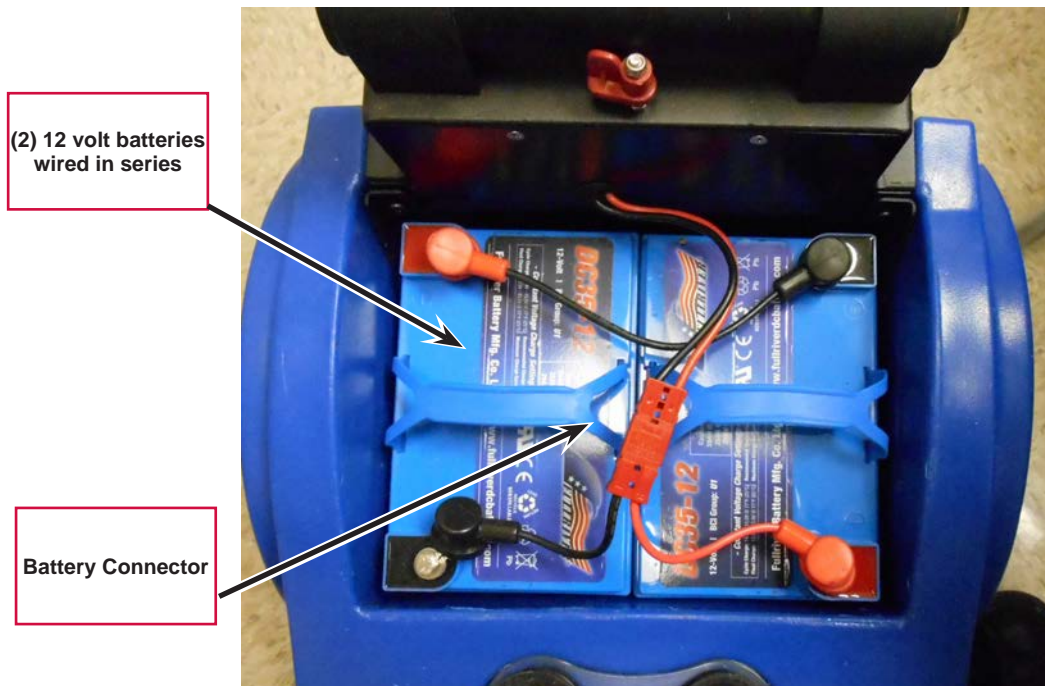
The control system will turn off the scrub system and recovery systems if the battery voltage drops too low to prevent damage to the batteries due to excessive discharging.

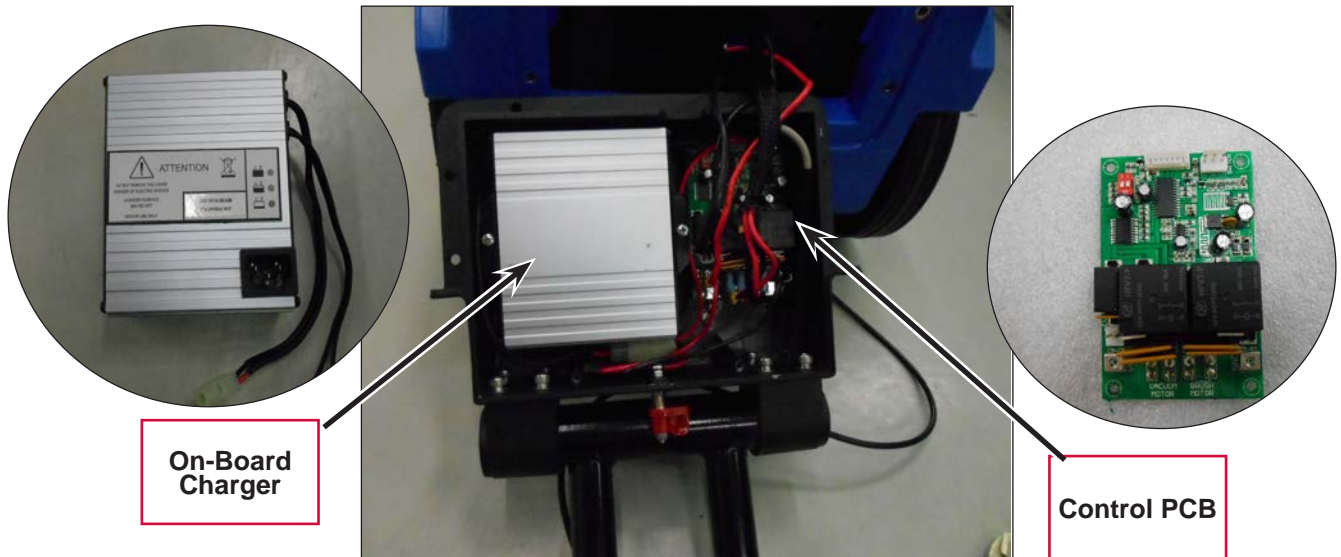
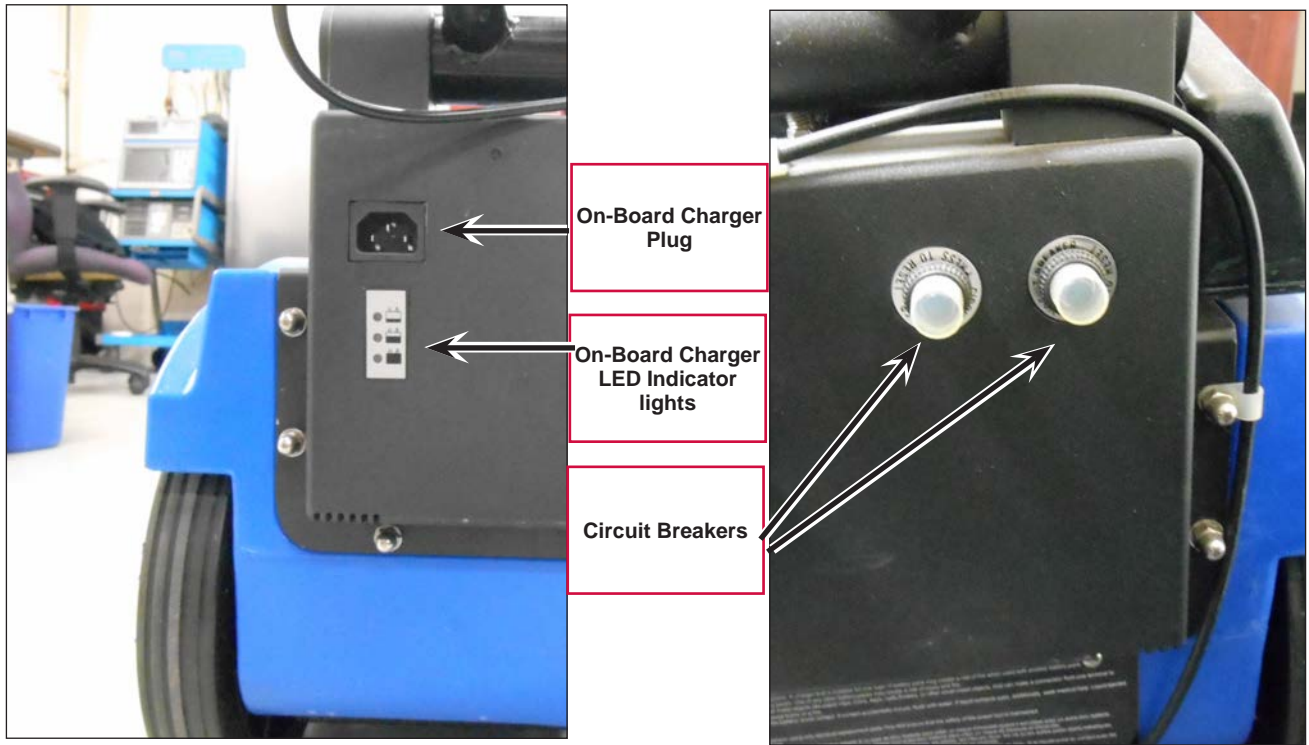
The machine wiring is color coded, and the wires are marked with yellow numbered bands corresponding to their location on the Wiring Harness Diagram.



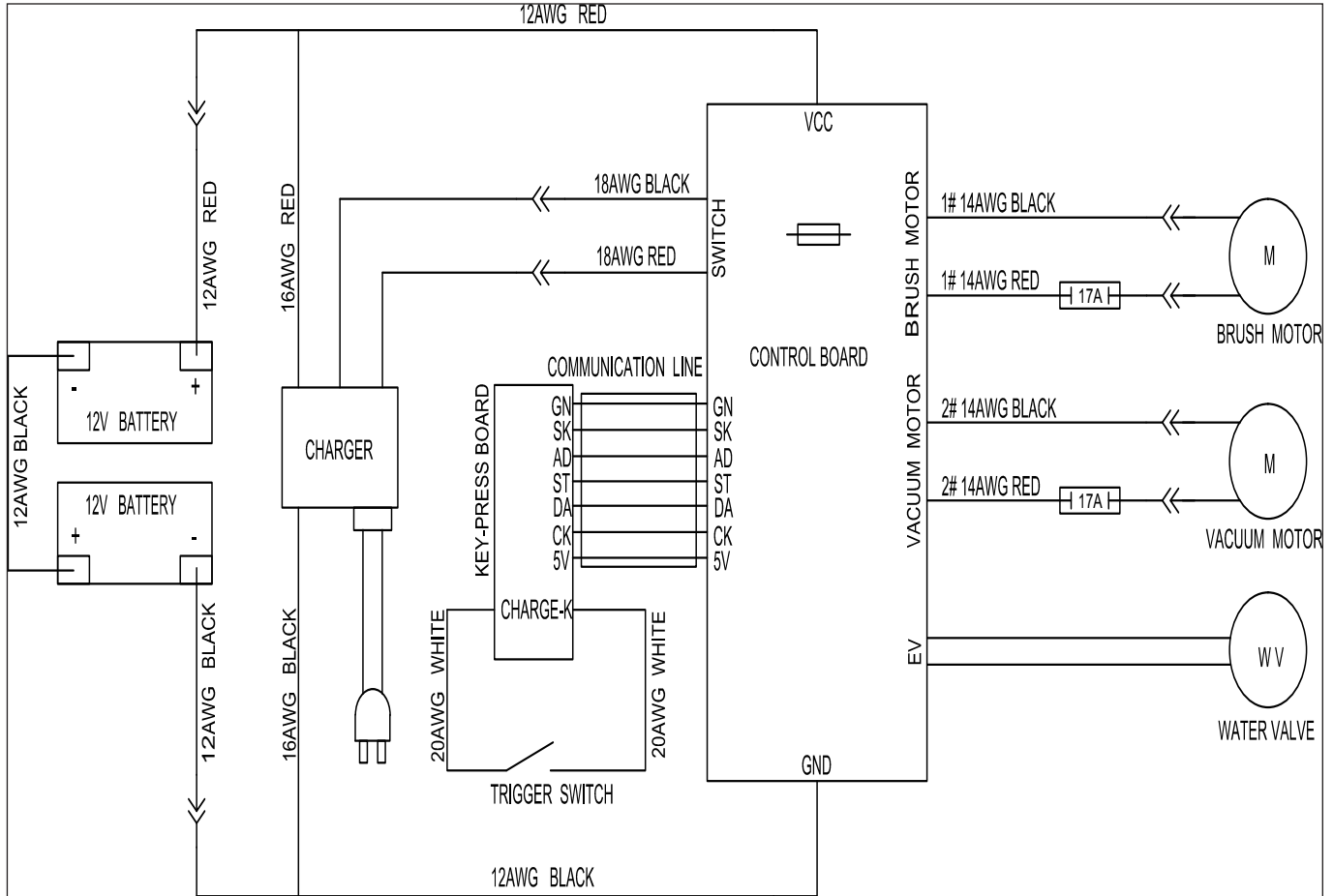
Component Locations

- Batteries
- Battery Connector
- Switch panel
- Circuit Breakers
- Charger plug and LED's
- Charger
- Control PCB





Wiring Harness Diagram



Battery Connections

- The batteries should be connected in series as shown in the picture below.



- Battery terminals and cables should be cleaned and checked periodically.
- Apply a coating or protective spray on the cable connections to prevent corrosion.

Battery Charging

TIP: For peak battery performance and life, keep the batteries charged at all times. Do not let the batteries sit in a discharged condition.

Battery Charging Procedure

1. Turn the machine OFF
2. Place the machine near an electrical outlet. (The use of an extension cord is not recommended)
3. Plug the charger power cord into the machine (plug socket is on the rear of the machine)
4. Plug the other end of the charger cord into the electrical outlet.
5. The charger will display the charge status using small LED lights (Near the charger plug socket)
 - **RED** flashing - The charge cycle has just started. The charger is “looking” at the batteries.
 - **RED** solid ON - The main charge cycle is underway
 - **YELLOW** solid ON - The secondary (finishing) charge cycle is underway
 - **GREEN** solid ON - The charge cycle is complete
 - **YELLOW** flashing - The charger doesn’t “see” the batteries
 - **RED** flashing - FAULT - The charger “sees” something major is wrong.

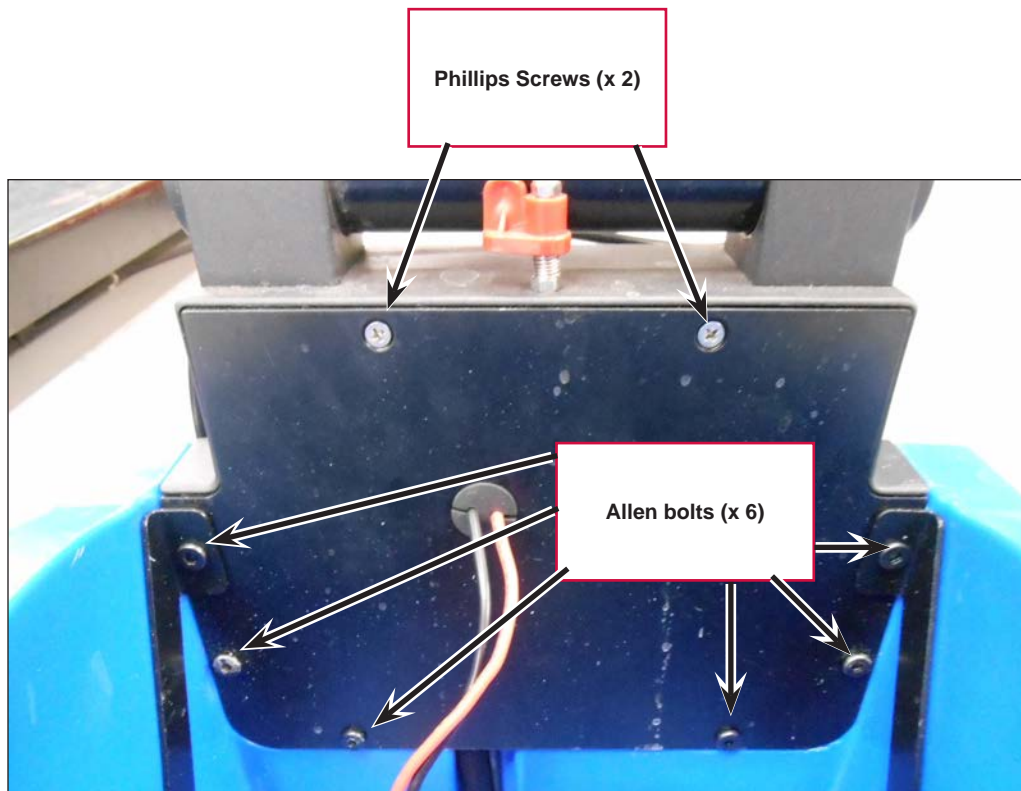
Battery Charging Notes

- If you run the machine to the **RED LED** every time, you are damaging the batteries.
- If you do not charge the batteries soon after the **YELLOW LED** comes on, the batteries continue to dis-charge, and you will damage the batteries.
- You can charge the batteries after each machine use, even though the batteries have not fully dis-charged. AGM batteries have no “memory”, and there will be no loss in battery performance or longevity.
- If the batteries are fully dis-charged, it will take 10 – 12 hours to fully re-charge them.
- Insure the charger is not plugged in to an outlet that may be switched off when the lights are turned off.

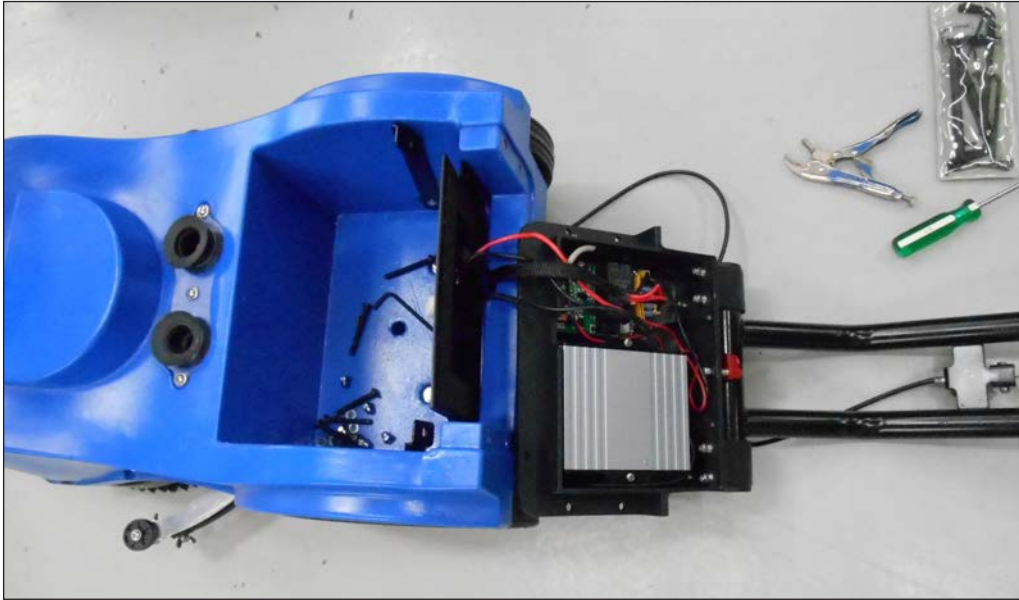
Removal and Installation

On-Board Charger

1. Remove the recovery tank
2. Disconnect batteries, and remove the batteries as a “pack”
3. Remove (5) of the (6) Allen bolts w/acorn nuts. NOTE: The (2) longer Allen bolts go through the support brackets
4. Before you remove the last bolt, fold the handle down over the machine
5. Remove the last Allen bolt
6. Remove the (2) Phillips screws that secure the cover plate.



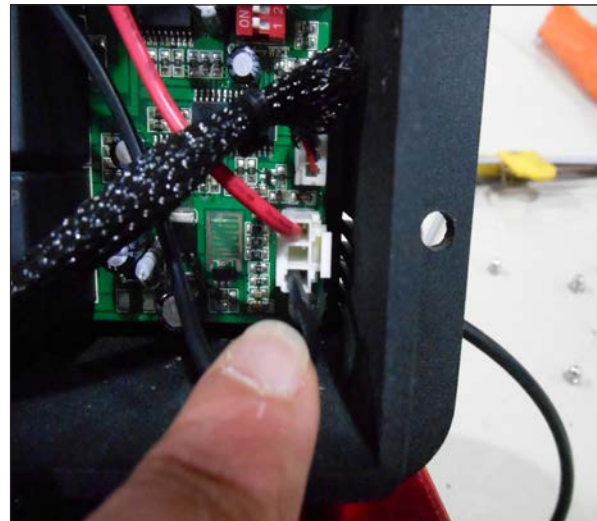
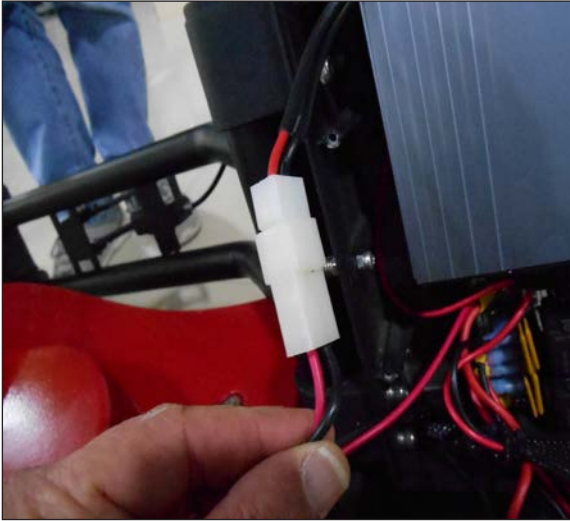
- 7. Lift and tilt the handle away from the machine



- 8. Remove the (2) Phillips screws that hold the charger in



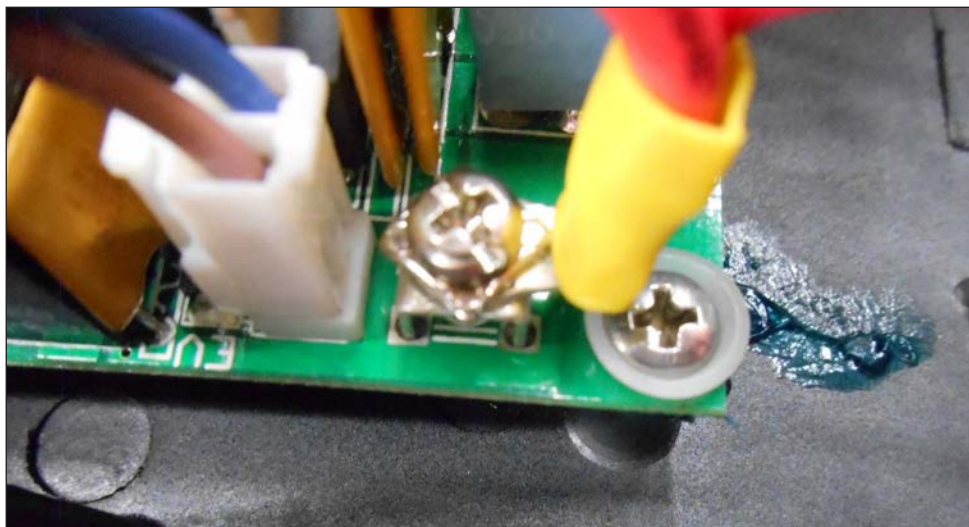
9. Disconnect the power and interlock wires



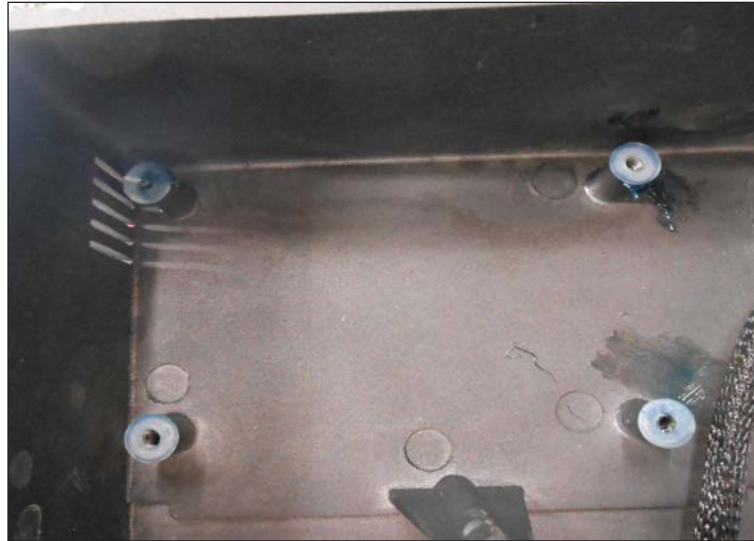
10. Remove the defective charger, and install a new one. Ensure the plug socket and the charger indicator LED lights align with the holes in the metal cover of the machine
11. Re-assemble in the reverse order

Control PCB

1. Gain access to the the control PCB following the steps listed above
2. Disconnect all of the wires and connectors from the PCB. The terminals for the 12 gauge wires from the batteries are screwed to the PCB with short Phillips screws.

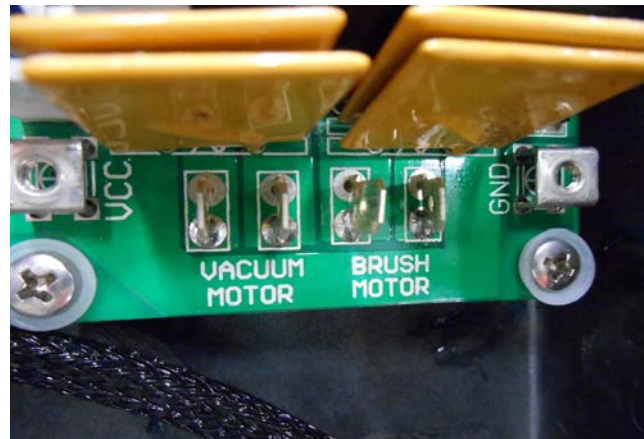
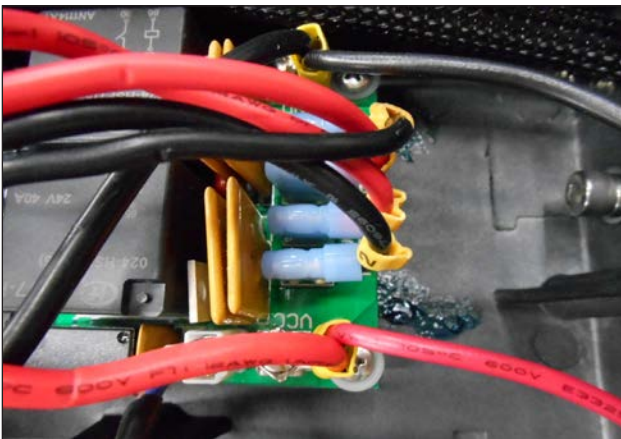


3. Remove the (4) Phillips screws that hold the PCB to the metal case. NOTE: There are nylon washers on the top and bottom of the PCB. Do not lose these washers
4. When re-installing the control PCB, use a dab of grease to hold the nylon washers in place on the mounting studs. It is very important to use these nylon washers to prevent a short circuit.



5. Re-mount the control PCB to the case using the (4) screws and nylon washers. Again, it is very important to use the nylon washers to prevent a short circuit
6. Re-attach the wires and connectors to the control PCB. Connect the motor wires from left to right, in the following manner:

- Vacuum motor - BLACK wire 2
- Vacuum motor - RED wire 2
- Brush motor - RED wire 1
- Brush motor - BLACK wire 1



7. Re-assemble the handle in the reverse order as described above

Basic Troubleshooting

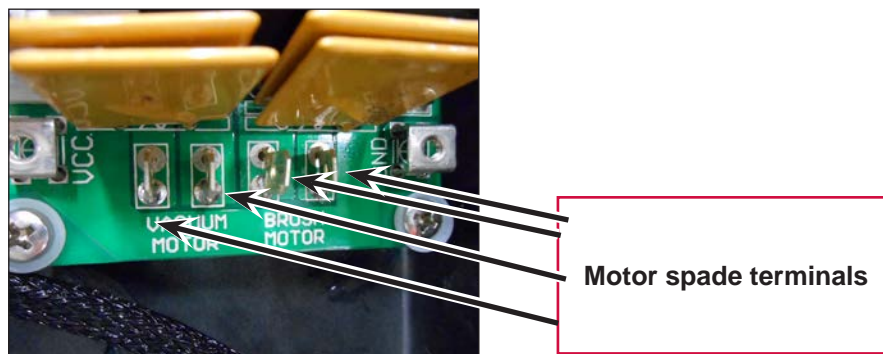
Problem	Cause	Correction
<ul style="list-style-type: none"> No Power 	<ul style="list-style-type: none"> Power switch not in the ON position 	<ul style="list-style-type: none"> Turn on the machine power switch
	<ul style="list-style-type: none"> Batteries not connected 	<ul style="list-style-type: none"> Connect battery connector
	<ul style="list-style-type: none"> Batteries completely discharged 	<ul style="list-style-type: none"> Re-charge batteries
	<ul style="list-style-type: none"> Defective Control PCB 	<ul style="list-style-type: none"> Replace Control PCB
	<ul style="list-style-type: none"> Defective Switch PCB 	<ul style="list-style-type: none"> Replace Switch PCB
<ul style="list-style-type: none"> Vacuum motor does not work 	<ul style="list-style-type: none"> Vacuum Circuit Breaker tripped 	<ul style="list-style-type: none"> Reset breaker
	<ul style="list-style-type: none"> Defective Vacuum Motor 	<ul style="list-style-type: none"> Replace Vacuum motor
	<ul style="list-style-type: none"> Defective Control PCB 	<ul style="list-style-type: none"> Replace Control PCB
	<ul style="list-style-type: none"> Defective Switch PCB 	<ul style="list-style-type: none"> Replace Switch PCB
<ul style="list-style-type: none"> Brush Motor does not work 	<ul style="list-style-type: none"> Brush Circuit breaker is tripped 	<ul style="list-style-type: none"> Reset breaker
	<ul style="list-style-type: none"> Defective Brush motor 	<ul style="list-style-type: none"> Replace Brush motor
	<ul style="list-style-type: none"> Defective Control PCB 	<ul style="list-style-type: none"> Replace Control PCB
	<ul style="list-style-type: none"> Defective Switch PCB 	<ul style="list-style-type: none"> Replace Switch PCB
	<ul style="list-style-type: none"> Defective trigger switch 	<ul style="list-style-type: none"> Replace trigger switch
<ul style="list-style-type: none"> Solution solenoid does not open 	<ul style="list-style-type: none"> Defective Solution solenoid 	<ul style="list-style-type: none"> Replace Solution solenoid
	<ul style="list-style-type: none"> Defective Control PCB 	<ul style="list-style-type: none"> Replace Control PCB
	<ul style="list-style-type: none"> Defective Switch PCB 	<ul style="list-style-type: none"> Replace Switch PCB
	<ul style="list-style-type: none"> Defective trigger switch 	<ul style="list-style-type: none"> Replace trigger switch

Troubleshooting Tips

- The Control PCB is in control of the LED lights on the Switch PCB. So, if the LED light comes on next to the switch on the Switch PCB, when you push the switch, you know the switch is OK, and the communication line between the Control PCB and Switch PCB is OK.
- Using the shop measurements below taken at the Control PCB, you can more accurately determine where the trouble is.

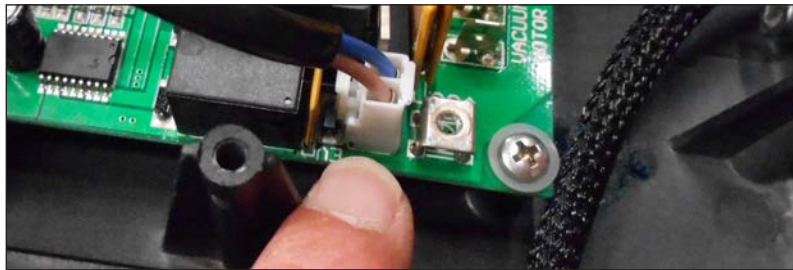
Shop Measurements

Figure 1. Showing the motor spade terminals for the Vacuum motor and Brush motor.



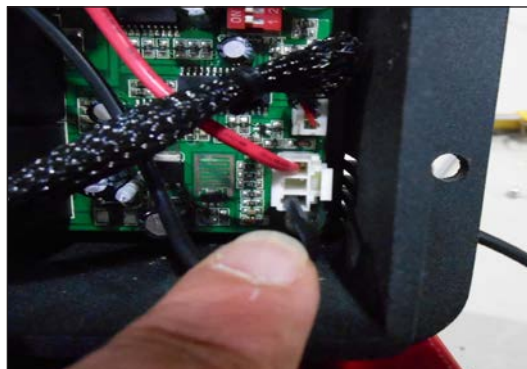
Measurement Point	Conditions	Volts DC Reading
Across the Vacuum motor spade terminals on the Control PCB	<ul style="list-style-type: none"> • Power switch ON • Vacuum switch ON 	24 volts DC
	<ul style="list-style-type: none"> • Any condition above not met 	0 volts DC
Across the Brush motor spade terminals on the Control PCB	<ul style="list-style-type: none"> • Power switch ON • Brush switch ON • Triggers pulled (to engage trigger switch) 	24 volts DC
	<ul style="list-style-type: none"> • Any condition above not met 	0 volts DC

Figure 2. Showing the Solution solenoid connector on the Control PCB



Measurement Point	Conditions	Volts DC Reading
DVM Black (GND) probe on B- DVM Red probe on Blue connector wire	<ul style="list-style-type: none"> • Power switch ON • Solution switch ON • Triggers pulled 	24 volts DC
	<ul style="list-style-type: none"> • Power switch ON • All other switches OFF 	24 volts DC
DVM Black (GND) probe on B- DVM Red probe on Brown connector wire	<ul style="list-style-type: none"> • Power switch ON • Brush switch ON • Triggers pulled (to engage trigger switch) 	0 volts DC
	<ul style="list-style-type: none"> • Any condition above not met 	24 volts DC

Figure 3. Showing the Charger Interlock connector on the Control PCB



Measurement Point	Conditions	Volts DC Reading
DVM Black (GND) probe on B-	<ul style="list-style-type: none"> Charger plugged in to 110 volts AC 	.3 volts DC
DVM Red probe on Red connector wire	<ul style="list-style-type: none"> Charger NOT plugged in to 110 volts AC 	24 volts DC
DVM Black (GND) probe on B-	<ul style="list-style-type: none"> Charger plugged in to 110 volts AC 	24 volts DC
DVM Red probe on Black connector wire	<ul style="list-style-type: none"> Charger NOT plugged in to 110 volts AC 	24 volts DC

Figure 4. Showing the Communication cable connector at the Control PCB



Measurements taken with DVM Ground (Black) probe on B -, and Red probe with “T” pin with connector plugged into Control PCB.

Communication Wire	Voltage Reading	Notes
RED 5V	<ul style="list-style-type: none"> 5 volts DC always 	<ul style="list-style-type: none"> DC Supply to Switch PCB
VIOLET (Pin 2) Clock	<ul style="list-style-type: none"> 0.8 volts DC always 	<ul style="list-style-type: none"> Clock signal to Switch PCB
WHITE Data	<ul style="list-style-type: none"> 0.3 volts Only Power ON 	<ul style="list-style-type: none"> Data line to Switch PCB. Each function (Vacuum, Brush, Solution) switch adds .3 volts
	<ul style="list-style-type: none"> 0.6 volts DC Power and (1) Function 	
	<ul style="list-style-type: none"> 0.9 volts DC and (2) Functions 1.2 volts DC and (3) Functions 	
YELLOW Strobe	<ul style="list-style-type: none"> .1 volts DC always 	
GREEN Analog/Digital	<ul style="list-style-type: none"> 5 volts always 	
VIOLET (Pin 6)	<ul style="list-style-type: none"> 0 volts DC with Triggers OFF 	<ul style="list-style-type: none"> Trigger switch NOT engaged
	<ul style="list-style-type: none"> 3 volts DC with Triggers ON 	<ul style="list-style-type: none"> Trigger switch engaged
GRAY Ground	<ul style="list-style-type: none"> 0 volts DC always 	<ul style="list-style-type: none"> GND Supply to Switch PCB

Handle System

Functional Description

The Clarke MA50 15B handle system is a major component of the machine. The handle system contains all of the electronics to control and operate the machine, as well as, the on-board battery charger. The handle also has a lever/gear mechanism to allow a wide variety of handle positions.

At the top of the handle is the Switch panel, the triggers to operate the machine, and the lever to adjust the position of the handle.

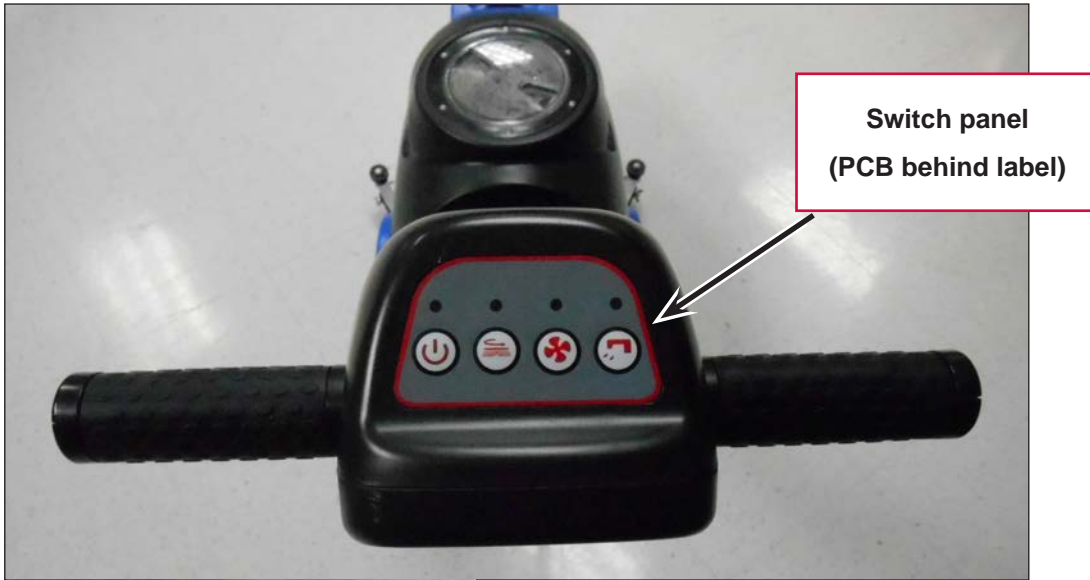
In the center of the handle is the Squeegee lift lever mechanism. This lever raises and lowers the squeegee assembly.

At the bottom of the handle system is the metal enclosure (Circuit Box) that houses the control PCB, and on-board battery charger. The circuit box also is the location for the circuit breakers for the vacuum motor and brush motor.

Between the switch PCB in the top of the handle, and the control PCB in the circuit box is a communication cable.

Component Locations

- Switch PCB
- Operating Triggers
- Handle adjust lever
- Front Handle Cover
- Squeegee Lift Lever
- Squeegee Lift Cable
- Handle Pivot Point (location of gears and spring for handle adjust mechanism)
- Circuit Box
- Circuit Breakers
- On-Board Battery Charger
- Control PCB
- Communication Cable



Switch panel
(PCB behind label)



Switch PCB



Switch label

Operating Triggers



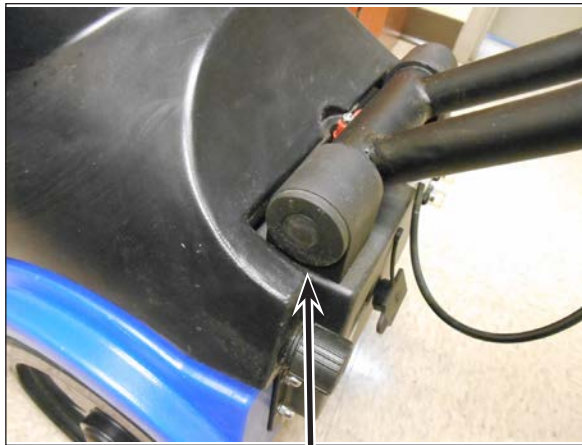
Handle Adjust Lever

Front Handle Cover

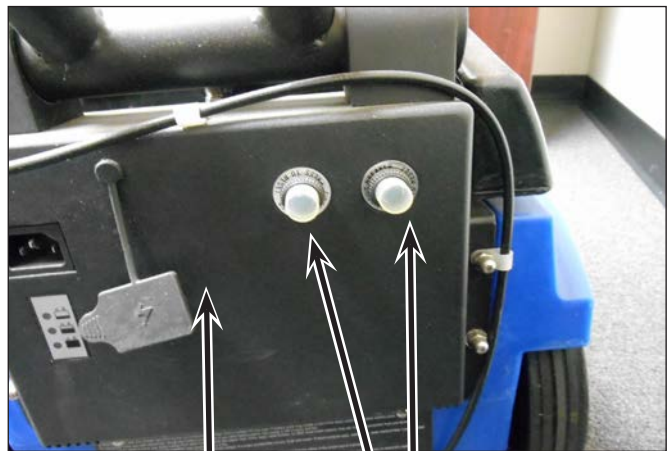


Squeegee Lift Lever

Squeegee Cable

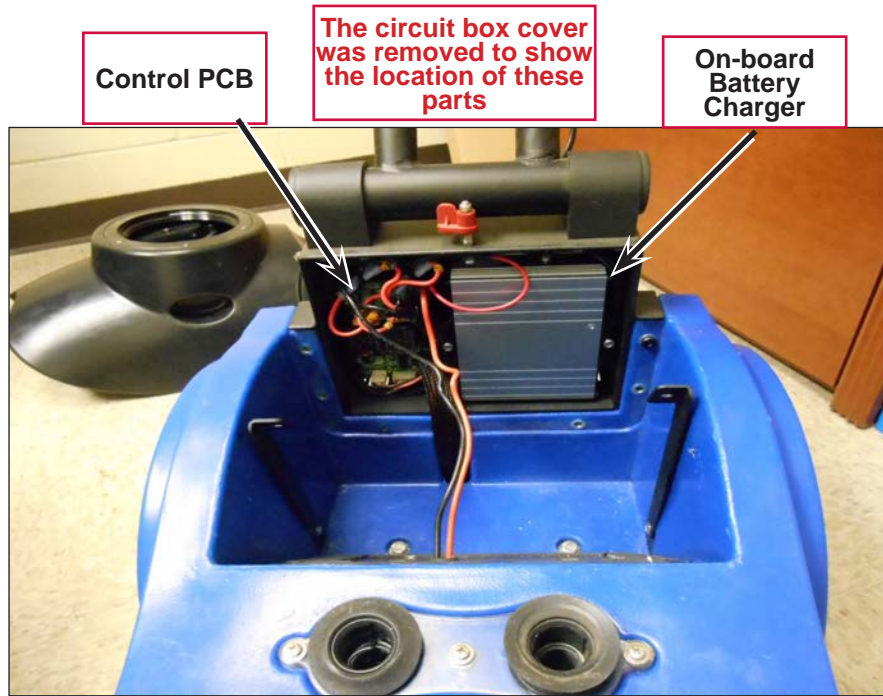


Handle Pivot Point

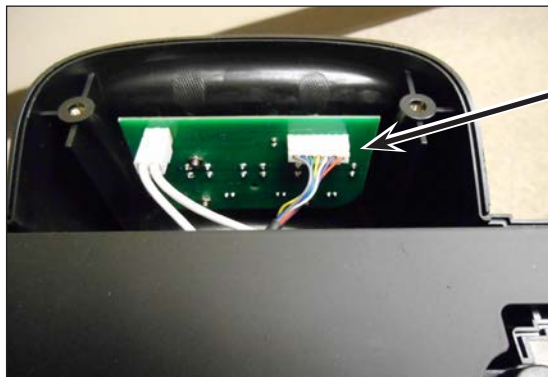


Circuit Box

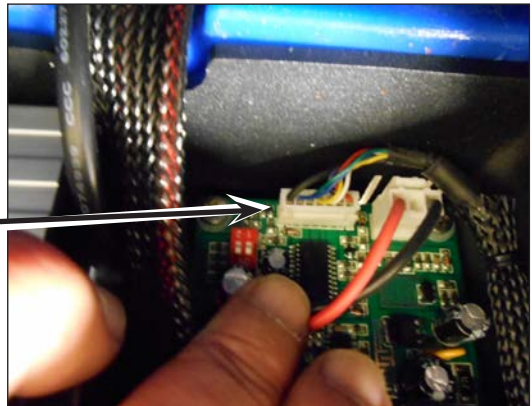
Circuit Breakers



Communication cable



At switch PCB



At control PCB

Removal and Replacement

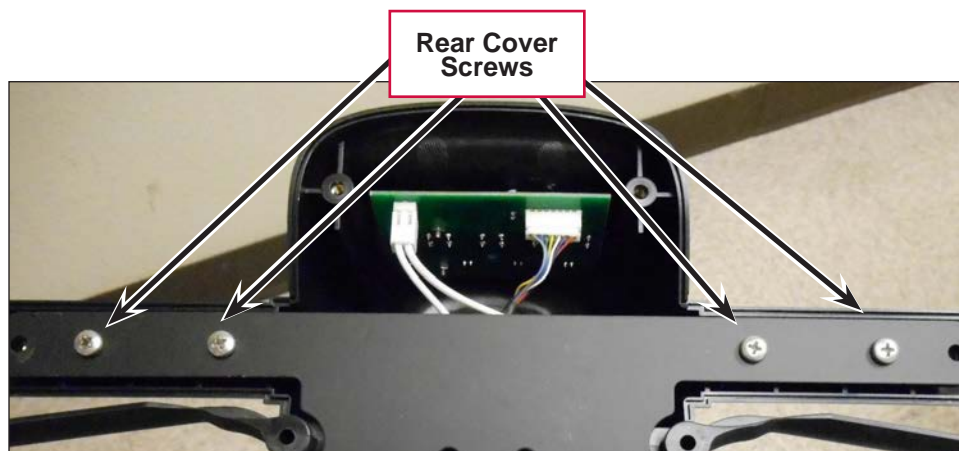
Switch PCB

NOTE: To remove the switch PCB, you must remove the switch label. Doing so will ruin the label. Make sure you also order a new switch label when you order a new switch PCB.

1. Drain both tanks completely
2. Remove the Recovery Tank
3. Disconnect the batteries
4. Remove the batteries as a “pack”
5. Fold the handle down over the machine
6. Remove the (8) screws that hold the rear cover to the handle. You will have to remove the rubber hand grips to access (2) of the screws



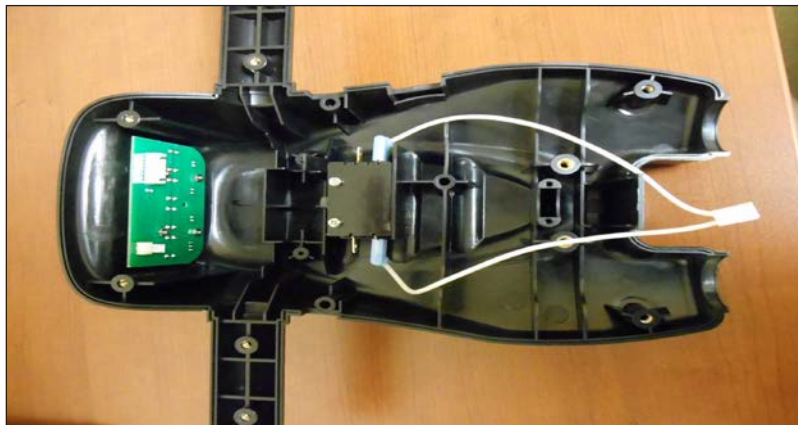
7. Remove the rear handle cover
8. Remove the (4) screws that attach the front handle cover to the metal handle



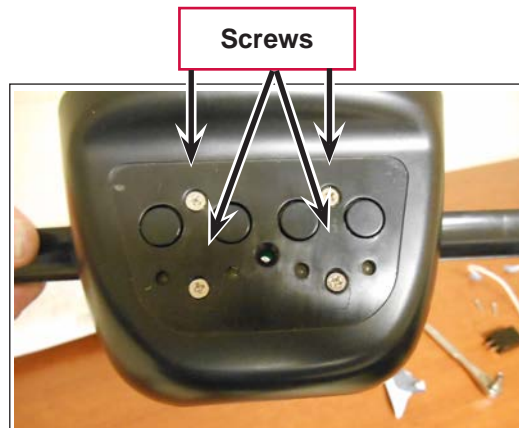
- 9. Gently lower the rear switch cover
- 10. Disconnect the wire connectors from the switch PCB



- 11. The rear cover assembly is now free



- 12. Remove the switch label to access the (4) screws that attach the switch PCB to the housing. Remove the (4) screws, and replace the switch PCB



13. Replace the switch label
14. Re-assemble the rear handle cover to the handle bar. Ensure the pins that are used to hold the triggers and handle adjust lever are all in place, and that no wires are pinched
15. Re-assemble the handle covers, and re-attach the handle to the machine

Triggers and Trigger Switch

1. Drain both tanks completely
2. Remove the Recovery Tank
3. Disconnect the batteries
4. Remove the batteries as a “pack”
5. Fold the handle down over the machine
6. Remove the (8) screws that hold the rear cover to the handle. You will have to remove the rubber hand grips to access (2) of the screws



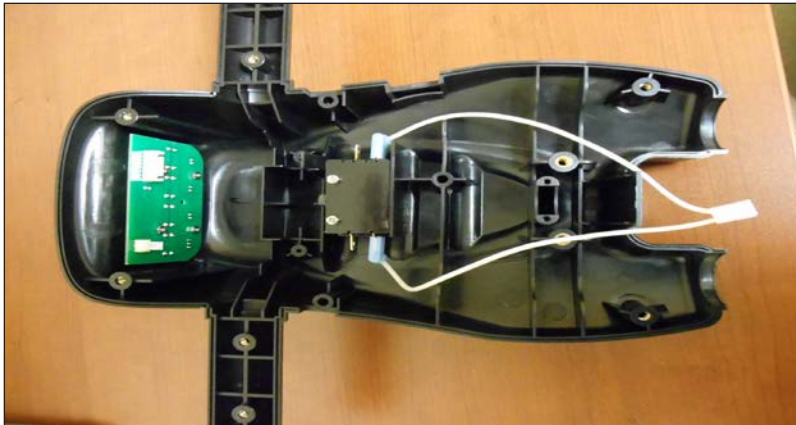
7. Remove the rear handle cover
8. Remove the (4) screws that attach the front handle cover to the metal handle



9. Gently lower the rear switch cover
10. Disconnect the wire connectors from the switch PCB



11. The rear cover assembly is now free

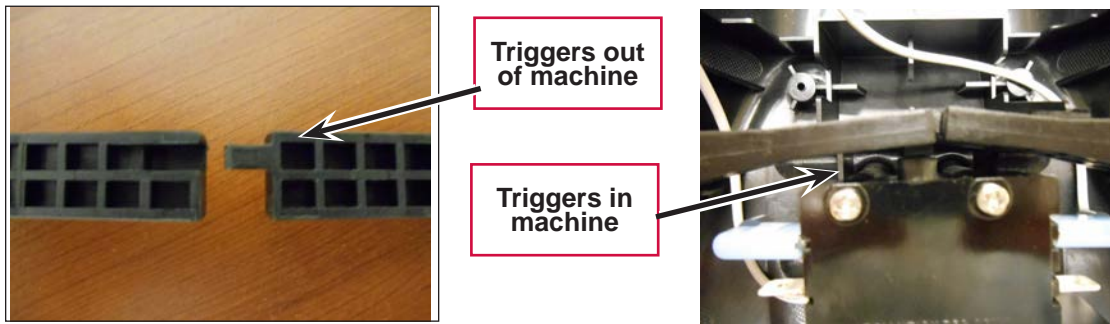


12. Remove the (2) screws that attach the trigger switch to the handle cover
13. Remove the wire harness from the defective switch, and attach the wires to the new switch to the same terminals

NOTE: Install the new switch with the white printing facing the handle. Refer to the pictures above and below. The unprinted side of the switch is facing you



14. Re-install the triggers onto the trigger pins. Make sure the (2) triggers “mate” in the center where they push against the switch button



15. Re-assemble the front cover assembly back onto the handle bar. Make sure all of the pins for the triggers and handle adjust lever are aligned with the holes

NOTE: The communication cable must be routed under the triggers (between the plastic housing and the triggers) in order for the handle cover assembly to be re-assembled properly.

16. Re-assemble the handle covers

Handle Adjust Cable and Gears

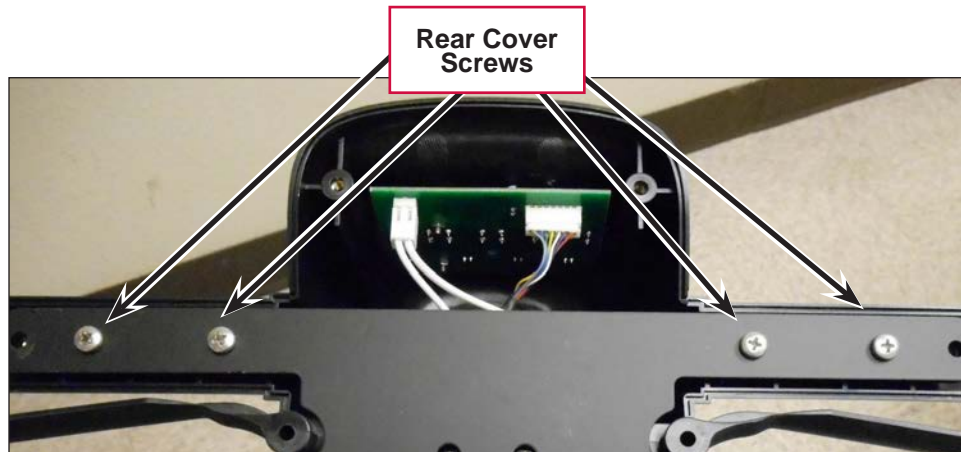
1. Drain both tanks completely
2. Remove the Recovery Tank
3. Disconnect the batteries
4. Remove the batteries as a “pack”
5. Fold the handle down over the machine
6. Remove the (8) screws that hold the rear cover to the handle. You will have to remove the rubber hand grips to access (2) of the screws



7. Remove the rear handle cover

NOTE: The trigger handle pins can come off with the rear handle cover.

8. Remove the (4) screws that attach the front handle cover to the metal handle

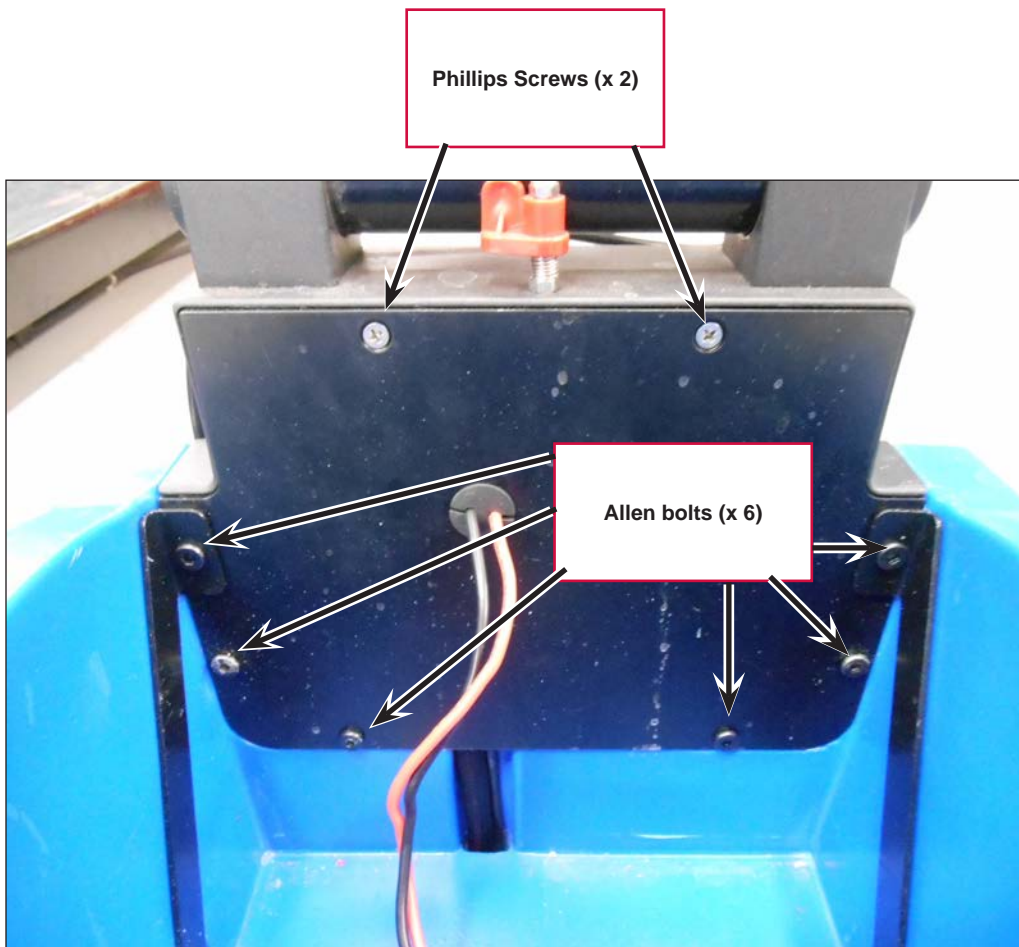


9. Loosen the hardware on the handle adjust cable, and slide it out of the groove of the handle bar

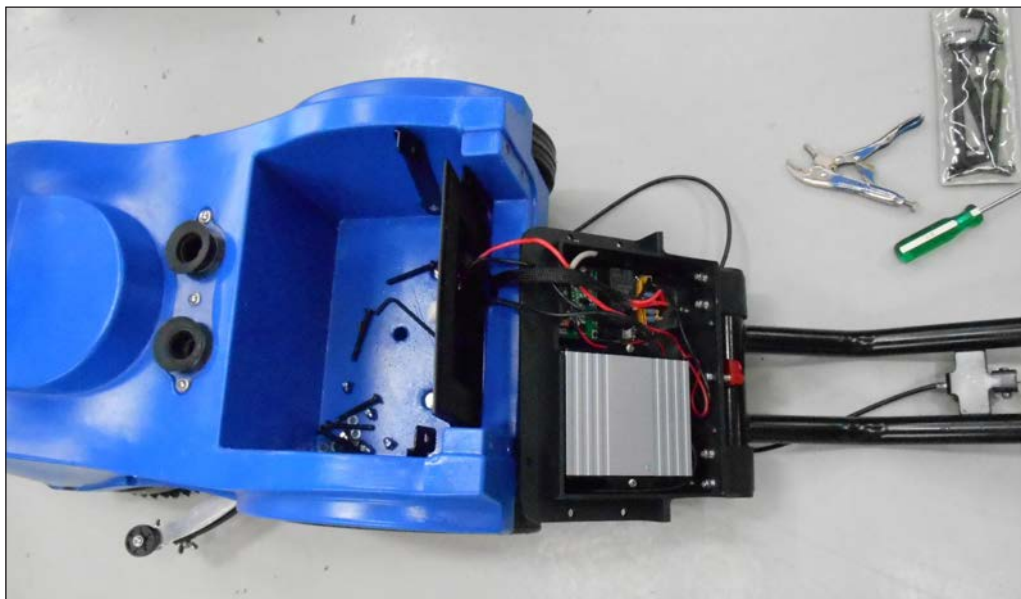


10. Now you must remove the handle from the machine to access the other end of the cable
 - Remove the recovery tank
 - Disconnect batteries
 - Remove batteries as a “pack”
 - Remove (5) of the (6) Allen bolts w/acorn nuts. NOTE: The (2) longer Allen bolts go through the support brackets
 - Before you remove the last bolt, fold the handle down over the machine
 - Remove the last Allen bolt

11. Remove the (2) Phillips screws that secure the cover plate



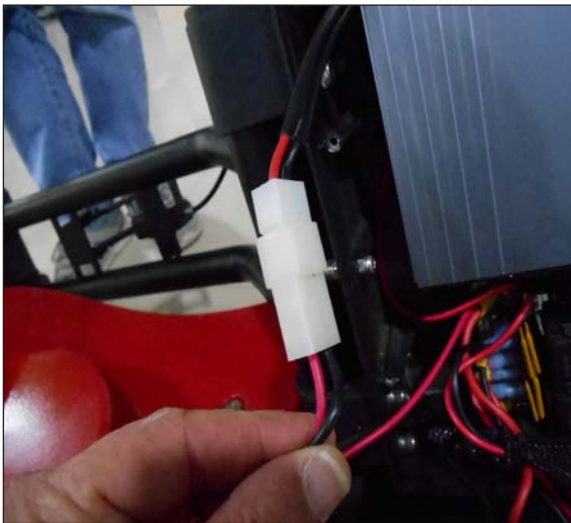
12. Lift and tilt the handle away from the machine



- 13. Remove the (2) Phillips screws that hold the charger in



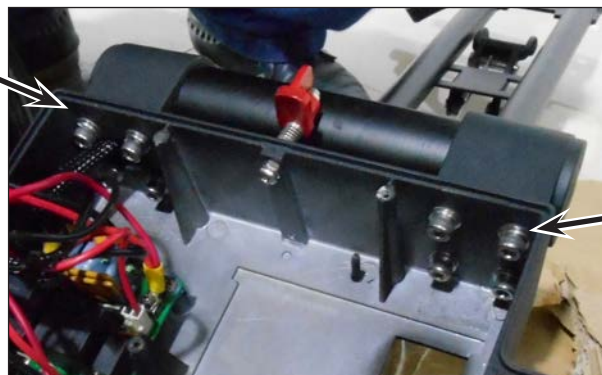
- 14. Disconnect the power and interlock wires



- 15. Remove the charger from the circuit box

- 16. Remove the (4) Allen head screws that hold the left guide block to the handle. Loosen the (4) on the right guide block

(4) Allen bolts to loosen



(4) Allen bolts to remove

17. You can now remove the guide block, and access the gear/spring assembly



18. Remove the entire cable with gears



19. Replace the defective parts with new, and apply a small amount of grease to the surfaces that rub together



20. Feed the cable end up through the handle tube. This takes a bit of patience, and is easier if you remove the handle from the right guide block, and reach in to help the cable go up the right tube of the handle



21. Re-connect the cable to the top mount
22. Adjust the top nut so there is about $\frac{1}{4}$ " of movement space between the (2) parts



23. Re-assemble the gears into the guide blocks, and re-attach the guide block to the handle. NOTE: This may take some wiggling to get all the holes to line up
24. Test the function of the handle adjust cable before you put everything back together
25. Re-assemble the handle assembly, and attach it to the machine

26. You can make small adjustments to the cable by removing the rubber plug on the end of the pivot point.



Recovery System

Functional Description

The recovery system on the MA50 15B is made up of a 2-stage vacuum motor, various pipes and hoses, and a ball-float assembly. The “working air” from the vacuum motor passes through the recovery tank standpipe, the ball-float assembly, then down to the squeegee. This working air pulls dirty water from the squeegee up through the vacuum tube pick-up adapter, then vacuum (pick-up) hose, through the vacuum seals, and into the recovery tank. The water then falls to the bottom of the tank, while the air returns to the vacuum motor.

The ball-float assembly is designed so that when the recovery tank is full, the ball will seal off the standpipe, preventing dirty water from entering the vacuum motor. The ball-float is the only means of protection to keep water from entering the vacuum motor.



Note: It is very important that the ball-float assembly is present and in good working order. The vacuum motor will be damaged if water and/or foam gets past the ball-float.

Between the solution tank, and recovery tank are (2) vacuum seals. These seals are an important component of the recovery system because they prevent water from leaking out. When the recovery tank is full, it can be removed from the machine, and carried to the drain for emptying.

Circuit Description

The vacuum motor circuit operation is very simple. When the power switch is on, and the vacuum switch is turned to ON, the signal is sent to the control PCB, and the control PCB sends 24 volts DC to the vacuum motor through a circuit breaker. The control PCB is supplied with 24 volts DC continuously, as long as the batteries are plugged in.

The vacuum motor is a 1/3 Horse power, 24 volt DC motor with maximum 40 inches of water lift.

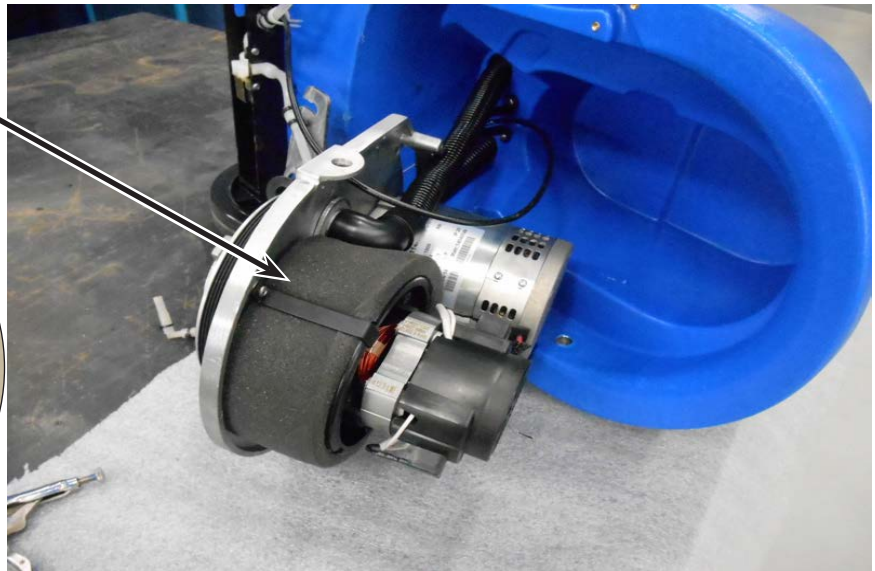
Component Locations

- Recovery Tank
- Recovery Tank Lid
- Recovery Tank Latch
- Vacuum Motor
- Vacuum Switch
- Vacuum Motor Circuit Breaker
- Ball-Float Assembly
- Standpipe
- Pick-up Tube Adapter
- Vacuum (pick-up) Hose

- Vacuum Seals



Vacuum Motor
(Shown with motor plate out of machine)





Vacuum Switch

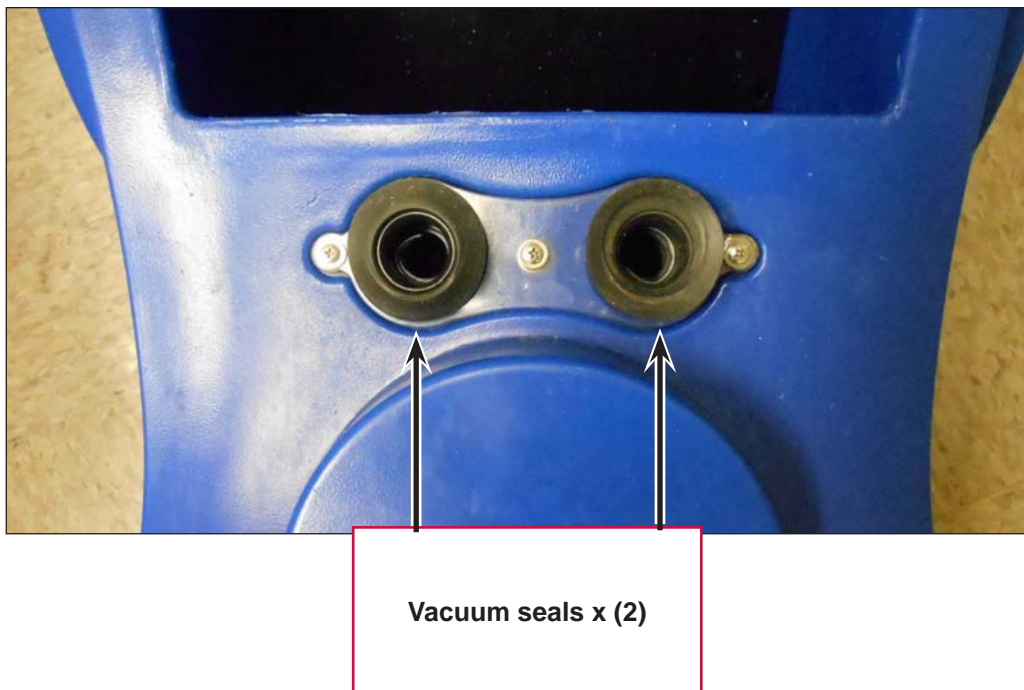
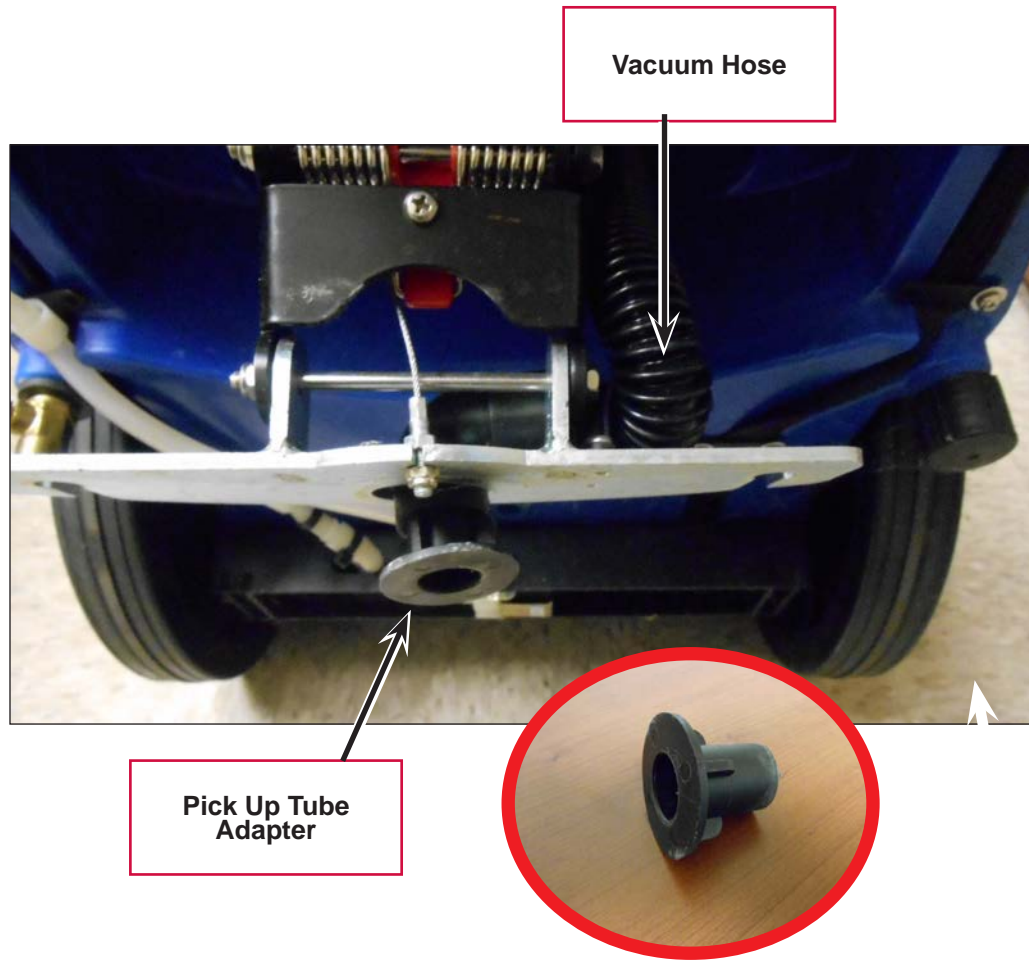
Vacuum Motor circuit breaker



Ball Float Assembly



Standpipe



Maintenance and Adjustment

Check ball-float operation

- Open the recovery tank cover
- Remove the ball-float from the stand-pipe adapter (it just slips onto the adapter fitting)
- The ball should move freely inside it’s cage all the way to the top, and all the way to the bottom
- Rinse the Ball Float Assembly thoroughly
- If the ball or cage is damaged, replace the ball-float assembly

Troubleshooting

Problem	Cause	Correc tion
<ul style="list-style-type: none"> • No Vacuum Motor Operation (Other functions work) 	• Vacuum circuit breaker tripped	• Reset circuit breaker
	• Defective vacuum motor	• Replace vacuum motor
	• Defective control PCB	• Replace control PCB
	• Defective vacuum switch	• Replace switch PCB
	• Defect in wiring	• Trace wiring using circuit diagram
<ul style="list-style-type: none"> • Poor pick-up at squeegee Restricted air flow 	• Recovery Tank is full	• Empty recovery tank
	• Clogged or kinked vacuum (pick-up) hose	• Check and clean out vacuum (pick-up) hose
	• Ball Float is stuck	• Remove and clean ball float.
Air Leaks	• Recovery tank lid is not screwed on tightly.	• Ensure cover is in place. Check the “O” ring
	• Recovery tank drain cap is not screwed on fully	• Screw the drain cap on fully
	• Pick-up tube adapter is not adjusted properly	• Adjust pick-up tube adapter so it’s seated into the indented area of the squeegee housing
	• Leaks in vacuum (pick-up) hose	• Replace vacuum (pick-up) hose
	• Rubber vacuum seals are damaged	• Replace rubber vacuum seals
Squeegee Issues	• Squeegee down pressure out of adjustment	• Adjust squeegee down pressure
	• Squeegee not mounted properly	• Confirm the squeegee is mounted firmly, and the “T” nuts are seated into the notches of the squeegee bracket
	• Squeegee blades have debris between the blade and the floor	• Clean off the squeegee blades using a damp cloth
	• Squeegee blades are worn out or torn	• Flip the squeegee blades to put a different edge on the floor (rear only)
		• Change the squeegee blades

Poor pick-up at squeegee

Good water pick up performance depends on the proper amount of air flowing through the squeegee assembly. Air entering the vacuum system before the squeegee will reduce it's ability to pick up water. Anything that restricts the movement of air through the system will also reduce it's ability to pick up water.

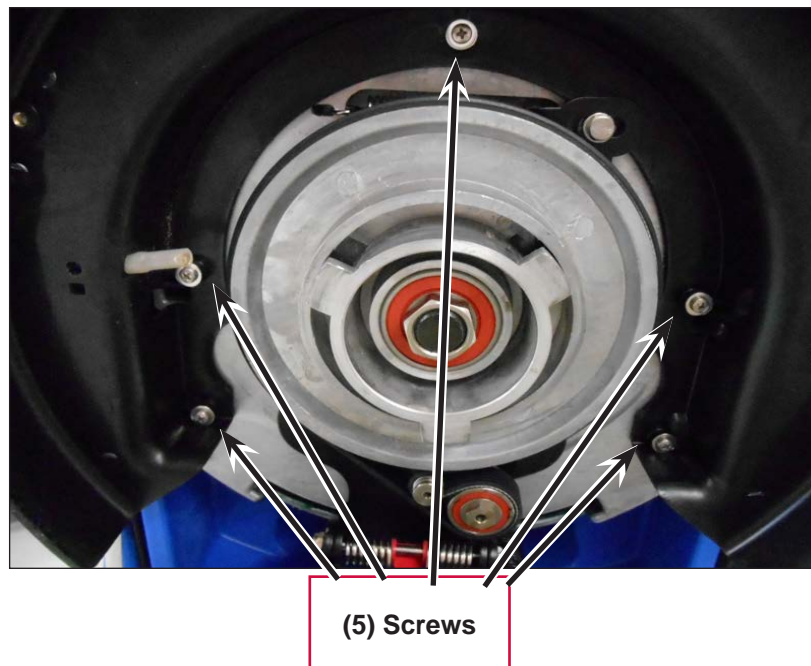
It is also critical to the recovery system that the squeegee blades are in good condition, and have the correct down pressure. Adjustment of the squeegee down pressure and instructions for replacing the squeegee blades will be discussed in the squeegee system section.

Removal and Installation

Vacuum motor

Removal:

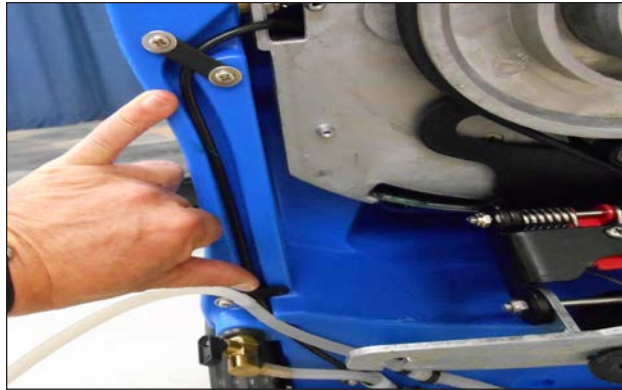
1. Drain both tanks completely
2. Remove the Recovery Tank
3. Disconnect the batteries, and remove as a "pack"
4. Use the Squeegee lift lever on the handle to lower the squeegee assembly
5. Tip the machine back
6. Remove the brush/pad driver
7. Remove the squeegee assembly
8. Remove the (5) screws that attach the brush deck



9. Remove the plastic solution feed elbow from the clip and move aside



10. Remove one of the screws and loosen the other to move the plastic retaining strips out of the way of the motor wires, and squeegee lift cable. This will allow you more room for movement



11. For the brush deck mounting bolts:

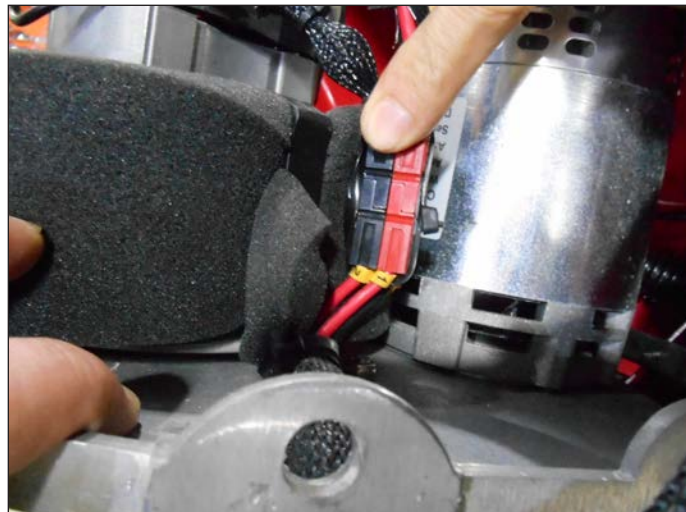
- Grasp the nylock nut, and unscrew the single Allen bolt on the right side of the machine. There is a bushing on the bolt. The bushing must be moved or taken out to get the motor plate to come out



- Repeat for the left side bolts. NOTE: The shorter Allen bolt toward the rear of the machine is used as a “stop”
- You can now carefully move the entire brush head out of the way to gain access to the squeegee cable mounting brackets



12. Disconnect the vacuum motor wire connector



13. Remove the (2) plastic tie down brackets that hold the vacuum motor to the metal deck plate



14. Remove the sound reducing foam from the defective vacuum motor
15. Remove the defective vacuum motor from the machine

Installation:

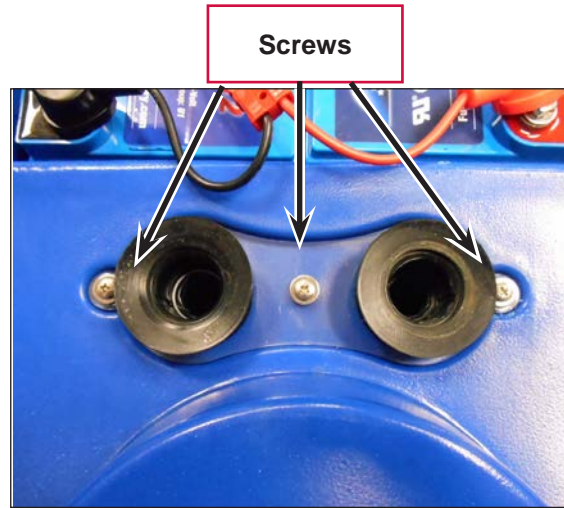
1. Wrap the sound reducing foam around the replacement vacuum motor
2. Install the vacuum motor onto the machine, insuring that the round opening in the vacuum motor is oriented onto the flange and "O" ring



3. Re-attach the (2) plastic tie down brackets
4. Re-connect the wire connector, and zip tie as required
5. Re-assemble the machine in the reverse order

Vacuum Seals

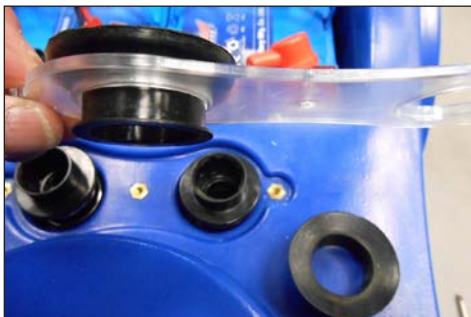
1. Remove and drain the recovery tank
2. Remove the (3) screws that hold in the vacuum seals



3. Lift up the plastic strap, and you can now slip the vacuum seals off from the hose cuffs, and out of the plastic strip



4. Slip the old seals out of the plastic, and slip the replacement seals in. Re-connect the seals to the hose cuffs



5. Re-assemble the seals and re-install the plastic retaining strip

Vacuum Motor Switch

The vacuum motor switch cannot be replaced separately. The entire switch PCB must be replaced. For detailed instructions on replacing the switch PCB, see the HANDLE SYSTEM section of this manual.

Control PCB

Replacement of the Control PCB is covered in the ELECTRICAL SYSTEM section of this manual.

Specifications

Shop Measurements

- Water lift measured at the pick up tube adapter (squeegee removed) - 30 inches
- Water lift measured at the vacuum seal (recovery tank removed) - 35 inches
- Amp draw of vacuum motor (normal operation) - 11.4 amps
- Amp draw of vacuum motor (overload/bypass operation) - 9.4 amps.

Scrub System

Functional Description

The Clarke MA50 15B uses a single 1/3 horse power motor to turn a belt driven pulley at 150 rpm. The MA50 15B has a “pivoting head” design, so the brush pressure is limited to the weight of the front of the machine. The only variation in brush pressure is the weight of the water in the tanks. The brush pressure is otherwise not adjustable.

The brush/pad driver attaches to the driven pulley using (3) square lugs. The brush motor spins counter-clockwise, and will only operate if the power switch is ON, the brush switch is ON, and the operating triggers are engaged.

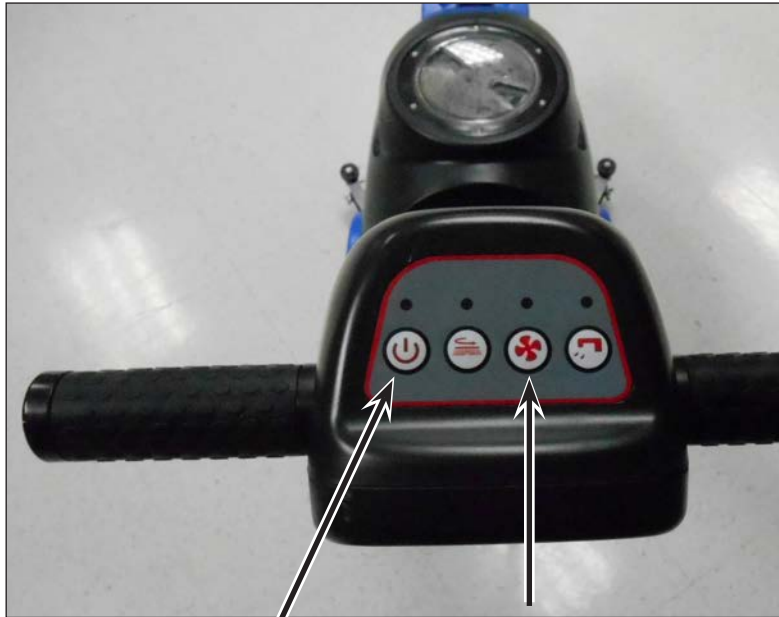
Tension on the drive belt is kept constant by a spring loaded tensioner.

Circuit Description

The brush motor receives power from the control PCB through a circuit breaker. B+ and B - are constantly supplied to the control PCB unless the on-board charger is plugged in, or the batteries are disconnected. When the power switch and brush switch are in the ON position on the switch PCB, and the operating triggers are pulled, 24 VDC is applied to the brush motor.

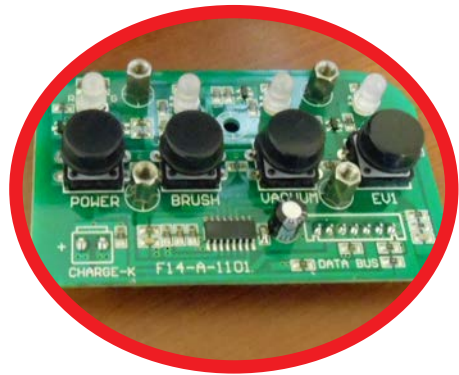
Component Locations

- Power Switch
- Brush Switch
- Switch PCB
- Operating Triggers
- Brush Circuit Breaker
- Control PCB
- Brush Motor
- Driven Pulley
- Drive Belt
- Belt Tension Pulley
- Belt Tension Bracket and Spring



Power Switch

Brush Switch



Switch PCB
(Behind Label)

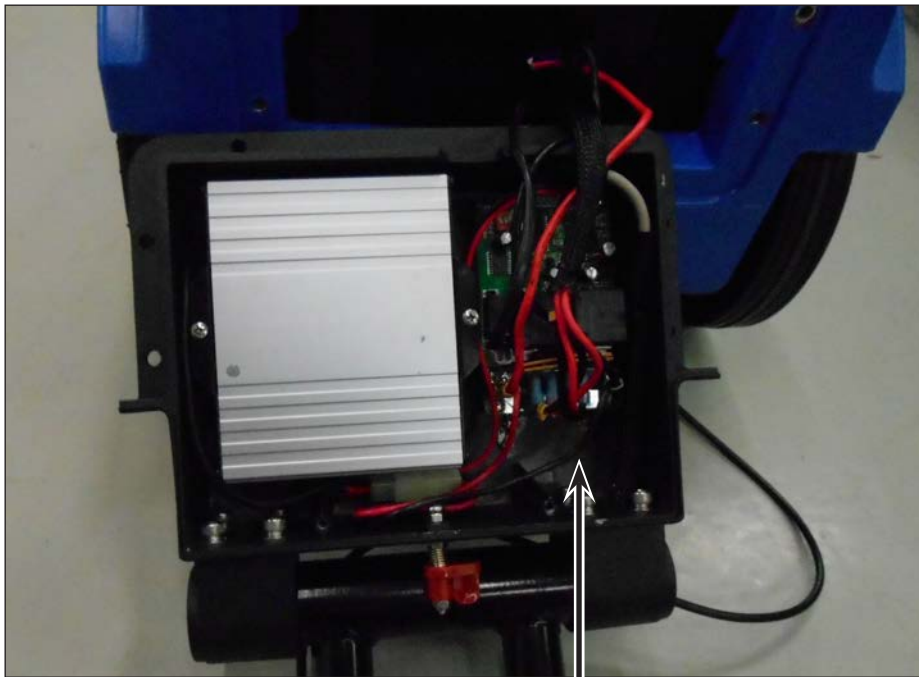
Operating Triggers





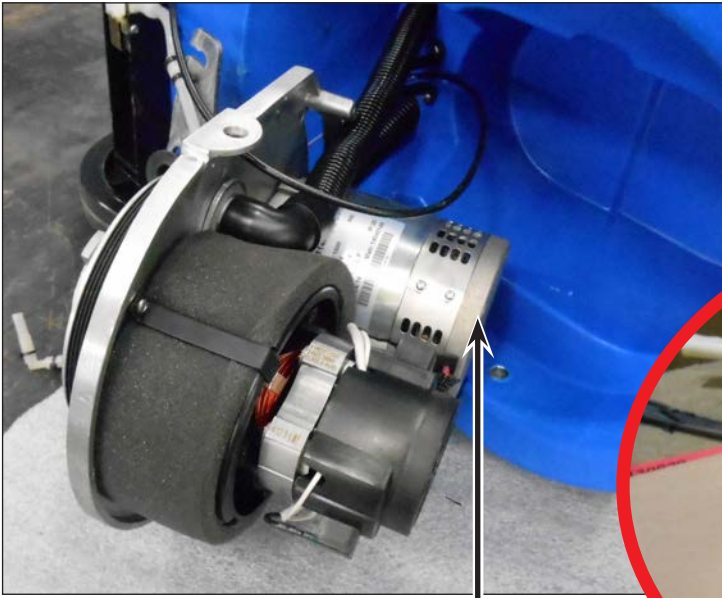
**Brush Circuit
Breaker**

**This view is shown with the handle and circuit box
cover removed**

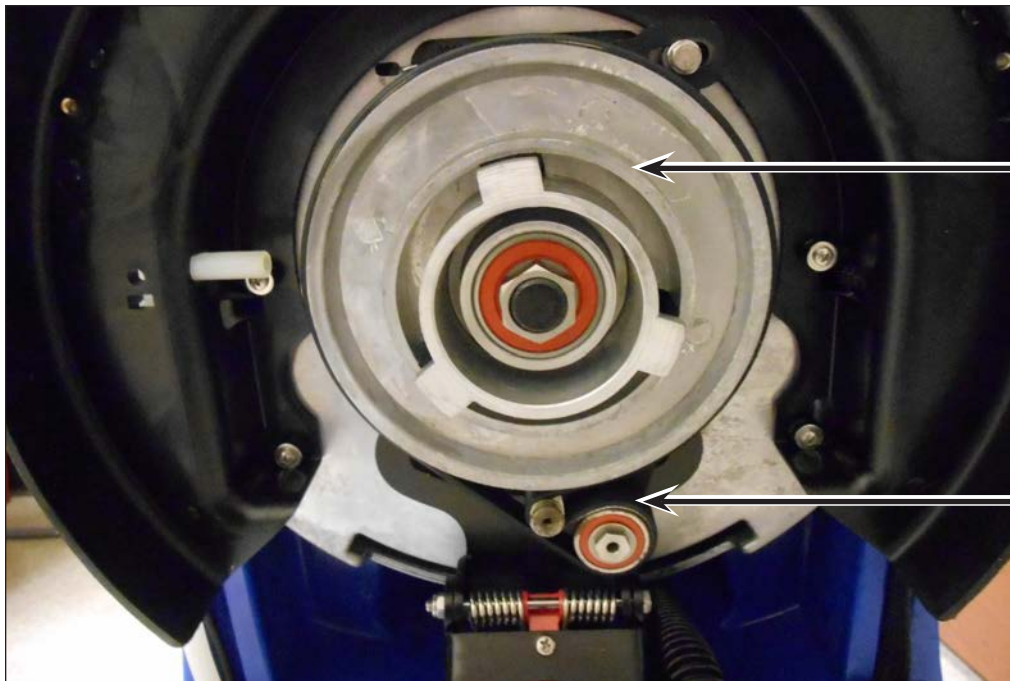


Control PCB

This view shown with motor plate removed from machine

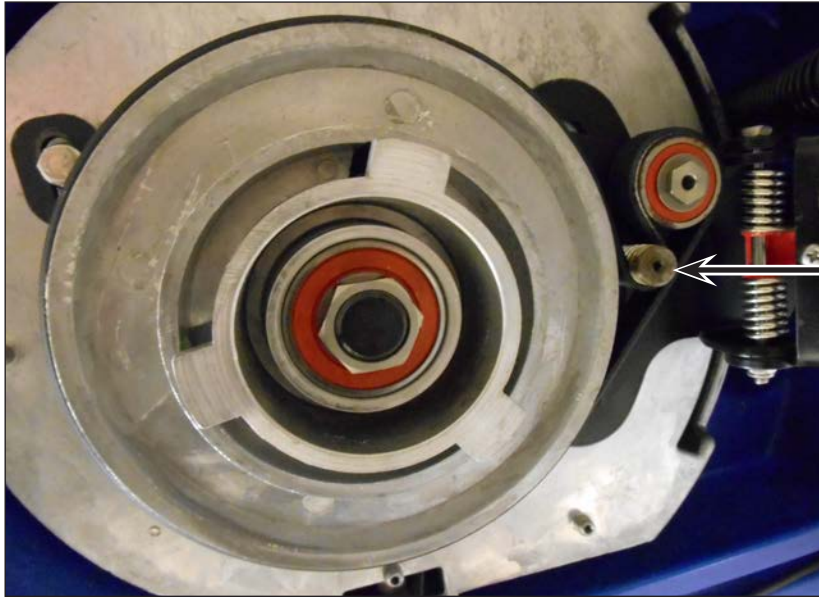


Brush motor



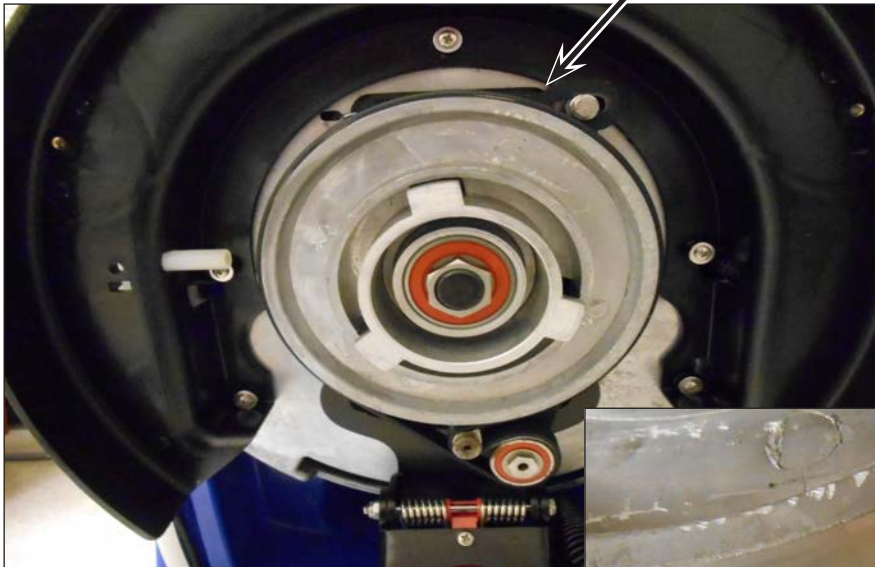
Driven Pulley

Drive Belt



Belt Tension Pulley

The Belt Tension Bracket and Spring are located on the opposite side of the driven pulley



Belt Tension Spring

Belt Tension Bracket



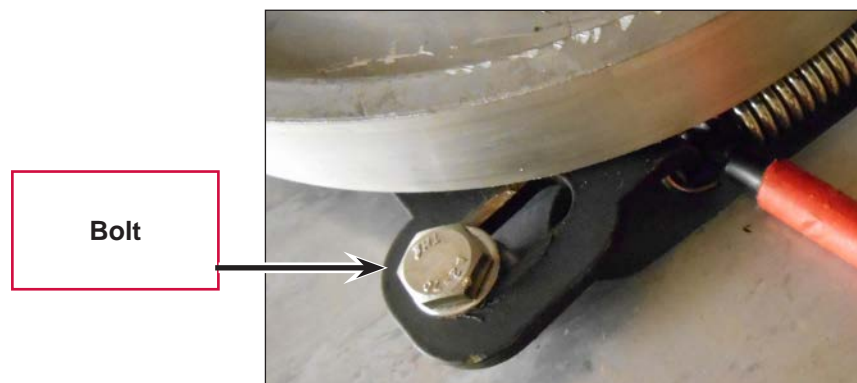
Troubleshooting

Problem	Causes	Solution
Brush circuit breaker trips repeatedly	<ul style="list-style-type: none"> The motor is overheating 	<ul style="list-style-type: none"> The machine is being used for work it was not designed to handle
	<ul style="list-style-type: none"> The driven pulley cannot spin freely 	<ul style="list-style-type: none"> Check the driven pulley for strings or other material that is preventing the pulley from turning
	<ul style="list-style-type: none"> The brush circuit breaker is defective 	<ul style="list-style-type: none"> Replace the circuit breaker
	<ul style="list-style-type: none"> The brush motor is defective 	<ul style="list-style-type: none"> Replace the brush motor
Brush motor will not turn, but the driven pulley spins freely	<ul style="list-style-type: none"> Brush circuit breaker is tripped 	<ul style="list-style-type: none"> Reset circuit breaker
	<ul style="list-style-type: none"> Defective trigger switch 	<ul style="list-style-type: none"> Replace trigger switch (see Electrical system)
	<ul style="list-style-type: none"> Defective brush motor 	<ul style="list-style-type: none"> Replace brush motor

Removal and Installation

Drive Belt

1. Drain both the Solution and Recovery tanks
2. Use the Squeegee lift lever on the handle to lower the squeegee assembly
3. Tip the machine back.
4. Remove the brush/pad driver
5. Remove the squeegee assembly
6. Loosen, but do not remove, the bolt on the belt tensioner bracket



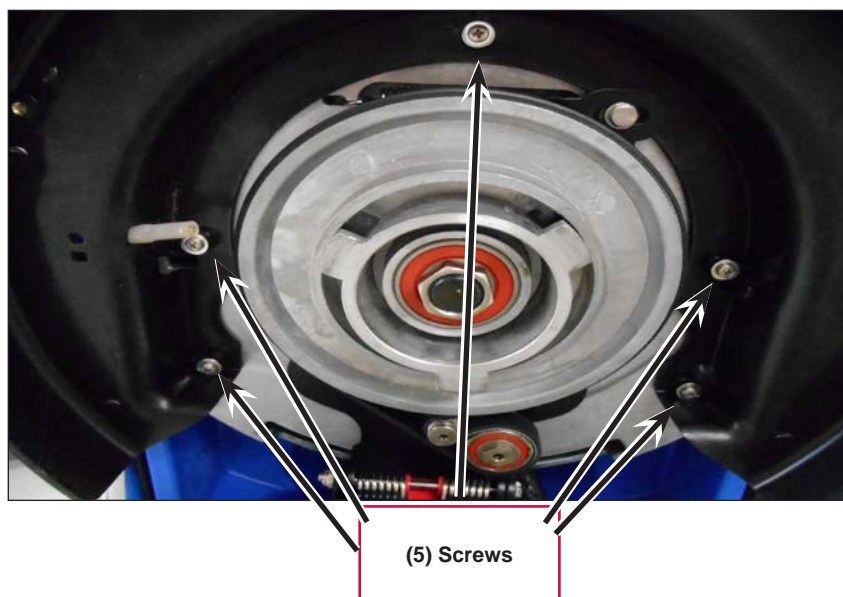
7. Grasp the bracket with a pair of pliers and pull to relieve the tension on the belt
8. Rotate the belt/pulley to work the belt off
9. Install the new belt in the reverse order

10. The belt routing is shown in this picture. Note that the “ribbed” side of the belt fits into the grooves on the brush motor shaft, and the “smooth” side of the belt rides on the Idler and driven pulleys.



Brush Motor

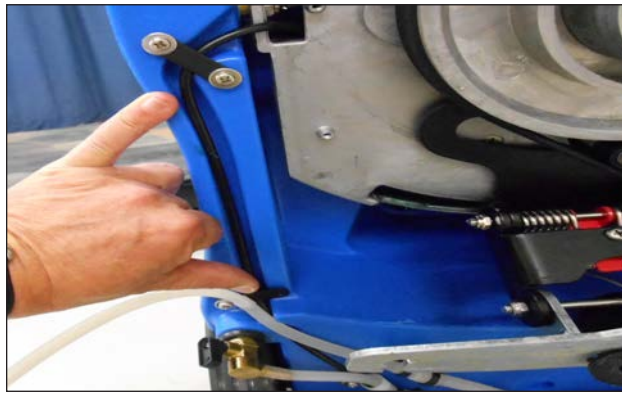
1. Drain both the Solution and Recovery tanks.
2. Remove the recovery tank
3. Remove the batteries as a “pack”
4. Use the Squeegee lift lever on the handle to lower the squeegee assembly
5. Tip the machine back
6. Remove the brush/pad driver and squeegee assembly
7. Remove the (5) screws that attach the brush deck



- Remove the plastic solution feed elbow from the clip and move aside



- Remove one of the screws and loosen the other to move the plastic retaining strips out of the way of the motor wires, and squeeze lift cable. This will allow you more room for movement



- For the brush deck mounting bolts:

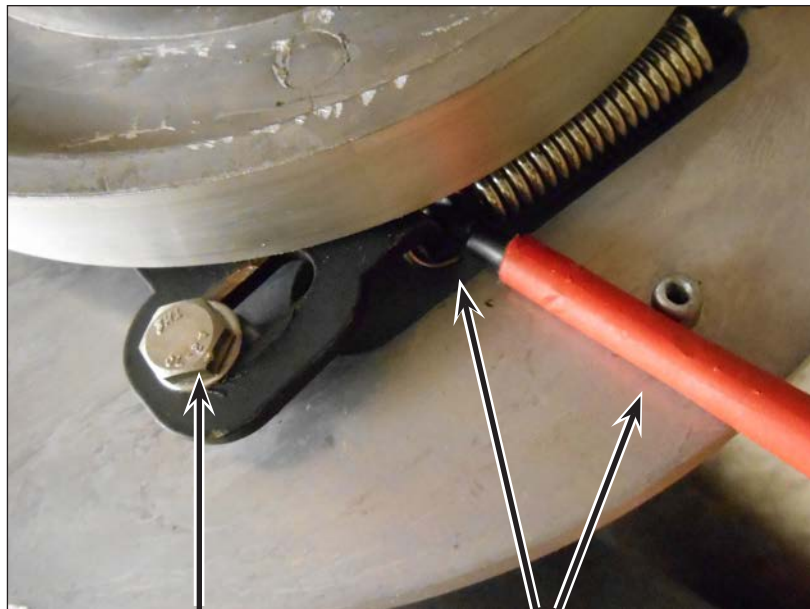
- Grasp the nylock nut, and unscrew the single Allen bolt on the right side of the machine. There is a bushing on the bolt. The bushing must be moved or taken out to get the motor plate to come out



- Repeat for the left side bolts. NOTE: The shorter Allen bolt toward the rear of the machine is used as a “stop”
- You can now carefully move the entire brush head out of the way to gain access to the brush motor.



11. Loosen the belt tension bracket bolt, and use a screwdriver to relieve the tension on the bracket



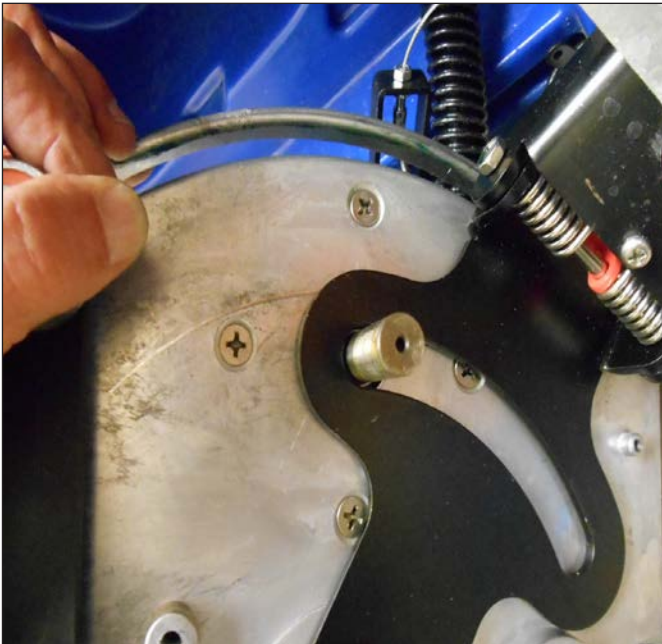
Belt tension bracket bolt

Using a screwdriver to relieve tension

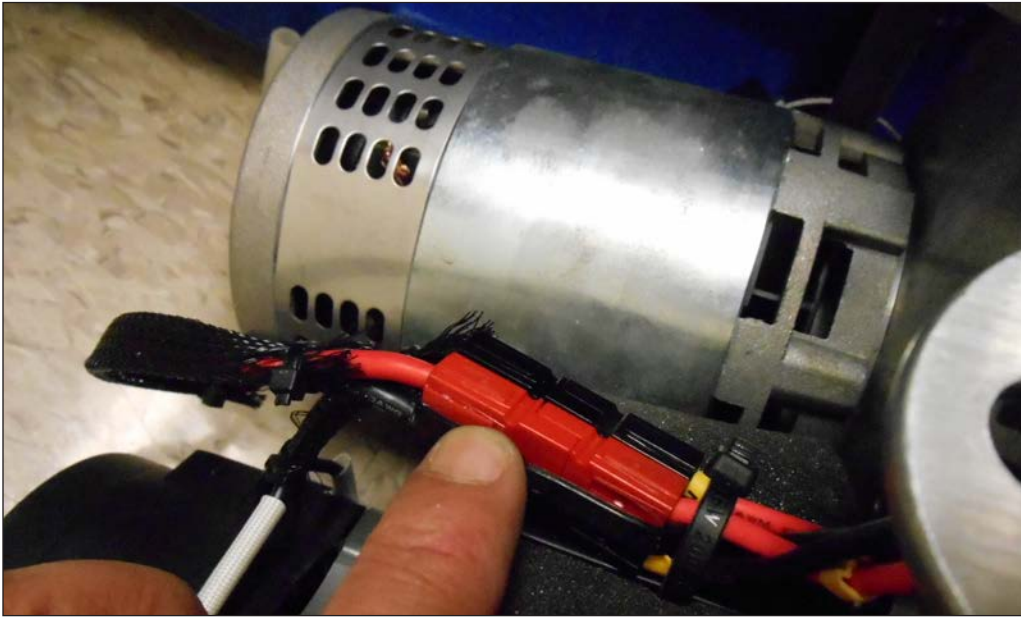
12. Remove the drive belt
13. Remove the large nut that holds the driven pulley



14. Remove the pulley to gain access to the brush motor mounting screws
15. Remove the (4) brush motor mounting screws. You will have to swing the squeegee bracket to get all the screws out



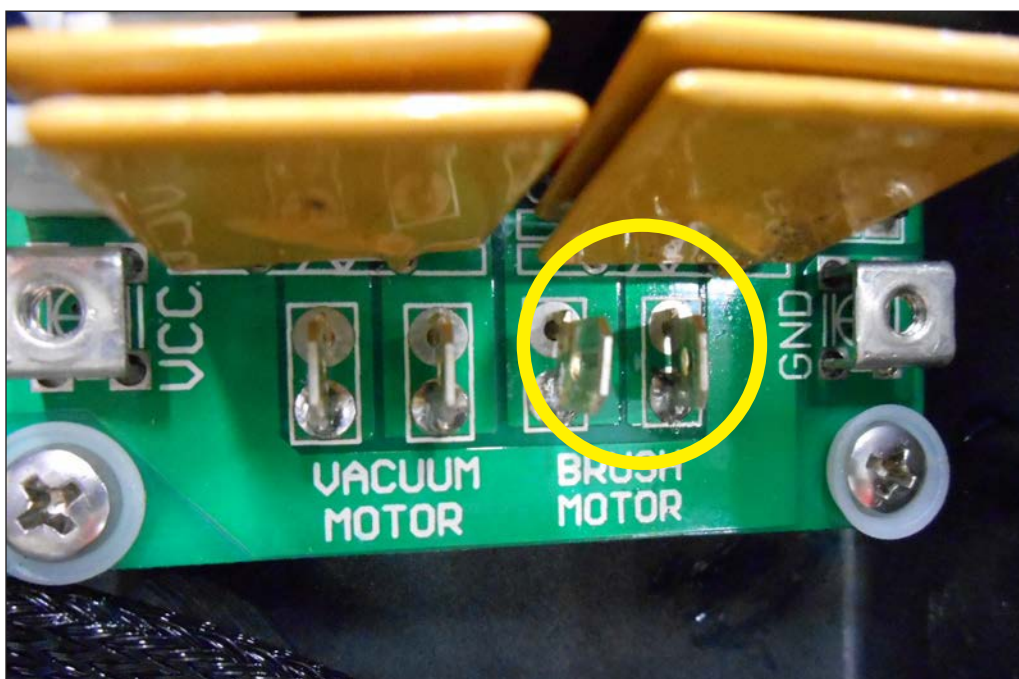
16. Cut the wire ties, and disconnect the brush motor connector



17. Install the new brush motor in the reverse order

Shop Measurements

- Amp draw of brush motor (free spin) - 2.8 amps
- Amp draw of brush motor (with brush turning on floor) - 9.5 amps
- Voltage measured at Control PCB terminals - 24 volts DC when POWER and BRUSH switches are ON



Solution System

Functional Description

The solution system is gravity feed, meaning there is no pump for the solution. The solution system is fed through a manual petcock (for adjusting solution flow) to a tube which connects to the solution valve.

The solution is then “held” by the solution valve. The solution valve is normally closed, and is energized when the solution switch is in the ON position, the brush switch is in the ON position, and the safety trigger switch is engaged. Once the solution valve is open, the solution continues to a tube that feeds the solution to an elbow just above the brush/pad driver.

The solution valve is open/closed only, and is not mechanically adjustable.

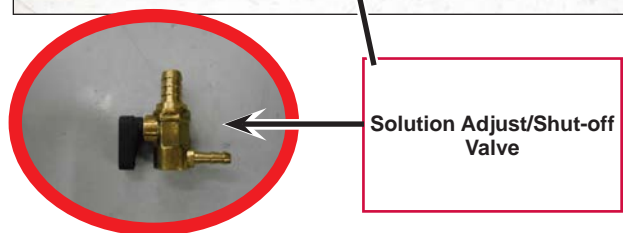
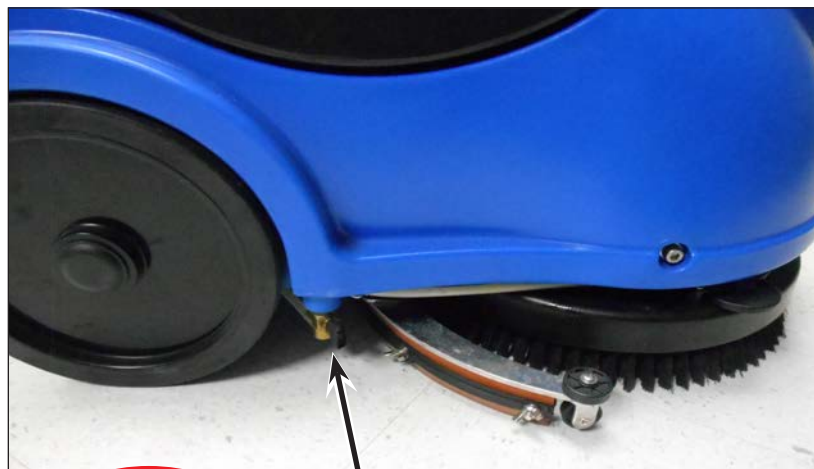
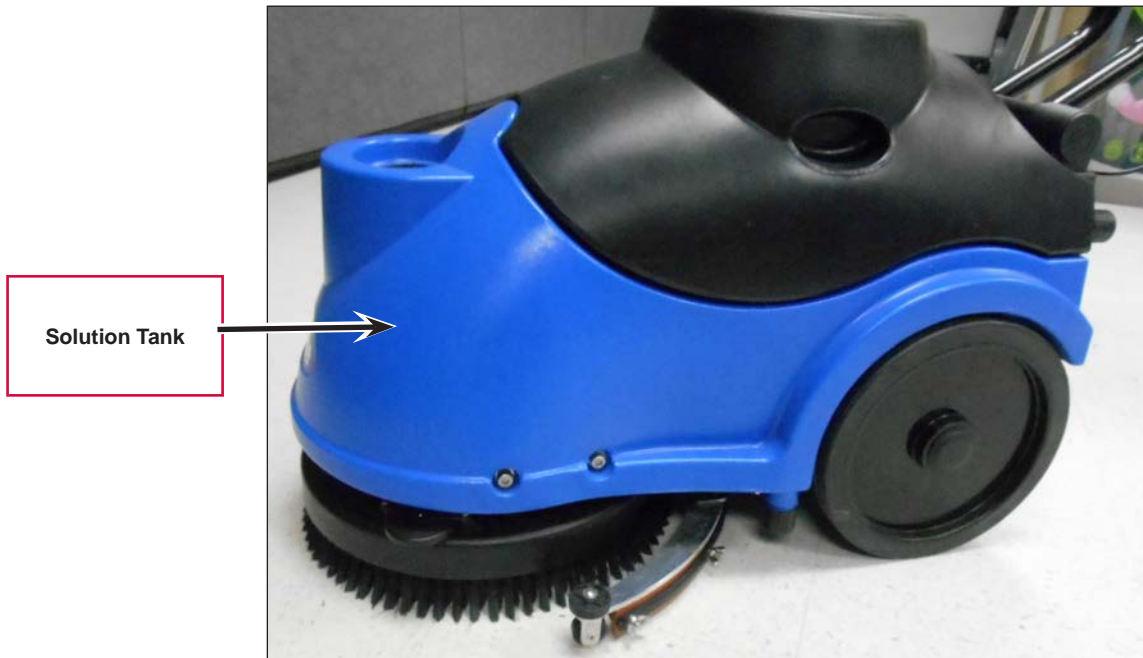
Circuit Description

The Solution circuit is very simple. When the Trigger switch is engaged, and the Solution Switch and Brush Switch is ON, the Solution Valve (Solenoid) will open, allowing solution to flow to the brush deck

The solution valve is connected to the Control PCB. The internal resistance of the solution valve is 113 ohms.

Component Locations

- Solution Tank
- Solution Shut-off/Adjustment Valve
- Solution Valve (solenoid)
- Solution Switch



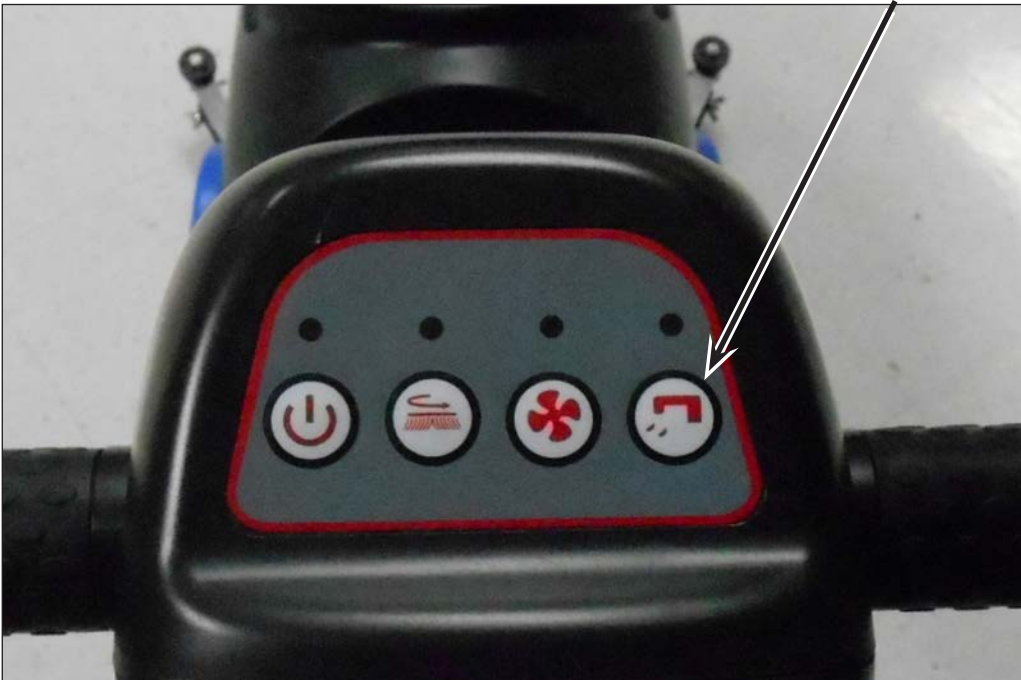
Solution Adjust/Shut-off Valve



Solution Valve
(Solenoid)



Solution Switch



Maintenance and Adjustment

Flushing Solution Tank

1. Work near a floor drain for convenient clean up if possible
2. Turn the power switch OFF
3. Remove the brush/pad driver
4. Close the Solution shut-off valve (The valve is closed when the handle is NOT in line with the hose)
5. Fill the Solution tank with hot water
6. Turn the power switch to ON, turn the Brush switch ON, turn the Solution switch ON. A full stream of water should flow out of the plastic elbow clipped to the brush deck
7. There is no solution filter on the MA50 15B, so if there is a restriction, it will be in the valve, solenoid, or tubes

Troubleshooting

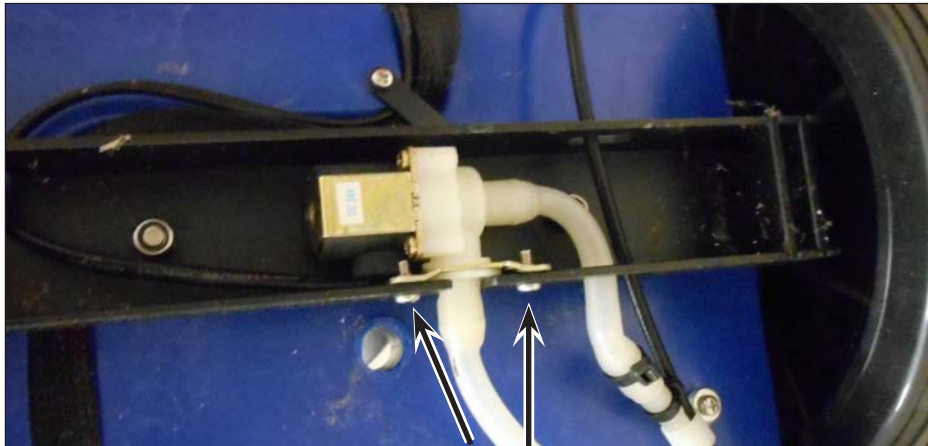
Problem	Cause	Correction
No Solution Flow	• Solution switch not in “ON” position	• Turn Solution switch to the “ON” position
	• Solution switch is defective	• Replace switch panel
	• Solution Solenoid is defective	• Replace Solution Solenoid
Insufficient Solution Flow	• Debris in the solution flow control	• Remove and clean the solution flow control
	• Debris in the solution feed lines	• Clean out solution tank and solution feed lines
	• Pinched/kinked solution feed hose	• Check all solution feed lines and remove pinches/kinks
	• Solution flow control knob is set too low	• Adjust the solution flow knob
	• Solution tank is near empty	• Re-fill Solution tank, and empty the Recovery tank
Solution leaks while machine is idle	• Leak in Solution tank	• Replace the Solution Tank
	• Defective solution solenoid	• Replace Solution solenoid
	• Solution tank is over-filled	• Drain some solution using the drain cap

Removal and Installation

Solution Solenoid

Note: Replacing the solution solenoid is difficult, and should only be done when you are certain it is a problem.

1. Remove all water from the solution and recovery tanks
2. Remove the Recovery tank
3. Remove the batteries as a “pack”, and set out of the way
4. Tip the machine back, and remove the squeegee assembly and brush
5. GENTLY tip the machine onto it's side
6. Remove the (2) screws that attach the solution solenoid to the axle

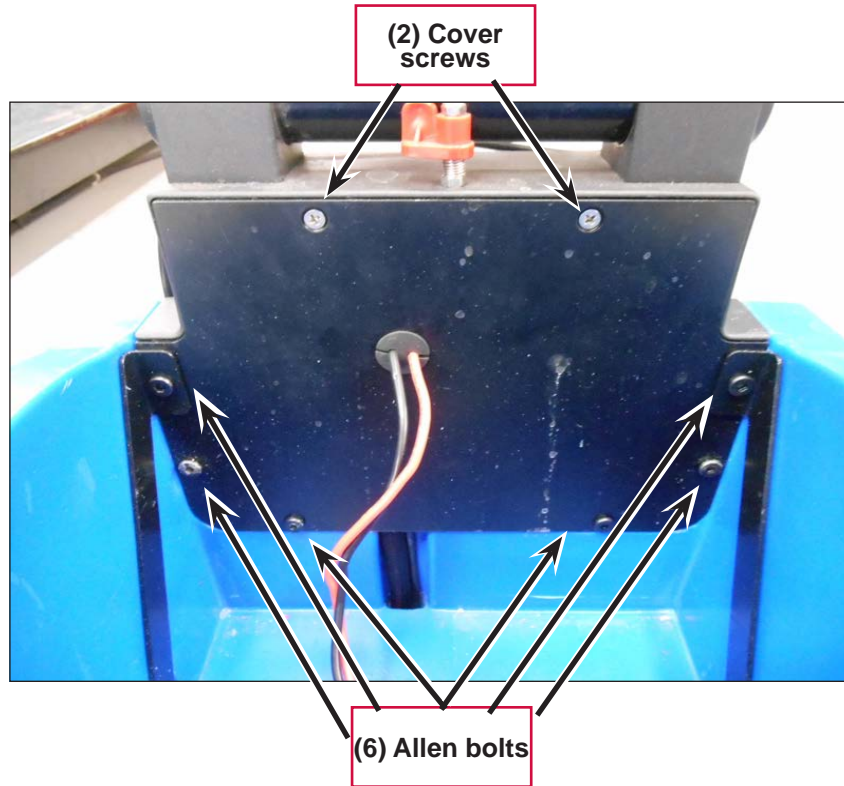


Screws

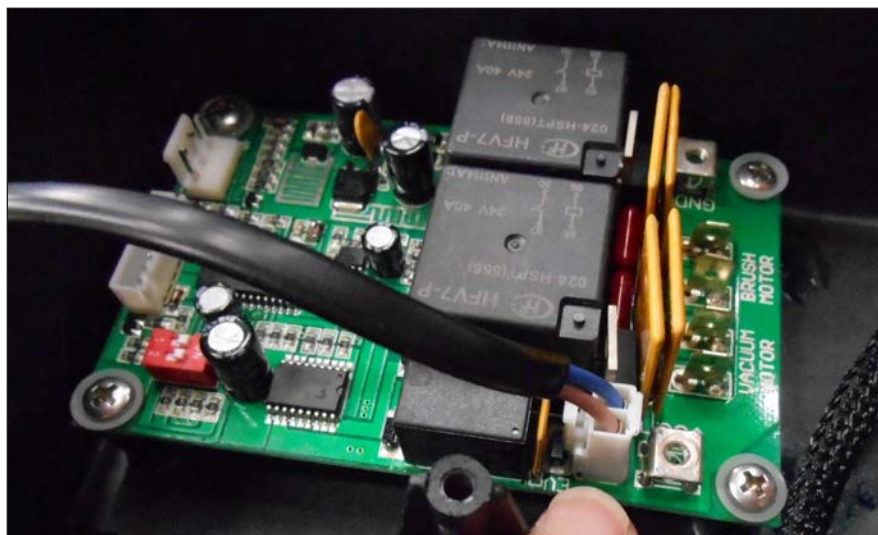
7. Remove the rubber tubes from the solenoid hose barbs. NOTE: These rubber tubes fit very tightly onto the hose barbs. A little heat will help removal
8. Remove (1) screw, and loosen the other to swing the plastic retaining strap out of the way



9. Now the solution solenoid is only attached to the machine by the wires. To get to the connector on the control PCB, you will need to remove the circuit box cover
10. Flip the machine right side up, and remove the (6) Allen bolts that attach the handle to the machine, and (2) Phillips screws, that hold the circuit box cover on. Do not remove the handle from the machine. After the (2) cover screws are removed, put (2) of the Allen bolts with acorn nuts back in place to hold the handle. NOTE: The (2) Allen bolts that pass through the support brackets are slightly longer than the other (4) bolts



11. Disconnect the solution solenoid cable from the control PCB



12. You can now “snake” the cable and connector out of the machine

13. “Snake” the cable and connector from the replacement solution solenoid through the machine, and install the connector onto the control PCB. The connector is “keyed” so pay attention
14. Remove the (2) Allen bolts that were holding the handle in place, and re-install the (2) cover screws
15. Re-install the (6) Allen bolts, acorn nuts and washers. NOTE: The acorn nuts that hold the plastic “C” clips for the squeegee lift cable do not use the flat washers
16. Flip the machine back on it’s side and re-install the new solution solenoid

Solution Flow control valve

1. Drain both tanks
2. Tip the machine back to gain access to the solution control valve



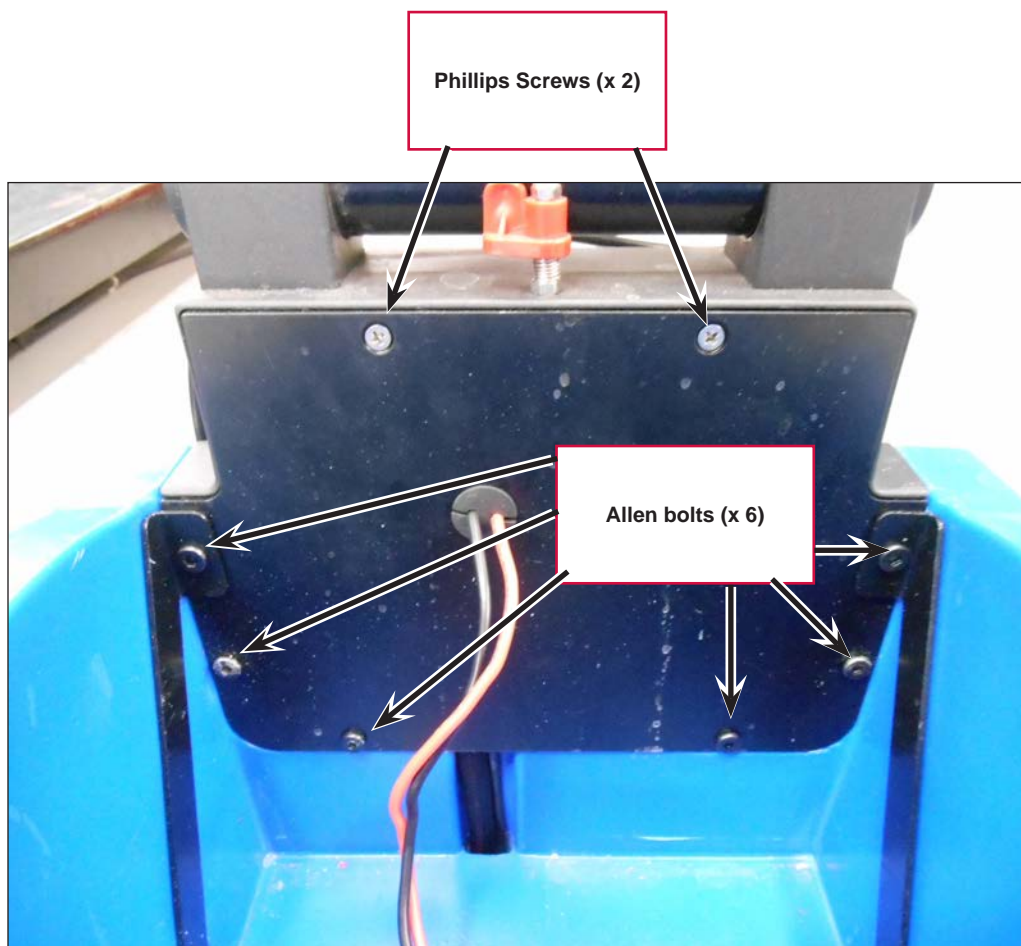
3. The larger hose barb on the valve is press fit into the gasket on the tank, and the smaller hose barb connects to the rubber tube that goes to the solution solenoid
4. Remove the valve from the tank gasket, and remove the rubber tube from the valve. The valve is now removed from the machine
5. Install the new valve in the reverse order

Solution Switch

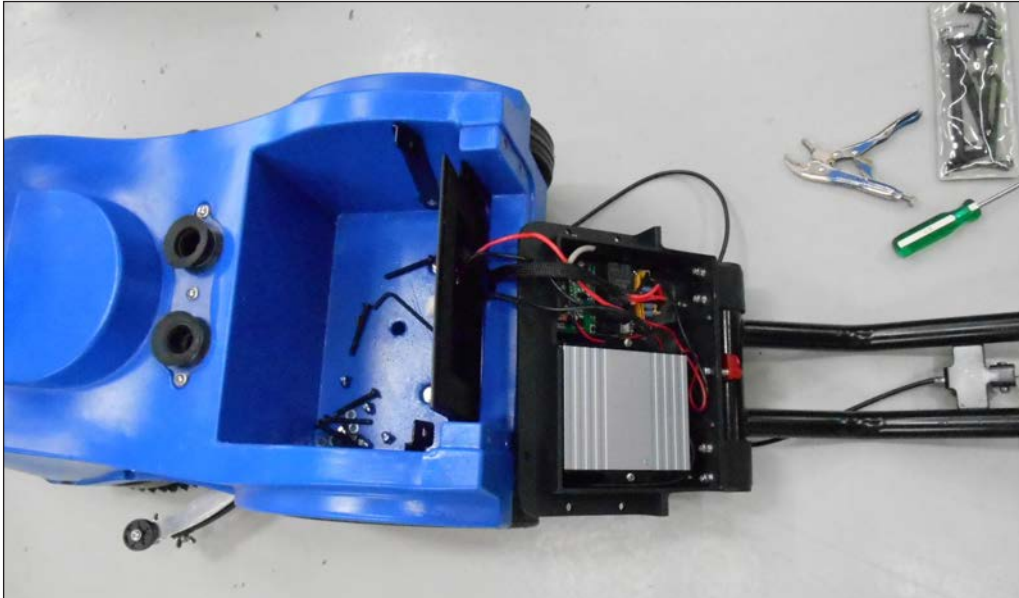
The solution switch is part of the switch PCB, and cannot be replaced separately. For detailed instructions on replacing the switch PCB, see the HANDLE SYSTEM section of this manual.

Control PCB

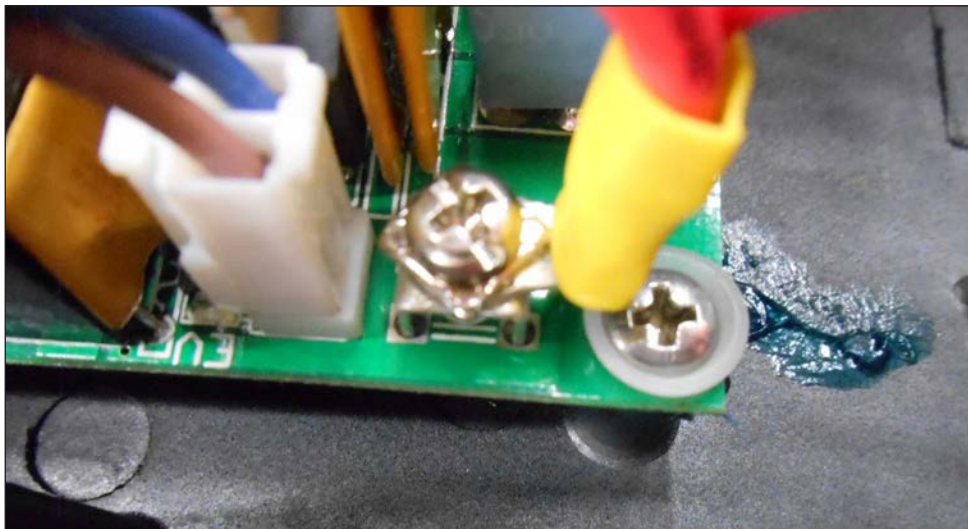
1. Remove the recovery tank
2. Disconnect batteries
3. Remove batteries as a “pack”
4. Remove (5) of the (6) Allen bolts w/acorn nuts. NOTE: The (2) longer Allen bolts go through the support brackets
5. Before you remove the last bolt, fold the handle down over the machine
6. Remove the last Allen bolt
7. Remove the (2) Phillips screws that secure the cover plate



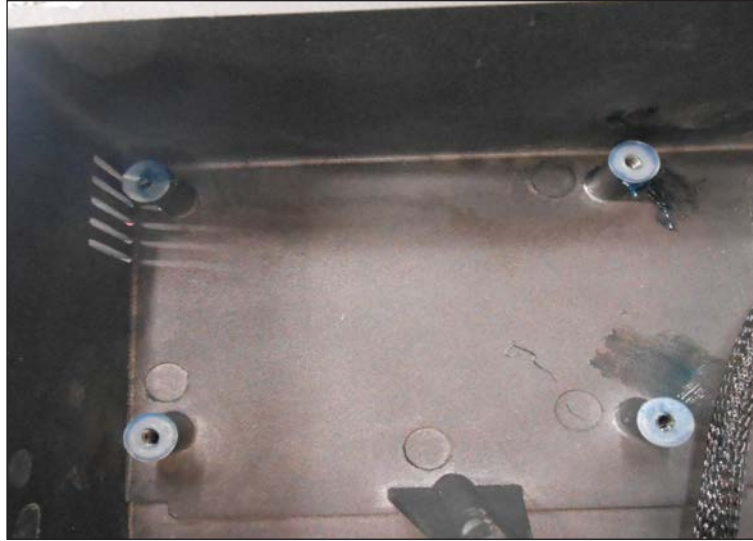
- Lift and tilt the handle away from the machine



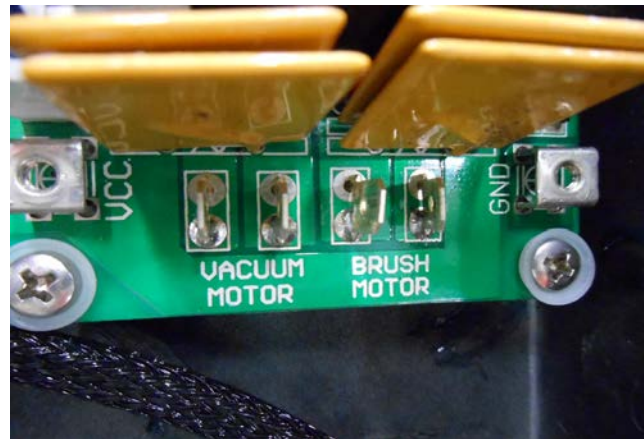
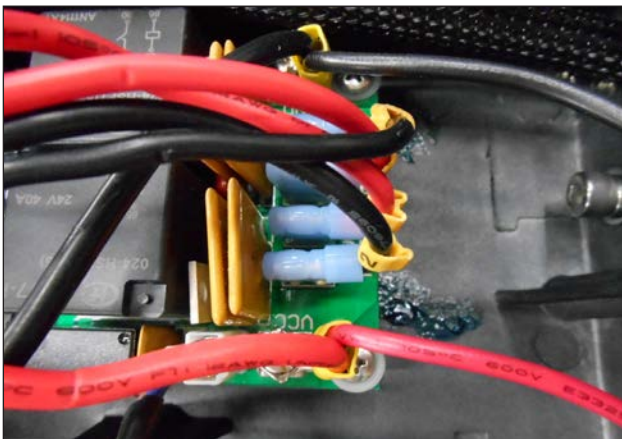
- Disconnect all of the wires and connectors from the PCB. The terminals for the 12 gauge wires from the batteries are screwed to the PCB with short Phillips screws



10. Remove the (4) Phillips screws that hold the PCB to the metal case. NOTE: There are nylon washers on the top and bottom of the PCB. Do not lose these washers
11. When re-installing the control PCB, use a dab of grease to hold the nylon washers in place on the mounting studs. It is very important to use these nylon washers to prevent a short circuit



12. Re-mount the control PCB to the case using the (4) screws and nylon washers. Again, it is very important to use the nylon washers to prevent a short circuit
13. Re-attach the wires and connectors to the control PCB. Connect the motor wires from left to right, in the following manner;
 - Vacuum motor - BLACK wire 2
 - Vacuum motor - RED wire 2
 - Brush motor - RED wire 1
 - Brush motor - BLACK wire 1



14. Re-assemble the handle in the reverse order as described above

Squeegee System

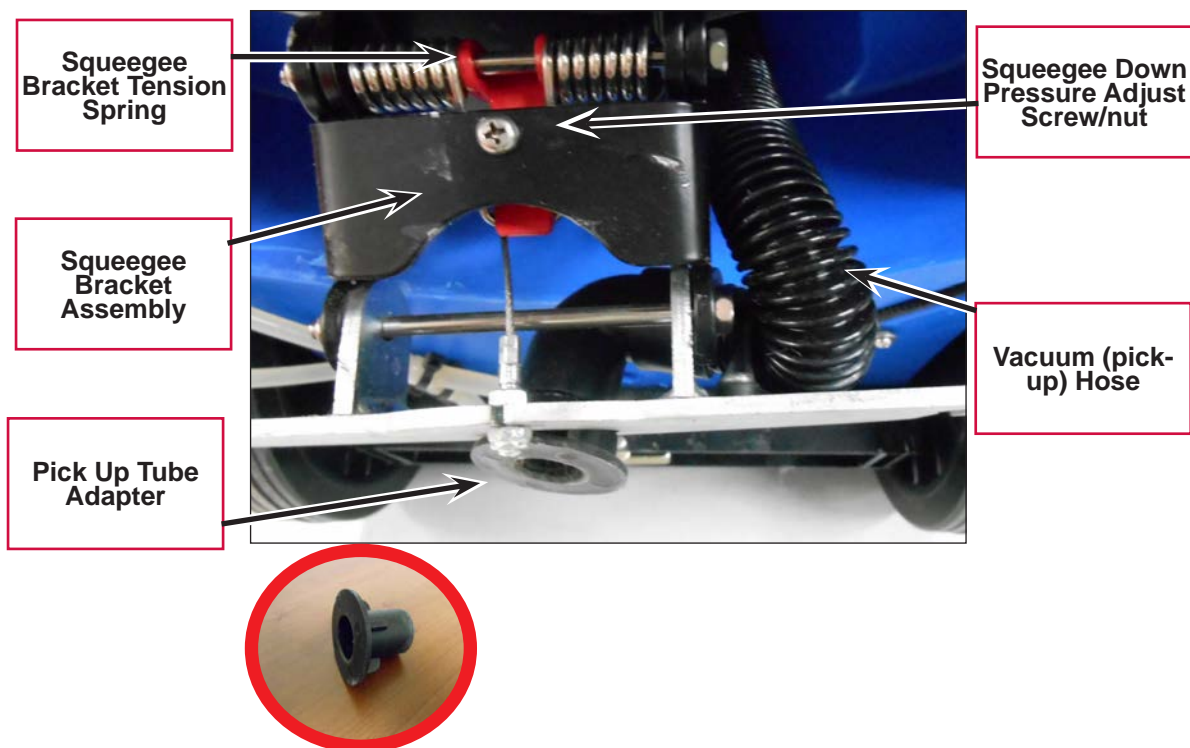
Functional Description

The CLARKE MA50 15B uses a parabolic style squeegee assembly attached to a swiveling squeegee mount bracket with (2) thumb screws. The squeegee is raised and lowered manually using the squeegee lift lever, and the squeegee lift cable. Down pressure on the squeegee is obtained by using a spring on the the squeegee mount bracket.

The squeegee assembly itself does not have any adjustments. The squeegee mounting bracket does have a bolt/nut for adjusting the down pressure of the squeegee assembly.

Component Locations

- Vacuum (pick-up) hose
- Pick Up Tube Adapter
- Squeegee Bracket Tension Spring
- Squeegee Down Pressure Adjust Screw/nut
- Squeegee Bracket Assembly
- Squeegee Assembly
- Squeegee Thumb Screws
- Squeegee Lift Handle
- Squeegee Lift Cable

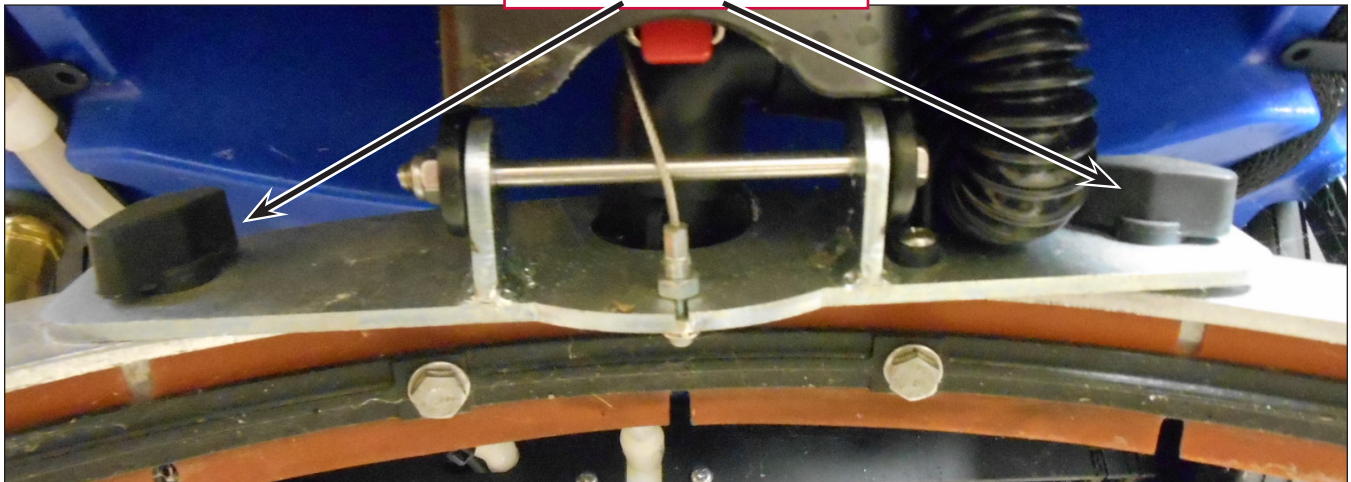




Squeegee Assembly



Squeegee Thumb Screws





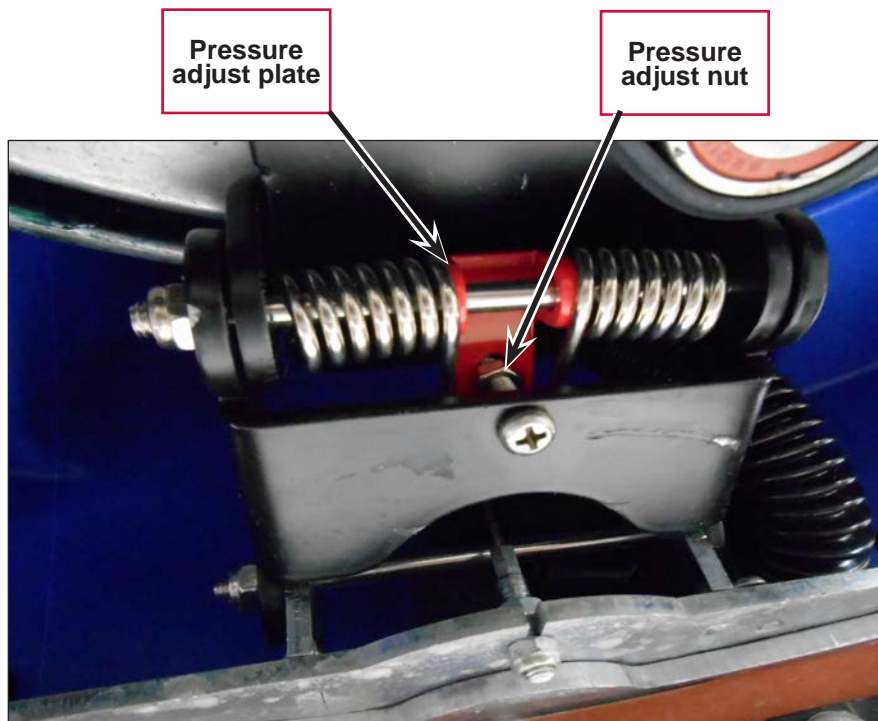
Squeegee Lift Handle

Squeegee Lift Cable

Maintenance and Adjustment

Adjusting the Squeegee down pressure

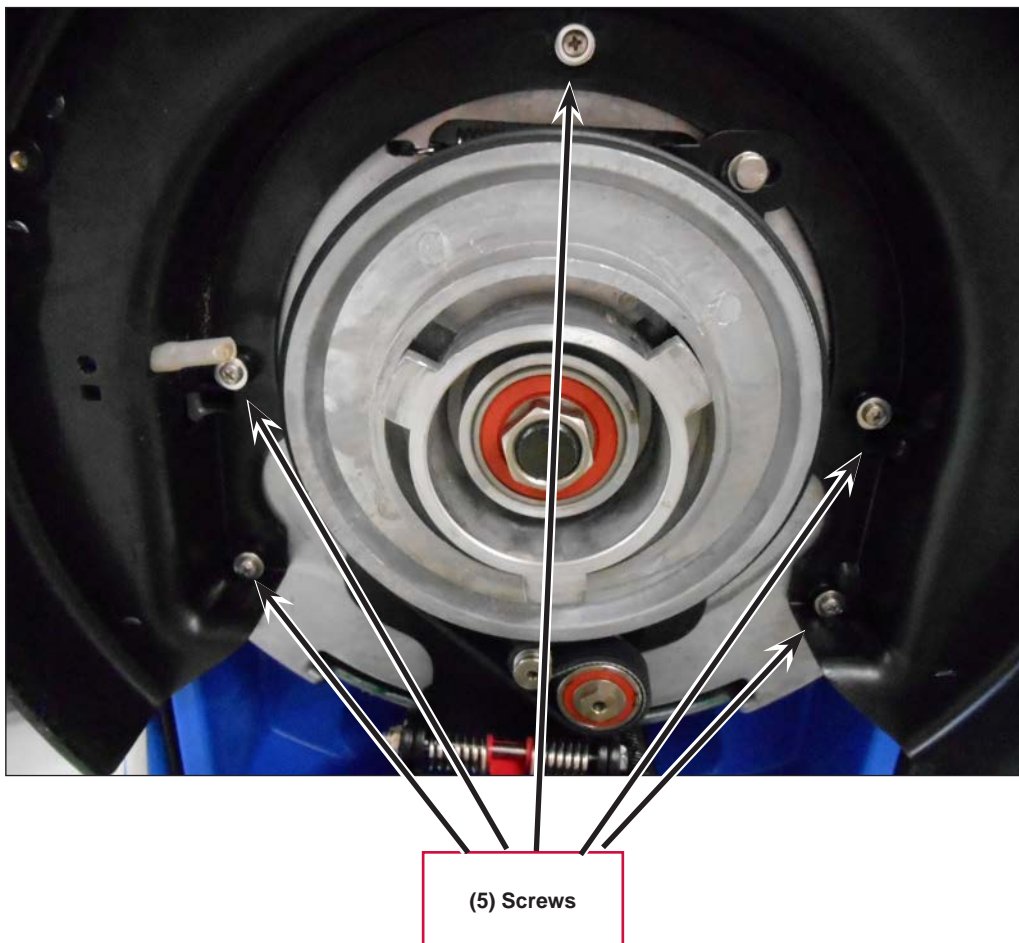
- The squeegee down pressure can be adjusted so that there is a gentle deflection across the entire blade while traveling in the forward direction. This deflection places the edge of the squeegee blade in the proper position for “wiping” the floor nearly dry. Proper deflection is between 1/8 and 1/4 inch.
1. Lower the squeegee lift cable (using the squeegee lift handle)
 2. Tip the machine back
 3. Remove the Brush/pad driver
 4. Remove the squeegee assembly
 5. Adjust the pressure adjust nut that the is against the pressure adjust plate
 - Adjust the nut away from the screw head for more pressure, toward the screw head for less pressure



Removal and Installation

Squeegee Lift Cable

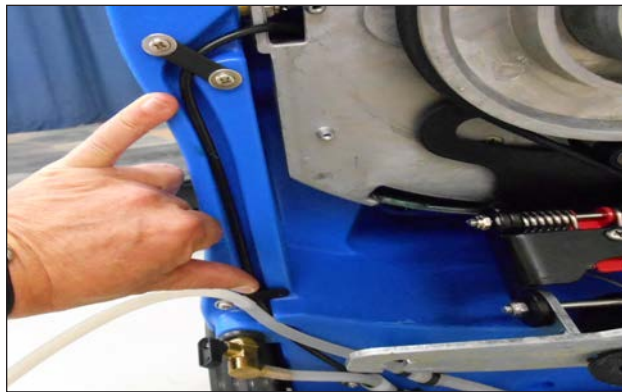
1. Drain both the Solution and Recovery tanks
2. Remove the recovery tank
3. Remove the batteries as a “pack”
4. Use the Squeegee lift lever on the handle to lower the squeegee assembly
5. Tip the machine back
6. Remove the brush/pad driver
7. Remove the squeegee assembly
8. Remove the (5) screws that attach the brush deck



9. Remove the plastic solution feed elbow from the clip and move aside



10. Remove one of the screws and loosen the other to move the plastic retaining strips out of the way of the motor wires, and squeegee lift cable. This will allow you more room for movement



11. For the brush deck mounting bolts:

- Grasp the nylock nut, and unscrew the single Allen bolt on the right side of the machine. There is a bushing on the bolt. The bushing must be moved or taken out to get the motor plate to come out



- Repeat for the left side bolts. NOTE: The shorter Allen bolt toward the rear of the machine is used as a “stop”
- You can now carefully move the entire brush head out of the way to gain access to the squeegee cable mounting brackets



12. Slightly loosen the nuts that attach the cable to the brackets. The brackets are slotted so you can slide the cable out

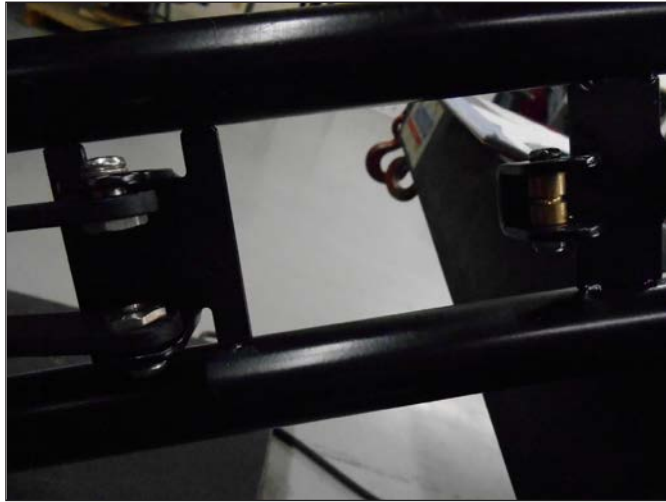




13. Remove the (2) plastic clamps that hold the squeegee to the rear of the machine



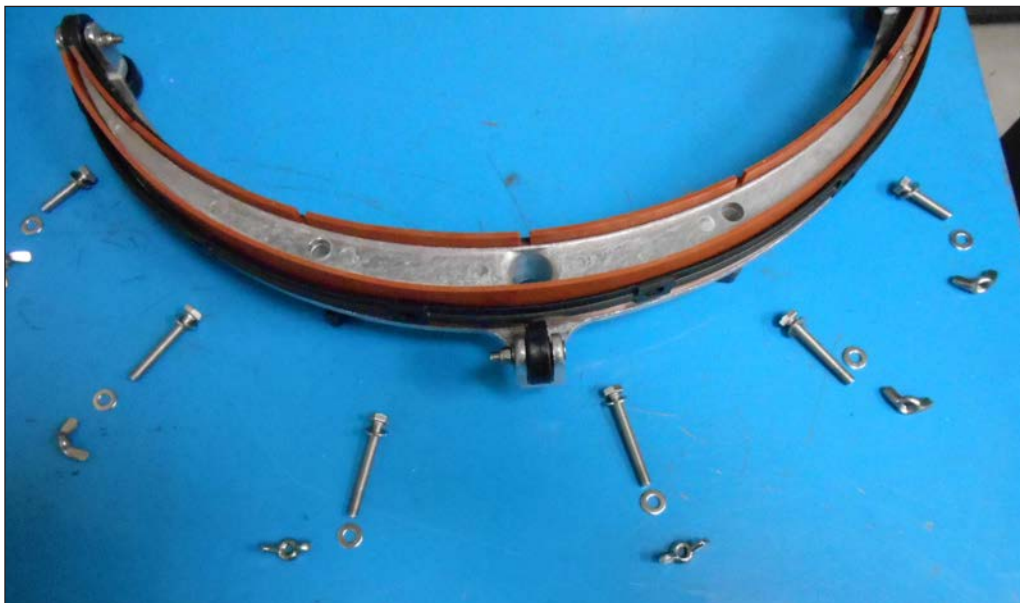
14. Remove one of the brass “rollers” on the handle, and disassemble the pin at the squeegee lift handle



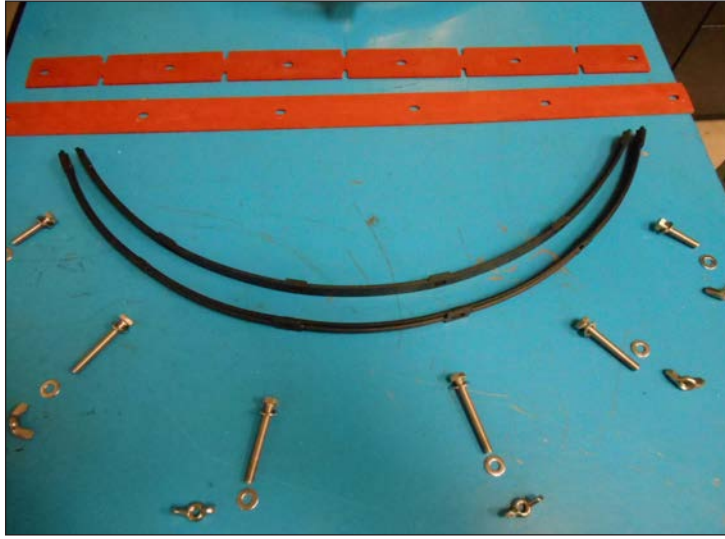
15. Snake the cable out of the machine
16. Replace in reverse order

Squeegee Blades

1. Lower the squeegee lift lever on the handle
2. Tip the machine back
3. Remove the squeegee assembly by unscrewing the (2) thumb screws
4. Remove the wing nuts and flat washers
5. Remove the (6) bolts. NOTE: The bolts are different lengths. Longest on the inside holes, and shortest on the outside holes



6. Now remove the plastic backing strips. NOTE: The inside backing strip is shorter than the outside strip



7. You can now remove the squeegee blades. NOTE: Both squeegee can be flipped, and used again. The blades have working surfaces on both edges
8. Re-assemble the squeegee in the reverse order

Troubleshooting

Problem	Cause	Correction
Poor Water Pick-Up	Vacuum leak(s) due to; <ul style="list-style-type: none"> • Leaky Vacuum hose • Damaged pick-up adapter tube • Recovery tank drain plug not installed properly • Recovery tank cover is mis-aligned, or damaged 	<ul style="list-style-type: none"> • Check the vacuum hose, and tighten/replace as necessary • Replace pick up adapter tube • Insure drain plug is installed correctly • Check the cover, and adjust/replace as necessary
	Restrictions due to build up of debris; <ul style="list-style-type: none"> • In the recovery tank or standpipe • In the vacuum hose • In the squeegee assembly 	Check the standpipe, check the vacuum hose, and squeegee assembly for accumulated dirt. Clean as required.
	Squeegee blades are worn, not installed correctly, or out of adjustment	Check the squeegee blades for proper installation, wear, or damage. Replace as required. Adjust the squeegee blades and/or down pressure.