



Electronic Service Manuals

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Clarke CA90 32T™



Service Manual

Model Numbers:

Clarke 810T

Clarke®

English

11/2015 - Form No. 56043170

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General Information

Machine Description

The CLARKE CA90 32T is a battery powered walk-behind automatic floor scrubber. It is intended for use in large commercial facilities such as hospitals, schools, factories, and retail stores.

The CLARKE CA90 32T is equipped with (2) counter rotating pad/brush holders to provide a 32 inch cleaning path.

The machine has (6) 6 volt batteries connected in series to provide 36 volts DC to the transaxle and other systems.

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
11/15	Initial publication

Other Reference Manuals

Clarke 810T Operators manual (Includes Parts List Information) - Form number 56091127

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 of CLARKE commercial floor cleaning equipment.

- Digital Voltmeter (DVM) with current clamp
- Hydrometer
- 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.

Safety

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

SYMBOLS



DANGER!

It indicates a dangerous situation with risk of death for the operator.



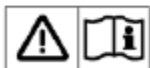
WARNING!

It indicates a potential risk of injury for people or damage to objects.



CAUTION!

It indicates a caution related to important or useful functions.
Pay careful attention to the paragraphs marked by this symbol.



CONSULTATION

It indicates the necessity to refer to the Operator's Manual before performing any procedure.

General Safety Instructions

Specific Cautions and Warnings are included to warn you of potential danger of machine damage or bodily harm.

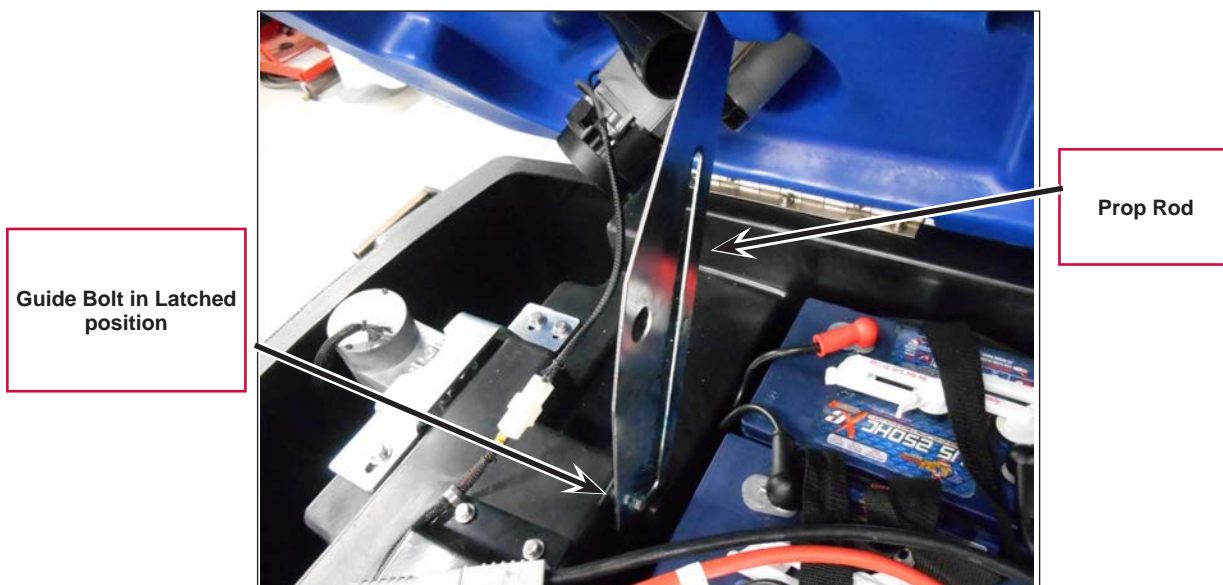
This machine is for commercial use, for example in hotels, schools, hospitals, factories, shops and offices other than normal residential housekeeping purposes.

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.
- Avoid sudden stops when on ramps or inclines. Avoid abrupt sharp turns. Use low speed down ramps.
- Keep sparks, flame and smoking materials away from batteries. Explosive gases are vented during normal operation.
- Charging the batteries produces highly-explosive hydrogen gas. Charge the batteries only in well-ventilated areas away from open flame. Insure the battery compartment is open during the charging process. Do not smoke while charging the batteries.
- Turn the Key Switch “OFF” and disconnect the batteries before servicing electrical components.
- Never work underneath a machine without safety blocks or stands to support the machine.
- 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.

Prop Rod

The Prop Rod holds up the recovery tank to allow access to the battery compartment, and is used during battery charging. Before using the prop rod, empty the recovery tank. Also, insure the guide bolt is in the latched position.



Nameplate

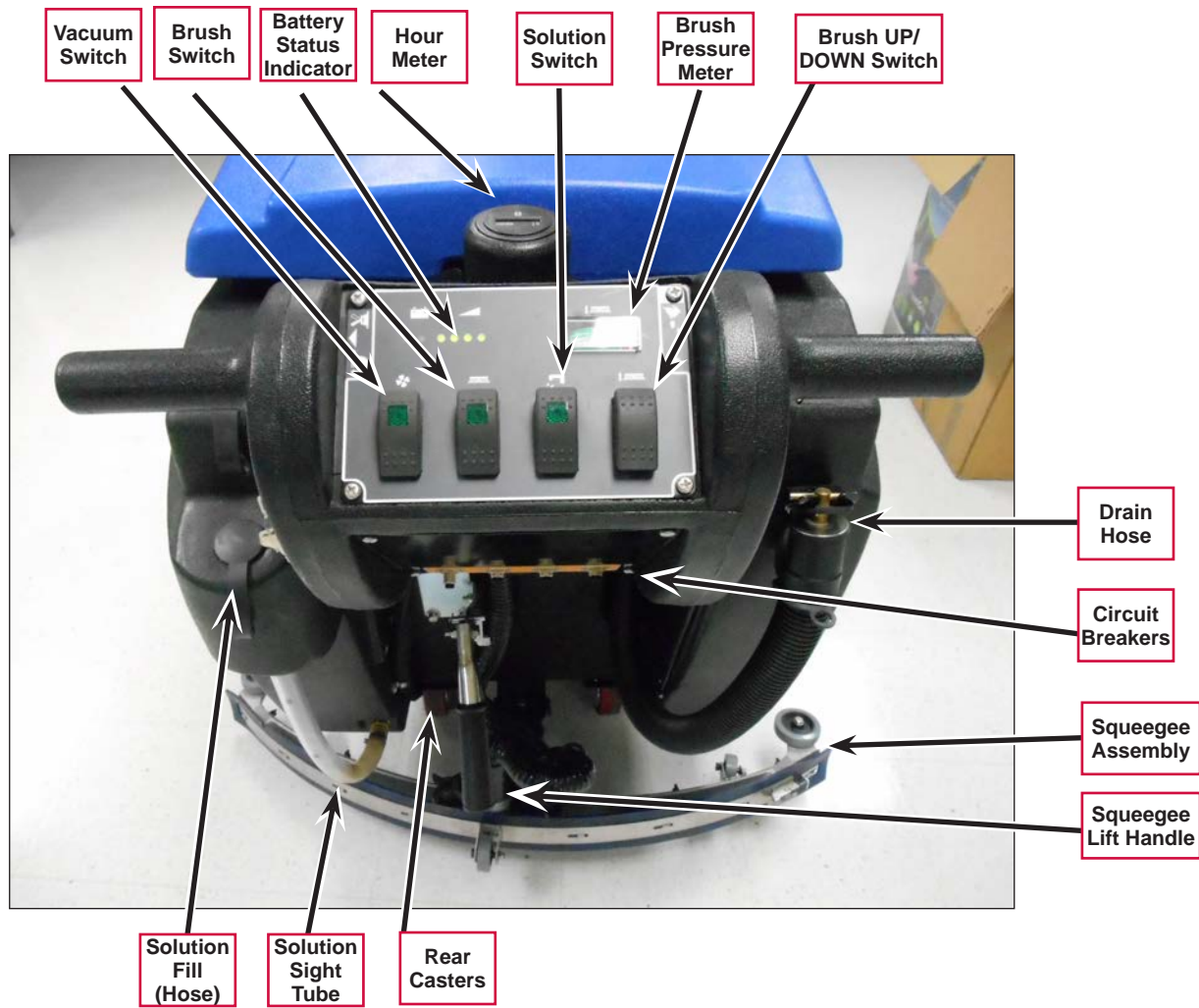
The nameplate contains important identification information which will be needed when ordering parts: Model number, Description, and Serial number.

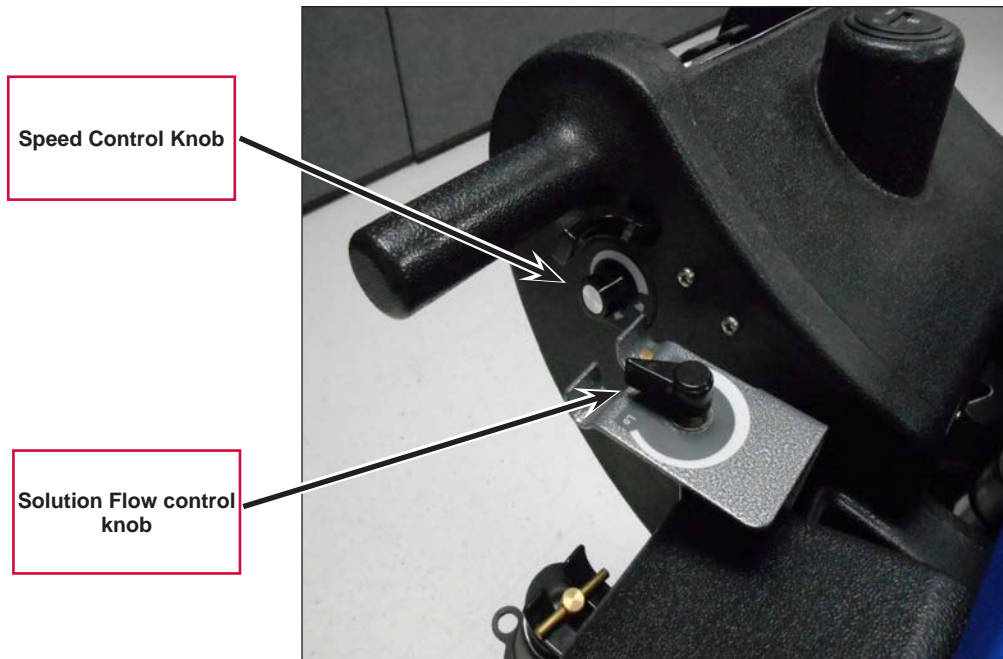
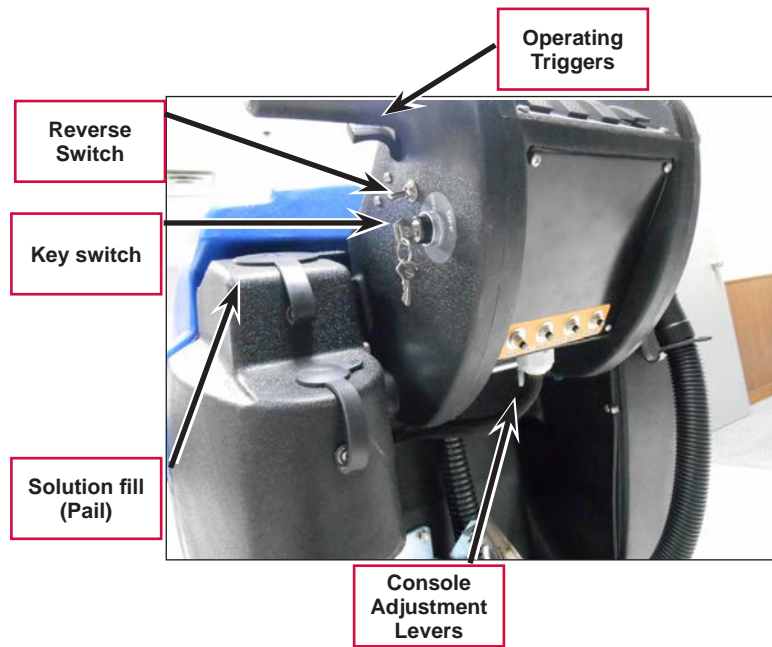


Machine Specifications

Specification	Standard	Metric
Cleaning Path	32 Inches	80 cm
Solution Tank	30 Gallons	115 l
Recovery Tank	28 Gallons	106 l
Pad Size	2 x 16 Inches	2 x 40.6 cm
Pad Pressure, variable	Up to 200 Pounds	Up to 91 kg
Squeegee Width	40 Inches	101.6 cm
Speed Control	Variable - Forward/Reverse	Variable - Forward/Reverse
Cleaning Productivity	34,560 Sq. ft/hr.	3211 Sq. m/hr.
Drive System	.5 H.P. Transaxle Drive	.37 kW Transaxle Drive
Wheels, Non-marking, Gray	(2) 12 Inch, Foam Filled	(2) 30.5 Cm Foam Filled
Brush Motor, RPM Speed	1 H.P., 200 RPM	.74 Kw, 200 RPM
Vacuum Motor/Water Lift	3 Stage/73 Inches	3 Stage/186 cm
Optional Batteries	Six 6 Volt - 250 amp./hour	Six 6 Volt - 250 amp./hour
Charger	25 Amp. Shelf Charger	25 Amp. Shelf Charger
Run Time per Charge	Approximately 4 1/2 - 5 hours	Approximately 4 1/2 - 5 hours
Weight without Batteries	440.5 Lbs	200 kg
Shipping weight w/o Batteries	631 Lbs	286 kg
Dimensions	66.5 in x 41.3 in x 42.9 in	169 cm x 105 cm x 109 cm

Component Locations





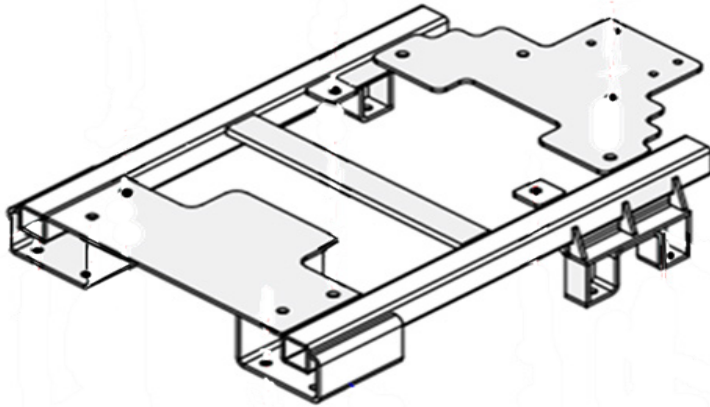
Preventative Maintenance

	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 fluid levels in battery cells		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
Grease the rear casters			X
Lubricate all pivot points with a silicone Spray			X
Thoroughly flush the solution tank, drain hose, and vacuum hose with hot water			X

Chassis System

Functional Description

The Clarke CA90 32T uses a welded steel chassis to support the machine. Bolted to the chassis are the solution tank, transaxle, casters, squeegee bracket, and brush deck supports. Also, the main wiring harness travels through one of the channels of the chassis.



Component Locations

The chassis is located underneath the solution tank, and above the transaxle and rear casters.

Control System

Functional Description

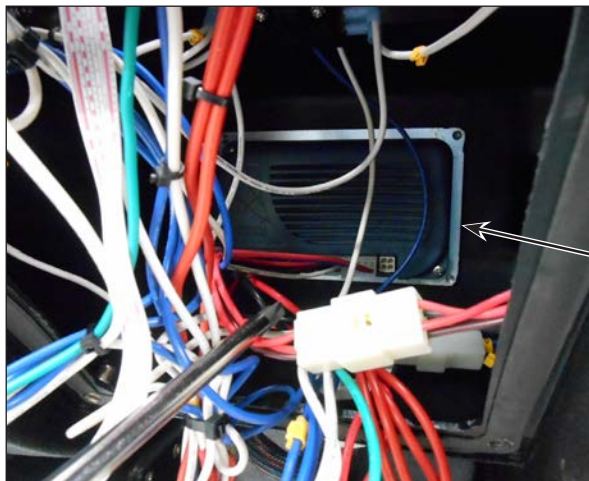
The CLARKE CA90 32T has (1) controller for the traction drive, and switches and solenoids for the other systems.

The traction drive controller is a Curtis model 1228-3430. The inputs for the Curtis Speed Control are B+, B - , Keyswitch enable, Forward/Reverse switch, and the Speed Control Potentiometer. When all of the inputs to the Curtis Speed Control Board are within the proper range, the machine will move.

All of the controls are located on or in the machine control housing within easy reach of the operator.

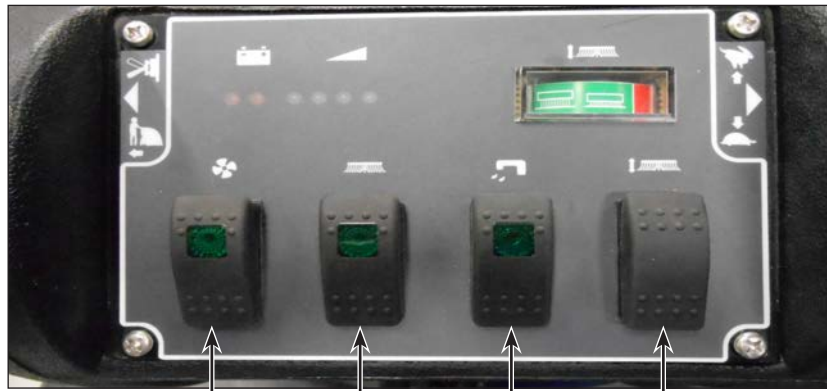
Component Locations

- Curtis Controller
- System Switches
- Trigger switch
- Forward/Reverse Switch
- Speed control knob
- Solution Control knob
- Solenoids
- Circuit breakers (Located on the lower panel of the control housing)

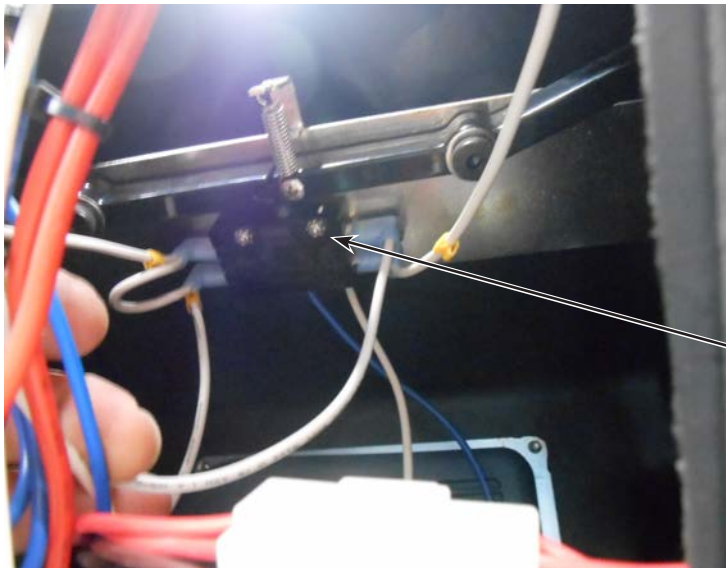


Curtis Speed
Controller
Mounted in
control housing

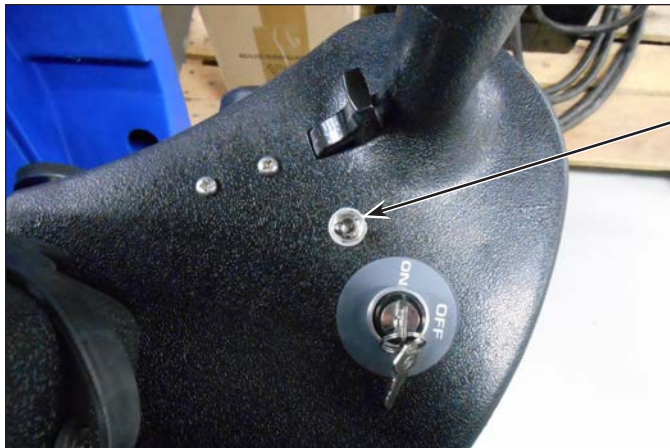
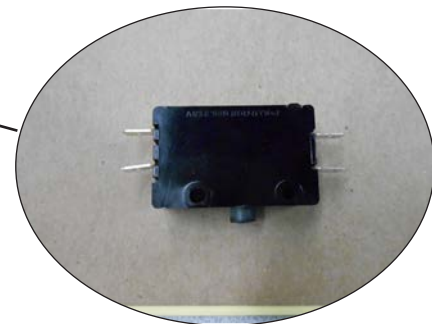




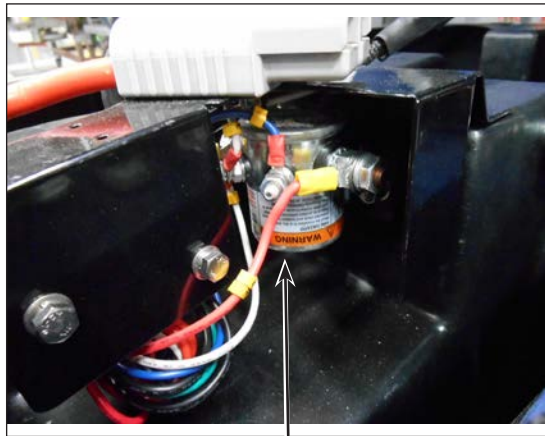
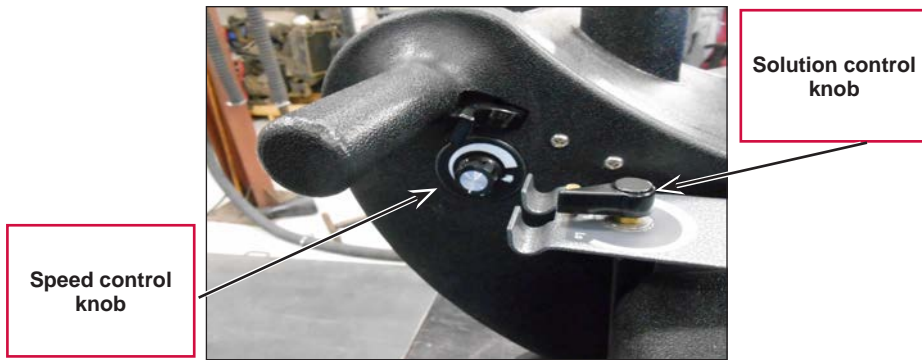
Vacuum Motor Switch Brush Switch Solution Switch Actuator Up/Down Switch



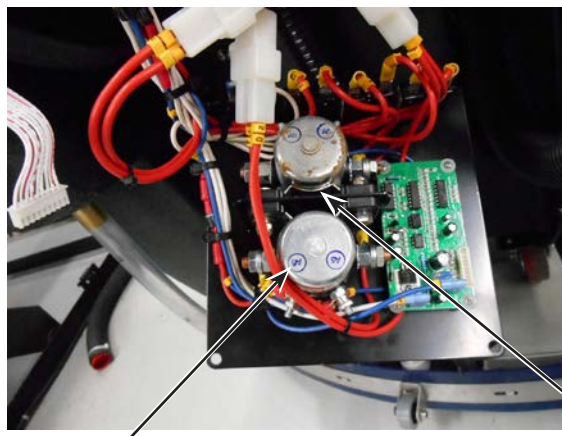
Trigger Switch
(looking up through lower housing panel)



Forward/Reverse Switch



MAIN Solenoid



Vacuum Solenoid

Brush Solenoid



Circuit Breakers (Located on lower control housing panel)

Maintenance and Adjustment

No maintenance or adjustment is required for the control system

Electrical System

Functional Description

The electrical system consists of switches, circuit breakers, and contactors mounted inside the control housing, and inside the battery compartment. The battery charger is a “shelf” style charger which is 36 volts DC, and has an output of 25 amps maximum.



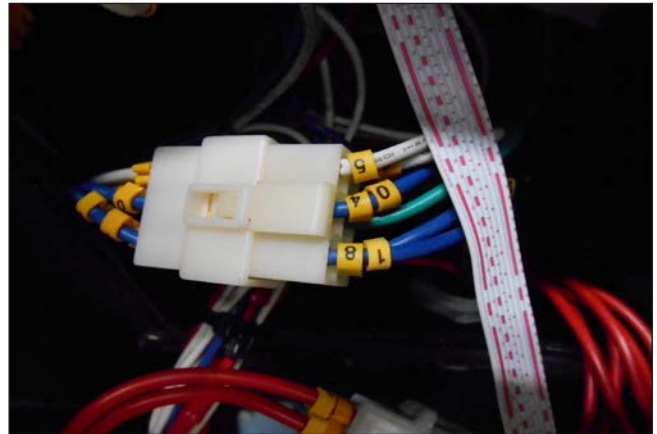
The electrical system is powered by (6) 6-volt batteries for a total of 36 volts. Heavy cables connect the batteries in series. A large gray main battery pack connector is used for connecting the batteries to the “shelf” battery charger unit.

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.

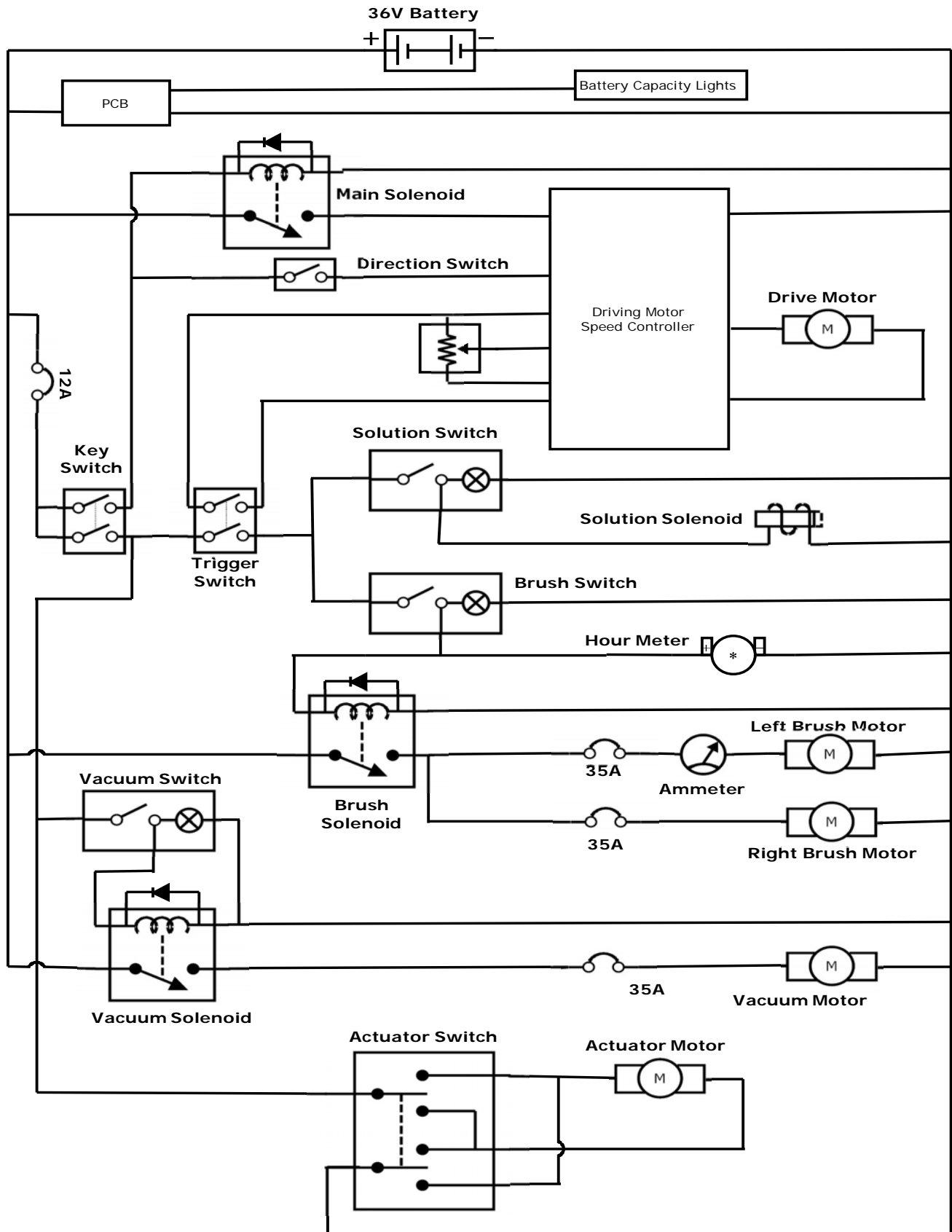
The circuit breakers protect various circuits from excessive current.



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

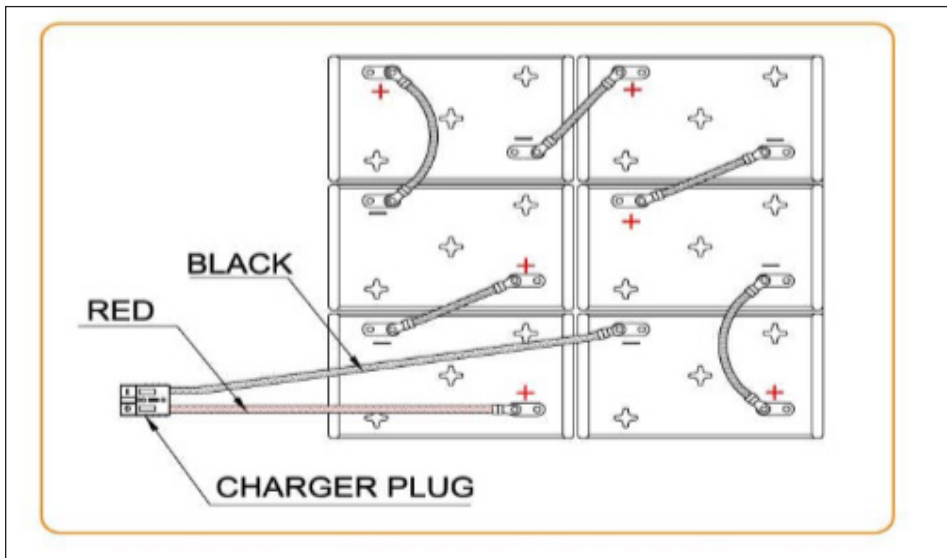


Electrical Circuit Diagram (ladder style)



Battery Connections

- The batteries should be connected in series as shown in the diagram 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



WARNING: Batteries emit hydrogen gas. Explosion or fire can result from hydrogen gas. Keep sparks and fire away ! Keep battery compartment open when charging.

- Turn the key switch to the “OFF” position.
- Insure the recovery tank is drained.
- Open the recovery tank, and set the prop rod to hold the tank in the UP position.
- Plug approved charger into a grounded wall outlet before plugging the charger into the machine.
- Plug the charger into the GRAY connector attached to the battery pack.
- The charger will automatically begin to charge the batteries, and it will automatically shut down when the charging cycle is complete.
- Upon completion of the charge, first unplug the charger from the wall outlet, then dis-connect the charger from the battery pack.
- Check the fluid levels in the batteries after charging is completed.
- Re-connect the GRAY connector from the battery pack to the machine connector.

Basic Troubleshooting

Problem	Cause	Correction
<ul style="list-style-type: none"> No Power 	<ul style="list-style-type: none"> Key not in "ON" position Main circuit breaker tripped Batteries need charge Loose battery connection 	<ul style="list-style-type: none"> Turn Key to "ON" position Reset Main breaker Re-charge batteries Check and tighten battery connections
<ul style="list-style-type: none"> Brush motor(s) does not run 		<ul style="list-style-type: none"> See Scrub System
<ul style="list-style-type: none"> Little or no solution flow 		<ul style="list-style-type: none"> See Solution System
<ul style="list-style-type: none"> Poor water pick-up 		<ul style="list-style-type: none"> See Squeegee System
<ul style="list-style-type: none"> Vacuum motor does not run 		<ul style="list-style-type: none"> See Vacuum System
<ul style="list-style-type: none"> Short run time 	<ul style="list-style-type: none"> Batteries need maintenance 	<ul style="list-style-type: none"> Maintain Batteries
	<ul style="list-style-type: none"> Bad cell in battery 	<ul style="list-style-type: none"> Isolate and replace defective battery
	<ul style="list-style-type: none"> Defective Charger 	<ul style="list-style-type: none"> Replace Charger

Recovery System

Functional Description

The recovery system on the CA90 32T is made up of a 3-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 (pick-up) hose, through the pick-up tube adapter, 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.

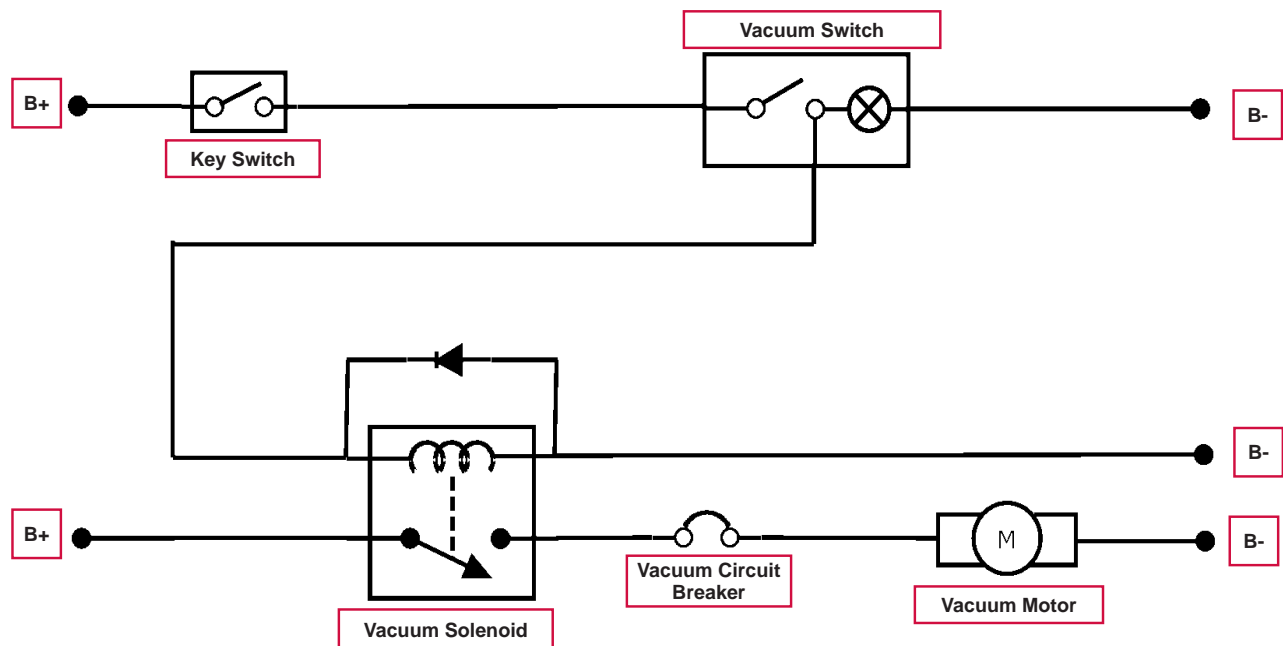


Note: It is very important that the ball-float assembly is present and in good working order. The vacuum motor will be damaged if water and/or foam gets past the ball-float.

Circuit Description

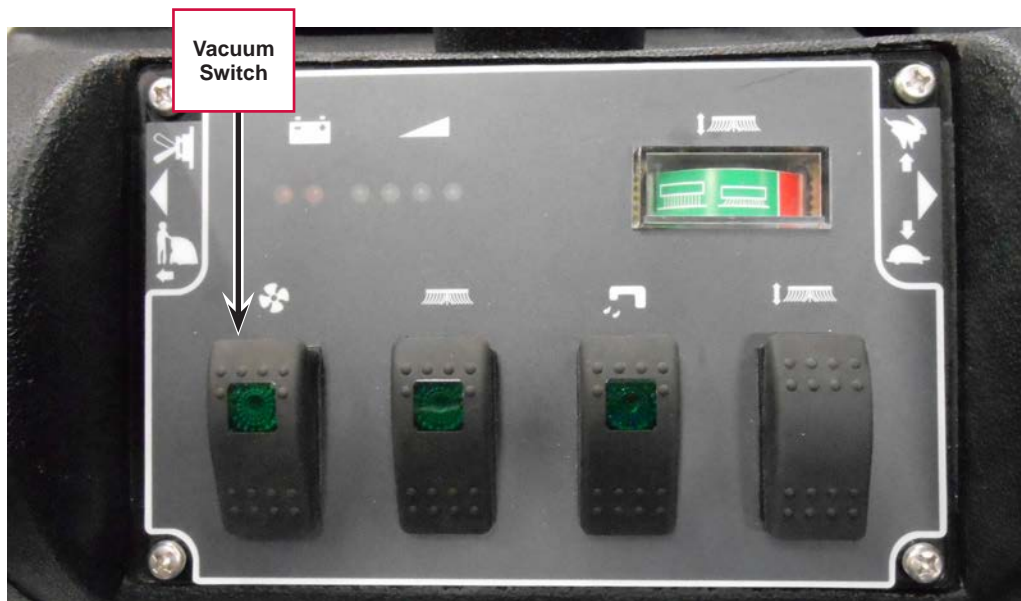
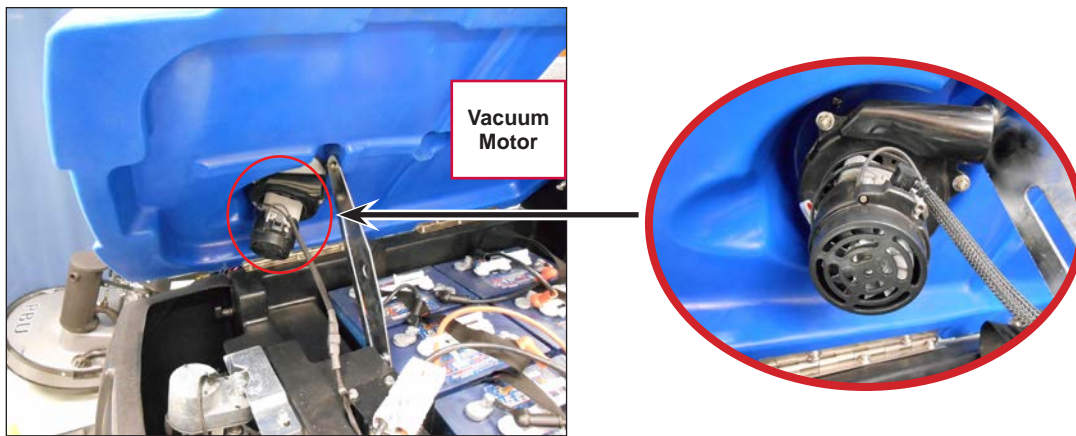
The vacuum motor circuit operation is very simple. When the switch is turned to ON, the coil of the vacuum solenoid is energized which allows full B+ power to flow through the main solenoid terminals to the vacuum motor. The circuit is protected by a 35 amp circuit breaker.

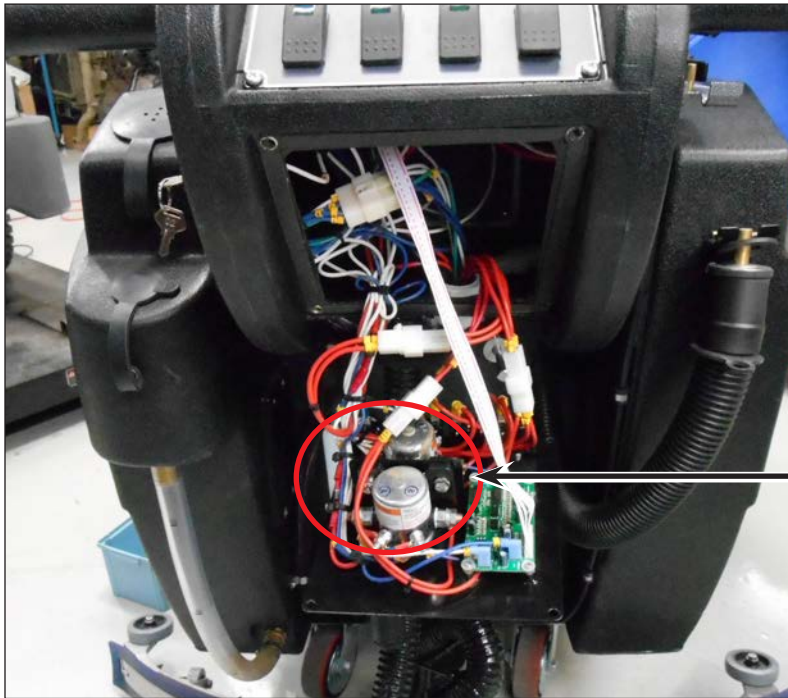
Circuit Diagram



Component Locations

- Vacuum Motor
- Vacuum Switch
- Vacuum Solenoid
- Vacuum Circuit Breaker
- Ball-Float Assembly
- Pick-up Tube Adapter
- Vacuum (pick-up) Hose
- Drain Hose





Vacuum Solenoid



Vacuum Circuit Breaker

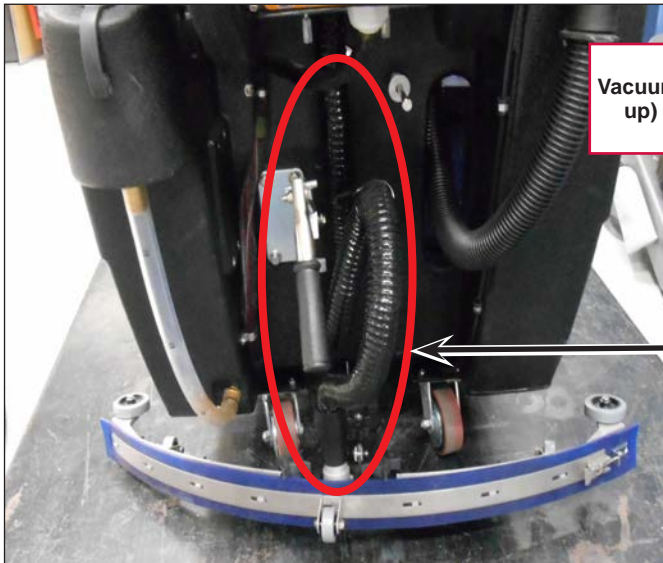


Ball Float Assembly





Pick-up Tube Adapter



Vacuum (pick-up) Hose



Drain Hose Connection at Recovery Tank



Other end of Drain Hose with Stopper

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.
- If the ball or cage is damaged, replace the ball-float assembly.

Adjust pick-up tube adapter bracket

- The pick-up tube adapter hole must align with the hole in the recovery tank. The angle of the pick-up tube adapter can be adjusted
- Remove the pick-up (vacuum) hose from the bottom of the pick-up tube adapter.
- Loosen the (2) bolts that hold the bracket to the solution tank.



Bolts for adjusting pick-up tube adapter bracket

- Adjust the bracket so the gasket on the top of the pick-up tube is flush and parallel with the bottom surface of the recovery tank.



NOTE Pick-up adapter and solution tank surface are parallel

- Tighten the (2) bolts

Checking Vacuum motor carbon brushes

- Remove the vacuum motor from the machine (see the removal instructions below)
- Remove the (2) screws that attach the plastic cover



Cover Screws (x 2)

- Remove the (2) screws that attach each carbon brush



Brush screws
(2) each brush

- CAREFULLY slide out the carbon brush assembly.
- If the carbon brush is less than 1/4 inch (6mm) as measured from the brass holder, the vacuum motor should be replaced.
- NOTE The carbon brushes are soldered in, and replacement is not recommended



Troubleshooting

Problem	Cause	Correc tion
<ul style="list-style-type: none"> No Vacuum Motor Operation (Other functions work) 	<ul style="list-style-type: none"> Vacuum circuit breaker tripped 	<ul style="list-style-type: none"> Reset circuit 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 vacuum solenoid 	<ul style="list-style-type: none"> Replace solenoid
	<ul style="list-style-type: none"> Defective vacuum switch 	<ul style="list-style-type: none"> Replace vacuum switch
	<ul style="list-style-type: none"> Defect in wiring 	<ul style="list-style-type: none"> Trace wiring using circuit diagram
<ul style="list-style-type: none"> Poor pick-up at squeegee Restricted air flow 	<ul style="list-style-type: none"> Clogged or kinked vacuum (pick-up) hose 	<ul style="list-style-type: none"> Check and clean out vacuum (pick-up) hose
	<ul style="list-style-type: none"> Clog at center tube of squeegee casting, pick-up tube adapter, or recovery tank entry hole 	<ul style="list-style-type: none"> Check and clean all (3) places
Air Leaks	<ul style="list-style-type: none"> Recovery tank cover gasket is leaking 	<ul style="list-style-type: none"> Insure the cover is fully in place. Replace the cover assembly if there is damage to the gasket
	<ul style="list-style-type: none"> Drain hose stopper is not fully seated 	<ul style="list-style-type: none"> Seat the stopper into the drain hose properly
	<ul style="list-style-type: none"> Pick-up tube adapter is not adjusted properly 	<ul style="list-style-type: none"> Adjust pick-up tube adapter (See instructions above in maintenance section)
	<ul style="list-style-type: none"> Drain hose has leaks 	<ul style="list-style-type: none"> Replace drain hose assembly
Squeegee Issues	<ul style="list-style-type: none"> Squeegee angle not correct 	<ul style="list-style-type: none"> Adjust squeegee angle
	<ul style="list-style-type: none"> Squeegee not mounted properly 	<ul style="list-style-type: none"> Confirm that the squeegee is mounted firmly, and that the “T” nuts are seated into the notches of the squeegee bracket
	<ul style="list-style-type: none"> Squeegee blades have dirt or debris between the blade and the floor 	<ul style="list-style-type: none"> Clean off the squeegee blades using a damp cloth
	<ul style="list-style-type: none"> Squeegee blades are worn out or torn 	<ul style="list-style-type: none"> Flip the squeegee blades to put a different edge on the floor 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 in the correct position (angle). Adjustment of the squeegee angle and instructions for replacing the squeegee blades will be discussed in the squeegee system section.

Removal and Installation

Vacuum motor

Removal:

- Completely drain the recovery tank
- Turn the keyswitch to OFF.
- Lift the left side of the recovery tank, and insure the recovery tank support bracket latches into place.
- Disconnect the battery connector.
- Disconnect the vacuum motor wire connector (NOTE: There may be protective heat shrink covering the connector. If so, carefully cut the heat shrink away.)
- Remove the (3) 10mm nylock nuts that hold the vacuum motor to the mounting studs. (NOTE: You may have to hold the studs to prevent them from turning)
- Slide the vacuum motor past the mounting studs and out.

Installation:

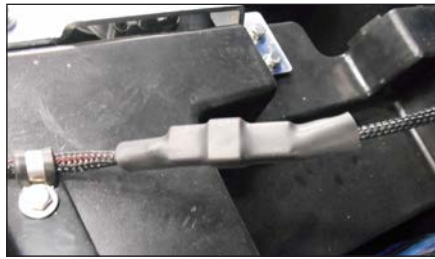
- Install a new vacuum motor gasket onto the new vacuum motor.



- Slide the new vacuum motor over the mounting studs. (NOTE: The vacuum motor must be installed in the correct orientation)



- Re-install the (3) nuts/washers to slightly compress the gasket. (NOTE: Do not over-tighten ! Damage to the vacuum motor can occur)
- Re-connect the vacuum motor connector. (NOTE: If you have replacement heat shrink, use it to cover the connection)



Specifications

Shop Measurements

- Water lift measured at the squeegee end of the pick-up hose - 60 inches



- Amp draw of vacuum motor with everything assembled, and only the vacuum powered - 18 amps.

Scrub System

Functional Description

The scrub system on the CA90 32T is composed of (2) disc style brush motors. These motors rotate toward the center of the machine to sweep solution and dirt toward the center of the squeegee path. The RIGHT motor spins conter-clockwise, and the LEFT motor spins clockwise. The brush motors will operate ONLY if the safety triggers are engaged on the control housing. The machine's Hour Meter is controlled by the brush circuit, and the meter will only run when the brushes are running.

The motors are mounted to the brush deck. The scrub deck can be lifted and lowered to adjust head pressure using an electric actuator. The actuator can be operated up or down anytime the machine power is ON. The brush pressure can be monitored by the operator using the ammeter (brush pressure meter) on the control housing.

The scrub deck is equipped with a rubber skirt to help contain the solution within the machine path.

Circuit Description

The (2) brushes are operated by using a combination of the trigger switch and the brush switch on the control housing. Both switches must be engaged for the brushes to operate. Power is then applied to the coil of the Brush Solenoid to supply battery power. Power flows through (2) Circuit Breakers, each brush motor having it's own circuit breaker. Power for the Left Brush Motor also flows through the Brush Pressure Gauge. The Brush Pressure Gauge is basically an ammeter used to display the brush pressure to the operator.

Circuit Diagram

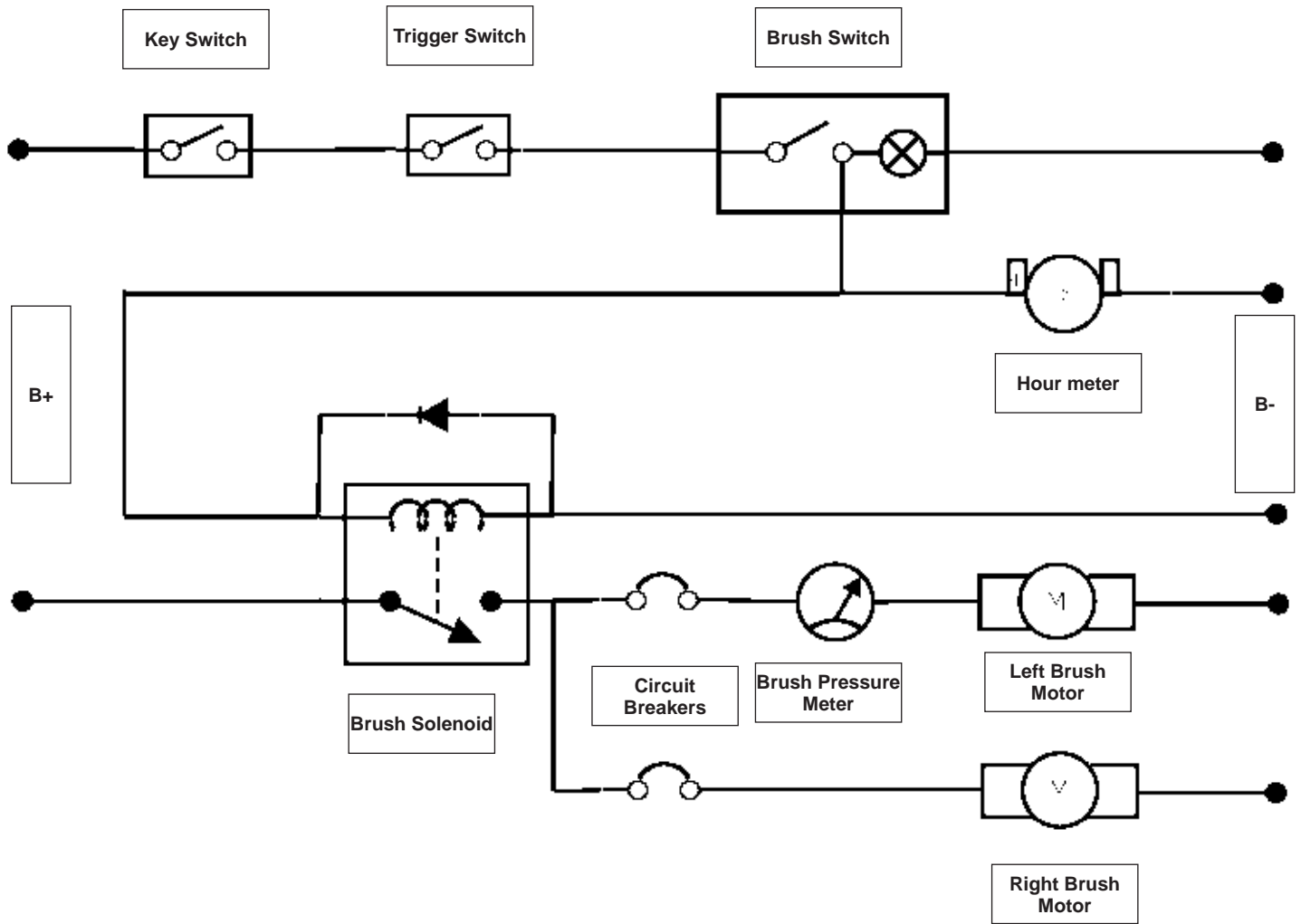


Figure 1: Brush Circuit

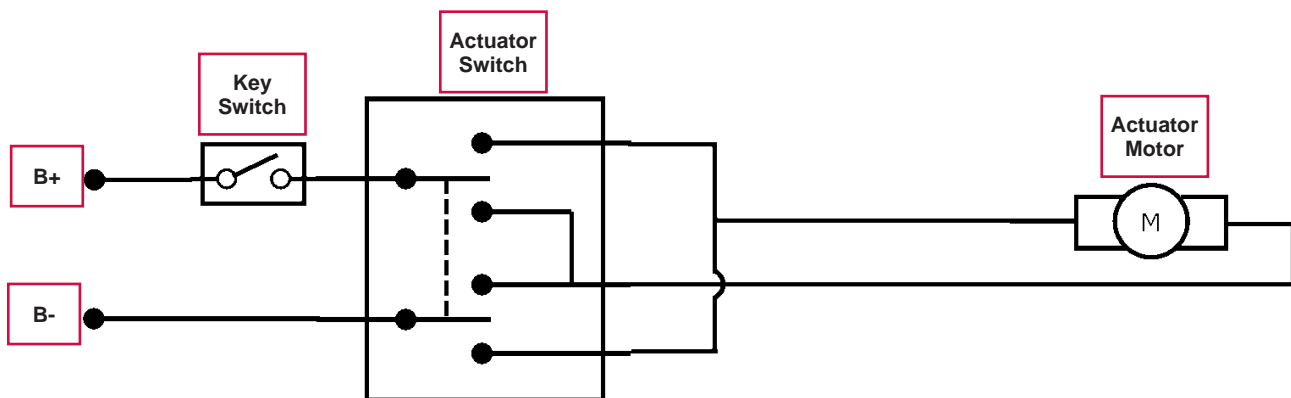
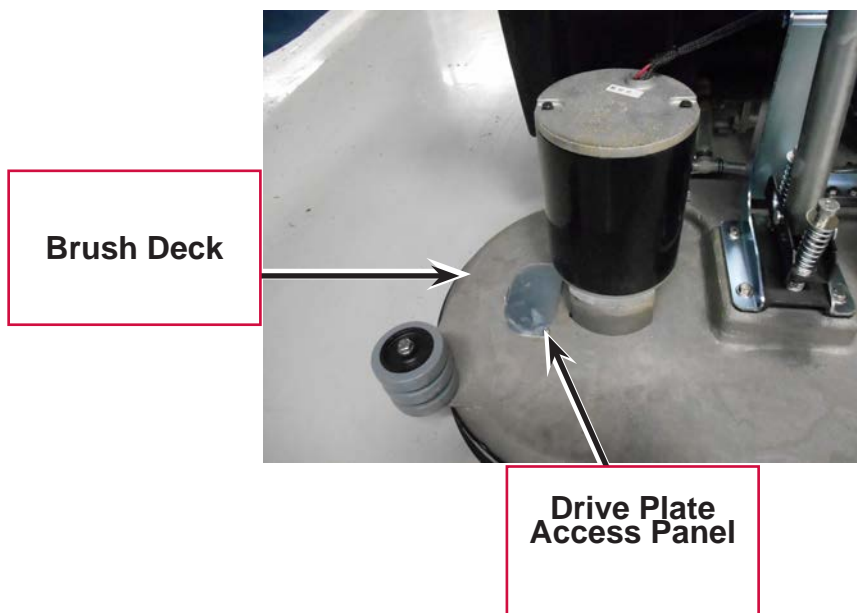
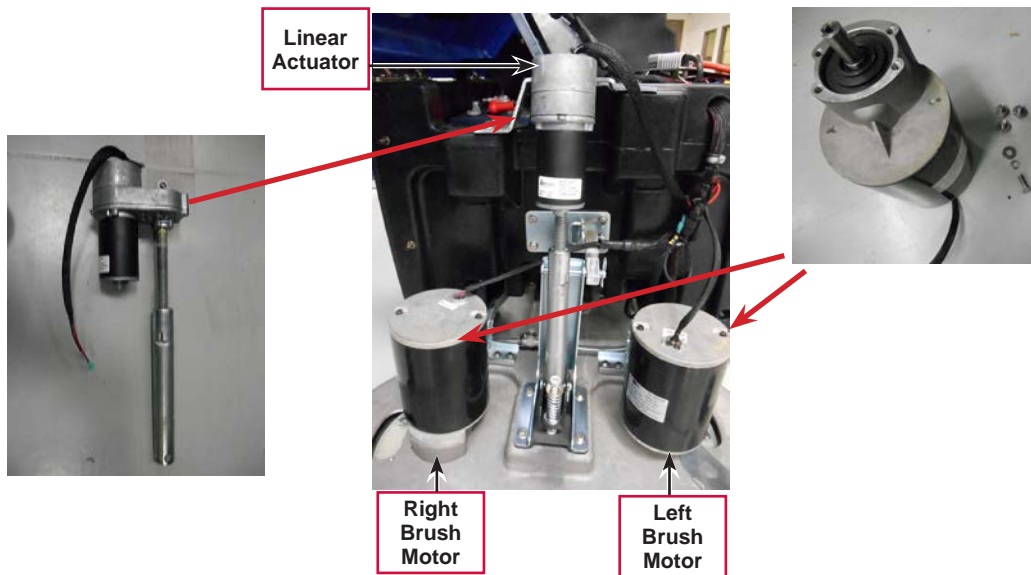


Figure 2: Actuator Circuit

Component Locations

- Linear Actuator
- Brush motors
- Brush Deck
- Drive Plate Access Panel
- Drive Plate Assembly
- Brush Pressure Gauge
- Brush Circuit Breakers
- Brush Solenoid

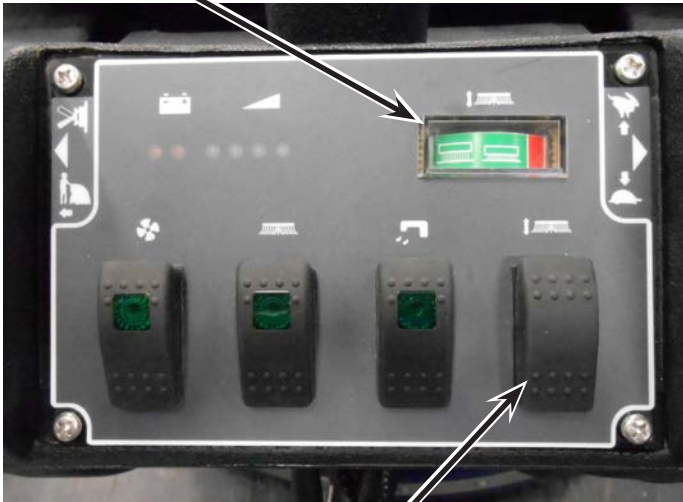




Drive Plate Assembly



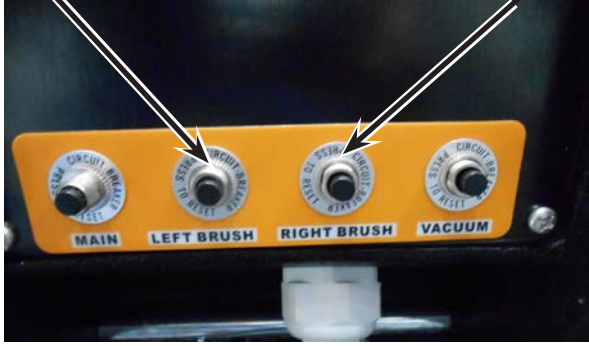
Brush Pressure Gauge

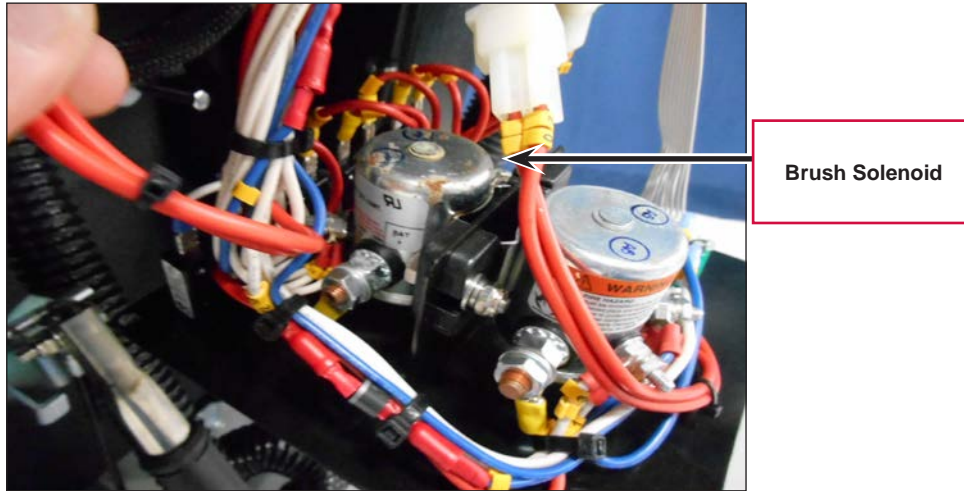


Actuator Switch

Left Brush Circuit Breaker

Right Brush Circuit Breaker

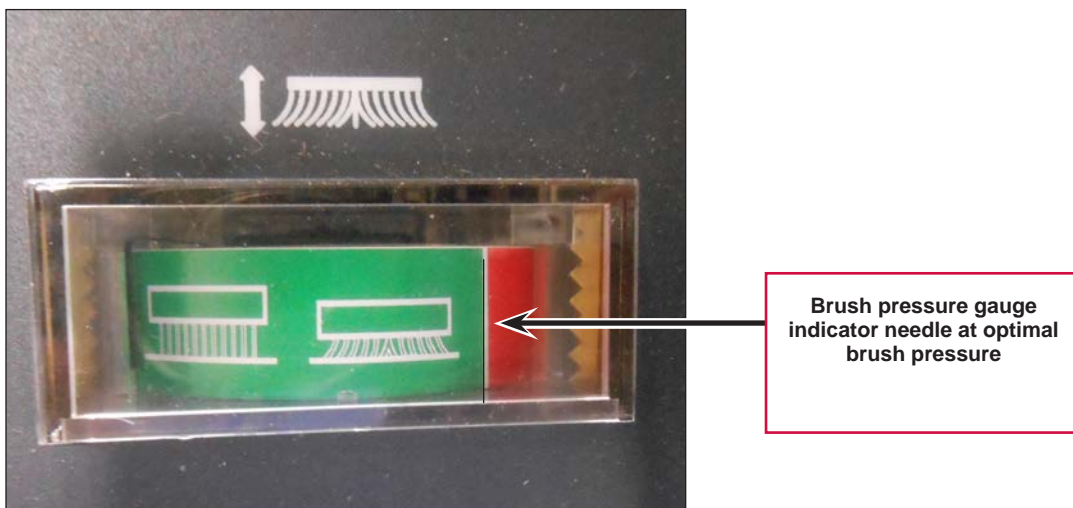




Maintenance and Adjustment

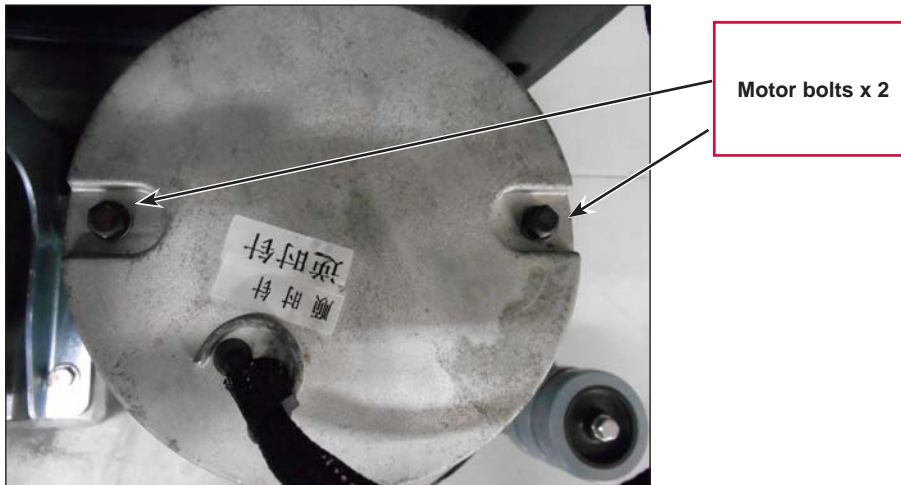
Adjusting the Scrub Deck height for best performance

- While the machine is in full operation (Brushes turning, solution flowing, and moving forward) use the Linear Actuator switch to adjust the Brush Pressure Gauge just into the white line between RED and GREEN.



Replacement of Carbon Brushes

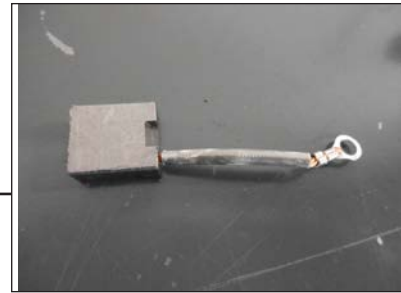
- Turn the machine key switch to OFF.
- Dis-connect the batteries from the machine.
- Remove the front shroud to access the brush motors.
- Remove the wire ties, and dis-connect the brush motor connectors.
- Remove the (2) motor bolts.



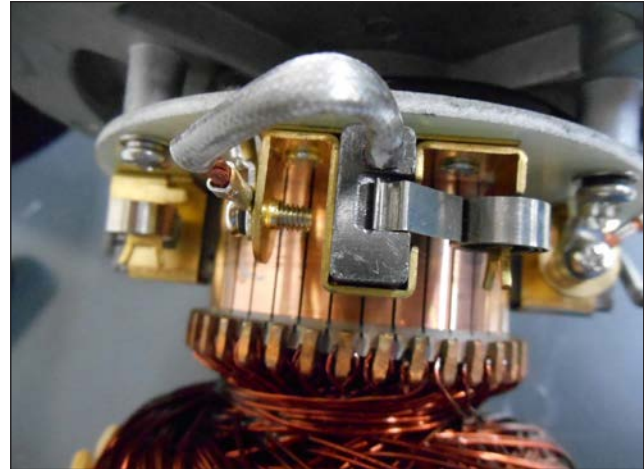
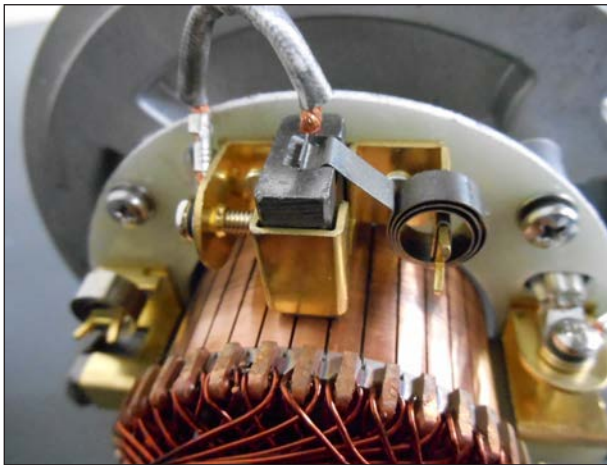
- Wiggle the motor back and forth to release the motor from the gearbox.
- Place the motor on the floor upside down, and slide a straight screwdriver between the top motor cover and the motor case. Place your foot on the screwdriver to hold the cover down. Lift off the case. NOTE: You must overcome the force of the magnets in the case.



- With the case removed, you can access the carbon brushes. NOTE: Pay attention to the way the carbon brush wires are folded up. The photos in this section had the wires moved to show the detail of the brush and spring.
- Lift the spring tab to slide the brush out of the holder.
- Remove the screw that attaches the wire tab to the contact.
- Remove the carbon brush.



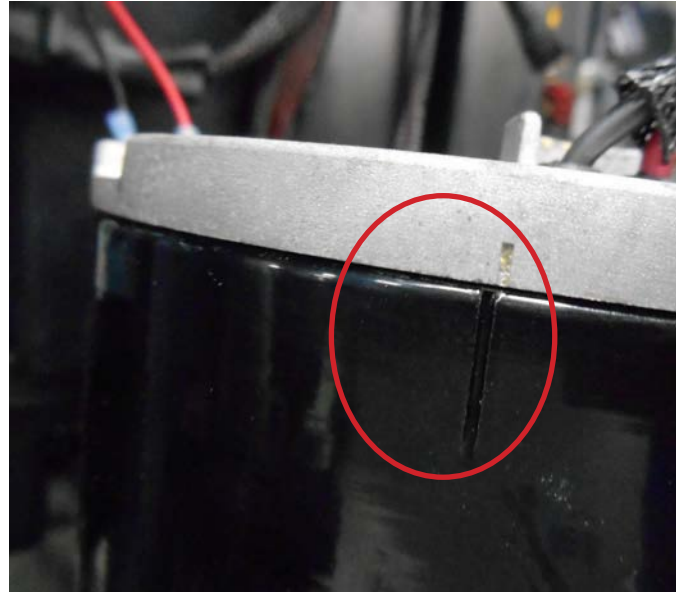
- Install new brushes in the reverse order. Insure the spring tab is seated properly on the carbon brush.



- Now gently fold the wires up toward the rotor end of the assembly.
- Re-install the case. NOTE: Be careful to keep your fingers clear. The magnets will “suck” the case from your hands.



- Re-assemble the motor to the gearbox. There are timing marks on the case, and the aluminum ends. Make sure these are aligned.



- Re-install the (2) motor screws. NOTE: The magnets inside the case will try to pull these inward.
- Re-connect the brush motor connector, tie wrap the brush connectors back together.
- Re-install the front shroud.

Troubleshooting

Problem	Causes	Solution
Neither brush Motor will run	Defective Brush Switch	Replace Brush switch
	Defective Trigger Switch	Replace Trigger Switch
	Defective Brush Solenoid	Replace Brush Solenoid
	Wiring issue	Trace wiring per diagram
Only one brush will run, or one brush runs slowly	Circuit breaker tripped	Reset Circuit breaker
	Carbon Brushes in brush motor are defective	Replace carbon brushes
	Brush motor defective	Replace Brush motor

Removal and Installation

Brush Motor

Removal

- Completely drain the recovery tank.
- Lift the recovery tank, and secure the tank support latch.
- Remove the front cover of the machine by removing the (4) knobs.
- With the machine key in the ON position, raise the brush deck to it's full up position using the actuator switch.
- Turn the key to the OFF position, and disconnect the batteries.
- Remove the 13mm bolt that holds the drive plate assembly onto the brush motor shaft.



- Slide the drive plate assembly off the motor shaft. (NOTE: You may have to wiggle the drive plate back and forth to remove it)
- Set aside the drive plate, bolt, washer, and shaft key.
- Remove the (4) bolts/lockwashers that attach the brush motor to the deck



- Cut the wire ties that secure the connector bundle.

- Dis-connect the motor connector. (NOTE - There may be protective heat shrink over the connector. If so, carefully cut away the heat shrink))
- Lift the motor out.

Installation

- Set the new motor in approximately the same location as the motor removed. (NOTE: This should be fairly easy to see due to the dirt build-up around the mounting bolts)
- Install and tighten the (4) mounting bolts/lockwashers.
- Re-install the drive plate assembly;
 - Place the shaft key in the slot in the drive plate. Hold it in place with your finger, and rotate the drive plate so that the key lines up with the slot in the motor shaft.
 - Slide the drive plate fully onto the shaft. (NOTE: You may have to wiggle the drive plate)
 - Re-attach the drive plate with the bolt and thick washer. (NOTE: Use RED Loctite on the drive plate bolt)
- Re-connect the brush motor connector.
- Re-connect the batteries, and turn the key to ON. Insure the speed control is set to minimum, turn on the brush switch and pull the trigger to turn on the brush motor. Make sure the brush is rotating in the correct direction. (Right motor goes counter-clockwise, Left motor goes clockwise).
 - If the brush is not rotating in the correct direction, you will need to swap the position of the wires in the brush motor connector.
- Apply heat shrink to protect the connector.
- Wire tie all of the connectors so they cannot contact the linear actuator.
- Re-install the front cover.

Linear Actuator

Removal:

- Completely drain the recovery tank.
- Lift the recovery tank, and secure the tank support latch.
- Remove the front cover of the machine by removing the (4) knobs.
- With the machine key in the ON position, lower the brush deck so it's resting on the floor using the actuator switch.

NOTE - If the Linear Actuator is not functioning, you may have to prop the brush deck up with blocks to remove the actuator.

- Turn the key to the OFF position, and disconnect the batteries.
- Straighten the cotter pin that secures the upper mounting pin



- Remove the cotter pin, and remove the upper mounting pin.
- Cut the wire ties that secure the connector bundle.
- Disconnect the (2) actuator wires.
- Remove the hairpin from the lower mounting pin, and remove the lower mounting pin.



- Carefully remove the actuator.

NOTE - It is important to measure the length of exposed threads on the actuator, and to keep the brush deck from moving. You will need to do these things to make the re-installation successful.



Installation

- Insure the new actuator has the same amount of exposed threads as the defective actuator.

- Place the tube portion of the actuator into the spring bracket so the holes line up.
- Insert the lower mounting pin, and secure it with the hairpin.
- Position the upper end of the actuator into the actuator bracket.
- Insert the upper mounting pin,
- Reconnect the actuator wires. (RED to wire 17, Black to wire 18)
- Wire tie all of the connectors so they cannot contact the linear actuator.
- Re-install the front cover.

Component Specifications (electrical)

Component	Specifications	
Scrub Deck Motor	RPM – 200	
	Current Draw – No Load - 3 Amps Current Draw - Full Load - 6 - 8 Amps depending on floor conditions	
Scrub Deck Actuator	Total Travel – 4.00" ±0.15"	
	Performance Data	
	No load	Current Draw – 1.8 ±1.0 Amps max.
	Full load	Current Draw – 3.0 ±1.0 Amps

Solution System

Functional Description

The solution system is gravity feed. Meaning there is no pump for the solution. The solution system is fed by (2) tubes which are connected to hose barbs at the bottom rear of the solution tank. The solution then passes through a solution shut-off valve, and the solution filter.

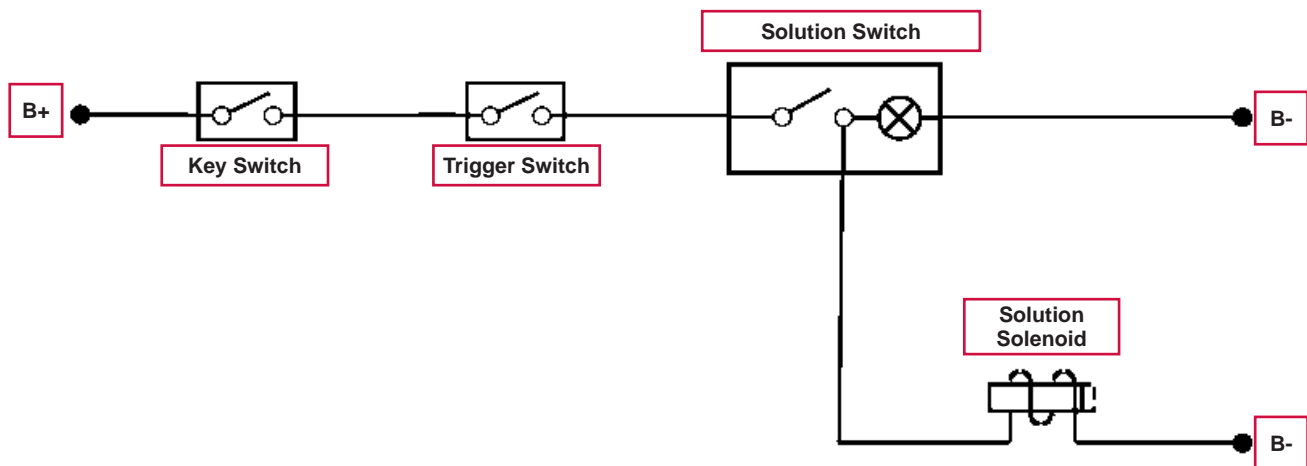
The solution is then “held” by the solution valve. The solution valve is normally closed, and is energized when the solution switch is in the ON position, and the safety trigger switch is engaged. Once the solution valve is open, the solution continues to a hose “T”, and the solution is split between the Right and Left hose barbs located above the brush drive plates.

The solution valve is mechanically adjustable, and the amount of solution flow is controlled by a cable connected between the solution valve, and the solution control knob. Because the solution is gravity feed, the solution flow will diminish as the solution tank becomes empty. It is normal for the flow to decrease, and the flow to go more to the right brush as the tank nears empty.

Circuit Description

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

Circuit Diagram



Component Locations

- Solution Tank
- Solution Shut-off Valve
- Solution Filter
- Solution Valve (solenoid)
- Solution Flow Adjustment Knob
- Solution Switch



Solution Tank

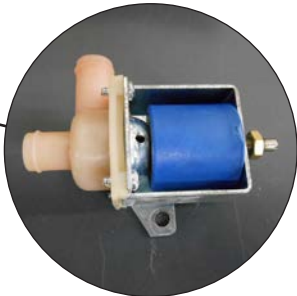


Solution Shut-off Valve

Solution Filter



Solution Valve



Solution Switch



Solution Flow Adjustment Knob

Maintenance and Adjustment

Solution Filter Cleaning

1. Work near a floor drain for convenient clean up if possible.
2. Turn the key switch OFF.
3. Close the Solution shut-off valve (The valve is closed when the handle is NOT in line with the hose)
4. Unscrew the solution filter cover
5. Remove and clean the screen.
6. Re-assemble in the reverse order. Make sure the gasket is seated properly in the filter cover.
7. Open the shut-off valve, and check for leaks.

Resetting the Solution Flow Adjustment Knob

NOTE: The solution valve has approximately (5) full 360 degree turns of adjustment from OFF to Maximum. The solution flow adjustment knob allows only about (1) full turn of adjustment. The factory setting is at the mid-range of the solution valve. Some customers want more solution flow (i.e. for unfinished concrete floors), while some customers may want less solution flow (i.e. for VCT)

1. Use a pliers to grip the brass knob stop.



2. Use a #2 phillips screwdriver to remove the screw that holds the pin. (Directly under the pin)
3. Turn the solution adjustment flow knob to get the desired amount of solution flow. Clockwise for LESS flow, Counter-clockwise for MORE solution flow. NOTE: Do not adjust the knob too far. If you adjust the knob to the Minimum or Maximum position of the solution valve, it can get stuck.
4. Replace the brass knob stop.

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 Solution switch
	• Solution Solenoid is defective	• Replace Solution Solenoid
Insufficient Solution Flow	• Restricted (clogged) solution filter	• Thoroughly clean the solution filter screen
	• 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 adjust knob is set too low	• Adjust the solution flow knob
	• Solution tank is near empty	• As the solution tank nears empty, the solution will only go to the right brush head. Re-fill the solution tank
Solution leaks while machine is idle	• Solution filter gasket is defective	• Replace Filter gasket
	• Solution solenoid diaphragm is not seating properly when “OFF”	• Replace Solution solenoid
	• Hose or fitting leak	• Inspect and repair hoses and fittings

Removal and Installation

Solution Valve

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

1. Remove all water from the solution and recovery tanks.
2. Choose a workspace where you can tip the machine onto it's side
3. Turn off the keyswitch, and disconnect the battery connector from the batteries to the machine.
4. Remove all (6) batteries, and set out of the way.
5. Remove the squeegee assembly and set aside.
6. GENTLY tip the machine onto it's side. This is a (2) person job.
7. Loosen the (2) hose clamps, and disconnect the tubes.
8. Remove the (2) bolts that hold the valve to the machine frame.

9. Now you can pull the valve out a bit to access the allen screw that attaches the adjust cable to the adjustment shaft of the valve.
10. Loosen the allen screw, and disconnect the cable from the valve.
11. Remove the (2) green wires. Note which wire goes to which tab on the valve.
12. Rotate the adjustment shaft of the new valve so that it is approximately in the same setting as the old valve.
13. Insure the Jam nut on the valve is not tightened.
14. Install the new valve in the reverse order of the above steps.

Specifications

The maximum flow rate of the solution system is 1 gallon per minute maximum. This is under ideal conditions with a full solution tank, and all new components. The flow rate is infinitely adjustable to zero flow rate from there.

Squeegee System

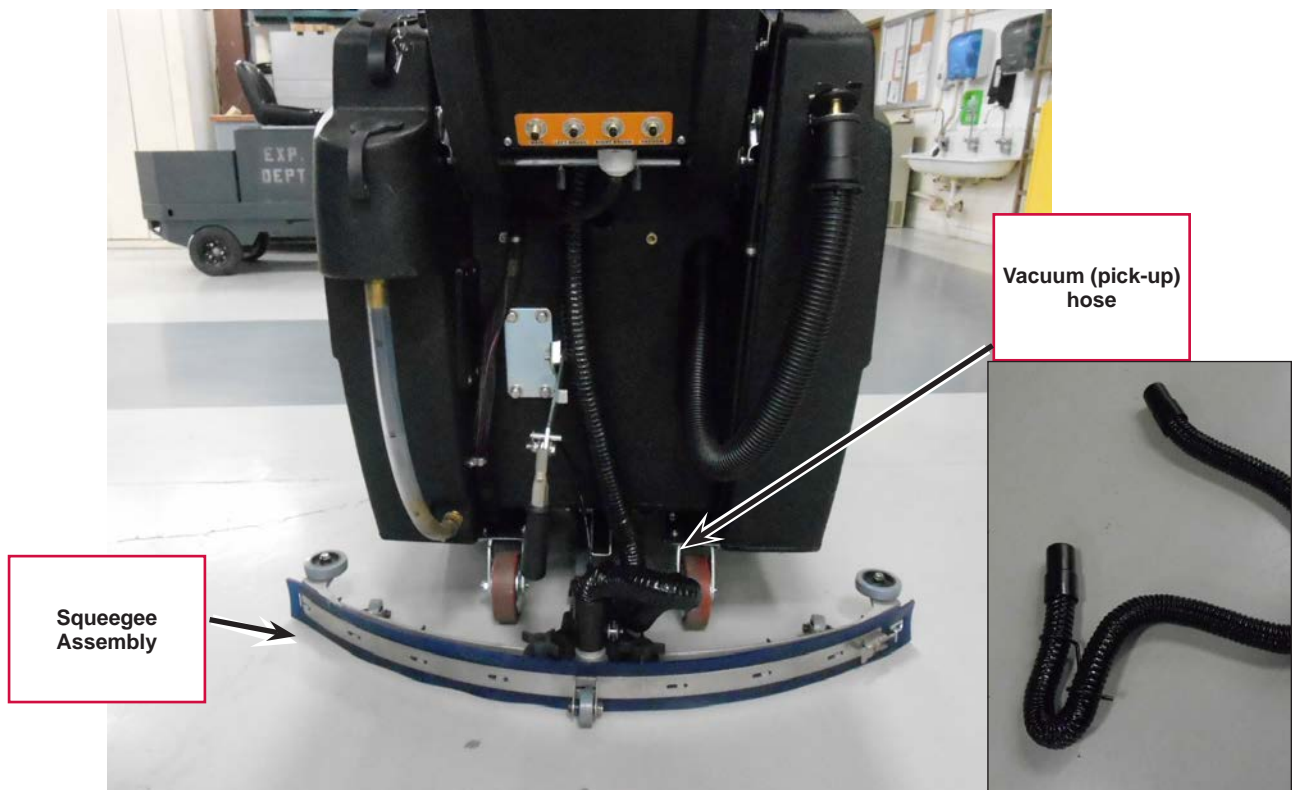
Functional Description

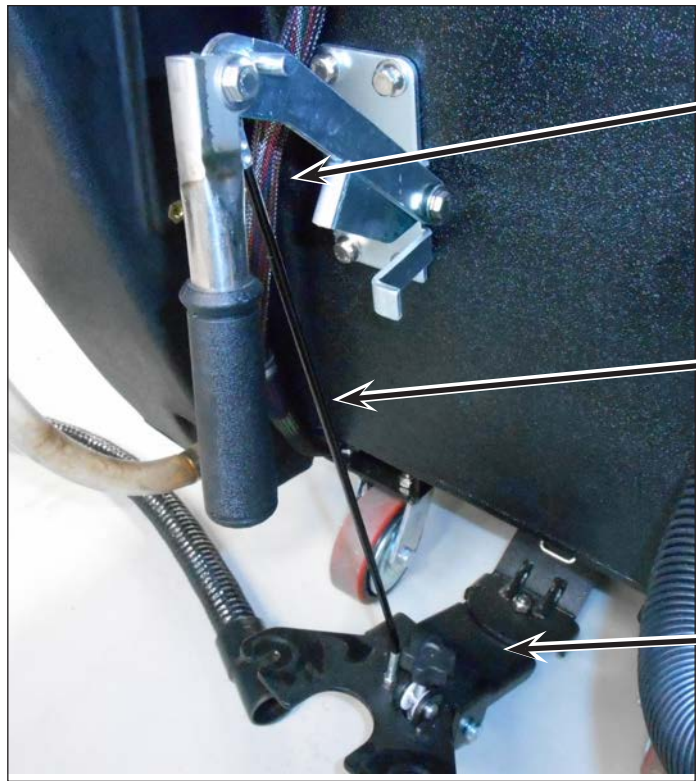
The CLARKE CA90 32T uses a parabolic style squeegee assembly attached to a swiveling squeegee mount bracket with (2) thumb screws. The squeegee is raised and lowered manually using the squeegee lift lever, and the squeegee lift cable. Down pressure on the squeegee is obtained by using a spring between the squeegee mount bracket and the machine chassis.

The squeegee assembly itself does not have any adjustments. The squeegee mounting bracket does have a thumb screw for adjusting the working angle of the squeegee assembly.

Component Locations

- Vacuum (pick-up) hose
- Squeegee assembly
- Squeegee Lift Handle
- Squeegee Lift Cable
- Squeegee Bracket Assembly
- Squeegee Bracket Tension Spring
- Squeegee Angle Adjust Knob

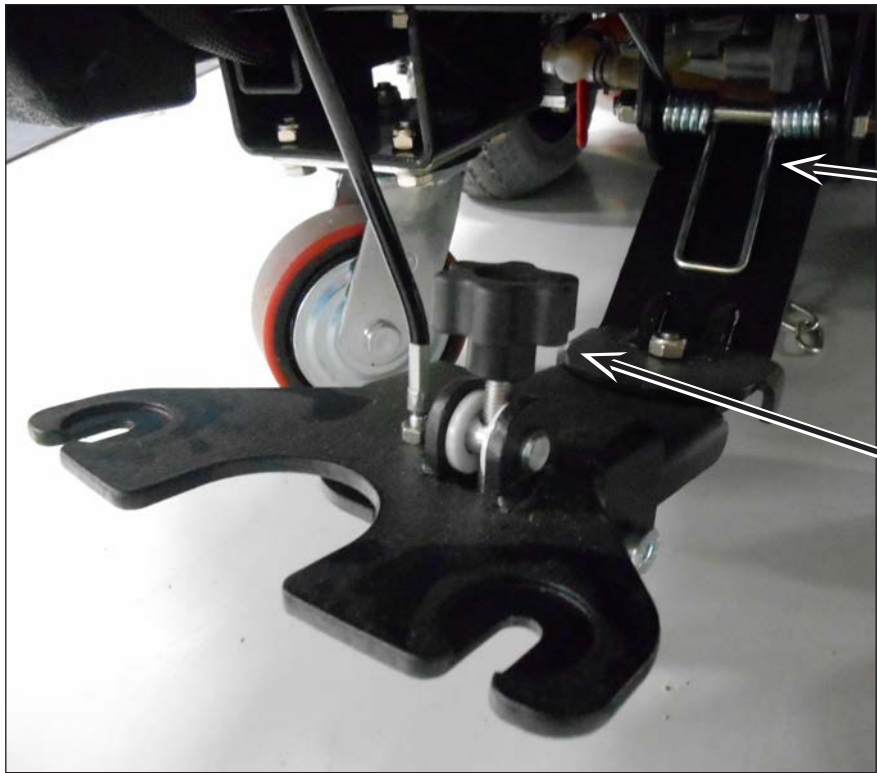




Squeegee Lift Handle

Squeegee Lift Cable

Squeegee Bracket Assembly



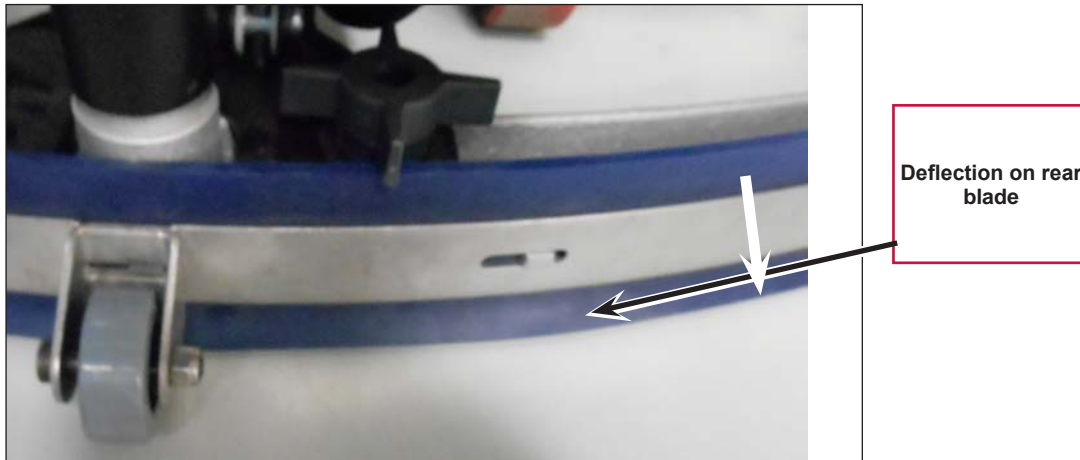
Squeegee Bracket Tension Spring

Squeegee Angle Adjust Knob

Maintenance and Adjustment

Adjusting the Squeegee Assembly Angle

- The rear squeegee blade should be adjusted so that there is a gentle deflection to the rear 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 1/4 and 1/2 inch.



- To adjust the angle of the squeegee assembly, turn the squeegee angle adjust knob.
 - Turn the knob clockwise to increase the deflection on the ends of the squeegee.
 - Turn the knob counter-clockwise to increase the deflection in the center of the squeegee.

Troubleshooting

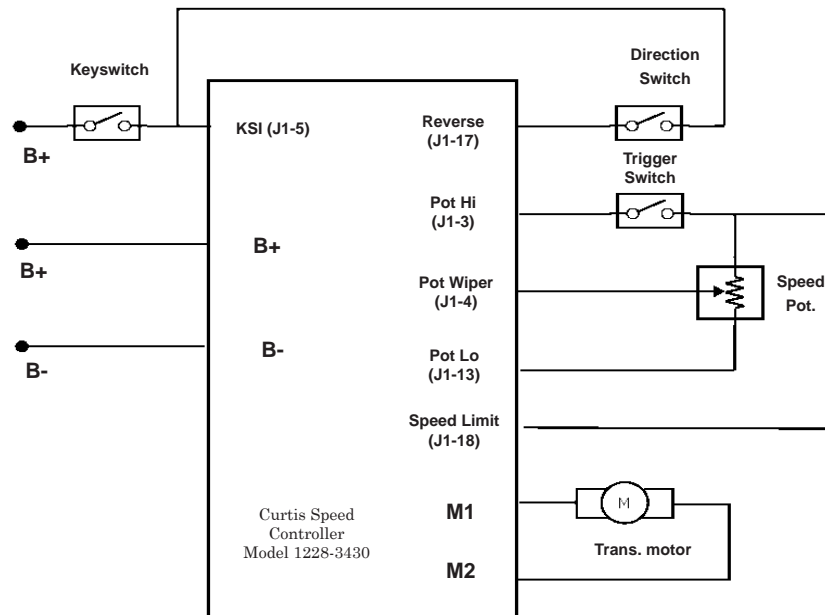
Problem	Cause	Correction
Poor Water Pick-Up	Vacuum leak(s) due to: <ul style="list-style-type: none"> • Leaky Vacuum hose • Damaged pick-up adapter gasket • Drain plug not installed properly • Recovery tank cover is misaligned, or damaged • Damaged Tank 	<ul style="list-style-type: none"> • Check the vacuum hose, and tighten/replace as necessary • Replace adapter gasket • Insure drain hose plug is installed correctly • Check the cover, and adjust/replace as necessary • Check the tank for leaks
	Restrictions due to build up of debris; <ul style="list-style-type: none"> • In the recovery tank • In the vacuum hose • In the squeegee assembly 	Check the recovery tank near the opening for the pick-up tube, 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.
		Flip the squeegee blade(s) to put a new edge to the floor. Adjust the squeegee blades and/or angle.

Wheel System, Traction

Functional Description

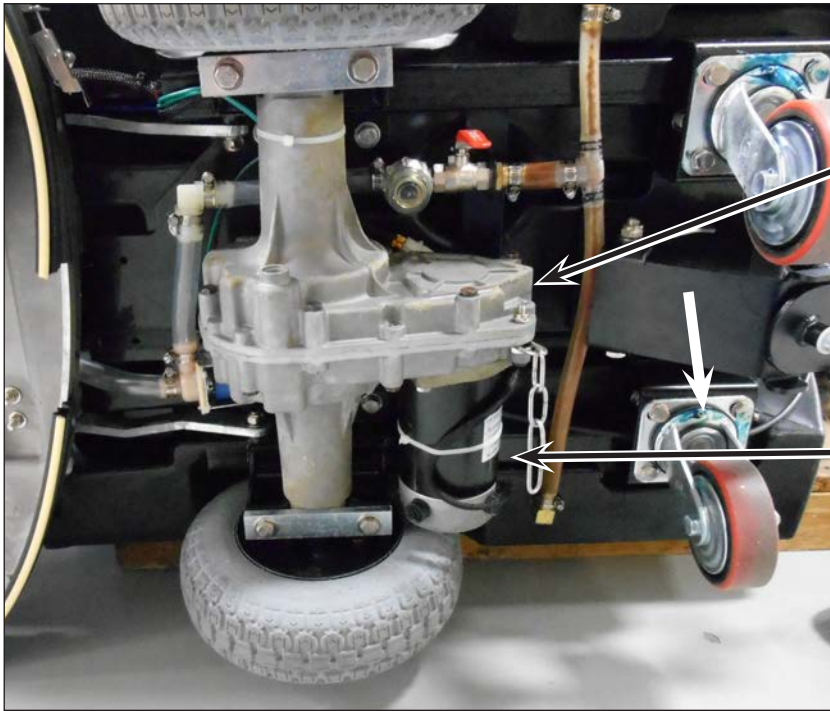
The Clarke CA90 32T traction drive is controlled by a Curtis Model 1228-3430 controller. Inputs into the controller are the key switch, the trigger switch, the forward/reverse switch, and the speed control potentiometer. Battery + and Battery - are wired through the MAIN solenoid to the controller at terminals B1 and B2. When all of the inputs are in the proper range, the Curtis controller will output voltage to the M1 and M2 terminals, and the transaxle motor will drive the transaxle.

Circuit Description



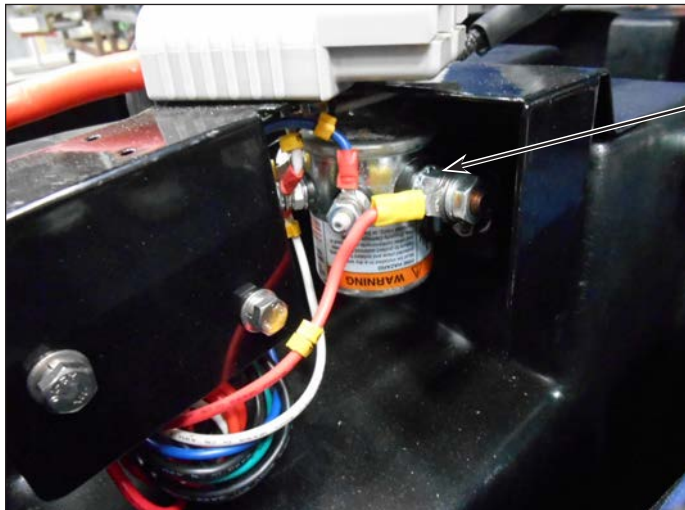
Component Locations

- Transaxle
- Transaxle Motor
- MAIN Solenoid
- Trigger Switch
- Forward/Reverse Switch
- Speed Control Potentiometer
- Curtis Speed Controller

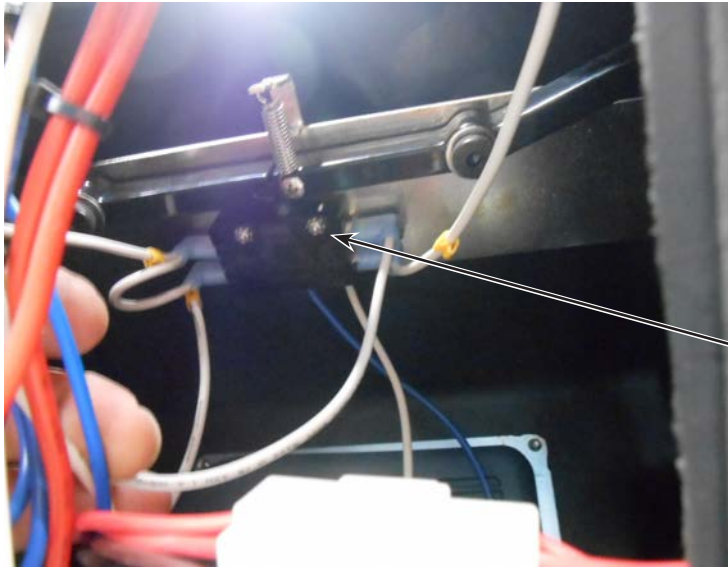


Transaxle

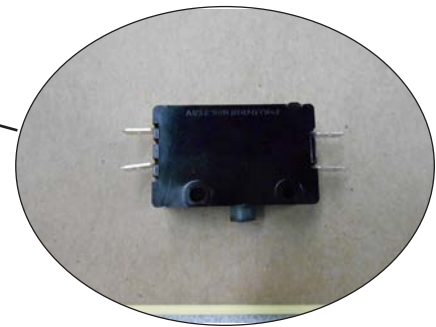
Transaxle Motor



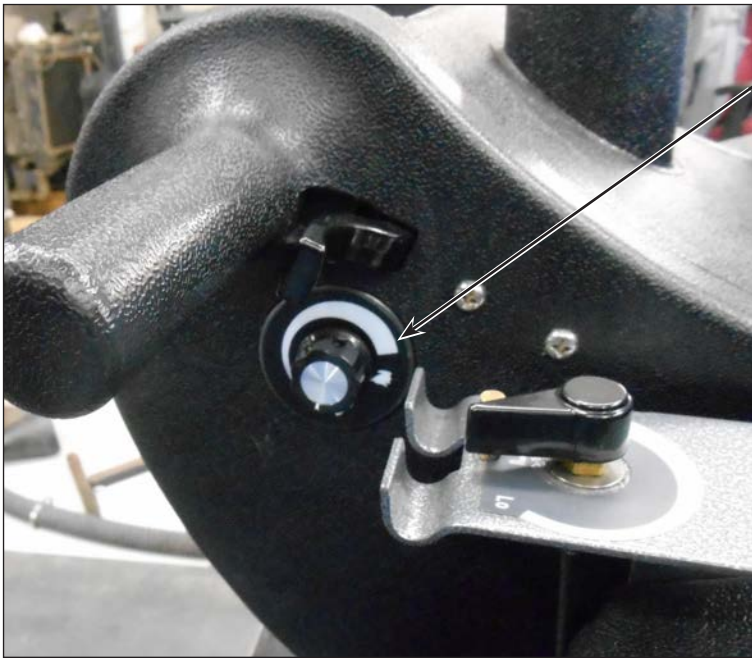
MAIN Solenoid



Trigger Switch
(looking up through lower housing panel)



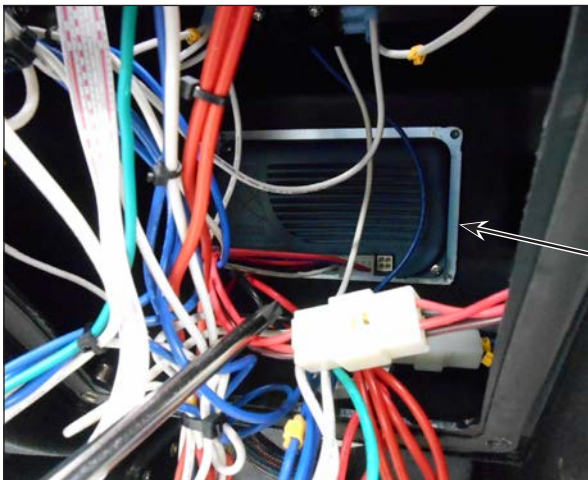
Forward/Reverse Switch



Speed Control Potentiometer
(With knob attached)



Speed Control Potentiometer Assembly



Curtis Speed Controller Mounted in control housing



Maintenance and Adjustment

The (2) rear casters should be greased every (6) months.

There is no other maintenance or adjustments required in the traction system.

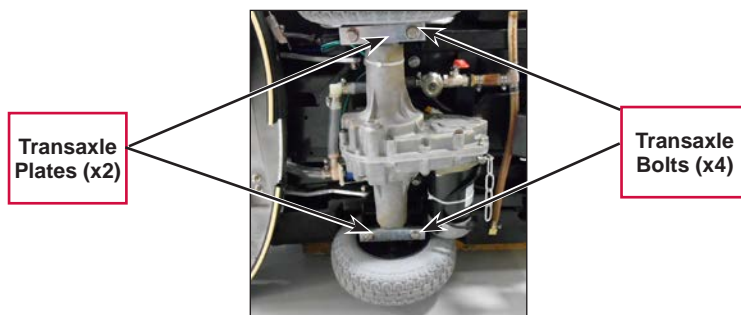
Troubleshooting

Problem	Cause	Correction
No drive	<ul style="list-style-type: none"> Defective Trigger Switch Defective Speed Pot. Assy. Open in wiring circuit Defective Transaxle/Motor Defective Speed Controller 	<ul style="list-style-type: none"> Replace Trigger Switch Replace Speed Pot. Assy. Check wiring with DVM Replace Transaxle/Motor Replace Speed Controller
Intermittent drive	<ul style="list-style-type: none"> Defective Speed Pot. Assy. Intermittent wiring 	<ul style="list-style-type: none"> Replace Speed Pot. Assy. Check wiring with DVM
Drives by itself	<ul style="list-style-type: none"> Defective Trigger Switch 	<ul style="list-style-type: none"> Replace Trigger Switch

Removal and Installation

Transaxle

- Remove all water from the solution and recovery tanks.
- Choose a workspace where you can tip the machine onto it's side
- Turn off the keyswitch, and disconnect the battery connector from the batteries to the machine.
- Remove all (6) batteries, and set out of the way.
- Remove the squeegee assembly and set aside.
- GENTLY tip the machine onto it's side. This is a (2) person job.
- Remove the (4) bolts/nuts that hold the (2) transaxle plates in place. NOTE: Be careful, the transaxle is now loose in the frame.



- Slide the transaxle out of the frame slots, so that you can access the motor connector.
- Disconnect the motor connector.
- Remove the wheels from the transaxle.

11. Install the new transaxle by following these steps in the reverse order.

NOTE 1: The transaxle must be oriented as shown in the picture above to clear the solution filter.

NOTE 2: The transaxle slots in the frame will align with the square ends of the transaxle housing, so there is no need to worry about side-to-side alignment.

NOTE 3: If you install the transaxle, re-install the batteries, and then discover the transaxle wires are reversed, do not panic. You simply need to switch the M1 and M2 wires on the Curtis Speed Controller.

Speed Control Potentiometer

1. Disconnect the batteries.
2. Remove the (4) screws from the upper control housing panel (dash board), and the (4) screws from the lower control housing panel.
3. GENTLY move the covers aside to gain access to the inside of the control housing.

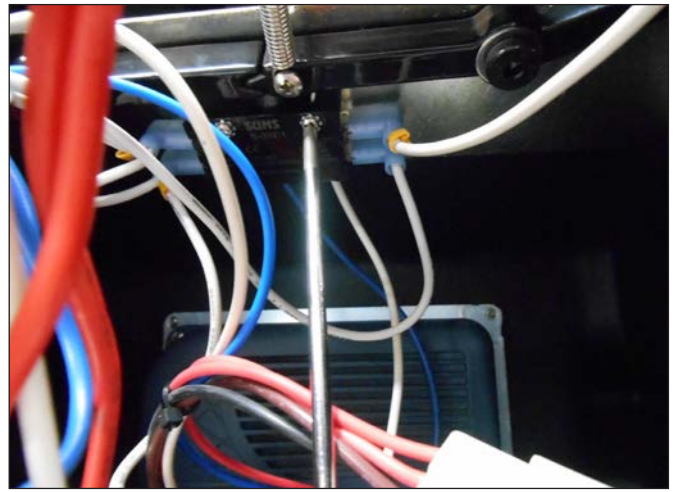


4. Use a small (2 mm) Allen wrench to remove the speed control knob.
5. Use a pliers or wrench to remove the nut and washer that attach the potentiometer to the housing.
6. Dis-connect the 4-pin connector to remove the speed control potentiometer.
7. Install a new speed control potentiometer by following the above steps in reverse order.

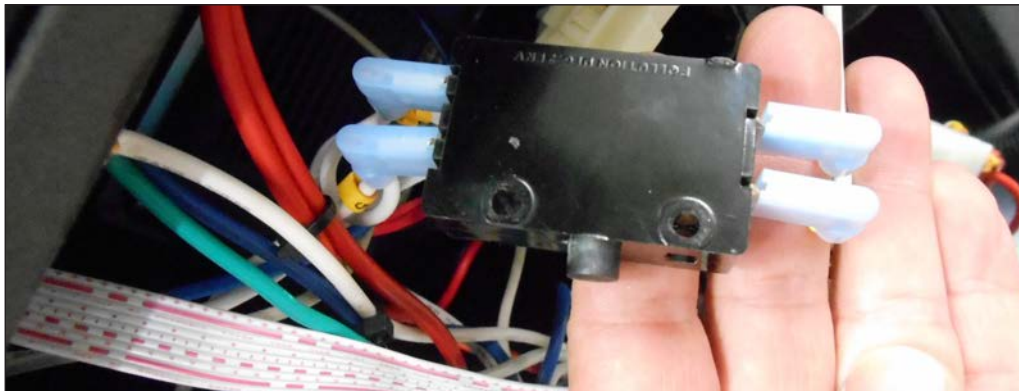
NOTE: Insure that all wires are connected, and not pinched when replacing the upper and lower panels.

Trigger Switch

1. Disconnect the batteries.
2. Remove the (4) screws from the upper control housing panel (dash board), and the (4) screws from the lower control housing panel.
3. GENTLY move them aside to gain access to the inside of the control housing. (See picture above)
4. Use a needle nose pliers (needle nose vice grips work the best) to hold the nylock nut on top of the switch. Reach up with a #1 phillips screwdriver to unscrew the screw. Repeat this for the other nut and screw. NOTE: The 3 mm screws strip easily, so be careful.



5. Swing the switch with wires still connected into a position where you can dis-connect/re-connect the wires from the switch.



6. Note that the switch information printed on the switch is away from you (facing down).
7. One at a time, dis-connect the wires from the old switch and re-connect them to the new switch.
8. Reinstall the switch in the reverse order of the steps above.

Curtis Speed Controller

NOTE: Replacing the Curtis Speed Controller is quite difficult. This unit has proven VERY reliable, and 99% of the time there are drive issues, the problem is something OTHER than the speed controller.

Before you change the Curtis Speed controller:

- Turn the keyswitch ON, and rotate the speed pot. to the lowest setting.
 - Place your ear as close as you can to the top of the control housing.
 - Pull the safety trigger(s) to engage the trigger switch.
 - Slowly rotate the speed pot. clockwise, and listen.
 - If you hear (1) click, the Curtis controller is fine, and the problem is “downstream”. So it’s either the wiring, or the transaxle motor.
 - If you hear (2) clicks, the Curtis controller is fine, and the problem is “upstream. So one if the inputs is not correct. Trigger switch, Speed Pot., Direction switch, or wiring.
 - If you hear no clicks at all, proceed with changing the Curtis controller.
1. Dis-connect the batteries.
 2. Remove the (4) screws that attach the lower control housing panel.
 3. GENTLY let it hang out of the way.
 4. Use a “stubby” #2 phillips screwdriver to loosen the (4) screws that attach the speed control plate to the rear of the control housing.



5. Disconnect the 18-pin white connector from the Speed controller.
6. Disconnect the (4) individual wires (B+, B -, M1, M2).
7. Carefully slide the Speed controller and plate out of the housing.
8. Remove the (2) phillips screws that hold the controller to the plate.
9. Reinstall the new Speed controller in the reverse order of the steps above.

Shop Measurements

Measurement at Pin	Circumstances	Voltmeter Reading
Curtis Controller Pin 18	Trigger On	4.5 volts DC
	Trigger Off	.7 volts DC
Curtis Controller Pin 17	Reverse On & Trigger On	37.1 volts DC
	Reverse Off or Trigger Off	0 volts DC
Curtis Controller Pin 13	Any	.42 volts DC
Curtis Controller Pin 5	Key On & Trigger On	37 volts DC
Curtis Controller Pin 4	Trigger On with Speed pot. at minimum	4.6 volts DC
	Trigger On with Speed pot. at maximum	.43 volts DC
Curtis Controller Pin 3	Trigger On	4.5 volts DC
	Trigger Off	.7 volts DC
Curtis Controller M1 to M2 with transaxle unplugged	Trigger On, Forward, at Maximum Speed	26.6 volts DC
	Trigger On, Reverse, at Maximum Speed	- 13.9 volts DC
Transaxle amp draw	Maximum Speed	1.9 amperes