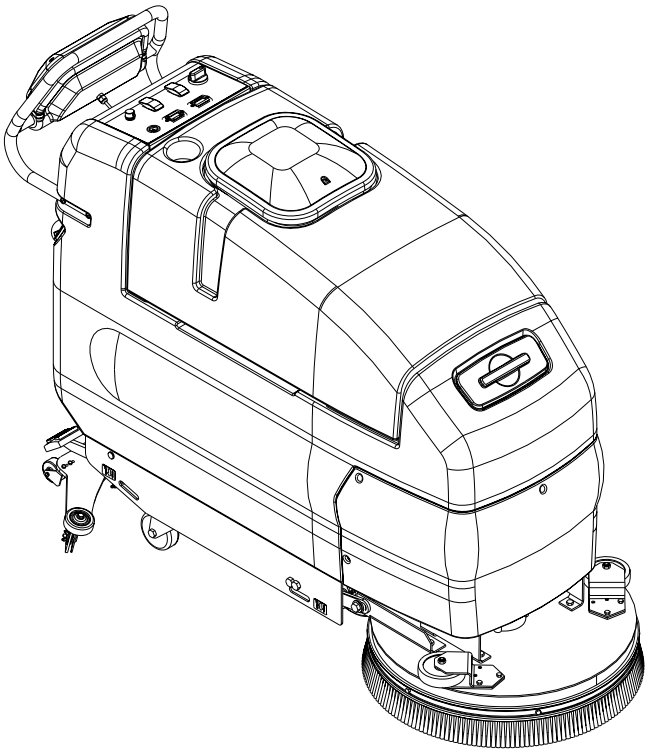
ConvertaMAX™ 20/26
BA 550/650



SERVICE MANUAL
Advance MODELS 56397010, 56397011
56397580, 56397581
Nilfisk MODELS 56397012, 56397013
56397582, 56397583

Nilfisk Advance
setting standards

1/00 revised 7/02 Form Number 56043056

TABLE OF CONTENTS

Note: All references to right, left, front, or rear in this manual are as seen from the operator's stand-point.

GENERAL INFORMATION

INTRODUCTION

This manual will help you get the most from your **ConvertaMAX™ 20/26 / BA 550/650**. Read it thoroughly before servicing the machine.
Note: Bold numbers in parentheses indicate an item illustrated on pages 9-10.
This product is intended for commercial use only.

PARTS AND SERVICE

Repairs, when required, should be performed by your Authorized Nilfisk-Advance Service Center, who employs factory trained service personnel, and maintains an inventory of Nilfisk-Advance original replacement parts and accessories.

Call the NILFISK-ADVANCE DEALER named below for repair parts or service. Please specify the Model and Serial Number when discussing your machine.

(Dealer, affix service sticker here.)

NAME PLATE

The Model Number and Serial Number of your machine are shown on the Nameplate on the machine. This information is needed when ordering repair parts for the machine. Use the space below to note the Model Number and Serial Number of your machine for future reference.

MODEL NUMBER _____

SERIAL NUMBER _____

TRANSPORTING THE MACHINE

⚠ CAUTION!

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

- The machine is tied down securely - see tie-down locations **(26)**.
- All access doors and covers are secured (tape and strap as needed).

TOWING

⚠ CAUTION!

If the machine must be towed or pushed, make sure the Key Switch (Main Power) **(18)** is in the OFF position, disconnect wheel drive motor wiring harness and do not move the machine faster than a normal walking pace (2-3 mph, 3-5kph) and for short distances only.

OTHER MANUALS AVAILABLE FOR YOUR MACHINE

The following manuals are available from the Nilfisk-Advance Literature Service Department (order according to model name, model number and machine's serial number):

- A Parts List and Operation Manual are available for each machine.
- The three Operation Manuals available for the BA 550/650 are multi-language: (Danish, Norwegian, Swedish, Finnish), (English, German, French, Netherlands) or (Spanish, Portuguese, Italian, Greek)

SYMBOLS

Nilfisk-Advance uses the symbols below to signal potentially dangerous conditions. Always read this information carefully and take the necessary steps to protect personnel and property.

⚠ DANGER!

Is used to warn of immediate hazards that will cause severe personal injury or death.

⚠ WARNING!

Is used to call attention to a situation that could cause severe personal injury.

⚠ CAUTION!

Is used to call attention to a situation that could cause minor personal injury or damage to the machine or other property.

GENERAL SAFETY INSTRUCTIONS

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

⚠ WARNING!

- This machine should only be used by properly trained and authorized persons.
- 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 batteries only in well-ventilated areas, away from open flame. Do not smoke while charging the batteries.
- Remove all jewelry when working near electrical components.
- Turn the key switch off (O) and disconnect the batteries before servicing electrical components.
- Never work under 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.
- Do not operate this machine on ramps or inclines of more than a 2 percent gradient.

⚠ CAUTION!

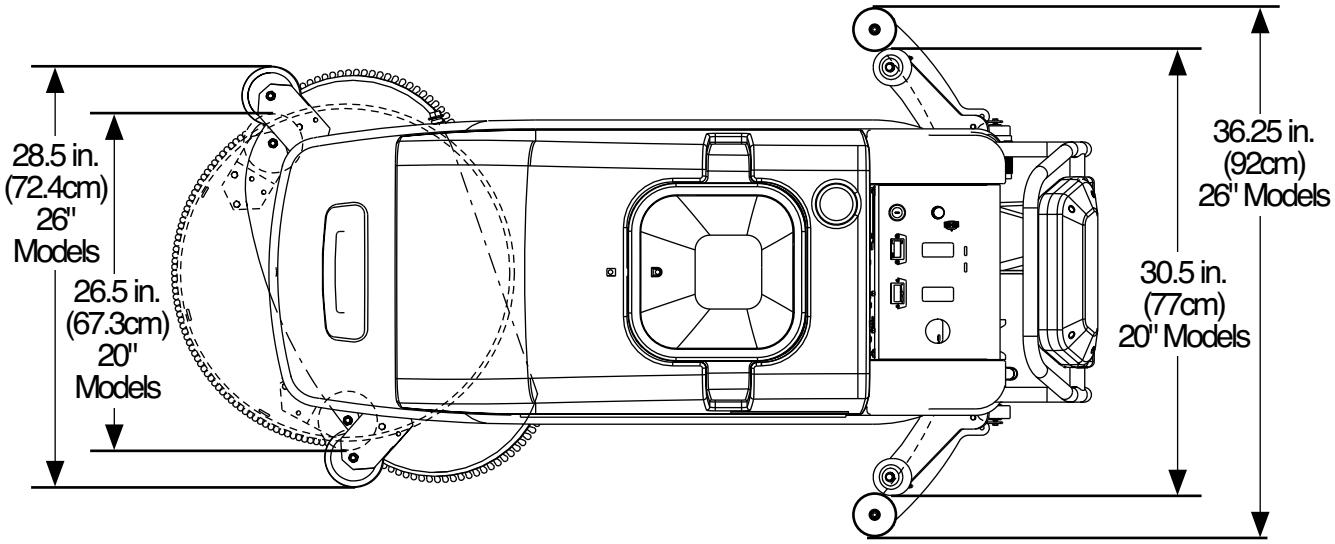
- This machine is not approved for use on public paths or roads.
- This machine is not suitable for picking up hazardous dust.
- Use care when using scarifier discs and grinding stones. Advance will not be held responsible for any damage to floor surfaces caused by scarifiers or grinding stones.
- When operating this machine, ensure that third parties, particularly children, are not endangered.
- Before performing any service function, carefully read all instructions pertaining to that function.
- Do not leave the machine unattended without first turning the key switch off (O), removing the key and securing the machine.
- Turn the key switch off (O) before changing the brush(es), and before opening any access panels.
- Take precautions to prevent hair, jewelry, or loose clothing from becoming caught in moving parts.
- Use caution when moving this machine in below freezing temperature conditions. Any water in the solution or recovery tanks or in the hose lines could freeze.

SAVE THESE INSTRUCTIONS

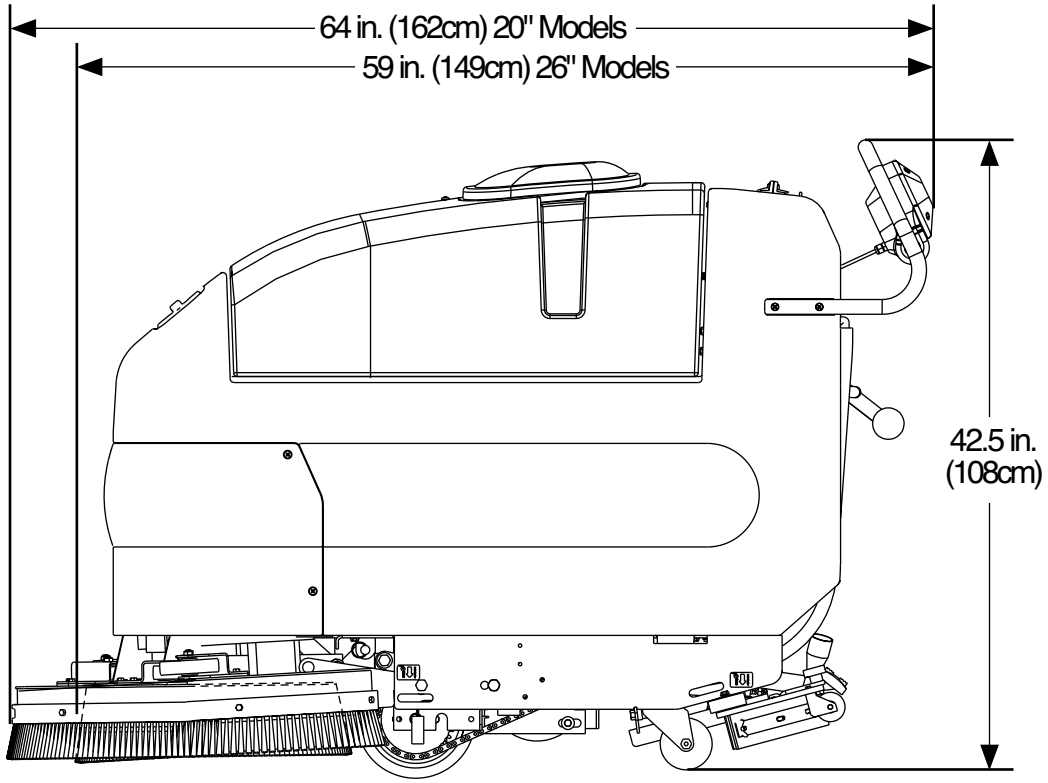
SPECIFICATIONS

General Specifications	English (Metric)
Machine Length	
20” Models	64 in. (162cm)
26” Models	59 in. (149cm)
Machine Width with Squeegee	
20” Models	30.5 in. (77cm)
26” Models	36.25 in. (92cm)
Machine Height	42.5 in. 108cm)
Machine Net Weight*	
20” Models	362 lbs. (164kg)
26” Models	384 lbs. (174kg)
Machine Gross Weight**	
20” Models	626 lbs. (284kg)
26” Models	648 lbs. (297kg)
Cleaning Width (scrubbing path)	
20” Models	20 inches (51cm)
26” Models	26 inches (66cm)
Coverage Rate Per Hour (theory)	
20” Models	28,000 sq. ft. (2600m^2)
26” Models	34,500 sq. ft. (3205m^2)
Coverage Rate Per Hour (average)	
20” Models	9,000 sq. ft. (836 m^2)
26” Models	11,300 sq. ft. (1050 m^2)
Brush Diameter 20” Models (qty of 1)	20 inches (50.8cm)
Brush Diameter 26” Models (qty of 2)	13 inches (36cm)
Brush Speed (20”)	200 RPM
Brush Speed (2 x 13”)	220 RPM
Brush Pressure	
20” Models	Low - 45 lbs. (20kg) High – 80 lbs. (36kg)
26” Models	Low – 70 lbs. (32kg) High – 110 lbs. (50kg)
Solution Tank Capacity	20 gal. (76l.)
Recovery Tank Capacity	20 gal. (76l.)
Vacuum Water Lift	63 inches (sealed) 14 inches (open hole adapter 1”)
Ramp Climbing Ability (gradeability)	2% grade
Sound power level as per ISO 3744 (at operator)	70 dB(A)/20μPa
Transport Speed (Maximum)	3.3 mph (5.3KPH)
Scrubbing Speed (Maximum)	3 mph (4.8KPH)
Power Source 24VDC Battery Pack	(4) 6V/238 AH batteries
Battery Weight (each)	66lbs. (29.9kg)
Battery Compartment Size	
Height	13.25 inches (33.6cm)
Width	15.5 inches (39.3cm)
Length	20.5 inches (52cm)
Battery Chargers	Automatic 24V – 20A DC / 115V 60Hz AC
Wheel Drive Motor	.5 hp, 373 watt
Brush Drive Motor (20” Models)	(1) 1 hp, 746 watt
Brush Drive Motor (26” Models)	(2) .75 hp, 560 watt
Vacuum Motor	.75 hp, 570 watt
Machine Current (Average)	20” Models: 40 Amps 26” Models: 50 Amps

***Net Weight:** Standard machine without options, empty solution and recovery tanks, without removable scrub brushes and no battery installed.
****Gross Weight:** Standard machine without options, empty solution tank and empty recovery tank, with removable scrub brushes and 238 AH batteries.



TOP VIEW



SIDE VIEW

MAINTENANCE

MAINTENANCE SCHEDULE

Maintenance intervals given are for average operating conditions. Machines used in severe operational environments may require service more often.

MAINTENANCE ITEM	Daily	Weekly	Monthly	Yearly
Charge Batteries	•			
Drain/Clean and Check Tanks & Hoses	•			
Check/Clean/Rotate the Brushes/Pads	•			
Check/Clean/Adjust the Squeegee	•	•		
Check/Clean Vacuum Shut-Off Float	•			
Check Each Battery Cell(s) Water Level		•		
Inspect and Clean Solution Filter		•		
Lubrication – Grease Fittings			•	
*Check Motor Carbon Brushes				•

Note: See the individual machine system sections for maintenance information.
* Have Nilfisk-Advance:

⚠ IMPORTANT!

Motor damage resulting from failure to service the carbon brushes is not covered under warranty. See the Limited Warranty Statement.

Check vacuum motor carbon brushes (Qty 2) once a year or after 300 operating hours.
Note if the vacuum or brush motor carbon brushes are 9.5mm (3/8 inches) or shorter, replace them.

Check brush motor carbon brushes (Qty 4) once a year or after 500 operating hours.
Check wheel drive motor carbon brushes every 500 operating hours. The original length of each brush is 20mm (25/32 inches). Replace when shorter than 9.5 mm (3/8 inches) to obtain the same motor efficiency as a new brush.

⚠ WARNING!

Turn the key switch off and disconnect the battery before servicing the machine.

BATTERIES AND CHARGERS

Attention: See the electrical system manual section for battery installation and charger system requirements.

LUBRICATING THE MACHINE

Once a month, pump a small amount of grease into each grease fitting on the machine until grease seeps out around the bearings.

Grease fitting locations are:

- Rear Caster Wheel Axle & Swivel (2) per Assembly

Once a month, apply light machine oil to lubricate the:

- Drive Chain
- Squeegee Height Adjustment Caster Hardware
- Pivot Points For the Squeegee & Scrub Brush Linkage

Advance ConvertaMAX 20/26 Models 56397010, 56397011, 56397580, 56397581
Nilfisk BA 550/650 Models 56397012, 56397013, 56397582, 56397583
PM Checklist

Customer _____

Address _____

City _____ **St** _____ **Zip** _____

Model _____ **Serial** _____ **Hours** _____

Defect Codes
- **A** needs adjustment
- **B** binding
- **C** dirty or contaminated
- **D** damaged, bent or torn
- **L** leaks
- **M** missing
- **W** worn out

Ref	OPERATIONAL INSPECTION ITEMS	OK	Defect Codes (circle)	Does Not Work
1	Drive Paddle Operation (check for Fwd/Rev Drive & any neutral creep)		A B D	
2	Drive System Performance (Speed Changes Min/Max)		noisy sluggish	
3	Scrub System (Raise/Lower, Brush Motor On/Off, Brush install & Remove Feature)		A B D	
4	Scrub Brush (pressure settings Normal & Heavy)		A B	
5	Squeegee System (Raise/Lower & Squeegee Tool pickup Performance)		A B D	
6	Vacuum Performance (Sealed water lift 63" and 1- inch open hole adapter 14 inches)		C L W	
7	Solution Control (On/Off Manual /Auto and Flow Volume Min/Max)		A B L	
8	Battery Charger (Auto turn ON & OFF)		D	

Ref	VISUAL INSPECTION ITEMS	Comments	OK	Defect Codes (circle)	Does Not Work
9	Scrub Brushes, check for wear and rotate			D M W	
10	Scrub Brush Motor(s), check for carbon brush wear	500 Hours		B C W	
11	Scrub Brush Motor(s), check gearboxes			B D L	
12	Brush Drive Plate Retainer Clips & flex couplers			C D M	
13	Scrub Deck Skirts and Side Wheels			D M W	
14	Solution Solenoid Valve			C D L W	
15	Solution Flow Control Valve and Linkage			A B D W	
16	Solution Tank, Delivery Hoses & Filter	Clean filter screen		C L	
17	Vacuum Motor Carbon Brushes (wear limit 3/8”)	300 Hours		B C W	
18	Vacuum Motor Gaskets and Filters			C D L	
19	Vacuum Float Ball & Cage Assembly	Clean float		C D M	
20	Recovery Tank Cover Gasket			L M W	
21	Recovery Tank Drain Hose & Cap			C D L	
22	Squeegee Pick-Up Hose	Back flush		C D L	
23	Squeegee Tool & Blades (clean & rotate)			A D W	
24	Squeegee Tool Wheels (lubricate)	Two side and two floor		A D W	
25	Battery Condition (load test, clean & water)			C W	
26	Front Drive Wheel Motor Check Carbon Brushes	500 Hours		B C W	
27	Front Drive Tire	tread wear		W	
28	Drive wheel Motor Chain (Lubricate and tension)			A B C W	
29	Rear chassis Caster Wheels (Lubricate)	tread wear		W	

NOTE: For additional service information see service manual form number 56043056 and operators manual form numbers 56041459, 56041460, 56041461.

WORK COMPLETED BY: ACKNOWLEDGED BY:

_____ _____ _____ _____

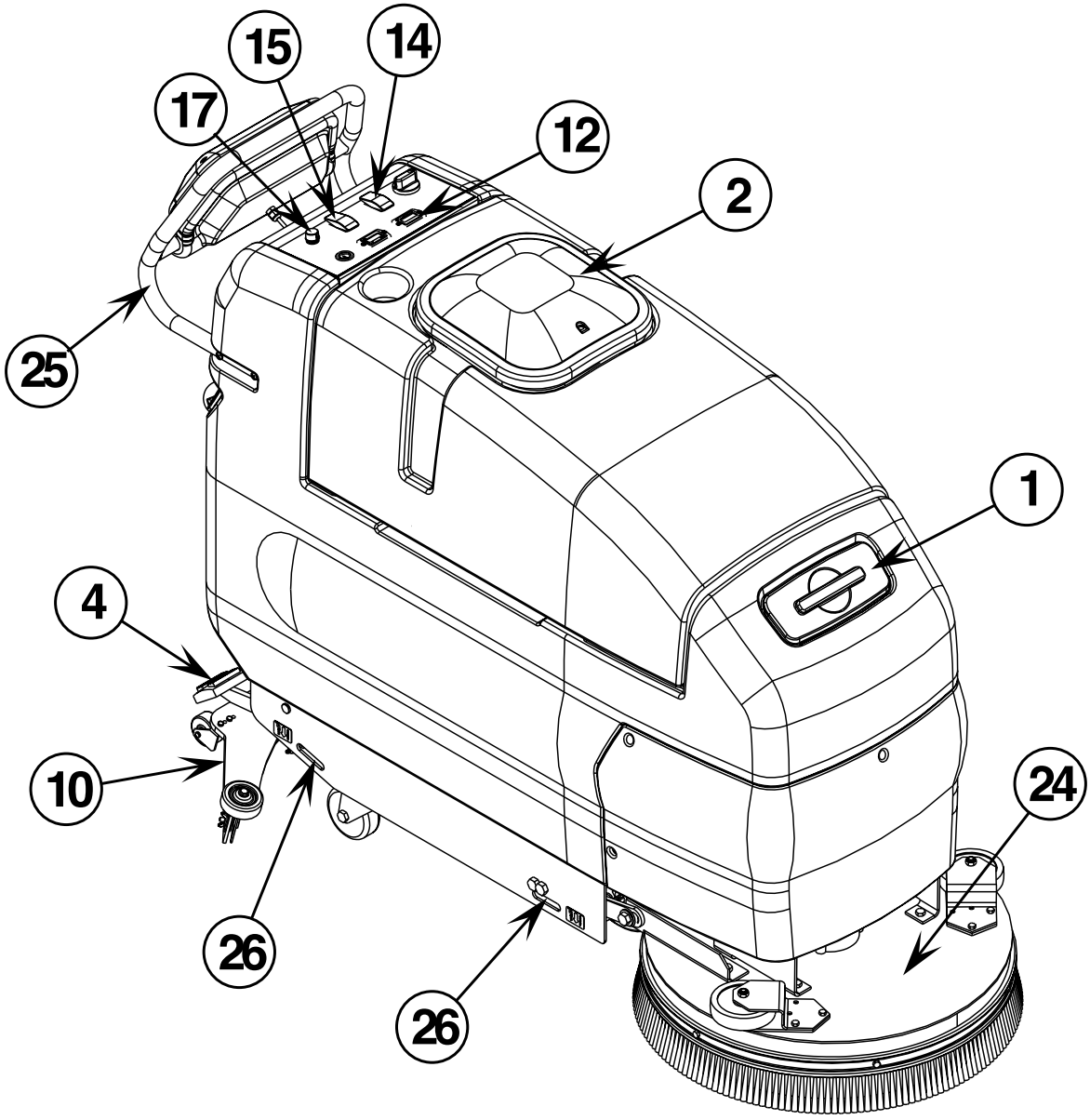
Service Technician Signature Date Customer Signature Date

8/09/01

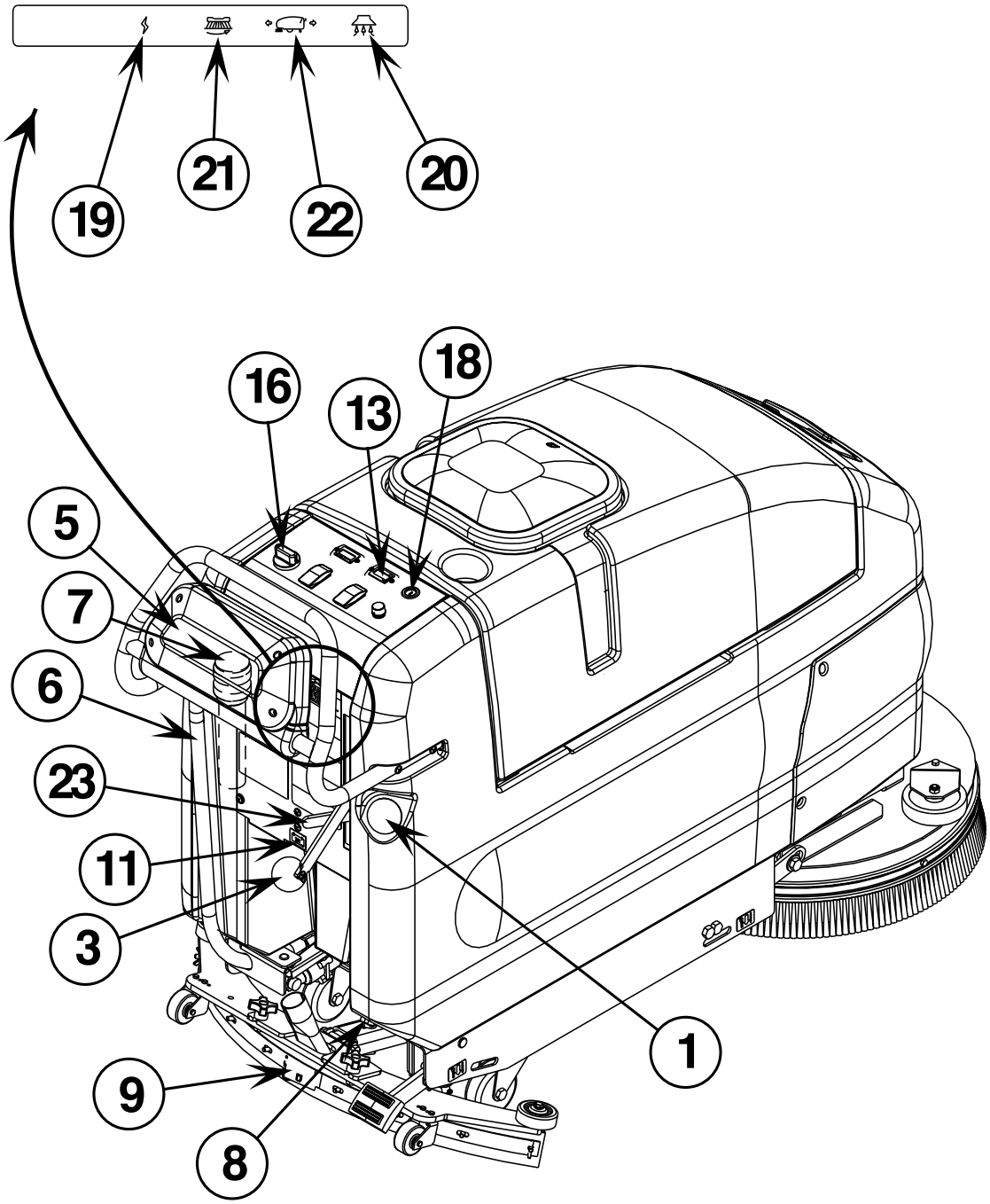
BLANK PAGE

KNOW YOUR MACHINE

1 Solution Tank Fill Openings (2)
2 Recovery Tank Cover
3 Vacuum / Squeegee Lever
4 Brush Raise / Lower Pedal
5 Drive Paddle
6 Solution Drain Hose / Level Indicator
7 Recovery Drain Hose
8 Squeegee Adjustment Knob
9 Squeegee Blade Latch
10 Squeegee
11 Battery Charger Connector
12 Battery Fuel Gauge
13 Hour Meter
14 Solution Switch, ON-Momentarily ON-OFF
15 Brush Remove Switch
16 Solution Flow Control Knob
17 Speed Limit Control Knob
18 Master Key Switch
19 Auxiliary Circuit Breaker
20 Vacuum Motor Circuit Breaker
21 Brush Motor Circuit Breaker
22 Wheel Drive Circuit Breaker
23 Scrub Pressure Lever
24 Brush Deck
25 Operator Control Handle
26 Tie Downs



KNOW YOUR MACHINE



FUNCTIONAL DESCRIPTION OF CONTROL BUTTONS:

Solution Tank Fill (1) – Open to fill the solution tank, use non-foaming chemicals only (capacity 20 gal. / 75 liters)
Recovery Tank Cover (2) – Point of entry for waste water into tank. Also houses float ball which shuts off vacuum port to vac motor when tank is full.
Squeegee Lever (3) – This lever controls both the squeegee and the vacuum motor. There are three positions: OFF, vacuum ON and vacuum ON with the squeegee on the floor.

* Off
* Vacuum ON
  This position lifts the squeegee slightly while leaving the vacuum turned on. This can be used for backing up during scrubbing, or supplies vacuum for cleaning remote areas using an attachment.
* Vacuum ON with the squeegee on the floor
  This position is for picking up solution while scrubbing.

Brush Raise / Lower Pedal (4) – Located at the right rear corner near the floor, this pedal is used to raise or lower the brush head.
Drive Paddle (5) – Located on top at the rear of the machine, the operator can make the machine go forward by pushing forward on it, or reverse by pulling backward on it. The speed is variable depending on how far forward or backward the paddle is moved. When the brush head is in the "DOWN" position, the brushes and solution will operate when the drive is engaged in either direction, but will stop after the machine is stationary for 1 second.
Solution Drain Hose / Level Indicator (6) – Used to empty the solution tank and show current level of solution in tank, graduations are marked on the side of the solution tank next to the hose.
Recovery Drain Hose (7) – Used to empty the recovery tank.
Squeegee Adjustment Knob (8) – Used to adjust the tilt of the squeegee. Turn knob clockwise to tilt the squeegee backwards and counter-clockwise to tilt it forward.
Squeegee Blade Latch (9) – Holds rear squeegee blade and straps in place, release to replace rear blade.
Squeegee (10) – Picks up solution after scrubbing.
Battery Charger Connector (11) – Plug battery charger into this port to charge batteries.
Battery Fuel Gauge (12) – Shows current state of charge of batteries.
Hour Meter (13) – Displays number of hours machine has been used.
Solution Switch (14) – This switch is used to select the mode of operation for the solution system. There are 3 modes of operation for this system. The modes are OFF, ON, MOMENTARY ON. Following is a description of each mode and how they are selected.

OFF: In this mode the solution flow is turned off.

ON: In this mode the solution flow will be turned on whenever the Drive Paddle **(5)** is in forward or reverse mode and the brush head is down. The solution flow will be turned off otherwise.

MOMENTARY ON: – Solution can be dispensed by pressing and holding the solution button. Solution will be dispensed for as long as the button is held. This is for pre-wetting the floor prior to scrubbing.

KNOW YOUR MACHINE

Brush Remove Switch (15) – To remove the brush(es) from the machine, have the machine stationary and the Brush Deck **(24)** in the "RAISED" position. Press the switch to the "REMOVE" position and release. The switch will snap to the OFF position, and the brush(es) will drop to the floor.
Solution Flow Control Knob (16) – Turn this dial to the right to increase solution flow to the floor. Turn to the left, to decrease the amount of solution flow to the floor. When the Drive Paddle **(5)** is released from either forward or reverse travel, the solution flow will stop automatically, and resume when the drive is engaged.
Speed Limit Control Knob (17) – The Speed Limit Control Knob is used to adjust the maximum speed in both forward and reverse.
Master Key Switch (18) – The master power switch.
Auxiliary Circuit Breaker (19) – Provides overload protection. If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Vacuum Motor Circuit Breaker (20) – Provides overload protection to machine's vacuum motor. If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Brush Motor Circuit Breaker (21) – Provides overload protection to machine's brush motor(s). If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Wheel Drive Circuit Breaker (22) – Provides overload protection to machine's wheel drive motor. If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Scrub Pressure Lever (23) – Two position lever provides two different scrubbing pressures.
TOP POSITION: – In this position the full weight of the scrub deck rests on the floor.
BOTTOM POSITION: – In this position the scrub pressure is approximately 30 pounds less.
Brush Deck (24) – Contains brush drive motor(s) and brush(es).
Operator Control Handle (25) – Operator holds onto this to control the machine.

CONTROL MODULE DESCRIPTION

The ConvertaMAX™ 20/26 / BA 550/650 scrubbers have an electronic module that controls the activation of the scrub brush motors for scrubbing and removal of the brushes/pads and the low voltage cutout function.

For normal scrubbing the brush motor(s) will activate only if the brushes are down and the Drive Paddle **(5)** (throttle) is in the forward or reverse position.

For removal of the brushes/pads the scrub deck must be in the up position. To remove the brushes/pads simply depress the Brush Remove Switch **(15)**. The module will momentarily run the brush motor and then stop it quickly.

The low voltage cutout is adjustable for two different thresholds. The normal setting cuts out at 1.75 volts per cell and the alternate setting cuts out at 1.83 volts per cell. The cutout level is selected by momentarily depressing the pushbutton switch located on the module circuit board.

***Important Note:** See the Low Voltage Cutout Level Selection manual section in the Electrical System and follow the instructions for setting the low voltage cutout threshold.

DESCRIPTION OF THE BATTERY FUEL GAUGE

The Battery Fuel Gauge **(12)** uses a 10 bar LED display that indicates the state of the batteries charge, successively, bar by bar, from full to empty. At 70% depth of discharge a single flashing light signals an energy reserve alert. At 80% of discharge, a double flashing light signals an empty alarm. The battery gauge will retain the last state-of-charge condition even when the machine has been turned off. The battery fuel gauge state-of-charge display indication is automatically reset to full charge when the battery pack is recharged.

SOLUTION SYSTEM

FUNCTIONAL OVERVIEW

The 20-gallon (76 l.) capacity solution tank uses two fill openings one located in the front and another in the rear, which offers ease of filling. Plumbed onto the tank outlet is a serviceable solution filter, to keep debris from entering the solenoid valve. Also fitted to the tank is flexible hose used to indicate the solution level and to drain the tank for system maintenance.

See Figure 1. The solution system uses (2) valves to regulate the amount of solution dispensed onto the floor. The Knob **(A)** located on the control panel operates the Main Solution Valve **(B)** that controls the needed flow volume demanded by the scrub brushes. The electrical solenoid valve (L1) **(C)** and control panel mounted solution switch (S2) start and stop the solution flow (See Electrical Diagram).

During normal machine operation the (S2) solution switch when turned ON works in conjunction with the wheel drive controller components and brush motor solenoid output to energize the (L1) solenoid valve. The solution will flow to the scrub brushes when the main flow control valve is open, the scrub deck is lowered and the handle drive paddle (box) is pushed or pulled into Fwd or Rev. Note: When the solution On/Off switch (S2) is turned Off, no flow can occur regardless of the main valve being On and the drive control paddle being activated.

FIGURE 1

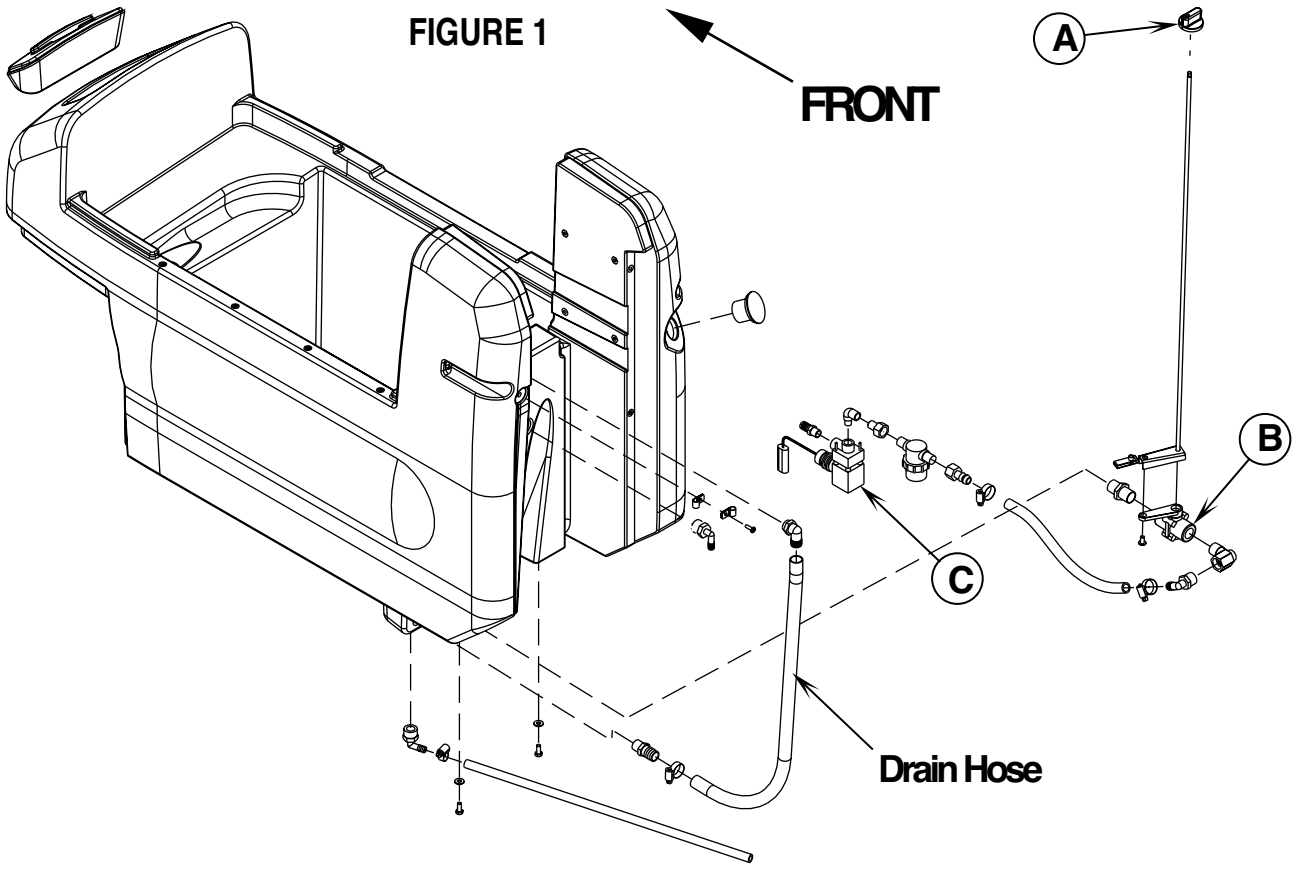


FIGURE 2

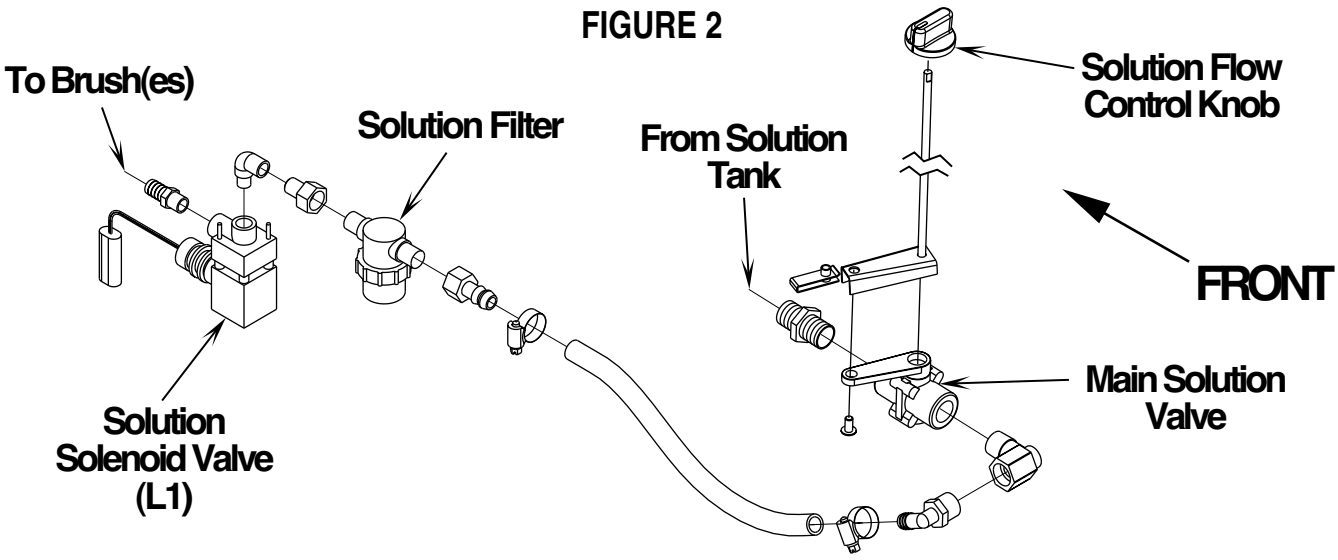
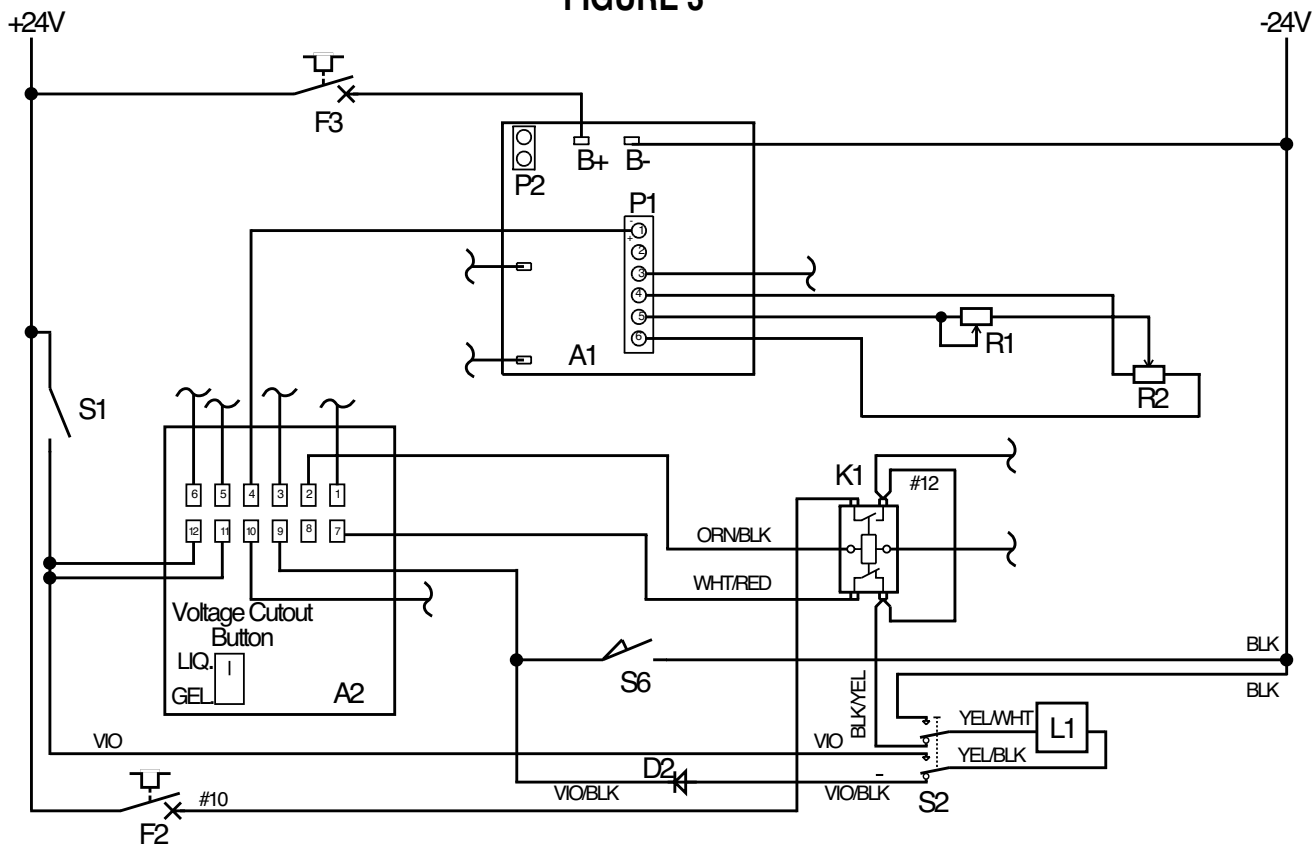


FIGURE 3



Electrical Diagram (Solution Switch Closed in the Full ON Position)

*For complete description of all callouts see Electrical System Wiring Diagram.

TROUBLESHOOTING GUIDE

Problem	Possible Cause
Inadequate or no solution flow	No solution in the tank
	Main solution flow control valve knob is in the off position
	Clogged solution filter, valves and hoses
	Defective solution solenoid valve (L1)*
	Defective control panel solution switch (S2)**

***See Solenoid Troubleshooting flow chart Symptom One for electrical system diagnostics.

****See Troubleshooting flow chart Symptom Two.

SOLUTION SYSTEM

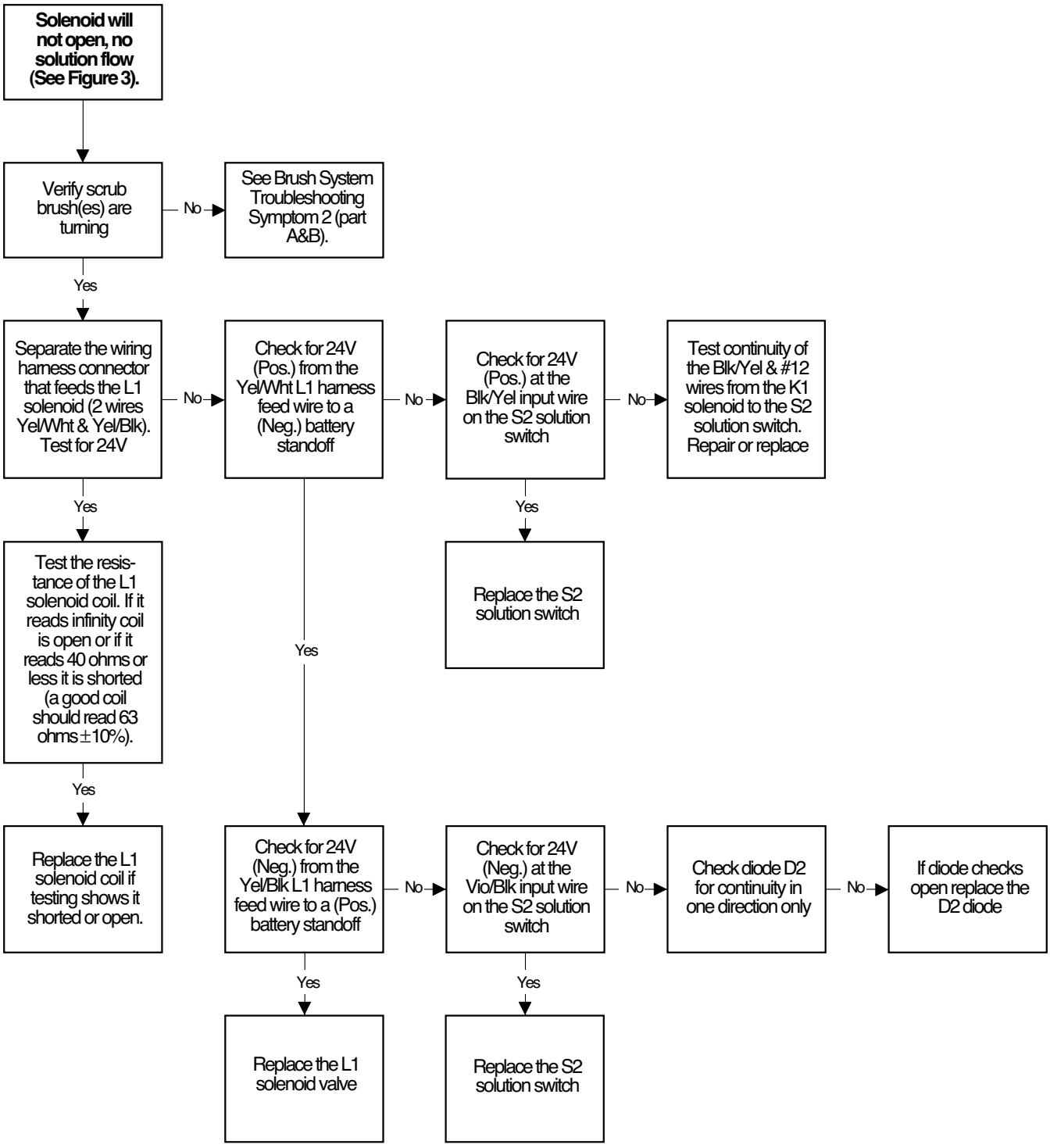
TROUBLESHOOTING GUIDE ELECTRICAL

Possible Symptoms

1 Solution solenoid valve will not open when the solution switch is in the full on position.
2 Solution solenoid valve will not open when the solution switch is in the momentary on position.

SYMPTOM ONE

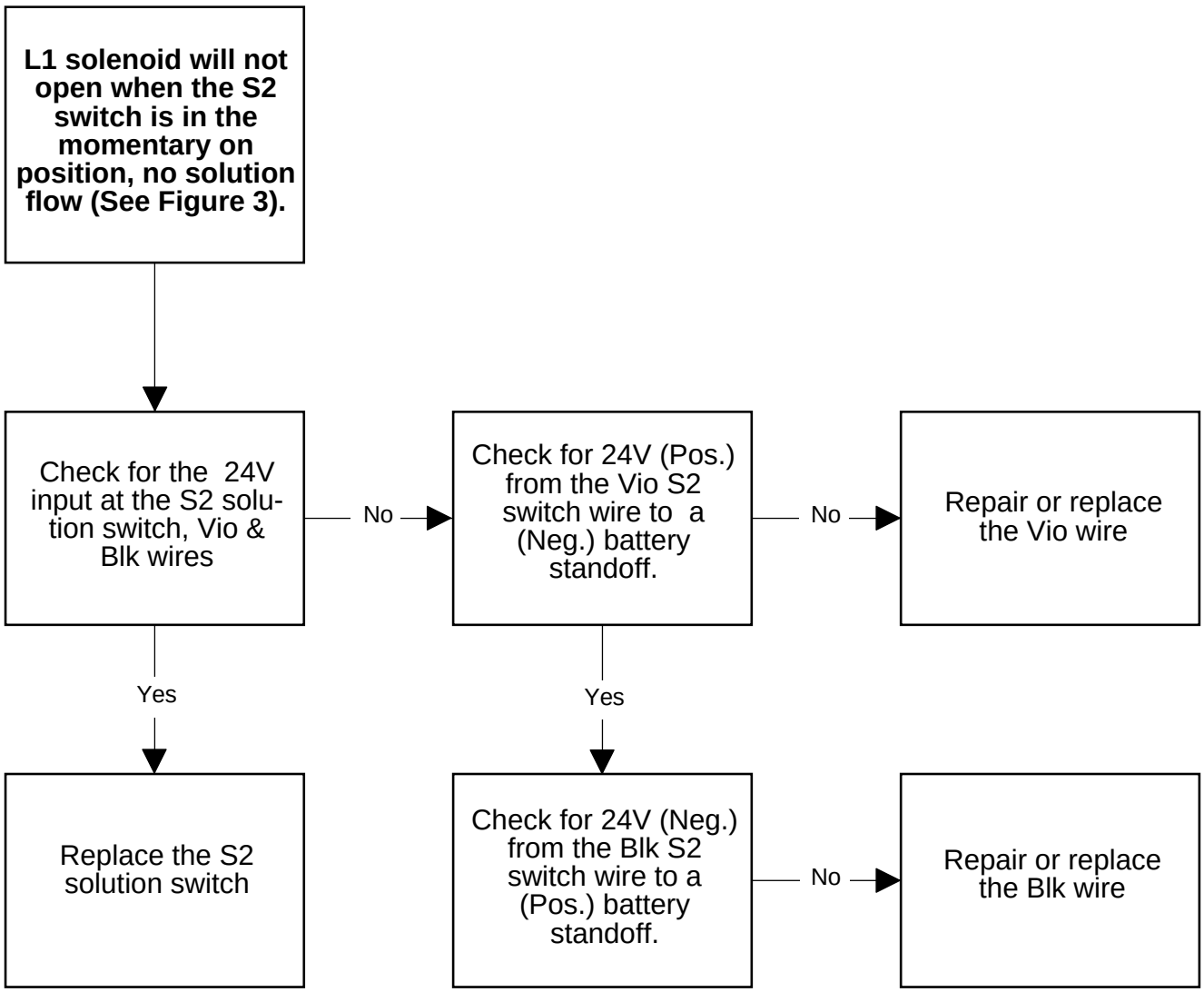
Note: Do all testing with the key switch on, brush switch closed (scrub deck lowered) and the drive paddle activated (pushed Fwd or pulled into Rev).



TROUBLESHOOTING GUIDE ELECTRICAL (CONTINUED)

SYMPTOM TWO

Note: Test with the key switch on and the solution switch held in the momentary on position.

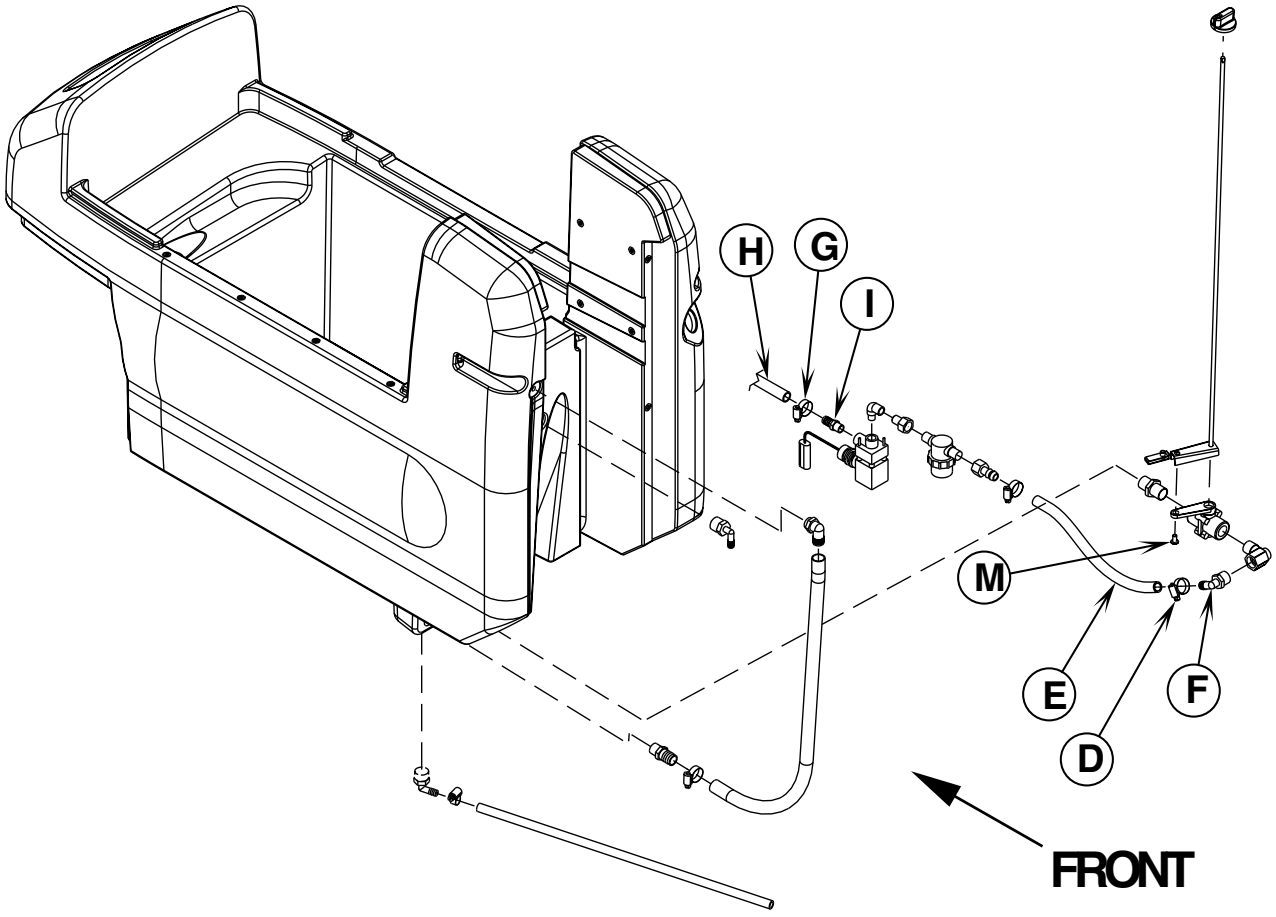


SOLUTION SYSTEM

SOLUTION SOLENOID VALVE AND STRAINER REMOVAL

1 Drain the solution tank using the tank drain hose.
2 See Figure 4. Loosen **(D)** Hose Clamp and pry the Hose **(E)** from the Elbow Fitting **(F)** as shown.
3 Loosen the **(G)** Hose Clamp and remove the **(H)** solution feed hose from the **(I)** solenoid valve barb.
4 Loosen the solenoid valve mount anchor connector, and then disconnect the valves' wiring harness connector.
5 Pull out from underneath the machine the combined valve and strainer assembly. Make service repairs as required and re-install in reverse order.

FIGURE 4

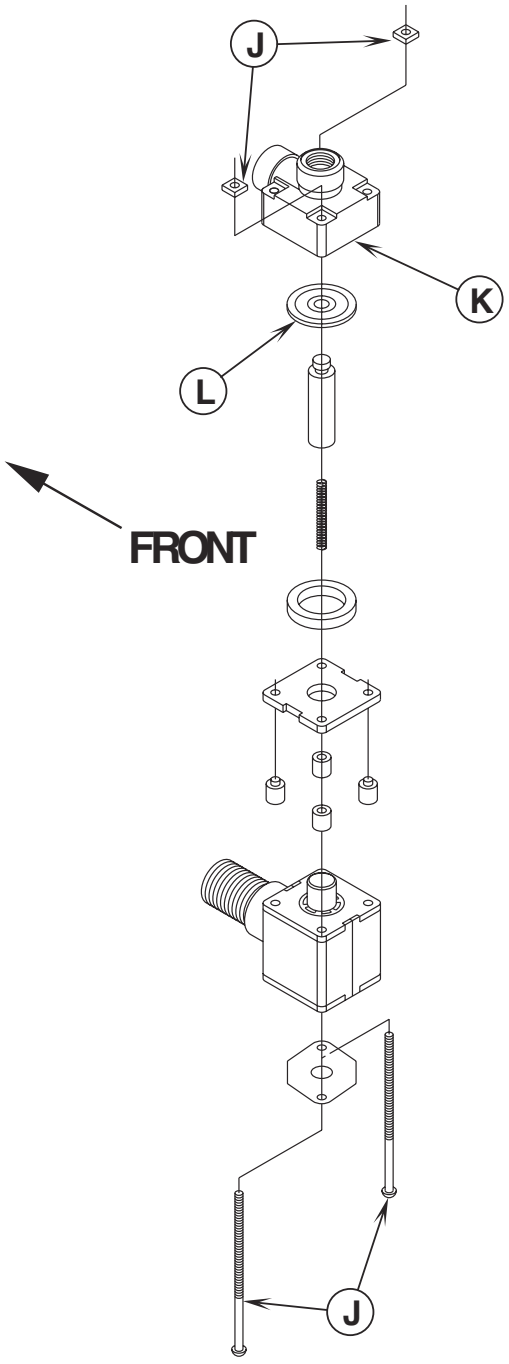


SOLENOID VALVE DISASSEMBLY AND CLEANING

1 Remove the solenoid valve. See the Solution Solenoid Valve And Strainer Removal section for instructions.
2 See Figure 5. Remove the (2) **(J)** Screws and nuts and disassemble the valve (be careful not to lose any internal parts).
3 Thoroughly wash dirt from block **(K)** and diaphragm **(L)**.
4 After reassembling, test the solenoid valve for proper operation.

Note: Solenoid valve replacement seal kit (Viton) part number 56324247.

FIGURE 5



SOLUTION FLOW CONTROL VALVE REMOVAL

1 Drain the solution tank and also remove the squeegee tool from the machine (this allows the needed room to work on the valve).
2 See Figure 4. Loosen the Hose Clamp **(D)** and pull the Hose **(E)** off the valve elbow fitting **(F)**.
3 Remove the Screw **(M)** that holds together both the water valve shaft arm and the solution valve arm.
4 Separate the control arms and work the shaft up and off the valve to allow the clearance for removal.
5 Turn the valve out of the solution tank connection and remove it from the machine. Note it is not necessary to remove the tank drain hose, just compress the hose to allow needed clearance to remove the valve.

SCRUB BRUSH SYSTEM

GENERAL BRUSH SYSTEM FUNCTIONAL OVERVIEW

The ConvertaMAX™ 20 / BA 550 models use (1) scrub brush (20 inch Dia.) driven by a single 1HP 24VDC-combination motor/gear unit. The ConvertaMAX™ 26 / BA 650 models use (2) scrub brushes (two 13 inch Dia.) driven by two 3/4HP 24VDC combination motor/gear units. The scrub deck is raised and lowered manually by a rear mounted foot pedal.

Control Module Scrub System Functions

The ConvertaMAX™ 20/26 / BA 550/650 scrubbers have an electronic timer module (A2) that controls the activation of the scrub brush motors, special scrub brush removal feature and a low voltage cutout function.

Scrub Brush Removal Function

For removal of the scrub brush(es) automatically the scrub deck must be in the up position and the drive system in neutral. To remove the scrub brush(es) simply depress the control panel remove switch (S3). The timer module will momentarily run the brush motor and then stop it quickly, where the brush inertia causes the brush to easily spin it's self off of the scrub brush motor drive cap.

Low Voltage Cut-Out Function

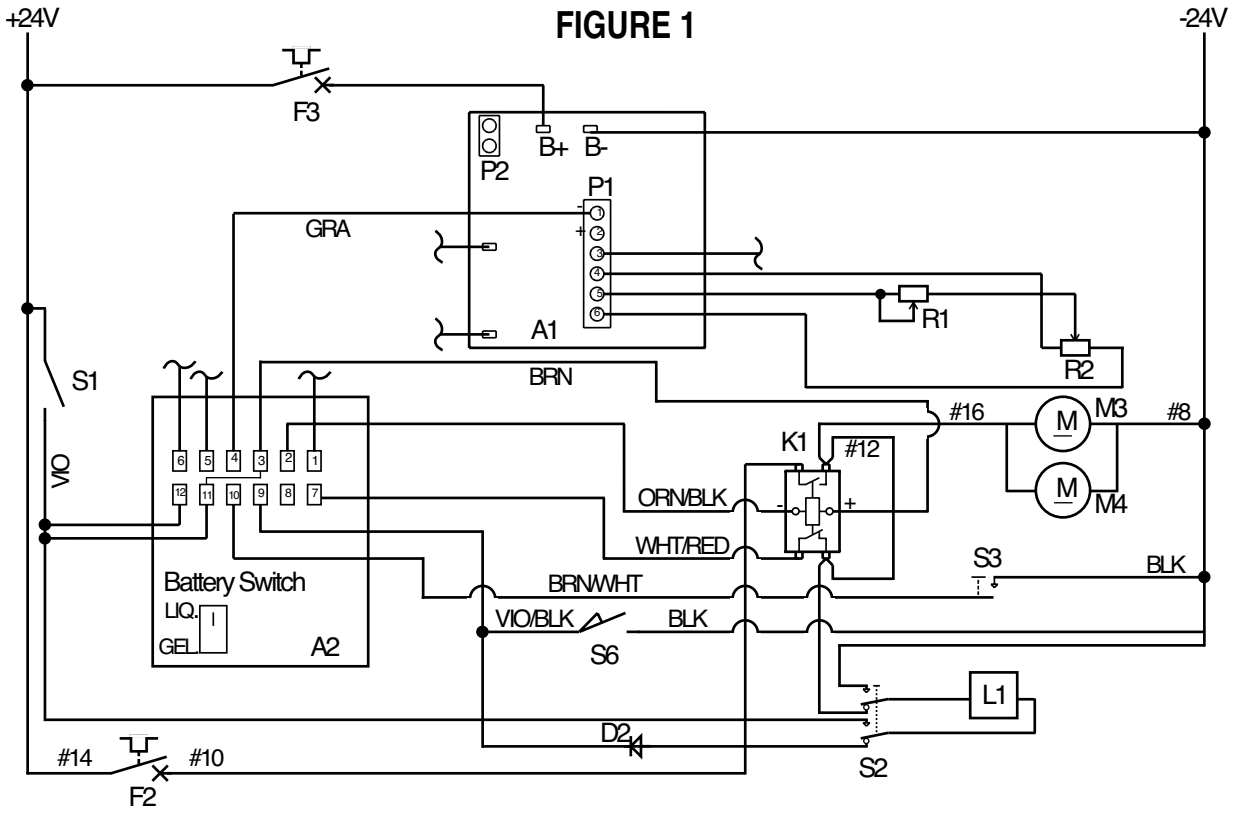
The purpose of the special low battery voltage cutout function is to help prolong battery life. The brush motor(s) and solution solenoid valve will turn off automatically and cease to function when the batteries discharge to 1.75 volts per cell or 1.83 volts per cell on alternate setting. Note: See the battery system section for instructions for selecting (setting) the two different thresholds (wet cell, lead acid or gel, maintenance free). **Special Service Note:** On all the 24V and 36V machines a minimum recharge voltage of 2.09 volts per cell must be reached to allow the scrub brush and solution systems (to reset) function again. A 24V-battery pack must increase to a 25.1-volt minimum and a 36V battery pack to 37.6 volts.

Scrub Brush Motor Function

See Figure 1. To turn ON (energize) the K1 brush motor solenoid the operator must lower the brush deck to close the S6 brush switch and move the drive paddle (Fwd or Rev) to activate the wheel drive.

These two operator functions described above deliver the required control circuit inputs, one positive and two negative, to start and stop the scrub brush motor(s). The Pos. control circuit-input starts with the S1 key switch closed and a Pos. voltage input to the pin 11 on the A2 timer module. The pin #11 is connected directly to pin #3 inside the module. The BRN wire from pin #3 sends the required Pos. control circuit input to the K1 coil terminal. One of the two Neg. circuit inputs is triggered when the machine is put in motion. The A1 speed control's P1 connection sends a Neg. input signal to the timer module pin #4. The second Neg. input is initiated when the S6 brush switch is closed sending a Neg. voltage signal to the timer pin #9. With the two Neg. inputs completed the timer circuit closes an internal relay that sends from pin #2 (ORG/BLK wire) the needed Neg. control circuit voltage to the K1 coil terminal. This then completes the K1 coil circuit (Pos. & Neg.) and pulls in the load contact making the brush motor(s) run.

FIGURE 1



Electrical Diagram

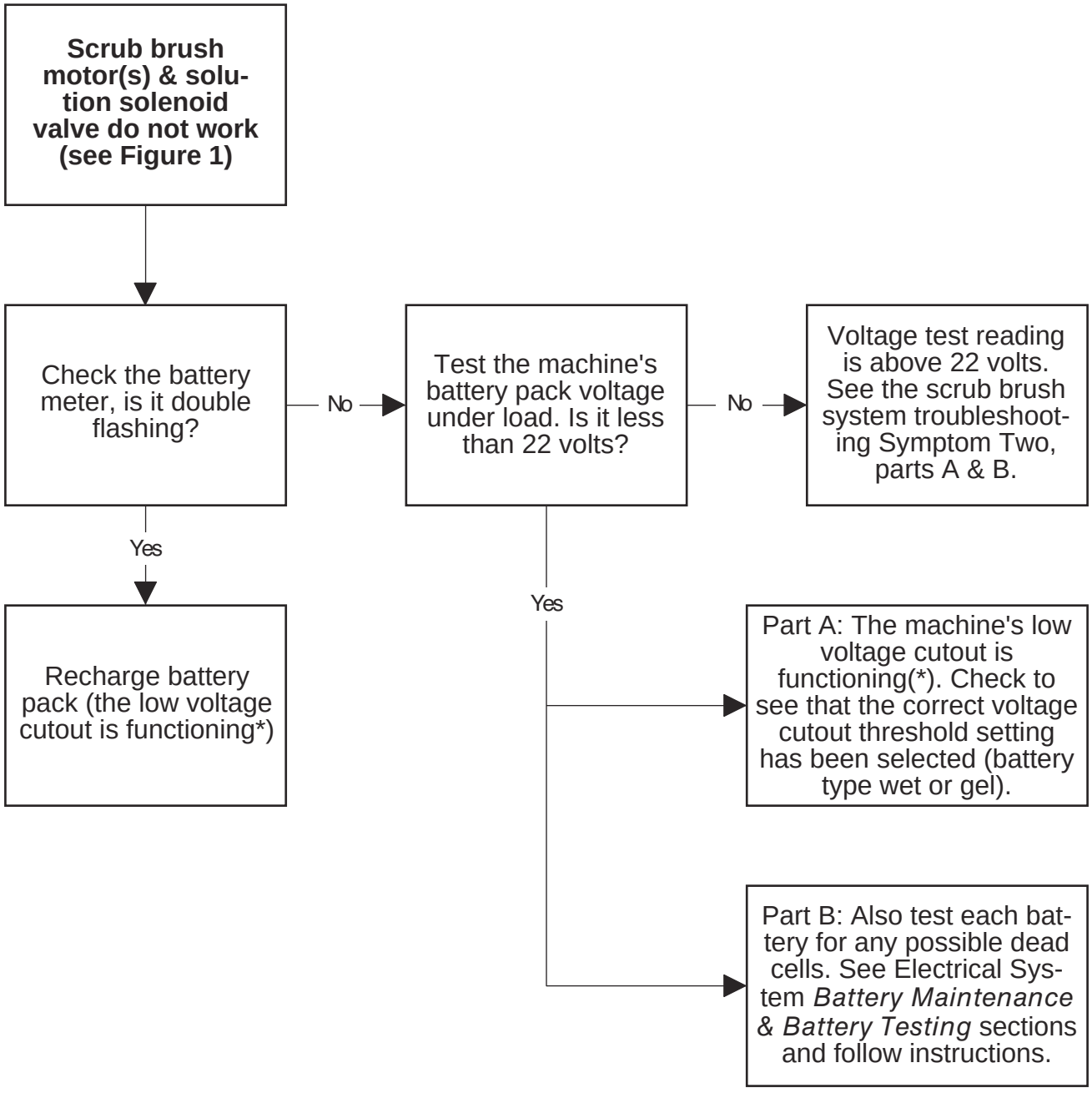
*For complete description of all callouts see Electrical System Wiring Diagram.

TROUBLESHOOTING GUIDE ELECTRICAL

Possible Symptoms

1 Scrub brush motor(s) and solution solenoid valve do not work
2 Scrub brush motor(s) do not work
3 Scrub brush auto remove function does not work

SYMPTOM ONE



*Reference the Description of the Battery Low Voltage Cutout Feature in the Electrical System of this manual.

SCRUB BRUSH SYSTEM

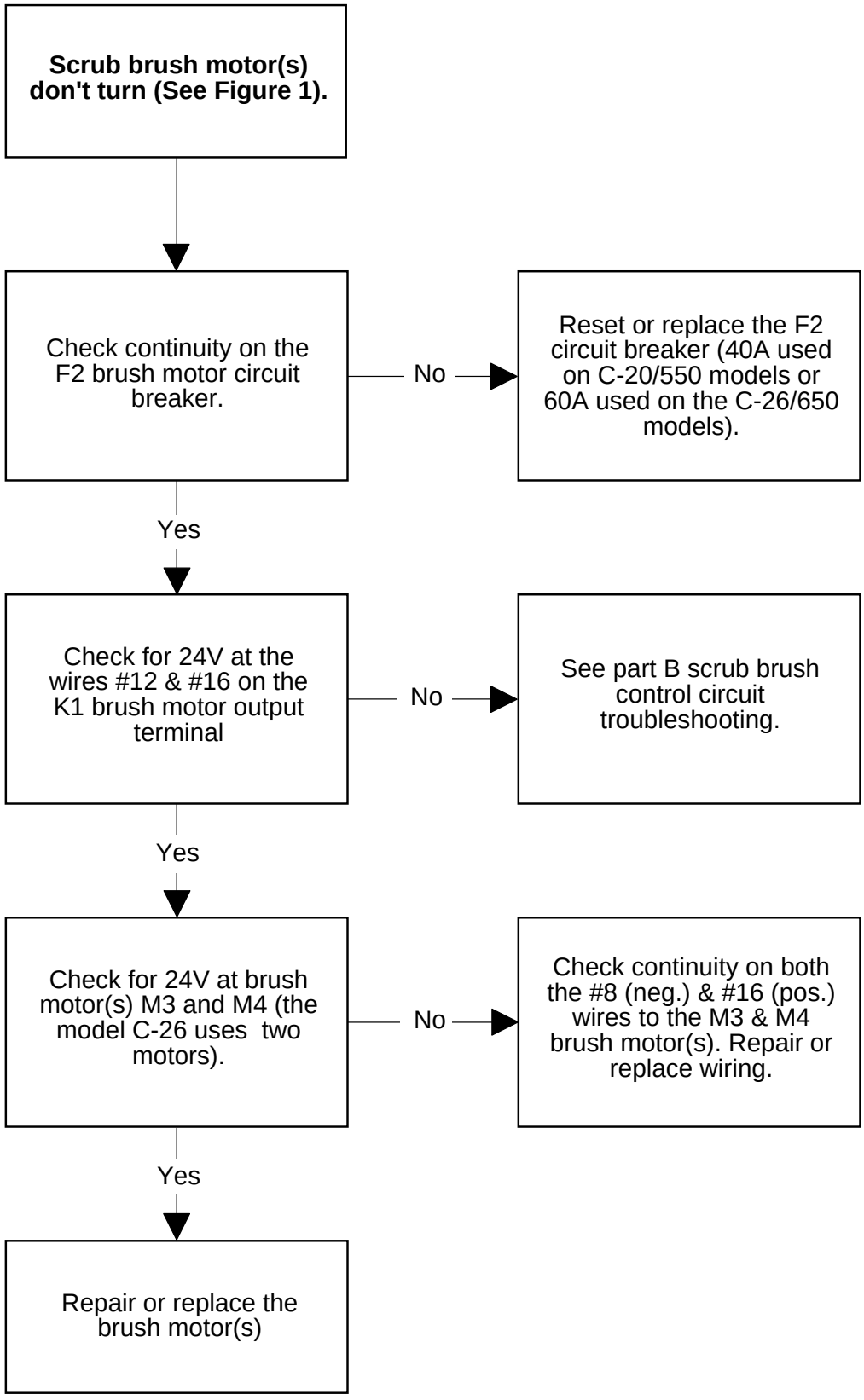
TROUBLESHOOTING GUIDE (CONTINUED)

SYMPTOM TWO

Brush Motor(s) Don't Turn

Note: Do all testing with the key switch on, brush switch closed (scrub deck lowered) and the drive paddle activated (pushed Fwd or pulled into Rev).

Part A: Scrub Brush Motor Load Circuit Troubleshooting Guide

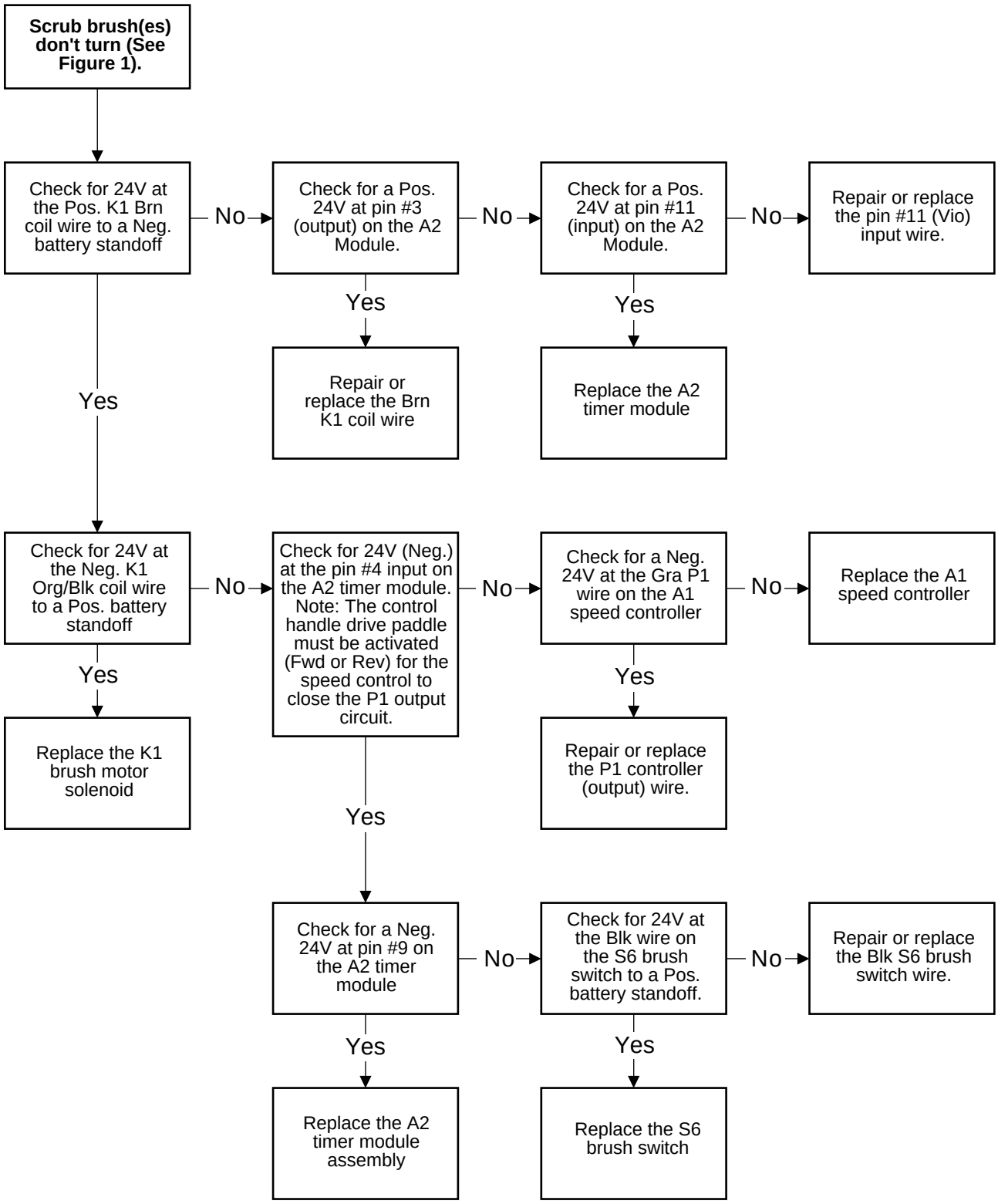


TROUBLESHOOTING GUIDE (CONTINUED)
SYMPTOM TWO

Brush Motor(s) Don't Turn

Note: Do all testing with key switch on, brush switch closed (scrub deck lowered) and drive paddle activated (pushed Fwd or pulled into Rev).

Part B: Scrub Brush Motor Control Circuit Troubleshooting Guide



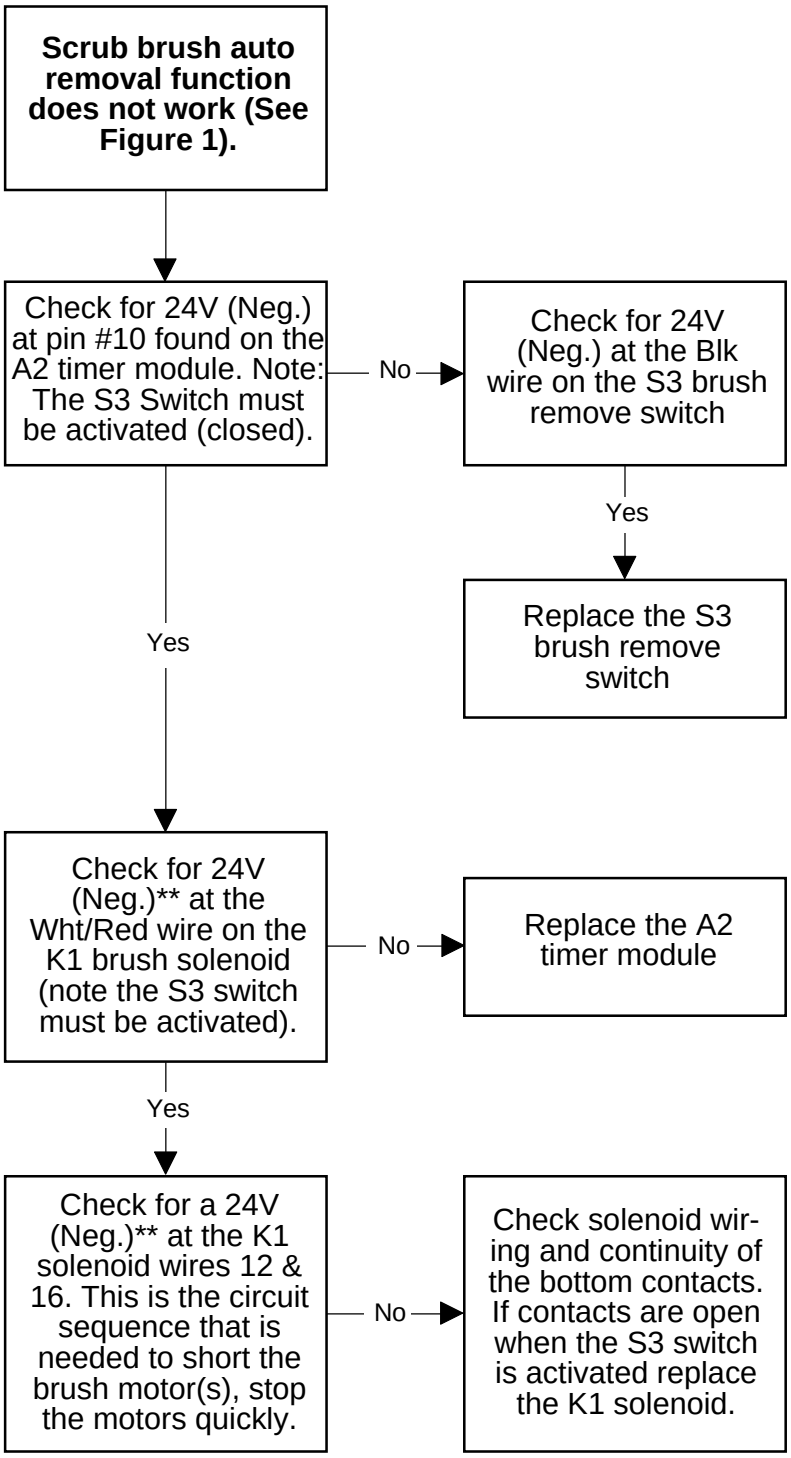
SCRUB BRUSH SYSTEM

TROUBLESHOOTING GUIDE (CONTINUED)
SYMPTOM THREE

Scrub Brush Auto Removal Function Does Not Work

Note: Do all testing with the key switch ON, scrub deck raised (S6 brush switch open*), drive system in neutral. To remove the scrub brush(es) simply depress the control panel remove switch S3.

Circuit sequence detail: The S3 switch is closed and the pin# 10 input causes a brief negative output at pin#2 that energizes the K1 solenoid and the brush motor(s) turn(s) momentarily. Next the A2 timer module de-energizes the solenoid and a negative output from pin #7 passes through the bottom contacts of the brush solenoid to short the motors to ground.



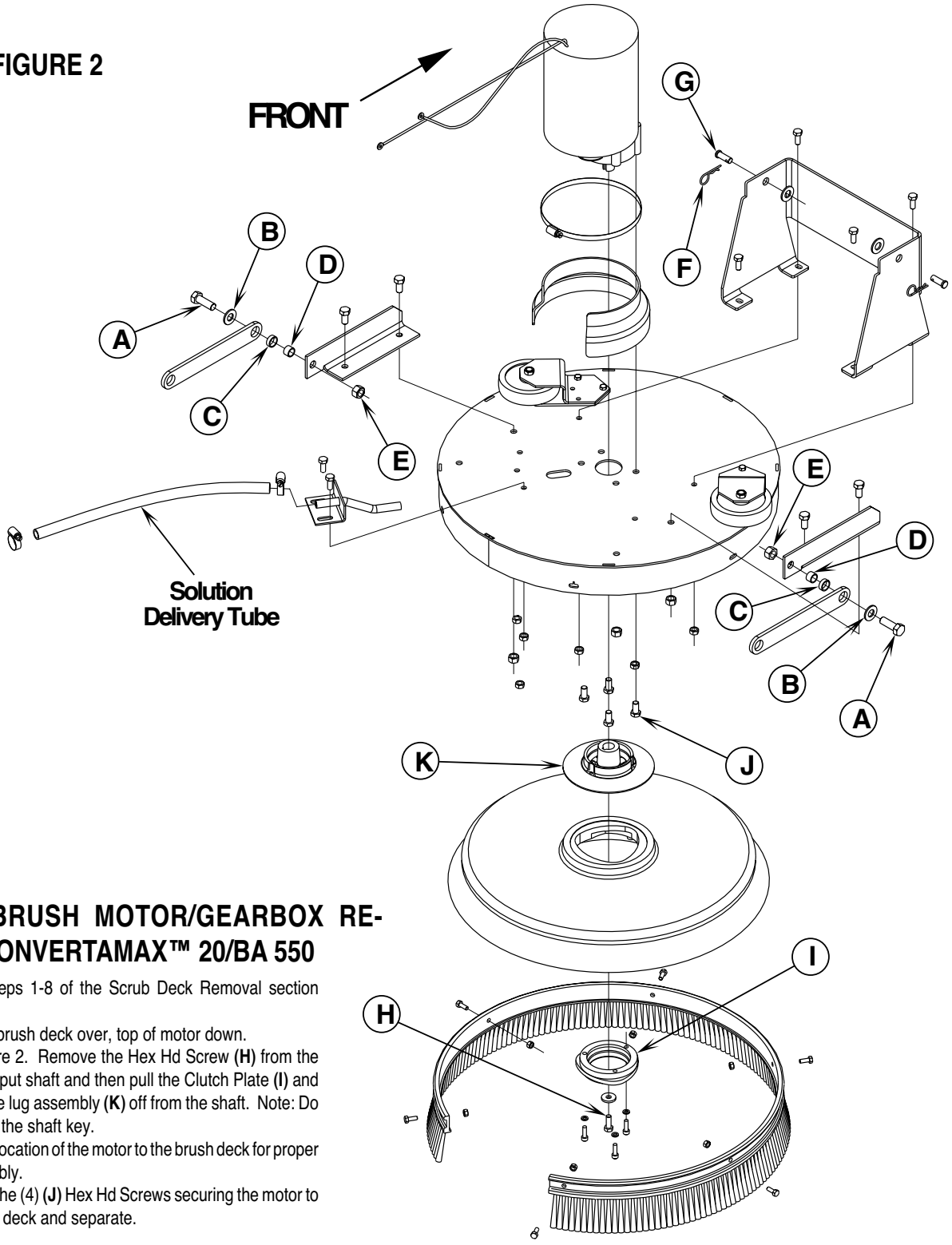
***Special Service Note:** Before following all the troubleshooting steps shown above test the S6 brush switch with an Ohm meter to confirm an open circuit. Also check the switch for proper adjustment (raised open/lowered closed).

****Special Service Note:** This will be a brief pulse not a continuous voltage.

MODEL CONVERTAMAX™ 20/BA 550 SCRUB DECK REMOVAL

1. Disconnect battery connector assembly in the battery compartment.
2. Remove the brush head cover (held in place by 5 screws).
3. Lower the brush deck to the floor with a brush installed.
4. See Figure 2. Remove the solution delivery hose at the scrub deck solution tube.
5. Remove the hardware items **(A,B,C,D** & **E)** from the brush head brackets and lift linkage arms. Note: Do not loose the removable lift arm bushings.
6. Remove (Qty 2) item **(F)** Hairpins and the (2) **(G)** Mount Pins from the (upper) scrub head lift linkage.
7. Pull the scrub head forward 12 inches (30 cm) to access the motor wiring terminal block.
8. Remove the motor wiring at the terminal block and then pull the brush head assembly completely from the machine. Note: See Figure 4 for the correct wiring for the single scrub brush motor.

FIGURE 2



SCRUB BRUSH MOTOR/GEARBOX REMOVAL CONVERTAMAX™ 20/BA 550

1. Follow steps 1-8 of the Scrub Deck Removal section above.
2. Turn the brush deck over, top of motor down.
3. See Figure 2. Remove the Hex Hd Screw **(H)** from the motor output shaft and then pull the Clutch Plate **(I)** and drive plate lug assembly **(K)** off from the shaft. Note: Do not loose the shaft key.
4. Mark the location of the motor to the brush deck for proper re-assembly.
5. Remove the (4) **(J)** Hex Hd Screws securing the motor to the brush deck and separate.

SCRUB BRUSH SYSTEM

MODEL CONVERTAMAX™ 26/BA 650 SCRUB DECK REMOVAL

1 Follow steps 1-3 in the Scrub Deck Removal section for the ConvertaMAX™ 20.
2 See Figure 3. Remove the Solution Delivery Tube **(L)** at the solution solenoid valve.
3 Remove the hardware items **(M, N, O, P, & Q)** from the brush head Support Brackets **(R)** and lift linkage arms.
4 Remove (Qty 1) item **(S)** Hairpin and the Mount Pin **(T)** from the (upper) scrub head lift linkage.
5 Pull the scrub head forward 12 inches (30 cm) to access the motor wiring terminal block.
6 Remove the motor wiring at the terminal block and then pull the brush head assembly completely from the machine. Note: See Figure 4 for the correct wiring for both the left and right scrub brush motors.

MODEL CONVERTAMAX™ 26/BA 650 SCRUB BRUSH MOTOR/GEARBOX REMOVAL

1 Follow steps 1-6 in the Model ConvertaMAX™ 26/BA 650 Scrub Deck Removal section.
2 Turn the brush deck over, top of the motors down.
3 Remove the scrub brushes from the brush holders then mark the location of the motor to the brush deck for proper re-assembly.
4 See Figure 3. Remove the (3) **(U)** Hex Screws and (3) **(V)** Nuts from each Flexible Coupler **(W)**.
5 Next remove the (3) Hex Lock Screws **(X)** that connect the coupler to the Drive Hubs **(Y)** and remove the brush holder(s) **(Z)**.
6 Remove the hardware items **(AA & BB)** that secure the Hub **(Y)** to the output shaft on each gearbox. Then pull the hub from the shaft and save the key.
7 Remove the (4) **(CC)** Screws and separate the motor/gearbox assembly from the scrub deck that needs replacement.
8 Re-assemble in reverse order and test for proper operation. Note: Apply a small amount of grease or a product called "Never Seize" to the gearbox output shaft when reinstalling the Drive Hub(s) **(Y)**.

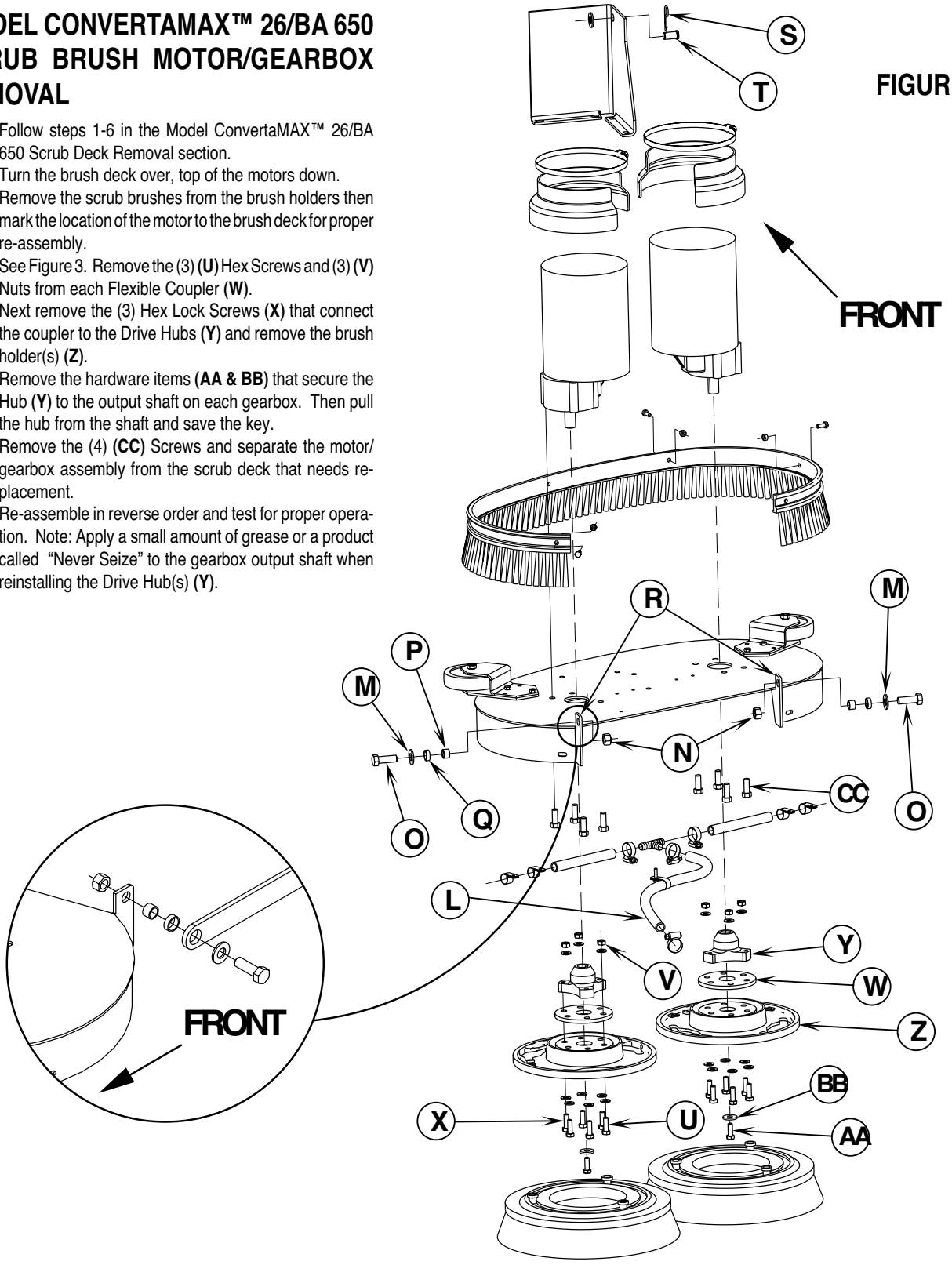
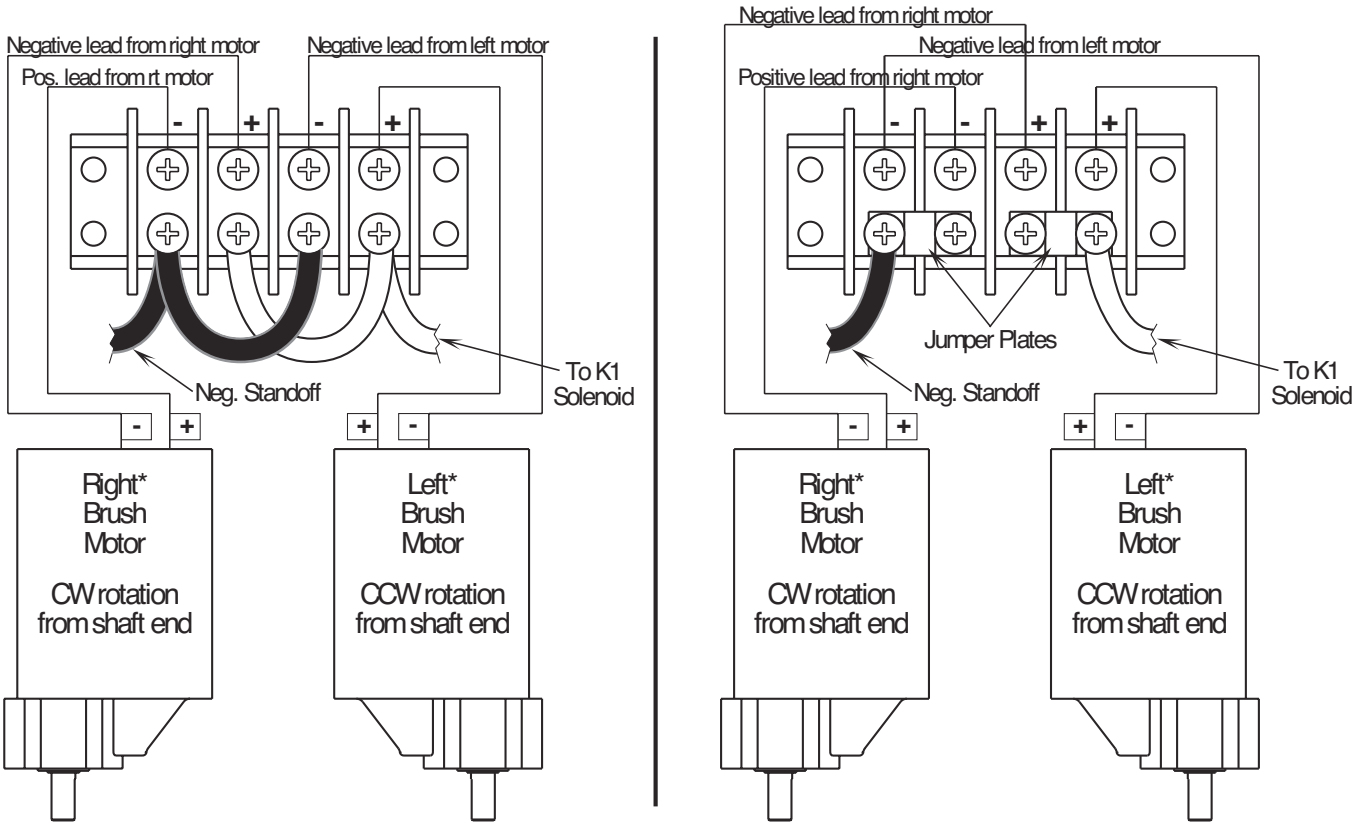


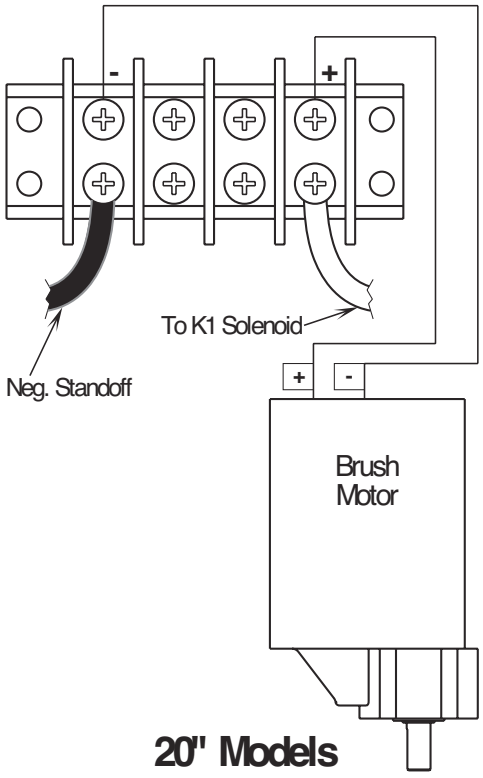
FIGURE 3

FIGURE 4



Without Jumper Plates **26" Models** **With Jumper Plates**

*Right and left are identified as seen from the rear of the machine.



20" Models

SCRUB BRUSH SYSTEM

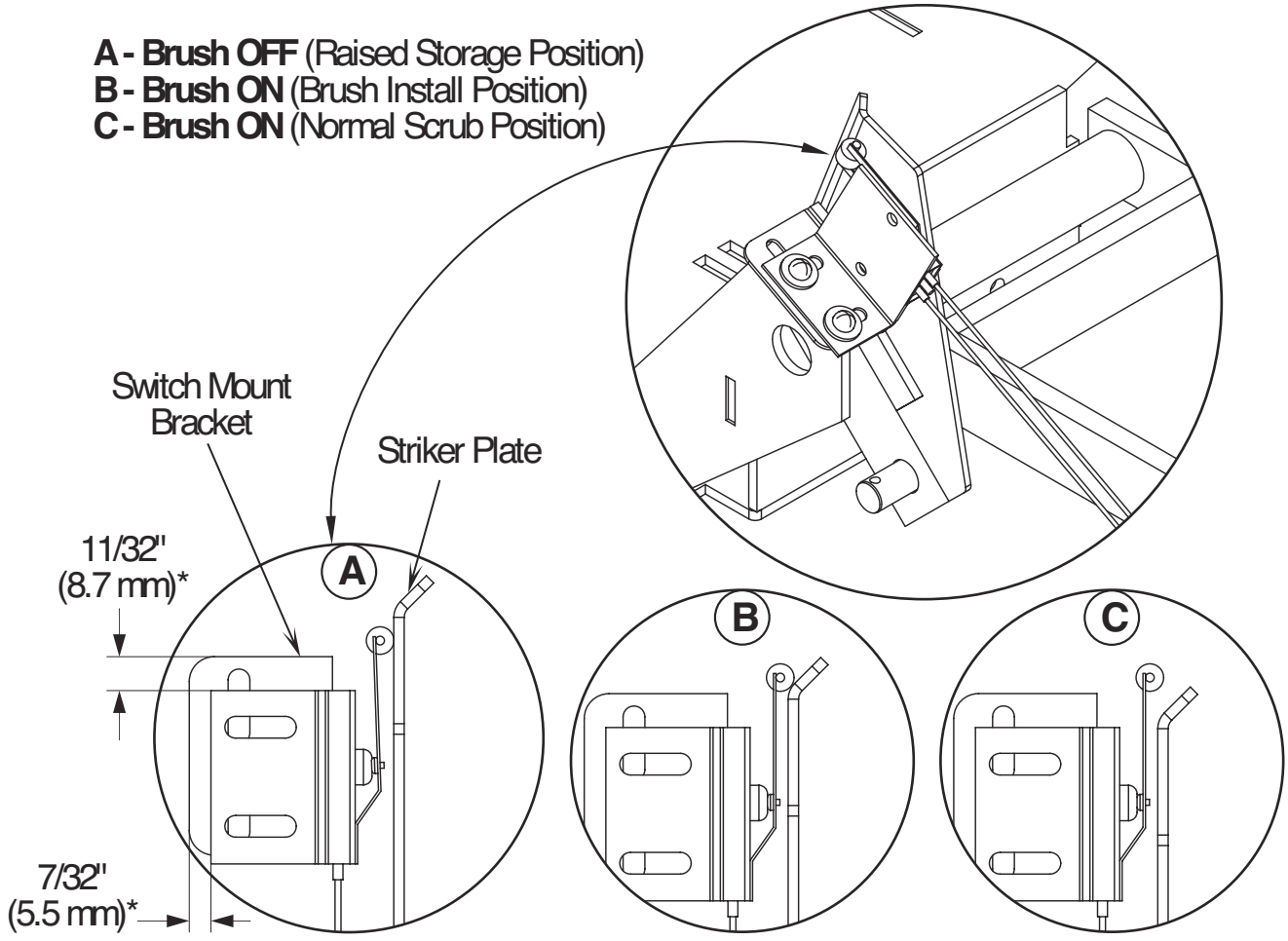
BRUSH HEAD SWITCH ADJUSTMENT (MACHINES BUILT BEFORE MARCH 2001)

⚠ WARNING!

Have the master key switch OFF when servicing the brush switch.

1. To access the brush switch remove the (5) screws securing the brush motor shroud then put the scrub brush deck in it's UP stored position.
2. See Figure 5(A, B & C) below. These illustrations show the correct switch operational positions for the (A) raised storage position, (B) brush install position and (C) normal scrub position.
3. With the key OFF, scrub deck raised, place scrub brush(es) underneath the drive disc(s) and lower deck for the automatic brush installation.
4. With the brush switch mounted loosely position the switch on the corner of the switch striker plate as shown in figure B. Note: The switch is mounted with the roller not compressed and is in its normally closed position.
5. Turn the key ON, engage the drive paddle and install the brushes onto the drive disc(s) automatically. Note: The brush motor(s) will run.
6. Raise and lower the brush-head to test the switch for proper switch functions. Up the brush(es) should not run and down the brush should run.

FIGURE 5



*Note: Measurements given are approximate and intended only as a starting point for adjustment.

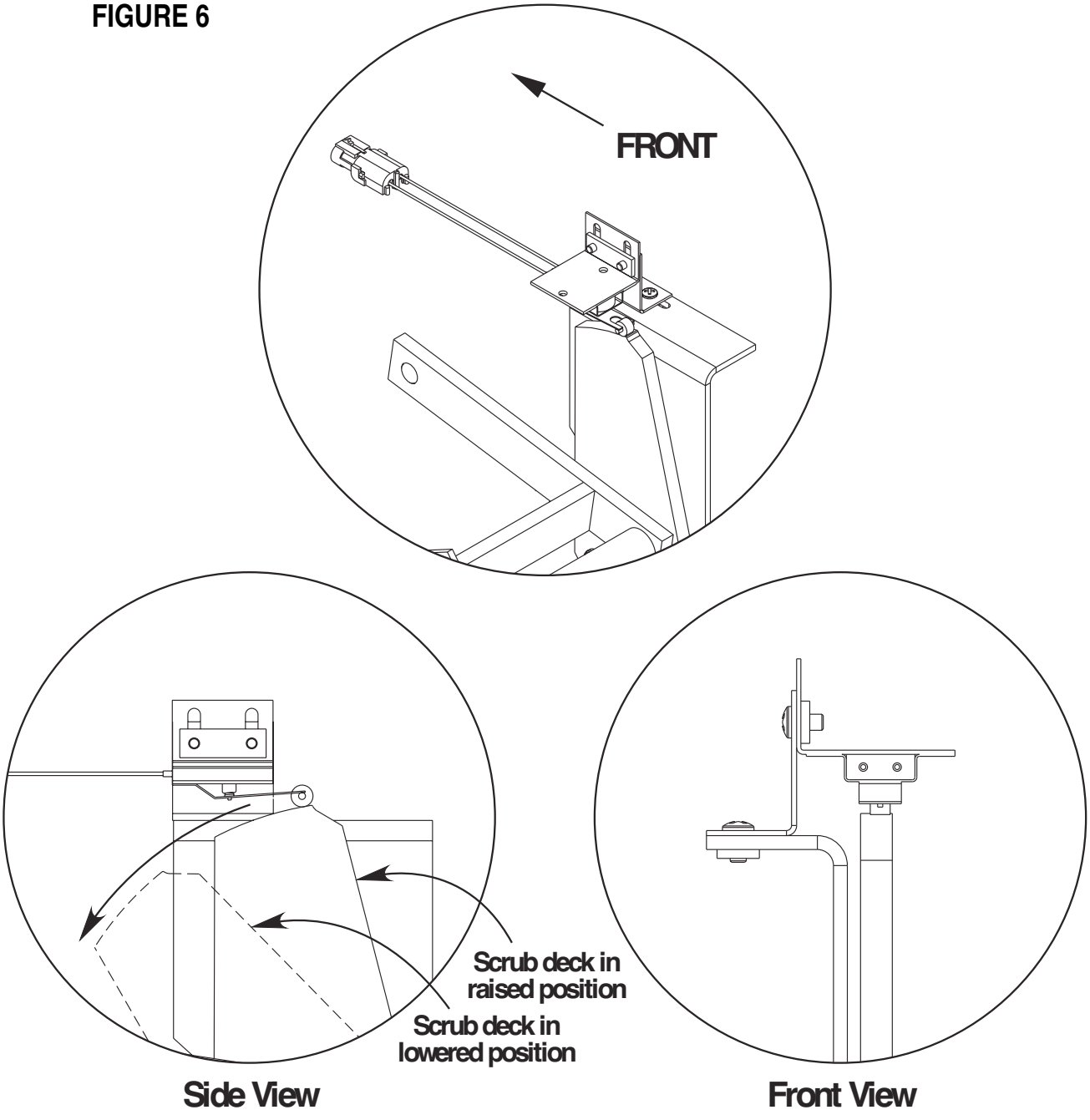
BRUSH HEAD SWITCH ADJUSTMENT (MACHINES BUILT AFTER FEBRUARY 2001)

⚠ WARNING!

Have the master key switch OFF when servicing the brush switch.

1. To access the brush switch remove the (5) screws securing the brush motor shroud then put the scrub brush deck in it's UP stored position.
2. See Figure 6. Position the switch arm roller on the corner of the striker bracket as shown.
3. Push the switch and roller down to compress the switch (you will hear a click) then tighten the mounting screws to secure the switch adjustment. Note the switch is now properly adjusted for an open circuit brush motors Off function.
4. Install scrub brush(es), lower the scrub deck, turn the key switch on and then engage the drive paddle to test that the brush motors run. Also cycle raise and lower the brush deck to check the proper On and Off brush and drive paddle operations.

FIGURE 6



RECOVERY SYSTEM

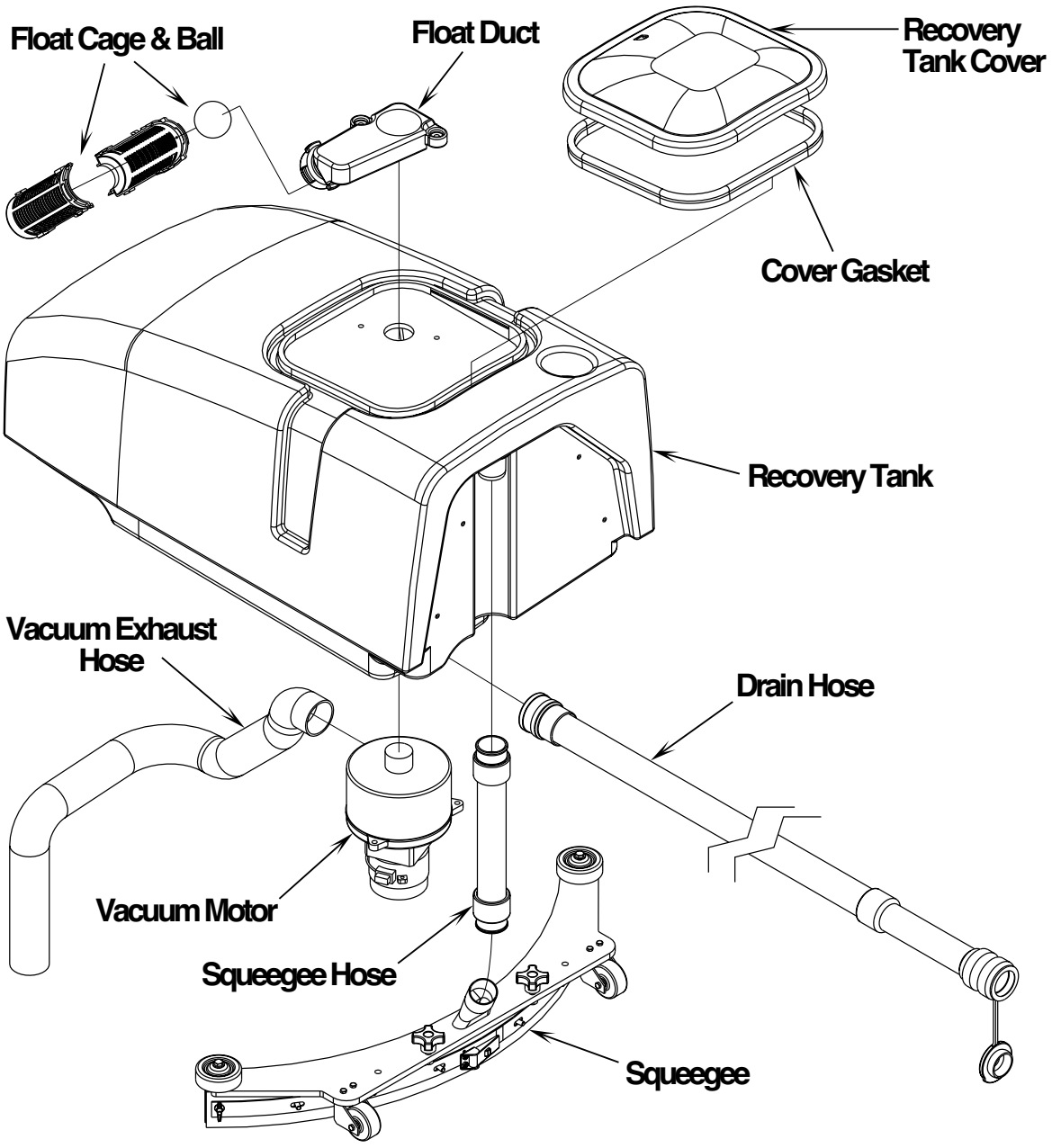
FUNCTIONAL OVERVIEW

Vacuum / Recovery System General

Dirt and water are lifted off the floor into the recovery tank by airflow, created by a 3-Stage 24V vacuum motor. The wastewater and air enter the vacuum system at the squeegee tool, through small openings (notches) located in the front squeegee blade. The small openings are the entrance points for the water and air, and help speed up the airflow producing the suction to lift the wastewater off of the floor. The air and wastewater move through the squeegee hose at high speed until it reaches the recovery tank. There the air slows down because of the increased volume (large size) of tank. With the decreased air speed the heavier water falls to the bottom of the recovery tank. Then at the same time the airflow continues through the tank, shutoff float, vacuum hose, vacuum motor and is exhausted out of the vacuum motor housing. No wastewater ever actually moves through the vacuum motor, just clean air.

The vacuum system uses a shutoff float to prevent the tank from being overfilled and stops any water from being sucked into the vacuum motor.

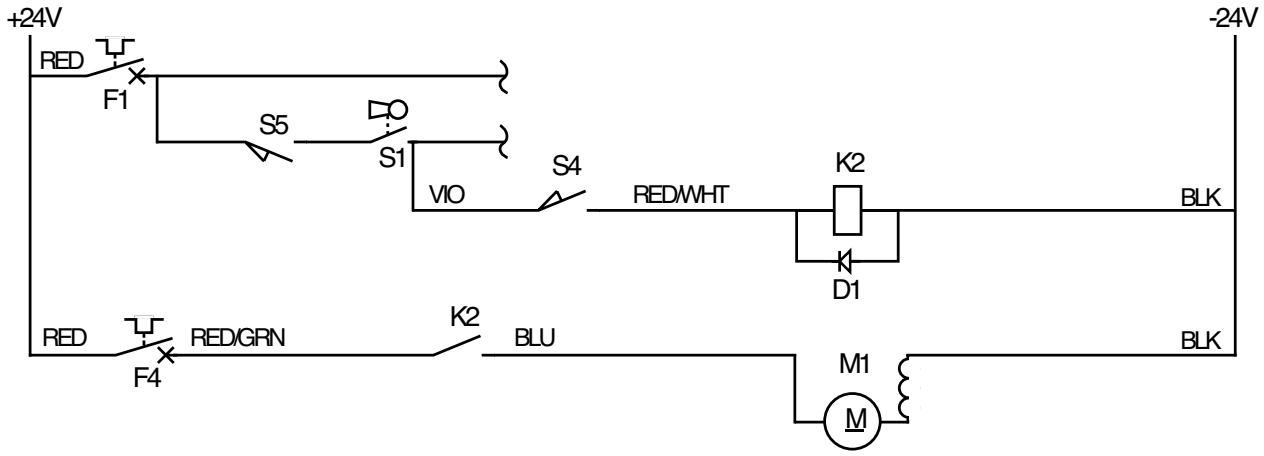
FIGURE 1



Vacuum Motor Function

See Figure 2. The K2 vacuum motor solenoid is energized (turned on) when lowering the squeegee raise/lower lever. With the squeegee lever lowered the S4 vacuum switch is closed and completes the control circuit that energizes K2 solenoid. With the load side of the K2 solenoid output voltage complete the M1 vacuum motor will run.

FIGURE 2



Electrical Diagram

*For complete description of all callouts see Electrical System Wiring Diagram.

VACUUM / RECOVERY SYSTEM SERVICE MAINTENANCE CHECKLIST

Whenever there is a vacuum problem, it's best to check over the entire system. Use the checklist below as a guide, to thoroughly check the vacuum system.

- ☐ Clean built-up dirt from the inside of the squeegee tool.
- ☐ Replace the squeegee blades if they are nicked or torn.
- ☐ Inspect the hose between the squeegee tool and the recovery tank, rinse any built-up dirt from the hose. Replace the hose if it is kinked or damaged.
- ☐ Inspect and make sure the gasket on the recovery tank cover is sealing and not damaged.
- ☐ Inspect and clean the vacuum motor float cage.
- ☐ Make sure that the recovery tank drain valve seals airtight.

TROUBLESHOOTING GUIDE

If water flows around the ends of the squeegee tool, instead of being pulled into the tool, the vacuum system is not working properly. When a vacuum system performs poorly, it is usually because of one of the following problems:

Vacuum Leak(s) – Air flowing into the vacuum system past a bad gasket or leaky hose, damaged tank, or a leaky drain valve. A vacuum leak below the water line will create turbulence in the recovery tank, causing water to enter the vacuum motor.

Restriction(s) – Anything that blocks the flow of air through the system. Restrictions may also be caused by built-up debris in the squeegee tool, vacuum hoses, float cage or wherever the airflow is forced to make a sharp turn.

Both leaks and restrictions decrease the quantity of air flowing through the squeegee tool. The air that does go through the squeegee tool moves slower, so it has less pick-up power.

RECOVERY SYSTEM

TROUBLESHOOTING GUIDE ELECTRICAL

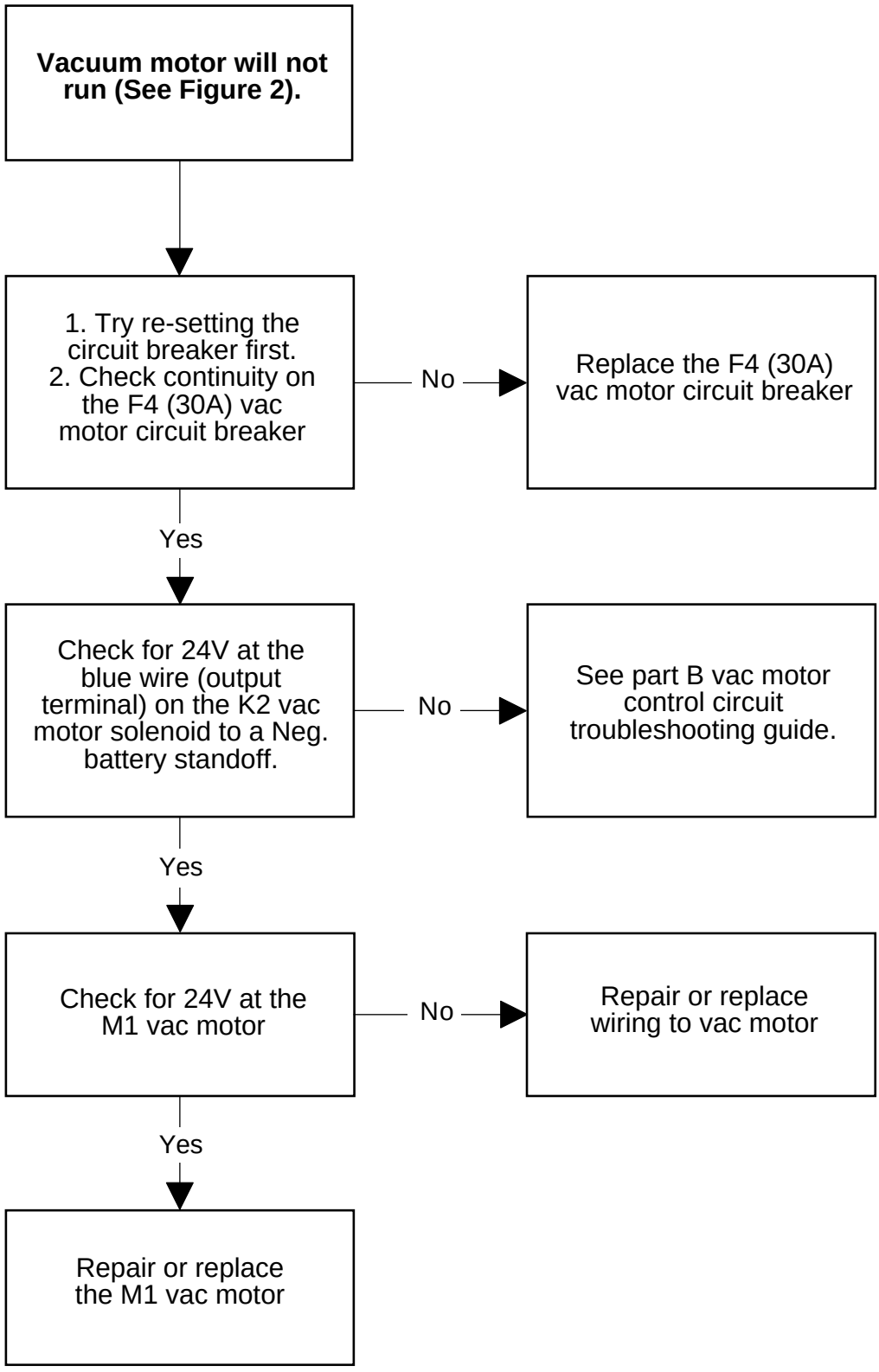
Possible Symptom

1 Vacuum motor will not run

SYMPTOM ONE

Note: Do all testing with the master key switch ON, vac switch S4 ON (squeegee lowered).

Part A: Vacuum Motor Load Circuit Troubleshooting Guide

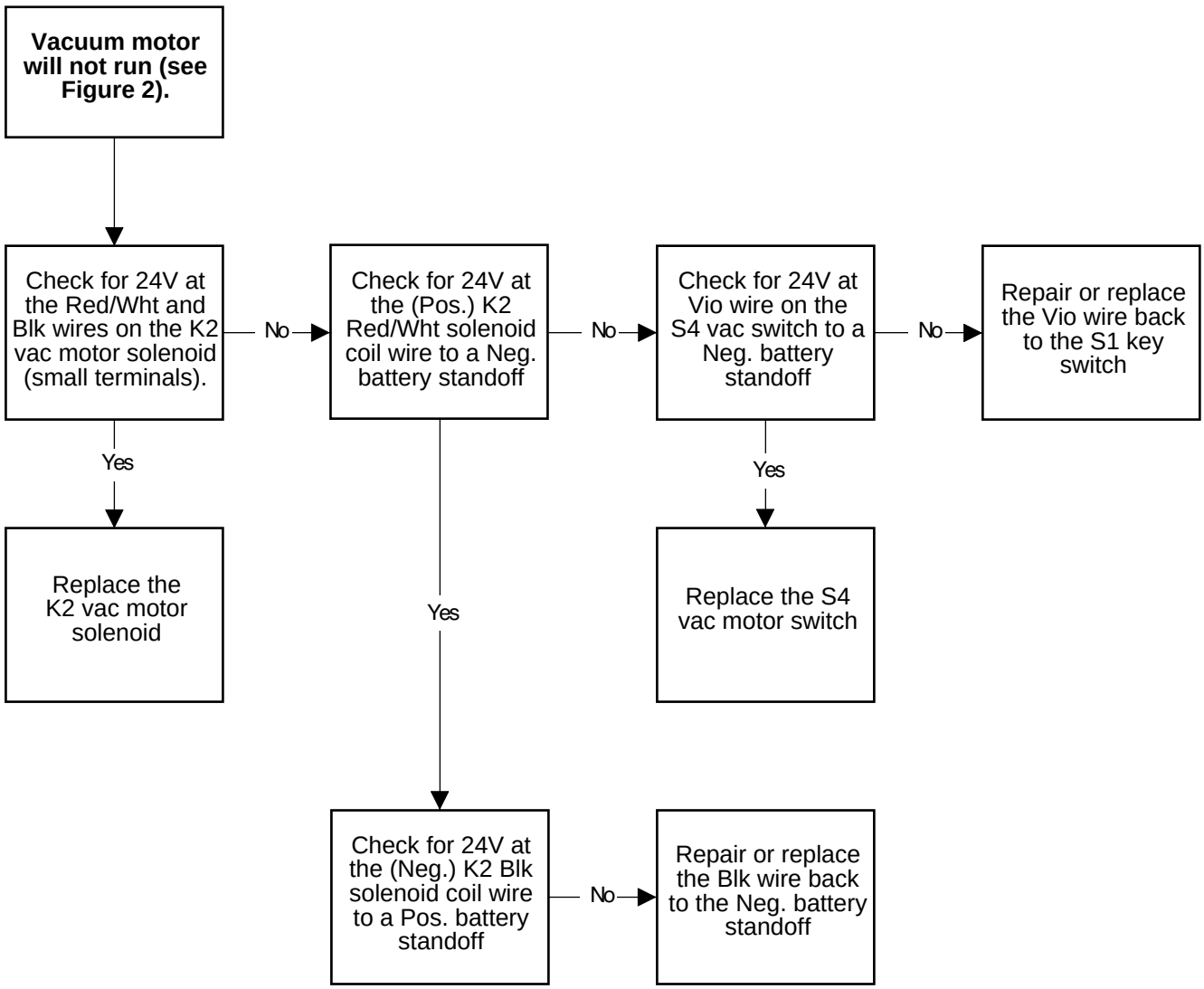


TROUBLESHOOTING GUIDE ELECTRICAL (CONTINUED)

SYMPTOM ONE

Note: Do all testing with the master key switch ON, vac switch S4 ON (squeegee lowered).

Part B: Vacuum Motor Control Circuit Troubleshooting Guide



RECOVERY SYSTEM

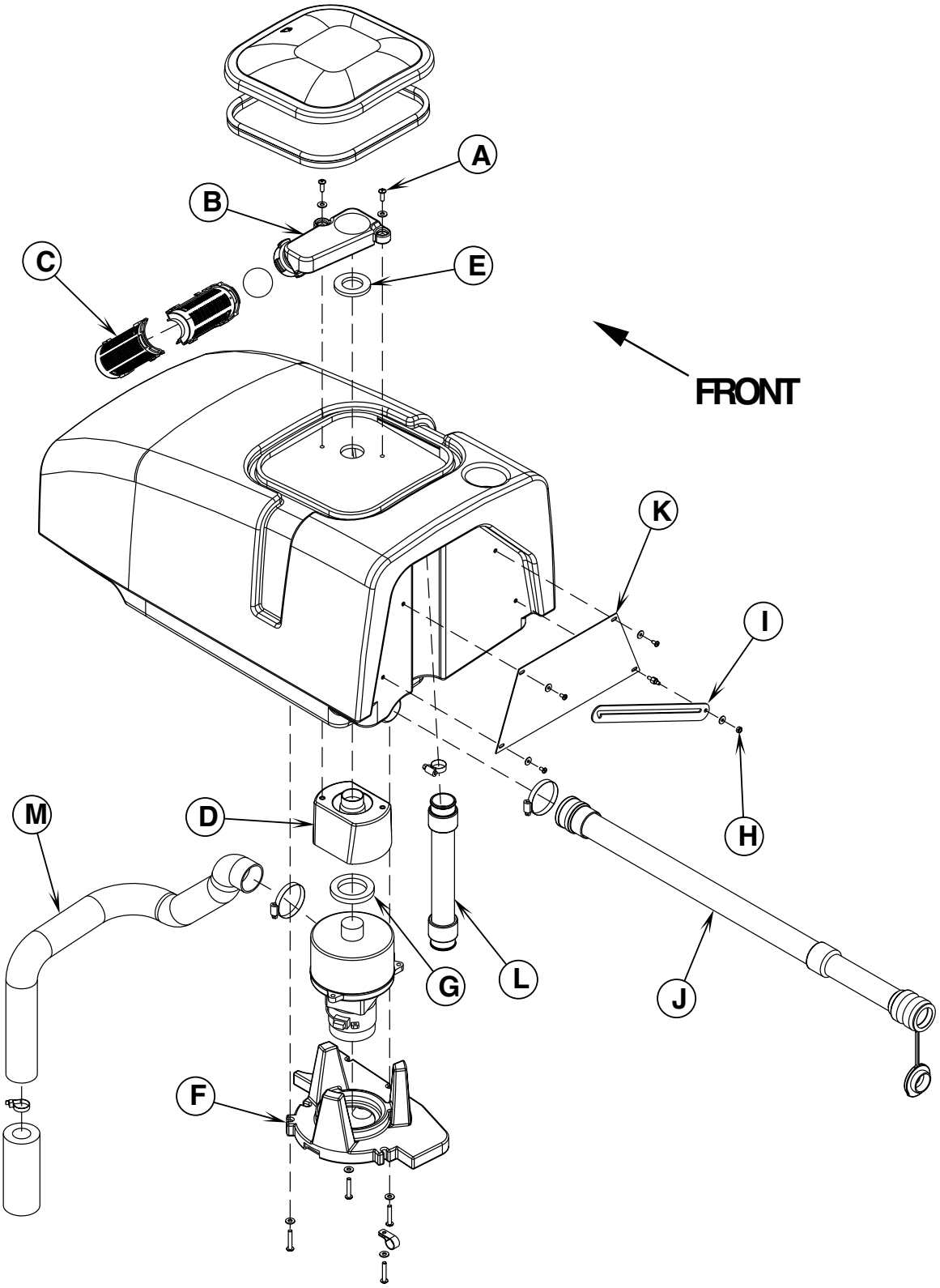
MAINTENANCE OF FLOAT CAGE AND FLOAT DUCT

1 Open the recovery tank dome lid and lay it to the side, remove the two **(A)** Screws and pull the Float Duct **(B)** and float cage assembly **(C)** from vac motor spacer **(D)**.

2 Snap apart the two float cage halves **(C)** and flush clean the float ball and cage pieces.

3 Inspect the Gasket **(E)** and clean any debris from the inside of the float duct housing. Then re-install all parts in reverse order.

FIGURE 3



VACUUM MOTOR REMOVAL

1 Drain the recovery tank using the drain hose.
2 Swing open the recovery tank, secure with prop rod and disconnect the vacuum motor harness connector.
3 See Fig 3. Remove the vacuum motor Duct Cover **(F)** secured to the bottom of recovery tank bottom (qty 4 screws).
4 Loosen the exhaust hose clamp and remove Hose **(M)** from the vac motor discharge tube and completely remove the motor from its mount cavity.
5 Inspect the condition of the vac motor Gasket **(G)** inside the vac motor mount cavity.
6 Make service repairs to the vac motor and re-install by following steps in reverse order.

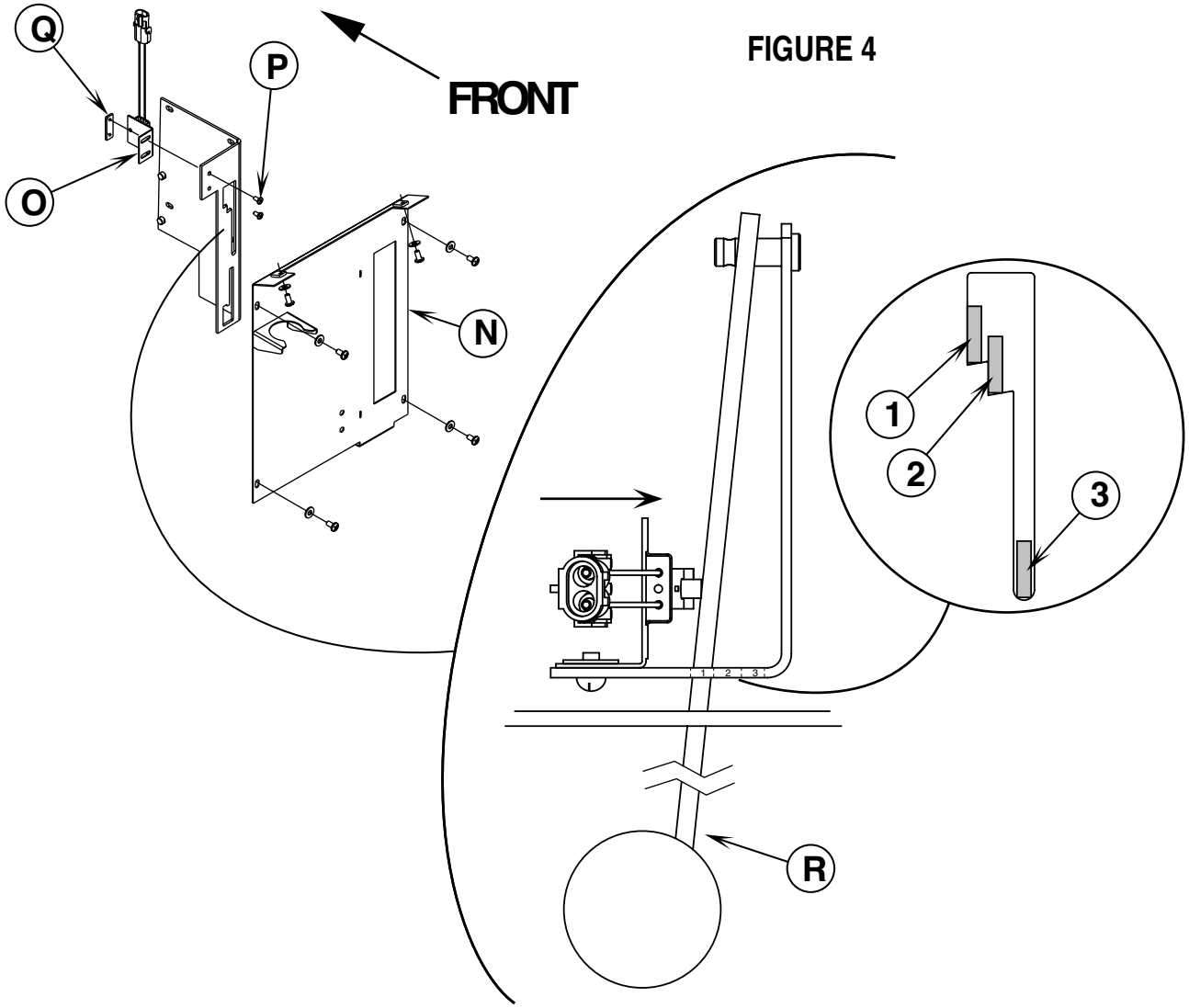
RECOVERY TANK REMOVAL

1 Follow steps 1-4 in the Vacuum Motor Removal section.
2 See Figure 3. Remove the Nut **(H)** and release the Tank Support Bar **(I)** and allow the tank to swing down to the side of the battery compartment box.
3 Loosen the hose clamp for the tank drain hose **(J)** and pull the hose free.
4 Remove the Tank End Panel **(K)** (3 screws) and remove the Squeegee Hose **(L)** from the tank connection.
5 Support the tank and remove the (4) screws from the hinge that attaches the tank to the top of the solution tank edge and pull the tank free from the machine.

VACUUM SWITCH REPLACEMENT AND ADJUSTMENT

1 With the key switch OFF remove the back Electrical Panel **(N)** secured with (6) screws to access the Vacuum Switch **(O)** as shown in Figure 4.
2 Remove the (2) Switch Mount Screws **(P)**, Nut Plate **(Q)** then separate the wiring connector and remove the switch from the machine.
3 With the squeegee Lift Lever **(R)** in the Up storage position **(1)** install the vacuum switch loosely to its mount bracket and reconnect the wiring.
4 See Figure 4. Move (push) the switch actuator arm roller against the squeegee lever to where it clicks then tighten the mounting screws.
5 Test with the key switch ON, the vacuum switch is in the open position (off) and the vac motor will not run. Move the squeegee lever to the next notch **(2)** and the switch will click to its closed position (on) and the vac motor will run.

FIGURE 4



SQUEEGEE SYSTEM

SQUEEGEE TOOL BLADE(S) REPLACEMENT

If the squeegee leaves narrow streaks or water, the blades may be dirty or damaged. Remove the squeegee, rinse it under warm water and inspect the blades. Reverse or replace the blades if they are cut, torn, wavy or worn.

To Reverse or Replace the Rear Squeegee Wiping Blade...

1 See Figure 1*. Raise the squeegee tool off the floor, then unsnap the Center Latch **(A)** on the squeegee tool.
2 Remove the Wing Nut **(B)** from each end of the squeegee, then remove the Tension Straps **(C)**.
3 Slip the Rear Blade **(D)** off the alignment pins.
4 The squeegee blade has 4 working edges. Turn the blade so a clean, undamaged edge points toward the front of the machine. Replace the blade if all 4 edges are nicked, torn or worn to a large radius.
5 Install the blade, following the steps in reverse order and adjust the squeegee.

To Reverse or Replace the Front Squeegee Blade...

1 Raise the squeegee tool off the floor, then loosen the (2) Thumb Nuts **(E)** on top of the squeegee and remove the squeegee tool from the mount.
2 Remove all the Hex Nuts **(F)** that hold the Front Blade **(G)** in place, then remove tension strap and blade.
3 The squeegee blade has 4 working edges. Turn the blade so a clean, undamaged edge points toward the front of the machine. Replace the blade if all 4 edges are nicked, torn or worn to a large radius.
4 Install the blade, following the steps in reverse order and adjust the squeegee.

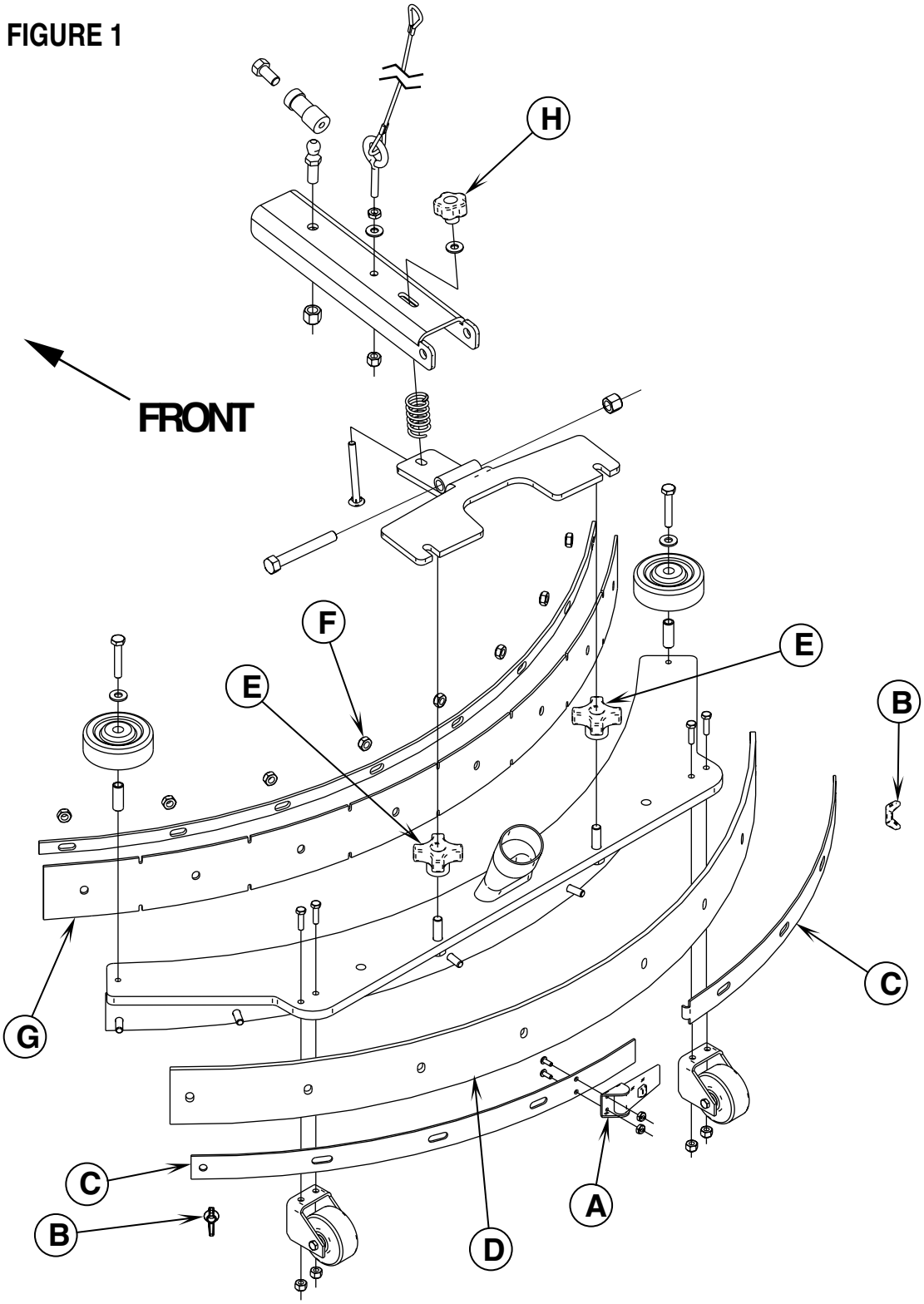
SQUEEGEE ADJUSTMENT

Adjusting the Squeegee Angle

Adjust the squeegee angle whenever a blade is reversed or replaced, or if the squeegee is not wiping the floor dry.

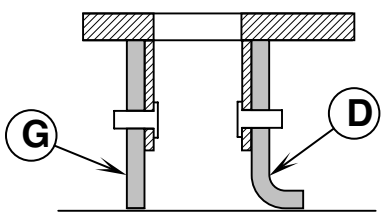
1 Park the machine on a flat, even surface and lower the squeegee. Push the machine forward enough to have the squeegee wiping blade fold over to the rear as shown in figure 2.
2 See Figure 1. Turn the Adjustment Knob **(H)** to tilt the tool forward (CCW) or backwards (CW), until the rear squeegee wiping blade touches the floor evenly across its entire width.

FIGURE 1



*Note the 20" squeegee tool is shown, the 26" squeegee tool is similar in adjustment and blade replacement.

FIGURE 2



WHEEL DRIVE SYSTEM

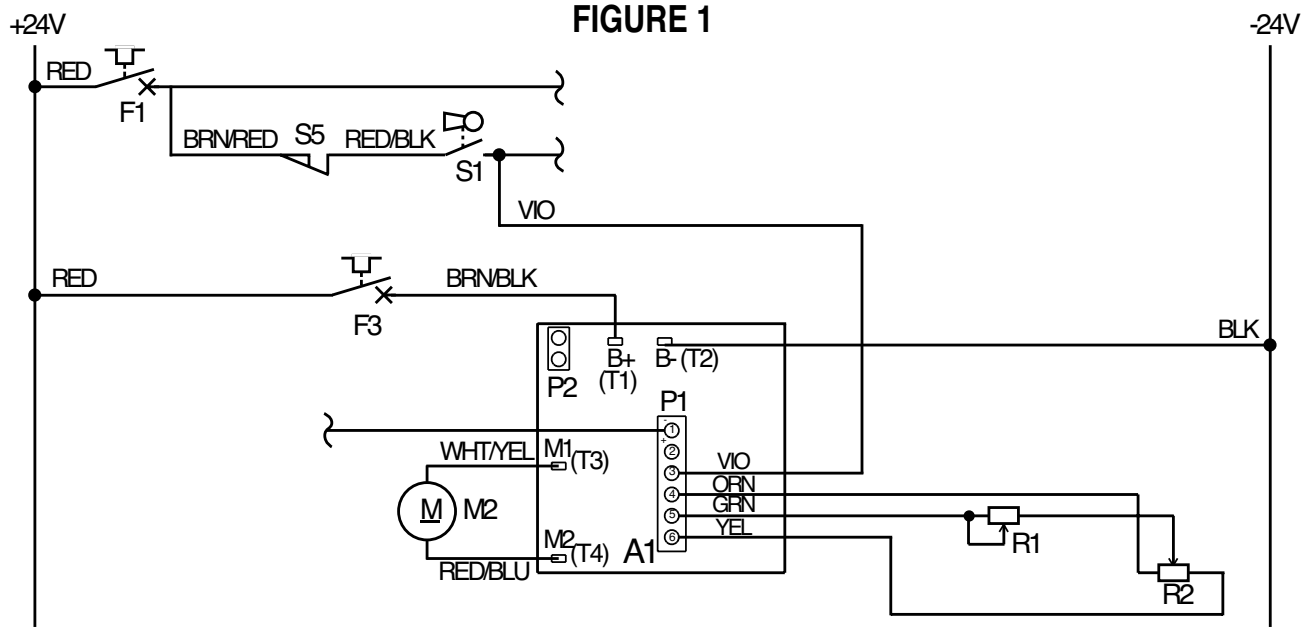
GENERAL FUNCTIONAL OVERVIEW

A 1/2 horsepower permanent magnet 24V DC motor drives the ConvertaMAX™ models 20/26 & BA 550/650. See Figure 3. The motor output is delivered to a single front mounted drive wheel driven by a chain. See Figure 1. The speed of the motor is regulated by a solid-state speed control (A1), located in the rear handle electrical compartment. The potentiometer (R2), mounted in the drive paddle, regulates both machine direction and variable speed demands. A second pot (R1) is mounted in the control panel and its knob can be adjusted to control the machines maximum transport speed.

Drive Motor System Function

See Figure 1. With the key switch S1 closed the violet wire inputs 24V to the A1 speed controller to make it operational (power it up). The F3 (30 Amp) circuit breaker supplies the (Pos.) 24V power input to the T1 or B+ controller terminal (Brn/Blk wire). The black wire from the battery Negative standoff supplies the (Neg.) 24V power input to the T2 or B- controller terminal. Moving the 5K Ohm R2 speed pot off its centered balanced neutral setting activates the operator input to the speed control. Forward or reverse movement of the drive paddle rotates the pot shaft and its variable resistance changes causing internal voltage input signal changes within the controller. These pot voltage related signals then energize the Fwd and Rev directional relays that selects the motor polarity and final voltage level outputs at the M1 & M2 terminals.

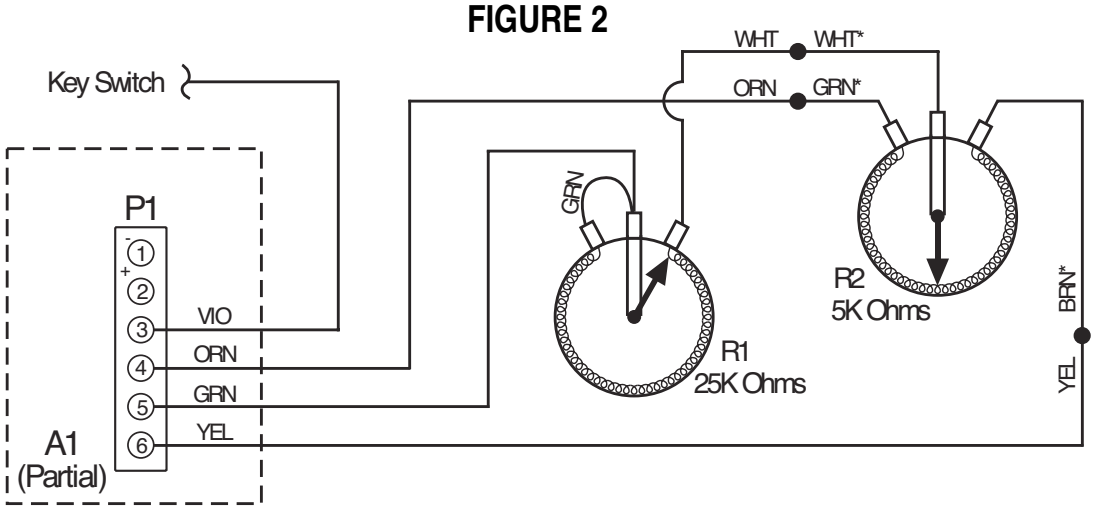
FIGURE 1



Electrical Diagram

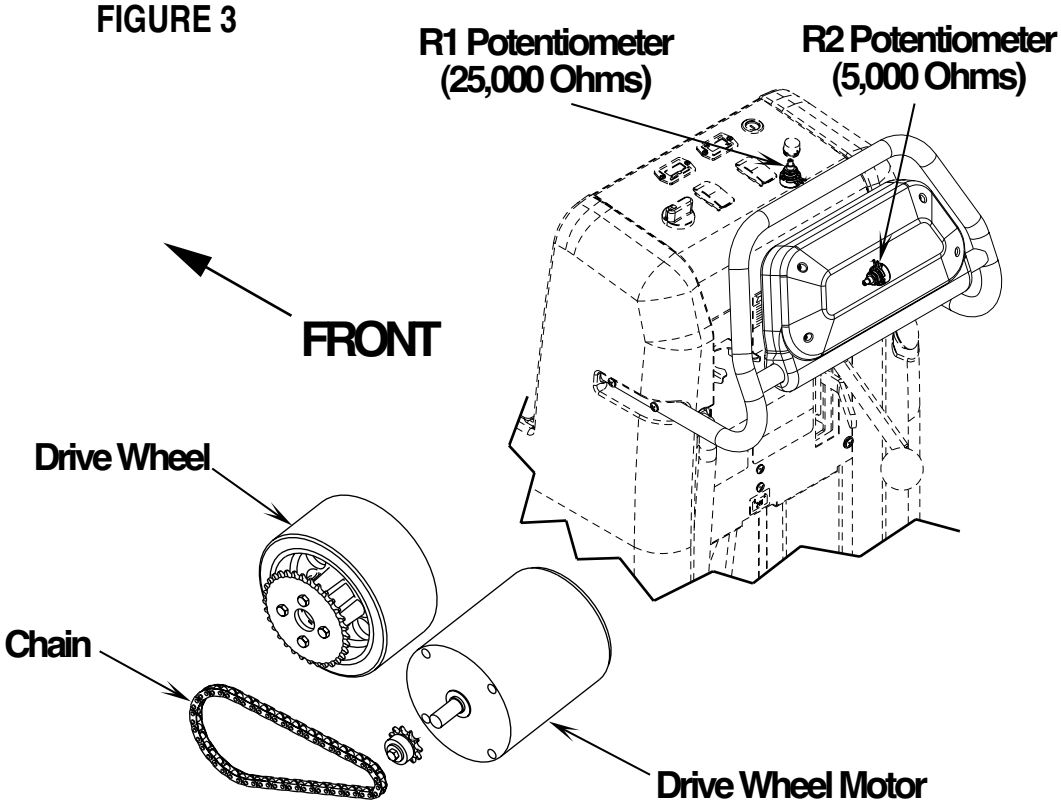
*For complete description of all callouts see Electrical System Wiring Diagram.

FIGURE 2



This drawing shows additional controller input circuit detail. The R1 pot is shown at the Max speed limiting setting and the R2 pot in neutral. *Handle wiring harness changed. Machines built after December 1, 2000 have different wire colors at R2 pot. Green wire changed to GRN/YEL, brown wire changed to BLK #2 (wire with the number 2 printed on it) and white wire changed to BLK #1.

FIGURE 3



WHEEL DRIVE TROUBLESHOOTING GUIDE

Problem	Possible Cause
• No forward or reverse wheel drive.	See Electrical Troubleshooting Flowcharts A & B.
• No wheel drive in one direction, loss of either forward or reverse.	Controller can't change electrical polarity to wheel motor. Replace the (A1) speed control.
• Machine creeps (moves) in forward or reverse with only the key switch ON.	• Check movement of the drive paddle spring centering device (auto dead-man return to neutral components). Repair or replace needed parts.
	• The R2 drive pot is out of adjustment. Reset to neutral the 5000 Ohm drive paddle potentiometer (*).
• During normal machine transporting with the 5K drive paddle pot activated the operator also adjusts the control panel maximum speed limiting R1 pot and does not affect the desired maximum machine speed output.	The R1 (25,000 Ohm) speed limiting pot wiper is either open where the machine runs at minimum speed or the pot wiper is shorted and runs at maximum speed. Replace the R1 pot (**).

* See Potentiometer Installation and Adjustment instructions in this manual section and reset the (5K) pot to neutral.
** See 25K Wheel Drive Speed Limit Potentiometer Testing instructions in this manual section.

WHEEL DRIVE SYSTEM

TROUBLESHOOTING GUIDE ELECTRICAL

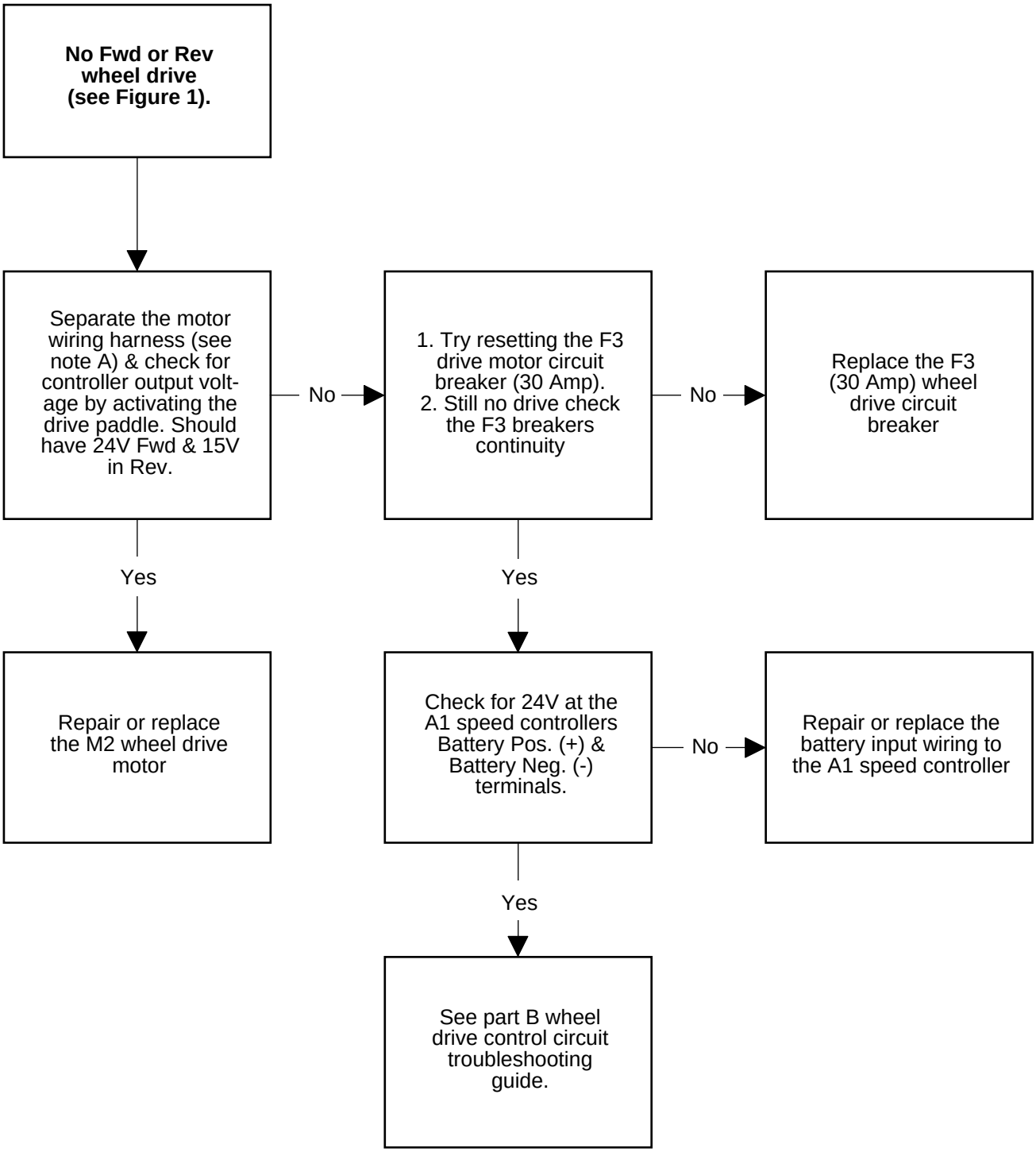
Possible Symptom

1 No forward or reverse wheel drive

SYMPTOM ONE

Note: Do all testing with control panel R1 speed limiting pot in the maximum position, the drive wheel jacked up off the floor, key switch ON, and the drive paddle activated (pushed Fwd or pulled into Rev.)

Part A: Wheel drive system motor load circuit troubleshooting guide



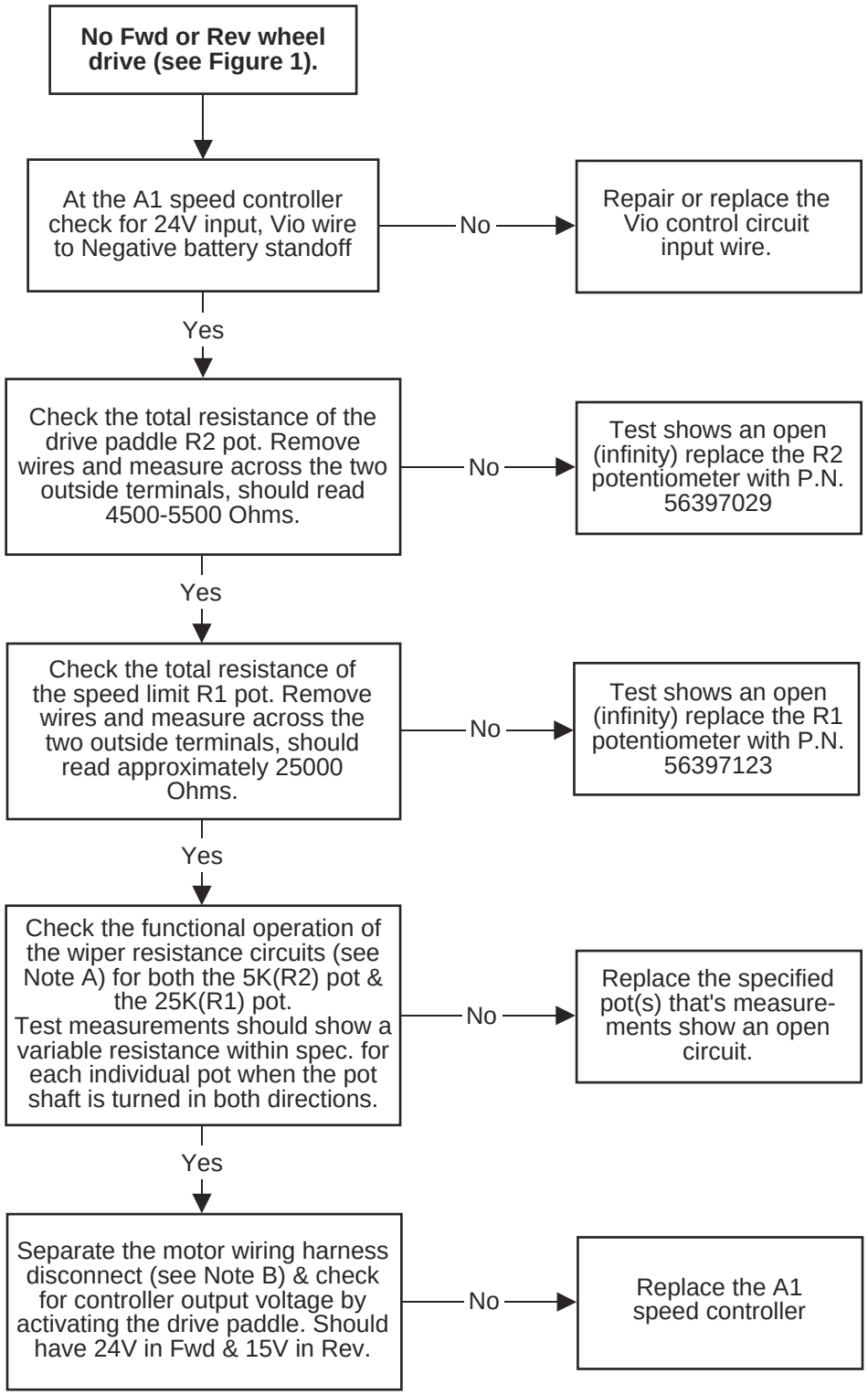
Note A: The drive wheel motor harness disconnect is located in the lower rear of the machine frame between the caster wheels.

TROUBLESHOOTING GUIDE ELECTRICAL (CONTINUED)

SYMPTOM ONE

Note: Do all testing with control panel R1 speed limiting pot in the maximum position, the drive wheel jacked up off the floor, key switch ON, and the drive paddle activated (pushed Fwd or pulled into Rev.)

Part B: Wheel drive system motor control circuit troubleshooting guide



Note A: Follow the potentiometer test instructions shown in the wheel drive system section.

Note B: The drive wheel motor harness disconnect is located in the lower rear of the machine frame between the caster wheels.

WHEEL DRIVE SYSTEM

CHAIN MAINTENANCE

- Every two months check the chain tension, 1/2 inch (13mm) deflection at mid point.
- Once a month check chain for binding and dryness, apply oil to lube the chain links.
- Yearly remove chain, clean and re-oil.

CHAIN REMOVAL AND ADJUSTMENT

Chain Removal:

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

1 See Figure 4. Loosen the Lock Nut **(A)** and back out Bolt **(B)** several turns to loosen the drive chain tension.
2 Remove the retainer clip from the chain's master link, separate and remove the chain from the sprockets.
3 To re-install chain loosen the (3) **(C)** drive motor mount screws and push the drive motor all the way forward. Note: The reason for this step is to shorten the distance between the sprockets to make it easier to reconnect the master link.
4 Install a new chain and reconnect the master link and tension chain. **Service Tip:** Attach a cable tie strap to the end of the chain to help guide it between the sprockets.

Adjustment:

1 Loosen the (3) motor mount Bolts **(C)** and the adjustment Lock Nut **(A)** to adjust chain tension.
2 Turn the Adjustment Bolt **(B)** in (CW) to obtain a 1/2 inch (13mm) chain deflection between the sprockets when moderate pressure is applied to the chain.
3 Tighten the adjustment bolt lock nut, the (3) motor mount bolts and test the drive system for proper operation.

WHEEL DRIVE MOTOR REMOVAL

1 Drain both the recovery and solution tanks, disconnect and remove the batteries and squeegee.
2 Remove the scrub brush head (follow steps in the Scrub Brush System section) from the machine. Then tip the machine on its right side.
3 Disconnect the drive motor wiring connector.
4 See Figure 4. Loosen the Lock Nut **(A)** and back out Bolt **(B)** several turns to loosen the drive chain tension.
5 Remove the retainer clip from the chains master link, separate and remove the chain from the sprockets.
6 Remove both the Setscrews **(D)** from the Drive Motor Sprocket **(E)** then remove the sprocket from the motor shaft.
7 Support the Drive Motor **(F)** then remove the (3) motor mount Bolts **(C)** and remove the motor and Chain Tension Bracket **(G)** from the machine.
8 Follow steps 1-7 in reverse order to reassemble, then refer to the Chain Adjustment section to retension the chain.

DRIVE WHEEL REMOVAL

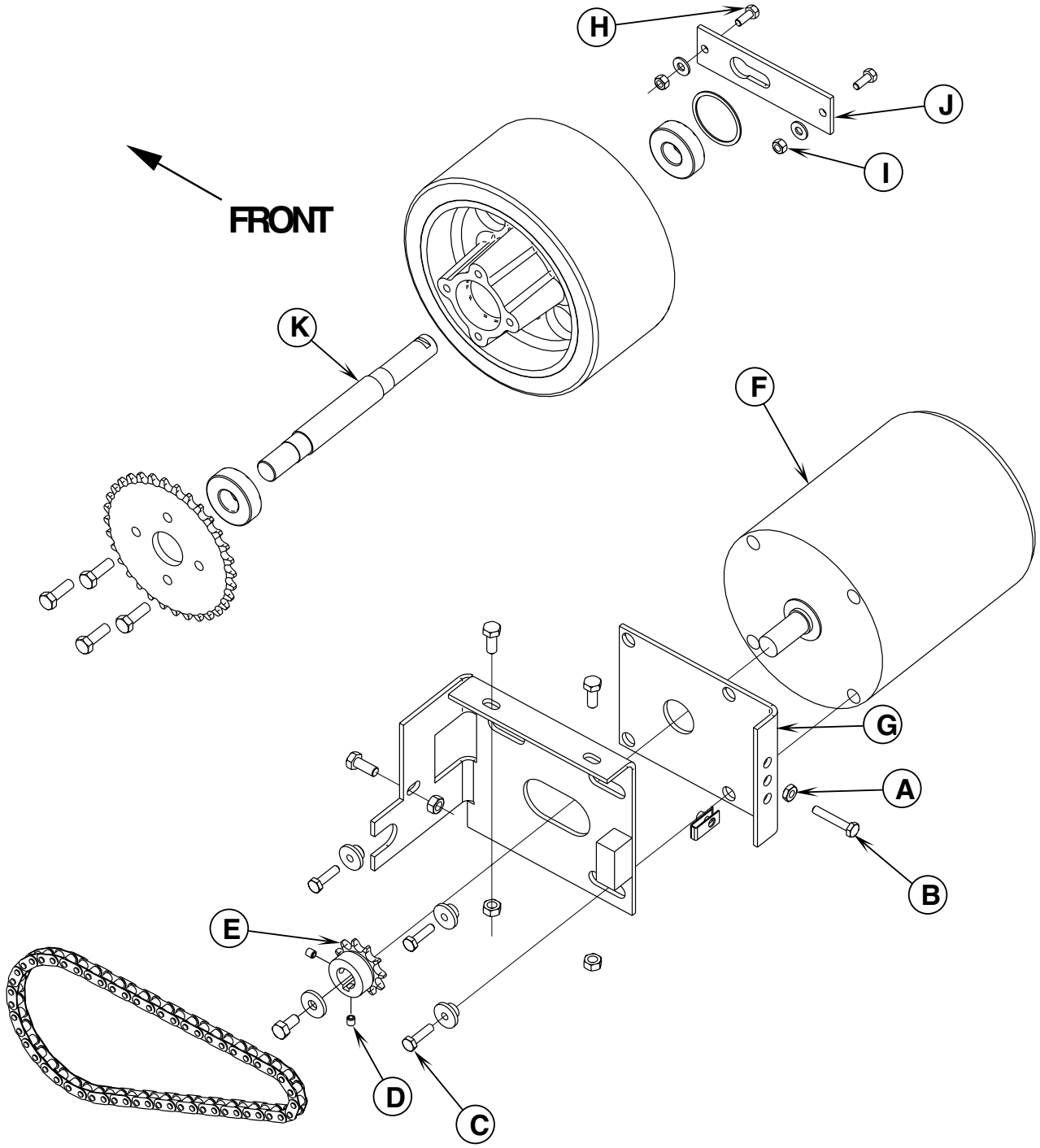
1 Remove the scrub brush(es) and squeegee tool from the machine.
2 Press the brush head raise/lower foot pedal all the way forward and also to the left to place the brush head in its maximum service height position.

⚠ WARNING!

Never work under machine without safety stands or blocking to support the machine.

3 Block caster wheels and jack front of machine too where the drive wheel is 1-1/2 inches (38mm) off the floor. **Service Tip**: Place a small automotive type scissors or bottle jack underneath the scrub brush deck in the middle being careful not to damage solution fittings.
4 Remove the drive chain (follow instructions in the Chain Removal manual section).
5 See Figure 4. Use a 10mm socket and wrench to remove the Hex Screws **(H)** and Nuts **(I)** that secure the Axle Retainer Bar **(J)** to the machine frame. Then slide the axle bar off the end of the Axle **(K)** to remove.
6 Pull the drive wheel assembly forward to remove the left side axle end from its side frame-mounting hole. Then maneuver the wheel assembly out from underneath the machine.
7 Follow steps 1-6 in reverse order to reassemble, then refer to the Chain Adjustment section to retension the chain.
8 Test-drive the machine for proper operation.

FIGURE 4



WHEEL DRIVE SYSTEM

5K POTENTIOMETER TESTING AND REMOVAL (FOR MACHINES BUILT BEFORE DEC. 1, 2000)

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

Testing the 5K Potentiometer

Note: The potentiometer (pot) doesn't have to be removed from its housing mount to test.

1 See Figure 5. Remove the front drive paddle Cover **(L)** from the rear (back) **(M)** held together with (4) item **(N)** Screws.

2 See Figure 6. Observe the 3 wires connected to the pot and disconnect. Note the proper wire numbers and/or colors and their terminal connections for re-assembly.

3 Test the Pot **(O)** using an ohmmeter, the potentiometer specification is 5K Ohms. Connect the meter leads to each of the outside connections (1 high & 3 low) on the pot, it should read approximately 5000 ohms (range 4500-5500 ohms).

4 Next, take the 1 high pot connection test lead and connect to the middle connection (2 wiper), then push and pull the rear cover to turn the shaft in both directions. The readings should be approximately half the total resistance (2500 ohms) towards 5000 ohms and 2500 ohms towards 0 ohms. Example "A" total resistance of pot 4840 ohms (1 high/3 low) test connections. Example "B" test middle connection (2 wiper) and outside rear (3 low) Fwd reading 2420 ohms to 4700 ohms, Rev 2420 ohms to 230 ohms.

5 Testing Summary: The above tests are to show the increase and decrease of the pot through its working range. If you do not get similar readings replace the Potentiometer **(O)**.

Potentiometer Removal

6 See Figure 7. Loosen the pot shaft anchor nut and unthread it to the end of the shaft.

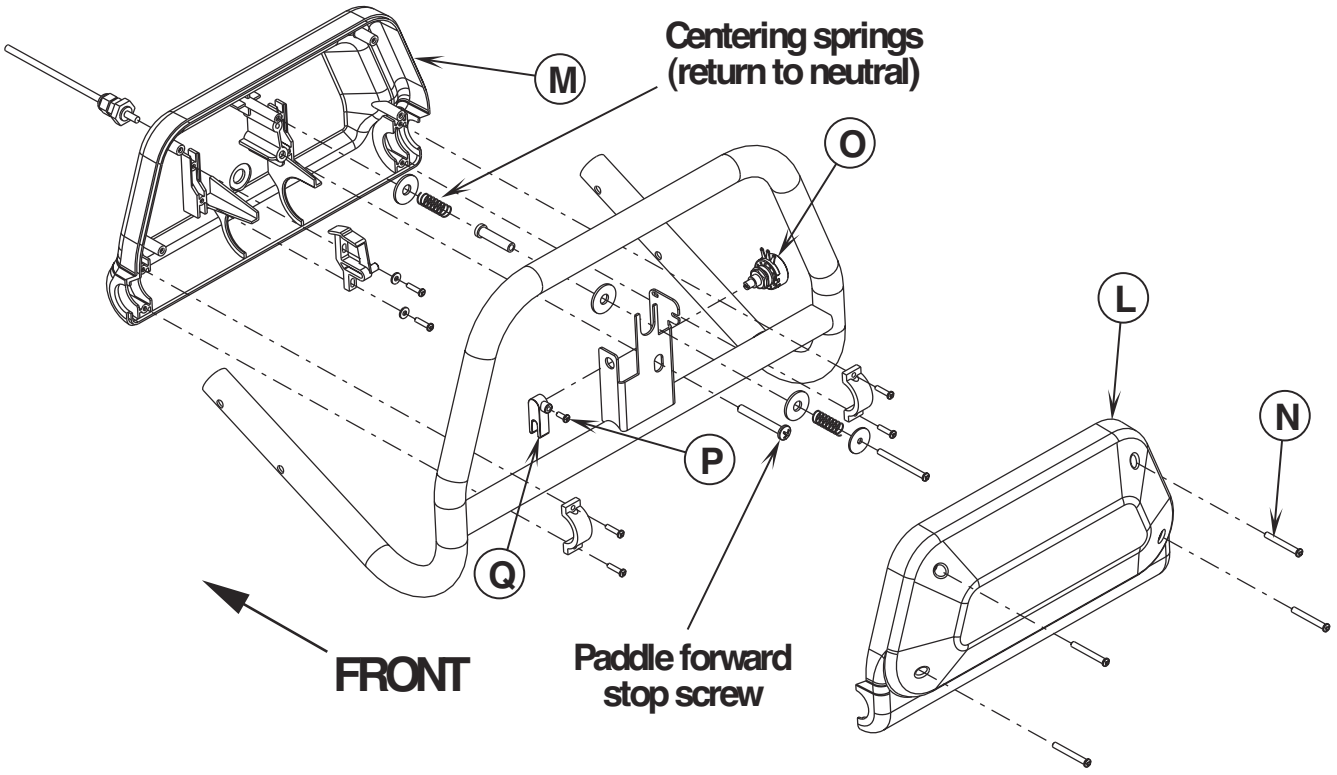
7 Back out the Screw **(P)** from the pot Fork **(Q)**.

8 Maneuver the pot out from its mounting bracket hole and separate the Fork **(Q)** from the shaft end.

9 Finish unthreading the anchor nut from the end of the pot and then remove the pot completely from the handle mount.

10 To reinstall a potentiometer see the Potentiometer Installation and Adjustment section in this manual system.

FIGURE 5



POTENTIOMETER INSTALLATION AND ADJUSTMENT (FOR MACHINES BUILT BEFORE DEC. 1, 2000)

⚠ WARNING!

The adjustment of the potentiometer is to set the drive paddle for a neutral drive motor operation. If the potentiometer is not adjusted properly, the machine could move either FWD or REV with no operator control.

1. See Figure 7. Install the pot into the handle mount hole, then place the washer and anchor nut just threaded a few turns onto the shaft end.
2. Using an ohmmeter connect leads to the middle terminal (2 wiper) and the (3 low pot) outside terminal. Then pre-set, turn the shaft to approximately 2300 ohms.
3. Observe the molded rib inside the Fork **(Q)** position it to align with the slot on the end of the pot shaft, then assemble together and tighten the **(P)** Screw.
4. Then without turning the pot shaft thread the anchor nut to seat the pot to its mount bracket.
5. Reconnect the ohmmeter test leads to the pot wiper and low terminal connections and adjust (turn the pot) to obtain half of pots total resistance. This will accurately set the true neutral drive paddle operator position.
6. Tighten the anchor nut secure. Note: Do not turn the potentiometer shaft when tightening. Reconnect the battery cable and turn the key switch on and test the drive system for proper FWD and REV operations. Note: The dash panel maximum speed control knob should be turned to the full speed position for testing.

FIGURE 6

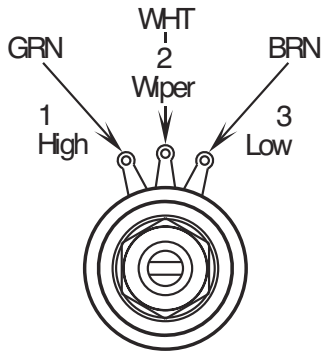
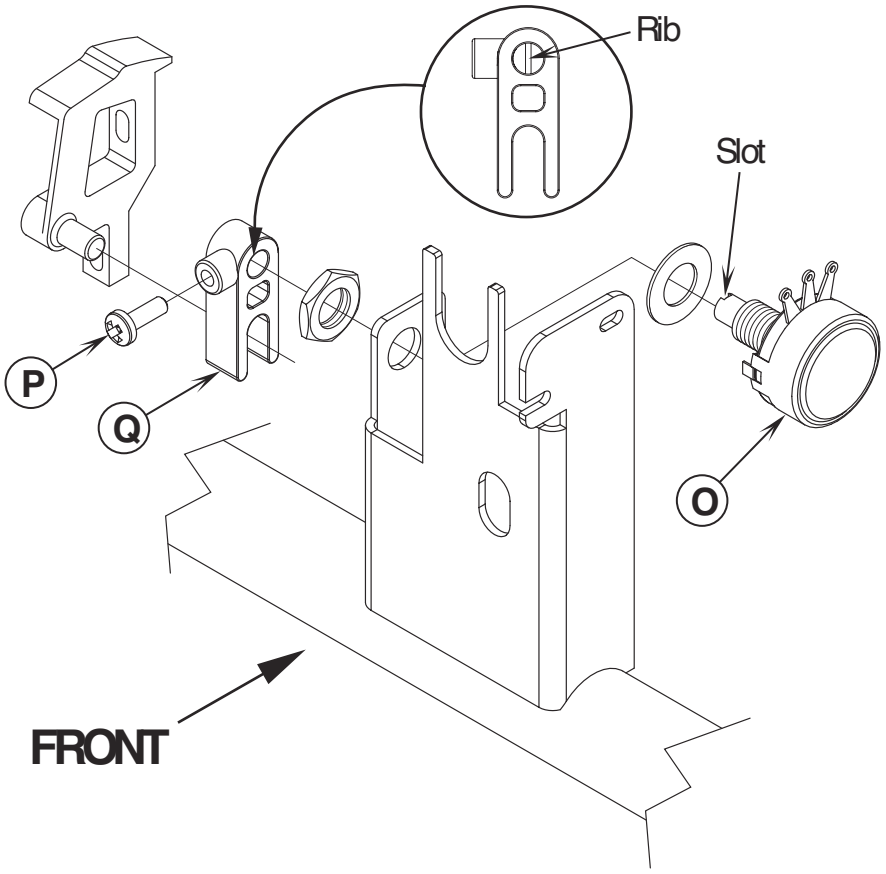


FIGURE 7



WHEEL DRIVE SYSTEM

5K POTENTIOMETER TESTING AND REMOVAL (FOR MACHINES BUILT AFTER DEC. 1, 2000)

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

Testing the 5K Potentiometer

Note: The potentiometer (pot) doesn't have to be removed from its housing mount to test.

1 See Figure 8. Remove the front drive paddle Cover **(L)** from the rear (back) **(M)** held together with (4) item **(N)** Screws.

2 See Figure 9. Observe the 3 wires connected to the pot and disconnect. Note the proper wire numbers and/or colors and their terminal connections for re-assembly.

3 Test the Pot **(O)** using an ohmmeter, the potentiometer specification is 5K Ohms. Connect the meter leads to each of the outside connections (1 high & 3 low) on the pot, it should read approximately 5000 ohms (range 4500-5500 ohms).

4 Next, take the 1 high pot connection test lead and connect to the middle connection (2 wiper), then push and pull the rear cover to turn the shaft in both directions. The readings should be approximately half the total resistance (2500 ohms) towards 5000 ohms and 2500 ohms towards 0 ohms. Example "A" total resistance of pot 4840 ohms (1 high/3 low) test connections. Example "B" test middle connection (2 wiper) and outside rear (3 low) Fwd reading 2420 ohms to 4700 ohms, Rev 2420 ohms to 230 ohms.

5 Testing Summary: The above tests are to show the increase and decrease of the pot through its working range. If you do not get similar readings replace the Potentiometer **(O)**.

Potentiometer Removal

6 See Figure 10. Loosen the pot shaft anchor nut and unthread it to the end of the shaft.

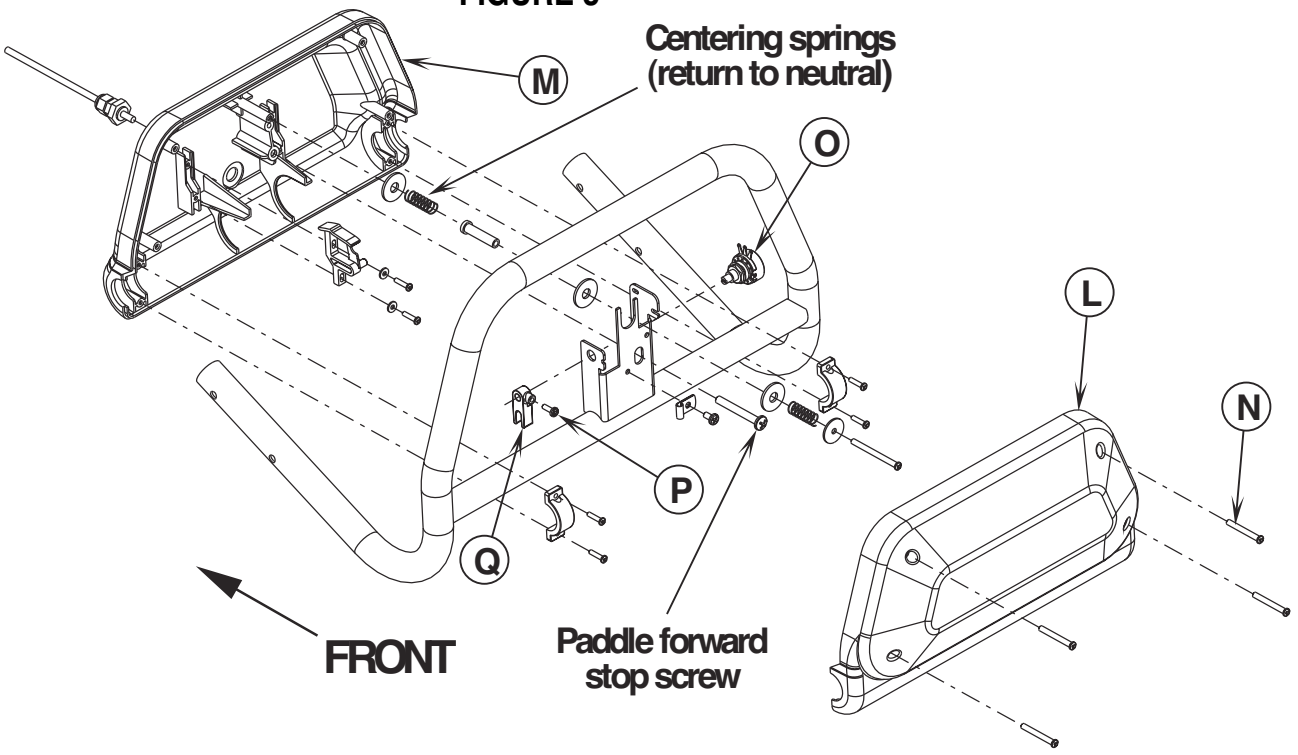
7 Back out the Screw **(P)** from the pot Fork **(Q)**.

8 Maneuver the pot out from its mounting bracket hole and separate the Fork **(Q)** from the shaft end.

9 Finish unthreading the anchor nut from the end of the pot and then remove the pot completely from the handle mount.

10 To reinstall a potentiometer see the Potentiometer Installation and Adjustment section in this manual system.

FIGURE 8



POTENTIOMETER INSTALLATION AND ADJUSTMENT (MACHINES BUILT AFTER DEC. 1, 2000)

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

⚠ WARNING!

The adjustment of the potentiometer is to set the drive paddle for a neutral drive motor operation. If the potentiometer is not adjusted properly, the machine could move in either forward or reverse without any operator input.

1 See Figure 10. Install the pot and washer into the handle mount hole, then tighten the anchor nut.

2 Install the Fork **(Q)** on the end of the pot shaft and paddle bracket drive pin as shown. Note: Do not tighten the fork/shaft Set Screw **(P)** at this time.

POTENTIOMETER INSTALLATION AND ADJUSTMENT (AFTER DEC. 1, 2000) (CONTINUED)

3 Using an ohmmeter connect test leads to the pot wiper (terminal #2) and pot low (terminal #3). Then adjust (turn) pot shaft to obtain half of the R1's total resistance. Service Tip: Use a small screwdriver inserted into the end of the fork housing to easily turn the slotted shaft end.

4 Next tighten the **(P)** Set Screw, being careful not to turn the shaft. Then install the (3) pot wires as shown (Figure 9).

5 Reconnect the battery cable and turn the key switch on and test the drive system for proper Neutral, Forward and Reverse operations. Note: The dash mounted speed control knob should be turned to its Maximum speed setting.

FIGURE 9

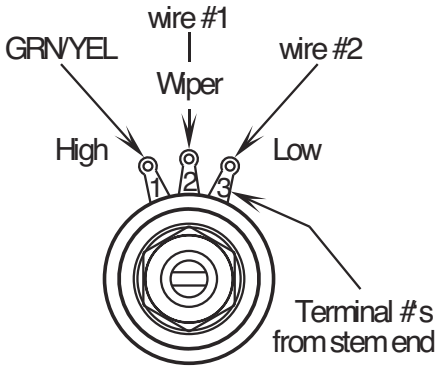
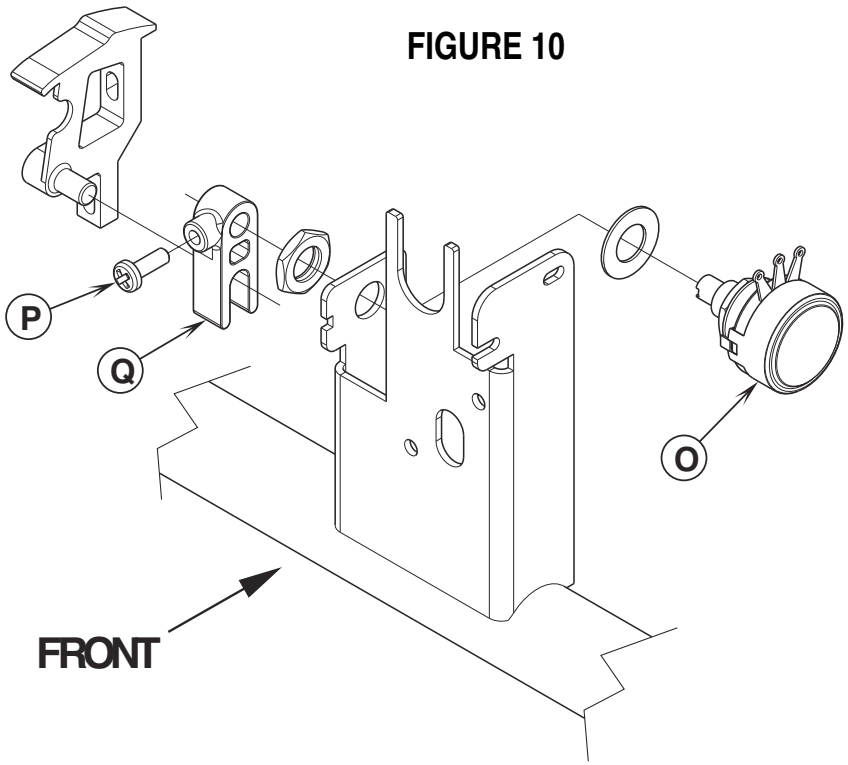


FIGURE 10



25K WHEEL DRIVE SPEED LIMIT POTENTIOMETER TESTING (ALL MODELS)

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

Testing the 25K Potentiometer

Note: The potentiometer (pot) doesn't have to be removed from the instrument panel to test.

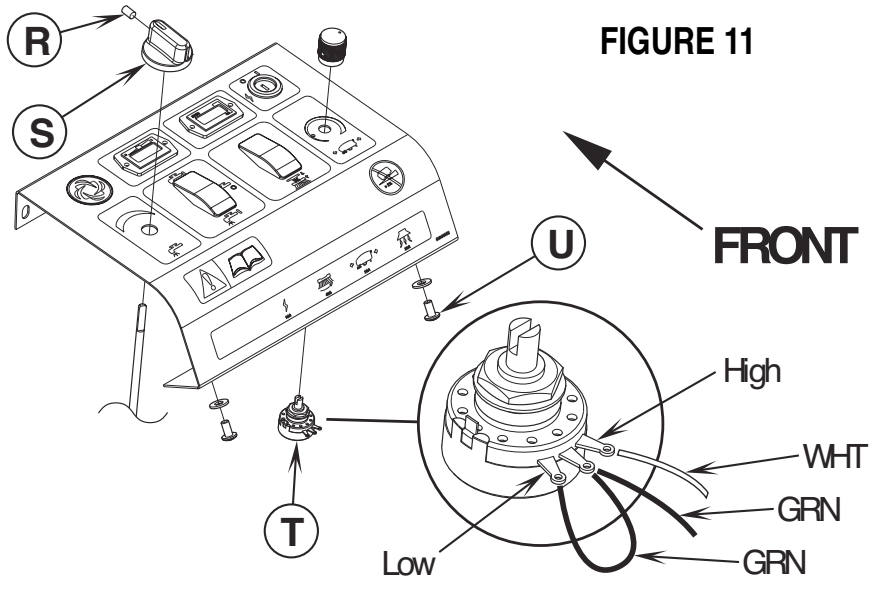
1 See Figure 11. Remove the Setscrew **(R)** if used, from the Solution Control Knob **(S)** then pull the knob off from the water valve shaft.

2 Remove the instrument panel, to access the speed adjustment pot **(T)**, secured with (4) item **(U)** Screws as shown.

3 Observe the wires connected to the pot and disconnect all three. Note the proper wire colors and their correct terminal connections to re-assemble.

4 Test the potentiometer **(T)** using an ohmmeter, the specification is 25000 ohms. Connect the meter leads to each of the outside connections on the potentiometer, should read approximately 25000 ohms. Next, take one of the test leads and connect to the middle terminal, then turn the stem both directions. The resistance value will change (vary) increasing and decreasing through its full range of 0-25000 ohms and 25000-0 ohms approximately. If you do not get similar readings replace the potentiometer.

FIGURE 11



ELECTRICAL SYSTEM

BATTERY SPECIFICATIONS

Use a combination of multiple 2-volt cell units to construct a 24 Volt DC battery pack system.

Nilfisk-Advance recommended battery pack capacity is a 238 AH @ 20 Hour Rate deep cycle battery system. Note: The battery pack must fit the battery compartment size listed below.

Battery compartment size	
Height	13-1/4 inches (33.6 cm)
Width	15.5 inches (39.3 cm)
Length	20-1/2 inches (52 cm)
Maximum battery pack weight	308 lbs. (139 kg)

BATTERY CHARGER SPECIFICATIONS

Use a 24 Volt DC output charger matching the AC input line voltage supply to be used.

Always when selecting a battery charger follow the recommendation of the battery supplier to match the proper charger DC output amperage to the amp/hour rating batteries being installed. This will prevent the battery pack from being over or under charged.

The recommended 238 AH battery should be matched to a 24V, 20 Amp output charger.

INSTALL THE BATTERIES

⚠ WARNING!

Use extreme caution when working with batteries. Sulfuric acid in batteries can cause severe injury if allowed to contact the skin or eyes. Explosive hydrogen gas is vented from inside the batteries through openings in the battery caps. This gas can be ignited by any electrical arc, spark or flame.

When Servicing Batteries...

- Remove all jewelry.
- Do not smoke.
- Wear chemical goggles, rubber gloves and a protective apron.
- Work in a well-ventilated area.
- Do not allow tools to touch more than one battery terminal at a time.

⚠ CAUTION!

Electrical components in this machine can be severely damaged if the batteries are not installed and connected properly. Batteries should be installed by Nilfisk-Advance or by a qualified electrician.

1 Remove the batteries from their shipping crate and carefully inspect them for cracks or other damage. If damage is evident, contact the carrier that delivered them or the battery manufacturer to file a damage claim.

2 Turn the Master Key Switch **(18)** OFF and remove the key.

3 Tip the recovery tank to the side, locked position. Remove the battery cables from inside the battery compartment.

4 Your machine comes from the factory with enough battery cables to install four 6 volt batteries. Carefully lift the batteries into the battery compartment and arrange them exactly as shown. Secure the batteries as close to the back of the machine as possible.

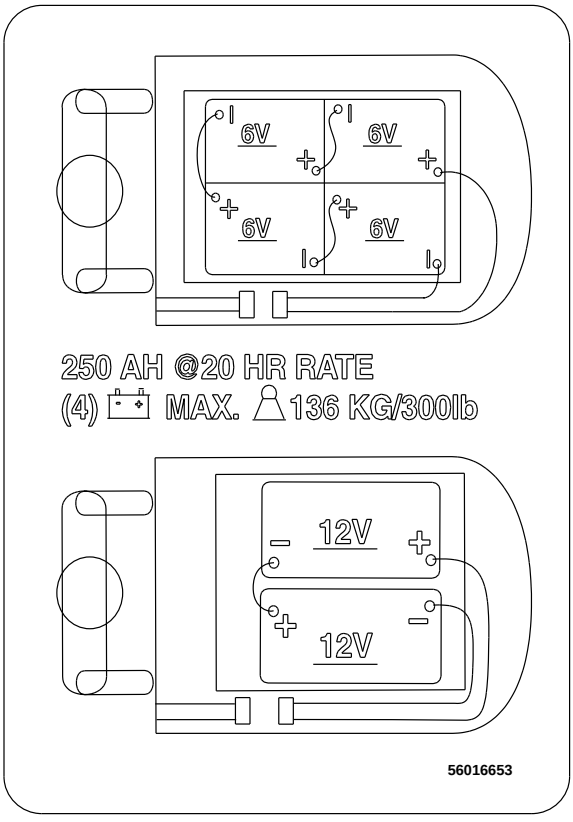
5 The terminals on the battery cables are marked "+" for positive and "-" for negative. Install the battery cables as shown, with the terminals marked "+" on the positive battery terminals and the terminals marked "-" on the negative terminals. Position the cables so the battery caps can be easily removed for battery service.

6 Carefully tighten the nut in each battery terminal until the terminal will not turn on the battery post. Then tighten the nut one additional turn. Do not over-tighten the terminals, or they will be very difficult to remove for future service.

7 Coat the terminals and posts with spray-on battery terminal coating (available at most auto parts stores).

8 Put one of the black rubber boots over each of the terminals.

FIGURE 1



DESCRIPTION OF THE BATTERY LOW VOLTAGE CUTOUT FEATURE

The ConvertaMAX™ 20 & 26 / BA 550 & 650 are equipped with a low voltage cutout feature to prevent over-discharging of the batteries. When a machines battery pack voltage falls below specifically defined thresholds (voltage settings) the scrub system is automatically shut down. The cutout level is adjustable. The standard lead acid battery (wet cell) setting is 21 volts (1.75V per cell) and alternate maintenance free battery (gel cell) setting is 22 volts (1.83V per cell). The standard setting is factory selected and should be used unless the battery manufacturer specifies the higher cutout voltage. **Special Service Note:** On all the 24V and 36V machines a minimum recharge voltage of 2.09 volts per cell must be reached to allow the scrub brush and solution systems (to reset) function again. A 24V-battery pack must increase to a 25.1-volt minimum and a 36V battery pack to 37.6 volts.

LOW VOLTAGE CUTOUT LEVEL SELECTION

See Figure 2. Have a qualified service technician perform this selection. The cutout level is selected by momentarily depressing the pushbutton switch located on the module circuit board. Observe the LED indicator light on the circuit board(*), which gives the following indications:

Light OFF	No battery power, key is off, or module not functioning
Light ON Slow Flash	Alternate maintenance free battery voltage threshold selected (22 volt setting)
Light ON Fast Flash	Standard lead acid battery voltage threshold selected (21 volt setting)
Light On Continuous	Module is in low voltage cutout mode(**)

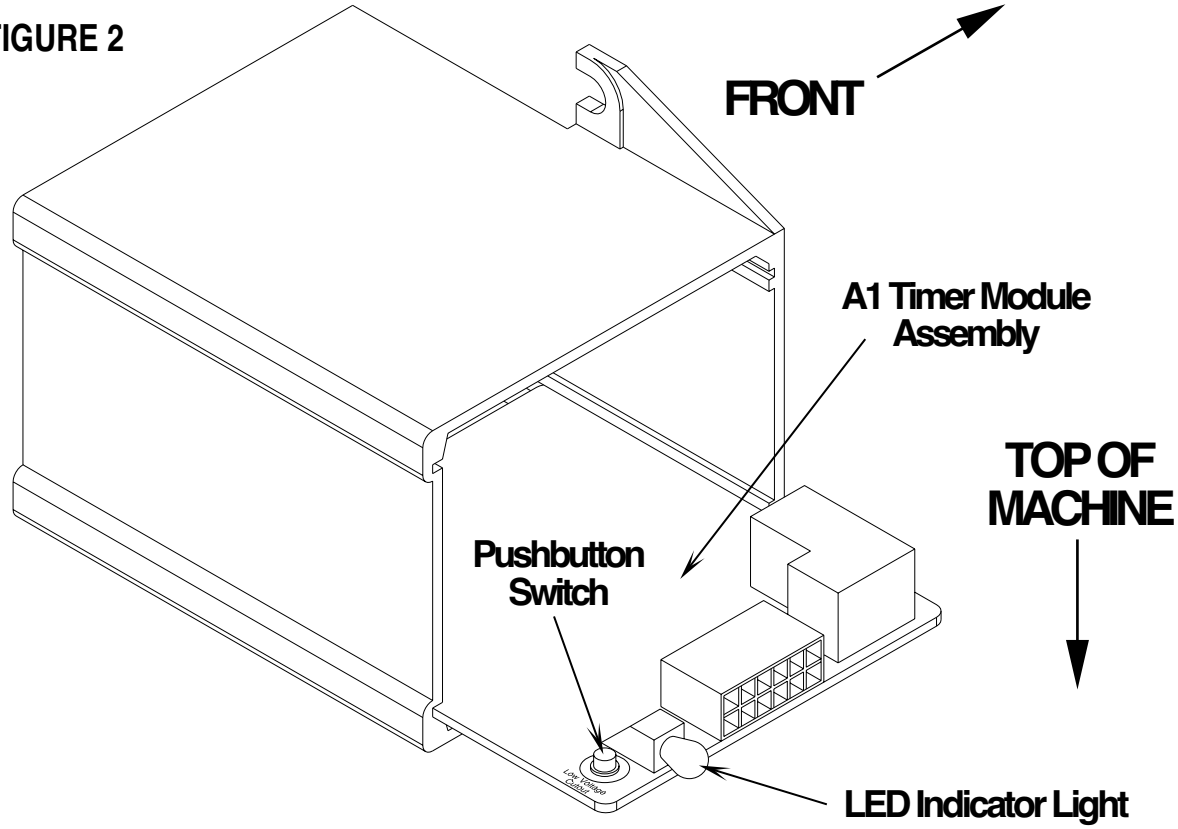
*****Remove the operator instrument panel to access the LED voltage selection indicator light.
******Scrub brush motor will not operate until batteries are recharged.

Special Battery System Note: It is important to know that the electronic controller module is not connected to the Curtis Battery Fuel Gauge **(12)**. Therefore, the fuel gauge may or may not be flashing when the module inhibits (shuts down) the brush motor operation depending on the low voltage cutout threshold selected.

DESCRIPTION OF THE BATTERY FUEL GAUGE

The Battery Fuel Gauge **(12)** uses a 10 bar LED display that indicates the state of the batteries charge, successively, bar by bar, from full to empty. At 70% depth of discharge a single flashing light signals an energy reserve alert. At 80% of discharge, a double flashing light signals an empty alarm. The battery gauge will retain the last state-of-charge condition even when the machine has been turned off. The battery fuel gauge state-of-charge display indication is automatically reset to full charge when the battery pack is recharged.

FIGURE 2



ELECTRICAL SYSTEM

CHARGING THE BATTERIES

Charge the machines battery pack each time the machine is used, or when the battery fuel gauge **(12)** is showing red flashing indicator lights. Note: The machine also uses a special low voltage cutout that inhibits the scrub system see in this manual section the description for the low voltage cutout feature.

To Charge the Batteries...

1. Push the connector from the charger into the machine Battery Charger Connector port **(11)** located behind the rear electrical control panel.
2. Follow the instructions on the battery charger.
3. Check the fluid level in all the battery cells after charging the batteries. Add distilled water, if necessary, to bring the fluid level up to the bottom of each battery cells filler tubes.

⚠ WARNING!

Do not fill the batteries before charging.
Only charge batteries in a well-ventilated area.
Do not smoke while servicing the batteries.

⚠ CAUTION!

Molded into the floor of battery compartment is a service drain for cleaning. To avoid damage to floor surfaces from a possible acid leak check that the drain hose is properly attached at both ends and is in good condition.

BATTERY MAINTENANCE

Proper maintenance of electric vehicle batteries can greatly extend their life. Well-maintained batteries may last up to 3 years, but failure after 1 year is common if maintenance has been poor.

There are 3 simple rules for good battery maintenance:

- **Maintain Proper Electrolyte Level (Weekly)** - Use distilled water in batteries whenever possible. If batteries are discharged, add just enough water to cover the plates in each cell. If batteries are fully charged, fill each cell to the bottom of the filler tube. **Do not over-fill the batteries! Do not add acid to batteries!**
- **Keep the Batteries Charged (Weekly)** - Batteries should be charged each time that a machine is used for more than 1 hour. Machine operators should open the battery compartment cover for charging, to avoid a concentrated build-up of hydrogen gas. Operators should follow the instructions provided with their specific battery charger, to determine how long the batteries should be charged. Even when a machine is stored, the batteries should be charged once a month to prevent the batteries from "sulfating". Almost all battery caps are vented, so there's no need to loosen or remove them for charging.
- **Keep the Batteries Clean (Monthly)** - Use a damp cloth to wipe dirt from the top of the batteries. Battery terminals must be clean and tight. If the tops of the batteries are wet after charging, the batteries have probably been over-filled or over-charged. Note: If there is acid on the batteries, wash the tops of the batteries with a solution of baking soda and water (2) tablespoons of baking soda to 1 quart of water.

BATTERY TESTING

A battery problem is usually recognized by the machine operator, as a decrease in the machine's running time. This condition is usually caused by one (or more) "dead cell" in the battery system- that is, one (or more) cell that is putting out less voltage than the other cells.

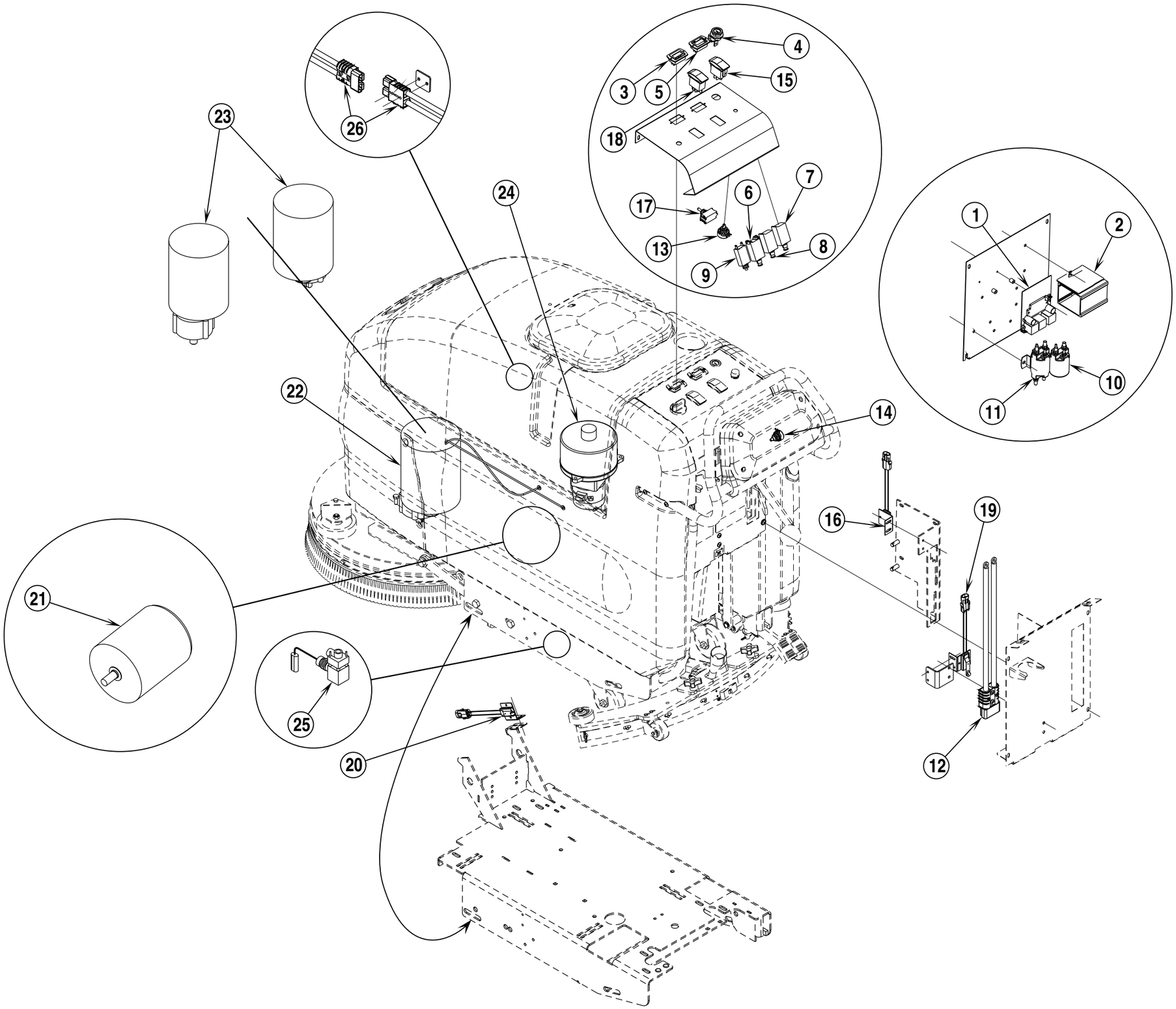
Note: Always charge batteries before testing.

There are 2 ways to find a dead cell:

- Use a hydrometer to check the specific gravity (or "state of charge") of the fluid in each cell. A dead cell is one that reads 50 points (or more) lower than the other cells.
- Use a volt meter to check the voltage of each battery with the scrub drive motor running. The battery with the dead cell will read 1 or 2 volts lower than the other batteries in the system.

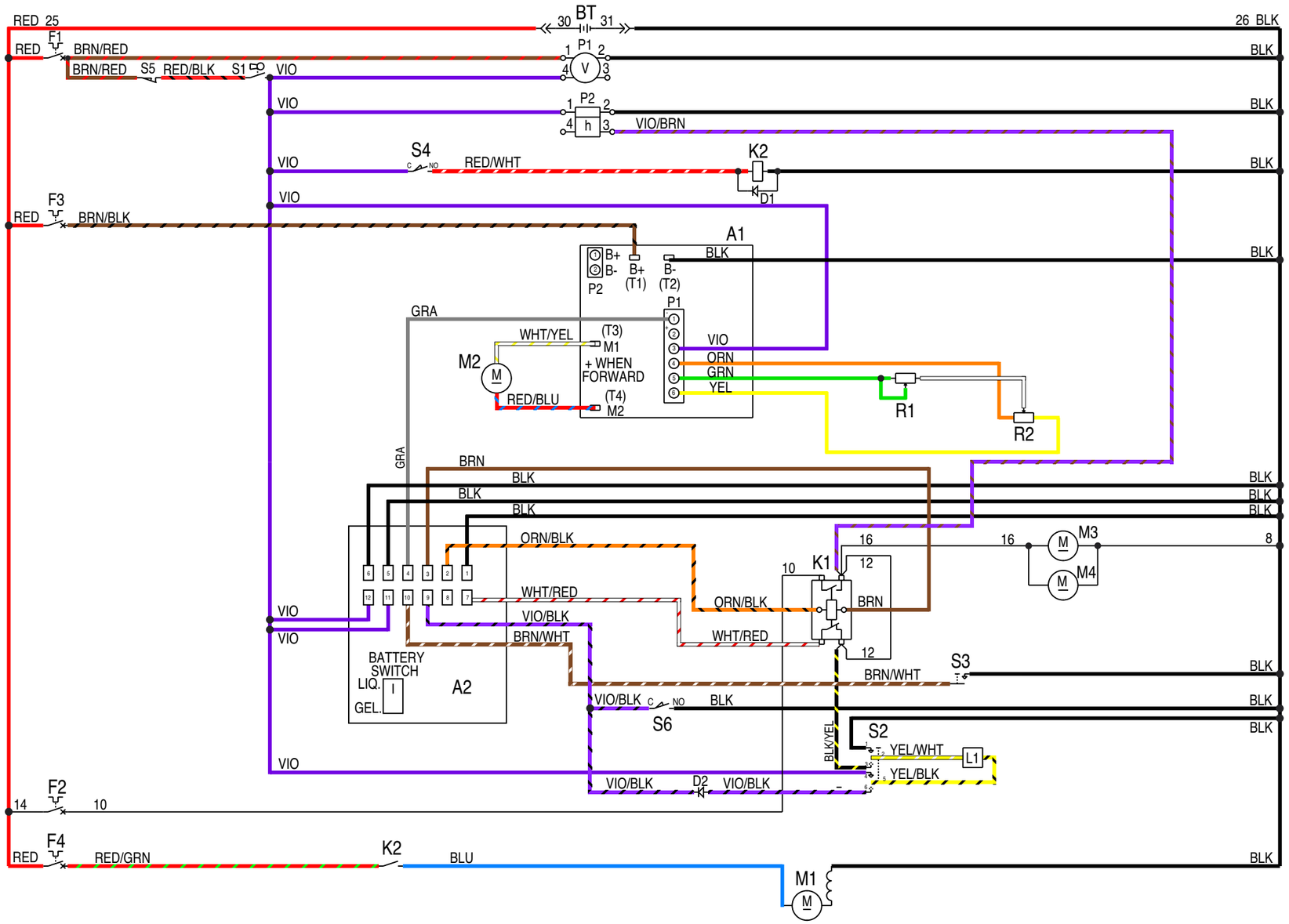
If the batteries in the machine are more than 1 year old, it's usually best to replace the whole set, rather than replacing just one battery.

COMPONENT LOCATION



Item	Description
1	Speed Control
2	Timer Module Assy
3	Fuel Gauge, Battery
4	Bracket, Keylock
5	Hourmeter
6	Circuit Breaker, 40 Amp **(20" model / Brush Motor)** Circuit Breaker, 60 Amp **(26" model / Brush Motor)**
7	Circuit Breaker, 30 Amp **(Vac Motor)**
8	Circuit Breaker, 30 Amp **(Wheel Drive Motor)**
9	Circuit Breaker, 10 Amp **(Auxiliary)**
10	Contactor, 24 VDC **(Vacuum Motor)**
11	Contactor, 24V SPDT **(Brush Motor)**
12	Charge Connector Assy
13	Potentiometer, 25K
14	Potentiometer, 5K
15	Switch, Rocker SPST **(Brush Remove)**
16	Switch, Vacuum
17	Switch, Toggle **(Main Power)**
18	Switch, Rocker **(Solution)**
19	Switch, Interlock
20	Switch, Brush
21	Motor, DC 1/2 HP **(Wheel Drive)**
22	Motor **(20" model / Brush)**
23	Motor **(26" model / Brush)**
24	Motor Assembly **(Vacuum)**
25	Solenoid Valve Assy **(Solution)**
26	Battery Connector Assy (in battery compartment)

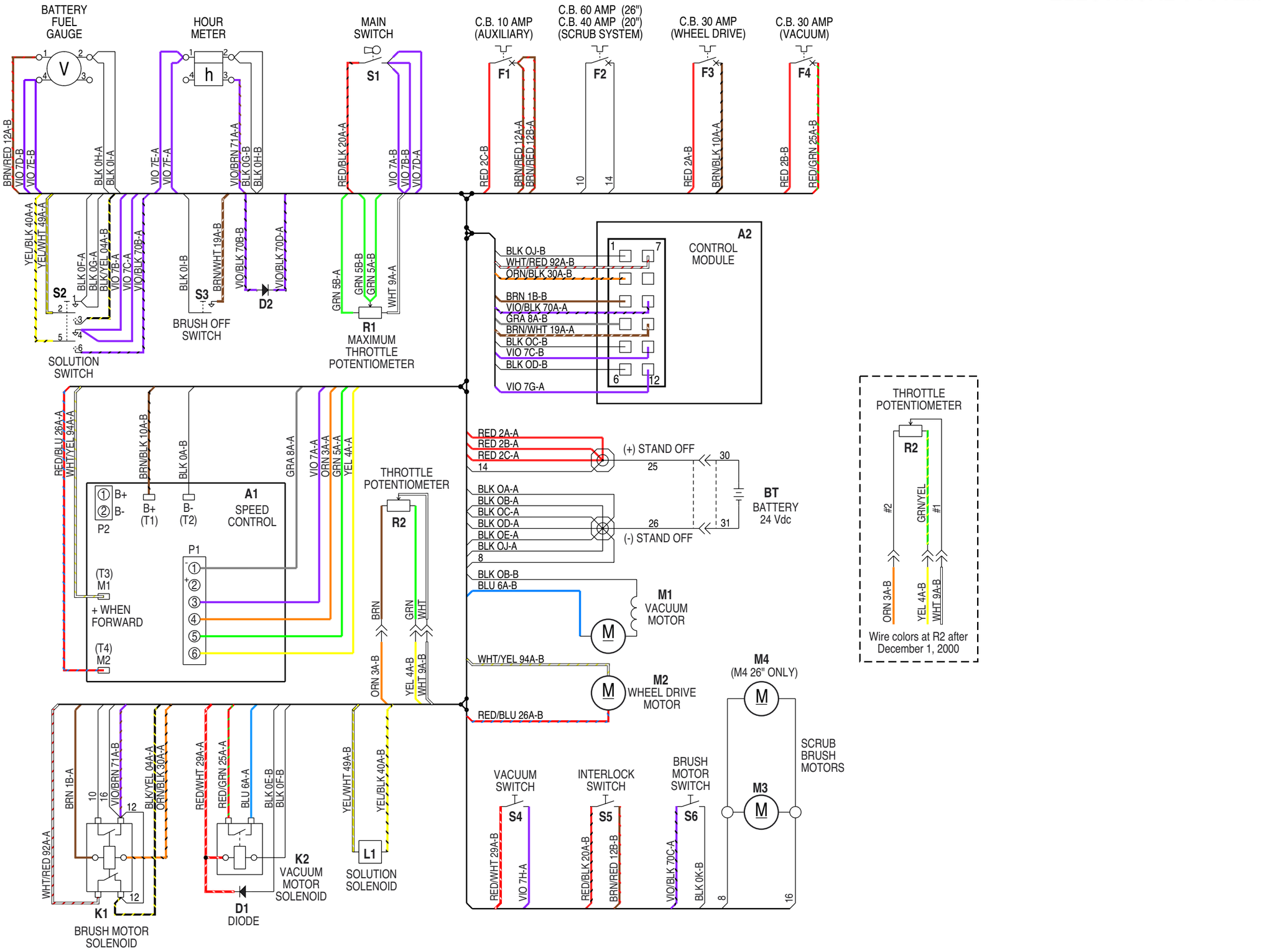
WIRING DIAGRAM / SCHEMATIC



Item	Qty	Description
A1	1	Speed Control
A2*	1	Timer Module Assy
BT		Battery, 24V
D1	1	Diode
D2	1	Diode
F1	1	Circuit Breaker, 10 Amp (**Auxiliary**)
F2	1	Circuit Breaker, 40 Amp (**20" model / Brush Motor**)
	1	Circuit Breaker, 60 Amp (**26" model / Brush Motor**)
F3	1	Circuit Breaker, 30 Amp (**Wheel Drive Motor**)
F4	1	Circuit Breaker, 30 Amp (**Vac Motor**)
K1	1	Contactor, 24V SPDT (**Brush Motor**)
K2	1	Contactor, 24 VDC (**Vacuum Motor**)
L1	1	Solenoid Valve Assy
M1	1	Vac Motor Assembly
M2	1	Wheel Drive Motor
M3	1	Motor (**20" model**)
	1	Motor / Gear Unit (**26" model**)
M4	1	Motor / Gear Unit (**26" model**)
P1	1	Fuel Gauge, Battery
P2	1	Hourmeter
R1	1	Potentiometer, 25K
R2	1	Potentiometer, 5K
S1	1	Switch, Toggle (**Main Power**)
S2	1	Switch, Rocker (**Solution**)
S3	1	Switch, Rocker SPST (**Brush Remove**)
S4	1	Switch, Vacuum
S5	1	Switch, Interlock
S6	1	Switch, Brush

***Terminal Identification of A2 Timer Module Assembly**

1	Relay Common
2	Pad Contactor Coil (+)
3	Pad Contactor Coil (-)
4	Speed Control Input
5	Battery (-)
6	Battery (-)
7	Relay Normally Open
8	Relay Normally Closed
9	Brush Switch Input
10	Remove Switch Input
11	Battery (+)
12	Battery (+)


BATTERY FUEL GAUGE
HOUR METER
MAIN SWITCH
C.B. 10 AMP (AUXILIARY)
C.B. 60 AMP (26")
C.B. 40 AMP (20")
(SCRUB SYSTEM)
C.B. 30 AMP (WHEEL DRIVE)
C.B. 30 AMP (VACUUM)
S1
F1
F2
F3
F4
BRN/RED 12A-B
VIO 7D-B
VIO 7E-B
BLK 0H-A
BLK 0I-A
VIO 7E-A
VIO 7F-A
VIO/BRN 71A-A
BLK 0G-B
BLK 0H-B
RED/BLK 20A-A
VIO 7A-B
VIO 7B-B
VIO 7D-A
RED 2C-B
BRN/RED 12A-A
BRN/RED 12B-A
RED 2A-B
BRN/BLK 10A-A
RED 2B-B
RED/GRN 25A-B
YEL/BLK 40A-A
YEL/WHT 49A-A
BLK 0F-A
BLK 0G-A
BLK/YEL 04A-B
VIO 7B-A
VIO 7C-A
VIO/BLK 70B-A
S2
SOLUTION SWITCH
BLK 0I-B
BRN/WHT 19A-A
S3
BRUSH OFF SWITCH
VIO/BLK 70B-B
VIO/BLK 70D-A
D2
GRN 5B-A
GRN 5B-B
GRN 5A-B
WHT 9A-A
R1
MAXIMUM THROTTLE POTENTIOMETER
A2
CONTROL MODULE
BLK OJ-B
WHT/RED 92A-B
ORN/BLK 30A-B
BRN 1B-B
VIO/BLK 70A-A
GRA 8A-B
BRN/WHT 19A-A
BLK OC-B
VIO 7C-B
BLK OD-B
VIO 7G-A
RED/BLU 26A-A
WHT/YEL 94A-A
BRN/BLK 10A-B
BLK 0A-B
GRA 8A-A
VIO 7A-A
ORN 3A-A
GRN 5A-A
YEL 4A-A
A1
SPEED CONTROL
B+
B-
B+ (T1)
B- (T2)
P2
P1
(T3) M1
+ WHEN FORWARD
(T4) M2
THROTTLE POTENTIOMETER
R2
BRN
GRN
WHT
ORN 3A-B
YEL 4A-B
WHT 9A-B
RED 2A-A
RED 2B-A
RED 2C-A
(+) STAND OFF
BLK OA-A
BLK OB-A
BLK OC-A
BLK OD-A
BLK OE-A
BLK OJ-A
(-) STAND OFF
BLK OB-B
BLU 6A-B
BT
BATTERY 24 Vdc
M1
VACUUM MOTOR
WHT/YEL 94A-B
M2
WHEEL DRIVE MOTOR
RED/BLU 26A-B
M4
(M4 26" ONLY)
M3
SCRUB BRUSH MOTORS
BRN 1B-A
VIO/BRN 71A-B
BLK/YEL 04A-A
ORN/BLK 30A-A
WHT/RED 92A-A
K1
BRUSH MOTOR SOLENOID
RED/WHT 29A-A
RED/GRN 25A-A
BLU 6A-A
BLK 0E-B
BLK 0F-B
K2
VACUUM MOTOR SOLENOID
D1
DIODE
YEL/WHT 49A-B
YEL/BLK 40A-B
L1
SOLUTION SOLENOID
VACUUM SWITCH
INTERLOCK SWITCH
BRUSH MOTOR SWITCH
S4
S5
S6
RED/WHT 29A-B
VIO 7H-A
RED/BLK 20A-B
BRN/RED 12B-B
VIO/BLK 70C-A
BLK 0K-B
THROTTLE POTENTIOMETER
R2
#2
GRN/YEL
#1
ORN 3A-B
YEL 4A-B
WHT 9A-B
Wire colors at R2 after December 1, 2000

DANMARK
Nilfisk-Advance Nordic A/S
Sognevej 25 - Box 344
DK-2605 Broendby
☎ 43 23 83 50 – Fax 43 42 15 95

NORGE
Nilfisk-Advance AS
Enebakkvn, 119, 0680 Oslo, Postboks 196, Manglerud, 0612 Oslo
☎ 22 08 63 50 – Fax 22 08 63 63
Distriktsrepresentanter over hele landet

SVERIGE
Nilfisk-Advance AB
Sjöbjörnsvägen 5, 117 67 Stockholm
☎ 085 55 944 00 – Fax 085 55 944 30

FINLAND/ SUOMI
BERNER Ltd. Facotek Department
Etäleranta 4B, 00130 Helsinki
☎ +358 9 1345 1382

AUSTRALIA
Nilfisk-Advance Pty. Ltd.
ACN 003 762 623
Head office: 17 Leeds Street, Rhodes, N. S. W. 2138
☎ (02) 9736 1244 – Fax (02) 9736 3910
Customer Responce Centre:
☎ 1 800 011 013

BELGIQUE / BELGIË/ LUXEMBOURG
Nilfisk-Advance s.a./n.v.
Doornveld/ Sphere Business Park
Industrie Asse 3, nr 11 – bus 41
1731 Zellik-Asse
☎ (02) 467.60.50 Fax (02) 463.44.16

CANADA
Nilfisk-Advance Ltd.
396 Watline Avenue
Mississauga, Ontario L4Z 1X
☎ (905) 712-3260 – Fax (905) 712-3255

DEUTSCHLAND
Nilfisk-Advance AG
Siemensstraße 25-27
25462 Rellingen
☎ (041 01) 3990 – Fax (04101) 399191
Zentraler Kundenservice
☎ für die Industrie: 0180 535 67 97
☎ Institutionen und Gebäudereiniger: 0180 500 11 70

FRANCE
Nilfisk-Advance S.A.
BP 246
91944 Courtaboeuf Cedex
☎ (01) 69.59.87.00 Télécopie (01) 69.59.87.01

HONG KONG
Nilfisk-Advance Ltd.
2001, 20/F HK Worsted Mills
Industrial Building
31-39 Wo Tong Tsui Street
Kwai Chung, N.T.
☎ 2427 59 51 – Fax 2487 5828

IRELAND
Nilfisk-Advance Ltd.
28 Sandyford Office Park
Dublin 18
☎ +353 1 2943838 – Fax +353 1 2943845

JAPAN
Nilfisk-Advance Inc.
3-4-9 Chigasaki Minami
Tsuzuki-Ku Yokohama 224
☎ 045-942-7741 – Fax 045-942-6545

MALAYSIA
Nilfisk-Advance Sdn Bhd
Lot 2, 1st. Floor
Lorong 19/1A
46300 Petaling Jaya
Selangor Darul Ehsan
☎ 03-7568188 / 03-7568189 / 03-7568388 – Fax 03-7566828

NEDERLAND
Nilfisk-Advance B.V.
Flevolaan 7, Postbus 341
1380 AH Weesp
☎ 0294-462121 – Fax 0294-430053

NEW ZEALAND
Nilfisk-Advance Limited
477 Great South Road, Penrose
Auckland
☎ (09) 525 0092 – Fax (09) 525 6440

SCHWEIZ / SUISSE
Nilfisk-Advance AG
Ringstrasse 19, 9533 Kirchberg/Wil
☎ 719 23 52 83 – Fax 719 23 84 44

SINGAPORE
Nilisk-Advance Pte. Ltd.
22, Woodlands Industrial Park E1
Singapore 757740
☎ (65) 759 9100 – Fax (65) 759 9133

TAIWAN
Nilfisk-Advance Ltd.
1 F, No.23, Lane 132, Sec. 2
Ta An Road, Taipei
☎ 700 22 68 – Fax 784 08 43

UNITED KINGDOM
Nilfisk-Advance Limited
Newmarket Road
Bury St. Edmunds
Suffolk IP 33 3SR
☎ (01284) 763163 – Fax (01284) 750562

USA
Nilfisk-Advance Inc.
14600 21st Avenue North
Plymouth, MN 55447-3408
☎ +1 800 989 2235 – Fax 1 800 989 6566

Nilfisk-Advance of America, Inc.
300 Technology Drive
Malvern, PA 19355
☎ (610) 647 647-6427

ÖSTERREICH
Nilfisk-Advance GmbH
Vorarlberg Allee 46
1230 Wien
☎ 1 616 58 30 – Fax 1 616 58 30 40

ESPAÑA
Nilfisk-Advance, S.A.
Torre D'Ara
Passeig del Rengle, 5 Pl.9-10
E-08302 – Mataró (Barcelona)
☎ Tel. 93 741 24 00 – Fax: 93 757 80 20
Central atención al cliente: 902 200 201
nilfisk@nilfisk-advance.es – www.nilfisk-advance.com
Distribuidores y Servicio Técnico en toda España y Andorra

ITALIA
Nilfisk-Advance Italia Spa
Località Novella Terza
26862 Guardamiglio (LO)
Italy
☎ +39 0377 414067-54 – Fax +39 0377 414097
www.nilfisk-advance.com

PORTUGAL
Nilfisk-Advance Lda.
Rua Cândido de Figueiredo, 91-i, 1500-133 LISBOA
☎ 01/7784142 – Fax 01/7785613
Porto 02/526766 – Fax 02/520739
Açores 096/628092/3 – Fax 096/628129
Madeira 091/228965 – Fax 091/228796

GREECE
Embiom S.A.
Λεωφ. Βουλιαγμένης 60
Αργυρούπολη
164 52 Αθήνα
✆ 9950613 - Fax 9951680

Nilfisk Advance
setting standards

www.nilfisk-advance.com