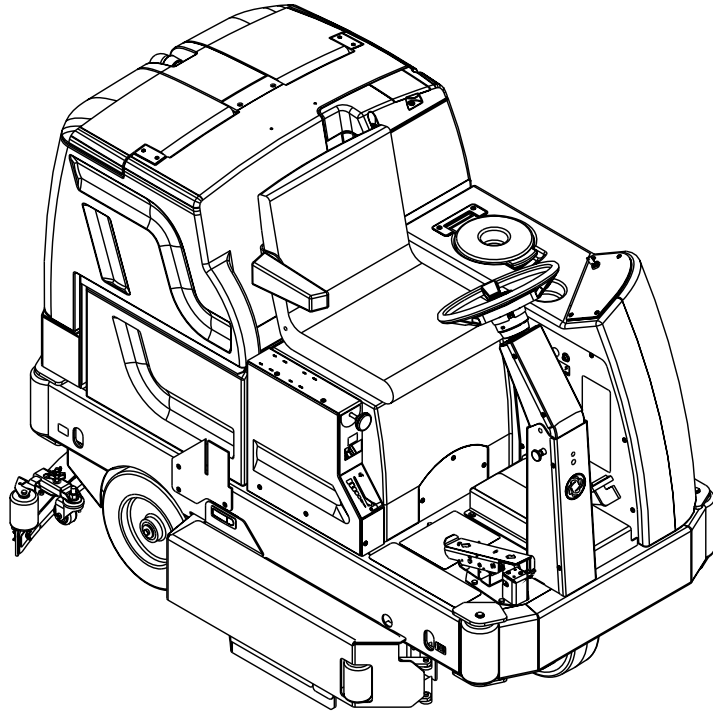


# Hydro-Retriever™ 3800

# Hydro-Retriever™ 2042

# BR 1100, 1100C, 1100C-XL



## **SERVICE MANUAL**

**Advance MODELS 56410000 (disc), 56410350 (cyl.),  
56410001 (2042), 56410500 (cyl. rollout),  
56410501 (disc rollout), 56410502 (2042 rollout)  
Nilfisk MODELS 56410002 (disc), 56410351 (cyl.),  
56410425 (1100C-XL)**



**Nilfisk  
Advance**

*setting standards*

1/01 revised 2/05 Form Number 56043058

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**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 **Hydro-Retriever™ 3800 / BR 1100** and **Hydro-Retriever™ 2042 / BR 1100C-XL**. Read it thoroughly before servicing the machine.

**Note: Bold numbers in parentheses indicate items illustrated on pages 9-10.**

## 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 \_\_\_\_\_

## OTHER MANUALS AVAILABLE FOR YOUR MACHINE

The following manuals are available from the Nilfisk-Advance Literature Service Department:

- Hydro-Retriever™ 3800 / BR 1100 / Hydro-Retriever™ 2042 / BR 1100C-XL Parts List - Form Number 56042410
- Hydro-Retriever™ 3800 / BR 1100 / Hydro-Retriever™ 2042 / BR 1100C-XL Operation Manuals - Form Numbers  
56041497 (Danish, Norwegian, Swedish, Finnish)  
56041498 (English, German, French, Dutch)  
56041499 (Spanish, Portuguese, Italian, Greek)

## 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 **(22)**.
- All access doors and covers are secured.
- The machine parking brake is set.

## TOWING

### CAUTION!

If the machine must be towed or pushed, make sure the Key Switch (Main Power) **(33)** is in the OFF position and do not move the machine faster than a normal walking pace (2-3 mph, 3-5kph) and for short distances only.

# CAUTIONS AND WARNINGS

## 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 danger of machine damage or bodily harm.

### **WARNING!**

- This machine shall be used only by properly trained and authorized persons.
- While on ramps or inclines, avoid sudden stops when loaded. Avoid abrupt sharp turns. Use low speed down hills. Clean only while ascending (driving up) the ramp.
- 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.

### **CAUTION!**

- This machine is not approved for use on public paths or roads.
- This machine is not suitable for picking up hazardous dust.
- Do not use scarifier discs and grinding stones. Nilfisk-Advance will not be held responsible for any damage to floor surfaces caused by scarifiers or grinding stones (can also cause damage to the brush drive system).
- 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 applying the parking brake.
- Turn the key switch off (O) before changing the brushes 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, causing damage to valves and fittings. Flush with windshield washer fluid.
- The batteries must be removed from the machine before the machine is scrapped. The disposal of the batteries should be safely done in accordance with your local environmental regulations.

**SAVE THESE INSTRUCTIONS**

# SPECIFICATIONS

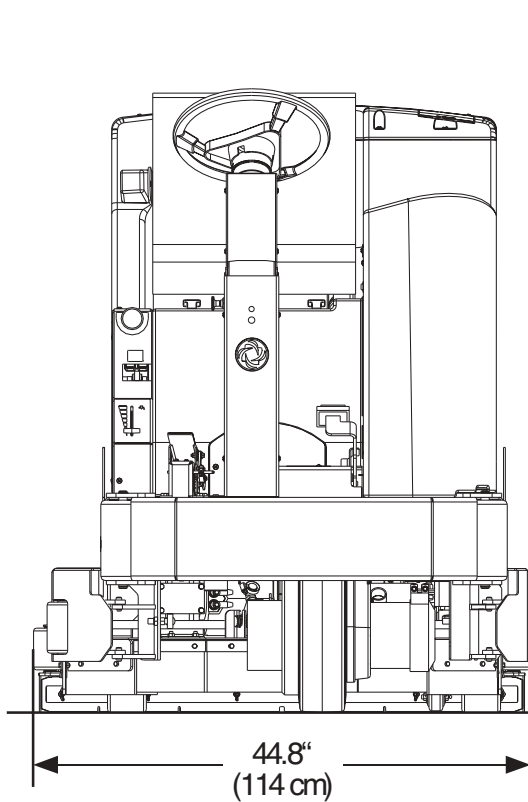
General Specifications	3800 / BR 1100 'disc' English (Metric)	3800 / BR 1100 'cyl.'	2042 / BR 1100C-XL
Machine Length	73.5 in. (186.7 cm)	73.5 in. (186.7 cm)	82 in. (208 cm)
Machine Length (with squeegee)	74.25 in. (189 cm)	74.25 in. (189 cm)	82.8 in. (210 cm)
Machine Width	42.8 in. (108.7 cm)	42.8 in. (108.7 cm)	47.5 in. (121 cm)
Machine Width (with squeegee)	44.8 in. (113.8 cm)	44.8 in. (113.8 cm)	51 in. (129.5 cm)
Machine Height	55.8 in. (141.7 cm)	55.8 in. (141.7 cm)	55.8 in. (141.7 cm)
Machine Height (with overhead guard)	79 in. (200 cm)	79 in. (200 cm)	79 in. (200 cm)
Machine Net Weight*	1,343 lbs. (609 kg)	1,343 lbs. (609 kg)	1,518 lbs. (689 kg)
Machine Gross Weight**	2,476 lbs. (1123 kg)	2,501 lbs. (1134 kg)	2,701 lbs. (1225 kg)
Cleaning Width (scrubbing path)	38 in. (96.5 cm)	38 in. (96.5 cm)	42 in. (106.6 cm)
Coverage Rate Per Hour (theory)	55,000 sq. ft. (5110 m <sup>2</sup> )/ hr.	55,000 sq. ft. (5110 m <sup>2</sup> )/ hr.	61,000 sq. ft. (5670 m <sup>2</sup> )/ hr.
Coverage Rate Per Hour (actual)	37,600 sq. ft. (3495 m <sup>2</sup> )/ hr.	37,600 sq. ft. (3495 m <sup>2</sup> )/ hr.	42,000 sq. ft. (3901 m <sup>2</sup> )/ hr.
Brush Disc type (qty of 2)	20 in. (51 cm) disc	–	–
Brush Cylindrical (qty of 2)	–	37 in. (94 cm)	41 in. (104 cm)
Brush Speed (Disc)	300 RPM	–	–
Brush Speed (Cylindrical)	–	900 RPM	900 RPM
Solution Tank Capacity	53 gal. (200 l)	53 gal. (200 l)	53 gal. (200 l)
Solution Flow Rate (Maximum)***	2.3 GPM (8.7 l/min.)	2.3 GPM (8.7 l/min.)	2.3 GPM (8.7 l/min.)
Recovery Tank Capacity	53 gal. (200 l)	53 gal. (200 l)	53 gal. (200 l)
Vacuum Water Lift	70 inches (sealed) 15 inches (1 in. orifice)	70 inches (sealed) 15 inches (1 in. orifice)	70 inches (sealed) 15 inches (1 in. orifice)
Ramp Climbing Ability (gradeability)	Transport 15.83% grade (8 degrees) Dry	Transport 15.83% grade (8 degrees) Dry	Transport 12.99% grade (8 degrees) Dry
Sound Level	73.5 dBA (at operator)	73.5 dBA (at operator)	73.5 dBA (at operator)
Transport Speed	4.6 mph (7.4 KPH)	4.6 mph (7.4 KPH)	4.6 mph (7.4 KPH)
Scrubbing Speed	3.5 mph (5.6 KPH)	3.5 mph (5.6 KPH)	3.5 mph (5.6 KPH)
Minimum Aisle Turn Width	86 inches (218 cm)	86 inches (218 cm)	96 inches (244 cm)
Power Source 36VDC Battery Pack	Qty (6) 6V, 395 AH batt.	Qty (6) 6V, 395 AH batt.	Qty (6) 6V, 395 AH batt.
Battery Weight (each)	123 lbs. (55.8 kg)	123 lbs. (55.8 kg)	123 lbs. (55.8 kg)
Battery Compartment Size			
Height	19.5 in. (49.5 cm)	19.5 in. (49.5 cm)	19.5 in. (49.5 cm)
Width	32.1 in. (81.5 cm)	32.1 in. (81.5 cm)	32.1 in. (81.5 cm)
Length	23.8 in. (60.4 cm)	23.8 in. (60.4 cm)	23.8 in. (60.4 cm)
Battery Chargers	36V Auto 36 Amp (120V, 60Hz)	same	same
	36V Auto 38 Amp (220V, 60Hz)	same	same
	36V Auto 36Amp (230V, 50Hz)	same	same
Wheel Drive Motor	36V, 2.7 hp, (2000 watts) Max Rating (same for all models)		
Brush Drive Motor single (disc)	36V, 3 hp, (2240 watts) Max Rating	–	–
Brush Drive Motor dual (cylindrical)	–	(2) 36V, 1 hp (746 watts) Max	same
Vacuum Motor	36V, .75 hp, (560 watts) Maximum Rating (same for all models)		
Maximum current draw under-normal working loads.	136 Amp without presweep 159 Amp with presweep	103 Amp without presweep 126 Amp with presweep	115 Amp

\***Net Weight:** Standard machine without options, empty solution and recovery tanks, without removable scrub brushes and no battery installed.

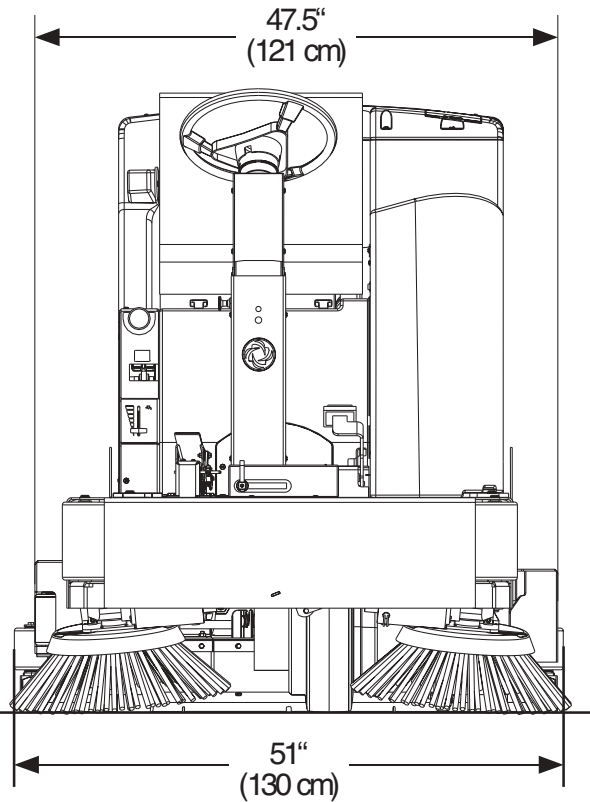
\*\***Gross Weight:** Standard machine without options, full solution tank and empty recovery tank, with removable scrub brushes and maximum size battery.

\*\*\*Reading taken with solution tank filled to 23 inches (water height).

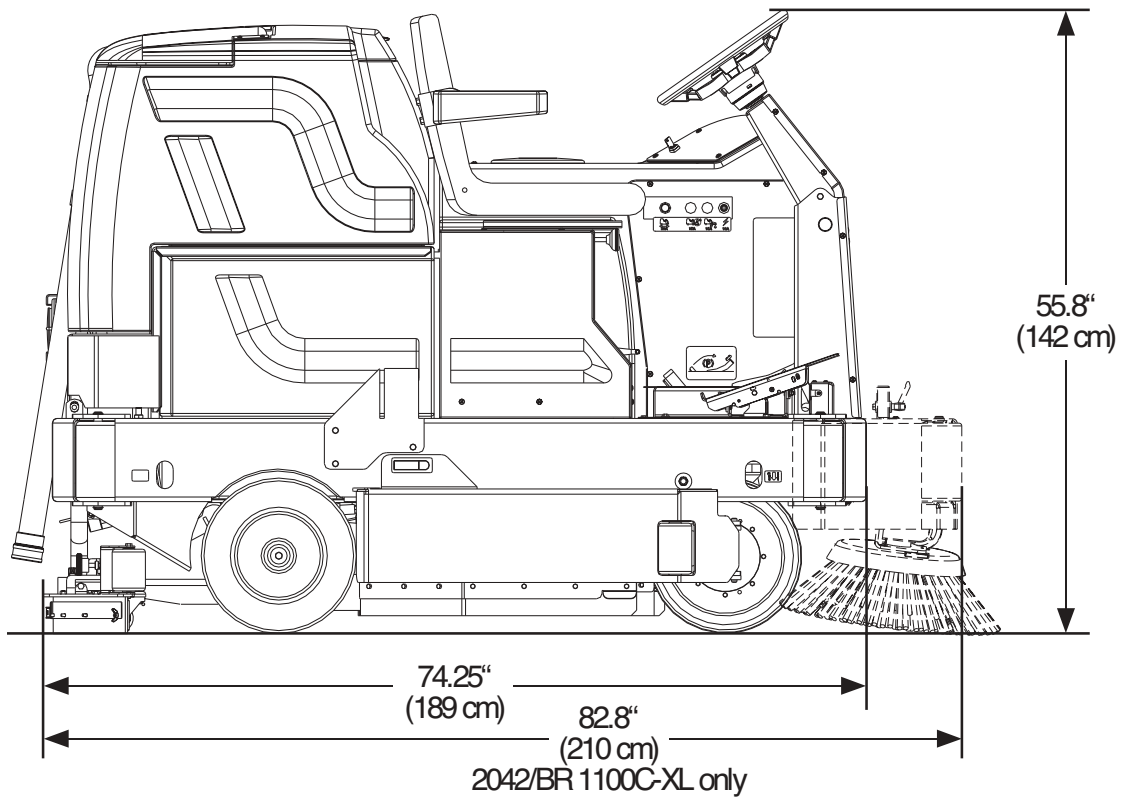
# SPECIFICATIONS



3800/BR 1100 FRONT VIEW



2042/BR 1100C-XL FRONT 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	•			
Check/Clean Tanks & Hoses	•			
Check/Clean/Rotate the Brushes/Pads	•			
Check/Clean Vacuum Shut-Off Float	•			
Check/Clean the vacuum motor foam filter	•			
Check/Clean/Adjust the Squeegee	•	•		
* Empty Debris Basket/Clean Solution Delivery Trough	•			
Check Each Battery Cell(s) Water Level		•		
Inspect Scrub Housing Skirts		•		
Inspect and clean Solution Filter		•		
Check Foot/ Parking Brake for Wear & Adjustment		•		
Lubrication - Grease Fittings			•	
** Check Carbon Brushes				•

Note: See the individual machine system sections for maintenance information.

\* Cylindrical models only.

\*\* Have Nilfisk-Advance:

Check vacuum motor carbon brushes (Qty 2) once a year or after 300 operating hours.

Check brush motor carbon brushes (Qty 4) once a year or after 500 operating hours.

Note if the vacuum or brush motor brushes are 9.5 mm (3/8 inches) or shorter, replace them.

Check wheel drive motor carbon brushes (Qty 4) once a year or every 500 operating hours. The original length of each brush is 30.5 mm (1.2 inches). Replace when shorter than 15.8 mm (5/8 inches) to obtain the same motor efficiency as a new brush. All four brushes must be replaced at the same time.

## WARNING!

Turn the key switch off, set the parking brake 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.

## WHEEL DRIVE MOTOR GEARCASE OIL CHECK & FILL

The gearbox of the drive unit is originally filled with SAE 85 W oil in the amount of 300 cc (10.16 US fluid ounce). It is recommended that the oil level be checked once a year or every 3000 hours of operation. It's also recommended that the oil be replaced every 5000 hours of operation. This can be performed with the drive unit remaining on the vehicle. Reference Figure 6 in the Wheel Drive System. Rotate wheel whereby the oil plug located on the Gearbox Cover (J) is rotated parallel to the ground (along the horizontal centerline of the motor shaft). After rotation to parallel position, allow a few moments for the oil to drain to the bottom of the gearbox. Then, remove the oil plug. Check to see if oil flows out of the plug hole. If no oil flows out, it may be necessary to add a small amount of oil to the gearbox. This oil can be added to gearbox via the plug hole. Pay careful attention to not over-fill the gearbox.

## 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:**

- Squeegee Caster Wheel Axle & Swivel (2) per Assembly
- Steering Wheel Shaft Universal joint
- Chain Tension Sprocket

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

- Steering Chain
- Squeegee Height Adjustment Caster Hardware
- General Pivot Points for the Squeegee & Brush Linkage



**Advance Hydro Retriever 3800  
Disc and Cylindrical (2001 versions)  
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

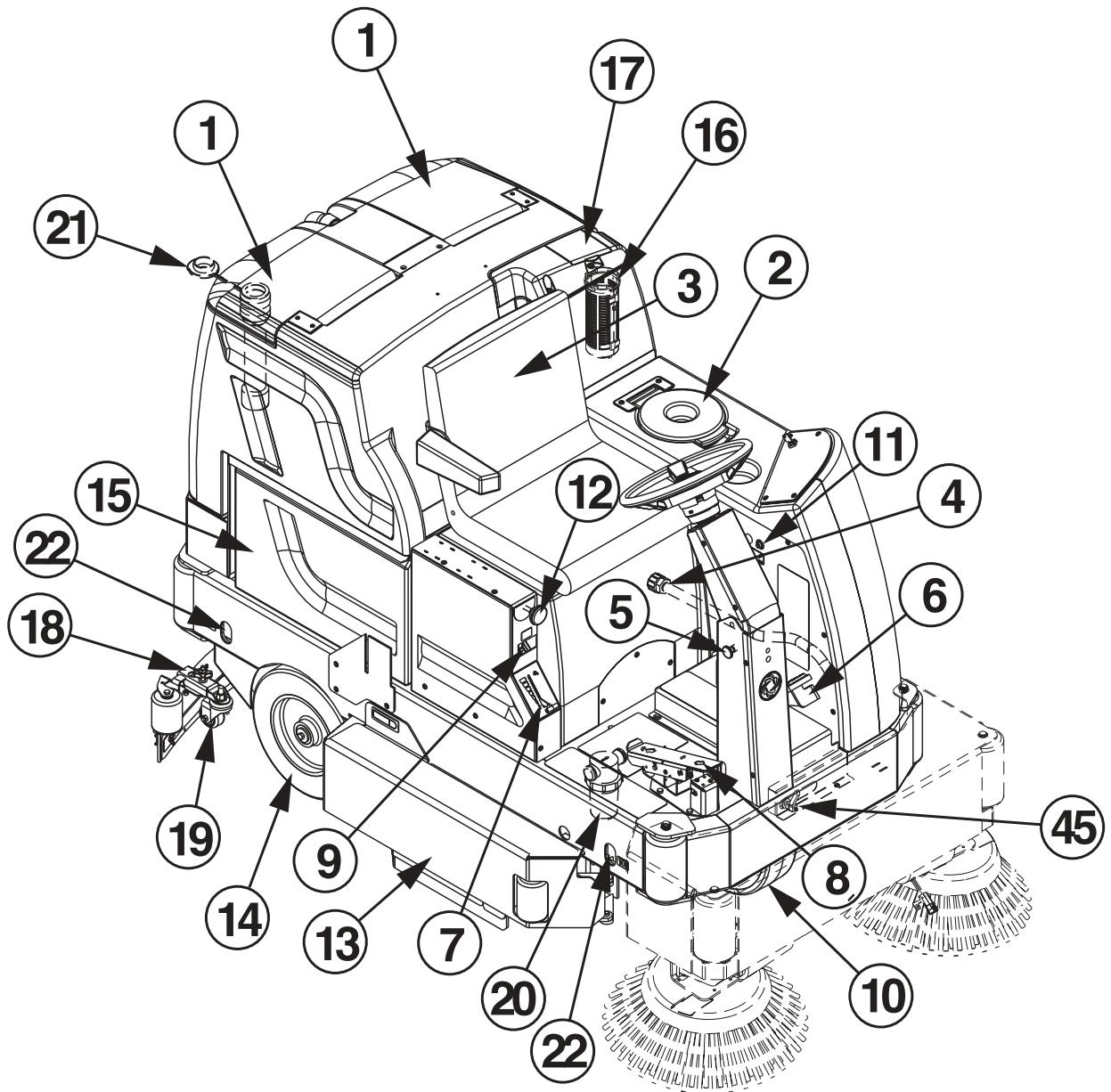
Ref	OPERATIONAL INSPECTION ITEMS	OK	Defect Codes (circle)	Does Not Work
1	Steering		A B	
2	Drive Pedal Operation (check for Fwd/Rev Drive & any neutral creep)		A B D	
3	Seat Safety Switch		M W	
4	Brakes (Service & Parking)		A B W	
5	Drive System Performance (Reference SVR Manual for Curtis Drive programmer Speed Changes)		noisy sluggish	
6	Scrub System (Raise/Lower and auto scrubbing functions)		A B	
7	Scrub Brush (pressure settings Normal & Heavy)		A B	
8	Squeegee System (Raise/Lower and Auto Lift in Reverse)		A B	
9	Vacuum Performance (Sealed water lift 70" and 1- inch open hole adapter 15 inches)		C L W	
10	Solution Control (On/Off and Flow Volume Min/Max)		A B	
11	Emergency Battery Disconnect Control Knob		B D	
12	Pre-Sweep System Accessory (If applicable)		A B D	
13	Tilt Steering Mechanism and Seat Lever		A B	
14	Optional Accessories (Headlight, Safety Beacon, Back Up Alarm, Etc.)		<---->	
15	Battery Charger (auto turn ON & OFF)			
16	Main Control Board Special Program Options (Reference SVR Manual 56043058) and check all applicable program settings. Examples stored error fault codes, diagnostic SVR test mode, scrub mode pressure settings etc.		A	

Ref	VISUAL INSPECTION ITEMS	Comments	OK	Defect Codes (circle)	Does Not Work
17	Scrub Brushes, check for wear and rotate (disc & cylindrical)			D M W	
18	Scrub Brush Motor(s) and disc machine gearboxes			B L	
19	Scrub Brush Drive Belt, wear and tension (cylindrical only)			A D W	
20	Scrub Brush Deck Actuator Motor			A B D	
21	Brush Drive Plate Retainer Clips & flex couplers			C D M	
22	Scrub Deck Skirts			D M W	
23	Solution Solenoid Valve			D L W	
24	Solution Flow Control Valve and Linkage			A B D W	
25	Solution Tank, Delivery Hoses & Filter	Clean filter screen		C L	
26	Vacuum Motor Carbon Brushes	Wear limit 3/8"		C W	
27	Vacuum Motor Gaskets and Filters			C D L	
28	Vacuum Float Ball & Cage Assembly	Clean float		C D M	
29	Recovery Tank Cover Gasket			L M W	
30	Recovery Tank Drain Hose & Cap			C D L	
31	Squeegee Pick-Up Hose	Back flush		C D L	



# KNOW YOUR MACHINE

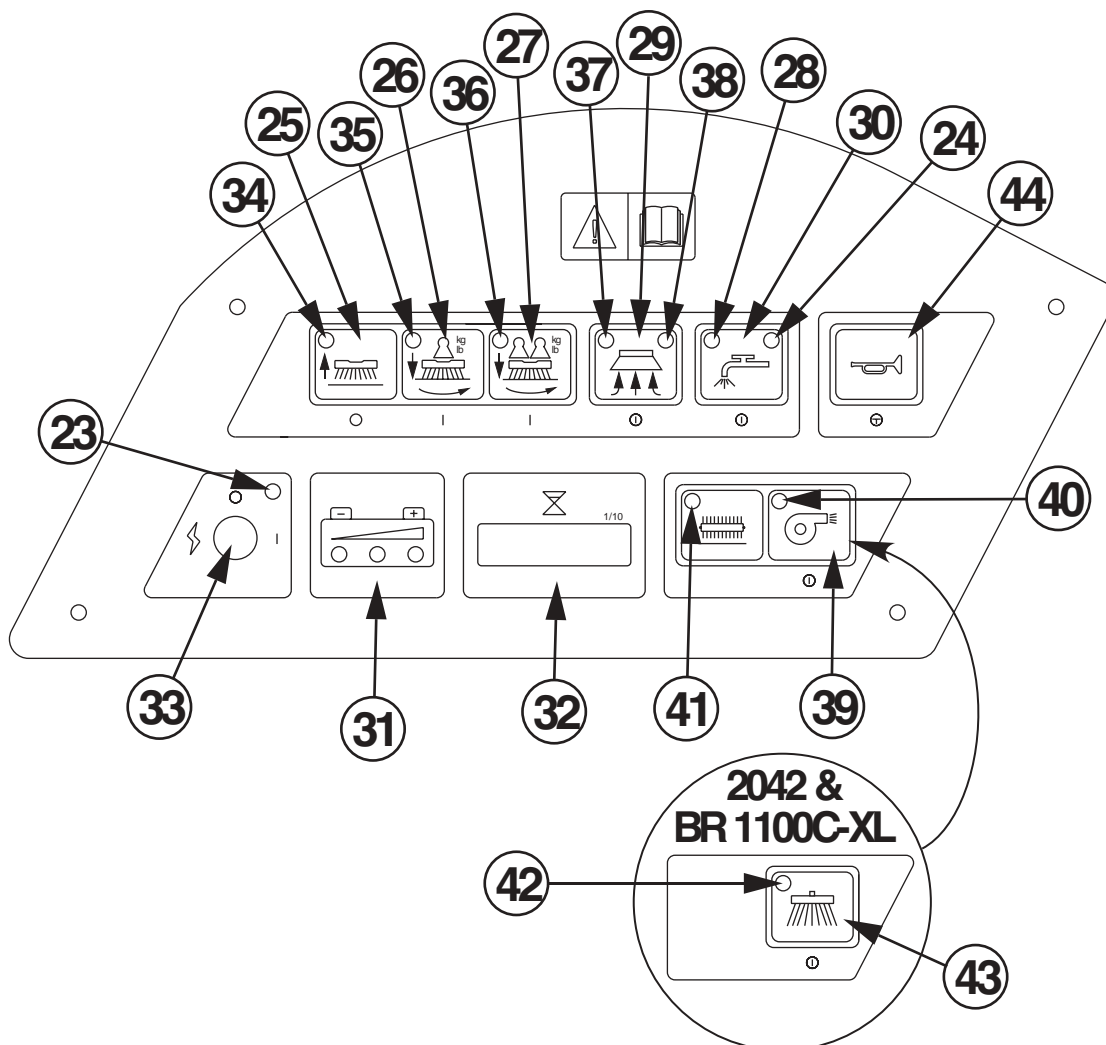
- |    |   |    |  |
|----|---|----|--|
| 1  | Recovery Tank Covers                          | 12 | Emergency Stop Switch / Battery Disconnect |
| 2  | Solution Tank Fill Cover                      | 13 | Scrub Brush Deck and Side Skirts           |
| 3  | Operator Seat w/Safety Switch                 | 14 | Rear Wheel                                 |
| 4  | Solution Tank Drain Hose                      | 15 | Battery Compartment                        |
| 5  | Steering Wheel Adj. Tilt Knob                 | 16 | Recovery Tank Shutoff Float                |
| 6  | Brake Pedal & Parking Brake Set/Release Lever | 17 | Vacuum Motor Filter Housing                |
| 7  | Solution Flow Control Lever                   | 18 | Squeegee Assembly                          |
| 8  | Drive Pedal Directional/Speed                 | 19 | Squeegee Casters                           |
| 9  | Charger Plug                                  | 20 | Solution Filter                            |
| 10 | Drive and Steer Wheel                         | 21 | Recovery Tank Drain Hose                   |
| 11 | Circuit Breakers                              | 22 | Tie Down Locations (4)                     |
|    |   | 45 | Side Broom Wear Adjustment Lever           |



# KNOW YOUR MACHINE

## CONTROL PANEL

- 23 Main Power Indicator
- 24 Solution System Fault Indicator
- 25 Scrub Off Button
- 26 Normal Scrub Button
- 27 Heavy Scrub Button
- 28 Solution System Indicator
- 29 Vacuum Button
- 30 Solution Button
- 31 Battery Condition Indicator
- 32 Hourmeter/Status Display
- 33 Master On/Off Key Switch
- 34 Scrub Mode Off Indicator
- 35 Normal Scrub Mode Indicator
- 36 Heavy Scrub Mode Indicator
- 37 Vacuum System Indicator
- 38 Vacuum System Fault Indicator
- 39 Presweep Dust Control Button (3800 / BR 1100 only - opt)
- 40 Presweep Dust Control Indicator (3800 / BR 1100 only - opt)
- 41 Presweep Power Indicator (3800 / BR 1100 only - opt)
- 42 Sweep System Power Indicator (2042 / BR 1100C-XL only)
- 43 Sweep System Control Button (2042 / BR 1100C-XL only)
- 44 Horn Button



## FUNCTIONAL DESCRIPTION OF CONTROL BUTTONS:

The controls were designed with one touch operation in mind. For single pass scrubbing the user can simply press one button and all systems on the machine will be ready to go.

For most single-pass scrubbing operations, the operator should only need to use the first three buttons on the control panel. These are the Scrub Off (25), Normal Scrub (26), and Heavy Scrub (27) buttons. For this reason these buttons are outlined in bright white on the control panel while the other buttons are outlined in a darker color.

**Scrub Off Button (25)** - Pressing this button when the unit is in a scrub mode will cause the following to occur:

- The scrub brushes will turn off
- The scrub deck will raise to the UP position
- The solution flow will be stopped
- The first time that this button is pressed, the vacuum/squeegee system will NOT be turned off. This is so that any remaining water may be picked up without having to turn the vacuum back on. If this button is pressed a second time (pressed after the scrub mode has been turned off) the squeegee will raise and the vacuum will shut off after a 6-second delay.

**Normal Scrub Button (26)** - Pressing the normal scrub button will enable the scrub system and set the scrub pressure to the last selected value for the normal scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number. Subsequent presses of the normal scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the normal scrub mode. Once the maximum value is reached the pressure setting will step back to 1. The factory default maximum for the normal scrub mode is 4. The following will occur when this button is pressed:

- The scrub deck will be lowered
- The vacuum and solution systems will be enabled (vacuum and solution modes = AUTO)
- As soon as a direction is commanded by the throttle (forward or reverse) the brushes will start turning and the vacuum will turn on. If the direction is forward, the squeegee will lower and the solution flow will start. If the direction is reverse, the squeegee will go to the up position and the solution flow will be stopped.

**Heavy Scrub Button (27)** - Pressing the heavy scrub button will enable the scrub system and set the scrub pressure to the last selected value for the heavy scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number. Subsequent presses of the heavy scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the heavy scrub mode. Once the maximum value is reached the pressure setting will step back to (normal scrub limit + 1). The factory default maximum for the heavy scrub mode is 7 (cylindrical) or 12 (disc). The following will occur when this button is pressed:

- The scrub deck will be lowered
- The vacuum and solution systems will be enabled (vacuum and solution modes = AUTO)
- As soon as a direction is commanded by the throttle (forward or reverse) the brushes will start turning and the vacuum will turn on. If the direction is forward, the squeegee will lower and the solution flow will start. If the direction is reverse, the squeegee will go to the up position and the solution flow will be stopped.

**Vacuum Button (29)** - This button is used to select the mode of operation for the vacuum/squeegee system. There are 3 modes of operation for this system. These modes are OFF, AUTO, ON. Following is a description of each mode and how they are selected.

**OFF MODE:** In this mode the vacuum is off and the squeegee is in the up position. As mentioned above, when a scrub mode is selected, the vacuum system will be placed in the AUTO mode. If it is desired to double-scrub (scrub without recovering the solution) the vacuum system can be turned off by pressing this button.

**AUTO MODE:** This mode is automatically selected when a scrub mode is selected. In this mode the squeegee will be in the down position unless the reverse direction is selected via the throttle. The vacuum will turn on if either direction is selected. While in this mode the vacuum will remain on for 10 seconds after the throttle returns to the neutral position. This is so that the solution in the squeegee and hose can be drawn into the tank. This mode can be selected independently of the scrub mode by pressing and releasing the vacuum button.

**ON MODE:** In this mode the squeegee will remain in the UP position and the vacuum will be on regardless of the throttle position. This mode is selected by pressing and holding the vacuum button for approximately 1.5 seconds. The vacuum mode must first be OFF before entering this mode. This mode is included in the event an external wand is to be used with this machine or if the operator wants to clean the squeegee using the vacuum hose.

**Solution Button (30)** - This button 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, AUTO, MOMENTARY ON. Following is a description of each mode and how they are selected.

**OFF MODE:** In this mode the solution flow is turned off. As mentioned above, when a scrub mode is selected, the solution system will be placed in the AUTO mode. If it is desired to scrub without dispensing solution, the solution can be turned off by pressing this button.

**AUTO MODE:** This mode is automatically selected when a scrub mode is selected. In this mode the solution flow will be turned on whenever the forward direction is selected via the throttle. The solution flow will be turned off otherwise.

**MOMENTARY ON MODE:** This mode can only be selected when the scrub mode is OFF. 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.

**Presweep Dust Control Button (opt) (39)** - Use this button in conjunction with the optional presweep kit. The dust control feature will only work when the brooms are running on the presweep unit.

**Sweep System Control Button (2042 / BR 1100C-XL only) (43)** - Use this button to turn the sweep system ON or OFF. The side brooms will only run when the scrub system is ON and the machine is in motion (not in neutral). If the scrub system is turned OFF while the sweep system is still ON, the side broom will automatically lower and run the next time the scrub system is turned ON.

**Horn Button (44)** - Pressing this button will activate the horn.

**Side Broom Wear Adjustment Lever (2042 / BR 1100C-XL only) (45)** - Use this adjustment lever to periodically re-adjust the down limit of the side brooms as they wear. Loosening the lever, sliding it to the left and re-tightening it will cause the side brooms to drop closer to the floor.

# KNOW YOUR MACHINE

## DESCRIPTION OF INDICATORS ON THE CONTROL PANEL:

In general, the following guidelines apply to the control panel indicators:

A steady red indicator means that the function is inhibited for some reason. For example, if the scrub system is off and the operator is not on the seat, the scrub system indicator will be red indicating that the system cannot be turned on until the operator is on the seat.

A flashing red indicator means that a fault has occurred in the particular system. An example of this would be an over-current fault.

A yellow indicator means that the particular function has been enabled but is not currently on. For example, if a scrub mode is selected and the throttle is in neutral, the scrub system, vacuum, and solution indicators will all be yellow indicating that the systems are enabled and ready to turn on when the throttle is moved to forward or reverse.

A green indicator means that the particular system is on.

A flashing green indicator means that the particular system is in a delayed-off condition. An example of this is when a scrub mode is selected and the throttle goes from forward or reverse to neutral. When this happens the vacuum indicator will flash green indicating that the vacuum is still on but that it will be turning off after the delay period.

### **Scrub Mode Off Indicator (34):**

- This indicator will be RED if the scrub system is inhibited for any reason. Possible reasons are:
  - Seat switch is open
  - The scrub deck has not returned to the UP position.
  - A system fault
  - Low voltage condition
- This indicator will be GREEN if the system is ready to be placed in either the normal or heavy scrub modes.
- This indicator will be OFF if either the normal or heavy scrub modes have been selected.
- This indicator will flash RED if there is a fault in one of the scrub system components. This will be accompanied by an error indication on the Hour Meter / Status Display (32).

### **Normal Scrub Mode Indicator (35):**

- This indicator will be YELLOW if the normal scrub mode has been selected but the scrub motor is off. This will be the case if the throttle is in the neutral position. The scrub motor will stay on for approximately 3 seconds after the throttle returns to the neutral position.
- This indicator will be GREEN if the normal scrub mode has been selected and the scrub motor is on.
- This indicator will be OFF if the scrub mode is off or if the heavy scrub mode has been selected.

### **Heavy Scrub Mode Indicator (36):**

- This indicator will be YELLOW if the heavy scrub mode has been selected but the scrub motor is off. This will be the case if the throttle is in the neutral position. The scrub motor will stay on for approximately 3 seconds after the throttle returns to the neutral position.
- This indicator will be GREEN if the heavy scrub mode has been selected and the scrub motor is on.
- This indicator will be OFF if the scrub mode is off or if the normal scrub mode has been selected.

### **Vacuum System Indicator (37):**

- This indicator will be YELLOW if the vacuum/squeegee system is in the AUTO mode and the throttle is in the neutral position. This indicates that the vacuum system is enabled but the vacuum is currently off.
- This indicator will be GREEN if the vacuum is currently on. This indicates that the system is in the AUTO mode and the throttle is not in neutral or that the vacuum system is in the ON mode.
- This indicator will FLASH GREEN if the shutoff delay is keeping the vacuum on. This occurs if the vacuum system is in the AUTO mode and the throttle goes to the neutral position. This will also occur if the vacuum system is turned off while it was in either the AUTO or ON modes. The shutoff delay will turn the vacuum off after the delay period.
- This indicator will be OFF if the vacuum/squeegee system is in the OFF mode.

### **Vacuum System Fault Indicator (38):**

- This indicator will flash red if there is a fault in the vacuum or squeegee systems. This will be accompanied by an error indication on the Hour Meter / Status Display (32).
- This indicator will be RED and the Hour Meter / Status Display (32) will show "FULL" if the recovery tank float valve has closed. If this indication occurs and the tank is not full, see the Troubleshooting section.

### **Solution System Indicator (28):**

- This indicator will be YELLOW if the solution system is in the AUTO mode and the throttle is in the neutral or reverse positions. This indicates that the solution system is enabled but the solution flow is currently off.
- This indicator will be GREEN if the solution system is in the AUTO mode and the throttle is in the forward position. It will also be GREEN if the solution system is in the MOMENTARY ON mode. This indicates that the solution flow is currently on.
- This indicator will be OFF if the solution system is in the OFF mode.

### **Solution System Fault Indicator (24):**

- This indicator will flash red if there is a fault in the solution system. This will be accompanied by an error indication on the Hour Meter / Status Display (32).

# KNOW YOUR MACHINE

## DESCRIPTION OF INDICATORS ON THE CONTROL PANEL: (CONTINUED)

### Main Power Indicator (23):

- This indicator will be GREEN when the key switch is ON.
- This indicator will flash RED if there is a system fault that requires turning the Master ON/OFF Key Switch (33) off to reset.
- This indicator will flash fault codes from the Curtis Speed Control if a fault exists. This will be accompanied by an "Err03" indication on the Hourmeter/Status Display (32).

### Presweep Dust Control Indicator (40):

- This indicator will be GREEN when the dust control feature is ON.
- This indicator will be YELLOW when the dust control feature is enabled but not ON.
- This indicator will be OFF if the dust control feature is not enabled or unit has the optional side broom kit installed.

### Presweep Power Indicator (41):

- This indicator will be GREEN when either the optional presweep or side broom kits are installed and turned ON.
- This indicator will be YELLOW when either the optional presweep or side broom kits are installed and enabled, but not ON (machine in neutral).
- This indicator will be flashing YELLOW when the optional side broom kit is installed, selected and turned ON, but the scrub system is OFF.
- This indicator will be OFF if the foot pedal on the optional presweep or side broom kits is UP.

### Sweep System Power Indicator (2042 / BR 1100C-XL only) (42):

- This indicator will be GREEN when the sweep system is turned ON.
- This indicator will be YELLOW when the sweep system is enabled, but not ON (machine in neutral).
- This indicator will be OFF if the sweep system is turned off.

## DESCRIPTION OF THE BATTERY CONDITION INDICATORS

The battery condition indicators will give an indication of the state of charge of the batteries. The battery condition monitor will retain the state-of-charge even if the key has been turned off. The state-of-charge indication is reset to full charge when the batteries have been recharged. It is also possible to choose between two different low voltage thresholds depending on whether maintenance free or standard batteries are being used (**have qualified service engineer perform this selection**). NOTE: The following percentages are based on useable battery capacity not total battery capacity. Therefore, 100% discharge = 80% of total battery capacity for standard wet cell batteries or 70% of total battery capacity for maintenance free batteries.

**Green Indicator** = full charge down to 50% discharge

**Green & Yellow Indicator** = 50% discharge down to 75% discharge

**Yellow Indicator** = 75% discharge down to 90% discharge

**Yellow & Red Indicator** = 90% discharge down to 95% discharge

**Red Indicator** = 95% discharge down to 99% discharge

**Flashing Red Indicator** = 100% discharge - scrub system will automatically shut down

**\*Important Note:** See the Main Control Board Special Program Options section in the Electrical System and follow the instructions for Selection of Low Voltage Cutout Threshold.

## DESCRIPTION OF HOURMETER / STATUS DISPLAY

The 5-character display in the middle of the bottom row of the control panel is primarily used as a display for the hourmeter function. This display is also used to display the following information depending upon which mode the control is in:

- Error codes\*
- Brush pressure adjustment settings for normal and heavy scrub mode (fixed and adjustable)\*
- Display of control system default parameters\*
- Recovery tank FULL indicator\*

\* NOTE: Have a qualified service engineer reference the Service Manual for explanations about the error code descriptions and scrub system control default parameter changes. A description of error codes can be found in the Electrical System.

**Emergency Stop Switch / Battery Disconnect (12):** This will remove all power from the machine.

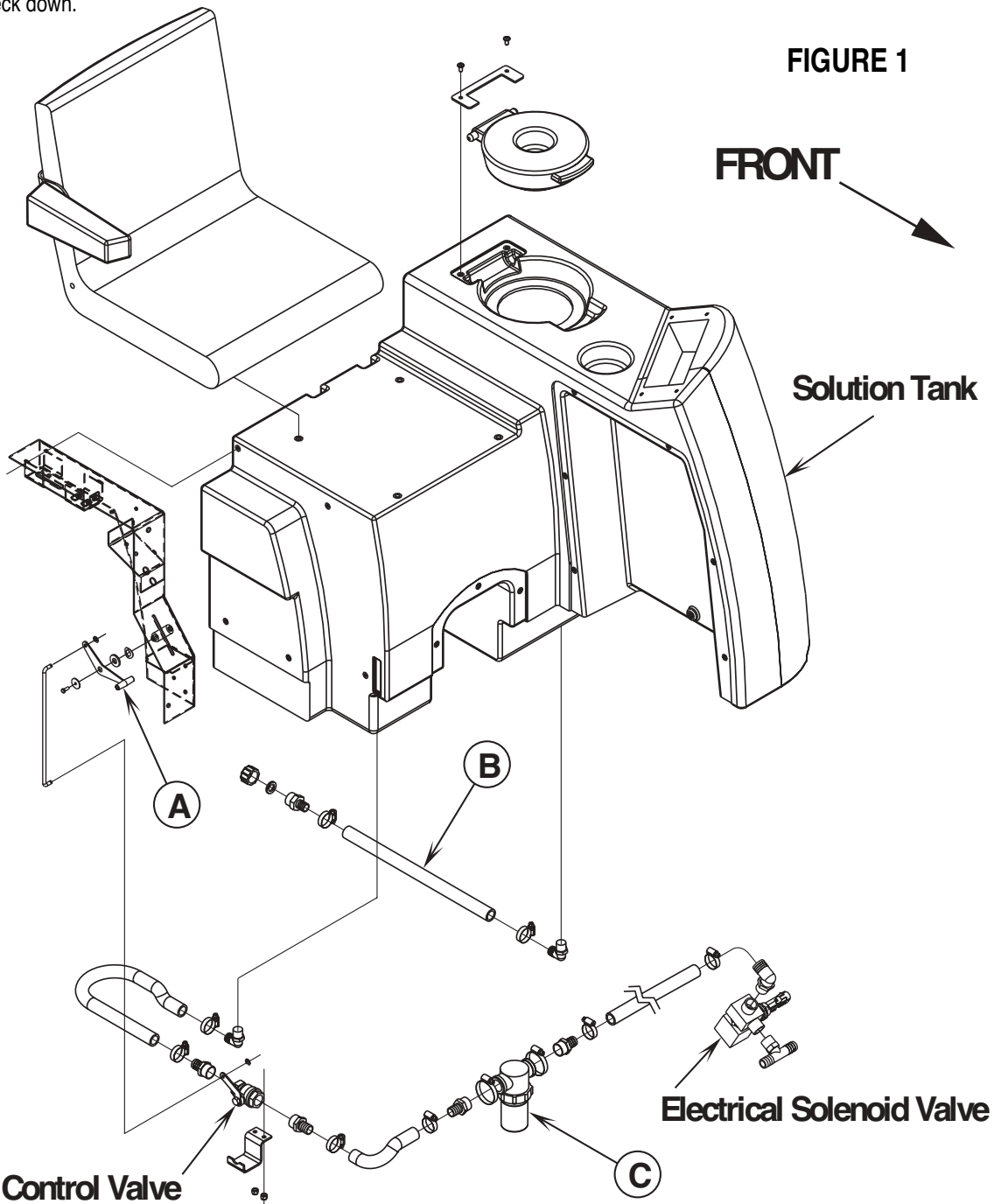
# SOLUTION SYSTEM

## FUNCTIONAL OVERVIEW

The plastic (polyethylene) molded main body structure fulfills three (design) functional uses. They are the platform for the operator's seat, mount location cavity for the electrical panel and as the storage tank for the machine's scrubbing solution. The solution tank fill capacity is 53 gallons (200 L). See Figure 1. Plumbed into the solution flow control valve's hose outlet is a serviceable solution filter to keep debris from entering the solenoid valve. Also fitted to the tank bottom is a short flexible drain hose to drain the tank for system maintenance.

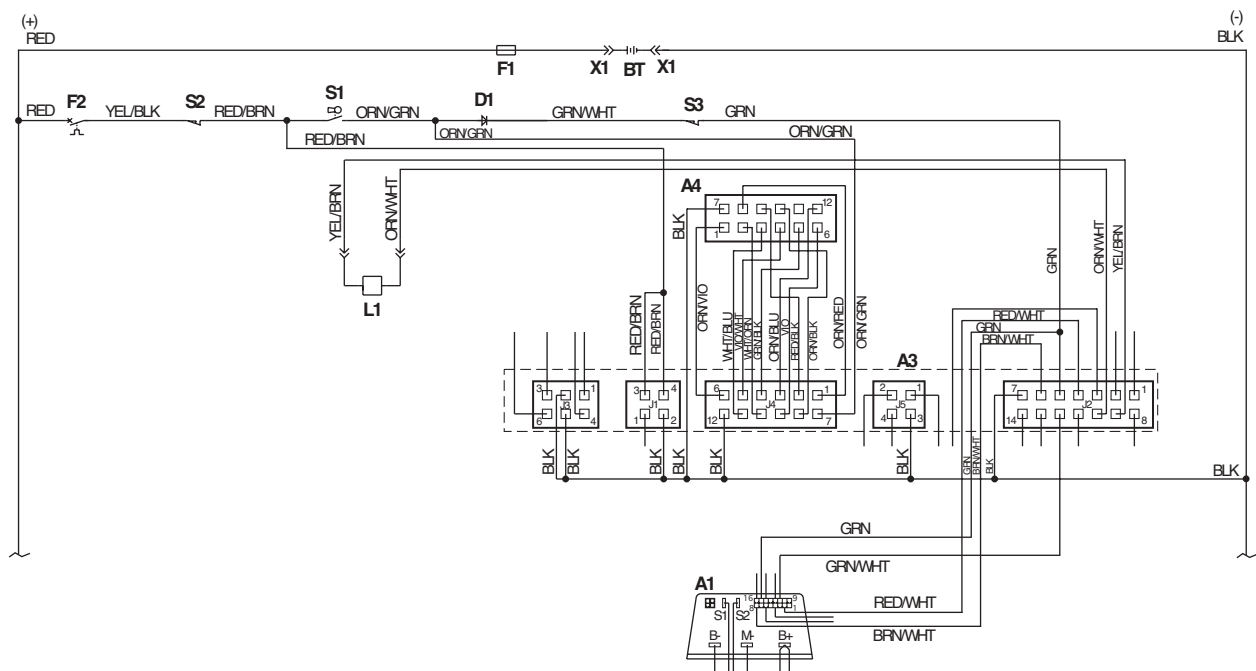
The solution system uses (2) valves to control and regulate the amount of solution dispensed onto the floor. The tee handle lever (A) is located below the right side of the operator's seat and regulates the needed flow volume demand for the scrub brushes. Located in the middle of the scrub deck is the electric solenoid valve L1, which stops and starts the solution flow to the scrub brushes. See Figure 2. The electrical circuit that turns on (energizes) the solenoid coil is activated through the (A4) control panel's switch buttons and the (A3) main controller assembly. Note: See the Know Your Machine section in this manual for a detailed explanation of the complete solution operation modes.

During normal and heavy machine scrubbing the solution system's Auto Mode is selected and works in conjunction with the (A1) wheel drive speed controller and the (A2) throttle input which then controls the scrub system's outputs to turn On & Off the (L1) solenoid valve. The solution then flows to the scrub brushes when the main valve is open, the scrub deck is lowered and the drive pedal is pushed into the forward drive position. Note: When the solution On/Off button is turned Off, no flow can occur regardless of the manual flow control valve being On, drive pedal activated and the scrub deck down.





## FIGURE 2



## TROUBLESHOOTING GUIDE

Problem	Possible Cause
Inadequate or no solution flow	No solution in the tank
	Main solution flow control valve lever is in the off position
	Clogged solution filter, valves, hoses & solution delivery trough (cyl.)
	Defective solution solenoid valve (L1)
	Solution system fault in the main controller A3*

\*Reference the Main Control Board Troubleshooting Guide in the Electrical System of this manual for further information.

## SOLUTION SYSTEM MAINTENANCE

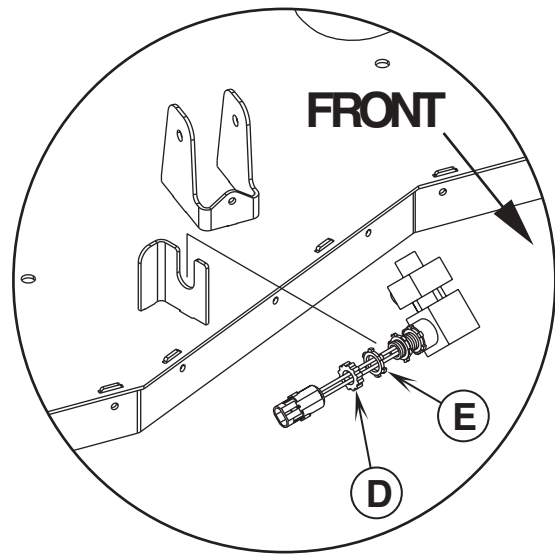
- **Solution Tank:** See Figure 1. Weekly empty the solution tank; remove the solution Drain Hose (B) from its storage area (located underneath the left side brush skirt frame). Direct the hose to a designated "Disposal Site" and flush the tank with clean water.
- **Solution Filter:** Remove and clean the inline Solution Filter (C). To access the filter housing for removal, work underneath the middle left side chassis panel. No tools are needed to remove the filter (hand tighten only). **Service Tip:** The manual solution control lever must be placed in the full OFF position. This prevents loss of solution when servicing the filter strainer with a partial or full tank.
- **Solution Delivery Trough:** Note on the cylindrical scrub deck clean the holes in the delivery trough to assure even distribution of solution.

# SOLUTION SYSTEM

## SOLUTION SOLENOID REMOVAL

- 1 Drain the solution tank or put the flow control lever in the full OFF position to prevent solution loss.
- 2 With the operator seated turn on the key switch then press the normal scrub button to lower the scrub deck to the floor. Note: Don't turn the key switch off until disconnecting the battery pack (push emergency disconnect knob (12)). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off. Turn Key OFF.
- 3 Open the right side scrub brush access door then remove the skirt assembly. Locate solenoid (front middle on scrub deck) and unplug the solenoid wire connection from the machine harness.
- 4 See Figure 3. Remove the Insulated Bushing (D) from the valve body nipple, then remove the (E) Conduit Anchor Connector.
- 5 Pull the valve from the deck mount bracket and loosen the (3) hose clamps then pry the hoses from fittings to complete the removal. Note: It may be easier to separate the two small hoses at the ends of the solution delivery tubes.
- 6 Make service repairs and re-install valve by following the above steps in reverse order.

FIGURE 3



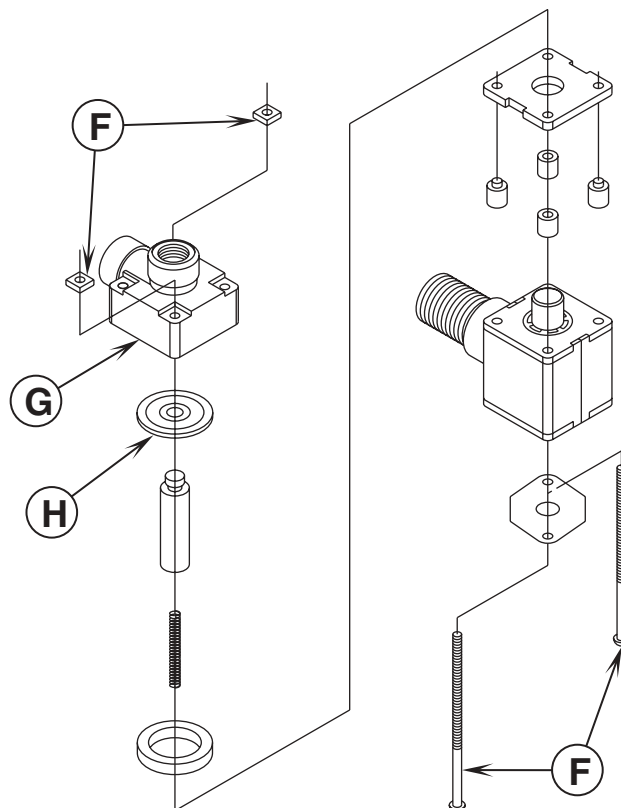
Disc machine solenoid mount shown,  
Cylindrical similar

## SOLENOID VALVE DISASSEMBLY AND CLEANING

- 1 Remove the solenoid valve. See the Solenoid Valve Removal section for instructions.
- 2 See Figure 4. Remove the (2) (F) Screws and Nuts and disassemble the valve (be careful not to lose any internal parts).
- 3 Thoroughly wash dirt from Block (G) and Diaphragm (H).
- 4 After reassembling test the solenoid valve for proper operation.

Note: Solenoid valve replacement seal kit (Viton) is part number 56324506.

FIGURE 4



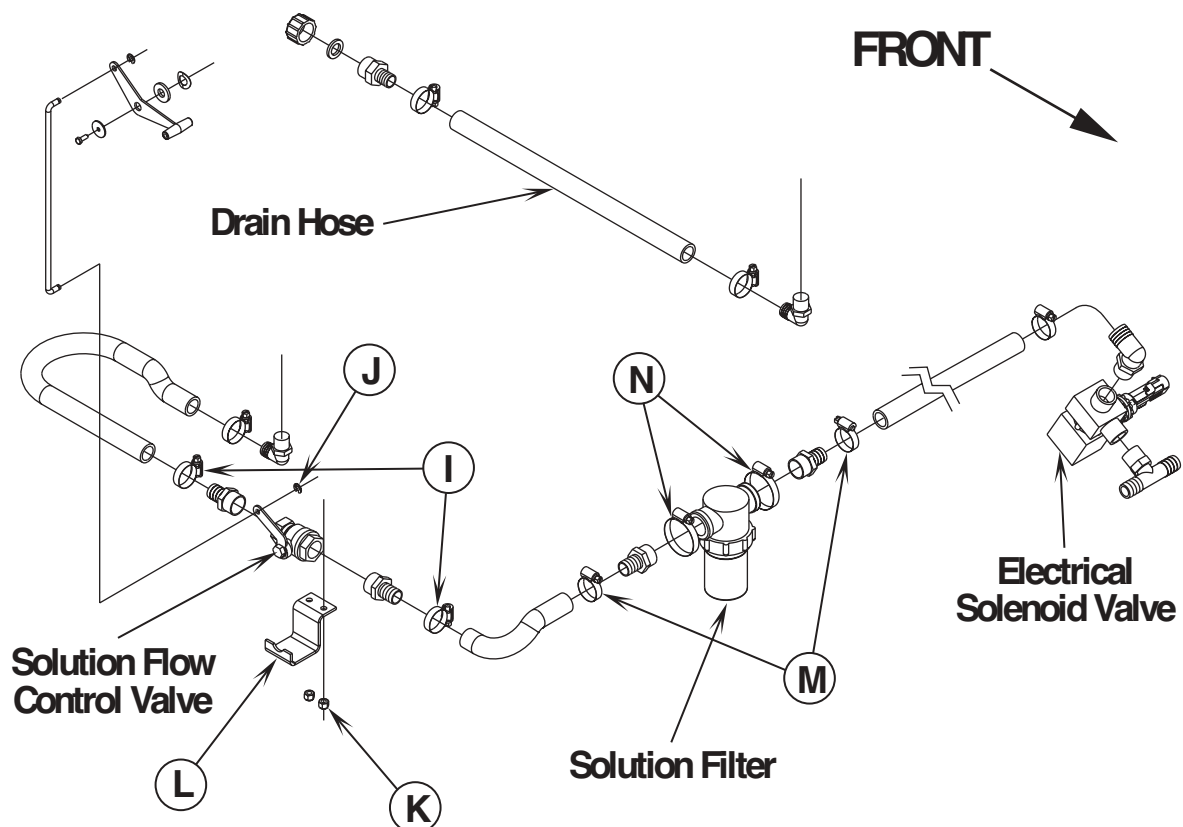
## SOLUTION FLOW CONTROL VALVE REMOVAL

- 1 Drain the solution tank using the drain hose.
- 2 Open the right side scrub brush access door then remove the skirt assembly (2 knobs) to access the valve.
- 3 See Figure 5. Loosen the (2) (I) Hose Clamps and pry off the inlet & outlet solution hoses from the valve's barbed fittings.
- 4 Remove the Retainer Ring (J) from the solution control rod and separate from the valve handle.
- 5 Remove the (2) (K) Hex Nuts securing the valve Mounting Bracket (L) and complete the removal of the valve and bracket.

## SOLUTION FILTER HOUSING REMOVAL

- 1 Drain the solution tank or put the flow control lever in the full OFF position to prevent solution loss.
- 2 Open the right side scrub brush access door then remove the skirt assembly (2 knobs) to access the solution filter.
- 3 See Figure 5. Remove (spin off) the filter bowl for easier access to the inboard mounting clamps.
- 4 Loosen the (2) Hose Clamps (M) and pry off both hoses (inlet & outlet) from the filter housing fittings.
- 5 Remove the (2) Hose Clamps (N) that secure the filter housing to the frame mounting bracket and pull the solution filter housing out from under the machine.

FIGURE 5



# SCRUB BRUSH SYSTEM

## FUNCTIONAL OVERVIEW

### • Disc Brush System Overview

See Figure 3. The machines Hydro-Retriever™ 3800 and BR 1100 (model #'s 56411000 & 56411002) use the disc type scrub system. A single 3HP 36V DC permanent magnet motor is connected at both ends with (2) 90-degree gearboxes that drive the two 20" disc (rotary) brushes.

### • Cylindrical Brush System Overview

See Figure 8. The machine models Hydro-Retriever™ 3800C, BR 1100C (#'s 56410350 & 56410351) and models 2042, BR 1100C-XL (#'s 56410001 & 56410425) use two cylindrical brushes that counter rotate to sweep up light debris and scrub at the same time. Each scrub brush is powered on opposing ends by 1 HP permanent magnet motors attached to separate poly-V belt/pulley drives.

### • General Brush Overview

On all models the scrub deck platform is raised & lowered automatically by a vertically mounted electric lift actuator motor. The operation of the machine's scrub functions are activated when the operator selects (presses) either the normal or heavy scrub (mode) panel buttons. The scrub pad or brush pressure ranges (normal & heavy) are independently programmable allowing the operator the choice to vary the scrubbing effort (pressure) while operating the machine. Note: See the Main Control Board Special Program Options section in this manual for more detailed operation and instructions to change scrub pressure settings.

See Figure 1. The machine's main scrub system input and output operating functions are regulated (managed) by the membrane switch display panel A4 and main control board A3. The major scrub system functions are...

### • Scrub Brush Motor Run Function

To turn On (energize) the K3 brush motor solenoid either the normal or heavy scrub button (location A4 panel) must be pressed and the drive pedal moved off its neutral position triggering an output from the A2 electronic throttle. These two-operator functions deliver the required A3 control board and A1 speed control circuit inputs.

Detailed Explanation of the scrub motor function

A closed A4 membrane panel switch input (either normal or heavy) enables the A3 microprocessor automatic functions for the brush lift, **brush solenoid**, solution solenoid, vacuum solenoid and squeegee lift. The next step is the movement of the foot pedal for the needed A2 throttle output to the A1 speed controller, which causes either FWD or REV motor action. At the moment of A2 throttle input the A1 controller closes an internal coil driver and outputs a POS. 36V signal from pin #8 (wire color Brn/Wht) to the A3 J2 pin #6 connection. This input signal causes the controller to output a NEG. 36V signal from J2 pin #1 (wire Vio/Blk) that energizes the K3 brush motor solenoid coil pulling in the high current contactor making the brush motor(s) turn on (run).

### • Scrub Brush Actuator Lift Motor Function

The control board outputs activate (raise and lower) the scrub-deck for installing, removing and controlling the scrub brushes' selected current load. The negative (-) drive motor wire is specially designed so that it has a known (specified) resistance value. As brush motor current passes through the negative wire that is, in effect, a low value resistor, a small voltage is developed across it which is proportional to the motor current. Any temperature change in this wire affects its resistance so the temperature is sensed by a thermistor (\*) attached to the wire. This allows the controller to provide error correction for the temperature resistance changes. When the controller senses a current draw out of the desired range it automatically turns on the M1 actuator motor to raise or lower the scrub deck. This process is on going in maintaining the operator's selected scrub motor current load (PA #) to sustain the desired brush working pressure.

### • Low Voltage Cut-Out Function

The purpose of the low voltage cutout function is to help prolong battery life. The main control board A3 is programmed to monitor the machine's battery pack voltage to prevent over discharging of the batteries. The brush motors, brush lift actuator and solution solenoid valve will turn OFF automatically and cease to function when the batteries are discharged to the selected cutout level. The cutout level is adjustable between two settings. The standard battery type (wet cell) is 31.5 volts (1.75 volts per cell) and maintenance free battery (gel) is 33 volts (1.83 volts per cell). Note: See the battery section for instruction in selecting (setting) the two different thresholds.

\* Thermistor: A special semiconductor resistor whose resistance value varies with temperature.

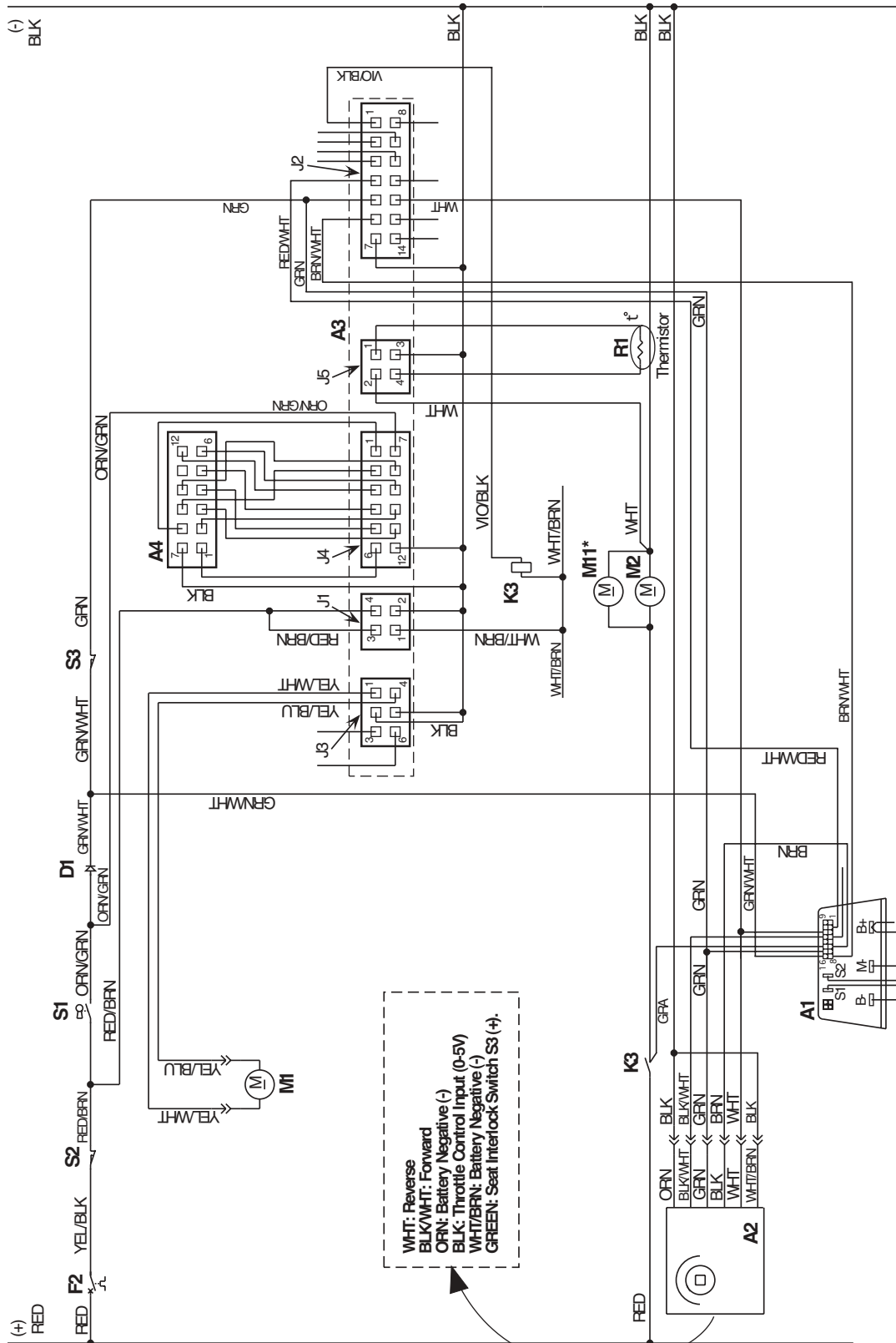
Note: See the "Know Your Machine" section in this manual for a complete explanation for all scrub system operational modes.

# SCRUB BRUSH SYSTEM

## SCRUB BRUSH SYSTEM TROUBLESHOOTING

On all models (disc & cylindrical) the scrub system's major electrical components are monitored by the main controller (A3) to detect any system function failures (error codes). The system components covered are the brush motor(s) (M2 & M11), brush solenoid (K3) and brush lift actuator motor (M1). Detected error codes from the main controller are displayed on the hour meter LED display as they occur. Note: Reference the Main Control Board Troubleshooting Guide in the Electrical System of this manual for specific fault descriptions and service repair actions.

**FIGURE 1**



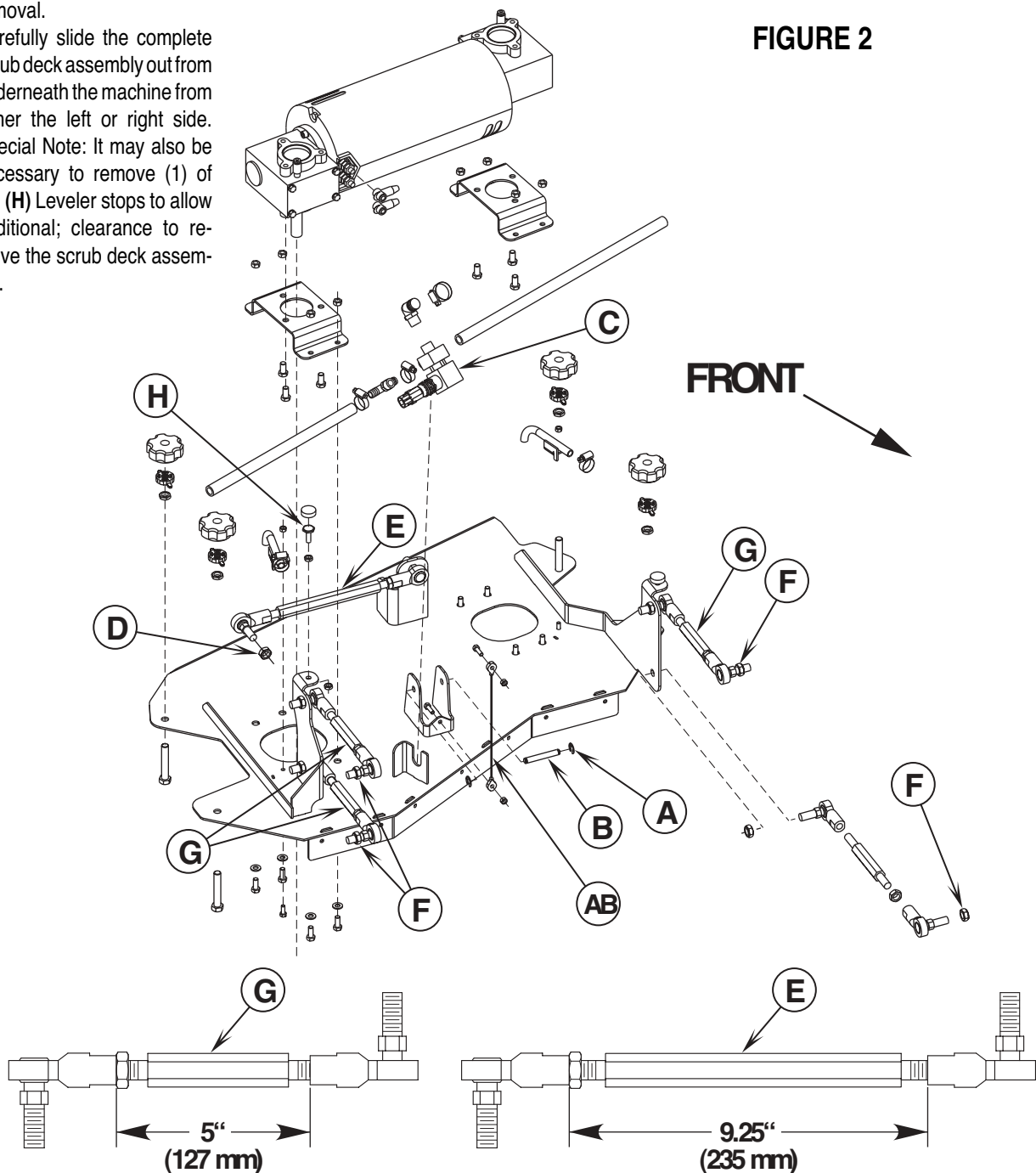
\*Cylindrical models use 2 motors.

# SCRUB BRUSH SYSTEM

## SCRUB BRUSH DECK REMOVAL (DISC)

- 1 Open both the left and right side brush housing doors. Then remove both splash skirts and scrub brushes.
- 2 Place wood blocking (2 by 4) under both brush drive discs and lower the deck to the floor by pressing the normal scrub panel button. After brush deck is in the lowered position don't turn the key switch off until disconnecting the battery pack (push in the emergency disconnect (12)). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
- 3 Turn master key to the OFF position.
- 4 See Figure 2. Remove either the top or bottom mounting hardware to disconnect the tethered Cable (AB). Then remove the Retainer Ring (A) from the lower actuator motor mount Pin (B). Next remove the pin from the deck mount bracket.
- 5 Remove the (2) brush motor wires at the motor terminals (POS. (+) red wire on top) and also unplug the wire connector to the water Solenoid Valve (C).
- 6 Remove the solution feed hose at the solenoid valve or solution filter housing.
- 7 Remove the (D) Hex Nut from the outside rear Support Bar (E) and pull the ball joint stud end from the frame bracket.
- 8 From the left and right side of the chassis remove the (4) front (F) Hex Nuts from the scrub deck Connecting Rods (G), then pull all rod ends from their mounting holes.
- 9 Remove the previously installed wood blocking from under the drive discs. Note: This must be done to allow needed clearance for deck removal.
- 10 Carefully slide the complete scrub deck assembly out from underneath the machine from either the left or right side. Special Note: It may also be necessary to remove (1) of the (H) Leveler stops to allow additional; clearance to remove the scrub deck assembly.

FIGURE 2



# SCRUB BRUSH SYSTEM

## SCRUB BRUSH MOTOR REMOVAL (DISC)

- 1 Follow steps 1-10 of the Scrub Brush Deck Removal (Disc) section.
- 2 See Figure 3. Remove the scrub brushes from the Brush Holders (I).
- 3 Remove the (3) (J) Screws from each Thermoid Disk (flexible coupler) (K) and remove the Brush Holders (I) from both (L) Hubs. Note: Use a 13 mm socket wrench to remove Screws (J).
- 4 Remove all (8) of hardware items (M, N & O) that secure the Gear Case Mount Brackets (P) to the scrub deck plate.
- 5 Remove the Gearbox / Motor Assembly (Q) from the scrub deck plate by pulling the assembly straight up.
- 6 Remove the (6) socket head cap screws securing the gearboxes to the brush motor and separate.
- 7 Re-assemble in reverse order and test for proper operation. **Note:** The proper brush motor installation position is where the two cable mounting bolts (wiring connections) face the front and right side on the scrub deck platform.

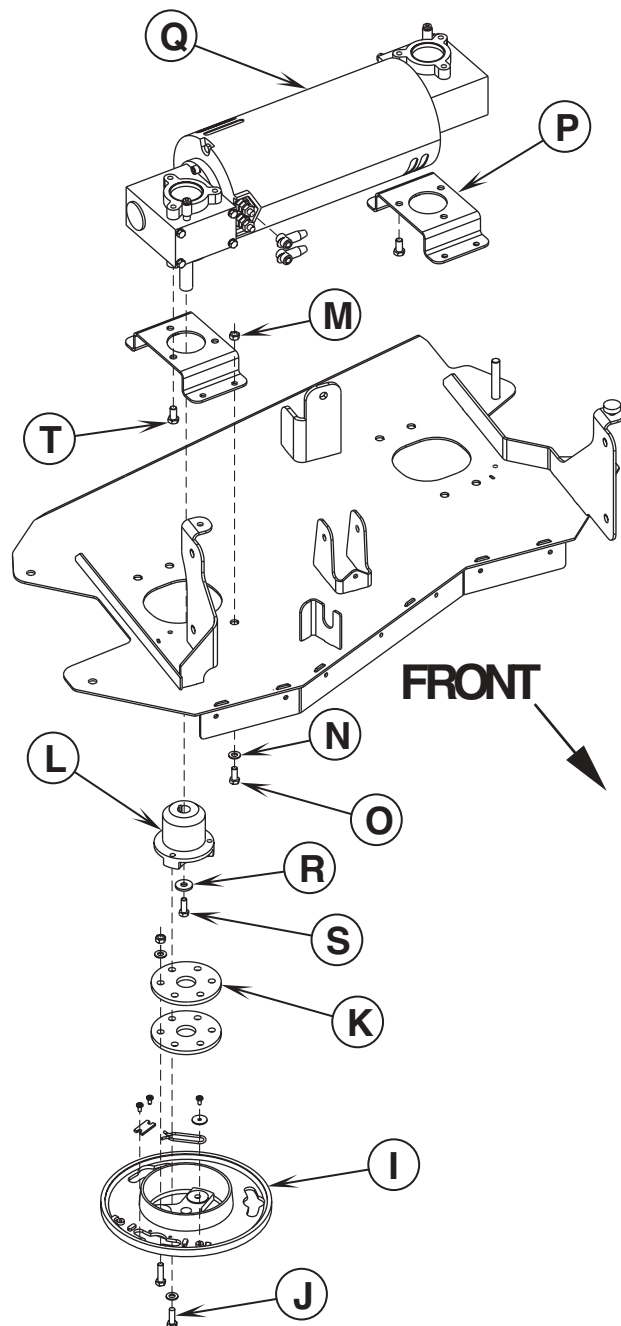
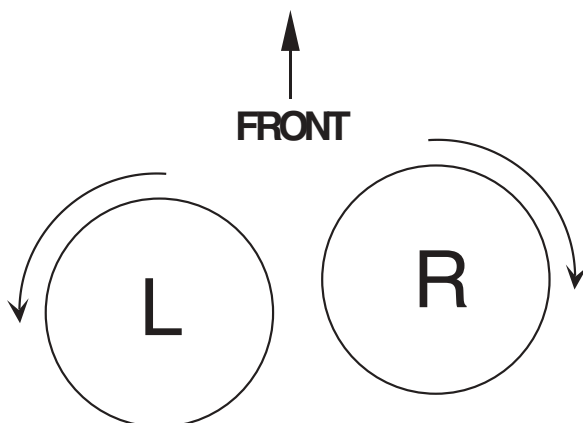
## SCRUB BRUSH GEARBOX REMOVAL (DISC)

Follow steps 1-10 of the Scrub Brush Deck Removal (Disc) section and steps 1-6 of the Scrub Brush Motor Removal (Disc) section.

- 1 See Figure 3. Remove the hardware items (R & S) that secure the Hub (L) to the output shaft on each gearbox. Then pull the hub from the shaft and save the key.
- 2 Remove the (3) (T) Screws and separate the Mount Bracket (P) from the gearbox that needs replacement.
- 3 Remove the (3) socket head cap screws securing the gearbox that needs replacement and separate from the brush motor.
- 4 Re-assemble in reverse order and test for proper operation. **Note:** Apply a small amount of grease or "Never Seize" to the gear box output shaft when reinstalling the drive Hub(s) (L).

**Note:** The gearbox output shaft rotates the brush holders in the opposite direction of other Nilfisk-Advance auto scrubbers (see below).

FIGURE 3



# SCRUB BRUSH SYSTEM

## SCRUB BRUSH GEAR BOX REPLACEMENT

If the need to replace a disc scrub drive gearbox should arise, please follow the re-assembly instructions below.

### 1 Installing the shaft keys-See Figure 4

Install (1) Shaft Key (U) into each end of motor shaft, you may need to use a hammer to complete this operation.

### 2 Applying Never Seize

Starting with the back-end of the motor. Apply some Never Seize onto the back-end shaft and key. The installation of Never Seize allows you to remove and replace the gearbox easily if the gearbox fails in the field.

### 3 Installing the Back-end Gearbox (V)

Visually line-up the Key (U) (installed into the motor shaft) with the keyway (W) on the inside of the gearbox. Slide the gearbox onto the shaft as far as it will go. If the gearbox does not slide on completely (flush with back-end bracket), **DO NOT** use a hammer to pound the gearbox on the rest of the way. Using a hammer will damage the shaft and bearings inside the gearbox. Carefully wiggle the gearbox back and forth while pushing the gearbox the rest of the way onto the motor.

### 4 Installing mounting screws

After the gearbox is completely flush with the back-end bracket of the motor, install 3 Screws (X) with lock Washers (Y) through the gearbox mounting flange and into the pre-drilled mounting holes in the back-end bracket. **Important:** Make sure that the gearbox shaft is pointing in the correct direction before installing the mounting screws. The gearbox shafts should both be pointing left, if viewing the motor from the back end and the lead terminals are at 12:00. Tighten screws as much as possible with your fingers, **DO NOT** tighten the bolts yet as the gearboxes still need to be lined up.

### 5 Installing the Comm.-end Gearbox (Z)

Repeat the above process for the comm.-end gearbox. **Remember:** Before installing the mounting screws into the comm.-bracket, make sure that the gearbox shaft is pointing in the correct direction. Both gearbox shafts should be pointing LEFT, if viewing the motor from the back-end with the lead terminals at 12:00. Also, remember to not tighten the mounting bolts yet.

### 6 Lining Up the gearboxes-See Figure 5

After you have made sure that the gearbox shafts are pointing in the correct direction and you have installed all 6 mounting screws (X) (3 in the back-end gearbox and 3 in the comm.- end gearbox), you must Line-up the gearboxes. Re-install the Gearbox/Motor Assembly onto the scrub deck as shown. Install and tighten the (6) Screws (AA) first and then tighten the (6) Screws (X).





# SCRUB BRUSH SYSTEM

## SCRUB BRUSH SIDE SKIRT REPLACEMENT (DISC)

- 1 See Figure 6. Loosen the (4) side skirt Retainer Knobs (AB) (2 per side) and pull the Skirt Assemblies (AC) off from the scrub deck.
- 2 Remove all the hardware that holds both the (short and long) blades and retainers to the skirt housing.
- 3 Each of the (2) long blades has 4 working edges and the (2) short blades have 2. Reinstall the blades to the skirt housing so a clean, undamaged edge points inside towards the scrub brushes. Replace the blades as a set if they are nicked, torn or worn beyond their ability to be adjusted.
- 4 Reinstall the skirt housing assemblies onto the machine and adjust the blade for proper contact to the floor when the brush deck is placed in the scrub position.

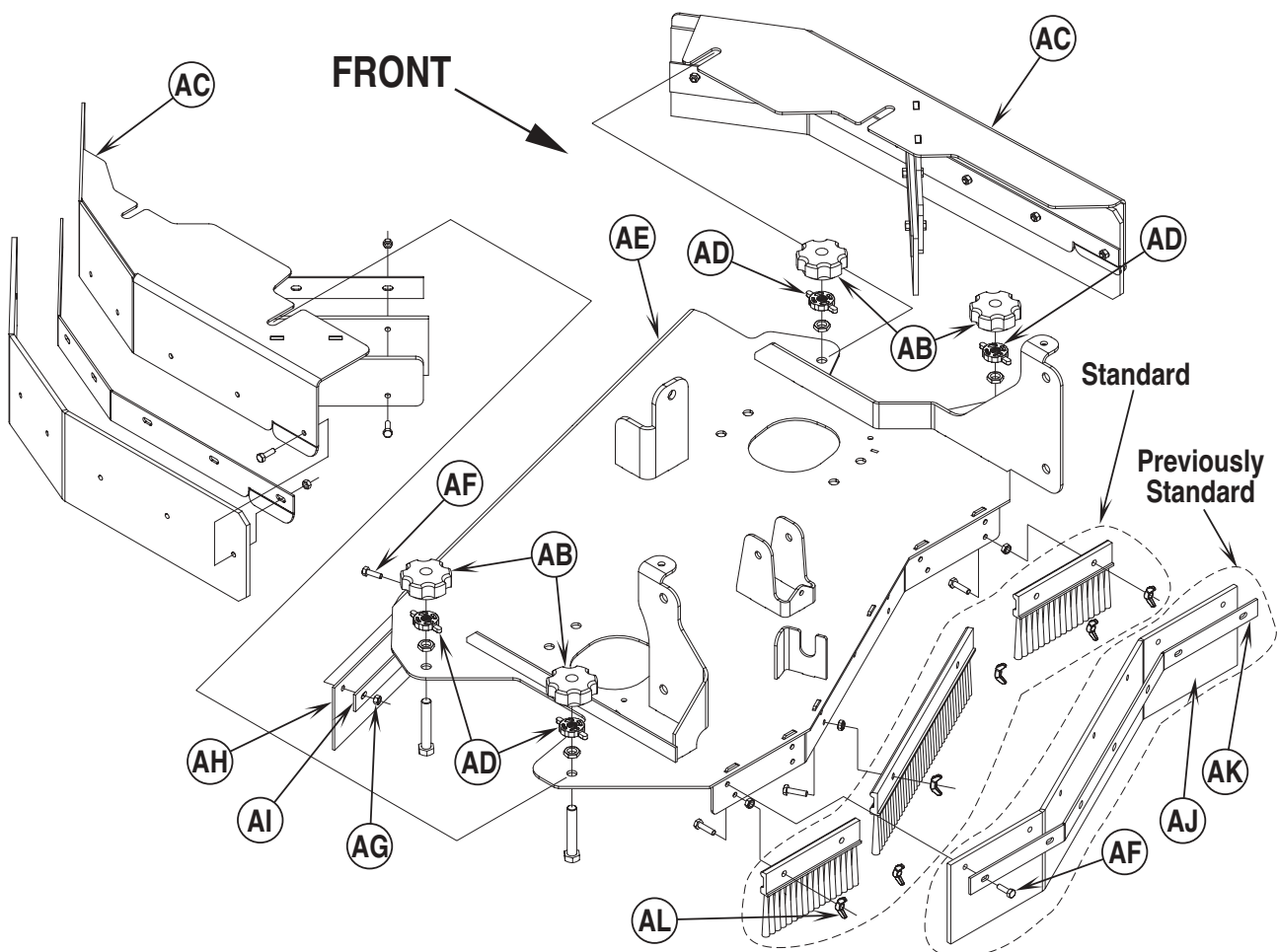
## SIDE SKIRT HEIGHT ADJUSTMENT (DISC)

- 1 See Figure 6. The side skirt housing knob retainer screw studs have leveling Adjuster Collars (AD), that are to be raised or lowered to compensate for blade wear.
- 2 To adjust, remove the Skirt Assemblies (AC) from the Scrub Deck (AE) to access the Adjuster Collars (AD). Adjustment Tip: The skirts Retainer Knobs (AB) can be loosened with skirts left on and the Adjuster Collars (AD) rotated by reaching under the skirt housing.
- 3 Turn the Adjuster Collars (AD) (Up or Down) to where the blades just fold over enough when scrubbing that all the waste water is contained inside the skirting. Note: Make small adjustments to obtain good blade wiping. Do not lower the blades too much to where they fold over excessively and cause unneeded blade wear.

## SCRUB BRUSH FRONT / REAR SKIRT REPLACEMENT (DISC)

- 1 Place the scrub deck in the UP position, then remove both the left and right side skirt assemblies from the machine.
- 2 See Figure 6. Remove the (13) (AF) Screws and (AG) Nuts from each front and rear skirt set. Separate the Skirts (AH & AJ) and Retainer Straps (AI & AK) from the scrub deck. If equipped with front bristle skirts, these can be removed without tools by removing the Wing Nuts (AL).
- 3 Replace with new blades when they are nicked, torn or worn beyond their ability to contain the brush solution within the skirting. Re-assemble in reverse order.

FIGURE 6



# SCRUB BRUSH SYSTEM

## SCRUB BRUSH LIFT ACTUATOR REMOVAL (DISC & CYLINDRICAL)

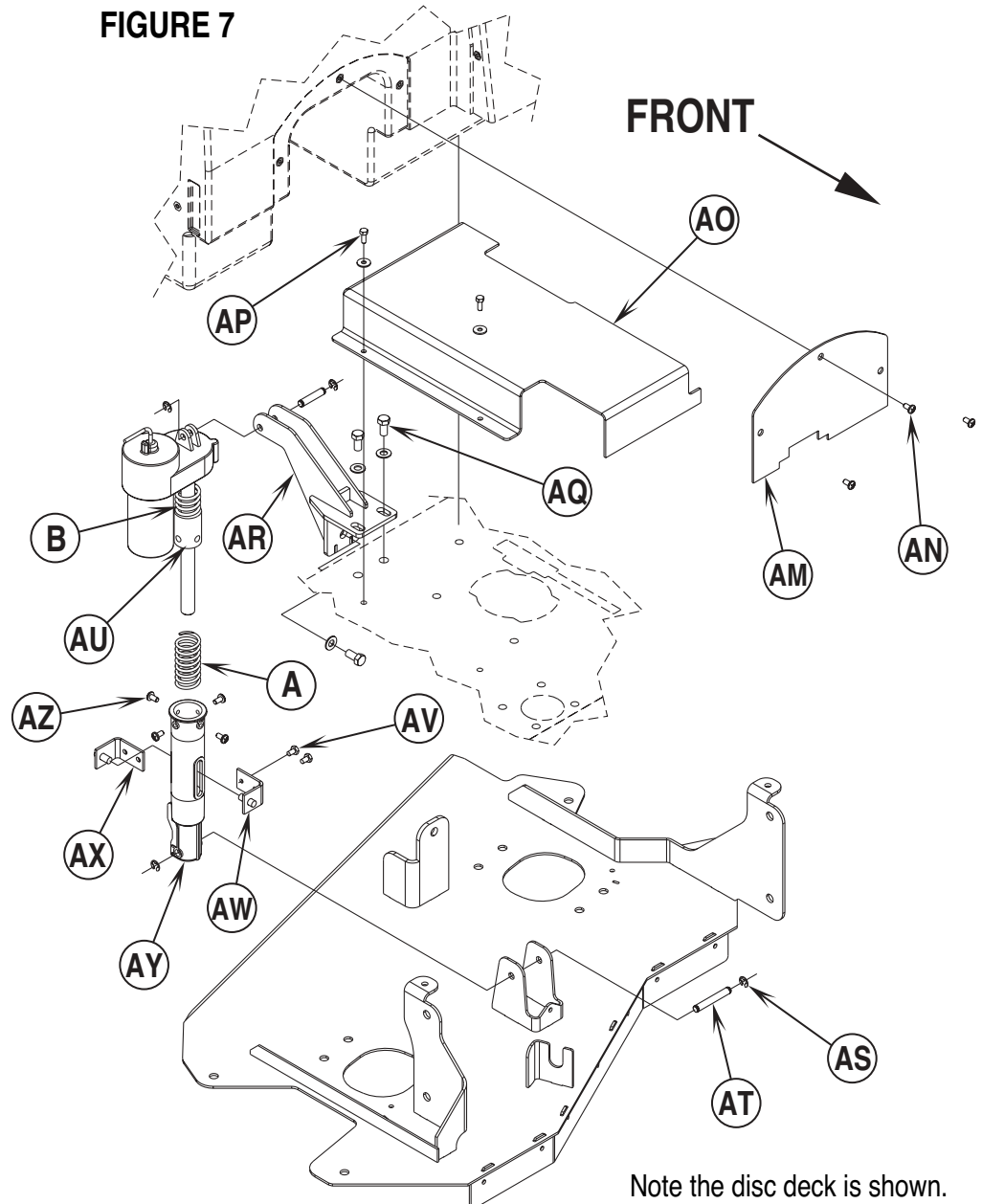
**Note:** All new replacement actuator motors are not shipped with the lift nut pre-adjusted for any machine model applications.

- 1 If possible lower the scrub deck with the scrub brushes installed. Don't turn the key switch off until disconnecting the battery pack by using the emergency disconnect (12). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
- 2 See Figure 7. Remove actuator inspection cover (AM) secured with (3) item (AN) screws and then also remove the false floor plate (AO) Qty (2) screws item (AP).
- 3 From underneath the machine disconnect the actuator motor wiring connector at the motor.
- 4 If the brush lift actuator has failed in the up position it will be necessary to support the brush deck with wood blocking. Note: This is done to remove the weight from the deck so that the mounting pins can be removed.
- 5 Remove the (3) item (AQ) hex screws that secure the upper motor mount bracket (AR) (2 screws from the top and 1 from bottom front of chassis).

- 6 Remove the left side retainer ring (AS) and push the lower mount pin (AT) from the scrub deck mount bracket.
- 7 Maneuver (push and then pull up) the combined upper mount bracket and actuator motor assembly through the top frame and solution tank opening.

- 8 **IMPORTANT:** After removing the actuator motor and before replacing a new motor or drive nut the IN & OUT limit switches must be set (or checked) to their correct specifications (see the electrical section for the actuator drive nut adjustments).
- 9 To disassemble the drive nut (AU) from the actuator shaft, remove the (2) screws (AV) and separate both retainers (AW) & (AX) from the spring housing (AY).

- 10 Remove the (4) spring housing retainer screws (AZ) and slide the spring housing and (long) compression spring (A) from the actuator shaft. Then spin the drive nut off the shaft and remove the (short) compression spring (B). Note: See the Actuator Drive Nut Adjustment section in this manual to properly install a new drive nut.



### Scrub Brush Lift Actuator Installation

- 11 After setting the correct brush lift actuator drive nut dimensions, follow in reverse the above removal steps to reassemble and reinstall.

**Service Tip:** Wrap a small amount of tape around the spring housing to prevent it from spinning out of adjustment.

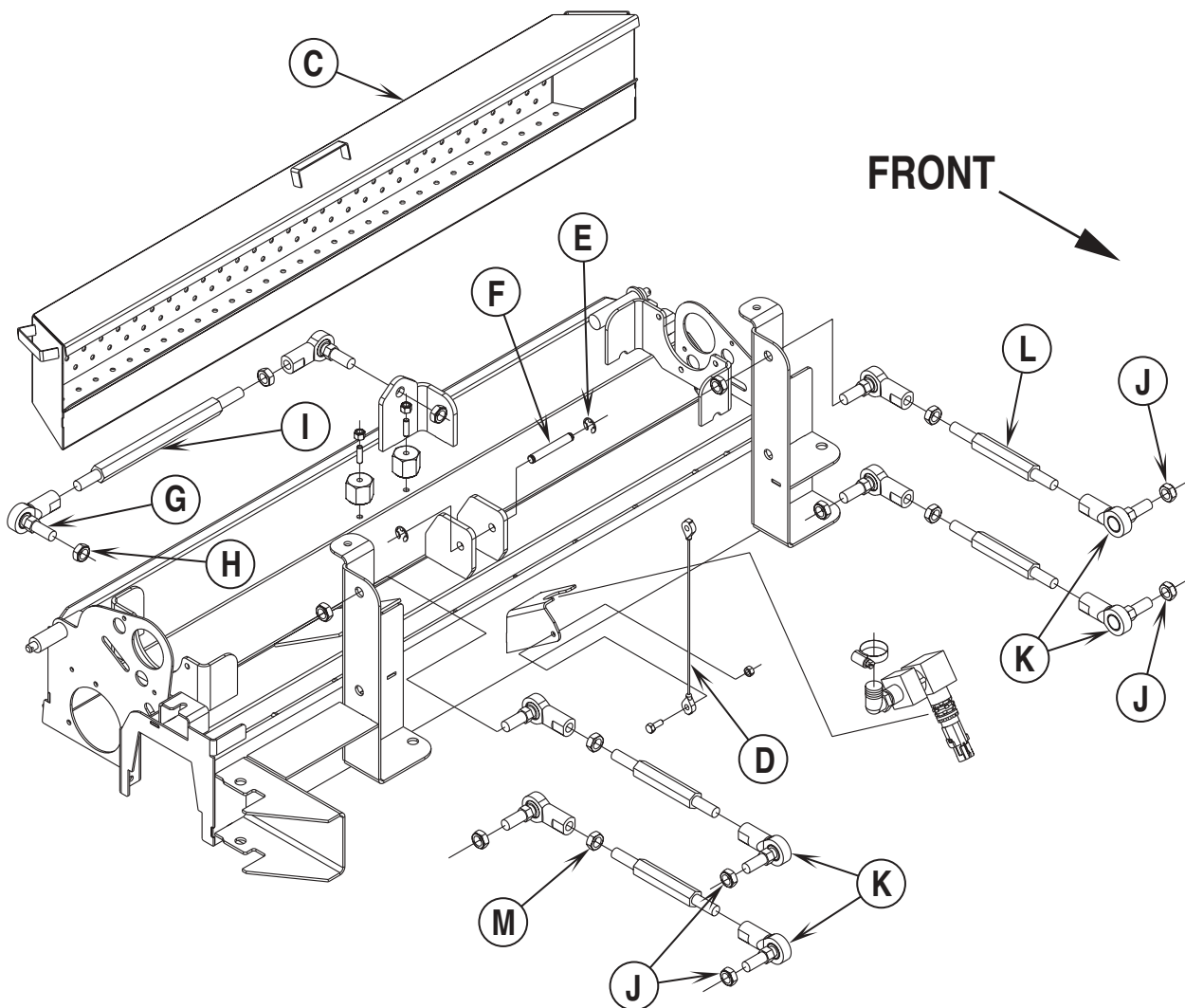
**Service Tip:** Shown in the Electrical System is the actuator power cord adapter PN 56407502 and instructions for use. This tool can be used to help position (raise or lower) the drive nut housing for ease in the actuator mounting pin installations. An additional method to control the output to the pad/brush lift actuator for installation and removal is to read the instructions in the Service Test Mode section for the special output control of the Normal Scrub Switch (26) (See Electrical System for steps to enter the Service Test Mode).

# SCRUB BRUSH SYSTEM

## SCRUB BRUSH DECK ASSEMBLY REMOVAL (CYLINDRICAL)

- 1 Lower the scrub deck with the cylindrical brushes installed. Note: Don't turn the key switch off until disconnecting the battery pack by pushing in the emergency disconnect knob (12). This procedure is done to prevent the scrub deck from automatically raising itself when the key is turned off. Turn the key switch Off.
- 2 Open both the left and right side brush housing doors and remove the Debris Hopper (C) (see Figure 8) from the machine.
- 3 Remove the nut and screw that secure the deck down limit Cable (D) at the deck mount bracket.
- 4 Remove the Retaining Ring (E) securing the lower lift motor mount Pin (F) and remove the pin from the deck mount.
- 5 Disconnect the brush lift motor wire harness at the motor.
- 6 Remove the mounting hardware, Screw (G) and Nut (H) then separate the Support Arm (I) from the machine's out board frame mounting bracket (right side of machine).
- 7 On both sides of the machine remove the (4) item (J) Hex Nuts from the front Ball Joint Ends (K), and then separate the deck support arms from the machine frame. **Note:** To access the top Hex Nuts (J) pop off the removable frame cover plugs using a screwdriver.
- 8 Cut any necessary wire ties that secure the wiring harnesses for the solution solenoid and scrub brush motors. Next remove the two main electrical wires (one black & one red) at the brush motor(s) terminal studs and then also unplug the wire connector for the solution solenoid valve.
- 9 Remove the solution feed hose at the solenoid valve and carefully slide the scrub deck assembly out from underneath the machine from either side.

FIGURE 8

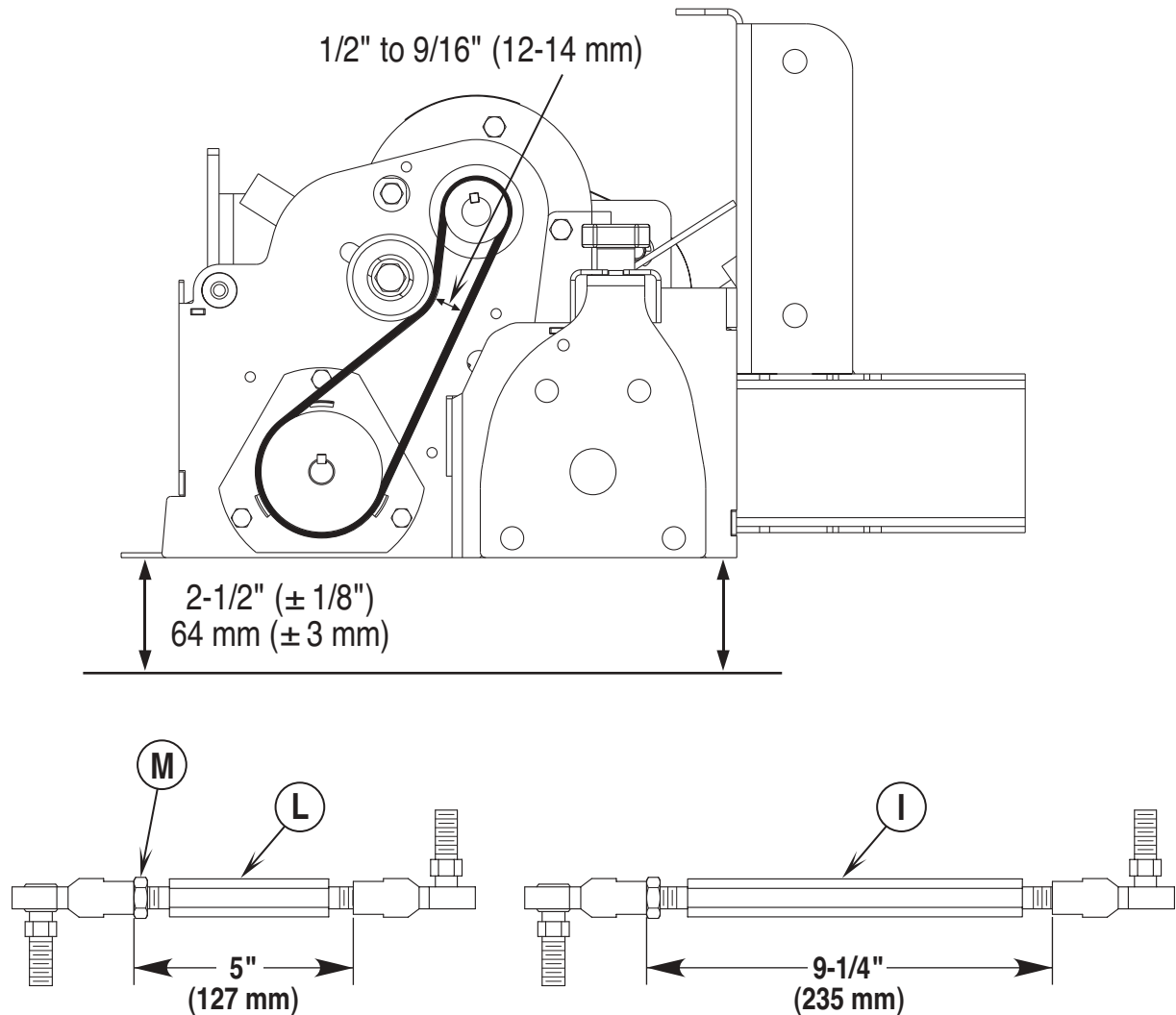


# SCRUB BRUSH SYSTEM

## SCRUB BRUSH DECK LEVELING ADJUSTMENT (CYLINDRICAL)

- 1 See Figure 9. On a level floor surface put the scrub deck in the raised (stored) position and measure the distance from the floor to the bottom edge of the scrub deck at all Four Corners as shown.
- 2 The four measurements should be approximately 2-1/2 inches (64 mm). To adjust, loosen the Lock Nuts (**M**) on the (4) Connecting Rods (**L**) and turn the center section of the rod(s) to raise or lower (lengthen or shorten) the levelness of the brush deck. **Note:** The assembly length on the ball joint connecting rods are adjusted to 5 inches (127 mm) from ball joint to ball joint as shown in Figure 9.
- 3 Re-tighten the connecting rod lock nuts and lower the brush deck to the floor and check for an even brush pattern.

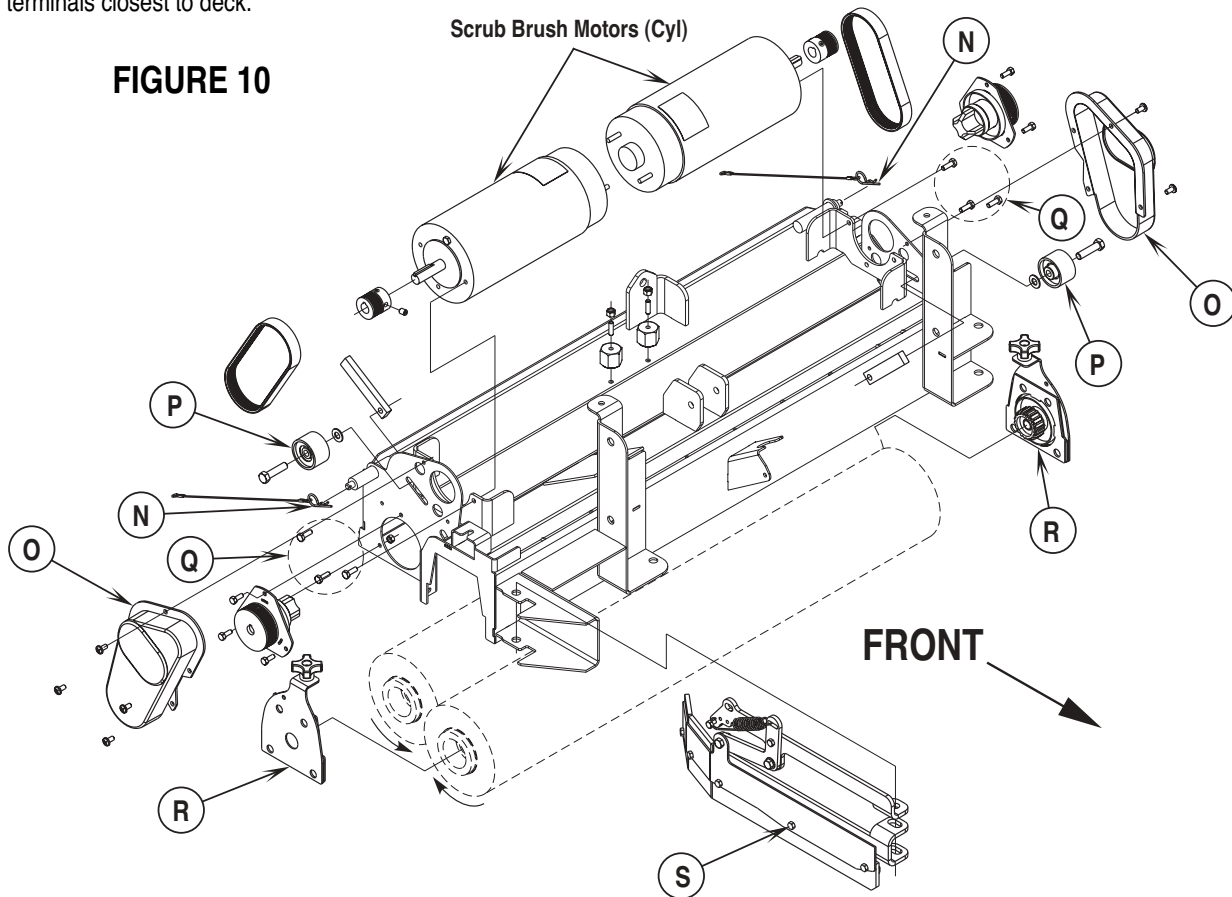
FIGURE 9



# SCRUB BRUSH SYSTEM

## SCRUB BRUSH MOTOR(S) REMOVAL (CYLINDRICAL)

- 1 See Figure 10. First open both the left and right side brush housing doors, and then remove the Hairpin (N) from both the scrub deck skirt assemblies and swing them open.
- 2 Next remove the Belt Guards (O) (4 screws per side). With an operator in the driver's seat with the key switch ON and the normal scrub function selected press the drive pedal to start the scrub brushes and observe which brush motor needs to be removed.
- 3 Next loosen the scrub brush belt tension Hex screw in the center of the Belt Idler (P) (using a 5/8" wrench).
- 4 Remove the wiring at both the Pos. & Neg. brush motor terminal studs and note the correct wiring connections (for reinstallation). Then remove the (3) Screws (Q) and lift the motor out from the front or rear of the scrub deck.
- 5 Reassemble in reverse order and adjust the belt tension to 1/2-9/16 inches (13-14 mm) as shown in Figure 9. Note: Install motors with A2 terminals closest to deck.



## SCRUB BRUSH BELT REPLACEMENT (CYLINDRICAL)

- 1 See Figure 10. Remove Hairpin (N) and swing open the scrub deck skirt assembly (right or left side) and remove the belt guard(s) (O) (4 screws each).
- 2 **Important Service Tip:** The left and right side drive belts are not the same lengths they must be ordered individually (P.N. 56410217, left side & P.N. 56410215, right side).
- 3 Loosen the scrub brush belt tension hardware on the Belt Idler Pulley (P) (using a 5/8" wrench). Pull the idler wheel away from the backside of the belt and roll the belt off both the motor and brush pulleys. Then inspect for wear and replace as needed.
- 4 Re-install the drive belt and tension the belt as shown in Figure 9. Then install the belt guard, reconnect the battery pack and test the scrub system for proper operation.

## SCRUB BRUSH SYSTEM MAINTENANCE

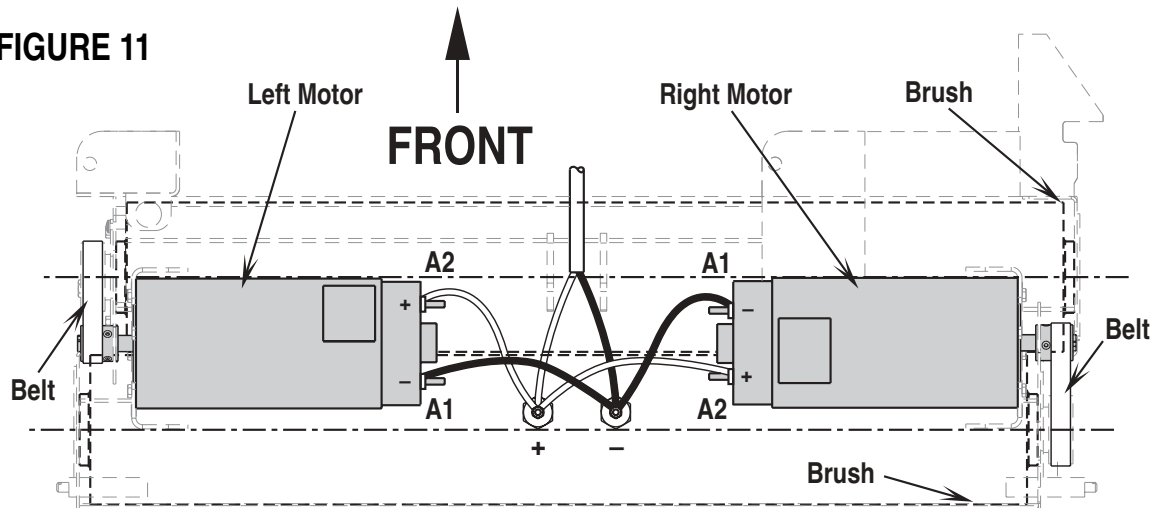
The scrubbing system must be serviced at regular intervals to maintain good scrubbing performance. Follow the maintenance steps listed below.

- 1 Rinse clean, built up debris from the debris hopper drain holes (daily).
- 2 Clean drain holes in the solution delivery trough on top of the scrub deck (weekly).
- 3 Clean built up dirt from the inside of the scrub brush housing (weekly).
- 4 Remove any string wrapped around the scrub brush, drive hub and idler hub (weekly).
- 5 Remove both the scrub brushes and rotate, turn end for end (weekly). See Scrub Brush Removal and Installation (Cyl) section.
- 6 Inspect the scrub brush bristles for wear, the brushes should be replaced when the bristle length is 1 inch (26 mm) or less (monthly).



# SCRUB BRUSH SYSTEM

FIGURE 11



## SCRUB BRUSH REMOVAL AND INSTALLATION (CYLINDRICAL)

- 1 Make sure the key switch is off and disconnect the battery pack before servicing.
- 2 To access the brushes, swing open both the side skirt assemblies. See Figure 10. Note: The skirts are held in place by Hairpins (N) on each side, remove the pins and swing the skirt assemblies out of the way.
- 3 Loosen the black knobs (one on each side) that secure the removable bearing idler support Plate (R) to the brush housing, then pull the plates down and out to remove. Grip the scrub brush and slide it from the housing end.
- 4 To install the brush slide it into the housing, lift slightly, push and turn until it seats into the drive end assembly.
- 5 Re-install the idler end plate assemblies, close the skirt assemblies and secure with the hairpins.

## SIDE SKIRT MAINTENANCE & ADJUSTMENT (CYLINDRICAL)

General Overview: The side skirts function is to channel the wastewater to the rear pick-up squeegee, helping contain the water within the machine's cleaning path. During normal use the blades will wear in time. The operator will notice a small amount of water leaking out underneath the side skirts. The skirt height adjustment is automatic on this system using spring tension and movable linkage arms to control the blade pressure. The side skirt assemblies must move up and down freely for proper operation.

### To replace the scrub system side skirts...

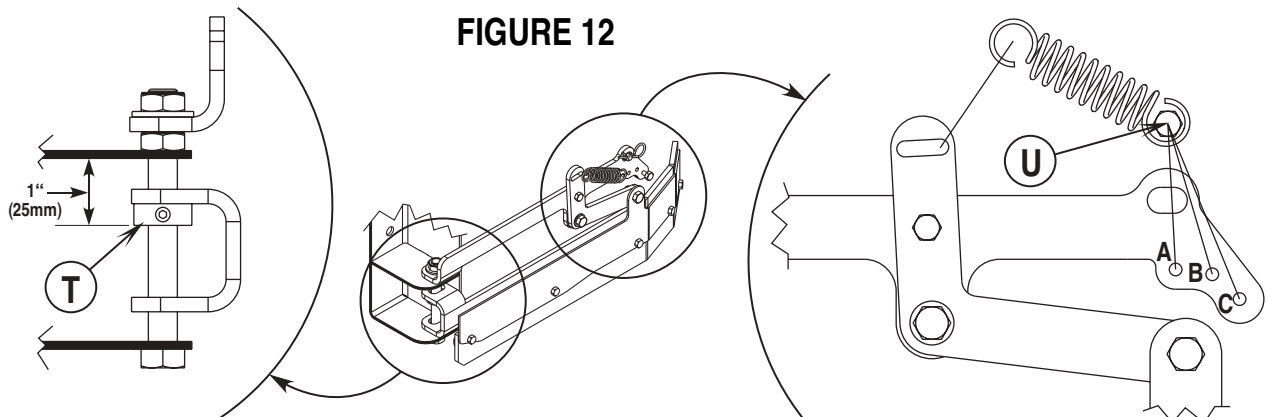
- See Figure 10. Remove the (2) Hairpins (N) and swing the skirt assemblies open. Remove the (S) Screws and nuts then remove the skirts and replace.

### To adjust the scrub system side skirts...

Note: The side skirt blade assemblies have two minor adjustments, they are the individual front collar height and the rear blade pressure spring.

See Figure 12. The stop collar (T) is installed on the pivot hinge bolt to help control the front skirt mount bracket's travel when the scrub deck is lowered. It limits the front of the blade from folding (curling) under when scrubbing. Thus allowing the blade to hold its shape better, reduce blade damage and wear.

See Figure 12. A limited amount of adjustment for general blade wear and squeegee wiping performance can be made by reinstalling the spring attachment screw (U) into a different mount hole (A, B or C). This change will increase or decrease the spring force (pressure) pulling down on the rear edge of the skirt blade. Position "C" creates maximum down pressure on the blade and position "A" is minimum pressure.



# SIDE BROOM SYSTEM (2042 / BR 1100C-XL)

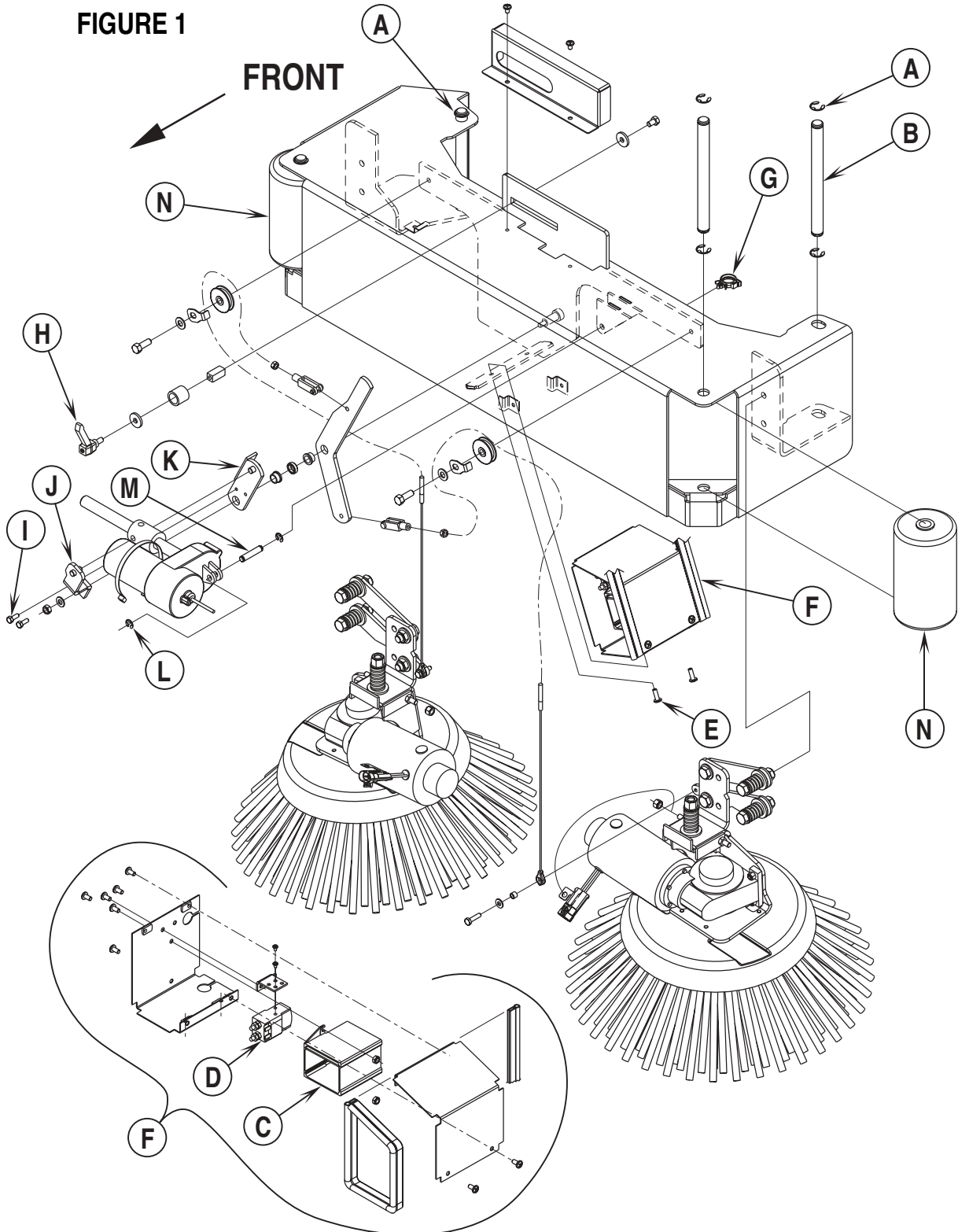
## GENERAL FUNCTIONAL OVERVIEW

### Side Broom System 2042 / BR 1100C-XL

The models 2042 & BR 1100C-XL only are equipped with two (left & right) 20-inch front corner mounted rotary sweeping brooms. Light sweepable debris can easily be directed into the two main cylindrical scrub brushes and collected in a removable debris tray.

The side broom motor assemblies are raised and lowered by a horizontally mounted electric actuator motor. The actuator linkage connects directly to (2) wire cables that controls the broom assemblies' vertical travel. The operator pressing the On/Off Sweep Control Button (43) (located on the control panel A4) activates the operation of the side brooms in both normal and heavy scrub modes. Note: The side brooms will only run when the scrub system is ON and the machine is in motion (not in neutral).

FIGURE 1





# SIDE BROOM SYSTEM (2042 / BR 1100C-XL)

## 2042 / BR 1100C-XL SWEEP FRAME ASSEMBLY REMOVAL

- 1 Lower the side brooms to the floor, then shut off machine power by pushing in the emergency quick disconnect knob (12).
- 2 From underneath front of machine unplug the side broom system wire harness connector. Also cut and remove any tie straps securing harness to chassis.
- 3 See Figure 1. Remove both top Retainer Rings (A) from the Broom Frame Mount Pins (B).
- 4 Drive the mount pins out of the frame from the topside. Then pull the sweep assembly forward to separate it from the chassis.

## SIDE BROOM ELECTRICAL BOX REMOVAL

Reason to remove is to access the actuator control card (C) and broom motor contactor (D) for needed service replacement.

- 1 Lower the side brooms to the floor, then shut off machine power by pushing in the emergency quick disconnect knob (12).
- 2 See Figure 1. Remove the (2) (E) Screws that secure the Electrical Box (F) to the broom frame. Then open the Conduit Retaining Clip (G).
- 3 Next push the box towards the right broom, just enough to clear the mount bracket. Then pull the box down to remove. Note: The box is fitted with pieces of gasket sealing material that makes the box fit very snug (tight).

## SIDE BROOM LIFT MOTOR REMOVAL

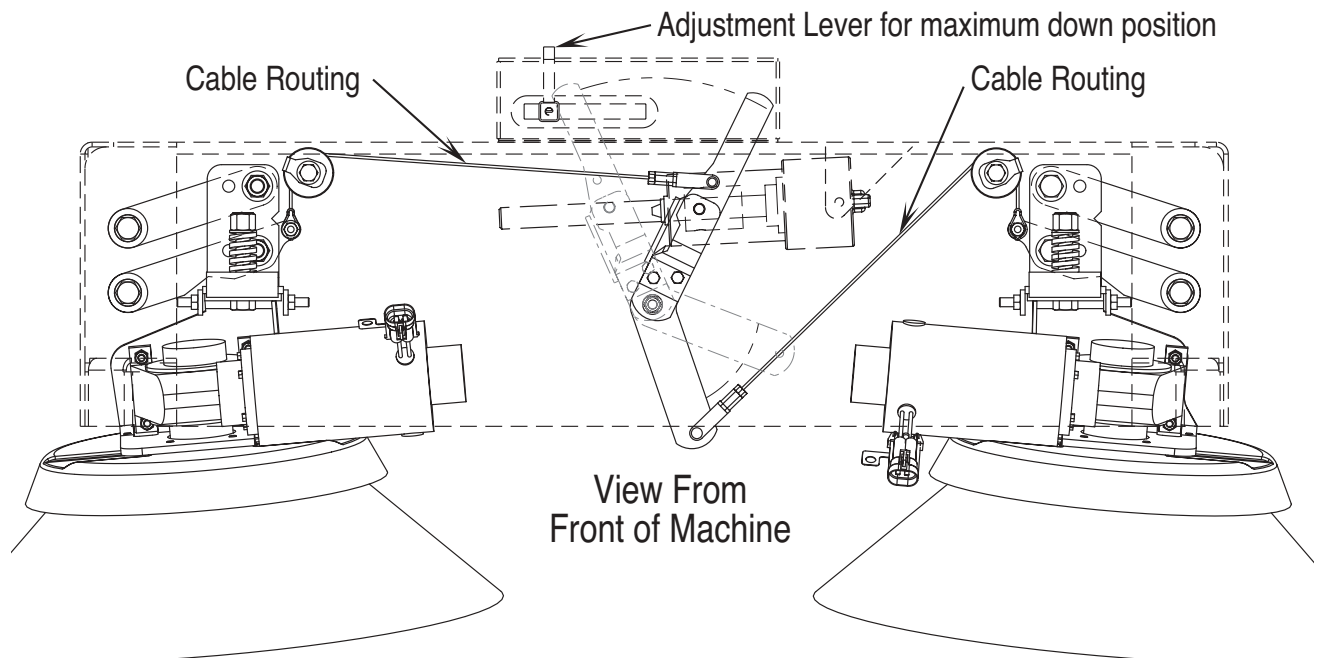
- 1 Lower side brooms to the floor then push the Battery Disconnect Knob (12) in to open battery circuit. Also move the broom height Adjustment Lever (H) to the full down position.
- 2 See Figure 1. Remove the (2) Hex Hd Screws (I) (use 10mm socket) to remove the Drive Nut Bracket (J) from the Arm (K).
- 3 Unplug the broom lift actuator motor wiring connector from the machine harness.
- 4 Remove the Retainer Ring (L) (next to the motor) and slide the Pin (M) out of the chassis mount bracket to complete the motor removal.

Note: New replacement lift actuator motors do not come with the lift drive nut pre-adjusted.

**Important:** After removing the actuator motor and before replacing a new motor or drive nut the IN & OUT limit switches must be set (or checked) to their correct specifications (see the Electrical System for Actuator Drive Nut Adjustment instructions).

- 5 After setting the correct actuator lift nut dimensions follow the above steps in reverse order to re-install.

FIGURE 2

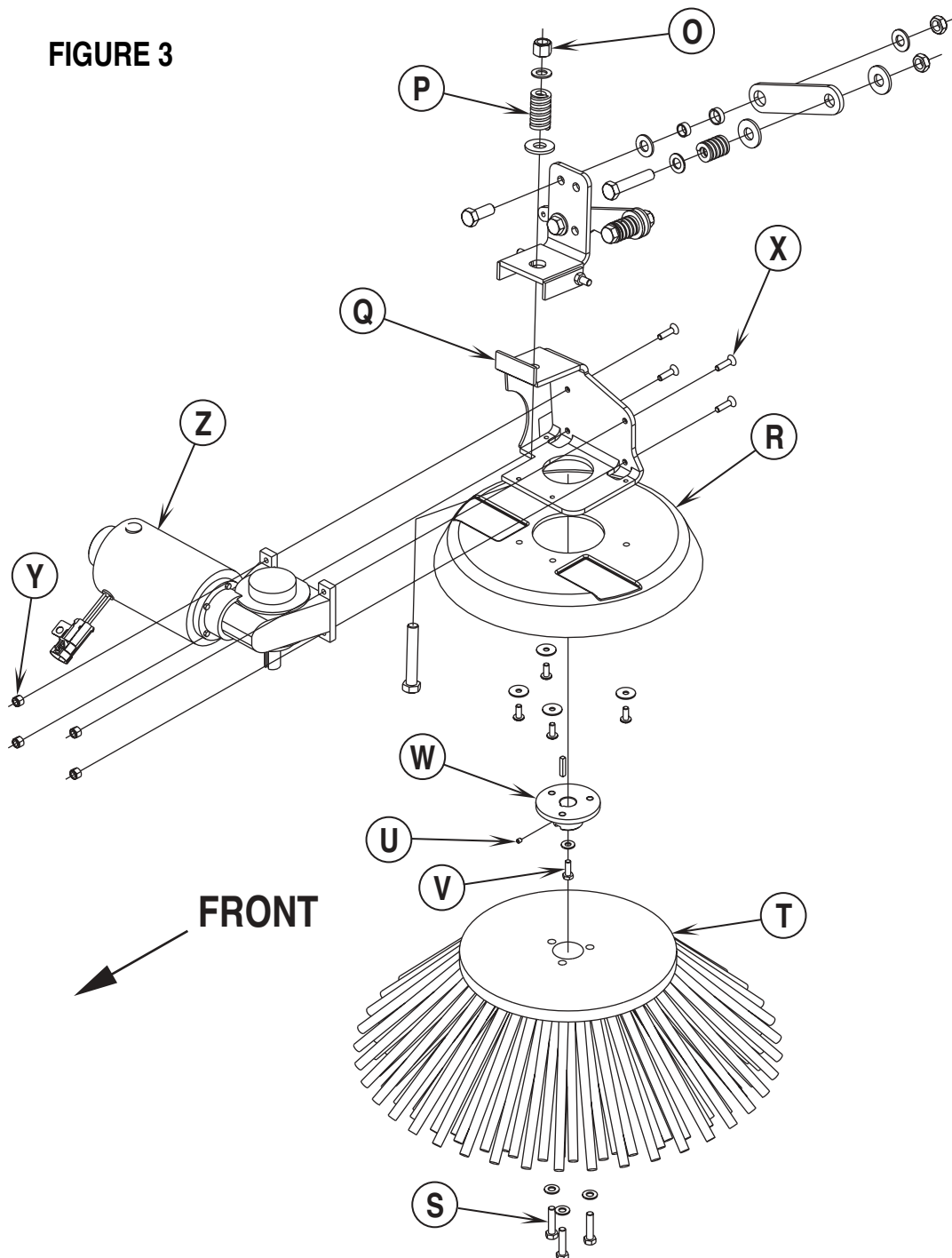


# SIDE BROOM SYSTEM (2042 / BR 1100C-XL)

## SIDE BROOM MOTOR(S) REMOVAL

- 1 Have the side brooms in the up (stored) position, then shut off machine power by pushing in the emergency quick disconnect knob (12).
- 2 See Figure 1. Next remove the Corner Bumper Roller (N) from the machine side requiring the broom motor repair.
- 3 See Figure 3. Through the bumper opening use a 3/4" wrench, 3/4" socket & ratchet to remove the Nut (O) & Spring (P) that holds the gear motor Mount Bracket (Q).
- 4 To remove the complete broom motor assembly step on the Broom Housing (R) to compress the bristles then pull it out from under frame.
- 5 Remove the (3) broom mount Screws (S) and remove the Broom (T).
- 6 Next loosen the Set Screw (U) and remove the Brush Drive Hub Screw (V). Then pull off the Hub (W) from the motor shaft.
- 7 Remove the (4) item (X) Screws and (4) (Y) Nuts that fasten the Motor (Z) to Mount Weldment (Q). Then complete the removal of the motor from the bracket.

FIGURE 3



# RECOVERY SYSTEM

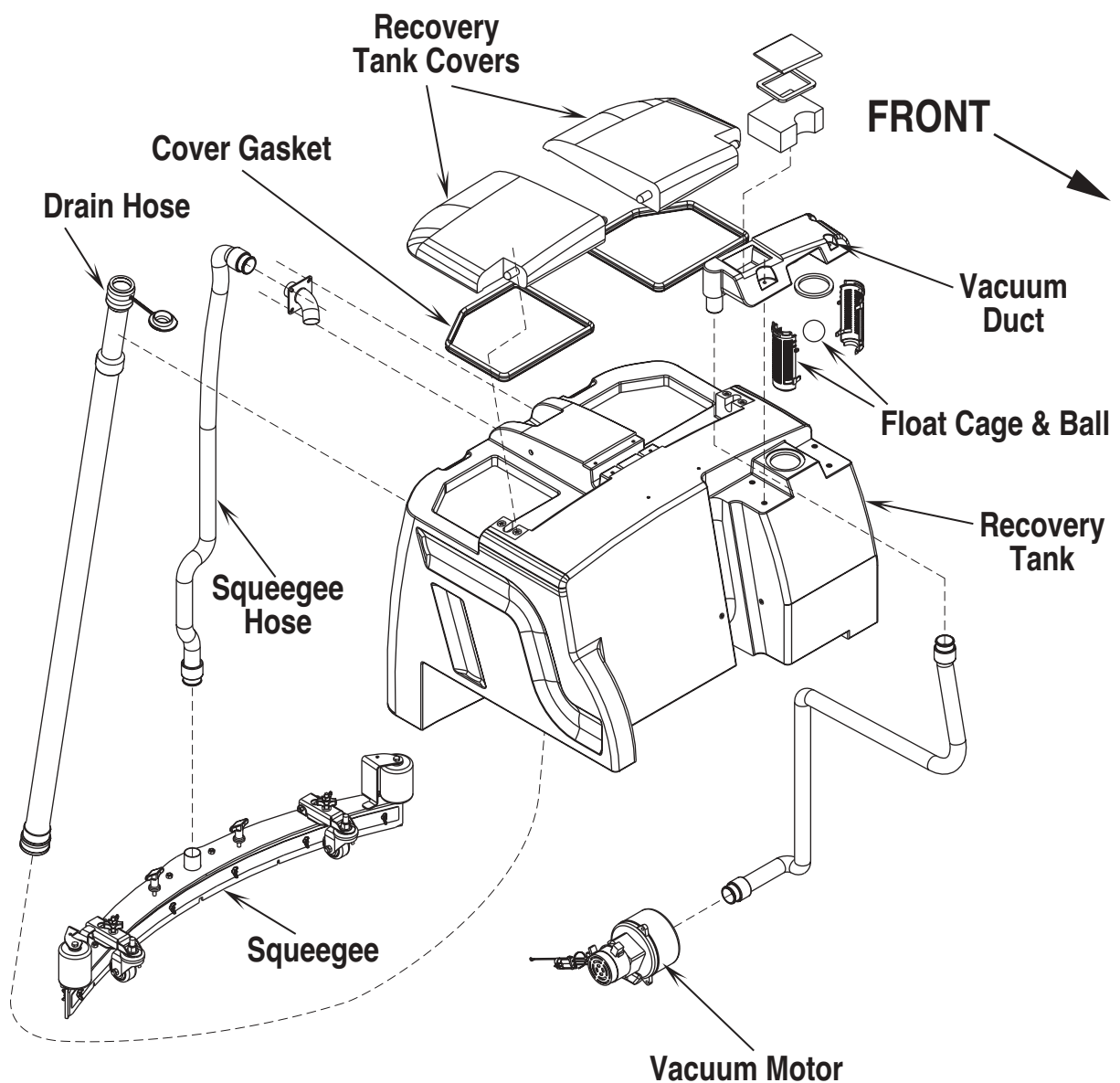
## FUNCTIONAL OVERVIEW

### Vacuum / Recovery System General

Dirt and water are lifted off the floor into the recovery tank by airflow, created by a 3-Stage 36V 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 motor and is exhausted out of the vacuum exhaust hose. No wastewater ever actually moves through the vacuum motor, just working 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. The 3800 / BR 1100 and 2042 / BR 1100C-XL are equipped with a feature that will automatically shut off the vacuum and scrub systems and display "FULL" on the hourmeter/status display if the recovery tank becomes filled.

FIGURE 1



# RECOVERY SYSTEM

## 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 gaskets on the recovery tank covers are sealing and not damaged.
- Inspect and clean the vacuum motor float cage and vacuum filter.
- 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.

**Vacuum Electrical Components** – The vacuum systems major electrical components are monitored by the main controller to detect any system function failures (error codes). The system components covered are the vacuum motor and vacuum solenoid. Detected error codes from the main controller are displayed on the hour meter LED display as they occur. Note: Reference the Main Control Board Troubleshooting Guide in the Electrical System of this manual for specific fault descriptions and service repair actions.

## MAINTENANCE OF VACUUM FILTER AND FLOAT CAGE

See Figure 2. To inspect and clean the vacuum motor foam filter just lift open the tethered Vac Duct Cover **(A)**. Remove the filter by pulling it out from the housing opening. Clean the filter by vacuum or washing it out in warm water. Note: The filter must be completely dry before reinstalling.

To inspect the vacuum shut off float just open the left rear recovery tank cover to access the float cage assembly (front left in recovery tank). The cage openings must be kept free of any debris that can restrict maximum airflow. To keep it clean, wipe off with a rag regularly or remove and flush with water. The cage is a two piece design and can be snapped apart to separate. Note: Another method of accessing the cage float for servicing is to remove the (3) **(B)** Screws and remove the vacuum duct housing from the recovery tank top opening.

## VACUUM MOTOR REMOVAL

### WARNING!

Disconnect the battery pack by pushing in the emergency disconnect knob **(12)** before making service repairs.

- 1 See Figure 2. Drain recovery tank using the attached drain hose.
- 2 Remove the squeegee tool from the machine. Next swing open the recovery tank, then separate the tank's support cable to allow service access to the vacuum motor.
- 3 See Figure 2. Remove from the bottom side of the machine the (2) item **(C)** Hex Head Screws that secure the vac motor mount Bracket **(D)** to the chassis.
- 4 From the top of the machine loosen the Hose Clamp **(E)** securing the Vac Hose **(F)** and remove the hose.
- 5 Loosen the (2) **(G)** Hex Nuts then slide the vac motor assembly forward and remove the plastic Shroud **(H)** from the vacuum motor.
- 6 Disconnect the vac motor wiring plug from the machine harness, then complete the removal of the vacuum motor assembly.
- 7 Make inspection and needed service repairs and or motor replacement as required and re-install following the above steps in reverse order.

## RECOVERY TANK REMOVAL

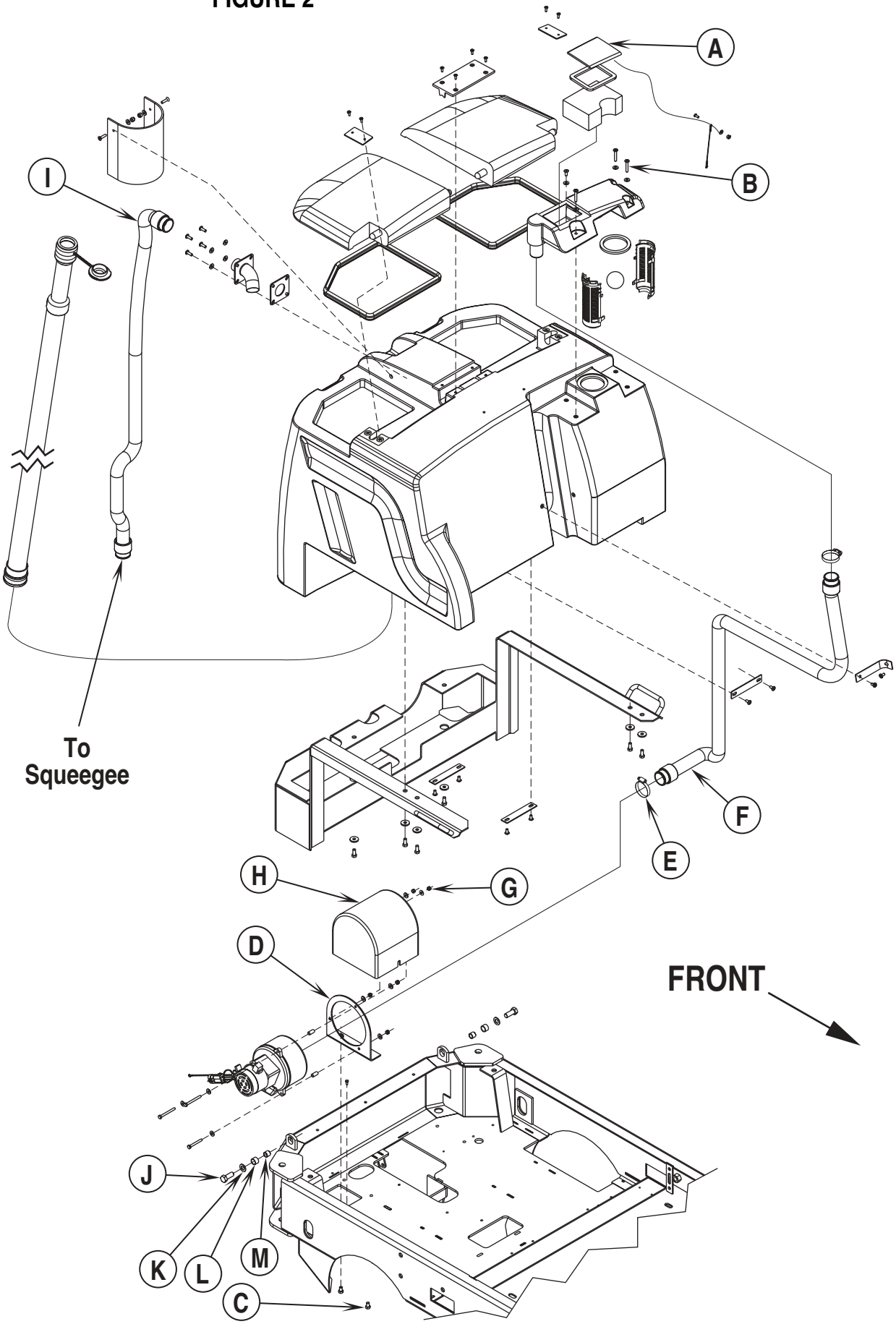
### WARNING!

Disconnect the battery pack by pushing in the emergency disconnect knob **(12)** before making service repairs.

- 1 See Figure 2. Drain recovery tank using the attached drain hose.
- 2 Tip the recovery tank to rear of machine then separate support strap and continue lowering the tank to its full open position. Service Note: Supporting the tank bottom with a chair or other appropriate device is helpful in both tank installation and removal.
- 3 Loosen the vacuum motor Hose Clamp **(E)** and pull the hose off from the motor inlet. Next remove the Squeegee Hose **(I)** at the squeegee pickup tube and from the top of the machine pull the hose up through the frame opening.
- 4 With the tank properly supported remove the (2) sets of mounting hardware items **(J, K, L & M)** from both ends of the tank mount.
- 5 Last remove the temporary tank support(s) and slowly lower the tank to the floor.
- 6 Make inspection and needed service repairs as required and re-install following the above steps in reverse order.

# RECOVERY SYSTEM

FIGURE 2



# SQUEEGEE SYSTEM

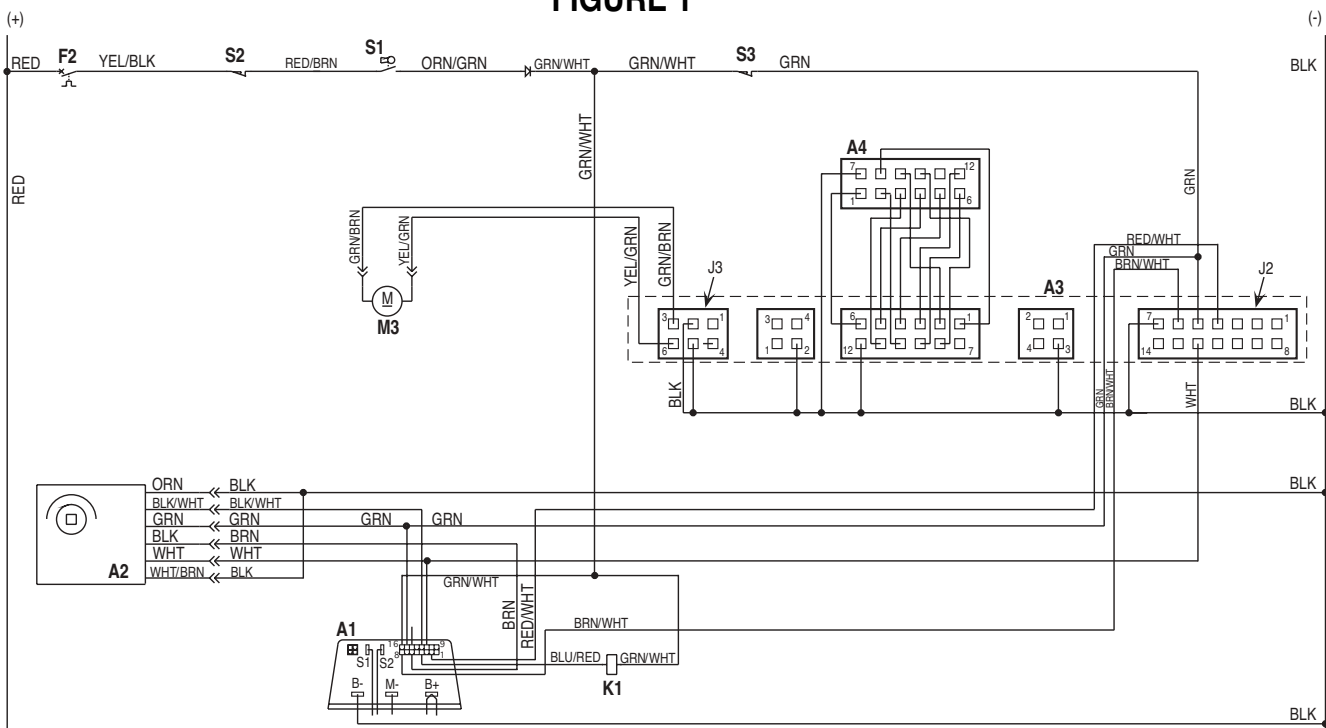
## SQUEEGEE SYSTEM LIFT MOTOR OVERVIEW

The squeegee pickup tool is raised and lowered by a 36V actuator motor assembly mounted horizontally in the left rear of the chassis underneath the recovery tank. The main control board assembly A3 regulates (manages) the machine's squeegee tool system input and output operating functions. See the Know Your Machine section in this manual for a detailed description of vacuum/squeegee operation modes.

## OPERATIONAL OVERVIEW OF THE SQUEEGEE LIFT MOTOR REVERSE FUNCTION

During normal or heavy scrubbing the squeegee operates in the auto mode. To prevent squeegee blade damage and excessive wear the squeegee tool is automatically lifted from the floor any time the machine is operated in reverse. See Figure 1. To get the squeegee tool to lift in reverse the drive pedal must be moved off its neutral or forward position, which triggers the needed reverse A2 throttle output. This battery (Pos. +) voltage signal from the reverse throttle wire delivers the required A3 board input to the J2 connector (pin #12 Wht wire). This then activates an internal relay circuit that outputs the correct voltage polarity for the M3 squeegee lift motor to run a specified time (output from J3). This raises the squeegee off the floor to the back up position, which is half of the normal distance observed when in the machine scrub off mode. Moving the drive pedal back to the neutral/forward position opens the A2 throttle reverse output and the A3 control board loses its input voltage signal. The J3 connector output reverses the polarity and lowers the tool back onto the floor.

FIGURE 1



## SQUEEGEE LIFT ACTUATOR REPLACEMENT

- 1 See Figure 2. Remove the Squeegee Tool (A) from the Squeegee Mount (B).
- 2 Lower the squeegee mount to the floor by pressing the Vac/Squeegee button on the control panel. Don't turn the key switch off, until pushing apart the battery emergency disconnect (12). This procedure is done to prevent the squeegee mount from automatically raising when the key is turned off.
- 3 Remove the (2) Hex HD Screws and Nuts (C & D) then remove the Drive Nut Bracket (E) from the Arm Weldment (F).
- 4 Unplug the squeegee lift motor wiring connector from the machine harness.
- 5 Remove the Retainer Ring (G) (next to the motor) and slide the Pin (H) out of the chassis mount bracket to complete the motor removal from the machine.

**Note:** New replacement lift actuator motors do not come with the lift nut pre-adjusted.

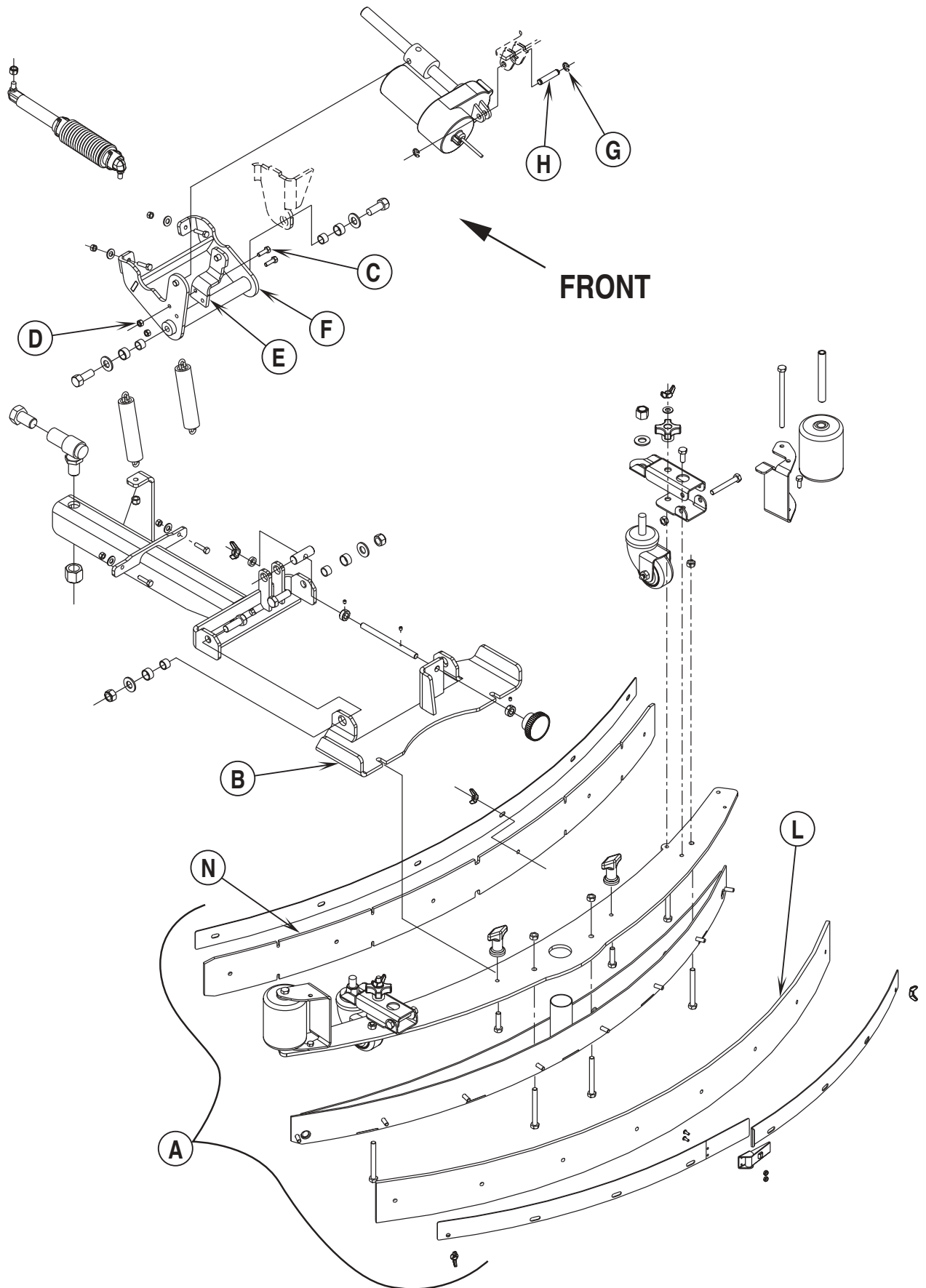
**Important:** After removing the actuator motor and before replacing a new motor or drive nut the IN & OUT limit switches must be set (or checked) to their correct specifications (see the Electrical System for the Actuator Drive Nut Adjustment instructions).

- 6 After setting the correct actuator lift nut dimensions follow steps 1-5 in reverse order to re-install.

**Service Tip Assembly Note:** Connect the special actuator power cord adapter (PN 56407502 shown in Electrical System Actuator Drive Nut Adjustment ) to the lift motor to help position the lift nut and mounting bracket for an easier installation.

# SQUEEGEE SYSTEM

FIGURE 2



# SQUEEGEE SYSTEM

## SQUEEGEE MAINTENANCE

If the squeegee leaves narrow streaks of 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 3. Raise the squeegee tool off the floor, then unsnap the Center Latch (I) on the squeegee tool.
- 2 Remove the Wing Nut (J) from each end of the squeegee, then remove the Tension Straps (K).
- 3 Slip the Rear Blade (L) off the alignment pins (shown in Figure 2).
- 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 See Figure 3. Raise the squeegee tool off the floor, then loosen the (2) Thumb Nuts (M) on top of the squeegee and remove the squeegee tool from the mount.
- 2 Remove all the wing nuts that hold the Front Blade (N) in place (shown in Figure 2), 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

There are two major squeegee tool adjustments, height and angle. The recommended adjustment steps are to set the tool angle first, then adjust the blade height.

### 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. Then drive the machine forward enough to have the squeegee blades fold over to the rear as shown in Figure 4.
- 2 See Figure 3. Loosen the Lock Wing Nut (O) (hand tightened). This secures the squeegee mount angle from easily vibrating out of adjustment.
- 3 Turn the Adjustment Knob (P) to tilt the tool forward or backwards, until the rear squeegee wiping blade touches the floor evenly across its entire width.
- 4 Re-tighten by hand the Lock Wing Nut (O).

### Adjusting the Squeegee Blade Height

Adjust the squeegee height whenever a blade is reversed or replaced, or if the squeegee is not wiping the floor dry. The squeegee blade height is easily adjustable at the caster wheels. To adjust...

- 1 Park the machine on a flat even surface and lower the squeegee. Then drive the machine forward enough to have the squeegee blades fold over to the rear as shown in Figure 4.
- 2 See Figure 3. Loosen both the lock adjustment Wing Nuts (Q) (need to be hand tightened only) located on the top of the caster mount bracket.
- 3 Rotate the Adjustment Knobs (R) CW (clockwise) to lift the squeegee and CCW (counter clockwise) to lower it. A starting point when replacing the blades is to adjust the caster-mounting bracket so it is level (parallel) to the top of the squeegee tool. Note: The Right and Left caster wheels must be adjusted equally to maintain level and even blade pressure.
- 4 Re-tighten the lock adjustment Wing Nuts (Q) and test for proper squeegee pick-up.



# SQUEEGEE SYSTEM

FIGURE 3

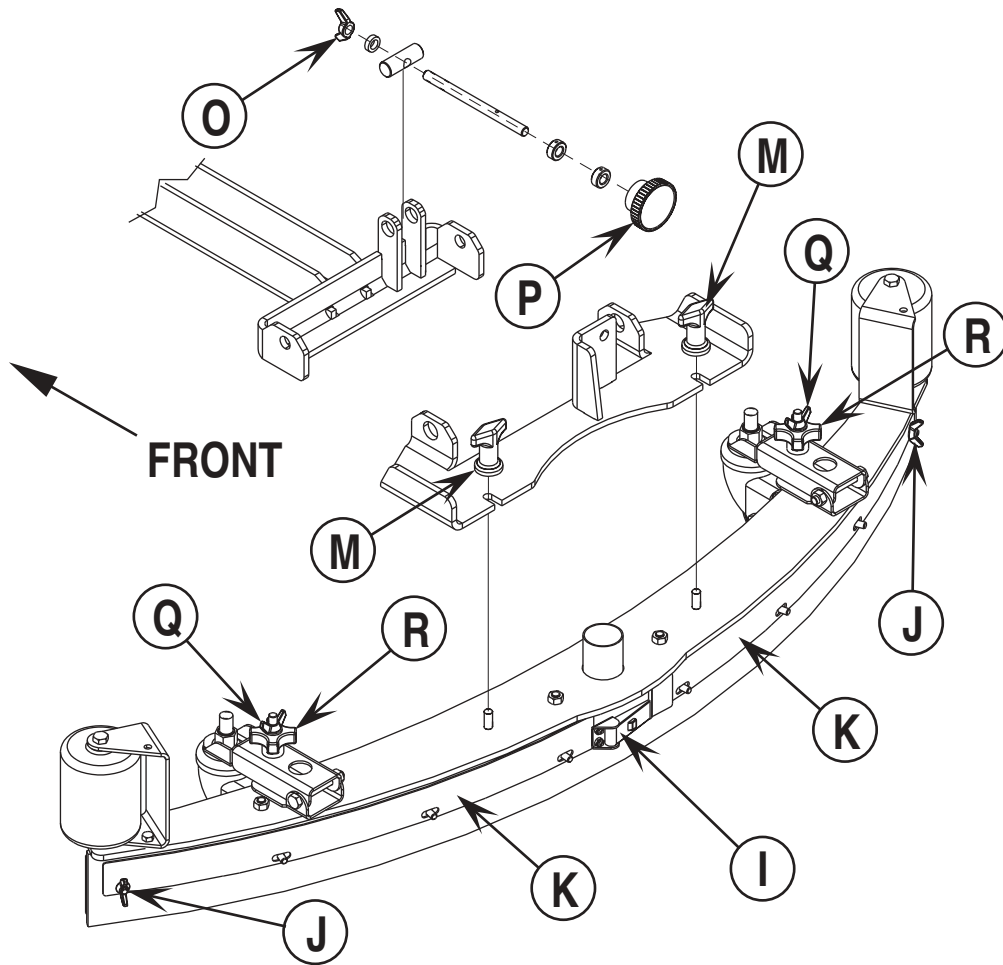
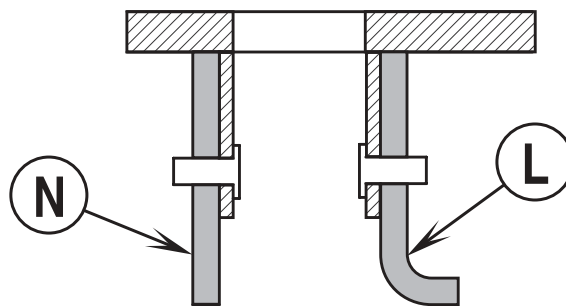


FIGURE 4



# WHEEL DRIVE SYSTEM

## GENERAL FUNCTIONAL OVERVIEW

A 2.7 HP separately excited (field & armature) 36V DC motor/gear/wheel unit (M6) is used to propel the machine. A Curtis model 1243 PMC solid state speed controller (A1) regulates (outputs) the variable speed Fwd/Rev wheel drive motor functions. The controller unit is located to the left of the operator seat, behind the electrical access panel. The electronic throttle A2 mounted to the operator foot pedal inputs to the (A1) controller the machine operator's specific speed and direction demands.

## DRIVE MOTOR SYSTEM CONTROLLER FUNCTION OVERVIEW

See Figure 1. To make the A1 speed controller's internal circuits operational (power it up) the two switches S1, main power and S2 charger interlock must be closed. Next the seat switch S3 must be depressed for the main contactor K1 to be energized. Depressing the foot pedal in either Fwd or Rev will move the electronic throttle A2 and provide the needed direction and 0-5V throttle input signals for controller output. These controller inputs direction and voltage then energize the internal transistors which selects the motor polarity and also at the same time manages the current and voltage output values to the two separate motor circuits (armature & field) per the percentage of the A2 throttle movement.

## MOTOR OPERATION

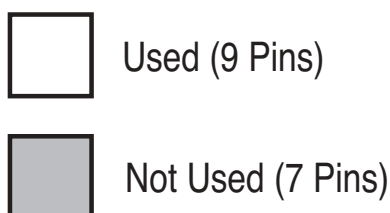
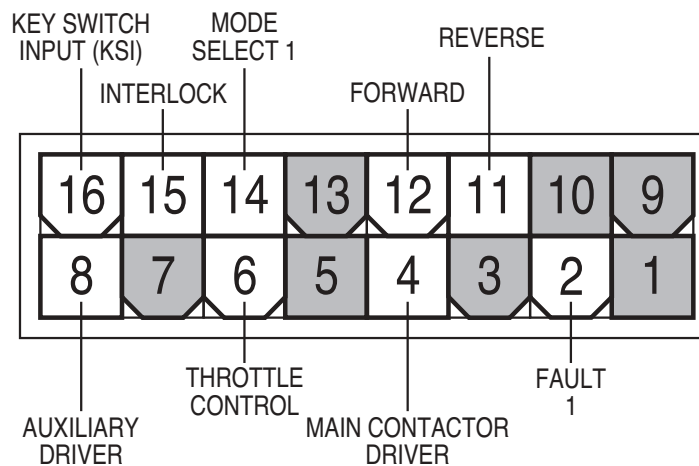
The motor has (4) terminal connections, (2) armature A1, A2 and (2) field D1, D2. The motor armature circuit receives from the controller a chopped on time off time \*PWM voltage and current output that varies the motor speed. The field circuit sees the current direction polarity change that effects the rotation of the motor CW for FWD and CCW for REV.

## DRIVE WHEEL SYSTEM SPEEDS

The speed controller is programmed for two maximum speed setting modes, M1max and M2max. The M1max is the transport speed mode and is set at 100% of the total systems speed potential. The M2max is the scrubbing speed mode and is set a 92% of the total system's speed potential. **Note:** Both of the speed settings (M1 & M2) can be changed (increased or decreased) from the original factory specifications only by using the hand held programmer PN 56409441. See in the electrical system section of this manual instructions for using the programmer for speed setting changes and troubleshooting diagnostics.

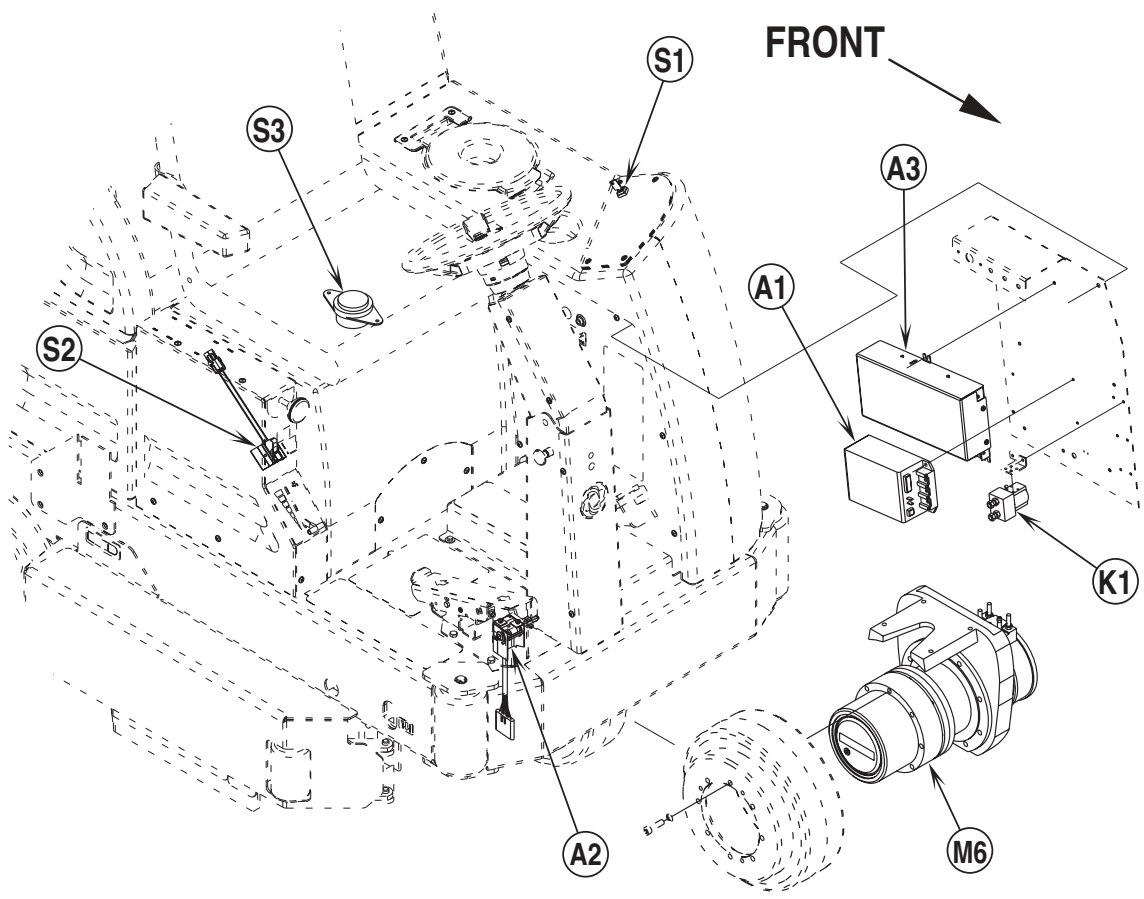
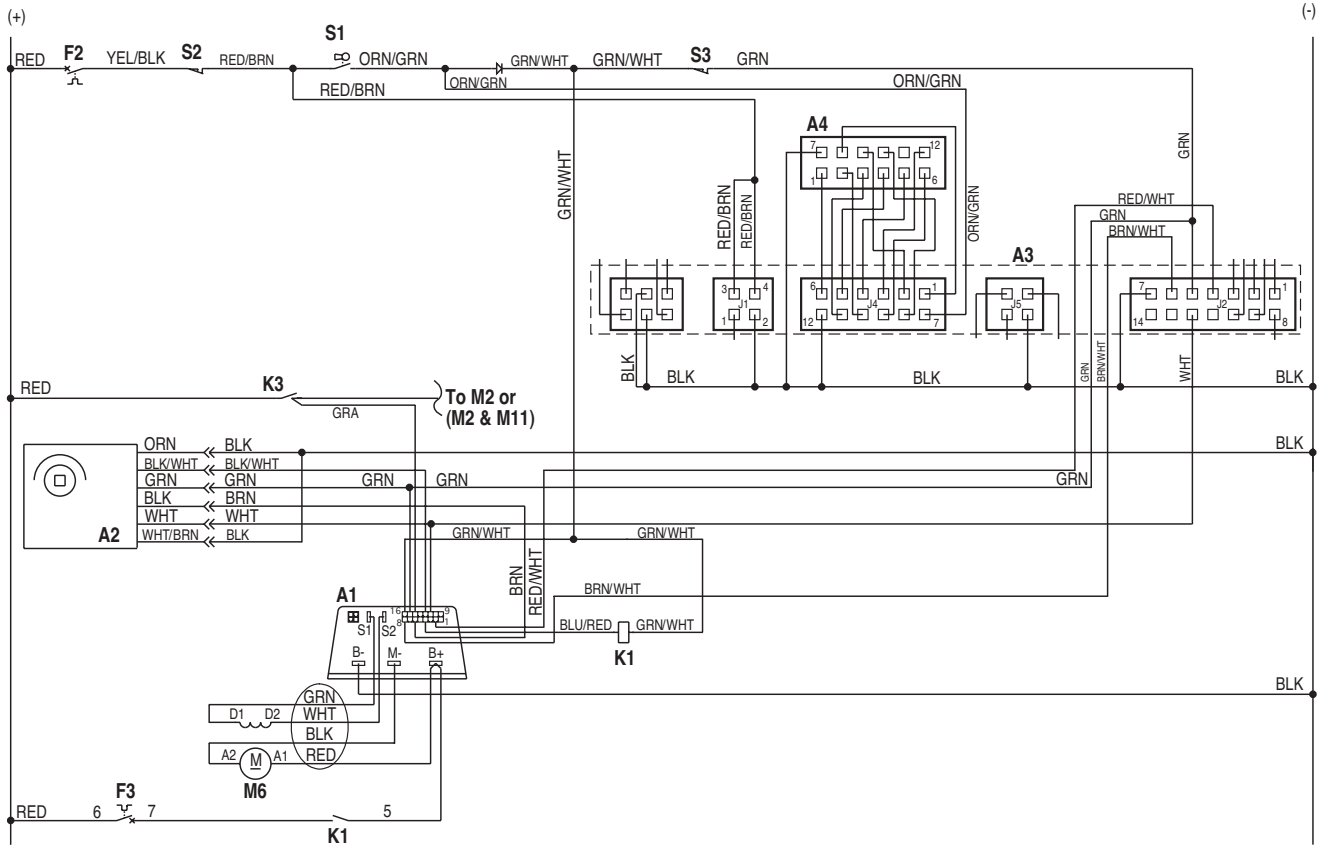
\*PWM; pulse width modulation, also called "chopping" is a technique that switches battery voltage to the motor ON and OFF very quickly, thereby controlling the speed of the motor.

### Detail of A1 16-pin connector:



# WHEEL DRIVE SYSTEM

## FIGURE 1



# WHEEL DRIVE SYSTEM

## Low Current controller A1 Pin Key Detail

Pin #	Wire Color	Controller Pin Description & Function
1		Open not used
2	Red/Wht	Fault 1: Controller fault output to operator control panel LED status display.
3		Open not used
4	Blu/Red	Main Contactor Driver: Battery (-) output to main contactor K1.
5		Open not used
6	Brn	Throttle Control: 0-5V electronic throttle motor speed input.
7		Open not used
8	Brn/Wht	Auxiliary Driver: Battery (-) output to main controller (A3) to turn on (activate) all auto scrub functions.
9		Open not used
10		Open not used
11	Wht	Reverse: Electronic throttle battery (+) motor direction input.
12	Blk/Wht	Forward: Electronic throttle battery (+) motor direction input.
13		Open not used
14	Gry	Mode Select 1: Drive motor scrub speed battery (+) input from (K3) scrub brush solenoid output.
15	Grn	Interlock: Seat switch (S3) input battery (+) to activate the main contactor driver pin 4 output to the K1 contactor.
16	Grn/Wht	KSI (key switch input): Battery (+) output powers up controller logic circuits.

## WHEEL DRIVE TROUBLESHOOTING GUIDE

Problem	Possible Cause
<ul style="list-style-type: none"> <li>• Wheel drive motor will not run in forward and reverse.</li> </ul>	<ul style="list-style-type: none"> <li>• Batteries need charging (low battery voltage, recharge batteries)</li> <li>• Wheel Drive Motor Circuit Breaker (<b>F3</b>) tripped (reset circuit breaker)</li> <li>• Control Circuit Circuit Breaker (<b>F2</b>) tripped (reset circuit breaker)</li> <li>• Parking Brake (<b>6</b>) set (release parking brake)</li> <li>• Emergency Stop Switch (<b>12</b>) tripped (pull red knob to reset)</li> <li>• Safety Switch (<b>S3</b>) in seat not closed (check seat switch)</li> <li>• Defective Charger Interlock Switch (<b>S2</b>) (adjust/replace switch)</li> <li>• Defective Wheel Drive Motor (replace motor) *</li> <li>• Defective Electronic Throttle (<b>A2</b>) (replace electronic throttle) *</li> <li>• Defective Main Contactor (<b>K1</b>) (replace main contactor) *</li> </ul>
<ul style="list-style-type: none"> <li>• Wheel drive in one direction only, loss of either forward or reverse.</li> </ul>	<ul style="list-style-type: none"> <li>• Test the Fwd &amp; Rev (<b>A2</b>) Electronic Throttle's wiring outputs (pins 11 &amp; 12) at the speed control for an open. Repair wiring or replace the A2 throttle.</li> <li>• Controller can't change electrical polarity to wheel motor replace the (<b>A1</b>) speed control.</li> </ul>
<ul style="list-style-type: none"> <li>• Hourmeter/status display shows an error 03 fault code.</li> </ul>	<ul style="list-style-type: none"> <li>• Speed controller has sensed an operation error code fault. (see the Status LED Fault Codes (Table 1) in the Electrical System)</li> </ul>

\* = See Curtis Speed Control Troubleshooting Section.

# WHEEL DRIVE SYSTEM

## STEERING CHAIN ADJUSTMENT

The steering chain should be adjusted so that there is about 1/4" (6 mm) total deflection with moderate pressure applied at point (A) shown in Figure 2. Loosen the bolt and lock nut on the chain idler sprocket then move the idler sprocket in the slot to adjust chain tension and retighten.

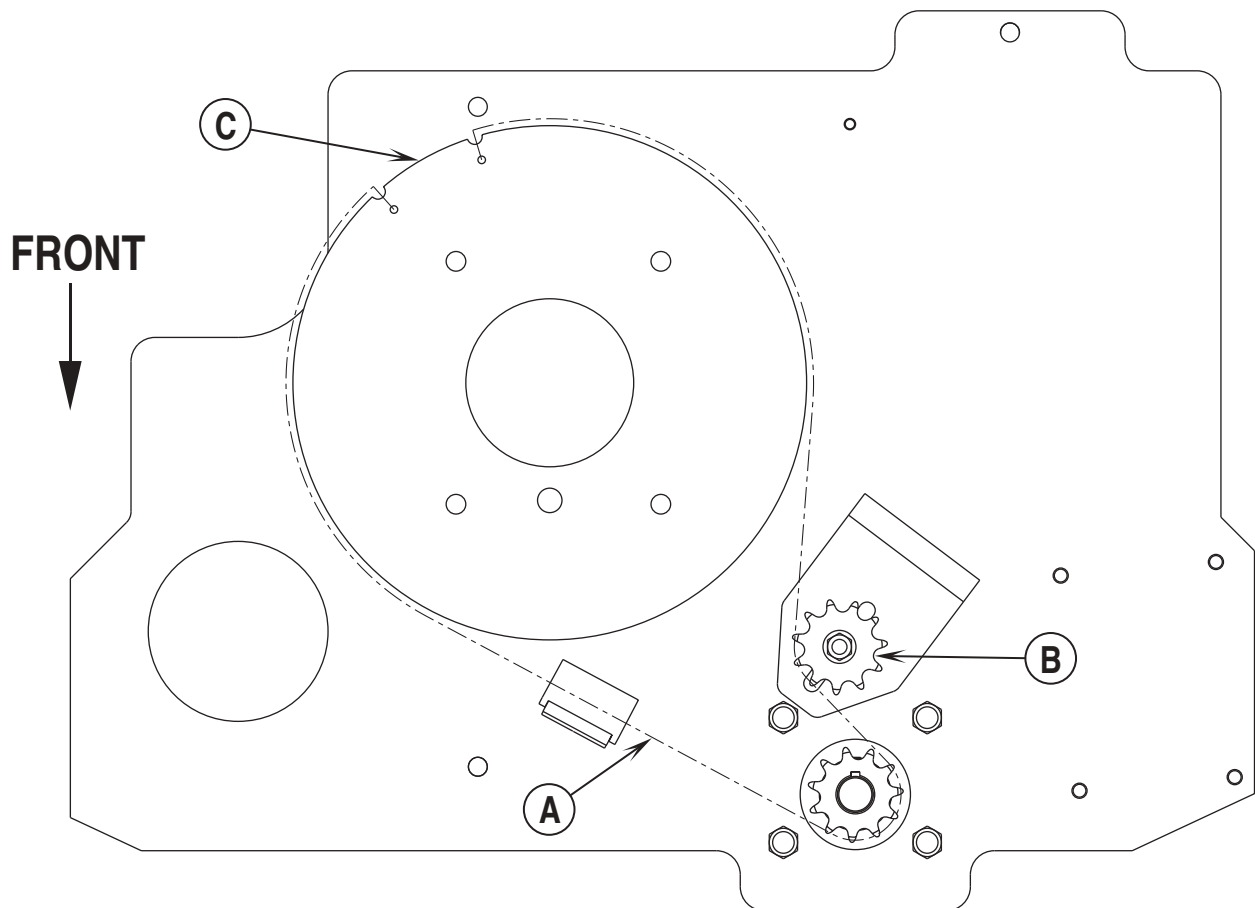
## STEERING CHAIN REMOVAL

- 1 See Figure 2. Loosen the bolt and lock nut on the Chain Tension Sprocket (B) to release the steering chain tension.
- 2 Remove both master links securing the steering chain at the Steering Plate (C), then remove the chain.
- 3 Re-assemble in reverse order, refer to steering chain adjustment section for proper chain routing and tension adjustment.

### Steering System Maintenance

- Oil the chain.
- Grease the steering shaft universal joint zert fitting.
- Grease the zert fitting on Chain Tension Sprocket (B).

FIGURE 2



Bottom View of Chassis

# WHEEL DRIVE SYSTEM

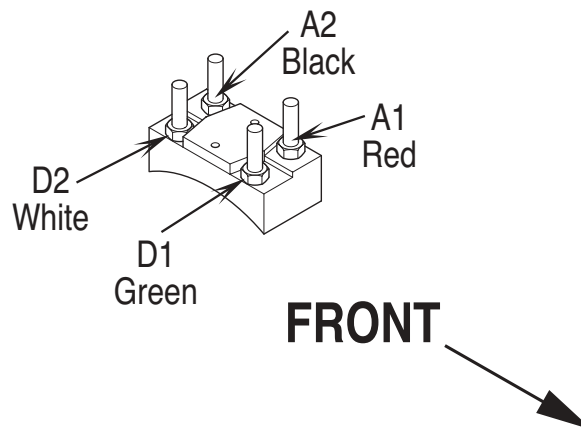
## STEERING SPINDLE AND WHEEL DRIVE ASSEMBLY REMOVAL

### ⚠ WARNING!

Turn the main power key switch (33) to the OFF position and disconnect the battery pack by pushing in the emergency disconnect knob (12). Next set machine parking brake (6) and block both rear wheels so machine can't roll.

- 1 See Figure 3. Observe the (4) motor wires note their colors and their correct terminal connections to re-assemble. Next remove all the wires using a 13 mm wrench. **Service Tip:** When ever disassembling or re-assembling the wire terminal connecting hardware use an extra wrench to help prevent the electrical motor stud(s) from rotating (this will prevent damage to the internal motor leads).
- 2 Remove the (1) socket head cap screw (use an 8 mm hex wrench) that retains the motor wiring harness P-clamp, then pull wiring to rear of machine.
- 3 See Figure 4. Remove the bolt and lock nut that secures Chain Tension Sprocket (B) from its chassis frame mount. Next turn the steering wheel assembly left and right to help roll the chain off the steering column Drive Sprocket (D).
- 4 Remove in the driver's compartment the false floor plate secured with (2) screws to allow access to the top spindle mount hardware.
- 5 Remove the bearing Dust Cap (E), and then remove the Cotter Pin (F) and Castle Nut (G) from the spindle shaft.

FIGURE 3



### ⚠ WARNING!

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

- 6 Safely jack up or lift the front of the machine 20-22 in. (50-55 cm) to remove the wheel motor spindle assembly by carefully guiding it down through the bottom of the frame opening and out from underneath the machine. **Note:** Be careful not to damage the threads and bearing surfaces when dropping the spindle down through the frame in removing it from the chassis.
- 7 Inspect bearings and seal and replace as needed. Remove the (4) (H) Screws to separate the spindle weldment from the steer plate and drive wheel motor mount.
- 8 To make further service repairs see the drive wheel motor and gear housing removal steps in this manual section.
- 9 Re-assemble in reverse order and tighten the Castle Nut (G) to eliminate any bearing play and then back off the nut enough to install a new cotter pin.

## DRIVE TIRE REMOVAL

**Note:** It is not necessary to remove the complete wheel drive / steer spindle assembly to service the drive tire only.

### ⚠ WARNING!

Turn the main power key switch (33) to the OFF position and disconnect the battery pack by push in the emergency disconnect knob (12). Next set machine parking brake (6) and block both rear wheels so machine can't roll.

- 1 **Service Tip:** Before disassembling punch witness marks into both the tire rim and gearbox housing to reference when re-assembling.
- 2 See Figure 6. Remove the (8) (I) Socket Headed Cap Screws from the tire rim (use an 8 mm hex socket wrench).

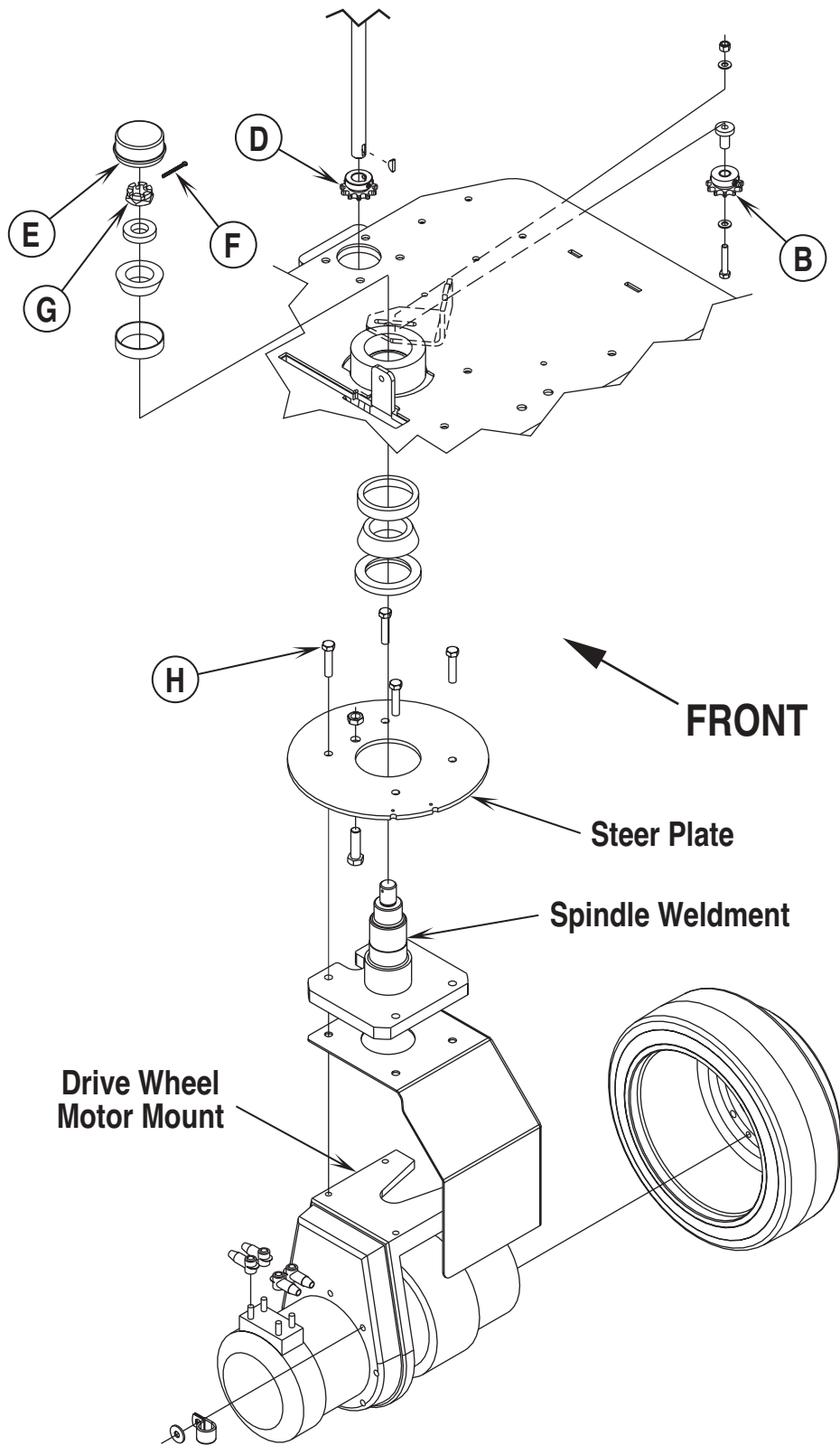
### ⚠ WARNING!

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

- 3 Safely jack up or lift the front of the machine 1-2 inches (25-50 mm) and block the machine frame on both sides at the front corners.
- 4 Locate the (3)-tapped holes laid out 120 degrees apart found on the tire rim. Next thread (3) of the (I) original drive tire screws (M10 x 35 mm) into the tapped holes, then turn all (3) screws equal amounts to push apart (separate) the tire from the gear housing (J).
- 5 **Service Tip:** To re-assemble drive tire to the gear housing line-up the previously installed witness marks. Then tap the rim in place and thread in the (8) cap screws and torque all screws to 59 ft/lbs. (80 Nm).

# WHEEL DRIVE SYSTEM

FIGURE 4



# WHEEL DRIVE SYSTEM

## GEAR HOUSING REMOVAL

- 1 Follow steps 1-7 of the Steering Spindle and Wheel Drive Assembly Removal section.
- 2 Follow steps 1-2 & 4 in the Drive Tire Removal section.
- 3 See Figure 6. Remove the (8) (K) socket headed cap screws (M8x30 mm) from the Motor Flange (L) (use a 6 mm hex socket wrench).
- 4 **Service Tip:** Before disassembling punch witness marks into both gear housing and motor mount flanges to reference when re-assembling.
- 5 Separate the gear housing from the drive motor by carefully prying apart the two major components. Tap with a hammer and a thin chisel between the gear housing flange and motor flange to loosen then pull apart.
- 6 **Note:** When disassembling gear oil will leak out of the gear housing section and the motor/gear coupler will be loose, also remember to protect the O-Rings (M) and Shaft Seal (N) on the motor flange from being damaged.
- 7 Reassemble in reverse order and torque the (8) motor flange screws (K) to 30 FT/LBS. (40 Nm).

## ELECTRIC DRIVE MOTOR REMOVAL

- 1 Follow steps 1-7 of the Steering Spindle and Wheel Drive Assembly Removal section, follow steps 1-2 & 4 in the Drive Tire Removal section and also follow steps 3-6 in the Gear Housing Removal section. **Note:** All the above steps are necessary to remove the complete electric motor unit from the complete wheel drive assembly.
- 2 See Figure 6. Remove the (8) (O) socket headed cap screws that secure the drive motor Field Housing (P) to the large motor mount casting (Q) (use an 8 mm hex socket wrench). Then separate the motor from the motor mount casting.
- 3 Next remove the (13) (R) socket headed cap screws (M5x20 mm) from the Motor Flange (L) (use a 4 mm hex socket wrench).
- 4 **Service Tip:** Before disassembling punch witness marks into both motor flange and motor field housing to reference when re-assembling.
- 5 Tap the motor Mount Flange (L) (motor end bell) completely off from the motor Field Housing (P). **Note:** Use a piece of hardwood or brass when tapping on the motor flange to remove.
- 6 See the carbon brush inspection instruction in this manual section for the steps to follow when removing the motor brush end bell assembly.
- 7 Inspect, test and make any needed motor repairs. Then reassemble in reverse order and torque the (13) motor flange Screws (R) to 7 FT/LBS. (10 Nm) and the (8) motor mount Screws (O) to 59 FT/LBS. (80 Nm).

## CARBON MOTOR BRUSH INSPECTION AND REPLACEMENT

### ⚠ SAFETY WARNING!

Turn the main power key switch (33) to the OFF position and disconnect the battery pack by pushing in the emergency disconnect knob (12). Next set machine parking brake (6) and block both rear wheels so machine can't roll.

To service and inspect carbon brushes it is not necessary to remove the drive motor.

- 1 To inspect the carbon brushes (Qty 4) for brush wear length remove the singular socket HD cap Screw (S) shown in Figure 6 (using a 4 mm hex wrench). Next loosen the (2) socket HD cap Screws (T) just enough to help separate the wiring terminal block pins that hold the metal inspection band onto the motor end bell.
- 2 **Service Tip:** Bend a sharp loop to the end of a stiff piece of wire to fabricate a tool to pull on the end of the carbon brush spring tail to easily help apply or remove the spring tension on the end of a carbon brush.
- 3 Remove the spring tension on the end of each brush using the above mentioned tool and then pull the brush from the holder to examine and measure. **Note:** A new brush measures 1.2" (30.5 mm) in length if less than .625" (15.8 mm) length replace. Each brush has two wire ends secured to the brush ring with a single cap screw (use a 4 mm hex wrench to remove screw).

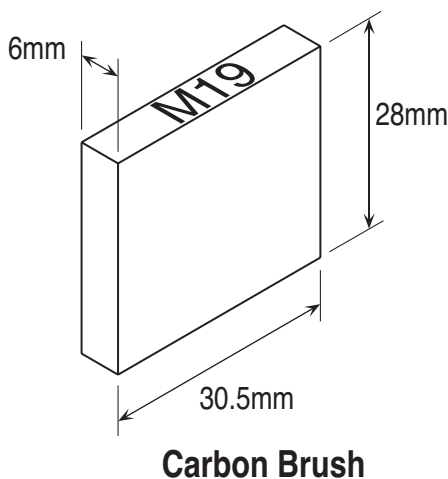
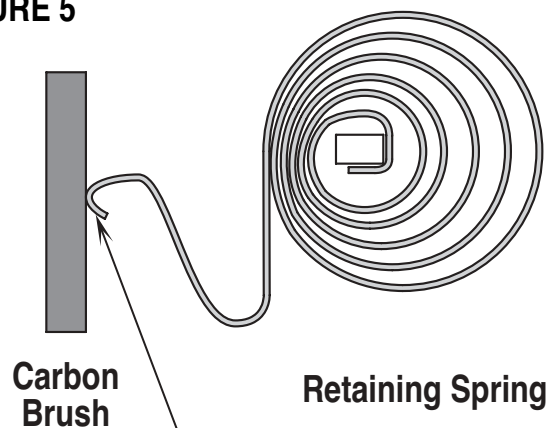


FIGURE 5



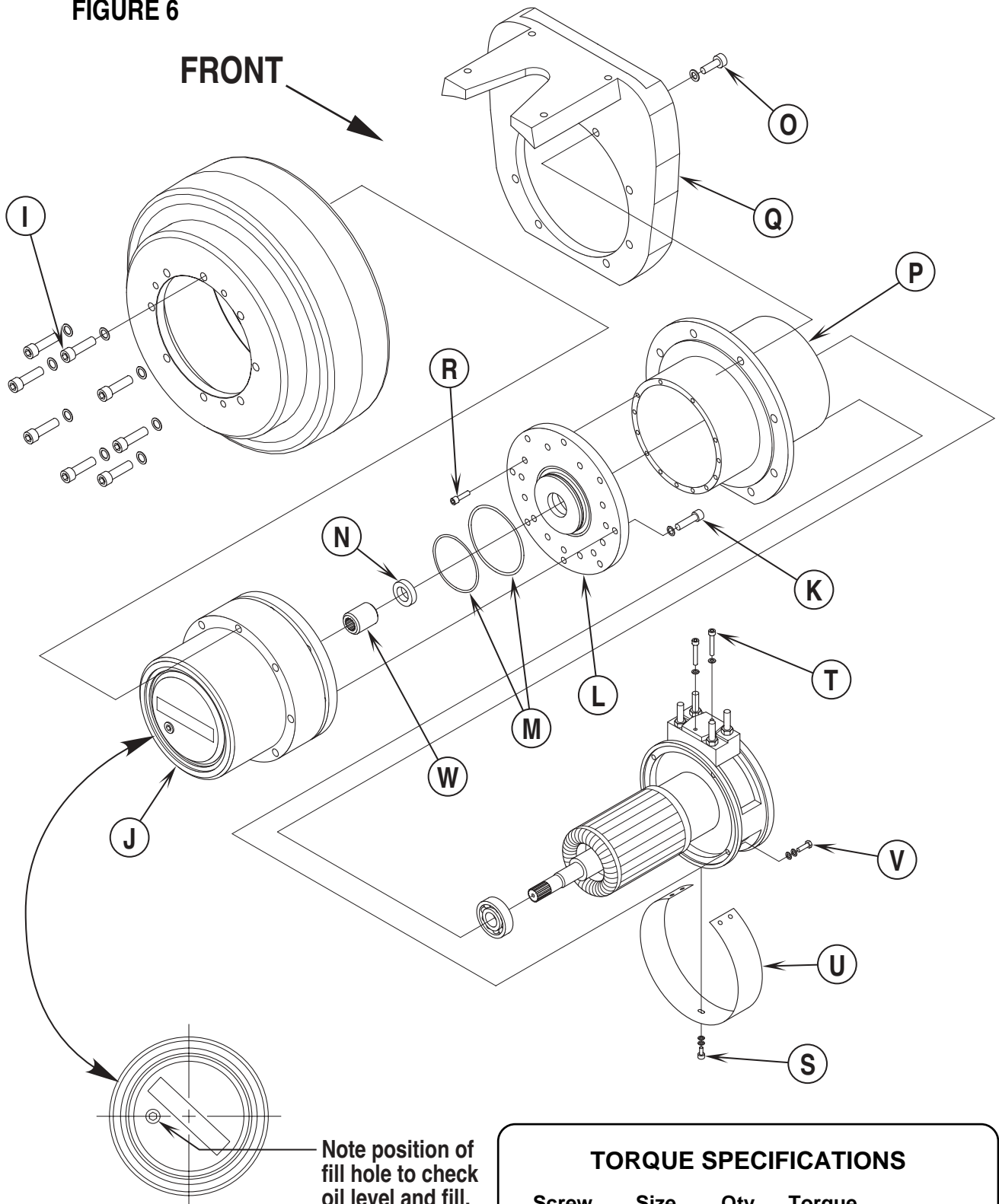
Note: Retaining Spring is shown in a service position not the operating position.



# WHEEL DRIVE SYSTEM

FIGURE 6

FRONT



Note position of fill hole to check oil level and fill.

## TORQUE SPECIFICATIONS

Screw	Size	Qty	Torque
I	M10x 35	8	59 Ft/lb (80Nm)
K	M8x30	8	29.5 Ft/lb (40Nm)
O	M10x30	8	59 Ft/lb (80Nm)
R	M5x20	13	7.4 Ft/lb (10Nm)

# WHEEL DRIVE SYSTEM

## REMOVAL OF THE CARBON BRUSH END-BELL HOUSING

**Important Service Note:** The motor end-bell housing has (4) small cap screws on the housing end; these fasteners are not for securing the end-bell to the field housing. Do not remove, their purpose is to fix the brush ring to the end bell casting. Read instructions below to remove the brush end-bell from the motor housing.

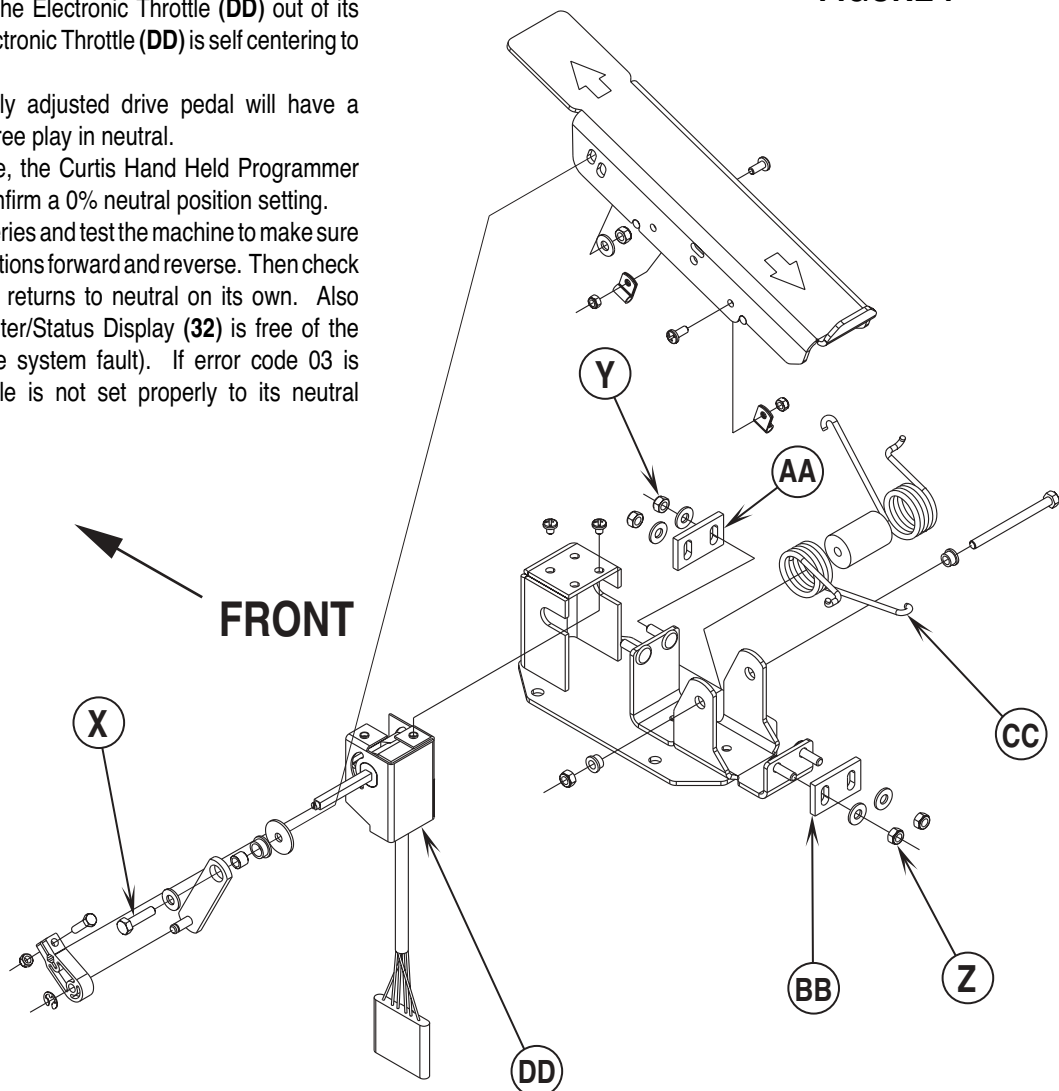
- 1 Follow step one in the Carbon Motor Brush Inspection and Replacement instructions to remove the Brush Inspection Band (U).
- 2 See Figure 6. Next remove the (2) socket HD cap Screws (T) holding the wiring terminal block and then remove the two motor field terminal studs D1 & D2 (shown in Figure 3). **Note:** Any time the motor end bell is to be removed from the motor field housing the two field wires must be separated to prevent breaking off the wires ring terminal ends.
- 3 Remove the (4) hex screws (V) that secure the end bell to the motor field housing.
- 4 To remove the end-bell tap evenly on the end-bell and separate from the motor field housing using a piece of hardwood or brass. **Note:** Observe when removing end-bell cap that the armature assembly may stay with the end cap and separate from the gear housing Drive Coupler (W) as shown in Figure 6. If this separation occurs it will be necessary to remove the gear housing and reconnect the drive coupler.

## THROTTLE CONTROL NEUTRAL ADJUSTMENT

If the drive pedal or electronic throttle have been removed or replaced the neutral position for the pedal will have to be set. Follow the steps below to accomplish this.

- 1 Turn the Master On/Off Key Switch (33) to the OFF position, set the Parking Brake (6) and disconnect the batteries.
- 2 See Figure 7. Make sure Screw (X) is loose. Loosen the (2) (Y) Nuts and the (2) (Z) Nuts.
- 3 Slide Plate (AA) all the way up and tighten the (2) (Y) Nuts. Then slide Plate (BB) up until it contacts the Spring (CC) and tighten the (2) (Z) Nuts.
- 4 Screw (X) should be centered in the slot in the drive pedal. Tighten Screw (X) being careful not to pull on the linkage, which would move the Electronic Throttle (DD) out of its neutral position (Electronic Throttle (DD) is self centering to neutral).  
**NOTE 1:** A correctly adjusted drive pedal will have a minimal amount of free play in neutral.  
**NOTE 2:** If available, the Curtis Hand Held Programmer could be used to confirm a 0% neutral position setting.
- 5 Re-connect the batteries and test the machine to make sure it moves in both directions forward and reverse. Then check that the drive pedal returns to neutral on its own. Also confirm the Hourmeter/Status Display (32) is free of the error code 03 (drive system fault). If error code 03 is displayed the throttle is not set properly to its neutral position, readjust.

FIGURE 7



# REAR WHEEL SYSTEM

## BRAKE SHOE ASSEMBLY INSPECTION

### ⚠ WARNING!

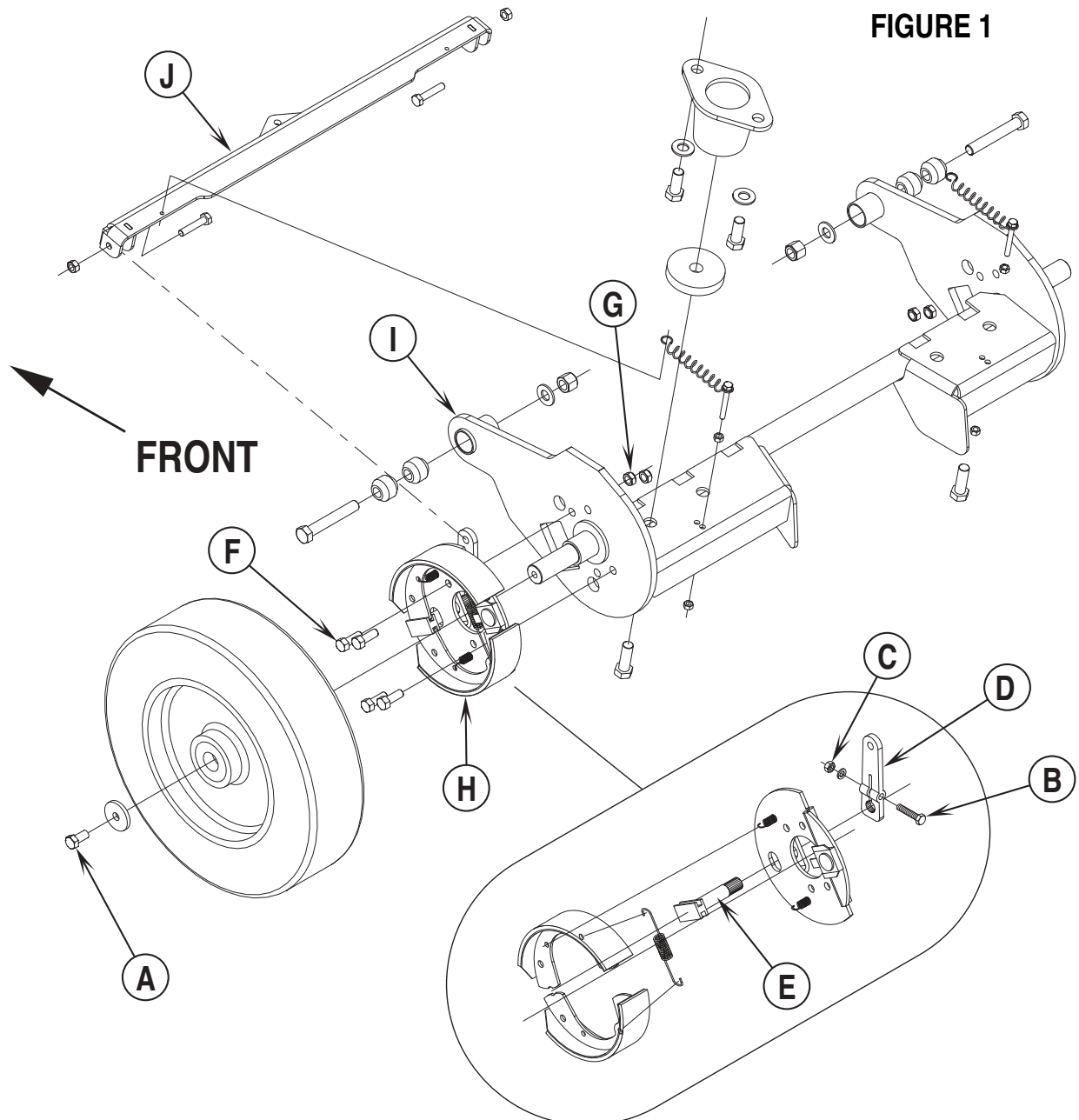
Never work under machine without safety stands or blocking to support the machine.

- 1 See Figure 1. Place wheel chokes on the opposite wheel to be serviced then loosen the hub retainer Bolt (A).
- 2 Open the brush skirt-housing door and position a jack on the frame rail and lift machine 1- 2 inches off the floor and secure with blocking or safety stand.
- 3 Remove the hub retainer Bolt (A) and rear wheel to inspect and service brake shoes.

## REMOVAL OF BRAKE ASSEMBLY

**Service Tip:** To gain more service access on the back side of the brake assembly remove the scrub brushes, lower scrub deck and disconnect the battery pack by pushing in the emergency disconnect knob (12).

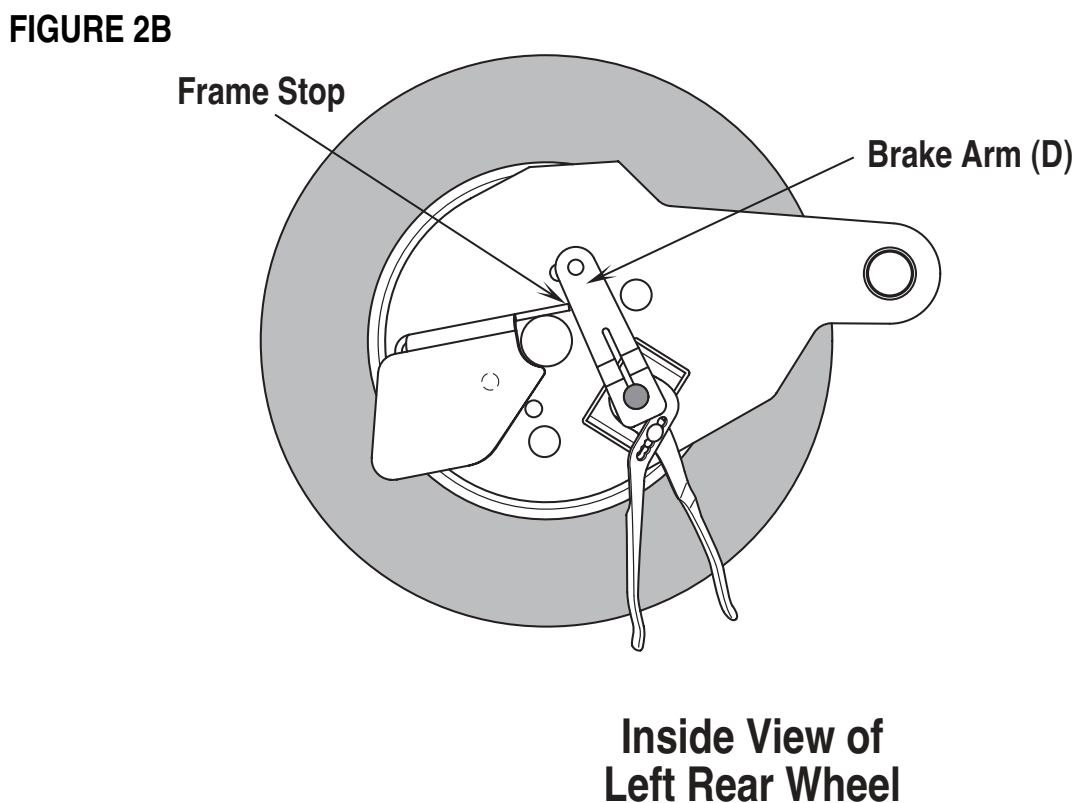
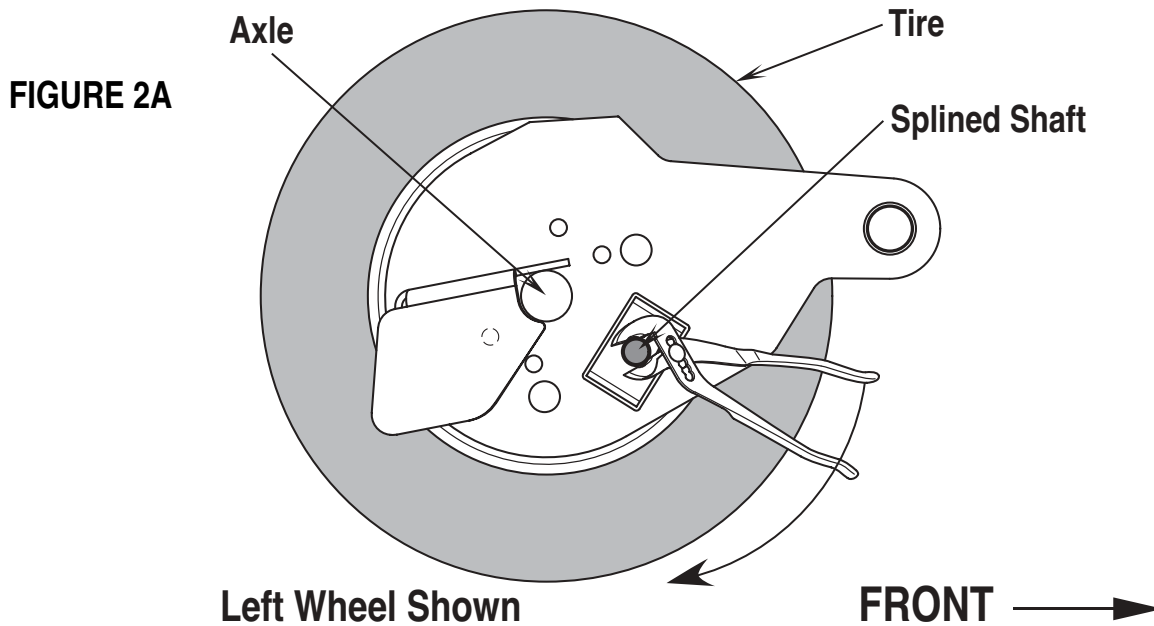
- 1 Follow steps 1-3 in the Brake Shoe Assembly Inspection section.
- 2 Remove the Hex Screw (B) and Nut (C) (pinch bolt) that secures the Brake Arm (D) to the brake actuator Spline Shaft (E) and pry it off.
- 3 Next remove using a 13 mm wrench and socket (4) of each hardware items (F) & (G) (nuts & screws) and then pull the Brake Assembly (H) from the Axle Support (I).



# REAR WHEEL SYSTEM

## INSTALLATION OF BRAKE SHOE ASSEMBLY

- 1 See Figure 1. Start with the Brake Arm (D) attached to the Brake Equalizer Bar (J). Next install the Brake Shoe Assembly (H) and rear wheel hub assembly onto the axle shaft.
- 2 See Figure 2A. From the back side of the wheel grip the splined input shaft with a locking pliers and turn it CW (clockwise) for the left wheel, to set the brake shoe linings to the wheel drum. **Note:** For the right wheel, turn the splined shaft CCW (counter clockwise).
- 3 See Figure 2B. Hold the brake input shaft firm and at the same time install the brake arm to the splined shaft also having the backside of the arm contacting its "frame stop" (as shown). Note: These assembly steps are important so both left and right arm angles are adjusted to provide equal shoe to drum contact. To achieve proper wheel brake engagement and pedal travel.
- 4 Next install the brake arms pinch bolt and tighten to secure the arm to the shaft. Then spin rear wheel by hand and press brake pedal to check that the wheel stops. Note: See brake cable adjustment if pedal has more than 1 inch of travel to start full brake engagement.
- 5 Lower machine and retighten the wheel hub retainer Bolt (A) and also test drive machine to check for correct service brake and parking brake functions.



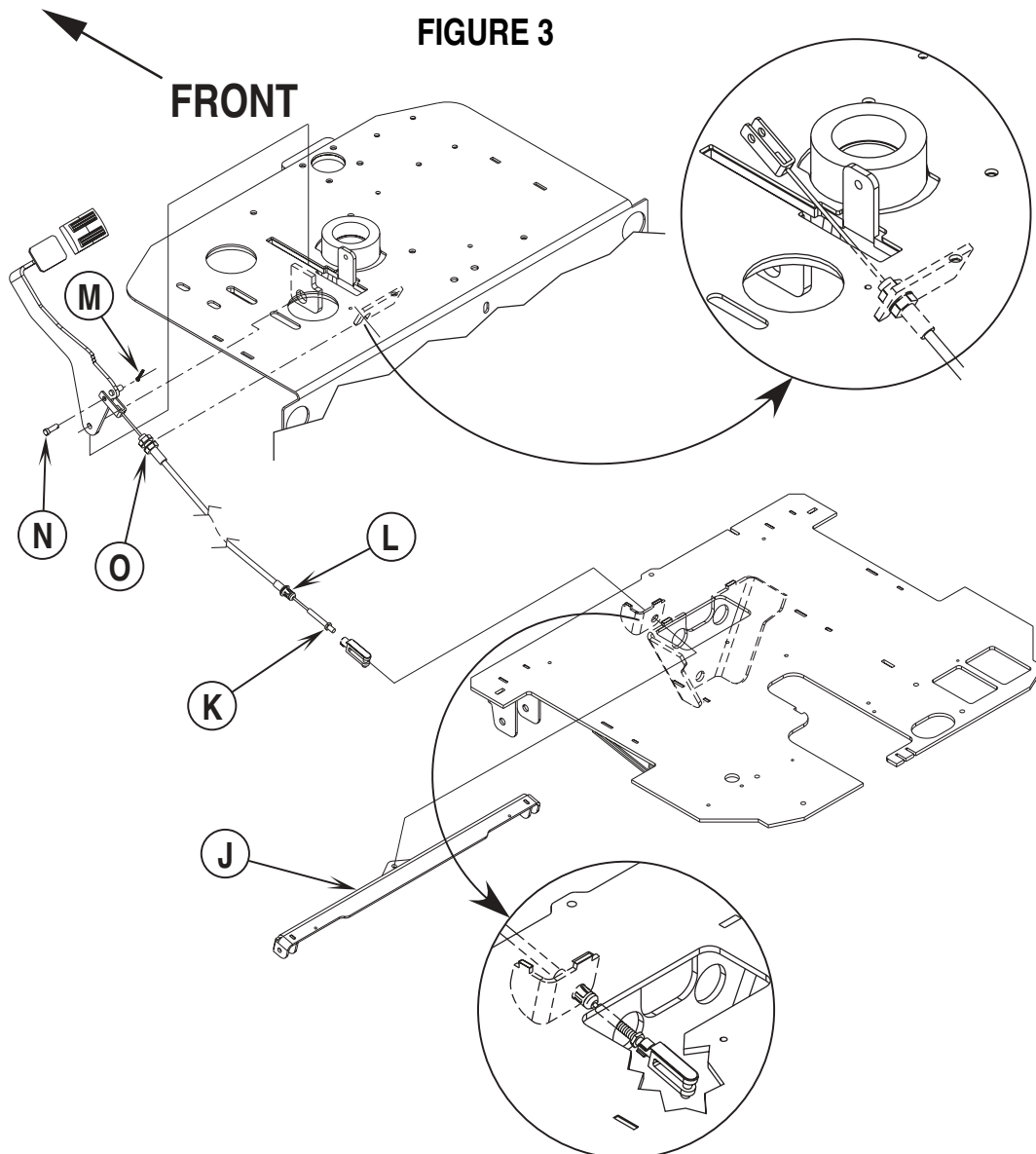
# REAR WHEEL SYSTEM

## BRAKE CABLE ADJUSTMENT

- 1 Block rear wheels then disconnect main battery cables (POS. & NEG.) and remove the battery box. Note: Use optional battery box lifting straps PN 56409067 to help lift the complete box without removing the batteries.
- 2 See Figure 3. First loosen the rear cable adjustment Lock Nut (**K**) then unsnap the clevis pin retainer clamp and push the pin out of its mounting bracket.
- 3 Thread the clevis end in or out and reattach to check correct pedal travel. Brake pedal travel should measure one inch (25 mm) and allow the parking brake latch to catch in one of the pedal lever notches. This parking latch adjustment is important to assure a solid parking brake setting.
- 4 Retighten lock nut and secure pin retainer clamp.

## BRAKE CABLE REMOVAL

- 1 Remove battery box by following step one in Brake Cable Adjustment section.
- 2 See Figure 3. First loosen the rear cable adjustment Lock Nut (**K**) then unsnap the clevis pin retainer clamp and push the pin out of its mounting bracket.
- 3 Unthread the clevis assembly from cable end and salvage, it will be reused.
- 4 Use a screwdriver to bend (flatten) the metal tabs on the cable Snap-In Fitting (**L**) then pull rear cable end forward from the frame mount.
- 5 At the front of the machine remove the false floor plate to access the brake pedal cable attachment point.
- 6 Remove the Cotter Key (**M**) and Clevis Pin (**N**) and separate the cable from pedal lever. Next loosen the cable conduit fitting Nuts (**O**) (located underneath machine) and pull the cable completely out from the bottom side of the chassis.
- 7 Reinstall new cable, follow above steps in reverse order then adjust cable for 1" (25 mm) of pedal travel.



# ELECTRICAL SYSTEM

## RECOMMENDED BATTERIES AND CHARGERS

Qty	Description	Weight	Length	Width	Height
6	Battery, 395AH @ 20hr, 6V	123 lbs.	11.66"	6.94"	16.69"
3	Battery, 450AH @ 20hr, 12V	309 lbs.	19.35"	10.76"	16.75"
1	Battery, 450AH @ 20hr, 36V	919 lbs.	31.12"	19.62"	16.75"
1	Automatic Battery Charger, 36V-36 Amp (120V, 60Hz)				
1	Automatic Battery Charger, 36V-38 Amp (220V, 60Hz)				
1	Automatic Battery Charger, 36V-36 Amp (230V, 50Hz)				

## 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...

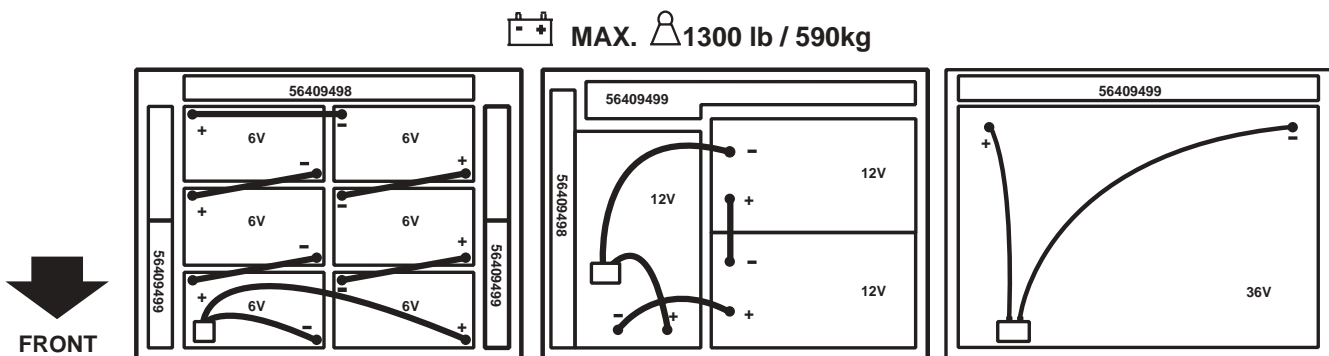
- Remove all jewelry.
- Do not smoke.
- Wear chemical goggles, rubber gloves and a protective apron.
- Work in a well-ventilated area.
- Do not allow tools to touch more than one battery terminal at a time.

### ⚠ 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 (33) OFF (O) and remove the key. Tip back the recovery tank to expose the battery compartment.
- 3 See Figure 1. Using (2) people and an appropriate lifting strap, carefully lift the batteries into the battery compartment and arrange as shown.
- 4 Insert spacers as shown. Install battery cables as shown and tighten the nuts on the battery terminals. Then coat the battery posts with grease.
- 5 Install the battery boots and secure tightly to the battery cables with the supplied tie straps.
- 6 Install the battery cover and connect the battery pack connector to the machine connector, tip the recovery tank back forward.

FIGURE 1



## DESCRIPTION OF THE BATTERY LOW VOLTAGE CUTOUT FEATURE

The models discussed in this manual are equipped with a low voltage cutout feature to prevent over-discharging of the batteries. When a machine's 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 1.75V per cell and alternate maintenance free battery (gel cell) setting is 1.83V per cell. The standard setting is factory selected and should be used unless the battery manufacturer specifies the higher cutout voltage.

## DESCRIPTION OF THE BATTERY CONDITION INDICATORS

The Battery Condition Indicator (17) will give an indication of the state of charge of the batteries. The battery condition indicator will retain the state-of-charge even if the key has been turned off. The state-of-charge indication is reset to full charge when the batteries have been recharged. It is also possible to choose between two different low voltage thresholds depending on whether maintenance free or standard batteries are being used (**have qualified service engineer perform this selection\***). NOTE: The following percentages are based on useable battery capacity not total battery capacity. Therefore, 100% discharge = 80% of total battery capacity for standard wet cell batteries or 70% of total battery capacity for maintenance free batteries.

**Green Indicator** = full charge down to 50% discharge

**Green & Yellow Indicator** = 50% discharge down to 75% discharge

**Yellow Indicator** = 75% discharge down to 90% discharge

**Yellow & Red Indicator** = 90% discharge down to 95% discharge

**Red Indicator** = 95% discharge down to 99% discharge

**Flashing Red Indicator** = 100% discharge - scrub system will automatically shut down

**\*Important Note:** See the Main Control Board Special Program Options manual section (located in the Electrical System) and follow the instructions for changing the low voltage cutout threshold.

## CHARGING THE BATTERIES

Charge the machine's battery pack each time the machine is used, or when the Battery Condition Indicator (31) 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 (9) located on the right control housing, next to the seat.
- 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 cell's filler tube.

## **WARNING!**

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

## 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 cells" in the battery system- that is, one or more cells 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 and drive motors 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.



# ELECTRICAL SYSTEM

## ACTUATOR DRIVE NUT ADJUSTMENT

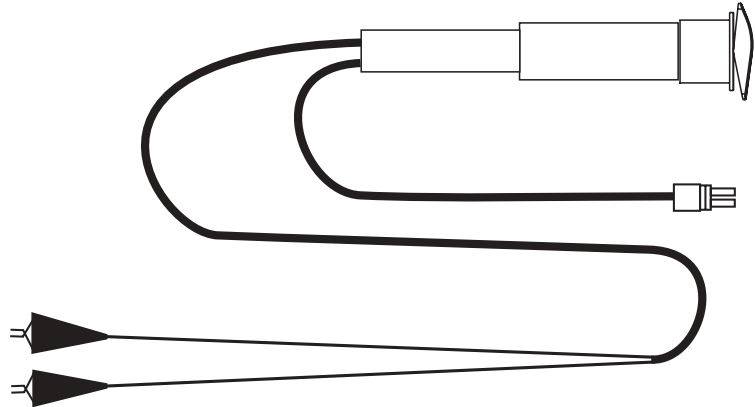
This manual section explains the steps for adjusting the drive nut settings for the machine's two lift actuator motors. Reference the chart below to find the IN & OUT dimensional specification for the specific actuator motor needing adjustment.

Part #	Actuator Motor	Drive Nut IN Position	Drive Nut OUT Position
56393303	Scrub Brush Lift	1/2" (13 mm)	4-1/4" (108 mm)
56393303	Squeegee Lift	2-3/8" (60 mm)	4-1/4" (108 mm)
56393303	Side Broom Lift (2042 / BR 1100C-XL only)	1" (25 mm)	4" (101 mm)

### General Instructions for All Actuator Motors

- 1 See Figure 2. This shows the special actuator power cord adapter (PN 56407502) that is needed to connect the machine's battery pack and actuator motor for setting the drive nut limit settings.
- 2 Open the machine battery compartment and disconnect the battery connector. The battery pack is needed to power the lift actuator motor to properly set the IN & OUT limit switches.
- 3 Connect the actuator motor to be tested to the power cord adapter end. Then connect the alligator clips from the cord adapter (red clip to the positive and black to negative) to battery connector or battery posts. The rocker switch is used to change the motor rotation in setting the correct drive nut dimension.

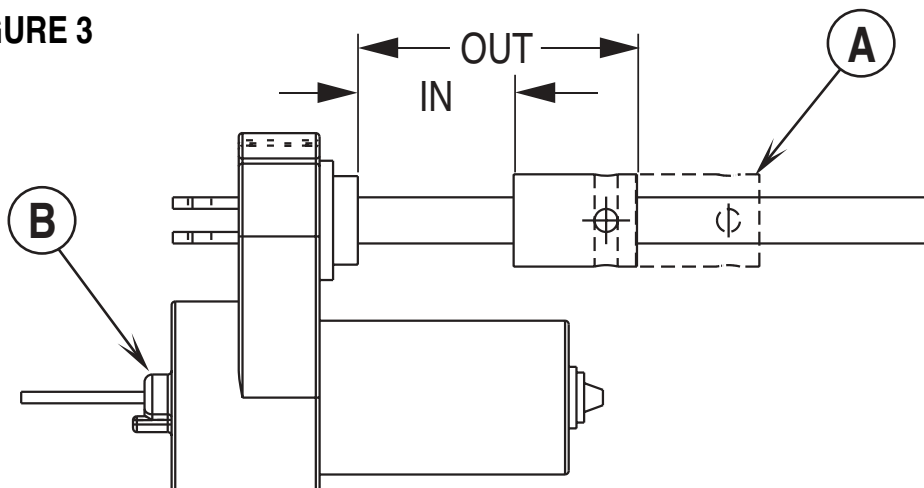
FIGURE 2



### Instructions for Squeegee and Side Broom Lift Actuator Drive Nut Adjustment

- 4 See Figure 3. Hold onto the Actuator Drive Nut (A) and press the rocker switch to run the drive motor and retract the nut towards the motor housing (its IN limit).
- 5 Measure the position of the drive nut on the actuator shaft. Manually turn the plastic drive nut to the IN position as shown in the chart.
- 6 Hold the drive nut then press the adapter cord rocker switch to run the drive motor to the OUT position (wait until the motor stops).
- 7 Measure the position of the drive nut on the shaft and compare the measurement with the OUT position shown in the chart.
- 8 When the measurement doesn't match the dimension shown in the chart it is necessary to remove the Adjuster Cover (B) and adjust the Out position.
- 9 To increase the travel of the drive nut, turn the adjuster clockwise. To decrease the travel of the nut, turn the adjuster counter clockwise. NOTE: Use a 5/16" wrench to turn the adjuster. Each click of the adjuster will change the nut travel 1/16 inch (1.6 mm).
- 10 After each adjustment, hold the drive nut, run the actuator IN & OUT and check both dimensions. After checking that the drive nut limits are set correctly then replace the adjuster cover. **Service Tip Note:** Use the above power cord adapter to help position the drive nut (in or out) for ease in actuator motor installations.

FIGURE 3





# ELECTRICAL SYSTEM

## Instructions for Scrub Brush Lift Actuator Drive Nut Adjustment

- 1 See Figures 4 & 5. On a new scrub lift actuator motor remove (spin-off) the Drive Nut (A) and install the short compression Spring (C) onto the actuator (lead screw) shaft first. Next reinstall the plastic drive nut as shown (with the nut pin pocket away from the motor).
- 2 Follow steps 4-10 in the section labeled Instructions for Squeegee and Side Broom Lift Actuator Drive Nut Adjustment (reference previous page).
- 3 After adjusting the actuator drive nut (dimensions) follow steps 10 and 11 (in the Scrub Brush Lift Actuator Removal manual section) to reassemble.

**Service Tip:** See Figure 5. Note the correct orientation of the Spring Housing (D) when installing the complete motor assembly and also run the drive nut to the OUT (extended) position for machine installation.

FIGURE 4

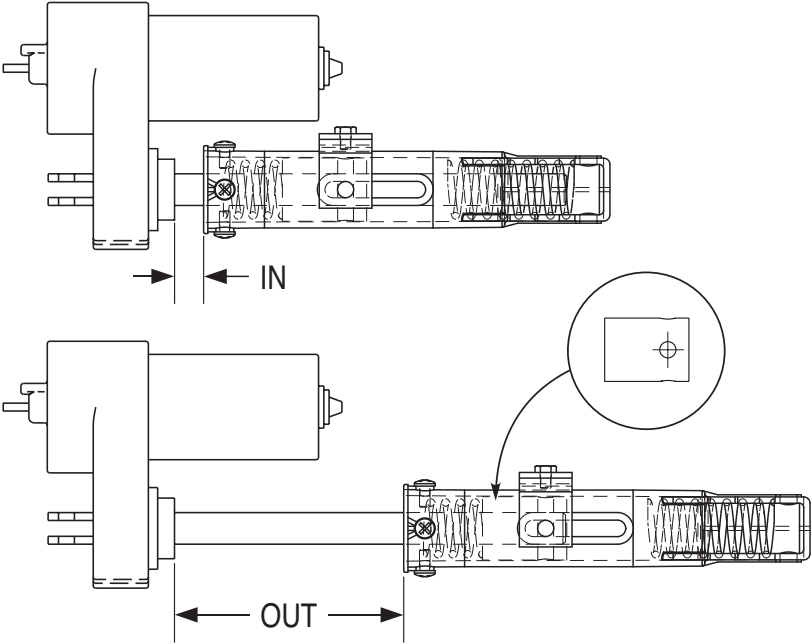
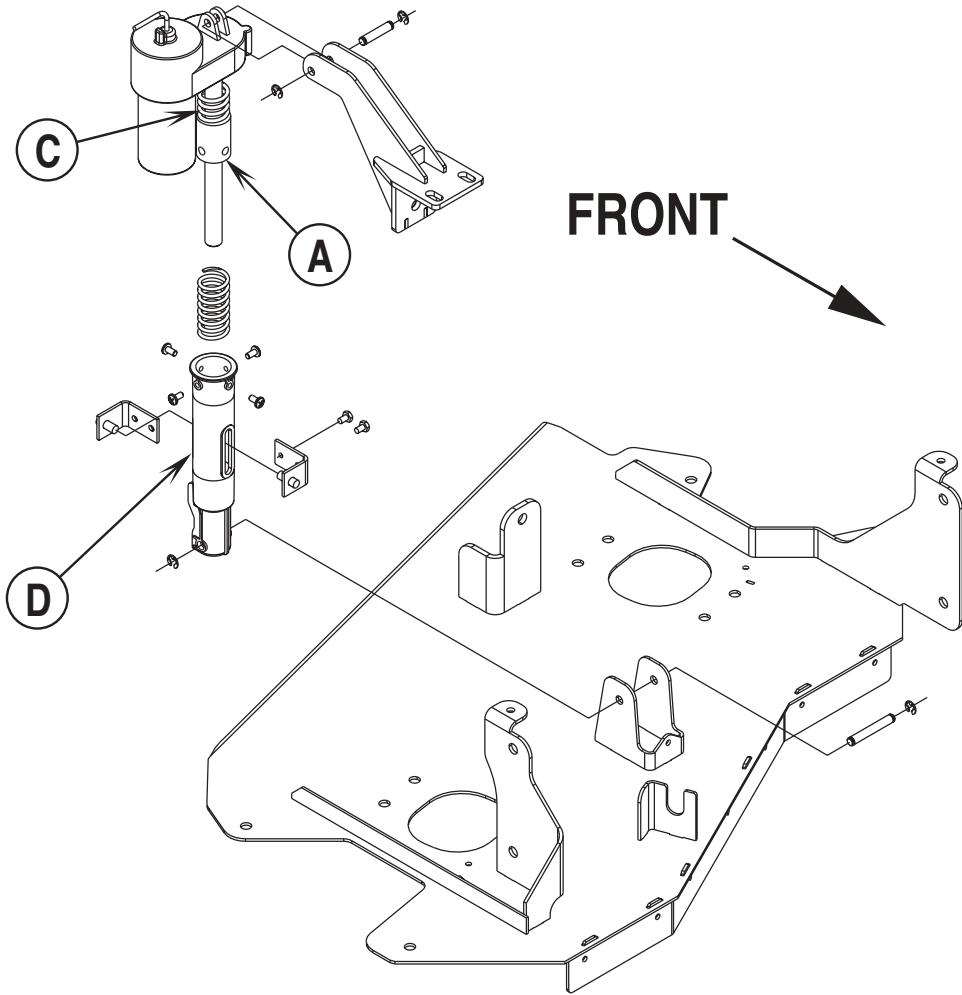


FIGURE 5



# ELECTRICAL SYSTEM

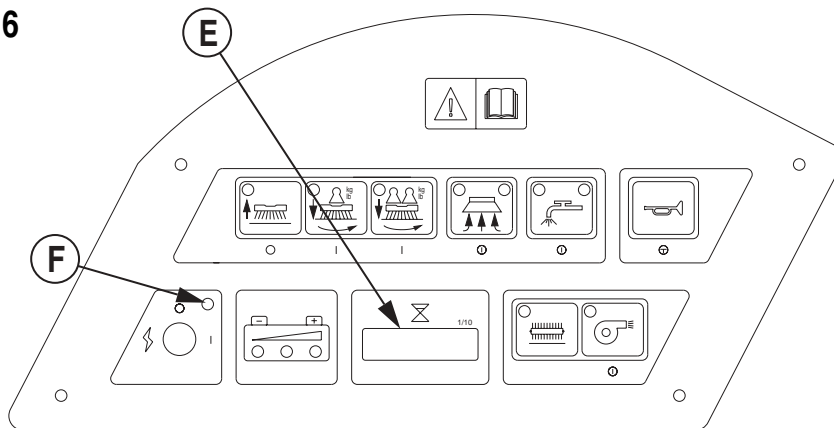
## CURTIS CONTROLLER DIAGNOSTICS

**Diagnostics Method A:** Uses the machine's control panel LED status display.

### FUNCTION OF THE SPEED CONTROLLER STATUS LIGHT AND DISPLAY

The Curtis 1243 speed control will output a fault code if there is a problem associated with the speed control and wheel drive system. See Figure 6. If a speed control fault occurs, the Hourmeter/Status display (E) will indicate "Err 03". When the Err03 is being displayed and detects a fault the Red Indicator (F) located by the key switch will flash a special error code sequence until the fault is corrected. See "Table 1" for a description of the fault indications. **Service Note:** Instructions on how to read the error code status light. Example, OO O = two light flashes, a short pause. One flash, long pause and the code will be repeated.

**FIGURE 6**



**Diagnostics Method B:** Uses the optional hand held programmer.

### PROGRAMMER DIAGNOSTICS

With a programmer, diagnostics and troubleshooting is more direct than with the LED alone. The programmer presents complete diagnostic information in plain language, no codes to decipher. Faults are displayed in the Diagnostic Menu, and the status of the controller inputs/outputs is displayed in the Test Menu.

The following 4-step process is generally used for diagnosing and troubleshooting an inoperative vehicle: (1) visually inspect the vehicle for obvious problems; (2) diagnose the problem, using the programmer; (3) test the circuitry with the programmer; and (4) correct the problem. Repeat the last three steps as necessary until the vehicle is operational.

Example: A vehicle that does not operate in "forward" is brought in for repair.

- 1 Examine the vehicle and its wiring for any obvious problems, such as broken wires or loose connections.
- 2 Connect the programmer, put it in diagnostic mode, and read the displayed fault information. In this example, the display shows "No Faults Present", indicating that the controller has not detected anything out of the norm.
- 3 Put the programmer in test mode, and observe the status of inputs and outputs in the forward direction. In this example, the display shows that the forward input did not activate when "forward" was selected, which means the problem is either in the electronic throttle or the throttle wiring.
- 4 Check or replace the electronic throttle and wiring and repeat the test. If the programmer shows the forward switch closing and the vehicle now drives normally, the problem has been corrected.

Refer to the Status Fault Codes (Table 1) for suggestions covering a wide range of possible faults.

### DIAGNOSTIC HISTORY

The handheld programmer can be used to access the controller's diagnostic history file. Connect the programmer, press the MORE INFO key, and then while continuing to hold the MORE INFO key, press the DIAGNOSTICS key. The programmer will read out all the faults that the controller has experienced since the last time the diagnostic history file was cleared. The faults may be intermittent faults, faults caused by loose wires, or faults caused by operator errors. Faults such as contactor faults may be the result of loose wires; contactor wiring should be carefully checked out. Faults such as HPD or over temperature may be caused by operator habits or by overloading.

After a problem has been diagnosed and corrected, clearing the diagnostic history file is advisable. This allows the controller to accumulate a new file of faults. By checking the new diagnostic history file at a later date, you can readily determine whether the problem was indeed completely fixed.

To clear the diagnostic history file, go to the Special Program Menu (by pressing and holding the MORE INFO key, and then pressing the PROGRAM key), scroll through the menu until "Clear Diagnostic History" is the top line in the display, and then press MORE INFO again. The programmer will prompt you to acknowledge or cancel.

See the PROGRAMMER OPERATION section of this chapter for more detail on programmer operation.

# ELECTRICAL SYSTEM

**STATUS LED FAULT CODES (TABLE 1)**

LED CODE	STATUS LIGHT DISPLAY	EXPLANATION	POSSIBLE CAUSE
Off	■■■■■	No power or defective controller	
Solid On	□	Controller or microprocessor fault	
1,1	0 0	Current sensor error	1. Controller defective.
1,2	0 00	Hardware failsafe error	1. Controller defective.
1,3	0 000	M- fault or motor output short	1. Internal M- short to B-. Controller defective.
1,4	0 0000	SRO fault	1. Improper sequence of KSI*, interlock (seat switch), and direction inputs. 2. Wrong SRO type selected. 3. Interlock or direction switch circuit open. 4. Sequencing delay too short.
2,1	00 0	Throttle wiper fault	1. Throttle input wire open. 2. Throttle input wire shorted to B+ or B-. 3. Throttle pot defective. 4. Wrong throttle type selected
2,3	00 000	HPD fault	1. Improper sequence of KSI*, interlock, and throttle inputs. 2. Wrong HPD type selected. 3. Misadjusted throttle pot. 4. Sequencing delay too short.
2,4	00 0000	Pot low input fault	1. Throttle pot wire open. 2. Throttle pot wire shorted. 3. Wrong throttle type selected.
3,1	000 0	Contact driver overcurrent or field winding shorted	1. Main contactor coil shorted. 2. Field winding shorted.
3,2	000 00	Main contactor welded	1. Main contactor stuck closed. 2. Main contactor driver shorted.
3,3	000 000	Motor field winding open	1. Field winding connection open. 2. Field winding open.
3,4	000 0000	Missing contactor	1. Main contactor coil open. 2. Main contactor missing. 3. Wire to main contactor open.
4,1	0000 0	Low battery voltage	1. Battery voltage <undervoltage cutback limit. 2. Corroded battery terminal. 3. Loose battery or controller terminal.
4,2	0000 00	Overvoltage	1. Battery voltage >overvoltage shutdown limit. 2. Vehicle operating with charger attached.
4,3	0000 000	Over / Under-temp. cutback	1. Temperature >85°C (185°F) or <25°C (-13°F). 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. Operation in extreme environments.
4,4	0000 0000	Anti-tiedown fault	1. Mode switches shorted to B+ 2. Mode switches "tied down" to select Mode 2 or Mode 4 permanently.

**\*NOTE:** A KSI (key switch input) system problem is a specific HPD (high pedal disable) type operational fault, caused by the operator activating the Fwd/Rev drive pedal before turning on the main key switch or activating the throttle before sitting on the seat. This can be cleared by returning the operator's drive pedal to neutral and cycling the key switch OFF and ON.

# ELECTRICAL SYSTEM

## INSTALLATION CHECKOUT FOR THE CURTIS SPEED CONTROLLER

### SAFETY!

The 1243 controller is inherently a high power device. When working around any battery powered vehicle, proper safety precautions should be taken. These include, but are not limited to: proper training, wearing eye protection, avoiding loose clothing and jewelry, and using insulated wrenches.

After installing a controller and before operating the vehicle, carefully complete the following checkout procedure. If you find a problem during the checkout, refer to the DIAGNOSTICS section of this chapter for further information.

The installation checkout can be conducted with or without the handheld programmer. The checkout procedure is easier with a programmer otherwise observe the Status LED for codes. The part number of the handheld programmer is **56409441**. **NOTE:** The Hydro-Retriever™ 3800 / BR 1100 has a newer revision controller if you have a programmer with a serial number before 2100 you will need to update your programmer. A free upgrade kit is available, order part number **56409822**. Also a different quad 4 pin programmer cable (PN **56409823**) is needed to link the programmer to the controller plug-in port.

### WARNING!

Put the vehicle up on blocks to get the drive wheel off the ground before beginning these tests.

Turn the key switch off and make sure that the seat switch is open, and the throttle is in neutral.

Do not stand, or allow anyone else to stand, directly in front of or behind the vehicle during the tests.

- 1 Remove electrical panel to access controller then observe LED status light on controller. If a programmer is available, connect it to the programmer connector.
- 2 Turn the key switch on. The programmer should “power up” with an initial display, and the controller’s Status LED should begin steadily blinking a single flash (once every 5 seconds). If neither happens, check for continuity in the key switch circuit and controller ground.
- 3 If you are using a programmer, put it into the diagnostic mode by pressing the DIAGNOSTICS key. The display should indicate “No Faults Found”. Note: Before pressing the diagnostics key, wait until model # screen appears, if the throttle is activated prior to this screen appearing the controller will shut down.
  - Close the seat switch (sit in the seat). The LED should continue blinking a single flash (every 5 seconds) and the programmer should continue to indicate no faults. If there is a problem, the LED will flash a diagnostic code and the programmer will display a diagnostic message. If you are conducting the checkout without a programmer, look up the LED diagnostic code in the DIAGNOSTICS section of this chapter (**Table 1**).
  - When the problem has been corrected, it may be necessary to cycle the key or seat switch to clear the fault code.
- 4 While sitting on the seat, operate the throttle. The motor should begin to turn in the selected direction. If it does not, verify the wiring to the main contactor, and the motor. The motor should run proportionally faster with increasing throttle. If not, refer to the DIAGNOSTICS section of this chapter (**Table 1**).
- 5 If you are using a programmer, put it into the test mode by pressing the TEST key. Scroll down to observe the status of the forward, reverse and brake switch (brake switch is actually the seat switch on the Hydro-Retriever™ 3800 / BR 1100 / 2042 and BR 1100C-XL). Cycle each switch in turn, observing the programmer. Each input should show the correct state on the programmer.
- 6 Take the vehicle off the blocks and drive it in an open area. It should have smooth acceleration and good top speed.

## PROGRAMMING VEHICLE SPEED CHANGES

The maximum high-speed (transport) and maximum low speed (scrub) can be changed electronically, using the handheld programmer. To change a parameter using the programmer, press the PROGRAM key, and scroll down the Program Menu until the desired parameter is the top line of the display. Press the appropriate CHANGE VALUE key (“up” or “down”) until the desired number is reached. The parameter is now set at the desired value. All programming occurs in real time. In other words, the parameters can be changed while the vehicle is in operation.

The upper and lower limits of parameters are set at the factory. Some parameters have dependencies on other parameters. When the programmer is being used to adjust a parameter and a limit is reached, the display will stop changing. To see why the display has stopped changing, press the MORE INFO key. If the limit is related to another parameter, that information will be displayed; changing the value of the related parameter may allow the original parameter to be adjusted further. Otherwise, the display simply says “Max Limit” or “Min Limit.”

Use of the programmer is described more fully in the PROGRAMMER OPERATION section of this chapter.

## MAINTENANCE

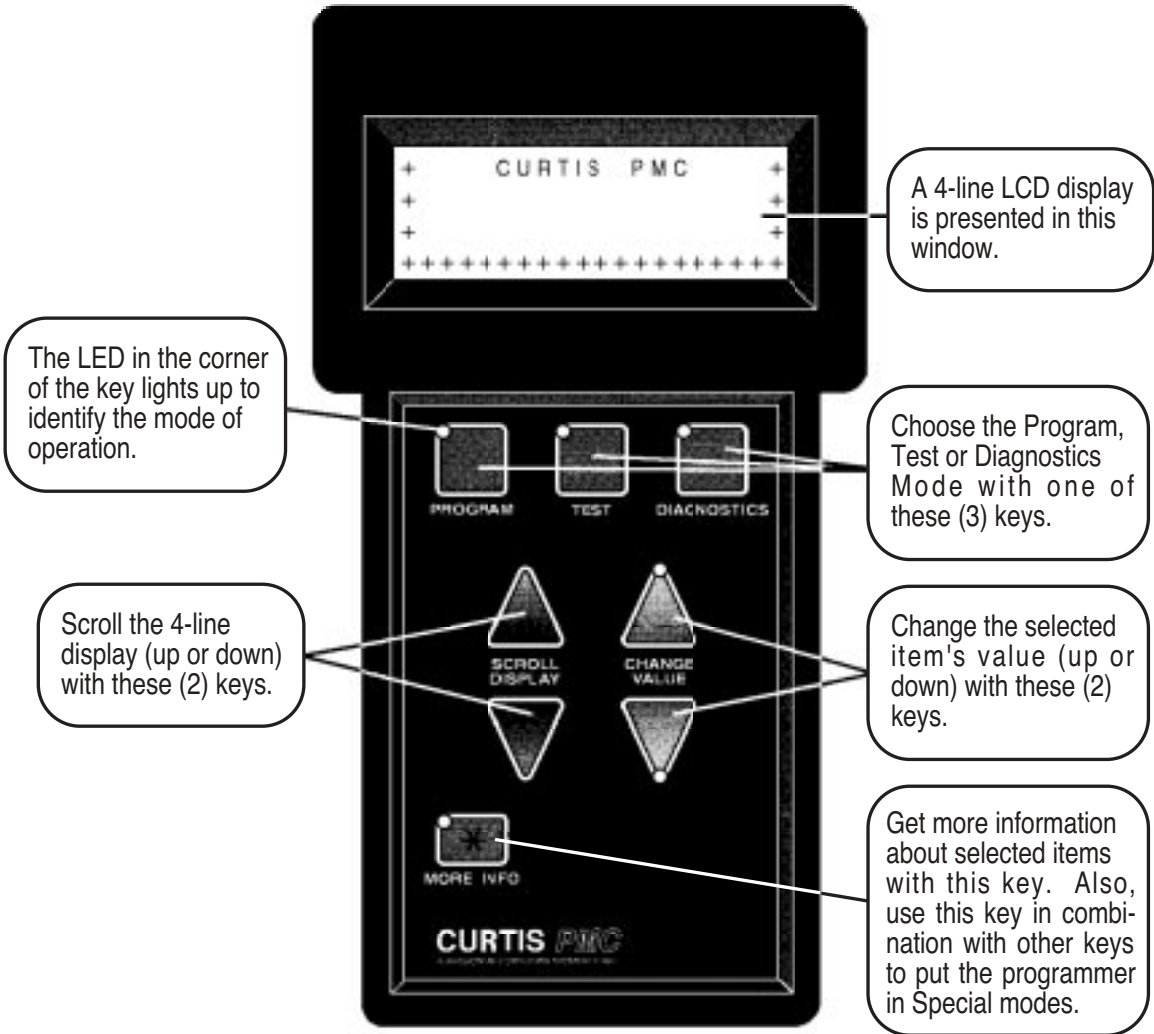
There are no user-serviceable parts inside the Curtis PMC 1243 controller. No attempt should be made to open the controller. Opening the controller may damage it and will void the warranty.

However, it is recommended that the controller exterior be cleaned periodically, and if a handheld programmer is available, this periodic cleaning provides a good opportunity to check the controller’s diagnostic history file.

**PROGRAMMER OPERATION**

The optional universal Curtis PMC handheld programmer / **PART NUMBER 56409441** (Figure 7) allows you to program, test, and diagnose Curtis PMC 1243 controllers. The programmer is powered by the host 1243 controller, via a modular connector located in the front of the controller.

**FIGURE 7**



When the programmer is first plugged into the controller, wait until the programmer has acquired all the controller parameters. When this step has been completed, the programmer displays the controller's model number, date of manufacture and software revision code. Following this initial display, the programmer displays a prompt for further instructions.

# ELECTRICAL SYSTEM

## PROGRAMMER OPERATION (CONTINUED)

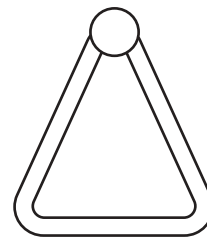
The programmer is operated via an 8-key keypad. Three keys select operating modes (Program, Test, Diagnostics), two scroll the display up and down, and two change the values of selected parameters. The eighth key, the MORE INFO key, is used to display further information about selected items within any of the three standard modes. In addition, when pressed together with the PROGRAM or the DIAGNOSTICS key, the MORE INFO key selects the Special Program mode or the Special Diagnostics mode.

The display window presents a 4-line LCD display. The display is visible even in bright sunlight. You can adjust the display contrast in the Special Program mode.

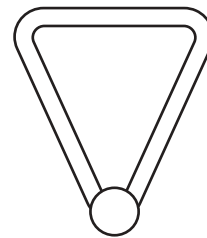
When one of the menu keys is pressed, the LED at the corner of the key lights up, identifying the mode of programmer operation. For example, if the TEST key is pressed, the LED at the corner of the key indicates that the programmer is now in the Test mode, and the Test Menu is displayed.

Four lines of a menu are displayed at a time. The item at the top of the display window is the selected item. To select an item, scroll within the menu until the desired item is positioned at the top of the display window. The selected item is always the top line. (In the Program mode, the selected item is highlighted by a flashing arrow). To modify a parameter or obtain more information about it, it must be scrolled to the top position in the display window.

To scroll up and down within a menu, use the two SCROLL DISPLAY arrow keys. The SCROLL DISPLAY arrow keys can be pressed repeatedly or be held down. When a key is held down, the scrolling speed increases the longer the key is held.

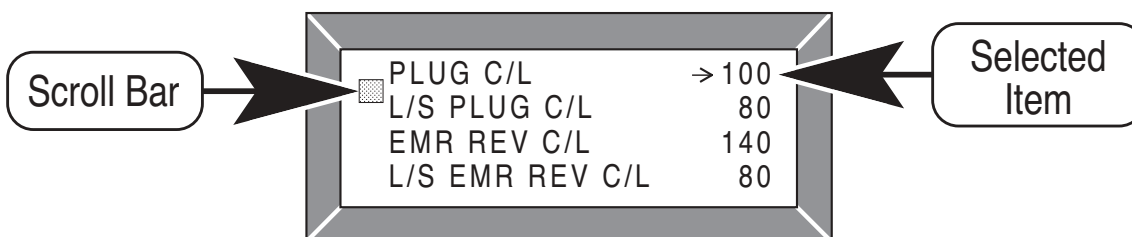


**SCROLL  
DISPLAY**



A small scroll bar at the left of the display window provides a rough indication of the position of the four displayed items within the entire menu. That is, when the bar is at the top of the window, the top of the menu is displayed. As you scroll through the menu, the bar moves downward. When the bar is at the very bottom of the window, you have reached the end of the menu. This sample display is from the Program Menu (Figure 8).

**FIGURE 8**



# ELECTRICAL SYSTEM

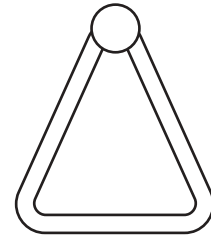
## PROGRAMMER OPERATION (CONTINUED)

The two CHANGE VALUE arrow keys are used to increase or decrease the value of a selected menu item. Like the SCROLL DISPLAY arrow keys, the CHANGE VALUE arrow keys can be pressed repeatedly or be held down. The longer a key is held, the faster the parameter changes. This allows rapid changing of any parameter.

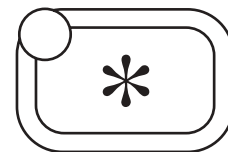
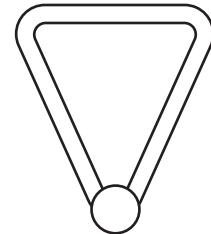
An LED on each CHANGE VALUE arrow key indicates whether the key is active and whether change is permissible. When the value of a parameter is being increased, the LED on the “up” CHANGE VALUE key is on until you reach the maximum value for that parameter. When the LED goes off, you cannot increase the value.

The MORE INFO key has three functions: (1) to display more information about the selected item, (2) to access the Special Program and Special Diagnostics modes (when used together with the PROGRAM and DIAGNOSTICS keys), and (3) to initiate certain commands (such as the Self Test).

“More information” is available in all of the programmer operating modes. After using the MORE INFO key to display additional information about the selected item, press the MORE INFO key again to return to the original list.



**CHANGE  
VALUE**



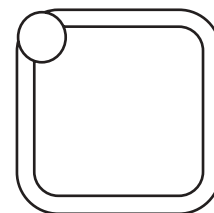
**MORE INFO**

## OPERATING MODES

### PROGRAM MODE

In the **Program** mode, accessed by pressing the PROGRAM key, all the adjustable parameters and features of the controller are displayed (four at a time), along with their present settings. The setting of the selected item, the item at the top of the display, with the flashing arrow can be changed, using the two CHANGE VALUE keys.

The LEDs on these keys indicate whether there is still room for change. That is, when the upper limit of a parameter's range is reached, the LED on the “up” key no longer lights up indicating that the present value cannot be increased; when the lower limit is reached, the LED on the “down” key no longer lights up.



**PROGRAM**

# ELECTRICAL SYSTEM

## OPERATING MODES (CONTINUED)

The MORE INFO key, when used in the Program mode, displays a bar graph along with the minimum and maximum values possible for the selected parameter. Parameters can be changed either from the main Program Menu or after the MORE INFO key has been pressed and the additional information is being displayed.

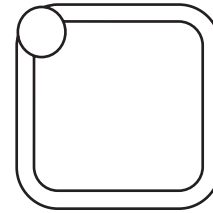
### PROGRAM MENU

M1MAX	High speed (transport), as percent of full throttle
M2MAX	Low speed (scrubbing), as percent of full throttle

## TEST MODE

In the **Test** mode, accessed by pressing the TEST key, real-time information is displayed about the status of the inputs, outputs, and controller temperature. For example, when the status of the forward switch is displayed, it should read "On/Off/On/Off/On/Off" as the switch is repeatedly turned on and off. In the Test mode, the item of interest does not need to be the top item on the list; it only needs to be among the four items visible in the window. The Test mode is useful for checking out the operation of the controller during initial installation, and also for troubleshooting should problems occur.

The MORE INFO key, when used in the Test mode, causes additional information to be displayed about the selected item (top line in the window).



**TEST**

### TEST MENU

THROTTLE %	Throttle reading, as % of full throttle
FIELD CURRENT	Motor field current, in amps
ARM CURRENT	Motor armature current, in amps
FIELD PWM	Motor field applied duty cycle, as %
ARM PWM	Motor armature appl'd duty cycle, as %
BATT VOLTAGE	Battery voltage across the capacitors
HEATSINK TEMP	Heatsink temperature, in °C
FORWARD INPUT	Forward switch: on/off
REVERSE INPUT	Reverse switch: on/off
MODE INPUT A	Mode Select 1 switch: on/off
MODE INPUT B	Mode Select 2 switch: on/off
INTERLOCK	Interlock switch: on/off
EMR REV INPUT	Emergency reverse switch: on/off
MAIN CONT	Main contactor: on/off
AUX DRIVER	Auxiliary driver: on/off

**Note:** Some items may not be available on all 1243 models.



# ELECTRICAL SYSTEM

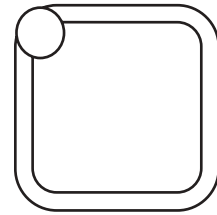
## OPERATING MODES (CONTINUED)

### DIAGNOSTICS MODE

In the **Diagnostics** mode, accessed by pressing the DIAGNOSTICS key, currently active faults detected by the controller are displayed.

The MORE INFO key, when used in the Diagnostics mode, causes additional information to be displayed about the selected item.

The following is not a menu as such, but a list of possible messages you may see displayed when the programmer is operating in either of the Diagnostics modes.



**DIAGNOSTICS**

### DIAGNOSTICS AND SPECIAL DIAGNOSTICS MENU

ANTI-TIEDOWN	Mode Select 1 switch closed at startup
CONT COIL/FLD SHORT	Contactor driver overcurrent or field winding short
CURRENT SHUNT FAULT	Current sensor error
EMR REV WIRING	Emerg. reverse wiring check failed
FIELD OPEN	Motor field winding open
HPD	High-pedal disable (HPD) activated
HW FAILSAFE	Hardware failsafe activated
LOW BATTERY VOLTAGE	Battery voltage too low
M- SHORTED	M- shorted to B-
MAIN CONT WELDED	Welded main contactor
MISSING CONTACTOR	Missing contactor
NO KNOWN FAULTS	No known faults
OVERVOLTAGE	Battery voltage too high
SRO	Static return to off (SRO) activated
THERMAL CUTBACK	Cutback, due to over/under temp
THROTTLE FAULT 1	Throttle wiper input fault
THROTTLE FAULT 2	Throttle low input fault

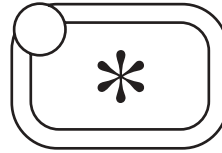
# ELECTRICAL SYSTEM

## OPERATING MODES (CONTINUED)

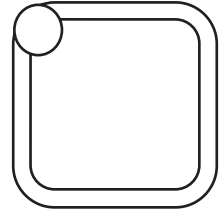
### SPECIAL PROGRAM MODE

The **Special Program** mode allows you to perform a variety of tasks, most of which are self-explanatory. Through the Special Program Menu, you can revert to earlier settings, save controller settings into the programmer memory, load the controller settings from the programmer into a controller, clear the controller's diagnostic history, adjust the contrast of the programmer's LCD display, select the language to be displayed by the programmer, and display basic information (model number, etc.) about the controller and the programmer.

To access the Special Program mode, first press the MORE INFO key. Then, while continuing to hold the MORE INFO key, press the PROGRAM key. The LED on the PROGRAM key will light, just as when the programmer is in Program mode. To distinguish between the program and Special Program modes, look at the menu items in the display.



**MORE INFO**



**PROGRAM**

The MORE INFO key is used initially to access the Special Program mode, and once you are within the Special Program mode, it is used to perform the desired tasks. To adjust the contrast in the display window, for example, select "Contrast Adjustment" by scrolling until this item is at the top of the screen, and then press MORE INFO to find out how to make the adjustment.

#### SPECIAL PROGRAM MENU

RESET ALL SETTINGS	Revert to original settings
CONT SETTINGS - PROG	Save controller settings in programmer
PROG SETTINGS - CONT	Load programmer settings in controller
CLEAR DIAG HISTORY	Clear diagnostic history memory
CONTRAST ADJUSTMENT	Adjust display contrast
LANGUAGE SELECTION	Select displayed language
PROGRAMMER INFO	Display programmer information
CONTROLLER INFO	Display controller information

# ELECTRICAL SYSTEM

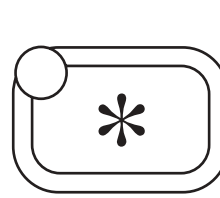
## OPERATING MODES (CONTINUED)

### SPECIAL DIAGNOSTICS MODE

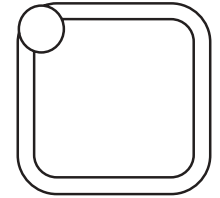
In the **Special Diagnostics** mode, the controller's diagnostic history file is displayed. This file includes a list of all faults observed and recorded by the controller since the history was last cleared. (**Note:** The maximum and minimum temperatures recorded by the controller are included in the Test Menu). Each fault is listed in the diagnostic history file only once, regardless of the number of times it occurred.

To access Special Diagnostics, first press the MORE INFO key. Then, while continuing to hold the MORE INFO key, press the DIAGNOSTICS key. The LED on the DIAGNOSTICS key will light, just as when the programmer is in Diagnostics mode. The seat switch must be open in order to access the diagnostic history file.

The MORE INFO key, when used within the Special Diagnostics mode, causes additional information to be displayed about the selected item.



**MORE INFO**



**DIAGNOSTICS**

To clear the diagnostic history file, put the programmer into the Special Program mode, select "Clear Diagnostic History", and press the MORE INFO key for instructions. Clearing the diagnostic history file also resets the maximum/minimum temperatures in the Test Menu.

### DIAGNOSTICS AND SPECIAL DIAGNOSTICS MENU

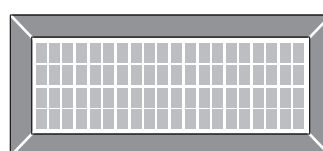
ANTI-TIEDOWN	Mode Select 1 switch closed at startup
CONT COIL/FLD SHORT	Contactor driver overcurrent or field winding short
CURRENT SHUNT FAULT	Current sensor error
EMR REV WIRING	Emerg. Reverse wiring check failed
FIELD OPEN	Motor field winding open
HPD	High-pedal disable (HPD) activated
HW FAILSAFE	Hardware failsafe activated
LOW BATTERY VOLTAGE	Battery voltage too low
M- SHORTED	M- shorted to B-
MAIN CONT WELDED	Welded main contactor
MISSING CONTACTOR	Missing contactor
NO KNOWN FAULTS	No known faults
OVERVOLTAGE	Battery voltage too high
SRO	Static return to off (SRO) activated
THERMAL CUTBACK	Cutback, due to over/under temp
THROTTLE FAULT 1	Throttle wiper input fault
THROTTLE FAULT 2	Throttle low input fault

## PEACE-OF-MIND PROGRAMMING

Each time the programmer is connected to the controller, it acquires all the controller's parameters and stores them in its temporary memory. You can revert back to these original settings at any time during a programming session via the Special Program Menu. Select "Revert to Previous Settings" by scrolling it to the top of the display window, press the MORE INFO key, and follow the instructions displayed. Any inadvertent changing of parameters can be "undone" using this procedure, even if you can't remember what the previous settings were, **as long as the programmer has not been unplugged and power has not been removed from the controller.**

## PROGRAMMER SELF TEST

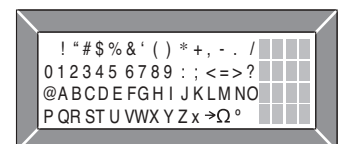
You can test the programmer by displaying two special test screens. Press the MORE INFO key while the programmer is powering up. During the Self-Test, you can toggle between the two test screens by pressing the SCROLL DISPLAY keys (Figure 9). The first screen turns on every LCD element and the second screen displays all the characters used in the various menus. As part of the Self-Test, you can also test the keys by pressing each one and observing whether its corner LED lights up. To exit the Self-Test, unplug the programmer or turn off the controller, and then repower it without holding the MORE INFO key.



**SCROLL  
DISPLAY**



**FIGURE 9**



# ELECTRICAL SYSTEM

## FUNCTIONAL OVERVIEW OF MAIN CONTROL BOARD

The primary function of the main control board is to position the scrubbing brush(s) with respect to the floor surface using a lift actuator motor to maintain the correct brush pressure and current draw of the brush motor. When the normal scrub or heavy scrub switch is depressed this will lower the scrub deck to the operating position and by activating the foot pedal start the brush motor. The controller is continuously monitoring the current to the brush motor and when it senses a current draw out of the desired range it automatically raises or lowers the brush deck by turning on the brush actuator motor. This process is repeated until the brush motor is shut off. The controller also manages the other supportive systems such as the squeegee lift, solution on/off, and vacuum motor. Note: See the Know Your Machine system in this manual for a complete explanation of the machine's operation.

The secondary function of the main control is to detect any system failures and display an error code on the hour meter display or store it in the main control board's recall memory mode. The error code(s) are used to help the serviceperson determine the fault and to quickly guide in repairing a specific system malfunction. Note: See the Troubleshooting Guide for further information.

An additional special feature of the main control board is to change program settings for a set of specific machine functions. See the Main Control Board Special Program Options section in this manual for further information.

## TROUBLESHOOTING GUIDE

Any error codes detected by main control board will be displayed on the hour meter LED display as they occur. If more than one-error exists the display will sequence through the error codes at one-second intervals. The error display will show on the hour meter as the letters Err followed by a two-digit code. EX: Err01 would be a non-fatal control fault. **When troubleshooting any "Fault Description" noted with a double asterisk (\*\*) follow the instructions for temporarily disabling the control boards special fault detection program.** See the Main Control Board Special Program Options section in this manual.

## MAIN CONTROLLER ERROR CODES

Error Code	Fault Description	Troubleshooting Action
Err01	Controller fault	1. Turn key switch off and back on. 2. If error fault returns, go into the <b>Fault Recall Mode*</b> (Main Control Board Special Program Options) to further investigate other possible causes. Make repairs to all electrical system faults found in the fault recall check. Replace control board only as the last step when troubleshooting.
Err02	Critical control fault	Same as Err01. Check <b>Fault Recall Mode*</b> . Replace control board. Follow troubleshooting actions listed for Err01.
Err03	Drive system fault	1. Check for a tripped drive motor circuit breaker (80 amp). Investigate reason for possible mechanical over load. Examples: sticking brakes, parking brake slide lever not released, prolonged ramp climbing. 2. See Curtis drive motor controller section to further troubleshoot the drive system ( <b>Table 1</b> ).
Err04	Scrub deck lift actuator overload	Check for binding of brush lift linkage and excessive weight on scrub brush deck. Repair.
Err05	Scrub deck lift actuator severe overload	1. Check for binding or frozen brush lift linkage and excessive weight on brush deck. 2. Check for short circuit in brush motor and wiring. Repair or replace.
Err06	Scrub deck lift actuator circuit open (**)	1. Check for disconnected actuator wiring, open in wiring or defective actuator motor. Repair or replace. 2. Controller failure (replace).

\* See the Main Control Board Special Program Options section to activate the Fault Recall function.

# ELECTRICAL SYSTEM

## MAIN CONTROLLER ERROR CODES (CONTINUED)

Error Code	Fault Description	Troubleshooting Action
Err07	Scrub motor overload	Check for binding in rotation of brushes or improper brush lift actuator operation. 2. Check the negative supply cable at the brush motor for a wiring problem or improper modifications (this is a special cable and must be replaced with the original OEM PN 56410113). 3. Check to see that the proper brush type is selected*** (disc or cyl).
Err08	Scrub motor severe overload	1. Same as Err07. 2. Check for short circuit in brush motor or wiring. 3. Inspect gearbox for failure. Repair or replace.
Err09	Scrub motor circuit open (**)	1. Check for open in brush motor wiring or defective motor. 2. Check the negative supply cable at the brush motor for a wiring problem or improper modifications (this is a special cable and must be replaced with the original OEM PN 56410113). 3. Replace defective brush motor contactor. 4. Check if brushes are installed.
Err10	Scrub motor contactor contacts shorted	Check solenoid for welded contacts (continuity test). If welded replace solenoid.
Err12	Scrub motor contactor coil overload	1. Check for wiring problems. 2. Check coil resistance if below 102 ohms replace solenoid.
Err13	Scrub motor contactor coil severe overload	1. Same as error code 12. 2. Shorted coil. Replace.
Err14	Scrub motor contactor coil circuit open (**)	1. Check for an open in the coil wiring 2. Check solenoid coil for high resistance (infinity). Repair or replace. 3. Controller failure (replace).
Err17	Scrub motor cable thermistor fault	Machine exposed to a very cold or hot operating temperature. Allow machine to be warmed or cooled to room temperature. Temp range 32°F to 185°F (0 to 85°C) 2. Cable failure, replace the brush motor negative cable assemble (this is a special cable and must be replaced with an original OEM PN 56410113). Note: Machine will still operate if error persists, replace.
Err18	Squeegee lift actuator overload	Check for binding of squeegee lift linkage and excessive weight of squeegee. Repair.
Err19	Squeegee lift actuator severe overload	Check for binding or frozen squeegee lift linkage and excessive weight on squeegee. 2. Check for short circuit in wiring or actuator motor. Repair or replace.
Err20	Squeegee lift actuator circuit open (**)	1. Check for disconnected actuator wiring, open in wiring or defective actuator motor, Repair or replace. 2. Controller failure (replace).
Err24	Vacuum motor overload	1. Check for debris in vac motor. 2. Worn carbon brushes. 3. Defective motor bearings. Repair or replace.
Err25	Vacuum motor severe overload	Check for short circuit in vac motor or wiring.
Err26	Vacuum motor circuit open (**)	1. Check for disconnected vacuum motor wiring, open in wiring, defective vacuum motor and vac contactor failure. Repair or replace. 2. Controller failure (replace).
Err27	Vacuum contactor contacts shorted	Check solenoid for welded contacts (continuity test). If welded replace solenoid.

\*\*\* See the Main Control Board Special Program Options section to activate the Brush Type Selection function.

# ELECTRICAL SYSTEM

## MAIN CONTROLLER ERROR CODES (CONTINUED)

Error Code	Fault Description	Troubleshooting Action
Err29	Vacuum contactor coil overload	1. Check for correct wiring. 2. Check coil resistance if below 183 ohms replace solenoid.
Err30	Vacuum contactor coil severe overload	1. Same as error code 29. 2. Check for a short circuit in wiring or solenoid coil. Repair or replace.
Err31	Vacuum contactor coil circuit open (**)	1. Check for open in coil wiring. 2. If wiring checks OK, replace solenoid. 3. Controller failure (replace).
Err32	Solution solenoid overload	1. Check for a wiring problem. 2. Check coil resistance (spec. is 95 Ohms + or – 10%). Replace contactor if lower than 85 Ohms.
Err33	Solution solenoid severe overload	Check for a short circuit in wiring or solenoid valve. Repair or replace.
Err34	Solution solenoid circuit open (**)	1. Check for disconnected solenoid wiring plug, open in wiring or defective solenoid. Repair or replace. 2. Controller failure (replace).
Err35	External wiring fault	Identify the 4 wire pin connector (J1) on the control board (2 Red/Brn, 1 Blk, 1 Wht/Brn). Check the 2 Red/Brn wires for 36 volts input to the connector. Repair.
Err36	No accessory output voltage	Identify the same 4 wire pin connector called out in Err35. Check the Wht/Brn wire for 36 volts (output) and all component load connections down line. Repair. 2. Possible controller failure.
Err40	Wheel drive auxiliary direction input fault	1. Check Aux driver Brn/Wht wire for continuity. If open repair wire. 2. Check for a 36V auxiliary drive output****, if it reads 0-volts replace A1 Curtis controller, if it reads 36V replace A3 main controller.
Err41	Pre-sweep/dust control contactor coils K4 & K5 overload or side broom motors contactor coil K4 overload	Check coil resistance (PN 56410087) spec 216 Ohms + or – 10% if lower than 183 ohms 15% replace contactor.
Err42	Pre-sweep/dust control contactor coils K4 & K5 severe overload or side broom motors contactor coil K4 severe overload	1. See error code 41. 2. Check for short circuit in wiring and contactor coil.
Err43	Pre-sweep contactor K5 coil circuit open/output fault (**)	1. Check for disconnected wiring, open in wiring, open in coil windings (infinity) and a defective S4 switch. Repair or replace. 2. Next check coil voltage (36V) if 0 volts replace the controller A3.
Err46	Dust control or side broom motor(s) contactor coil K4 circuit open/output fault (**)	1. Check for disconnected wiring, open in wiring and open in coil winding (infinity). Repair or replace. 2. Next check for coil voltage (36V) if 0 volts replace the controller A3.

\*\*\*\* To check for output voltage the drive pedal must be in either forward or reverse to allow the Curtis controller (A1) to close the auxiliary output circuit. See the scrub brush system functional overview for an explanation of the speed control's auxiliary driver output circuit.

# ELECTRICAL SYSTEM

## ADDITIONAL ERROR CODE TROUBLESHOOTING INFORMATION

When entering the main controller error fault recall mode and a fault Err01 or Err02 has been detected, the service person may see a second set of error codes. Refer to the chart below that shows the additional fault error codes by machine system.

These secondary codes give information on a specific failure that is internal on the control board circuit. Therefore it is important to follow through with all troubleshooting actions of any system faults that support an internal controller circuit failure before replacing a new main control board. Example: A shorted solution solenoid valve causes a control fault 01 or 02 which appears on the machine's hour meter / status display. The service person brings up the fault recall memory and sees additional two-digit number(s) as shown in error code range in the chart below. A complete check of that fault area would be completed before installing a new main control board.

	Error Code	Fault Area By Machine System	Re-check troubleshooting actions for Main Controller Error Codes
A	60 61 89	Vacuum Motor Solenoid	Err24 – Err31
B	62 63 96	Brush Motor Solenoid	Err07 – Err17
C	74	Squeegee Actuator	Err18 – Err20
D	80	Brush Lift Actuator	Err04 – Err06
E	84	Solution Solenoid	Err32 – Err34
F	58	Presweep Output	Err41 – Err46

## MISCELLANEOUS ELECTRICAL SYSTEM TROUBLESHOOTING HORN CIRCUIT

- If the horn doesn't work check for 36V at horn wires. The horn (H3) is mounted under the right front of the machine frame (just below the operator's foot pedal).
- If 0 volts, check for a failure (open) of the 2 Amp fuse F7 located on the main control assemble (A3).

## IMPORTANT SERVICE TIP

When troubleshooting the electrical system with a displayed error code also enter the Service Test Mode Program to help diagnosis and confirm a specific failure.

# ELECTRICAL SYSTEM

## SERVICE TEST MODE:

To assist in the troubleshooting and servicing of the electrical system and related components on the 3800 / BR 1100 / 2042 and BR 1100C-XL scrubbers, a special test mode which allows independent control of the various outputs and monitoring of the various inputs has been incorporated.

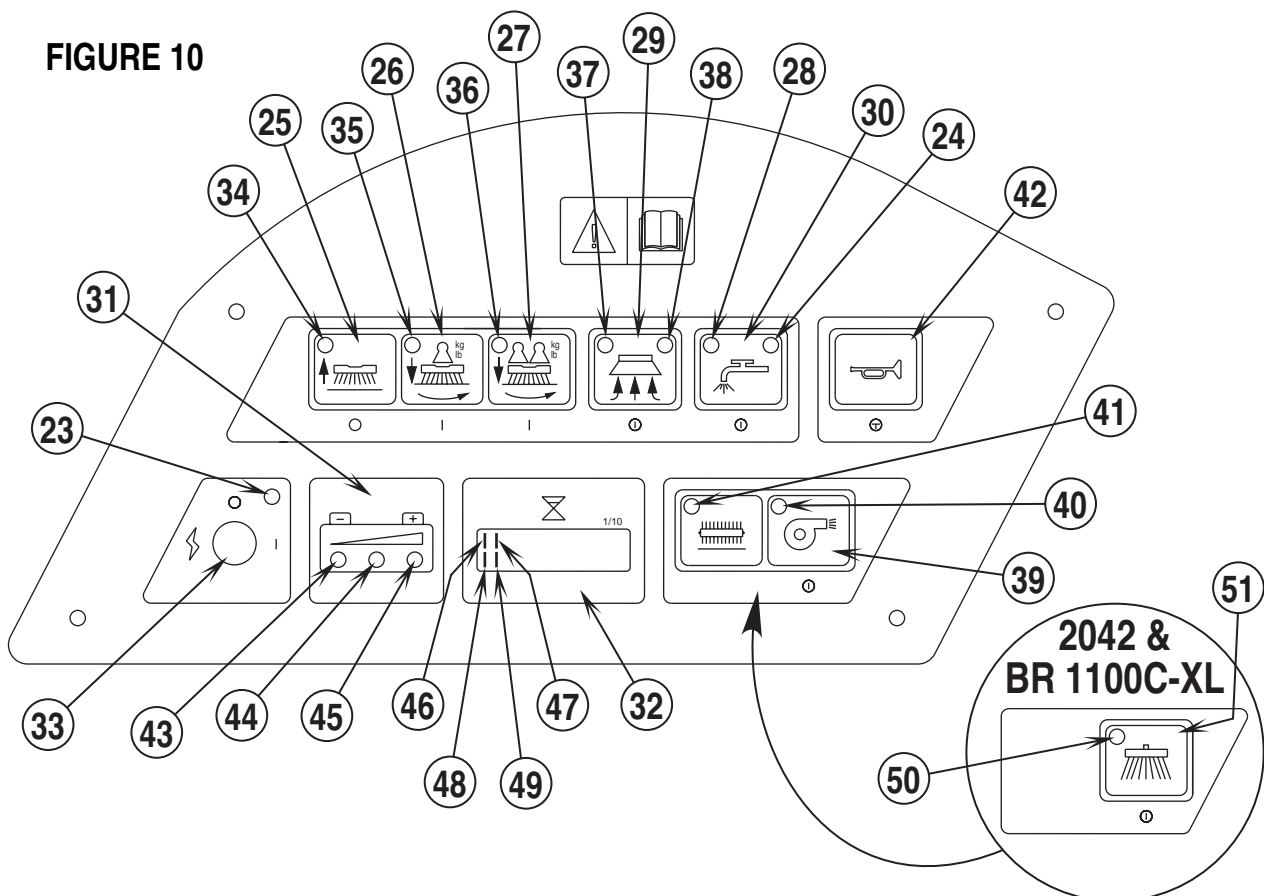
To enter the service test mode perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the Scrub Off and Normal Scrub switches (25 & 26).
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "test".
- 5 Release both switches.
- 6 The function of each switch and indicator is described in the following pages.
- 7 To exit this mode turn the master on/off key switch to the off position.

## CONTROL PANEL

- |    |                                 |    |   |
|----|---------------------------------|----|---|
| 23 | Main Power Indicator            | 38 | Vacuum System Fault Indicator                           |
| 24 | Solution System Fault Indicator | 39 | Presweep Dust Control Button (opt)                      |
| 25 | Scrub Off Button                | 40 | Presweep Dust Control Indicator (opt)                   |
| 26 | Normal Scrub Button             | 41 | Presweep Power Indicator (opt)                          |
| 27 | Heavy Scrub Button              | 42 | Horn Button   |
| 28 | Solution System Indicator       | 43 | Battery Status Red Indicator                            |
| 29 | Vacuum Button                   | 44 | Battery Status Yellow Indicator                         |
| 30 | Solution Button                 | 45 | Battery Status Green Indicator                          |
| 31 | Battery Condition Indicator     | 46 | Pad Actuator Up Indicator                               |
| 32 | Hourmeter/Status Display        | 47 | Squeegee Actuator Up Indicator                          |
| 33 | Master On/Off Key Switch        | 48 | Pad Actuator Down Indicator                             |
| 34 | Scrub Mode Off Indicator        | 49 | Squeegee Actuator Down Indicator                        |
| 35 | Normal Scrub Mode Indicator     | 50 | Sweep System Power Indicator (2042 & BR 1100 C-XL only) |
| 36 | Heavy Scrub Mode Indicator      | 51 | Sweep System Control Button (2042 & BR 1100 C-XL only)  |
| 37 | Vacuum System Indicator         |    |   |

FIGURE 10





## SERVICE TEST MODE (CONTINUED)

### **Input Indicators:**

See Figure 10 for button locations.

### **Battery status red indicator (43):**

Speed control status signal. This is an output from the speed control to the main control unit that indicates the status of the speed control. Normally this indicator will blink every 5 seconds when the key is on. If there is a speed control fault this indicator will flash the fault code produced by the speed control. This is an active low signal. (High state = approximately 36 volts, low state = approximately 0 volts).

### **Battery status yellow indicator (44):**

Speed control forward/reverse signal. This is an output from the speed control to the main control unit that indicates when the throttle has been moved from the neutral position either forward or reverse. The yellow indicator will be lit if this signal is active low. (High state = approximately 36 volts, low state = approximately 0 volts).

### **Battery status green indicator (45):**

Throttle reverse signal. This is an output from the throttle to the main control unit that indicates when the throttle has been moved in the reverse direction. The green indicator will be lit if this signal is active high. (High state = approximately 36 volts, low state = approximately 0 volts).

### **Status Display (32):**

If no over-current faults are present, the status display will show the battery voltage. This display is accurate to within +/- 0.15 volts. Therefore, the voltage displayed may not correlate precisely to a high-accuracy, calibrated voltmeter.

The leftmost digit (**46,47,48 & 49**) of the display is used to indicate the current direction for the pad/brush lift actuator and squeegee lift actuators. This will be described in detail in the sections pertaining to the control of the actuator outputs.

The digit second from the left will be "P" if the pre-sweep foot pedal switch is closed or if side broom unit is installed.

If over-current faults are present, the status display will indicate the fault codes.

### **Output Controls:**

The control panel switches are used to control various output functions of the main control unit. Below is a list of each switch and the function it controls. Following the list is a detailed description of each function.

Horn switch (**42**): Used to jog actuators.

Scrub off switch (**25**): Controls pad/brush motor.

Normal scrub switch (**26**): Controls pad/brush lift actuator.

Heavy scrub switch (**27**): Controls squeegee lift actuator.

Vacuum switch (**29**): Controls vacuum.

Solution switch (**30**): Controls solution solenoid.

Dust control switch (**39**): Controls the pre-sweep/side-broom and dust control (optional).

### **Horn Switch (42):**

This switch is used to momentarily activate either the pad/brush lift actuator or the squeegee lift actuator. See the descriptions below for more details.

### **Scrub Off Switch (25):**

This switch is used to toggle the state of the pad/brush motor. Pressing and releasing this switch will alternately turn the pad/brush motor on and off. The indicator (**34**) provides the following status information:

**Off** - Pad/brush output is off and there is no current flow through the contactor coil and no pad/brush motor current sensed.

**Green** - Pad/brush output is on and there is normal current flow through the contactor coil and normal pad/brush motor current sensed.

**Flashing red** - Either the pad/brush motor output is off and there is current flow through the coil, or pad/brush motor current is sensed (shorted output driver, control error, shorted contactor, wiring error), or the pad/brush motor output is on and there is no current flow through the coil, or no pad/brush motor current is sensed (open circuit, open relay coil, open contactor contacts, wiring error or open output driver).

# ELECTRICAL SYSTEM

## SERVICE TEST MODE (CONTINUED)

### Normal Scrub Switch (26):

This switch is used to control the output to the pad/brush lift actuator. Pressing and releasing this switch will cycle the actuator output through 4 states. These are:

- 1 - output off, direction = up
- 2 - output on, direction = down
- 3 - output off, direction = down
- 4 - output on, direction = up

When the output is in state 1, the actuator output is turned off. The pad actuator up indicator (46) will be lit and the normal scrub indicator (35) should be off. If the indicator (35) is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the up indicator (46) is flashing, this indicates that the pad/brush lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the horn switch (42). This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its up limit.

When the output is in state 2, the actuator output is turned on. The pad actuator down indicator (48) will be lit and the normal scrub indicator (35) should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, or open output driver). The horn switch has no effect in this state.

When the output is in state 3, the actuator output is turned off. The pad actuator down indicator (48) will be lit and the normal scrub indicator (35) should be off. If the indicator (35) is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the down indicator (48) is flashing, this indicates that the pad/brush lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the horn switch (42). This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its down limit.

When the output is in state 4, the actuator output is turned on. The pad actuator up indicator (46) will be lit and the normal scrub indicator (35) should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, or open output driver). The horn switch has no effect in this state.

### Heavy Scrub Switch (27):

This switch is used to control the output to the squeegee lift actuator. Pressing and releasing this switch will cycle the actuator output through 4 states. These are:

- 1 - output off, direction = up
- 2 - output on, direction = down
- 3 - output off, direction = down
- 4 - output on, direction = up

When the output is in state 1, the actuator output is turned off. The squeegee actuator up indicator (47) will be lit and the heavy scrub indicator (36) should be off. If the indicator (36) is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the up indicator (47) is flashing, this indicates that the squeegee lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the horn switch (42). This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its up limit.

When the output is in state 2, the actuator output is turned on. The squeegee actuator down indicator (49) will be lit and the heavy scrub indicator (36) should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, or open output driver). The horn switch has no effect in this state.

When the output is in state 3, the actuator output is turned off. The squeegee actuator down indicator (49) will be lit and the heavy scrub indicator (36) should be off. If the indicator (36) is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the down indicator (49) is flashing, this indicates that the squeegee lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the horn switch (42). This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its down limit.

When the output is in state 4, the actuator output is turned on. The squeegee actuator up indicator (47) will be lit and the heavy scrub indicator (36) should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, or open output driver). The horn switch has no effect in this state.

## SERVICE TEST MODE (CONTINUED)

### Vacuum Switch (29):

This switch is used to toggle the state of the vacuum motor. Pressing and releasing this switch will alternately turn the vacuum motor on and off. The indicator (37) provides the following status information:

**Off** - Vacuum output is off and there is no current flow through the contactor coil and no vacuum motor current sensed.

**Green** - Vacuum output is on and there is normal current flow through the contactor coil and normal vacuum motor current sensed.

**Flashing yellow** - Either the vacuum motor output is off and there is current flow through the coil or vacuum motor current is sensed (shorted output driver, control error, shorted contactor, wiring error) or the vacuum motor output is on and there is no current flow through the coil or no vacuum motor current is sensed (open circuit, open relay coil, open contactor contacts, wiring error or open output driver).

### Solution Switch (30):

This switch is used to toggle the state of the solution solenoid. Pressing and releasing this switch will alternately turn the solution solenoid on and off. The indicator (28) provides the following status information:

**Off** - Solenoid output is off and there is no current flow through the solenoid coil.

**Green** - Solenoid output is on and there is normal current flow through the solenoid coil.

**Flashing yellow** - Either the solenoid output is off and there is current flow through the coil (shorted output driver or control error) or the solenoid output is on and there is no current flow through the coil (open circuit, open solenoid coil, or open output driver).

### Dust Control Switch (39):

This switch is used to control the outputs to the pre-sweep and dust control. Pressing and releasing this switch will activate these outputs in the following order. NOTE 1: This switch will only function if the pre-sweep option has been previously enabled. NOTE 2: Upon entering "Service Test Mode" you are at step one. Press this switch and observe step 2. The order of output activation is as follows:

- 1 - pre-sweep off, dust control off
- 2 - pre-sweep on, dust control off
- 3 - pre-sweep off, dust control off
- 4 - pre-sweep off, dust control on
- 5 - pre-sweep off, dust control off
- 6 - pre-sweep on, dust control on

The pre-sweep and dust control indicators (40 & 41) provide the following status information:

**Off** - output is off and there is no current flow through the contactor coil.

**Green** - output is on and there is normal current flow through the contactor coil.

**Flashing yellow** - output is off and there is current flow through the coil (shorted output driver, control error, wiring error) or the output is on and there is no current flow through the coil (open circuit, open relay coil, wiring error or open output driver).

NOTE: The control does not monitor the current flow in the pre-sweep motors or the dust control motor. Only the contactor currents are monitored.

### Side Broom Control Switch (51):

This switch is used to control the outputs to the side broom. Pressing and releasing this switch will activate these outputs in the following order. NOTE: Upon entering "Service Test Mode" you are at step one. Press this switch and observe step 2. The order of output activation is as follows:

- 1 - side broom off, up position
- 2 - side broom on, up position
- 3 - side broom off, up position
- 4 - side broom off, down position
- 5 - side broom off, up position
- 6 - side broom on, down position

The side broom indicator (50) provides the following status information:

**Off** - output is off and there is no current flow through the contactor coil.

**Green** - output is on and there is normal current flow through the contactor coil.

**Flashing yellow** - output is off and there is current flow through the coil (shorted output driver, control error, wiring error) or the output is on and there is no current flow through the coil (open circuit, open relay coil, wiring error or open output driver).

NOTE: The control does not monitor the current flow in the side-broom motors. Only the contactor currents are monitored.

# ELECTRICAL SYSTEM

## MAIN CONTROL BOARD SPECIAL PROGRAM OPTIONS

### **Scrub mode description:**

On the 3800 / BR 1100 / 2042 and BR 1100C-XL, both the normal and heavy scrub modes are independently programmable to have user adjustable or fixed scrub pressure settings.

If the adjustable option is selected (factory default), the operator will be able to vary the amount of scrub pressure while operating the machine. Maximum pressure limits can be programmed for both the normal and heavy scrub modes. This can be used to prevent the use of too much pressure while still allowing the operator some adjustment of the scrub pressure.

If the fixed option is selected, a pre-set scrub pressure will be used for each mode (normal/heavy). The pre-set pressure settings can be selected by a special key sequence described later. This would allow a supervisor to set up two different scrub pressures (normal/heavy) thereby preventing the operator from having the capability to vary the pressure throughout the full range.

The scrub pressure can be set from 1 to 7 for cylindrical brush machines and 1 to 12 for disc brush/pad machines. The allowable range for the normal scrub mode is 1 through 4 and the range for the heavy scrub mode is (normal limit + 1) through 7 or 12 depending on model. This number is a relative indication of scrubbing effort. The actual pressure applied will vary depending on the floor surface and the type of pad/brush used.

### **Scrub mode operation (adjustable):**

If the adjustable option is selected (factory default) the scrub mode operation is as follows:

Pressing the normal scrub button will enable the scrub system and set the scrub pressure to the last selected value for the normal scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" (Pressure Adjustment) followed by a number.

Subsequent presses of the normal scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the normal scrub mode. Once the maximum value is reached the pressure setting will step back to 1. The factory default maximum for the normal scrub mode is 4.

Pressing the heavy scrub button will enable the scrub system and set the scrub pressure to the last selected value for the heavy scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number.

Subsequent presses of the heavy scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the heavy scrub mode. Once the maximum value is reached the pressure setting will step back to (normal scrub limit + 1). The factory default maximum for the normal scrub mode is 7 (cylindrical) or 12 (disc).

### **Scrub mode operation (fixed):**

If the fixed option is selected the scrub mode operation is as follows:

Pressing the normal scrub button will enable the scrub system and set the scrub pressure to the pre-set normal scrub pressure setting. The operator will not be able to adjust the pressure for the normal scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number.

Pressing the heavy scrub button will enable the scrub system and set the scrub pressure to the pre-set heavy scrub pressure setting. The operator will not be able to adjust the pressure for the heavy scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number.

### **Scrub mode programming for user adjustable scrub pressure:**

To program the normal scrub mode for user adjustable scrub pressure perform the following steps:

- 1 Turn the master key switch off.
- 2 Press and hold the normal scrub button.
- 3 Turn the master key switch on while continuing to hold the normal scrub button until the status display shows "PA \* ", where \* is a number from 1 to 4.
- 4 Press and release the normal scrub button until the display shows "adjustable".
- 5 Press and release the scrub off button to save the setting.
- 6 The display will now change to "PA" followed by a number in the range of 1 to 4. This is the maximum pressure that will be allowed for the normal scrub mode.
- 7 Press and release the normal scrub button to select the desired limit.
- 8 Press and release the scrub off button to save the pressure level.
- 9 The display will now show "done" indicating that the normal scrub mode is programmed.
- 10 Turn the master key switch off.

## SPECIAL PROGRAM OPTIONS (CONTINUED)

To program the heavy scrub mode for user adjustable scrub pressure perform the following steps:

- 1 Turn the master key switch off.
- 2 Press and hold the heavy scrub button.
- 3 Turn the master key switch on while continuing to hold the heavy scrub button until the status display shows "PA \* ", where \* is a number from 2 to 12.
- 4 Press and release the heavy scrub button until the display shows "adjustable".
- 5 Press and release the scrub off button to save the setting.
- 6 The display will now change to "PA" followed by a number in the range of (normal scrub limit + 1) to 7 (cylindrical) or 12 (disc). This is the maximum pressure that will be allowed for the heavy scrub mode.
- 7 Press and release the heavy scrub button to select the desired limit.
- 8 Press and release the scrub off button to save the pressure level.
- 9 The display will now show "done" indicating that the heavy scrub mode is programmed.
- 10 Turn the master key switch off.

### **Scrub mode programming for fixed (non-adjustable) scrub pressure:**

To program the normal scrub mode for fixed scrub pressure perform the following steps:

- 1 Turn the master key switch off.
- 2 Press and hold the normal scrub button.
- 3 Turn the master key switch on while continuing to hold the normal scrub button until the status display shows "PA \* ", where \* is a number from 1 to 4.
- 4 Press and release the normal scrub button until the display shows "non-adjustable".
- 5 Press and release the scrub off button to save the setting.
- 6 The display will now change to "PA" followed by a number in the range of 1 to 4. This is the scrub pressure that will be used for the normal scrub mode.
- 7 Press and release the normal scrub button to select the desired pressure.
- 8 Press and release the scrub off button to save the pressure level.
- 9 The display will now show "done" indicating that the normal scrub mode is programmed.
- 10 Turn the master key switch off.

To program the heavy scrub mode for fixed scrub pressure perform the following steps:

- 1 Turn the master key switch off.
- 2 Press and hold the heavy scrub button.
- 3 Turn the master key switch on while continuing to hold the heavy scrub button until the status display shows "PA \* ", where \* is a number from 2 to 12.
- 4 Press and release the heavy scrub button until the display shows "non-adjustable".
- 5 Press and release the scrub off button to save the setting.
- 6 The display will now change to "PA" followed by a number in the range of (normal scrub limit + 1) to 7 (cylindrical) or 12 (disc). This is the scrub pressure that will be used for the heavy scrub mode.
- 7 Press and release the heavy scrub button to select the desired limit.
- 8 Press and release the scrub off button to save the pressure level.
- 9 The display will now show "done" indicating that the heavy scrub mode is programmed.
- 10 Turn the master key switch off.

NOTE: Either scrub mode (normal/heavy) may be programmed for adjustable or fixed scrub pressure independently. They do not have to be programmed the same.

### **Restoring the scrub modes and pressures to factory default settings:**

FACTORY DEFAULT: Normal scrub = adjustable, limit = 4; Heavy scrub = adjustable, limit = 7 or 12 depending on scrub deck type.

If it is desired to restore the normal and heavy scrub modes and pressure settings back to the factory default settings, perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the normal scrub and heavy scrub switches.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "donE".
- 5 Release both switches.
- 6 The scrub modes and pressures have now been restored.
- 7 Turn the master on/off key switch to the off position.

# ELECTRICAL SYSTEM

## SPECIAL PROGRAM OPTIONS (CONTINUED)

**CURRENT DRAW OF SCRUB BRUSH MOTORS (TABLE 2)**

**36V\***

PA#	1	2	3	4	5	6	7	8	9	10	11	12
<b>3 HP (Disc)</b>	25 Amps	29.5 Amps	34 Amps	38.5 Amps	43 Amps	47.5 Amps	52 Amps	56.5 Amps	61 Amps	65.5 Amps	70 Amps	75 Amps
<b>(2) 1 HP (Cyl.)</b>	18 Amps	22 Amps	26 Amps	30 Amps	34 Amps	38 Amps	42 Amps					

\*Change of 4.5 Amps per PA unit. Values given are approximate.

### Selection of Low Voltage Cutout Threshold:

FACTORY DEFAULT: STD

The 3800 / BR 1100 / 2042 and BR 1100C-XL is equipped with a low voltage cutout feature to prevent over-discharging the batteries. This feature will automatically shut down the scrub system when the battery voltage falls to the selected threshold. The cutout level is adjustable. The standard setting is 31.5 volts (1.75 volts per cell) and the so-called maintenance free setting is 33 volts (1.83 volts per cell). The standard setting should be used unless the battery manufacturer specifies the higher cutout voltage. It is important to note that some maintenance free batteries (including some gelled electrolyte cells) are capable of being safely discharged down to 1.75 volts per cell. To select between the two types:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off switch.
- 3 While holding the scrub off switch turn the master on/off key switch to the on position.
- 4 Continue to hold the scrub off switch until the scrub off indicator turns red and the hourmeter/status display shows "Std" or "FrEE".
- 5 Release the scrub off switch.
- 6 Pressing and releasing the scrub off switch will now select between the two options. For standard wet cell batteries select "Std" and for maintenance free batteries select "FrEE".
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

### Recall Of Stored Error (Fault) Codes:

Whenever an electrical system fault is detected by the main control unit, one or more error codes are displayed and stored by the control unit. If it is desired, the error code (if any) from the previous operation of the machine can be recalled for troubleshooting purposes. To recall the last stored error codes perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the horn switch.
- 3 While holding the horn switch turn the master on/off key switch to the on position.
- 4 Continue to hold the horn switch until the hourmeter/status display shows "Err \*". (\* will be a letter indicating the revision level of the control unit)
- 5 Release the horn switch.
- 6 If there were previously no error codes stored, the display will now show "nonE". Go to step 12.
- 7 If error codes were stored, the display will now show the stored code(s) and the scrub off indicator will now be green.
- 8 To clear the stored codes press and release the scrub off switch.
- 9 The hourmeter/status display will now show "ErASE" and the heavy scrub indicator will be yellow.
- 10 To clear the stored codes, press and release the scrub off switch one more time. To return to the error code display without clearing the codes press the heavy scrub switch.
- 11 If the scrub off switch was pressed the error codes will have been cleared and the display will show "nonE".
- 12 To exit the error code recall mode, turn the master on/off key switch to the off position.

## SPECIAL PROGRAM OPTIONS (CONTINUED)

### Enabling Or Disabling The Vacuum Automatic Shutoff Option:

FACTORY DEFAULT: ON

The 3800 / BR 1100 / 2042 and BR 1100C-XL is equipped with a feature that will automatically shut off the vacuum and scrub systems and display "FULL" on the hourmeter/status display if the recovery tank becomes filled. If problems are encountered with the vacuum automatic shutoff feature, such as the vacuum shutting off even if the recovery tank is not full, this feature can be disabled. To enable or disable this feature perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the vacuum switch.
- 3 While holding the vacuum switch turn the master on/off key switch to the on position.
- 4 Continue to hold the vacuum switch until the hourmeter/status display shows "OFF" or "on" and the vacuum indicator is green.
- 5 Release the vacuum switch.
- 6 Pressing and releasing the vacuum switch will now select between "on" or "OFF". On means that the vacuum automatic shutoff feature is enabled, off means that the feature is disabled.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

### Vacuum Motor Configuration Option:

FACTORY DEFAULT: 1

The 3800 / BR 1100 / 2042 and BR 1100C-XL can be equipped with an optional dual vacuum motor. The control must be programmed for the number of vacuum motors installed so that the over-current protection will function properly. To select the vacuum motor configuration perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off switch and the vacuum switch.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "1" or "2" and the vacuum yellow indicator is lit.
- 5 Release both switches.
- 6 Pressing and releasing the vacuum switch will now select between "1" or "2". Use "1" for a single vacuum motor and "2" for dual vacuum motors.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

### Enabling Or Disabling Fault Detection:

FACTORY DEFAULT: ON

Normally, the main control unit will perform checks of the electrical system during operation. If a fault occurs in a particular system that system (and possibly others) will be shut down. This can make troubleshooting the system difficult. This option will allow service personnel to disable some of the fault detection checks to facilitate troubleshooting. This will not disable the over-current protection on any of the systems. To enable or disable fault checking:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off switch and the solution switch.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "OFF" or "on" and the solution yellow indicator is lit.
- 5 Release both switches.
- 6 Pressing and releasing the solution switch will now select between "on" or "OFF". On means that the fault checking option is enabled, off means that the option is disabled.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

# ELECTRICAL SYSTEM

## SPECIAL PROGRAM OPTIONS (CONTINUED)

### **Brush Type Selection:**

FACTORY DEFAULT: cyl (cylindrical), disc (disc)

The 3800 / BR 1100 can be equipped with two different scrub deck options. One uses cylindrical scrub brushes and the other uses standard disc type scrub brushes. This function configures the control unit current settings for each of the scrub deck types. To change from one type to the other follow steps below.

Upon installation of a new control unit the machine will not operate until a selection is made. The display will scroll the message "select brush type". By pressing the heavy scrub switch either disc (disc) or cylindrical (cyl) may be selected. To save the setting turn the main key switch to the off position.

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off and heavy scrub switches.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the heavy scrub yellow indicator is lit and the hourmeter/status display shows "Cyl" or "dISC".
- 5 Release both switches.
- 6 Pressing and releasing the heavy scrub switch will now select between the two options.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

### **Pre-Sweep/Side-Broom Sweeping Options:**

All machine models without sweeping attachment options are programmed, FACTORY DEFAULT: OFF

Exception: The models 2042 and BR 1100C-XL are built with dual side brooms standard, FACTORY DEFAULT: SB

The disc type scrub machines models 3800 & BR1100 are designed to be equipped with the pre-sweep & dust control option (PS). The cylindrical models 3800C & BR1100C are designed to be equipped with the side-broom option (SB). To operate either sweeper accessory attachment the needed sweep option (PS or SB) program must be activated. This program option can be selected or changed by performing the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off switch and the dust control/side broom switch.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "OFF", "PS" or "Sb" and the dust control/side broom yellow indicator is lit.
- 5 Release both switches.
- 6 Press and release the dust control/side broom switch will now select between "OFF", "PS" or "Sb". Use "OFF" to disable the pre-sweep/side-broom & dust control feature, "PS" for the disc-type machine pre-sweep unit and "Sb" for the cylindrical scrub machine side-broom unit.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

Special Note 1: The cylindrical model machines 3800C & BR1100C can except (use) the pre-sweep option that is normally used on the rotary disc machines. Just program for the pre-sweep (PS) option selection.

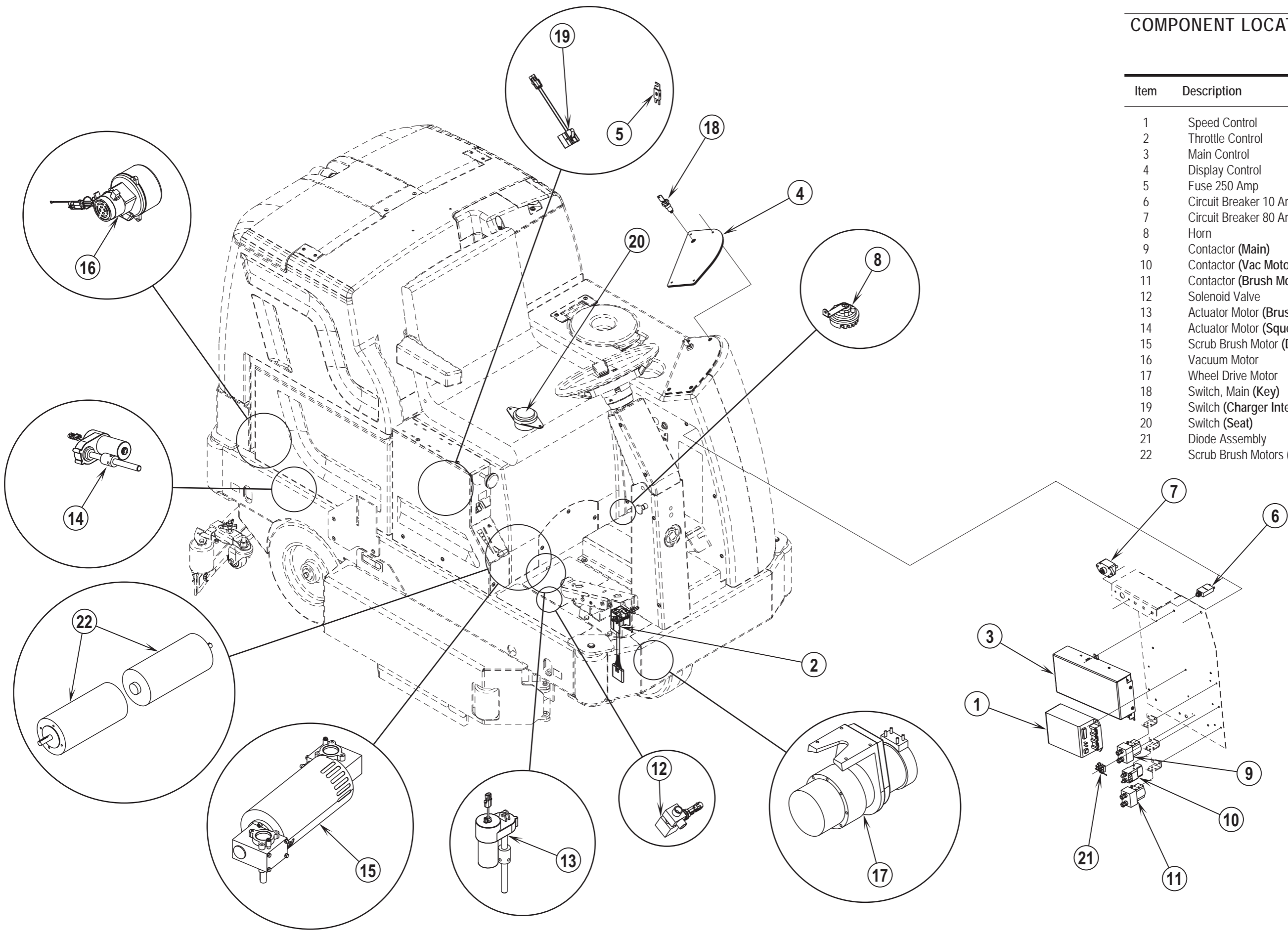
Special Note 2: When the machine's scrub deck option is properly selected cylindrical or disc (described above) its designed sweep attachment option will automatically be selected and activated the first time it is installed.



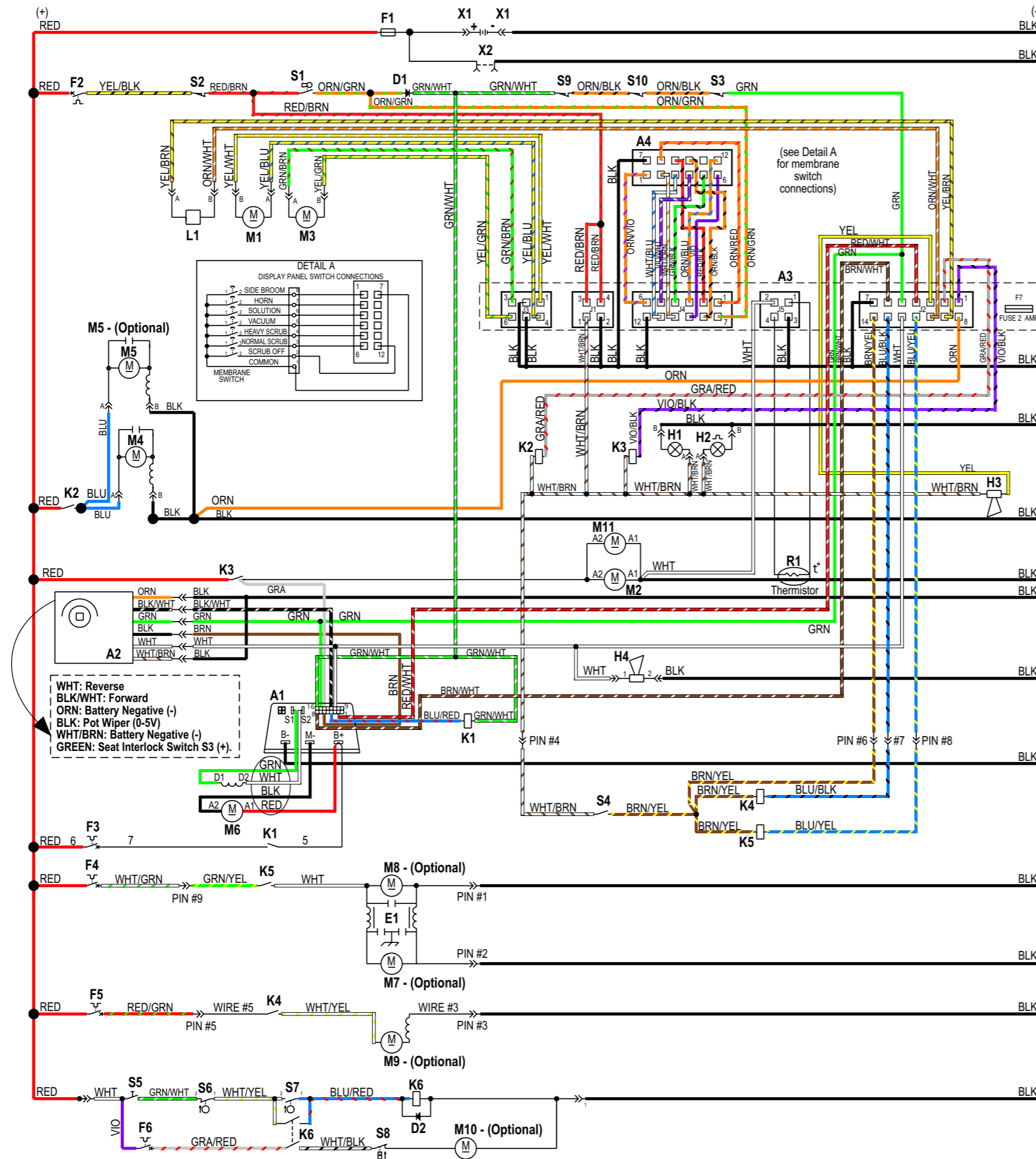
# ELECTRICAL SYSTEM

## COMPONENT LOCATION

Item	Description
1	Speed Control
2	Throttle Control
3	Main Control
4	Display Control
5	Fuse 250 Amp
6	Circuit Breaker 10 Amp
7	Circuit Breaker 80 Amp
8	Horn
9	Contactor (Main)
10	Contactor (Vac Motor)
11	Contactor (Brush Motor)
12	Solenoid Valve
13	Actuator Motor (Brush Lift)
14	Actuator Motor (Squeegee Lift)
15	Scrub Brush Motor (Disc)
16	Vacuum Motor
17	Wheel Drive Motor
18	Switch, Main (Key)
19	Switch (Charger Interlock)
20	Switch (Seat)
21	Diode Assembly
22	Scrub Brush Motors (Cylindrical)



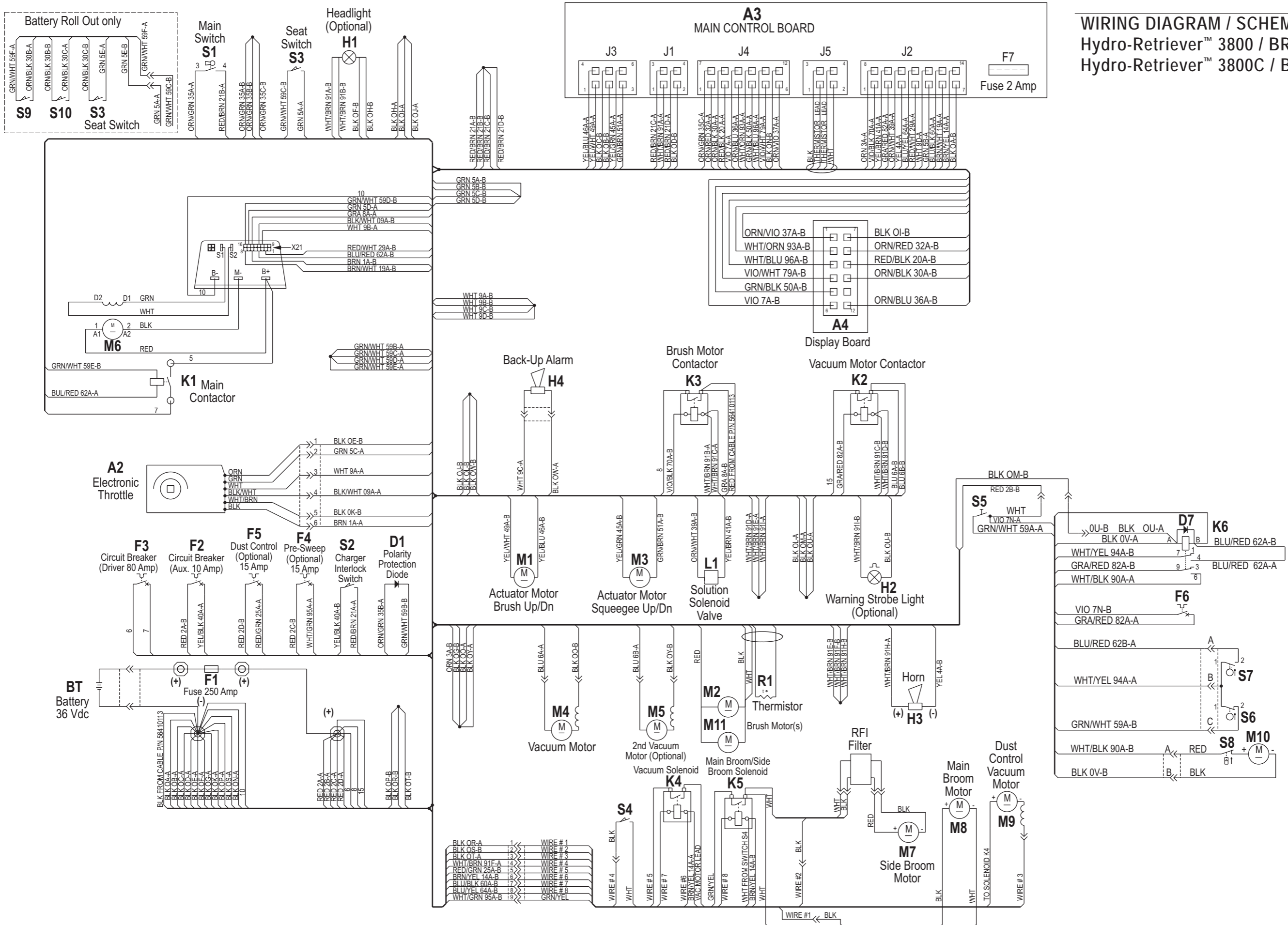
# ELECTRICAL SYSTEM



## WIRING DIAGRAM / SCHEMATIC Hydro-Retriever™ 3800 / BR 1100 Hydro-Retriever™ 3800C / BR 1100C

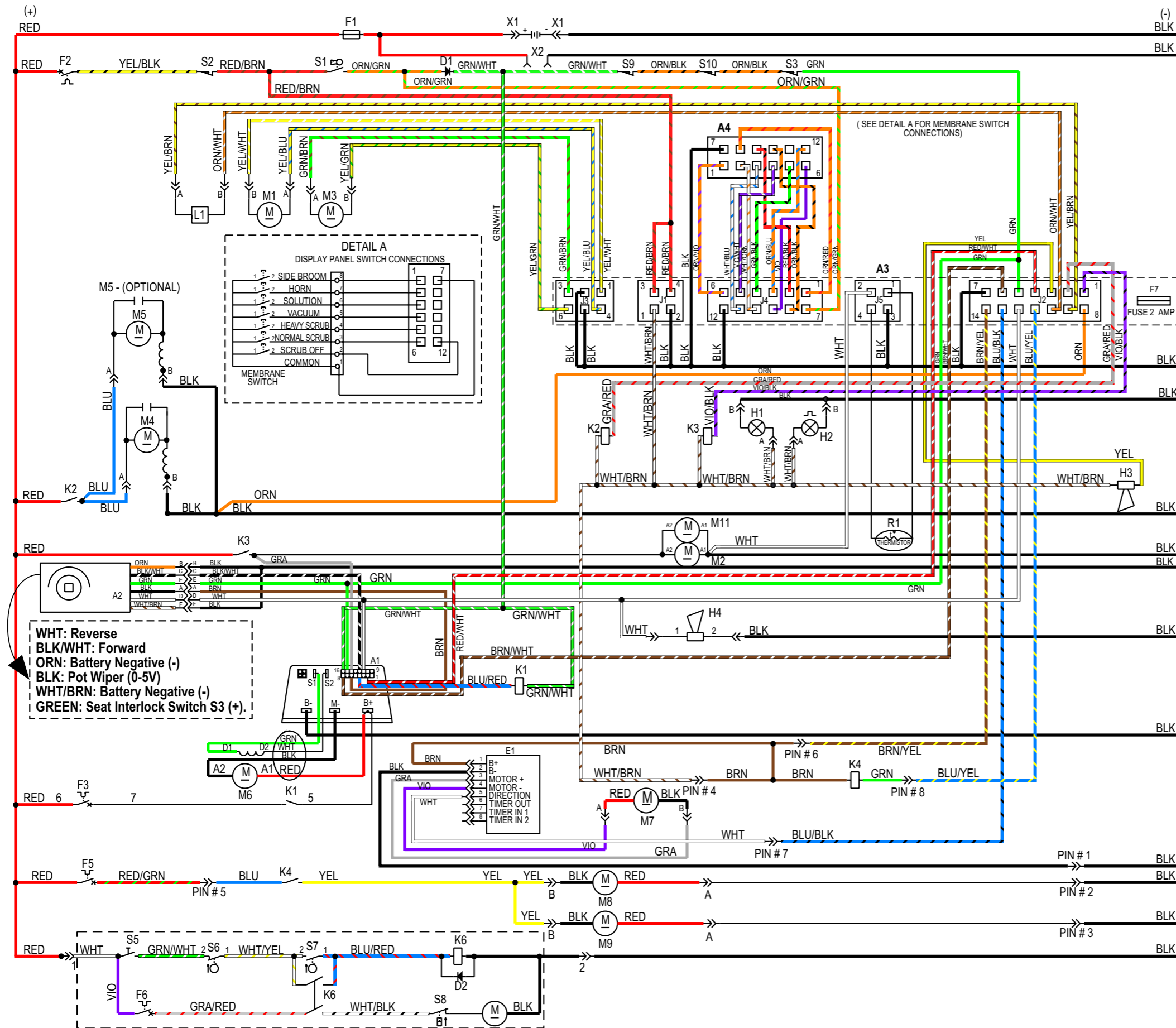
Item	Description
A1	Speed Controller
A2	Throttle Control (Electronic Throttle)
A3	Main Control (Control Assembly)
A4	Display Control (Display Panel Assembly)
BT	36Vdc Battery
D1	Diode
D2	Diode
E1	RFI Filter
F1	Fuse, 250 Amp (Main)
F2	Circuit Breaker, 10 Amp (Control Circuit)
F3	Circuit Breaker, 80 Amp (Wheel Drive)
F4	Circuit Breaker, 15 Amp (Optional Pre-Sweep)
F5	Circuit Breaker, 15 Amp (Dust Control, Optional)
F6	Circuit Breaker, 3.5 Amp (Extended Scrub, Optional)
F7	Fuse, 2 Amp (Horn) *Not Shown
H1	Head Light (Optional)
H2	Strobe Light (Optional)
H3	Horn
H4	Back-Up Alarm (Optional)
K1	Contactor, Main
K2	Contactor, Vac Motor
K3	Contactor, Brush Motor
K4	Contactor, Dust Control (Optional)
K5	Contactor, Main And Side Broom (Optional)
K6	Contactor, Pump (Optional)
L1	Solenoid Valve
M1	Actuator Motor Brush Up/Dn
M2	Scrub Brush Motor
M3	Actuator Motor Squeegee Up/Dn
M4	Vacuum Motor
M5	Vacuum Motor (Optional)
M6	Wheel Drive Motor
M7	Side Broom Motor (Optional, Presweep)
M8	Main Broom Motor (Optional, Presweep)
M9	Vac. Motor Dust Control (Optional, Presweep)
M10	Pump Motor (Optional)
M11	Brush Motor (only on cylindrical brush models)
R1	Thermistor
S1	Main Switch
S2	Charger Interlock Switch
S3	Switch, Seat
S4	Pre-Sweep Switch (Optional)
S5	Extended Scrub Switch (Optional)
S6	Switch, Pump Stop (Optional) (Mercury Switch)
S7	Switch, Pump Start (Optional) (Mercury Switch)
S8	Switch, Pressure (Optional)
S9	Switch, Battery Roll Out (with Roll Out only)
S10	Switch, Battery Roll Out (with Roll Out only)
X1	Battery Disconnect (Connector Assembly)
X2	Charger Connector (Charger Plug Assembly)

WIRING DIAGRAM / SCHEMATIC  
 Hydro-Retriever™ 3800 / BR 1100  
 Hydro-Retriever™ 3800C / BR 1100C





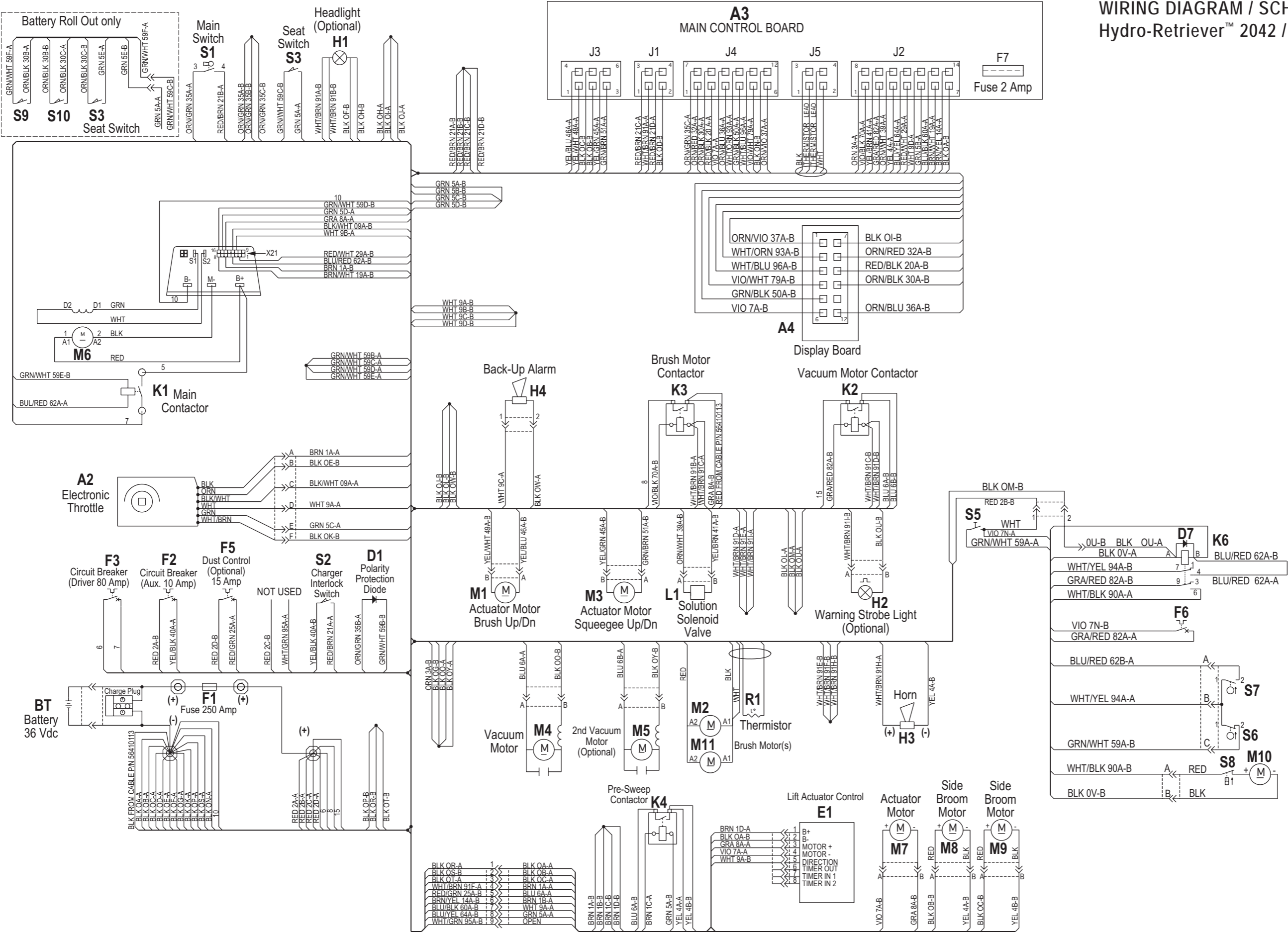
# ELECTRICAL SYSTEM



## WIRING DIAGRAM / SCHEMATIC Hydro-Retriever™ 2042 / BR 1100C-XL

Item	Description
A1	Speed Controller
A2	Throttle Control (Electronic Throttle)
A3	Main Control (Control Assembly)
A4	Display Control (Display Panel Assembly)
BT	36Vdc Battery
D1	Diode
D2	Diode
E1	Actuator Module
F1	Fuse, 250 Amp (Main)
F2	Circuit Breaker, 10 Amp (Control Circuit)
F3	Circuit Breaker, 80 Amp (Wheel Drive)
F5	Circuit Breaker, 15 Amp (Side Brooms)
F6	Circuit Breaker, 3.5 Amp (Extended Scrub, Optional)
F7	Fuse, Horn 2 Amp (Located on A3 Circuit Board)
H1	Head Light (Optional)
H2	Strobe Light (Optional)
H3	Horn
H4	Back-Up Alarm (Optional)
K1	Contactor, Wheel Drive
K2	Contactor, Vac Motor
K3	Contactor, Brush Motor
K4	Contactor, Side Brooms
K6	Contactor, Pump (Optional)
L1	Solenoid Valve
M1	Actuator Motor Brush Up/Dn
M2	Scrub Brush Motor
M3	Actuator Motor Squeegee Up/Dn
M4	Vacuum Motor
M5	Vacuum Motor (Optional)
M6	Wheel Drive Motor
M7	Actuator Motor Side Brooms Up/Dn (Optional)
M8	Side Broom Motor, Right
M9	Side Broom Motor, Left
M10	Pump Motor (Optional)
M11	Scrub Brush Motor
R1	Thermistor
S1	Main Switch
S2	Charger Interlock Switch
S3	Switch, Seat
S5	Extended Scrub Switch (Optional)
S6	Switch, Pump Stop (Optional) (Mercury Switch)
S7	Switch, Pump Start (Optional) (Mercury Switch)
S8	Switch, Pressure (Optional)
S9	Switch, Battery Roll Out (with Roll Out only)
S10	Switch, Battery Roll Out (with Roll Out only)
X1	Battery Disconnect (Connector Assembly)
X2	Charger Connector (Charger Plug Assembly)

WIRING DIAGRAM / SCHEMATIC  
Hydro-Retriever™ 2042 / BR 1100C-XL



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**Austria (Sales Sub)**

Nilfisk-Advance GmbH	Phone: +43
Voralberger Allee 46	1616 58 30 22
A-1230 Wien	Fax: +43
<a href="mailto:info@nilfisk-advance.at">info@nilfisk-advance.at</a>	1616 58 30 40
<a href="http://www.nilfisk-advance.at">www.nilfisk-advance.at</a>	

---

**Belgium (Sales Sub)**

Nilfisk-Advance NV/SA	Phone: +32
Doornveld Sphere Business Park	(0)2467 60 50
Industrie Asse 3, No. 11	Fax: +32
B-1731 Zellik-Asse	(0)2463 44 16
<a href="http://www.nilfisk-advance.be">www.nilfisk-advance.be</a>	

---

**Czech Republic (Sales Sub)**

Nilfisk-Advance s.r.o.	Phone: +420
Lysinská 44/1863	2 44 09 09 12
143 00 Praha - Modrany	+420
Czech Republic	2 44 09 09 21 4
	Fax: +420
	2 44 40 23 93

---

**Denmark**

Nilfisk-Advance A/S	Phone: +45
Sognevej 25	43 23 81 00
DK-2605 Brøndby	Fax: +45
<a href="mailto:mail@nilfisk-advance.dk">mail@nilfisk-advance.dk</a>	43 43 77 00
<a href="http://www.nilfisk-advance.com">www.nilfisk-advance.com</a>	

---

**Denmark (Prod. Sub)**

Gerni A/S	Phone: +45
Myntevej 2	89 12 22 00
DK-8900 Randers	Fax: +45
<a href="http://www.gerni.com">www.gerni.com</a>	86 43 14 81

---

**Denmark (Sales Sub)**

Nilfisk-Advance Nordic A/S	Phone: +45
Sognevej 25A	43 23 40 50
Postbox 344	Fax: +45
DK-2605 Brøndby	43 23 40 60
<a href="mailto:kundeservice@nilfisk-advance.dk">kundeservice@nilfisk-advance.dk</a>	
<a href="http://www.nilfisk-advance.dk">www.nilfisk-advance.dk</a>	

---

**France (Sales Sub)**

Nilfisk-Advance S.A.	Phone: +33
27 avenue de la Baltique	1695 98 700
Villebon sur Yvette	Fax: +33
P.B. 246	1695 98 701
F-91944 Courtaboeuf Cedex	
<a href="mailto:info@nilfisk-advance.fr">info@nilfisk-advance.fr</a>	
<a href="http://www.nilfisk-advance.fr">www.nilfisk-advance.fr</a>	

---

**Germany (Sales Sub)**

Nilfisk-Advance AG	Phone: +49
Siemensstrasse 25-27	4101 3990
Postfach 1361	Fax: +49
D-25462 Rellingen	4101 39 91 91
<a href="mailto:info@nilfisk-advance.de">info@nilfisk-advance.de</a>	
<a href="http://www.nilfisk-advance.de">www.nilfisk-advance.de</a>	

---

**Greece (Sales Sub)**

Nilfisk-Advance A.E.	Tel.: +30
8, Thoukididou Str.	210 963 3443
Argioupoli	Fax: +30
Gr - 164 52 Athens	210 965 0975
Greece	

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**Holland (Sales Sub)**

Nilfisk-Advance B.V.	Phone: +31
Camerastraat 9 (2e verdieping)	36 546 07 00
1322 BB Almere	Fax: +31
Postbus 60112	36 523 51 48
1320 AC Almere	
<a href="http://www.nilfisk-advance.nl">www.nilfisk-advance.nl</a>	

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**Ireland (Sales Sub)**

Nilfisk-Advance Limited	Phone: +35
28 Sandyford Office Park	3 12 94 38 38
Sandyford, Dublin 18	Fax: +35
Ireland	3 12 94 38 45

---

**Italy (Prod & Sales Sub)**

CFM SpA	Phone: +39
Nilfisk-Advance Div. Guardamiglio	0377 /414021
Localita Novella III	/45 1124
I-26862 Guardamiglio (Mi)	Fax: +39
	0377 51 443

---

**Italy (Prod & Sales Sub)**

CFM S.p.A.	Phone: +39
Via Porrettana 1991	059 973 0000
I-41059 Zocca (Modena)	Fax: +39
<a href="mailto:cfm@cfm.it">cfm@cfm.it</a>	059 973 0099

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**Norway (Sales Sub)**

Nilfisk-Advance AS	Phone: +47
Ulvenveien 89C	23 06 75 00
N-0581 Oslo	Fax: +47
	23 06 75 01

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**Poland (Sales Sub)**

Nilfisk-Advance Sp.Z.O.O.	Phone: +48
05-800 Pruszków	22 738 37 50
ul. 3-go MAJA 8	Fax: +48
Poland	22 738 37 51

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**Portugal (Sales Sub)**

Nilfisk-Advance, Lda.	Phone: +35
Sintra Business Park	121 911 2670
Zona Industrial Da Abrunheira	Fax: +35
Edificio 1, 1o A	121 911 2679
P-2710-089 Sintra	

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**Russia (Sales Sub)**

Nilfisk-Advance LLC	Phone: 7
Vyatskaya str. 27, bld. 7	095 783 9602
127015 Moscow	Fax: +7
Russia	095 783 9603

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**Spain (Sales Sub)**

Nilfisk-Advance S.A.	Phone: +34
Torre D'Ara	93 741 2400
Passeig del Rengle, 5 Pl.10	Fax: +34
E-08302 Mataró (Barcelona)	93 757 8020
<a href="mailto:nilfisk@nilfisk-advance.es">nilfisk@nilfisk-advance.es</a>	

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**Sweden (Sales Sub)**

Nilfisk -Advance A/S	Phone: +46
Sjöbjörnsvägen 5	8555 94400
Box 44045	Fax: +46
S-100 73 Stockholm	8555 94430
<a href="mailto:info@nilfisk-advance.se">info@nilfisk-advance.se</a>	
<a href="http://www.nilfisk-advance.se">www.nilfisk-advance.se</a>	

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**Sweden (Prod.)**

Nilfisk-Advance A/S	Phone: +46
Åmål Branch	5321 7500
Strömsbergsgatan	Fax: +46
Box 127	5321 7595
S-662 23 Åmål	

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**Switzerland (Sales Sub)**

Nilfisk-Advance AG	Phone: +41
Ringsstrasse 19	71 92 38 444
Kirchberg/Industrie Stelzl	Fax: +41
CH-9500 Wil	71 92 35 283

[www.nilfisk-advance.ch](http://www.nilfisk-advance.ch)

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**UK (Sales Sub)**

Nilfisk-Advance Limited	Phone: +44
Newmarket Road	1284 763163
Bury St. Edmunds	Fax: +44
UK-Suffolk IP33 3SR	1284 750 562

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**USA (Prod.)**

Nilfisk-Advance Inc.	Phone: +1 763
14600 21.st Avenue North	745 3500
Plymouth, MN 55447-3408	Fax: +1 763
<a href="http://www.mn.nilfisk-advance.com">www.mn.nilfisk-advance.com</a>	745 3718

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**USA (Sales Sub)**

Nilfisk-Advance America Inc.	Phone: +1 610
300 Technology Drive	647 6420
Malvern, PA 19355	Fax: +1 610
<a href="http://www.pa.nilfisk-advance.com">www.pa.nilfisk-advance.com</a>	647 6427

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**Canada (Sales Sub)**

Nilfisk-Advance Canada Comp.	Phone: +1 905
396 Watline Avenue	712 3260
Mississauga, Ontario L4Z 1X2	Fax: +1 905
	712 3255

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**Australia (Sales Sub)**

Nilfisk-Advance Pty. Ltd.	Phone: +61(0)2
48 Egerton Street	9648 2700
Silverwater, NSW 2128	Fax: +61(0)2
Postal addresse:	9648 2711
PO Box 6046	
Silverwater. NSW 1811	
<a href="mailto:info@nilfisk-advance.com.au">info@nilfisk-advance.com.au</a>	
<a href="http://www.nilfisk-advance.com.au">www.nilfisk-advance.com.au</a>	

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**China (Shenzhen)**

Nilfisk-Advance (Shenzhen) Ltd	Phone: +86 755
Blok 3, Unit 130, 1001 Honghua Road	8359 7937 el.
Int. Commercial & Trade Center	8359 7939-42
Fuitian Free Trade Zone	Fax: +86 755
518038 Shenzhen	8359 1063
P.R. China	

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**China (Suzhou)**

Nilfisk-Advance Professional	Phone: +86 512
Cleaning Equipment (Suzhou) Co. Ltd.	8918 5656
306 Su Hong Zhong Road, Build. 2	Fax: +86 512
Suzhou Industrial Park	8918 5666
215021 Suzhou	
P.R. China	

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**Hong Kong (Sales Sub)**

Nilfisk-Advance Ltd.	Phone: +852
2001 HK Worsted Mills Ind'l Bldg.,	2427 5951
31-39 Wo Tong Tsui St.	Fax: +852
Kwai Chung, Hong Kong	2487 5828

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**Japan (Sales Sub)**

Nilfisk-Advance Inc.	Phone: +8145
3-17-40-101 Chigasaki Higashi	942 7741
Tsuzuki-ku, Yokohama 224-0033	Fax: +8145
Japan	942 6545

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**Malaysia (Sales Sub)**

Nilfisk-Advance Sdn Bhd	Phone: +60 3
No. 21, Jalan SS 25/41	7956 8188
Mayang Industrial Park	Fax: +60 3
47301 Petaling Jaya	7966 6828
Selangor, Malaysia	

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**New Zealand (Sales Sub)**

Nilfisk-Advance Limited	Phone: +64(0)9
Danish House	525 0092
6 Rockridge Avenue	Fax: +64(0)9
Penrose 92-829	525 6440
Auckland1135	
Postal addresse:	
Private Bag 92 825	
Auckland	
New Zealand	

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**Singapore (Sales Sub)**

Nilfisk-Advance Pte. Ltd.	Phone: + 65
22,Woodlands Industrial Park E1	6 7599100
Singapore 757740	Fax: +65
<a href="mailto:sales@nilfisk-advance.com.sg">sales@nilfisk-advance.com.sg</a>	7599133

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**Taiwan, ROC (Sales Sub)**

Nilfisk-Advance Ltd.	Phone: +886
Taiwan Branch (H.K.)	2 2239 8812
1F, No. 193, Sec.2	Fax: +886
Xing Long Rd., Taipei	2 2239 8832
Taiwan, R.O.C.	

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**Thailand (Sales Sub)**

Nilfisk-Advance Co. Ltd.	Phone: +66 2
89 Soi Chokechai-Ruammitr	275-5630
Viphavadee-Rangsit Road	Fax: +66 2
Ladyao, Jatuchak, Bangkok 10900	691-4079
Thailand	



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# 56409569 LIFT SLING KIT

For Advance Hydro-Retriever™ 3800 / Nilfisk BR 1000, BR 1100

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040521	1	Instruction Sheet
1	56409571	1	Lift Bar
2	56015656	1	Decal, Warning Lifting
3	56409570	4	Cable
4	56491726	4	Bushing
5	56002168	4	1/2 Flat Washer
6	56003022	4	1/2-13 x 1-1/4 Loc Bolt

Refer to Figure 2 when ordering replacement parts.

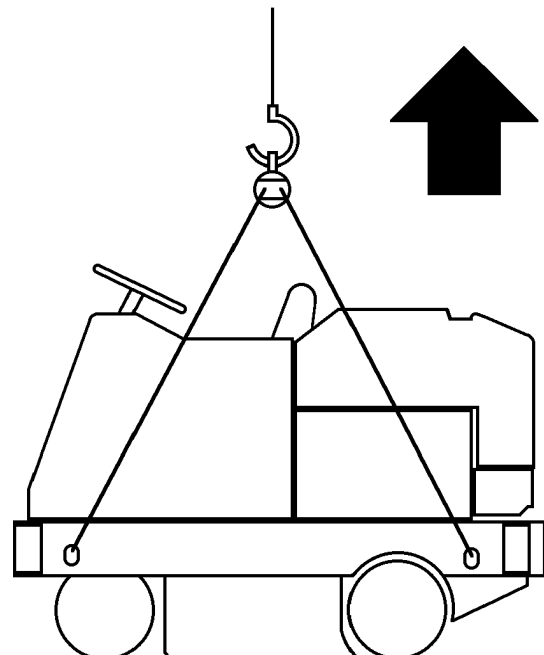
## INSTALLATION INSTRUCTIONS

### WARNING!

PERSONEL INJURY AND MACHINE DAMAGE MAY RESULT IF THE FOLLOWING INSTRUCTIONS ARE NOT READ AND UNDERSTOOD.

- 1 Inspect the sling. Do not use if any damage from cracking, wearing or fraying is visible.
- 2 Disconnect power supply (batteries).
- 3 Drain both the solution and recovery tanks.
- 4 Remove both presweep and overhead guard if your machine has these kits installed.
- 5 See Figure 1. Hook the lifting sling up to the machine as shown. Be sure hooks fully engage at all four corners.

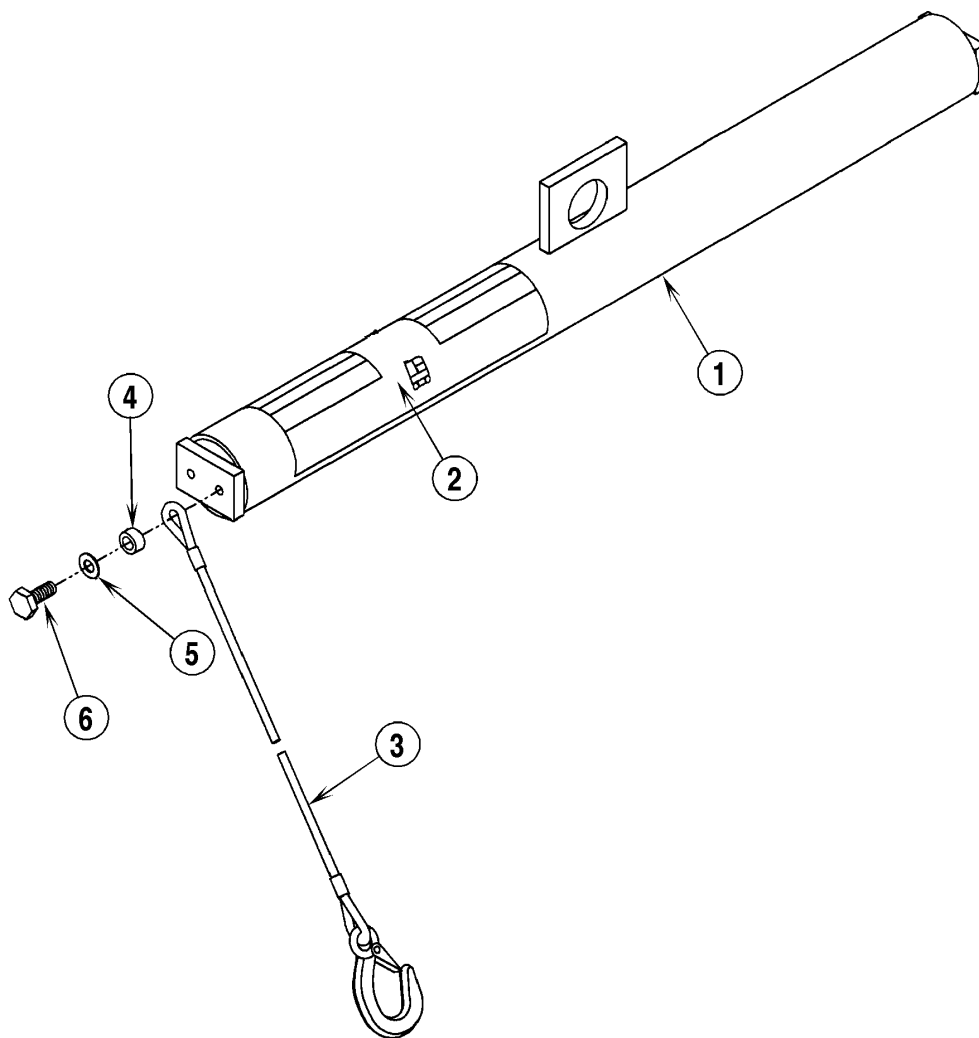
**FIGURE 1**



**Note:** Use a crane or hoist rated for at least 3,000 lbs (1,350 kg) when lifting. The lift sling has a maximum capacity of 2,800 lbs (1,270 kg).

- 6 Make sure that no one is present on or below the machine while lifting.
- 7 Lift, swing and lower slowly.

**FIGURE 2**



# 56407236 HEADLIGHT KIT

For  
Advance Hydro-Retriever™ 3200 / Hydro-Retriever™ 3800 (model 56410000)  
Nilfisk BR 850 / BR 1100

## CONTENTS OF KIT

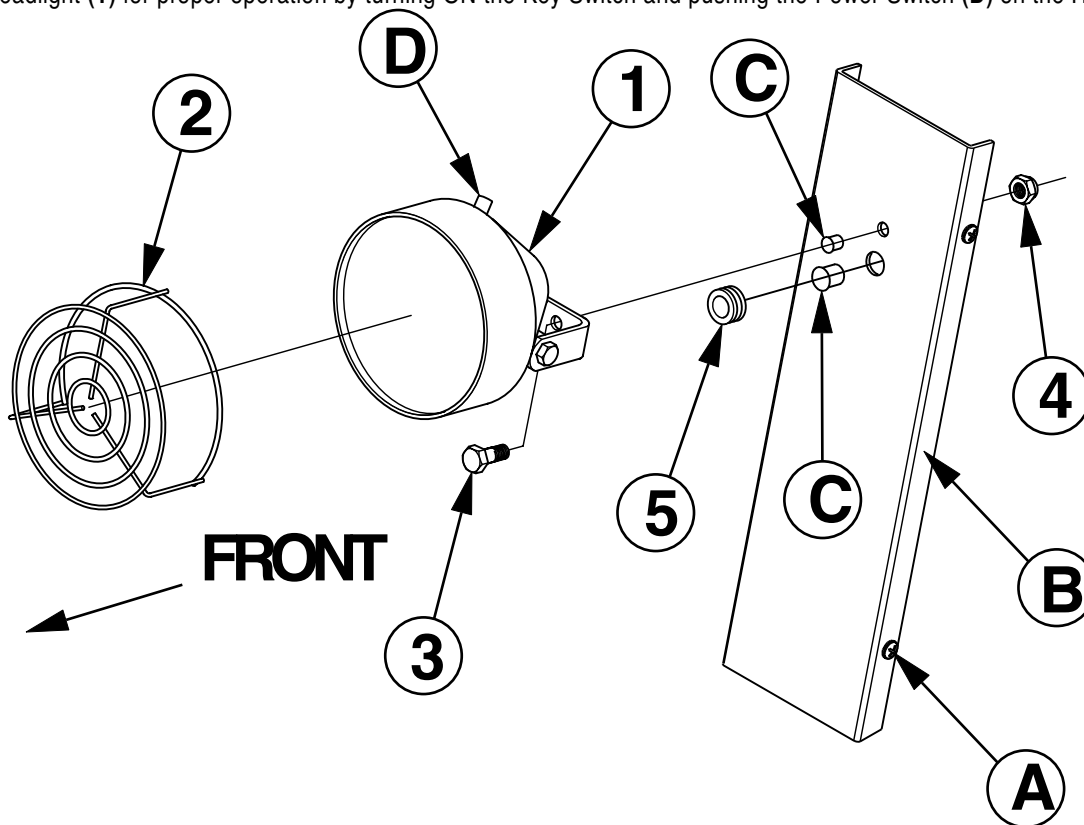
ITEM	PART NO.	QTY	DESCRIPTION
	56040637	1	Instruction Sheet
1	56409239	1	Headlight
2	56409557	1	Headlight Guard
3	56003179	1	Scr, Hex Thd To Hd M8-1.25 x 20mm
4	56003389	1	Nut, Hex Nyl Loc M8-1.25
5	56321540	1	Grommet
6	56172230	2	Terminal Tab .25 Ins

## INSTALLATION INSTRUCTIONS

### ⚠ WARNING!

DISCONNECT BATTERIES BEFORE SERVICING.

- 1 Turn the key switch OFF and **Disconnect the Batteries**.
- 2 Remove the (4) **(A)** Screws and remove the Front Panel **(B)**.
- 3 Remove the (2) **(C)** Button Plugs from the Front Panel **(B)**.
- 4 Install the Grommet **(5)** into the bottom hole as shown.
- 5 Insert the wires from the Headlight **(1)** through the Grommet **(5)** and then secure the Headlight to the Front Panel **(B)** as shown, using the Screw **(3)** and Nut **(4)** from the kit. Snap the Headlight Guard **(2)** over the Headlight **(1)** as shown.
- 6 Connect the (2) Terminal Tabs **(6)** to the Headlight wires.
- 7 Connect the single BLACK Wire from the Headlight **(1)** to the double BLACK Wire from the Wiring Harness.
- 8 Connect the single RED Wire from the Headlight **(1)** to the double WHITE/BROWN Wire from the Wiring Harness.
- 9 Re-install the Front Panel **(B)** on the machine and re-connect the batteries.
- 10 Test the Headlight **(1)** for proper operation by turning ON the Key Switch and pushing the Power Switch **(D)** on the Headlight **(1)**.



# 56410174 BACK-UP ALARM KIT

For Advance Hydro-Retriever™ 3800 (model 56410000) / Nilfisk BR 1100

## CONTENTS OF KIT

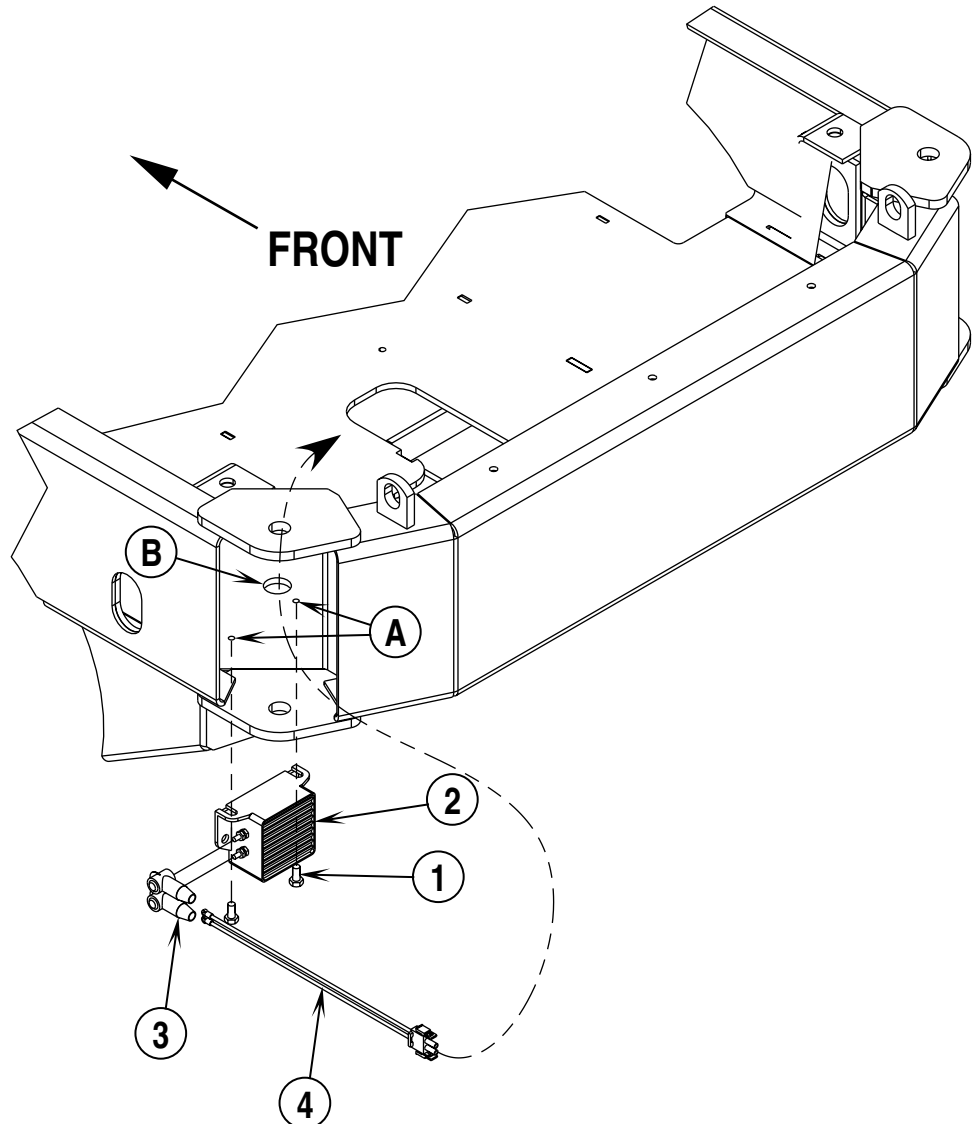
ITEM	REF. NO.	QTY	DESCRIPTION
	56040723	1	Instruction Sheet
1	56009033	2	Scr, Hex Thd Form 1/4-20 x .50
2	56409232	1	Back-Up Alarm
3	56409538	2	Insulator, Terminal
4	56410171	1	Wire Assembly, Pigtail

## INSTALLATION INSTRUCTIONS

### **⚠ WARNING!**

DISCONNECT BATTERIES BEFORE SERVICING.

- 1 If Items (2, 3 & 4) are not already assembled together, do so before proceeding.
- 2 Slip one Terminal Insulator (3) over each wire of the Wire assembly (4) as shown.
- 3 Attach the RED wire from Wire Assembly (4) to the (+) terminal and the BLACK wire from Wire Assembly (4) to the (-) terminal of the Back-Up Alarm (2), then slide the Terminal Insulators (3) over each terminal.
- 4 Under the left rear corner of the machine, there are (2) pre-drilled holes (A). Mount the Back-Up Alarm (2) with the (2) Screws (1) from the kit as shown.
- 5 Route the Wire Assembly (4) up through hole (B).
- 6 Drain and tip the recovery tank back.
- 7 Next to the squeegee lift actuator at the rear of the machine there is a bundle of wire connectors. Find the wire connector which has (1) BLK wire and (1) WHT wire connected to it and remove the protective plug. Plug Wire Assembly (4) into this connector.
- 8 Reconnect the batteries and test the Back-Up Alarm by driving the machine in reverse.



# 56410193 PRESWEEP / DUST CONTROL KIT

For Advance Hydro-Retriever™ 3800 (models 56410000, 56410350) / Nilfisk BR 1100 (models 56410002, 56410351)

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040724	1	Instruction Sheet
*	N/A	1	Presweep Assembly
D	56454538	2	Circuit Breaker, 15Amp
E	56459367	2	Boot, Reset

\* = Refer to illustrated parts breakdown directly after these installation instructions for replacement parts.

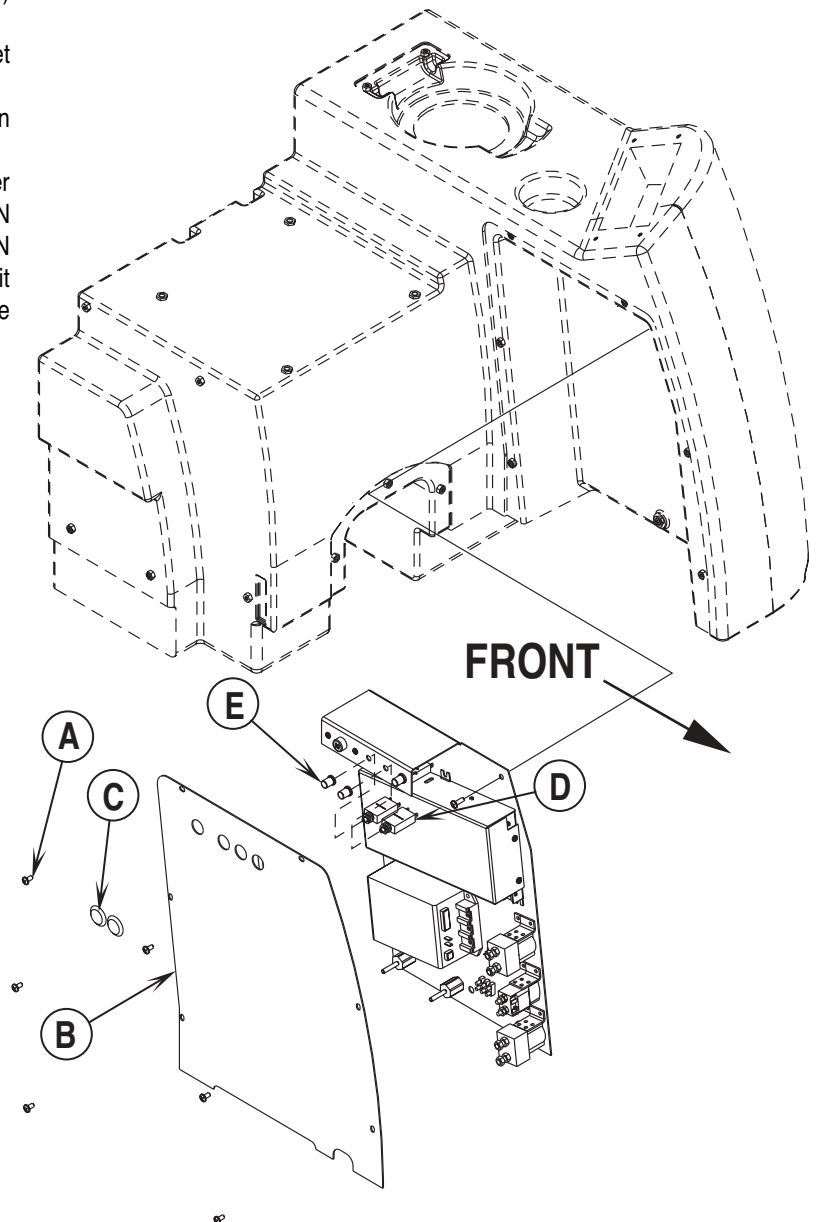
## INSTALLATION INSTRUCTIONS

### ⚠ WARNING!

DISCONNECT BATTERIES BEFORE SERVICING.

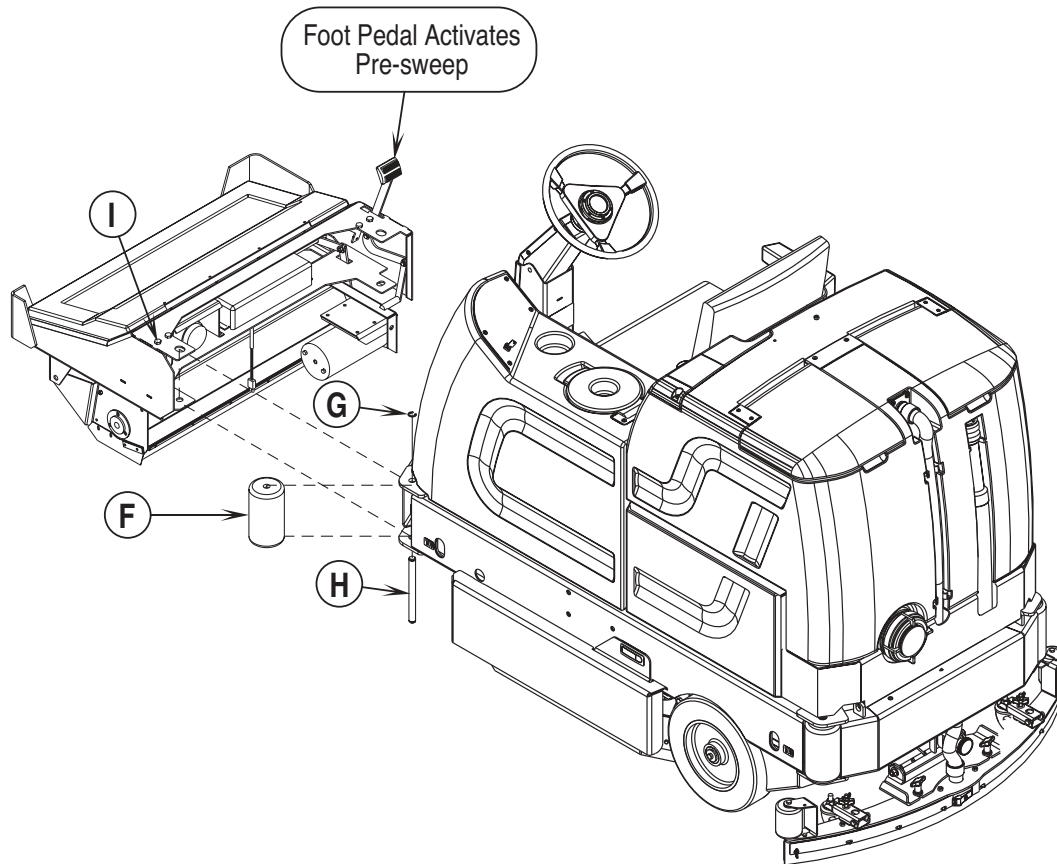
- 1 See Figure 1. Remove the (6) **(A)** Screws and remove Panel **(B)** from the machine. Remove and discard the (2) **(C)** Plugs.
- 2 Install the (2) **(D)** Circuit Breakers and the (2) **(E)** Reset Boots as shown.
- 3 The wiring for these two circuit breakers is pre-installed in the machine, it only needs to be connected.
- 4 The circuit breaker directly next to the 10Amp circuit breaker is the pre-sweep circuit breaker. The RED and WHT/GRN wires should be connected to it. The RED and RED/GRN wires should be connected to the other 15Amp circuit breaker which is the dust control breaker. Re-install the Panel **(B)**.

FIGURE 1



- 5 See Figure 2. Remove both front Roller Bumpers (F). Do this by removing the top Retainer Ring (G) from the left Roller Bumper Pin (H) and drop the pin out from the bottom, the Right Side Roller Bumper Pin can be removed from the top. Save these pins for installation of the presweep assembly.
- 6 Slide the presweep assembly up to the front of the machine.
- 7 Remove the protective plug from presweep wiring connector under the right front corner of the machine. Plug the wiring harness from the presweep assembly into this connector.
- 8 Loosen the (4) (I) Bolts. Lift the presweep assembly up into place where the roller bumpers used to mount, and re-install the (2) (H) Roller Bumper Pins from the bottom up. Re-install the (2) Retainer Rings (G) on the Roller Bumper Pins.
- 9 Lift up on the front of the presweep assembly until it is firmly up against the front of the machine and then tighten the (4) (I) Bolts.
- 10 Before testing the presweep, check the height of the front skirt (the skirt on the hopper), it should be level to the floor and just lightly touching the floor. If it drags the floor too much it will be pulled into the broom. Adjust if necessary.
- 11 Re-connect the batteries and follow the steps below under **Pre-Sweep / Dust Control Configuration**.

**FIGURE 2**



**PRE-SWEEP / DUST CONTROL CONFIGURATION:**

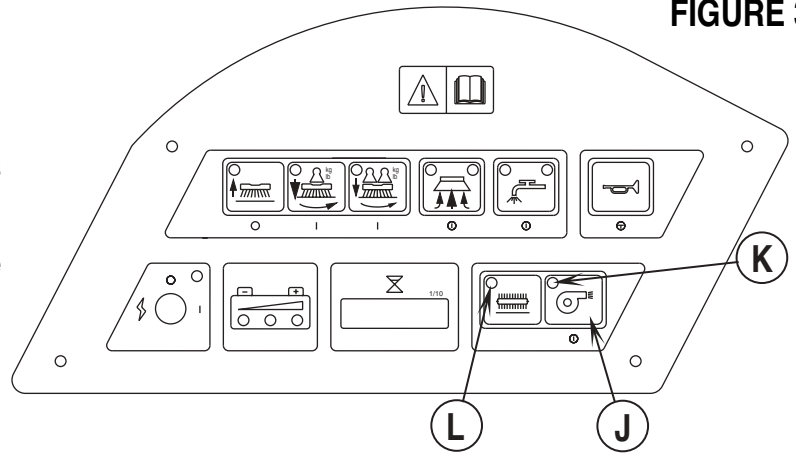
FACTORY DEFAULT: OFF

If the brush type option is properly selected this option will be automatically selected the first time that the pre-sweep/side-broom option is installed and activated. This option can also be selected by performing the following steps:

- A Turn the master on/off key switch to the off position.
- B Press and hold the scrub off switch and the dust control switch.
- C While holding both switches turn the master on/off key switch to the on position.
- D Continue to hold both switches until the hourmeter/status display shows "OFF", "PS" or "Sb" and the dust control yellow indicator is lit.
- E Release both switches.
- F Pressing and releasing the dust control switch will now select between "OFF", "PS" or "Sb". Use "OFF" to disable the pre-sweep/side-broom & dust control feature, "PS" for the disc-type machine pre-sweep unit and "Sb" for the cylindrical scrub machine side-broom unit.
- G To save the new setting, turn the master on/off key switch to the off position.
- H The new setting will be saved and will remain in effect until it is changed again.

- 12 To test the presweep, turn the key switch ON and lower the main and side brooms by depressing the foot pedal on the presweep unit. This will automatically enable the electrical system for the presweep. The main and side brooms will now turn on when the drive pedal is moved from the neutral position. The brooms will turn off approximately 1.6 seconds after the machine stops moving in neutral. The dust control feature can be enabled at any time via the Dust Control Button (J) on the Operator's Control Panel of the machine (see figure 3), however it will only turn on when the brooms turn on.

**FIGURE 3**



**Presweep Dust Control Indicator (K):**

- This indicator will be GREEN when the dust control feature is ON.
- This indicator will be YELLOW when the dust control feature is enabled but not ON.
- This indicator will be OFF if the dust control feature is not enabled.

**Presweep Power Indicator (L):**

- This indicator will be GREEN when the optional presweep kit is installed and turned ON.
- This indicator will be YELLOW when the optional presweep kit is installed and enabled, but not ON (machine in neutral).
- This indicator will be OFF if the foot pedal on the optional presweep kit is UP.

- 12 After testing for proper operation, check the side and main brooms for proper adjustment.

**To adjust the main broom:**

- 13 Park the machine on a level floor and set the parking brake.

- 14 Turn the key switch ON and lower the presweep with the foot pedal. Let the main broom run for about 1 minute. This allows the broom to polish a "strip" on the floor.

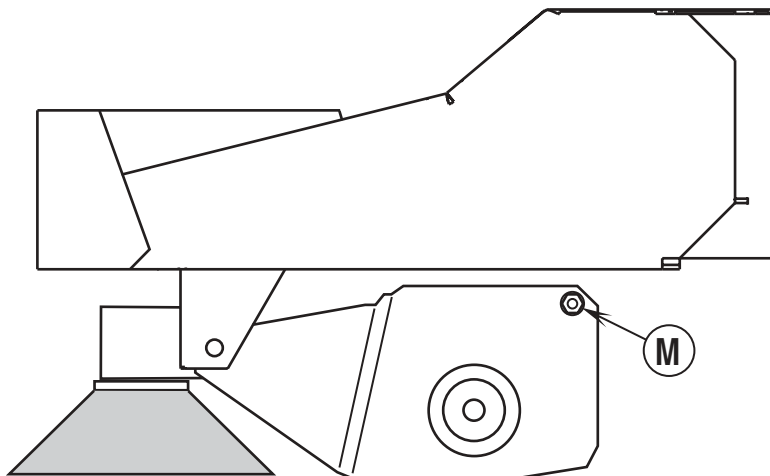
- 15 After 1 minute, release the parking brake and move the machine so that the polished strip is visible. The strip should be 1-1/2 to 2 inches (3.81 to 5.14 cm) wide its entire length.

**Note:** Adjusting the broom for a pattern wider than specified decreases sweeping performance and increases broom wear.

- 16 If the polished strip is tapered toward either end, loosen nut (M) (see figure 4) and raise or lower the left end of the broom to compensate and retighten nut (M).

- 17 Re-test the broom to make sure the polished strip is an even width its entire length (repeat step 16 if necessary and re-test after each adjustment).

**FIGURE 4**

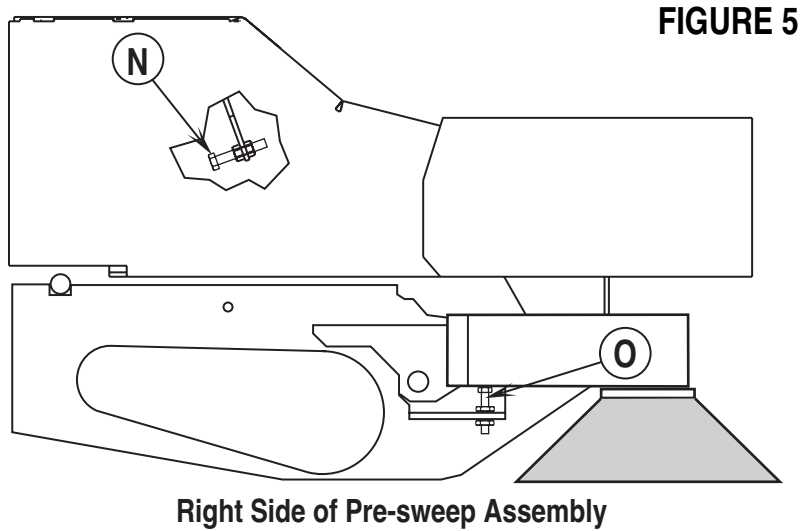


**Left Side of Pre-sweep Assembly**

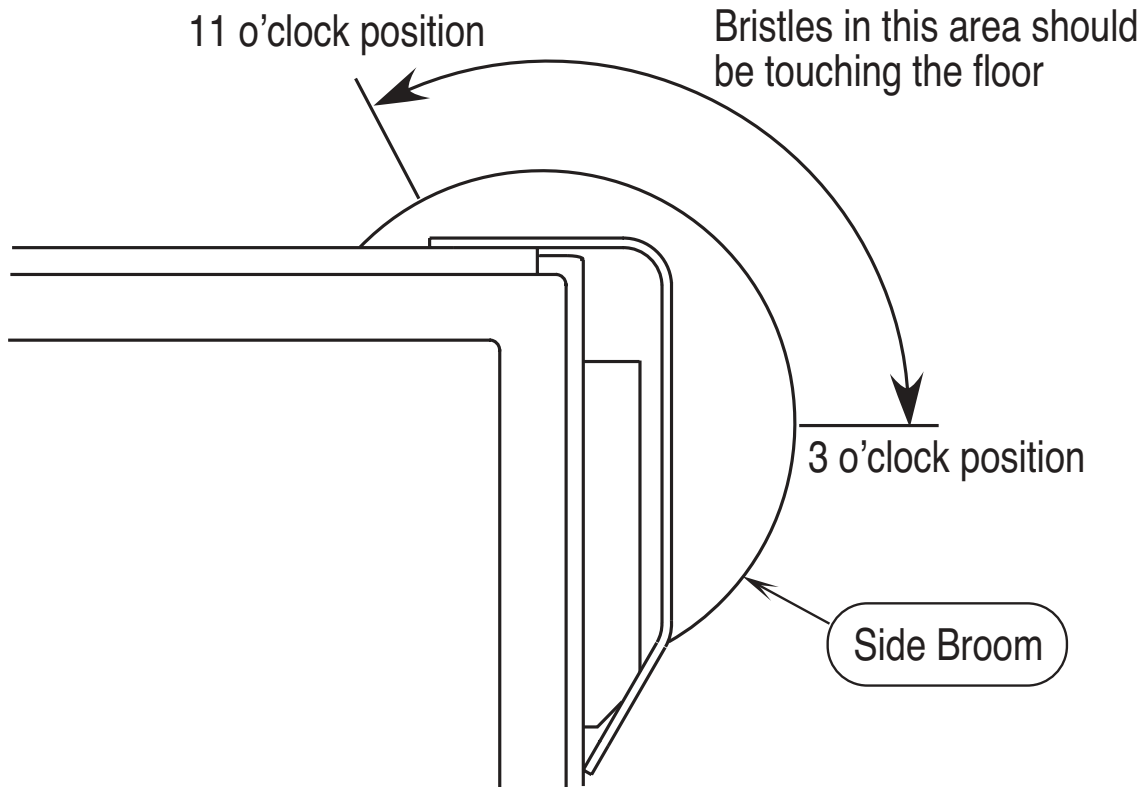
- 18 If the polished strip is too wide or too narrow, the broom height can be adjusted by turning bolt (N) (see figure 5) clockwise to widen or counter clockwise to narrow the width of the strip (open hopper door for access to bolt (N) and loosen lock nut first).
- 19 Re-test the broom to make sure the polished strip is 1-1/2 to 2 inches (3.81 to 5.14 cm) wide its entire length. After the broom is properly adjusted, retighten the lock nut on bolt (N).

**To adjust the side broom:**

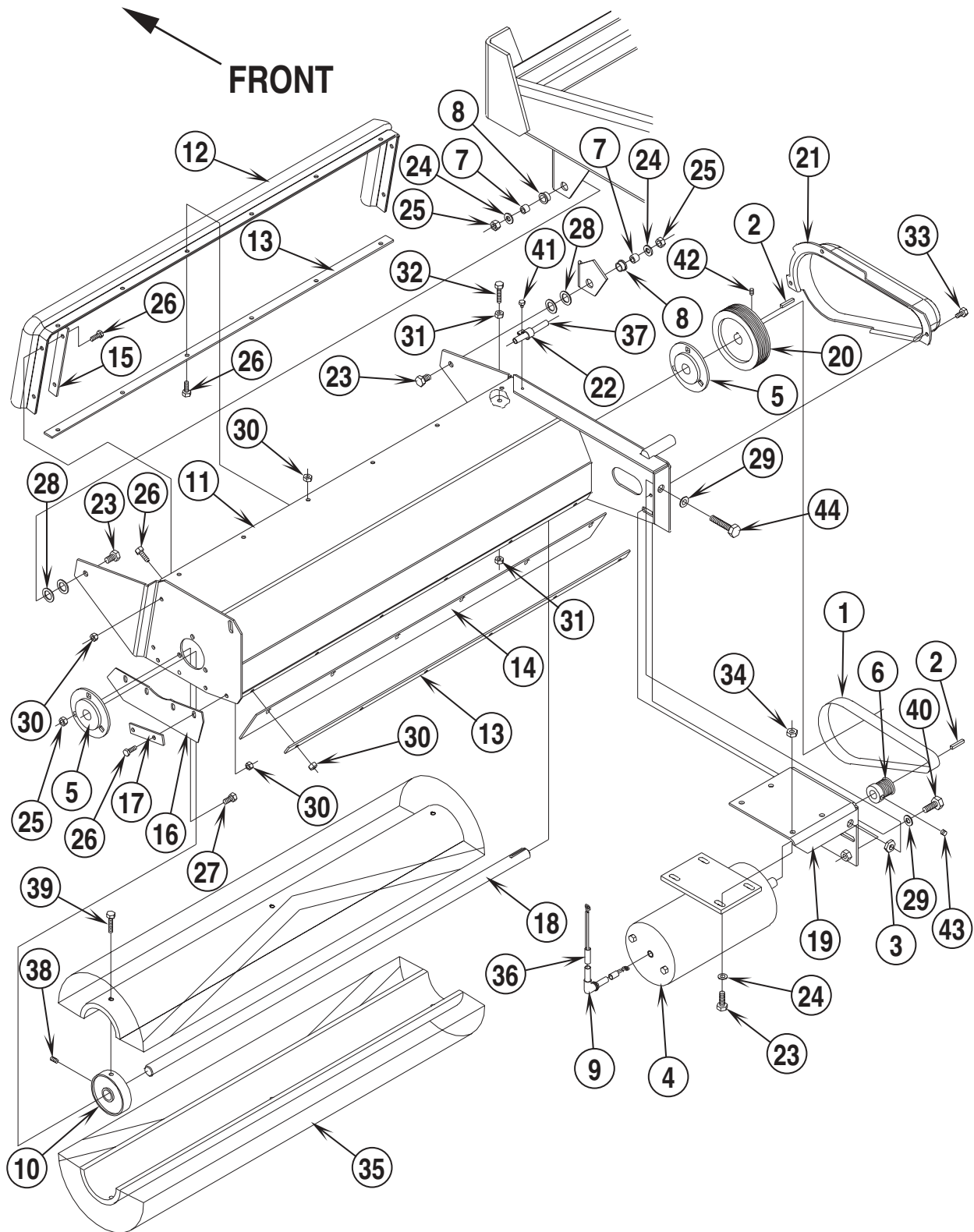
- 20 Park the machine on a level floor and set the parking brake.
- 21 Turn the key switch ON and lower the presweep with the foot pedal.
- 22 See Figure 6. Observe the side broom while it is running. The bristles from the "11 o'clock" position to the "3 o'clock" position (about 1/3 of the bristles / as viewed from the operator's seat) should be touching the floor.
- 23 If the side broom requires adjustment, loosen the lock nuts and turn bolt (O) (see figure 5) clockwise to lower and counter clockwise to raise the side broom.
- 24 Re-test after each adjustment. After the broom is properly adjusted, retighten the lock nuts on bolt (O).



**FIGURE 6**







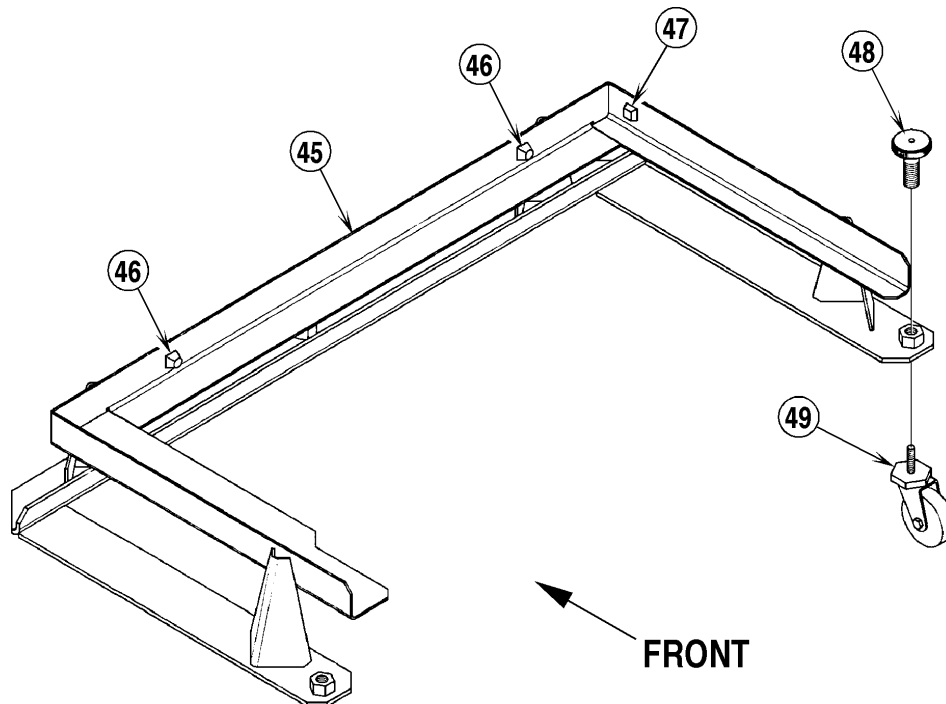
# PRESWEEP KIT (BROOM HOUSING)

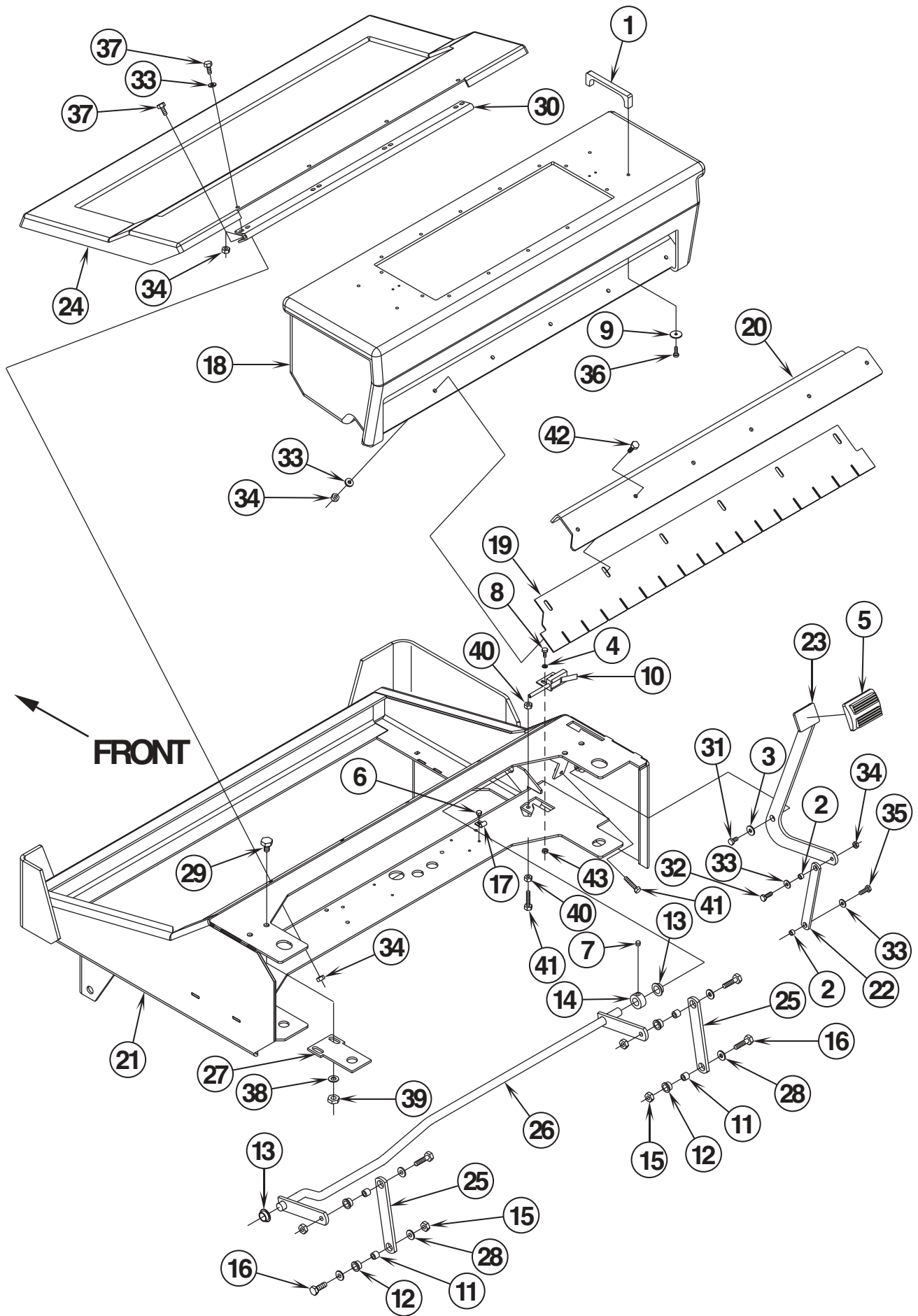
Item	Ref. No.	Qty	Description	Item	Ref. No.	Qty	Description
	56410193	1	Presweep Kit <b>NOTE #1</b>	26	56002155	24	1/4-20 x 3/4 Screw
*	56040724	1	Instruction Sheet	27	56002035	6	5/16-18 x 5/8 Bolt
1	56755263	1	Poly V Belt	28	56151858	4	Thrust Bearing
2	56003240	2	Key	29	56002063	2	3/8 Flat Washer
3	56009085	1	3/8-16 Jam Nut	30	56002708	24	1/4-20 Nyl Loc Nut
4	56261210	1	Motor	31	56009087	2	1/4-20 Jam Nut
5	56393601	2	Flange Bearing	32	56002047	1	1/4-20 x 1-1/4 Screw
6	56387542	1	Sheave	33	56009033	3	1/4-20 x 1/2 HP-5 Screw
7	56244941	2	Bushing	34	56002701	4	5/16-18 Nyl Loc Nut
8	56185264	2	Flange Bearing	35	56505627	1	Main Broom
9	56754199	1	Strain Relief	36	56410245	1	Cord
10	56475462	3	Insert	37	56410246	1	Cord
11	56409296	1	Broom Housing	38	56002119	3	1/4-20 x 1/2 Loc Set Screw
12	56409266	1	Seal	39	56009088	6	1/4-20 x 1-1/4 HP-5 Screw
13	56409267	2	Seal Strap	40	56002947	1	3/8-16 x 1 Loc Bolt
14	56409268	1	Rear Skirt	41	56009012	1	#10-24 x 3/8 HP-5 Screw
15	56409278	2	Side Front Strap	42	56002930	2	1/4-20 x 3/8 Loc Set Screw
16	56409279	2	Side Skirt	43	56002086	2	5/16-18 x 1/4 Loc Set Screw
17	56409280	4	Side Skirt Strap	44	56002470	1	3/8-16 x 2 Bolt
18	56409282	1	Shaft		56409547	1	Presweep Cart Assembly (#45-49) <b>Note #2:</b>
19	56409283	1	Motor Bracket				
20	56409284	1	Sheave	45	56409548	1	Frame
21	56409286	1	Belt Guard	46	56382566	2	Bumper
22	56300152	1	Cable Clamp	47	56402940	2	Bumper
23	56002221	6	5/16-18 x 1 Bolt	48	56409555	3	Adjusting Knob
24	56001939	6	5/16 Flat Washer	49	56458838	3	Caster Wheel
25	56002826	8	5/16-18 Thin Nyl Loc Nut				

\* = Not Shown

**Note #1:** The Presweep Kit PN56410193 does not include the Presweep Cart Assembly PN56409547.

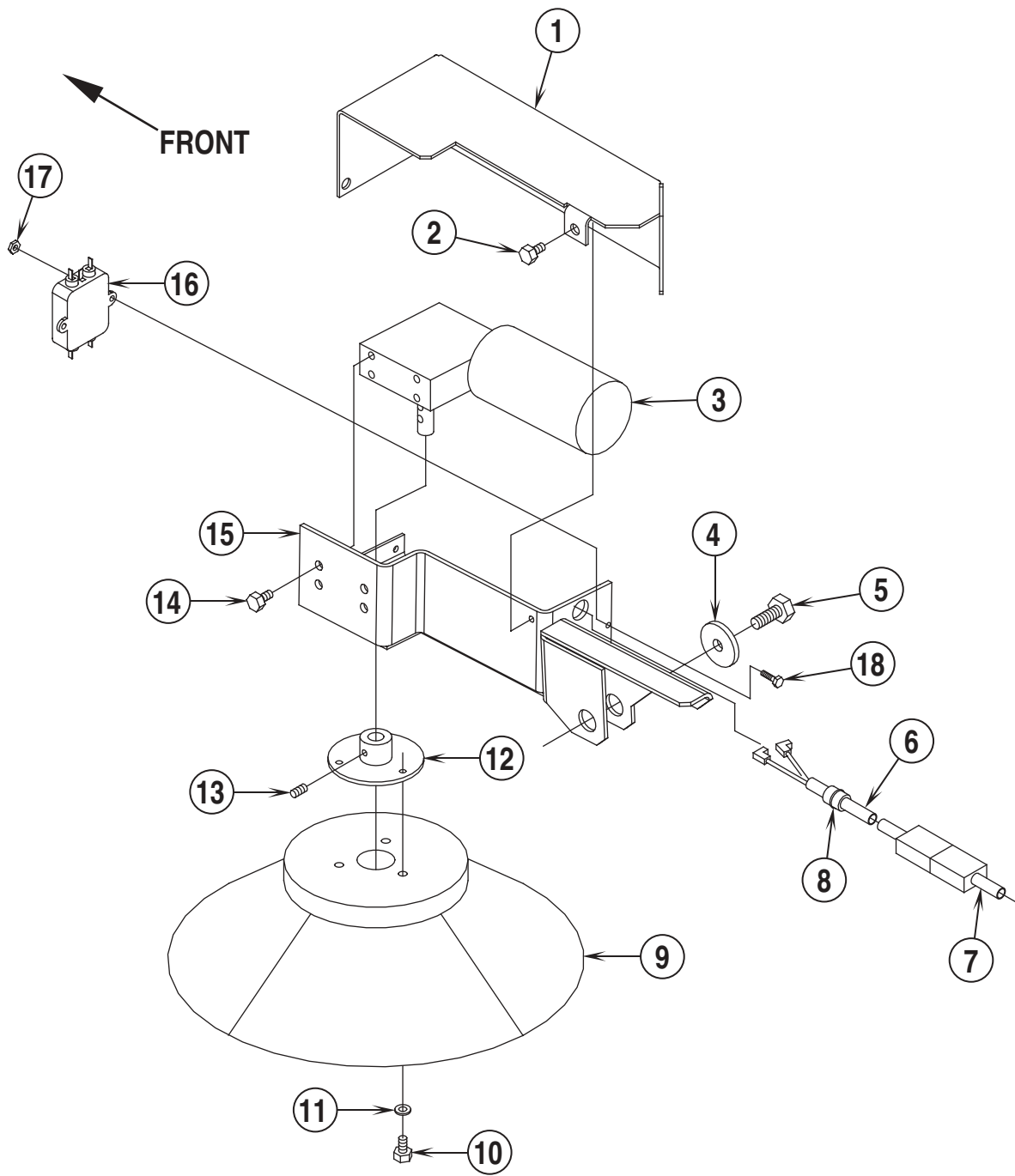
**Note #2:** The Presweep Cart Assembly is used to sit the Presweep Assembly on for storage and moving to and from the machine.





## PRESWEEP KIT (FRAME & HOPPER)

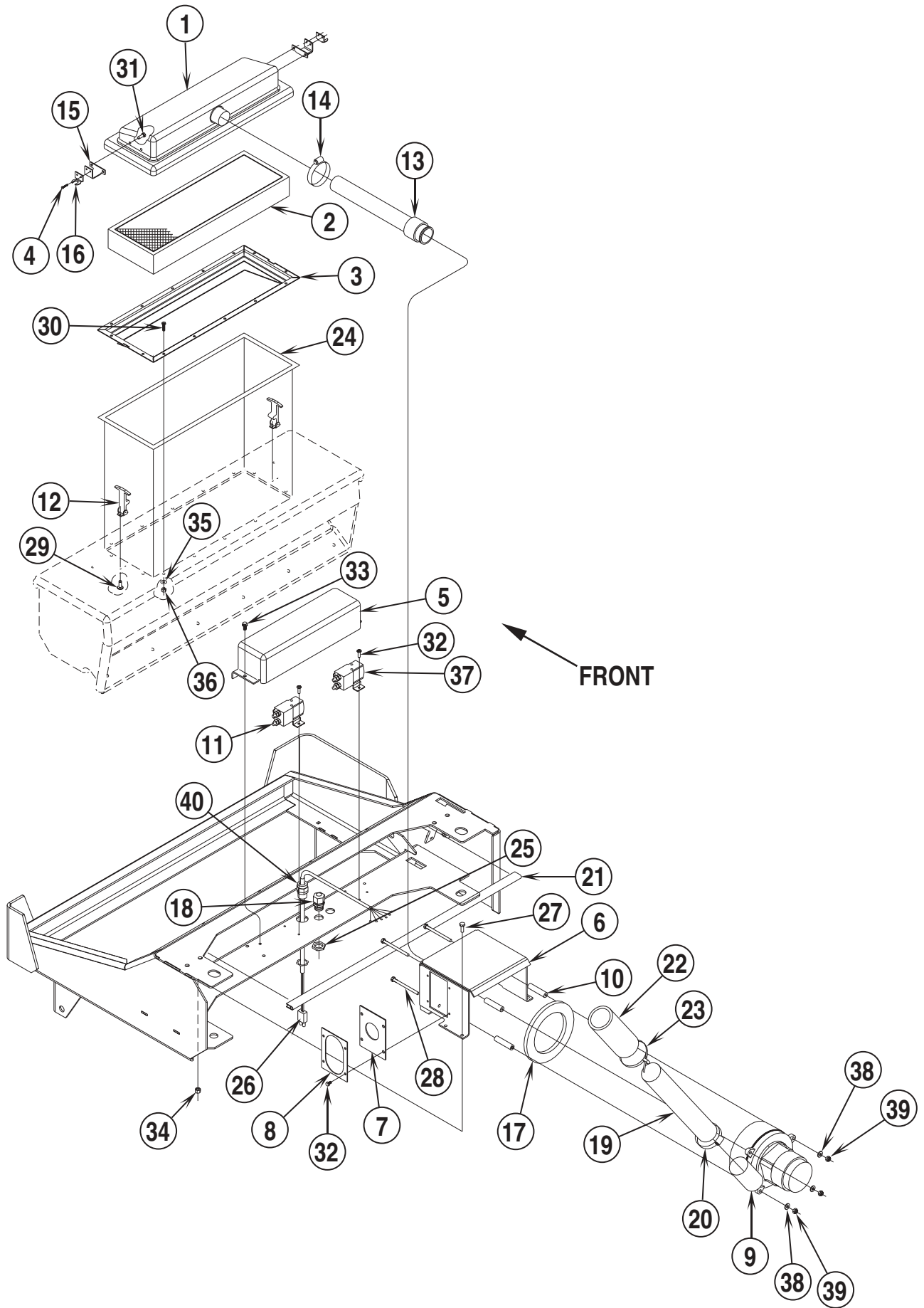
Item	Ref. No.	Qty	Description
1	56300101	2	Handle
2	56379298	2	Bushing
3	56009002	1	Washer
4	56001954	2	#10 Flat Washer
5	56365002	1	Rubber Pad
6	56009012	1	#10-24 x 3/8 HP-5 Screw
7	56002086	1	5/16-18 x 1/4 Loc Set Screw
8	56002503	2	#10-24 x 1/2 Screw
9	56009096	4	Washer
10	56410249	1	Switch
11	56244941	4	Bushing
12	56185264	4	Flange Bearing
13	56470173	2	Flange Bearing
14	56367354	1	Collar
15	56002701	4	5/16-18 Nyl Loc Nut
16	56001834	4	5/16-18 x 1-1/4 Bolt
17	56481890	1	P Clamp
18	56409803	1	Hopper
19	56409270	1	Front Skirt
20	56409271	1	Front Flap Strap
21	56410204	1	Frame
22	56409293	1	Strap
23	56409298	1	Lift Lever
24	56409657	1	Cover
25	56409395	2	Strap
26	56409767	1	Rod
27	56409481	2	Plate
28	56001939	5	5/16 Flat Washer
29	56002127	4	3/8-16 x 3/4 Bolt
30	56459192	1	Hinge
31	56003039	1	1/4-20 x 1/2 Loc Screw
32	56002155	1	1/4-20 x 3/4 Screw
33	56002098	15	1/4 Flat Washer
34	56002840	14	1/4-20 Thin Nyl Loc Nut
35	56002948	1	1/4-20 x 3/4 Loc Screw
36	56002124	4	#10-24 x 5/8 Screw
37	56001836	8	1/4-20 x 5/8 Screw
38	56002063	4	3/8 Flat Washer
39	56002841	4	3/8-16 Thin Nyl Loc Nut
40	56009087	2	1/4-20 Jam Nut
41	56002047	2	1/4-20 x 1-1/4 Screw
42	56001821	6	1/4-20 x 7/8 Screw
43	56002768	2	#10-24 Nyl Loc Nut



# PRESWEEP KIT (SIDE BROOM)

Item	Ref. No.	Qty	Description
1	56409715	1	Cover Plate
2	56009033	9	1/4-20 x 1/2 HP-5 Screw
3	56409713	1	Motor
*	56471129	1	Carbon Brush Kit (for 56409713)
*	56471167	1	Gear Assembly, Replacement (for 56409713)
4	56367117	1	Washer
5	56002947	1	3/8-16 x 1 Loc Bolt
6	56409714	1	Cord
7	56410246	1	Cord
8	56163015	1	Strain Relief
9	56475179	1	Side Broom
10	56001854	3	1/4-20 x 1/2 Screw
11	56002098	15	1/4 Flat Washer
12	56467522	1	Brush Holder
13	56002119	4	1/4-20 x 1/2 Loc Set Screw
14	56002933	4	1/4-20 x 3/8 Loc Screw
15	56409716	1	Side Broom Mount
16	56409712	1	RFI Filter
17	56002802	2	Nut, Hex Nyl Loc 8-32
18	56003007	2	Scr, Hex Hd 8-32 x .50

\* = Item Not Shown



# PRESWEEP KIT (DUST CONTROL)

Item	Ref. No.	Qty	Description
1	56409758	1	Filter Cover
2	56409760	1	Filter Assy
3	56409757	1	Filter Retainer
4	56003419	4	Rivet, Blind
5	56409768	1	Cover
6	56409762	1	Vac Motor Mount
7	56409765	1	Boot
8	56409764	1	Plate, Cover
9	56409785	1	Vac Motor
*	56503003	1	Carbon Brush Set for 56409785
10	56409763	3	Stand-Off
11	56410087	1	Solenoid ( <b>Vac Motor</b> )
12	56393560	2	Latch
13	56409761	1	Hose
14	56329145	1	Hose Clamp
15	56409759	2	Keeper, Mount
16	56393559	2	Keeper
17	56385437	1	Gasket
18	56323135	2	Strain Relief
19	56323295	1	Hose
20	56440213	1	Hose Clamp
21	56409779	1	Gasket
22	56391807	1	Foam, Acoustical
23	56477613	1	Tie, Cable
24	56209434	48"	Gasket (122 cm)
25	56009095	2	Nut, Conduit Lock 1/2-14
26	56410244	1	Wiring Harness
27	56002155	8	Scr, Hex Hd 1/4-20 x .75
28	56001817	3	Scr, Hex 1/4-20 x 3.25
29	56002438	4	Scr, Pan Phil Thd Form 8-32 x .50
30	56002504	14	Scr, Hex Hd #10-24 x .75
31	56002530	4	Scr, Hex Thd Form 1/4-20 x .38
32	56009012	8	Scr, Hex Thd Form #10-24 x .38
33	56009033	2	Scr, Hex Thd Form 1/4-20 x .50
34	56002840	4	Nut, Hex Nyl Loc-Thin 1/4-20
35	56001954	4	Wsh, Flt SAE #10
36	56002768	4	Nut, Hex Nyl Loc #10-24
37	56410087	1	Solenoid ( <b>Main Broom / Side Broom</b> )
38	56002098	3	Wsh, Flt SAE 1/4
39	56002708	3	Nut Hex Nyl Loc 1/4-20
40	56416406	1	Strain Relief
*	56454538	2	Circuit Breaker, 15Amp <b>NOTE</b>
*	56459367	2	Boot, Reset <b>NOTE</b>

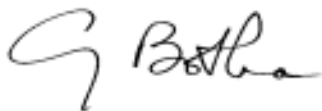
\* = Item Not Shown

**NOTE:** These 2 items are installed on the rider scrubber itself during installation.



## TYPE: Pre-Sweep for BR1100

<p><b>EU Overensstemmelseserklæring</b> <b>DK</b> Fejemaskine Maskinen er fremstillet i overensstemmelse med følgende direktiver:  Maskindirektiv: 98/37/EØF EMC-direktiv: 89/336/EØF 92/31/EØF 93/68/EØF Lavspændingsdirektiv: 73/23/EØF 93/68/EØF Harmoniserede standarder: EN 60 335-2-72</p>	<p><b>Déclaration CE de conformité</b> <b>B, F</b> Balayeuse Cette machine a été fabriquée conformément aux directives suivantes: Réglementation machine: 98/37/CEE Réglementation CEM: 89/336/CEE 92/31/CEE 93/68/CEE Règlement basse tension: 73/23/CEE 93/68/CEE Normes harmonisées: EN 60 335-2-72</p>
<p><b>EU Överensstämmelseförsäkran</b> <b>S, FIN</b> Sopmaskin Maskinen är tillverkad i överensstämmelse med följande direktiver: Maskindirektiv: 98/37/EEG EMC-direktiv: 89/336/EEG 92/31/EEG 93/68/EEG Lågspänningsdirektiv: 73/23/EEG 93/68/EEG Harmoniserade standarder: EN 60 335-2-72</p>	<p><b>EG-conformiteitsverklaring</b> <b>NL, B</b> Borstelveger Deze machine is vervaardigd overeenkomstig de volgende richtlijnen: Machine richtlijn: 98/37/EEC EMC-richtlijn: 89/336/EEC 92/31/EEC 93/68/EEC Laagspanning richtlijn: 73/23/EEC 93/68/EEC Geharmoniseerde normen: EN 60 335-2-72</p>
<p><b>EU Declaration of Conformity</b> <b>GB, IRL</b> Floor sweeper This machine was manufactured in conformity with the following directives and standards: Machine Directive: 98/37/EEC EMC-directive: 89/336/EEC 92/31/EEC 93/68/EEC Low voltage directive: 73/23/EEC 93/68/EEC Harmonized standards: EN 60 335-2-72</p>	<p><b>Declaración de conformidad de la CEE</b> <b>E</b> Barredora Esta máquina ha sido fabricada en conformidad a las siguientes normativas: Normativa de la máquina: 98/37/CEE Normativa EMC: 89/336/CEE 92/31/CEE 93/68/CEE Normativa sobre baja tensión: 73/23/CEE 93/68/CEE Normas armonizadas: EN 60 335-2-72</p>
<p><b>Dichiarazione di conformità - CEE</b> <b>I</b> Spazzatrice È prodotto in conformità alle disposizioni contenute nelle Direttive del Consiglio dei Ministri: M-direttiva: 98/37/EEC EMC-direttiva: 89/336/EEC 92/31/EEC 93/68/EEC LV-direttiva: 73/23/EEC 93/68/EEC Norme armonizzate: EN 60 335-2-72</p>	<p><b>EU Declaração de conformidade da CE</b> <b>P</b> Varredora Esta máquina foi fabricada em conformidade com as seguintes directrizes: Directriz de maquinaria: 98/37/CEE Directriz EMC: 89/336/CEE 92/31/EEC 93/68/CEE Directriz de baixa voltagem: 73/23/CEE 93/68/CEE Normas harmonizadas: EN 60 335-2-72</p>
<p><b>EG – Konformitätserklärung</b> <b>D, A</b> Kehrmaschine Diese Maschine wurde gemäß den folgenden Richtlinien hergestellt: Maschinenrichtlinie: 98/37/EWG EMV-Richtlinie: 89/336/EWG 92/31/EWG 93/68/EWG Niederspannungsrichtlinie: 73/23/EWG 93/68/EWG Harmonisierte normen: EN 60 335-2-72</p>	<p><b>EU:n yhdenmukaisuudesta direktiiveihin</b> <b>FIN</b> Lakaisukone On valmistettu noudattaen yhteisön määräämiä direktiivejä: M-direktiivi: 98/37/CEE EMC-direktiivi: 89/336/CEE 92/31/CEE 93/68/CEE LV-direktiivi: 73/23/CEE 93/68/CEE Yhdenmukaistetut standardit: EN 60 335-2-72</p>
<p><b>Δηλώση προσαρμογής/συνόρφωσης</b> <b>EU</b> <b>GR</b> Μηχανήμα συντηρησης δαπέδων Το μηχανήμα έχει κατασκευαστεί ονμψωπα με τις παρακάτω προ- συναγραφές: Προσυναγραφή μηχανήματος: 98/37/EEC Προσυναγραφή-EMC: 89/336/EEC 92/31/EEC 93/68/EEC Προσυναγραφή χαμηλής τάσεως: 73/23/EEC 93/68/EEC Εναρμονισμένα προτυπα: EN 60 335-2-72</p>	



8.1.2000

Gerhard Botha, Senior Vice President, Manufacturing

Nilfisk-Advance, Inc.  
14600 21st Avenue North  
Plymouth, MN 55447 USA

Nilfisk-Advance A/S  
Sognevej 25  
DK-2605 Brøndby, Denmark

# 56410192 OVERHEAD GUARD KIT

For Hydro Retriever™ 3800(model 56410000) / BR 1100

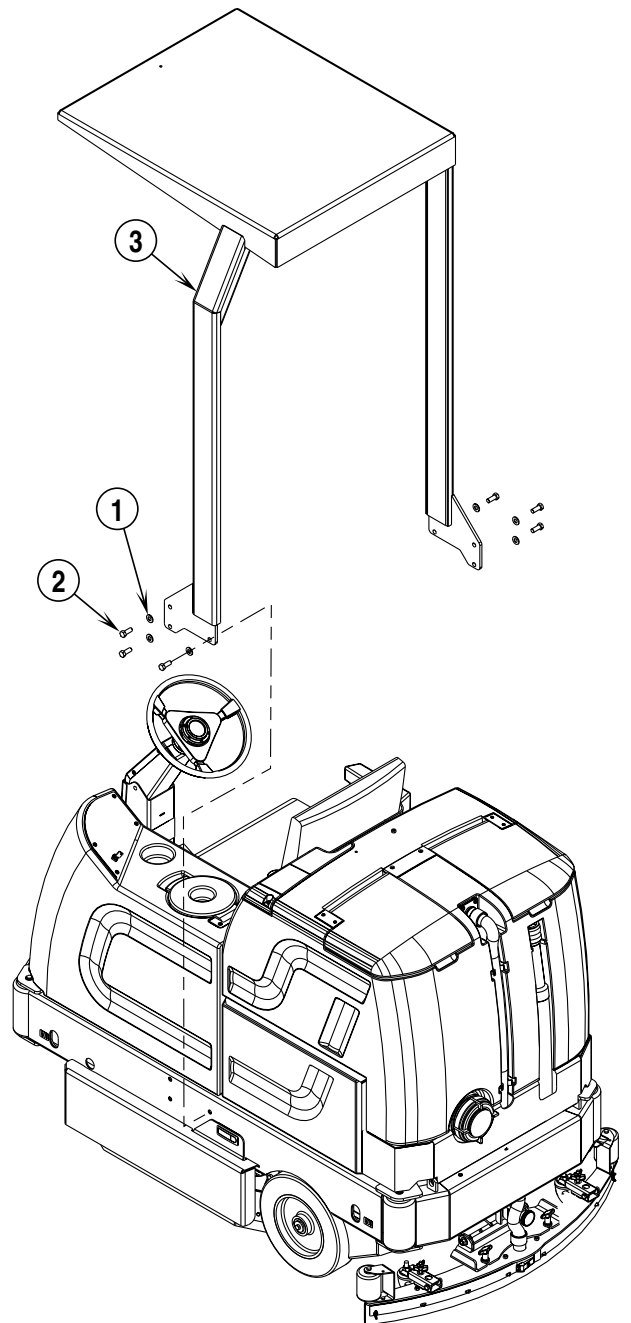
## CONTENTS OF KIT

ITEM	PART NO.	QTY	DESCRIPTION
	56040726	1	Instruction Sheet
1	56001879	6	Wsh, Flt SAE 1/2
2	56003022	6	Scr, Hex Hd Loc 1/2-13 x 1.25
3	56410200	1	Overhead Guard Weldment

## INSTALLATION INSTRUCTIONS

- 1 Turn the machine off. Set the parking brake.
- 2 Use a hoist to lift the overhead guard into position over the machine as shown.
- 3 Install the Overhead Guard Weldment (3) using Screws (2) and Washers (1).

**IMPORTANT! Use only the hardware provided in the kit! Hardware strength is a factor in product safety.**



# 56410197 VACUUM WAND CADDY KIT

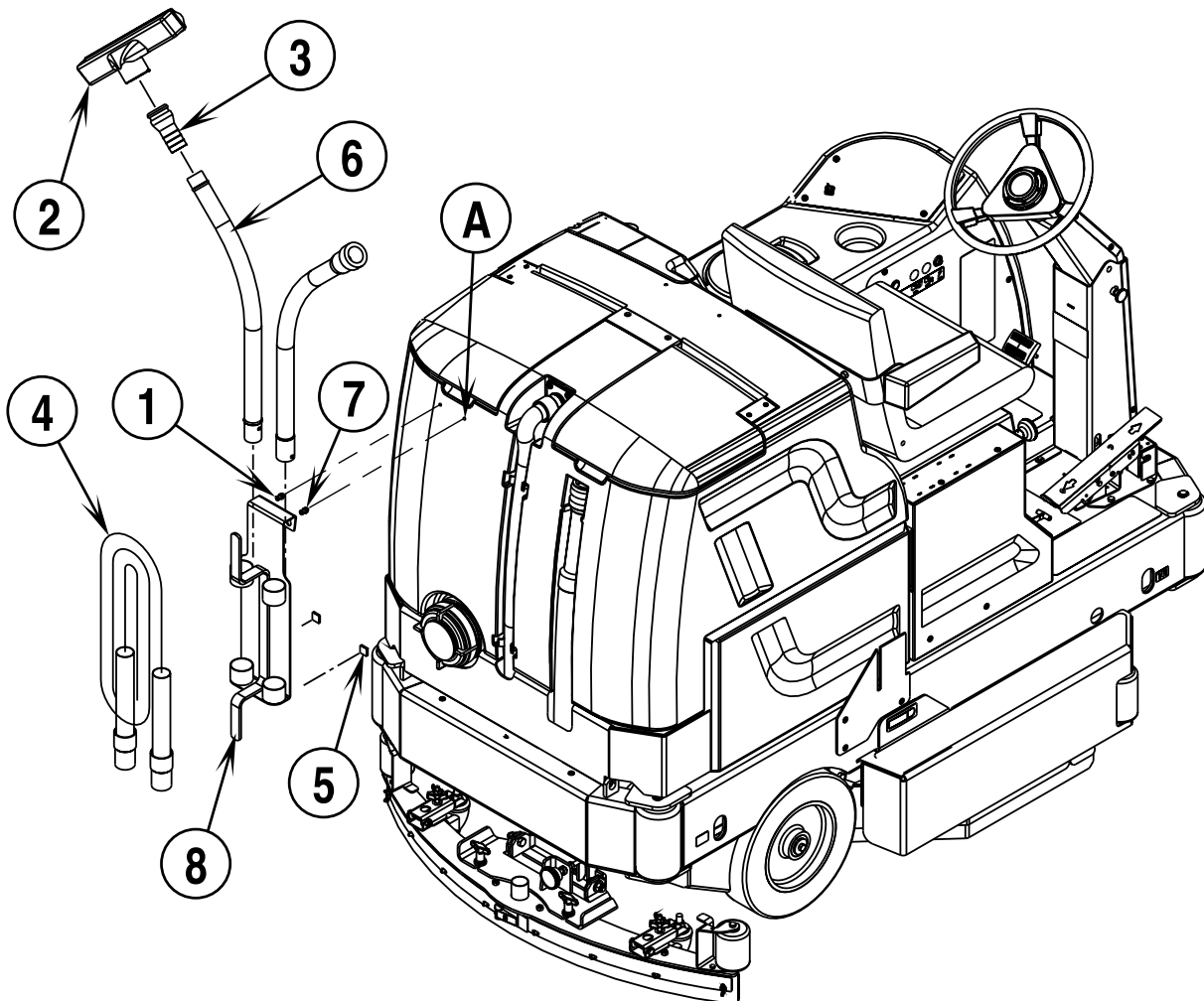
For Advance Hydro-Retriever™ 3800 (model 56410000) / Nilfisk BR 1100

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040727	1	Instruction Sheet
1	56002124	2	Scr, Pan Phil 10-24 x .62
2	56205114	1	Squeegee Tool, 14"
3	56301339	1	Coupler
4	56329062	1	Vac Hose, 1.50
5	56402940	2	Bumper
6	56409563	1	Wand, 2 Piece
7	56412310	2	Spacer, Stepped
8	56410202	1	Caddy Weldment

## INSTALLATION INSTRUCTIONS

- 1 Install Bumpers (5) as shown, if not already done.
- 2 Slide Screws (1) through Spacers (7) and screw them into Inserts (A) in the tank (screw heads should be flush with top of inserts).
- 3 Hang the Caddy Weldment (8) through key holes onto the tank.
- 4 Slide the Wands (6) down into the tubular holders and wrap Hose (4) around the brackets as shown.
- 5 Install the Coupler (3) and Squeegee Tool (2) onto the end of the Wand Tube (6) as shown.



# 56410195 DUAL VACUUM MOTOR KIT

For Advance Hydro-Retriever™ 3800 (model 56410000) / Nilfisk BR 1100

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040728	1	Instruction Sheet
1	N/A	1	Vac Motor Assembly
*	56002098	8	Wsh, Flt SAE 1/4
*	56003168	1	Scr, Hex M6-1.0 x 50mm
*	56003169	2	Scr, Hex M6-1.0 x 60mm
*	56003403	5	Nut, Hex Nyl Loc M6-1.00
*	56410063	1	Vacuum Support
*	56410064	3	Stand-Off
*	56410065	1	Vac Motor W/Cap
*	56410067	1	Foam, Vac Motor
*	56410068	1	Foam, Vac Motor
*	56410086	1	Dual Vacuum Shroud
2	56001862	2	Scr, Hex Hd 5/16-18 x .50
3	56262163	1	Hose
4	56329145	4	Clamp, Hose SAE #24
5	56410219	1	Tee Weldment
6	56410221	1	Hose, 1.5 Dia. x 4 inch

\* = These parts are pre-assembled to make up item (1), see Figure 2 for replacement parts breakdown.

## INSTALLATION INSTRUCTIONS

### WARNING!

DISCONNECT BATTERIES BEFORE SERVICING.

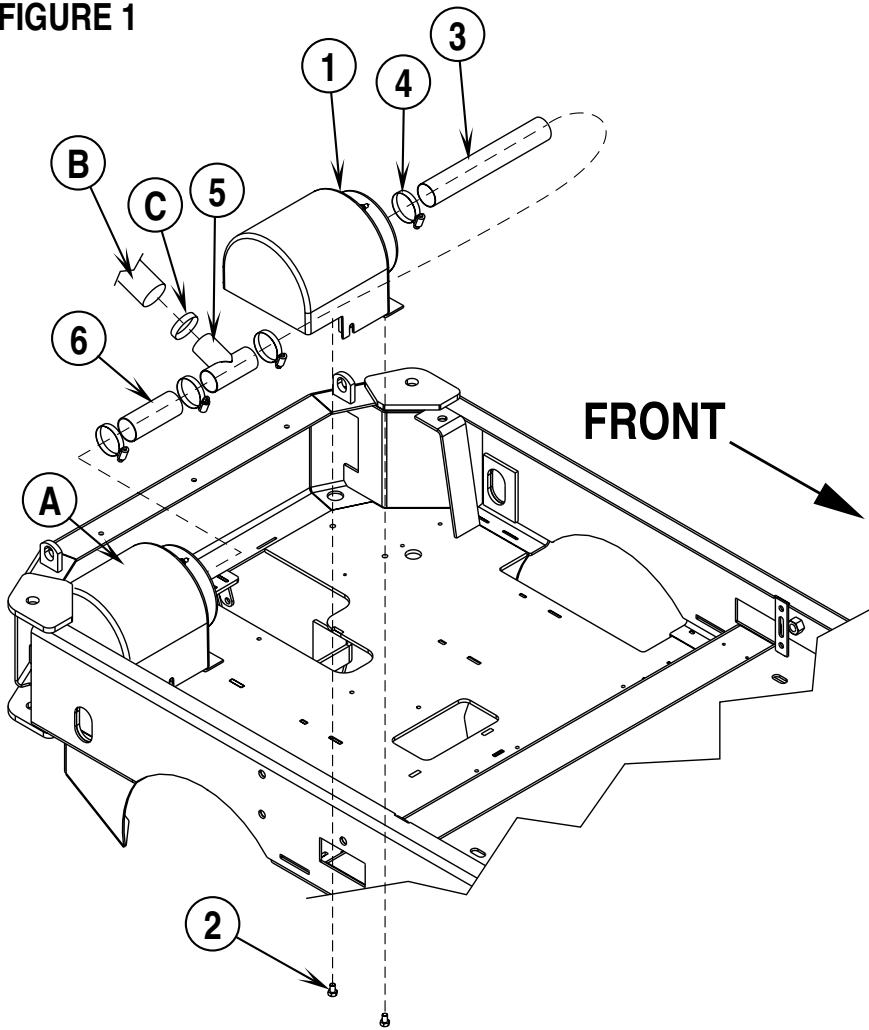
- 1 Drain the recovery tank at a designated "DISPOSAL SITE".
- 2 Disconnect the recovery tank cable and tip the tank all the way back.
- 3 See Figure 1. Install the Vac Motor Assembly (1) to the left of the original vac motor using the (2) Screws (2) from the kit as shown (no drilling required / holes predrilled).
- 4 Next to the squeegee lift actuator at the rear of the machine there is a bundle of wire connectors. Find the large wire connector which has (1) BLU wire and (1) BLK wire connected to it and remove the protective plug. Plug Vac Motor Assembly (1) into this connector.
- 5 Disconnect the vac hose from the original vac motor (A) and install Tee (5) and Hoses (3 & 6) using the (4) Hose Clamps as shown. Route Hose (3) as shown, it should lay between the battery box and the second Vac Motor Assembly (1).
- 6 Connect the vac hose (B) previously connected to the original vac motor to the Tee (5) as shown. Re-use the original Hose Clamp (C).
- 7 Tip the recovery tank back into place and reconnect the recovery tank cable.
- 8 Reconnect the batteries and follow the steps below under VACUUM MOTOR CONFIGURATION.

### VACUUM MOTOR CONFIGURATION:

The control must be programmed for the number of vacuum motors installed so that the over-current protection will function properly. To select the vacuum motor configuration perform the following steps:

- 1 Turn the master on/off key switch to the off position.
- 2 Press and hold the scrub off switch and the vacuum switch.
- 3 While holding both switches turn the master on/off key switch to the on position.
- 4 Continue to hold both switches until the hourmeter/status display shows "1" or "2" and the vacuum yellow indicator is lit.
- 5 Release both switches.
- 6 Pressing and releasing the vacuum switch will now select between "1" or "2". Use "1" for a single vacuum motor and "2" for dual vacuum motors.
- 7 To save the new setting, turn the master on/off key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.
- 9 Test for proper operation (lower squeegee and run vacuum system to make sure both vac motors are running / seat switch and key switch must be ON and drive pedal must be off of neutral position).

**FIGURE 1**

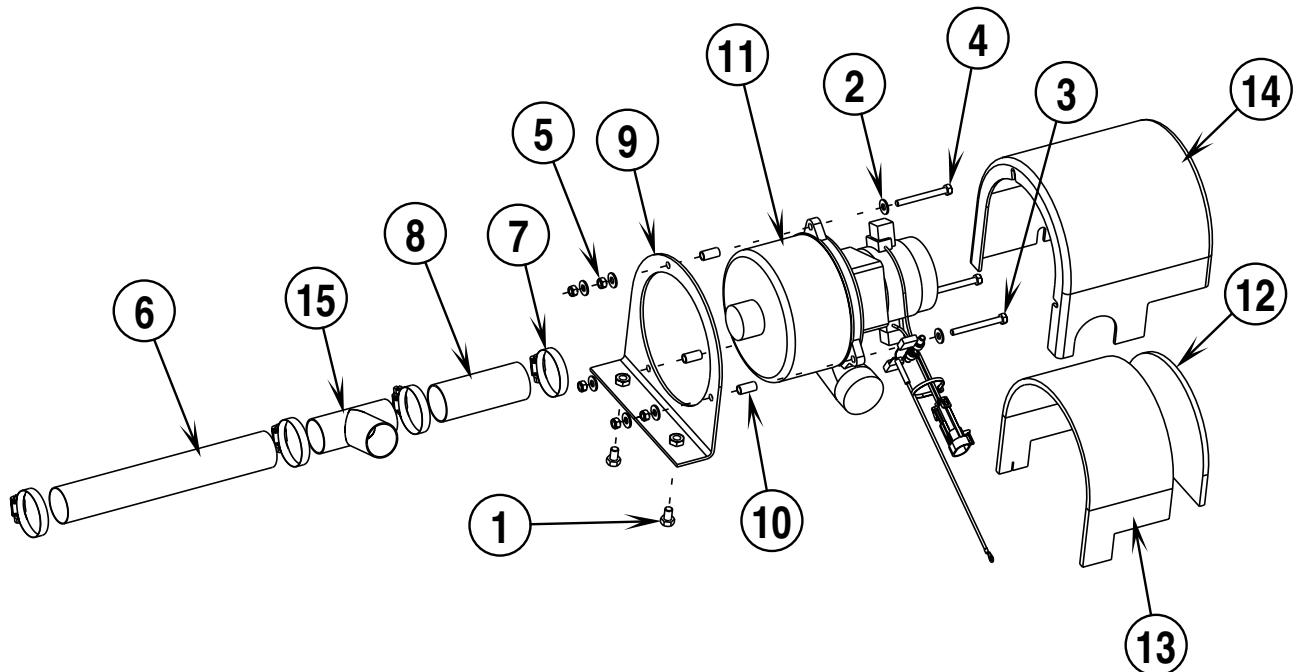


**FIGURE 2 PARTS CALLOUTS**

Item	Ref. No.	Qty	Description
1	56001862	2	Scr, Hex Hd 5/16-18 x .50
2	56002098	8	Wsh, Flt SAE 1/4
3	56003168	1	Scr, Hex M6-1.0 x 50mm
4	56003169	2	Scr, Hex M6-1.0 x 60mm
5	56003403	5	Nut, Hex Nyl Loc M6-1.00
6	56262163	1	Hose
7	56329145	4	Clamp, Hose SAE #24
8	56410221	1	Hose, 1.5 Dia x 4 inch
9	56410063	1	Vacuum Support
10	56410064	3	Stand-Off
11	56410065	1	Vac Motor W/Cap
*	56397098	1	Carbon Brush Set
12	56410067	1	Foam, Vac Motor
13	56410068	1	Foam, Vac Motor
14	56410086	1	Dual Vacuum Shroud
15	56410219	1	Tee Weldment

\* = Not Shown

**FIGURE 2**



# 56410196 EXTENDED SCRUB KIT

For Advance Hydro-Retriever™ 3800 (model 56410000) / Nilfisk BR 1100

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040729	1	Instruction Sheet
*	N/A	1	Extended Scrub Assembly
1	56410243	1	Cord, Recycle

\* = Refer to illustrated parts breakdown directly after these installation instructions for replacement parts.

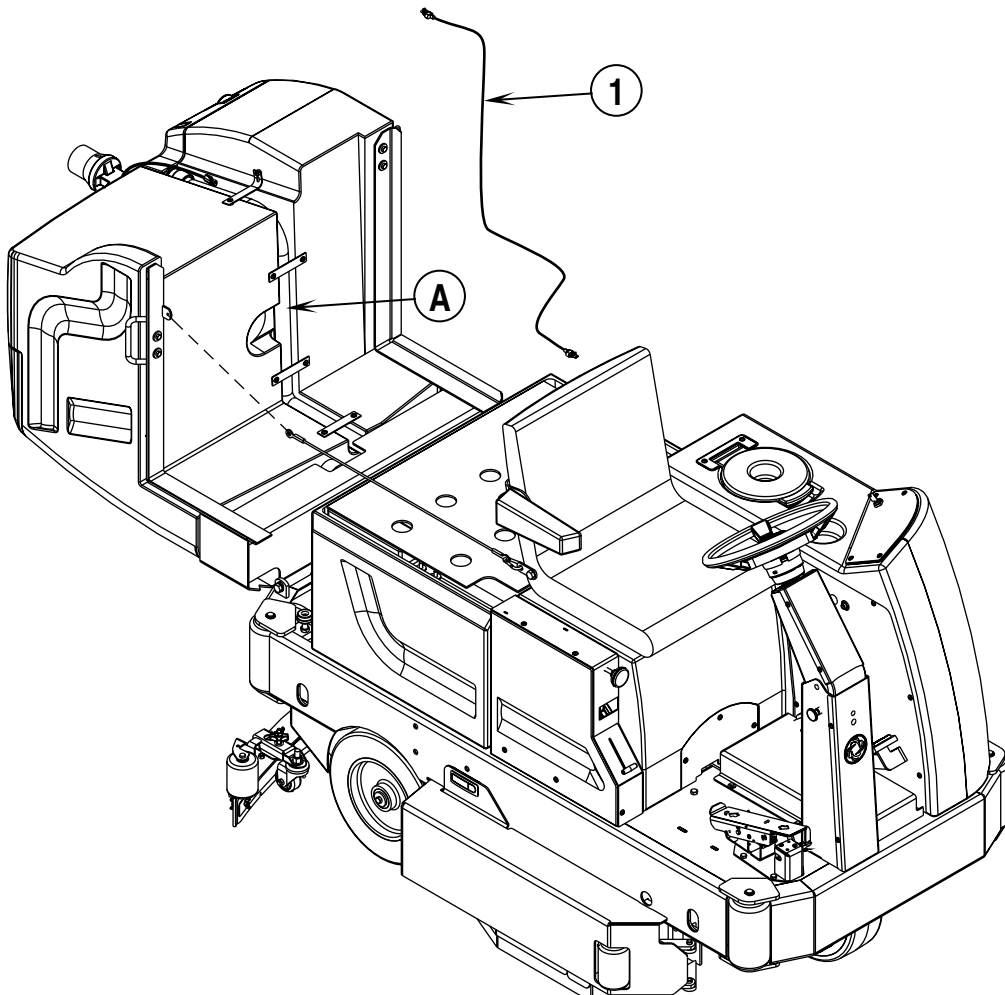
## INSTALLATION INSTRUCTIONS

### **⚠ WARNING!**

DISCONNECT BATTERIES BEFORE SERVICING.

- 1 See Figure 1. Empty the recovery tank and tip back as shown. Route Cord Assembly (1) along-side the Vacuum Hose (A) in the front of the recovery tank.
- 2 Bring Cord Assembly (1) out through the same opening at the bottom of the recovery tank mount weldment that the vacuum hoses are routed through.
- 3 Next to the squeegee lift actuator at the rear of the machine there is a bundle of wire connectors. Find the wire connector which has (1) RED wire and (1) BLK wire connected to it and remove the protective plug. Plug Cord Assembly (1) into this connector.

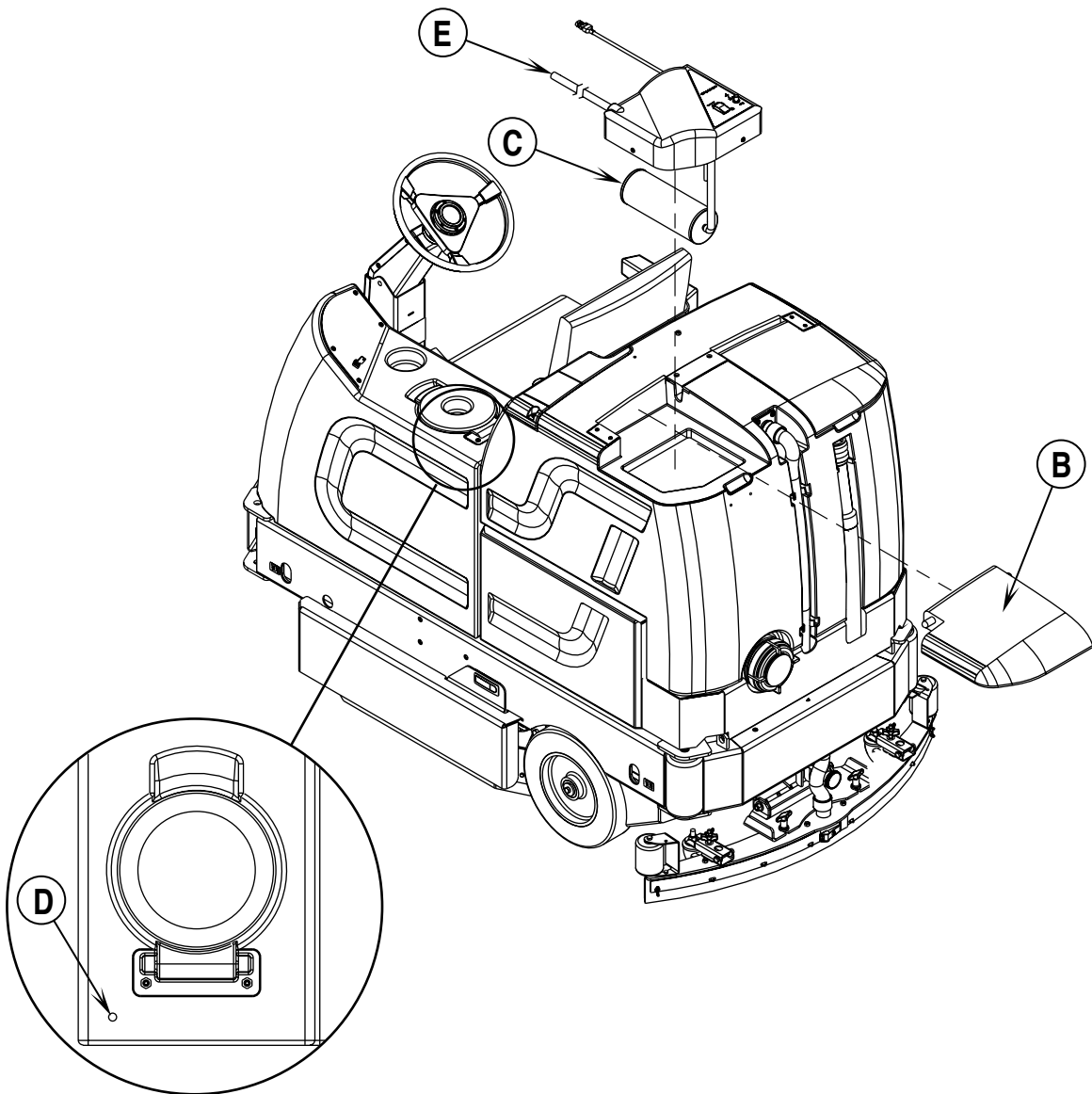
FIGURE 1

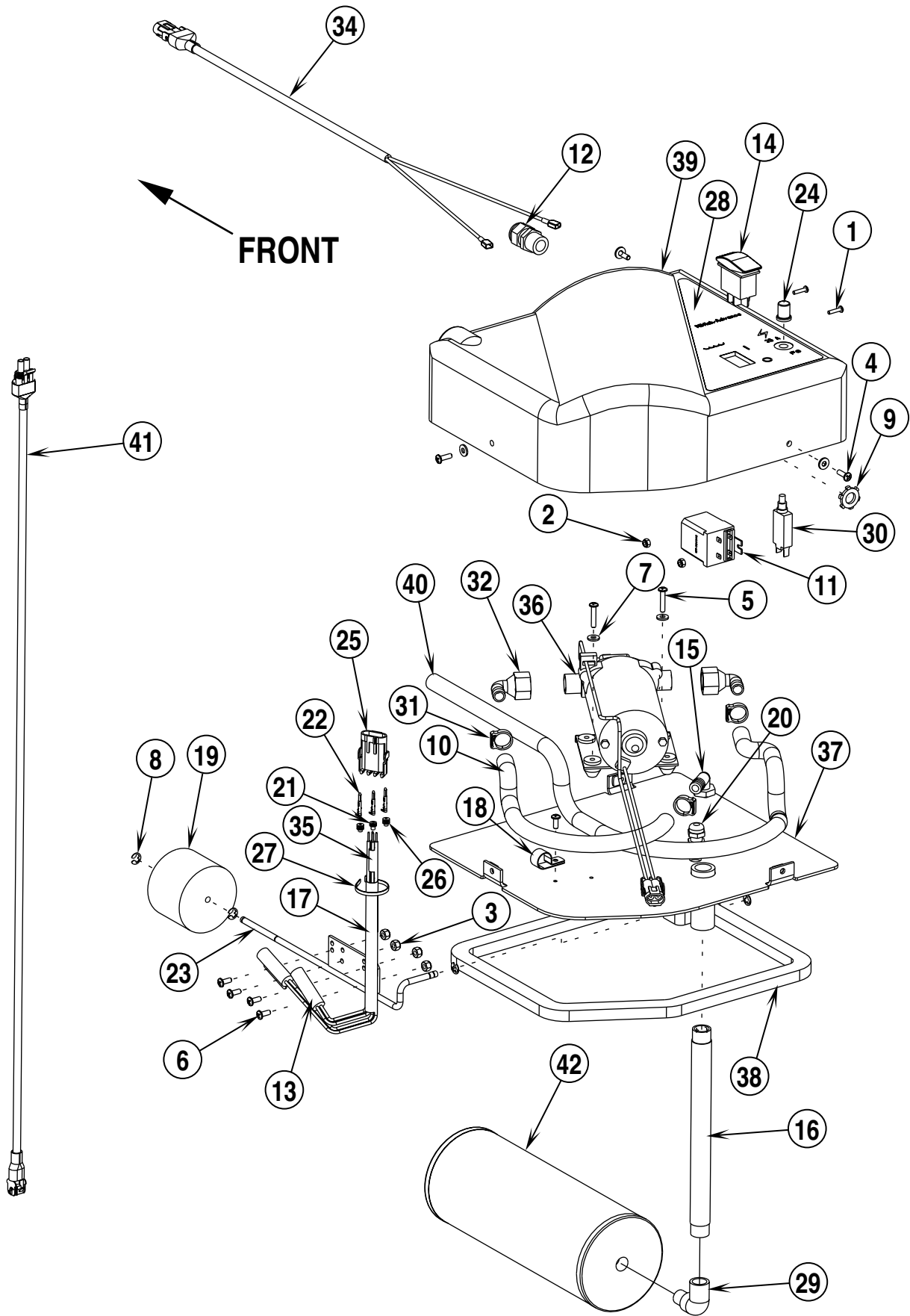


- 4 See Figure 2. Tip the recovery tank back forward and remove the Left Rear Recovery Tank Cover (B).
- 5 The Strainer (C) for the Extended Scrub Kit is shipped loose and needs to be installed prior to installing the assembly on the machine. It only needs to be hand tightened onto the elbow.
- 6 Set the Extended Scrub Assembly on the recovery tank in place of the previously removed Left Rear Cover (B) as shown.
- 7 Route the Extended Scrub Assembly power cord to the front of the recovery tank and plug it into the previously installed Cord Assembly (1).
- 8 Locate the drill locating dimple (D) and using a hole saw, drill a 3/4" (19mm) hole in the top of the solution tank.
- 9 Insert the Hose (E) from the Extended Scrub Assembly through this hole.
- 10 Before testing the Extended Scrub System for proper operation, fill the recovery tank up to about 9" (23cm) from the top of the tank with water.
- 11 The power switch and circuit breaker for the Extended Scrub System are on the top of the unit.

**NOTE:** Remove the Extended Scrub Assembly before tipping the recovery tank back.

**FIGURE 2**







# EXTENDED SCRUB KIT

Item	Ref. No.	Qty	Description
1	56002005	2	Scr, Pan Phil 6-32 x .62
2	56002830	2	Nut, Hex Nyl Loc 6-32
3	56002836	4	Nut, Hex Nyl Loc SS 10-24
4	56002896	3	Scr, Pan Phil SS 10-24 x .62
5	56002898	2	Scr, Pan Phil SS 10-24 x1.00
6	56002900	5	Scr, Pan Phil SS 10-24 x .50
7	56002916	5	Wsh, Fit SAE SS #10
8	56003268	4	Ring, Ret Ext Type E Reinf. .25 Dia.
9	56009095	1	Nut, Conduit Lock 1/2-14
10	56260930	1	Hose, Nylon Braid
11	56261219	1	Relay
12	56323135	1	Strain Relief
13	56388167	2	Switch, Enclosed Mercury
14	56393312	1	Switch, Rocker
15	56409152	1	Barb, 90 Elbow 1/2 x 1/2 NPT
16	56409226	1	Nipple, 1/4-18
17	56409608	1	Sleeve, R.S.
18	56442003	1	Clamp, P
19	56456023	1	Float, Foam
20	56456027	1	Strain Relief
21	56459263	1	Seal, Weather Pack
22	56459264	3	Terminal, Weather Pack, Male
23	56459320	1	Rod Weldment
24	56459367	1	Boot, Reset Button
25	56462072	1	Connector, Male
26	56462074	2	Seal, Weather Pack
27	56478246	1	Tie, Cable
28	56016369	1	Decal, Extended Scrub
29	56742125	1	Elbow, 90 Street
30	56228414	1	Circuit breaker, 3.5A
31	56254142	3	Clamp, Hose
32	56261246	2	Elbow, Shur-Flo
33	56409264	1	Harness, Extended Scrub
34	56409434	1	Cord Assembly 14/2 x 24
35	56409607	1	Tube, Heatshrink
36	56409611	1	Pump Assy
*	56260740	1	Diaphragm Kit
*	56260741	1	Valve Kit
*	56503014	1	Pressure Switch
*	56503030	1	Check Valve Repair Kit
37	56410232	1	Base Weldment
38	56410240	1	Gasket, Recycler
39	56410241	1	Cover, Recycler
40	56410242	1	Hose, Nylon Braid
41	56410243	1	Cord, Recycle
42	56456035	1	Strainer

\* = Not Shown

# 56410194 WARNING BEACON KIT

For Advance Hydro-Retriever™ 3800 (model 56410000) / Nilfisk BR 1100

## CONTENTS OF KIT

ITEM	REF. NO.	QTY	DESCRIPTION
	56040730	1	Instruction Sheet
1	N/A	1	Beacon Assembly
*	56002124	2	Scr, Pan Phil 10-24 x .62
*	56416433	1	Strobe
*	56410218	1	Beacon Pedestal, Routed
2	56002507	2	Scr, Pan Phil 1/4-20 x .75
3	56410170	1	Cord Assembly

\* = These parts are pre-assembled to make-up the Beacon Assembly (1).

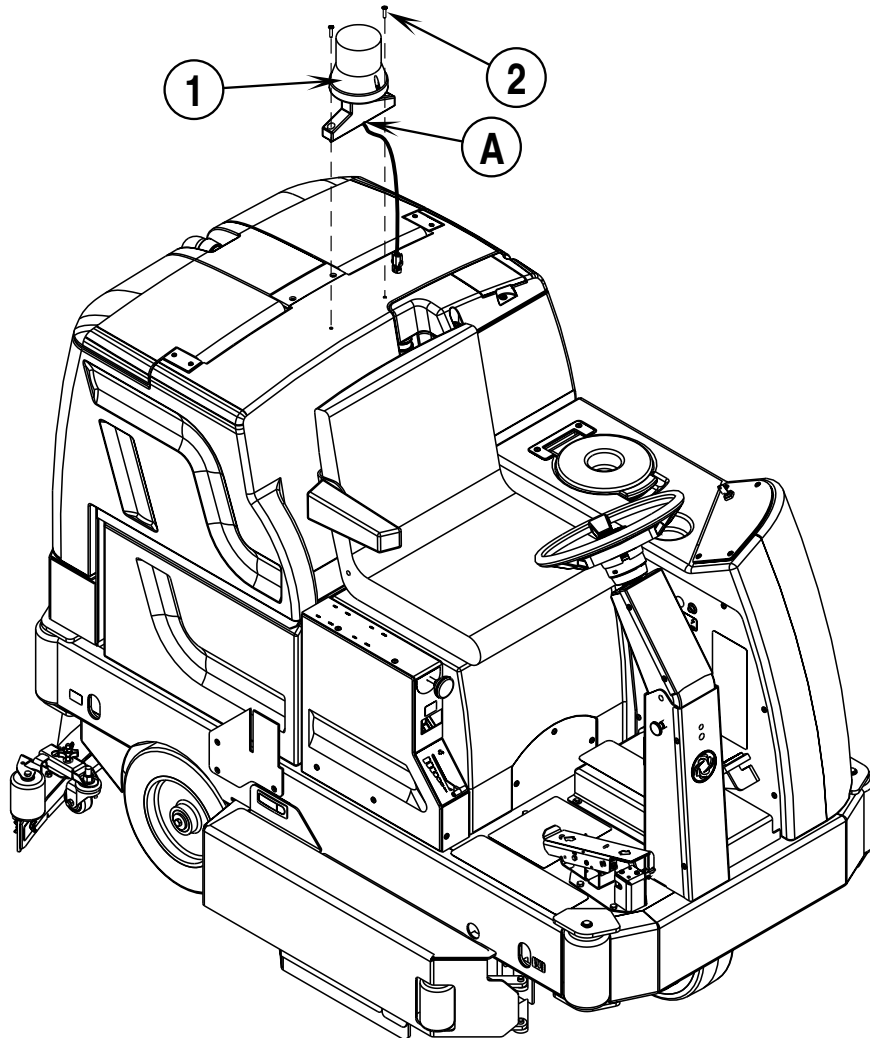
## INSTALLATION INSTRUCTIONS

### **⚠ WARNING!**

DISCONNECT BATTERIES BEFORE SERVICING.

- 1 See Figure 1. Bolt Beacon Assembly (1) to the top of the recovery tank as shown using the (2) Screws (2). Make sure the Notch (A) in the Beacon Pedestal is facing toward the FRONT of the machine and the wires are routed through this notch.

FIGURE 1



- 2 See Figure 2. Empty the recovery tank and tip back as shown. Route Cord Assembly (3) along-side the Vacuum Hose (B) in the front of the recovery tank and plug it into the Beacon Assembly Connector (C).
- 3 Bring Cord Assembly (3) out through the same opening at the bottom of the recovery tank mount weldment that the vacuum hoses are routed through.
- 4 Next to the squeegee lift actuator at the rear of the machine there is a bundle of wire connectors. Find the wire connector which has (1) WHT/BRN wire and (1) BLK wire connected to it and remove the protective plug. Plug Cord Assembly (3) into this connector.
- 5 Tip the recovery tank back forward and test for proper operation, when the key switch is turned ON, the beacon should operate.

**FIGURE 2**

