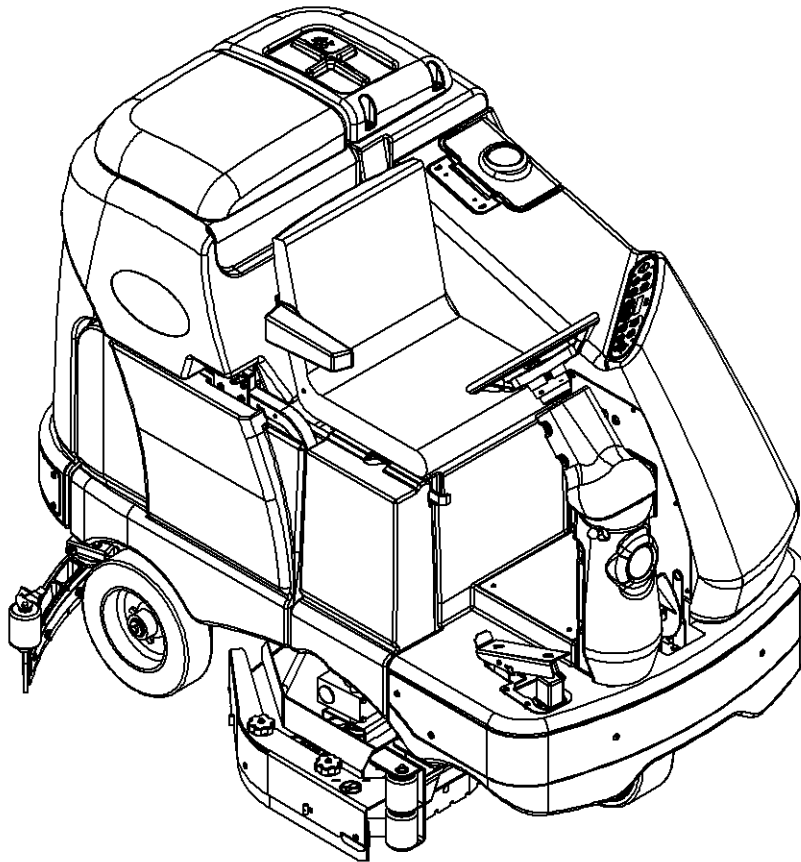


BR 1100S, BR 1300S



Service Manual



Models:
56413006(BR 1100S), 56413007(BR 1100S C / w/sweep system), 56413889(OBS / BR 1100S C / w/o sweep system)
56413010(BR 1300S), 56413011(BR 1300S C / w/sweep system), 56413890(OBS / BR 1300S C / w/o sweep system)
56413785(BR 1100S EDS), 56413781(BR 1100S C EDS / w/sweep system), 56413897(OBS / BR 1100S C EDS / w/o sweep system)
56413782(BR 1300S EDS), 56413783(BR 1300S C EDS / w/sweep system), 56413898(OBS / BR 1300S C EDS / w/o sweep system)

11/08 revised 2/10
FORM NO. 56043122

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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 **Nilfisk rider scrubber**. Read it thoroughly before servicing the machine.

Note: Bold numbers and letters in parentheses and underlined indicate an item illustrated on pages 11-13 i.e. (B).

PARTS AND SERVICE

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

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

(Dealer, affix service sticker here.)

NAME PLATE

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

MODEL NUMBER _____

SERIAL NUMBER _____

TRANSPORTING THE MACHINE

CAUTION!

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

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

TOWING

CAUTION!

If the machine must be towed or pushed, make sure the Master On/Off Key Switch (**A**) 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. Note: Disconnecting the wheel drive motor wiring connector will make a disabled machine easier to push.

OTHER MANUALS AVAILABLE FOR YOUR MACHINE

- Parts List - Form Number 56042498
- Instructions for Use - Form Numbers 56041628 (Danish, Norwegian, Swedish, Finnish)
56041629 (German, French, Dutch, Russian)
56041630 (Spanish, Portuguese, Italian, Greek)
56041631 (Estonian, Latvian, Lithuanian, Slovenian)
56041632 (Slovakian, Czech, Polish, Hungarian)
56041654 (Turkish, English)
- Curtis Programmer Manual Number 56043101

CAUTIONS AND WARNINGS

SYMBOLS

Nilfisk uses the symbols below to signal potentially dangerous conditions. 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.



Read all instructions before using.

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.
- Only use the brushes provided with the appliance or those specified in the instruction manual. The use of other brushes may impair safety.

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 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) and remove the key, 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, recovery or detergent 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.
- Do not use on surfaces having a gradient exceeding that marked on the machine.
- All doors and covers are to be positioned as indicated in the instruction manual before using the machine.

SAVE THESE INSTRUCTIONS

TECHNICAL SPECIFICATIONS

General Specifications common to All Models

Machine Length	73.5 in. (187cm)	
Machine Height	58.5 in. (148.6cm)	
Machine Height (w/overhead guard)	84 in. (213cm)	
Machine Body Width	40 in. (101.6cm)	
Solution Tank Capacity	70 gal. (265l.)	
Recovery Tank Capacity	70 gal. (265l.)	
Sound pressure level as per IEC 60704-1 (at operator)	72 dB(A)	
Vibrations at the Hand Controls (ISO 5349-1)	1.12 m/s ²	
Vibrations at the Seat (EN 1032)	0.35 m/s ²	
Transport Speed (Fwd. Maximum)	5.5 mph (8.9 kphm)	
Transport Speed (Rev. Maximum)	4.8 mph (7.7 kphm)	
Gradeability (Transport)	14.5%/ 8°	
Gradeability (Working –Scrubbing)	10.5%/ 6°	
Wheel Drive Motor	1.75 hp, 1300 watt	
Vacuum Motor (3 stage)	.75 hp, 560 watt	
Vacuum Water Lift for one motor	(Sealed)	68 in.
	(Open Hole Adapter 1")	14 in.
Vacuum Water Lift for two motors	(Sealed)	74 in.
	(Open Hole Adapter 1")	27 in.
Power Source (Batteries)		
Battery Weight (395 amp) STD (6) 6 volt @ 20 hour rate	121 lbs. (55kg)	
Battery Weight (450 amp) Opt. (1) Mono-Block @ 20 hour rate	919 lbs. (417kg)	
Battery Compartment Size (approx.)		
Height (Max.)	19 in. (48.2cm)	
Width (Max.)	20 in. (50.8cm)	
Length (Max.)	31.75 in. (80.6cm)	
Maximum Wheel Floor Loading (Center Front)	80 N/cm ² / 116 PSI	
Maximum Wheel Floor Loading (Left Rear)	60 N/cm ² / 86 PSI	
Maximum Wheel Floor Loading (Right Rear)	56 N/cm ² / 81 PSI	

Battery Chargers – see Electrical System *Battery Section*

Specifications common to deck size

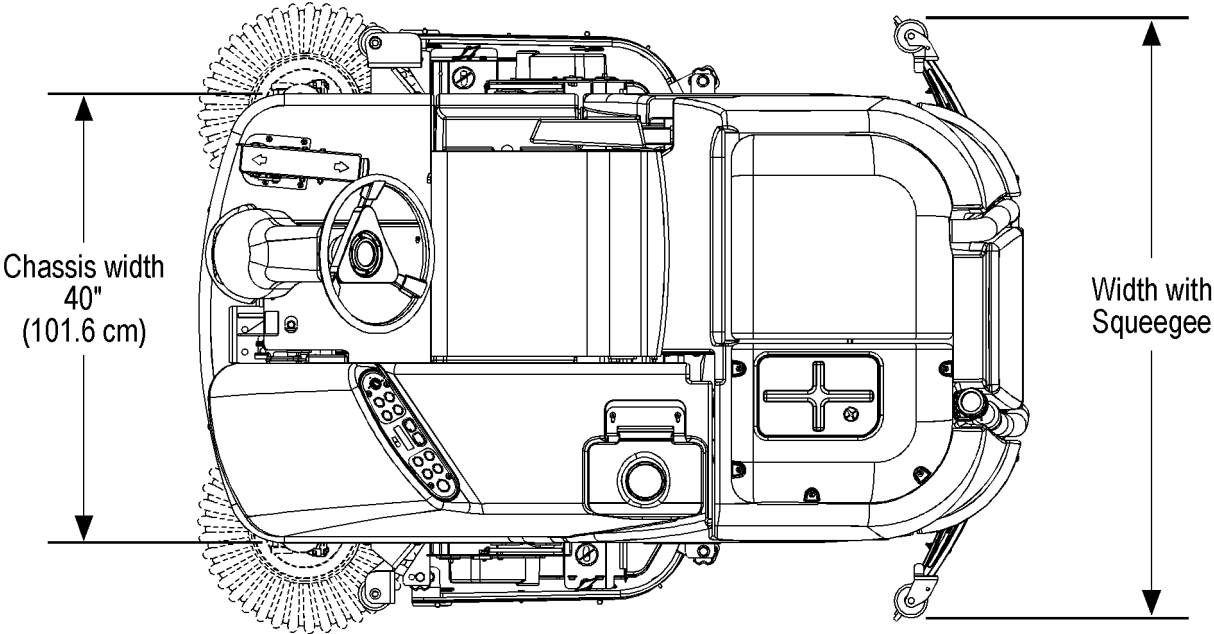
	BR 1100S	BR 1300S
Machine Width with Squeegee (English)	49 in. "F"	57 in. "H"
Metric	78cm "F"	91cm "H"
Scrub Brush Size		
(Disc)		
Diameter	(2) 20 in. (50.8cm)	(3) 17 in. (43cm)
(Cylindrical)		
Outside Scrub Brush Diameter (inside core is 5 in.)	8.5 in. (21.6cm)	8.5 in. (21.6cm)
Scrub Brush Length (2 per machine)	38.37 in. (97.4cm)	46.62 in. (118.4cm)
Scrub Brush Motor (Disc)	(1) 3.0 HP 2240 watts	(3) 1.5 HP 1120 watts
(Cylindrical)	- All Cylindrical Models use (2) 1.5 HP 1120 watts -	
Scrub Brush Speed (Disc)	240 RPM	225 RPM
(Cylindrical)	630 RPM	630 RPM
Minimum Aisle Turn Width	84 in. (214cm)	84 in. (214cm)
Machine Net Weight* (English)	1,845 lbs.	1,845 lbs.
Metric	837kg	837kg
Machine Gross Weight** (English)	3,545 lbs.	3,545 lbs.
Metric	1608kg	1608kg
Cleaning Width (scrubbing path) (English)	40 in.	48in.
Metric	101cm	122cm
Coverage Rate Per Hour (3.5 MPH) (English)	61,600 ft ²	73,920 ft ²
Metric (5.6 KPH)	5722m ²	6867m ²

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

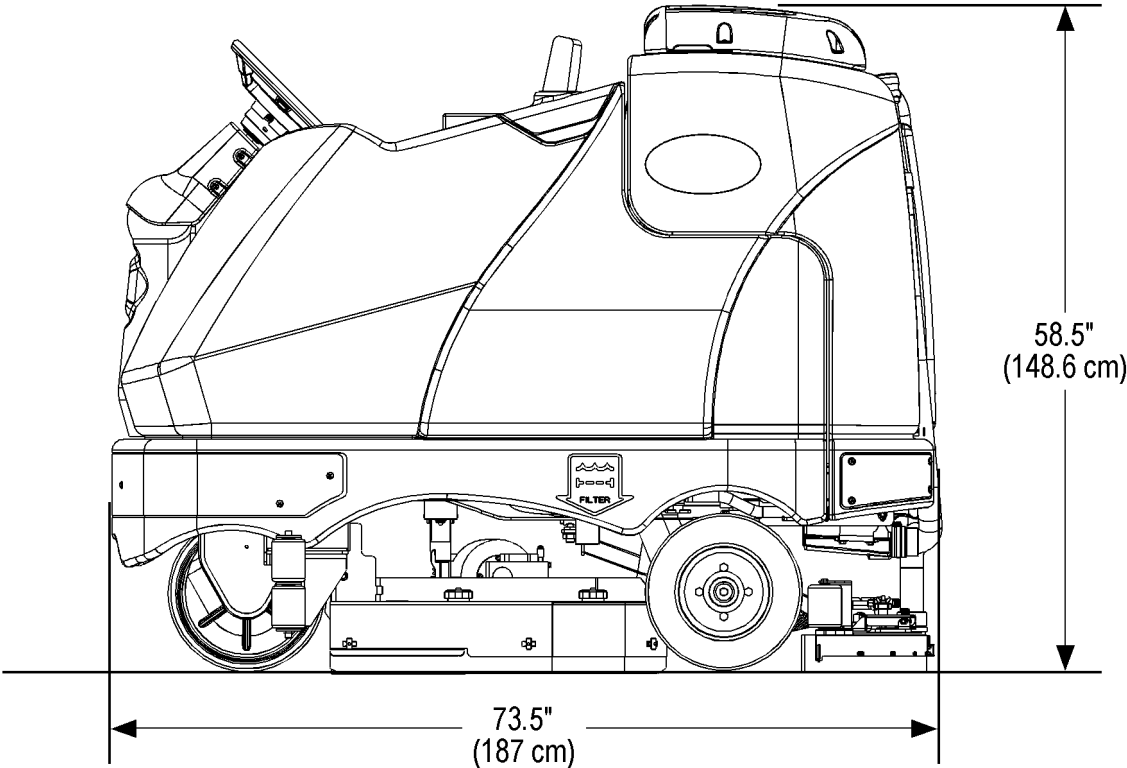
****Gross Weight:** Standard machine without options, full solution tank and empty recovery tank, with removable scrub brushes and 450 AH batteries.

***Listings for watts are maximum values.

SPECIFICATIONS



TOP VIEW



SIDE VIEW

MAINTENANCE

AFTER USE

- 1 When finished scrubbing, press the Scrub Off Switch (**E**). This will automatically raise, retract and stop all the machine systems (brush, squeegee, vacuum, solution and detergent (EDS models)). Then drive the machine to a service area for daily maintenance and review of other needed service up keep.
- 2 To empty the solution tank, remove the Solution Drain Hose (**4**) from it's storage clamp. Direct the hose to a designated "DISPOSAL SITE" and remove the plug. Rinse the tank with clean water.
- 3 To empty the recovery tank, pull the Recovery Tank Drain Hose (**19**) from its storage area. Direct the hose to a designated "DISPOSAL SITE" and remove the plug (hold the end of the hose above the water level in the tank to avoid sudden, uncontrolled flow of waste water). The Recovery Tank Drain Hose can be squeezed to regulate the flow. Rinse the recovery tank with clean water. Inspect the recovery and vacuum hoses; replace if kinked or damaged.
- 4 Remove the brushes or pad holders. Rinse the brushes or pads in warm water and hang up to dry.
- 5 Remove the squeegee, rinse it with warm water and re-install on mount.
- 6 Remove the hopper on cylindrical systems and clean thoroughly. Remove from either side of the machine by removing the skirt and tilting the hopper up and away from housing, then pull out.
- 7 Check the maintenance schedule below and perform any required maintenance before storage

MAINTENANCE SCHEDULE

MAINTENANCE ITEM	Daily	Weekly	Monthly	Yearly
Charge Batteries	X			
Check/Clean Tanks & Hoses	X			
Check/Clean/Rotate the Brushes/Pads	X			
Check/Clean the Squeegee	X			
Check/Clean Vacuum Shut-Off Float	X			
Check/Clean the vacuum motor foam filter(s)	X			
Clean Hopper on Cylindrical System	X			
Check Each Battery Cell(s) Water Level		X		
Inspect Scrub Housing Skirts		X		
Inspect and clean Solution Filter		X		
Check Foot/ Parking Brake For Wear & Adjustment		X		
Clean Solution Trough on Cylindrical System		X		
Purge Detergent System (EDS only)		X		
Side Broom Maintenance		X		
Lubrication - Grease Fittings			X	
* Check Carbon Brushes				X

* Have Nilfisk check the vacuum motor carbon motor brushes once a year or after 300 operating hours. The brush and drive motor carbon brushes check every 500 hours or once a year.

NOTE: Refer to the Service Manual for more detail on maintenance and service repairs.

- 8 Store the machine indoors in a clean dry place. Keep from freezing. Leave the tanks open to air them out.
- 9 Turn the Master Key Switch (**A**) OFF (O) and remove the key.

LUBRICATING THE MACHINE – FIGURE 1

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

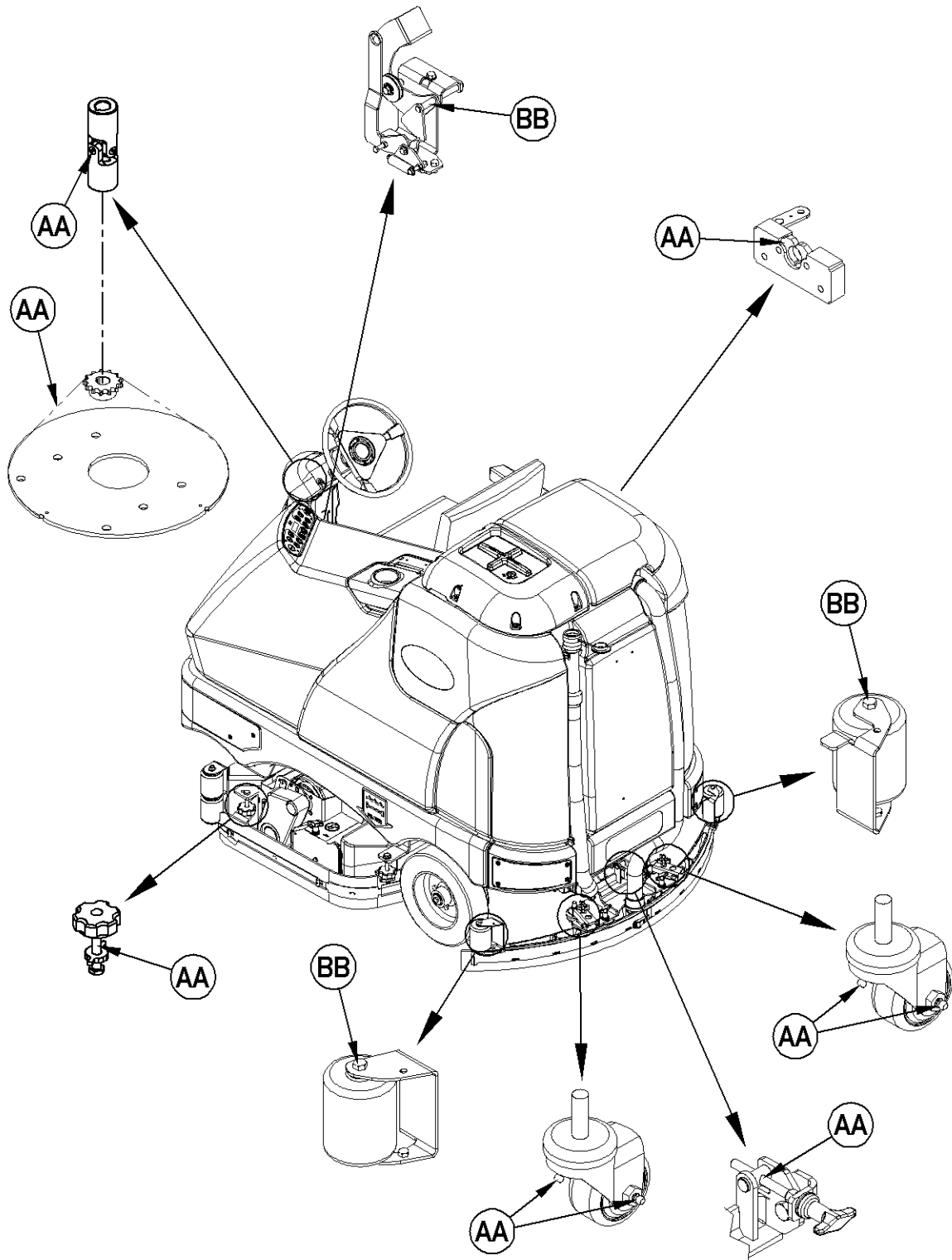
Grease fitting locations (or apply grease to) (AA):

- Squeegee Caster Wheel Axle and Pivot
- Steering Wheel Shaft Universal joint
- Steering Chain
- Squeegee mount angle adjustment knob threads

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

- Squeegee tool end wheels
- Recovery Tank release latch
- Brake Pedal (parking brake) linkage

FIGURE 1



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Nilfisk BR 1100S, 1300S, S/C Models
Disc and Cylindrical
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 (when operator stands up machine is to stop)		A D	
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 (see SVR Manual programming, 3 different modes)		A B	
8	Squeegee System (Raise/Lower and auto lift in reverse function)		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 L	
11	Emergency Battery Disconnect Control Lever		B D	
12	Side broom Sweep System, Raise/Lower and auto sweep functions (cylindrical only)		A B D	
13	Tilt Steering Mechanism and Seat		A B D	
14	Optional Accessories (headlight, safety beacon, etc.)		D	
15	Main Control Board Special Program Options (check all applicable program settings, reference SVR Manual 56043122); Example, Fault Recall Mode, Etc.		Program as needed	
16	Battery Charger Operation		D	
17	Chemical Detergent System Functions (used only on the EDS models)		C L	

Ref	VISUAL INSPECTION ITEMS	Comments	OK	Defect Codes (circle)	Does Not Work
18	Scrub Brushes, check for wear and rotate			A B D W	
19	Scrub Brush Motor(s) and disc machine gearboxes	Carbon Brushes		B L W	
20	Scrub Brush Drive Belt, wear (cylindrical only)			A D W	
21	Scrub Brush Deck Actuator Motor			A B D W	
22	Brush Driver Plates (flex coupler & retainer clips) (disc only)			D M	
23	Brush Idler Bearing Plate& Driver (cylindrical only)			C W	
24	Scrub Deck Skirts			A B W	
25	Solution Solenoid Valve			C L	
26	Solution Tank, Delivery Hoses & Filter	Clean Filter Screen		C L	
27	Vacuum Motor Carbon Brushes	Wear Limit 3/8"		W	
28	Vacuum Motor Cover Gasket and Filters			L W	
29	Vacuum Float Ball & Cage Assembly	Clean Float		C M	
30	Recovery Tank Cover Gasket			C D L	
31	Recovery Tank Drain Hose & Cap	Flush		C L	
32	Squeegee Pick-Up Tool & Hose	Back flush		C L	

Ref	VISUAL INSPECTION ITEMS (continued)	Comments	OK	Defect Codes (circle)	Does Not Work
33	Squeegee Blades (clean & rotate)			A C D W	
34	Squeegee Mount Wheels (lubricate)	4 Grease Fittings		A C W	
35	Squeegee Lift Actuator Motor & Lifting Bar			A B D	
36	Battery Pack Condition (clean & water)	Load Test		C W	
37	Front Drive Wheel Motor	Carbon Brushes		C W	
38	Front Drive Tire	Tread Wear		W	
39	Rear Brake Rotors & Disc Wear	Adjust Free Play		A B W	
40	Drive Pedal Linkage (neutral return)	Torsion Spring		A B	
41	Steering Chain (lubricate & tension)	1/4" Deflection		A B C	
42	Steering Column (knob & plunger spring) also Universal Joint	Grease		A D	
43	Rear Wheels (bearing wear)	Tread Wear		C W	
44	Sweep Debris Tray (cylindrical only)	Rinse		C	

NOTE: For additional service information see service manual form number 56043122 and operators manual form numbers 56041628, 56041629, 56041630, 56041631, 56041632 & 56041654.

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

WORK COMPLETED BY:

ACKNOWLEDGED BY:

 Service Technician Signature

 Date

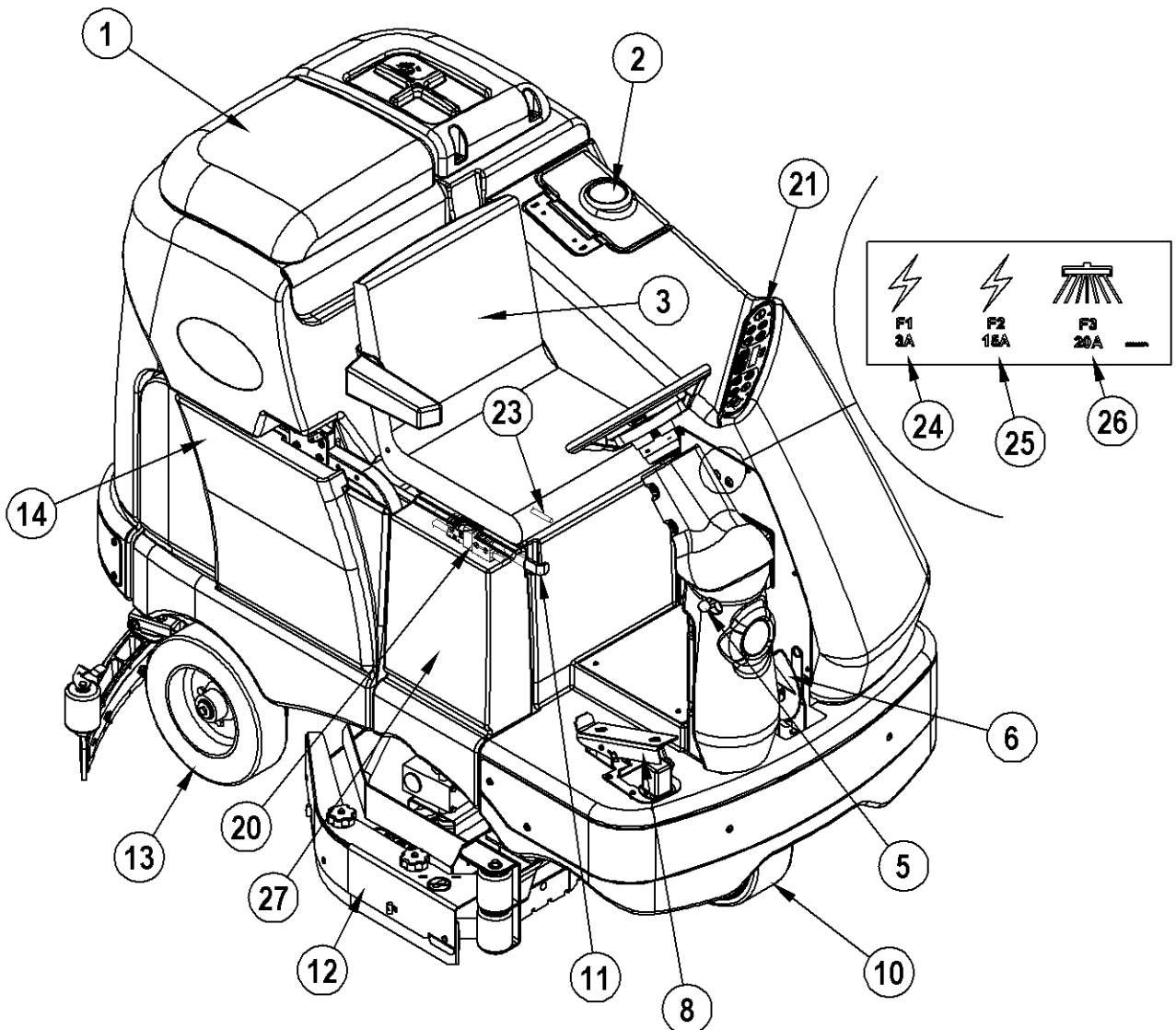
 Customer Signature

 Date

KNOW YOUR MACHINE

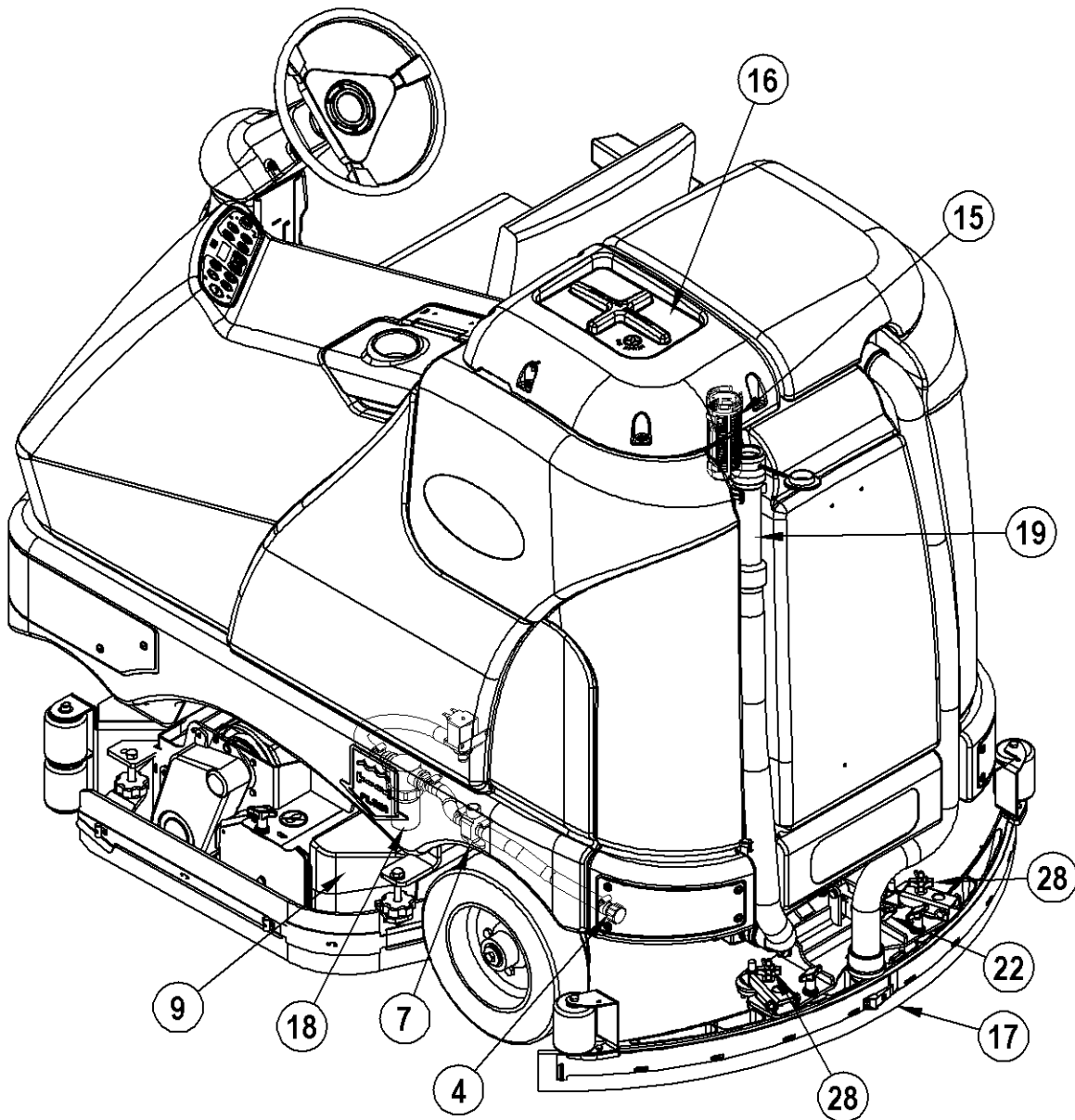
As you read this manual, you will occasionally run across a bold number or letter in parentheses and underlined - example: **(2)**. These numbers and letters refer to an item shown on these pages unless otherwise noted. Refer back to these pages whenever necessary to pinpoint the location of an item mentioned in the text.

- 1 Recovery Tank Cover
- 2 Solution Tank Fill Cover
- 3 Operator's Seat
- 4 Solution Tank Drain Hose
- 5 Steering Wheel Tilt Adjust Knob
- 6 Brake Pedal / Parking Brake
- 7 Solution Shut-Off Valve
- 8 Drive Pedal, Directional/Speed
- 9 Hopper (cylindrical models only)
- 10 Drive and Steer Wheel
- 11 Emergency Stop Switch / Battery Disconnect
- 12 Scrub Deck
- 13 Rear Wheel
- 14 Battery Compartment (under recovery tank)
- 15 Recovery Tank Shut-Off Float



KNOW YOUR MACHINE

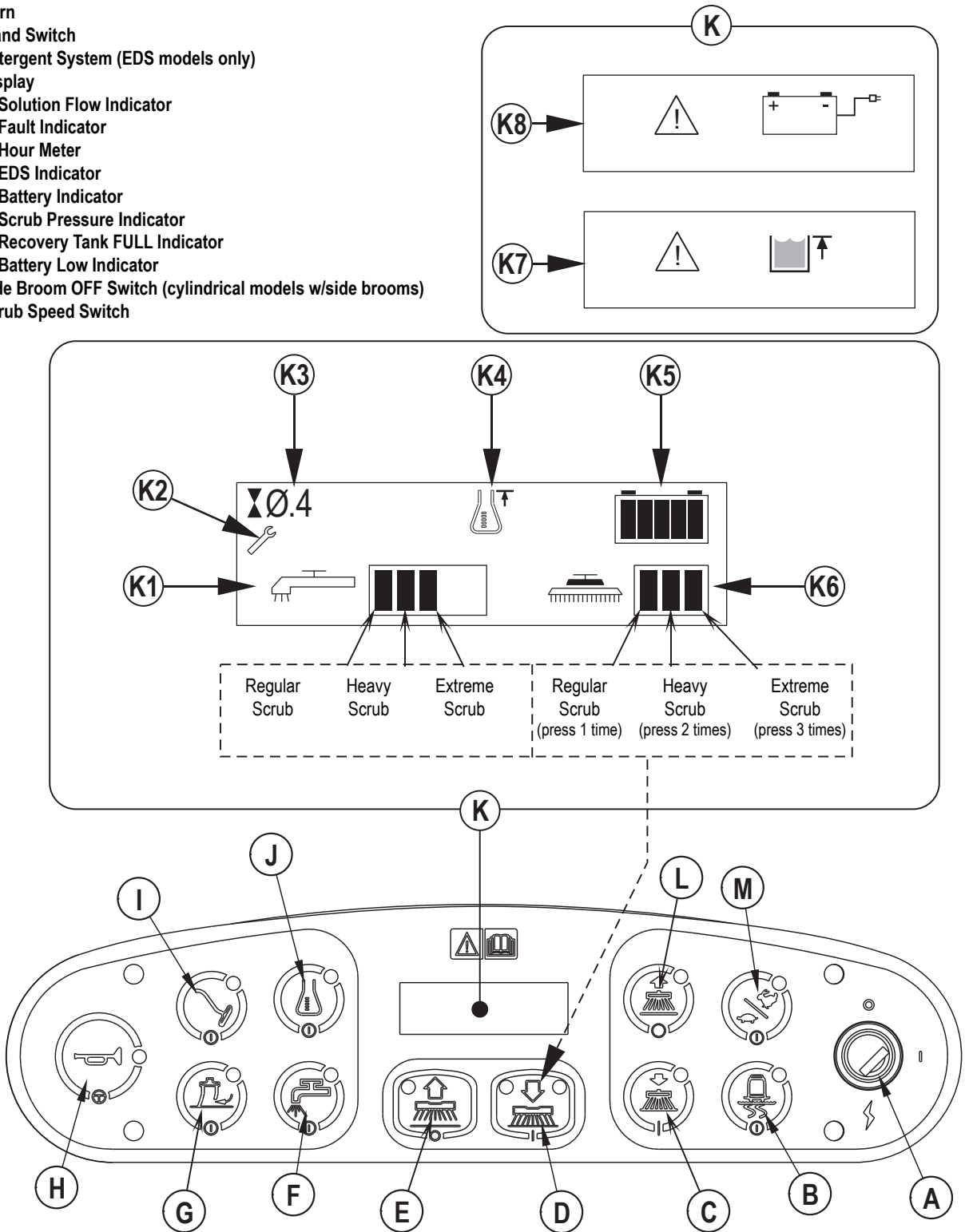
- 16 Vacuum Motor Filter Housing
- 17 Squeegee Assembly
- 18 Solution Filter
- 19 Recovery Tank Drain Hose
- 20 Machine Battery Connector
- 21 Control Panel
- 22 Squeegee Tilt Adjust Knob
- 23 Operator Seat Adjustment Lever
- 24 Control Circuit Breaker
- 25 Auxiliary Circuit Breaker
- 26 Brush Motor Circuit Breaker
- 27 Side Access Panel
- 28 Squeegee Height Adjust Knob



KNOW YOUR MACHINE

CONTROL PANEL – EDS

- A Key Switch
- B Traction Control Switch
- C Side Broom ON Switch (cylindrical models w/side brooms)
- D Scrub ON / Pressure Increase Switch
- E Scrub OFF / Switch
- F Solution Switch
- G Vacuum Switch
- H Horn
- I Wand Switch
- J Detergent System (EDS models only)
- K Display
- K1 Solution Flow Indicator
- K2 Fault Indicator
- K3 Hour Meter
- K4 EDS Indicator
- K5 Battery Indicator
- K6 Scrub Pressure Indicator
- K7 Recovery Tank FULL Indicator
- K8 Battery Low Indicator
- L Side Broom OFF Switch (cylindrical models w/side brooms)
- M Scrub Speed Switch



KNOW YOUR MACHINE

FUNCTIONAL DESCRIPTION OF CONTROL PANEL SWITCHES:

The controls on your rider scrubber were designed with *one touch operation* in mind. For single pass scrubbing the user can simply depress one switch 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 middle switches on the control panel. These are the red Scrub OFF and the green Scrub ON/Pressure increase switches.

(A) Key Switch – Main power switch, when turned on controls the battery input to the machine's main control board and the wheel drive speed control.

(B) Traction Control Switch - Pressing this switch when the unit is in a scrub mode will cause the following to occur.

- The torque value of the wheel drive motor is reduced to minimize drive wheel slippage thus providing better traction.

(D) Scrub ON/Pressure increase Switch (Auto Scrub Mode) – If the scrub system is off, pressing this switch once will cause the following to occur:

- The scrub system will be enabled with the scrub pressure set to the #1 normal setting and the scrub deck and squeegee will automatically be lowered. On the cylindrical units the side brooms will also be lowered to the floor. Note press the switch twice for #2 heavy scrub setting and three times for the #3 extreme scrub setting.
- The vacuum system will be enabled.
- The solution system will be enabled.
- As soon as the throttle (operator foot pedal) is moved from its neutral position the scrub brushes will start turning and the vacuum will turn on. If the direction is forward the solution will also start automatically. If the direction is reverse, the solution flow will be stopped. When the unit is already scrubbing additional activating of the switch will increase to the next highest scrub pressure setting (cycling through example 1,2,3 back to 1), at the same time the control panel display will show the correct changed value chosen.
- Special Operational Note: The solution, vacuum and detergent systems are automatically enabled when the scrub ON switch is pressed. Any individual system can be turned OFF or back ON by simply pressing its switch at any time during scrubbing.

(E) Scrub OFF Switch – Pressing this switch when the unit is in a scrub mode will cause the following to occur:

- The scrub brushes will turn off and the scrub deck will be raised to the up position and on cylindrical models the side brooms will also be raised.
- The solution will be stopped.
- The vacuum switch indicator light will start to blink the squeegee will be raised to its up position after 4-5 seconds and the vacuum motor will shut off after a 10 second delay. Pressing the switch a second time before completing the vacuum delay will turn off the vacuum motor immediately.

(F) Solution Switch –

- Press the solution switch and hold for approximately 5 seconds to pre-wet the floor. Note this must be done prior to pressing the Scrub ON switch **(D)**.
- When operating in any (3) of the auto scrub pressure modes both the standard solution and detergent (EDS models) systems have 3 flow rate presets that coincide with the 3 scrub modes.
- Note: There is a solution flow rate over-ride function if the operator needs to set a different flow rate without increasing scrub pressure. Hold the solution switch **(F)** for 2 seconds (solution indicator will start flashing) and then let go. You then have 3 seconds to set a different flow rate by pressing the switch repeatedly until the flow indicator **(K1)** shows the rate needed. The machine is programmed for two additional dosage levels plus the 3 normal default values for a total of 5 flow volumes. If any scrub pressure change is made in the solution over-ride mode it will reset to its default solution output.

(G) Vacuum Switch – This switch is used to select the mode of operation for the vacuum recovery system. Following is an explanation of the different operational modes and how they are selected.

- **Scrub ON Auto Mode:** Pressing the vacuum switch when scrubbing will raise the squeegee tool and the vacuum motor will run for additional 5-6 seconds then shut OFF. This mode is used when the operator desires to double-scrub (scrub without recovering the solution).
- **Scrub OFF Mode:** In this mode (non-scrubbing) when the vacuum switch is pressed the squeegee is lowered and the vacuum motor will run continuously, no throttle pedal input needed. When the machine is moved into reverse the squeegee will be raised and lowered when moving the machine forward. This mode is used to pickup water from the floor without selecting a scrub mode.
- Pressing the scrub OFF switch when the unit is in the auto scrub mode will cause the following to occur: The squeegee will raise and the vacuum motor will go into a 10sec time delay and then shut off. Press the vacuum switch again before the time delay has ended will shut the vacuum off immediately. See the scrub OFF **(E)** explanation above for all the complete scrub OFF functions.
- Note: When the recovery tank becomes full (when in the auto scrub mode) the vacuum motor shuts off and all the other systems except the drive motor, the full tank icon is displayed on the dash panel.

(H) Horn Switch – Pressing this switch will activate (turn ON) the horn.

(I) Wand Switch – The switch is used when the optional (external) vacuum scrub wand is used. Pressing this switch will turn ON the vacuum motor and optional solution pump continuously until the switch is pressed again to turn it OFF. Note: When operating in the wand mode and the vacuum switch is pressed the vacuum will turn off in 5-6 seconds (time delay).

FUNCTIONAL DESCRIPTION OF CONTROL PANEL SWITCHES:

(J) Detergent System ON/OFF switch – Pressing this switch will turn ON or OFF the detergent option. See the main programming options in this manual to select (activate) the onboard detergent delivery system.

(C) Side Broom ON/Down Switch and (L) Side Broom OFF/UP Switch - These switches are only functional on the cylindrical scrub models equipped with side brooms. When the scrub system is ON the side brooms are lowered to the floor to the same position when the scrub system was last turned OFF (auto memory operating position). Note: There is a broom height over-ride adjustment function for raising or lowering the side brooms to obtain the corrected broom contact patterns in compensating for normal broom wear. To enter to adjust hold either the down **(C)** or up **(L)** side broom switches for 2-3 seconds (both switch indicators will flash) and then let go. You then have 3 seconds to press either switch to reset the needed broom(s) working pattern position. The machine is now reprogrammed to work with the new setting.

(M) Scrub Speed Switch – When the machine is operating in any one of its scrub settings the machine's travel speed is reduced to the speed controllers pre-programmed 70% of its maximum transport speed. Pressing the switch increases (over-rides) the 70% max programmed scrub speed to 100% of transport speed.

FUNCTIONAL DESCRIPTION OF CONTROL PANEL INDICATOR LIGHTS:

In general the following guidelines apply to the control panel indicators

When the key switch **(A)** is first turned ON all of the Blue control panel indicator lights will turn on for 1 second for an operational test.

A blue indicator means that a system is ON and running or has been enabled and ready to turn on when the drive pedal (throttle) is moved into forward or reverse.

Scrub OFF Indicator (E):

- This indicator will be blue when the scrub system is OFF and is ready to be activated.
- This indicator will be OFF when the scrub system has been turned ON.

Scrub ON/Scrub Mode Select Indicator (D):

- The left side indicator will be blue when the Normal scrub mode has been selected.
- The right side indicator will be blue when the Heavy scrub mode has been selected.
- Both the right and left indicator will be blue when the Extreme scrub mode has been selected.

Solution System Indicator (F):

- This indicator will be blue when the solution system has been enabled and or is turned ON.
- This indicator will be OFF when the solution system has been turned OFF.
- This indicator will flash blue when the solution tank float senses a low solution level.

Vacuum System Indicator (G):

- This indicator will be blue when the vacuum system has been enabled and or is turned ON.
- This indicator will flash blue when the vacuum system is operating in the time delay shut down mode (normal 5-10 seconds).
- This indicator will be OFF when the vacuum system is disabled and turned OFF.

Horn Indicator (H): Its blue indicator is ON when the horn is sounded and OFF when the switch is not pressed.

Wand Switch Indicator (I): Its blue indicator is ON when the wand has been enabled or is turned ON and OFF when the switch is not selected.

Detergent EDS System Indicator (J): Note the control board automatically recognizes that the machine has an operational detergent system through its wiring harness connection.

- Its indicator will be blue to signal the operator that the system is enabled and turned ON.
- This indicator will be OFF when the detergent system switch has been pressed to disable, have it turned OFF.

Side Broom ON/Down Indicator (C):

- Its indicator will be blue to signal the operator that the side brooms are in the down working position, enabled and turned ON.
- This indicator will be OFF when the scrub system has been turned OFF brooms raised in there stored position.
- This indicator will flash blue when the operator has entered the brush height adjustment mode.

Side Broom OFF/UP Indicator (L):

- Its indicator will be blue to signal the operator during the time that the side brooms are being raised to the UP non-working position.
- Its indicator will be OFF when the scrub system has been turned OFF brooms raised into there stored position.
- This indicator will flash blue when the operator has entered the brush height adjustment mode.

Scrub Speed Indicator (M):

- This indicator will be blue when the maximum 100% transport speed is enabled.
- This indicator will be OFF when the reduced scrub speed is enabled.

Traction Control Indicator (B):

- This indicator will be blue when the traction control mode is enabled.
- This indicator will be OFF when the traction control mode is disabled.

1 - 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 70 gallons (265 L). See Figure 1.1 & 1.2. Plumbed into the bottom of the solution tank outlet is a tee fitting and combined shut-off valve (A) (ball valve). The right branch of the tee fitting has attached a short flexible hose (B) to be used to drain the tank for system maintenance. The left branch of the shut-off valve feeds solution to a serviceable filter (C) that keeps debris from entering the solenoid valve.

The standard model machine's solution system uses an electrically activated solenoid valve. The solution in the tank is fed by gravity to the L1 valve and its output volume is controlled by the A2 board's programmable capability. The L1 solenoid's coil circuit opens and closes (pulsing ON & OFF) pulling its valve diaphragm ON and OFF its seat. This is how the (3) different auto flow volumes are managed. Note on the EDS systems the L1 valve is not pulsed it is just turned ON and OFF and a separate solution pump is turned ON and OFF (pulsed) by the A2 control board's program. Note: Reference the EDS manual section for its detailed component layout and operational explanation.

During machine scrubbing the solution system's Auto Mode is pre-selected and works in conjunction with the (A1) wheel drive speed controller and R1 throttle pot input, this is what activates the main control board's outputs to turn ON and OFF the L1 solenoid valve. The solution then flows to the scrub brushes any time the scrub deck is lowered and the drive pedal is pushed into the forward drive position. Note: When the dash panel solution switch is pressed (turned off), no flow can occur regardless of the drive pedal Fwd position and the scrub deck being down.

Threaded into the tank bottom is the S5 liquid level tank switch (float switch). When the solution level drops to about 2-3 inches left in the tank it signals the main control board of a low level condition. The operator will then notice on the dash panel that its solution indicator light is flashing ON & OFF. Note: The machine will continue to function, the flashing indicator is just a low level reminder.

FIGURE 1.1

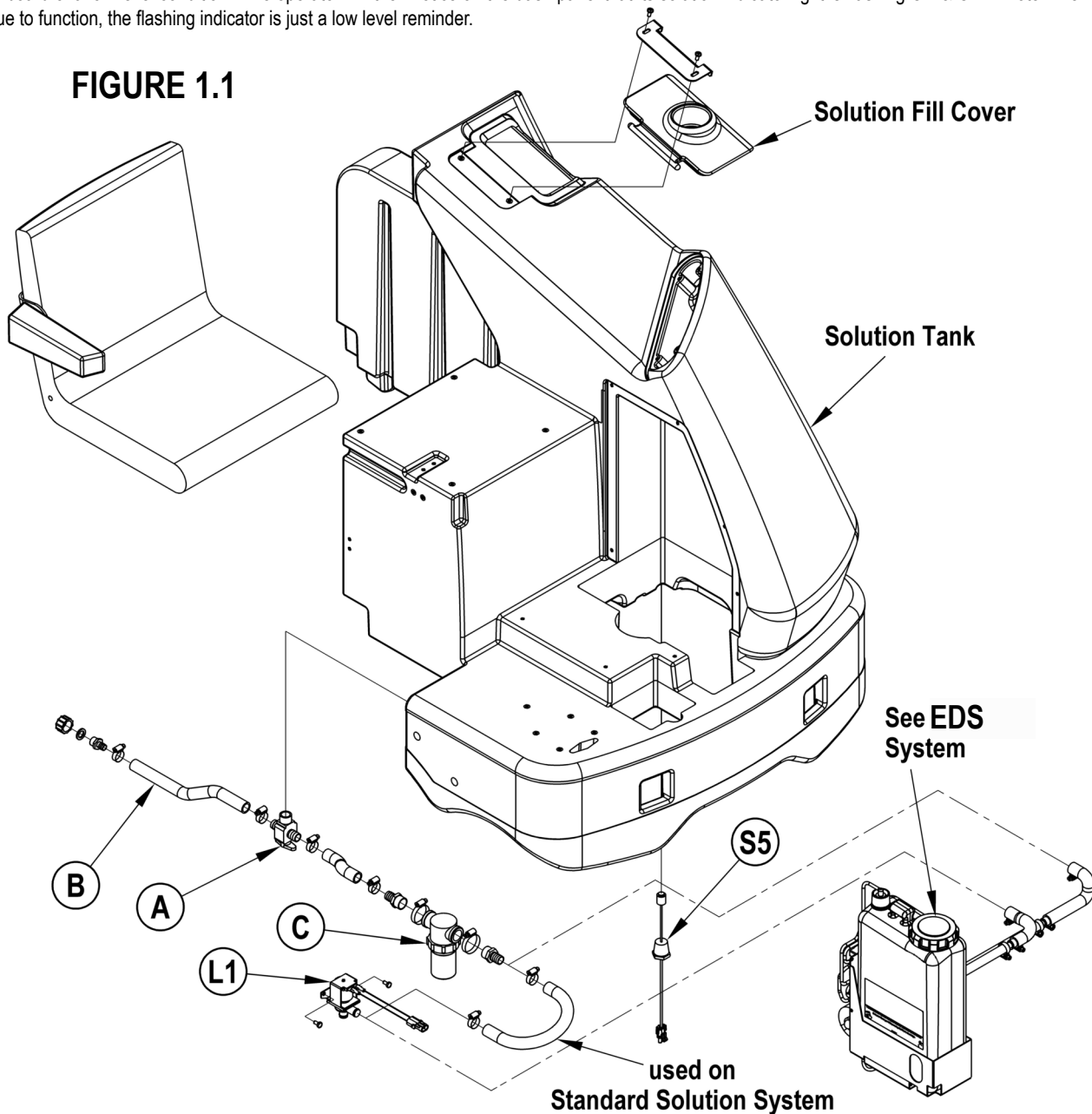
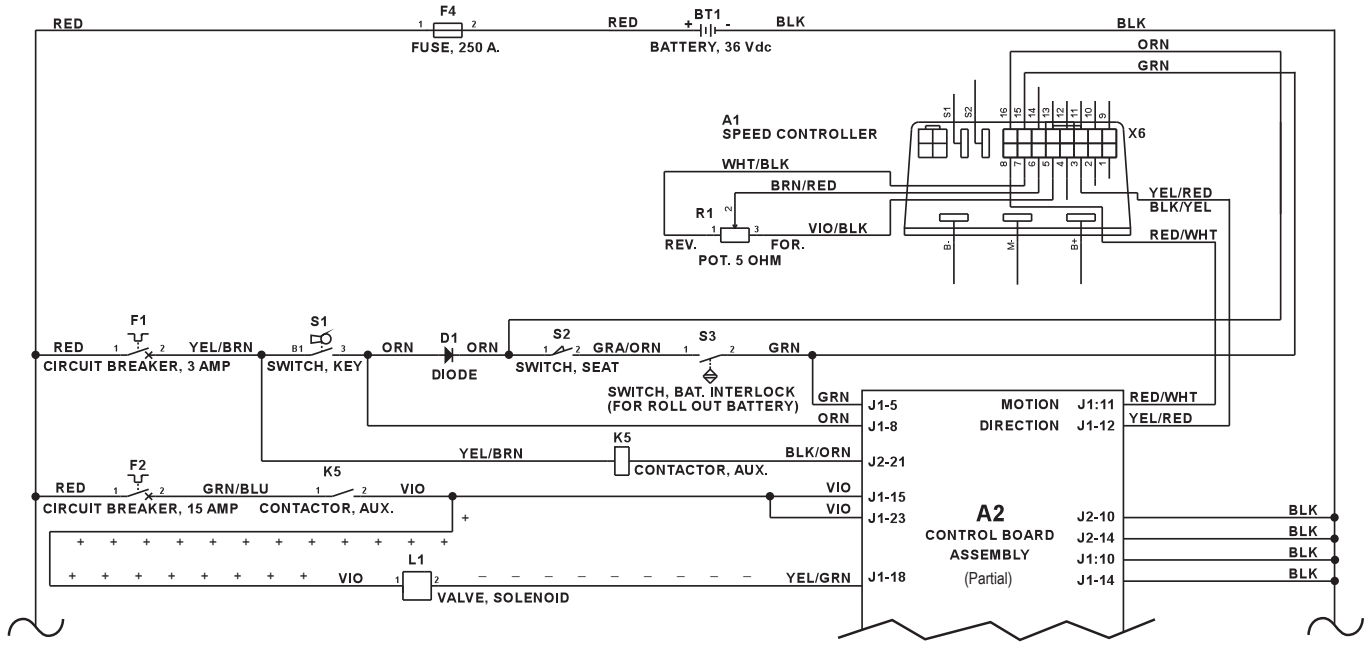


FIGURE 1.2




TROUBLESHOOTING GUIDE

Problem	Possible Cause
Inadequate or no solution flow - on standard models	No solution in the tank
	Solution shut-off 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 A2*
Inadequate or no solution flow - on EDS systems	See EDS system section for its troubleshooting guide

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

SOLUTION SYSTEM MAINTENANCE

- **Solution Tank:** See Figure 1.1. Weekly empty the solution tank; remove the solution Drain Hose (B) from its storage area (located above the left rear tire). 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 solution tank.  No tools are needed to remove the filter (hand tighten only). **Service Tip:** The manual solution ball valve (shut-off) handle 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.

FLOW RATES / WATER SETTINGS

SOLUTION FLOW RATE (TABLE 3)					
	Standard flow rates			Over-ride flow rates	
	1 bar	2 bars	3 bars	4 bars	5 bars
BR 1100S Disk	.84 GPM	1.00 GPM	1.50 GPM	2.00 GPM	2.50 GPM
BR 1100S Cylindrical	.70 GPM	.84 GPM	1.00 GPM	1.50 GPM	2.50 GPM
BR 1300S Disk	1.00 GPM	1.50 GPM	2.00 GPM	2.25 GPM	2.50 GPM
BR 1300S Cylindrical	.84 GPM	1.00 GPM	1.50 GPM	2.00 GPM	2.50 GPM

1 - SOLUTION SYSTEM

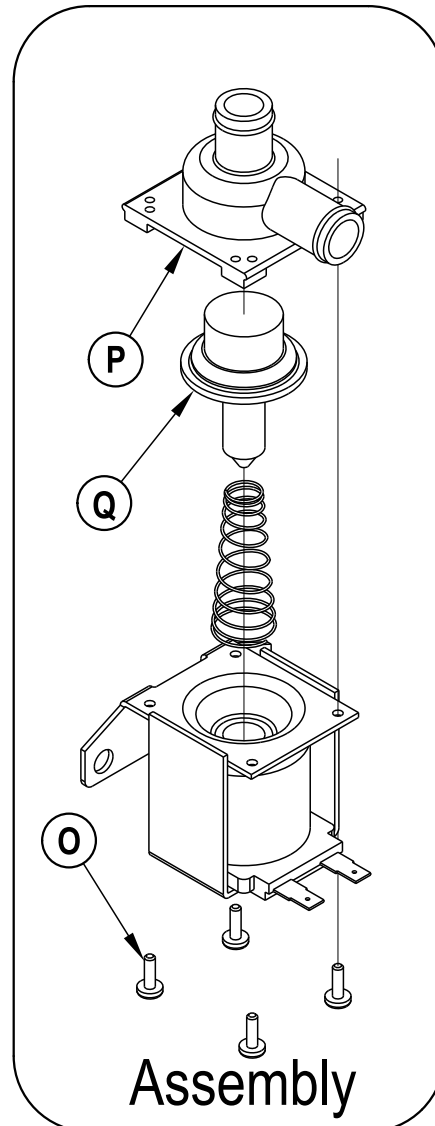
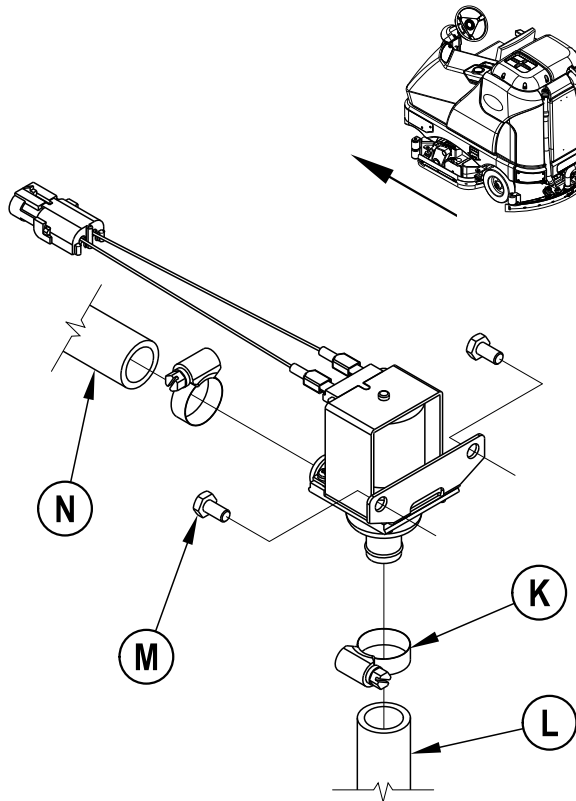
SOLENOID VALVE REMOVAL

- 1 Drain the solution tank or turn the solution filter ball valve to the off position to prevent solution loss.
- 2 Disconnect the battery supply to the machine.
- 3 **See Figure 1.4.** Unplug the L1 solenoid valve wire assembly connection from the machine harness.
- 4 Unscrew the inlet Hose Clamps (**K**) that secure the hoses to the valve body.
- 5 Separate (pry) the solution outlet hose (**L**) off from its valve body barbed fitting.
- 6 Remove the (2) Hex Screws (**M**) that secure the valve to the underside of the chassis, then pull the valve body to the front separating it from the solution inlet Hose (**N**), completing the part removal.

SOLENOID VALVE DISASSEMBLY AND CLEANING

- 1 Remove the solenoid valve. See the *Solenoid Valve Removal* section for instructions.
- 2 **See Figure 1.4.** Remove the (4) (**O**) Screws and disassemble the valve (be careful not to lose any internal parts).
- 3 Thoroughly wash dirt from block (**P**) and diaphragm (**Q**).
- 4 After reassembling, test the solenoid valve for proper operation.

FIGURE 1.4



FUNCTIONAL OVERVIEW

• Disk Brush System Overview

See Figure 2.2. The disk models manufactured in 2 scrub system dimensions 40"(101.6cm) & 48"(121.92cm) use a rotary disk type scrub system powered by (1) 3 HP motor gearbox assembly, for the 40"(101.6cm) deck and (3) 1-1/2 HP for the 48"(121.92cm) decks.

• Cylindrical Brush System Overview

See Figure 2.6. The cylindrical models 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 (2) 1-1/2 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) the scrub on (mode) panel button. The scrub pad or brush pressure ranges (1-3) are selectable 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 2.1. The machine's main scrub system input and output operating functions are regulated (managed) by the A3 display panel and main control board A2. The major scrub system functions are...

• M9 / M10 / M11 Scrub Brush Motor Run Function Overview

Note: To operate run the scrub brushes the A3 control panel scrub ON switch must be depressed.

Positive & Negative low (control) and high (load) current circuit inputs:

- Battery Pos. is connected to the K5 auxiliary coil (wire color YEL/BRN)
- Battery Pos. is sent through the S1 key switch, S2 seat switch and if equipped the S3 battery roll out interlock switch. This supplies the A2 board one of its Pos. battery inputs to pin # J1-5 (GRN wire).
- From the S1 key switch another battery Pos. input is made to the A2 control board at pin# J1-8 (ORN).
- The A2 control board is connected to battery ground by a group of (4) wires (J1-10&14 and J2-10&14).
- With the above A2 board control inputs completed a negative low current control circuit output from the A2 control board pin# J2-21 (BLK/ORN wire) completes the K5 coil circuit. The energized K5 contactor pulls in (closes its load contact K5) and supplies all the brush motor coils (K2, K3 & K4) their needed positive circuit input.
- Note: The machine must be moving to turn on the scrub brush motor(s).
- The A1 speed controller outputs a negative voltage signal (-) from its pin #8 (RED/WHT wire) to the A2 control board pin #J1-11. Note: The A1 speed control's pin #8 motion output signal occurs whenever the R1 direction/throttle pot (foot-pedal) is moved off its neutral setting.
- Battery Pos. is fed from the F4 fuse (250 Amps) to all the separate large terminal battery inputs at the brush motor contactors (K2, K3 & K4). Note: The quantity of contactors used is defined by the deck type and scrub width.
- This motion command signal allows the control board A2 to complete (connect) the negative coil circuits to each separate brush motor contactor (K2 wire YEL/BLU, K3 wire WHT/VIO & K4 wire GRA/RED) with a completed brush motor coil circuit the heavy load contact is pulled in (closed) and the positive brush motor load circuit is complete.
- The brush motor(s) negative high current wiring (BLK 6-1) is connected to the master battery ground terminal and completes the high current load circuit allowing the motors to run.

• M2 - Scrub Brush Actuator Lift Motor Function

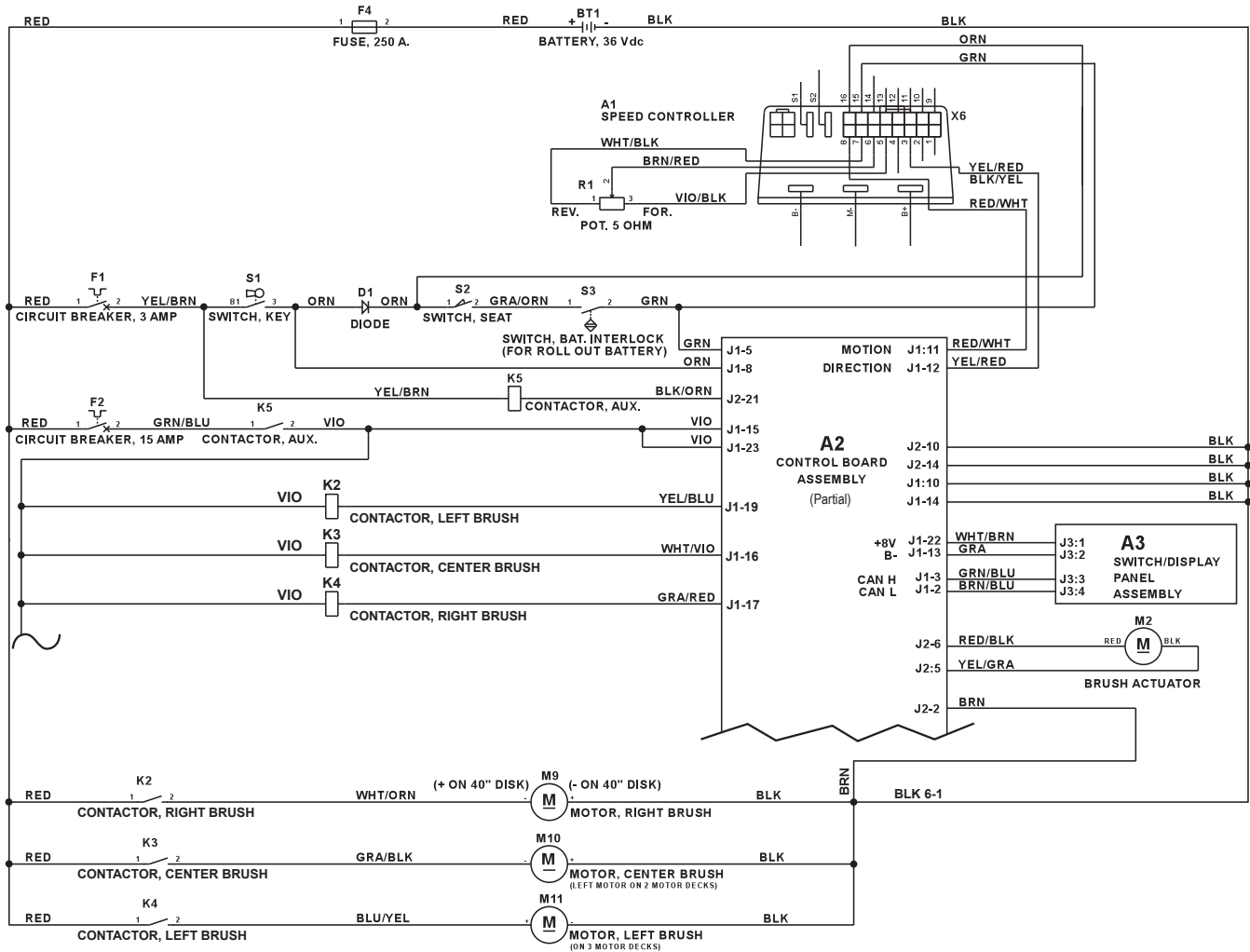
The A2 control board outputs a controlled motor voltage polarity change (wires J2-5 and J2-6) that raises and lowers the scrub-deck for installing, removing and controlling the scrub brushes' selected current load. The large BLK negative (-) scrub brush motor wire is specially designed so that it has a known (specified) resistance value must not be modified. As brush motor current passes through the negative wire that is, in effect, a low value resistor, a small voltage drop is developed across it which is proportional to the motor current. This voltage change is inputted to the A2 control board at J2-2 (BRN) and the A2 ground wire group (J1-10&14 and J2-10&14). Any surrounding temperature change in this large Neg. motor wire affects its resistance so the temperature is sensed by a thermistor (*) built into the control board A2. 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 M2 actuator motor to raise or lower the scrub deck. This process is on-going in maintaining the operator's selected scrub motor current load setting to sustain the desired brush working pressure.

2 - 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 (A2) to detect any system function failures (error codes). The system components covered are the brush motor(s) (M9, M10 & M11), brush solenoid(s) (K2, K3 & K4) and brush lift actuator motor (M2). 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 2.1

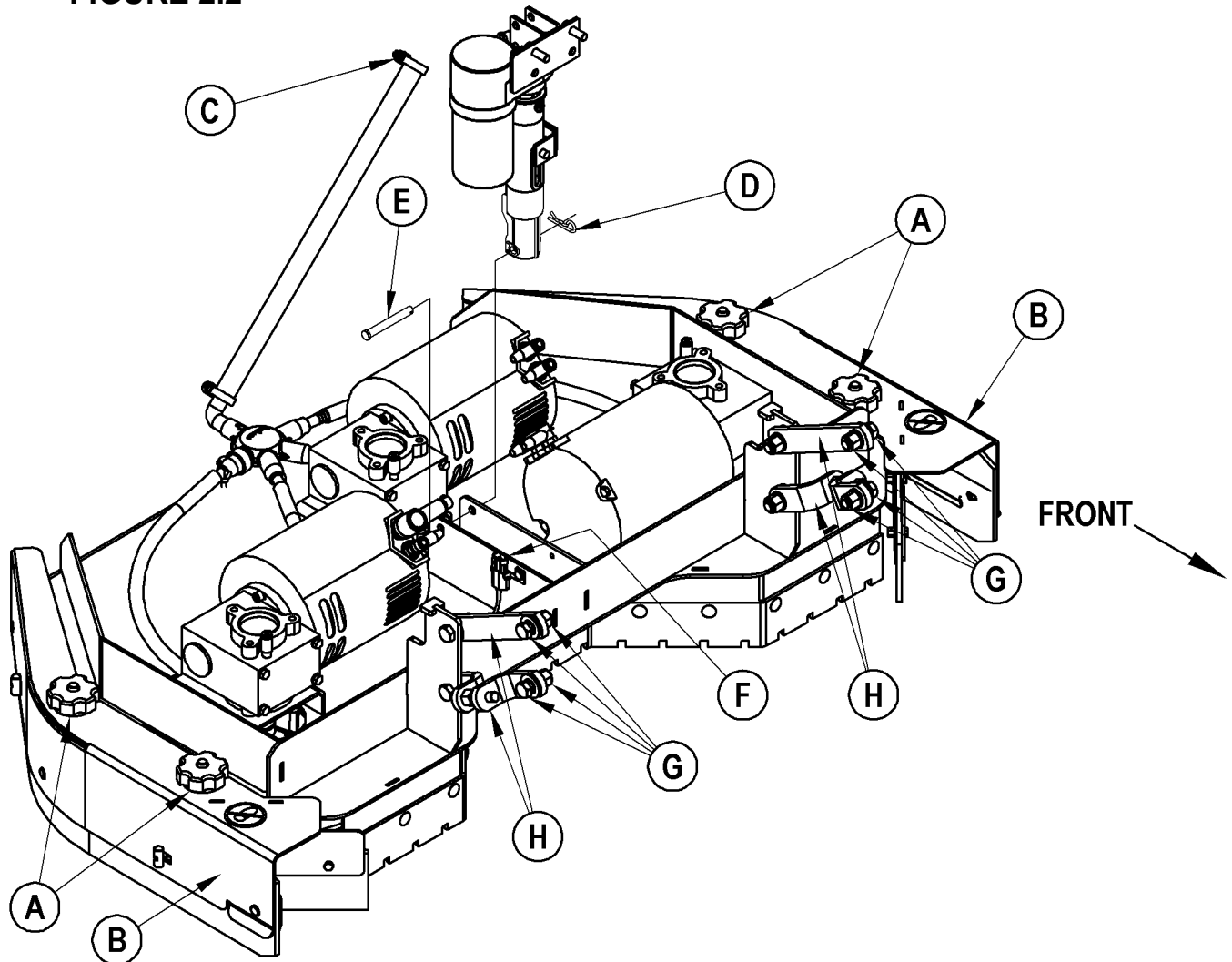


SCRUB BRUSH DECK REMOVAL (DISC)

⚠ WARNING!

- 1 Set Machine parking brake (6) and block (choke) both rear wheels so machine can't roll.
- 2 See Figure 2.2. Loosen the (4) side skirt retainer knobs (A) (2 per side) and pull the skirt assemblies (B) off from the deck. Then remove the scrub brushes from the brush holders.
- 3 Place wood blocking (2x4) under both outside brush drive discs (brush holders) and lower the deck to the floor by pressing the scrub on 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 (11)). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
- 4 Turn the master key to the OFF position.
- 5 Remove the solution feed hose at solution distribution bladder located on the scrub deck.
- 6 Remove bottom lift actuator Hair Pin (D), then push the Retainer Pin (E) from its housing and mount bracket holes. Next disconnect the actuator wire harness connector. **Note:** This will prevent the actuator from being turned on and rising when it is disconnected from its deck mount.
- 7 Reference the correct brush motor wire connections at each individual motor then remove all the wiring from the motor terminals. Next locate on the brush deck the motor deck ID (identification) Resistor Plug (F) and separate its connector.
- 8 From the left and right front deck supports remove the (G) (4) hex nuts, hex screws and bushings then swing the Pivot Support Arms (H) away from their mounting holes.
- 9 Remove the previously installed wood blocking from underneath the drive discs. **Note:** This must be done to allow the needed clearance for the deck removal.
- 10 Carefully slide the complete deck assembly out from underneath the machine from its left side. **Note:** Observe the position of the disconnected lift actuator housing and swing it to the rear to clear its mount bracket pocket.

FIGURE 2.2



2 - SCRUB BRUSH SYSTEM

SCRUB BRUSH MOTOR AND GEARBOX REMOVAL (DISC)

Individual Brush Motor removal

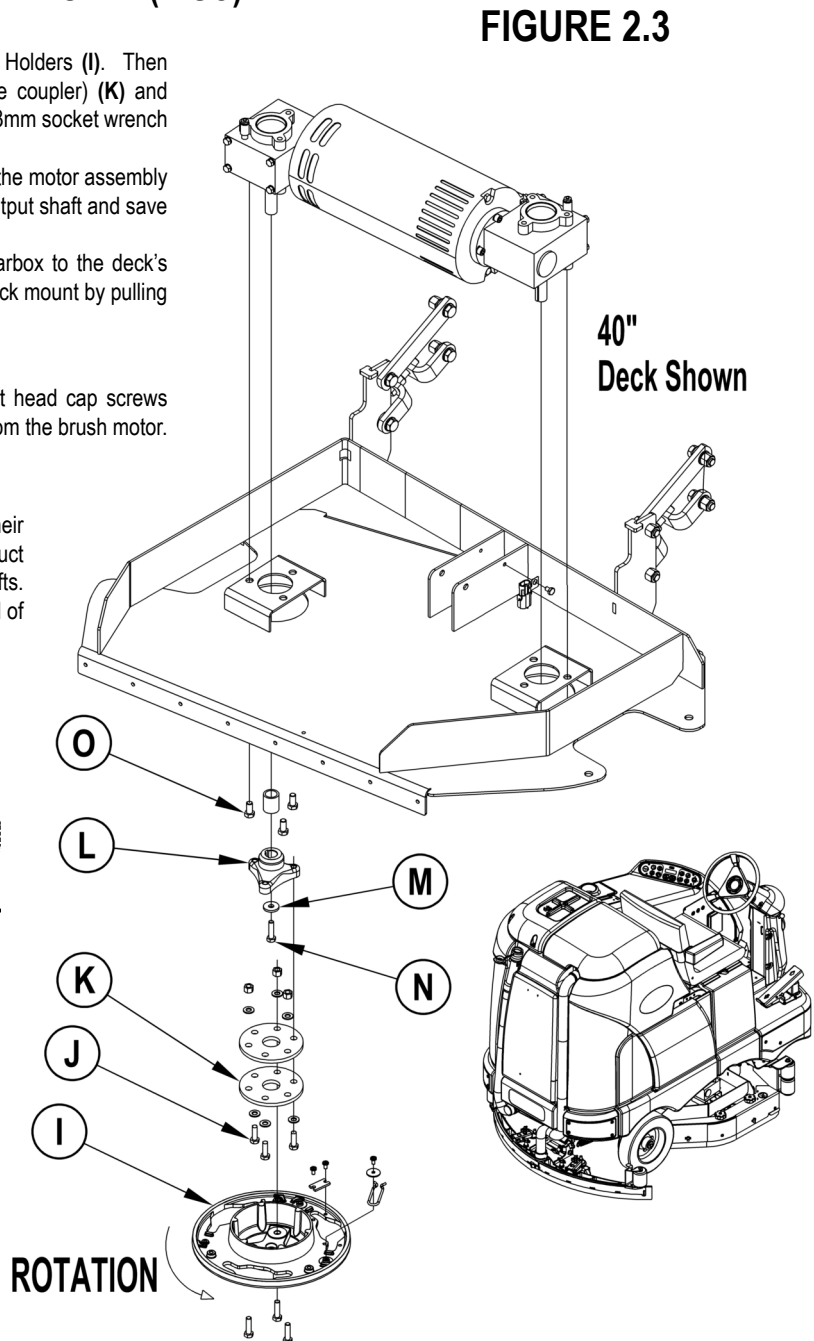
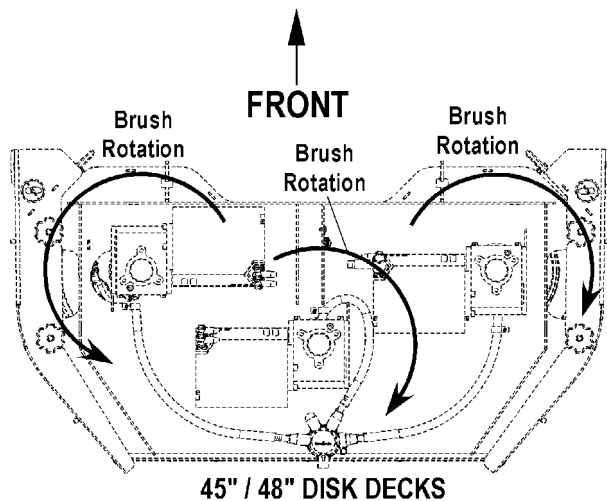
- 1 See Figure 2.3. Remove the scrub brushes from the Brush Holders (I). Then remove the (3) (J) Screws from each Thermoid Disk (flexible coupler) (K) and remove the Brush Holder (I) from the Hub(s) (L). **Note:** Use a 13mm socket wrench to remove the Screws (J).
- 2 Remove the hardware items (M & N) that fasten the Hub (L) to the motor assembly that needs replacement. Then pull the hub from the gearbox output shaft and save the key stock.
- 3 Remove Qty (3) hex Screws (O) that secures each motor gearbox to the deck's mounting plate. Then separate the motor assembly from the deck mount by pulling it straight up.

Individual Gearbox Removal

- 1 To remove the gearbox from the motor remove the (3) socket head cap screws securing the gearbox that needs replacement and separate it from the brush motor. **Note:** Save the internal gearbox key stock for reassembly.

Reassembly

- 1 Reinstall in reverse order and test the motor assembly(s) for their proper operation. **Note:** Apply a small amount of grease or a product called "Never Seize" to the gearbox (both input and output) shafts. This will assist in any future ease of disassembly in the removal of the Drive Hub(s) (L).



SIDE SKIRT MAINTENANCE

The side skirt's function is to channel the waste water to the 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. A height adjustment can easily be made to lower the blades so that all the water can be pick-up by the squeegee.

To reverse or replace the scrub system side skirt(s) ...

- 1 See Figure 2.4. Loosen the (2) side skirt Retainer Knobs (AA) (2 per side) and remove the Skirt Assemblies (BB) from the scrub deck. **NOTE:** Remove the skirts by first sliding them forward and then pulling them off.
- 2 Remove all the hardware that holds the blades to the skirt housings. **NOTE:** The main blade on each skirt housing is held on with Tool-less Retainers. Simply loosen the large Wing nuts (CC) and then turn the Knobs (DD) on the outside of the skirt housing until they are horizontal and push through the slots. The small inside Blade (EE) on disk models is held on by (2) screws and nuts and has 2 working edges.
- 3 The main skirt blade has 4 working edges as shown. Turn the blade so a clean, undamaged edge faces toward the center of the machine. Replace the blades as a set if all 4 edges 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.

SCRUB BRUSH SYSTEM - 2

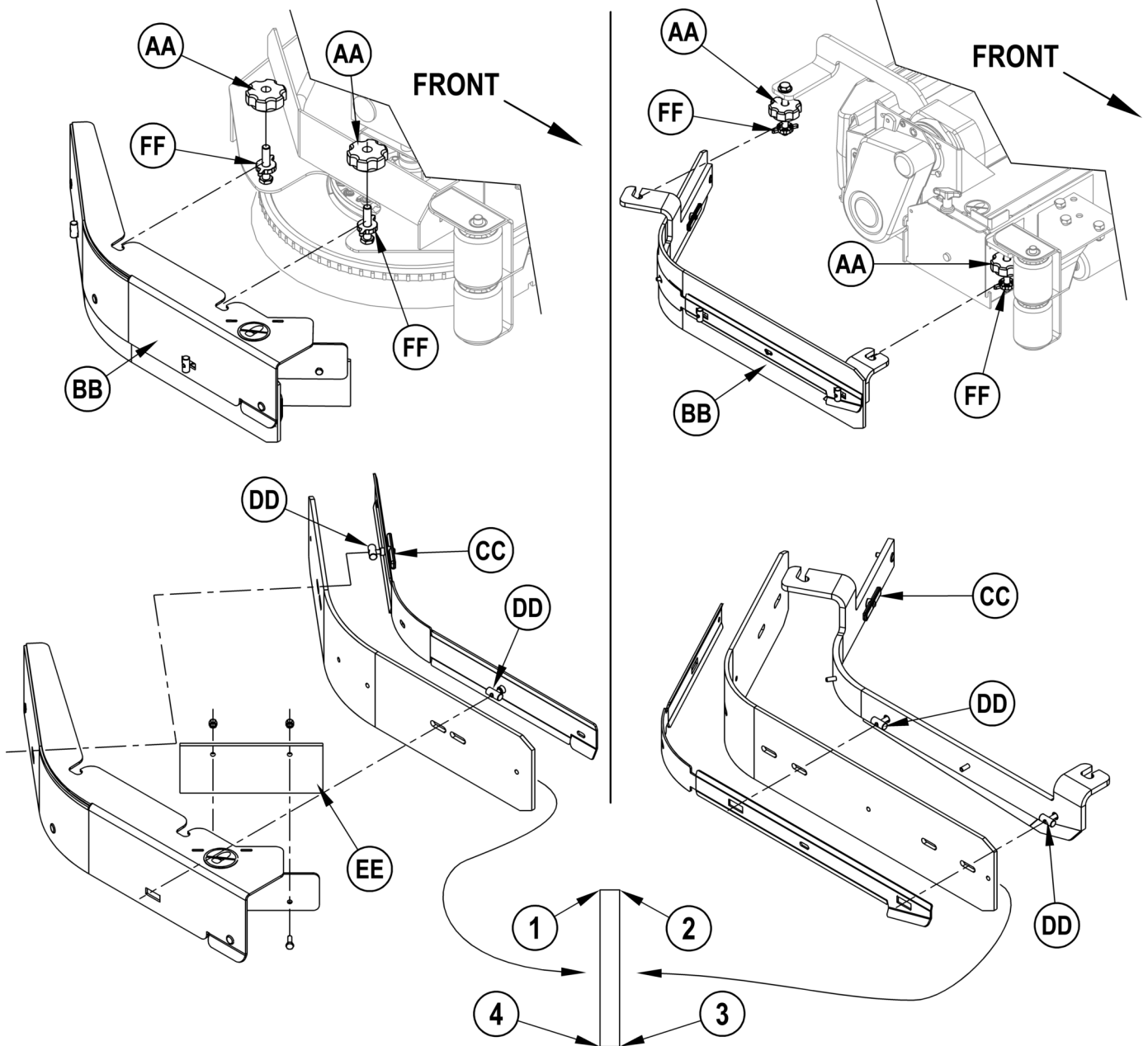
SIDE SKIRT HEIGHT ADJUSTMENT

- 1 The side skirt housing knob retainer screw studs have leveling Adjuster Collars (FF) that can be raised or lowered to compensate for blade wear.
- 2 To adjust, remove the Skirt Assemblies (BB) from the scrub deck to access the Adjuster Collars (FF). Adjustment Tip: The skirts Retainer Knobs (AA) can be loosened with skirts left on and the Adjuster Collars (FF) rotated by reaching under the skirt housing.
- 3 Turn the Adjuster Collars (FF) (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.

DISK

CYLINDRICAL

FIGURE 2.4



2 - SCRUB BRUSH SYSTEM

SCRUB BRUSH DECK LIFT ACTUATOR REMOVAL (DISC & CYLINDRICAL)

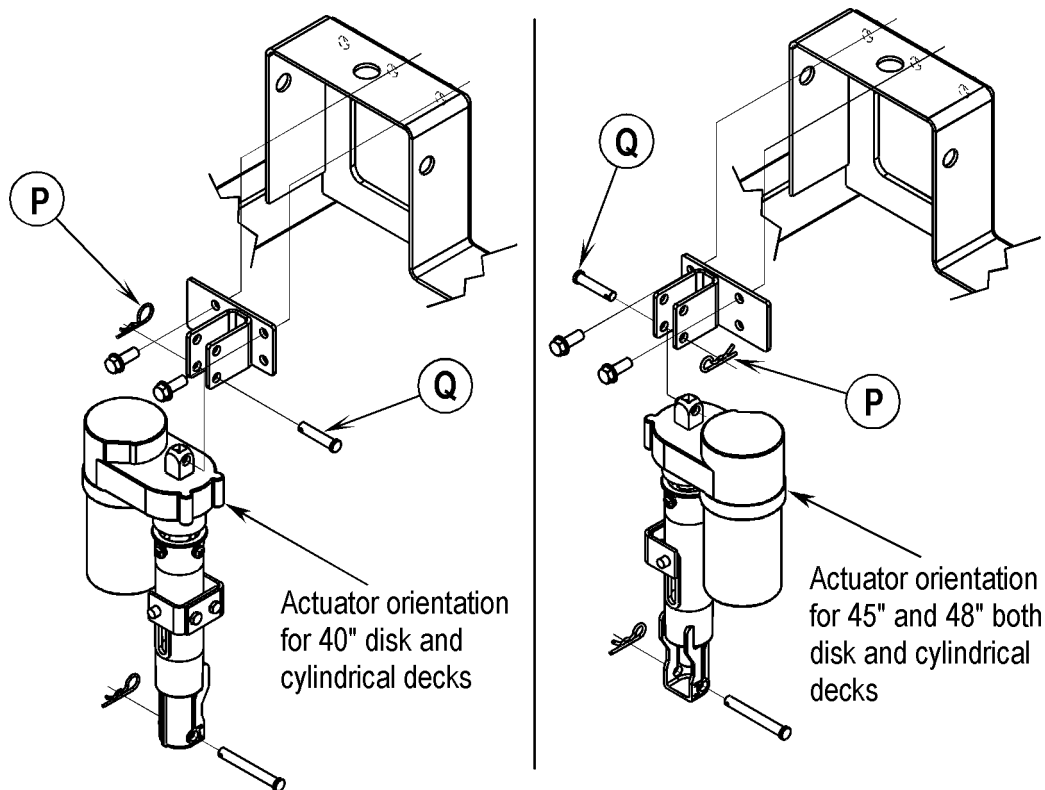
Note: All new replacement actuator motors are not shipped with the lift nut pre-adjusted for any specific machine model application.

Note: The scrub deck must be removed to access the scrub deck lift motor's top mount bracket.

- 1 Follow the steps for "Scrub Brush Deck Assembly Removal" for the deck type (disc or cylindrical) needing the service repair work.
- 2 **See Figure 2.5.** From underneath the middle of the machine locate and remove the upper Hairpin (P), then slide the actuator Mount Pin (Q) from the housing and frame mounting bracket holes allowing the motor to drop down completing its removal.
- 3 See the *Actuator Drive Nut Adjustment* instructions in the electrical manual section to properly install a new drive nut and to verify its dimensional travel measurements.
- 4 After setting (or testing) the correct drive nut measurements, follow in reverse the above steps to reassemble and reinstall.

Service Tip: Shown in the "Electrical System" is the actuator power cord adapter P.N. 56407502 and instruction for use. This tool can be used to help position (extend or retract) the lift actuator housing for ease in installation of the bottom mounting (clevis) pin.

FIGURE 2.5



SCRUB BRUSH DECK ASSEMBLY REMOVAL (CYLINDRICAL)

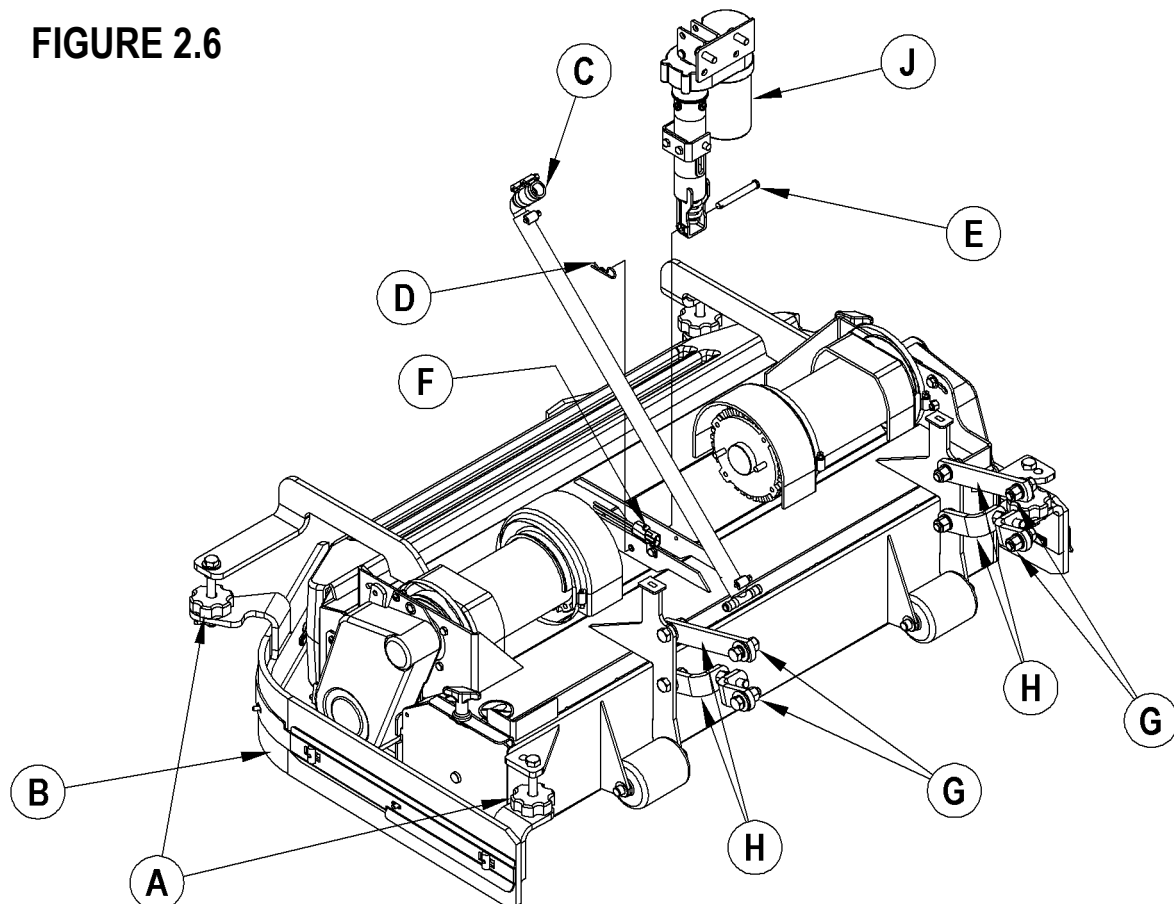
WARNING!

- 1 Set machine parking brake (6) and block (choke) both rear wheels so machine can't roll.
- 2 See Figure 2.6. Loosen the (4) side skirt Retainer Knobs (A) (2 per side) and pull the Skirt Assemblies (B) off from the deck. Next remove, slide out the rear deck debris tray.
- 3 With the scrub brushes on the machine lower the scrub deck to the floor by pressing the "Scrub ON" button. **Special Service Note:** 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 (11)). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
- 4 Turn the master key to the OFF position.
- 5 Remove the solution feed Hose (C) at the solution solenoid valve located underneath the left side of the machine ahead of the rear wheel.
- 6 Remove bottom lift actuator Hair Pin (D), then push the Retainer Pin (E) from its housing and mount bracket holes. Next disconnect the actuator wire harness connector. **Note:** This will prevent the actuator from being turned on and rising when it is disconnected from its deck mount. **Service Tip:** Connect the Advance power cord adapter (P.N. 56407502) to the lift motor harness then position (relieve the pressure on) the Lift Pin (E) for ease of removal.
- 7 Reference the correct brush motor wire connections at each individual motor then remove all the wiring from the motor terminals. Next locate on the brush deck the motor deck ID (identification) Resistor Plug (F) and separate its connector.
- 8 From the left and right front deck supports remove the (G) (4) hex nuts, hex screws and bushings then swing the Pivot Support Arms (H) away from their mounting holes. **Special Service Note:** The removal of both the left and right side brooms and both the front chassis corner rollers will allow easier access to the (4) front scrub deck support arms' mounting hardware.

WARNING!

- 9 Safely jack up the front of the machine 1-1/2 – 2 inches (38-50 mm) and put a wood block (2 x 4) underneath the drive wheel for a safety support.
- 10 The deck Actuator (J) must be put into its retracted (up) position to allow needed clearance when pulling the deck assembly out from underneath the machine. **Service Tip:** Connect the power cord adapter (P.N. 56407502) to the motor; hold the actuator housing and run (shorten) the actuator housing length. See the *Actuator Drive Nut Adjustment* section in this manual for additional operational details. An alternate method to gain the needed actuator clearance to slide the deck out from under the machine would be to safely jack up the front of the machine. **Warning!** Support both front corners with proper jack stands or blocking before working underneath the machine.
- 11 Carefully slide the complete deck assembly out from underneath the machine from either side. **Note:** Observe the position of the disconnected lift actuator housing and swing it to the rear to clear its mount bracket pocket.

FIGURE 2.6

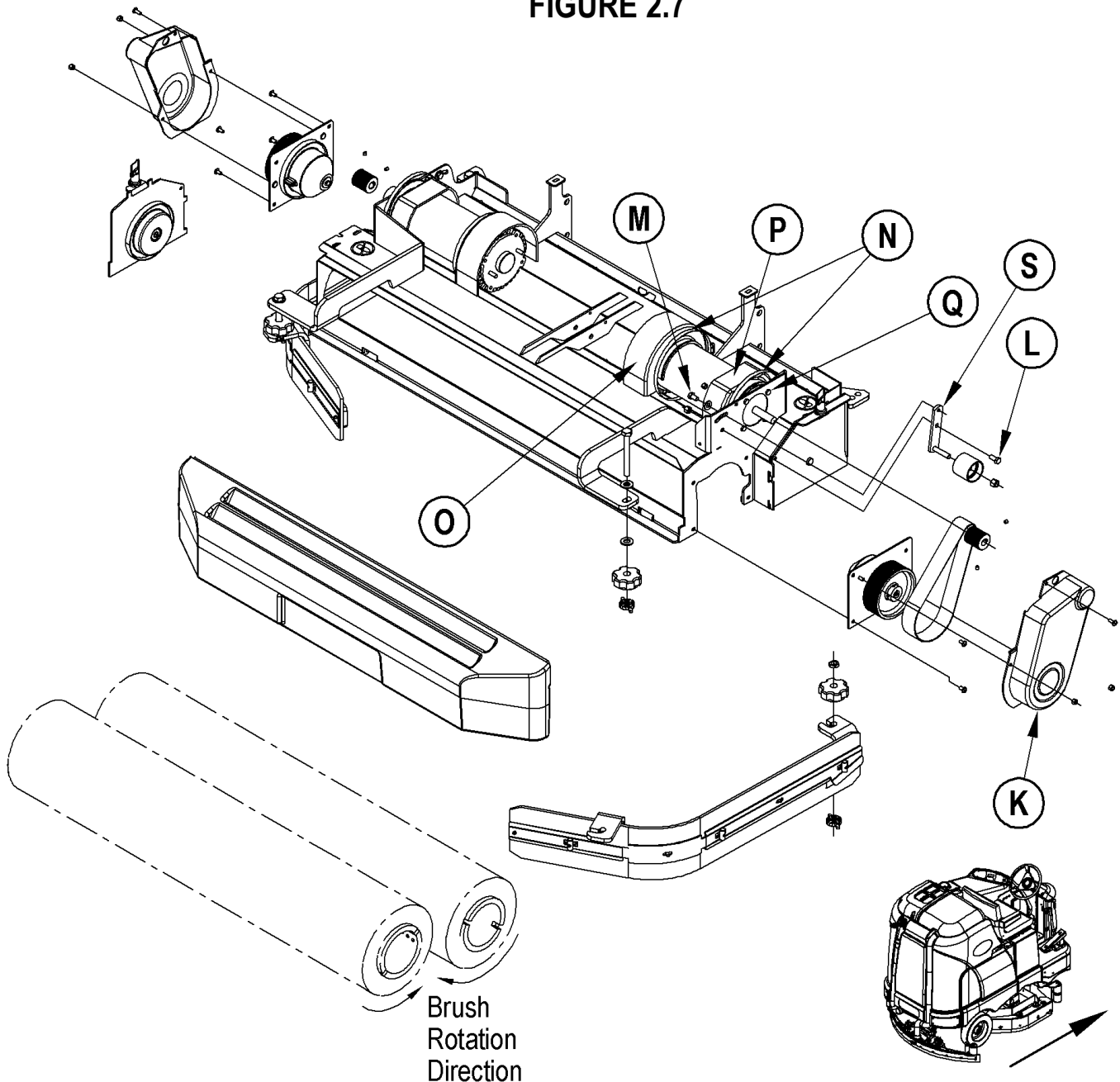


2 - SCRUB BRUSH SYSTEM

SCRUB BRUSH BELT REPLACEMENT (CYLINDRICAL)

- 1 See Figure 2.7. Remove the side Skirt Assembly on the side needing service. Next remove the Belt Guard (K) fastened with two studs and a screw and nut (use a 10 mm socket).
- 2 Loosen the belt idler arm assembly hardware items (L & M) this will release the tension on the belt, then roll the belt off the pulleys to remove.
- 3 Install a new belt to the pulleys.
- 4 See Figure 2.8. Grip the 1 inch wide Idler Arm (S) with an adjustable wrench to obtain a 1/8" belt deflection at midpoint. Then tighten the top Screw (L) and then remove wrench used to tension belt and finish tightening the bottom arm pivot screw. **Note:** Two holes are drilled into the end of the motor mount plate. The holes are used to quickly help index the belt tensioning Idler Arm (S). Position the idler arm between the holes when installing a new belt, this will approximate the correct belt tension. Then recheck for the 1/8" deflection and make any additional adjustment to assure the proper belt performance and belt/bearing life.
- 5 Reinstall the belt guard, side skirt and test the scrub system for proper operation.

FIGURE 2.7



SCRUB BRUSH SYSTEM - 2

SCRUB BRUSH MOTOR REPLACEMENT (CYLINDRICAL)

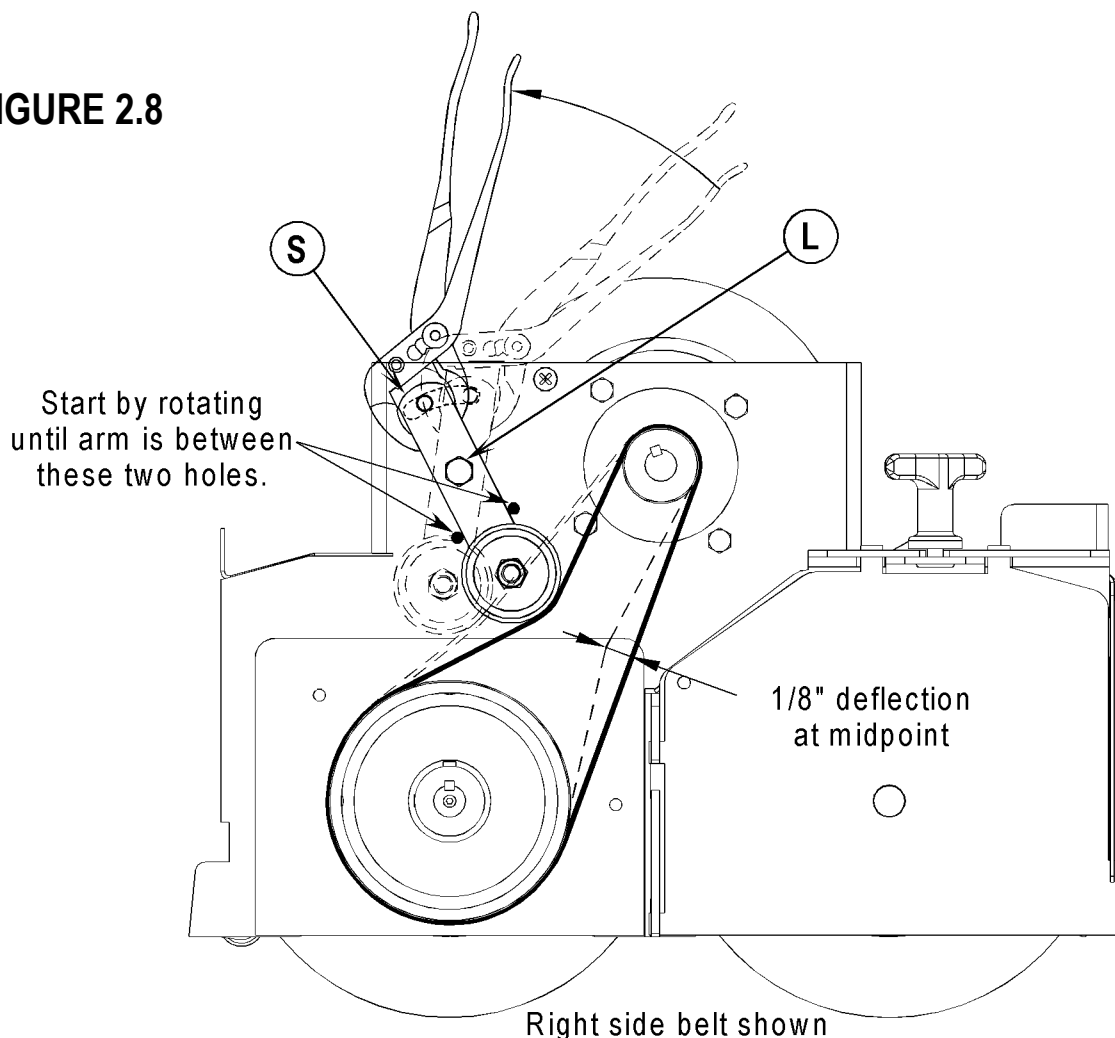
Note: It is not necessary to remove the complete scrub deck assembly from the machine to service an individual scrub brush motor.

- 1 Remove the side skirt assembly on the side of the deck that needs the scrub motor serviced. Next remove, slide out the rear deck debris tray.
- 2 With the scrub brushes on the machine lower the scrub deck to the floor by pressing the Scrub ON button. **Special Service Note:** 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 (11)). This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
- 3 Turn the master key to the OFF position.
- 4 **See Figure 2.7.** Loosen both worm Gear Clamps (N) that fastens the in & out board motor shrouds to the motor housing. Then remove both the shrouds (O & P) from the motor.
- 5 Remove the Belt Guard (K) fastened with two stud nuts and a screw and nut (use a 10 mm socket).
- 6 Remove Qty 4 (Q) Screws that secure the Scrub Motor (R) to its deck mount. Also notice that the motor may stick to the motor mount be careful as motor will drop, watch fingers.
- 7 Turn the motor clockwise to access the motor terminal studs. Observe the correct wire connections for reassembly then remove both motor wires.
- 8 The deck assembly needs to be lowered to the lift actuator's maximum down position (travel) to gain the clearance needed to remove the motor from the machine. One method is to reconnect the battery and enter the main controller's service test mode (see the optional programming section and follow instructions). The second method is to connect the power cord adapter (P.N. 56407502) to the lift motor and run (lower) the deck housing. See the *Actuator Drive Nut Adjustment* section in this manual for additional operational details.
- 9 Pull and push the motor back towards the rear of the machine clearing the chassis supports to complete its removal at the location were the debris box would be located.

Reassembly of the Cylindrical Scrub Brush Motor

- 1 Follow the above steps in reverse order with the exception that the drive belt tension must be reduced to allow the installation of the (4) motor mount Bolts (Q). Then see the *Scrub Brush Belt Replacement (Cylindrical)* section in this manual and follow its instructions to replace or re-tension the belt.

FIGURE 2.8



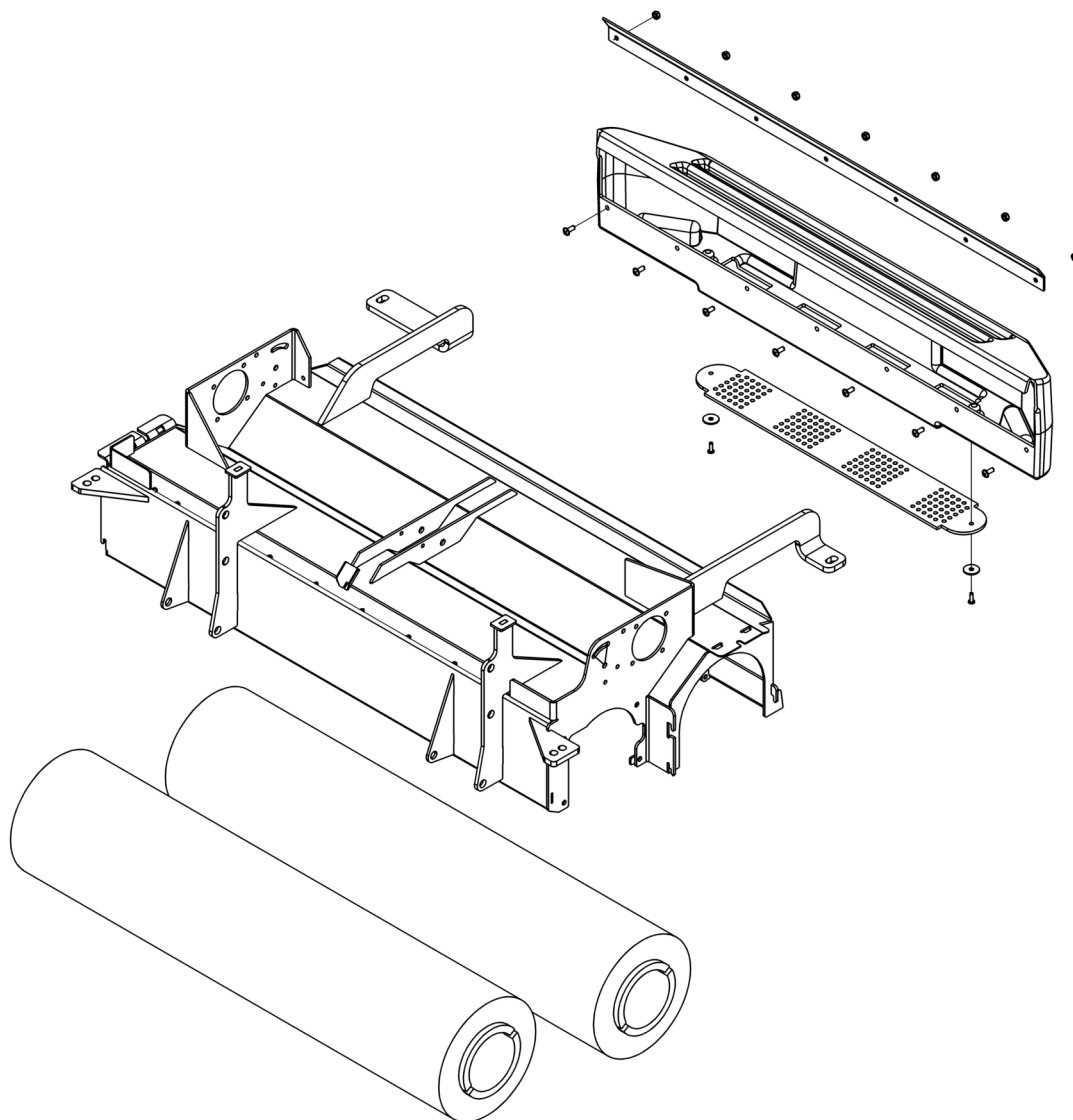
2 - SCRUB BRUSH SYSTEM

SCRUB BRUSH SYSTEM MAINTENANCE (CYLINDRICAL)

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

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

FIGURE 2.9



INSTALL THE BRUSHES (CYLINDRICAL)

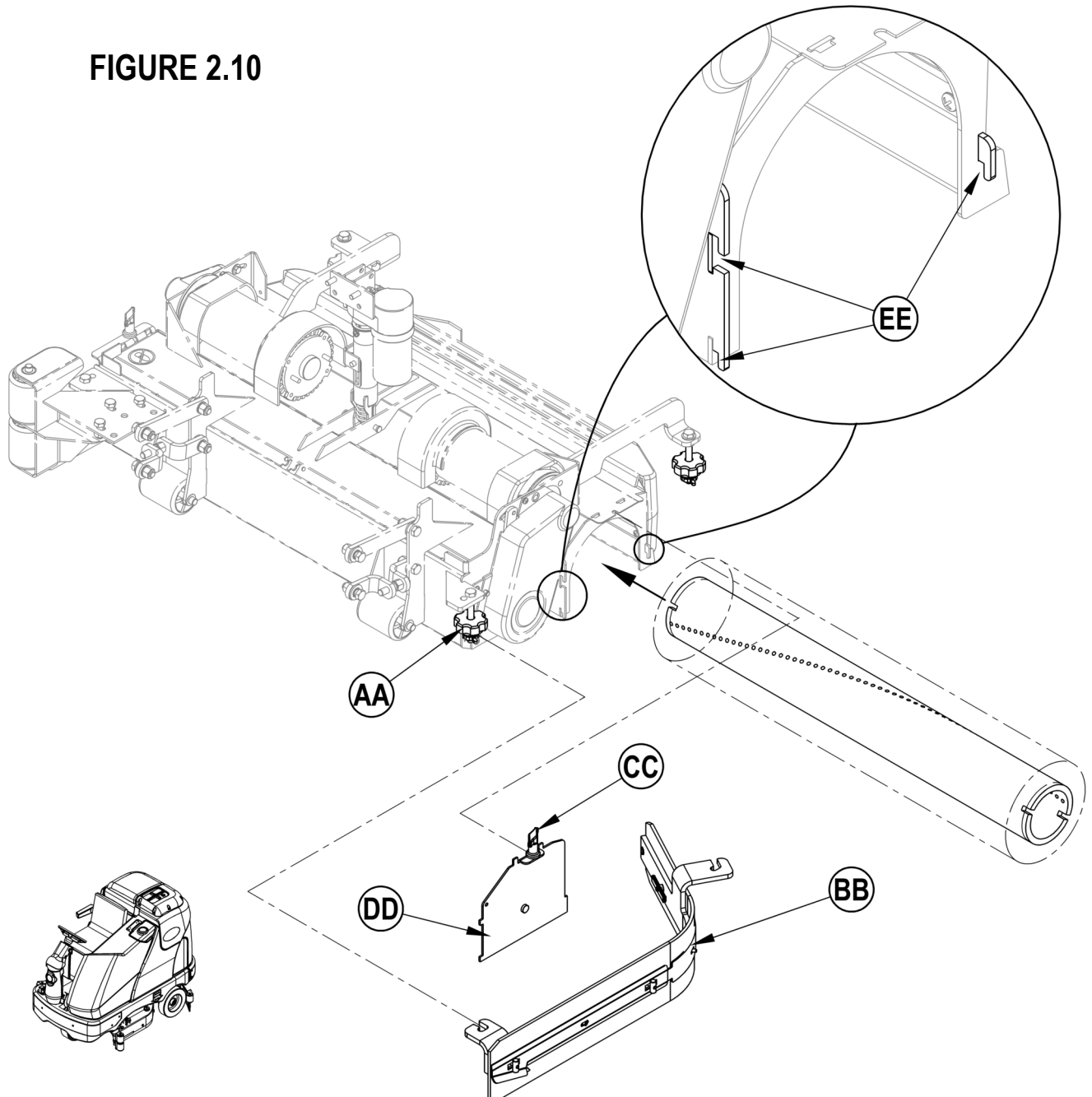


CAUTION!

Turn the key switch off (O) and remove the key, before changing the brushes, and before opening any access panels.

- 1 Make sure the Scrub Deck is in the RAISED position. Make sure the Key Switch (A) is off (O).
- 2 See Figure 2.10. Remove both side skirt assemblies. NOTE: The skirts are held in place by two large Knobs (AA). Loosen these knobs, slide the Skirt Assemblies (BB) forward slightly and then off of the Scrub Deck.
- 3 Loosen the Black Knobs (CC) on top of the Idler Assemblies (DD) until they drop down far enough to disengage from the Notches (EE) and remove.
- 4 Slide the brush into the housing, lift slightly, push and turn until it seats. Re-install the Idler Assemblies (DD) and Skirt Assemblies (BB).

FIGURE 2.10



3 - SIDE BROOM SYSTEM

GENERAL FUNCTIONAL OVERVIEW

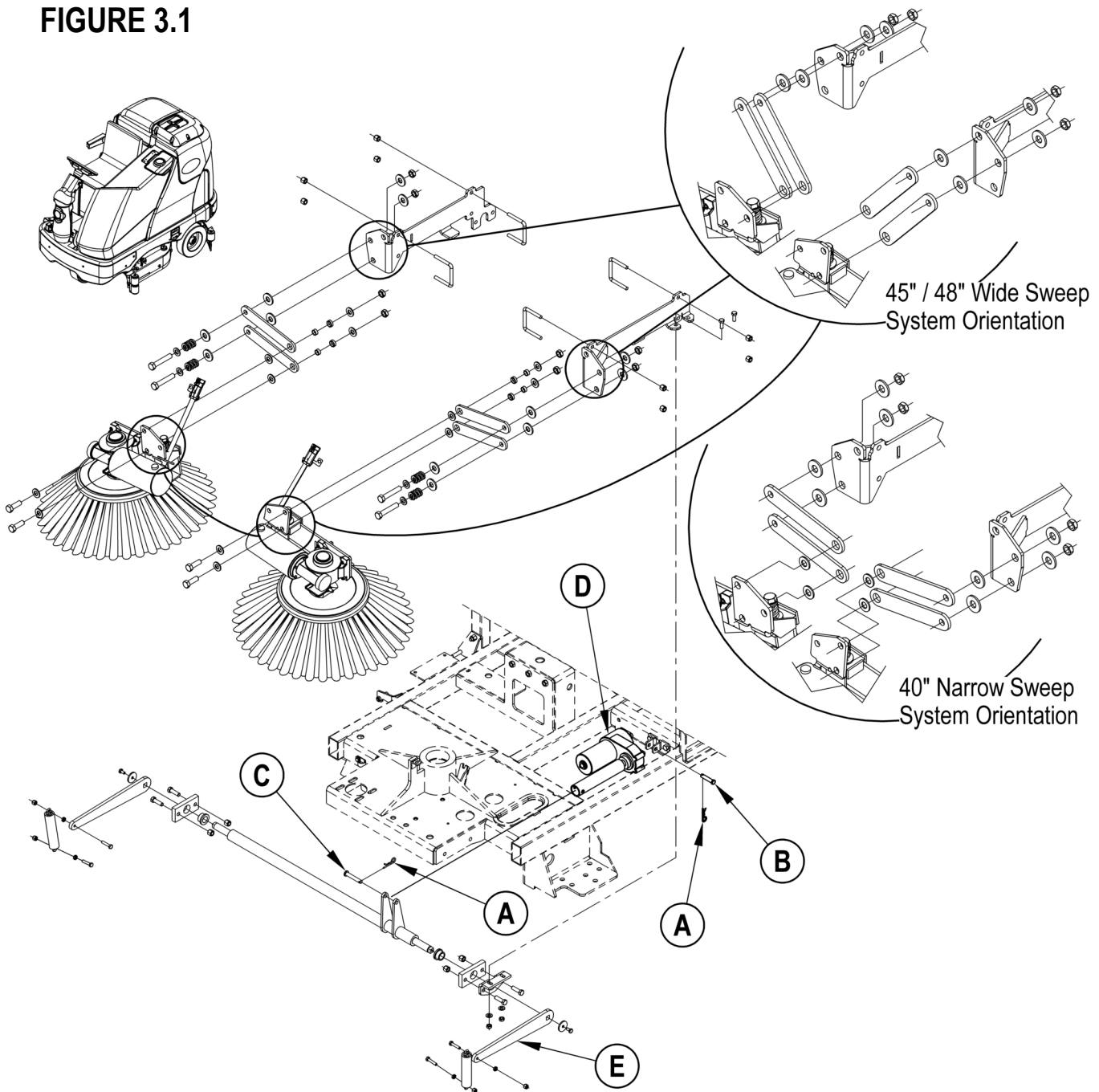
Side Broom System

Certain cylindrical scrubber models are equipped with two (left & right) 20-inch (50.8 cm) front corner mounted rotary sweeping brooms. Light sweep-able debris is easily directed into the two main cylindrical scrub brushes and collected in a removable debris tray.

See Figure 3.1. The side broom motor assemblies are raised and lowered by a horizontally mounted electric Actuator Motor (D) connected to a pivoting mechanical arm linkage assembly. Fastened at each end of the arm linkage assembly are two short pieces of chain attached to both side broom assemblies that input the raising and lowering of the side brooms.

To turn on (run) the side brooms the operator can press either the ON or OFF Side Broom Control Buttons (C) & (L) (located on the control panel A3) which activates (lowers) the side brooms in all three scrub pressures modes. **Note 1:** The side brooms will only run when the scrub system is turned ON and the machine is in motion (not in neutral). **Note 2:** Reference the "Know Your Machine" section in this manual for more detailed operation and instructions in using the side broom sweep system.

FIGURE 3.1



SIDE BROOM LIFT ACTUATOR MOTOR REPLACEMENT

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

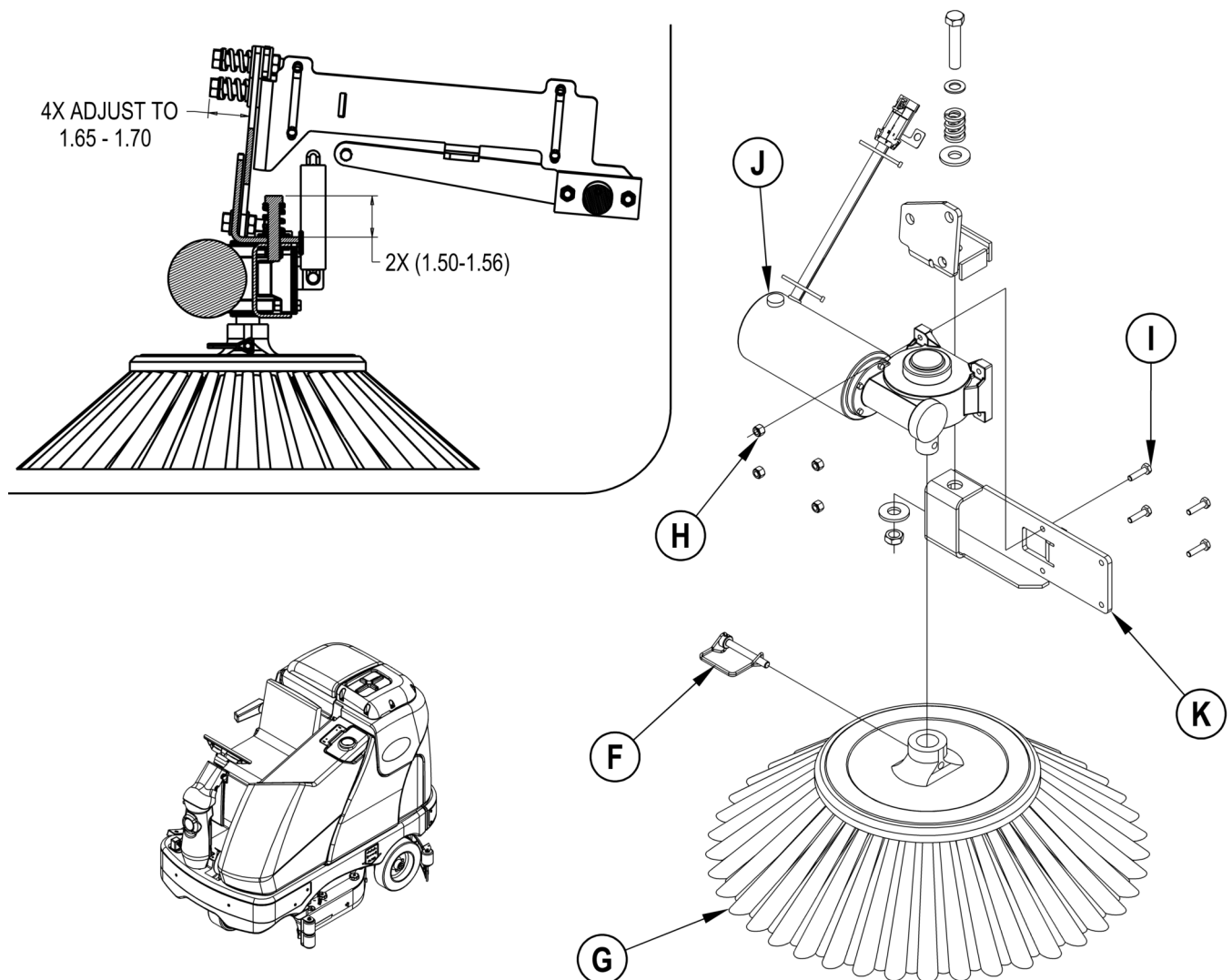
- 1 Follow steps 1-11 of the *Scrub Brush Deck Assembly Removal (Cylindrical)* manual section. The scrub deck must be removed to access the side broom lift motor.
- 2 The side broom lift actuator motor is located underneath the left front of the machine ahead of its side skirt.
- 3 See Figure 3.1. Cut the wiring tie strap if needed then disconnect the wiring connector at the motor.
- 4 Pull out the (2) Hairpins (A) then remove the (2) (B & C) Clevis Pins that secure the motor at the frame and lift arm mounts, then drop the Motor (D) out from underneath the machine to complete its removal. **Note:** It may be helpful to lift up and down on the Lift Arm (E) to relieve any pre load pressure on the actuator mounts pins in removing the front Clevis Pin (C).
- 5 See the *Actuator Drive Nut Adjustment* instructions in this manual section to properly install a new drive nut and to verify its dimensional travel measurements.
- 6 After setting (or testing) the correct drive nut measurements, follow in reverse the above removal steps to reassemble and reinstall.

Service Tip: Shown in the Electrical System is the actuator power cord adapter P.N. 56407502 and instruction for use. This tool can be used to help position (extend or retract) the drive nut for ease in the installation of the mounting (clevis) pins.

SIDE BROOM MOTOR REPLACEMENT

- 1 See Figure 3.2. Remove the side broom Retainer Pin (F) then pull down on the Side Broom (G) and remove it from the motor shaft.
- 2 Disconnect the motor wiring connector from the main machine harness, may need to cut tie straps.
- 3 Remove the hardware items (H & I) quantity (4) of each that fasten the Gear Motor Assembly (J) to the side broom bracket Weldment (K).
- 4 Assemble in reverse order and test for proper working operation of the side broom motor.

FIGURE 3.2



4 - RECOVERY SYSTEM

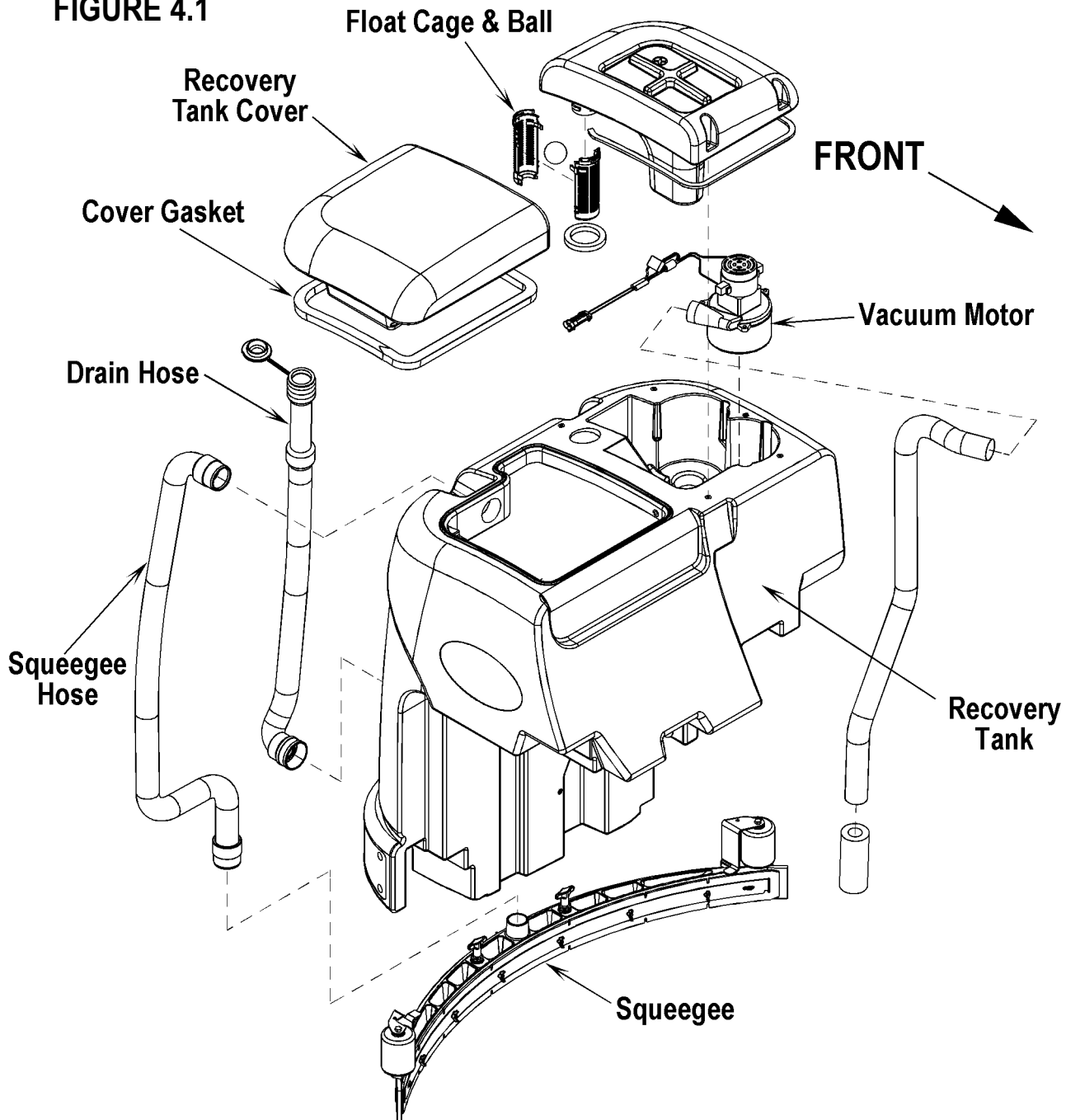
FUNCTIONAL OVERVIEW

Vacuum / Recovery System General

Dirt and water are lifted off the floor into the 70 Gallon (265 liter) 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, vacuum fan inlet screen, vacuum motor and is exhausted out of the vacuum exhaust hose. No wastewater ever actually moves through the vacuum motor, just the working air.

The vacuum system uses a shut-off float to prevent the tank from being overfilled and stops any water from being sucked into the vacuum motor. When the float ball rises (to full tank level) it will seat itself inside the cage assembly and block off the air flow. This causes a reduced vacuum motor current load which is sensed by the main control board and automatically shuts off the vacuum and scrub systems. The dash panel will then display the recovery tank full indicator icon to alert the operator that the tank needs to be drained. Note: See the "Know Your Machine" section in this manual for an illustration of the full indicator icon.

FIGURE 4.1



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.

- Inspect and clean the vacuum motor float cage, vacuum filter and inlet screen.
- Clean built-up dirt from the inside of the squeegee tool.
- Replace the squeegee blades if they are nicked or torn. Make needed angle and height adjustments to the squeegee tool assembly.
- Inspect the hose between the squeegee tool and the recovery tank, rinse any built-up dirt from the hose. Replace the hose if it is kinked or damaged.
- Inspect and make sure the gasket on the recovery tank cover are sealing and not damaged.
- Make sure that the recovery tank drain hose cap 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 SYSTEM FILTER, SCREEN AND FLOAT CAGE

See Figure 4.2. To inspect and clean both the vacuum motor (foam) filter and inlet screen just lift open the tethered Vacuum Filter Cover **(A)**. Remove the filter and screen by pulling it out from the recessed housing opening. Clean the filter and screen by vacuum or washing them out in warm water. Note: The filter and screen must be completely dry before reinstalling.

To inspect the vacuum shut-off Float Cage **(B)** just lift open the right rear recovery tank cover (cage location, left rear corner of opening). The cage openings (slots) must be kept free of any debris that can restrict maximum airflow. To keep it clean, wipe it off with a rag regularly or flush with water. The cage is a two piece design and can be snapped apart to separate.

VACUUM MOTOR REMOVAL

WARNING!

Disconnect the battery pack by pushing in the emergency disconnect lever **(11)** before making service repairs.

- 1 See Figure 4.2. Drain the recovery tank using the attached drain hose. Then release the tank latch and tilt the tank to the rear.
- 2 Remove the (5) Screws **(C)** from the vacuum motor Cover **(D)** and then lift the cover straight up guiding the float cage up through the opening in the recovery tank completing its removal.
- 3 Disconnect wiring harness connector from Vacuum Motor **(E)** and lift the motor out from its mounting cavity.
- 4 Inspect all the vacuum system gaskets (items **F, G, H & I**), also clean the vacuum motor foam Filter **(J)**, Screen **(K)** and Exhaust Hose **(L)**.
- 5 Inspect the carbon motor brushes, if less than 3/8" (10 mm) in length replace.

RECOVERY TANK REMOVAL

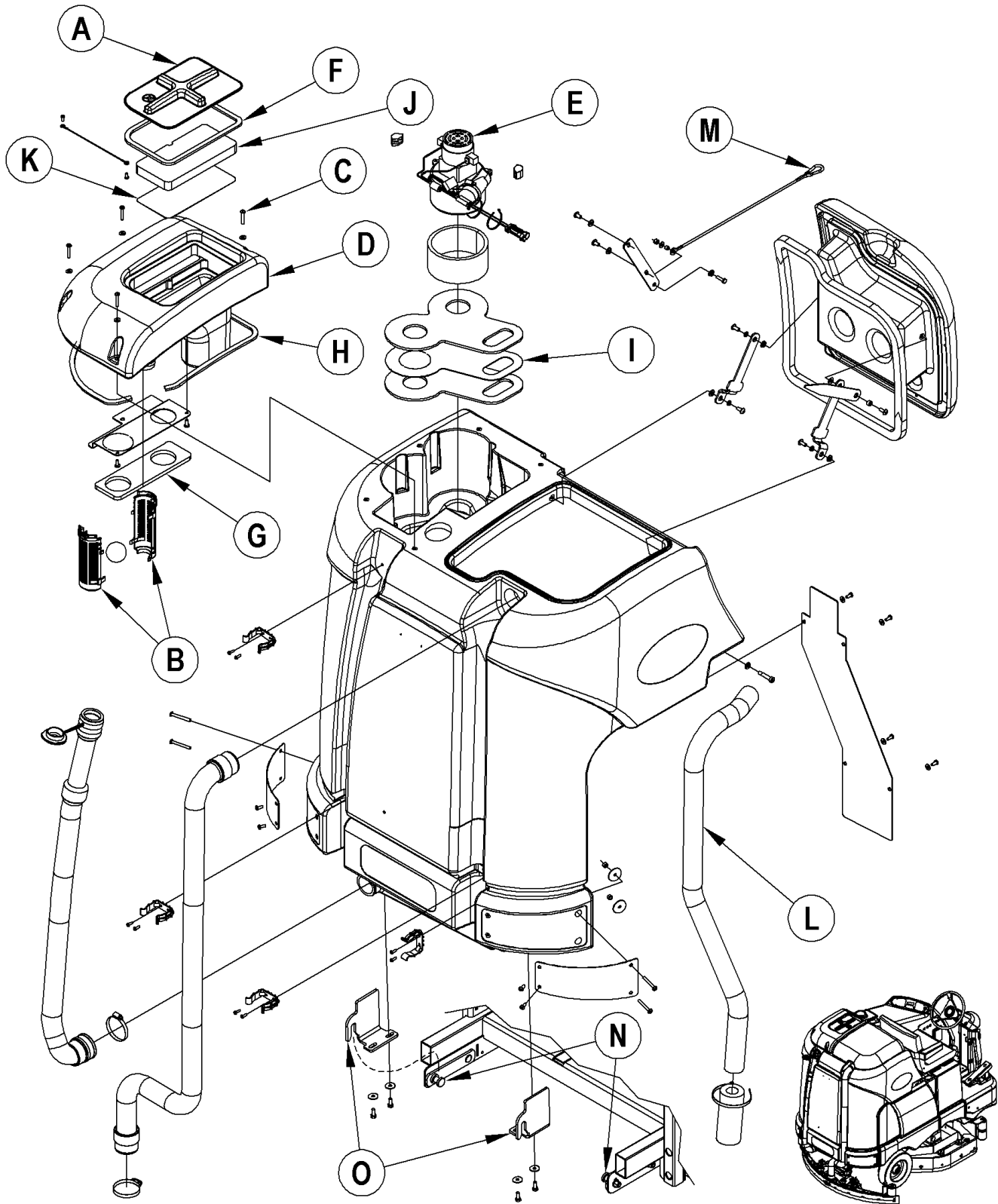
WARNING!

Disconnect the battery pack by pushing in the emergency disconnect lever **(11)** before making service repairs.

- 1 See Figure 4.2. Drain the recovery tank using the attached drain hose.
- 2 Disconnect the squeegee hose at the squeegee tool and also at the top of the tank (just twist the hose to remove). Note: The optional removal of the squeegee tool at the mount will allow more room to maneuver, in removing the tank.
- 3 Locate the vacuum motor wiring connector underneath the left rear bottom of the recovery tank and disconnect it.
- 4 Release the tank latch and tilt the tank to the rear then separate the Tether **(M)** (wire cable) from the back of the driver's seat. Note: Have control (a good grip of the tank) do not allow the tank to fall on its own to the floor. Continue to lower the tank to the floor level. The tank is attached to the chassis by two Pins **(N)** lift up on the tank ends to separate and pull the tank free from the machine. Note: Be careful not to crush or damage the drain hose when pulling the tank from the chassis.
- 5 To re-install the tank align each side of the Tank Bracket **(O)** with the chassis pins one at a time and grip the opening of the tank cover at the rear and quickly lift up to set (engage) the tank to its upright position. Follow in reverse the above steps to complete its installation.

4 - RECOVERY SYSTEM

FIGURE 4.2



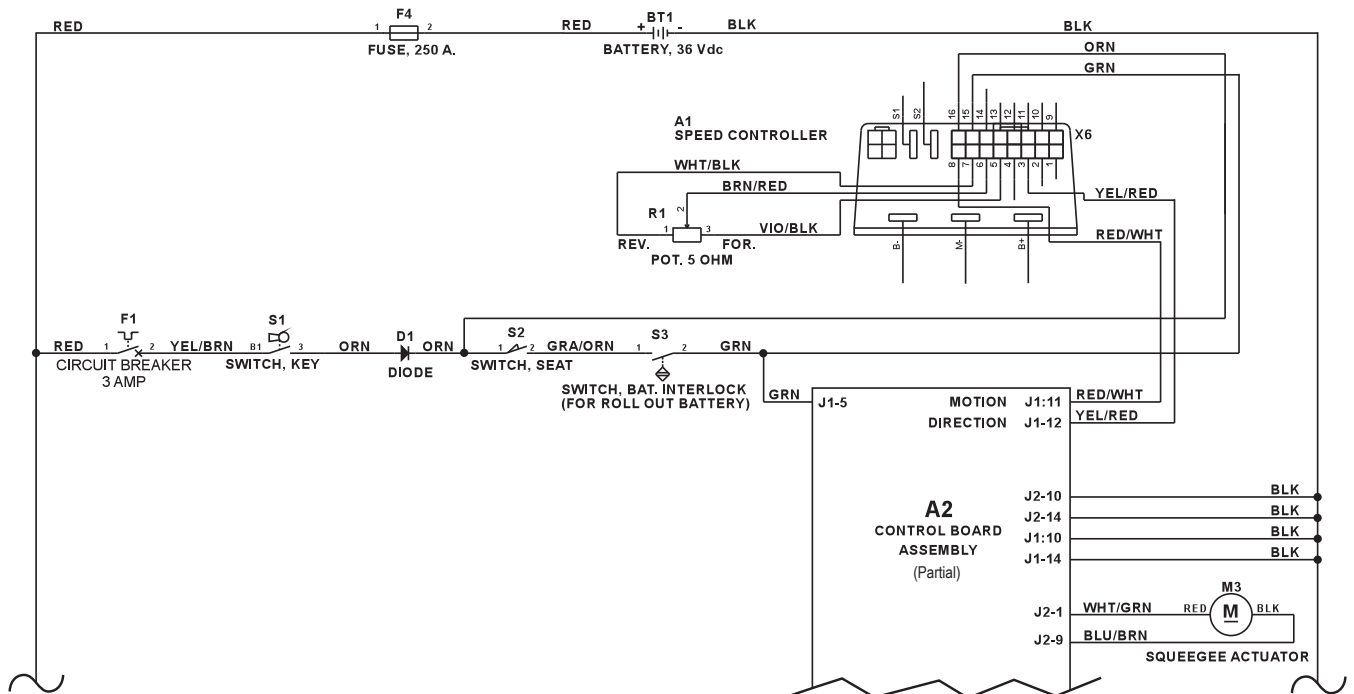
SQUEEGEE SYSTEM LIFT MOTOR OVERVIEW

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 A2 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 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 5.1. 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 A1 direction output. This battery (Pos. +) voltage signal from the reverse throttle wire delivers the required A2 board input to the J1 connector (pin #12 YEL/RED 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 J2-1 and J2-9). 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 A1 throttle reverse output and the A2 control board loses its input voltage signal. The A2 board connector output reverses the polarity and lowers the tool back onto the floor.

FIGURE 5.1



5 - SQUEEGEE SYSTEM

SQUEEGEE LIFT ACTUATOR REPLACEMENT

- 1 See Figure 5.2. Remove the Squeegee Tool (A) from the Squeegee Mount (B).
- 2 Lower the squeegee mount to the floor by pressing the Vacuum Switch (G) on the control panel. Don't turn the key switch off, until pushing apart the battery Emergency Disconnect (11). This procedure is done to prevent the squeegee mount from automatically raising when the key is turned off.
- 3 Unplug the squeegee lift motor wiring connector from the machine harness.
- 4 From underneath the machine remove the (2) Cotter Pins (C) and then slide out (push) both Mount Pins (D) from their mounting holes 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).

- 5 After setting the correct actuator lift nut dimensions follow steps 1-4 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 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 5.2. Raise the squeegee tool off the floor, then unsnap the Center Latch (E) on the squeegee tool.
- 2 Swing out Tension Straps (F) at both ends and disengage the straps' slot from the front tool tension strap then remove.
- 3 Slip the Rear Blade (G) off the alignment pins.
- 4 The squeegee blade has 4 working edges. Turn the blade so a clean, undamaged edge points toward the front of the machine. Replace the blade if all 4 edges are nicked, torn or worn to a large radius.
- 5 Install the blade, following the steps in reverse order and adjust the squeegee.

To Reverse or Replace the Front Squeegee Blade...

- 1 See Figure 5.2. Raise the squeegee tool off the floor, then loosen the (2) Thumb Nuts (H) on top of the squeegee and remove the squeegee tool from the mount.
- 2 Remove both rear tension straps first then remove all the wing nuts that hold the Front Blade (J) in place (shown in Figure 5.2), 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 5.2 inset.
- 2 Turn the Adjustment Knob (K) to tilt the tool forward or backwards, until the rear squeegee wiping blade touches the floor evenly across its entire width.

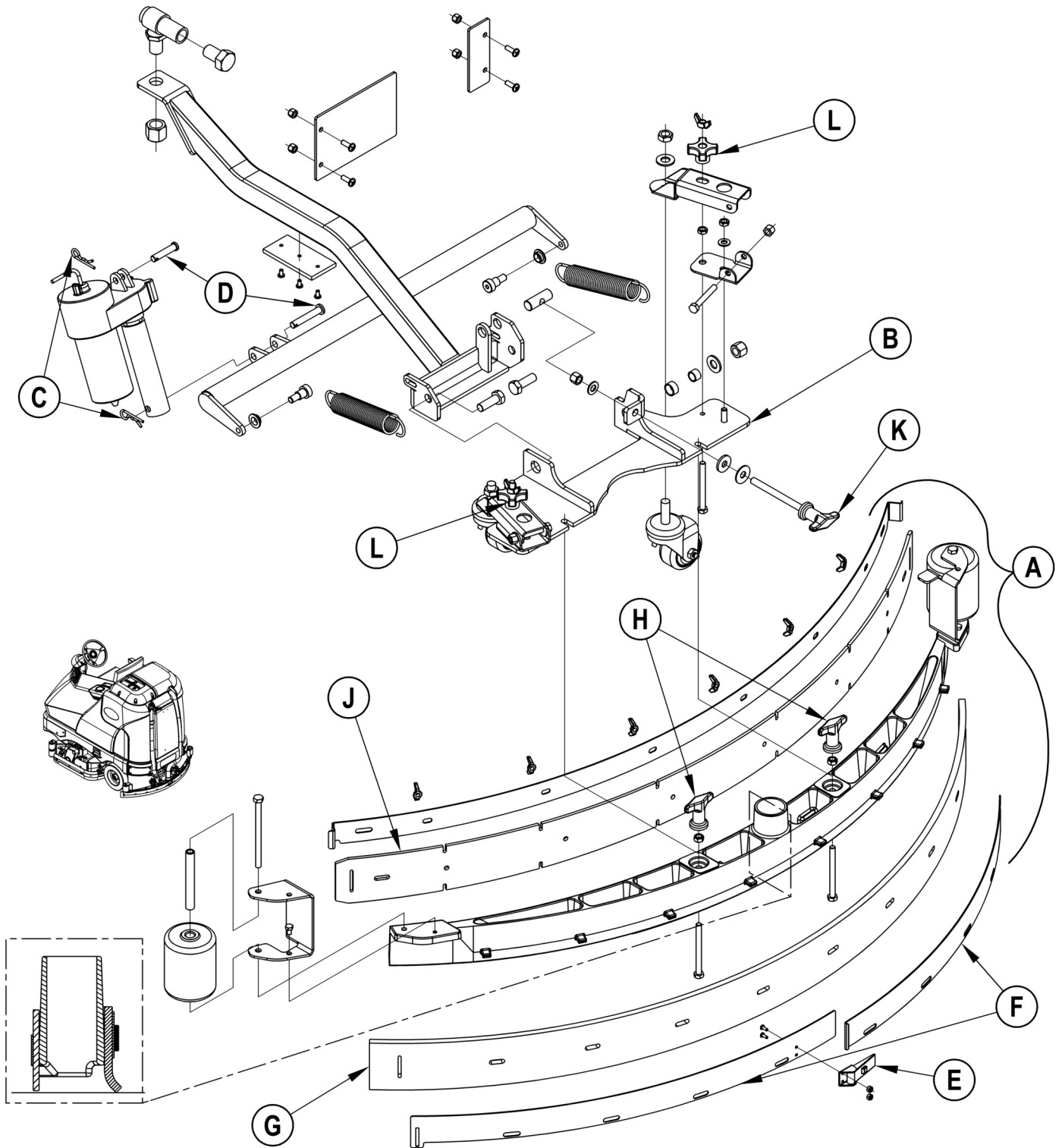
Adjusting the Squeegee Blade Height

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 5.2 inset.
- 2 Rotate the Adjustment Knobs (L) 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.

SQUEEGEE SYSTEM - 5

FIGURE 5.2



6 - WHEEL DRIVE SYSTEM

GENERAL FUNCTIONAL OVERVIEW

A 1.75 HP separately excited (field & armature) 36V DC motor/gear/wheel unit (M1) 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 electrical potentiometer R1 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 6.1. 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 K7 to be energized. Depressing the foot pedal in either Fwd or Rev will move the R1 potentiometer 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 R1 throttle movement.

MOTOR OPERATION

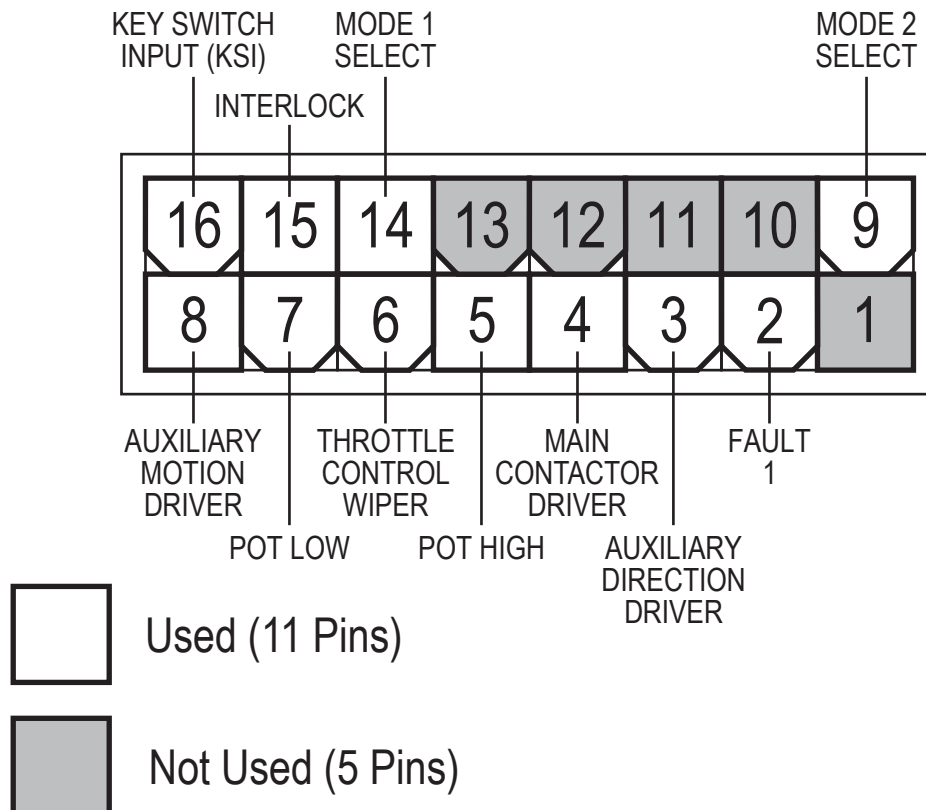
The motor has (4) terminal connections, (2) armature A1, A2 and (2) field F1, F2. The motor armature circuit receives from the controller a chopped on time off time *PWM voltage and current output that varies the motor speed. The field circuit sees the current direction polarity change that effects the 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 at 70% 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 of this manual instructions for using the programmer for speed setting changes and troubleshooting diagnostics.

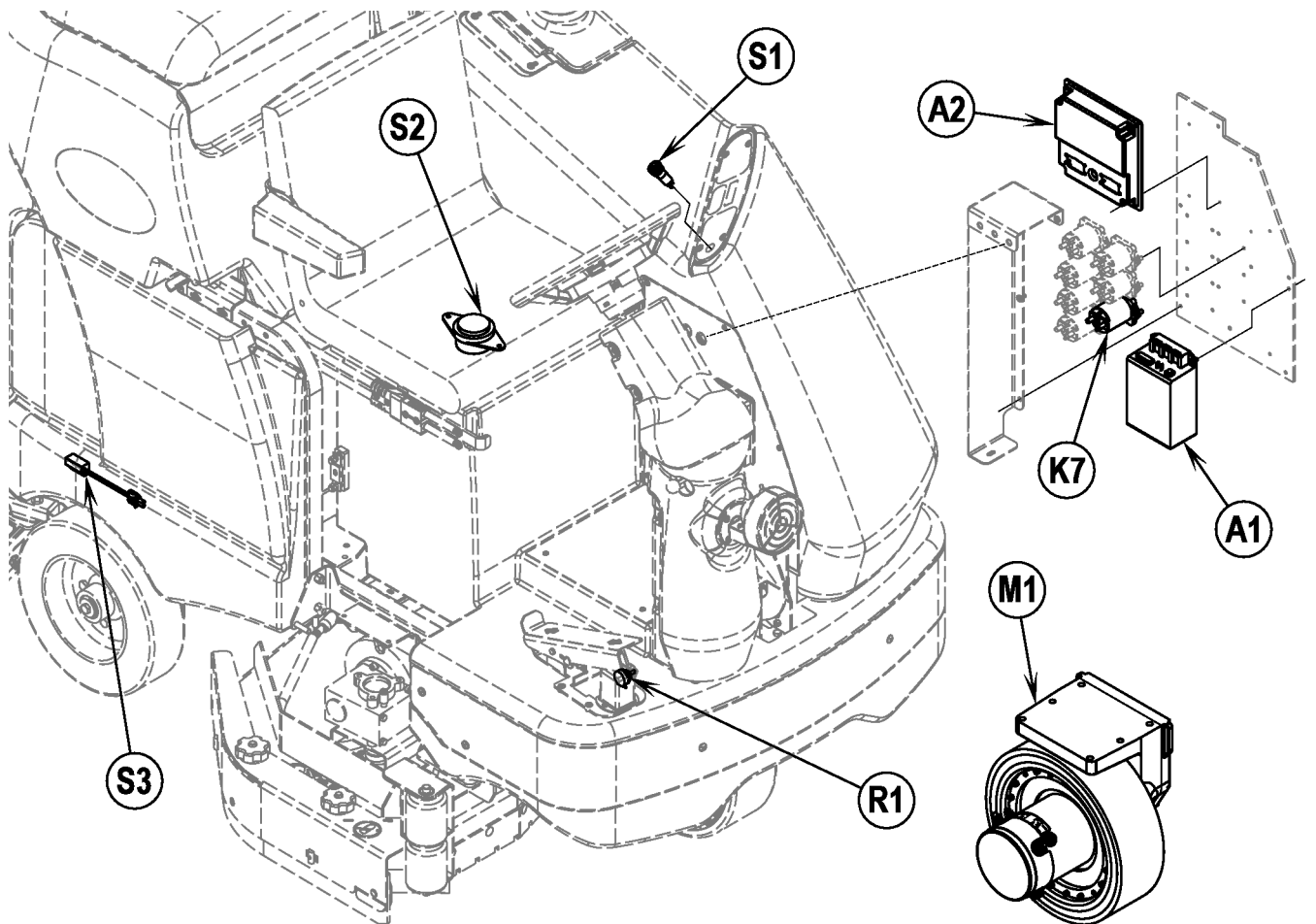
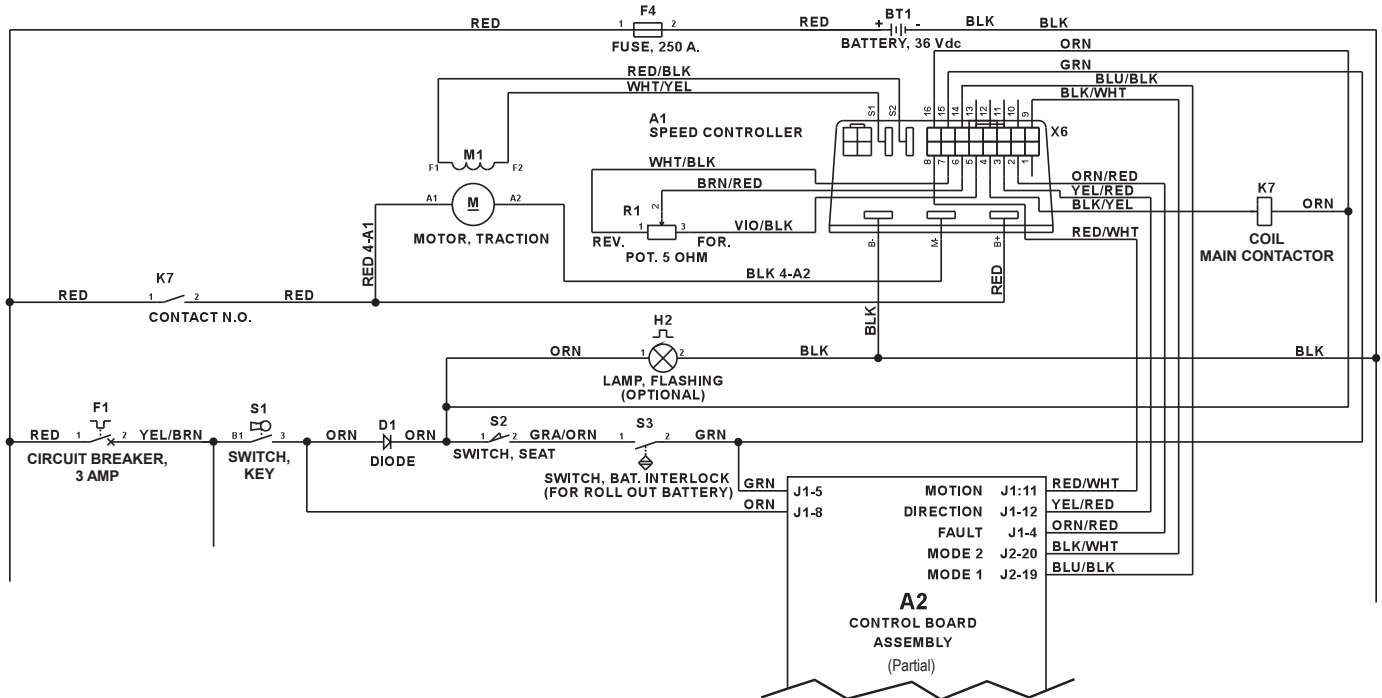
*PWM; pulse width modulation, also called "chopping" is a technique that switches battery voltage to the motor ON and OFF very quickly, thereby controlling the speed of the motor.

Detail of A1 16-pin connector, as shown in Figure 6.1



WHEEL DRIVE SYSTEM - 6

FIGURE 6.1



6 - WHEEL DRIVE SYSTEM

Low Current controller A1 Pin Key Detail

Pin #	Wire Color	Controller Pin Description & Function
1	-	Open not used
2	ORN/RED	Fault 1: Controller fault output to operator control panel chemical LED status display.
3	YEL/RED	Rev direction/Back-up alarm. Auxiliary Driver output: Battery () commands, turns off solution, raises squeegee and sounds back-up alarm.
4	BLK/YEL	Main Contactor Driver: Battery (-) output to main contactor K7.
5	VIO/BLK	Throttle pot R1 Pot. High (+)
6	BRN/RED	Throttle pot R1 wiper input
7	WHT/BLK	Throttle pot R1 Pot. Low (-)
8	RED/WHT	Motion Auxiliary Driver: Battery (-) output signal to main controller (A2) to turn on (activate) all auto scrub functions.
9	BLK/WHT	Mode Select 2 input: Battery (+) (reference Speed Control "TABLE 5") closed
10	-	Open not used
11	-	Open not used
12	-	Open not used
13	-	Open not used
14	BLU/BLK	Mode Select 1 input: Battery (+) (reference Speed Control "TABLE 5") closed
15	GRN	Interlock: Seat switch (S2) input battery (+) to activate the main contactor driver pin 4 output to the K7 contactor. Note: With battery roll-out (option) the S3 interlock is wired in series with S2 & must also be closed.
16	ORN	KSI (key switch input): Battery (+) output powers up controller logic circuits.

Speed Control (TABLE 5)		
PIN 9 Select 2 (A2 input)	PIN 14 Select 1 (A2 input)	EFFECT
LOW - 0V	LOW - 0V	Transport Mode (Mode #1)
HIGH - 36V	LOW - 0V	Scrub Mode (Mode #2)
LOW - 0V	HIGH - 36V	Traction Mode (Mode #3)
HIGH	HIGH	N/A

WHEEL DRIVE TROUBLESHOOTING GUIDE

Problem	Possible Cause
<ul style="list-style-type: none"> Wheel drive motor will not run in forward and reverse. 	<ul style="list-style-type: none"> Batteries need charging (low battery voltage, recharge batteries) Control Circuit Circuit Breaker (F1) tripped (reset circuit breaker) Parking Brake (6) set (release parking brake) Emergency Stop Lever (12) tripped (reconnect) Safety Switch (S2) in seat not closed (check seat switch) Defective Battery Roll-out Interlock Switch (S3) (adjust/replace switch) Defective Wheel Drive Motor (replace motor) * Defective Potentiometer Throttle (R1) (replace pot throttle) * Defective Main Contactor (K7) (replace main contactor) *
<ul style="list-style-type: none"> Wheel drive in one direction only, loss of either forward or reverse. 	<ul style="list-style-type: none"> Controller can't change electrical polarity to wheel motor at terminals S1 & S2 (field). Replace the (A1) speed control.
<ul style="list-style-type: none"> Hourmeter/status display shows an error 03 fault code. 	<ul style="list-style-type: none"> Speed controller has sensed an operation error code fault. (see the Status LED Fault Codes (TABLE 1) in the Electrical System)

* = See Curtis Speed Control Troubleshooting Section.

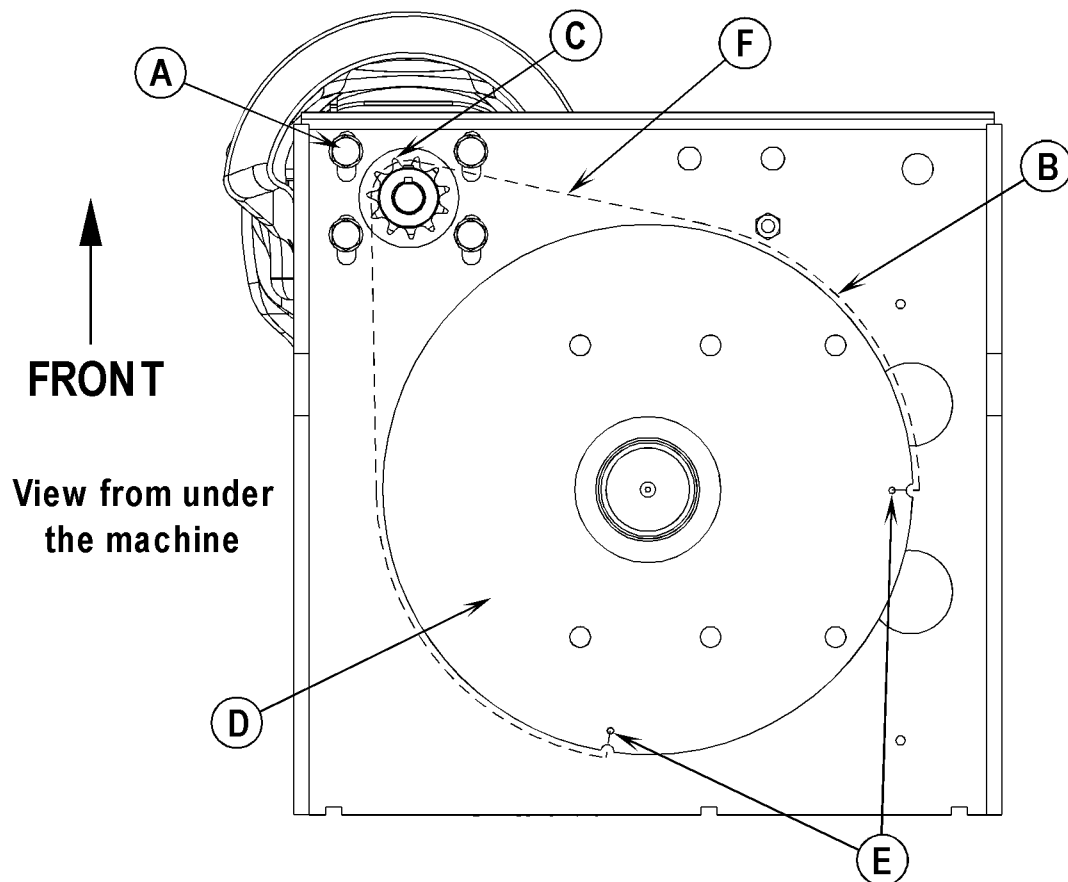
STEERING CHAIN REMOVAL AND TENSIONING

- 1 Turn the master key switch off and separate the battery pack Emergency Disconnect (11).
- 2 See Figure 6.2. From underneath the front of the machine loosen the (4) (A) Screws and push the lower steering column to the rear of the machine. This is done to separate the Chain (B) from the Steer Sprocket (C).
- 3 Remove both Master Links (E) that secure the chain to the Steer Plate (D) then remove the chain from the chassis.
- 4 Reassemble parts in reverse order and adjust chain tension so that there is about $3/16'' - 1/4''$ (4.7 – 6.4mm) total deflection with moderate pressure applied at the Mid-point (F) (as shown). **Service Tip Note:** Use a pry bar or shims between the chassis and steer column to help secure the tension adjustment when tightening the (4) steering column mounting screws.

Maintenance

- 1 Inspect the chain for looseness and binding, re-tension the chain to $3/16'' - 1/4''$ (4.7 – 6.4mm) deflection by following the above adjustment instructions.
- 2 Keep all of the steer chain links oiled to prevent excessive wear and binding.

FIGURE 6.2



6 - WHEEL DRIVE SYSTEM

FRONT DRIVE TIRE REMOVAL

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

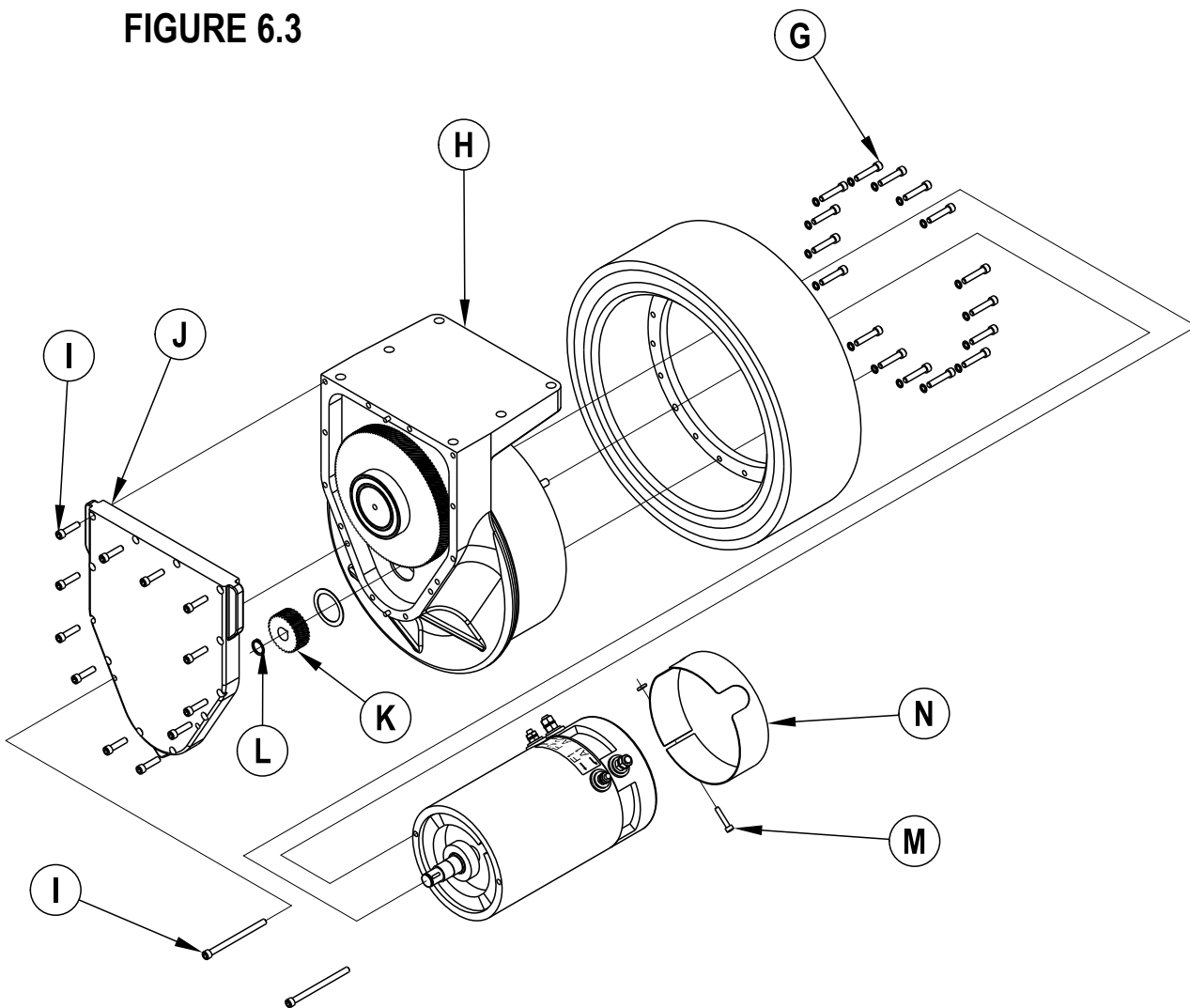
Turn the key switch (A) to the OFF position and disconnect the battery pack by pushing in the emergency disconnect red lever (11). Next set machine parking brake (6) and block both rear wheels so machine can't roll.

⚠ WARNING!

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

- 1 See Figure 6.4. Remove the (4) motor wires as shown.
- 2 See Figure 6.3. Remove the (16) (G) socket headed cap screws (5/16 x 24) from the rim (use a 1/4" Hex drive socket).
- 3 Safely jack up or lift the front of the machine 1-2 inches (25-50 mm) and block both front machine corners.
- 4 Locate the 2 tapped holes laid out 180 degrees apart found on the tire rim. Thread two 1/4 x 20 hex head screws into the tapped holes, then turn the screws equal amounts to push apart (separate) the tire from the gear housing (H).
- 5 To re-assemble clean the tire rim and drive drum and apply a small amount of Anti Seize to the back side of the rim and torque all screws to 24-26ft/lbs, (32-35 Nm).

FIGURE 6.3



TORQUE SPECIFICATIONS			
Screw	Size	Qty	Torque value
G	5/16-24	16	24-26 ft/lbs. (32-35 Nm)
I	1/4-28	14	10 ft/lbs. (13 Nm)

ELECTRIC DRIVE MOTOR REMOVAL

- 1 Follow steps 1-7 of the *Steering Spindle and Wheel Drive Assembly Removal* section.
- 2 See Figure 6.3. Remove the (12) (I) socket headed cap screws (2 long & 10 short) that fasten the gear case cover (J) to the large gear housing (H) (use a 3/16" hex driver socket). Then separate (pry) the cover from the housing by tapping on the 3 casting ear corners located on the cover.
- 3 The (K) small motor gear must be removed next. Use an external snap ring pliers to remove the retainer ring (L) then pull the gear from the end of the motor shaft.
- 4 With the motor gear removed the complete motor assembly can now be separated from the gear housing.
- 5 Reassemble in reverse order and torque the (12) gear case cover screws (I) to 10 ft/lbs (13 Nm).

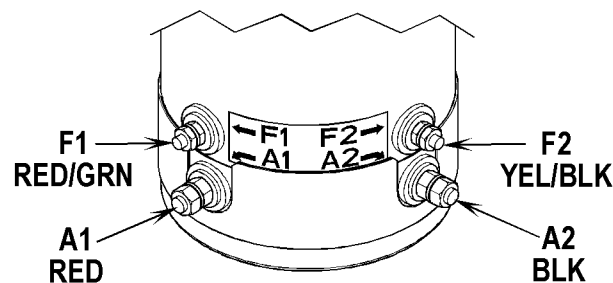
CARBON MOTOR BRUSH INSPECTION AND REPLACEMENT

WARNING!

Turn the key switch (A) to the OFF position and disconnect the battery pack by pushing in the emergency disconnect red lever (11). Next set machine parking brake (6) and block both rear wheels so machine can't roll.

- 1 To inspect the carbon brushes (Qty 4) for brush wear and length, remove the socket head cap Screw (M) shown in Figure 6.3 (using a 1/8" hex wrench) then separate the metal Inspection Band (N) from 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 springtail 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 inch (25.4 mm) in length if less than 3/8 inch (10 mm) length replace. Each brush has a wire end secured to the brush ring with a small hex screw (use a 5/16" socket to remove screw).

FIGURE 6.4



6 - WHEEL DRIVE SYSTEM

STEERING SPINDLE AND WHEEL DRIVE ASSEMBLY REMOVAL

WARNING!

Turn the key switch **(A)** to the OFF position and disconnect the battery pack by pushing in the emergency disconnect red lever **(11)**. Next set machine parking brake **(6)** and block both rear wheels so machine can't roll.

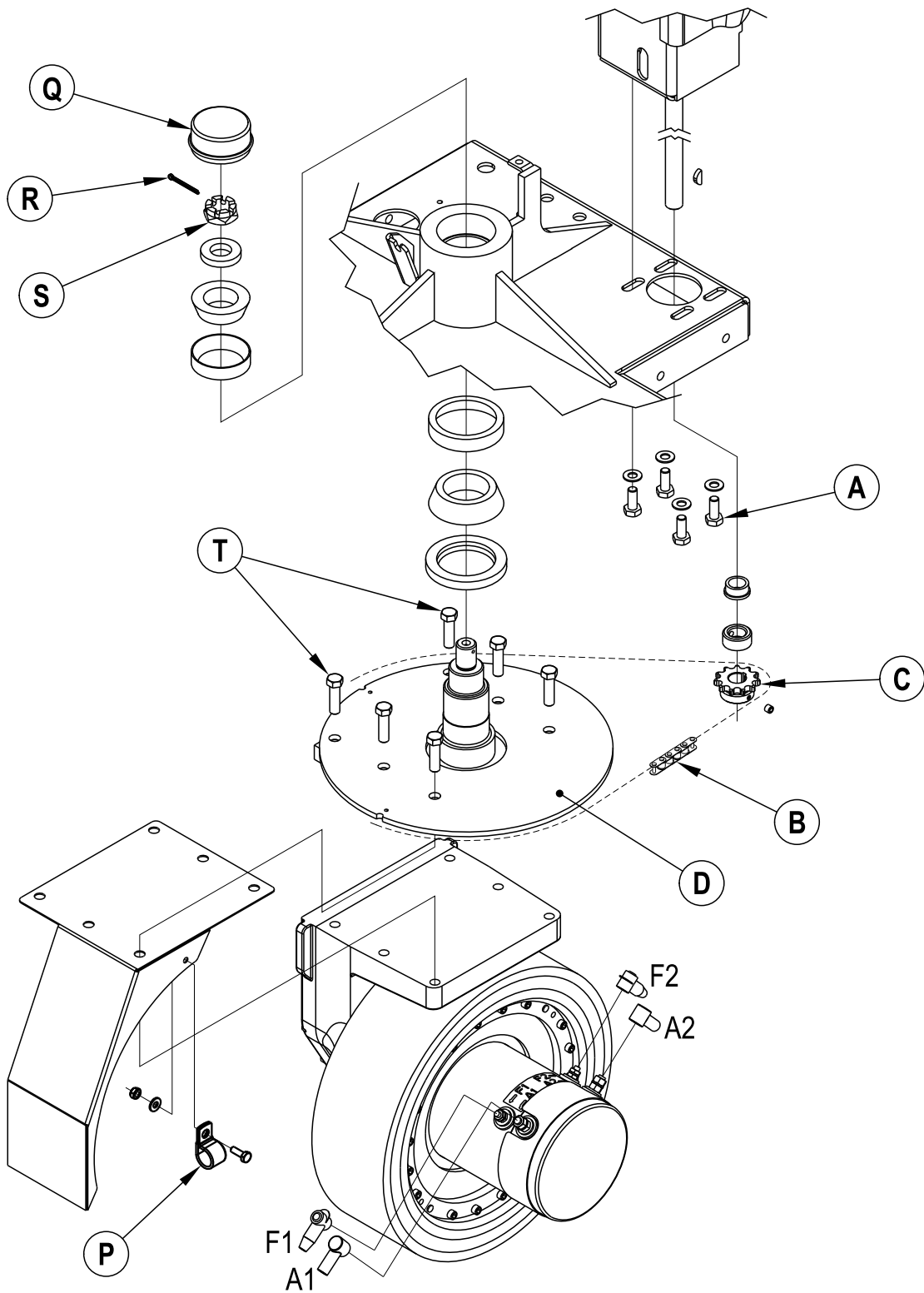
- 1 See Figure 6.4. Observe the (4) motor wires note their colors and their correct terminal connections to re-assemble. Next remove all the wires use a 7/16 wrench for the two small terminals and 1/2" wrench on the large terminals. Service Tip: When ever disassembling or re-assembling the wire terminal 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 See Figure 6.5. Remove the Hex Head screw and nut (use a 7/16" wrench) that retains the motor wiring harness P-clamp **(P)** and then pull wiring to rear of machine.
- 3 From underneath the front of the machine loosen the (4) **(A)** screws and push the lower steering column to the rear of the machine. This is done to separate the chain **(B)** from the steer sprocket **(C)**.
- 4 Remove in the driver's compartment the false floor plate secured with (3) screws to allow access to the top spindle mounting hardware.
- 5 Remove the bearing dust cap **(Q)**, cotter pin **(R)** and then the castle nut **(S)** from the spindle shaft.

WARNING!

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

- 6 Safely jack up or lift up the front of the machine 8 -10 inches (20-25 cm) from the center point, bottom edge of the solution tank. Carefully guide wheel motor assembly down and out of its frame opening. Tilt motor assembly to the side while raising machine then pull it out from underneath the machine. **Note:** Be careful not to damage the threads and bearing surfaces when dropping the spindle shaft down through the frame when removing it from the chassis.
- 7 Inspect bearings and seal and replace as needed. If further service work is needed, remove the (6) **(T)** screws to separate the spindle/steer plate weldment and splash fender from the gear box housing. Also see the drive wheel motor removal steps in this manual section.
- 8 Re-assemble in reverse order and tighten the castle nut **(S)** to eliminate any bearing play and then back off the nut enough to install a new cotter pin.

FIGURE 6.5



6 - WHEEL DRIVE SYSTEM

POTENTIOMETER REMOVAL AND TESTING

⚠ WARNING!

Disconnect the machine's battery pack connector (13) before servicing.

Potentiometer Removal

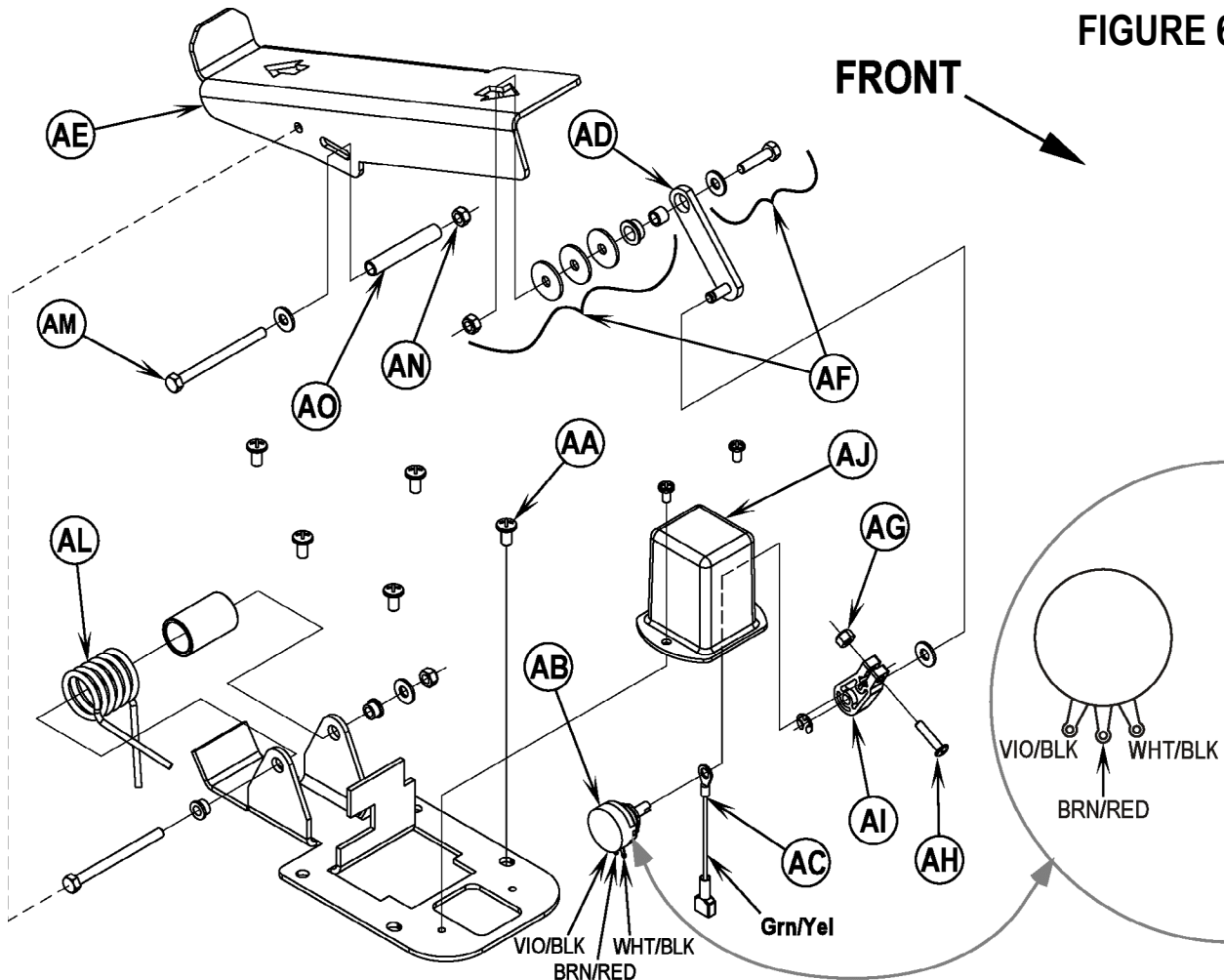
- 1 See Figure 6.6. Remove the (5) Screws (AA) securing the drive pedal mount assembly to the chassis then carefully lift the pedal assembly up and lay it on its side.
- 2 Observe the (3) wires connected to the Drive Pedal Potentiometer (pot) (AB) and also the single GRN/YEL throttle ground wire (AC), note the proper wire colors and their terminal connections for re-assembly. Then disconnect wiring and remove the pedal mount assembly from the machine.
- 3 Remove the Link Rod (AD) from the Pedal (AE). **Note:** Be careful not to lose the link rod mounting hardware items (AF).
- 4 Loosen the Nut (AG) and Screw (AH) at the drive pedal Throttle Lever (AI). Then pry the lever off from the end of the item (AB) potentiometer shaft. Next remove the pot from the Mount Housing (AJ).

Testing the Potentiometer

Note: The pot doesn't have to be removed from the housing to test.

- 1 Test the potentiometer using an Ohmmeter (the pot specification is 5K Ohms).
- 2 Connect the meter leads to each of the outside connections on the potentiometer. The meter should read approximately 5000 Ohms (plus or minus 500 Ohms).
- 3 Next, move one of the test leads to the middle connection and turn the stem in both directions. The range of the readings should be approximately 1300-2500 Ohms or 2500-3700 Ohms increasing and decreasing through its full range.
- 4 If you do not get these readings replace the potentiometer.

Technical Service Tip: A simple short cut method for testing and adjusting the pot resistance values is at the speed controller's 16 pin plug. Just disconnect plug and back probe pins 5, 6 & 7 (wire colors VIO/BLK, BRN/RED and WHT/BLK). The controller can be easily accessed by removing the electrical panel door located in the operator's compartment.



POTENTIOMETER INSTALLATION AND ADJUSTMENT

⚠ WARNING!

The adjustment of the potentiometer is to set the drive pedal for a neutral drive motor operation. If the pot is not adjusted properly, the machine will creep in either FWD or REV.

- 1 See Figure 6.6. Install the pot into the Mount Housing (AJ) and tighten the attachment nut.
- 2 Connect together loosely both the Link Rod (AD) to the Pedal (AE), and the Throttle Lever (AI) to the potentiometer input shaft. Then tighten only the Link Rod (AD) pedal mounting Hardware (AF). Note: Check the movement of the Foot Pedal (AE) it must move freely in both Fwd and Rev.
- 3 See Figure 6.6 inset. Attach test leads from a volt/ohm meter to the VIO/BLK and WHT/BLK wire connection points on the potentiometer to check it's total resistance (example 4800 Ohms).
- 4 Next connect the ohmmeter test leads to the VIO/BLK and BRN/RED potentiometer connection points. Then using a small screwdriver, turn the shaft end on the pot to half the total resistance previously measured. Example: 4800 Ohms divided by 2 = 2400 Ohms. Then without turning the shaft, tighten the Screw (AH) and Nut (AG) to secure the setting at the Throttle Lever (AI).
- 5 Follow steps 1-2 in reverse order (see Potentiometer Removal steps) to finish the installation. Then test-drive the machine for proper speed and FWD/REV directional control.
- 6 **Service Tip:** Also confirm the Hourmeter/Status Display (K) is free of the error code 03 (drive system fault). If error 03 is shown the throttle is not set properly for the potentiometer and or drive pedal neutral position. Check both again and readjust.

ALTERNATE METHOD FOR THROTTLE ADJUSTMENT

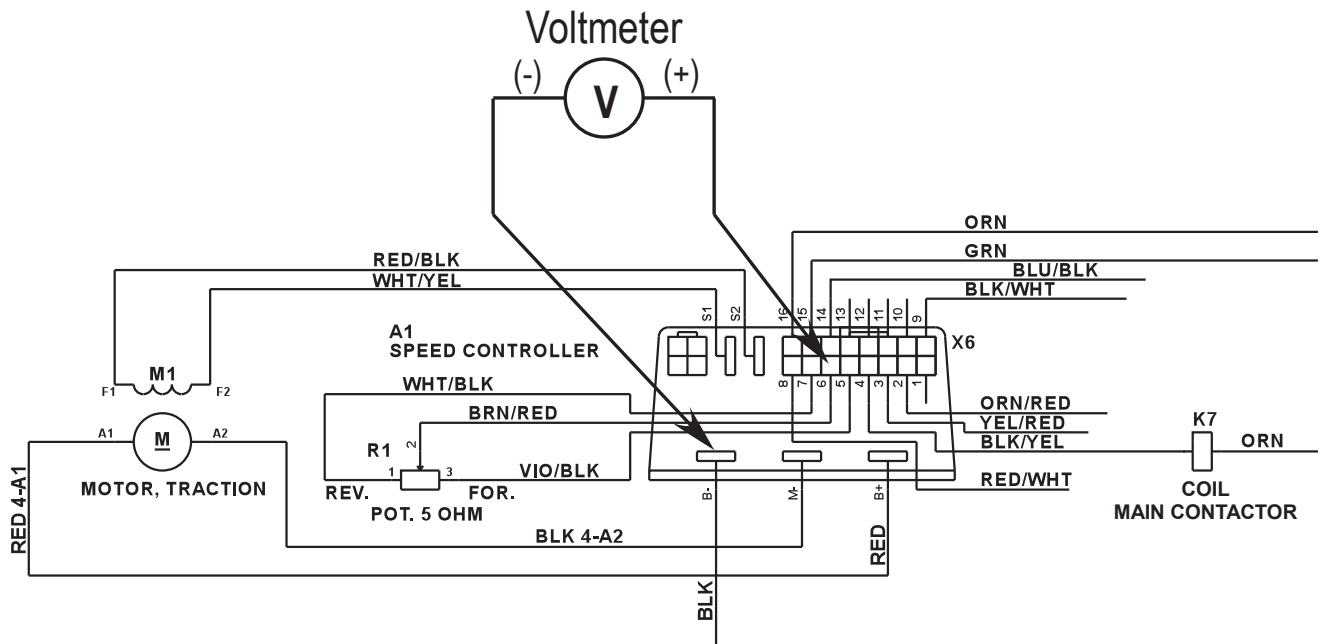
The throttle adjustment is easier and more accurately adjusted by measuring the throttle potentiometer wiper voltage with respect to B (-).

To set throttle neutral:

- 1 Connect a voltmeter to B (-) on the speed controller and the BRN/RED wire. A thin probe can be inserted into the connector at pin 6 on the speed controller, or an insulation piercing probe can be used on the BRN/RED wire.
- 2 Adjust the throttle potentiometer to 2.50 +/- .05 volts with the throttle pedal in neutral.

This will insure that the throttle is centered on neutral and there is 100% throttle when the pedal is fully depressed in the forward direction. A Curtis programmer can be used to check that there is 100% throttle in forward.

FIGURE 6.7



6 - WHEEL DRIVE SYSTEM

DRIVE PEDAL NEUTRAL ADJUSTMENT & PEDAL REPLACEMENT

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

WARNING!

Disconnect the machine's battery pack connector (13) before servicing.

- Note: See Figures 6.6 & 6.8. Before making any adjustments, inspect the Torsion Spring (AL) for defects and the correct positions of both spring ends (repair or replace).

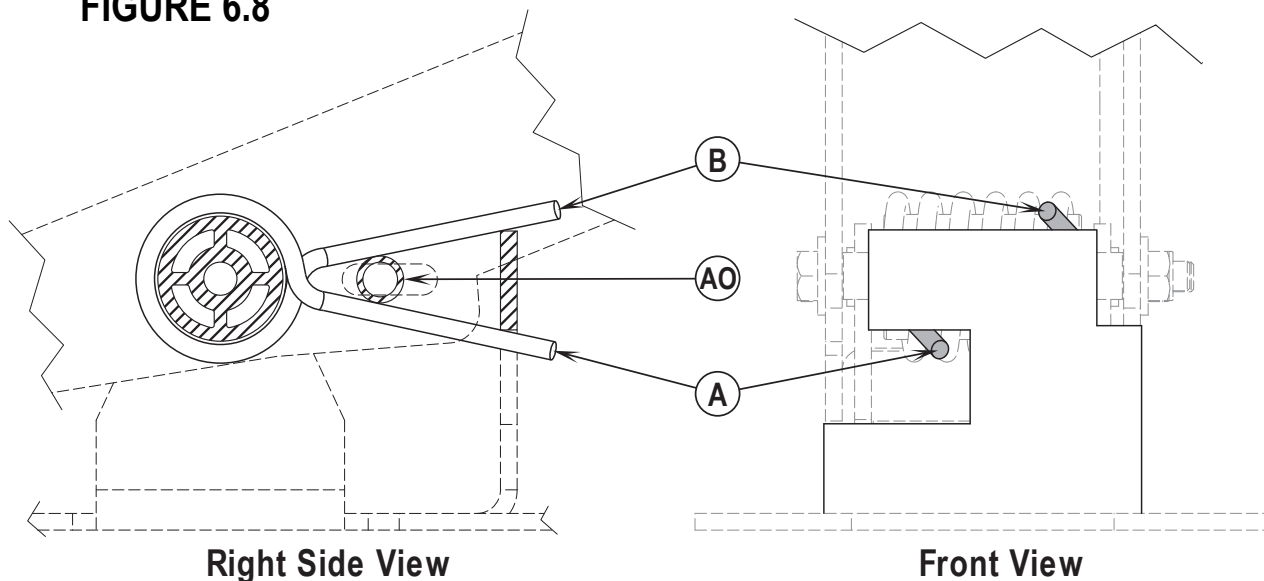
To Adjust Pedal Spring

- 1 Loosen the Screw (AM) & Nut (AN), the screw with bushing is positioned between both Fwd & Rev torsion spring ends. Its placement controls the needed pre-load pressure to eliminate excessive pedal free-play and a balanced spring rate to return the pedal to a centered (neutral) position.
- 2 Push the screw back into the pedal frame slot to increase spring tension and eliminate pedal free play. Then tighten the screw & nut being careful not to pull on the linkage connection to the pot shaft and disturb (move) its neutral setting.

To Replace Pedal or Spring

- 3 Position the torsion spring ends (A & B) as shown. This is with the Bushing (AO) and Screw (AM) not installed.
- 4 Place the bushing inside the pedal channel pilot it into position using a scratch awl or a pin punch.
- 5 Then pivot (press) the pedal and insert the screw from the opposite side pushing the guide tool out.
- 6 Use a screwdriver to tap and pry the bushing back in the pedal slot to increase spring tension
- 7 Work the bushing back & forth on both sides of the pedal to obtain equal spacing. Then tighten the screw and nut.
- 8 A correctly adjusted drive pedal will have minimal amount of free-play when selecting a drive direction.
- 9 Reconnect the batteries and test the machine to make sure it does not "creep" forward or reverse when the pedal returns to neutral.
- 10 **Service Tip:** Also confirm the Hourmeter/Status Display (K) is free of the error code 03 (drive system fault). If error 03 is shown the throttle is not set properly for the potentiometer and or drive pedal neutral position. Check both again and readjust.

FIGURE 6.8



REAR WHEEL & BRAKE CALIPER REMOVAL

⚠ WARNING!

Install wood blocking in front and behind the front drive wheel to prevent the machine from rolling.

Removal

- 1 Grip the brake lever Return Spring (A) and pull back to remove it from the retainer Bolt (B) mounted to the chassis.
- 2 **For the left side wheel only:** unclip the brake cable Clevis Pin (C) at the arm and remove it from its brake arm mounting hole.
- 3 **For the right side wheel only:** remove the Cotter Pin (D) from the Brake Linkage Rod (E) and separate it from the brake arm mounting hole.
- 4 Loosen the center hex Screw (F) that fastens the Rear Wheel (G) to the axle.
- 5 Position a suitable jack underneath the wheel axle and jack up the machine so that the wheel is off the floor approximately 1 inch.

⚠ WARNING!

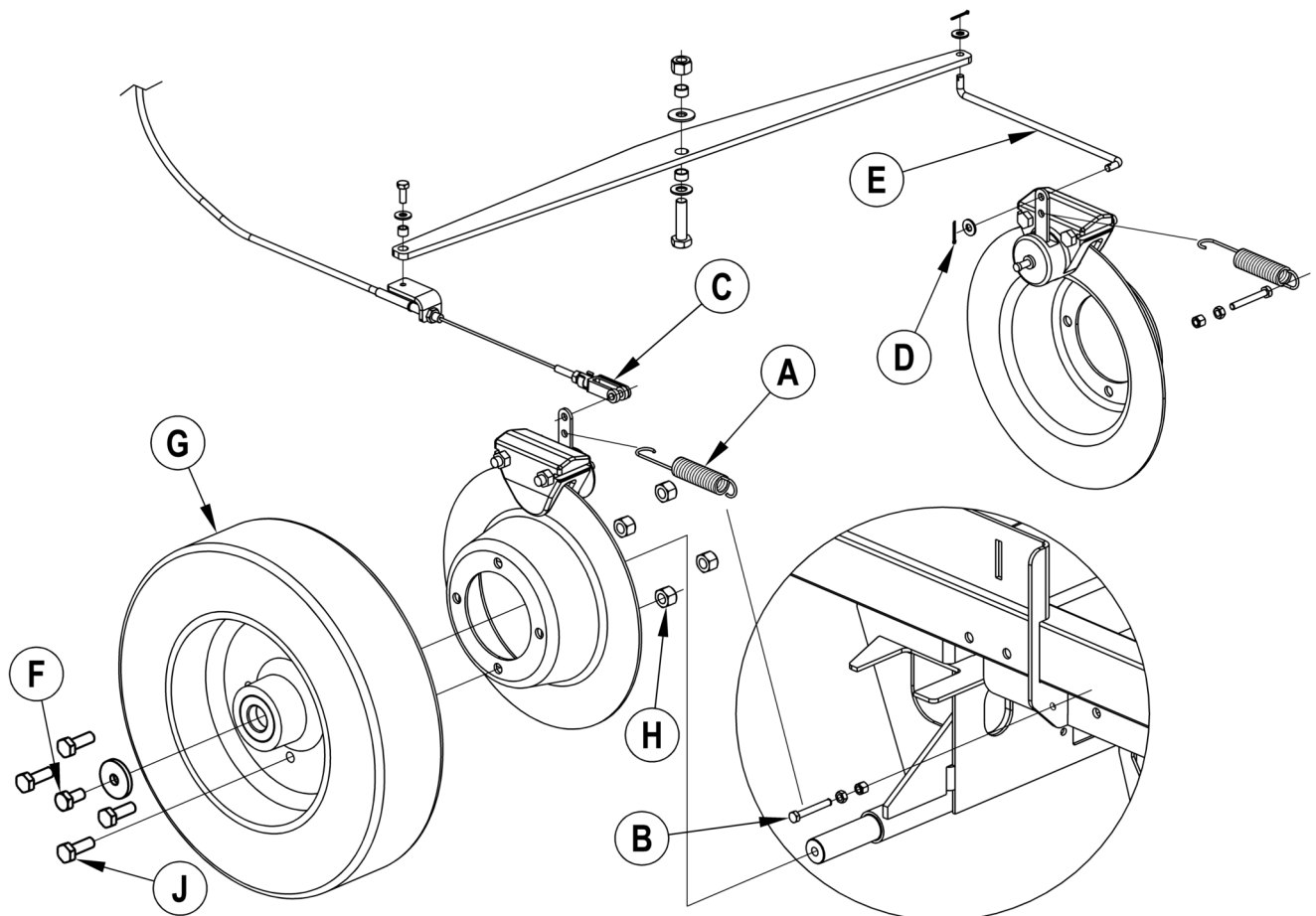
Place wood blocking under the rear axle as the machine is only being supported by the jack. This is to prevent any accidents or machine damage when the wheel is off.

- 6 Carefully pull the complete wheel brake assembly off the axle. If replacing the wheel remove the (4) Nuts (H) and Screws (J) that retains the brake rotor to the wheel hub.

Re-Install

- 7 If replacing wheel reattach the salvaged brake rotor to the new wheel hub then place the brake caliper onto the rotor and align caliper slots with the chassis and slide the assembly onto the axle. **Special Service Note:** Apply a small amount of Loctite 242 (blue) thread sealant to the wheel hub Screw (F) to prevent loosening of the screw. Also use an 11/16 inch wrench to install or remove the retainer wheel screw.

FIGURE 7.1



7 - REAR WHEEL SYSTEM

BRAKE CABLE REPLACEMENT

- 1 See Figure 7.3. To access the cable assembly at the brake pedal remove the floor plate. Next loosen the Lock Nut (**K**) on the cable end mounting Bolt (**L**) then remove the bolt and cable end.
- 2 Loosen the cable casing Anchor Nuts (**M**) and pull the cable free from its mount bracket on the chassis.
- 3 On the lower left side of the chassis at midpoint locate a Plastic Tie Strap (**N**) and cut it to free the cable at that point.
- 4 At the left brake caliper unclip the cable Clevis Pin (**C**) at the arm and separate.
- 5 Loosen the cable anchor Lock Nuts (**O**) at the equalizer yoke mounting bracket the cable assembly is now completely disconnected. Tape a new cable to the end of the old at the brake pedal and pull the old cable out fishing the new cable through the chassis.
- 6 Follow the above steps in reverse to reconnect the cable and follow the steps below to adjust the brake for proper operation.

BRAKE CABLE ADJUSTMENT

⚠ CAUTION!

After any adjustment made to the brake system always test ride the machine to confirm the proper operation of the brakes.

- 1 Have the parking brake lever released in the off position.
- 2 See Figure 7.3 for the front brake cable (**M**) Anchor Connection. Adjust cable with a 1/4" of threads exposed as shown and tighten hardware.
- 3 Install a new tie strap to chassis this is used to guide, allow a small amount of cable movement. There should be about a 1/2" space as shown.
- 4 The left rear brake clevis connection Pin (**C**) (adjustable) should have about 1/8"-3/16" of thread engagement as shown tighten hardware.
- 5 See illustration for the movable rear brake cable (**O**) Anchor Connection. Adjust cable with an 1/8" of threads exposed as shown.
- 6 Adjust the (**O**) Connection to obtain a snug brake pedal no free-play then tighten hardware.

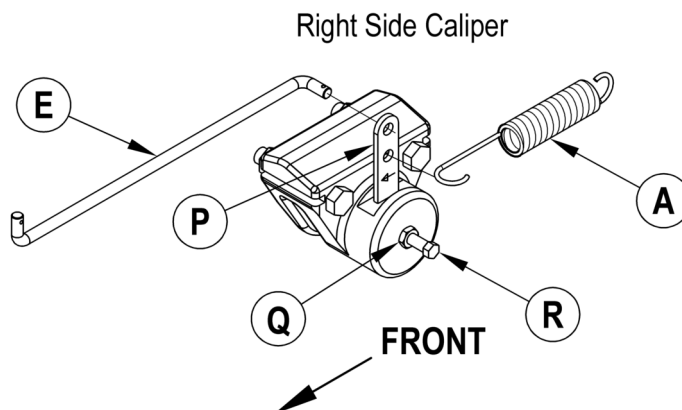
BRAKE CALIPER PAD WEAR ADJUSTMENT

⚠ CAUTION!

After any adjustment made to the brake system always test ride the machine to confirm the proper operation of the brakes.

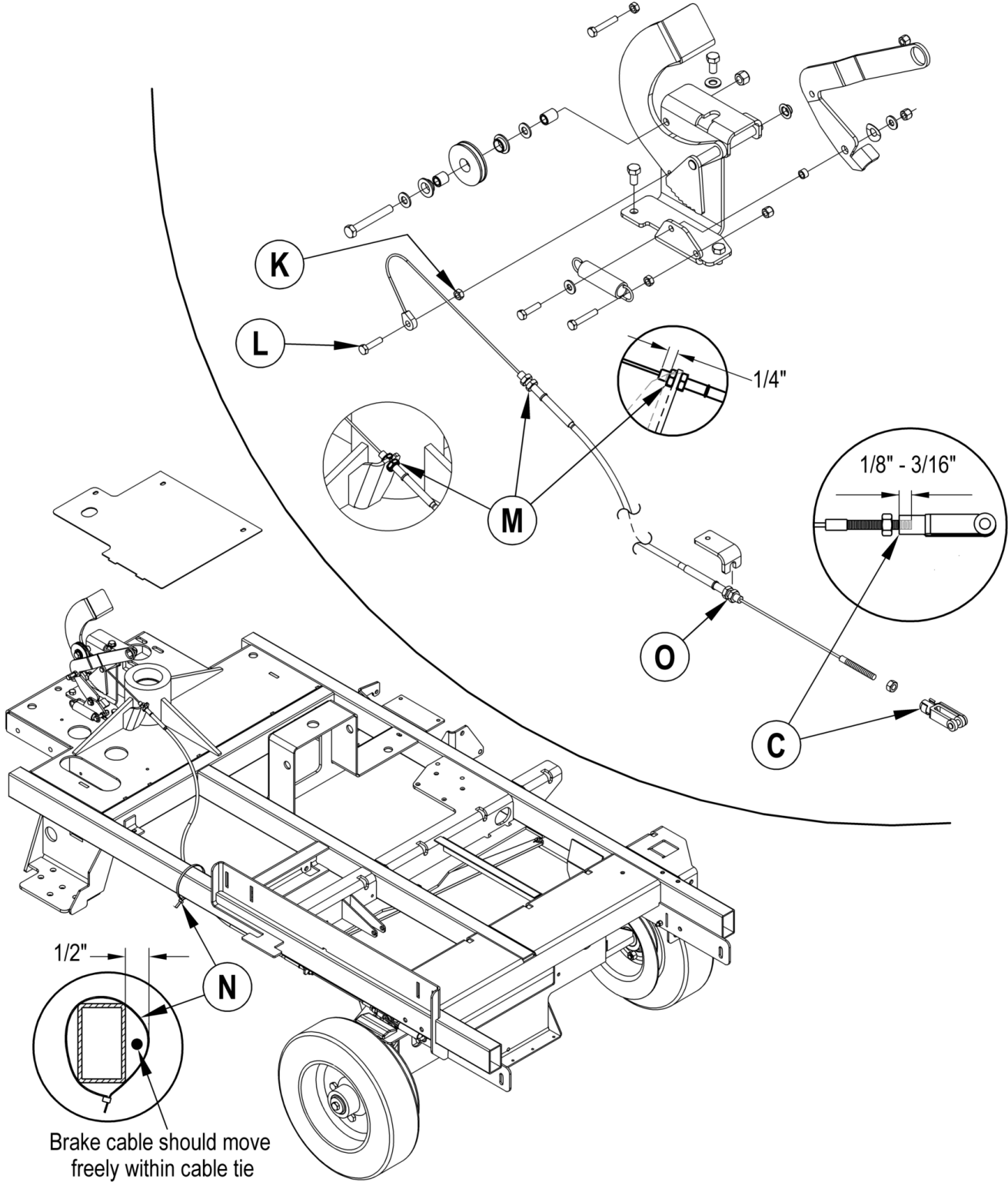
- 1 See Figure 7.2. The Brake Arm (**P**) must not bottom out against the front slot on the caliper.
- 2 To adjust loosen the large outer Lock Nut (**Q**) then turn the inner caliper Adjustment Screw (**R**) in to compensate for pad wear. **Note:** Do not over-adjust to the point that the pad drags excessively against the brake rotor.
- 3 After making the adjustment, the machine should push easily when the brake pedal is not engaged.

FIGURE 7.2



REAR WHEEL SYSTEM - 7

FIGURE 7.3



8 - ELECTRICAL SYSTEM

INSTALL THE BATTERIES



WARNING!

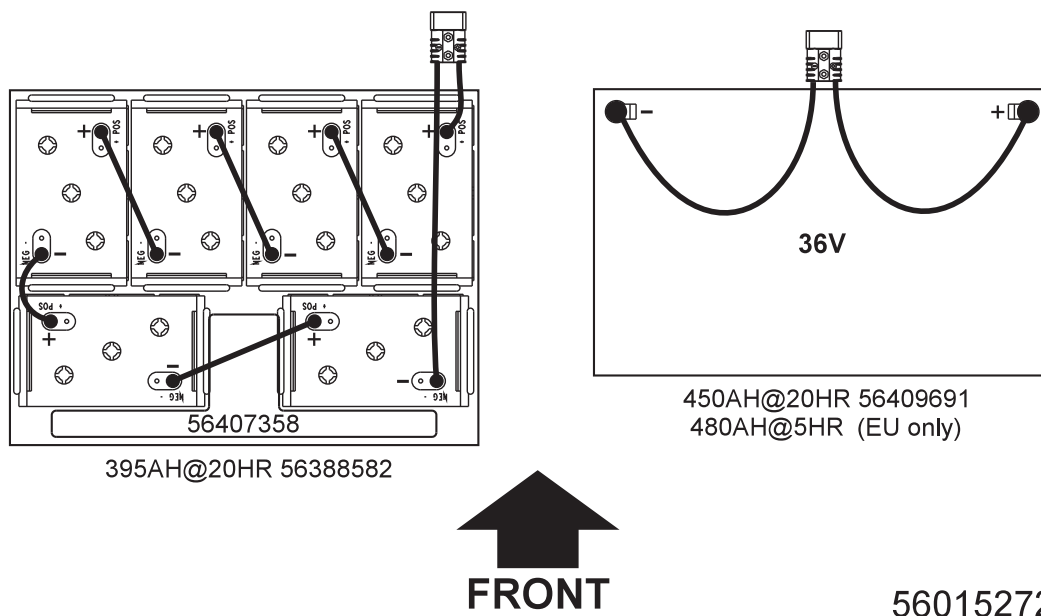
Use extreme caution when working with batteries. Sulfuric acid in batteries can cause severe injury if allowed to contact the skin or eyes. Explosive hydrogen gas is vented from the batteries through openings in the battery caps. This gas can be ignited by any electrical arc, spark or flame. Do not install any lead-acid battery in a sealed container or enclosure. Hydrogen gas from overcharging must be allowed to escape.

When Servicing Batteries...

- Remove all jewelry
- Do not smoke
- Wear safety glasses, rubber gloves and a rubber apron
- Work in a well-ventilated area
- Do not allow tools to touch more than one battery terminal at a time
- ALWAYS disconnect the negative (ground) cable first when replacing batteries to prevent sparks.
- ALWAYS connect the negative cable last when installing batteries.

FIGURE 8.1

450 AH @ 20 HR RATE
 **1300 LB / 590KG**
(6)  MAX



CAUTION!

Electrical components in this machine can be severely damaged if the batteries are not installed and connected properly. Nilfisk, a qualified electrician, or the battery manufacturer should install batteries.

- 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 (A) OFF and remove the key.
- 3 Remove the recovery tank from the machine. **NOTE:** Disconnect the tether and the vacuum motor wiring and lift the tank straight up and off the machine.
- 4 Your machine comes from the factory with enough battery cables to install six 6 volt batteries. Using at least (2) people and an appropriate lifting strap, carefully lift the batteries into the battery compartment and arrange them exactly as shown in **FIGURE 8.1**. Secure the batteries as close to the front of the machine as possible. If installing a mono-block battery use an overhead hoist.
- 5 Install the battery cables as shown. Position the cables so the battery caps can be easily removed for battery service.
- 6 Carefully tighten the nut in each battery terminal until the terminal will not turn. Do not over-tighten the terminals, or they will be very difficult to remove for future service.
- 7 Coat the terminals with spray-on battery terminal coating (available at most auto parts stores).
- 8 Put one of the black rubber boots over each of the terminals and connect the Battery Pack Connector (20).

SPECIFIC WET CELL BATTERY INFORMATION

Wet Cell Battery specifications

- Use a combination of multiple 2-volt cell units to construct a 36 Volt DC battery pack system.
- Nilfisk recommended battery pack capacity is a 395 AH @ 20 Hour Rate deep cycle battery system. Note: The battery pack must fit the battery compartment size listed in *Specifications*.

Wet Cell Battery Charger Specifications

- Use a 36 Volt DC output charger matching the DC battery pack voltage and the input AC line voltage supply being used.
- When selecting a battery charger always follow the recommendation of the battery supplier to match the proper charger DC output amperage to the amp/hour rating batteries being installed. This will prevent the battery pack from being over or under charged.
- The recommended 395 AH battery should be matched to a 36V, 36 Amp output charger on machines using (6) 6V batteries.
- The optional 450 AH battery should be matched to the Advance 36V, 38 Amp output charger.

DESCRIPTION OF THE LOW VOLTAGE CUTOUT FEATURE

All 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 1.72V per cell and alternate maintenance free battery (gel cell) setting is 1.81V per cell. The standard setting is factory selected and should be used unless the battery manufacturer specifies the higher cutout voltage.

Special Service Note: On all the 36V machines a minimum recharge voltage of 2.13 volts per cell must be reached to allow the scrub brush and solution system to (reset) function again. A 36V-battery pack must increase to a 38.6-volt minimum.

DESCRIPTION OF THE BATTERY CONDITION INDICATORS

The Battery Condition Indicator will give an indication of the state of charge of the batteries, 5 vertical bars indicates a fully charged battery after a complete charging cycle. 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.

Explanation of Battery Indicator Bars and Voltage Ranges

Battery Indicator	36 volt machines	
	Standard	Alternate
5 vertical indicator bars	36.1+	36.1+
4 vertical indicator bars	35.5-36.1	35.5-36.1
3 vertical indicator bars	34.4-35.5	34.4-35.5
2 vertical indicator bars	33.9-34.4	33.9-34.4
1 vertical indicator bars	32.2-33.9	33.3-33.9
0 vertical indicator bars	30.9-32.2	32.8-33.3
Low Voltage Cut Out	<30.9	<32.8



Condition Indicator
Located on Display Panel

8 - ELECTRICAL SYSTEM

CHARGING WET BATTERIES

Charge the batteries each time the machine is used or when the Battery Indicator (**K5**) is reading less than full.

To Charge the Batteries...

- 1 See **Figure 8.1.5**. Depress the Battery Disconnect (**11**).
- 2 Open Side Access Panel (**27**) and push the connector from the charger into the Battery Connector (**20**).
- 3 Follow the instructions on the battery charger.
- 4 After charging the batteries check the fluid level in all battery cells. Add distilled water, if necessary, to bring the fluid level up to the bottom of the filler tubes.

⚠ WARNING!

Do not fill the batteries before charging.

Charge batteries in a well-ventilated area.

Do not smoke while servicing the batteries.

When Servicing Batteries...

- Remove all jewelry
- Do not smoke
- Wear safety glasses, rubber gloves and a rubber apron
- Work in a well-ventilated area
- Do not allow tools to touch more than one battery terminal at a time
- ALWAYS disconnect the negative (ground) cable first when replacing batteries to prevent sparks.
- ALWAYS connect the negative cable last when installing batteries.

⚠ CAUTION!

To avoid damage to floor surfaces, wipe water and acid from the top of the batteries after charging.

CHECKING THE BATTERY WATER LEVEL

Check the water level of the batteries at least once a week.

After charging the batteries, remove the vent caps and check the water level in each battery cell. Use distilled or de-mineralized water in a battery filling dispenser (available at most auto parts stores) to fill each cell to the level indicator (or to 10 mm over the top of the separators). DO NOT over-fill the batteries!

⚠ CAUTION!

Acid can spill onto the floor if the batteries are overfilled.

Tighten the vent caps. Wash the tops of the batteries with a solution of baking soda and water (2 tablespoons of baking soda to 1 liter of water).

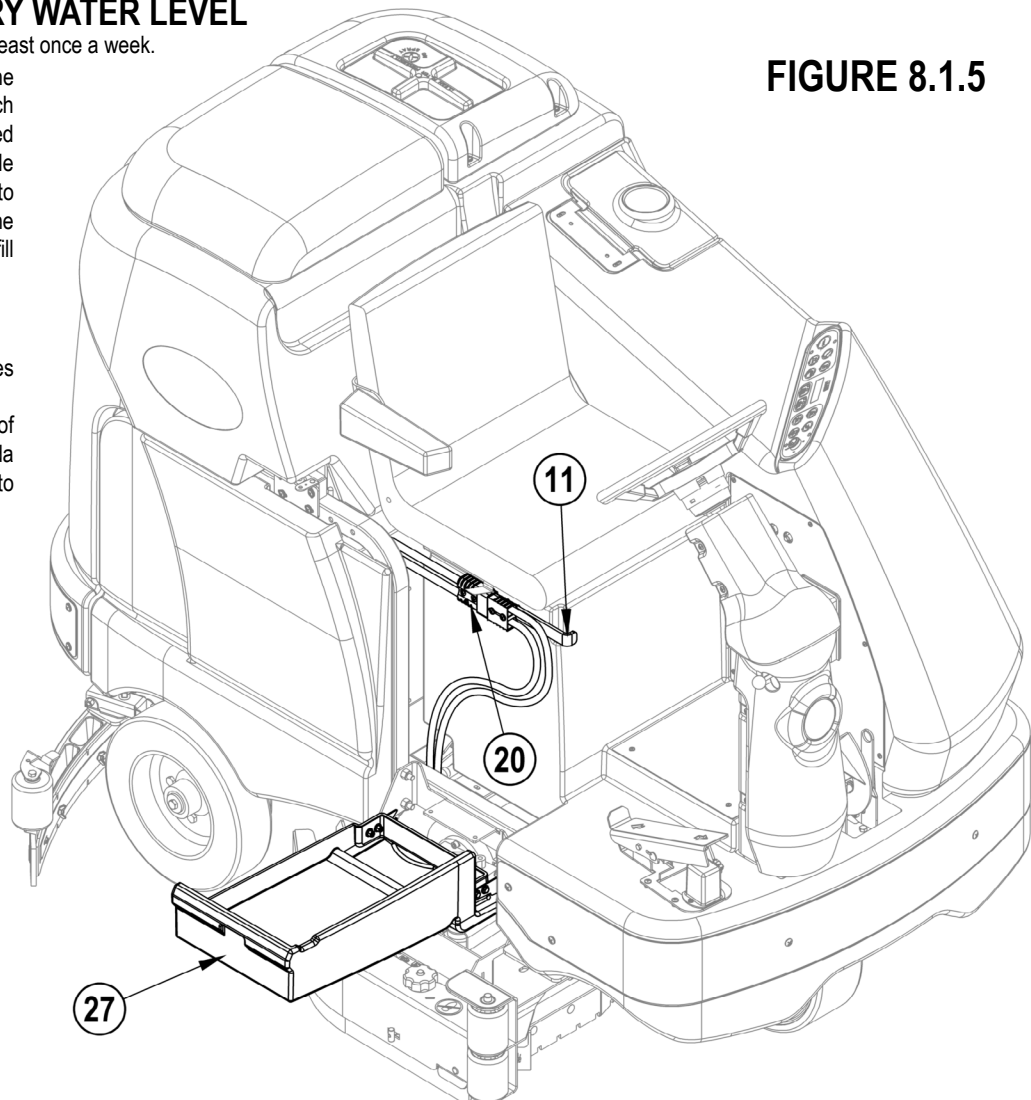


FIGURE 8.1.5

BATTERY MAINTENANCE WET CELL BATTERIES

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 are 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.

APPROXIMATE STATE OF CHARGE

<u>Charged</u>	<u>1.265 Initial Full Charge</u>
100%	1.265
75%	1.225
50%	1.190
25%	1.155
Discharged	1.120

8 - ELECTRICAL SYSTEM

ACTUATOR DRIVE NUT ADJUSTMENT

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

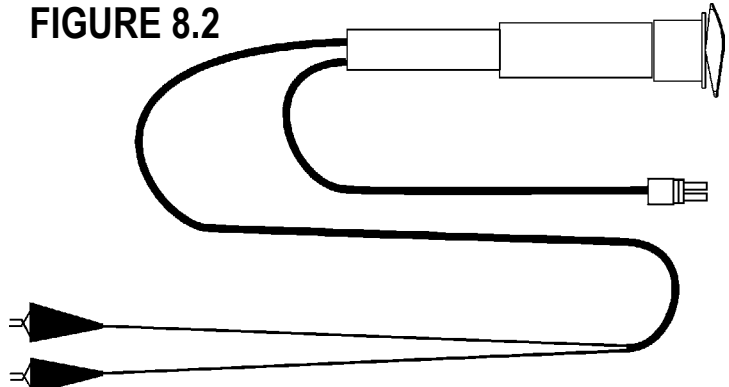
Part #	Actuator Motor	Spring Housing IN Position	Spring Housing OUT Position	Models
56413700	Scrub Brush Lift*	4-1/8" (10.48cm)	4" (10.16cm)	ALL
56413111	Squeegee Lift	1-1/4" (3.17cm)	3-1/8" (7.93cm)	ALL
56413129	Side Broom Lift	1-5/8" (4.12cm)	3-1/8" (7.93cm)	cylindrical w/ side brooms

*The IN dimension reference point is the edge of the gearbox case to the center pin weldment of the drive nut retainer bracket (Fig. 8.4). The OUT dimension's reference point is the edge of the gearbox to the edge of the plastic spring housing also shown in (Fig. 8.4). Note: All adjustment settings are measured out of the machine (not attached).

General Instructions for All Actuator Motors

- 1 See **Figure 8.2**. 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 8.2



Instructions for Squeegee & Side Broom Lift Actuator Drive Nut Adjustment

- 1 See **Figure 8.3**. 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 (it's IN limit).
- 2 Measure the position of the drive nut on the actuator shaft. Manually turn the steel tube to the IN position as shown in the chart above.
- 3 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).
- 4 Measure the position of the drive nut on the shaft and compare the measurement with the OUT position shown in the chart.
- 5 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.
- 6 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 1/2" (13 mm) socket to turn the adjuster. Each click of the adjuster will change the nut travel 1/16 inch (1.6 mm).
- 7 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 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 8.3

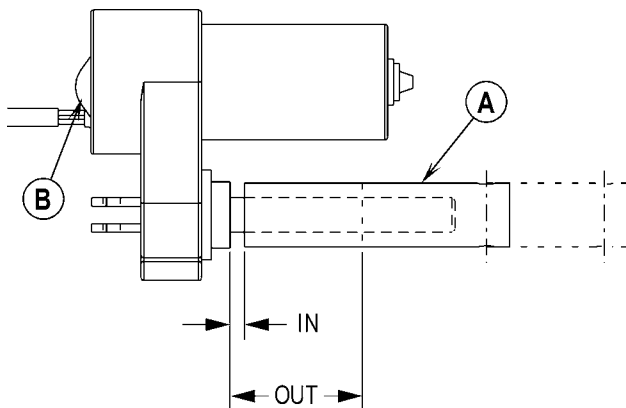


FIGURE 8.4

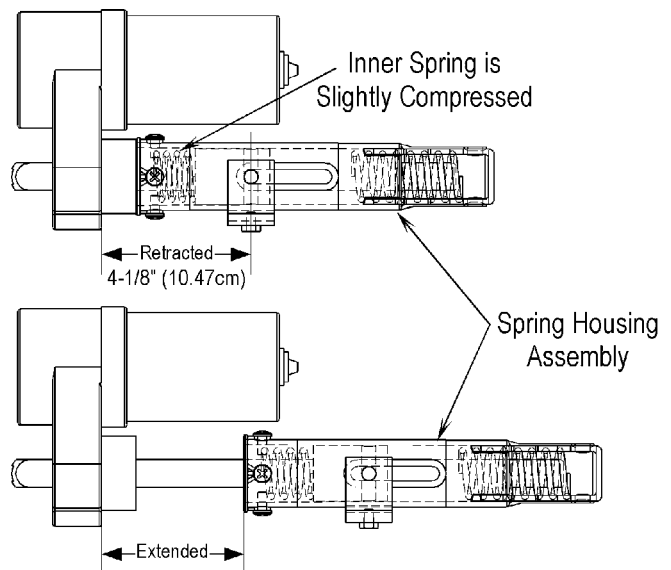


FIGURE 8.5

Instructions for Scrub Brush Lift Actuator Drive Nut Adjustment

- 1 See Figure 8.5 and 8.6. On a new scrub lift actuator motor remove (spin-off) the Drive Nut (C) and install the short compression Spring (D) onto the actuator (lead screw) shaft. Next reinstall the plastic Drive Nut (C) as shown (with the nut pin pocket away from the motor). Then finish assembly of remaining parts (long compression spring, Spring Housing (E) and mounting hardware).
- 2 Hold onto the spring housing assembly and press the rocker switch to run the drive motor and retract the spring housing towards the motor housing (its IN limit).
- 3 Measure the position of the spring housing assembly on the actuator shaft. Manually turn the spring housing assembly to the appropriate IN position shown in the chart on previous page. **Additional adjustment instructions:** The inner top spring is set at a pre-loaded compressed setting. It will be necessary to slightly over-ride the manual adjustment after running the drive nut in and turning it by hand. A small problem is observed in the retracted position as the pin mounting bracket interferes with the motor. After making the initial adjustment hold the nut and run it out enough so that the Pin Bracket (F) can be turned in to make up difference from the dimension targeted. Example: the first IN dimension measures 4-1/2" minus the 4-1/8 target dimension the difference is 3/8". Turn in nut manually 3/8" and then run the housing in under power until the inner limit stops the motor. Readjust until dimension shown is achieved.
- 4 Hold the spring housing assembly, then press the adapter cord rocker switch to run the drive motor to the OUT position (wait until the motor stops).
- 5 Measure the position of the spring housing assembly on the shaft and compare the measurement with the OUT position shown in the chart.
- 6 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.
- 7 To increase the travel of the spring housing assembly, turn the adjuster clockwise. To decrease the travel of the assembly, turn the adjuster counterclockwise. NOTE: Use a 1/2" (13mm) socket to turn the adjuster. Each click of the adjuster will change the spring housing assembly travel 1/16 inch (1.6mm).
- 8 After each adjustment, hold the spring housing assembly, run the actuator IN & OUT and check both dimensions. After checking that the spring housing limits are set correctly replace the adjuster cover. Service Tip Note: Use the above power cord adapter to help position the spring housing assembly (in or out) for ease in actuator motor installations.
- 9 After adjusting the actuator spring housing dimensions, follow the *Scrub Brush Lift Actuator Removal (Disc or Cylindrical)* manual section to reassemble. Reference Figure 8.5 to correctly mount the top of lift motor to the chassis by model size.

Service Tip: See Figure 8.5. Note the correct orientation of the Spring Housing (E) when installing the complete motor assembly and also run the spring housing assembly to the IN (retracted) position for machine installation.

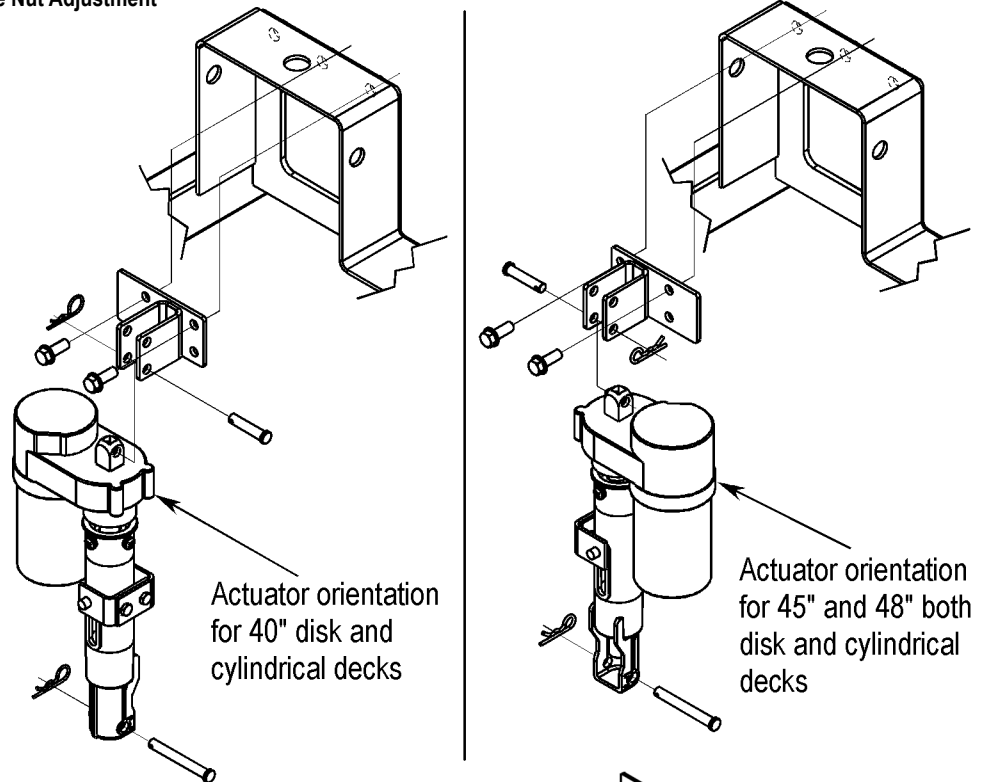
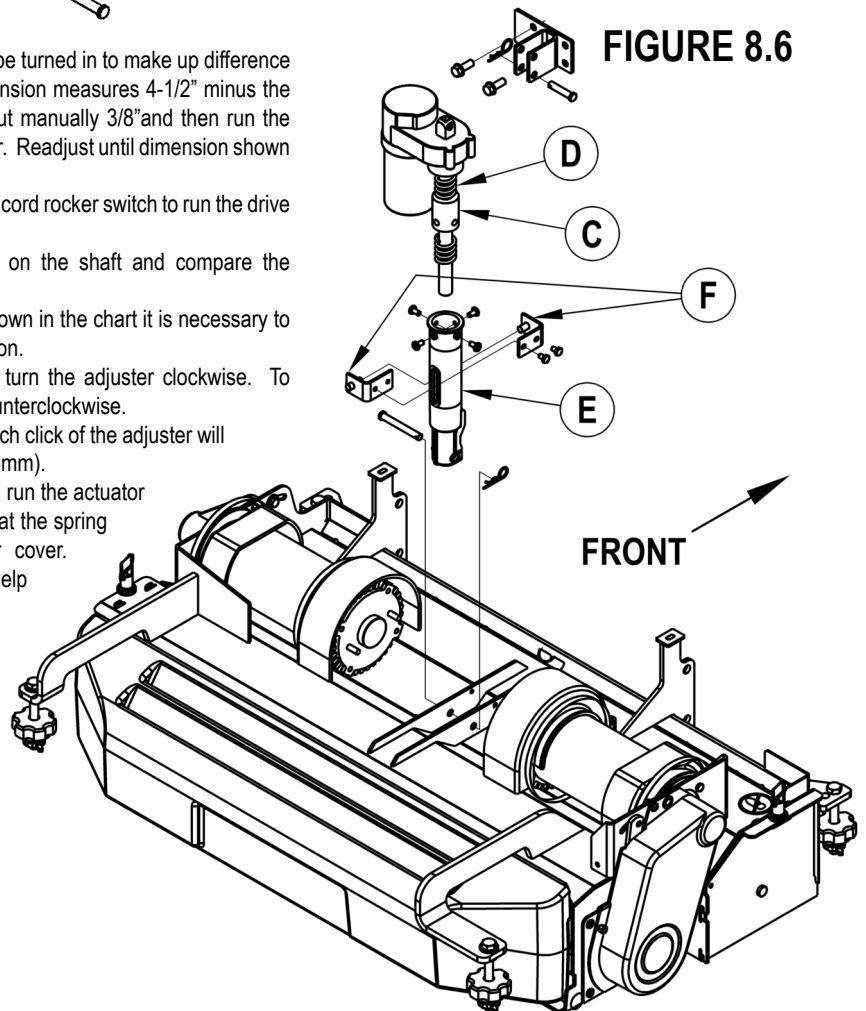


FIGURE 8.6




8 - ELECTRICAL SYSTEM

CURTIS CONTROLLER DIAGNOSTICS:

Diagnostics Method A: Uses the machine's control display LED panel and detergent (EDS) system switch indicator.

FUNCTION OF THE SPEED CONTROLLER STATUS LIGHT AND DISPLAY

The Curtis 1243- (36V) speed control will output a fault code if there is a problem associated with the speed control and wheel drive system. See **Figure 8.7**. If a speed control fault occurs, the display LED panel (**K**) on all models will indicate  03. When the 03 error code is displayed and detects a fault the Blue Indicator (**J**) normally the detergent (EDS) system indicator light 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. This indicates a fault code 2,1.

Diagnostics Method B: Uses the optional hand held Curtis programmer model 1307 or the new model 1311 MP1101.

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 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.

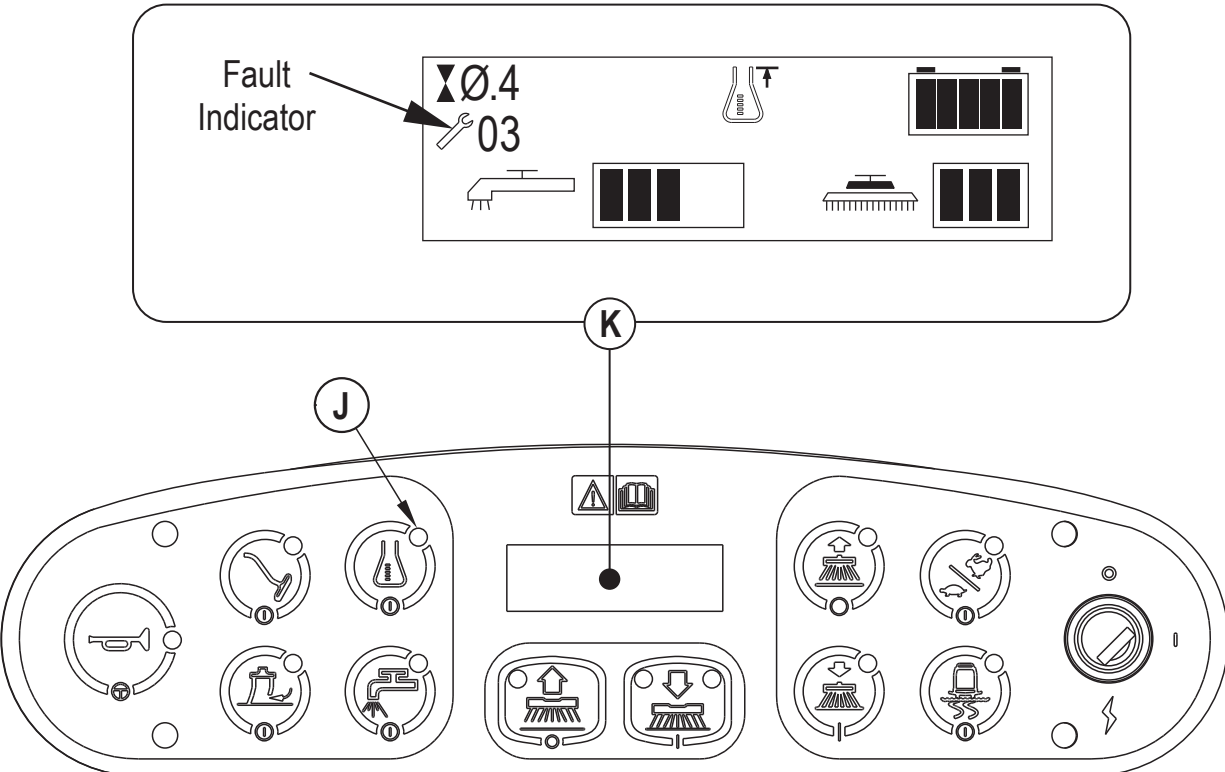
See the Curtis programmer manual 56043101 for more detail on programmer operation.

Curtis programmer diagnostics

New text note:

The text used above in the descriptions of the Curtis programmer usage is that used for the original (older) model 1307. The manual 56043101 can be referenced for the correct usage terminology for the new model programmer 1311.

FIGURE 8.7



8 - 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	
0,1	0 (single LED flash every 5 seconds)	Controller operational; no faults	
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	Contactora 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 <under-voltage cutback limit. 2. Corroded battery terminal. 3. Loose battery or controller terminal.
4,2	0000 00	Over-voltage	1. Battery voltage >over-voltage 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.

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 (located on operator panel detergent indicator light). The part number of the handheld programmer is 56409441.

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 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 touch pad operator panel detergent indicator light. If a programmer is available, connect it to the programmer plug-in port.
- 2 Turn the key switch on. The programmer should "power up" with an initial display. 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.
 - 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 switch to clear the fault code.
- 4 Move the drive pedal to operate the throttle. The motor should begin to turn in the selected direction. If it does not, verify the wiring to the controller, 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. 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 M1 (transport) and maximum low speed M2 (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 models (1307 / old style and 1311 / new style) is described more fully in the Curtis Programmer manual 56043101.

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.

8 - ELECTRICAL SYSTEM

FUNCTIONAL OVERVIEW OF MAIN CONTROL BOARD

The primary function of the main control board A2 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(s). When the scrub ON switch is depressed this will lower the scrub deck to the operating position and by activating the drive pedal start the brush motors. The controller is continuously monitoring the current to the brush motors 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 solution on/off, squeegee lift, side brooms 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 display panel 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




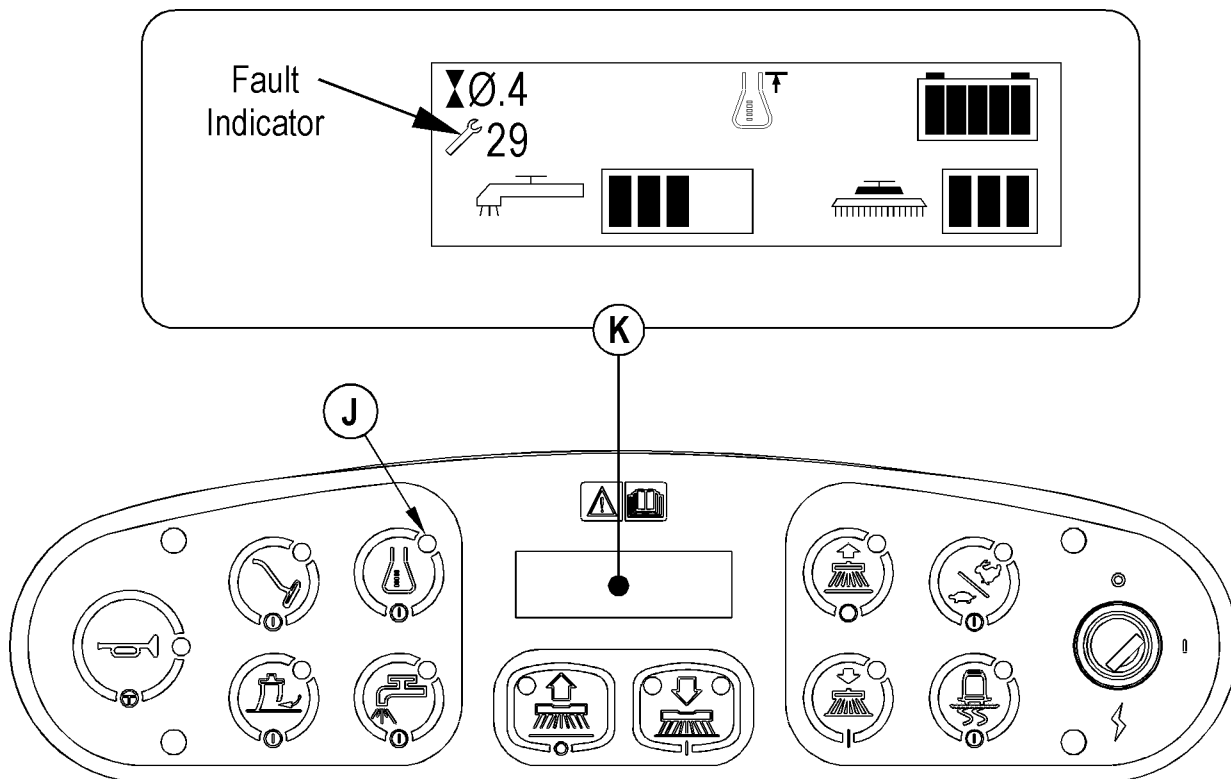













See Figure 8.8. Any error codes detected by main control board will be displayed on the display panel as they occur. If more than one-error exists the display will sequence through the error codes at one-second intervals. On all models the error will display as a mechanical wrench symbol  followed by a two-digit code. EX:  03 would be a drive system fault. EX:  29 would be an open vacuum motor.

FIGURE 8.8




















MAIN CONTROLLER ERROR CODES











Display Code	Fault Description	Troubleshooting Action
 01	Scrub deck sense R2 resistor fault	A fault will occur if scrub deck sensor resistor is unplugged or damaged. 1. Check resistor wiring for an open and substitute a new resistor and test scrub deck for proper operation. Note: There are 4 different resistor values used on the different deck types, see the electrical diagram decal for the correct specification for the resistor to replace.
 02	Detergent ratio sensor fault	A fault will occur if detergent ratio sensor is unplugged or damaged. 1. Check sensor wiring for an open and substitute a new sensor and test to see that detergent is properly dispensed.
 03	Speed control fault	Observe the blue flashing light detergent indicator light (location operator panel) then see Curtis drive motor controller section to further troubleshoot the drive system (TABLE 1).
 04	Scrub motor overload Remember some models use 1, 2 & 3 motors. Note; See "TABLE 2" Scrub Pressure for detailed load current values for the different decks.	1. Check for binding in rotation of brushes and improper brush deck lift actuator operation. 2. Check the negative supply cable at the brush motor for a wiring problem and also the small Brn current sense wire in the harness and main controller pin J2-2. 3. Check for a short circuit in brush motor or wiring. On the Cylindrical models check for excessive belt tension and condition of the idler bearing.
 05	Left brush motor contactor coil overload The contactor K4 on 3 motor decks is the left motor (nominal coil resistance is 94 Ohms for all 3 motor contactors).	1. Check for a K4 coil wiring problem, short circuit (wire colors Vio & Gra/Red). 2. Check resistance of coil, if resistance is below 75 Ohms, replace the coil.
 06	Center brush motor contactor coil overload The contactor K3 on a 3 motor deck is the center motor on a 2 motor the left motor.	Same as 05 K3 coil wire colors are Vio & Wht/Vio
 07	Right brush motor contactor coil overload The contactor K2 on 2 or 3 motor deck is the right motor and the only contactor on a single motor deck.	Same as 05 K2 coil wire colors are Vio & Yel/Blu
 08	Scrub deck actuator overload Normal current load 1-3 Amps, max. Current load 6 Amps, max. current no load 1.4 Amps	1. Check for binding or frozen brush lift linkage and excessive weight on the brush deck. 2. Check for a short circuit in the actuator motor and wiring. Repair or replace. * To test, disconnect the motor plug and attach the actuator test cord (56407502) and perform an Amp draw test. Compare readings to the fault description specification information to the left.
 09	Vacuum motor overload Normal current load for one motor 16-20 Amps. Normal current load for two motors 32-40 Amps.	1. Check for debris in vac motor(s). 2. Worn carbon brushes. 3. Defective motor bearings. 4. Check for a short circuit * in vac motor or wiring. Repair or replace.
 10	K1 Vacuum motor contactor coil overload; its nominal coil resistance is 100 Ohms.	1. Check for a K1 coil wiring problem, short circuit (wire colors Vio & Blu). 2. Check resistance of coil, if resistance is below 80 Ohms, replace the coil.
 11	Squeegee actuator overload Normal current load 1-2 Amps, max. Current load 6 Amps, max. current no load 1.4 Amps	1. Check for binding or frozen squeegee lift linkage and excessive weight on the squeegee mount. 2. Check for a short circuit in the actuator motor and wiring. Repair or replace. * To test, disconnect the motor plug and attach the actuator test cord (56407502) and perform an Amp draw test. Compare readings to the fault description specification information to the left.
 12	L1 Solution solenoid overload The nominal coil resistance is 74 Ohms.	1. Check for a wiring problem (short). 2. Check coil resistance; replace solution solenoid if lower than 58 Ohms.
 13	EDS Solution pump overload Normal current load .8-1.8 Amps Current load 3.2 Amps or over will cause code 13 pump motor overload.	1. Check for short circuits in wiring and the M12 pump motor. 2. Disconnect pump motor and run the machine to see if the wiring is shorted. 3. Check the current draw and compare specification data to the left if motor shows high Amp draw replace.

8 - ELECTRICAL SYSTEM

MAIN CONTROLLER ERROR CODES (CONTINUED)

	16	K6 Side broom motor contactor coil overload Nominal coil resistance is 100 Ohms	1. Check for a K6 coil wiring problem, short circuit (wire colors Vio & Brn/Blk). 2. Check resistance of coil, if resistance is below 80 Ohms, replace the contactor.
	17	Side broom actuator overload Normal current load 1-2 Amps, max. Current load 6 Amps, max. current no load 1.4 Amps	1. Check for binding or frozen side broom lift linkage and excessive weight on the lifting arms. 2. Check for a short circuit in the actuator motor and wiring. Repair or replace. * To test, disconnect the motor plug and attach the actuator test cord (56407502) and perform an Amp draw test. Compare readings to the fault description specification information to the left.
	18	K5 Auxiliary contactor coil overload Nominal coil resistance is 100 Ohms	1. Check for a K5 coil wiring problem, short circuit (wire colors Yel/Brn & Blk/Orn). 2. Check resistance of coil, if resistance is below 80 Ohms, replace the contactor.
	19	Back-up alarm overload Spec. 5-15 VDC, Load current 100 ma	1. Check for a back-up alarm wiring problem, short circuit (wire colors Pos. Orn/Brn & Neg. Blu/Wht). 2. Disconnect back up alarm and test to see if the wiring is shorted if not replace the back-up alarm.
	20	Horn output fault Load current spec. 1.2 Amps	1. The horn or horn wiring's Pos. +36V power feed is shorted to ground (wire colors Vio & Blu/Red). 2. Disconnect horn and test to see if the wiring is shorted if not replace the horn.
	21	Scrub motor open	1. Check for an open circuit in motor wiring or defective motor. 2. Check for 36 Volts at the scrub motor that is not running if 0 Volts replace the brush motor contactor.
	22	Left brush motor contactor coil open	1. Check for open circuit in the K4 coil and wiring (wire colors Vio & Gra/Red). 2. Test for 36V at the K4 coil if 0-Volts replace the main control board A2.
	23	Left brush motor contactor coil short to ground	1. Disconnect the K4 coil wiring (wire colors Vio & Gra/Red) and check to see if the code disappears (yes or no). If yes the code disappears replace the brush contactor. If no the code does reappear test wiring for a short back to the battery pack ground. Repair or replace defective wire. 2. If the above test doesn't remove the code, substitute a new A2 main control board.
	24	Center brush motor contactor coil open	Same as code 21 K3 coil wire colors are Vio & Wht/Vio
	25	Center brush motor contactor coil short to ground	Same as code 23 K3 coil wire colors are Vio & Wht/Vio
	26	Right brush motor contactor coil open	Same as code 21 K2 coil wire colors are Vio & Wht/Vio
	27	Right brush motor contactor coil short to ground	Same as code 23 K2 coil wire colors are Vio & Wht/Vio
	28	Scrub deck actuator open	1. Check for disconnect lift actuator wiring. 2. Check for an open circuit in motor wiring or defective motor. 3. Check for A2 controller output voltage at actuator wiring plug, should be 36 volts if 0 Volts controller failure replace.
	29	Vacuum motor open	1. Check for disconnect vacuum motor wiring. 2. Check for an open circuit in vac motor wiring or defective motor. 2. Check for 36 Volts at the vacuum motor if 0 Volts replace the vacuum motor contactor K1.
	30	Vacuum motor contactor coil open	1. Check for open circuit in the K1 coil and wiring (wire colors Vio & Blu). 2. Test for 36V at the K1 coil if 0-Volts replace the main control board A2.
	31	K1 Vacuum motor contactor coil short to ground	1. Disconnect the K1 coil wiring (wire colors) and check to see if the code disappears (yes or no). If yes the code disappears replace the brush contactor. If no the code does reappear test wiring for a short back to the battery pack ground. Repair or replace defective wire. 2. If the above test doesn't remove the code, substitute a new A2 main control board.
	32	Squeegee actuator open	1. Check for disconnect squeegee actuator motor wiring plug connection. 2. Check for an open circuit in actuator motor wiring (Wht/Grn & Blu/Brn) or defective motor M3. 3. Check for 36 Volts at the actuator motor if 0 Volts replace the main control board A2.

MAIN CONTROLLER ERROR CODES (CONTINUED)

 33	L1 Solution solenoid open	1. Check for open circuit in the L1 coil and wiring (wire colors Vio & Yel/Grn). 2. Test for 36V at the L1 coil if 0-Volts replace the main control board A1.
 34	L1 Solution solenoid short to ground	1. Disconnect the L1 solenoid coil wiring and check to see if the code disappears yes or no. If yes the code disappears replace the solenoid. If no the code does reappear test wiring for a short back to the batteries ground. Repair or replace defective wire. 2. Substitute a new A1 control board.
 35	Solution pump open (optional used on EDS models only)	1. Check for open circuit in the M12 pump motor and wiring (wire colors Vio & Blu/Orn). 2. Test for 36V at the pump motor if 0-Volts replace the main control board A1.
 36	Side broom motor contactor coil open	1. Check for open circuit in the K6 coil and wiring (wire colors Vio & Brn/Blk). 2. Test for 36V at the K6 coil if 0-Volts replace the main control board A1.
 37	K6 Side broom motor contactor coil short to ground	1. Disconnect the K6 coil wiring (wire colors Vio & Brn/Blk) and check to see if the code disappears (yes or no). If yes the code disappears replace the K6 contactor. If no the code does reappear test wiring for a short back to the battery pack ground. Repair or replace defective wire. 2. If the above test doesn't remove the code, substitute a new A1 main control board.
 38	Side broom actuator motor open	1. Use an Ohmmeter and check for an open circuit in the M4 side broom actuator and its wiring (wire colors Gra/Vio & Grn/Orn) if defective repair or replace. 2. Test for 36V at side broom actuator if 0-Volts replace the main control board A1.
 39	Auxiliary motor contactor coil open	1. Check for open circuit in the K5 coil and wiring (wire colors Yel/Brn & Blk/Orn). 2. Test for 36V at the K5 coil if 0-Volts replace the main control board A1.
 40	K5 Auxiliary motor contactor coil short to ground	1. Disconnect the K5 coil wiring (wire colors Yel/Brn & Blk/Orn) and check to see if the code disappears (yes or no). If yes the code disappears replace the K5 contactor. If no the code does reappear test wiring for a short back to the battery pack ground. Repair or replace defective wire. 2. If the above test doesn't remove the code, substitute a new A1 main control board.
 41	Back-up alarm open	1. Use an Ohmmeter and check for an open circuit in the H1 back-up alarm and its wiring (wire colors Orn/Brn & Blu/Wht) if defective repair or replace. 2. Test for 36V at the back-up alarm if 0-Volts replace the main control board A1.
 42	Back-up alarm short to ground	1. The Back-up alarm and or its wiring's Pos. (+36V) power feed is shorted to ground, test pos. wire to ground for short circuit (wire colors Orn/Brn Bat.+ & Blu/Wht B-). Repair or replace defective wiring. 2. Disconnect alarm and test to see if the circuit wiring is still causing an error code (shorted) if not replace the Back-up alarm.

** See *Service Test Mode* in this manual for further trouble shooting information.

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

* Short Circuit definition:

- A short circuit is a parallel path of very low resistance, often caused accidentally.
- With low resistance there is an excessive amount of current.
- The excessive current will either melt the wires or open a fusible link.

8 - ELECTRICAL SYSTEM

SERVICE TEST MODE:

The purpose of the service test mode program is to assist the service repairperson with numerous quick short-cut troubleshooting procedures. These test instructions allow for the separate control of each individual electrical system component independent of the normal machine operator inputs.

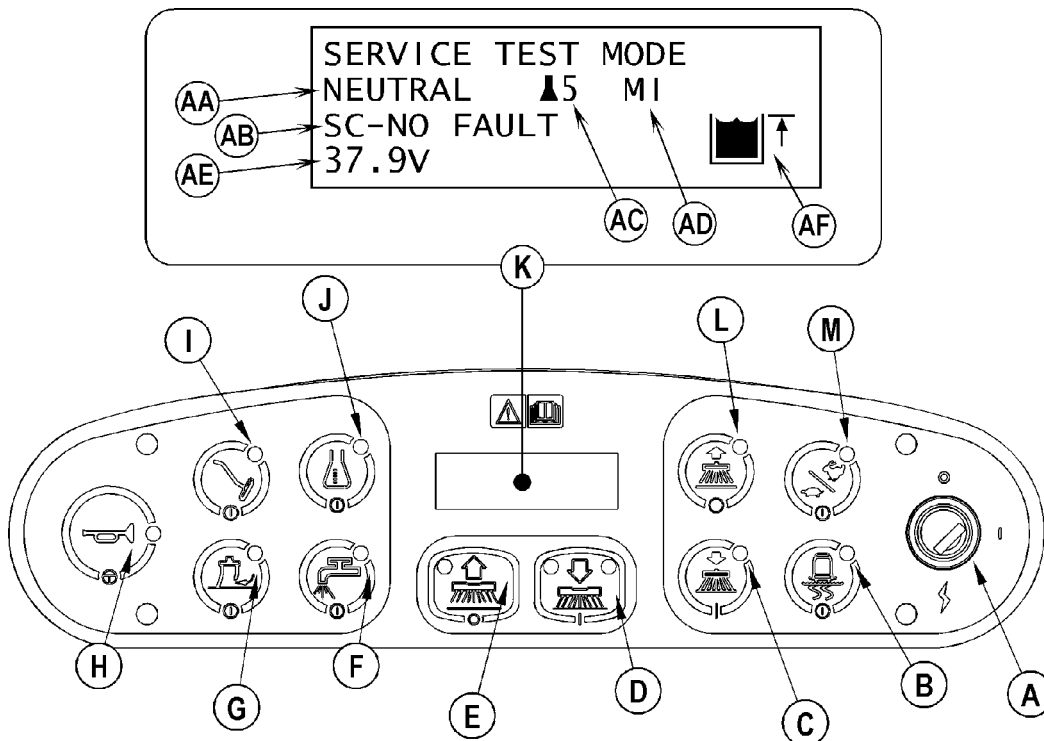
To enter the service test mode perform the following steps:

- 1 Turn the main power on/off key switch to the off position.
- 2 Press and hold the Wand Switch (I).
- 3 While holding the wand switch turn the main power key switch to the ON position.
- 4 Continue to hold the wand switch until its indicator light turns on and the panel display reads "SERVICE TEST MODE".
- 5 Release the wand switch its indicator light turns off and the display shows numerous service test mode status callouts (see **Figure 8.9** for detail description of callout information).
- 6 The function of each switch and indicator is described in the following pages.
- 7 To exit this mode, turn the main power key switch to the OFF position.

CONTROL PANEL

- A Key Switch
- B Traction Control Switch
- C Side Broom ON/DOWN Switch (only used on cylindrical models w/side brooms)
- D Scrub System ON / Pressure Select Switch
- E Scrub System OFF Switch
- F Solution Switch
- G Vacuum Switch
- H Horn
- I Wand Switch
- J Detergent Switch (used on EDS models only)
- K Display
- AA Speed Control Foot Throttle Status
- AB Speed Control Status
- AC Detergent Ratio Status
- AD Wheel Drive Transport Mode Status
- AE Battery Display Status
- AF Solution Tank Low Level Status
- L Side Broom OFF/UP Switch (only used on cylindrical models w/side brooms)
- M Scrub Speed Switch

FIGURE 8.9



Main Control Panel Status Indicators:

See Figure 8.9 for status indicator callouts.

Speed Control Foot Throttle Status (AA):

Listed below are the 3 displayed speed control input signals

- The control panel display will read "NEUTRAL" when the operator foot pedal is at rest.
- The control panel display will read "FORWARD" when the operator foot pedal is depressed in its FWD direction to activate its forward drive mode functions.
- The control panel display will read "REVERSE" when the operator foot pedal is depressed in its REV direction to activate its reverse drive mode functions.

Speed Control Status (AB):

This indicator will read "SC-NO FAULT" (speed controller non-fault) if the status signal from the speed control is normal. If a speed control fault exists, this indicator will read "SC-FAULT" (speed control fault). Refer to the speed control section for details on these codes.

Detergent Ratio Status (AC):

A detergent bottle and ratio Number from 1 to 9 will be shown on the display for units equipped with this optional system. This indicates to the operator the specific ratio that the controller is set to dispense detergent at. It will be blank if the detergent option is not installed and its programmed mode not selected. Reference the decal attached to the detergent cartridge to understand the exact detergent amounts being used.

Wheel Drive Transport Mode Status (AD):

The Speed control has three operational modes; they are shown on the display as M1, M2 & M3 and can be jogged from one to the other by pressing (activating) its correct main control panel switch(s). See the switch output controls instruction below on how to select the correct main control switches to test the 3 wheel drive mode functions.

Battery Display Status (AE):

The status display will show the units battery pack voltage. The display is accurate to within +/- 0.20 volts. Therefore, the voltage displayed may not correlate precisely to a high-accuracy, calibrated voltmeter.

- An example of a voltage read out would be: 36.7 V

Solution Tank Low Level Status (AF):

A solution tank icon is shown with a direction arrow pointing UP or DN. The up arrow indicates the solution level is above the 3-4 inch minimum. With a down arrow the level is low to signal the operator that the tank should be refilled so that an unexpectedly empty tank will not cause the operator to stop the scrub operation.

Display Panel Switch Output Controls:

See **Figure 8.9**. 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.

Scrub OFF switch (**E**): Controls brush motor(s).

Scrub ON/Scrub Mode switch (**D**): Controls scrub deck lift actuator.

Vacuum switch (**G**): Controls squeegee lift actuator.

Wand switch (**I**): Controls vacuum motor(s).

Solution switch (**F**): Controls solution solenoid (and solution pump on EDS models).

Horn switch (**H**): Used to jog actuators (scrub deck and squeegee).

Detergent switch (**J**): Controls the detergent pump (on EDS models).

Fast/Slow Select switch (**M**): Selects the M2 speed control speed limit.

Traction Control switch (**B**): Selects the M3 speed control speed limit.

Side Broom OFF/UP switch (**L**): Controls side broom motor(s)

Side Broom ON/Down switch (**C**): Controls side broom lift actuator.

Scrub System Off Switch (E):

This switch is used to toggle the state of the brush motor. Pressing and releasing this switch will alternately turn the brush motor on and off. It's LED indicator provides the following status information:

Off - Brush motor output is off and there is no brush motor current sensed.

Steady Blue - Brush motor output is on and there is normal brush motor current sensed.

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Scrub ON/Pressure Select Switch (D):

This switch is used to control the output to the scrub deck 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 and both scrub ON LED's should be OFF. If the Scrub ON switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the left LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, 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 and both LED's should be OFF. If the Scrub ON switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the left LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The horn switch has no effect in this state.

Vacuum Switch (G):

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 and the vacuum LED should be OFF. If the vacuum switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the vacuum LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, 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 and the vacuum LED should be OFF. If the vacuum switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the vacuum LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The horn switch has no effect in this state.

Side Broom ON/Down Switch (C):

This switch is used to control the output to the side broom 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 and the side broom on/down switch LED should be OFF. If the side broom on/down switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the side broom on/down switch LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, 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 and the side broom on/down switch LED should be OFF. If the side broom on/down switch was the last switch pressed, it is possible to momentarily activate the actuator output using the horn switch. 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 and the side broom on/down switch LED should be ON. The LED indicator will be a steady blue if the control senses current flow through the actuator. It will flash blue if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The horn switch has no effect in this state.

Wand Switch (I):

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 provides the following status information:

Off - Vacuum motor output is off and there is no vacuum motor current sensed.

Steady Blue - Vacuum output is on and there is normal vacuum motor current sensed.

Solution Switch (F):

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

Off – Solenoid and solution pump outputs are off.

Steady Blue – Solenoid and solution pump outputs are on.

Horn Switch (H):

This switch is used to momentarily activate either the scrub deck lift actuator or the squeegee lift actuator. See the descriptions above for more details.

Scrub Speed Switch (M):

This switch is used to toggle the state of the multimode output to the speed control. This is used to select which speed limit the speed control uses. Pressing and releasing this switch will alternately turn the multimode output on (M2) and off (M1). The indicator (**AD**) provides the following status information:

Off – Speed control mode 1 is selected (transport speed).

Steady Blue – Speed control mode 2 is selected (scrub speed).

Traction Control Switch (B):

This switch is used to toggle the state of the multimode output to the speed control. This is used to select which speed limit the speed control uses. Pressing and releasing this switch will alternately turn the multimode output on (M3) and off (M1). The indicator (**AD**) provides the following status information:

Off – Speed control mode 1 is selected (transport speed).

Steady Blue – Speed control mode 3 is selected (traction speed).

Detergent Switch (J):

This switch is used to toggle the state of the detergent pump. Pressing and releasing this switch will alternately turn the detergent pump on and off. The LED indicator provides the following status information:

Off – Detergent pump output is off.

Steady Blue – Detergent pump output is on.

Side Broom OFF/UP Switch (L):

This switch is used to toggle the running state of the side broom motors. Pressing and releasing this switch will alternately turn the side broom motors on and off. The LED indicator provides the following status information:

Off – Side broom motors output is off.


Steady Blue – Side broom motors output is on.

8 - ELECTRICAL SYSTEM

MAIN CONTROL PROGRAMMING OPTIONS

Fault Recall of Stored Error Codes:

Whenever the main control unit detects an electrical system fault, 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 main power switch to the off position.
- 2 Press and hold the solution switch.
- 3 While holding the solution switch, turn the main power key switch to the on position.
- 4 Continue to hold the solution switch until the solution indicator turns on.
- 5 Release the solution switch. A wrench icon will be displayed on the left top corner of the display indicating you are in fault recall mode.
- 6 If there were previously no error codes stored, the display will show the no-fault wrench icon  – asking you to reset the machine (no fault). Go to step 10.
- 7 If error codes were stored the display will show the wrench icon and error number(s) right next to the wrench. The scrub system off indicator will now blink. If there is more than one error code stored. It will toggle through all the errors stored.
- 8 If it is desired to save the codes, go to step 10.
- 9 To clear the stored codes press the scrub off switch. The display will now show key switch icon asking you to reset the machine.
- 10 To exit the fault recall mode, turn the main power key switch to the off position.

Restoring the scrub pressure to factory default settings:

If it is desired to restore the scrub pressures to factory default setting, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub-on switch.
- 3 While holding the scrub-on switch, turn the main power key switch to the on position.
- 4 Continue to hold the scrub-on switch until the display shows key switch icon.
- 5 The factory default pressures have now been restored.
- 6 Turn the main power key switch to the off position.

Fault Detection On or Off:

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 turn the fault checking on or off:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub-off switch and solution switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until both switch indicators turn on.
- 5 Release both switches. The display will now show a wrench icon in the upper left corner indicating fault protection mode. The solution indicator light will blink and the scrub off will be turned on.
- 6 Pressing and releasing the solution switch will now select between fault' detection enabled (wrench icon w/no cross) or disabled (wrench icon w/cross). Enabled means that the fault checking is turned on, disabled means that the fault checking is turn off.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again. Turn the key off to exit.

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Displaying the Control Unit Revision Level:

If it is desired to view the revision level of the control unit software perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub off switch and traction switch.
- 3 While holding both switches, turn the main power key switch to the on position. Both indicator lights will come on, and then release both switches.
- 4 The LCD display will show the revision level of the main control board and display board. The traction control indicator will blink in revision display mode.
- 5 To exit mode, turn the main power key switch to the off position.

Monitor Mode:

The control system on this rider scrubber is equipped where the 5 machine settings listed below can quickly be checked for the machine's specific set up. In order to monitor current settings, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the detergent switch.
- 3 While holding the detergent switch turn the main power key switch to the on position.
- 4 Continue to hold the detergent switch until the detergent switch indicator begins to blink.
- 5 Release the detergent switch, the display will show current machine programmed settings; scrub deck type, scrub deck size, detergent mode on/off, fault detection on/off and vacuum motor selection 1 or 2.
- 6 To exit this mode, turn the main power key switch to the off position.

Scrub Deck Down Time Period Adjustment:

FACTORY DEFAULT: 2 SECONDS

When scrub on switch is pressed, the control unit will automatically lower the deck for 2 seconds. The time that the deck is lowered is adjustable from 1 second to 3 seconds in .1 second increments. To adjust the scrub deck down time, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub on and solution switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until both switch indicators turn on.
- 5 Release both switches. The display will now show a clock icon in the upper left corner with a number indicating scrub deck down time period and the scrub on indicator light will blink.
- 6 Pressing and releasing the scrub on switch will now select the time period. Each pressing and releasing of the switch represents .1 sec. 2.0 seconds, 2.1 seconds etc.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 Turn the key switch to the off position and the new setting will be saved. This setting will remain in effect until it is changed again.

8 - ELECTRICAL SYSTEM

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Light Scrub Setting Adjustment:

FACTORY DEFAULT: SCRUB PRESSURE = ONE BAR, SOLUTION= ONE BAR, DETERGENT= 0 (IF AVAILABLE).

The light scrub pressure, solution rate and detergent rate can be programmed depending on its application where high solution rate is needed with light scrub pressure or low solution rate with heavy scrub pressure. To change all or any one setting, scrub, solution and detergent, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub on and wand switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until wand switch indicator turns on and the light scrub on switch indicator blinks.
- 5 Release both switches. The display will now show a scrub icon (either disc or cylindrical) with the current scrub pressure setting. Scrub off indicator will turn on and light scrub indicator will blink.
- 6 Pressing the scrub on switch will now select the new scrub pressure. Pressing scrub off switch will save the new setting and move to the solution rate setting.
- 7 The display will now show solution icon with gauge. Light scrub indicator will stop blinking and solution indicator will blink. Pressing solution switch will now select solution rate. Pressing scrub off switch will save the new setting and move to detergent setting (if available).
- 8 On machines equipped with the optional detergent system the display will now show detergent bottle with current setting. Detergent indicator will blink. Pressing detergent switch will now select new detergent setting. Pressing scrub off switch will save the new setting and display the key switch icon.
- 9 Turn the key switch to the off position, the new settings will remain in effect until it is changed again.

SCRUB PRESSURE & CURRENT LOAD (AMPS) SPECIFICATIONS (TABLE 2)

Scrub Mode	Scrub Pressure Indicator	DECK TYPE			
		Disc BR 1100S	Cyl. BR 1100S	Disc BR 1300S	Cyl. BR 1300S
Light Scrub	1 bar(#1)	40 AMPS	35 AMPS	50 AMPS	35 AMPS
Heavy Scrub	2 bars(#2)	50 AMPS	45 AMPS	60 AMPS	45 AMPS
Extreme Scrub	3 bars(#3)	65 AMPS	55 AMPS	80 AMPS	55 AMPS

SOLUTION FLOW RATE (TABLE 3)

	Standard flow rates			Over-ride flow rates	
	1 bar	2 bars	3 bars	4 bars	5 bars
BR 1100S Disk	.84 GPM	1.00 GPM	1.50 GPM	2.00 GPM	2.50 GPM
BR 1100S Cylindrical	.70 GPM	.84 GPM	1.00 GPM	1.50 GPM	2.50 GPM
BR 1300S Disk	1.00 GPM	1.50 GPM	2.00 GPM	2.25 GPM	2.50 GPM
BR 1300S Cylindrical	.84 GPM	1.00 GPM	1.50 GPM	2.00 GPM	2.50 GPM

DETERGENT SETTINGS (TABLE 4)

0	Normal detergent setting
-	10% less than normal detergent setting
+	10% more than normal detergent setting

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Heavy Scrub Setting Adjustment:

FACTORY DEFAULT: SCRUB PRESSURE = TWO BAR, SOLUTION= TWO BAR, DETERGENT= 0 (IF AVAILABLE).

The heavy scrub pressure, solution rate and detergent rate can be programmed depending on its application where a higher solution rate is need with heavy scrub pressure or low solution rate with heavy scrub pressure. To change all or any one setting, scrub, solution and detergent, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub on and detergent switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until detergent switch indicators turns on and the heavy scrub blinks.
- 5 Release both switches. The display will now show a scrub icon (either disc or cylindrical) with the current scrub pressure setting. Scrub off indictor will turn on and heavy scrub indicator will blink.
- 6 Pressing the scrub on switch will now select the new scrub pressure. Pressing scrub off switch will save the new setting and move to the solution rate setting.
- 7 The display will now show solution icon with gauge. Heavy scrub indicator will stop blinking and solution indicator will blink. Pressing solution switch will now select solution rate. Pressing scrub off switch will save the new setting and move to detergent setting (if available).
- 8 The display will now show detergent bottle with current setting. Detergent indicator will blink. Pressing detergent switch will now select new detergent setting. Pressing scrub off switch will save the new setting and display the key switch icon.
- 9 Then turn the key switch to the off position, the new settings will remain in effect until it is changed again.

Extreme Scrub Setting Adjustment:

FACTORY DEFAULT: SCRUB PRESSURE = THREE BAR, SOLUTION= THREE BAR, DETERGENT= 0 (IF AVAILABLE).

The extreme scrub pressure, solution rate and detergent rate can be programmed depending on its application where a higher solution rate is need with extreme scrub pressure or low solution rate with extreme scrub pressure. To change all or any one setting, scrub, solution and detergent, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub on and vacuum switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until vacuum switch indicators turns on and the extreme scrub blinks.
- 5 Release both switches. The display will now show a scrub icon (either disc or cylindrical) with the current scrub pressure setting. Scrub off indictor will turn on and extreme scrub indicator will blink.
- 6 Pressing the scrub on switch will now select the new scrub pressure. Pressing scrub off switch will save the new setting and move to the solution rate setting.
- 7 The display will now show solution icon with gauge. Extreme scrub indicator will stop blinking and solution indicator will blink. Pressing solution switch will now select solution rate. Pressing scrub off switch will save the new setting and move to detergent setting (if available).
- 8 The display will now show detergent bottle with current setting. Detergent indicator will blink. Pressing detergent switch will now select new detergent setting. Pressing scrub off switch will save the new setting and display the key switch icon.
- 9 Then turn the key switch to the off position, the new settings will remain in effect until it is changed again.

8 - ELECTRICAL SYSTEM

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Fast Slow Lockout:

FACTORY DEFAULT: ON

The control system on this rider scrubber is programmed to limit the maximum speed while scrubbing to a value less than that allowed for driving when not scrubbing. The speed select switch on the control panel will override this speed limit feature and allow scrubbing at a higher speed. If it is desired to prevent scrubbing at this faster speed the fast /slow feature can be turned off. To turn this feature on or off perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the fast/slow switch.
- 3 While holding the fast/slow switch turn the main power key switch to the on position.
- 4 Continue to hold the fast slow switch until the fast/slow switch and scrub off indicators both turn on.
- 5 Release the fast/slow switch. The fast/slow indicator light will blink and the scrub off LED will be turned on.
- 6 Pressing and releasing the fast/slow switch will now select between fast/slow-enabled and fast/slow disabled. Enabled means that the high speed scrub feature is turned on, disabled means that the high speed scrub feature is turned off.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again.

EDS Detergent System Selection Mode:

Factory Option

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub off switch and detergent switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until both switch indicators turn on.
- 5 Release both switches. The display will now show a detergent bottle in the upper left corner indicating the detergent selection mode. The detergent indicator light will blink and the scrub off will be turned on.
- 6 Pressing and releasing the detergent switch will now select between a normal detergent bottle icon for showing an activated turned on mode or a detergent bottle with a cross through it showing a non-activated turned off mode.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again.

Detergent User Ratio Selection:

FACTORY DEFAULT: 8

There are 9 different settings for detergent ratio. When the slide magnet is not attached to a detergent bottle it will be necessary to manually program the user detergent ratio, by performing the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the detergent switch and horn.
- 3 While holding the detergent switch turn the main power key switch to the on position.
- 4 Continue to hold the detergent switch until the detergent and horn switch indicators both turn on.
- 5 Release both switches, the horn indicator will go out, the scrub-off LED will turn on and the detergent indicator will start to blink.
- 6 The display will show a detergent bottle with the current user ratio number.
- 7 Pressing detergent switch will now select detergent setting number (reference the illustration below to understand the number and assigned ratio).
- 8 Press scrub-off switch to save new setting. The display will show key switch icon.
- 9 Turn the key switch to the off position. The new setting will be saved and will remain in effect until it is changed again.

NOTE: Program to the desired ratio needed when not using a detergent container (cartridge) that uses the magnetic slider. Also when the magnetic slider is not used the #8 default setting (1:256) will be automatically selected.

%	oz./gal	RATIO	
.3	-	1:300	9
.4	½	1:256	8
.5	-	1:200	7
.66	-	1:150	6
.8	1	1:128	5
1	-	1:100	4
1.5	2	1:64	3
2	2½	1:50	2
3	4	1:32	1

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Vacuum Motor Configuration Option:

FACTORY DEFAULT: SINGLE (1)

All rider scrubber models covered in this manual can be equipped with an optional dual vacuum motor. The A1 main controller must be programmed for the number of vacuum motors installed so that the current overload protection will function properly. To select the vacuum motor configuration to be used perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the scrub system off and vacuum switches.
- 3 While holding both switches turn the main power key switch to the on position, until only the vacuum and scrub-off LED's are on.
- 4 Release both switches. The vacuum indicator light will start blinking.
- 5 The control panel display will now indicate its setting either single or dual.
- 6 Pressing and releasing the vacuum switch will now toggle between "single" for a single vacuum motor or "dual" for two vacuum motors.
- 7 To save the new setting, press the scrub-off switch and then turn the key switch to the off position.
- 8 The new setting will be saved and will remain in effect until it is changed again.

Recovery Tank Full Detection Enable /Disable:

FACTORY DEFAULT: ENABLE

The BR 1100S series is equipped with a feature that will automatically shut off the vacuum and scrub systems and display a recovery tank full icon on the control panel display when the recovery tank becomes full. If problems are encountered with the vacuum shutoff feature, such as the vacuum shutting off even when the recovery tank is not full, this feature can be turned off. To turn this feature on (enable) or off (disable) perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the vacuum switch.
- 3 While holding the vacuum switch, turn the main power key switch to the on position.
- 4 Continue to hold the vacuum switch until the vacuum indicator turns on.
- 5 Release the vacuum switch. The display will now show a text message "Rec Tank Full Detect Enable or Disable". The vacuum indicator light will blink and the scrub off will be turned on.
- 6 Pressing and releasing the vacuum switch will now select between the Enable or Disable vacuum feature. Enable means that the automatic shutoff feature is turned on; disable means that the automatic shutoff feature is turned off.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again. Turn the key off to exit.

Solution Flow in Reverse Enable/Disable:

FACTORY DEFAULT: ENABLE

The solution flow is programmed to dispense solution when backing up. If it is desired to disable solution dispensing in reverse, perform the following steps:

- 1 Turn the main power switch to the off position.
- 2 Press and hold the vacuum switch and solution switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until both switch indicators turn on.
- 5 Release both switches. The display will now show a text message either solution in reverse enable or disable. The solution indicator light will blink and the scrub off will be turned on.
- 6 Pressing and releasing the solution switch will now alternate between the enable or disable solution in reverse functions. If enable is selected, solution flow will stay on when backing up (reverse). If disable is selected, solution flow will stop when backing up (reverse).
- 7 To save the setting, press the scrub-off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again. Turn the key off to exit.

8 - ELECTRICAL SYSTEM

MAIN CONTROL PROGRAMMING OPTIONS (CONTINUED)

Display Indicator Lights; LED Intensity Selection Option:

FACTORY DEFAULT: NORMAL INDICATOR LIGHT INTENSITY

If it is desired to change the display panel's indicator lights intensity level (brightness) perform the following steps.

- 1 Turn the main power switch to the off position.
- 2 Press and hold the vacuum switch and wand switch.
- 3 While holding both switches, turn the main power key switch to the on position.
- 4 Continue to hold both switches until both switch indicators turn on.
- 5 Release both switches. The display will now show a light bulb icon in the upper left corner indicating LED light intensity selection. The vacuum indicator light will blink and the scrub off will be turned on.
- 6 Pressing and releasing the vacuum switch will now select between the normal intensity or extra bright intensity levels.
- 7 To save the setting, press the scrub off switch. The display will show the key switch icon asking the user to reset the machine.
- 8 The new setting will be saved and will remain in effect until it is changed again. Turn the key off to exit.

One Minute Detergent and Solution Pump Purge:

The optional EDS detergent system has a purge (flush) program to assure that the detergent delivery hoses and related components are kept open and clean. A general operational description in how the system functions is found in this manual's appendix. Perform the following steps to activate the maintenance purge function:

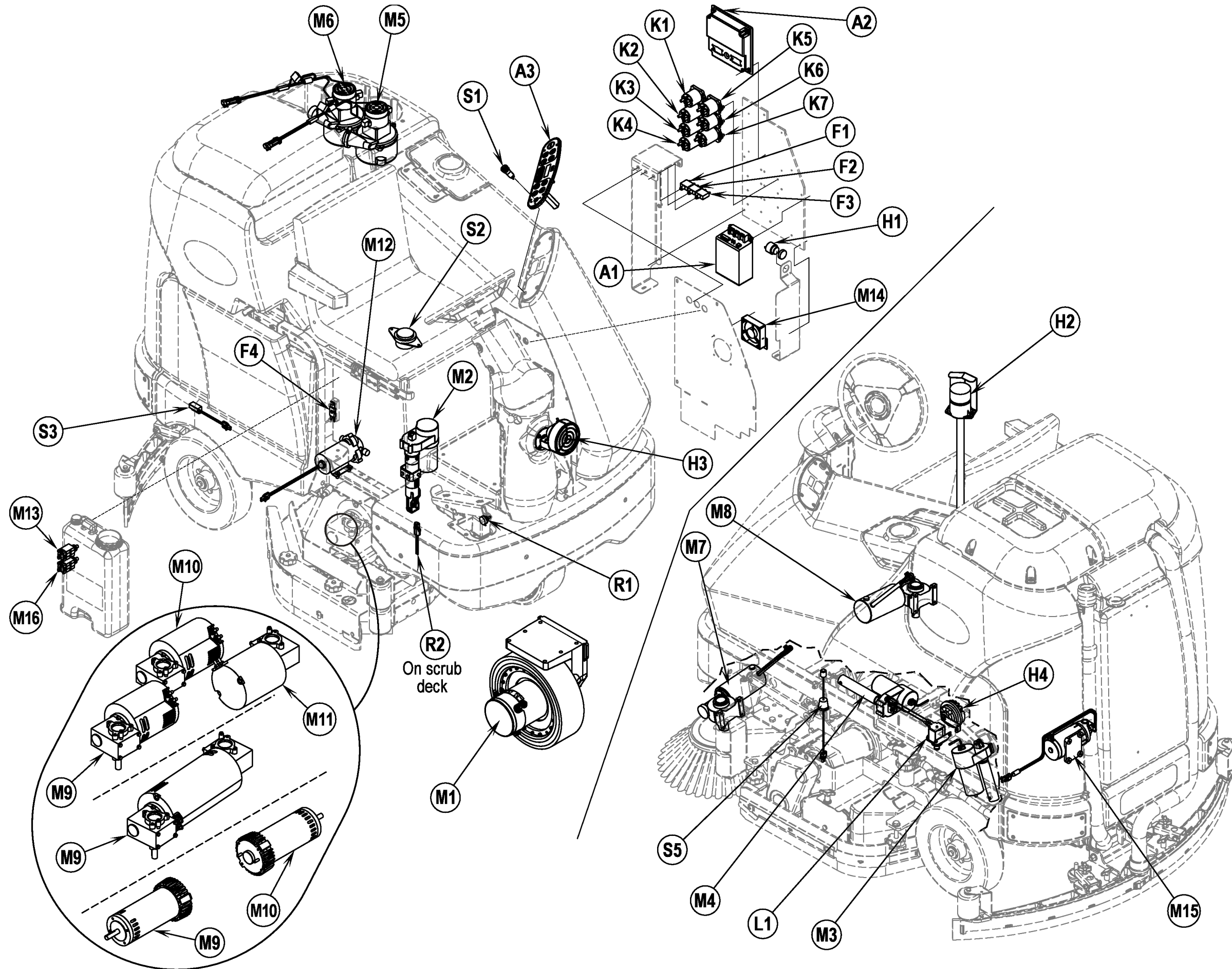
- 1 Turn the main power key switch to the ON position.
- 2 Press and hold both the detergent switch & solution switch down for 2-3 seconds.
- 3 The purge system will start (run) both the detergent and solution pumps for 20 seconds. Both switch indicator lights will flash ON/OFF once a second.
- 4 The display will show the key switch icon when the purge is finished.

ELECTRICAL SYSTEM - 8

COMPONENT LOCATION

Item	Description
A1	Speed Control
A2	Control Board Assembly
A3	Switch/Display Panel Assembly
F1	Circuit Breaker, 3 Amp (Control Circuit)
F2	Circuit Breaker, 15 Amp (Auxiliary Circuit)
F3	Circuit Breaker, 20 Amp (Side Brooms)
F4	Fuse, 250 Amp
H1	Backup Alarm (optional)
H2	Strobe Light (optional)
H3	Headlight (optional)
H4	Horn
K1	Contactors, Vacuum
K2	Contactors, Right Brush (all models)
K3	Contactors, Center Brush (BR 1300S disk and all cyl)
K4	Contactors, Left Brush (BR 1300S disk only)
K5	Contactors, Auxiliary
K6	Contactors, Side Brooms
K7	Contactors, Main (Speed Controller)
L1	Solenoid, Solution
M1	Motor, Wheel Drive
M2	Lift Actuator, Brush
M3	Lift Actuator, Squeegee
M4	Lift Actuator, Side Broom
M5	Motor Assembly, Vac
M6	Motor Assembly, Vac (optional)
M7	Gearmotor Assembly, Side Broom (cyl models only)
M8	Gearmotor Assembly, Side Broom (cyl models only)
M9	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M10	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M11	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M12	Pump, Solution Control (EDS™)
M13	Pump, Chemical Metering (EDS™)
M14	Fan Assembly
M15	Pump, Accessory (optional)
M16	Pump, Chemical Metering (EDS™)
R1	Potentiometer, 5K Ohm (Throttle)
R2	Resistor Assy (Deck Type Selection)
S1	Switch, Key
S2	Switch, Seat
S3	Switch, Battery Interlock (optional)*
S5	Switch, Solution Empty

*Used with battery roll-out option.

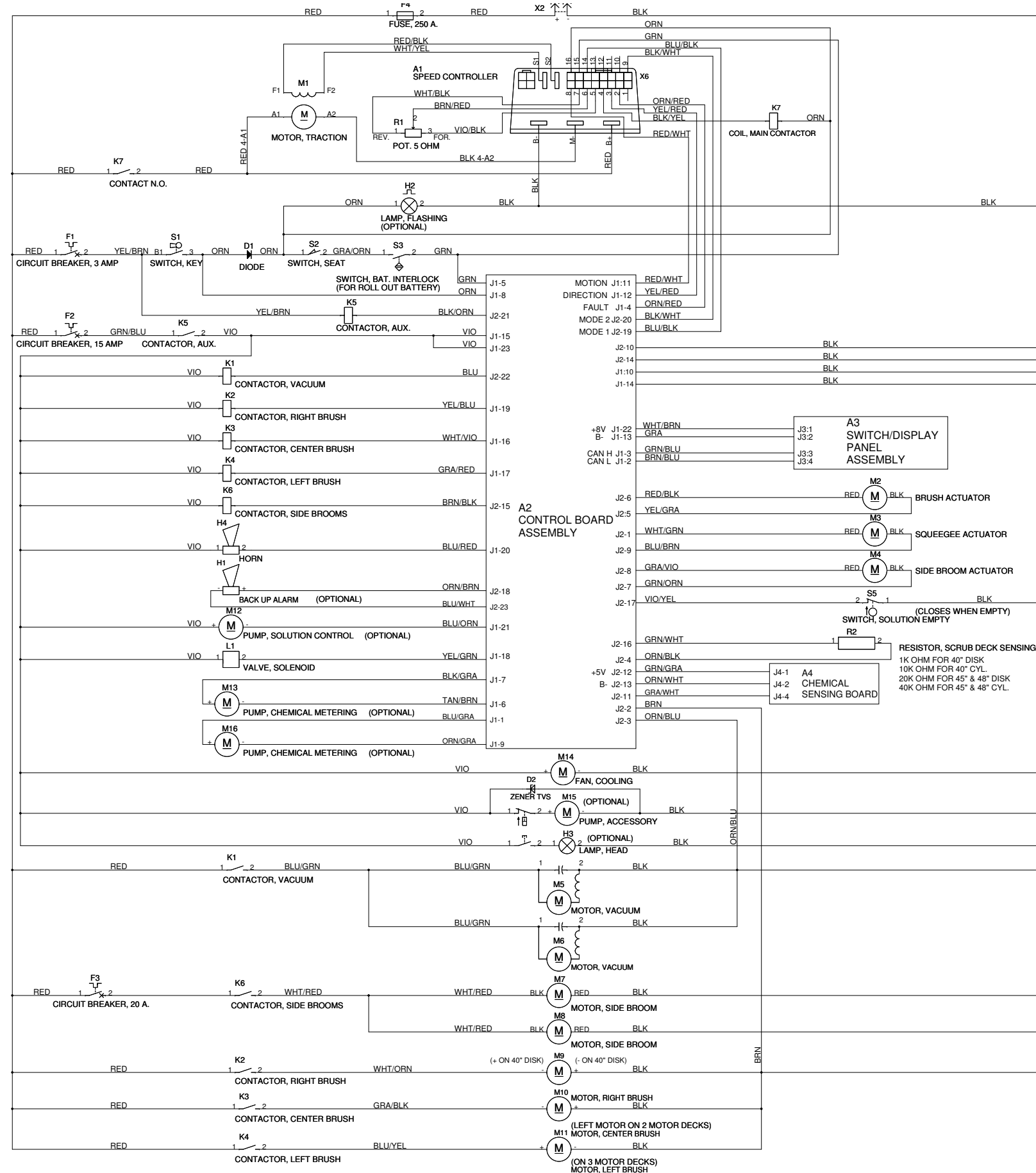


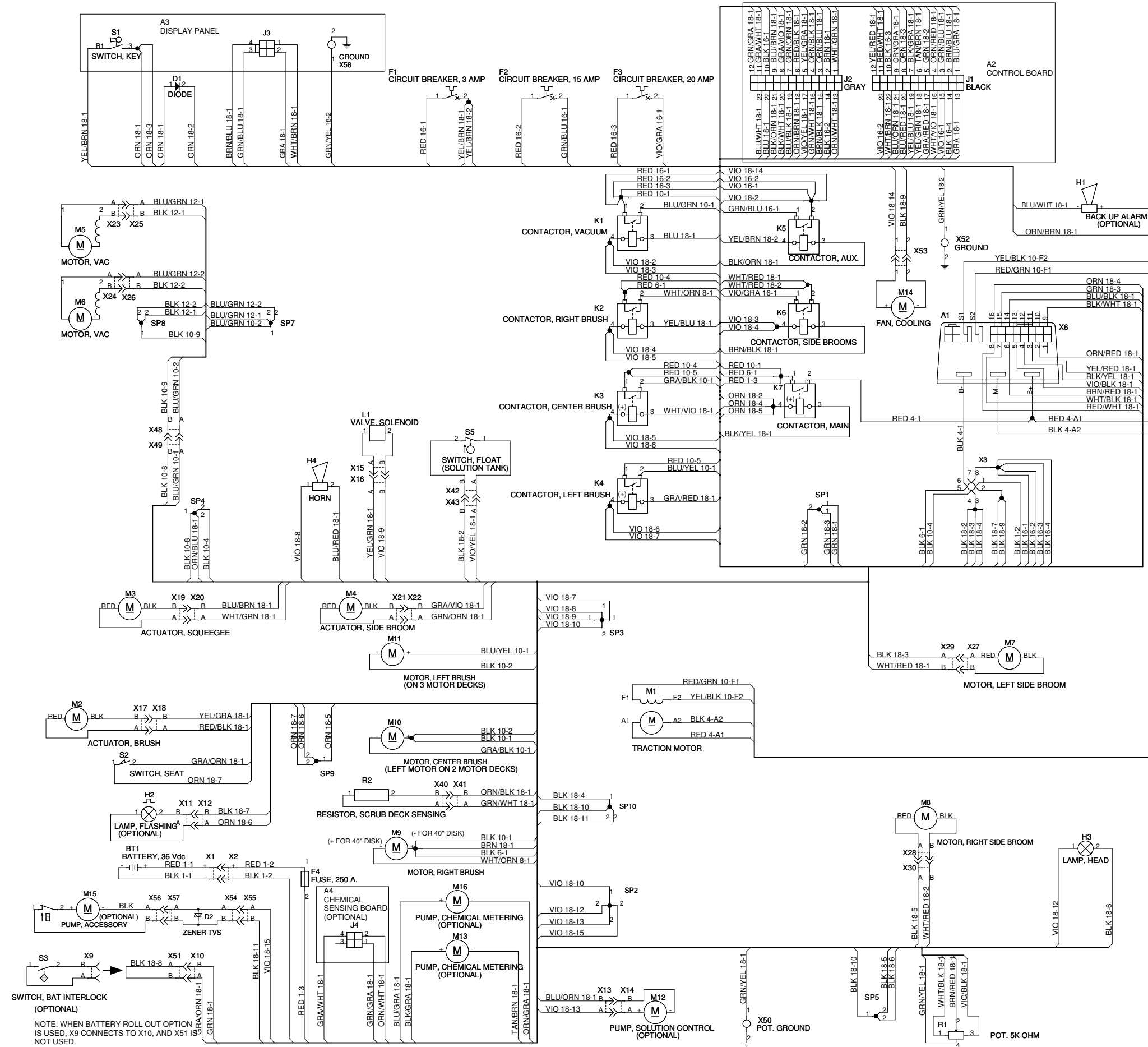
8 - ELECTRICAL SYSTEM

WIRING DIAGRAM / SCHEMATIC

Item	Description
A1	Speed Control
A2	Control Board Assembly
A3	Switch/Display Panel Assembly
F1	Circuit Breaker, 3 Amp (Control Circuit)
F2	Circuit Breaker, 15 Amp (Auxiliary Circuit)
F3	Circuit Breaker, 20 Amp (Side Brooms)
F4	Fuse, 250 Amp
H1	Backup Alarm (optional)
H2	Strobe Light (optional)
H3	Headlight (optional)
H4	Horn
K1	Contacteur, Vacuum
K2	Contacteur, Right Brush (all models)
K3	Contacteur, Center Brush (BR 1300S disk and all cyl)
K4	Contacteur, Left Brush (BR 1300S disk only)
K5	Contacteur, Auxiliary
K6	Contacteur, Side Brooms
K7	Contacteur, Main
L1	Solenoid, Solution
M1	Motor, Wheel Drive
M2	Lift Actuator, Brush
M3	Lift Actuator, Squeegee
M4	Lift Actuator, Side Broom
M5	Motor Assembly, Vac
M6	Motor Assembly, Vac (optional)
M7	Gearmotor Assembly (cyl models only)
M8	Gearmotor Assembly (cyl models only)
M9	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M10	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M11	Motor, Gearbox Assy (disk) or Motor, Brush (cyl)
M12	Pump, Solution Control (EDS™)
M13	Pump, Chemical Metering (EDS™)
M14	Fan Assembly
M15	Pump, Accessory (optional)
M16	Pump, Chemical Metering (EDS™)
R1	Potentiometer, 5K Ohm
R2	Resistor Assy
S1	Switch, Key
S2	Switch, Seat
S3	Switch, Battery Interlock (optional)*
S5	Switch, Solution Empty

*Used with battery roll-out option.

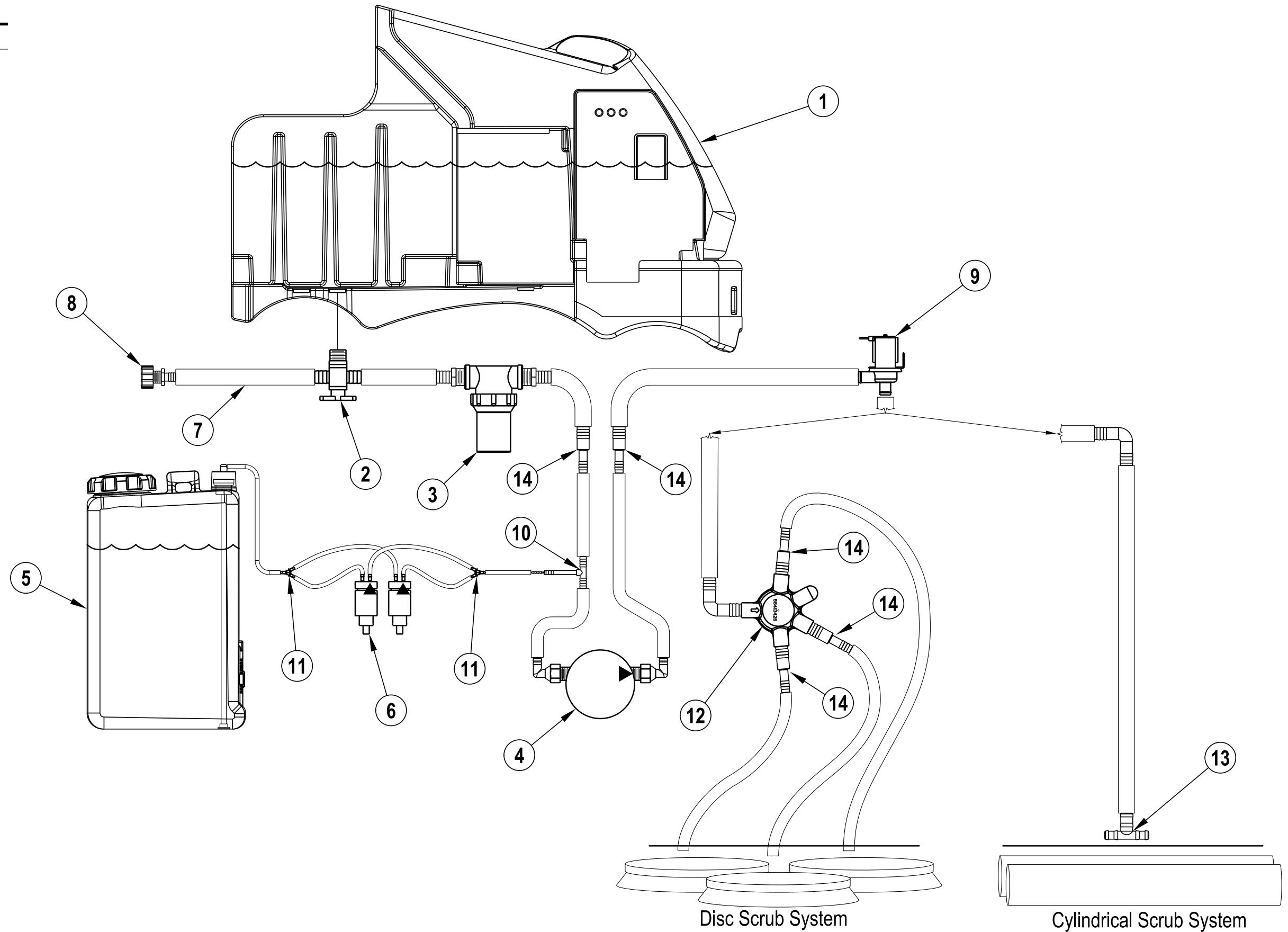




9 - DETERGENT (EDS) SYSTEM

PLUMBING SCHEMATIC

Item	Description
1	Solution Tank
2	Shut Off Valve
3	Inline Solution Filter
4	Solution Pump
5	Detergent Tank
6	Detergent Pump
7	Drain Hose </td
8	Drain Plug
9	Solution Solenoid Valve
10	Reducer Tee
11	Y Barb, Fitting
12	Solution Manifold (Disc Models)
13	Tee
14	Coupler Barb



DETERGENT (EDS™) SYSTEM PREPARATION AND USE

Fill the detergent cartridge with a maximum of 2.2 gallons (8.32 Liters) of detergent. **SERVICE NOTE:** Remove the detergent cartridge from the detergent box prior to filling to avoid spilling detergent on the machine.

See Figure 9.1. It is recommended that a separate cartridge be used for each detergent you plan to use. The detergent cartridges have a white decal on them so you can write the detergent name on each cartridge to avoid mixing them up. The detergent cartridge has a Magnetic Slider (AA) on one end that needs to be set to the proper dilution ratio according to the dilution instructions on the manufacturer's bottle. Slide the Magnet Slider (AA) to the appropriate location on Detergent Dilution Ratio Decal (BB). The system should be purged of previous detergent when switching to a different detergent. **SERVICE NOTE:** Move machine over floor drain before purging because a significant amount of detergent will be dispensed in the process. Refer to *MAIN CONTROL PROGRAMMING OPTIONS, Detergent User ratio Selection* to electronically program the chemical ratio if your cartridge has no magnetic slider.

To Purge When Changing Chemicals:

- 1 Disconnect and remove the detergent cartridge.
- 2 **See Figure 9.2.** Turn the Key Switch (A) ON and press the Detergent Switch (J) and the Solution Switch (E) down for at least 2-3 seconds. **NOTE:** Once activated the purge process takes 20 seconds. See illustration on next page for Detergent System indicators. Normally one purge cycle is adequate to purge the system.

To Purge Weekly:

- 1 Disconnect and remove the detergent cartridge. Install and connect a Cartridge filled with clean water.
- 2 Turn the Key Switch (A) ON and press the Detergent Switch (J) and the Solution Switch (E) down for at least 2-3 seconds. **NOTE:** Once activated the purge process takes 20 seconds. See illustration on next page for Detergent System indicators. Normally one purge cycle is adequate to purge the system.

FIGURE 9.1

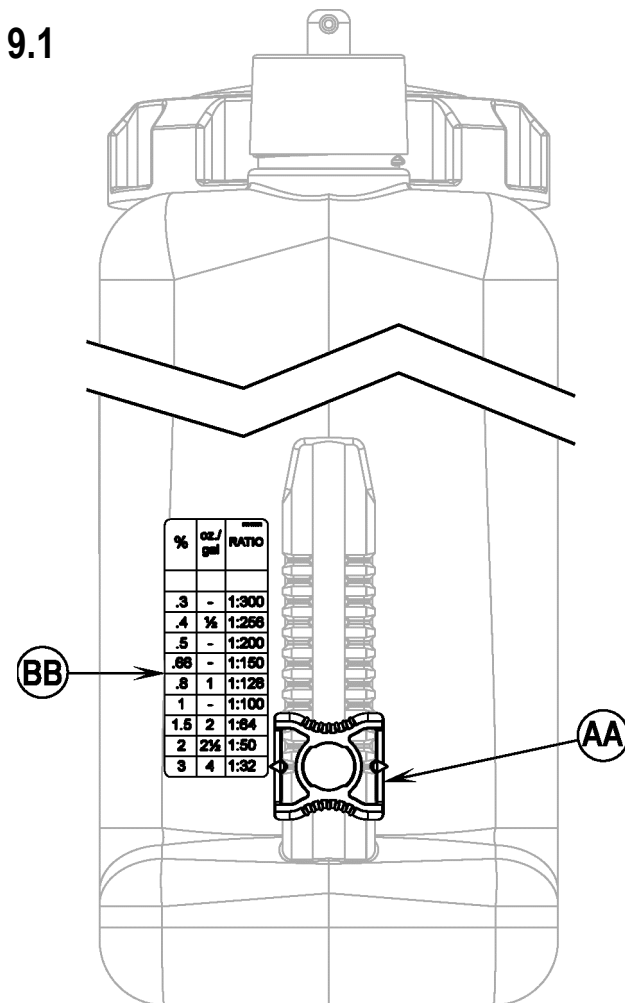
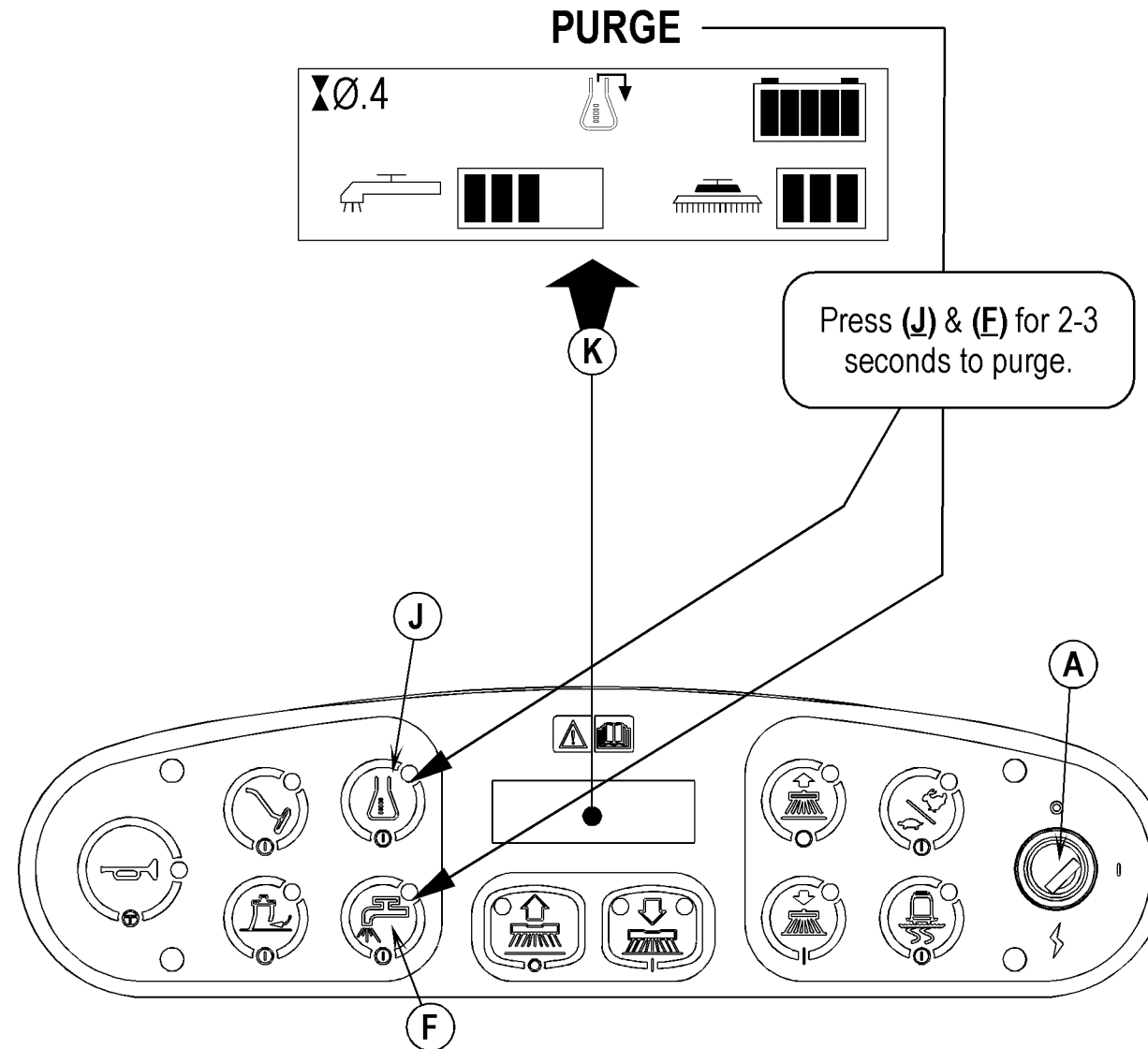


FIGURE 9.2



EDS Troubleshooting Notes

No detergent being dispensed

- Detergent storage bottle is empty.
- Check the main control board's optional programming to confirm the detergent system mode is selected.
- Check detergent lines for blockage or damage.
- The detergent bottle cap must be properly seated and tight to pull (draw soap) from the bottle.
- The magnetic sliders magnet's polarity (North Pole) must point towards the pickup sensor board. To check flip/flop magnet trying it both ways in its holder. It will work in only one position.
- Check the wire connections at the detergent pumps for correct wiring polarity and corrosion free and tight connections. With the system activated touch the pumps to feel them pulsate when operating.



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