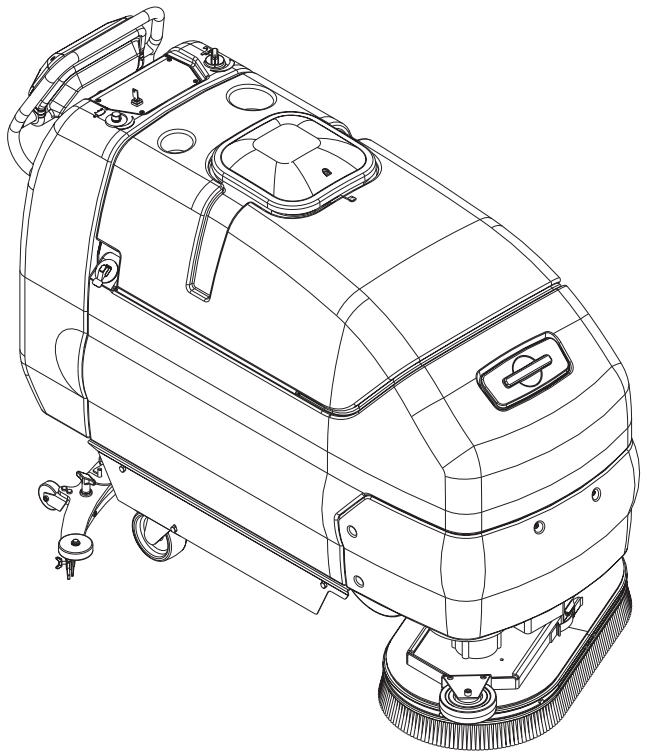
ConvertaMAX™ 28/34
I-MAX™ 28HD/34HD
BA 750/850



SERVICE MANUAL

Advance MODELS (Active 56396015, 56396019, 56396016, 56396020) (Obsolete 56396000, 56397200, 56396001, 56397201)

Nilfisk MODELS (Active 56396017, 56396018) (Obsolete 56396002, 56396003)

Nilfisk Advance

setting standards

5/00 revised 12/02 Form Number 56043057

TABLE OF CONTENTS

TABLE OF CONTENTS

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

GENERAL INFORMATION

INTRODUCTION

This manual will help you get the most from your **ConvertaMAX™ 28/34, I-MAX™ 28HD/34HD & BA 750/850**. Read it thoroughly before servicing the machine.

Note: Bold numbers in parentheses indicate an item illustrated on pages 9-10.

PARTS AND SERVICE

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

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

(Dealer, affix service sticker here.)

NAME PLATE

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

MODEL NUMBER _____

SERIAL NUMBER _____

TRANSPORTING THE MACHINE

⚠ CAUTION!

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

- The machine is tied down securely - see tie-down locations in Know Your Machine section.
- 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 **(20)** 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.

OTHER MANUALS AVAILABLE FOR YOUR MACHINE

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

- A Parts List and Operation Manual are available for each machine (request by your machine's "Model Number" and "Serial Number").
- Operation Manuals for the BA 750 / BA 850 are multi-language; (Danish, Norwegian, Swedish, Finnish), (English, German, French, Netherlands) or (Spanish, Portuguese, Italian, Greek)

CAUTIONS AND WARNINGS

SYMBOLS

Nilfisk-Advance 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.

GENERAL SAFETY INSTRUCTIONS

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

⚠ WARNING!

- This machine should only be used by properly trained and authorized persons.
- Keep sparks, flame and smoking materials away from batteries. Explosive gases are vented during normal operation.
- Charging the batteries produces highly explosive hydrogen gas. Charge batteries only in well-ventilated areas, away from open flame. Do not smoke while charging the batteries.
- Remove all jewelry when working near electrical components.
- Turn the key switch off (O) and disconnect the batteries before servicing electrical components.
- Never work under a machine without safety blocks or stands to support the machine.
- Do not dispense flammable cleaning agents, operate the machine on or near these agents, or operate in areas where flammable liquids exist.
- Do not clean this machine with a pressure washer.
- Do not operate this machine on ramps or inclines of more than a 9.5 degree angle.

⚠ CAUTION!

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

SAVE THESE INSTRUCTIONS

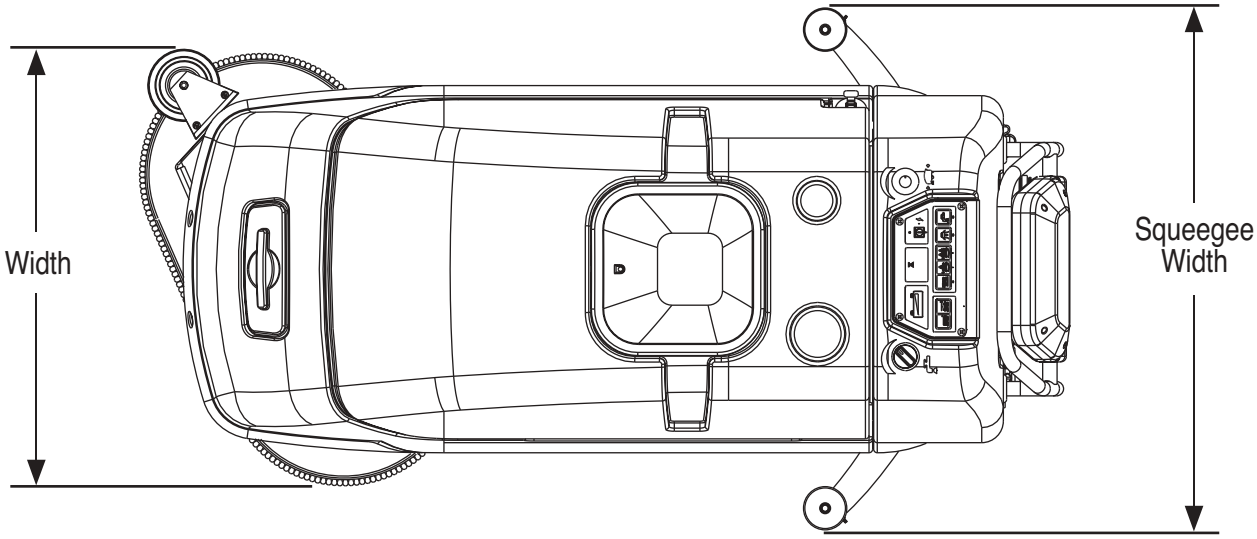
SPECIFICATIONS

Model designation: (**A**)=ConvertaMAX 28 & BA 750, (**B**)=I-MAX 28HD, (**C**)=BA 850, (**D**)=ConvertaMAX 34, (**E**)=I-MAX 34HD

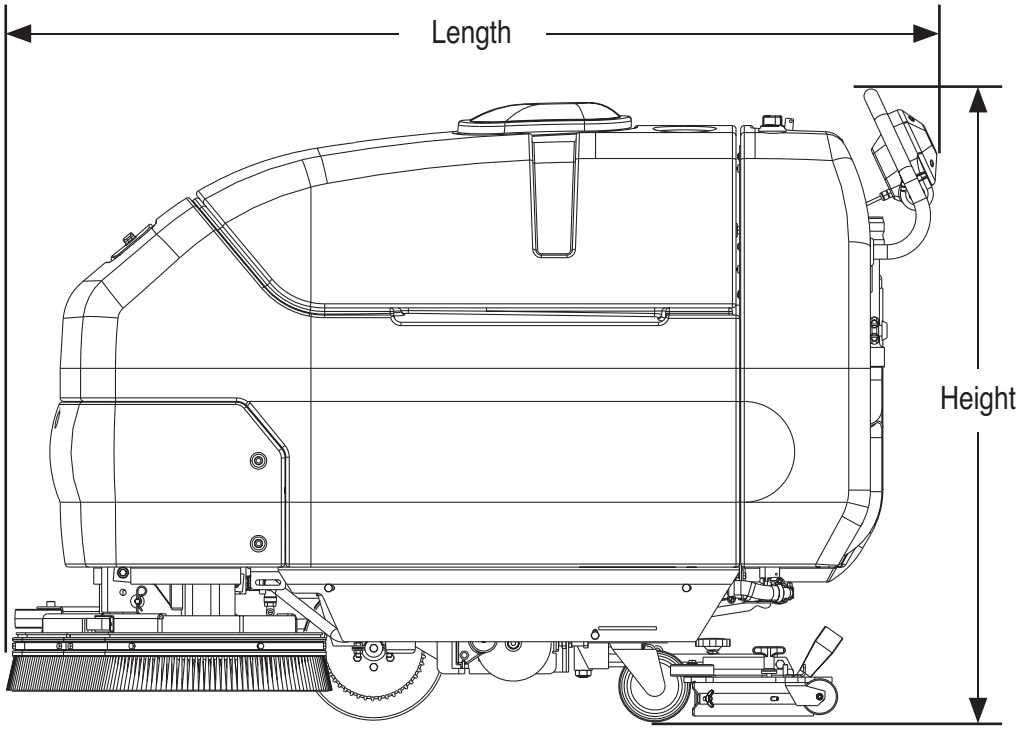
General Specifications

	A	**B**	**C**	**D**	**E**
Machine Length (English)	64 in.	65 in.	67.5 in.	67.5 in.	67.5 in.
Metric	163cm	165cm	172 cm	172 cm	172 cm
Machine Width with Squeegee (English)	36.25 in.	36.25 in.	45 in.	45 in.	45 in.
Metric	92cm	92cm	114cm	114cm	114cm
Machine Width w/out Squeegee (English)	30 in.	30 in.	30 in.	35.5 in.	35.5 in.
Metric	76cm	76cm	76cm	90cm	90cm
Machine Height	44 in. (112cm)	44 in. (112cm)	44 in. (112cm)	44 in. (112cm)	44 in. (112cm)
Machine Net Weight* (English)	495 lbs.	535 lbs.	556 lbs.	579 lbs.	619 lbs.
Metric	225 kg	243 kg	252 kg	263 kg	281 kg
Machine Gross Weight** (English)	1,100 lbs.	1,140 lbs.	1,120 lbs.	1,350 lbs.	1,435 lbs.
Metric	499 kg	518 kg	508 kg	612 kg	651 kg
Cleaning Width (scrubbing path) (English)	28 in.	28 in.	33.5 in.	33.5 in.	33.5 in.
Metric	71cm	71cm	85 cm	85 cm	85 cm
Coverage Rate Per Hour (theory) (English)	37,100 ft^2	37,100 ft^2	44,388 ft^2	44,388 ft^2	44,388 ft^2
Metric	3,447m^2	3,447m^2	4,124m^2	4,124m^2	4,124m^2
Coverage Rate Per Hour (actual) (English)	16,900 ft^2	16,900 ft^2	20,475 ft^2	20,475 ft^2	20,475 ft^2
Metric	1,570m^2	1,570m^2	1,902m^2	1,902m^2	1,902m^2
Brush Diameter (qty of 2) (English)	14.5 in.	14.5 in.	17 in.	17 in.	17 in.
Metric	37cm	37cm	43cm	43cm	43cm
Brush Speed (RPM)	220	220	220	220	220
Brush Pressure Variable, (English)	25-250 lbs.	25-300 lbs.	25-250 lbs.	25-250 lbs.	25-300 lbs.
Metric	11-113 kg	11-136 kg	11-113 kg	11-113 kg	11-136 kg
Solution Tank Capacity	24 gal. (91l.)	24 gal. (91l.)	24 gal. (91l.)	30 gal. (114l.)	30 gal. (114l.)
Recovery Tank Capacity	24 gal. (91l.)	24 gal. (91l.)	24 gal. (91l.)	30 gal. (114l.)	30 gal. (114l.)
Vacuum Water Lift (Sealed)	56 in.	56 in.	56 in.	68 in.	68 in.
(Open Hole Adapter 1")	9 in.	9 in.	9 in.	13 in.	13 in.
Sound power level					
as per ISO 3744 (at operator)	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)
Transport Speed (**Fwd.** Maximum)	265 FPM	265 FPM	265 FPM	265 FPM	265 FPM
Metric	81 m/min	81 m/min	81 m/min	81 m/min	81 m/min
Transport Speed (**Rev.** Maximum)	140 FPM	140 FPM	140 FPM	140 FPM	140 FPM
Metric	43 m/min	43 m/min	43 m/min	43 m/min	43 m/min
Power Source (Batteries) STD	(**4**) 6V/238AH	(**4**) 6V/238AH	(**4**) 6V/238AH	(**6**) 6V/238AH	(**6**) 6V/238AH
Battery Weight (each)	66lbs. (29.9kg)	66lbs. (29.9kg)	66lbs. (29.9kg)	66lbs. (29.9kg)	66lbs. (29.9kg)
Battery Compartment Size					
Height (Max.)	13 in. (33cm)	13 in. (33cm)	13 in. (33cm)	15 in. (38 cm)	15 in. (38 cm)
Width (Max.)	15 in. (38cm)	15 in. (38cm)	15 in. (38cm)	21.37 in. (54 cm)	21.37 in. (54 cm)
Length (Max.)	24 in. (61cm)	24 in. (61cm)	24 in. (61cm)	23.5 in. (59 cm)	23.5 in. (59 cm)
Battery Chargers – see Electrical System Battery Section					
Wheel Drive Motor (all models)	.75 hp, 560 watt	.75 hp, 560 watt	.75 hp, 560 watt	.75 hp, 560 watt	.75 hp, 560 watt
Vacuum Motor (all models)	.75 hp, 570 watt	.75 hp, 570 watt	.75 hp, 570 watt	.75 hp, 570 watt	.75 hp, 570 watt
Brush Drive Motors (2 each)	.75 hp, 560 watt	1 hp, 746 watt	.75 hp, 560 watt	.75 hp, 560 watt	1 hp, 746 watt
Machine Current (Average)	65 Amps	81 Amps	65 Amps	60 Amps	65 Amps

***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 305 AH batteries.



TOP VIEW



SIDE VIEW

MAINTENANCE

MAINTENANCE SCHEDULE

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

MAINTENANCE ITEM	Daily	Weekly	Monthly	Yearly
Charge the Batteries	X			
Drain / Clean and Check Tanks & Hoses	X			
Check / Clean / Rotate the Brushes/Pads	X			
Check / Clean / Adjust the Squeegee	X	X		
Check / Clean Vacuum Shut-Off Float	X			
Check Each Battery Cell's Water Level		X		
Inspect and Clean Solution Filter		X		
*Check Parking Brake For Wear & Adjustment		X		
Lubricate the Machine			X	
**Check Motor(s) Carbon Brushes				X

*If machine is equipped with the optional parking brake.
**Note: See the individual machine system sections for maintenance information.

⚠ WARNING!

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

- Check vacuum motor carbon brushes (Qty 2) once a year or after 300 operating hours.
- Check brush and wheel drive motor(s) carbon brushes (Qty 4 per motor) once a year or after 500 operating hours.
- The original (new) length of each carbon brush is 1" (25.4mm) on all machine models 24 volt and 36 volt motors.
- Replace carbon brushes when shorter than 3/8" (9.5mm) to obtain the same motor efficiency as new brushes.

⚠ IMPORTANT!

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

BATTERIES AND CHARGERS

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

LUBRICATING THE MACHINE

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

Grease fitting locations are:

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

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

- Drive Chain
- Squeegee Tool Adjustment Knob, Wheels & Rollers
- Pivot Points For the Squeegee & Scrub Brush Linkage

Advance ConvertaMAX 28/34, I-MAX 28HD/34HD
Models 56396000, 56397200, 56396001, 56397201, 56396015, 56396019, 56396016, 56396020
Nilfisk BA 750/850 Models 56396002, 56396003, 56396017, 56396018
PM Checklist

Customer _____

Address _____

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

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

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

Ref	OPERATIONAL INSPECTION ITEMS	OK	Defect Codes (circle)	Does Not Work
1	Drive Paddle Operation (check for Fwd/Rev Drive & any neutral creep)		A B D	
2	Drive System Performance (Speed Changes Min/Max)		noisy sluggish	
3	Scrub System (Raise/Lower, Brush Motor On/Off, Brush install & Remove Feature)		A B D	
4	Scrub Brush (pressure settings Normal & Heavy)		A B	
5	Squeegee System (Raise/Lower & Squeegee Tool pickup Performance)		A B D	
6	Vacuum Performance (Sealed water lift 56" for 24V, 68" for 36V and 1- inch open hole adapter 9" for 24V, 13" for 36V)		C L W	
7	Solution Control (On/Off Manual /Auto and Flow Volume Min/Max)		A B L	
8	Battery Charger (Auto turn ON & OFF)		D	

Ref	VISUAL INSPECTION ITEMS	Comments	OK	Defect Codes (circle)	Does Not Work
9	Scrub Brushes, check for wear and rotate			D M W	
10	Scrub Brush Motors, check for carbon brush wear	500 Hours		B C W	
11	Scrub Brush Motors, check gearboxes			B D L	
12	Brush Drive Plate Retainer Clips & flex couplers			C D M	
13	Scrub Deck Skirts and Side Wheel(s)			D M W	
14	Solution Solenoid Valve			C D L W	
15	Solution Flow Control Valve and Linkage			A B D W	
16	Solution Tank, Delivery Hoses & Filter	Clean filter screen		C L	
17	Vacuum Motor Carbon Brushes (wear limit 3/8")	300 Hours		B C W	
18	Vacuum Motor Gaskets			C D L	
19	Vacuum Float Ball & Cage Assembly	Clean float		C D M	
20	Recovery Tank Cover Gasket			L M W	
21	Recovery Tank Drain Hose & Cap			C D L	
22	Squeegee Pick-Up Hose	Back flush		C D L	
23	Squeegee Tool & Blades (clean & rotate)			A D W	
24	Squeegee Tool Wheels (lubricate)	2 side and 2 floor		A D W	
25	Battery Condition (load test, clean & water)			C W	
26	Front Drive Wheel Motor Check Carbon Brushes	500 Hours		B C W	
27	Front Drive Tire	tread wear		W	
28	Drive wheel Motor Chain (Lubricate and tension)			A B C W	
29	Rear chassis Caster Wheels (Lubricate)	tread wear		W	

NOTE: For additional service information see service manual form number 56043057 and operators manual form numbers 56041463, 56041464, 56041465 / 56041479 / 56041515, 56041516, 56041517.

WORK COMPLETED BY: ACKNOWLEDGED BY:

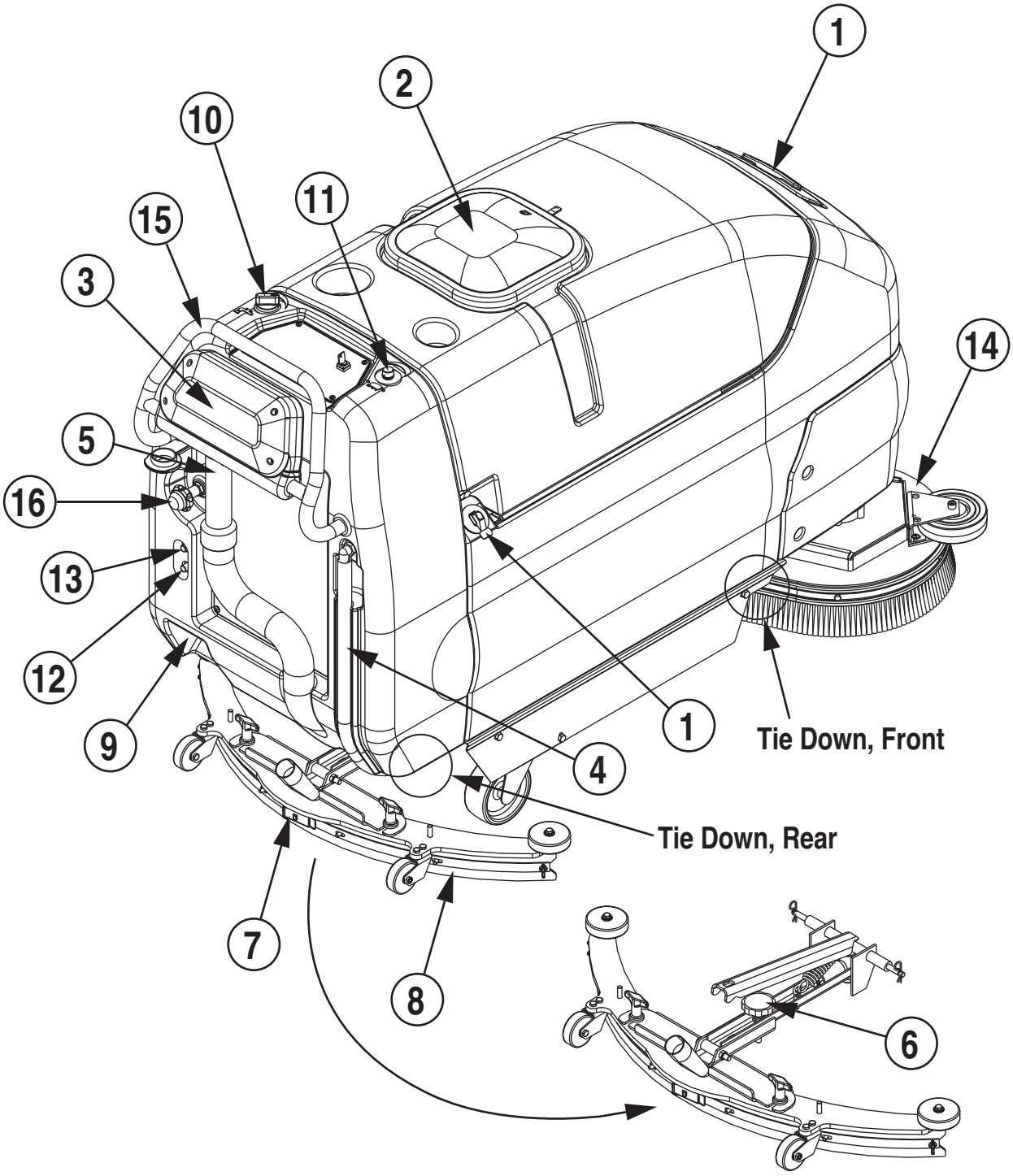
_____ _____ _____ _____

8/09/01

BLANK

KNOW YOUR MACHINE

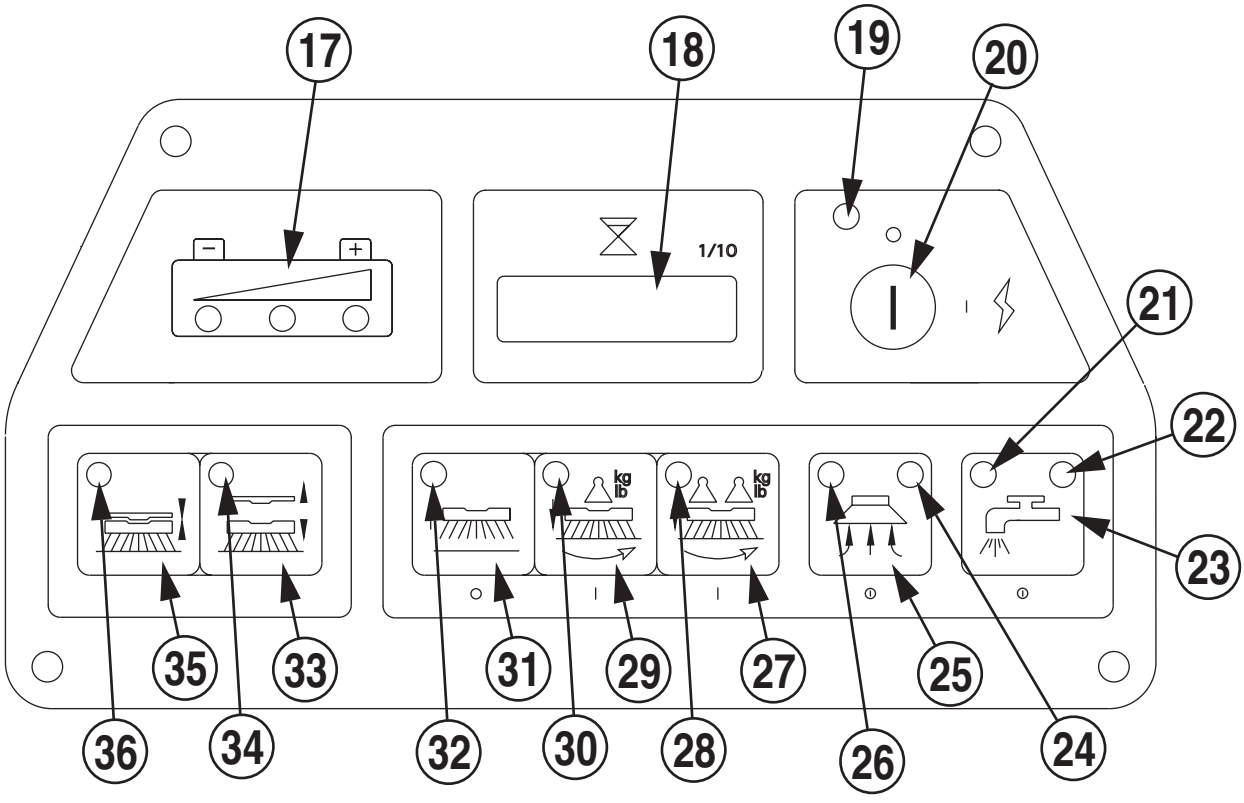
1 Solution Tank Fill
2 Recovery Tank & Cover
3 Drive Paddle
4 Solution Drain Hose / Level Indicator
5 Recovery Drain Hose
6 Squeegee Adjustment Bolt
7 Squeegee Blade Latch
8 Squeegee
9 Battery Charger Connector
10 Solution Flow Control Knob
11 Speed Limit Control Knob
12 Wheel Drive Circuit Breaker (40 Amp)
13 Control Circuit Circuit Breaker (10 Amp)
14 Brush Deck
15 Operator Control Handle
16 Operator Hand Brake



KNOW YOUR MACHINE

CONTROL PANEL

17 Battery Condition Indicator
18 Hourmeter/Status Display
19 Main Power Indicator
20 Master On/Off Key Switch
21 Solution System Indicator
22 Solution System Fault Indicator
23 Solution Button
24 Vacuum System Fault Indicator
25 Vacuum Button
26 Vacuum System Indicator
27 Heavy Scrub Button
28 Heavy Scrub Mode Indicator
29 Normal Scrub Button
30 Normal Scrub Mode Indicator
31 Scrub Off Button
32 Scrub Mode Off Indicator
33 Brush Remove Button
34 Brush Remove Indicator
35 Brush Install Button
36 Brush Install Indicator



FUNCTIONAL DESCRIPTION OF CONTROLS:

Solution Tank Fill (1) – Open to fill the solution tank, use non-foaming chemicals only. Capacity is 24 or 30 gallons (90 or 113 Liters) depending on model.
Recovery Tank & Cover (2) – Rear of tank is entry for waste water into tank. Capacity is 24 or 30 gallons (90 or 113 Liters) depending on model. Cover also houses float ball, which shuts off vacuum port to vac motor when tank is full.
Drive Paddle (3) – Located on top at the rear of the machine, the operator can make the machine go forward by pushing forward on it, or reverse by pulling backward on it. The speed is variable depending on how far forward or backward the paddle is moved. When the brush head is in the "DOWN" position, the brushes, vacuum and solution will operate when the drive is engaged in either direction, but will stop after the machine is stationary for 3 seconds.
Solution Drain Hose / Level Indicator (4) – Used to empty the solution tank and show current level of solution in tank, graduations are marked on the side of the solution tank next to the hose.
Recovery Drain Hose (5) – Used to empty the recovery tank.
Squeegee Adjustment Bolt (6) – Used to adjust the tilt of the squeegee. Turn bolt clockwise to tilt the squeegee backwards and counter-clockwise to tilt it forward.
Squeegee Blade Latch (7) – Holds rear squeegee blade and straps in place, release to replace rear blade.
Squeegee (8) – Picks up solution after scrubbing.
Battery Charger Connector (9) – Plug battery charger into this port to charge batteries.
Solution Flow Control Knob (10) – Turn this dial to the right to decrease solution flow to the floor. Turn to the left, to increase the amount of solution flow to the floor. When the Drive Paddle **(3)** is released from either forward or reverse travel, the solution flow will stop automatically, and resume when the drive is engaged.
Speed Limit Control Knob (11) – The Speed Limit Control Knob is used to adjust the maximum speed in both forward or reverse.
Wheel Drive Circuit Breaker (12) – Provides overload protection to machine's wheel drive motor. If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Control Circuit Circuit Breaker (13) – Provides overload protection. If it trips, it will pop out. To reset, wait one minute and press the button back in. If any breaker trips repeatedly, have the machine serviced.
Brush Deck (14) – Contains brush drive motors and brushes.
Operator Control Handle (15) – Operator holds onto this to control the machine.
Operator Hand Brake (16) – Use to prevent machine from rolling.

FUNCTIONAL DESCRIPTION OF CONTROL BUTTONS:

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

For most single-pass scrubbing operations, the operator should only need to use the middle three buttons on the control panel. These are the Scrub Mode Off, Normal Scrub, and Heavy Scrub buttons. For this reason these buttons are outlined in bright white on the control panel while the other buttons are outlined in gray.

Solution Button (23) - This button is used to select the mode of operation for the solution system. There are 3 modes of operation for this system. The modes are OFF, AUTO, MOMENTARY ON. Following is a description of each mode and how they are selected.
OFF MODE: In this mode the solution flow is turned off. As mentioned below, when a scrub mode is selected, the solution system will be placed in the AUTO mode. If it is desired to scrub without dispensing solution, the solution can be turned off by pressing this button.
AUTO MODE: This mode is automatically selected when a scrub mode is selected. In this mode the solution flow will be turned on whenever forward or reverse direction is selected via the Drive Paddle **(3)**. The solution flow will be turned off otherwise.
MOMENTARY ON MODE: This mode can only be selected when the scrub mode is OFF. Solution can be dispensed by pressing and holding the solution button. Solution will be dispensed for as long as the button is held. This is for pre-wetting the floor prior to scrubbing.
Vacuum Button (25) - This button is used to select the mode of operation for the vacuum/squeegee system. There are 3 modes of operation for this system. These modes are OFF, AUTO, ON. Following is a description of each mode and how they are selected.
OFF MODE: In this mode the vacuum is off and the squeegee is in the up position. As mentioned below, when a scrub mode is selected, the vacuum system will be placed in the AUTO mode. If it is desired to double-scrub (scrub without recovering the solution) the vacuum system can be turned off by pressing this button.
AUTO MODE: This mode is automatically selected when a scrub mode is selected. In this mode the squeegee will be in the down position unless the reverse direction is selected via the Drive Paddle. The vacuum will turn on if either direction is selected. While in this mode the vacuum will remain on for 10 seconds after the Drive Paddle returns to the neutral position. This is so that the solution in the squeegee and hose can be drawn into the tank. This mode can be selected independently of the scrub mode by pressing and releasing the vacuum button.
ON MODE: In this mode the squeegee will remain in the UP position and the vacuum will be on regardless of the Drive Paddle **(3)** position. This mode is selected by pressing and holding the Vacuum Button **(25)** for approximately 1.5 seconds. The vacuum mode must first be OFF before entering this mode. This mode is included in the event an external wand is to be used with this machine or if the operator wants to clean the squeegee using the vacuum hose.

KNOW YOUR MACHINE

Heavy Scrub Button (27) - Pressing the heavy scrub button will enable the scrub system and set the scrub pressure to the last selected value for the heavy scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number. Subsequent presses of the heavy scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the heavy scrub mode. Once the maximum value is reached the pressure setting will step back to (normal scrub limit + 1). The factory default maximum for the normal scrub mode is 9 (commercial) or 12 (industrial). The following will occur when this button is pressed:

- The scrub deck will be lowered
- The vacuum and solution systems will be enabled (vacuum and solution modes = AUTO)
- As soon as a direction is commanded by the Drive Paddle **(3)** (forward or reverse) the brushes will start turning and the vacuum will turn on.

Normal Scrub Button (29) - Pressing the normal scrub button will enable the scrub system and set the scrub pressure to the last selected value for the normal scrub mode. The status display will momentarily display the scrub pressure setting. This is indicated by "PA" followed by a number. Subsequent presses of the normal scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the normal scrub mode. Once the maximum value is reached the pressure setting will step back to 1. The factory default maximum for the normal scrub mode is 4. The following will occur when this button is pressed:

- The scrub deck will be lowered
- The vacuum and solution systems will be enabled (vacuum and solution modes = AUTO)
- As soon as a direction is commanded by the Drive Paddle **(3)** (forward or reverse) the brushes will start turning and the vacuum will turn on.

Scrub Off Button (31) - Pressing this button when the unit is in a scrub mode will cause the following to occur:

- The scrub brushes will turn off
- The scrub deck will raise to the UP position
- The solution flow will be stopped
- The first time that this button is pressed, the vacuum/squeegee system will NOT be turned off. This is so that any remaining water may be picked up without having to turn the vacuum back on. If this button is pressed a second time (pressed after the scrub mode has been turned off) the squeegee will raise and the vacuum will shut off after a 10 second delay.

Brush Remove Button (33) – To remove the brushes from the machine, have the machine stationary and the Brush Deck **(14)** in the "RAISED" position. The Brush Remove Indicator **(34)** will be yellow when it is okay to activate the remove feature, otherwise it will be off.

- Press and release the pad/brush remove button. The Brush Remove Indicator **(34)** will turn green to show that the remove process is activated.
- The scrub motor will run for a brief period and then stop abruptly. This should cause the pads/brushes to drop off of the drive lugs.

Brush Install Button (35) – Have the machine stationary and the Brush Deck **(14)** in the "RAISED" position. The Brush Install Indicator **(36)** will be yellow when it is okay to activate the install feature, otherwise it will be off.

- Place the pads/brushes under the scrub deck so that the pads/brushes are centered under the drive lugs.
- Press and release the pad/brush install button. The Brush Install Indicator **(36)** will turn green to show that the install process is activated.
- The scrub deck will lower and the scrub motors will run momentarily to engage the pads/brushes. If the pads/brushes do not engage fully, press and hold the install button to activate the scrub motors.
- To scrub, press either the Normal **(29)** or Heavy Scrub Button **(27)**.
- To raise the scrub deck, press the Scrub Off Button **(31)**.

DESCRIPTION OF INDICATORS ON THE CONTROL PANEL:

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

A steady red indicator means that the function is inhibited for some reason.

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

A yellow indicator means that the particular function has been enabled but is not currently on. For example, if a scrub mode is selected and the Drive Paddle **(3)** is in neutral, the scrub system, vacuum, and solution indicators will all be yellow indicating that the systems are enabled and ready to turn on when the Drive Paddle **(3)** is moved to forward or reverse.

A green indicator means that the particular system is on.

A flashing green indicator means that the particular system is in a delayed-off condition. An example of this is when a scrub mode is selected and the Drive Paddle **(3)** goes from forward or reverse to neutral. When this happens the vacuum indicator will flash green indicating that the vacuum is still on but that it will be turning off after the delay period.

Main Power Indicator (19):

- This indicator will be GREEN when the key switch is ON.
- This indicator will flash RED if there is a system fault that requires turning the Master ON/OFF Key Switch **(20)** off to reset.
- This indicator will flash fault codes from the Curtis Speed Control if a fault exists. This will be accompanied by an "Err03" indication on the Hourmeter/Status Display **(18)**.

DESCRIPTION OF INDICATORS ON THE CONTROL PANEL: (CONTINUED)

Solution System Indicator (21):

- This indicator will be YELLOW if the solution system is in the AUTO mode and the Drive Paddle **(3)** is in the neutral position. This indicates that the solution system is enabled but the solution flow is currently off.
- This indicator will be GREEN if the solution system is in the AUTO mode and the Drive Paddle **(3)** is in the forward or reverse position. It will also be GREEN if the solution system is in the MOMENTARY ON mode. This indicates that the solution flow is currently on.
- This indicator will be OFF if the solution system is in the OFF mode.

Solution System Fault Indicator (22):

- This indicator will flash red if there is a fault in the solution system. This will be accompanied by an error indication on the Hour Meter / Status Display **(18).**

Vacuum System Fault Indicator (24):

- This indicator will flash red if there is a fault in the vacuum or squeegee systems. This will be accompanied by an error indication on the Hour Meter / Status Display **(18).**
- This indicator will be RED and the Hour Meter / Status Display **(18)** will show "FULL" if the recovery tank float valve has closed. If this indication occurs and the tank is not full, see the Troubleshooting section.

Vacuum System Indicator (26):

- This indicator will be YELLOW if the vacuum/squeegee system is in the AUTO mode and the Drive Paddle **(3)** is in the neutral position. This indicates that the vacuum system is enabled but the vacuum is currently off.
- This indicator will be GREEN if the vacuum is currently on. This indicates that the system is in the AUTO mode and the Drive Paddle **(3)** is not in neutral or that the vacuum system is in the ON mode.
- This indicator will FLASH GREEN if the shutoff delay is keeping the vacuum on. This occurs if the vacuum system is in the AUTO mode and the Drive Paddle **(3)** goes to the neutral position. This will also occur if the vacuum system is turned off while it was in either the AUTO or ON modes. The shutoff delay will turn the vacuum off after the delay period.
- This indicator will be OFF if the vacuum/squeegee system is in the OFF mode.

Heavy Scrub Mode Indicator (28):

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

Normal Scrub Mode Indicator (30):

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

Scrub Mode Off Indicator (32):

- This indicator will be RED if the scrub system is inhibited for any reason. Possible reasons are:
- The scrub deck has not returned to the UP position.
- A system fault
- Low voltage condition
- This indicator will be GREEN if the system is ready to be placed in either the normal or heavy scrub modes.
- This indicator will be OFF if either the normal or heavy scrub modes have been selected.
- This indicator will flash RED if there is a fault in one of the scrub system components. This will be accompanied by an error indication on the Hour Meter / Status Display **(18)**.

Brush Remove Indicator (34):

- This indicator will be YELLOW when it is OK to activate the remove feature, otherwise it will be off.
- This indicator will be GREEN if the remove process is activated.

Brush Install Indicator (36):

- This indicator will be YELLOW when it is OK to activate the install feature, otherwise it will be off.
- This indicator will be GREEN if the install process is activated.

DESCRIPTION OF THE BATTERY CONDITION INDICATOR

Attention: See the Electrical System manual section for the explanation of the battery condition indicator lights.

DESCRIPTION OF THE HOURMETER/STATUS DISPLAY

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

- Error codes*
- Brush pressure adjustment setting for normal and heavy scrub modes
- Display of service test mode and control system default parameters*
- Recovery tank FULL indicator*

*NOTE: Reference (in the Electrical System) the Main Control Board Troubleshooting Guide and the Main Control Board Special Program Options sections. These sections will explain the machine error code descriptions and scrub system controller default parameter changes.

SOLUTION SYSTEM

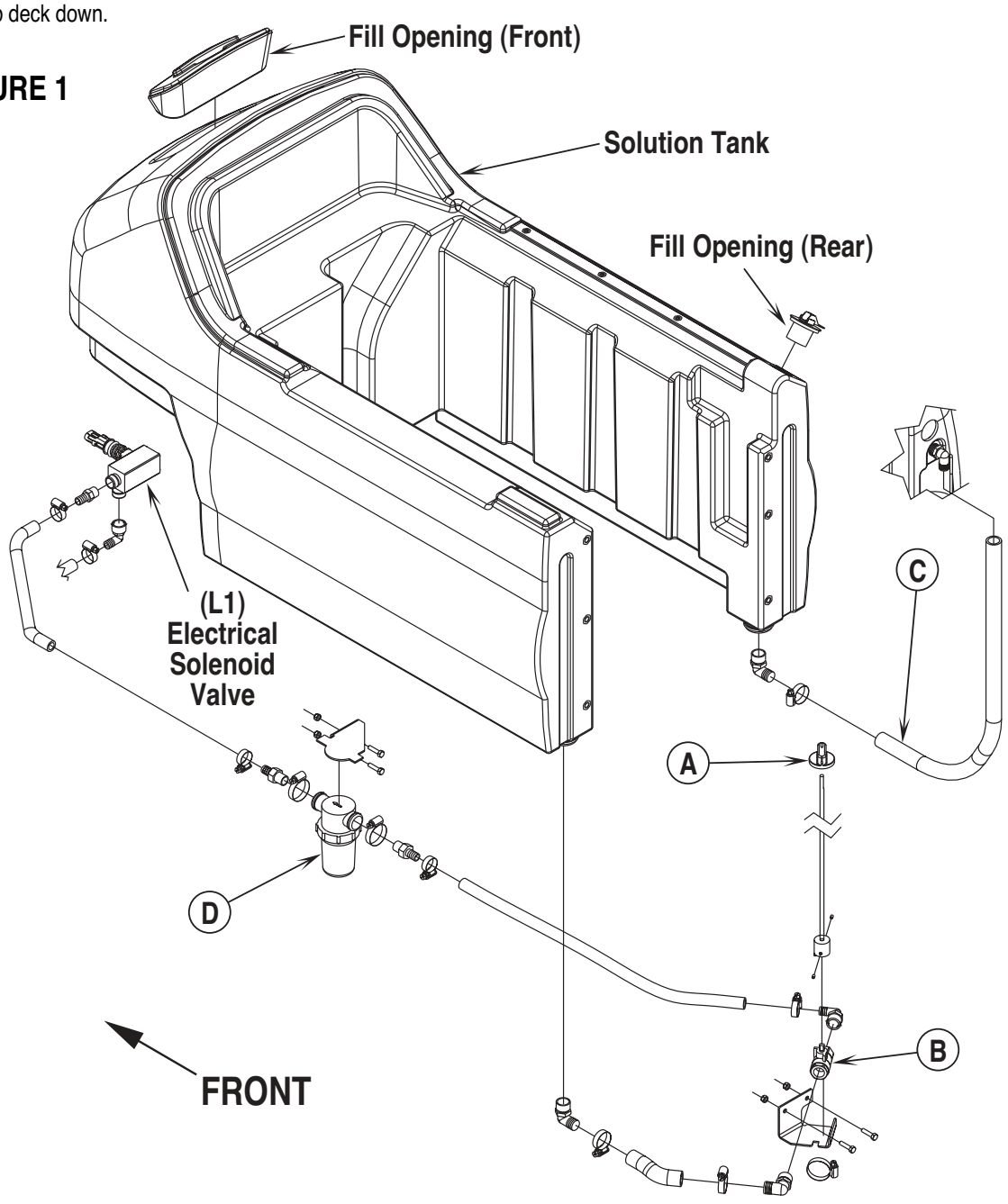
FUNCTIONAL OVERVIEW

The ConvertaMAX™ 28, I-MAX™ 28HD and BA 750/850 models have a solution tank fill capacity of 24-gallons (90 liters). The ConvertaMAX™ 34 and I-MAX™ 34HD models tank capacities are 30-gallons (114 liters). All models use two tank fill openings one located in the front and another in the rear, which offers ease of filling. Plumbed into the main solution control valve hose outlet is a serviceable solution filter, to keep debris from entering the solenoid valve. Also fitted to the tank is a flexible hose used to indicate the solution level and to drain the tank for system maintenance.

See Figure 1*. The solution system uses (2) valves to regulate the amount of solution dispensed onto the floor. The knob **(A)** located on the control panel operates the main solution valve **(B)** that controls the needed flow volume demand to the scrub brushes. The (L1) electrical solenoid valve stops and starts the solution flow to the scrub brushes. The electrical circuit that turns on (energizes) the solenoid coil is activated through the (A3) control panel switch buttons and the (A2) main controller assembly. Note: See the Know Your Machine section in this manual for a complete explanation of the solution operation modes.

During normal and heavy machine scrubbing the solution systems Auto Mode is selected and works in conjunction with the wheel drive speed controller and the (A2) main controller's scrub system outputs to turn On & Off the (L1) solenoid valve. The solution will flow to the scrub brushes when the main flow control valve is open, the scrub deck is lowered and the handle drive paddle (box) is pushed or pulled into Fwd or Rev. Note: When the solution On/Off button is turned Off, no flow can occur regardless of the manual flow control valve being On, drive control paddle activated and the scrub deck down.

FIGURE 1



***Note:** Figure 1 shows the solution components of the ConvertaMAX™ 28, I-MAX™ 28HD, BA 750 and BA 850 (old style). Similar components are found on the ConvertaMAX™ 34 and I-MAX™ 34HD.

TROUBLESHOOTING GUIDE

Problem	Possible Cause
Inadequate or no solution flow	No solution in the tank
	Main solution flow control valve knob is in the off position
	Clogged solution filter, valves and hoses
	Defective solution solenoid valve (L1)
	Solution system fault in the main controller A2*

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

SOLUTION SYSTEM MAINTENANCE

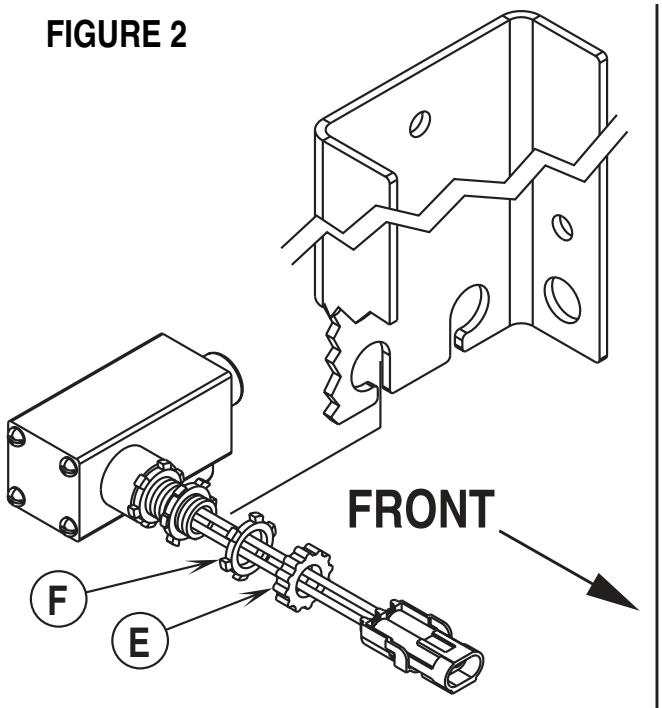
• **Solution Tank:** See Figure 1. Weekly empty the solution tank; remove the solution Drain Hose **(C)** from its storage area (located on the right rear control handle compartment). Direct the hose to a designated "Disposal Site" and flush the tank with clean water.

• **Solution Filter:** Remove and clean the inline Solution Filter **(D)**. To access the filter housing for removal, work underneath the middle left side chassis panel. No tools are needed to remove the filter (hand tighten only). **Service Tip:** The manual solution control knob must be placed in the full OFF position. This prevents loss of solution when servicing the filter strainer with a partial or full tank.

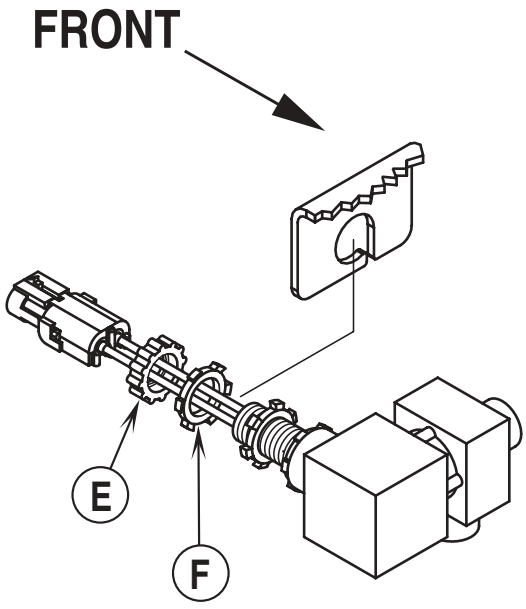
SOLENOID VALVE REMOVAL (BEFORE SN BREAK)**

1. Drain the solution tank, or put the flow control valve knob in the full off position to prevent solution loss.
2. Lower the brush deck to the floor with the scrub brushes installed. Don't turn the key switch off until disconnecting the battery pack connector. This procedure is done to prevent the scrub deck from automatically raising when the key is turned off.
3. Remove the front brush head shroud (held in place by 6 screws) and the right side scrub brush skirt assembly from the machine.
4. Disconnect the solenoid wire assembly pig tail connector. Unplug the solenoid valve wire assembly connection from the machine harness.
5. Loosen the two hose clamps and separate both solution hoses at the solenoid valve body.
6. See Figure 2. Remove the Insulated Bushing **(E)** from the valve body nipple, then remove the **(F)** Conduit Anchor Connector from the nipple as shown.
7. Pull the valve body to the rear and guide the coil wires through the slot in the mount bracket to complete removal. Make service repairs and re-install in reverse order.

FIGURE 2



ConvertaMAX™ 28, I-MAX™ 28HD, BA 750 and BA 850



ConvertaMAX™ 34 and I-MAX™ 34HD

**Note: Follow these instructions for machines before these serial numbers. ConvertaMAX™ 28 – 1520376, I-MAX™ 28HD – 1516325, BA 750 – 1516328, BA 850 – 1516334, ConvertaMAX™ 34 – 1521967, I-MAX™ 34HD – 1517856.

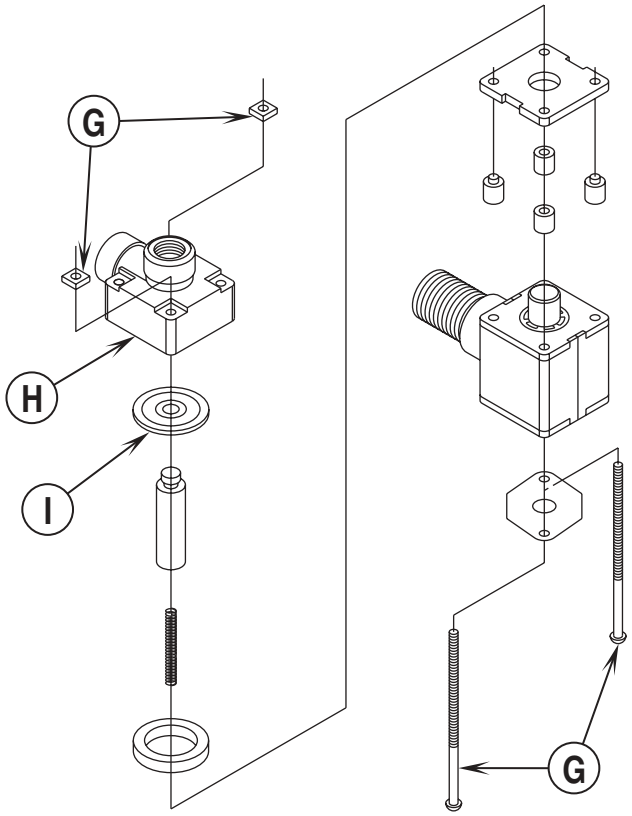
SOLUTION SYSTEM

SOLENOID VALVE DISASSEMBLY AND CLEANING (BEFORE SN BREAK)*

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

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

FIGURE 3



SOLUTION FILTER REMOVAL (BEFORE SN BREAK)*

1 Drain the solution tank using the solution drain hose or put the flow control valve knob in the full off position to prevent solution loss.
2 See Figure 4A or 4B. Loosen the (2) Hose Clamps **(J)** and pry off both the solution hoses (inlet & outlet) from the filter head barb fittings.
3 Loosen the (2) Hose Clamps **(K)** and separate the filter housing from the filter mounting bracket tabs.

SOLUTION FLOW CONTROL VALVE REMOVAL (BEFORE SN BREAK)*

1 Drain the solution tank using the drain hose.
2 See Figure 4A or 4B. Loosen the (2) Hose Clamps **(L)** & **(M)** and pry off both solution hoses (inlet & outlet) from the shut off valve.
3 Remove the (2) Set Screws **(N)** from the adjustment rod connection Adapter **(O)**.
4 Remove the (2) Nuts **(P)** & Screws **(Q)** that secure the Valve Mount Bracket **(R)** then separate the valve from the rod connection and remove the bracket and valve from the machine.
5 With the valve and bracket removed loosen the Hose Clamp(s) **(S)** and remove the valve from the mount bracket.

*Note: Follow these instructions for machines before these serial numbers. ConvertaMAX™ 28 – 1520376, I-MAX™ 28HD – 1516325, BA 750 – 1516328, BA 850 – 1516334, ConvertaMAX™ 34 – 1521967, I-MAX™ 34HD – 1517856.

FIGURE 4A ConvertaMAX™ 28, I-MAX™ 28HD, BA 750 & BA 850

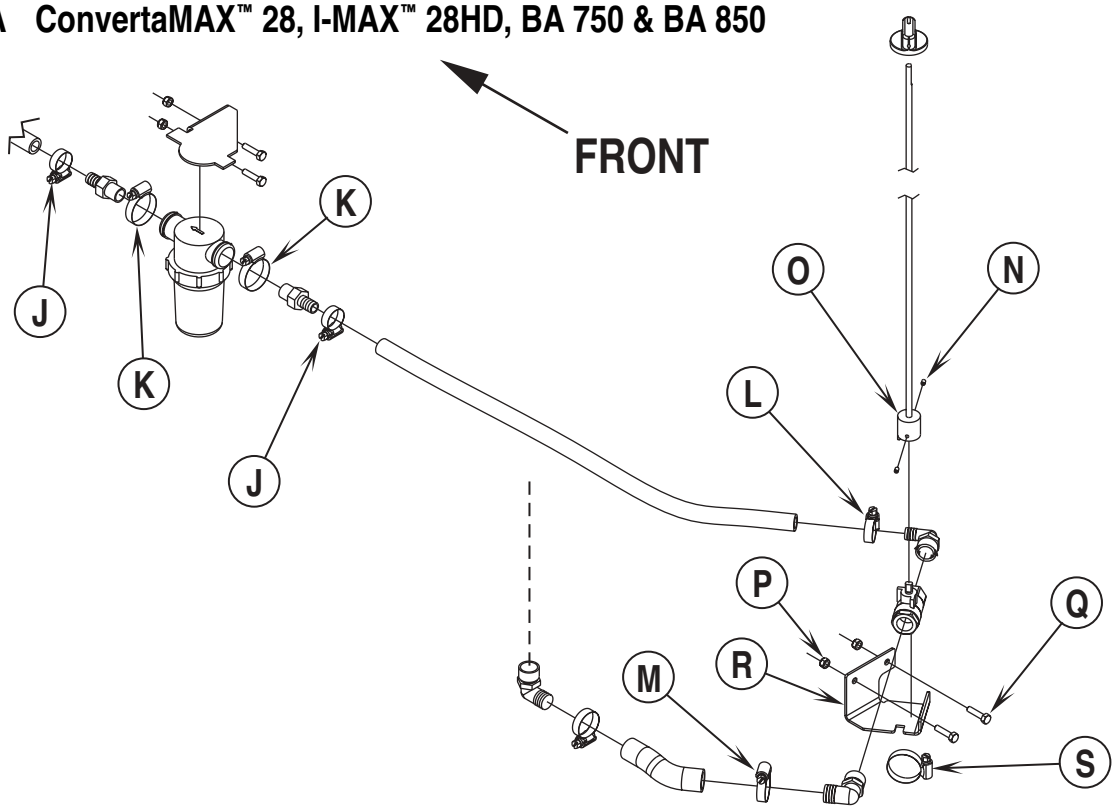
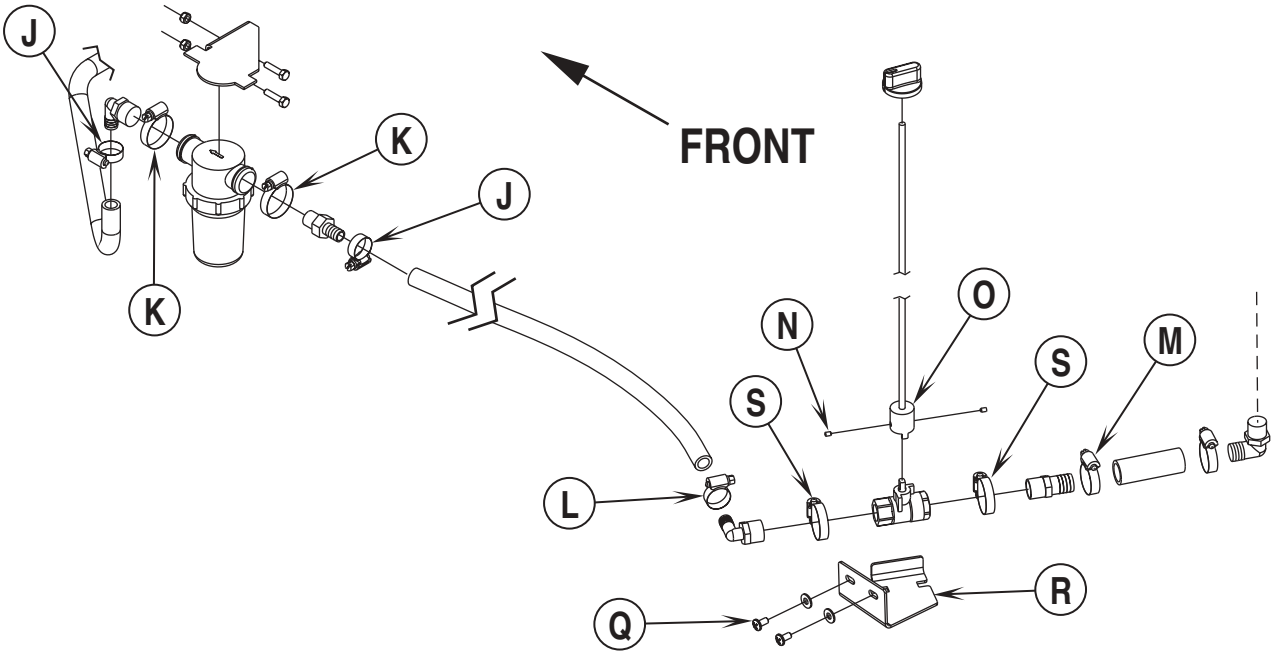


FIGURE 4B ConvertaMAX™ 34 & I-MAX™ 34HD



SOLUTION SYSTEM

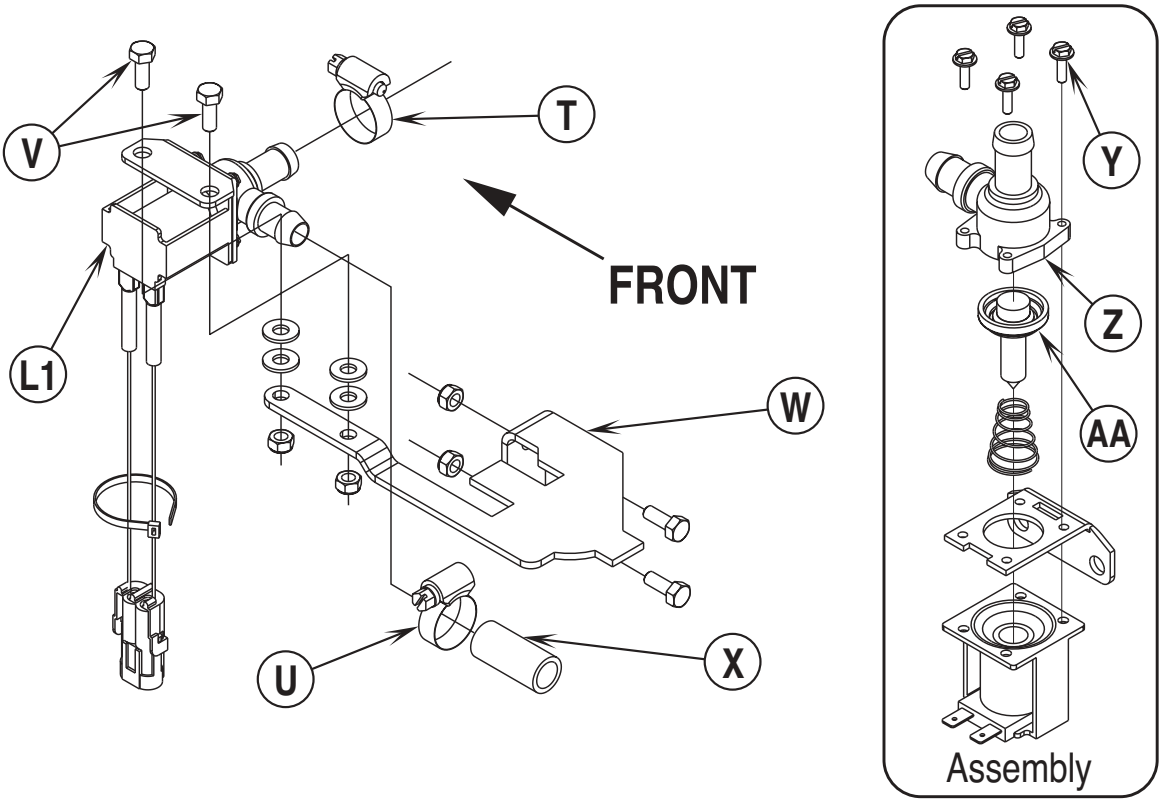
SOLENOID VALVE REMOVAL (AFTER SN BREAK)**

1 Drain the solution tank or put the Flow Control Valve Knob **(A)** (shown in Figure 1) in the full off position to prevent solution loss.
2 Remove the lower left side chassis panel (held in place by 3 screws) and the left side scrub brush skirt assembly from the machine.
3 See Figure 5. Unplug the L1 solenoid valve wire assembly connection from the machine harness.
4 Loosen both the inlet and outlet Hose Clamps **(T)** and **(U)** that secure the hoses to the valve body.
5 Separate (pry) the solution outlet hose off from its valve body barbed fitting.
6 Remove the (2) Hex Screws **(V)** that secure the valve to the Mount Bracket **(W)**, then pull the valve body to the front separating it from the solution inlet Hose **(X)**, completing the part removal.

SOLENOID VALVE DISASSEMBLY AND CLEANING (AFTER SN BREAK)**

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

FIGURE 5



SOLUTION FILTER REMOVAL (AFTER SN BREAK)**

1 Drain the solution tank using the solution drain hose or put the flow control valve knob in the full off position to prevent solution loss.
2 See Figure 6A or 6B. Loosen the (2) Hose Clamps **(BB)** and pry off the inlet solution hose from the filter head hose barb fitting.
3 Remove the (2) Hose Clamps **(CC)** that secure the filter housing to the Mount Bracket **(W)**, then pull the valve body to the rear separating it from the solution outlet hose, completing the part removal.

**Note: Follow these instructions for machines with these serial numbers and after. ConvertaMAX™ 28 – 1520376, I-MAX™ 28HD – 1516325, BA 750 – 1516328, BA 850 – 1516334, ConvertaMAX™ 34 – 1521967, I-MAX™ 34HD – 1517856.

SOLUTION FLOW CONTROL VALVE REMOVAL (AFTER SN BREAK)**

1 Drain the solution tank using the drain hose.
2 See Figure 6A or 6B. Loosen the (2) Hose Clamps **(DD)** and **(EE)** and pry off inlet solution Hose **(FF)** from the flow control valve.
3 Remove the Philips head Screw **(GG)** (using a short handled screwdriver) that secures the operator solution adjustment rod **(HH)** to the ball valve arm and separate.
4 Remove the (2) Nuts **(II)** & Screws **(JJ)** that secure the valve Mount Bracket **(KK)** to the chassis. Then pull the valve and bracket to the rear separating the valve from the solution outlet Hose **(LL)**, completing the part removal.

FIGURE 6A ConvertaMAX™ 28, I-MAX™ 28HD, BA 750 & BA 850

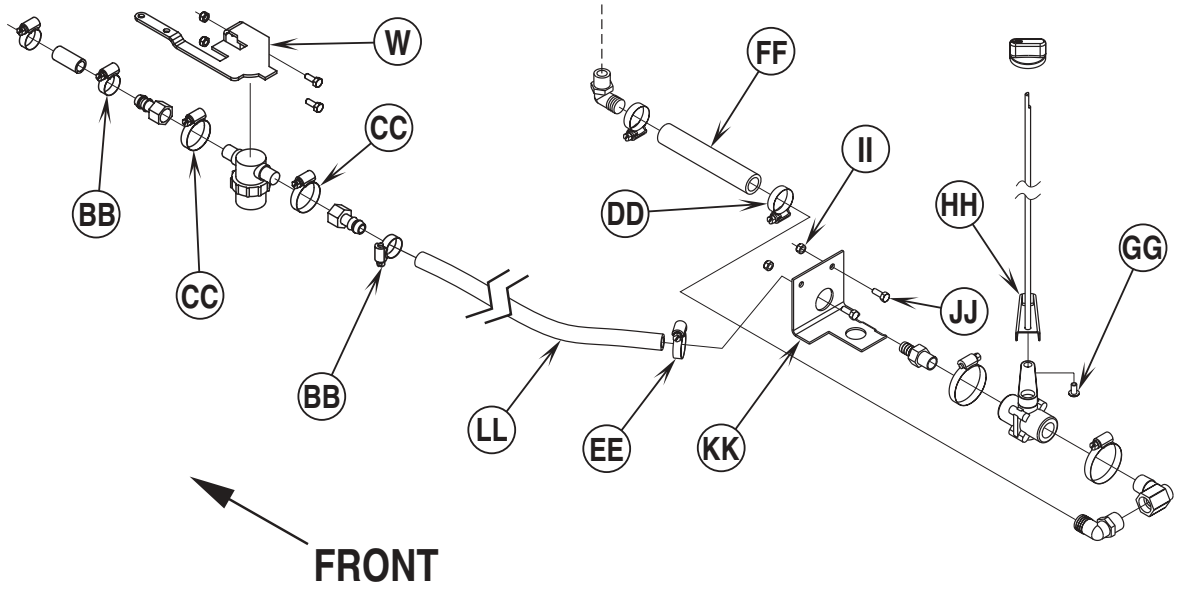
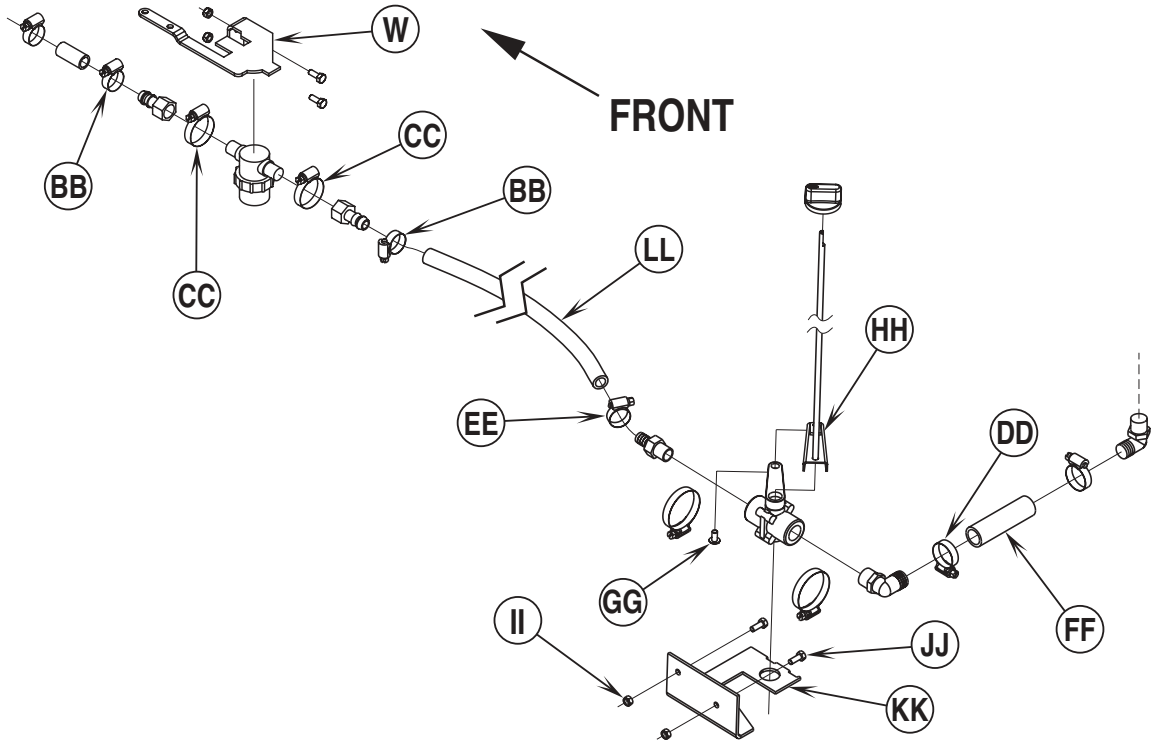


FIGURE 6B ConvertaMAX™ 34 & I-MAX™ 34HD



**Note: Follow these instructions for machines with these serial numbers and after. ConvertaMAX™ 28 – 1520376, I-MAX™ 28HD – 1516325, BA 750 – 1516328, BA 850 – 1516334, ConvertaMAX™ 34 – 1521967, I-MAX™ 34HD – 1517856.

SCRUB BRUSH SYSTEM

GENERAL BRUSH SYSTEM FUNCTIONAL OVERVIEW

Two permanent magnet DC motor/gear units drive all machine models' scrub brushes. The C-Max 28, BA750&850 models use 3/4HP 24V motors and the I-Max 28HD uses 1HP 24V motors. The larger C-Max 34 model uses 3/4HP 36V motors and the heavy duty I-Max uses 1 HP 36V motors. The scrub deck on all models is raised and lowered automatically using a vertically mounted lift motor actuator assembly. When in the normal or heavy scrub mode(s) the operator can change the amount of scrub 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.

The machines' main scrub system input and output operating functions are regulated (managed) by the control board assembly A2. The major scrub system functions are…

• Scrub Brush Install and Remove Functions

Overview of the scrub brush install circuit function. See Figure 1. Press and release the Brush Install Button **(35)**, input for the main control board A2 (wire color Orn/Vio at the J4 Control board connector). This activates an internal relay that turns on the M1 brush lift actuator motor for a specified run time (output). This lowers the brush deck onto the top of the brushes. The next step is triggered automatically when the lift motor run time ends (stops) this momentarily energizes the brush motor solenoid K2 (control board output wire colors Wht/Brn (J1) and wire Vio/Blk (J2). This causes the brush motors M4 & M5 to run a short time to complete the brush installation function.

Overview of the scrub brush remove circuit function. Press and release the Brush Remove Button **(33)**, input for the main control board A2 (wire color Wht/Org at the J4 control board connector). This activates a control board internal relay output that energizes the K3 brush remove relay coil (wires Wht/Brn (J1) and wire Brn/Yel (J2). With the K3 relay contact closed a control board timer output turns on momentarily the K2 brush solenoid to run the brush motors. The next step is the turning off of the K2 solenoid and the connection of the battery ground circuit through the bottom normally closed K2 contacts. With two negative voltage inputs at the brush motors it causes the motors to stop abruptly where the brush inertia easily spins the bushes off the motor drive disc lugs.

• Low Voltage Cut-Out Function

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

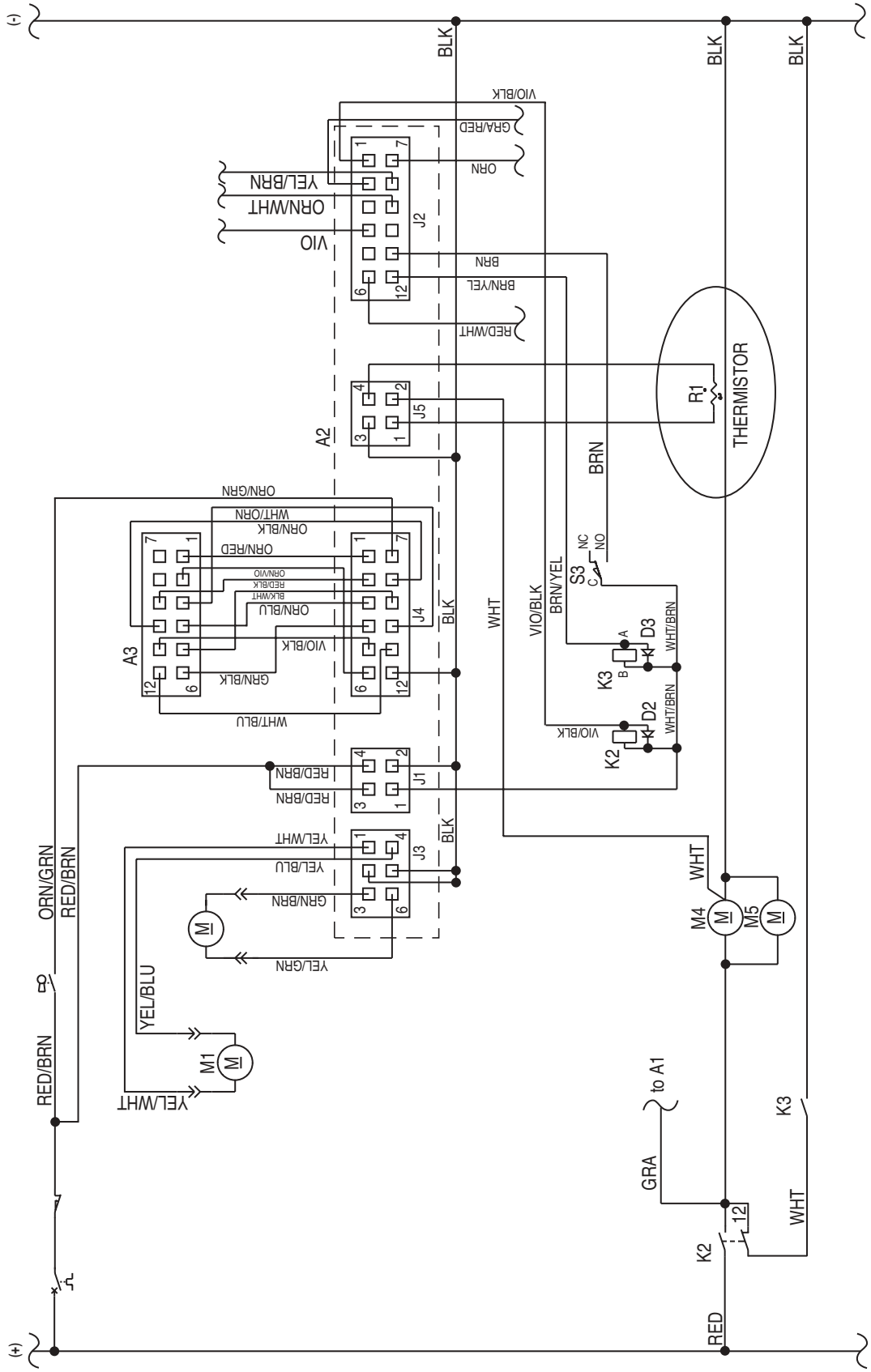
• Scrub Brush Motor Run Function

To turn On (energize) the K2 brush motor solenoid either the normal or heavy scrub buttons must be pressed and the drive paddle moved off its neutral position. These two operator functions deliver the required control board circuit inputs. The control board A2 circuit outputs at J1 Wht/Brn (positive wire) and J2 Vio/Blk (negative wire) energizes, completes the K2 coil circuit. This pulls in the upper solenoid load contact (normally open) making the scrub brush motors M4 & M5 run.

• Scrub Brush Actuator Lift Motor Function

The control board outputs activate (raise and lower) the scrub-deck for installing, removing and controlling the scrub brushes at the selected proper current load. A thermistor monitors the motor current, the voltage drop across the negative cable is monitored. The thermistor is used to compensate for changes in the cable resistance as the temperature of the cable changes. When the controller senses a current draw out of the desired range it automatically turns on the M1 actuator motor to raise or lower the scrub deck. This process is on going in maintaining the current loads and operating brush working pressure.

FIGURE 1


(-)
BLK
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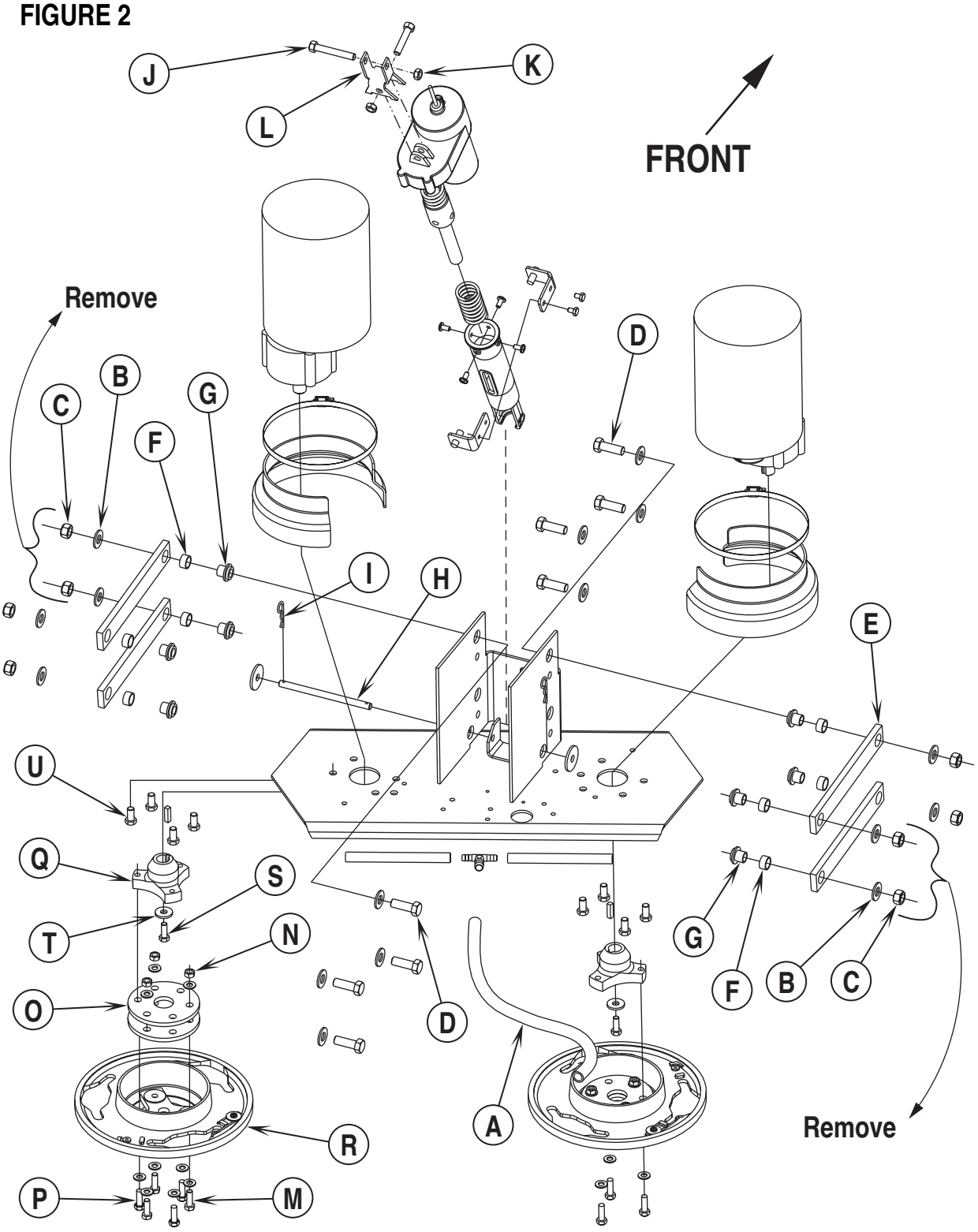
BLK
VIO/BLK
GRA/RED
ORN
YEL/BRN
ORN/WHT
VIO
J2
BRN
BRN/YEL
RED/WHT
R1
THERMISTOR
J5
A2
BRN
ORN/GRN
WHT/ORN
ORN/BLK
ORN/RED
ORN/VIO
RED/BLK
BLK/WHT
ORN/BLU
VIO/BLK
GRN/BLK
J4
A3
BLK
WHT
VIO/BLK
BRN/YEL
S3
NC
NO
C
D3
WHT/BRN
K3
D2
WHT/BRN
K2
WHT/BLU
RED/BRN
RED/BRN
J1
YEL/WHT
YEL/BLU
GRN/BRN
J3
BLK
WHT
M4
M5
ORN/GRN
RED/BRN
YEL/BLU
M1
YEL/WHT
YEL/GRN
to A1
GRA
K3
WHT
K2
12
RED
(+)

SCRUB BRUSH SYSTEM

SCRUB BRUSH SYSTEM TROUBLESHOOTING

The scrub system's major electrical components are monitored by the main controller to detect any system function failures (error codes). The system components covered are the brush motors, brush solenoid and brush lift actuator motor. 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



Note: Figure 2 shows the scrub brush components of the ConvertaMAX™ 28, I-MAX™ 28HD, and BA 750. Similar components are found on the ConvertaMAX™ 34, I-MAX™ 34HD, and BA 850.

28/34 BRUSH DECK REMOVAL

1 Follow steps 1-4 in the Scrub Brush Lift Actuator Removal section to separate the lower actuator mounting point.
2 Remove the left side chassis panel from the machine (3-4 screws).
3 Remove the Solution Hose **(A)** from the outlet barb at the solenoid valve.
4 Remove the (4) sets of hardware items **(B)**, **(C)** & **(D)** from the deck Lift Arms **(E)** (two hardware groupings from the left front and two from right rear) as shown. Note: Don't lose the Bearing Sleeve **(F)** and Bushing **(G)** insert in the ends of the lift support arms.
5 Pull the scrub deck forward 12 inches (30 cm) to access the motor wiring terminal block.
6 Remove the motor wiring at the terminal block and then pull the brush head assembly completely from the machine. Note: See Figure 3 for the correct wiring illustration for rewiring each model.

SCRUB BRUSH LIFT ACTUATOR REMOVAL

• Choose either Method A or Method B to remove the scrub brush lift actuator.

Method A (using the service test mode instructions)

1 Remove the front scrub deck shroud (6 screws).
2 With scrub brushes installed and the brush deck in the up (storage) position enter the main controller diagnostic service test mode. See the Service Test Mode section in the Electrical System for instructions follow steps 1-5.
3 See the Know Your Machine section control panel drawing. When in the service test mode press the Normal Scrub Button **29** once to start the actuator motor down (off its up limit) then push it a second time (1 to 2 seconds after activating the motor) to stop it.
4 Next press the Brush Install Button **35** to momentarily turn on (jog) the actuator output (down) to a position where the bottom deck Actuator Pin **(H)** is loose (see Figure 2). Remove the Cotter Pin **(I)** from the lower Actuator Pin **(H)** and pull the pin from the mount bracket.
5 Disconnect the actuator motor wiring harness pig tail connector.
6 Remove the Hex Screw **(J)** and Nut **(K)** that secures the upper Actuator Yoke **(L)** at the frame mount.
7 Tilt the motor assembly to the rear then maneuver the actuator out of the machine from the front of the brush deck.
8 See ***Important Service Note** below.

Method B (using the external cord adapter)

1 Remove the front scrub deck shroud (6 screws).
2 With scrub brushes installed and the brush deck in the up (storage) position disconnect the actuator motor wiring harness pig tail connector.
3 Next connect the Nilfisk-Advance actuator power cord adapter (PN 56407502) to the machine's battery pack and lift actuator motor pig tail connector.
4 Press the cord adapter rocker switch to momentarily run (jog) the actuator out put (up and down) to a position where the bottom deck Actuator Pin **(H)** is loose (see Figure 2). Remove the Cotter Pin **(I)** from the lower Actuator Pin **(H)** and pull the pin from the mount bracket.
5 Remove the Hex Screw **(J)** and Nut **(K)** that secures the upper Actuator Yoke **(L)** at the frame mount.
6 Tilt the motor assembly to the rear then maneuver the actuator out of the machine from the front of the brush deck.
7 See ***Important Service Note** below.

Note: If the lift actuator motor will not run it will be necessary to jack up the front of the machine or shim up the brush deck to remove the weight on the lower deck Actuator Pin **(H)** to remove.

***Important Service Note:** After removing any actuator motor and before installing a new motor or drive nut the IN and OUT limit switches must be set (or checked) to their correct specifications. Reference the Electrical System in this manual for the Actuator Drive Nut Adjustment and follow these instructions before replacing the actuator motor.

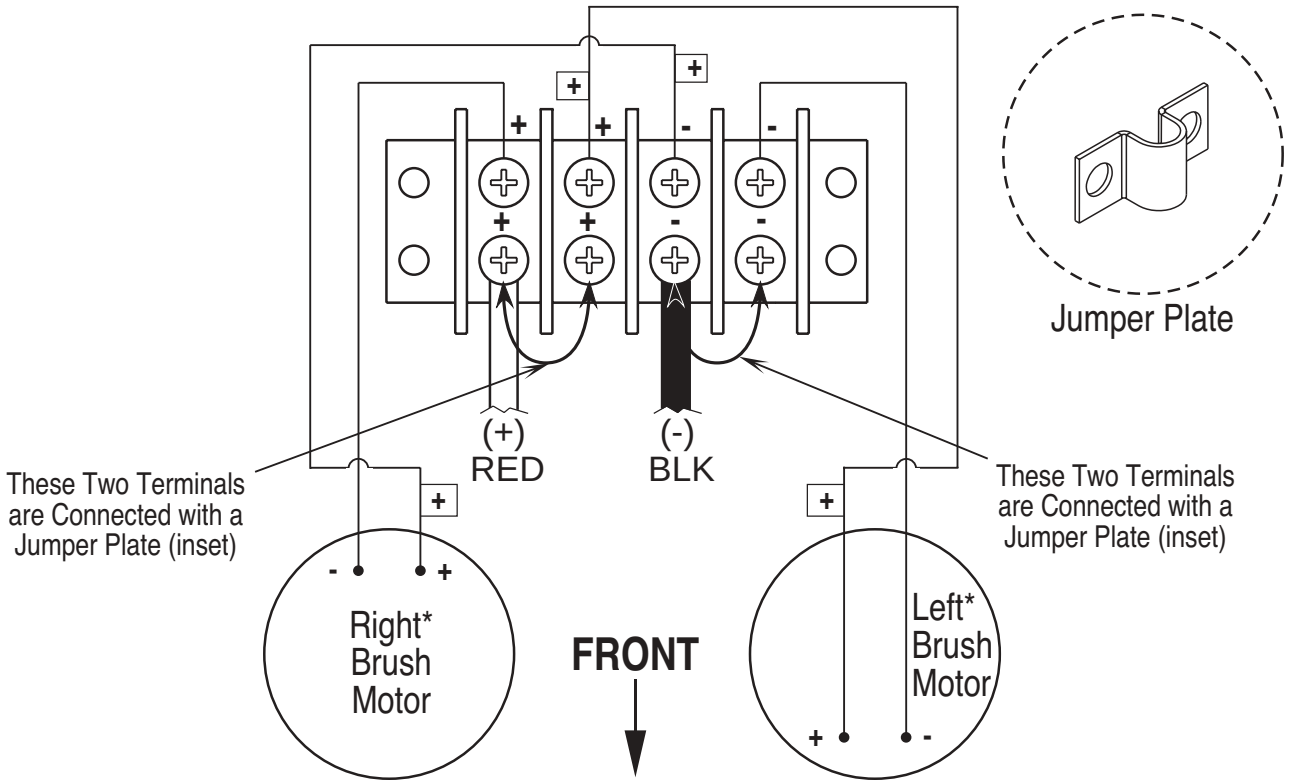
After setting the correct actuator nut adjustments for the scrub brush lift motor, follow removal steps in reverse order to reassemble.

SCRUB BRUSH MOTOR/GEARBOX REMOVAL

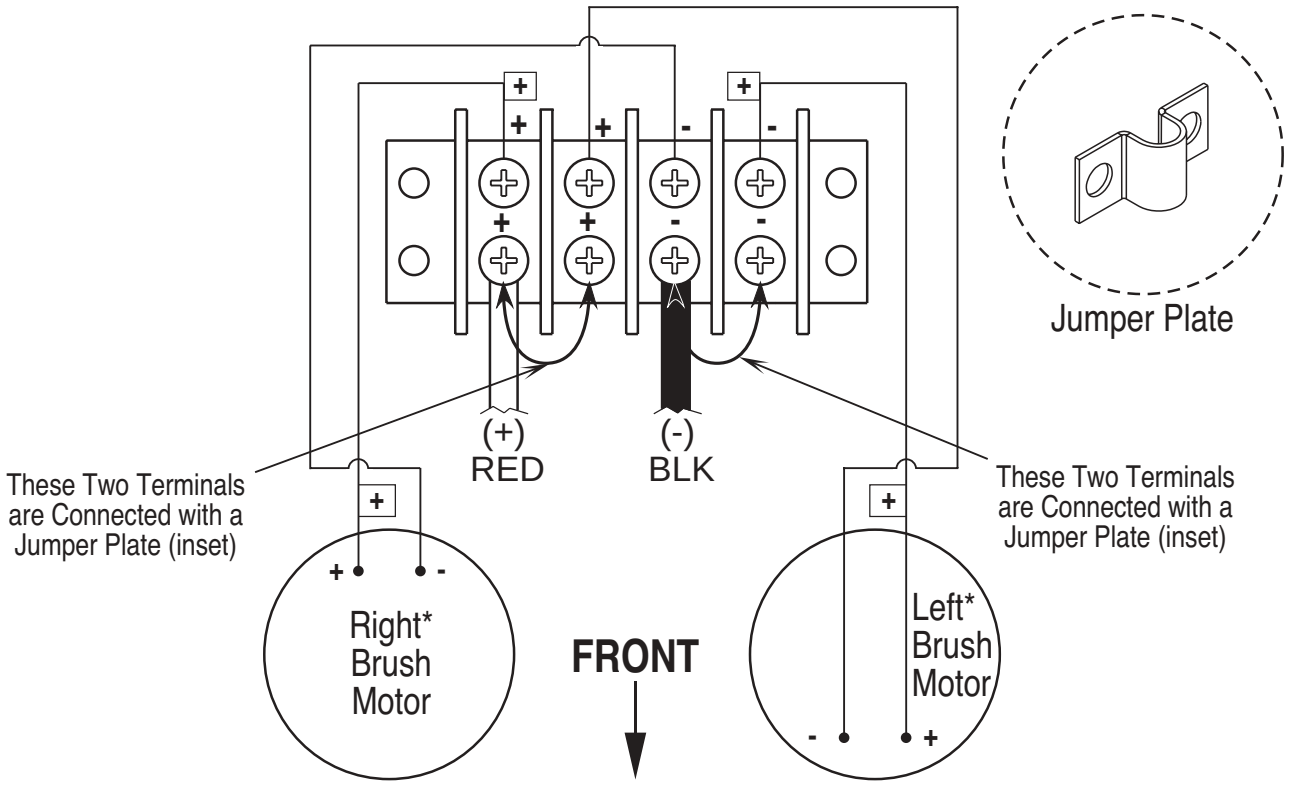
1 Follow steps 1-6 in the 28/34 Brush Deck Removal section.
2 Turn the brush deck on its side.
3 Remove the scrub brushes from the brush holders then mark the location of the motor to the brush deck for proper re-assembly.
4 See Figure 2. Remove the (3) **(M)** Hex Screws and (3) **(N)** Nuts from each Flexible Coupler **(O)**.
5 Next remove the (3) Hex Lock Screws **(P)** that connect the coupler to the Drive Hubs **(Q)** and remove the brush holder(s) **(R)**.
6 Remove the hardware items **(S & T)** that secure the Hub **(Q)** to the output shaft on each gearbox. Then pull the hub from the shaft and save the key.
7 Remove the (4) **(U)** Screws and separate the motor/gearbox assembly from the scrub deck that needs replacement.
8 Re-assemble in reverse order and test for proper operation. Note: Apply a small amount of grease or a product called "Never Seize" to the gearbox output shaft when reinstalling the Drive Hub(s) **(Q)**.

SCRUB BRUSH SYSTEM

FIGURE 3



Motor wiring for: ConvertaMAX™ 28, BA 750, BA 850, ConvertaMAX™ 34 and I-MAX™ 34HD
*Right and left are identified as seen from the rear of the machine.



Motor wiring for: I-MAX™ 28HD
*Right and left are identified as seen from the rear of the machine.

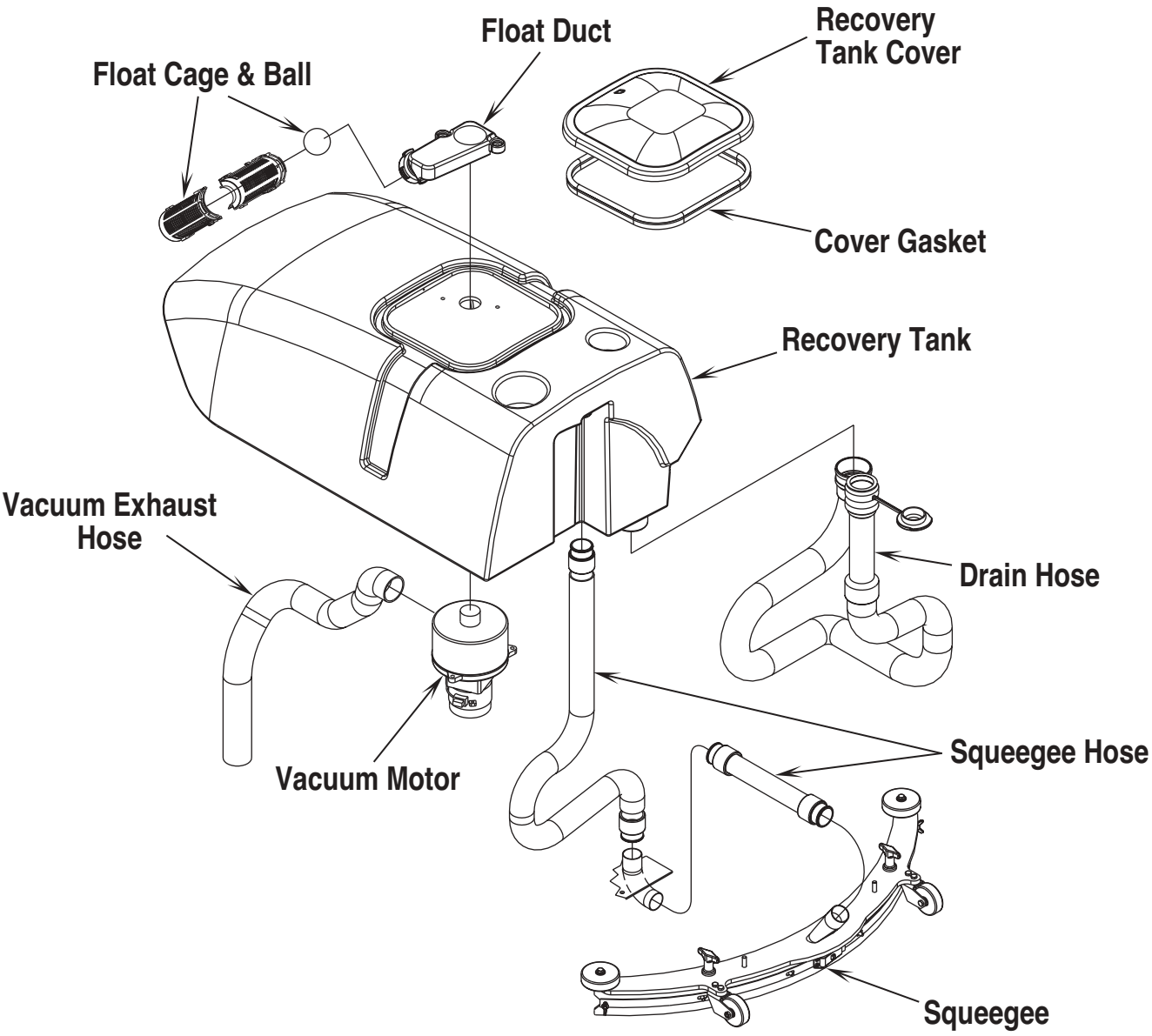
FUNCTIONAL OVERVIEW

Vacuum / Recovery System General

Dirt and water are lifted off the floor into the recovery tank by airflow, created by a 3-Stage 24V or 36V vacuum motor. The wastewater and air enter the vacuum system at the squeegee tool, through small openings (notches) located in the front squeegee blade. The small openings are the entrance points for the water and air, and help speed up the airflow producing the suction to lift the wastewater off of the floor. The air and wastewater move through the squeegee hose at high speed until it reaches the recovery tank. There the air slows down because of the increased volume (large size) of tank. With the decreased air speed the heavier water falls to the bottom of the recovery tank. Then at the same time the airflow continues through the tank, shutoff float, vacuum motor and is exhausted out of the vacuum exhaust hose. No wastewater ever actually moves through the vacuum motor, just clean air.

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

FIGURE 1



Note: Figure 1 shows the vacuum recovery components of the ConvertaMAX™ 28, I-MAX™ 28, and BA 750. Similar components are found on the ConvertaMAX™ 34, I-MAX™ 34, and BA 850. New models use one squeegee hose.

RECOVERY SYSTEM

VACUUM / RECOVERY SYSTEM SERVICE MAINTENANCE CHECKLIST

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

- ☐ Clean built-up dirt from the inside of the squeegee tool.
- ☐ Replace the squeegee blades if they are nicked or torn.
- ☐ Inspect the two hoses between the squeegee tool and the recovery tank, rinse any built-up dirt from the hoses. Replace the hoses if they are kinked or damaged.
- ☐ Inspect and make sure the gasket on the recovery tank cover is sealing and not damaged.
- ☐ Inspect and clean the vacuum motor float cage.
- ☐ Make sure that the recovery tank drain hose and 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 section of this manual for specific fault descriptions and service repair actions.

MAINTENANCE OF FLOAT CAGE AND FLOAT DUCT

1. See Figure 2. Open the recovery tank dome lid and lay it to the side, remove the two **(A)** Screws and pull the Float Duct **(B)** and float cage assembly **(C)** from vac motor spacer **(D)**.
2. Snap apart the two float cage halves **(C)** and flush clean the float ball and cage pieces.
3. Inspect the Gasket **(E)** and clean any debris from the inside of the float duct housing. Then re-install all parts in reverse order.

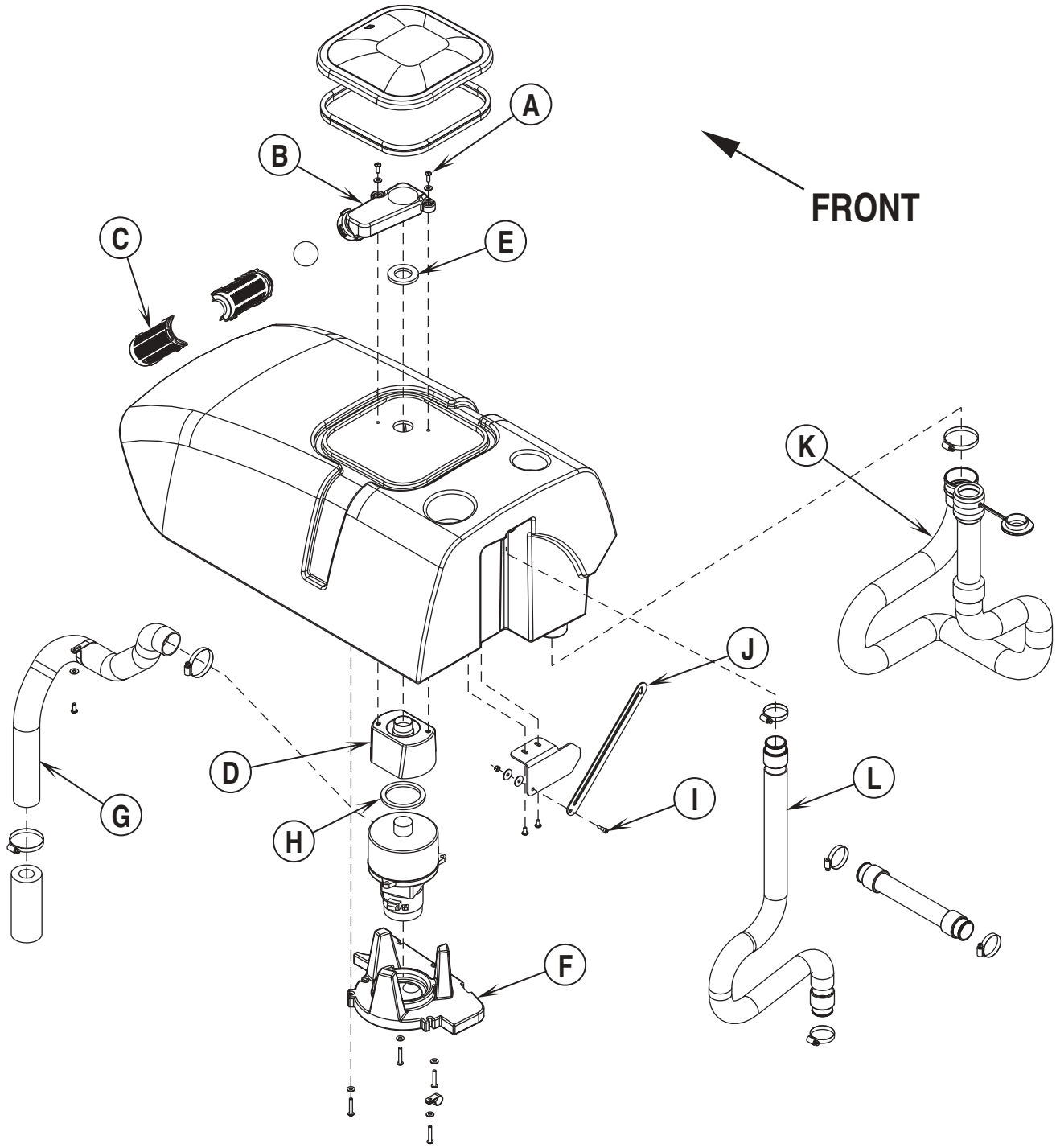
VACUUM MOTOR REMOVAL

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

RECOVERY TANK REMOVAL

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

FIGURE 2



SQUEEGEE SYSTEM

SQUEEGEE SYSTEM LIFT MOTOR OVERVIEW

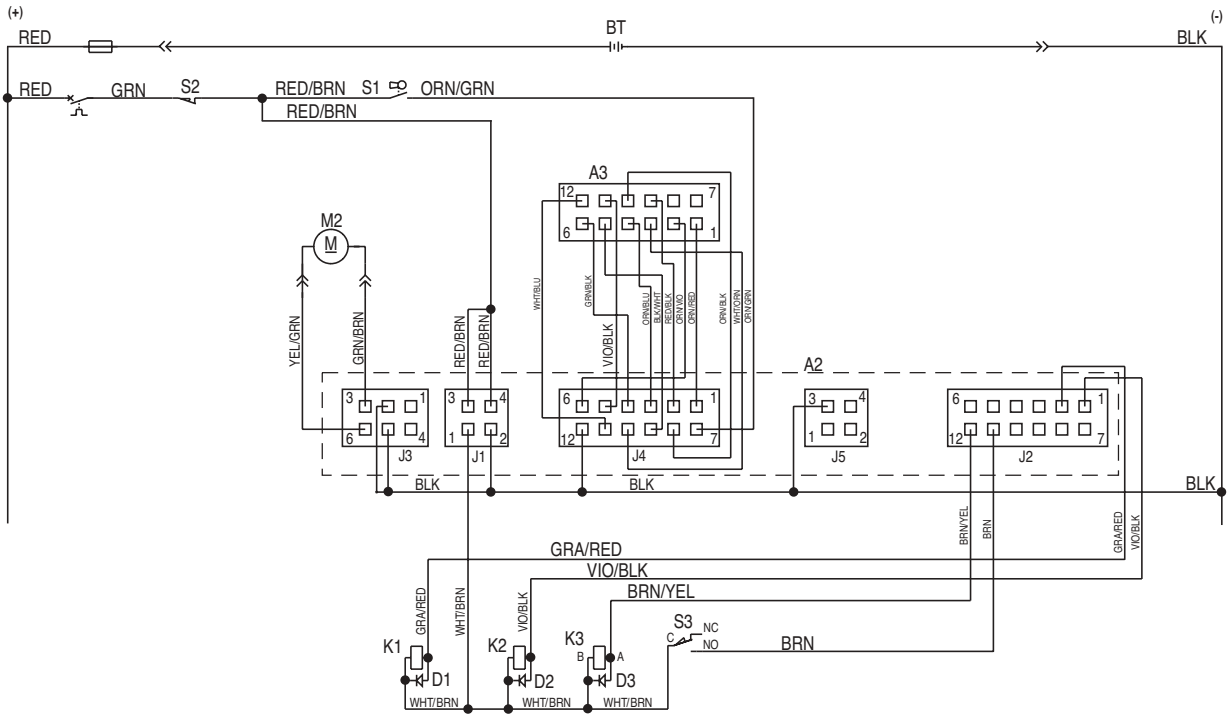
All machine models' squeegee pickup tools are raised and lowered by either a 24V or 36V actuator motor assembly mounted in the rear control handle housing. The control board assembly A2 regulates the machine's squeegee tool system input and output operating functions. Pressing the vacuum button located on the control panel activates the vacuum/squeegee circuit. 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

See Figure 1 and 3. During normal or heavy scrubbing the squeegee operates in the auto mode. To prevent squeegee blade damage and excessive wear the squeegee tool is automatically lifted from the floor any time the machine is operated in reverse. To get the squeegee tool to lift in reverse the S3 reverse switch (located in the drive paddle housing) must be closed by pulling the operator drive paddle backwards. This is done by having the switch arm compressed by striking the cam plate when pulling the operator drive paddle backwards.

The positive output voltage from the S3 reverse switch NO (normally open) terminal connection delivers the required A2 board input at the J2 connector (pin #11 Brn wire). This activates an internal relay that outputs the correct voltage polarity for the M2 squeegee lift motor to run a specified time (output from J3). This raises the squeegee off the floor to the back up position, which is half of the normal distance observed when in the machine scrub off mode. Moving the drive paddle back to the neutral/forward position opens the S3 switch and the A2 control board loses its input voltage signal. The J3 connector output reverses the polarity and lowers the tool back onto the floor.

FIGURE 1



Electrical Diagram

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

REVERSE SWITCH INSTALLATION AND ADJUSTMENT

1 Loosely install the S3 reverse switch to the drive paddle mount bracket then connect the wires as shown (see Figure 3).

2 Next position the Cam Controller **(A)** to where the switch arm just makes contact at the base of the cam controller ramp angle as shown. Note: The correct switch installation is where the switch arm is not compressed and is in its normally closed position.

Enter the main controller diagnostic service test mode to observe certain battery gauge indicator lights. See the Service Test Mode section in the Electrical System and follow steps 1-5.

The need to enter the service test mode is used to monitor (verify) the correct wheel drive and main control board's inputs and outputs in relationship to their proper operating sequence. Below is the proper test procedure and adjustment instructions to follow for attaining the proper operation of the squeegee reverse raising and lowering function.

⚠ CAUTION!

When making adjustments to the throttle assembly be careful not to move the throttle abruptly as the machine may move unexpectedly. Always make throttle assembly adjustments with plenty of room around the machine in case the machine moves unexpectedly.

See Figures 2 & 3. To test, slowly move the throttle paddle in the reverse direction (from neutral) the yellow indicator (2) should always light before the green indicator (3). Also, the green indicator (3) should light before the machine starts to creep. Both indicators should be off when the throttle is in neutral and only the yellow indicator (2) should illuminate when the throttle is moved in the forward direction.

If the indicators do not function as described above, the reverse switch actuator cam should be adjusted. If the green indicator (3) lights before or at the same time as the yellow indicator (2), the cam must be moved down. If the machine begins to creep before the green indicator (3) lights, the cam must be moved up.

Note: Press on center of paddle assembly when cover is off for the above test. Pressing on either side causes plastic to twist and give false indications.

FIGURE 2

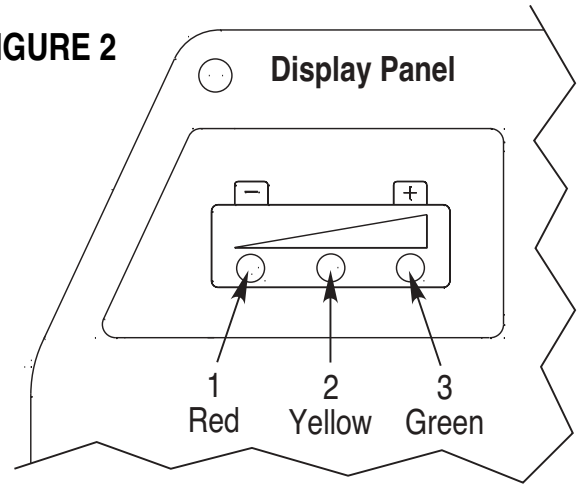
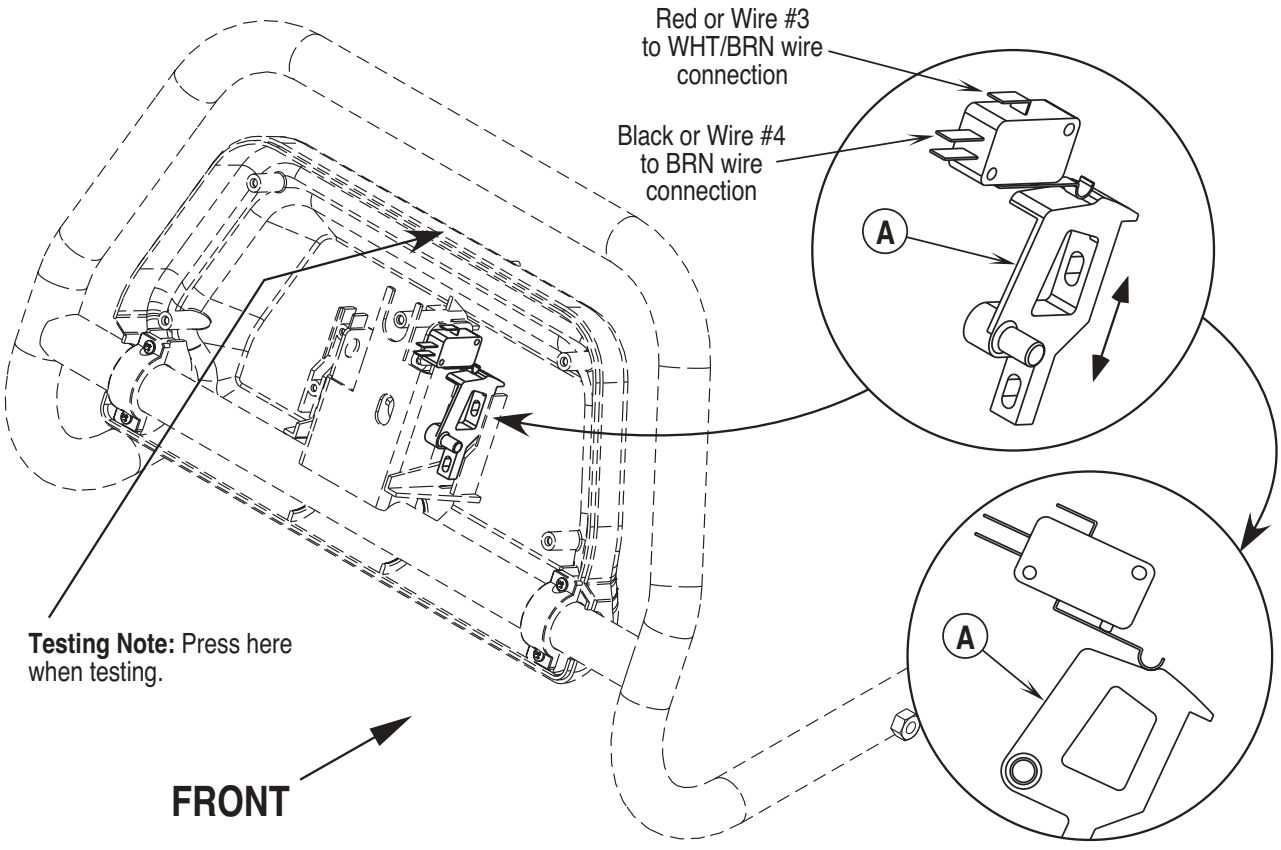


FIGURE 3



SQUEEGEE SYSTEM

SQUEEGEE LIFT ACTUATOR MOTOR REMOVAL

1 See Figure 5. Remove the squeegee pickup tool from the squeegee mount.
2 Remove the drain hose from its mount and lay it to the side. Next remove the rear panel from the control handle housing secured by (6) screws, this allows access to the squeegee actuator motor.
3 Unplug the actuator motor wiring connector from the machine harness.
4 Remove the Retainer Ring **(B)** from the lower Pin **(C)**.
5 Lift up on the Squeegee Mount **(D)** to unload the weight on the Lifting Link **(E)** and slide the pin out and separate the link from the actuator drive tube.
6 Remove the upper Retainer Ring **(F)** and slide the upper Pin Mount **(G)** out and lift the actuator motor assembly from the machine. **Note:** All new replacement actuator motors are not shipped with the lift nut tube pre-adjusted.
7 **Important Service Note:** After removing any actuator motor and before installing a new motor or drive nut the IN and OUT limit switches must be set (or checked) to their correct specifications. Reference the Electrical Section in this manual for the Actuator Drive Nut Adjustment and follow these instructions before replacing the actuator motor.
8 After setting the correct actuator nut adjustments for the squeegee lift motor follow steps 1-6 in reverse order to reassemble.

SQUEEGEE TOOL BLADE(S) REPLACEMENT

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

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

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

To Reverse or Replace the Front Squeegee Blade...

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

SQUEEGEE ADJUSTMENT

Adjusting the Squeegee Angle

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

1 Park the machine on a flat, even surface and lower the squeegee. Push the machine forward enough to have the squeegee wiping blade fold over to the rear as shown in Figure 4.
2 See Figure 5*. Turn the Adjustment Knob **(O)** to tilt the tool forward (CCW) or backwards (CW), until the rear squeegee wiping blade touches the floor evenly across its entire width.

FIGURE 4

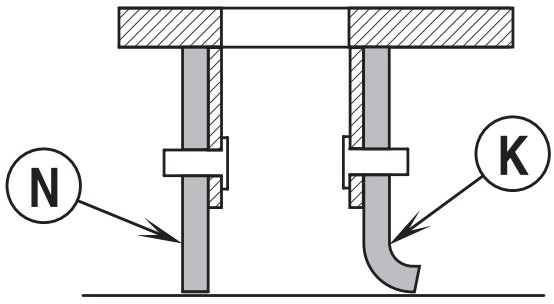
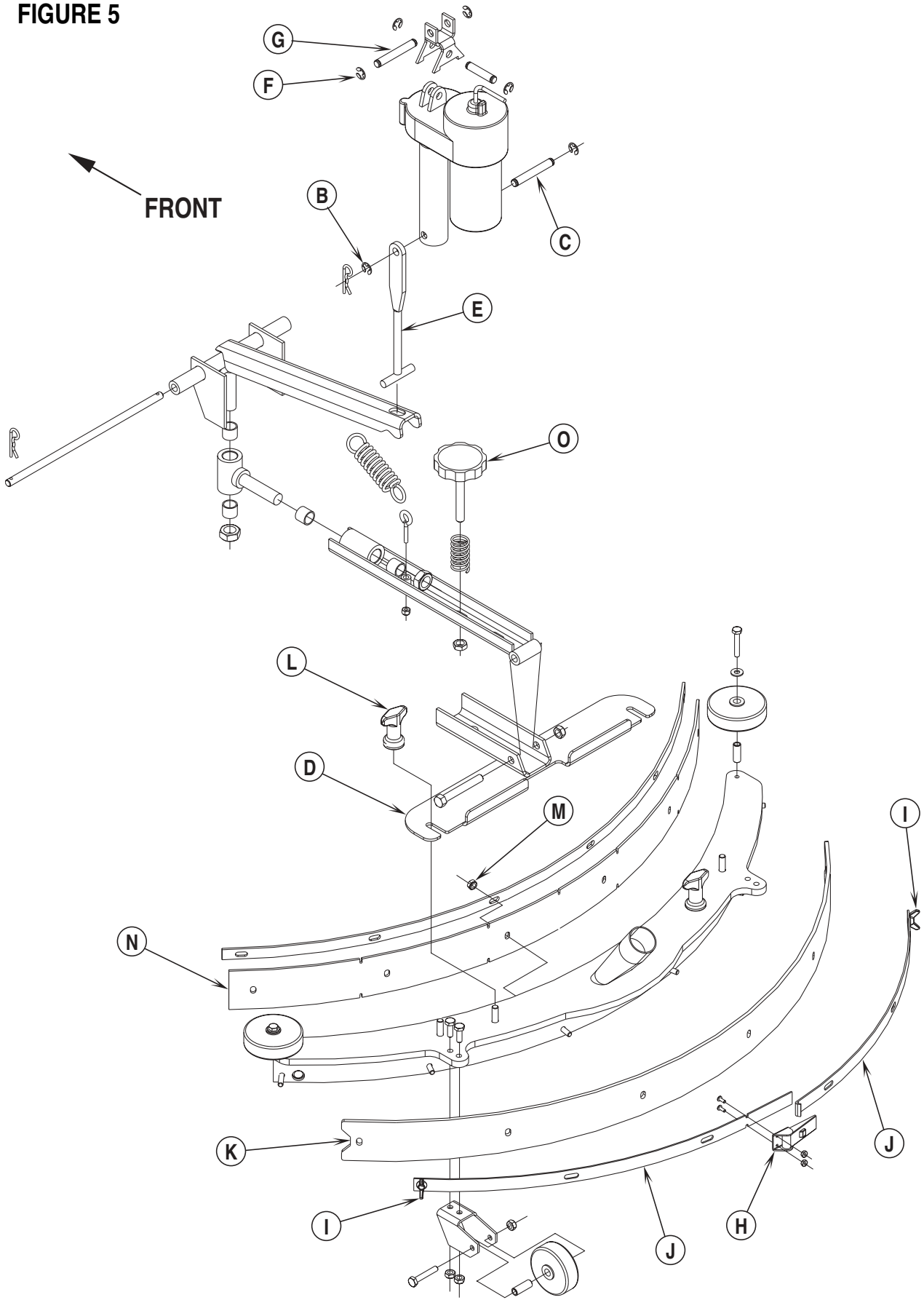


FIGURE 5



***Note:** Figure 5 shows the squeegee tool for the ConvertaMAX™ 28, I-MAX™ 28HD, and BA 750, the squeegee tool for the ConvertaMAX™ 34, I-MAX™ 34HD, and BA 850 is similar in adjustment and blade replacement.

WHEEL DRIVE SYSTEM

GENERAL FUNCTIONAL OVERVIEW

See Figures 1 and 3. A 3/4 horsepower permanent magnet (24V or 36V) motor/gear unit (M6) is used for the wheel drive on all machines. The motor/gear unit output is delivered to a single front mounted drive wheel driven by a chain as shown in Figure 3. A Curtis PMC solid state speed controller (A1) regulates the variable speed and Fwd/Rev wheel drive motor functions. Location of the controller is in the rear handle housing electrical compartment. The potentiometer R3 mounted in the drive paddle inputs to the A1 controller the machine operator's throttle (variable speed) and direction demands. A second pot R2 (knob adjusted) is mounted on the top surface of the handle housing and controls the machine's maximum transport, and scrub speeds.

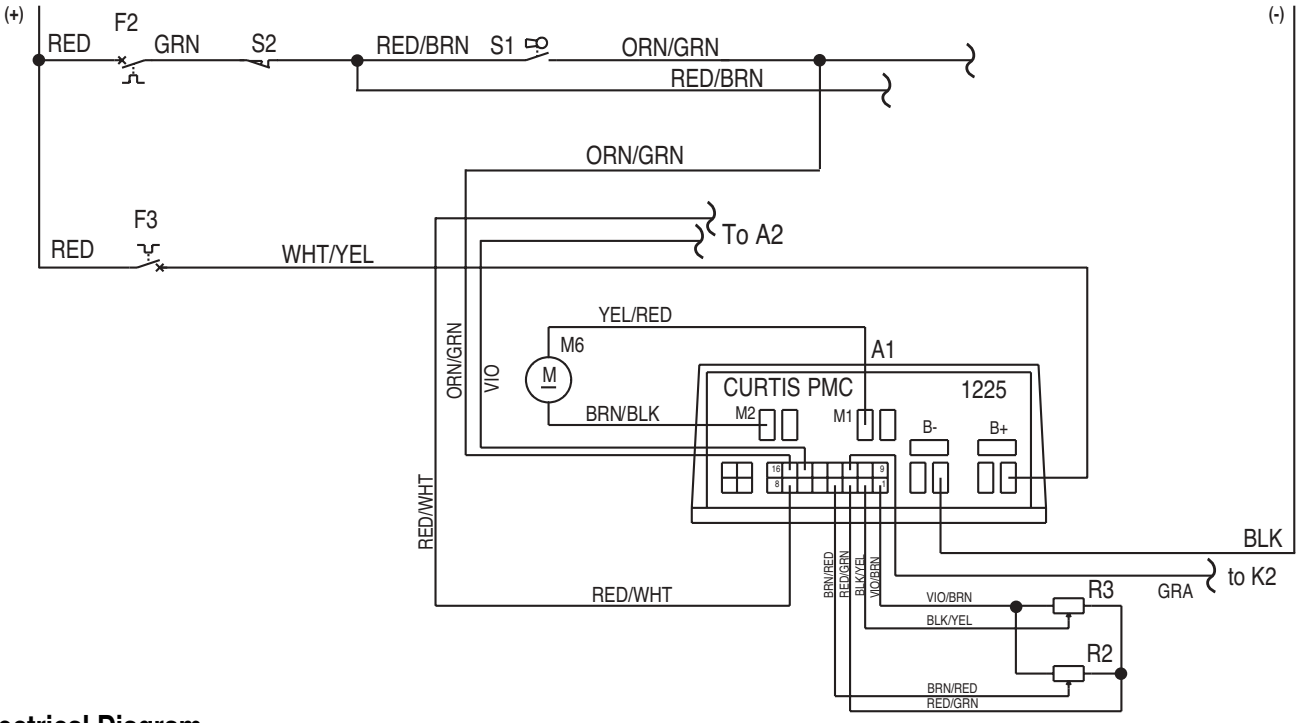
Drive Motor System Function

See Figures 1 and 2. With the key switch S1 closed the Org/Grn wire inputs 24V or 36V to the A1 speed controller to make its internal control circuits operational (powering it up). The F3 circuit breaker (40 Amp) supplies the positive load circuit voltage input to the B+ controller terminal (Wht/Yel wire). The black wire from the battery negative standoff supplies the (NEG.) input to the B- controller terminal.

Moving the 5K Ohm R3 pot off its centered balanced neutral setting of approximately 2500 Ohms, activates the operator input to the speed control. Forward or reverse movement of the drive paddle rotates the pot shaft and the pot's variable resistance value changes which generates the internal voltage signals (0-5Volts) needed for the controller out operation. These control board voltage input signals are what energizes the Fwd and Rev directional relays, which then selects the motor polarity and final voltage level outputs at the M1 & M2 terminals.

When the operator turns the R2 speed limit Pot from min. to max. (CW) this causes an input resistance relationship change between the pot high (+) and wiper terminals (high to low Ohms) thus increasing the maximum wheel motor operating speed range. Turning the knob (CCW) increases the resistance and the motor speed range is reduced.

FIGURE 1



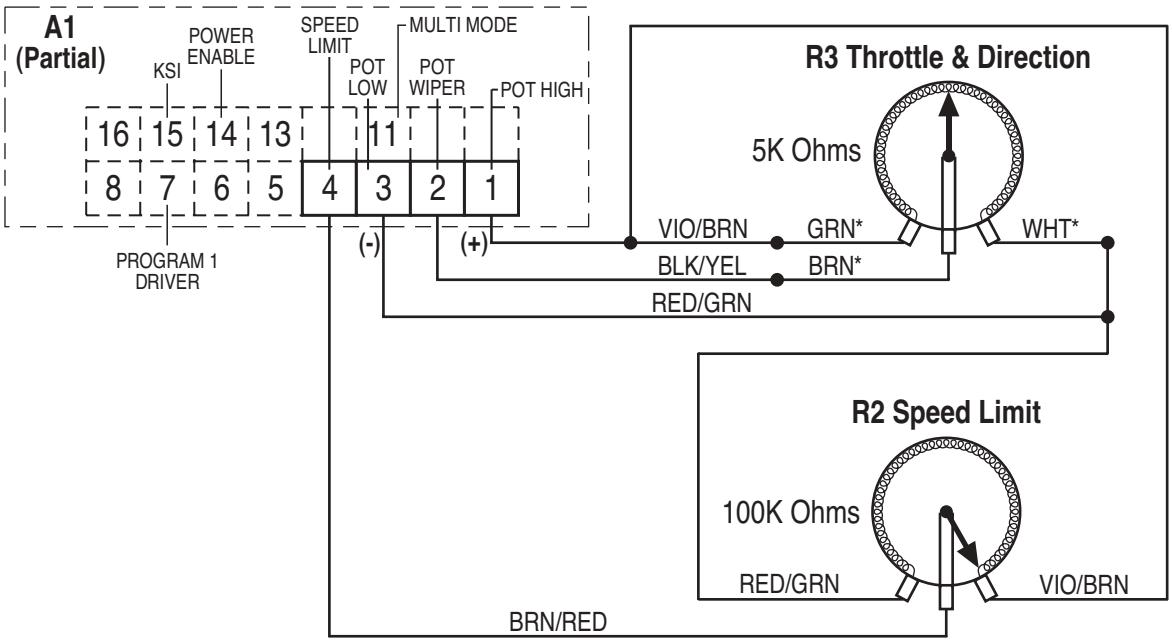
Electrical Diagram

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

FIGURE 2

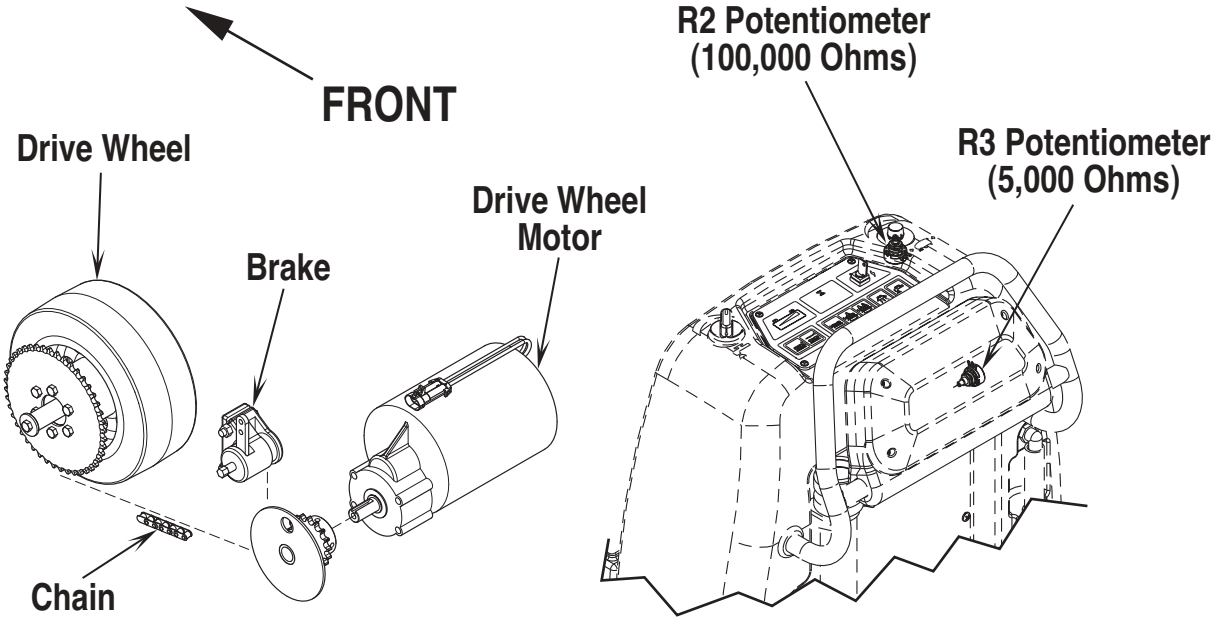
R2 Voltage Values
0V = Minimum Speed
5V = Maximum Speed

R3 Voltage Values
0 – 2.5V Forward
2.5V – 5V Reverse



This drawing shows additional controller input circuit detail. The R2 pot is shown at the Max speed setting and the R3 pot in neutral.
*Handle wiring harness changed. Machines built after December 1, 2000 have different wire colors at R3 pot. Green wire changed to GRN/YEL, brown wire changed to #2 (wire with the number 2 printed on it) and white wire changed to #1.

FIGURE 3



WHEEL DRIVE SYSTEM

WHEEL DRIVE TROUBLESHOOTING GUIDE

Problem	Possible Cause
• Wheel drive motor will not run in forward and reverse.	See Electrical Troubleshooting Flowcharts A & B in this section.
• Wheel drive in one direction only, loss of either forward or reverse.	Controller can't change electrical polarity to wheel motor. Replace the (A1) speed control.
• Hourmeter/status display shows an error 03 fault code.	• Speed controller has sensed an operation error code fault. *See the Status LED Fault Codes (Table 1) in the Electrical System.
• During normal machine transporting the operator adjusts the R2 speed limit pot and there is no effect on the machine's speed output.	The R2 (100,000 Ohm) speed limiting pot wiper is either open where the machine runs at minimum speed or the pot wiper is shorted and runs at maximum speed. Before replacing the R2 pot (**), check for a loose/disconnected wire.

** See 100K Wheel Drive Speed Limit Potentiometer Testing instructions in this manual system.

TROUBLESHOOTING GUIDE ELECTRICAL

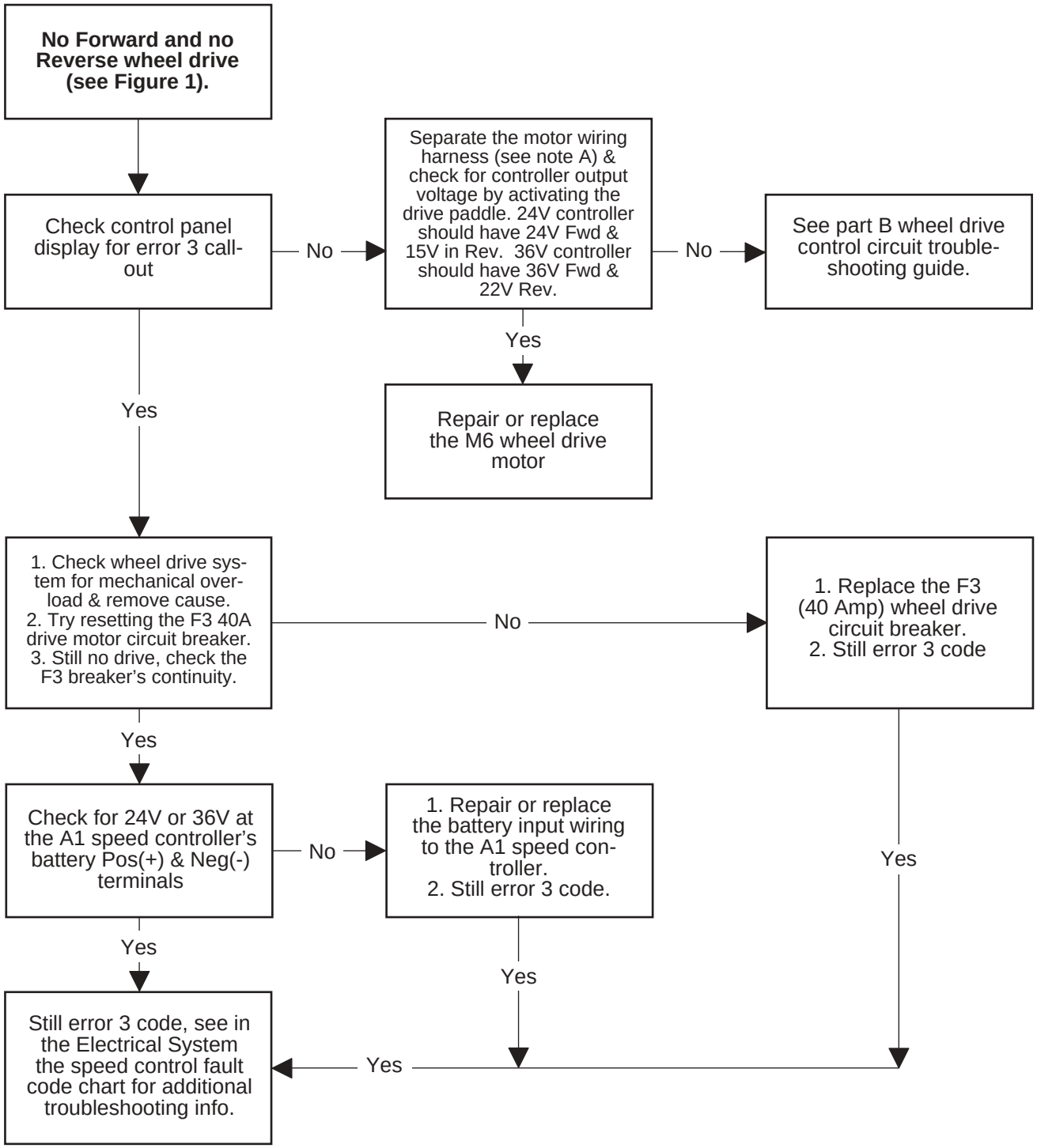
Possible Symptom

1 No forward and no reverse wheel drive

SYMPTOM ONE

Note: Do all testing with control panel R2 speed limiting pot in the maximum position, the drive wheel jacked up off the floor, key switch ON, and the drive paddle activated (pushed Fwd or pulled into Rev.)

Part A: Wheel drive system motor load circuit troubleshooting guide



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

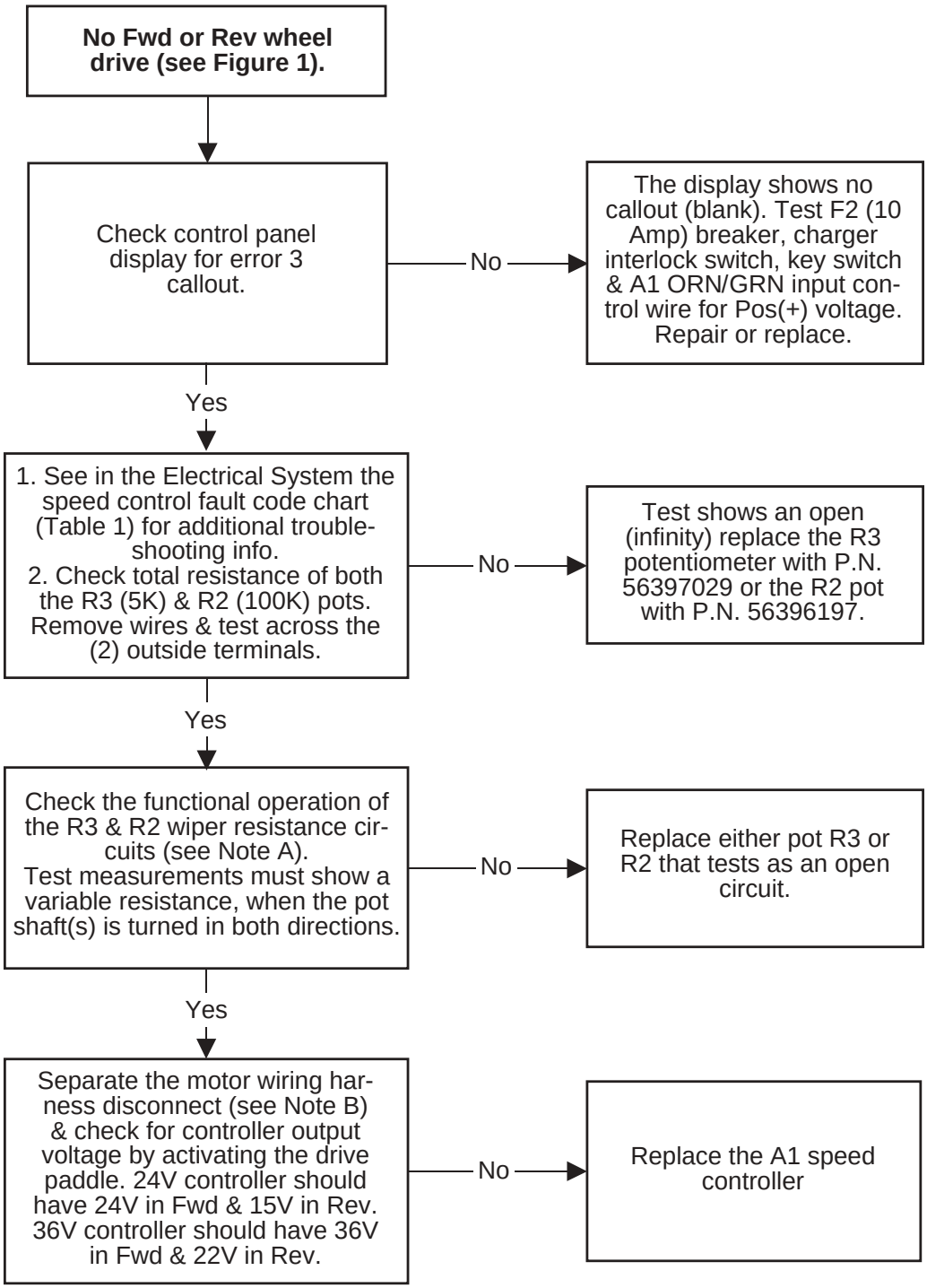
WHEEL DRIVE SYSTEM

TROUBLESHOOTING GUIDE ELECTRICAL (CONTINUED)

SYMPTOM ONE

Note: Do all testing with control panel R2 speed limiting pot in the maximum position, the drive wheel jacked up off the floor, key switch ON, and the drive paddle activated (pushed Fwd or pulled into Rev.)

Part B: Wheel drive system motor control circuit troubleshooting guide

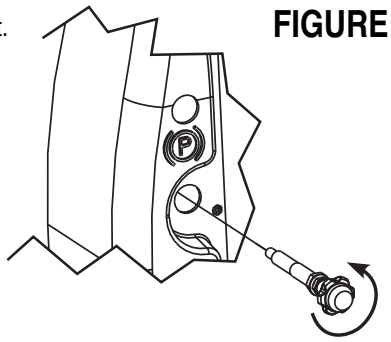


Note A: Follow the potentiometer R3 and R2 test instructions shown in the Wheel Drive System.
Note B: The drive wheel motor harness disconnect is located in the lower rear of the machine frame between the caster wheels.

PARKING BRAKE OPERATION

1 See Figure 4. To set the parking brake press the center of the brake assembly handle and at the same time grip the outside knob then pull backwards and release.
2 Next turn the knob CCW to tighten the cable for a firm brake caliper to rotor engagement.
3 To release the parking brake, press the end of the handle and push in.

FIGURE 4



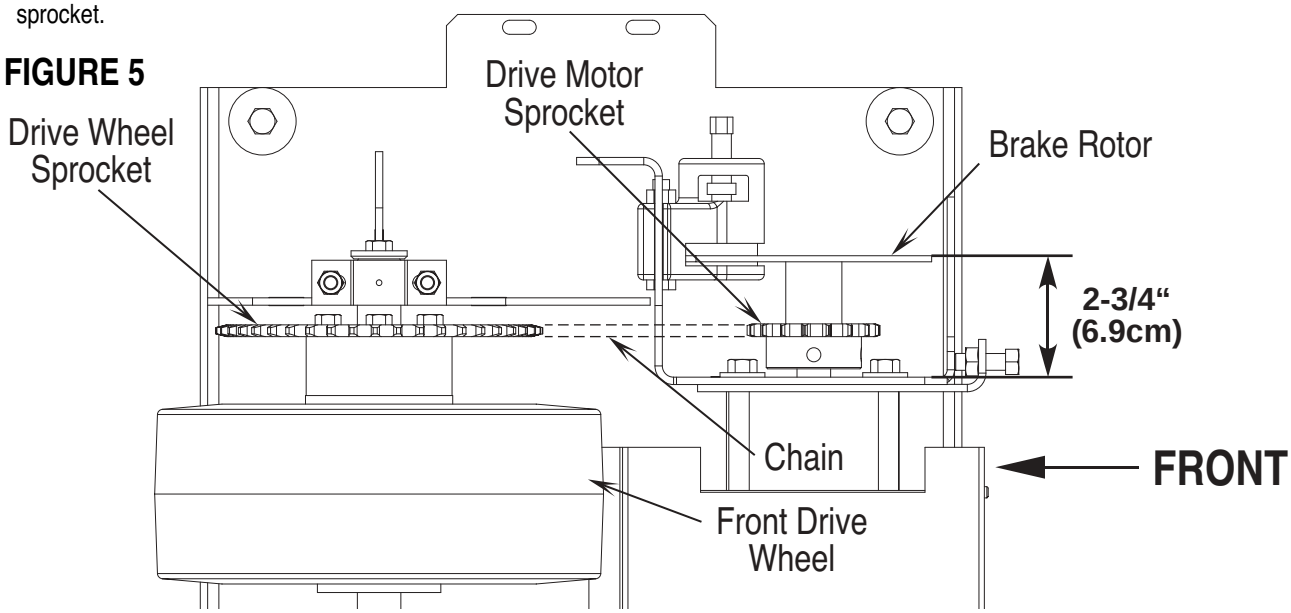
BRAKE ASSEMBLY REMOVAL

⚠ WARNING!

Disconnect the battery pack before servicing the machine.

1 Remove the left side chassis panel to access the parking brake components.
2 Remove the bolt and nut that secure the brake cable at the brake caliper arm.
3 Separate the drive chain by removing the master link.
4 See Figure 7. Rotate the brake rotor/sprocket assembly **(A)** to a working position to access the (2) 5/16-18 set screws. Loosen both the Set Screws **(B)** using a 5/32" Hex socket then pull the caliper and rotor assembly off the end of the drive motor shaft.
5 Follow the above steps in reverse order to reassemble. Note: See Figure 5, which shows the correct alignment dimension for the drive sprocket.

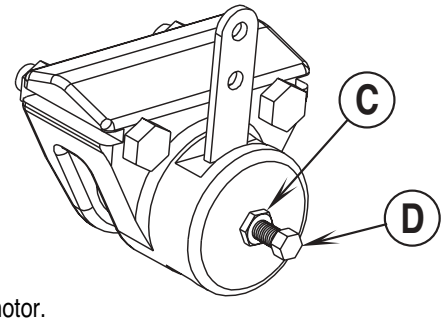
FIGURE 5



BRAKE CALIPER ADJUSTMENT

1 See Figure 6. Loosen the large outer Nut **(C)**, then turn the inner caliper adjustment Screw **(D)** in to compensate for pad wear. Note: Do not over adjust to the point that the pad drags excessively against the brake rotor. After making the adjustment test the parking brake for proper operation both set and released.

FIGURE 6



DRIVE MOTOR REMOVAL

⚠ WARNING!

Disconnect the battery pack before servicing machine.

1 Follow steps 1-4 in the Brake Assembly Removal section.
2 Remove the right side chassis panel.
3 Separate the drive motor harness connector.
4 Mark the end of the motor and motor cover to help assist in the reinstallation of the motor.
5 Remove the (4) **(E)** Hex HD drive motor mount screws as shown in Figure 7.
6 Loosen the (2) **(F)** Nuts and pull the Motor Cover **(G)** away from their mounting studs. Note: This is necessary to allow the needed clearance to remove the motor from the machine.
7 Rotate the motor so that the gearbox is not caught on the edge of the motor cover then complete the removal by pulling the motor from the machine.
8 Follow the above steps in reverse order to reassemble. **Service Tip Note:** Clamp the motor Adjustment Plate **(H)** to the motor mount to help hold it in place when reinstalling the drive motor.

WHEEL DRIVE SYSTEM

DRIVE WHEEL REMOVAL

Important: Read instructions below before starting servicing on the drive wheel.

⚠ WARNING!

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

1 Place wood blocking in the front and rear of both caster wheels, to prevent the machine from rolling.
2 Remove both the left and right side chassis panel and then separate the drive chain by removing the master link.
3 Place the scrub deck in the up position then remove the scrub brushes from the machine.
4 Next shim the bottom sides of the scrub deck drive discs with wood blocking. Use blocking with dimensions of 3" width x 3-1/2" height x 20" length (7.6 cm x 8.9 cm x 50.8 cm).
5 See Figure 7. Remove the two hardware items **(I)** & **(J)** from both the front Axle Clamps **(K)** then loosen the two rear screws and nuts and swing the clamps to the rear.
6 Enter the main controller diagnostic service test mode. Read the Service Test Mode manual section for instructions and follow steps 1-5.

⚠ CAUTION!

When in the Service Test Mode don't press (activate) the Scrub Off Button **(31)** when the wood blocking is positioned under the scrub brush drive discs as it will turn on the brush motors.

7 See the Know Your Machine section control panel drawing. When in the service test mode press the Normal Scrub Button **(29)** once to start the actuator motor down (off its up limit) then push it a second time (1 to 2 sec. after activating the motor) to stop it.
8 Next press the Brush Install Button **(35)** to momentarily turn on (jog) the actuator output (down) to a position where the actuator stops at its bottom limit (maximum scrub deck extension) then turn the master key off. This will raise the frame off the floor creating the needed clearance for removing the motor. After positioning the actuator motor disconnect the battery.
9 Roll the wheel forward then maneuver the wheel assembly out from underneath the right side of the machine.
10 Make needed service repairs and re-install the drive wheel in reverse order. Note: Step 8 describes the procedure to raise the scrub deck, to lower the scrub deck follow steps listed here…

- Reconnect the battery and again enter the main controller diagnostic service test mode by following steps 1-5 in the Service Test Mode manual section.
- Press the Normal Scrub Button **(29)** once to start the actuator up (off its down limit) then push it a second time (1 to 2 sec. after the motor starts) to stop it.
- Next press the Brush Install Button **(35)** to momentarily turn on (jog) the actuator output (up) to lower the frame back down onto drive wheel axle. Note: Cycling the normal scrub button again and activating the Install Button **(35)** while still in the service test mode would reverse the polarity to the actuator and raise the machine frame up away from the floor.

IMPORTANT SERVICE NOTES: Listed below is an **alternate lifting method** that can be used to raise and lower the chassis to remove the drive wheel.

1 Place the scrub deck in the up (raised) position, and then remove both of the scrub brushes.

⚠ WARNING!

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

2 Jack the machine up using a suitable hydraulic bottle jack or mechanical scissors jack placed under the middle of the bottom deck surface.

CHAIN REMOVAL AND CHAIN ADJUSTMENT

Chain Removal

⚠ WARNING!

Disconnect the battery pack before servicing.

1 See Figure 7. Loosen the (4) motor mount Bolts **(E)** by inserting a 9/16" standard socket and extension bar through the brake rotor access hole. Rotate the brake rotor to access and align the socket wrench with each individual mounting bolt.
2 Loosen the Lock Nut **(L)** and back out the adjustment Bolt **(M)** several turns to help release the chain tension.
3 Remove the retainer clip from the chain's master link then separate and remove from sprockets.
4 Install a new chain and reconnect the master link and adjust chain tension (follow Chain Adjustment instructions below). **Service Tip:** Push or pry the motor forward to shorten the distance between the sprockets to make it easier to reconnect the master link.

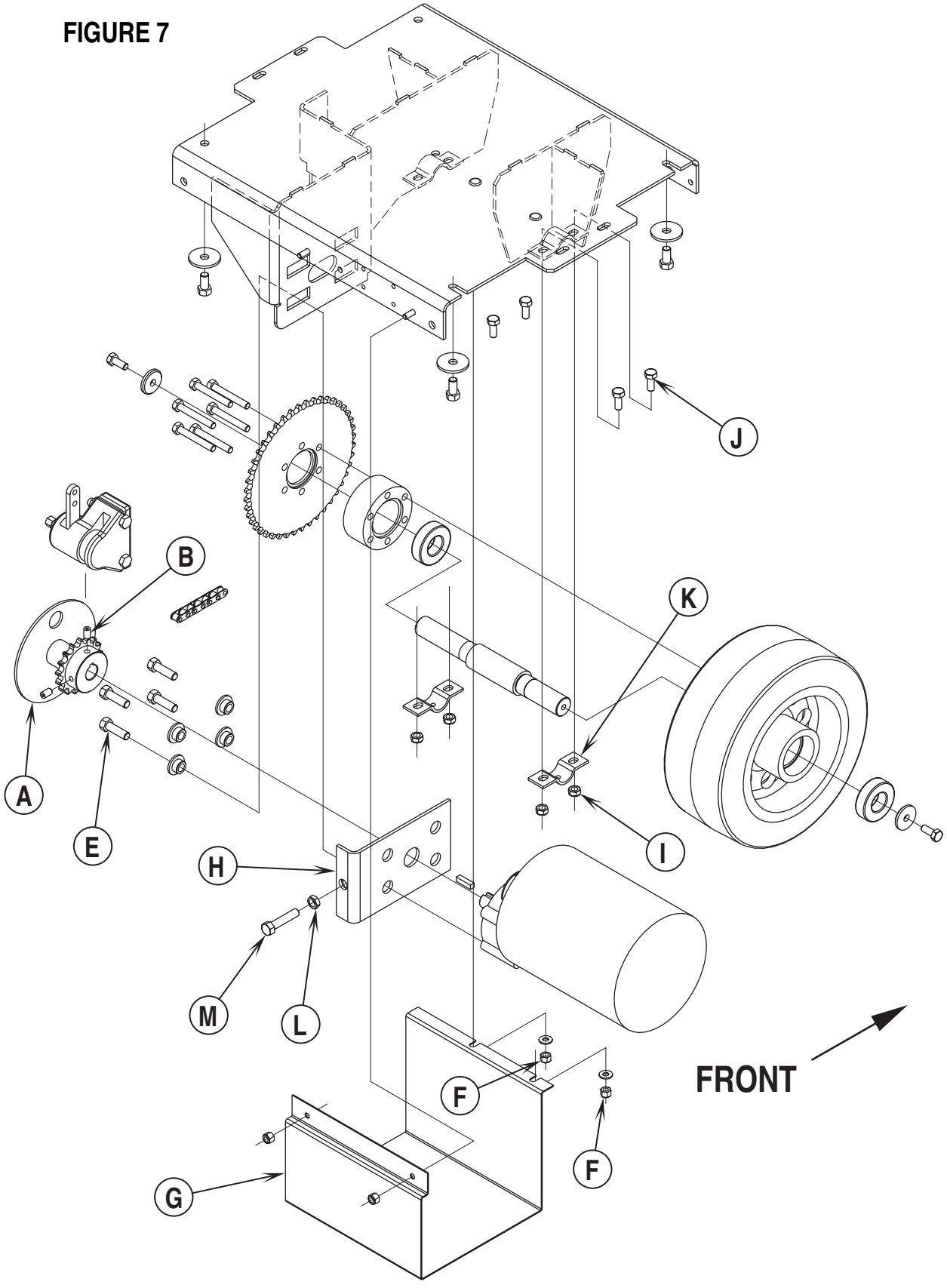
Chain Adjustment

1 Loosen the (4) Motor Mount Bolts **(E)** and the adjustment Lock Nut **(L)** to adjust chain tension.

2 Turn the adjustment Bolt **(M)** in (CW) to obtain a 1/2" (13mm) chain deflection between the sprockets when moderate pressure is applied to the chain.

3 Retighten the adjustment bolt lock nut, the (4) motor mount bolts and test the drive system for proper operation.

FIGURE 7



WHEEL DRIVE SYSTEM

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

⚠ WARNING!

Disconnect battery cables at the battery pack disconnect before servicing.

Testing the 5K Potentiometer

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

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

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

3 Test the Pot **(O)** using an ohmmeter, the potentiometer specification is 5K Ohms. Connect the meter leads to each of the outside connections (1 high & 3 low, shown in Figure 9) on the pot, it should read approximately 5000 ohms (range 4500-5500 ohms).

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

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

Potentiometer Removal

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

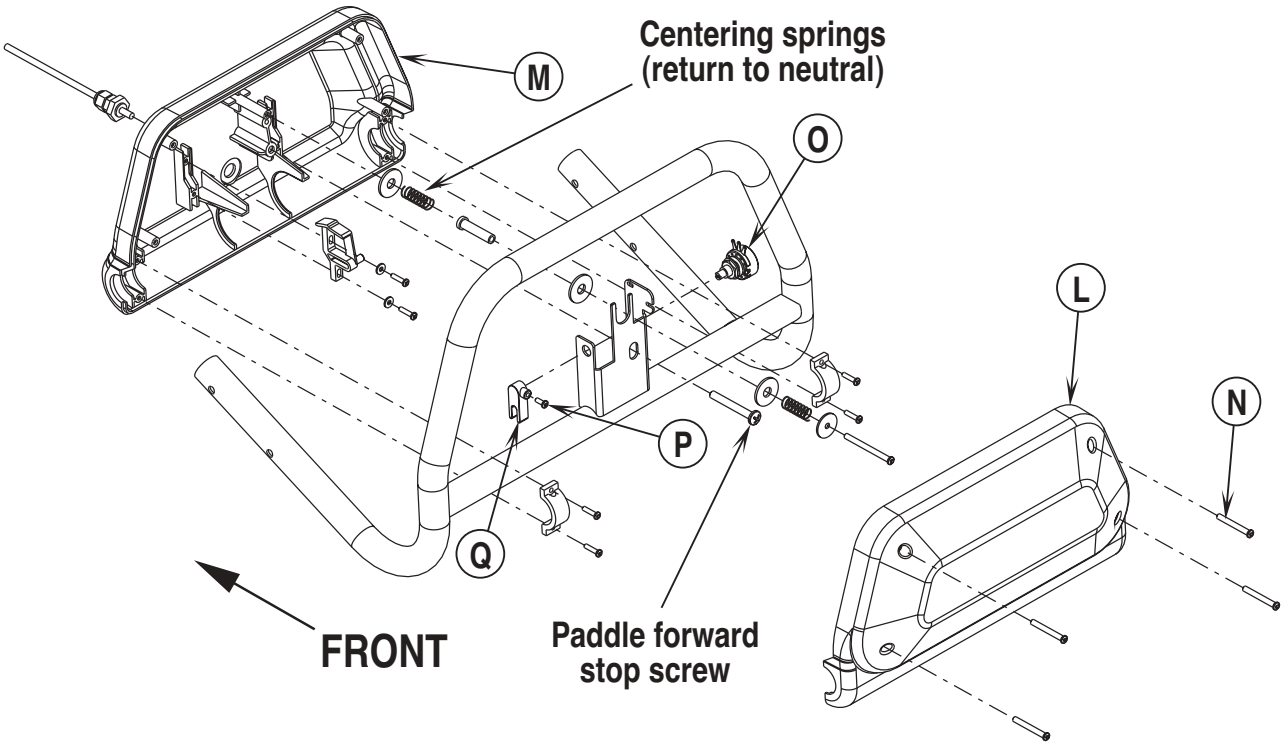
7 Back out the Screw **(P)** from the pot Fork **(Q)**.

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

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

10 To reinstall a potentiometer see the adjustment section in this manual section.

FIGURE 8



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

⚠ WARNING!

The adjustment of the potentiometer is to set the drive paddle for a neutral drive motor operation. If the potentiometer is not adjusted properly, the machine will not move in either FWD or REV with normal operator control input.

1. See Figure 10. Install lock washer (on pot side), pot and anchor nut to the handle mount bracket as shown. NOTE: Do not completely tighten the anchor nut at this time.
2. Using an ohmmeter connect leads to the middle terminal (2 wiper) and the (3 low pot) outside terminal. Then pre-set, turn the shaft to approximately 2500 ohms.
3. Observe the molded rib inside the Fork **(Q)** and position it to align with the slot on the end of the pot shaft, then assemble together and tighten the **(P)** Screw.
4. Then without turning the pot shaft thread the anchor nut just enough to seat the pot to its mounting bracket.
5. Reconnect the ohmmeter test leads to the pot wiper and low terminal connections and adjust (turn the pot) to obtain half of pot's total resistance. This will accurately set the true neutral drive paddle operator position.
6. Tighten the anchor nut secure. Note: Do not turn the potentiometer shaft when tightening. Reconnect the battery cable and turn the key switch on and test the drive system for proper FWD and REV operations. Note: The dash panel maximum speed control knob should be turned to the full speed position for testing.

FIGURE 9

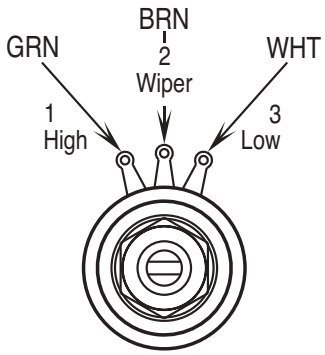
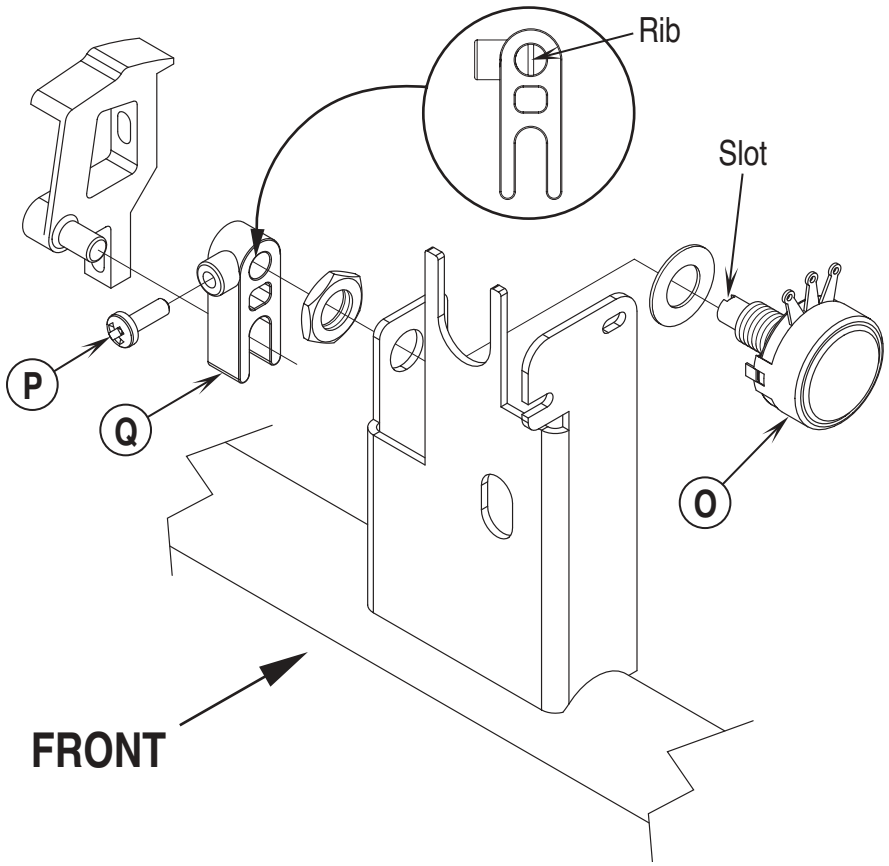


FIGURE 10



WHEEL DRIVE SYSTEM

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

⚠ WARNING!

Disconnect battery cables at the battery pack disconnect before servicing.

Testing the 5K Potentiometer

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

1 See Figure 11. Remove the front drive paddle Cover **(L)** from the rear housing **(M)** held together with (4) item **(N)** Screws.

2 See Figure 12. Observe the 3 wires connected to the pot and disconnect. Note the proper wire numbers and/or colors and their terminal connections for re-assembly.

3 Test the Pot **(O)** using an ohmmeter, the potentiometer specification is 5K Ohms. Connect the meter leads to each of the outside connections (1 high & 3 low, shown in Figure 12) on the pot, it should read approximately 5000 ohms (range 4500-5500 ohms).

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

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

Potentiometer Removal

6 See Figure 13. Loosen the pot shaft anchor nut and unthread it to the end of the shaft.

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

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

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

10 To reinstall a potentiometer see the adjustment section in this manual section.

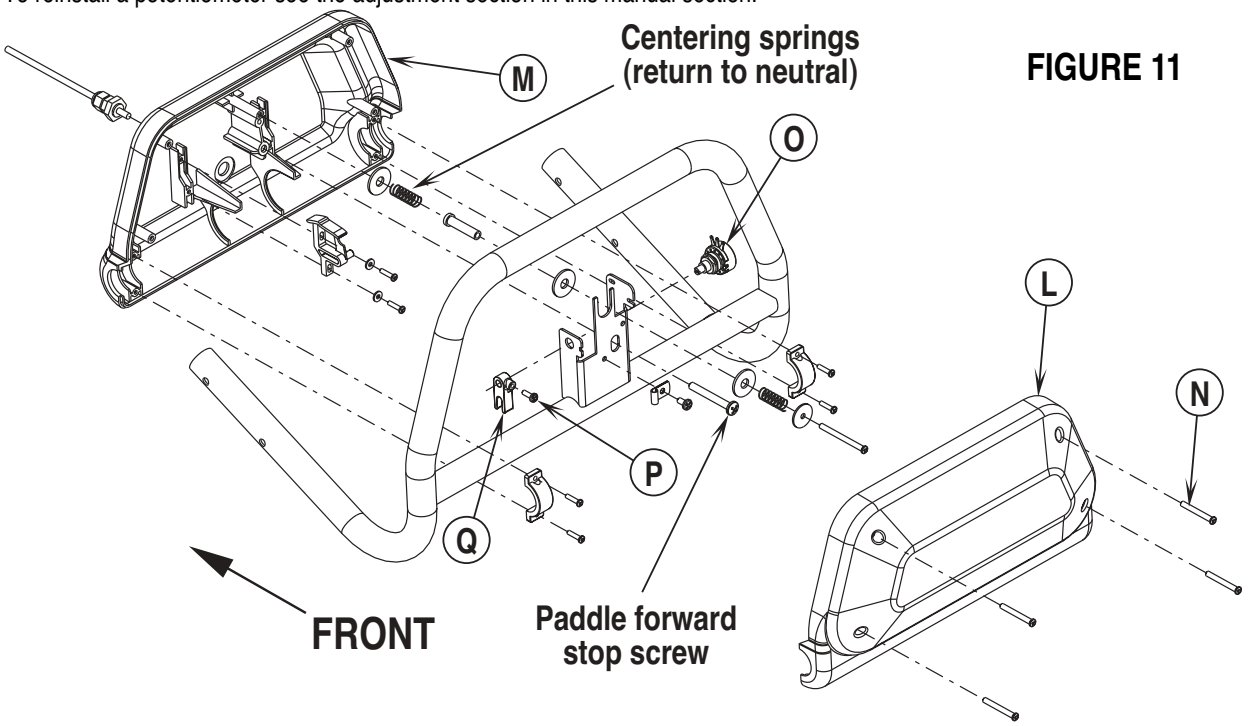


FIGURE 11

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

⚠ WARNING!

Disconnect a battery cable at the battery pack before servicing.

⚠ WARNING!

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

1 See Figure 13. Install the pot and washer into the handle mount hole, then tighten the anchor nut.

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

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

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

4 Next tighten the **(P)** Set Screw, being careful not to turn the shaft. Then install the (3) pot wires as shown (Figure 12).

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

FIGURE 12

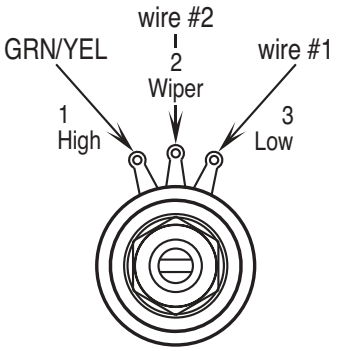
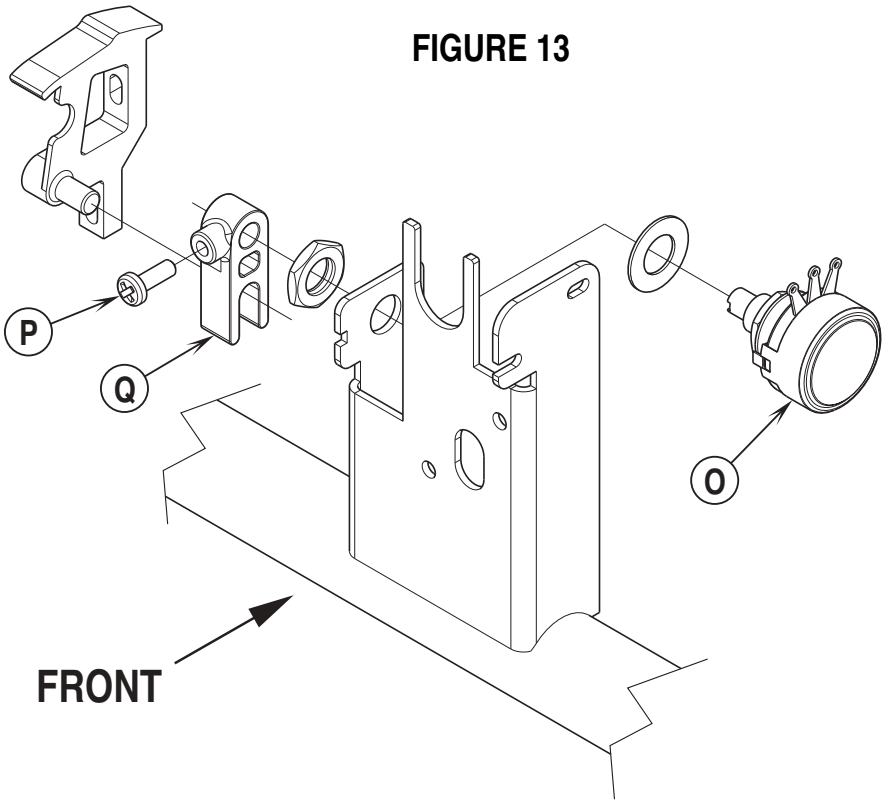


FIGURE 13



100K WHEEL DRIVE SPEED LIMIT POTENTIOMETER TESTING (ALL MODELS)

⚠ WARNING!

Disconnect the battery connector before servicing.

Note: The potentiometer (pot) should be removed from the handle housing to easily test.

1 See Figure 14. Remove the Set Screw **(R)** (5/64" wrench) and pull off the Adjustment Knob **(S)** from the stem of the pot.

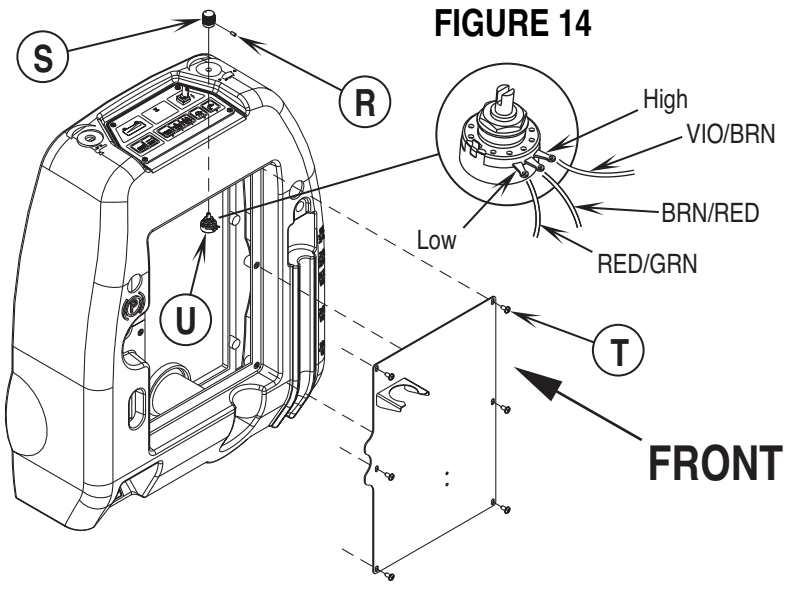
2 Remove the rear electrical access panel secured with (6) Screws **(T)**.

3 Remove the pot's anchor nut (1/2 inch wrench) then pull the Pot **(U)** and wires out from the electrical compartment.

4 Observe the proper wire colors and their correct terminal connections to re-assemble.

5 Disconnect all three wires and test the potentiometer **(U)** using an ohmmeter. The specification is 100,000 ohms. Connect the meter leads to each of the outside connections on the potentiometer, should read approximately 100,000 ohms. Next, take one of the test leads and connect to the middle terminal, then turn the stem both directions. The resistance value will change (vary) increasing and decreasing through its full range of 0-100,000 ohms and 100,000-0 ohms approximately. If you do not get similar readings replace the potentiometer.

FIGURE 14



ELECTRICAL SYSTEM

BATTERY SPECIFICATIONS

Use a combination of multiple 2-volt cell units to construct a 24 or 36 Volt DC battery pack system.

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

BATTERY CHARGER SPECIFICATIONS

Use a 24 or 36 Volt DC output charger matching the AC input line voltage supply to be used.

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

The recommended 238 AH battery should be matched to a 24 or 36V, 25 Amp output charger.

INSTALL THE BATTERIES

⚠ WARNING!

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

When Servicing Batteries...

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

⚠ CAUTION!

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

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

2 Turn the Master Key Switch **(20)** OFF and remove the key.

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

4 Your machine comes from the factory with enough battery cables to install four or six (6 volt), 305 Amp hour batteries. Carefully lift the batteries into the battery compartment and arrange them exactly as shown. Secure the batteries as close to the back of the machine as possible.

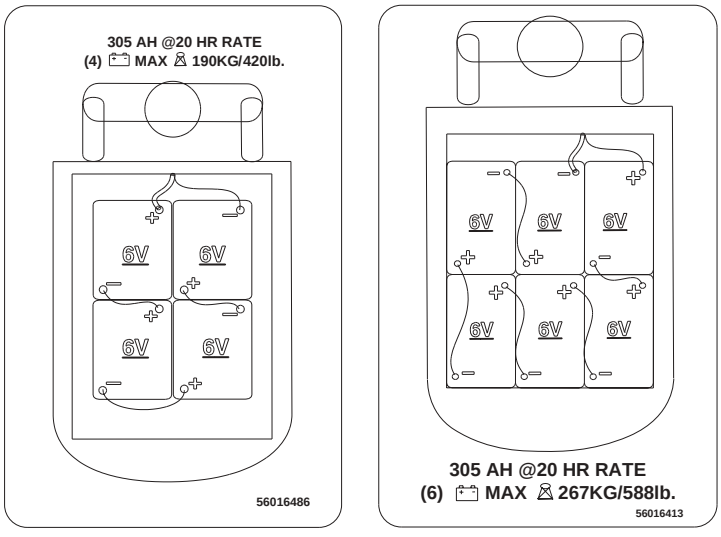
5 The terminals on the battery cables are marked "+" for positive and "-" for negative. Install the battery cables as shown, with the terminals marked "+" on the positive battery terminals and the terminals marked "-" on the negative terminals. Position the cables so the battery caps can be easily removed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

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

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

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

FIGURE 1



DESCRIPTION OF THE BATTERY LOW VOLTAGE CUTOUT FEATURE

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 1.75V per cell and alternate maintenance free battery (gel cell) setting is 1.83V per cell. The standard setting is factory selected and should be used unless the battery manufacturer specifies the higher cutout voltage. **Special Service Note:** On all the 24V and 36V machines a minimum recharge voltage of 2.09 volts per cell must be reached to allow the scrub brush and solution systems (to reset) function again. A 24V-battery pack must increase to a 25.1-volt minimum and a 36V battery pack to 37.6 volts.

DESCRIPTION OF THE BATTERY CONDITION INDICATORS

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

Green Indicator = full charge down to 50% discharge
Green & Yellow Indicator = 50% discharge down to 75% discharge
Yellow Indicator = 75% discharge down to 90% discharge
Yellow & Red Indicator = 90% discharge down to 95% discharge
Red Indicator = 95% discharge down to 99% discharge
Flashing Red Indicator = 100% discharge - scrub system will automatically shut down

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

CHARGING THE BATTERIES

Charge the machine's battery pack each time the machine is used, or when the Battery Condition Indicator **(17)** is showing red flashing indicator lights. Note: The machine also uses a special low voltage cutout that inhibits the scrub system see in this manual section the description for the low voltage cutout feature.

To Charge the Batteries...

1. Pull back the battery connector flap and push the connector from the charger into the machine Battery Charger Connector port **(9)** located on the lower left rear control housing
2. Follow the instructions on the battery charger.
3. Check the fluid level in all the battery cells **after** charging the batteries. Add distilled water, if necessary, to bring the fluid level up to the bottom of each battery cells filler tubes.

⚠ WARNING!

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

BATTERY MAINTENANCE

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

There are 3 simple rules for good battery maintenance:

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

BATTERY TESTING

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

Note: Always charge batteries before testing.

There are 2 ways to find a dead cell:

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

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

ELECTRICAL SYSTEM

ACTUATOR DRIVE NUT ADJUSTMENT

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

Part #	Actuator Motor	Drive Nut IN Position	Drive Nut OUT Position	Models*
56393303	Scrub Brush Lift	1-3/8" (35 mm)	5-3/8" (136 mm)	A, B
56393303	Scrub Brush Lift	2-1/4" (57 mm)	5-1/4" (133 mm)	**C**, D, E
56412072	Squeegee Lift (24V)	7/8" (22 mm)	3-1/8" (79 mm)	A, B
56412072	Squeegee Lift (before SN 1477842, 24V)	7/8" (22 mm)	3-1/8" (79 mm)	**C**
56412072	Squeegee Lift (after SN 1477841, 24V)	7/8" (22 mm)	3-3/8" (86 mm)	**C**
56397230	Squeegee Lift (before SN 1477842, 36V)	1-3/4" (44 mm)	3-3/4" (95 mm)	D, E
56397230	Squeegee Lift (after SN 1477841, 36V)	7/8" (22 mm)	3-3/8" (86 mm)	D, E

***Model designation:** (**A**)=ConvertaMAX 28 & BA 750, (**B**)=I-MAX 28HD, (**C**)=BA 850, (**D**)=ConvertaMAX 34, (**E**)=I-MAX 34HD

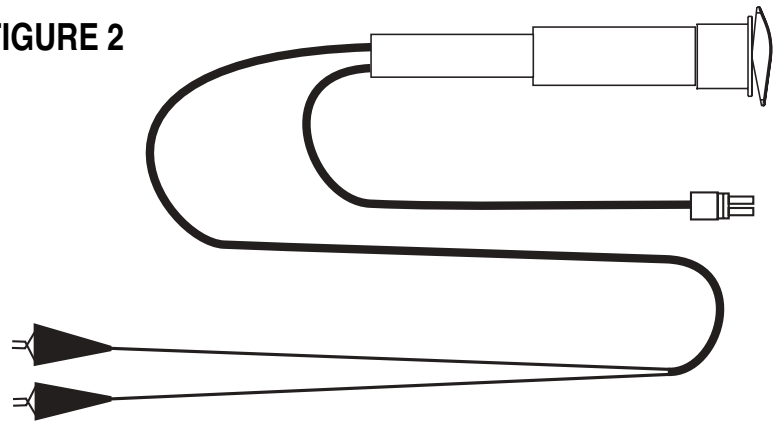
General Instructions for All Actuator Motors

1 See Figure 2. This shows the special actuator power cord adapter **(PN 56407502)** that is needed to connect the machine's battery pack and actuator motor for setting the drive nut limit settings.

2 Open the machine battery compartment and disconnect the battery connector. The battery pack is needed to power the lift actuator motor to properly set the IN & OUT limit switches.

3 Connect the actuator motor to be tested to the power cord adapter end. Then connect the alligator clips from the cord adapter (red clip to the positive and black to negative) to battery connector or battery posts. The rocker switch is used to change the motor rotation in setting the correct drive nut dimension.

FIGURE 2



Instructions for Squeegee Lift Actuator Drive Nut Adjustment

4 See Figure 3. Hold onto the Actuator Drive Nut **(A)** and press the rocker switch to run the drive motor and retract the nut towards the motor housing (it's IN limit).

5 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.

6 Hold the drive nut then press the adapter cord rocker switch to run the drive motor to the OUT position (wait until the motor stops).

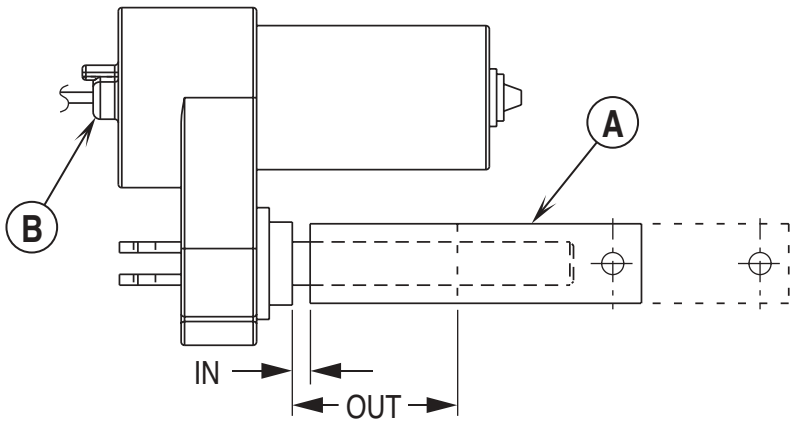
7 Measure the position of the drive nut on the shaft and compare the measurement with the OUT position shown in the chart.

8 When the measurement doesn't match the dimension shown in the chart it is necessary to remove the Adjuster Cover **(B)** and adjust the Out position.

9 To increase the travel of the drive nut, turn the adjuster clockwise. To decrease the travel of the nut, turn the adjuster counter clockwise. NOTE: Use a 5/16" (8 mm) wrench to turn the adjuster. Each click of the adjuster will change the nut travel 1/16 inch (1.6 mm).

10 After each adjustment, hold the drive nut, run the actuator IN & OUT and check both dimensions. After checking that the drive nut limits are set correctly then replace the adjuster cover. **Service Tip Note:** Use the above power cord adapter to help position the drive nut (in or out) for ease in actuator motor installations.

FIGURE 3



Instructions for Scrub Brush Lift Actuator Drive Nut Adjustment

1 See Figure 4 and 5. On a new scrub lift actuator motor remove (spin-off) the Drive Nut **(A)** and install the short compression Spring **(C)** onto the actuator (lead screw) shaft first. Next reinstall the plastic drive nut as shown (with the nut pin pocket away from the motor).

2 Follow steps 4-10 in the section labeled Instructions for Squeegee Lift Actuator Drive Nut Adjustment (reference previous page).

3 After adjusting the actuator drive nut dimensions follow either method A or B in the Scrub Brush Lift Actuator Removal manual section to reassemble.

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

FIGURE 4

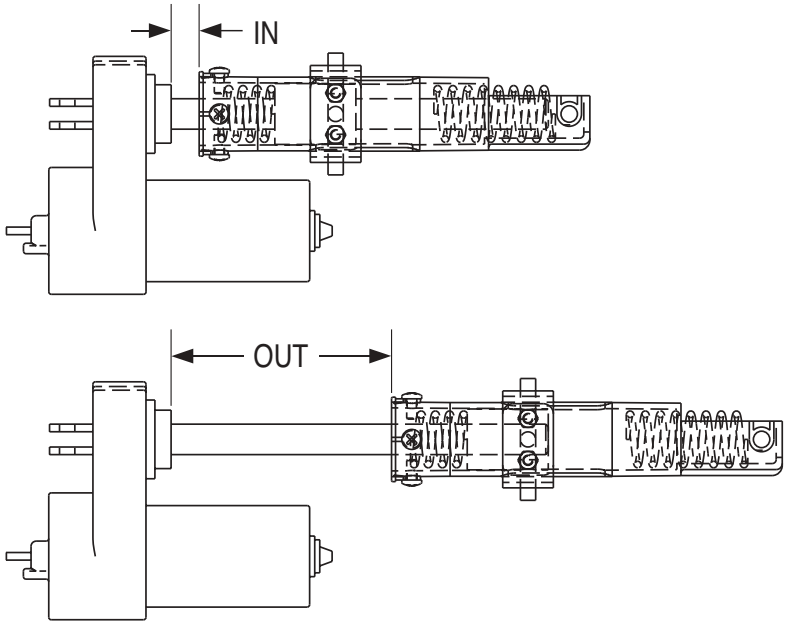
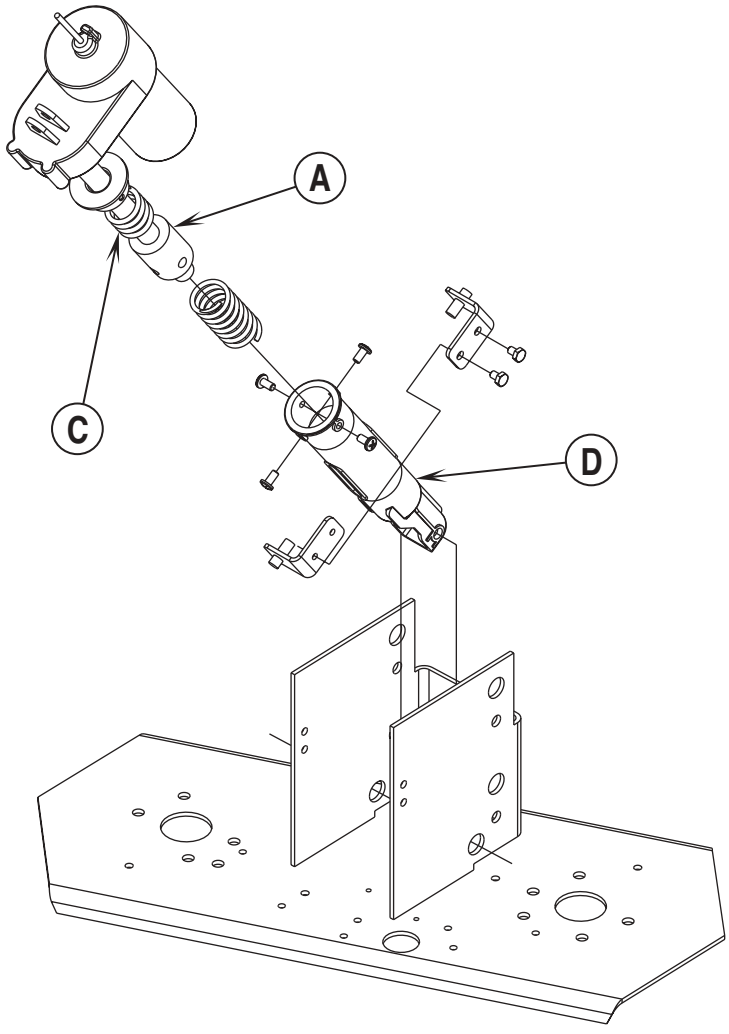


FIGURE 5



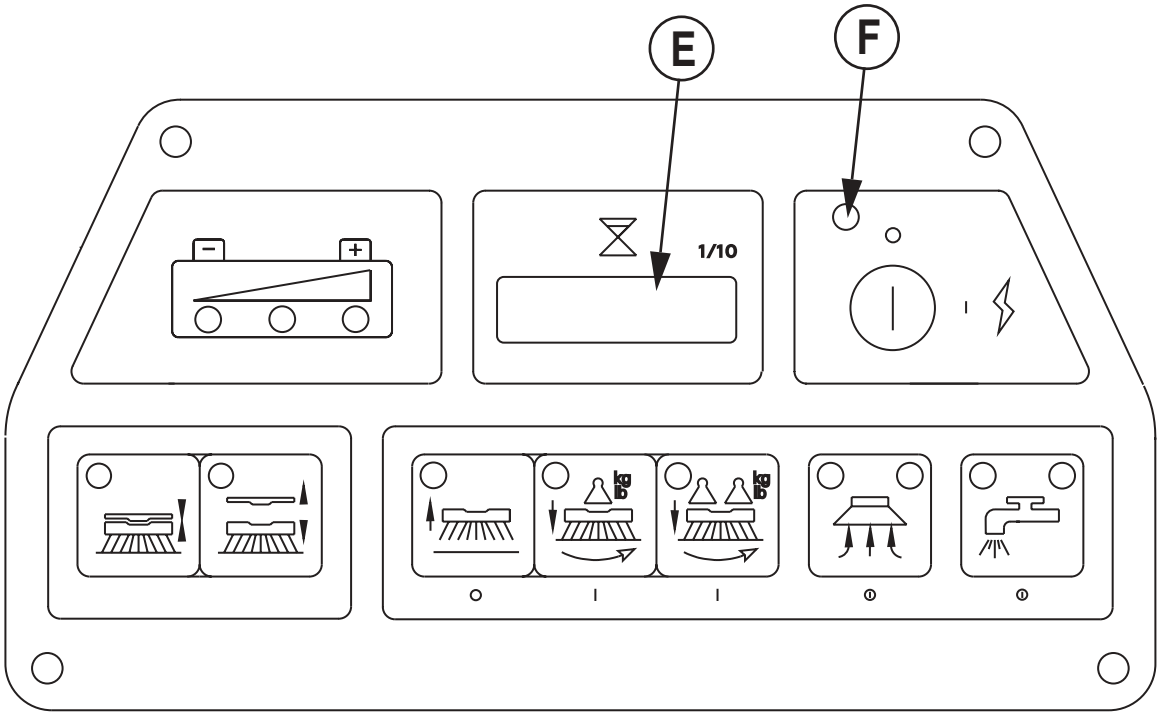
ELECTRICAL SYSTEM

CURTIS CONTROLLER TROUBLESHOOTING GUIDE

FUNCTION OF THE SPEED CONTROLLER STATUS LIGHT AND DISPLAY

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

FIGURE 6



STATUS LED FAULT CODES (TABLE 1)

LED CODE	STATUS LIGHT DISPLAY	EXPLANATION	POSSIBLE CAUSE
1,1	O O	Output fault	1. Short in motor or in motor wiring. 2. Controller failure.
		Overcurrent fault	1. Short in motor or in motor wiring. 2. Controller failure.
1,2	O OO	EEPROM fault	1. EEPROM failure or fault.
		Main contactor fault	1. Main contactor welded. 2. Main contactor driver fault. 3. Main contactor coil fault.
		Precharge fault	1. Internal controller fault. 2. Low battery voltage.
		Motor voltage fault	1. Motor voltage does not correspond to throttle request. 2. M1 or M2 output shorted to B- or B+. 3. **Motor overload*** or internal motor short. 4. Controller failure.
2,2	OO OO	HPD fault	1. Improper sequence of **KSI****, power enable, and throttle inputs. 2. Misadjusted throttle pot.
2,3	OO OOO	HPD fault present for > 5 sec.	1. Misadjusted throttle. 2. Broken throttle pot. 3. Broken throttle mechanism.
2,4	OO OOOO	Speed limit pot fault	1. Speed limit pot wire broken or disconnected. 2. Broken speed limit pot.
3,3	OOO OOO	Throttle fault	1. Throttle input wire open. 2. Throttle input wire shorted to B- or B+. 3. Throttle pot defective. 4. Wrong throttle type selected.
4,1	OOOO O	Low battery voltage	1. Battery voltage <16 volts (24V models). 2. Corroded or loose battery terminal. 3. Loose controller terminal.
4,2	OOOO OO	Overvoltage	1. Battery voltage >36 volts (24V models). 2. Vehicle operating with charger attached.
4,3	OOOO OOO	Over / Under-temp. cutback	1. Temperature >95°C (203°F) or<-25°C (-13°F). 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. Operation in extreme environments.

***DRIVE MOTOR OVERLOAD NOTE:** The error 03 code will also be displayed if the wheel drive circuit breaker is tripped. Most likely the error will only occur when the drive paddle is in the forward or reverse position. If the circuit breaker is tripped the speed control may display a "1,2" indicator flash sequence.

****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 paddle before turning on the main key switch. This can be cleared by returning the operator's drive paddle to neutral and cycling the key switch OFF and ON.

ELECTRICAL SYSTEM

FUNCTIONAL OVERVIEW OF MAIN CONTROL BOARD

The primary function of the main control board is to position the scrubbing brushes with respect to the floor surface using a lift actuator motor to maintain the correct brush pressure and current draw of the brush motor. When the Normal Scrub Button **(29)** or Heavy Scrub Button **(27)** is depressed this will lower the scrub deck to the operating position and by pushing or pulling the operator drive paddle 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 motors are shut off. The controller also manages the other supportive systems such as the squeegee lift, solution on/off, and vacuum motor. Note: See the Know Your Machine section in this manual for a complete explanation of the machine's operation.

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

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

MAIN CONTROL BOARD TROUBLESHOOTING GUIDE

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

MAIN CONTROLLER ERROR CODES

Error Code	Fault Description	Troubleshooting Action
Err01	Non fatal control fault (internal)	1. Turn key off. 2. Turn key on. 3. If error fault returns, go into the **Fault Recall Mode*** (Main Control Board Special Program Options) to further investigate other possible causes. Make repairs to all electrical system faults found in the fault recall check. Replace control board only as the last step when troubleshooting.
Err02	Fatal control fault (internal)	Same as Err01. Check **Fault Recall Mode***. Replace control board. Follow troubleshooting actions listed for Err01.
Err03	Speed control fault	1. Check for a tripped drive motor circuit breaker (40 A). Investigate reason for possible mechanical overload. Examples: sticking brake, parking brake slide lever not released, prolonged ramp climbing. 2. See Curtis Controller Troubleshooting Guide section to further troubleshoot the drive system.
Err04	Brush lift actuator overload	Check for binding of brush lift linkage and excessive weight on scrub brush deck. Repair. Normal current draw 2-3 amps.
Err05	Brush lift actuator severe overload	1. Check for binding or frozen brush lift linkage and excessive weight on brush deck. 2. Check for short circuit in brush motor and wiring. Repair or replace.
Err06	Brush lift actuator circuit open (**)	Check for disconnected actuator wiring, open in wiring or defective actuator motor. Repair or replace.
Err07	Brush motor overload	1. Check for binding in rotation of brushes or improper brush lift actuator operation. 2. Check the negative supply cable at the brush motor for a wiring problem or improper modifications (this is a special cable and must be replaced with the original OEM part***).
Err08	Brush motor severe overload	1. Check for short circuit in brush motor or wiring. 2. Inspect gearbox for failure. Repair or replace.

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

** Follow the instructions for temporarily disabling the control boards special Fault Detection program.

*** Note: Negative cable Part # 56396184 for C-MAX 28, I-MAX 28HD & BA 750/850. Negative cable Part # 56397297 for C-MAX 34 & I-MAX 34HD.

Error Code	Fault Description	Troubleshooting Action
Err09	Brush motor circuit open (**)	1. Check for open in brush motor wiring or defective motor. 2. Check the negative supply cable at the brush motor for a wiring problem or improper modifications (this is a special cable and must be replaced with the original OEM part***).
Err10	Brush contactor contacts shorted	Check solenoid for welded contacts (continuity test). If welded replace solenoid.
Err12	Brush contactor coil overload	1. Check diode for continuity in one direction only, if bad, replace diode. 2. Check for proper installation of diode (silver band is wired to positive side of coil) 3. Check for wiring problems. 4. Check coil resistance, if below 48 ohms for 24V or 110 ohms for 36V, replace solenoid.
Err13	Brush contactor coil severe overload	1. Same as error code 12. 2. Shorted coil. Replace
Err14	Brush contactor coil open / output fault	1. Check for an open in the coil wiring 2. Check solenoid coil for high resistance (infinity). Repair or replace.
Err15	Brush current too high	1. Check for proper brush lift actuator operation (actuator linkage). 2.Check for free rotation of brush drive assembly.
Err16	Brush current too low	1. Check for improper, too low brush pressure (see brush pressure adjustment section). 2. No brushes installed 3. Check proper brush lift actuator operation.
Err17	Brush motor cable thermistor fault	1. Machine exposed to a very cold or very hot operating temperature. Allow machine to be warmed or cooled to room temperature. Temp range 32ºF to 180ºF (0 to 82ºC) 2. Cable failure, replace the brush motor negative cable assembly (this is a special cable and must be replaced with an original OEM part***). An Err17 will NOT inhibit normal operation of the machine.
Err18	Squeegee actuator overload	Check for binding of squeegee lift linkage and excessive weight on squeegee. Repair. Normal current draw 2.5 amps for 24V and 36V.
Err19	Squeegee actuator severe overload	1. Check for binding or frozen squeegee lift linkage and excessive weight on squeegee. 2. Check for short circuit in wiring or actuator motor. Repair or replace.
Err20	Squeegee actuator circuit open / output fault (**)	Check for disconnected actuator wiring, open in wiring or defective actuator motor. Repair or replace.
Err24	Vacuum motor overload	1. Check for debris in vac motor 2. Worn carbon brushes 3. Defective motor bearings. Repair or replace.
Err25	Vacuum motor severe overload	Check for short circuit in vac motor or wiring.
Err26	Vacuum motor circuit open (**)	Check for disconnected vacuum motor wiring, open in wiring or defective vacuum motor. Repair or replace.
Err27	Vacuum contactor contacts shorted	Check solenoid for welded contacts (continuity test). If welded replace solenoid.
Err29	Vacuum contactor coil overload	1. Check diode for continuity in one direction only, if not, replace diode. 2. Check for proper installation of diode (silver band is wired to positive side of coil) 3. Check for correct wiring. 4. Check coil resistance, if below 48 ohms for 24V or 110 ohms for 36V, replace solenoid.
Err30	Vacuum contactor coil severe overload	1. Same as error code 29. 2. Check for a short circuit in wiring or solenoid coil. Repair or replace.
Err31	Vacuum contactor coil open / output fault	1. Check for open in coil wiring. 2. If wiring checks OK, replace solenoid.

*** Note: Negative cable Part # 56396184 for C-MAX 28, I-MAX 28HD & BA 750/850. Negative cable Part # 56397297 for C-MAX 34 & I-MAX 34HD.

ELECTRICAL SYSTEM

Error Code	Fault Description	Troubleshooting Action
Err32	Solution solenoid overload	1. Check for a wiring problem. 2. Check coil resistance, if below 50 ohms for 24V or 115 ohms for 36V replace solenoid.
Err33	Solution solenoid severe overload	Check for a short circuit in wiring or solenoid valve. Repair or replace.
Err34	Solution solenoid open / output fault (**)	Check for disconnected solenoid wiring plug, open in wiring or defective solenoid. Repair or replace.
Err35	External wiring fault (power input to controller)	Identify the 4 wire pin connector on the control board (2 Red/Brn, 1 Blk, 1 Wht/Brn). Check the 2 Red/Brn wires for (24 volts or 36 volts) input to the connector. Repair
Err36	No accessory output voltage	Identify the same 4 wire pin connector called out in Err35. Check the Wht/Brn wire for 24 volts or 36 volts (output) and all component load connections down line. Repair
Err37	Brush remove relay coil overload	1. Check for a wiring problem. 2. Check coil resistance, if below 420 ohms for 24V or 800 ohms for 36V replace solenoid.
Err38	Brush remove relay coil severe overload	Check for a short circuit in wiring or solenoid valve. Repair or replace.
Err39	Brush remove relay coil open / output fault	Check for disconnected solenoid wiring plug, open in wiring or defective solenoid. Repair or replace.
Err40	Squeegee reverse (raise) switch input fault	1. Check for a wiring problem at switch terminals. 2. Check switch adjustment and also test for a defective switch. Adjust, repair or replace.

ADDITIONAL ERROR CODE TROUBLESHOOTING INFORMATION

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

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

	Error Code	Fault Area By Machine System	Re-check troubleshooting actions for Main Controller Error Codes
A	59	Brush Remove Relay	Err37 – Err39
B	60 61 89	Vacuum Motor Solenoid	Err24 – Err31
C	62 63 96	Brush Solenoid	Err07 – Err17
D	74	Squeegee Actuator	Err18 – Err20
E	80	Brush Lift Actuator	Err04 – Err06
F	84	Solution Solenoid	Err32 – Err34

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.

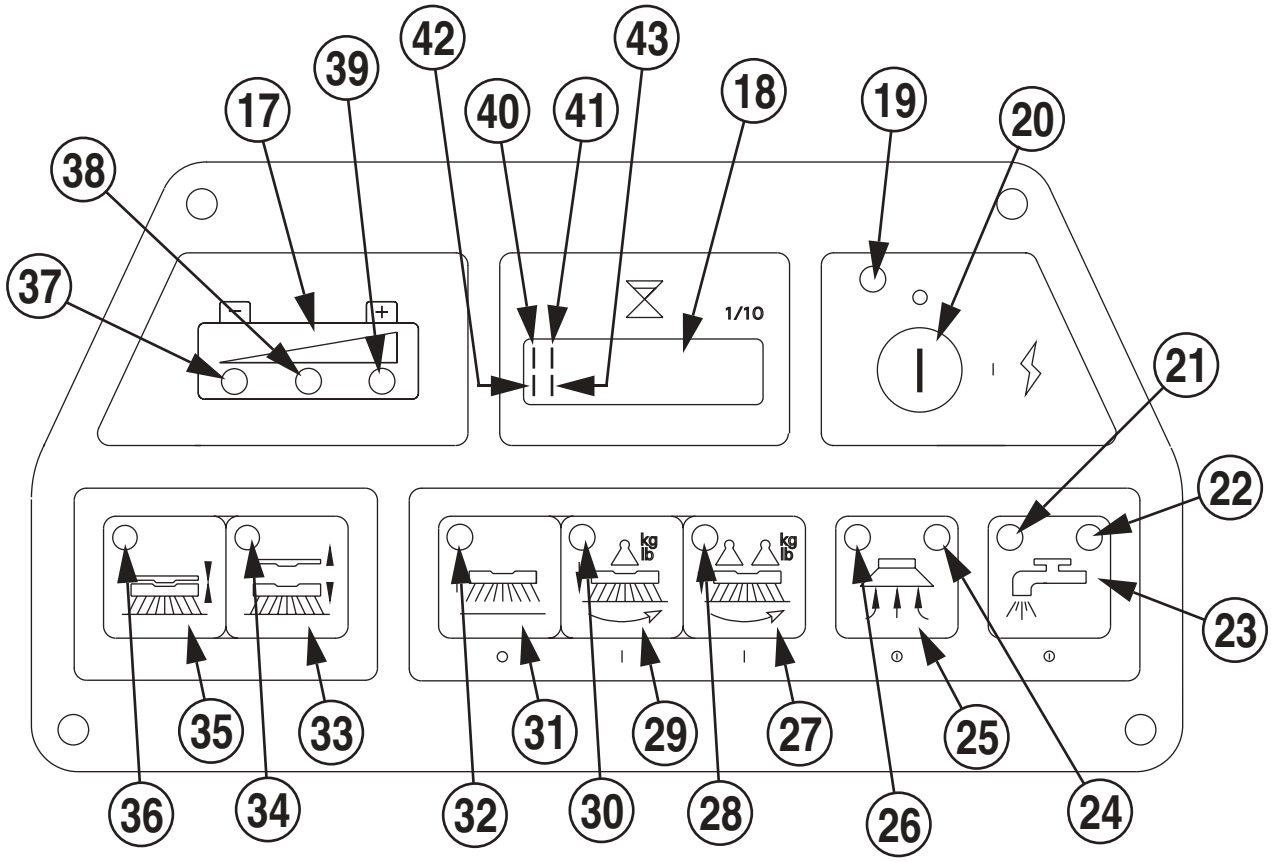
To enter the service test mode perform the following steps:

1 Turn the master on/off key switch to the off position.
2 Press and hold the Scrub Off and Normal Scrub buttons (**29** & **31**).
3 While holding both switches turn the master on/off key switch to the on position.
4 Continue to hold both switches until the hourmeter/status display shows “test”.
5 Release both switches.
6 The function of each switch and indicator is described below.
7 To exit this mode turn the master on/off key switch to the off position.

CONTROL PANEL

17 Battery Condition Indicator
18 Hourmeter/Status Display
19 Main Power Indicator
20 Master On/Off Key Switch
21 Solution System Indicator
22 Solution System Fault Indicator
23 Solution Button
24 Vacuum System Fault Indicator
25 Vacuum Button
26 Vacuum System Indicator
27 Heavy Scrub Button
28 Heavy Scrub Mode Indicator
29 Normal Scrub Button
30 Normal Scrub Mode Indicator
31 Scrub Off Button
32 Scrub Mode Off Indicator
33 Brush Remove Button
34 Brush Remove Indicator
35 Brush Install Button
36 Brush Install Indicator
37 Battery Status Red Indicator
38 Battery Status Yellow Indicator
39 Battery Status Green Indicator
40 Pad Actuator Up Indicator
41 Squeegee Actuator Up Indicator
42 Pad Actuator Down Indicator
43 Squeegee Actuator Down Indicator

FIGURE 7



ELECTRICAL SYSTEM

SERVICE TEST MODE (CONTINUED)

Main Controller Inputs

See Figure 7 for button locations.

Battery status red indicator (37):
Speed control status signal. This is an output from the speed control to the main control unit that indicates the status of the speed control. Normally this indicator will be on whenever the key is on. If there is a speed control fault this indicator will flash the fault code produced by the speed control.

Battery status yellow indicator (38):
Speed control forward/reverse signal. This is an output from the speed control to the main control unit that indicates when the throttle has been moved from the neutral position either forward or reverse. The yellow indicator will be lit if this signal is active.

Battery status green indicator (39):
Throttle assembly reverse signal. This is a switch output from the throttle assembly to the main control unit that indicates when the throttle has been moved in the reverse direction. The green indicator will be lit if this signal is active.

To observe the battery pack voltage value see Status Display (18):

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

The leftmost digits **(40, 41, 42 & 43)** of the status display are used to indicate the current direction for the pad/brush lift actuator and squeegee lift actuators. This will be described in detail in the sections pertaining to the control of the actuator outputs.

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

Main Controller Outputs

See Figure 7. 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.

Install switch **(35)**: Activates install indicator and used to jog actuators.
Remove switch **(33)**: Controls remove relay.
Scrub off switch **(31)**: Controls pad/brush motor.
Normal scrub switch **(29)**: Controls pad/brush lift actuator.
Heavy scrub switch **(27)**: Controls squeegee lift actuator.
Vacuum switch **(25)**: Controls vacuum.
Solution switch **(23)**: Controls solution solenoid.

Install Switch Function (35):
This switch is used to momentarily activate (run) either the pad/brush lift actuator or the squeegee lift actuator. See the descriptions below for more details. The install indicator **(36)** should illuminate when this switch is pressed.

Remove Switch (33):
This switch is used to toggle the state of the pad/brush remove relay. Pressing and releasing this switch will alternately turn the remove relay on and off. The indicator **(34)** provides the following status information:
Off - Relay is off and there is no current flow through the relay coil.
Green - Relay is on and there is normal current flow through the relay coil.
Flashing yellow - Either the relay output is off and there is current flow through the coil (shorted output driver or control error) or the relay output is on and there is no current flow through the coil (open circuit, open relay coil, or open output driver).

Scrub Off Switch (31):
This switch is used to toggle the state of the pad/brush motor. Pressing and releasing this switch will alternately turn the pad/brush motor on and off. The indicator **(32)** provides the following status information:
Off - Pad/brush output is off and there is no current flow through the contactor coil and no pad/brush motor current sensed.
Green - Pad/brush output is on and there is normal current flow through the contactor coil and normal pad/brush motor current sensed.
Flashing yellow - Either the pad/brush motor output is off and there is current flow through the coil or pad/brush motor current is sensed (shorted output driver, control error, shorted contactor, wiring error) or the pad/brush motor output is on and there is no current flow through the coil or no pad/brush motor current is sensed (open circuit, open relay coil, open contactor contacts, wiring error or open output driver).

SERVICE TEST MODE (CONTINUED)

Normal Scrub Switch (29):

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

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

Service Tip Note: The switch cycle inputs described below can also be used to facilitate the adjustment and or replacement of the lift actuators.

When the output is in state 1, the actuator output is turned off. The pad actuator up indicator **(40)** will be lit and the normal scrub indicator **(30)** should be off. If the indicator **(30)** is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the up indicator **(40)** is flashing, this indicates that the pad/brush lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the install switch **(35)** This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its up limit.

When the output is in state 2, the actuator output is turned on. The pad actuator down indicator **(42)** will be lit and the normal scrub indicator **(30)** should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The install switch has no effect in this state.

When the output is in state 3, the actuator output is turned off. The pad actuator down indicator **(42)** will be lit and the normal scrub indicator **(30)** should be off. If the indicator **(30)** is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the down indicator **(42)** is flashing, this indicates that the pad/brush lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the install switch **(35)**. This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its down limit.

When the output is in state 4, the actuator output is turned on. The pad actuator up indicator **(40)** will be lit and the normal scrub indicator **(30)** should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The install switch has no effect in this state.

Heavy Scrub Switch (27):

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

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

Service Tip Note: The switch cycle inputs described below can also be used to facilitate the adjustment and or replacement of the lift actuators.

When the output is in state 1, the actuator output is turned off. The squeegee actuator up indicator **(41)** will be lit and the heavy scrub indicator **(28)** should be off. If the indicator **(28)** is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the up indicator **(41)** is flashing, this indicates that the squeegee lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the install switch **(35)** This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its up limit.

When the output is in state 2, the actuator output is turned on. The squeegee actuator down indicator **(43)** will be lit and the heavy scrub indicator **(28)** should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The install switch has no effect in this state.

When the output is in state 3, the actuator output is turned off. The squeegee actuator down indicator **(43)** will be lit and the heavy scrub indicator **(28)** should be off. If the indicator **(28)** is flashing yellow, this indicates that the control is sensing current flow through the actuator (shorted output driver, control error). If the down indicator **(43)** is flashing, this indicates that the squeegee lift system is currently selected. This means that it is possible to momentarily activate the actuator output using the install switch **(35)** This can be used to jog the actuator to allow precise positioning of the actuator. NOTE: the actuator can only move in this situation if it is not at its down limit.

When the output is in state 4, the actuator output is turned on. The squeegee actuator up indicator **(41)** will be lit and the heavy scrub indicator **(28)** should be green or flashing green. The indicator will be a steady green if the control senses current flow through the actuator. It will flash green if no actuator current flow is sensed (actuator at limit, open circuit, open output driver). The install switch has no effect in this state.

ELECTRICAL SYSTEM

SERVICE TEST MODE (CONTINUED)

Vacuum Switch (25):

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 **(26)** provides the following status information:

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

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

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

Solution Switch (23):

This switch is used to toggle the state of the solution solenoid. Pressing and releasing this switch will alternately turn the solution solenoid on and off. The indicator **(21)** provides the following status information:

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

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

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

MAIN CONTROL BOARD SPECIAL PROGRAM OPTIONS

Scrub mode description:

On all the models covered in this manual, both the normal and heavy scrub modes are independently programmable to have user adjustable or fixed scrub pressure settings.

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

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

The scrub pressure can be set from 1 to 9 for commercial machines and 1 to 12 for industrial machines. The allowable range for the normal scrub mode is 1 through 4 and the range for the heavy scrub mode is (normal limit + 1) through 9 or 12 depending on model. This number is a relative indication of scrubbing effort. The actual pressure applied will vary depending on the floor surface and the type of pad/brush used.

Scrub mode operation (adjustable):

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

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

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

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

Subsequent presses of the heavy scrub button will step the pad pressure setting through the allowable range up to the maximum value programmed for the heavy scrub mode. Once the maximum value is reached the pressure setting will step back to (normal scrub limit + 1). The factory default maximum for the normal scrub mode is 9 (commercial) or 12 (industrial).

Scrub mode operation (fixed):

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

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

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

Scrub mode programming for user adjustable scrub pressure:

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

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

ELECTRICAL SYSTEM

SPECIAL PROGRAM OPTIONS (CONTINUED)

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

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

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

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

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

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

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

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

Restoring the scrub modes and pressures to factory default settings:

FACTORY DEFAULT: Normal scrub = 2, Heavy scrub = 5

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

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

CURRENT DRAW OF SCRUB BRUSH MOTORS

24V*		
PA#	3/4 HP Models A & C	1 HP Model B
1	20A	20A
2	25A	25A
3	30A	30A
4	35A	35A
5	40A	40A
6	45A	45A
7	50A	50A
8	55A	55A
9	60A	60A
10		65A
11		70A
12		75A

36V**		
PA#	3/4 HP Model D	1 HP Model E
1	15A	15A
2	18A	18A
3	21A	21A
4	24A	24A
5	27A	27A
6	30A	30A
7	33A	33A
8	36A	36A
9	39A	39A
10		42A
11		45A
12		48A

Model designation: (**A**)=ConvertaMAX 28 & BA 750, (**B**)=I-MAX 28HD, (**C**)=BA 850, (**D**)=ConvertaMAX 34, (**E**)=I-MAX 34HD

*Change of 5 Amps per PA unit on 24 volt system. Values given are approximate.
**Change of 3 Amps per PA unit on 36 volt system. Values given are approximate.

ELECTRICAL SYSTEM

SPECIAL PROGRAM OPTIONS (CONTINUED)

Selection of Low Voltage Cutout Threshold:

FACTORY DEFAULT: STD

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

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

Recall Of Stored Error (Fault) Codes:

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

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

Enabling Or Disabling The Vacuum Automatic Shutoff Option:

FACTORY DEFAULT: ON

The models covered in this manual are equipped with a feature that will automatically shut off the vacuum and display “FULL” on the hourmeter/status display if the recovery tank becomes filled. If problems are encountered with the vacuum automatic shutoff feature, such as the vacuum shutting off even if the recovery tank is not full, this feature can be disabled. To enable or disable this feature perform the following steps:

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

SPECIAL PROGRAM OPTIONS (CONTINUED)

Enabling Or Disabling Fault Detection:

FACTORY DEFAULT: ON

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

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

Brush Type Selection:

FACTORY DEFAULT: 3/4 HP CMAX/BA, 1 HP IMAX

The ConvertaMAX/IMAX 28, BA 750/850 & ConvertaMAX/IMAX 34 can be equipped with two different scrub motor options. Some use two 3/4 horsepower motors (ConvertaMAX & BA 750/850) and the others use two 1 horsepower motors (IMAX). This function configures the control unit current settings for each of the motor sizes. To change from one type to the other:

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

⚠ CAUTION!

Improperly setting this parameter can result in serious damage to the machine. If this is set for 1 HP motors with 3/4 HP motors installed on the machine, the motors may be overloaded which can cause overheating and permanent damage to the motors. It could also create a fire hazard.

Brush Install Position Adjustment:

FACTORY DEFAULT: 5.0 SECONDS

The amount of time that the pad/brush lift actuator runs during the install operation can be adjusted if necessary to properly engage the pads/brushes. The time period can be adjusted from 4.0 to 6.0 seconds with 5.0 seconds being standard. To change the time period:

1 Turn the master on/off key switch to the off position.
2 Press and hold the install and remove switches.
3 While holding both switches turn the master on/off key switch to the on position.
4 Continue to hold both switches until the hourmeter/status display shows a number between 4.0 and 6.0.
5 Release both switches.
6 Pressing the install switch will increase the time (up to 6.0) and pressing the remove switch will decrease the time (down to 4.0).
7 To save the new setting, turn the master on/off key switch to the off position.
8 The new setting will be saved and will remain in effect until it is changed again.

ELECTRICAL SYSTEM

Enabling/Disabling the Auto Brush Install/Remove Feature:

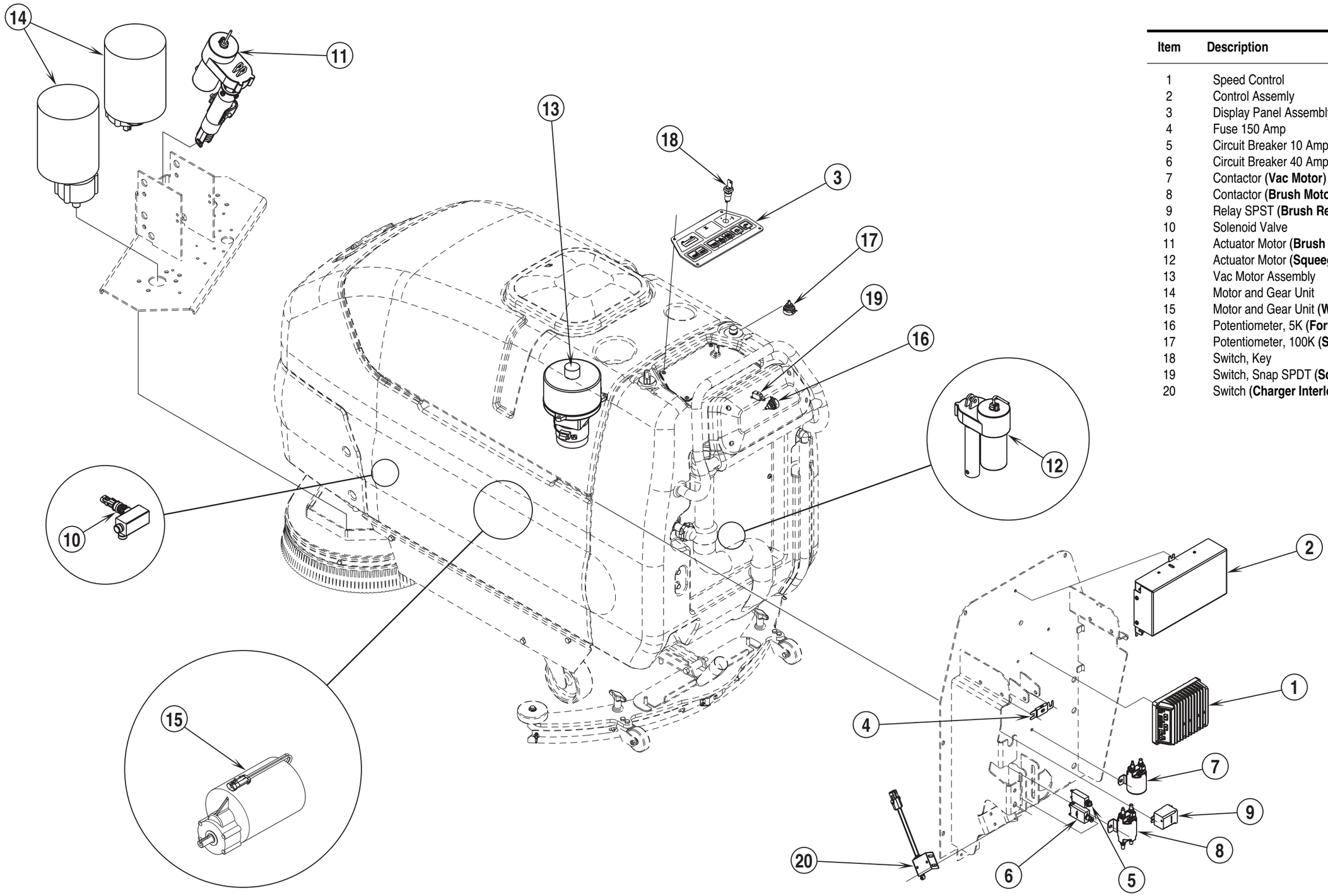
FACTORY DEFAULT: ENABLED

If it is desired to disable this feature perform the following steps:

1 Turn the master on/off key switch to the off position.
2 Press and hold the brush remove switch button.
3 While holding the brush remove switch turn the master on/off key switch to the on position.
4 Continue to hold the brush remove switch until the hourmeter/status display shows "ON" or "OFF" and the brush remove indicator turns green. Then release the brush remove switch.
5 Pressing and releasing the brush remove switch will now select between "ON" (enabled) or "OFF" (disabled).
6 To save the new setting, turn the master on/off key switch to the off position.
7 The new setting will be saved and will remain in effect until it is changed again.

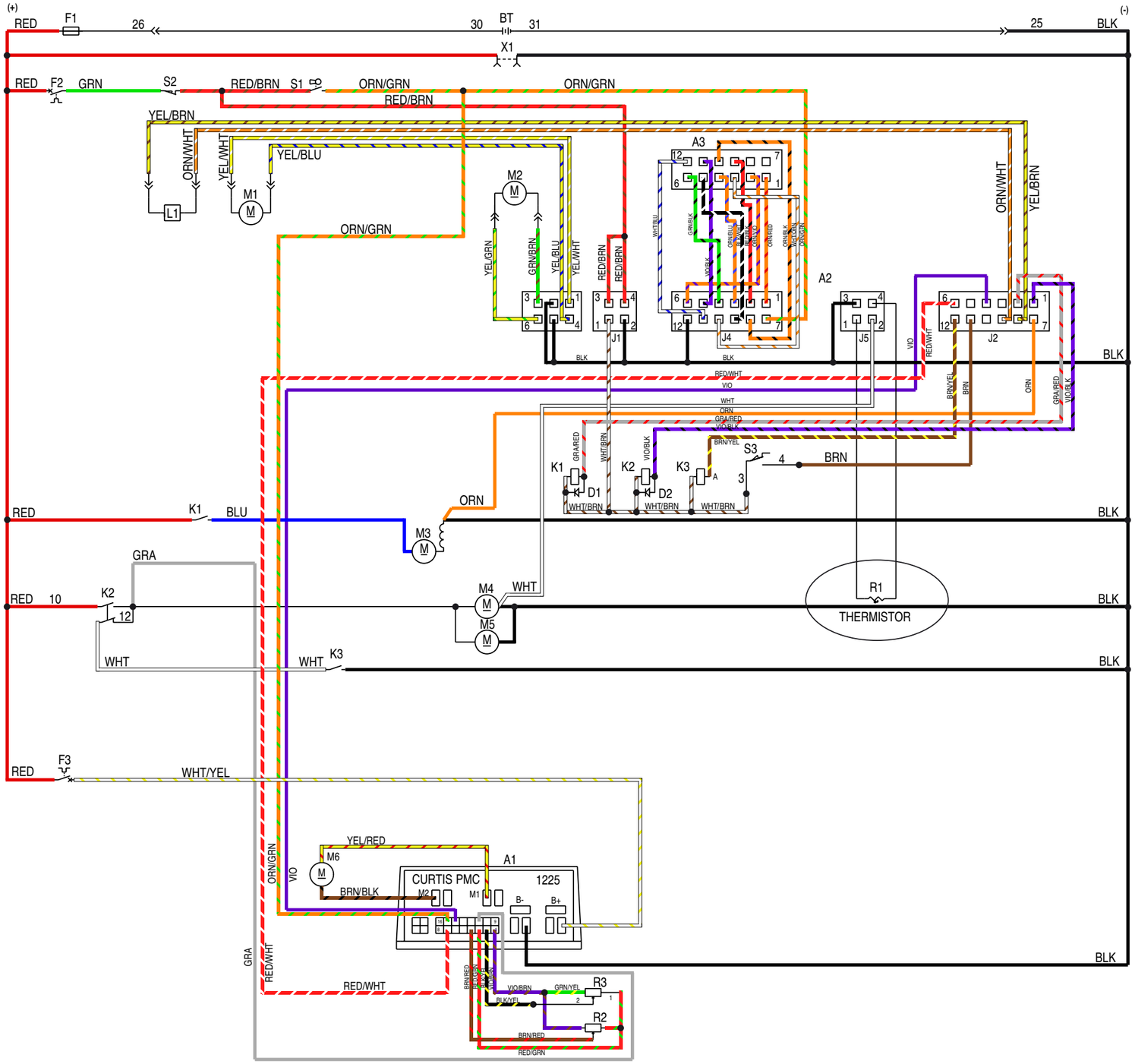
NOTES

COMPONENT LOCATION



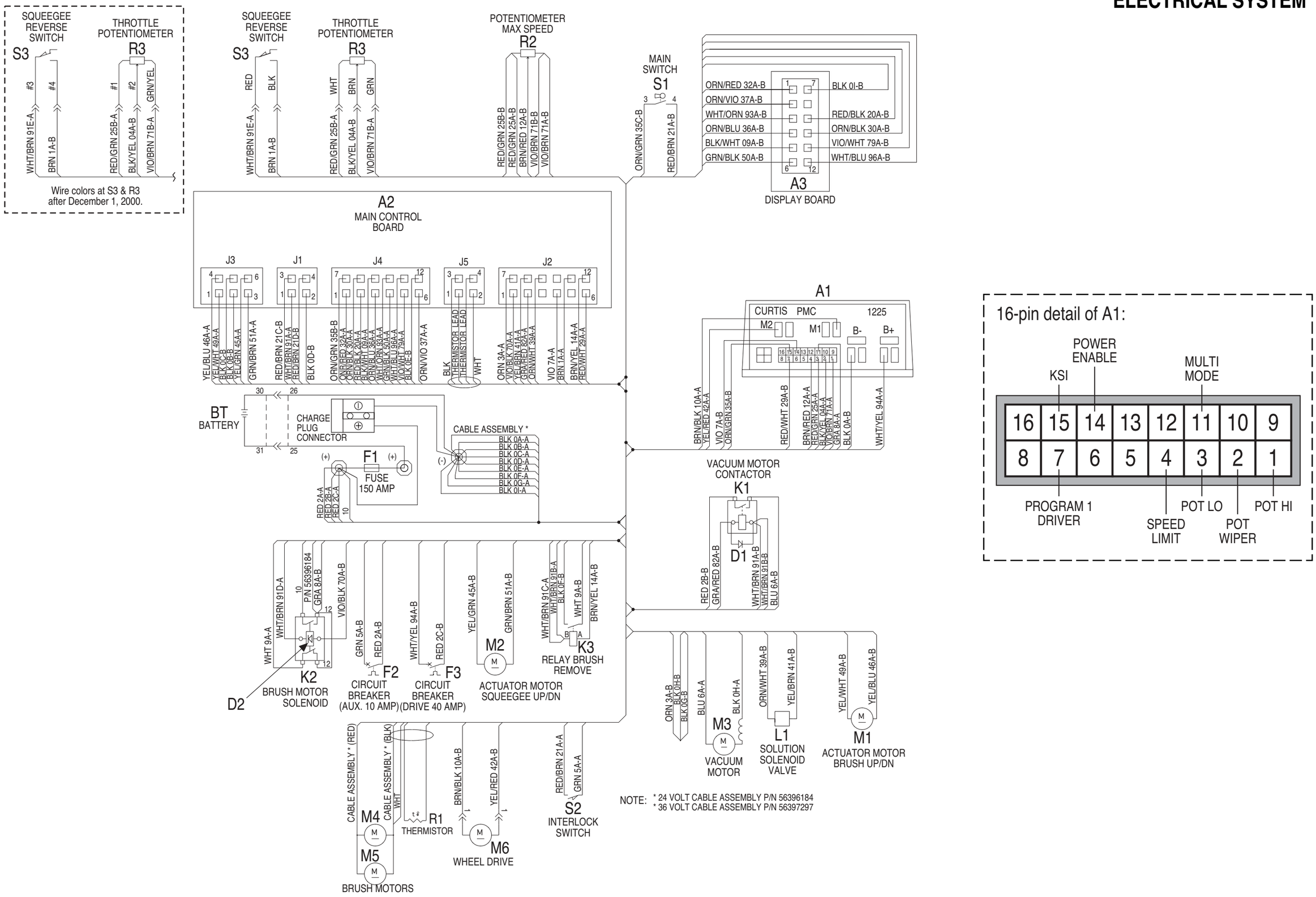
Item	Description
1	Speed Control
2	Control Assemly
3	Display Panel Assembly
4	Fuse 150 Amp
5	Circuit Breaker 10 Amp
6	Circuit Breaker 40 Amp
7	Contactor **(Vac Motor)**
8	Contactor **(Brush Motor)**
9	Relay SPST **(Brush Remove)**
10	Solenoid Valve
11	Actuator Motor **(Brush Lift)**
12	Actuator Motor **(Squeegee Lift)**
13	Vac Motor Assembly
14	Motor and Gear Unit
15	Motor and Gear Unit **(Wheel Drive)**
16	Potentiometer, 5K **(Forward / Reverse)**
17	Potentiometer, 100K **(Speed Control)**
18	Switch, Key
19	Switch, Snap SPDT **(Squeegee Reverse)**
20	Switch **(Charger Interlock)***

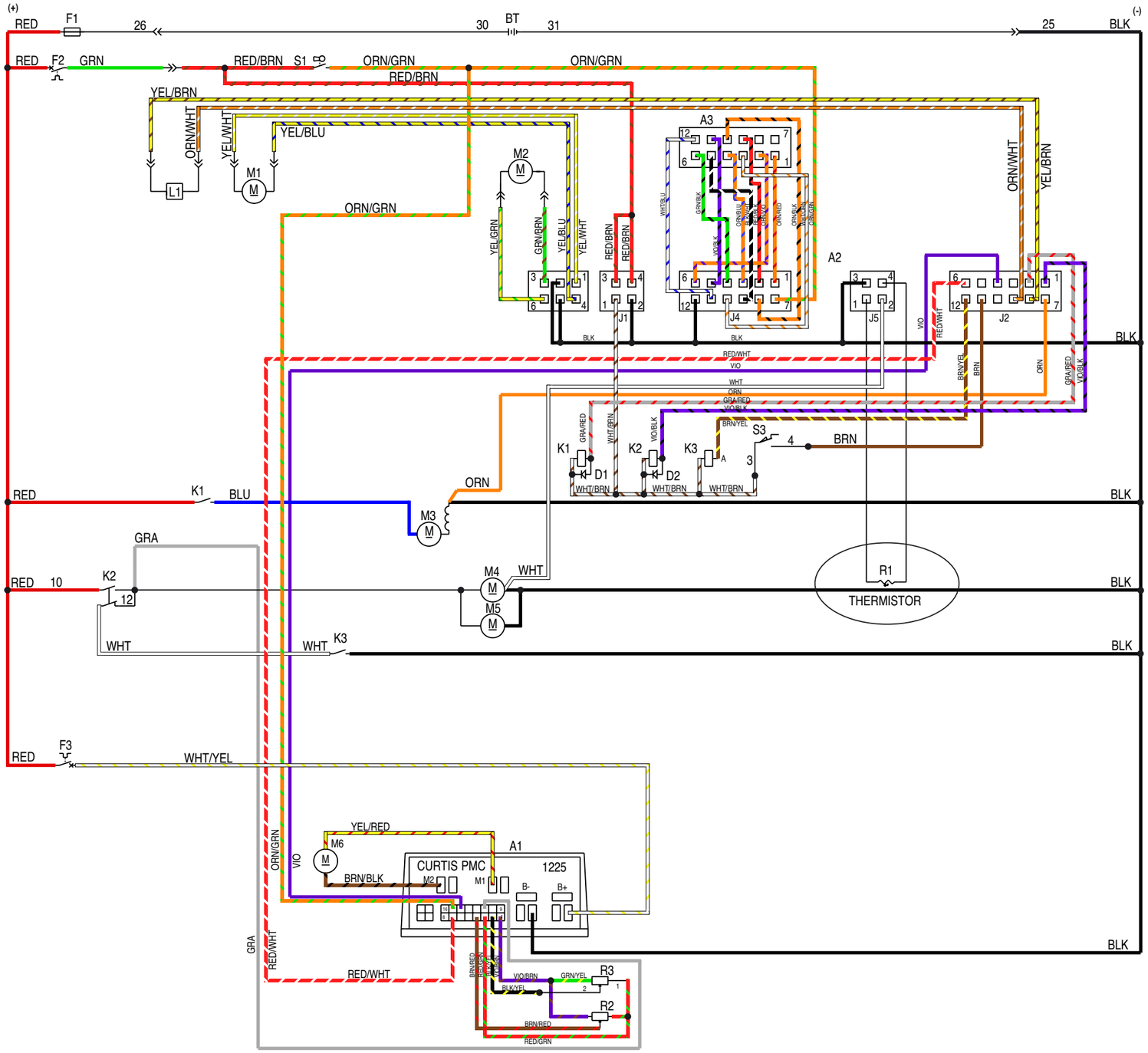
*Charger Interlock Switch is found only on the following models: 56396000, 56397200, 56396001, 56397201, 56396002, 56396003



WIRING DIAGRAM / SCHEMATIC
For Models: 56396000, 56397200, 56396001, 56397201, 56396002 & 56396003

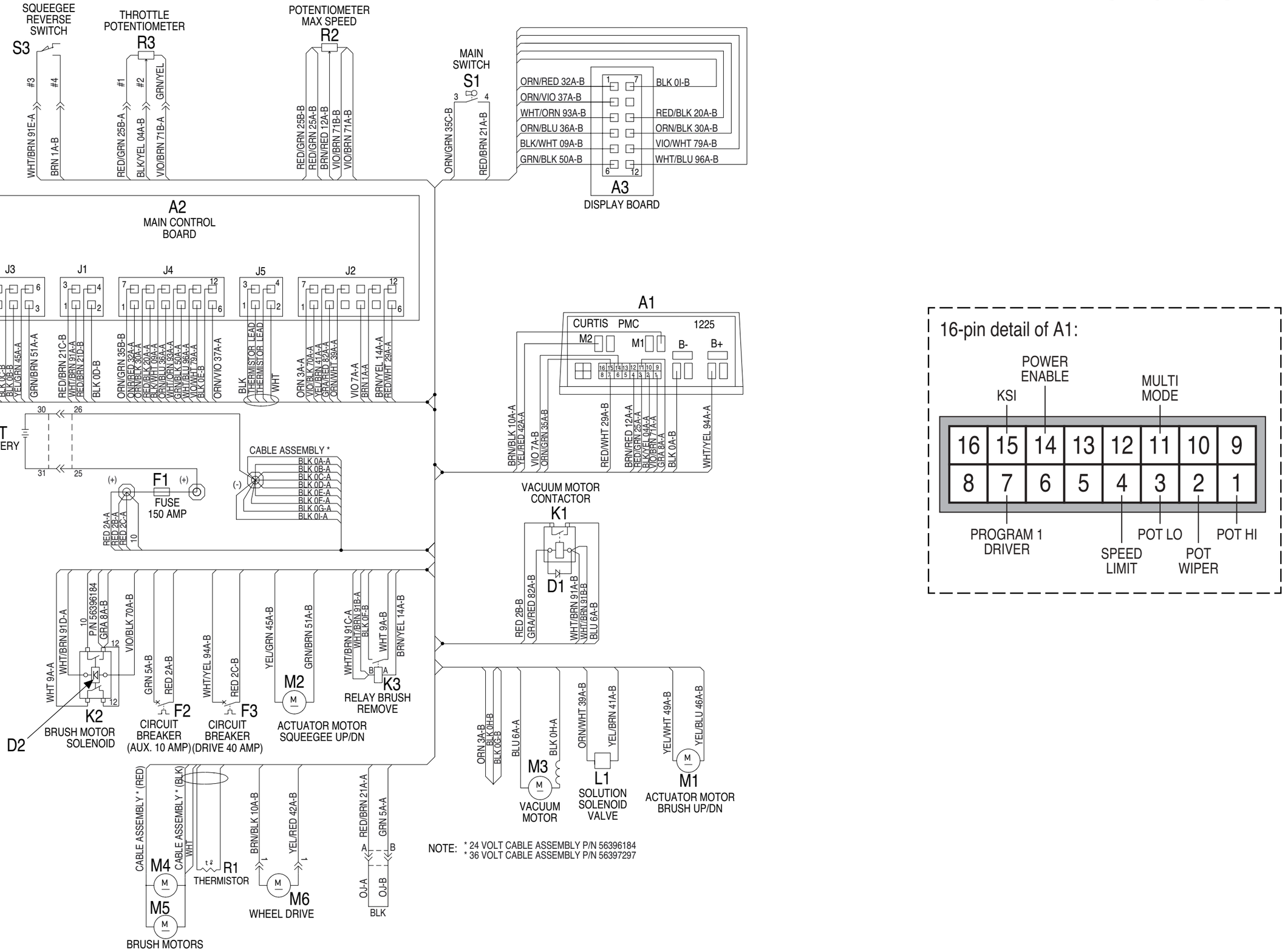
Item	Description
A1	Controller
A2	Control Assembly
A3	Display Panel Assembly
BT	Battery*
D1	Diode
D2	Diode
F1	Fuse, 150 Amp
F2	Circuit Breaker 10 Amp (**Control Circuit**)
F3	Circuit Breaker 40 Amp (**Wheel Drive**)
K1	Contactor, DC (**Vac Motor**)
K2	Contactor, SPDT (**Brush Motor**)
K3	Relay, SPST, (**Brush Remove**)
L1	Solenoid Valve
M1	Actuator, Motor (**Brush Lift**)
M2	Actuator, Motor (**Squeegee Lift**)
M3	Vac Motor Assembly
M4	Motor and Gear Unit, (**Brush**)
M5	Motor and Gear Unit, (**Brush**)
M6	Motor and Gear Unit, (**Wheel Drive**)
R1	Thermistor
R2	Potentiometer, 100K (**Speed Control**)
R3	Potentiometer, 5K (**Forward / Reverse**)
S1	Switch, Key
S2	Switch (**Charger Interlock**)
S3	Switch, Snap SPDT (**Squeegee Reverse**)
X1	Charge Connector Assy


SQUEEGEE REVERSE SWITCH
S3
THROTTLE POTENTIOMETER
R3
#3
#4
#1
#2
GRN/YEL
WHT/BRN 91E-A
BRN 1A-B
RED/GRN 25B-A
BLK/YEL 04A-B
VIO/BRN 71B-A
Wire colors at S3 & R3 after December 1, 2000.
SQUEEGEE REVERSE SWITCH
S3
THROTTLE POTENTIOMETER
R3
POTENTIOMETER MAX SPEED
R2
RED
BLK
WHT
BRN
GRN
RED/GRN 25B-B
RED/GRN 25A-B
BRN/RED 12A-B
VIO/BRN 71B-B
VIO/BRN 71A-B
MAIN SWITCH
S1
ORN/GRN 35C-B
RED/BRN 21A-B
ORN/RED 32A-B
ORN/VIO 37A-B
WHT/ORN 93A-B
ORN/BLU 36A-B
BLK/WHT 09A-B
GRN/BLK 50A-B
BLK 0I-B
RED/BLK 20A-B
ORN/BLK 30A-B
VIO/WHT 79A-B
WHT/BLU 96A-B
A3
DISPLAY BOARD
A2
MAIN CONTROL BOARD
J3
J1
J4
J5
J2
YEL/BLU 46A-A
YEL/WHT 49A-A
BLK 0C-B
BLK 0B-B
YEL/GRN 45A-A
GRN/BRN 51A-A
RED/BRN 21C-B
WHT/BRN 91A-A
RED/BRN 21D-B
BLK 0D-B
ORN/GRN 35B-B
ORN/RED 32A-A
ORN/BLK 30A-A
RED/BLK 20A-A
BLK/WHT 09A-A
ORN/BLU 36A-A
GRN/BLK 50A-A
WHT/BLU 96A-A
VIO/WHT 79A-A
BLK 0E-B
ORN/VIO 37A-A
BLK
THERMISTOR LEAD
THERMISTOR LEAD
WHT
ORN 3A-A
VIO/BLK 70A-A
YEL/BRN 41A-A
GRA/RED 82A-A
ORN/WHT 39A-A
VIO 7A-A
BRN 1A-A
BRN/YEL 14A-A
RED/WHT 29A-A
A1
CURTIS PMC 1225
M2
M1
B-
B+
BRN/BLK 10A-A
YEL/RED 42A-A
VIO 7A-B
ORN/GRN 35A-B
RED/WHT 29A-B
BRN/RED 12A-A
RED/GRN 25A-A
BLK/YEL 04A-A
VIO/BRN 71A-A
GRA 8A-A
BLK 0A-B
WHT/YEL 94A-A
BT
BATTERY
CHARGE PLUG CONNECTOR
CABLE ASSEMBLY *
BLK 0A-A
BLK 0B-A
BLK 0C-A
BLK 0D-A
BLK 0E-A
BLK 0E-A
BLK 0G-A
BLK 0I-A
F1
FUSE 150 AMP
RED 2A-A
RED 2B-A
RED 2C-A
VACUUM MOTOR CONTACTOR
K1
D1
RED 2B-B
GRA/RED 82A-B
WHT/BRN 91A-B
WHT/BRN 91B-B
BLU 6A-B
WHT/BRN 91D-A
P/N 56396184
GRA 8A-B
VIO/BLK 70A-B
WHT 9A-A
K2
BRUSH MOTOR SOLENOID
D2
GRN 5A-B
RED 2A-B
F2
CIRCUIT BREAKER (AUX. 10 AMP)
WHT/YEL 94A-B
RED 2C-B
F3
CIRCUIT BREAKER (DRIVE 40 AMP)
YEL/GRN 45A-B
GRN/BRN 51A-B
M2
ACTUATOR MOTOR SQUEEGEE UP/DN
WHT/BRN 91C-A
WHT/BRN 91B-A
BLK 0E-B
WHT 9A-B
BRN/YEL 14A-B
K3
RELAY BRUSH REMOVE
ORN 3A-B
BLK 0H-B
BLK 0G-B
BLU 6A-A
BLK 0H-A
M3
VACUUM MOTOR
ORN/WHT 39A-B
YEL/BRN 41A-B
L1
SOLUTION SOLENOID VALVE
YEL/WHT 49A-B
YEL/BLU 46A-B
M1
ACTUATOR MOTOR BRUSH UP/DN
CABLE ASSEMBLY * (RED)
CABLE ASSEMBLY * (BLK)
WHT
M4
M5
BRUSH MOTORS
R1
THERMISTOR
BRN/BLK 10A-B
YEL/RED 42A-B
M6
WHEEL DRIVE
RED/BRN 21A-A
GRN 5A-A
S2
INTERLOCK SWITCH
NOTE: * 24 VOLT CABLE ASSEMBLY P/N 56396184
* 36 VOLT CABLE ASSEMBLY P/N 56397297
16-pin detail of A1:
POWER ENABLE
KSI
MULTI MODE
16 15 14 13 12 11 10 9
8 7 6 5 4 3 2 1
PROGRAM 1 DRIVER
SPEED LIMIT
POT LO
POT WIPER
POT HI



WIRING DIAGRAM / SCHEMATIC
For Models: 56396015, 56396019, 56396016 56396020, 56396017 & 56396018

Item	Description
A1	Controller
A2	Control Assembly
A3	Display Panel Assembly
BT	Battery*
D1	Diode
D2	Diode
F1	Fuse, 150 Amp
F2	Circuit Breaker 10 Amp (**Control Circuit**)
F3	Circuit Breaker 40 Amp (**Wheel Drive**)
K1	Contactor, DC (**Vac Motor**)
K2	Contactor, SPDT (**Brush Motor**)
K3	Relay, SPST, (**Brush Remove**)
L1	Solenoid Valve
M1	Actuator, Motor (**Brush Lift**)
M2	Actuator, Motor (**Squeegee Lift**)
M3	Vac Motor Assembly
M4	Motor and Gear Unit, (**Brush**)
M5	Motor and Gear Unit, (**Brush**)
M6	Motor and Gear Unit, (**Wheel Drive**)
R1	Thermistor
R2	Potentiometer, 100K (**Speed Control**)
R3	Potentiometer, 5K (**Forward / Reverse**)
S1	Switch, Key
S3	Switch, Snap SPDT (**Squeegee Reverse**)



16-pin detail of A1:

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