

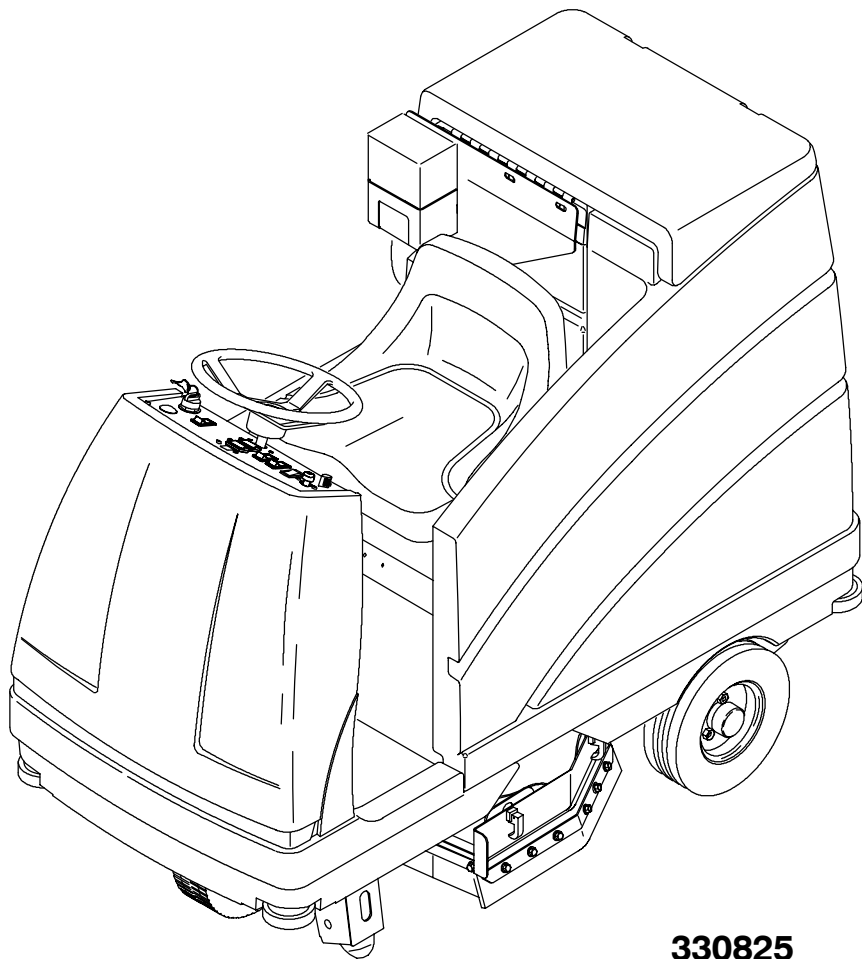


EZ Rider HP™

Service Information



The safe scrubbing alternative™



330825
Rev. 00





This manual provides service information for the NOBLES Model EZ Rider HP.

This machine will provide excellent service. However, the best results will be obtained at minimum costs if:

- The machine is operated with reasonable care.
- The machine is maintained regularly - per the maintenance instructions provided.
- The machine is maintained with NOBLES supplied or equivalent parts.

Manual Number - 330825

Revision: 00

Published: 6-05

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ELECTRICAL

Troubleshooting Information

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions in Operator's Manual
- * Always use an ESD (Electrostatic Discharge) strap when working near the Control Board
- * Be cautious when working near Control Board – *Battery voltage is always present, even with Key OFF*
- * Always unplug Battery Connector when removing or replacing components

DURING TESTS:

- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action

NOTE: Troubleshooting charts may be shown with optional equipment. The optional equipment may not be specified in these charts. Some machines may not be equipped with all components shown.

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EZ Rider HP Electrical Schematic (0000000-10143032)

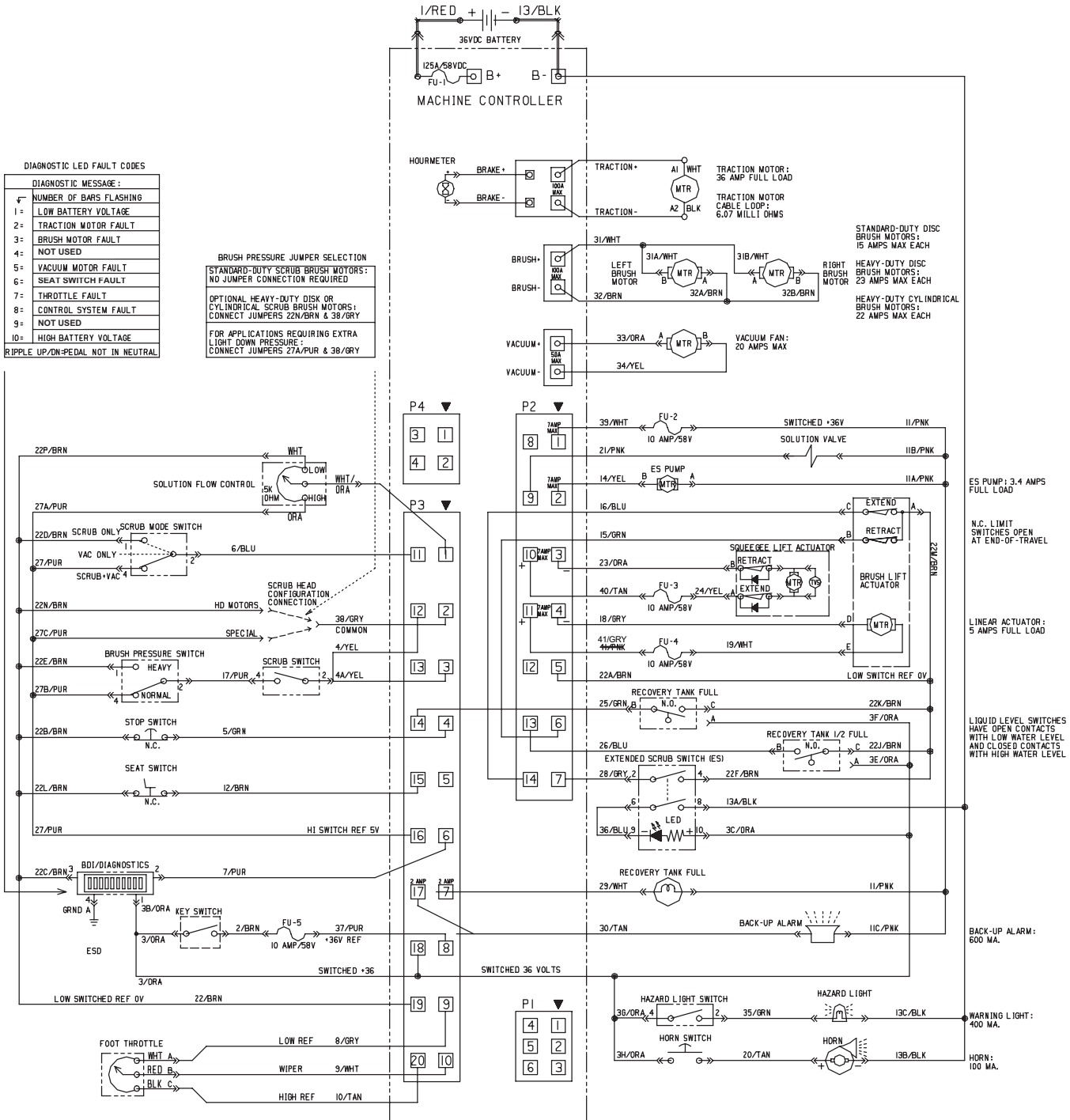
DIAGNOSTIC LED FAULT CODES

DIAGNOSTIC MESSAGE:
✓ NUMBER OF BARS FLASHING
1= LOW BATTERY VOLTAGE
2= TRACTION MOTOR FAULT
3= BRUSH MOTOR FAULT
4= NOT USED
5= VACUUM MOTOR FAULT
6= SEAT SWITCH FAULT
7= THROTTLE FAULT
8= CONTROL SYSTEM FAULT
9= NOT USED
10= HIGH BATTERY VOLTAGE
✓ RIPPLE UP/DN-PEDAL NOT IN NEUTRAL

BRUSH PRESSURE JUMPER SELECTION
 STANDARD-DUTY SCRUB BRUSH MOTORS:
 NO JUMPER CONNECTION REQUIRED

OPTIONAL HEAVY-DUTY DISK OR
 CYLINDRICAL SCRUB BRUSH MOTORS:
 CONNECT JUMPERS 22N/BRN & 38/GRY

FOR APPLICATIONS REQUIRING EXTRA
 LIGHT DOWN PRESSURE:
 CONNECT JUMPERS 27A/PUR & 38/GRY



EZ Rider HP Electrical Schematic (10143033-

P2 CONNECTOR DESIGNATIONS		P3 CONNECTOR DESIGNATIONS	
P2-1	SWITCHED B+	P3-1	NOT USED
P2-2	SCRUB OPTION OUTPUT	P3-2	DN PRESS CONFID INPUT
P2-3	SQUEEGEE ACTUATOR (-)	P3-3	SCRUB SPEED INPUT
P2-4	BRUSH LIFT ACTUATOR (-)	P3-4	EMERGENCY STOP INPUT
P2-5	LOW SWITCHED REF (OV)	P3-5	SOLUTION FLOW INPUT
P2-6	ACTUATOR RETRACT LIMIT	P3-6	BATTERY INDICATOR
P2-7	SCRUB OPT. SWITCH INPUT	P3-7	REC TANK FULL OUTPUT
P2-8	SWITCHED B+	P3-8	KEY SWITCH POWER
P2-9	SOLUTION FLOW OUTPUT	P3-9	THROTTLE LOW REF
P2-10	SQUEEGEE ACTUATOR (+)	P3-10	THROTTLE WIPER
P2-11	BRUSH LIFT ACTUATOR (+)	P3-11	SCRUB MODE SWITCH INPUT
P2-12	HIGH SWITCHED REF (SV)	P3-12	SCRUB ON NORM/HD INPUT
P2-13	REC TANK 1/2 FULL INPUT	P3-13	NOT USED
P2-14	ACTUATOR EXTEND LIMIT	P3-14	REC TANK FULL INPUT
		P3-15	SEAT SWITCH INPUT
		P3-16	HIGH SWITCH REF (SV)
		P3-17	BACK-UP ALARM OUTPUT
		P3-18	KEY SWITCH INPUT
		P3-19	LOW SWITCH REF (OV)
		P3-20	THROTTLE HIGH REF

DIAGNOSTIC LED FAULT CODES

DIAGNOSTIC MESSAGE:

1: NUMBER OF BARS FLASHING

1: LOW BATTERY VOLTAGE

2: TRACTION MOTOR FAULT

3: BRUSH MOTOR FAULT

4: NOT USED

5: VACUUM MOTOR FAULT

6: SEAT SWITCH FAULT

7: THROTTLE FAULT

8: CONTROL SYSTEM FAULT

9: NOT USED

10: HIGH BATTERY VOLTAGE

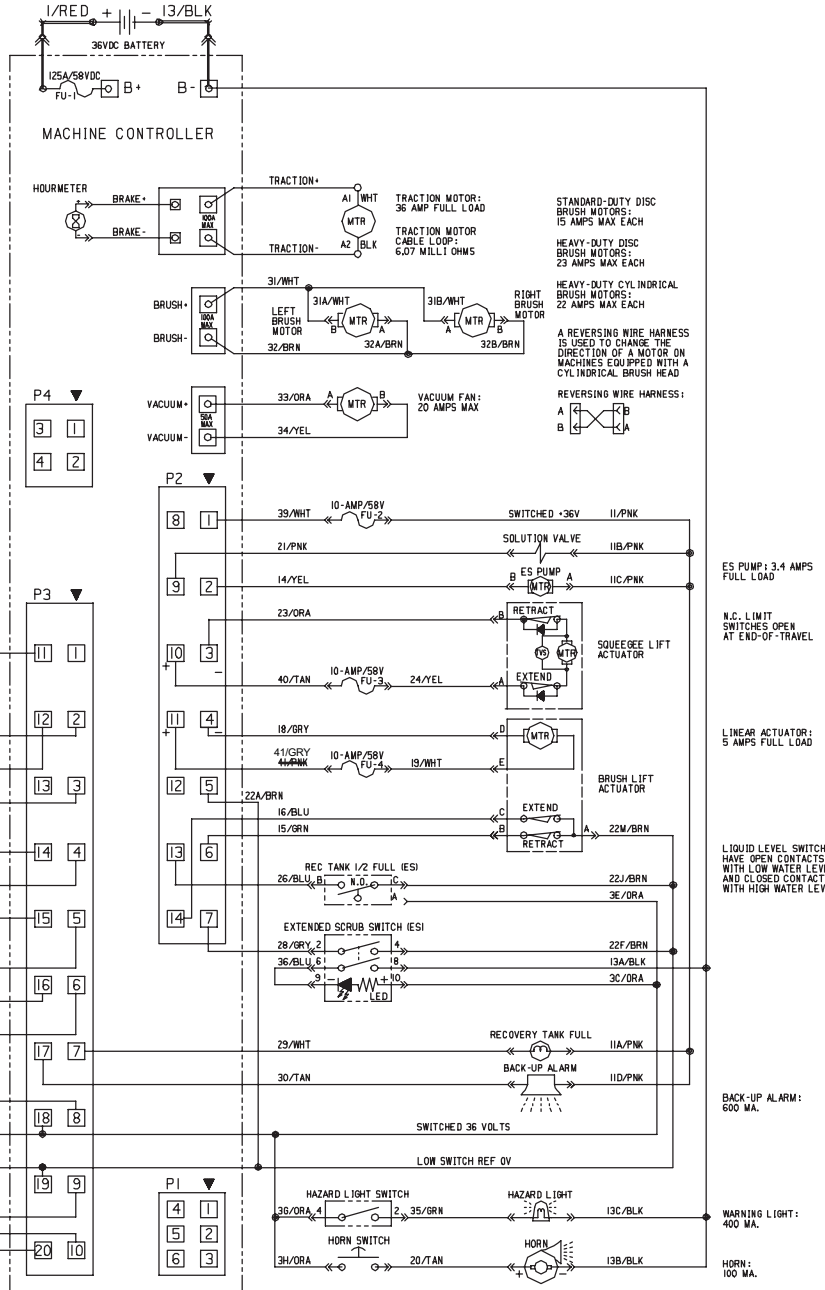
RIPPLE ← PEDAL NOT NEUTRAL

BRUSH PRESSURE JUMPER SELECTION

STANDARD-DUTY SCRUB BRUSH MOTORS:
NO JUMPER CONNECTION REQUIRED

OPTIONAL HEAVY-DUTY DISK OR
CYLINDRICAL SCRUB BRUSH MOTORS:
CONNECT JUMPERS 22M/BRN & 38/GRY

FOR APPLICATIONS REQUIRING EXTRA
LIGHT DOWN PRESSURE:
CONNECT JUMPERS 27A/PUR & 38/GRY

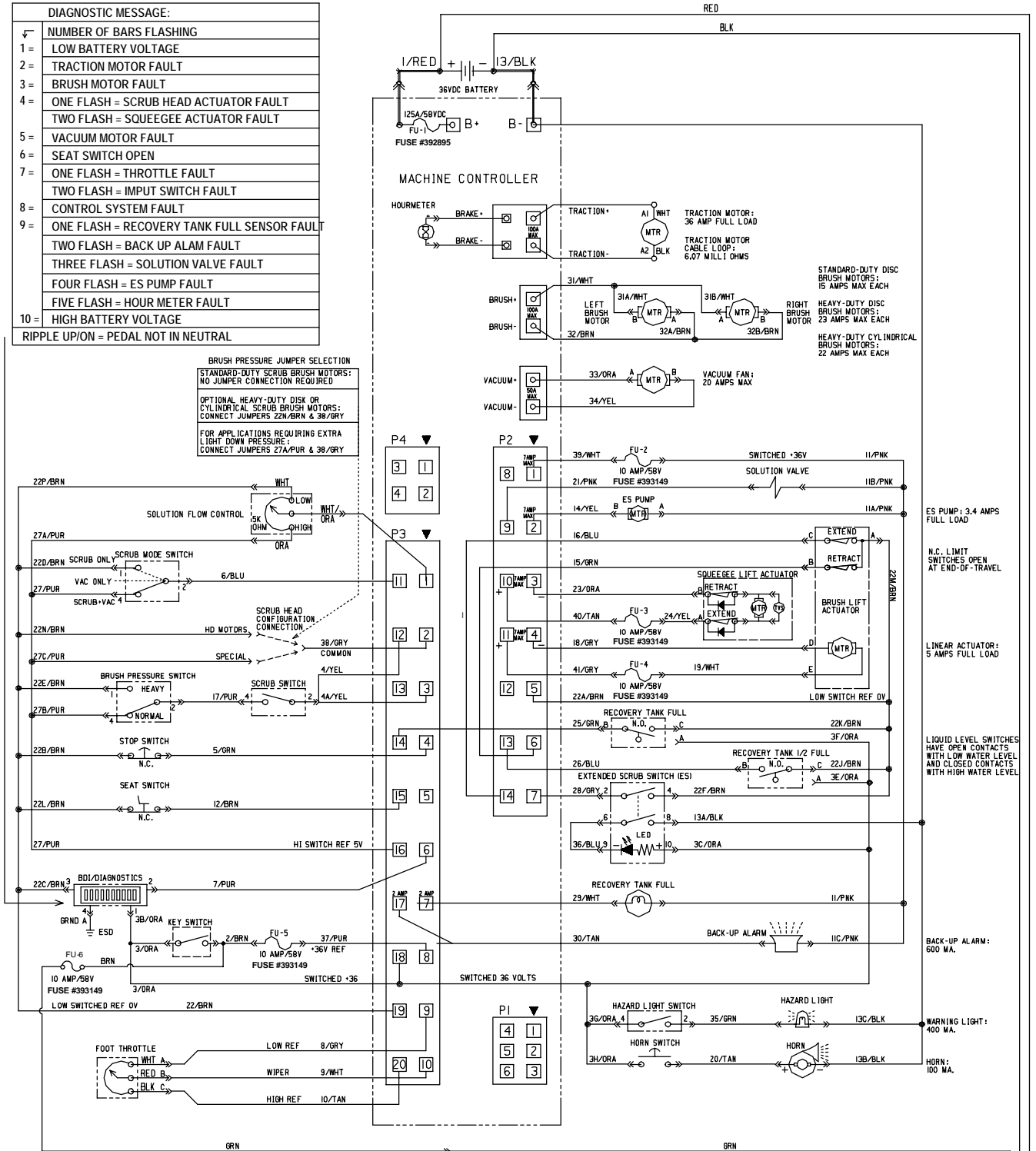


EZ Rider HP Electrical Schematic for Models with Optional On-board Charger

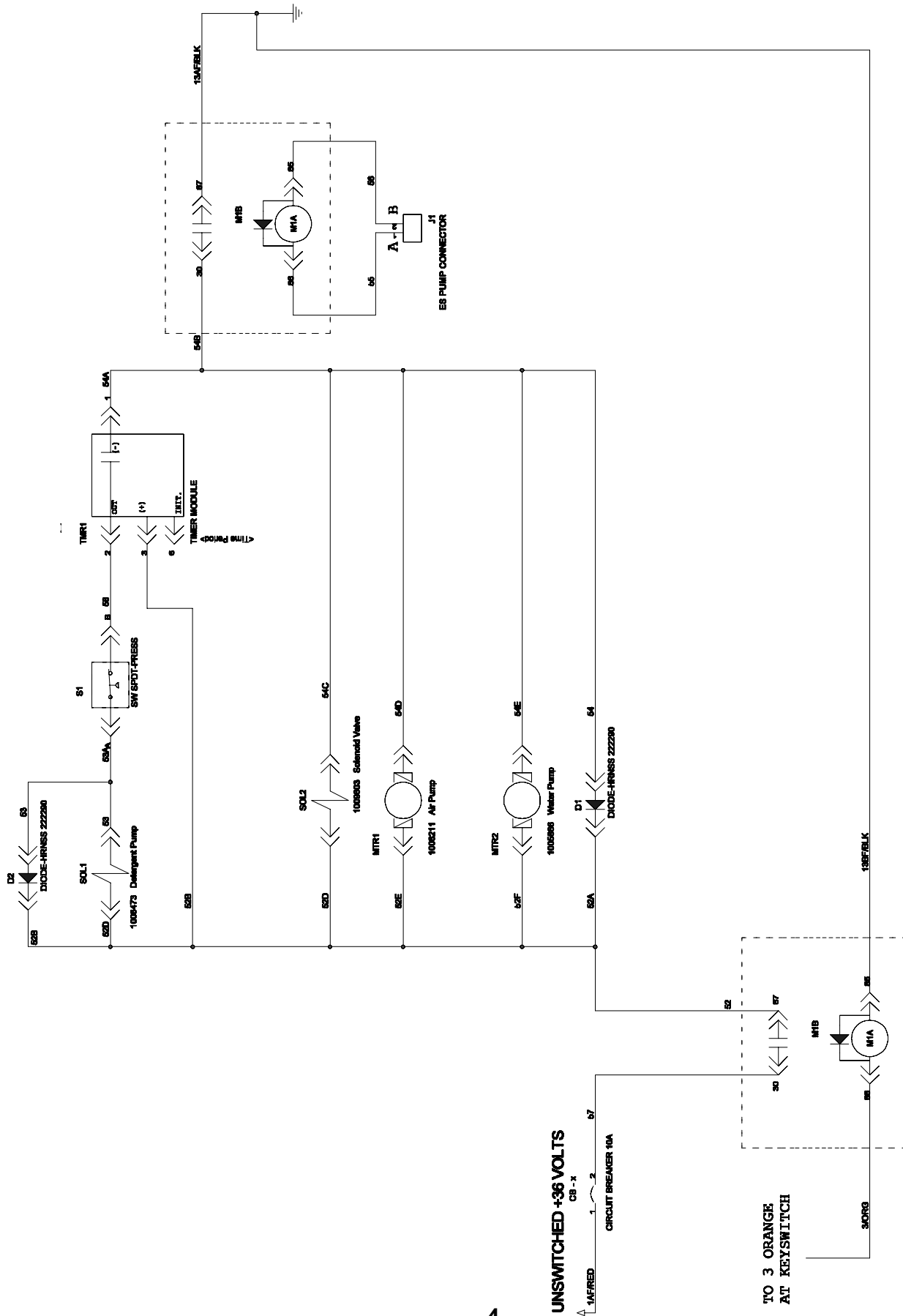
DIAGNOSTIC LED FAULT CODES

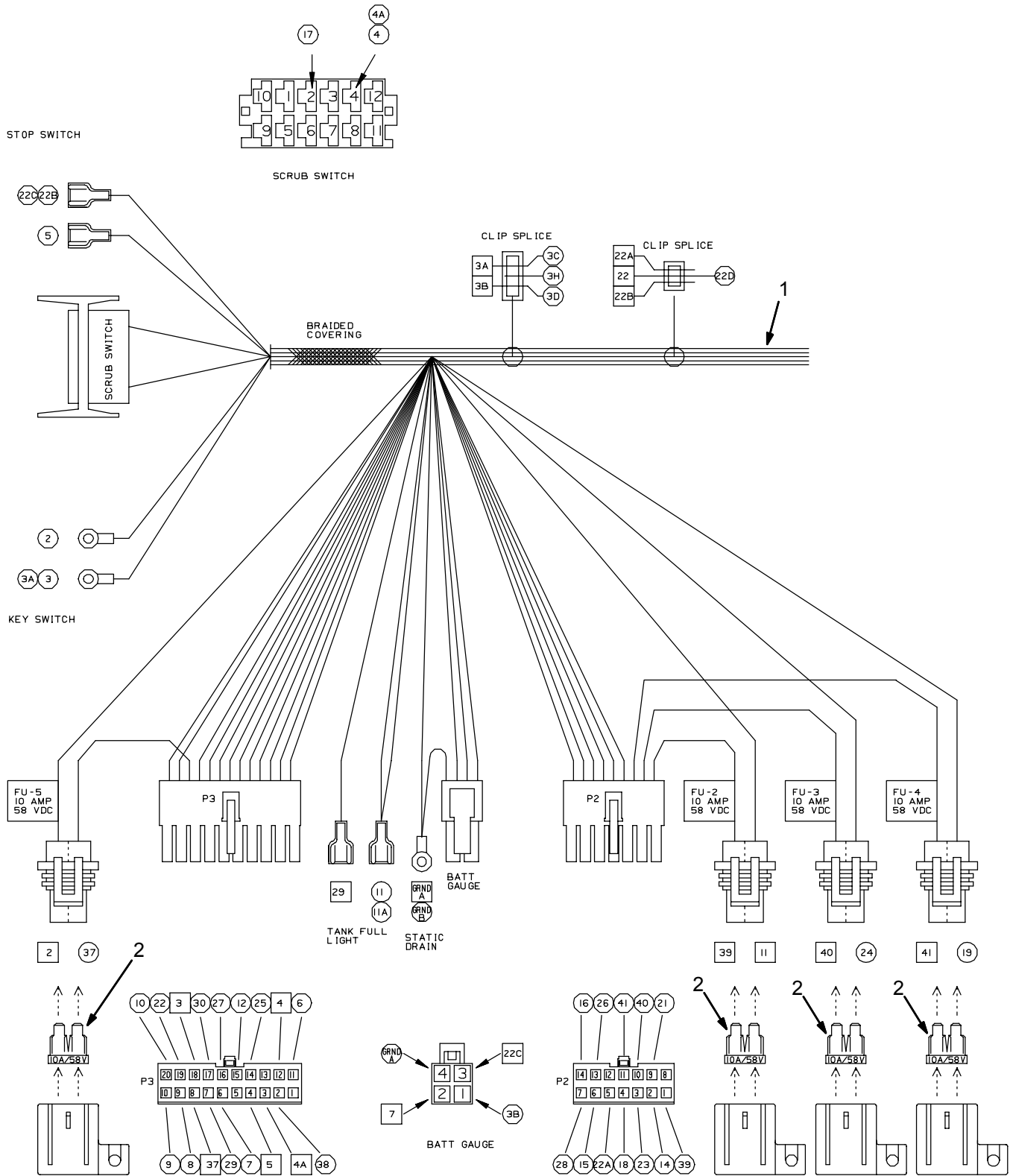
DIAGNOSTIC MESSAGE:	
✓	NUMBER OF BARS FLASHING
1 =	LOW BATTERY VOLTAGE
2 =	TRACTION MOTOR FAULT
3 =	BRUSH MOTOR FAULT
4 =	ONE FLASH = SCRUB HEAD ACTUATOR FAULT TWO FLASH = SQUEEGEE ACTUATOR FAULT
5 =	VACUUM MOTOR FAULT
6 =	SEAT SWITCH OPEN
7 =	ONE FLASH = THROTTLE FAULT TWO FLASH = INPUT SWITCH FAULT
8 =	CONTROL SYSTEM FAULT
9 =	ONE FLASH = RECOVERY TANK FULL SENSOR FAULT TWO FLASH = BACK UP ALAM FAULT THREE FLASH = SOLUTION VALVE FAULT FOUR FLASH = ES PUMP FAULT FIVE FLASH = HOUR METER FAULT
10 =	HIGH BATTERY VOLTAGE
RIPPLE UP/ON = PEDAL NOT IN NEUTRAL	

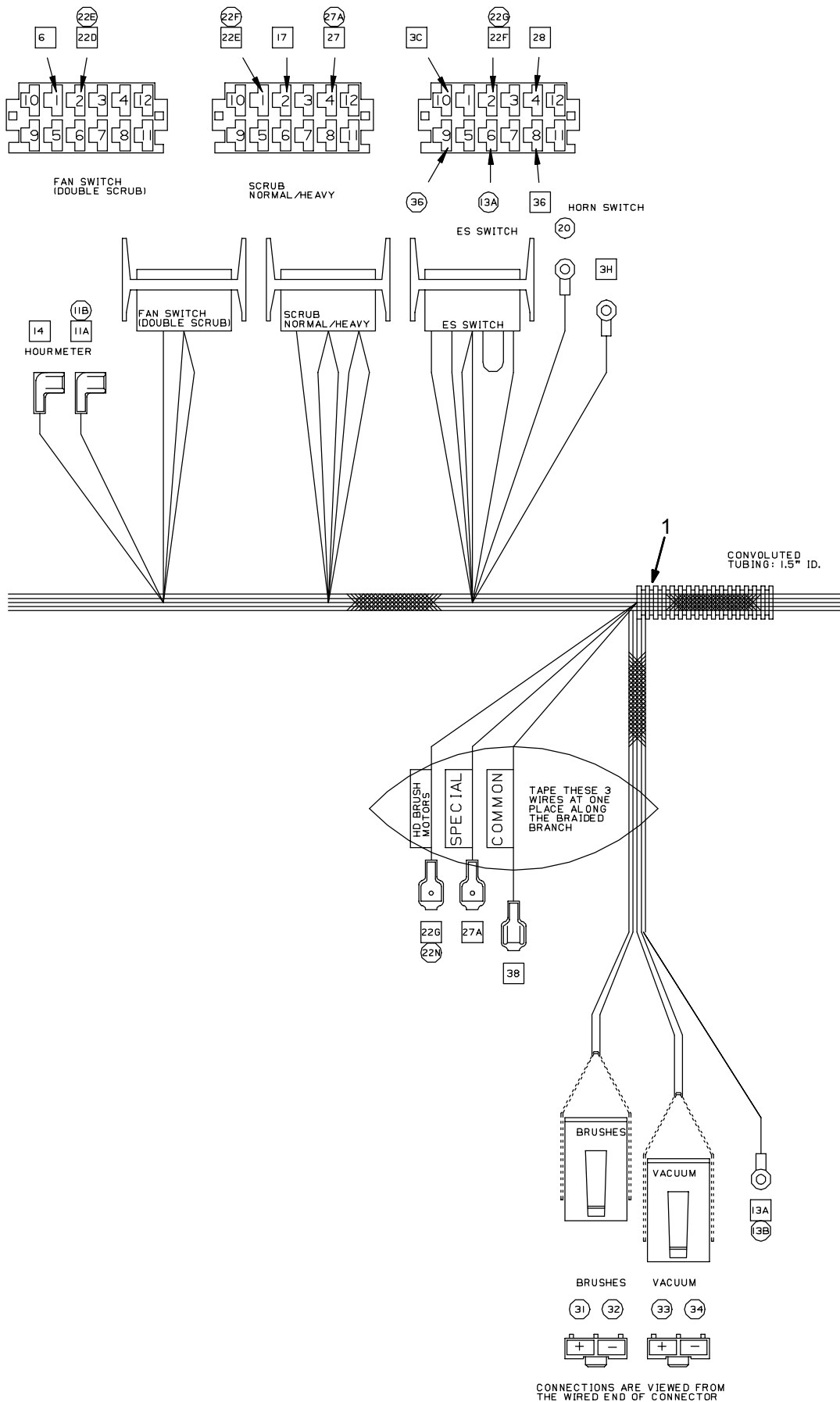
BRUSH PRESSURE JUMPER SELECTION
STANDARD-DUTY SCRUB BRUSH MOTORS:
 NO JUMPER CONNECTION REQUIRED
**OPTIONAL HEAVY-DUTY DISK OR
 CYLINDRICAL SCRUB BRUSH MOTORS:**
 CONNECT JUMPERS 22N/BRN & 38/GRY
**FOR APPLICATIONS REQUIRING EXTRA
 LIGHT DOWN PRESSURE:**
 CONNECT JUMPERS 27A/PUR & 38/GRY

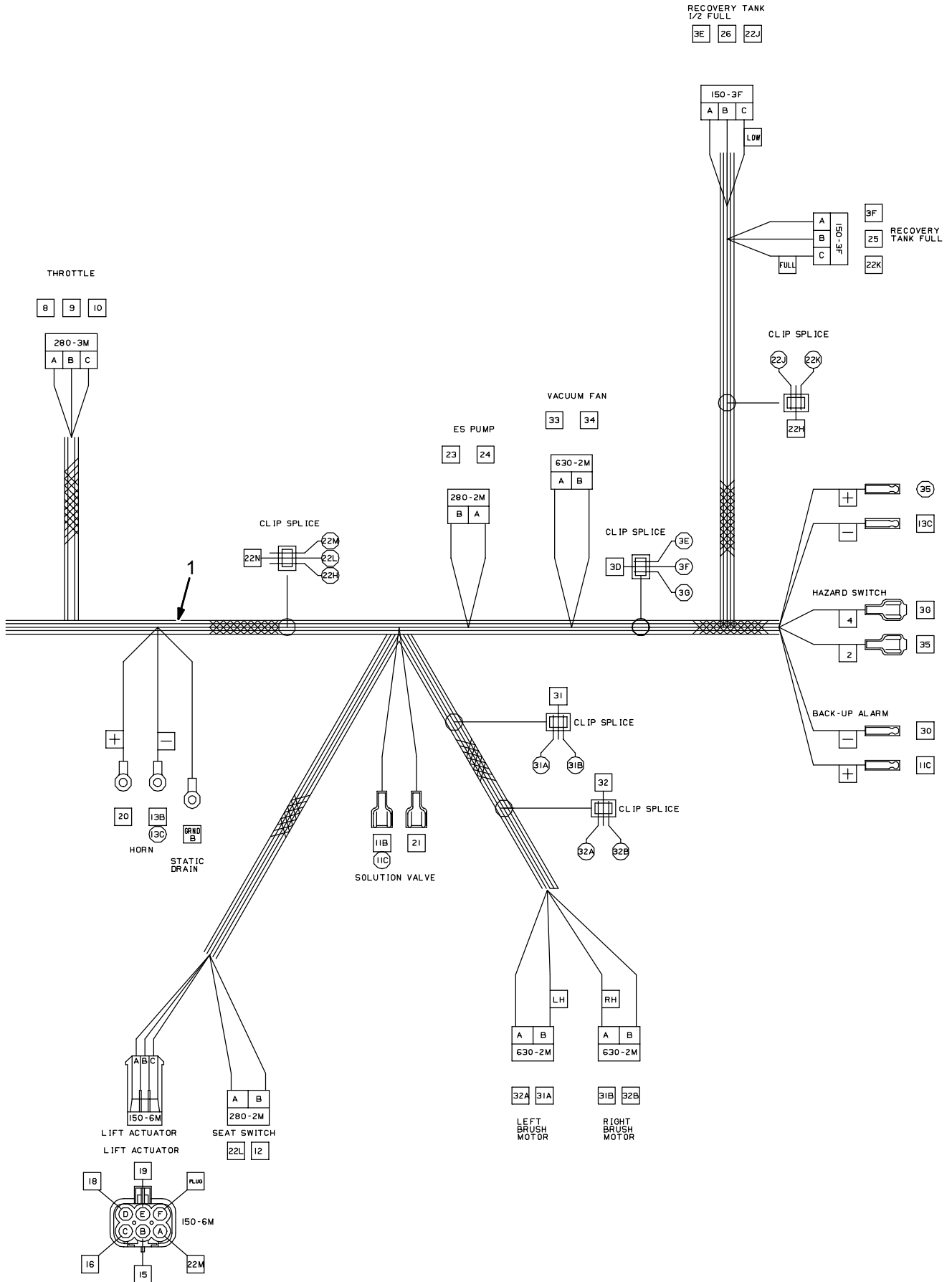


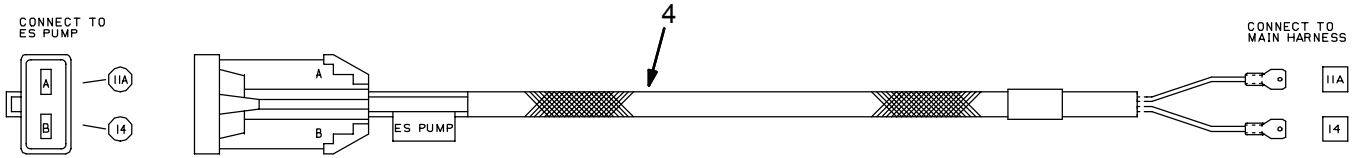
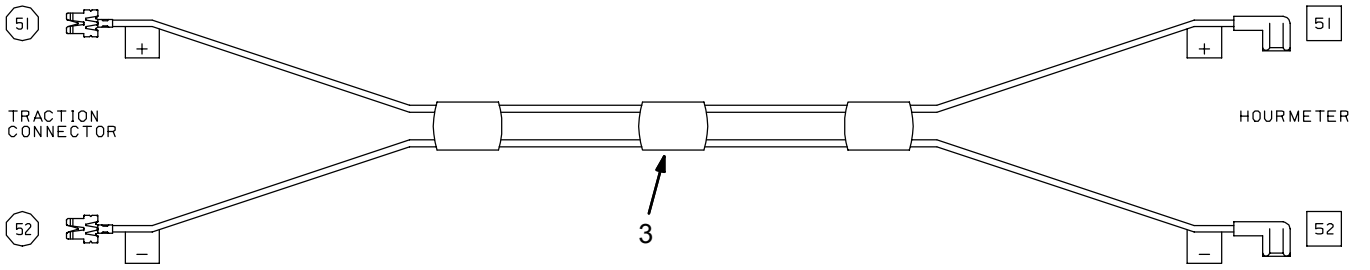
EZ Rider HP Electrical Schematic Addendum for Models with FaST System

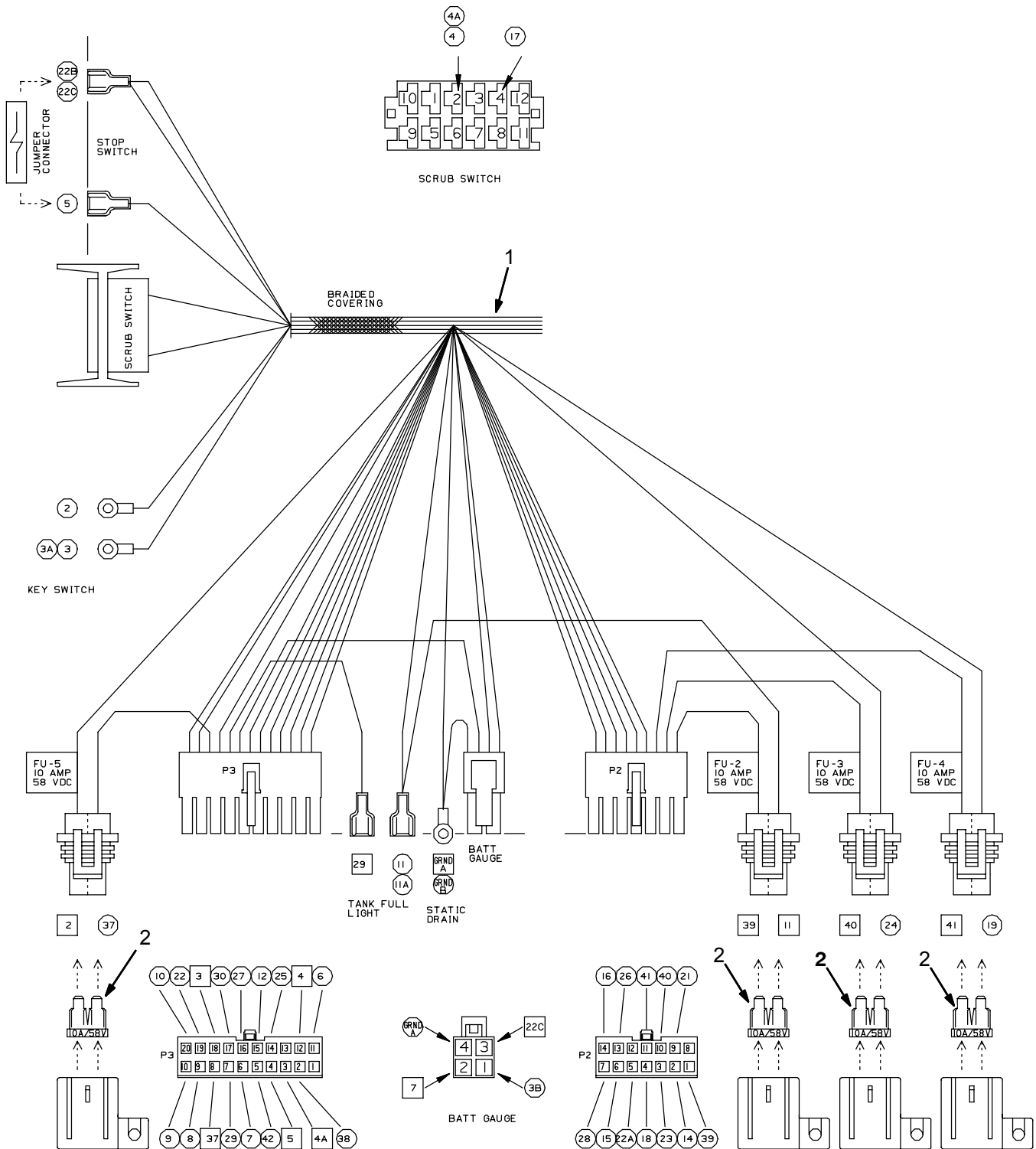


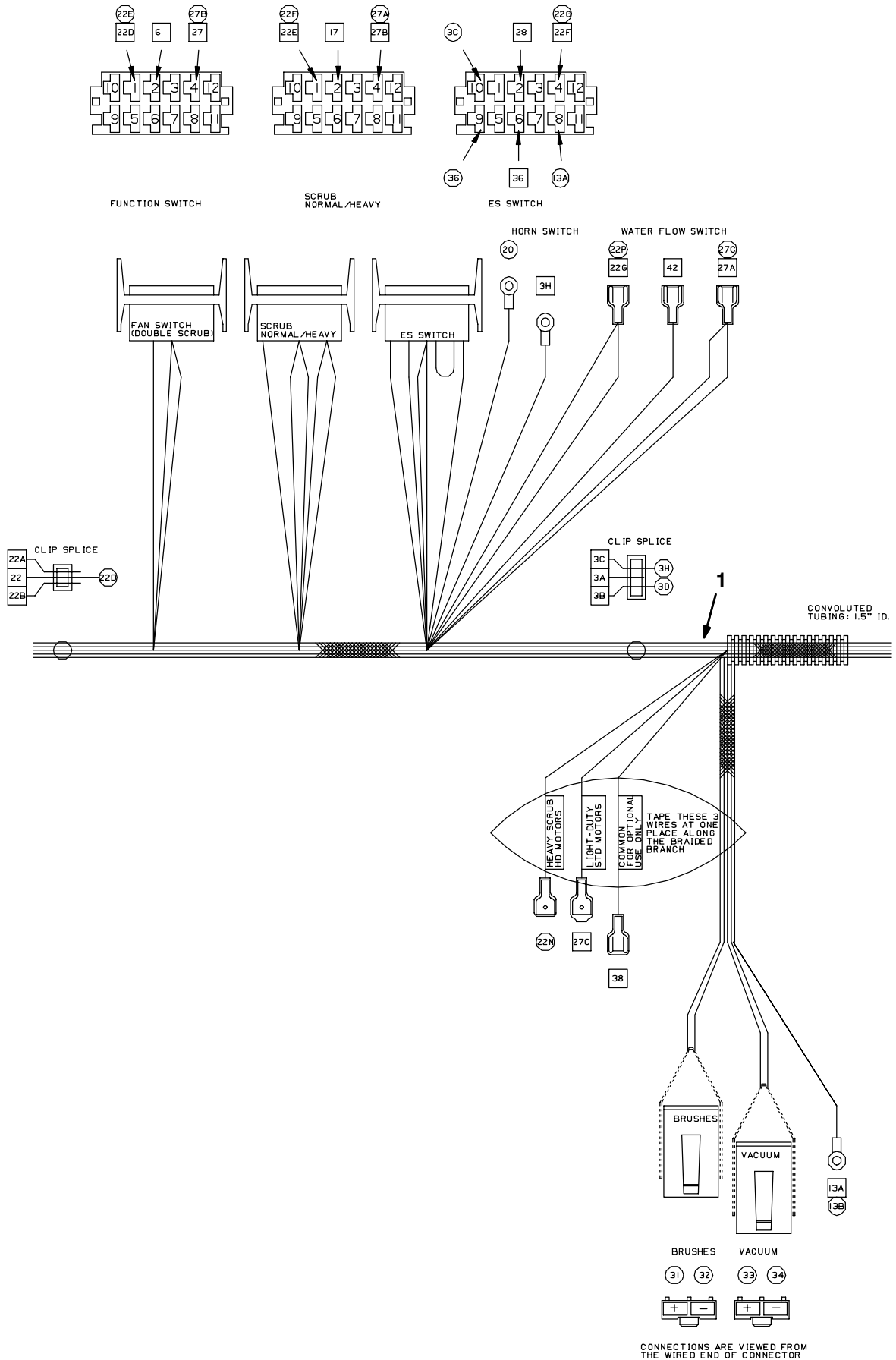


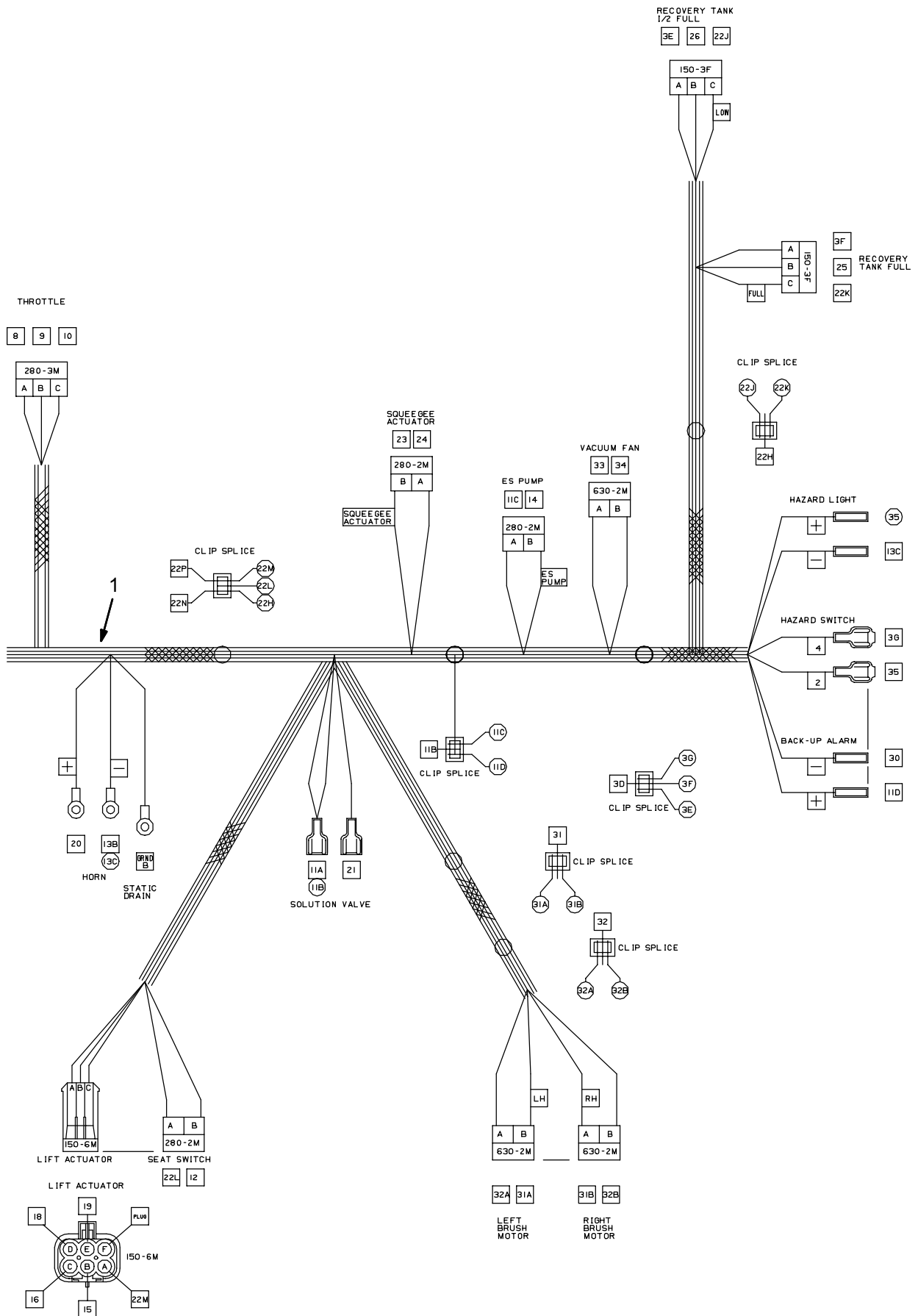


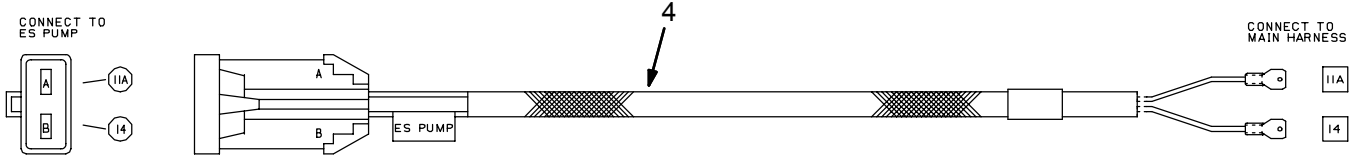
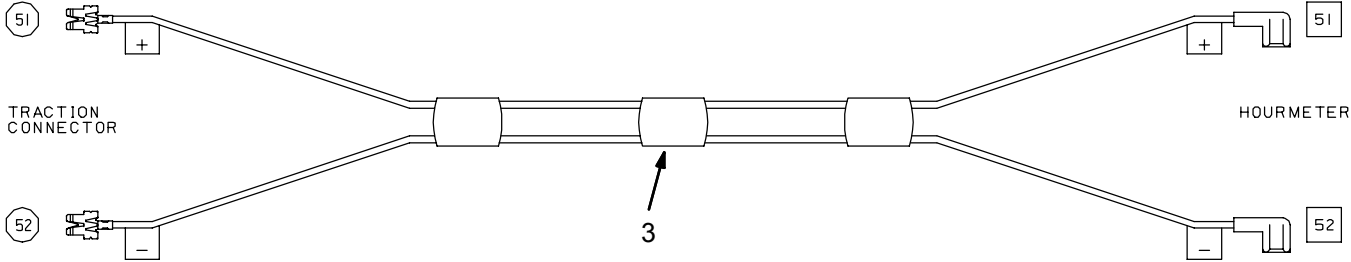


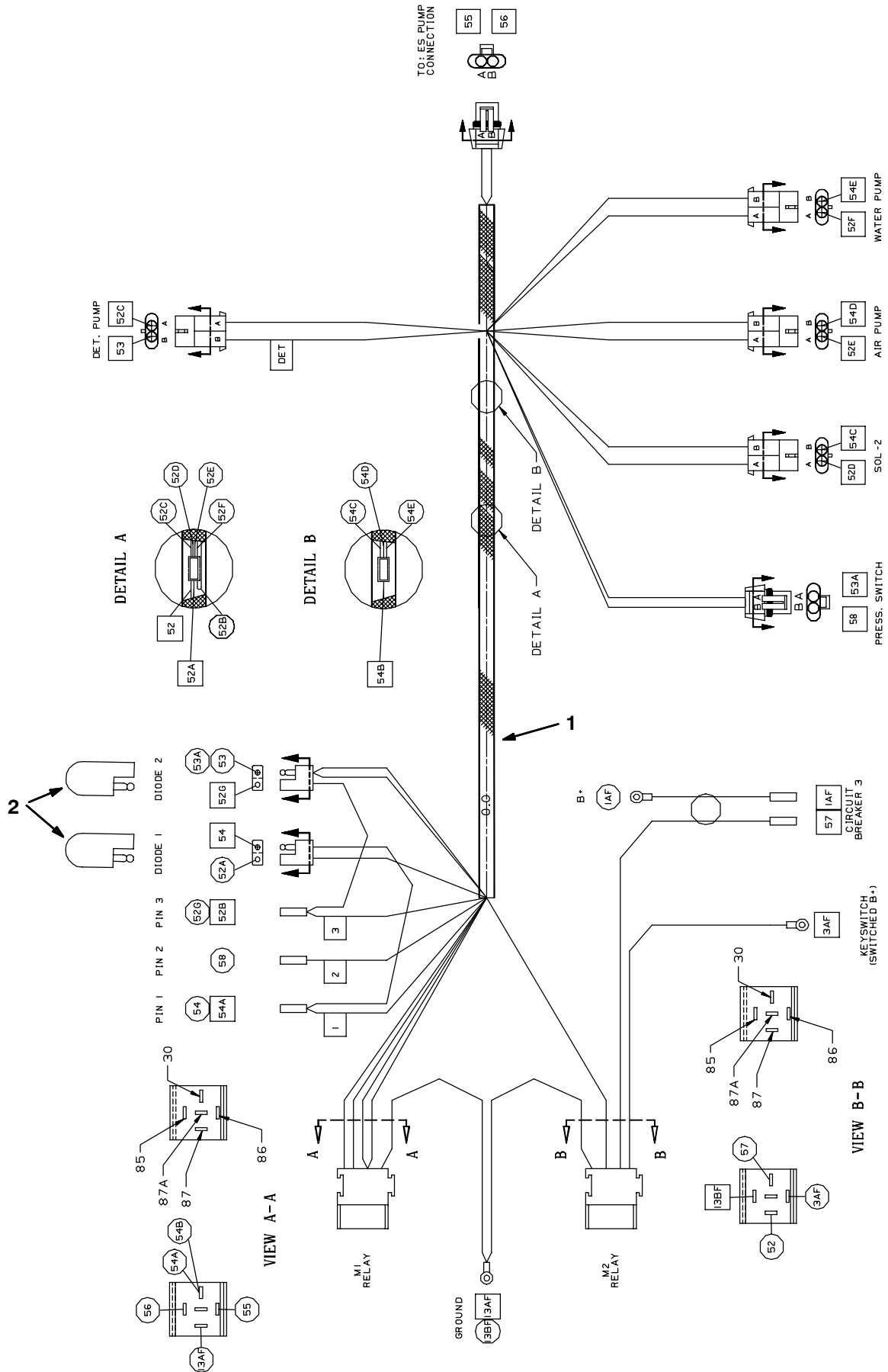


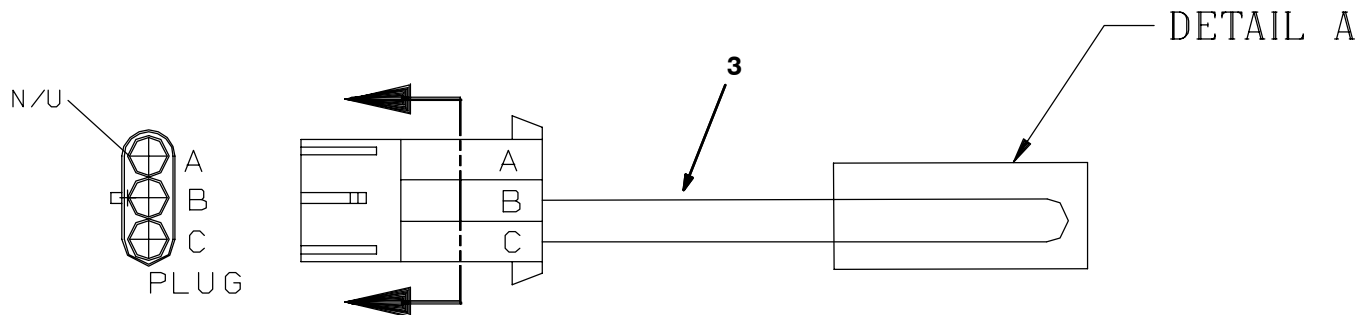




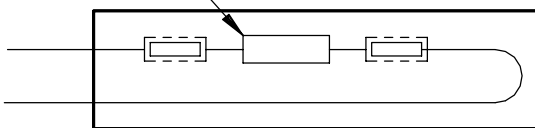






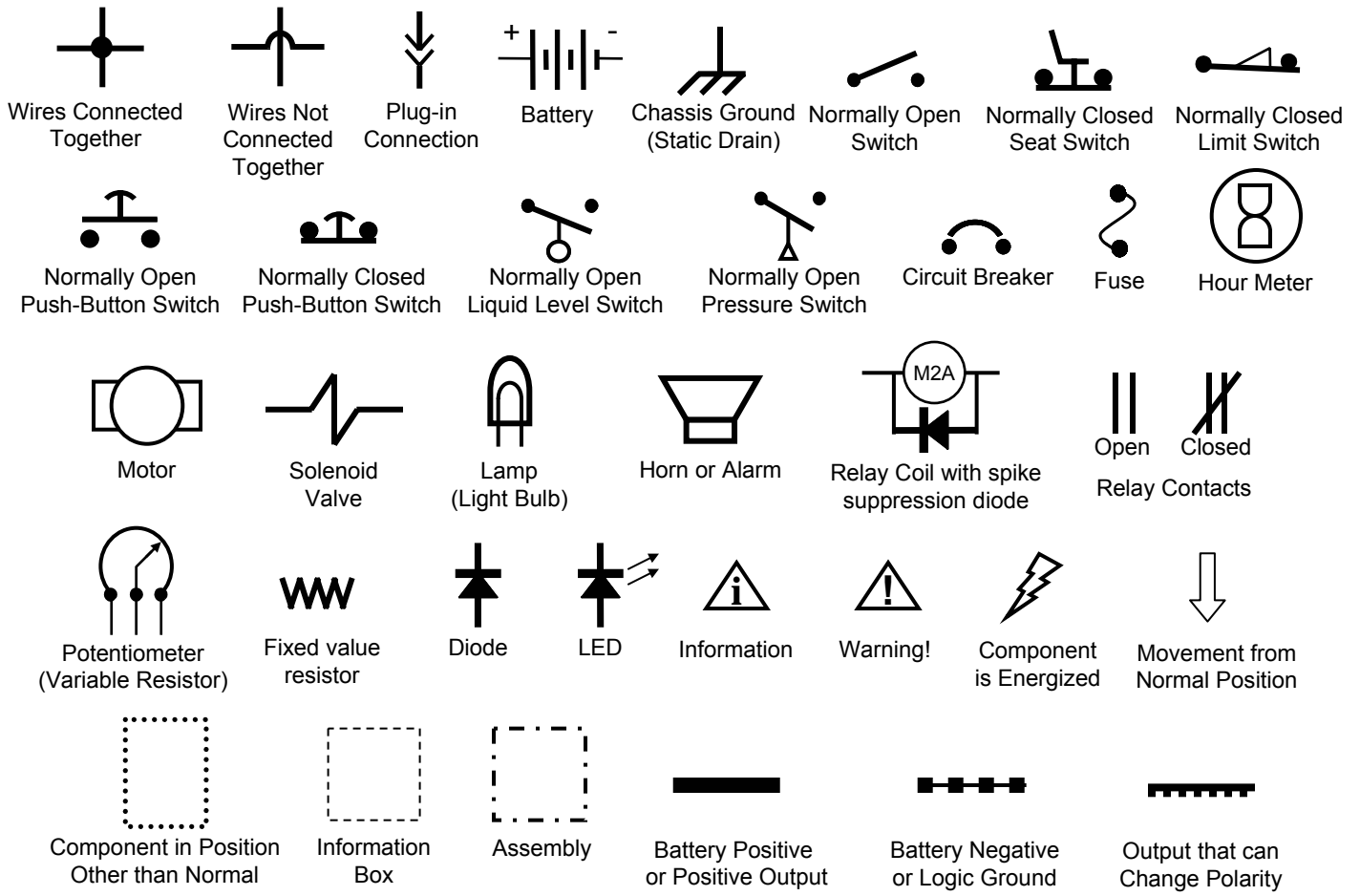


5.6K 1/4 WATT 5% RESISTOR



Commonly Used Electrical Symbols & Terms

NOTE: The term "NORMALLY" refers to the component's "at rest" or "de-energized" position



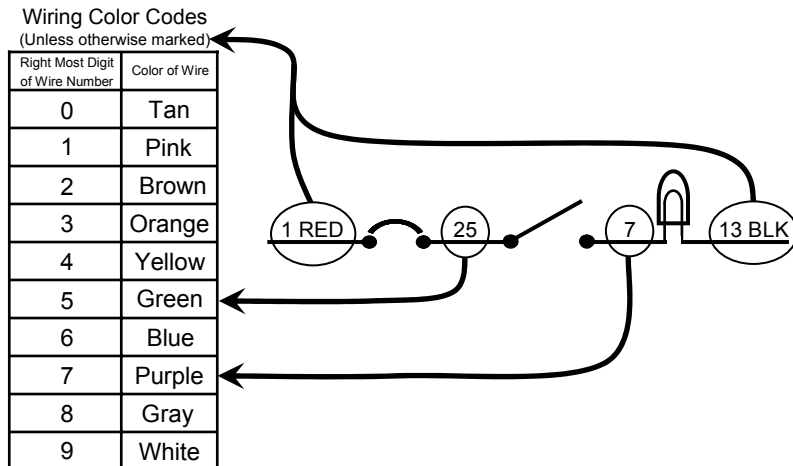
Terms & Abbreviations

BDI – Battery Discharge Indicator

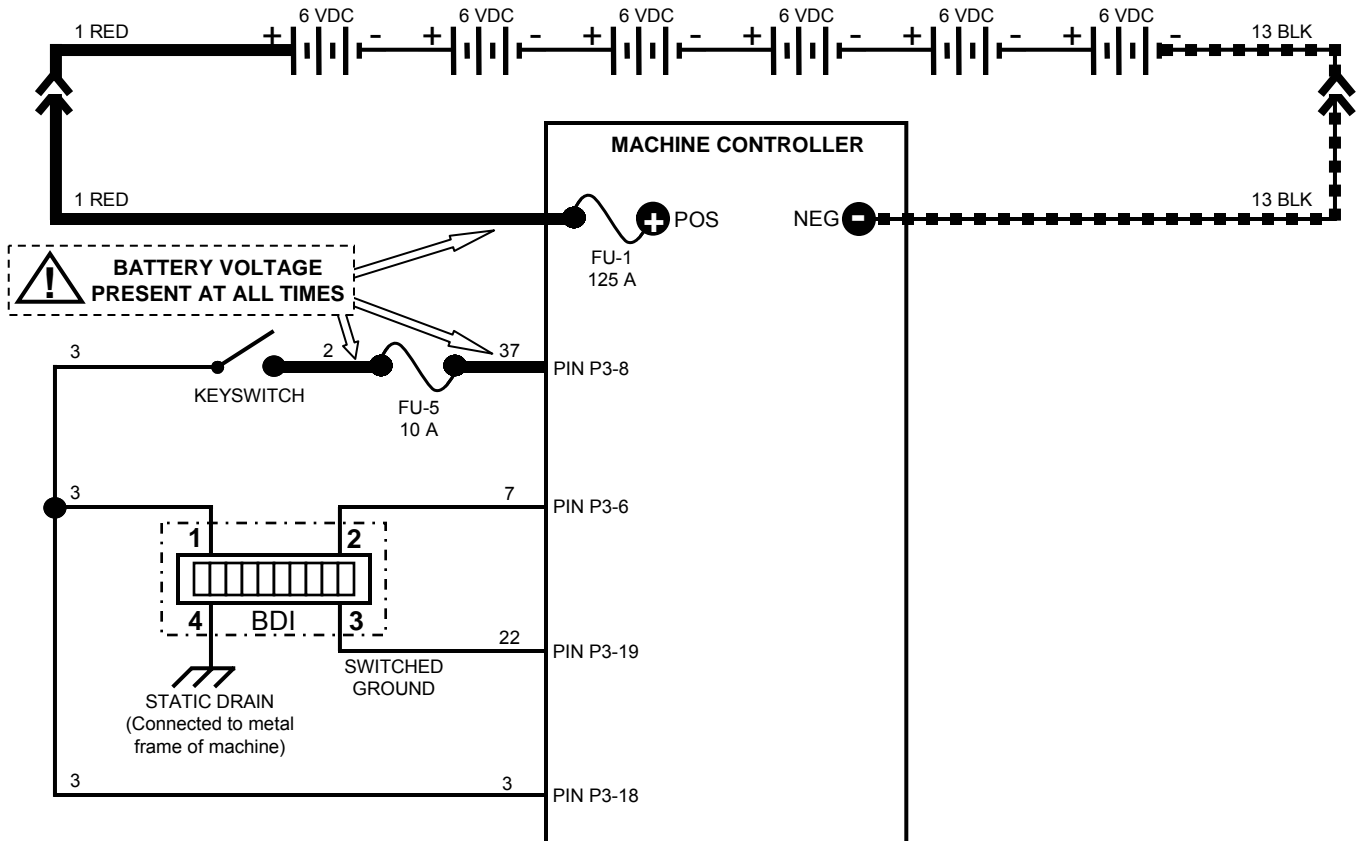
LED – Light Emitting Diode

PWM (Pulse Width Modulation) – A method of using controlled on/off times to regulate the voltage and current supplied to an electrical device

Example of Wiring Numbers & Colors:



EZ Rider HP - Key OFF

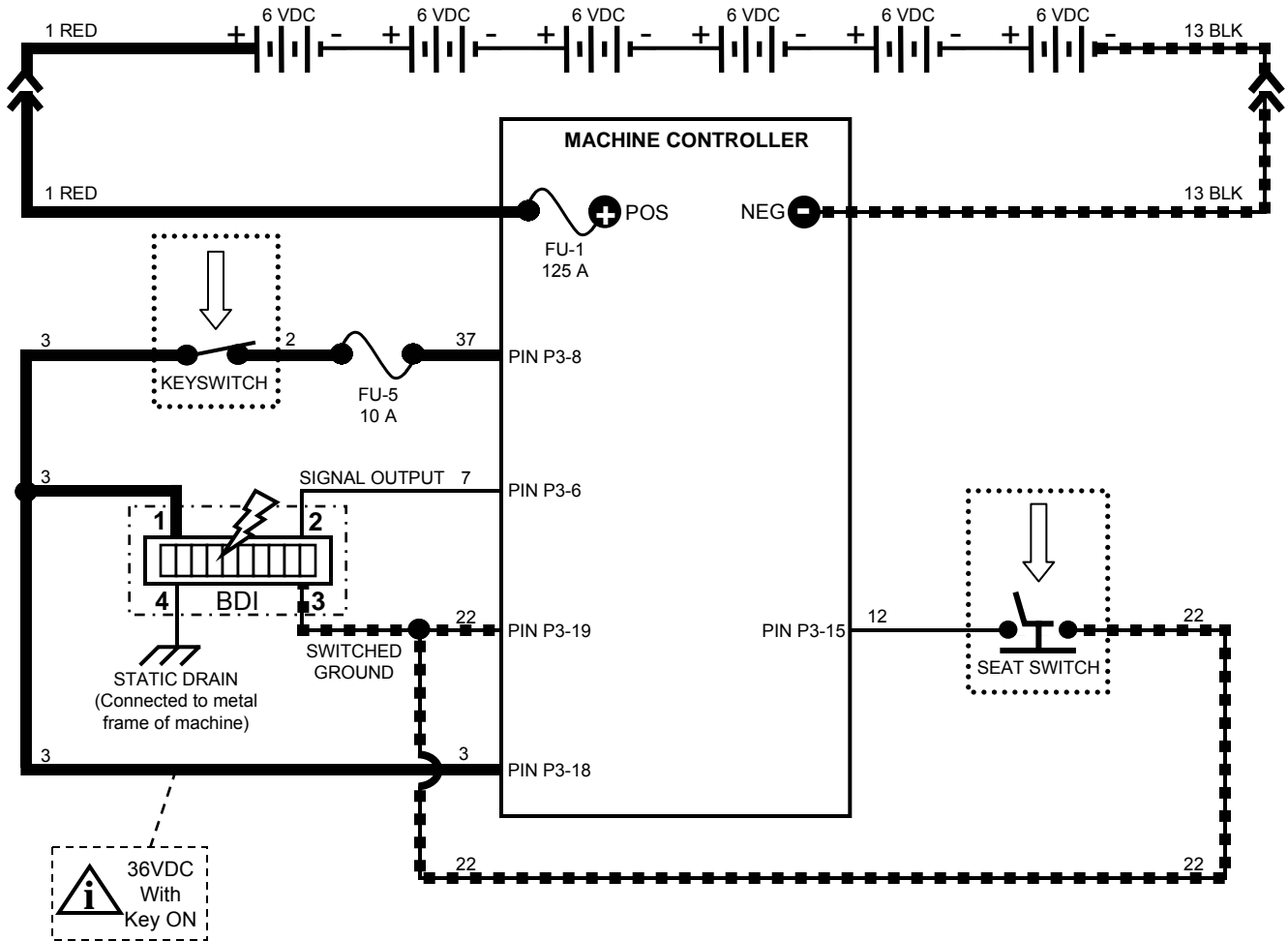


Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

! Be cautious when working near Control Board – *Battery voltage is always present, even with Key OFF*

EZ Rider HP - Key ON, Operator on Seat



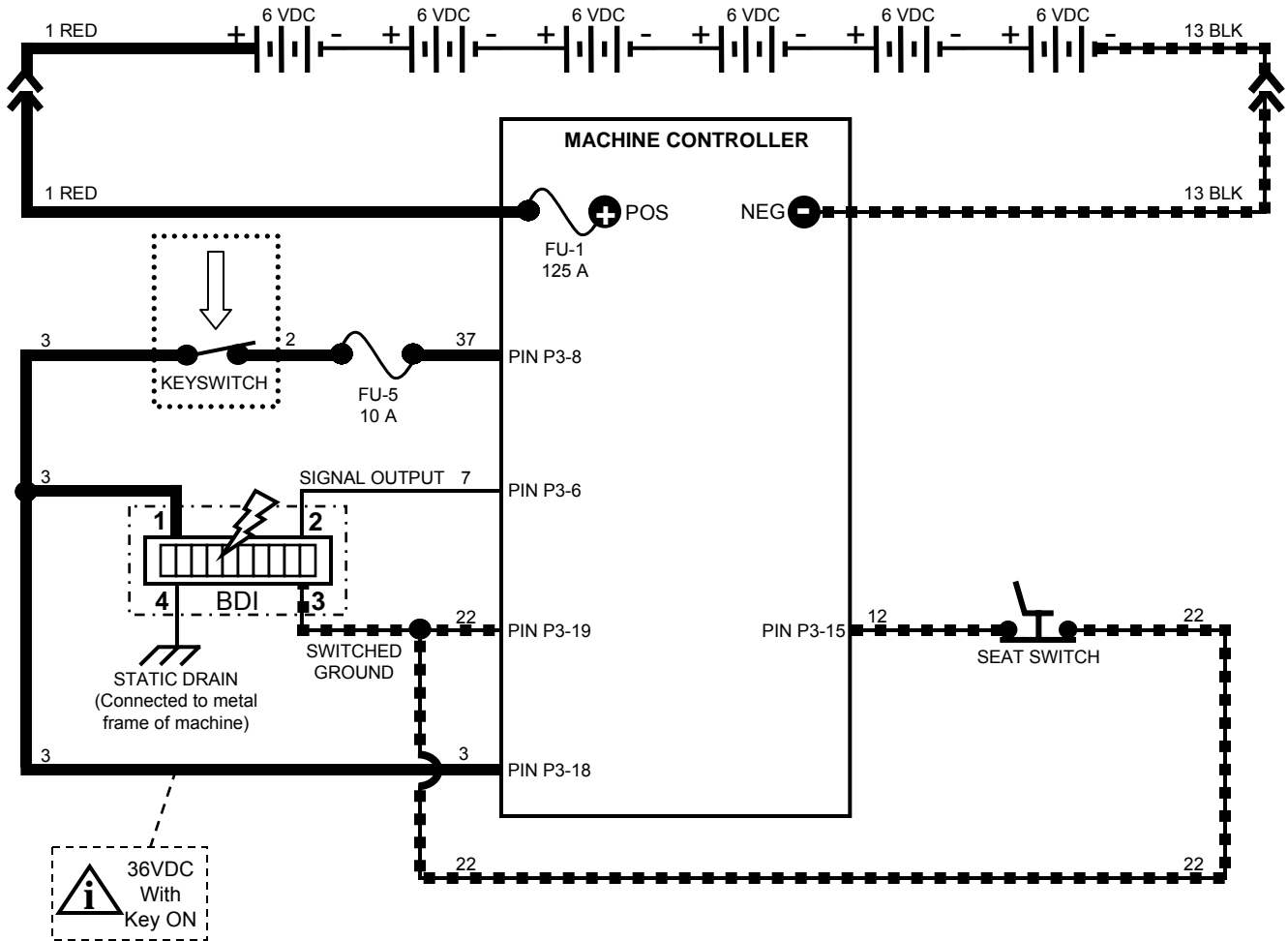
Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



BDI should display the state of charge of the batteries if no faults are found; Refer to Machine Controller troubleshooting if BDI LED's are flashing

EZ Rider HP - Key ON, Operator NOT on Seat



Wiring Color Codes (Unless otherwise marked)

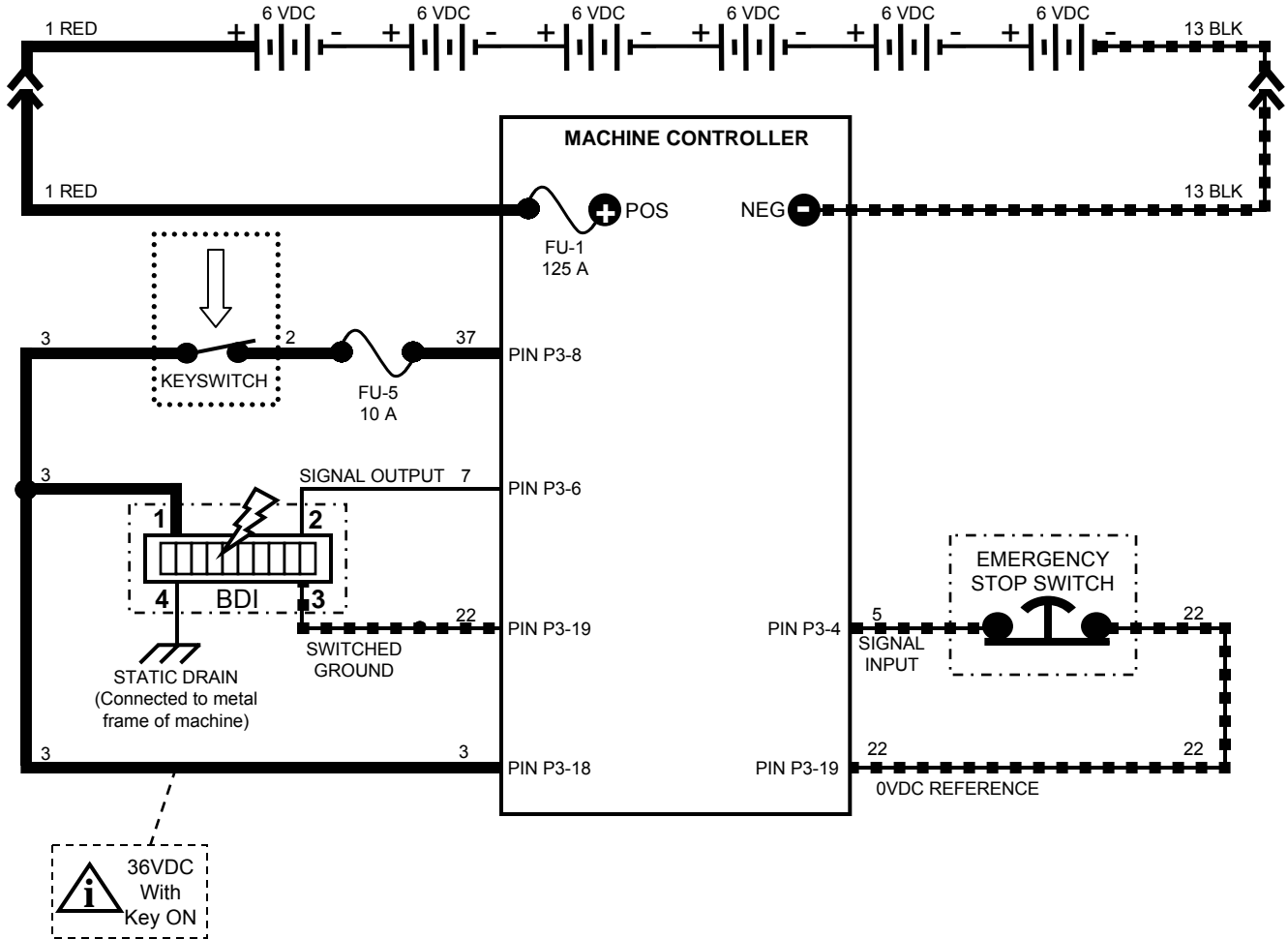
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



BDI should display 6 rapidly flashing LED's, indicating that the operator is not sitting on seat; Refer to Machine Controller troubleshooting for more information

EZ Rider HP – Emergency Stop Switch

CONDITIONS: **Key ON**



Wiring Color Codes (Unless otherwise marked)

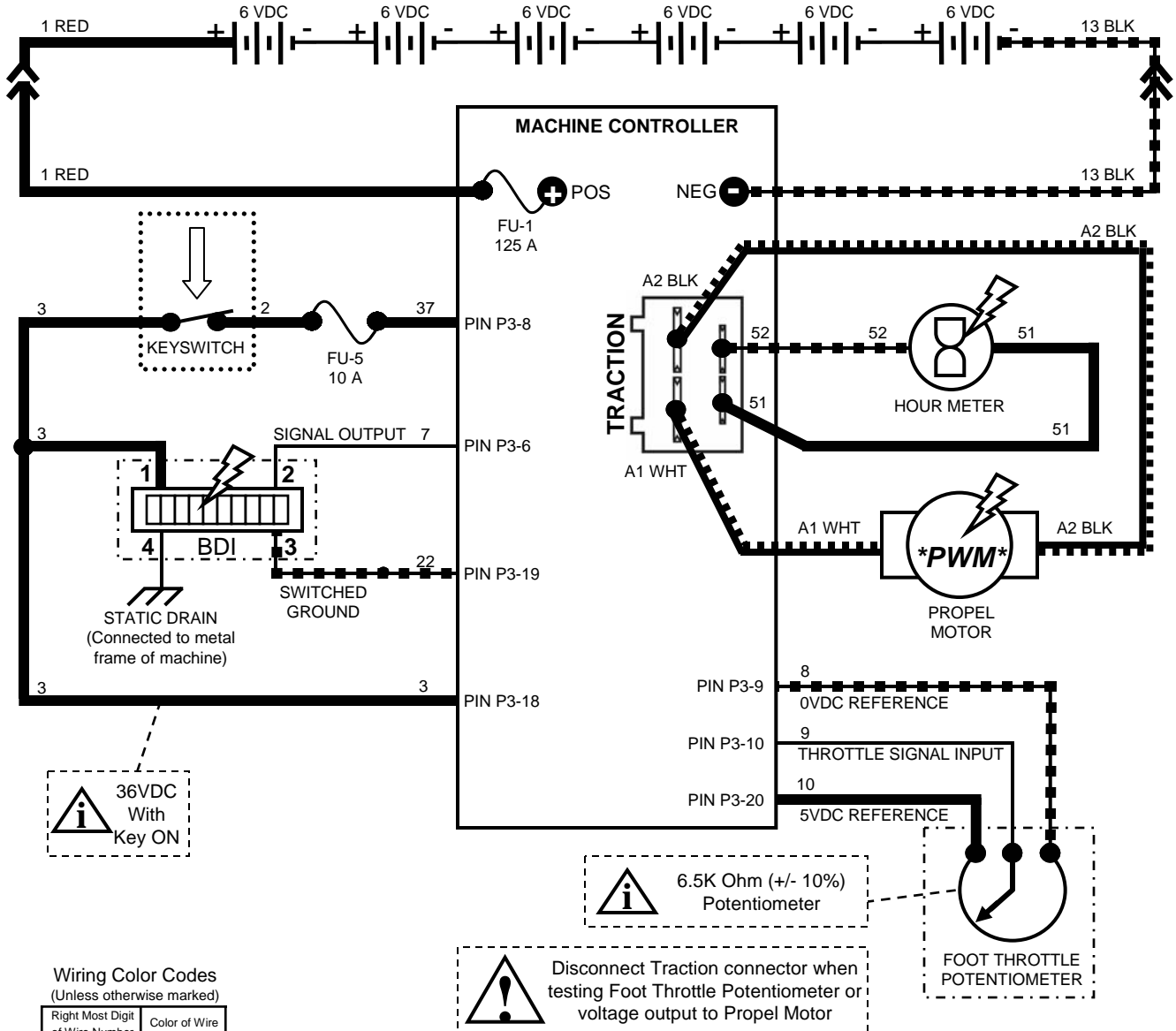
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



Emergency Stop Switch is normally closed; Activating the Emergency Stop Switch opens the switch and removes the 0VDC reference voltage to PIN P3-4. Machine will function normally if a 0VDC reference voltage is sensed at pin P3-4. All machine functions will shut off if no reference voltage is sensed at pin P3-4. If the Emergency Stop Switch has been activated, the BDI should display 8 rapidly flashing LED's; Refer to Machine Controller troubleshooting for more information.

EZ Rider HP – Propel System

CONDITIONS: **Key ON, operator on seat & travel (forward or reverse)**




36VDC With Key ON

6.5K Ohm (+/- 10%) Potentiometer

Disconnect Traction connector when testing Foot Throttle Potentiometer or voltage output to Propel Motor

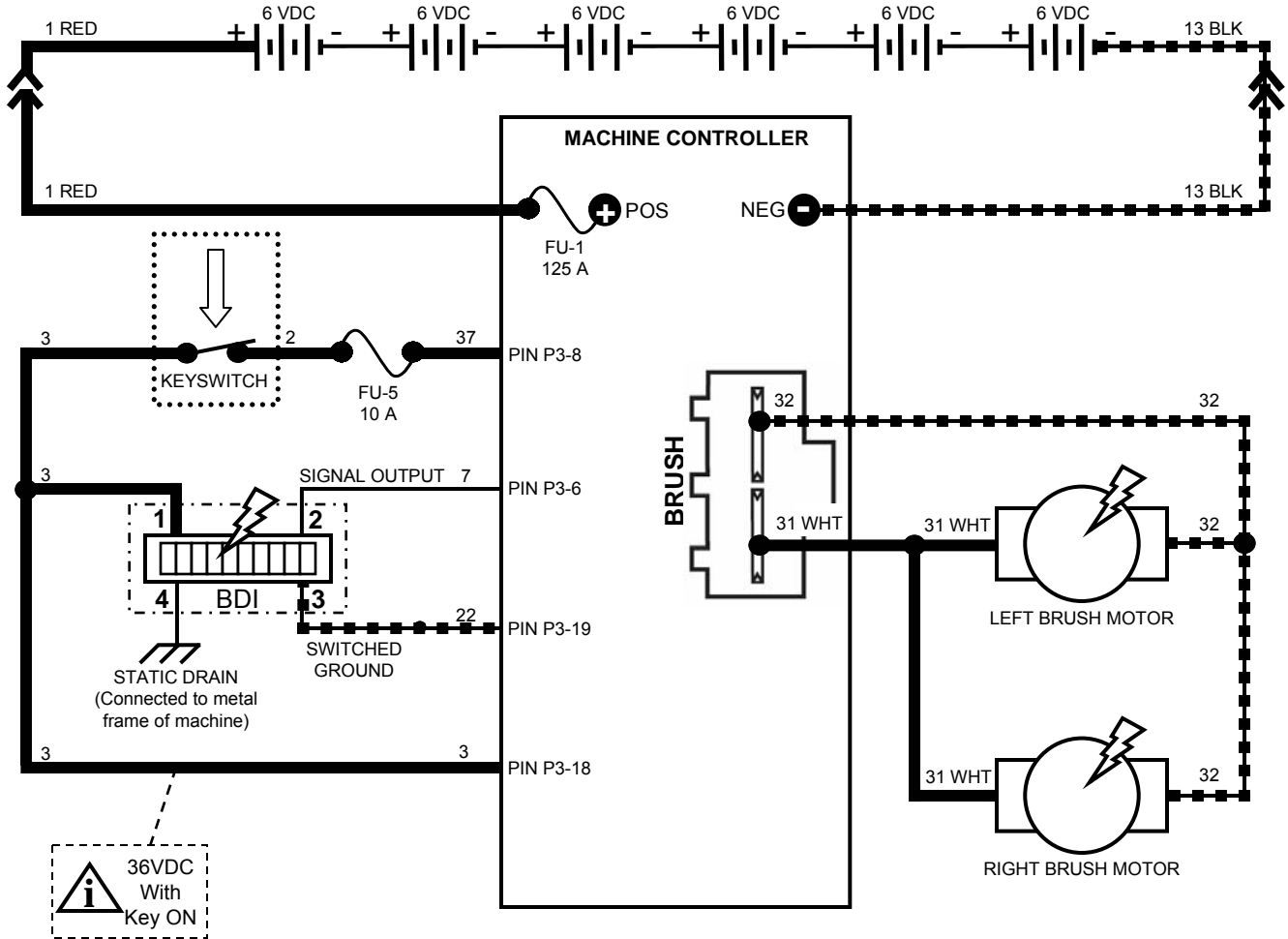
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

 Typical Propel Motor Current Draw: 1 to 25 Amps in motion, higher at start-up
 Maximum NO-LOAD current: 6 Amps (wheel raised off floor)
 Maximum current allowed to Propel Motor by controller: 63 Amps
 Propel Motor Voltage: 0 to 36 VDC - FORWARD
 0 to approx. 27 VDC - REVERSE
 Propel Motor is controlled by PWM (Pulse Width Modulation)
 Throttle Signal Input will vary from approximately 0 to 5VDC as propel pedal is moved from full forward to full reverse, with neutral being approximately 2.5VDC

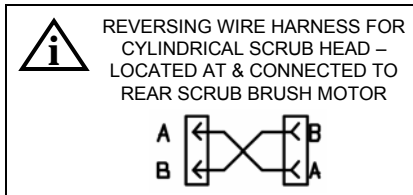
EZ Rider HP – Scrub Brush Motors

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON, scrub mode switch in “scrub only” or “scrub & vacuum” position



Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



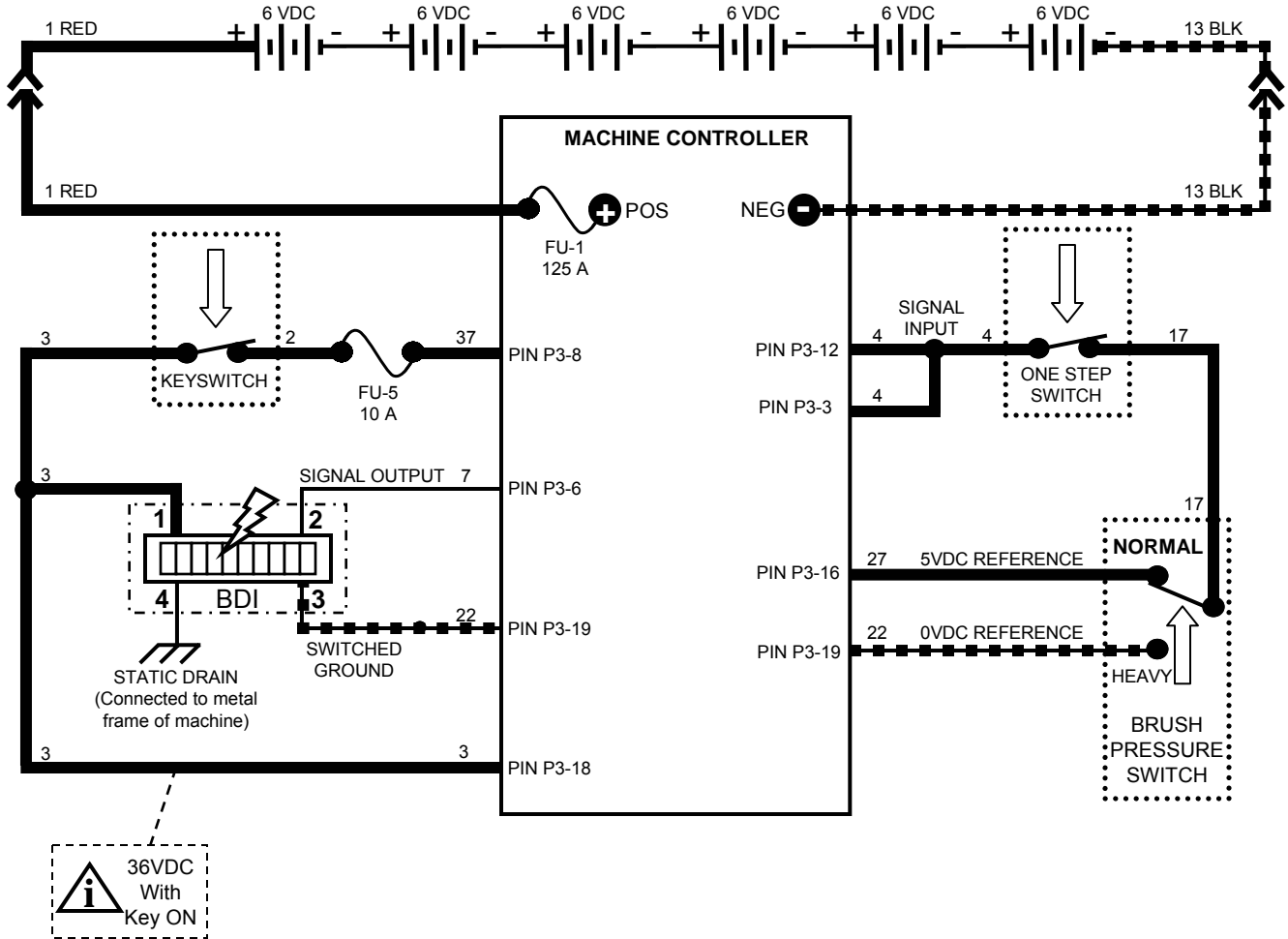
Maximum Brush Motor Current Draw:

Standard-duty DISC brush motors – 15 Amps Maximum EACH
Heavy-duty DISC brush motors – 23 Amps Maximum EACH
CYLINDRICAL brush motors – 22 Amps Maximum EACH

A reversing wire harness is used to change the direction of one motor on machines equipped with a CYLINDRICAL scrub head (see diagram above)

EZ Rider HP – Scrub & Brush Pressure Switches (Normal Brush Pressure)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON, scrub mode switch in “scrub only” or “scrub & vacuum” position



Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



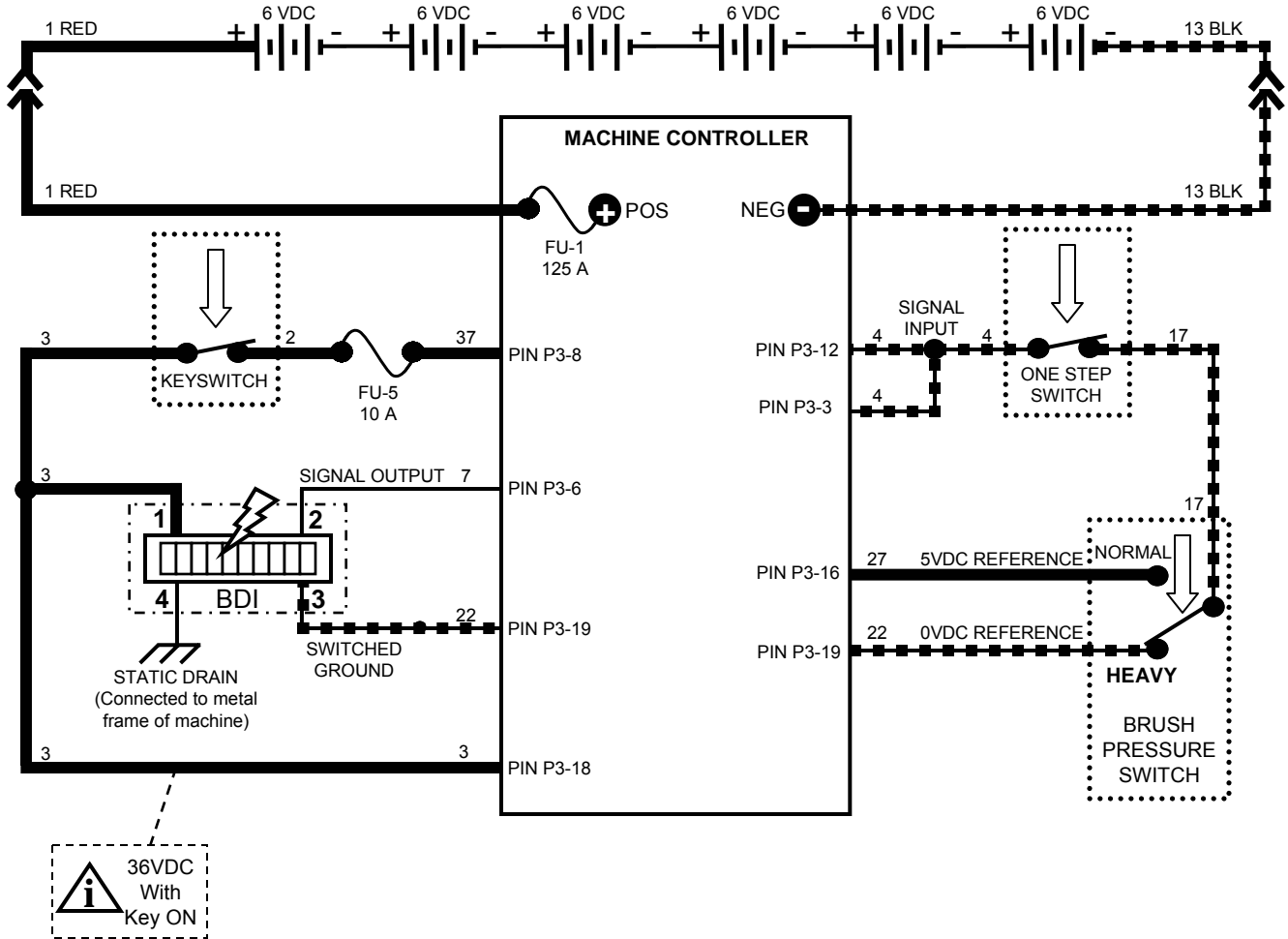
Normal brush pressure will be applied if a 5VDC reference voltage is sensed at pins P3-12 and P3-3

Heavy brush pressure will be applied if a 0VDC reference voltage is sensed at pins P3-12 and P3-3

Scrub Functions will be disabled if NO reference voltage is sensed at pins P3-12 and P3-3

EZ Rider HP – Scrub & Brush Pressure Switches (Heavy Brush Pressure)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON, scrub mode switch in “scrub only” or “scrub & vacuum” position



Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

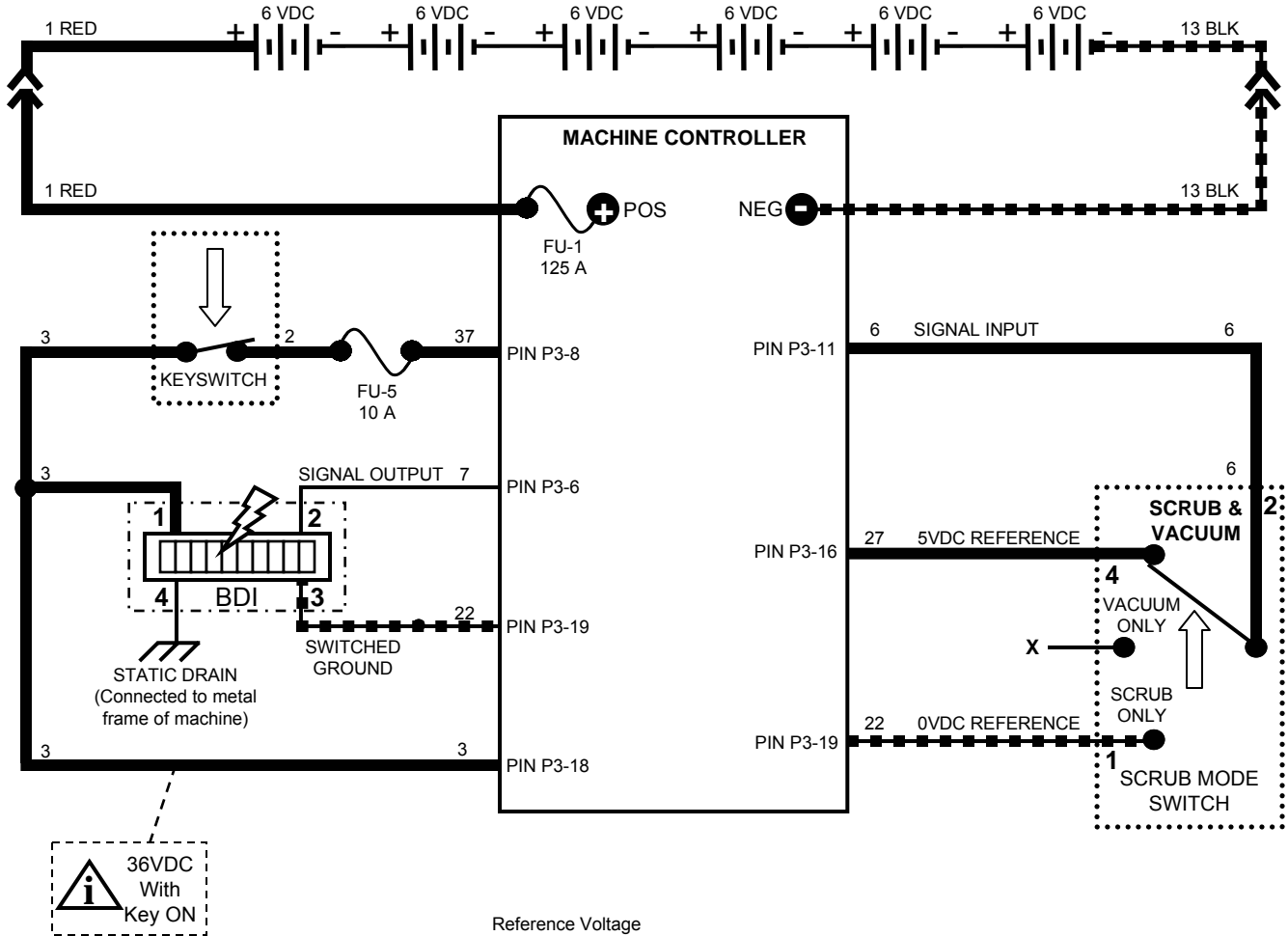
! Normal brush pressure will be applied if a 5VDC reference voltage is sensed at pins P3-12 and P3-3

Heavy brush pressure will be applied if a 0VDC reference voltage is sensed at pins P3-12 and P3-3

Scrub Functions will be disabled if NO reference voltage is sensed at pins P3-12 and P3-3

EZ Rider HP – Scrub Mode Switch (Scrub & Vacuum)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON



Switch Position	Reference Voltage to P3-11	System Functions
Scrub & Vacuum	5VDC	All scrub, vacuum, & squeegee operations
Vacuum Only	NONE	Vacuum & Squeegee operations only – No scrubbing
Scrub Only	0VDC	Scrub operations only – No vacuum or squeegee operations

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

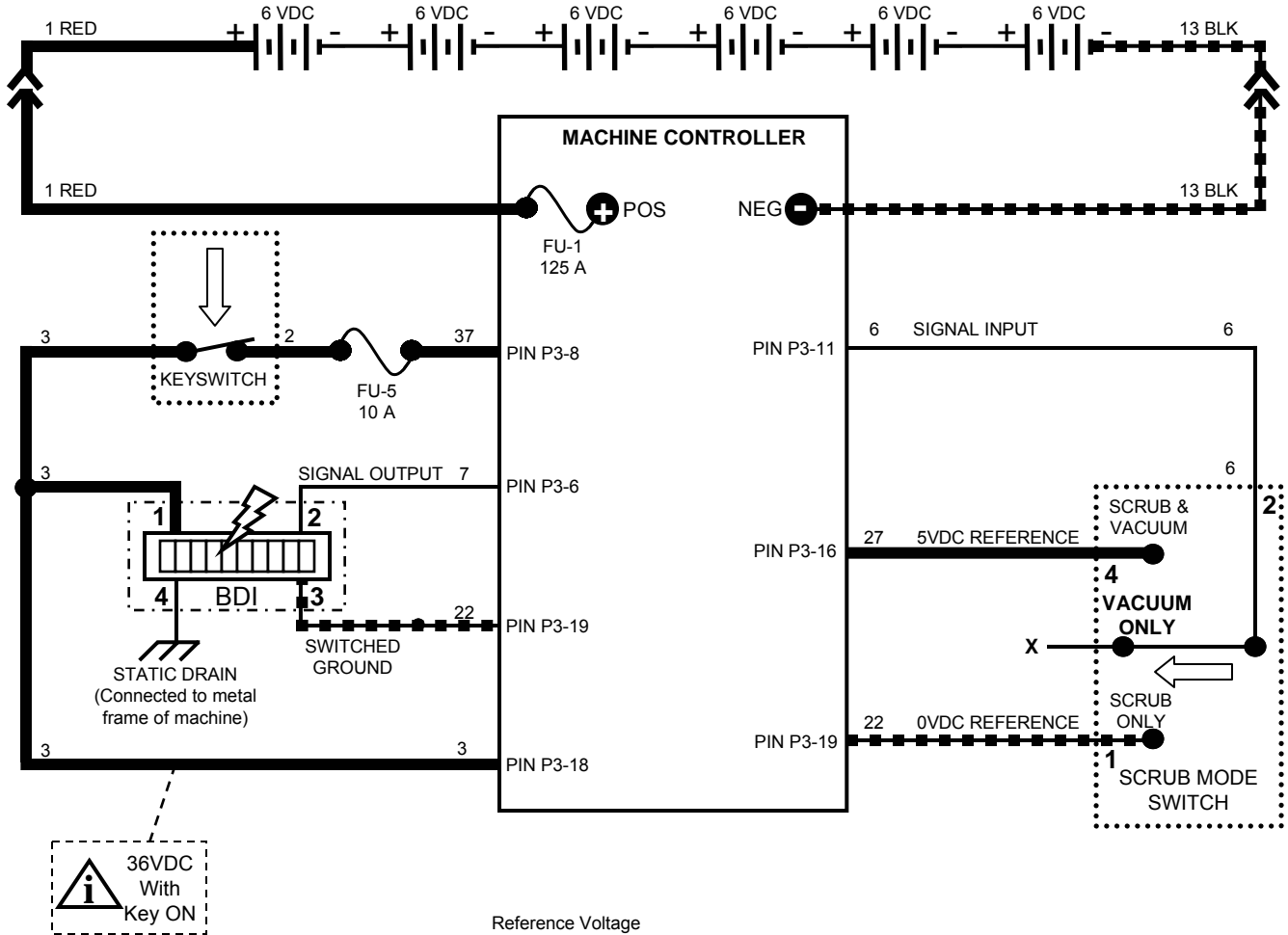
⚠ Scrub system and Vacuum/Squeegee system will operate if a 5VDC reference voltage is sensed at pin P3-11

Vacuum/Squeegee system ONLY will operate if NO reference voltage is sensed at pin P3-11 (Default state)

Scrub system ONLY will operate if a 0VDC reference voltage is sensed at pin P3-11

EZ Rider HP – Scrub Mode Switch (Vacuum Only)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON



Switch Position	Reference Voltage to P3-11	System Functions
Scrub & Vacuum	5VDC	All scrub, vacuum, & squeegee operations
Vacuum Only	NONE	Vacuum & Squeegee operations only – No scrubbing
Scrub Only	0VDC	Scrub operations only – No vacuum or squeegee operations

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

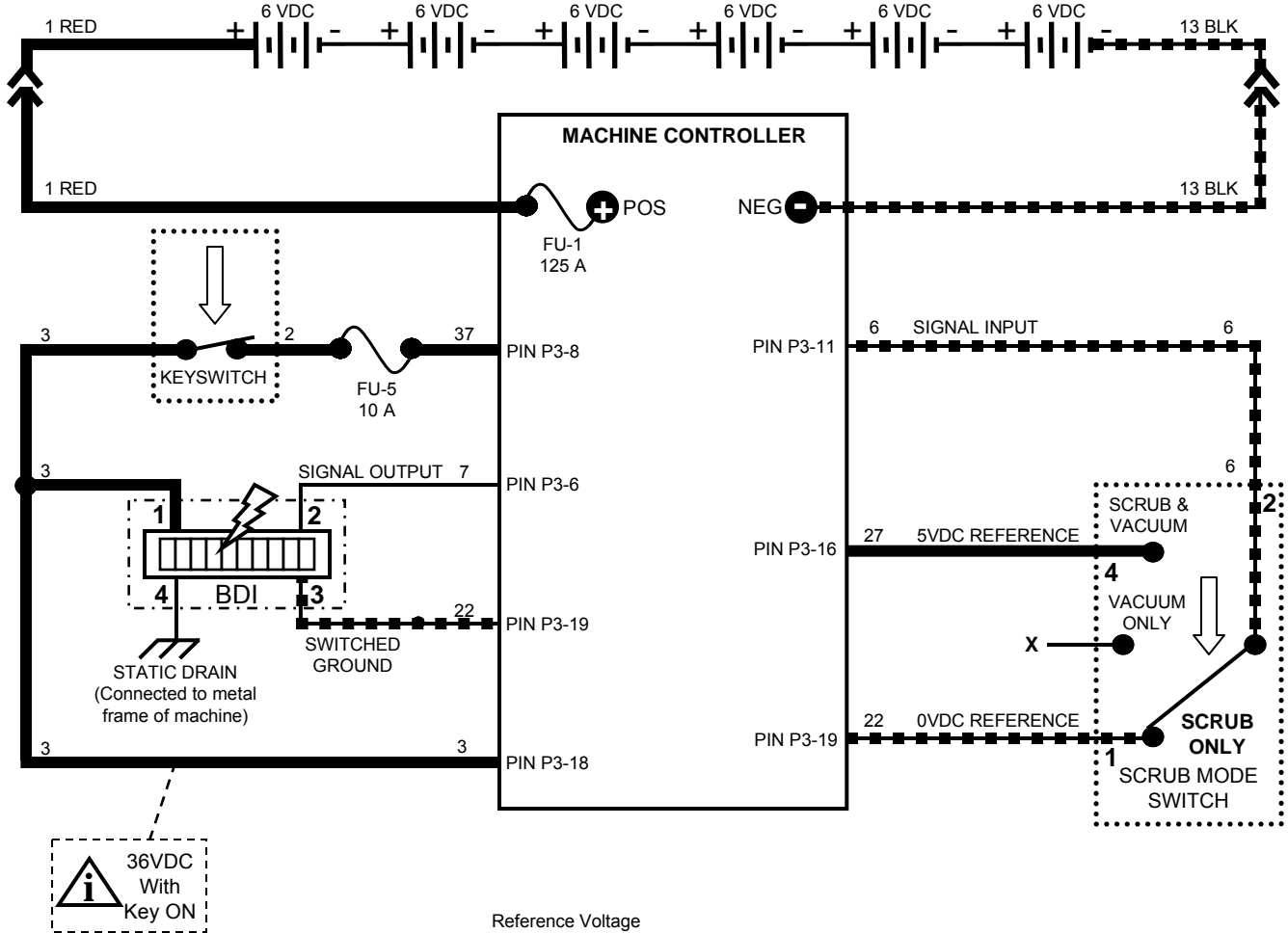
⚠ Scrub system and Vacuum/Squeegee system will operate if a 5VDC reference voltage is sensed at pin P3-11

Vacuum/Squeegee system ONLY will operate if NO reference voltage is sensed at pin P3-11 (Default state)

Scrub system ONLY will operate if a 0VDC reference voltage is sensed at pin P3-11

EZ Rider HP – Scrub Mode Switch (Scrub Only)

CONDITIONS: **Key ON, operator on seat, forward travel, One Step switch ON**



Switch Position	Reference Voltage to P3-11	System Functions
Scrub & Vacuum	5VDC	All scrub, vacuum, & squeegee operations
Vacuum Only	NONE	Vacuum & Squeegee operations only – No scrubbing
Scrub Only	0VDC	Scrub operations only – No vacuum or squeegee operations

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

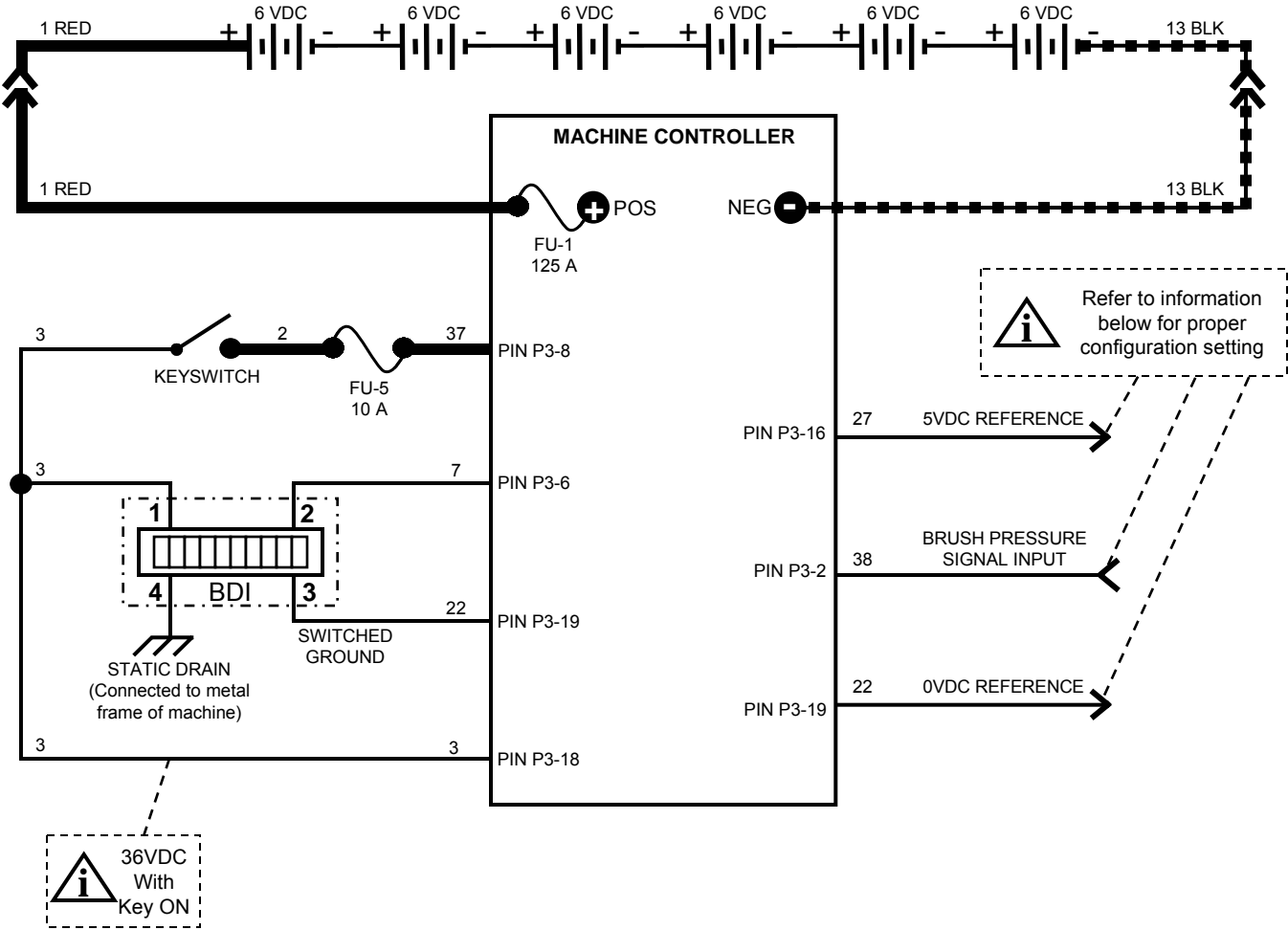
⚠ Scrub system and Vacuum/Squeegee system will operate if a 5VDC reference voltage is sensed at pin P3-11

Vacuum/Squeegee system ONLY will operate if NO reference voltage is sensed at pin P3-11 (Default state)

Scrub system ONLY will operate if a 0VDC reference voltage is sensed at pin P3-11

EZ Rider HP – Scrub Head Configuration Connection


CONDITIONS: **Key OFF** to change configuration setting



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

Configuration Settings:

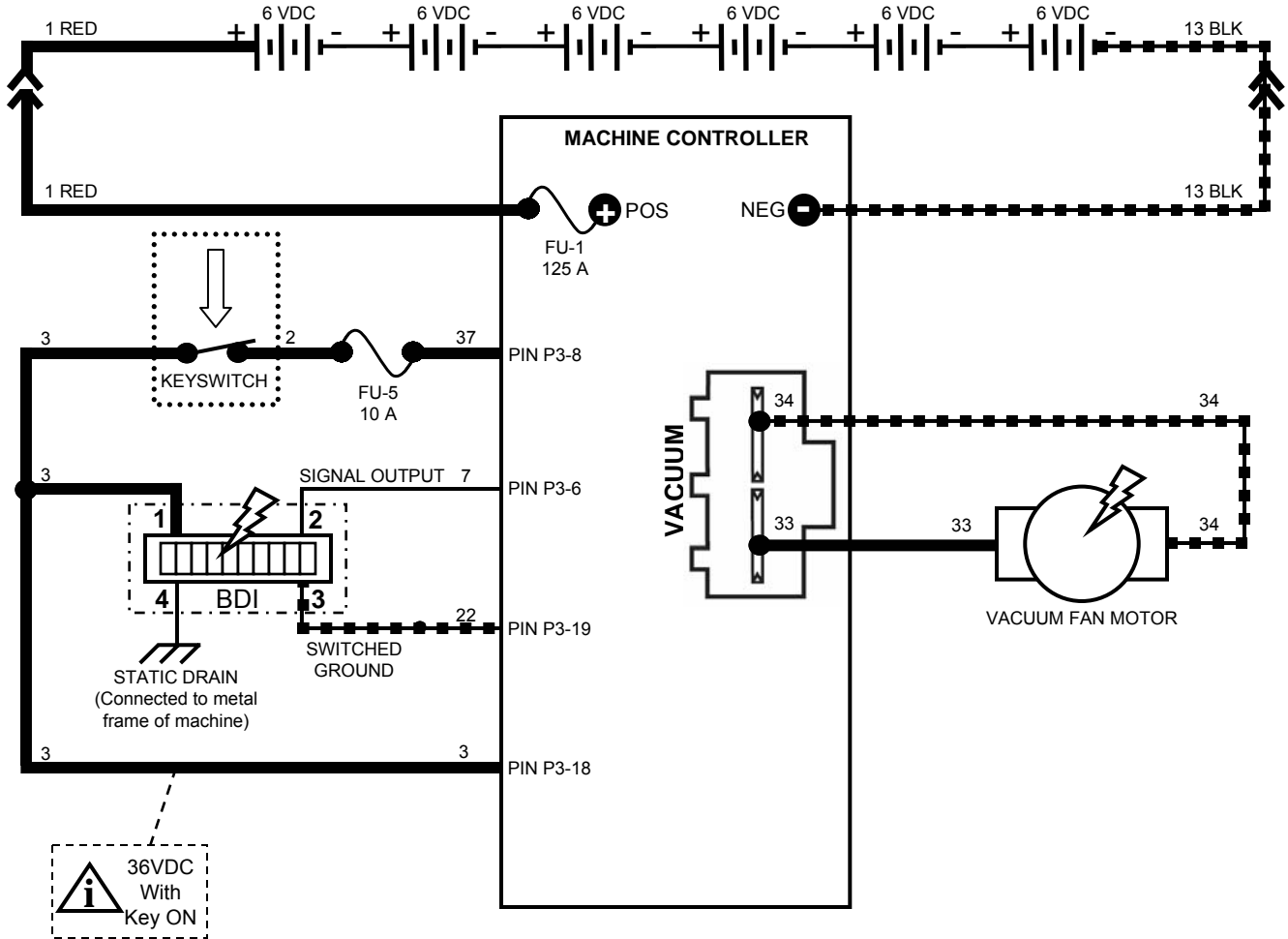
 For Standard-duty DISC scrub brush motors:
MAKE NO CONNECTIONS

For CYLINDRICAL or Heavy-duty DISC scrub brush motors:
CONNECT WIRES 22 & 38 (0VDC reference & signal input)

For applications requiring EXTRA-LIGHT down pressure:
CONNECT WIRES 27 & 38 (5VDC reference & signal input)


EZ Rider HP – Vacuum Fan Motor

CONDITIONS: Key ON, operator on seat, One Step switch ON, scrub mode switch in “vacuum only” or “scrub & vacuum” position



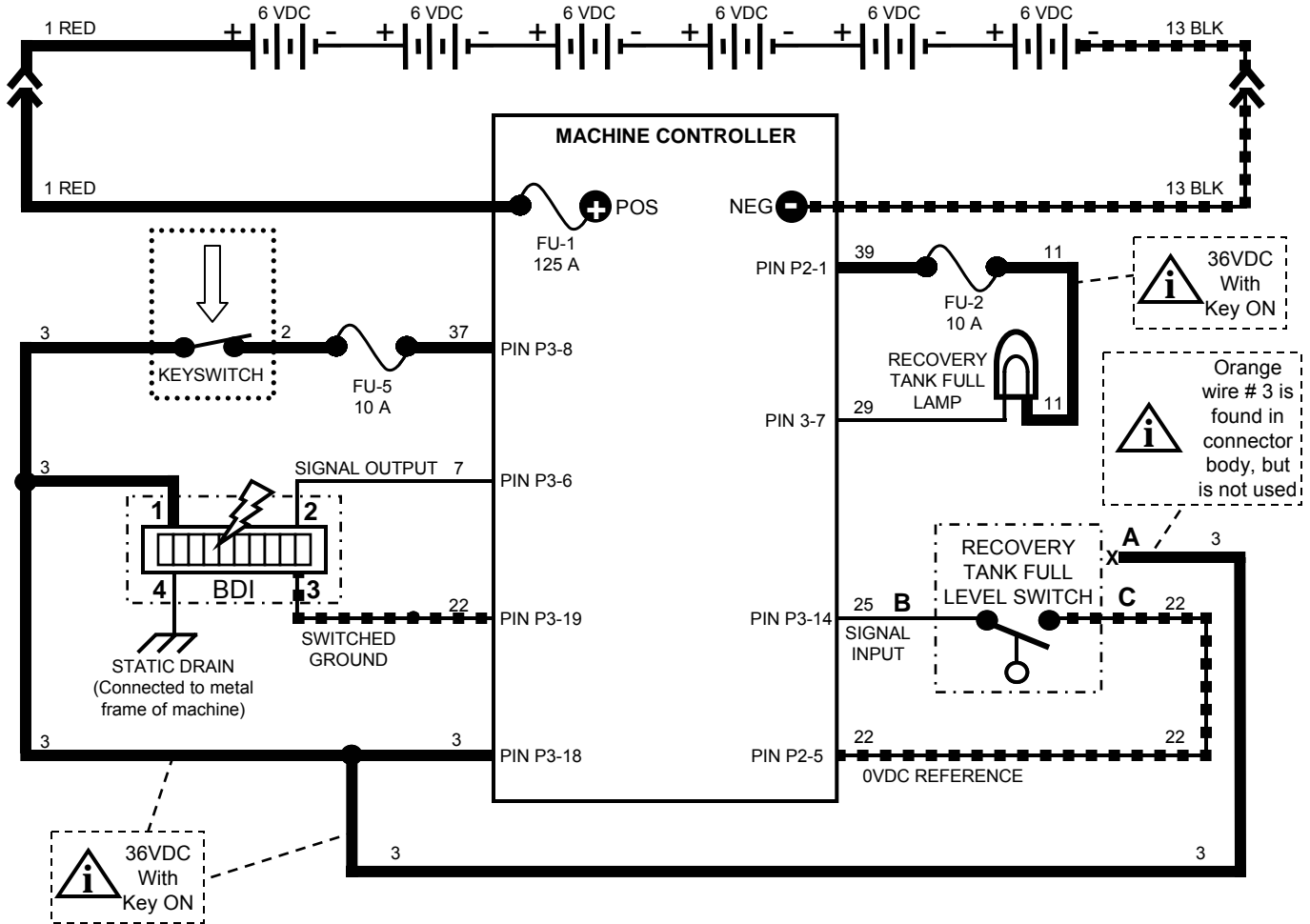
Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

 Maximum Vacuum Fan Motor Current Draw: 20 Amps
Typical Vacuum Fan Motor Current Draw: 16 to 18 Amps


EZ Rider HP – Recovery Tank Full Level Switch

CONDITIONS: **Key ON**



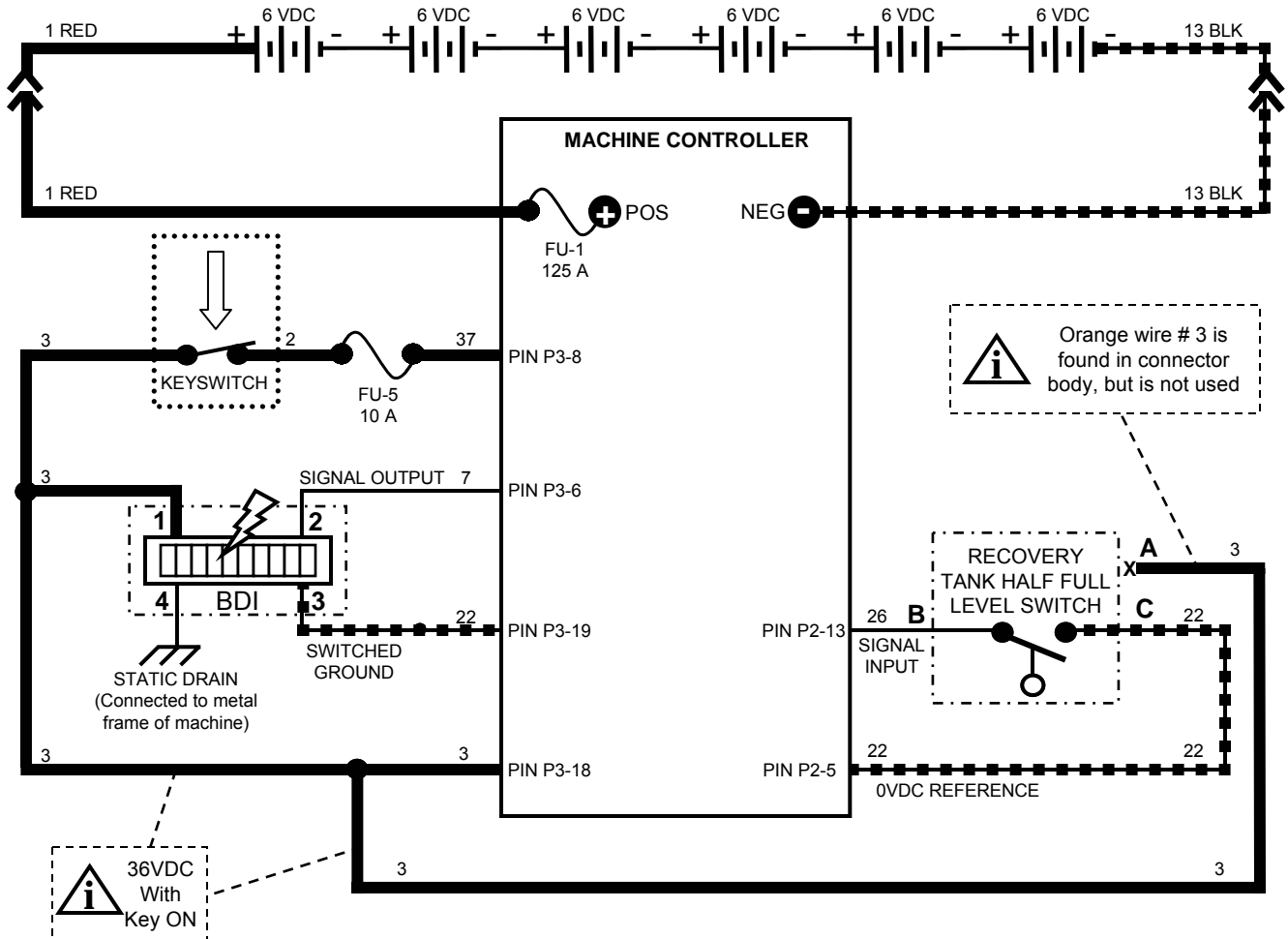
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

 Recovery Tank Full Switch **closes** when recovery tank is full
 Recovery Tank Full Lamp is lit when recovery tank is full
 Recovery Tank Full Switch is in the OPEN position with low or empty tank
 Recovery Tank Full Switch is in the CLOSED position with full tank

EZ Rider HP – Recovery Tank Half Full Level Switch (ES Only)

CONDITIONS: **Key ON**



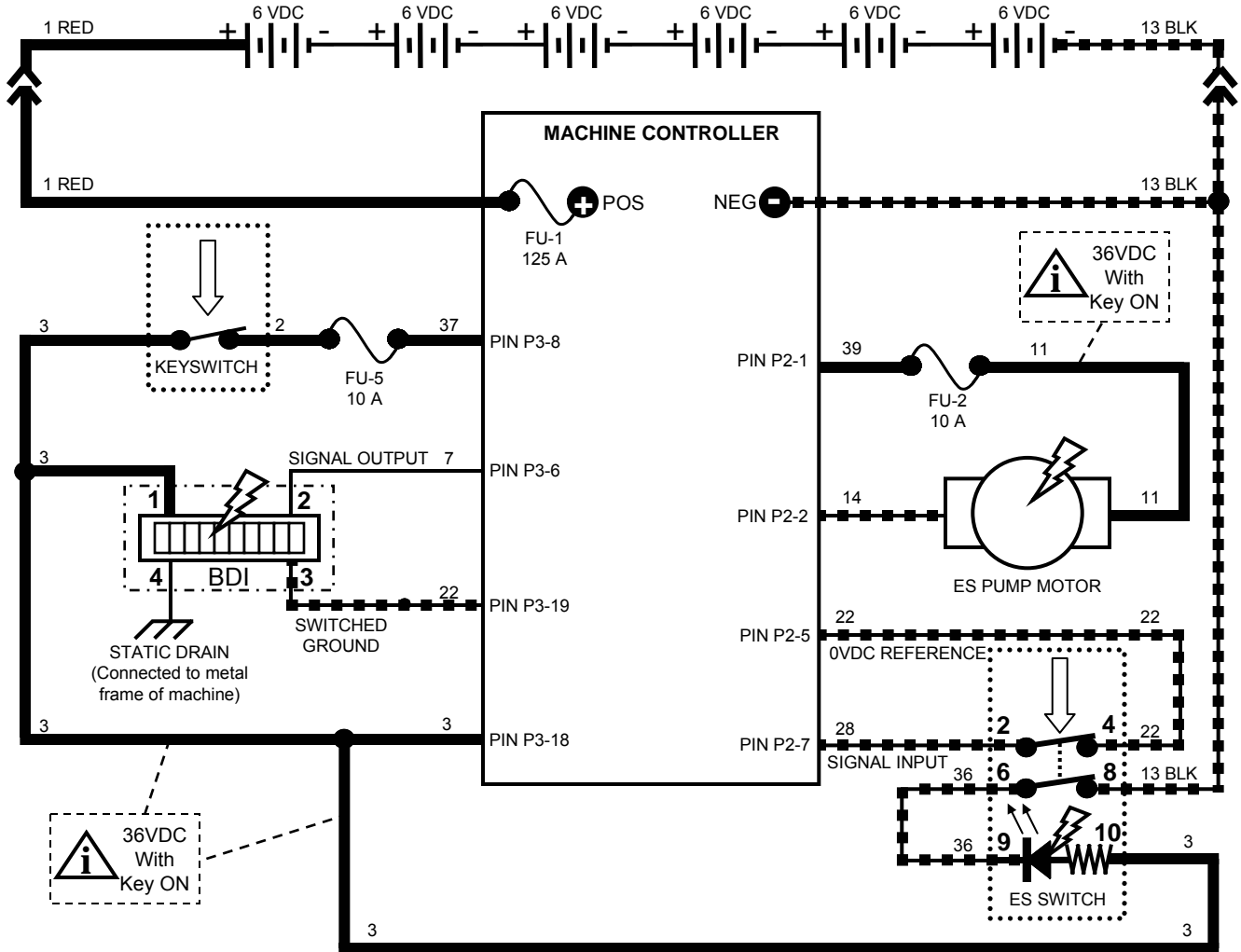
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

i Recovery Tank Half Full Switch **closes** when recovery tank is half full or higher
 Recovery Tank Half Full Level Switch is in the OPEN position with low or empty tank
 Recovery Tank Half Full Level Switch is in the CLOSED position with at least a half full tank
 If wire # 26 (PIN P2-13) is grounded or shorted to the 0VDC reference, the Machine Controller will assume the ES system is installed and the recovery tank is at least half full


EZ Rider HP – Extended Scrub (ES) System

CONDITIONS: Key ON, operator on seat, recovery tank at least half full



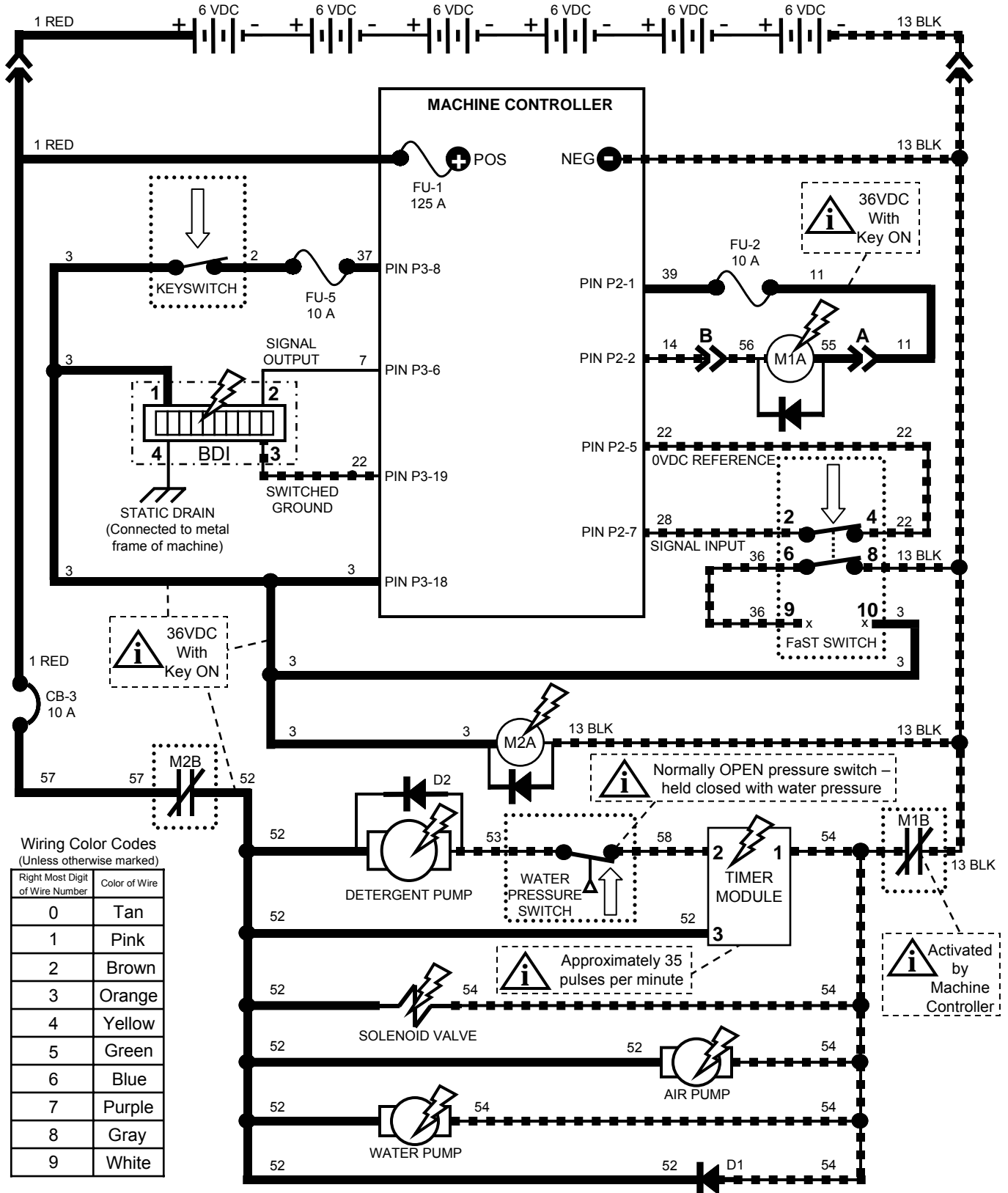
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

 Recovery Tank must be at least half full for ES pump to operate
 ES system will be active anytime ES Switch is ON, regardless if scrub system is ON or not
 ES Pump current draw: 3.4 Amps at full load

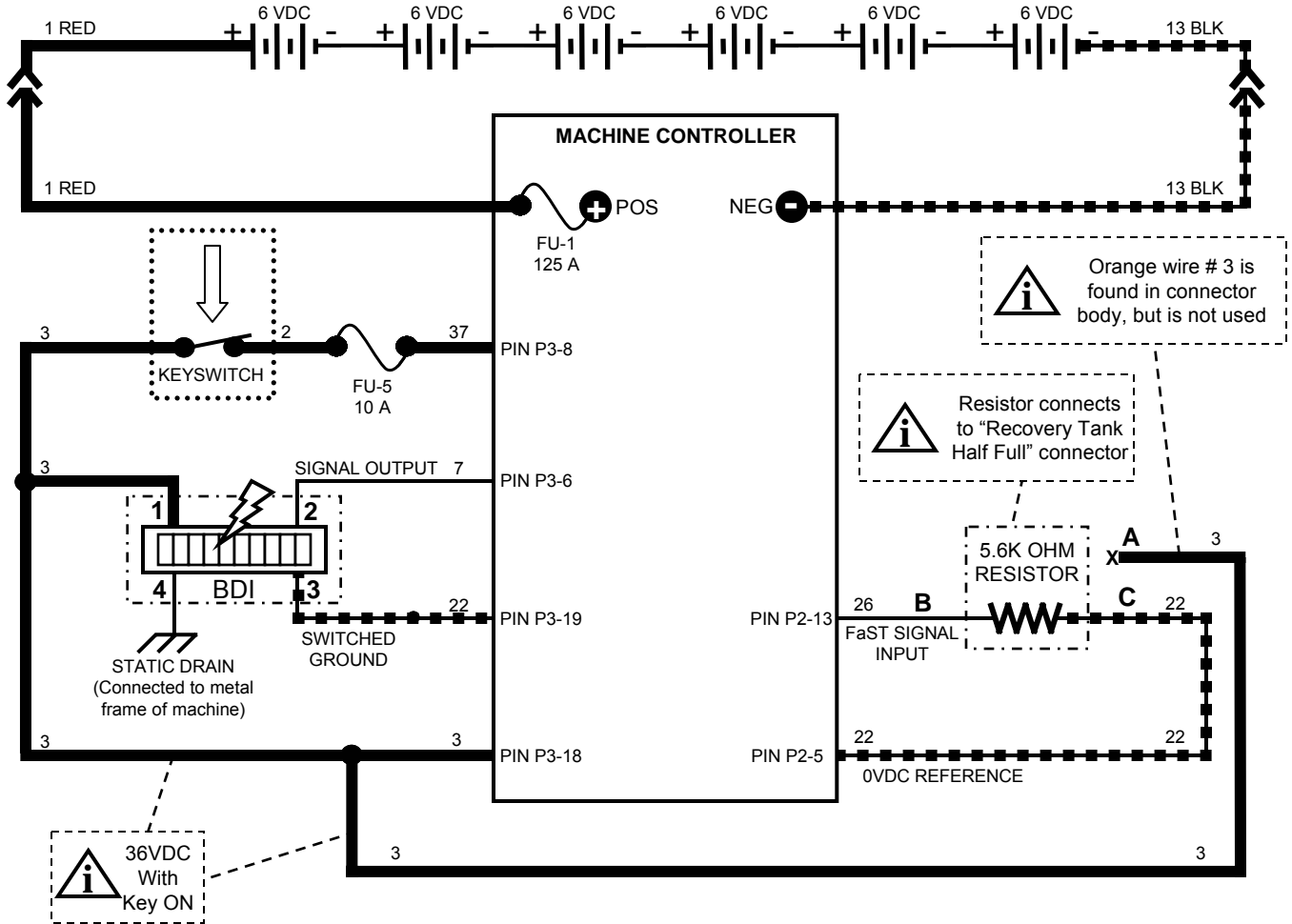
EZ Rider HP – FaST System

CONDITIONS: Key ON, operator on seat, forward travel, scrub system active



EZ Rider HP – Signal Resistor (FaST Only)

CONDITIONS: **Key ON**



Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



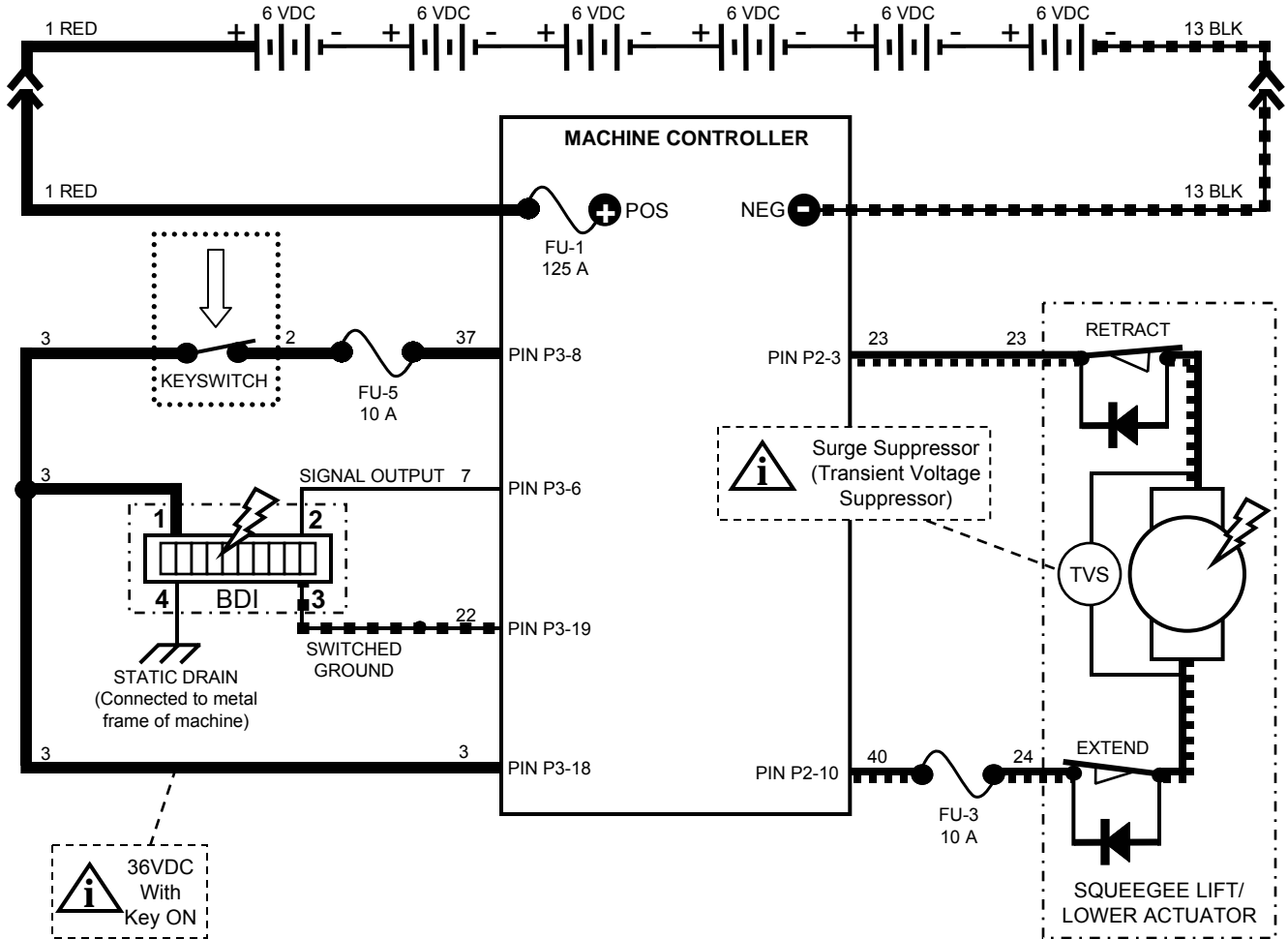
The 5.6K Ohm resistor connected as shown above will tell the Machine Controller that the FaST system is installed

If the 5.6K Ohm resistor is not installed, the Machine Controller will assume there is no FaST system installed and the recovery tank is not at least half full

If wire # 26 (PIN P2-13) is grounded or shorted to the 0VDC reference, the Machine Controller will assume the ES system is installed and the recovery tank is at least half full

EZ Rider HP – Squeegee Actuator

CONDITIONS: Key ON, operator on seat, engage or disengage One Step switch with Vacuum Fan active



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



Squeegee Actuator limit switches are both normally closed, and the respective switch will open at the end-of-travel when extending or retracting

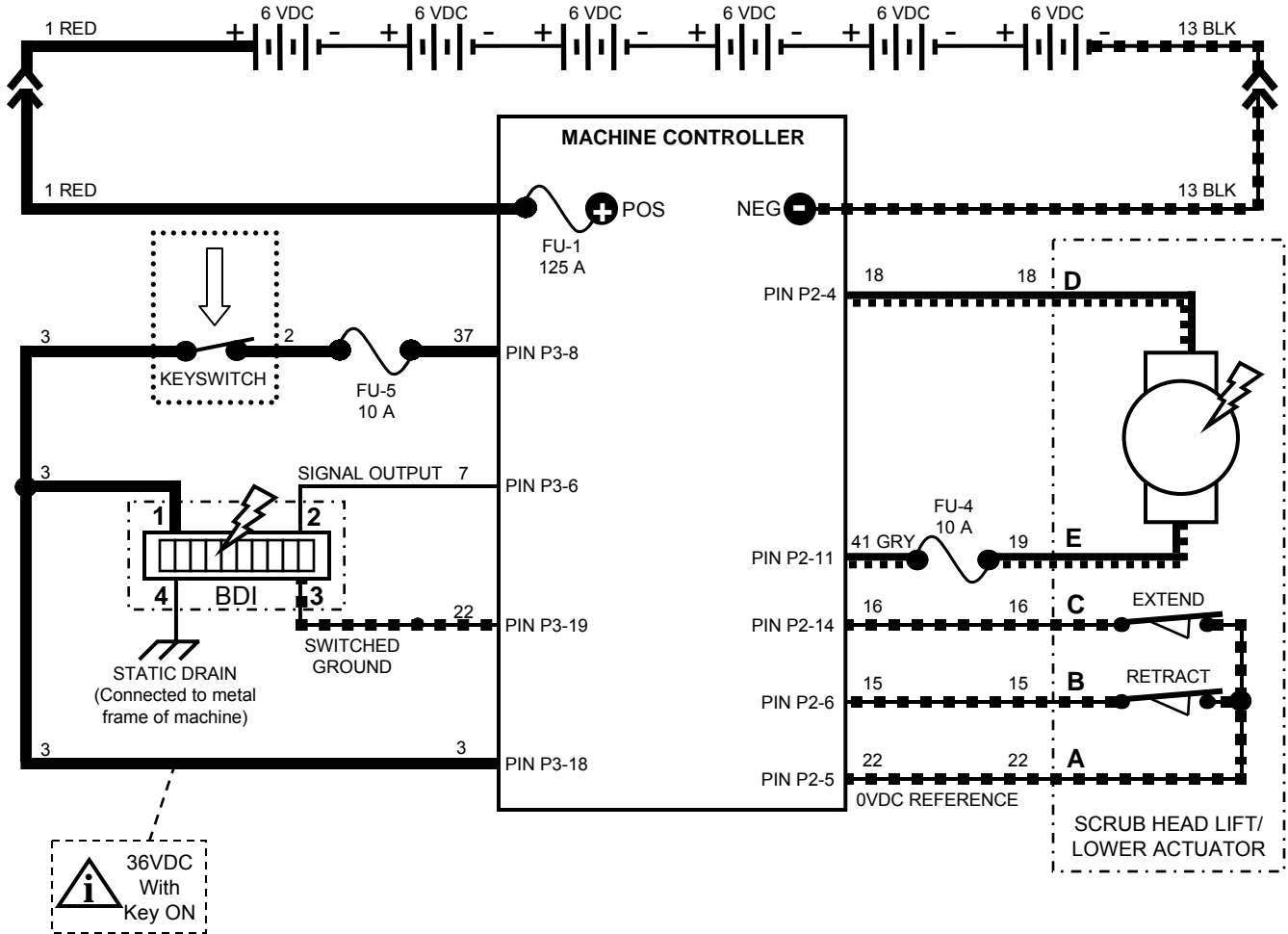
Both limit switches will be closed during actuator travel

Diodes are used to allow current flow around the open switch at the beginning of actuator movement (until switch closes)

Squeegee Actuator current draw: 5.0 Amps at full load

EZ Rider HP – Scrub Head Actuator

CONDITIONS: Key ON, operator on seat, engage or disengage One Step switch with scrub system active



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



Scrub Head Actuator limit switches are both normally closed, and the respective switch will open at the end-of-travel when extending or retracting
Machine controller will turn OFF Scrub Head Actuator when either PIN P2-14 or P2-6 no longer receives the 0VDC reference signal
Both limit switches will be closed during actuator travel
Scrub Head Actuator current draw: 5.0 Amps at full load

EZ Rider HP–Scrub Head Actuator Removal & Installation

DESCRIPTION:

Instructions to remove and reinstall the scrub head lift actuator on the model EZ Rider HP

SPECIAL TOOLS / CONSIDERATIONS: None

(Estimated time to complete: 1 hour)

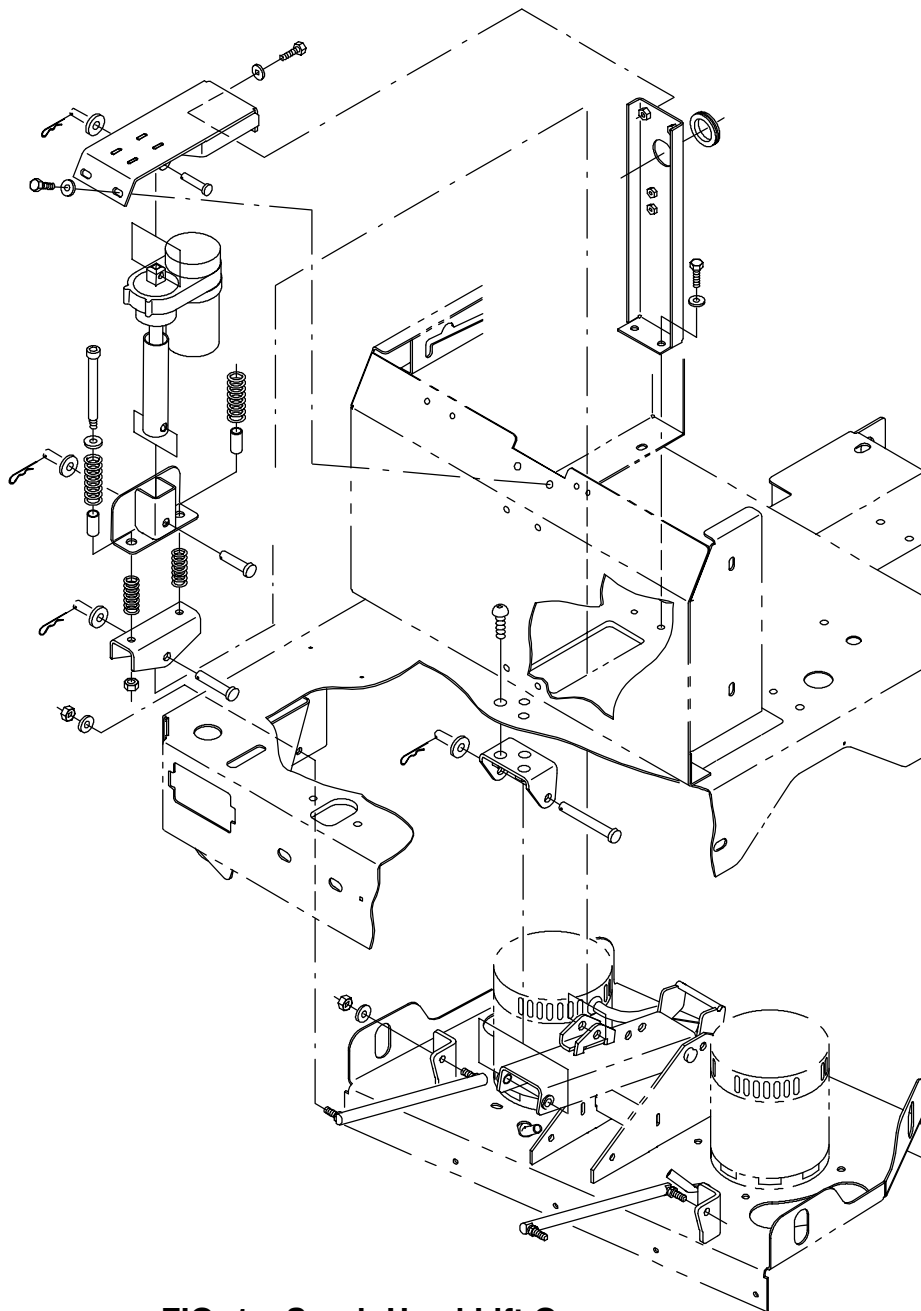
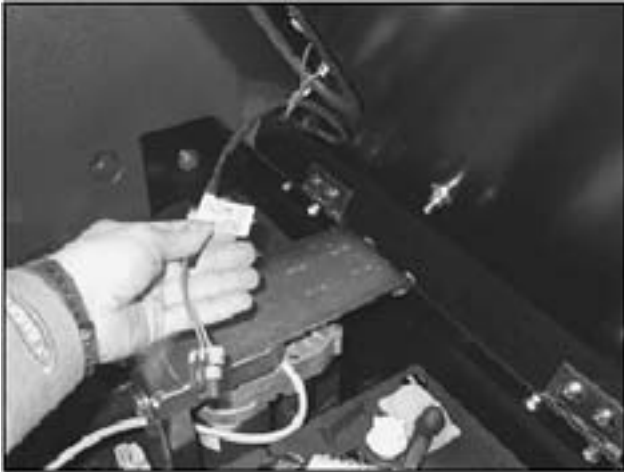


FIG. 1 - Scrub Head Lift Group

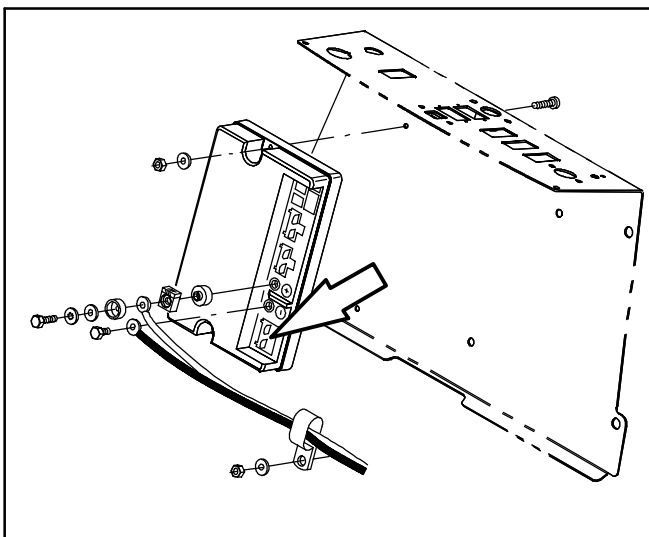
EZ Rider HP–Scrub Head Actuator Removal & Installation

Removal:

1. Unplug the seat switch.



2. Unplug the traction plug from the P&G controller.



3. Remove the scrub brushes or pad drivers.

IB 340570 (3-04)

4. Loosen the four bolts holding actuator plate.



5. Put the vacuum fan/squeegee switch into the vacuum off position. Put the one-step (scrub) switch into the on position.



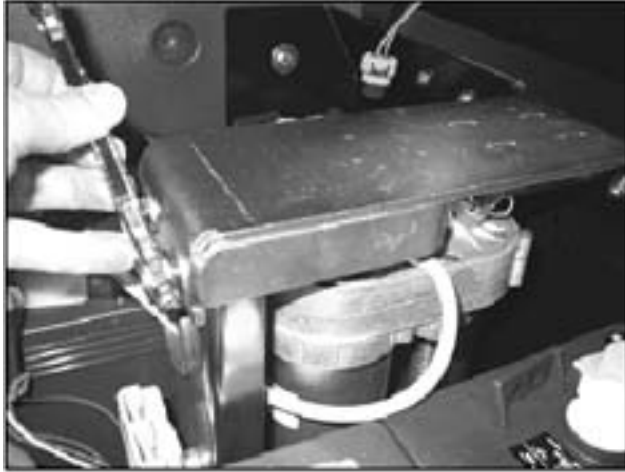
6. Turn the key switch on and activate the pedal in the forward direction. The scrub deck will begin to lower and the brush motors will turn on.



EZ Rider HP–Scrub Head Actuator Removal & Installation

7. When the scrub deck makes contact with the floor and begins to raise the actuator plate, turn the power off at the key switch or by using the power kill switch.

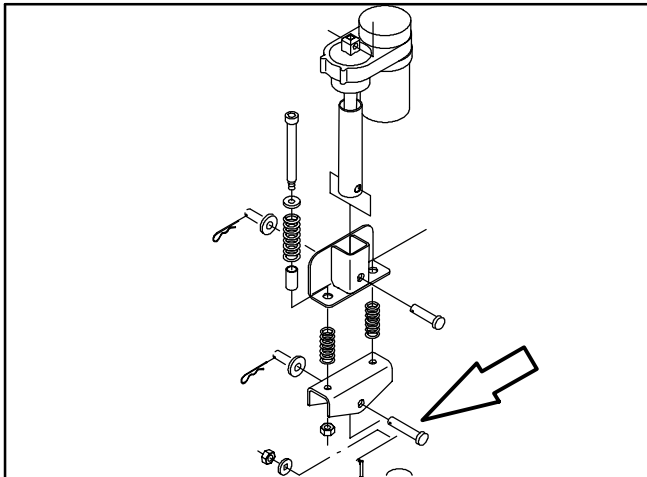
8. Remove the four bolts holding the plate in place.



9. Power on and activate forward propel until the actuator reaches full extension, then power off.



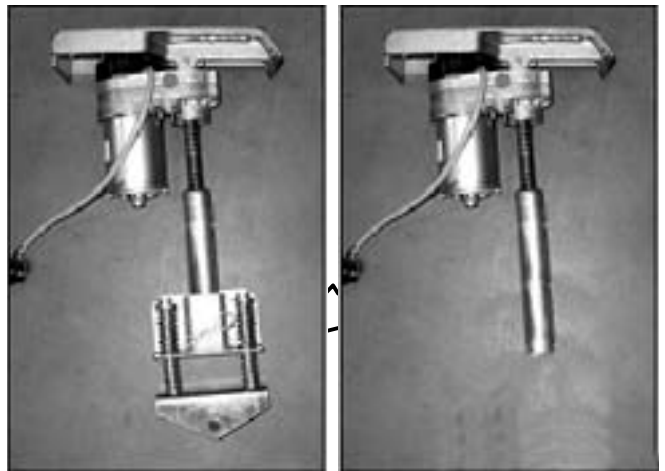
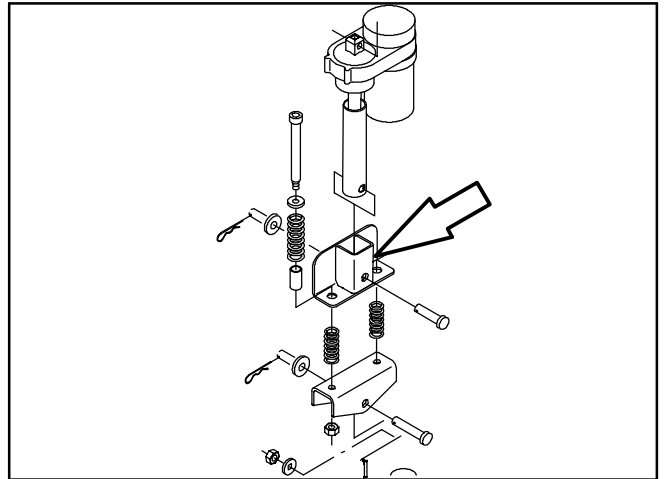
10. Remove the clevis pin at the lower channel.



11. Unplug the actuator and lift out the assembly.



12. Remove the lower bracket assembly.

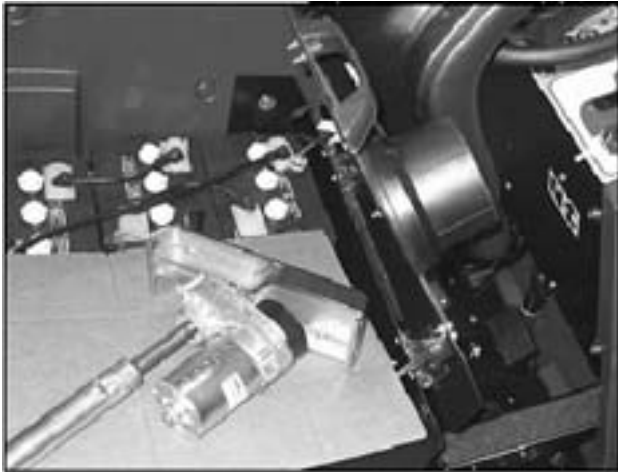


EZ Rider HP–Scrub Head Actuator Removal & Installation

Installation:

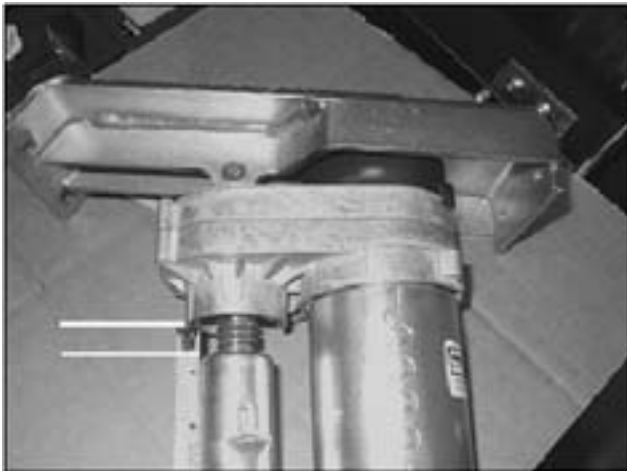
13. Lay some cardboard or other non-conductive material across the batteries and lay the actuator assembly down on it.

! FOR SAFETY: To prevent shock or sparks, do not lay actuator or metal tools on battery cables.



14. Plug the actuator into the harness, power on and allow the actuator to turn freely until the upper limit switch in the actuator opens and turns the motor off.

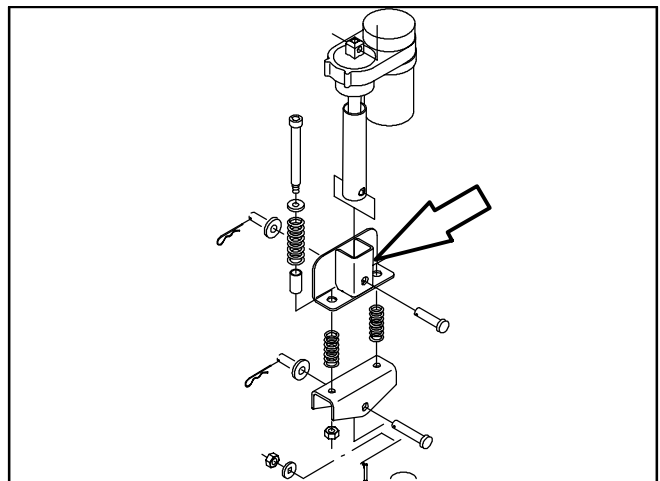
15. Power off. Turn the tube by hand until the gap between the gear-box and tube is 11 mm (7/16 in).



16. Hold onto the tube, power on, activate forward propel until the actuator reaches full extension, then power off. HOLD ON TO THE TUBE ALL THE WAY. If it slips, repeat steps 13 & 14.

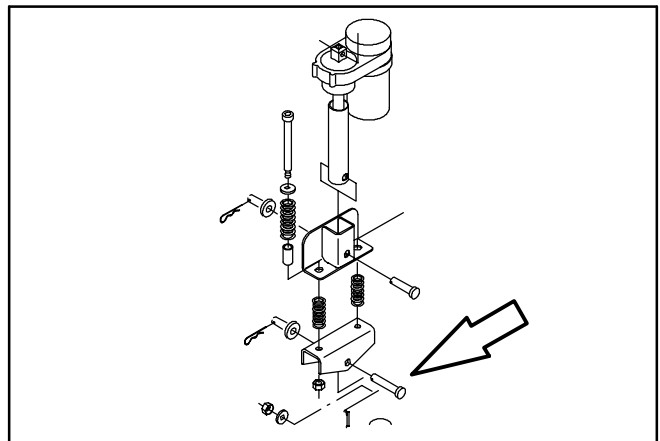


17. Unplug the actuator and reinstall the lower bracket



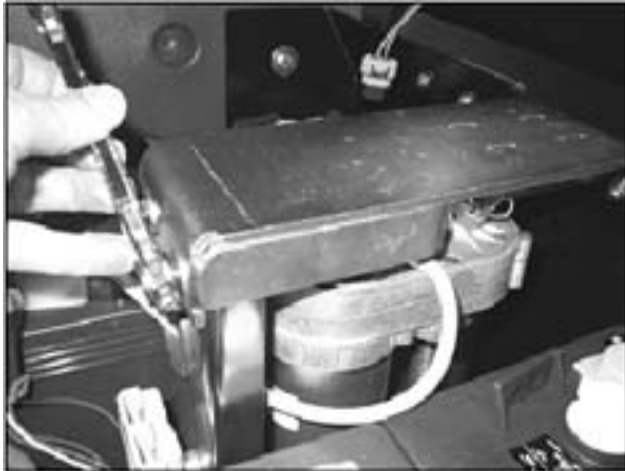
18. Remove the cardboard and place the actuator back into position.

19. Connect the actuator to the machine by installing the lower clevis pin.



EZ Rider HP–Scrub Head Actuator Removal & Installation

20. Start the two rear bolts into the actuator plate.



21. Power on, and allow the actuator to retract and pull the upper plate into position.

! FOR SAFETY: Keep hands clear of pinch points while retracting actuator.



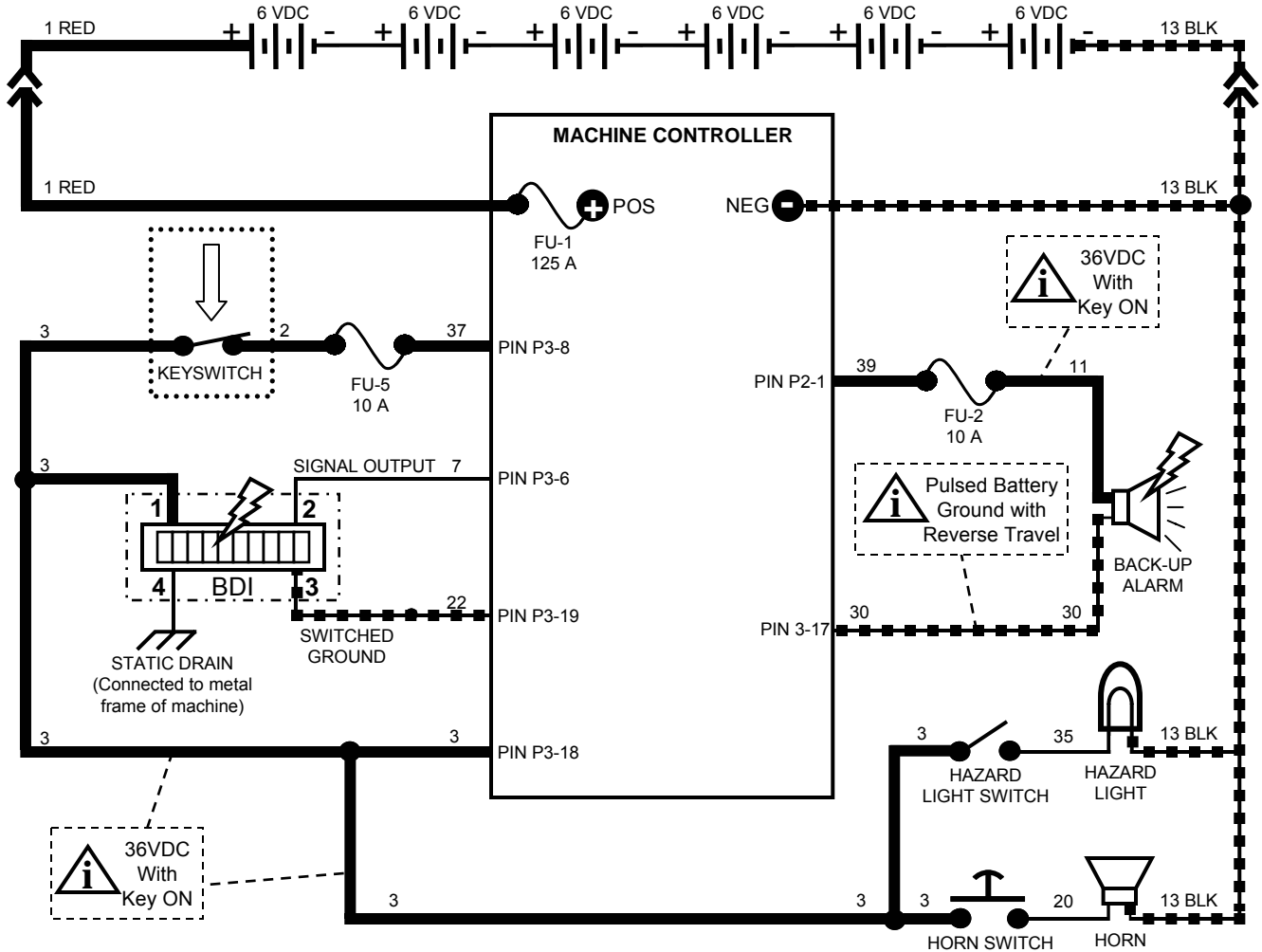
22. Install and tighten all four plate bolts and plug in the actuator.

23. Plug in the seat switch and the traction plug.

24. Install scrub brushes or pad drivers.


EZ Rider HP – Horn, Back-up Alarm & Hazard Light Systems

CONDITIONS: Key ON, operator on seat & reverse travel (for back-up alarm)



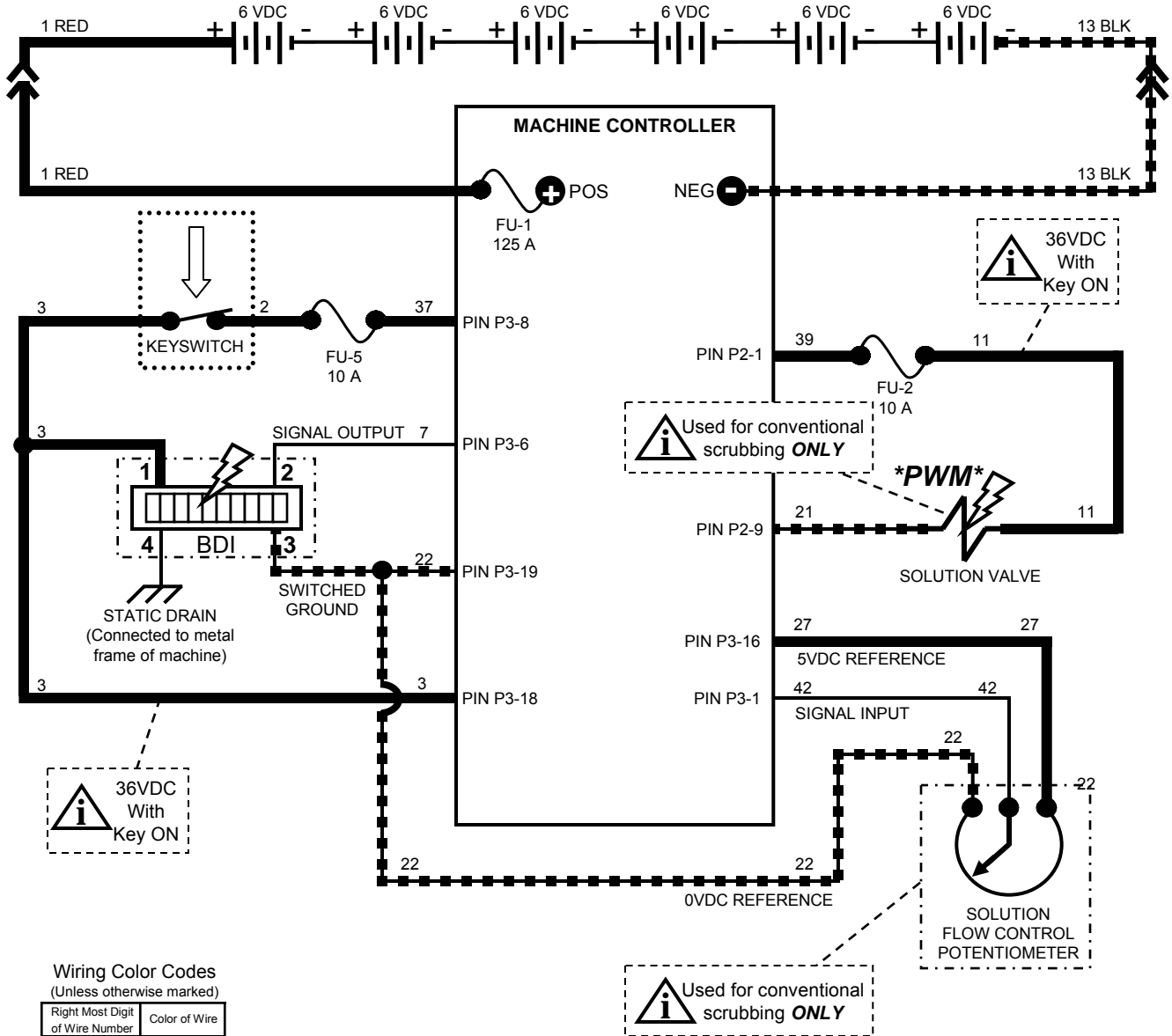
Wiring Color Codes (Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

 Back-up Alarm sounds only during reverse travel

EZ Rider HP – Solution Flow Control (00000000-10143032)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON, scrub mode switch in “scrub only” or “scrub & vacuum” position



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

! Not all machines use electronic Solution Flow Control – some machines use a mechanical device to control the amount of solution applied to the floor

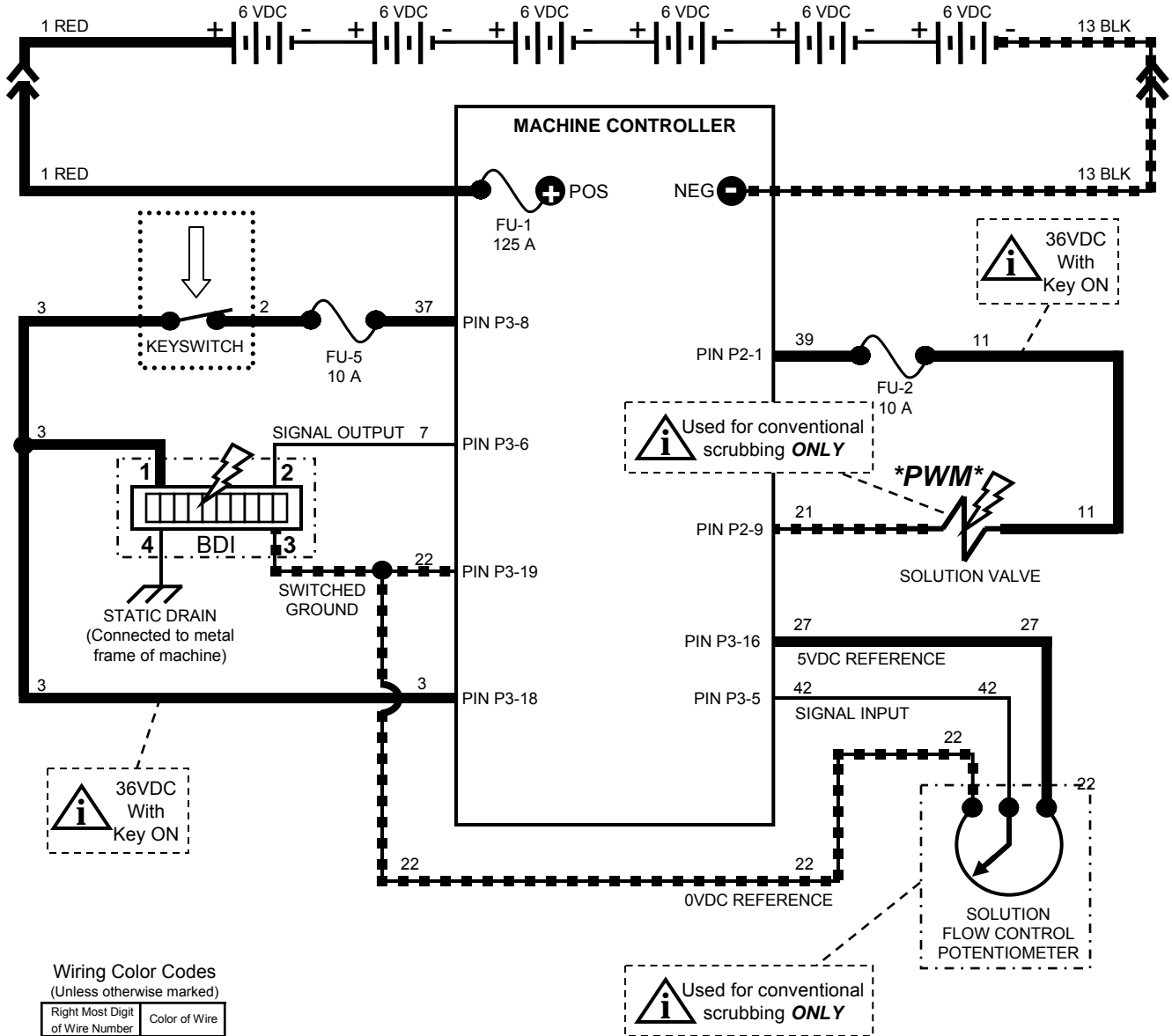
If electronic Solution Flow Control is used, the Solution Valve is controlled by Pulse Width Modulation

The Solution Valve and Solution Flow Control Potentiometer is used only during conventional scrubbing – they are NOT used during FaST scrubbing

Typical Solution Valve current draw: 0.3 to 0.5 Amps

EZ Rider HP – Solution Flow Control (10143033-)

CONDITIONS: Key ON, operator on seat, forward travel, One Step switch ON, scrub mode switch in “scrub only” or “scrub & vacuum” position



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
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Typical Solution Valve current draw: 0.3 to 0.5 Amps

EZ Rider HP – Fuses & Circuit Breaker

Fuses

fuse #	rating	circuit protected	location
FU-1	125 Amps	Machine Controller	On Machine Controller where Battery (+) cable attaches
FU-2	10 Amps	Solution Valve; ES Pump; Recovery Tank Full Lamp; Back-up Alarm	Near the two multi-pin connectors on the Machine Controller
FU-3	10 Amps	Squeegee Lift Actuator	
FU-4	10 Amps	Scrub Head Actuator	
FU-5	10 Amps	Key Switch; BDI; Machine Controller	

Circuit Breaker

circuit breaker #	rating	circuit protected	location
CB-3	10 Amps	FaST Detergent, Air, & Water Pumps; FaST Solenoid Valve; FaST Timer Module	On the lower part of the operator console

Troubleshooting Guide for the PG Drives “Trio” Controller

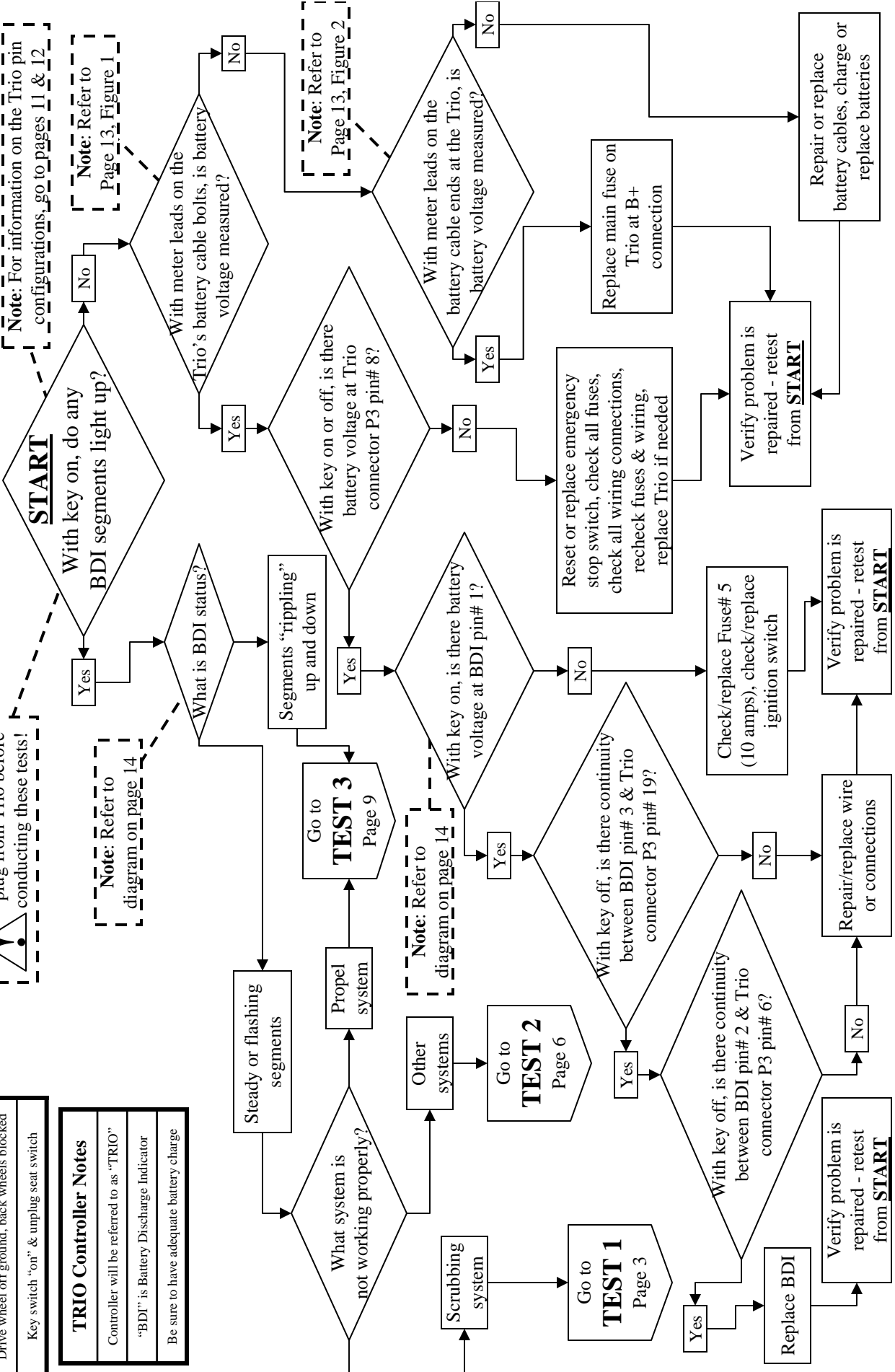
This guide was prepared to help you diagnose and repair the machine controller. It is recommended that you begin your troubleshooting at the **START** point on page 2. The following chart lists the contents of this troubleshooting guide

page	description
2	START point for troubleshooting
3	TEST 1: Scrubbing Functions Troubleshooting
4	Covers the following functions:
5	Scrub brush motors, scrub head and squeegee actuators, and vacuum fan
6	TEST 2: Other Systems Troubleshooting
7	Covers the following functions:
8	ES system, recovery tank full light, horn, & solution flow control (if electrically controlled)
9	TEST 3: Propelling Troubleshooting
10	Covers traction motor and foot throttle
11	TRIO pin configurations diagram
12	TRIO connectors P2 & P3 pin inputs and outputs charts
13	TRIO battery cable connections diagram
14 - 15	TRIO BDI charts & diagrams

Controller System Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug from Trio before conducting these tests!	
Drive wheel off ground, back wheels blocked	
Key switch "on" & unplug seat switch	

TRIO Controller Notes	
Controller will be referred to as "TRIO"	
"BDI" is Battery Discharge Indicator	
Be sure to have adequate battery charge	



Disconnect traction motor plug from Trio before conducting these tests!

Note: For information on the Trio pin configurations, go to pages 11 & 12.

Note: Refer to Page 13, Figure 1

Note: Refer to Page 13, Figure 2

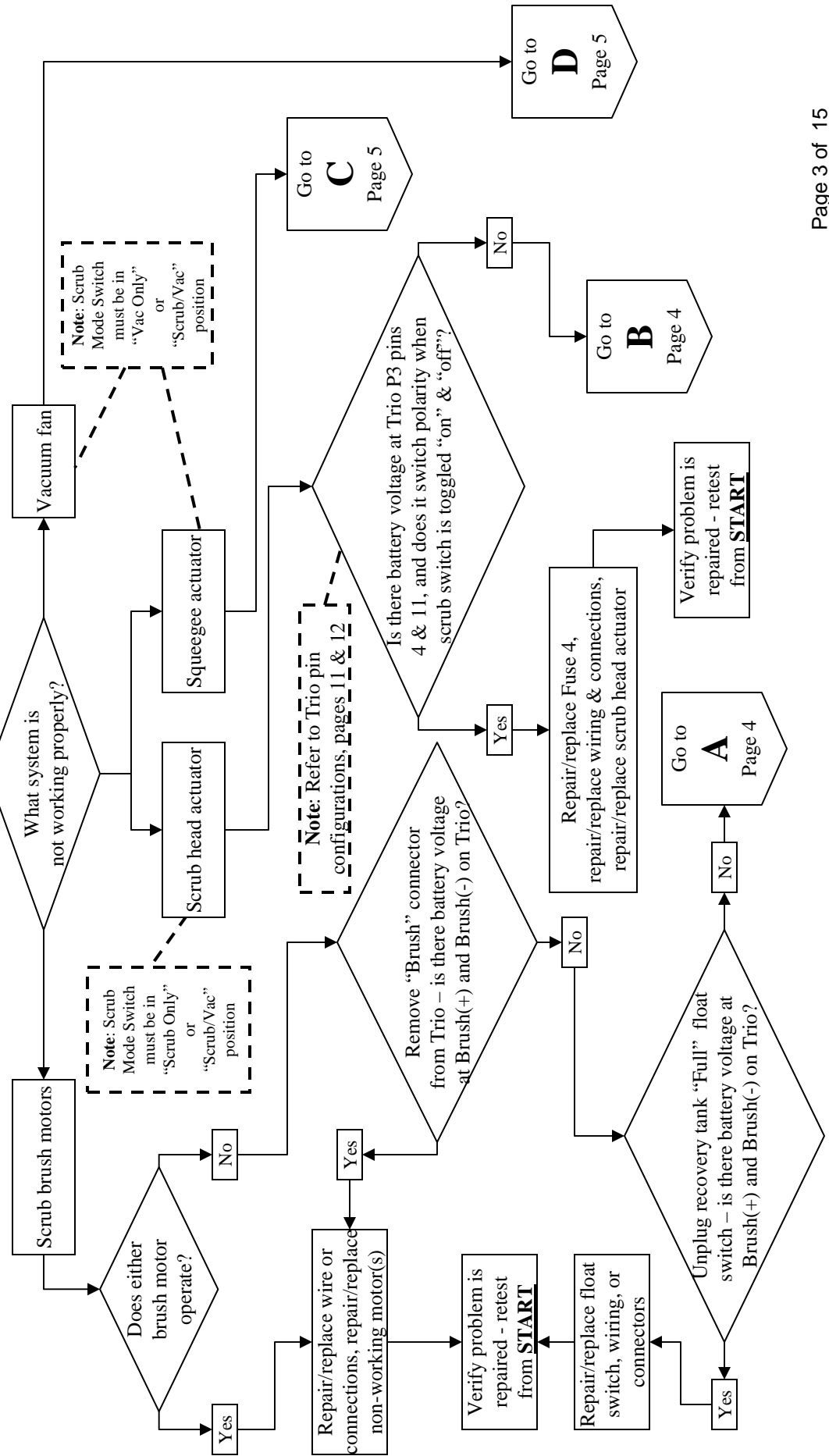
Scrubbing System Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug from Trio before conducting these tests!	Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)	Unplug seat switch
Recovery tank level below float switches	Key & Scrub switch "on"

TEST 1 Scrub System

Disconnect traction motor plug from Trio before conducting these tests!

Note: This test will cover scrub brush motors, scrub head and squeegee actuators, and vacuum fan

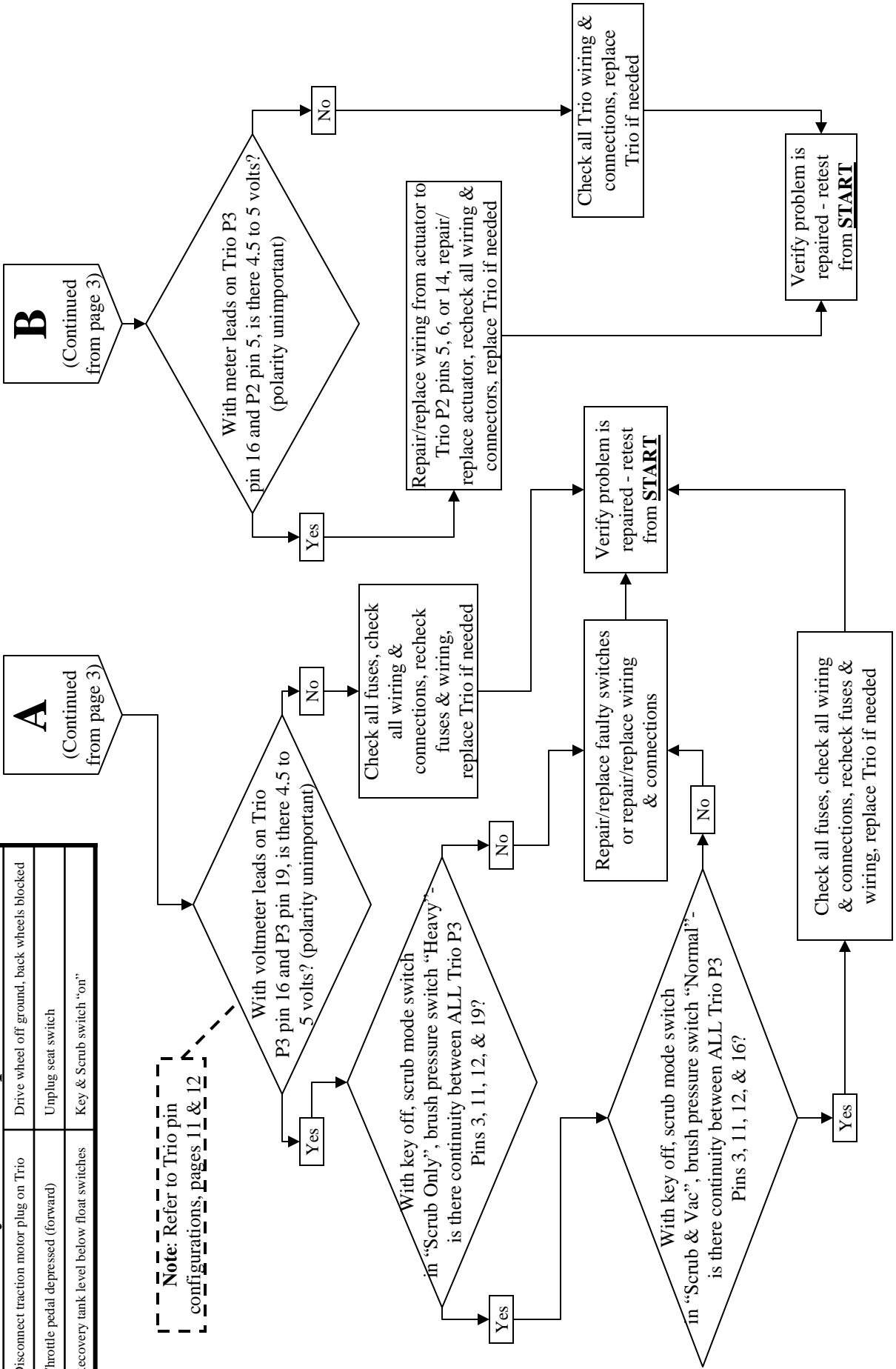


Scrubbing System Troubleshooting

Safety & Test Requirements:

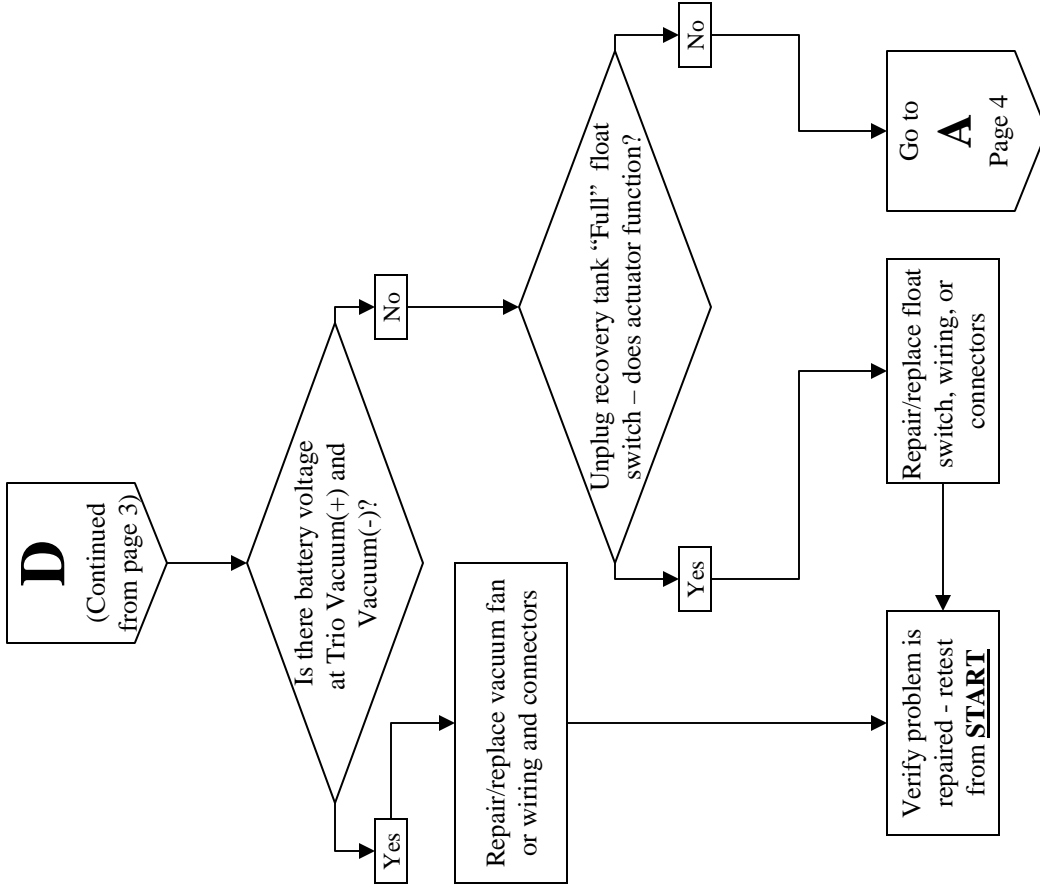
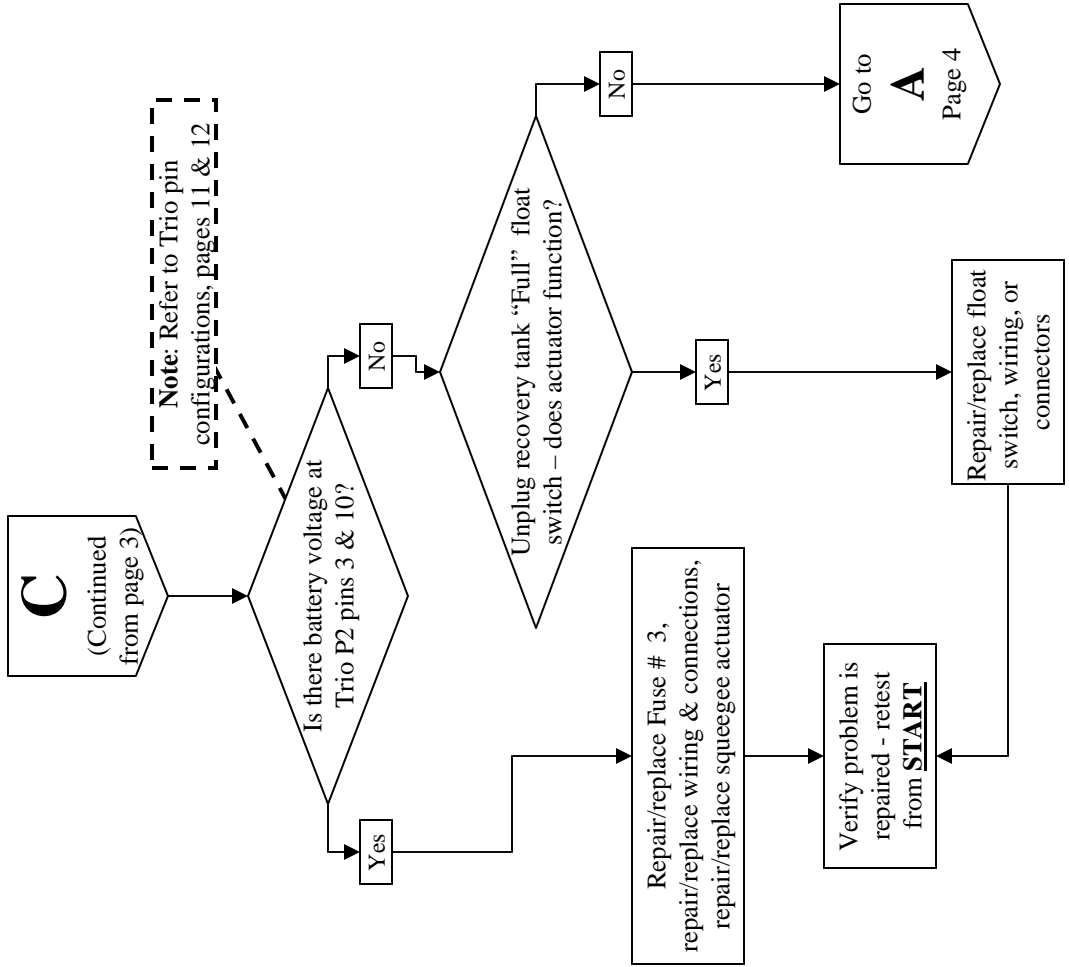
Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)	Unplug seat switch
Recovery tank level below float switches	Key & Scrub switch "on"

Note: Refer to Trio pin configurations, pages 11 & 12



Scrubbing System Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)	Unplug seat switch
Recovery tank level below float switches	Key & Scrub switch "on"



Other Systems Troubleshooting

Safety & Test Requirements:

Disconnect traction motor plug from Trio before conducting these tests!
Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)
Unplug seat switch
Recovery tank level below float switches
Key & Scrub switch "on"

TEST 2 Other Systems

Disconnect traction motor plug from Trio before conducting these tests!

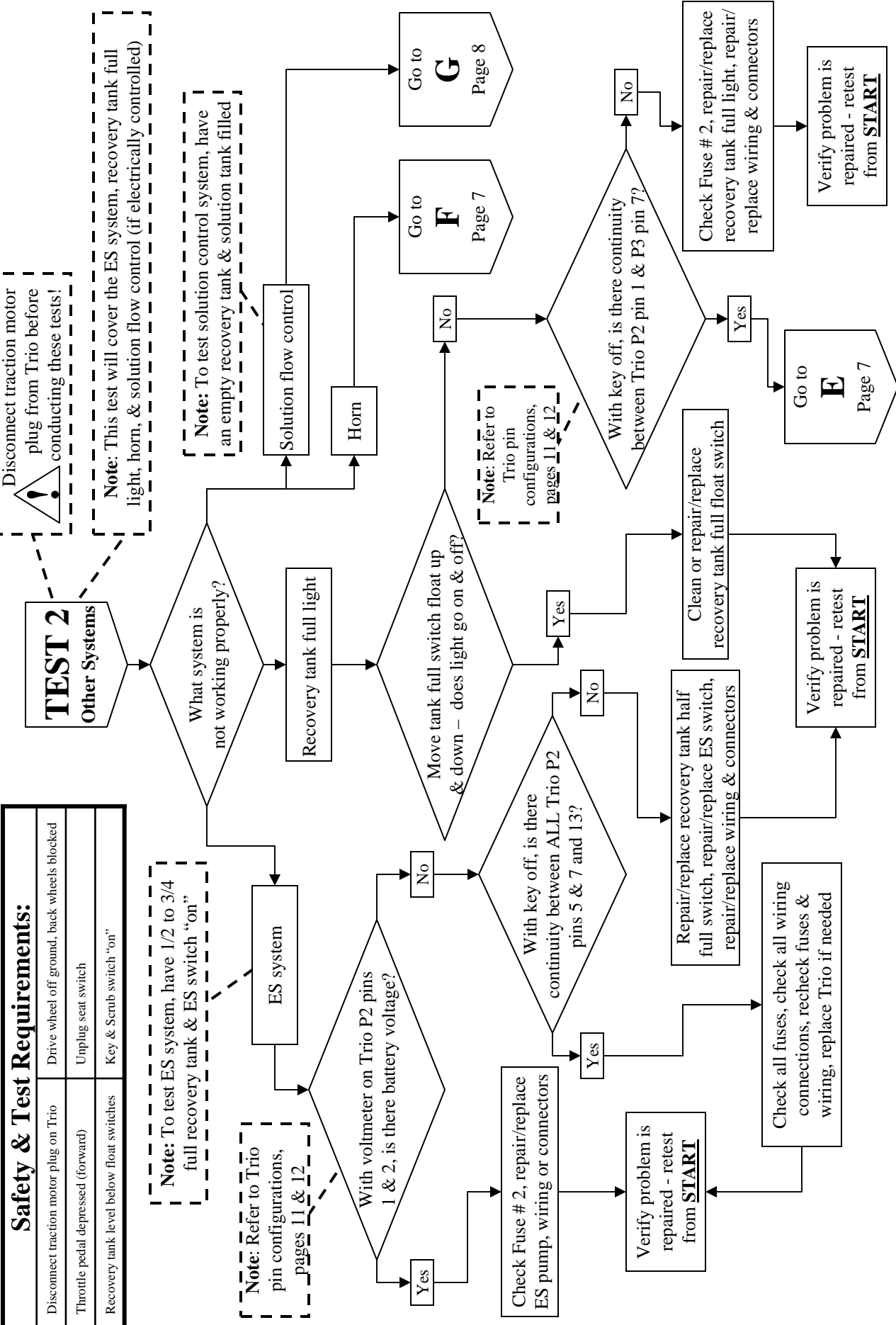
Note: This test will cover the ES system, recovery tank full light, horn, & solution flow control (if electrically controlled)

Note: To test solution control system, have an empty recovery tank & solution tank filled!

Note: To test ES system, have 1/2 to 3/4 full recovery tank & ES switch "on"

Note: Refer to Trio pin configurations, pages 11 & 12

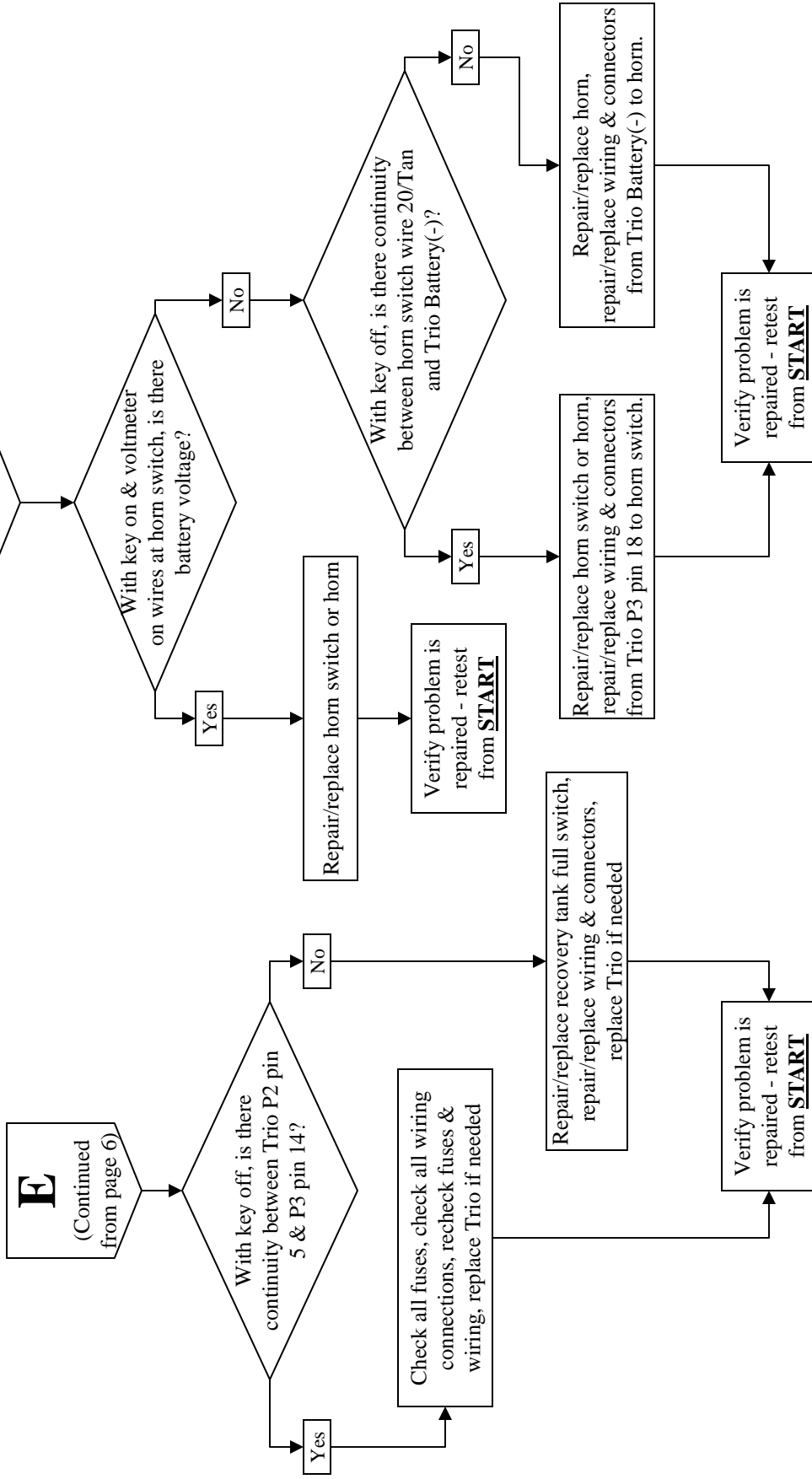
Note: Refer to Trio pin configurations, pages 11 & 12



Other Systems Troubleshooting

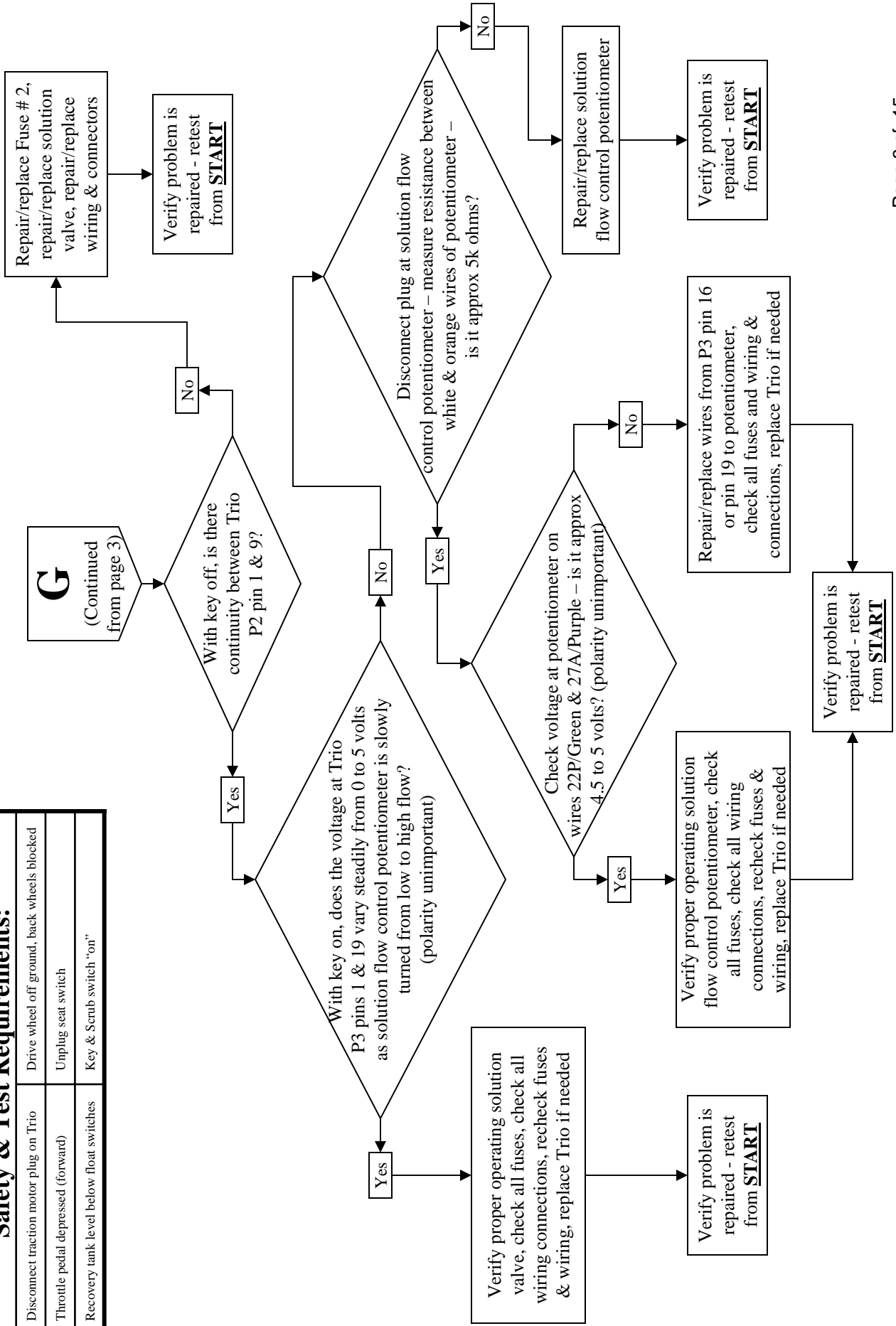
Safety & Test Requirements:

Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)	Unplug seat switch
Recovery tank level below float switches	Key & Scrub switch "on"



Other Systems Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Throttle pedal depressed (forward)	Unplug seat switch
Recovery tank level below float switches	Key & Scrub switch "on"

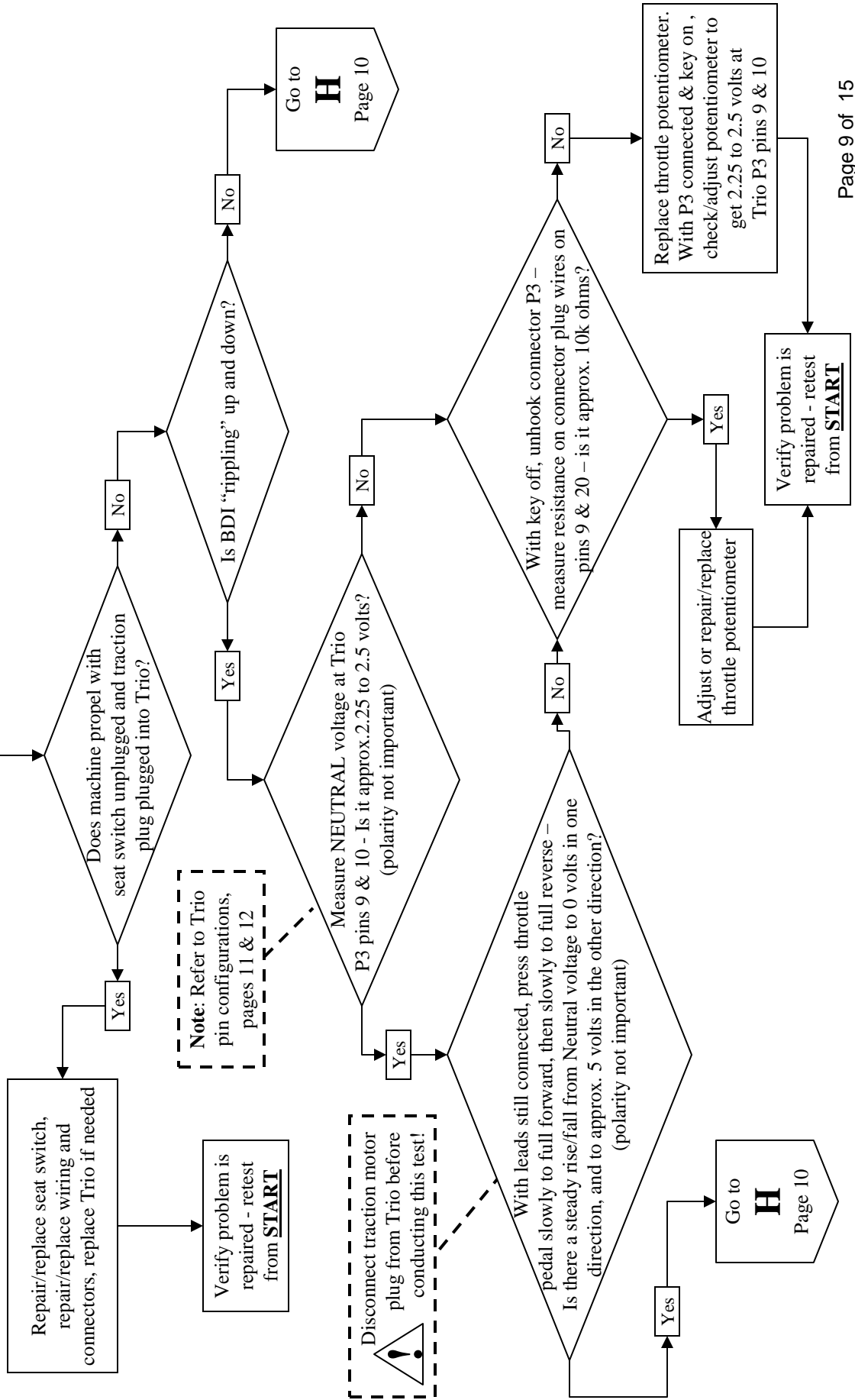


Propelling Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Key switch "on"	Unplug seat switch

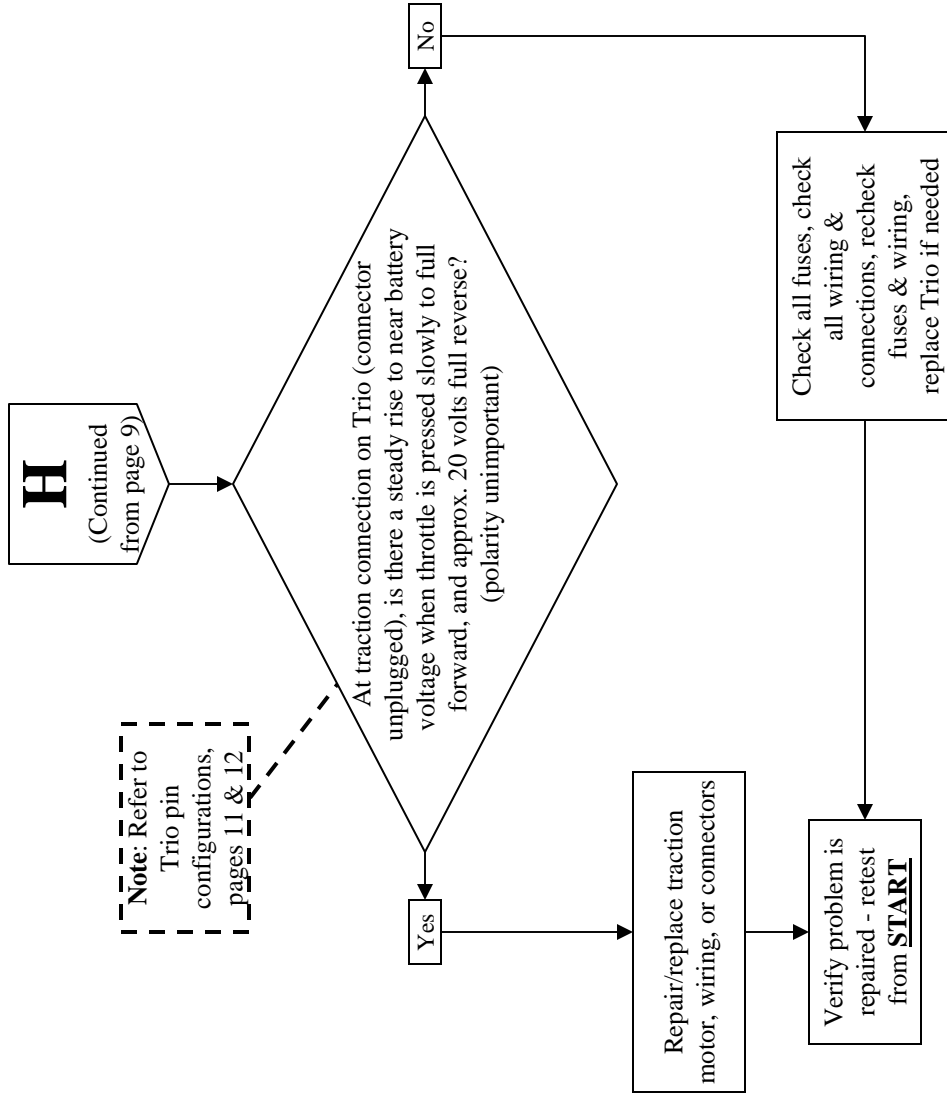
TEST 3
Propel System

Note: This test will cover the traction motor & foot throttle

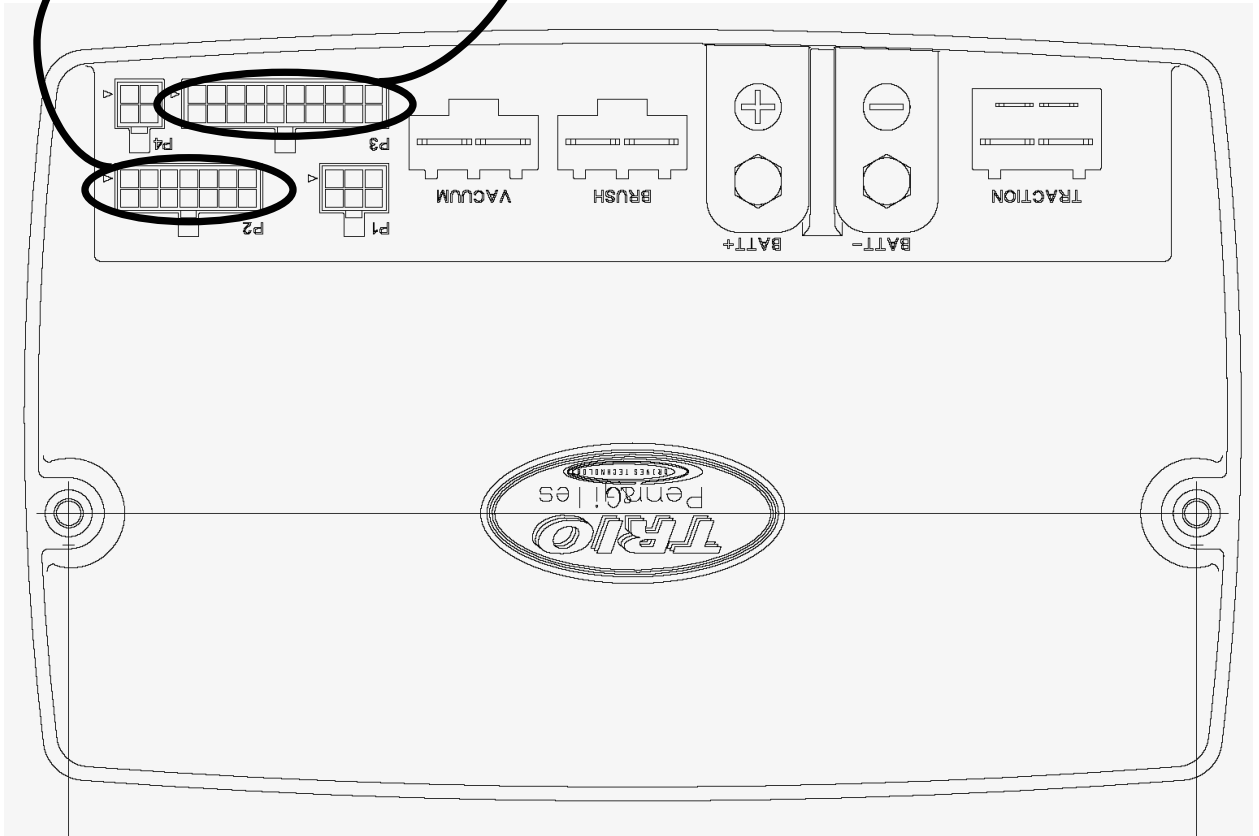


Propelling Troubleshooting

Safety & Test Requirements:	
Disconnect traction motor plug on Trio	Drive wheel off ground, back wheels blocked
Key switch "on"	Unplug seat switch



Trio Pin Configurations



NOTE: As viewed from rear of connectors (wire side)

Trio Pin Inputs & Outputs

Connector P2

pin	input/output	description
P2-1	OUTPUT	SWITCHED BATTERY (+) FROM KEY SWITCH
P2-2	OUTPUT	ES PUMP [BATTERY (-)]
P2-3	OUTPUT	SQUEEGEE ACTUATOR [BATTERY (+) OR (-)]
P2-4	OUTPUT	SCRUB HEAD ACTUATOR [BATTERY (+) OR (-)]
P2-5	OUTPUT	0 VDC REFERENCE
P2-6	INPUT	SCRUB HEAD ACTUATOR RETRACT
P2-7	INPUT	ES SWITCH
P2-8	X	NOT USED
P2-9	OUTPUT	SOLUTION VALVE [BATTERY (-)]
P2-10	OUTPUT	SQUEEGEE ACTUATOR [BATTERY (+) OR (-)]
P2-11	OUTPUT	SCRUB HEAD ACTUATOR [BATTERY (+) OR (-)]
P2-12	X	NOT USED
P2-13	INPUT	RECOVERY TANK HALF FULL SWITCH
P2-14	INPUT	SCRUB HEAD ACTUATOR EXTEND

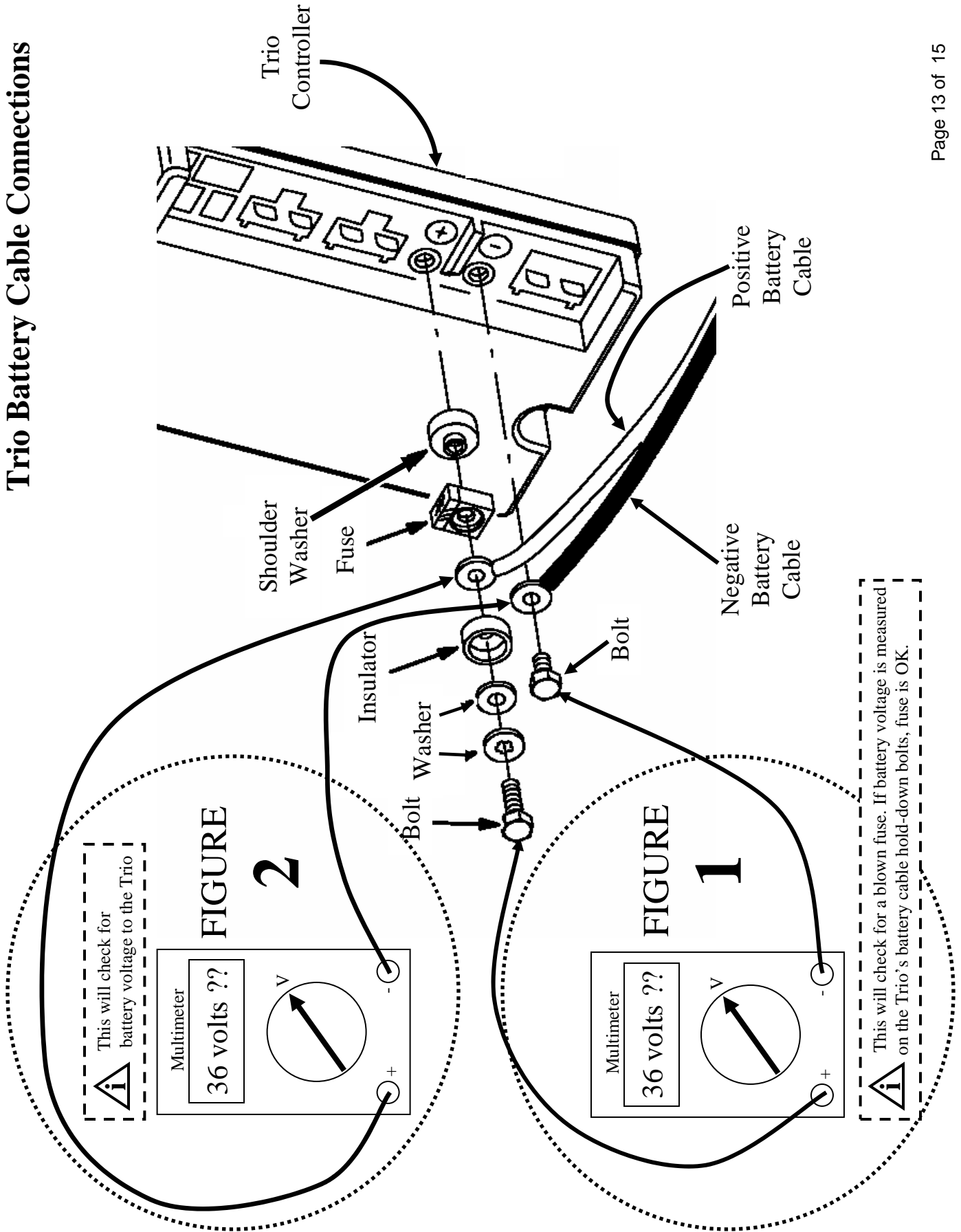
Connector P3

pin	input/output	description
*P3-1	INPUT	SOLUTION FLOW CONTROL (0 TO 5 VDC)
P3-2	INPUT	SCRUB HEAD TYPE (TRI-STATE)
P3-3	INPUT	SCRUB ON/OFF & BRUSH PRESSURE
P3-4	INPUT	EMERGENCY STOP SWITCH
**P3-5	INPUT	SOLUTION FLOW CONTROL (0 TO 5 VDC)
P3-6	OUTPUT	BATTERY DISCHARGE INDICATOR
P3-7	OUTPUT	RECOVERY TANK FULL LAMP [BATTERY (-)]
P3-8	OUTPUT	CONSTANT BATTERY (+)
P3-9	OUTPUT	0 VDC REFERENCE
P3-10	INPUT	THROTTLE POSITION (0 TO 5 VDC)
P3-11	INPUT	SCRUB MODE SWITCH (TRI-STATE)
P3-12	INPUT	SCRUB ON/OFF & BRUSH PRESSURE
P3-13	X	NOT USED
P3-14	INPUT	RECOVERY TANK FULL SWITCH
P3-15	INPUT	SEAT SWITCH
P3-16	OUTPUT	5 VDC REFERENCE
P3-17	OUTPUT	BACK-UP ALARM [BATTERY (-)]
P3-18	INPUT	SWITCHED BATTERY (+) FROM KEY SWITCH
P3-19	OUTPUT	0 VDC REFERENCE
P3-20	OUTPUT	5 VDC REFERENCE

* P3-1 not used on machines with serial numbers 10143033 and above

** P3-5 not used on machines with serial numbers 00000000 to 10143032

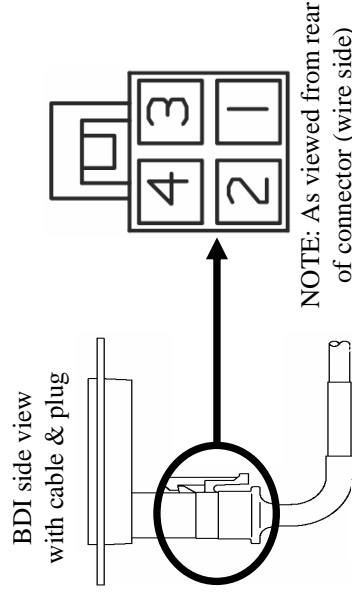
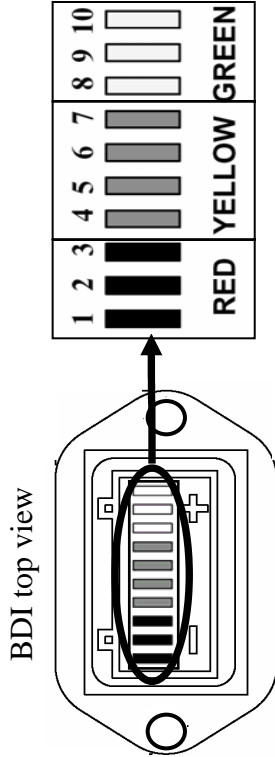
Trio Battery Cable Connections



Trio BDI Information

BDI Status Indicators

Indicator	Description
Red, yellow, and green LED's lit (not flashing)	System OK, no faults found, adequate charge in batteries
Only red and yellow LED's lit (not flashing)	Batteries will soon need to be charged
Only red LED's lit (not flashing)	Charge batteries immediately
LED's ripple up only (not down)	Batteries are being charged
BDI blinks on every 5 seconds	Controller has entered sleep mode after 20 minutes of inactivity
BDI flashing rapidly	Fault has been sensed; Refer to BDI Diagnostic Codes below
Ripple Up & Down	Throttle pedal depressed at start-up



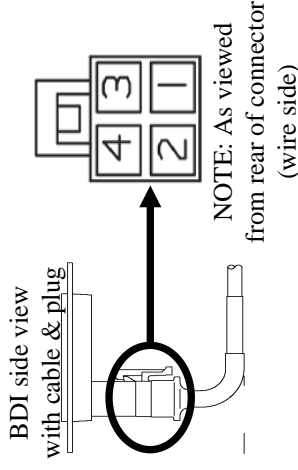
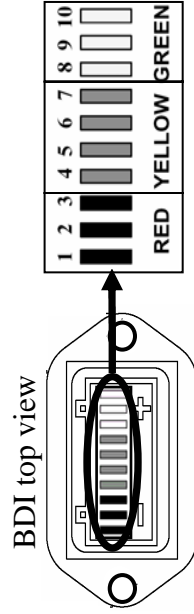
BDI Diagnostic Codes

# Bars Flashing	Description of Fault	Possible Causes
1	LOW BATTERY VOLTAGE	Batteries need charged; Bad connection to batteries
2	TRACTION MOTOR FAULT	Bad connection to propel motor
3	SCRUB BRUSH MOTOR FAULT	Bad connection to scrub brush motors
4	NOT USED	
5	VACUUM MOTOR FAULT	Bad connection to vacuum fan motor
6	SEAT SWITCH FAULT	Operator not on seat; Faulty seat switch
7	THROTTLE FAULT	Throttle depressed before start-up
8	CONTROL SYSTEM FAULT	Emergency Stop Switch activated; Wiring issue; Faulty Trio controller
9	NOT USED	
10	EXCESSIVE BATTERY VOLTAGE	Bad connection to batteries
NOTE: Ripple Up & Down indicates throttle pedal depressed at start-up		

Trio BDI Information for Models with Optional On-board Charger

BDI Status Indicators

Indicator	Description
Red, yellow, and green LED's lit (not flashing)	System OK, no faults found, adequate charge in batteries
Only red and yellow LED's lit (not flashing)	Batteries will soon need to be charged
Only red LED's lit (not flashing)	Charge batteries immediately
LED's ripple up only (not down)	Batteries are being charged
BDI blinks on every 5 seconds	Controller has entered sleep mode after 20 minutes of inactivity
BDI flashing rapidly	Fault has been sensed; Refer to BDI Diagnostic Codes below
Ripple Up & Down	Throttle pedal depressed at start-up



BDI Diagnostic Codes

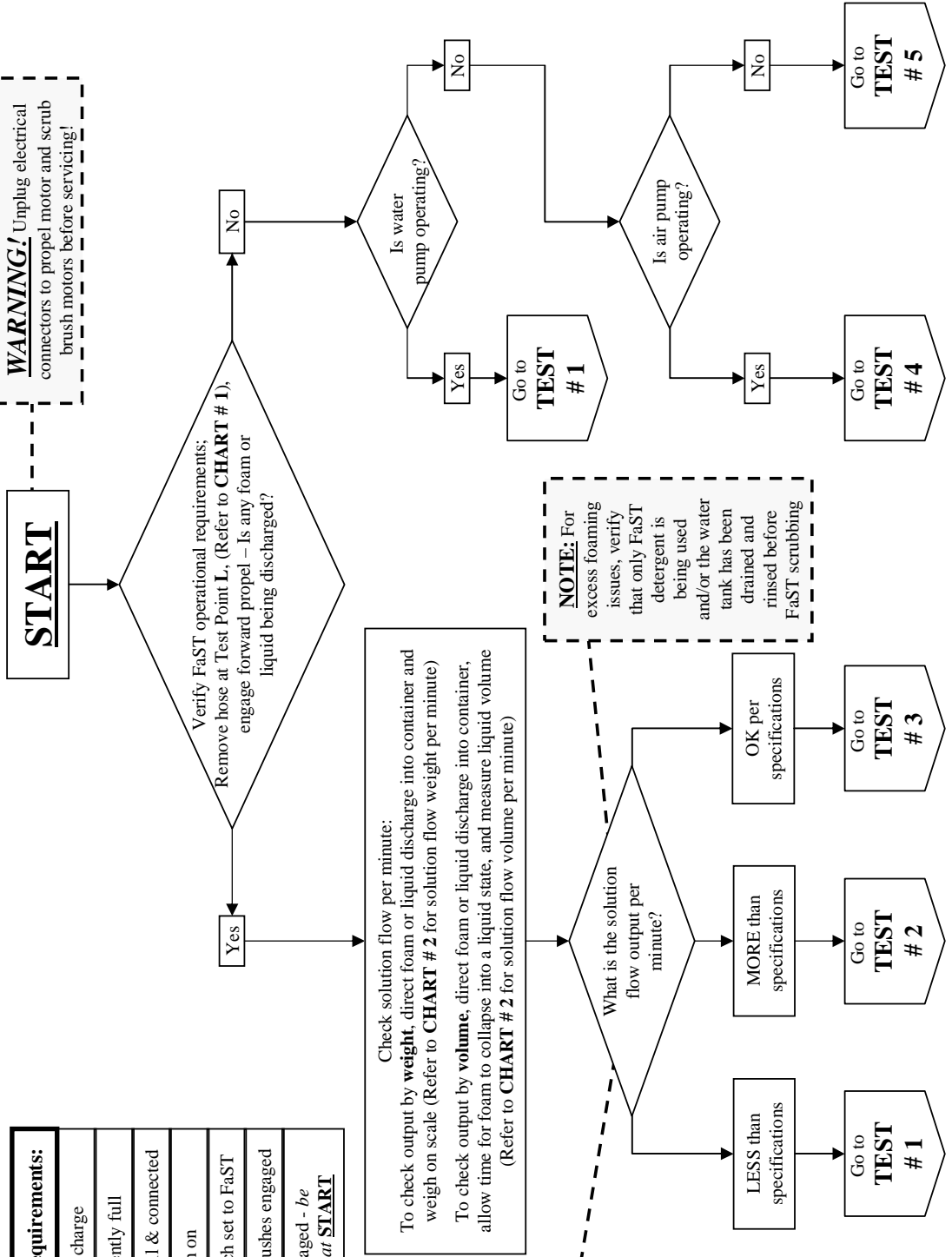
# Bars Flashing	# of Flashes	Description of Fault	Possible Causes
1	1	LOW BATTERY VOLTAGE	Batteries need charged; Bad connection to batteries
2	1	TRACTION MOTOR FAULT	Bad connection to propel motor
3	1	SCRUB BRUSH MOTOR FAULT	Bad connection to scrub brush motors
4	1	SCRUB HEAD ACTUATOR FAULT	Faulty actuator; Actuator unplugged
	2	SQUEEGEE ACTUATOR FAULT	Faulty actuator; Actuator unplugged
5	1	VACUUM MOTOR FAULT	Bad connection to vacuum fan motor
6	1	SEAT SWITCH FAULT	Operator not on seat; Faulty seat switch
7	1	THROTTLE FAULT	Throttle depressed before start-up
	2	INPUT SWITCH FAULT	Incorrect throttle pedal signal; Open throttle potentiometer
8	1	CONTROL SYSTEM FAULT	Emergency Stop Switch activated; Wiring issue; Faulty Trio controller
	1	RECOVERY TANK FULL FAULT	Faulty level sensor; ; Level sensor unplugged
9	2	BACK-UP ALARM FAULT	Faulty back-up alarm; Shorted back-up alarm or faulty wiring
	3	SOLUTION VALVE FAULT	Incorrect solution valve signal; Open solution valve potentiometer
	4	ES PUMP FAULT	Faulty ES pump; Shorted ES pump or faulty wiring
10	5	HOUR METER FAULT	Faulty hour meter; Shorted hour meter or faulty wiring
	1	EXCESSIVE BATTERY VOLTAGE	Bad connection to batteries

NOTE: Ripple Up & Down indicates throttle pedal depressed at start-up

FaST Overall System Troubleshooting

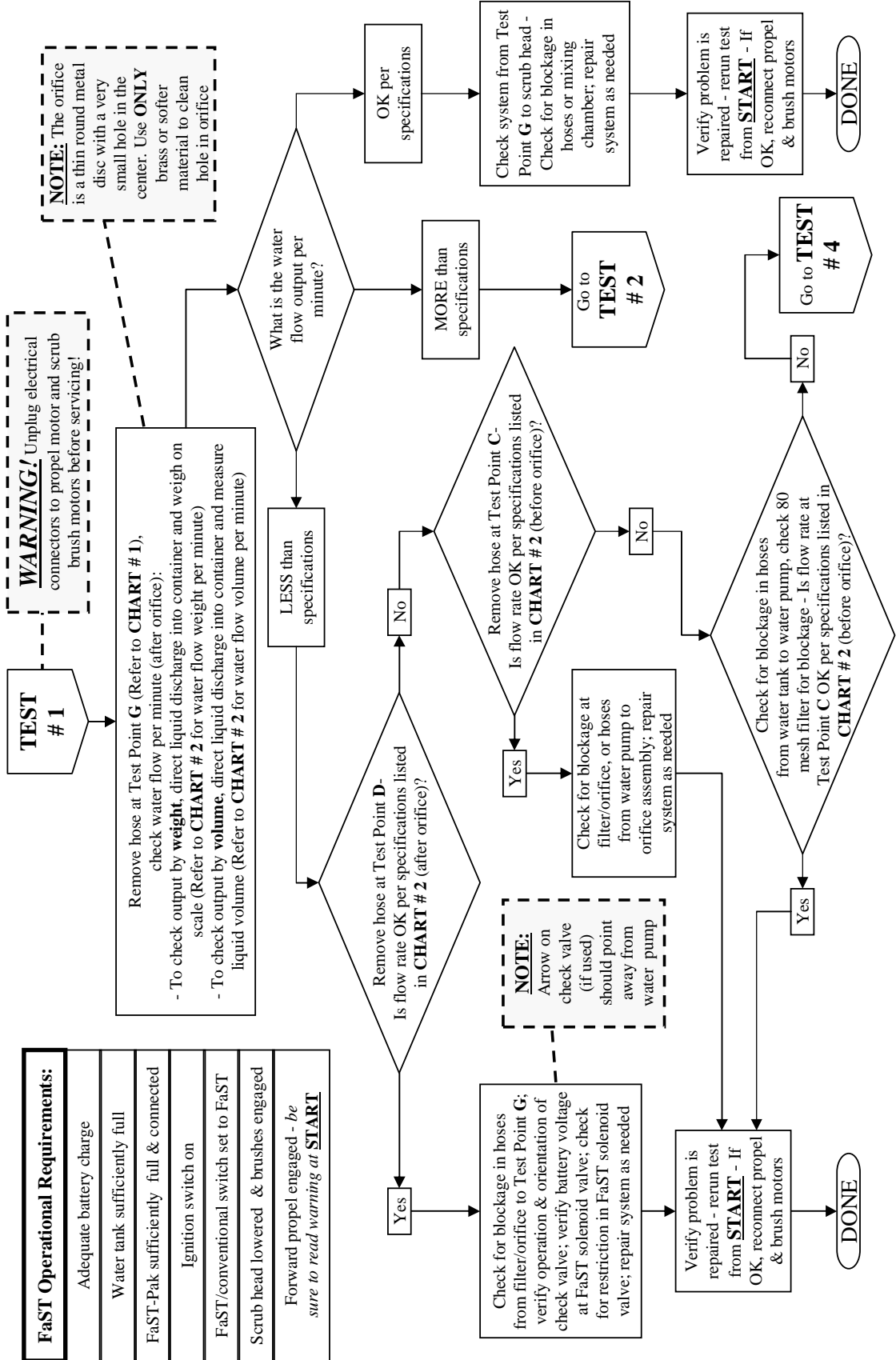
FaST Operational Requirements:	
Adequate battery charge	
Water tank sufficiently full	
FaST-Pak sufficiently full & connected	
Ignition switch on	
FaST/conventional switch set to FaST	
Scrub head lowered & brushes engaged	
Forward propel engaged - <i>be sure to read warning at START</i>	

WARNING! Unplug electrical connectors to propel motor and scrub brush motors before servicing!



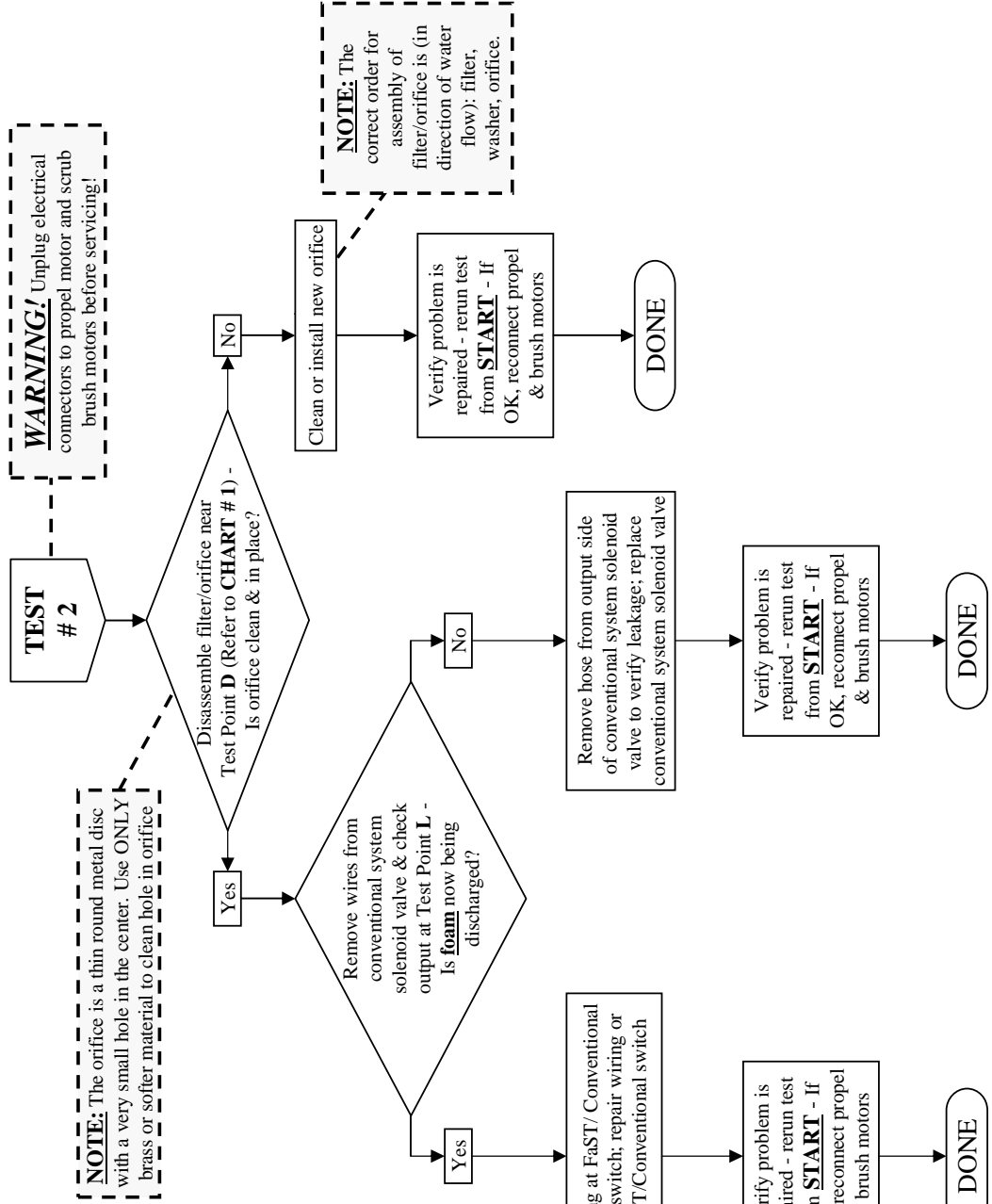
FaST Troubleshooting - TEST #1 (Low/no water or foam)

FaST Operational Requirements:	
Adequate battery charge	
Water tank sufficiently full	
FaST-Pak sufficiently full & connected	
Ignition switch on	
FaST/conventional switch set to FaST	
Scrub head lowered & brushes engaged	
Forward propel engaged - <i>be sure to read warning at START</i>	



FaST Troubleshooting - TEST #2 (Too much water and low/no foam)

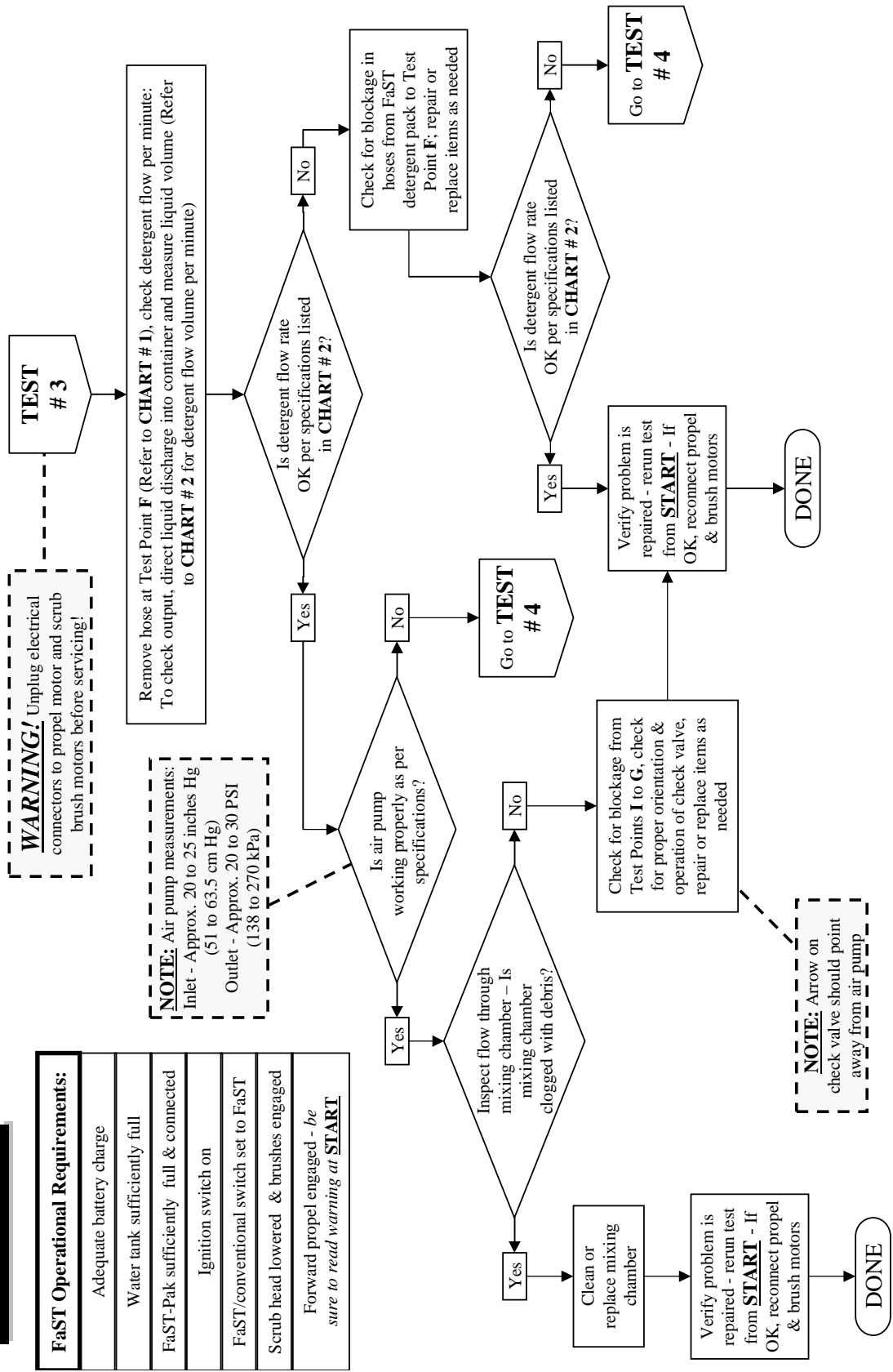
FaST Operational Requirements:
Adequate battery charge
Water tank sufficiently full
FaST-Pak sufficiently full & connected
Ignition switch on
FaST/conventional switch set to FaST
Scrub head lowered & brushes engaged
Forward propel engaged - <i>be sure to read warning at START</i>



FaST Troubleshooting - TEST #3

(Water OK, no foam)

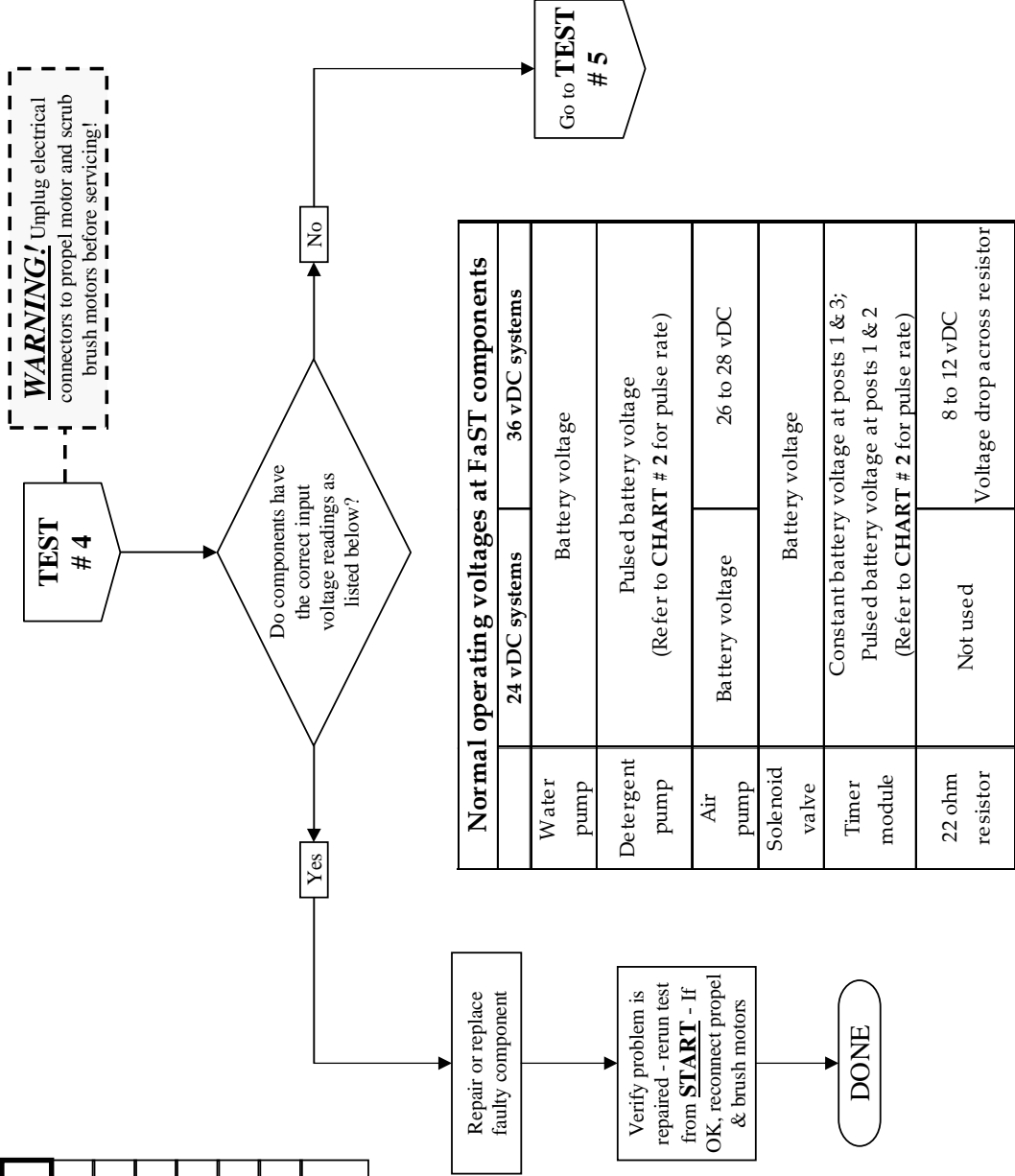
FaST Operational Requirements:	
Adequate battery charge	
Water tank sufficiently full	
FaST-Pak sufficiently full & connected	
Ignition switch on	
FaST/conventional switch set to FaST	
Scrub head lowered & brushes engaged	
Forward propel engaged - <i>be sure to read warning at START</i>	



FaST Troubleshooting - TEST #4

(Individual component testing)

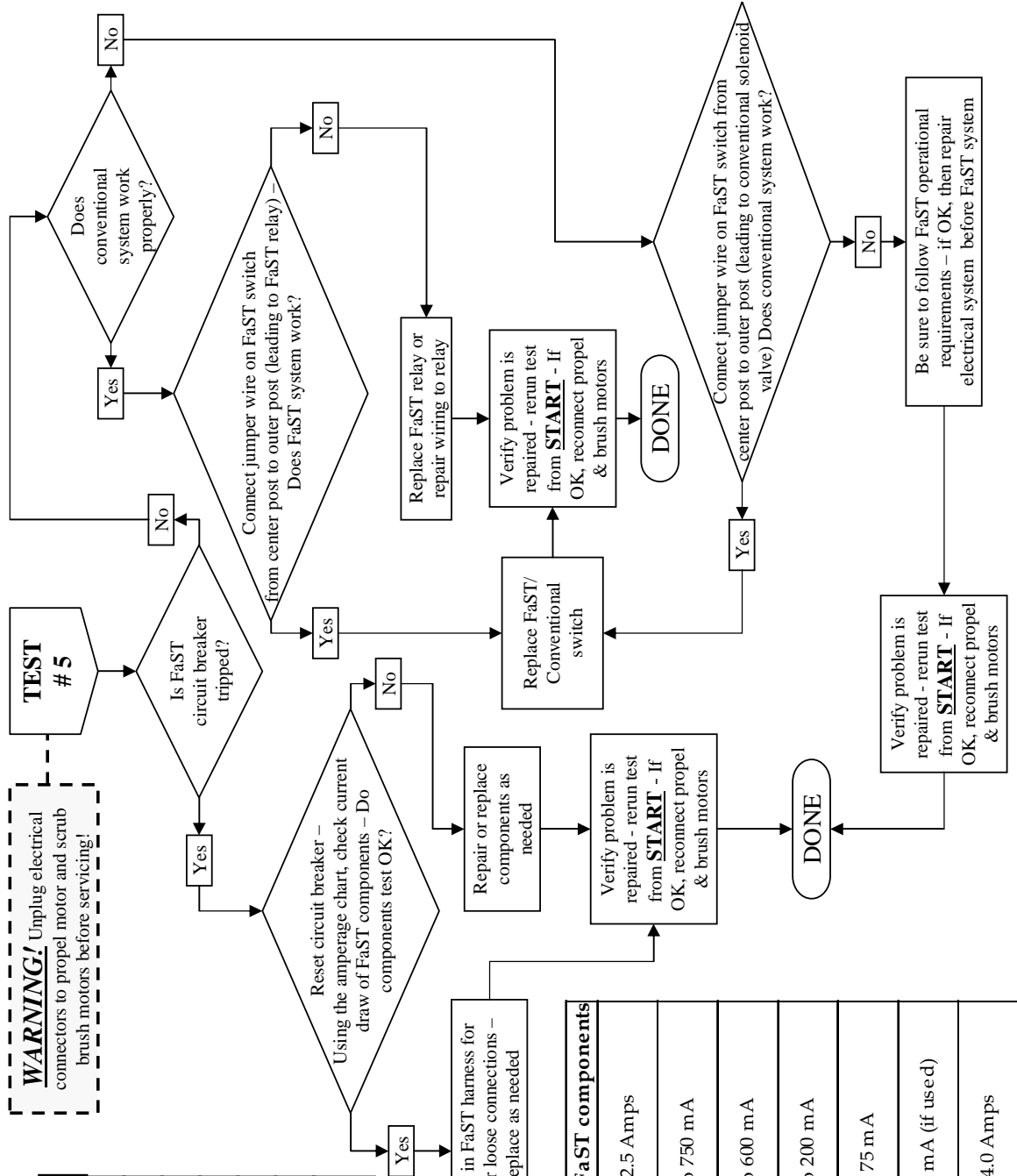
FaST Operational Requirements:
Adequate battery charge
Water tank sufficiently full
FaST-Pak sufficiently full & connected
Ignition switch on
FaST/conventional switch set to FaST
Scrub head lowered & brushes engaged
Forward propel engaged - <i>be sure to read warning at START</i>



FaST Troubleshooting - TEST #5

(Overall electrical testing)

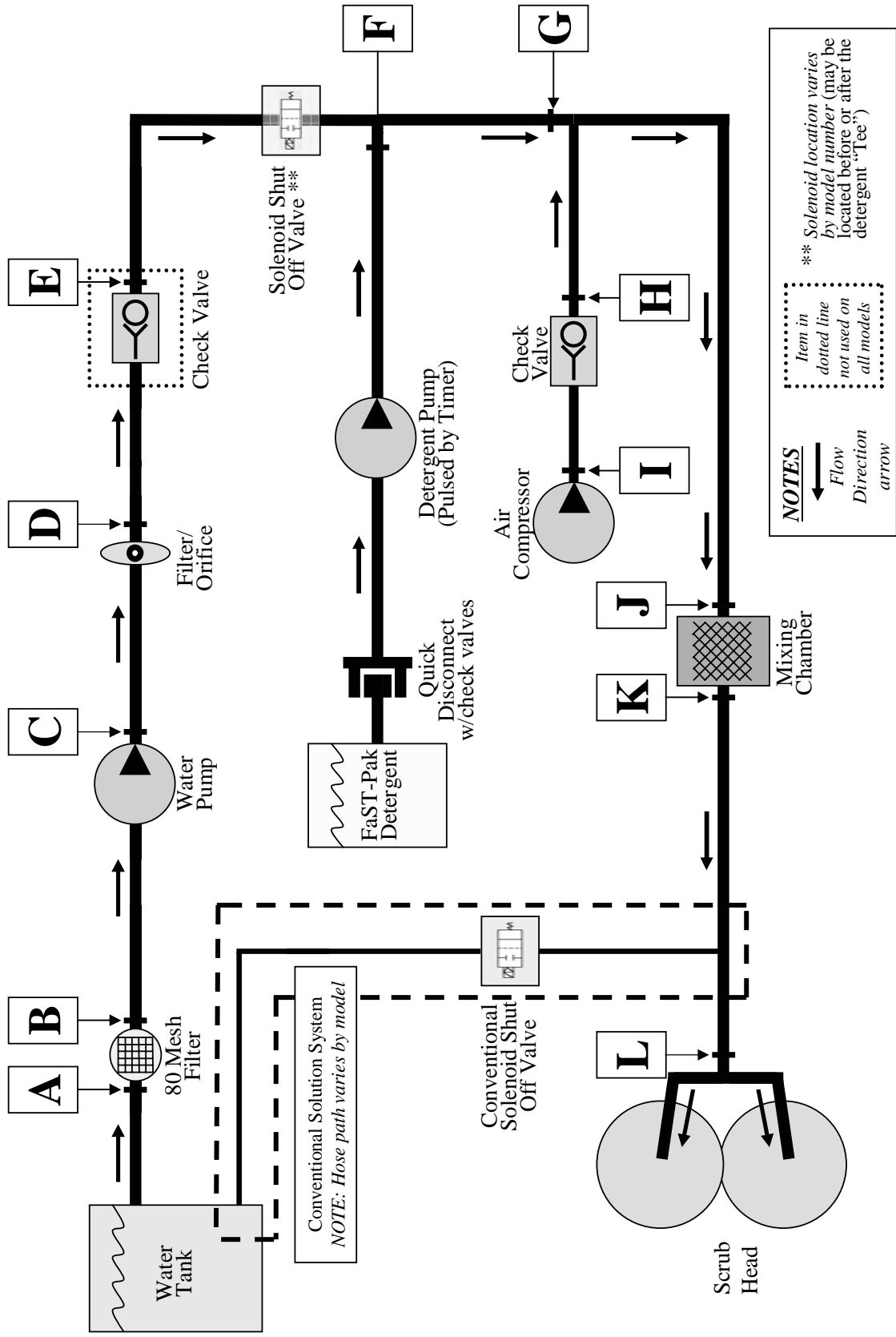
FaST Operational Requirements:	
Adequate battery charge	
Water tank sufficiently full	
FaST-Pak sufficiently full & connected	
Ignition switch on	
FaST/conventional switch set to FaST	
Scrub head lowered & brushes engaged	
Forward propel engaged - <i>be sure to read warning at START</i>	



Normal operating amperages of FaST components	
Water pump	Approx. 1.8 to 2.5 Amps
Detergent pump	Approx. 250 to 750 mA
Air pump	Approx. 400 to 600 mA
Solenoid valve	Approx. 100 to 200 mA
Timer module	Approx. 5 to 75 mA
22 ohm resistor	Approx. 400 to 450 mA (if used)
System Total	Approx. 2.5 to 4.0 Amps

FaST

Test Points - CHART # 1



NOTES
 Flow Direction arrow
 Item in dotted line not used on all models
 ** Solenoid location varies by model number (may be located before or after the detergent "Tee")

FaST Specifications - CHART # 2

FaST water and detergent flow specification chart

Description / Measurement	Specification
Water Pump part #	1005866
Water Pump pressure before orifice (psi)	40-45 (internally relieved)
Water pressure after orifice (psi)	3.0
Water Pump head part #	391433
Water flow before orifice (L/min)	5.3
Water flow before orifice (GPM)	1.4
Water flow before orifice (kg/min)	5.3
Water flow before orifice (lb/min)	11.66
Liquid flow after orifice (L/min)	1.13
Liquid flow after orifice (GPM)	0.3
Liquid flow after orifice (kg/min)	1.13
Liquid flow after orifice (lb/min)	2.5
Orifice & body part #	1014675
Orifice plate part #	1014011
Orifice diameter (inches)	0.045
Detergent pump pulse rate per min	34.7
Detergent flow (ml/min)	1.25

Optional On-board Charger Setup Instructions

Page 1 of 2

DESCRIPTION:

The charger is set at the factory to match the batteries supplied with your machine. These instructions explain how to change the charger settings if the charger is purchased as an aftermarket part or if the charger settings need to be changed for different type or size of batteries. Please follow step-by-step instructions.

SPECIAL TOOLS / CONSIDERATIONS: NONE

(Estimated time to complete: 5 minutes)

PREPARATION:

This charger has nine settings for various types of batteries. **Always make sure the charger is at the proper setting BEFORE charging batteries.**

The green indicator light flashes (when the charger is first plugged into an AC outlet) to show the charger setting. **DO NOT** plug the charger into a battery at this point. Count the number of flashes separated by a pause to determine the charger setting (i.e., three flashes, pause, three flashes, pause, etc. means the charger is in the third setting). Refer to Fig. 1.



Fig. 1

Tennant uses only two of the charger settings;

1. Setting 3 (3 flashes) is for 36 VDC systems with battery ratings between 200–250Ah.
2. Setting 7 (7 flashes) is for 36 VDC systems with battery ratings more than 250Ah.

NOTE: If charging batteries not supplied by Tennant, use the charger manufacturer's instructions to determine which setting to use.

3. Read the instructions provided by the charger manufacturer and the instructions and safety messages (Refer to Fig. 2) mounted on the charger for installation/operation instructions and safety information.



Fig. 2

Optional On-board Charger Setup Instructions

Page 2 of 2

TO CHANGE CHARGER SETTING:

1. Plug the charger into the an AC outlet. The charger will run through a self test for about 2 seconds. Then the green indicator light will flash for 11 seconds to show the charger's current setting. (See previous page). The charger setting must be changed during this 11 second time span.

NOTE: If you waited more than 11 seconds to change the setting, the red indicator light will turn on. When this happens, unplug the charger from the AC outlet, wait a few seconds, then replug it into the outlet to start the cycle over.

2. During the 11 second time span, connect the charger to the battery connector for 3 seconds, and then unplug the charger from the battery (Refer to Fig. 3). The charger will advance to the next setting.

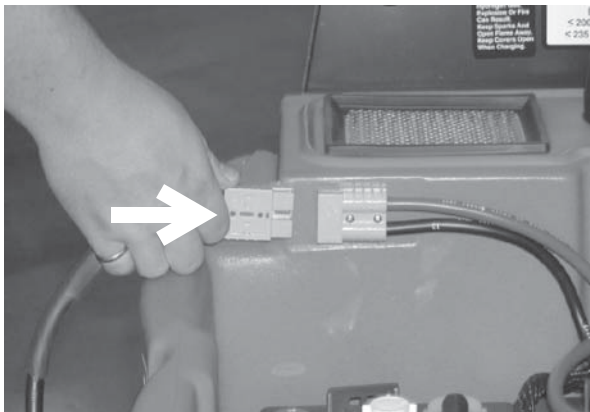


Fig. 3

3. Repeat previous step until the desired setting is displayed.
4. After the desired setting is reached, plug the charger connector into the battery connector until the output relay clicks (this happens 10 seconds after it is plugged in). The indicator light will flash red and the setting is saved in the charger memory.

NOTE: To change to a setting for another size battery, unplug the charger from the AC outlet, wait a few seconds, then replug the charger back into the AC outlet. Follow Steps 2 through 4 to change the setting.

5. The charger can now be used to charge batteries. (See Machine Operation manuals for charging instructions).

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