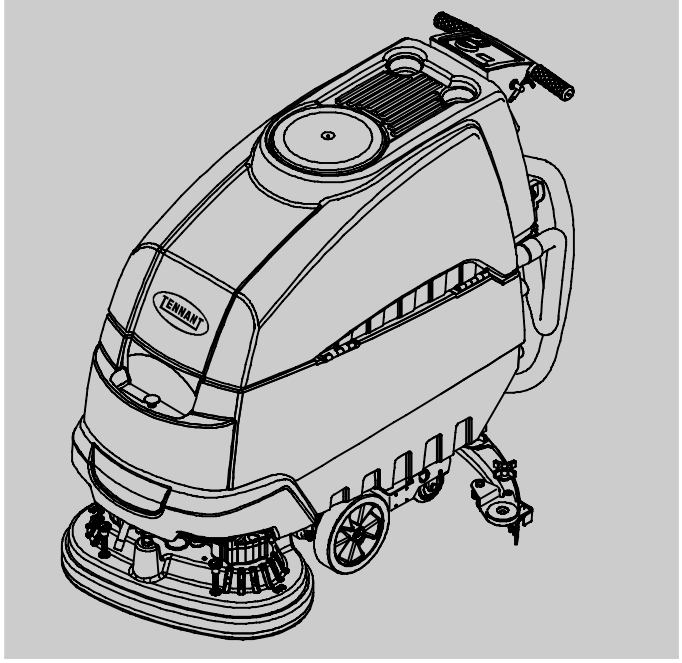
# T5e

**Automatic Scrubber**

## Service Information Manual

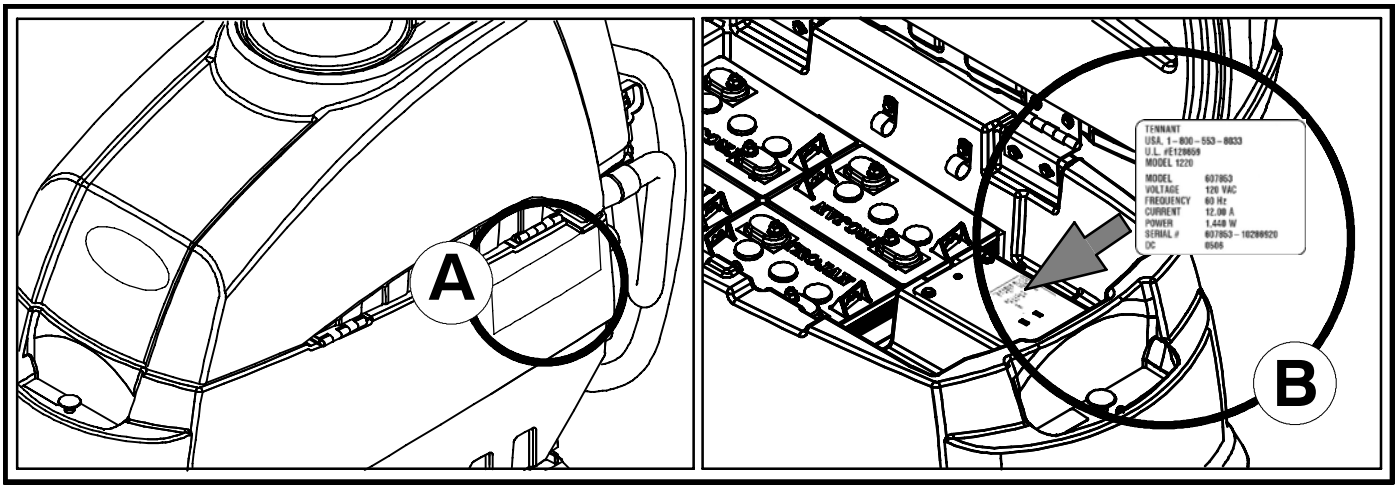


FaST® Foam Scrubbing Technology

## International

**9002342**
**Rev. 00 (10-2006)**

www.tennantco.com




**FOR REPLACEMENT PARTS**

Identify machine model and serial number.

1. **(A)** Identify the machine model.
2. **(B)** Identify the machine serial number from the data plate.

Refer to the TENNANT Parts Manual.

*NOTE: Only use TENNANT Company supplied or equivalent parts. Parts and supplies may be ordered online, by phone, by fax or by mail.*

**Tennant Company**
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Minneapolis, MN 55440
Phone: (800) 553-8033 or (763) 513-2850
www.tennantco.com

# T5e Service Information Manual

## Table of Contents

## BEFORE CONDUCTING TESTS:

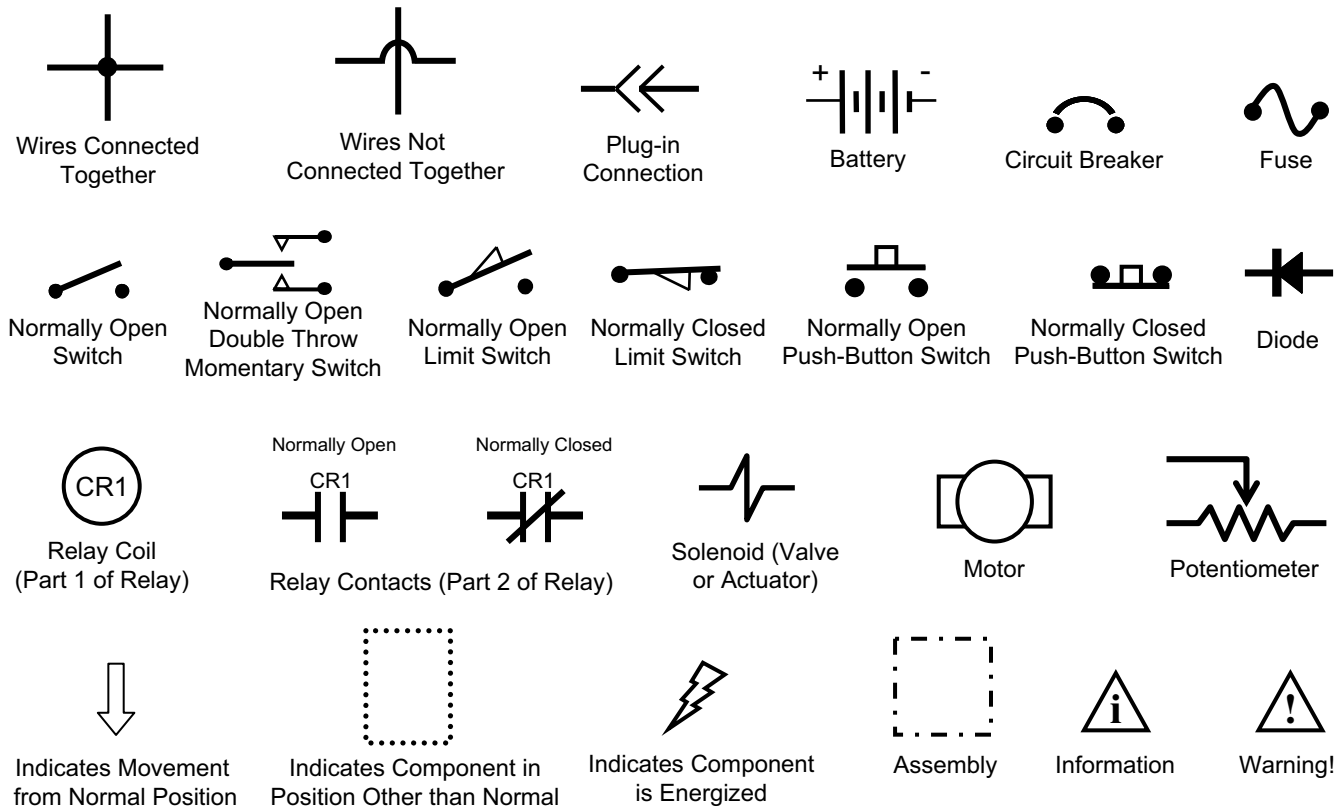
- Read and Follow ALL Safety Warnings and Precautions in Operator's Manual
- Always use an ESD (Electrostatic Discharge) strap when working near the Control Board
- Be cautious when working near Control Board – *Battery voltage is always present, even with Key OFF*
- Always Disconnect Batteries when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

## DURING TESTS:

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

# Commonly Used Electrical Symbols & Terms

NOTE: The term “NORMALLY” refers to the components’ “at rest” or “de-energized” position



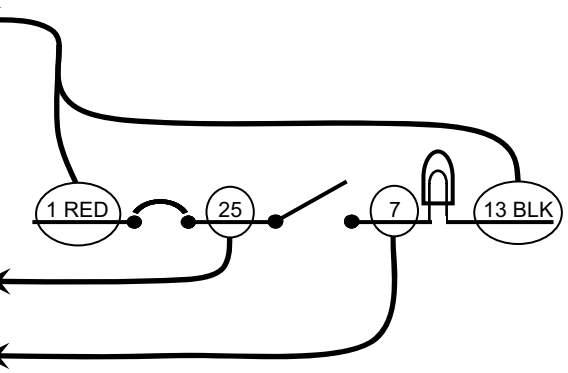

## Terms & Abbreviations

AC – Alternating Current
BDI – Battery Discharge Indicator
CB – Circuit Breaker
CR – Relay (Contact Type)
LED – Light Emitting Diode
M – Motor
PWM (Pulse Width Modulation) – A method of using controlled on/off times to regulate voltage and current to an electrical device
Standoff – A common connecting point for multiple wires

## Example of Wiring Numbers & Colors:

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 |



# T5e Component Locator

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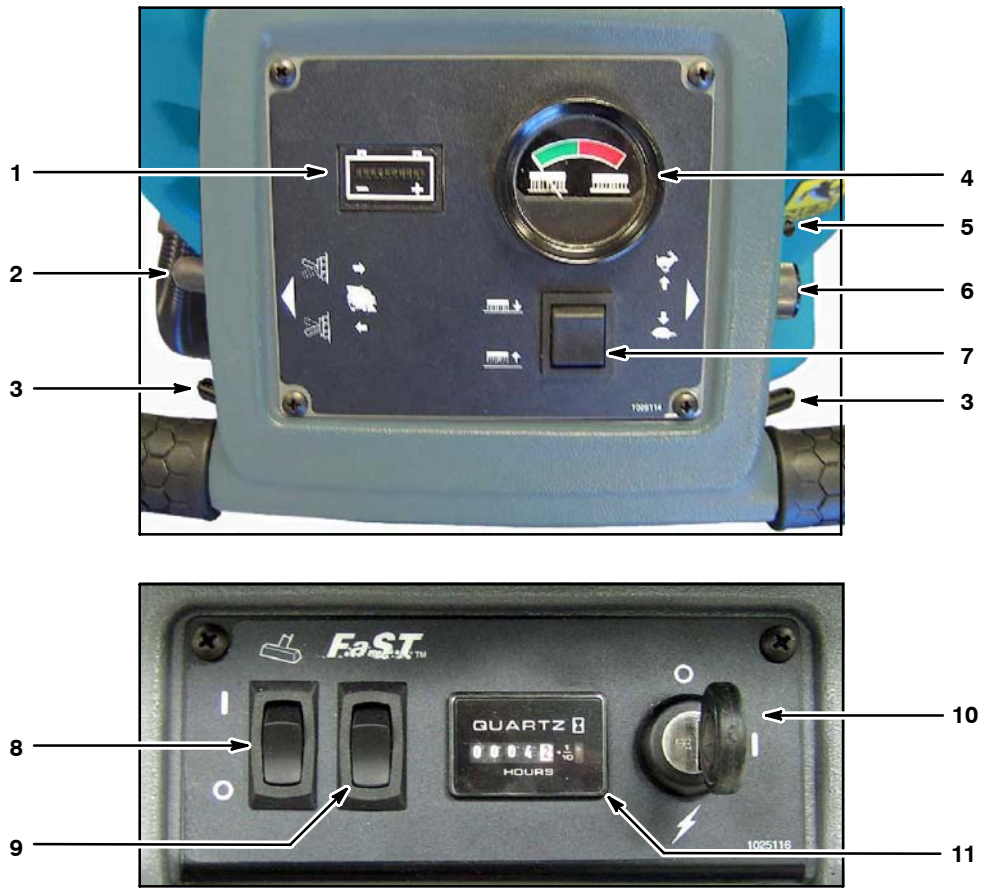


1. Battery Meter
2. Reverse Trigger
3. Start Triggers
4. Brush Pressure Meter
5. Control Console Height Adjustment Lever
6. Speed Control Knob
7. Brush Pressure Switch
8. Off-Aisle Wand on/off Switch (option)
9. FaST System on/off Switch (option)
10. Main Power on/off Key Switch
11. Hour Meter

# T5e Component Locator

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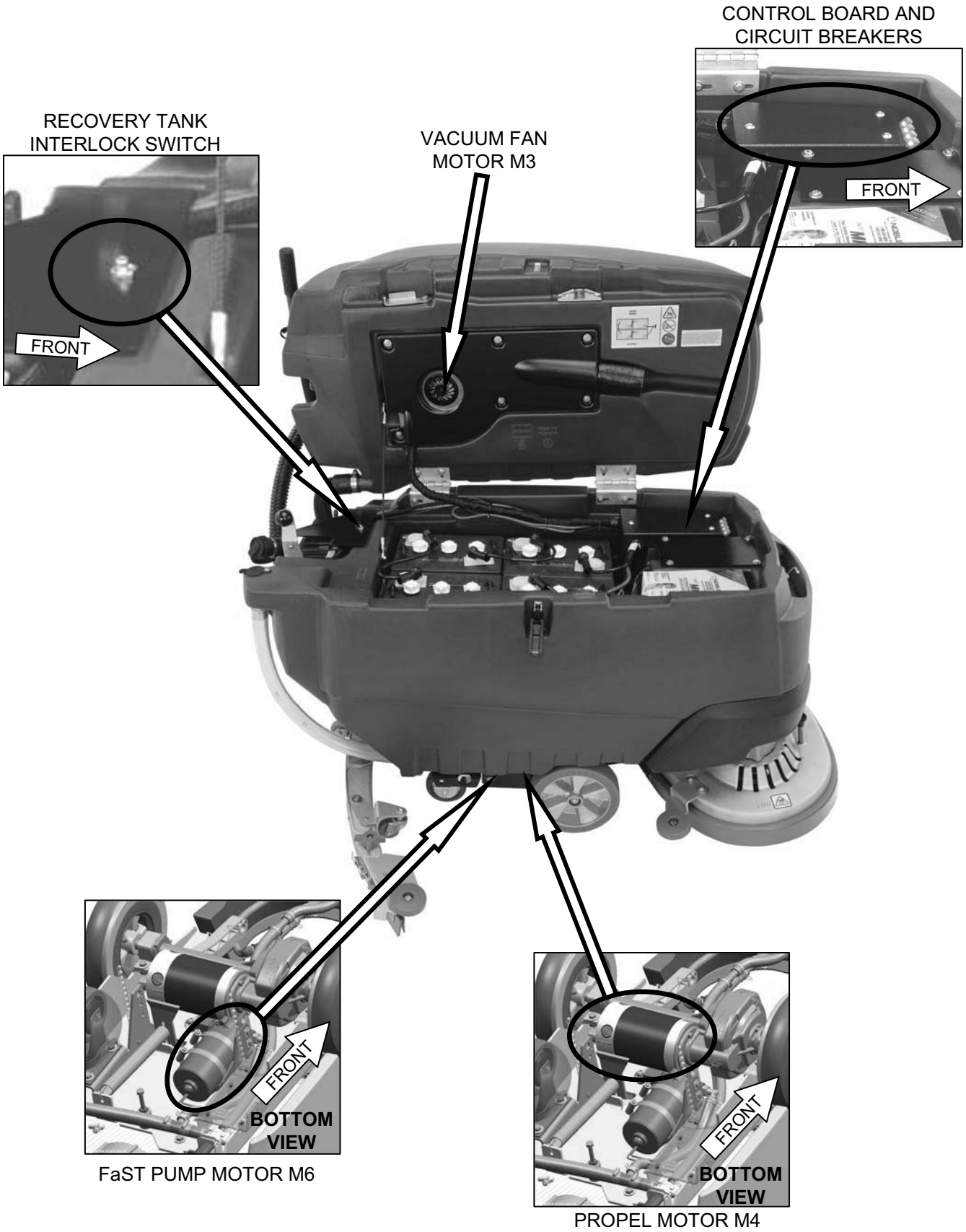

# T5e Component Locator

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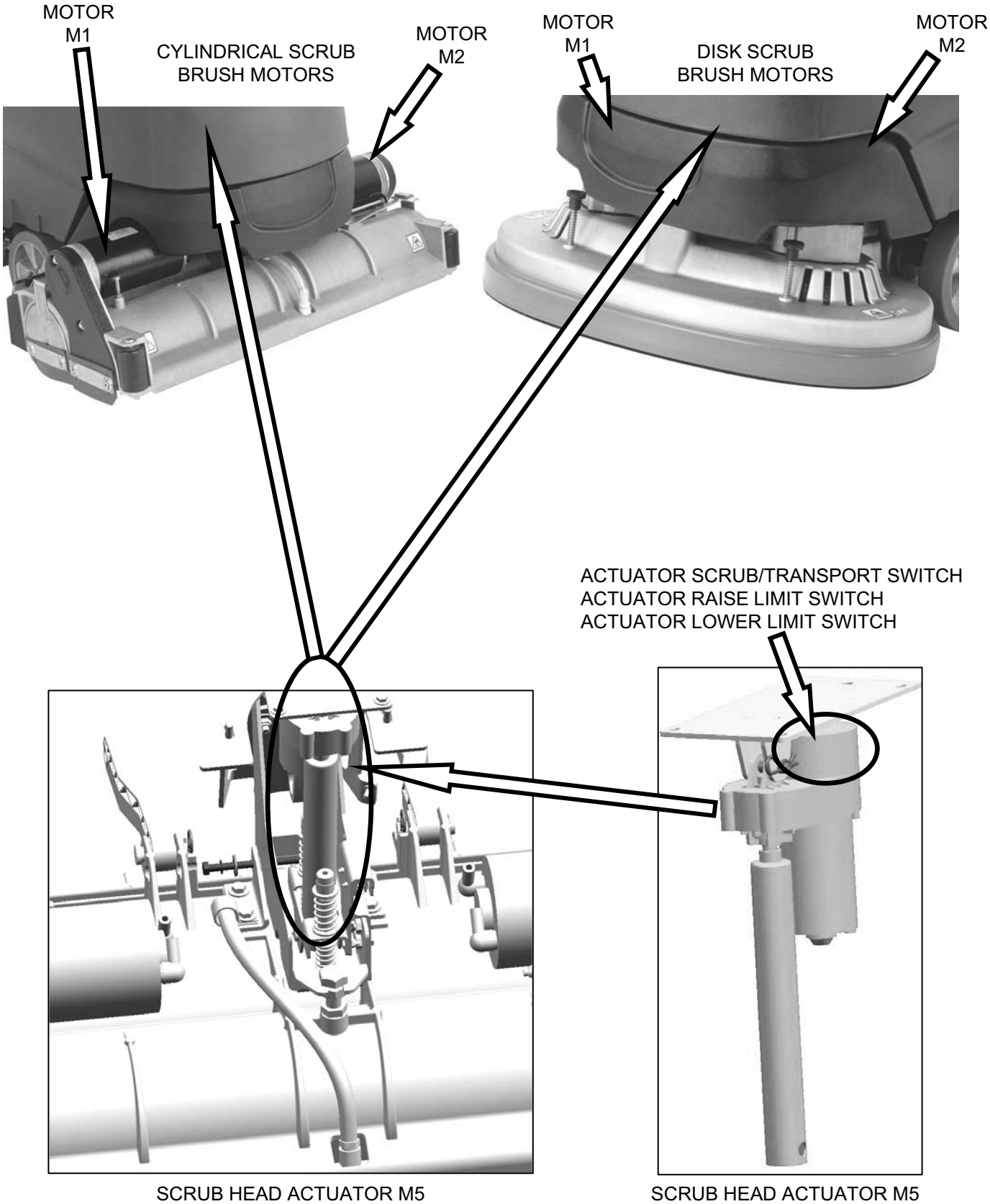


SCRUB HEAD ACTUATOR M5

SCRUB HEAD ACTUATOR M5

# T5e Component Locator

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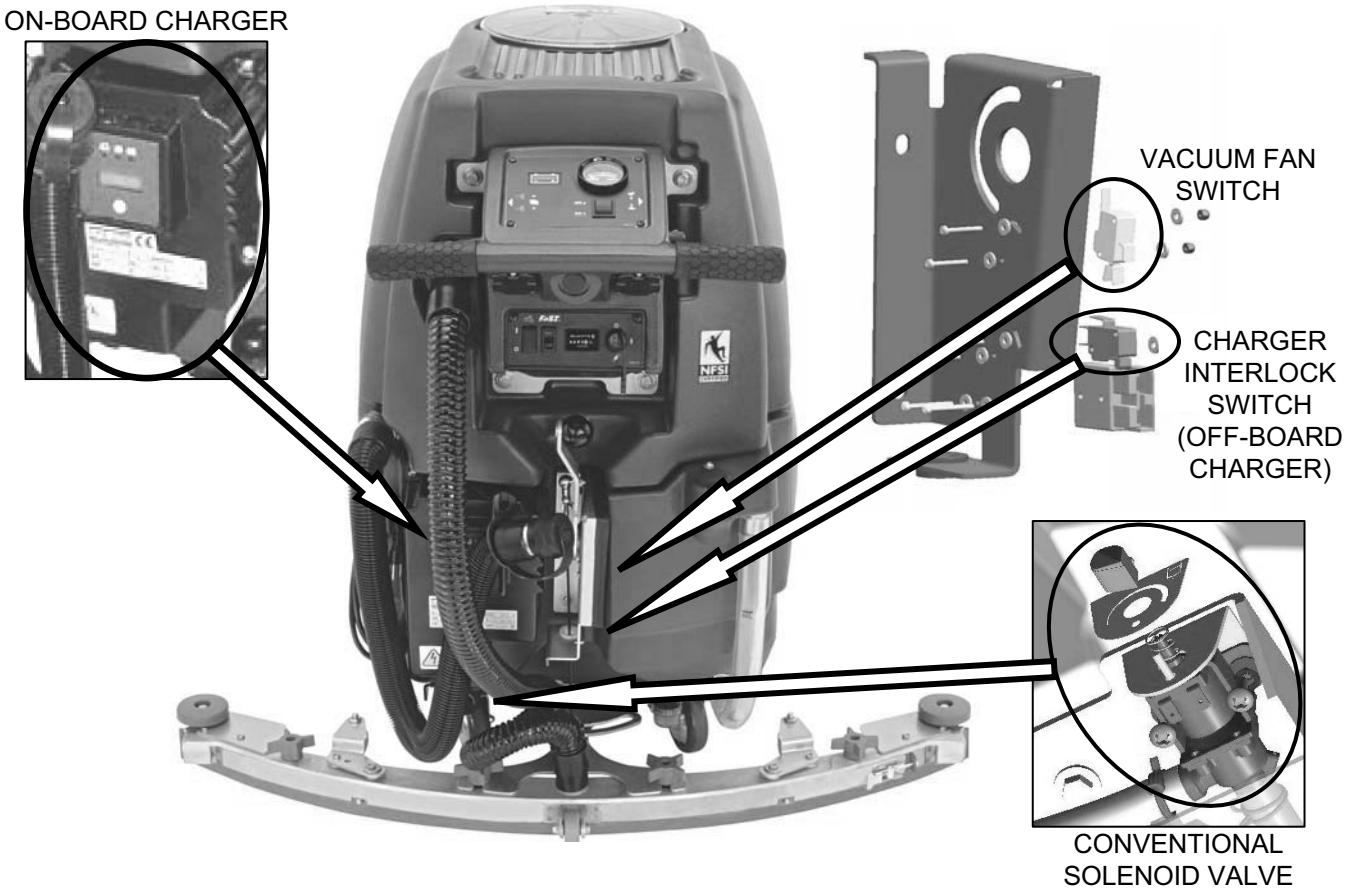
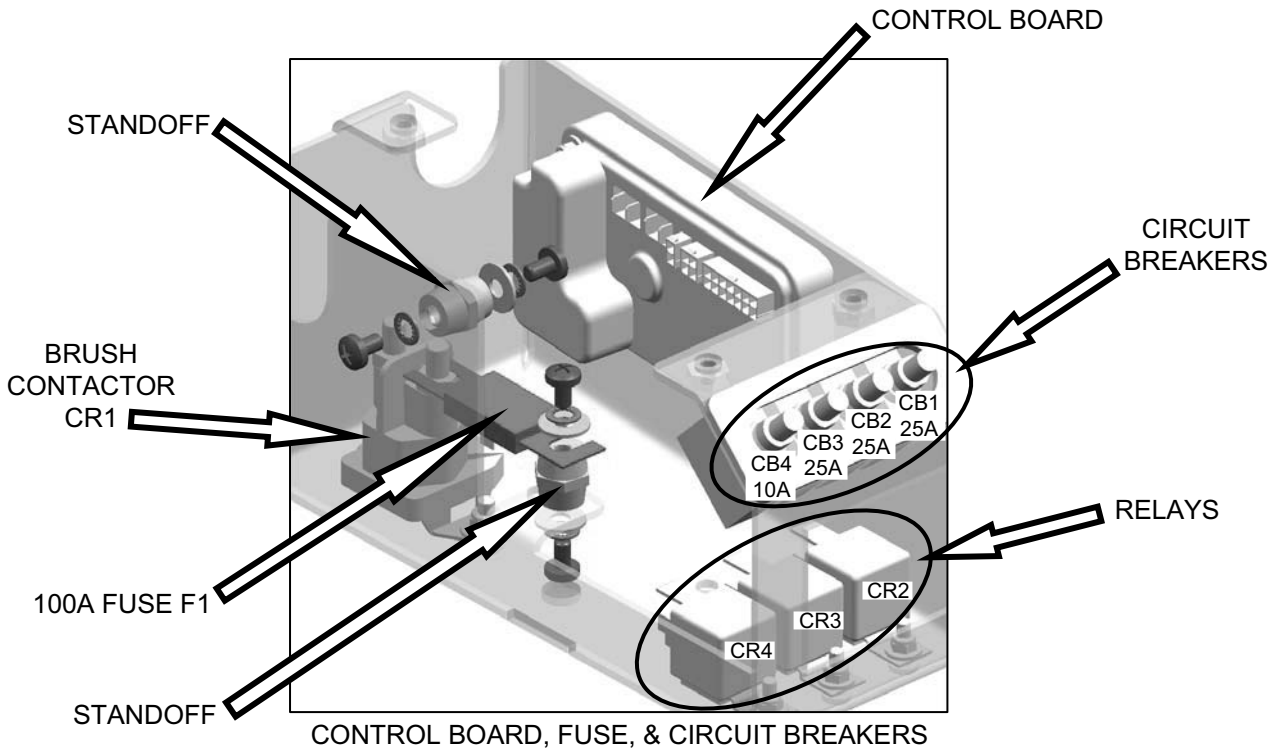



CONTROL BOARD, FUSE, & CIRCUIT BREAKERS

# T5e Machine Specifications



| MODEL | Disk, 600mm | Disk, 700mm | Disk, 800mm | Cylindrical, 650mm | Cylindrical, 800mm |
|---|---|---|---|---|---|
| **LENGTH** | 1,357 mm | 1,408 mm | 1,471 mm | 1,399 mm | 1,399 mm |
| **WIDTH** | 645 mm | 737 mm | 838 mm | 711 mm | 864 mm |
| **HEIGHT** | 1,120 mm | | | | |
| **MINIMUM AISLE TURN** | 1,346 mm | 1,499 mm | 1,626 mm | 1,575 mm | 1,638 mm |
| **WEIGHT** | 133 kg | 145 kg | 151 kg | 151 kg | 155 kg |
| **WEIGHT WITH BATTERIES** | 258 kg | 269 kg | 275 kg | 275 kg | 279 kg |
| **RECOVERY TANK CAPACITY** | 105 L | | | | |
| **SOLUTION TANK CAPACITY** | 85 L | | | | |
| | | | | | |
| **DRIVE SYSTEM** | Transaxle, 24 V, .19 kW | | | | |
| **TRAVEL SPEED, MAXIMUM** | Cleaning: 67 m/min Transporting: 72 m/min | | | | |
| | | | | | |
| **PRODUCTIVITY RATE** Theoretical | 2,450 $m^2$/hr | 2,860 $m^2$/hr | 3,270 $m^2$/hr | 2,660 $m^2$/hr | 3,270 $m^2$/hr |
| **PRODUCTIVITY RATE** Estimated Actual | 1,660 $m^2$/hr | 1,930 $m^2$/hr | 2,230 $m^2$/hr | 1,785 $m^2$/hr | 2,230 $m^2$/hr |
| **CLEANING PATH WIDTH** | 600 mm | 700 mm | 800 mm | 650 mm | 800 mm |
| **BRUSH DIAMETER** | 302 mm | 353 mm | 404 mm | 151 mm | 151 mm |
| **BRUSH PRESSURE** | Up to 54 kg | | | | |
| **SOLUTION FLOW RATE** | 1.89 L /min | 1.89 L/min | | 2.27 L/min | 2.27 L/min |
| **SQUEEGEE WIDTH** | 908 mm standard | 1,051 mm standard | 1,185 mm standard | 1,051 mm standard | 1,185 mm standard |
| | 800 mm narrow aisle | 908 mm narrow aisle | 1,051 mm narrow aisle | 908 mm narrow aisle | 1,051 mm narrow aisle |
| | | | | | |
| **BRUSH MOTOR** | Qty 2, .55 kW, 220rpm, 24 V, 29 A | | | Qty 2, .47 kW, 1500 rpm, 24 V, 23 A | |
| **VACUUM MOTOR** | 640 W, 3-stage 5.7, 24 V, 26 A | | | | |
| **WATER LIFT/AIR FLOW** | 55 mm $H^2O$/ 32.4 $L^3$/m | | | | |
| | | | | | |
| **BATTERIES** | Qty 4, 6 V | | | | |
| **BATTERY CAPACITY** | WET (lead Acid) = 235Ah @ 20 h rate Sealed (Gel)= 200Ah @ 20 h rate | | | | |
| **RUN TIME PER CHARGE*** | WET = Up to 5.0 hours Gel = Up to 4.0 hours | | | | |
| **ON-BOARD CHARGER** | 120VAC, 10A, 50/60Hz, 24VDC, 20A output / 230VAC, 5A, 50/60Hz, 24VDC, 20A output | | | | |
| | | | | | |
| **TOTAL POWER CONSUMPTION** | 50 A nominal | | | | |
| **VOLTAGE DC** | 24 VDC | | | | |
| | | | | | |
| **PROTECTION GRADE** | IPX3 | | | | |
| **DECIBEL RATING AT OPERATOR'S EAR, INDOORS.**** | 67dBA | | | 68dBA | |
| **VIBRATION AT CONTROLS** | <.1188 $m/s^2$ | | | <.103 $m/s^2$ | |
| **ACCELERATION RATE ON OPERATOR - MAX.** | .179 m /$s^2$ | | | | |
| **GRADE LEVEL, MAX.** | Scrubbing 5% (3°), Transporting 8% (5°) | | | | |

* Run times are based on Continuous Scrubbing Run Times.

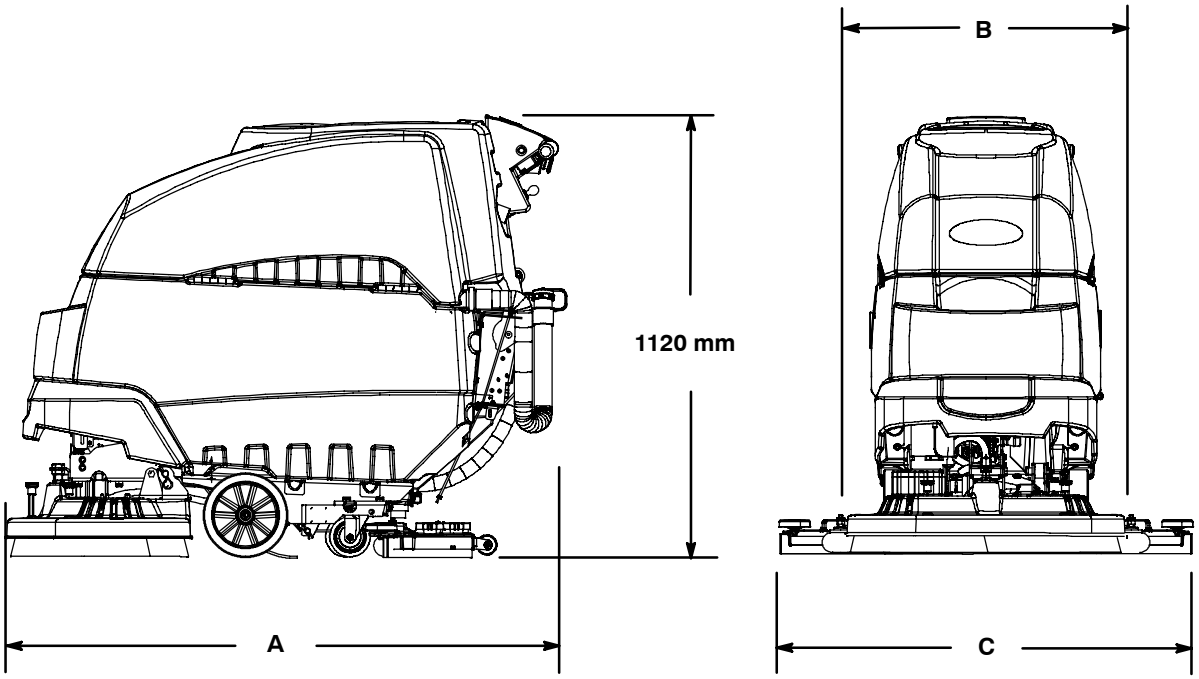
** Sound levels (ISO 11201) as recommended by the American Association of Cleaning Equipment Manufacturers (AACEM) and OSHA.

# T5e Machine Specifications



| FaST SYSTEM | Disk, 600mm | Disk, 700mm | Disk, 800mm | Cylindrical, 650mm | Cylindrical, 800mm |
|---|---|---|---|---|---|
| **PRODUCTIVITY RATE** Estimated Actual | 1865 $m^2$/hr | 2115 $m^2$/hr | 2440 $m^2$/hr | 1950 $m^2$/hr | 2440 $m^2$/hr |
| **SOLUTION PUMP** | 24 Volt DC, 3.5 A, 5.6 L/min open flow, 4.13 Bar bypass setting | | | | |
| **SOLUTION FLOW RATE** | 0.57 L/min. | 0.83 L/min. | | 0.57 L/min. | 0.83 L/min. |
| **CONCENTRATE FLOW RATE** | 0.57 CC/min. | 0.83 CC/min. | | 0.57 CC/min. | 0.83 CC/min. |
| **CONCENTRATE TO WATER DILUTION RATIO** | 1:1000 | | | | |

## MACHINE DIMENSIONS




| Models: | 600 mm Disk | 700 mm Disk | 800 mm Disk | 650 mm Cylindrical | 800 mm Cylindrical |
|---|---|---|---|---|---|
| **A =** | 1,357 mm | 1,408 mm | 1,471 mm | 1,399 mm | 1,399 mm |
| **B =** | 645 mm | 737 mm | 838 mm | 711 mm | 864 mm |
| **C =** | 908 mm | 1,051 mm | 1,185 mm | 1,051 mm | 1,185 mm |

## SAFETY LABELS

The safety labels appear on the machine in the locations indicated. Replace labels if they are missing or become damaged or illegible.

**WARNING LABEL -**
Located on recovery tank cover.



**BATTERY CHARGE LABEL -**
Located on bottom side of recovery tank.

**⚠WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.**

**SPINNING BRUSH LABEL -**
Located on scrub head

**⚠WARNING: Spinning Brush. Keep Hands Away. Turn Off Power Before Working On Machine.**

## BATTERY INSTALLATION

**⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Hood Open When Charging.**

**FOR SAFETY: When installing batteries, wear protective gloves and eye protection. Avoid contact with battery acid.**

**Battery Specifications:**
Four 6 volt, 235A/20h deep cycle batteries. Maximum battery dimensions:
7.5 in / 190 mm W x 10.8 in / 275 mm L x 11.2 in / 284 mm H.

1. Park the machine on a level surface, remove the key and set the parking brake, if equipped.
2. Carefully install the batteries into the battery compartment tray (Figure 1). Arrange the battery posts as shown (Figure 2).


**FIG. 1**

3. Connect the battery cables to the battery posts as shown (Figure 2), RED TO POSITIVE (+) and BLACK TO NEGATIVE (–).

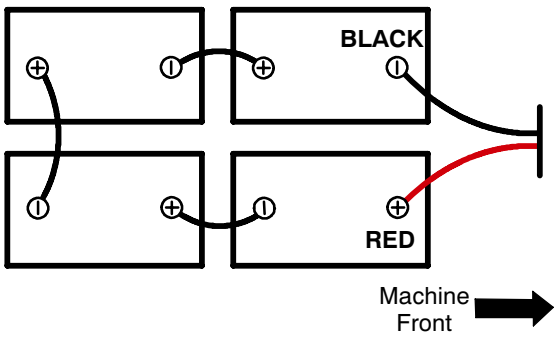



**FIG. 2**

## SQUEEGEE REMOVAL & INSTALLATION

### REMOVING SQUEEGEE ASSEMBLY

1. Park the machine on a level surface, remove the key and set the parking brake if equipped.
2. Lift the squeegee lift lever to the upward position (Figure 3).

**FIG. 3**

3. Remove the vacuum hose from the squeegee assembly. Note loop and clip on hose (Figure 4).

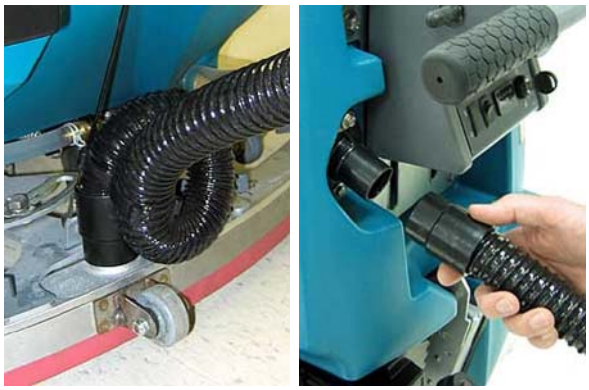


**FIG. 4**

4. Loosen the knobs and slide squeegee assembly away from pivot bracket (Figure 5).

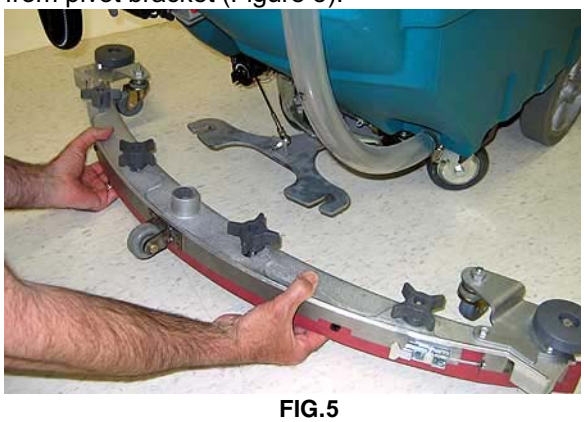


**FIG.5**

5. Installation is in reverse order of removal.

6. Check the squeegee blades for proper deflection. The blades should deflect as shown (Figure 6).

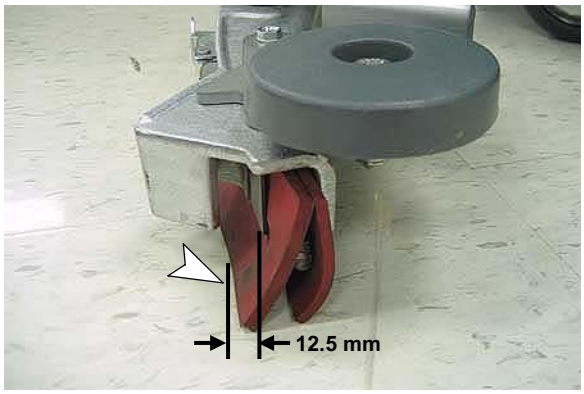



**FIG. 6**

7. To adjust the blade deflection, place the squeegee assembly on a level surface and adjust the casters as shown (Figure 7).

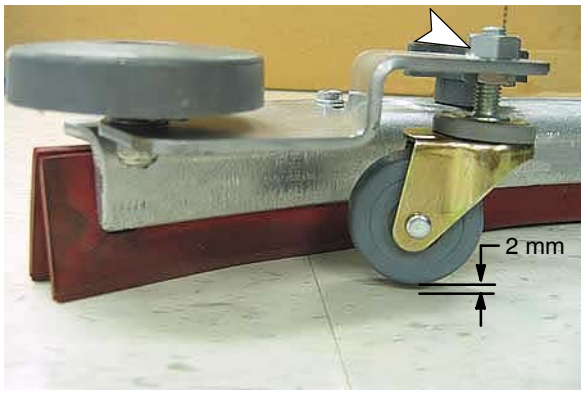



**FIG. 7**

## CIRCUIT BREAKERS AND FUSES

The machine is equipped with four resettable circuit breakers and four fuses to protect the machine from damage. If a breaker should trip, determine the cause, allow the motor to cool then manually reset the circuit breaker button. The circuit breaker panel is located near the battery compartment (Figure 29). The fuses are located inside the circuit breaker box. When replacing a fuse never substitute a higher Amp rated fuse than specified.

CIRCUIT BREAKERS:

10 A – Main (A)
25 A – Vacuum motor (B)
25 A – Left brush motor (C)
25 A – Right brush motor (D)

FUSES:

100 A – Main
30 A – Propel motor
7.5 A – FaST system
7.5 A – Off-aisle wand pump (located in control console)

## CHARGING BATTERIES

**ATTENTION: To prolong the life of the batteries only recharge the batteries if the machine was used for a total of 30 minutes or more. Do not leave batteries discharged for lengthy periods.**

**⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.**

**FOR SAFETY: When servicing batteries, wear protective gloves and eye protection when handling batteries and battery cables. Avoid contact with battery acid.**

### BATTERY CHARGER SPECIFICATIONS

- CHARGER TYPE:
  - FOR SEALED (Gel) BATTERIES
  - FOR WET (Lead acid) BATTERIES
- OUTPUT VOLTAGE - 24 VOLTS
- OUTPUT CURRENT - 20 AMPS
- AUTOMATIC SHUTOFF CIRCUIT
- FOR DEEP CYCLE BATTERY CHARGING

### ON-BOARD BATTERY CHARGER SETTINGS

If your machine is equipped with the on-board charger, the charger settings must be set for your battery type before charging. Failure to properly set will result in battery damage.

To determine your battery type, see battery label. Contact your battery supplier if not specified.

To verify the setting of the charger, connect the charger cord into an electrical receptacle. The charger will display a sequence of codes. One of the codes will either read "GEL" or "Acd" (Figure 41).

GEL = Set for sealed/maintenance free batteries
Acd = Set for wet/lead acid batteries


**FIG. 41**

To change the setting, unplug the charger, peel up the corner of the display label and set the switches accordingly (Fig. 42). The charger cord must be unplugged when resetting.


SEALED “GEL” BATTERY WET “Acd” BATTERY

**FIG. 42**

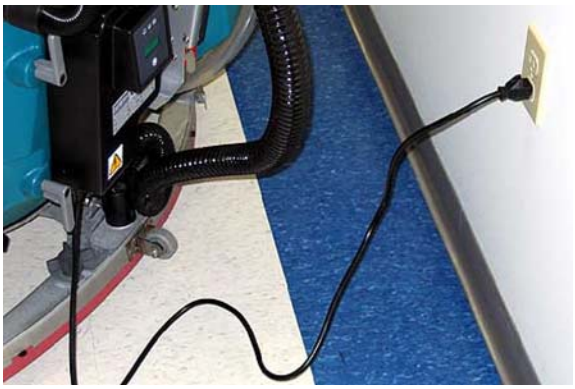
## USING THE ON-BOARD BATTERY CHARGER

**IMPORTANT: Before charging, make sure that the charger setting is properly set for your battery type (See ON-BOARD CHARGER SETTINGS).**

1. Transport the machine to a well-ventilated area.
2. Park the machine on a flat, dry surface. Turn the key off and set the parking brake, if equipped.
3. If charging wet (lead acid) batteries check the fluid level before charging (See BATTERY MAINTENANCE).
4. Prop up the recovery tank for ventilation (Figure 43).


5. Connect the charger’s AC power supply cord into a properly grounded receptacle (Figure 44).

***NOTE:*** *The machine will not operate when charging.*



6. The charger will display a sequence of codes once the cord is connected (Figure 45).

   Three-digits + the following code:

   A = Charging current

   U = Battery voltage

   h = Charging time

   C = Charging ampere-hours [Ah]

   E = Energy used [Kwh]

   “GEL” or “Acd” = Battery type the charger is currently set for. Before charging make sure your battery type matches the display: GEL=Sealed, Acd=Wet (lead acid). To change setting, see ON-BOARD CHARGER SETTINGS.

   Press the arrow button to review the codes.

7. Once the charging cycle begins, the indicator lights will progress from red, yellow to green. When the green indicator light comes on, the charging cycle is done. Unplug the charger cord.

If the charger detects a problem, the charger will display an error code (See ON-BOARD BATTERY CHARGER ERROR CODES).

## ON-BOARD BATTERY CHARGER ERROR CODES

| DISPLAY CODE | FAULT | SOLUTION |
|---|---|---|
| bat | Loose or damaged battery cable | Check battery cable connections. |
| | Battery exceeded maximum voltage level. | No action necessary. |
| E01 | Exceeded maximum battery voltage allowed. | No action necessary. |
| E02 | Safety thermostat exceeded maximum internal temperature. | Check if the charger vents are obstructed. |
| E03 | Exceeded maximum time for charging phase leaving the batteries undercharged due to a sulfated or faulty battery. | Repeat the charging cycle and if the error code E03 reappears check battery or replace it. |
| SCt | Safety timer exceeded maximum charging time. Interrupts charging cycle. | Replace battery. |
| Srt | Possible internal short circuit. | Contact Tennant Service 1-800-553-8033 |

## USING AN OFF-BOARD BATTERY CHARGER

1. Transport the machine to a well-ventilated area.
2. Park the machine on a flat, dry surface. Turn the key off and set the parking brake, if equipped.
3. If charging wet (lead acid) batteries, check the fluid level before charging (See BATTERY MAINTENANCE).
4. Prop up the recovery tank for ventilation (Figure 46).


**FIG. 46**

5. Connect the charger's AC power supply cord into a properly grounded receptacle.
6. Connect the charger's DC cord into the machine's battery receptacle (Figure 47).


**FIG. 47**

7. The supplied charger will automatically begin charging and shut off when fully charged.

***NOTE:*** *The machine will not operate when charging.*

**ATTENTION: Do not disconnect the charger's DC cord from the machine's receptacle when the charger is operating. Arcing may result. If the charger must be interrupted during charging, disconnect the AC power supply cord first.**

## ADJUSTING SCRUB HEAD BRUSHES

To ensure optimum scrubbing performance periodically check the scrub head for proper adjustment.

**FOR SAFETY: Before adjusting scrub head, stop machine on level surface, remove key and set parking brake if equipped.**

### DISK MODEL

Tools required: Measuring device, 1-1/16 in / 27 mm wrench and 15/16 in / 24mm wrench

1. With brushes installed, lower the scrub head and apply medium brush pressure.
2. Turn machine off and remove key.
3. From the center front and back of scrub head, measure the distance from the top edge of scrub head to the floor (Figure 48).

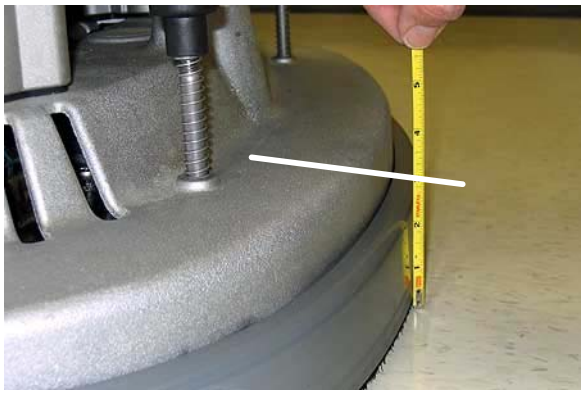


**FIG. 48**

4. If scrub head is not level, loosen the lock nut and turn the scrub head leveling screw to level. Tighten down the lock nut once head is level (Figure 49).

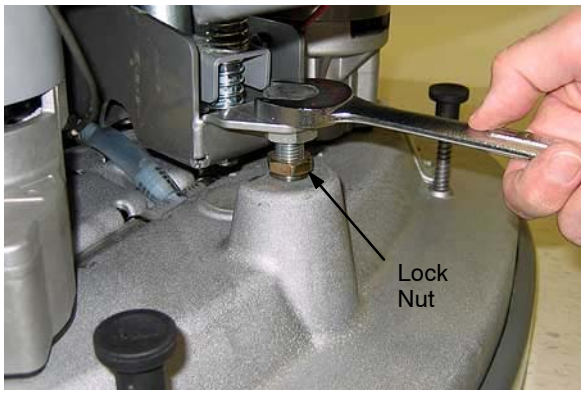



**FIG. 49**

### CYLINDRICAL BRUSH MODEL

After installing a new set of cylindrical brushes check the brush pattern to ensure proper brush adjustment. Brushes that are not properly adjusted will result in premature wear and poor scrubbing performance (Figure 50).

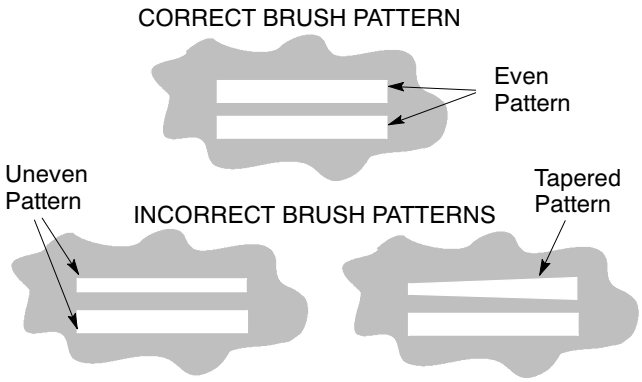



**FIG. 50**

**To Inspect the Brush Pattern:**

1. Position the machine on a dry dusty floor or apply a powdered substance, such as chalk.
2. Disconnect the drive motor wire connector to keep machine from moving forward (Figure 51).

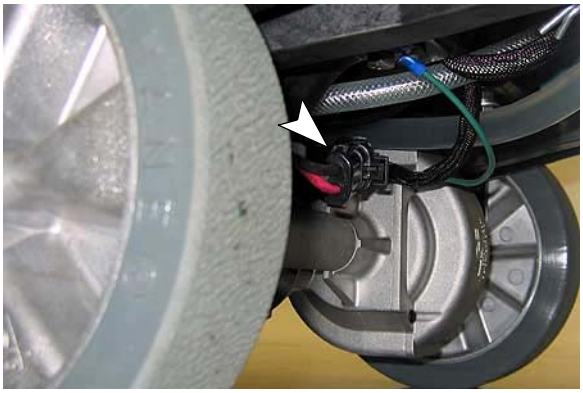


**FIG. 51**

3. Lower the scrub head to the floor and apply maximum brush pressure.
4. Shut off the solution flow.
5. Pull the triggers to create a brush pattern on the floor.
6. Raise the scrub head and pull the machine away.
7. Observe the brush pattern on floor. If the brush pattern is uneven or tapered, adjustment is required.
8. Reconnect drive motor wire.

**To Adjust an Uneven Brush Pattern:**

Tools required: Measuring device, 1-1/16 in / 27 mm wrench and 15/16 in / 24mm wrench

1. Measure the distance from the front edge of the scrub head to the floor and from the back edge of the scrub head to the floor (Figure 52). The measurements should be the same.

**FIG. 52**

2. To level the scrub head, loosen the lock nut and turn the leveling screw clockwise to lower the rear of the scrub head or counter-clockwise to lower the front (Figure 53).

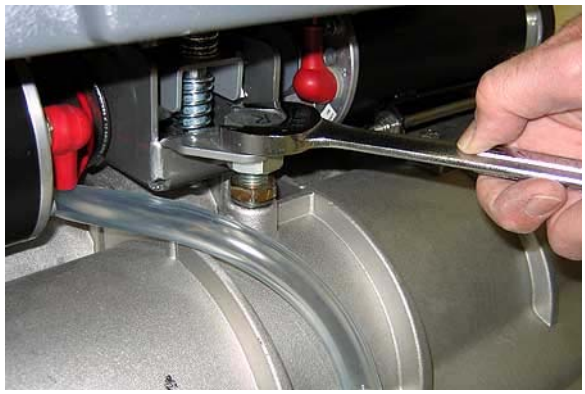


**FIG. 53**

3. Recheck brush pattern.

***NOTE:*** *Replace brush when bristles are worn to 5/8 in / 15 mm.*

**To Adjust a Tapered Brush Pattern:**

Tools required: 3/8 in / 10mm wrench and 6mm hex wrench

1. Raise the scrub head off floor and remove key.
2. Remove the idler plate from the brush (Figure 54).

**FIG. 54**

3. Hold the brush plug shaft with a wrench and loosen the 6mm hex screw (Figure 55).

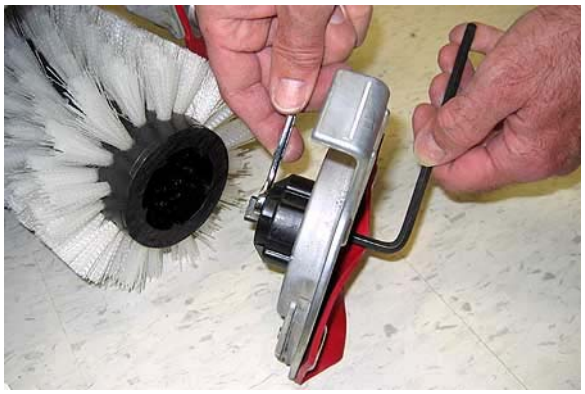


**FIG. 55**

4. To lower the brush end, turn the shaft clockwise for the front brush and counter-clockwise for the rear brush. Retighten hex screw (Figure 56).

**FIG. 56**

5. Recheck brush pattern.

***NOTE:*** *Replace brushes when bristles are worn to 5/8 in / 15 mm.*

## MACHINE MAINTENANCE

To keep the machine in good working condition, it's important that the following maintenance procedures are performed on a routine basis.

**⚠ WARNING: Electrical Hazard. Disconnect Battery Cables Before Servicing Machine.**

### DAILY MAINTENANCE (After Every Use)

1. Drain the recovery tank (Figure 57).

**FIG. 57**

2. Rinse out the recovery tank (Figure 58).

**FIG. 58**

3. Remove the recovery tank float shut-off screen and clean (Figure 59).

**FIG. 59**

4. Drain the solution tank (Figure 60).

**FIG. 60**

5. Rotate pad or replace when worn (Figure 61).

**FIG. 61**

6. Empty and rinse out the debris trough (Figure 62).

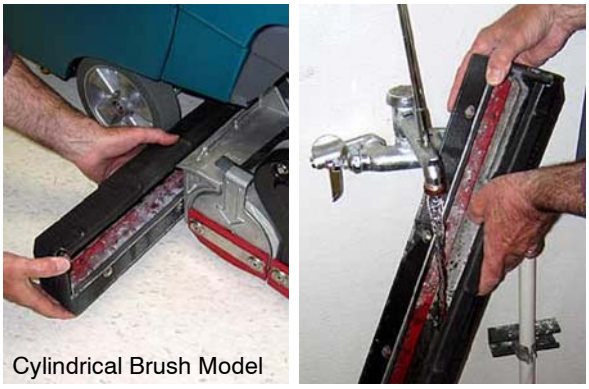



**FIG. 62**

7. Inspect the cylindrical brushes for wear. Rotate brushes from front-to-rear every 50 hours (Figure 63). Replace when worn to a length of *5/8 in / 15 mm*.

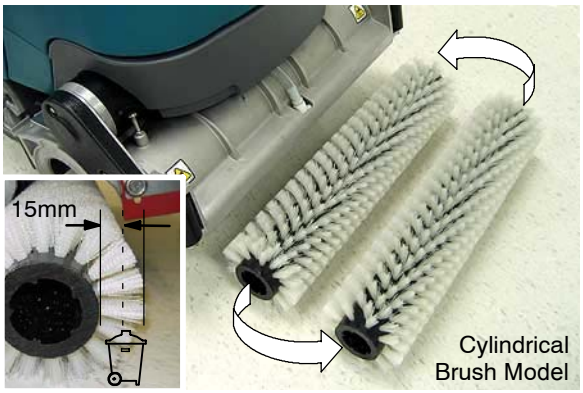



**FIG. 63**

8. Remove debris buildup from the underside of the cylindrical brush scrub head, including the idler plates and drive hubs (Figure 64).

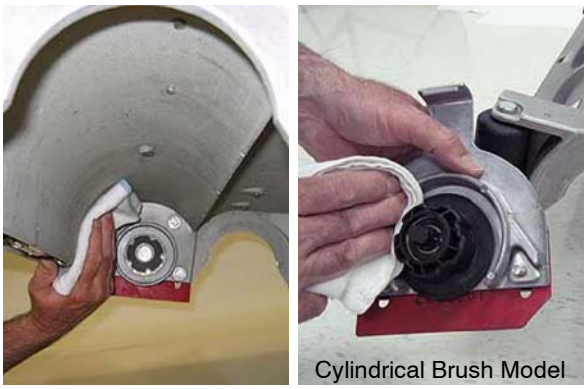



**FIG. 64**

9. Wipe the squeegee blades clean (Figure 65). Store the squeegee assembly in the raised position to prevent blade damage.

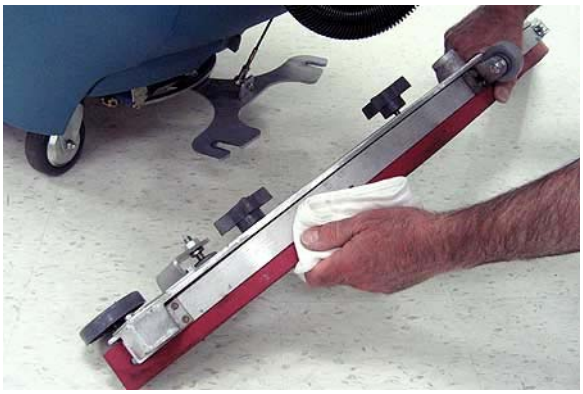


**FIG. 65**

10. Check the condition of the squeegee blade wiping edge (Figure 66). Rotate blade if worn (See SQUEEGEE BLADES).

**FIG. 66**

11. Clean the machine with an all purpose cleaner and damp cloth (Figure 67).

**FOR SAFETY: When cleaning machine, do not power spray or hose off machine. Electrical malfunction may occur.**

**FIG. 67**

12. Inspect the condition of the scrub head skirt, replace if worn or damaged (Figure 68).

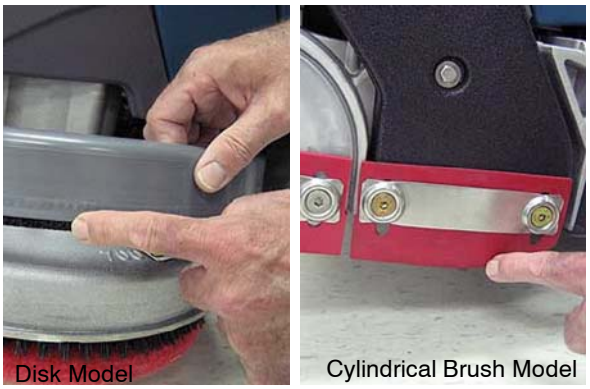



**FIG. 68**

13. FaST Model: Connect the FaST-PAK supply hose to the storage plug when not in use (Figure 69). Remove any dried concentrate from the hose connector by soaking it in warm water.

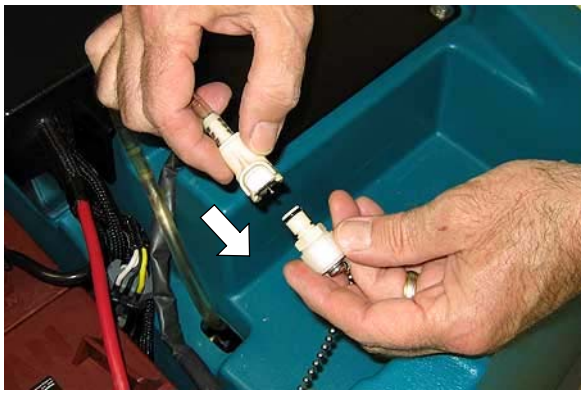


**FIG. 69**

14. Clean wet/lead acid batteries to prevent corrosion and check for loose battery cable connections (See BATTERY MAINTENANCE).

15. Recharge the batteries (Figure 70) after a total of 30 minutes of use or more.

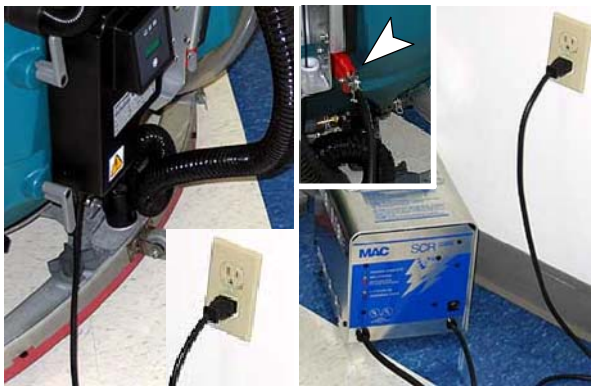



**FIG. 70**

## MONTHLY MAINTENANCE

1. Remove the solution tank filter from underneath the machine and rinse out the screen (Figure 71). Make sure the solution tank is empty before removing filter.

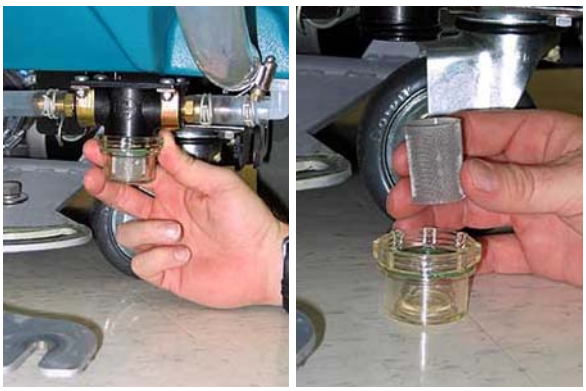


**FIG. 71**

2. Check the cylindrical brush belt tension every 100 hours (Figure 72). Belt tension should flex 0.1 in / 3mm at midpoint, with 2.5-2.7 lb / 1.13-1.22 kg force.

**⚠ WARNING: Electrical Hazard. Disconnect Battery Cables Before Servicing Machine.**

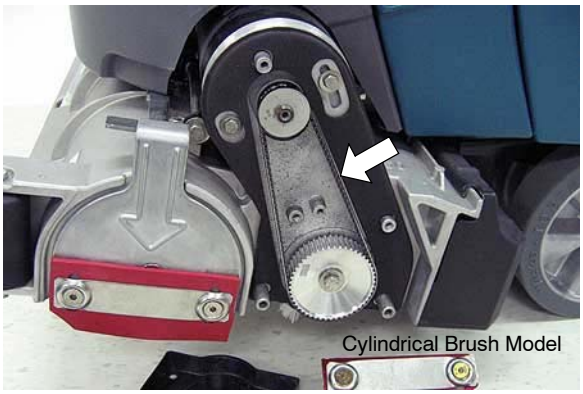



**FIG. 72**

3. Inspect and clean the recovery tank cover seal (Figure 73). Replace if damaged.

**FIG. 73**

4. Lubricate all pivot points and rollers with a water resistant grease.

5. Lubricate the casters with a water resistant grease (Figure 74).

**FIG. 74**

6. Clean the parking brake clamp with a cleaning solvent.

7. Check the machine for loose nuts and bolts.

8. Check the machine for leaks.

## BATTERY MAINTENANCE (Wet/lead acid batteries)

1. Check battery fluid level frequently to prevent battery damage. The fluid should be at the level shown (Figure 75). Add distilled water if low. DO NOT OVERFILL, the fluid may expand and overflow when charging.

**CORRECT BATTERY FLUID LEVEL:**

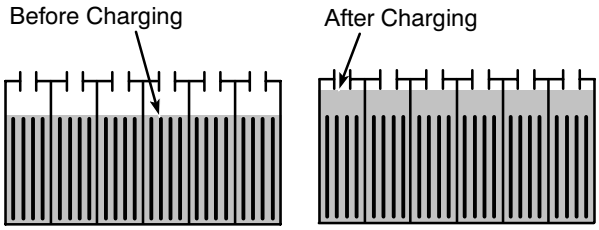



**FIG. 75**

**⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.**

2. Clean the batteries to prevent battery corrosion. Use a scrub brush with a mixture of baking soda and water (Figure 76).

**FOR SAFETY: When cleaning batteries, wear protective gloves and eye protection. Avoid contact with battery acid.**


**FIG. 76**

## SQUEEGEE BLADES

When the blades become worn, simply rotate the blades end-for-end or top-to-bottom to a new wiping edge. Replace blades when all edges are worn.

The front blades on the 28 in / 700 mm and 32 in / 800mm squeegee assemblies have 12/14 slots on one edge and 6 slots on the opposite edge (Figure 77). If making sharp turns with the cylindrical brush models use the 12/14 slotted edge for maximum water pickup.

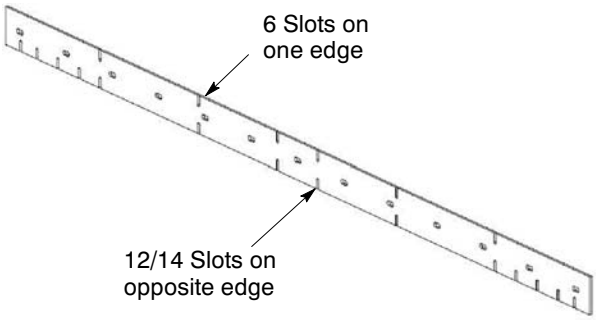



**FIG. 77**

**Replacing Squeegee Blades:**

1. Loosen the band clamp and remove the band from the squeegee assembly (Figure 78).

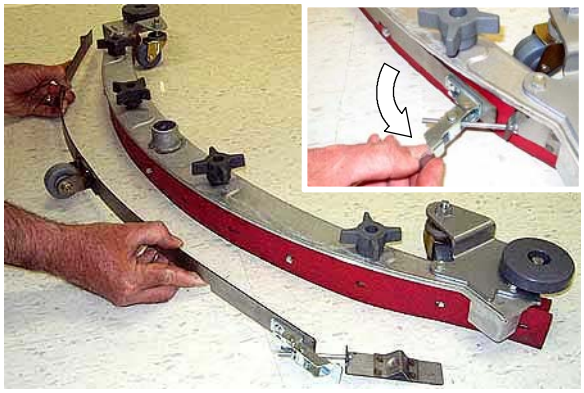


**FIG. 78**

2. Replace or rotate the rear blade to a new wiping edge and replace band (Figure 79).

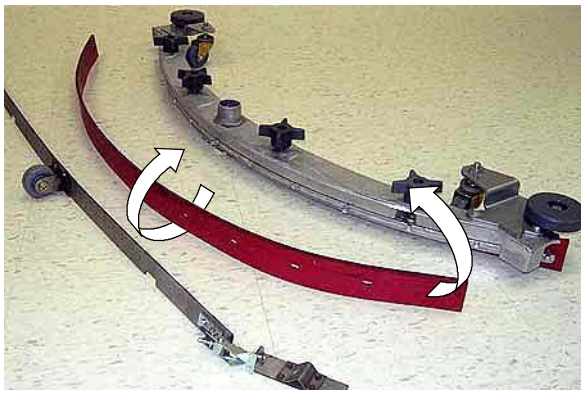


**FIG. 79**

3. To change the front blade, remove the band and loosen the four knobs. Replace or rotate the front blade to a new wiping edge (Figure 80)

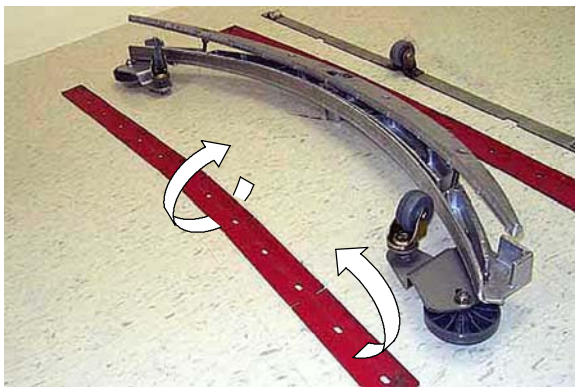


**FIG. 80**

## MOTOR MAINTENANCE

**Contact an Authorized Tennant Service Center for carbon brush replacement.**

| Carbon Brush Replacement | Hours |
|---|---|
| Drive Transaxle Motor | 750 |
| Vacuum Motor | |
| Disk Brush Motors | |
| Cylindrical Brush Motors | 1000 |

**⚠ WARNING: Electrical Hazard. Disconnect Battery Cables Before Servicing Machine.**

## FaST SYSTEM MAINTENANCE

Every 1000 hours replace the orifice plate and filter screen located inside the detergent injector assembly.

1. To access the detergent injector assembly, lower the scrub head and remove the front shroud (Figure 81)

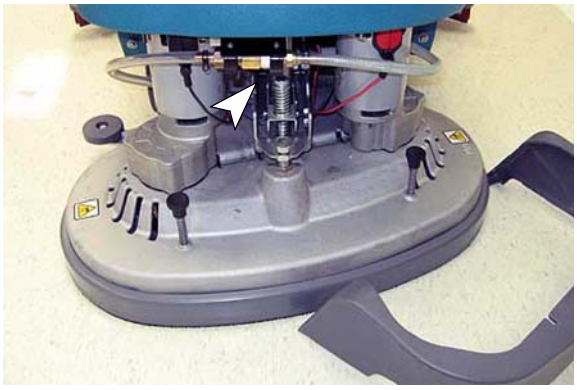


**FIG. 81**

2. Remove the injector assembly from clamps (Figure 82).

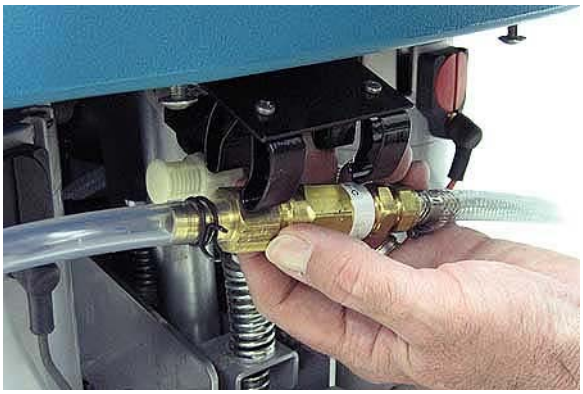


**FIG. 82**

3 Unthread the black plastic filter housing and replace the orifice plate and filter (Figure 83).

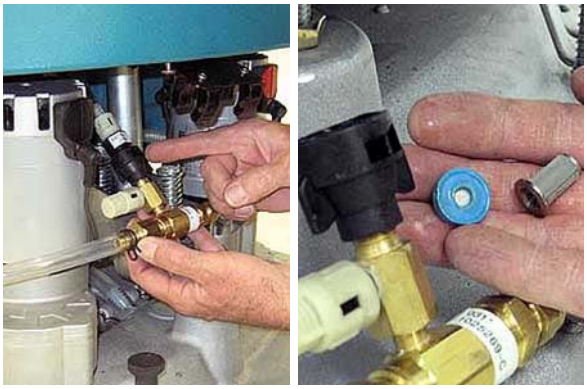


**FIG. 83**

## JACKING UP MACHINE

Use the designated locations to jack up the machine for service (Figure 84). Empty the recovery and solution tank and position the machine on a level before jacking.

**FOR SAFETY: When servicing machine, jack machine up at designated locations only. Use jack or hoist that will support machine weight.**

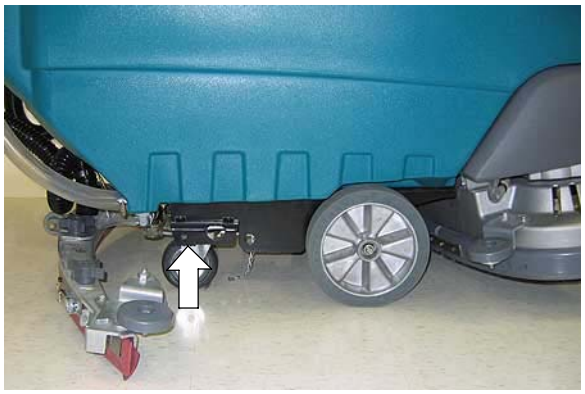


**FIG. 84**

## TRANSPORTING MACHINE

When transporting the machine by trailer or truck, be certain to follow the transporting procedure below:

1. Drain machine tanks.
2. Load the machine using a ramp that can support the machine weight and person loading it. The maximum ramp incline should not exceed 11° at a ramp length of 3.7m (12 ft).
3. Position the front of machine up against the front of the trailer or truck. Lower the scrub head and squeegee.
4. Set the parking brake, if equipped, and place a block behind each wheel to prevent the machine from rolling.
5. Secure with tie-down straps as shown (Figure 85). It may be necessary to install tie-down brackets to trailer or truck.

**FOR SAFETY: When loading/unloading machine onto/off truck or trailer, use a ramp that can support the machine weight and person loading it, do not exceed a 11° ramp incline at a ramp length of 3.7m (12 ft), use tie-down straps to secure machine and block machine wheels.**

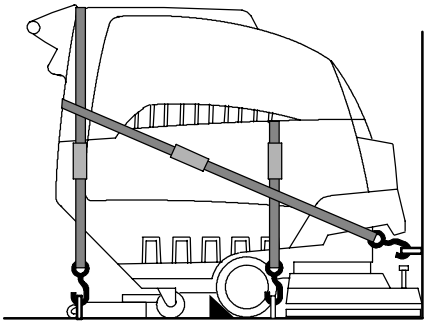


**FIG. 85**

## STORING MACHINE

1. Charge the batteries before storing machine to prolong the life of the batteries.
2. Drain and rinse the tanks thoroughly.
3. Store the machine in a dry area with the squeegee and scrub head in the up position.
4. Open the recovery tank cover to promote air circulation.

**ATTENTION: Do not expose machine to rain, store indoors.**

5. If storing machine in freezing temperatures, make sure to drain machine of all water.

   For models equipped with the FaST System, follow the FaST SYSTEM FREEZE PROTECTION procedure below.

### FaST SYSTEM FREEZE PROTECTION

Valve Coupling #1002856 and 15 cm Hose #63182 are required (Purchased separately).

1. Remove the FaST-PAK carton and connect the valve coupling and 15cm hose (purchased parts) to the supply hose (Figure 86).

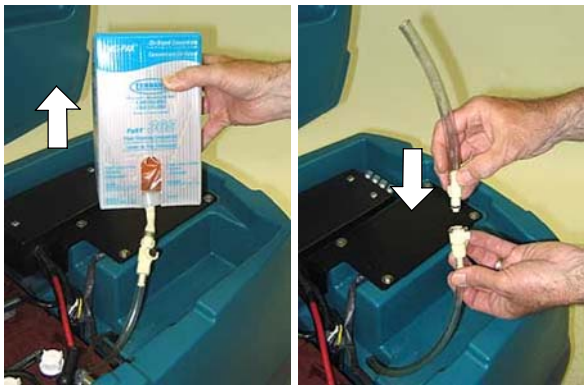


**FIG. 86**

2. Disconnect the opposite end of the supply hose from the injector assembly and drain the supply hose (Figure 87). To access the injector assembly remove the front shroud.

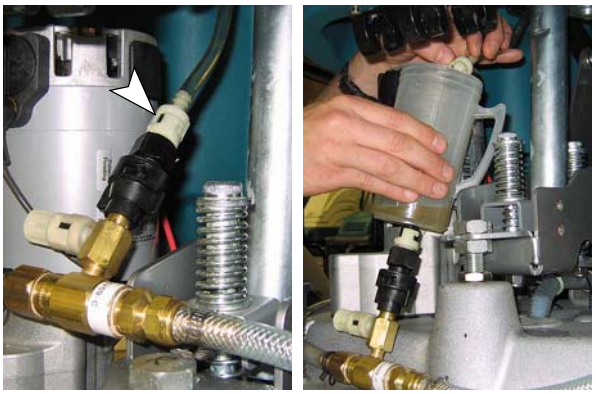


**FIG. 87**

3. Reconnect the supply hose to injector assembly and pour a recreational vehicle (RV) anti-freeze into the supply hose until full (Figure 88).

**FIG. 88**

4. Operate the FaST system as normal until the foaming stops. This step could take anywhere from 5-10 minutes.

5. Remove the valve coupling and connect the storage plug (Figure 89).

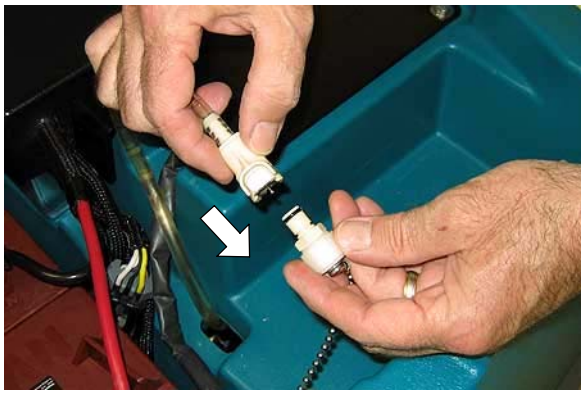


**FIG. 89**

6. Drain the recovery and solution tanks and store machine.

7. To drain the anti-freeze, repeat the draining process above and reconnect the supply hose to the FaST-PAK carton.

## RECOMMENDED STOCK ITEMS

Refer to the Parts List Manual for recommended stock items. Stock Items are clearly identified with a bullet preceding the parts description. See example below:

| | | | | |
|---|---|---|---|---|
| 26 | 1017380 | (00000000- | )● | Hose, Drain, Assy, 1.5d X 29.5l, Blk,Flx |
| 27 | 1008639 | (00000000- | )● | Drain Assy |
| 28 | 1019563 | (00000000- | )● | Strap, Drain Cap |
| 29 | 1008637 | (00000000- | )● | O Ring, 1.48" Id, 1.76" Od |

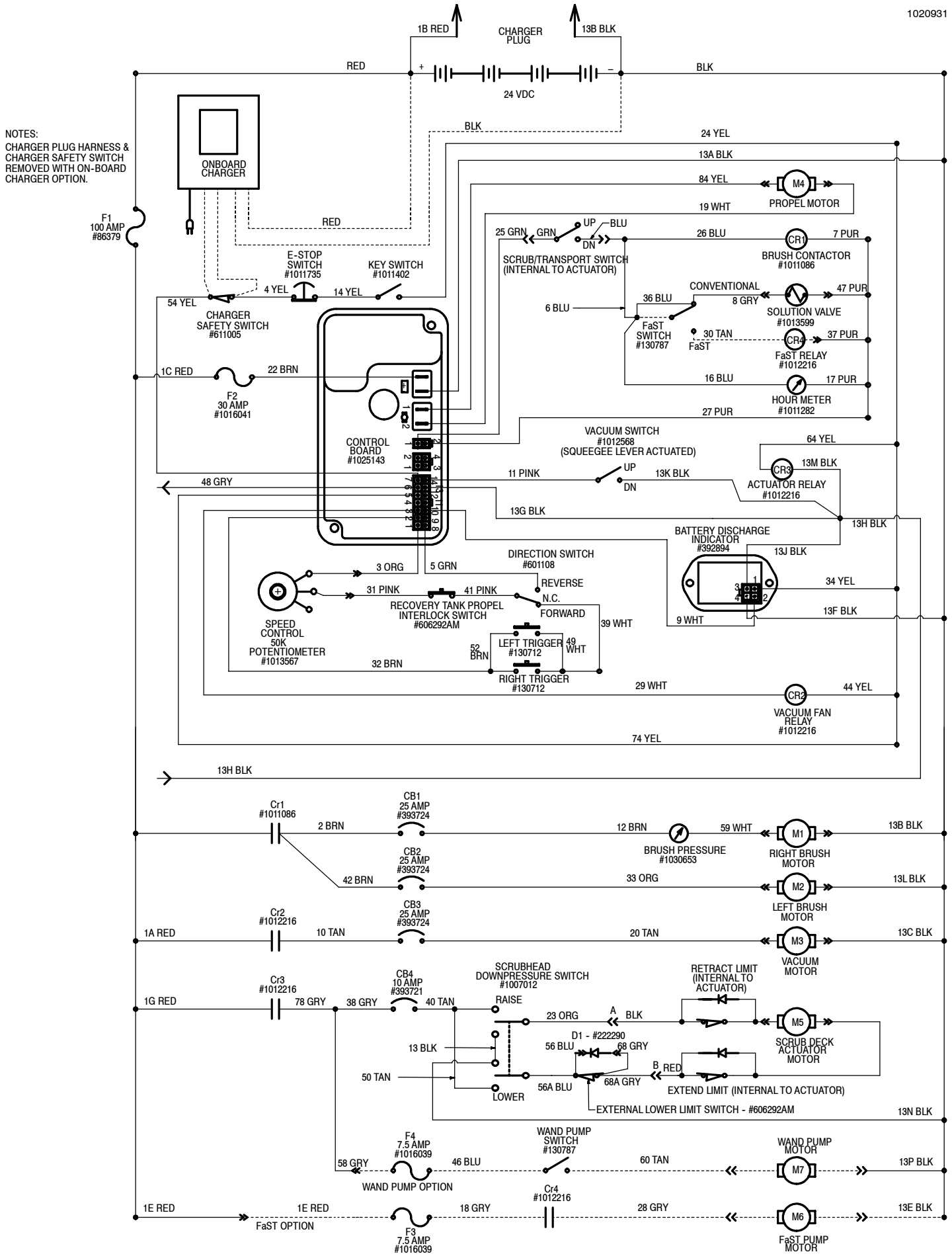
## TROUBLESHOOTING

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| Machine will not operate | Discharged batteries | Charge batteries |
| | Emergency-stop button activated | Turn button clockwise to reset |
| | Faulty battery(s) | Replace battery(s) |
| | Loose battery cable | Tighten loose cable |
| | Tripped main circuit breaker | Reset 10A main circuit breaker |
| | Main fuse blown | Replace 100A main fuse |
| | Faulty key switch | Contact Service Center |
| | Machine fault detected. | See Battery Meter LED Fault Codes |
| On-board battery charger will not operate | Plug not connected to power supply | Check plug connection |
| | Faulty charger fuse | Replace charger fuse |
| | Faulty power supply cord | Replace cord |
| | Error detected. | See On-board Battery Charger Error Codes |
| Brush motor(s) will not operate | Scrub head is raised off floor | Lower scrub head |
| | Battery meter lockout activated | Recharge batteries |
| | Discharged batteries | Charge batteries |
| | Tripped brush motor circuit breaker | Reset 25A circuit breaker button |
| | Faulty scrub head (up/down) switch | Contact Service Center |
| | Faulty trigger switch(es) | Contact Service Center |
| | Faulty brush motor or wiring | Contact Service Center |
| | Worn carbon brushes | Contact Service Center |
| | Broken or loose belt (cylindrical brush model) | Replace or tighten belt |
| | Faulty relay switch | Contact Service Center |
| Machine will not propel | Parking brake is set | Release parking brake lever |
| | Machine fault detected | See Battery Meter LED Fault Codes |
| | Propel motor fuse blown | Replace 30A fuse |
| | Faulty transaxle motor or wiring | Contact Service Center |
| | Worn carbon brushes | Contact Service Center |
| | Exceeded maximum incline | Avoid steep inclines and reset key |
| Vacuum motor will not operate | Squeegee is raised off floor | Lower squeegee |
| | Discharged batteries | Charge batteries |
| | Tripped vacuum motor circuit breaker | Reset 25A circuit breaker button |
| | Faulty vacuum motor or wiring | Contact Service Center |
| | Worn carbon brushes | Contact Service Center |
| Little or no solution flow | Solution tank is empty | Fill solution tank |
| | Clogged solution tank filter | Clean solution tank filter |
| | Discharged batteries | Charge batteries |
| | Clogged solution valve | Remove valve and clean |
| | Solution flow control knob set too low | Adjust solution control flow knob |
| | Loose screw on control knob | Calibrate knob and retighten screw. |

## TROUBLESHOOTING - Continued

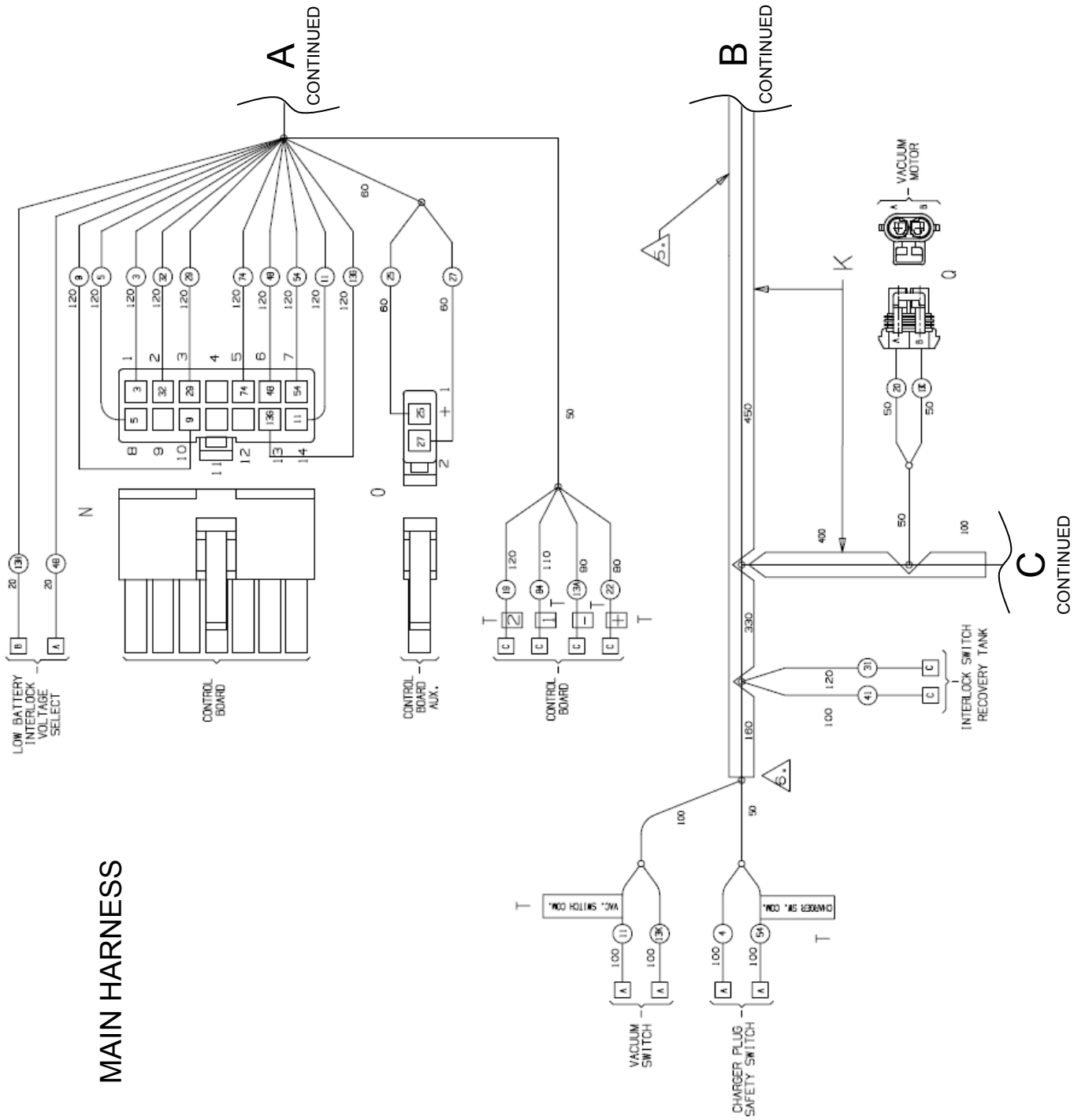
| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| Poor water pickup | Recovery tank is full or excessive foam buildup | Drain recovery tank |
| | Loose drain hose cap | Tighten cap |
| | Clogged float shut-off screen located in recovery tank | Clean screen |
| | Clogged squeegee assembly | Clean squeegee assembly |
| | Worn squeegee blades | Replace or rotate squeegee blades |
| | Incorrect Squeegee blade deflection | Adjust Squeegee blade height |
| | Loose vacuum hose connections | Secure hose connections |
| | Clogged vacuum hose | Remove clogged debris |
| | Damaged vacuum hose | Replace vacuum hose |
| | Recovery tank cover not in place | Properly position cover |
| | Damaged recovery tank cover seal | Replace seal |
| | Faulty vacuum motor | Contact Service Center |
| | Low battery charge | Recharge batteries |
| Poor scrubbing performance | Debris caught in brush | Remove debris |
| | Worn brushes/pads | Replace brushes/pads |
| | Incorrect brush pressure setting | Adjust pressure setting |
| | Wrong brush/pad type. | Use correct brush/pad |
| Reduced run time | Batteries not fully charged | Fully recharge batteries |
| | Defective batteries | Replace battery |
| | Batteries need maintenance | See BATTERY MAINTENANCE |
| | Faulty battery charger | Repair or replace battery charger |
| FaST Model: FaST System does not operate or operate correctly | FaST system switch is not turned on | Turn on FaST system switch |
| | FaST-PAK supply hose not connected | Connect supply hose |
| | Clogged FaST-PAK supply hose or connectors | Soak in warm water to unclog |
| | Empty FaST-PAK carton | Replace FaST-PAK carton |
| | Kink in FaST-PAK supply hose | Undo hose kink |
| | Clogged FaST solution system | Contact Service Center |
| | Faulty FaST system on/off switch | Contact Service Center |
| | Faulty pump | Contact Service Center |
| | Clogged solution tank filter | Drain solution tank. Remove solution tank filter, clean and reinstall |
| | Clogged detergent orifice/filter screen | Replace orifice/filter screen (See FaST SYSTEM MAINTENANCE) |
| | Clogged FaST solution inlet filter | Contact Service Center |
| | FaST Pump fuse blown | Replace 7.5A fuse |

# T5e –Electrical Schematic



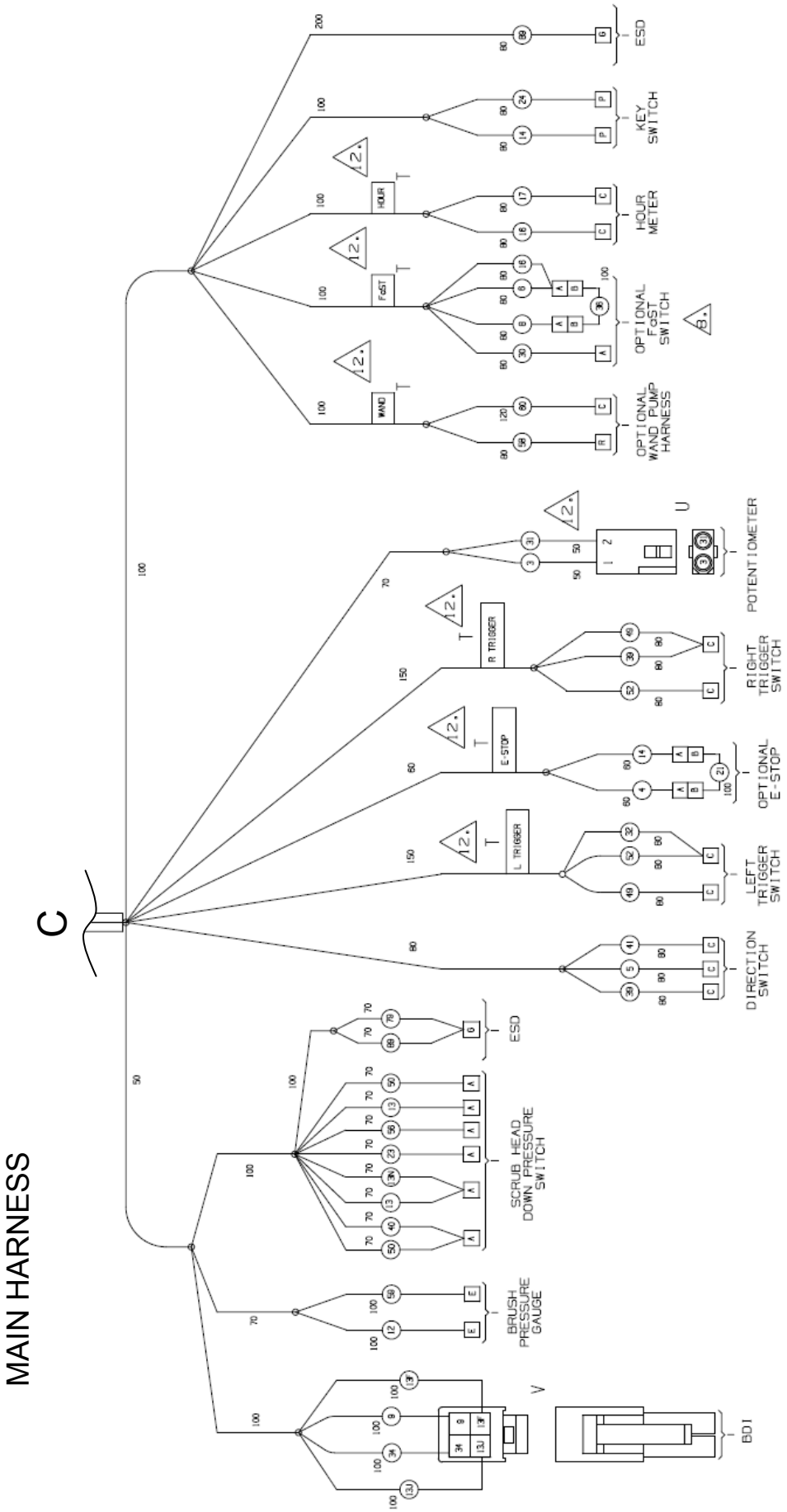
# T5e –Wiring Harness Detail

(Page 1 of 6)



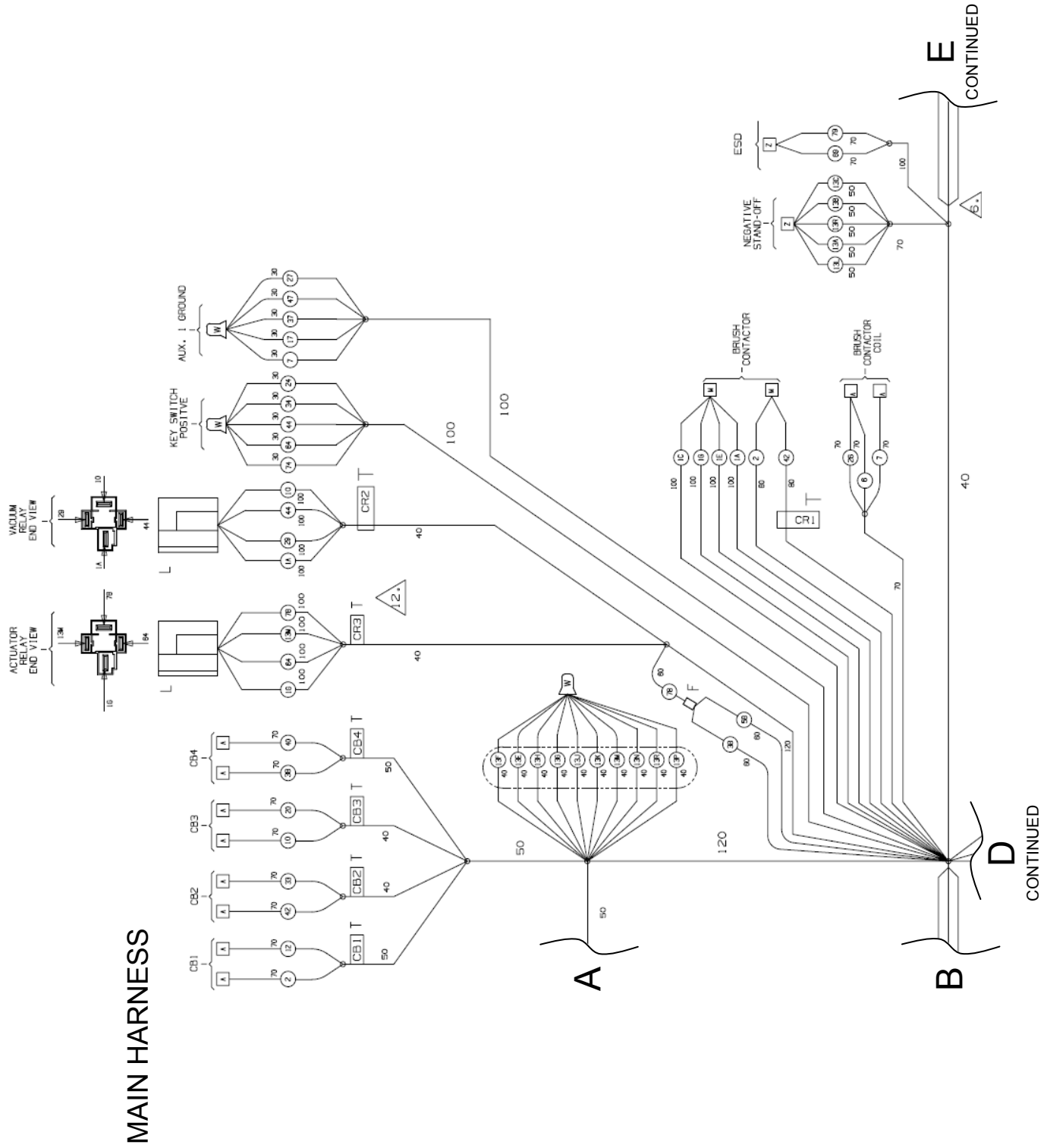
# T5e –Wiring Harness Detail

(Page 2 of 6)



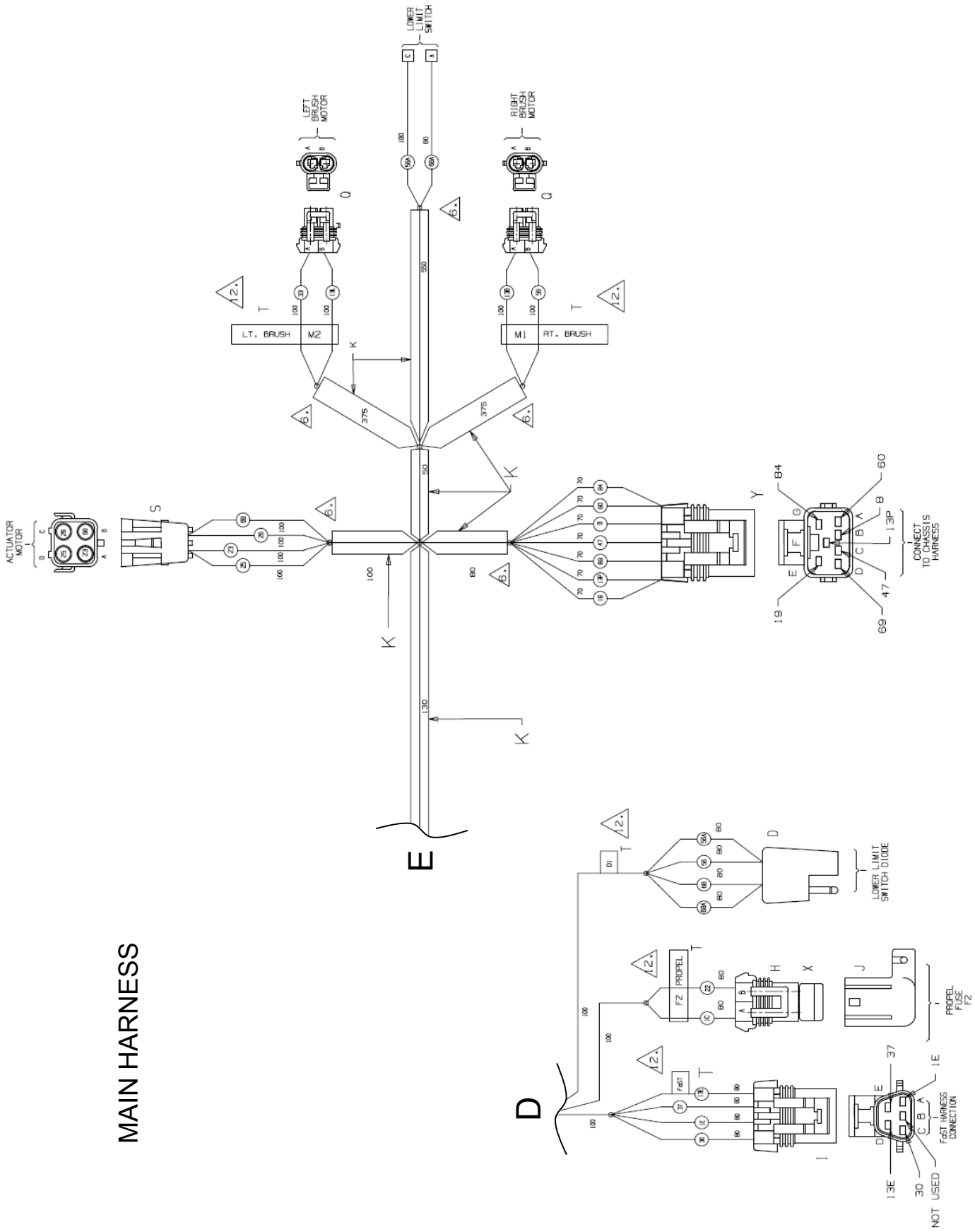
# T5e –Wiring Harness Detail

(Page 3 of 6)



# T5e –Wiring Harness Detail

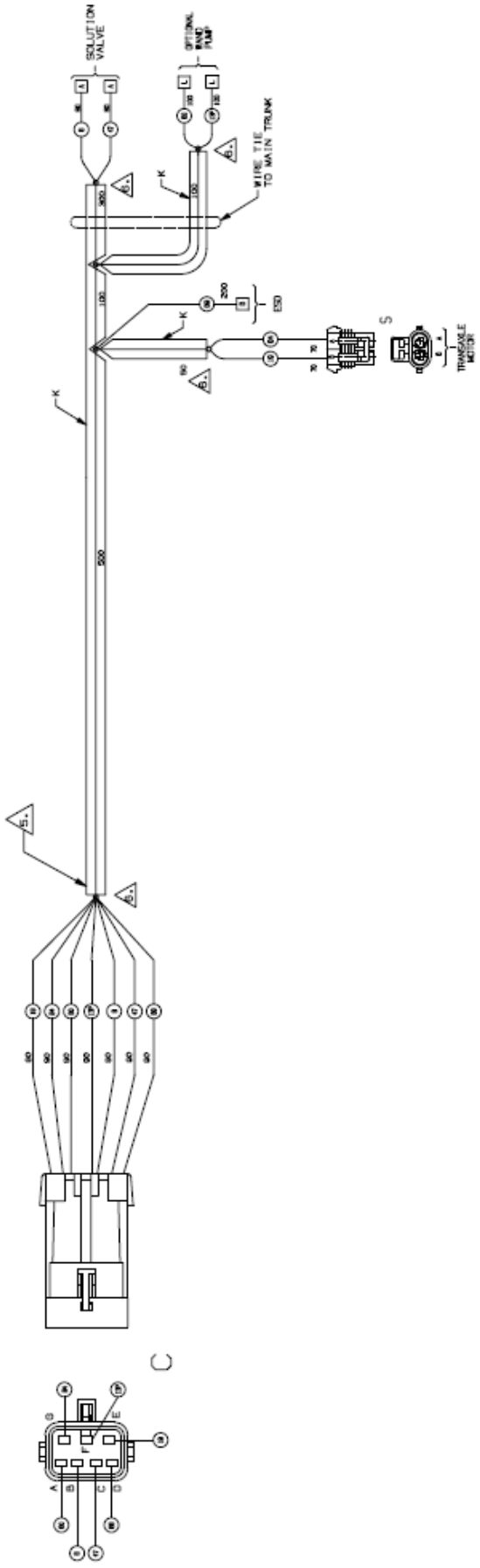
(Page 4 of 6)



# T5e –Wiring Harness Detail

(Page 5 of 6)

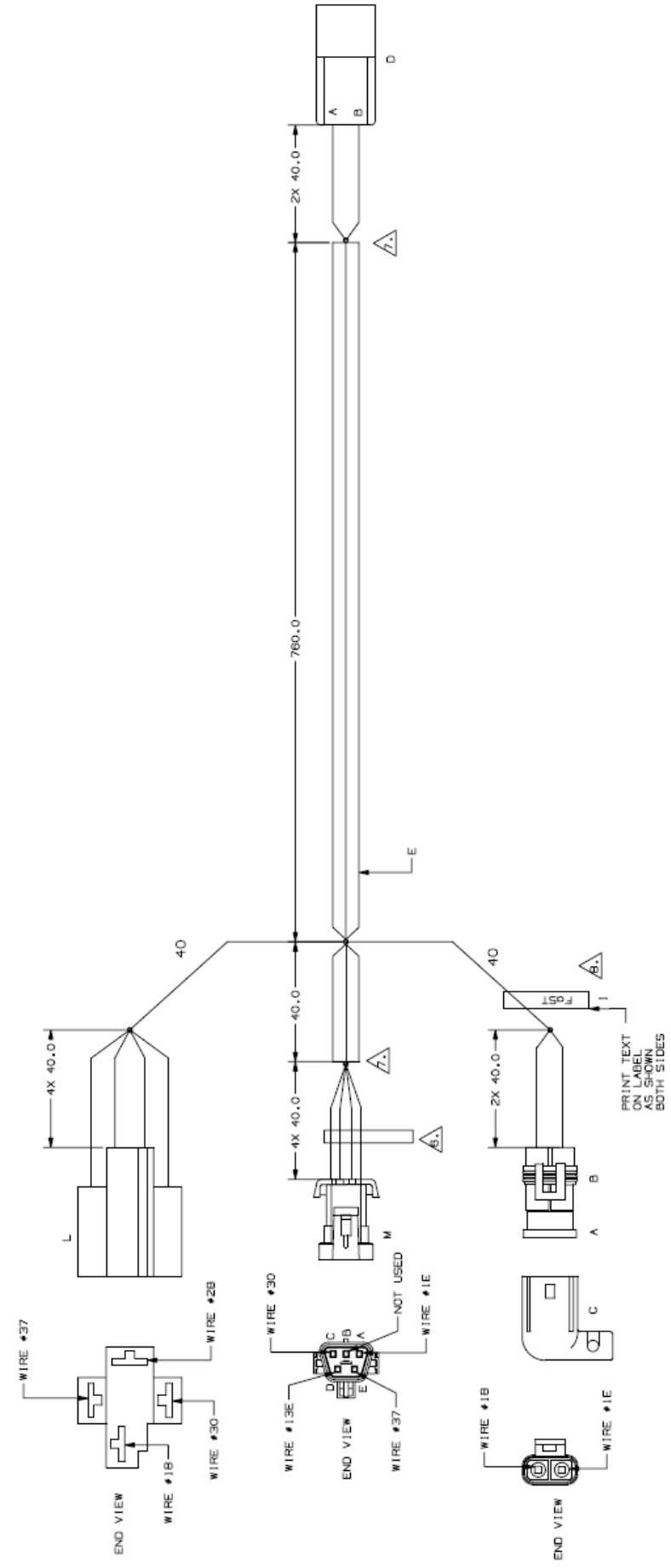
CHASSIS HARNESS



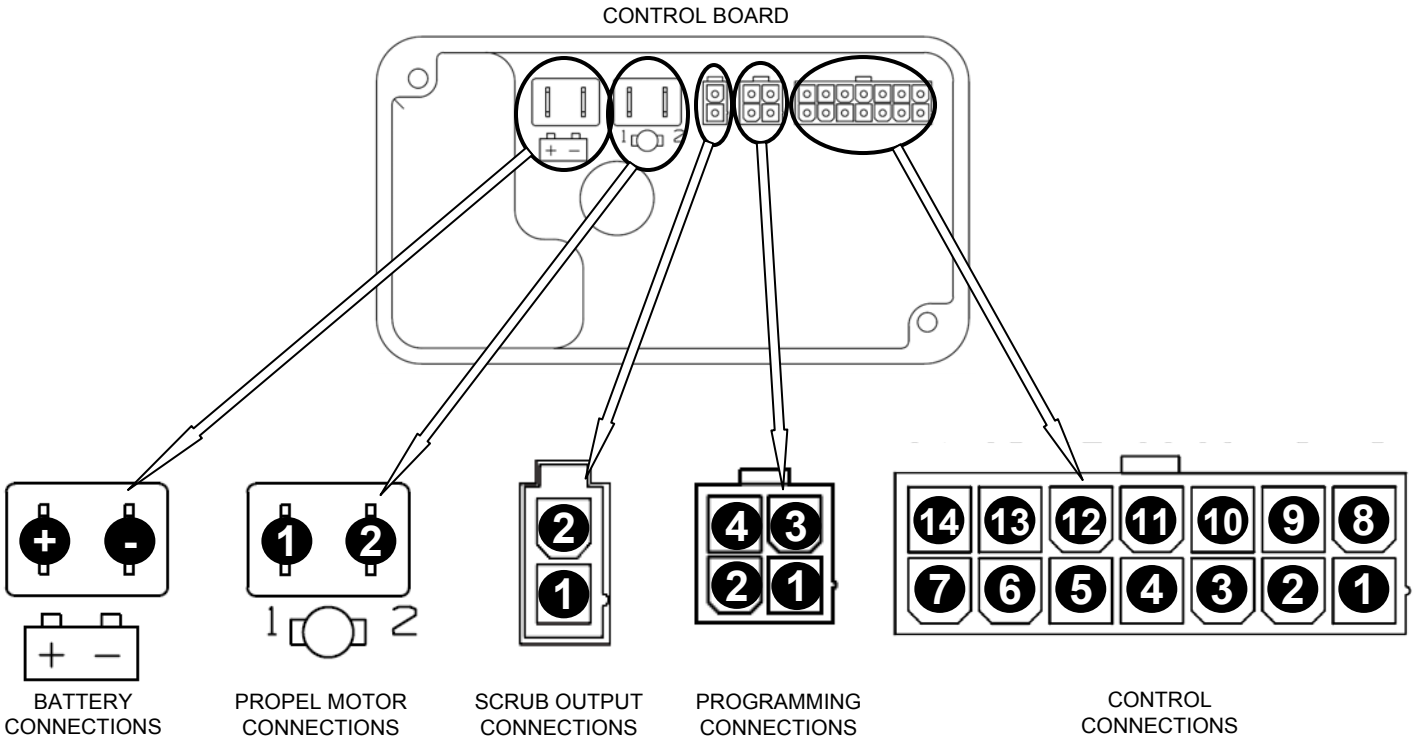
# T5e –Wiring Harness Detail

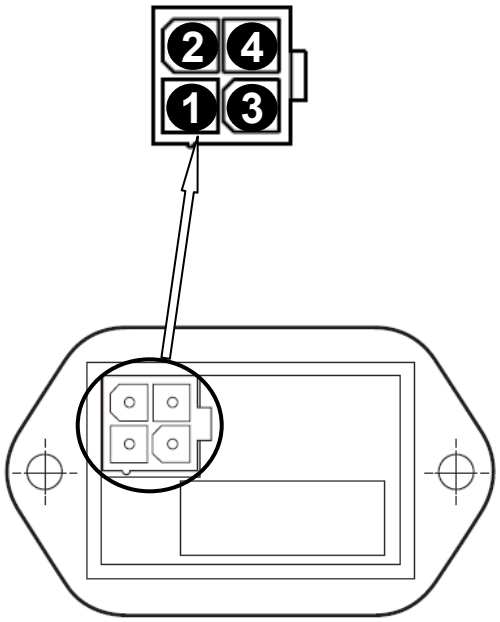
(Page 6 of 6)

FaST HARNESS



# T5e –Control Board & BDI Details




BATTERY DISCHARGE INDICATOR
(VIEWED FROM REAR)

# T5e –Control Board & BDI Pin Charts

## CONTROL BOARD CONNECTIONS

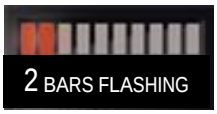
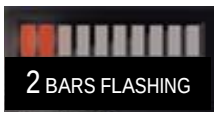
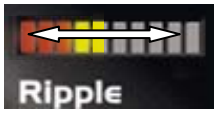
| Name | Pin # | Wire # | Color | Active Voltage | Inactive Voltage | Input/ Output | Function/Component Controlled | | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Battery Connections | + | 22 | brown | battery (+) | x | input | x | Battery positive power supply | |
| | - | 13A | black | battery (-) | x | input | x | Battery negative power supply | |
| Propel Motor Connections | 1 | 84 | yellow | 0v to 24v | 0v | output | M4 | Propel motor power supply connections | Forward=4v to 24v, Reverse=0v |
| | 2 | 19 | white | 0v to 24v | 0v | output | | | Reverse=1.5v to 12v, Forward=0v |
| Scrub Output Connections | 1 | 25 | green | battery (+) | battery (+) | output | see notes | Scrub functions power supply | Controls CR1 (brush contactor), solution valve, CR4 (FaST relay), & hour meter |
| | 2 | 27 | purple | battery (-) | open | output | | | |
| Programming Connections | 1 | x | x | x | x | x | x | Used only for programming the control board | |
| | 2 | x | x | x | x | x | x | | |
| | 3 | x | x | x | x | x | x | | |
| | 4 | x | x | x | x | x | x | | |
| Control Connections | 1 | 3 | orange | see notes | | input | x | Throttle signal input | Reverse=0v to 2.25v; Fwd=2.75v to 5v; Neutral=2.25v to 2.75v |
| | 2 | 32 | brown | 5v | x | output | x | Throttle 5v reference signal | |
| | 3 | 29 | white | battery (-) | open | output | CR2 | Vacuum fan relay | |
| | 4 | x | x | x | x | x | x | | |
| | 5 | 74 | yellow | battery (+) | open | input | x | Key switch input | Signal to turn control board ON |
| | 6 | 48 | gray | battery (-) | 2.5v | input | x | Low battery voltage lockout level select | Normal mode: wire 48 **NOT** connected to 13H (22.4v lockout)<br>Special mode: wire 48 connected to 13H (20.7v lockout) |
| | 7 | 54 | yellow | battery (+) | battery (+) | output | x | Battery (+) supply for input switches | Output in series to charger safety,E-stop,& key switches |
| | 8 | 5 | green | 0v | x | output | x | Throttle 0v reference signal | |
| | 9 | x | x | x | x | x | x | | |
| | 10 | 9 | white | see notes | | output | BDI | Battery Discharge Indicator | Communicates battery & control board information (up to 10v) |
| | 11 | x | x | x | x | x | x | | |
| | 12 | x | x | x | x | x | x | | |
| | 13 | 13G | black | battery (-) | x | output | see notes | Battery (-) output for various components | Output to vacuum switch, CR3 actuator relay, Battery Discharge Indicator, & low battery voltage lockout select |
| | 14 | 11 | pink | 0v | 2.5v | input | x | Vacuum switch | |

## BATTERY DISCHARGE INDICATOR CONNECTIONS

| Name | Pin # | Wire # | Color | Active Voltage | Inactive Voltage | Input/ Output | Function |
|---|---|---|---|---|---|---|---|
| Battery Discharge Indicator | 1 | 34 | yellow | battery (+) | x | input | Battery (+) supply voltage |
| | 2 | 9 | white | 10v to 24v | x | input | Battery status signal |
| | 3 | 13J | black | 0v | 0v | input | Battery (-) supply voltage |
| | 4 | 13F | black | 0v | 0v | input | Static drain path |

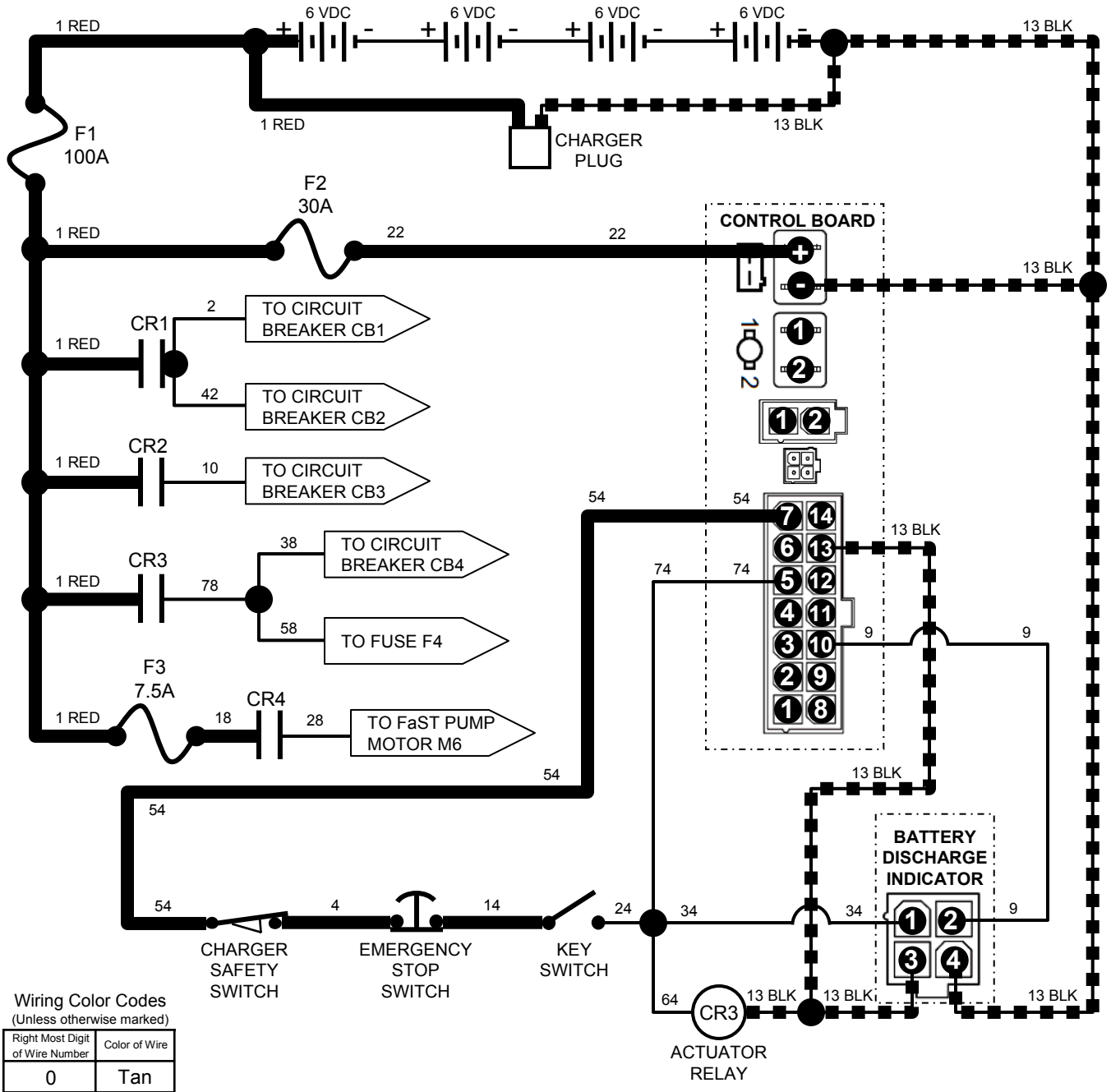
# T5e – BDI Diagnostic Fault Indicators

## LED Flashing Codes

| | | |
|---|---|---|
|  | **Very Low Battery Voltage** | The batteries need immediate charging or there is a bad connection to the batteries. Charge the batteries,or check the connections to the battery. |
|  | **Low Battery Voltage (Slowly Flashing @ 40Hz)** | The batteries need charging or there is a bad connection to the batteries. Charge the batteries,or check the connections to the battery. |
|  | **Propel Motor Open (Quickly Flashing @ 200 Hz)** | The propel motor has an open connection. Check all the connections and wires between the motor and the control board. Test motor for open circuit. |
|  | **Propel Motor Shorted** | The propel motor has a short circuit. Check all the connections and wires between the motor and the control board. Test motor for short circuit. |
|  | **Battery Lockout** | The voltage level of the batteries has fallen below the Battery Lockout Level and the control board is inhibiting certain machine functions. Charge the batteries. |
|  | **Not Used** | |
|  | **Not Used** | |
|  | **Not Used** | |
|  | **Possible Control Board Fault** | A control board fault is indicated. Make sure that all connections are secure. |
|  | **Not Used** | |
|  | **High Battery Voltage** | An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check all battery connections. |
|  | **Control Board in Sleep Mode** (LED's flash one at a time from left to right) | The controller has entered sleep mode. Switch the control system off and then on again. |
|  | **Throttle Displaced** (LED's ripple back and forth) | A throttle fault is indicated. Make sure that the forward and reverse switches are released before switching on the machine, or check all connections and wires from the switches to the control board. |

# T5e - Key OFF Power Distribution (With Standard Off-Board Battery Charger)

CONDITIONS: Key OFF, off-board battery charger **NOT CONNECTED** to charger plug




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 |

= Battery Negative or Logic Ground

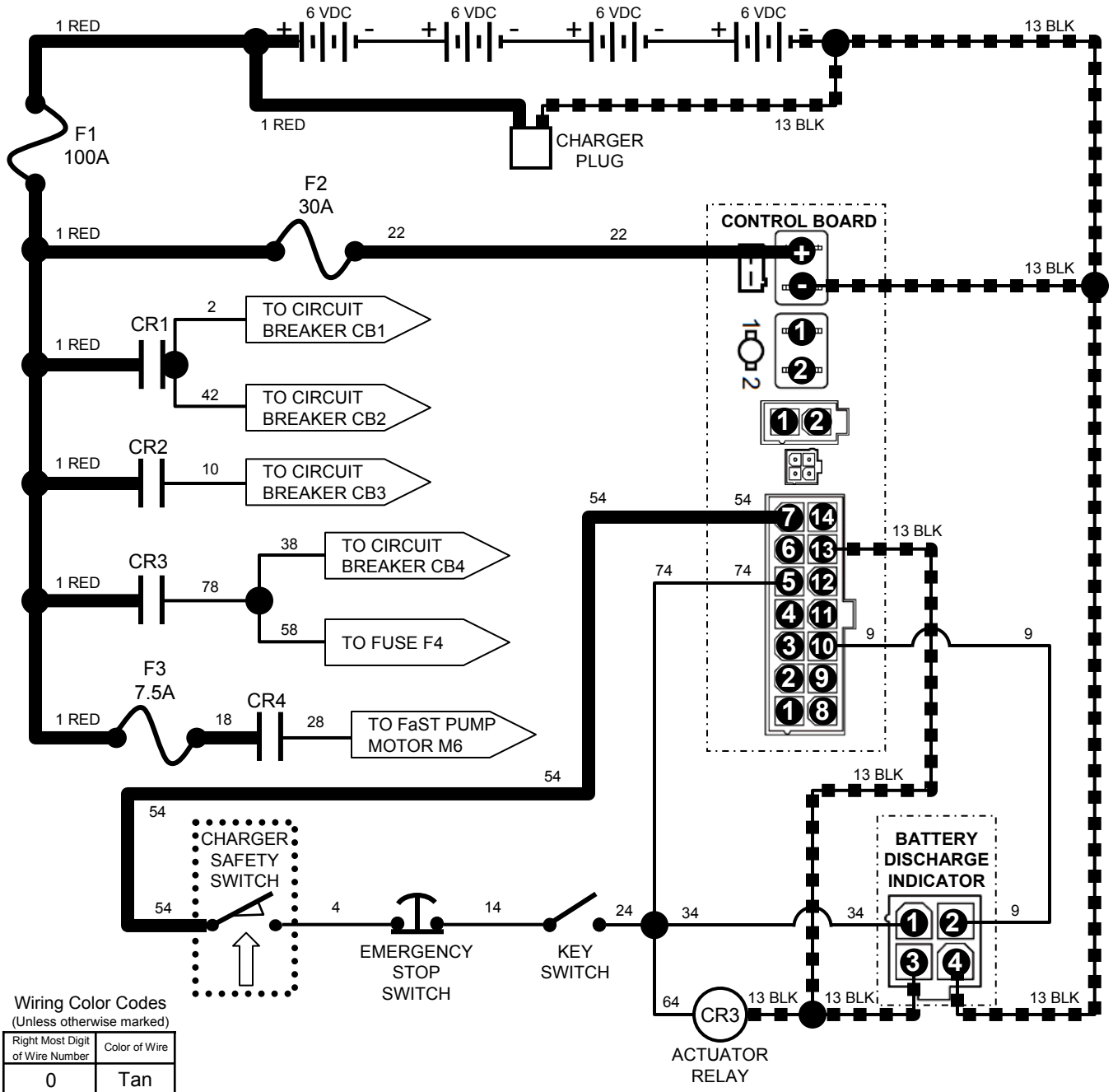
= Battery Positive or Logic High

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

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e - Key OFF Power Distribution (With Standard Off-Board Battery Charger)

CONDITIONS: Key OFF, off-board battery charger **CONNECTED** to charger plug




Wiring Color Codes
(Unless otherwise marked)

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| 2 | Brown |
| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

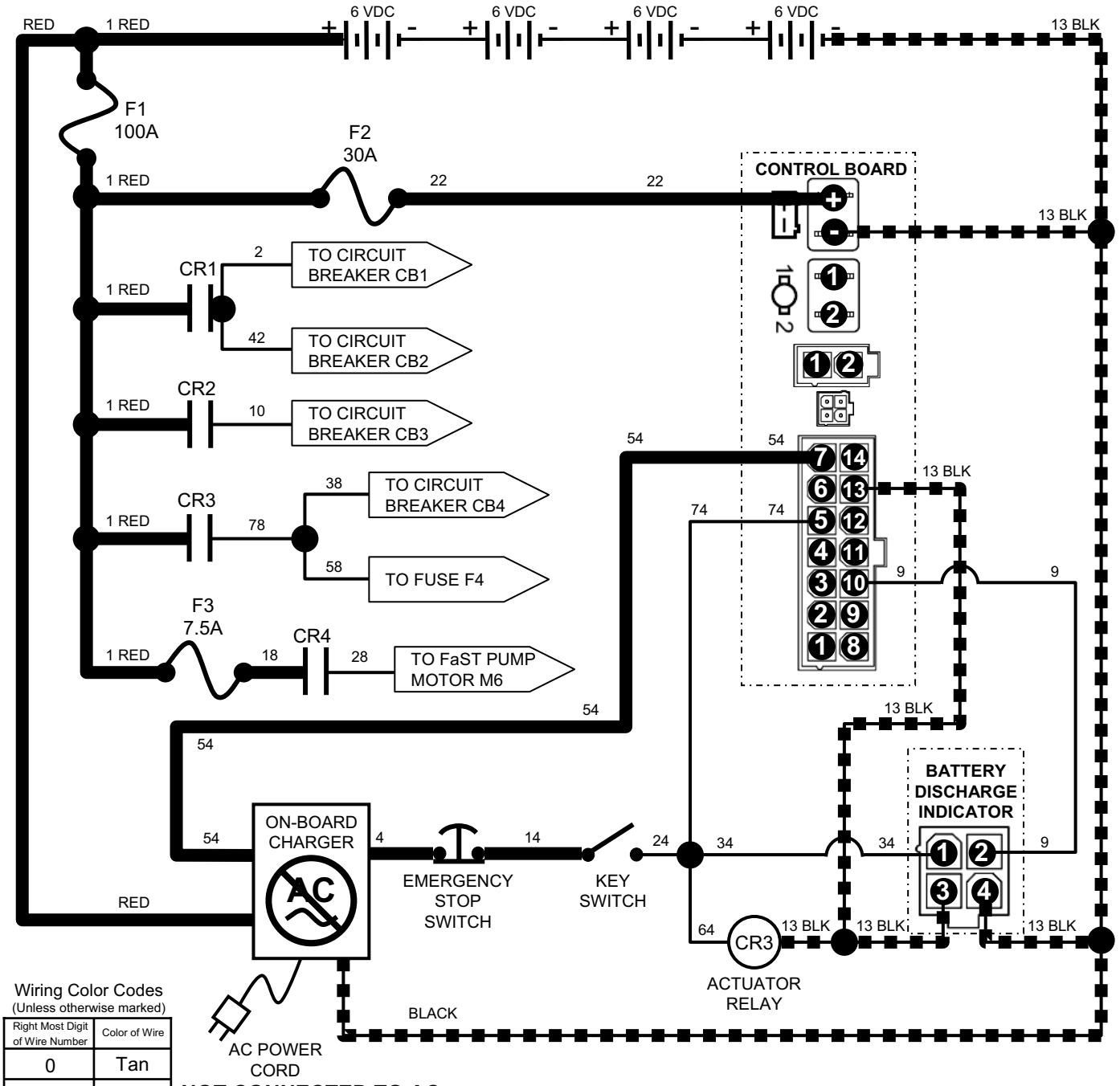
= Battery Positive or Logic High

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

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e - Key OFF Power Distribution (With Optional On-Board Battery Charger)

CONDITIONS: Key OFF, On-Board battery charger **NOT CONNECTED** to AC power




**NOT CONNECTED TO AC**

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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

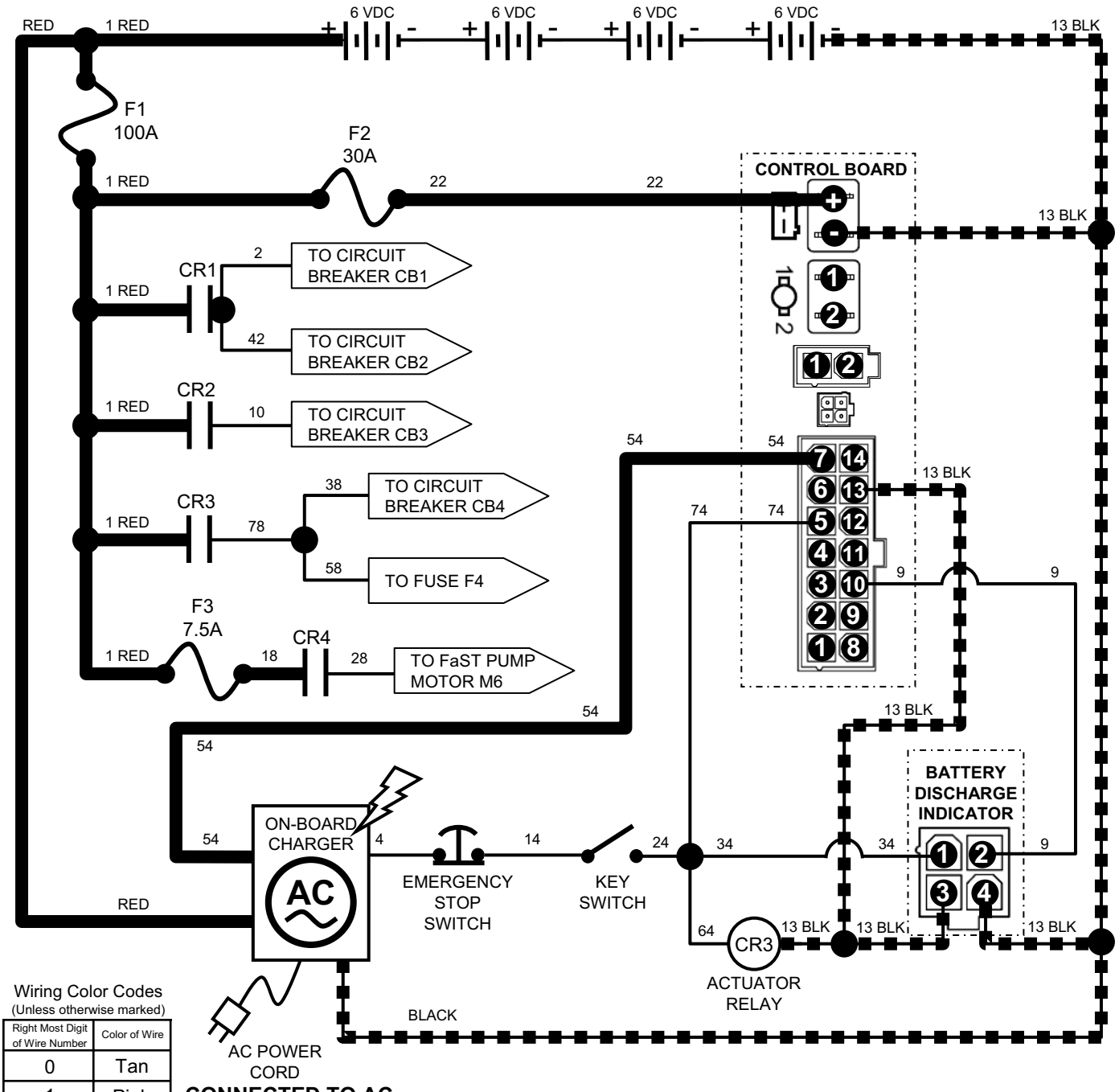
**Be cautious when working near Control Board -**
***Battery voltage is always present, even with Key OFF***

**The battery charger uses a normally closed relay to send a signal to the control board – the relay opens when the charger is plugged in to AC power**

**If On-Board Charger is connected to AC power, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e - Key OFF Power Distribution (With Optional On-Board Battery Charger)

CONDITIONS: Key OFF, On-Board battery charger **CONNECTED** to AC power




Wiring Color Codes
(Unless otherwise marked)

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|---|---|
| 0 | Tan |
| 1 | Pink |
| 2 | Brown |
| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

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

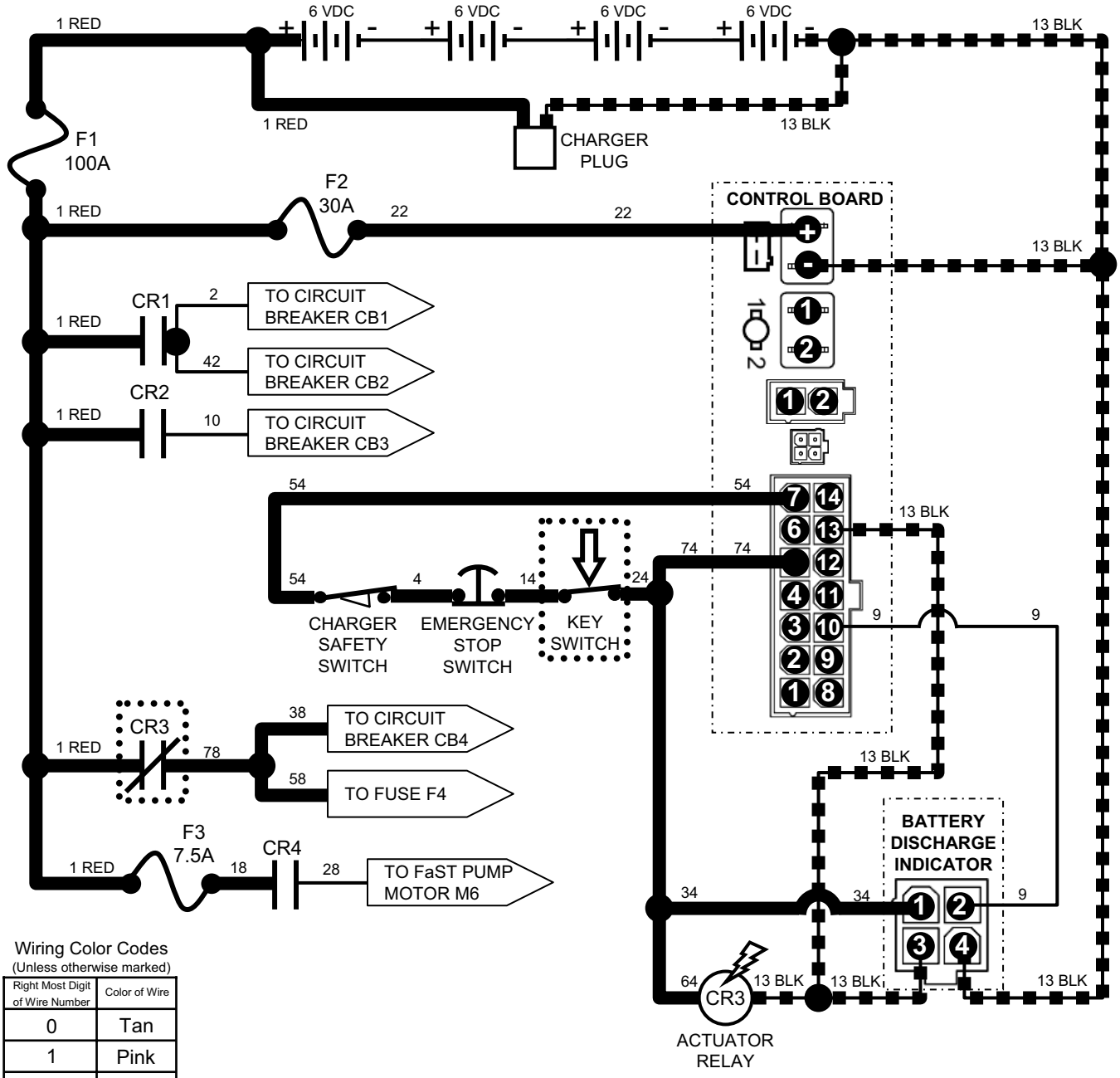
**The battery charger uses a normally closed relay to send a signal to the control board – the relay opens when the charger is plugged in to AC power**

**If On-Board Charger is connected to AC power, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e - Key ON Power Distribution

CONDITIONS: Key ON

**The troubleshooting information from this page forward applies to machines with On-Board or Off-Board Chargers unless otherwise noted**




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 |

= Battery Negative or Logic Ground

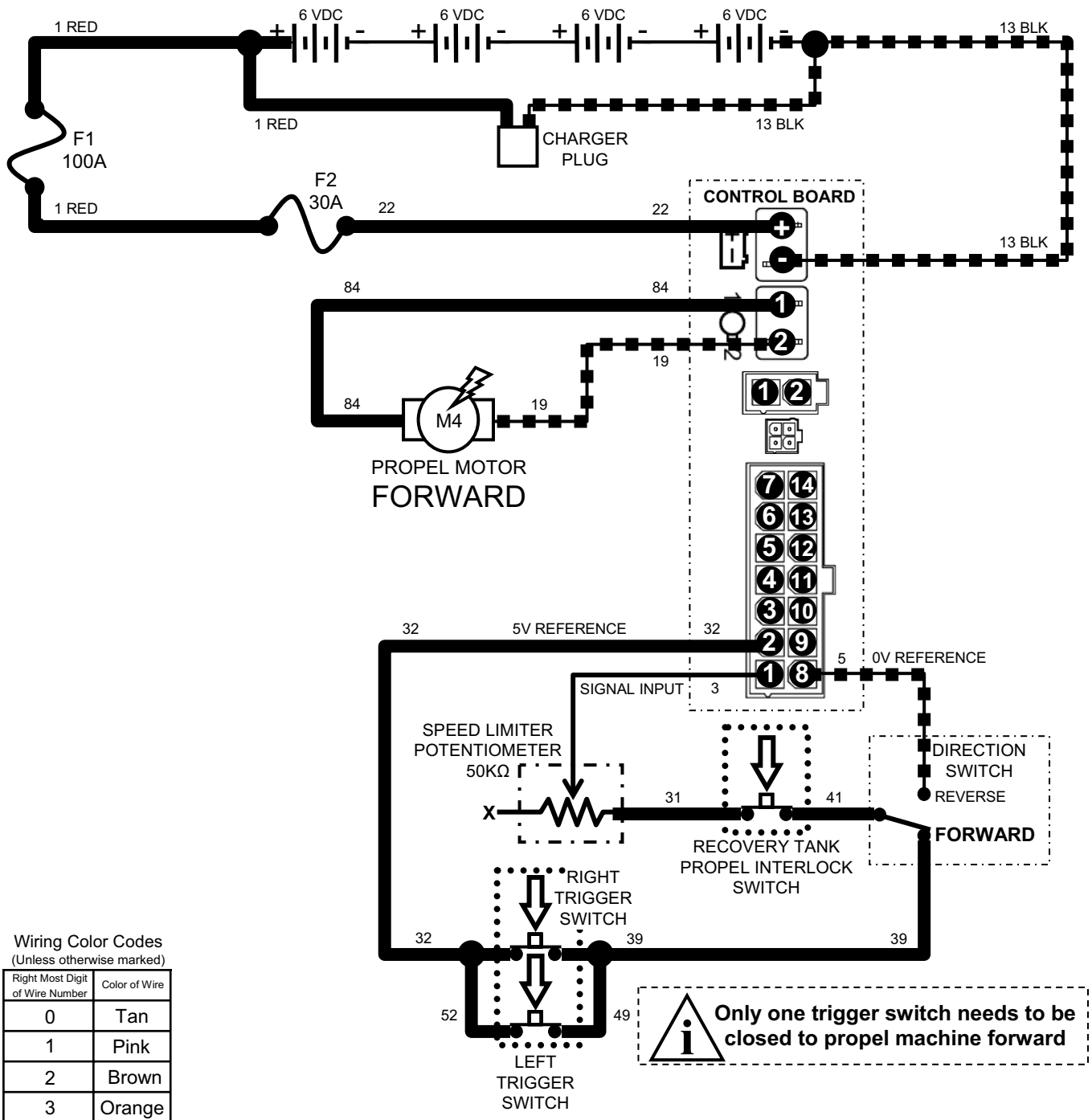
= Battery Positive or Logic High

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

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e – Propel Forward System

CONDITIONS: Key ON, forward propel engaged




Wiring Color Codes
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|---|---|
| 0 | Tan |
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| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

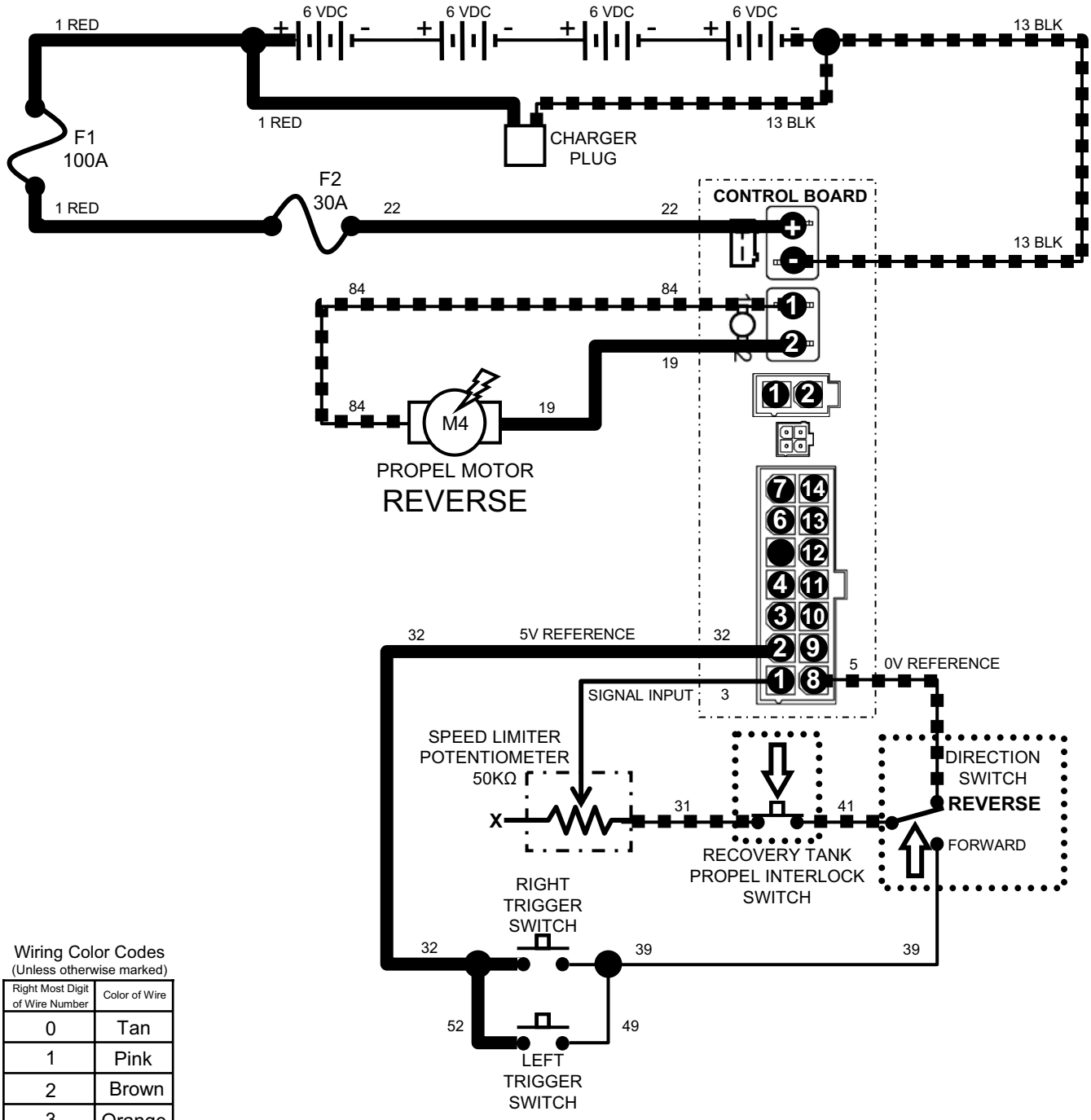
**Be cautious when working near Control Board -**
***Battery voltage is always present, even with Key OFF***

**The Propel Motor (M4) is controlled by PWM; A higher duty cycle will result in higher travel speed**

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e – Propel Reverse System

CONDITIONS: Key ON, reverse propel engaged




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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

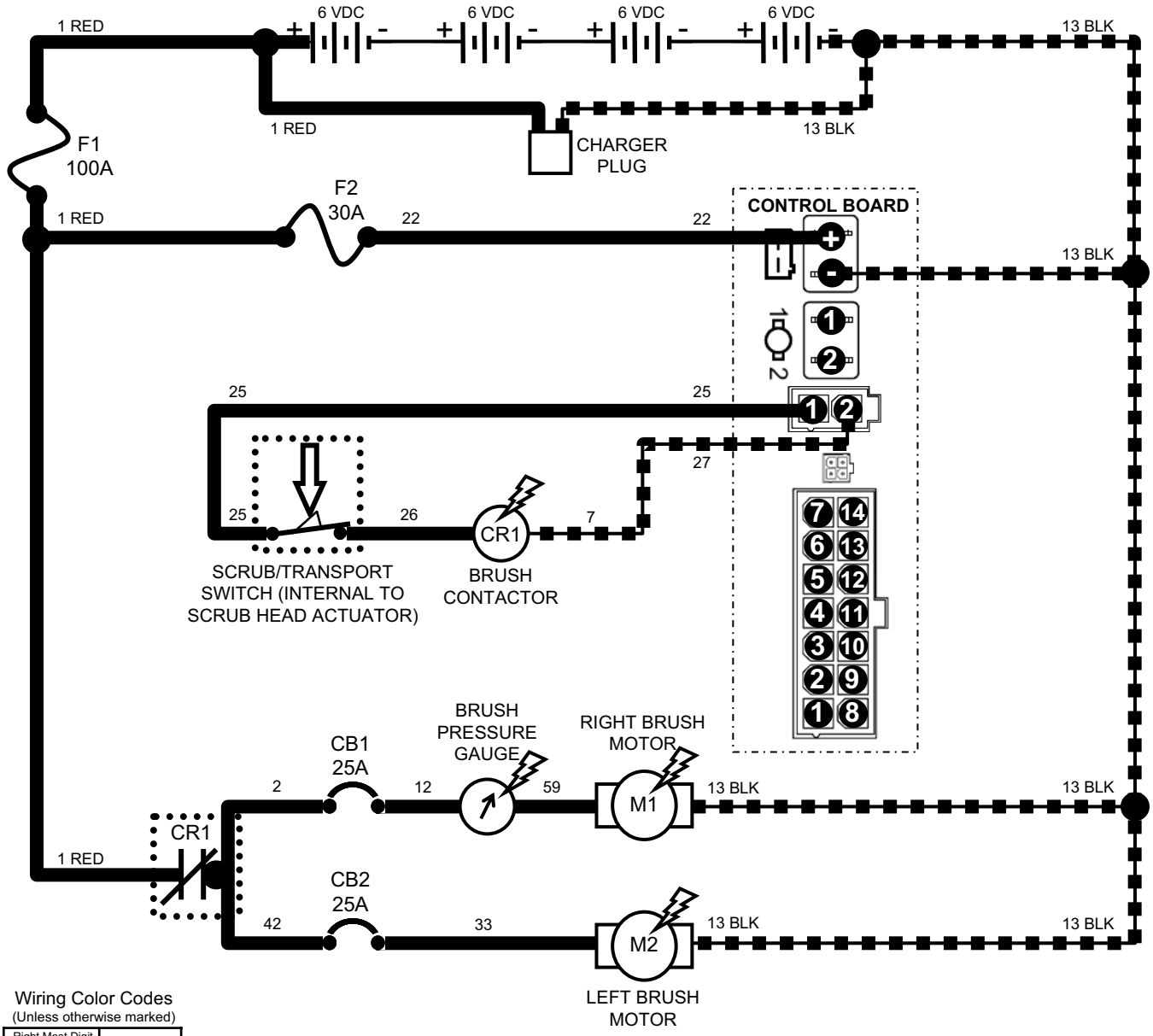
**Be cautious when working near Control Board -**
***Battery voltage is always present, even with Key OFF***

**The Propel Motor (M4) is controlled by PWM; A higher duty cycle will result in higher travel speed**

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e – Scrub Brushes

CONDITIONS: Key ON, Scrub Head lowered for cleaning, propel engaged




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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

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

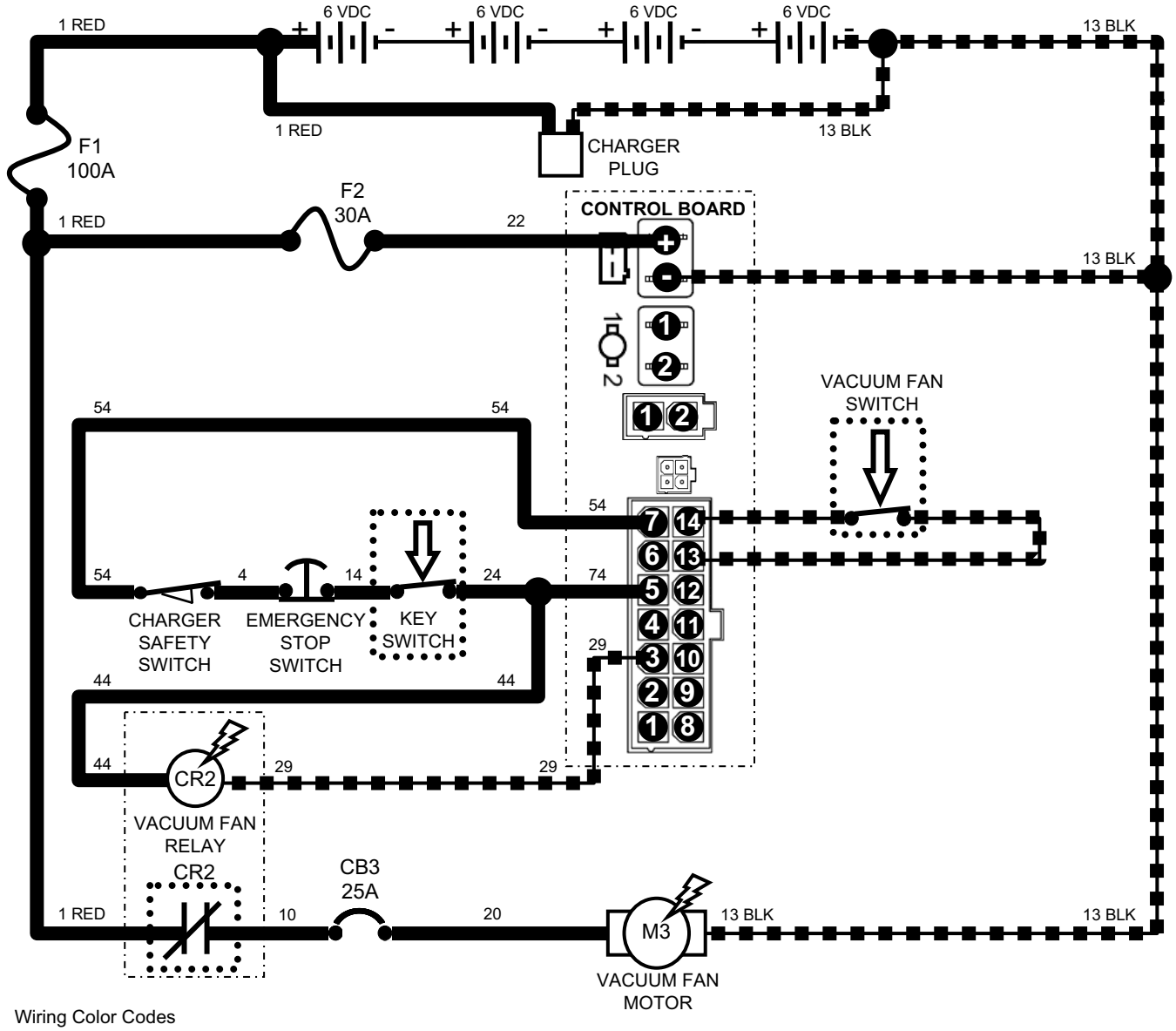
**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

**The Scrub/Transport Switch closes when the Scrub Head Actuator extends (lowers) 2" (50mm) or more**

**The Brush Pressure Gauge monitors current on the Right brush motor only**

# T5e – Vacuum Fan System

CONDITIONS: Key ON, Squeegee lowered




Wiring Color Codes
(Unless otherwise marked)

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|---|---|
| 0 | Tan |
| 1 | Pink |
| 2 | Brown |
| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

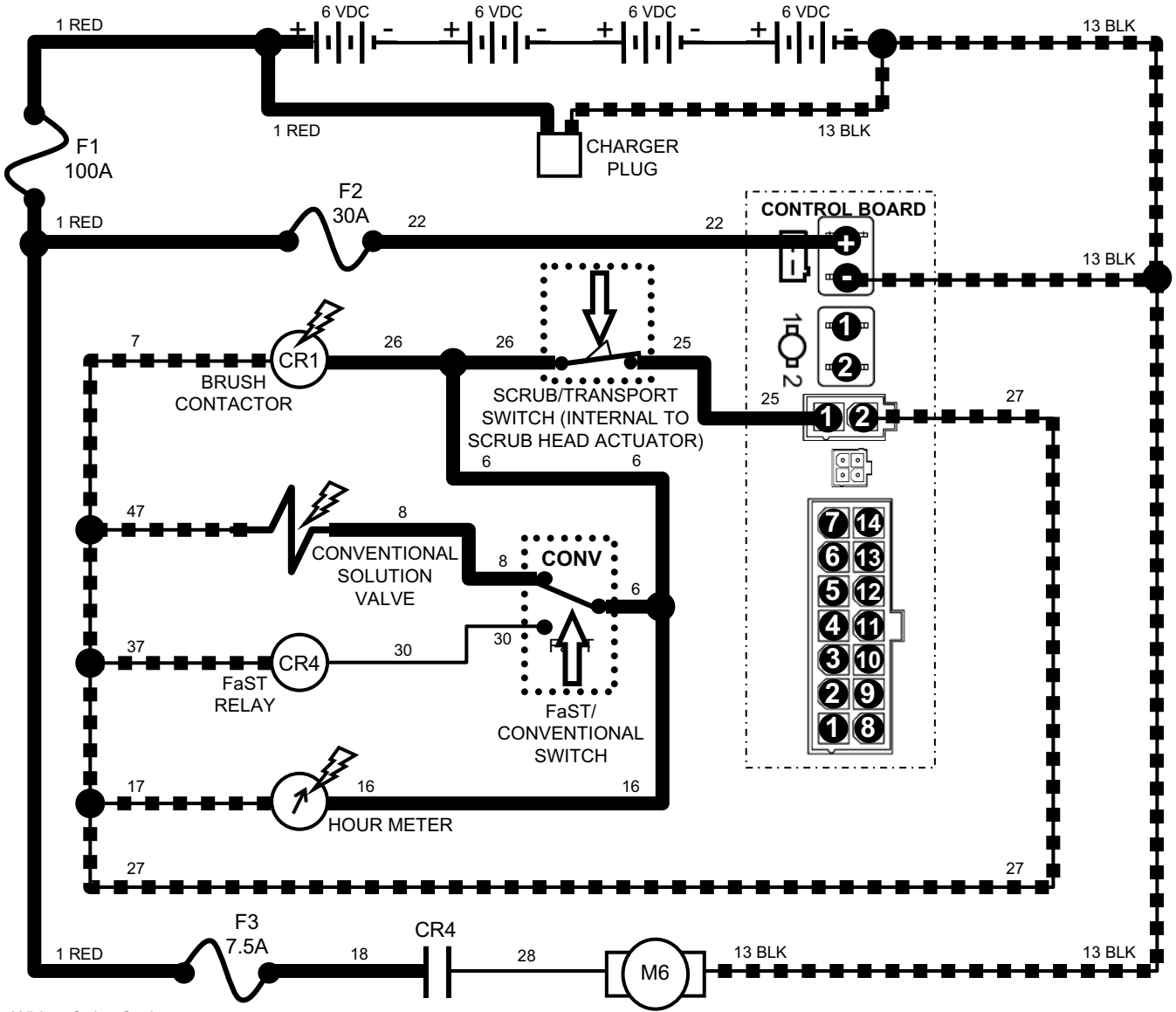
= Battery Positive or Logic High

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

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

# T5e – Conventional Solution Valve, Hour Meter

CONDITIONS: Key ON, scrub head lowered for cleaning, propel engaged, conventional scrub selected




Wiring Color Codes
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|---|---|
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| 1 | Pink |
| 2 | Brown |
| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

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

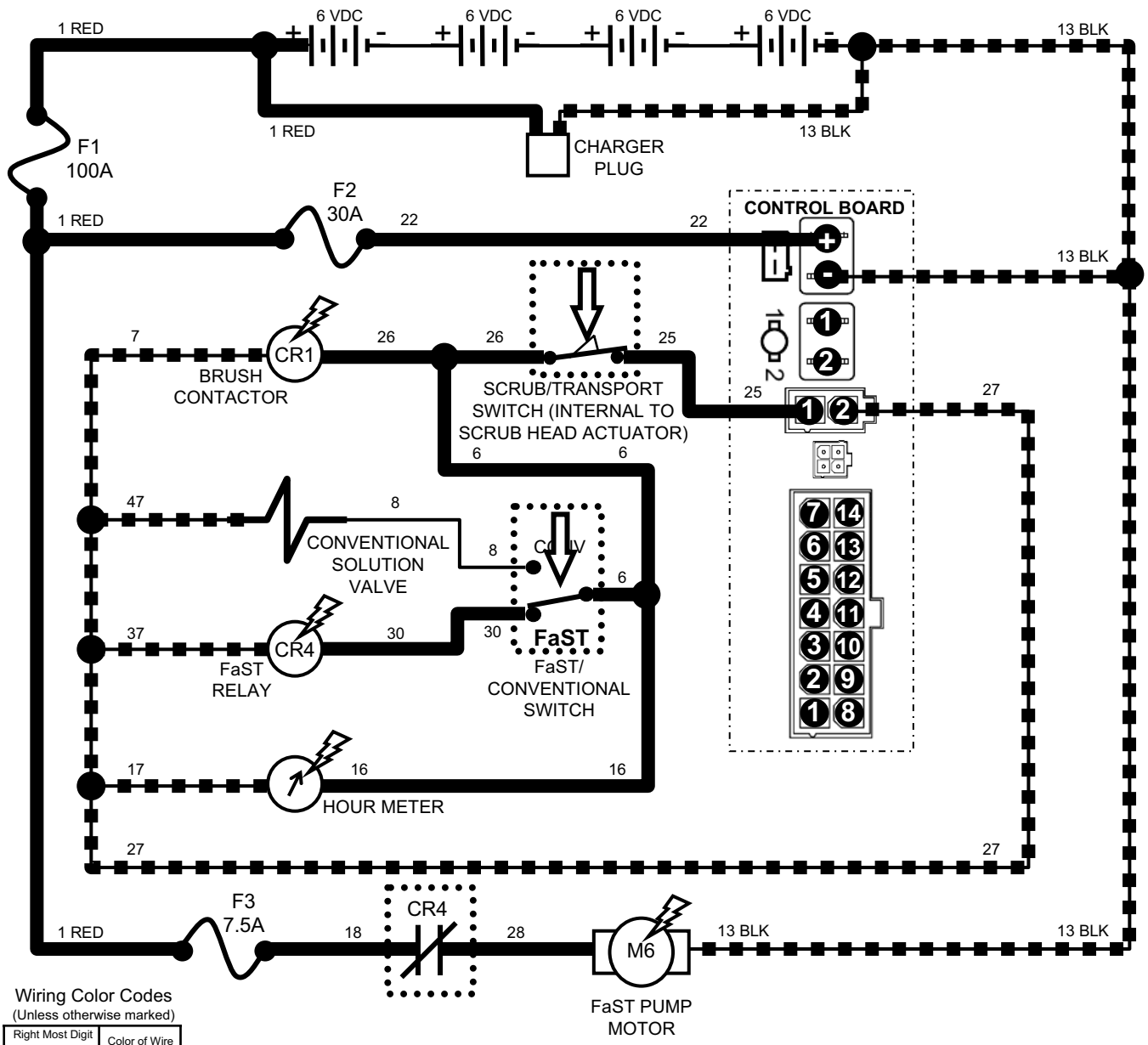
**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

**The Scrub/Transport Switch closes when the Scrub Head Actuator extends (lowers) 2" (50mm) or more**

**The Hour Meter is activated only when the Scrub Head is lowered, and propel is engaged**

# T5e – FaST Pump, Hour Meter

CONDITIONS: Key ON, scrub head lowered for cleaning, propel engaged, FaST scrub selected




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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

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

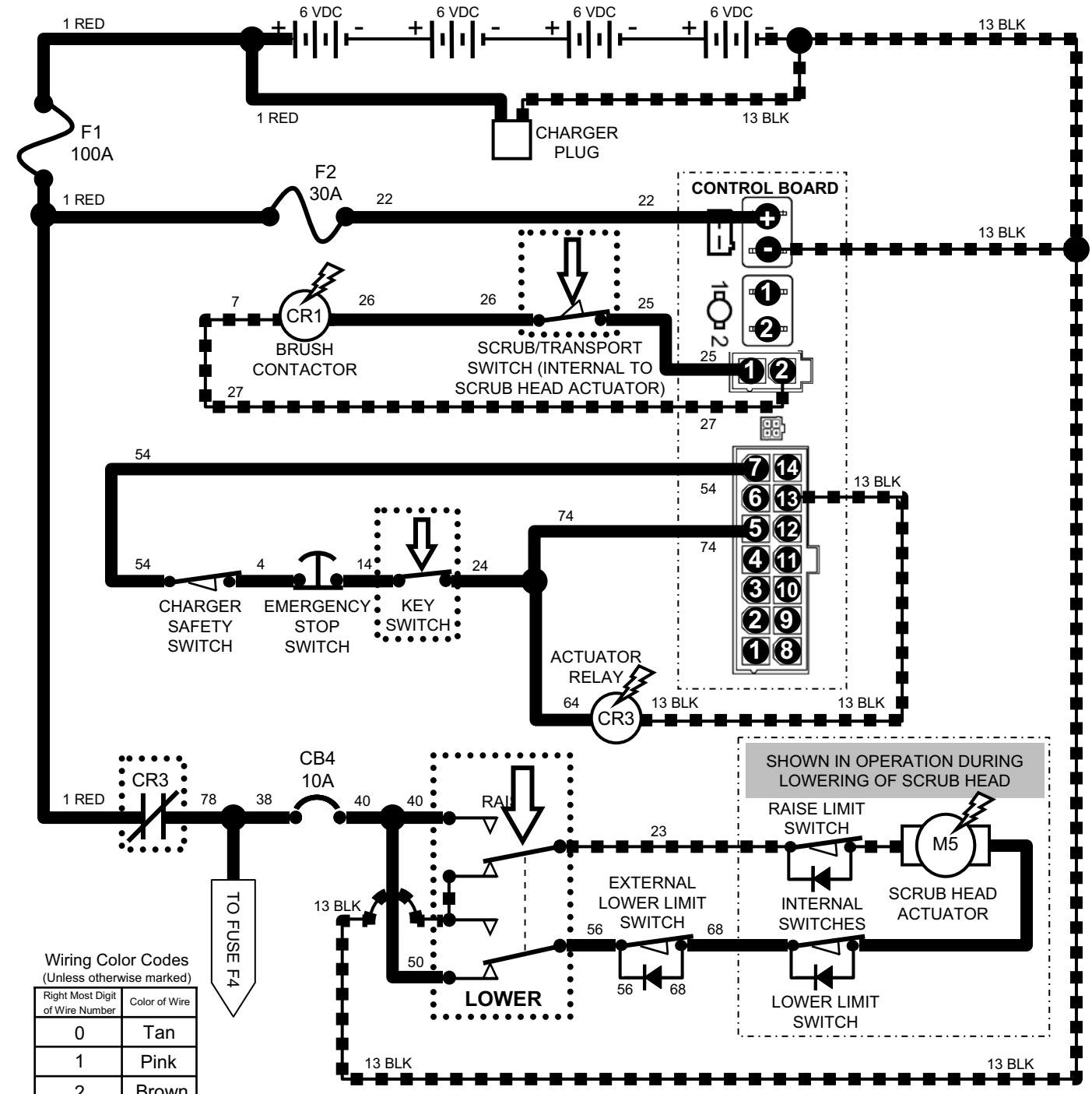
**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**

**The Scrub/Transport Switch closes when the Scrub Head Actuator extends (lowers) 2" (50mm) or more**

**The Hour Meter is activated only when the Scrub Head is lowered, and propel is engaged**

# T5e – Scrub Head Actuator LOWER (Extend)

CONDITIONS: Key ON, scrub head lower switch activated




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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

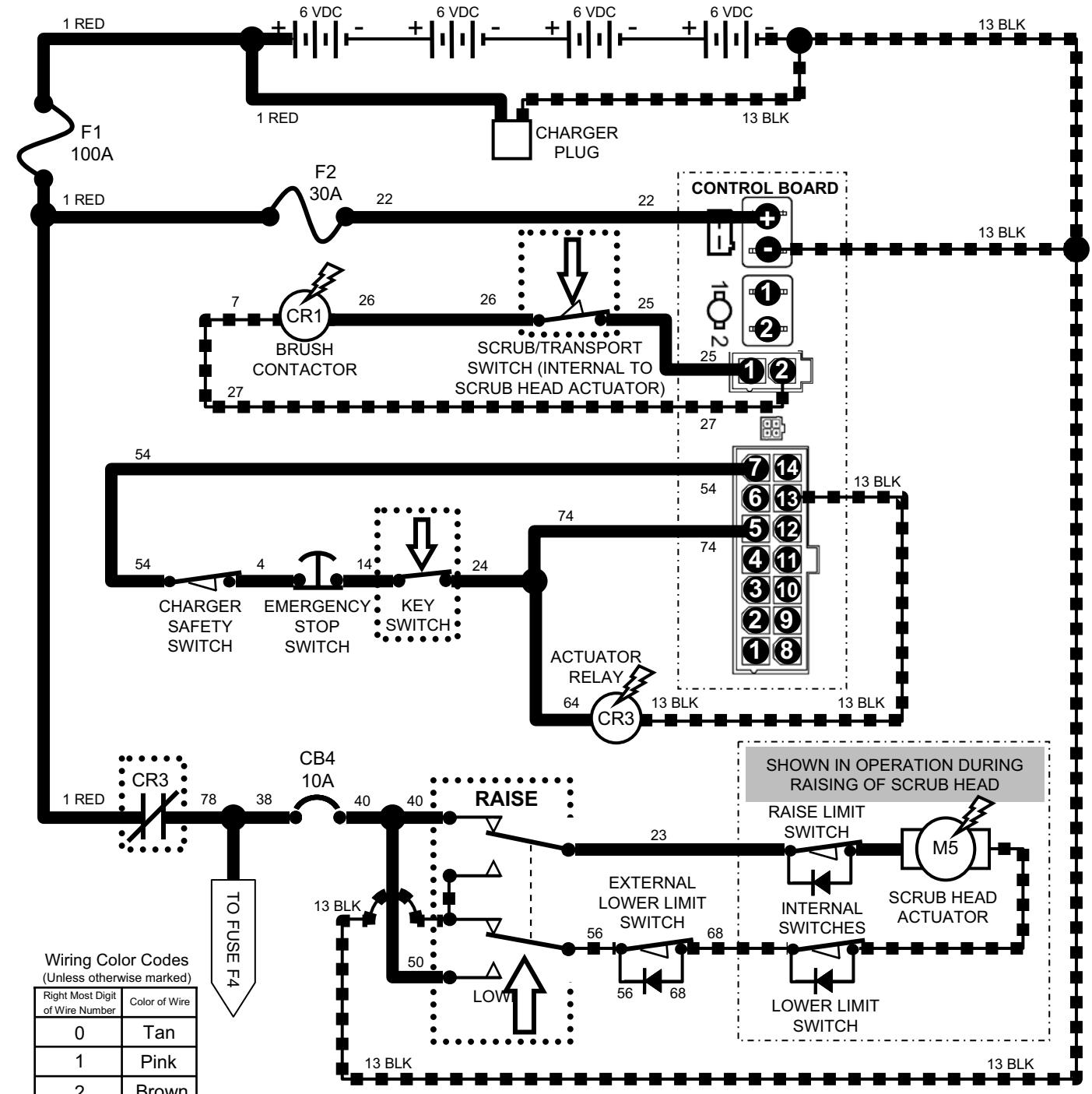
## Scrub Head Actuator Logic Chart

| condition \ switch | Internal Switches: Scrub/ Transport | Internal Switches: Raise Limit | Internal Switches: Lower Limit | External Switch: Lower Limit |
|---|---|---|---|---|
| Fully Retracted (UP) | OPEN | OPEN | CLOSED | CLOSED |
| Fully Extended (DOWN) | CLOSED | CLOSED | OPEN | OPEN |
| Retracting (RAISING) | * | CLOSED | CLOSED | CLOSED |
| Extending (LOWERING) | * | CLOSED | CLOSED | CLOSED |

* Scrub/Transport Switch closes when actuator is extended 2" (50mm) or more

# T5e – Scrub Head Actuator RAISE (Retract)

CONDITIONS: Key ON, scrub head raise switch activated




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 |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

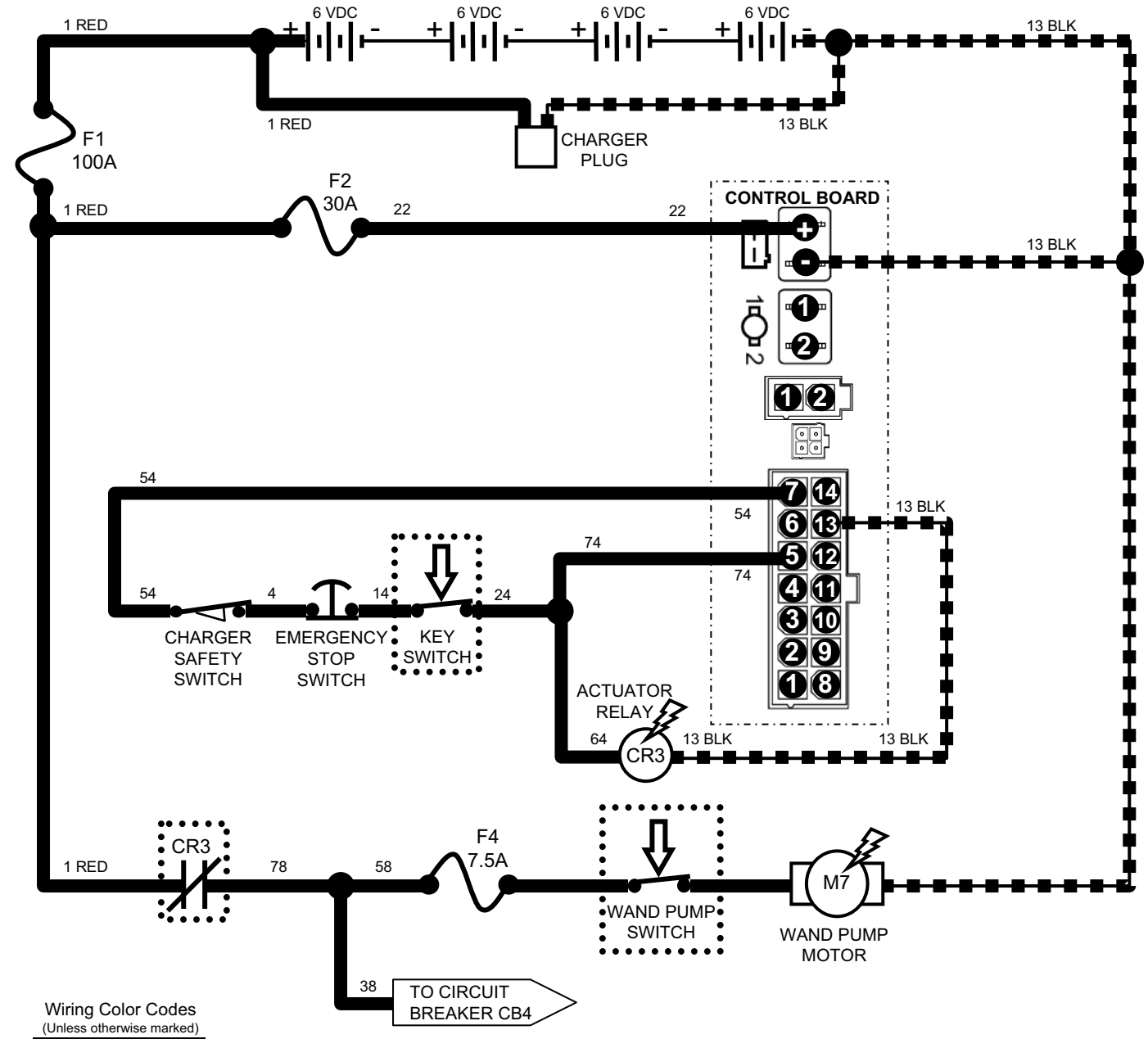
## Scrub Head Actuator Logic Chart

| condition \ switch | Internal Switches | | | External Switch |
|---|---|---|---|---|
| | Scrub/ Transport | Raise Limit | Lower Limit | Lower Limit |
| Fully Retracted (UP) | OPEN | OPEN | CLOSED | CLOSED |
| Fully Extended (DOWN) | CLOSED | CLOSED | OPEN | OPEN |
| Retracting (RAISING) | * | CLOSED | CLOSED | CLOSED |
| Extending (LOWERING) | * | CLOSED | CLOSED | CLOSED |

* Scrub/Transport Switch closes when actuator is extended 2" (50mm) or more

# T5e – Wand Pump

CONDITIONS: Key ON, wand pump switch ON




Wiring Color Codes
(Unless otherwise marked)

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| 1 | Pink |
| 2 | Brown |
| 3 | Orange |
| 4 | Yellow |
| 5 | Green |
| 6 | Blue |
| 7 | Purple |
| 8 | Gray |
| 9 | White |

= Battery Negative or Logic Ground

= Battery Positive or Logic High

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

**If Charger Plug is connected to battery charger, ALL machine functions will be disabled when Key Switch is turned ON**