Operation & Service Manual

MAX
Lane Machine

July 2022 / 14-900107-000

MAX Lane Machine Operation & Service Manual

Manual Part No. 14-900107-000

Notice: If available, updates to this manual can be found on-line at www.brunswickbowling.com.

Confidential proprietary information. All information contained in this document is subject to change without notice.

Brunswick Bowling Products
525 West Laketon Avenue
Muskegon, MI 49441-2601
U.S.A.

231.725.3300

CONTENTS

Section 1: SAFETY!

NOTES & WARNINGS

Throughout this publication, "Warnings", and "Cautions" (accompanied by one of the International HAZARD Symbols) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. They are defined below. OBSERVE AND READ THEM CAREFULLY!

These "Safety Alerts" alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, along with training and "Common Sense" operation, are major accident prevention measures.

NOTE or IMPORTANT!: Will designate significant informational notes.

WARNING! Will designate a mechanical or nonelectrical alert which could potentially cause personal injury or death.

WARNING! Will designate electrical alerts which could potentially cause personal injury or death.

CAUTION! Will designate an alert which could potentially cause product damage.

Will designate grounding alerts.

SAFETY NOTICE TO USERS OF THIS MANUAL

This manual has been written and published by the Service Department of Brunswick Bowling Products to aid the reader when servicing or installing the products described.

It is assumed that these personnel are familiar with, and have been trained in, the servicing or installation procedures of these products, which includes the use of common mechanic's hand tools and any special Brunswick or recommended tools from other suppliers.

We could not possibly know of and advise the reader of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not attempted any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by Brunswick, must first completely satisfy himself that neither his nor the product's safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

It should be kept in mind, while working on the product, that the electrical system is capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the power to the product should be disconnected prior to servicing and remain disconnected until servicing is complete.

GENERAL SAFETY PRECAUTIONS

In addition to the warnings and cautions provided within the manual, you should understand and follow these general principles for safe machine operation.

CAUTION! Do not operate with an extension cord or power cord other than the one provided with this machine.

WARNING! Get a partner to help in lifting and lowering to avoid back injury. Take care when lifting or lowering this machine into transport position. Use proper lifting and lowering techniques. Make sure to bend at the knees and use a back support, if needed.

WARNING! Be sure the building's power supply provides properly grounded receptacles and the correct voltage and amps for this machine: 115V, 20A or 230V, 15A service.

WARNING! Do not attempt to make any wiring modifications.

CAUTION! Replace fuses with those of the same specifications listed in the wiring diagram in the Appendix of this manual.

CAUTION! Use only cleaners and conditioners intended for use with this machine.

WARNING! Do not allow fluid to enter the electrical enclosure or come in contact with electrical components.

CAUTION! Do not pour cleaner into the conditioner tank, turn off machine immediately and remove and clean thoroughly. Refer to Section 6 of this manual.

WARNING! Always undertake maintenance operations away from the approach to avoid spilling liquids on the approach and clean up any drips or spills immediately.

CAUTION! Manage the power cord so that it does not get trapped under the lane machine. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

WARNING! Never use any batteries, other than the type supplied with the machine or other options authorized by Brunswick. Mixing battery types or using batteries that are different from what is supplied with the machine may damage the machine and cause serious injury or death to the operator. Use of alternate batteries, power supplies or chargers will void the machine warranty.

1. This product is intended only for use in commercial bowling centers and by a trained operator.

2. Do not attempt to undertake any maintenance or service for which you are not qualified.

3. Contact your Brunswick Sales or Service Representative if you are interested in receiving training.

4. Do not overfill tanks.

5. Be sure all components are dry before supplying power to the machine.

6. If you need assistance, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com

7. This product should only be operated in 40°F to 105°F (5°C to 40°C) ambient air temperature, in relative humidity not exceeding 50%, and at altitudes up to 6560 feet (2000 m) above mean sea level.

8. Transportation and storage temperatures should not exceed -10°F to 130°F (-25°C to +55°C) and should not exceed 160°F (70°C) for more than 24 hours.

9. This machine is designed and manufactured to provide many years of dependable service. Industry experience and common sense are important factors to ensure optimal reliability.

10. Lane machine waste will generally be considered nonhazardous, consisting of lane oils, lane cleaners, and environmental dust/debris. It is understood that the machine owner, and their staff, bear complete responsibility to ensure lane machine waste is properly collected, and disposed of in compliance with local, state, and federal waste disposal laws. Brunswick recommends reaching out to your local waste management authority to coordinate consistent pickups of lane maintenance waste. It should NOT be dumped into a septic tank or sanitary sewer system.

GROUNDING

This Class I, Single-Phase lane cleaning/conditioning machine must be grounded while in use to protect the operator from electric shock. The machine is provided with a three-conductor cord and a three-contact grounding-type attachment plug to fit the proper grounding-type receptacle. The GREEN/YELLOW conductor in the cord is the grounding wire. Never connect this wire to any other terminal than the grounding pin of the attachment plug.

A 15 Amp, 120-Volt nominal AC input grounding plug is supplied on the power cords as shown in the *Figure 1-1.* Make sure that the machine is connected to an outlet having the same configuration as this plug when your center is supplied with 120-Volt nominal AC, single phase power.

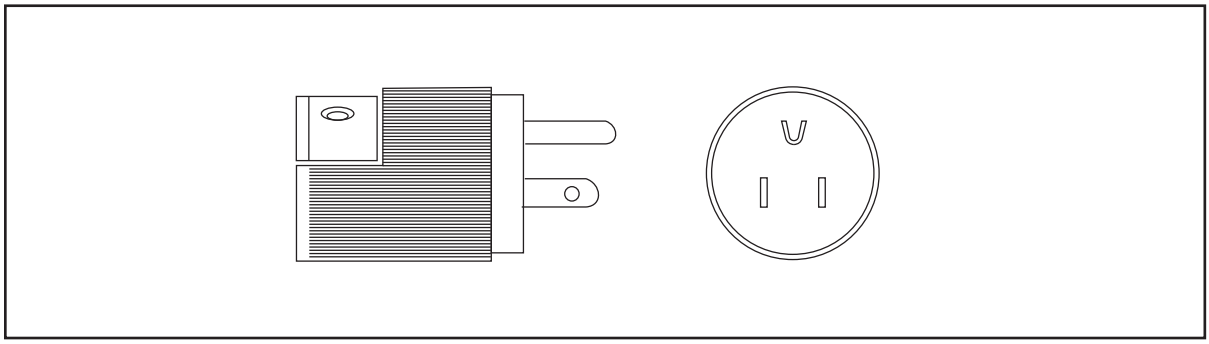

Figure 1-1

A 16 Amp, 230-Volt nominal AC input grounding Schuko type plug is supplied on the power cord for international MAX shipments as shown in *Figure 1-2*. If you need to replace this plug or use an adapter, make sure that the black wire is connected to the "line" terminal, the white wire is connected to the "neutral" terminal and the green wire is connected to the "ground" terminal.

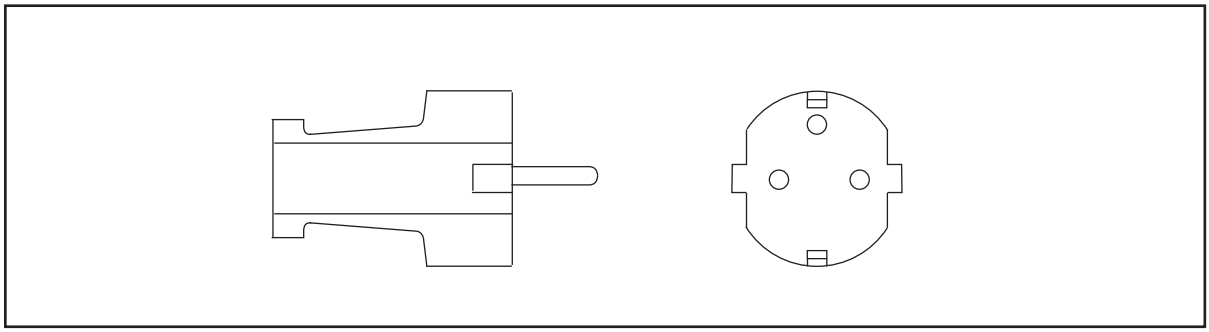

Figure 1-2

MACHINE DECALS

Daily Maintenance (reorder part number 14-100472-000), Serial Number, Cautions (reorder part number 14-100146-000), Charger Connections (reorder part number 14-101954-000) and BTS/Warranty Contact (reorder part number 14-100425-000) decals are located on the lane machine as shown in *Figures 1-3 and 1-4.* Please make sure that you understand and are familiar with the instructions on these decals before operating or servicing this lane machine. If you need assistance or replacement decals, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com.

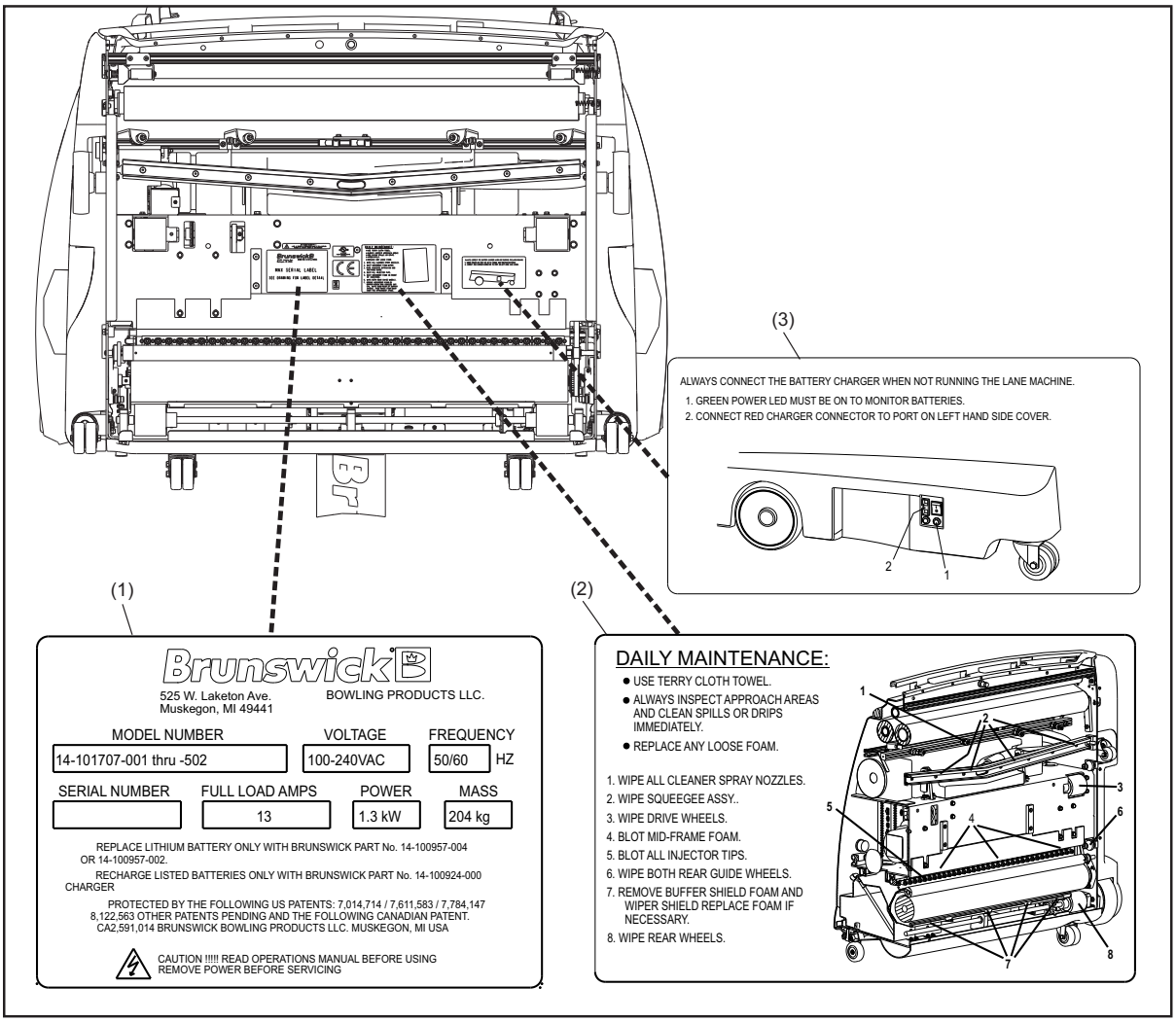

Figure 1-3. Serial Number and Daily Maintenance Decal Locations

(1) SERIAL # DECAL

(2) DAILY MAINTENANCE DECAL (REORDER PART NUMBER 14-100472-000)

(3) CHARGER CONNECTION DECAL (REORDER PART NUMBER 14-100954-000)

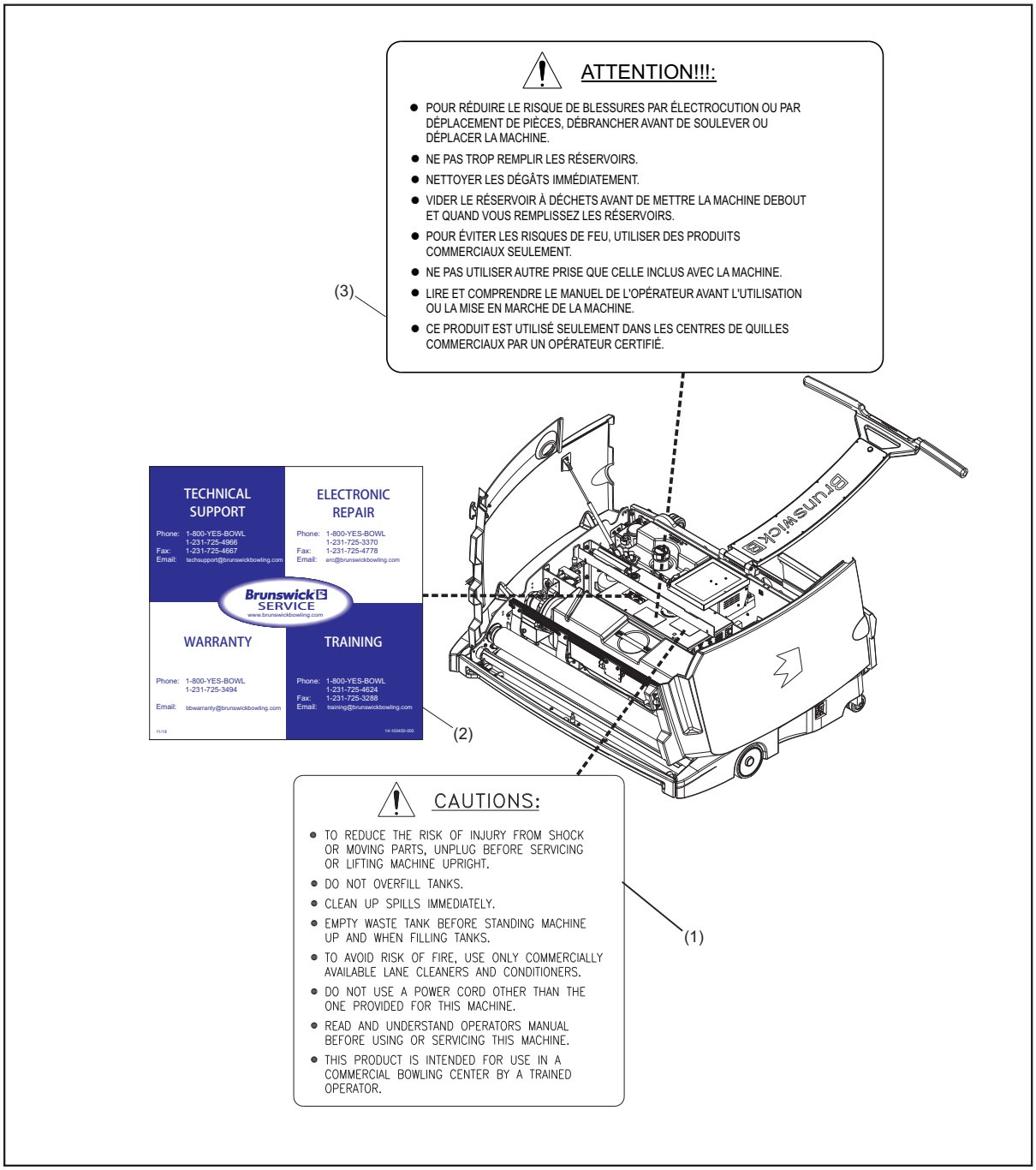

Figure 1-4. Caution & Support Decal Locations

(1) CAUTION DECAL (REORDER PART NUMBER 14-100146-000)

(2) BTS/WARRANTY CONTACT DECAL (REORDER PART NUMBER 14-100425-000)

(3) CAUTION DECAL - FRENCH (REORDER PART NUMBER 14-100552-000)

TABLET MESSAGES AND WARNINGS

There are no user serviceable items inside the Tablet Interface. Messages and warnings are displayed on the tablet to indicate issues or problems with the lane machine. Refer to the Troubleshooting section of this manual for details regarding these messages and warnings.

If you need assistance, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966.
For non-emergency support, e-mail techsupport@brunwickbowling.com.

Section 2: Getting to Know the MAX

Before you get started you should understand the basic parts and processes of the machine. This section gives you a general introduction to the machine, its design, and how it works. Illustrations identify important parts and systems and provide references to better understand the machine.

For purposes of orientation and reference, unless stated otherwise, when this manual refers to areas on the machine, it will be assumed the machine is in the operating position, as viewed by the operator at the foul line. Refer to *Figure 2-1.*

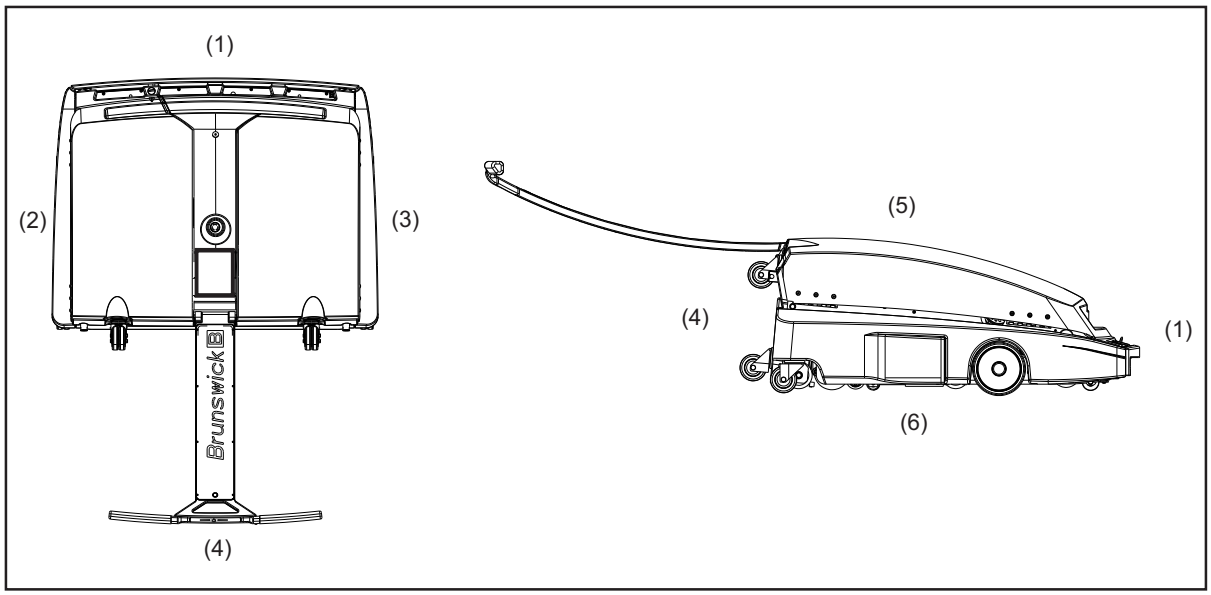

Figure 2-1. Machine Orientation

(1) FRONT
(2) 7 PIN OR LEFT SIDE
(3) 10 PIN OR RIGHT SIDE
(4) REAR
(5) TOP
(6) BOTTOM

In this section you will find:

1. Machine Specifications
2. An introduction to the machine's features
3. A visual guide to the machine:
   a. In operating position (Top View)
   b. In transport position (Bottom View)
   c. Tablet Interface
   d. Handle controls

MACHINE SPECIFICATIONS

Dimensions

Refer to *Figure 2-2.*

Crate Dimensions: 85” x 48” x 26” (2.16 m x 1.22 m x .66 m)
Machine Dimensions: 57” x 45” x 18” (1.45 m x 1.14 m x .46 m)

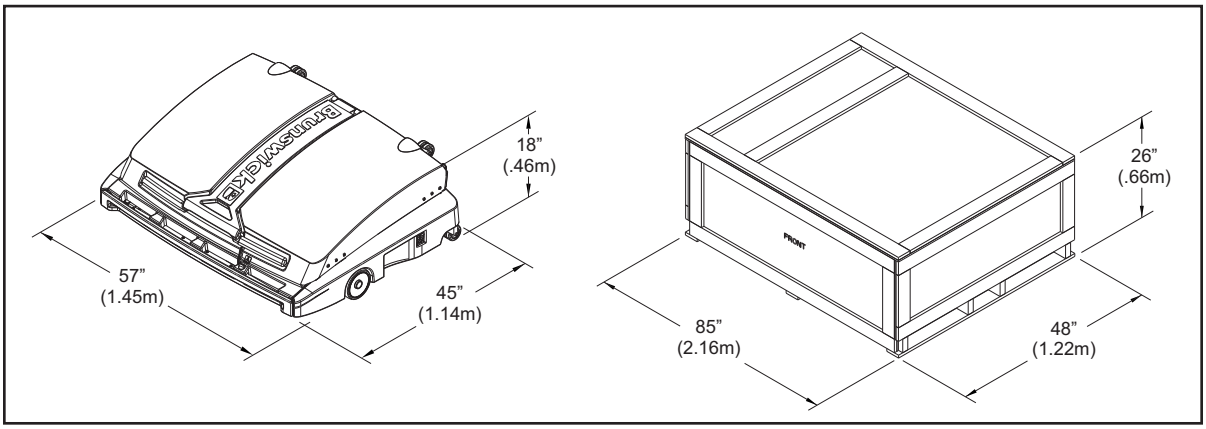

Figure 2-2. Crate & Machine Dimensions

Weights

Crate, Machine, Power Cord, Charger, Spare Parts Kit: 500-600 lbs (227-272 kg)
Machine Weight w/ Power Supply: 375 lbs. (170 kg)
Power Supply w/ Lithium Battery: 400 lbs. (181 kg)

Capacities

Cleaner Tank Capacity: 2.5 gal. = 320 fl. oz. (9.46 l = 9464 ml) up to 40 lanes
Conditioner Tank Capacity: 1.6 qt.. = 51 fl. oz. (1.51 l = 1508 ml) up to 60 lanes
Waste Tank Capacity: 2.5 gal. = 320 fl. oz. (9.46 l = 9464 ml) up to 40 lanes

Transport/Storage Position

Some maintenance procedures are performed with the machine in "transport position," with the machine upright, its underside exposed, and resting on its transport casters. Refer to *Figure 2-3.*

WARNING! Always unplug AC power cord from the machine before servicing or lifting machine into transport position. Never supply AC power to machine when it is in transport position. Note: It is OK to connect DC power from battery charger in transport position.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

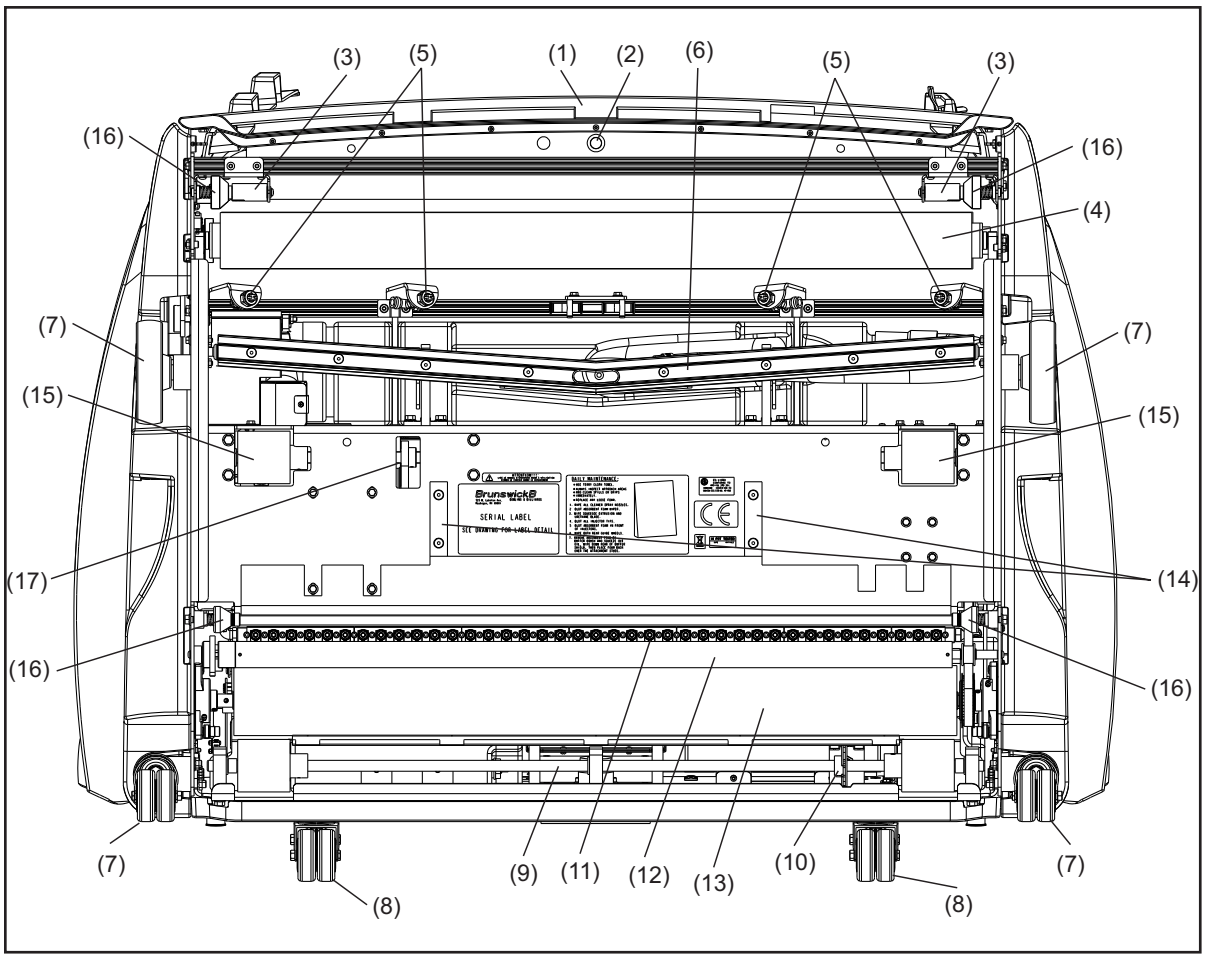

Figure 2-3. Transport Position

(1) FRONT HANDLE/BUMPER
(2) END-OF-LANE SENSOR
(3) TRANSITION ROLLERS
(4) DUSTER CONTACT ROLLER
(5) CLEANER SPRAY NOZZLES
(6) VACUUM SQUEEGEE HEAD
(7) LANE TO LANE WHEELS
(8) TRANSPORT CASTERS ASSEMBLY
(9) REAR SHAFT ASSEMBLY
(10) DISTANCE ENCODER
(11) CONDITIONER INJECTORS
(12) DISPERSION ROLLER
(13) BUFFER BRUSH
(14) SKID PLATES
(15) TRACTION DRIVE WHEELS
(16) GUIDE ROLLERS
(17) DISTANCE ENCODER (SECONDARY)

Operating Position

Most maintenance operations are made with the machine in “operating position” with the covers open. Refer to *Figure 2-4*.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

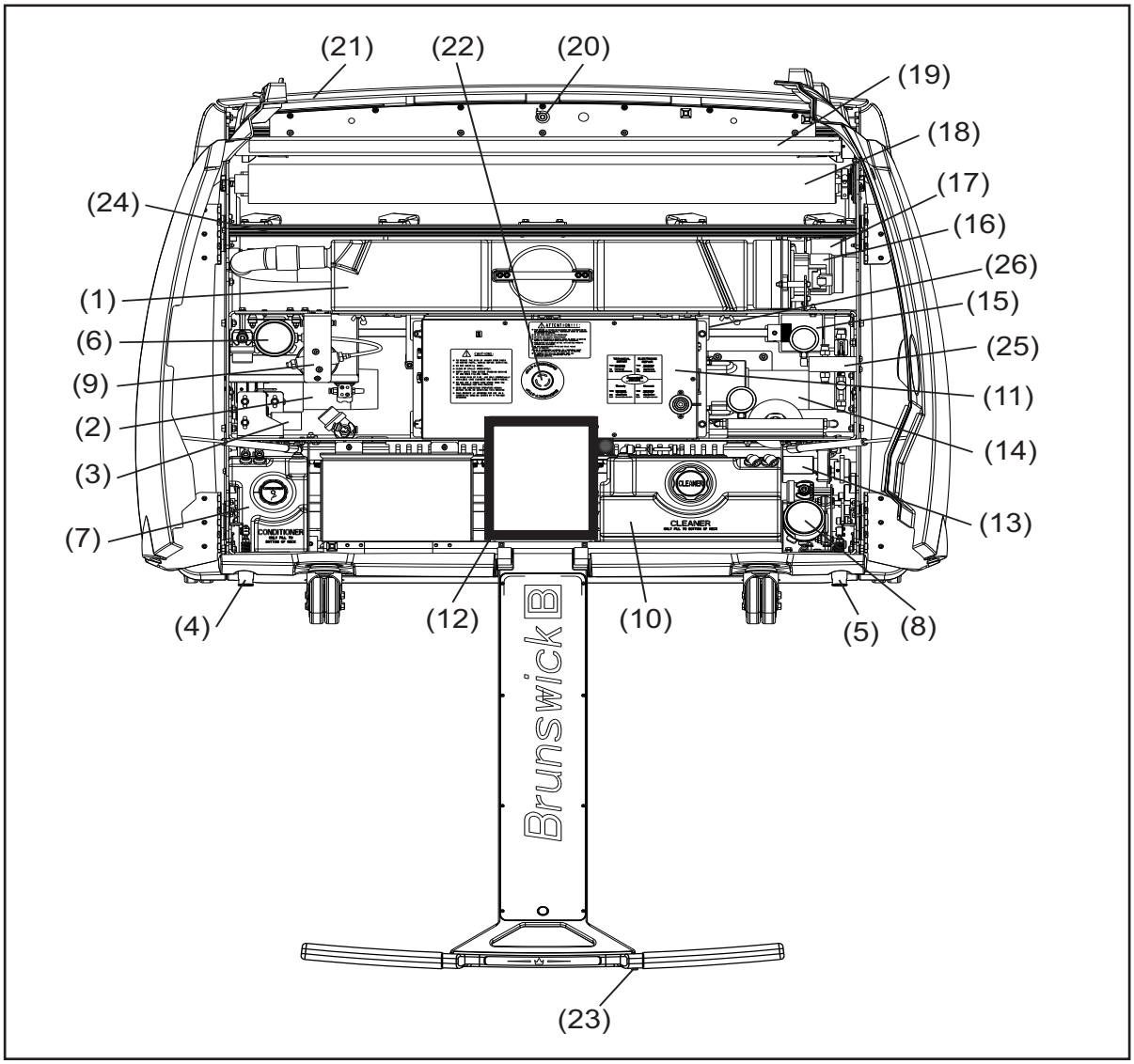

Figure 2-4. Operating Position

(1) WASTE RECOVERY TANK
(2) BUFFER DRIVE MOTOR
(3) BUFFER LIFTING MOTOR
(4) LEFT CORD KILL ASSEMBLY
(5) RIGHT CORD KILL ASSEMBLY
(6) CONDITIONER PUMP
(7) CONDITIONER SUPPLY TANK
(8) CLEANER PUMP
(9) CONDITIONER SPIN-ON
(10) CLEANER SUPPLY TANK
(11) ELECTRONICS ENCLOSURE
(12) USER INTERFACE (TABLET)
(13) DISPERSION ROLLER MOTOR
(14) TRACTION DRIVE MOTOR
(15) TRACTION WHEELS
(16) VACUUM MOTOR ASSEMBLY
(17) DUSTER CLOTH MOTOR
(18) DUSTER CLOTH SUPPLY ROLL
(19) DUSTER CLOTH TAKE UP ROLL
(20) END-OF-LANE SENSOR
(21) FRONT HANDLE/BUMPER
(22) EMERGENCY SHUT OFF SWITCH
(23) START BUTTON
(24) CLEANER RAIL ASSEMBLY
(25) CLEANER MANIFOLD
(26) DISTANCE ENCODER (SECONDARY)

MACHINE FEATURES

The MAX is designed to make lane care easy, reliable, and customized for the needs of individual bowling centers.

1. **Direct + injector technology.** We have leveraged the technology of Mercury Marine to develop a patented injection system with unprecedented precision. Thirty-nine injectors (one for each board) are independently controlled to deliver precise amounts of conditioner directly to the lane surface. Oil output is measured in industry-standard "units of oil calculations."
2. **Powerful and rugged tablet.** The MAX utilizes a powerful 10.4 inch full color industrial tablet that monitors operations, tells you when the machine needs maintenance, and uses ***predictive analytics*** to monitor the machines performance. It lets you customize just about every aspect of operation – from daily schedules, to cleaner patterns, to conditioner volumes and more. The tablet interface is deliberately simple to use and understand, without extensive training or instruction.
3. **Backup power options.** The MAX gives you the ability to switch between a Lithium battery or the AC/DC Power supply to operate the machine. The MAX uses a smart charger system to maintain battery life and performance. The MAX comes with a 125 ft. power cable and is quick to setup. The tablet software monitors the charge and documents the charge cycle. A buzzer will alert you if the machine is not charging after use.
4. **Superior pattern control.** The MAX comes pre-programmed with high-performance conditioner patterns that can be graphically displayed and easily customized. Paired with the Brunswick Pattern Manager-MAX software it is easy to create your own pattern library and transfer patterns to the machine as well as make backups of the machines log files and data.
5. **Easy maintenance.** Daily maintenance only takes a matter of a few minutes after each use of the machine. The MAX tablet will also track and inform you when additional maintenance is required.

New Features

1. **Durable top covers.** The MAX has dent and crack resistant top covers that are easy to maintain. Scratches will not be noticeable as the color is throughout the entire thickness of the covers.
2. **Handle controls.** The MAX uses a single, durable start button to start the preparation and the operation of the machine..
3. **Tablet Interface.** The MAX utilizes a 10.4 inch Android based tablet, making the operation of the machine more simple and much faster. Pattern downloads take less than 7 seconds. The tablet is WIFI enabled giving you multiple options from receiving automatic updates and downloading unlimited patterns to sending logging files. Connect and share information in the runswick Cloud.
4. **ARM electronic enclosure.** Rugged relays and circuit breaker connections. A new 32-bit ARM processor for faster processing. The design allows the machine to charge regardless if the power is ON or OFF.
5. **Patented conditioner contamination alarm.** The MAX will detect if water or cleaner is poured into the conditioner tank and prevent the user from operating the machine until the contamination is cleared from the supply tank. A message will display with the error information.
6. **Simple squeegee adjustment.** The design of the squeegee lifting assembly makes the overall adjustment easier. We have included a new squeegee adjustment tool that ensures the squeegee contact is correct on the lane surface.
7. **Fail-safe travel system.** The MAX utilizes two (2) distance counters to improve the consistency of the travel speed. A sensor may be bypassed in the event one would fail.
8. **Cleaner pressure sensor.** A pressure sensor in the cleaner manifold will monitor cleaner spray pressure and will generate an error message if the spray pressure is outside of tolerances.
9. **Strong and fast duster motor.** The MAX uses a robust motor that has steel gears resulting in more cycles of the motor.
10. **Predictive Analytics.** A feature that tracks the lanes per stop and will warn you of potential issues before they become serious.
11. **Blue AC power LED.** The LED is used to identify when the lane machine is running on AC power rather than a DC battery.
12. **Brunswick Cloud.** Offers you the ability to search for software updates, patterns to use in your machine, and share logging files for support purposes

MAX Tablet Interface

The Tablet lets you monitor the machine's operation while you use it. It also alerts you to maintenance needs, tells you about past service records, gives access to conditioning programs, and much more. Refer to *Figure 2-5.*

***NOTE**: For detailed information on using the Tablet, see Section 4: "*Understanding the Tablet Interface".

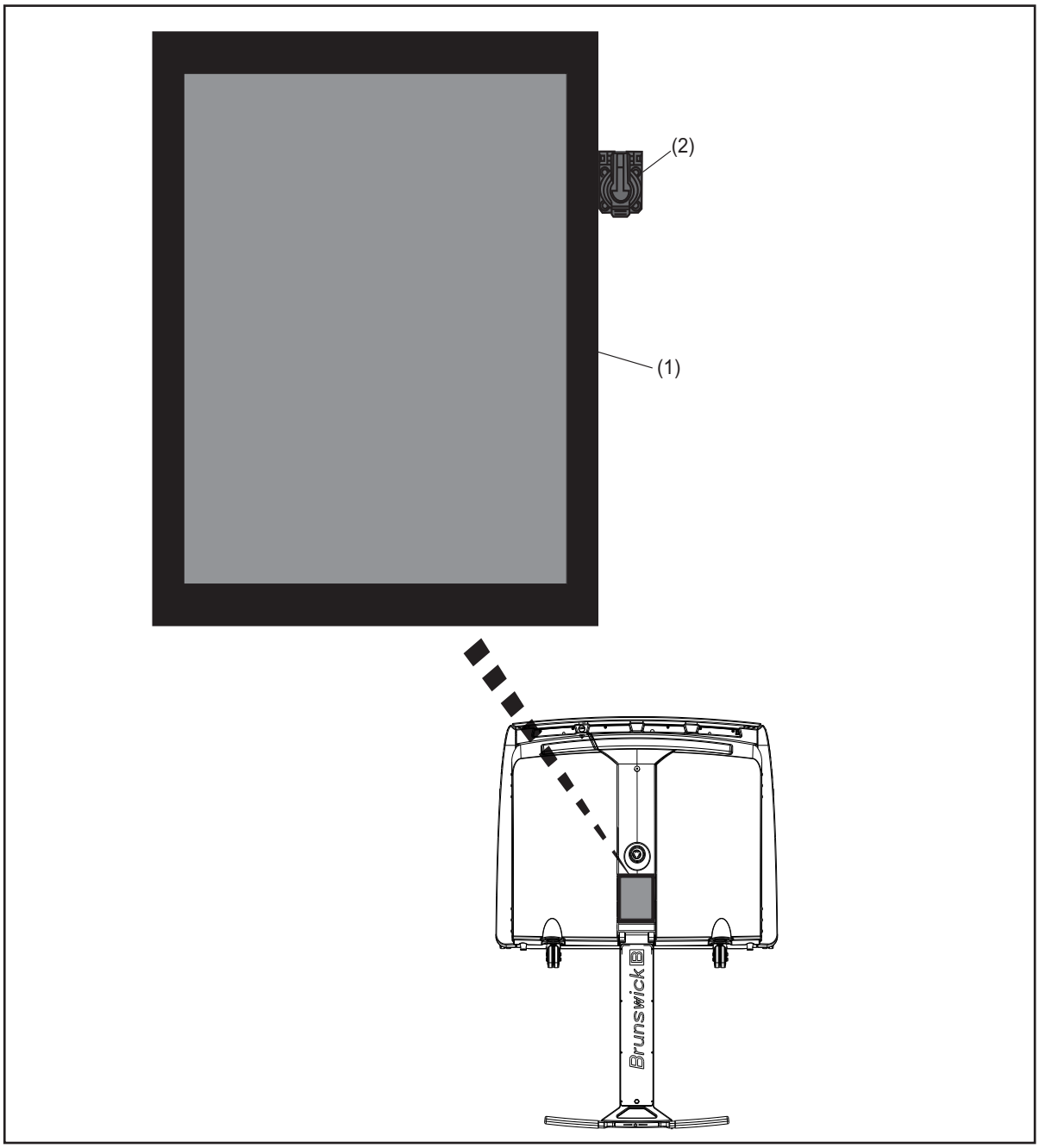

Figure 2-5. Tablet Interface

(1) TABLET INTERFACE (2) USB CONNECTION

Handle Controls

All of the machine's operations can be controlled using the control pad on the machine's handle. By putting the machine functions on the handle, we reduce stooping, kneeling and bending and allow more healthful operation of the machine. Refer to *Figure 2-6*.

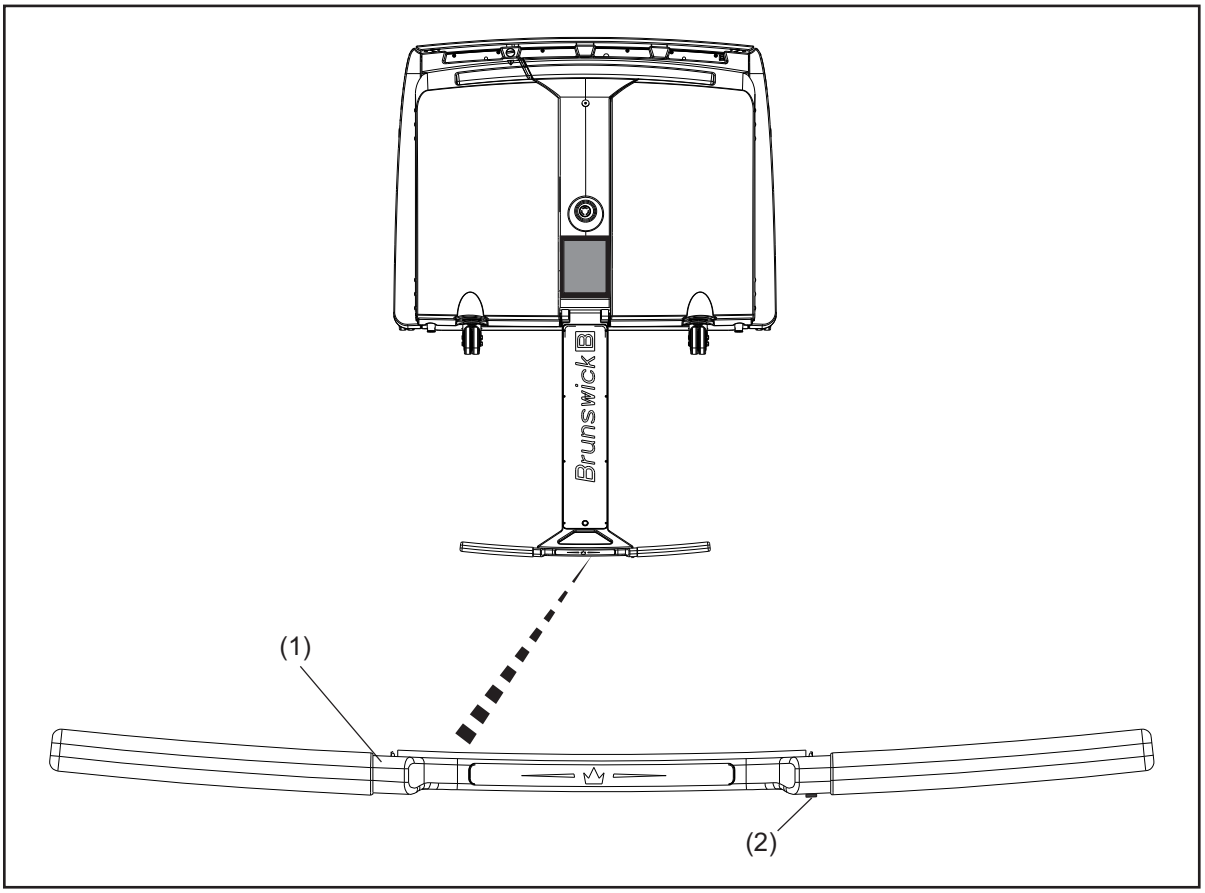

Figure 2-6. Handle Controls

(1) OPERATOR HANDLE

(2) START BUTTON

Section 3: MAX Power System

This section is to inform the customer how to properly maintain the battery to achieve maximum life. Follow the information closely to avoid any issues and to prevent damage to the battery.

BATTERY

The MAX contains a single, custom, 24 volt lithium battery equipped with an internal battery management system to protect the cells and ensure proper balance between cells. The large capacity battery is capable of running 60 lanes per charge, and is expected to achieve 1460 charge/discharge cycles. This is equal to running 60 lanes per charge, once a day for 4 years or twice a day for 2 years.

The power cable of the lithium battery is connected to the electrical enclosure.

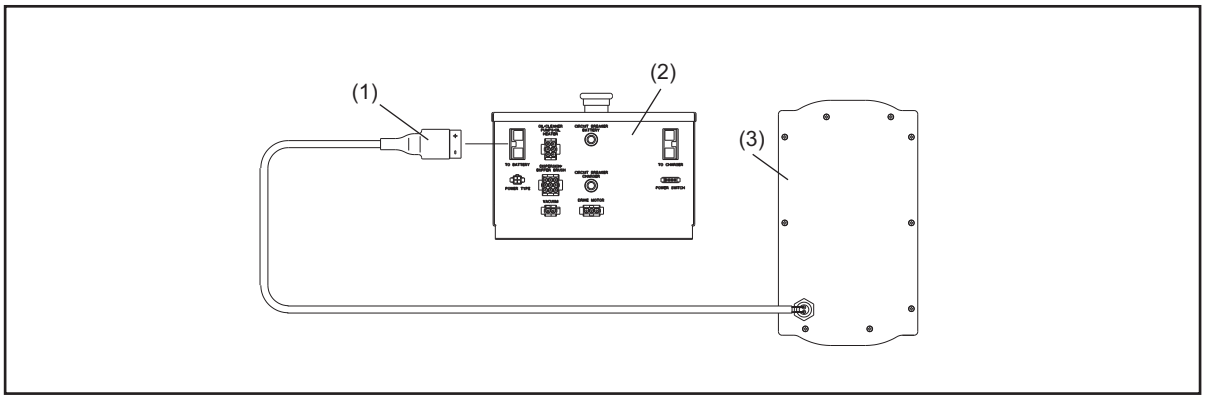

Figure 3-2. Lithium Battery

(1) LITHIUM POWER CABLE (2) ELECTRONIC ENCLOSURE (3) LITHIUM BATTERY

BATTERY CHARGER

The ProNautic 2420P charger is supplied with the proper 115/230VAC input power cord and 24VDC output power cord already attached. The charger should also be preset for the type of battery included in your MAX lane machine. The lithium battery should be preset to the Custom Profile with charging and auto-maintain voltages set to 28.6 vdc. Call Brunswick Technical Service or your installing distributor if your charger is not set to these proper settings for the type of battery in your MAX.

It is best to install the charger onto a wall within 8’ (2.438 m) of a power outlet that is not being used to power other equipment. The AC power cord has an in-line On/Off power switch to allow you to turn the power off BEFORE disconnecting or reconnecting the DC output cable from the charge port of the MAX. The DC output cable should then be reconnected to the charge port of the MAX BEFORE turning the AC power back on to the charger. This sequence assures that the charger always starts with the proper mode necessary for the state of battery discharge.

CHARGING SYSTEM

The MAX Lithium battery is intended to have the power remain ON at all times in order to monitor the performance and charging of the batteries. However, the battery will charge if the machine is powered OFF.

A power switch and two indicator lights are located on the left hand side cover to display proper operation. Refer to *Figure 3-2*. The Green "Power" LED should be ON to indicate that it is ready for operation or charging. The most common causes for Green 'POWER' LED being OFF include:

- Emergency Stop switch being depressed – Twist to pop up/ON
- Power Switch (on LH Side Cover) being OFF – Press switch to ON
- Battery Cable being disconnected from Electrical Enclosure – Open top cover to reconnect

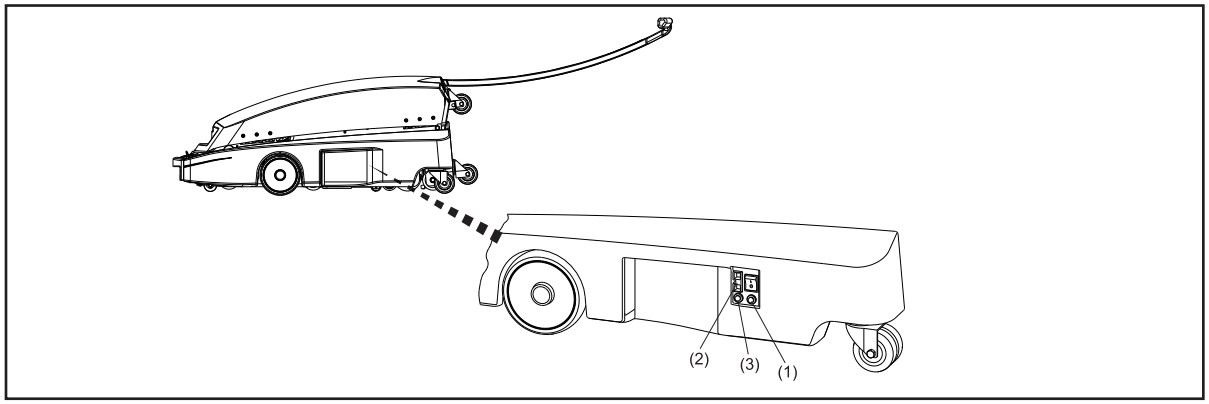

Figure 3-2. Battery Charger Connections

(1) GREEN POWER LED MUST BE ON TO CHARGE AND MONITOR BATTERIES

(2) CONNECT RED CHARGER CONNECTOR TO PORT ON LEFT HAND SIDE COVER

(3) BLUE LED WILL ILLUMINATE ONLY WHEN USING AC POWER CABLE

Remember, always connect the battery charger to MAX lane machine when not running lanes:

- The MAX green 'POWER' LED must be on to monitor charging
- Connect the RED Charger Connection to the port on the LH cover BEFORE plugging the battery charger into the proper AC input power
- The battery charger is designed to remain connected to the MAX Lane Machine whenever not running the lane machine. It will keep the battery in optimal condition and will not overcharge it.
- Leaving the lane machine on for any extended time without connecting the battery charger will slowly discharge the battery and reduce its capacity.

Make sure that the battery charger is positioned so it has adequate clearance to allow air circulation by the cooling fan. Disconnect the AC Input Power before disconnecting the DC Output. Detailed operating instructions are supplied with the battery charger. Refer to *Figure 3-2*.

NOTE: *Always properly recycle your batteries by returning to an authorized recycling center.*

WARNING! Never use any batteries, other than the type supplied with the machine or other options authorized by Brunswick. Use of alternate batteries, power supplies or chargers will void the machine warranty.

AC/DC POWER SUPPLY

All versions of the MAX utilize an AC/DC power supply which is designed to be operated with an AC power cable. It also provides a level of back up protection if the batteries fail to recharged after use or hold a charge as they end their life cycle. When purchased, the MAX AC/DC Power Supply is installed below the electrical enclosure before the lane machine is shipped.

Perform the following steps to switch to using the AC/DC Power Supply. Refer to *Figure 3-3.*

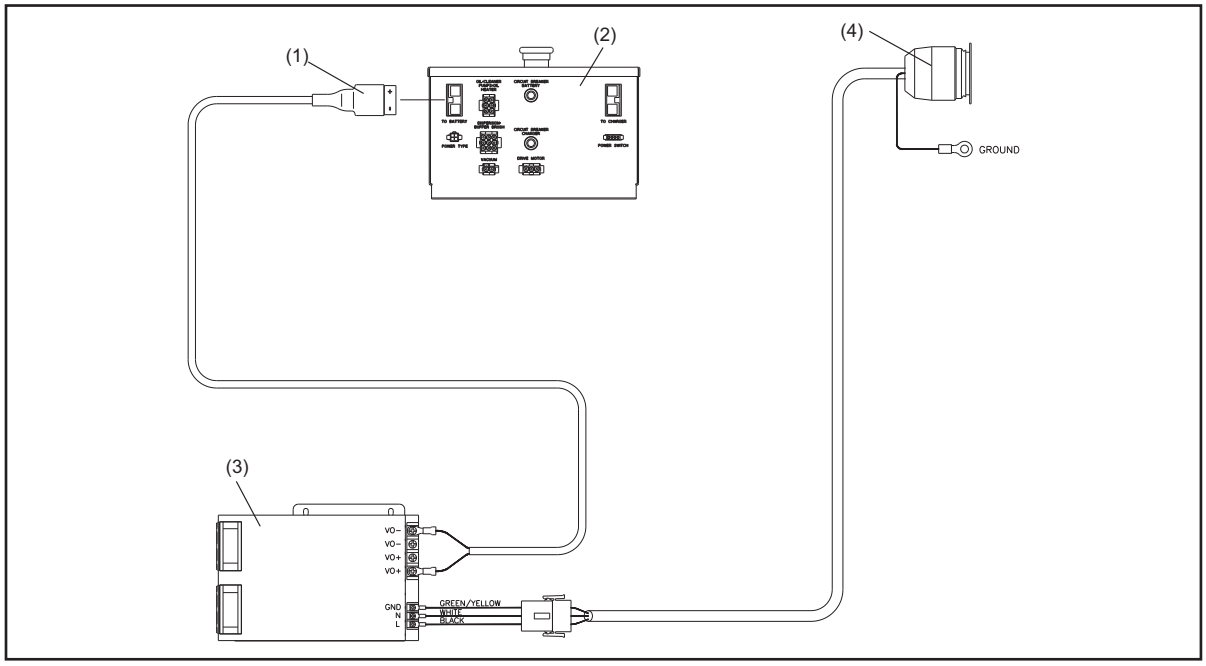

Figure 3-3. AC/DC Power Supply

(1) AC/DC POWER CABLE
(2) ELECTRONIC ENCLOSURE
(3) AC/DC POWER SUPPLY
(4) TWIST LOCK ON REAR COVER

Internal Connections

1. Disconnect the Lithium Battery power cable from the electrical enclosure connection labeled "To Battery".
2. Locate the red AC/DC Power Supply, 24VDC power cable connector. (The cable is usually coiled just under the left side of the electrical enclosure).
3. Connect the AC/DC Power Supply cable to the "To Battery" connector on the electrical enclosure. (The opposite end of the AC/DC Power Supply is already connected to the Twist-Lock connector on the rear cover.)

External Connections

4. Connect the Twist-Lock end of the supplied 125' power cord into the matching connector in the rear cover.
5. Place the power cord ring into the Cord Kill assembly.
6. Connect the other end of the 125' cable into a grounded power supply with 100-240VAC, 50/60 Hz.

The MAX machine should now be powered by the 24VDC nominal output of the AC/DC Power Supply and operate similarly as if it were powered by a battery. The blue LED indicator will illuminate indicating the machine is operating on AC power. The operator will now need to manage the power cord so that it does not get trapped under the lane machine during operation.

The 125' power cord should only be connected to the AC/DC Twist-Lock connector on the rear cover when the MAX is in the operating position. This cord should be disconnected before the machine is lifted into the transport position. If the batteries are not fully charged, the AC/DC Power Supply cable should be disconnected from the electrical enclosure after running the lanes and the battery power cable should be reconnected to the electrical enclosure.

NOTE: *Remember, always connect the battery charger to MAX lane machine when not running lanes.*

Section 4: Understanding The Tablet Interface

The Tablet Interface is powerful, yet intuitive and easy to use and understand. This section gives you a tour of the four primary menus of the Interface and provides step-by-step instructions for customizing the machine's operations in each of those areas.

INTRODUCTION TO THE TABLET INTERFACE

The Tablet Interface ("Tablet" or "UI") is the interface between the user and the machine's computer control system. The Tablet monitors the machine's operation, tells you when you need to replace or repair parts, and lets you customize just about every aspect of operation to the needs of your bowling center or the preferences of your bowlers.

NOTE: *"Oil" is used interchangeably with "conditioner" on the Tablet display screen.*

The Basic Elements of Tablet Screens

Most Tablet screens have an upper menu bar that shows the four main content areas, a left-hand menu bar that lets you choose options within those four main screens. A lower status bar also provides you with the machine status, date and time as well as specific sensor information. Refer to *Figure 4-1.*

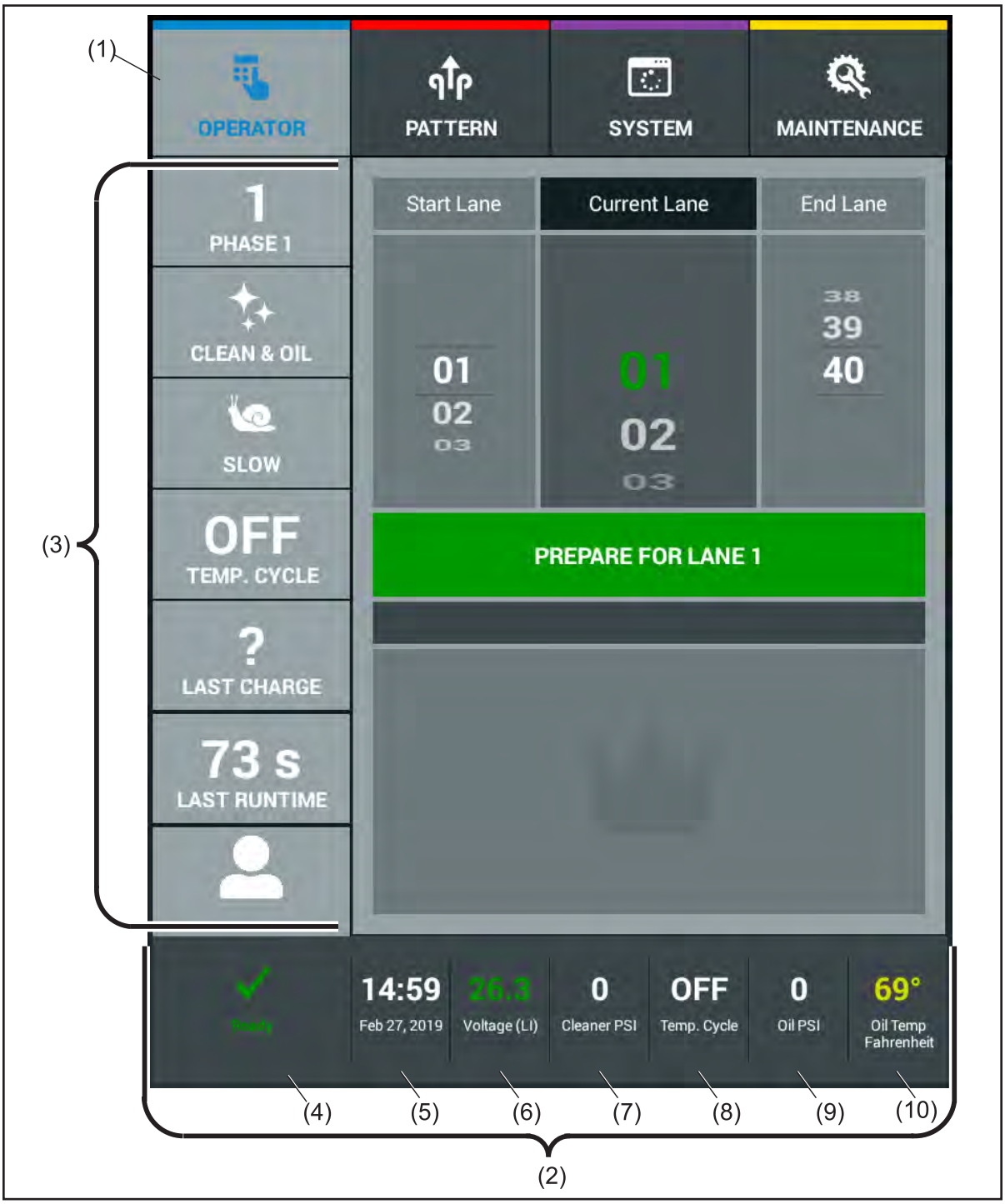

Figure 4-1. Screen Elements

(1) MENU BAR
(2) STATUS BAR
(3) MENU OPTIONS
(4) MACHINE STATUS
(5) DATE AND TIME
(6) BATTERY VOLTAGE
(7) CLEANER PRESSURE
(8) TEMPERATURE CYCLE STATUS
(9) OIL PRESSURE
(10) OIL TEMPERATURE

How to Navigate

Simply touch a button on the Menu Bar or Menu Options column on the left side of the screen. Upon touching the screen, you will be taken into that Menu or Option. To exit an Option, press anywhere on the tablet screen. To exit a Menu, select another Menu. You may also press “OK”, “Cancel” or “Exit” when prompted.

Handle Controls

A “GO” or “OK” button is located on the right side of the handle. It is used to prepare and run the lane machine. In some instances, it can be used to confirm error messages. Refer to *Figure 4-2.*

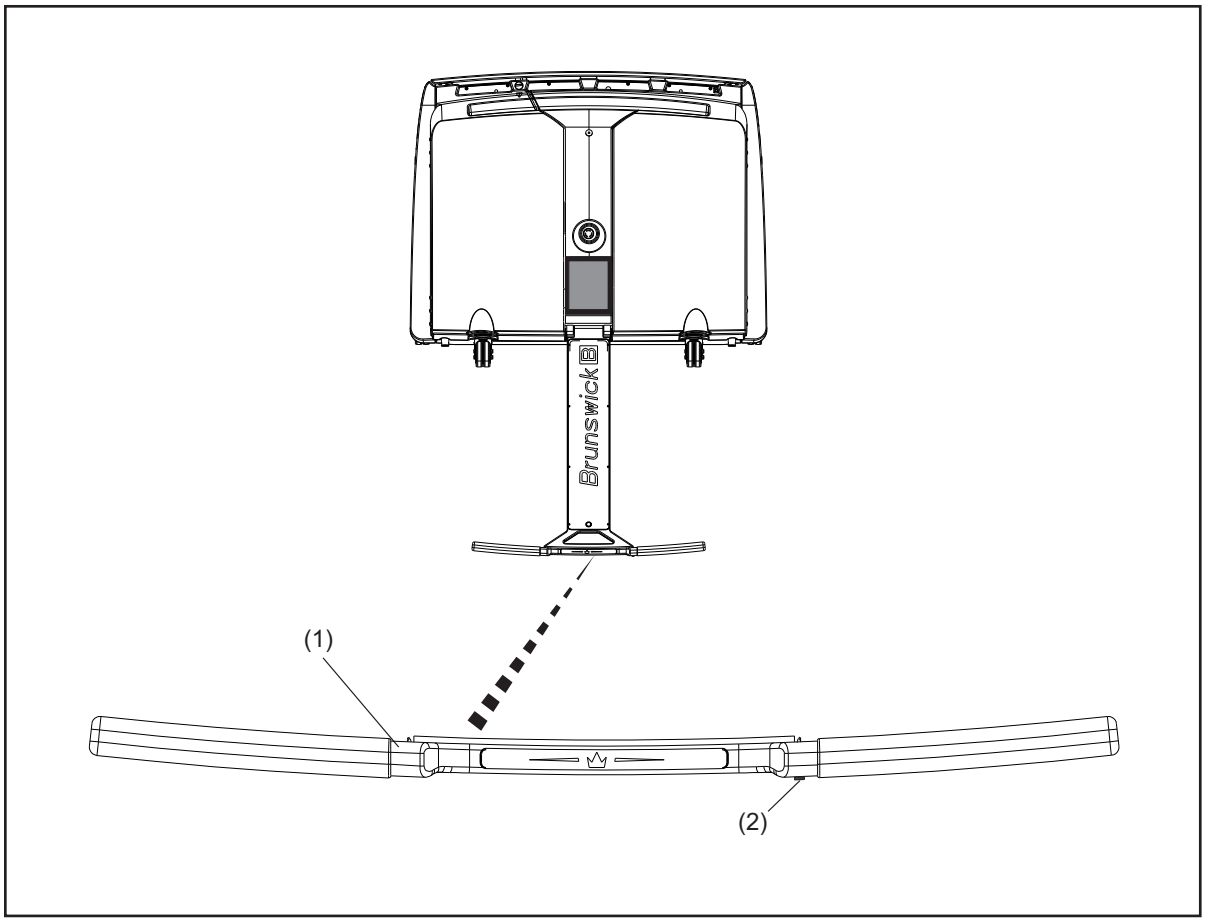

Figure 4-2. Handle Controls

(1) OPERATOR HANDLE
(2) OK BUTTON

Sleep Mode

The tablet screen will turn off after 5 minutes of no activity. After 10 minutes of no activity the tablet will go into sleep mode. To wake the tablet, press anywhere on the tablet screen.

Removable Tablet

The Max is supplied with an external power supply so you can remove the tablet from the machine to change information, check counters, or design/edit patterns. This can be performed at a desk or work station.

Security

Access to machine operations can be controlled by assigning Personal Identification Numbers (PINs) that prevent unauthorized access to the machine or its programs. Additionally, each user can be assigned one of three available levels of access based on their job function

See the **Setting up PINs**, later in this section for more info on security levels and pin access.

Messages

Status messages: Status messages display in the lower right area of the control screen and remain visible on the screen until another status message is displayed. Status messages describe general information about the machine's current and normal operations. Examples: *ready, running.*

Alert messages: Low level messages to keep you informed if system operation parameters are beginning to change. Example: *cleaner pressure is a little low.*

Warning messages: Warning messages alert you to minor issues that need to be addressed. Example: *low cleaner fluid*.

Error messages: Error messages alert you to operational issues that need to be addressed. An error message will stop the machine from running until the problem has been corrected. Example: *Squeegee switch is not working properly.*

Maintenance messages: Maintenance messages are warning messages that tell you when a replaceable part has reached its useful life. Maintenance messages display during start-up. Maintenance messages will not prevent the machine from running . Example: *duster cloth needs to be replaced*.

THE OPERATOR SCREEN

This screen displays during the normal operation of the machine. As you work, it gives you general information about the current setup and operation. Refer to *Figure 4-3.*

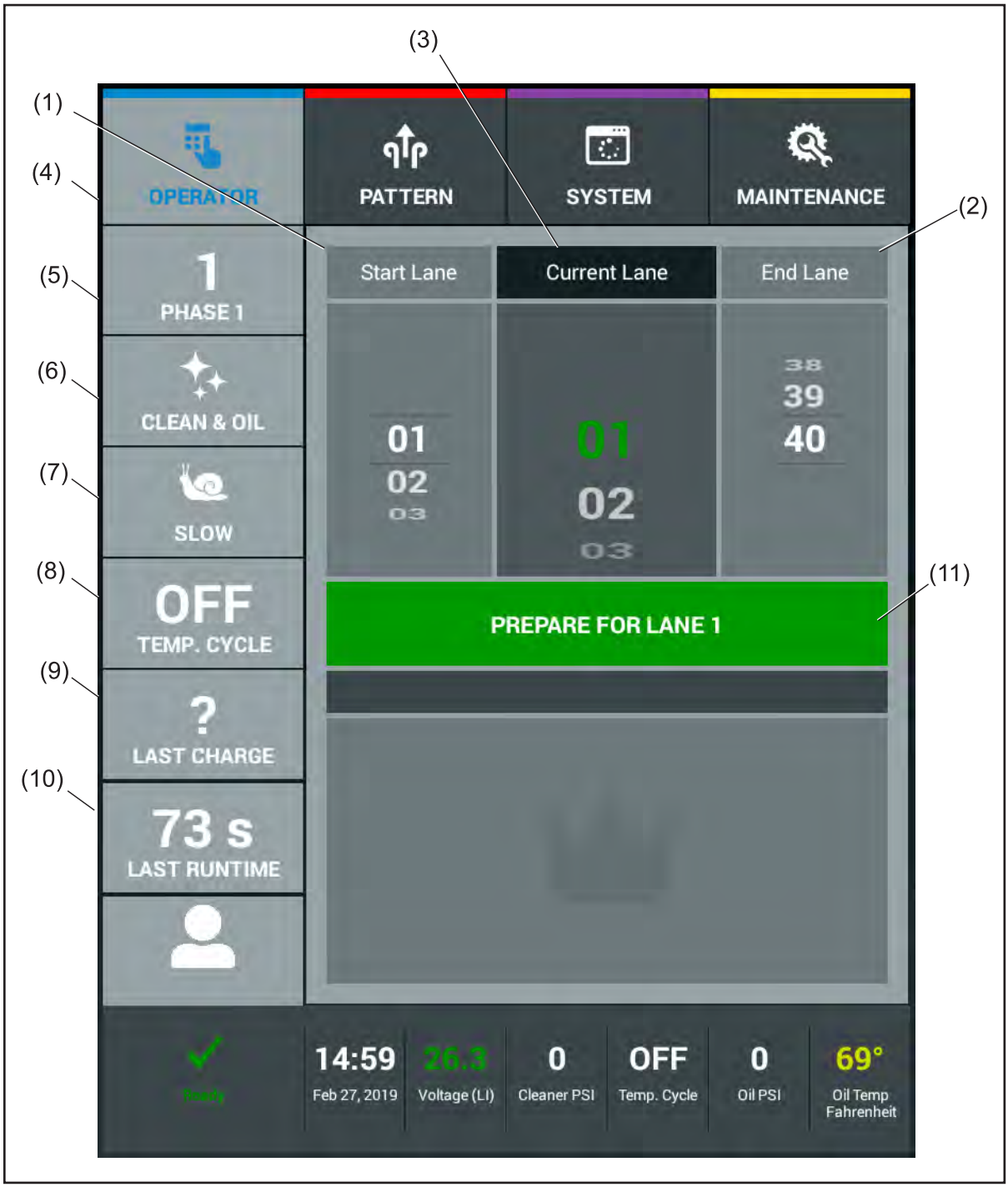

Figure 4-3. Operator Screen

(1) START LANE
(2) END LANE
(3) CURRENT LANE
(4) PATTERN NAME/NUMBER/OVERRIDE
(5) MODE OF OPERATION/OVERRIDE
(6) TRAVEL SPEED/OVERRIDE
(7) OIL TEMPERATURE OVERRIDE
(8) LAST CHARGE STATUS
(9) LAST LANE RUNTIME
(10) LOGIN/LOGOUT USER
(11) PREPARE MACHINE TO RUN

Changing the Start Lane

1. Touch the number wheel for the “Start Lane”, with your finger.
2. Swipe your finger up or down to change the “Start Lane”.

NOTE: *When you leave the operator screen, the lane machine will return to its default “start lane” settings*

Changing the End Lane

1. Touch the number wheel for the “End Lane”, with your finger.
2. Swipe your finger up or down to change the “End Lane”.

NOTE: *When you leave the operator screen, the lane machine will return to its default “start lane” settings.*

Skipping or Repeating Lanes

If you want to skip or repeat lanes during a session, you must change the “Current Lane” so the machine can maintain your place in the process. If you skip lanes, the tablet will direct you to return to the lowest lane once you’ve completed the last lane in the normal sequence (the end lane).

1. Touch the number wheel for the “End Lane”, with your finger.
2. Swipe your finger up or down to change the “End Lane”.

Pattern Override

Allows you to override a previously scheduled conditioner pattern for the session. Press the Pattern Number Option to select the conditioner pattern. Select the conditioner pattern you wish to override. Refer to *Figure 4-4.*

Figure 4-4. Pattern Override

Mode Override

Allows you to see the mode in which the machine is operating. There are three modes to select from. *Clean & Oil, Clean (only), and Oil (only).* To override the "default" mode for this session select the Mode Option. Refer to *Figure 4-5.*

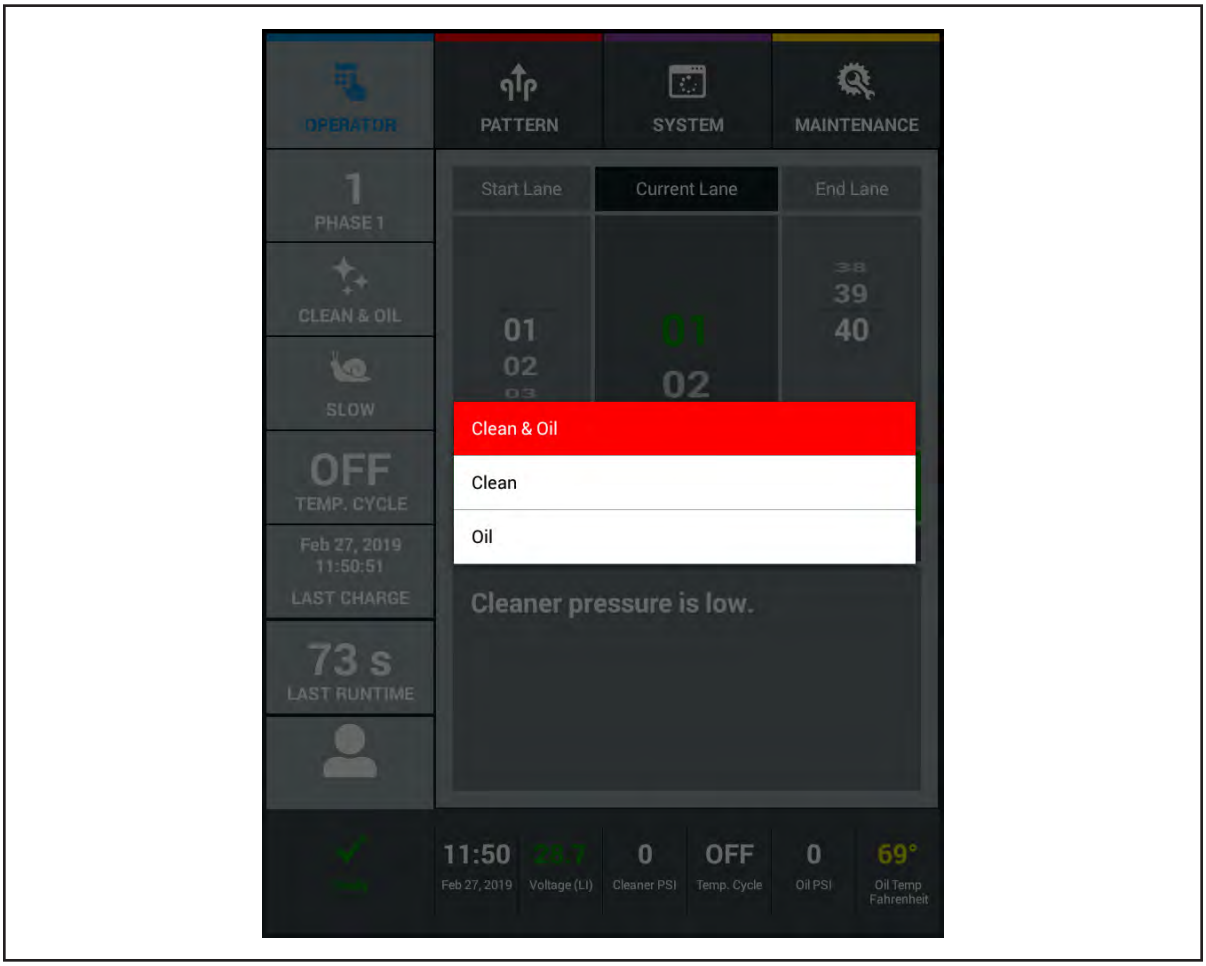

Figure 4-5. Mode Override

Forward Travel Speed Override

Allows you to see the “default” forward travel speed of the current conditioner pattern. There are three speeds to choose from. *Fast, Medium, and Slow*. To override the default speed, touch the Speed Option and select the travel speed for this session. Refer to *Figure 4-6.*

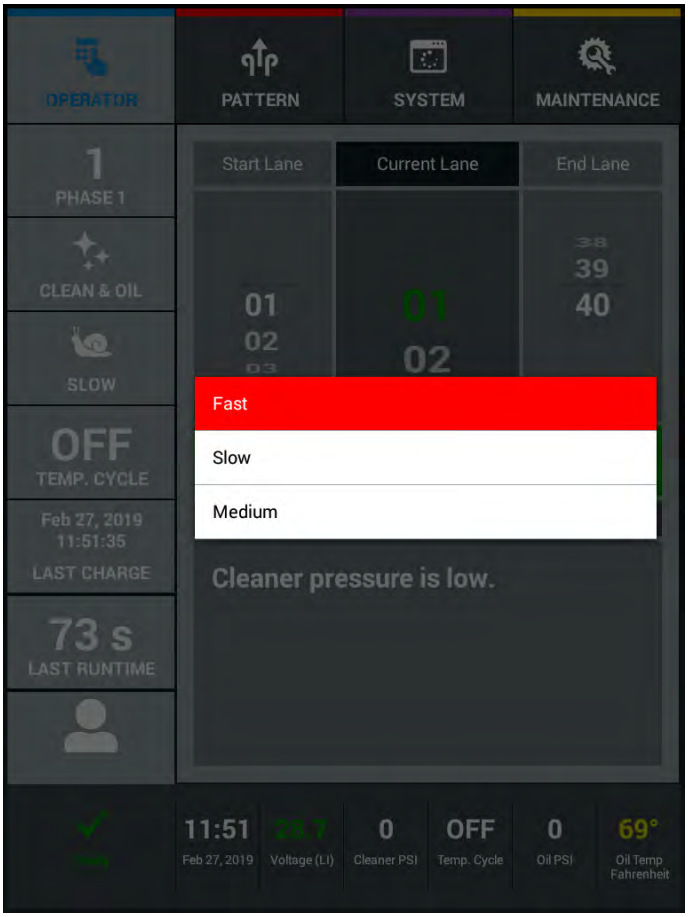

Figure 4-6. Speed Override

Temperature Cycle Override

Allows you to override a previously scheduled Temperature Cycle operation. To turn on the Temperature Cycle, touch the Temp. Cycle box and the status will change from OFF to ON.

NOTE: *All "Overrides" will be displayed in red text for each specific override function.*

Last Charged Box

The date/time that the battery was last fully charged. This is intended to assure that the previous operator properly charged the battery when expected. The MAX keeps detailed log files of the battery voltage every five minutes while charging.

Last Runtime

Displays the amount of time the machine needed to complete the previous lane. The runtime for each Forward Speed is monitored and will change between a yellow or red value if the speeds fall outside of the desired parameters.

Login and Logout Button

This option is only available if the Security is set up for the various operators. The feature makes the user accountable for their session on the lane machine. To Logout, touch the button and the screen will prompt the next user to enter in their PIN number. Refer to *Figure 4-7.*

Figure 4-7. Login Screen

THE PATTERN MENU

The pattern screen lets you schedule, select, create, edit, or save conditioning patterns. The MAX comes with UNLIMITED patterns. You may use these patterns as your own or use them as a template to create more customized patterns. You may also save machine data locally or to a USB drive.

Pattern Scheduler

Lets you schedule different conditioning patterns for up to 3 time periods per day, 7 days per week, and for up to 2 different ranges of lanes to accommodate different types of bowlers and leagues. Refer to *Figure 4-8.*

NOTE: *Make sure that a certified Brunswick Installer has set up the number of lanes in your center from the system menu before you start setting up your Pattern Scheduler.*

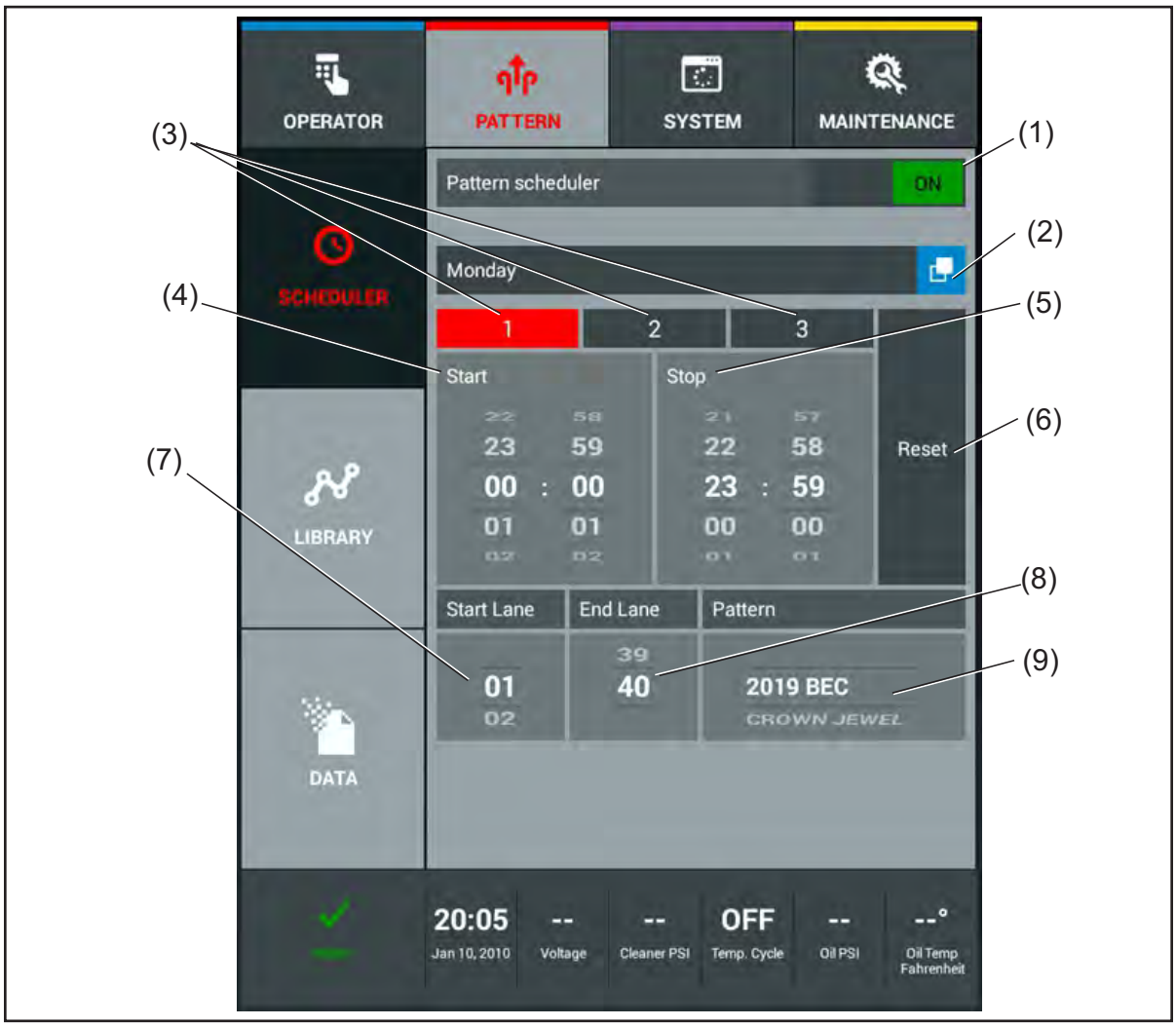

Figure 4-8. Pattern Scheduler

(1) PATTERN SCHEDULER ON/OFF SWITCH
(2) DAY OF THE WEEK
(3) TIME PERIODS
(4) START TIME
(5) STOP TIME
(6) RESET SCHEDULE
(7) START LANE
(8) END LANE
(9) PATTERN SELECTION

Setting up a Lane Maintenance Schedule that may Vary by Day, Time, or Lane Ranges

1. Turn on the Pattern Scheduler by touching the ON/OFF switch on the screen.
2. Select the Day of the week.
   a. Touch the "Day of the Week" button.
   b. Touch the day you wish to schedule on the screen.
3. Select the time period you wish to set (up to 3 periods per day).
   a. To use the same pattern for the entire day, use the following settings.
      i. Select time period "1" by touching the screen.
      ii. Set the "Start Time" to "00:00" by swiping the wheel up or down with your finger.
      iii. Set the "End Time" to "23:59" by swiping the wheel up or down with your finger.
   b. To use different patterns during different times of the day, enter start and end times until the remaining time periods equal a 24 hour day.
4. Selecting the lane ranges and pattern.
   a. To use the same pattern on all lanes, use the default setting:
      i. Start lane is "1".
      ii. End lane is "40" (end lane is the number of lanes in your center).
   b. To select a pattern, swipe the pattern wheel up or down until you have your desired pattern.
   c. To create 2 lane ranges, use the following settings example:
      i. Start lane is "1".
      ii. End lane is "20".
      iii. Select the desired pattern for this lane range.
      iv. Start lane is "21".
      v. End lane is "40"
      vi. Select the desired pattern for this lane range.

NOTE: *If any day or time period is left without a scheduled pattern, all lanes will run on the default pattern (pattern 1). Please check to make sure that you have not allowed time gaps between any of the 3 allowable time periods or lane ranges. These gaps could result in an unexpected pattern selection if the lane machine is in operation during that time gap.*

5. Leave the Pattern Menu to save changes.

Pattern Library

This menu allows you to program custom information for each conditioning pattern, including pattern Shape and volume.

The first screen in your Pattern Library is the Pattern list screen. This screen allows you to select a specific pattern that you wish to view Refer to *Figure 4-9.*

Figure 4-9. Pattern Library

(1) PATTERN NAME AND LENGTH
(2) CATEGORY (DIFFICULTY LEVEL)
(3) PATTERN OIL VOLUME (MILLILITERS)
(4) CREATE PATTERN
(5) DELETE PATTERN
(6) EDIT PATTERN
(7) IMPORT PATTERNS
(8) EXPORT PATTERNS

Selecting A Pattern

You can select any pattern in your library to view by touching the Pattern Name. The first screen will be the Pattern Parameter screen that allows you to customize specific settings for the pattern such as the Mode and Forward Travel Speed. You may also change the start of the oil, cleaner spray and squeegee. Refer to *Figure 4-10.*

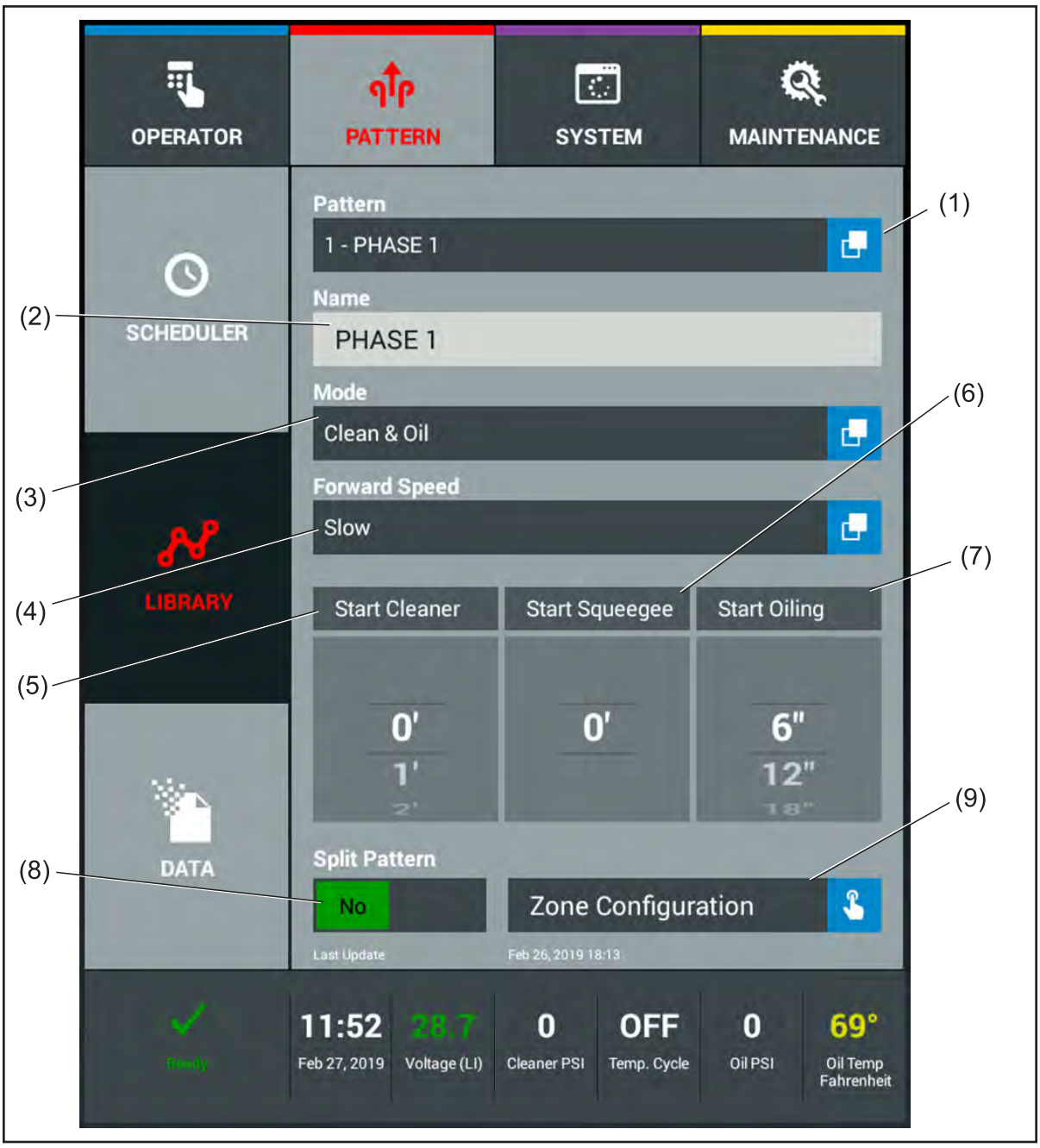

Figure 4-10. Pattern Parameter Screen

(1) PATTERN LIST
(2) PATTERN NAME
(3) MODE OF OPERATION
(4) FORWARD TRAVEL SPEED
(5) START CLEANER SPRAY
(6) START SQUEEGEE
(7) START OILING FROM FOUL LINE
(8) SPLIT PATTERN FUNCTION
(9) ENTER ZONE CONFIGURATION
(10) LAST PATTERN UPDATE

Mode

The mode allows you to select the type of operation you wish to perform for that pattern. You can select between clean and oil, clean only, and oil only. The clean and oil mode cleans and conditions the lanes in one forward and reverse run. The clean only mode uses only the cleaning system, and the oil only mode will only apply conditioner. To separate the clean and condition mode into a two-run operation refer to "Split Pattern" later in this section.

Changing the Mode of Operation

1. Touch the Mode box with your finger.
2. Select from 3 modes of operation, Clean & Oil, Oil, or Clean.

Forward Speed

The MAX offers you three choices of travel speeds: "Fast", "Medium" and "Slow". In most instances the machine will operate in the "Medium" speed (~24 inches per second). The "Fast" speed (~27 inches per second) will reduce the cleaning time and battery drain for centers using lighter volumes of conditioner. The "Slow" speed (~21 inches per second) will increase the cleaning time and battery drain for centers using heavier volumes of conditioner.

Changing the Forward Speed

1. Touch the Forward Speed box with your finger.
2. Select from 3 speeds Fast, Medium, or Slow based on the volume of your oil pattern.

NOTE: *The travel speed is critical for cleaning performance. Forward speed setting should be selected based on the oil pattern volume and the type of lane oil being used. For volumes of 21 ml or less use "Fast". For medium volume patterns of 21-25 ml use "Medium". For high volume patterns of 25 ml or greater use "Slow". Oils that are more difficult to clean should use "Medium" and "Slow".*

Start Cleaner

This option allows you to set a distance down the lane, in feet, to start spraying cleaner. It is designed for use on patterns that require the back end of the lane to be cleaned without cleaning the entire lane. We also recommend using this option if you have wood lanes and the head (maple) section has feathering (splintering between boards) or board separation. Software prevents your start cleaner spray distance from being shorter than the start squeegee distance.

NOTE: *Default setting is 0. Select any distance up to 57 feet. The number must be greater than or equal to the "Start Squeegee Distance".*

Start Squeegee

The start squeegee option is the counter part to the start cleaner spray option when used for cleaning the back end of the lane. It also allows you to "dry" squeegee the conditioner from old wood lanes showing feathering or board separation leaving a thin film of oil that will help protect the wood surface. Measured in feet, this option may be turned on before the cleaner spray starts, but not afterward.

Changing the Distance from the Foul Line at which the Squeegee Lowers

1. With your finger, swipe the Start Squeegee wheel, up and down, until you reach the desired distance to lower the squeegee.

Start Oiling

This option is used as a safety feature on the lane machine. Select a start distance from the foul line to start conditioning, in 6 inch increments up to 24 inches. This prevents any applying or buffing of oil within that distance from the foul line, leaving it clean so recreational bowlers have less tendency to track oil onto the approaches. A level 2 security ID will allow you to set the minimum distance in the System Settings menu.

Changing the Distance from the Foul Line at which the Oiling Begins

1. With your finger, swipe the Start Oiling wheel, up and down, until you reach the desired distance to begin the oiling.

NOTE: *Default setting is 6 inches. Select between 12, 18, and 24 inches.*

Split Pattern

The split pattern option enables the user to separate the "clean & oil" mode into two separate runs of the machine performed on the same lane. By selecting "Yes" the machine will travel down the lane performing the cleaning operation and return to the foul line. Then by the user's action, the machine will travel down the lane performing the conditioning operation and also buffing the pattern on the reverse. When "No" is selected the machine will clean and condition the lanes in one operation.

Splitting the Pattern to Separate the Cleaning and Conditioning Functions

1. With your finger, touch the Split Pattern switch to change from OFF to ON.

Last Update

The last update is a feature that allows you to see if and when a conditioning pattern was last modified. This proves helpful when trying to troubleshoot the pattern or if the pattern was suspect to an unauthorized modification. The "Pattern change log" stores each time the pattern or its parameters are modified.

Zone Configuration

Touching the Zone Configuration button will open an additional screen that will display an overhead view of your oil pattern. It also allows you to modify zone lengths, add or remove zones, and set the End Cleaner Spray distance. These can be used to help fine tune your conditioner pattern. If you double tap an oil zone, you will gain access to the Oil Levels screen to modify the profile of the conditioner pattern.

You can create anywhere from 1-8 zones in a pattern. A zone can be between 3 and 57 feet long and can be adjusted in 0.5 foot increments. The Zone Configuration screen also displays the length of the zones, total pattern distance, pattern volume, and crosswise ratios that dictate the difficulty level. Up and down arrows allow you to easily set the length you intend to use. You may also use your finger to adjust the End Cleaner Spray. Refer to *Figure 4-11.*

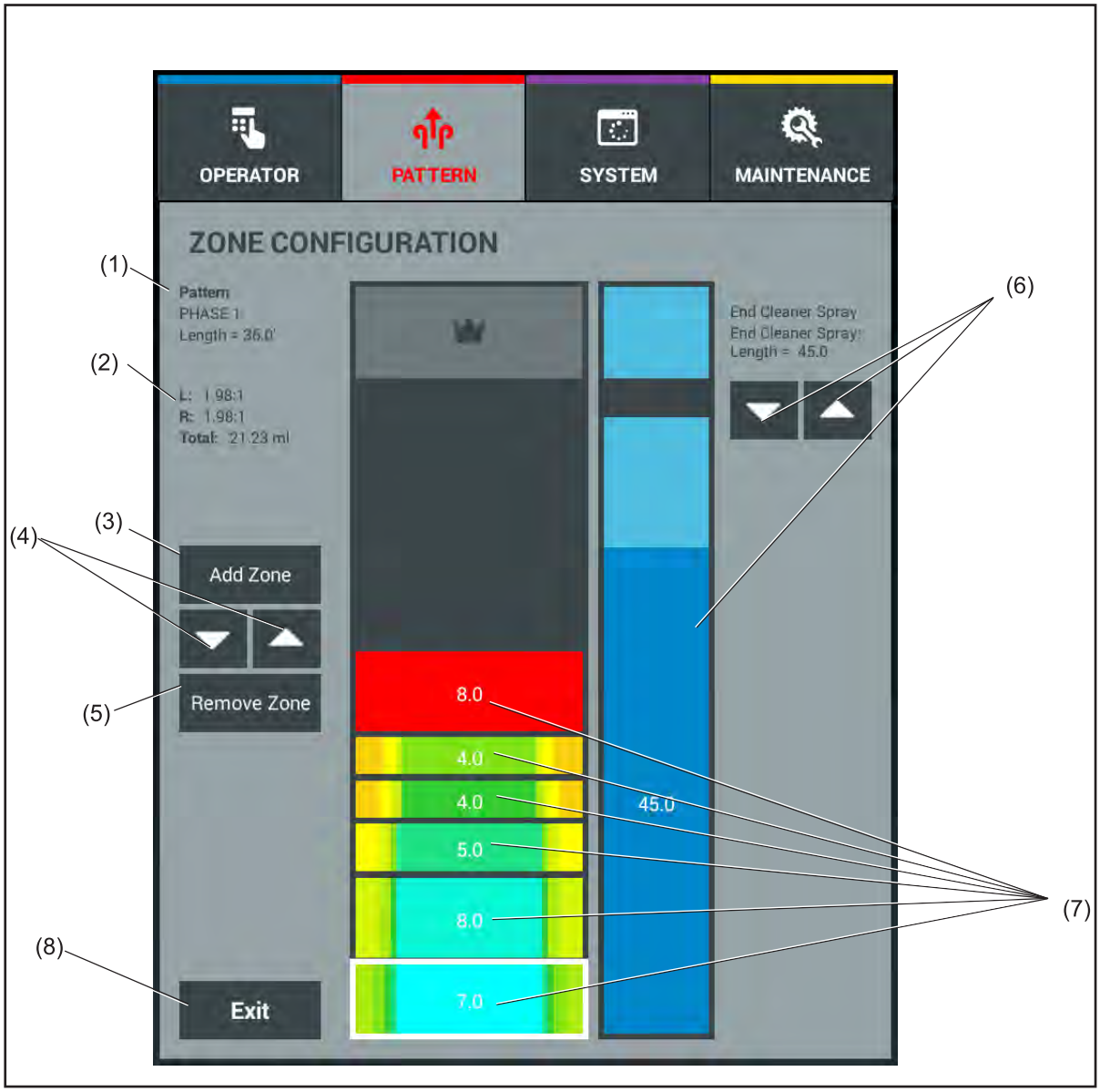

Figure 4-11. Zone Configuration

(1) PATTERN NAME/DISTANCE
(2) PATTERN RATIOS/VOLUME
(3) ADD ZONE BUTTON
(4) ZONE LENGTH UP/DOWN
(5) REMOVE ZONE BUTTON
(6) END CLEANER SPRAY CONTROLS
(7) PATTERN ZONES
(8) EXIT BUTTON

Modifying a Zone

1. Select a zone you wish to modify using your finger.
2. Use the Up or Down arrow to change the length of an individual zone

NOTE: *The Tablet will prompt you to download the pattern to the machine control board after you exit the zone configuration screen. Press "OK" to start the download or "Exit" to download at a later time.*

Adding a Zone

1. Press the Add Zone button and a new zone will appear at the end of the oil pattern.
2. Modify the new zone to the length and profile you wish.

Remove Zone

1. Select the zone you want to remove so it is highlighted.
2. Press Remove Zone and that zone will be removed from the pattern.

NOTE: *It may be necessary do adjust the lengths of other zones when adding or removing, to achieve the desired overall pattern length.*

Changing the End Cleaner Spray Distance

The cleaner is applied in a continuous spray to the lane during the cleaning operation. You can select the distance at which the cleaner spray ends between 45' and 57'. This lets you synchronize the cleaner usage with each patterns cleaning needs. The cleaner can be turned off earlier, allowing the surplus cleaner in the scrubbing vacuum head assembly to clean the back ends of the lane. The MAX will always spray the pin deck with cleaner.

1. Use the up or down arrows to adjust the End Cleaner Spray distance. You may also touch and drag the image to increase or decrease the End Cleaner distance.

Viewing the Oil Levels of a Zone

1. Touch the zone you wish to modify or view.
2. Touch the same zone again to enter into the Oil Levels screen.

Oil Level Screen

The Oil Levels screens allow you to look at the shape of the pattern within a zone. You can make adjustments to individual boards or you may select a group of boards to adjust. This screen is accessed through the Zone Configuration screen in the Pattern menu. Refer to *Figure 4-12.*

NOTE: *Changes made in the Oil Levels screen will require a new download of the pattern to the machine control board.*

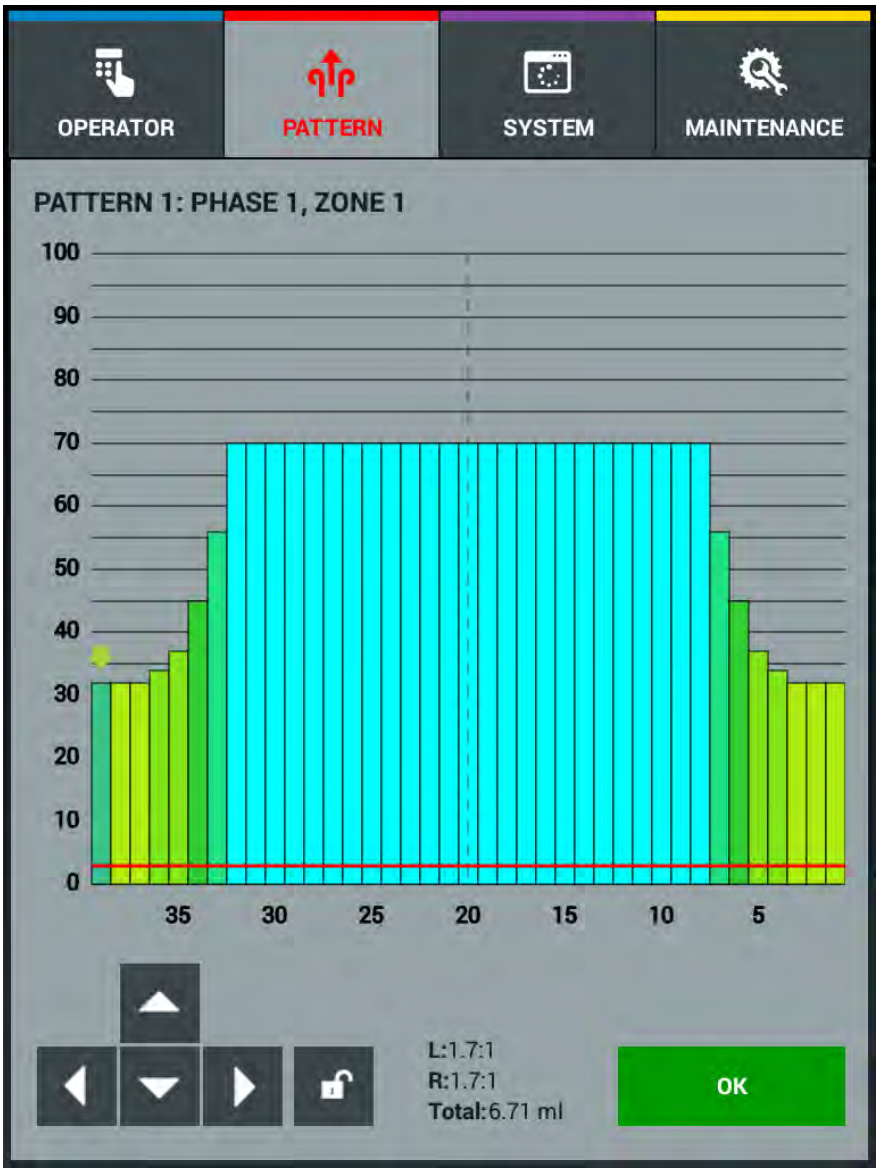

Figure 4-12. Oil Levels

NOTE: *The Oil Levels screen lets you adjust the amount of oil applied to each of the 39 boards in each zone of your pattern. Oil levels are measured in "units of oil", the USBC standard, and are adjustable in 1-unit increments. The USBC minimum oil volume of 3 units is shown as a red line on the oil levels graph.*

Modifying the Oil Levels of a Zone

1. Navigate to the board you want to change by touching that board with your finger or by using the left and right arrows at the bottom of the screen.
2. Use the up and down arrow to increase or decrease the level of oil on that particular board.
3. To select multiple boards, move to the first board in the set you would like to modify.
   a. Press the "Lock" button and use the left or right arrow to move the second arrow to the end of the board range you wish to change.
   b. Use the up and down arrows to increase or decrease the level of oil on those specific boards.
   c. Press the "Lock" button if you wish to make more modifications to additional boards.
4. Press OK when you have completed your changes and you will return to the Zone Configuration screen.

NOTE: *As you change the Oil Levels in a zone, the crosswise ratio and volume will likely change.*

Pattern Download

Each time a conditioner pattern is modified, the Tablet is required to "download" the pattern data to the machine control board inside the electronic enclosure before that conditioner pattern can be run on any lane. The download message will appear when you "Exit" the "Zone Configuration" screen or if you are in the operator screen and a pattern has not been downloaded since it was last modified. Refer to *Figure 4-13.*

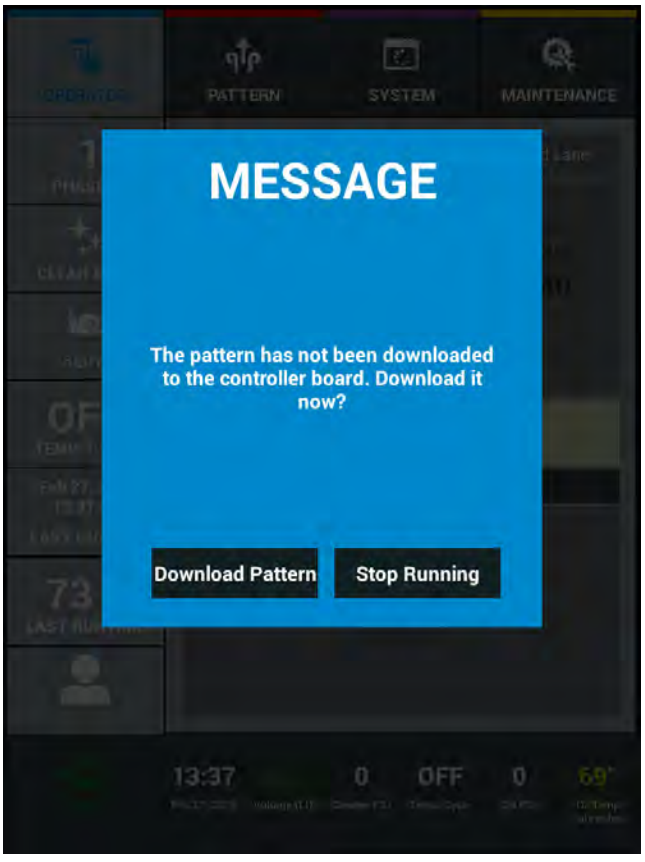

Figure 4-13. Pattern Download Message

The download time is approximately 7 seconds. A download progress bar will appear along with the pattern number and name. If necessary the download may be aborted by pressing “Cancel” on the screen. Refer to *Figure 4-14*.

NOTE: *Any new or revised pattern must be downloaded from the tablet to the machine control board to perform a conditioning run using that pattern. When the pattern is downloaded from the Operator screen the machine will prepare to run when the download is completed. The machine will instruct the operator to place the machine on the lane.*

Figure 4-14. Download Progress Bar

NOTE: *All patterns must be downloaded after changing to a different conditioner selection. To avoid unnecessary downloads, select your desired conditioner from the System menu before downloading patterns.*

Managing Patterns

It is important to define the different ways to manage the conditioner pattern data. There are 2 ways to transfer patterns. The “USB” drive and the “Brunswick Cloud”.

Using a USB to Import and Export Patterns

Patterns can be transferred using a USB memory stick or thumb drive for the purposes of saving them to the Pattern Manager-MAX PC software or to share them with others. The USB can also be used to add patterns to your tablet’s Pattern Library. Refer to *Figure 4-15*

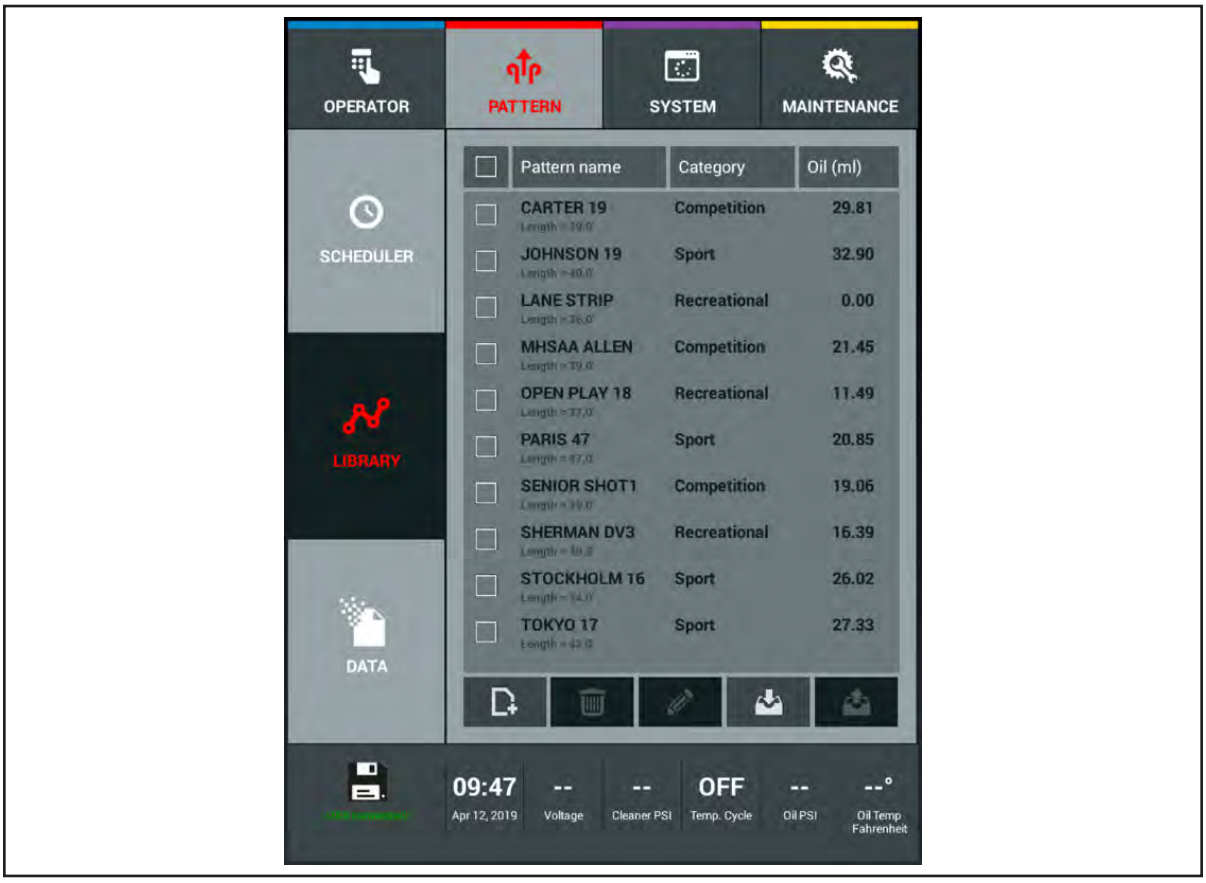

Figure 4-15. USB Connected

Importing Patterns from a USB Drive

1. Insert the USB into the USB port towards the top right corner of the tablet.
   a. The bottom left corner “lane machine status” icon will change when the USB connects to the tablet.
2. Touch the lighted “Import” button on the tablet.
3. A directory of file folders on the USB will open. Refer to *Figure 4-16.*

Figure 4-16. USB Directory

4. Select the file folder that contain the conditioner patterns to view them. Refer to *Figure 4-17.*

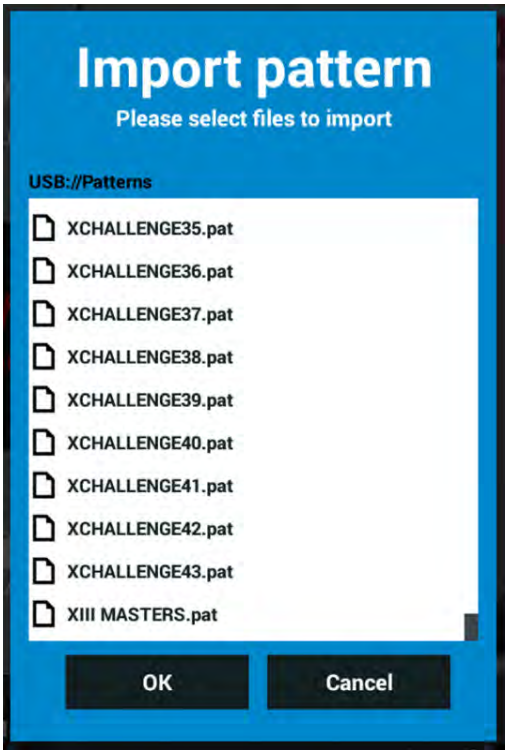

Figure 4-17. USB Pattern Files

5. Select the pattern you would like to Import into the tablet. You may select multiple patterns at the same time. Refer to *Figure 4-18.*

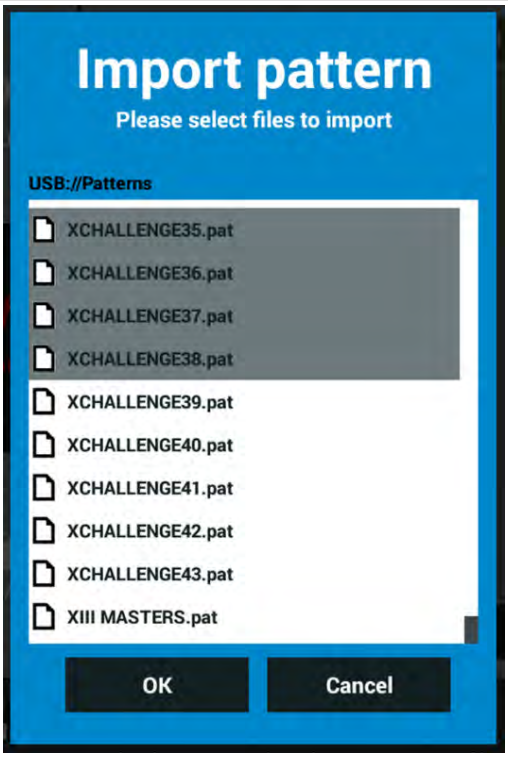

Figure 4-18. Select Patterns

6. When you have finished selecting patterns, press the “OK” button on the screen to transfer them to the tablet.

Exporting Patterns to a USB Drive

1. Insert the USB into the USB port towards the top right corner of the tablet.
   a. The bottom left corner “lane machine status” icon will change when the USB connects to the tablet.

2. Select patterns to Export by touching the check box located to the left of the pattern name and the “Export” icon will highlight. Refer to *Figure 4-19.*

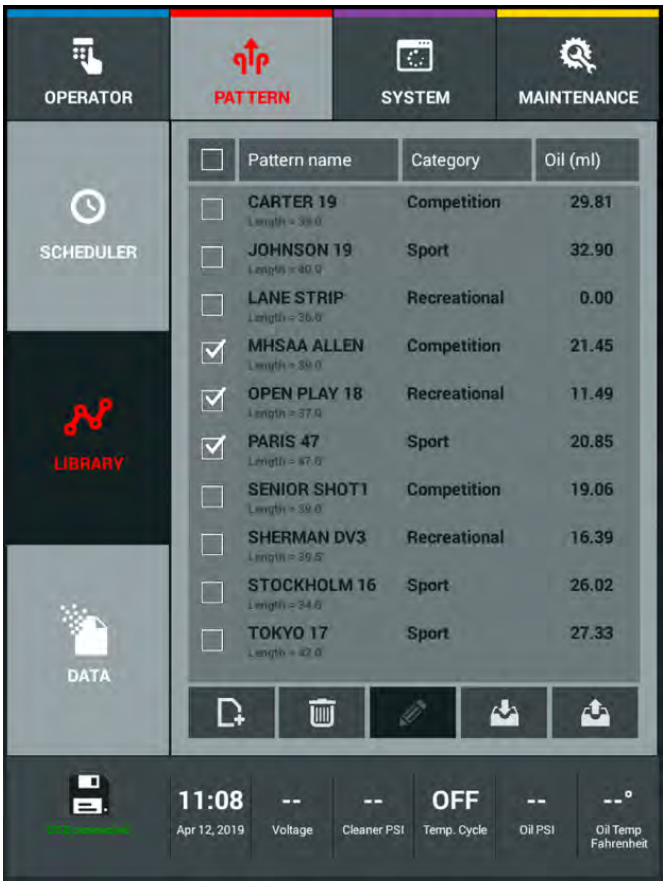

Figure 4-19. Pattern Export Selection

3. Touch the “Export” button to open the USB file directory window and select the folder you want to save your patterns in (*Figure 4-20)*. Press “OK” to Export the patterns to the USB.

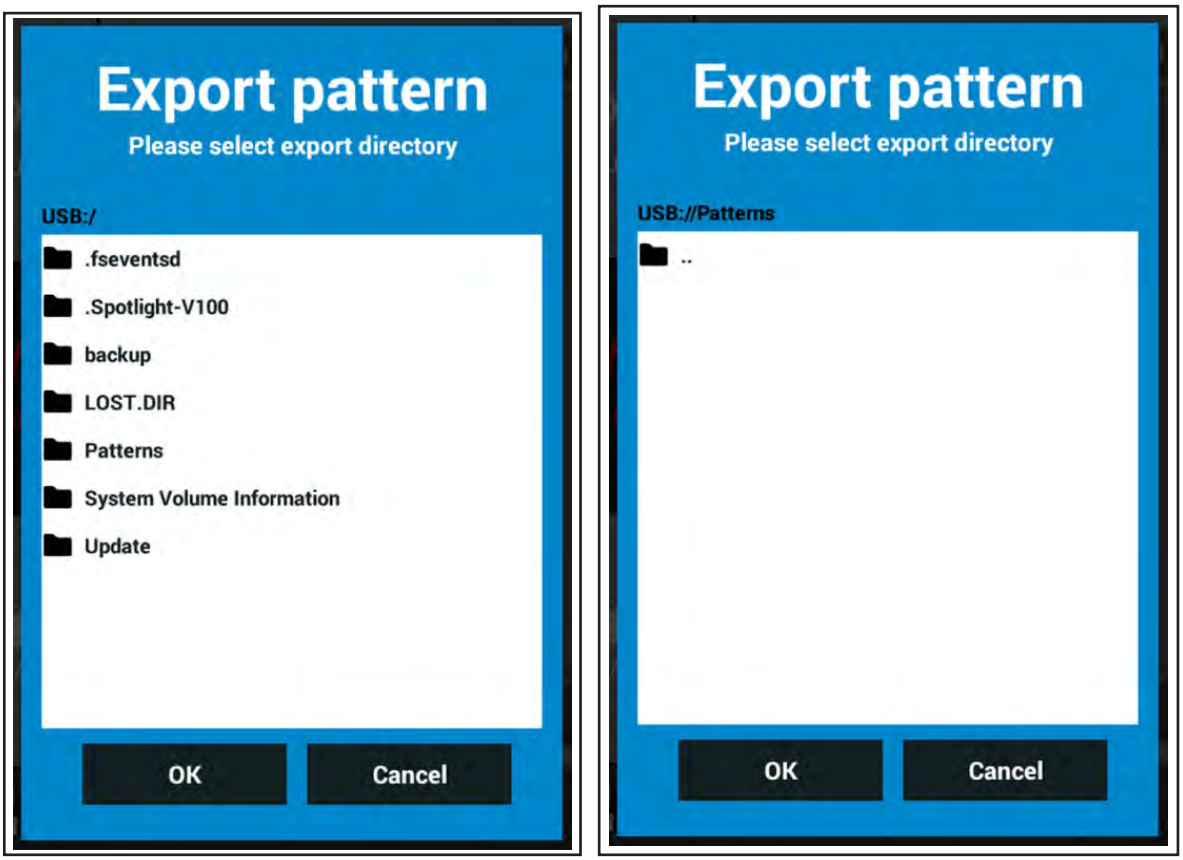

Figure 4-20. USB Export Directory and File Folder

Using the Brunswick Cloud to Import and Export Patterns

You can use the Brunswick Cloud to export patterns to your own “Private” pattern library. This gives you a single storage location that you can modify at any time. You can use the Brunswick Cloud to import patterns for your spare tablet so both tablets have all the same patterns. Refer to *Figure 4-15*

Exporting Patterns to the Brunswick Cloud

1. Go to the Pattern menu and select Library
2. Select patterns to Export by touching the check box located to the left of the pattern name and the “Export” icon will highlight. Refer to *Figure 4-21.*

Figure 4-21. Export To Brunswick Cloud

3. Press the “Export” button.
4. Patterns will transfer to your Private Library on the Brunswick Cloud. Refer to *Figure 4-22.*

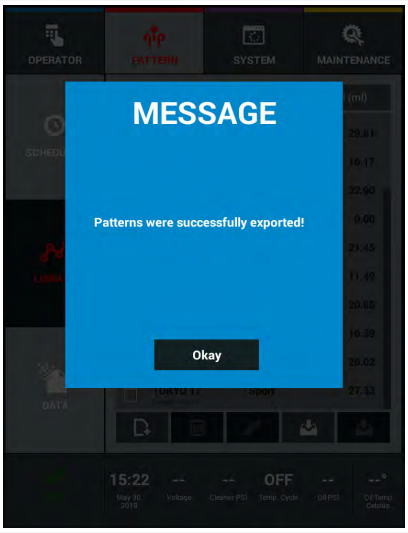

Figure 4-22. Export To Private Library Message

Importing Patterns From the Brunswick Cloud

1. Go to the Pattern menu and select Library.
2. Press the highlighted “Import” button on the tablet. Refer to *Figure 4-21*
3. Select one of the two options.
   a. “Private” to view patterns you have saved to the Brunswick Cloud. Refer to *Figure 4-23.*
      i. Select the patterns you wish to import into your tablet and press”OK”.
   b. “Brunswick” to find new patterns from the Brunswick Public Library. Refer to *Figure 4-24.*
      i. Select from the list of new patterns to import into your tablet and press “OK”.

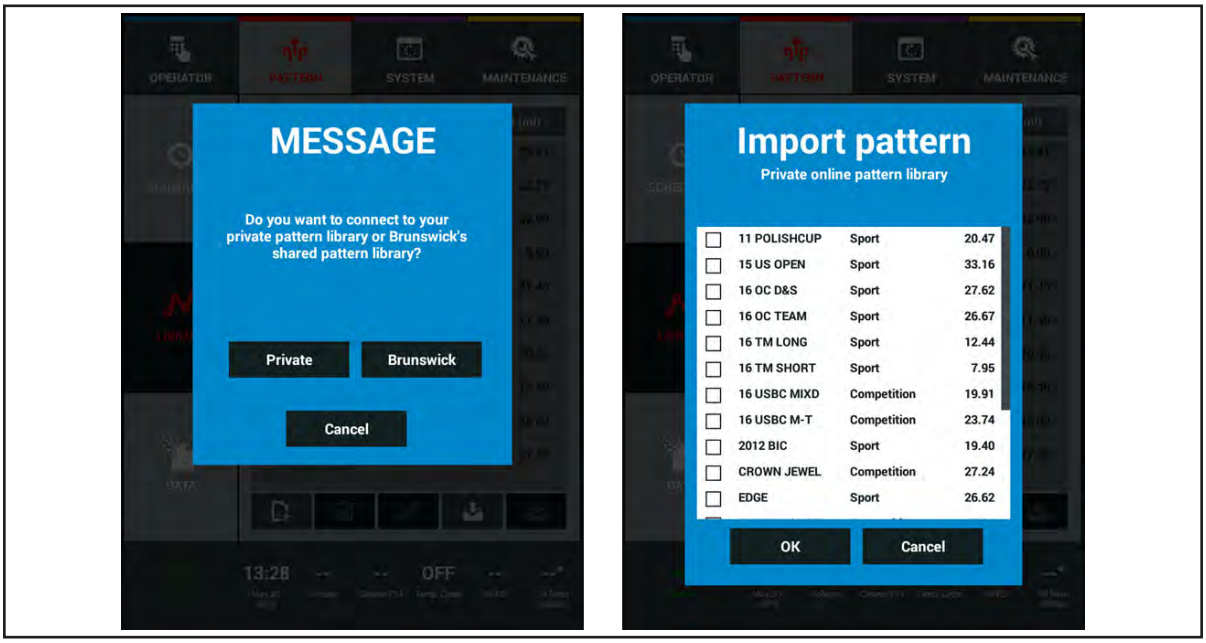

Figure 4-23. Private Library Import Screens

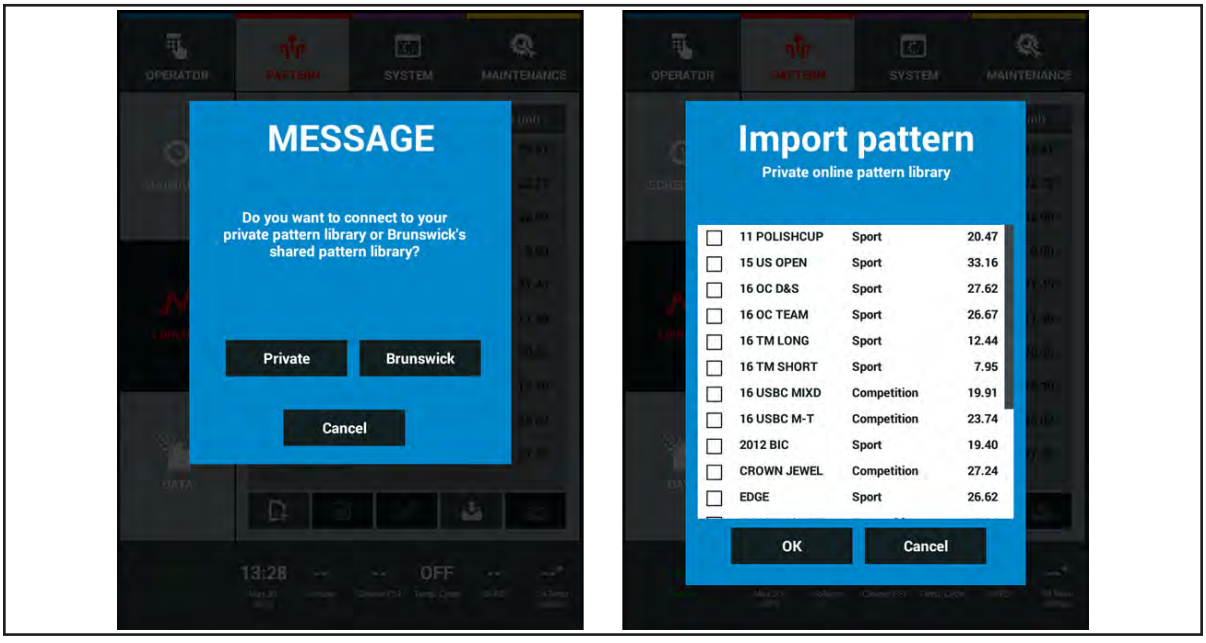

Figure 4-24. Brunswick Public Library

NOTE: *Patterns from other versions of Direct+ lane machines must be converted to the .PAT file extension in the Brunswick Pattern Manager-MAX Software for use in the MAX lane machine.*

Managing Machine Data

There are multiple ways to maintain the lane machine data. Lane machine data consists of machine settings such as System Center Information, Security, Global and Machine settings, and Conditioner selection. A backup will also contain the machine's Log Files. You can create a "Local Backup" to the tablet or a "USB Backup" to store on a computer. You may also restore the data as a "Local Restore" or a "USB Restore. A "Factory Reset" can be performed if you want all your settings back to the factory default values. Refer to *Figure 4-25.*

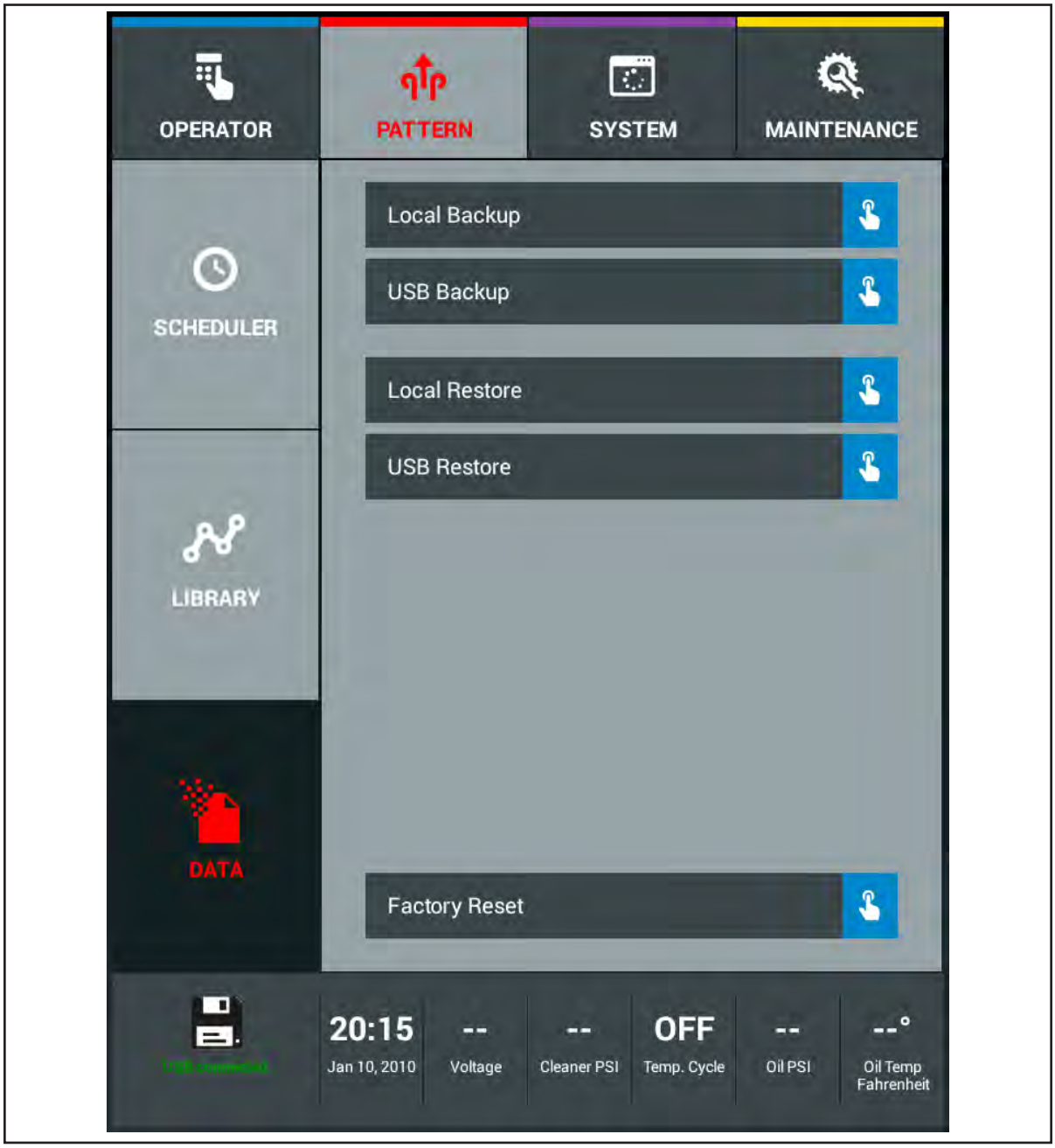

Figure 4-25. Backup and Restore Machine Data

Procedure for Creating a Local Backup

1. Go to the Pattern menu and select Data.
2. Select Local Backup and the machine settings will be saved to the tablet memory. Refer to *Figure 4-25.*

Procedure for Restoring a Local Backup

1. Go to the Pattern Menu and select Data
2. Select Local Restore and the machine settings will revert back to the last saved data. Refer to *Figure 4-25.*

Procedures for Creating a USB Backup

1. Go to the Pattern Menu and select Data.
2. Insert a USB drive into the USB port on the right side of the tablet.
3. Select USB backup and the data will appear in a backup folder on the USB drive. Refer to *Figure 4-25.*

Procedures for Restoring a USB Backup

1. Go to the Pattern Menu and select Data.
2. Insert the USB drive into the USB port on the right side of the tablet.
3. Select USB Restore and the screen will show a list of backups on the USB drive.
4. Select the backup folder you wish to restore and you will receive a message asking if you wish to continue. Press “OK” and the machine data will revert to the data on the selected backup.

NOTE: *It is good practice to create a backup prior to restoring. The Log Files will not over write existing Logs on a tablet. Log files can not be edited or deleted.*

THE SYSTEM SCREEN

About the System Screen

The system menu provides basic information about the bowling center and the machine, and provides a security function to control access to different machine functions. Refer to *Figure 4-26.*

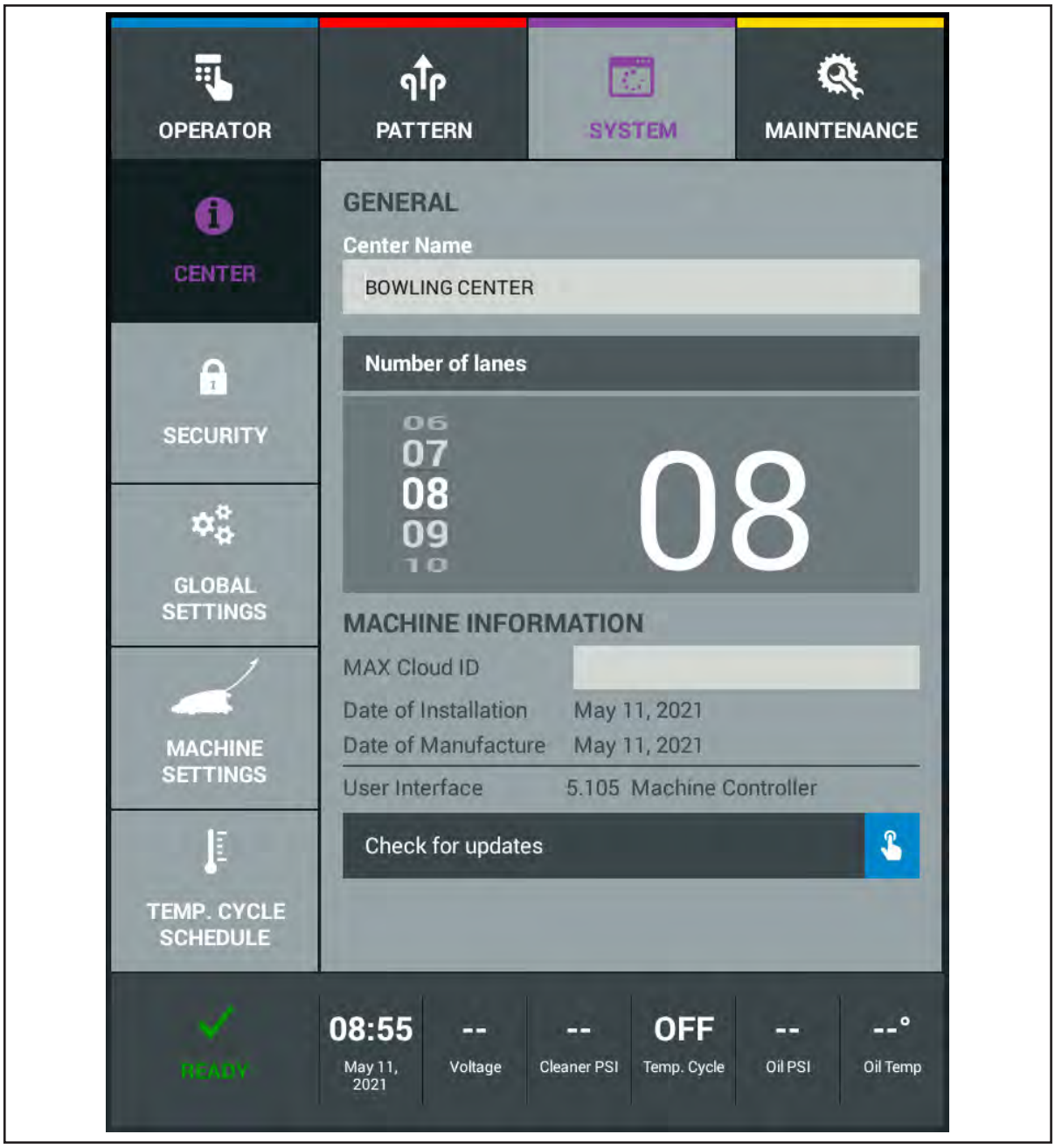

Figure 4-26. System Screen

There are five screen options in the System menu.

Center - Displays the name of the bowling center and the total number of lanes. It also displays the machine type, battery type, tablet serial number, machine installation and tablet manufacturing date. At the bottom of the screen, you will see the user interface software version as well as the machine control version inside the electronic enclosure. There is an active button, at the bottom of the screen used to search for software updates.

Security - Lets you control who has access to the machine's operation and programming.

Global Settings - Allows you to set parameters such as date and time, date format, language, and temperature (Fahrenheit/Celsius).

Machine Settings - Allows you to set machine parameters such as starting the squeegee and cleaner spray, distance oil begins from the foul line, squeegee wipe delay, and the distances to turn ON the vacuum motor going forward as well as turning OFF on the return. At the bottom of the screen you can select and change the conditioner selection.

Temperature Cycle Scheduler - Lets you set a schedule to start heating the oil prior to starting the lanes.

System Center

The "Center" screen allows you to enter the name and number of bowling lanes in the center. It is very important to have the correct number of lanes if you are using the scheduler option. Refer to *Figure 4-26.*

NOTE: *A Brunswick installer will set up this screen with the name of your center and the number of lanes.*

Entering the Name of Your Bowling Center

1. Go to the System menu.
2. Select the field under the Center Name
3. When the keyboard appears, type in the name.

Entering the Number of Lanes

1. Select the number of lanes by swiping the scroll wheel up or down.

IMPORTANT!: *If you change the number of lanes after initial setup, you may have to update your pattern scheduler (the pattern scheduler uses the number of lanes entered here in establishing schedules).*

2. Exit to another menu to save changes.

System Security

The security screen allows you to protect information and settings in the machine from unwanted changes. There are three levels of access to choose from that limit which operators have access to what information. Refer to *Figure 4-27.*

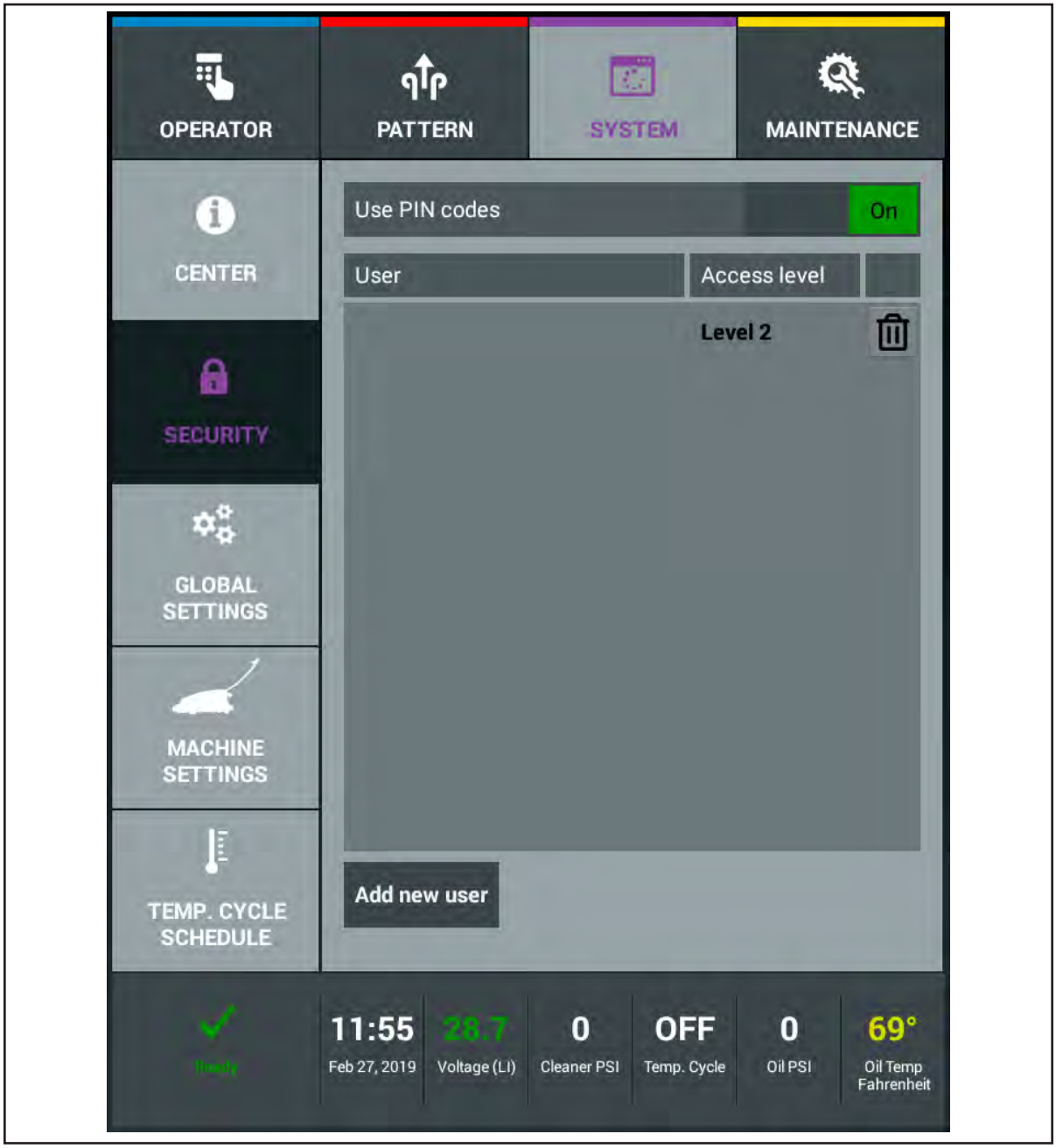

Figure 4-27. System Security

Operator level allows those users to only operate the machine and does not allow them into the Pattern, System, and Maintenance menus. An Operator level user cannot override any functions in the Operator menu.

Level 1 user has access to override patterns and certain parameters in the operator screen. This level user can also access the Maintenance menu for troubleshooting purposes.

Level 2 users have full access to every menu and every screen. This person is typically the mechanic or center manager.

To Set Up Security

1. Navigate to the System menu and select the Security option
2. Turn the Security ON by tapping next to or sliding the green switch to the ON position.
3. Select “Add User” at the bottom of the screen. Refer to *Figure 4-28.*
4. Select the “User Name” and allow the user to enter in his or her name.
5. Select the “PIN” field for the user to enter in their Personal Identification Number.
6. Select the level of access for that user then press OK.

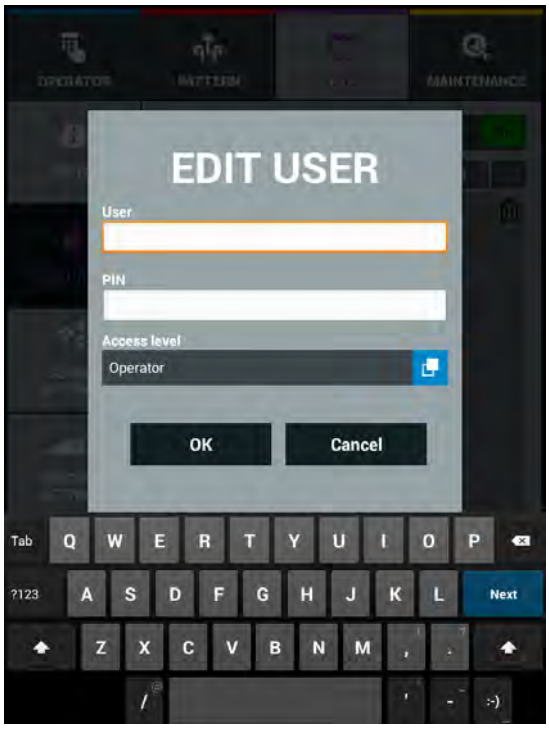

Figure 4-28. Security Add/Edit User

System Global Settings

The system settings are used to set clock functions like the date, time, and date format (MM/DD/YY or DD/MM/YY). The operator can select their preferred language and whether to see units of measure expressed in Imperial (US) or Metric (International) as well as setting the temperature format between Fahrenheit or Celsius. Refer to *Figure 4-29.*

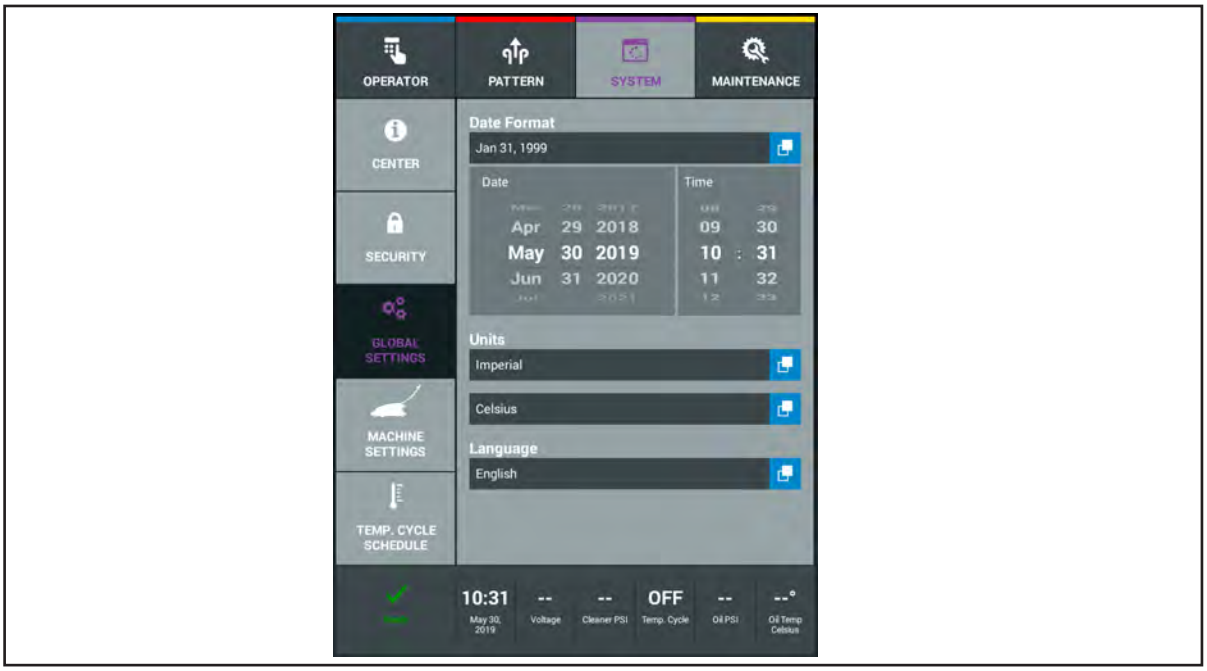

Figure 4-29. System Global Settings

Changing the Date Format

1. Go to the System menu and select Global Settings.
2. Select the Date Format button to bring up the list of formats available.
3. Exit to another menu to save your selection.

Changing the Date and Time

1. Go to the System menu and select Global Settings.
2. Use the scroll wheel to select the Month, Day, Year, and time of day.
3. Exit to another menu to save your selection.

Changing the Units of Measure

1. Go to the System menu and select Global Settings.
   a. To change how distance is displayed select the box and choose between Imperial (USA) or Metric (International).
   b. To change how temperature is displayed select the box and choose between Fahrenheit or Celsius.
2. Exit to another menu to save your selection.

Changing the Language

1. Go to the System menu and select Global Settings.
2. Select the Language button and a list of available languages will appear.
   a. Select the appropriate language.
3. Exit to another menu to save your selection.

System Machine Settings

The Machine Settings allow the user to fine tune machine parameters like how the vacuum is used and where functions begin in relationship to the foul line. The user can also adjust how the squeegee is raised at the end of the lane and selecting the type of Conditioner being used. *Refer to Figure 4-30.*

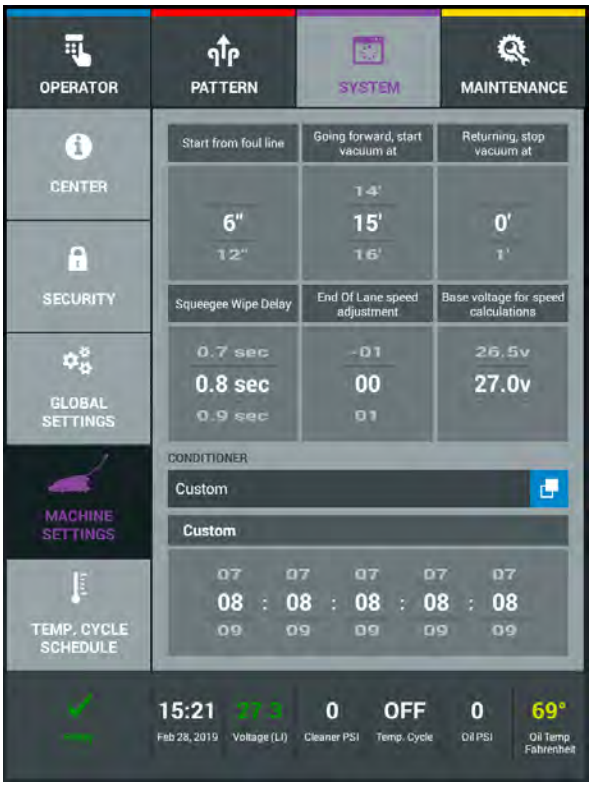

Figure 4-30. System Machine Settings

Changing the Start From Foul Line

1. Go to the System menu and select Machine Settings.
2. Swipe the scroll wheel either up or down to select the default starting distance from the foul line that the oil pattern will begin. Distances are in 6 inch increments with 6 inches being the minimum (12, 18, 24 are additional options).
3. Exit to another menu to save changes.

Changing the Vacuum ON and OFF Distances

1. Go to the System menu and select Machine Settings.
2. Changing the Going Forward, Start Vacuum At.
   a. Swipe the scroll wheel up or down to the selected distance you would like the vacuum to begin. It is recommended not to go further than 30 feet.
3. Changing the Returning, Stop Vacuum At.
   a. Swipe the scroll wheel to the selected distance you would like the vacuum to begin.
4. Exit to another menu to save changes.

NOTE: *Changing the distance where the vacuum turns ON and OFF allows you to conserve battery power and helps maintain a healthy battery. It is not recommended to turn ON the vacuum beyond 30 feet to prevent cleaner from being pushed into the gutters and to ensure that all of the waste is pulled into the waste tank. Turning the vacuum OFF on the return will also help conserve battery power but can cause dirty cleaner drips as the machine returns to the foul line.*

Changing the Squeegee Wipe Delay

1. Go to the System menu and select Machine Settings.
2. Swipe the scroll wheel up or down to select the amount of time (tenths of seconds) until the squeegee is wiping the back of the pin deck as the machine begins its return to the foul line.
3. Exit to another menu to save your changes.

NOTE: *The Squeegee Wipe Delay is used to release excess moisture from the squeegee blade to prevent dirty cleaner drips as the machine returns. It is important to set this option so that the center of the squeegee wipes no more than 2 inches onto the pin deck. This setting is set by your machine installer.*

Changing the End Of Lane Speed Adjustment

1. Go to the System menu and select Machine Settings.
2. Swipe the scroll wheel up or down to select the value.
   a. If the value is increased, the drive motor voltage will increase to ensure that the machine travels to the end of the pin deck.
   b. If the value is decreased, the drive motor voltage will decrease slightly to ensure that the machine does not travel beyond the end of the pin deck.
3. Exit to another menu to save your changes.

Changing the Base Voltage Adjustment

1. Go to the System menu and select Machine Settings.
2. Swipe the scroll wheel up or down to select the value.
   a. If the value is increased (0.5 increments), the machine speed will increase and the machine will complete its run in a faster time.
   b. If the value is decreased (0.5 increments) the machine speed will decrease and the machine will complete its run in a slower time.
3. Exit to another menu to save your changes.

NOTE: *Consult Brunswick Technical Support for changing this setting as other adjustments may cause the machine to travel slower.*

Changing the Conditioner Selection

1. Go to the System menu and select Machine Settings.
2. Select the Conditioner button to bring up a list of lane conditioners.
   a. Select the conditioner you are using.
3. Exit to another menu to save your changes.

Using the Custom Conditioner Selection

1. Go to the System menu and select Machine Settings.
2. Select the Conditioner button to bring up a list of lane conditioners.
   a. Select “Custom” from the list of conditioners and the conditioner values will highlight in white font.
   b. Swipe the scroll wheels up or down to set each of the five values.
3. Exit to another menu to save your changes.

NOTE: *Contact Brunswick Technical Support for a list of values of competitive conditioners.*

System Temperature Cycle Scheduler

The scheduler for the temperature cycle will allow you to automatically turn the conditioner heat cycle ON and OFF at specific times each day of the week. This will allow for the conditioner to be at a consistent temperature when applied to the lane surface. Since this feature adds to the power consumption of the machine, **IT IS RECOMMENDED THAT YOU SCHEDULE THESE CYCLE TIMES TO BE ON PRIOR TO CONDITIONING THE LANES** – while the battery charger is still connected. This will use the batter charger power to heat the conditioner. During the conditioning cycle on the lanes, the running of the conditioner pump is sufficient to maintain the conditioner temperature without using the heater feature. Refer to *Figure 4-31.*

NOTE: *A caution will appear on the Tablet near the Temperature Cycle Box if you continue to leave the Temperature Cycle ON while conditioning the lanes.*

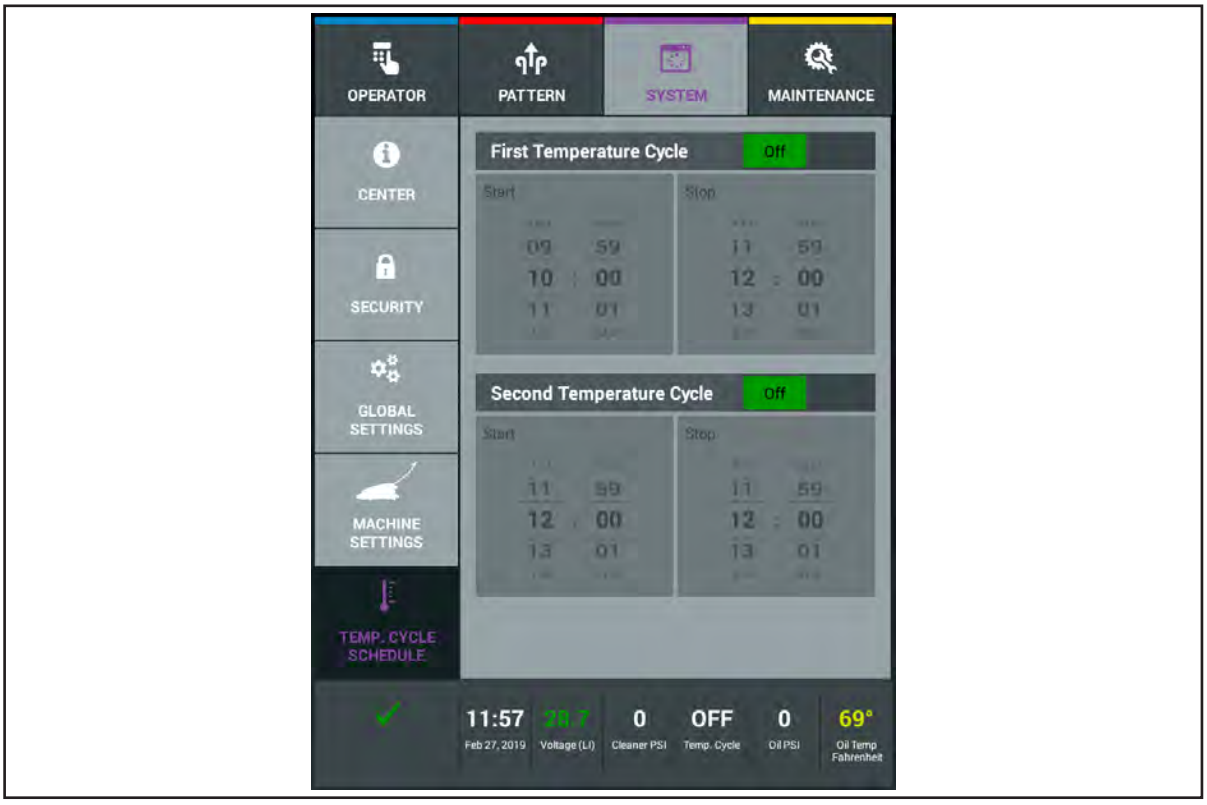

Figure 4-31. System Temperature Cycle Scheduler

Setting the Temperature Cycle

1. Go to the System menu and select the Temperature Cycle selection.
2. Turn ON the First Temperature Cycle.
3. Swipe the scroll wheel up or down to set the Start time.
4. Swipe the scroll wheel up or down to set the Stop time.
5. Repeat steps 2-4 if you wish to also use the Second Temperature Cycle option.

NOTE: *The conditioner Temperature Cycle can be run while the MAX is in the transport position. This feature was added to allow the conditioner heat cycle to be used while the battery charger is still connected to the machine.*

NOTE: *The conditioner Temperature Cycle can also be manually changed between ON and OFF from the Operators Screen.*

The Maintenance Screen

About the Maintenance Screen

The maintenance screen provides information about the long-term use and maintenance of the machine. Refer to *Figure 4-32.*

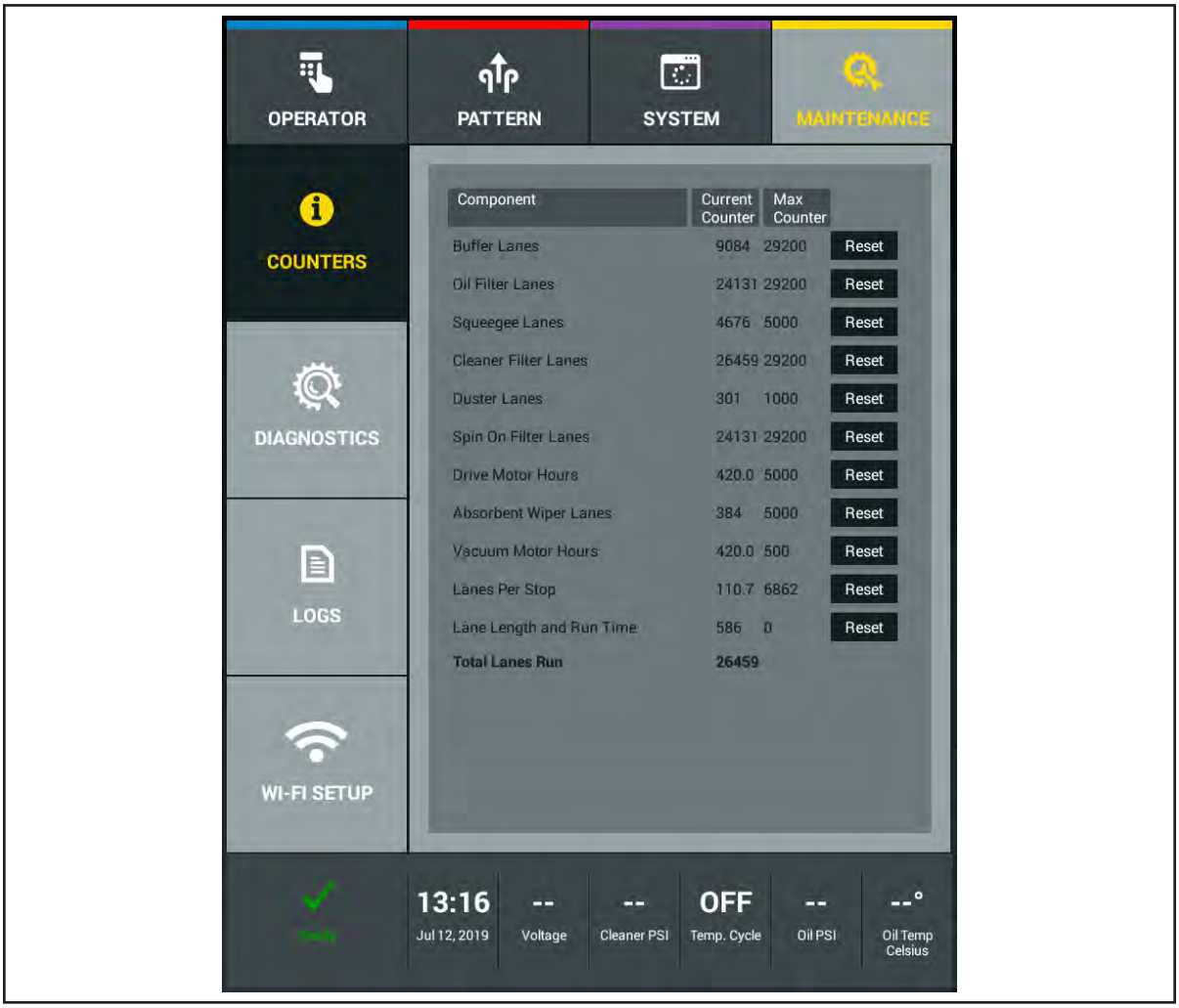

Figure 4-32. Maintenance Screen

Counters display the total lanes run, the amount of use on a variety of replaceable parts, and alerts you when a part is reaching the end of its useful life. These will generate a warning message when the counter expires. The maintenance message will continue to appear before running each lane until the counter is reset.

Diagnostics shows the current state of all major hardware devices and allows you to cycle motors on and test sensors and switches for troubleshooting purposes.

Logs keeps and displays records of pattern changes, patterns run, maintenance, error messages, lane length, runtimes, battery charging, and voltage run.

WIFI Setup allows you to connect to WIFI for software updates, accessing the Brunswick Public Library, Private Brunswick Cloud account and sharing Log files with Brunswick Technical Support.

Maintenance Counters

The MAX monitors the life of consumable items that will need periodic replacing or cleaning. Life expectancy of most items are based on the number of lanes they will perform. Motors are monitored in the number of hours they are used. After you replace a part, you must reset the counter for that part to start the counter for the new part (the duster cloth counter will reset automatically if the duster cloth is changed during a running session via the "change duster cloth" button in the Operator's Screen). A list of the counter values is shown in section 7. Refer to *Figure 4-33.*

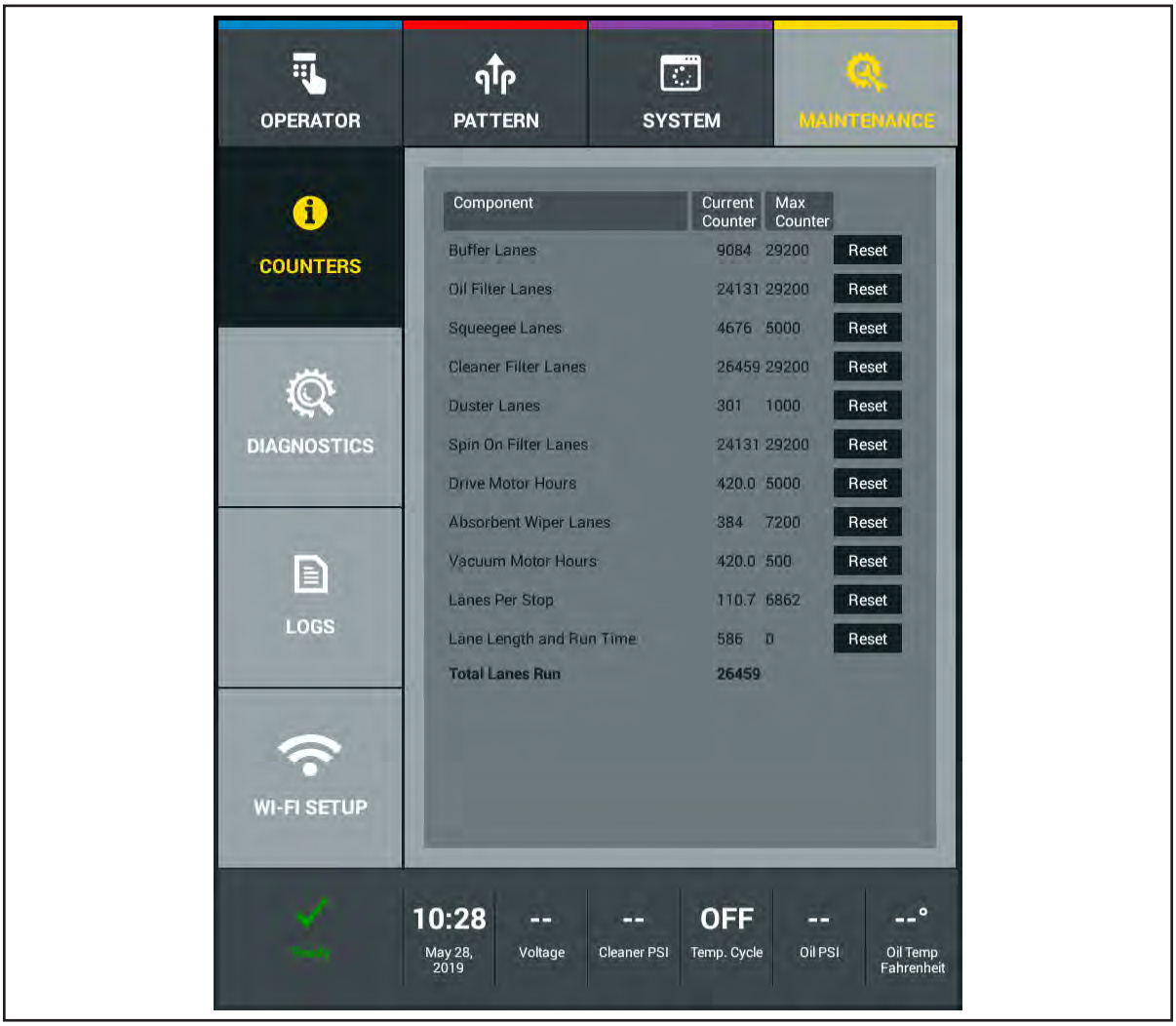

Figure 4-33. Maintenance Counters

Resetting a Counter

1. Go to the Maintenance screen and select Counters.
2. Find the counter that requires a reset.
3. Press the Reset button to the right of the counter and that counter will reset to 0.
4. Exit to another menu to save changes.

NOTE: *You can't reset the counter for Total Lanes Run.*

Maintenance Diagnostics

This menu allows you to operate the pumps and motors and test the operation of sensors and switches. Diagnostics is an invaluable function for troubleshooting machine problems. Refer to *Section 6 - Troubleshooting* for more information. Refer to *Figure 4-34.*

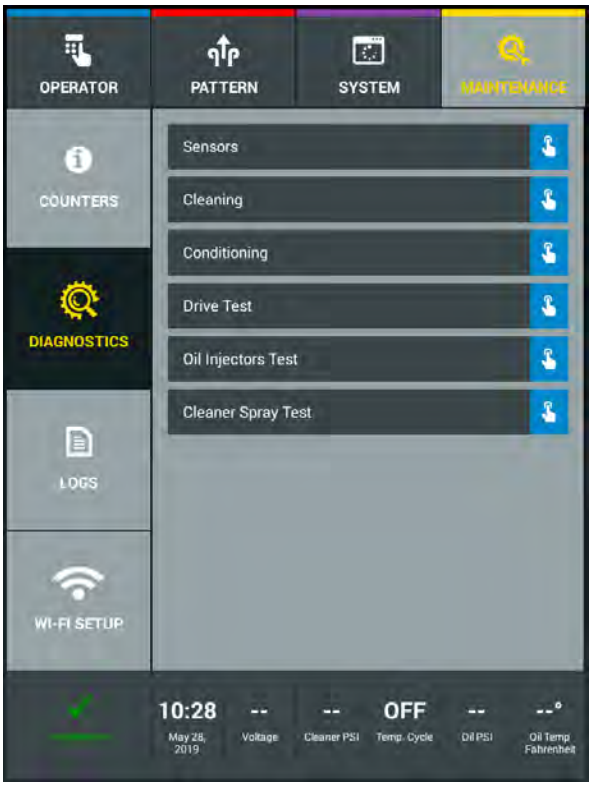

Figure 4-34. Maintenance Diagnostics

Sensors

This menu lets you view the current status of all sensors or switches for diagnostic purposes. Refer to *Figure 4-35.*

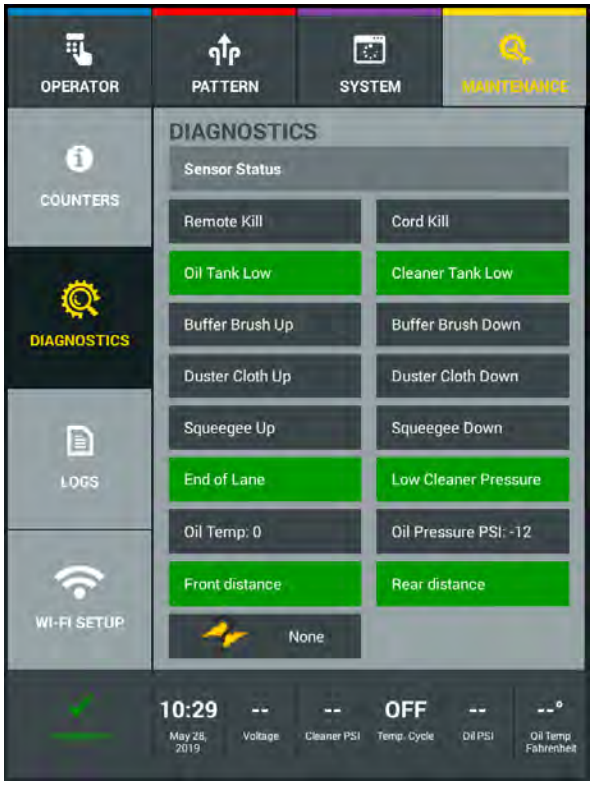

Figure 4-35. Maintenance Diagnostics Sensors

Cleaning

This menu lets you view the current status of all sensors or switches, and view or test all motors in the cleaning system. Refer to *Figure 4-36.*

NOTE: *There are two ways we test component functions. Some components will run for 20 seconds (vacuum, cleaner pump) while others may toggle between sensors (duster cloth, squeegee). If you are unsure how to properly test, contact Brunswick Technical Support or your Brunswick Distributor*

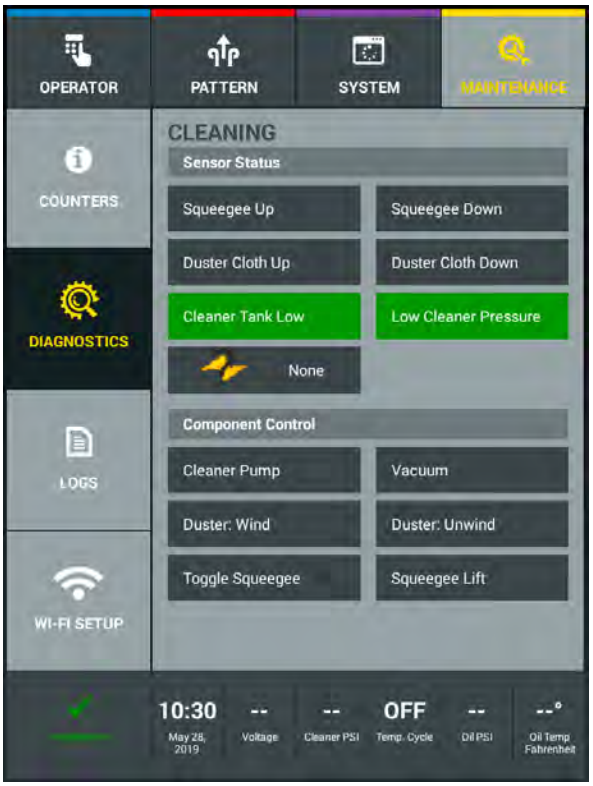

Figure 4-36. Maintenance Diagnostics Cleaning

To view a cleaning system sensor position or test a motor function:

1. Go to the Maintenance menu and select Diagnostics, then select Cleaning.
2. Select the Component Function you wish to test by pressing that button.
3. If there are corresponding sensors, you will see the Sensor Status change.

Conditioning

This menu lets you view the current status of all sensors or switches, and view or test all motors in the conditioning system. Refer to *Figure 4-37.*

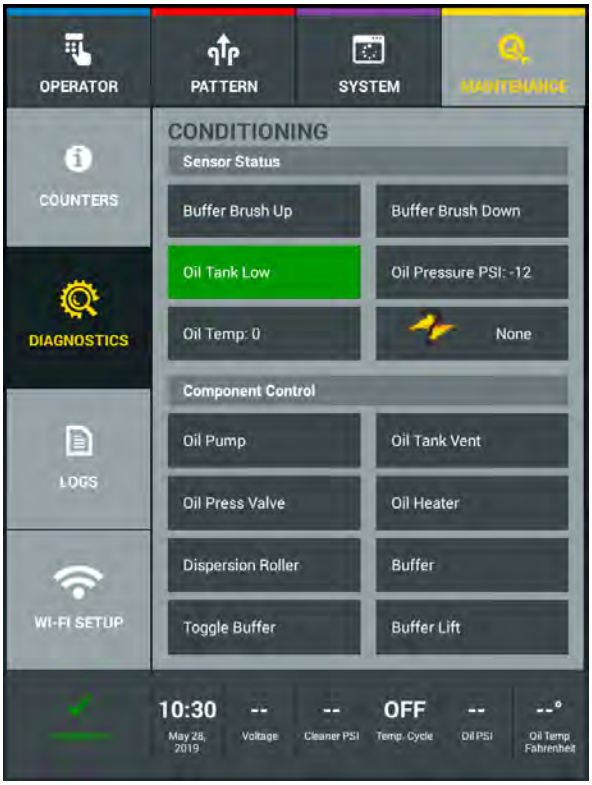

Figure 4-37. Maintenance Diagnostics Conditioning

To view a cleaning system sensor position or test a motor function:

1. Go to the Maintenance menu and select Diagnostics, then select Conditioning.
2. Select the Component Function you wish to test by pressing that button.
3. If there are corresponding sensors, you will see the Sensor Status change.

Drive

This menu lets you view the current status of all sensors or switches, and view or test all motors in the conditioning system. Refer to *Figure 4-38.*

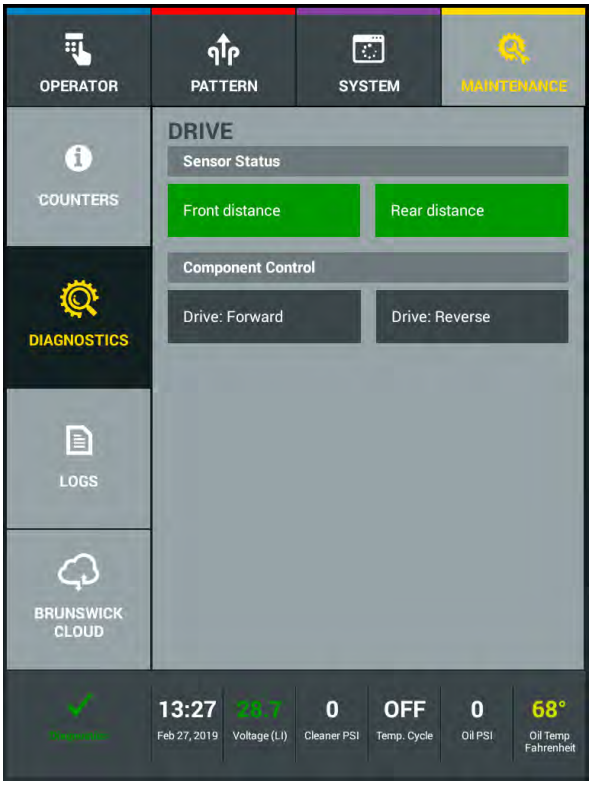

Figure 4-38. Maintenance Diagnostics Drive

To view a cleaning system sensor position or test a motor function:

1. Go to the Maintenance menu and select Diagnostics, then select Drive.
2. Select either Drive: Forward or Drive: Reverse to turn on drive motor.

NOTE: *The front distance sensor is on the main traction drive shaft and can be seen operate with the covers open. The sensor will flash and the screen will refresh at a slower rate than the actual sensor. The rear sensor must be turned by hand to see the function on the tablet screen.*

Oil Injector Test

The test for the Oil Injectors is designed for the technician to visually see each injectors spray pattern. This diagnostic function verifies that each injector is firing properly and to identify if an injector has failed or not creating the appropriate spray pattern. The machine will travel approximately 25 feet down the lane during this test. The process includes cleaning the lane and firing each injector in a sequential order allowing the technician to easily see each injection without interference by the buffer brush. Refer to Figure 4-39.

Figure 4-39. Maintenance Diagnostics Oil Injector Test

Performing the Oil Injector Test

1. Go to the Maintenance menu and select Diagnostics, then select Oil Injector Test.
2. Press “PREPARE for Lane” and the machine will prepare itself to run.
3. Push the machine on the lane surface when message appears.
4. Press OK a second time to begin the test.

Cleaner Spray Test

The test for the Cleaner spray is used to verify the cleaner coverage. This test allows the technician to visually see how well the cleaning spray is covering the lane during a cleaning run. The process is performed in two passes of the lane machine. The first pass of the machine will clean approximately 25 feet of the bowling lane. The second pass sprays cleaner to the bowling lane as it travels without interference of the duster and the squeegee assembly. The cleaner will pulse about half way through the second run. Cleaner spray pressure during this test should be between 17-19 psi. Refer to *Figure 4-40.*

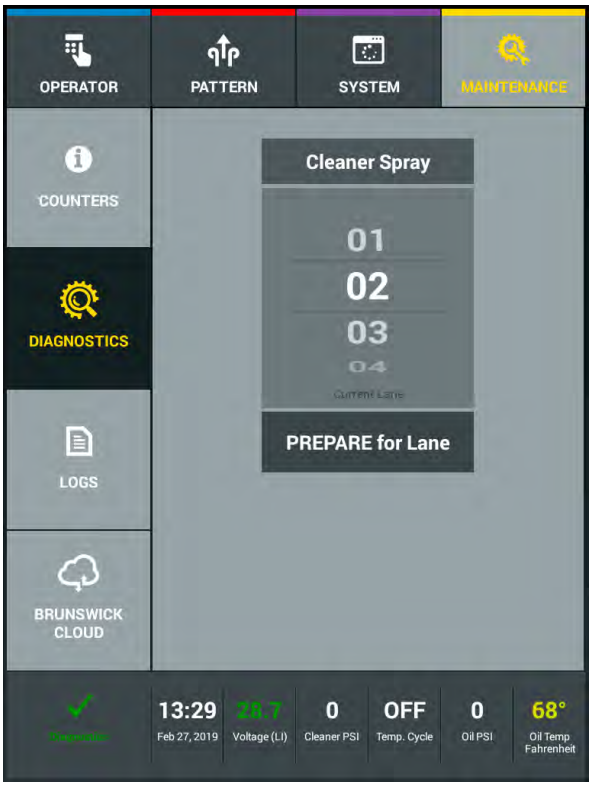

Figure 4-40. Maintenance Diagnostics Cleaner Spray Test

Performing the Cleaner Spray Test

1. Go to the Maintenance menu and select Diagnostics, then select Cleaner Spray Test.
2. Press “PREPARE for Lane” and the machine will prepare itself to run.
3. Push the machine on the lane surface when message appears.
4. Press OK a second time to begin the test.
   a. The machine will travel down the lane cleaning, then return to the foul line after it travels approximately 25 feet.
5. Press OK a second time when the message is displayed.
   a. The machine will travel down the lane only spraying the cleaner so you can see the spray coverage.

Maintenance Logs

Most programming changes and all of the maintenance and error messages displayed are tracked and can be viewed on the Logs screen to make troubleshooting faster and more reliable. Users with Level 1 or 2 security access can view all logs. **Logs cannot be edited or deleted by the user.** Refer to *Figure 4-41.*

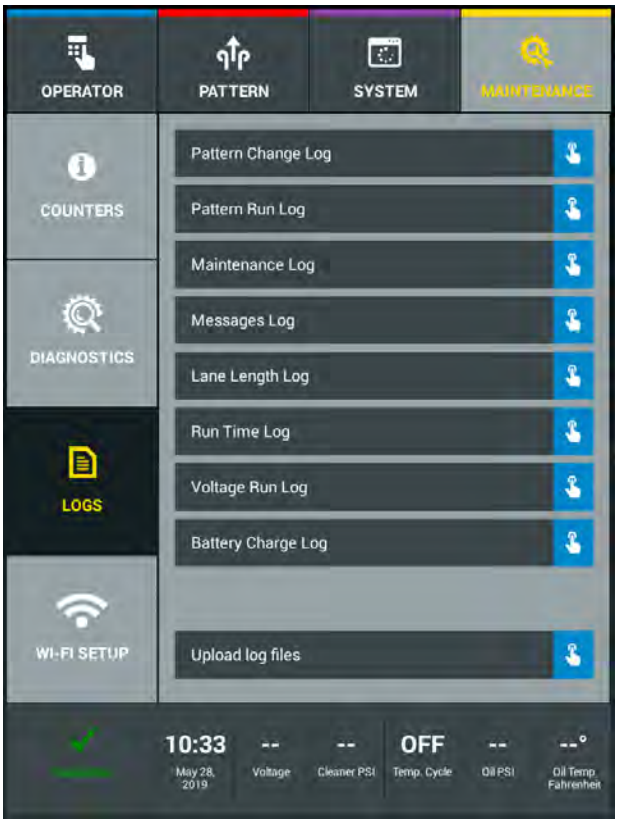

Figure 4-41. Maintenance Logs

Pattern Change Log

This log tracks all changes to any pattern parameter or pattern modifications. It also logs the date and time of the change and the ID of the user who made the change, if the login feature is enabled. Refer to *Figure 4-42.*

1. Go to the Maintenance screen and select Logs, then select the Pattern Change Log.
2. Swipe your finger up or down on the screen to view log file.

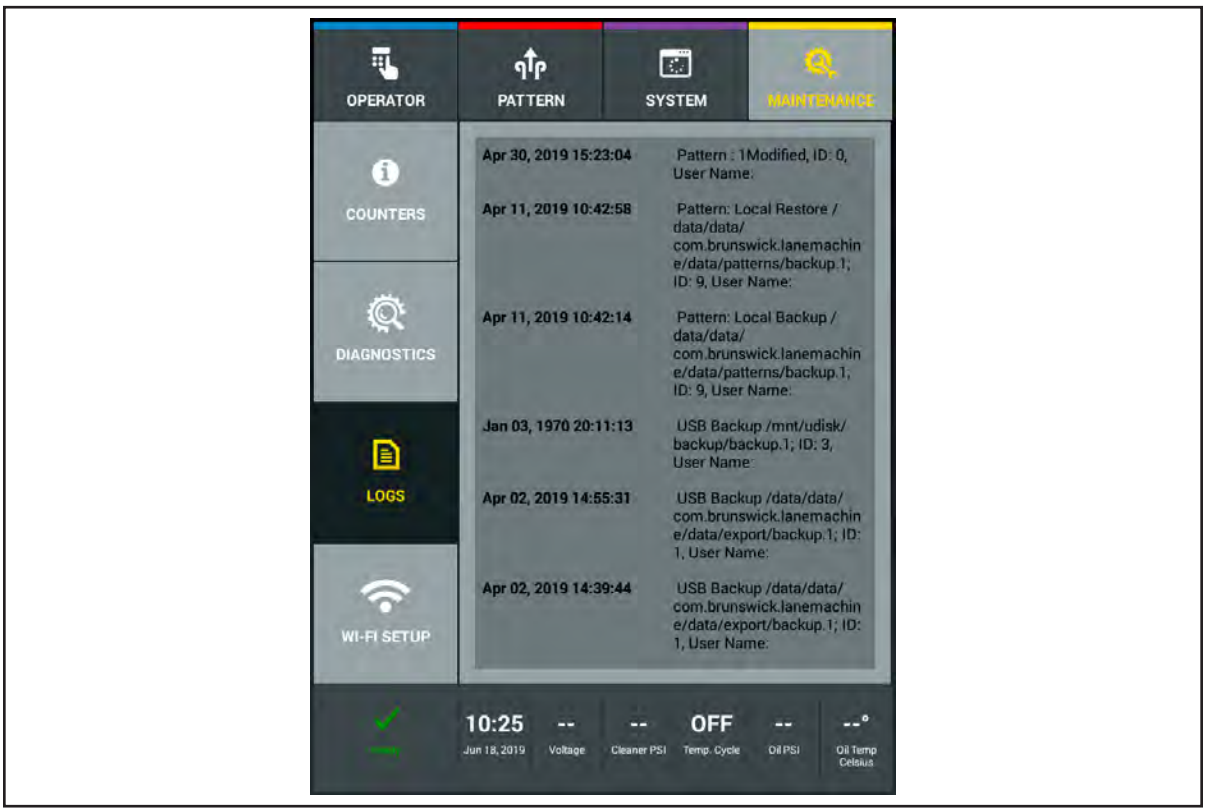

Figure 4-42. Pattern Change Log

Pattern Run Log

This log provides historical information on the machine's operations including what lanes were run, in what order the lanes were run, the times the lanes were run, which patterns were run on each lane, any pattern overrides, and the ID of the user who ran the lanes, if the login feature is enabled. Refer to *Figure 4-43.*

1. Go to the Maintenance screen and select Logs, then select the Pattern Run Log.
2. Swipe your finger up or down on the screen to view log file.

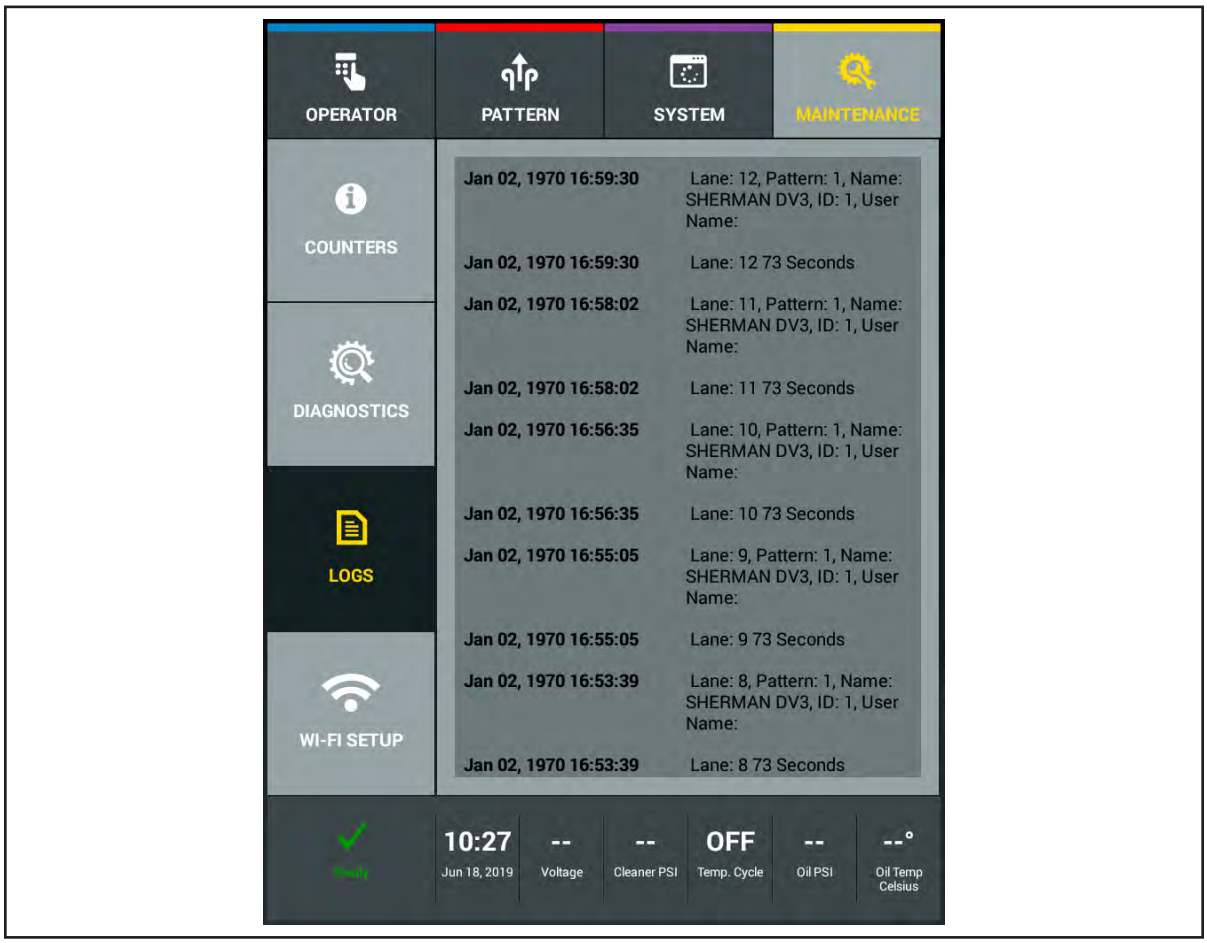

Figure 4-43. Pattern Run Log

Maintenance Log

This log tracks when hardware items needed to be replaced, when counters were reset, and provides a date and time stamp and user name to verify when these actions took place. Refer to *Figure 4-44.*

1. Go to the Maintenance screen and select Logs, then select the Maintenance Log.
2. Swipe your finger up or down on the screen to view log file.

Figure 4-44. Maintenance Log

Message Log

This log tracks all errors and warning messages and provides a date and time stamp to verify when those messages were displayed. Refer to *Figure 4-45.*

1. Go to the Maintenance screen and select Logs, then select the Messages Log.
2. Swipe your finger up or down on the screen to view log file.

NOTE: *Maintenance logs can be backed up to a USB flash drive as explained earlier in Section 4, "Backing Up and Importing Data". These logs may contain information that is helpful to Brunswick Technical Support when troubleshooting issues. They can explain how to attach backup files to an e-mail or ship the USB flash drive with your center maintenance logs. The maintenance logs, counters and critical center data cannot be imported back to your Tablet.*

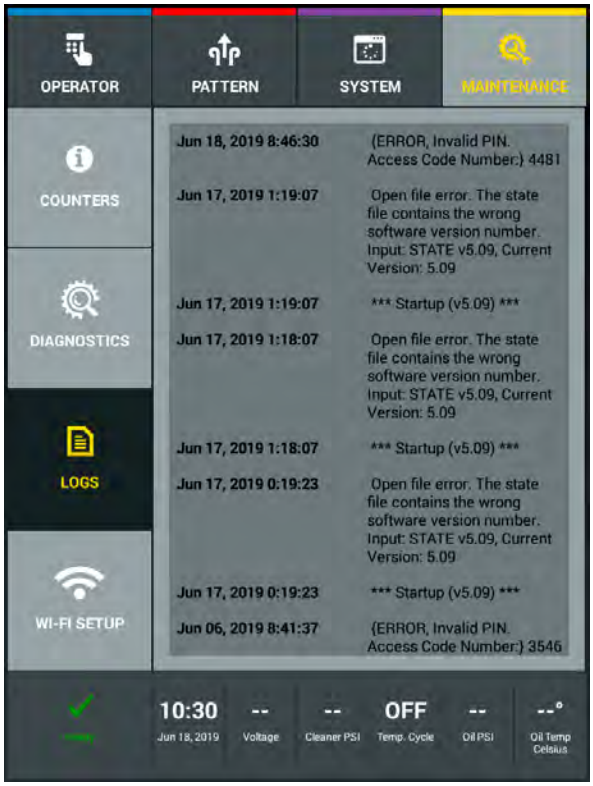

Figure 4-45. Message Logs

Lane Length Log

This log displays the lane length for each lane number in the bowling center. Two sensors monitor the distance on the traction drive shaft and the read distance shaft. The data is recorded in "tick counts", which indicates the length that the end of lane senors is triggered for each lane. Refer to *Figure 4-46.*

The average, highest and lowest tick counts are displayed for each lane along with the actual value for the last three runs on that lane.

This information can show how consistent the recorded tick count is for each lane to indicate possible distance encoder or end of lane sensor maintenance. It can also identify wheel slippage caused by too much pressure on the squeegee assembly or potential issues with the lane surface topography. This information is only accurate if the operator verifies that they only run the same lane that is displayed on the current lane number on the center of the tablet.

The lane lengths will not be recorded in this log if the lane machine displays an error relating to the "tick count" or end-of-lane sensor. The most common cause for this type of error is a short (low) tick count caused by an operator pushing the lane machine beyond the foul line before pressing the start button. The lane length may need to be reset in the counter option of the maintenance screen to correct.

1. Go to the Maintenance screen and select Logs, then select the Lane Length Log.
2. Swipe your finger up or down on the screen to view log file.

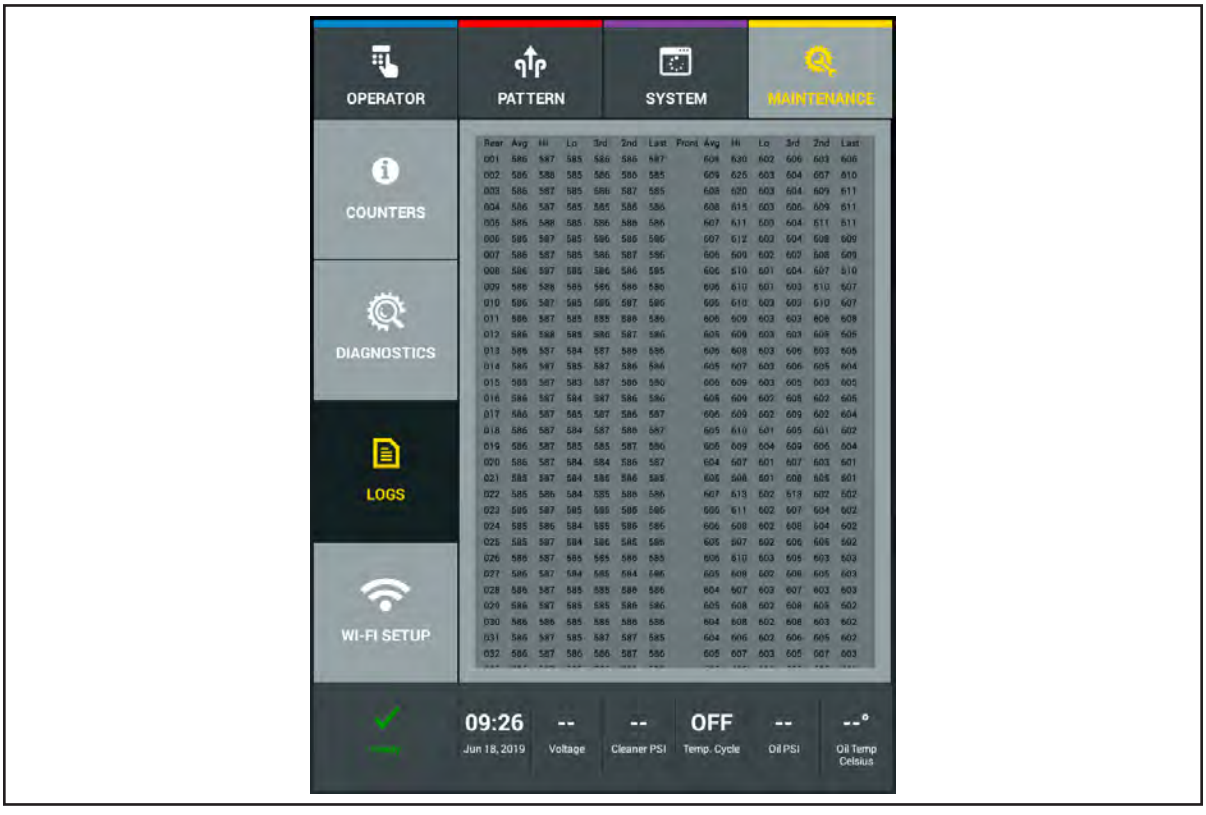

Figure 4-46. Lane Length Logs

Run Time Log

This log displays the amount of time that it is required to complete a lane at each of the 3 forward travel speeds. Like the Lane Length Log, the Run Time Log will also record any speed adjustments it will make to maintain the correct run time for each speed. Refer to *Figure 4-47.*

The speed "feedback" loop monitors the rate of travel and will adjust itself to either decelerate or accelerate as needed. Expected run times for Fast, Medium, and Slow are listed as follows.

Fast: ~65 seconds Medium: ~69 seconds Slow: ~73 seconds

Run times in yellow values means that the machine is running slightly slower or faster than expected. These messages are "Alert" messages.

Run times with red values indicates that the run time is far out of range and it is strongly recommended to make adjustments. These messages a "Warning" messages.

1. Go to the Maintenance screen and select Logs, then select the Run Time Log.
2. Swipe your finger up or down on the screen to view log file.

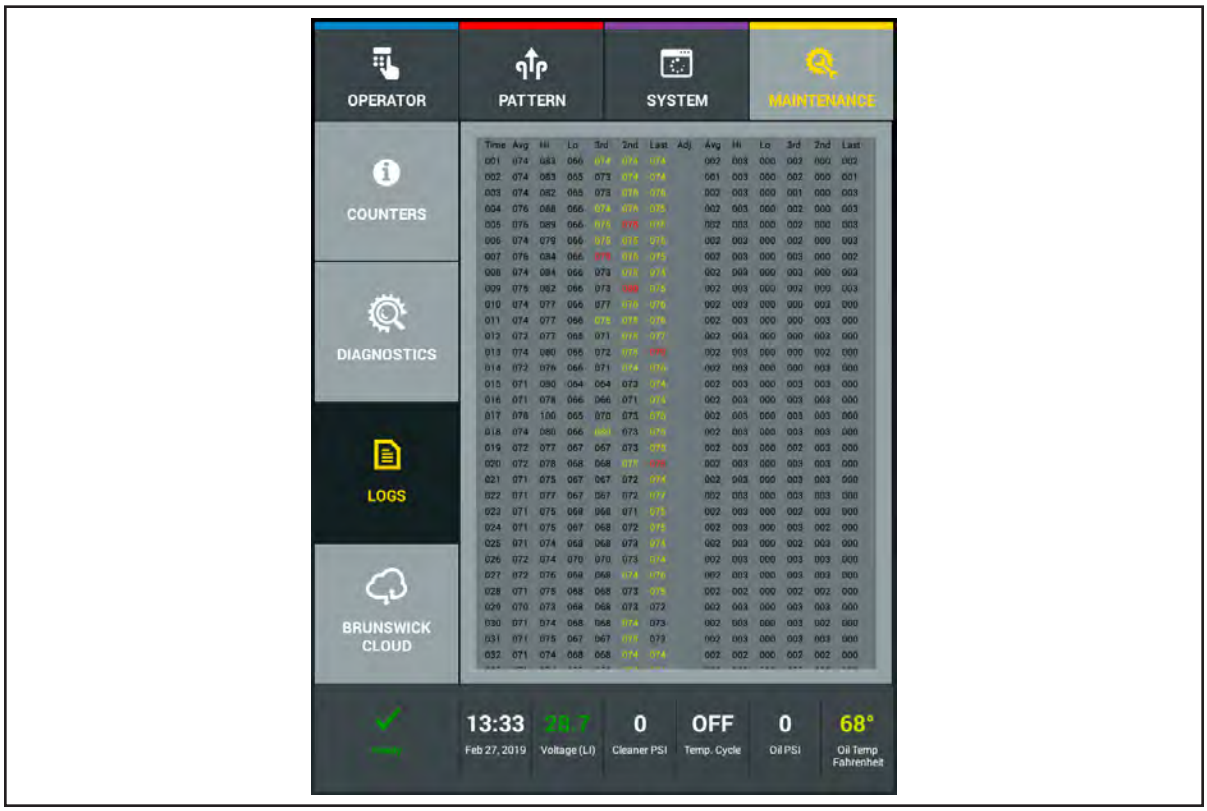

Figure 4-47 Run Time Logs

Voltage Run Log

The voltage log records the voltage of the battery while the machine is in use. The tablet records the voltage data at three different times for each lane that is maintained. This information can be useful as a tracking tool to monitor voltage drop trends. This could also be used to troubleshoot potential voltage issues with the batteries. Refer to *Figure 4-48.*

1. Go to the Maintenance screen and select Logs, then select the Voltage Run Log.
2. Swipe your finger up or down on the screen to view log file.

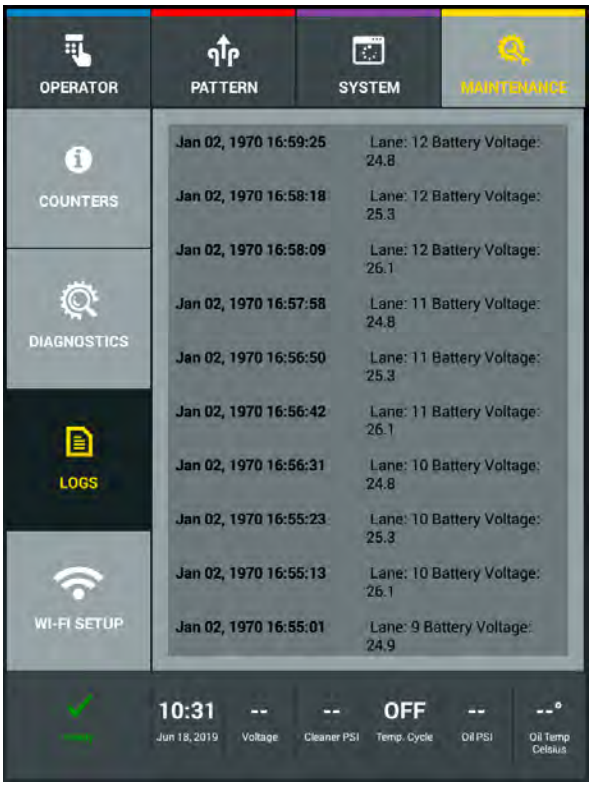

Figure 4-48 Voltage Run Logs

Battery Charge Log

The battery charge log will record the battery voltage during the charging cycle. It will take a "snapshot" of this voltage every two minutes. Similar to the Voltage Log, this log will give you the ability to track and troubleshoot the charging operation of the MAX batteries and charging unit. Refer to *Figure 4-49.*

1. Go to the Maintenance screen and select Logs, then select the Battery Charge Log.
2. Swipe your finger up or down on the screen to view log file.

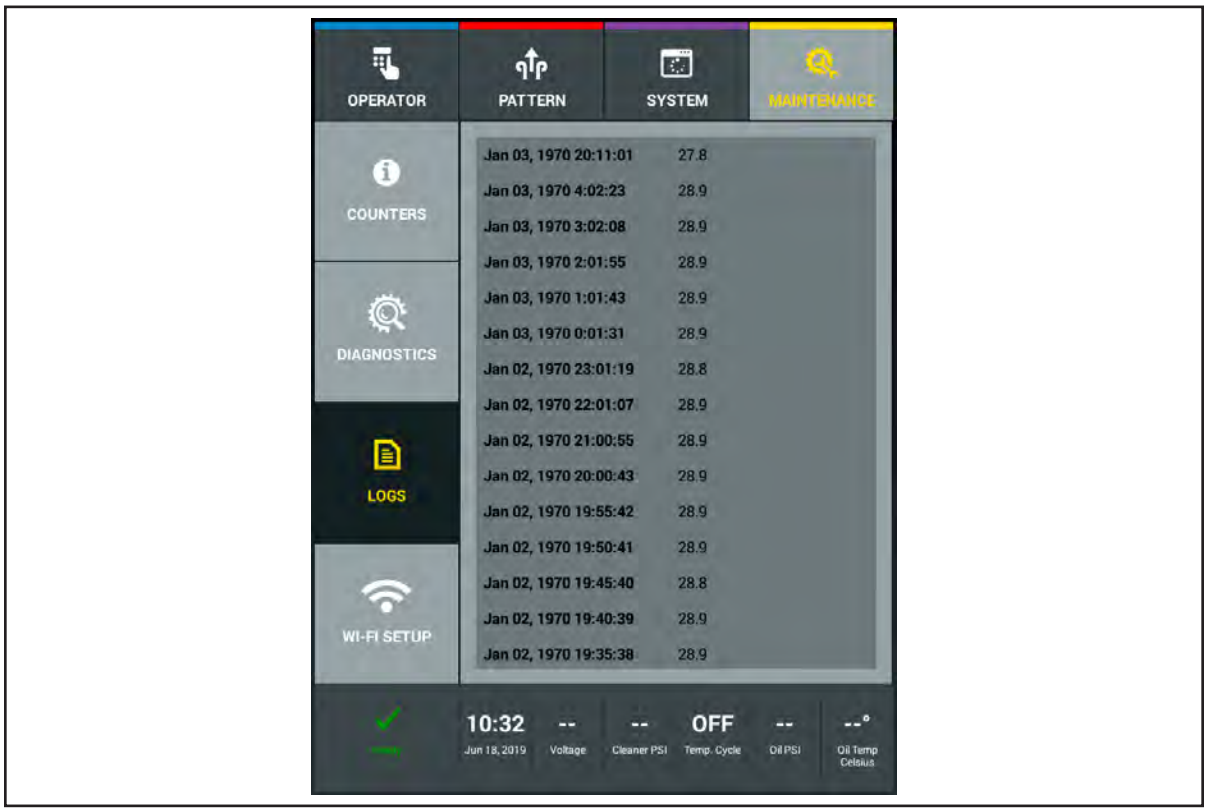

Figure 4-49 Battery Charge Log

Upload Log Files

Log files can be loaded up to the Brunswick Cloud in the event you have issues that require technical support. This feature makes it faster and easier for our technical staff to help resolve potential issues. A Message box allows you to write a short explanation for the upload. You must activate WIFI to share the log files and you will be receive a message if the upload is successful. Refer to *Figure 4-50.*

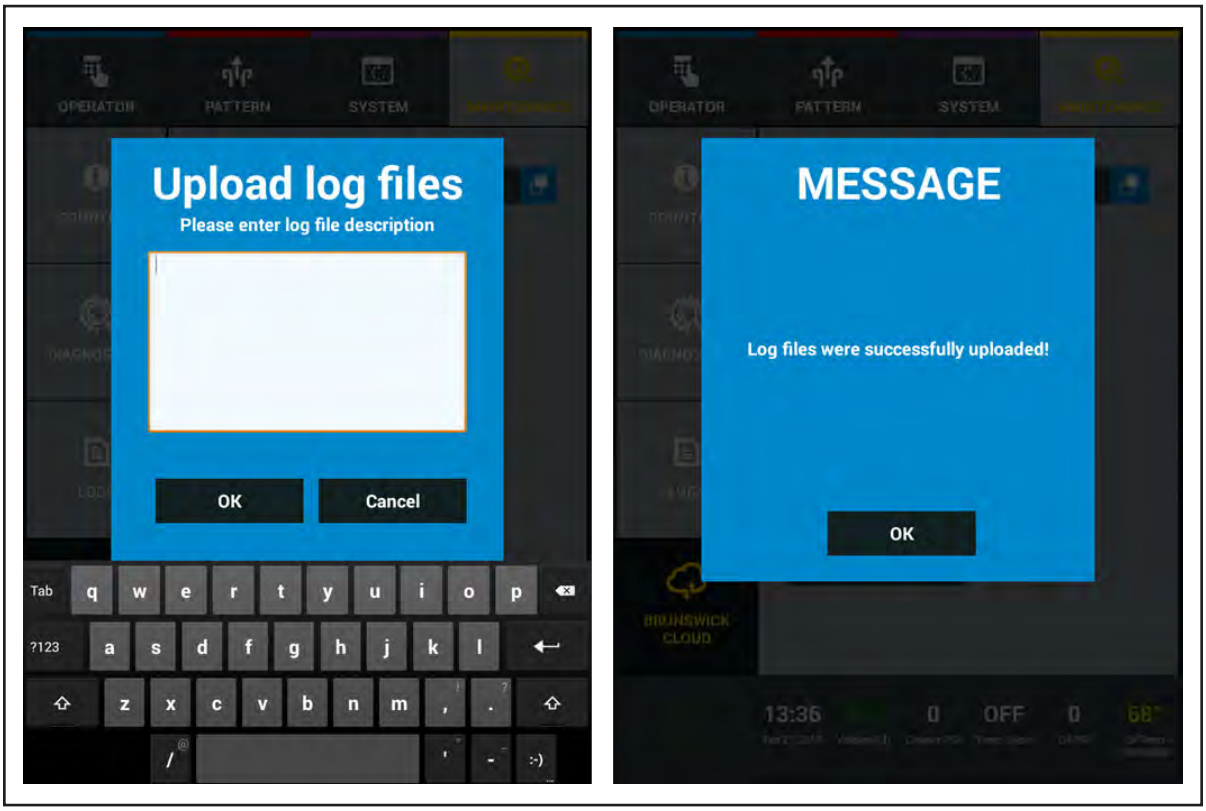

Figure 4-50 Upload Log Files and Successfully Uploaded Message

Maintenance WIFI Setup

The tablet is WIFI compatible allowing you to connect to the Brunswick Cloud to upload and download log files, machine data and patterns. The WIFI should be turned on to upload and download, but may be turned off if the tablet or machine is out of range. It is preferred that the WIFI connection is secured and requires a security password. Public WIFI networks are usually slower speed and high in traffic. To ensure the best option for sharing with the Brunswick Cloud, use a secured WIFI connection. Refer to *Figure 4-51.*

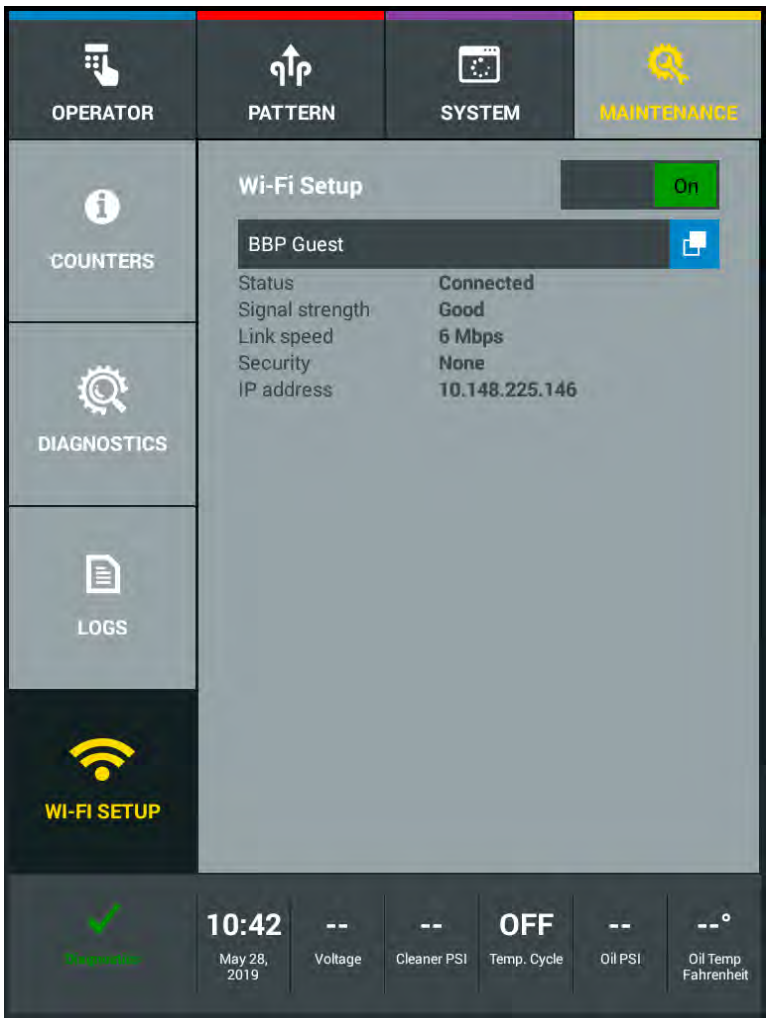

Figure 4-51 WIFI Setup

How to Setup the WIFI Network

1. Go to the Maintenance menu and select WIFI Setup.
2. Turn ON the WIFI by taping the WIFI switch until it reads “ON”.
3. Press the ***NO NETWORK*** button to see the list of available WIFI networks.
   a. Select the appropriate network
   b. Enter in a security password (if necessary)
4. The information for the status, signal strength, link speed, security, and IP address will populate.

Intentionally Blank

Section 5: Operating the Machine

Ready to get to work? Here's what you need to know to start, stop, and run the machine for normal, daily use. If you want detailed information about the sequence of operations, or to find out more about what's happening within the machine at each stage, see Sequence of Operations portion of **Section 7: Troubleshooting**.

In this section you will find:

1. What to know before you get started
2. Start-up procedure
3. Shutdown procedure
4. Storing the machine

BEFORE YOU START

Step 1: ***Check tanks and duster cloth supply roll to be sure the machine is ready to operate.***

a. Make sure cleaner and conditioner supply tanks are properly filled and caps are properly tightened.

b. Make sure that the air was purged from the conditioner system if the conditioner system was completely empty. Refer to Section 6 - Maintaining the Max.

c. Make sure the waste recovery tank is empty. If not, remove the waste tank from the machine and dispose of the used lane machine waste properly. Do NOT dump recovery tank in a septic tank or sanitary sewer system. Follow your local environmental regulations for the best method of disposal.

d. Make sure there is enough cloth on the duster cloth supply roll to complete the number of lanes desired.

CAUTION! Fill and empty tanks with the machine in operating position (See "Finding Your Way Around the MAX") and away from lanes and approaches. Use the no-spill container and the oil fill nozzle to avoid spilling. Clean all spills and drips immediately.

Step 2: ***Position the machine on the approach.***

a. With the machine in operating position, roll the machine to the first lane, about 2 feet away from the foul line.

b. Align the target on the top cover of the machine with the center board of the lane.

START-UP PROCEDURE

Step 1: *Supply Power to the Machine*

BATTERY OPERATION

a. Unplug the battery charger cord from the 7 pin side of the machine.

NOTE: *The MAX is designed to remain on at all times (24/7) including charging times. In the event that the power is off, turn on using the switch on the 7 pin side of the machine near the charging port for the battery charger so the charging data can be logged. The MAX WILL charge if the power switch is in the off position.*

b. With the machine in its operating position, place it on the approach in front of the foul line.

NOTE: *If the Tablet doesn't power up, check the main switch on the side of the machine or the Emergency Stop button on top of the electronic enclosure. Make sure that the serial cable assembly is plugged into the bottom of the tablet.*

c. The status window displays, "READY" in the lower, right box on the screen.

CORDED OPERATION

a. Unplug the battery cable from the Electronics Enclosure.

b. Plug in the AC/DC power supply cable into the Electronics Enclosure.

c. Plug one end of the power cord into the machine and the other end into the wall outlet. (115-volt, 50/60 HZ, 20 amp outlet or 230-volt, 50HZ, 15 amp outlet).

NOTE: *If the Tablet doesn't power up, check the main switch on the electronic enclosure. Also rotate the emergency shut off switch clockwise 1/4 turn and release.*

d. Place power cord ring into the cord kill assembly.

NOTE: *The cord should follow the machine from lane to lane to avoid interference.*

e. The status window displays "READY" in the lower, left box on the screen.

Step 2: ***Press handle button or "Prepare for Lane #" to prepare the machine to run.***

NOTE: *During first usage you are required to download a pattern if you change the pattern or change the selected conditioner.*

a. The machine lowers the duster contact roller and squeegee into operating position, turns on the vacuum motor (AC power only) and pressurizes the conditioning system.

NOTE: *After the first lane, machine will pressurize the conditioning system when the reverse pass is completed.*

b. The display screen displays "Put the lane machine on the lane" when the machine is ready to begin operation.

c. Position the machine on the lane with the rear caster wheels aligned with the gutter just in front of the foul line. Use the handle magnetic catch to center the machine onto the lane.

d. When putting the machine on the lane, once the duster cloth contacts the lane surface, the machine will pulse spray cleaner for 5 seconds.

Step 3: ***Press handle button a second time to begin operation on first lane.***

a. The machine accelerates forward, automatically cleaning and conditioning the lane until it reaches the pin deck. *For a detailed description of these operations, refer to Section 7, Troubleshooting, Sequence of Operations.*

b. When the machine reaches the end of the pin deck, it reverses direction and returns to the foul line, completing the conditioning operation.

c. The Tablet displays the number of the next lane to be cleaned and conditioned.

CAUTION! When using the AC power cord, manage the power cord so it does not get trapped under the lane machine. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

Step 4: ***Move machine to subsequent lanes.***

a. When the lane is completed, pull the machine back onto the approach about 3 feet from the foul line.

b. Turn machine and use the rear lane to lane wheels to steer it to the next lane. Press "OK" to prepare the machine to run and wait for the display screen to prompt "Put the lane machine on the lane."

c. Position the larger front wheels so they align with the gutter just in front of the foul line of the next lane.

d. Press "OK" to begin operation on the lane.

e. Continue same procedure on subsequent lanes.

EMERGENCY STOP

In the event that you need to stop the machine in an emergency while it is operating on the lane, there are three possible safe options:

Option 1 (Battery or Corded Operation)

The E-stop button in the top center of the machine will shut down all power when depressed. Twist the top of the switch clockwise and release to turn power back on. (This is also a good one to check if you cannot turn the machine on!)

Option 2 (Corded Operation)

If an AC power cord is being used, the cord kill switches on the left or right rear of the machine will stop the travel and functions of the machine when the power cord is pulled firmly by the operator. The operators choices after this are:

- Press *"OK"* to continue operations.
- Press *"Return to the Foul Line"*.
- Press *"Stop Running"* to stop all functions.

Option 3 (Battery Operation)

If DC battery power is being used, the remote stop transmitter (one of two supplied) should be pressed to activate the remote stop receiver located on the bottom of the electronics enclosure. This will stop the travel and functions of the machine. If the machine travel doesn't stop immediately, continue to press the transmitter button as the machine nears the end of the pattern, before it reaches the pinsetter. The operators choices after this are:

- Press *"OK"* to continue operations.
- Press *"Return to the Foul Line"*.
- Press *"Stop Running"* to stop all functions. Refer to *Figure 5-1.*

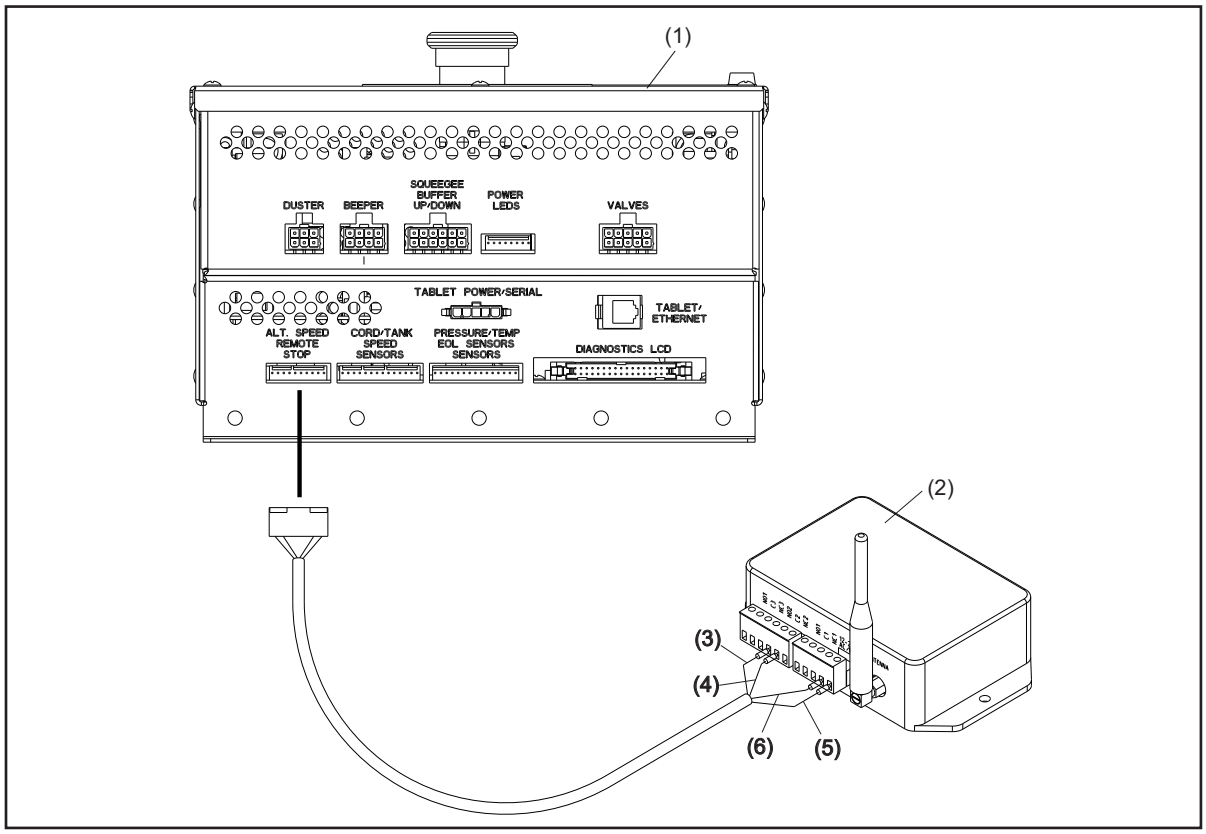

Figure 5-1. Remote Stop

(1) ELECTRONIC ENCLOSURE
(2) REMOTE STOP RECEIVER
(3) GREEN (NO2)
(4) WHITE (C2)
(5) RED (12 VDC)
(6) BLACK (GROUND)

SHUTTING DOWN

Step 1. Pull machine off of the lane and onto approach.

CAUTION! Never raise the machine into transport position until you have emptied the waste recovery tank.

WARNING! When using the AC power cord, always disconnect it from the back of the machine before placing the machine in transport position.

Step 2. Empty the waste recovery tank. This will allow time for the machine to depressurize the conditioning system. Remove the waste tank from the machine and dispose of the used lane machine waste properly. Do NOT dump recovery tank in a septic tank or sanitary sewer system. Follow your local environmental regulations for the best method of disposal.

Step 3. CORDED: Turn power off at the main switch then remove the power cord from the machine. Unplug the power cord at the power receptacle. This will shut down the Tablet and the electrical enclosure.

BATTERY: Connect to the battery charger as soon as possible. When using the Lithium battery, DO NOT SHUT DOWN THE MACHINE POWER. Even though the machine will charge with the power off, you will lose the ability to track the charging in the Battery Charge log file.

STORING THE MACHINE

1. Fill the lane cleaner and conditioner tanks before storing.

2. Stand machine upright onto its transport casters.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

3. Wrap power cord in large loops for storage, DO NOT store on lane machine.

4. Perform all daily maintenance task. Refer to Section 6: Maintaining the Max for more information.

5. Store the machine on a secure, warm location.

6. Connect the charger to the lane machine, then turn the charger “On”.

NOTE: *The warning buzzer will sound if the charger is not turned on. Refer to the troubleshooting section.*

NOTE: *If the battery operated machine cannot be connected to the charger during storage, then fully charge the battery and turn off the machine power before storage.*

Section 6: Maintenance & Service

All machines need regular maintenance to stay in good working condition. The MAX was designed to make routine maintenance easy—parts are located where you can get to them and maintenance procedures are logical and simple to follow.

In this section you will find:

1. Checklist for daily maintenance
2. Checklist for weekly maintenance
3. Checklist for annual maintenance
4. Quick-List of "Counter" limits
5. Step-by-step instructions for replacing, servicing, and adjusting machine components

BEFORE YOU PERFORM ANY MAINTENANCE

Before undertaking any maintenance, you should be familiar with the following Maintenance precautions and all of the Safety precautions noted in Section 1: Safety. In order to safely maintain this machine, you must be trained in the procedures in this manual, including the use of common mechanic's hand tools and any special Brunswick tools. For clarification on any of this information, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com

Always perform maintenance in an open area, away from lanes and approaches.

DAILY MAINTENANCE

WARNING! Before performing maintenance, be sure the power cord is disconnected from both the machine and the wall outlet. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques such as bending at the knees and using a back support, if needed.

Refer to the Daily Maintenance Decal and Location information in Section 1, *Figure 1-3*.

Daily Maintenance in Operating Position

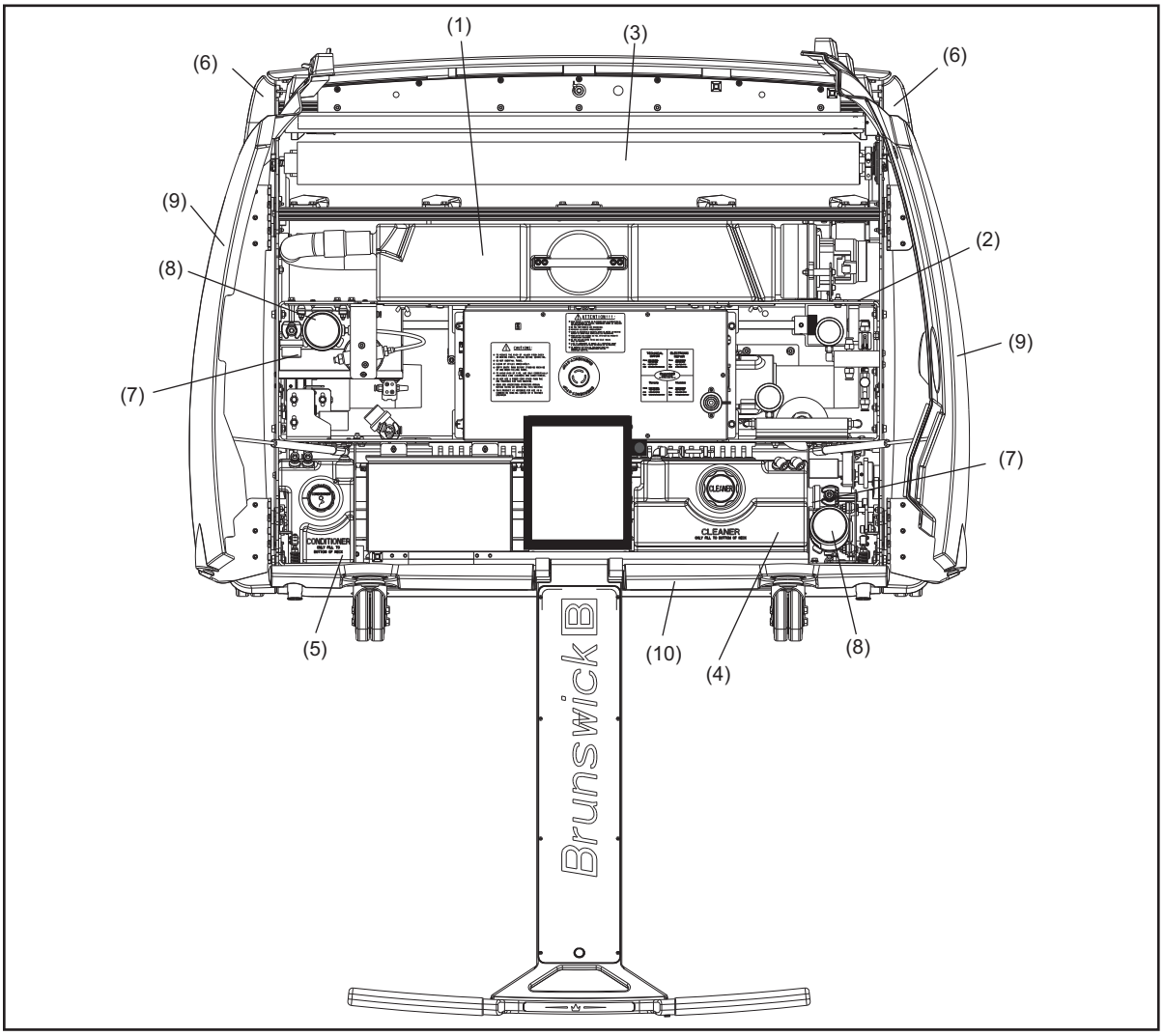

Figure 6-1. Operating Position - Daily Maintenance

(1) WASTE RECOVERY TANK
(2) FRAME DIVISION WALL
(3) DUSTER CLOTH SUPPLY ROLL
(4) CLEANER SUPPLY TANK
(5) CONDITIONER TANK
(6) SIDE COVERS
(7) FILTERS
(8) PUMPS
(9) TOP COVERS
(10) REAR COVER

1. Empty waste recovery tank, after each use, and wipe with a dry cloth.

CAUTION! You must empty the waste recover tank before transporting the machine. Remove the waste tank from the machine and dispose of the used lane machine waste properly. Do NOT dump recovery tank in a septic tank or sanitary sewer system. Follow your local environmental regulations for the best method of disposal.

2. Wipe frame division wall.
3. Check duster cloth supply roll and replace if needed.
4. Fill cleaner supply tank.
    a. Remove cap from cleaning tank, remove cap on end of the fill tube, located on the cleaner mixing vessel, and insert fill tube into cleaning tank.

CAUTION! Use only Brunswick approved cleaning fluids.

b. Press and hold button on container until cleaner nears the bottom of the tank neck. Do not fill into the neck of the tank.

c. Release button and let cleaner remaining in tube drain into tank before replacing the cap on the end of the fill tube.

d. Wipe any drips that collect in the depressed area around the outside of the tank neck.

WARNING! Fill and empty tanks with the machine in operating position and away from lanes and approaches. Use the no-spill containers to avoid spilling. Clean all spills and drips immediately.

5. Fill **conditioner supply tank.**

NOTE: *The fill spout in the spare parts kit should fit onto the conditioner container.*

a. Remove cap from conditioner tank, cap on end of the fill spout and insert fill tube into conditioner tank.

CAUTION! Use only Brunswick approved conditioner fluids.

b. Slowly tilt the oil container until conditioner begins to flow and continue until the oil nears the bottom of the tank neck. Do not fill into the neck of the tank.

c. Let any conditioner remaining in tube drain into tank before replacing the cap on the end of the fill tube.

d. Wipe any drips that collect in the depressed area around the outside of the tank neck. Remove the neck foam and squeeze with a dry towel if it becomes saturated with oil..

6. Wipe conditioning compartment, including **any areas that shows oil residue,** with a dry cloth.

WARNING! Take care when working around electrical connections to avoid damaging wire connections.

7. Wipe **top, rear** and **side covers**.

Daily Maintenance in Transport Position:

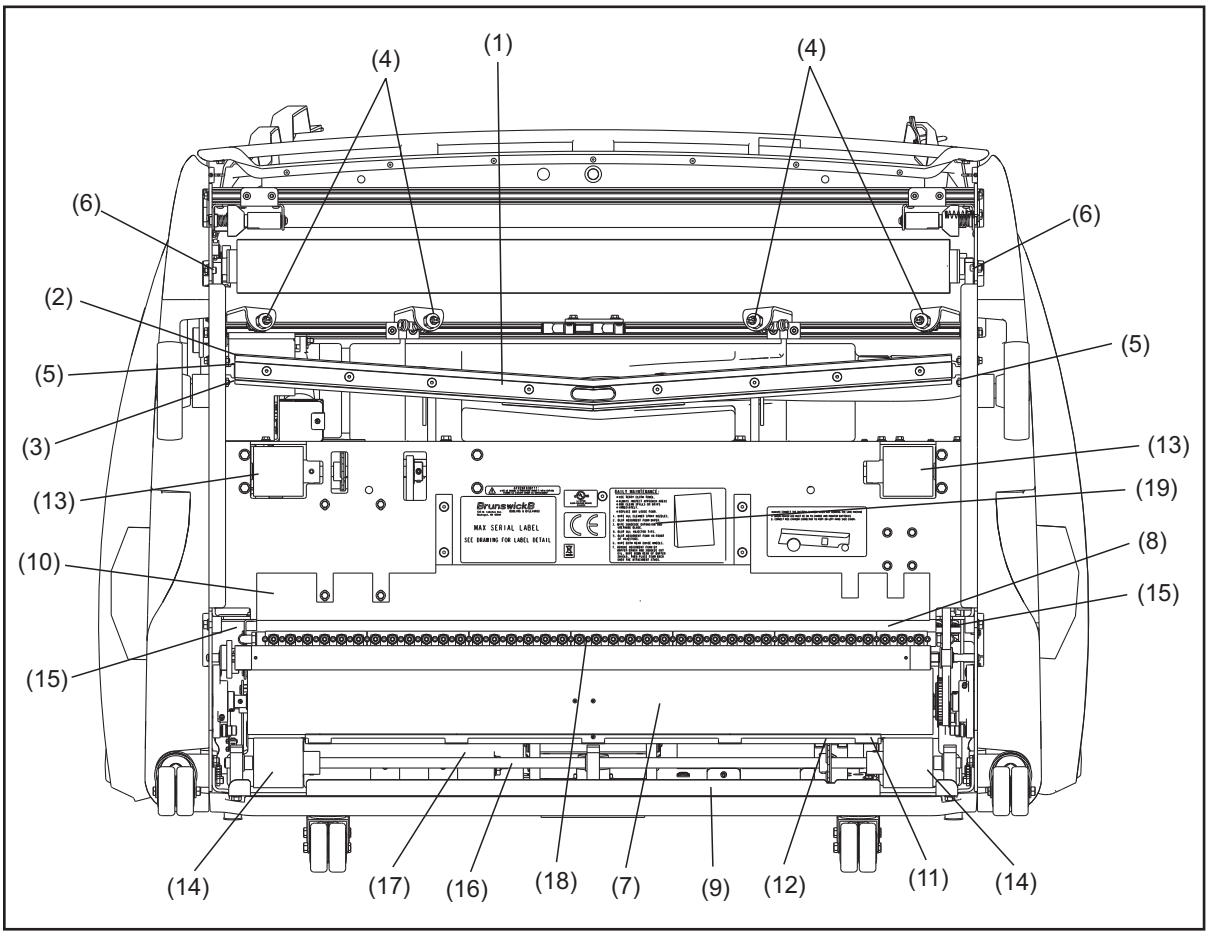

Figure 6-2. Transport Position - Daily Maintenance

(1) SQUEEGEE HEAD ASSEMBLY
(2) ABSORBENT WIPER
(3) SQUEEGEE BLADE
(4) CLEANER SPRAY NOZZLES
(5) SQUEEGEE ADJUSTMENT GUIDE BLOCKS
(6) CONTACT ROLLER PIVOT ARMS
(7) BUFFER BRUSH
(8) FRAME DIVISION WALL
(9) REAR WALL
(10) ABSORBENT FOAM IN FRONT OF INJECTORS
(11) FOAM STRIP
(12) BUFFER BRUSH SHIELD
(13) TRACTION DRIVE WHEELS
(14) REAR WHEELS
(15) REAR GUIDE WHEELS
(16) REAR SHAFT AREA
(17) REAR FRAME AREA
(18) INJECTOR TIPS
(19) DAILY MAINTENANCE DECAL

To keep your MAX looking and performing in like new condition, be diligent with the daily maintenance. Wipe any areas that may become dirty and address any maintenance issues, immediately.

1. Wipe **cleaner spray nozzles**.

2. Wipe the entire **squeegee head assembly** including the **absorbent wiper** and **squeegee blade** with a dry terry cloth to remove dirt and moisture.

3. Wipe the **squeegee adjustment guide blocks** for the squeegee head assembly.

4. Wipe the **contact roller pivot arms** and **side frames**.

5. Wipe **buffer brush** area including **frame division wall, rear wall,** and **absorbent foam in front of injectors.**

6. Wipe bottom side of machine, including **traction drive, rear wheels, rear guide wheels, rear shaft**, and **rear frame area**.

7. Blot **injector tips** with a lint-free terry cloth.

8. Remove the **foam strip** from the lower edge of the buffer shield. Squeeze the conditioner from the foam strip by placing it between layers of a terry cloth towel and applying pressure. Do not twist or wring out the foam strip to avoid stretching or tearing it.

9. Wipe the inside surface of the **buffer brush shield** with a terry cloth towel.

10. Replace the dry foam strip over the retaining pins on the buffer shield. Make sure that the foam strip is pushed completely onto the base of the retaining pins so there is no gap between the surface of the buffer shield and the foam strip.

11. Replace the buffer shield foam strip with a replacement in the spare parts kit or order a new foam strip (reorder part number 14-100427-000) if it becomes torn, stretched or does not remain tightly attached to the buffer brush shield.

12. Begin the battery charging cycle.

    a. Plug the battery charger into the charging port on the 7-pin side of the machine covers.

    b. Verify the green power light is on – if not check the E-stop and power switches to verify they are not off.

    c. Plug in and turn on the battery charger.

    d. Verify the charge output voltage and current display correctly.

WARNING! Always inspect approach areas and clean spills or drips immediately. Replace any loose foam.

NOTE: *The Daily Maintenance Decal on the bottom of the machine (refer to Figure 6-2) contains helpful reminders for each step explained above.*

SCHEDULED MAINTENANCE

In addition to daily maintenance, these tasks should be scheduled, depending on use. Refer to the Preventative Maintenance Chart that accompanies the machine.

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and the machine is turned off.

Scheduled Maintenance in Operating Position

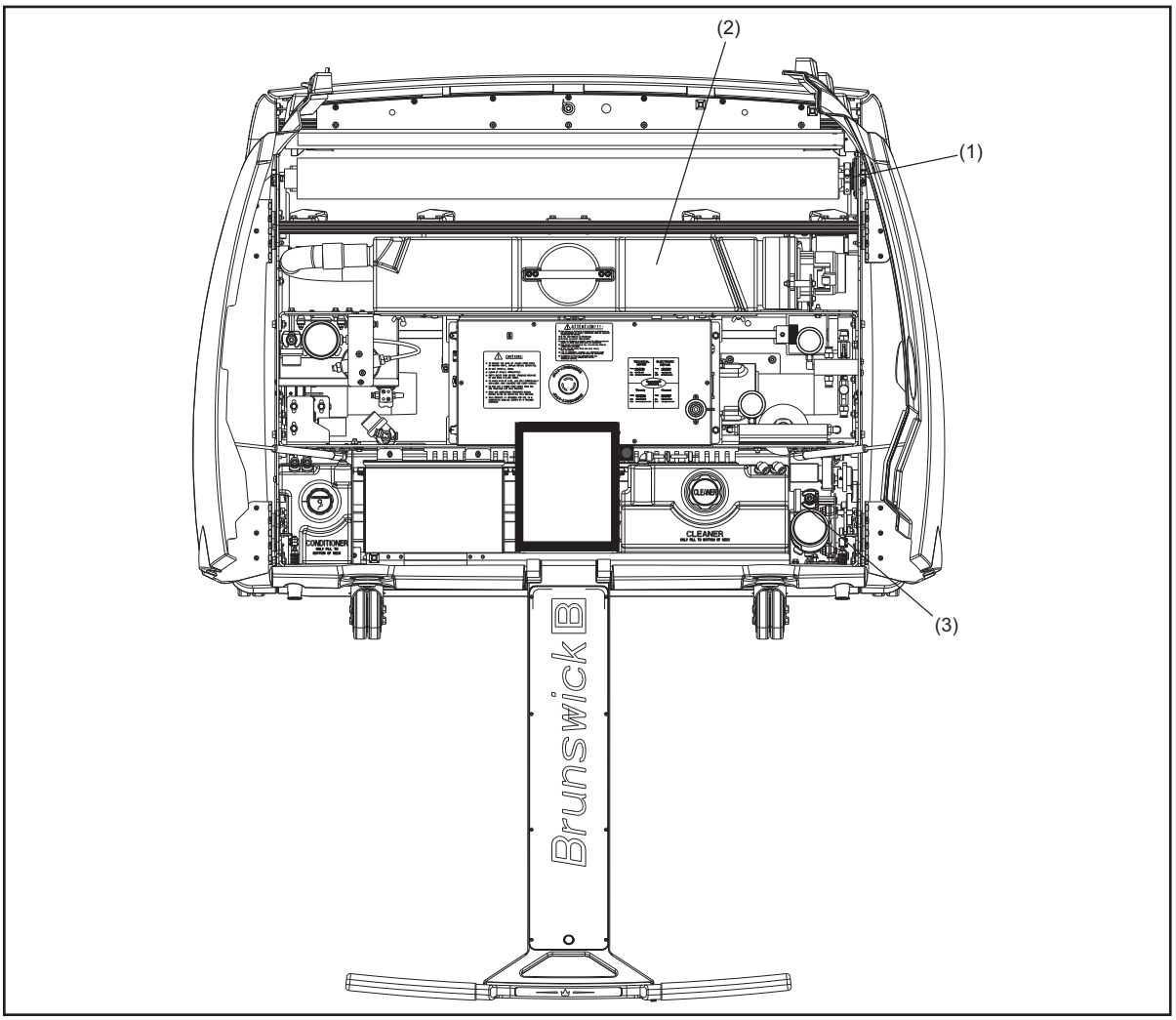

Figure 6-3. Operating Position - Scheduled Maintenance

(1) DUSTER CLUTCH ASSEMBLY (2) WASTE RECOVERY TANK (3) CLEANER PRE-PUMP FILTER

1. Check the tension setting on **duster clutch assembly.** For more information, refer to the *Adjusting the Duster Clutch* procedure detailed later in this section.

2. Rinse **waste recovery tank** with hot water**.**

3. Inspect all **electrical connections** for loose or damaged wires.

Scheduled Maintenance in Transport Position

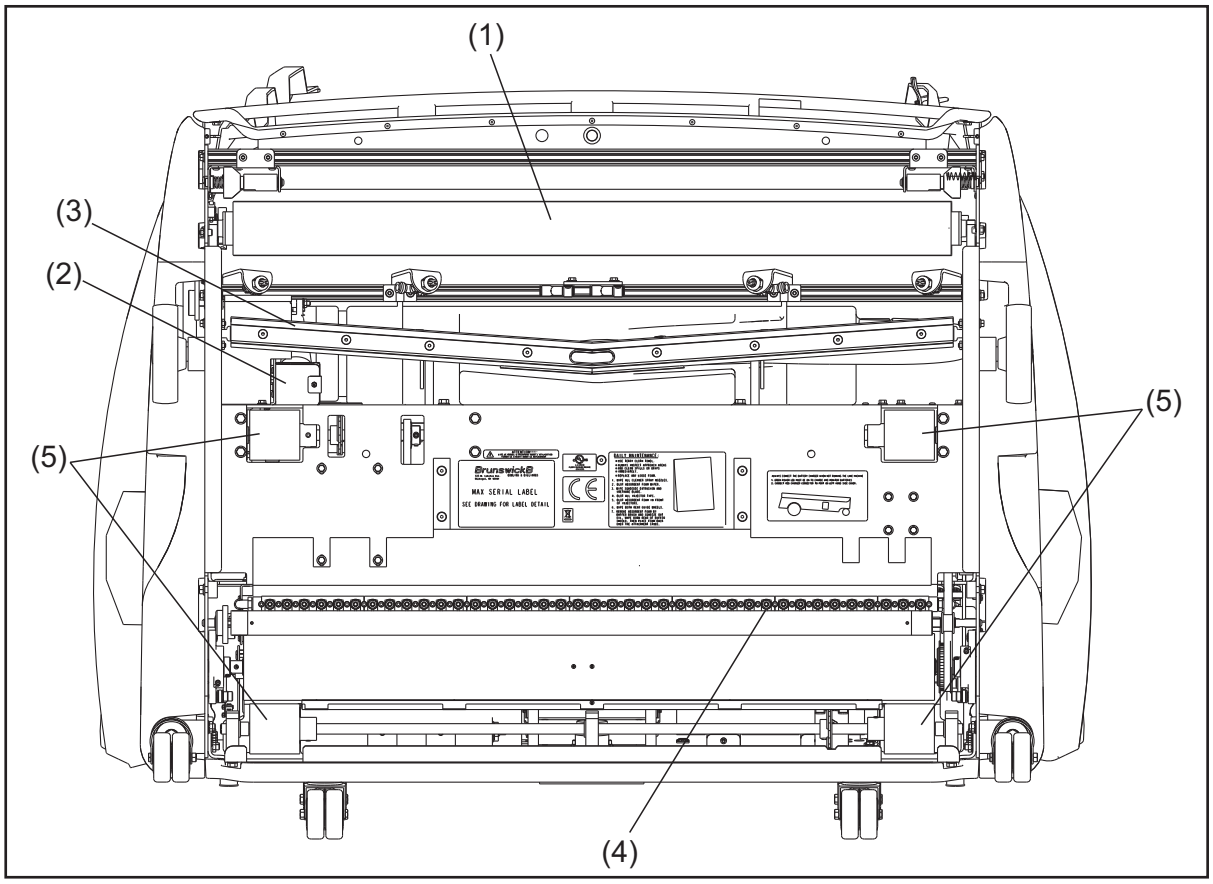

Figure 6-4. Transport Position - Scheduled Maintenance

(1) DUSTER CLOTH CONTACT ROLLER
(2) VACUUM EXHAUST DEFLECTOR
(3) ABSORBANT WIPER
(4) OIL INJECTOR TIPS
(5) TRACTION AND REAR DRIVE WHEELS

1. Wipe duster contact roller with a dry cloth.

2. Remove and squeeze out the absorbent foam material inside the vacuum exhaust deflector. Wipe the felt around the vacuum exhaust.

3. Check the absorbent wiper on the front edge of the squeegee blade. Replace the absorbent wiper if it becomes worn or swollen every 3-6 months. Rotate the squeegee blade if edge becomes dull or damaged. Replace every 14,600 lanes.

4. Clean the oil injector tips with white vinegar and cotton swabs.

5. Clean the traction drive wheels rear counter wheels with IPA99.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques such as bending at the knees and using a back support, if needed.

ANNUAL MAINTENANCE

In addition to the daily and scheduled maintenance, these items should be done once a year, depending on use. The MAX uses high-quality parts to ensure long life. Yet with the demands of daily use, you'll want to replace parts that wear and check the adjustment of other components to keep your machine in peak working order.

Wear on your machine is directly related to the amount of use and quality of preventative maintenance. Your replacement needs may be higher or lower than the guidelines given here. If you have questions about maintaining your machine, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and the machine is off.

Annual Maintenance in Operating Position

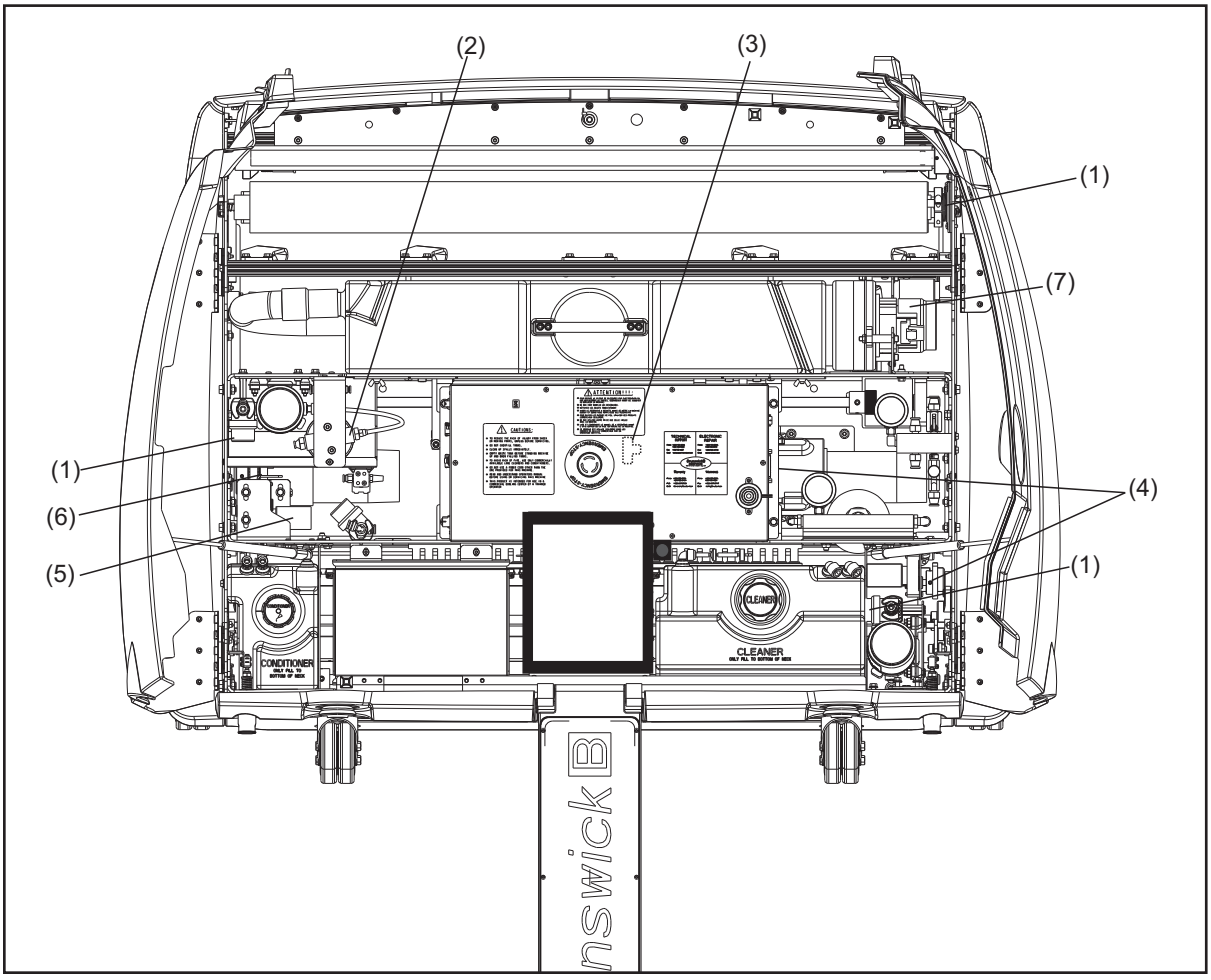

Figure 6-5. Operating Position - Annual Maintenance

(1) CLEANER/CONDITIONER SCREEN FILTERS
(2) CONDITIONER SPIN-ON FILTER
(3) SQUEEGEE LIFTING ASSEMBLY
(4) TRACTION DRIVE/DISPERSION ROLLER CHAINS
(5) BUFFER LIFTING ASSEMBLY
(6) BUFFER DRIVE BELT
(7) VACUUM MOTOR ASSEMBLY

NOTE: *The following maintenance items are explained in detail, later in this section, in the* ***How to Replace, Adjust, or Lubricate Parts*** *procedure.*

1. Clean or replace in-line **cleaner**, and **conditioner screen filters.**
2. Replace **conditioner spin-on filter.**
3. Lubricate **squeegee lifting assembly.**
4. Lubricate **traction drive chain** and **dispersion roller chain.**
5. Lubricate **buffer lifting assembly.**
6. Inspect buffer **drive belt,** check tension and adjust if needed.
7. Inspect **vacuum motor assembly**, clean and replace if needed. The vacuum motor is rated for 500 working hours. The motor life and performance will become less when the motor reaches the endo of life or is contaminated by waste from an overfilled recovery tank..
8. Inspect all fittings and tubing for damage and replace if needed.
9. Inspect all electrical connections and repair or replace if needed.

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and the machine is off.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques such as bending at the knees and using a back support, if needed.

Annual Maintenance in Transport Position

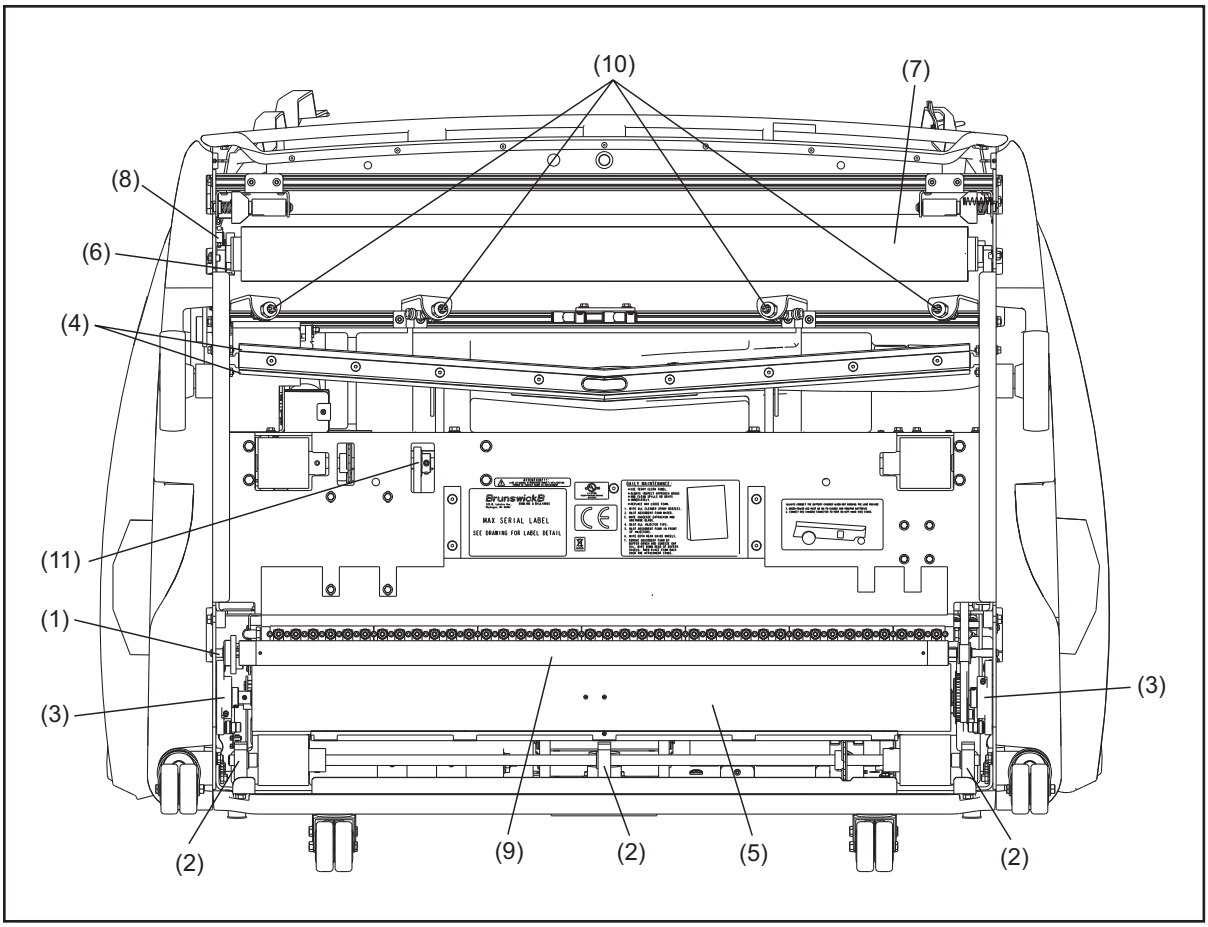

Figure 6-6. Transport Position - Annual Maintenance

(1) DISPERSION ROLLER (GREASE LOCATION)
(2) REAR WHEEL/TRACTION DRIVE BEARING BLOCKS
(3) BUFFER BRUSH BEARINGS
(4) ABSORBENT WIPER AND SQUEEGEE BLADE
(5) BUFFER BRUSH
(6) DUSTER CLUTCH ASSEMBLY
(7) DUSTER CONTACT ROLLER
(8) DUSTER UP/DOWN SWITCHES
(9) DISPERSION ROLLER
(10) CLEANER SPRAY NOZZLES AND CHECK VALVE FILTERS
(11) TRACTION DRIVE CHAIN

NOTE: *The following maintenance items are explained in detail, later in this section, in the* ***How to Replace, Adjust, or Lubricate Parts*** *procedure..*

1. Grease **dispersion roller.**
2. Lubricate **rear-wheel bearing blocks** and **traction drive bearing blocks.**
3. Grease **buffer brush bearings.**
4. Replace **absorbent wiper** (Replace every 5000 lanes) and **squeegee blade** (flip every 3 to 6 months, replace every 12 months). You may need to replace them sooner depending on the usage of the machine.

.

5. Inspect **buffer brush** and replace if needed.
6. Inspect **duster clutch assembly** and **hardware** and replace if needed.

7. Inspect **duster contact roller** for shrinkage, chunks, dents, or brittleness and inspect hardware for wear. Replace as needed.

.

8. Inspect **duster up/down switches** for damage and replace if needed.

9. Inspect **dispersion roller** for damage, check chain tension and repair, replace, or adjust if needed.

10. Remove **cleaner spray nozzles** and **check valve filters.** Clean all by soaking in a distilled white vinegar for 30 minutes, rinse with warm water and blow out with compressed air.

WARNING! Wear safety glasses when using compressed air. Place a cloth under the spray tip assembly to absorb residual fluid that may drip when removing tips.

11. Inspect **traction drive chain** alignment and tension and adjust if needed.

TABLET MAINTENANCE MESSAGES

Certain wear components have specific life expectancies they should achieve before they need replacing. In some situations such as lanes with surface issues or environments that are very dirty the wear can be accelerated and life expectancy shortened.

The Tablet maintains a count of the total number of lanes run as well as the amount of time the motors are in use. This information is used to trigger resetable counters for specific components listed in the Diagnostics - Counters". Once the counter threshold has passed for a component, the Tablet will display the warning message until the component is replaced and its counter reset. The warning message will always appear with the heading"Warning: A hardware counter has expired…" and the specific component(s) listed. Refer to *Figure 6-7.*

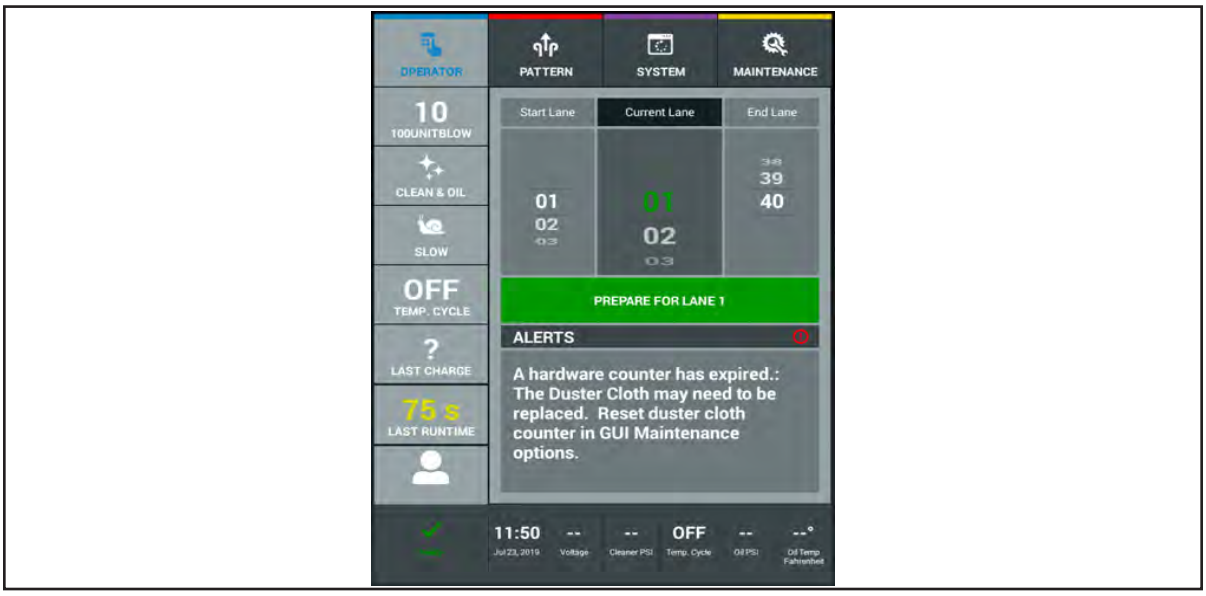

Figure 6-7. Tablet Maintenance Messages

Below is a list of all the counters and the expected life (in lanes or in hours) for each component monitored by the Tablet. Refer to *Maintenance Counters in Section 4 - Understanding the Tablet interface* for instructions on resetting a counter.

NOTE: *The Spin-on filter is recommended to be replaced after 29,200 lanes or whenever switching brands of lane conditioner.*

NOTE: *Inspect and rotate the squeegee absorbent wipe and urethane blade to place the opposite edge in use every 3 months or 5,000 lanes. Replace if needed.*

Quick-list of Maintenance Counters

Buffer Lanes	29,200 lanes
Squeegee Lanes Replace	14,600 lanes
Duster Lanes	1,000 lanes
Oil Filter Lanes	14,600 lanes
Cleaner Filter Lanes	1,200 lanes
Spin-On Filter Lanes	29,200 lanes
Absorbent Wiper Lanes Replace	5,000 lanes
Drive Motor Hours	5,000 hours
Vacuum Motor Hours	500 hours
Lithium Battery	1,600 cycles (approximately 4 years in a 40 lane center
Lane Length and Runtime	As Needed
Lanes Per Stop	As Needed

The Buffing and Squeegee Systems

Using the Buffer Brush Adjustment Tool

The MAX is equipped with its own adjustment tool for measuring the height of the buffer brush. The adjustment tool is mounted inside the lane machine between the electronic enclosure and the center compartment wall separating the cleaning section from the center compartment. It is fastened by two wing nuts. Refer to *Figure 6-8.*

The adjustment tool has three notches used to verify adjustments. The buffer brush may use all three notches (1/16", 1/8", and 3/16"). The buffer brush is set at 1/16" at the factory. To properly use the Buffer Brush adjustment tool, position so it spans the rear shaft wheel and the traction drive wheel on one side of the machine and then the opposite side. The notches should align with the buffer brush so they are spanning the assembly. Refer to *Figure 6-8.*

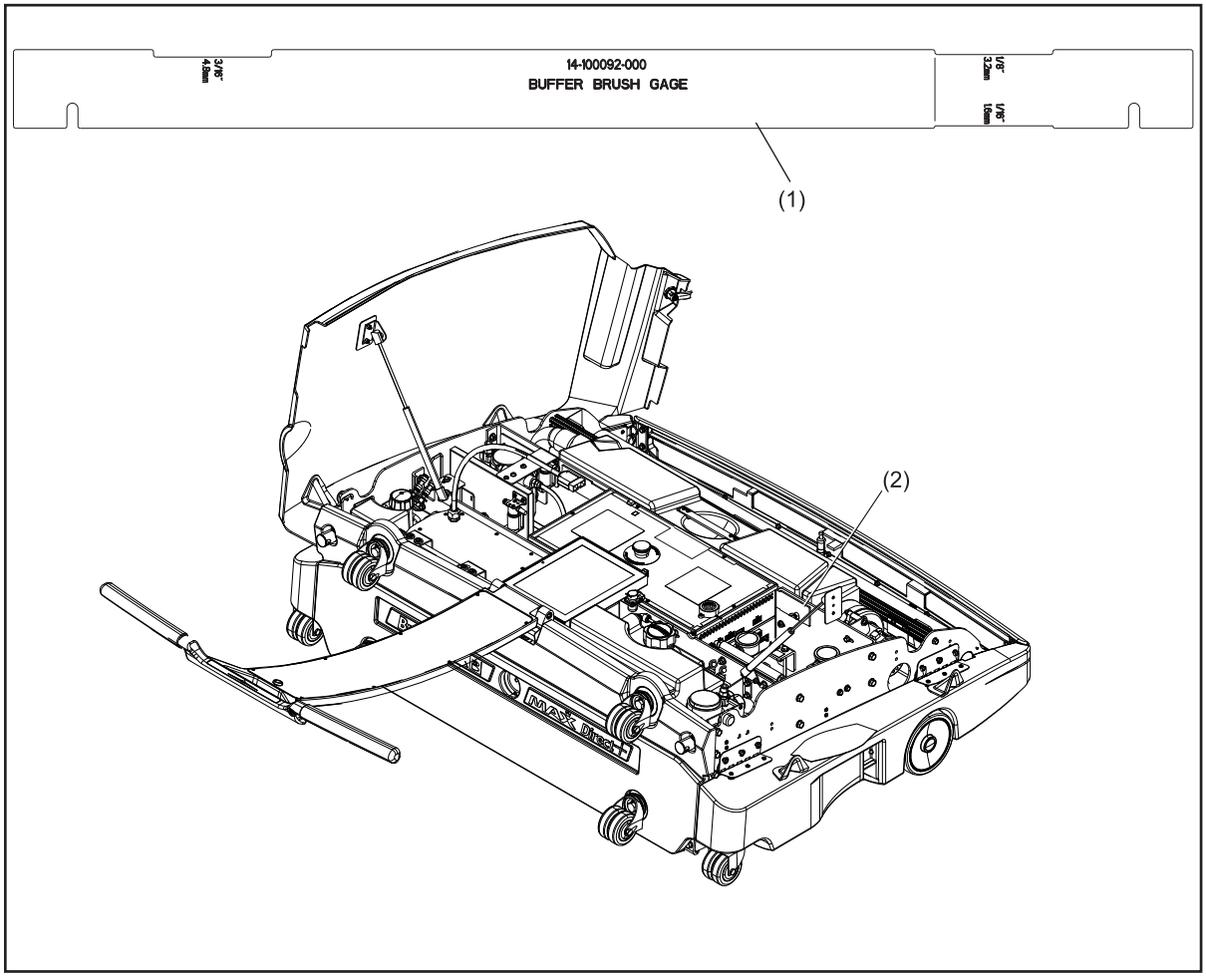

Figure 6-8. Adjustment Tool Storage Location

(1) SQUEEGEE/BUFFER ADJUSTMENT TOOL

(2) ADJUSTMENT TOOL STORAGE LOCATION

Using the Squeegee Adjustment Tool

The MAX is equipped with its own adjustment tool for measuring the height of the squeegee. The adjustment tool is located in the spare parts kit that accompanies the machine. The tool is used to measure the distance between the lane surface and the squeegee extrusion. Refer to *Figure 6-9.*

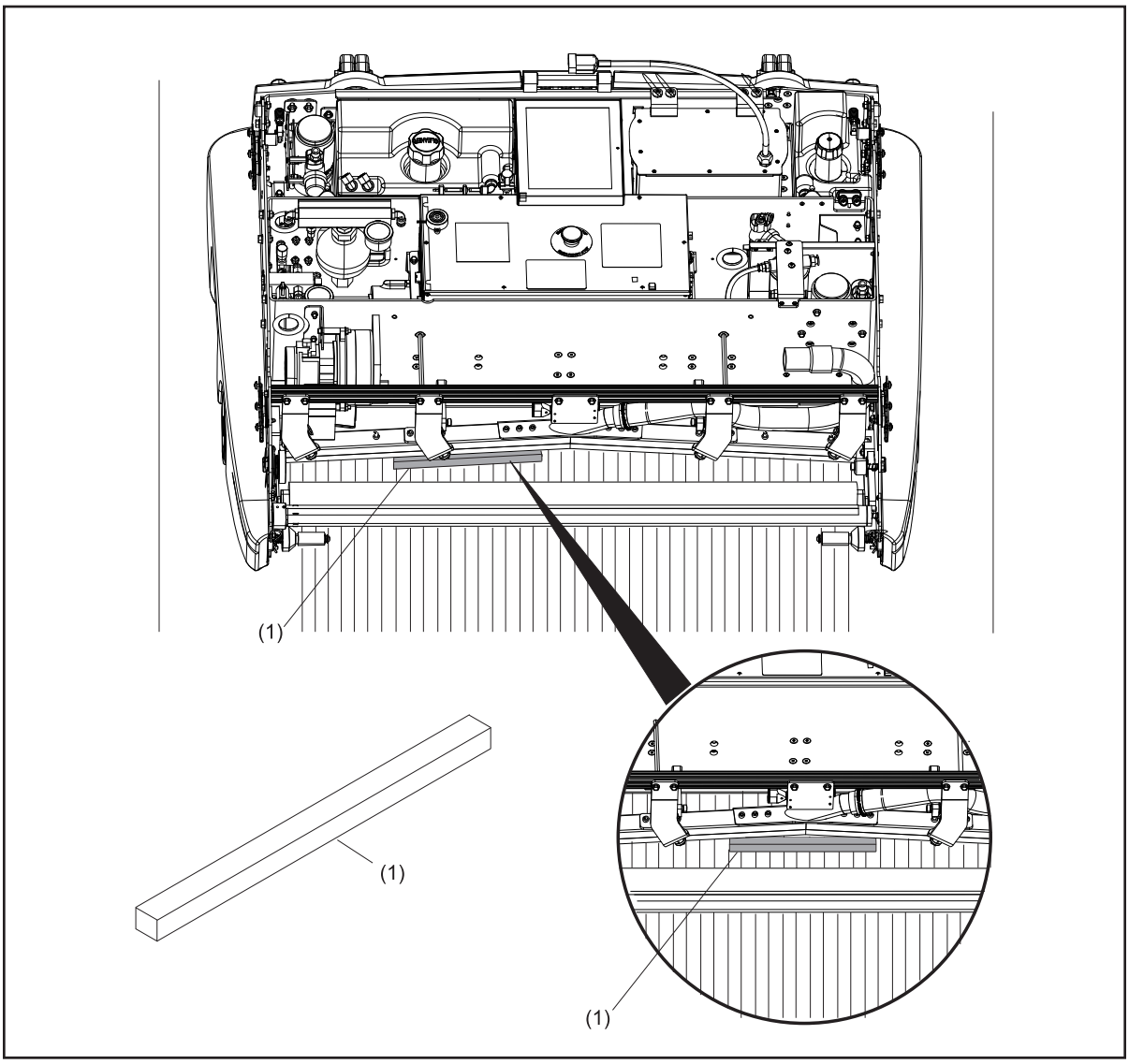

Figure 6-9. Using the Adjustment Tool - Section View

(1) SQUEEGEE ADJUSTMENT TOOL

NOTE: **Refer to the *Adjusting the squeegee blade height*** *and* ***Adjusting the buffer brush height*** *in this section.*

Replacing the Duster Cloth

Parts needed: new duster cloth supply roll

1. With the machine on the approach and in the Transport Position, open the covers.

2. Grasp the supply roll side located nearest to the mid-frame wall and rotate by turning counter-clockwise (from 7-pin side).

3. Slide the waste roll to the 7-pin side, and remove from the machine

4. Tip the duster cloth take-up roll to allow the metal stiffener tube to slide out of the duster cloth take-up roll core. Set the metal stiffener tube aside and dispose of the duster cloth take-up roll and core.

5. Remove the empty duster cloth supply roll core from the top position by following the same process as in 2 & 3 above. Keep the metal stiffener tube with the empty duster cloth supply roll core.

6. Insert the metal stiffener tube from the duster cloth take-up roll core into the new supply roll core and install the new duster cloth supply roll in the upper supply roll position on the machine.

7. Unwind several feet of cloth and route it through the duster system as shown on the routing decal. This decal should be located on the left side wall of the machine (7 pin side) in the area of the supply roll hub.

8. Drape the loose end of the duster supply cloth over the top of the waste recovery tank and onto the electronics enclosure.

9. Remove the paper backing from the unused strip of double sided tape on the old duster cloth supply core.

10. Lay the core, adhesive side down, across the duster supply cloth between the waste recovery tank and the electronics enclosure. Care should be taken to keep the core at a straight 90 degree angle to the cloth.

11. Wind the duster cloth over the top of the old duster cloth supply core as shown on the routing decal.

12. With at least two full winds on the old duster cloth supply core, install it into the lower, duster cloth take-up roll position in the front of the machine.

13. From the Maintenance Diagnostics for the cleaning, wind up the excess cloth using the “Duster Cloth: Wind” button. Repeat until the Duster Up switch highlights.

14. Reset the Duster Cloth counter in the Maintenance Counters screen.

15. Close the covers and resume operation of the machine.

Adjusting the Duster Clutch

Tools needed: 3/16” Allen wrench, 3/8” open end wrench

CAUTION! To prevent damage to duster gear motor, DO NOT force motor to turn by rotating shaft or chain.

1. Lower the duster cloth using the “duster unwind” button in the Tablet diagnostics for cleaning, then wind the cloth up, using the “duster wind” button. The motor should lift the duster contact roller to its raised position and then advance ~ 1/2” of new cloth.

2. Once the motor quits turning, the clutch on the duster cloth supply roll and duster motor on the duster cloth take-up roller should maintain their position. Press down firmly on the raised duster contact roller with the fingertips of both hands to check for proper adjustment of the duster clutch.

3. If the duster does not remain in the raised position after trying to press down, the duster clutch needs to be adjusted. To increase torque, use a 3/16” wrench and loosen the collar bolt.

4. Hold the supply roll of cloth to keep the threaded inner drive post of the clutch stationary during this adjustment. Use the 3/16” Allen wrench as a lever to rotate the outer clutch collar clockwise in steps of ¼ turn (90 degrees). Then retighten the collar bolt with the 3/16” Allen wrench to hold this setting.

5. Next, check to make sure that the duster clutch is not tightened too tightly to advance new duster cloth. Lower the duster cloth using the “duster unwind” button in the Tablet diagnostics for cleaning. Then wind the duster cloth using the “duster wind” button. The load on the duster cloth motor should increase and turn more slowly when the supply roll of cloth turns (causing the duster clutch to slip). At least ¼” of new cloth should be unrolled from the supply roll.

6. If the duster cloth motor stalls before it advances at least ¼” of new cloth OR if it reverses direction or “back lashes” after the duster cloth motor stops turning, then there is too much torque on the duster clutch. To decrease torque, use a 3/16” Allen wrench to loosen the collar bolt.

7. Hold the supply roll of cloth to keep the threaded inner drive post of the clutch stationary during this adjustment. Use the 3/16” Allen wrench as a lever to rotate the outer clutch collar counter-clockwise in steps of 1/8 turn (45 degrees). Then retighten the collar bolt with the 3/16” Allen wrench to hold this setting.

8. Repeat steps 1-7 to verify the proper duster clutch adjustment.

Adjusting the Down Stop for the Duster Contact Roller Pivot-Arm

Tools needed: 3/16” allen wrench, 7/16” Open-end wrench: Refer to *Figure 6-10.*

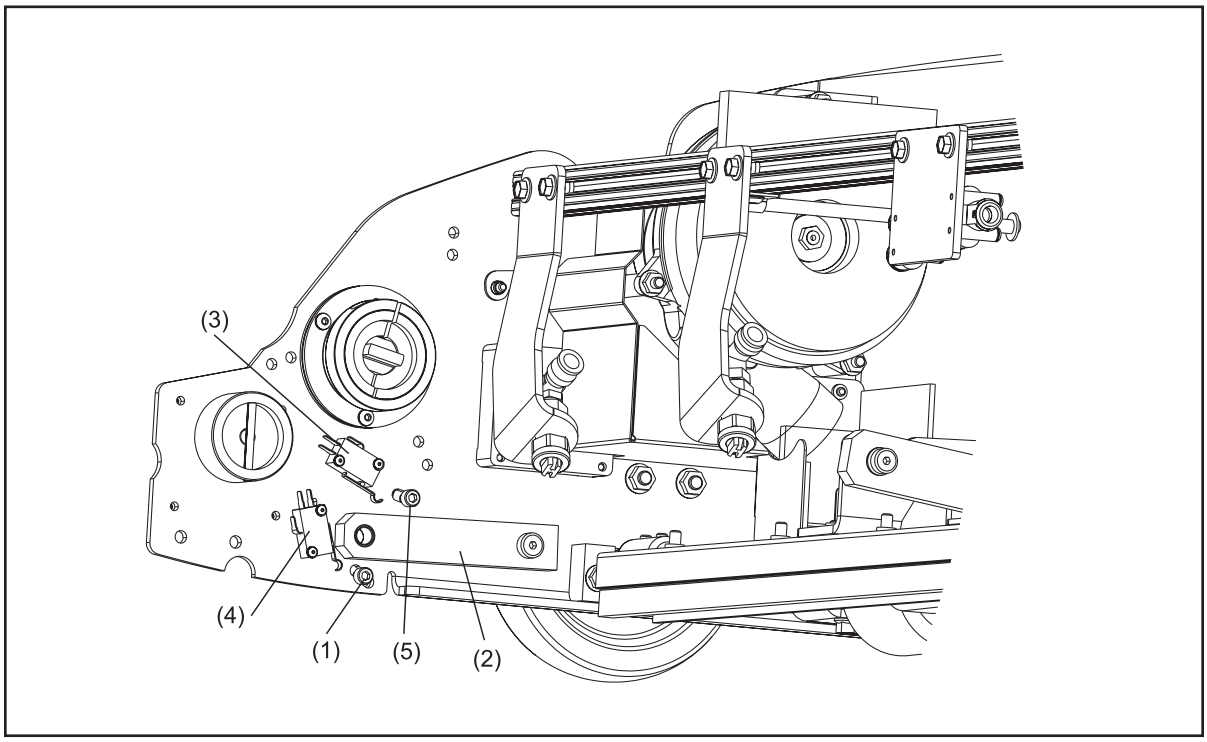

Figure 6-10. Adjusting Down Stop

(1) DUSTER CONTACT ROLLER DOWN STOP BOLT
(2) DUSTER CONTACT ROLLER PIVOT ARM
(3) DUSTER UP SWITCH
(4) DUSTER DOWN SWITCH
(5) DUSTER CONTACT ROLLER UP BOLT

1. Place the machine in transport position with the power off.

2. Locate the duster contact roller down stop bolt below the pivot arm of the contact roller.

3. Loosen the bolt using a 3/16” allen wrench and 7/16” open-end wrench and move the stop bolt up or down in the slotted hole to adjust the position of the stop. The stop bolt should be located in the center of the adjustment slot on both the 7 and 10-pin sides.

Adjusting the Up Stop for the Duster Contact Roller Pivot-Arm

Tools needed: 3/16” Allen wrench, 7/16” Open-end wrench. Refer to *Figure 6-11.*

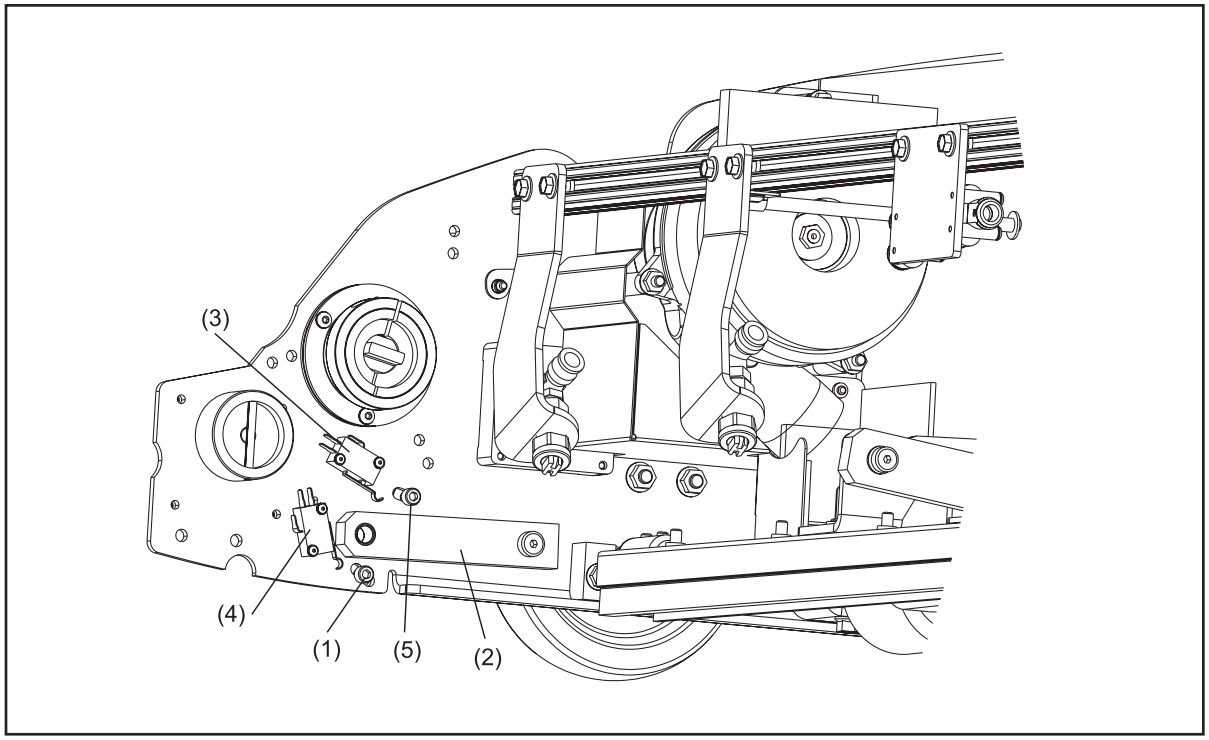

Figure 6-11. Adjusting Up Stop

(1) DUSTER CONTACT ROLLER DOWN STOP BOLT
(2) DUSTER CONTACT ROLLER PIVOT ARM
(3) DUSTER UP SWITCH
(4) DUSTER DOWN SWITCH
(5) DUSTER CONTACT ROLLER UP BOLT

1. Place the machine in the transport position with the power off.

2. Locate the duster contact roller up stop bolt above the pivot arm of the contact roller.

3. Loosen the bolt using a 3/16” allen wrench and 7/16” open-end wrench and move the stop bolt up or down in the slotted hole to adjust the position of the stop.

4. The stop bolt should be located so that when the duster contact roller pivot arm is against the up stop bolt it allows the up switch to be completely engaged, but does not push the arm of the up switch past the switch body. Refer to *Figure 6-11.*

Replacing the Duster Up/Down Switches

Tools needed: 1/8” allen wrench, 1/16” allen wrench, 1/4” open-end wrench.

Parts needed: duster up or down switch (Part Number 11-616025-000).

Refer to *Figure 6-9.*

1. Place the machine in transport position with the power off and open the cover.
2. Remove the side cover on the 10-pin side of the machine by removing the locator pins.
3. Identify the faulty switch.
    a. The duster “up” switch is in mounted in an adjustable slot, up and behind the duster contact roller when the machine is in transport position.
    b. The duster “down” switch is mounted in an adjustable slot and is visible from below the duster contact roller.
4. Move the duster cloth out of the way in order to access the switches.
5. Remove the duster up/down switch by removing the 2 mounting screws with the 1/4” wrench and 1/16” allen wrench and disconnecting the wires from the fast-on connectors.
6. Transfer the wires from the old duster up/down switch to the new switch.
7. Replace wires following the same wiring pattern as the original switch:
    a. Up switch wiring: white = common, green = n.o. (normally open).
    b. Down switch wiring: blue = common, brown = n.o. (normally open).
8. Remount duster up/down switch.
9. Verify the placement of the duster down switch.
    a. The switch should begin to engage when the contact roller pivot arm is contacting the down stop.

NOTE: *The duster down switch should indicate the down position in the cleaner diagnostics when the duster cloth motor is lowered with the lane machine in the operating position on the approach, when it is resting against the down stop for the contact roller pivot arm. When the lane machine is pushed on the front of the lane, the lane should push the contact roller up slightly so the duster down switch is no longer engaged.*

    b. Loosen the screw and adjust the position of the switch until it is correct.

10. Verify the placement of the duster up switch.

    a. The switch should be engaged when the contact roller pivot arm is against the up stop.

    b. Loosen the screw and adjust the position of the switch until it is correct. Do not allow the pivot arm to push the up switch arm past the body of the switch.

11. Replace the duster cloth.

12. Replace the side cover.

Adjusting the Squeegee Blade Height

Tools needed: Squeegee adjustment tool, ½" wrench, 7/16" socket with long extension.
Adjustment: 7/16" to ½" (min/max on adjustment tool) Refer to *Figure 6-12.*

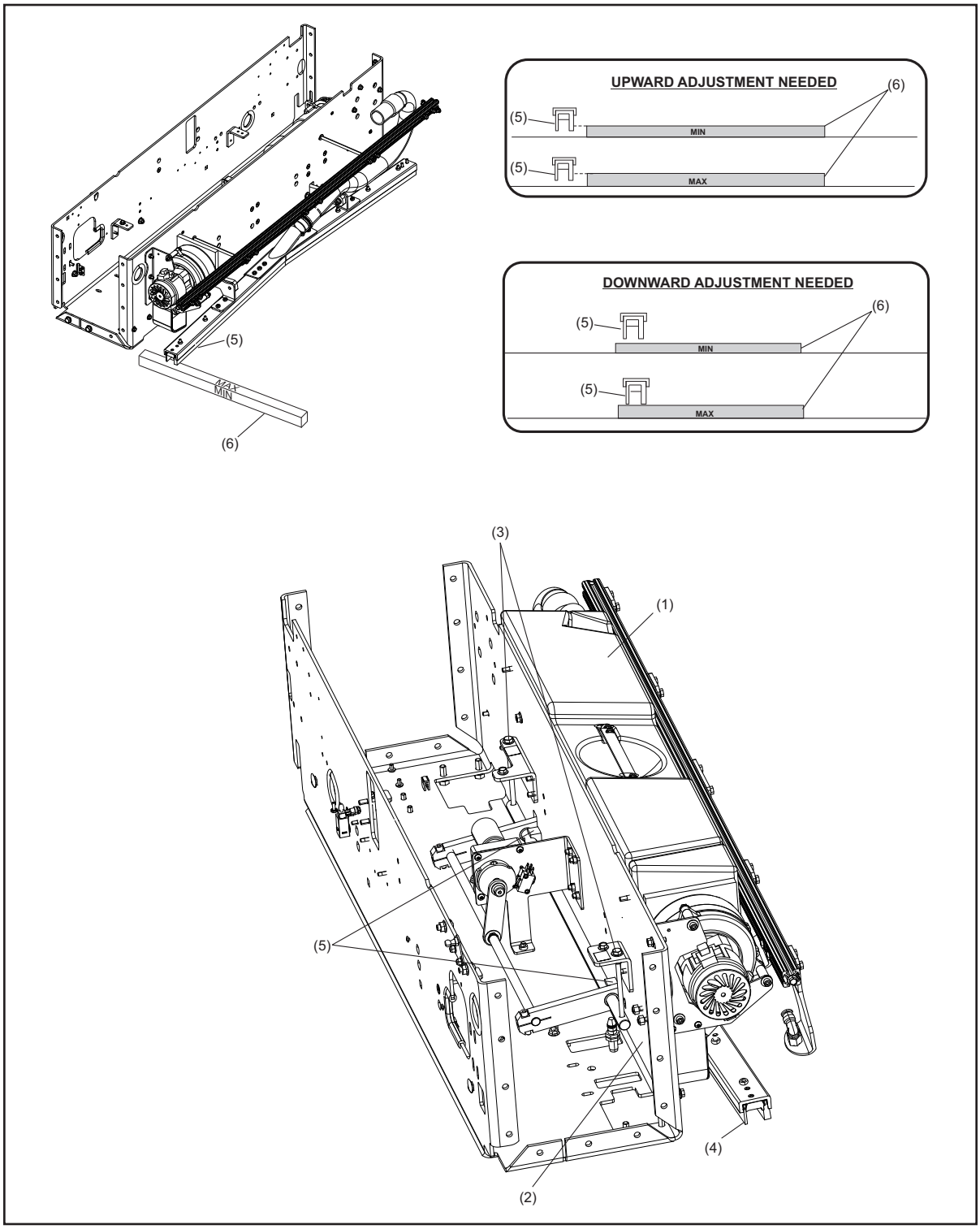

Figure 6-12. Adjusting Squeegee Blade Height

(1) WASTE RECOVERY TANK
(2) FRONT FRAME DIVISION WALL
(3) PLATE ADJUSTING SCREW
(4) SQUEEGEE BLADE
(5) PIVOT SHAFT MOUNTING SCREW
(6) SQUEEGEE TOOL

1. Place machine in Operating Position with the covers open and the power supply on.

2. Go to the “Cleaning Diagnostics” screen in the “Maintenance” menu of the Tablet.

3. Lower the squeegee head so the sensor shows the squeegee is down and remove the waste recovery tank.

4. Place the machine on the lane and push the machine out to the arrows.

5. Place the squeegee adjustment tool on the lane surface between the cloth and the squeegee assembly with the “max” side facing up.

6. Slide the adjustment tool underneath the front of the squeegee assembly. If the tool does not fit at the “max” dimension then rotate it to the “min” adjustment and repeat. If the tool still does not fit, an upward adjustment is required.

7. Raise the squeegee and pull the lane machine onto the approach.

Warning!: Do not loosen the pivot shaft mountng screws while the squeegee is down and on the lane.

8. Loosen the 2 pivot shaft mounting screws with the ½” wrench so the pivot shaft can move up or down freely. Use the 7/16” socket with extension to raise and lower each side of the pivot shaft. The 2 adjustment screws are located on either side of the electronic enclosure in the mid-frame. The adjustment manages the overall height and balance left to right.

    a. If the squeegee is too high, rotate the adjustment screws counter-clockwise to lower the squeegee assembly.

    b. If it’s too low, rotate the adjustment screws clockwise to raise the squeegee assembly.

    c. One full turn equal 1/10 of adjustment

NOTE: *When rotating the adjustment screws, count the full number of turns of the ratchet to ensure that the assembly is adjusted equally on both sides.*

9. Tighten the 2 pivot shaft mounting screws using the ½” wrench.

10. Check the adjustment and repeat until the adjustment tool fits between the lane and squeegee extrusion for either the min or max adjustment.

11. Replace the waste recovery tank.

12. Perform a clean only run to test the cleaning.

Adjusting the Squeegee Blade Pitch

Tools needed: 3/8” open-end wrench, 7/16” open-end wrench.
Adjustment: slightly forward from center of the adjustment slot. Refer to *Figure 6-13*

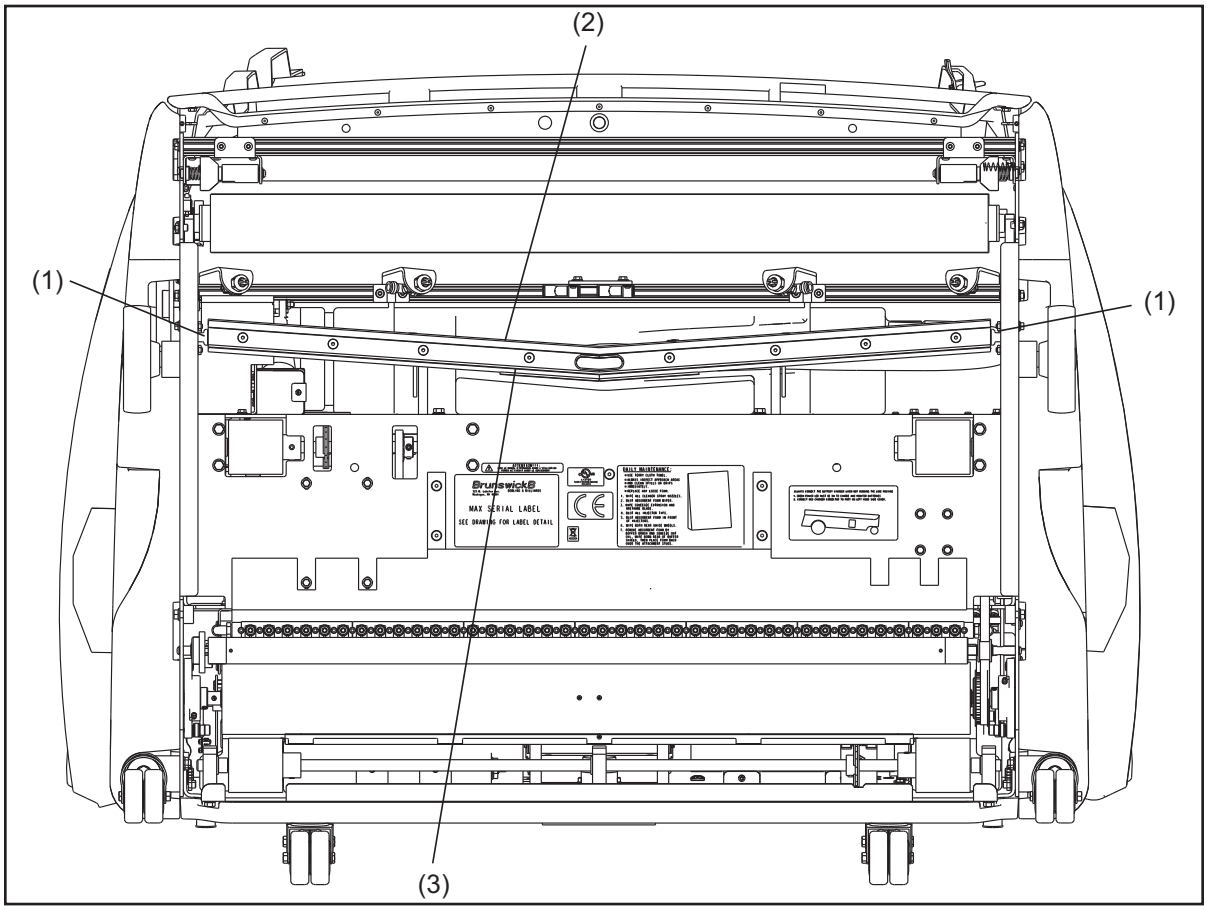

Figure 6-13. Adjusting Squeegee Blade Pitch

(1) SQUEEGEE ADJUSTMENT GUIDE BLOCKS
(2) ABSORBENT WIPER
(3) SQUEEGEE BLADE

1. Place machine in Operating Position with the covers open and the power supply on.
2. Go to the “Cleaning Diagnostics” screen in the “Maintenance” menu of the Tablet.
3. Lower the squeegee head so the sensor shows the squeegee is down and remove the waste recovery tank.
4. Raise the machine into the transport position.
5. Loosen, but do not remove, the two mounting bolts for each the squeegee adjustment guide blocks on the 7 and 10-pin sides.

6. Adjust the guides.

    a. Moving the guides towards the front of the machine forces more pressure on the center of the squeegee blade (for lane depressions).

    b. Moving the guide blocks towards the rear of the machine releases pressure from the center of the squeegee blade (for crowning lanes) and applies more pressure to the absorbent wiper.

7. Tighten the bolts for the squeegee adjustment guide blocks. Verify the squeegee has some play to pivot forward and backward and is not binding in the guide blocks.

8. Lower machine into position..

9. Place the machine on the lane and push the machine out to the arrows.

10. Visually check the squeegee for even deflection away from the vacuum head.

NOTE: *It may be necessary to perform the squeegee height adjustment after making the pitch adjustment.*

11. Replace the waste tank.

12. Restore power to the machine and test clean the lane.

Replacing the Absorbent Wiper And Squeegee Blade

Tools Needed:

- 3/16” Allen wrench
- 1/2” Open end wrench
- 5/32” Allen wrench
- 5/16” nut driver

Parts Needed To Rotate Existing Absorbent Wiper or Squeegee

New Absorbent Wiper, part number 14-100556-000, included with spare parts package.
New Squeegee Blade part number 14-100523-000

Refer to *Figure 6-13.*

1. Put machine in transport position.

2. Open covers and remove cleaner waste recovery tank.

3. Remove the two shoulder pivot bolts for the squeegee head using 3/16” allen wrench and 1/2” wrench on hex nuts.

4. Take the vacuum head to a work table and remove the hose with a 5/16” nut driver.

5. Remove all 8 flat head cap screws with a 5/32” Allen wrench from inside the vacuum head and gently pry up the inner retaining channel and remove.

6. Remove and replace the absorbent wiper blade or rotate the blade depending on the blade usage.

NOTE: *The squeegee blade are designed to be flipped so that you receive at least two uses of the blade.*

7. Check the squeegee blade for wear, flip and reuse, or replace as required.
8. Place the inner retaining channel in-between the absorbent wiper blade and the squeegee blade.
9. Using the screws removed in step #5 above (the inside end of each inner channel uses the shorter screw), start on the outside end and gently work the retaining channel down as you tighten the bolts.

NOTE: *Make sure the retaining channel does not pull the blade down under the retainer. Both the absorbent wiper and squeegee blade should be straight across the width of the vacuum head after tightening.*

10. Replace the hose and reinstall the squeegee head in the lift arms using the two shoulder type bolts.
11. Verify correct adjustment of the squeegee blade height per this manual.

NOTE: *The absorbent wiper has an expected life is 3-5 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface*

NOTE: *The squeegee blade is two sided and after one side has reached the end of its useful life, rotate the squeegee blade to place the opposite edge in use. Expected life is 3 – 6 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface..*

Replacing the Squeegee Up/Down Switches

Tools needed: 1/16” allen wrench, 3/8” socket wrench with extension.
Parts needed: replacement switches (Part Number 11-616026-000). Refer to *Figure 6-14.*

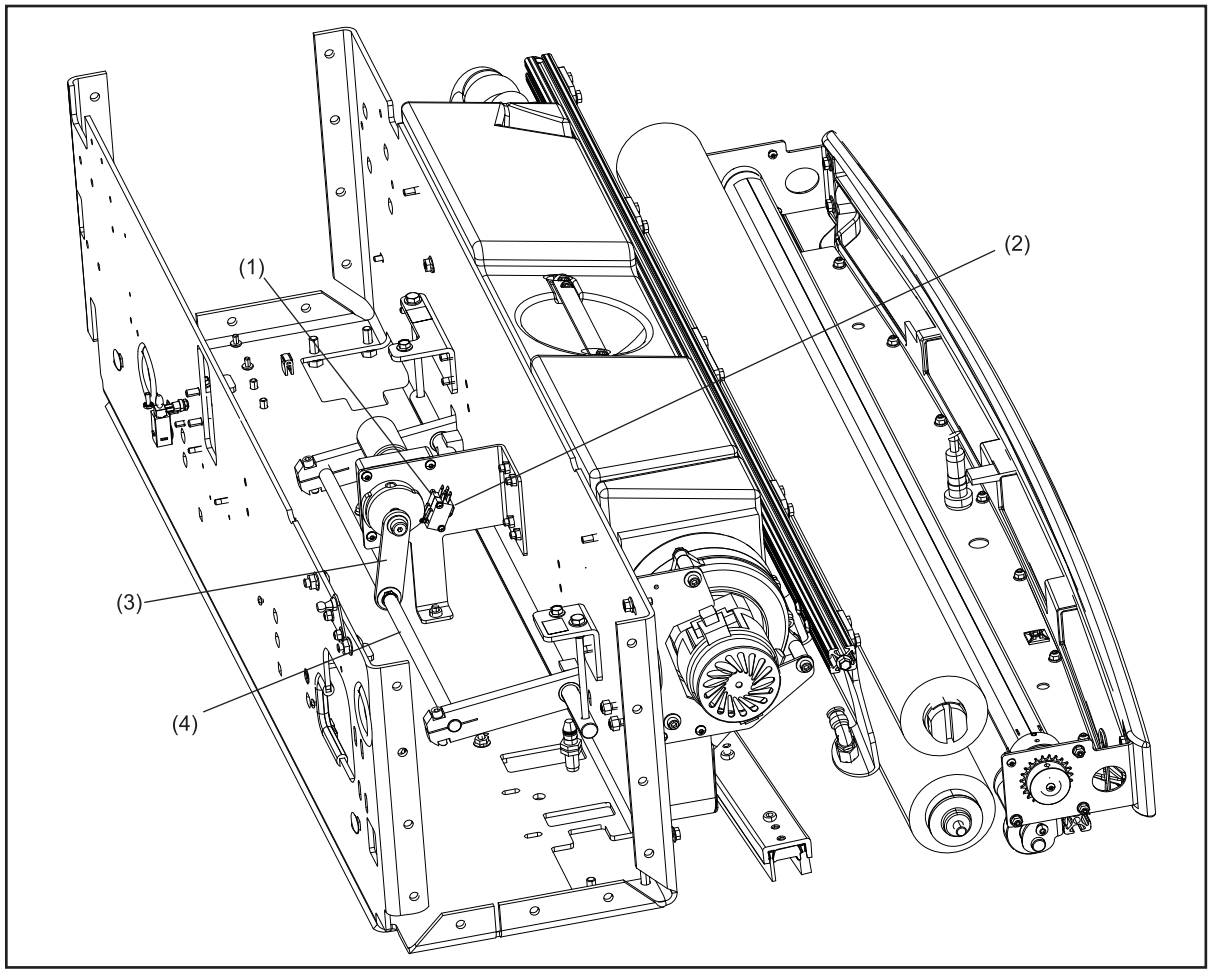

Figure 6-14. Replacing Squeegee Up/Down Switches

(1) SQUEEGEE UP SWITCH (2) SQUEEGEE DOWN SWITCH (3) SQUEEGEE PIVOT ARM
(4) SQUEEGEE LIFTING LINKAGE

1. Place machine in operating position with the power supply disconnected and open the cover.
2. Remove the electronic enclosure and set aside using this process:
    a. Disconnect all cables from the sides and rear of the enclosure.
    b. Loosen and remove 4 bolts that secure electronic enclosure to mounting brackets.
    c. Remove and set aside.

⚠ ***CAUTION! Do not use emergency stop button as a handle to lift enclosure***

3. Disconnect switch cables at connector plug, leaving the wires on the switches.

4. Remove the 2 screws that secure the switch to the mounting bracket using a 1/16” allen wrench.

NOTE: *The up/down switches are mounted back to back on the bracket and can be distinguished by the color of their wires; the “up” switch has green and white cables, the “down” switch has blue and black cables.*

5. Remove switches.

6. Replace faulty switch.

7. Reconnect cables using the fast-on cable connectors.

8. Position switches on mounting bracket and replace and tighten screws that secure switches to the bracket.

NOTE: *Position switches as close to the cam as possible to ensure good contact with switches.*

9. Connect Cable plug to harness.

10. Position the electronics enclosure in place, replace and tighten bolts that secure the electronic enclosure to mounting brackets, and reconnect all cables.

Lubricating the Squeegee Lifting Assembly

Refer to *Figure 6-14.*

1. Apply one drop of oil to each side of the bearings on the squeegee pivot arm.

2. Apply one drop of oil to the bearings on the squeegee lifting linkage connected to the cam for the lifting motor and to the shaft connecting both squeegee pivot arms. The squeegee blade is two sided and after one side has reached the end of its useful life, rotate the squeegee blade to place the opposite edge in use. Expected life is 3 – 6 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface.

Draining the Cleaner Supply Tank

Tools needed: None.

Parts needed: Drain tubing found in the spare parts kit, spare container. Refer to *Figure 6-15.*

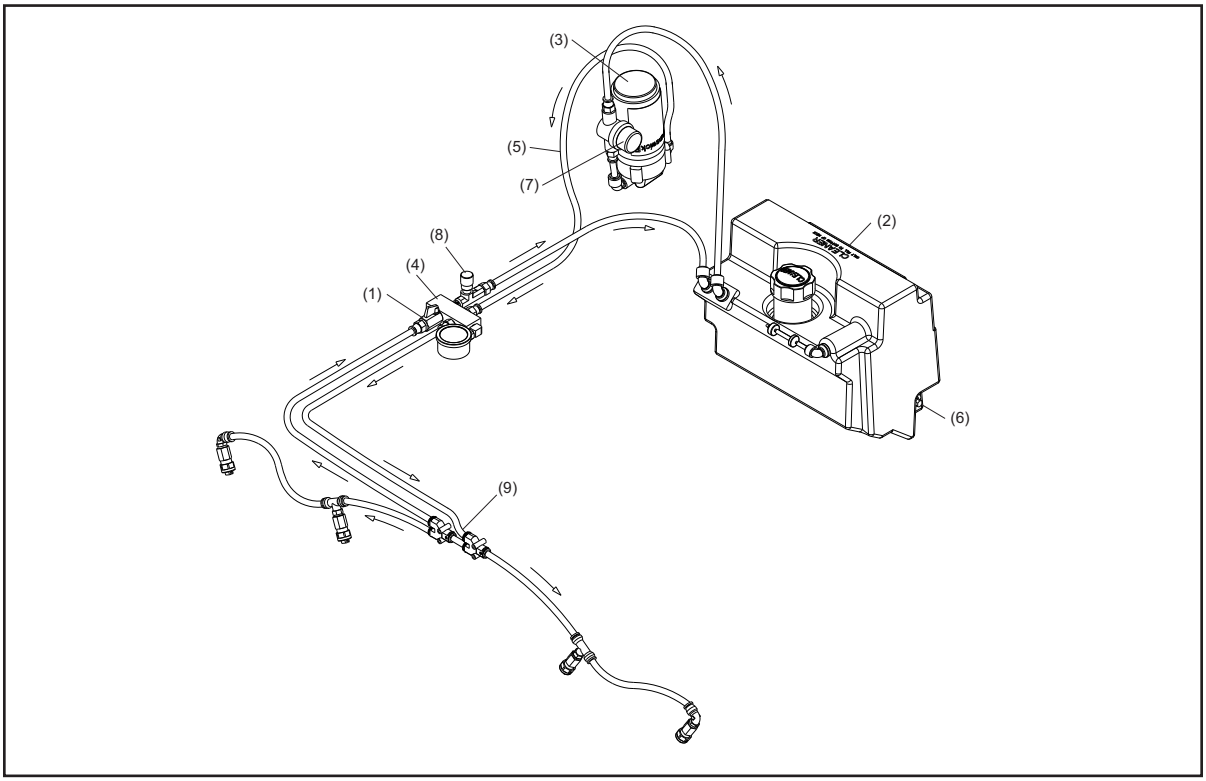

Figure 6-15. Draining the Cleaner Supply Tank

(1) CLEANER SHUT OFF VALVE
(2) CLEANER SUPPLY TANK
(3) CLEANER PUMP
(4) CLEANER MANIFOLD
(5) SUPPLY TUBING
(6) CLEANER LEVEL FLOAT SENSOR
(7) CLEANER SCREEN FILTER
(8) PRESSURE CONTROL VALVE
(9) DISCONNECT TO USE DRAIN TUBE

1. Place the machine in the operator position and supply power.
2. Place a rag underneath the cleaner manifold.
3. Disconnect the supply tubing from the left hand (7-pin side) top position of the union "Y" assembly. Refer to number (9) in *Figure 6-15.*
4. Attach the drain tubing with the 3/8" elbow union to the supply tubing removed in step 3.
5. Route the drain tubing into a container and hold in place.
6. Go to Cleaning Diagnostics and turn on the cleaner pump.
7. Continue to run pump until cleaner has been completely drained.
8. Remove the drain tubing and reconnect the supply line to the manifold.

IMPORTANT!: *It is very important to make sure the tubing is not damaged and that it is inserted completely into the fitting.*

Replacing the Level Float Sensor in the Cleaner Supply Tank

Tools needed: 3/8” open ended wrench or socket, 1” open ended wrench

Parts needed: Replacement Level Float Sensor (Part Number 14-100942-000). Refer to *Figure 6-15.*

1. Drain the cleaner supply tank. (Refer to draining the cleaner supply tank at the beginning of this section.).
2. Place the machine in transport position with the power supply disconnected.
3. Disconnect cable from level float sensor (push down and away on tab to disconnect).
4. Disconnect tubing from tank, loosen two mounting bolts and remove tank.
5. Remove faulty sensor from the tank using a 1” and 3/8” wrench, turning counter-clockwise to loosen the sensor compression nut.
6. Insert the new sensor with the indicator pointing toward the top of the tank and tighten.

NOTE: *Sensor is correctly positioned if the white float hangs down toward the bottom of the tank when machine is in operating position.*

7. Replace tank in machine, tighten mounting bolts and replace tubing.
8. Reconnect sensor cable.
9. Fill the cleaner supply tank to verify that there is no leaking from around the new cleaner level float sensor.

Replacing/Cleaning the Cleaner Screen Filter

Parts needed: Cleaner filter - screen only, 40-mesh, part number 11-655024-004 or complete filter assembly with fittings, part number 14-100478-000.

Tools needed: spare container, 3/8” open ended wrench or socket. Refer to *Figure 6-15.*

1. Place machine in operating position with covers open.
2. Disconnect power to the machine and the cable assembly attached to the Cleaner Pump.
3. Slowly disconnect the tubing from the top of the filter. Once air is introduced into the tubing the cleaner will flow back into the tank.
4. Loosen the two bolts at the top of the pump and filter assembly that secure it to the rear frame and lift out the cleaner pump and filter bracket.
5. Disconnect the return tubing from the cleaner supply tank fitting. Move the pump and filter bracket to the top of the cleaner supply tank.
6. Remove the cleaner tank cap and route the tubing from the filter assembly into the neck of the tank and allow as much fluid from the filter assembly to drain into the tank.

7. Remove the cap of the strainer assembly and remove the mesh strainer.

8. Clean the filter/strainer by running under water or replace, if necessary. (a spare strainer is located in the spare parts kit)

9. Replace strainer and bowl, take care to ensure the strainer is on straight, not crushed, and the bowl gasket is properly positioned around the entire groove of the filter body.

10. Reconnect the supply tubing as you replace the pump and filter bracket in the machine, tighten the bolts.

11. Reconnect the pump power and ground cables, and restore power to the machine.

12. Place machine on the lane and turn on the cleaner pump via the "Cleaner Diagnostics" screen in the "Maintenance" menu of the Tablet. This will prime the system removing air.

13. Set the cleaner pressure to 18 psi as it may measure a higher pressure reading with the cleaned or new mesh strainer.

14. Test clean one or more lanes (as needed) to verify that all air has been purged from the cleaning system.

NOTE: *To test the cleaning performance set the pattern to a "Clean" mode in the "Design", "Pattern Parameters" in the "Pattern" menu.*

Adjusting the Cleaner Pressure

Tools needed: none.

Adjustment: 17 - 19 psi.. Refer to *Figure 6-15.*

1. Place the machine in the operator position and supply power.

2. Place the machine on the lane and open the two top covers.

3. Navigate to "Cleaning", "Diagnostics" in the "Maintenance" menu.

4. Turn on the Cleaner Pump paying attention to the pressure reading on the Tablet.

5. Rotate the pressure control valve knob on the cleaner manifold assembly, clockwise to increase the system pressure.

6. Turn the pressure control valve knob on the cleaner manifold assembly, counter-clockwise to decrease the system pressure.

7. Secure the pressure valve setting knob by tightening the top set screw.

Replacing the Vacuum Seal

Tools needed: single-edge razor blade.
Parts needed: New Vacuum Seal (Part Number 14-100487-000 included with spare parts package). Isopropyl Alcohol (Part number 61-869255-000). Refer to *Figure 6-16*

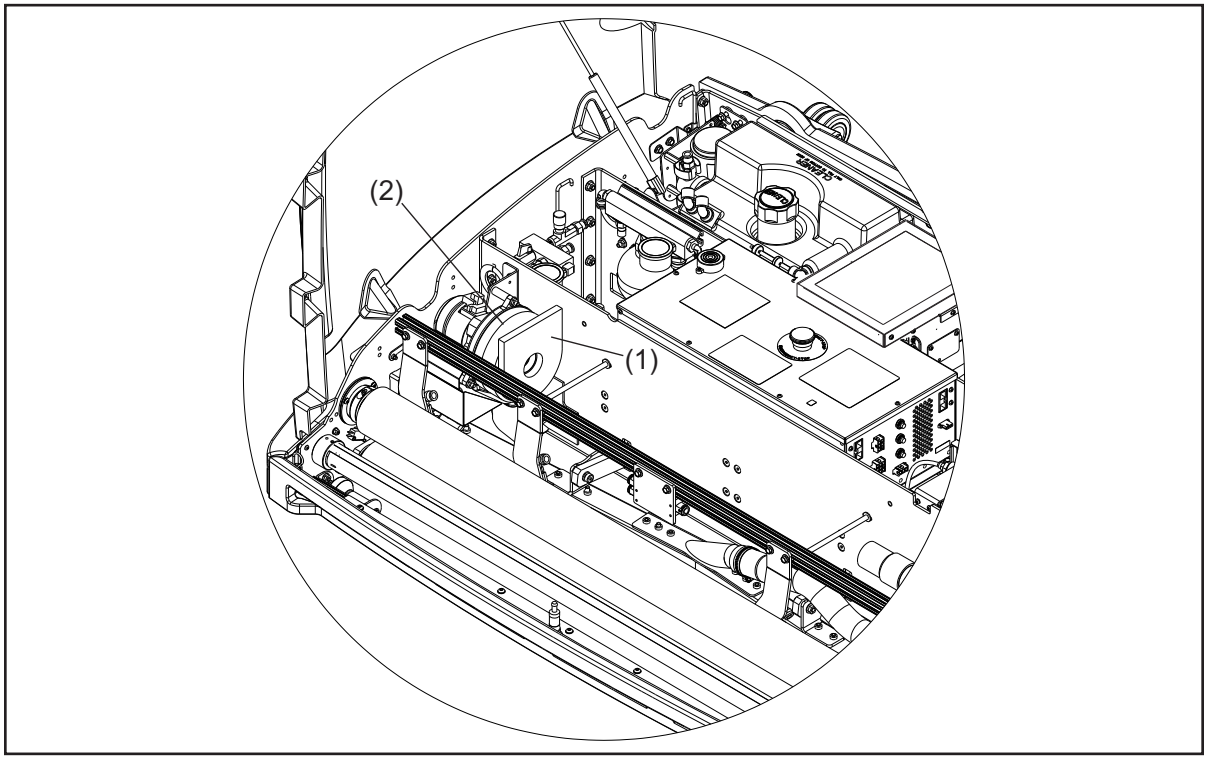

Figure 6-16. Replacing the Vacuum Seal

(1) VACUUM SEAL (2) VACUUM HOUSING

1. Place the machine in transport position with the power disconnected and the cover off.
2. Remove waste recovery tank.
3. Remove the old seal and carefully clean residue with isopropyl alcohol from vacuum housing.
4. Remove self-adhesive backing from new seal.
5. Attach new seal to vacuum motor housing, centering the seal over the hole in housing and aligning the flat edge of the seal with the top of the machine.
6. Inspect the 14-100378-000 Absorbent Foam Vacuum exhaust /deflector felt and 14-100104-000, 14-100105-000 and 14-100106-000 vacuum exhaust/deflector felt and replace as needed with 14-860222-000 adhesive.
7. Replace waste recovery tank.

NOTE: *Make sure that the vacuum motor assembly mounting bracket is positioned in the slots to provide even pressure between the vacuum housing and the waste recovery tank.*

The Conditioning System

Depressurizing the Conditioning System

Tools needed: None.

1. Enter the “Conditioning” option in the “Diagnostics” menu.

2. Turn on the “Oil Tank Vent” valve and the “Oil Pressure” valve.

***NOTE**: Each valve function will run for 20 seconds. Repeat step two, if necessary, to fully depressurize the system so the pressure sensor reads 0.*

Draining the Conditioner Supply Tank

Tools needed: None.
Parts needed: Drain tubing found in the spare parts kit, spare container. Refer to *Figure 6-17.*

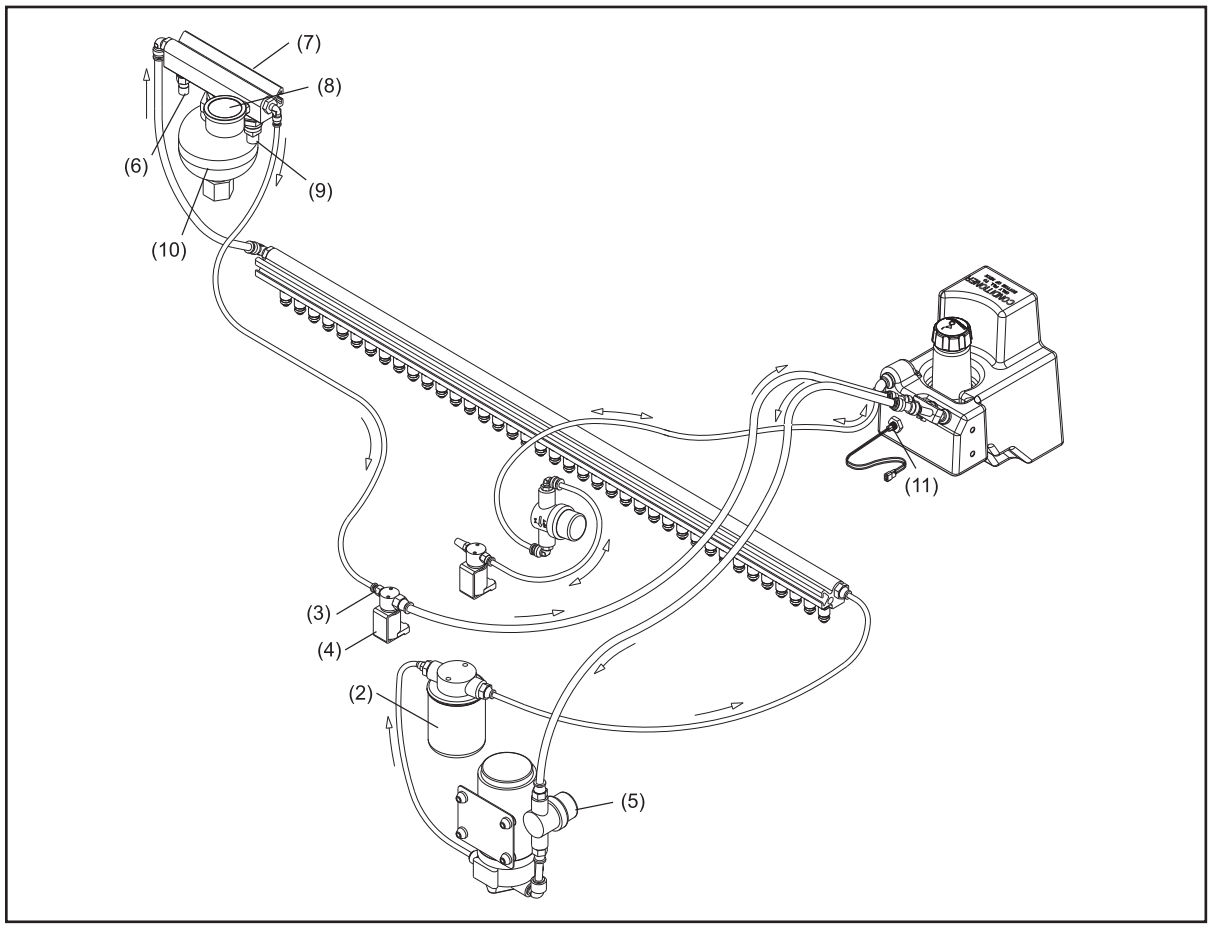

Figure 6-17. Replacing Level Sensor in Supply Tank

(1) CONDITIONER LEVEL FLOAT SENSOR
(2) CONDITIONER SPIN-ON FILTER
(3) DISCONNECT TO USE DRAIN TUBE
(4) CONDITIONER PRESSURE CONTROL VALVE
(5) CONDITIONER SCREEN FILTER
(6) CONDITIONER TEMPERATURE SENSOR
(7) ACCUMULATOR RAIL
(8) CONDITIONER PRESSURE GAUGE
(9) CONDITIONER PRESSURE SENSOR
(10) ACCUMULATOR
(11) OIL CONTAMINATION SENSOR

1. Place the machine in the Operator Position and supply power.

2. Verify that there is no pressure within the conditioning system by viewing the sensor reading in the “Conditioning” screen in the Maintenance diagnostics menu.

3. If the conditioning system is pressurized, refer to *Depressurizing The Conditioning System* procedure at the beginning of the *Conditioning System section*.

4. Locate the “Oil Pressure” valve, in the center frame next to the conditioner pump, and place a terry towel under the valve fitting facing the 10-pin side.

5. Remove the tubing, from the inlet side of “Oil Pressure” valve only, that extends to the accumulator rail assembly and attach the drain tubing supplied in the spare parts kit to the end of the tubing you just removed.

6. Route the drain tubing to a container.

7. Turn on the “Oil Tank Vent” valve and the “Oil Pump”.

8. Repeat step 7 until air is exiting the drain tubing.

9. Remove the drain tubing and reconnect the tubing to the “ Oil Pressure” valve.

NOTE: *It is very important to make sure the tubing is not damaged and that it is inserted completely into the fitting.*

Replacing the Level Float Sensor in Conditioner Supply Tank

Tools Needed: 3/8” open ended wrench or socket, 1/8” Allen wrench

Parts needed: Replacement Level Float Sensor, part number 14-100942-000. Refer to *Figure 6-17.*

1. Drain the conditioner supply tank. (Refer to draining the conditioner supply tank.)

2. Remove the battery clamps with the 1/8” Allen wrench.

3. Turn off bower and disconnect the battery cable from the electronic enclosure, then remove the battery.

4. Disconnect all tubing at conditioner tank.

5. Disconnect cable from level float sensor.

6. Remove the 4 mounting screws for the frame support next to the oil tank.

7. Remove tank by loosening (2) support bolts and lifting tank out of the machine.

8. Remove faulty sensor from the tank using a 1” and 3/8” wrench, turning counter-clockwise to loosen the sensor compression nut.

9. Insert the new sensor with the indicator pointing toward the top of the tank and tighten.

NOTE: *Sensor is correctly positioned if the white float hangs down toward the bottom of the tank when machine is in the operating position.*

10. Replace tank into machine and tighten mounting bolts.

11. Replace the frame support with the 4 mounting screws.

12. Reconnect sensor cable.

13. Reconnect tubing at tank.

14. Fill the conditioner supply tank to verify that there is no leaking from around the new level sensor.

Removing the Conditioner Pump and Filter Assembly

Tools Needed: Shop Towels, 5/32 Allen wrench, 3/8" socket or wrench.
Standard Strap Oil Filter Wrench (for spin-on filter.)

NOTE: *This procedure must be performed in the operating position with the covers open. Push the machine out 24" past the foul line out onto the lane surface.*

WARNING! Before the filter is replaced the conditioner system must be drained and the Temperature Cycle must be turned OFF. Failure to do so may result in personal injury to the user and could also cause damage to the lane machine.

1. Drain the Conditioning System. Refer to "Draining the Conditioner Supply Tank" instructions.

2. Remove the Pump and Filter Assembly
   a. Turn off power to the MAX by the main power switch located on the 7-pin side cover.
   b. Disconnect the "Oil Pump" and "Oil Pressure" valve cable assemblies.
   c. Place a dry towel underneath the "Oil Pressure" valve assembly.
   d. Disconnect the tubes on both sides of the "Oil Pressure" valve, the oil supply tube at the pre-pump filter, and from the outlet side of the spin-on filter.
   e. Remove the three mounting screws for the "Oil Pump and Filter" bracket assembly. Refer to Figure 6-??.
   f. Remove the screw attaching the bracket assembly to the drip pan.
   g. Lift the "Oil Pump and Filter Assembly and drain as much oil from the filters into a container.

3. Remove the Spin-On Oil Filter
   a. At your work station, remove the spin-on filter body using the standard oil filter wrench.
   b. Turn the oil filter wrench counter-clockwise to remove.
   c. Drain and discard old filter.

4. Install the New Spin-On Oil Filter.
   a. Lubricate the gasket for the new spin-on filter with oil.
   b. Install the new spin-on oil filter by hand until tight. Use the oil filter wrench to tighten the filter an additional quarter of a turn.

5. Install the Pump and new Filter Assembly. Refer to "Installing the Oil Pump and Filter Assembly" procedure.

Installing the Oil Pump and Filter Assembly

1. Re-install the "Conditioner Pump and Filter" assembly back into the machine and fasten the 3 screws for the center wall.

2. Fasten the bracket to the drip pan.

3. Connect the tubes on both sides of the "Oil Pressure" valve, the oil supply tube at the pre-pump filter, and from the outlet side of the spin-on filter.

4. Connect the "Oil Pressure" valve and "Oil Pump" cable assemblies.

Removing the Conditioner Pump

Tools needed: 3/8" open end wrench.

1. Remove the Conditioner Pump and Filter Assembly. Refer to *Removing Conditioner Pump and Filter Assembly* procedure.

2. Remove the pre-pump filter assembly from its holders and pivot up.

3. Using the 3/8" wrench to remove the 4 mounting screws for the pump.

4. Remove the pump from the bracket assembly.

5. Disconnect the tube from the pump that connects to the Spin-on filter.

6. Disconnect the pre-pump filter assembly from the pump.

Installing the New Conditioner Pump

1. Place the pump onto the 4 mounting screws on the bracket.

2. Fasten the 4 washers and 4 nuts to the mounting screws.

3. Tighten the 4 nuts until 4-5 threads extend above the nuts.

Removing and Installing the Oil Pressure Valve

Tools needed: 3/32" Allen wrench

1. Using the Allen wrench, remove the 2 mounting screws for the oil pressure valve.

2. Fasten the new oil pressure valve using the screws in the previous step.

Bleeding the Conditioner System and Checking for Leaks

1. Fill the conditioner tank and turn on the Temperature Cycle function and check tubing for leaks.

2. In the Operator screen, turn on the Temperature Cycle Override. Air will be purged from the system during the process.

3. Check the tubing for the Oil Pump and Filter assembly for leaks.

Recharging the Accumulator Assembly

Tools needed: ½" and 1" open end wrenches, bicycle pump

1. Place the machine in the operating position with covers open and power on.

2. Verify that there is no pressure in the oil system. If system is pressurized, refer to Depressurizing the Conditioning System earlier in this section.

3. Disconnect the Oil Pressure Sensor and the Oil Temperature Sensor.

4. Remove the 2 nuts mounting the accumulator rail assembly using the ½" wrench.

5. Pivot the accumulator rail assembly to expose the bottom side of the accumulator.

6. Remove the valve cap from the accumulator with the 1" wrench. Refer to Figure 6-??.

NOTE: *The accumulator has a tire valve that is used to fill with compressed air. The air is separated from the oil by a bladder which creates pressurised oil storage while the machine is injecting oil.*

7. Connect the bicycle tire pump to the valve on the bottom of the accumulator.

8. Begin pumping the air slowly into the accumulator assembly until the oil pressure gauge reads 12 psi.

9. Remove the bicycle pump from the accumulator and replace valve cap.

10. Remount the accumulator assembly to the center frame.

11. Connect the Oil pressure sensor and Oil temperature sensor.

The Buffing System

Adjusting the Buffer Brush

Tools needed: 3/8" socket wrench and 9" extension, 9/64" Allen wrench, buffer/squeegee adjustment tool. Refer to *Figure 6-18.*

1. With the machine in the operators position, lower the buffer brush in the diagnostics for conditioning using the "Toggle buffer brush" button.

2. Once the brush is in the down position, disconnect power cord from the machine and lift into the transport position.

3. Lay the handle on the floor with a towel underneath and open the 7-pin side top cover.

4. Loosen the three (3) bolts that mount the brush lifting motor assembly, to the 7-pin side of the machine, using a 3/8” socket wrench.

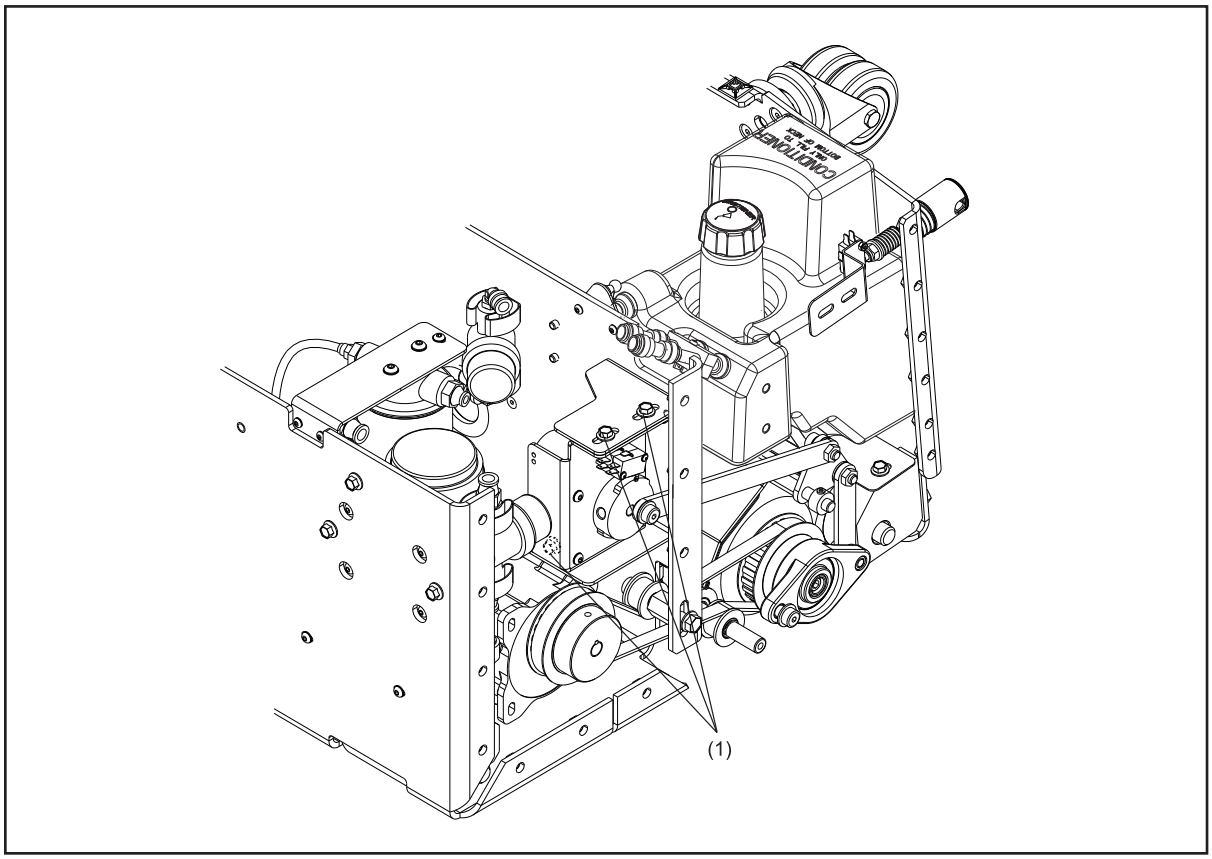

Figure 6-18. Adjusting the Buffer Brush

(1) THREE MOUNTING BOLTS

5. Place adjustment tool (mounted inside the lane machine in front of the electronics enclosure) across the rear wheel and drive wheel on the 7-pin side of the machine. Refer to *Figure 6-19.*

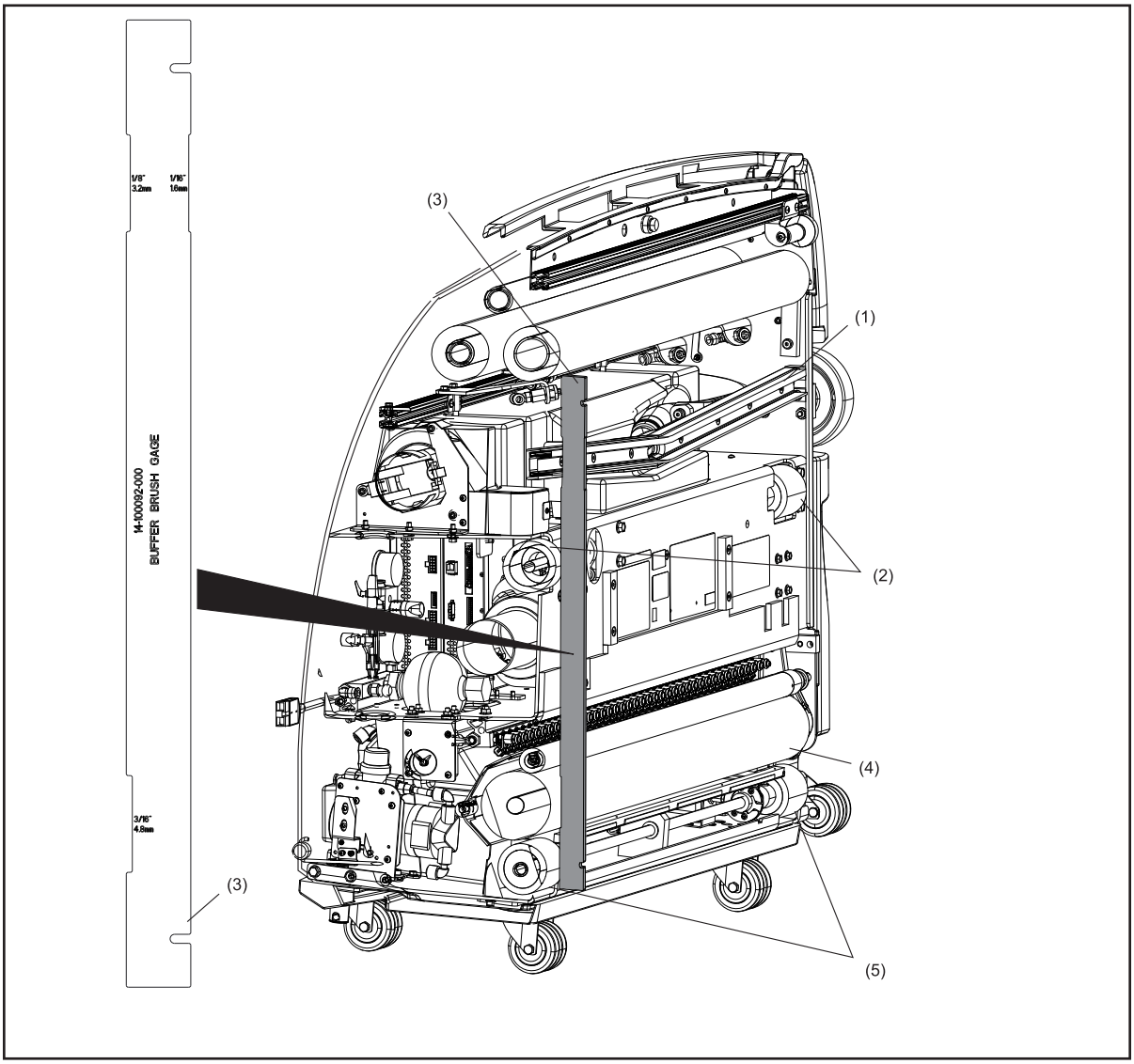

Figure 6-19. Adjustment Tool - Section View

(1) SQUEEGEE/VACUUM HEAD ASSEMBLY
(2) TRACTION DRIVE WHEELS
(3) BUFFER/SQUEEGEE ADJUSTMENT TOOL
(4) BUFFER BRUSH
(5) REAR SHAFT WHEELS

6. Verify that the desired adjustment notch is sitting over the buffer brush (the buffer brush is set at the factory with the 1/16" notch).

7. To raise the buffer brush, move the motor position in the slots toward the front of the machine.

8. To lower the buffer brush, move the motor position in the slots toward the rear of the machine.

9. When the brush is in desired position, snug two of the three mounting bolts using the 3/8" socket wrench.

10. Verify adjustment on 7-pin side of machine, then check the adjustment across the rear and drive wheels on the 10-pin side of the machine.

11. If the adjustment is equal on both sides of the machine, then completely tighten the three mounting bolts making sure not to over tighten and deform the adjustment slots. If the adjustment is not balanced, continue with the following steps.

12. Locate the collar, on the 10-pin side, bottom of the machine (found directly under the dispersion roller) that holds the two sides of the brush lifting shaft. Refer to *Figure 6-20.*

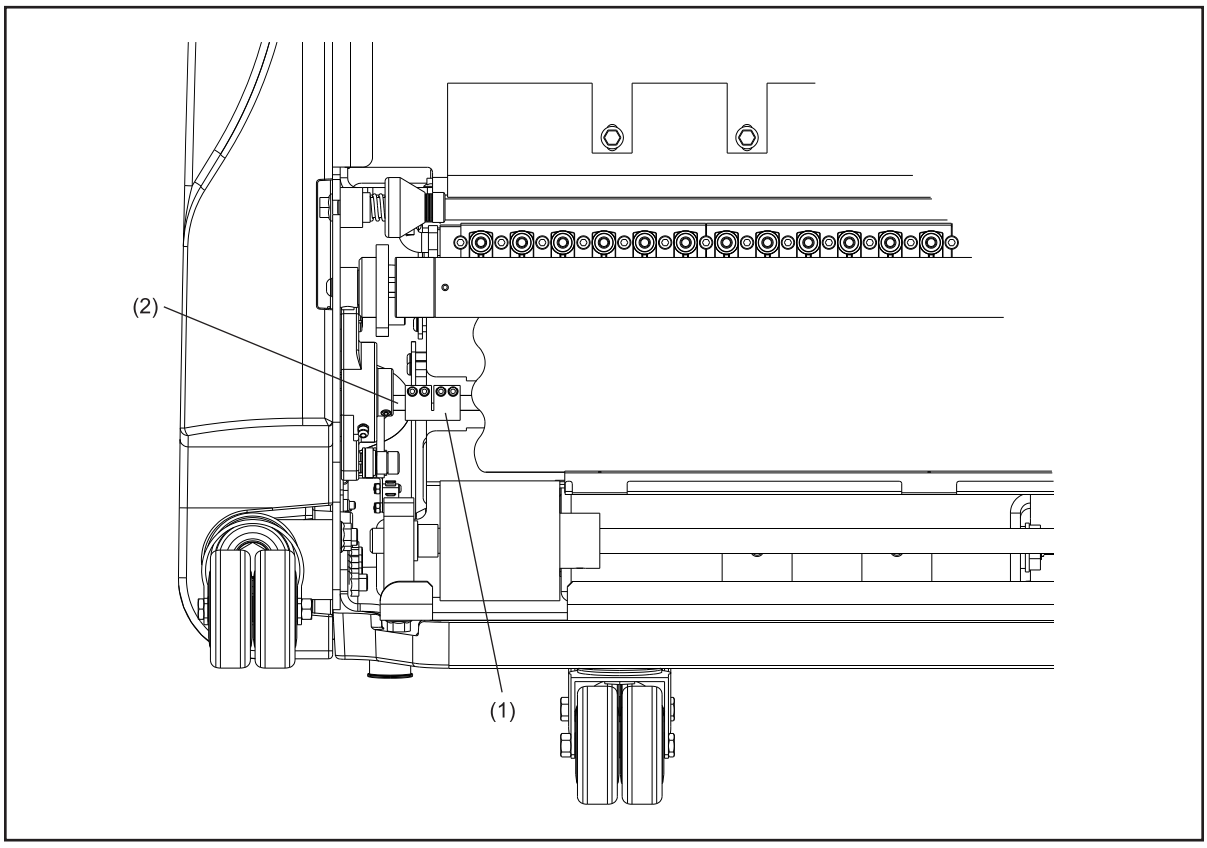

Figure 6-20 Collar

(1) COLLAR (2) SHORT SHAFT

13. Slightly loosen the 2 screws, using a 9/64” allen wrench, on the short side of the shaft assembly.

14. Check the adjustment of the buffer brush and push/pull on the buffer brush wall-mounted bearing until the proper adjustment is achieved.

15. Tighten the screws on the collar.

16. Tighten (but do not over tighten) the four mounting bolts making sure not to deform the adjustment slots. Refer to *Figure 6-17.*

17. Replace the 7-pin side cover and fasten to the machine.

Replacing the Buffer Brush

Tools needed: 1/8” Allen wrench, and long 1/4” T-Wrench (supplied with kit).

Parts needed: Buffer Brush Assembly, part number 14-100043-000, and attachment screw, part number 11-005308-000, blue loctite. Refer to *Figure 6-21.*

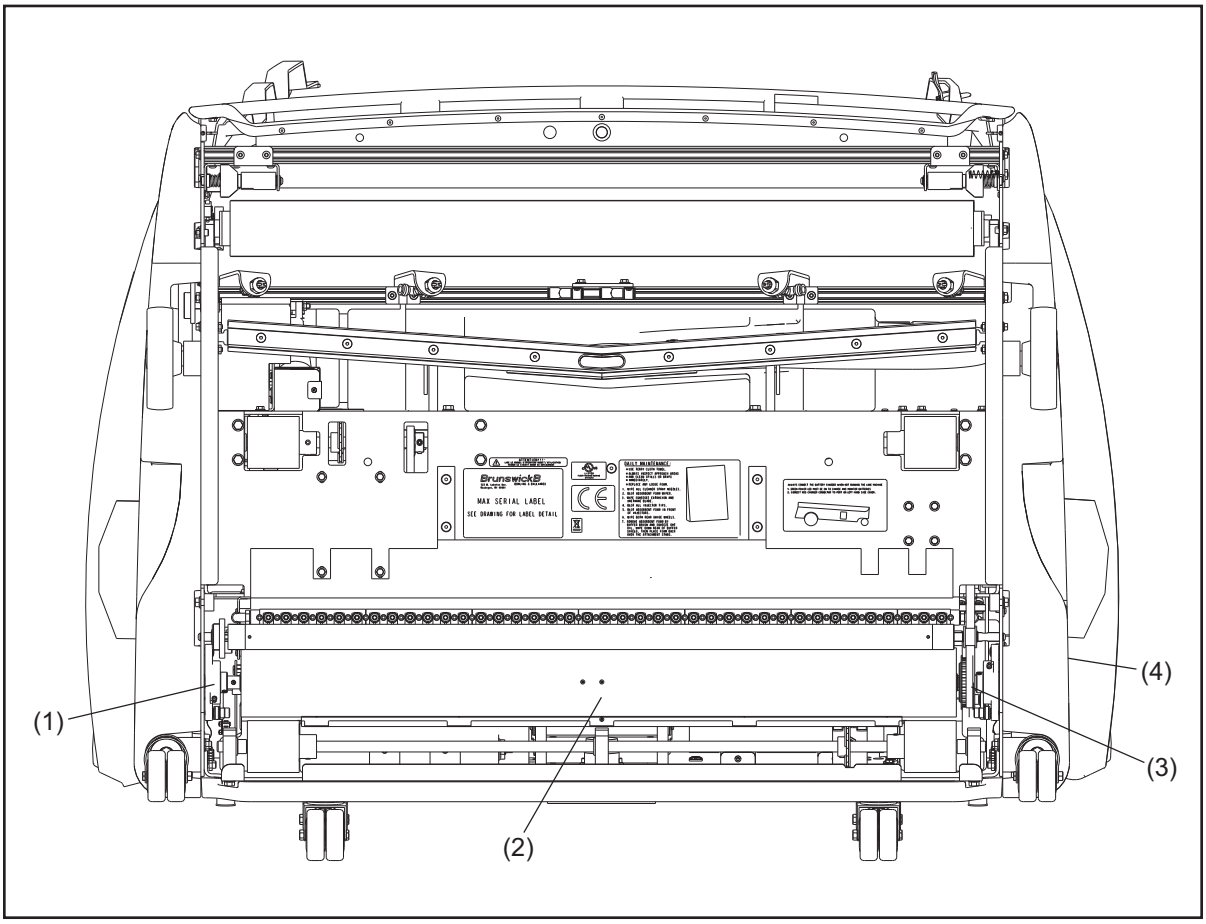

Figure 6-21. Replacing the Buffer Brush

(1) WALL MOUNTED BEARING
(2) BUFFER BRUSH
(3) BUFFER DRIVE PULLEY
(4) ACCESS HOLE FOR 1/4” SOCKET HEAD CAP SCREW

1. Place machine in transport position.
2. Remove the 10-pin side cover by removing the 3 pins that mount the cover to the machine frame.
3. Remove 2 set screws on the 10-pin side, wall-mounted buffer brush bearing using a 1/8” Allen wrench.
4. Remove socket-head cap screw inside the buffer drive pulley using 1/4” T-wrench. This will allow the buffer brush shaft to separate from the buffer drive pulley, which will remain in the machine.

NOTE: *Access the socket-head cap screw via the access hole on the 7-pin side of the machine’s cover.*

5. Slide buffer brush toward 10-pin side of machine, swing brush away from the machine and then slide brush out of the bearing housing.

6. Inspect the groove-end of the buffer shaft and make sure there are no burrs or scars that may effect how well the brush slides into the wall-mounted bearing. File if necessary.

7. Install new buffer brush by reversing step 4.

8. Replace socket-head cap screw using blue loctite.

9. Replace set screws on wall-mounted bearing.

NOTE: *Make sure that the set screws align within the groove on the end of the buffer brush shaft.*

10. Tighten set screws.

11. Verify the adjustment of the buffer brush using the straightedge alignment tool.

12. Place the buffer/squeegee adjustment tool from the drive wheel to the rear wheel, with the edge of straightedge resting on both wheels.

13. Check to ensure that the brush contacts the desired notch of the adjustment tool.

14. Check adjustment on both the 7-pin and the 10-pin sides of the machine.

15. Adjust if necessary. (For additional information see **Adjusting the Buffer Brush**.)

Adjusting the Buffer Belt Tension

Tools needed: adjustable wrench, 1/2” wrench.
Parts needed (if replacing): Buffer Drive Belt, part number 11-655022-000. Refer to *Figure 6-22*.

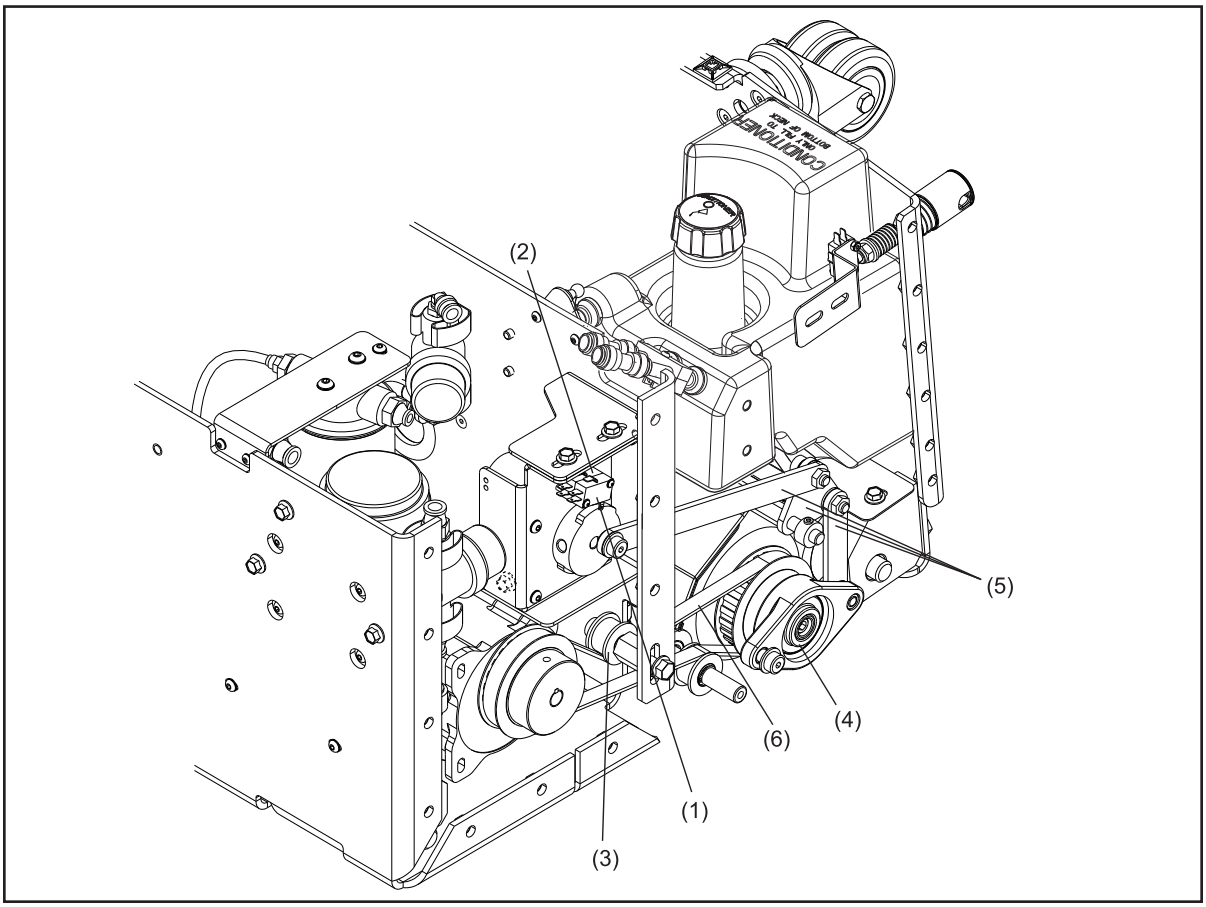

Figure 6-22. Adjusting Buffer Belt Tension, Replacing Buffer Up/Down Switches, Lubrication Buffer Brush Bearings and Lubricating Brush Lifting Assembly

(1) BUFFER UP SWITCH
(2) BUFFER DOWN SWITCH
(3) BUFFER BELT IDLER ASSEMBLY
(4) BUFFER BRUSH BEARING
(5) BUFFER BRUSH LIFTING LINKAGES
(6) BUFFER DRIVE BELT

1. Place machine in transport position with the power supply disconnected.
2. Remove the side cover from the 7-pin side of the machine.
3. Place machine in operating position.
4. Supply power to machine.
5. Lower buffer brush by selecting “toggle buffer up/down” on the “Conditioner diagnostics” screen in the “Maintenance” menu.
6. Disconnect power from machine.
7. Place adjustable wrench on the hex-mount inside the machine and place the 1/2” wrench on the bolt on the outside of the machine.
8. Loosen the bolt from the outside using the 1/2” wrench.
9. To increase belt tension, lower the idler assembly.
10. To decrease belt tension, raise the idler assembly.
11. Secure the assembly position by tightening the nut (place adjustable wrench on spacer nut inside machine, and tighten bolt on the outside of machine using 1/2” wrench).

NOTE: *Make sure that the belt tension is not too tight or too loose. Poor adjustment can cause damage to belt and/or motor.*

Replacing the Buffer Up/Down Switches

Tools needed: 1/16” Allen wrench, 3/8” open-end wrench, 1/8” Allen wrench, 3/16” Allen wrench, #2 Phillips screwdriver, Straight blade screwdriver, 10 mm socket and drive. Refer to *Figure 6-22.*

1. Place the machine in operating position and turn off main power switch on the left hand side cover.
2. Disconnect battery and power identification jumper from the electronic enclosure.
3. Remove the six screws that mount the left hand top cover with a #2 Phillips screwdriver and disconnect the gas spring from the frame using a straight blade screwdriver.
4. Remove the four screws that mount the battery clamps using the 1/8” Allen wrench.
5. Lithium Battery: Remove from the machine.
6. Remove the four screws that attach the frame support between the battery location and the conditioner tank using a 3/8” wrench.
7. Disconnect the level float sensor from the cable harness as well as the two 3/8” tubing and one 1/4” tubing from the conditioner tank.
8. Remove the two screws that mount the conditioner tank and remove the tank.

9. Disconnect the cable harness from the buffer lifting motor assembly.

10. Remove the screw mounting the buffer lift connecting link through the hole in the left hand side frame, with a 3/16” Allen wrench.

11. Remove the three screws that mount the buffer lifting motor assembly from the center frame and remove the assembly.

12. Identify faulty switch.

NOTE: *The up/down switches (which are mounted back to back on the bracket) can be distinguished by the color of their wires; the “up” switch has green and white cables, the “down” switch has blue and black cables.*

13. Disconnect cables from faulty switch at cable connectors.

14. Remove switches from the mounting bracket by loosening and removing 2 mounting screws using a 1/16” Allen wrench.

15. Remove faulty switch.

16. Connect cables to new switch at fast-on cable connectors.

17. Position switches on mounting bracket as close to the motor shaft as possible and tighten screws that secure switches to the bracket.

18. Replace the buffer lifting motor assembly and fasten the three screws with the 3/8” wrench.

19. Connect the buffer lift connecting link to the cam through the access hole in the left hand side frame and tighten with the 3/16” Allen wrench.

20. Connect the cable assembly to the buffer lifting motor assembly.

21. Replace the conditioner tank with the two screws and tighten with the 3/8” wrench.

22. Connect the tubing to the tank and level float sensor to the cable harness.

23. Lithium Battery: Install the battery into the tray with battery cable closest to the electronic enclosure.

24. Replace the battery clamps with the four screws and fasten with the 1/8” Allen wrench.

25. Replace the left hand top cover with the six screws and tighten with the #2 Phillips screwdriver.

26. Connect the gas spring (no tools needed).

27. Connect the battery cable and power type jumper to the electronic enclosure and turn on the main power switch on the left hand side cover.

Lubricating the Buffer Brush Bearings

Refer to *Figure 6-22.*

1. Attach grease gun to the grease fitting located on the wall mounted buffer bearing.
2. Squeeze gun twice.
3. Repeat for the opposite side.

Lubricating the Buffer Brush Lifting Assembly

Refer to *Figure 6-22.*

1. Apply one drop of oil to the bearings in the buffer brush lifting linkages on 7 and 10-pin sides.

Replacing the Dispersion Roller

Tools needed: 5/32” Allen wrench. .Refer to *Figure 6-23.*

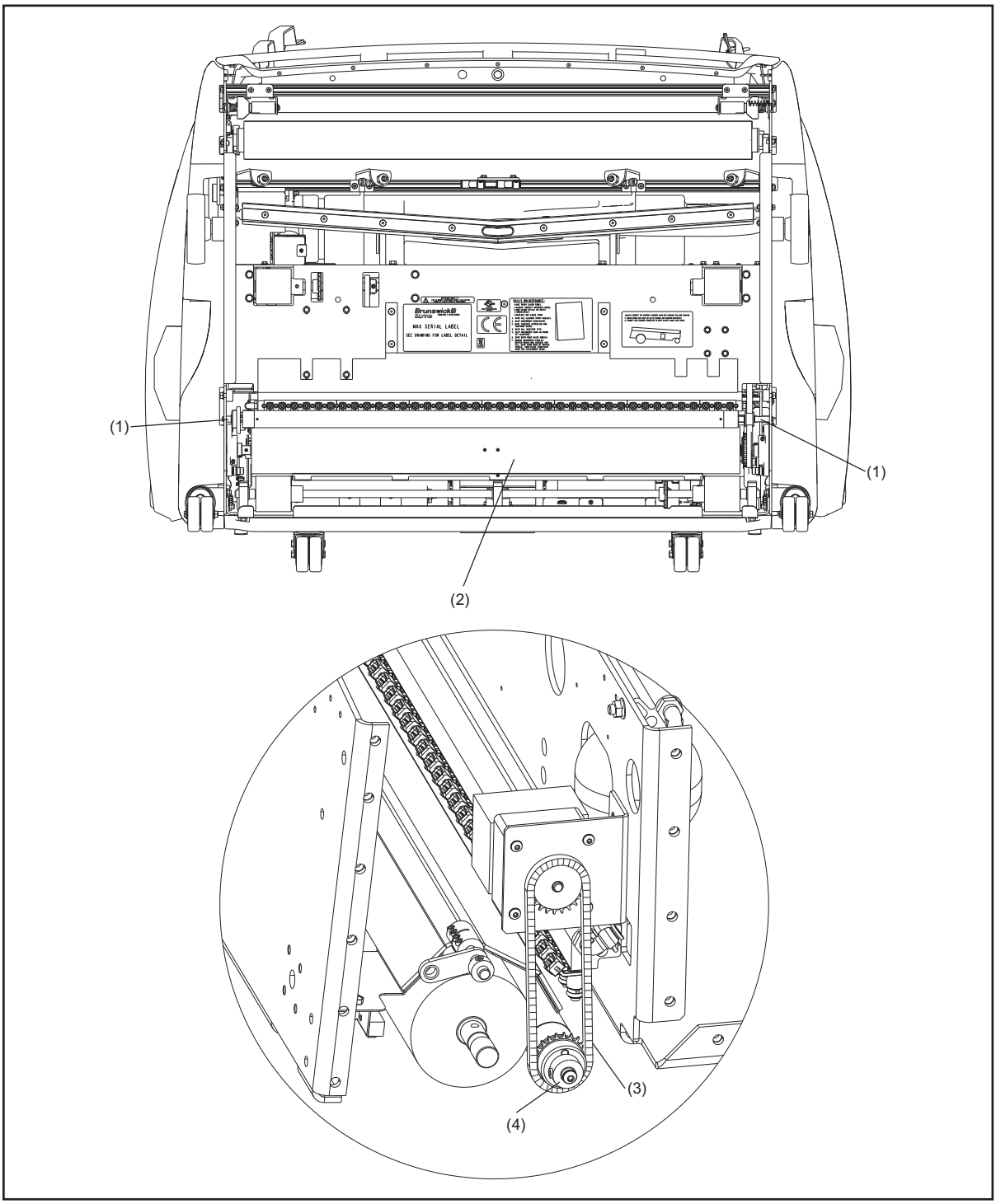

Figure 6-23. Replacing and Lubricating Dispersion Roller

(1) DISPERSION ROLLER MOUNTING BOLTS
(2) DISPERSION ROLLER
(3) DISPERSION ROLLER CHAIN
(4) GREASEABLE END OF DISPERSION ROLLER

1. Place machine in transport position with the power supply disconnected.

2. Remove dispersion roller.

    a. Remove side covers from machine.

    b. Remove 2 button-head bolts—one from each end of dispersion roller using a 5/32” Allen wrench.

    c. Slide the dispersion roller out, removing the roller drive chain from the 10-pin side of the machine.

3. Position the new dispersion roller in place, sprocket end first, replacing the chain on the sprocket.

4. Replace the buffer brush idler pulley on the mounting shaft and ensure that it’s in-line with the motor drive and brush drive pulleys, and make sure the drive belt is in proper position.

5. Insert button head bolts and position the dispersion roller in the center of the mounting slots. Refer to Dispersion Roller Adjustment.

6. Tighten button head bolts completely.

7. With the machine in the operator position, lower the buffer brush in the diagnostics for conditioning using the “Toggle Buffer Brush” button.

8. Once the brush is in the down position, disconnect power cord from the machine and lift into the transport position.

9. Verify that there is slight contact between the buffer brush and dispersion roller across the entire width. Adjust the dispersion roller bolt in the side frame slot if necessary for uniform contact.

Lubricating the Dispersion Roller

Refer to *Figure 6-23.*

1. Place machine in transport position with power supply disconnected.

2. Remove side cover from 10-pin side of machine.

3. Remove the button head bolt that fastens dispersion roller on the 10-pin side of the machine.

4. Insert grease fitting (part number 14-100202-000, supplied in spare parts package) into the dispersion roller.

5. Attach grease gun with standard bearing grease and pump 2 to 3 times.

6. Remove grease fitting and insert bolt.

7. Check adjustment to buffer brush and tighten.
   For more information see ***Adjusting the Buffer Brush.***

The Drive System

Replacing the End-of-Lane Sensor.

Tools needed: adjustable wrench.
Parts needed: replacement EOL sensor (Part Number 14-100235-000). Refer to *Figure 6-24.*

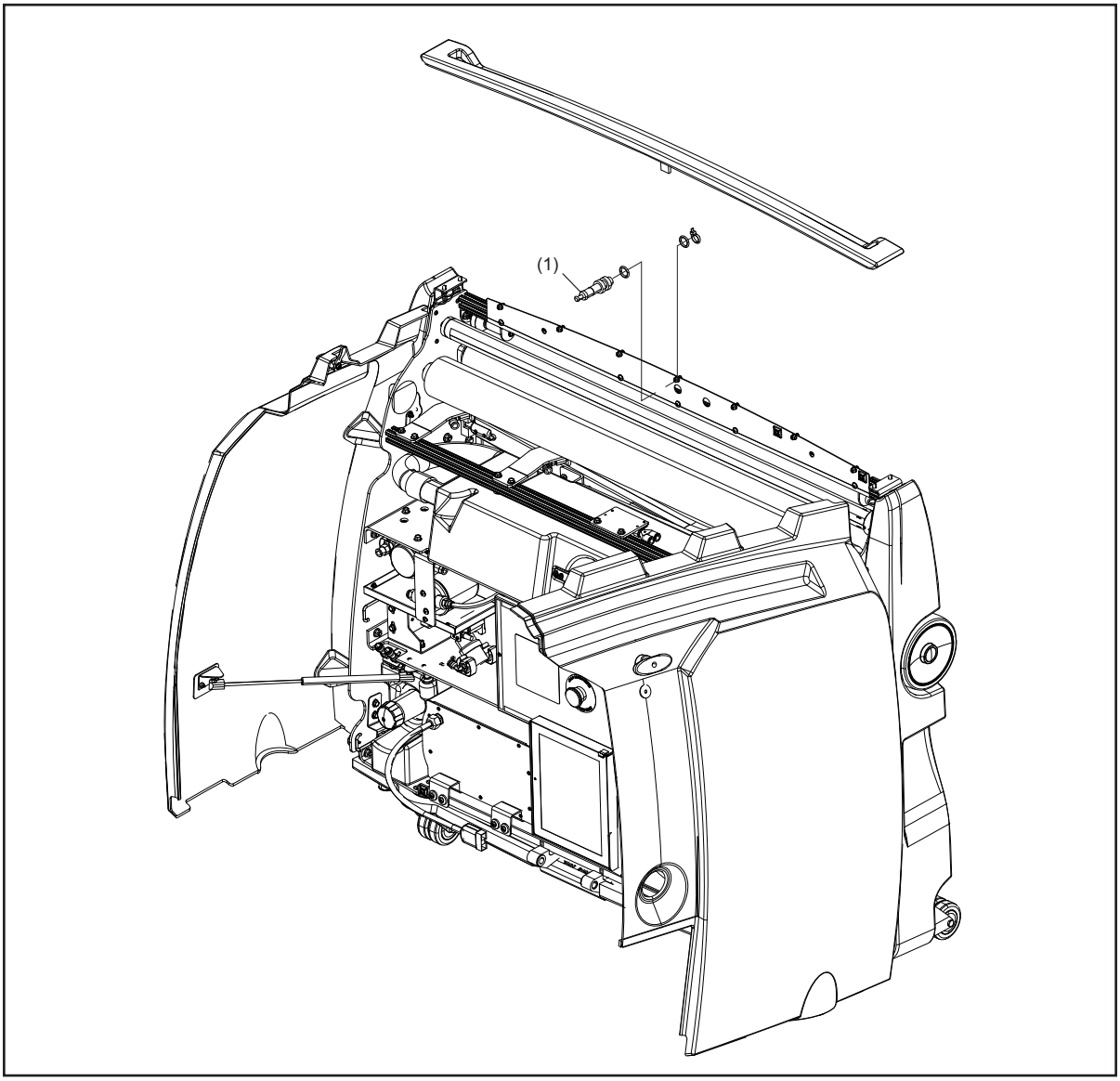

Figure 6-24. End-of-Lane Sensor

(1) END OF LANE SENSOR

1. Place machine in transport position with the cover open and power supply disconnected.
2. Loosen and remove nut at base of sensor.
3. Remove black O-ring from base of sensor.
4. Disconnect sensor cable from the quick-connect cable harness.
5. Pull sensor out from the top side of the machine and remove the second O-ring on top side of the sensor.

6. Place an O-ring under the top-side nut and then install new sensor from top side of the machine.

7. Place the second O-ring on the sensor pushing it up to the bottom side of the mounting shield.

8. Insert and tighten nuts at base of sensor until the end of the sensor is just even with the bottom edge of the lower nut.

NOTE: *DO NOT over tighten nuts.*

Adjusting the Distance Encoders

Tools needed: 11/16” wrench, 3/8” socket wrench, feeler gauges.

Refer to *Figure 6-25.*

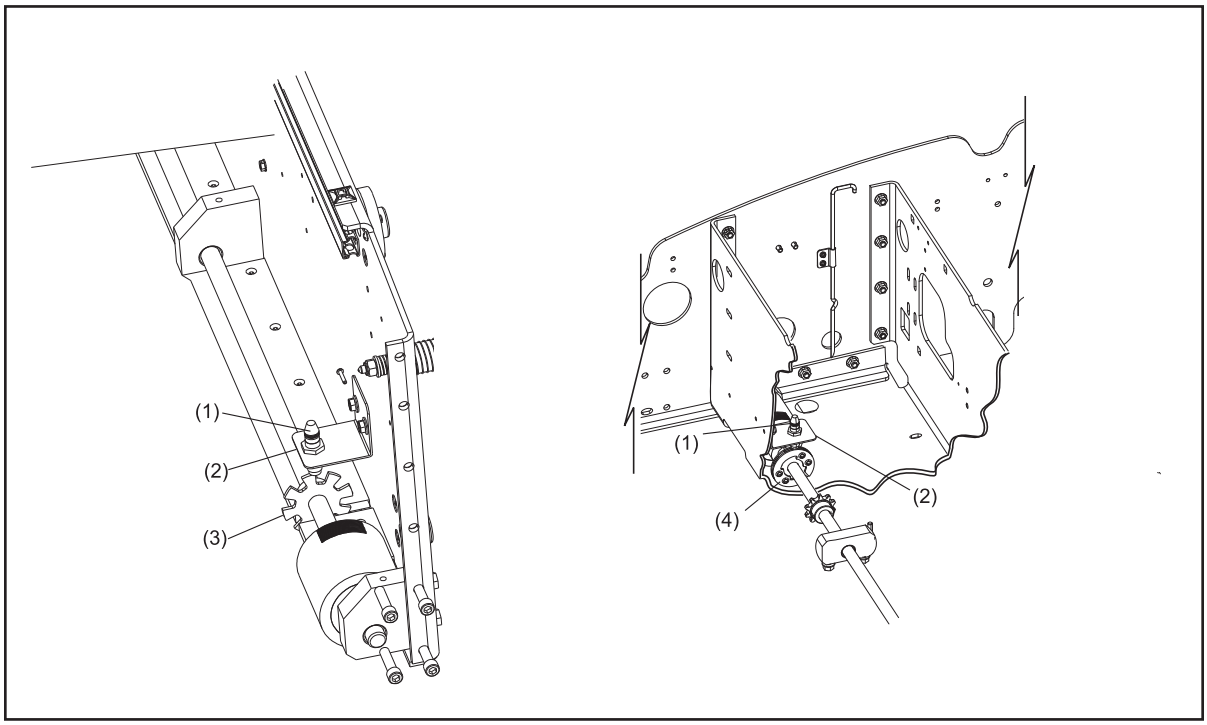

Figure 6-25. Distance Encoders

(1) DISTANCE ENCODER (2) MOUNTING BRACKET (3) REAR ENCODER WHEEL SPROCKET
(4) FRONT ENCODER WHEEL SPROCKET

NOTE: *The removal, adjustment and replacement procedure is the same for both the rear and front encoder sensors.*

1. Place machine in transport position with the power supply disconnected.

2. Remove the battery clamps with the 1/8” Allen wrench.

3. Disconnect the battery cable from the electronic enclosure and remove the battery from the machine.

4. Remove the 4 screws that fasten the battery tray to the rear and center frame using the 1/8” Allen wrench.

5. Check the distance between the encoder and the encoder wheel sprocket, using the set of feeler gauges, and verify that it is 1.5 mm +/- 0.5 mm (.06” +/- .02”). To adjust distance, do the following:

    a. Loosen mounting nut on bottom side of mounting bracket using 11/16” wrench.

    b. Adjust assembly position so that the sensor end of the distance encoder extends 15/16” from the bottom side of the encoder bracket

    c. Tighten mounting nut to secure position.

    d. Check the distance between the encoder and the encoder wheel sprocket, using the set of feeler gauges, and verify that it is 1.5 mm +/- 0.5 mm (.06” +/- .02”).

Replacing the Distance Encoders

Tools needed: 11/16” wrench, 3/8” socket, 7/16” socket (front sensor).
Parts needed: replacement distance encoder (Part Number 14-100254-000). *Refer to Figure 6-25.*

NOTE: *The removal, adjustment and replacement procedure is the same for both the rear and front encoder sensors.*

1. Place machine in transport position with the power supply disconnected.
2. Remove the battery clamps with the 1/8” Allen wrench.
3. Disconnect the battery cable from the electronic enclosure and remove the battery from the machine.
4. Remove the 4 screws that fasten the battery tray to the rear and center frame using the 1/8” Allen wrench.
5. Loosen and remove bolts that secure encoder bracket to machine wall (Located underneath the Conditioner supply tank).
6. Disconnect encoder cable from the cable harness.
7. Pull encoder assembly out from the top side of machine.
8. Remove mounting nut on bottom side of mounting bracket using 11/16” wrench.
9. Install new encoder assembly from top side of the machine so that the sensor end extends 15/16” from the bottom side of the encoder bracket.
10. Insert and tighten mounting nut to secure encoder assembly to bracket.
11. Replace bolts to secure encoder bracket to machine wall.
12. Connect encoder cable to the quick-connect cable harness.
13. Check the distance between the encoder and the encoder wheel sprocket. It should be 1.5 mm +/- 0.5 mm (.06” +/- .02”).

14. Adjust encoder as needed.

Adjusting the Traction Drive Chain Tension and Alignment

Tools needed: 3/8” socket wrench, 5/32” allen wrench.

Refer to *Figure 6-26.*

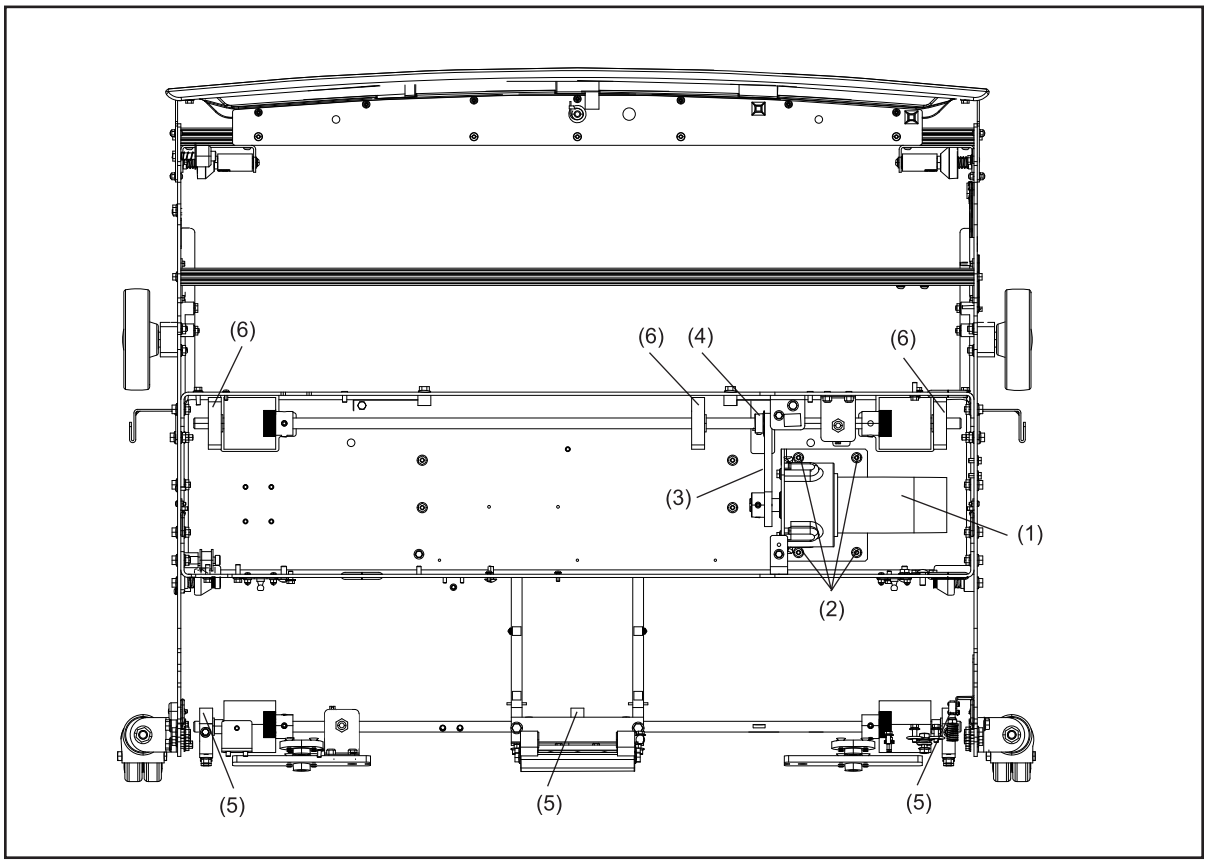

Figure 6-26. Adjusting and Lubricating Drive Chains

(1) TRACTION DRIVE MOTOR
(2) TRACTION DRIVE MOTOR MOUNTING BOLTS
(3) TRACTION DRIVE CHAIN
(4) TRACTION DRIVE SHAFT SPROCKET
(5) REAR SHAFT BEARING BLOCKS
(6) TRACTION DRIVE BEARING BLOCKS

1. When you depress the traction drive chain, there should be about 3/8” of movement in the chain. If there is too much, or too little movement, follow this procedure.
2. Place machine in transport position with power supply disconnected.
3. Slightly loosen 4 mounting bolts that secure the traction drive motor to the frame.
4. Place machine in operating position.
5. Check movement of chain.
6. To tighten chain, slide traction drive motor assembly away from the traction drive wheels to tighten up slack.

7. To loosen chain, slide traction drive motor assembly toward the traction drive wheels to provide more slack.

8. Tighten the 4 bolts on the bottom side of the center compartment to align the chain.

9. Loosen the 2 set screws on the drive shaft sprocket with a 5/32” allen wrench.

10. Carefully, tap the sprocket with a soft-face hammer to align with the motor sprocket.

NOTE: *Improper alignment will cause drive system to make noise during travel.*

11. Tighten the set screws with the 5/32” allen wrench.

Lubricating the Traction Drive Chain and Dispersion Roller Chain

Refer to *Figure 6-26.*

1. Apply a small amount of chain grease to the traction drive chain at the sprocket and spread the grease across the chain links.

2. Repeat the procedure for the dispersion roller chain.

Lubricating the Bearing Blocks

Refer to *Figure 6-26.*

1. Apply one drop of oil to each side of the rear-wheel bearing blocks where the shaft and bearing meet.

2. Repeat the procedure for the traction drive bearing blocks.

General Machine Maintenance

Replacing Fuses

Tools needed: fuse puller, replacement fuses included in spare parts kit.

1. Place machine in the operator position with the cover open and power supply disconnected.

2. Remove Tablet to access enclosure screws.

3. Remove cover from electronics enclosure by removing 6 screws in cover.

4. Locate motor control board (The motor control board is the large board on the top).

NOTE: *See fuse drawings in Appendix.*

5. Locate bad fuse (all fuses are labeled on the control board).

NOTE: *See electrical diagrams in the appendix for more information.*

6. Remove fuse using fuse puller found in the spare parts kit..

7. Install new fuse.

WARNING! Always use the correct size and amperage fuse.

8. Replace cover and reinstall cover screws and Tablet.

Replacing the Cord-Kill Switches

Tools needed: 3/8” wrench, 1/16” allen wrench, 1/4” open-end wrench.
Parts needed: replacement switch (Part Number 11-616031-000).

Refer to *Figure 6-27.*

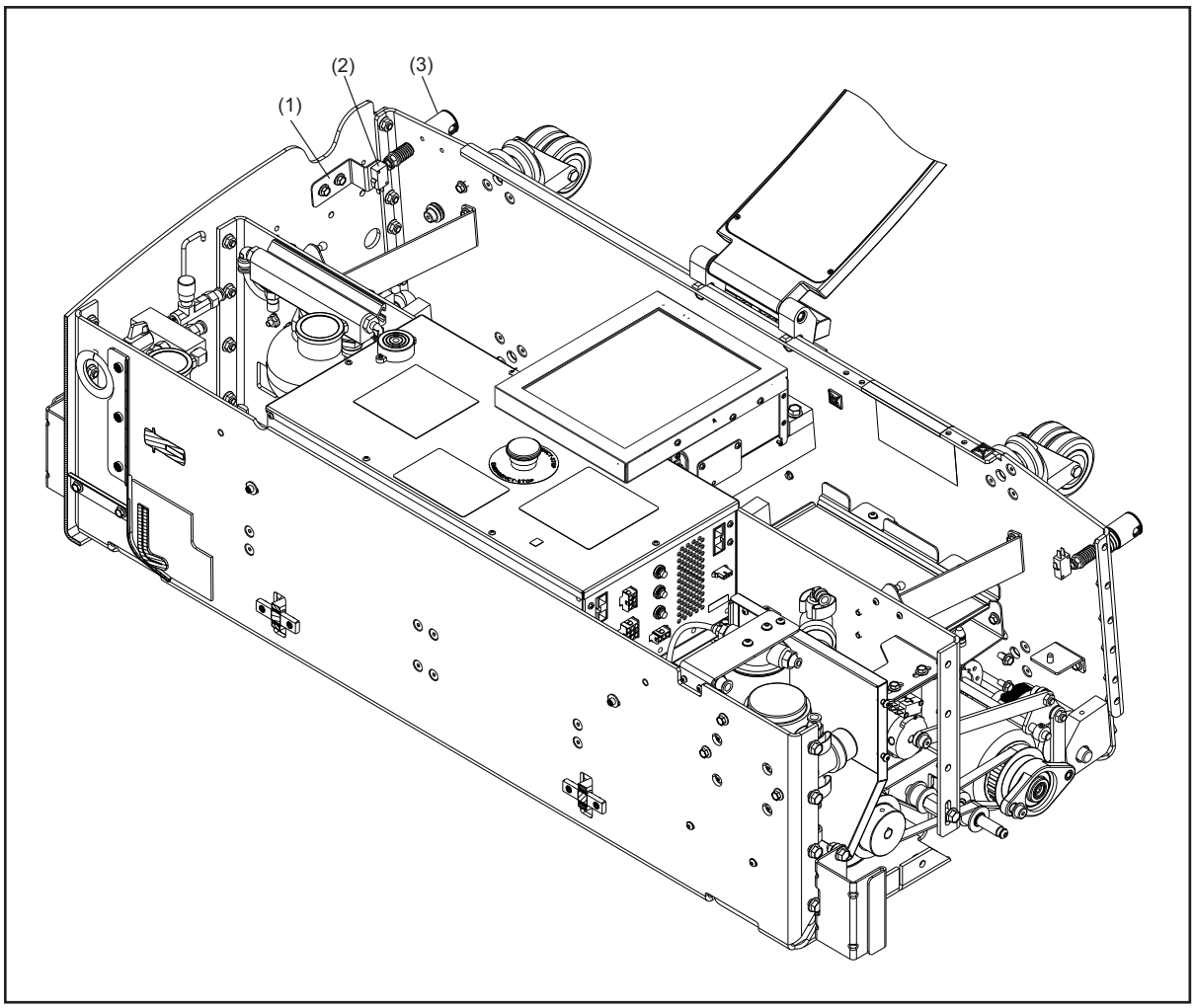

Figure 6-27. Replacing Cord Kill Switches

(1) CORD KILL SWITCH BRACKET (2) CORD KILL SWITCH (3) CORD KILL STUD

1. Place machine in operating position with cover open and power supply disconnected.

2. Identify the bad switch using the Diagnostics screen on the Tablet (Refer to Troubleshooting section for instructions on using the Tablet Diagnostics).

3. Remove the 2 bolts that secure the cord-kill bracket to the machine side wall and remove the cord-kill switch assembly.

4. Remove the screws that secure the switch to the bracket using a 1/16” Allen wrench & 1/4” open-end wrench.

5. Remove faulty switch.

6. Using the old switch as a guide, reconnect the wires on the new switch following the order for wire connections. Refer to electrical schematics in the Appendix for details.

7. Mount the new switch to the bracket using the 2 mounting screws.

8. Insert and tighten the 2 bolts to secure the bracket to the side wall.

9. Check to ensure there is a 1/32” to 1/16” gap between the cord-kill stud and the switch body to provide the proper contact between the plunger on the lanyard and the switch.

Section 7: Troubleshooting

The MAX's User Interface (Tablet) will alert you to most operational or maintenance problems by displaying an alert, warning or error message. It is also a powerful tool for troubleshooting. This section teaches you to properly use the Tablet to effectively troubleshoot, lists all the messages you might encounter and provides guidance for correcting problems.

This section also provides a highly detailed look at the machine's sequence of operations. Understanding the normal operation can be useful for identifying and correcting problems when they arise.

In this section you will find:

1. A sequence of machine operation, system-by-system.
    a. Preparing for operation
    b. The cleaning system
    c. The conditioning system
    d. The buffing operation
    e. The traction drive system
2. A guide to troubleshooting using the Tablet.
3. A list of error messages with troubleshooting guidance.
4. A list of alert and warning messages with troubleshooting guidance.
5. A list of maintenance messages with replacement information.
6. A list of mechanical failures with troubleshooting guidance.

WARNING! Do not attempt to undertake any maintenance or service for which you are not qualified. If you need assistance, or are interested in training, call Brunswick Technical Support, or contact your Brunswick Sales or Service Representative.

If a message appears or a problem occurs that is not addressed in the troubleshooting section, please contact your Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com

SEQUENCE OF OPERATION

This section provides a detailed look at how the machine, its controller, and its component parts work together in sequence. Understanding the normal sequence of operations can be a useful resource for troubleshooting.

Preparing for Operation Off Approach

1. While the machine is connected to the charger, the machine can warm the conditioner to operating temperature. (This will only occur if the Temperature Cycle feature is turned “ON” on the Tablet, either using the Temperature Scheduler or the Temperature Cycle Override) The control system:

    a. Opens the conditioner pressure control valve and the conditioner vent valve, allowing the conditioner pump to circulate conditioner through the heated injector rail.

    b. When conditioner reaches operating temperature (factory-set to 80°F (26°C), the conditioner pump turns off and the pressure control valve and the conditioner vent valve close after the conditioning system depressurizes.

    c. The operator screen displays the temperature of the conditioner.

Preparing for Operation On Approach

1. When the operator presses handle button or the “Prepare for Lane” button to prepare the machine to operate, the control system:

   a. Rotates the duster cloth take-up roll to lower the duster contact roller into operating position and confirms that the duster cloth is in the “down” position via the duster down switch.

   b. Lowers the squeegee head assembly into operating position via the squeegee up/down motor and confirms that the squeegee is in the “down” position via the squeegee down switch.

   c. Turns on the conditioner pump and conditioner vent valve to slightly over-pressurize the conditioning system (accumulator and injector rail assembly) and then turns off the conditioner pump and vent valve.

   d. Opens the conditioner pressure control valve and conditioner vent valve to allow conditioner to flow back to the conditioner tank until the system has reached target pressure of 20 psi.

   e. Starts the vacuum motor.

   f. The operator screen displays “PUT THE MACHINE ON THE LANE” when the machine is ready to begin operation. Refer to *Figure 7-1.*

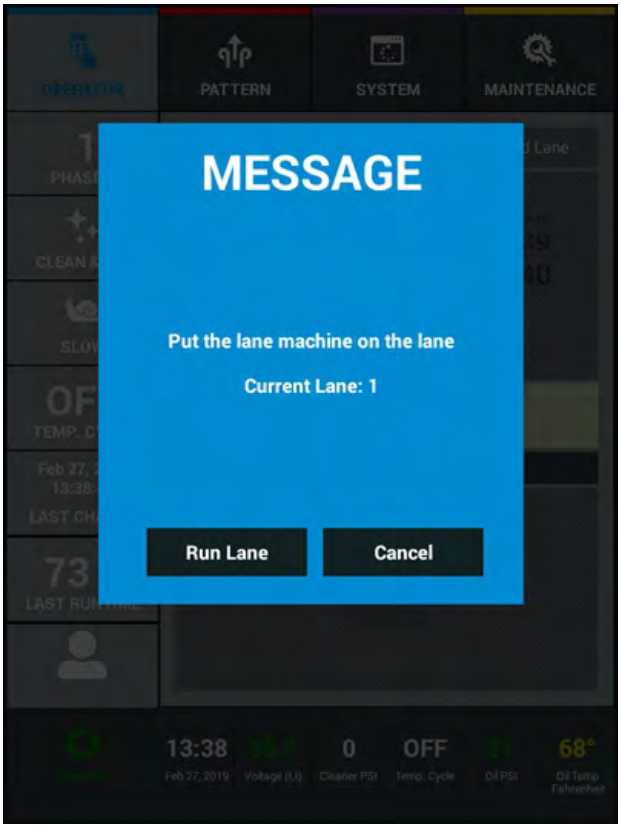

Figure 7-1. Put the Lane Machine on the Lane

Normal Clean and Condition Operation on Lane

1. As the MAX is placed on the lane, the system sprays a 5 second pulse of cleaner as the duster contact roller assembly is lifted off the “down” switch (only if the start cleaner distance and the start squeegee distance are set at “0” in the Pattern Parameters Screen).

2. Once the machine is properly seated on the lane with the rear wheels aligned with the gutters just in front of the foul line, and the operator presses the handle button for the second time, the control system:

    a. Turns on the traction drive motor to accelerate the machine toward the pin deck.

    b. Directs the cleaner pump to apply a steady spray of cleaning fluid on the lane.

    c. Vacuums the used conditioner and cleaner (if using AC power otherwise the vacuum will start at the operator selected distance in the System Machine Setting screen).

    d. Lowers the buffer brush into contact with the lane surface via the buffer lifting motor at a distance specified by the operator.

    e. Turns on the buffer drive motor to start rotating the buffer brush and turns on the dispersion motor to start rotating the dispersion roller.

    f. Tells the conditioning system to inject conditioner onto the lane surface according to the user’s selected pattern.

3. The machine continues at a steady forward speed and the control system:

    a. Stops the buffer drive and dispersion motors and raises the buffer brush at the end of the user specified conditioner pattern.

    b. Turns off the cleaner spray at the user specified distance.

    c. Pulses the cleaner spray on and off before the pin deck.

    d. Stops the machine at the end of the lane after the end of lane sensor is activated.

    e. Winds the duster cloth to the up position, and advances more cloth for use on the next lane.

4. The traction drive motor is turned on, in reverse, to accelerate the machine toward the foul line and the control system:

    a. Raises the squeegee assembly as the machine begins the return.

    b. Lowers the buffer brush and turns on the buffer drive and dispersion motors to rotate the brush and dispersion roller once the machine reaches the proper position in the conditioner pattern.

    c. Stops at the foul line, turns off the brush and dispersion motors, and lifts the buffer brush.

    d. Turns off the vacuum motor.

    e. Turns on the conditioner pump and conditioner vent valve to slightly over-pressurize the conditioning system (accumulator and injector rail assembly).

    f. Opens the conditioner pressure control valve and conditioner vent valve to allow conditioner to flow back to the conditioner supply tank until the system has reached target pressure required for the next lane.

The Cleaning System

1. The duster cloth removes dust and dirt from the lane surface. Refer to *Figure 7-2.*

    a. The duster cloth motor unwinds the duster cloth take-up roll to allow the duster contact roller to lower under its own weight until it engages the duster down switch.

    b. The duster cloth dusts the lane surface as the machine travels toward the pin deck.

    c. When the machine reaches the end of the lane, the duster cloth take-up roll winds up, creating tension in the cloth that lifts the duster cloth contact roller until it reaches the duster up switch (a friction clutch attached to the duster cloth supply roll is adjusted to ensure the contact roller reaches a fixed stop in the "up" position before it unrolls).

    d. The duster cloth take up roll continues to rotate to advance clean duster cloth for use on the next lane.

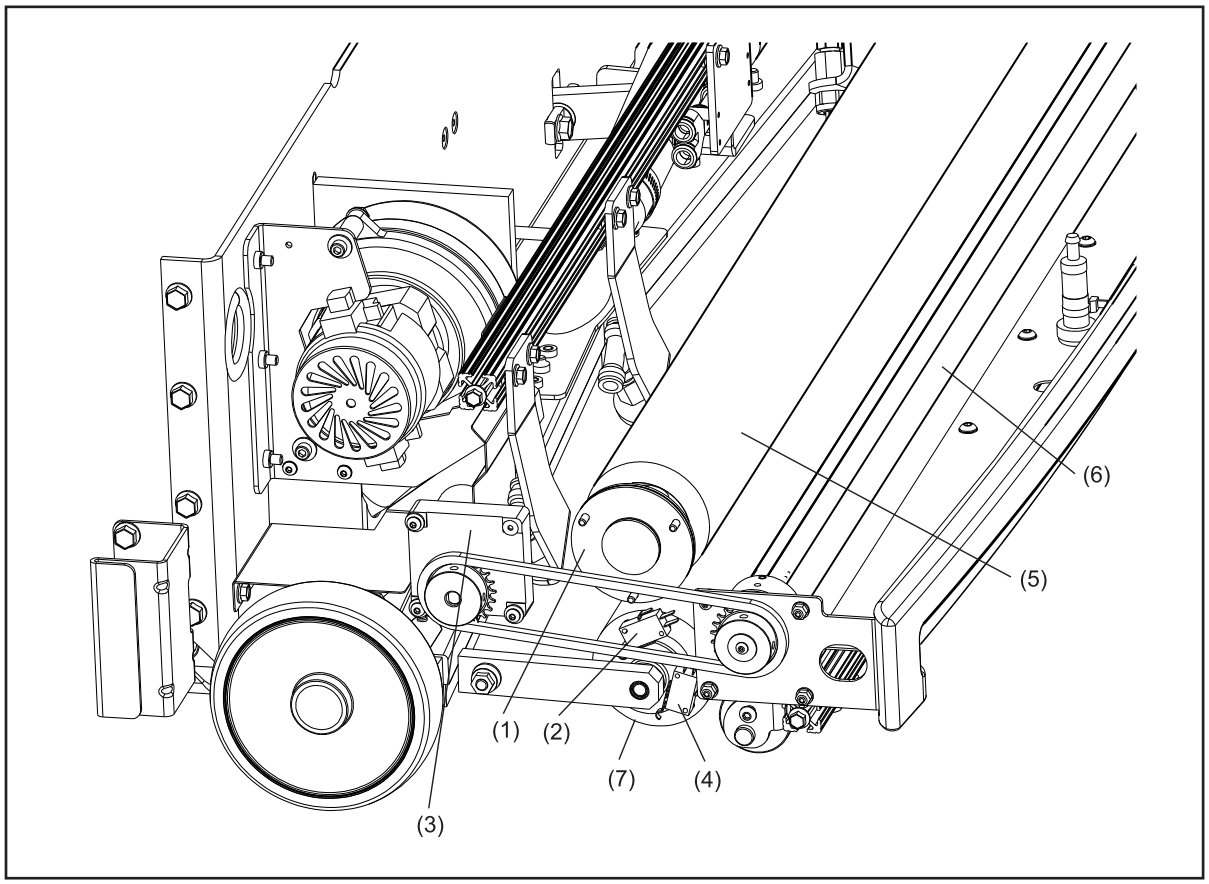

Figure 7-2. Duster Cloth System

(1) DUSTER CLUTCH
(2) DUSTER UP SWITCH
(3) DUSTER CLOTH MOTOR
(4) DUSTER DOWN SWITCH
(5) DUSTER CLOTH SUPPLY ROLL
(6) DUSTER CLOTH TAKE UP ROLL
(7) DUSTER CONTACT ROLLER

2. The cleaner pump applies cleaning fluid to the lane. Refer to *Figure 7-3.*

   a. Four spray nozzles apply a continuous spray of cleaning fluid to the lane.

   b. A spring-loaded check valve opens when more than 10 psi of cleaning fluid is supplied by the pump.

   c. An adjustable cleaner pressure control valve controls the cleaner volume and pressure.

   d. The control system turns off the cleaning pump at a distance determined by the user. It also quickly sprays one time on the pin deck before stopping the flow of cleaner through the spray nozzles.

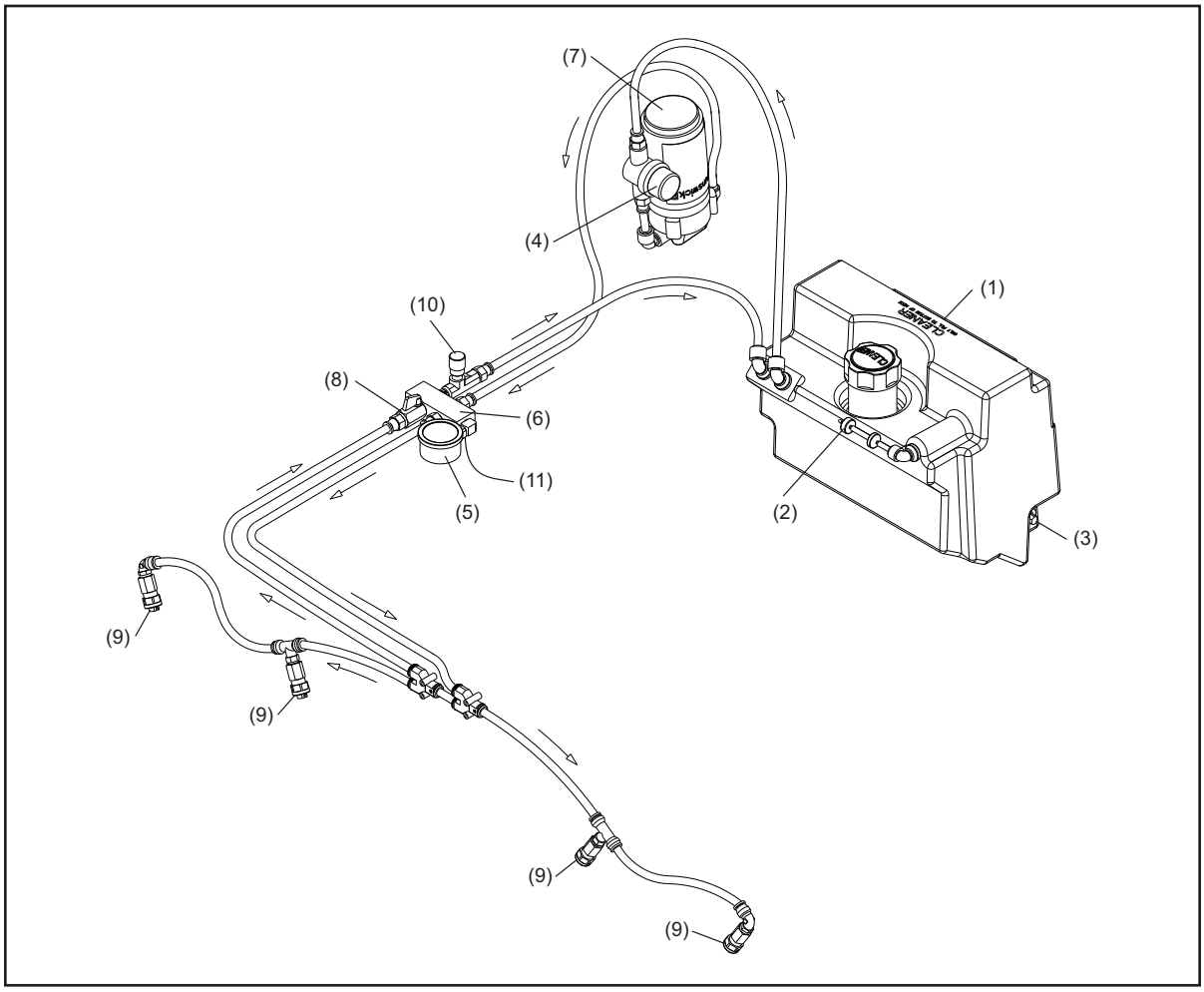

Figure 7-3. Cleaner Spray System

(1) CLEANER SUPPLY TANK
(2) CLEANER VENT VALVE
(3) CLEANER LEVEL FLOAT SENSOR
(4) CLEANER SCREEN FILTER
(5) CLEANER PRESSURE GAUGE
(6) CLEANER MANIFOLD
(7) CLEANER PUMP
(8) CLEANER SHUT OFF VALVE
(9) CLEANER SPRAY NOZZLES
(10) PRESSURE CONTROL VALVE
(11) CLEANER PRESSURE SENSOR

3. The absorbent wiper agitates the cleaning fluid on the lane to help loosen dirt and conditioner. Refer to *Figure 7-4*.

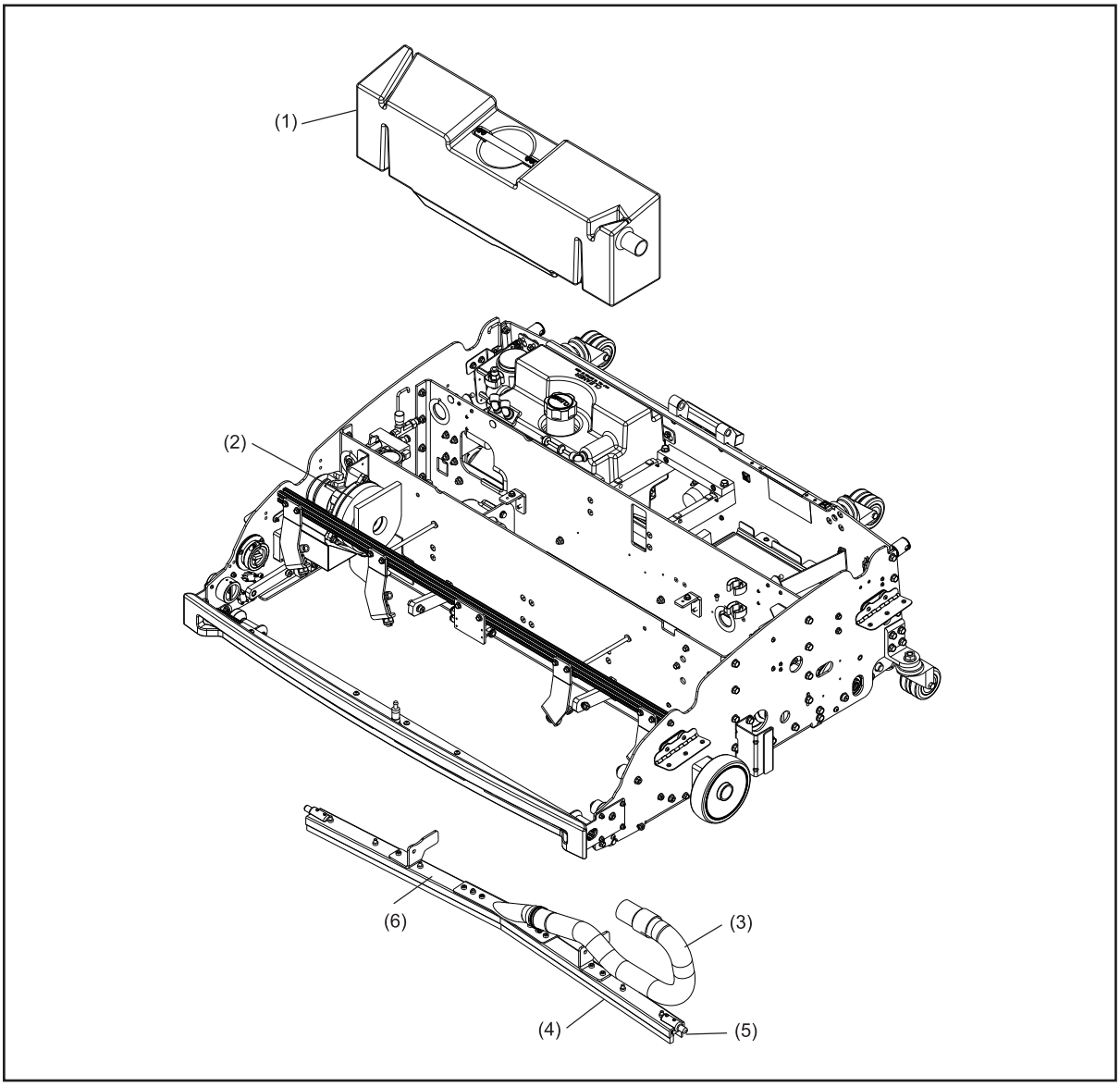

Figure 7-4. Cleaner Vacuum System

(1) WASTE RECOVERY TANK
(2) VACUUM MOTOR ASSEMBLY
(3) VACUUM HOSE
(4) ABSORBENT WIPER
(5) SQUEEGEE BLADE
(6) SQUEEGEE HEAD ASSEMBLY

4. The squeegee assembly and vacuum remove cleaner and conditioner from the lane surface and collect it in the waste recovery tank. Refer to *Figure 7-4.*

   a. The squeegee blade channels waste fluid to the center of the squeegee assembly.

   b. Waste fluid is suctioned to the waste recovery tank.

   c. A baffle system in the waste recovery tank directs waste liquids and solids to the bottom of the tank. This isolates the waste material away from the vacuum motor.

The Conditioning System

1. The machine applies conditioner directly to the lane surface in a pattern specified by the user. Refer to *Figure 7-5.*

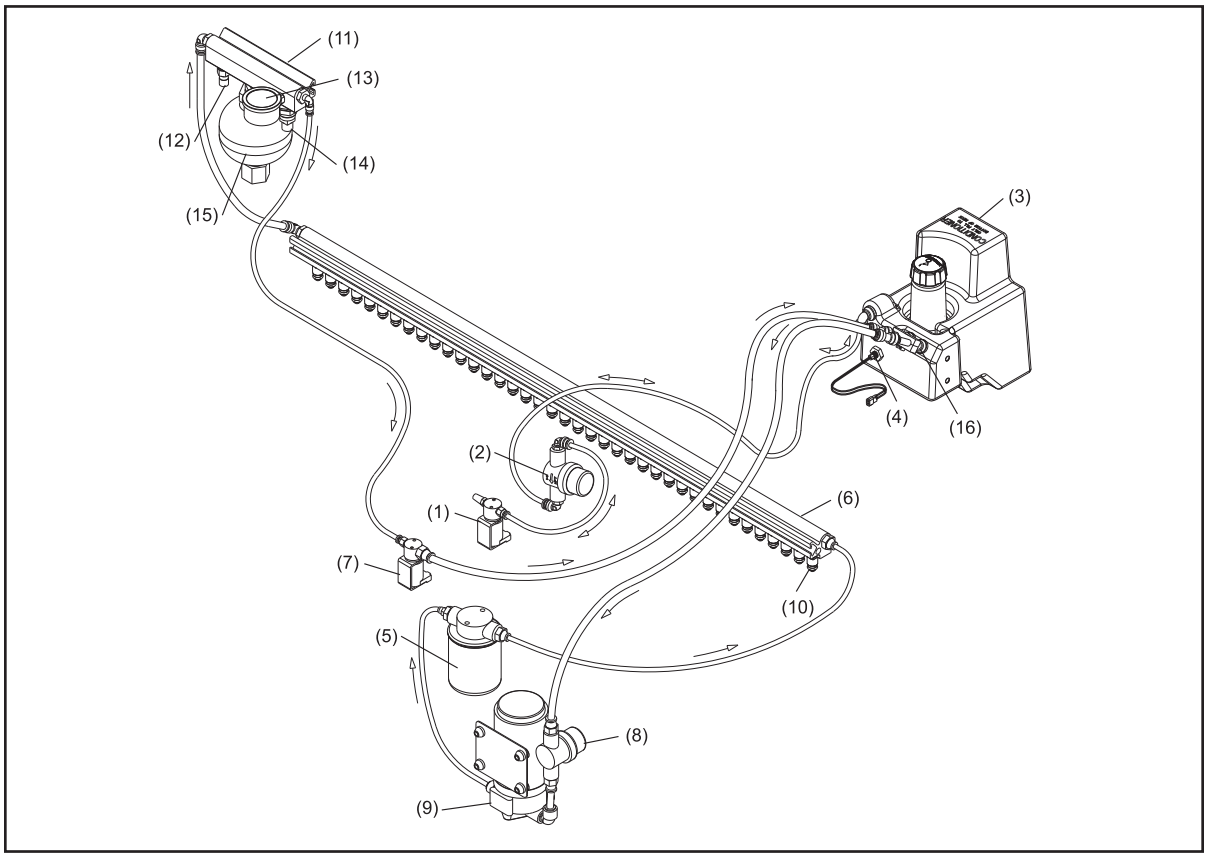

Figure 7-5. Conditioning System

(1) CONDITIONER VENT VALVE
(2) CONDITIONER OVERFLOW RESERVOIR
(3) CONDITIONER SUPPLY TANK
(4) CONDITIONER LEVEL FLOAT SENSOR
(5) CONDITIONER SPIN-ON FILTER
(6) INJECTOR RAIL ASSEMBLY
(7) CONDITIONER PRESSURE CONTROL VALVE
(8) CONDITIONER SCREEN FILTER
(9) CONDITIONER PUMP
(10) CONDITIONER INJECTOR
(11) ACCUMULATOR RAIL
(12) CONDITIONER TEMPERATURE SENSOR
(13) CONDITIONER PRESSURE GAUGE
(14) CONDITIONER PRESSURE SENSOR
(15) ACCUMULATOR
(16) OIL CONTAMINATION SENSOR

a. 39 injectors mounted in a pressurized rail apply conditioner directly onto the lane surface.

b. The rail is fixed (i.e. the injectors do not reciprocate from side to side) to avoid creating a zigzag conditioner pattern on the bowling lane.

c. Each injector disperses fluid across the approximate width of one board of the lane and is independently controlled based on the conditioning pattern selected.

d. Injectors pulse every 0.1 feet (30.5 mm) (pulse pattern is distance based, not dependent on machine's rate of travel).

e. The pressure of the conditioning system is set before conditioning the first lane as described previously in this section, "Preparing for Operation". The pressure of the conditioning system is then reset as soon as the lane machine returns to the foul line so it is ready for the next lane.

The Buffing Operation

1. During the forward travel of the buffing operation, the machine disperses the conditioner on the lane surface and buffs it, then continues its return travel to the foul line. Refer to *Figure 7-6.*

   a. The buffer brush lowers at the selected starting pattern distance and begins rotating.

   b. The dispersion roller, rotating in the same direction as the buffer brush, contacts the buffer brush and blends the conditioner amongst the bristles through side-to-side oscillation.

   c. When the machine reaches the end of the selected conditioning pattern distance, the control system stops the rotation of the buffer brush and dispersion roller. It turns on the buffer lift motor and raises the brush up and out of contact from the lane as the machine continues its travel to the pin deck when in the “Clean and Oil” mode.

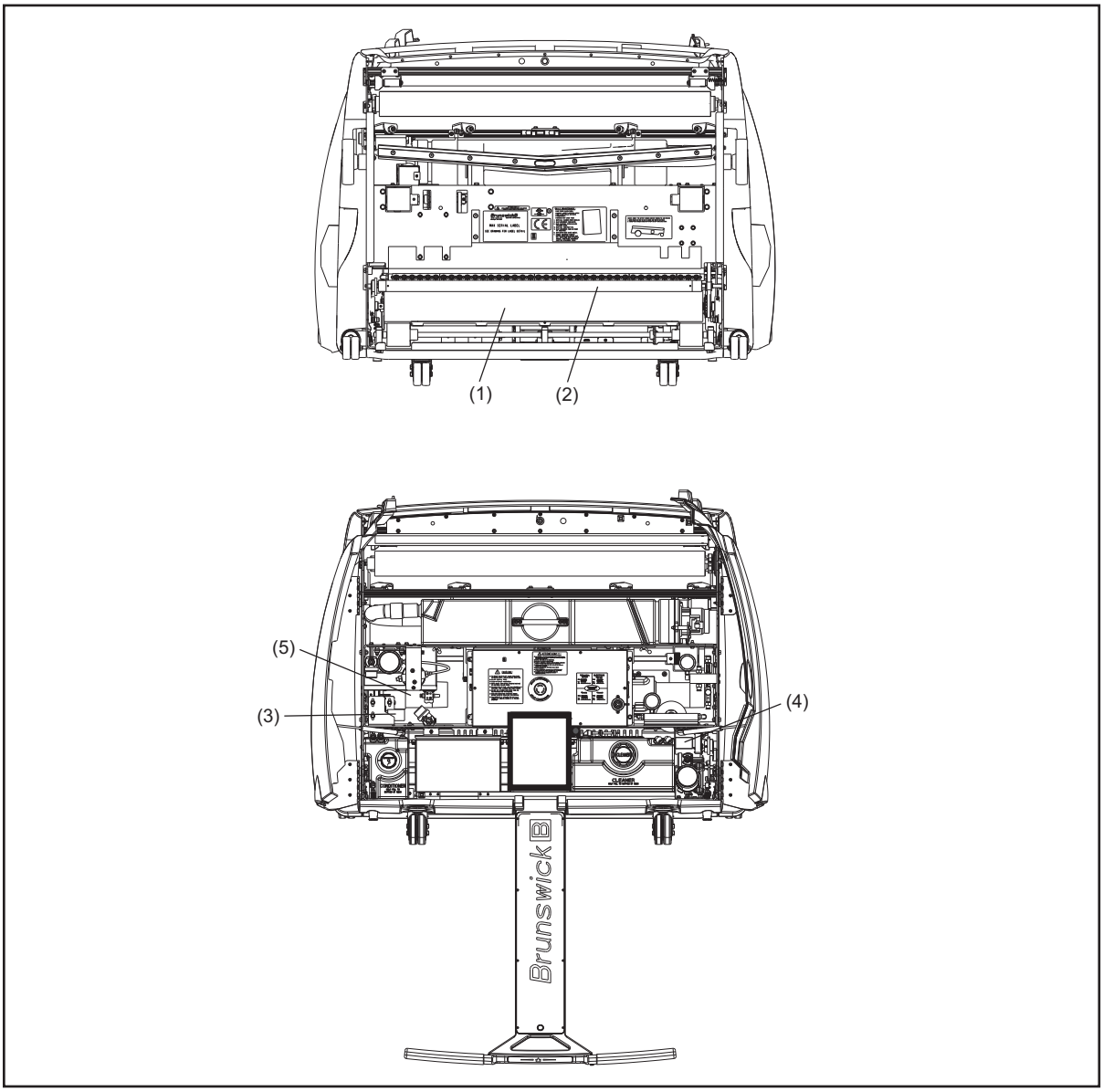

Figure 7-6. Buffing System

(1) BUFFER BRUSH
(2) DISPERSION ROLLER
(3) BRUSH LIFTING MOTOR
(4) DISPERSION MOTOR
(5) BRUSH ROTATION MOTOR

The Traction Drive System

1. The machine travels up and down the lane by means of a traction drive motor connected through a chain to two drive wheels. Refer to *Figure 7-7.*

    a. At the optional “Fast” speed, the machine travels forward at a constant 27 inches per second.

    b. At “Medium” speed, the machine travels forward at a constant 24 inches per second.

    c. At “Slow” speed the machine travels forward at a constant 21 inches per second. This option is used to optimize lane cleaning

For information on how to change the travel speed, see Section 4.

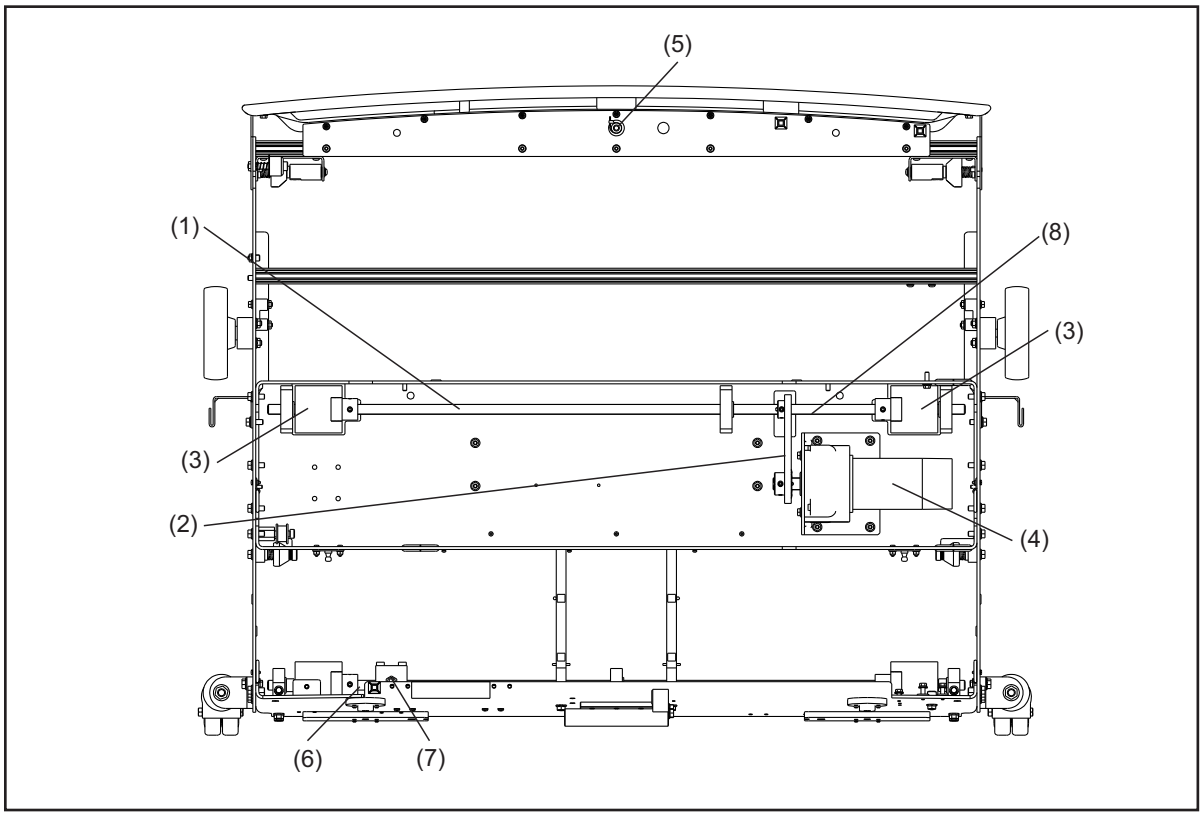

Figure 7-7. Traction Drive System

(1) TRACTION WHEEL DRIVE SHAFT
(2) TRACTION MOTOR CHAIN
(3) TRACTION DRIVE WHEELS
(4) TRACTION DRIVE MOTOR
(5) END OF LANE SENSOR
(6) REAR SHAFT
(7) DISTANCE SENSOR (REAR)
(8) DISTANCE SENSOR (FRONT)

2. Forward travel.

    a. The machine travels forward at a constant 21, 24, or 27 inches per second.

    b. As the front of the machine travels past the end of the pin deck, the end-of-lane sensor signals the controller to travel an additional 1.2 feet (36.5 cm) before applying the brake.

    c. The duster cloth motor rotates the take-up roll to raise the contact roller away from the lane surface until it contacts the duster up switch.

    d. The take-up roll continues to rotate to advance clean cloth for use on the next lane.

    e. The traction drive motor turns on to accelerate the machine back to the foul line as the squeegee head assembly raises.

3. Return to the foul line.

    a. The machine returns to the foul line in reverse travel at a constant travel speed of 27 inches per second.

    b. The buffer brush lowers into contact with the lane surface at the end of the lane pattern to continue buffing conditioner on the return to the foul line (no conditioner is applied on the return).

NOTE: *If the conditioner values in the last pattern zone equal zero, the buffer brush will not lower until reaching the next to last zone.*

    c. As a safety precaution, the machine is designed to decelerate as it reaches the foul line.

    d. Once the machine reaches the foul line, the conditioner system prepares the pressure and the Tablet displays the number of the next lane to be maintained.

TROUBLESHOOTING USING THE TABLET

NOTE: *It is possible for a temporary power loss to cause the electronic enclosure (firmware) to get out of sync with the Tablet. If the system appears locked or repeats the same error message, it is recommended that you shut off the power to the lane machine, then restore power so the firmware and Tablet can reboot together.*

The Tablet is a very helpful tool to use for troubleshooting machine issues that may occur from time to time. In the "Maintenance" menu you can enter the "Diagnostics" sub menu, of the lane machine, and have a choice of selections for "Sensors", "Cleaning", "Conditioning", "Drive", "Oil Injector Test" and "Cleaner Spray Test". Within each of the choices, you have sensory components and motor functions that can be tested to check the status and functionality.

1. Place the machine in the operator position and supply power.
2. Go to the "Maintenance" menu.
3. Go to the Diagnostics sub menu.

The screen will now display your "Diagnostics" options that are broken into each system of the lane machine. Refer to *Figure 7-8.*

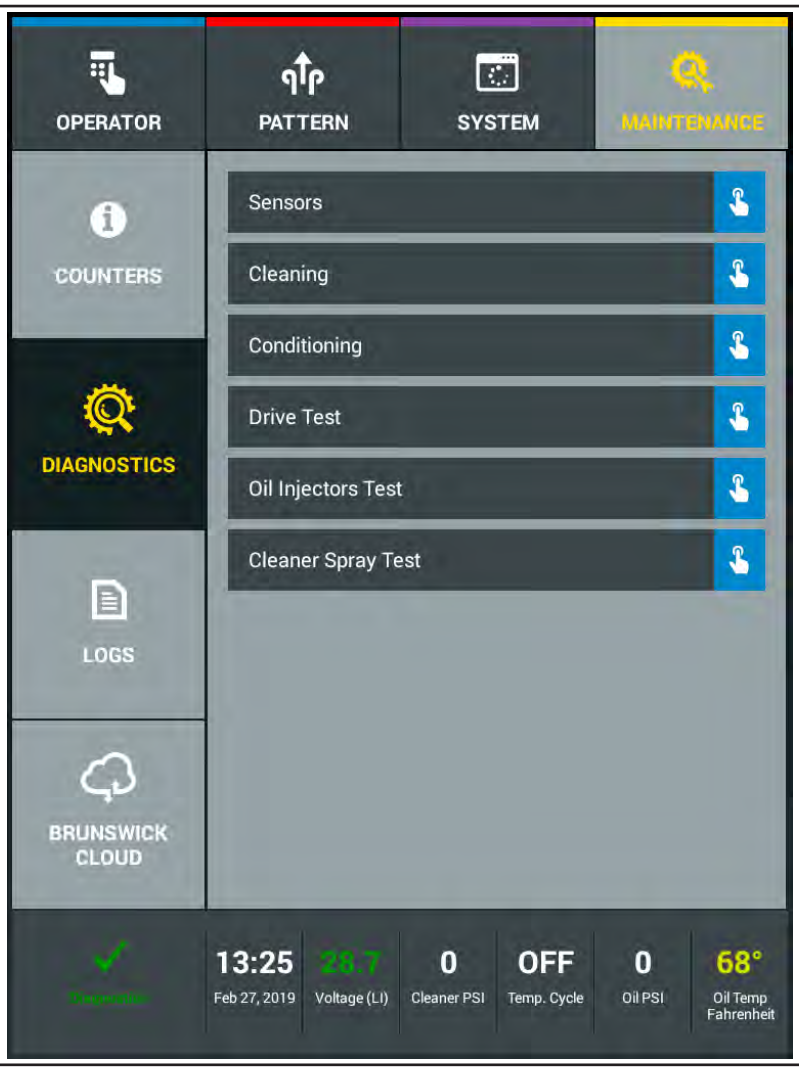

Figure 7-8. Diagnostics

Sensors

The “Sensors” diagnostic screen displays the current status of all sensors and switches used in the lane machine. Refer to *Figure 7-8*. The display can inform you of the position of a motor or components, such as the “squeegee up”, or can give you a digital reading, such as the temperature or pressure sensors. To test a particular sensor or switch, you can manually activate it by engaging the plunger on the switch or spinning the rear shaft to activate the “speed” encoder. Certain functions can also be tested through the diagnostics for the “Cleaning”, “Conditioning”, and “Drive” systems. Refer to *Figure 7-9.*

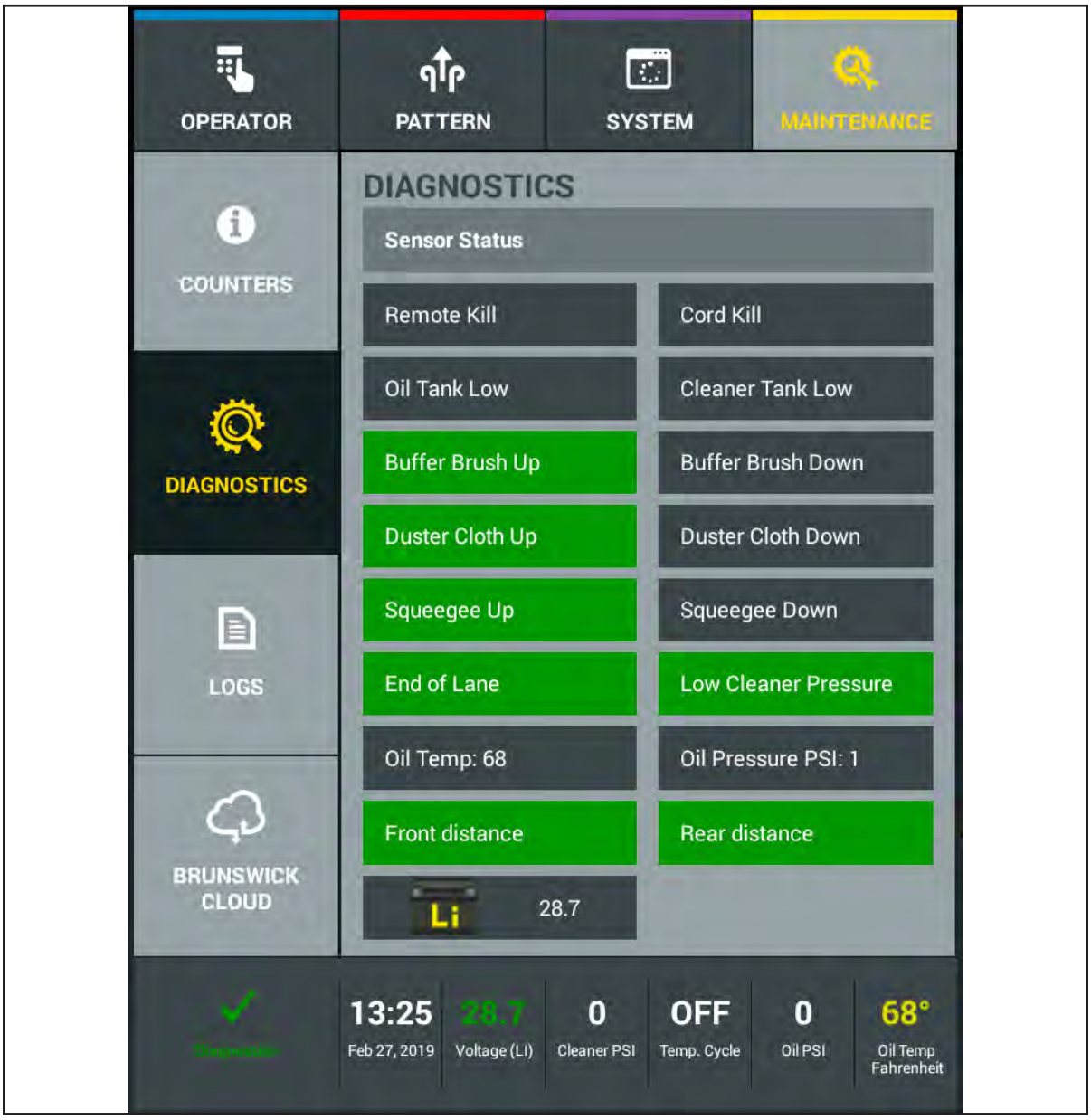

Figure 7-9. Diagnostics - Sensors

1. Select the “Sensors” button with your finger.
2. Identify the sensor that is suspect to failure.
3. Physically actuate the switch or sensor and the sensor status will be displayed.

Sensors, such as the fluid level sensors, can only be checked by draining and filling the tank. However, if the Warning message appears and the tank is full, there may be a failure of the sensor.

Cleaning

The “Cleaning” diagnostics screen is split into 2 sections. The top section displays the sensors and current status used in conjunction with the cleaning system (sensors include squeegee and duster position, cleaner fluid level sensor). The bottom section displays the motor functions (vacuum, cleaner pump, duster motor) that can be selected and tested for either a period of up to 20 seconds or may be toggled between positions (Toggle Squeegee). Any timed function can be turned off in less than the remaining 20 seconds by pressing the button again. Multiple functions may be turned on at the same time (cleaner pump. Refer to *Figure 7-10.*

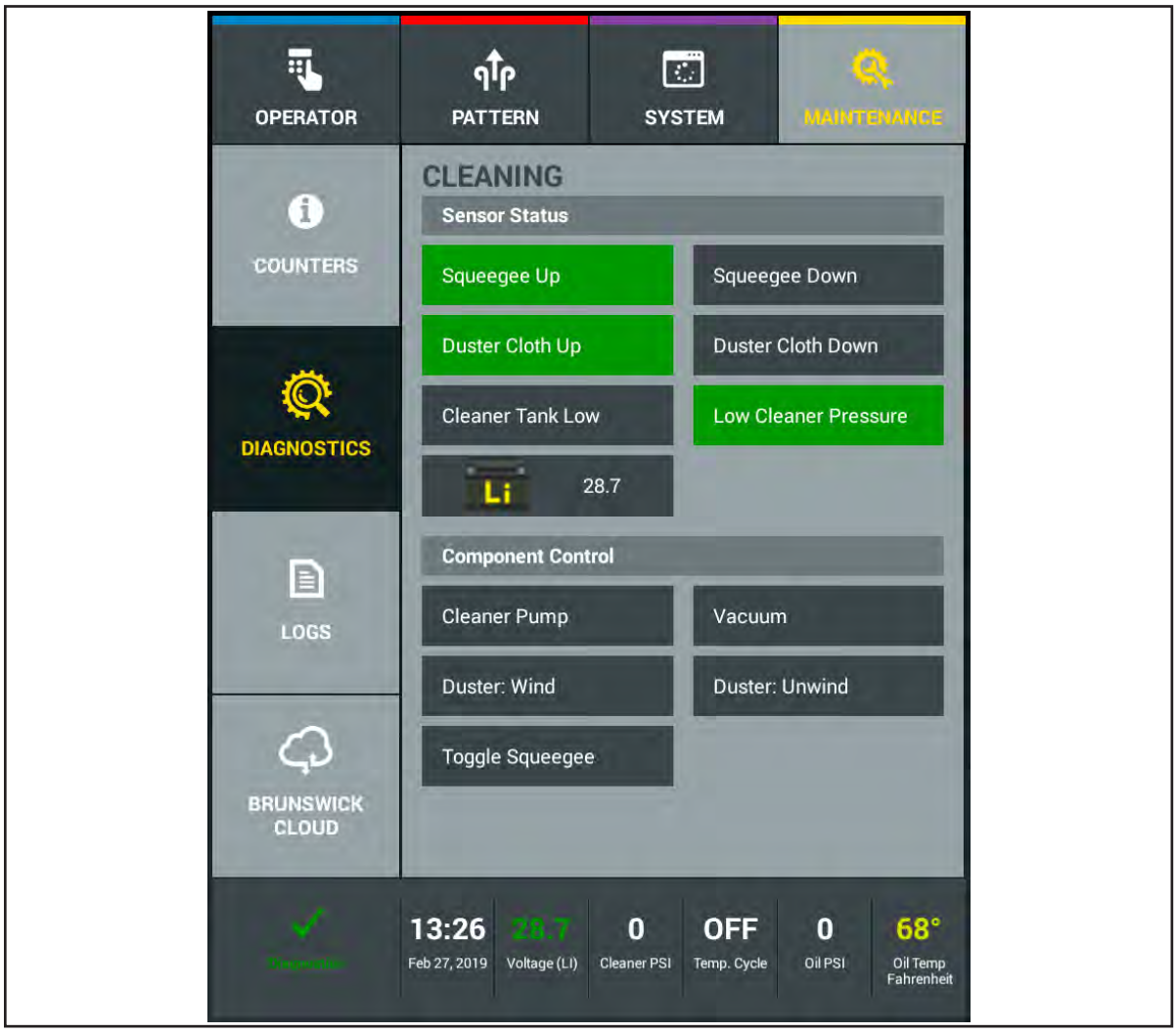

Figure 7-10. Diagnostics - Cleaning

CAUTION! Do not operate cleaner pump with the machine on the approach.

1. Select the “Cleaning” button to enter that screen.
2. Identify and select the motor function that is suspect to failure.
3. Press the button for that component and the component will run for 20 seconds and shut off, except for the “Toggle Squeegee” and the “Duster: Wind” and “Duster: Unwind” button which moves between the up and down switches. Any timed function can be turned off in less than the remaining 20 seconds by pressing that button again.

Sensors will highlight when a motor function related to the sensor is activated.

Conditioning

The “Conditioning” diagnostics screen is also split into 2 sections. The top section displays the sensors and current status used in conjunction with the conditioning system (sensors include buffer position, temperature, pressure, and conditioner supply tank level sensor). The bottom section displays the motor functions (buffer drive and lift motors, conditioner pump, heater, and dispersion motor) that can be selected and tested for either a period of up to 20 seconds or may toggle (Toggle Buffer up/down) between positions. Multiple functions may be turned on at the same time (**always turn on the “Oil Tank Vent” whenever running the “Oil Pump” or the “Oil Press Valve”**). Refer to *Figure 7-11.*

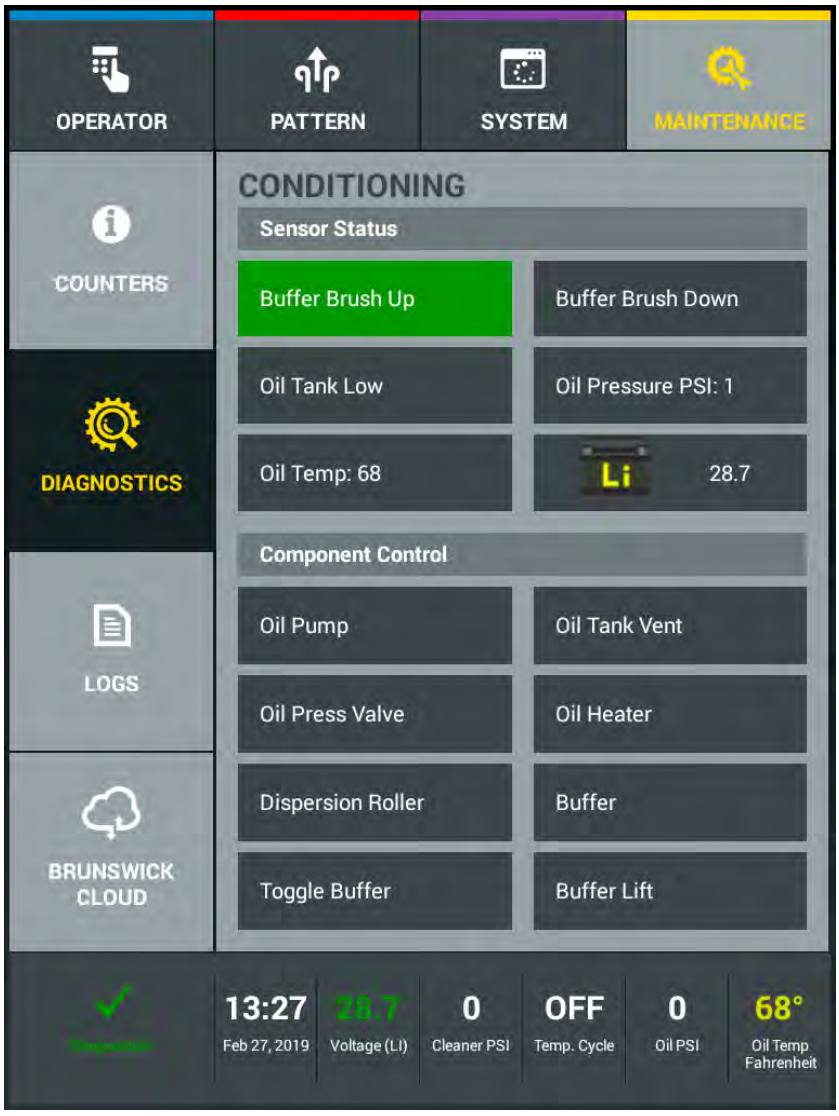

Figure 7-11. Diagnostics - Conditioning

1. Select “Conditioning” by pressing the button.
2. Identify and select the motor function that is suspect to failure.
3. Press the component button and the component will run for up to 20 seconds and shut off except for the “Toggle Buffer up/down” button which moves between the buffer brush up and down switches. Any timed function can be turned off in less than the remaining 20 seconds by pressing the button again.

Sensors will highlight when a motor function related to the sensor is activated.

Drive

The “Drive” diagnostics screen is used to test the traction drive motor. The test can be performed on the lane surface or on the approach. The machine will travel, if on lane, at a slower speed for up to 20 seconds. While it is traveling on the lane, you will notice the front and rear distance encoder sensor button highlighting (on) each time a tooth from the encoder wheel passes the encoder sensor. If you are testing the traction drive motor on the approach, the rear distance encoder sensor will not transition between on and off unless the rear shaft is rotated by hand. The front distance sensor will flash as stated above. Refer to *Figure 7-12.*

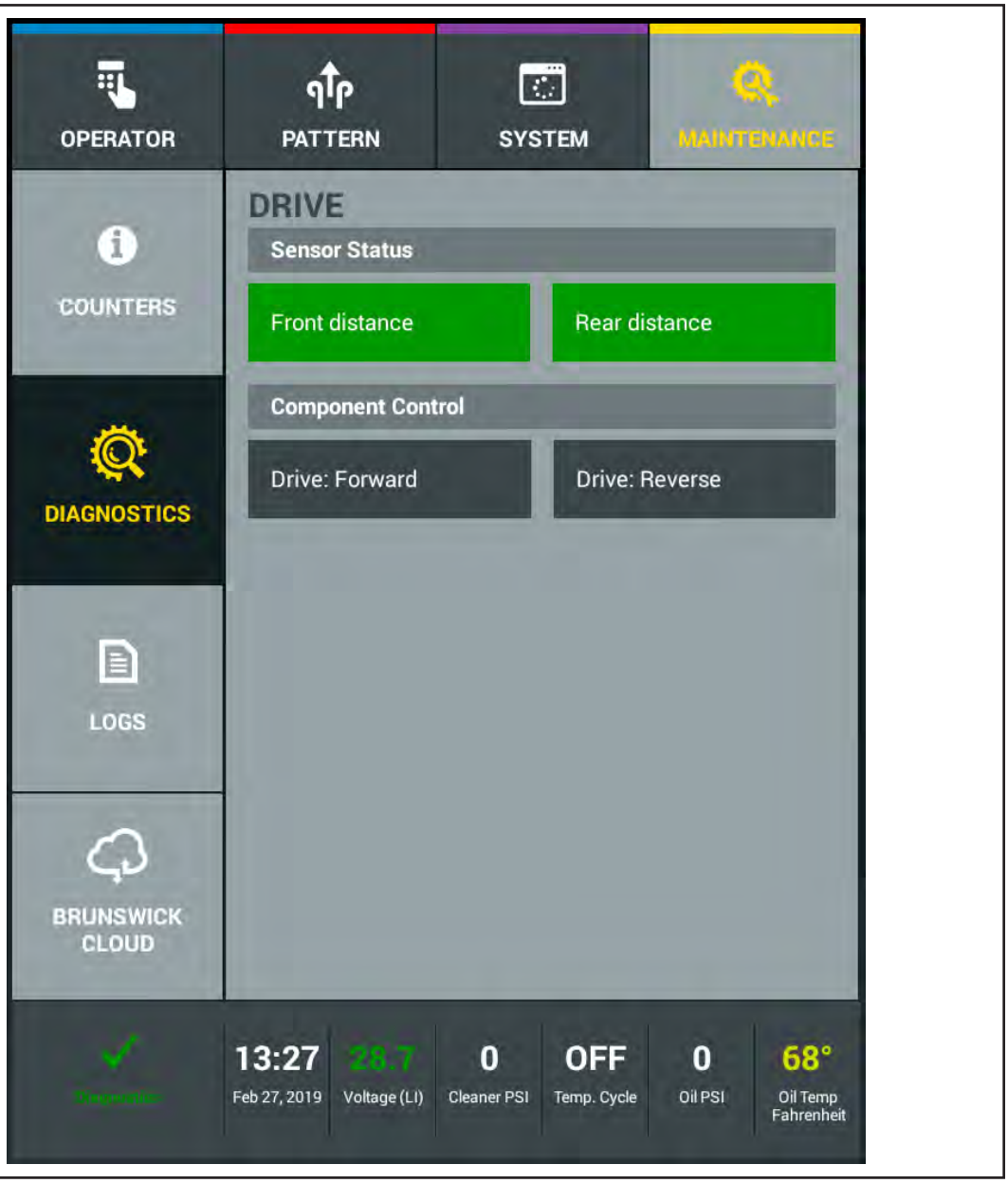

Figure 7-12. Diagnostics - Drive

1. Select “Drive” by pressing the button.

2. Select the “Drive: Forward” or “Drive: Reverse by pressing the button and the motor will run for 20 seconds. Any timed function can be turned off in less than the remaining 20 seconds by pressing the button again.

Oil Injector and Cleaner Spray Tests

The “Oil Injector Test” diagnostic screen and “Cleaner Spray Test” allows you to test the “Oil injectors” and “Cleaner Spray” functions. In the event that an oil injector or a cleaner spray nozzle is suspect to failure, you may perform these tests to visually inspect the spray pattern and identify an issue.

The test for the Oil Injectors is designed for the technician to visually see each injectors spray pattern. This diagnostic function verifies that each injector is firing properly and to identify if an injector has failed or not creating the appropriate spray pattern. The machine will travel approximately 25 feet down the lane during this test. The process includes cleaning the lane and firing each injector in a sequential order allowing the technician to easily see each injection without interference by the buffer brush. Refer to *Figure 7-13.*

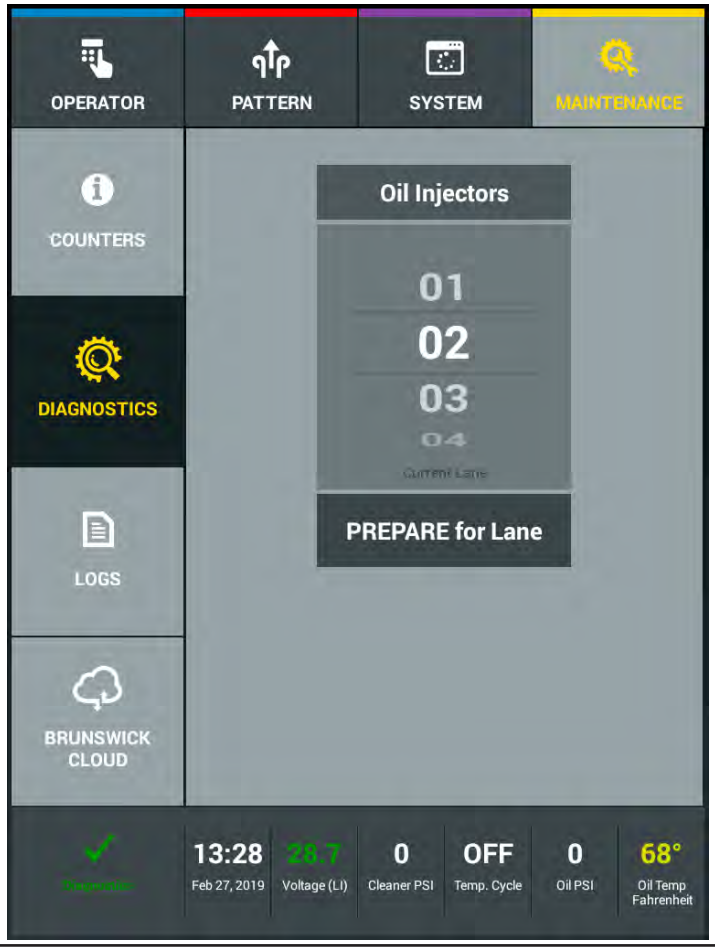

Figure 7-13. Diagnostics - Oil Injector Test

1. Select “Oil Injectors” by pressing the button.
2. Press handle button to prepare the lane machine to run a lane. The injector test pattern may need to be downloaded.
3. “Put the lane machine on the lane” when instructed.
4. Press handle button again to start the cleaning operation of the “Oil Injectors” test. The machine will automatically clean approximately the first 25 feet of the bowling lane and inject at the same time while performing this test. Perform a clean only or a clean and condition after completion of the Oil Injector test.

NOTE: *After test is completed it will be necessary to clean and recondition the lane with the appropriate conditioner pattern.*

"Cleaner Spray" test for the cleaner spray is used to verify the coverage and pressure. This test allows the technician to visually see how well the cleaning spray is covering the lane during a cleaning run. The process is performed in two passes of the lane machine. The first pass of the machine will clean approximately 25 feet of the bowling lane. The second pass sprays cleaner to the bowling lane as it travels without interference of the duster and the squeegee assembly. Refer to *Figure 7-14.*

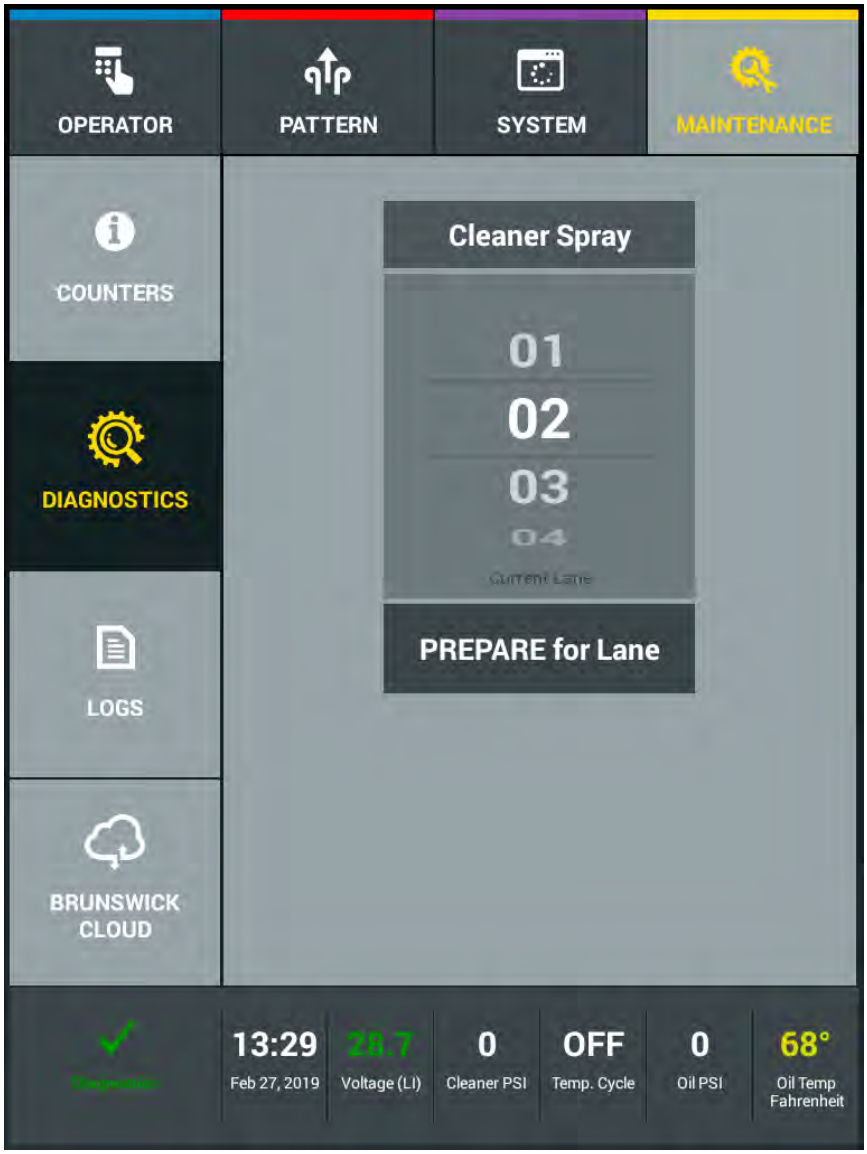

Figure 7-14. Cleaner Spray

1. Select "Cleaner Spray" by pressing the button.
2. Press the handle button to prepare the lane machine to run a lane.
3. "Put the lane machine on the lane" when instructed.
4. Press the handle button again to start the cleaning operation of the "Cleaner Spray" test.
5. Press the handle button when the machine returns to the foul line, this will start the cleaner spray coverage test.

NOTE: *DO NOT allow cleaner to completely dry on lane surface. After test is completed it will be necessary to clean and recondition the lane with the appropriate conditioner pattern.*

PREDICTIVE ANALYTICS

The MAX software utilizes Predictive Analytics that monitors operations of the lane machine. The monitoring of systems and functions allow the machine to notify you if something is changing. Alerts messages are low level warnings informing you what to look for and what adjustments you can make. The alerts appear in the Operator screen while you are maintaining lanes. Predictive analytics will inform you that the machine is traveling a little slower than expected, or that the cleaner pressure is slightly out of range. This information allows you to be proactive at resolving potentially larger issues and affecting the performance of the machine. See Warning and Alert Messages later in this section.

ERROR MESSAGES

Error messages appear on the Tablet if the lane machine fails during preparation or operation. Some errors allow you to continue operation. Some require immediate attention, especially those that affect the consistency and performance of a conditioner pattern. In such cases, you may need to recondition a lane after correcting the error.

The images in *Figure 7-15* are examples of possible error messages the Tablet may display during preparation.

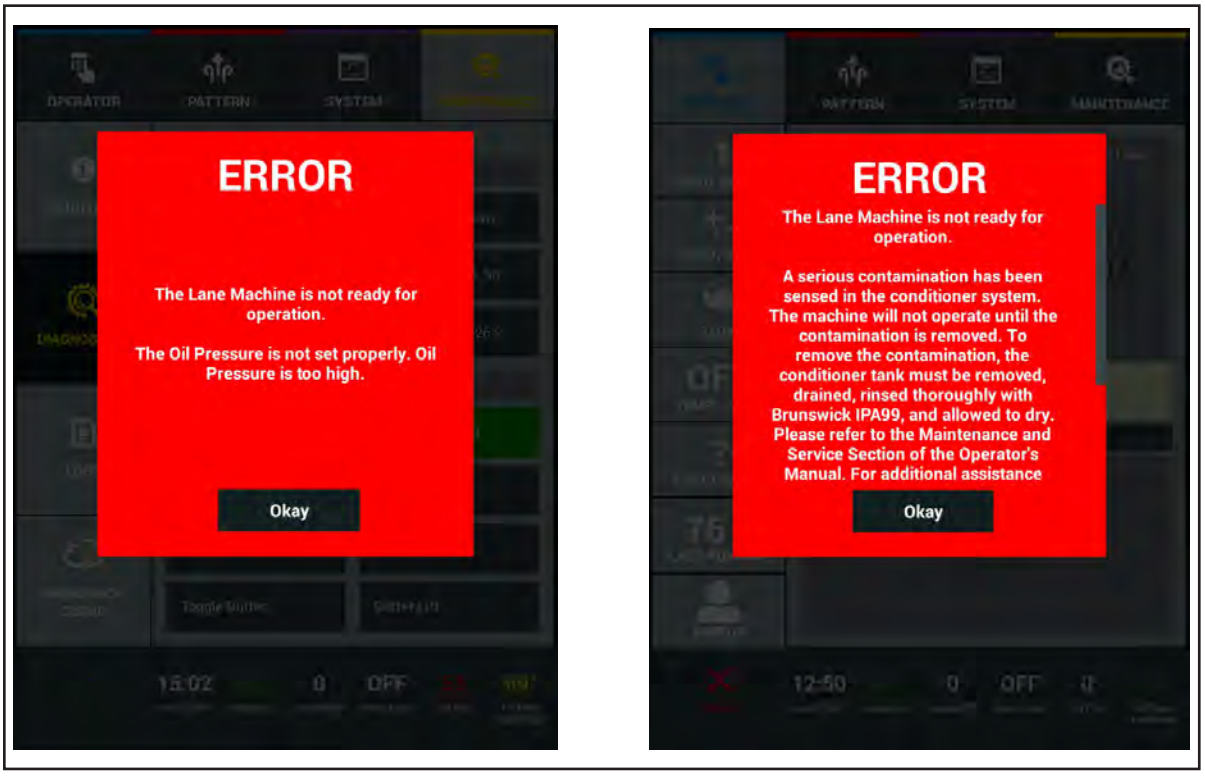

Figure 7-15. Error Messages - Preparation

The images in *Figure 7-16* are examples of possible error messages the Tablet may display during operation.

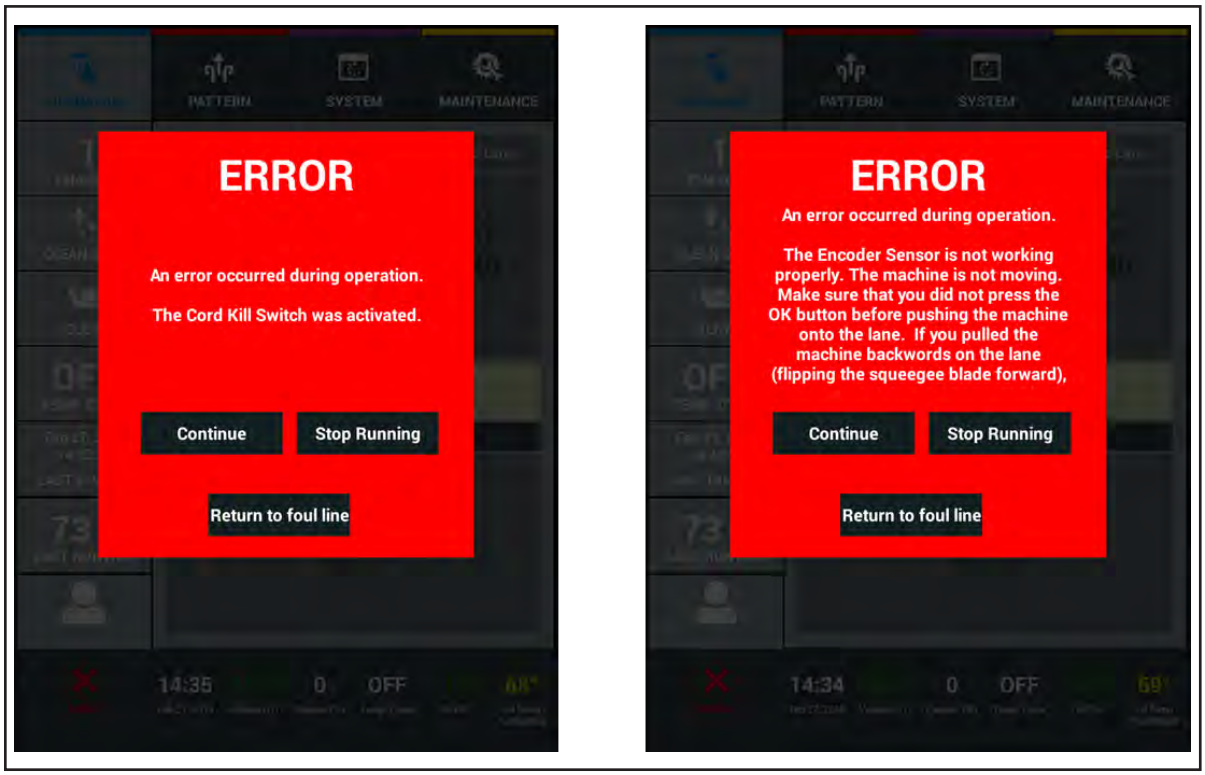

Figure 7-16. Error Messages - Operation

Oil Contamination Error

The MAX is equipped with a patented "Oil Contamination" sensor that can detect the presence of cleaner and water, in the conditioner supply tank. The "Oil Contamination" sensor is **your protection** for the critical system components such as the Oil Injector Rail and Accumulator Rail assemblies. All components for the conditioning system are critical and can lead to extensive repair costs – not to mention hours worth of work.

How the Oil Contamination Sensor Works

If cleaner and water are introduced into the conditioner tank, the cleaner and water will sink to the bottom of the tank because oil is lighter than water. The cleaner and water will bridge the stainless steal pipes inside the tank, then creates a signal that is sent to the electronic enclosure causing the Oil Tank Vent and Oil Pressure Valve to open allowing the conditioning system to depressurize. If the oil pump is running, it will turn off immediately to prevent the contamination from circulating through the system. To see the error refer to *Figure 7-15.*

Procedures for Removing Contamination

If the Conditioner Tank becomes contaminated by cleaner and water, follow these steps to ensure that you have properly resolved the contamination issue.

Tools needed:
IPA99, 1/8" Allen wrench, 3/8" socket for a ¼" ratchet drive or 3/8" wrench, shop rag or towel

1. Removing the conditioner tank
   a. Turn off power on the left-side (7-pin) side of the machine and disconnect the battery from the electronic enclosure.
   b. Remove the two battery clamps with the 1/8" Allen wrench and set aside.
   c. Remove the battery and set aside with the clamps.
   d. Remove the frame support with the 3/8" socket or wrench (support is between the conditioner tank and battery).
   e. Place the rag or towel underneath the conditioner supply and return tubing and slowly remove tubing to prevent drips. The oil in the tubing will drain back into the conditioner tank.
   f. Disconnect the conditioner tank vent tube and the level sensor below the tank.
   g. Remove the two conditioner tank mounting screws on the outside of the frame wall with the 3/8" socket or wrench.
   h. Carefully remove the conditioner tank disconnecting the two contamination sensor wires from the assembly.
   i. Take the tank to a work area. The tank will lay on the long flat side as it does in the lane machine when in transport position. This will prevent the tank from leaking.

2. Cleaning the conditioner tank
   a. Empty the contents of the tank into a waste container.
   b. Pour in the IPA99 until the conditioner tank is half full and place cap back on the tank.
      1) Take a piece of 3/8 tubing into the supply and return fittings.
      2) Cover the oil tank vent fitting to prevent leaking.

3. Agitate the conditioner tank for a minute and let sit for another 5 minutes.

4. Empty the conditioner tank into the waste container and allow the conditioner tank to air dry (the IPA99 will force water in the tank to evaporate).

Replacing the conditioner tank

NOTE: *Verify that the inside of the conditioner tank is completely dry including the stainless steal tubing and tank fittings. Moisture that remains will cause the contamiation error if not thoroughly dry. It is also important to check the conditioner supply tubing is clean and clear. Clean the tubing with IPA99 if contamination is still present.*

1. Position the conditioner tank into the machine and connect the wires to the contamination sensor and level sensor. Set the tank on the tank support below.
2. Fasten the 2 screws that mount the tank to the left-side frame using the 3/8” socket or wrench.
3. Fasten the frame support (next to the tank) with the 4 screws using the 3/8” socket or wrench.
4. Connect the conditioner supply, return, and vent tubing making sure they are inserted properly.
5. Replace the battery and fasten with the two battery clamps and 4 screws using the 1/8” Allen wrench.
6. Connect the battery to the electronic enclosure and turn the machine on from the main power switch.
7. Fill the conditioner tank with lane conditioner until the oil is to the bottom of the tank opening. If the contamination is still present the system will generate the Oil Contamination message.
8. Turn on the Temperature Cycle Override to circulate the oil until air is purged from the system.

List of Error Messages

Tables 7-1 through 7-13 provide a list of error messages with potential problems and remedies. If using the MAX's Diagnostics menu does not resolve your problem, please contact your Brunswick Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com

Error Messages that Appear During Preparation (on approach)

Error Message - Table 7-1:
The lane machine is not ready for operation.
The duster cloth is not working properly. The Duster Cloth down sensor did not activate.

Error Message - Table 7-2:
The lane machine is not ready for operation.
The squeegee is not working properly. The squeegee down sensor did not activate.

Error Message - Table 7-3:
The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too low.

Error Message - Table 7-4:
The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too high.

Error Message - Table 7-5:
A communication error occurred.

Error Messages that Appear During Operation (on lane)

Error Message - Table 7-6:
An error occurred during operation.
The Encoder Sensor is not working properly. The machine is not moving.

Error Message - Table 7-7:
An error occurred during operation.
The Cord Kill Switch is not working properly. The Cord Kill Switch was activated.

Error Message - Table 7-8:
An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush down sensor was not activated.

Error Message - Table 7-9:
An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush up sensor did not activate.

Error Message - Table 7-10:
An error occurred during operation.
The Squeegee is not working properly. The Squeegee Up sensor did not activate.

Error Messages - Table 6-11:
An error occurred during operation.
The Duster cloth is not working properly. The Duster cloth up sensor did not activate.

Error Message - Table 7-12:
An error occurred during operation.
The End of Lane Sensor is not working properly.

Error Message - Table 7-13:
Other error messages.

Error Messages that Appear During Preparation (on approach)

Error Message - Table 7-1:

The lane machine is not ready for operation.
The duster cloth is not working properly. The Duster Cloth down sensor did not activate.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Duster cloth is down and contacting the switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary
2. Duster cloth is down and not contacting the switch	1. Switch has come out of adjustment 2. Duster contact roller is binding 3. Machine was on the lane during preparation	1. Re-adjust switch so it actuates when cloth is in its full down position 2. Check duster assembly for damage; check for loose hardware 3. Pull the machine onto the approach and prepare to run lane
3. Duster Cloth is up and did not lower	1. The duster cloth is routed incorrectly on the take-up core 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Duster motor failure	1. Refer to adjustments in section 4.0 or the diagram located in the Machine 2. Repair connection 3. Verify motor function using Tablet diagnostics and replace if necessary

Error Message - Table 7-2:

The lane machine is not ready for operation.
The squeegee is not working properly. The squeegee down sensor did not activate.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Squeegee lift motor cycles until it actuates the up switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary
2. Squeegee is up and did not lower	1. Broken wire or loose connection at motor or at electronic enclosure 2. Loose Cam 3. Squeegee motor failure	1. Repair connection 2. Tighten set screw on the “flat” of the motor shaft 3. Verify motor function using Tablet diagnostics and replace if necessary

Error Message - Table 7-3:

The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too low.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. No pressure reading from digital pressure sensor (- -)	1. Pressure sensor is not connected 2. Broken wire or loose connection at sensor or at electronic enclosure	1. Connect cable to sensor 2. Repair connection
2. System pressure below limit for required operating pressure	1. Air inside the conditioning system 2. Bad tube fitting connection 3. Oil pressure control valve failure 4. Pump by-pass failure 5. AD Converter failure on machine control Board 6. Conditioner tank vent valve failure	1. Cycle conditioner with vent valve and oil pressure control valve open 2. **Option 1:** Make sure tube is cut at 90° angle, **Option 2:** Make sure tubing is seated properly in fitting. If both are correct replace fitting. 3. Verify oil pressure control valve function using Tablet diagnostics and replace if necessary. 4. **Option 1**: Adjust by-pass (call BTS); **Option 2:** Replace pump 5. Call BTS 6. Verify vent function using tablet diagnostics and replace if necessary

Error Message - Table 7-4:

The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too high.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. System pressure above limit for required operating pressure	1. Broken wire or loose connection at oil pressure control valve or at the electronic enclosure	1. Repair connection
	2. Pressure control valve failure	2. Verify oil pressure control valve function by using Tablet diagnostics and replace if necessary.
	3. Pressure sensor failure	3. Verify sensor function using Tablet diagnostics and replace if necessary.
	4. AD Converter failure on machine control board	4. Call BTS

Error Messages - Table 7-5:

A communication error occurred.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. This error message may occur when the lane machine is on the approach or at the foul line.	1. Ethernet cable not connected	1. Check connection at either end of cable
	2. Damaged PCB or other electrical problem inside electronics enclosure or Tablet.	2. Call BTS

Error Messages that Appear During Operation (on the lane)

Error Message - Table 7-6:

An error occurred during operation.
The Encoder Sensor is not working properly. The machine is not moving.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Machine does not move (traction drive wheels slipping)	1. Machine not seated properly onto lane	1. Reposition MAX onto lane surface
	2. High gutters, bumpers or wide lanes	2. **Option 1**: Lower gutters **Option 2**: Replace or repair bumpers **Option 3:** Adjust the front/rear transition/ guide rollers
	3. Excess cleaner causing wheels to slip	3. Check squeegee adjustment See *Adjusting the squeegee blade* for more information
	4. Too much oil	4. Check pattern settings and conditioner Settings, clean wheels with IPA99
	5. Squeegee too low	5. Verify front distance sensor count in the Lane Length Log. See *Adjusting the squeegee blade* for more information
	6. Traction drive wheels binding against frame	6. Check for loose set screws at traction
2. Machine does not move (traction drive wheels not turning)	1. Blown fuse	1. Replace fuse and check wire connections
	2. Broken wire or loose connection at motor or at the electronic enclosure	2. Repair connection
	3. Traction drive motor failure	3. Verify motor function using Tablet diagnostics and replace if necessary
	4. Speed control board failure	4. Call BTS
3. Rear shaft does not turn	1. Rear shaft bearing blocks not aligned	1. Re-align bearing blocks and carefully tighten
	2. Rear shaft is bent	2. Replace shaft
	3. Rear wheels binding against bearing blocks	3. Adjust one wheel 1/16” away from sleeve bearing by loosening set screws on wheel
	4. Bent rear or side frame	4. Call BTS
4. Distance encoder sensor failure	1. Broken wire or loose connection at sensor or at the electronic enclosure	1. **Option 1**: Repair connection **Option 2:** Verify sensor function using Tablet diagnostics and replace if necessary
5. Distance encoder sensor out of adjustment	1. Loose sensor or mounting hardware	1. Tighten hardware and verify adjustment See *Adjusting the distance encoder* for more information
	2. Loose mounting hardware for the rear shaft	2. Tighten hardware and verify adjustment

Error Message - Table 7-7:

An error occurred during operation.
The Cord Kill Switch is not working properly. The Cord Kill Switch was activated.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Power cord is obstructed		1. Make sure that power cord has free movement as it travels 2. Do not step on cord while machine is in operation
2. Cord kill switch malfunction	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Cord kill switch failed 3. Cord kill switch is out of adjustment 4. Cord kill stud tension is incorrect	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary 3. Position switch mounting bracket so the switch is activated by the cord kill stud (1/32” to 1/16” from switch housing) 4. Adjust cord kill stud to 70 pounds of pulling force to activate the switch (compressed length of heavy spring is 3/4”)

Error Message - Table 7-8:

An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush down sensor was not activated.

NOTE: *Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Buffer brush lifting motor cycles until it actuates the up switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary
2. Buffer brush is up and did not lower	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Buffer brush lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using Tablet diagnostics and replace if necessary

Error Message - Table 7-9:

An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush up sensor did not activate.

***NOTE**: Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Buffer brush lifting motor cycles until it actuates the down switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary
2. Buffer brush is down and did not raise	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Buffer brush lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using Tablet diagnostics and replace if necessary

Error Message - Table 7-10:

An error occurred during operation.
The Squeegee is not working properly. The Squeegee Up sensor did not activate.

***NOTE**: Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Squeegee motor cycles until it actuates the down switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using Tablet diagnostics and replace if necessary
2. Squeegee is down and did not raise	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Squeegee lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using Tablet diagnostics and replace if necessary

Error Messages - Table 7-11:

An error occurred during operation.
The Duster cloth is not working properly. The Duster cloth up sensor did not activate.

***NOTE**: Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. Duster cloth is down and did not raise	1. Duster cloth not attached properly to the waste core	1. Check attachment
	2. Duster cloth supply roll turns easily	2. Tighten clutch torque bolt See *Adjusting the duster clutch* for more information
	3. Duster cloth supply roll is not able to turn	3. **Option 1:** Loosen clutch torque bolt See *Adjusting the duster clutch* for more information **Option 2:** Replace duster clutch
	4. Broken wire or loose connection at switch, motor or at the electronic enclosure	4. Repair connection
	5. Failed switch	5. Verify switch function using Tablet diagnostics and replace if necessary
	6. Failed duster motor	6. Verify motor function using Tablet diagnostics and replace if necessary
	7. Plastic plug on end of duster cloth waste core is not properly engaged into drive hub.	7. Check that duster cloth is not restricting the plastic plug from full engagement with roll pin in drive hub. Also check staples are not loose between plug and core.

Error Message - Table 7-12:

An error occurred during operation.
The End of Lane Sensor was not received when expected. Reset the lane length counter on the counters screen, then check the End of Lane Sensor.

***NOTE**: The above message is generated when the machine forward travel stops and reverses before the end of the pin deck.*

***NOTE**: Verify error source through Tablet diagnostics.*

What you may observe	Potential problem	Action
1. LED on end of lane sensor is not lit	1. Improper Height	1. Adjust Height See Adjusting the end-of-lane sensor for more information
	2. Improper Sensitivity Adjustment	2. Adjust Sensitivity See Adjusting the end-of-lane sensor for more information
	3. Pin deck out of spec, defective pin spot, or missing lane plug	3. Option 1: Adjust or repair pin deck Option 2: Replace pin spot or missing lane plug
	4. Failed Sensor	4. Verify sensor function using Tablet diagnostics and replace if necessary
	5. Pushing the machine too far from the foul line	5. Reset counter and start the machine as close to the foul line as possible

Error Messages - Table 7-13:

Other error messages

***NOTE**:: Verify error source through Tablet diagnostics.*

These messages begin... The lane machine is not ready for operation…	**Potential problem**	**Action**
An error occurred during the pattern parameter download	1. Changes to the existing pattern parameters did not download correctly to the machine	1. **Option 1:** Exit the screen and try again **Option 2:** Remove and restore power and try again
Invalid pattern parameters were sent to the controller or the pattern parameter data is bad	1. The lane machine cannot operate with the current pattern parameters	1. Download the pattern again 2. Contact the BTS or your Brunswick installer of the lane machine
Flash packet write error	1. The controller could not write the pattern data to the flash memory	1. Turn off the power, restore the power and try running again.
An error occurred during the pattern download	1. The desired lane conditioning pattern did not download correctly to the lane machine.	1. Turn off the power, restore the power and download the pattern again.
Power lost	1. Machine is unplugged, the power switch on the enclosure is off, or the emergency stop switch has been depressed. 2. The battery or power supply connection is loose 3. Defective machine control pcb.	1. Check that the power cord is plugged into a working outlet and that all power switches are turned on. 2. Check the “Battery In” connection on the electronic enclosure 3. Contact the BTS or your Brunswick installer of the lane machine.
The cleaner pressure is not set properly. The cleaner pressure is low.	1. The pressure for the cleaner is set below 14 psi. 2. Pre-pump filter is dirty. 3. Tubing not pressed into the fittings completely or not trimmed at a 90 degree angle - allowing air into the system.	1. Follow the adjustment; Cleaner Pinch Valve Adjustment 2. Remove bowl filter, inspect, clean or replace as required. ***Note: Debris accumulates on the inside of this screen filter and may not be viewable from the outside.*** 3. Check tubing connections - reseat in the fitting or re-trim as needed.
The controller board did not respond within the required time period.	1. The lane machine took too long to complete the lane 2. The conditioner pump took to long to pressurize the system 3. The operator did not respond to a machine command within the allowable time	1. Check pin deck travel and adjust EOL travel speed or base voltage 2. The conditioner pump is obstructed or failed 3. Restart lane preparation
Limited Lanes Remaining!	1. The battery voltage is getting low	1. Determine if you are close enough to finish the lanes (2-3 lanes from finishing) 2. Plug in the battery charger to charge the battery 3. Disconnect the Battery cable from the electrical enclosure, connect the AC/DC power supply to the electrical enclosure and plug in the AC power cord.
Battery voltage is too low to run lanes	For the selected battery type, the voltage is too low to continue running the lanes	1. Plug in the battery charger to charge the battery 2. Disconnect the Battery cable from the electrical enclosure, connect the AC/DC power supply to the electrical enclosure and plug in the AC power cord.

WARNING AND ALERT MESSAGES

Warning messages appear when certain parameters are incorrect for proper operation. Maintenance messages are warning messages generated by counters that track when wearable parts have reached their usage limits covered in section 6.

The images in *Figure 7-17* are examples of maintenance messages the Tablet may display when a hardware counter has expire.

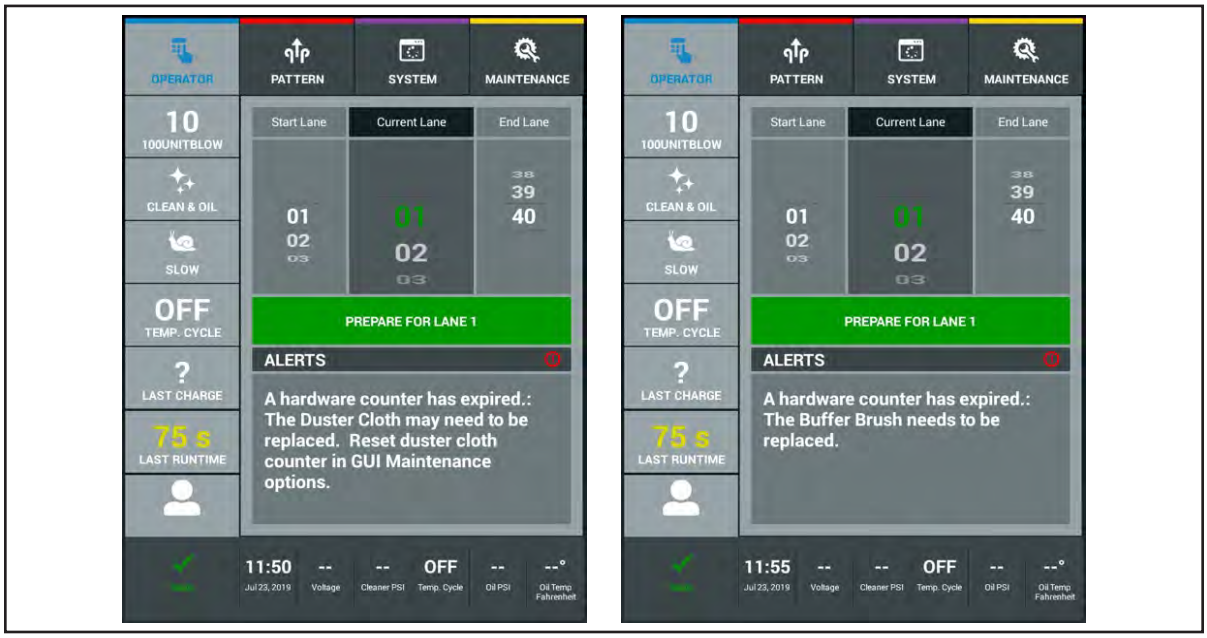

Figure 7-17. Tablet Maintenance Messages

Alert messages appear during operation and inform you when a function is slightly out of the parameter range. These messages are used to keep you informed of changes so you can make an adjustment to a function before it becomes a larger issue, If Alerts are neglected they can become an error that can affect your conditioner pattern or stop operation of the lane machine. It is recommended to address alerts to maintain proper operation of the lane machine. Refer to *Figure 7-18*.

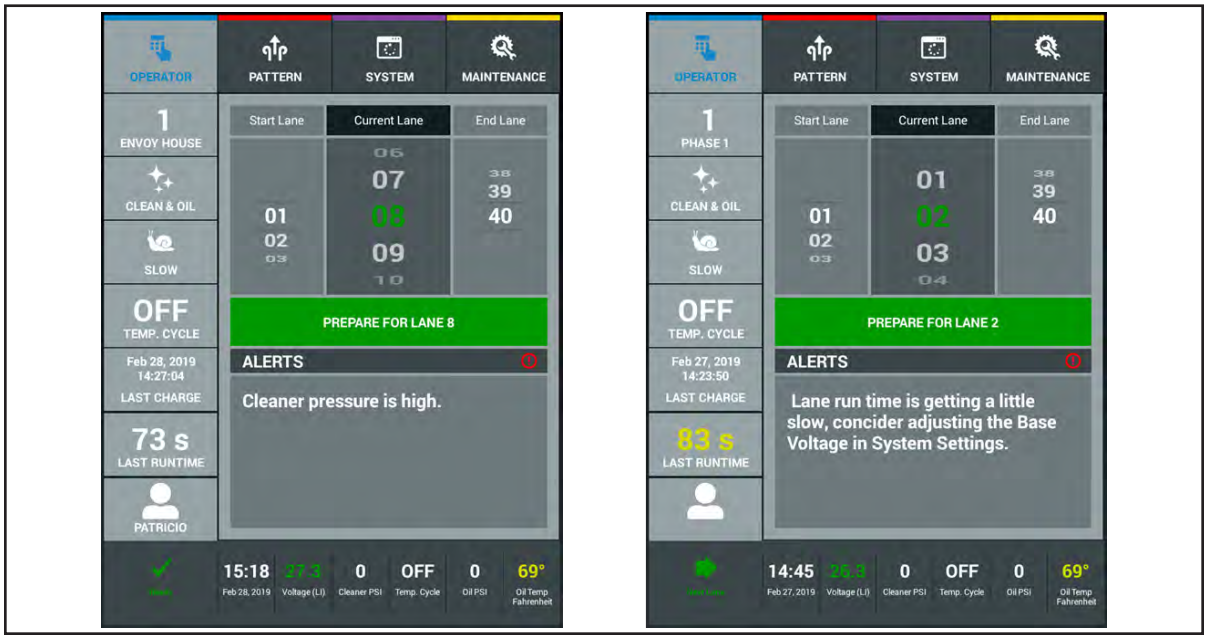

Figure 7-18. Alert Messages

Warning messages are generated when you need to charge the machine or for maintenance messages generated when a hardware counter expires. These messages mean that action must be taken before the machine can no longer operate (error messages), requiring immediate attention and ensuring that the machine is functioning properly for your customers. Refer to *Figure 7-19.*

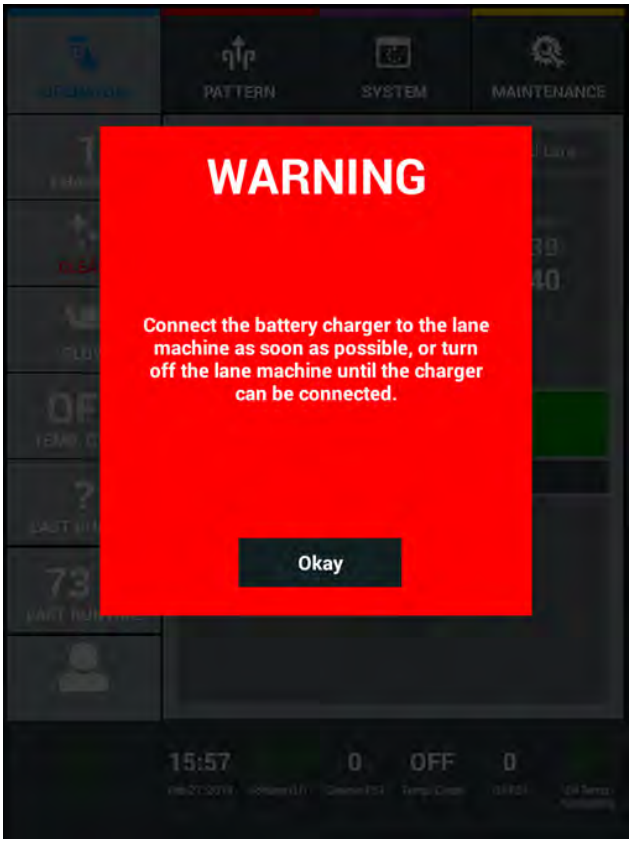

Figure 7-19. Warning Messages

***NOTE**: Maintenance logs can be backed up to the Brunswick Cloud or a USB flash drive as explained earlier in Section 4. These logs may contain information that is helpful to Brunswick Technical Support when troubleshooting issues. They can explain how to upload to the Brunswick Cloud, attach backup files to an e-mail or ship the USB flash drive with your center maintenance logs. The maintenance logs, counters and critical center data cannot be imported back to your Tablet.*

Table 7-14 provides a list of warning messages with potential remedies. If you're unable to resolve a problem, please contact your Brunswick Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunwickbowling.com

Warning Messages - Table 7-14.

***NOTE**: Verify error source through Tablet diagnostics.*

These messages begin... **The lane machine is not ready for operation…**	**Potential problem**	**Action**
The oil level is low. Add more oil to the tank.	1. Conditioner Level 2. Level sensor is unplugged at the tank or electronic enclosure 3. Level sensor has failed	1. Add conditioner to the conditioner supply tank until the bottom of the tank opening 2. Reconnect the cable 3. Verify sensor function using Tablet diagnostics and replace if necessary
The cleaner level is low. Add more cleaner to the tank	1. Cleaner level is low 2. Level sensor is unplugged at the tank or electronic enclosure 3. Level sensor has failed	1. Add cleaner to the cleaner supply tank to the bottom of the tank opening 2. Reconnect the cable 3. Verify sensor function using Tablet diagnostics and replace if necessary
The oil temperature is too low (Only occurs when the "Temperature cycle" function is turned "ON")	1. Conditioning system has not reached the target temperature. 2. Temperature sensor or the heating element is unplugged. 3. Temperature sensor or heating element has failed	1. Press "OK" on the tablet to bypass message and continue heating or allow system to reach the target temperature 2. Reconnect the cable 3. Verify sensor or heating element using Tablet diagnostics and replace if necessary
The oil temperature is too high	1. Conditioning system has exceeded the target temperature 2. Heater is always on	1. Go to the System settings and turn "OFF" the Temperature Cycle 2. **Option 1:** Check voltage going to heater **Option 2:** Check LED function on motor control board inside the electronic enclosure
The end of the lane sensor was elevated too early The end of the lane sensor may be faulty	1. End of lane sensor is out of adjustment 2. The machine is started too far from the foul line or the rear lane distance sensor is out of adjustment/binding 3. End of lane sensor is unplugged	1. **Option 1:** Check height and sensitivity adjustments. The end of lane sensor may be faulty. See *Adjusting the end-of-lane sensor* for more information **Option 2:** Check for excess gap between lane panels and pin deck, missing plugs, or gutters that are too high (raising the front of machine). Have qualified maintenance person address lane or gutter repairs. 2. Check Lane Length log file and rear shaft and frame flatness 3. Reconnect cables

MAINTENANCE MESSAGES

Maintenance messages, as detailed in Table 7-15 and also addressed in section 4, tell you when a consumable part has reached its usage limit. We recommend you perform the necessary maintenance as soon as the message occurs. You can, however, override the message if necessary. For example: until you have completed all lanes. All maintenance messages will be displayed as Alerts.

To override a maintenance message, press the handle button. The message continues to display each time the machine is prepared for operation, until the maintenance is completed and the counter is reset.

Once you have checked or replaced the part, reset the counter in the "Counters" screen of the Maintenance menu. Navigate to the expired counter reset and press "Reset." Refer to *Figure 7-20.*

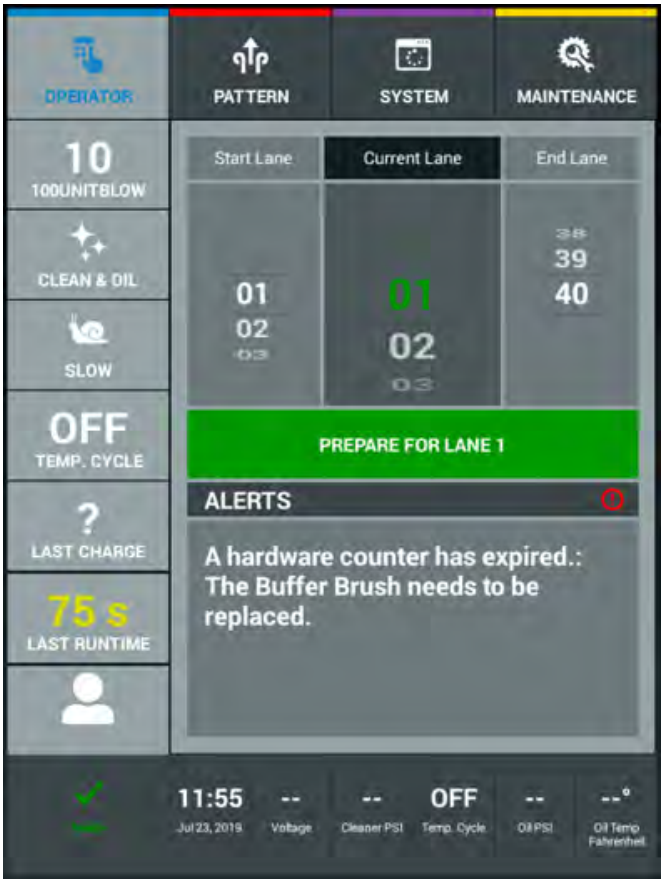

Figure 7-20. Maintenance Messages

Quick-list of Maintenance Counters

Buffer Lanes	29,200 lanes
Squeegee Lanes Replace	14,600 lanes
Duster Lanes	1,000 lanes
Oil Filter Lanes	14,600 lanes
Cleaner Filter Lanes	1,200 lanes
Spin-On Filter Lanes	29,200 lanes
Absorbent Wiper Lanes Replace	5,000 lanes
Drive Motor Hours	5,000 hours
Vacuum Motor Hours	500 hours
Lithium Battery	1,600 cycles (approximately 4 years in a 40 lane center
Lane Length and Runtime	As Needed
Lanes Per Stop	As Needed

Maintenance Messages - Table 7-15.

These messages begin… A hardware counter has expired…	Action
Duster cloth needs to be replaced	Replace the duster cloth, press the reset button to zero the counter ***See Replacing the duster cloth for more information.***
The buffer brush needs to be replaced	Replace the buffer brush, Replace the buffer brush, press the reset button to zero the counter ***See Replacing the buffer brush for more information***
The squeegee blade needs to be replaced	Replace the squeegee blade, Replace the squeegee blade, press the reset button to zero the counter ***See Replacing the squeegee blade for more information***
The cleaner screen filter needs to be replaced or cleaned	Clean or replace the cleaner filter, Replace the cleaner filter, press the reset button to zero the counter ***See Replacing/cleaning the conditioner/in-line strainer for more information***
The conditioner spin-on filter needs to be replaced	Replace the conditioner spin-on, Replace the Spin-On, press the reset button to zero the counter ***See Replacing the spin-on conditioner filter for more information***
The traction drive motor needs to be replaced	Service and replace the traction drive motor Replace the traction drive motor, press the reset button to zero the counter
The vacuum motor assembly needs to be replaced	Service and replace the vacuum motor assembly Replace the vacuum motor, press the reset button to zero the counter

In addition to the other high wear items, the MAX will also monitor the “Lanes Per Stop” to identify if the machine is not performing to our productions standards. Lanes Per Stop records the errors that happen while the machine is processing a lane. If the lanes per stop are too frequent, contact your Brunswick distributor or BTS (Brunswick Technical Support) for more information.

Lanes Per Stop monitors the frequency of errors and can help you identify the cause of these errors. And hopefully lead you to a quick resolution.

MECHANICAL FAILURES

Tables 7-16 through 7-21 provide a list of possible mechanical failures and the steps to correct them. If you need assistance, please contact your Brunswick Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunswickbowling.com.

List Of Mechanical Failure Categories

Duster Cloth Assembly - Table 7-16
Cleaning System - Table 7-17
Conditioning Appearance & Application - Table 7-18
Traction Drive System - Table 7-19
Electrical System - Table 7-20
Tablet - Table 7-21

Duster Cloth Assembly - Table 7-16

***NOTE**:: Verify error source through Tablet diagnostics.*

Problem	Cause	Solution
Machine leaving lines of dust on the lane.	1. Duster cloth is too wet	1. **Option 1:** Verify correct cleaner pressure. **Option 2:** Adjust spray nozzles away from duster cloth.
	2. Duster clutch is too tight, cloth is not advancing	2. Loosen clutch adjustment ***See Adjusting the duster cloth for more information***
Duster cloth is not dusting entire lane.	1. Duster contact roller is not lowering completely	1. **Option 1:** Check for binding in roller movement. **Option 2:** Check for uneven winding of cloth.
	2. Duster contact roller has flat spots or depressions	2. **Option 1:** Replace contact roller cushion tube. **Option 2:** Check lane for topography problems.
Duster assembly chatters on back of lane	1. Contact roller cushion has a flat spot	1. Replace contact roller cushion tube
Duster cloth is dragging on lane during return run	1. Clutch is adjusted too loose	1. Tighten clutch adjustment per manual ***See Adjusting the duster cloth for more information***
	2. Loose hub on duster cloth motor shaft	2. Tighten set screw in hub
	3. Hub on take up core is loose and slipping	3. Repair or replace hub on cardboard take up core
	4. Duster cloth motor failure	4. Verify motor function using Tablet diagnostics and replace if necessary

Cleaning System - Table 7-17

***NOTE**: Verify error source through Tablet diagnostics.*

Problem	Cause	Solution
Lane is not getting clean (Cleaner spray system problems)	1. Obstruction in cleaner supply tank	1. Check inside supply tank for foreign matter
	2. Clogged cleaner screen filter	2. Remove cleaner screen filter, clean or replace as needed
	3. Cleaner pump not running	3. **Option 1**: Verify operation using maintenance screen **Option 2:** Check for correct voltage at cleaner pump plug **Option 3:** Check for bad fuse on motor controller PCB **Option 4:** Check for bad wire or plug connection **Option 5:** Replace cleaner pump
	4. Blockage in one or more cleaner spray nozzles	4. **Option 1:** Clean with hot water or replace check valve filter; **Option 2:** Clean with hot water or replace spray tip
	5. Cleaner supply tank empty	5. Adjust low fluid sensor by turning to allow for clean vertical drop, or replace
	6. Low cleaner spray system pressure	6. **Option 1**: Adjust max pressure to 18 psi **Option 2:** Verify cleaner screen filter is not clogged **Option 3:** Replace cleaner pump
	7. Cleaner spray nozzle(s) not properly adjusted	7. **Option 1:** Perform cleaner spray test in maintenance menu **Option 2:** Adjust cleaner spray nozzles so spray in a straight line across the lane with even overlap. Align ball join if necessary (call BTS).
	8. Poor water quality	8. Use a charcoal filter to filter impurities when mixing cleaner
	9. Improper cleaner or mix ratio	9. Try using a higher mix concentration of cleaner (4:1) or call BTS for advice on the proper cleaner for your type of conditioner.

Cleaning System - Table 7-17 (continued)

Problem	Cause	Solution
Lane is not getting clean (Squeegee head assembly problems)	1. Worn absorbent wiper	1. Turn, flip, or replace based on condition
	2. Improperly adjusted squeegee head assembly	2. Use adjusting template to perform adjustment and check squeegee blade deflection on the lane. **S*ee Adjusting Squeegee for more information***
	3. Worn squeegee blade	3. Turn or replace based on condition
	4. Poor vacuum seal	**4. Option 1:** Adjust vacuum mounting bracket plate **Option 2:** Replace vacuum seal
	5. Poor performance of vacuum motor	5. Repair or replace vacuum motor
	6. Waste recovery tank is over full	6. Remove the waste tank from the machine and dispose of the used lane machine waste properly. Do NOT dump recovery tank in a septic tank or sanitary sewer system. Follow your local environmental regulations for the best method of disposal.
	7. Dirty cleaner drips on return	**7. Option 1:** Vacuum hose cuffs are not tight around the in-take pipe of the squeegee head assembly or on the waste recovery tank **Option 2:** Vacuum exhaust diffuser foam is not in proper position or needs to be cleaned or replaced. **Option 3:** Cleaner pressure is too high

Conditioning Appearance & Application - Table 7-18

Problem	Cause	Solution
One or more conditioner injectors are not firing	1. Unplugged conditioner injector cable	1. **Option 1:**Reconnect plug to conditioner injector **Option 2:** Reconnect plug at electronic enclosure
	2. Defective conditioner injector, wire, connection, or PCB	2. Contact BTS for troubleshooting support.
	3. Injector tip ubstructed or dirty	3.Clean injector tips with a cotton swap and white vinegar
	4. Contamination within the injector rail	4. Contact BTS immediately
Injector marks not blended on lane surface	1. Buffer brush out of adjustment	1. Refer to Buffer Brush Adjustment for more information
	2. Dispersion roller out of adjustment	2. Refer to Dispersion roller adjustment for more information
	3. Buffer brush not rotating	3. **Option 1**: Tighten buffer brush bolt **Option 2:** Verify and adjust buffer belt tension
	4. Defective buffer brush	4. Verify buffer brush lane counter and replace if necessary
	5. Buffer drive motor not operating	5. **Option 1:** Verify fuse condition, and replace is necessary **Option 2:** Verify motor function using Tablet diagnostics and replace if necessary
Tape readings different than programmed units	1. Wrong conditioner selected in the System Conditioner screen	1. Select the correct lane conditioner – if not listed contact Brunswick BTS
	2. Conditioning system not holding pressure	2. Verify pressure through Tablet diagnostics, if machine is not holding pressure contact the Brunswick BTS
	3. Lane surface is not getting cleaned properly	3. Check cleaning system adjustments ***Refer to Cleaning System Adjustment for more information***
	4. Duster contact roller dragging in pattern	4. Adjust duster clutch
	5. Buffer brush worn or out of adjustment	***5. Refer to Buffer Brush Adjustment for more information***
	6. Lane monitor not working properly	6. Contact the Brunswick BTS
	7. Accumulator lost precharge	7. See section 6 for instructions to recharge the accumulator

Traction Drive System - Table 7-19

***NOTE**: Verify error source through Tablet diagnostics.*

Problem	Cause	Solution
Noise coming from the drive system	1. The traction motor chain is not aligned properly	1. Adjust sprockets until the chain is aligned correctly
	2. Traction motor chain is too loose or too tight	2. Adjust traction drive motor until there is a 1/2” movement in the chain
	3. Too much traction drive shaft movement from side to side	3. Adjust traction drive wheels 1/16” from bearing blocks
	4. Bent traction drive shaft	4. Verify shaft is bent, replace if necessary
Travel Speed is incorrect or inconsistent	1. Squeegee is too low	1. Check Lane Length Log rear and front tick counts and adjust squeegee
	2. Electrical issue (low voltage)	2. Check connections inside the electronic enclosure or contact BTS or contact your certified MAX technician
	3. Failed speed control board	3. Contact BTS for replacement
Not traveling down lane	1. Traction wheels not in contact with lane	1. **Option 1:** Verify squeegee head assembly adjustment ***Refer to Squeegee Head Assembly Adjustment for more information*** **Option 2:** Inspect guide rollers, adjust guide roller spacing if necessary **Option 3:** Verify proper gutter height, repair if necessary
	2. Traction drive motor is not operating	2. **Option 1:** Verify fuse condition, and replace if necessary **Option 2:** Verify motor function using Tablet diagnostics and replace if necessary **Option 3**: Contact BTS for additional support

Electrical System - Table 7-20

WARNING! ***Always unplug power cord from the machine before servicing or lifting machine into transport position.***

Problem	Cause	Solution
No power to electronics enclosure	1. Battery not charged, connected	1. Check battery charge and connection
	2. Main switch on the electronic enclosure is turned “OFF”	2. Turn on main switch (switch should illuminate when “ON”)
	3. Emergency shut-off switch button is depressed	3. Twist the Emergency shut-off switch to disengage
Trips in-line breakers	1. Failed circuit breaker	1. Replace circuit breaker
	2. Loose connection on the circuit breaker or relay inside the enclosure	2. Check connections inside the electronic enclosure
	3. Short in electrical system	3. Contact Brunswick BTS
Blown fuse	1. Bad or pinched wire or cable assembly	1. Repair or replace cable assembly
		2. Replace with correct size fuse
	2. Wrong fuse size	***See Appendix for electrical drawings***
	3. Improper adjustment of component	3. Adjust chain, belt, or check for binding of component(s) related to the fuse

Tablet - Table 7-21

Problem	Cause	Solution
No power to Tablet	1. Power is disconnected at the Tablet or the electronic enclosure	1. Reconnect cable
	2. Emergency shut-off switch is depressed	2. Twist the Emergency shut-off switch to disengage.
	3. Power cord is not plugged in if using AC power	3. Check the 125’ power cord is properly connected at both ends.
	4. Main switch on the side cover is turned off	4. Turn on main switch on side cover.
	5. Battery is not charged	5. Connect charger to machine

Intentionally Blank Page

Section 8: Lane Maintenance and Pattern Design Theory

LANE MAINTENANCE

Identifying Your Maintenance Needs

It is important to understand and identify the type of maintenance that is required in your center. Every bowling center is a different environment, in a different geographic area. These are just some factors that you should be aware of when creating your maintenance plan, which included your cleaner, conditioner and cloth (3C's). Dirt is your worst enemy! Controlling dirt in your center is key to protecting the equipment and reducing maintenance costs associated with a lack of maintenance.

1. **Recognize your geographic region.**
   The region of the world in which you live can dictate the type and frequency of general maintenance you need to perform and how you need to store your equipment and supplies. Eliminating issues with dirt and varying temperatures as the seasons change. Store your Lane machine, conditioners, and cleaners in a room that has temperature control. Conditioners can become thicker and cleaners can crystallize when they become cold. This can increase the preparation time to set up the machine and possibly affect the characteristics of the products. The amount of dirt your center produces can affect lane pattern as well as damage the lane surface, gutters and eventually affect your pin setting or spotting equipment.

2. **Identify your bowling environment.**
   Stopping dirt begins at the main entrance of your center. Having entry way rugs or mats are your first line of defense in reducing the migration of dirt throughout the center. Keeping the floors clean and free of dirt and dust. Regulating the temperature helps eliminate the stresses that affect the topography of the lane surface as temperatures change. This will also help minimize the effect of humidity. These variables all affect the oil pattern and ball reaction consistency.

3. **Inspect your lanes and approaches**
   It is good practice to inspect your lanes and approaches on a regular basis. Inspections of panel seams for a proper seal and for lane plugs that are raised or missing help prevent more costly damage in the future.

4. **Create your maintenance plan.**
   Once you know how dirty your center is, a plan can be made based on that information. Below is a list of maintenance procedures and our recommendation of the frequency of the maintenance.

Maintenance	Minimum	Maximum
Dusting gutters	Twice per week	Daily
Dusting approaches	Daily	Three times per day
Spot cleaning approaches	Daily	Three times per day
Deep cleaning approaches	Monthly	Weekly
Washing gutters and flat gutters	Yearly	Monthly
Inspect panel seams and lane plugs	Yearly	Monthly

PATTERN DEVELOPMENT

The Direct+ Technology™ pattern design theory is based on Brunswick's history of understanding the relationship between bowling balls, lane conditioners, and lane surfaces. Patterns can be created to accommodate many different types of play including recreactional, or sport focused centers.

Direct+ allows accurate placement of conditioner nearly every inch of the pattern so you can design and adjust specific areas of the conditioner patterns without affecting the entire pattern. This makes the process of setting up and adjusting patterns much quicker than existing machines. You simply select the zone that you wish to design or adjust and set the oil level to the desired volume and shape.

As stated earlier in this section, much of what you do for your oil pattern is dictated by your bowling center environment. Some things to consider when making a decision on your oil pattern are the type customers at your center (recreational, sport or a combination of both). The lane surface is also another factor that helps you decide the type of conditioner and cleaner to use.

Bowler Types (customers)

There are a few types of centers around the world. You have centers that focus mainly on recreation or "Open Play" while others may be more traditional centers that focus more on the sport side hosting leagues and tournament. The last group of centers are a hybrid between Recreational and Sport, accommodating both types of customers.

a. Recreational bowling center customers typically use house balls and rental shoes. They require lower volumes of oil and shorter patterns to minimize pin setter related issues. See Pattern Volumes later in this section.

b. Sport bowling centers use more types of patterns to accommodate their customers participating in leagues are tournaments. These patterns are higher volume to withstand the punishment of high technology bowling balls and higher bowler revolution rates (revs). These patterns also vary in their difficulty levels as well as oil pattern volume.

c. Hybrid centers have both sport and recreational customers. These centers have dedicated lanes that they use for open play as well as leagues.

Lane Surfaces

Lane surfaces can vary between wood and synthetic construction. Wood surfaces are softer than synthetic surfaces and are know to play higher friction. While synthetic lanes are harder and lower friction. Surface wear also influence how you build your oil pattern and how frequently it will need to be adjusted as the surface wear continues.

Selecting Your Supplies

Using the bowling center environment, bowler types, and lane surface information will help you make a decision on the type of conditioner and cleaner you choose to use. Your Brunswick distributor or Product Specialist can help you make this decision much faster and help you with developing the best pattern to fit your needs.

We can look at the aspects of creating a pattern to give you a desired ball reaction as well as the level of difficulty.

Pattern Lengths
Distance from the foul line to the area of the lane oil is applied to. There are 3 categories of oil pattern length. Short, Medium and Long.

a. Short length patterns are good for recreational centers. They are also used in centers that have low friction surfaces and for challenging sport patterns. **Pattern length: Less than 38 feet**.

b. Medium length patterns are most commonly used in hybrid centers focused on both sport and recreational customers. This length matches well for most bowler types and offers flexibility or a variety of bowling ball cover stocks. **Pattern length: 38 to 42 feet.**

c. Long patterns are used in centers which are hybrid or sport focused. This is dependent on lane surface type, age, and bowler types. **Pattern length: Greater than 42 feet.**

Pattern Crosswise Ratios
The crosswise ratio of an oil pattern dictates the difficulty level that affects scoring. Patterns are classified in 3 categories, Recreational, Competitive, and Sport. Sport patterns are the most difficult for your average bowler to play on. They are typically used for the elite level of bowling athletes including the Professional Bowlers Association. Refer to *Figure 8-1.*

Ratio calculations are made by dividing the average of boards 3 to 7 into the average of boards 18 left to 18 right. This calculation is done separately for the left and right as a pattern my not be symmetric on both sides of the lane.

a. Sport patterns have the highest level of difficulty. This makes it difficult for most bowler types to throw more strikes and have higher scores. These types or patterns are commonly used at the elite level of competition such as the Professional Bowlers Association and USBC. **Pattern ratio: 3 to 1 or lower**.

b. Recreational patterns commonly have the lowest level of difficulty that offers a large variety of bowler types to have higher scores and more strikes. **Pattern ratio: Greater than 6 to 1.**

c. Competitive patterns fit between Sport and Recreational patterns and are used for tournaments that are for a medium level of difficulty. **Pattern ratio: Above 3 to 1 and up to 6 to 1.**

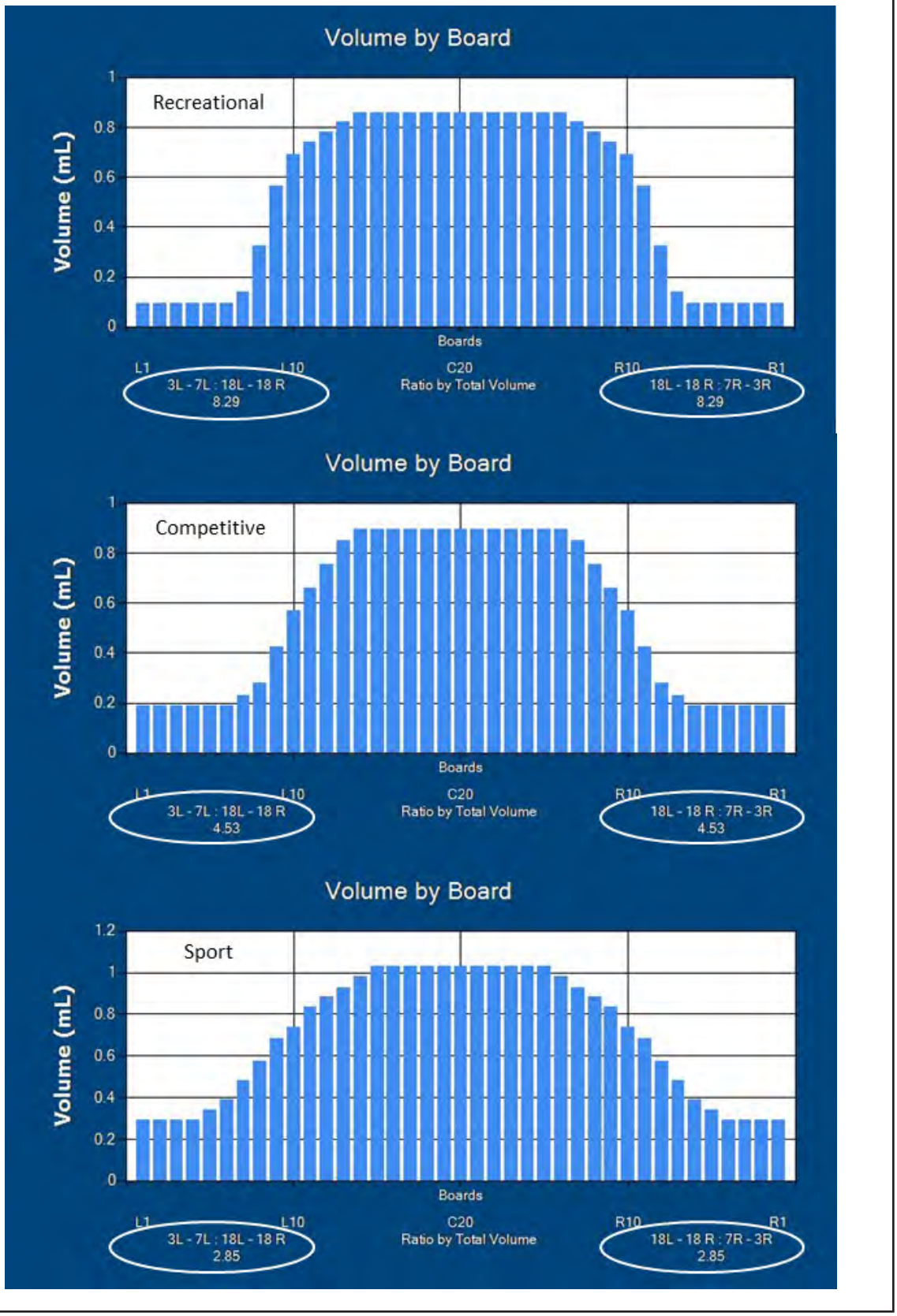

Figure 8-1. Pattern Ratios

Length ratio is calculated by the amount of oil in the beginning to the pattern, divided by the amount of oil at the end of the pattern. Also known as the Lengthwise Taper controls the variety of angles different bowler types can use when competing. Refer to *Figure 8-2.*

a. Strong lengthwise ratio means there is **more** than 3 times the amount of oil in the beginning of the oil pattern than at the end of the pattern. This creates more angles that players can use to compete on a pattern.

b. Weak lengthwise tapers means that there is **less** than 3 times the amount of oil in the beginning of the pattern than there is at the end of the pattern. This forces more bowler types to play the same or similar part of the bowling lane. This is more common for recreational and competitive patterns.

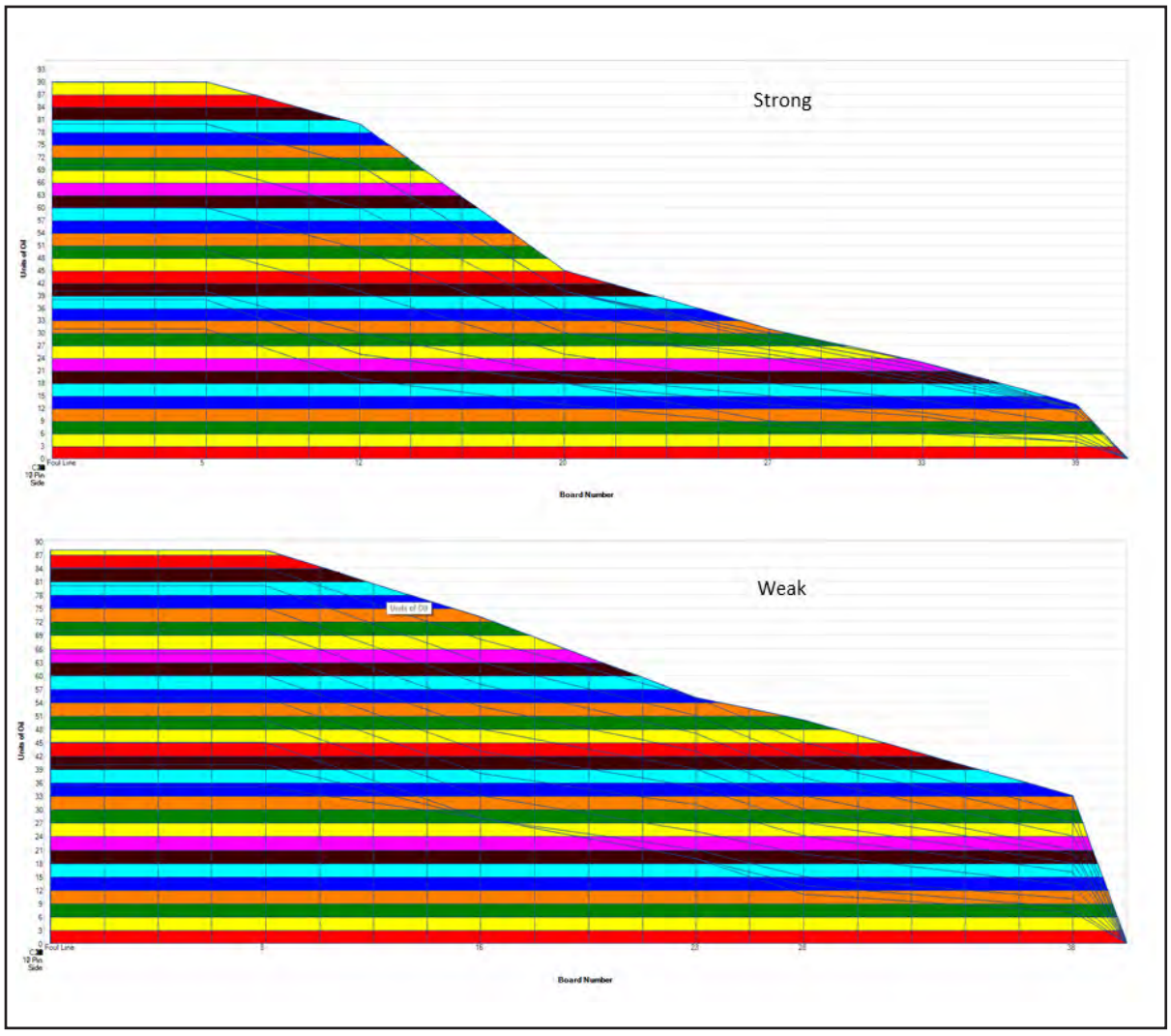

Figure 8-2. Lengthwise Ratios

Pattern Volumes

Pattern volume is also grouped in 3 categories. These categories are Low, Medium, and High volumes. The amount of oil you use is dependent on the lane surface, lane conditioner, and bowler type.

a. **Low volume** patterns are perfect for centers solely focused on recreational or open play. Customers will use house balls made of either polyester or urethane. These balls do not absorb oil and cause more oil to migrate to the pit area potentially causing pin setter related issues. **Pattern volume: less than 19 milliliters**.

b. **Medium volume** patterns are more common in centers with a league and open play based center. This volume gives more flexibility for a more diverse group of bowler types and bowling ball cover stock choices. **Pattern volume: 19 to 25 milliliters.**

c. **High volume** patterns are more common in sport focused centers. These volumes help protect the lanes from the high-performance bowling balls as well as a larger number of games played between lane maintenance. **Pattern volume: Greater than 25 milliliters.**

Design a Conditioner Pattern

Pattern design with the MAX has become a lot easier.

1. Zone configuration
   The zone configuration allows you to design patterns with a minimum of one zone to a maximum of eight zones. Zone lengths can range from 3 feet to 57 feet. Recreational patterns can vary from 3 zones to 5 zones with zone lengths from 8 feet to 12 feet. The last zone in the pattern should always be a buff zone to help optimize the lengthwise taper of the pattern. Adjust the cleaner transition so the volume of cleaner reduces at least two feet into the last zone. Sport and competitive patterns utilize 5 to 8 zones with zone lengths ranging from 5 feet to 10 feet. Again, the last zone should be a buff zone. The end cleaner spray should be adjusted 45-50 feet to properly clean the lane. Refer to *Figure 8-3.*

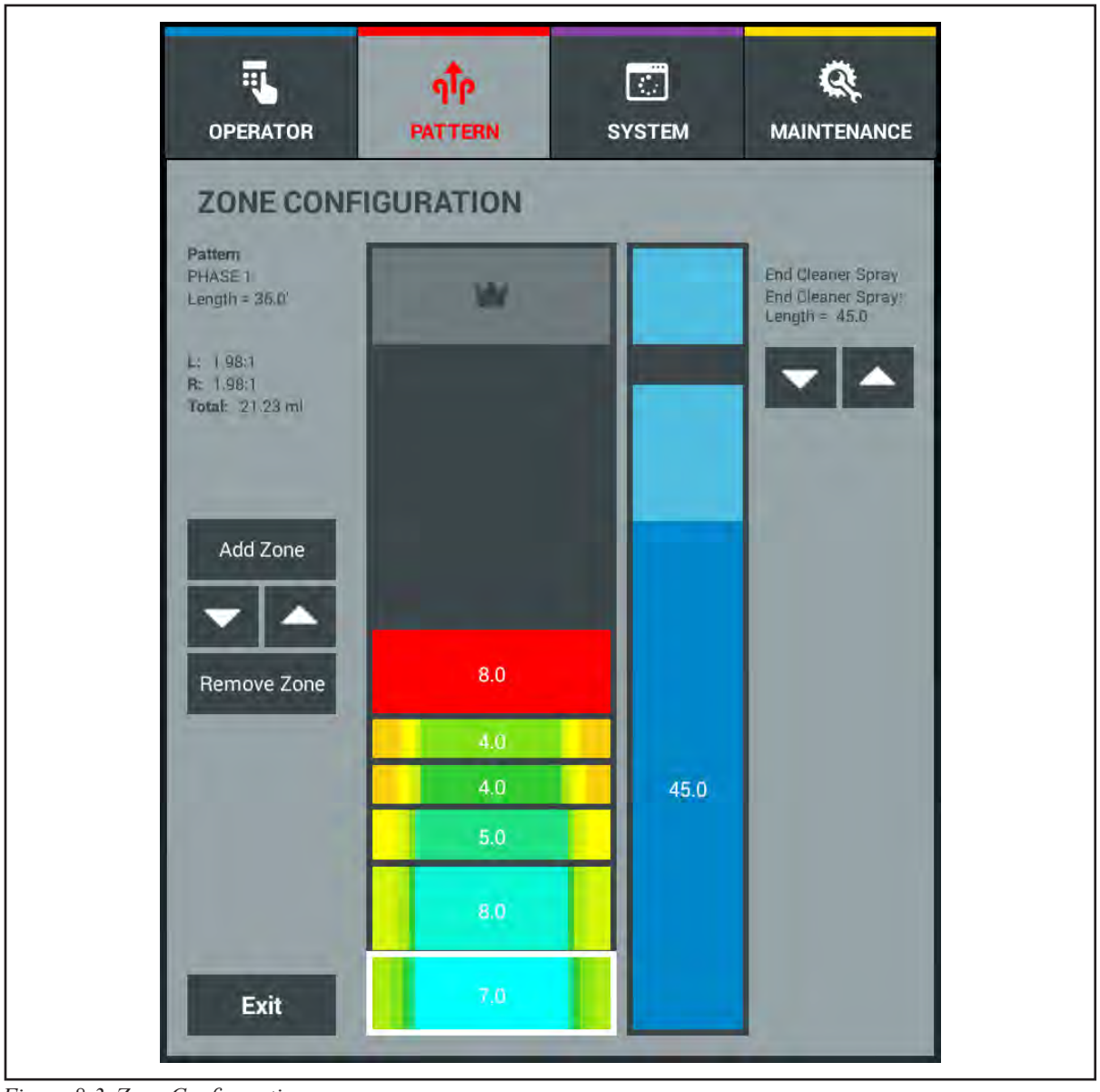

Figure 8-3. Zone Configuration

2. Oil levels

The oil levels screen allows you to create the shape and levels of the conditioner pattern in units of oil. Minimum and maximum levels range from 0 to 100 units. To create the proper lengthwise taper of a pattern, oil levels, from zone to zone, should decrease between 15% and 30%. This is the same for sport and recreational patterns. The percent decrease from zone to zone depends on the starting oil level in the first zone. If the first zone conditioner level is lower (60 units or less) the percentage decrease in the following zones will be smaller and if the first zone conditioner level is higher (above 60 units), the percentage of decrease is higher. The last zone or buff zone should have 1 to 3 units set in the oil level screen on at least one board. This allows the machine to buff the remaining zone of the pattern, in both directions, without injecting conditioner and enhance the lengthwise taper. Set all boards for zero (0) and the machine will buff the last zone in the forward direction of travel only. This increases the lengthwise taper even more. Refer to *Figure 8-4.*

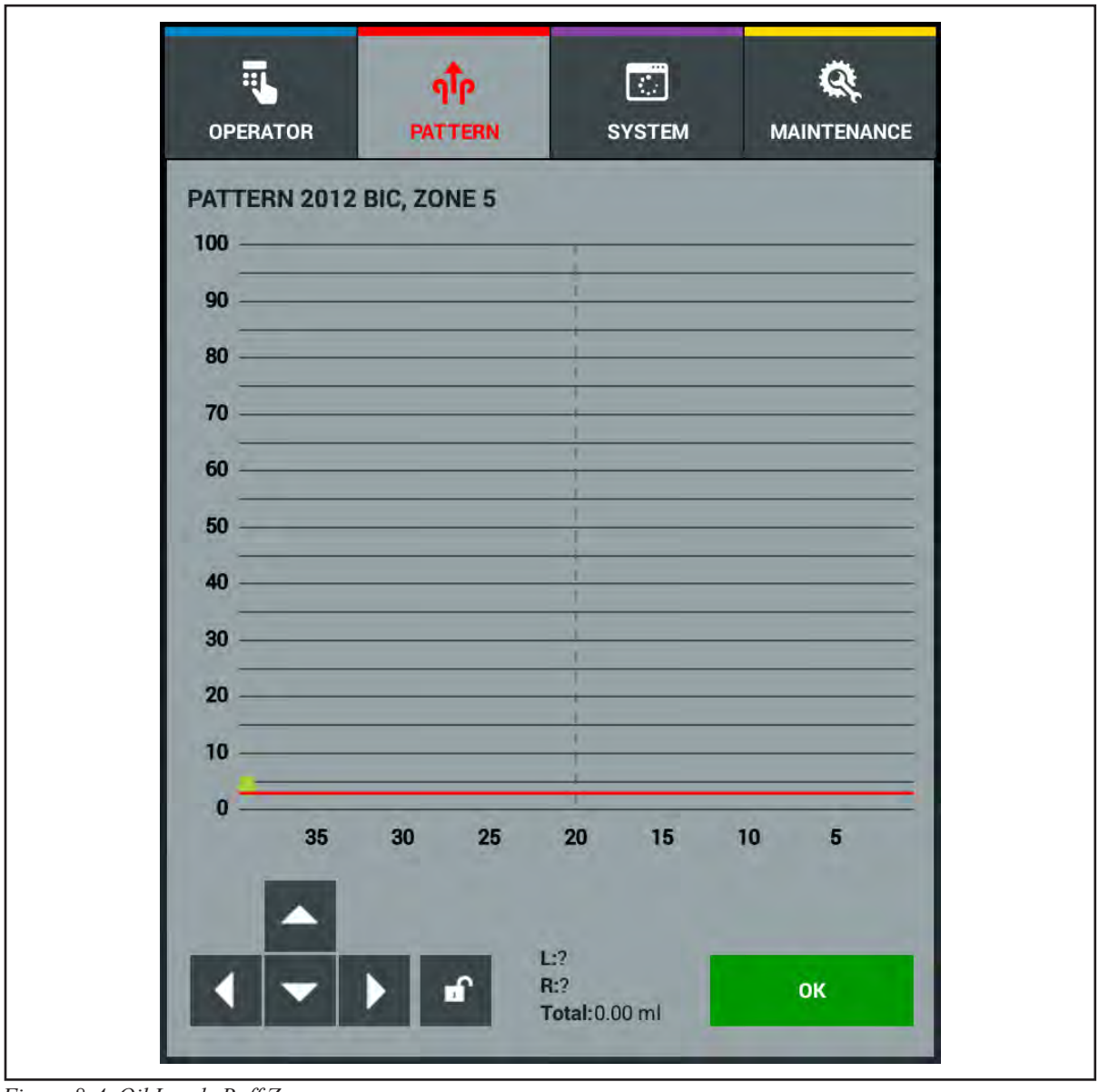

Figure 8-4. Oil Levels Buff Zone

Verifying The Conditioner Pattern

Verification of the conditioner pattern is a step used to qualify the pattern you are using. It allows you to see that the MAX is consistently producing a conditioner pattern based on what is programmed in the Pattern Design screens. It also allows you to identify wear components such as, the absorbent wiper, squeegee, or buffer brush. All of which can have an effect on the units of oil and the performance of a pattern as they have exceeded their life. To verify the conditioner pattern follow these steps.

1. Verify that the machine is cleaning properly before performing the verification process.
2. Select the zone or zones you wish to verify.
3. After running a few lanes, take a tape sample of the conditioner pattern, one foot before the end of that zone (i.e. zone #2 ends at 15 feet, tape distance is 14 feet).
4. Read the tape using the Brunswick Computer Lane Monitor.
5. Compare the lane monitor readings to the programmed units of oil in the tablet.

Adjusting The Conditioner Pattern

The MAX allows you to make adjustments to specific area of the conditioner pattern without having to make unnecessary adjustments to the rest of the pattern. Adjustments to the conditioner pattern should be made based on ball reaction. The ball reaction should be observed when the pattern is fresh and as it transitions as lineage increases. If the pattern transition is not as desired, refer to the follow procedure for making adjustments.

1. Identify the area of the pattern that is not performing properly.
2. Go to the pattern library and view the Zone Configuration and Oil Levels screens.
3. Select the zone that corresponds with the area of the lane that needs adjustments.
4. Make adjustments to the zone length or to the oil levels to change the pattern transition.
5. Download the pattern.
6. If the pattern adjustments are successful, upload the modified pattern to your private cloud library or to Pattern Manager-MAX for backup/storage.

BRUNSWICK PATTERN LIBRARY

The Brunswick Pattern Library (BPL) is a collection of more than 300 conditioner patterns that offers a variety of options for different difficulty levels. There are 3 different categories of patterns (Recreational, Competitive, and Sport) to choose patterns that fit the needs of your customers. There are many good starting patterns for recreational patterns for open play or leagues. The BPL has many tournament patterns used in many locations around the world and are perfect to use when training for competitions or just for fun. All of these patterns can be accessed on the Brunswick Cloud to your MAX tablet. Select the patterns you wish to download to your machine. The patterns can also be stored in your private Brunswick Cloud account you receive when you purchased the machine.

Importing Patterns from the Brunswick Cloud

The machine should be in operating position with power ON. Verify that the WI-FI is ON and has a good connection. Ensure your unique 8-digit MAX Cloud ID is entered into the System-Center menu to pair your tablet to your personal Brunswick Cloud account.

1. Go to your Pattern menu and select “Library” to access your patterns. Refer to *Figure 8-5.*

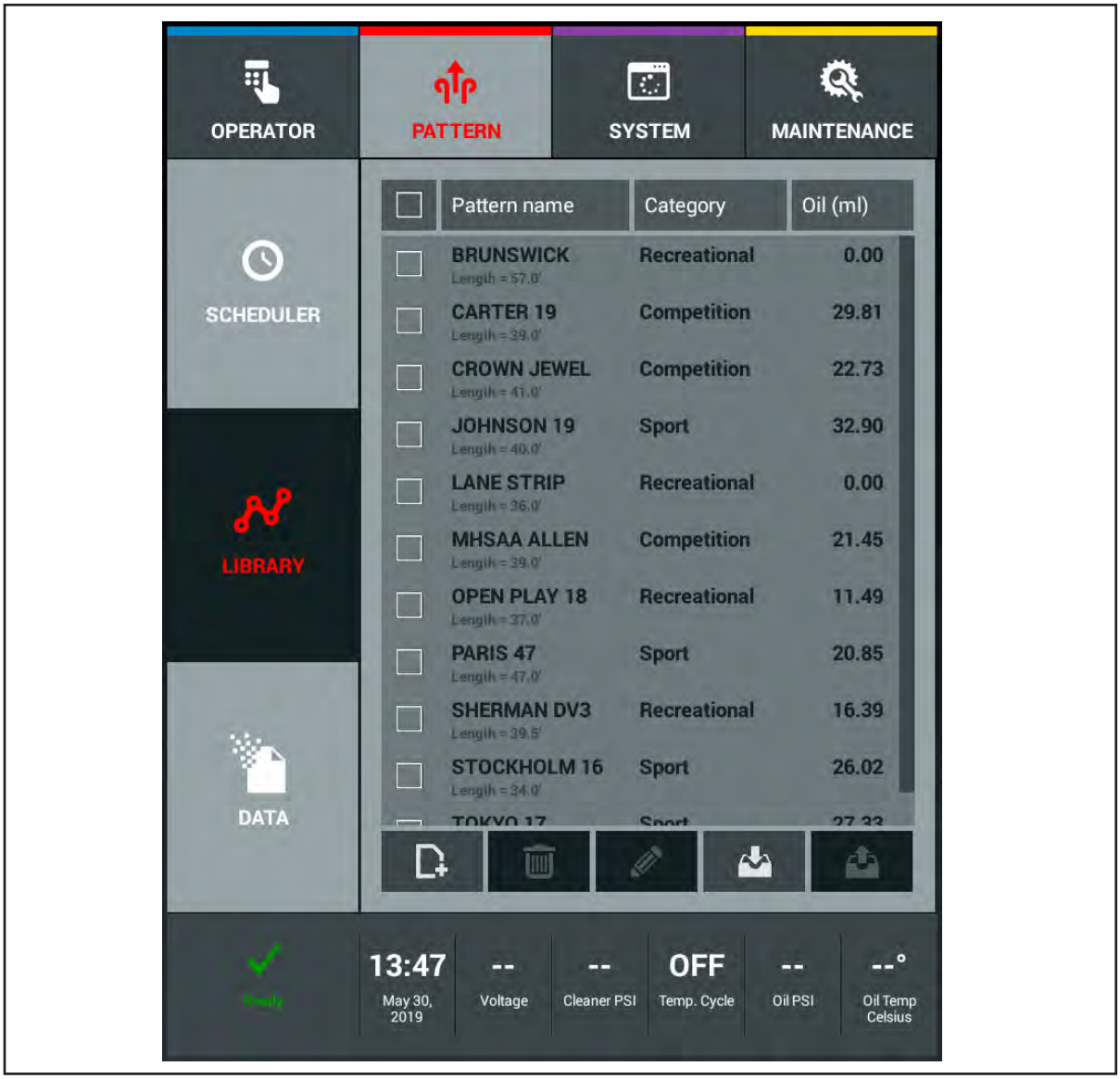

Figure 8-5. Pattern Library

2. Select the Import button to access the Brunswick Cloud. This will generate a message asking you to choose between Private or Brunswick. Refer to *Figure 8-6*.

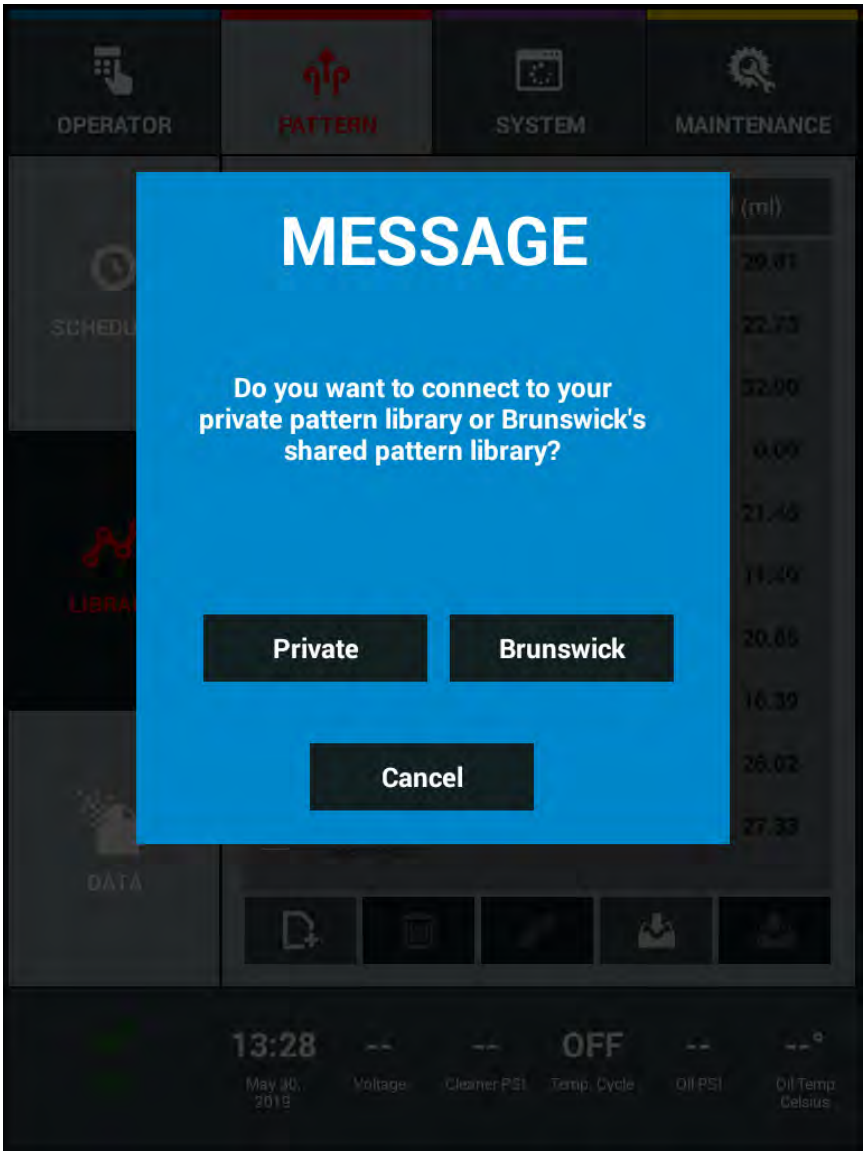

Figure 8-6. Pattern Library Brunswick Cloud Message

3. Select Brunswick to access the Public library. Refer to *Figure 8-7.*

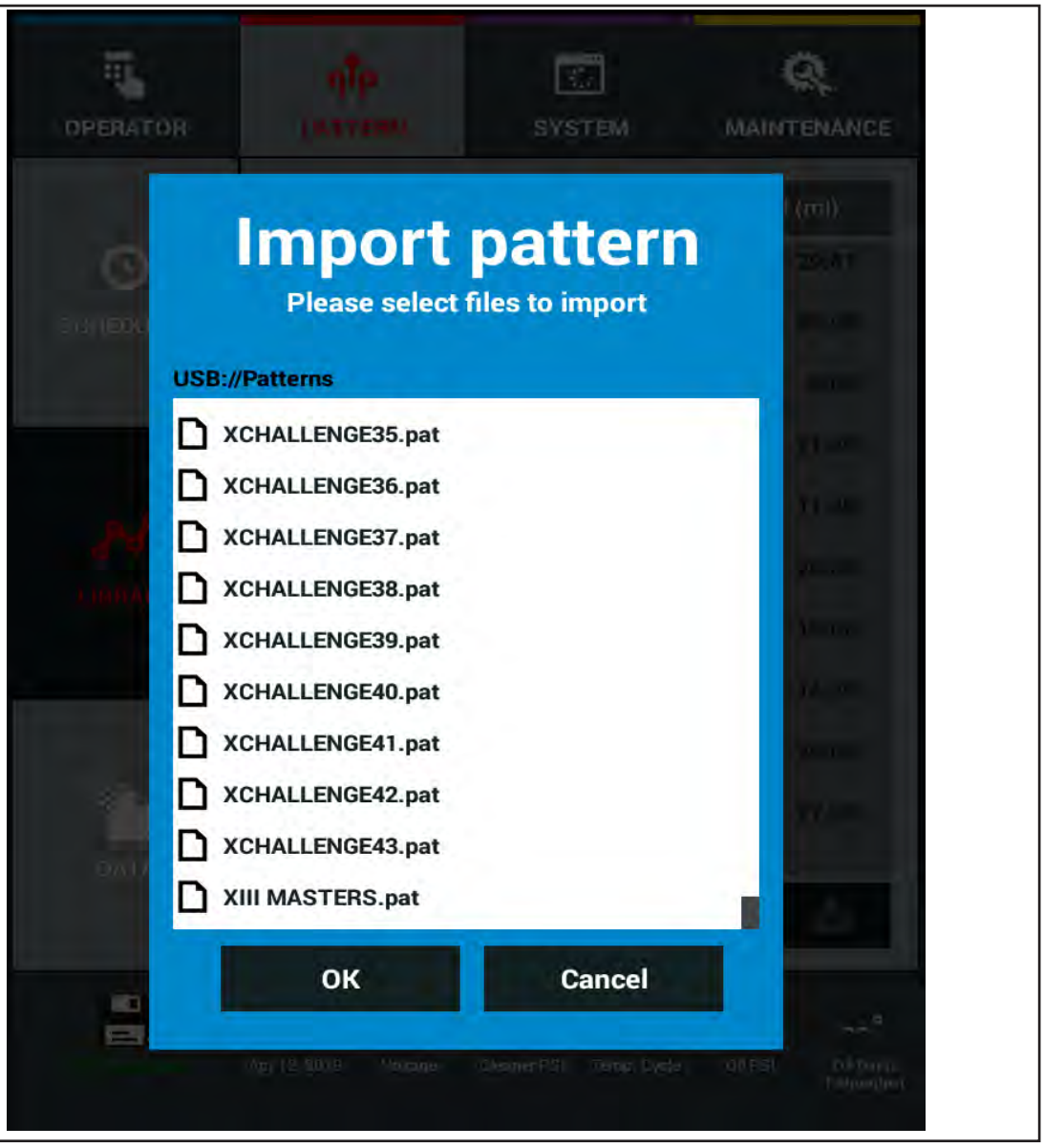

Figure 8-7. Brunswick Brunswick Cloud Public

4. Select the pattern(s) you wish to download to your tablet and press OK. You will see a pattern download progress bar followed by a message that the pattern was successfully imported. Refer to *Figure 8-8.*

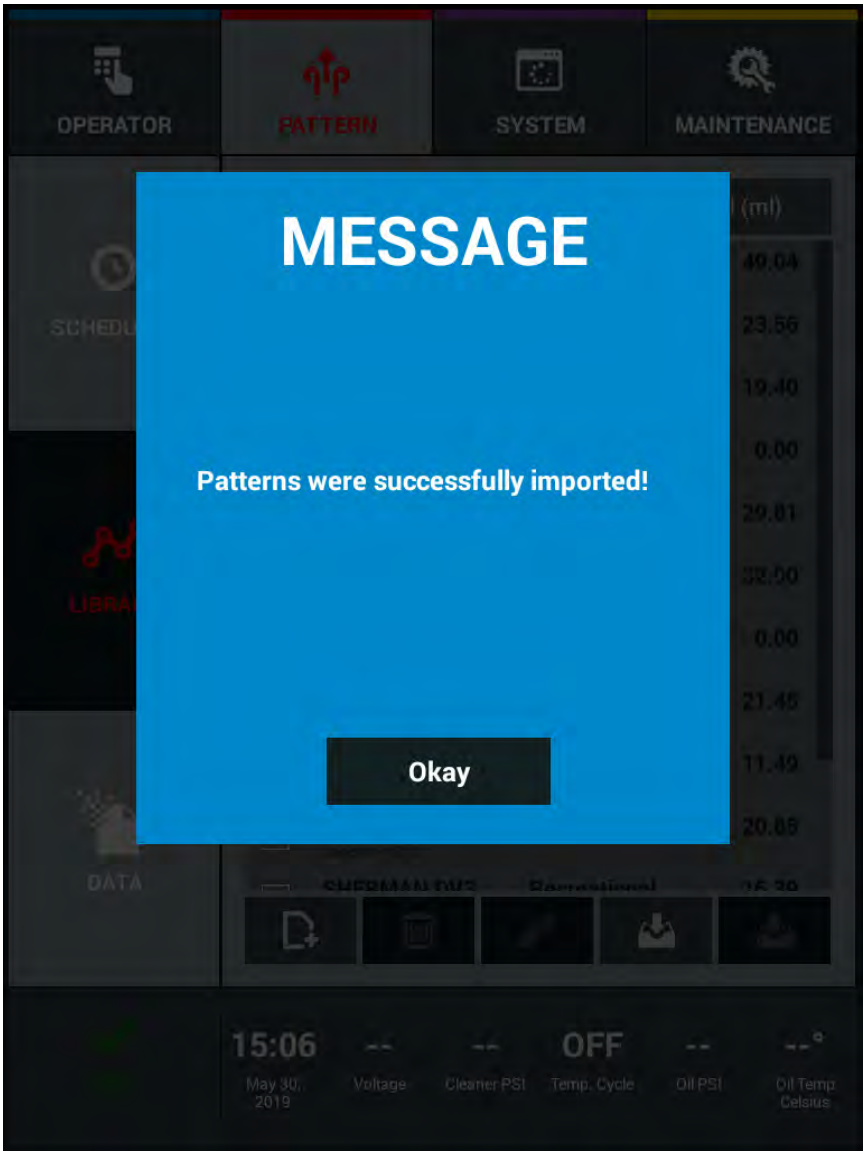

Figure 8-8. Import Successful Message

Exporting Patterns To Your Private Brunswick Cloud Account

The machine should be in operating position with power ON. Verify that the WI-FI is ON and has a good connection.

1. Go to your Pattern menu and select “Library” to access your patterns. Refer to *Figure 8-5.*

2. Select the patterns you wish to export to your Private Brunswick Cloud account by checking the boxes to the left of the pattern name. Refer to *Figure 8-9.*

Figure 8-9. Selecting Patterns For Brunswick Cloud Export

3. Press the Export button on the lower right of the screen. You will see the pattern upload progress bar followed by a message that the pattern(s) were successfully exported. Refer to *Figure 8-10.*

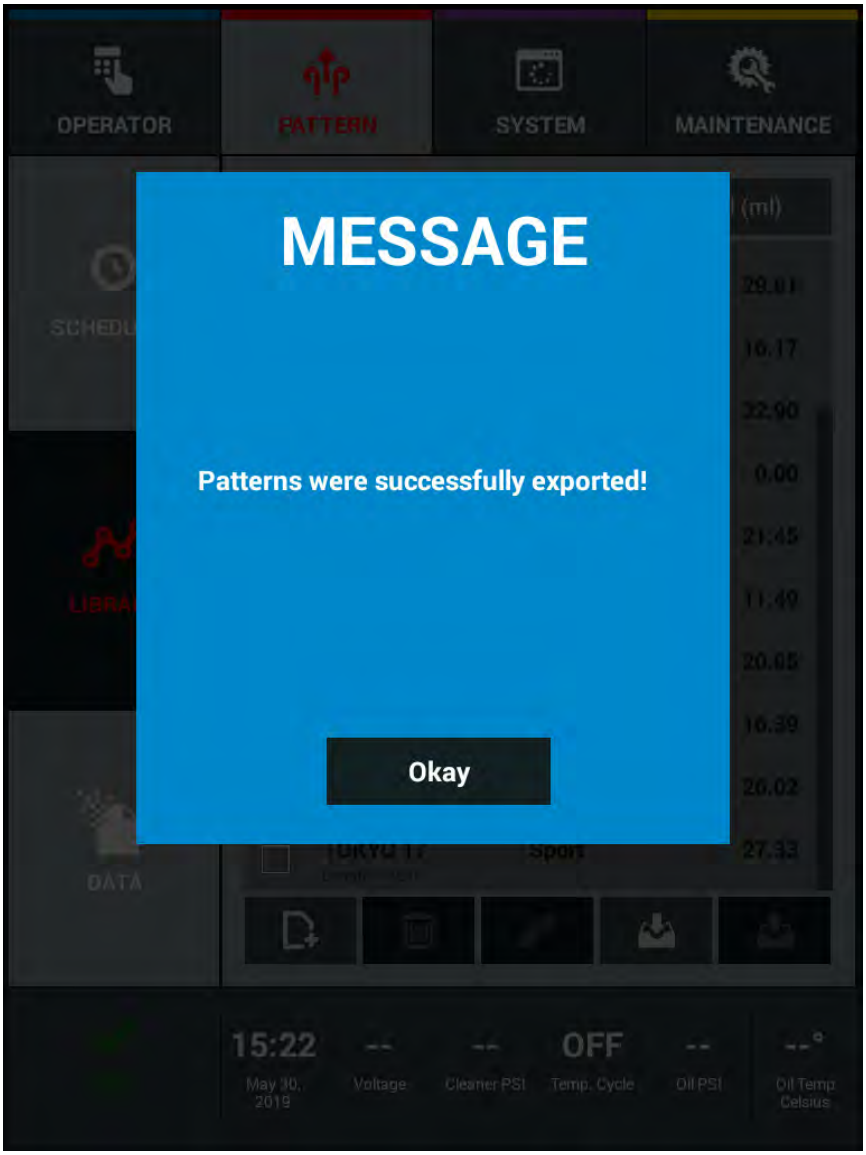

Figure 8-10. Export Successful Message

Importing Patterns From Your Private Brunswick Cloud Account

Patterns can be imported from your Brunswick Cloud account in the event it is deleted on the tablet or if it is a replacement tablet.

1. Go to your Pattern menu and select “Library” to access your patterns. Refer to *Figure 8-5.*
2. Select the Import button on the tablet screen and select “Private” when the message appears. Refer to *Figure 8-3.*
3. Select the pattern(s) you wish to import by checking the box to the left of the pattern name. When all patterns are selected, press OK. Refer to *Figure 8-11.*

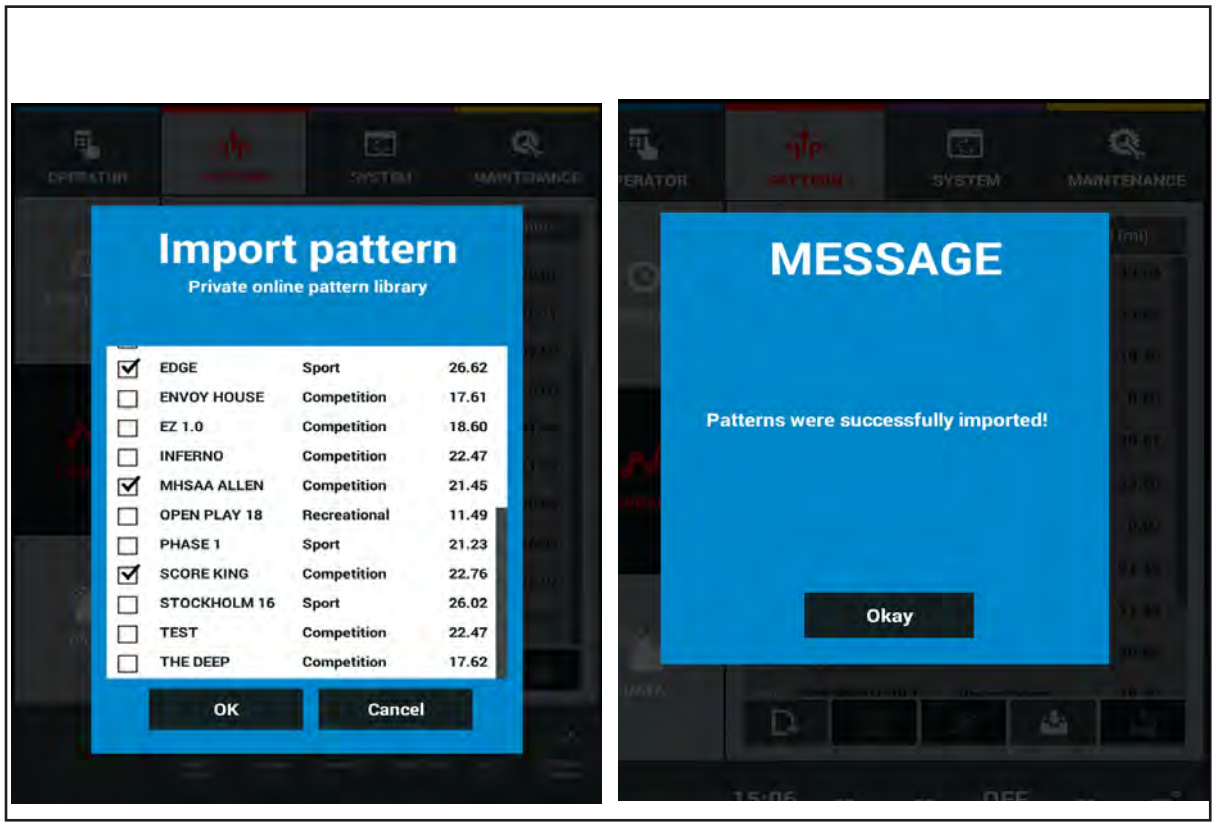

Figure 8-11. Import From Private Library

Section 9: Appendix

This Appendix provides technical documentation that may be helpful for your general reference.

In this Appendix you will find:

1. Pre-Installation Packing List
2. A set of electrical schematics and diagrams

PRE-INSTALLATION PACKING LIST

These items should be shipped with the MAX Lane Machine. Please call us if you are missing any items on this packing list.

Lane Machine Complete with Covers and Tablet

1. 125' (38.1m) Power Cord
2. Spare Parts Kit
3. Straight Edge Alignment Tool
4. MAX Operation & Service Manual
5. Battery Charger

Spare Parts Kit MAX Lane Machine (14-860252-000)

The Spare Parts Kit includes all items listed below. These items can also be ordered individually, with the part number provided.

STANDARD PACKAGING

			CONTENTS
	1.00	11-112134-000	TOOL - DUAL FUSE PULLER
	1.00	11-616025-000	SWITCH - LEVER, SPDT, .187 QUICK CONNECT
	1.00	11-616026-000	SWITCH - ROLLER LEVER, SPDT, .187, 0.1A @ 125VAC
	1.00	11-616031-000	SWITCH - PIN PLUNGER, SPDT, .187 QUICK CONNECT
	1.00	11-655029-001	SPIN-ON FILTER
	2.00	11-655043-019	TUBE - 3/8" O.D. X 34.00" LG. POLYETHYLENE
	2.00	11-655070-000	SPRAY TIP - 110°, .050 GPM, STAINLESS STEEL
	2.00	11-655086-000	STRAINER - 100 MESH, 5 PSI CHECK VALVE
	2.00	11-655090-000	FITTING - UNION STRAIGHT, 3/8" TUBE
	1.00	14-100202-000	FITTING - GREASE, DISPERSION ROLLER
	1.00	14-100378-000	FOAM - VACUUM DIFFUSER
	1.00	14-100394-000	THUMB DRIVE
	2.00	14-100427-000	FOAM - BUFFER SHIELD DRIP
	1.00	14-100487-000	SEAL - WASTE TANK, "D" SHAPE
	1.00	14-860209-000	PKG. - CLEANING MIXING VESSEL W/NO SPILL SPOUT
	1.00	14-860214-000	PKG. - FUSE, 4.0A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860216-000	PKG. - FUSE, 10.0A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860218-000	PKG. - FUSE, 6.3A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860242-000	PKG-FUSE,SLOW BLOW-UL LISTED 2.0 AMP,5 X 20MM, 250V
	1.00	14-101092-000	TOOL - SQUEEGEE ADJUSTMENT
	1.00	14-101263-000	AC INPUT ADAPTER - TABLET, GUI
	1.00	11-672528-000	POWER RELAY - SINGLE POLE, 24 VDC
	1.00	11-672529-000	POWER RELAY - SINGLE POLE, 24 VDC
	1.00	11-696017-000	CIRCUIT BREAKER - 30 AMP
	1.00	57-500114-000	POWER CORD, 2.5M, 3 COND., 220V, LANE SERVER
	1.00	68-100143-000	CORD - POWER, 115V, 7.5FT.
	1.00	14-900106-000	MANUAL - MAX SPARE PARTS
	1.00	14-900107-000	MANUAL - MAX OPERATION AND SERVICE
	1.00	14-860247-700	PACKING LIST - MAX LANE MACHINE SPARE PARTS KIT

ELECTRICAL SCHEMATICS & DIAGRAMS

The following schematics and diagrams are provided for your reference:

Fuse Locations & Specifications and Output LED Locations

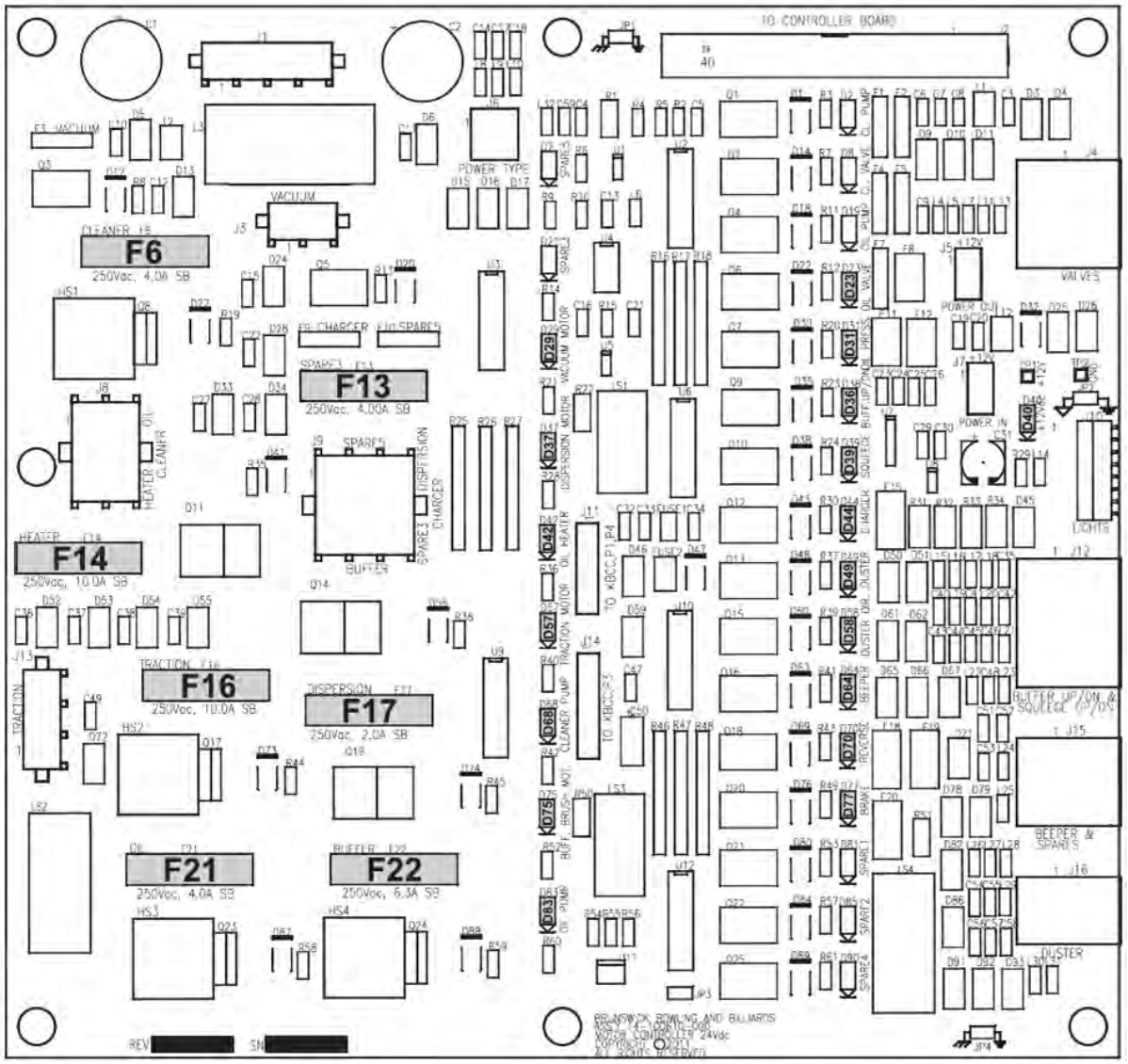

Figure 9-1. Fuse and LED Locations

Fuses

Location ID	Part No.	Description	Application
F6	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V, 5 x 20 mm, Slow Blow	Cleaner Pump
F13	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V, 5 x 20 mm, Slow Blow	Spare
F14	14-860216-000	Pkg. of 5 Fuses - 10A, 250V, 5 x 20 mm, Slow Blow	Conditioner Heater
F16	14-860216-000	Pkg. of 5 Fuses - 10A, 250V, 5 x 20 mm, Slow Blow	Traction Drive Motor
F17	14-860242-000	Pkg. of 5 Fuses - 2.0A, 250V, 5 x 20 mm, Slow Blow	Dispersion Roller Motor
F21	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V, 5 x 20 mm, Slow Blow	Conditioner Pump
F22	14-860218-000	Pkg. of 5 Fuses - 6.3A, 250V, 5 x 20 mm, Slow Blow	Buffer Drive Motor

Fuse Specification chart

LED Indicators

Location ID	Application
D23	Conditioner (Oil) Vent Valve
D29	Vacuum Motor
D31	Conditioner (Oil) Pressure Valve
D36	Buffer Lift Motor
D37	Dispersion Roller Motor
D39	Squeegee Lift Motor
D40	12 vdc Power to Motor Controller PCB
D42	Conditioner (Oil) Heater
D44	Battery Charger Solenoid
D49	Duster Cloth Motor
D57	Traction Drive Motor
D58	Duster Cloth Motor (up) Reverse
D64	Beeper
D68	Cleaner Pump
D70	Traction Drive Motor Reverse
D75	Buffer Drive Motor
D77	Traction Drive Motor Brake
D83	Conditioner (Oil) Pump

LED Applications Chart

Electrical System Schematic - Left Side View

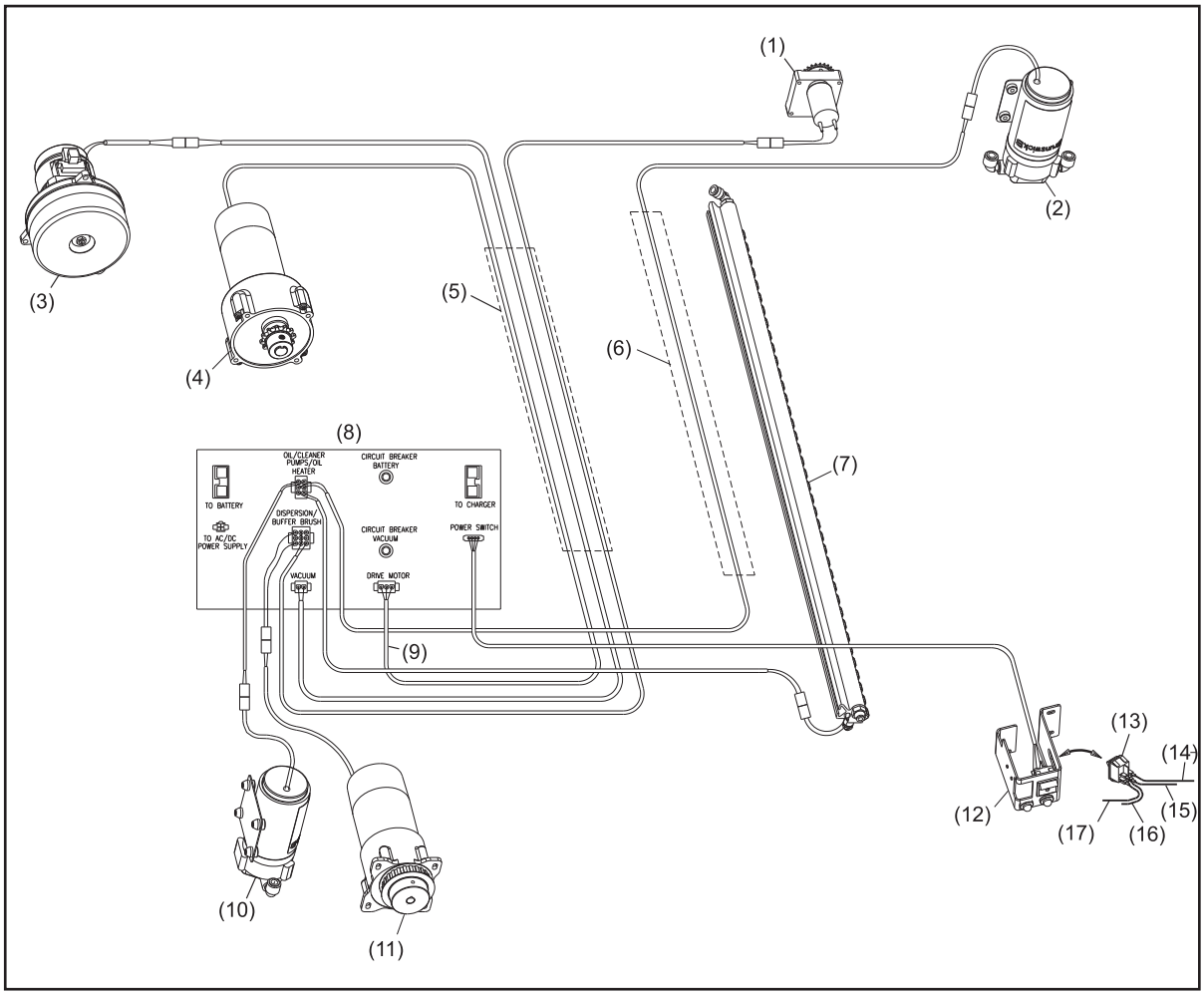

Figure 9-2. Electrical System - Left

(1) DISPERSION ROLLER MOTOR
(2) CLEANER PUMP
(3) VACUUM
(4) DRIVE MOTOR
(5) RACEWAY (INSIDE U-CHANNEL)
(6) RACEWAY (ABOVE INJECTOR RAIL)
(7) INJECTOR RAIL
(8) ELECTRICAL ENCLOSURE
(9) DRIVE MOTOR CABLE
(10) CONDITIONER PUMP
(11) BUFFER BRUSH MOTOR
(12) CHARGING PORT
(13) POWER SWITCH
(14) RED (TOP)
(15) BLACK (BOTTOM)
(16) WHITE (TOP)
(17) GREEN (BOTTOM)

Electrical System Schematic - Right Side View

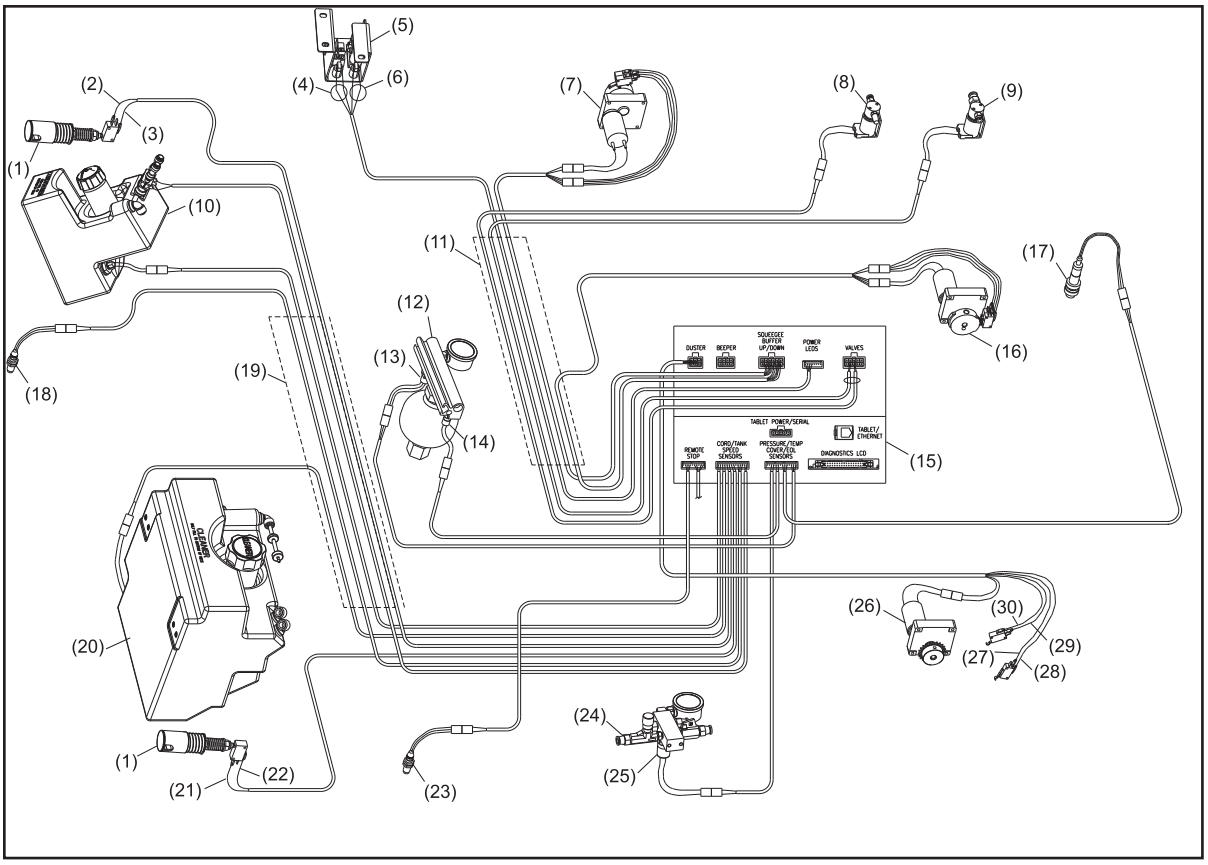

Figure 9-3. Electrical System - Right

(1) CORD KILL
(2) RED (NO)
(3) BLACK COM
(4) RED (-) BLACK (+)
(5) CHARGING PORT
(6) ORANGE (-) BROWN (+)
(7) BUFFER UP/DOWN MOTOR
(8) CONDITIONER VENT VALVE
(9) CONDITIONER PRESSURE VALVE
(10) CONDITIONER TANK
(11) RACEWAY (INSIDE U-CHANNEL)
(12) ACCUMULATOR
(13) PRESSURE SWITCH
(14) TEMPERATURE SENSOR
(15) ELECTRICAL ENCLOSURE
(16) SQUEEGEE UP/DOWN MOTOR
(17) EOL SENSOR
(18) REAR SPEED SENSOR
(19) RACEWAY (ABOVE INJECTOR RAIL)
(20) CLEANER TANK
(21) RED (NO)
(22) BLACK (NO)
(23) FRONT SPEED SENSOR
(24) CLEANER MANIFOLD
(25) PRESSURE SENSOR
(26) DUSTER MOTOR
(27) BROWN (N0)
(28) BLUE (COM)
(29) GREEN (NO)
(30) WHITE (COM)

Electrical System Schematic - Rear View

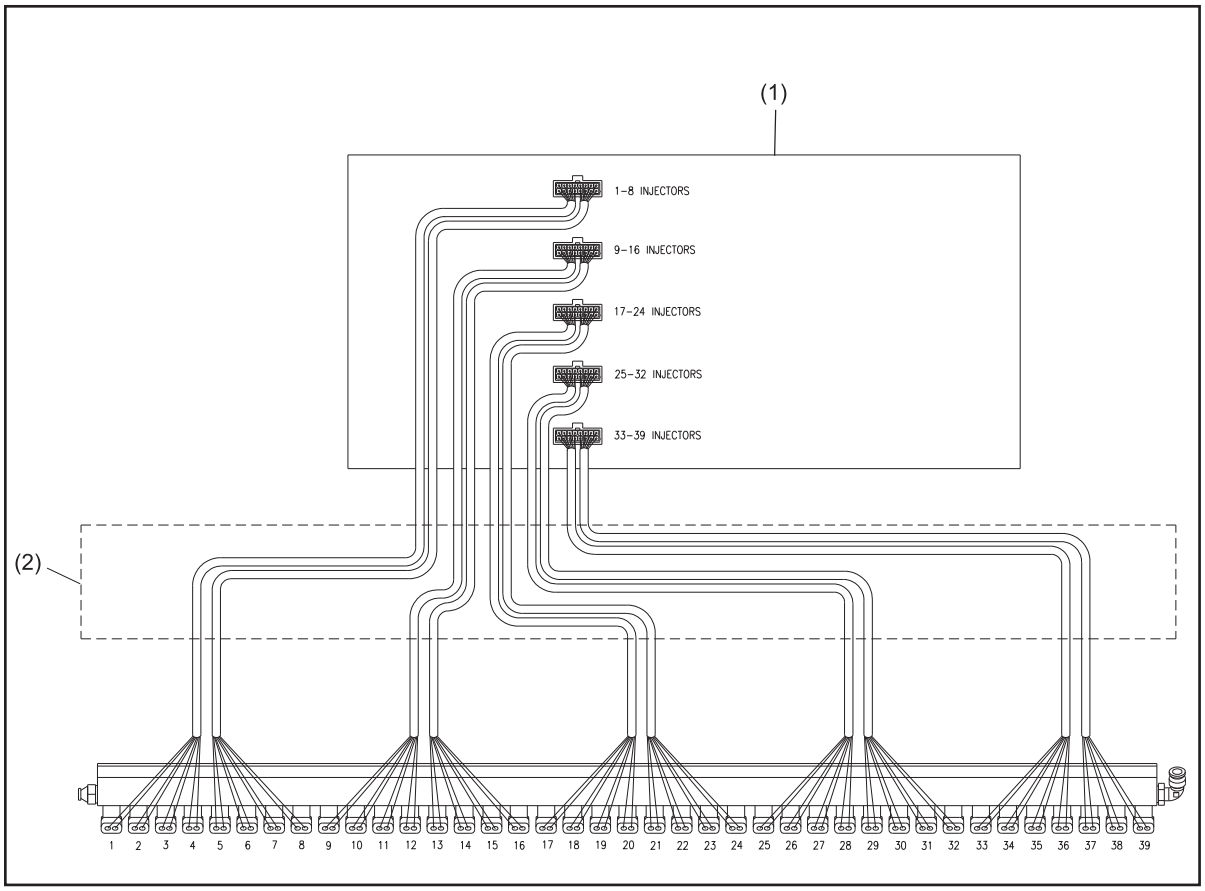

Figure 9-4. Electrical System - Rear

(1) ELECTRICAL ENCLOSURE (2) RACEWAY (ABOVE INJECTOR RAIL)

Electronics Control Enclosure - 24VDC

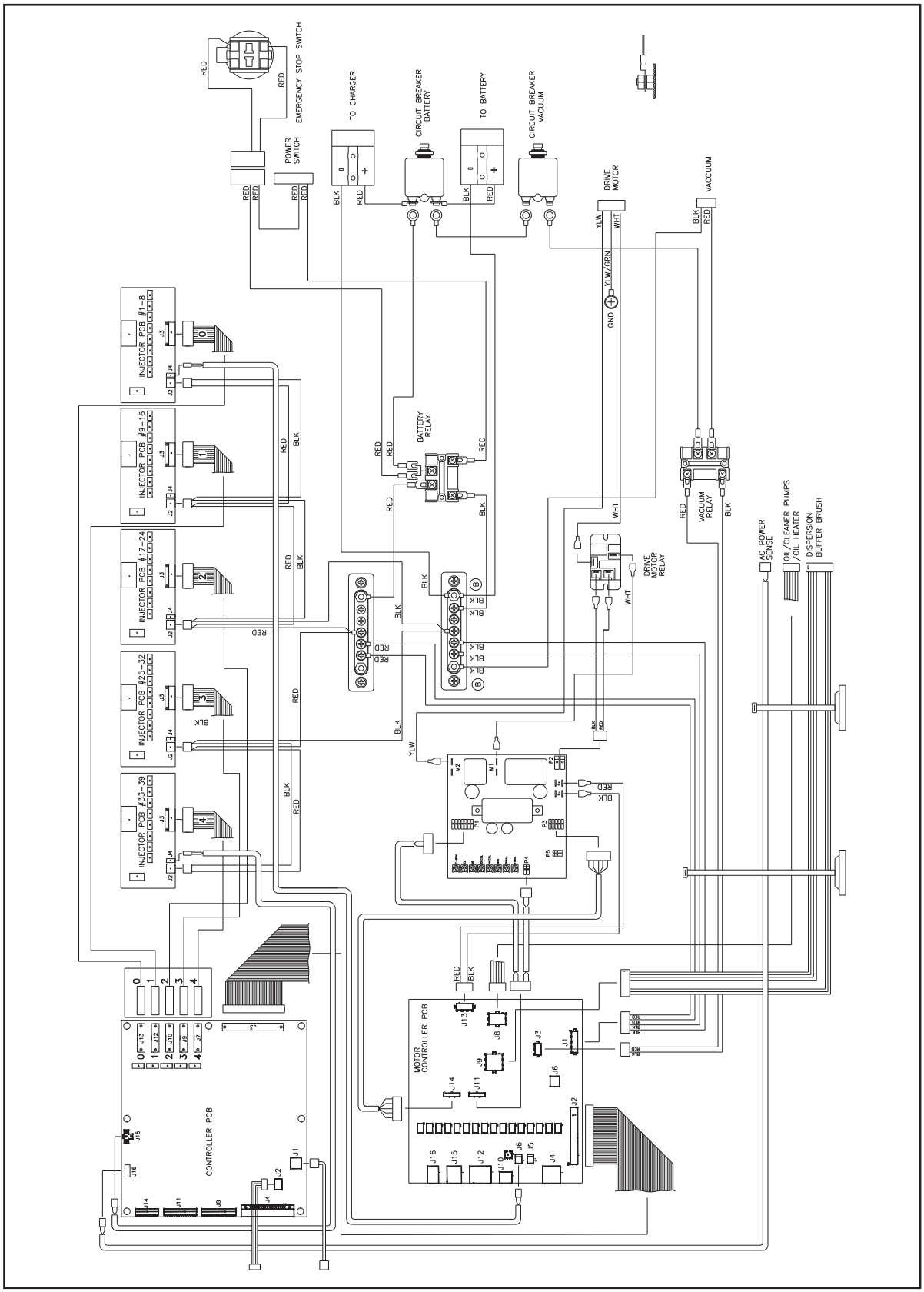

Figure 9-5. Electronic Control Enclosure Schematic

Overall Tablet Schematic

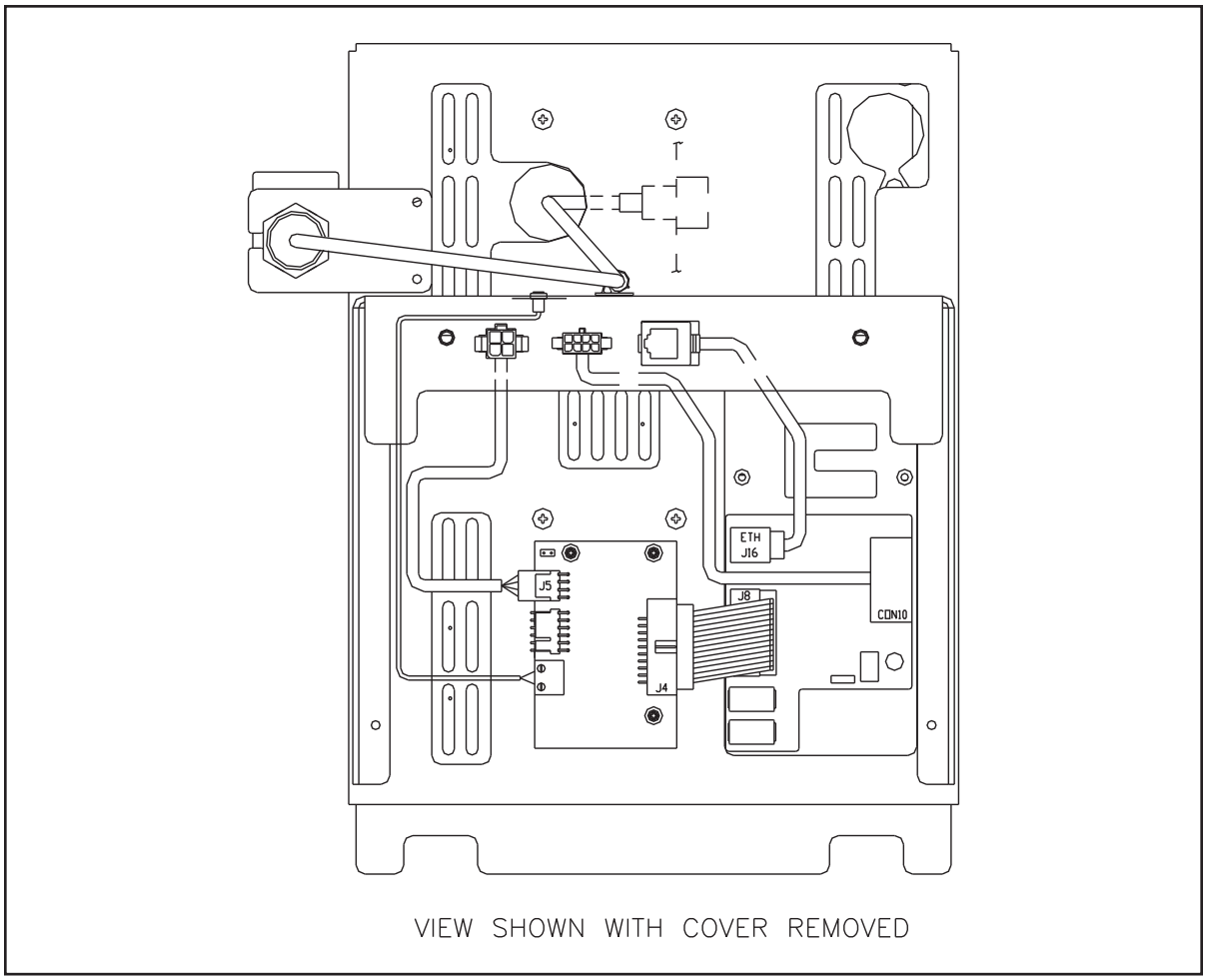

Figure 9-6. Overall Tablet Schematic

Tablet & Handle Keypad Schematic

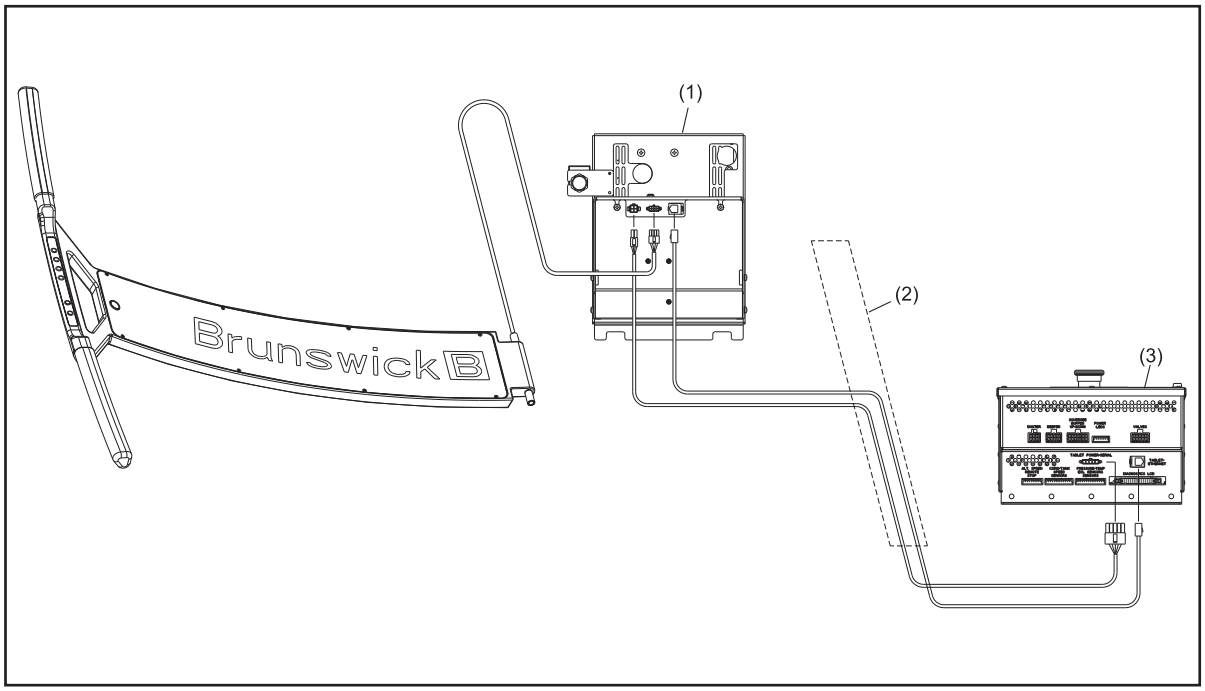

Figure 9-7. Tablet and Handle Button Schematic

(1) TABLET

(2) RACEWAY (ABOVE INJECTOR RAIL)

(3) ELECTRICAL ENCLOSURE