X4 ROVR
(Battery)

Walk-Behind Scrubber
English EN
Operator Manual



Hygenic Fully® Cleanable Tanks
TennantTrue® Parts
Insta-Click™ Magnetic Disk

Powered by LITHIUM-ION

Europe

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INTRODUCTION

This manual is furnished with each new model. It provides necessary operation and maintenance instructions.



Read this manual completely and understand the machine before operating or servicing it.

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

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

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PROTECT THE ENVIRONMENT

Please dispose of packaging materials, used components such as batteries and fluids in an environmentally safe way according to local waste disposal regulations. Always remember to recycle.

MACHINE DATA

Please fill out at time of installation for future reference.

Model No. – _____

Serial No. – _____

Installation Date – _____



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INTRODUCTION

This operator manual contains information to allow for quick start−up of the new Tennant X4 ROVR Scrubber, powered by BrainOS. This document may be periodically revised. This X4 ROVR Scrubber, can be used in manual mode or as self−driving, robotic scrubber. Use in robotic (autonomous) mode requires a subscription to Brain Corp's Autonomy Services. It is important to follow all provided instructions and warnings. Failure to adhere to instructions could result in damage to the machine and injury.

The X4 ROVR is a commercial floor scrubber powered by BrainOS software. The Brain−enabled scrubber is capable of functioning in either manual or robotic (autonomous, self−driving) modes. When in robotic mode, the Brain−enabled scrubber is driven by the BrainOS navigation software. This product may be covered by one or more patents or pending patent applications. See www.braincorporation.com/patents for details. Discrete portions of this product were made possible by open source software. Please see www.braincorp.com/open−source−attributions/ for details.

INTENDED USE AND PRECAUTIONS

The X4 ROVR is an industrial/commercial robotic walk behind scrubber machine. It is designed exclusively to wet scrub both rough and smooth hard surfaces (concrete, tile, stone, synthetic, etc). This machine can be operated in either robotic mode (without operator) or manual mode (with operator). This machine is intended for indoor use only. Do not use this machine on soil, grass, artificial turf, or carpeted surfaces. This machine is not intended for use on public roadways. Do not use this machine other than described in this Operator Manual. Only use recommended accessories. The X4 ROVR Scrubber, powered by BrainOS, should only be used by trained operators in controlled, restricted environments approved by Brain Corp/Tennant Company.

Additional training materials may be provided as to the intended use of the X4ROVR Scrubber, and it should only be used in accordance with such training. Use the machine in approved environments in accordance with the Autonomous Navigation Software End User License Agreement (EULA). Approved environments shall also be limited to cleaning areas with adequate cellular communication signals permitting cellular data communication with the machine to enable periodic safety-related updates not less than monthly.

The operator is responsible for the use of each Brain−enabled X4 ROVR Scrubber in both manual and robotic mode. Each operator must be mindful to use the machine in accordance with its intended use and precautions at all times. Operators will not engage in any of the following conduct or activities with respect to the Autonomy Services or BrainOS:

- Transmission of any software or other materials that contain any viruses, worms, trojan horses, defects, spyware, spiders, screen−scrapers, or other items of a destructive or disruptive nature;
- The machine onboard cameras may capture images of people who happen to be in its surrounding. There may be local laws of operation relating to use of technology with cameras. Please comply with all applicable laws, including using signage or obtaining consents as required;
- Exploitation of the Autonomy Services, BrainOS, or the Brain−enabled scrubber hardware in any unauthorized manner, including by trespassing or burdening server or network capacity or infrastructure;
- Framing, mirroring, or reselling any part of the Autonomy Services or BrainOS without written authorization from Brain Corp;
- Unauthorized collection of user information; or
- Attempting to deliberately damage the Autonomy Services or BrainOS, or undermine the legitimate operation of the Autonomy Services or BrainOS.

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IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS

The following precautions are used throughout this manual as indicated in their descriptions:



WARNING: To warn of hazards or unsafe practices that could result in severe personal injury or death.

FOR SAFETY: To identify actions that must be followed for safe operation of equipment.

The following information signals potentially dangerous conditions to the operator. Know when these conditions can exist. Locate all safety devices on the machine. Report machine damage or faulty operation immediately.



WARNING: Flammable materials can cause an explosion or fire. Do not use flammable materials in tank(s).



WARNING: Flammable materials or reactive metals can cause an explosion or fire. Do not pick up.



WARNING: Spinning brush. Keep hands away.



WARNING: Magnetic Field Hazard. Magnetic pad driver/brush can be harmful to those with pacemakers or medical implants.



ESCALATOR WARNING: Always place a cone or other physical barrier at escalator entrances and exits before teaching or running routes.

This machine is equipped with technology that automatically communicates over the cellular network. This machine is equipped with BrainOS software that is accessible via the BrainOS User Interface (UI) Touch Screen. Avoid operating machine in areas where other equipment that may be sensitive to electromagnetic noise is located.

FOR SAFETY:

1. Do not operate machine:
   - Unless trained and authorized.
   - Unless operator manual is read and understood.
   - Under the influence of alcohol or drugs.
   - In Manual Mode: While using a cell phone or other types of electronic devices.
   - Unless mentally and physically capable of following machine instructions.
   - With brake disabled.
   - Without filters in place or with clogged filters.
   - If it is not in proper operating condition.
   - In areas where flammable vapors/liquids or combustible dusts are present.
   - In outdoor areas. This machine is for indoor use only.
   - In areas that are too dark to safely see the controls or operate the machine.
   - In areas with possible falling objects.
   - With pads or accessories not supplied or approved by Tennant. The use of other pads may impair safety.
2. Before Starting Machine:
   - Check machine for fluid leaks.
   - Make sure all safety devices are in place and operate properly.
   - Make sure all covers are closed, latched, and locked.
3. When using machine in manual mode:
   - Use only as described in this manual.
   - Reduce speed when turning.
   - Go slowly on inclines and slippery surfaces.
   - Do not scrub on ramp inclines that exceed 2% / 1° grade or transport (GVWR) on ramp inclines that exceed 2% / 1° grade.
   - Push machine slowly through doorways and narrow openings.
   - Be cautious of the squeegees near bystanders and obstacles.
   - Always be aware of surroundings while operating machine.
   - Use care when reversing machine.
   - Keep children and unauthorized persons away from machine.
   - Do not allow machine to be used as a toy.
   - Do not carry passengers on any part of the machine.
   - Always follow safety and traffic rules.
   - Report machine damage or faulty operation immediately.
   - Follow mixing, handling and disposal instructions on chemical containers.
   - Place proper floor cleaning signage in areas where the machine is operating and people are present, in accordance with standard floor cleaning practices.
   - Follow site safety guidelines concerning wet floors.

4. While machine is operating in robotic mode:
   - Use only as described in this manual.
   - Remove key from ON/OFF key switch to prevent unauthorized use without disrupting robotic route.
   - Do not attempt to ride machine.
   - Do not operate machine in environments requiring fail−safe performance (areas where machine failure could lead to personal injury or property damage).
   - Guard sudden drops, stairs, escalators, or moving platforms in area of machine operation with a physical barrier.
   - Do not use ladders, scaffolds, or other temporary constructed structures in area of machine operation.
   - Only scrub flat, hard surfaces with 2% or less incline.
   - Do not operate machine in low traction environments (ice, oil, etc...).
   - Do not leave electrical cords or low profile items (anything having a height of less than 18 cm from ground) in area of machine operation.
   - Always operate machine in manual mode when going into elevators or through automatic doors. Robotic routes should never include going into elevators or through automatic doors.
   - Keep children and unauthorized persons away from machine.
   - Do not allow machine to be used as a toy.
   - Do not carry passengers on any part of the machine.
   - Always follow safety and traffic rules.
   - The operator needs to stop the machine in the event of a facility emergency (facility shutdown, fire alarm, tornado, etc..).
   - Do not operate machine with other manually controlled vehicles unless the operators are trained to operate safely around other autonomous machines.
   - Do not operate machine in areas with other autonomous machines.
   - Report machine damage or faulty operation immediately.
   - Follow mixing, handling and disposal instructions on chemical containers.
   - Place proper floor cleaning signage in areas where the machine is operating and people are present, in accordance with standard floor cleaning practices.
   - Follow site safety guidelines concerning wet floors.

5. Before leaving or servicing machine:
   - Stop on level surface.
   - Turn off machine and remove key.

6. When servicing machine:
   - All work must be done with sufficient lighting and visibility.
   - Keep work area well ventilated.
   - Avoid moving parts. Do not wear loose clothing, jewelry and secure long hair.
   - Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.
   - Block machine tires before jacking machine up.
   - Jack machine up at designated locations only. Support machine with jack stands.
   - Use hoist or jack that will support the weight of the machine.
   - Do not push or tow the machine on inclines with the brake disabled.
   - Do not power spray or hose off machine. Electrical malfunction may occur. Use damp cloth.
   - Plug the charger into a properly rated outlet only.
   - Disconnect battery connections before working on machine.
   - Do not disconnect battery connections while the machine is charging. Machine electrical damage may occur.
   - Do not pull on battery charger cord to unplug. Grasp plug at outlet and pull.
   - Do not use incompatible battery chargers as this may damage battery packs and potentially cause a fire.
   - Do not charge frozen batteries.
   - Inspect charger cord regularly for damage.
   - Keep all metal objects off batteries.
   - Use a non-conductive battery removal device.
   - Use a hoist and adequate assistance when lifting batteries.
   - Battery installation must be done by trained personnel.

- Follow site safety guidelines concerning battery removal.
- All repairs must be performed by trained personnel.
- Do not modify the machine from its original design.
- Use Tennant supplied or approved replacement parts.
- Wear personal protective equipment as needed and where recommended in this manual.



For Safety: wear hearing protection.



For Safety: wear protective gloves.



For Safety: wear eye protection.

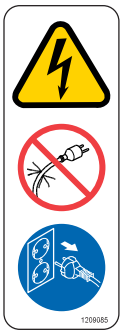


For Safety: wear protective dust mask.

7. When using Lithium-ion Battery model:
   - Battery pack is designed exclusively for specific Tennant machine applications. Do not install battery pack in unapproved machines.
   - Dispose of battery in accordance with local regulations. Contact Tennant Service.
   - Contact Tennant Service or your local regulatory authorities for proper transporting instructions of lithium−ion batteries.
   - Use only OEM approved battery charger supplied with lithium−ion battery.
   - Do not expose battery to temperatures below −4°F (−20°C), above 104°F (40°C).
   - Do not use machine immediately after long−term extreme temperature storage. Before use, return battery module temperature range to 50°F (10°C)~95°F (35°C).
   - Do not operate or store battery in hazardous environment (electrically charged, humidity, extreme temperatures and magnetic fields).
   - Do not expose battery to flame or plasma.
   - Do not drop, crush or subject battery to impact, as it may cause battery to heat up or catch fire.
   - Do not put battery in fire or water to avoid battery explosion.
   - Do not touch battery with wet hand, avoid electric shock.
   - Stop using or charging the battery immediately if battery has abnormal temperature, leakage or other abnormal conditions.
8. When loading/unloading machine onto/off truck or trailer:
   - Use ramp, truck or trailer that will support the weight of the machine and operator.
   - Drain tanks before loading machine.
   - Do not push on a slippery ramp.
   - Use caution when operating on a ramp.
   - Do not load/unload on ramp inclines that exceed 15.8% / 9° grade.
   - Turn off machine and remove key.
   - Block machine tires.
   - Use tie-down straps to secure machine.

The following safety labels are mounted on the machine in the locations indicated. Replace damaged/missing labels.

WARNING LABEL - Do not charge batteries with damaged cord. Electric shock can result. Disconnect charger cord before servicing.



Located on the rear right side of machine.

WARNING LABEL - Batteries emit hydrogen gas. Explosion or fire can result. Keep sparks and open flame away when charging.



Located on the rear right side of machine.

FOR SAFETY LABEL - Read manual before operating the machine.



Located on the tank cover.

WARNING LABEL - Flammable materials or reactive metals can cause explosion or fire. Do not pickup.



Located on the tank cover.

FOR SAFETY LABEL - Electrical compnents, use grounding strap before opening panel.



Located on the tank cover.



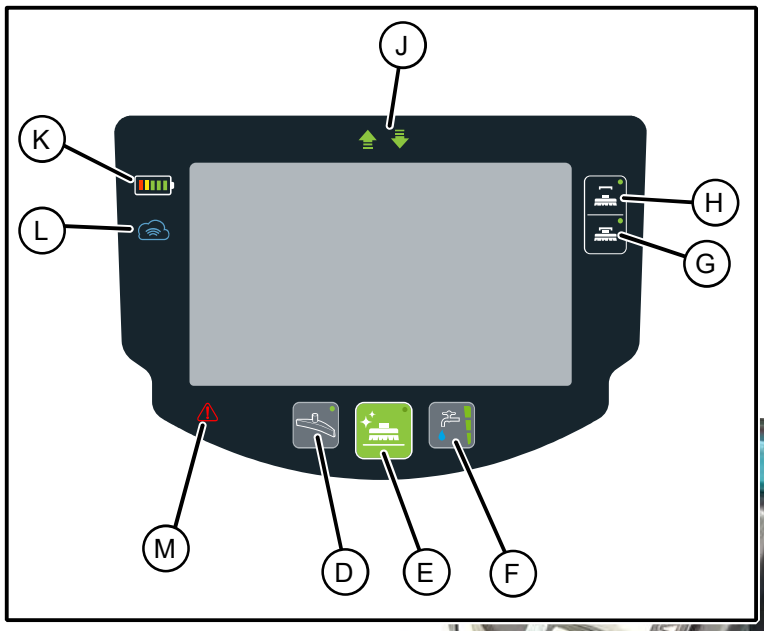
OPERATION

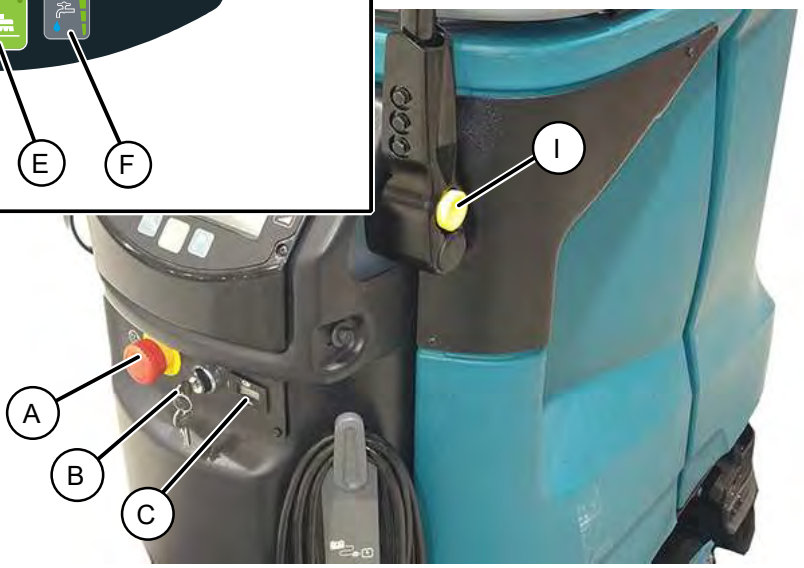
MACHINE COMPONENTS

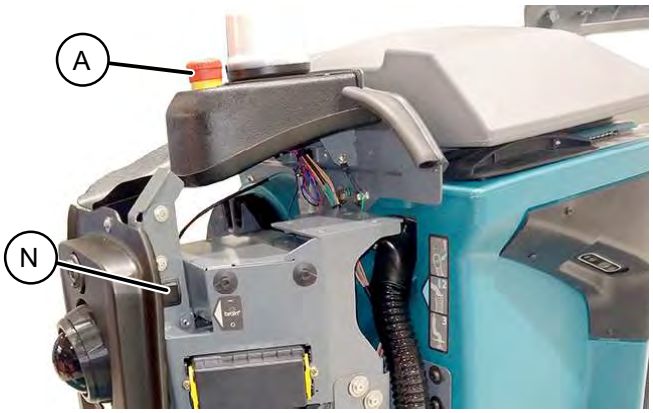


A. Control handle
B. Power assist bail
C. User Interface (UI) touchscreen
D. Control panel
E. On-board battery charger cord hooks
F. On-board battery charger cord
G. Rear squeegee
H. Side squeegee
I. Front cover
J. Battery
K. Flashing light
L. Tank lid
M. Scrub head
N. Perimeter guard
O. Recovery tank
P. Vacuum inlet screen
Q. Recovery tank debris tray
R. Solution tank
S. Solution tank cap
T. Solution tank level/drain hose
U. Recovery tank drain hose
V. Squeegee release handle
W. Service panel locking latch

CONTROLS AND INSTRUMENTS







A. Emergency Stop Button (located on control panel and top of machine)
B. ON/OFF key switch
C. Hourmeter
D. Vacuum fan / squeegee button
E. 1-Step button
F. Solution flow button
G. Insta-Click, brush attach button
H. Insta-Click, brush release button
I. Control handle position release button
J. Machine travel direction indicators
K. Battery discharge indicator
L. Cloud connectivity indicator (Telemetry)
M. Fault indicator
N. BrainOS power switch

CAMERAS AND SENSORS



A. Sensors - Front Camera
B. Sensors - Front 3D LIDAR
C. Sensors - Front Lower LIDAR
D. Sensors - Rear lower LIDAR
E. Sensors - Side 3D camera

MACHINE SETUP

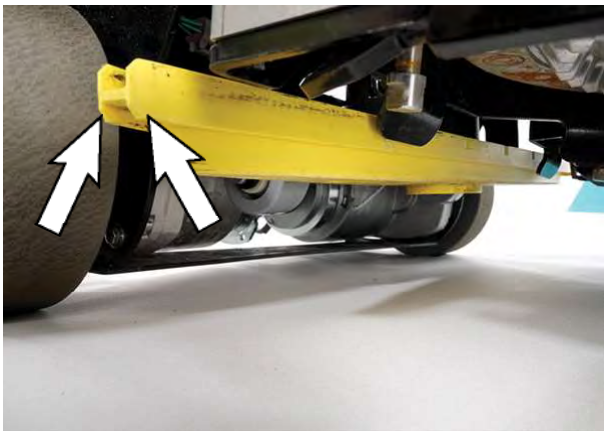
ATTACHING REAR SQUEEGEE

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

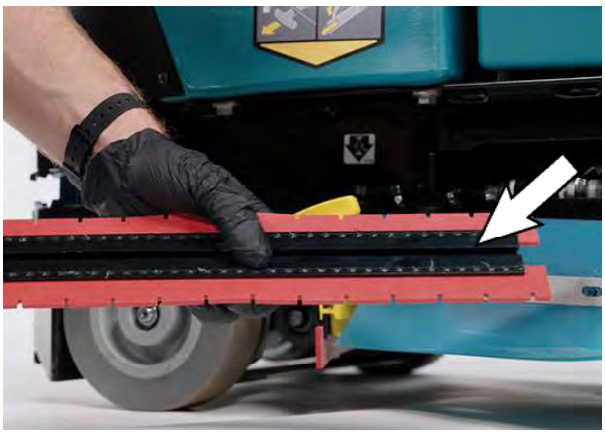
1. Pull on the squeegee release handle to unlock the squeegee.



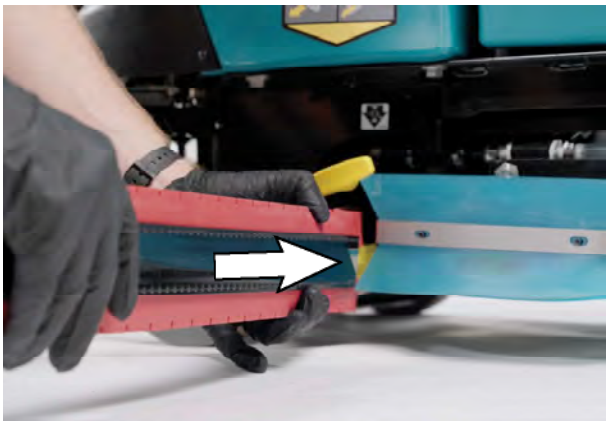
The squeegee assembly has two guides for the squeegees to slide on. The front and rear squeegee guides.



The squeegees have a slot in the middle of them to slide onto the squeegee guides.



2. Slide the front squeegee onto the front squeegee guide.



3. Slide the rear squeegee onto the rear squeegee guide.



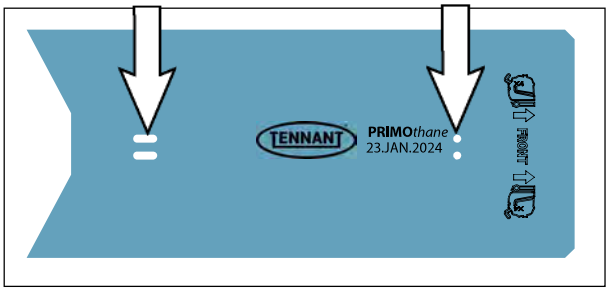
4. Push in on the squeegee release handle to lock the squeegee into position.

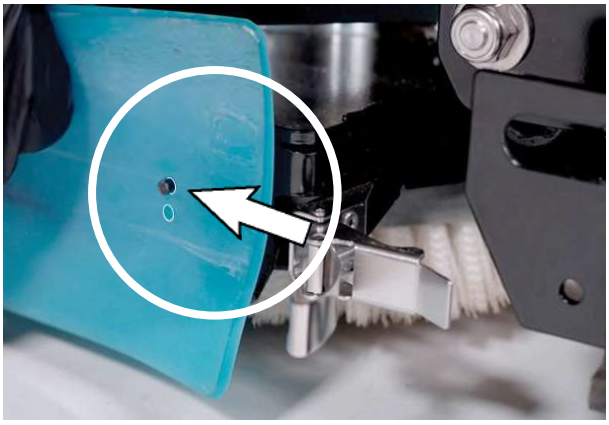


5. Verify the squeegees are locked in place by giving them a slight push or pull along the guide to ensure they do not move.

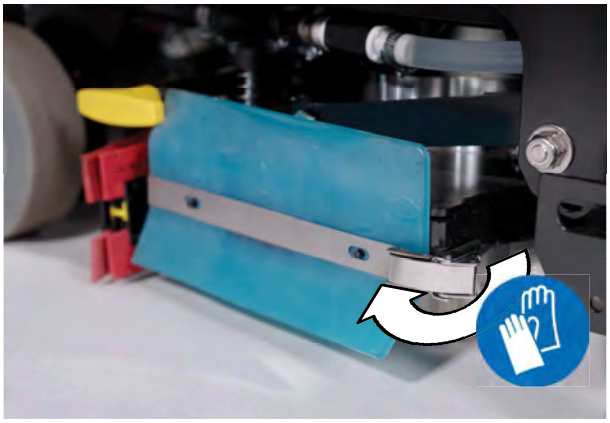
ATTACHING SIDE SQUEEGEES

1. Unlatch the side squeegee retaining band.
2. Install the side squeegee blade. Be sure the top holes in the squeegee blade are hooked onto the tabs on the scrub head.





3. Tighten the rear squeegee retaining band latch.



4. Repeat steps 1 through 3 for the other side.

NOTE: This procedure is for the initial installation of the side squeegees blades with new brushes. For daily maintenance see REPLACING (OR ROTATING) THE SIDE SQUEEGEE BLADES.

INSTALLING BRUSHES / PADS

1. Turn the *ON/OFF key switch* on.



2. Attach the pad to the pad driver before installing the driver.

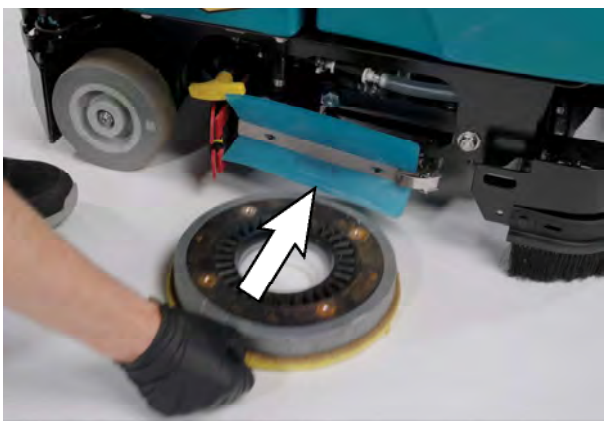




3. Push the new brush or pad driver under the scrub head and lift the brush or pad driver until the magnet holds the brush or pad onto the drive hub.

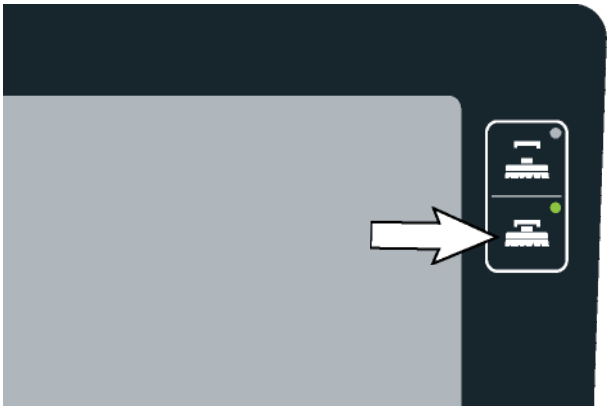
NOTE: Only a portion of the brush or pad driver can be connected to the scrub head while in the raised position. The brush will only totally connect when the brush connect button is pressed and the scrub head lowers.

4. Repeat procedure for the second brush or pad driver on the other side of the machine.



WARNING: Magnetic Field Hazard. Magnetic pad driver/brush can be harmful to those with pacemakers or medical implants.

5. Press the brush connect button to lower the scrub head and fully connect the brushes.



FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

6. As the machine begins robotic operation, observe scrubbing performance to ensure that all components are functioning properly.

BATTERIES

Lithium-Ion batteries must be charged prior to initial use, see CHARGING THE BATTERIES section of the manual.

ATTACHING FRONT PERIMETER GUARD

1. Stop machine on a level surface.
2. Turn the machine *ON/OFF key switch* off.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

3. Place the front perimeter guard underneath the front of the machine.
4. Secure the front perimeter guard on the machine with ten plastic rivets.





FILLING THE SOLUTION TANK

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

1. Press the control handle release button and rotate the handle into one of the two lower positions.



2. Open the tank cover.



3. Remove the solution tank cap.



WARNING: Flammable materials can cause an explosion or fire. Do not use flammable materials in tank(s).

4. Fill the solution tank with water (not to exceed 60°C/140°F) until the water level reaches the required amount on the solution level indicator.





5. Pour a recommended cleaning detergent into the solution tank according to the mixing instructions on the container.

6. Replace the solution tank cap. Close the tank cover.

FOR SAFETY: When using machine, follow mixing and handling instructions on chemical containers.

NOTE: When filling the solution tank with a bucket, make sure that the bucket is clean. Do not use the same bucket for filling and draining the machine.

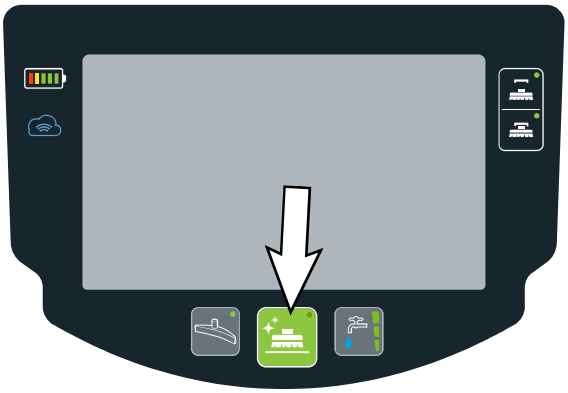
NOTE: Only use recommended cleaning detergents. Machine damage due to improper detergent usage will void the manufacturer's warranty.

OPERATION OF CONTROLS

1-STEP BUTTON

Press the *1-Step button* to activate the scrubbing functions. The scrub head/squeegee assembly lowers and the vacuum fan turns on. The light in the button is luminated.

NOTE: The scrub heads do not start spinning until the machine is propelling forward.



Press the *1-Step button* again to stop scrubbing. The light in the 1-Step button will turn off and the vacuum fan will stop and the scrub head/squeegee assembly rise.

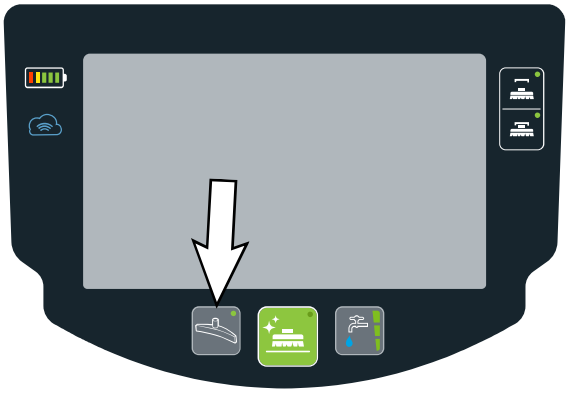
NOTE: The squeegee will remain down and the vacuum fan will remain on for a few seconds to pick up remaining water after the 1-STEP button is deactivated.

FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

NOTE: The Insta-click buttons will not operate while the 1-Step button is activated.

VACUUM FAN / SQUEEGEE BUTTON

Press the *vacuum fan / squeegee button* to lower the scrub head/squeegee assembly and activate the vacuum fan. The indicator light on the button will go on when activated.



Press the *vacuum fan button* again to turn off the vacuum fan and raise the scrub head/squeegee assembly. The indicator light in the button will turn off.

SOLUTION FLOW BUTTON

Under normal soilage conditions the solution flow level should be set to the lowest setting (the bottom light). Under heavy grime conditions, the solution flow level should be set to a higher setting (middle or top lights). Travel speed and floor conditions will affect scrubbing performance.

With the *1-Step button* activated, press the *Solution flow button* to both increase or decrease the solution flow. The solution flow indicator lights display the current solution flow setting.

NOTE: It is recommended that medium or high solution flow levels be used for uncoated or unpolished floors (more porous).

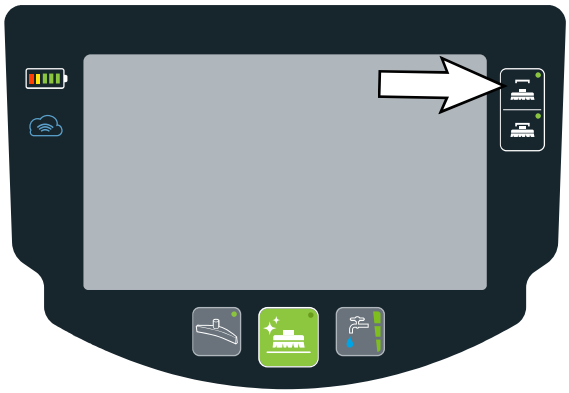


NOTE: The machine will operate for a longer time if the Solution Flow settings are set to lowest setting (bottom lights).

INSTA-CLICK BUTTONS

The machine is equipped with Insta-Click that helps the operator release and attach the brushes and pads to the scrub head.

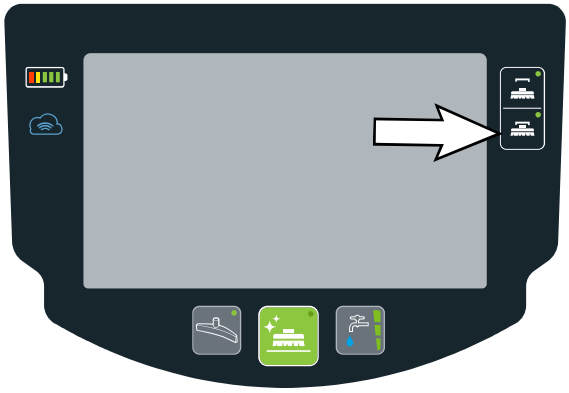
To release the brush or pad from the machine press the Insta-Click brush release button. This will raise the scrub head and release the brush or pad from the scrub head and drop to the floor.



To attach the brush or pad to the machine, slide the brush under the scrub head and lift the brush up onto the scrub head until the magnet in the scrub head connects to the brush.

NOTE: Only a portion of the brush or pad driver can be connected to the scrub head while in the raised position. The brush will only totally connect when the brush connect button is pressed and the scrub head lowers.

Press the Insta-click attach button which will lower the scrub head and slowly spin the scrub head until the brush or pad securely attaches to the scrub head.



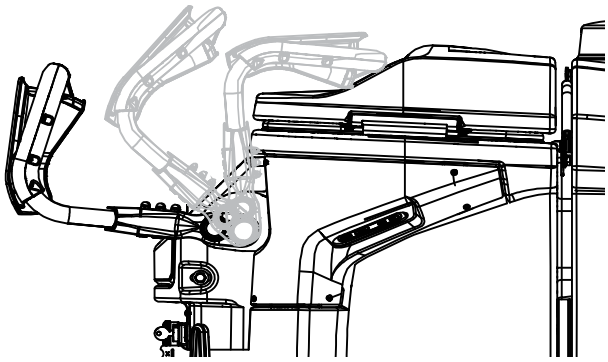
WARNING: Magnetic Field Hazard. Magnetic pad driver/brush can be harmful to those with pacemakers or medical implants.

FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

NOTE: The Insta-click buttons will not operate while the 1-Step button is activated.

CONTROL HANDLE

The adjustable control handle is used to push the machine. It has three locking positions, stowed, which is used for autonomous mode, and a high and lower manual position.



To adjust the control handle, press the control handle button and rotate the handle up or down into desired position. Make sure the control handle button locks into position securing the handle in position.



NOTE: The handlebar must be locked in the stowed position to run a saved route. A notification will appear if the handlebar is in the lowered position.

NOTE: The handlebar must be locked in one of the two lowered positions to teach a route. A notification will appear if the handlebar is in the stowed position.

POWER ASSIST BAIL

The control handle includes a power assist bail. When the operator pushes or pulls on the machine and presses or pulls on the power assist bail, the drive motors of the machine add power to make the machine easier to move. The faster the operator walks, the more assist provided by the drive wheels. Each drive wheel is independent offering drive assist in forward, reverse and while making turns.



Push the machine with the power assist bail to make the machine move forward. The forward arrow illuminates on the control panel



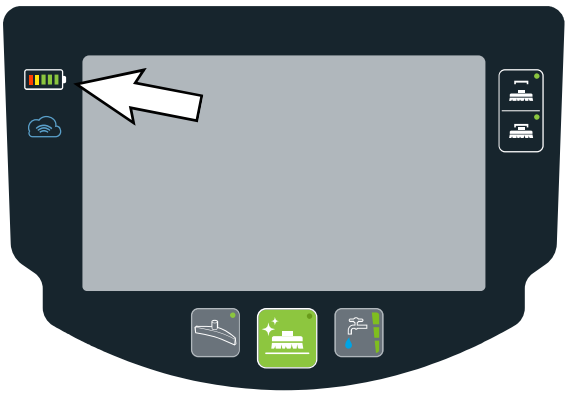
Pull the machine with the power assist bail to make the machine move backwards. The reverse arrow illuminates on the control panel.



NOTE: When the power assist bail is released, the machine will come to a stop and the automatic parking brake will engage.

BATTERY DISCHARGE INDICATOR

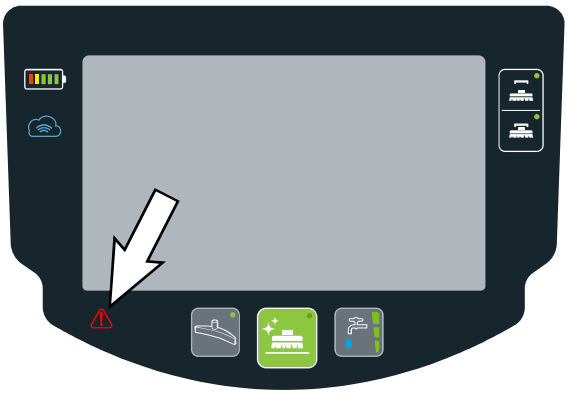
The battery discharge indicator (BDI) displays the charge level of the batteries while the machine is operating. When the batteries are fully charged, all five indicators are lit. When the discharge level reaches the red light, stop scrubbing and recharge the batteries. When the red light begins to flash, the scrub function will be disabled to protect the batteries from total discharge. The machine will still propel when the red light is flashing. This will allow user to transport the machine to the charging station.



NOTE: Once the scrub function is disabled (flashing red light), the propel run time is limited to 15 minutes before machine power completely shuts down. Do not store the machine for a long period at this discharged level, the battery may further discharge to a level that is unrecoverable.

SERVICE INDICATOR

When the machine or on-board battery charger detects a fault, the service indicator will light up and begin flashing (Figure 46). The battery discharge indicator lights will also flash a fault code. See SERVICE INDICATOR CODES to diagnose machine fault.



EMERGENCY STOP BUTTONS

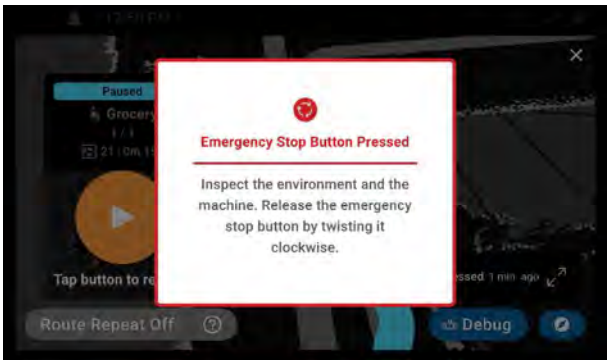
This machine is equipped with two *Emergency Stop buttons*, one near the control panel and one on top of the machine. Use the *Emergency Stop buttons* only in emergency situations, as solution could be potentially released from the squeegee vacuum hose and onto the floor, creating a slipping hazard.

NOTE: These buttons should not be used for normal stopping, as premature wear to the parking brake and/or drive system may occur.

Press either *Emergency Stop button* in an emergency to halt the machine power.



Immediately after either *Emergency Stop button* is pushed the Emergency Stop Button Pressed screen will appear on the *UI touchscreen*. Follow the instructions on the *UI touchscreen.*



Twist the *Emergency Stop button* used to stop the machine clockwise to disengage the emergency stop function. The Emergency Stop Button Released screen appears on the *UI touchscreen* immediately after the *Emergency Stop button* is disengaged. Touch CONFIRM.

If the *Emergency Stop button* was pressed when the machine was on a robotic route, press the *start/pause button* to resume scrubbing in the robotic mode. As the machine begins robotic operation, observe scrubbing performance to ensure that all components are functioning properly.

If the *Emergency Stop button* was pressed when the machine was in the manual mode or when teaching a new route, press the *1-Step button* and resume operating the machine in the manual mode or teaching the new route.

NOTE: When teaching the machine, the 1-Step button must be pressed before beginning to teach the machine after the Emergency Stop button is disengaged. The 1-Step button is automatically turned off when the Emergency Stop button is engaged and must be turned back on to continue teaching the machine.

MACHINE HOUR METER

The *hour meter* records the number of hours the machine has been operated. This information is useful for servicing the machine. The *hour meter* is located next to the machine key switch.



FLASHING LIGHT

The flashing light alerts pedestrians of the presence of the machine and informs the operator of the status of the machine. The flashing light will blink briefly when the machine starts.

When the machine is in autonomous mode the light slowly flashes blue. The light will flash red if the machine has an error, fault, or e-stop. Once the error or fault is corrected or the e-stop is turned off, the light will flash blue once returned to autonomous mode.

When the machine is in manual mode the light does not flash. When the machine is charging the light flashes green. When charging is complete the light illuminates solid green. The light will also flash green while attaching/detaching the brushes or pads.

When the machine is being serviced in service mode, the light will illuminate solid white.



SERVICE PANEL LOCKING LATCH

The front cover service panel has a locking latch to ensure the latch remains closed while the machine is running in autonomous mode. Use a phillips head screw driver to lock/unlock the front cover service panel.

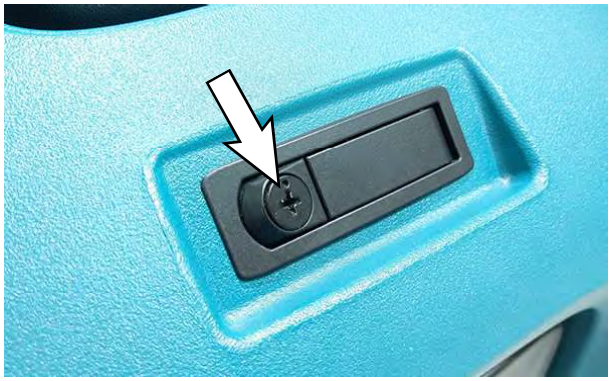


Turn the lock clockwise to lock the latch.

Turn the lock counterclockwise to unlock the latch.



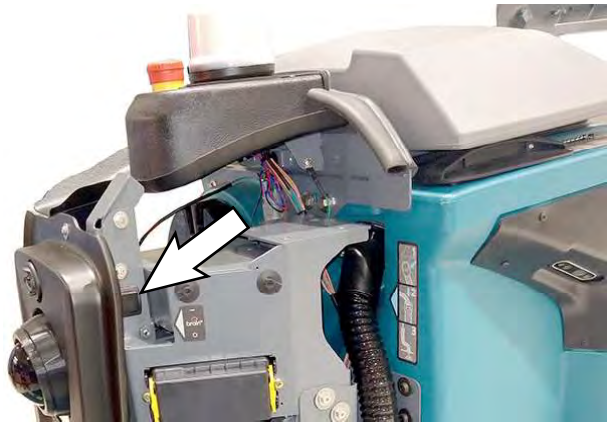
Press on the latch button to open the latch.



FOR SAFETY: Before starting machine make sure all covers are closed, latched, and locked.

BRAIN OS POWER SWITCH

The Brain OS power switch is located under the front service panel of the machine and turns on/off the autonomous features of the machine. These features include the *User Interface touchscreen*, the machine's connectivity to the Brain OS mobile app, and the machine's connection to the battery discharge indicator. The machine can be run in manual mode with the Brain OS switch off.



NOTE: When the Brain OS power button is turned off the User Interface touchscreen will not come on and the battery discharge indicator will flash repeatedly.

Press the top of the switch to turn the Brain OS power on.



Press the bottom of the switch to turn the Brain OS power off.

NOTE: Ensure the Service Panel latch is locked before operating the machine. See SERVICE PANEL LOCKING LATCH.

USER INTERFACE (UI) TOUCHSCREEN

The *User Interface (UI) touchscreen* is located in front of the control handle. The *UI touchscreen* provides access to all the machine robotic operation controls, battery, solution tank, and recovery tank alerts. When a maintenance task requires immediate attention, an alert is triggered and appears on the *UI touchscreen*.

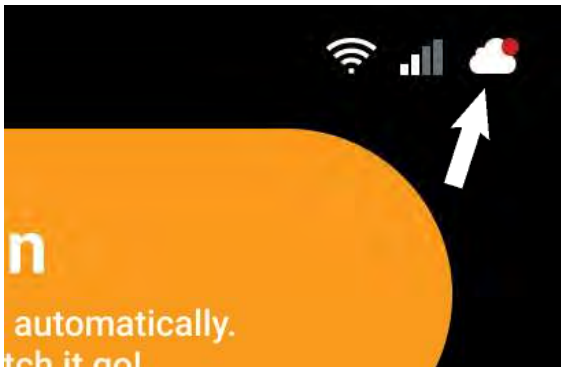


When the machine is turned on, the Brain OS software will automatically initialize.

ROC: ROBOT OPERATIONS CENTER
(BrainOS Software)

The BrainOS software provides access to the Brain Corps Robotic Operations Center, also known as the ROC. The ROC is a cloud-based robot operations center, managed by Brain Corp. technicians, that enhances the machine abilities by providing monitoring and analysis. The ROC is connected through the BrainOS mobile app from the Google Play store or the App store on iOS. See *CONNECTING A PHONE WITH THE ROC.*

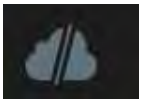
New versions of the software are automatically uploaded to the machine.



The *ROC indicator* is located on the *UI touchscreen* status bar. When the indicator is illuminated, the machine is successfully connected to the ROC. If the indicator is gray, the ROC is not connected and cannot be paired with a cell phone.



Connected



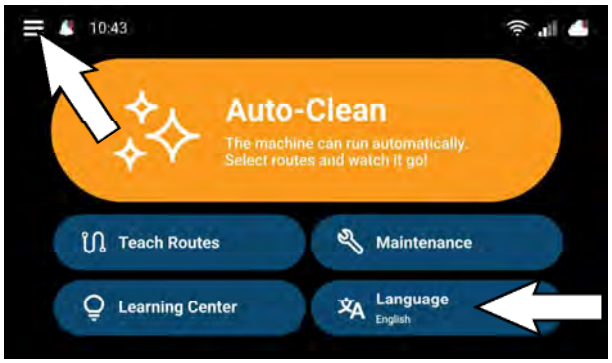
Not Connected

BRAINOS SOFTWARE

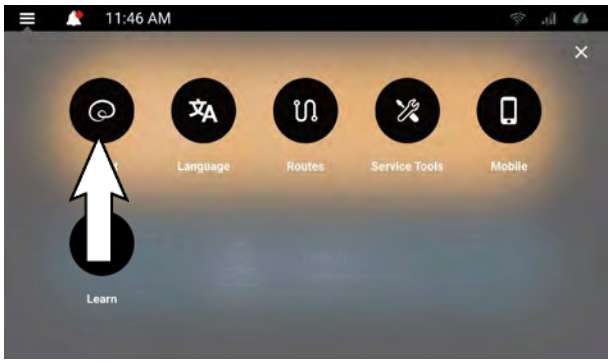
Over-the-air updates allow new versions of BrainOS software to be automatically downloaded remotely over the built in modem. This capability ensures that the machine has the latest BrainOS software, which is important for implementing new features and improvements.

It is critical that all machines have the latest version of BrainOS software installed. To check the version of BrainOS software:

1. Turn the *ON/OFF key switch* on. Allow the BrainOS to start up (approximately 1 minute). The *UI touchscreen* displays the main menu. Touch SETTINGS menu icon or the LANGUAGE icon.



2. Within the SETTINGS menu, touch ABOUT.



The About menu defaults to the Machine Info tab.



3. Touch Software Info.



4. The software information is display.



5. Scroll for more information.



HOW THE MACHINE WORKS

The scrub components of the machine are a solution tank, scrub brushes or pads, a squeegee, a vacuum fan, and a recovery tank.

The buttons on the control panel control the machine scrubbing functions. The 1-Step button activates all scrubbing functions. The vacuum fan will come on and the scrub head will lower. When the machine is pushed the scrub heads spin and the solution begins to flow. The *vacuum fan/squeegee button* turns the vacuum fan on/off and raises and lowers the squeegee. The solution buttons control the solution flow. Adjustments to these buttons are recorded when teaching a route.

The operator pushes/pulls the machines control handle and power assist bail to control the path of the machine. The faster the operator pushes/pulls the machine the more assist the drive wheels offer to control the speed of the machine. The scrub heads stop spinning and the solution flow stops when the machine is pulled backwards. When the operator stops pushing and releases the power assist bail, the machine stops and engages the parking brake.

NOTE: The amount and type of soilage play an important role in determining the type of brushes or pads to use. For specific recommendations, see the BRUSH INFORMATION section of this manual or contact a Tennant representative.

The machine is equipped with BrainOS software that is accessible via the *User Interface (UI) touchscreen*, also known as the *UI touchscreen*. BrainOS technology offers a robotic mode feature that provides the ability for the machine to perform floor cleaning by following one of the saved navigation routes without direct, real-time operator control. The machine can only operate in robotic mode in areas where cleaning routes have been taught and saved. The machine can be taught standard cleaning routes or an Area Fill route, where the operator teaches the perimeter of an area and the machine determines the best route to complete cleaning the area. The *UI touchscreen* allows an operator to teach a new cleaning route, run an existing cleaning route robotically, access triggered alert messages, and more. It also provides constant visibility to current battery life and ROC connection status.

Home location codes must be permanently installed before the machine can be used in robotic mode. A home location code is a unique code identifier that the machine scans to determine its current location, as well as any routes that have been saved to that specific home location code. The machine is designed to work with up to 5 home location codes. Each home location code can store up to 26 routes for a total of 130 routes.

CONVENTIONAL SCRUBBING

Water and detergent from the solution tank flow to the floor through a solution system. The brushes use the detergent and water solution to scrub the floor clean. As the machine propels forward, the squeegee wipes the dirty solution from the floor. The suction created by the vacuum fan then draws the dirty solution from the squeegee into the recovery tank.

BRUSH INFORMATION

For best results, use the appropriate brush or pad for the cleaning application. Listed below are brushes and pads and the applications for which each is best suited.

NOTE: The amount and type of soilage play an important role in determining the type of brush or pad to use. Contact a Tennant representative for specific recommendations.

Polypropylene brush - General purpose polypropylene bristles lift lightly compacted dirt without scuffing high-gloss coated floors.

Nylon brush - Softer nylon bristles are recommended for scrubbing coated floors. Cleans without scuffing.

Scrubbing pad (Blue) - For medium to heavy-duty scrubbing. Removes dirt, spills, and scuffs.

Buffing pad (Red) - For light duty scrubbing without removing floor finish.

Polishing pad (White) - For maintaining highly polished or burnished floors.

Polishing pad (Yellow) - For cleaning and gradual polishing with repeated use.

Grip pad driver - The grip-face backing allows pads to be fully used and holds pads in place without penetrating the pad. The magnet-activated centering device works with all Tennant pads and allows for fast, easy pad replacement.



MACHINE OPERATION

PRE-OPERATION CHECKLIST

- ☐ Check the machine for fluid leaks.
- ☐ Check the tank cover seals for damage and wear.
- ☐ Check the condition of the scrubbing brushes. Remove any string, banding, plastic wrap, or other debris wrapped around them.
- ☐ Check the squeegees for damage and wear.
- ☐ Check the perimeter guard, and perimeter guard bristles for debris, damage, and wear.
- ☐ Check the vacuum hose for debris or blockage.
- ☐ Drain and clean the recovery tank.
- ☐ Check the brakes and steering for proper operation.
- ☐ Check the service records to determine maintenance requirements.
- ☐ Check the front and side 2D and 3D cameras and the upper and lower LIDAR sensors for dirt, dust, and smudges. Use provided microfiber cloth to clean all cameras and LIDAR sensors.
- ☐ Check the horn, safety lights, and audible alarms (if equipped).
- ☐ Make sure all covers are closed, latched, and locked.

WHILE OPERATING THE MACHINE (ROBOTIC MODE/MANUAL MODE)

Pick up rugs, obstructions, and oversized debris before scrubbing. Pick up wire, string, twine, large pieces of wood, or any other debris that could become wrapped around or tangled in the brushes.

Push the machine in as straight of a path as possible. Avoid bumping into posts or scraping the sides of the machine. Overlap the scrub paths by several centimeters (a few inches).

Adjust the machine speed, brush pressure, and solution flow as required when scrubbing. Use the minimal brush pressure and solution flow settings as possible.

If poor scrubbing performance is observed, stop scrubbing and refer to MACHINE TROUBLESHOOTING.

Perform the Daily Maintenance Procedures after scrubbing (see MACHINE MAINTENANCE).

Push the machine slowly on inclines. Use the control handle to control machine speed on descending inclines. Scrub with the machine up inclines rather than down inclines. Do not teach a robotic route on an incline or decline.

FOR SAFETY: When using machine in manual mode, go slowly on inclines and slippery surfaces.

FOR SAFETY: When using machine, place proper floor cleaning signage in areas where the machine is operating and people are present, in accordance with standard floor cleaning practices. Follow site safety guidelines concerning wet floors.

See Autonomous Navigation Software End User License Agreement (EULA) for further uses and restrictions.

Do not operate machine in areas where the ambient temperature is above 40° C (104° F). Do not operate scrubbing functions in areas where the ambient temperature is below 2° C (38° F).

FOR SAFETY: When using machine in manual mode, do not scrub on ramp inclines that exceed 2% / 1° grade or transport (GVWR) on ramp inclines that exceed 2% / 1° grade.

FOR SAFETY: While machine is operating in robotic mode, only scrub flat, hard surfaces with 2% or less incline.

To protect the lower LIDAR sensor from being damaged from passersby, shopping carts, etc... always park the machine with the front end facing a wall or barrier.

WHILE OPERATING THE MACHINE (ROBOTIC MODE ONLY)

This machine should only be used to scrub flat, hard surfaces with 2% or less incline when operating in robotic mode.

The machine is not designed or intended for use in environments requiring fail-safe performance including, but not limited to, any application where machine failure could lead to personal injury or property damage.

SCRUBBING - MANUAL MODE

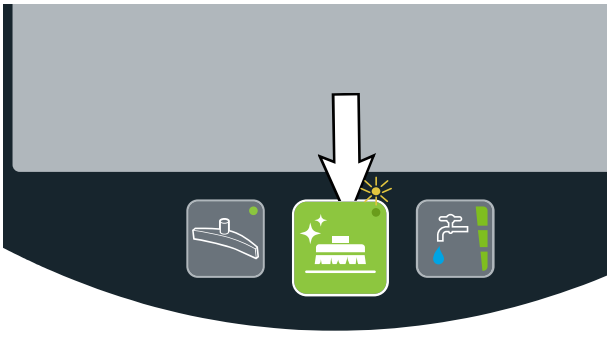
FOR SAFETY: Do not operate machine, unless operator manual is read and understood.

1. Turn the *ON/OFF key switch* on.

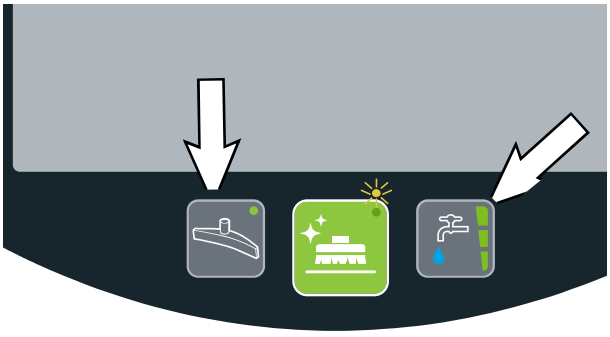


NOTE: If the Brain OS power button is not turned on the UI touchscreen will not display and the battery discharge indicator with flash repeatedly indicating no autonomous features are available.

2. Lower the control handle to one of the two lowered positions.
3. Press the *1-Step button*. The light in the button is illuminated. All the preset scrubbing functions will turn on.



4. Adjust the preferred scrubbing settings as required.



5. Push on the machine and power assist bail to go forward to start scrubbing.

WARNING: Flammable materials or reactive metals can cause an explosion or fire. Do not pick up.



NOTE: Pulling back on the machine handle and power assist bail for reverse will turn off the scrub heads and solution flow temporarily until the machine resumes propelling forward.

6. Hold the power assist bail and push harder and walk faster to increase the machine speed. Walk slower to decrease the machine speed.
7. Press the 1-Step button and release the bail to stop scrubbing.

NOTE: The squeegee will remain down and the vacuum fan will remain on for a few seconds to pick up remaining water after the 1-STEP button is deactivated.

NOTE: When the power assist bail is released, the machine will come to a stop and the automatic parking brake will engage.

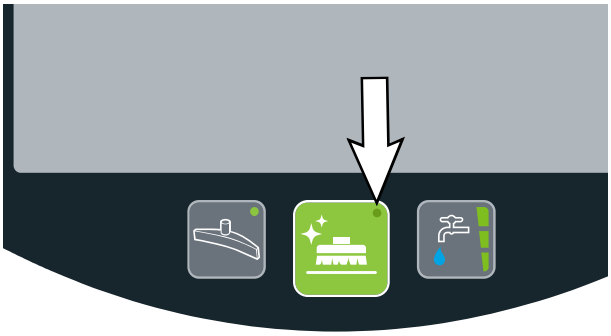
FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

8. Turn key off.

WATER PICKUP MODE (NO SCRUBBING)

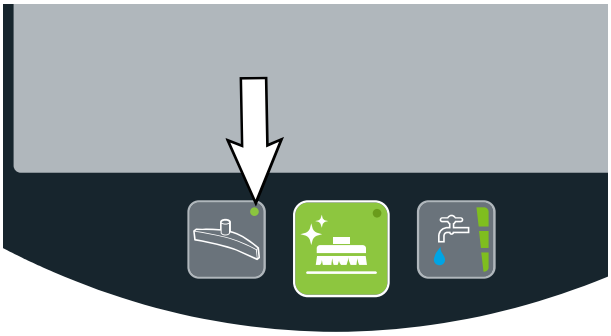
The machine can be used to pick up water or non-flammable liquid spills without scrubbing.

To pick up water or non-flammable liquid spills, check to make sure that the *1-Step button* is not activated. The light in the *1-Step button* must be off.



WARNING: Flammable materials or reactive metals can cause an explosion or fire. Do not pick up.

Then press the *vacuum fan/squeegee button*. The light in the *vacuum fan/squeegee button* will illuminate, the scrub head/squeegee assembly will lower and the vacuum fan will start operating. Then pick up the water or non-flammable liquid spill.



SCRUBBING - ROBOTIC MODE

FOR SAFETY: Do not operate machine, unless operator manual is read and understood.

ESTABLISH HOME LOCATION CODES

Home location codes must be permanently installed before using the machine in robotic mode. A home location code is a unique bar code identifier that the machine scans to determine its current location, as well as any routes that have been saved to that specific home location code. The machine is designed to work with up to 5 home location codes, and each home location code can store up to 26 routes for a total of 130 routes.

Home location codes are used to establish the start and end point of a cleaning route. The number of home location codes needed may vary, depending on the size of the space where the machine will be operating in robotic mode.

- Multiple home location codes may be necessary for large or unusually mapped areas where more than 26 cleaning routes are needed.
- Establish a unique home location code for each floor of a multi-level building.
- Install home location codes in a permanent location on an open wall or column near commonly cleaned areas that do not change from day-to-day. If the home location code is moved even slightly, the route may not be performed correctly.
- Install home location codes at a height of 30 in. (7500 mm) from the floor.



- Install home location codes so that the machine can easily scan with the front camera at a distance of no less than 24 in. (610 mm).



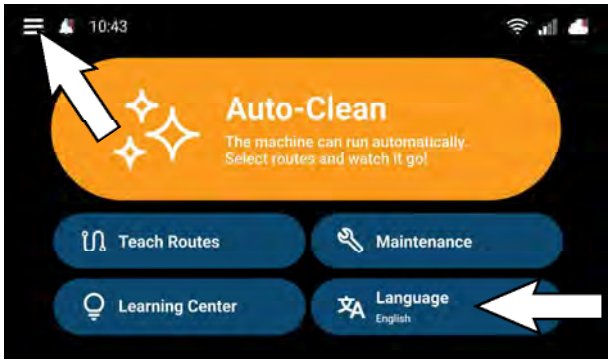
- Securely affix home location codes to the wall.
- The entire home location code must be clearly visible, not hidden behind furniture or shelving.
- Do not install home location codes near stairways, fire exits, or fire, first aid, or emergency equipment.
- Do not photocopy, laminate, or place home location codes in a glossy sleeve or cover. Doing so may prevent the machine from being able to scan the code.

NOTE: If a home location code is lost or damaged, additional home location codes are available. Contact customer service for a replacement.

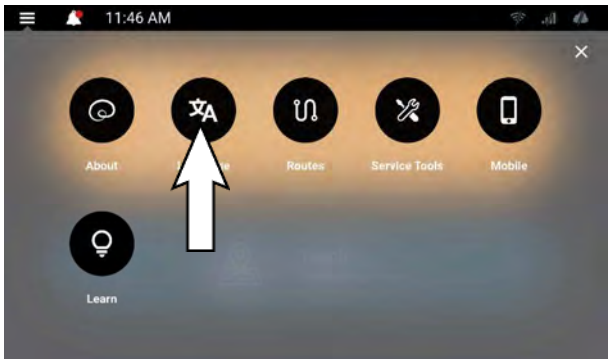
CHANGING REGION / LANGUAGE

The *UI touchscreen* can be set to display a variety of languages. English is the default language.

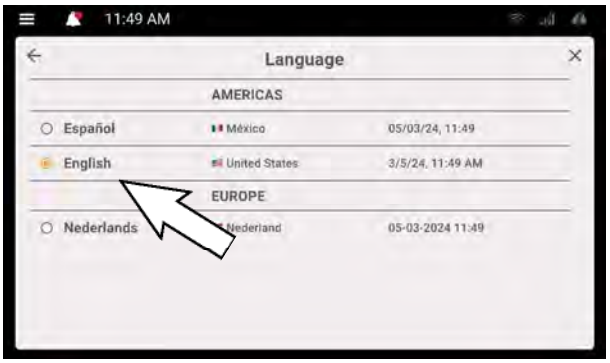
1. Turn the *ON/OFF key switch* on. Allow the BrainOS to start up (approximately 1 minute). The *UI touchscreen* displays the main menu. Touch SETTINGS menu icon or the LANGUAGE icon.



2. Within the SETTINGS menu, touch LANGUAGE.



3. Select the desired language.

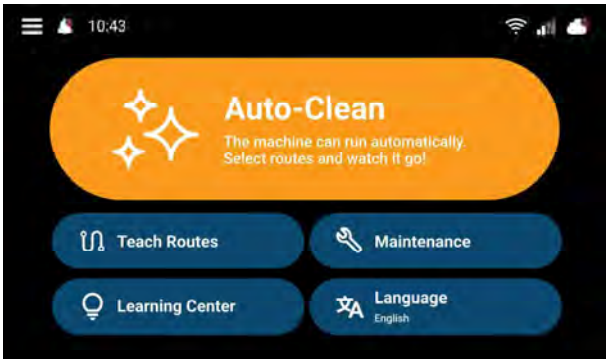


4. The menus are now displayed in the selected language.

POSITIONING THE MACHINE AT THE HOME LOCATION CODE

The machine must be positioned so the front camera can scan the home location code. The machine cannot be operated in robotic mode until a home location code is scanned and recognized.

1. Touch the applicable task (Auto-Clean or Teach Routes).



2. Push the machine to the desired home location code, positioning the machine so the front camera is no less than 24 in. (610 mm) from the home location code.

NOTE: Only use home markers provided with the machine, previous home markers are not recognized by the machine.

3. The machine automatically begins scanning the home location code, as shown on the *UI touchscreen*. If the machine is unable to scan the home location code, the *UI touchscreen* will display an error message with messages how to resolve.



NOTE: A flashlight can be used in dark and low light areas to help the machine see and scan the home location code.

NOTE: Do not stand in front of the machine front camera when it is trying to scan the home location code.

4. If running a route, a **Success! Choose a route to start cleaning** message briefly appears on the *UI touchscreen* after the machine successfully scans the home location code.

   If teaching a route, a **Success! Choose a box to save your route to** message briefly appears on the *UI touchscreen* after the machine successfully scans the home location code.

NOTE: Do not drive the machine before selecting an option from the UI touchscreen. If the machine is driven after scanning the home location code but before selecting the next option, a warning message will appear on the UI touchscreen stating, Please do not move the robot after homing.

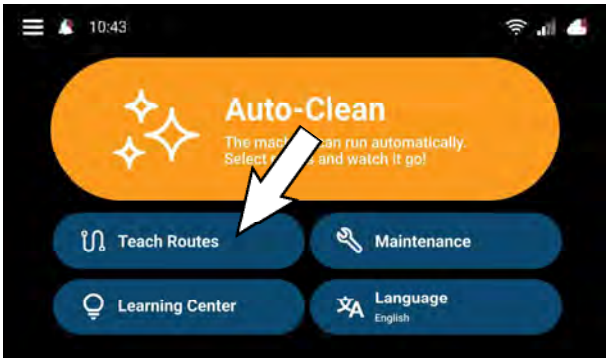
TEACHING A NEW ROUTE (BrainOS Software)

Things to consider before teaching a robotic route:

- The machine can only operate in robotic mode in areas where cleaning routes have been taught and saved.
- The machine can be taught two different types of cleaning procedures, a cleaning *Route* or an *Area Fill*.
- A route that takes 1 hour to teach can take the machine up to 2 hours to complete in robotic mode. When operating in robotic mode, the maximum speed is approximately 2.5 mph (4.0 Km/h). Routes longer than 1 hour are not recommended due to water and battery capacity. For best performance, split large cleaning routes into multiple smaller cleaning routes.
- Avoid teaching routes near sudden drops in floor surfaces, stairs, loading docks, or ramps. Maintain a safe distance of approximately 18 in. (457 mm) from such areas when teaching the machine a new route.
- Use barriers as needed positioned so they can be detected by machines sensors. The barriers should be 5.5 in. (140 mm) to 8.5 in. (220 mm) from the ground and at least 4 in. (100 mm) or more wide. Make sure multiple barriers are no wider than the width of the machine.
- If a route is taught in an area with obstructions that are later removed, the machine will not clean the areas where the obstructions were previously located.
- Avoid teaching routes in areas with highly polished/reflective surfaces, plexiglass, or reflective black surfaces since such surfaces are difficult for the machine to detect.
- Avoid teaching routes where there is excessive sunlight on the floor surface. Sunlight reflections on the floor surface could adversely affect robotic machine performance.
- Avoid teaching routes in areas with overhanging or protruding objects. These objects may not be detected when the machine is operating or making sharp turns

Teaching the machine a new robotic route:

1. Turn the *ON/OFF key switch* on. Allow the BrainOS to start up (approximately 1 minute). The UI Touchscreen displays the main menu.
2. Position the control handle into one of the two lowered positions.
3. Touch TEACH ROUTES.

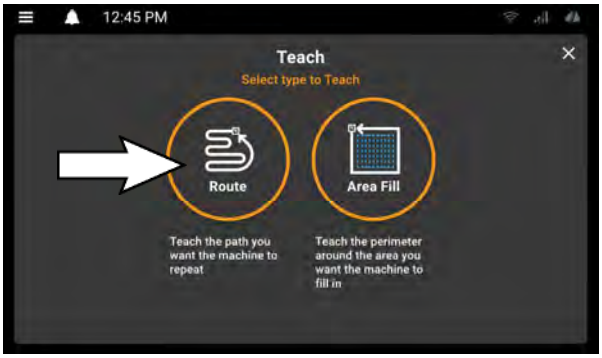


4. Select the type of route to teach, ROUTE or AREA FILL.

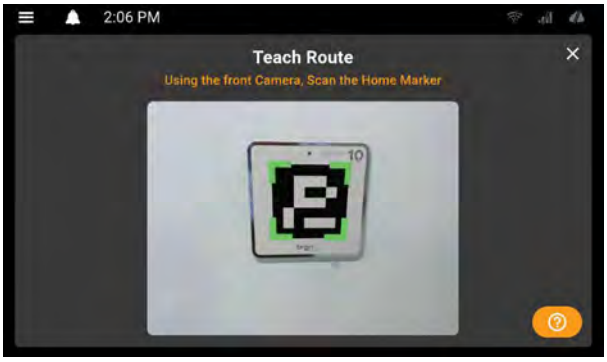


TEACHING A ROUTE

1. Touch ROUTE.

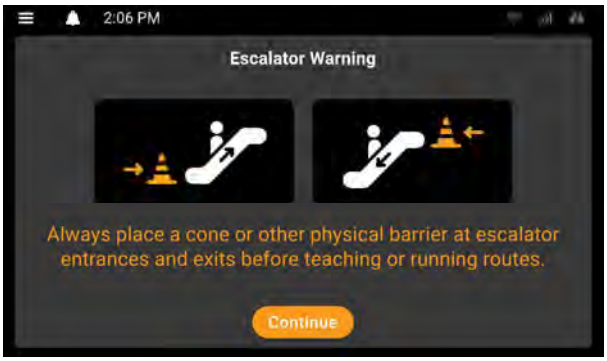


2. Push the machine to the desired home marker, positioning the machine so the front camera is no less than 24 in (610 mm) from the home marker. See POSITIONING THE MACHINE AT THE HOME MARKER.

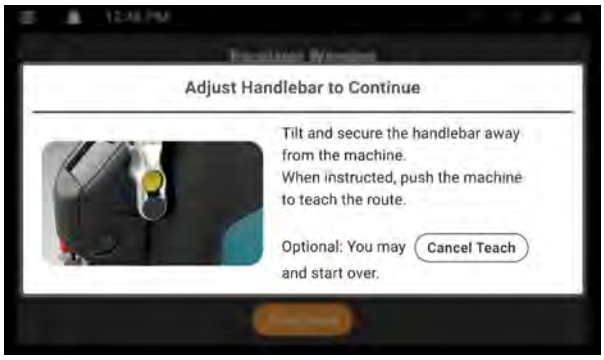


3. The machine automatically begins scanning the home marker, as shown on the *UI touchscreen*. If the machine is unable to scan the home marker, the *UI touchscreen* will display an error message with suggestions on how to resolve.

4. Upon successful scanning of a home marker, the UI touchscreen displays an Escalator Warning. Touch CONTINUE.

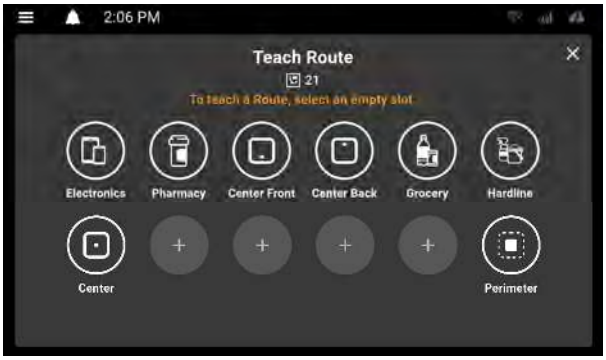


NOTE: The handlebar must be locked in one of the two lowered positions to teach a route. A notification will appear if the handlebar is in the stowed position.

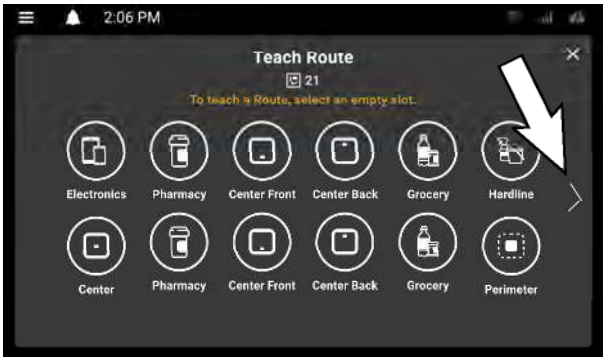


5. Touch one of the available routes to select.

NOTE: If no routes are available, an existing route must be deleted in order to teach a new route. See EDIT / DELETING ROUTES.



NOTE: Each home marker can save up to 26 routes. Twelve routes are displayed on a home marker route window. Use the window arrows to navigate to other selections.



6. Enable the 1-Step button and select the desired cleaning options.

NOTE: If the 1-Step button is not pressed, the route will be saved with no cleaning systems engaged.

7. Push the machine through the entire cleaning route to be saved. The *Teach Route - The machine will learn as you go* screen displays as you record the route along with the amount of time spent on the route so far.



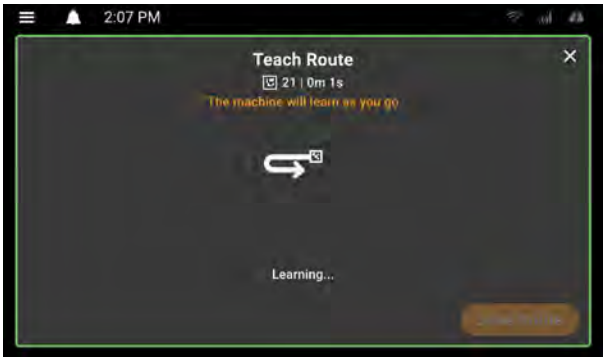
NOTE: When teaching a new route with a non-scrubbable area, press the 1-Step button approximately 120 in (3048 mm) prior to reaching the area to raise the scrub head and squeegee. Press the 1-Step button again to lower the scrub head and squeegee when past the area. The BrainOS navigation software will remember where in the route the cleaning systems were lifted and lowered when operating in robotic mode.

NOTE: Avoid U-turns. The machine requires a minimum of 54 in (1371 mm) to perform a U-turn.

NOTE: Avoid tight corners. The machine requires a minimum of 36 in (914 mm) to navigate a corner.

NOTE: Avoid narrow spaces. The machine requires a width of 28 in (711 mm) to navigate aisles and between displays.

FOR SAFETY: While machine is operating in robotic mode, only scrub flat, hard surfaces with 2% or less incline.



8. Resume teaching the new route ending it at the home marker or select the close icon in the right corner of the UI screen to close the window and stop teaching the route.

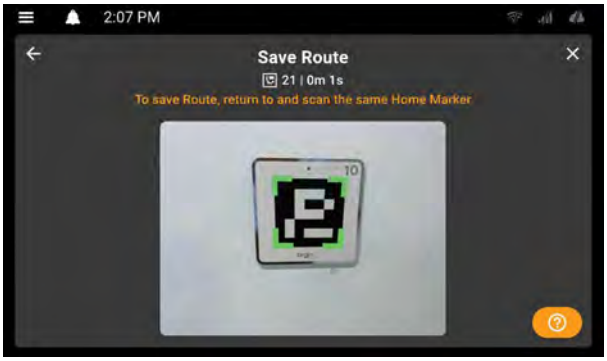
NOTE: If cancelling the new route, touch CANCEL on the UI touchscreen. The UI touchscreen states **Cancel Teach?** *Touch Yes to cancel the route and return to the main menu. Touch No to return to teaching the new route.*

9. When cleaning route is complete, select the *Save Route* button.

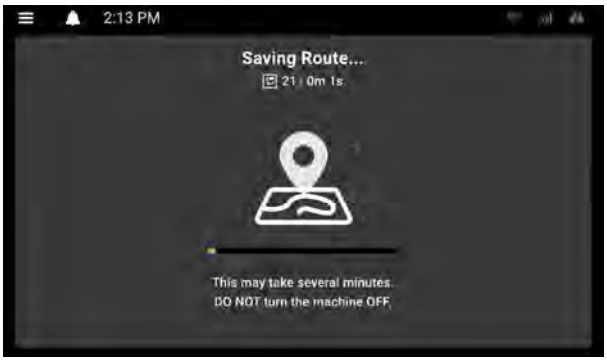


10. Return to the home marker and rescan it to save the route.

NOTE: A new cleaning route cannot be saved until the machine scans the same home marker a second time in the same physical location.



11. The *Save Route...* screen is displayed while the route is saved.



NOTE: If the UI touchscreen states **Route Failed to Save***, touch TEACH to repeat the entire procedure to teach the cleaning route.*

NOTE: If the machine reads an incorrect home location an error will display along with a message instructing what home location to go to.

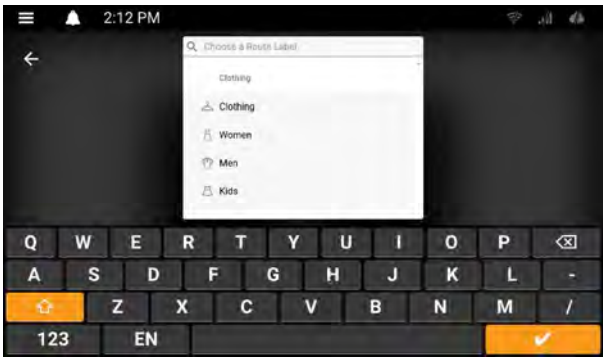
12. When the route is successfully saved, select either the *Done* button or *Edit Label* button to give the route a name.



NOTE: Selecting SAVE without assigning a label to the route will display the default <NO LABEL>. name to the saved route.

13. Enter a name for the saved route.

NOTE: Route labels can have a maximum of 40 characters.



14. Route saved with new name.

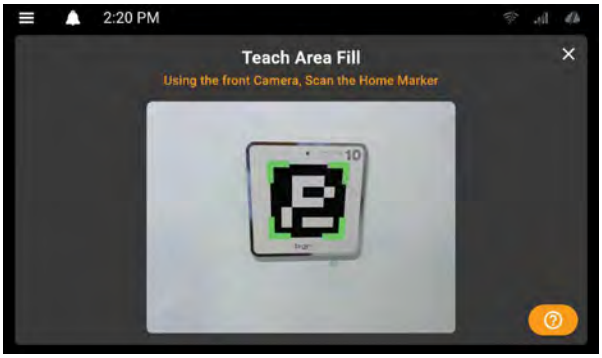


TEACHING AN AREA FILL

1. Touch AREA FILL.

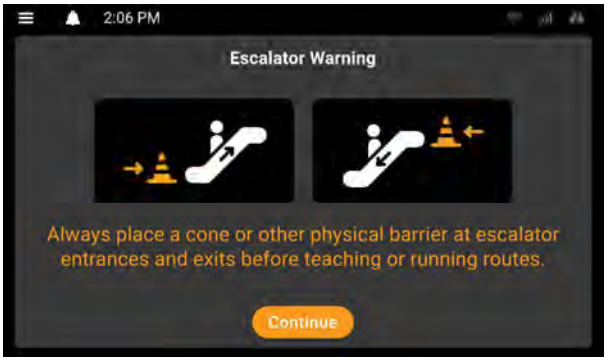


2. Push the machine to the desired home marker, positioning the machine so the front camera is no less than 24 in (610 mm) from the home marker. See POSITIONING THE MACHINE AT THE HOME MARKER.

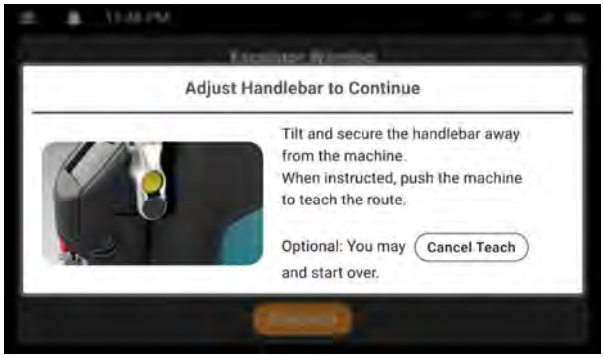


3. The machine automatically begins scanning the home marker, as shown on the *UI touchscreen*. If the machine is unable to scan the home marker, the *UI touchscreen* will display an error message with suggestions on how to resolve.

4. Upon successful scanning of a home marker, the UI touchscreen displays an Escalator Warning. Touch CONTINUE.

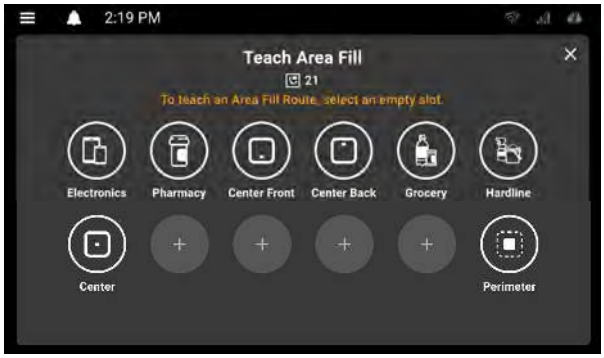


NOTE: The handlebar must be locked in one of the two lowered positions to teach a route. A notification will appear if the handlebar is in the stowed position.

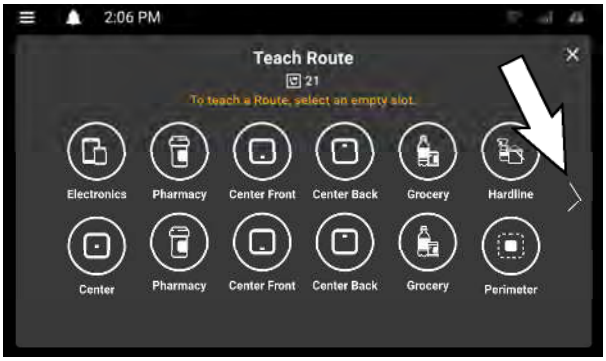


5. Touch one of the available routes to select.

NOTE: If no routes are available, an existing route must be deleted in order to teach a new route. See EDIT / DELETING ROUTES.



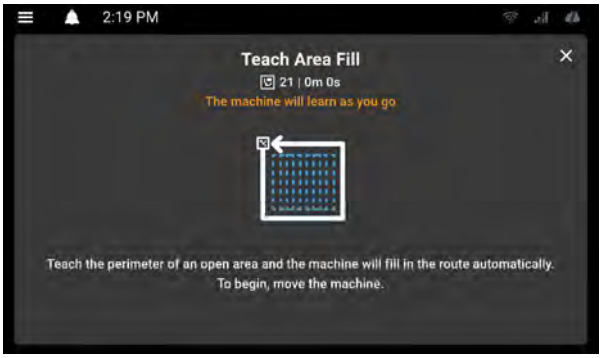
NOTE:Each home marker can save up to 26 routes. Twelve routes are displayed on a home marker route window. Use the window arrows to navigate to other selections.



6. Enable the 1-Step button and select the desired cleaning options.

NOTE: If the 1-Step button is not pressed, the route will be saved with no cleaning systems engaged.

7. Push the machine around the perimeter of the area to be cleaned. The *Teach Area Fill - The machine will learn as you go* screen displays as you record the route along with the amount of time spent on the route so far.



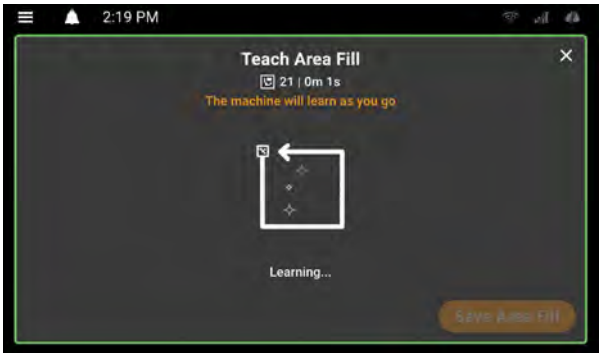
NOTE: When teaching a new route with a non-scrubbable area, press the 1-Step button approximately 120 in (3048 mm) prior to reaching the area to raise the scrub head and squeegee. Press the 1-Step button again to lower the scrub head and squeegee when past the area. The BrainOS navigation software will remember where in the route the cleaning systems were lifted and lowered when operating in robotic mode.

NOTE: Avoid U-turns. The machine requires a minimum of 54 in (1371 mm) to perform a U-turn.

NOTE: Avoid tight corners. The machine requires a minimum of 36 in (914 mm) to navigate a corner.

NOTE: Avoid narrow spaces. The machine requires a width of 28 in (711 mm) to navigate aisles and between displays.

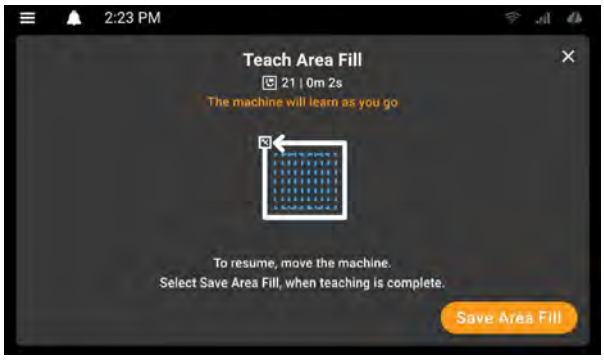
FOR SAFETY: While machine is operating in robotic mode, only scrub flat, hard surfaces with 2% or less incline.



8. Resume teaching the new area fill ending it at the home marker or select the close icon in the right corner of the UI screen to close the window and stop teaching the route.

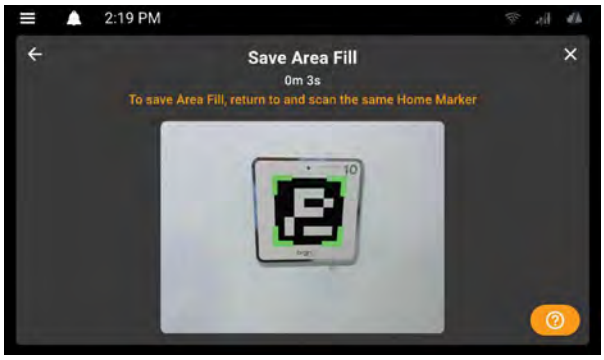
NOTE: If cancelling the new route, touch CANCEL on the UI touchscreen. The UI touchscreen states **Cancel Teach?** *Touch Yes to cancel the route and return to the main menu. Touch No to return to teaching the new route.*

9. When the area fill route is complete, select the *Save AREA FILL* button.

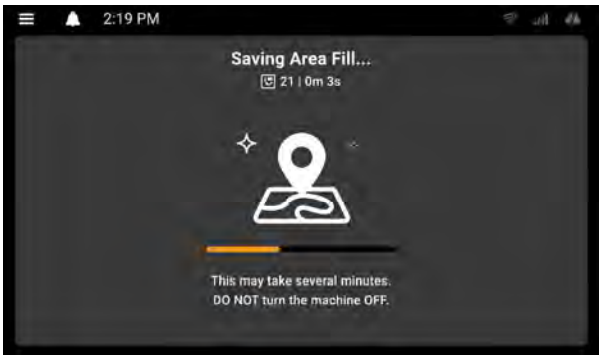


10. Return to the home marker and rescan it to save the route.

NOTE: A new cleaning route cannot be saved until the machine scans the same home marker a second time in the same physical location.



11. The *Saving Area Fill...* screen is displayed while the route is saved.



NOTE: If the UI touchscreen states **Route Failed to Save***, touch TEACH to repeat the entire procedure to teach the cleaning route.*

NOTE: If the machine reads an incorrect home location an error will display along with a message instructing what home location to go to.

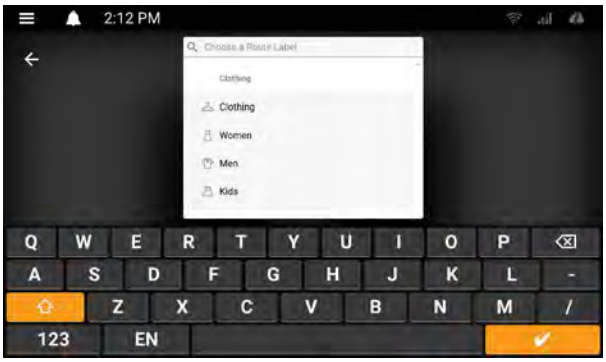
12. When the route is successfully saved, select either the *Done* button or *Edit Label* button to give the route a name.



NOTE: Selecting SAVE without assigning a label to the route will display the default <NO LABEL>. name to the saved route.

13. Enter a name for the saved route.

NOTE: Route labels can have a maximum of 40 characters.



14. Route saved with new name.

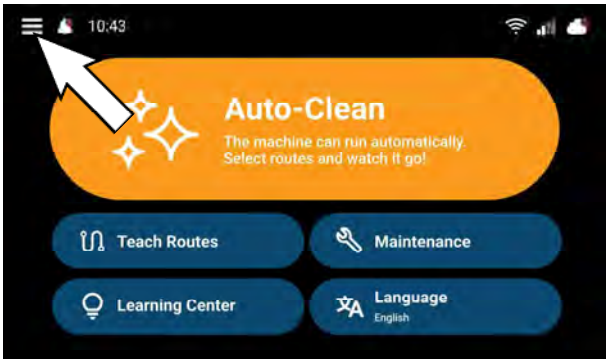


CONNECTING A PHONE WITH THE ROC

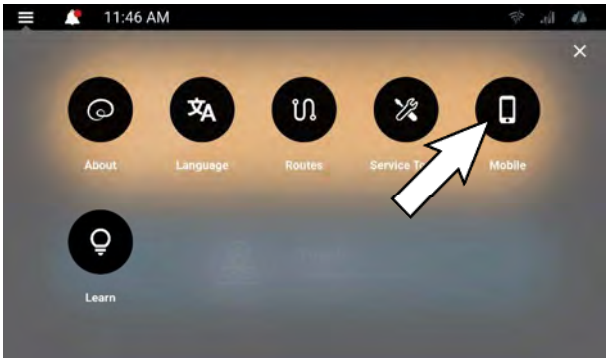
Before running a cleaning route in robotic mode, it is recommended that the operator pair their cell phone with the Brian OS Mobile app.

When connected to the BrainOS mobile app, the ROC will send messages to the app whenever the machine encounters an alert and/or when the route is complete. Connecting to the ROC through the BrainOS mobile app allows multiple users to connect to a machine at the same time.

1. Turn the *ON/OFF key switch* on.
2. Touch the SETTINGS menu icon on the main menu on the *UI touchscreen*. The SETTINGS menu is displayed.

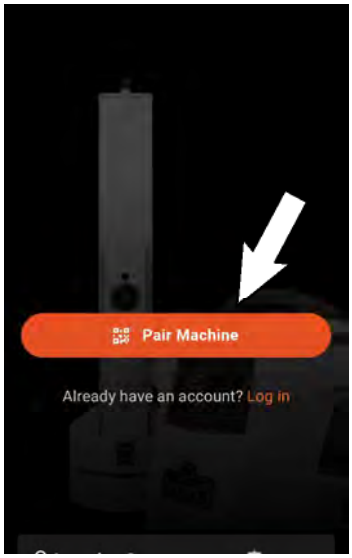


3. Touch MOBILE ALERTS.



NOTE: The Mobile app screen with the QR code will also appear when an operator runs a saved route.

4. Install the BrainOS mobile app from the Google Play store or the App store on iOS.



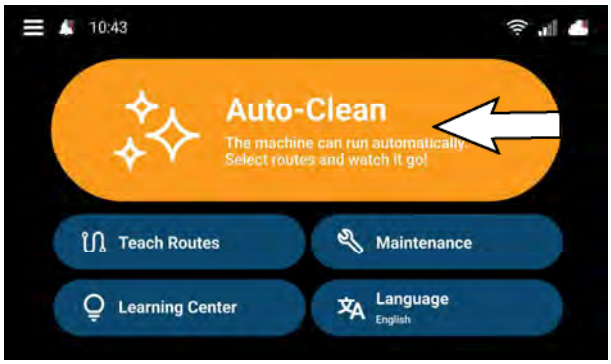
5. Open BrainOS mobile app and pair the app to the machine by scanning the QR code.



RUNNING A ROBOTIC CLEANING ROUTE (BrainOS Software)

Once one or more cleaning routes have been taught and saved, the machine can be operated in robotic mode. When running a route in robotic mode, pairing a cell phone can be a valuable tool. See ROC: ROBOT OPERATIONS CENTER (BrainOS Software).

1. Turn the *ON/OFF key switch* on.
2. When the main menu appears on the *UI touchscreen*, touch AUTO-CLEAN.



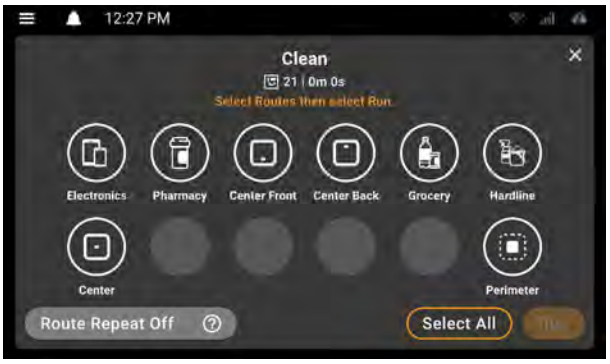
3. Push the machine to the desired home location code, positioning the machine so that the front camera scans the home location code (See POSITIONING THE MACHINE AT THE HOME LOCATION CODE). The machine automatically begins scanning, as displayed on the *UI touchscreen*.
4. Position the handlebar into the stowed position.



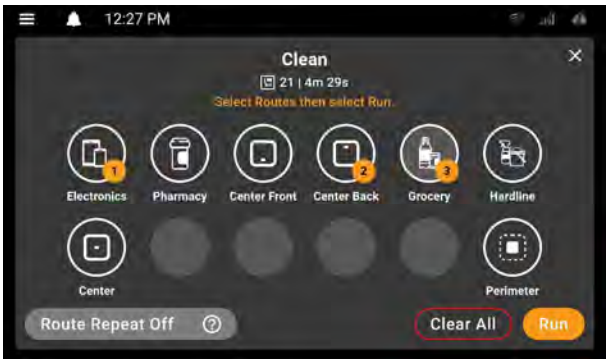
NOTE: The handlebar must be locked in the stowed position to run a saved route. A notification will appear if the handlebar is in one of the two lowered positions.



5. A list of all existing routes for the scanned home marker is displayed.



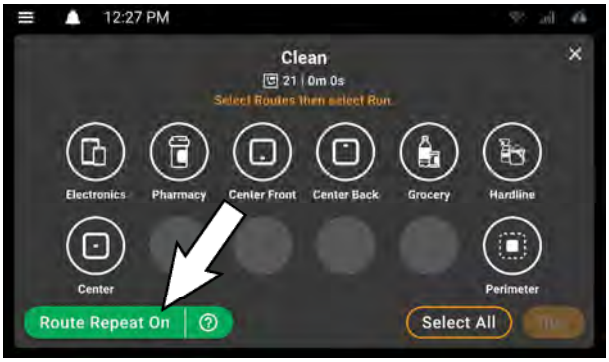
6. Select the cleaning route(s) to be run. The cleaning routes will operate continuously in the order they are selected as displayed in the corner of each selected route.



7. To remove or reorder cleaning routes, deselect a cleaning route by selecting it again. The cleaning route number will grey out and all of the other selected routes will renumber.

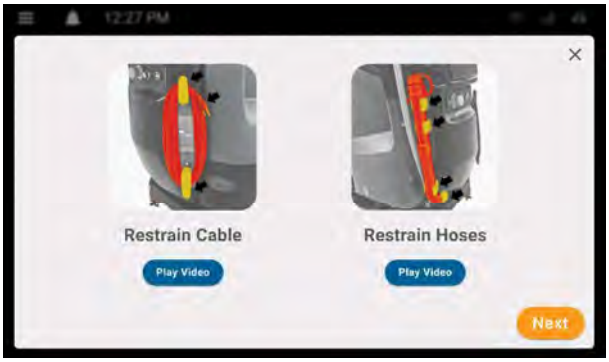
8. Select the cleaning route again and it will be added and renumbered as the last route to run.

9. If it is necessary to have the machine run the same route(s) multiple times (route looping), select the route repeat button.



NOTE: Both single routes and multiple routes can be chosen to be run multiple times.

10. A pre-operation checklist appears with reminder videos to help the operator setup the machine for operation. Select *Play Video* on each checklist item to view each video.



11. Scan the QR code with the Brain OS mobile app to pair the machine to the cell phone. See CONNECTING A PHONE WITH THE ROC.



12. The cleaning in progress screen appears while the machine runs the cleaning route.

13. If needed press the *Pause* button to interrupt the cleaning route.



14. Press the Start button resume the cleaning route.

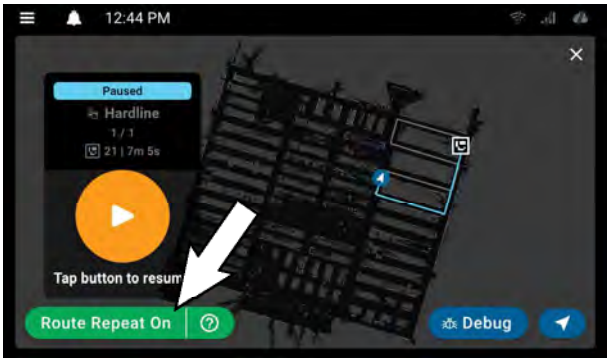


15. If necessary, adjust the scrub settings for the area(s) to be scrubbed. See SETTING SCRUB MODES.

16. Remove the key from the *ON/OFF key switch* without turning the key to the off position. This will not disrupt the robotic route and prevent the key from being stolen or lost.



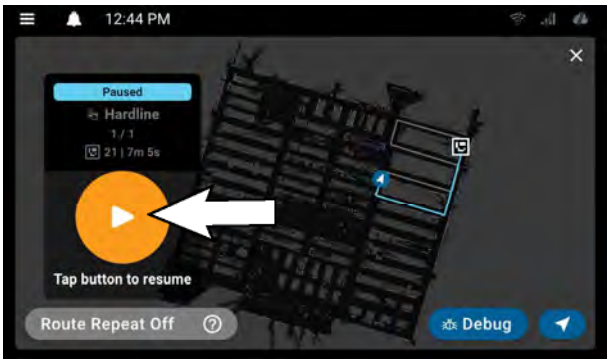
17. If it is necessary to have the machine run the same route(s) multiple times (route looping), select the *loop button*.



NOTE: Both single routes and multiple routes can be chosen to be run multiple times.

18. As the machine begins robotic operation, observe scrubbing performance to ensure that all components are functioning properly.

19. If any scrubbing functions need adjustment, touch *pause* to pause the machine. The *UI touchscreen* states **Paused: To resume, touch the Start/Pause icon.**



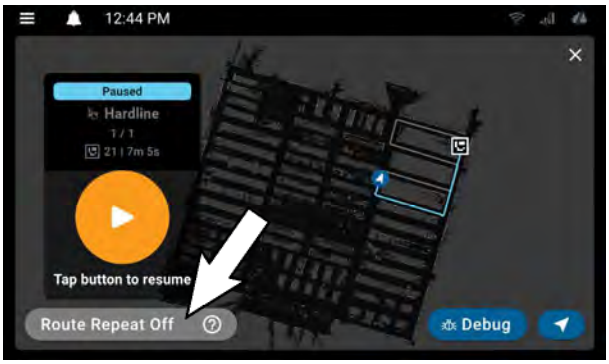
20. Make the necessary adjustments to the brush pressure, solution flow, and squeegees.

21. Touch *play button* to resume the route in robotic mode. Observe scrubbing performance to ensure that all components are functioning properly.

22. As the machine runs the route in robotic mode, the UI touchscreen locks and states **Cleaning...**, as well as displaying the direction the machine is traveling, amount of time spent on the route, and the total amount of time the route should take in robotic mode.

23. If route repeat was selected, the machine will track the number of routes the machine has repeated. To view, press the *pause button* to pause the machine.

24. When route repeating is complete, select the route repeat button again to cancel it. Select yes to verify the canceling of Route Repeat.



25. Touch *pause* to resume the route in robotic mode. The machine will continue the current route and stop at the home marker.

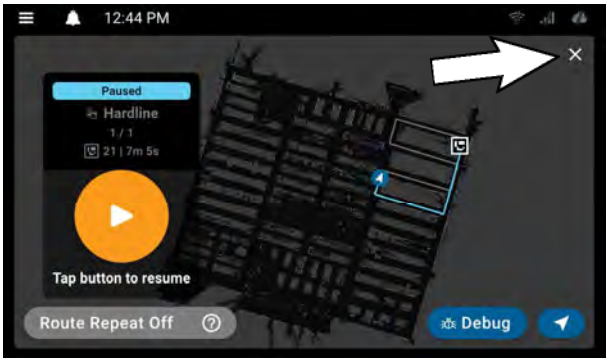
26. The UI touchscreen becomes disabled during robotic mode. If touched the screen disabled message appears. To regain use of the UI screen, use the *start/Pause button* to pause the machine.

27. If an assist message is triggered during the robotic route, the machine automatically pauses and the UI touchscreen displays the assist message along with steps to resolve. If a phone is paired to the ROC, the ROC sends a text message of the alert to the phone. See SYSTEM MESSAGES.

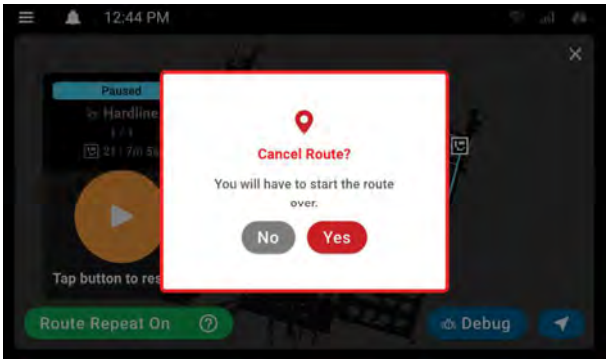
NOTE: If the machine repeatedly triggers an assist message in the same place on a cleaning route, even when there are no obstructions, there could be an environmental factor such as a reflection causing the machine to sense an obstruction in the cleaning path. For help resolving the issue, contact customer service and provide the home location code number, route letter, area of concern, and pictures of what the machine sees (if possible). Customer service may be able to remotely adjust the route to improve performance.

28. If the machine has to restart due to an assist message that stopped it, observe scrubbing performance to ensure that all components are functioning properly.

29. To cancel a route, close the route window by touching the X in the corner on the UI touchscreen.



30. Verify if the route should be canceled.



31. When the machine completes the robotic route, the *UI touchscreen* displays **COMPLETE**, as well as route information, length of time spent on the route, and a map of the route that shows areas cleaned. Touch DONE to return to the main menu.



32. If multiple routes were run, use the arrows to navigate to each route complete notification.

33. Touch RUN ROUTE to select another cleaning route to run in robotic mode (see previous steps).

34. If finished cleaning, drive the machine to a designated parking station, insert the key into the *ON/OFF key switch* and turn the *ON/OFF key switch* off.

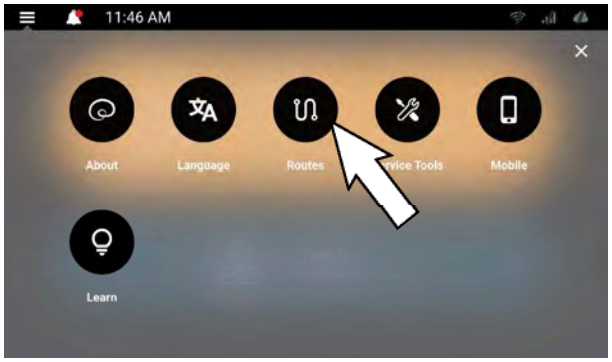
AUTONOMOUS ROUTE HISTORY

The autonomous route history can be used to check the weekly autonomous routes (home marker number, route, time the route was run, and how long it took the machine to run the route) for the machine.

1. On the main menu, touch SETTINGS menu icon to go to the SETTINGS menu.



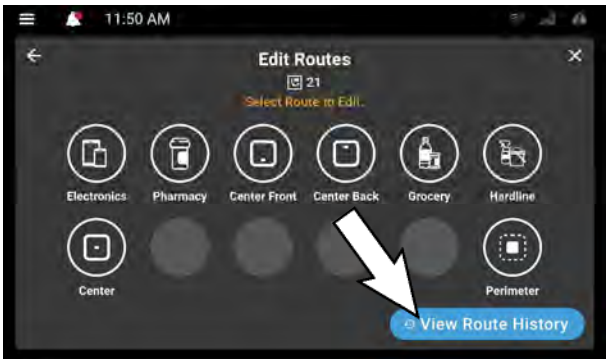
2. Touch ROUTES.



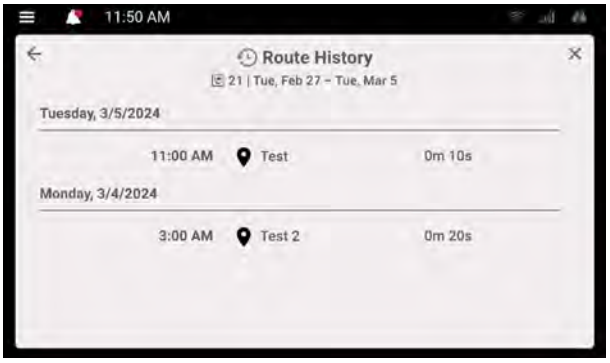
3. Touch the home marker to view the saved routes.



4. Touch VIEW ROUTE HISTORY.

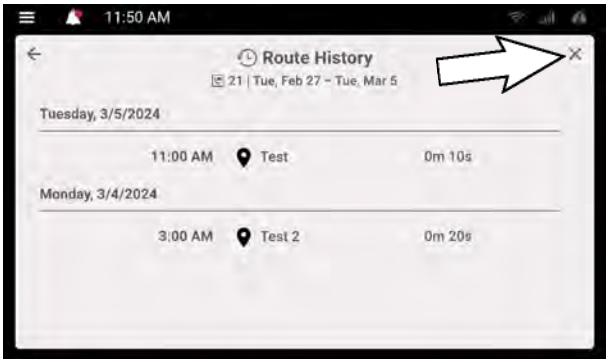


5. A WEEKLY HISTORY screen will appear. Touch the desired route to check the cleaning history.



The home marker number, route, time the route was run, and how long it took the machine to run the route are displayed next to the home marker symbol. The date the route was run appears above the route information. Touch the BACK button to return to the SETTINGS menu.

6. Close the route history window by touching the X in the corner on the UI touchscreen.



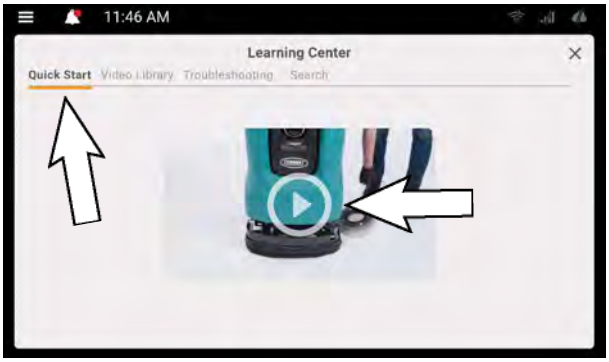
LEARNING CENTER

The Learning Center contains brief tutorial videos for Training, Daily Maintenance, and Periodic Maintenance tasks.

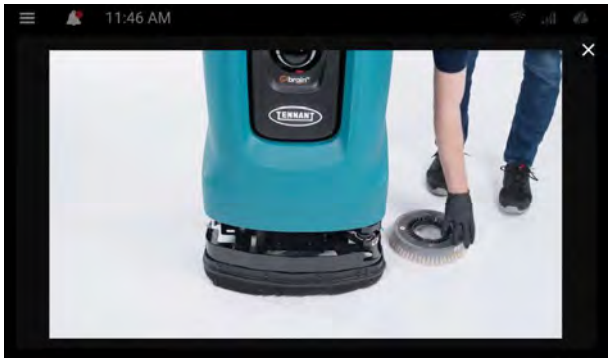
1. On the main menu, touch LEARNING CENTER.



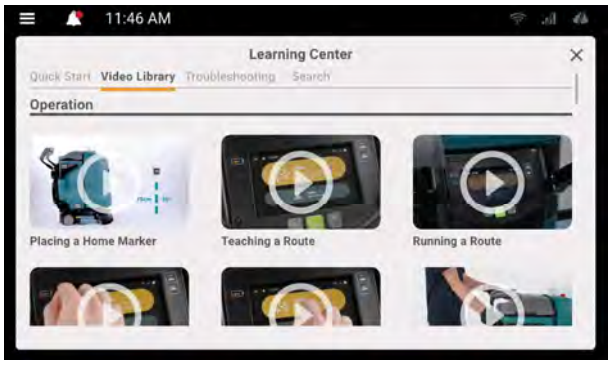
2. The QUICK START tab contains videos of the most common tasks. Touch the video to view it.



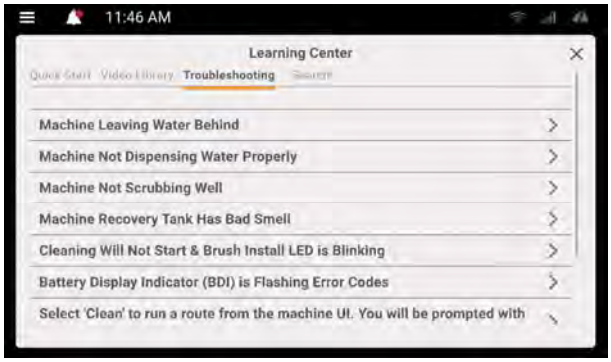
3. The video window expands to full screen for video playback. Close the video window by touching the X in the corner on the UI touchscreen.



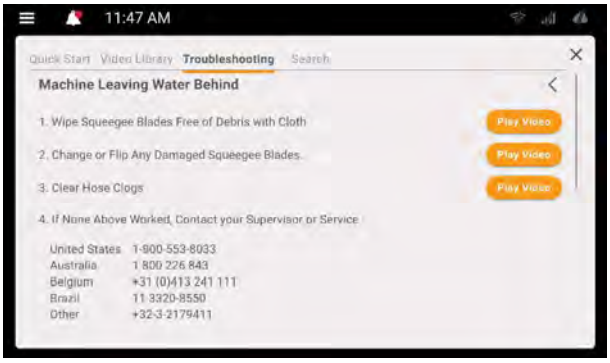
4. The VIDEO LIBRARY tab contains all of the available machine videos.



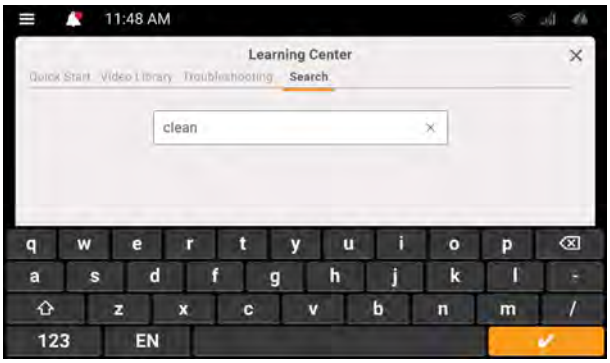
5. The TROUBLESHOOTING tab contains a list of possible problems the operator may encounter. Touch the troubleshooting topic in need.



6. The TROUBLESHOOTING tab list the area of need and possible solutions. Touch the PLAY VIDEO button to view the video.



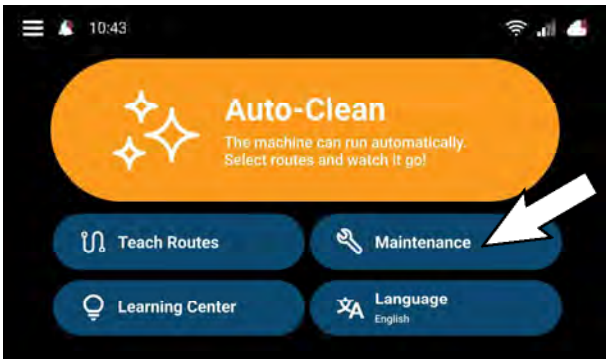
7. The SEARCH tab allows the operator to type in a terms and it will search the learning center and display the results.



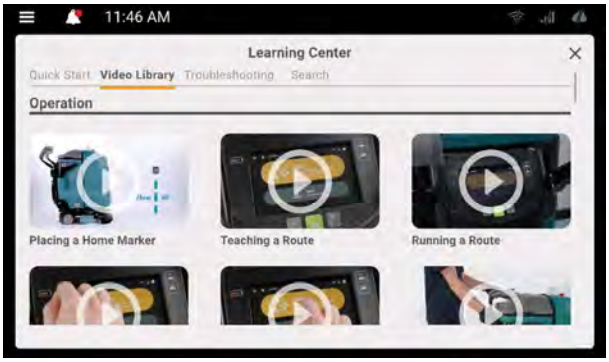
MAINTENANCE BUTTTON

The MAINTENANCE button is a quick link to the periodic maintenance videos stored within the Video Library of the Learning Center.

1. On the main menu, touch MAINTENANCE.

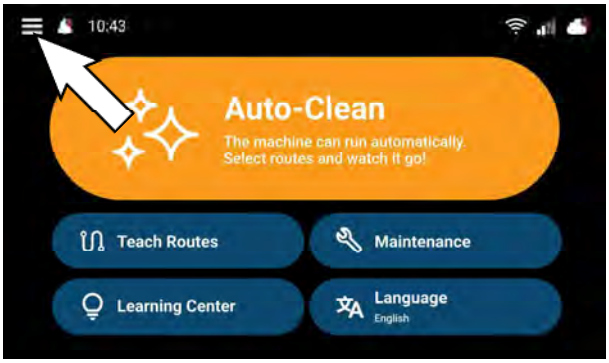


2. Select the desired maintenance video within the maintenance section of the Video Library of the Learing Center.

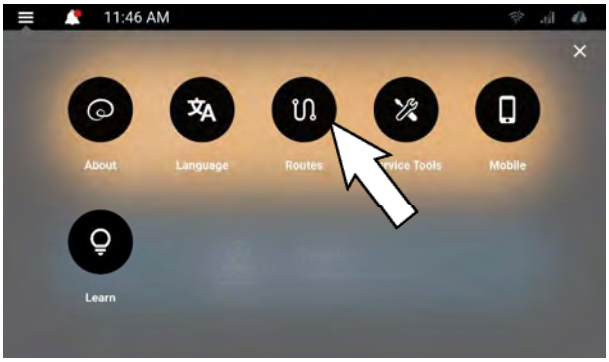


EDIT / DELETING ROUTES

1. On the main menu, touch SETTINGS menu icon to go to the SETTINGS menu.



2. Touch ROUTES.

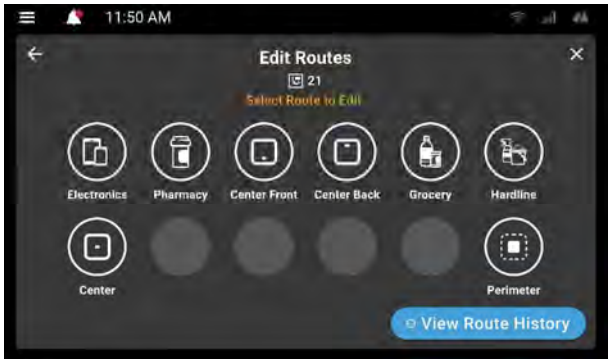


3. Select the desired home location to view the routes available to be edited at that location.

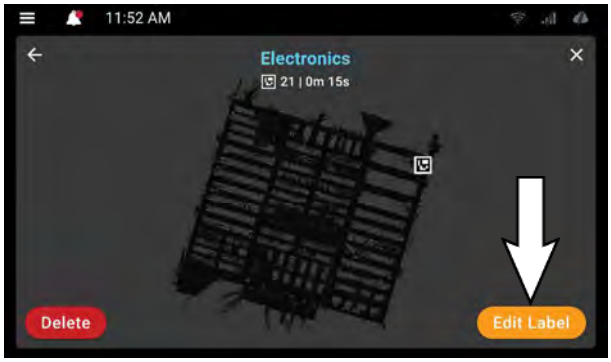


NOTE: If the machine is programmed for multiple home locations the home locations will be listed in chronological order starting from the lowest to the highest on the UI touchscreen.

4. All existing routes for the selected home location are displayed on the *UI touchscreen.* Touch the route to edit.

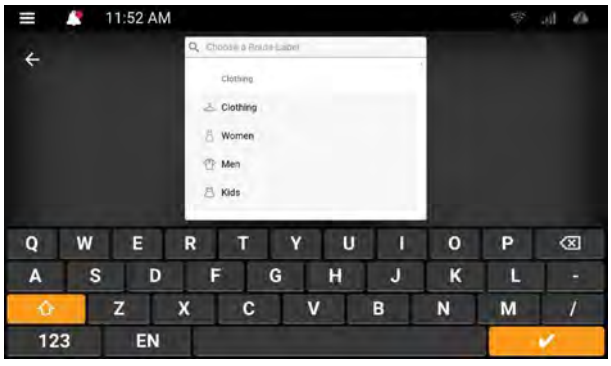


5. Touch EDIT LABEL to enter or change a name of a saved route.



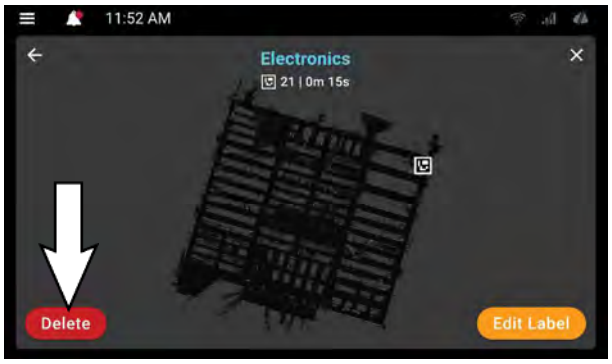
NOTE: Selecting SAVE without assigning a label to the route will display the default <NO LABEL>. name to the saved route.

6. Enter a name for the saved route.

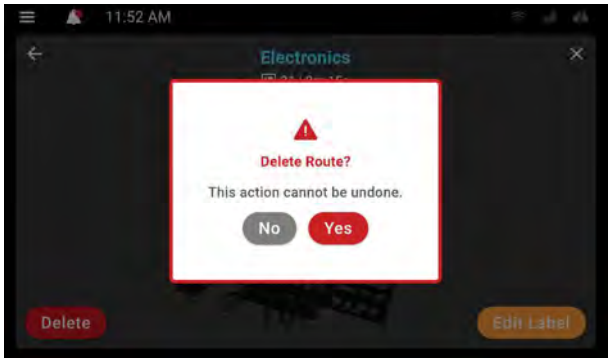


NOTE: Route labels can have a maximum of 40 characters.

7. Touch DELETE ROUTE to permanently delete the selected route from the machine.



8. Touch YES to confirm the route deletion and permanently delete the selected route.



NOTE: A deleted route cannot be retrieved by the software. If a route is deleted by accident, it must be re-taught (see TEACHING A NEW ROUTE).

NOTE: Touch NO to cancel the route deletion.

9. Close the route window by touching the X in the corner on the UI touchscreen to return to the SETTINGS menu.

DRAINING AND CLEANING THE TANKS

When cleaning is finished the recovery tank should be drained and cleaned. The solution tank then can be filled again for additional cleaning.

1. Drive the machine to a solution disposal drain.
2. Turn the machine *ON/OFF key switch* off.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

3. Remove the recovery tank drain hose. While holding the hose up, remove the plug, then slowly lower the drain hose to the floor drain or sink.



4. Lift the recovery tank cover. Flush the inside of the recovery tank with clean water.



WARNING: Flammable materials can cause an explosion or fire. Do not use flammable materials in tank(s).

NOTE: DO NOT use steam to clean tanks. Excessive heat can damage tanks and components.

5. Insert the nozzle of the hose into the vacuum hose monthly or every 50 hours of operation to rinse any debris that may be caught inside the hose.



6. Rinse the float sensor located inside the recovery tank.



7. Wipe the vacuum screen monthly or every 50 hours of operation to remove any debris that may be caught in the screen.



8. Replace the recovery tank drain hose plug and hang the drain hose back on the machine. Secure the drain hose in the drain hose clips.

NOTE:Ensure the drain hose is secure in the drain hose clips so it will not interfere with the machine sensors.



9. Remove the debris tray from the recovery tank and empty/rinse the debris tray.



10. Reinstall the debris tray into the recovery tank.

NOTE: To allow the interior of the tank to dry, leave the recovery tank cover open if machine is not going to be immediately used again after the recovery tank is drained. Allowing the interior of the recovery tank to dry prevents mold/mildew from building up inside the tank.

11. Inspect the solution tank interior for cleaning detergent build up and hard water build up. Proceed to the following step to clean the solution tank if there is evidence of either.

12. Disconnect the solution tank drain hose from the machine and slowly lower the drain hose to the floor drain.



13. Remove the solution tank cap.



14. Flush the inside of the solution tank with clean water.

15. Reconnect the solution tank drain hose to the solution tank.

16. Remove and inspect the solution tank in-line filter monthly or every 50 hours of operation. Clean as necessary. Replace if damaged.



17. Reinstall the solution tank in-line filter onto the machine.

18. Reinstall the solution tank cap.

NOTE: To allow the interior of the tank to dry, do not reinstall the solution tank cap if machine is not going to be immediately used again after the solution tank is drained. Allowing the interior of the solution tank to dry prevents mold/mildew from building up inside the tank.

SYSTEM MESSAGES

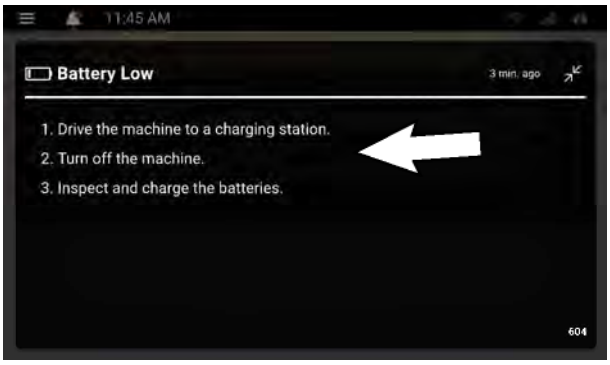
ALERTS - MANUAL MODE

The operator will receive an alert when there is a mechanical/electronic issue with the machine while operating in manual mode. Critical alerts require the operator to stop the machine. Routine alerts will allow the operator to continue operating the machine.



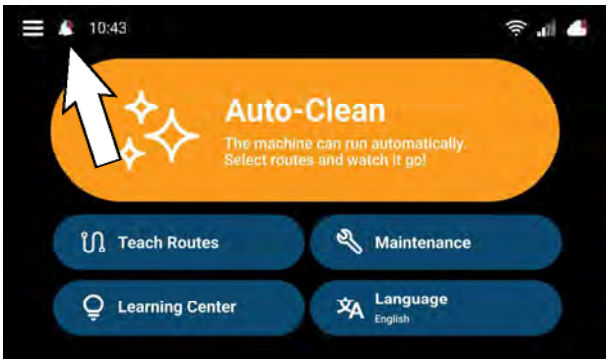
Touch on the arrows to expand the alert window to view the instructions to clear the alert.

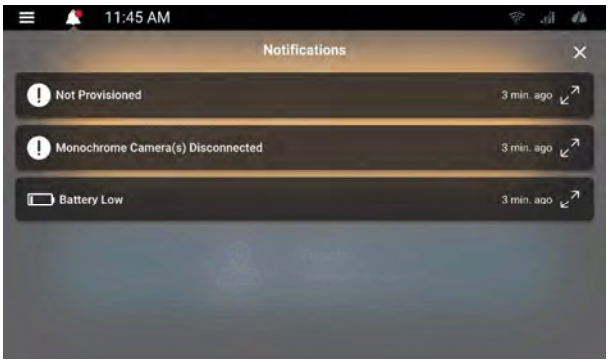




To reset the alert indicators, follow the alert message instructions to eliminate the cause of the alert. The alert indicator will reset when the machine is restarted.

Alerts are also indicated through the alert notification bell, When there is an alert the notification bell gets a red dot on it. The machine may have multiple alerts. Touch the notification bell to open the list of machine alerts.





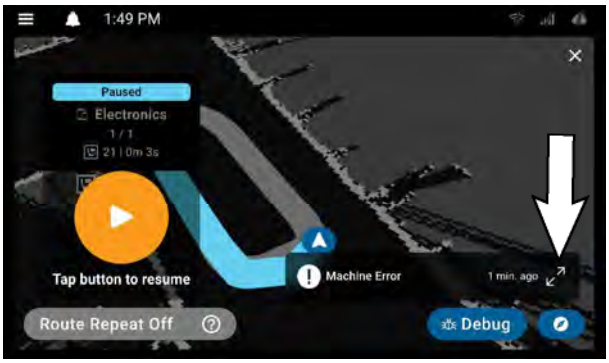
If the machine has to restart due to an alert that stopped it, observe scrubbing performance to ensure that all components are functioning properly.

ASSISTS - ROBOTIC MODE

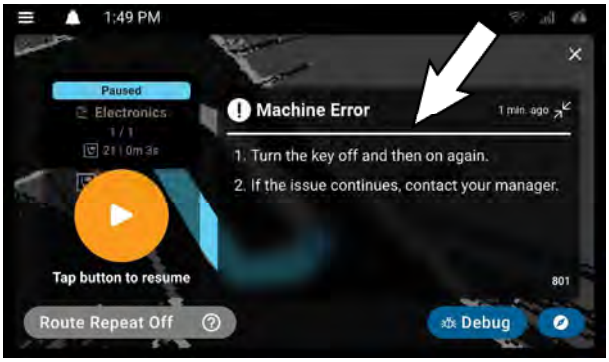
The operator will receive an assist message and the machine will pause when there is a mechanical/electronic issue with the machine while operating in robotic mode. All scrub functions are disabled when an assist message is triggered. The machine can be manually moved with an assist message, but all scrubbing functions are disabled.

NOTE: If manually moving a machine after an assist, check the area for any standing water or solution. Clean the area as needed.

When BrainOS is installed on a phone and paired to the ROC, the assist message and the machine location is sent to the paired phone.



Touch on the arrows to expand the assist message to view the assist message and steps to resolve the issue



Follow the on screen instructions to clear an assist message.

Refer to the assist message table below to determine the cause and remedy for the message.

If the machine has to restart due to an assist message that stopped it, observe scrubbing performance to ensure that all components are functioning properly.

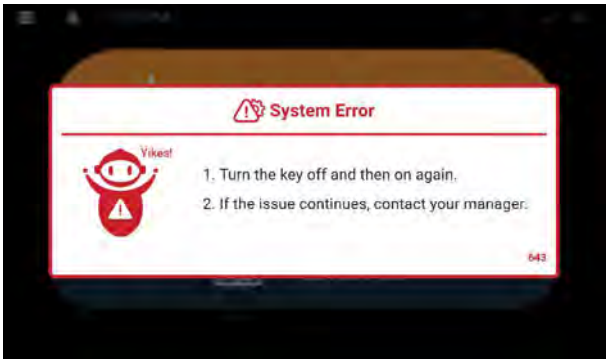
Assists	Cause(s)	Remedy
111	Machine error	1. Turn off the machine. 2. Wait 15 seconds. 3. Turn on the machine. 4. If issue persists, contact manager.
112	Machine unable to find a path forward	1. Make sure the path is clear. 2. Push the machine past any obstacles and resume. 3. If issue persists, contact manager.
113	Machine unable to find a path forward	1. Make sure the path is clear. 2. If machine is off its path, push machine to the direction of the highlighted path. 3. If issue persists, restart machine or contact manager.
114	Machine obstruction	1. Ensure there ar no obstructions near the machine. 2. Clean the sensors, if needed. 3.To resume, press the Start/pause button. 4. If issue persists, restart machine or contact manager.
115	Machine error	1. Restart the machine. 2. If issue persists, contact manager.
200	Recovery tank full	1. Drain the recovery tank. 2. Walk the machine back to the route. 3. To resume, press the Start/Pause button.
201	Water tank empty	1. Fill the solution tank. 2. Walk the machine back to the route. 3. To resume, press the Start/Pause button.
500	Emergency stop button pressed	1. Inspect the environment and the machine. 2. Release the emergency stop button by twisting it clockwise. 3. To resume the previous action, tap Start button.
801	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.
802	Turn on key	1. Turn the key ON and then resume the task.
803	Bypass handle ON	1. Release or stow the handle and then resume the task.
804	Charger is connected	1. Disconnect machine from external charger before use.
805	Machine controller error	1. Restart the machine. 2. If the issue continues, contact your manager.
806	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.

Assists	Cause(s)	Remedy
807	Machine controller error	1. Restart the machine. 2. If the issue continues, please unplug and replug battery or contact your manager and open a service ticket.
1000	Route lost	1. Push the machine to the Home Marker. 2. Restart the route.
651-533	Machine controller error	1. Restart the machine. 2. Make sure the path is clear. 3. If the issue continues, please unplug and replug battery or contact your manager and open a Service ticket.
8800-14	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.
9500-14	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.
9600-14	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.
9700-14	Machine error	1. Restart the machine. 2. If the issue continues, contact your manager.

NOTE: Contact a Tennant Service representative for all other fault codes.

SYSTEM ERRORS (ROBOTIC MODE / MANUAL MODE)

If a System Error code should appear, turn off the machine, wait 15 seconds, and then turn the machine back on. If the system error persists contact Customer Service immediately.

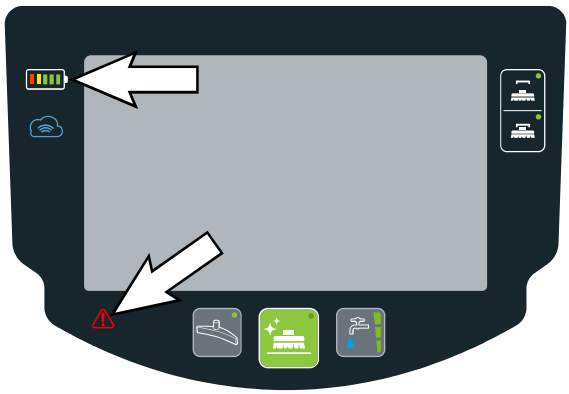


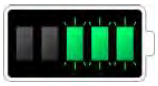
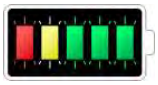
MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Trailing water-poor or no water pickup	Vacuum fan turned off	Turn vacuum fan on
	Worn squeegee blades	Rotate or replace squeegee blades
	Vacuum hose clogged	Flush vacuum hoses
	Vacuum fan filter dirty	Clean vacuum fan filter
	Vacuum fan cover seals worn	Replace seals
	Debris caught on squeegee	Remove debris
	Vacuum hose to squeegee or recovery tank disconnected or damaged	Reconnect or replace vacuum hose
	Recovery tank cover not completely closed	Check for obstructions and close cover
Vacuum fan will not turn on	Vacuum fan switch turned off	Turn vacuum switch on
	Recovery tank full	Drain recovery tank
	Foam filling recovery tank	Empty recovery tank
		Use less detergent
	Recovery tank sensor dirty or stuck	Clean or replace sensor
Little or no solution flow to the floor	Solution tank empty	Fill solution tank
	Solution flow turned off	Turn solution flow on
	Solution supply lines plugged	Flush solution supply lines
	Clogged solution tank filter	Drain solution tank, remove solution tank filter, clean and reinstall
Poor scrubbing performance	*1-Step button* not on	Turn *1-Step button* on
	Improper detergent or brushes used	Contact Tennant service representative
	Recovery tank full	Empty recovery tank
	Solution tank empty	Fill solution tank
	Debris caught on scrub brushes or pads	Remove debris
	Worn scrub brush	Replace scrub brush
	Low battery charge	Charge batteries until the charger automatically turns off

SERVICE INDICATOR CODES

When the machine or battery charger detects a fault, the service indicator will flash. A fault code will be provided to determine problem as described below.

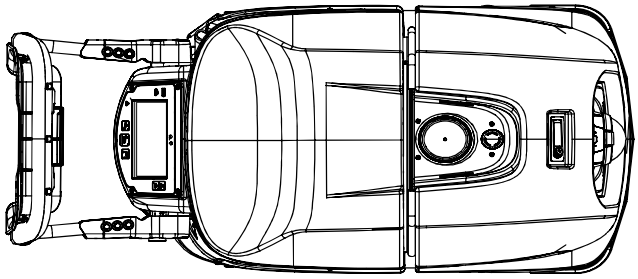


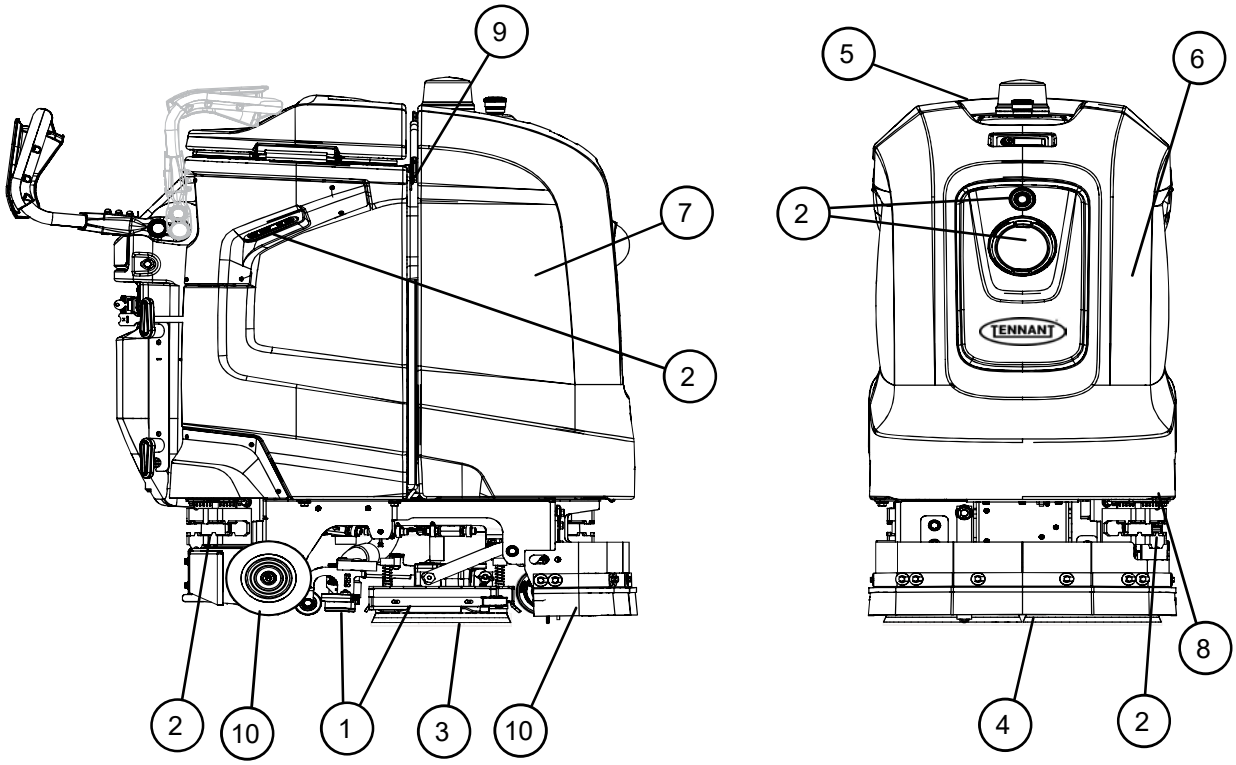
LED Light Pattern	LCD Fault Code	Fault Condition	Reason	Correction
None	0x0000	FAULT_NONE		
None	0x0010	FAULT_PARKING_BRAKE		
	0x0790	FAULT_SOLUTION_ TANK_EMPTY	1. Solution tank empty. 2. Wiring, connector, or solution tank switch issue.	1. Fill solution tank. 2. If solution tank is not empty, check tank switch and wiring.
	0x0791	FAULT_RECOVERY_ TANK_FULL	1. Recovery tank full. 2. Wiring, connector, or recovery tank switch issue.	1. Empty recovery tank. 2. If recovery tank is not full, check tank switch and wiring.
	0xFF11	FAULT_LOW_ BATTERY	1. Battery voltage too low.	1. Charge battery.
	0xFF12	FAULT_VERY_LOW_ BATTERY	1. Battery voltage too low.	1. Charge battery.
	0xFFF0	FAULT_ESTOP	1. E-Stop pressed. 2. E-Stop wiring problem.	1. Key off machine. 2. Press and reset E-Stop button. 3. Key on machine. 4. If fault persists, check harness connections between E-Stop and Propel Controller. 5. Replace or repair harness. 6. Replace E-Stop button.
	0xFFFF	FAULT_UNKNOWN		

LED Light Pattern	LCD Fault Code	Fault Condition	Reason	Correction
	0xF100	FAULT_CHARGER_ GENERIC	1. Charger error condition.	1. Contact service.
	0xF101	FAULT_CHARGER_NO_ BATTERY	1. Charger not connected to battery pack.	1. Check cable connections. 2. If fault code persists, contact service.
	0xF102	FAULT_CHARGER_ OVERHEAT	1. Charger overheated.	1. Let charger cool. Move to well ventilated area. 2. If fault persists, contact service.
	0xF103	FAULT_CHARGER_ CAN_LOST	1. Charger communication fault.	1. Power cycle machine. 2. If fault code persists, contact service.
	0xF104	FAULT_CHARGER_ TIMER_PHASE_I	1. Battery unable to charge correctly	1. Contact service.

NOTE: Contact a Tennant Service representative for all other fault codes.

MAINTENANCE





MAINTENANCE CHART

The table below indicates the Person Responsible for each procedure.

O = Operator.
T = Trained Personnel.

Interval	Person Resp.	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
Daily	O	3	Pad	Check, flip or replace		1
	O	3	Scrub brush	Check for damage, wear, debris		1
	O	1	Side and rear squeegees	Check, flip or replace	-	3
				Check deflection and leveling	-	6
	O	2	Front/side 2D and 3D sensors and upper/ lower LIDAR sensors	Check for damage. Clean with provided microfiber cloth	-	8
	O	4	Perimeter guards (left, right, and front)	Check for debris, damage, and wear	-	3
	O	5	Recovery tank	Clean tank, basket, and float sensor	-	5
	O	6	Solution tank	Drain and rinse as necessary	-	1
50 Hours or Monthly	T	4	Front perimeter guard	Inspect adjustment plates for slipping. Adjust as necessary		1
	O	5	Recovery Tank	Clean screen filter and vacuum hose		
	O	5	Recovery tank lid seal	Check for wear and damage		1
	O	8	Solution tank in-line filter	Remove and clean	-	1
100 Hours	T	9	Vacuum fan seal and vacuum hose seal	Check for damage and wear	-	2
200 Hours	T	7	Battery terminals and cables	Check connections	-	12
500 hours	T	10	Tires	Check for damage and wear	-	3
750 Hours	T	9	Vacuum fan motor(s)	Replace carbon brushes	-	1

NOTE: Maintenance videos can be viewed on the UI touchscreen found in the Video Library within the Learning Center. See LEARNING CENTER.

BATTERIES

The lithium−ion battery pack is a maintenance−free battery protected by a battery management system (BMS). To achieve the maximum battery life, carefully follow the instructions below:

– Lithium-Ion batteries must be charged prior to initial use.

– Carefully follow the Important Safety Instructions section in the manual when using the Lithium−ion Battery Model.

– Only use the lithium−ion battery charger supplied with machine.

– Charge battery pack in well−ventilated areas. For best charging performance, charge the battery pack in temperatures below 80°F/27°C and above 41°F/5°C. Battery pack may shut down and not take a charge in elevated or freezing temperatures.

– It is recommended to only recharge battery pack when discharge indicator level reaches the last bar. Do not store the machine for an extended period if battery is discharged to the last bar, the battery may further discharge to a level that is unrecoverable.

– When the machine shuts down due to a depleted battery pack, do not repeatedly cycle the key switch on and off. This may cause permanent battery pack damage. Recharge battery pack immediately to avoid damage.

– Allow charge cycle to completely charge battery pack. The charge cycle will take 3 hours.

– Opportunity charging (i.e. partial charge cycle of a half hour or more) is only recommended if discharge level is below 80%.

Do not operate machine in temperatures above 104°F / 40°C or below −4°F / −20°C. Machine may shutdown if exceed these temperatures.

CHECKING CONNECTIONS

After every 200 hours of use check for loose battery connections. Replace any worn or damaged wires.

CHARGING THE BATTERIES

The charging instructions in this manual are intended for the battery charger supplied with the machine. The use of other battery chargers that are not supplied and approved by Tennant are prohibited. Refer to the charger owners manual for additional information. Contact distributor or Tennant for battery charger recommendations.

FOR SAFETY: The use of incompatible battery chargers may damage battery packs and potentially cause a fire hazard.

IMPORTANT NOTICE: The battery charger is set to charge the battery type supplied with the machine.

1. Drive the machine to a well-ventilated area.
2. Park the machine on a flat, dry surface, turn off machine and remove key.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key..

3. Unwrap the on-board battery charger AC power supply cord from its storage hooks and plug it into a properly grounded wall outlet.



FOR SAFETY: Do not disconnect battery connections while machine is charging. Machine electrical damage may occur.

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

   The battery discharge indicator lights will ripple back and forth during the charging cycle. When all five lights repeatedly flash two times, the charging cycle is complete.



*NOTE: **Do Not** disconnect battery cables while charger is plugged in, circuit board damage may result.*

5. After charging batteries unplug the AC power supply cord from the outlet and wrap the cord around the on-board charger cord hooks. Secure cord with tie strap.

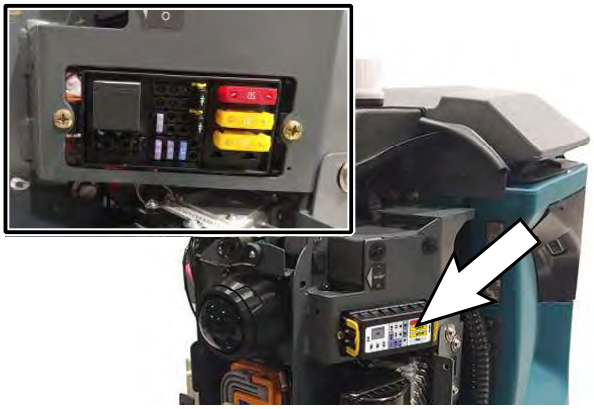
NOTE:Ensure the charger cord is secured with the tie strap so it will not interfere with the machine sensors.

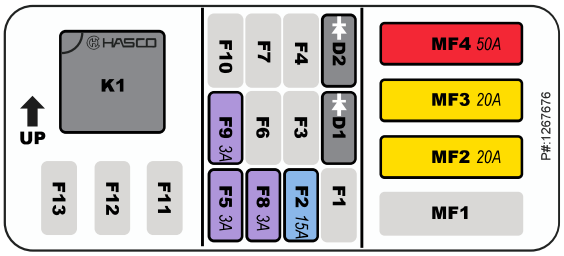


FUSES AND RELAYS

A fuse is a one-time protection device designed to stop the flow of current in the event of a circuit overload. Relays switch the electrical power going to the machine electrical systems on/off.

The fuse/relay panel is located under the front cover of the machine. Remove the fuse/relay panel cover under the front cover.





NOTE: Always replace the fuse with a fuse of the same amperage.

Fuse	Rating	Circuit Protected
F1	NA	Spare
F2	15A	AMR
F3	NA	Spare
F4	NA	Spare
F5	3A	Key switch
F6	NA	Spare
F7	NA	Spare
F8	3A	Always on power
F9	3A	Solution pump
F10	NA	Spare
F11	NA	Spare
F12	NA	Spare
F13	NA	Spare

Fuse	Rating	Circuit Protected
MF1	NA	Spare
MF2	20A	Left propel motor
MF3	20A	Right propel motor
MF4	50A	Scrub controller
K1	15A	Charger interlock relay
D1	1A	Diode 1
D2	1A	Diode 2

ELECTRIC MOTORS

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Replace or check the motor carbon brushes as indicated. Contact trained personnel to check or replace carbon brushes.

Carbon Brush Replacement/ Check	Hours
Vacuum motor (replace)	750

CAMERAS AND SENSORS

FRONT AND SIDE 2D AND 3D CAMERAS

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Check the front and side 2D and 3D cameras for dirt, dust, smudges, and damage daily (or before each robotic run). Debris, streaks, or smudges could deliver false environmental information to the machine.

Cleaning camera lenses should only be done with microfiber cleaning cloths designed for sensitive optical surfaces (one is included with the home location markers). In extreme cases, a lens cleaning solution formulated for optical polycarbonate lenses may be used. Do not spray camera lenses with solution. If a lens cleaning solution is required, wet the cleaning cloth sparingly - do not spray cleaning solution onto the camera unit.

NOTE: Do not scratch or damage the 2D or 3D camera lenses. Robotic machine performance could be adversely affected if camera lenses are scratched or damaged.



Side 2D cameras are located on each side of the machine.



FRONT AND REAR LIDAR SENSORS

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Check the front and rear LIDAR sensors for dirt, dust, smudges, and damage daily (or before each robotic run). Debris, streaks, or smudges could deliver false environmental information to the machine.

Cleaning LIDAR sensors should only be done with microfiber cleaning cloths designed for sensitive optical surfaces (one is included with the home location markers). In extreme cases, a lens cleaning solution formulated for optical polycarbonate lenses may be used. Do not spray LIDAR sensors with solution. If a lens cleaning solution is required, wet the cleaning cloth sparingly - do not spray cleaning solution onto the LIDAR sensors.

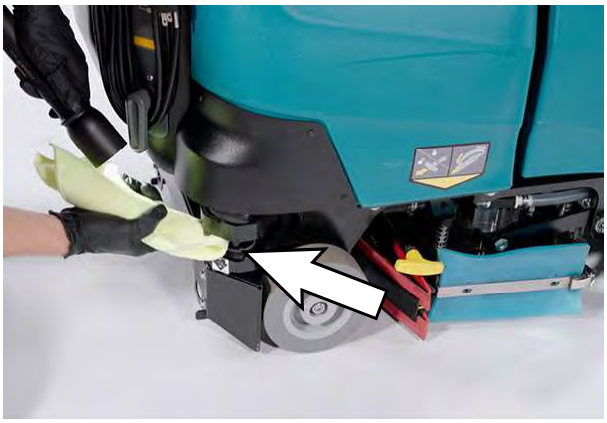
Clean the front large LIDAR sensor.



NOTE: Do not scratch or damage the front or rear LIDAR sensor surfaces. Robotic machine performance could be adversely affected if sensor surfaces are scratched or damaged.

NOTE: Due to the LIDAR sensors being located near the cleaning surface, pay particular attention to ensure the front, side, back, and bottom surfaces are completely clear of all dirt, smudges, and/or other debris. Use a flashlight to inspect these sensor surfaces and ensure they are thoroughly cleaned.

The lower LIDAR sensors are located in the front and rear of the machine.



SCRUB BRUSHES AND PADS

Check scrub brushes daily for wire or string tangled around the brush or brush drive hub. Also check brushes for damage and wear.



Replace the pads when they no longer clean effectively. Replace the brushes when they no longer clean effectively or when the bristles are worn to the yellow indicator.



Cleaning pads must be placed on pad drivers before they are ready to use. The cleaning pad is held in place by the pad driver.

Cleaning pads need to be cleaned immediately after use with soap and water. Do not wash the pads with a pressure washer. Hang pads, or lie pads flat to dry.

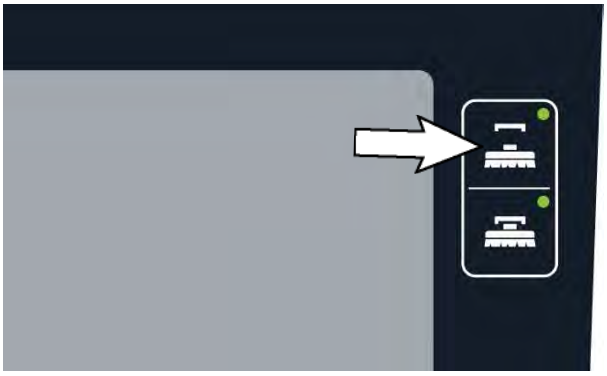
NOTE: Always replace brushes and pads in sets. Otherwise one brush or pad will clean more aggressively than the other.

REPLACING THE BRUSH OR PAD DRIVER

1. Stop machine on a level surface. Make sure the scrub head is in the raised position.
2. Turn the machine *ON/OFF key switch* off.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

3. Pull the brush release button to raise the scrub head and release the scrub brushes from the scrub head.



FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

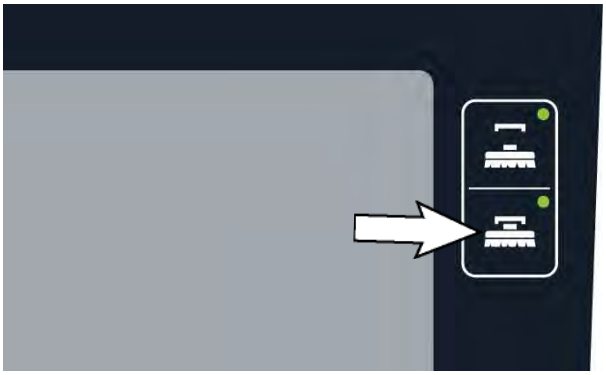
4. Remove the brushes/pad drivers from under the scrub head.



5. Push the new brush or pad driver under the scrub head and lift the brush or pad driver until the magnet holds the brush or pad onto the drive hub.

NOTE: Only a portion of the brush or pad driver can be connected to the scrub head while in the raised position. The brush will only totally connect when the brush connect button is pressed and the scrub head lowers.

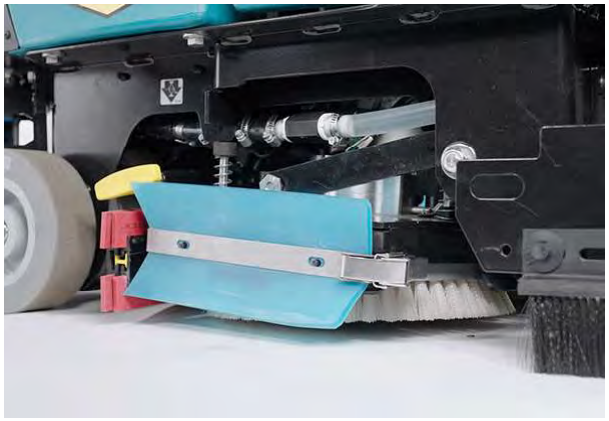
6. Press the brush connect button to lower the scrub head and fully connect the scrub brushes to the scrub motor hubs.



WARNING: Magnetic Field Hazard. Magnetic pad driver/brush can be harmful to those with pacemakers or medical implants.

FOR SAFETY: Keep hands and feet clear while brushes are releasing or attaching and when 1-Step is shut off.

7. Ensure the brushes or pad drivers are securely mounted on the brush drive hub.



NOTE: If scrub brushes fail to connect to the drive hub, realign the brushes under the scrub head and try again.

REPLACING THE DISK PAD

1. Remove the pad driver from the machine.
2. Lift the scrub pad off of the pad driver.
3. Flip or replace the scrub pad, center the scrub pad on the pad driver. Gently push down the pad onto the pad driver for it to stick onto the pad drive.

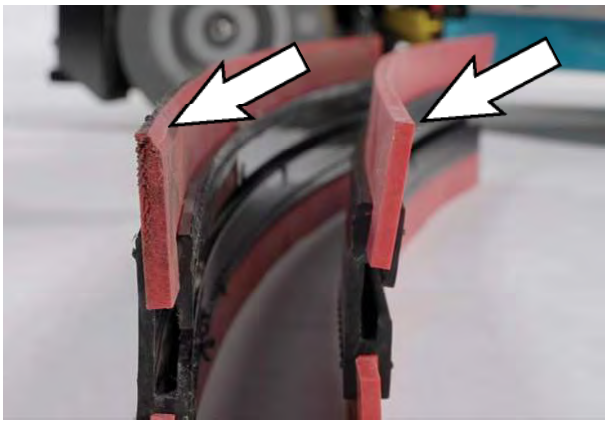


4. Press the pad onto the pad driver.



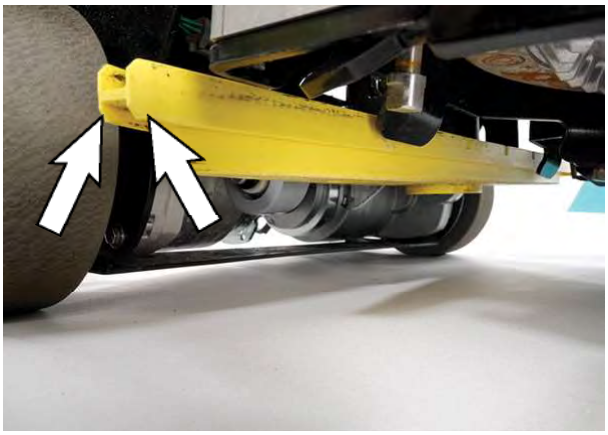
SQUEEGEE BLADES

Check the squeegee blades for damage and wear daily. Each squeegee blade has two wiping edges. When the blades become worn, rotate the blades end-for-end to a new wiping edge. Replace blades when all edges are worn.



Check the deflection of the squeegee blades daily or when scrubbing a different type of surface.

The squeegee assembly has two guides for the squeegees to slide on. The front and rear squeegee guides.



The squeegees have a slot in the middle of them to slide onto the squeegee guides.



REPLACING (OR ROTATING) THE REAR SQUEEGEE BLADES

1. Stop machine on a level surface. Make sure the scrub head is in the raised position.
2. Turn the machine ON/OFF key switch off.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

3. Pull on the squeegee blade release lever to unlock the squeegee blade.



4. Slide the rear squeegee out of the rear squeegee guide.



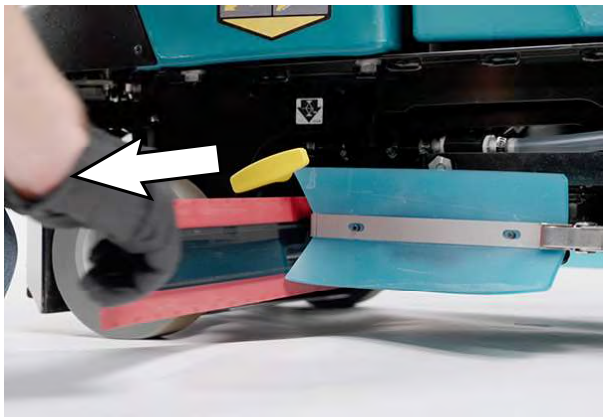
5. Check the squeegee edge for wear, rotate end from end if worn. Replace if necessary.



6. Slide the rear squeegee back into the rear squeegee guide.



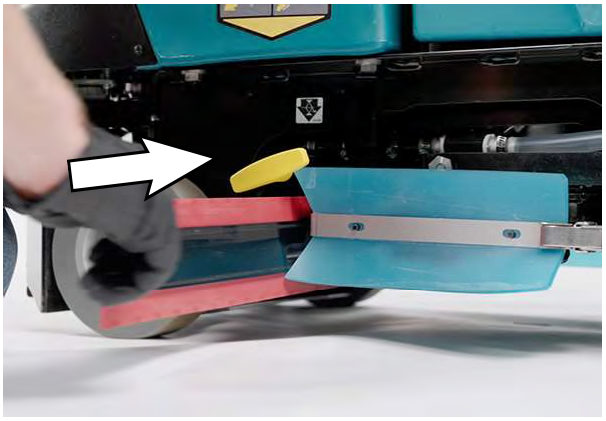
7. Slide the front squeegee out of the front squeegee guide.



8. Check the squeegee edge for wear, rotate end from end if worn. Replace if necessary.



9. Slide the front squeegee back onto the front squeegee guide.



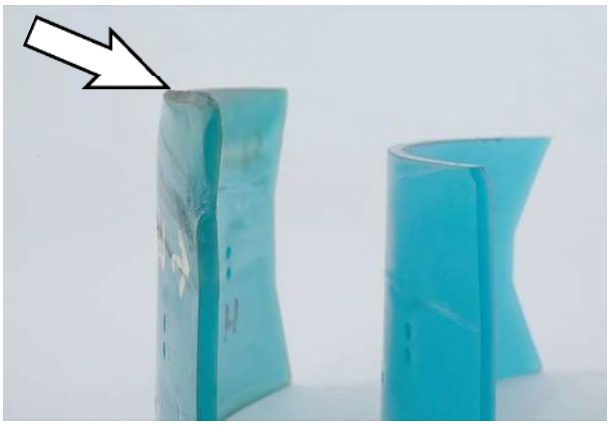
10. Push in on the squeegee release handle to lock the squeegee into position.



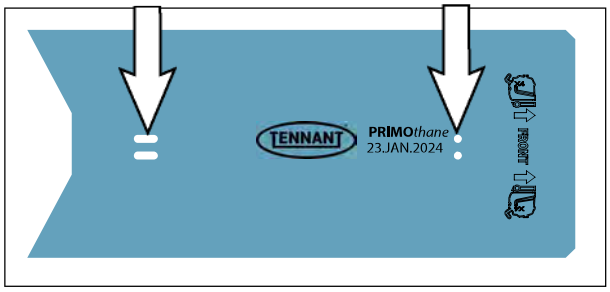
11. Verify the squeegees are locked in place by giving them a slight push or pull along the guide to ensure they do not move.

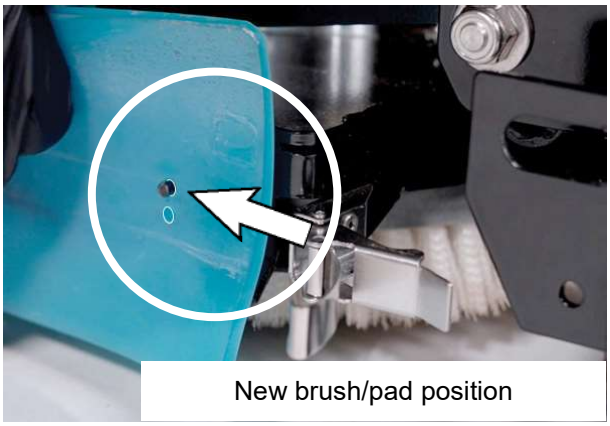
REPLACING (OR ROTATING) THE SIDE SQUEEGEE BLADES

Check the side squeegee blades for damage and wear daily. Each side squeegee blade has four wiping edges. When the blades become worn, rotate the blades top-to-bottom to a new wiping edge. Once both edges are worn, swap squeegee blades from one side of the machine to the other to use the opposite edges. Replace blades when all edges are worn.

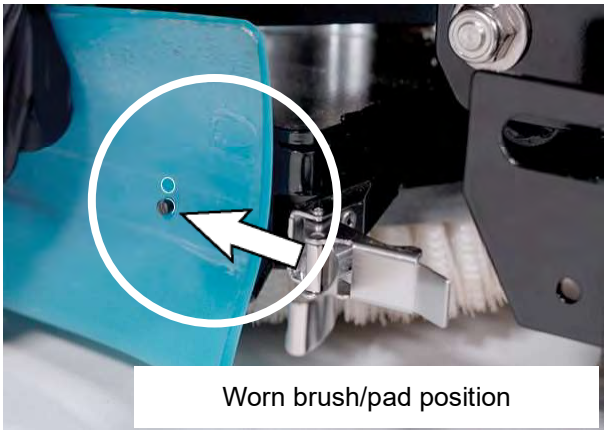


The side squeegee blades have 2 rows of mounting holes. The top row is used when the machine has new brushes or pads installed. As the brushes/pads wear, the scrub head rides lower to the ground causing more deflection of the squeegee blades which may result in trailing solution. If excessive trailing solution, raise the squeegee blade by installing the squeegee blades onto the bottom row of holes





New brush/pad position

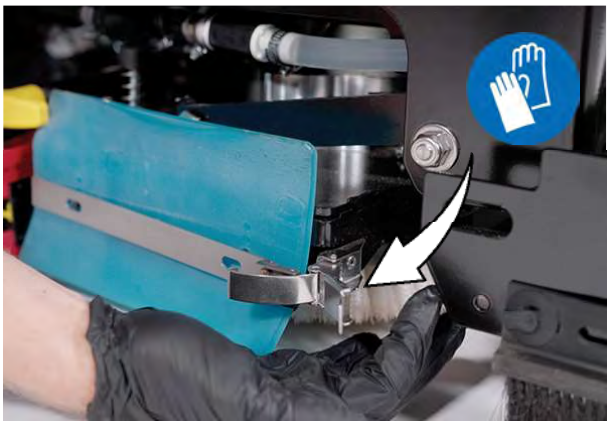


Worn brush/pad position

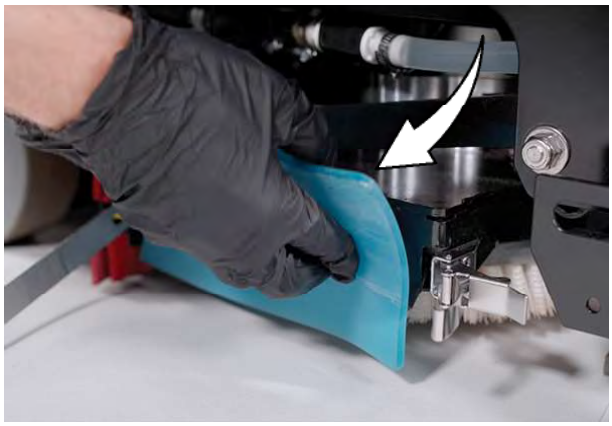
1. Stop machine on a level surface. Make sure the scrub head is in the raised position.
2. Turn the machine ON/OFF key switch off.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

3. Unhook the latch on the side squeegee retaining band from the side squeegee assembly. Open the retaining band.

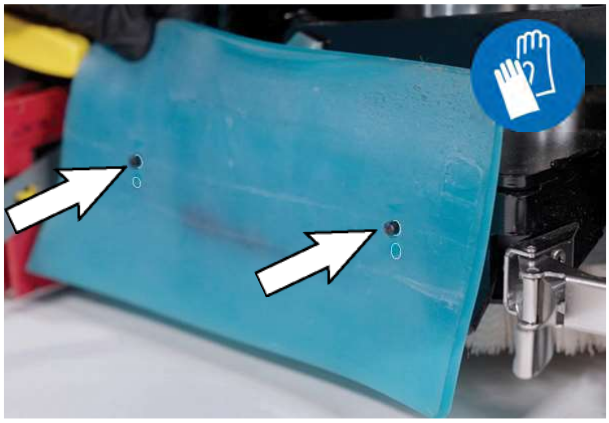


4. Remove the side squeegee blade.



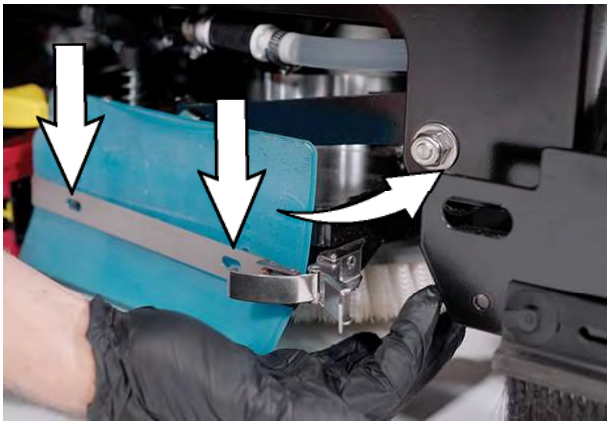
5. Check the squeegee edge for wear, rotate top-to-bottom or swap side to side if worn. Replace if necessary.

6. Reinstall the squeegee by aligning the appropriate holes to the pins on the bracket.



Check the deflection of the squeegee blades daily or when scrubbing a different type of surface. Reposition the side squeegees as needed.

7. Close the retaining band aligning the holes in the band to the pins on the bracket and relatch the band into position.



8. Repeat for other side squeegee blade.

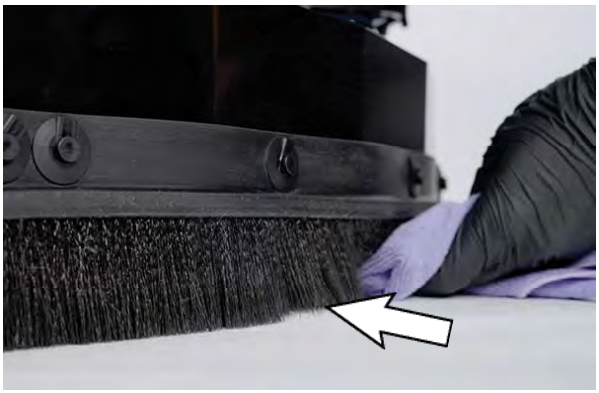
SKIRTS AND SEALS

PERIMETER GUARD

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Check perimeter guard bristles for debris, damage, and wear daily. The bristles should lightly touch the floor. Replace damaged and/or worn bristle assemblies.





RECOVERY TANK SEAL

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

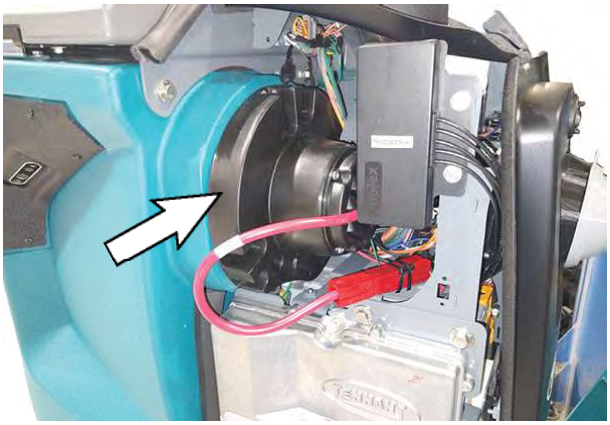
The recovery tank seal is located on the bottom of the recovery tank cover. Check the seal for damage and wear monthly or after every 50 hours of operation.



VACUUM FAN SEAL

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Check the vacuum fan seal for damage and wear after every 100 hours of operation.

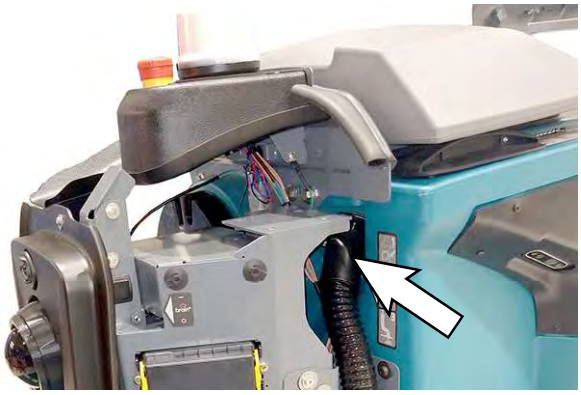


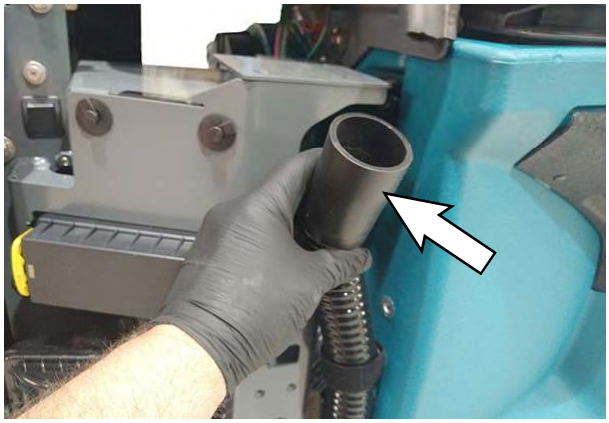
NOTE: Ensure the Service Panel latch is locked before operating the machine. See SERVICE PANEL LOCKING LATCH.

VACUUM HOSE SEAL

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Check the vacuum hose seal for damage and wear after every 100 hours of operation.



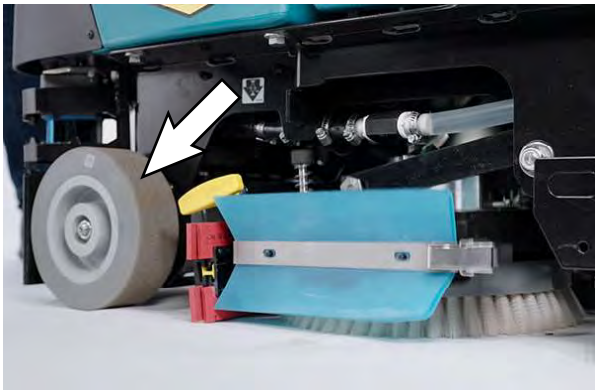


NOTE: Ensure the Service Panel latch is locked before operating the machine. See SERVICE PANEL LOCKING LATCH.

TIRES

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

The machine has two solid rubber tires in the rear, and one rubber coated swivel caster in the front. Check the tires for damage and wear after every 500 hours of operation.



PUSHING, TOWING, AND TRANSPORTING THE MACHINE

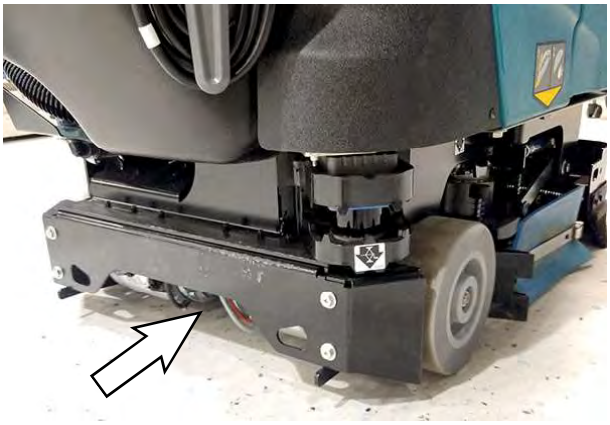
PUSHING OR TOWING THE MACHINE

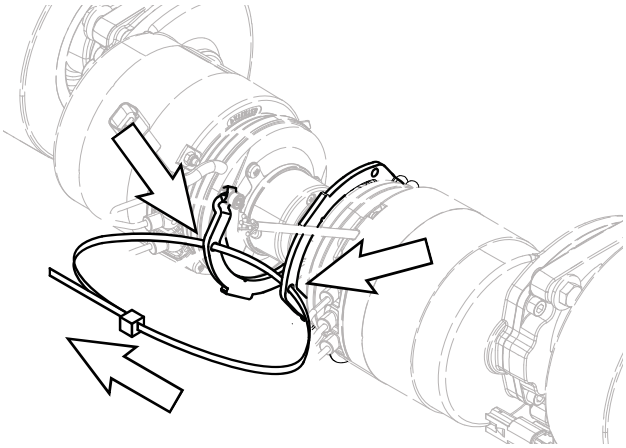
If the machine becomes disabled, it can be pushed from the front or rear, but only tow it from the front.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Before attempting to push or tow the machine, disengage the brake as described below.

To disengage the brake, insert a zip tie into the holes on the brake release levers of each drive wheel and pull the zip tie tight to hold the levers in the release position.





Only push or tow the machine for a very short distance and do not exceed 4.8 kph (3 mph). It is NOT intended to be pushed or towed for a long distance or at a high speed.

*NOTE: **Do** **Not** push or tow machine for a long distance or damage may occur to the propelling system.*

Immediately after pushing the machine, remove the zip tie from the brake release levers. NEVER operate the machine with the parking brake disabled.

FOR SAFETY: Do not operate machine with the brake disabled.

TRANSPORTING THE MACHINE

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

FOR SAFETY: When loading/unloading machine onto/off truck or trailer, drain tanks before loading machine.

1. Raise the squeegee and scrub head.

FOR SAFETY: When loading/unloading machine onto/off truck or trailer, use ramp, truck or trailer that will support the weight of the machine and operator.

FOR SAFETY: When loading/unloading machine onto/off truck or trailer, do not load/unload on ramp inclines that exceed 15.8% / 9° grade.

NOTE: The machine ability to climb a ramp is affected by tire wear, ramp surface, weather conditions, and other factors. Trailering should only be performed by personnel trained on how to safely load a machine.

2. Push the machine onto the trailer or truck. Position the machine so the weight of the machine is safely distributed and can be safely strapped down to the trailer or truck.

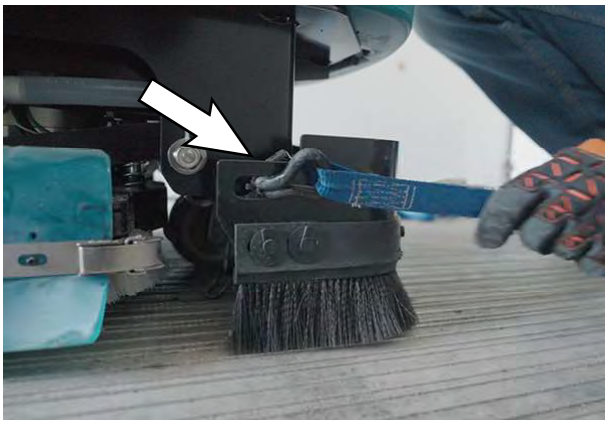


3. Raise the control handle into the stowed position.



4. Turn off the machine.

5. Hook the tie-down straps to the tie down slots in the front perimeter guard bracket and then secure the tie-downs to the trailer or truck to prevent the machine from tipping.





<u>Do</u> <u>Not</u> wrap the tie-down straps around the lower LIDAR sensor or route the tie-down straps over the front of the LIDAR sensor.

NOTE: It may be necessary to install tie-down brackets to the floor of the trailer or truck.

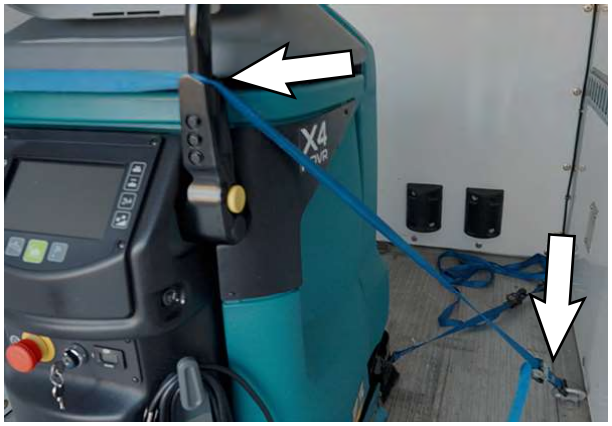
FOR SAFETY: When loading/unloading machine onto/off truck or trailer, use tie-down straps to secure machine.

6. Hook the tie-down straps to the tie down slots in the rear bumper and then secure the tie-downs to the trailer or truck to prevent the machine from tipping.



7. Route the tie-down strap over the slots in the control handle and then secure the tie-downs to the trailer or truck to prevent the machine from tipping.





8. Ensure all tie-down straps are fully tightened and machine is completely secure on the trailer or truck.

9. Stow/secure all parts removed from the machine in a safe place where they will not be lost or damaged.

JACKING UP THE MACHINE

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

Empty the recovery and solution tanks before jacking the machine.

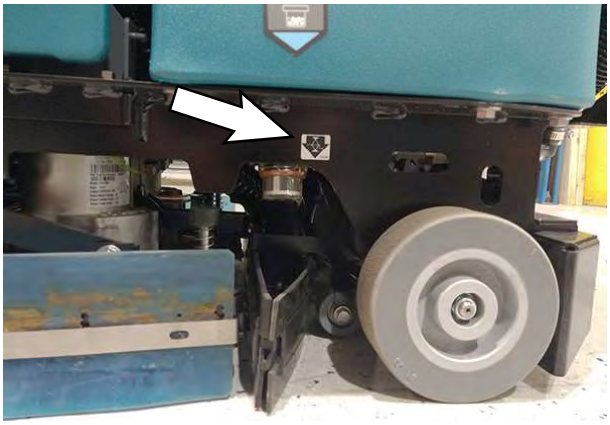
The jacking locations at the front and rear of the machine are located on the LIDAR brackets.





The jacking locations on the left and right hand sides of the machine are located on the machine frame.





FOR SAFETY: When servicing machine, block machine tires before jacking machine up. Use a hoist or jack that will support the weight of the machine. Jack machine up at designated locations only. Block machine up with jack stands.

STORAGE INFORMATION

The following steps should be taken when storing the machine for extended periods of time.

1. Drain and clean the solution and recovery tanks. Open the recovery tank cover to promote air circulation.
2. Charge the batteries before storing machine to prolong the life of the batteries. Recharge Lithium-ion batteries stored at approximately 77°F/25°C once a year or 113°F/45°C once every two years.
3. Disconnect batteries before storing.
4. Lithium-ion batteries: Turn off battery power with the battery power button.
5. Park the machine in a cool, dry area. Do not expose the machine to rain. Store indoors.

FREEZE PROTECTION

FOR SAFETY: When storing Lithium-ion Battery model, do not expose battery to temperatures below -22°F/30°C, above 140°F/60°C. Do not use machine immediately after long term extreme temperature storage. Before use, return battery module temperature range to 50°F/10°C ~95°F/35°C.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

1. Drain the solution tank and recovery tank of all water.
2. Pour 2 gallons (8 liters) of full strength Propylene Glycol Based / Recreational Vehicle (RV) antifreeze into the solution tank. Do not dilute.

FOR SAFETY: Avoid eye contact with antifreeze. Wear safety glasses.

3. Turn the machine power on and operate the solution flow system. Turn the machine off when the antifreeze appears at the scrub head.

Continue with the freeze protection procedure if machine is equipped with the *ec-H2O* system.

SPECIFICATIONS

GENERAL MACHINE DIMENSIONS / CAPABILITIES

Item	Dimension / Capacity
Length (handle stowed)	960 mm (38 in)
Length (handle lower position 1)	1070 mm (42.1 in)
Length (handle lower position 2)	1153 mm (45.4 in)
Height (to light)	1130 mm (44.5 in)
Width/frame	560 mm (22 in)
Width/machine with scrub head	560 mm (22 in)
Brush diameter	254 mm (10 in)
Scrubbing path width	500 mm (20 in)
Track	533 mm (21 in)
Wheel base	497 mm (19.6 in)
Solution tank capacity	37L (10 gallons)
Recovery tank capacity	37L (10 gallons)
Demisting chamber	13L (3.5 gallons)
Weight/net less batteries	161 Kg (356 lb)
Weight/with standard battery package	182 Kg (403 lb)
GVWR	222 Kg (490 lb)
Protection Grade	IPX3

Values determined as per IEC 60335-2-72	Measure
Sound pressure level LpA	66.5 dB(A)
Sound pressure uncertainty KpA	2.7 dB(A)
Sound power level LWA + Uncertainty KWA	86.6 dB(A)
Vibration - Hand-arm	<2.5 m/s^2

GENERAL MACHINE PERFORMANCE

Item	Measure
Aisle turnaround (right)	1130 mm (44.5 in)
Aisle turnaround (left)	1130 mm (44.5 in)
Brush down pressure	18 Kg (40 lb)
Travel Speed Forward (maximum) - Manual Mode	4.8 Km/h (3.0 mph)
Travel Speed Forward (maximum) - Robotic Mode	2 Km/h (1.3 mph)
Travel Speed Reverse	1.6 Km/h (1.0 mph)
Maximum rated climb and descent angle with full tanks (Robotic Mode)	2%
Maximum ramp incline for scrubbing - (Robotic mode)	2%
Maximum ramp incline for transporting (GVWR - Manual mode only)	2% /1°
Maximum ramp incline for loading – Empty (Manual mode only)	15.8% / 9°
Maximum ramp incline for scrubbing - (Manual mode)	2% / 1°
Maximum ambient temperature for machine operation	40° C (104° F)
Minimum temperature for operating machine scrubbing functions	1° C (34° F)

POWER TYPE

Type	Quantity	Volts	Ah Rating	Weight (each)
Batteries (Lithium-Ion)	1	24	90Ah	21.3kg (47 lb)

Type	Use	Quantity	VDC	kW (hp)
Electric Motors	Scrub brush	2	24	0.23 kW (0.3 hp)
	Vacuum fan	1	24	0.46 kW (0.6 hp)
	Propelling	2	24	0.18 kW (0.2 hp)

Type	VDC	amp	Hz	Phase	VAC
Charger (Smart)	24	41.7	50/60	1	100-240

TIRES

Location	Type	Size
Front (1)	Caster	40 mm wide x 100 mm OD (1.5 in wide x 3.9 in OD)
Rear (2)	Solid	51 mm wide x 156 mm OD (2.0 in wide x 3.9 in OD)

CONVENTIONAL SCRUBBING

Item	Measure
Solution pump	24 Volt DC, 3 A, 2.8 LPM (0.75 GPM), min open
Solution flow rate	Low: 0.18 gpm
	Medium: 0.24 gpm
	High: 0.35 gpm

MACHINE DIMENSIONS

