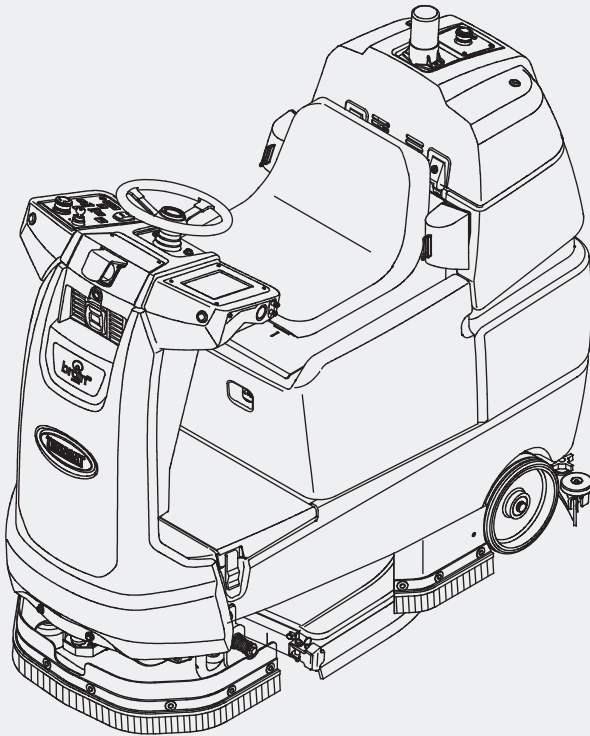




T7AMR

(Battery)

Rider-Scrubber Operator Manual



*Hygenic Fully[®] Cleanable Tanks
TennantTrue[®] Parts*



North America / International



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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 T7AMR Scrubber, powered by **BrainOS**. This document may be periodically revised. This T7AMR 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 T7AMR 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 T7AMR is an industrial/commercial robotic rider 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 T7AMR 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 T7AMR 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 T7AMR 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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USER INTERFACE (UI) TOUCHSCREEN

The *User Interface (UI) touchscreen* located to the left of the steering wheel. The *UI touchscreen* provides a system login screen, 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 **BrainOS** software will automatically initialize. Once initialized, a security PIN (Personal Identification Number) must be entered to access **BrainOS** software and use its robotic functionality.



BATTERY DISCHARGE BAR

The *battery discharge bar* displays the charge level of the batteries.



When the batteries are fully charged, the *battery discharge bar* is completely filled. As the batteries discharge, the *battery discharge bar* moves from the right to the left.

When the battery is low, an alert is triggered and displays on the *UI touchscreen*. All scrubbing functions are stopped, but the machine can still be driven. Recharge the batteries. See **CHARGING THE BATTERIES** in the **MAINTENANCE** section.

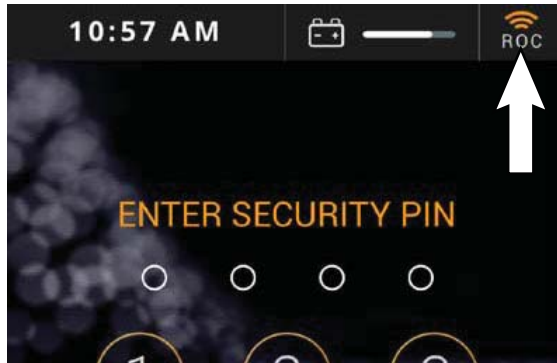
*NOTE: Do not charge batteries more often than necessary. Excessive charging could reduce the life of the batteries. It is best to charge the batteries only when alerted that the battery needs charging. See **BATTERIES** in the **MAINTENANCE** section.*

OPERATION

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 via a 4G LTE modem and does not require user interaction to connect. New versions of the software are automatically uploaded to the machine without disrupting service or operator interaction.



The *ROC indicator* is located on the *UI touchscreen* status bar. When the indicator is orange, 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.

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* turns the preset scrub functions on and off. The *ec-H2O button* (option) enables the *ec-H2O NanoClean* (electrically converted water) system. The *vacuum fan/squeegee button* turns the vacuum fan on/off and raises and lowers the squeegee. The brush pressure buttons control the scrub brush pressure, and the solution buttons control the solution flow.

The steering wheel controls the path of the machine travel. The *directional switch* controls the forward or reverse direction of the machine. The propel pedal controls the speed of the machine. The brake pedal slows and stops the machine.

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 *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 10 home location codes. Each home location code can store up to 6 routes for a total of 60 routes.

CONVENTIONAL SCRUBBING

Water and detergent from the solution tank flow to the floor through a solution valve. 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.

ec-H2O SCRUBBING SYSTEM (OPTION)

When using the *ec-H2O NanoClean* technology, normal water passes through a module where it is electrically converted into a cleaning solution. The electrically converted water attacks the dirt, allowing the machine to easily scrub away the suspended soil. The converted water then returns to normal water in the recovery tank.

The *ec-H2O* system can be used with all double scrubbing applications.

NOTE: Do not enable the ec-H2O system with conventional cleaning detergents in the solution tank. Drain, raise and refill the solution tank with only clear cool water before operating the ec-H2O system. Conventional cleaning detergents/restorers may cause failure to the ec-H2O solution system.



LOGGING INTO BrainOS

A PIN (Personal Identification Number) is required to log in to BrainOS when the machine is initially turned on or after 3 minutes (180 seconds) of no touch activity on the *UI touchscreen*. This is to ensure that only authorized personnel can access and use the BrainOS robotic functionality.

1. Turn the *ON/OFF key switch* on. Allow the BrainOS to start up (approximately 1 minute).
2. Use the *UI touchscreen keypad* to enter security four-digit PIN.



3. Upon successful PIN (Personal Identification Number) entry, the *UI touchscreen* displays the main menu.



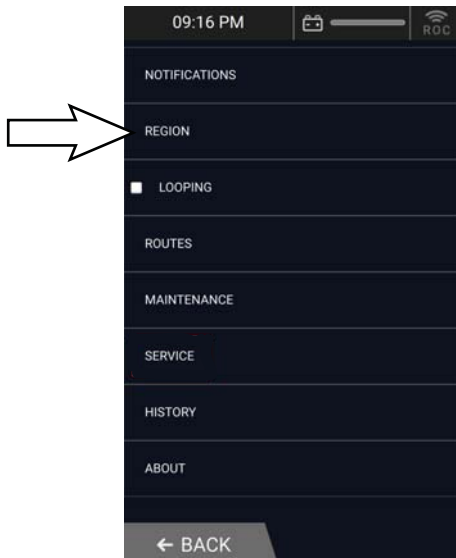
CHANGING REGION / LANGUAGE

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

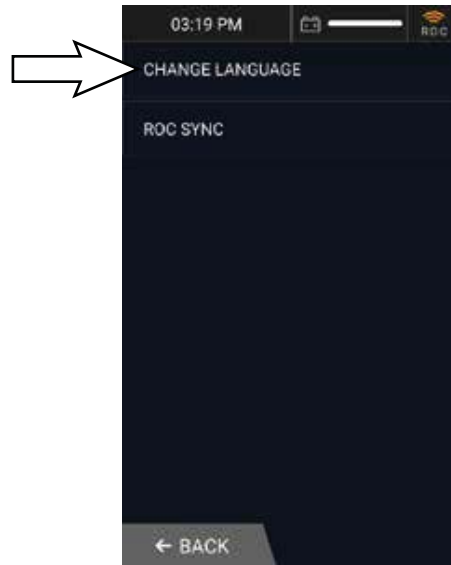
1. Upon successful PIN (Personal Identification Number) entry, the *UI touchscreen* displays the main menu. Touch **SETTINGS**.



2. Touch **REGION**.



3. Touch **CHANGE LANGUAGE**.



4. Select the desired language.



5. Touch **BACK** to return to the region menu, touch **BACK** to return to the settings menu, and touch **BACK** to return to the main menu.

POSITIONING THE MACHINE AT THE HOME LOCATION CODE

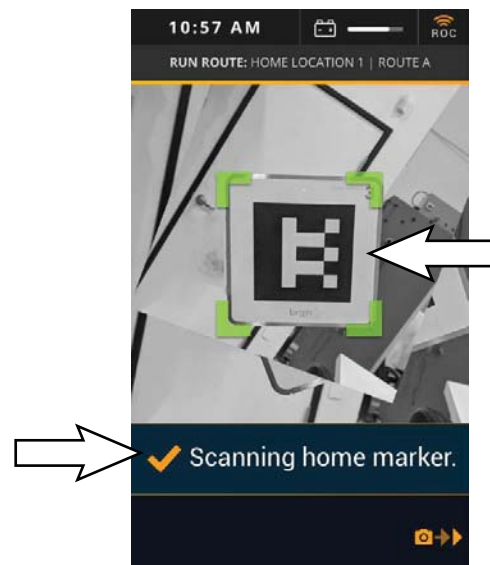
The machine must be positioned so the right-side 2D camera can scan the home location code. The machine cannot be operated in robotic mode until a home location code is scanned and recognized.

1. Upon successful PIN (Personal Identification Number) entry, the *UI touchscreen* displays the main menu. Touch the applicable task (RUN ROUTE or TEACH ROUTE).



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

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 right-side camera when it is trying to scan the home location code.

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.
- 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.
- 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.

Teaching the machine a new robotic route:

1. Turn the *ON/OFF key switch* on. Allow the **BrainOS** to start up (approximately 1 minute).
2. Use the *UI touchscreen keypad* to enter security four-digit PIN (Personal Identification Number).
3. Upon successful PIN (Personal Identification Number) entry, the *UI touchscreen* displays the main menu. Touch **TEACH ROUTE**.



4. Drive the machine to the desired home location code, positioning the machine so the right-side camera is no less than 24 in (610 mm) from the home location code. See **POSITIONING THE MACHINE AT THE HOME LOCATION CODE**.
5. 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 suggestions on how to resolve.

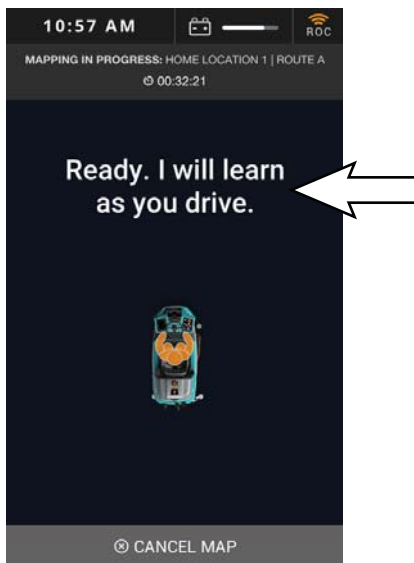
6. A **Success! Choose a box to save your route to.** message briefly appears on the *UI touchscreen* after the machine successfully scans the home location code, followed by a list of all existing and available routes for the scanned home location code.



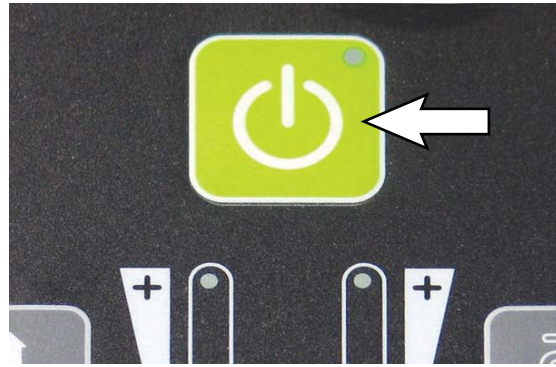
NOTE: In the above screen routes A and B are already being used for robotic routes. Routes C, D, E, and F are available for new routes.

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

7. Touch one of the available routes to select. The *UI touchscreen* states **Ready. I will learn as you drive.**

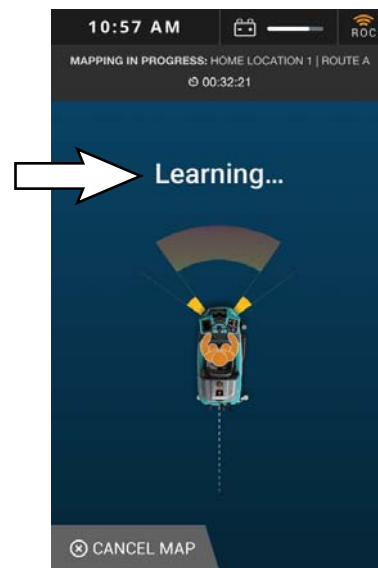


8. Press the *1-Step button* to activate the cleaning systems.



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

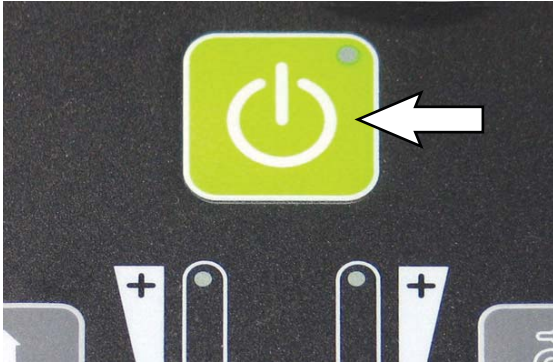
9. Press the *propel pedal* and drive the machine through the entire cleaning route to be saved. As soon as driving begins, the *UI touchscreen* states **Learning...** along with the amount of time spent on the route so far.



NOTE: Do not teach a route with an incline or decline.

NOTE: Do not teach the machine routes that include driving into an elevator or automatic doors.

*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.*



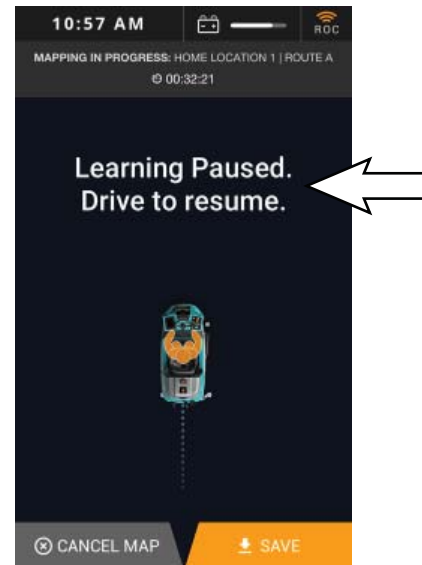
NOTE: Avoid U-turns. The machine requires a minimum of 120 in (3048 mm) to perform a U-turn.

NOTE: Avoid tight corners. The machine requires a minimum of 60 in (1524 mm) to navigate a corner.

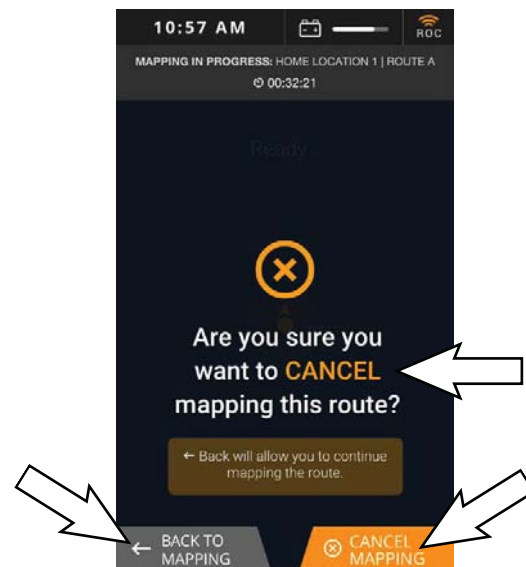
NOTE: Avoid narrow spaces. The machine requires a width of 48 in (1220 mm) to navigate aisles and between displays.

FOR SAFETY: While machine is operating in robotic mode, only scrub flat, hard surfaces of 0% incline.

10. Once driving stops, the UI touchscreen states **Learning Paused. Drive to resume.** with options to SAVE or CANCEL MAP. Touch SAVE to save the new route.



*NOTE: If cancelling the new route, touch CANCEL MAP on the UI touchscreen. The UI touchscreen states **Are you sure you want to CANCEL mapping this route?** Touch CANCEL MAPPING to cancel the route and return to the main menu. Touch BACK TO MAPPING to return to the previous screen.*



NOTE: Touch BACK TO MAPPING to return to the previous screen. Begin driving to resume teaching the new route.

- The machine will scan the home location code a second time at the end point of the cleaning route. If the machine does not see the home location code from the right-side camera, the *UI touchscreen* states **Drive to scan my home location**.

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

- When in the process of saving, the *UI touchscreen* displays **Saving Route**.



- When the route is successfully saved, the *UI touchscreen* briefly displays **Success! Route saved**, and then returns to the main menu. The new cleaning route is saved and is now available to run in robotic mode.



*NOTE: If the UI touchscreen states **Error 20007 Failed to create a route**, touch Return to Home to return to the main menu. Repeat the entire procedure to teach the cleaning route.*



PAIRING A PHONE WITH THE ROC

Before running a cleaning route in robotic mode, it is recommended that the operator pair their cell phone to the ROC. When a cell phone is paired to the ROC, the ROC will send SMS or MMS messages to the phone whenever the machine encounters an alert and/or when the route is complete.

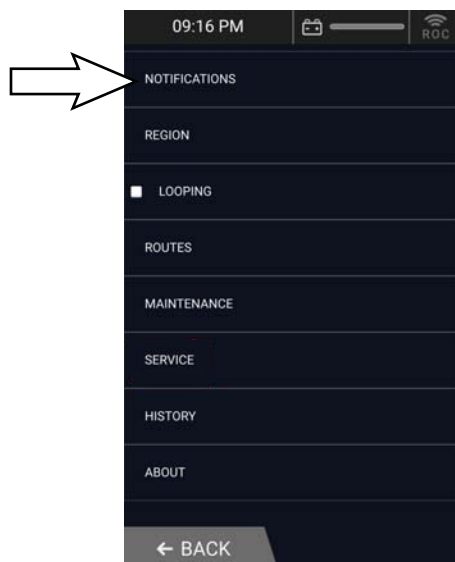
To ensure only the on site operator receives alerts from the ROC, only one phone can be paired to the ROC to receive status alerts. A paired phone number is automatically discarded when the machine is turned off or a new phone is paired.

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

2. Touch **SETTINGS** on the main menu on the *UI touchscreen*. The **SETTINGS** menu is displayed.



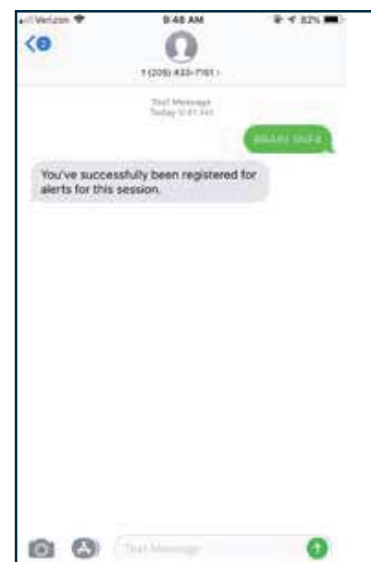
3. Touch **NOTIFICATIONS**.



4. Follow the instructions on the *UI touchscreen* to pair a cell phone to the ROC.



5. Pairing is successful when the cell phone receives a confirmation text message.



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 *RUN ROUTE*.



3. Drive to the desired home location code, positioning the machine so that the right-side 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. A **Success! Choose a route to run.** is briefly displayed, followed by a list of all existing routes for the scanned home location code.

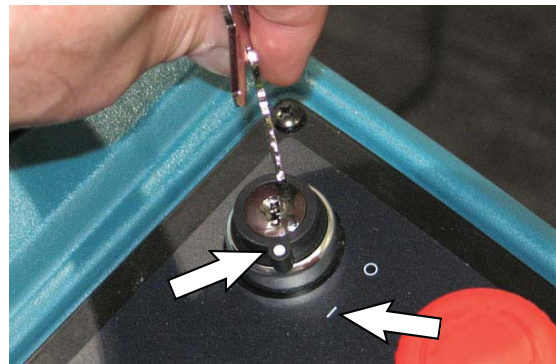
5. Touch the cleaning route to run in robotic mode.



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










NOTE: The machine does not save solution flow and brush pressure settings for a robotic route, as these needs may change from day-to-day. Determine cleaning requirements for the area(s) being cleaned and adjust solution flow and brush pressure settings as necessary.

7. Remove the key from the *ON/OFF* key switch.











FOR SAFETY: While machine is operating in robotic mode, remove key from *ON/OFF* key switch to prevent unauthorized use without disrupting robotic route.

OPERATION

Alert(s)	Cause(s)	Symbol	Additional Indicator(s)	Remedy (Displayed on the UI touchscreen)
202 BATTERY IS TOO LOW *	Batteries need to be charged.		Beep or chirp every 10 seconds.	<ol style="list-style-type: none"> 1. Drive to charging station. 2. Inspect and charge batteries.
PATH IS BLOCKED	Obstacle(s) on cleaning route.		N/A	<ol style="list-style-type: none"> 1. Make sure the robot's path is clear or drive past any obstacles. 2. Press rear BLUE button to start.
IMPACT DETECTED	Obstacle(s) on the cleaning route. Machine bumped obstacle(s) along route.		N/A	<ol style="list-style-type: none"> 1. Make sure the robot's path is clear or drive past any obstacles. 2. Inspect the robot. 3. If everything is clear, press rear BLUE button to start.
ROBOT IS OFF PATH	Machine is off designated scrubbing path.		N/A	<ol style="list-style-type: none"> 1. Follow the blue arrow and drive to the red path. 2. When correct, the path will turn white. 3. Press rear BLUE button to start.
SENSOR ERROR	Sensor(s) dirty or damaged.		N/A	<ol style="list-style-type: none"> 1. Inspect/clean robot's sensors for damage or debris. 2. Wipe the sensors with microfiber cloth. 3. If there are no issues, press the BLUE button in the back to resume.
MACHINE ERROR	Steering wheel obstruction.		N/A	<ol style="list-style-type: none"> 1. Make sure that the steering wheel is free and clear. 2. Press the BLUE button in the back to resume.
203 TRACTION MOTOR ERROR	Propelling issues.		Directional switch LEDs flash.	<ol style="list-style-type: none"> 1. Power off robot 2. Disconnect then reconnect the battery. 3. Power the robot back on. 4. If issue persists, contact Customer Service.
204 BRUSH ERROR	Damaged brushes. Debris caught in brushes.		Brush pressure indicator lights and 1-Step button LED flash.	<ol style="list-style-type: none"> 1. Inspect brushes/pads for damage or debris. Adjust or replace as needed. 2. If there are no issues, press the BLUE button in the back to resume. 3. If issue persists, contact Customer Service.
205 VACUUM ERROR	Obstruction caught inside vacuum hose. Damaged vacuum hose.		Vacuum fan/ squeegee button LED flash.	<ol style="list-style-type: none"> 1. Inspect vacuum and hose for damage or debris. 2. If the hose is clear, press the BLUE button to resume. If the hose is broken, contact Customer Service.

** All scrubbing functions stop, but the machine can still be driven. If necessary, press the 1-Step button for an additional minute of operation to pick up standing water or solution.*

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

Alert(s)	Cause(s)	Symbol	Additional Indicator(s)	Remedy (Displayed on UI touchscreen)
206 SQUEEGEE ERROR	Obstruction caught in squeegee. Damaged or missing squeegee.		Vacuum fan/ squeegee button LED flash.	1. Inspect squeegee for damage or debris. Adjust or replace as needed. 2. If there are no issues, press the BLUE button in the back to resume. (Robotic) 3. If issue persists, contact Customer Service.
207 SCRUB DECK ERROR	Obstruction preventing scrub deck from raising/lowering.		Brush pressure indicator lights and 1-Step button LED flash.	1. Turn off and inspect machine. 2. If there are no issues, press the BLUE button in the back to resume. (Robotic) 3. For damage or persistent problems, contact Customer Service.
208 NO BRUSH ERROR	No brushes installed. Brushes not properly installed.		Brush pressure indicator lights and 1-Step button LED flash.	1. Make sure brushes or pads are properly installed. 2. If there are no issues, press the BLUE button in the back to resume. (Robotic) 3. If issue persists, contact Customer Service.
209 SEAT SENSOR TRIGGERED	Person or object on operator seat while machine is in robotic mode.		N/A	1. Check that the seat is clear. 2. Press rear BLUE button to start.
210 BRAIN STATE ERROR	Brain controller error.	NA	N/A	1. Turn off and inspect machine. 2. Reboot and attempt to operate. 3. If issue persists, contact customer Service.
BRAKE ERROR	Electronic/mechanical brake error or issue.		Directional switch LEDs flash.	Please Contact Customer Service Immediately.
ERROR MESSAGE	Generic controller error or issue.		N/A	Please Contact Customer Service Immediately.
THROTTLE ERROR	Electronic/mechanical throttle error or issue.		N/A	Please Contact Customer Service Immediately.
215 UNKNOWN ERROR	Error(s) of an unknown origin.		N/A	1. Turn off and inspect machine. 2. Reboot and attempt to operate. 3. If issue persists, contact customer Service.
216 E-STOP ENGAGED	<i>Emergency Stop button</i> engaged.	**	All LEDs control panel will flash.	1. Inspect area being cleaned and the machine. 2. If clear, disengage <i>Emergency Stop button</i> .

**See *EMERGENCY STOP BUTTON* for *Emergency Stop* related screens/alerts.

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