

Big Ox Ai-32

Industrial Robotic Scrubber

Operator Manual

RPS Corporation
1711 South Street, Racine, WI 53404 USA

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INTRODUCTION

This operator manual contains information to allow for quick start-up of the new Big Ox Ai-32 industrial robotic scrubber, powered by RPS. This document may be periodically revised.

This Big Ox Ai-32 industrial robotic scrubber can be used in manual mode or as a self-driving, robotic scrubber. It is important to follow all provided instructions and warnings. Failure to adhere to instructions could result in damage to the machine and injury.

INTENDED USE AND PRECAUTIONS

The Big Ox Ai-32 is an industrial/commercial robotic stand-on 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 Big Ox Ai-32, powered by RPS, should only be used by trained operators in controlled, restricted environments approved by RPS.

The operator is responsible for the use of each Big Ox Ai-32 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:

- Transmission of any software or other materials that contain any viruses, worms, trojan horses, defects, spyware, or items of a destructive 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, RPS OS, or the RPS software;
- Framing, mirroring, or reselling any part of the software without written authorization from RPS;
- Unauthorized collection of user information; or
- Attempting to deliberately damage the RPS software, or undermine the legitimate operation of the RPS software.

IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS

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

MODIFICATION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if

not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

⚠ 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.

ESCALATOR WARNING: Always place a cone or other physical barrier at escalator entrances and exits before scanning a map.

This machine is equipped with technology that automatically communicates over the cellular network. This machine is equipped with RPS OS software that is accessible via the RPS OS User Interface (UI) Touch Screen.

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 RPS. 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.
- Check brakes and steering for proper operation.

3. When using machine in manual mode:

- Use only as described in this manual.
- Release the go pedal to stop machine.
- Reduce speed when turning.
- Go slowly on inclines and slippery surfaces.
- Do not scrub on ramp inclines that exceed 7% / 4° grade or transport (GVWR) on ramp inclines that exceed 20% / 11° grade.
- Drive slowly through doorways and narrow openings.
- Be cautious of the squeegee near bystanders and obstacles.
- Keep all parts of body inside operator station while machine is moving.
- 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. When using machine in robotic mode:

- Use only as described in this manual.
- As the machine begins robotic operation, observe scrubbing performance to ensure that all components are functioning properly.
- Do not attempt to stand on machine.
- Do not grab steering wheel or put hands or arms through the holes of the steering wheel. Steering wheel may move rapidly and unexpectedly while in robotic mode.
- 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 7% 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 10 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.
- 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.
- 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 without an operator standing on the operator platform controlling 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 off-board charger into a properly rated outlet only.
- Do not disconnect the off-board charger's DC cord from the machine's receptacle when the charger is operating. Arcing may result. If the charger must be interrupted during charging cycle, disconnect the AC power supply cord first.
- Disconnect battery connections before working on machine.
- Do not disconnect battery connections while 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 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 RPS 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 RPS machine applications. Do not install battery pack in unapproved machines.
- Dispose of battery in accordance with local regulations. Contact RPS Service.
- Contact RPS 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.
- Do not use machine after long-term storage. Before use, return battery module temperature range to 50°F (10°C) ~ 95°F (35°C).

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 drive on a slippery ramp.
- Use caution when operating on a ramp.
- Do not load/unload on ramp inclines that exceed 20% / 11° grade.
- Lower scrub head and squeegee before tying down machine.
- Turn off machine and remove key.
- Block machine tires.
- Use tie-down straps to secure machine.

OPERATION

MACHINE COMPONENTS

- A. Steering Wheel
- B. Control panel
- C. NFC Reader
- D. Directional switch
- E. Emergency shut-off button
- F. Speed knob
- G. Operator presence pedal
- H. Go pedal
- I. Solution tank
- J. Solution tank fill port
- K. Auto-Fill Solution tank Auto-Fill
- L. Recovery tank
- M. Recovery tank cover
- N. Recovery tank drain hose
- O. Battery compartment
- P. Rear squeegee
- Q. Squeegee vacuum hose
- R. Front perimeter guard
- S. Side squeegee
- T. Scrub head
- U. Flashing light
- V. Charging electrode
- W. Auto solution tank fill port
- X. Auto recovery tank drain port

CONTROLS AND INSTRUMENTS

- A. 1-Step button
- B. Scrub pressure decrease button
- C. Scrub pressure Increase button
- D. Solution flow decrease button
- E. Solution flow increase button
- F. Vacuum button
- G. Emergency stop
- H. Horn button
- I. Yellow start/pause button
- J. Signal lights (Rear)

CAMERAS AND SENSORS

Sensors - 32 Beam LIDAR

Sensors - 1 Beam LIDAR

Sensors - Distance Sensor

Signal lights (Front)

Sensors - Front 3D camera

Sensors - Front 2D camera

Sensors - Side 3D camera (located on each side of machine)

Sensors - Rear 3D camera

FCC LABEL INFORMATION

Machine Nameplate

Product Name: Big Ox Robotic Scrubber

Model: Ai-32

Rated input voltage: 43.8V

Rated input current: 25A

Dimension (L×W×H): 1630×1100×1440mm

GVW: 650kg

Unladen Weight: 405kg

IP Code: IPX3

Manufacturer: RPS Corporation

Address: 1711 South Street Racine, WI 53404 USA

Use only with <Model WS Ai-32> workstation

À utiliser uniquement avec la station de travail <Model WS Ai-32>

"WARNING - To reduce the risk of injury, user must read instruction manual."

"AVERTISSEMENT - Pour réduire le risque de blessure, l'utilisateur doit lire la notice d'instruction."

Workstation (Dock Station) Nameplate

Product Name: Big Ox Workstation

Model: WS Ai-32

Rated input voltage: 110-120V~ 60Hz

Rate input power: 1500W

Rated Output: 43.8V 25A

IP Code: IPX3

Dimension (L×W×H): 664×500×1435mm

Weight: 56kg

Use only with <Model Ai-32> Big Ox Robotic Scrubber

À utiliser uniquement avec le robot laveur Big Ox <Model Ai-32>

Before charging, read the instructions.

Avant de charger, lire les instructions.

Manufacturer: RPS Corporation

Manufacturer's address: 1711 South Street Racine, WI 53404 USA

MACHINE SETUP

ATTACHING SQUEEGEE ASSEMBLY

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 rear squeegee under the squeegee mount bracket and fasten with the two knobs.
4. Connect the vacuum hose to the squeegee assembly. Loop the hose as shown using the hose clip provided.

The squeegee deflection is set at the factory. If the squeegee blade needs adjustments, see ADJUSTING REAR SQUEEGEE BLADE DEFLECTION section of this manual.

INSTALLING BRUSHES/PADS

To install the brushes or pad, see REPLACING DISK SCRUB BRUSHES OR PAD DRIVER section of this manual.

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.

Place the front perimeter guard underneath the front of the machine.

3. Install the front perimeter guard onto the front of the machine.

FILLING THE SOLUTION TANK

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

The machine is equipped with auto-fill port at the rear of the machine.

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

FOR CONVENTIONAL SCRUBBING:

Open the solution tank fill port (or use the Auto-Fill System) and partially fill it with water (not to exceed 60°C/140°F). Pour the required amount of detergent into the solution tank according to mixing instructions on the bottle. Then continue filling the solution tank with warm water until the water level is just below the fill port.

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: For Conventional Scrubbing, only use recommended cleaning detergents. Machine damage due to improper detergent usage will void the manufacturer's warranty.

OPERATION OF CONTROLS

DIRECTIONAL SWITCH

Press the top of the directional switch to move the machine forward. The forward arrow light located at the top of the switch will illuminate when the machine is placed in the forward direction.

Press the bottom of the directional switch to move the machine in reverse. The reverse arrow light located at the bottom of the switch will illuminate when machine placed in the reverse direction.

SETTING SCRUB MODES

SETTING BRUSH PRESSURE

Under normal soilage conditions, the brush pressure should be set to the minimum setting. Under heavy grime conditions, the brush pressure should be set to the maximum setting. Travel speed and floor conditions will affect scrubbing performance.

With the 1-Step button activated, press the Scrub pressure decrease or increase button to adjust the brush pressure settings. The brush pressure indicator lights display the current brush pressure setting.

SETTING SOLUTION FLOW

Under normal soilage conditions the solution flow level should be set to the lowest setting. Under heavy grime conditions, the solution flow level should be set to a higher setting. Travel speed and floor conditions will affect scrubbing performance.

With the 1-Step button activated, press the Solution flow decrease or increase button to adjust the solution flow settings. 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 Brush Pressure and Solution Flow settings are set to lowest setting.

EMERGENCY STOP BUTTONS

This machine is equipped with one Emergency Stop button on the control panel. Use the Emergency Stop buttons only in emergency situations, as solution could be potentially released 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 Emergency Stop button in an emergency to halt the machine power. Twist the Emergency Stop button used to stop the machine to the right and press reset on the UI screen to disengage the emergency stop function.

If the Emergency Stop button is pressed when the machine is running a robotic task, the in-process task is terminated. Restart the machine by turning the engaged Emergency Stop button

to the right, and press reset on the UI screen to disengage the emergency stop function. Reselect a new task to begin the robotic task.

YELLOW START/PAUSE BUTTON

The machine is equipped with a yellow start/pause button below the Lidar that is used to start a robotic task or pause an in-process robotic task. When a saved navigation task is selected on the UI touchscreen, the yellow start/pause button flashes. When pressed to start the task in robotic mode, the yellow start/pause button stops flashing and remains consistently illuminated during robotic operation. The yellow start/pause button is off when operating the machine in manual mode.

BLUE PEDESTRIAN LIGHT

The blue pedestrian light shines onto the floor in front of the machine to alert pedestrians the machine is near. The blue pedestrian light automatically comes on when the robotic model is activated. Position the blue light so it illuminates far enough out from the machine to adequately alert pedestrians that machine is near.

USER INTERFACE (UI) TOUCHSCREEN

The User Interface (UI) touchscreen located to the bottom of the steering wheel. The UI touchscreen provides a system login screen, access to all 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 RPS software will automatically initialize. Once initialized, NFC card must be scanned to access RPS software and use its robotic functionality.

OPERATION

HOW THE MACHINE WORKS

The scrub components of the machine are a solution tank, a squeegee, a vacuum fan, and a recovery tank. Scrub brushes (pads) or cylindrical can be selected.

The buttons on the control panel control the machine scrubbing functions. The 1-Step button turns the preset scrub functions on and off. 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 Speed knob controls the speed of the machine. The left foot on the Operator presence pedal and right foot on the go pedal accelerate speed and remove foot from the green go pedal to stop 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 RPS representative.

BRUSH AND PAD INFORMATION

For best results, use the appropriate brush or pad for the cleaning application.

Nylon brush (Disk and Cylindrical) – Softer nylon bristles are recommended for scrubbing coated floors. Cleans without scuffing.

PolyPro brush (Disk and Cylindrical) – Heavy duty polypropylene bristles provide a more aggressive cleaning performance.

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

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

High productivity stripping pad (Black) – For aggressive stripping of heavy finishes or sealers, or for very heavy duty scrubbing.

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

PRE-OPERATION CHECKLIST

- ☐ Check the machine for fluid leaks.
- ☐ Check the battery charge level.
- ☐ Check the tank cover seals for damage and wear.
- ☐ Clean the vacuum fan inlet filter.
- ☐ Check the condition of the scrubbing brushes. Remove any string, banding, plastic wrap, or other debris wrapped around them.
- ☐ Check the squeegees for damage, wear and for deflection adjustment.
- ☐ Check the left perimeter guard, right perimeter guard, front 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 Lidar, cameras for dirt, dust, and smudges. Use microfiber cloth to clean all cameras and LIDAR sensors.
- Check the horn, headlights, taillights, safety lights, and audible alarms.

SCRUBBING - MANUAL MODE

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

1. Turn the ON/OFF key switch on.
2. Press the 1-Step button. The light in the button is illuminated. All the preset scrubbing functions will turn on.
3. Select the preferred scrubbing settings (See SETTING SCRUB MODES).
4. Place the directional switch in the direction the machine is to be moved (forward or reverse).

NOTE: The machine can scrub in both forward and reverse.

NOTE: The squeegee automatically rises when the machine is driven backwards. This prevents damaging the squeegee. When the machine is placed in reverse, the vacuum fan will shut off after a short delay.

5. Press the go pedal to begin scrubbing.

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

6. Release the go pedal to stop the machine. Scrubbing functions stop and the automatic park brake will engage when the machine stops.

The Speed knob can be used to control the machine if quicker stopping is needed or if operating on an incline. Do not operate machine on inclines exceeding 7% when scrubbing.

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

7. Press the 1-Step button to stop scrubbing. The light in the 1-Step button will turn off and the scrubbing functions will turn off after a short delay.

DOUBLE SCRUBBING

NOTE: Double scrubbing is available in Manual Mode only. Do Not operate the machine on an autonomous cleaning route with the squeegee in the raised (double scrub) position.

For heavily soiled areas, use the double scrubbing method.

Before double scrubbing, lift the side squeegees to keep them from channeling water while double scrubbing.

To double scrub, press the 1-Step button, then the vacuum fan button. The light above the vacuum fan button will turn off, the squeegee will raise and the vacuum fan will stop operating. Then scrub the area.

Let the cleaning solution set on the floor for 3-5 minutes.

Place the side squeegees back on to the machine before scrubbing the floor the second time.

Press the vacuum fan button again to lower the squeegee and to turn on the vacuum fan. The light above the vacuum fan button will illuminate. Scrub the floor a second time to pick up the cleaning solution.

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.

Then press the vacuum fan/squeegee button. The light in the vacuum fan/squeegee button will illuminate, the squeegee 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.

LOGGING INTO RPS OS

A NFC card is to log in to RPS OS 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 RPS OS robotic functionality.

1. Turn the ON/OFF key switch on. Allow the RPS OS to start up (approximately 1 minute).

RUNNING A ROBOTIC CLEANING ROUTE (For Operator)

1. Turn the ON/OFF key switch on.
2. Scan the operator NFC card or Use the UI touchscreen keypad to enter the system.
3. Upon successful entry, the UI touchscreen displays the main menu. Select Auto-scrub or Scan&Scrub to next step.
 - 4.1.1 Select task and press next step. (Auto-scrub)
 - 4.1.2 Check Lidar reflection to identify whether robot is in the right position within the map.
 - 4.1.3 Relocate position and direction of robot to match Lidar reflection and map.
 - 4.1.4 Check if Lidar reflection match with map.
 - 4.1.5 Press the Yellow start/pause button to start the robotic route. The yellow warning light flashes to signal that robotic cleaning is starting.
 - 4.1.6 As the machine runs the route in robotic mode, the UI touchscreen states Cleaning in Progress, as well as the machine current location on the cleaning route, amount of time spent on the route in robotic mode.
 - 4.2.1 Drive to the desired home location code, positioning the machine so that the front-side camera scans the QR code. The machine automatically begins scanning, as displayed on the UI touchscreen.
 - 4.2.2 Press the Yellow start/pause button to start the robotic route.
 - 4.2.3 As the machine runs the route in robotic mode, the UI touchscreen states Cleaning in Progress.
1. As the machine begins robotic operation, observe scrubbing performance to ensure that all components are functioning properly.
2. If any scrubbing functions need adjustment, press the Yellow start/pause button on the UI screen or behind the 3D Lidar to pause the machine.
3. Make the necessary adjustments to the brush pressure, solution flow, and squeegees.
4. Press the blue start/pause button to resume the route in robotic mode.

WHILE OPERATING THE MACHINE

Pick up 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.

Drive as straight 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).

Avoid turning the steering wheel too sharply when the machine is in motion. The machine is very responsive to the movement of the steering wheel. Avoid sudden turns, except in emergencies.

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

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.

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 7% grade or transport (GVWR) on ramp inclines that exceed 20% grade.

FOR SAFETY: While machine is operating in robotic mode, only scrub flat, hard surfaces of 7% 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.

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. Rinse the float sensor located inside the recovery tank.
6. Replace the recovery tank drain hose cap and mount the drain hose back onto the mounting clip after the tank is drained.
7. Close the recovery tank cover.

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.

To reset the alert indicators, turn off the machine and then eliminate the cause of the alert. The alert indicator will reset when the machine is restarted.

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
	Squeegee out of adjustment	Adjust squeegee
	Vacuum hose clogged	Flush vacuum hoses
	Vacuum fan filter dirty	Clean vacuum fan filter
	Debris caught on squeegee	Remove debris
	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 filter, clean and reinstall
Poor scrubbing performance	1-Step button not on	Turn 1-Step button on
	Improper detergent or brushes used	Contact RPS 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
	Brush pressure set too light	Increase brush pressure
	Low battery charge	Charge batteries until charger automatically turns off

MAINTENANCE

MAINTENANCE CHART

0 = Operator, T = Trained Personnel.

Interval	Resp.	Key Description	Procedure
Daily	0	Side and rear squeegees	Check, flip or replace; Check deflection and leveling
Daily	0	2D and 3D sensors and LIDAR sensors	Check for damage. Clean with provided microfiber cloth
Daily	0	Scrub brushes/pads	Check for damage, wear, debris
Daily	0	Perimeter guards (front)	Check for debris, damage, and wear
Daily	0	Recovery tank	Clean tank, screen filter, and float sensor
50 Hours	0	Scrub head floor skirt	Check for damage and wear
100 Hours	T	Vacuum fan and recovery tank seals	Check for damage and wear
100 Hours	0	Solution tank seals	Check for damage and wear
500 Hours	T	Vacuum fan motor(s)	Check motor brushes (Check every 100 hours after initial 500 hour check)
500 Hours	T	Scrub brush motors	Check motor brushes (Check every 100 hours after initial 500 hour check)
500 Hours	T	Tires	Check for damage and wear

LITHIUM-ION BATTERY

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 32°F/0°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.
- 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.

BATTERY POWER BUTTON / BATTERY DISCHARGE INDICATOR

Each Lithium-Ion battery contains a power button to turn on/off the battery power supply. The battery discharge indicator (BDI) displays the current state of the battery.

When the batteries are fully charged, all five green indicators are lit. As the battery discharges, the indicator levels decreases. If the indicators flash red the battery is getting very low. If the indicators display solid red along with green, the battery has a fault. Contact RPS Service to fix the fault.

To turn off the battery power (while the batteries are active), press the battery power button. The battery discharge indicators will turn off. Battery should be shut down before any service is completed on the battery.

To turn on the battery power (when the batteries are shutdown), press the power button. The battery discharge green indicators will illuminate when turned on.

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 RPS is prohibited. Refer to the charger owner's manual for additional information. Contact distributor or RPS for battery charger recommendations.

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

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

1. Connect the charger DC cord into the machine battery charge receptacle then plug the AC power supply cord into a properly grounded wall outlet. Refer to the off-board battery charger owner's manual for operating instructions.

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

2. The charger will automatically begin charging and shut off when fully charged. The maximum charging cycle may take up to 6 hours depending on battery type.

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

3. After charging batteries unplug the AC power supply cord from the outlet before disconnecting the charger from the machine.
4. Disconnect the battery charger from the machine.

CAMERAS AND SENSORS

FRONT, BACK AND SIDE 3D CAMERAS

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

Check 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. Use the provided microfiber cloth to clean the cameras. Do not apply water to the cameras or the microfiber cloth.

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.

UPPER AND LOWER LIDAR SENSORS

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

Check the upper and lower 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. Use the provided microfiber cloth to clean the sensors. Do not apply water to the sensors or the microfiber cloth.

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

NOTE: Due to the lower LIDAR sensor 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 flash light to inspect these sensor surfaces and ensure they are thoroughly cleaned.

SCRUB BRUSHES

The machine can be equipped with either disk or cylindrical scrub brushes. Check scrub brushes daily for wire or string tangled around the brush or brush drive hub. Also check brushes or pads for damage and wear.

DISK BRUSHES AND PADS

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 with a center disk. Both sides of the pad can be used for scrubbing. Turn the pad over to use the other side.

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 lay pads flat to dry.

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

REPLACING DISK BRUSHES OR PAD DRIVERS

1. Raise the scrub head.
2. Turn off the machine.

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

3. Open the main brush access door and side squeegee support door.
4. Quickly turn the brush opposite from its cleaning direction and let the brush drop to the floor.
5. Remove the brush from under the scrub head.
6. Push the new brush under the scrub head, align the brush drive socket with the brush drive hub, and lift the brush up onto the brush drive hub then quickly turn the brush in the cleaning direction.
7. Ensure the brush is securely mounted on the brush drive hub.
8. Close and secure the squeegee support door and close the main brush access door.
9. Repeat procedure for the other brush.

REPLACING CYLINDRICAL SCRUB BRUSHES

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

Rotate the brushes from front-to-rear after every 50 hours of operation. Replace the brushes when they no longer clean effectively.

NOTE: Replace worn brushes in pairs. Scrubbing with brushes of unequal bristle length will result in diminished scrubbing performance.

1. Open the main brush access door and side squeegee support door.
2. Remove the idler plate from the scrub head.
3. Remove the brush from the scrub head.
4. Position the brush with the double row end towards the scrub head opening. Guide the new brush onto the drive hub.
5. If rotating the brushes, always rotate the front with the back so that they wear evenly. They may be rotated end for end as well.
6. Reinstall the idler plate onto the scrub head.

NOTE: Do not switch the left or right idler plates or the brushes will need to be readjusted by trained personnel.

7. Close and secure the squeegee support door and close the main brush access door.
8. Repeat for the brush on the other side of the scrub head.

SQUEEGEE BLADES

- Check the squeegee blades for damage and wear daily. When the blades become worn, rotate the blades end-for-end or top-to-bottom 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. Check the leveling of the rear squeegee every 50 hours of operation.

The rear squeegee assembly can be removed from the squeegee pivot to prevent damage during transport of the machine.

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. Remove the squeegee vacuum hose from the rear squeegee assembly. Then loosen both rear squeegee assembly mounting knobs.
4. Pull the rear squeegee assembly from the machine.
5. Loosen the rear squeegee retaining band tension latch and remove the retaining band.
6. Remove squeegee blade from the rear squeegee assembly.
7. Install the new squeegee blade or rotate the existing blade to the new edge. Be sure the holes in the squeegee blade are hooked onto the tabs on the blade clamp.
8. Reinstall the rear squeegee retaining band onto the squeegee assembly. Be sure each of the flanges on the retaining band is seated in the cut outs in the rear squeegee assembly.
9. Tighten the rear squeegee retaining band tension latch.
10. Reinstall the rear squeegee under the squeegee mount bracket and tighten all two knobs.
11. Reinstall the squeegee vacuum hose onto the rear squeegee assembly.

REPLACING OR ROTATING THE SIDE SQUEEGEE BLADES

1. If necessary, raise the scrub head.

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

2. Open the main brush access door and side squeegee support door.
3. Unhook the retaining band latch from the side squeegee assembly.
4. Remove the retaining band from the side squeegee assembly.
5. Remove the squeegee blade from the side squeegee assembly.
6. Install the rotated or new rear squeegee blade onto the side squeegee assembly.
7. Hook the retaining band onto the retaining band retainer tab on the side squeegee assembly.
8. Fasten the retaining band latch onto the side squeegee assembly.
9. Close and secure the squeegee support door and close the main brush access door.
10. Repeat for the side squeegee on the other side of the scrub head.

LEVELING THE REAR SQUEEGEE

Leveling the squeegee ensures the entire length of the squeegee blade is in even contact with the surface being scrubbed. Perform this adjustment on an even and level floor.

1. Lower the squeegee and drive the machine forward a few feet.
2. Turn off the machine ON/OFF key switch.

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

3. Look at the deflection of the squeegee over the full length of the squeegee blade.
4. If the deflection is not the same over the full length of the blade, turn the squeegee leveling bolt to make adjustments.

The squeegee leveling bolt is located directly before the squeegee suction hose. Disconnect the suction hose from the squeegee frame when leveling squeegee.

Turn the squeegee leveling bolt counter-clockwise to increase the deflection at the ends of the squeegee.

Turn the squeegee leveling bolt clockwise to decrease the deflection at the ends of the squeegee blade.

ADJUSTING REAR SQUEEGEE BLADE DEFLECTION

Deflection is the amount of curl the overall squeegee blade has when the machine moves forward. The best deflection is when the squeegee wipes the floor dry with a minimal amount of deflection.

The correct amount of deflection is 12 mm (0.50 in) for scrubbing smooth floors and 15 mm (0.62 in) for rough floors.

SKIRTS AND SEALS

SCRUB HEAD FLOOR SKIRT

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

The skirt is located in front of the scrub head. Check the skirt for damage and wear after every 50 hours of operation.

The skirts should clear the floor by 0 to 6 mm (0 to 0.25 in) when the scrub brushes are new and the scrub head is down.

CYLINDRICAL BRUSH DRIVE BELTS

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

The brush drive belts are located on the cylindrical brush scrub head. Check the belts for damage and wear after every 200 hours of operation.

FRONT PERIMETER GUARD

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

Check the front 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 after every 100 hours of operation.

TIRES

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

The machine has three solid rubber tires: one tire is front and two are in the rear. 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 rear.

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 the tip of a small screw driver between the brake release lever and the body of the encoder.

Only push or tow the machine for a very short distance and do not exceed 3.2 kp/h (2 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 screw driver from between the brake release lever and the body of the encoder. 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:

1. Raise the squeegee and scrub head.

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

2. Remove the rear squeegee from the machine.
3. Remove the hardware securing the front perimeter guard from the front perimeter guard brackets and remove the front perimeter guard from the machine.

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 20%/11° grade.

4. Drive 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.
5. Turn off the machine.
6. Place a block behind each wheel to prevent the machine from rolling.
7. Hook the tie-down straps to the stabilizer arms and then secure the tie-downs to the trailer or truck to prevent the machine from tipping. Do Not wrap the tie-down straps around the lower LIDAR sensor or route the tie-down straps over the front of the LIDAR sensor.
8. Route the rear tie-down straps through the opening at the center part of the rear axle and secure the tie-downs to the trailer or truck to prevent the machine from tipping.

9. Ensure all tie-down straps are fully tightened and machine is completely secure on the trailer or truck.
10. 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. Remove the front perimeter guard from the front perimeter guard brackets located at the front of the machine before jacking up the front end of the machine.

Front jacking location is located on the side of the machine. Rear jacking locations are located on both sides of the machine at the rear of stand on position.

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 to 60-80% before storing machine to prolong the life of the batteries. Recharge batteries once a month.
3. Disconnect batteries before storing.
4. 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.

SPECIFICATIONS

GENERAL MACHINE DIMENSIONS / CAPABILITIES

Item	Dimension / Capacity
Length	1630 mm
Height (to Steering Wheel)	1450 mm
Width/frame	920 mm
Width/rear squeegee (roller to roller)	1100 mm
Brush diameter	810 mm
Scrubbing path width	330 mm
Track	768 mm
Wheel base	950 mm
Solution tank capacity	150 L
Recovery tank capacity	190 L
Demisting chamber	40 L
Weight/net less batteries	335 Kg
Weight/with battery package	400 Kg
GVWR	650 Kg
Protection Grade	IPX3

GENERAL MACHINE PERFORMANCE

Item	Measure
Aisle turnaround (Water Coverage)	2845 mm
Travel Speed Forward (max) - Manual Mode	6.4 Km/h (1.8 m/s)
Travel Speed Forward (max) - Robotic Mode	5.4 Km/h (1.5 m/s)
Travel Speed Reverse - Manual Mode Only	2.5 Km/h (0.7 m/s)
Max rated climb/descent with full tanks (Robotic)	16% (9°)
Max rated climb/descent when scrubbing (Robotic)	7% (4°)
Max rated climb/descent with full tanks (Manual)	16% (9°)
Max rated climb/descent with empty tanks (Manual)	20% (11°)
Max rated climb/descent when scrubbing (Manual)	7% (4°)
Maximum ambient temperature for operation	40°C (104°F)
Minimum temperature for scrubbing functions	2°C (36°F)

POWER TYPE

Type	Volts / VDC	Rating	Other
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Battery	36V	200 Ah	70 Kg
Scrub brush (disk)	36 VDC	0.75 kW (1.00 hp)	
Scrub brush (cylindrical)	36 VDC	0.75 kW (1.00 hp)	
Vacuum fan	36 VDC	0.6 kW (0.8 hp)	
Propelling	36 VDC	0.1 kW (1.36 hp)	
Charger	36 VDC / 40 amp	50-60 Hz / 1 Phase	100-240 VAC

TIRES

Location	Type	Size
Front (1)	Solid	80 mm wide x 250 mm OD
Rear (2)	Solid	80 mm wide x 300 mm OD

CONVENTIONAL SCRUBBING

Item	Measure
Solution flow rate	Low: 1.1 L/min; Medium: 2.4 L/min; High: 3.4 L/min

MACHINE DIMENSIONS

Length: 1655 mm (65.2 in)

Height: 1443 mm (56.8 in)

Track (at rear wheels): 768 mm (30.2 in)

Wheel base: 950 mm (37.4 in)