



# Cleaning Station for Gecko Gripper

Gecko Gripper Appendix

Original Instructions (En)

Version 1.0.0

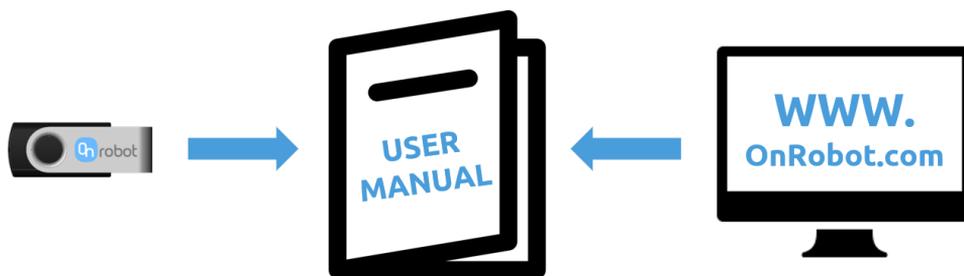
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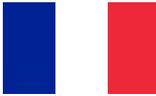
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# 1. Technical Sheet

## 1.1. Features

- Removes build-up of grip-inhibiting particulate matter
- Integrates into robot program for autonomous cleaning
- Easy installation onto robot workspace
- Operated by the motion of the robotic arm
- Does not require any direct wiring
- Easy-to-clean and easy-to-replace roller cartridges

<i>Specification / Feature</i>	<i>Value / Comments</i>			
Recommended use	Removes build-up of inhibiting particulate matter, fine mist from cutting fluids			
Not recommended for	Liquids, silicone-based oils and greases (will damage rollers)			
Time required for Gecko Gripper cleaning	5 to 15 seconds depending on robot speed			
	<u>Low Dust Environment</u>	<u>Medium Dust Environment</u>	<u>High Dust Environment</u>	<u>Machine Fluid Mist Environment</u>
# of Gecko Gripper cleaning cycles before rollers need to be cleaned	10k to 20k	5k to 10k	1k to 5k	10 – 1k
% recovery of Gecko Gripper related grip strength after cleaning cycle	90% to 100%	80% to 90%	70% to 80%	50 – 80%
# of cleaning cycles before rollers need to be changed	Every 10 – 1 000 cycles depending on cleaning frequency and environmental conditions. (Note this is cleaning cycles – NOT gripper cycles)			
Roller Life	Recommend roller replacement every 5,000-25,000 cleaning cycles or as needed. * It should be noted that every 1000 cleaning cycles can equate to 1 million Gripper cycles. Rollers should be cleaned with water, alcohols or acetone; other organic solvents may swell or damage the rollers.			

## 1.2. Typical Applications

- Routine cleaning of the Gecko Gripper pads

## 1.3. Operating Conditions

	<i>Minimum</i>	<i>Typical</i>	<i>Maximum</i>	<i>Unit</i>
Power supply	N/A	N/A	N/A	N/A
Current consumption	N/A	N/A	N/A	N/A
Operating temperature	0	-	50	°C
	32	-	122	°F
Calculated MTBF (operating life) - Rollers	5,000	-	25,000	cycles
Calculated MTBF (operating life) - Station	500k	-	1 Million	cycles

## 2. What's in the Box?

Everything you need to get started with the Cleaning Station for Gecko Gripper is included:

- 1 x Cleaning Station for Gecko Gripper
- 2 x silicon roller cartridge
- Mounting Hardware
  - M12x1.75mm x 80m bolts (Qty: 4)
  - M12x1.75mm nuts (Qty: 4)
- User manual, data sheet (USB)

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### 3. Introduction



#### **DANGER**

You must read, understand and follow all safety information in this manual, and the robot manual and all associated equipment before initiating robot motion. Failure to comply with safety information could result in death or serious injury.

#### **3.1. Importance of Cleaning the Gecko Gripper Pads**

It is normal for the Gecko Gripper pads to accumulate dirt or dust during normal usage. This dust, however, reduces the Gecko's gripping power. Using even short cleaning cycles, the gripper can regain ~95% of its gripping capacity. It is therefore strongly recommended that you incorporate the Cleaning Station into your robot workflow.

## 4. Installing the Cleaning Station

The cleaning station is an enclosed box that protects cartridges of cleaning rollers that are used to clean the surface of the Gecko Gripper pads. It is operated by the motion of the robotic arm and does not require any direct wiring. The Cleaning Station can be integrated into your robot program for autonomous cleaning.



*Figure 1 The Gecko Gripper cleaning station, in Closed (left) and Open (right) positions. The Open position shows the blue cleaning rollers over which the Gecko Gripper pads must pass.*

To ensure proper pad cleaning and successful long-term station use, ensure that the cleaning station is securely fixed in place and that the four critical waypoints are set as described below.

### 4.1. Positioning and Securing the Station

One will need to secure the cleaning station in an appropriate location so that the robot arm does not simply move it during the cleaning process.

- Step 1:** Attach the Cleaning Station to your workstation surface with the enclosed screws through the mounting slots. The cleaning station is designed to be opened in a single linear motion. Make sure to position the station in a way that the robot can fully open the station door.
- Step 2:** There are two slots in the bottom of the station (*see Figure 2 below*). Use the enclosed four screws to secure the cleaning station to your workstation surface. *For example, you may need to drill holes into your workstation surface to receive the cleaning station screws.*

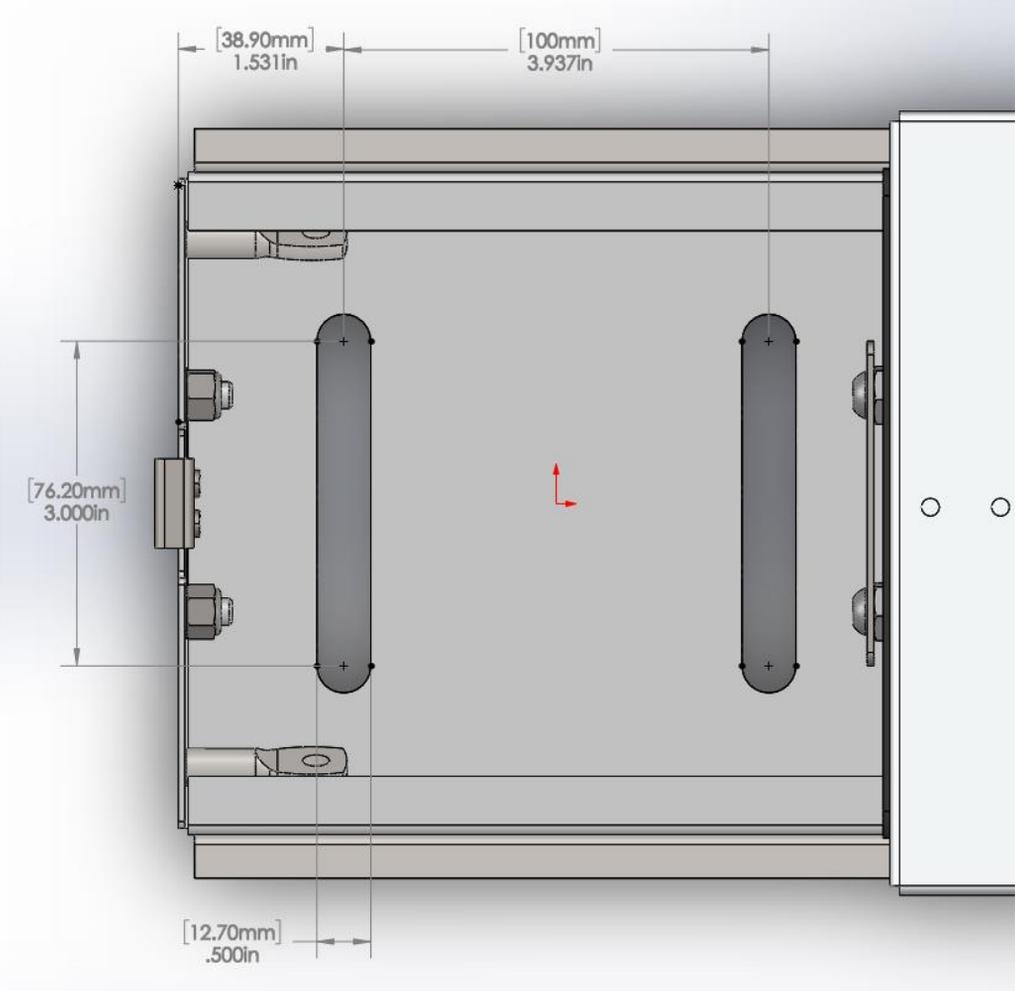


Figure 2 Cleaning station dimensions, viewed from above with the top door in its open position. There are two mounting slots (outlined with blue/black dotted lines) that should be used to secure the cleaning station to the work surface. Dimensions are given in inches and [mm].

## 4.2. Preparing the Station

Before using the Cleaning Station, be sure to unwrap each roller from its plastic shipping film.



*Figure 3 Left roller without packaging; right roller with packaging.*

## 5. Operating the Cleaning Station

Once the Cleaning Station has been securely installed, you must teach the robot the cleaning station waypoints in order to successfully automate station door opening and robot pad cleaning.

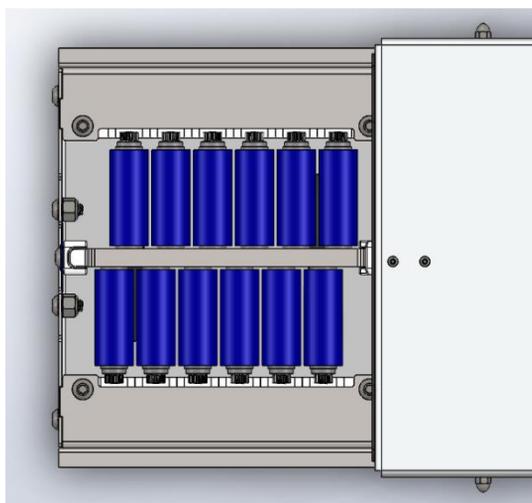
### 5.1. Programming Cleaning Station Waypoints

Use the following steps to establish the cleaning station position and waypoints.

- Step 1: Open the Cleaning station by hand by pushing back the top cover/door until you hear a click and the door remains open without pressure. The door is now in its latched position. (To undo, simply push the door slightly more open from its latched position to release the latch and allow it to slide closed.)



*Figure 4 Opening the Cleaning Station door by hand.*



*Figure 5 Overhead view of the fully open cleaning station with all rollers exposed.*

## Operating the Cleaning Station

Step 2: Position the gripper squarely over the cleaning pads, ensuring that the back set of pads are in line with one set of rollers and the front set of pads are in line with the other set of rollers.



Figure 6 Setting the y-axis position of the gripper, aligning each row of pads with a corresponding row of cleaning rollers. Begin by moving the gripper over the open cleaning station (left) before moving it into contact with the rollers (right).

**This position establishes the front/back or y-axis value for pad cleaning.**

Make sure to maneuver the gripper onto the rollers slowly as to avoid any damage to the machine or the cleaning station.

Step 3: Once you have visually checked that the gripper pads are aligned with the cleaning rollers, continue bringing the gripper down until the pads contact the rollers and then lower the gripper an additional 2-3mm.

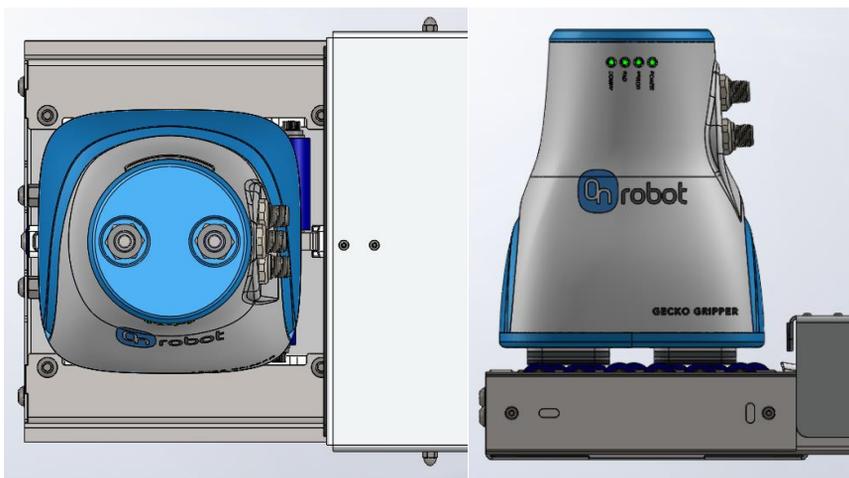


Figure 7 Proper Gecko Gripper positioning in the x- and y-directions (left) and z-direction (right).

You can test this position by moving the gripper a few millimeters to the left or right to ensure the rollers are turning as the pads glide over them.

**This position establishes the height or z-axis value for pad cleaning.**



*Figure 8 The gripper pads are depressing the cleaning station rollers 2-3mm (compare the height of the left five rollers to sixth rightmost roller).*

You are now ready to teach the robots the appropriate waypoints for movement along the x-axis for pad cleaning.

Step 4: Set the cleaning waypoints. We recommend using the following four waypoints for programming gripper cleaning:

Waypoint (1): **Keeping the y- and z-axes the same as above**, position the gripper such that it is just outside the cleaning station door. This is the **Outside Station Waypoint**. This is the first position the robot should move to when the cleaning station is closed and needs to be opened for the first time.

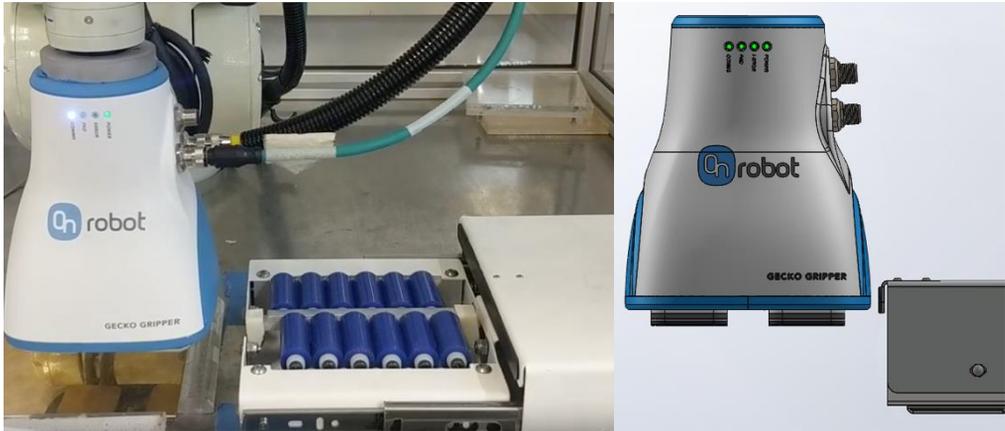


Figure 9 Setting the Outside Station Waypoint, viewed from slightly above the cleaning station (left picture) and depicted directly from the side (right image).

Waypoint (2): **Keeping the y- and z-axes the same as above**, position the gripper such that the pads are contacting the leftmost cleaning rollers. This is **Cleaning Station Waypoint 1**.



Figure 10 Setting Cleaning Station Waypoint 1, viewed from slightly above the cleaning station (left picture) and depicted directly from the side (right image).

Waypoint (3): **Keeping the y- and z-axes the same as above**, move the gripper carefully in the x-direction to the right until the gripper nearly touches the door of the station. This is **Cleaning Station Waypoint 2**.

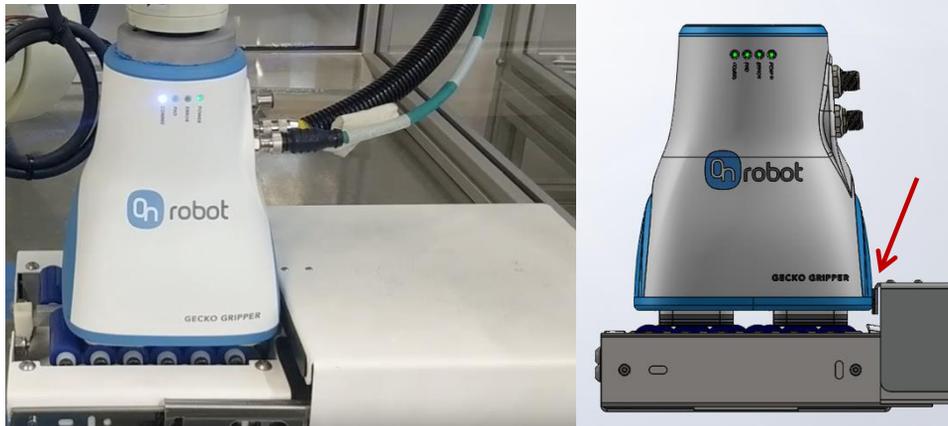


Figure 11 Setting Cleaning Station Waypoint 2, viewed from slightly above the cleaning station (left picture) and depicted directly from the side (right image).

When programming a cleaning program, you will simply instruct the robot to oscillate between waypoints Cleaning Station 1 and Cleaning Station 2 until the desired number of cleaning loops has been reached.

Performing 1-2 cleaning loops is sufficient to remove dust and recover ~90% of pad adhesion.

Waypoint (4): **Keeping the y- and z-axes the same as above**, move the gripper slowly in the x-direction such that it presses into the door until you hear the “click” that releases the door from its latched position. This is the **Cleaning Station Door Waypoint** for opening and shutting the cleaning station door. *Note: be careful not to open the cleaning station door beyond the “click” position to avoid damage to the cover.*



*Figure 12 Setting the Cleaning Station Door Waypoint, viewed from slightly above the cleaning station (left picture) and depicted directly from the side (right image). Note that in both images, the gripper is in contact with the edge of the cleaning station door (see arrow).*

From the **Cleaning Station Door Waypoint**, you can test door opening/closing by moving the gripper to the left or back to **Outside Station Waypoint**. You should observe the cleaning station door closing behind the retreating gripper body.



*Figure 13 The cleaning station door will follow the robot gripper back to its closed position when the gripper moves between Cleaning Station Door Waypoint and Outside Station Waypoint.*

Cleaning motion requires the robot to make a lateral pass over the rollers in the cleaning station. The motion introduces the pads over the rollers two at a time. It is recommended, that you may pass one set of pads over the rollers first in one cleaning cycle and for the 2nd cleaning cycle the gripper may be rotated 180 degrees to allow for the opposite set of pads to pass over the rollers first and subsequently alternate for additional cleaning cycles. This will maximize cleaning efficiency on the pads.

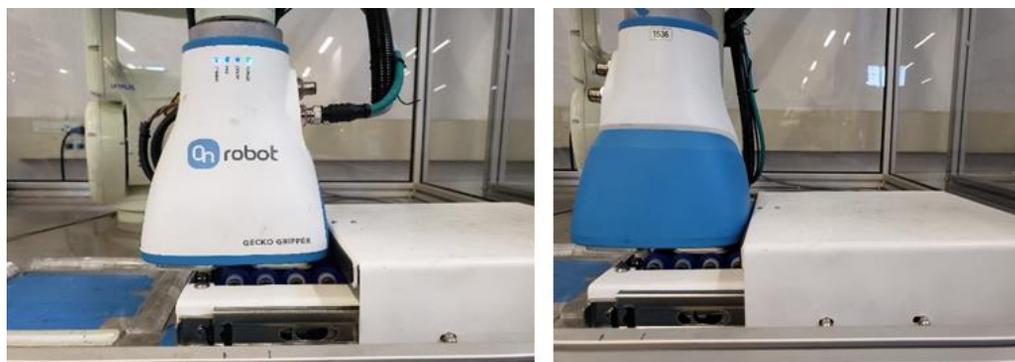


Figure 14 It is recommended if possible to alternate gripper position by 180 degrees every other cleaning cycle

## 6. Maintaining the Cleaning Station

Over time, the cleaning rollers will get dirty and become less effective. The roller assembly can be removed, cleaned with water or alcohol in combination with compressed air or a lint free towel, then returned to the cleaning station. It is strongly recommended to wipe the rollers clean with a damp cloth and not an excessive amount of alcohol or water, which can wick inside the bearings of the rollers and remain in the rollers during operation.

Alternatively, tape can be used to remove particles from the rollers. Simply take a strip of tape or lint roller and wipe it back and forth on the cleaning station rollers to remove particles.

**IMPORTANT: Any kind of oil or grease – including finger/hand oils will negatively impact Gecko Gripper performance. Therefore, while not necessary it is recommended that one wears latex, nitrile, or equivalent gloves if planning to touch rollers or Gecko Pads directly.**

- Oils/grease can be removed with same ALCOHOL and lint-free towel mentioned above, if necessary.
- For deep cleaning to remove oils/grease and/or dust, the rollers can be washed with soap and warm water. The whole roller assembly can be washed, but for the reasons mentioned above, it is recommended to disassemble the roller assembly and wash only the rollers. Allow the rollers to dry completely before reassembling.
  - For reassembly, please note that the 12 thin nylon washers go on the *inside* of the rollers, closest to the aluminum support bar. The 24 nylon sleeve bushings go on both ends of the rollers.

## Maintaining the Cleaning Station

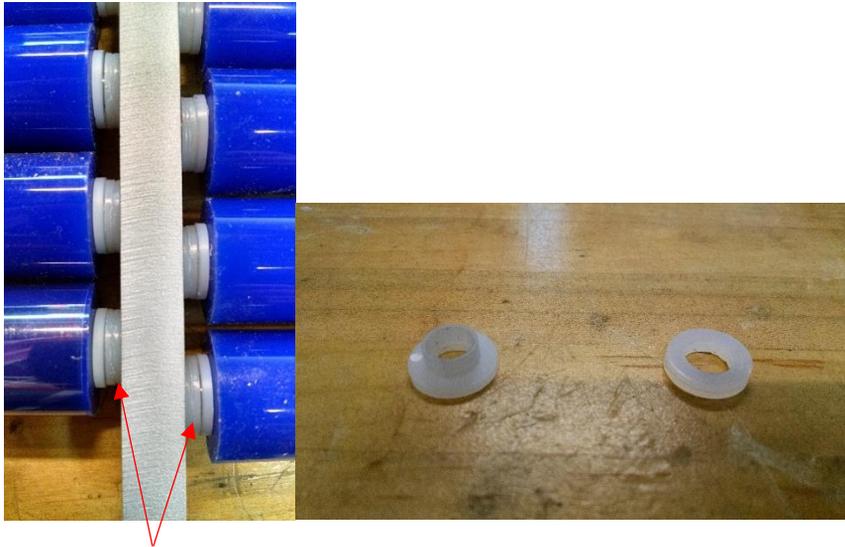


Figure 15: Left image - Properly assembled roller assembly. Right image - Nylon sleeve bushing on left. Nylon washer on right.

To remove and return the roller assembly, follow these simple steps:

- Step 1: Manually open the cleaning station door. Push the door open until you hear a “click,” locking it into the “open” position.
- Step 2: Pull back on the retaining latch to release the roller assembly. It is located at the center of the lower cleaning station tray and is one of the parts first revealed by opening the door.

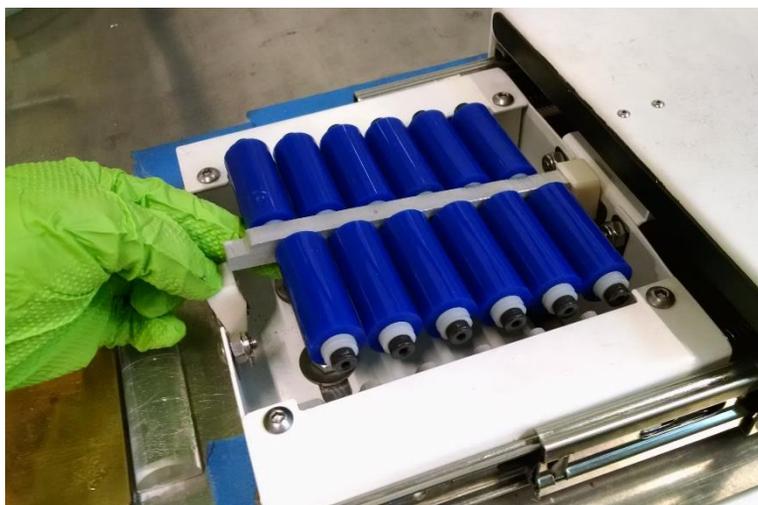


Figure 16 Release the retaining latch to free the roller assembly.

Step 3: Remove the roller assembly. Perform any cleaning or replacement of rollers.

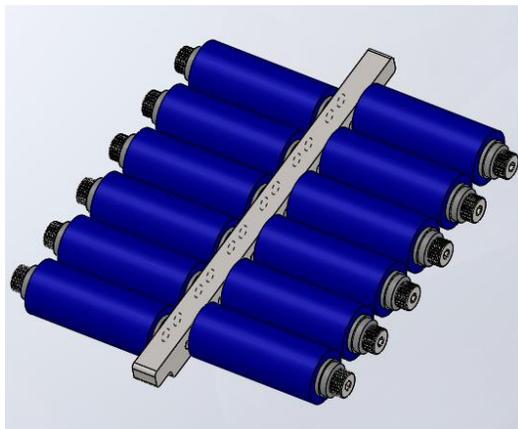


Figure 17 The removable roller assembly.

Step 4: Reinsert the cleaned/new roller assembly, first inserting the central aluminum bar into square notch located closest to the open door, then pushing the opposite end down so the rollers lay flat.



Figure 18 Align the center pin of the roller assembly with the square hole closest to the door (red circle).

Step 5: Release the retaining latch so that it locks the roller assembly into place.

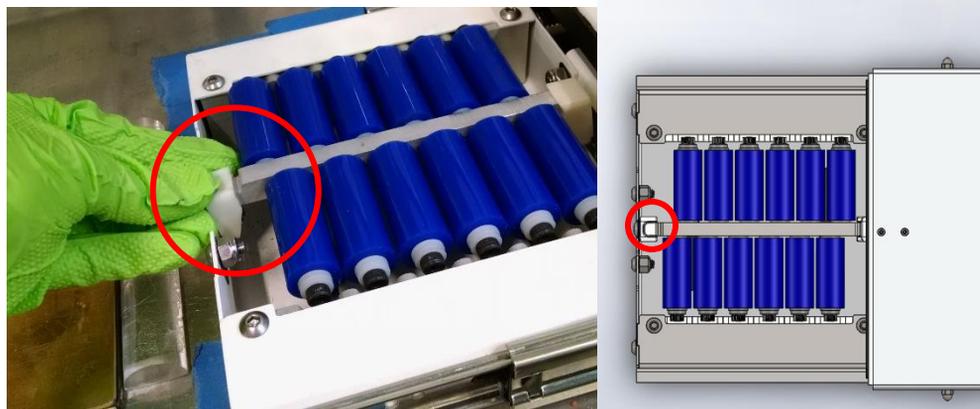


Figure 19 Ensure that the retaining latch catches on the notch of the roller assembly in order to properly secure the rollers (see red circle in installation picture, left, and overhead view rendering, right).



Figure 20 The roller assembly now resecured by the retaining latch.

Step 6: Push the cleaning station door slightly more open until you hear a “click,” releasing the door from its lock and allowing it to slide closed.

You have successfully completed cleaning maintenance of the roller assembly.