SEC Series 100 and 150
User Guide

M-Vac® Systems, Inc.

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Warnings

The vacuum pump in the Support Equipment Case (SEC) is only intended to be used with an appropriately assembled M-Vac purchased from M-Vac Systems, Inc. Do not attempt to use the vacuum created by the SEC for any other purpose. Doing so voids the manufacturers warranty and could lead to irreparable damage to the equipment.

Do not attempt to open the solution pressure chamber door for any reason until the "Solution Pressurization" switch has been turned "Off" and the chamber is no longer pressurized. Failure to do so could lead to serious injury and damage to the SEC.

Prior to opening the back panel of the SEC, make sure to unplug the power cord on the SEC from the power outlet. Failure to do so could lead to serious injury and damage to the SEC.

Do not run the vacuum pump extended periods of time when not in use. This may cause the system to overheat and cause damage to the equipment.

The SEC housing is water resistant. Direct pressure spray of the control panel is not recommended and may allow the ingress of water. Potential electrical component damage is possible. Indirect spray should not cause damage.

M-Vac's, Surface Rinse Solution (SRS) bags, and SEC Extension tubing are disposable items. No attempts to disassemble, sterilize, reassemble, or refill for reuse should be made. M-Vac Systems, Inc. is not responsible or liable for consequences of misusing disposable products.

M-Vac Systems is not responsible for misuse or improper use of the equipment. Only trained technicians can operate the equipment.

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Parts Overview

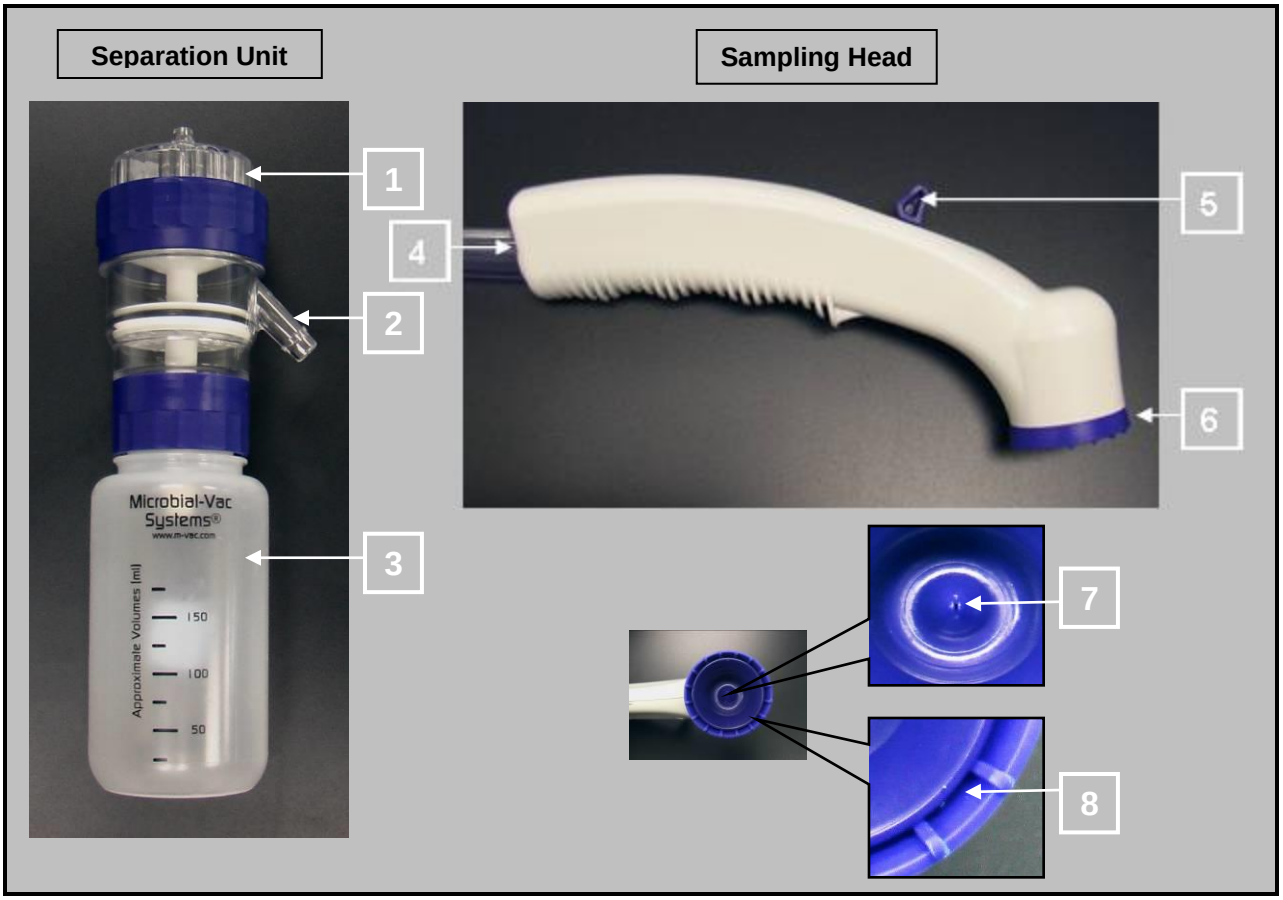
SEC 100 & 150 (Support Equipment Case)

1	Hook for Hanging Solution Bag
2	Pressure Chamber Door
3	Notch for Solution Bag Port
4	Pressure Chamber Door Latch

5	Tension Knob
6	Separation Unit Support Clip/Arm
7	Sampling Head Support Clip/Arm

8	Vacuum Power Switch
9	Solution Pressurization Switch and Indicator Light
10	Main System Power Switch
11	Vacuum Port (shown with tubing connected)
12	Vacuum Pressure Gauge
13	Flow Meter & Indicator Lights

M-Vac (Separation Unit & Sampling Head)



1 Lid
2 Hose Barb for Vacuum Line from SEC
3 Sample Collection Bottle

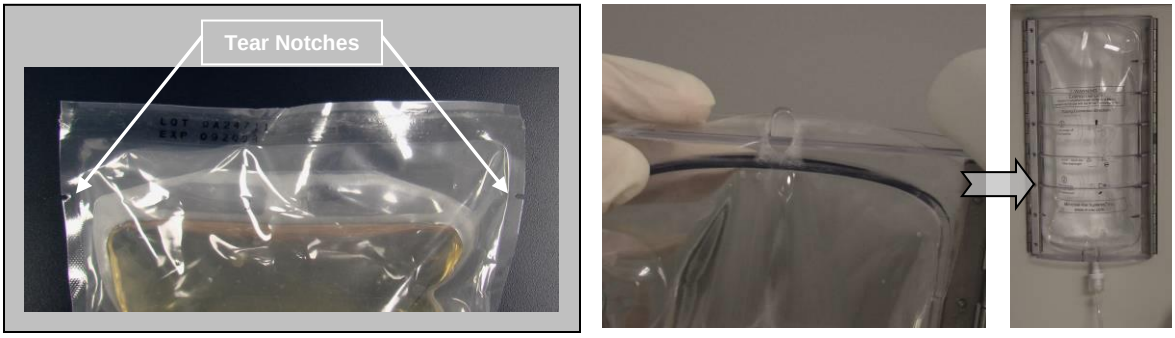
4 Vacuum & Solution Tubing
5 Solution Switch
6 Flexible Surface Contact Ring
7 Solution Spray Nozzle
8 Vacuum Ring

Surface Rinse Solution (SRS) Bag

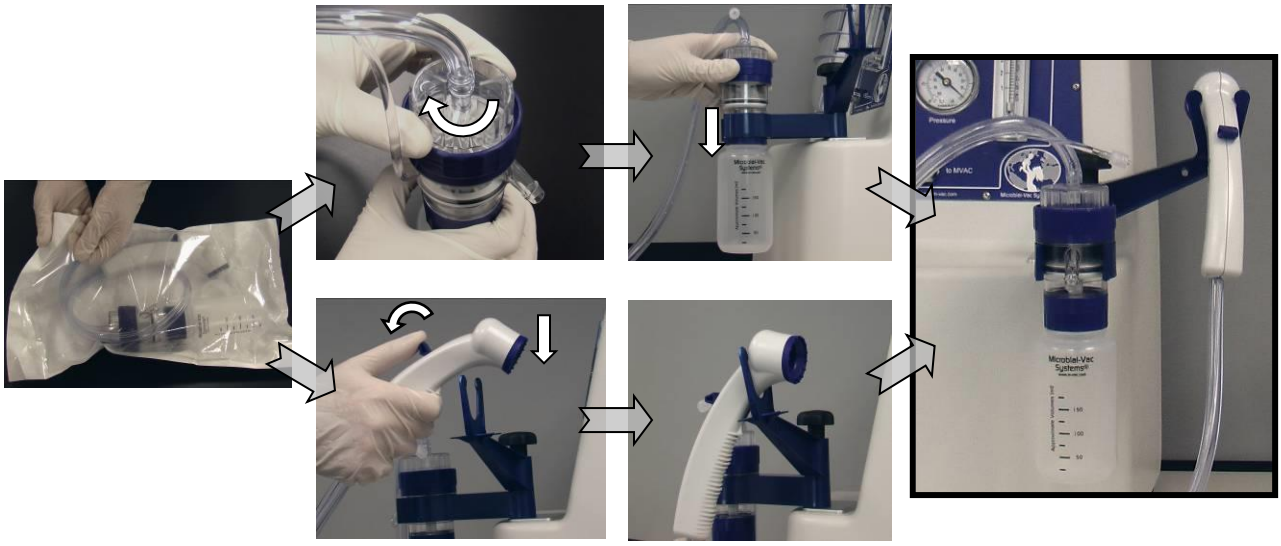
1 Hole for Hanging on SEC Pressure Chamber Door
2 Threaded Solution Port
3 Breakaway Sterile Barrier Tip

System Setup

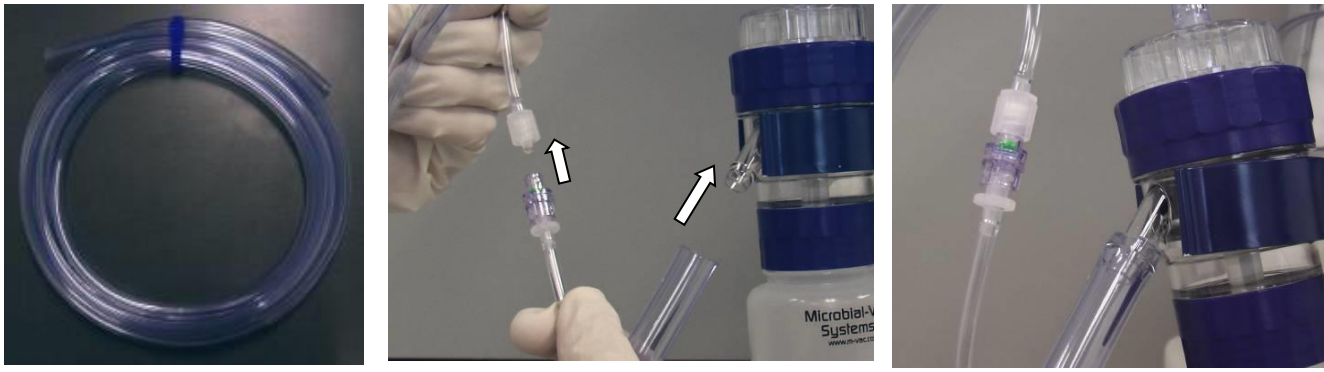
1. Turn ON the SEC power switch
2. Remove over wrap from Surface Rinse Solution bag by tearing straight across at the notches on the side of the over wrap & hang bag on solution door (see figure).



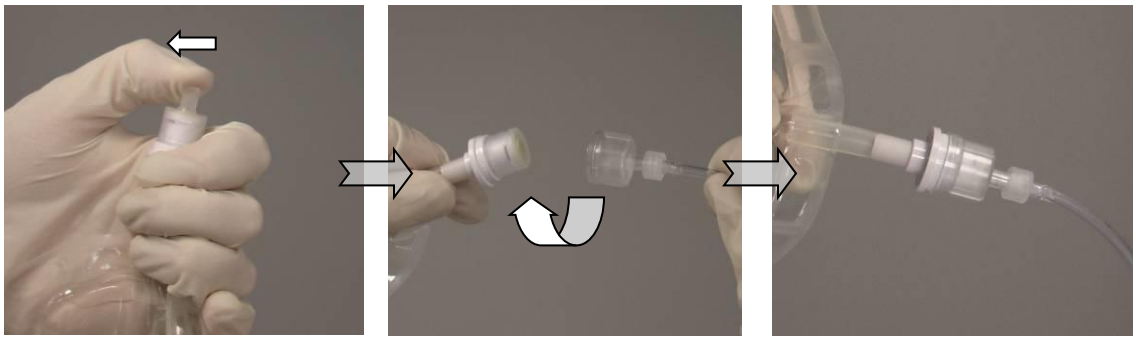
3. Preparing the M-Vac for use (one approach)
   1. Remove M-Vac & **tighten lid** (tighten-release-tighten)
   2. **Turn OFF switch** on sampling head by pulling back with thumb or finger
   3. Place separation unit and sampling head in holder (**Do not contaminate the male fitting on solution line**)



4. Open extension tubing by tearing at the notches on the side of the pouch. Attach solution line fitting to the M-Vac fitting on the M-Vac. Lightly attach vacuum tubing.

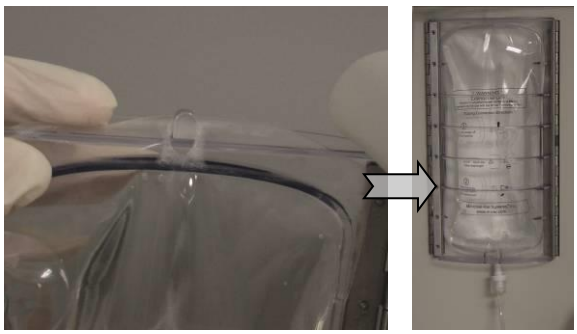


5 Aseptically break tip off SRS bag from step 2. Connect spiked fitting of the tubing to the bag port. To connect, **push and twist** the fittings together until fully seated.

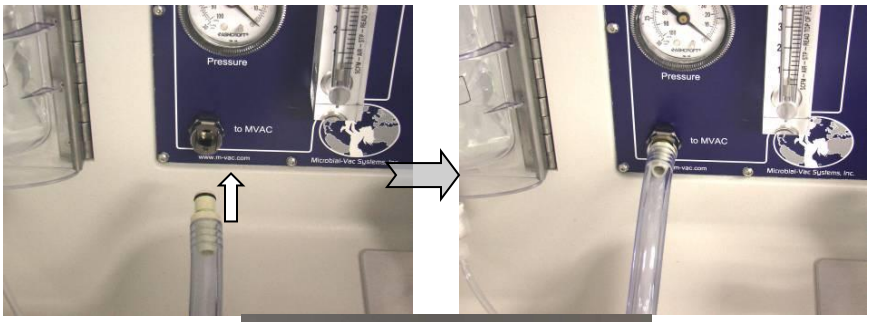


Do not contaminate the rubber septum under tip of SRS Bag by touching it

6 Close the door until it is locked shut by hinged latch. Turn Solution Pressurization switch to "ON." It is pressurized when the low pressurization indicator light turns "OFF".



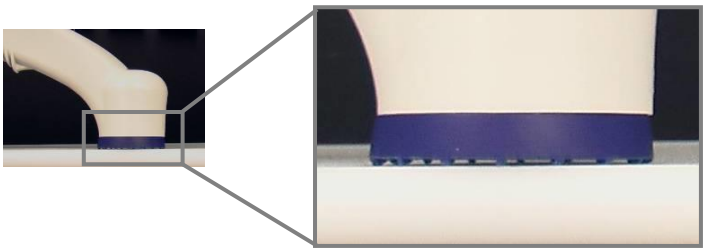
7 Connect vacuum side of tubing to SEC by slipping the quick-connect fitting into the vacuum port on SEC labeled "to MVAC".



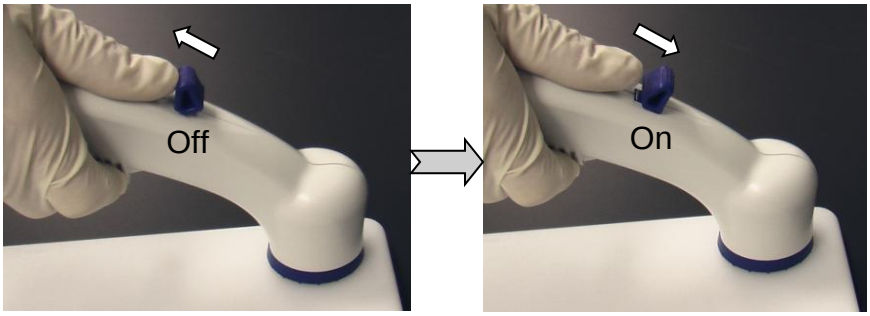
Collecting Samples

This section gives general guidelines for sampling surfaces with the M-Vac. Customers will need to determine the best method for sampling their specific surface of interest.

1. Turn the Vacuum switch of the SEC to ON.
2. With the vacuum pump ON, retighten the lid on the Separation Unit.
3. Place the sampling head against that surface to be sampled as shown below. Try to keep **all** the flexible feet in **light** contact with the surface or equally in contact with the surface while sampling.



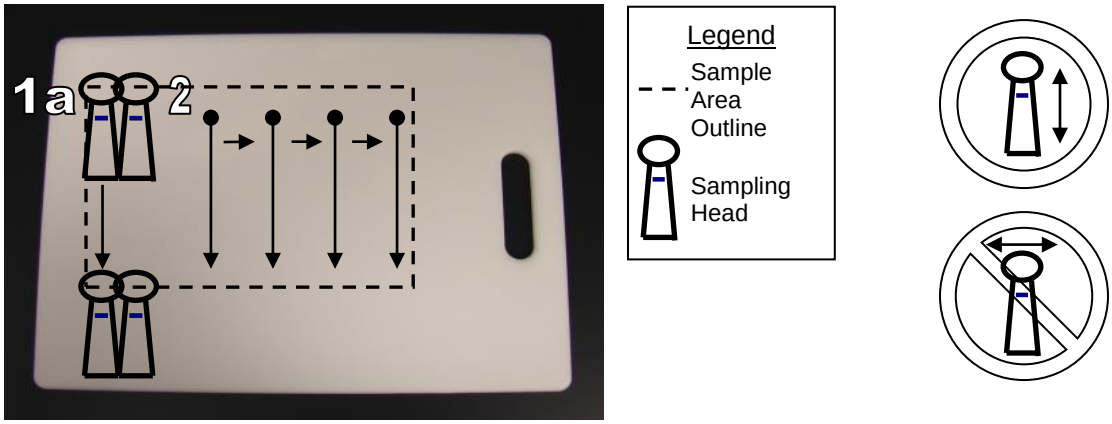
4. Turn the surface rinse solution (SRS) ON and OFF as shown below with thumb or finger.



- For Practice – A Petri dish makes an excellent surface
  i. Looking through the bottom of the dish shows how the system works
  ii. Lifting the flexible feet from the surface of the Petri dish shows why they should **all** be kept in **light** contact with the sample surface
  iii. It can be used to practice sampling while watching for solution loss. Solution loss is when droplets of solution are coming out from under the sampling head. As sampling proficiency improves, little solution will be left behind on the surface during the process
  iv. The surface being left wet is normal, but solution squirting out from under the sides of the sampling head is not. If there is solution squirting out from under the sides of the sampling head, the head is not being kept in even contact with the sample surface
  v. It can be used to practice the different orientations, horizontal, vertical, etc…

5 The following is an example of unidirectional sampling.

- Starting at point 1a, turn solution ON and pull the sampling head toward you while applying light pressure to the sample surface (~2.4 - 4.8 in/sec)
- At point 1b, turn OFF the solution and return to point 1a. Sample over the same area with the solution OFF once or twice.
- Move to position 2 and repeat the sampling process (Overlap the prior sampling path about 30 percent)
- Repeat until the desired sampling area has been sampled (This technique will vary depending on the surface being sampled)
- Depending on the surface being sampled, repeat the entire process from the beginning point to the end point with another set of wet and dry cycles



- Do not apply excessive force to the sampling head. It is not meant to be used as a scrubbing device.
- Unidirectional sampling is shown above, bidirectional sampling is another approach. It is sampling with the solution ON in both directions or in other words, instead of turning it OFF and moving back to the starting point, the sampling head is pushed back to the staring point with the solution ON

6 If the sampling area is large and additional bottles are needed to complete the sample, turn the Vacuum switch on the SEC to OFF. Remove the sample collection bottle as outlined on page 10. Replace the full bottle with a sterile bottle and continue sampling.

7 When sampling a small area:

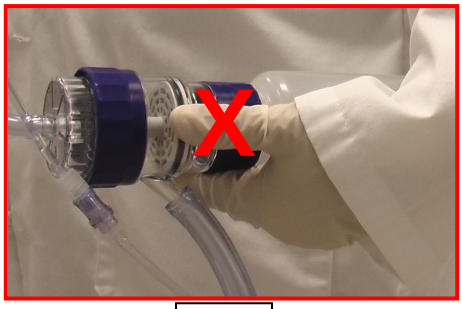
- Ensure that the sample is taken while moving the sampling head across the spot (at least the length and width of the sample area).
- Sample the area until a minimum of 30 mL has been collected

Separation Unit Orientation During Sampling

Always make sure the Separation Unit is upright during sampling. Failure to do so will decrease airflow through the sampling head and reduce the performance of the M-Vac system. This is best accomplished by keeping the Separation Unit in the clip on the SEC or attached to the clip on the chest harness.

Yes

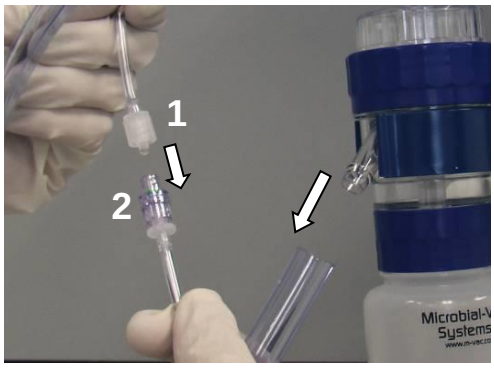
Yes



NO

Removing/Replacing M-Vac

1. Turn OFF the vacuum
2. Turn OFF the Solution Pressurization (optional).
3. Before removing the used M-Vac, be sure that the collected sample has already been removed and properly sealed or filtered.
4. Remove the used Separation Unit and Sampling Head from their holders and set them down.
5. Clean the holders.
6. Open a new M-Vac and place it on the holders.
7. Pull vacuum tubing off hose barb on the side of the Separation Unit
8. Disconnect the solution line at the Separation Unit by unthreading the M-Vac fitting (1) from the check valve (2) and connect it to the new M-Vac.



CAUTION: When twisting apart the valves, keep the check valve (2) connected to the vacuum tubing solution line. Disconnecting it from the vacuum tubing will allow Surface Rinse Solution to spray or spill from solution line.

9. Connect the vacuum tubing to the new M-Vac.
10. Properly dispose of the used Separation Unit and Sampling Head.

Replacing Surface Rinse Solution (SRS) Bag

1. Depressurize the Solution Pressurization chamber by turning Solution Pressurization switch to OFF.
2. Remove over wrap from new SRS bag by tearing straight across at the notches on the side of the over wrap (see figure below).

3. Open Solution Pressurization Chamber and remove used SRS bag from hook.
4. Connect the new SRS bag to the hook.
5. Disconnect spiked fitting on solution line from threaded SRS bag port fitting and connect it to the new SRS Bag (See “Setting up to Collect Samples”).
6. Discard old SRS bag.

Removing/Replacing Sample Collection Bottle

1. Turn Vacuum switch to OFF.
2. Unscrew the bottle from the Separation Unit.
3. Place a lid on the removed bottle and tighten.
4. If the M-Vac is going to be used to continue sampling an area or to take another sample, screw a new bottle on the Separation Unit.

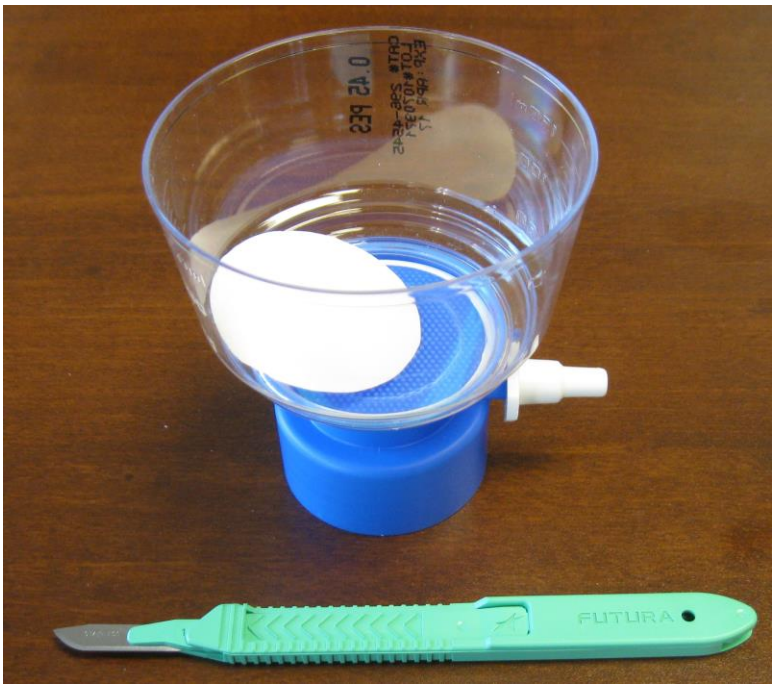
Filtering a Sample

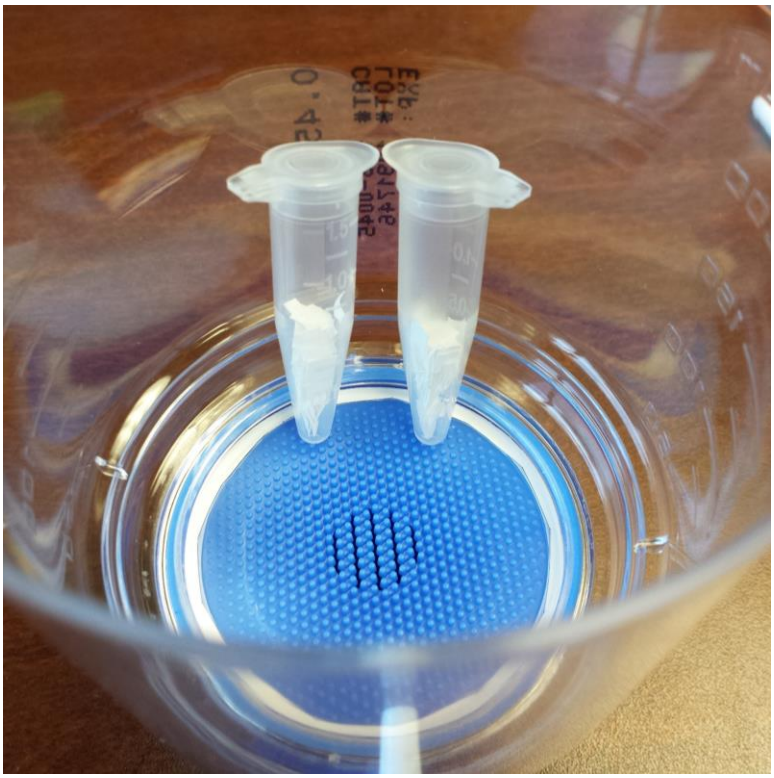
1. On a “sterile” field, open the vacuum filter unit
2. Attach the M-Vac vacuum tubing to the vacuum filter
    a. With the SEC as the vacuum source, remove the vacuum tubing from the M-Vac and attach it to the vacuum port of the vacuum filter
3. Support the vacuum filter in an upright position during processing
4. Turn ON the vacuum on the SEC (Remove the lid on filter funnel)
5. Swirl the sample in the bottle and then slowly pour into the vacuum filter funnel
6. Continue vacuuming until all the solution has passed through the filter
7. It is recommended to complete the following rinsing procedure at least once – turn OFF the vacuum, release the vacuum pressure, remove the filtrate collection bottle from the bottom of the concentration filter and pour it back into the sample bottle, replace the filtrate collection bottle and repeat steps 3-6
8. If desired, the vacuum filter funnel walls can be rinsed with DI water at the end of filtering

9 Discard the filtrate (filtered solution)

10 Handle the filter/filter funnel apparatus with standard evidence handling practices
   a. Filter can be stored and dried while in the housing

11 For extraction, using a sterile scalpel remove and process the entire filter. The filter can be cut into strips or confetti for placement in an extraction tube (or tubes as shown). A variety of extraction methods have been used successfully to process the filter. Please contact M-Vac Systems for the latest list.





Maintenance

End of the Day

1. Ensure that the switches are OFF on the Vacuum, Solution Pressure & Power
2. If you choose to use the vacuum tubing or solution the next day or shift, leave the used M-Vac (sampling head and separation unit) attached and in the OFF position to maintain sterility of the solution line.
3. In the event of contamination, wipe down Support Equipment Case (SEC) with a suitable disinfectant such as 70% EtOH or 10% Hypochlorite. Common laboratory grade sanitizers are suitable for use on the SEC. The SEC should not be submersed in liquid; doing so will void any applicable warranties. The SEC housing is water resistant, although direct pressure wash is not recommended.
4. For overnight storage, the SEC should be kept in a location where it will be safe from damage and contamination.

Periodic Maintenance

Annual service contracts are available through M-Vac Systems. In addition to the potential end user service show below, the equipment is calibrated and inspected.

1. Perform the following inspections in accordance with the usage table below:
   a. Look through the viewing window in the back of the SEC to see if there is any liquid in the trap. If liquid is present, empty the trap according the instructions shown below.
   b. Inspect the ventilation filter per the instructions shown below.
   c. Replace the Vacuum Exhaust HEPA Filter.
2. Preventative maintenance schedule according to usage environment.

Inspection Schedule					
		Average System Usage			
Environment	Item	1 hr/week	1 hr/day	4 hr/day	8+ hr/day
Indoor – Low Particulate	Ventilation Filter	Annual	Annual	Annual	6 Months
	Exhaust Filter	3 Years	Annual	Annual	Annual
	Liquid Trap	Monthly	Monthly	Weekly	Daily
Outdoor – Medium Particulate	Ventilation Filter	Annual	6 Months	Quarterly	Monthly
	Exhaust Filter	3 Years	Annual	Annual	Annual
	Liquid Trap	Monthly	Monthly	Weekly	Daily
Dusty – High Particulate	Ventilation Filter	6 Months	Quarterly	Monthly	Weekly
	Exhaust Filter	3 Years	Annual	Annual	Annual
	Liquid Trap	Monthly	Monthly	Weekly	Daily

Note: Liquid Trap Filter is cleaned or replaced base on exposure and condition.

Emptying the Liquid Trap

Required when moisture has entered the SEC by way of the "Vacuum Port". The trap is visible through window on back of the SEC.

1. Unplug the SEC power cord from the power outlet.
2. Unscrew the screws from the back panel of the SEC and remove panel.
3. Carefully reach into back of SEC, tilt bottom of the trap towards the opening and unthread clear bowl of water trap from the lid by rotating bowl counter clockwise.
4. Remove filter, floats and rubber ball from inside the bowl
5. Discard liquid in bowl following any applicable local and/or federal codes for disposal of potential contamination.
6. Chemically disinfect bowl, two floats, rubber ball and filter.
7. Reassemble bowl by placing filter in the center of the bowl. Next place two floats inside the filter. Finally, place rubber ball inside of filter on top of floats.
8. Replace bowl assembly by threading onto lid inside SEC.
9. Replace back panel of the SEC and secure all screws removed in step 2 of this section.

Changing the Vacuum Exhaust HEPA Filter

1. Unplug the SEC power cord from the power outlet.
2. Remove the screws from the back panel of the SEC and remove panel.
3. Carefully reach into the back of the SEC on the right side and disconnect HEPA filter from the upper coupling by pressing the release button.
4. Remove HEPA filter from holding clip by firmly pulling filter to the left (towards the opening on the back panel).
5. Disconnect the lower coupler by rotating the filter ¼ turn counter clockwise.
6. To install a new HEPA filter, reverse steps 3-5.
7. Replace back panel of the SEC and secure all screws removed in step 2 of this section.

Maintaining the SEC Ventilation Filter

1. Unplug the SEC power cord from the power outlet.
2. Remove the screws from the ventilation filter cover of the SEC.
3. Remove the filter.
    a. If the filter is a foam filter, wash the filter in mild soap and water.
    b. If the filter is a HEPA filter, replace the filter.
4. Replace the filter and reattach the ventilation filter cover.

Long Term Storage

1. Follow steps 1 – 3 in above section "End of the Day"
2. Store in a location where the SEC will be protected from extreme temperatures and potential damage from jarring or moisture.

Troubleshooting

Symptom	Possible Remedy
No or low airflow at the sampling head	Make sure the power cord is plugged into an outlet (SEC 100 – 120 VAC, SEC 150 – 230 VAC), the Main System Power switch is ON and the Vacuum Power switch is ON
	Check that the vacuum tubing between the SEC and M-Vac is properly attached
	Check to make sure a sample collection bottle is attached to the Separation Unit
	Make sure the sampling head, tubing, and separation unit are not clogged with debris that could restrict airflow
	Look through the window on the back of the SEC and make sure the liquid trap is not full of liquid; if it is, follow the instructions for emptying the liquid trap
	Check the Separation Unit and make sure the lid is tight
Surface Rinse Solution (SRS) does not flow when sampling head switch is turned "On"	Make sure power is supplied to the SEC and the switch labeled "Solution Pressure" is ON
	Check to ensure all fittings between the SRS bag to the sampling head are securely connected. Disconnect and reconnect the check valve fitting on the solution line between the SEC extension tube and the Separation Unit.
	Make sure the SRS bag is not empty and the outlet tube is not pinched under chamber door or anywhere along the path to the sampling head. The SRS bag outlet tube should be positioned in the notch below the Solution Pressurization Chamber of the SEC to prevent pinching.
	Remove the current bag of SRS and try a new bag of SRS in the pressure chamber
Surface Rinse Solution remains on surface being sampled	Ensure the "Vacuum" switch is ON
	Make sure the sample collection bottle is not overly full or that Separation Unit is not sideways during sampling
	Review sampling techniques to ensure proper methods are being used
	Make sure the sampling head, tubing, and Separation Unit are not clogged with debris that could restrict airflow
	If this M-Vac has been used for an extended period on a large surface, replace it with a new M-Vac
Moisture is in the vacuum tubing between the M-Vac and Support Equipment Case (SEC)	Make sure the Separation Unit is not upside down or sideways during sampling
	If the filter system in the Separation Unit is damaged, liquid may be pulled past the system and into the vacuum line, replace the M-Vac. Note: Condensation may occur in certain environments and is normal.
Sampling Head suctions down to sampling surface	Excessive pressure may be being applied during sampling; The sample surface may be too soft or flexible.
High Air Flow Indicator Light is illuminated	Check the vacuum tubing connections to make sure they are all made and secure.
	Check the Separation Unit to make sure the lid is tight.
	Check the vacuum tubing to ensure that it has not been cut or breached.

Low Air Flow Indicator Light is illuminated	Check the vacuum tubing to ensure that it is not kinked or plugged. Remove the vacuum tubing from the Separation Unit. If the light goes OFF, replace the M-Vac. If it does not go OFF, remove the vacuum tubing from the SEC. If the light goes OFF, replace the vacuum tubing. If the light does not go OFF when the vacuum tubing is removed from the SEC or replaced, call customer support.
Illuminated "Low" solution pressure indicator	If the "Low" solution pressure indicator is illuminated, wait for 30 seconds while the system finishes pressurizing. The system is pressurized when the switch is ON and the low solution pressure indicator is OFF. If the indicator remains ON, call customer support.
Problems adjusting the Separation Unit Support Clip or the Sampling Head Support Clip	If the clips are not remaining in their adjusted position, tighten the Tension Knob by turning it clockwise. If the clips will not adjust easily, loosen the Tension Knob by turning it counter-clockwise until the adjust resistance is satisfactory.

Contact your sales representative if troubles remain following completion of above troubleshooting tips

Call: (801) 523-3962 or visit our website www.m-vac.com

M-Vac Systems, Inc. is not responsible or liable for misuse of products. End users who attempt such actions do so at their own risk.

Patents issued and pending