EcigAero® Aerosol Exposure Apparatus

User's Manual

AUTOMATE® SCIENTIFIC™ ©

For indoor use only from 5° to 40°C.

Do not get wet or subject to visible condensation.

Supply Voltage:
EcigAero® controller = 15V DC, 5A external power supply

Activating the atomizers inside the tank/pod at low resistance (ohms) could lead the atomizer coils to get extremely hot, causing malfunction or possibly fire.

Cleaning acrylic parts with alcohol or acetone will cause them to crack and void the warranty.

Do not move the EcigAero by lifting the plastic cylinder. Please lift using the metal base instead.

Clean with a mild soap solution with a damp cloth only.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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EcigAero® Aerosol Exposure Apparatus

User's Manual

The EcigAero® is intended for research use only.

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Please observe all animal use procedures in accordance with the National Institutes of Health (United States) or your regional Guide for the Care and Use of Laboratory Animals, and your institution's Animal Care and Use Guidelines.

Introduction

FOR RESEARCH USE ONLY

The EcigAero®Aerosol Exposure Apparatus is a device to consistently deliver electronic cigarette (E-Cig) aerosol to rodents under programmable, reproducible conditions to study the health effects and toxicology of electronic cigarettes. AutoMate Scientific, Inc. is not responsible for injury or death resulting from medical or pharmacological use.

Hardware Overview

The EcigAero consists of a large cylinder and drinking water for one or more freely-moving rodents. Electronic valves control intermittent, pressurized air flow through four (4) E-Cigs or pods. A power supply delivers precise user-defined voltage to activate pods without requiring their battery or mod. A programmable valve controller and Windows software allow the user to deliver unattended E-Cig aerosol in user-defined "puffs" and timing over many hours to simulate the circadian vaping pattern of E-Cig users.

Interchangeable manifolds facilitate the use of many popular types of E-Cigs and pods. A nebulizer can be connected for delivery of an aerosol of any liquid such as nicotine solution or saline for plain aerosol control. Fresh air is delivered when E-Cig aerosol is off, even in the event of power loss. A sensitive regulator and flow meters permit the monitoring and adjustment of E-Cig and fresh air. The device is sealed and includes a HEPA filter to protect personnel from exhaust while using the EcigAero.

Laboratory Applications

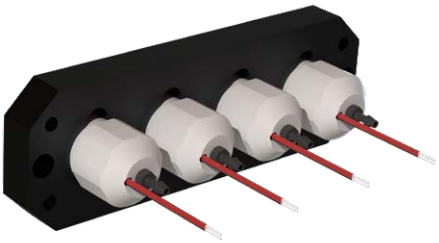
Timed control provides schedulable and accurate delivery in acute and chronic settings to ensure E-Cig aerosol rapidly enters the blood of the subject animal, minimizes first-pass metabolism and achieves stable and reproducible pharmacokinetics that are similar to human E-Cig vapers. The EcigAero can be used to study E-Cig effluent, nicotine addiction, nicotine toxicology, and nicotine teratogenicity. It can also deliver aerosols of other drugs of abuse such as marijuana, cocaine, heroin. EcigAero is a novel tool for understanding the health effects of chronic nicotine exposures such as with tobacco cigarettes, E-cigarettes and other tobacco products, for studies of pharmacology, toxicology, tobacco-related diseases, and for discovery of medications.

Accessories & Manifolds

AutoMate Scientific offers a number of products which complement the EcigAero: Aerosol Nebulizer, E-Cig Manifolds specific to manufacturer, Exposure Control Software (Windows) and ValveLink8.2 WiFi/digital/manual controller.

3-jet Collsion Aerosol Nebulizer
with direct connections to cylinder
Part #19-N

ValveLink®8.2 WiFi/digital/
manual controller
Part #01-18w



EcigAero®
JUULpod manifold
Part #19-J

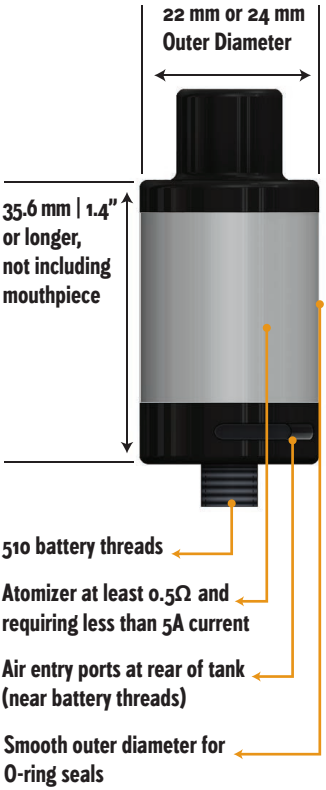
EcigAero®
Battery-powered (blu PLUS+) manifold
Part #19-BP

Accessories & Manifolds

EcigAero®
Universal "510" thread manifold
Part #19-510

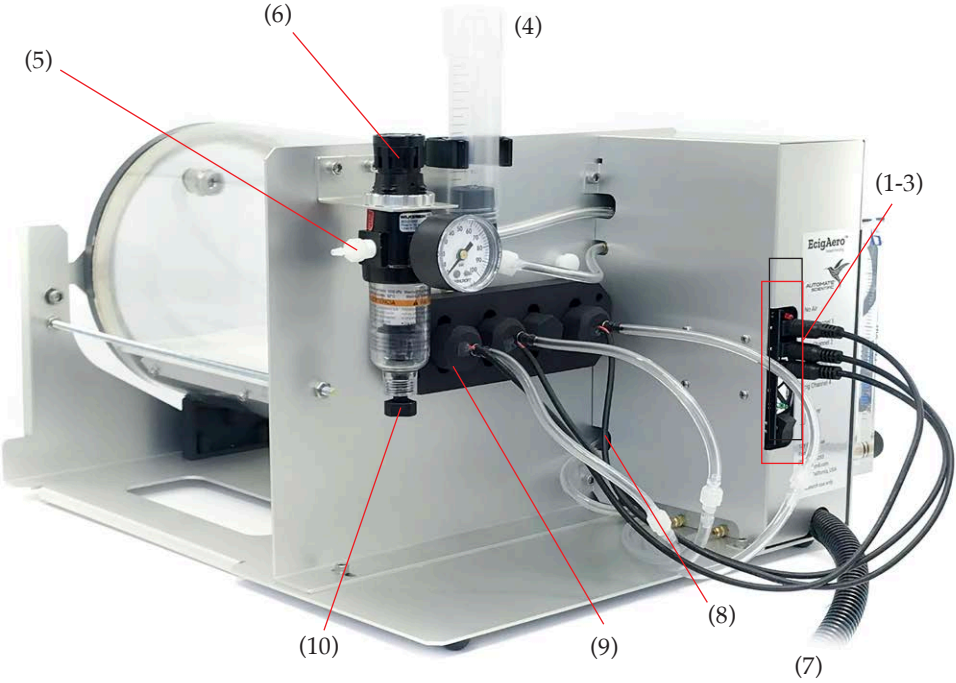
Can accommodate most vape tanks that are either 22mm or 24mm in diameter with 510 battery threads and air entry ports on the end near the battery threads. The holders will not fit tanks that have air entry ports near the front (mouthpiece), and they will only fit tanks with a round outer diameter and overall length greater than 1.75". The holders use O-rings to seal to the outer diameter of the tanks, so tanks with large grooves or embossed designs on the body may not seal. Please contact AutoMate Scientific if you have questions about whether a specific tank will fit.

ECig Tank Sizing Chart



EcigAero®
*my*blu Liquidpods manifold
Part #19-BL

Set-up Diagram



(1) Power switch

(2) Main power LED (green)

(3) Red LED will come ON when lack of supply air pressure is detected

(4) Fill water reservoir and insert into clip above the manifold with the feeder tube leading into chamber.

(5) Connect air pressure from house air, tank, or compressor to the ⅛" hose barb inlet next to (6) pressure regulator black knob. Use the supplied hose clamp as needed.

(7) Attach the numbered valve cables to the ports on the back of the Valve-Link as shown on the previous page. Plug power plug into ValveLink.

(8) Barb fitting for nebulizer valve (sold separately)

(9) E-Cig manifold and (4) holders

(10) 5 micron filter and water trap. Screw the black plastic "triangle" on the bottom in the opposite direction - clockwise - to open the drain, and counter-clockwise to close.

First Time Set-up

Save the packing material

We suggest you save the box and packing materials for future storage or in the event you need to ship the unit back to us. Always ship your EcigAero in one box inside another due to its fragile but heavy nature. We can give you photos and repacking instructions.

Air pressure connection

Connect your air pressure from house air, tank, or compressor to the ⅛" hose barb inlet next to pressure regulator black knob (#5 on the Set-up Diagram). Use the supplied hose clamp as needed. You should adjust your SUPPLY pressure between 15 and 100 psi or 2-3 times the Ecig working pressure, with an upper limit of 120 psi. For your initial setup, adjust the Ecig regulator to around 2 psi using the large gauge. To adjust: pull the black knob up one step, adjust the pressure and push knob back down to lock desired pressure.

Keep the air pressure between 0.5 and 2 psi with JUUL pods or they leak.

Fresh air

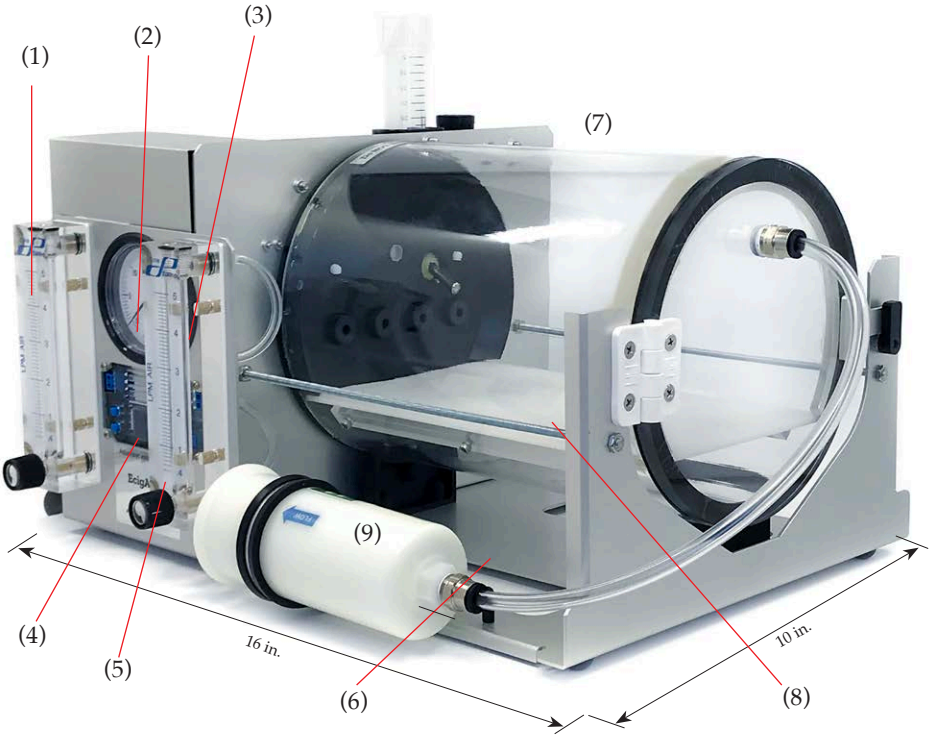
The fresh air valve into the chamber is OPEN by default. Turn ON your air supply when you have subjects in the chamber. Adjust the fresh air flow to 5 liters per minute using the black knob on the fresh air flow meter.

Be sure to turn your air supply OFF when you are not doing experiments with rodents in the chamber, to prevent your pressurized air from escaping.

Power

Plug the provided power supply into the wall and into the EcigAero below the power switch. Connect the power cable coming OUT of the ECig machine to the back of the ValveLink controller. Turn the ECig power switch on.

Device Diagram



(1) E-Cig air flow meter & regulator knob

(2) E-Cig air pressure gauge

(3) Fresh air flow meter & regulator knob

(4) E-Cig voltage meter

(5) E-Cig voltage adjuster (small brass screw marked "CV" on meter)

(6) Area (under animal cylinder) for optional wireless telemetry system, i.e. DSI PhysioTel® Implantable Telemetry

(7) Animal cylinder (do not clean with alcohol or acetone)

(8) Removable tray

(9) Replaceable HEPA Filter (see page 17 for instructions)

Footprint dimensions: 16 in x 10 in, 12 in (h)
Recommended table space: 18 in x 18 in

First Time Set-up - Continued

ValveLink® controller

E-Cig aerosol delivery is controlled by 5 solenoid pneumatic valves which are operated by any 12V valve controller like AutoMate Scientific's ValveBank or ValveLink. Connect EcigAero plugs as follows:

Ecig Plug	ValveLink port	Use
1-4	4-7	Valves 1-4
5	8	Optional Nebulizer
0	3	White light for nose pokes

Test air flow manually

Before installing any electronic cigarettes or pods, confirm that the ValveLink is controlling the ECig valves and air is flowing. Pushing buttons 4-7 should toggle their LEDs between red and green. When all ECig valves are closed (all ValveLink lights are red), then fresh air will always flow. Fresh air will stop whenever an ECig valve is opened. You can observe and control the flow from the two flow meters.

Important note about manifold ports

Please note the manifolds are specific to the E-Cig pod/tank type. **During use, all four holders must be installed, including unused holders to keep a closed system and prevent aerosol from escaping.** If you use less than four holders, you must use a plug for proper operation.

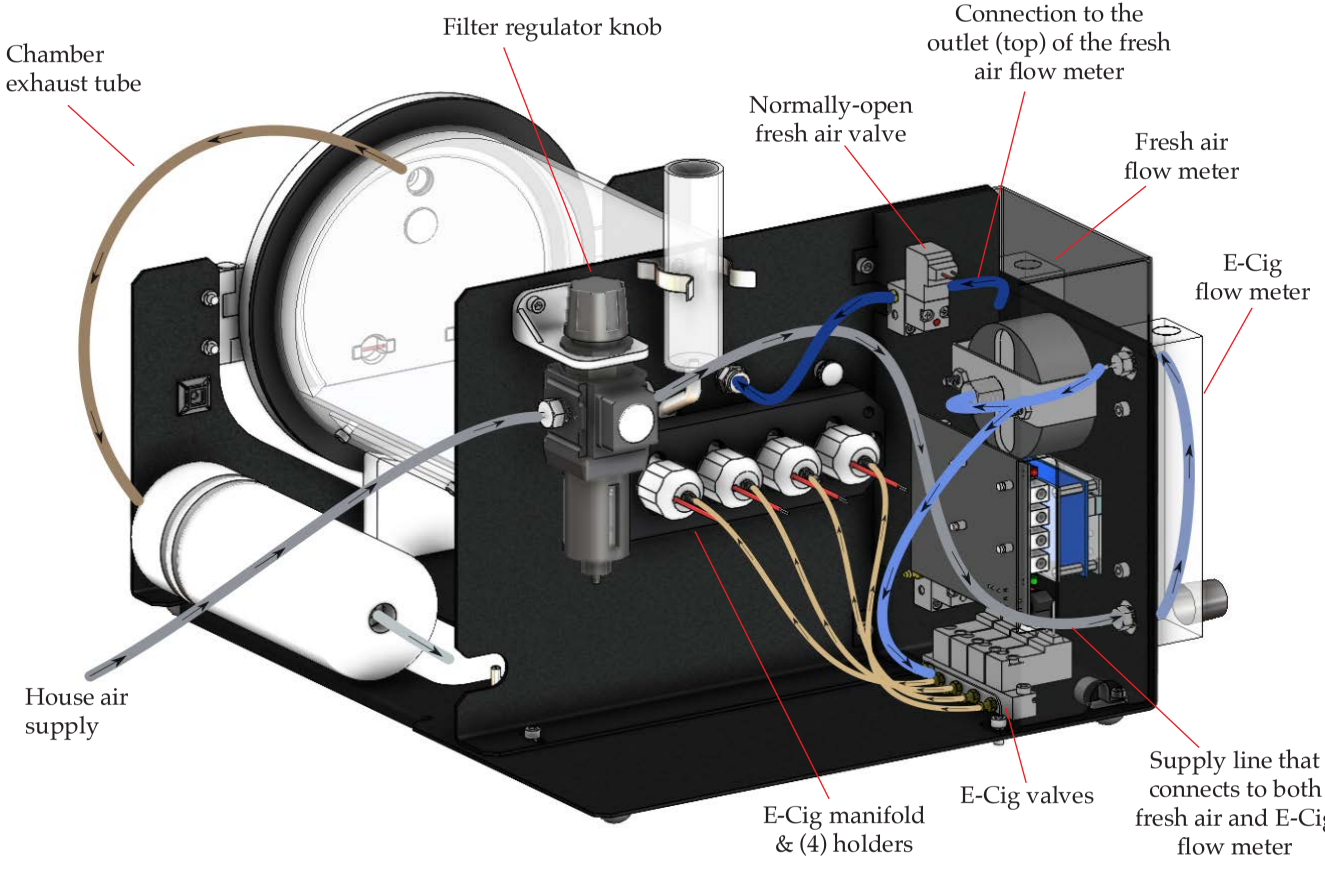
Using a fume hood

It is always preferential to use the device in a fume hood to prevent unwanted exposures to aerosols to those outside the vented hood space – especially in case an animal must be removed from the device during an experiment.

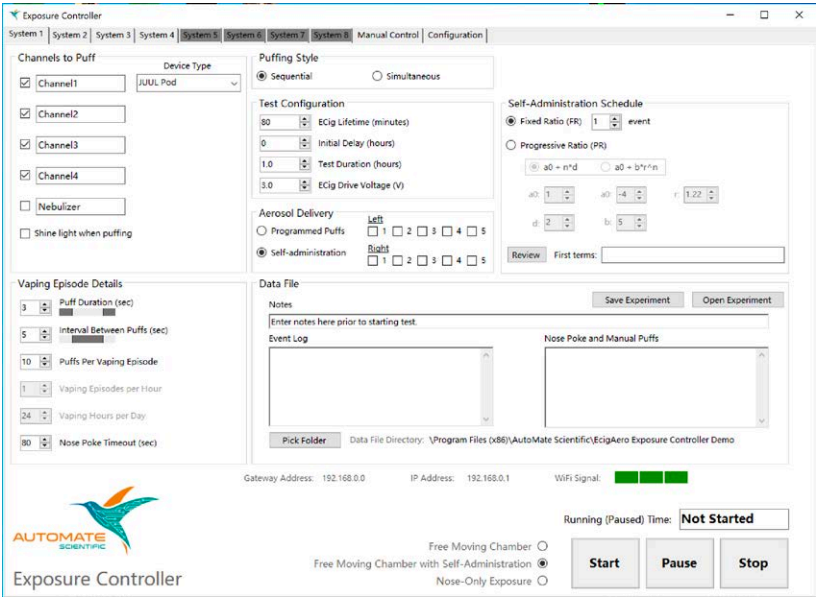
Rodent water reservoir

Fill the included water reservoir and insert it into clip above the manifold. Remember to replenish the water for each experiment as needed.

Flow Schematic



Exposure Control Software



Please see the separate manual for the Exposure Control Software.

AutoMate Scientific will provide a link to download the latest ECig Exposure software. We do not recommend using the ValveLink 8.2 control software from the ValveLink web page.

Operation

Inserting and replacing E-Cigs

*Please note, the holders and manifolds are specific to the Pod / Tank Type.

For JUULpods and *my*blu Liquidpods

1. Remove holder from manifold.

2. Insert pod into holder making sure the two metal contacts of the pod touch the pins inside the holder. (pic.11-1)

pic. 11-1

3. Insert holder into the manifold and twist ¼ turn to secure. (pic 11-2)

****Set the air pressure between 0.5 to 2 psi.**

pic. 11-2

Operation - Continued

For battery-powered (blu PLUS+)

1. Apply a tiny amount of lubricant on E-Cig to easily slide through the manifold and keep the o-ring seals moist.

2. The E-Cig can be inserted into the holder by either:

   a) directly inserting it through the inside of the chamber which does not require removal of the E-Cig holder, or

   b) removing the holder from the manifold, inserting the E-Cig, and replacing the E-Cig holder into the manifold.

NOTE: Make sure the mouthpiece of the E-Cig is facing into the animal exposure chamber**

For Universal "510" thread tanks

1. Remove holder from manifold.

2. Insert tank into holder and gently turn to thread tank into holder.

NOTE: Do not over-tighten the tank into the holder

3. Replace holder into the manifold.

Flow meters

The two flow meters display the flow rate for aerosol and fresh air supply. Use the knobs on the two flow meters to adjust the desired flow. The meter on the left controls the E-Cig aerosol, and the meter on the right controls the fresh air supply. Only make adjustments when all the holders and/or plugs are inserted in the manifold. Be careful adjusting air flow while the EcigAero is in operation and connected to a power source, as insufficient air flow through the holders may burn-out pods. The red "no air" warning light should illuminate and protect pods if air flow stops.

Air flow rates

Typical air flow rate for mouse/rat:

1 E-Cig/pod/tank*	0.8 - 1 L/min
2 E-Cig/pod/tank*	1.6 - 2 L / min
3 E-Cig/pod/tank*	2.4 - 3 L/min
4 E-Cig/pod/tank	3.2 L - 4 L /min
Fresh air flow is recommended at 2.8 – 3.8 L/min or 40-55 air changes / hour (ACH) for mouse chamber, or 5 L/min (40 ACH) for rat chamber.	

*If you are using less than four holders, you must use the provided plugs for proper operation. The device requires a closed system to operate correctly.

Do not actuate the E-Cig valves without fresh air flowing through the system, or any installed pods/tanks may overheat and burn out.

If a pod overheats or leaks in the E-Cig holder, the holder and electrical contacts can be wiped out using alcohol on a cloth or swab.

Working pressure

Working pressure with E-Cigs: 10-20 psi maximum. 2 - 3 psi may be adequate to generate 4 LPM of air flow. Working pressure with the nebulizer: 20-80 psi.

3-jet Collsion Nebulizer
Maximum working pressure: 100 psi
Typical air flow for 3-jet Nebulizer: 8 LPM @ 30 psi, 17 LPM at 80 psi, 21 LPM at 100 psi

Follow the nebulizer directions to fill the bottle with the correct volume of solution.

Do not to bend, kink or block the large tube from the nebulizer into the cylinder while it is pressurized.
The glass bottle of the nebulizer will explode with back pressure > 1 psi.

E-Cig supply voltage (by Pod/Tank Type)

The E-Cig and tank holders are puffed with electricity whenever their valves are opened to start airflow. The supply voltage can be adjusted by turning the small brass screw labeled “CV” on the display mounted to the base frame. The system can deliver a maximum of 8 Amps (2A per channel if 4 channels are puffed at the same time), but we recommend a safety margin of only using a maximum of 5 Amps. If working with low-resistance pods or tanks that draw more than 2 A each, then not all channels can be puffed at once.

Pod/Tank Type	**Supply Voltage (V)**
JUULpods	3.0
*my*blu Liquidpods	3.0
Battery-powered (blu PLUS+)	N/A
VaporFi or "510" thread	Depends on the tank atomizer being used

For an unknown 510 tank, consider setting the voltage to 3.0 V or less. Open the valve channel containing the new tank, and confirm ECig air is flowing and the red "low pressure" light is not on. Look at the Buck converter screen. If the small, red "CC" light is on, slowly increase the right-hand "CC" screw and watch the current (Amps) as the bottom number on the display. Stop increasing the current once the vape tank is delivering a solid stream of vapor, or a maximum of 5 amps. Once you reach 5 amps, if the "CC" light has gone out, you can slowly increase the voltage using the "CV" screw until the vape tank makes a solid stream of vapor. If you reach 5 amps and the "CC" light is on, then you are using a tank that requires more power than this device can provide.

We recommend a minimum coil resistance of 0.7 Ω. Using V=IR, we can calculate a maximum current of 5 A using a typical coil voltage of 3.5 V.

Some vape tanks include an adjustable "airflow ring." We would recommend tanks WITHOUT an adjustable ring since they are easy to accidentally rotate, and this might inadvertently introduce variations from experiment to experiment.

Cleaning

DO NOT CLEAN THE CLEAR PLASTIC CYLINDER WITH ALCOHOL OR ACETONE. Cleaning the rodent chamber with either will cause it to crack, and cylinders cracked by alcohol or acetone exposure are not covered under the warranty.

After each use the inner surface of the rodent chamber should be thoroughly cleaned by wiping with water, detergent or disinfectant, but not alcohol or acetone. The tray inside the cylinder is removable for easy cleaning.

E-Cig holders can be wiped out using alcohol on a cloth or swab.

Replacing Parts

Please note the manifolds and holders are specific to the type of E-Cig pod/tank type (JUULpods, *my*blu Liquidpods, blu PLUS+ and VaporFi/Universal "510" tanks).

How to change the manifold (specific to Pod/Tank type)

First disconnect the air tubes, then disconnect the electrical plugs. Remove the screws on each end of the manifold. Install new manifold and screws, reconnect electrical plugs and air tubes.
*Adjust airflow settings respective to Pod/Tank type (see page 10)

1. Disconnect air tubes

2. Disconnect electrical plugs

3. Remove manifold end screws

4. Remove the manifold from the manifold holder and replace it with the desired manifold

5. Replace the manifold end screws

6. Reconnect the electrical plugs

7. Reconnect air tube

Replacing Parts

How to replace the HEPA filter

First note the flow direction (arrow) indicated on the filter. Air must flow from the cylinder and out of the open hole. Unscrew the tube fitting from the filter. Remove thumb nut to open filter clamp and remove the old filter. Insert new filter into the clamp, making sure the flow direction is correct, then finger tighten the thumb nut and reconnect tube fittings. We suggest replacing the HEPA filter at least once a year.

All of the eliquid passes through the HEPA filter which can eventually clog and limit flow through the system. For extreme users, it may be beneficial to bypass the HEPA filter and exhaust directly into a fume hood. Some users periodically weight their HEPA filter to help determine when to replace it.

Accessories & Replacement Part List

AutoMate Scientific offers a number of products which complement the EcigAero®.

Part No.	Item
19-4-R	EcigAero Rodent aerosol exposure apparatus
Order one or more E-Cig manifolds separately:	
E-Cig Manifolds	
19-J	EcigAero JUULpod manifold
19-BP	EcigAero blu PLUS+ manifold (battery-powered)
19-510	EcigAero Universal "510" thread Horizontal manifold
19-BL	EcigAero *my*blu Liquidpods manifold
19-N	3-jet Collsion Aerosol Nebulizer with direct connections to cylinder for E-Cig
Accessories:	
19-ECS	EcigAero Windows Exposure Control Software
01-18w	ValveLink8.2 WiFi/digital/manual valve controller
19-H20	Replacement rodent drinking reservoir and sipper tube
19-HEPA	Replacement HEPA filter
compressor	Quiet air compressor (115 VAC) - 220V also available

Safety Instructions

The following instructions pertain to the risk of fire, electric shock, or bodily injury. Please read all of these instructions carefully.

1. Follow all the instructions and warnings marked on this product or included in this manual.

2. Do not use this product on an unstable cart, stand, or table. This product may fall, causing serious damage to the product.

3. Slots and openings in the cabinet are provided for ventilation. To ensure the reliable operation of your product, and to protect it from overheating, these openings must not be blocked or covered. Do not use this product on a bed, sofa, rug or other similar surfaces. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

4. Never push objects of any kind into the product through the cabinet openings, as they may touch dangerous voltage points or short-out parts that could result in fire or electric shock. Never spill liquids of any kind in the product.

5. This product should only be connected to the AC power source indicated on your product system's information label. If you are not sure of the type of AC power available, consult your dealer or local power company. Only connect this product to a power outlet that matches the power requirements of this product.

6. Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.

7. If you have to use an extension cord with this product, make sure that the total amperage rating of all equipment plugged into it does not exceed the amperage rating of the extension cord. Also, make sure that the total of all products plugged into the main AC power outlet does not exceed 15 amps.

8. Unplug your product from the main electrical power before cleaning. Do not use liquid cleaner or aerosol cleaners. Use a damp cloth for cleaning.

9. Do not use this product near water except as described herein.

10. Unplug this product from the main power outlet and call for service under any of the following conditions:

A. If the power cord or plug is damaged or frayed.
B. If liquid has been spilled into the product.
C. If the product has been exposed to rain or water.
D. If the product has been dropped or the cabinet has been damaged.
E. If the product exhibits a distinct change in performance, indicating a need for service.

STOP!!

If you ever have to remove the main system unit cover, observe the following precautions:

A. The power supply cord must be unplugged before the main system unit cover is removed. (Separe le cordon d'alimantation et puis enleve le couvercle.)

B. Once removed, the cover must be replaced and screwed in position before the power supply is plugged back in. (Apres le couvercle en place et remettre le cordon d'alimentation.)

Warranty

AutoMate Scientific, Inc. warrants its products against defects of workmanship and/or material for ONE YEAR from the date of sale. Any product that fails to perform as specified may be returned, freight pre-paid to the factory (with a written explanation of the problem) for examination and repair or replacement. If it is defective, AutoMate Scientific will repair or replace (at our option) the product without charge and return it to you.

If the examination indicates that non-compatible fluid, destructive environment, accidental damage, modification or abusive practices have occurred, all labor, materials and freight costs shall be at the expense of the customer.

Due to the nature of clinical laboratory applications, AutoMate Scientific, Inc. will NOT accept the return of any products which have been used with HAZARDOUS MATERIALS or harmful environment.

This warranty is in lieu of all other warranties, whether oral or written, express or implied. In no event shall AutoMate Scientific, Inc. or its licensor/licensees be liable for contingent, special, direct, indirect or consequential damages for the breach of any express or implied warranty or resulting from the use, failure or malfunction of any product, including damage to property and, to the fullest extent permitted by law, damages for personal injury, even if AutoMate Scientific, Inc. has been advised of the possibility of such damages or if this warranty is found to fail its essential purpose. AutoMate Scientific, Inc's liability is limited to the reimbursement of the cost of the product. All other warranties, including, but not limited to warranties for fitness or merchantability for a particular purpose are expressly excluded. No verbal changes to this policy will be authorized.

AutoMate Scientific, Inc. manufactures and sells goods in accordance with U.S. federal, state and local laws, but assumes no responsibility or liability for laws, regulations, duties, or taxes imposed by any foreign country. All terms and conditions hereof shall be governed by the laws of the State of California.

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