



Residential Technical Manual

(HomeSeal, HomeSeal Pro & HomeSeal Connect)

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II. Background

1. Ownership and Use of Manual

The Aeroseal LLC (hereinafter referred to as "Aeroseal") Technical Manual is the property of Aeroseal. Updates to the Manual (if needed and at Aeroseal's sole discretion) will be sent to dealers through the mail system or through e-mail. Dealers are urged to consult the manual for diagnostic information, aerosol sealing techniques, troubleshooting, repairs, and maintenance.

2. Confidential Information

All information in this Technical Manual is confidential and meant only for direct use by the dealer and their current employees who are engaged in providing duct sealing services. All information in the Technical Manual is proprietary and unauthorized release or use constitutes a violation of the sublicense agreement.

3. Homeowner Safety Information

Homeowner and Contents Protection: The Dealer is responsible for assuring the safety and well being of the homeowner and the contents of their houses on all jobs. The dealer should:

- a) Keep homeowners away from areas where high sealant concentrations may exist.
- b) Assure that pregnant women and people with breathing difficulties are not at home during the injection process.
- c) Ventilate using a scrubber fan and, if possible, box fans in areas that may be exposed to escaping sealant.
- d) Cover homeowner property that might be exposed to high sealant concentrations in attics or basements.
- e) Keep homeowners away from work areas near ladders, in attics, or in tight workspaces.
- f) Prevent accidental spillage by using a tarp under equipment setup and performing any product dilution outside of the homeowner's home. If accidental spillage occurs, clean up immediately using adherent remover or other solvent(s).
- g) Use a liquid-tight tarp under the aerosol injector to prevent spillage of liquid sealant onto finished floors. The tarp should extend at least 6 feet from the injector under the lay-flat tubing.
- h) Take care when removing the lay flat tubing from the injector to assure that any potential liquid sealant in the tubing or machine does not contact the homeowner's floors.
- i) Keep the sealing equipment clean and free of liquid sealant at all times.

4. Technician Safety Information

The safety of technicians performing the sealing work should be assured at all times. Aeroseal recommends that proper respiratory protection should be worn at all times when in spaces with high aerosol concentrations (e.g. during the injection process in attics, basements or crawl spaces with significant duct leakage) and that technicians be provided with skin protection (gloves) for use with the solvent, and fiber masks or cartridge respirators with organic/particulate canisters for use in duct zones such as attics or basements. Additional recommended safety precautions include:

- a) Not overextending reaches if using tall ladders during the diagnostic or sealing process.
- b) Using only approved electrical connections for the injector machine, including GFIC pigtails.
- c) Using scrubber fans to ventilate areas where sealant material may escape from leaky duct sections.
- d) Placing walking boards across ceiling joists to prevent stepping through the ceiling when working in an attic.
- e) Wearing protective glasses when removing register grilles.
- f) Wearing liquid-tight gloves when using solvents.
- g) Wearing respiratory protection when working in areas with sealant particles in the air.
- h) Sensitive individuals or individuals regularly submitted to high sealant particle concentrations should wear cartridge respirators with organic/particulate canisters.



Figure I-1: Technician in an attic with a dust mask.

5. Sealant Material Specifications

Sealant Material: The aerosolized sealant utilized in the HomeSeal Injector is suspended in water. That water-suspended sealant meets all of the viscosity, safety, IAQ and longevity standards spelled out below:

Viscosity: The sealant shall meet the following viscosity standard: 1.0 centistokes @ 68°F

Safety Certification: The sealant shall meet or exceed the following U.L 181 safety standards when applied by means of the HomeSeal Injector to random circular leaks ranging from 1/16 to 1/2 inches in diameter in galvanized sheet-metal duct sections:

Burning Test: The sealant shall pass the burning test within U.L. 181.

Mold Growth and Humidity Test: The sealant shall pass the mold growth and humidity test within U.L. 181.

Temperature Test: The sealant shall pass the temperature test within U.L. 181.

Erosion Test: The sealant shall show no signs of erosion (i.e., no visual deterioration or dislodged particles) when submitted to the erosion test within U.L. 181.

Surface Burning Characteristics: The sealant shall have Flame Spread ratings of less than 5, and Smoke Developed ratings of less than 5 when applied to cement board at a coverage rate of 0.0064 ounces of solid material per ft² of surface area, and then submitted to U.L. 723 "Tests for Surface Burning Characteristics of Building Materials.6."

IAQ Testing: The sealant shall meet or exceed the following indoor air quality specifications:

VOC Emissions: The sealant shall emit no known carcinogens or toxic substances either when in liquid form, or after drying to solid seal form.

Accelerated Longevity Testing: The sealant shall have successfully passed the seal longevity test described below:

Test Sample: The sealant shall be applied by means of the **HomeSeal** injector to a 4 ft long, 8" by 12" rectangular galvanized sheet-metal duct section with close tolerance end caps and longitudinal seams (no transverse seams). The duct section shall contain 18 in² of physical leakage area in the form of circular and slot leaks, including 15 holes at 1/8" diameter, 40 holes at 1/2" diameter, and 10 slots of 1/4" by 4". The injection process shall be run until there is no more than 1.8 in² of physical leakage area remaining in the duct sample.

Test Procedure: The sealed sheet-metal duct sections shall be submitted to a minimum of 50,000 simultaneous sinusoidal temperature and pressure cycles of at least 6 minutes per cycle, where the pressure differential across the seals shall vary between 150 Pa and 0 Pa, and the temperature of the air within the duct section shall vary between 65-70°F and 200°F.

Test Results: The measured effective leakage area of the sealed samples shall not increase by more than 10% during or after the 50,000 cycles.

6. Safety Data Sheets (also known as MSDS sheets)

On all job sites, including during diagnostics/sales, the Dealer shall have Safety Data Sheets (SDS) available for the sealant material and any solvents that will be used. The SDS for Duct Seal, and the cleaners can be found in the Appendix to this Manual and the latest copy can be downloaded at www.aeroseal.com/sds

III. Aeroseal Equipment and Supplies

1. Aeroseal standard equipment start-up kit

- a) Patented Aeroseal® Sealant Injection Machine*
- b) scrubber fan,
- c) 5 micron air filter with adapter fitting to air hose, compressed air hose,
- d) air compressor moisture/oil filter assembly,
- e) 12" diameter clamp,
- f) 12" diameter flange and clamp,
- g) 75' of blue tubing,
- h) electric knife,
- i) USB cable with field duty fittings and
- j) spare parts kit

* Three versions - HomeSeal®, HomeSeal Pro® or HomeSeal Connect®

2. Major Equipment and Supplies organized by the Dealer

Start-up Equipment & supplies needed for training.

(Can be ordered separately from Aeroseal)

- Air Compressor
 - Portable air compressor, 115V, 1.5hp, Single Phase, 6.5 CFM @ 100psi,
8 gallon tank, at least 125 psi cut-out
 - Recommend: Jenny model: K15A-8P-115/1
- 3 Standard Extension Cords
 - 14 gauge, 110V US plug, 50ft
- Laptop with Aeroseal software installed and configured
- Start-up supplies (Sealant, Ductmask, Clamps, Cleaning solvent, Foam)

3. Sources for Recurring Supplies

All business-specific parts and supplies are available through Aeroseal LLC. The current ordering procedure is to fax or email the order form as indicated to Aeroseal, or call 1.877.fix.duct (1.877.349.3828) and place an order over the phone.

4. Tools and Supplies to be organized by the Dealer

The following is a list of tools, equipment and supplies that typically would be needed for performing duct sealing using the HomeSeal system. The dealer is responsible for providing these items.

Tools

- TWO 50 ft. Extension Cords
- TWO Step Ladders: 8 ft. to 12 ft.
- Measuring Tape
- Screw Gun with self-tapping screws
- Tin shears
- Round-Injection-Hole Cutter (e.g. Malco hole cutter, nibbler, shears, reciprocating saw, 3" hole saw)
- Flashlight, Razor knife
- Standard box of hand tools
- Shop Vac, Dustpan, clean-up materials
- Vice mounted in Truck
- Circuit Breaker Finder
- Voltmeter AC/DC for testing/troubleshooting

Safety Equipment

- Ground Fault Circuit Interrupters (GFCIs) for all circuits
- Particulate Masks Double strap type at a minimum (N-95 NIOSH approved)
- Respirator with Organic-Vapor/Particle Canisters (e.g. North Model 7700-30 or 5500-30 half-mask respirator, fitted with particulate/organic-vapor (Black/Magenta) cartridges 7581P100 (Grainger 6T452 2004))
- Eye Wash
- Safety Glasses
- Rubber Gloves

Supplies

- THREE Tarps or 3 ft x 12 ft Runner Tarps
- Sheet Metal for Injection-Hole Repairs (for 12-inch or 14-inch diameter holes)
- Duct Insulation, Spray Adhesive
- Blue Board, Duct Board
- Mastic and Mesh
- Duct, Foil, and Butyl Tapes
- Extra Print Cartridges, Paper

5. Warranty and Claim Forms

HomeSeal Pro System One Year Limited Warranty:

**AEROSEAL, LLC
ONE YEAR LIMITED WARRANTY POLICY
HomeSeal System & Gen-II SmartSeal system**



FOR HELP CONTACT: Aeroseal LLC, Tech Support, 7989 South Suburban Road, Centerville, OH - 45458, Phone 1.877. Fix.Duct

Limited Warranty for HomeSeal System Hardware:

Aeroseal warrants to Sublicensee that the HomeSeal and Gen-II SmartSeal System hardware will be free from defects in workmanship and materials under normal use and maintenance for a period of **one (1) year** from the date of shipment by Aeroseal, subject to limitations and other provisions of the Patent Sublicense Agreement. During this 1-year warranty period, Aeroseal, at its option, will repair or replace any manufacturing defect or defective part; provided that (i) Sublicensee shall have notified Aeroseal of the defect in writing during the 1-year warranty period and (ii) Aeroseal has determined the HomeSeal or Gen-II SmartSeal System to be defective. Aeroseal will process any notice of defect in good faith. Sublicensee acknowledges that its sole and exclusive remedy for any defect described in this Section shall be limited to repair or replacement by Aeroseal of any defect in the HomeSeal or Gen-II SmartSeal System hardware. THE EXPRESS WARRANTIES SET FORTH IN THIS SECTION ARE IN LIEU OF ALL OTHER WARRANTIES REGARDING THE HOMESEAL SYSTEM HARDWARE, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Except for the foregoing warranty, Sublicensee shall be responsible for the maintenance and repair of the HomeSeal or Gen-II SmartSeal System hardware.

Warranty Restrictions: Notwithstanding the foregoing, the warranties set forth in Sections 3.4, 3.5 and 4.3 shall be null and void if Sublicensee does any of the following (i) uses, or permits the use of, the HomeSeal or Gen-II SmartSeal System or any part thereof for any purpose except in accordance with this Agreement and the Technical Manual; (ii) fails to maintain and operate the HomeSeal or Gen-II SmartSeal System in accordance with the Technical Manual; (iii) uses any replacement part or other components to repair or modify the HomeSeal or Gen-II SmartSeal System which are not provided by or authorized by Aeroseal; (iv) permits any person or entity (other than employees of Sublicensee trained to utilize the HomeSeal or Gen-II SmartSeal System) to use the HomeSeal or Gen-II SmartSeal System; (v) parts with possession or control of the HomeSeal System without Aeroseal's prior written consent; (vi) makes, or allows to be made, any changes, alterations, additions or improvements to the HomeSeal or Gen-II SmartSeal System (other than those required to keep the HomeSeal or Gen-II SmartSeal System in good condition and running order in accordance with the Technical Manual) without Aeroseal's prior written consent; or (vii) uses any other sealant material or other product with the HomeSeal or Gen-II SmartSeal System other than the Aeroseal Sealant Products or other products approved by Aeroseal.

Sub-Licensee Dealer Claim Form – HomeSeal Pro System Warranty:**SUB-LICENSEE DEALER CLAIM FORM – HOMESEAL or Gen-II SmartSeal SYSTEM WARRANTY**

_____ a Certified Aeroseal Duct Diagnostic and Sealing sub-licensee warrants that the HomeSeal or Gen-II SmartSeal System is operated and maintained by the Aeroseal LLC trained technician and used as per the Aeroseal, LLC's procedures and standards.

Description of the defect _____

Component and serial # _____

Registered Case id number _____

Dealer name and number _____

Certified technician _____

Signature _____

LEGAL REMEDIES: The sub-licensee dealer **must** notify the Company in writing, by certified or registered letter to Aeroseal LLC, 7989 South Suburban Road, Centerville, OH -45458, of any defect or complaint, stating the defect or complaint and a specific request for repair, replacement, or other correction of the product under warranty, mailed at least thirty (30) days before pursuing any legal rights or remedies.

WARRANTY CONDITIONS and LIMITATIONS:

1. The warranty is for the benefit of Sublicensee only and may not be transferred or assigned, whether by operation of law or otherwise.
2. Sublicensee has complied in all respects with the Patent License Agreement and the Technical manual.
3. Aeroseal reserves the right to request the failed or defective part and to send such parts for analysis and refurbishment.
4. Aeroseal at its option, may provide a new or refurbished part to replace any failed or defective part.
5. Aeroseal, LLC will not be responsible for ANY SPECIAL, INDIRECT OR CONSEQUENTIAL PROPERTY OR COMMERCIAL DAMAGE OF ANY NATURE WHATSOEVER.

LIMITATION OF WARRANTIES – ALL IMPLIED WARRANTIES (INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) ARE HEREBY LIMITED IN DURATION TO ONE YEAR. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LAST, SO THE ABOVE MAY NOT APPLY TO YOU. THE EXPRESS WARRANTIES ARE EXCLUSIVE AND MAY NOT BE ALTERED, ENLARGED, OR CHANGED BY THE SUBLICENSEE OR OTHER PERSON WHATSOEVER.

THIS WARRANTY DOES NOT COVER:

1. Labor or other costs incurred for diagnosing, removing, installing, shipping, or handling of either defective parts, or replacement parts,
2. Normal maintenance as outlined in the Technical Manual and Training Materials,
3. Parts not supplied or designated by Company, or damages resulting from their use,
4. Failure, damage or repairs due to misapplication, abuse, improper maintenance, unauthorized alteration or improper operation,
5. Failure due to voltage conditions, blown fuses, open circuit breakers, or damages due to the inadequacy of electrical service.
6. ANY SPECIAL, INDIRECT OR CONSEQUENTIAL PROPERTY OR COMMERCIAL DAMAGE OF ANY NATURE WHATSOEVER.

This Warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Ten Year & Three Year Limited Warranty – Certified Duct Diagnostics & Sealing

AEROSEAL, LLC
TEN YEAR & THREE YEAR LIMITED WARRANTY POLICY
Duct Sealing from the Inside



Aeroseal warrants to the Sublicensee that the Aeroseal Sealant Products sold by Aeroseal shall be of like grade and quality to and in accordance with Aeroseal's published Data Sheet for such Aeroseal Sealant Products. In addition, subject to limitation and provisions of Patent Sub-license Agreement, **Aeroseal warrants to the Sublicensee** that, when properly applied in accordance with the Technical Manual and other training materials or bulletins provided by Aeroseal from time to time, the duct seals created according to Licensed Services will be **free of defects for a period of 10-years in residential application and for a period of 3-years in commercial applications**, after the date of the sealing application.

Sublicensee may, but is not required; to offer a warranty from Sublicensee (not from Aeroseal) to any homeowner and building owner for which it properly performs the Licensed Services, and Sublicensee shall be solely responsible for such warranty.

Upon satisfactory demonstration by Sublicensee that the foregoing warranty has been breached and that Sublicensee is eligible for such warranty, Aeroseal will reimburse Sublicensee an amount equal to Sublicensee's direct documented costs to repair or replace the defective duct seals, including the direct labor costs of performing the repair or replacement, but not including general overhead, administrative costs, travel time or other general costs of Sublicensee.

In order to make a claim, Sublicensee shall submit to Aeroseal a fully completed limited warranty claim form, and provide such other information regarding the defective duct seals as Aeroseal may reasonably request.

Aeroseal LLC, will send the reimbursement within 30 days of the accepting the completed claim. Aeroseal, LLC reserve the right to apply the claim amount to any outstanding balance.

Warranty Restrictions: Notwithstanding the foregoing, the warranties shall be null and void if Sublicensee does any of the following (i) uses, or permits the use of, the HomeSeal or Gen-II SmartSeal System or any part thereof for any purpose except in accordance with this Agreement and the Technical Manual; (ii) fails to maintain and operate the HomeSeal or Gen-II SmartSeal System in accordance with the Technical Manual; (iii) uses any replacement part or other components to repair or modify the HomeSeal or Gen-II SmartSeal System which are not provided by or authorized by Aeroseal; (iv) permits any person or entity (other than employees of Sublicensee trained to utilize the HomeSeal or Gen-II SmartSeal System) to use the HomeSeal or Gen-II SmartSeal System; (v) parts with possession or control of the HomeSeal or Gen-II SmartSeal System without Aeroseal's prior written consent; (vi) makes, or allows to be made, any changes, alterations, additions or improvements to the HomeSeal or Gen-II SmartSeal System (other than those required to keep the HomeSeal or Gen-II SmartSeal System in good condition and running order in accordance with the Technical Manual) without Aeroseal's prior written consent; or (vii) uses any other sealant material or other product with the HomeSeal or Gen-II SmartSeal System other than the Aeroseal Sealant Products or other products approved by Aeroseal.

Sub-licensee Dealer Claim Form – Sealant Warranty Residential Application

SUB-LICENSEE DEALER CLAIM FORM - SEALANT WARRANTY RESIDENTIAL APPLICATION

a Certified Aeroseal Duct Diagnostic and Sealing sub-licensee warrants that the sealing application at the below address was completed by the Aeroseal LLC trained technician and complies with Aeroseal, LLC's application procedures and standards.

Please submit the **WARRANTY COST CLAIM FORM** to Fax. 1.866.285.1180 or mail to 7989 South Suburban Road, Centerville, OH - 45458

Date of Application _____ **Date of Failure** _____

Failure description _____

Home owner Name _____

Home owner address _____

Quantity of Sealant _____

Direct Labor hours _____ **Direct labor hour Rate** _____

Certified technician _____

CASE ID number _____

Signature _____

SUB-LICENSEE DEALER CONFIRMS THAT THE FOLLOWING WARRANTY CONDITIONS WERE FULFILLED.

LEGAL REMEDIES: The Sublicensee dealer **must** notify the Company in writing, by certified or registered letter to Aeroseal LLC, 7989 South Suburban Road, Centerville OH-45458, of any defect or complaint, stating the defect or complaint and a specific request for repair, replacement, or other correction of the product under warranty, mailed at least thirty (30) days before pursuing any legal rights or remedies.

WARRANTY CONDITIONS and LIMITATIONS

1. The warranty is for the benefit of Sublicensee only and may not be transferred or assigned, whether by operation of law or otherwise.
2. Sublicensee has complied in all respects with the Patent License Agreement and the Technical manual.
3. Any modifications to the duct system, or introduction of corrosive substances, after the application date, will void this warranty,
4. All work shall be performed by the certified technician of the Aeroseal LLC's sub-licensee dealer. Call 1.877.FIX.DUCT for verification,
5. Aeroseal reserves the right to inspect the failed or defective product.
6. Aeroseal, LLC will not be responsible for ANY SPECIAL, INDIRECT OR CONSEQUENTIAL PROPERTY OR COMMERCIAL DAMAGE OF ANY NATURE WHATSOEVER. Some states do not allow the exclusion of incidental or consequential damages, so the above limitation may not apply to you.

THIS WARRANTY DOES NOT COVER:

1. Residences and buildings with ozone generators,
2. Labor or other costs incurred for diagnosing the defect or failure,
3. Failure, damage due to improper maintenance and alterations to the duct system

Please call Customer Service 1.877.Fix.Duct for any questions of for any concerns with regards to duct cleaning, other maintenance or alterations to duct

IV. Aeroseal Computer and software

1. Aeroseal Software Program Overview

The Aeroseal Software Program was developed to automate the diagnosis of duct-system leakage and the duct sealing process. It records homeowner information, tracks and controls the sealing process on a minute-by-minute basis, and prints a certificate of completion and duct-system label at the end of the sealing process.

After prompting the user to either enter a new homeowner or choose an existing homeowner, the software proceeds to the sealing process.

2. Dealer Specific Software Inputs

The Residential Aeroseal Software Program is designed to allow customization by the Dealer. This is accomplished using the Maintenance button on the toolbar within the program and selecting “Contractor Info”. The specific customizable fields include:

- a) Logos for Certificates of Completion
- b) Contractor Name to be printed on Certificate
- c) Default Altitude of Contractor’s Region

The Dealer-specific logo files usually need to be set up during the Aeroseal training by the trainer and they can be later modified by the Dealer. The logo file is the basis for the header of the sealing certificates. The logo file should be copied to the ‘C: Drive’ of your laptop and placed in the folder of your choice (common to place logo file in ‘My Pictures’ folder on the C: Drive). The logo can be edited using most picture/text-box editing software, including “Paint”; however it should be saved as a bitmap (.bmp) file. The files are usually called ‘contractorname’logo.bmp or ‘contractorname’header.bmp, however files with a different name can be chosen. To choose a logo file, go to Maintenance on the toolbar in the Aeroseal Software Program, select “Contractor Info”. Type your company name in the field labeled “Certificate Contractor Name”. Then click the ‘browse’ button next to the field labeled “Folder Logo Location”. This is where we browse to the contractor logo file we saved. Locate the logo file and open it. The file directory should now be spelled out in the “Folder Logo Location” field. Next hit “Save” and the logo file will be saved as your default logo printed on each certificate of completion.

Technical hint: Copy your logo and other files to the laptop’s hard drive before pointing the Aeroseal program to them. The reason for this is simple. If you load your logo from an external drive (memory stick or CD), the logo might not be there when you go to a job. To avoid printing homeowner documents without your logos, it’s best to copy your files to “C: Drive – My Pictures or folder of your choice” first.

3. Computer Operation and Maintenance

The laptop computer includes the Aroseal Software Program used to control and report the aerosealing process. Although laptop computers are designed to be more resistant to transport than a desktop computer, they still need to be treated with more care than most tools used in the HVAC business. The laptop computer is connected to the Homeseal unit's lid via a USB cable. Mounted inside the lid of the machine is a series of electronic boards and circuitry including the DG-700 & Labjack and an on board Gigabyte computer? These are the analog/digital devices processing all the inputs/outputs to and from the laptop computer.

The following operation and maintenance procedures are recommended:

- a) The laptop should be stored in a cool dry place when not in use. It should **never** be kept in an extremely **hot or cold truck** or left **directly in sunlight for extended periods**.
- b) The laptop should be turned off when not in use.
- c) Cover the computer when sealing in areas of high particle concentration (foggy areas).
- d) To shut down the computer, Exit the Aroseal program, select Start on the bottom of the desktop, and select "Shut Down"
- e) The computer screen should be closed when not in use.
- f) During Sealing or Diagnostics, adjust the computer screen angle so that the homeowner has an optimum view.
- g) The keyboard of the laptop needs to be kept free of dirt and moisture
- h) The laptop should always be shut down when being moved. Sudden movement when it is on can cause extensive damage to the hard drive and result in loss of data. Hard drive failure caused by jarring or misuse is expensive to repair and may void any warranty on the laptop.
- i) Additional software installed by the Dealer onto the Aroseal laptop can cause problems with the Aroseal Software Program. Video games, music download software, or sexually explicit materials shall not be loaded onto these computers. These programs are often gateways for viruses and other malicious programs. If a laptop needs to be reformatted, the Aroseal Software Program will need to be reinstalled at Aroseal's factory location.

4. Digital - Analog Converter (DG-700 & LabJack)

The Aroseal machine incorporates custom electronics that interfaces between the Aroseal software and the hardware devices like the manometer, sensors, and speed controllers. DG-700 measures pressures (via two separate transducers). The LabJack measures temperatures in the HomeSeal machine (and inlet air humidity of system). The LabJack also controls the injection process (including the sealant pump, sealant

atomization and all the heaters) by means of two digital outputs. The DG-700 regulates duct-pressurization fan speed with an analog output.

A common problem you might encounter with the Lab Jack or DG700 is a loss of communication with the software program. This loss of communication can result from :-

1. Disconnected or failed communications cable(s) between the Lab Jack / DG700 and the computer or interface board
2. A failed or disconnected AC Adapter for the DG700
3. A short or break in one of the sensors or wires attached to the Lab Jack / DG700 / Interface Board
4. A problem with the software drivers used for communications
5. A failure of the Lab Jack to turn on when the machine turns on
6. A failure of the DG700 to turn on when the Aeroseal software starts

Do not subject the DG-700 pressure ports to large pressure differentials (i.e. greater than 1000 Pa (4 inches H₂O or 0.15 PSI)

If you are experiencing communication problems, please call 1-877-fix-duct and an Aeroseal support technician can help you resolve the issue.

5. Aeroseal Computer Troubleshooting

Generic Problems

Computer “blinks out” or totally crashes. Although computers and software programs have improved over the years, occasionally computers will crash. The Aeroseal software itself will not cause a computer crash. However, there are many possible causes:

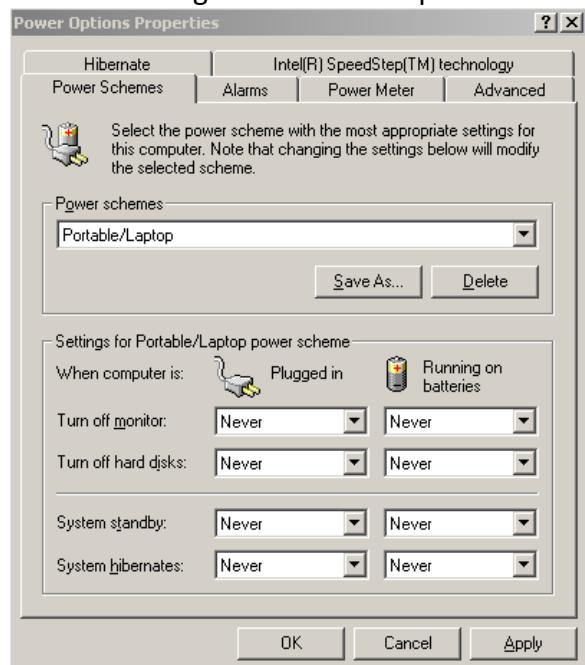
- **Lack of power:** The battery may be uncharged or near the end of its life. Also, the AC power cord may not be plugged in to a live power source.
- **Third-party software or viruses may have corrupted the hard drive.** Aeroseal strongly urges you not to install other software on Aeroseal laptops since this may cause problems or expose the computer to a virus or other attacks. If you do have a virus, you may have to hire a computer expert to help get rid of it unless you are well versed in Windows.
- **A specific hardware component may be failing.** For example, a hard drive may be failing or a motherboard may be flaky. Check to see if your warranty is still valid.
- The Power Management may not be set up correctly. See Power Management below.

Power Management. If the Power Management settings on a laptop are enabled, the likelihood for problems increases. For this reason, Aeroseal does not recommend using Power Management since it may cause the computer to “sleep” during longer seal jobs. Also, not all laptops gracefully “wake up” when Power Management kicks in.

Power Management settings can (depending on the operating system) be altered by entering the Control Panel:



 Power Options Configures energy-saving settings for your computer
Double-clicking on the Power Options icon will display a dialog box similar to this:



No Dealer Logos on Printed Pages: Please refer to the “Logo Documents” section above (p.16). If you experience further difficulty setting up your logo, call Aeroseal tech support for assistance.

Keys and Mouse on Computer do not respond: Sometimes the Aeroseal program might “lock-up” not responding to any keystrokes or clicks, including a non-responsive mouse. If this happens, press “Ctrl-Alt-Del” on the keyboard all at once. A small screen will appear that displays all the “applications” that are running. It is likely to show a status of “not responding” for the Aeroseal.exe program. This can be remedied by highlighting the Aeroseal program in the small screen, and clicking on the “End Task” button. The Aeroseal program should shut down and take you back to the desktop. This function should only be used as a last resort, as using it may result in losing any unsaved data such as sealing screen info. It is best to call tech support and have them determine if this step is necessary. If this does not work, pressing “Ctrl-Alt-Del” again should restart the computer. When the computer completes rebooting, re-start the Aeroseal program, select the homeowner you were working on and resume the activity that you were working on.

Screens do not change quickly When you move to print, create the certificate, the computer has to compile a lot of information and it may take a few moments to create the screen. **Do not keep pressing the button.**

Error Communicating with DG-700 This error can occur any time that the Aeroseal Software Program attempts to read data from the built in manometer (DG-700) equipment. The three places in the program where this could occur are:

- a) during the Combustion Air Zone Safety Test,
- b) during a Pre-Sealing or Post-Sealing Leakage Test

- c) during the Sealing Process

The potential causes of this communications problem are described in detail in Section III-5.

6. Software & Database Sync with Aeroseal servers

Per your sublicense agreement, a software upload process must be done every month. We recommend that you do this before the 5th of every month as a standard routine schedule.

Failure to upload for a period of greater than 31 days will cause the Aeroseal software to stop working.

Data Upload Procedure

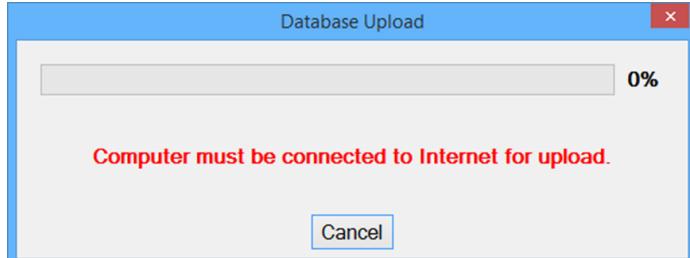
1. **Establish a connection to the Internet.** How you connect to the Internet is up to you. Some offices have wi-fi network connections and some rely on hardwired network connections. Aeroseal is not responsible for establishing a connection to the Internet, nor is Aeroseal responsible for supporting your laptop's connection to your office network.
2. **Verify your Internet connection.** To make sure you are actually connected to the Internet, use your Internet Explorer to navigate to an Internet site with "fresh content." For example, <http://news.yahoo.com/> (Yahoo! News) will always have fresh content. If you are not able to view this site, you have not established a connection to the Internet and your Aeroseal data upload will not work.



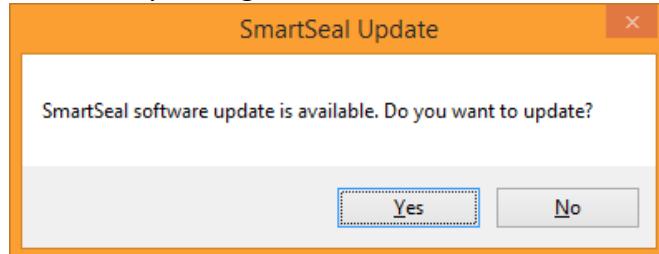
3. Start the Aeroseal Program.
4. Select the menu choice: "Maintenance/ Upload to Aeroseal".



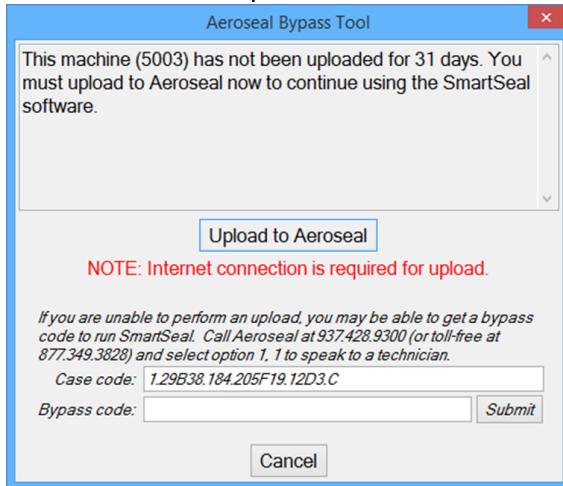
5. The upload process will start automatically if there is an internet connection. The program will shut down and restart on its own. The software license is now refreshed and ready to use.



6. During the upload process, the software will prompt you if a new update is available. Please click 'yes' to get the latest software version.



7. If you forget to do an upload in a month, you may encounter a dialog box as shown below. Click 'Upload to Aeroseal' to proceed.



V. Aeroseal Duct Sealing Process

1. Aerosol Sealing Equipment - Overview

The Aeroseal duct sealing system is based upon a patented process for injecting sealant particles to seal the leaks with all vent register openings temporarily blocked. The patented aerosol injection machine aerosolizes the sealant, evaporates the water in the sealant, and pressurizes the duct system with air that carries the particles to the leaks. In a properly prepared duct system, the only outlets for the aerosol-laden air are duct leaks. The sealant particles travel to these leaks, attaching to the wall at the leaks and then to each other, thereby reducing the size of the duct leaks until they are sealed. The HomeSeal machine utilizes a patented high-pressure small-angle nozzle with isolated compressed air heating.

2. Aeroseal Duct Sealing Process – Overview

Aeroseal duct sealing is a step-by-step process through which the Aeroseal Software Program guides the user. This section describes the key steps in that process, the details of which can be found within other sections of Chapter V. Equipment and operational issues is presented in Section V-3. Details on General Procedures are in Section V-4, and information about special applications is presented in Section V-5.

Any technician performing aerosol sealing should have been trained by means of this manual, in accordance with the sublicense agreement, and tested both in the classroom and in the field prior to performing aerosol sealing independently.

The sealing process consists of the following steps

- a) Preparations prior to leaving for job site:
 1. Review homeowner information, work order tasks, and installation instructions from Salesman
- b) Upon arrival at the site:
 1. Ask homeowner if there are any children or pets that need to be accommodated. Ensure that there will not be any pregnant women or elderly persons in the home during the injection process. Review **Occupants and Contents Safety** in Section V-4.
 2. Obtain homeowner permission to take a look around their home. Ask the homeowner to show you any hidden registers.
- c) Walk-Through Inspection:
 1. Turn on the HVAC system to be sure it is operational
 2. Walk the site looking for any items that affect the Aeroseal sealing process:
 - a) electrical connection points,
 - b) duct injection points,
 - c) problematic registers,
 - d) Disconnected ducts.
 - e) VAV boxes

- f) Fire dampers
 - g) Smoke detectors/fire alarms
 3. Determine whether a **Pre-Sealing Combustion Air Zone Safety Test** needs to be performed (see Section V-4)
 4. If necessary, start the Aeroseal Software Program and run the **Pre-Sealing Combustion Air Zone Safety Test** (see Section V-4)
- d) Equipment Set-Up:
1. Bring in all required equipment, tools, materials, ladders, etc.
 2. Walk through the house sealing all grilles with DuctMask and writing down the sizes of all register plugs
 3. Find the appropriate plugs, or cut new ones, at the truck (Helper Task)
 4. Attach the HomeSeal Pro unit to duct system (see Section V-4 - **Duct System Injection Connection**), and make all electrical connections
 5. Connect the laptop computer to the HomeSeal machine and start the Aeroseal Software Program. For a wireless system, press the start button for the Gigabyte Brix and start your tablet. Refer to steps in Appendix for connection procedure.
 6. Preform a pre-seal leakage test on the whole HVAC system before your duct system inspection and equipment isolation, and or before any work is performed. This step is especially important if you have a utility homeowner rebate program. The pre-seal leakage numbers could be understated when you insert foam into the registers as compared to when you use duct mask to cover the registers. This difference could impact homeowner rebate. The register boot leakage (the cracks between the sheet rock and registers on walls or ceilings or the space between the metal duct and the floor on basement systems) will not show up in the pre-seal test when you use the foam in place. NOTE: We recommend that the dealer seal the boot leakage manually.

e) Aerosol Sealing:

1. Plug the registers with foam plugs (see **Room Register Isolation** in Section V-4)
2. ISOLATE THE HVAC EQUIPMENT (Section V-4)
3. Perform the Pre-Sealing Duct System Inspection in Section V-4
4. Start the sealing process within the Aeroseal Software Program according the procedures for the type of sealing equipment in use
5. Perform **Manual Sealing**, including register boots, during the injection process
6. Move the sealing equipment for second injection if necessary
7. Flush the sealing equipment with water

f) Post-Seal Testing:

1. Return the duct system to the same conditions as during the Pre-Seal Leakage test (note that the grilles can be left plugged with foam as long as boot leaks are sealed manually)
2. Run the **Post-Sealing Leakage Test** within the Aeroseal Software Program (Section V-4)
3. Remove all register plugs and replace grilles according to **Clean Up** procedures (section V-4)
4. Run the **Combustion Air Zone Safety Test** within the Aeroseal Software Program (Sections V-4)

g) Sealing Documentation:

1. Print the **Certificate of Completion** (see Section V-4) for the homeowner, and possibly a second certificate for a utility program

h) Clean Up and Departure:

1. Reassure that all **Clean Up** (section V-5) procedures are completed, including removing all equipment from the home to be cleaned outdoors
2. Reassure that all HVAC and electrical circuits are in working order.
3. Walk through the home, making sure that everything is as it was upon arrival (see **Departure** in section V-5).
4. Be sure to start up the HVAC equipment and check for airflow and proper operation.

3. Setting up HomeSeal Equipment and accessories

Tools and Equipment Checklist

The installer needs to check their equipment and materials list prior to going to a Duct Improvement job. These are listed in Section III.

Electrical Connections

The **HomeSeal** unit **requires** six 120V AC electrical connections, to power the following:

- 1) Compressor – 120V (**~15 AMPS**)
- 2) HomeSeal Pro Machine
 - a. Plug 1 (top) – system components 120 V (**~6 AMPS**)
 - b. Plug 2 – 1500W heater 120V (**~13 AMPS**)
 - c. Plug 3 – 1500W heater 120V (**~13 AMPS**)
- 3) Scrubber Fan(s) - **(3.5 AMPS each)**

Based upon the current draw, the installer needs to find up to **FOUR** separate 120V AC circuits with at least 15-AMP circuit breakers. Electrical connections should be made using the following procedures:

- **Use GFCI pigtails on all electrical cords.** This avoids the possibility of electrocution due to a short to ground.
- Care must be taken to avoid tripping circuit breakers. One way to be sure of this is to use **circuit identification devices** that indicate whether two outlets are on the same circuit simply by being plugged into those outlets. Another (somewhat less reliable) way is to read the breaker box to determine the location of the different circuits.
- If a breaker gets tripped, make sure that it gets reset, and leave a note telling the homeowners that they may need to reset their clocks/alarms. Do not use a circuit that has a major appliance in use on it. This would include refrigerators (always considered in use), microwaves, washing machines, hair dryers, garbage disposals, space heaters, and window-mounted air conditioners.
- Follow the current draws above to determine which cords can be plugged into the same circuits, noting that most residential circuit breakers are 15 Amps. To avoid tripping a circuit breaker, do not plug any other power cords into the compressor circuit. However, if a 20-Amp circuit is available, it is convenient to plug the compressor and the compressed air dryer into the same circuit, leaving both in the truck/trailer.

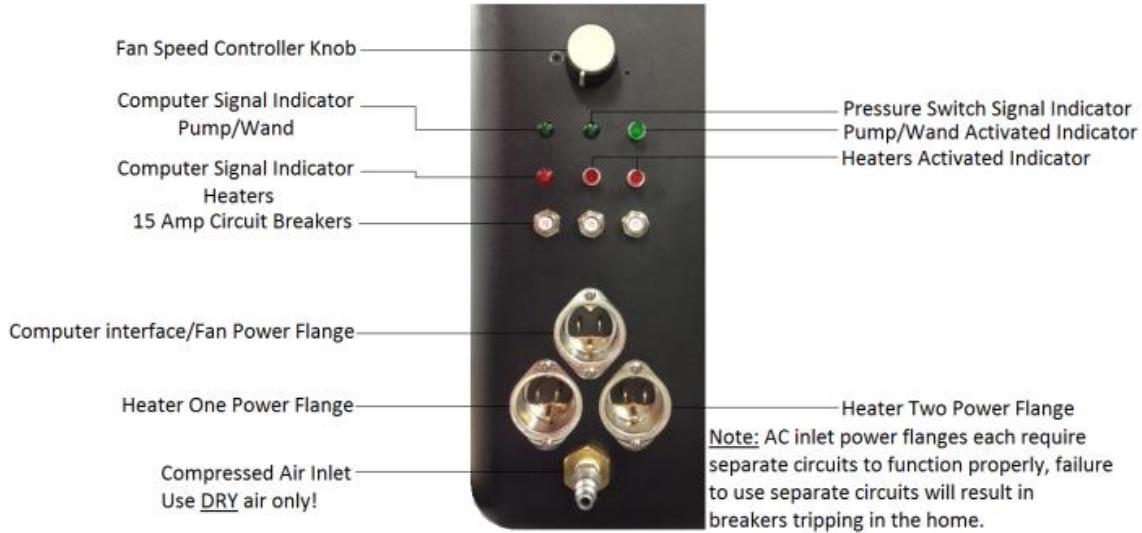
Injection Equipment Setup

- Before bringing the HomeSeal unit into the home, inspect all parts of the equipment that come in contact with the liquid sealant. Make sure that the nozzle and the sealant tubing are not clogged. The “air-side” and the “liquid-side” of the Wand can be quickly checked using the compressed-air hose. The “male-male” adaptor (see background in Figure V-28) allows the compressed-air hose to be connected directly to the air side of the wand, and a “rubber-tipped sprayer” combined with short section of tubing can be used to blow out the liquid side of the wand. (see Figure V-42 in Section V-3 Maintenance) **Clogged nozzles or tubing can cause low sealant flow, and therefore low sealing rates.** An indication of clogging is bouncing liquid lines during sealing or low sealant consumption compared to the fluid level indicator.
- Sealing Equipment Location
- To determine the best sealing equipment location, first see Sections V-3 and V-4 (Sealing Operation) to determine the injection point. To minimize the possibility of accidental spillage of liquid sealant, protective tarps must be used whenever the sealing equipment is located within the living space.
- When choosing the location for the unit, remember that the angle needs to be adjusted to keep the nozzle pointed slightly up from the middle of the lay flat tubing, and that the angle of the lay flat tubing should be parallel to the nozzle (preferably horizontal). Also remember that the nozzle tip should be at least 8 feet from the duct injection point or any sharp bend in the lay flat tubing. The HomeSeal unit shall be handled and located so as to not damage the homeowner’s furnishings and walls.
- Compressor Location

Set up the Compressor and Compressed-Air Dryer in a location where:

- the compressor power cord can reach an unused outlet (20-Amp if possible)
- the compressor noise is minimized (preferably in the truck/trailer or garage)

Make sure you start the Air Dryer about a half hour before the job starts to get peak performance. This could be the first thing you do at the jobsite. If your machine was shipped with a 5 Micron Air filter, then install this at the machine along with the pressure gauge.

Front Panel of Homesea Connect*Front Panel of Homesea and HomeSeal Pro Units*

There are three power cords needed to run the HomeSeal system. One supplies power to the fan, pump and wand heater. The other two supply power for each of the two air heating coils. Each of these plugs requires almost 15 amps so we need to be sure that each cord is pulling from an individual, unloaded house circuit or generator circuit. Just under the three power connections is the compressed air input

connection. This is the compressed air hose coming from the air dryer output. There are also two connections on the back of the fan box: the USB cable connection for the computer and the blue tube port to take pressure readings from the duct system. The blue tube should be plugged into the blue port on the back of the fan box and the other end should be inserted into the duct system for pressure reading.

Sealant Bottle Install

Duct Seal sealant used in HomeSeal equipment does not require any special mixing. The equipment pumps undiluted sealant through special Masterflex tubing. Sealant that has any lumps or coagulation should not be used. The steps are-

- Inspect the sealant gallon for any signs of coagulation.
- Replace the bottle cap with the sealant pick-up tube assembly.
- Place the sealant jug in the HomeSeal box and connect the tubing from the sealant pump to the pick-up tube. **Note:** the pump tubing should be kept on the “blind” screw inside the HomeSeal box when the sealant container is not in use.
- Do not place the sealant jug in the HomeSeal Box until you are ready to inject.
- **DO NOT STORE SEALANT IN FREEZING TEMPERATURES OR EXTREME HEAT. THIS WILL RENDER YOUR SEALANT USELESS.** Optimum temperatures are 40F to 120F.

Injection Nozzle (also called ‘the wand nozzle’)

The HomeSeal equipment uses a standard air compressor to atomize the liquid with a high-pressure, high-velocity jet. This patented atomization nozzle uses no moving parts within the Aeroseal equipment, and has high level of reliability as long as the appropriate air compressor is used. The nozzle uses an air gap (cooling air pocket in Figure V-3) to reduce heating of the liquid until after atomization, thereby reducing clogging.

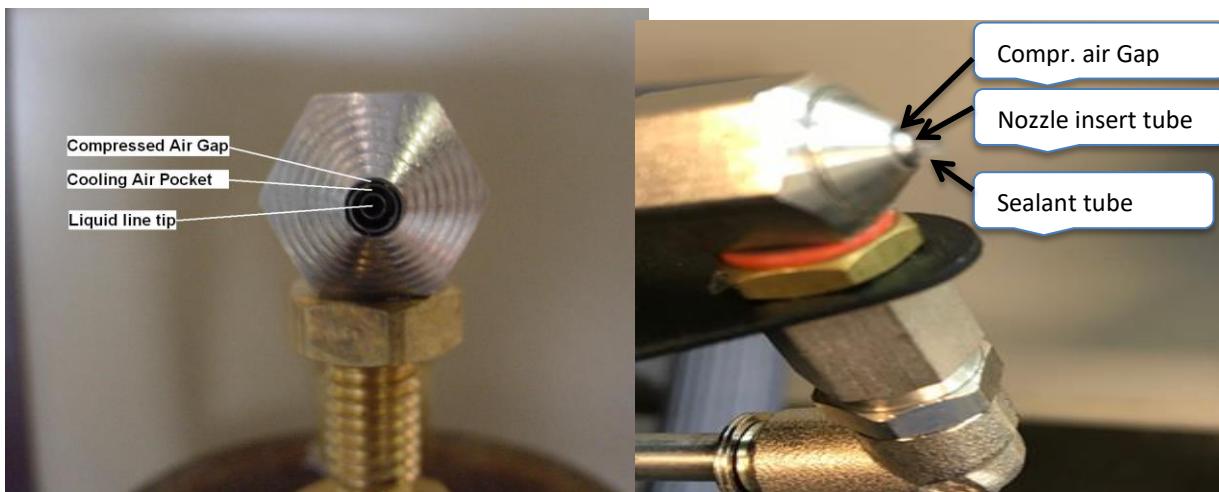


Figure V-3: HomeSeal atomization tip. The liquid comes out of the middle cylinder, which is surrounded by an annular cooling air gap, which is in turn surrounded by annular gap through which the compressed air is blown. Pic on left is for Wand nozzle. Pic on right is for Homeseal connect nozzle.

When using this compressed-air atomizer, it is very important to utilize an effective dryer system to treat the compressed air. The atomization Wand contains an in-line compressed-air heater that shorts out if water condenses in the line. When this heater shorts, sealing rates decrease significantly, and liquid deposition will occur either in the duct system or in the layflat tubing. For the dryer to be effective, it must be a system that is rated for continuous use. The provided 5 micron filter removes most moisture from the air line and needs to be installed at the machine. If using a refrigerated dryer, CONNECT THE AIR LINE FROM THE COMPRESSOR TO THE DRYER BEFORE TURNING ON THE DRYER to avoid freezing of the air line in the dryer.

Nozzle/Wand Components

The HomeSeal equipment uses an Atomization Wand with several components built into the wand, including:

- a) a compressed air heater (see discussion above)
- b) a temperature sensor to monitor the condition of the compressed-air heater.
- c) a High pressure air connection (95psi)
- d) a thermostatic safety switch

DO NOT PLUG THE WAND AC POWER PLUG INTO ANY CIRCUIT OTHER THAN THE PROVIDED SOCKET. DOING SO MAY BURN OUT YOUR HEATER AND WILL VOID YOUR WARRANTY.

The internal components of the Wand are shown in Figure V-4.



Figure V-4: Compressed-air heater inside the atomization Wand (nozzle is located to the left of the photo). Photo to the top right shows how the wiring, compressed air, and liquid sealant connections enter the Wand. Bottom photo is of a Arrowhead Spray nozzle Assembly that is used in HomeSeal Connect.

Scrubber Fan System

We recommend using a high-volume, high-efficiency scrubber fan in conjunction with Aeroseal equipment to mitigate risk of overspray into occupied spaces.

Always use PLEATED FILTERS SPECIFICALLY DESIGNED TO CAPTURE SMALLER PARTICLES (MERV-14 Ultra Allergen or better). You should also face the outlet of the scrubber in a direction where it is not blowing onto any of the home owner's property or walls to avoid situations where small particles pass through the filters and be blown out of the fan outlet. If the fan outlet discharge is within 15 feet of any items or walls, those items or walls should be covered with a protective tarp to prevent any sealant from sticking to them.



Figure V-5: High-volume scrubber fan with ultra-allergen high-efficiency filters installed on five sides for maximum in-room filtration. ULTRA-ALLERGEN FILTERS OR MERV 14 OR BETTER MUST BE USED.

Although the high-flow scrubber fan (see Figure V-5) fitted with small-particle filters should provide an acceptable environment, it is recommended that technicians wear N95 NIOSH approved dust mask when working in areas of high overspray concentration. The sealant is non-toxic and there should be no alarm to the home owner, but the technician working in the presence of high overspray concentration day in and day out should take the proper preventive precautions to avoid significant inhalation/ingestion of the Aeroseal sealant.

Minimize Overspray

For residences that have a high risk of overspray (panned returns) use a conservative approach and lower the sealant injection rate initially (pausing pump periodically).



Photo shows a typical panned return joint and highlights the 90-degree turn return joints can take from registers.

A conservative approach includes:

1. Turning manual fan control on and perform a walk-through of the house:
 - a. Check existing foam plugs to ensure they are not leaking air (tape if required)
 - b. Listen for any escaping (missed registers)
2. If pre-sealing leakage test is abnormally high identify the location of the problem and address it:
 - a. Manually turn fan on and pull each plug one at a time to find the register that does not have air flow. That will indicate the run with significant leakage.
 - b. If needed you may use smoke or fog indicator (place in fan box) without the fan filter. The smoke/fog will indicate areas of high leakage.
3. Start sealing process:
 - a. If over spray is noticed or sealing graph flat lines, start and stop sealing in 5-minute increments to identify major leaks.
 - b. Go up in pump speed only if you notice no overspray in the living area
4. Other steps a dealer may want to pursue
 - a. Use additional fans to pressurize the room
 - b. Section off large returns
 - c. Use scrubber fans or box fans with filters to move air
 - d. Increase the frequency of safety walkthroughs
 - e. House pressurization: For a basement house, a blower door or box fan can be used to pressurize the living space of the building or depressurize the basement space, reducing the possibility of overspray into the living areas.

Safety Procedures

In addition to the Occupant and Contents Safety procedures in Section V-4, there are several safety features in the software and hardware to control the sealing process. In case of an emergency the operator should unplug all three power cords into the machine. These safety procedures include:

- The air heaters in the 14-inch diameter Heater Cylinder are wired through Snap-disk thermostats that cut power to the individual heater circuits if the temperature at the Snap disks reach approximately 200°F.
- The heater in the wand is fitted with a thermostat that cuts out at approximately 330°F.
- The software provide alarms and warning if the discharge temperature exceeds 150 °F

It is recommended that the operator-

- Does not open any Electrical Control Panel or the Heater Cylinder while power is applied. Electric shock is possible.
- Uses only grounded electrical circuits and cords
- Uses Cords with GFCI pigtailed.

THE SEALING MACHINE SHOULD NOT BE OPERATED IF THERE IS SEALANT MATERIAL ON THE HEATER-CYLINDER HEATERS OR INSULATORS

4. Sealing Procedures at a Home

Occupants and Contents Safety

Thorough Duct Inspection: The installer should perform a thorough inspection of the duct system to assure that it can be sealed with the Aeroseal system without damage to the duct system or the homeowner's property.

Occupancy: Occupancy of the home should be kept at a minimum during the injection process so as to minimize the possibility of accidentally dislodging register seals or of sensitive individuals being exposed to aerosol particles. Pregnant women, infants, pets and persons with respiratory and health problems should not be present during the injection process. Do make sure you disclose the SDS (Safety Data sheet) for the sealant to the home owner.

Scrubber Fans: Scrubber fans, either box fans with furnace filters on the suction side or Aeroseal-manufactured scrubber fans, shall be on-site and employed at all sealing jobs. These fans are particularly critical in basements where exposed or partially exposed ductwork allows sealant particles to escape into the space. Scrubber fan(s) can be installed in a window, blowing out so as to depressurize the space with high sealant particle concentrations. Scrubber fans are not necessary when sealing new construction at the rough-in stage.

House Pressurization: For a basement house, a blower door or box fan can be used to pressurize the living space of the building throughout the aerosol injection period, so as to avoid the possibility of aerosol particles entering the living space from the basement. Temporarily taping a box fan into a window space can pressurize the living space to up to 5 Pa, depending on the tightness of the building shell (see Figure V-17). Pressurization is not necessary when sealing new construction at the rough-in stage. An alternate way could be to place the scrubber fans in the basement and run the air outside. This will create a negative pressure in the basement and force particles to move downwards.



Figure IV-17: Fan being installed into window space to provide building pressurization

Duct-System Injection Connection

The Aeroseal Injection machine is connected to the duct system via Layflat Tubing (polyethylene tubes flattened onto rolls) and the flanges that come with the Aeroseal Equipment Package.

Supply Side

For the supply side of the duct system, the aerosol injection point is typically just downstream of the evaporator coil. Return side injection typically occurs just upstream of the fan at the return plenum, or sometimes thru the filter grille opening. The choice of injection point must take into account the following:

1. Generally use the largest injection flange possible (14 inch vs. 12-inch vs 10-inch) to reduce velocities (and therefore wall deposition) at the injection point.
2. To reduce wall deposition opposite the flange, use the deepest trunks possible for the injection. **Do not use trunks less than 8 inches across.**
3. Always use DuctMask on the inside duct walls near the injection point to avoid permanent deposition on those walls. Note that it does not stick well to many internal duct liners or ductboard.
4. **Access for injection** can be made by cutting a **new opening**, removing a **connecting duct**, or occasionally thru the access hole for the **humidifier**.
5. In situations where the furnace is being removed for replacement, the injection connection is typically made using a collar mounted to a cardboard or rigid insulation board, similar to that use for sealing through a **Return Side** filter grille.
6. The hole for the injection flange in sheet metal plenums can be made with a Malco hole cutter, a nibbler, a reciprocating saw, or snips. If using a Malco hole cutter or reciprocating saw, as well as some types of nibblers, care must be taken to avoid dropping filings into the furnace or coil, and the opening site must be vacuumed.
7. Choose a configuration that facilitates **ISOLATING THE HVAC EQUIPMENT** (section V-5).



Figure V-20: In duct board plenums, use a razor knife to cut a slanted hole in the supply or return (i.e. a pumpkin cut). Install the injector collar with long screws through the insulation into a backing plate.

The connection between the flange and the duct system is typically submitted to large forces, and therefore must be mechanically fastened with something other than tape. For metal plenums, use self-taping screws to connect the 12- or 14-inch flanges to plenum openings. Tape the flange to the plenum from the inside of the flange to prevent sealant particles from escaping. By taping from the inside, the pressure that builds up in the duct system during sealing tends to make the tape seal more tightly, rather than lifting external tape off the joint by pushing it away. Taping from the inside also tends to keep the flange clean. When sealing is complete, cut a sheet metal patch, re-apply any insulation that was removed onto the patch, and then mastic and screw the patch to the plenum.

For duct board plenums, use drywall screws to attach the injection collar, screwing through the duct board into pre-drilled 1-inch-square metal back-up plates. Use at least 5-6 screws to mechanically attach the flange to the duct board plenum. In this instance, apply tape to the joint between the flange and the exterior of the duct board, as tape will not stick well to the raw insulation if an interior seal is attempted. The hole cut into a duct board plenum for access should be a pumpkin cut (i. e., the edge cut at an angle to assure that the outside diameter of the plug removed is larger than the inside diameter). This allows the removed plug to be reused without falling into the plenum (see Figure V-20).

Return Side

Careful inspection of the return system should be used to determine which end of the system is most appropriate for injecting sealant material. Return systems with multiple grilles are often best sealed by injecting near the plenum, whereas systems with one or two Filter Grilles are often best sealed by injecting at a Filter Grille.

When injecting near the plenum, follow the same procedures as for the Supply Side, with the following differences:

- 1) The fan access door can be used for connection to the system if the HVAC system fan is removed.
- 2) When using the fan access door for injection, follow the procedures below for filter grilles.

When injecting into a filter-grille return opening (or into the rectangular plenum opening left if the furnace or coil is removed), follow these steps:

- 1) Remove the filter grille and cut a piece of rigid insulation board (or rigid cardboard) to fit the opening.
- 2) Cut a 12 –14 inch diameter hole into the board (depending upon the size flange being used).
- 3) Tape the flange to the inside perimeter of the hole using standard duct tape.
- 4) The board MUST be well secured to the opening. Due to the large pressure forces exerted on such a board, care must be taken to assure that it does not get lifted off by the pressures created during sealing, and that it has an airtight connection to the opening.
- 5) ISOLATE THE HVAC EQUIPMENT (section V-5).

Lay-Flat Tubing

The layflat tubing used to connect the Aeroseal Machine to the ductwork comes in 36 inch size, where the size refers to the width of the roll (36-inch tubing opens up into a 23-inch diameter tube). The lay-flat tubing is attached to the flange by means of quick-connect clamps. The lay-flat tubing is typically folded around the clamps prior to connecting the clamps to the flanges or the Aeroseal Sealing Equipment. These connections should generally be straightened out by loosening the clamps with the injector blower at medium speed (best performed with the manual fan speed control) so as to allow twisting of the tube relative to the flange or equipment. **CAUTION:** Loosening and re-clamping the lay flat tubing at the sealing machine or flange can cause cuts or tears in the layflat that will leak air. Always check for layflat leaks after clamping, by feeling for airflow around the clamp with the fan in operation. Gentle sanding of the edges of the clamps significantly reduces the chances of cutting the layflat tubing.

Using the “Wye” for Sealing (if Equipped)

An alternative to injection at a plenum or trunk duct is to inject through TWO ducts using a “Wye” to split the flow. THIS PROCEDURE SHOULD ONLY BE USED WHEN THERE IS NO OTHER ALTERNATIVE. To use this technique, the tubing leaving the “wye” should be connected to ducts at least 10 inches in diameter, however two 8-inch-diameter ducts can be used if there is absolutely no other way to seal the system. Smaller ducts imply higher speeds and more loss of sealant on the duct walls. When using a “Wye” for injection, follow these procedures:



In Residential set-up, a Wye Kit is used in the following situations-

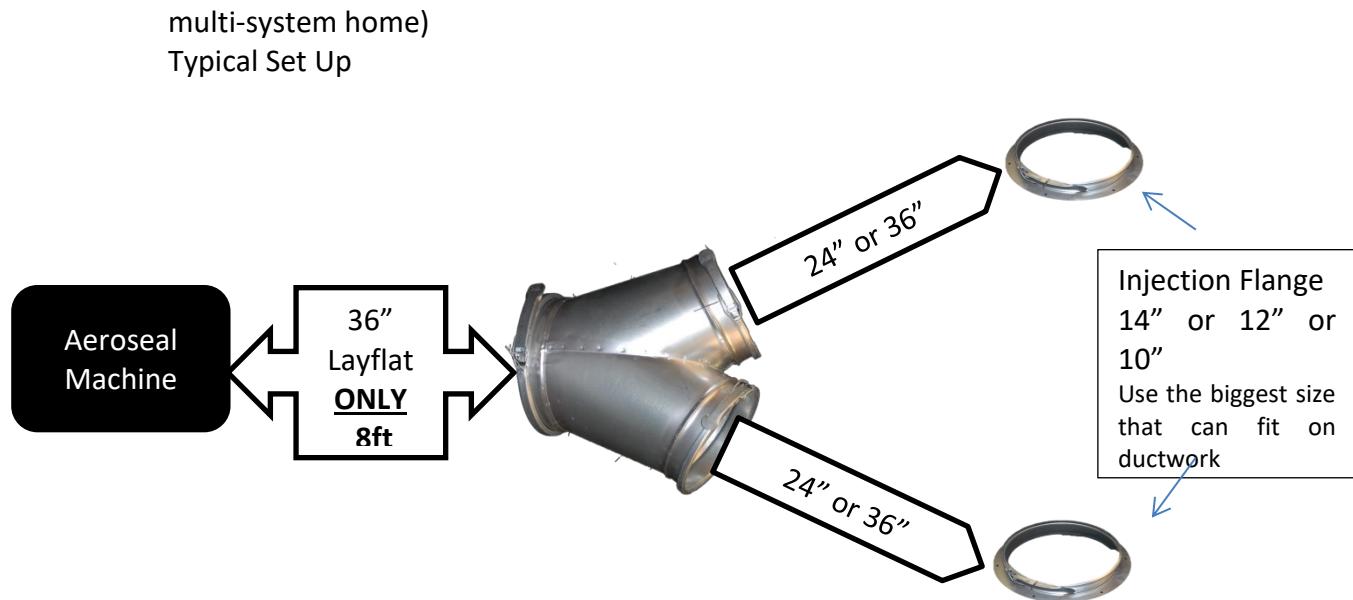
- Simultaneous Supply + return (small systems with estimated overall leakage < 250CFM50)

<Used mostly in Attic systems>

- Sealing from registers.

<Needed when no access point at the Plenum / systems are in closets > - > 40% of the time

- Sealing Zoned systems where dampers can't be removed (Big homes)
- Sealing of two isolated duct sections (may belong to separate systems in a



Why 10" Flanges?

Most of the duct systems (in over 40% of trainings), we are unable to find a big enough ductwork to attach onto. Cramped spaces/ closet systems do not allow for the standard 12" flanges. Dealers without HVAC/ sheet metal background would appreciate a ready accessory rather than the techs trying to figure out after reaching on-site. <Need to make it easy for techs- esp duct cleaners/ Home performance cos. >

Why 24" Layflat on two downstream legs of the Wye?

Using 36" layflat typically fills up the basement, equipment room area and movement in/ out of doors is difficult. Also it is cumbersome to connect onto a smaller injection point. Some instances they may have to connect onto a 6/8" register boot – and is not easy <Need to make things Easy/ Efficient for tech>

- Fan flows using this method should be limited to 250 CFM over the duct leakage in cfm25. High air speeds cause loss of sealant on the duct walls.
- **"Wye" should be located at least 8 feet** from the injector so that sealant particles will have a sufficient time to dry.
- Connect to the duct system using 10" quick-connect collars or connect via reducers to inverted boots that match the dimensions of the boots into which you are injecting into.
- Seal the inverted boots to the existing boots by taping from the inside

Another application of the "Wye" is to seal supply and return ducts simultaneously. This technique should only be used when the duct system is relatively tight to start with - total leakage should be no more than 250 CFM. Larger leakage results in higher flows, which

create turbulence in the “Wye”, resulting in sealant being deposited in the “wye” instead of at the leaks.

Simultaneous sealing with the “Wye” has generally slower sealing rates, and generally does not improve set-up time, as when sealing each side separately, one side can be prepared while the other is sealing. The one advantage of simultaneous sealing of supply and return ducts is that the duct system can be sealed to a lower final leakage, as the minimum leakage at which the machine will work applies to the sum of the supply and return leakage, rather than the minimum applying to each side individually.

Isolating the HVAC Equipment

The protection of HVAC equipment shall be assured at all installations. This includes assuring that furnace heat exchangers, fan assemblies and air conditioner or heat-pump coils are not subjected to aerosol-laden air at any time during the sealing process. Access to the supply and return plenums is often necessary to accomplish this. All residential HVAC configurations cannot be anticipated, so the installer must, in some cases, use their ingenuity to properly perform equipment isolation.

NOTE: The HVAC equipment to be protected includes more than the Furnace and Coils. Careful inspection of the duct system should be performed to locate any mechanical apparatus in the duct system that could be damaged or clogged by sealant particles. The installer shall, prior to sealant injection, **protect the following items: in-line fans, Manual Dampers, Zone Dampers, humidifiers, fresh air intakes, attached ventilation systems, UV lamps, etc.**

Supply Side

The preferred isolation method at the supply plenum is to use a flexible foam plug inserted through the hole previously cut for the aerosol injection flange (see **Duct System Injection Connection** section). After measuring the duct or plenum opening at the coil or furnace and cutting the foam $\frac{1}{2}$ inch larger than the opening in both dimensions, the installer folds the foam before it is inserted and unfolded at the blockage point. The following should be taken into account when protecting the HVAC equipment at the supply plenum:

- The **duct pressure** near the end of the sealing process is **high enough to displace the plug**, particularly large plugs (pressure pushes with more force on a larger area). When installing the plug, assure that it is supported at the back (e.g. by the top of the coil or heat exchanger). At a minimum, push on the center of plug to assure that it can take an increase in pressure. One way to create a support is to make an “X” across the opening with duct tape, assuring that at the tape stuck to the duct wall for at least 4” at each end of the “X”.
- **Covering the plenum plug** with duct mask or layflat plastic keeps it clean for future use.
- **Cardboard** can be used instead of foam, however it needs to be well supported.
- The equipment can sometimes be protected at the plenum by disconnecting the **expansion joint** (typically black rubberized fabric) and inserting a sheet of

cardboard or sheet metal.

Return Side

When injecting through a flange at the plenum end of the return duct:

- The equipment can be isolated at the filter slot if the flange is on the grille side of the slot. If the filter is fairly rigid and well supported, it can be wrapped in plastic, reinserted, and taped at the edges.
- Instead of reinserting the filter, a 1-inch thick rigid insulation board can be inserted into the filter slot and then taped.
- The equipment can also be isolated from inside the furnace cabinet by removing the fan access door and blocking the entrance to the cabinet with a well-supported block of foam, cardboard or rigid insulation.
- Alternatively, a foam block with adequate support can be installed between the flange and the HVAC system fan.

When injecting through a filter grille:

- The equipment is best isolated from inside the furnace cabinet by removing the fan access door and blocking the entrance to the cabinet with a well-supported block of foam, cardboard or rigid insulation.

When injecting through the fan cabinet door:

- The HVAC system fan must be removed from the unit. They are usually on a track and can be slid out.
- A piece of cardboard or rigid insulation board can then be installed over the fan exit hole and taped.
- Be sure to cover any electrical connections with plastic or DuctMask to prevent exposure to sealant.

Room Register Isolation (a.k.a blocking)

Preparing the duct and HVAC system prior to aerosol injection is generally the most time consuming part of the sealing process. Careful attention to this phase of the work

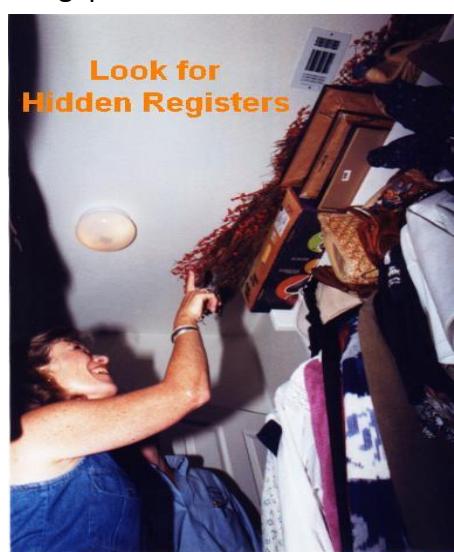


Figure IV-21: Ask the homeowner to show you any hidden registers that would allow sealant to escape if left un-plugged
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dramatically reduces the possibility of spending hours cleaning a damaged building surface. Most problems that have occurred with the aerosol injection process have been associated with poor seals at the registers, failure to plug hidden registers, or leaks in lay flat tubing connections allowing sealant to escape.

The removal and temporary closure of all registers and grilles must be assured prior to commencing aerosol injection. **Ask the homeowner to show you all the registers.**

Register/Grille blocking

In completed homes, temporary closure for aerosol injection should generally be performed by removing registers/grilles, and sealing the boots from the inside with reusable foam plugs cut from the closed-cell foam sheets provided by AEROSEAL. The foam plugs should be cut 1/2" over the size of the opening in both dimensions. For example, the plug for a 4" by 10" boot would be 4 ½ by 10 ½ inches. **Writing the nominal grille size on the plugs (e.g., 4X10), and storing them by size, makes re-use much more efficient.** The following procedures should be followed when **temporarily** sealing registers and grilles:

1. Care should be exercised when removing the register covers so as not to damage paint or other coverings on ceilings, walls, or floors. Registers that are painted or caulked over should be cut around the edges with a razor knife before removal. Advise homeowner in advance that removing old registers may chip existing paint.
2. In some circumstances, one or two grilles can be temporarily sealed with foil or plastic-film tape. There are two key issues associated with using tape for temporary sealing: 1) any such grilles need to be INSPECTED CONTINUOUSLY DURING AEROSOL INJECTION, and 2) tapes that stick well, and therefore do not fail under pressure, are likely to peel paint or leave some adhesive when removed. Assure that any surface being taped will not peel, and can be submitted to an adhesive solvent.
3. Register boots often have dirt, ceiling texture material, acoustic coating materials, or other building materials just inside the opening. **Cover the floor or furniture prior to removing register covers and applying register plugs.**
4. Return grilles sealed with rigid insulation board need to be taped to avoid leakage. Any methods used to create this closure shall not damage the paint or the grilles, and shall be capable of withstanding 500 Pa pressure differentials without leakage during the sealing process.
5. Whenever possible, install the foam plugs so that the gap between the boot and the sheet rock or flooring can be sealed (mastic, caulk or foil tape) during the injection process.
6. Many floor and ceiling boots have been warped during their initial installation. Be sure to tightly fit the foam plugs
7. Prior to the injection process, manually turn fan speed control to “**full on**” to check plug tightness. Be sure to return fan control to the “**just on**” position prior to pre-seal testing.

Manual Sealing Procedures

Manual duct sealing should be planned when doing aerosol sealing jobs. Installers must perform this by using proper sealing materials, application methods and mechanical connections. This includes using butyl-backed foil tape, water-based mastic, and fiberglass mesh.

Manual sealing is to be performed under the following circumstances:

- When there are large (> 0.25 inch across) accessible leaks. This type of sealing can be performed simultaneously with aerosol sealing. When sealing large leaks, assure that the mastic is applied liberally, and that fiberglass mesh is applied whenever the size of the leak exceeds 0.25 inches.
- When the return duct system is small and easily accessible (e.g. a platform return) or has very few joints (e.g. a single flex duct return duct with only one grille). These types of returns can be manually sealed quickly and can be timed for when aerosol sealant is being injected into the supply side.
- If the sealing plot “flat-lines”, indicating large leaks. After uncovering such leaks, possibly using a “smoke emitter” or a fogger at the air intake of the Fan Box to locate the leaks, manual sealing would be required. **Tip:** Two installers are often necessary to make the “smoke emitter” effective, as attics or crawl spaces will often become smoky before one installer can get there after lighting the emitter. Hit “pause” and have one installer light the smoke emitter only after all installers are prepared to look for the smoke trail. BE SURE TO WARN HOME OCCUPANTS BEFORE USING A SMOKE EMITTER.

Mechanical Connections

For both aerosol and manual sealing, all duct systems must be checked for inadequate mechanical connections. Disconnected ducts should be secured with nylon draw bands. They need not be manually sealed as long as the reconnection occurs before aerosol sealing of that section of ductwork. Large-diameter metal ducts should be inspected prior to sealing. Large-diameter sections that are not screwed together can separate during sealing.

Pre-Seal Procedures

Pre-Sealing Leakage Test

The total leakage of the system including ducts, plenums, register boots and mechanical equipment should be measured during this test. The Aeroseal injection machine performs like a “Duct Blaster” during this leakage measurement.

The blue pressure tube assembly (Tee with two equal-length tubes) should be inserted into supply and return sides of the duct system through register plugs or other convenient openings (see Figures V-18 and V-19). Placing the equal-length tubes in both the supply and return provides the average of the two pressures. This vastly improves the accuracy of the test, particularly when there is significant resistance between the supply and return sides (e.g. a dirty or blocked coil).

With the duct pressure held constant at 0.10 inch H₂O (25 Pa), the software **measures the airflow thru the fan box**. As all purposeful duct openings have been temporarily blocked,

the measured airflow through the fan box is the leakage of the duct system at an average pressure of 0.10 inch H₂O (25 Pa). This pressure is a typical average pressure seen by duct leaks, however different types of systems, for example systems with variable-speed fans, or systems with significant flow restrictions, can submit duct leaks to much higher pressures. Similarly, leaks in rectangular sheet metal ducts are often submitted to lower pressure differentials during normal operation, due to the generally lower flow resistance and generally higher leakage levels of these duct systems.



Figure V-18: Be sure that the blue duct-pressure tube is free of debris, sealant and water. Clogged tubes can create inaccurate pressures



Figure V-19: Blue duct-pressure line with "Tee" for averaging supply and return-side pressures. While injecting, or during a single side test (supply only or return only), be sure to have the pressure tubes **only** in the side you are pressurizing.

Procedure:

1. Turn off the HVAC unit to be tested.

2. Open any mechanical dampers after marking their existing position.
3. Use DuctMask to temporarily seal all registers and return grilles prior to their removal.
 - The foam register plugs will be installed after the pre-seal leakage measurement is recorded. This procedure allows measurement of all leakage at the register-boot/sheet-rock junctions and the HVAC equipment.
 - Also seal any intentional outdoor air intakes on the return side (very common in light commercial buildings)
4. Place the blue pressure tubes through the temporary seals in one supply and one return register.
5. The software forces you to select an Inlet Gate Setting before allowing the test to be run. Generally select inlet gate # 2 to start with. Be sure that the inlet gate on the machine is set to the same setting. If gate #2 is not the appropriate setting, the software program will instruct the user to change the gate setting.
6. Press F2 to begin. The fan will gradually ramp up to, and then hold, a duct/mechanical-system pressure of 25 Pa. Leakage is displayed in CFM @ 25 Pa, and in square inches of equivalent hole size.
7. To repeat the test, if needed, press **F2** again (the software will warn that the previous measurement will be erased).
8. After the Pre-Seal test is complete, remove all temporary DuctMask seals and replace with foam blocks.
9. Press **F9** to continue to the sealing screen.

NOTE: The Pre-Sealing Leakage Test cannot be re-run after any aerosol sealing has been performed.

Pre-Sealing “Combustion Air Zone Safety” Test

- Prior to sealing, there are several different possibilities related to the “Combustion Air Zone Safety Test”:
 - 1) The Aeroseal Installer should perform a Pre-Sealing Combustion Air Zone Safety Test prior to sealing.
 - 2) If the results from the test showed values in **Red** (lower than -3 Pa.), the salesman should have included measures to correct the problem in the Work Order. If the homeowner elected not to have the repair work performed, the Aeroseal Installer should advise the homeowner that a safety problem still exists, and that it could possibly worsen after sealing.
 - 3) If the Combustion Air Zone Safety Test indicates a “**Red** Zone Value”, the homeowner should be advised that a “potentially hazardous condition exists”:
 - **Do Not Alarm** the homeowner. The installer should explain that they will perform a Post-Sealing Combustion Air Zone Safety Test to see if an unsafe condition still exists after sealing.
 - 4) If the Post Seal Combustion Air Zone Safety Test displays a reading in the **Red** Zone, the installer should print the page, advise the homeowner of the situation, and prepare a work order to fix the problem. Possible remedies might include:
 - For Fireplace Back drafting Problems

- sealing the ducts
- adding a return air grille to rooms that are isolated from the Combustion Zone
- increasing door undercuts to aid in return air movement
- installing jumper ducts to rooms that are isolated from the Combustion Zone
- For Depressurized-Basement Problems
 - sealing the ducts
 - providing outside combustion air to the basement
 - Adding a fixed supply register in the basement
- **Tip #1: In situations where the Combustion Air Zone Safety problem is due to unbalanced return air,** to determine which rooms can push the Combustion Air Zone Safety Test into a safe result, repeat the test with the doors to those rooms open to the Combustion Zone.
- Tip #2: In situations where the Combustion Safety problem is in an unfinished basement with a furnace, sealing the return ducts is likely to solve the problem.

Pre-Sealing Duct System Inspection

Once the Pre-sealing Leakage test and the Pre-Sealing Combustion Air Zone Safety Test have been completed, several additional steps must be followed prior to starting the sealing process:

- Inspect the system for Duct Dampers, and if found, follow the procedures in Section V-5
- Manually turn the Fan-Box speed control up until the layflat tubing becomes taut.
- Ensure that the lay flat tubing is not twisted at the Injector-Assembly and Plenum-Flange clamps
- Check lay flat tubing at both ends for cuts or tears due to the clamp
- Ensure that all grilles and plenums are plugged.
- Check register and plenum plugs for any dislodging
- Ensure that the sealant jug is full
- Check the tubing in the pump head, to be sure it is not crimped and the hold-down tabs are tight
- Turn on ventilation/scrubber fans

Aeroseal sealing Procedures

Key things to remember when using the Aeroseal machine include:

1. Check all liquid connections for tightness before injecting.
2. Always locate and start the Scrubber Fan prior to initiating injection, and assure that it is fitted with appropriate MERV 14 or better rating pleated filters (e.g. 3M Filterete Ultra-Allergen).
3. Connect the compressed-air hose between the compressor and the 5 Micron filter then install this at the fan box along with the inlet pressure gauge assembly (**do not** install the 5 Micron filter at the compressor)
4. Plug in all heaters on the Heater Cylinder to get a better sealing rate.

All aerosol injections must be performed under the control of the computer-control hardware and software package provided by **AEROSEAL**, which includes automatic safety shutoff of injection in case of inadequate pressure, overheating, inadequate flow, excessive pressure, or increases in duct leakage.

OPERATING THE EQUIPMENT WITHOUT THE SOFTWARE SAFEGUARDS WILL VOID THE WARRANTY AND POTENTIALLY VOID DEALER RIGHTS TO THE AEROSEAL PROCESS.

Step-by-Step Protocol

1. Preparations

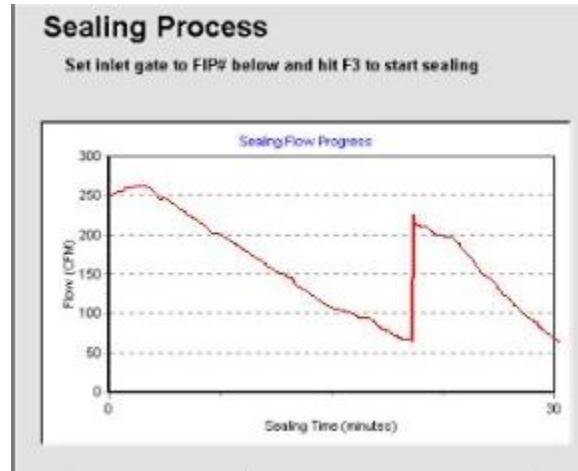
- a. **Equipment Protection:** Follow the procedures in **Section V-4** to assure that the **HVAC equipment is isolated from sealant particles**, including furnace heat exchangers, fan assemblies and air conditioner or heat-pump coils Humidifiers and UV lights.
- b. **Connections:** Check all A/C-power connections (HomeSeal Box, Compressor, Compressed-Air Dryer, and Scrubber Fans (1)). If you have a HomeSeal Pro (wireless) unit then you need to Power ON the on-board Gigabyte computer inside the Lid. Turn on the handheld tablet/laptop and follow the HomeSeal Pro start-up instructions to make a remote connect between the tablet and the machine.
- c. **Register Seals:** Follow the procedures in **Section V-4** to seal the registers, generally by replacing ductmask seals with **closed-cell-foam seals**.
- d. **Homeowner and Technician Safety:** Turn on scrubber fans in injection zone and living zone. Refer to **Sections V-3 and V-4** of this manual.
- e. **Computer:** Proceed to the sealing screen, choose gate setting (Use gate position #2 unless the duct system has more than 500 CFM of leakage.)
- f. **Sealant:** Connect a fresh gallon of sealant in the HomeSeal Box
- g. **HomeSeal Box:** Move gate to same position specified on the computer (usually Gate 2 – see above).
- h. **Manual Check:** Manually turn the fan to full speed, and then walk the entire duct system, checking every register, listening for leaks or unsealed registers, and looking for any evidence of air flow into the living space.
 - i. Return fan speed control to the “**Just On**” position

2. Start Sealing

- a. **Press F2/Start Button:** Select the amount of sealant in the container on the pop-up screen (FULL when starting a new gallon of sealant)
 - b. Ensure that the sealant is being pumped and atomized properly. Check that the pilot lights on the HomeSeal Box are turned on during injection. Examine the nozzle tip to be sure that sealant spray is being ejected.
 - c. Turn on the fan manually to 100% and perform a walk around safety check, listening for air escaping from hidden registers and checking all foam blocks for tightness. Note: if small amounts of air is escaping around the foam plugs, hit pause, readjust the foam so no air is escaping. Start the sealing process.
 - d. Once it is clear that the sealing material has reached the nozzle ensure that the nozzle is at the center of the layflat tubing and no sealant deposition takes place on the lay flat tubing. Conduct a walk through the entire house and look for any sealant odor or for noise from small leaks. Look in HVAC equipment cabinet and smell for sealant leaks at the HVAC fan and coil seals. It is recommended to remove the coil access door so if any sealant does make it past the foam it is not directed through the cooling coil. If sealant leaks occur, hit “**Pause Sealing**” and repair the seals or leaks ASAP. The heaters and fan can remain operational.
 - e. **Adjust Flow/Duct-Pressure:** Follow the procedures below to choose the appropriate flow and pressure. Use the “Slower/Faster” arrows to adjust the fan speed.
3. Monitor Sealing
 - a. **Initial Monitoring:** For the first 5-10 minutes of injection, monitor the process continuously, carefully watching the leakage, duct pressure, fan flow, temperatures and sealing rate before commencing other duties. This allows the installer to catch any problems early on.
 - b. **Operating Temperatures:** Assure that the inlet, outlet and compressed-air temperature sensors are operating properly. The difference between the inlet temperature and outlet temperature generally increases over the course of sealing as the fan flow drops. The outlet temperature is usually less than 130 °F, as the snap-disk thermostats turn off the heaters at higher temperatures.
 - c. **Duct Pressure:** The minimum pressure within the duct system during aerosol particle injection is **10 Pa (0.04 inches of water)**. Because pressures lower than 10 Pa will result in low sealing efficiencies and long injection times, **the Aeroseal Software Program does not allow injection at lower duct pressures**. Low duct pressures can be eliminated either by reducing the portion of the duct system being sealed or by manually sealing large leaks. Duct Pressures should not be allowed to exceed **400 Pa (1.6 inches of water)** in systems containing ductboard trunks or plenums. Sheet-metal ducts can be submitted to considerably higher pressures, so their maximum operating pressure is not likely to ever be exceeded.
 - d. **Minimum Fan Flow:** The Fan Box flow rate should not be allowed to drop below **150 cfm**, so as to avoid slow sealing. Extended periods of injection at low fan flows (100-150 CFM) also cause excessive sealant deposition on duct walls.

- e. **Optimum Fan Flow:** The Fan flow rate can have a large impact on sealing performance. Low flows cause the sealant particles to fall out of the airflow onto the duct surface before reaching the leaks, and can reduce the duct pressure below the required minimum. High flows can produce excessive turbulence at bends or transitions, thereby causing sealant particles to be deposited at those locations and onto duct walls. **Use the Faster and Slower buttons on the computer screen to maintain the fan flow to be approximately 150 CFM over the instantaneous Duct Leakage displayed on the screen in [CFM@25Pa](#).**
- f. **Sealant Material:** The Aeroseal Software Program tracks the number of minutes of sealant remaining in the container based upon the initial selection of sealant level by the user and the pump setting history. When the calculated remaining sealant material drops below 5 minutes of injection, the software pops up a warning. When the warning appears, or if you notice the “Remaining Sealant” getting low, hit “Pause Sealing” and refill or replace the sealant container prior to restarting sealing. Note that the proper level in the “Sealant Level” window that pops up needs to be checked when sealing is restarted. NOTE: If sealing is paused for any reason, the “Sealant Level” pops up when sealing is restarted, and should be left at “Not Changed” unless the sealant level was modified.
- g. **Leakage Tracking:** Duct leakage in [CFM@25Pa](#) and Square Inches is displayed on screen throughout the sealing process and is plotted on the graph every minute. However, leakage values on the graph may differ from the actual leakage. Numerical and graphical data during sealing are estimated values based upon an average relationship between pressure and flow. Depending upon the type of leakage in the duct system, the sealing-process leakage values may be either higher or lower than the actual leakage at 25 Pa. In addition, the Pre-Seal leakage is often higher than the initial leakage on the graph because equipment and boot leakage are not measured during sealing, and injection is often performed on supply and return ducts separately.
- h. **Pauses in Sealing:** The Aeroseal Software Program will stop the sealant injector for the following conditions:
 - 1. low fan flow (minimum value in software 150cfm) **CAN BE OVERRIDEN**
 - 2. high duct pressure (depends on type of duct material selected) **CAN BE OVERRIDEN**
 - 3. low duct pressure (<10 Pa)
 - 4. blown seal (sudden change in leakage area by 20 sq. in)
 - 5. red tube is disconnected (or lid is opened)
 - 6. the sealant level is low
 - 7. insufficient compressed air pressure to allow the pump to turn on
 - 8. The pump voltage goes to 0 Volts, indicating either a stopped pump or a bad voltage measurement or lack of compressed air pressure.
 - 9. danger of sealant saturating the air and “raining” water in the ducts
 - **“Pause” button** can be used to intentionally pause the injector (wand) and pump operation. The fan and heaters remain on.

- To continue sealing, click on the “**Start Seal**” button or hit the **F2** key. The sealant pump and compressed-air heater will restart.
- i. **Sealing Progress:** The rate at which leaks are sealed depends upon: a) the type of ductwork (e.g. ductboard vs. flex duct vs. sheet metal), b) the type of leaks (size and location), and c) the overall leakage level. The slope of the leakage graph (Red Line) indicates this rate of sealing. Experienced operators can gauge when sealing is not proceeding at the expected rate. In general, sealing rates are higher near the beginning of the sealing process, and are faster for leakier systems. Typically, sealing rates of rectangular sheet metal duct systems averages around 10 cfm per minute. Flex duct systems typically seal at about half those rates, and ductboard systems can seal even more slowly. If rates are below the expected values, actions need to be taken to remedy the situation (See Low Sealing Rate Procedures section)
- j. **Low Sealing Rate Procedures:** If the leakage graph does not begin to decline at the usual rate within the first five minutes of injection, or if the leakage stops declining, possible causes should be investigated in the following order:
1. Re-walk the entire duct system to check for missing or failed plugs or large leaks (e.g. missing end caps), recheck the air handler plugs, and smell around for sealant material. Also check the layflat tubing for leaks (particularly at the clamp connections). If you smell sealant material, find the source, then “**Pause Sealing**” on the computer screen, and repair the problem before restarting sealing.
 2. Look at the nozzle tip thru the layflat tubing to assure that sealant material is being injected. If sealant injection is not obvious, slowly push the layflat tubing down in front of the nozzle tip and look for white deposits on the inside of the layflat tubing. If sealant is not being injected, follow the troubleshooting procedures in **Sealing Operation Troubleshooting Section** below.
 3. Assure that there isn’t any liquid sealant in the layflat tubing, either due to the spray hitting the tubing, or a failed compressed-air heater - see **Sealing Operation Troubleshooting Section** below.)
- k. **Secondary Sealing Process:** In situations where the supply and return are sealed consecutively, once the first side is finished, click on “Pause” Sealing and move the lay flat tubing to the other side (if the tubing has significant sealant deposition, replacing it with new tubing will increase sealing rates). Click on Start Sealing or hit F2 key to re-start sealing. The graph will spike up to the initial leakage of the second side.



- I. General Monitoring Procedures
 1. Check progress of sealing job every 10 minutes
 2. Refill sealant material approximately every 45 minutes, times will vary depending upon pump speed.
 3. Perform manual sealing at HVAC equipment, plenum connections, and return side if applicable
 4. Clean and/or prepare register grilles for re-installation
 5. Caulk gaps between register boots and sheet rock or flooring (be careful not to seal in foam plugs)
 6. Inspect Combustion Appliances for any potential code or safety issues

4. Finish Injection
 - a. Sealing Should be Terminated when:
 - Duct leakage has been reduced below the target level (e.g. **>80% sealed, 30 cfm25, or equals 5% of fan flow**).
 - fan flow cannot be maintained above **70 cfm** due to duct pressure constraints
 - duct pressure has reached **600 Pa** (400 Pa for Ductboard)
 - graph shows a “**flat-line**” that cannot be remedied (e.g. due to a large inaccessible leak)

DO NOT ATTEMPT TO TRY TO SEAL BELOW THE ABOVE SPECIFIED LEAKAGE LEVEL. ELSE YOU WILL RUN THE RISK OF OVERSPRAY BACKFLOW INTO THE MACHINE CAUSING HARDWARE DETERIORATION AND MAINTENANCE ISSUES. Call Aeroseal technical support if you run into these situations who can guide you some maintenance steps.
 - b. Sealing Termination/ Flushing Procedure:
 - Click on the “Stop Sealing” button or hit the F3 key, which turns off the injector fan and sealant pump.
 - The Software Program will ask if you are sure you want to stop sealing. If you choose YES, the program will initiate the FLUSHING process.
 - Replace the sealant gallon with another gallon filled with water.

- Choose the length of the Flush process - Flush until the fluid line is clear and water is being sprayed through the wand. (Generally 3 – 4 minutes is adequate)
- Click on the “Start Flushing” button or hit the F2 key,
- Once the Flush process is complete, the software turns off the sealant pump and heaters, but does not turn off the Fan-Box fan for at least 2 minutes to cool down the Wand and heaters in the 14” cylinder
- Should the installer want to re-start the sealing process at this point, they will have to wait for the cool down process to complete.

Post Sealing Procedures

Post-Sealing Leakage Test

Once the sealing process is complete, the post-sealing leakage test must be performed under the same conditions as the pre-sealing leakage test (except that foam plugs may be left in the registers as long as the register boot/sheet rock junctions have been sealed permanently with a manual sealing method e.g., caulk, butyl-backed foil tape or mastic).

- Generally set the inlet gate to Position #3 on Fan Box and select Fan Inlet gate #3 on the computer screen. **Be sure that the inlet gate on the machine is set to the same setting.**
- If gate #3 is not the appropriate setting, the software program will instruct the user to change the gate setting.
- Assure that the blue pressure tube assembly (Tee with two equal-length tubes) is inserted into supply and return sides of the duct system through register plugs or other convenient openings
- **Press F2 to begin.** The program will then initiate the same test as was performed prior to sealing.
- As for the Pre-Sealing Leakage test, if needed, press **F2** again to repeat the test (the software will warn that the previous Post-Sealing Leakage Test results will be erased).
- Press **F9** to move to Post Seal Combustion Safety Test

Post-Sealing “Combustion Air Zone Safety” Test

- After sealing, the “Combustion Air Zone Safety Test” needs to be run again. Follow the same procedures as for the **Pre-Sealing Combustion Air Zone Safety Test**. In general, there should be **NO SURPRISES** associated with the results of this test. The results of the **Pre-Sealing Combustion Air Zone Safety Test** should have been used to produce one of four possible outcomes:
 1. A work order to fix the pre-existing combustion safety problem,
 2. A warning to the homeowner that sealing could produce a combustion safety problem that would need to be corrected after sealing,
 3. A clear indication the sealing should only improve any potential combustion safety problems, or
 4. A signed acknowledgement by the homeowner that they are aware of the potential problem, but choose not to have it addressed.
- If the Post-Sealing Combustion Air Zone Safety Test produces a value in the **Red** (lower than -3 Pa.), the installer must present these results and a summary of required repair work to the homeowner. Possible remedies might include:
 - For Fireplace Back drafting Problems due to Inadequate Returns
 - adding a return air grille to rooms that are isolated from the Combustion Zone
 - increasing door undercuts to aid in return air movement
 - installing jumper ducts to rooms that are isolated from the Combustion Zone
 - **In situations where the Combustion Safety problem is due to unbalanced return**

air, to determine which rooms can push the Combustion Air Zone Safety Test into a safe result, repeat the test with the doors to those rooms open to the Combustion Zone.

- For Depressurized-Basement Problems
 - providing outside combustion air to the basement
 - Adding a fixed supply register in the basement
- This procedure should produce one of two outcomes:
 1. the homeowner's approval of a work order for the measures required to correct the problem, or
 2. a signed release from the homeowner explaining that they are aware of the issue, and have elected not to have the repair work performed.

Create Homeowner sealing certificate

All homeowners shall be provided with a printed or electronic copy of the Certificate of Completion generated by the Aeroseal Software Program for verifying the sealing job. After selecting **Certificates** in the Aeroseal Software Program on the **Sealing is Complete** screen (see Figure V-26), place a blank sheet of paper into the printer and press print. Be sure to give the printed certificate to homeowner and provide a brief explanation of the results. **Note:** Before you print out the homeowner sealing certificate, make sure that all Homeowner details (like name and address) are correct. After printing, all fields get locked and you will **NOT** be able to make any further changes to the certificate

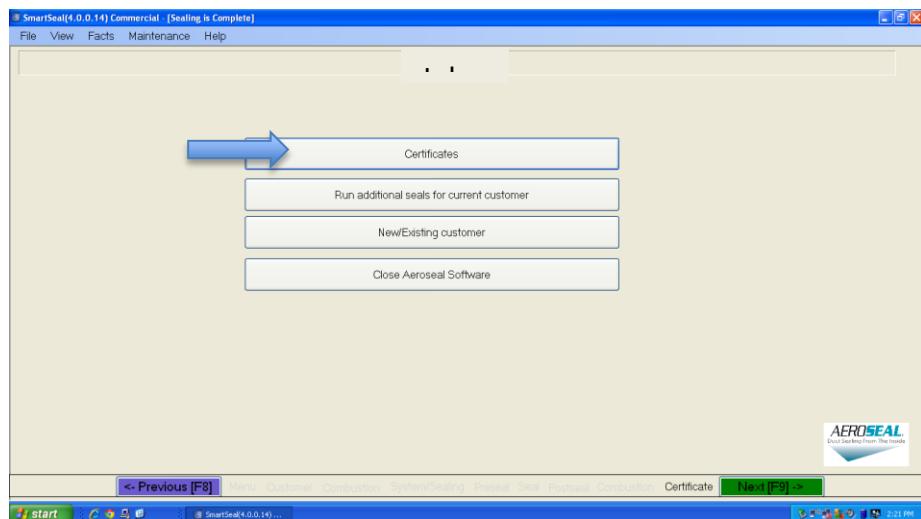


Figure V-26: Sealing is Complete screen from Aeroseal Software Program.

Clean Up

Installer must always take precautions to **prevent spillage** on carpet, furniture, and other personal property, as DUCT SEAL can be difficult to remove.

- Disconnect lay flat tubing from the duct injection flange and HomeSeal Injector Assembly, tie the Injector-Assembly end in a knot and then roll the tubing before taking it outside. Be sure not to leak any sealant material that may have collected in the tubing.
- Inspect supply and return plenums to be certain that coil/fan plugs have been removed
- Re-install grilles and immediately vacuum any debris that falls.
- For sheet metal systems, repair the Injection Flange Connection by installing a sheet metal patching plate over the injection hole. For internally lined ductwork, glue a round section of duct insulation of the same size as the hole onto the patch before screwing it over the injection hole. Once the patch is in place, seal it on the outside with metal-foil tape or water-based mastic.
- For duct board systems, cover the hole with the round pumpkin-cut plug that was removed prior to sealing. Once the plug is in place, seal it on the outside with metal-foil tape or water-based mastic.
- Reinstall the Return Air filter (with a new one if possible).
- Restart the HVAC system and assure that it is operating properly.
- Follow the Maintenance Procedures for **HomeSeal equipment** (see Appendix)

Accidental spillage

- Soak up excess liquid with absorbent materials such as disposable towels, paper towels, etc. Place absorbent materials in plastic bags or other suitable containers for later disposal. Residual material may be removed by wiping with water-dampened rags or by flushing with a water spray. Remove as much as possible, repeating as necessary and for as long as the residue will continue to be removed. Non-absorbent surfaces can be cleaned using Buckeye Workout muscle cleaner. Place all clean up materials in a suitable container for later disposal.
- Dried (set) DUCT SEAL on Aeroseal sealing equipment and accessories can be removed with Buckeye Workout cleaner by soaking small parts in a container with a tight fitting lid, or by wiping, brushing or spraying and then wiping dry with rags.
- Remove DUCT SEAL and cleaner from skin immediately by washing affected areas with soap and water as soon as possible after contact. For emergency and other first aid procedures, refer to the SDS sheets.
- DUCT SEAL liquid spill onto clothing can be very difficult to remove. Keep the affected area wet with water and wash immediately.
- Carpets that feel tacky due to extended exposure to sealant overspray particles are cleaned most efficiently and cost-effectively by professional carpet cleaning services.

Bedding comforters have been successfully dry-cleaned after being exposed to particle fogging.

Disposal

The information provided herein is for disposal of very minor volumes of DUCT SEAL, as would be expected for normal use of the Aeroseal process. Undiluted sealant material is typically supplied in cases of four one-gallon containers.

Absorbent materials from minor clean-up operations can be disposed as solid trash in sanitary trash landfills. Excess liquid DUCT SEAL (up to 1 gallon) can be absorbed into soil or sand in a can or an open top plastic container and allowed to air dry. When dry, the container can be disposed as solid trash. An alternative method involves freezing the liquid, separating the solid mass from the liquid. The solid portion can be disposed as solid general trash. The liquid can normally be disposed through the municipal sanitary waste system. DUCT SEAL imparts a white, milky color to water that may not be removed or sufficiently diluted by the treatment facility.

Each municipality has their own regulations and restrictions related to the disposal of materials through the sanitary sewer system. The local regulatory agency should be contacted and advised if small amounts of DUCT SEAL are expected to be **regularly discharged** into the sanitary sewer system. DUCT SEAL, as with any chemical product, must not be disposed of into Storm Sewers or onto open land.

Sealant Material Disclosure

The Right-to-Know Law and OSHA Regulations require that employers and employees be familiar with applicable Safety Data Sheets (SDS) prior to using any chemical product. The SDS for the sealant material (DUCT SEAL) is available in Appendix section. The latest copy can also be downloaded at www.aeroseal.com/sds. No adverse health effects are expected during normal application of DUCT SEAL; however, a high quality respirator or dust mask (minimum N95 NIOSH approved) should be worn. Use a half mask respirator if it is necessary to be in close contact with spray mist particles in confined spaces (See "Safety" section). This is to prevent unnecessary entry of sealant particles into the respiratory system.

5. Special Applications

Underground Ducts

In certain regions of the country, ductwork is sometimes installed underground, typically under a concrete slab. Aeroseal is uniquely suited to addressing leaks in these types of systems, however there are currently some important caveats associated with these types of applications. The key caveat is the existence of standing water in the duct system either during the application or afterwards. Since Aeroseal can only seal leaks through which air can blow during the sealing process, leaks that are under water during injection will simply not get sealed. Another key issue is that the Aeroseal process generally does not

seal a duct system to be airtight, which means that if the ducts become surrounded by standing water after sealing, it will slowly leak into the ducts. It will of course leak in more slowly than before, but leak in nonetheless. The third problem is that the sealant material is not designed to sit in standing water for extended periods.

There is only one foolproof solution to the problem of injection through standing water, and that is to simply not do it. In regions with wet and dry seasons (e.g. California) the key is to inject near the end of the dry season. However to solve the problems associated with the water coming back during the wet season, the source of the water problem needs to be removed, for example by directing the roof drains away from the house, and/or adding drainage around the perimeter of the house.

The fact that Aeroseal generally does not create an airtight duct system can be addressed by providing pressure/flow relief at the far end of the duct system at the end of the sealing process. By relieving the pressure, the fan can continue to move air and sealant particles through the duct system, even when the ducts themselves are very tight.

Houses with Ozone Generators

Stationary or portable ozone generators have sometimes been used by homeowners to "reduce odors" or "freshen the air". Unfortunately, ozone is a very strong oxidant, and eats away at many polymers, including adhesives such as those found in carpets and in the sealant material used by Aeroseal. Oxidation by ozone can in fact create smells in a house that can be very difficult to get rid of, including a smell of Aeroseal sealant material similar to that experienced during the application process. AEROSEAL DOES NOT RECOMMEND UTILIZING THE AEROSEAL PROCESS IN HOMES THAT EMPLOY OZONE GENERATORS. If a homeowner believes that utilizing an ozone generator is improving the environment inside their home, Aeroseal suggests that the Dealer direct the homeowner to the US EPA website that addresses indoor ozone generators:

<http://www.epa.gov/iaq/pubs/ozonegen.html>

Homes with Special Registers and Grilles

Toe-Kick Grilles: Grilles or registers located in the toe space under cabinets in baths or kitchens can be difficult to block for aerosol injection. In some cases there is no boot between the duct and the grille (i.e. the duct terminates at the bottom of the dead cavity under the cabinet). In other cases the grille cannot be removed due to a new kitchen floor or molding blocking the removal of the grille (see Figure V-22). The following steps should be followed:

- Whenever possible, the grille should be removed and a foam plug installed in the boot.
- If the grille can be removed, but there is no boot, install a plug into the duct where it enters the cavity. In crawlspace houses it is sometimes easier to remove and plug the duct from the crawlspace.

- If the grille cannot be removed, use a flashlight to determine whether there is a boot, and whether the boot is poorly connected to the grille. If there is no boot (or it is poorly connected), assure that the bottom of the cabinet above is airtight. In all cases, seal the grille with plastic-film or foil duct tape, and be sure to monitor that grille throughout the injection process.



Figure V-22: Toe-Kick register blocked by a newly installed carpet.

Built-In Grilles: In higher-end homes, grilles are sometimes built into wooden cabinetry or hardwood floors (see Figure V-23). These grilles sometimes require some ingenuity for sealing, including the possibility of cutting small individual blocks (see Figure V-52) Grilles that are built into hardwood floors can often be taped and then covered with some magazines to stop the tape from being lifted up by the pressure in the ducts near the end of the sealing process.



Figure V-23: Grille cut incorporated into built-in furniture. Always determine whether sealant injected behind such a grille can enter the furniture or other inappropriate locations.



Figure V-24: Temporary sealing of a recently painted high-end return grille.

Slot Grilles: Some homes contain slot diffusers similar to those found in commercial buildings. These grilles can usually be taped with foil or plastic-film duct tape. As with any other grille, extreme caution must be exercised when using tape if the grille is painted.

Ducts with Dampers

Supply ducts sometimes contain dampers, either manual or motorized. These dampers need to be addressed when injecting aerosolized sealant into the duct system. In the case of **Manual Dampers** (see Figure V-25), the procedure is a straightforward three-step process:

1. Mark the existing position of each damper (Note that the angle of central shaft is the key, as the handle can have some play).
2. Open the damper fully for the injection process.
3. Put the dampers back to their original positions at the end of the sealing process.

Note: Dampers are usually located near the plenum, however that is not always the case. The entire duct system should be checked

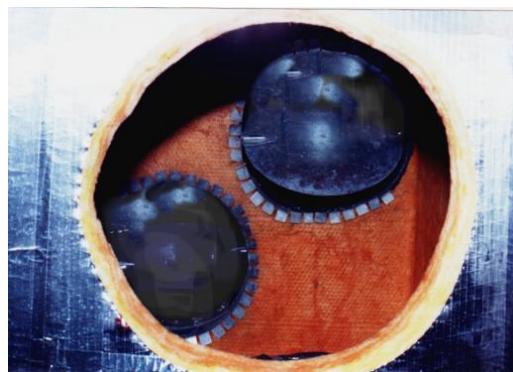


Figure V-25: Manual Dampers reduce airflow and sealant flow, and must be fully opened during aerosol injection.

In the case of **Motorized Zone Dampers**, it is best not to inject aerosol sealant directly through them. Aeroseal has run experiments with several brands of electric dampers, and found them to be functional after sealant was blown through them (**in the completely open position**) for typical sealing time periods. However, testing has not been performed to determine whether sealant deposited at the shafts increases the torque on the motor enough to impact its lifetime.

In general, motorized zone dampers are usually located in accessible positions close to the HVAC equipment, and are **sometimes** easily removable. **The best solution is to remove the dampers temporarily when possible.** Alternatively, particularly when there are only two or three dampers located close to the HVAC equipment, injection can be performed downstream of the dampers, causing much less of a chance that heavy deposition will occur.



6. APPENDIX

A) SDS for DUCT SEAL



Safety Data Sheet

Rev date: May 25, 2015

DUCT SEAL

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

Product Identifier

Product Form: Mixture

Product Name: DUCT SEAL

Intended Use of the Product

Sealing HVAC ductwork leaks on

Emergency Telephone Number

Emergency Number: 937-428-3300

SECTION 2: HAZARDS IDENTIFICATION

Emergency Overview

Appearance: Milky white solution

Physical state: Liquid

This product is a stable dispersion of very small polymer particles in water, surfactants, hydrocolloid stabilizers, and

minor amounts of inorganic salts.

Potential Health Effects

Inhalation

May cause irritation to respiratory tract

Skin Contact

May cause slight skin irritation

Eye Contact

May cause slight eye irritation

Ingestion

Unknown – Safe handling and hygiene practices are recommended to avoid ingestion

Aggravated or Medical Condition

Pre-existing disorders of the following organs (or organ systems) may be

aggravated by exposure to this material – skin, upper respiratory tract, lung (for

example, asthma-like conditions)

Symptoms

Signs and symptoms of exposure to this material through breathing, swallowing,

and/or prolonged contact of the materia through the skin may include: stomach

or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways),

lung irritation, central nervous system depression (dizziness, drowsiness,

weakness, fatigue, nausea, headache, unconsciousness), difficulty in breathing,

lung edema (fluid buildup in the lung tissue)



SECTION 3: COMPOSITION

Name

CAS No.

Trade Secret

35% max

~0.01%

<0.0053% (after application – when dried)

SECTION 4: FIRST AID MEASURES

General

Never give anything by mouth to an unconscious person. If you feel discomfort, seek medical advice (show the label where possible).

Not expected to present a significant inhalation hazard under anticipated condition of normal use. When symptoms occur, move exposed person to fresh air at once. Administer artificial respiration if breathing has stopped. Keep airway open. Call for medical attention.

Not expected to require first aid measures. Immediately flush contaminated skin with water and wash with soap and water.

Immediately flush with water for at least 15 minutes with eyelids apart to ensure irrigation of eye and lid tissues. Remove contact lenses, if present. Get medical help if redness, pain, or irritation persists.

Rinse mouth. Small ingested amounts are not expected to produce adverse health effects.

Amounts larger than 1 fl. oz. should be recovered from stomach by aspiration. Immediately call a POISON CENTER or doctor/physician.

Inhalation

When symptoms occur, move exposed person to fresh air at once. Administer artificial

respiration if breathing has stopped. Keep airway open.

Call for medical attention.

Skin Contact

Not expected to require first aid measures. Immediately flush contaminated skin with water and wash with soap and water.

Eye Contact

Immediately flush with water for at least 15 minutes with eyelids apart to ensure irrigation of

Ingestion

eye and lid tissues. Remove contact lenses, if present. Get medical help if redness, pain, or

SECTION 5: FIREFIGHTING MEASURES

Fire Hazard

Product is not flammable

Explosion Hazard

Product is not explosive

Extinguishing Media

Use extinguishing media appropriate for surrounding fire or dry chemical, Carbon-dioxide (CO₂). Exercise same caution as when fighting any chemical fire. Do not enter fire area without proper protection gear, including eye and respiratory protection.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Unusual Hazards

When polymer burns, water, carbon-dioxide, carbon monoxide, and smoke are produced. Pyrolysis products may include such materials such as acetic acid, acrolein, and acetaldehyde.

SECTION 7: HANDLING AND STORAGE

Precaution for Safe Handling

Handle in accordance with good industrial hygiene and safety procedures. Wash hands and

Personal Protection Equipment

other exposed areas with mild soap and water before eating, drinking, or smoking and again

Conditions for Safe Storage, Including Any Incompatibilities

when leaving work. Do not eat, drink or smoke when using this product. Wash hands and forearms thoroughly after handling.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Exposure Controls

Store away from heat and strong oxidizing agents and acids. Use in well-ventilated areas only.

Ventilation

Ventilation is always recommended to maintain the vapor concentration below the PEL (110 ppm Vinyl acetate)

Personal Protective Equipment

Use NIOSH/MSHA approved filter or respirator where vapor or mist is generated

Respiratory Protection

Wear safety glasses with side shields or chemical goggles, if splash may occur

Eye Protection

Chemically resistant gloves to minimize skin contact

Protective Gloves



DuctSeal

DUCT SEAL Rev date: May 25, 2015

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Chemical and Physical Properties

Physical State	Liquid
Appearance	Milky white
Color	Sweet
Odor Threshold	Not available
pH	3.8-4.2
Relative Evaporation Rate	Not available
Melting Point	<0°C (32°F)
Freezing Point	-100°C (122°F)
Boiling Point	Does not flash below boiling point
Flash Point	Not available
Auto-Ignition Temperature	Decomposition Temperature
Flammable/Solid/gas	Not available
Lower Flammable Limit	Not available
Upper Flammable Limit	Not available
Vapor Pressure	17.54 mm Hg @ 20°C (68°F)
Relative Vapor Density at 20°C	Not available
Relative Density	0.95-1.05 @ 25°C (77°F)
Density	8.2-8.8 lb/gal
Specific Gravity	Not available
Solubility	Water-soluble 20°C (68°F)
Low Pow	Not available
Low Kow	Not available
Viscosity, Kinematic	Not available
Viscosity, Dynamic	>1 @ 20°C (68°F)
Explosion Data – Sensitivity to Mechanical Impact	Not available
Explosion Data – Sensitivity to Static Discharge	Not available

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability	Product is stable.
Condition(s) to Avoid	Cogulation may occur following freezing, thawing, or boiling. Avoid direct sunlight or extreme hot or cold conditions.
Incompatible Materials	Strong oxidizers, bases, alkali materials such as sodium or metal hydrides.
Hazardous Reactions	Product will not undergo hazardous polymerization.
Hazardous Decomposition Products	When polymer burns, water, carbon dioxide, carbon monoxide, and smoke are produced. Pyrolysis products may include acetic acid and irritating toxic fumes.

DUCT SEAL Rev date: May 25, 2015

SECTION 11: TOXICOLOGICAL INFORMATION

Product: Duct Seal
Acute Toxicity
LD50 and LC50 Data
Skin Corrosion/Irritation
pH
Sensitive Eye Damage/Irritation
Respiratory or Skin Sensitization
Germ Cell Mutagenicity
Teratogenicity
Carcinogenicity
Specific Target Organ Toxicity (Repeated Exposure)
Aspiration Hazard
Symptoms/Injuries After Inhalation
Symptoms/Injuries After Skin Contact
Symptoms/Injuries After Eye Contact
Symptoms/Injuries After Ingestion

Ingredient: Vinyl Acetate Monomer (108-05-4)

LD50 Oral Rat	2920 mg/kg
LD50 Dermal Rat	2320 mg/kg
LC50 Inhalation Rat	11410 mg/m ³ (Exposure time: 4h)
ATE (derm, mist)	1.5 mg/l/4hr

SECTION 12: ECOLOGICAL INFORMATION

Product: Duct Seal
Toxicity
Mobility in soil
No data available

Ingredient: Vinyl Acetate Monomer (108-05-4)

LC50 Fish1	14mg/l (Exposure time: 96h- Species: Gammarus pulex [static])
LC50 Fish2	15.04-21.54 mg/l (Exposure time: 96h- Species: Lepeophtheirus salmonis [static])

Other Information: Avoid release to environment.

SECTION 13: DISPOSAL CONSIDERATION
Dispose of waste material in accordance with all local, regional, national, provincial, territorial, and international regulations.

In Accordance with D.O.T.	Not Regulated
In Accordance with IMDG	Not Regulated
In Accordance with IATA	Not Regulated
In Accordance with TDG	Not Regulated
Unit Container	1 Gallon

DuctSeal

Rev date: May 25, 2015

DUCT SEAL

SECTION 15: REGULATORY INFORMATION

HMIS Hazard Rating		NFPA Fire Diamond	
Health	1	Health	1
Flammability	0	Flammability	0
Physical Hazard	0	Instability/Ractivity	0
Personal Protection	E (Safety glasses, gloves, mask)	Special Notice	N/A

HMIS Legend:

C: Minimal Hazard	0: No Hazard
1: Slight	1: Slight
2: Moderate	2: Moderate
3: Serious	3: Serious
4: Severe	4: Severe
Refer to HMIS III by ACGI for exact definition	

U.S. Federal Regulations

Product Duct Seal

California Proposition 65

This product does not contain any chemicals known to the State of California

to cause cancer, birth defects, or other reproductive harm.

Ingredient: Vinyl Acetate Monomer [108-05-4]

Listed on the United States TSCA inventory

Listed on SARA Section 302

Listed on SARA Section 313

SARA Section 302 - Threshold Planning Quantity (TPQ): 1,000

SARA Section 313 - Emission Reporting: 0.1%

Notification status

United States TSCA List	Y (Positive listing)
Canada, Canadian Environmental Protection Act Domestic Substances List (DSL) (Can. Gaz. Part II, Vol. 1,33)	Y (Positive listing)
Australia Industrial Chemical (Notification and Assessment) Act	N (Negative listing)
Japan, Kasdin-Hou Law List	N (Negative listing)
Korea, Toxic Chemical Control Law (TCC) list	N (Negative listing)
Philippines, The Toxic Substances and Hazardous and Nuclear-Waste Control Act	N (Negative listing)
China, Inventory of Existing Chemical Substances	N (Negative listing)

SECTION 16: OTHER INFORMATION

Document Prepared by: Aeroseal LLC (Tel: 1-877-349-3888)

This document has been prepared in accordance with SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 (g). The information provided herein is based on our current knowledge and is intended to describe the product for the purpose of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. The information relates only to the specific material designated and may not be valid for such material used in combination with other materials or in processes, unless specified in the text.

No warranties of any kind, either expressed or implied are made regarding products described or information set forth, or that the products design, data or information may be used without infringing the intellectual property rights of others.

Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

This document is available for download at: www.aeroseal.com/sds

B) SDS for Cleaner: Buckeye Workout

Safety Data Sheet		BE-5007 - Buckeye Workout	Revision Date: 19-Aug-2014																					
1. IDENTIFICATION <hr/> <p>Product Identifier Product Name: Buckeye Workout</p> <p>Other means of identification SDS #: BE-5007</p> <p>Product Code 5007</p> <p>Recommended use or uses and restrictions on use Spray and Wipe Ready-to-Use Cleaner, Water Based.</p> <p>Recommended Use</p> <p>Details of the supplier of the safety data sheet</p> <p>Supplier Address Buckeye International, Inc. 2700 Wagner Place Maryland Heights, MO 63043 USA</p> <p>Emergency Telephone Number Company Phone Number 1-861-632-8956 (International) 1-800-303-0441 (North America) INFOTRAC 1-822-323-3500 (International) 1-800-635-5053 (North America)</p>																								
2. HAZARDS IDENTIFICATION <hr/> <p>Appearance: Lime green solution</p> <p>Physical State: Liquid</p> <p>Odor: Floral</p> <p>Classification:</p> <p>This chemical does not meet the hazardous criteria set forth by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). However, this Safety Data Sheet (SDS) contains valuable information critical to the safe handling and proper use of this product. This SDS should be retained and available for employees and other users of this product.</p>																								
3. COMPOSITION/INFORMATION ON INGREDIENTS <hr/> <table border="1"> <thead> <tr> <th>Chemical Name</th> <th>CAS No</th> <th>Weight-%</th> </tr> </thead> <tbody> <tr> <td>Water</td> <td>77-03-9</td> <td>>91</td> </tr> <tr> <td>Propylene Glycol Phenyl Ether</td> <td>770-33-4</td> <td><5</td> </tr> <tr> <td>Allylbenzenesulfonic Acid</td> <td>88884-22-5</td> <td><2</td> </tr> <tr> <td>Monothiobutanamine</td> <td>141-43-5</td> <td><1</td> </tr> <tr> <td>EDTA</td> <td>60-00-4</td> <td><1</td> </tr> <tr> <td>Sodium Nitroide</td> <td>1310-73-2</td> <td><1</td> </tr> </tbody> </table> <p>*If Chemical Name/CAS No is "proprietary" and/or Weight-% is listed as a range, the specific chemical identity and/or percentage of composition has been withheld as a trade secret**</p>				Chemical Name	CAS No	Weight-%	Water	77-03-9	>91	Propylene Glycol Phenyl Ether	770-33-4	<5	Allylbenzenesulfonic Acid	88884-22-5	<2	Monothiobutanamine	141-43-5	<1	EDTA	60-00-4	<1	Sodium Nitroide	1310-73-2	<1
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Cleaner: Workout

BE-5007 - Buckeye Workout		Revision Date: 19-Aug-2014	Revision Date: 19-Aug-2014								
7. HANDLING AND STORAGE											
Precautions for safe handling											
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Use personal protection recommended in Section 8.											
Advice on Safe Handling											
Conditions for safe storage, including any incompatibilities											
Keep container tightly closed and store in a cool, dry and well-ventilated place. Keep container closed when not in use. Store at room temperature.											
Incompatible Materials											
Chlorine bleach. May damage some plastics.											
8. EXPOSURE CONTROLS/PERSONAL PROTECTION											
Exposure Guidelines:											
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Appropriate engineering controls											
Engineering Controls											
Ensure adequate ventilation, especially in confined areas. Eyewash stations. Showers.											
Individual protection measures, such as personal protective equipment											
Eye/Face Protection											
Risk of contact: Wear approved safety goggles.											
Skin and Body Protection											
Rubber gloves. Suitable protective clothing.											
Respiratory Protection											
Ensure adequate ventilation, especially in confined areas.											
General Hygiene Considerations											
Handle in accordance with good industrial hygiene and safety practice.											
9. PHYSICAL AND CHEMICAL PROPERTIES											
Information on basic physical and chemical properties											
Physical State											
Appearance											
Color											
Liquid Lime green solution Lime green											
Odor Threshold											
Floral Not determined											
10. STABILITY AND REACTIVITY											
Reactivity											
Not reactive under normal conditions.											
Chemical Stability											
Stable under recommended storage conditions.											
Possibility of Hazardous Reactions											
None under normal processing.											
Hazardous Polymerization											
Hazardous polymerization does not occur.											
Conditions to Avoid											
Keep separated from incompatible substances. Keep out of reach of children.											
Incompatible Materials											
Chlorine bleach. May damage some plastics.											
Hazardous Decomposition Products											
Carbon oxides Nitrogen oxides (NO _x). Sulfur oxides.											
11. TOXICOLOGICAL INFORMATION											
Information on likely routes of exposure											
Product Information											
Eye Contact											
Avoid contact with eyes.											
Skin Contact											
Avoid contact with skin.											
Inhalation											
Avoid breathing vapors or mists.											
Ingestion											
Do not ingest.											

Cleaner: Workout

BE-5007 - Buckeye Workout		Revision Date: 19-Aug-2014																														
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Component Information																																
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Information on physical, chemical and toxicological effects																																
<p>Symptoms Please see section 4 of this SDS for symptoms.</p> <p>Delayed and immediate effects as well as chronic effects from short and long-term exposure</p> <p>Carcinogenicity This product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC or NTP.</p>																																
12. ECOLOGICAL INFORMATION																																
<p>Ecoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.</p>																																
13. DISPOSAL CONSIDERATIONS																																
<p>Waste Treatment Methods Disposal should be in accordance with applicable regional, national and local laws and regulations.</p> <p>Disposal of Wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.</p> <p>Contaminated Packaging Disposal should be in accordance with applicable regional, national and local laws and regulations.</p>																																
14. TRANSPORT INFORMATION																																
<p>Note Please see current shipping paper for most up to date shipping information, including exemptions and special circumstances.</p> <p>DOT Not regulated</p> <p>IATA Not regulated</p> <p>IMO Not regulated</p>																																
15. REGULATORY INFORMATION																																
<p>International Inventories</p> <p>TSCA Legend: TSCA - United States Toxic Substances Control Act Section 8(b) Inventory</p> <p>US Federal Regulations</p> <p>SERCIA</p> <table border="1"> <thead> <tr> <th>Chemical Name</th> <th>Fish</th> <th>Toxicity to microorganisms</th> <th>Crustacea</th> <th>Hazardous Substances RQs</th> <th>CERCLA/SARA RQ</th> <th>Reportable Quantity (RQ)</th> </tr> </thead> <tbody> <tr> <td>Alkylbenzenesulfonic Acid 6554-22-5</td> <td>3.96 h Oncorhynchus mykiss mg/L EC50 static 15.72 h Desmoderminus subsppatus mg/L EC50 static 141-43-5</td> <td>LC50 1000 mg/L 96 h Brachydanio rerio mg/L LC50 1000 mg/L 96 h Leprinus macrochir 1000 mg/L LC50 static 114-196 h Oncorhynchus mykiss mg/L LC50 static 200-36 h Oncorhynchus mykiss mg/L LC50 static 200-36 h</td> <td>2.9-48 h Daphnia magna 65-48 h Daphnia magna mg/L EC50</td> <td>5000 lb</td> <td>5000 lb</td> <td>RC 5000 lb final RQ RC 2270 kg final RQ RC 1000 lb final RQ RC 154 kg final RQ</td> </tr> <tr> <td>EDTA 60-00-4</td> <td>1.01-72 h Drosophila melanogaster suspiciens mg/L LC50 static 50-00-4</td> <td>LC50 1000 mg/L 96 h Pimephales promelas mg/L LC50 static 45-4-96 h Oncorhynchus mykiss mg/L LC50 static</td> <td>113-48 h Daphnia magna mg/L EC50 static</td> <td>1000 lb</td> <td>1000 lb</td> <td></td> </tr> <tr> <td>Sodium hydroxide 1310-73-2</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td> </tr> </tbody> </table> <p>Persistence/Degradability Not determined.</p> <p>Bioaccumulation Not determined.</p> <p>SARA 313 Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title IV of the Code of Federal Regulations, Part 372</p>			Chemical Name	Fish	Toxicity to microorganisms	Crustacea	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)	Alkylbenzenesulfonic Acid 6554-22-5	3.96 h Oncorhynchus mykiss mg/L EC50 static 15.72 h Desmoderminus subsppatus mg/L EC50 static 141-43-5	LC50 1000 mg/L 96 h Brachydanio rerio mg/L LC50 1000 mg/L 96 h Leprinus macrochir 1000 mg/L LC50 static 114-196 h Oncorhynchus mykiss mg/L LC50 static 200-36 h Oncorhynchus mykiss mg/L LC50 static 200-36 h	2.9-48 h Daphnia magna 65-48 h Daphnia magna mg/L EC50	5000 lb	5000 lb	RC 5000 lb final RQ RC 2270 kg final RQ RC 1000 lb final RQ RC 154 kg final RQ	EDTA 60-00-4	1.01-72 h Drosophila melanogaster suspiciens mg/L LC50 static 50-00-4	LC50 1000 mg/L 96 h Pimephales promelas mg/L LC50 static 45-4-96 h Oncorhynchus mykiss mg/L LC50 static	113-48 h Daphnia magna mg/L EC50 static	1000 lb	1000 lb		Sodium hydroxide 1310-73-2	-	-	-	-	-			
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Cleaner: Workout

BE-5007 - Buckeye Workout	Revision Date: 19-Aug-2014			
CWA (Clean Water Act)				
Component	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
EDTA 60-00-4 (<1) Sodium hydroxide 1310-73-2 (<1)	5000lb 1000lb			X X

U.S. State Regulations**California Proposition 65**

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Monoethanolamine 141-43-5	X	X	X
EDTA 60-00-4	X	X	X
Sodium hydroxide 1310-73-2	X	X	X

16. OTHER INFORMATION

NFPA	Health Hazards	Flammability	Instability	Special Hazards
HMs	1 Not determined	0 Not determined	0 Not determined	Not determined Not determined Not determined

Issue Date:

27-Dec-2011
19-Aug-2014
New format

Revision Date:

27-Dec-2011

19-Aug-2014

New format

Revision Note:

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

C) *Protocol for sealing Basement systems*

1. Set up the main Aeroseal equipment in the basement, locate hvac system and determine injection points. Make sure that you protect HVAC equipment & coils by putting appropriate foam blocks (usually at the plenum).
2. Find all and any Supply and Return vents (registers) in the house and block them with properly sized foam plugs. Each plug needs to be dimensioned so that it is $\frac{1}{2}$ " longer in length and width than the sheet metal duct opening. For large homes, you may choose to work on the supply and return sections and stagger / overlap the prep-work and sealing process.
 - a. Finished basements typically have venting that need to be blocked or plugged. They may have recessed lighting and bath fans which need to be taped over with duct mask to avoid possible fogging and hazing that can occur during the sealing process.
 - b. Unfinished basements could also have Supply and Return venting as well that will need to be blocked and or plugged.
3. Once setup is complete, manually ramp up the fan and check not only the basement but the entire home for ANY missed boots or vents for plugging. At the same time, check the duct work for any major issues that need fixed prior to Aerosealing. Then go ahead and complete your pretest with the Aeroseal system. After your pretest is complete go ahead and take care of all if any issues you have with the duct system that Aeroseal won't be able to seal (breaks in ductwork/ hole size over 5/8 inch).
4. Before you start sealing the duct system, make sure you have the scrubber fans available to use in the house. To be on the safe side, assume that there will be an overspray (fogging and hazing effect) during the sealing process - which will need to be contained and or controlled. If you encounter fogging and you don't do anything to scrub the air, this may result in the glue settling down on furniture, carpets and will cause mostly everything to become tacky or sticky. Therefore:
 - a. Set up a scrubber fan in or near the area you are injecting at. Make sure you use MERV 14 or better filters so they can catch the small overspray particles.
 - b. Connect a 25 ft. piece of layflat tubing or 12" flex duct to the scrubber using appropriate clamp. Route the layflat/ flex duct to vent air outside through a door or window.
 - c. Open doors and windows in the basement. You can also use some supplemental box fans to help push the fogging /hazing out of the window or door.
 - d. If you're sealing in a finished basement you can possibly seal off the actual equipment room where your injection is. You can accomplish this by taping plastic over the doorway into that room and letting your lay flat to go through it. This will help contain the overspray (fogging/ hazing) in the equipment room.
 - e. When you turn ON the scrubber, the basement will be at a negative pressure and will help contain most of the fogging/hazing in the house.
 - f. Make sure that scrubber or circulating fan does NOT blow directly at the Aeroseal equipment which contains sensitive pressure measuring ports.

- g. If you're sealing an unfinished basement fogging/hazing can be relatively difficult to contain and control recommendations are :
 1. Make sure you have several plastic sheeting and or drop cloths to cover things in the basement.
 2. Open any and all doors, windows, set up box fans to keep air moving. Set up the scrubber with flex attached at the location that has a high probability of fogging/hazing and feed flex out a window or door.
5. Continuously keep a look out for possible fogging during the sealing process. Do a smell test in the entire house to make sure that no plugs were missed. Periodically monitor the house for blown plugs. As sealing progresses, the duct pressure rises and foam plugs that are not installed properly may come loose and cause overspray condition. The technician may need to pause the system (stops the sealant injection) so that the fogging/hazing can be cleared out by the scrubbers.
6. Once you are finished with the seal and you have completed the posttest test, remove the blocks, clean up, load up and leave the area as it was when you got there. Remember to turn ON the HVAC system as you clean up and close all outside doors and windows before you leave.

D) *Protocol for sealing to very tight leakages (Low seal protocol)*

Low level leakage protocols are designed to prevent sealant back flow into your machine which may cause sealant to coat the internal components of your equipment. Sealant deposition on the heater coils may cause a smoke/ odor issue when using the machine in a home owner's place. Deposition on the fan blades will cause it to jam up, unbalanced rotor and result in accelerated failure. It is possible to seal duct work down to extremely low levels and keep your equipment relatively clean by following below protocol.

Standard Aeroseal procedures call for an end to sealing once the majority of leaks have been sealed. This is achieved when the duct pressure has increased beyond desired 'safe' levels (generally 600Pa for flex duct and sheet metal and 400Pa for ductboard) or if the air flow has reduced below 150 CFM (71L/s).

This can also be seen by the sealing graph reaching a point where it is no longer decreasing but has gone flat. If the graph has gone flat it may not be possible to seal any lower due to the size of the holes being sealed. The largest possible opening that can be sealed efficiently is 5/8th of an inch. Often times, the duct has been sealed to a desirable level by this point, but in certain circumstances additional sealing may be necessary to achieve specifications or standards. The following protocol should be followed when getting to a very low leakage level is necessary:

- a) Follow all the normal steps and procedures for sealing; that is blocking all registers/diffusers as well as blocking/isolating any of the HVAC equipment prior to sealing.
- b) Run pre-seal test and begin sealing just as you normally would. During sealing if you see the chart flat lining or if the Estimated leakage area (ELA) has reached $<4.65 \text{ in}^2 (\sim 30 \text{ cm}^2)$ then start the low seal protocol. This leakage level equates to 25CFM (12L/s) @ 25Pa. Note that the threshold leakage # changes with the set operating pressure and it will be convenient to use the ELA # displayed on the sealing screen.
- c) First step of the low seal protocol is to manually open the plug in the ductwork that is furthest downstream from the Aeroseal injection point. Typically a 10" x 4" register (40in^2 or 260 cm^2) will help generate enough flow. You can use a smaller size of vent, but this may slow down the overall process.
- d) Attach lay-flat tubing to the opening in the ductwork and exhaust it outside of the building. This will minimize the risk of excessive overspray and difficult clean-up. Another alternative is to run the exhaust into a HEPA scrubber that will capture the excess overspray
- e) Once the furthest plug has been removed and vented outside, continue sealing. At this point the duct pressure will significantly decrease and leakage levels will increase due to the artificial leakage applied to the duct system. A 'blown seal' error is likely to pop up. Go ahead and acknowledge the error and continue sealing as the error has been caused by opening the plug. Also at this point the sealing graph will show a steep increase. Again this is expected as a plug in the

ductwork has been opened and ‘leakage’ has increased accordingly. At this point make note of the difference in hole size and cfm increase. The increased value amount will give you the number to try to achieve to seal down to be a zero leakage. Continue to seal and you will see the graph again decreasing but note that the leakage values at this time are not an accurate depiction of actual duct leakage due to the artificial vent leakage. By opening the furthest plug, the aerosol is again able to flow and seal smaller leaks that were not sealed initially.

- f) It is important that you visually monitor for backflow in the layflat during sealing. If you see white overspray slowly backing into the fanbox, click the ‘Pause’ button to stop sealant spray into ductwork. Keep the fan running till layflat has cleared up and then press the ‘start’ button to re-start the injection process. Keep doing this till you have reached your target leakage level. By periodically cycling the pump, you are avoiding injecting excess glue into the ductwork that is already filled with aerosol.
- g) Continue sealing until the graph has flat-lined or you have reached a target CFM. Stop the sealing process and proceed to flush. While flushing the Aeroseal system, go and replace the plug in the furthest opening that was removed. At this point, you should see the graph significantly decrease and you can move on to the post-seal test. Now run the post-seal test per normal procedure. The fan box gate will likely need to be “choked” down to setting ‘3’ or ‘4’ to increase the negative fan box pressure to finish the post-seal test.

If your duct system has multiple trunk lines, then you will have to repeat the above venting process by unblocking a register in each trunk section. The basic idea is to create sufficient air flow through the ductwork so that sealant can get to all of the leaks. The bigger the size of the vent, lower will be your deposition.

The job is now complete and ready to be presented to the homeowner. Explain this process to the homeowner and explain the sharp spikes/declines in the graph as the points where the plug was removed and reinserted. The true numbers the homeowner should worry about at this point are the initial pre-seal leakage test number and the final post-seal leakage test number. These are both evident on the final certificate.

E) Protocol for sealing very leaky return ductwork (Panned returns, building cavities)

Sealing return sides of HVAC equipment is important as it is related to IAQ and comfort benefits to the home owner. When you encounter building cavity returns, set realistic expectations. Achieving 5-20% system leakage is common, but actual results are determined by construction quality.

Sealing of Return air ducts can be a challenge due to wide range of construction practices prevalent all over the country. The issues can be caused by –

- a) Panned return: In this case the return is ducted out with panning. This is where they run a duct and utilize the floor joist and wall cavities to get air from inside the home back to the system.
- b) Shared Utilities: Many a times, you will find that a plumber, at time of building the home, might have decided to run piping through the joists of the floor which is also being used by the electrician and heating/ cooling contractors.

The above issues and possible big breaks prevents a minimum of 10 Pa pressure from being built up inside the duct work so that sealing can commence. Also increases the chance of overspray. This write up suggests a protocol to seal these types of returns.

- For unfinished ceilings, please do a visual inspection so you get a better idea of the connections and also monitor them during the process. Usually all panning and wall cavity type ducting will start from a main duct header that is run from the Heating /Cooling return air side plenum. This duct will have appropriate cutouts to enable a connection to the section of floor joist or wall cavity. Contractors can do this by panning of sheet metal, thermo-panning, or perhaps even duct board.
- For finished ceilings, use a combination of Cameras, lighting, and airflow to inspect and monitor while sealing.
- Note - plan to seal the supply and return ductwork separately.

A. Complete a Pre-seal test as you normally would.

- a. You may have to Turn fan box to 100% and use Gate 1 for very leaky ductwork
 - b. If you measure a high leakage number (>400CFM), then this may be your first hint of a very leaky duct work. Manually ramp up the fan to 100% and ensure you are on Gate 1. Check for major leaks (Visual, cobwebs, listen for major leaks) and repair big holes manually.
 - c. If the 'Current duct Pressure' is < 10 Pa even when fan is at 100% and the Gate is at #1 position, then you will not be able to commence sealing.
 - d. Also Mobilize all your scrubbers and box fans and keep ready for use during sealing.
- B. If you can generate at least 10Pa duct pressure (the minimum needed inject glue), then follow the usual sealing procedure but keep a cautious watch for overspray and use scrubbers liberally. You may want to start sealing from Gate # 1 position.
- C. If you cannot develop 10Pa minimum pressure, then you may need to -
- a. Assure top of panning/ joist is intact
 - b. Check headers

- c. Zone (isolate) system, where required, seal portions at a time. You can Zone at the injection point (Left/ right ductwork) or at branches (for each floor) or at the grilles (if there is no Air movement).
 - i. Pressurize the main duct.
 - ii. Start by sealing the main trunk line duct. Once it has been sealed remove the blocks in place one by one and seal each section incrementally.
 - iii. If you remove a block and your pressure drops drastically then put the block back in and try a different section, this will also tell you that there is a specific issue with that section of panning that will need to be addressed by a mechanical fix.
- D. As a last step do the post seal test with all blocks removed. Please note that the graph on the certificate will show sudden jumps – representing the fact that you removed the blocks. However the summary on the left side with pre and Post seal readings will be accurate.

Tips-

- Always remember to inspect as much of the duct system as possible prior to the seal as this will allow you to determine best locations to zone off/ sectionalize.
- Do recognize that for large size leaks (>5/8" size), you may be required to do some manual repairs.
- Be prepared with scrubbers for overspray control.

F) Protocol for Sealing a Duct System through Supply and Return Boots

We all know that there are times when it is difficult to find sufficient space on the plenum to mount a 12 or 14 inch flange collar along with 36 inch layflat connection as an injection point. Space constraints become more acute when this is an attic system or crawl space system or could be ones which are tight to the ceiling without much clearance. This write up is to share a few alternate ways to set up the injection point that will enable you to seal through the boots of the supply and return ductwork:

1. Reverse boot –you need the same size boot as the register boot you plan to use as an injection point. Attach the new boot to the boot in the floor or ceiling and connect your layflat to the boot.
2. * Note- you must seal both boots together with tape and/or screws.
3. Pipe through Block - Cut a block big enough to fit into boot (injection point). Remember this should be sized $\frac{1}{2}$ " larger than the boot size. Take a piece of pipe used for ducting and put it into the block (after you cut out a suitable hole). Insert this assembly (block with pipe) into the boot register.
* Note- the piece of pipe should be at least 24 inches long to attach to your 36" layflat properly.
4. Modified injection flange - Make suitable fittings that can be installed to the size of boots you are trying to seal through. This should also be about 24
5. Inches long and be able to cut in a 8 to 10 inch hole to either mount a flange collar or a collar or a 90 to so layflat can be attached.

Steps

- 1) Complete all blocking and isolation of the system per normal procedure.
- 2) Preferably Use a Wye which will allow you to send spray through 2 boots simultaneously. This arrangement will look similar to the one when you seal supply and return ductwork at the same time.
- 3) During sealing, closely monitor for leaks at the custom injection points and adjust accordingly.
- 4) Slow down fan speed to reduce turbulence and deposition at the injection point. If a lot of sealant is back drafting into the machine, you should pause the pump and wait till the layflat gets clear of glue.

Sealing through boots can be a time saver if done properly. However we would recommend that you use this procedure only in instances where injection points are tight and inaccessible.

Related tips –

- a) If you are in new construction jobs you would get a lot of fogging and hazing during sealing process. Avoid installing the equipment in the basement which will also help in keeping your machine stay clean.
- b) Expect deposition in the boot area (injection point) as the sealant spray gets funneled through a very small size opening. To minimize this deposition, you can slow down the fan manually. Overall time to seal will increase.

G) Grill Count & Measure worksheet

Grill Count & Measure Worksheet

Customer Name

ANSWER

Prepared by (technician)

ANSWER

H) In Home Survey form

Dealer Logo



In-Home Survey Form

Name			
Address			
City/State/Zip			
Phone			
Email			
Surveyor's Name			
Date of Survey			
Survey Checks	Check Performed?	Notes	
Unit located and inspected for accessibility		Furnace/Air Handler Location Attic system: yes no Outdoor AC/HP Tonnage: _____ Basement: yes no Upflow yes no Downflow yes no Horizontal yes no Other _____	
Located Supply and Return Injection points – Confirmed both points are accessible and acceptable		Injection points will accept: 12" 14" Other _____	
Type of Ductwork notated		Supply Sheet Metal Duct: yes no Flexible Duct: yes no Fiberglass Duct Board: yes no Other: yes no _____ Return Sheet Metal Duct: yes no Flexible Duct: yes no Fiberglass Duct Board: yes no Wall Cavity: yes no Panned Return: yes* no Location: Inside / Outside wall *If yes, has customer been informed that Panned Returns are generally difficult to seal, and do not have as high a success rate as other types of returns. yes no	
Accessories to be removed before sealing		Humidifier: yes no UV-Light: yes no High Efficiency Air Cleaner: yes no Ozone Generator: yes no Other _____	

Is system set-up for Automatic Electronic Dampering		yes* no *If yes, an additional \$25 will be assessed per damper (3 or more). Total # dampers: _____
Located where foam blocks can be inserted in both return and supply to block coil/filter		
Located where machine can be set to perform sealing		
Confirmed that 8ft of lay-flat can be run between the duct and nozzle of sealing machine before any turns or movement in lay-flat tubing		yes no
Customer informed of anything they may need to cover/protect or move, to prevent overspray damage		
All Return Registers counted – Customer informed of anything that may need to be moved to access registers		Sizes: _____ _____ _____
All Supply Registers counted – Customer informed of anything that may need to be moved to access registers		4 x 10 _____ 6 x 10 _____ 4 x 12 _____ 6 x 12 _____ Other _____ _____
Customer informed of what to expect the day of the sealing – Process was explained along with how long it may take		
Customer has been informed of Overspray and Paint/Drywall clause in Contract		
Additional comments: 		
Footprint of Home: _____ x _____		

I) Check List for performing Aeroseal Residential Jobs

(refer to the technical manual for more details if needed)

- 1. Arrive on site for job, Greet homeowner and explain possibility of overspray and safety pre-cautions. [Look out for pets, infants and people with allergies]
- 2. Check for combustion appliances in the house envelope and determine if a CAZ test is required.
- 3. Determine location and size of your injection points.
- 4. Cover computers, sensitive equipment, and expensive furniture (artwork, pianos, etc.).
- 5. Isolate equipment room in basement homes for efficient air scrubbing of overspray.
- 6. Start job site prep and set up – tape off all recess lights, get an accurate list of required blocks

- 7. Ensure all supplies and returns are blocked – make sure all blocks are $\frac{1}{2}$ in. larger than the boots.
- 8. Set up system – measure length of 36 in. lay-flat tubing needed to connect to the duct system, find electrical outlets needed to operate Aeroseal system, 3 separate circuits are required.

- 9. Isolate system – block supply and return from duct system
- 10. Connect the layflat to the injection point on the duct you are going to seal. Insert blue tube mid to far side of the duct system you are sealing for proper pressure reading. If the blue tube is too close to the injection point, you may underestimate leakage rate.

- 11. Complete pre-test to determine leakage.

- 12. Seal duct system – make sure that the sealant bottle is in the unit and that the sealant tube is locked into the pump head. Check the retainer tabs for proper tension.

- 13. During the sealing process, complete safety checks to ensure that there is no serious over spray in the home [Look for missed / blown plugs]. If you encounter these issues, pause the process and take remedial action including use of additional scrubbers.
- 14. When seal is complete flush system – with water
- 15. Complete post seal test – to see improvement, print or E-mail certificate to homeowner.
- 16. Repeat steps 11 thru 14 for the return side duct work sealing (if sealing separately).
- 17. Follow maintenance procedures for wand: Blow out wand – disconnect the air hose from the unit and connect the blowout tool blow out air and sealant side of the wand. Clean Air cooling gap in Nozzle.
- 18. Tear Down: Break down system, remove all blocking, seal around any and all penetrations where boots are going through drywall or flooring and replace registers.
- 19. Make sure to drain air compressor and check oil level.
- 20. Turn on homeowner's HVAC system to confirm operation and good air flow.
- 21. Clean up the job site - make sure you remove your trash.
- 22. Check to make sure all equipment is clean, accounted for, and loaded for next job.

J) Typical Machine Maintenance and Upkeep

1 Fanbox nozzle

Remove any overheated dirty sealant from nozzle of fanbox and clean up with Buckeye cleaner that was provided. If blue duct mask tape is on the nozzle, remove it and clean up the area and allow it to dry. You can also use the same cleaner to clean the inside of fanbox nozzle and the silver grate behind the wand. Following cleaning, use blue duct mask tape to cover the end of the nozzle.

2 Gate cleaning and maintaining

The gate must flow freely open and close. If the gate is stiff moving up and down, it is typically due to sealant overspray. Try some WD-40 on each side of the gate to free it up.

3 Pump head cleaning

This piece of the machine is the most difficult of all to clean. There are several moving parts to check. If you have a hard time turning the pump center screw (large) with a screwdriver, try some WD-40 on it and work it in. It should turn, but will be a bit stiff. Also make sure that the black slide connectors are in proper position. Use a very soft rag to finish up the cleaning.

4 Filter

Filter size is 15½ x 20 x ½. It is a basic fiberglass filter. Major factors determining how often to change the filter include where you set up or how much fogging occurred. Recommend replacing filter at least every 6 seals.

5 Pick-up tube cleaning

After each use, the pick-up tube should be rinsed out thoroughly to ensure proper sealant flow from sealant bottle during operation.

6 General cleaning of fanbox inside and out

Using a wet soapy rag, wipe down the exterior of the fanbox to get as much off as possible. Then spray some of the Buckeye cleaner on it. Wait about a minute or two and wipe off very well. If there is a slight residue, this can be removed with warm soapy water. The inside can be cleaned in the same way.

If you have had a major spill of sealant in the box, wipe it up as soon as you can.

If you have a buildup of sealant on your heaters, please contact tech support and they will walk you through how to get them clean. A visual check of all electrical connections under the lid is something to look at as well, due to vibration from moving the unit from place to place. Make sure the electrical connections are secure and tight.

Check the bulk head connectors for tightness as well. If loose, tighten. These are the blue tube connectors located on the rear of the fanbox lid.

K) Maintenance Charts & frequency for Aeroseal system and Accesories

Main Aeroseal system

TASK	EVERY			
	SEAL	DAILY	MONTHLY	DURATION
CLEAN NOZZLE ASSEMBLY	X	X	X	15 MINS
INSPECT SEALANT CONDITION	X	X	X	1 MIN
DRAIN COMPRESSOR AIR TANKS	X	X	X	2 MINS
INSPECT COMPRESSED AIR FILTERS/FITTINGS	X	X	X	2 MINS
CLEAN/INSPECT PUMP & ROLLERS		X	X	5 MINS
INSPECT/REPLACE FANBOX FILTER		X	X	1 MINS
INSPECT/REPLACE AIR SCRUBBER FILTERS		X	X	3 MINS
CLEAN/INSPECT SEALANT BUILDUP ON INLET GATE			X	3 MINS
CLEAN/INSPECT SEALANT BUILDUP ON TUBE FITTINGS ON LID			X	2 MINS
CLEAN/INSPECT SEALANT BUILDUP ON FANBOX BREAKERS			X	2 MINS
LAPTOP: SMARTSEAL UPLOAD			X	2 MINS
LAPTOP: SMARTSEAL UPDATES			X	2 MINS
LAPTOP: WINDOWS UPDATES			X	10 MINS

AirCompressor

Procedure	Daily	Weekly	Monthly	Annually (200 Hrs.)
Check pump oil level	X			
Oil leak inspection	X			
Drain condensation in air tanks	X			
Check for unusual noise/vibration	X			
Check for air leaks	X			
Inspect belt(s)	X			
Inspect air filter(s). Clean or replace if necessary		X		
Clean exterior of compressor		X		
Check safety relief valve			X	
Check belt adjustment			X	
Check and tighten all bolts			X	
Check air connections and compressor joints for leaks			X	
Change pump and/or engine oil				X

NOTICE

The pump oil must be changed after the first 20 hours of operation. This will remove contaminants contained in the crankcase due to break-in.

L) Nozzle cleaning and maintenance (applicable for HS Connect Systems)

This section covers the protocol for HomeSeal Connect systems that are equipped with Nozzle triangle Assembly. Refer to separate appendix if you have a wand style system.

Proper cleaning and maintenance will greatly reduce the risk of nozzle overheating and is critical for proper sealant droplet formation in the ducts.

Aeroseal recommends that HSC users clean the nozzle after every seal and it is critical that proper cleaning procedures be followed to ensure that there are no obstructions in key components of the injection system.

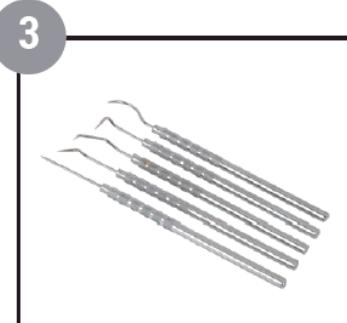
HSC systems feature an innovative and easilyaccessible injection system. The nozzle assembly must be cleaned and maintained properly and with precision in order to avoid overheating. ANY build-up, debris, or other contamination that can settle into the gap between the OD of the insert tube and ID of the nozzle tip WILL restrict airflow. Proper airflow is critical to maintaining nozzle heater temperature and droplet formation.

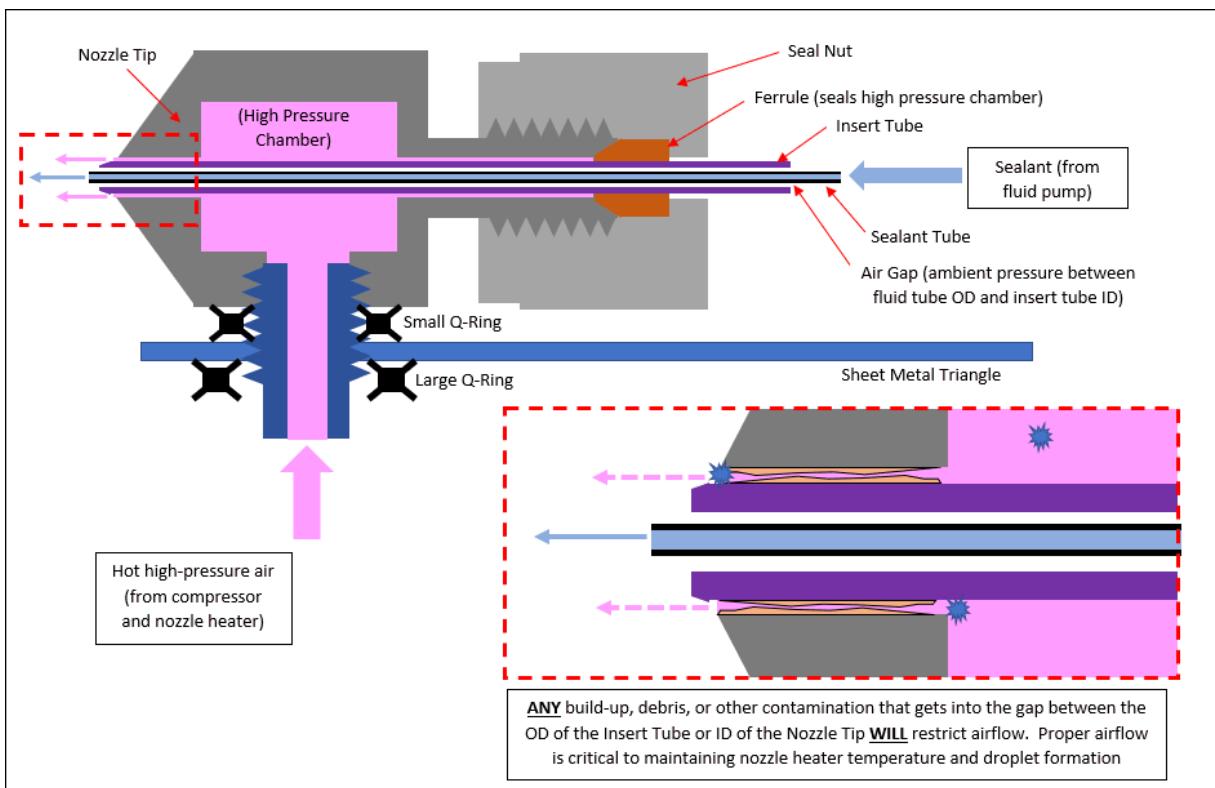


**15 min.
cleaning after
every job**

Tools required for proper cleaning:

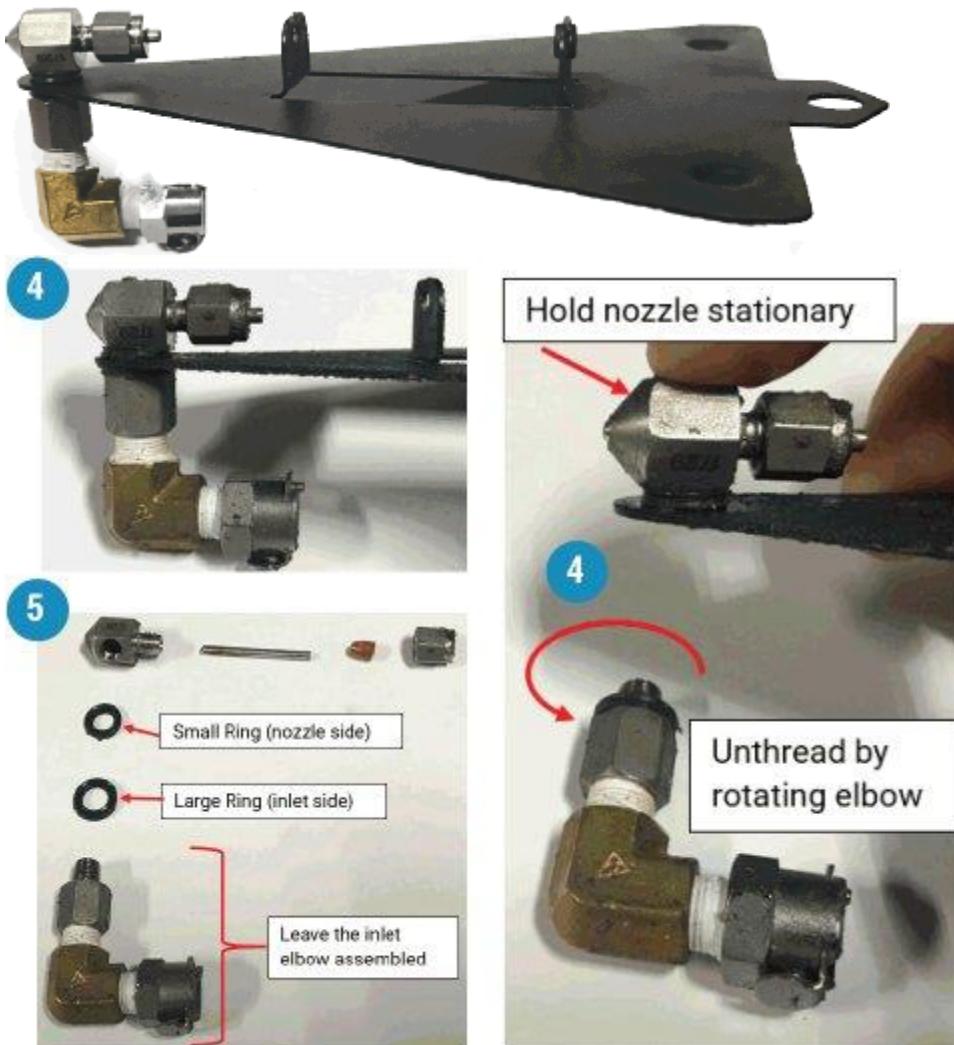
1. HSC nozzle assembly
2. air nozzle cleaning brushes
3. dental picks
4. hot (tap) water
5. Dev 16 or Buckeye Workout cleaner
6. (2) plastic cups
7. disposable shop towels
8. nitrile gloves





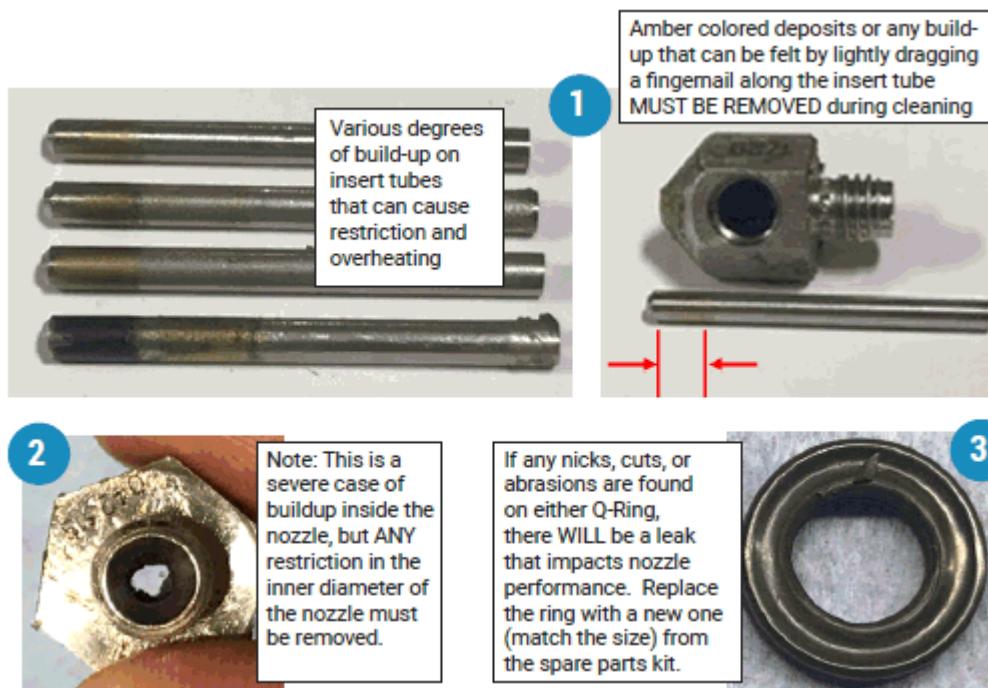
STEP ONE: Disassembly

1. Remove fluid line and braided hose
2. Remove triangle assembly from fanbox
3. Hold nozzle securely
4. Twist bottom elbow to separate pieces from sheet metal triangle; NOTE: this prevents damage to the Q-ring under the nozzle tip (*cuts and abrasions on the Q-ring can cause debris to collect inside the nozzle assembly which will block airflow and cause overheating*)
5. Separate Q-rings, loosen nozzle compression nut, separate nozzle, insert tube and ferrule



STEP TWO: Inspection

1. Inspect for build-up on insert tube:
 - a. Visually inspect for an amber color or other residue
 - b. "Fingernail check" by feeling for any resistance change along the tube
2. Inspect for build-up in the nozzle ID
3. Inspect for damage on the Q-rings



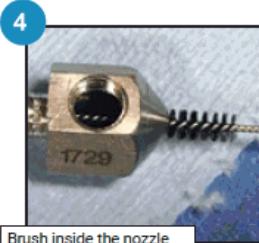
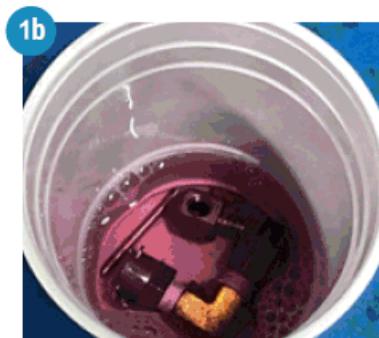
STEP THREE: Cleaning

1. Soak the nozzle:

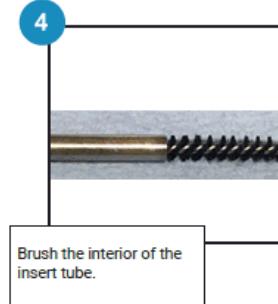
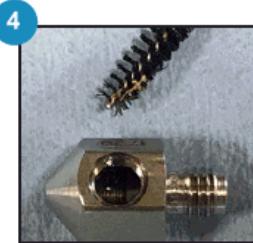
Option A - soak in Buckeye Workout cleaner for 5 minutes, do not dilute, be sure to agitate during soaking time

Option B - soak in Gard Dev 16 cleaner for 2 minutes; 1 part cleaner, 2 parts hot water, be sure to agitate during soaking time
2. Rinse and soak for 2 minutes in hot water, be sure to agitate during soak time
3. Wipe exterior of all parts with clean shop towels.
4. Clean ALL interior surfaces with small air nozzle cleaning brushes and dental picks
 - a. using brushes reduces the chance of leaving debris/lint inside the nozzle components
 - b. twisting the brush clockwise during insertion and/or use of dental picks into the part can help pull debris to the outside edges where it can be more easily cleaned
5. Rinse parts in hot water and blow dry (inside/outside) with filtered compressed air

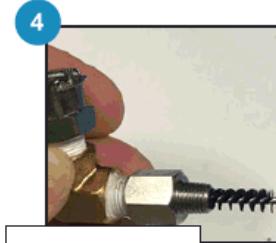
6. If any surface is still tacky or has smeared adhesive, repeat steps 1-5.



Brush inside the nozzle bore (both ends), female thread, and inside the central cavity of the part.



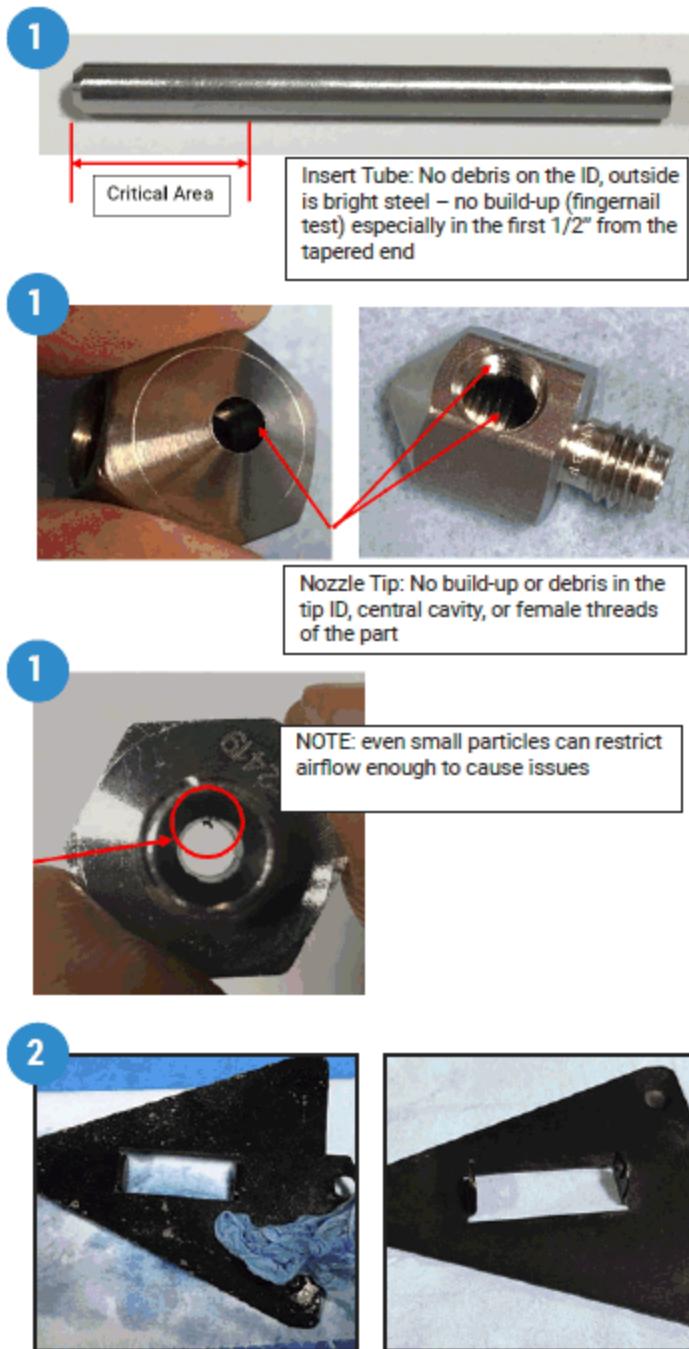
Brush the interior of the insert tube.



Brush the interior of the inlet elbow (both ends).

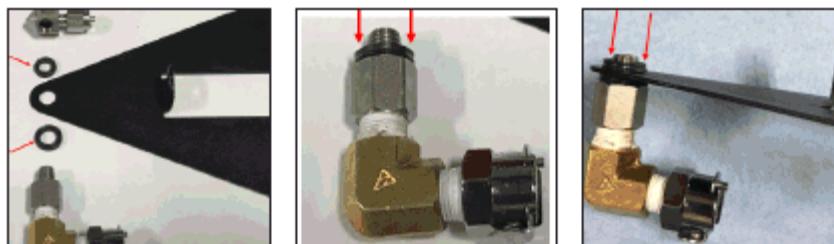
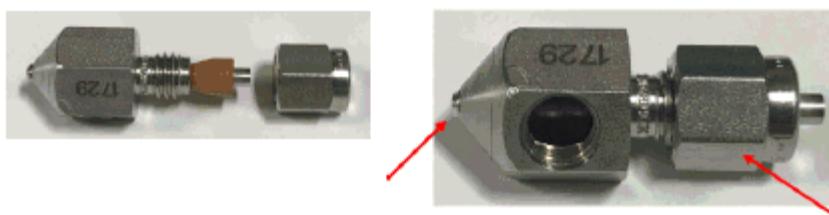
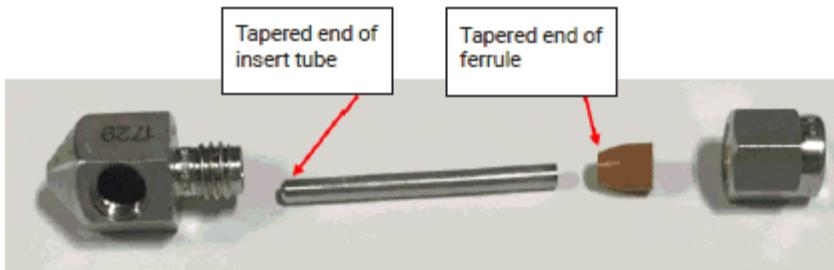
STEP FOUR: Reinspection

1. Inspect critical areas on parts before reassembly
2. Wipe sheet metal triangle with cleaner and a shop towel
3. Rinse and dry



STEP FIVE: Reassembly

1. Assemble nozzle
2. Check for ferrule deformation and cracks (from overtightening)
3. Assemble triangle
4. Large Q-ring fully installed onto the inlet elbow (push flush to the shoulder on the fitting)
5. Small Q-ring on top of the sheet metal triangle (push flush to the triangle)
6. Hold the nozzle stationary and thread the inlet elbow into it (appx 2 turns)
7. Finish with the nozzle and inlet elbow aligned as shown
NOTE: The nozzle assembly may not feel fully “tight” when correctly assembled. It should not rattle on the triangle, but overcompressing the Q-Rings (3rd turn on the inlet elbow) will create leaks and cause issues with droplet formation
8. Reinstall onto the fanbox (insert and align fluid tube, connect braided hose)



*M) How to use Buckeye Workout cleaner or alternate cleaners
With the Aeroseal Process*

Cleaning sheet metal ductwork

Apply the cleaner with a spray bottle. Allow the solvent to sit for several minutes. Once the solvent has had time to soak in, use a plastic brush to work it in. Clean up residue with a rag and repeat again with clean paper towel. Once the residue has been cleaned up, rinse again with water to pick up the remaining residue.

Cleaning wand sprayer head and equipment

WARNING: Do not soak wand tips in solvent while attached to the wand. The chance of solvent ingress into compressed air heater and consequent damage is high.

Use a spray bottle to lightly coat the wand and Aeroseal equipment. Let the solvent soak in for several minutes. Use a plastic brush to work the solvent on the affected areas. Wipe down with clean dry rags or paper towels. Rinse with water to clean the remaining residue.

Note: unfinished or unpainted aluminum surfaces will discolor if left for periods longer than 15 minutes.

Cleaning floors/ occupied spaces with glue spills/ overspray

Note: On all occupied and finished spaces perform a test swatch in an inconspicuous area to be sure that the cleaner or solvent will not discolor or remove any finish on surfaces affected by spills or overspray.

Follow the instructions above for all hard surfaces “after” testing for any change in finishes or discoloration. For spills on all furniture, carpet and non-hard surface cleaning use a spray bottle with water to soak the affected area. Apply the water around the spill and work your way to it. Vacuum up with a shop vac and repeat several times. Apply solvent and allow time for it to soak in. Vacuum up and repeat. Rinse several times with water and vacuum.

For dry particle overspray cleanup, it is recommended that you use a professional carpet and upholstery cleaner. Attempting to clean dry sealant particles from carpet and upholstery without the proper equipment may cause problems that cannot be cleaned up and replacement of the affected areas may be required.

There are several cleaners that can be used, other than the Buckeye Workout cleaner that is shipped along with the original kit. Other non-caustic cleaners that work very well are listed –

- Shu Bee citrus wipes also work very well at cleaning wands, fanbox and any residue or sealant that needs removed.
- Simple Green or Dawn dish soap used in hot to warm water does a good job at cleaning off counters, etc. as well as cleaning up parts such as flanges and wyes. Let them soak overnight. Once they are clean, tape up the inside of the wye and flanges prior to reuse to minimize the amount of cleaning required next time. Blue duct mask tape can be removed and replaced much faster than having to clean these items.
- Any type of citrus cleaner works well at removing sealant residue.



N) Wand Maintenance protocol (applicable for HomeSeal and HomeSeal Pro systems

- a) Remove the sealant nut and washer first.



- b) Loosen the liquid nut and push the liquid tube back through the nozzle.



- c) Loosen the nozzle standpipe lock nut and rotate the nozzle tail toward you about 45 degrees.



- d) Remove the compression fitting and the 1/8" tube and ferrule.



- e) Notice the burnt sealant on the outside of the 1/8" tube – be sure to remove this old sealant using steel wool before reassembly
f) Insert 0.142" reamer into the nozzle tip by hand and spin the reamer to remove any baked-on sealant. Blow out the scrapings using compressed air to complete the cleaning. This cleaning will restore your wand to like-new condition.



- g) Insert 1/8" tube back into the nozzle tip and center the tube while tightening the compression fitting. Do not over-tighten the compression fitting or you will damage the tube.



- h) Rotate the compressed air nozzle back in-line with the liquid tube. Slide the liquid tube back into place sticking out approximately 1mm from the nozzle tip and tighten its compression fitting only finger tight. Make use of the alignment tool to get both nozzle and sealant end aligned. Then add $\frac{1}{4}$ turn to both compression fittings using the supplied adjustable wrench.



- i) Replace the cleanout screw and washer.



Reamer may be purchased from Aeroseal or online from a machine shop supply company. You will need a 0.142" reamer.

- j) Do not soak nozzle tip in cleaner before routine cleaning. This would turn the sealant into jelly and become difficult to remove completely. For best results, wait until the nozzle is dry with no water present. This makes it easier to remove external sealant from the nozzle body.
- k) Aeroseal recommends cleaning the nozzles after every 4 or 5 uses. The cleaning procedure should only take 20 minutes.
- l) After each use, blow out the sealant and air tube of the wand using the blowout tool provided in your maintenance kit. Inside this kit you will also find a small alignment tool and a very small drill bit. These are used to clear the sealant tube and cooling gap on the wand nozzle prior to next usage. Simply insert the small drill bit into the sealant tube and make sure it is free and clear. Then insert the the small alignment tool into the nozzle head over the sealant tube. Make sure the tool can be seen in between the two nuts that tighten the ferrules. Then clean off any sealant residue and dirt.

O) HomeSeal Pro (specific) Procedures

Below are procedures specific for your HomeSeal Pro (Wireless) machine. The machine has an on-board computer (Gigabyte) with Aeroseal software preinstalled and set for your use. Follow the below steps for starting and for a **'Safe'** shutdown down your machine.

- A. Plug power into the top circuit of your machine. This will power on the electronics inside the lid. The router will start automatically and create a hot spot. (Allow for 2-3 minutes for the router to boot up)
- B. Turn on your tablet/laptop: This will bring you to the desktop terminal screen.



- C. Turn on the Gigabyte Computer: This is the onboard computer inside the Homeseal-Pro Unit.



On your tablet, make sure to check and see if your tablet/laptop is connected to unit's wi-fi hotspot. The name of the hotspot is "Aeroseal nnnn". The connection should happen automatically as your tablet and routers' information is factory set. However if you need to reconnect, then select the wifi- hot spot and use the password mentioned on the label inside your lid (Default password is aeroseal1234!)

- D. On the Terminal screen find the icon for connecting to the Fanbox: Double click the icon to connect to fanbox. The tablet then should automatically connect and show you the desktop screen of the Gigabyte computer (built in computer) that houses the aeroseal software. You should see a white background screen with the Fanbox number.



The above step should be automatic as the user name and password for the connection is factory set. If needed, under the lid of your unit is a label with the username and password that will help you make a manual connection. You can

also use this information to make a connection using a different laptop or tablet.



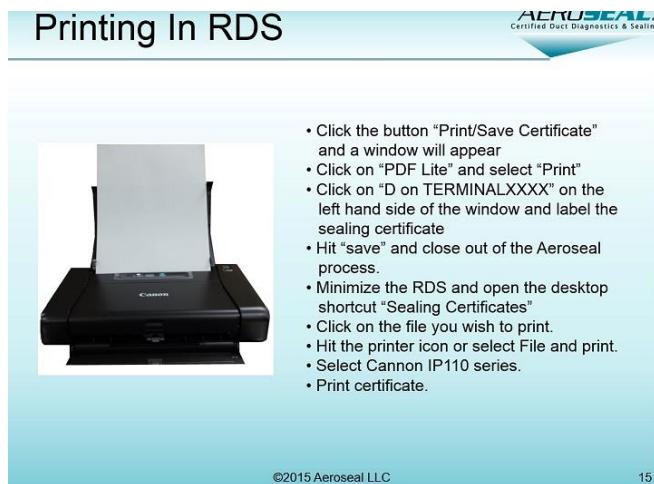
E. Check for condition of the UPS Batteries –

*Battery Voltages : check to make sure that the batteries are charged they should read more than 3.2V. If not you may want to order batteries in to and replace them. These batteries allow the Gigabyte computer in the lid of the unit to remain powered up in case of breakers tripping that cause unsafe windows shutdown and subsequent connectivity issues.

F. Open the Aeroseal software: This will allow you to run the program and start the aeroseal process.

G. PRINTING /SAVING CERTIFICATES:

One of the last steps of the aeroseal process is to save and print out the sealing certificate for the homeowner. The first step is to save the certificate as a pdf lite file in the shared aeroseal folder. Then close the aeroseal program. The certificate will be saved on your tablet and you have a choice to email or print out the certificates. For printing on-site, make sure that the fanbox is powered ON. Also refer to detailed instructions in the below picture..



H. SHUTDOWN PROCEDURE: After taking your printouts or saving the sealing certificate, you need to do a “SAFE” shut down of the hardware. Locate the RED button icon on the Fanbox desktop. Double click the icon. This will shut down the fanbox and bring you back to the Terminal desktop. **DO NOT JUST TURN OFF THE BRIX COMPUTER BY PUSHING THE POWER SUPPLY BUTTON. THIS CAN AND PROBABLY WILL CAUSE CONNECTION ISSUES WHEN YOU RE-START THE SYSTEM.** (The above step ensures that the Windows operating system shuts down properly)

I. Shut down the tablet and store in a safe location.

J. How to upload/refresh the aeroseal license for HomeSeal Pro:

Per the aeroseal license agreement, the dealer is supposed to upload job data once a month to Aeroseal’s servers. The software will keep track and advise you when the license has expired. However it is a good practice to schedule an upload procedure in the first week of every month to avoid any delays on the job site.

- a. Set up the machine in your shop or at a place where there is internet connection.
- b. Follow steps A thru F above.
- c. Once you are connected to the Gigabyte computer and on the Fanbox screen open the Aeroseal software.
- d. make sure that you are connected to an internet connection either by Hotspot or Wi-Fi
- e. Select \maintenance\upload to Aeroseal



- f. The process should take less than 4 minutes (changes depending on your internet connectivity speed). Once done, you have 30 more days to use the software.

P) HomeSeal Connect (specific) Procedures

The HomeSeal Connect wireless system incorporates an Aero4 injection system instead of the traditional wand. All procedures are the same except for dismantling and reassembling the 'arrowhead sprayer assembly'.

Steps for Dismantling



1. Disconnect Power and compressed air lines from the box. Ensure that the injection system, Nozzles have cooled down.
2. Remove sealant tube from nozzle assembly. This is the small clear poly tube that feeds the nozzle through the two grommets. It is simply removed by pulling the tube carefully from the arrow head of the assembly. Take care as to NOT kink the tube.
3. Disconnect the air line tube from the nozzle assembly. These are a sharkbite style connector fittings. Hold the top ring of the fitting to disengage and pull out the air line. Then push arrow head assembly to an angle (disengage one magnet at a time) and remove from the fan-heater nozzle.



Once removed from homeseal connect system, the nozzle can be taken apart and cleaned easily. Loosen the rear nut to the nozzle and remove the air tube. Using the cleaning solution, clean the tube outside. Use the reaming tool to scrape off any sealant from the inside of the nozzle. Reassemble the tube into the nozzle and tighten the back nut.



Steps for Ressembly

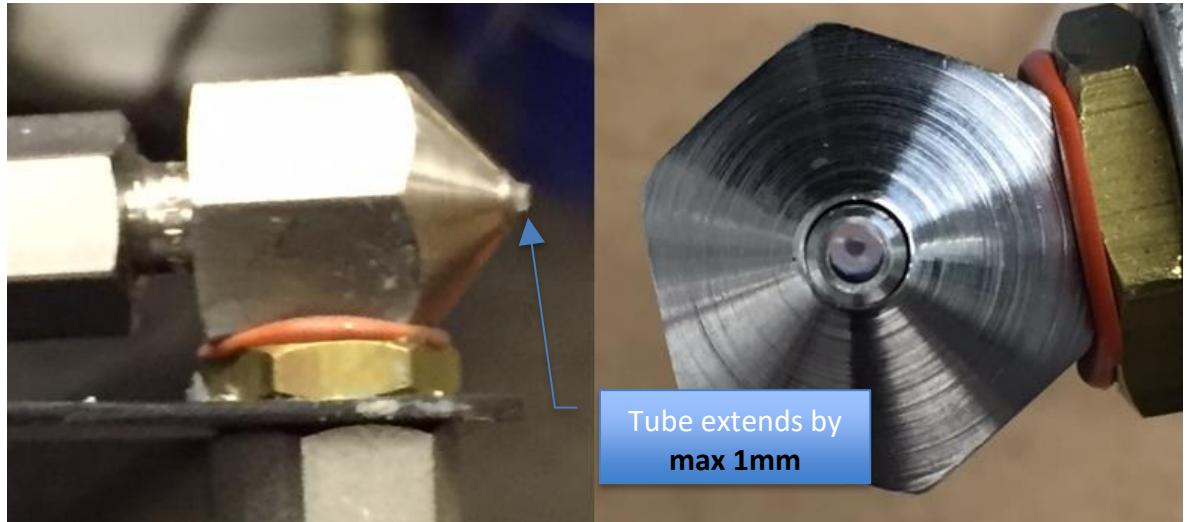
4. Reassemble the arrowhead back into the homeseal connect unit. It is an easy process if you feed the high temperature polytube (for the sealant) through the arrowhead assembly first. The rubber grommets help hold the tube firmly during the injection process.



5. Place the arrowhead assembly carefully into the Fan-heater nozzle. The magnets mounted on the assembly will self locate in the right location. Do take care that the high temperature poly tubing does NOT get kinked. Reconnect the airline tube into the connection on of the arrow head assembly. Make sure that the air tube is pushed all the way so there are no Air leaks.



6. Adjust the poly sealant tube so that it extends through the face of the nozzle $1/32$ of an inch (or 1 mm) out (see picture)



Maintenance schedule

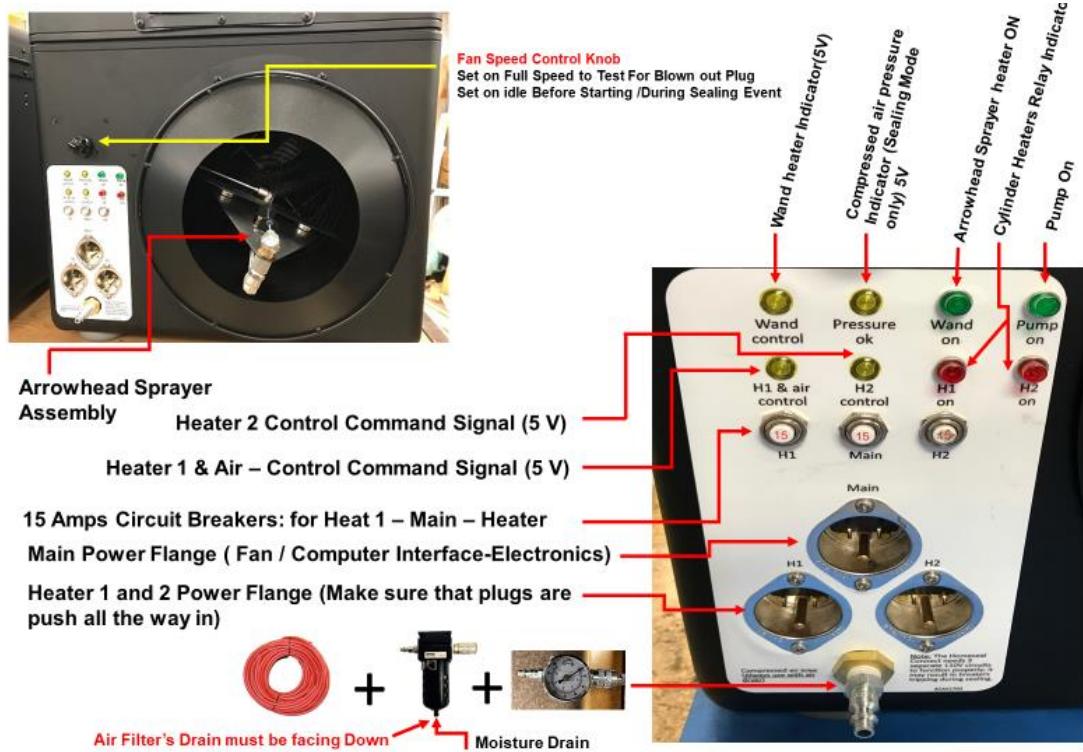
DAILY

- A. Follow the routine flush process with water after your sealing event. Visually inspect the nozzle tip and make sure that there is no white sealant in the tube and the nozzle tip is NOT clogged. Disconnect the air line to the nozzle assembly. Remove sealant tube from nozzle and move or position nozzle assembly to the side for safe transport.
- B. Wipe off any residual sealant or glue from nozzle and clean assembly.

After every 8 to 9 seals

- A. Remove nozzle assembly
- B. Remove back nut to nozzle spray head. Remove tube from nozzle and clean with cleaning solution ream out inside of nozzle blow out nozzle and reassemble. Then follow steps for daily maintenance.

Front Panel of Homeseal Connect (Details)



Q) Troubleshooting for Alarms & abnormal events during sealing process

Graph on Sealing Screen “Flat lines” or Increasing Duct Leakage

If the leakage on the sealing screen does not decline for 5-10 minutes known as “flat lining” or gradually increases for more than 2 minutes, following actions must be taken to discover and address the cause.

- Check for fluid line blockages in the nozzle, pickup tube or kinked lines. Also check the sealant container to ensure you are pumping sealant.
- If sealant flow is fine, there is a chance that a large hole/gap exists in the duct system and cannot be sealed. Look for excessive fogging generalized to a local area that would indicate a large leak in the ductwork in that area. This large leak would have to be mechanically fixed as Aeroseal seals best up to 5/8" gaps/holes.
- **Ensure that no register plugs or equipment blockages are failing:** Sealant deposits near plug/blockage edges are one indicator of seal failures which could cause a reverse in your sealing graph.
- Check for holes in the layflat tubing.
- **Check for large openings in the duct systems:** Check for high concentrations of sealant in the duct zones and Smell for sealant, look for evidence of particles, and look for air movement around ducts. (e.g. moving cobwebs)
- **Ensure the sealant is being delivered:** Depress layflat tubing in front of nozzle to see if sealant is coming out of the tip. If sealant does not deposit on the layflat tubing, see Nozzle Not Spraying Sealant Material Section.
- **Recheck for large and medium sized openings.** If most of the sealant material is flowing out of a large hole or several slits over ½ inch wide, the sealing proceeds more slowly:
 - o Look at the diagnostic (if one was preformed prior to sealing) for room flow from registers that were marginal or low.
 - o Look in the attic or basement for sealant escaping any large openings or take offs that are completely open or joints and collars that are disconnected.
 - o Place a fogger at the inlet to the Fan Box with the fan running and look for the fog as it escapes from any large holes. Get set up to view the leaks prior to starting the fogger

When all large leaks are fixed, hit “F2 – Start Seal”. After ensuring that the machine is working properly, and assuring the large leak(s) cannot be found, the installer should call their supervisor and consider the following:

If the remaining leakage is below 5% of the HVAC system fan flow (assume 400 cfm/ton), or the fraction of the initial leakage sealed is greater than 80% of the pre-seal leakage amount, the job can be considered complete.

If the remaining leakage is above 5% of the HVAC system fan flow and the fraction of the leakage is less than 50% of the pre-seal amount, ask the Aeroseal supervisor about the possibility of a homeowner concession or an add-on to address the large inaccessible leakage (depending upon the performance requirements in the contract.)

Nozzle Not Spraying Sealant Material

- In order to determine if sealant is being injected, depress lay flat tubing in front of nozzle when in the sealing mode. Check if sealant is coming out of the tip. If sealant does not deposit on the layflat tubing:
 - Ensure that there is sealant in the jug
 - Ensure that the pick-up tube in the jug is attached
 - Ensure that the pump is coming on. If not:
 - Ensure that the program is in sealing mode and not in pause
 - Ensure that compressed air is available. Start by checking the pilot light on the HomeSeal Box
 - Ensure that the nozzle tip is not clogged (clear with supplied drill bit)
 - Ensure that the back side of the nozzle is not clogged
 - Ensure that sealant is not pooling at a connection point due to a disconnect.

Hardware alarms (sensors, controls)

The Aeroseal Software Program used with your specific equipment contains a maintenance utility to help diagnose potential issues. The utility can be started by selecting the **Maintenance \View Hardware** option on the software. It is best to call Aeroseal for support when running into any problems. If an actual problem or bug is present they will be able to quickly diagnose and resolve most problems. Be sure to have a standard volt meter / resistance meter in your tool kit.

- One-Time Overrides for Sensor Failures

The Aeroseal Software Program contains a built in utility for overriding sensors if they fail. This workaround is designed to help a technician to complete a sealing job in situations where sensors fail at the job site. This is accomplished ONLY under telephone assistance from Aeroseal personnel.

**NEVER OVERRIDE THE SENSORS TO ACHIEVE A HIGHER SEALANT INJECTION,
THIS WILL ONLY LEAD TO WET SEALANT BEING DEPOSITED INTO THE DUCT
SYSTEM!**

Software Safeguards

Warnings in the Aeroseal Software Program that stop the sealing process include:

- **Wand Overheating:** Overheating of the compressed-air temperature can stop the injection process. The maximum value is specified in the Aeroseal program database (default 330°F). As the compressed air keeps running when the sealing is paused, this situation is not likely to occur. If it does occur, it is likely due to clogging of the compressed air at the nozzle tip. It could also be due a

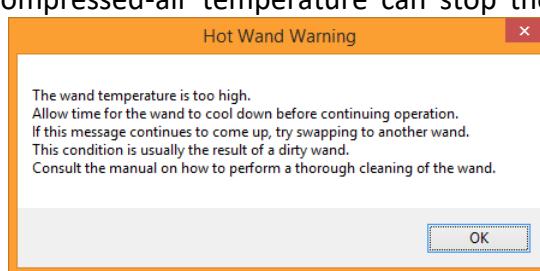


Figure IV-6. Overheating Error Screen

measurement failure, so assure that the compressed-air temperatures are realistic and stable (not 999 or 395 or bouncing erratically which can indicate LabJack and sensor failure modes, respectively. If the compressed air temperature reading does not go back down, unplug the wand power and watch for the temperature to decrease.) To solve the problem, assure that the compressed air is coming out at the usual rate, and if not, switch Wands and then **click on Start Sealing or hit the F2 key to resume sealing**. If the fan flow is adequate and the **Overheating** warning comes back, again assure that the Outlet Temperatures are realistic (as before mentioned). If this alarm still persists then the problem could be clogged up wands. Please refer to the maintenance section of this manual to clean the wands.

- **Raining in Duct System:** The Aeroseal Software Program also stops sealant injection if the program calculates that there is a danger of water condensation in the duct system at the current conditions. To solve the problem, raise the airflow in the system or add heat to the system. A ceramic heater can be used to preheat the air in the area the HomeSeal unit is setup. Just take caution not to blow air into the direction of the inlet gate as this could alter the airflow at the gate and mess up the fan box pressure readings. This is a common error and will come up during every job once the airflow in the system drops below the saturation point which is determined by flow, RH and temperature. If the condition persists, first assure that all Heater Cylinder heaters are plugged in and operational. This can be determined by looking at the sealing screen; if the “1” or “2” heater squares are red then one or both of the 1500W heater circuits do not have power. Check the heater power circuits to be sure they are plugged in and the circuit breakers are not tripped. If this condition persists and heaters are all on (C, 1, 2 all green), add dry heat to the system by blowing air from a ceramic space heater toward the back of the fan box to lower the relative humidity of the air entering the system as stated above. **Click on Start Sealing or hit the F2 key to resume sealing.**

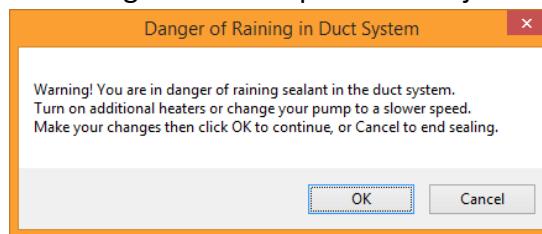


Figure IV-7. Raining Sealant Error Screen

- **Possible Blown Seal:** *Cause:* calculated duct leakage increases by more than the amount specified in the Aeroseal database. The Aeroseal Software Program turns off the control signal to the injector and pump and displays “Possible Blown Seal”. The purpose of this warning is to avoid injection of sealant into the house or the HVAC equipment due to a register plug or a coil/fan/HVAC-equipment plug becoming dislodged. However, register-plug failures are extremely rare, and equipment plugs fail rarely, so in most cases the warning is triggered by the blue tube being pinched or being stepped on which will change the pressure momentarily. This warning can also be triggered by the lay-flat tubing being depressed or being blown by

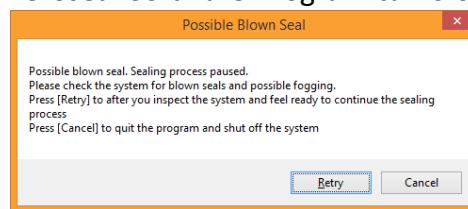


Figure IV-8. Blown Seal Error Screen

the wind. Wind impacts are largest when a large gate opening is used to measure a relatively small fan flow. Going to a smaller gate can often reduce wind-induced or layflat-tubing-induced errors. NOTE: If the leakage increases slowly this warning will not occur. **Hit OK on warning, look for and fix any plug problems, and then click on Start Sealing or hit the F2 key to resume sealing**

- **Low Duct Pressure:** *Cause:* duct pressure is below 10 Pa. The installer cannot override this. The first thing to do is assure that the blue tube(s) are inserted into the section of ductwork being sealing, that the block for the HVAC equipment is in place, and that all register blocks are in place. Next, the fan flow should be increased, first by increasing the fan speed, or potentially by opening to a larger inlet gate. If the problem persists, the duct system may be too leaky to be sealed with one Fan Box. In this case the solution is either to find and fix any large hole or gap in the ductwork, and/or to divide the duct system into smaller sections. **Click on Start Sealing or hit the F2 key to resume sealing**
- **High Duct Pressure:** *Cause:* The pressure in the air ducts is exceeding the allowable max pressure for the type of duct construction you are sealing. If the pressure on the computer screen is significantly below the max allowable after the warning is cleared, the warning was probably caused by somebody stepping on the **Blue** tube. If the duct pressure on the computer screen is near or above max allowable, the fan flow should be reduced depending upon the type of ductwork you are sealing. However, if the fan flow has to be reduced enough to create a **Low Flow** warning, the sealing process is complete (some rare exceptions to this may occur). This warning can be overridden and the sealing then restarted, and the warning will not appear a second time. **Click on Start Sealing or hit the F2 key to resume sealing**

Suggested maximum allowable pressures (Pascal)

Building Cavity	400pa
Concrete/Masonry	1000pa
Drywall	400pa
DuctBoard	400pa
FlexDuct	600pa
Metal	750pa
Metal Flex	600pa
Wood	600pa

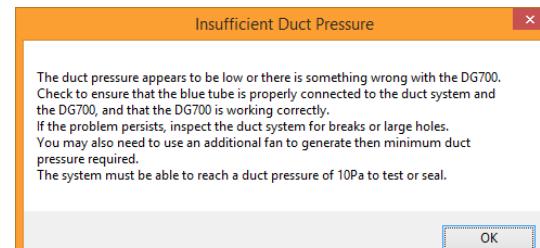


Figure IV-9. Low Duct Pressure Error Screen

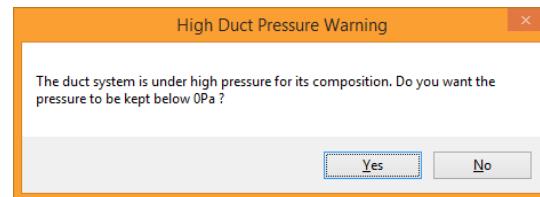


Figure IV-10. High Duct Pressure Error Screen

- **Low Flow:** *Cause:* Fan flow is less than 150 CFM, which means that the flow in the ducts might cause excessive deposition on the bottom of the duct. The fan flow should be increased, by speeding up the fan speed or going to a larger inlet gate opening. Fan flows less than 100 CFM CAN CREATE A FIRE DANGER IF THERE IS SEALANT MATERIAL ON THE HEATER COILS OR INSULATORs. Therefore it is imperative to let the sealant clear from the layflat tubing when sealing under 30cfm25. It's best to seal then pause, seal then pause to keep your equipment clean and clear of excess residue. Certain circumstances require sealing down to such low numbers such as trying to meet energy star requirements of 5% of total fan flow. **Click on Start Sealing or hit the F2 key to resume sealing once you determine your system is clean enough to continue at low flows.** Alternately, create additional flow by opening up the last register in each duct section and exhaust the overspray into a scrubber or to the outside. Acknowledge the blown seal alarm. You will also notice a spike in the sealing graph, but these steps will allow you to continue to seal till the graph flat lines. Follow subsequent flush procedures and do a post seal with all the register plugs back in place.

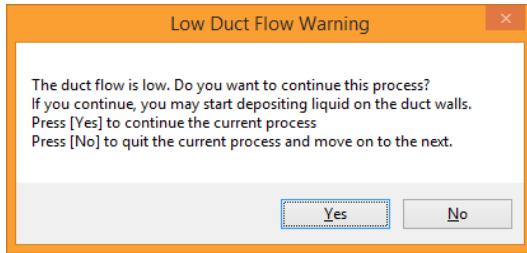


Figure IV-11. Low Flow Error Screen

- **Check Sealant:** *Cause:* the software will automatically shut down the sealing process when it calculates that there are less than 5 minutes of sealant injection remaining before the container is empty. In this situation, check the actual sealant level, and add sealant if it is low. If the sealant level is not as low as the computer suggests either the beginning sealant level was not set properly or the sealant is not being delivered through the wand as quickly as the computer is calculating. In this case, check your liquid system for fluid clogs, especially in the wand nozzle.



Figure IV-12. Low Sealant Error Screen

Once all check-out and refilling is complete, **click on Start Sealing or hit the F2 key to resume sealing, and then choose the new sealant level in the box that pops up.** Note that once the low sealant warning pops up, the software will allow sealing to be restarted for an additional five minutes without changing anything. This can be handy when the sealing is almost complete.

- **Maximum Cylinder temperature:** *Cause:* the software will alert user if the cylinder temperature sensor reaches 160F and will ask the technician to disconnect one of the heater power cords. The overheating typically occurs especially when there is very low flow due to fan or gate setting or when leakage is very low. When this occurs, then consider low sealing protocol, open one of the register plugs as pressure relief or open gate/ ramp up fan to create flow.