Chemical Injection Technologies

Installation/Service Bulletin

SUPERIOR VacuFeed™ Liquid Chemical Feed Systems Installation & Operation

IMPORTANT!! READ THESE PRECAUTIONS BEFORE PROCEEDING!!!

These are very important for your personal safety, and for proper chemical feed operation.

1. Read these precautions and all related instructions thoroughly and follow them carefully. If you do not understand any of the information, call your local SUPERIOR supplier or Chemical Injection Technologies, Inc. Do not attempt to install or operate any chemical feed equipment unless you are properly trained.
2. Make certain all required safety equipment is in place and operational.
3. When performing any maintenance or handling any chemicals, Chemical Injection Technologies, Inc. strongly recommends that protective clothing and eye protection be worn. When dealing with chemicals known to produce dangerous or noxious gas vapor, a an appropriate gas mask, preferably a self contained breathing apparatus, should be on hand, and all operations personnel properly trained in its use.
4. The fumes from chlorine solutions, and certain other chemicals, can be lethal in large enough doses. Therefore, you should always have a co-worker observe from a safe location when you are working on any type of liquid chlorine (sodium hypochlorite) feeding equipment, or any other chemical which can produce dangerous fumes.
5. Secure all chemicals and chemical feeding equipment, making them inaccessible to unauthorized individuals.
6. Inspect all tubing and piping when replacing chemical solution, for cracking or deterioration and replace as necessary. (Always wear protective clothing and safety glasses when inspecting tubing).
7. Never mix cleaning solutions or solvents with the chemicals being fed by the equipment. When introducing any cleaning chemicals (such as Muriatic acid) always flush the system with clean water before and after cleaning.
8. Chemicals used may be dangerous. They should be used according to warnings shown on the label, using the directions given with each type of chemical. Different chemicals often look alike, so do not assume they are the same. Chemical Injection Technologies, Inc. cannot be responsible for the misuse of chemicals being fed by the VacuFeed equipment. Always have material safety data sheet (MSDS) available for any fluid being fed.
9. VacuFeed is **NOT** to be used to handle flammable liquids.

MATERIALS COMPATIBILITY

The SUPERIOR VacuFeed system is designed to feed liquids with a wide range of viscosity, specific gravity, and chemical composition. The wetted materials (those parts that contact the solution being metered) used in the VacuFeed can be varied to provide the most resistance to corrosion or attack by the chemical being fed. Standard models of the VacuFeed system are designed to feed either chlorine solutions (Sodium Hypochlorite or Calcium Hypochlorite), Sodium Bisulfate, or Aqueous Ammonia. These chemicals require some different materials of construction in the wetted areas, and the user should make certain that the correct model is being used for the chemical being fed. Other chemicals *may* be compatible with the standard materials of construction but Chemical Injection Technologies, Inc. makes no representation as to the fitness of purpose, either implied or stated, for any such use.

All of the materials used in wetted areas are very resistant to most chemicals. However, there are some chemicals, such as strong acids or organic solvents, which can cause deterioration of some elastomer and plastic parts. Consult a Chemical Resistance Guide or Supplier information on chemical compatibility.

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1.0 INSTALLATION

1.1 LOCATION

The VacuFeed Liquid Chemical Feed System should be located in an area that allows convenient connections to both the chemical storage tank and the liquid inlet at the vacuum regulator, as well as access to the ejector water supply and chemical solution piping..

- Tubing or rigid pipe used to connect the chemical storage tank to the VacuFeed unit should be installed in such a manner as to make it easy to inspect for possible leaks and any signs of aging or cracking.

- Tubing or pipe conveying chemicals should be placed in areas where there is no danger of physical contact causing breakage or premature wear due to friction.

- Sunlight affects all plastics to some degree, causing accelerated aging of the material which can reduce the useful life of the product as well as increasing maintenance, service and replacement parts costs. It can also cause deterioration of the strength of some chemicals, especially Sodium Hypochlorite (Liquid Bleach). Wherever practicable, the VacuFeed unit, and any chemical storage tanks, should be placed in areas where there is little or no direct sunlight.

- Higher temperatures can cause deterioration of many chemicals and increases the effect of chemicals on wetted materials. The increase will vary with the material and the chemical being used. Whenever possible, avoid locating the VacuFeed unit or chemical storage tanks in areas where high temperatures can occur.

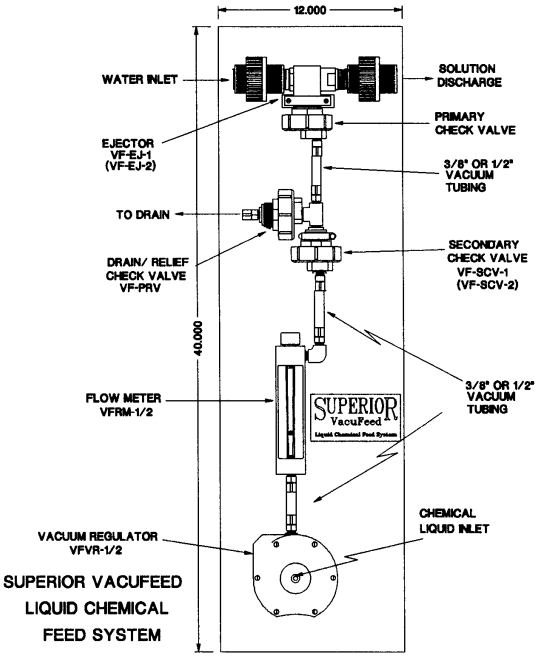


FIGURE 1

1.2 MOUNTING THE VACUFEED UNIT

- The VacuFeed unit is designed as a modular system, mounted on a sub-panel which MUST be installed with all of the components remaining in their relative positions. Do not remove any of the component sub-assemblies from the panel for re-location. If any of the sub-assemblies (vacuum regulator, meter panel, check valves, or ejector) are re-positioned or removed from the mounting panel for any reason, it may affect the consistent and repeatable flow rate of the liquid feed. Chemical Injection Technologies, Inc. accepts no responsibility for accuracy or repeatability of a set flow rate if any components are moved.

- VacuFeed MUST be installed vertically, and as level as possible. The proper orientation of the VacuFeed unit is shown in Figure 1.

- The mounting panel must be securely fastened to a wall or other sturdy support. The panel may be drilled at any point to allow fastening. The panel does not have to be removed from its supporting wall or other structure in order to remove components for maintenance or service since they are all attached from the front of the panel.

1.3 EJECTOR CONNECTIONS (PIPING) See Figure 2

- The VacuFeed uses a water operated venturi (nozzle) to produce the vacuum necessary to operate the system. This venturi is a part of the ejector assembly, located at the top of the VacuFeed Panel.

- The point at which the chemical solution which results from the mixing of the liquid chemical and the ejector operating water is tpo be injected into the water treatment system, should be carefully chosen so that the water pressure at this point (back pressure) is as low as possible. Water pressure to the ejector must be high enough to overcome the back pressure and create a strong jet in the nozzle. In most pressurized water system applications an ejector water booster pump will be required to increase the water pressure sufficiently to create a vacuum. In some systems it may be possible to place a pressure reducing valve in the main water pipe, allowing some water to by-pass the valve through the ejector and then flow into the lower pressure side of the valve.

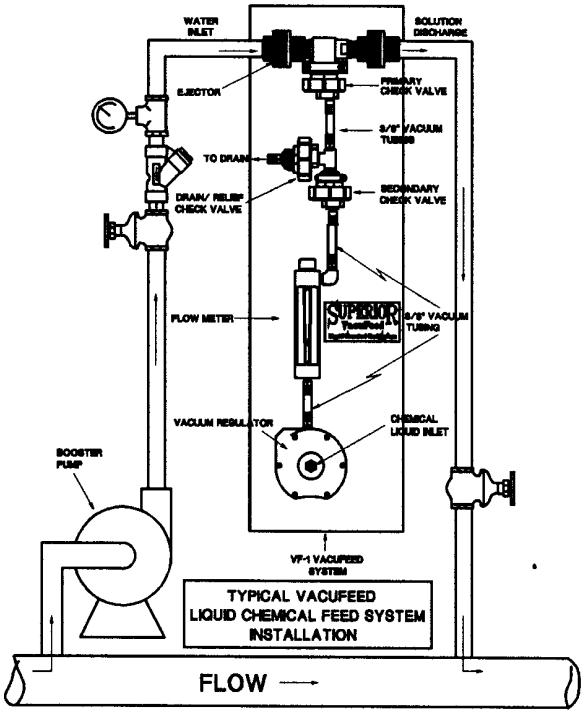


FIGURE 2

- Generally, the amount of water (GPM) required to operate the ejector depends upon the liquid chemical flow rate (gallons per hr. or liters per hr.). The higher the chemical flow rate, the greater the water flow needed. Ejectors are available with several different sizes of nozzle

orifices which may be used in place of the standard nozzle supplied for the liquid feed capacity of your VacuFeed. If you require less water flow through the ejector, or a lower pressure differential across the ejector, consult the Ejector Nozzle Requirements chart in the Appendix.

- Ejector water supply pressure must be greater than the pressure into which solution is ejected. The amount of pressure differential may vary with the particular application. Generally, the greater the pressure into which the chemical will be injected, the greater the required differential pressure. However, the minimum pressure differential and water flow for your installation should be determined prior to installation and start-up.

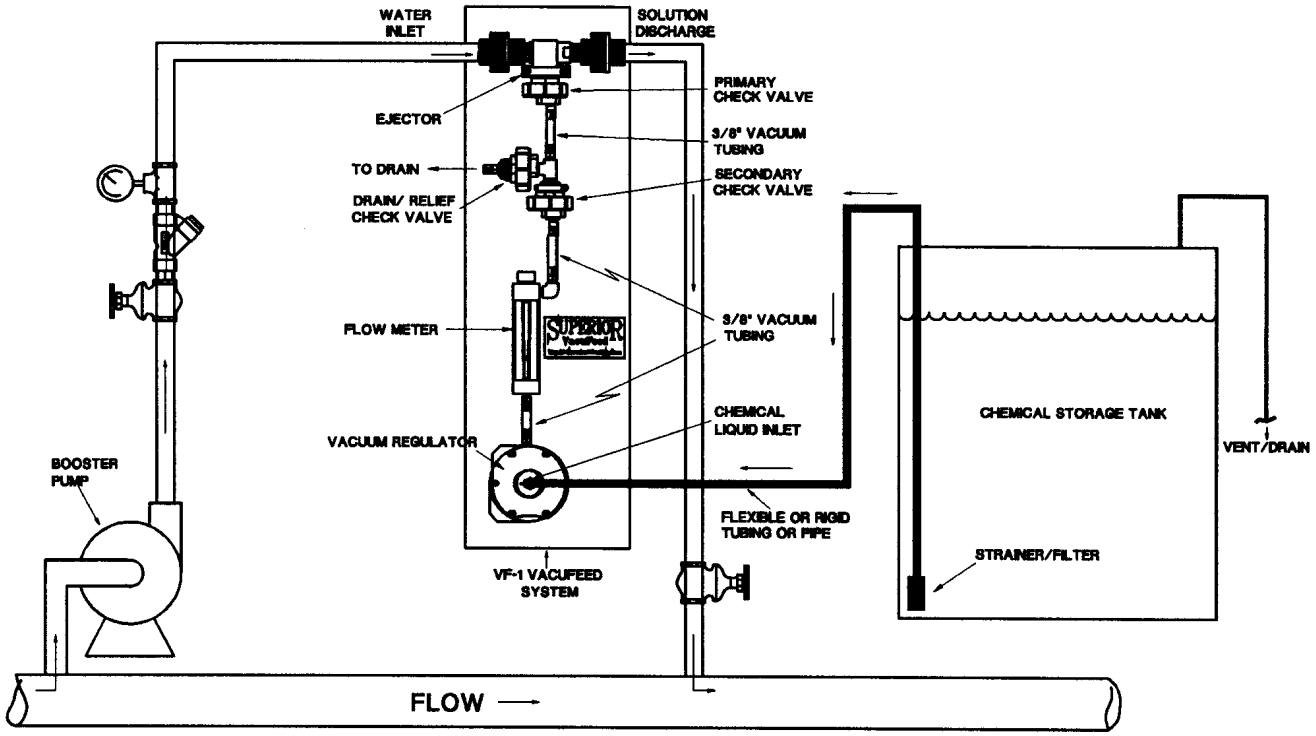
- Water and solution piping may be rigid pipe or flexible hose. The ejector is supplied with 1" NPT PVC female threaded unions. Pipe or hose must be supported to avoid placing a strain on the ejector mounting bracket, and to avoid water line "torque" in high pressure on-off systems.

- A shutoff valve followed by a Y-type strainer is suggested to aid in servicing the unit. A pressure gauge installed between the Y-type strainer and the ejector is desirable as a service and diagnostic tool, and is recommended *very strongly*. A second shutoff valve installed in the chemical solution piping between the ejector and the point of chemical solution injection is also recommended, so that the VacuFeed system may be isolated from pressurized water for servicing without shutting down the water main or other treatment system.

- Before applying any water pressure to the ejector piping, check all connections for tightness, especially union fittings and the nozzle/diffuser assembly. The nozzle (inlet) and diffuser (outlet) seal against the ejector body with gaskets recessed in the ejector body. Do not over-tighten as this may cause the gaskets to deform, resulting in water or chemical solution leaks.

1.4 CONNECTING TO CHEMICAL STORAGE TANK See Figure 3

- Appropriate size plastic tubing is commonly used to connect the chemical storage tank to the VacuFeed liquid inlet. However, rigid pipe may also be used. Be certain that the tubing or piping materials are compatible with the chemical you are feeding.



TYPICAL VACUFEED LIQUID CHEMICAL FEED SYSTEM INSTALLATION

FIGURE 3

- Figure 3 shows a typical VacuFeed installation. The VacuFeed does not have to be located in an area which is environmentally controlled, but it should be protected from freezing conditions which may cause the liquids to solidify and expand. Likewise, excessive heat may cause reactions with chemicals that are not desirable, but which are not a problem at normal ambient temperatures. It is not affected by moisture or dust.

- Connect suction tubing to the liquid inlet on the vacuum regulator. This inlet is fitted with a standard tubing connector of appropriate size for your unit's maximum feed rate (3/8" OD tube up to 10 GPH, ½" OD tube up to 25 GPH). The tube fitting may be removed, as well as the reducing bushing between the fitting and the regulator body, if rigid pipe installation is desired. Rigid pipe used for the chemical transfer from the chemical storage tank, must be of a material compatible with the chemical being fed. Always install a union pipe fitting close to the VacuFeed inlet to allow removal of the regulator for service. *NOTE: also see Section 3.2 for details on optional installation*

of a 3-way valve for cleaning deposits from the system.

- The VacuFeed system is a self-priming design, and utilizes a controlled vacuum technique. Therefore, the level of the liquid in the storage tank relative to the level of the VacuFeed inlet is not of critical importance. However, whenever possible, it is advisable to keep both suction lift and pipe friction losses to a minimum to insure the most efficient operation. If tubing or piping runs greater than 25 feet are contemplated, consult a friction loss chart to determine if the maximum liquid flow rate will cause friction losses greater than 5 feet of head. If this is the case, consider using larger diameter tubing or pipe to reduce the friction loss. Excessive friction loss may result in feed rate variations. NOTE: When feeding chemicals which have a greater tendency to produce air or gas bubbles, such as sodium hypochlorite, it may be helpful to ensure that the liquid level in the chemical tank is above the VacuFeed inlet.

- A suitable straining or filtering device should be attached to the chemical tubing or pipe to prevent solids from entering the system. It is best to attach these devices to the inlet end of the tubing in the chemical storage tank. This enables the filter to also protect the tubing from solids buildup. However, in-line filters may be used. If the chemicals have a tendency to form larger solid particles in the storage tank, or if the chemicals are delivered with a high percentage of solids, it is advisable to use a two-stage filtering scheme with a first stage "screen" type filter of a mesh size which will trap the larger particles. The fewer solids which enter the VacuFeed system, the less maintenance and cleaning will be required. The strainer/filter should be positioned so that it is at least 1-2 inches (2-5 cm) above the bottom of the chemical tank. To keep chemical from becoming contaminated, the tank should have a cover, but must be vented to a safe area. The chemical tank must not be air tight, and must allow air to enter to prevent a vacuum from forming inside, which will cause liquid feed to drop or cease and the tank walls to collapse.

- The chemical tank and filter/strainer should be cleaned regularly, to ensure continuous trouble free operation. If the chemical being fed regularly precipitates out of solution or does not dissolve easily or completely (e.g. calcium hypochlorite), a mixer should be used in the chemical tank.

2.0 START-UP AND OPERATION

2.1 CHECK FOR VACUUM

- The ejector, with its water supply and solution line, must be properly installed and operating before checking for vacuum.

- Unless the ejector is creating a vacuum, the VacuFeed will not work. Check for vacuum **before** attaching the chemical tubing or piping. Place a finger, or a vacuum gauge with a short piece of tubing, over the fitting at he liquid inlet on the vacuum regulator. With the ejector running, you should observe a rapid build-up of vacuum at this point. If there is no vacuum, the condition must be corrected.
  a. Disconnect the vacuum tubing at the ejector fitting and check for vacuum. If no vacuum, refer to section 1.3 and be certain that the supply pressure is sufficient and that the nozzle or piping is not plugged. Correct the condition and obtain proper vacuum before proceeding.
  b. If vacuum exists at the ejector, replace the tubing at the ejector fitting, and disconnect the tubing at the outlet of the meter panel. Check for vacuum at this point. If no vacuum, first check to be sure there is no vacuum being pulled at the drain outlet. If a vacuum is present at the drain outlet, the drain valve must be disassembled and the seat cleaned, then reassembled and checked again.
  c. If there is no vacuum present at the drain outlet, then a blockage is occuring in the secondary check valve. Disassemble and check for foreign material or sticking of the diaphragm and seat seal. Correct the condition and reassemble.
  d. If there is a vacuum present at the tubing connecting to the top of the meter panel, reattach the tubing and disconnect the tubing at the bottom of the meter panel. Check for vacuum. If no vacuum, the meter panel must be checked for leaks or plugging. Correct the condition and reattach the tubing.
  e. If vacuum is present at the bottom of the meter panel, then the problem is in the vacuum regulator. Refer to the service section and correct the condition.

2.2 START-UP

- Attach the chemical tubing to the regulator inlet. Start the booster pump or other water supply to the ejector.

- Open the rate valve and observe chemical enetering the metering tube. Keep the rate valve open until all air has passed through the metering tube.

- Adjust the feed rate to the desired level. Read the feed rate in gallons per hour (GPH) on the left side of the scale, or in Liters per hour (LPH) on the right side of the scale.

- Observe the feed rate periodically for the first 24 hours of operation. It may be necessary to readjust the feed rate a few times while the internal components acclimate to the temperature of the liquid, and all gasses are purged. After this initial run-in the system should feed at a steady rate and be repeatable in on-off operation.

2.3 OPERATION

- The VacuFeed system is designed for continuous or on-off (start/stop) operation, while maintaining a set chemical feed rate. The feed rate (rate of flow) of the liquid chemical is adjusted by means of a manual rate control valve. Automatic feed rate control systems are available which can vary the feed rate in proportion to the flow of water being treated, or to maintain a set residual, or both. Consult your SUPERIOR supplier or Chemical Injection Technologies, Inc., for information. Existing VacuFeed systems can be retrofitted for automatic control.

- All VacuFeed liquid flow meters are precision calibrated with a scale reading in Gallons per Hour (GPH) and Liters per Hour (LPH). All scale calibrations are representative of liquids with a **SPECIFIC GRAVITY OF 1.0** (clear water). Different chemicals, and even different concentrations of the same chemical, have varying specific gravities. You must determine the approximate specific gravity of the chemical you are feeding if you wish to know the precise flow rate at any given point on the scale. This information may be obtained from your

chemical supplier, or you may use a number of inexpensive hydrometers which are available from laboratory supply companies. Consult the SPECIFIC GRAVITY CONVERSION CHART in the Appendix to determine the actual flow rate at different specific gravities.

EXAMPLE: A chemical with a specific gravity of 1.3 is feeding with a flow rate of 10 GPH on the scale. To find the exact flow rate on the conversion chart, find your indicated scale flow rate on the left side of the chart, and read the Actual flow rate for 1.3 specific gravity to the right under the 1.3 column. The actual flow rate would be 10.36 GPH.

For most systems, operators will take periodic samples of water and test for chemical concentrations, then make adjustments until the desired level is obtained. Usually, the scale readings will be close enough for initial settings based on calculated dosage rates. Use of the conversion charts is mainly to allow for accurate reporting of chemical feed rates to regulatory agencies.

3.0 MAINTENANCE

3.1 CHEMICAL STORAGE TANK

- While chemicals vary in the amount of deposits which may precipitate or settle out on the bottom of a chemical storage tank, some cleaning will always be necessary.
- Always wear skin, eye, and respiratory safety equipment when working on or around a chemical storage tank or piping. If the chemical has *any* potential for releasing dangerous or toxic fumes, extra care must be taken to use a self contained breathing apparatus (SCBA).
- A regular maintenance schedule should be developed to clean the filter and screens in the chemical feed tubing or piping, to avoid feed rate problems in the VacuFeed system. A clogged screen or filter will seriously affect the VacuFeed's ability to maintain a set feed rate, and may impair its ability to attain a desired feed rate.

3.2 CLEANING DEPOSITS IN THE VACUFEED SYSTEM

- Some chemicals, such as Sodium Hypochlorite (Bleach) can build up deposits on metering surfaces or other critical areas which may cause some reduction or fluctuation of the chemical feed rate. When this happens, it will be necessary to remove those deposits. It is advisable to set up a routine maintenance schedule to clean the VacuFeed and remove all deposit build-up before performance is affected.

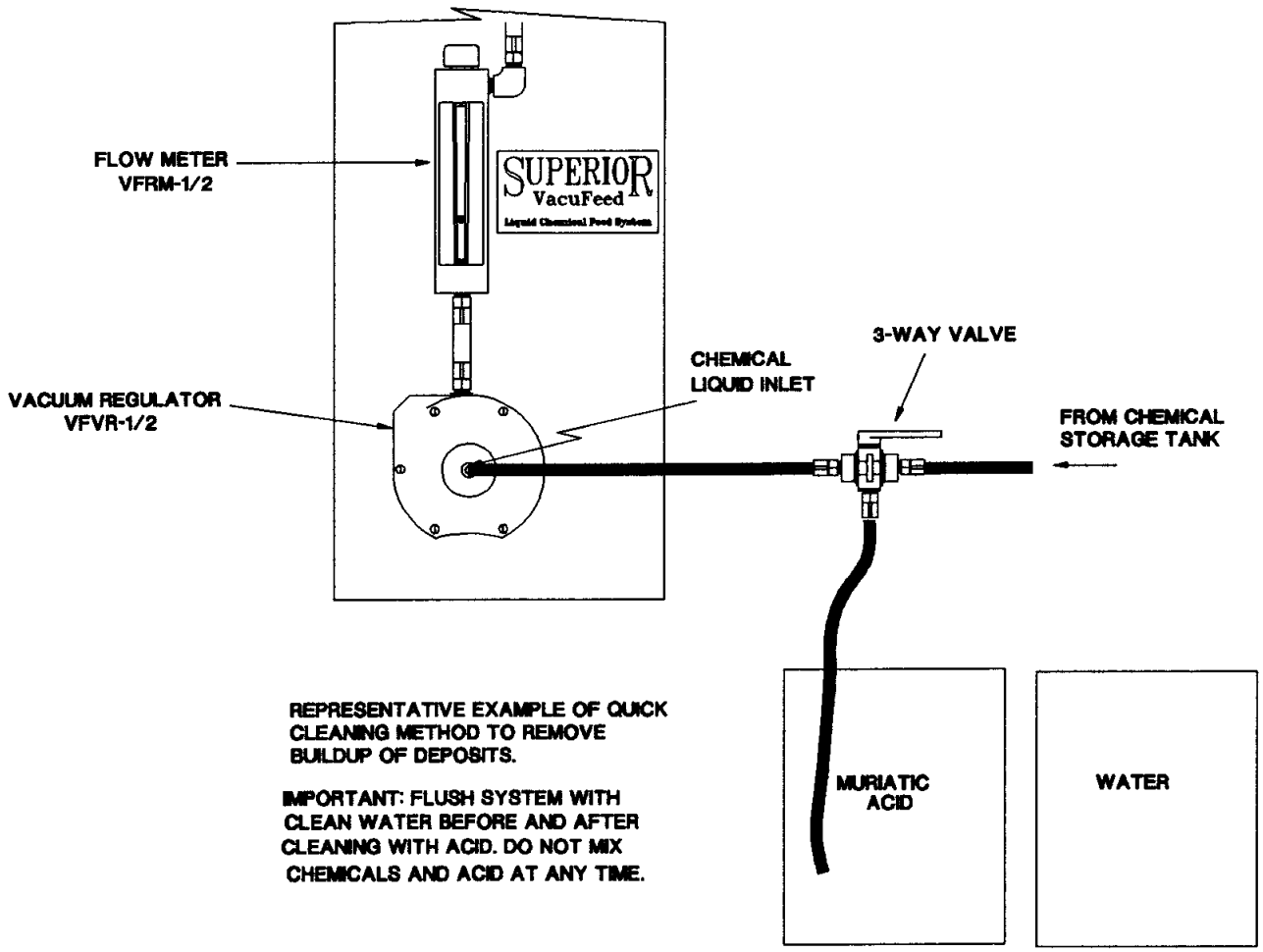


FIGURE 4

- Depending upon the chemical you are feeding and its tendency to build up deposits in the system, there are a number of methods which may be used to clean the system with minimum effort and down time. Before attempting any cleaning operation, you must determine whether the cleaning solutions or solvents you wish to use are compatible with the materials of construction of the VacuFeed system. In particular, avoid use of any solvents which will react with PVC or ABS plastics.

    - Prior to introducing any cleaning chemical or solvents, be absolutely certain of their reaction with the chemical you are feeding with the VacuFeed. It is always advisable to flush the system or the individual parts (if disassembling) with clean water before using any solvents or cleaning chemicals. If you are not certain of the possible reactions, consult your chemical supplier.

    - If you need to disassemble any or all parts of the VacuFeed system for cleaning, refer to Section 4.0 SERVICE, for disassembly and reassembly instructions. Always be certain to thoroughly flush all parts with clean water before reassembly.

    - A simple but effective method for periodic cleaning, when feeding some types of chemicals, is to install a 3-way valve in the chemical tubing or piping between the chemical storage tank and the vacuum regulator inlet (SEE FIGURE 4). This is particularly effective when feeding Sodium Hypochlorite, and using a solution of Muriatic acid to dissolve deposits. The solvent or cleaning chemical must be compatible with the materials of construction and, very importantly, they must be capable of being introduced into the water treatment system without presenting a dangerous or toxic situation. If the water treatment system cannot have these cleaning chemicals introduced, then it may be possible to divert the resultant ejector discharge into a waste system or tank while cleaning is taking place.

      In the example of a cleaning setup shown above, the VacuFeed system is feeding Sodium Hypochlorite. A 3-way valve with suitable materials is installed in the tuning between the chemical Storage tank and the vacuum regulator inlet. When cleaning is necessary to dissolve deposits, the bypass leg of the 3-way valve is placed into a container of clean water and the valve opened to allow water to flush the system. Then, the tubing is moved to the Muriatic Acid container and acid is allowed to feed (usually at a low rate to increase the contact time). At the end of the acid feeding cycle, move the tubing back to the clean water container to flush the acid from the system, and return the 3-way valve to normal feeding position. Adjust the feed rate back to the desired setting. *NOTE: you must wear protective clothing, gloves and eye protection when handling any chemicals.*

    - Hard water can cause excessive deposits of calcium carbonate in the ejector venturi area, causing reduced performance, These deposits can be easily cleaned by immersing the ejector nozzle in muriatic acid. It is only necessary to immerse the nozzle portion of the ejector, but the entire ejector may be immersed without damaging the ejector. DO NOT immerse the ejector mounting bracket. Flush thoroughly with clean water before returning to operation.

4.0 SERVICE / DISASSEMBLY

All components are easily removed from the mounting panel for service. Tubing connects each component and the tubing connectors are designed for easy disassembly and re-assembly. Before removing any components it is strongly suggested that the entire system be **flushed with clean water** while the ejector is running, to remove any concentrated chemicals. If this is not practical, extra care must be taken and **protective gloves, clothing and eye protection must be worn**.

Figure 5

4.1 EJECTOR

The ejector may be removed from the mounting panel without removing its mounting bracket. Before performing any service on the ejector, shut off the water supply to the ejector and the water in the main. Unscrew the two bolts on the front of the mounting bracket holding the ejector body. (FIGURE 5)

- CLEANING THE HIGH PRESSURE EJECTOR CHECK VALVE

    1. Unscrew the check valve assembly counter-clockwise from the ejector body (EJ-110). Wrench lugs are located on the underside of the check valve assembly if you cannot unscrew it by hand.

    2. *Carefully* lift the edge of the check valve (CV-150) (FIGURE 6) and inspect. Clean both the valve and the sealing surfaces with wood alcohol or apple cider vinegar. Do not use any solvents.

    3. When re-installing the check valve assembly, put a *small* amount of "Fluorolube" or Dow Corning DC33 silicone grease on the seat o-ring (OR-105) and seat gasket (GK-120) for lubrication. Screw check valve assembly (clockwise) into ejector body. USE NO TOOLS, HAND TIGHTEN ONLY.

Figure 6

- CLEANING THE LOW PRESSURE EJECTOR CHECK VALVE

    1. The low pressure check valve is housed inside the check valve assembly. Any cleaning or service requires disassembling the entire check valve assembly. Unless a leak is observed, or you wish to replace the low pressure check valve seat as preventive maintenance, it is recommended that you do <u>not</u> disassemble the unit. If disassembly <u>is</u> required, follow instructions under "Replacement", below, and always replace the low pressure check valve seat o'ring (OR-114).

- EJECTOR CHECK VALVE - REPLACEMENT

    1. HIGH PRESSURE CHECK VALVE: After inspecting the check valve as described above, if wear or damage is noted, the check

valve (CV-150) should be replaced. Grasp the outer edges of the check valve (CV-150) and apply a steady pulling force until the "umbrella" tip pops free. Be certain it is completely removed. Examine the check valve seat sealing surface for deposits and clean with wood alcohol or apple cider vinegar.

A. Check the seat sealing surface with a straight-edge to be certain that it is completely flat. If the center is slightly raised, you will see light under the straight-edge or it will "rock" over the center. If the seat sealing surface is not flat, use a very fine sand- paper or emery cloth on a flat surface (plate glass), and gently move the check valve seat in a *figure 8 pattern only*. Do not rub back and forth or the seat will become distorted.

B. Coat the tip of new check valve with a very light film of DC33 silicone grease. Put the tip of the check valve in the check valve seat hole and using the handle of a screwdriver or other rounded object, push against the center of the check valve until the tip snaps into seat. (FIGURE 7). **DO NOT TWIST CHECK VALVE OR DAMAGE MAY OCCUR**.

Figure 7

2. LOW PRESSURE CHECK VALVE: if water has been observed coming out of the tubing fitting on the check valve assembly, it will be necessary to disassemble the check valve housing, and replace the check valve seat o-ring, and possibly the check valve diaphragm if it is damaged.

A. Hold the check valve seat/outlet body (CV-110) with a wrench or place the wrench lugs in a vise. Using a 1 inch open-end wrench, place the wrench on the "outside" of the raised wrench lug on top of the check valve inlet body (CV-111). This is the side into which the vacuum fitting is screwed. Turn the inlet body counter-clockwise to unscrew it.

B. When disassembling, note the position of the diaphragm and spring. Usually, the spring will remain attached to the diaphragm bolt (CV-103) (FIGURE 8).

C. Inspect the check valve seat o'ring for dirt or deposits. The o'ring may be cleaned and re-used, but it is recommended that the o-ring be replaced whenever the unit is disassembled. (FIGURE 9). Inspect the check valve sealing surface on the diaphragm bolt (CV-103) and clean with wood alcohol or apple cider vinegar.

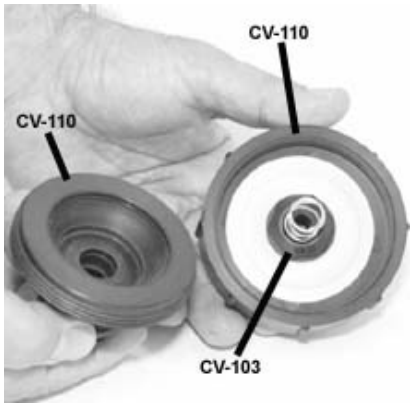


Figure 8

D. If the diaphragm (CV-104) has been damaged or has been severely distorted, it must be replaced. When re-assembling the diaphragm assembly, be certain that no dirt or debris is on the sealing surfaces of the diaphragm, the diaphragm bolt (CV-103) or nut (CV-105). Be careful when tightening the diaphragm bolt and nut to avoid tearing the diaphragm. (FIGURE 10)

E. Re-assemble by placing the spring and diaphragm assembly into the recessed hole in the outlet body (CV-110). Make sure that the diaphragm assembly is centered and carefully place the inlet body (CV-111) over the threads of the outlet body. Hand tighten until resistance is felt. Using a wrench or vise to hold the outlet body, and a 1" open-end wrench on the inlet body tighten down the inlet body until snug. DO NOT OVER-TIGHTEN.

F. Examine seat o-ring (OR-105) and seat gasket (GK-120)for wear or damage and replace if necessary. When reinstalling the check valve assembly, put a small amount of DC33 silicone grease on the seat o-ring (OR-105) and seat gasket (GK-120) for lubrication. It is recommended that Teflon pipe sealing tape be applied to the threads of the check valve assembly.

Figure 9

G. Screw check valve seat (clockwise) into ejector body. *USE NO TOOLS. HAND TIGHTEN ONLY*.

- CLEANING/INSPECTION OF EJECTOR NOZZLE

1. To remove the ejector nozzle for cleaning, the water pressure in the main must first be shut off unless the ejector was initially installed with a valve on the inlet side and a ball valve or corporation stop in the outlet so that isolation of the ejector is possible.

2. Loosen the nozzle and diffuser from the check valve body, using suitable wrenches. Unscrew the nozzle (EJ-130). The ejector body, the nozzle and the diffuser (EJ-150) are now separated. (FIGURE 11).

3. Nozzle plugging can be caused by:
   A. Piece of foreign material (pipe sealer, stone or dirt accumulation). This can be readily blown out or pushed out very carefully, with a wire in the reverse direction. Do not use sharp tools

Figure 10

or alter the size of the orifice in any way.

B. Excess plastic pipe solvent used during initial installation of inlet piping. If such solvent has chemically bonded to the nozzle orifice, the nozzle must be replaced.

C. Build-up of deposit. This could be a chemical build- up of iron, manganese or other material which usually can be removed by immersing the nozzle in muriatic acid and rinsing. CAUTION: Read all warning labels on Muriatic Acid bottle and avoid skin contact. It is recommended that safety goggles or face shield be used when working with any strong acid. Some waters are such that this build-up can cause an ejector to become inoperative every two months. If build-up is excessive and requires constant cleaning, you may consider the possibility of adding "sequestering" chemicals (such as hexametaphosphate) into the ejector water supply line. Consult local regulatory agencies before adding any chemicals to a potable water system. *NOTE: The 3-way valve cleaning system example shown in section 3.2 will also help to clean deposits which may form in the nozzle.*

Figure 11

- TO RE-INSTALL THE NOZZLE: Insert the nozzle through the ejector body and fasten to the solution diffuser outlet (EJ-150) using new gaskets (GK-125) on each side of ejector body and hand tighten only. Using wrenches of suitable size *tighten 1/4 turn ONLY*. These are plastic materials and excessive tightening may cause damage or can result in breaking of the nozzle threads.

- Re-install the ejector supply and the solution discharge hose or pipe. Connect the vacuum tubing. Open all valves and check for leaks, and check for proper vacuum. (SEE SECTION 2.1)

Figure 12

4.2 CLEANING LIQUID CHEMICAL FEED RATE ADJUSTMENT VALVE AND METERING TUBE

- Unscrew the rate valve plug assembly (RV-140) from the top of Remote Meter Assembly, and pull the plug assembly with steady pressure until it "pops" out of the rate valve seat. (FIGURE 12).

- Insert a nail or thin screwdriver *through* two of the four holes in the top of the rate valve seat. While holding the flow metering tube with one hand, turn the seat counter-clockwise. The metering tube will loosen and may be removed, (FIGURE 13).

- Continue unscrewing the rate valve seat until it is free of its threads. Grasp the rate valve seat and pull up until it pops out.

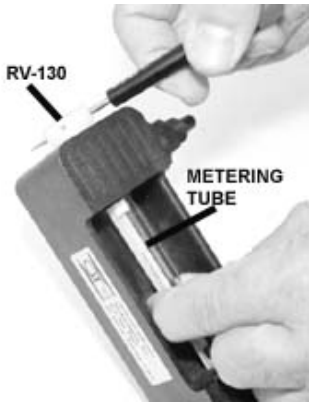


Figure 13

- To clean the rate valve plug (RV-140):

  1. Clean the silver tip and shaft using a cloth dipped in lacquer thinner or acetone. CAUTION: Do not use any lacquer thinner or acetone on o-rings. This can cause the material to soften or become damaged.

  2. Use a mild solvent, such as alcohol to clean o-rings. Examine the o'rings (OR-102) and make sure they are free of bruises or scratches. Replace if necessary. Use a light film of DC33 silicone grease on the o-rings and threads.

- To clean the rate valve seat (RV-130):

  1. Use a cotton swab (Q-Tip) with a small amount of wood alcohol and clean out the inside of the rate valve seat.
  2. If dirt or deposits have formed in the metering orifice of the rate valve seat, a pipe cleaner dipped in alcohol can be carefully inserted through the orifice and gently moved back and forth. (FIGURE 14).

  3. Clean the metering tube gasket surface with the cotton swab.

  4. Inspect and clean the rate valve seat o-rings (OR-103) with alcohol. Replace if damaged or worn.

- To clean the metering tube assembly:

  1. Use tweezers or needle nosed pliers and pull out the float stops on each end of the glass tube. MAKE SURE THE METERING BALL IS NOT LOST.

  2. Clean the inside of the glass tube with a pipe cleaner using wood alcohol and rinse thoroughly with warm water. Clean the metering ball float.

  3. Re-install ball float and float stops.

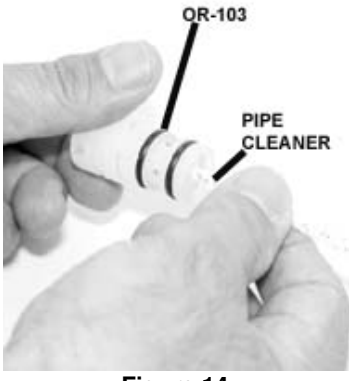


Figure 14

- Place Teflon pipe tape on threads of the rate valve seat (RV-130)and apply a thin film of DC33 silicone grease to the o-rings. Snap valve seat in place until the threads can engage. Turn the rate valve seat clockwise 1-1/2 turns.

- Replace the metering tube:

  1. The metering tube gaskets can usually be re-used. If damaged, replace them. Place one gasket on the bottom of the rate valve seat and one gasket in the recess of the flow meter body at the bottom of the metering tube area. (NOTE: some sizes of metering tubes use larger "Lip" type gaskets on the top than on the bottom).

  2. Center the top of the metering tube under the rate valve seat and center the bottom over the hole in the lower gasket.

  3. Using the rate valve removal tool (nail) or pliers tighten (clockwise) the rate valve seat while holding the metering tube in place with numbers of proper scale facing front. Be sure the tube is centered over the gasket holes. When the metering tube no longer can be rotated easily, tighten the rate valve seat another ¼ to ½ turn. Do not over tighten so as to squash the gaskets since this can cause a vacuum leak.

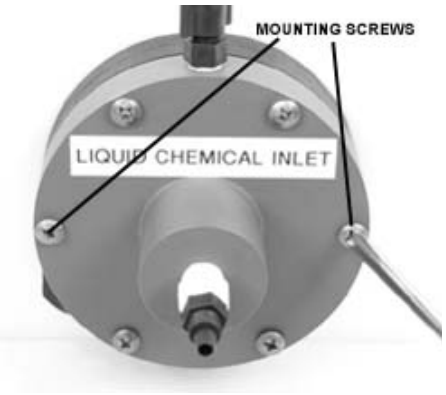


Figure 15

- Replace the Rate Valve Plug assembly (RV-140) by placing it into the top of the rate valve seat and gently pushing down until the O-ring pops into the seat and the threads can engage. Tighten down the rate valve a few turns.

Figure 16

4.3 DISASSEMBLY OF VACUUM REGULATOR

The vacuum regulator is attached to the mounting panel by the two vacuum regulator body bolts located on either side of the mid-point of the regulator, and are screwed into “tee-nuts” attached to the back side of the mounting panel. (FIGURE 15). Unscrew these two bolts and the vacuum tubing connector, and remove the regulator. It is necessary to disassemble the vacuum regulator in order to perform any cleaning or service of the inlet valve.

- Remove the four screws which hold the body assembly together and separate the body halves. (FIGURE 16).
- Grasp the diaphragm back plate (VR-141)* and pull the entire diaphragm assembly out of the front body. (*NOTE: VR-140 and VR-160 are assembled as VR-141). If the white guide pin is sticking in the front body, carefully use a nail to push the pin through from the front of the vacuum regulator. (FIGURE 17).

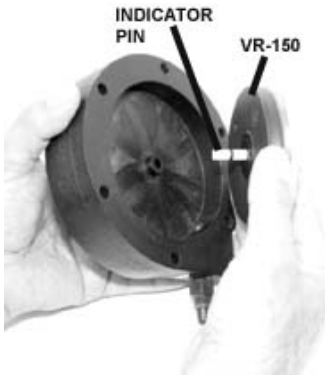


Figure 17

Figure 18

- Examine the diaphragm. It is normal for some wrinkles to be present. The diaphragms are made of special, very tough, chemical resistant material and failure is extremely unlikely. Should it be necessary to disassemble the diaphragm proceed as follows:

  1. Grasp both the front and back diaphragm plates and unscrew them. (FIGURE 18). If the plates cannot be unscrewed by hand you may use a vise to clamp one of the plates and use a strap wrench or marine deck plate spanner wrench to unscrew the other.

  2. The diaphragm can now be removed. *Note the position of the "convolution" on the diaphragm.* **The raised portion should always face the back of the chlorinator when installed.**

  3. Clean the parts thoroughly using wood alcohol or Apple Cider vinegar, and carefully inspect the o-rings for damage or wear and replace if necessary.

- **CLEANING THE INLET VALVE AND SEAT** (FIGURE 19)

  1. Remove the vacuum tube fitting (if used) from the regulator liquid inlet. Then unscrew the adaptor bushing, if used. All pipe and tubing fittings must be removed from the vacuum regulator inlet before attempting to disassemble the inlet valve for cleaning or service.

  2. To disassemble the inlet valve:

     A. Insert a flat bladed screwdriver into the inlet hole, and carefully engage the slot in the inlet valve plug (IV-930).

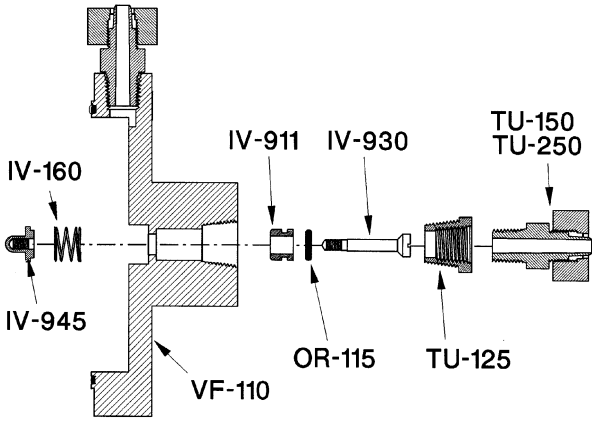


Figure 19

Use a small pliers to hold the Inlet spring guide (IV-945) and turn the screwdriver counter-clockwise to unscrew the inlet valve plug from the inlet spring guide. (FIGURE 20).

B. Remove the inlet valve plug (IV-930) and inlet spring (IV-160).

C. Remove the inlet valve seat (IV-911) from the regulator back body by inserting a round object which is slightly smaller than the hole in the back body (ex: a small socket), through the hole from the diaphragm side, and push the inlet valve seat out of the inlet. Be very careful not to damage the seat which is made of Teflon. Do not attempt to pull the seat out from the inlet side - you will damage the valve sealing surface. (FIGURE 21)

D. Carefully remove the valve seat o-ring (OR-115) from the seat. Inspect the sealing surface of the inlet valve seat (IV-911). This surface must be completely free of dirt, nicks, or scratches. A magnifying glass gives a good indication of the quality of the seat. Use a cotton swab dipped in lacquer thinner, acetone or alcohol to carefully clean the seat. DO NOT attempt to clean the seat with a sharp tool. If the seat shows any sign of damage it must be replaced.

E. The inlet valve pug (IV-930), spring (IV-160) spring guide (IV-945) and valve seat without o-ring (IV-911) can be immersed in laquer thinner or acetone to remove deposits. If any deposits remain they may need to be cleaned with muriatic acid or soaked in vinegar.

F. The inlet area of the regulator back body should be free of deposits or foreign material. DO NOT USE SOLVENTS SUCH AS LAQUER THINNER OR ACETONE TO CLEAN ANY PART OF THE VACUUM REGULATOR BACK BODY. Use apple Cider vinegar or alcohol. If deposits persists, you may need to dip the back body in muriatic acid.

G. Rinse all parts in clean water before re-assembly.

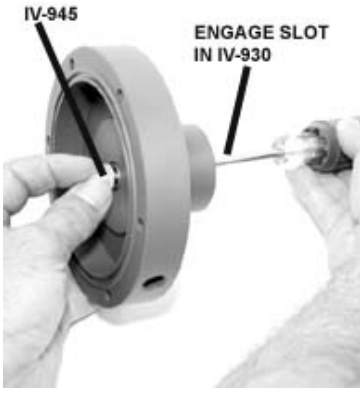


Figure 20


Figure 21

- **RE-ASSEMBLING THE INLET VALVE**

1. Slip the valve seat o-ring (OR-115) over the inlet valve seat (IV-911). A very small amount of DC-33 silicone grease may be used. This will also aid in the insertion of the valve seat into the regulator back body.

2. Place the valve seat, beveled end first, into the inlet of the regulator back body, being careful not to damage the sealing surface. Push the valve seat down into the inlet until it bottoms against the back body inlet area. A short piece of vacuum tubing is usually good for this purpose, or use a flat round object which has a larger diameter than the center hole of the valve seat (FIGURE 22). You must be careful not to damage or scratch the inblte valve seat sealing surface. Turn the back body over and check to be certain that the white inlet valve seat is tight against the grey PVC hole (FIGURE 23).

Figure 22

Figure 23

3. Place the inlet valve plug (IV-930) into the inlet hole and allow it to drop through the inlet valve seat. Insert a flat bladed screwdriver into the inlet hole, and carefully engage the slot in the inlet valve plug (IV-930). Place the inlet valve spring (IV-160) and spring guide (IV-945) over the inlet valve plug threads and screw the inlet valve plug into the spring guide with the screwdriver while holding the spring guide with your fingers (FIGURE 24). Once the threads have engaged continue to screw the valve plug into the spring guide until the guide bottoms against the flat portion at the base of the inlet valve plug threads. DO NOT OVERTIGHTEN.

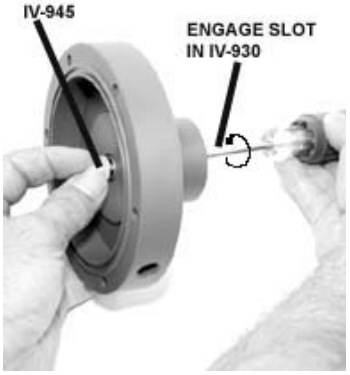


Figure 24

4.4 REASSEMBLING THE VACUUM REGULATOR

- Inspect the OR-108 diaphragm body o-ring for wear or damage and replace if necessary. Be ceratin that the OR-108 o-ring is properly seated.

- Replace the diaphragm assembly in the front body and be certain it moves freely in the front body. Press it forward several times to be certain it returns to the “neutral: position. (FIGURE 25)

- Place the back body on a table with the diaphragm body seal o'ring (OR-108) in place and lower the front body onto it.

- Grasp the entire unit and turn it over so the back body is on top and re-assemble the four screws, but not the two mounting screws (See FIGURE 15 to identify screws). These screws should be run in until they just begin to tighten. Do not insert the two mounting screws until you are ready to re-mount the vacuum regulator on the mounting panel.

- When re-mounting the vacuum regulator on the mounting panel. Insert the two mounting screws and run them into the “tee” nuts in the mounting panel until they just begin to tighten. Tighten all bolts in a criss-cross pattern until they are all snug. Do not over tighten. Sealing is accomplished by the large o'ring between the bodies (OR-108). **THERE SHOULD BE A GAP OF APPROXIMATELY 1/16" (1.6mm) BETWEEN THE TWO BODY HALVES. DO NOT ATTEMPT TO CLOSE THIS GAP BY TIGHTENING THE BODY SCREWS.** (FIGURE 26).

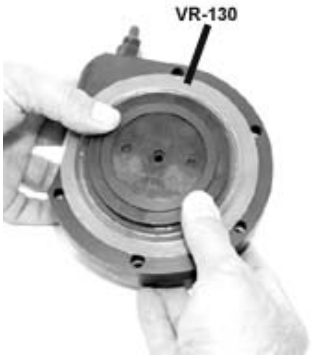


Figure 25

Figure 26

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