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## Mass Spec will not pump down Applies to 5973A/N MSD

There are several situations that could cause the 5973A/N to have problems pumping down. The following scenarios should help in isolating problems related to pumping down the 5973A/N and establishing a good working vacuum:

- Bad Hivac Pump (Turbo Or Diffusion Pump)
- Turbo Pump Over Speed
- Diffusion Pump Is Or Was Too Hot
- Leak At Gc Injection-Port
- Leak At Mass-Spec Interface
- Leak At Analyzer Door O-Ring
- Analyzer Door Thumb Screws To Tight
- Broken Column
- Column Flow Too High

### OPERATION OF HIVAC PUMP

The 5973A/N has several built in diagnostics to inform you of the operation of the Mass Specs vacuum system. Understanding what the system is trying to tell you is paramount in determining problems with pumping down the Mass Spec. The first thing is to determine the status of the vacuum system, which can be done by selecting

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[VACUUM DIAGNOSTICS] on the ChemStation. The 5973A/N can have one of two different vacuum systems, either a diffusion pump based system, or a turbo pump based system. The info you get will be slightly different depending on which system you have, so refer to your hardware manual for the particulars on the type of vacuum system that you have. From vacuum diagnostics it can be determined, for the most part, if the vacuum system is working properly. The following scenarios are just a few possible problems that could occur; refer to your hardware manual for further details.

### **TURBO PUMP OVER SPEED - (turbo pump systems only)**

This error is usually the result of a massive air leak around the analyzer door O-ring, the result of not pressing on the ends of the analyzer door during the initial moments of pump down. To correct this, verify that the rear thumbscrew is loose and the front thumbscrew is snug only. Then press in on both ends of the analyzer door until the vacuum can cause a seal between the analyzer door and the analyzer door O-ring.

### **DIFFUSION PUMP IS OR WAS TOO HOT- (diffusion pump systems only)**

This is an indication that, at sometime, the diffusion pump overheated. This can be caused by the diffusion pump being low on oil, the diffusion pump cooling fan not running or running too slowly. The error can also mean a problem with electronics or diffusion pump temperature switches. If this error appears, the easiest check to perform is to verify that the cooling fan is spinning properly. This is subjective, because the fan could be spinning, but not spinning fast enough. If the fan appears to be turning slowly or not at all, the fan needs to be replaced.

Also, if the diffusion pump oil level is too low this can also cause an overheating problem. If the user feels comfortable with the diffusion pump maintenance procedure in the hardware manual, the oil level can be checked. (Only perform this procedure if you are comfortable with the procedure outlined in the hardware manual.) Finally, if the **TOO HOT** temperature sensor fails, or the electronics reading the inputs from this Sensor fails, the system could report an erroneous **TOO HOT ERROR**. Unless you are familiar with troubleshooting and changing these temperature sensors, **ONSITE SERVICE OR TECHNICAL SUPPORT IS RECOMMENDED!**

### **DIFFUSION PUMP TOO COLD - (diffusion pump systems only)**

This error indicates that the system determined the diffusion pump is too cold for normal operation. This can be caused by several factors. The first thing to check is to verify that the foreline pressure is **BELOW 300 mtorr**. If the foreline pressure is **ABOVE**

300 mtorr the system will not allow power to the diffusion pump, this will cause a diffusion pump too cold condition. Foreline pressure above 300 mtorr, and not dropping, can be an indication that your system has a leak, which is covered later in these troubleshooting procedures.

Next determine if the diffusion pump is actually cold. You can do this by placing your hand next to the diffusion pump air vent ( CAUTION DO NOT PHYSICALLY TOUCH DIFFUSION PUMP, IT COULD BE HOT), then notice if the air being blown out the vent appears to be cool or warm. If the vented air feels cool and the foreline pressure is good (below 300 mtorr), it could indicate that the diffusion pump heater has burned out or problems with the electronics controlling power to the diffusion pump heater. If the vented air feels warm this could indicate that the pump is still operating properly, but the possibility exists that either the too cold sensor or the electronics that read the input from this sensor has failed, giving an erroneous or false error message. Unless you are familiar with troubleshooting the temperature sensors and diffusion pump system, TECHNICAL SUPPORT or ONSITE SERVICE IS RECOMMENDED!

## LEAK AT GC - INJECTION PORT

After it's determined that the pumping system (DIFFUSION/TURBO and ROUGH PUMP) are functioning, the easiest way to troubleshoot the system is by isolating half of the system. In this case, remove the column from the injection port of the GC and cap off (plug) the column by pressing the column end into a septum.

**NOTE:** If your column is at least 30 meters long or longer and 0.25mm id or smaller, you should be able to remove the column without venting the system. However don't take your time about plugging off the column.

Allow the system to continue to pump down for a reasonable time to establish if the problem has been corrected. If the problem is corrected by capping off the column, then we can assume the Mass Spec and the column as it's installed into the Mass-Spec Interface is OKAY. Troubleshooting can now be confined to problems at the injection port or column flow rate being too high.

If problems still exist, proceed to the next section.

## LEAK AT MASS SPEC INTERFACE

## LEAK AT ANALYZER DOOR O-RING

**NOTE:** Anytime that the 5973A is vented and you're pumping down from atmospheric pressure, "IT IS EXTREMELY IMPORTANT TO PUSH IN ON THE FRONT AND REAR OF THE ANALYZER DOOR UNTIL THE VACUUM CAUSES A SEAL BETWEEN THE O-RING AND THE ANALYZER DOOR.

In this step it is necessary to perform the mass spec vent procedure. After the Mass Spec has been vented, remove the column from the Mass Spec interface. At this point it makes sense to check the condition of the analyzer door o-ring. The o-ring should be free of cuts, nicks, flat spots and pieces of particulate. The o-ring, the groove that the o-ring seats in and the analyzer top plate surface that the o-ring seals against, should be cleaned by wiping off with a lint free cloth and isopropyl alcohol or methanol.

Cap off (plug) the Mass Spec interface by using a blank ferrule (ferrule without the whole). If you have no blank ferrules, install a short length of column into the Mass Spec interface using a new ferrule and brass interface nut in just the same way you would install a regular column; then cap off (plug) the short length of column by pressing on a septum. The analyzer door has 2 thumbscrews, the thumbscrew at the rear should not be tightened at all, while the thumb screw at the front should only be snug. Pump the Mass Spec down and allow an appropriate pump down time to determine if the problem has been corrected.

**NOTE:** It is important to push in on both ends of the analyzer door when initially pumping down the mass spec until the vacuum causes the analyzer door to seal against the o-ring.

At this point if the Mass Spec pumps down then we know that the Mass Spec Interface and Mass Spec are OKAY. If we are satisfied that everything is okay, it's time to reinstall the column and make another attempt to pump down the Mass Spec.

**NOTE:** You can pump the system down in stages to verify everything as you go. To do this, install the column, "using a new ferrule", into the Mass Spec interface and plug the injection port end of the column just like we did before.

Pump the system down. If everything checks out okay, remove the septum plug from the injection port end of the column and install column into the GC injection port.

## **ANALYZER DOOR THUMBSCREWS**

There are two analyzer door thumb screws, one at the front and one at the rear of the analyzer door. During normal operation the rear thumbscrew should not be tightened at all, the front thumbscrew should only be snug. The purpose of the thumbscrews are not to facilitate achieving good vacuum, but to protect the analyzer door from swinging open during shipment or in an event of loss vacuum. Over tightening the thumb screw could cause uneven pressure between the analyzer door and the o-ring, which may make it impossible to achieve a good working vacuum.

## **BROKEN OR CRACKED COLUMN**

If there was a problem pumping down with the column plugged, then shut the system down and check column basket for a possible broken or cracked column.

## **COLUMN FLOW TOO HIGH**

Remember to always verify flow rates into your 5973A/N. The particular pumping system that you have, Turbomolecular or Diffusion pump, will determine the flow rates that your system is designed to handle. Refer to your hardware manual for the flow ratings of your particular pumping system. Also, using columns with internal diameters of 0.32mm id or larger could make it difficult to achieve proper vacuum or to set proper head pressure on the column.

If problems still exist, technical support or onsite service is recommended!