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Mass Spec Will not Pump Down Applies to 5971A MSD

Possible Causes for This Problem

There are several situations that could cause your 5971A to have problems attaining a working vacuum, the following scenarios should help you in isolating problems related to pumping down the 5971A and establishing a good working vacuum:

- BAD DIFFUSION PUMP/TEMPERATURE SWITCHES/COOLING FAN
- DIFFUSION PUMP IS OR WAS TOO HOT
- DIFFUSION PUMP TOO COLD
- LEAK at GC INJECTION-PORT
- LEAK at MASS-SPEC INTERFACE
- LEAK at ANALYZER BOOT SEAL
- ANALYZER SHIPPING CLAMPS INSTALLED
- BROKEN COLUMN
- COLUMN FLOW TOO HIGH

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The information contained herein is intended for use by informed individuals who can and must determine its fitness for their purpose.

BAD DIFFUSION PUMP / TEMPERATURE SWITCHES / COOLING FAN

The 5971A has several built in diagnostics to inform you of the operation of the systems diffusion pump. Understanding what the system is trying to tell you is paramount in determining problems with pumping down the Mass Spec. The first thing to do is to determine the status of the diffusion pump, "which can be done by going into [VACUUM DIAGNOSTICS]". From there it can be determined if most operations concerning the diffusion pump are operating normally.

A message of "**DP heater on, Diffusion pump HOT**" is a normal indication that the diffusion pump is operating normally. Any message indicating that the **diffusion pump is cold** (except directly after turn on), **diffusion pump is or was too hot** or **system in vent status** (except when actually venting the Mass Spec) are all indications of a possible problem.

DIFFUSION PUMP IS OR WAS TOO HOT

This indicates that the Mass Specs diagnostic system has generated a signal that the diffusion pump has at sometime overheated. This can be caused by the diffusion pump being low on oil, the diffusion pump cooling fan not running or running too slowly or a problem with electronics or diffusion pump temperature switches. If this error appears, then the easiest check to perform is to verify that the cooling fan is spinning properly, (which is subjective), because the fan could be turning, but not turning 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 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 switches, **ONSITE SERVICE OR TECHNICAL SUPPORT IS RECOMMENDED!**

DIFFUSION PUMP TOO COLD

This error indicates that the system believes that the diffusion pump is too cold for normal operation. This can be caused by several reasons. 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 the diffusion pump to turn on and 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 (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 TOUCH THE VENT ITSELF, IT COULD BE VERY 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), this could indicate that the diffusion pump heater has burned out or indicate 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, "in other words the system is 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 and ROUGH PUMP), are functioning, then the easiest way to troubleshoot the system is by eliminating half of the system. In other words 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 .25id 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 have proved that in all likelihood 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.

Remember, the column flow rate should be limited to 1ml/min or less to be able to establish a good working vacuum.

IF PROBLEM STILL EXIST proceed to the next section.

LEAK AT MASS SPEC INTERFACE

LEAK AT ANALYZER BOOT SEAL

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 boot seal. The seal should be free of cuts, nicks, flat spots and pieces of particulate. The seal, the manifold surface and the analyzer top plate surface that it 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 hole). In the case where 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.

Pump the Mass Spec down and allow an appropriate pump down time to determine if the problem has been corrected. At this point, if the Mass Spec pumps down then we know that the Mass Spec Interface and Mass Spec is OKAY.

NOTE: During initial pump down, it maybe necessary to push down lightly on the top of the analyzer until the vacuum is able to pull the analyzer top plate down and makes a seal on the boot seal.

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. Install the column in the interface and plug the injection port end of the column just like we did in the previous procedure.

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

ANALYZER SHIPPING CLAMPS INSTALLED

Analyzer shipping clamps should not be tightened during normal operation of MassSpec. These clamps are only designed for keeping the analyzer in place during shipping or moving the Mass Spec over an extended distance. These clamps if used during normal operation can actually impede the ability to achieve a good working vacuum or if vacuum is achieved can cause an air leak. Either remove clamps completely and store in drawer or loosen the clamps enough so that they don't exert any pressure on the analyzer top plate.

BROKEN OR OBSTRUCTED COLUMN

If there was a problem pumping down with the column obstructed or broken, then shut 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 5971A since the pumping system is designed to handle flow rates up to, but not exceeding 1 ml/min. Also, using columns with internal diameters of .32 or larger could make it difficult to achieve proper vacuum or to set proper head pressure on the column.

IF THE PROBLEM STILL EXISTS, THEN TECH SUPPORT OR ONSITE SERVICE IS RECOMMENDED!!!