AMS Hardware Updates, Tips and Tricks

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AMS User’s Meeting 2015
9/13/15
V84 Testing
V84 Testing

- V84 installed on P3 of BNL CToF
- Using PCB V84 Controller
- V84 has V70 size threads and V84 size o-ring for vent port
- Using V70 KF fitting at vent port, o-ring not ideal
V84 Issues

• **Cooling is critical.** We had a V84 running under NO LOAD for 1 month, with no cooling.

• The pump overheated and failed...

• We had a V70 and a V81 running on the same system for the same time period, also without cooling, without an issue.

• Another V84 pump has been running for 2 weeks, with cooling, and has not gotten above 31°C.
V84 Issues

• Vent Port uses V70 size threads, but a larger O-Ring. The adapters supplied by Agilent have the same O-Ring as the V70, which is inconsistent with the V84 default O-Ring. Agilent is looking into creating a KF16 to M5 connector with the proper O-Ring size. (Aerodyne has leak checked, and it does not leak, even with the smaller O-Ring.)

• Vent port is in a slightly different location compared to V70 and V81. Using V84 on P3 or P4 will require some minor plumbing changes to the AMS.

• V84 is wider than the V81 or V70. This means that ARI’s fan mounting system will not work, and we need to figure out other means to mount a fan.
Summary

• Cooling is critical!!

• Minor Replumbing will be necessary.

• Necessary adapter fittings are still a work in progress.

• More testing needs to be done:
  • V84 on P4 and P6.
  • With V70 and V81 controllers. (Agilent says that it will work with all three.)
Some Interesting Issues That Have Come Up Recently
My software froze and when I restarted it the filament wouldn’t light on my SP-AMS? What is wrong do I need to remove the ToF replace the filament?

• Make sure your software is attempting to light the correct filament. On many SP-AMS systems filament #2 is the only one that is connected. If the software defaults to filament #1 and you try to turn on the filament it wont light. Switch to filament #2.
I replaced the MCPs and now I have no signal. What could possibly be wrong?

First check connections is a cable not reattached including those two on the other side of the ToF

Some other possibilities
Broken grid wires.

Take extra caution not to touch grid wires...

Drift Voltage Tab must press against Drift Tube inside of TOF
• We have recently had the case of filaments repeatedly blowing in AMS’s
If filament is severely blown suspect LVS module in TPS
Heater Removal

- Heater Power Wires
- Thermocouple Connection
- Screws to hold heater on
END
AMS Maintenance Tips

- Clean vacuum chamber surface
- Check for loose/missing connections/fasteners
- Check for stressed cables
- Always monitor pump performance
- Always monitor MD1/Lens pressures (load/no load)
- Clean cooling fan filters
- Dirt inside computer
- “Dirt” on computer HD (clean up and defrag)
Clean exposed surfaces

Corrosion

Salt corrosion

Rust
Missing fasteners

Aluminum dust

Missing fastener, chaffing metal
Dust and Electronics are mortal enemies!
Inspect Shipping Container

Fork Lift Damage

Don’t leave instrument in the shipping container
A Case Of Extreme Shipping Damage

Lesson: This really shows how hard your instrument could be jerked around in transport. Be careful when selecting transport. This crate was knocked over in transport.
Typical Pressures (Torr)

<table>
<thead>
<tr>
<th></th>
<th>No Load</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD1</td>
<td>~1.5</td>
<td>~4.0</td>
</tr>
<tr>
<td>Lens</td>
<td>~0.00</td>
<td>~1.3</td>
</tr>
</tbody>
</table>

Know what they are on your specific AMS, so you can note any changes.
What are the operating currents for all pumps?

<table>
<thead>
<tr>
<th>Pump</th>
<th>Gas Load Off (mA)</th>
<th>Gas Load On (mA)</th>
<th>Delta T* (Degrees C/Closed/Open)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>~ 450</td>
<td>~ 850</td>
<td>9/13.3</td>
</tr>
<tr>
<td>P3</td>
<td>~ 250</td>
<td>~ 300</td>
<td>9/9.3</td>
</tr>
<tr>
<td>P4</td>
<td>~ 200</td>
<td>~ 250</td>
<td>6/5.9</td>
</tr>
<tr>
<td>P5</td>
<td>&lt; 200</td>
<td>&lt; 200</td>
<td>6.2/6.5</td>
</tr>
<tr>
<td>P6</td>
<td>~ 200</td>
<td>~ 200</td>
<td>9.6/9.6</td>
</tr>
</tbody>
</table>

*Delta T = Pump Temp – Ambient Temp

Record Pump Data with Pump Control Software
Pump Speeds

<table>
<thead>
<tr>
<th></th>
<th>Speed (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>963</td>
</tr>
<tr>
<td>P3</td>
<td>1250</td>
</tr>
<tr>
<td>P4</td>
<td>1100</td>
</tr>
<tr>
<td>P5</td>
<td>963</td>
</tr>
<tr>
<td>P6</td>
<td>1150</td>
</tr>
</tbody>
</table>
The current and/or temperature of Pump “X” has recently increased. I think it may fail soon, is there something I can do?

• One may be able to exchange the pump before it actually fails. Hopefully you have been recording pump data before and after the current/temp change. Having the data showing the changes of the pump characteristics makes it easier to prove to Agilent that an exchange is necessary.
A pump failed on my AMS, what is the best way to store the instrument until I can obtain an exchange pump?

- Close the inlet valve, and let the MD1 diaphragm pump evacuate the chamber.

  Doing this, at least you will know that the chamber is ~2 Torr, which should save the MCP.
I am bringing my AMS to a location where I expect frequent power outages, what can I do to protect the AMS?

• Make sure that all interlocks are functioning as they should. See interlock troubleshooting power point.

• Use a UPS. Interlock Description & Troubleshooting.ppt
Interlock Explanation

• Master Interlock
  • Software Interlock
  • Polls all pumps
  • If any pump has an error, shuts down all pumps

• Ionizer Interlock
  • P5 falls below 90% of full rotational speed
  • Red LED on TPS, shuts off High Voltages

• Vaporizer Interlock
  • P4 and/or P6 fall below 90% of full rotational speed
  • Heater LED and Heater Power LCD on EB shut off
  • Shuts off power to Vaporizer
Leak Checking Tricks
If the Airbeam (m/z 28,32,40) has a diff/closed ratio of < 2 you probably have a leak.

Note: Incorrect chopper servo alignment can also cause these symptoms.
Determine where leak is by examining magnitude of signal

If the leak is in the PToF region, the difference Airbeam will be attenuated and the closed AB will not be changed too much from normal.

If it’s in the detection region, the difference AB will be about the same as normal, but the closed air signal will have an elevated background.
Using ToF as Leak Checker

- He or Ar are good choices.
- Using He may require a change in the timing window.
- Use controlled bursts of gas, don't “flood” system.
- Depending on where the leak is, may need to wait several seconds for a response.
Filament Installation
Install filaments such that they are as parallel as possible to the ion cage. Be EXTRA careful when installing that nothing is shorting. The ceramic washer is critical, as it isolates the filament from ground.
This side down!
I replaced a filament, it turns on, but the emission current is different than before. Why?

- No two filaments are alike, and the new filament will need a different Filament Current to obtain the same emission current.

- When you turn on the filament, reduce the filament current to 0A, and bump it up a little at a time until you obtain the desired emission current.
Tuning Tip:

• Tune *both* Filaments *before* leaving for the field.
  • This can save time and possibly prevent one from having to vent while in the field. Also, sometimes a filament does not tune as well as one would like, so one may get a better tune with the second filament.
Vmode Bleed Through in Wmode
Lens = 3100V

Lens = 2000V
I Lost my PToF signal, what can I do to fix?

• PToF Issues are usually chopper related. The first thing to check is that the chopper is a clean square wave, and that it is set to a reasonable frequency. If that is not the case, follow the chopper calibration procedure.

[Chopper Frequency Calibration.ppt](#)

• If the chopper is okay, the problem may be that the NI-6024e card is “hung up” and needs to be reset. Don’t just simply restart the computer, but shut it down, and unplug for several seconds.