Agilent Purification System, LAB EXERCISE

LAB TITLE

Getting familiar with the Agilent G9300A, G9301A, G9306A, G9302A and 9303A Preparative Pumps.

Lab Objectives

The purpose of this LAB is to familiarize yourself with the Agilent G9300A, G9301A, G9306A, G9302A and G9303A preparative pumps repair procedures and diagnostics. These pumps are also known as 210/218 or SD-1 pumps

The LAB is divided into four parts:

1) Module Repair Procedures for the 210/218 pumps
2) Module Repair Procedures for the SD-1 pumps
3) Pump Diagnostics
4) Resonance adjustment procedures for the 21x and SD-1 pumps

Created by Petro Van Poppel, 16 April 2013

1)Modular repair procedures for 21x pumps

***IMPORTANT:* Use the Service Manual, General LC Assembly Drawings and any other instructions in this LAB**

a) Un-plumb and un-stack your solvent delivery system. **Beware of leaking solvents!!!**

b) Check the operational voltage setting and adjust if necessary.

c) Using proper anti-static precautions (in your tool box), open your pump and practice removing the following assemblies:
   i) Pump head
   ii) Mixer and/or Pressure module
   iii) Power supply **(be careful with the correct grounding and fan cable installation)**
   iv) CPU board
   v) Cooling fans **(note correct air flow direction!)**
   vi) Cam/Motor assembly **(don't remove motor from the CAM assembly)**

d) Switch over the cam follower wheels.
(just rotate them)

e) Find the display contrast and adjust this.
(if you can't find where, try and use common sense ☺)

f) Check the pump resonance and adjust if necessary.
(follow the instructions in section 4A – Resonance adjustment procedure 21x)

g) Reset the main board; which methods can you use:
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h) Open the pump head and replace the seal for the same one.
(make sure to pre-wet the seal with IPA)

i) Carefully put all parts back together.

j) Re-stack and configure the pump(s) correctly.
(set ID's including CIM, check pump head size, set min/ max pressure, set pressure error behaviour, set piston stroke, set compressibility factors)

k) Make pump operational, prime and flush with water (3 times the head volume).
(plumbing, wiring, communicate with OpenLAB)

2)Modular repair procedures for SD-1 pumps

a) Un-plumb and un-stack your solvent delivery system. **Beware of leaking solvents!!!**

b) Check the operational voltage setting and adjust if necessary.

c) Using proper anti-static precautions (in your tool box), open your pump and practice removing the following assemblies:
   i) Pump head
   ii) Transducer board, pump driver boards and CPU board
   iii) Pump drive assembly
   iv) Power supply **(be careful with the correct grounding and fan cable installation)**
   v) Cooling fans **(note correct air flow direction!)**

d) Check/adjust the head drive flags.
(make sure to use the Service How To)

e) Find the display contrast and adjust this.
(if you can't find where, try and use common sense ☺)

f) Check the pump resonance and adjust if necessary.
(follow the instructions in section 4B – Resonance adjustment procedure SD-1)

g) Open the pump head and replace the seal for the same one.
(make sure to pre-wet the seal with IPA)

h) Carefully put all parts back together.

i) Re-stack and configure the pump(s) correctly.
(set ID's including CIM, check pump head size, set min/ max pressure, set pressure error behaviour)

j) Make pump operational, prime and flush with water (3 times the head volume).
(plumbing, wiring, communicate with OpenLAB)

3)Pump diagnostics

a) How can you prime the pump, using the pump itself? What are important details to remember, when doing this?
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b) How can you best remove air from a piston chamber?
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c) Measure the flow rate accuracy and if need be, adjust.

d) How do you adjust the flow rate on the 21x pumps?
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e) How do you adjust the flow rate on the SD-1 pumps?
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f) Check the pressure read out:

i) Connect two pumps to build a gradient system with water on pump A and 0.5% acetone on pump B.

ii) Connect the preparative restriction capillary, disconnect the fraction collector.

iii) Create median flow on both pumps and set the channel 1 wavelength to 265nm.

iv) Open the Online Plot with the signal of channel 1 and of the pressure on screen. Check the pressure signal (fluctuation) against channel 1 with different solvent compositions.

v) Play with Compressibility settings to see the influence of wrong compressibility with prep pumps.

4)A *Resonance Adjustment Procedure 21x*

a) **Remove pump head if connected** and press the “FLOW” key and set the flow to 200 ml/min and time to 2 minutes.

b) Press the “RUN” key and verify that the pump is turning clockwise when viewed from above. Listen for resonance and irregular noise (note that resonance at 80 ml/min is normal).

c) When the pump speed reaches 140 ml/min, press the “HOLD” key.

d) Adjust R149 to minimize the resonance at 140 ml/min.

e) Press the “RUN” key and allow pump to continue to 200 ml/min. Observe resonance noise has not increased, DO NOT adjust R149 unless absolutely necessary.

f) Install a tested **25ml pump head**. Plumb the system with a restrictor to recycle from a bottle of clean 50/50 water/IPA mix.

g) Press the “SETUP” key followed by the “DOWN” key to enter into setup mode. Change the Head Size (HdSz) to 25ml using the arrow keys.

h) Press the “PRESSURE” key and zero the pressure reading using the arrow keys. Set the maximum pressure to 4600 psi and press “ENTER”.

i) Press “FLOW” key and set flow to 25 ml/min and time to 2 minutes. Press “RUN” and allow pump to ramp to maximum flow. Verify resonance has not increased.

4)B *Resonance Adjustment Procedure SD-1*

a) Note settings of R55, R57, R84 and R85 on the drive board, so that they can be returned to their original position later, if necessary.

b) Run a flow of 10% of the maximum flow rate with a backpressure of at least 500PSI, and increase or decrease to find the loudest resonance.

c) Adjust the “zero” pots (R55 and R85) for minimum resonance using a long insulated screw driver.

d) Adjust the “gain” pots (R57 and R84) for minimum resonance.

e) If the resonance gets worse, return all pots to their original settings.