



PPMS Service Note 1070-311

Bent Pins Inside the Sample Chamber

It has come to the attention of Quantum Design that there has been an increase in the instances of sample chambers with bent pins. We would like to prevent the system down time that is associated with such a costly repair. Accordingly, here are a few simple steps, that when used, will reduce the likelihood of damaging the pins at the bottom of the sample chamber. Also, attached are some instructions that detail the proper method of removing foreign debris from the sample chamber.

Preventive Measures

- Only insert QD pucks, or puck interfaces (Rotators, coil sets, He3...), into the sample space.
- Periodically check pucks for loose screws, especially the screw located on the bottom of the puck. Over time, with thermal cycling the screws can work themselves loose to the point of falling out.
- Before inserting new pucks into the sample space, use the provided puck adjustment tools (2 stainless steel rings: one to expand puck fingers, the other to compress the puck fingers) to help ensure the proper fit.
- Before placing pucks into the sample space, check that the puck fits securely into the extraction tool. With the puck all ready inserted into the extraction tool, gently pull on the puck. It should stay in place. Also rotate the puck, while still in the extraction tool; the puck should not come free. If not please contact QD service.
- When using the extraction tool, do not touch the lever on the top until you are ready to release the puck.
- Keep the sample space covered when not inserting/removing samples, or option hardware (Rotators, coil sets, He3...).
- If anything falls into the sample space, use the “Safe Removal Instructions” discussed in detail below to remove the items. DO NOT try to “fish” anything out of the sample chamber.



Example of damage pins removed from a sample chamber.

Safe Removal Instructions

These instructions will detail a way for a user to remove loose items safely from the bottom of the PPMS sample chamber. They detail a process in which the sample chamber is removed from the PPMS probe while it is still in liquid helium. As long as the instructions are followed closely, there is minimal risk of plugging the PPMS impedances. If you are unsure or nervous about performing any step in the following process please contact a Quantum Design service representative before proceeding.

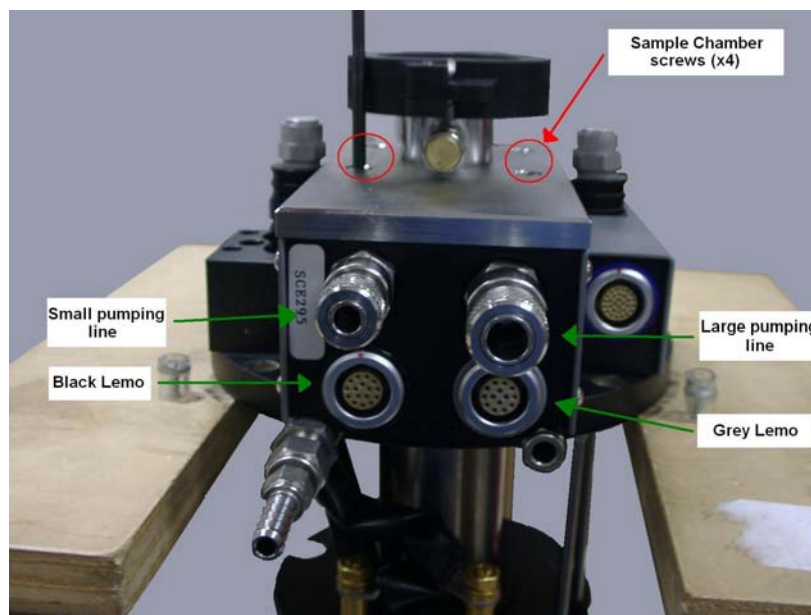
System Status: It is assumed that the chamber is empty except for the sample, dropped puck, or other debris.

- Magnetic field stable at 0 Oe.
- Temperature stable at 320K for at **least** 30 minutes (this step is key to avoid plugging the PPMS probe) before proceeding.
- Vent the sample chamber.

Removal of sample chamber: The speed with which you perform the next 3 steps will help insure minimal damage to the PPMS cooling annulus and impedances. Ideally, the total time the sample chamber is removed from the PPMS is less than 20 minutes.

- Remove the baffle set and KF-40 centering ring assembly (if installed).
- Remove the high vacuum system (if applicable).
- Use the 5/32" ball driver to remove the four (4) bolts that secure the sample chamber to the PPMS probe.

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- Unplug the grey Lemo (from the probe end).
- Unplug the small (stainless steel) pumping line.
- Unplug the large (stainless steel) pumping line.
- Unplug the black Lemo (from the probe end).
- Turn off the model 6000.
- Pull the sample chamber straight up and out of the PPMS probe.
- Cover the now exposed cooling annulus with a sheet of paper (to protect the o-ring and prevent anything from falling into the annulus).

Cleaning the sample space:

- Slowly turn over the sample chamber so that any loose items can freely slide/fall out. For more persistent items you may need to do the following:
 - With the sample chamber upright, pour in some alcohol, or acetone, and gently swish (or agitate) the fluid in the sample space.
 - Slowly turn over the sample chamber to allow the solvent to pour out onto a Kimwipe (or other disposable sheet).
 - Repeat as necessary to remove the persistent item.

NOTE: Performing the steps listed above may require you to recondition your sample chamber when using the Helium 3 and/or the Dilution Refrigerator inserts before base temperatures are obtainable again.

- A can of compressed air can be used to help remove items/solvent from inside the sample space.

Reinstalling the sample chamber:

- Place the sample chamber back into the cooling annulus.
- Secure the sample chamber back into place using the 5/32" ball driver and screws removed earlier.
- Plug in the small (stainless steel) pumping line.
- Plug in the black Lemo.
- Plug in the grey Lemo.

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- Seat (DO NOT plug in completely) the large, stainless steel, pumping line.
- Turn on the Model 6000.
- Perform a purge and seal.
- Set a Temperature of 10K at a rate of 20 K/min.
- Once there is vacuum on the large pumping line, (fitting should be pulled into probe, and/or a loud sucking sound) snap in the large pumping line.
 - **NOTE:** There should be an audible “click” when the large line is plugged in and it should not come free when pulled on.
- Let the system continue to cool for about 1 minute.
- Set the temperature to 100K at a rate of 20 K/min.

Collect PPMS impedances data:

- Once stable at 100K for at least 20 minutes, open a log file (in MultiVu).
 - In the upper panel select: Utilities\Log PPMS Data...
 - Within the ‘Log Data’ dialog box, select the ‘General’ tab (if not already displayed).
 - Press the ‘Browse’ button and select the location for the data file to be saved in (default is: C:\QdPpms\data).
 - In the ‘File name:’ box type “post-SC-swap” and press the ‘Open’ button.
 - In the ‘Repeat Every’ box type “60”.
 - Click on the ‘Standard Items’ tab.
 - Press the ‘Select All’ button. You should see all the check boxes now marked
 - Click on the ‘Diagnostic Items’ tab.
 - Press the ‘Select All’ button. You should see all the check boxes now marked
 - Click on the ‘General’ tab.
 - Press the ‘Start’ button.
 - Press the ‘View Data’ button. This should open up a data plot named ‘post-sc-swap.dat’.
 - On the data plot, right click the mouse and highlight ‘Data Selection’. Then left click the mouse. This should open the ‘Graph: Data Selection...’ window.
 - Set the following:

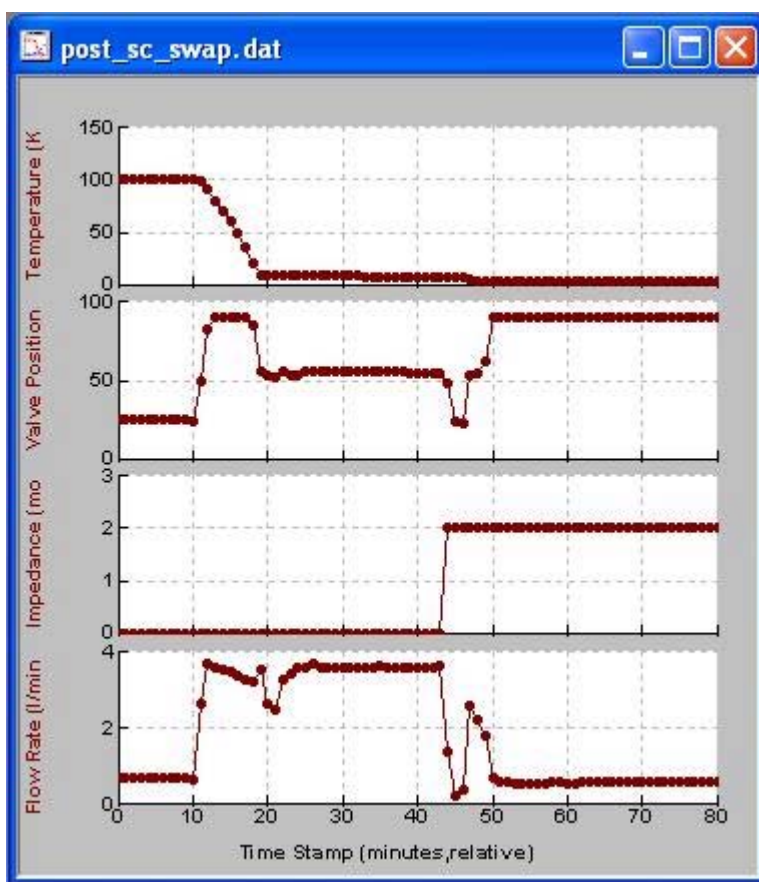
<i>Axis</i>	<i>Data</i>
X	Time Stamp (sec)
Y1	Temperature (K)
Y2	Valve Position (deg)
Y3	Impedance (mode)
Y4	Flow Rate (l/min)

- Press the ‘OK’ button.
- It is also useful to record flow readings from a set of ball gauges (provided with the PPMS), typically the most useful gauges are the 0-500 cc/min, and the 0-5 l/min. If ball gauges are available please record the pump exhaust when:
 - The temperature is stable at 100K (~100 cc/min)
 - The temperature is changing from 100K to 4K (~2.5 l/min)
 - The temperature is stable at 4K (~500 cc/min)
- Set the system temperature to 4K at a rate of 20 K/min.
- Let the system go stable at 4K. Then wait for 30 minutes.
- Set the temperature to 300K and press the ‘Stop’ button on the ‘Log Data’ dialog window.

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Analyze PPMS impedance data: To analyze the data file (post-SC-swap.dat), you will need to have the data file open in MultiVu and displayed as mentioned in the table above. If your data does not agree with any of the following checkpoints, or looks very different than the plot shown below, please contact a Quantum Design service representative.

- While the temperature (Y1) is stable at 100K (first part of plot) the flow rate (Y4) should be > 1.0 l/min.
- While the temperature is decreasing towards 4K (before the temperature goes stable) check the following:
 - Valve position (Y2) = 90 degrees
 - Impedance (Y3) = 0
 - Flow Rate (Y4) = ~ 2.0 to 2.5 l/min
- And finally while stable at 4K check the following:
 - Valve position (Y2) = 90 degrees
 - Impedance (Y3) = 2
 - Flow Rate (Y4) = ~ 0.5 l/min



Example PPMS log file.