In the event of a potential clog

Symptoms:

1. Acquisition with no data collection
2. Sporadic, irregular data collection

The most common location for clogs is between the “Loop System” and the Nebulizer. Through these locations the internal diameter of the distance between sample line and the nebulizer output narrows to a diameter ~50 µm.

A. Stop sample data acquisition
   1. In the Control tab of the Acquisition window, Press the STOP button
   2. Do a Manual Valve Switch to move out of the sample loop containing your sample (Write down the Sample loop containing your sample)
      a. Our hope is to retain as much of your sample as possible for use post repair
      b. This should ensure that only water from the carrier solution reservoir or at worst very dilute sample is being pushed through the system
   3. The syringe pump should remain active through the repair process. Do not turn this off...

B. Identify the location of the clog
   1. Test the “Blue” sample line between the “Loop System” and the Capillary sample line
a. Unscrew the sample line from the luer lock where it attaches to the “Loop System”
   i. From the Luer lock port one should see water/sample seeping from the port
   ii. If no water/sample liquid appears the problem is likely more complicated that is fixable by a user.
      a. Syringe pump, sample loop or valve switch clog.
   iii. If water is present, the clog is likely further down the sample line. Reattached the “Blue” Sample line to the “Loop System”

b. Unscrew the sample line from its attachment point on the heat shield cage where it connects to the capillary line
   i. If no water/sample liquid appears from the far end of the sample line, the problem is likely in this sample line.
      a. The syringe pump pushes sample/water forward at a rate of 45 µL per sec.
      b. Replace this line with a backup “Blue” Sample line located in the back up parts bin
ii. If water/sample liquid appears, the clog is likely further down the sample line. Reattached the “Blue” Sample line to its attachment point on the heat shield cage.

![Image of a sample line with a clog]

“Blue” Sample line look for drop to accumulate at ~45 μL per min

2. Test the junction between the “Blue” Sample line and the Capillary Sample line.

![Image of a junction between sample lines]

a. Unscrew the Capillary Sample line from the Heat Shield Cage.
   i. Watch for water/sample liquid to accumulate in the port holding the Capillary Sample line.
   ii. If no liquid appears, the clog is at this junction.
      a. To remove the clog, remove the “Blue” Sample Line from underneath this port and force water through the junction with a 3 mL syringe filled with water from both ends of the junction.
b. Reattach both the “Blue” Sample line and the Capillary Sample line

iii. If liquid appears, the clog is elsewhere.
   a. Reattach both the Capillary Sample line

3. Test the Capillary Sample line
   a. Remove the Capillary Sample line its port on the Nebulizer
      i. Watch for droplets to form from the capillary at a steady rate (~45uL worth of drops per minute).
      ii. If no droplets appear or drop formation is very slow, the clog is likely here.
         a. Replace this line with a backup Capillary Sample line located in the back up parts bin
         b. Remove the sample line from its port on the heat shield cage.
         c. Reattach the new Capillary Sample line on both the heat shield and the port on the nebulizer.
iii. If droplets appear as normal, the clog is likely in the nebulizer.
   a. Reattach the new Capillary Sample line to the port on the nebulizer

![Capillary Sample line droplets form in quick steady fashion](image)

4. Test the nebulizer
   a. Prepare a 2" piece of 1" wide lab tape
   b. Quickly remove the Nebulizer from its holding port on the Spray Chamber
   c. Cover the holding port opening with the 2" piece of lab tape

![Cover the nebulizer port with lab tape upon removal.](image)
d. Using a flashlight pointed underneath the outflow of the Nebulizer, look for the presence of a straight, congruent spray.
   i. If the spray looks normal, I have no answer.
      a. The clog is likely upstream or is indicative of a problem with the Syringe pump.

ii. If the spray looks disrupted (no stream) or is skewed in one direction, replace the nebulizer.
   a. A cleaned nebulizer is always kept at the ready on top of the Auto Sampler
      i. On the clogged nebulizer, remove the Capillary Sample Line from its port and remove the Nebulizer Gas Tubing from the Nebulizer side arm.
      ii. On the new Nebulizer, attach the Nebulizer Gas tubing to the side arm first, then attach the Capillary Sample line.
   b. Quickly, remove the tape covering the Nebulizer port.
   c. Reinsert the “new” Nebulizer angling the spray upwards 30 degrees from horizon as you slide the nebulizer forward.
      i. If the plasma stays on, test the new setup with a test run of beads.
      ii. If the plasma is blown out, you need to restart the plasma from scratch.
C. Resume data collection
   1. In the Acquisition Window, select the **Acquisition** tab.
      a. Select the *Browse* button and enter an amended name for the sample prematurely halted due to a clog
      b. Keep all the other acquisition time delay settings as they were prior to the clog
      c. Adjust the acquisition time to reflect the number of pushes remaining for your sample.
   2. In the Acquisition Window, select the **Control** tab
      a. Select the *Run* button to switch to the loop containing your sample and to resume sample acquisition