Lonestar- Tips for Aqueous Based Liquid and Powder Sample Analysis Using the v2.x Lonestar and v2.x ATLAS

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OW-004700-TM	13/03/2013	Jonathan Angove	New document
	1/5/14	AP	Reformatted and added comments etc
	26/8/14	Jonathan Angove	New details added regarding the venting procedure

Contents

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Warning Labels

This symbol is used to highlight a section explaining particularly important safety considerations

This warning label indicates danger of electrical shock hazard

This warning label indicates parts of the product that will become hot during use. Please take care.

Introduction

This document details tips and suggestions for use of the Lonestar® with ATLAS™ sampling for liquid and powder analysis. It gives suggestions how to avoid contamination issues by using appropriate flow settings, Split Flow Box (SFB) settings and by other means of flow control.

> Gloves should be worn at all times when handling samples or performing maintenance to avoid contaminating the sample flowpath

For further details on how to install the hardware, please consult the installation documentation on the Owlstone website. Please ensure that you are familiar with the hardware naming.

Figures 1 and 2 show a typical setup when the Lonestar® is used with an ATLAS sampling system as well as detail of the ATLAS sampling module.

Set up and Components

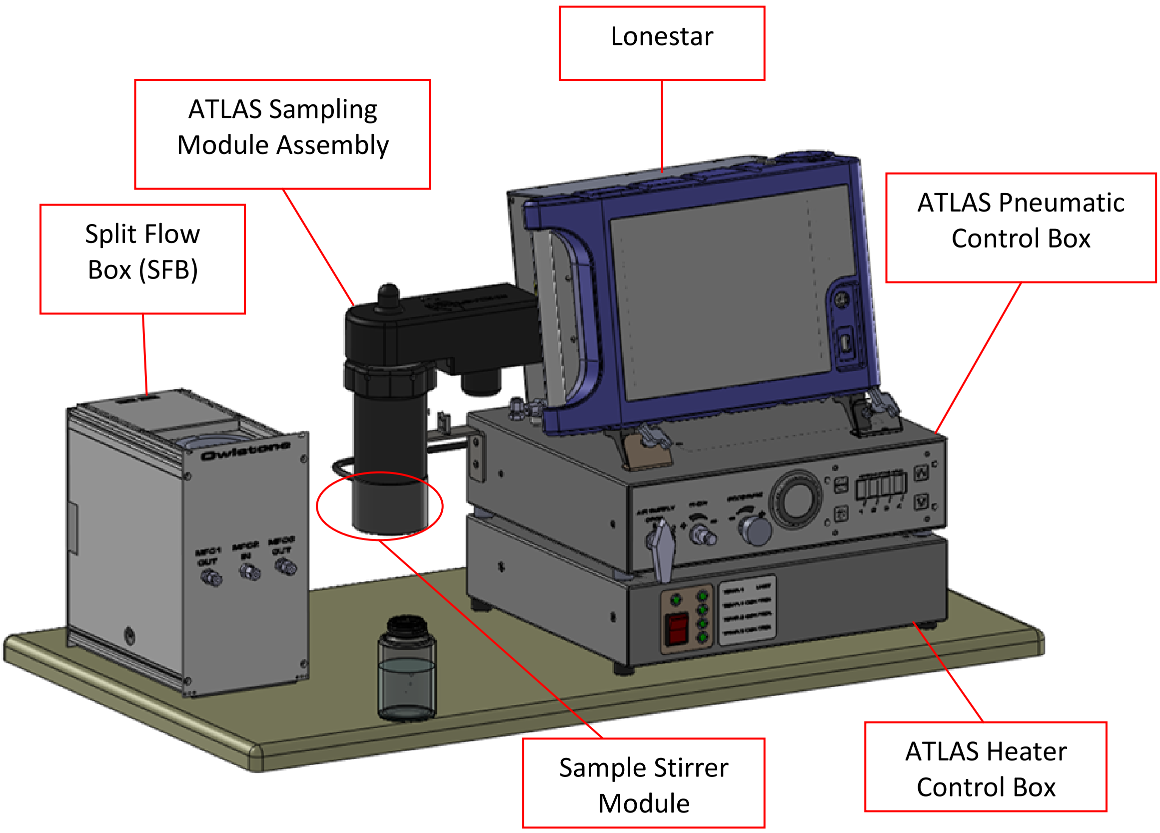

Figure 1 An example Lonestar ATLAS- Split Flow Box installation

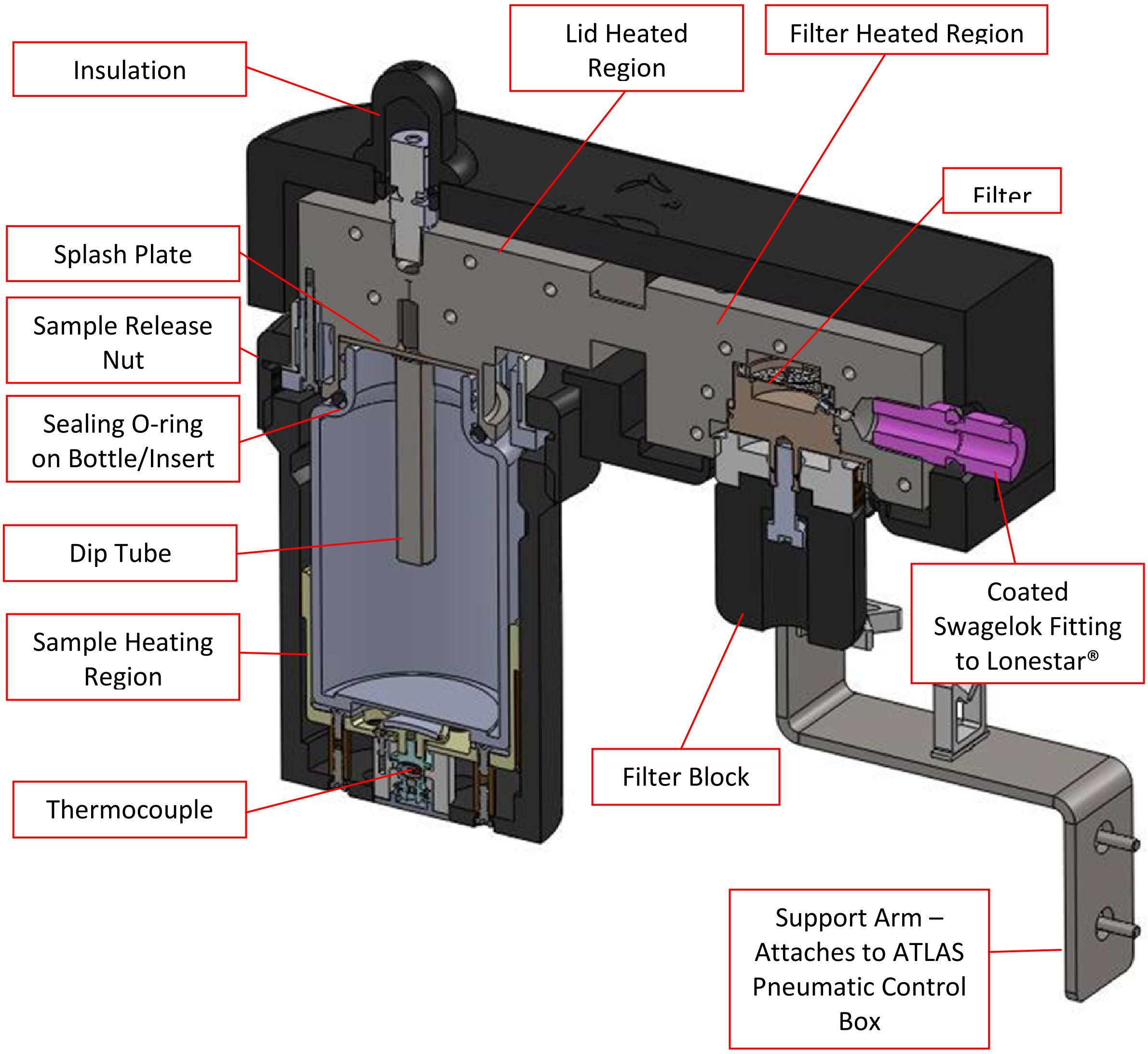

Figure 2 Diagram of components of the ATLAS Sampling Module

The flow-path within the ATLAS Sampling Module and Lonestar® are glass-coated, where possible, to ensure sample flow-path is inert to any analyte. The dip tube and splash plate are also glass-coated, but these are consumable (replaceable) items. If, through stirring a sample or some other means, the glass-coating is removed from the dip tube or splash-plate, they should be replaced to eliminate carryover of an analyte that adsorbs to un-coated stainless steel.

> ⚠ The glass coating can be removed by strong acids or bases, so care must be taken not to use strong acid or basic solutions to clean the ATLAS Sampling Module

The dip tube has either a notch for a ¼" spanner OR a hex shaped end and a tool supplied by Owlstone for its removal. The splash-plate is captivated on the dip tube and will be removed at the same time. Please see Appendix 2 for details on changing the dip tube

The dip tubes are used to:

1. Secure the splash-plate to the underside of the heated "Lid" region.
2. Achieve more reproducible sample analysis by preventing short-cutting of the sample flow away from the surface to the sample.

If a Split Flow Box is not installed, it is advisable to use mass flow controllers in preference to rotameters, but whether rotameters or mass flow controllers are used, you need to be able to regulate the sample, split and makeup flows, even if just to allow the pressurization and venting of the Lonestar ATLAS™ to be performed in the best possible way.

The ATLAS Sampling Module was designed to hold either

- 120mL Traceclean VWR bottles
- 10mL headspace vials + metal insert
- 22mL scintillation vials + metal insert

See Appendix 1 for the part numbers. An o-ring is used on the neck of the VWR bottle or the metal inserts to make a leak-tight seal.

Figure 3 The vials, inserts and bottles available for use in the ATLAS Sampling Module

If either the 10mL or 22mL vials are used, a short dip tube (Owlstone PN 02-1334) must be used to prevent the standard dip tube breaking the vials when the Sample Holder is tightened.

Sample volumes up to 40mL can be analysed using the VWR bottle and the standard dip tube (Owlstone 02-0344). For larger sample volumes of 40 to 60mL use the middle-length dip tube (Owlstone 02-1282).

For analysis of powders, an extra filter should be installed between the splashplate and the underside of the heated Lid region (see Appendix 3).

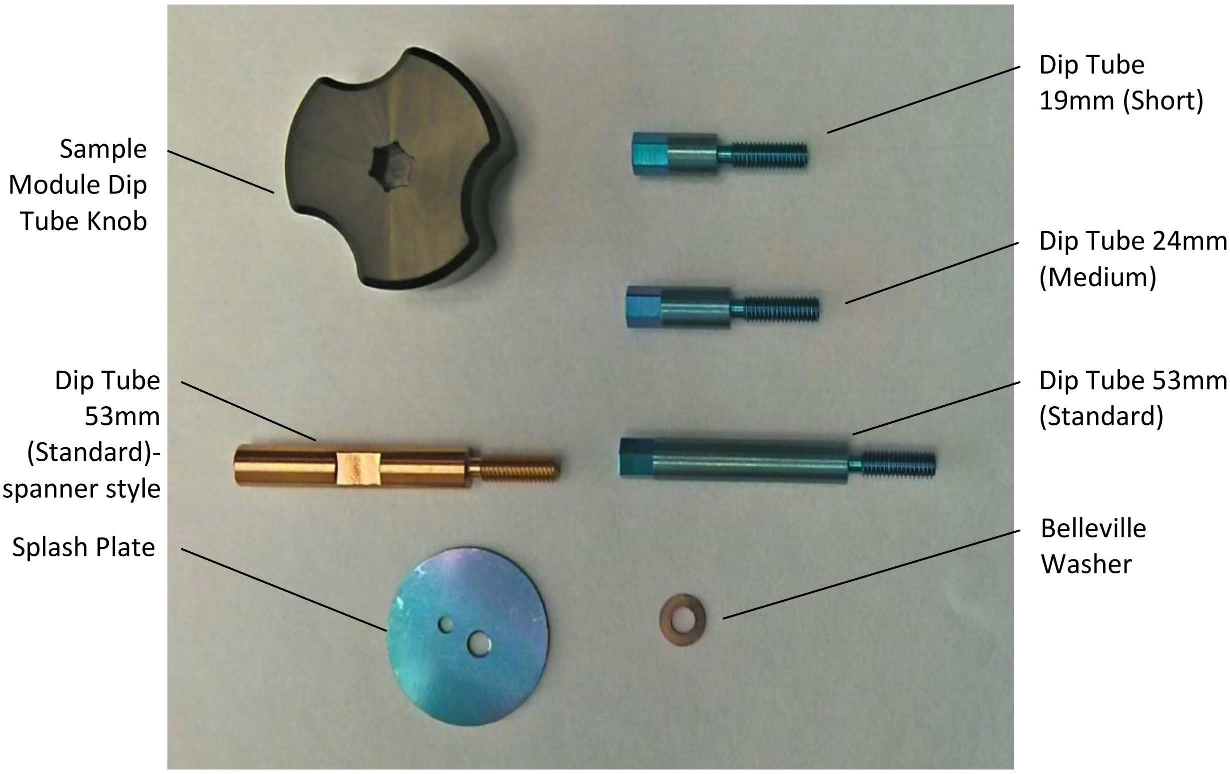

Figure 4 Photograph of Dip Tubes (Hex Knob and 1/4 in spanner styles), a Splash-plate and a Belleville washer. Note that the colour difference of the coated parts is due to differences in the coating thickness and can typically vary from pink to brown to blue

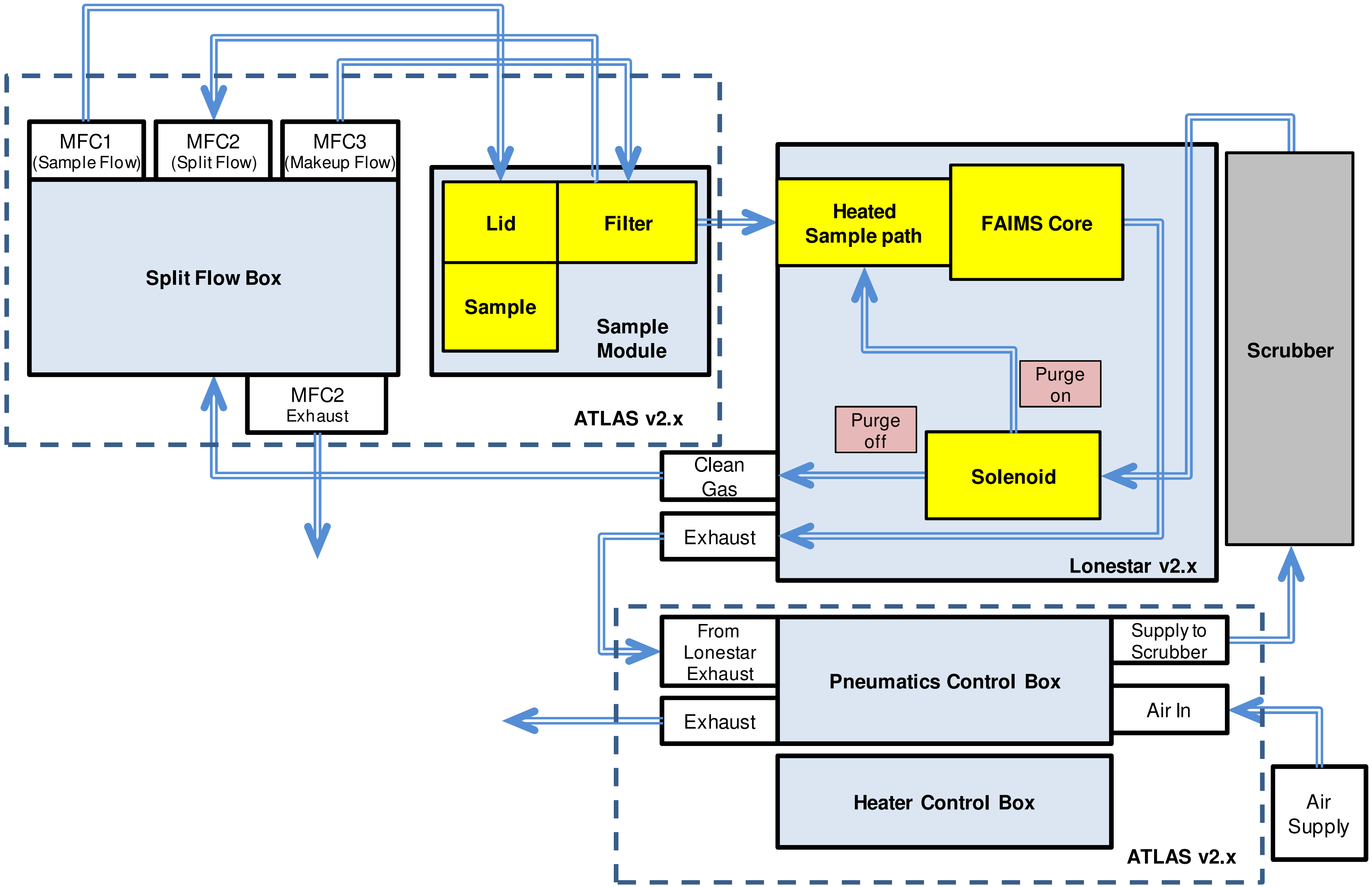

Figure 5 Schematic of the gas flow paths in a Lonestar v2.x connected to an ATLAS v2.x.

Aqueous Based Liquid Sample Analysis

The Lonestar® is a gas-phase detection system. For liquid samples, the gas in the headspace above the liquid must be swept into the Lonestar® for detection. The gas should be filtered using a filter with a 1µm pore size to restrict the size of particle that can enter the detector to prevent damage to the FAIMS chip.

Sample Volume

It is important to limit the sample volume so that the dip tube does not contact the surface of the sample. The use of the dip tube is however, generally necessary to avoid short-cutting of the sample gas in the ATLAS Sampling Module.

The standard length dip tube supplied with the Lonestar® ATLAS™ can accommodate sample volumes of 40mL in the 120mL Traceclean VWR bottles (89094-050). Metal inserts are available to accommodate 10mL headspace vials or 22mL scintillation vials. For further common spare parts, please see Appendix 1.

If a metal insert is being used to hold vials, the standard dip tube must be removed to avoid breaking the vial and one of the shorter dip tubes used. See Appendix 2 for the method used to replace a standard dip tube with a shorter dip tube.

Minimising Water in the Sample Gas

It is beneficial to minimise water in the sample gas to a) minimise the effect on the spectra, and b)to reduce or eliminate issues with the water condensing inside different components of the Lonestar® and ATLAS™ system. The Lonestar® internal ("Ambient") temperature is approximately 30°C, so if the sample gas contains a concentration of water with a dew point temperature above 30°C, then the gas is likely to condense within the Lonestar® system.

Different methods to avoid any water condensation issues are described below.

Split Gas Flows

The amount of analyte in the sample gas is generally limited by the rate at which is diffuses out of the liquid. If the sample gas flow is diluted, this will also dilute the water vapour; reducing the dew point of the gas, and reducing the possibility of water condensing in the Lonestar® and ATLAS system.

The Lonestar® sensitivity, however, DOES depend on the gas flow; so the total flow through the Lonestar® must be sufficient for analysis, hence the need for a Makeup Flow (MFC3). See Figure 5

A rule-of-thumb is; for every 10°C increase in sample temperature, the water content in the headspace doubles. If a sample flow of 500mL/min was used for a aqueous (water) sample at 50°C , and the Lonestar internal "Ambient" temperature is 30°C, then with a makeup flow greater than 1000mL/min, there should be no condensation within the Lonestar®. Typically, to give some margin, a makeup flow of 1500mL/min would be used in this example.

Tube Heating

When using the Split Gas Flow method described above, some of the (undiluted) sample gas flow will be split to an exhaust via the Split Flow (MFC2) port on the ATLAS Sampling Module- see Figure 5. This flow split would allow the sample temperature to be higher than 50°C because of the dilution by the makeup flow which reduces the dew point (humidity). However, the water in the *pipe* leading to MFC2 may still condense on the tube cold wall so it will be necessary to heat the tubing connected to MFC2 or to use a water vapour condensing bottle (see subsequent section).

It is important that the tubing from the split port on the ATLAS Sampling Module to either a rotameters or to the “MFC 2 In” fitting on the Split Flow Box is heated. Failure to heat this tubing may result in the water condensing in the tubing, causing the flow through the rotameter or MFC 2 of the Split Flow Box to fluctuate; unless a collection bottle is placed in-line (see below)

Care must be taken when venting the Lonestar® to swap sample bottles to ensure that the Lonestar® is flushed with clean, dry air before the pressure within the Lonestar® is lowered; and that the pressure is not lowered too quickly

Water Vapour Condenser

If heating the tube leading to the Split Flow port (MFC2) is not possible, then using a water condenser before the gas flow enters MFC2 should eliminate any problems.

One method that has been tested is to use a 100ml Duran bottle with push in fittings on the lid, and allow the gas to flow through the (cool) bottle. If gas flows are not too high, then water should preferentially condense on the glass walls of the bottle, and not inside the PTFE tubing, or within MFC2.

Sample Analysis Procedure using the Split Flow Box

Venting Procedure

1. Press “STOP” button on the Lonestar® DF Matrix screen.
2. The Split Flow Box controls the flows within the ATLAS Sampling Module. Wait until the pressure has stabilized below $0.4bar_g$ before removing the sample.

When using the Split Flow Box, the flows are set in the Settings tab of the Lonestar® software. The “Idle” flows are those used when the “STOP” button has been pressed, after which the sample is typically removed, requiring the pressure to be vented. A tabulated example of the flow settings to be able to do this and minimise any contamination issues is shown in **Error! Reference source not found.** As can be seen, a sample flow of 20mL/min from MFC 1 is used to prevent humidity build-up within the lid region of the ATLAS Sampling Module for high temperature samples. However, a split flow (MFC 2) of 50mL/min is also set to ensure that the humid sample flow does not enter the Lonestar®. Clean, dry air from MFC 3 enters the Lonestar for 10 seconds at a high flow rate to maintain the operating pressure within the Lonestar® for 10 seconds before this flow is lowered. It is worth noting that the initial flows set for MFC3 should total the total flow used during the sample analysis to prevent an initial drop in pressure, similar to those shown in Figure 7.

MFC 1		MFC 2		MFC 3	
Time (s)	Flow (mL/min)	Time (s)	Flow (mL/min)	Time (s)	Flow (mL/min)
0	20	0	50	0	2350
		10	100	35	2000
		15	200	40	1750
		20	300	45	1500
		25	400	50	1250
		30	500	55	1000

Figure 6 Tabulated example flows for the Idle settings using the Split Flow Box

Sampling Procedure - No Headspace Pre-concentration

1. Replace the sample in the Sample Holder and tighten the Sample Release nut.
2. Press “START” button on DF Matrix screen. The flows stored as part of the configuration setting in the Measure tab on the Settings tab will be used for the analysis.

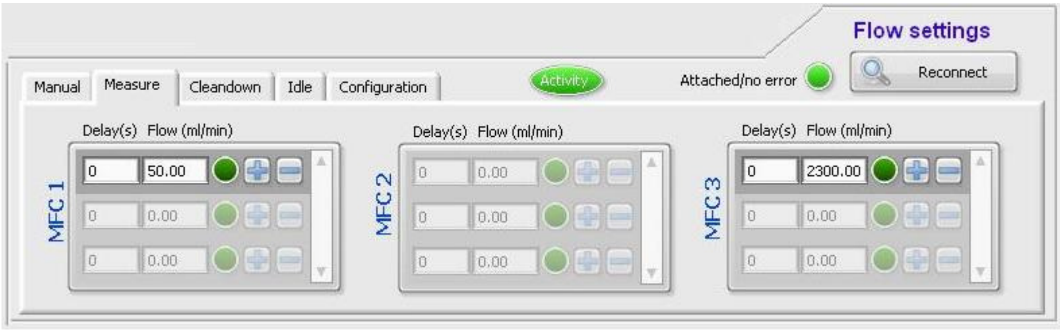

Figure 7 Example flows for a sample analysis without headspace pre-concentration

As can be seen in Figure 7, the sample flow (MFC 1) is set to 50mL/min at time 0 seconds and the makeup flow of 2300mL/min is also started at 0seconds delay. In this example, no split flow is being used. Also note that the Idle settings in Figure 6 are using approximately the same total flow as these example sample flows. This is so there is no pressure drop when the “STOP” button is pressed to ensure no water or analytes condense within the Lonestar® system.

Sampling Procedure- Headspace Pre-concentration Required

1. Replace the sample in the Sample Holder and tighten the Sample Release Nut.
2. Press “START” button on DF Matrix screen. The flows stored as part of the configuration setting in the Measure tab on the Settings tab will be used for the analysis.

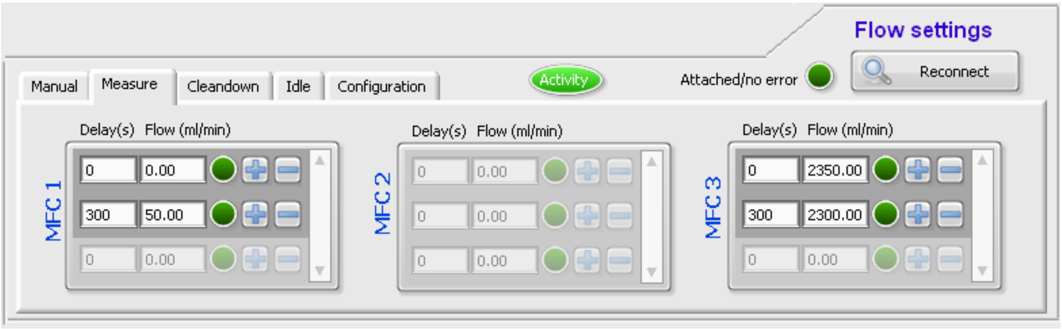

Figure 8 Example flows for a sample analysis with headspace pre-concentration

With a headspace pre-concentration method, it is desirable for the total flow to remain the same throughout the analysis. In Analyser Mode the system pressure is monitored and an alarm state is displayed if the system pressure drifts outside the setpoints. In the example shown in Figure 8, a headspace pre-concentration of 5 minutes (300 seconds) is used before the sample flow of 50mL/min is set. Note that the makeup flow also changes at 5 minutes so that the total flow through the system remains at 2350mL/min, so there will be no drop in pressure throughout the analysis. A split flow, if required, would also typically be delayed until the headspace pre-concentration time has been completed. Care must be taken if high sample temperatures are used to prevent water condensing on the dip tube and splashplate. A temperature of 70°C for the Lid Heated Region is advised.

Sample Analysis Procedure using Rotameters

Failure to follow this strict regime of venting and sampling using the Lonestar ATLAS™ may result in water or analyte condensing within the system in an un-heated zone, resulting in system contamination which may take a significant time to cleandown

Venting Procedure

1. Press "STOP" button on the Lonestar® DF Matrix screen.
2. Press the "Purge" button to ON.
3. Wait 10 seconds
4. Stop the sample flow by closing the sample rotameter.
5. Blank the exhaust fitting on the rear of the ATLAS Pneumatic Control Box.
6. Close the Air Supply using the toggle valve on the front of the Pneumatic Control Box.
7. Slowly open the rotameter on the split port on the ATLAS Sampling Module to release the pressure within the Lonestar ATLAS™ at a flow rate not exceeding 250mL/min.
8. Wait until the pressure is below $0.4bar_g$ before removing the sample.

Sampling Procedure - No Headspace Pre-concentration

1. Replace the sample in the Sample Holder and tighten the Sample Release Nut.
2. Remove the blanking cap from the exhaust fitting on the rear of the ATLAS Pneumatic Control Box.
3. Close the rotameter on the split port on the ATLAS Sampling Module.
4. Open the Air Supply using the toggle valve on the front of the Pneumatic Control Box.
5. Press "START" button on the Lonestar® DF Matrix screen and enter the datafile name, if required.

6. Press the “Purge” button to OFF.
7. Rotameters pulse the flow at this stage until the pressure within the Lonestar ATLAS™ has stabilized.
8. Once the pressure has stabilized, slowly open the sample flow rotameter to the desired flow rate.
9. Open the split flow rotameter to the desired flow, if required.

Sampling Procedure - Headspace Pre-concentration Required

1. Replace the sample in the Sample Holder and tighten the Sample Release Nut.
2. Remove the blanking cap from the exhaust fitting on the rear of the ATLAS Pneumatic Control Box.
3. Close the rotameter on the split port on the ATLAS Sampling Module.
4. Open the Air Supply using the toggle valve on the front of the Pneumatic Control Box.
5. Press “START” button on the Lonestar® DF Matrix screen and enter the datafile name, if required.
6. Press the “Purge” button to OFF.
7. Rotameters pulse the flow at this stage until the pressure within the Lonestar ATLAS™ has stabilized.
8. Once the desired headspace pre-concentration time has passed, slowly open the sample flow rotameter to the desired flow rate.
9. Open the split flow rotameter to the desired flow.

Fine Powder Sample Analysis

As already mentioned, the Lonestar® is a gas-phase detection system with the headspace above the sample being swept through a filter into the Lonestar® for detection. Solid samples can also be tested, though the sensitivity will depend on the rate of release of the analytes into the headspace. A large solid surface area (such as a powder), high sample temperatures and use of headspace pre-concentration methods are likely to be required, unless highly volatile analytes within the solid samples are being analysed, for example odours from plastic components.

Sample Disturbance and Contamination

When testing fine powders care must be taken not to disturb the powder, forming a “ cloud” in the sample bottle. If this happens, the powder is likely to travel throughout the ATLAS Sampling Module to the filter, (See Figure 2) where it is likely to remain until the filter is changed. If the powder is smaller than 1µm in diameter, it is possible for it to pass through the filter and into the Lonestar®, depositing on the FAIMS chip surface. In this case the Lonestar® will likely need to be returned to Owlstone for cleaning.

The times when the surface of the fine powder is most likely to be disturbed is when the sample flow is first started, especially if rotameters are being used, and when the sample is being removed from the ATLAS Sampling Module. If the Lonestar ATLAS™ is not at its operating pressure, rotameters tend to pulse a large flow until the pressure has stabilized. It is this pulse of sample flow that is likely to disturb the fine powder into a “cloud” in the Sample Holder. For this reason, we would recommend that the sample flow is delayed until the Lonestar® has reached its operating pressure, similar to the headspace pre-concentration method detailed above. To do this, a rotameter must be installed to regulate the sample and makeup flows.

If the Sample Holder is opened whilst the Lonestar ATLAS™ pressure is above 0.3bar_g, a pressure lower than for liquid sample removal, there is the possibility the pressure will be released through the Sample Release Nut, sending a “cloud” of fine powder into the headspace. The particles are likely to settle on the dip tube and splash plate and then be carried into the ATLAS Sampling Module when the sample flow is next restored.

One method to limit the disturbance of the surface of the fine powder is to use low sample flow rates and a reduced surface area, either by using 10mL headspace vials or 22mL scintillation vials held in the appropriate metal insert. A short dip tube is also advised to be fitted, with an extra 1µm filter installed between the splash plate and the Lid Heated Region, see "Appendix 3 – Replacing the Standard Dip Tube with a Shortened Dip Tube and Inserting a Second Filter above the Splash Plate" for the installation of this filter.

Sample Analysis Procedure using the Split Flow Box

Venting Procedure

1. Press “STOP” button on the Lonestar® DF Matrix screen.
2. The Split Flow Box controls the flows within the ATLAS Sampling Module. Wait until the pressure has stabilized below 0.3bar_g before removing the sample.

The flows are set in the Settings tab of the Lonestar® software. The “Idle” flows are those used when the “STOP” button has been pressed. A tabulated example of the flow settings is shown in Figure 9, the same as used in Figure 6 as these venting flows are also appropriate. As can be seen, a sample flow of 50mL/min from MFC 1 is used to help prevent a buildup of fine powder within the lid region of the ATLAS Sampling Module. However, a split flow (MFC 2) of 100mL/min is also set to ensure that any powder preferentially flows out of the split port and does not enter the Lonestar®. Clean, dry air from MFC 3 enters the Lonestar for 10 seconds at a high flow rate to maintain the operating pressure within the Lonestar® for 10 seconds before this flow is lowered. It is worth noting that the initial flows set for MFC3 should total the total flow used during the sample analysis to prevent an initial drop in pressure, similar to those shown in Figure 7.

MFC 1		MFC 2		MFC 3	
Time (s)	Flow (mL/min)	Time (s)	Flow (mL/min)	Time (s)	Flow (mL/min)
0	20	0	50	0	2350
		10	100	35	2000
		15	200	40	1750
		20	300	45	1500
		25	400	50	1250
		30	500	55	1000

Figure 9 Tabulated example flows for the Idle settings using the Split Flow Box

Sampling Procedure– Delaying the Sample Flow

1. Replace the sample in the Sample Holder and tighten the Sample Release Nut.
2. Press “START” button on DF Matrix screen. The flows stored as part of the configuration setting in the Measure tab on the Settings tab will be used for the analysis.

This is similar to the example shown for headspace pre-concentration, but the sample delay does not necessarily have to be as long. 30seconds is generally sufficient time for the pressure to stabilize fully within the Lonestar® system, but in the example shown in Figure 10 a delay of 5minutes is used. Note that the total flow through the system remains at 2350mL/min, so there will be no pressure fluctuations within the sample analysis, and that the sample flow is increased in small stages.

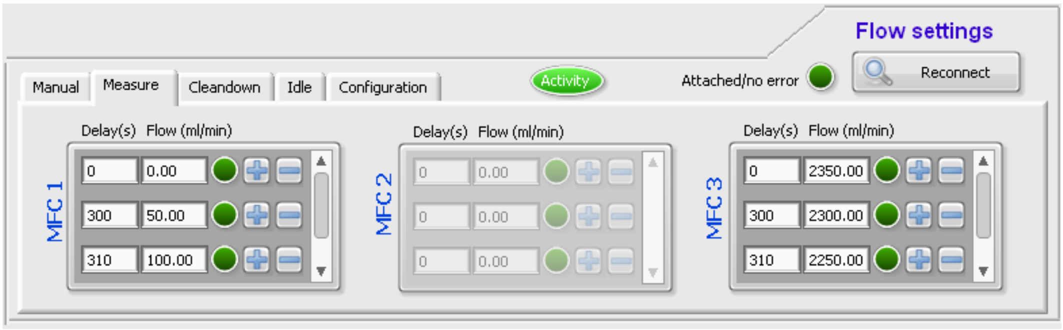

Figure 10 Example flows for a powder sample analysis

Sample Analysis Procedure using Rotameters

Failure to follow this strict regime of venting and sampling using the Lonestar ATLAS™ may result in a "cloud" of fine powder in the headspace above the sample, resulting in system contamination which may take a significant time to cleandown

Venting Procedure

1. Press "STOP" button on the Lonestar® DF Matrix screen.
2. Press the "Purge" button to ON.
3. Wait 10 seconds.
4. Stop the sample flow by closing the sample rotameter.
5. Blank the exhaust fitting on the rear of the ATLAS Pneumatic Control Box.
6. Close the Air Supply using the toggle valve on the front of the Pneumatic Control Box.
7. Slowly open the rotameter on the split port on the ATLAS Sampling Module to release the pressure within the Lonestar ATLAS™ at a flow rate not exceeding 250mL/min.
8. Wait until the pressure is below $0.3bar_g$ before removing the sample.

Sampling Procedure – Delaying the Sample Flow

1. Replace the sample in the Sample Holder and tighten the Sample Release Nut.
2. Remove the blanking cap from the exhaust fitting on the rear of the ATLAS Pneumatic Control Box.
3. Close the rotameter on the split port on the ATLAS Sampling Module.
4. Open the Air Supply using the toggle valve on the front of the Pneumatic Control Box.
5. Press "START" button on the Lonestar® DF Matrix screen and enter the datafile name, if required.
6. Press the "Purge" button to OFF. Rotameters pulse the flow at this stage until the pressure within the Lonestar ATLAS™ has stabilized, but the only rotameter with a flow set is the makeup rotameter so there should be little disturbance of the powder.
7. Once the Lonestar ATLAS™ has stabilized at its operating pressure or the desired headspace pre-concentration time has elapsed, slowly open the split flow rotameter to the desired flow rate, if required.
8. Open the sample flow rotameter to the desired flow.

Appendix 1 – Common Lonestar Spare Parts

Please note, these part numbers are those used by Owlstone in Cambridge for ordering. It is possible that International suppliers use different part numbers for each Country. Please contact your local distributor for the relevant part numbers.

Title	Supplier	Part Number
120mL Traceclean sample bottles	VWR US	89094-050
120mL Traceclean sample bottles	Owlstone	50-0506
10mL headspace vials – crimp cap style	Fisher	VGA-100-070K
10mL Metal Vial Holder	Owlstone	02-1134
22mL scintillation vials	Fisher	VGA-870-010P
22mL Metal Vial Holder	Owlstone	02-1135
Membrane filter, 1µm, unlaminated, PTFE, 25mm diameter	Owlstone	50-0622
O-rings for bottles, 34 x 4mm, Viton, 60 shore	Owlstone	50-0879
Sample Module Dip Tube 53mm (Standard)	Owlstone	02-0793
Sample Module Dip Tube 24mm (Medium)	Owlstone	02-1282
Sample Module Dip Tube 19mm (Short)	Owlstone	02-1334
Sample Module Assembly Splash Plate	Owlstone	02-0805
Belleville washer (coated)	Owlstone	51-0344
Sample Module Dip Tube Knob	Owlstone	02-1497

Appendix 2 – Replacing the Standard Dip Tube with a Shortened Dip Tube

Gloves must be worn at all times to avoid contaminating the sample flowpath

The ATLAS Sampling Module is heated to temperatures that can cause burns. Please ensure the heated zones are cooled to a safe temperature before commencing any maintenance

1. Vent the Lonestar ATLAS™ to ambient pressure as detailed above.
2. Remove the Sample Holder from the ATLAS Sampling Module and place in a convenient location out of the way.
3. Using a ¼" spanner or the Dip Tube Knob, provided in the installation kit, remove the dip tube. The splashplate is captivated on the dip tube and will be removed at the same time.
4. Remove the splashplate and Belleville washer from the dip tube.
5. Screw the Belleville washer and splashplate onto the short dip tube, the Belleville washer goes over the threads first.

   TIP: to use a small Allen key through the remaining hole in the splashplate to guide the splashplate and dip tube into the correct position in the ATLAS Sampling Module.
6. Tighten the dip tube, ensuring the splashplate is secure against the underside of the Heated Lid Region.
7. Insert a clean, new bottle or vial into the Sample Holder, or Sample Holder containing a metal insert. If a metal insert is being used, ensure that there is an o-ring on it as this is what will make a leak-tight seal.
8. Using the Sample Release Nut, tighten the Sample Holder to ensure a leak-tight seal.
9. Return the ATLAS Sampling Module to its operating temperatures; a simple way of doing this is to load the relevant configuration file, which will upload the correct parameters.
10. Begin sample analysis, though saving the data is not necessary at this stage, and allow the system to clean down before use.

Appendix 3 – Replacing the Standard Dip Tube with a Shortened Dip Tube and Inserting a Second Filter above the Splash Plate

Gloves must be worn at all times to avoid contaminating the sample flowpath

The ATLAS Sampling Module is heated to temperatures that can cause burns. Please ensure the heated zones are cooled to a safe temperature before commencing any maintenance

1. Vent the Lonestar ATLAS™ to ambient pressure as detailed above.
2. Remove the Sample Holder from the ATLAS Sampling Module and place in a convenient location out of the way.
3. Using a ¼" spanner or the Dip Tube Knob provided in the installation kit, remove the dip tube and Belleville washer. The splashplate is captivated on the dip tube and will be removed at the same time.
4. Remove the splashplate and Belleville washer from the dip tube.
5. Place a clean filter on the splashplate and hold it up to the light.
6. Using a scalpel, cut a hole in the filter to allow the dip tube to pass through the filter.
7. Screw the Belleville washer and splashplate onto the short dip tube.
8. Place the filter over the threads on the dip tube and push down to the splashplate.

   TIP: Use a mirror to determine the correct orientation of the holes in the Heated Lid Region for the dip tube and splashplate to correctly align in the ATLAS Sampling Module.
9. Tighten the dip tube, ensuring the splashplate is secure against the underside of the Heated Lid Region.
10. Use the mirror once again to ensure the hole in the splashplate for sample to pass through is completely covered by the filter. If the hole does not appear as a complete circle of white filter, then remove the dip tube and splashplate, re-align the filter and try again.
11. Insert a clean, new bottle or vial into the Sample Holder, or Sample Holder containing a metal insert. If a metal insert is being used, ensure that there is an o-ring on it as this is what will make a leak-tight seal.
12. Using the Sample Release Nut, tighten the Sample Holder to ensure a leak-tight seal.
13. Return the ATLAS Sampling Module to its operating temperatures; a simple way of doing this is to load the relevant configuration file, which will upload the correct parameters.
14. Begin sample analysis, though saving the data is not necessary at this stage, and allow the system to clean down before use.

About Owlstone

Owlstone develops and commercializes innovative new technologies to address the critical need for compact, dependable and cost-effective chemical and biological detection solutions for a wide range of markets.

Owlstone was formed through the recognition of the opportunities created by the application of micro- and nano- technology to develop improved sensing solutions.

Owlstone is focused on the innovation of detection technologies to address unmet needs, developing solutions that are flexible enough to target a range of markets with the potential for growth by enabling new application opportunities.

From homeland security to home safety, Owlstone is working with leading manufacturers and integrators across a range of markets to develop products incorporating our microchip chemical sensing solution.

Owlstone is headquartered in the United States and has laboratory facilities in the United Kingdom. Owlstone Ltd was founded in 2003 with a seed investment of two million dollars from Advance Nanotech, Inc., a New York based company specializing in the investment in and commercialization of nanotechnologies.