90-0577 Pressure Testing of a Lonestar® 3.0 with ATLAS™ Sampling Module 2.x

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001	19/8/2016	Céline Lainé	New issue for Lonestar v3.0 and ATLAS v2.x

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Notices

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The supplied system is in compliance with international regulations. If this system is used in a manner not specified by Owlstone Ltd, the protection provided by the system could be impaired

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.

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Introduction

This document details the steps to perform a system pressure test to establish if a leak is present within the Lonestar® and ATLAS™ Sampling Module, measured using only the pressure sensor in the Lonestar. If the Lonestar® system is not leak-tight, the detection method reproducibility and accuracy will be affected.

Leaks can be found at the joints of pipes, at the joint between the Lonestar® and the ATLAS™ Sampling Module.

It is unusual for a leak to occur within the Lonestar® once it has been installed and running for some time, however, leaks may occur because of poor handling during delivery, or problems during assembly of the components.

The Lonestar® system pressure test is instructed as a systematic approach to determine the source of a leak:

1. Test of the Lonestar® used with the ATLAS™ Sampling Module
2. Split the Lonestar® system into its constituent parts to test them separately before reassembling them
3. Retest of the Lonestar® used with the ATLAS™ Sampling Module

There is also an automated pressure test built into the Lonestar® software, detailed in the Appendix.

For further details on how to install the Lonestar® system, please consult the document:

90-0550- Installation of Lonestar 3.0 with an ATLAS 2.x

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Set up and Components

Please ensure that you are familiar with the hardware naming before generating the system blank.

Figure 1 shows the final setup of the Lonestar® when used with an ATLAS™ sampling system.

Figure 2 details the Sampling Module Assembly parts of the ATLAS™.

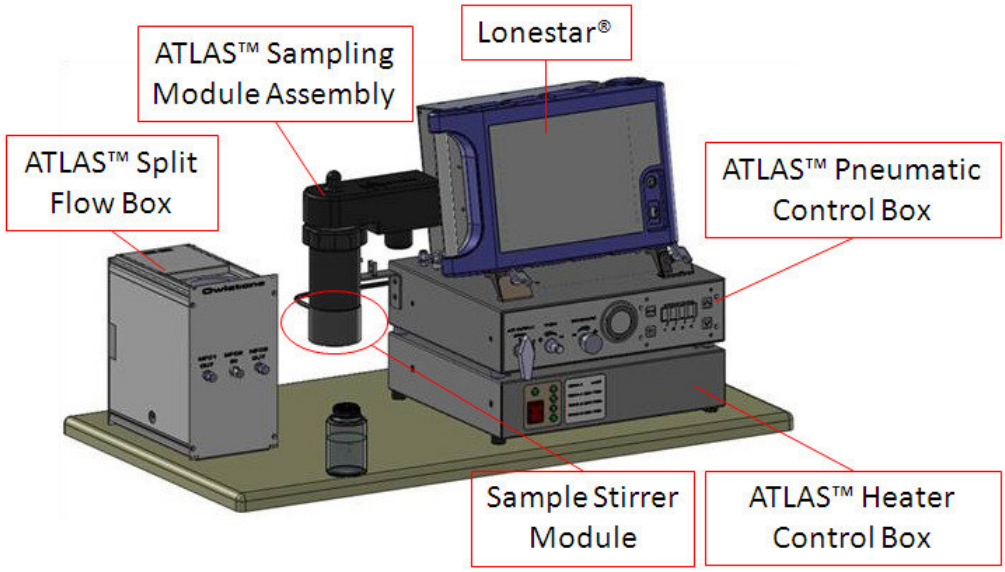

Figure 1 Lonestar® ATLAS™ Split Flow Box installation

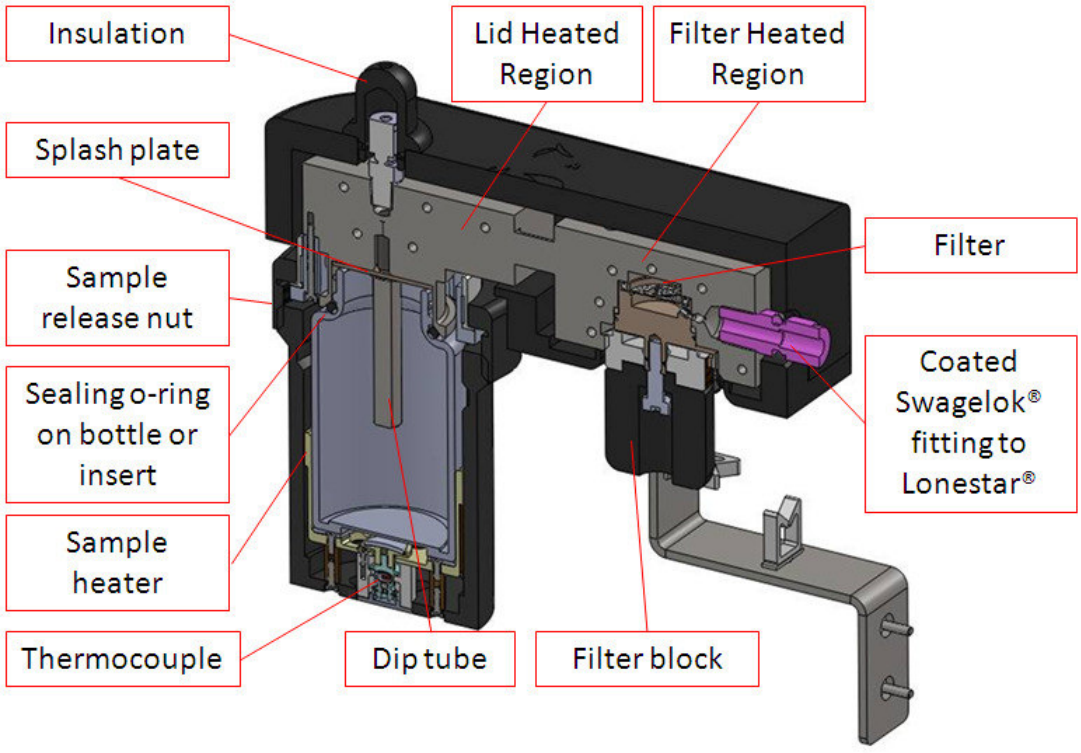

Figure 2 Diagram of components of the ATLAS™ Sampling Module Assembly

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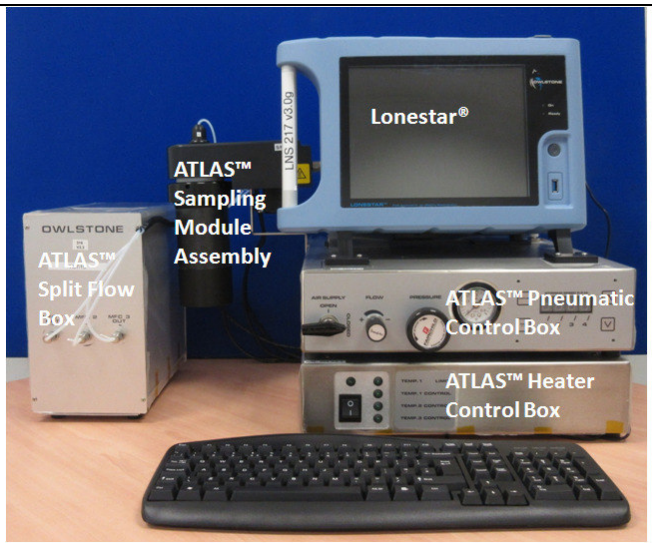
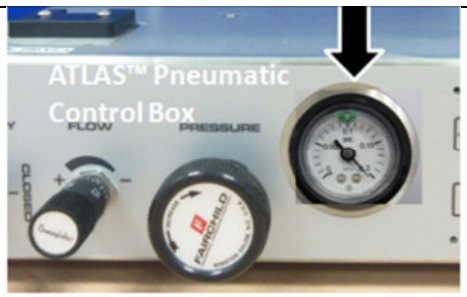
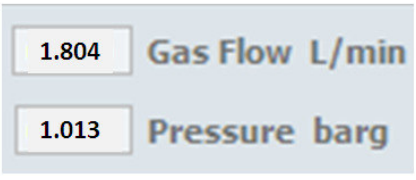
Instructions

The Lonestar® system pressure test instructions detail a systematic approach to determine the source of a leak:

1. Test of the entire system
2. Split the system into its constituent parts to test them separately before reassembling them
3. Retest the entire system

Pressure test of the Lonestar® and ATLAS™ system

Step	Instructions	Pictures
1	Please make sure the Lonestar® system installation has been completed following the document: **90-0550–Installation of a Lonestar 3.0 with ATLAS 2.x**	
2	To start the entire system pressure test, set the pressure on the ATLAS™ Pneumatic Control Box to 0.2 MPa (2 bar_g).	
3	Turn on the air flow to the Lonestar® system by turning the ATLAS™ Pneumatic Control Box air supply valve to **OPEN**. Verify that the Lonestar® software pressure reads about 1 bar_g.	ATLAS™ Pneumatic Control Box  Lonestar® software 

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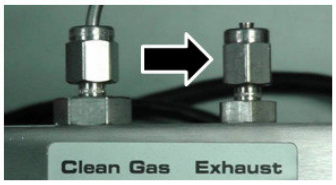
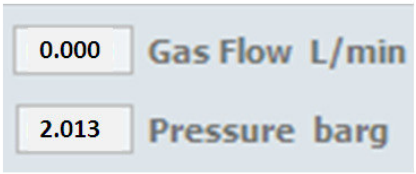
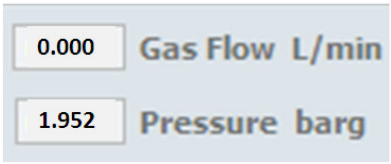
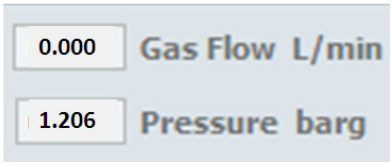
4	Blank both exhausts of the Lonestar® system located at the back of the ATLAS™ Pneumatic Control Box and the front ATLAS™ Split Flow Box using 1/8" Swagelok® blanking nuts. Verify the Lonestar® software gas flow reads 0 L/ min and the pressure has now increased to about 2 bar_g	ATLAS™ Pneumatic Control Box  ATLAS™ Split Flow Box  Lonestar® software 
5	Turn off the air flow to the Lonestar® system by turning the ATLAS™ Pneumatic Control Box air supply valve to **CLOSED**.	
6	Allow 20-30 seconds for any initial pressure drop then monitor the pressure reading on the Lonestar® software for 10 minutes by leaving the system untouched. If after 10 minutes, the pressure has dropped by less than 0.1 bar_g then the Lonestar® can be considered to be sufficiently leak-tight and the pressure test is complete.	✓ Pressure test OK Lonestar® system air-tight  Lonestar® system ready ✗ Pressure test not OK Leak detected within the Lonestar® system  Carry on with the pressure test procedure Note: An initial drop in pressure of <0.10 bar_g is possible as the pressure stabilises.

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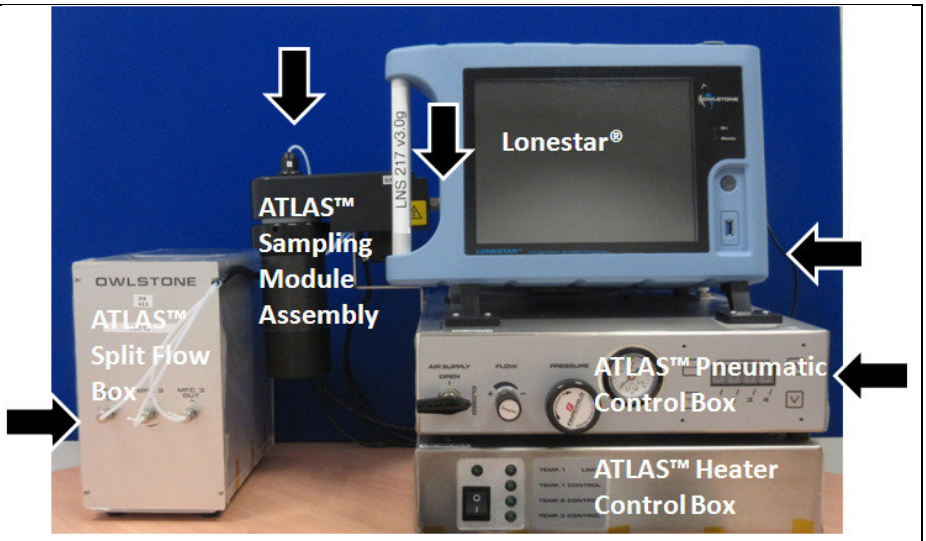
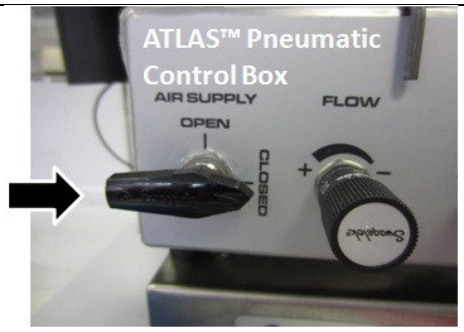
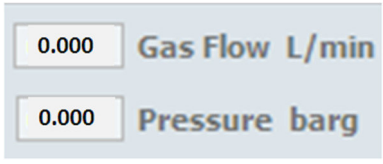
	If after 10 minutes the pressure has dropped by more than 0.10 bar_g then there is a leak within the system. Check systematically all Swagelok® fittings and tighten them if required. Once all Swagelok® fittings have been verified, repeat a pressure test following steps 3 to 7.	 Please tighten Swagelok® fittings in two steps: 1. Hand tighten 2. Tighten with the spanner only a further 1/16 to 1/8 turn. WARNING: Overtighthened Swagelok® fittings can damage the PTFE pipes and cause leaks.
8	If on second attempt, a pressure drop >0.1 bar_g is detected, follow the steps below to identify the source of the leak by splitting the system into its constituent parts to test them separately.	

Pressure test of the ATLAS™ Split Flow Box

The method to pressure test the ATLAS™ Split Flow Box is to isolate it from the Lonestar® system and pressure test the remaining system. If no leak is detected when the ATLAS™ Split Flow Box is removed then it can be inferred that the leak comes from the ATLAS™ Split Flow Box.

9	To isolate the ATLAS™ Split Flow Box, make sure the ATLAS™ Pneumatic Control Box valve is turned to **CLOSED** to turn the air flow off.	
10	Verify on the Lonestar® software that the pressure reading has dropped to 0.0 bar_g.	

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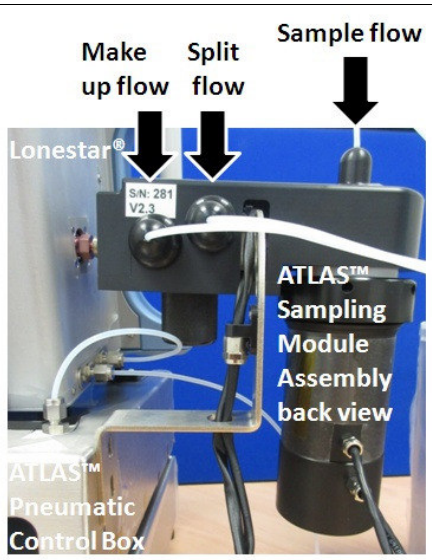
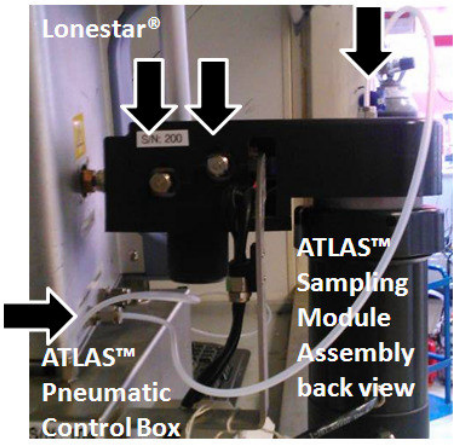
11	Disconnect the PTFE pipes of the make-up, split and sample flows of the ATLAS™ Sampling Module Assembly. To do so, remove the black insulation from each socket and unscrew the Swagelok® nut.	
12	Disconnect the PTFE pipe going to the air inlet at the back of the ATLAS™ Split Flow Box.	
13	Connect the PTFE pipe supplying air from the side of the Lonestar® to the sample flow located at the top of the ATLAS™ Sampling Module. Cap off the make-up flow and split flow Swagelok® fittings with 1/8” blanking nuts.	

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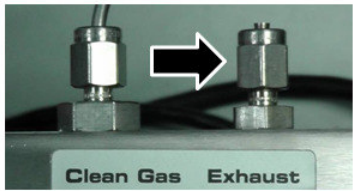
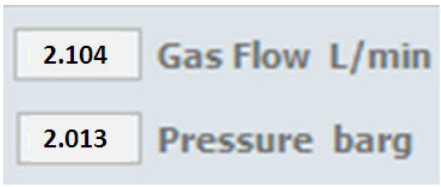
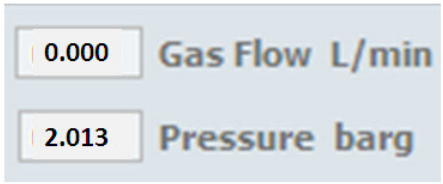
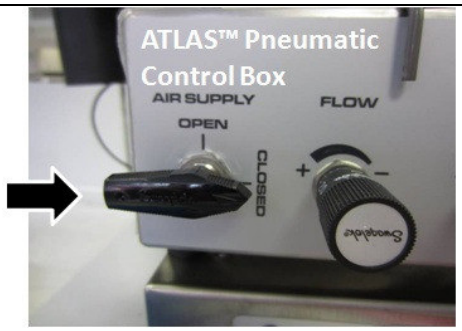
14	Open the air flow of the Lonestar® system using the ATLAS™ Pneumatic Control Box air supply valve. Without the ATLAS™ Split Flow Box to regulate the flow, the system pressure is set by the regulator. Verify the Lonestar® software pressure reads about 2 bar_g. Blank the ATLAS™ Pneumatic Control Box exhaust located at the back with a 1/8" Swagelok® blanking nut. Verify the Lonestar® software gas flow reads 0 L/ min.	ATLAS™ Pneumatic Control Box   Lonestar® software  
15	Turn off the air flow of the Lonestar® system using the ATLAS™ Pneumatic Control Box air supply valve.	

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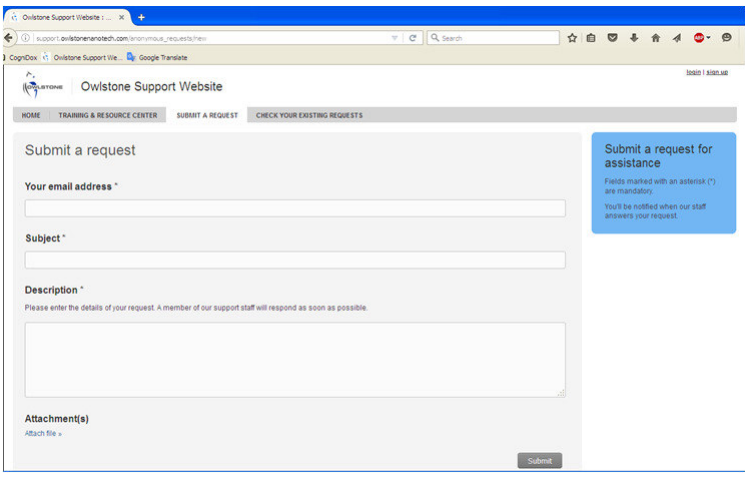
16	Allow 20-30 seconds for any initial pressure drop then monitor the pressure reading on the Lonestar® software for 10 minutes by leaving the system untouched. If after 10 minutes, the pressure has dropped by less than 0.1 bar_g then there is no significant leak within the remaining Lonestar® system. The leak is in the ATLAS™ Split Flow Box. If the pressure has dropped by more than 0.1 bar_g there is a leak in the remaining components of the system. Carry on with the pressure test to localise the leak.	✓ Pressure test OK Remaining Lonestar® system air-tight 0.000 Gas Flow L/min 1.952 Pressure barg Previous leak detected located within the ATLAS™ Split Flow Box ✗ Pressure test not OK Leak detected within the remaining Lonestar® system 0.000 Gas Flow L/min 1.206 Pressure barg Carry on with the pressure test procedure Note: An initial drop in pressure of <0.10 bar_g is possible as there may be some settling of the internal pressure regulator.
17	Please inform Owlstone® support that the ATLAS™ Split Flow Box is leaking by sending a request using the website.	http://support.owlstonenanotech.com/anonymous_requests/new 

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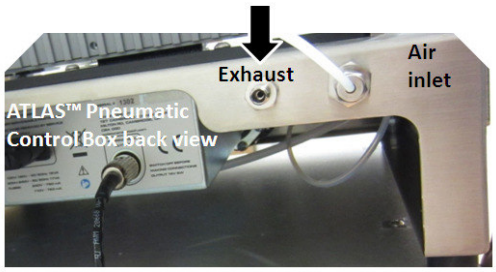
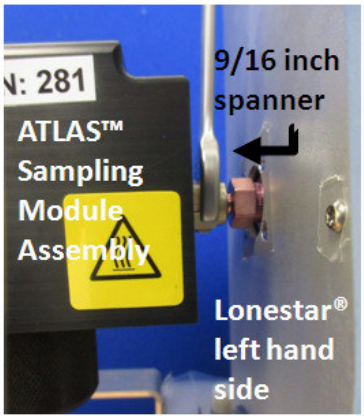
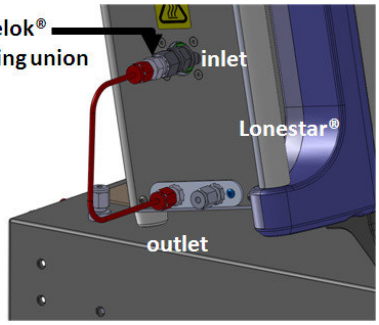
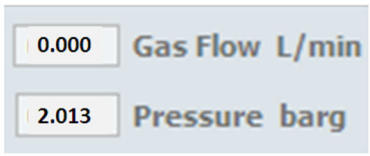
Pressure test of the ATLAS™ Sampling Module Assembly

The method to pressure test the ATLAS™ Sampling Module Assembly is to remove it from the system and pressure test the remaining system. If no leak is detected when the ATLAS™ Sampling Module Assembly is removed, then the leak comes from the ATLAS™ Sampling Module Assembly itself.

18	On the ATLAS™ Pneumatic Control Box, leave the air supply valve on **CLOSED** and remove the blanking Swagelok® nut from the exhaust fitting at the back.	 
19	Remove the ATLAS™ Sampling Module Assembly from the Lonestar® using a 9/16” spanner.	FRONT VIEW 
20	Replace the ATLAS™ Sampling Module Assembly with a length of pipe going from the clean gas outlet to the inlet. A ¼” – $^{1}/_{8}$” Swagelok® reducing union (part number 50-0618) is required to connect the pipe.	
21	Open the air flow of the Lonestar® system using the ATLAS™ Pneumatic Control Box air supply valve. Verify the Lonestar® software pressure reads about 2 bar_g. Blank the ATLAS™	ATLAS™ Pneumatic Control Box   Lonestar® software  

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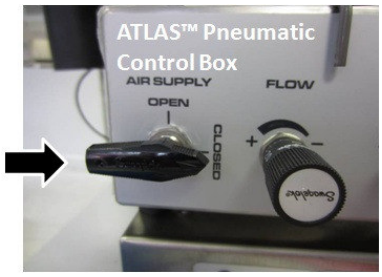
	Pneumatic Control Box exhaust located at the back with a 1/8” Swagelok® blanking nuts. Verify the Lonestar® software gas flow reads 0 L/ min.	
22	Turn off the air flow to the Lonestar® system by turning the air supply valve to **CLOSED** on the ATLAS™ Pneumatic Control Box.	
23	Allow 20-30 seconds for any initial pressure drop then monitor the pressure reading on the Lonestar® software for 10 minutes by leaving the system untouched. If the pressure has dropped by less than 0.1 bar_g there is no significant leak within the remaining Lonestar® system. The leak was present in the ATLAS™ Sampling Module Assembly. If the pressure has dropped by more than 0.1 bar_g there is a leak in the remaining components of the system. Carry on with the pressure	✓ Pressure test OK Remaining Lonestar® system air-tight 0.000 Gas Flow L/min 1.952 Pressure barg Previous leak detected located within the ATLAS™ Sampling Module Assembly ✗ Pressure test not OK Leak detected within the remaining Lonestar® system 0.000 Gas Flow L/min 1.206 Pressure barg Carry on with the pressure test procedure

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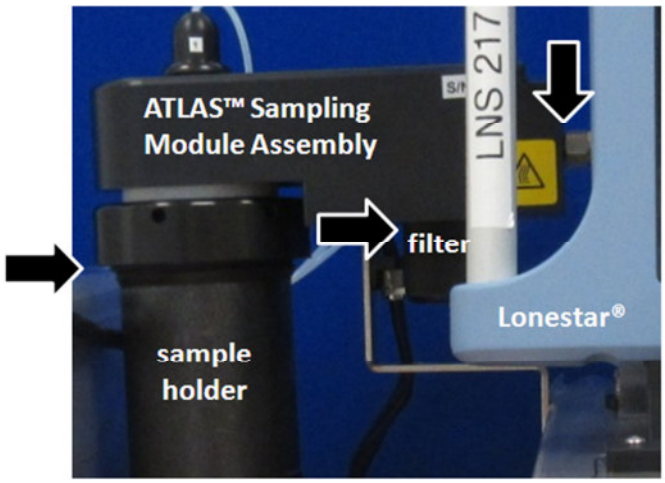
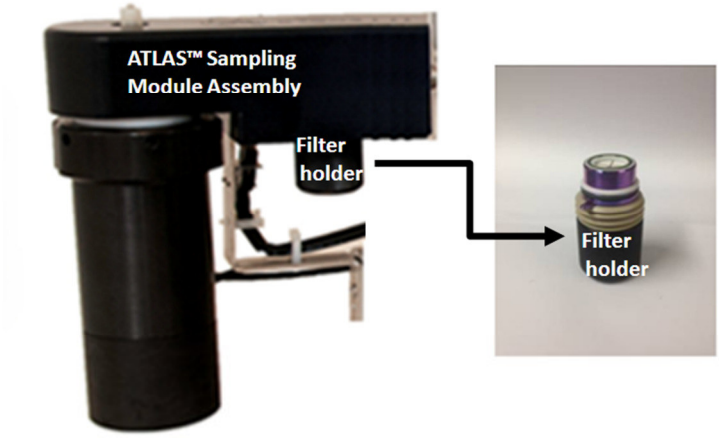
	test to localise the leak.	
24	Sites for possible leaks within the ATLAS™ Sample Module Assembly are: -sample bottle o-ring damage. -filter holder o-ring damage. -joint between the ATLAS™ Sample Module Assembly and the Lonestar® not being tight. -A large moulding line on the glass bottle which doesn't let the o-ring seal.	
25	Replace the o-ring on the sample holder or bottle. Attach the sample holder to the ATLAS™ Sample Module Assembly lid region, ensuring that the o-ring is compressed.	 
26	Remove the filter holder from the ATLAS™ Sampling Module Assembly by unscrewing it. Ensure that the ATLAS™ Sampling Module Assembly is depressurised and has cooled before unscrewing the filter holder.	 NOTE: The filter may be hot depending upon the temperature set.

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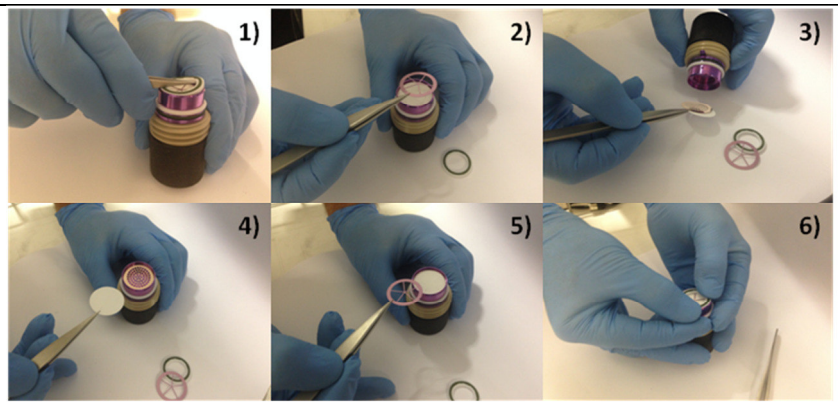
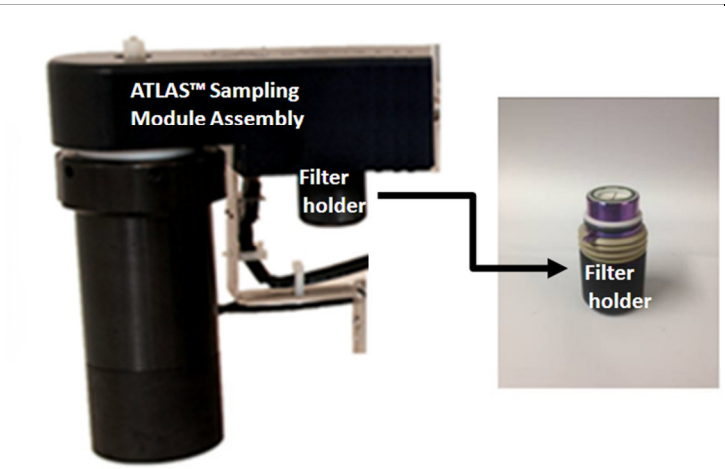
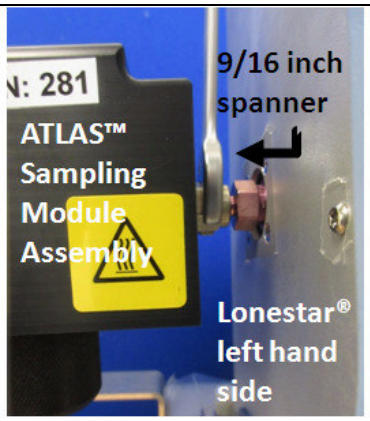
27	Change the filter paper within the filter holder. After changing the filter, the Lonestar® system may need to be run for up to 2 days with clean air flowing, to allow the new filter to clean down.	 **1)** Using tweezers lift the white PTFE component containing the green o-ring. **2)** Lift the purple metal piece holding the filter paper in place. **3)** Remove the filter paper. **4)** There will be a final purple metal piece remaining. Place the new filter paper on top of the remaining purple metal piece and reassemble the filter parts. **5)** Add the purple metal holder back. **6)** Press the PTFE part and o-ring back in place
28	Screw the filter back into the ATLAS™ Sample Module Assembly.	
29	Reinstall the ATLAS™ Sample Module Assembly to the Lonestar® to repeat the pressure test.	

Pressure test of the Lonestar® scrubber

The method to pressure test the Lonestar® is to remove its scrubber and pressure test the remaining system. If no leak is detected when the Lonestar® scrubber is removed, then the leak comes from the Lonestar® scrubber itself.

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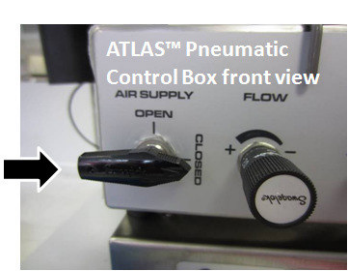
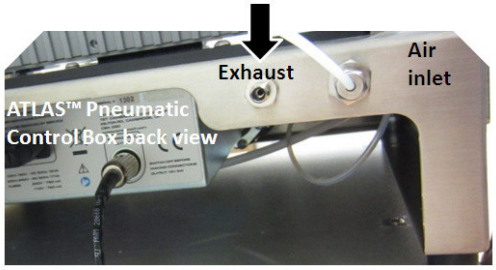
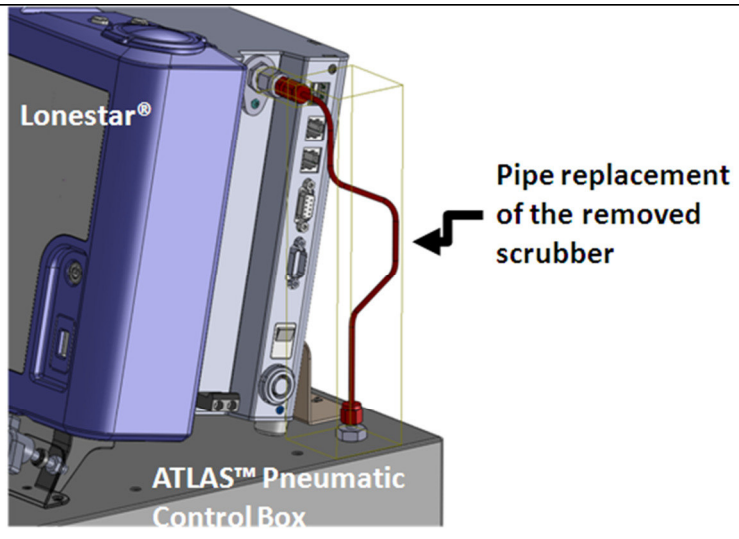
30	Turn off the air flow to the Lonestar® system by turning the air supply valve to **CLOSED** on the ATLAS™ Pneumatic Control Box and remove the blanking Swagelok® nut from the exhaust fitting at the back if not done already.	 
31	Remove the scrubber from the Lonestar® by unscrewing both Swagelok® fittings located at the top and at the bottom of the scrubber.	
32	Connect the air supply from the ATLAS™ Pneumatic Control Box directly to the Lonestar®, using a 1/8" – ¼" Swagelok® adaptor.	

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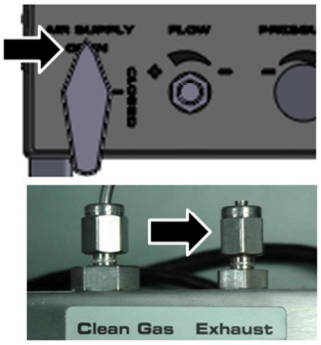
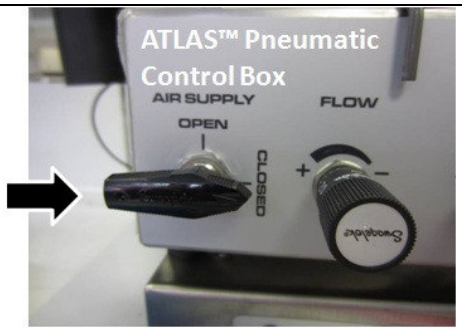
33	Open the air flow of the Lonestar® system using the ATLAS™ Pneumatic Control Box air supply valve. Verify the Lonestar® software pressure reads about 2 barg. Blank the ATLAS™ Pneumatic Control Box exhaust located at the back with a 1/8” Swagelok® blanking nuts. Verify the Lonestar® software gas flow reads 0 L/min.	ATLAS™ Pneumatic Control Box  Lonestar® software 
34	Turn off the air flow to the Lonestar® system by turning the air supply valve to **CLOSED** on the ATLAS™ Pneumatic Control Box.	
35	Allow 20-30 seconds for any initial pressure drop then monitor the pressure reading on the Lonestar® software for 10 minutes by leaving it untouched. If after 10 minutes, the pressure has dropped by less than 0.1 bar_g then there is no significant leak within the remaining Lonestar® system. The leak was present	✓ Pressure test OK Remaining Lonestar® system air-tight  Previous leak detected located within the Lonestar® scrubber ✗ Pressure test not OK Leak detected within the remaining Lonestar® system  Carry on with the pressure test procedure

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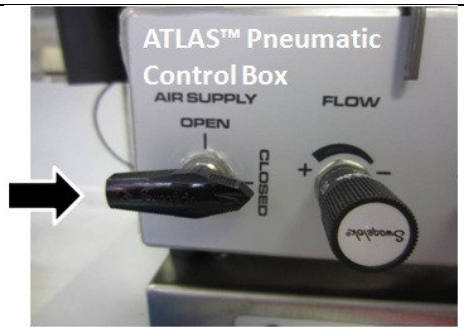
	in the scrubber. If the pressure has dropped by more than 0.1 bar_g there is a leak in the remaining components. Carry on with the pressure test to localise the leak.	
36	If the leak has been located in the scrubber, unscrew the top to check that the scrubber has been assembled using a 1.8 mm diameter o-ring in the lid. Replace this o-ring from one supplied with the Lonestar® if it is damaged. If any PTFE tape is on the main outer thread then remove it. Replace the top onto the scrubber tightly and repeat the pressure test.	

Pressure test of the ATLAS™ Pneumatic Control Box

The ATLAS™ Pneumatic Control Box is tested separately.

37	Leave the air flow to the Lonestar® system off by having the air supply valve to **CLOSED** on the ATLAS™ Pneumatic Control Box.	

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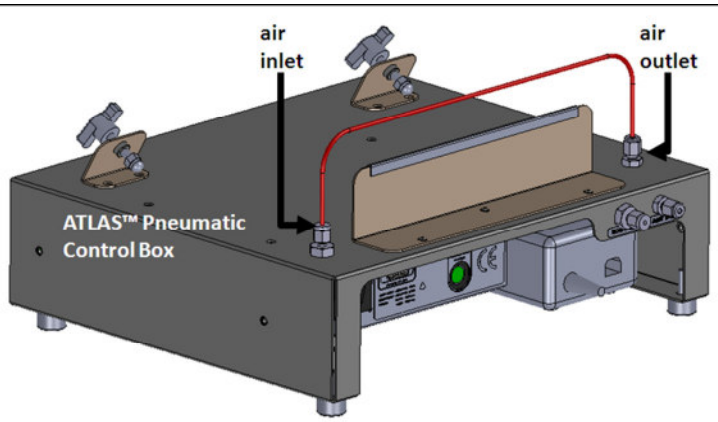
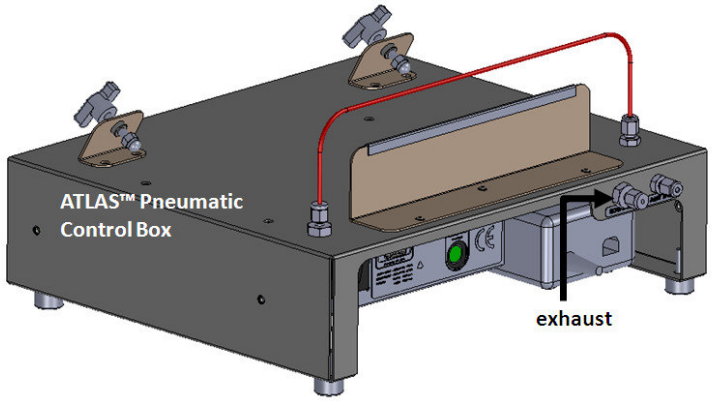
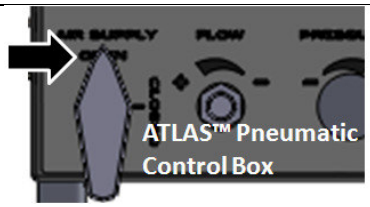
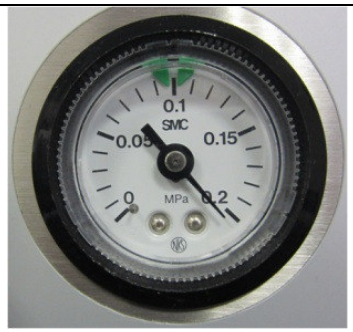
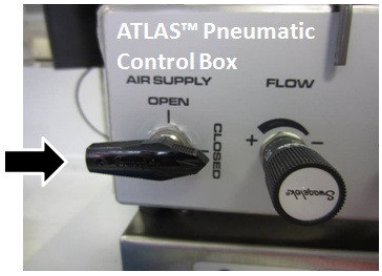
38	Remove the Lonestar® from the top of the ATLAS™ Pneumatic Control Box. Connect the ATLAS™ Pneumatic Control Box air inlet port located on the top-right to the exhaust port on the top-left.	
39	Blank the exhaust fitting at the back of the ATLAS™ Pneumatic Control Box using a 1/8" Swagelok® blanking nut.	
40	Turn the air supply valve to **OPEN** and allow the system to pressurise.	
41	Verify that the non-bleeding pressure gauge reads 0.2 MPa (2 bar_g).	
42	Turn off the air flow to the Lonestar® system by turning the air supply valve to **CLOSED** on the ATLAS™ Pneumatic Control Box.	

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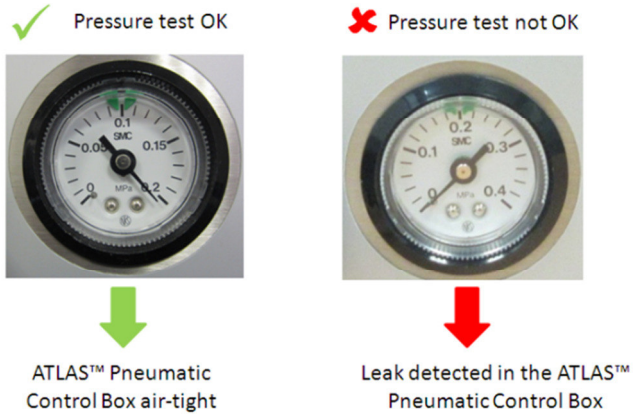
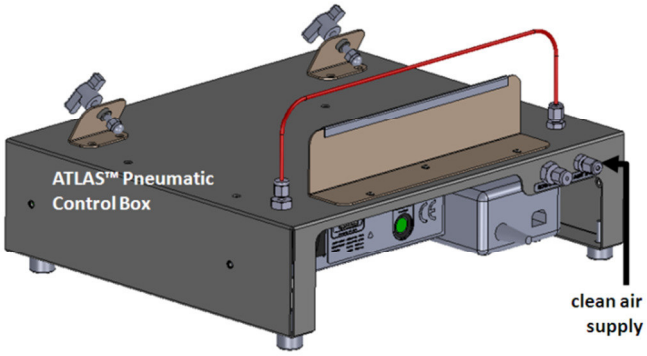
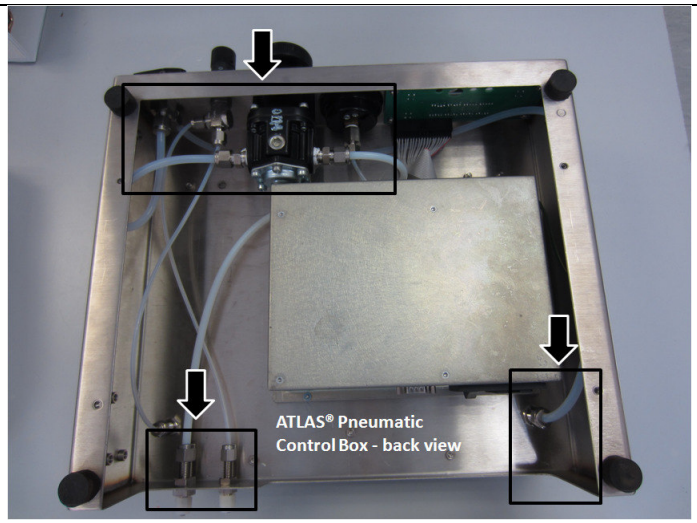
43	Monitor the pressure reading on the non-bleeding pressure gauge for 5 minutes. If after 5 minutes, the pressure has dropped, then there is a leak in the ATLAS™ Pneumatic Control Box.	
44	Disconnect the ATLAS™ Pneumatic Control Box from the air supply by unscrewing the Swagelok® nut attached to the clean air supply located at the back.	
45	Check systematically all Swagelok® fittings of the ATLAS™ Pneumatic Control Box and tighten them if required. Once all Swagelok® fittings have been verified, repeat a pressure test. If, on second attempt, the ATLAS™ Pneumatic Control Box shows no pressure drop, the leak comes from the Lonestar®.	 Please tighten Swagelok® fittings in two steps: 1. Hand tighten 2. Tighten with the spanner only a further 1/16 to 1/8 turn.

Pressure test of the Lonestar® fitting

The only fitting that may be serviced outside Owlstone® is the ¼" NPT to ¼" Swagelok® pipe fitting that connect the ATLAS™ Sampling Module to the Lonestar®.

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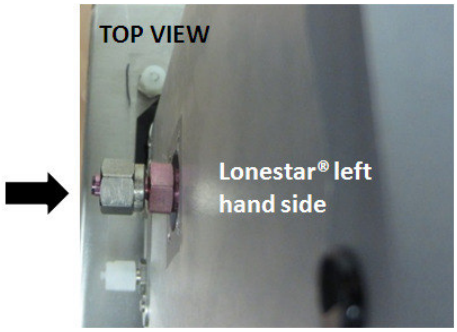
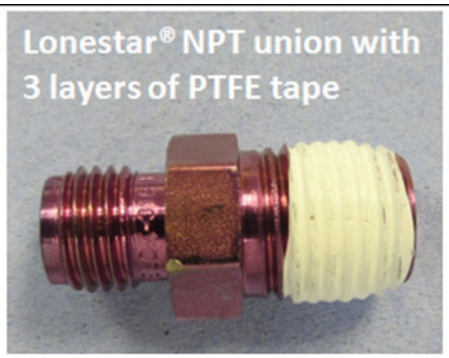
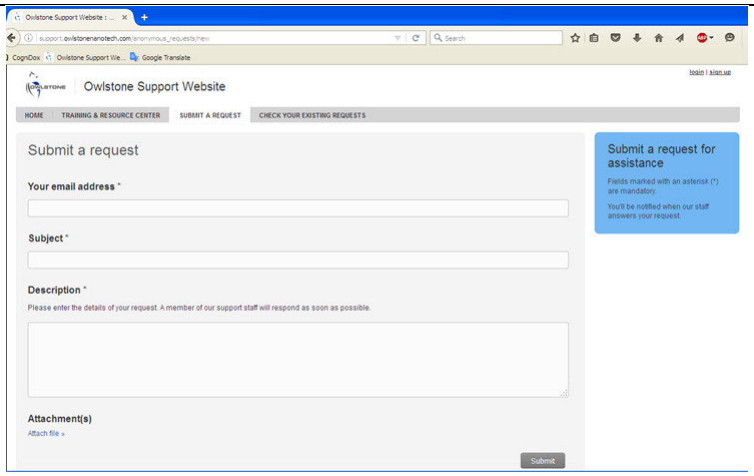
46	The ¼" NPT to ¼" Swagelok® pipe fitting is located on the left hand side of the Lonestar®. It has PTFE tape used to make the seal. Remove this fitting and check the threads for damage.	
47	Using tweezers carefully remove any threads of PTFE from the NPT fitting male and female sides of the thread. If this is not done carefully, the PTFE threads could end up on the FAIMS chip and affect the performance of the Lonestar® system.	
48	If the thread of the NPT fitting appears damaged, then contact Owlstone® support department. If the thread is OK, apply only 3 layers of the provided Swagelok® oil free PTFE tape (part number 50-1054) to the fitting and tighten it in place.	 Please remember to wear gloves when manipulating Swagelok® fittings and oil free PTFE tape to avoid any finger grease contamination to the Lonestar® system.
49	Pressure test the Lonestar® as detailed earlier If the Lonestar is still leaking, please contact Owlstone® support.	

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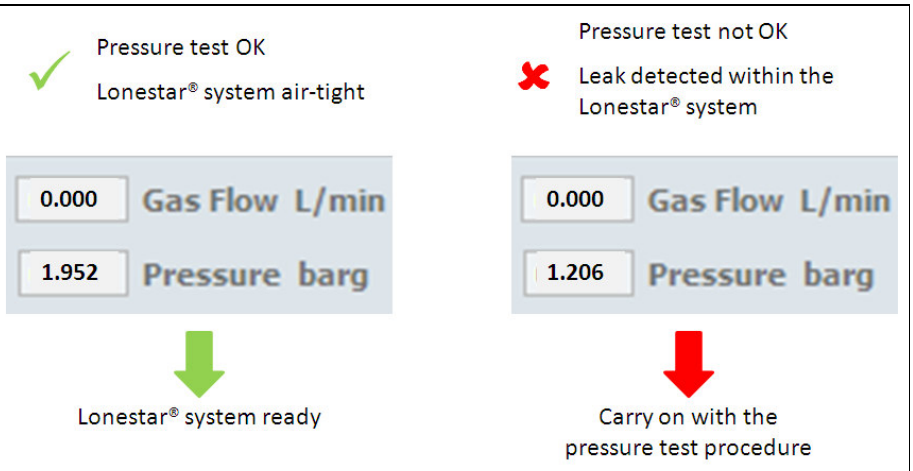
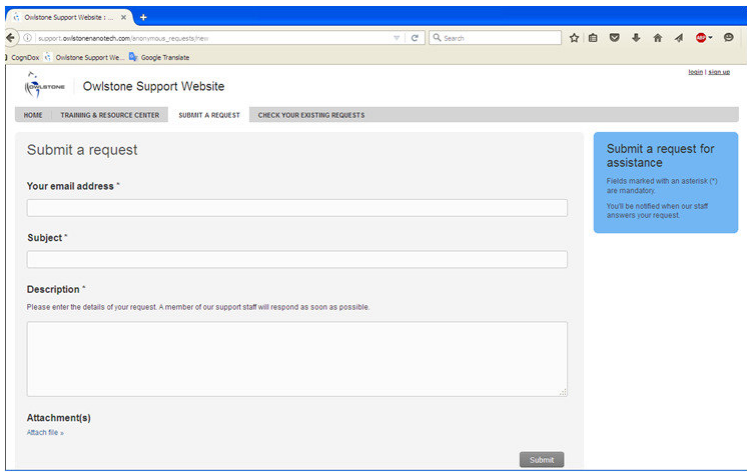
Pressure test of the Lonestar® and ATLAS™ system

Once all Lonestar® and ATLAS™ components have been pressure tested separately, assembly them together using the installation document if needed:

CC-900550-PR – Installation of Lonestar 3.0 with an ATLAS 2.x

50	Perform a final pressure test following steps 3 to 7.	
51	To contact the Owlstone® support department, please submit a request using the website:	http://support.owlstonenanotech.com/anonymous_requests/new 

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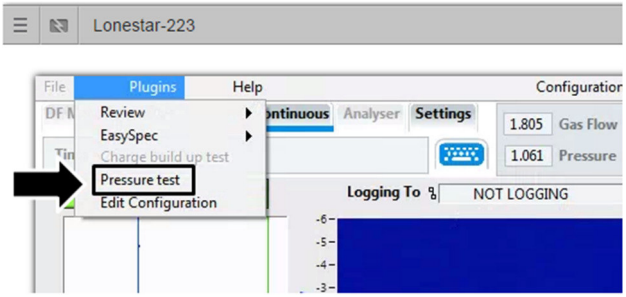
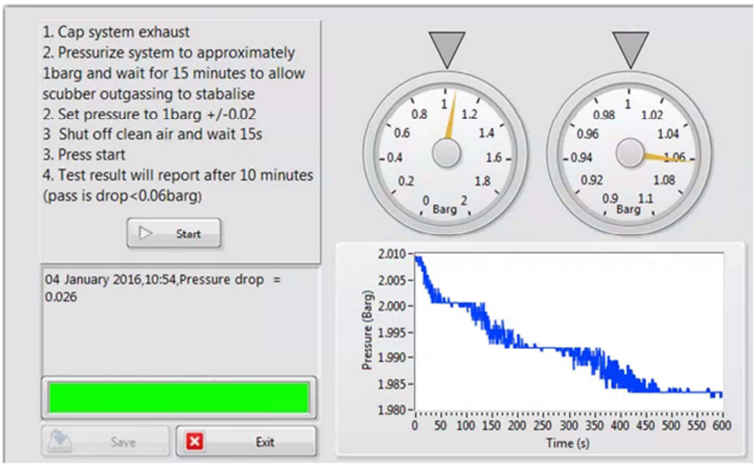
Appendix - Lonestar® software pressure test

Another option to do the testing is using the option that Lonestar® software offers.

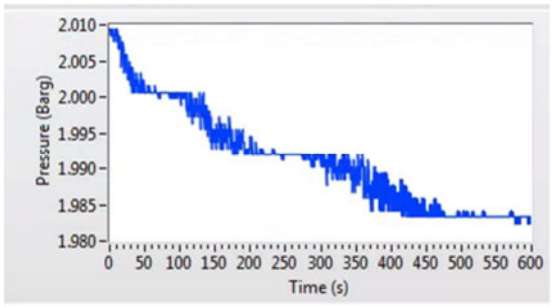
1. In the Lonestar software toolbar select Plugins; Pressure test:



2. The following screen appears:



3. The steps to follow are similar to the procedure detailed above; however in the v4.912 s/w this test is based on a 1bar pressure which means that you cannot do a whole system (Lonestar® + ATLAS™) test. The Lonestar® system plots the pressure versus time showing the pressure test monitoring for 10 minutes and fails if the pressure drop is more than 0.06 bar (60 mbar).



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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.

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