SGE

ms noVent™

Installation & Operating Instructions

ms noVent

MASS SPECTROMETER COLUMN CHANGE INTERFACE

The ms-NoVent™ interface is designed to allow column changing or column maintenance to be carried out without the need to shut down the mass spectrometer. The design of the interface ensures that no air or water enters the mass spectrometer while the column is disconnected, which in turn ensures that the ion source remains contamination free. As a result a column can be changed and the instrument brought back on line in minutes.

To protect your MS's integrity

The ms-NoVent tee is manufactured from stainless steel with a soft brass threaded insert for the connection to the MS interface. This will ensure that no damage can be done to the MS interface.

1•0
ms-NoVent Principle of Operation:

Normal MS Column Changeover
- Shut down the ion source and pumps
- Cool the MS to room temperature
- Vent to air
- Change column
- Pump down
- Heat to operating temperature
- Allow system to stabilize
- Change over time - around 6-12 hours

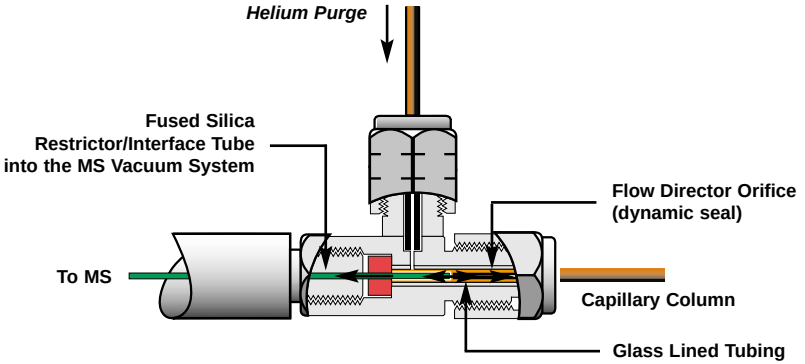
Contrary to the common perception, re-establishing the vacuum is the easy part after pump down on the system begins. This is especially true for systems with a turbo molecular pump.

Most GC-MS systems have separate heating zones for the source and quadrupole and thermal equilibrium can be re-established very quickly in most cases. After pump down begins, air (nitrogen and oxygen) can be eliminated from the mass spec usually within half an hour. This is not the problem.

Water is always the biggest problem when venting the mass spec. Elimination of water can take 6-12 hours with most systems. This is especially important when high sensitivity auto-tuning is required such as that used in environmental labs (ie. DFTPP tuning).

The ms-NoVent prevents air and water from entering the MS during column change-over. The key to the ms-NoVent is the unique fluidic valve and deactivated fused silica interface tube which are located at the MS interface as part of the ms-NoVent Tee. The Tee is shown in Figure 1. Before the column is removed from the interface, a helium purge is turned on. The fused silica restrictor interface tube limits the flow of helium into the mass spectrometer, which only marginally effects its vacuum. As shown in Figure 1, after the column has been removed from the GC, the fluidic valve (via the Flow Director Orifice) will prevent air from entering the mass spectrometer. In other words, the flow of helium through the orifice acts as a dynamic seal preventing air from being sucked back into the MS.

Figure 1.



Normal Operation Mode

In normal operation the Helium purge is turned off. The column flow is directly through to the MS via the fused silica transfer tube. Note: The transfer tube and tee in normal operation are under vacuum through the MS interface vacuum.

Column Change Mode

In the column change mode a helium purge is applied to the Interface Tee. The column can then be disconnected without shutting down or "venting" the MS. The existing column or a new column can then be reconnected and the ms-NoVent switched back to normal mode for standard operation.
Note: There is no time limit to how long the MS system can be left in the column change mode.

1•1
Standard ms-NoVent Overview
The standard ms-NoVent consists of two components:

a) Control Module

b) Interface Tee MS connection

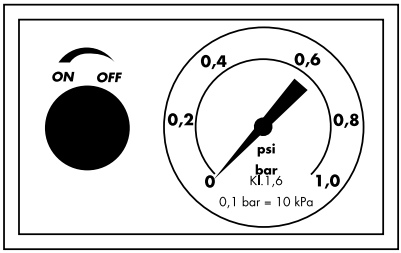
1•2

Control Module

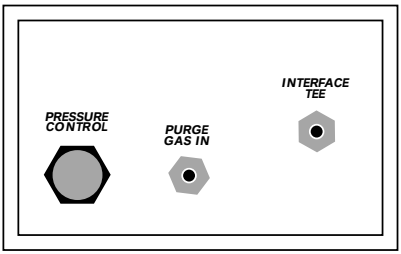
The Control Module manages the purge gas required by the ms-NoVent when a column is disconnected. A pressure gauge, located on the front of the module, enables monitoring of purge pressure. Purge gas is controlled using the on-off knob; counter clockwise to turn ON and clockwise to turn OFF. The knob is equipped with a slipping clutch that allows it to rotate, even when it is in the full OFF position. This ensures the valve cannot be damaged due to over tightening. The valve is in the OFF position when it no longer moves towards the case. Gas Inlet and Outlet connections are on the rear of the control module.

Note: Columns with an outside diameter less than 0.38mm OD can be inserted into the glass lined tee. Do not force large OD.

Front Panel



Rear Panel



1•3

"Interface Tee" MS Connection

The heart of the ms-NoVent is the Interface Tee installed onto the MS interface inside the GC oven, along with an MS specific fused silica interface restrictor.

2•0

Installation of the Interface

2•1

Cool all the heated zones of the GC-MS and follow the specific venting procedure for your MS.

2•2

Turn off the carrier gas source supply.

2•3

Turn off the GC and unplug the power cord.

2•4

Place the ms-NoVent control module in a convenient position on top of, or beside the GC.

2•5

Cut the carrier gas source inlet line behind the back of the GC. Insert and fix the Parker® tee piece using the nuts and ferrules provided. Connect the $^1/_8$" bushed end of the supplied $^1/_{16}$" stainless steel tubing to the side arm of the Parker® tee using the nuts and ferrules provided. Connect the other end of the $^1/_{16}$" tubing to the ms-NoVent control module "purge gas in", securing it with the Graphitized Vespel® nut and ferrule provided. See Figure 2 for an exploded diagram.

2•6

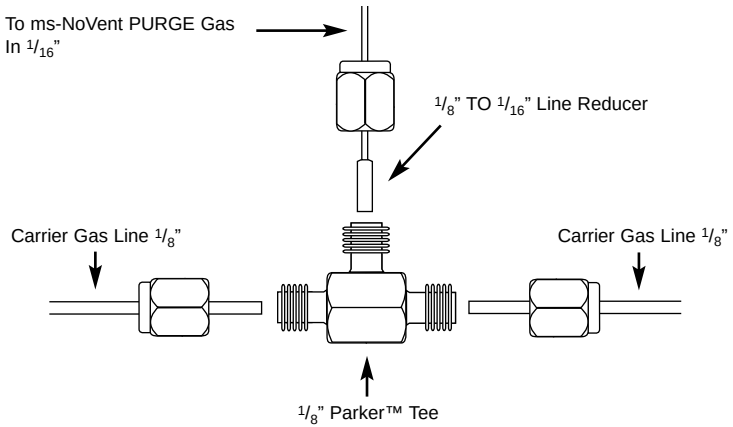
Take the second piece of coiled $^1/_{16}$" stainless steel (NOT having the $^1/_8$" bushing) and identify the marked end. The marked end of the tubing has a restriction which MUST be connected to the ms-NoVent tee.

2•7

Connect the NON-MARKED end of the $^1/_{16}$" tubing to the "Interface Tee" outlet of the ms-NoVent control module using the $^1/_{16}$" nut and Grapgitized Vespel® ferrule provided. Thread the tubing into the GC oven so that its outlet is located near the ms-NoVent tee.

Note: The tubing can be introduced into the oven by one of the holes in the roof of the GC. Be careful not to get insulation into the tubing when passing it through the oven roof. Another option would be to have the tubing enter via the same hole as the transfer line ie. oven wall.

Figure 2.



2•8
Disconnect the column from the mass spectrometer, following the normal vent procedure.

Caution: MS interface may be HOT. Care should be taken when dealing with HOT surfaces.

2•9
Restrictors supplied with an adapter

FOR SOME INSTRUMENTS AN ADAPTER IS REQUIRED TO ALLOW THE NOVENT TEE TO BE CONNECTED TO THE MS INTERFACE.

THE ADAPTOR IS SEALED TO THE MS INTERFACE USING A METAL SilTite™ FERRULE. SCREW THE ADAPTOR ONTO THE MS INTERFACE ENSURING THAT THE METAL FERRULE REMAINS IN PLACE.

Tighten the adapter using the following procedure:

a) Using fingers (rather than a wrench) tighten the adapter onto the MS interface until it stops.

b) Using a wrench tighten a further 30° no further. Do not be tempted to go further (more is not better) and the interface may be damaged.

c) It is not necessary to temperature cycle the oven and retighten the seal.

2•10
Check that the pressure gauge on the ms-NoVent control box reads between 5-8 psi. If the pressure is outside this range, adjust the pressure regulator control knob on the back of the ms-NoVent pressure module.

2•11
Turn the ms-NoVent purge gas on. Helium is now purging through the control box and purge line.

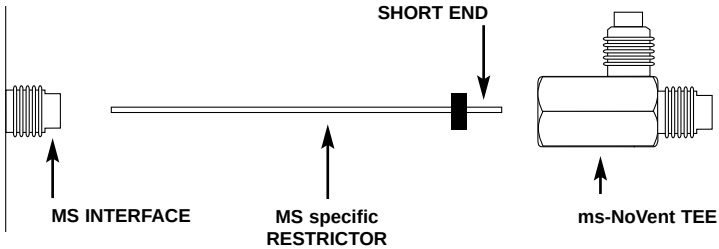
Check that the pressure gauge still reads between 5-8 psi. If the pressure is outside this range adjust using the pressure control knob.

After 5 minutes, turn the purge gas off again. Reconfirm that the pressure setting is between 5-8psi. Adjust if necessary. Turn the ms No-Vent purge gas on again and continue purging.

Note: For high sensitivity applications, allow the lines to purge for 2-4 hours to expel all ambient air and water trapped in the control module and purge gas lines.

2•12
Remove the MS specific restrictor from its protective packaging. There are two types of restrictor seals. Original seals were vespel seals encased in a stainless steel ring fixed onto the fused silica restrictor. These instructions are for the updated SilTite (all metal seals). Insert the short end of the restrictor into the ms-NoVent tee ensuring that the fused silica tubing passes into the GLT orifice at the centre of the tee approximately 5mm.

Figure 3.



Note: Replace restrictors after the seal between the MS and interface is broken. i.e. for source cleaning.

Slide the long end of the restrictor through the interface and into the mass spectrometer's source. Figure 3. Tighten the tee using the following procedure:

a) Using fingers (rather than a wrench) tighten the tee onto the interface (or adapter) until it stops.
b) Using a wrench tighten a further 30°, no further. A reliable seal will be achieved. Do not be tempted to go further (more is not better) as the interface may be damaged and the fused silica restrictor will be broken after approximately 180° of further turning.

2•13
Connect the "purge gas outlet" tube to sidearm of the ms-NoVent union tee inside the oven. It is important that the tubing is inserted all the way into the tee sidearm to avoid leakage. Tighten using the procedure outlined in 2.12.

2•14
Connect the column to the injector and turn the column head pressure back on. Place the other end of the column in some organic solvent and check for bubbles exiting the end of the column. Do not connect the column to the ms-NoVent interface tee until all the air has been purged out of it. This will take 5 to 10 minutes. You may also wish to condition or "Bake Out" the column at this point to avoid contamination of the MS.

Column Connection to the ms-NoVent

IT IS IMPORTANT THAT CARE IS TAKEN TO CORRECTLY INSTALL THE COLUMN TO AVOID POSSIBLE LEAKAGE. Use the following procedure to install the column:

a) Insert the capillary column into the $^1/_{16}$" nut.

b) Insert the capillary column into the SilTite ferrule; ensure the direction of ferrule is as shown in Figure 4A.

Figure 4A.

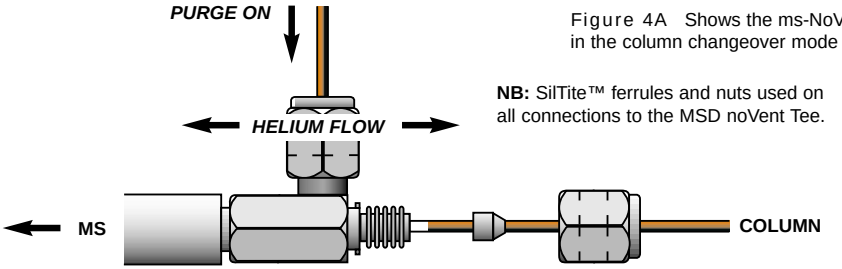


Figure 4A Shows the ms-NoVent in the column changeover mode

NB: SilTite™ ferrules and nuts used on all connections to the MSD noVent Tee.

c) Slide the ferrule loosely into the $^1/_{16}$" nut.

d) With the left hand holding the $^1/_{16}$" nut, and the right hand holding the capillary column; place the end of the capillary column onto the flat face of the Tee as shown in Figure's 4B and 4C.

Note: Columns with an outside diameter less than 0.38mm OD (such as 0.22mm ID and 0.25mm ID columns) can be inserted into the WELL (see Figure 4C) a short distance. Larger OD columns will not fit and a butt connection with the Flat Face of Tee will need to be made.

DO NOT FORCE THE COLUMN INTO THE TEE.

Figure 4B.

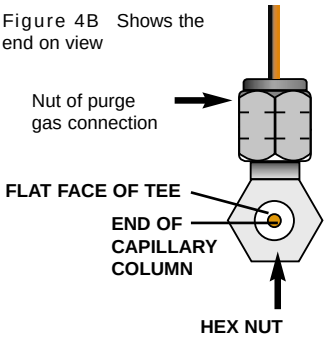


Figure 4B Shows the end on view

NB: SilTite™ ferrules and nuts used on all connections to the MSD noVent Tee.

Figure 4C.

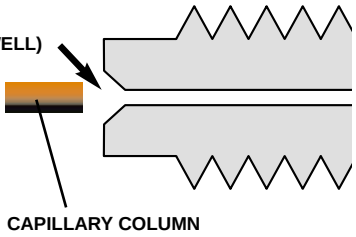
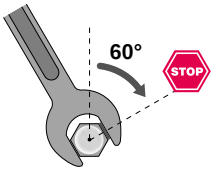


Figure 4C Side view of Interface Tee showing the column.

e) Slide the $^{1}/_{16}$" nut onto the Tee and finger tighten while maintaining a minimum amount of pressure on the column which is located in the Tee hole.

f) Using a wrench, gradully tighten the SilTite nut until the ferrule just begins to hold the fused silica. Then tighten a further 60°.



2•16
Pump down the Mass Spectrometer and allow the system to equilibrate (on the initial installation of the ms-NoVent, MS equilibration may take 5-10 hours). Ensure that ms-NoVent purge gas is off.

Note: Placing the ms-NoVent in line will decrease column flow due to its restriction. To compensate for this column length, head pressure and flow will need to be adjusted on the GC. Table 2 at the rear of these instructions lists the "old" programmed parameters (before the ms-NoVent is installed) and "new" programmed parameters (after the ms-NoVent is installed) which will need to be programmed to maintain the same flow through the column. Always double-check the average flow velocity after the ms-NoVent is installed using an unretained solute.

2•17
The system is now ready for use.(See Figure 5)

Figure 5.

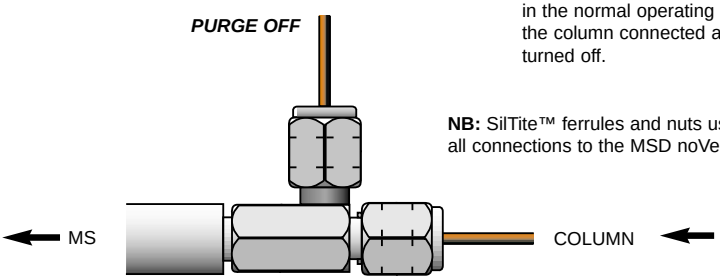


Figure 5 Shows the ms-NoVent in the normal operating mode with the column connected and the gas turned off.

NB: SilTite™ ferrules and nuts used on all connections to the MSD noVent Tee.

2•18
Double check the average column flow velocity using an unretained solute.

3•0
Procedure for changing a column

3•1
Cool the oven and injection port to ambient temperature and turn the column head pressure off.

3•2
Turn the ms-NoVent purge gas on. Helium is now purging through the control box and into the tee.

3•3
Disconnect the column from the ms-NoVent interface tee and the injector.

Caution: The interface tee may be very hot. Heat insulating oven mitts/gloves should be used when handling hot surfaces.

3•4
Connect the column to the injector and turn the column head pressure back on. Place the other end of the column in some organic solvent (you can use one of the solvent wash bottles from an autosampler) and check for bubbles exiting the end of the column. Do not connect the column to the ms-NoVent interface tee until all the air has been purged out of it. This will take 5 to 10 minutes.
You may also wish to condition the column at this point to avoid contamination of the MS.

3•5
Column Connection to the ms-NoVent
IT IS IMPORTANT THAT CARE IS TAKEN TO CORRECTLY INSTALL THE COLUMN TO AVOID POSSIBLE LEAKAGE. Use the following procedure to install the column:

a) Insert the capillary column into the $^1/_{16}$" nut.

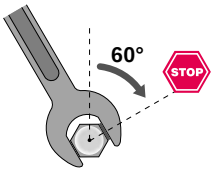
b) Insert the capillary column into the SilTite ferrule; ensure the direction of ferrule is as shown in Figure 4A.

c) Slide the ferrule loosely into the $^1/_{16}$" nut.

d) With the left hand holding the $^1/_{16}$" nut, and the right hand holding the capillary column; place the end of the capillary column onto the flat face of the Tee as shown in Figure's 4B and 4C.
Note: Columns with an outside diameter less than 0.38mm OD (such as 0.22mm ID and 0.25mm ID columns) can be inserted into the WELL (see Figure 4C) a short distance. Larger OD columns will not fit and a butt connection with the Flat Face of Tee will need to be made.
DO NOT FORCE THE COLUMN INTO THE TEE.

e) Slide the $^{1}/_{16}$" nut onto the Tee and finger tighten while maintaining a minimum amount of pressure on the column which is located in the Tee hole.

f) Using a wrench, gradually tighten the SilTite nut until the ferrule just begins to hold the fused silica. Then tighten a further 60°.



3•6
Switch on the oven, injection port heater and column head pressure.

3•7
Turn the ms-NoVent purge gas off.

3•8
The system is now ready for use. (Figure 5)

3•9
Double check the column flow velocity using an unretained solute.

Table 2

5973 MS		(Old Pressure, New Pressure, New Length) Internal Diameter		
Column Length	0.1	0.22	0.25	0.32
10	(30.3, 32.95, 11.21)			
12		(-3.5, 3.03, 30.08)		(-9.4, 3.24, 137.48)
15			(-3.9, 4.24, 46.15)	(-8.1, 4.56, 127.70)
25		(8.6, 15.27, 41.35)		(-3.7, 9.17, 117.69)
30			(6.9, 15.26, 57.7)	(-1.5, 11.46, 117.81)
50		(31.8, 38.61, 65.73)		(7.3, 20.55, 128.39)
60			(28.5, 37.10, 86.28)	(11.7, 25.07, 136.15)

5972/1 MS (approx equal to Varian sat123)		(Old Pressure, New Pressure, New Length) Internal Diameter		
Column Length	0.1	0.22	0.25	0.32
10	(30.3, 34.07, 11.75)			
12		(-3.5, 5.12, 37.56)		(-9.4, 7.28, 206.29)
15			(-3.9, 6.81, 59.48)	(-8.1, 8.57, 186.44)
25		(8.6, 17.36, 47.32)		(-3.7, 13.186, 160.67)
30			(6.9, 17.85, 68.14)	(-1.5, 15.49, 156.93)
50		(31.8, 40.74, 71.08)		(7.3, 24.64, 159.88)
60			(28.5, 39.77, 95.39)	(11.7, 29.18, 165.78)

5970 MS/Varian Saturn 2000		(Old Pressure, New Pressure, New Length) Internal Diameter		
Column Length	0.1	0.22	0.25	0.32
10	(30.3, 36.47, 12.93)			
12		(-3.5, 9.17, 54.52)		(-9.4, 15.12, 379.92)
15			(-3.9, 11.77, 90.11)	(-8.1, 16.35, 331.88)
25		(8.6, 21.37, 59.91)		(-3.7, 20.93, 262.23)
30			(6.9, 22.82, 90.52)	(-1.5, 23.23, 247.77)
50		(31.8, 44.81, 81.89)		(7.3, 32.45, 229.65)
60			(28.5, 44.84, 113.98)	(11.7, 37.03, 230.37)

Shimadzu QCP5000/5050 All types / Finnigan GCQ		Internal Diameter		
Column Length	0.1	0.22	0.25	0.32
10	(30.3, 35.95, 12.67)			
12		(-3.5, 8.34, 50.77)		(-9.4, 13.51, 339.95)
15			(-3.9, 10.75, 83.31)	(-8.1, 14.75, 298.64)
25		(8.6, 20.55, 57.22)		(-3.7, 19.34, 239.44)
30			(6.9, 21.81, 85.70)	(-1.5, 21.65, 227.53)
50		(31.8, 43.98, 79.63)		(7.3, 30.86, 214.41)
60			(28.5, 43.81, 110.06)	(11.7, 35.43, 216.36)

All calculations made assuming: He carrier, 50°C oven temp and 35cm/sec average linear velocity.

ms-NoVent RESTRICTORS

An instrument specific restrictor must be installed into the MS interface for correct operation of the ms-NoVent. Please ensure the restrictor matches your MS.

Instrument	Pcs	P/N
HP5970 Restrictor	2	113405
HP5971/5972/GCD Restrictor	2	113407
HP5973 Restrictor	2	113409
HP5988A Restrictor	2	113424
HP5989 Engine Restrictor	2	113422
Shimadzu QP5000/5050 Restrictor (Standard Interface)	2	113411
Shimadzu QP5000/5050 Restrictor (WIF - wide bore interface)	2	113429
Varian Saturn 1,2 & 3 Restrictor	2	113416
Varian Saturn 2000 Restrictor	2	113413
Finnigan GCQ Restrictor	2	113420
Finnigan SSQ7000 Restrictor	2	113427

Packing List

Description	Qty
ms-NoVent Control Module	1
ms-NoVent Interface Tee	1
Parker Tee Fitting	1
Stainless Steel Tubing (1m) $^{1}/_{16}$" OD with $^{1}/_{8}$" sleave	1
Stainless Steel Tubing (1m) $^{1}/_{16}$" OD x 0.8mm (with rest) ID	1
Spanners: $^{5}/_{16}$" - $^{1}/_{4}$"	2
SilTite™ Ferrules: $^{1}/_{16}$"	5
SilTite™ Ferrules: 0.4mm ID	5
SilTite™ Ferrules: 0.5mm ID	5
Graphitized Vespel® $^{1}/_{16}$" ferrules	5
Instructions	1

Replacement P/N

ms-NoVent Control Module	1	113404
ms-NoVent Interface Tee	1	113418
Stainless Steel Tubing (1m) $^{1}/_{16}$” OD x 0.8mm (with rest) ID	1	113417
SilTite™ Ferrules: $^{1}/_{16}$”, (10 ferrules and 2 nuts)	1	073203
SilTite™ Ferrules: 0.4mm ID, (10 ferrules and 2 nuts)	1	073200
SilTite™ Ferrules: 0.5mm ID, (10 ferrules and 2 nuts)	1	073201

Trouble Shooting Guide

Symptom	Possible Cause	Remedy
System Leakage		
MS will not pump down	Gross leak in one of the ms-NoVent tee connections	1) Check column connection - retighten 2) Check helium purge side arm connection - retighten 3) Check tee-interface connection – retighten
High background of 18, 28 and 32 ion.	Air Leakage	1) Check column connection - retighten 2) Check helium purge side arm connection - retighten 3) Check tee-interface connection – retighten
Purge Gas Control/Column Flow		
Poor MS vacuum without the presence of 28 or 32 ions	Helium ms-NoVent purge not turned off	1) Check helium purge valve is turned off 2) Check that valve is operating correctly
No signal from MS	1) Helium ms-NoVent purge not turned off 2) Column blocked 3) ms-NoVent tee or restrictor blocked	1) Ensure helium purge gas is off 2) Check column flow with column disconnected 3) Check tee and/or restrictor for blockage
Long retention times	Helium ms-NoVent purge not turned off	1) Check helium purge valve is turned off 2) Check that valve is operating correctly
Chromatography Parameters		
Chromatographic retention is different from when the ms-NoVent was not connected	Pressure/flow/column length compensation has not been programmed	1) Following the procedure outlined in to effect compensation 2) Check flow velocity with unretained solvent peak
System Activity	1) MS restrictor active 2) Wrong restrictor selected	Replace MS restrictor
Poor peak shape	1) Column Connection 2) Broken MS restrictor	1) Reconnect the column 2) Check restrictor and replace if broken
Large tailing solvent peak in splitless injection	Micropurge (50µL/min) from control box is blocked	1) Check micropurge flow from helium purge line 2) Unblock by ultrasonication/gas pressure if possible 3) Replace helium purge line
Argon is a very good way to check for the source of MS system leakage. By moving the Argon around system connections and looking at a total ion MS trace, the presence of Argon in the MS flow steam can be identified by the 40amu – Argon ion. Also note: 18amu=water; 28amu = Nitrogen; and 32amu = Oxygen		

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