



Capillary Flow Technology: Purged Ultimate Union

**REDUCE DOWNTIME AND INCREASE  
YOUR LAB'S PRODUCTIVITY**

The Measure of Confidence



**Agilent Technologies**

# Perform reliable routine maintenance in a matter of minutes, not hours



Routine operation of any GC/MS system typically requires occasional maintenance of the inlet and column. The mass spectrometer must be shut down to cool and vent the system. Once maintenance is complete, the system must be restarted, pumped down, and baked out before samples can be run again, resulting in significant downtime.

Laboratories could benefit from a reliable way to conduct routine maintenance on a GC/MS system without cooling and venting – especially for high-throughput operations. However, previous attempts at designing a suitable quick-maintenance flow system have had a number of drawbacks:

- » Large metal fittings with high thermal mass do not track oven temperatures well
- » Many oven temperature cycles can cause leaks over time, risking damage to the MS source
- » Internal surfaces are not inert, leading to peak broadening or loss of analytes

## The Purged Ultimate Union provides an effective solution without the drawbacks

Agilent's Capillary Flow Technology Purged Ultimate Union, sometimes referred to as the pressure-controlled tee (PCT), is designed to provide simple backflush to an existing GC or GC/MS method. It addresses all drawbacks while facilitating:

- Fast column removal or replacement without the need to cool and vent the MSD
- Risk-free inlet and column maintenance by preventing air from entering the MSD
- Shorter analysis times and increased sample throughput by removal of high molecular weight compounds using backflushing mode

### How it works...

## THE VERSATILITY TO PERFORM CONCURRENT AND POST-RUN BACKFLUSH

#### Configurations for backflush:

The basic configuration for the Purged Ultimate Union is one inlet (S/SL, MMI or PTV) to one detector. However, it can be used in several backflush configurations.

*Post-Column:* backflush wizard adjusts conditions to offset change in outlet pressure caused by the source controlling the flow for the short post column.

*Coated and Uncoated\* Pre-Column:* requires two columns with options of two equal lengths connected by purged union at midpoint or the purged union joining a shorter (5 m) first section with a longer (15 m) second section.

#### Modes for backflush:

*Post-run:* easiest to configure, backflush occurs after last peak of interest can be implemented.

*Concurrent:* backflush occurs during data collection, eliminating the need for a post run program, saving time and improving lab productivity.

\*Recommended for use only as short retention gaps and not in equal length to the second column.

## Simplify maintenance without affecting detection limits

Applying backflushing helps maintain the GC and the MS source by removing later eluting compounds from the column before reaching the MS, and prior to the next sample injection. This example shows the results of the Purged Ultimate Union (PCT) configuration for rapid and universal GC/MS backflushing, applied to selected reaction monitoring. Using a simple PCT configuration, quick column and inlet maintenance can be performed without venting the MS system or hindering detection limits.

Replicate injections showed no statistically significant difference between the peak areas or heights for the 272 & 241 m/z transition (**Table 1**). Moreover, retention time reproducibility was unaffected by adding PCT, and a standard deviation of less than 0.1 seconds was achieved both with and without the PCT. (Absolute retention times can shift slightly due to a minor difference in the absolute flows and lengths). Signal-to-noise was also indistinguishable between the two configurations, although noise is uniformly low in selected reaction mode. The degree of correspondence is best illustrated in **Figure 1**.

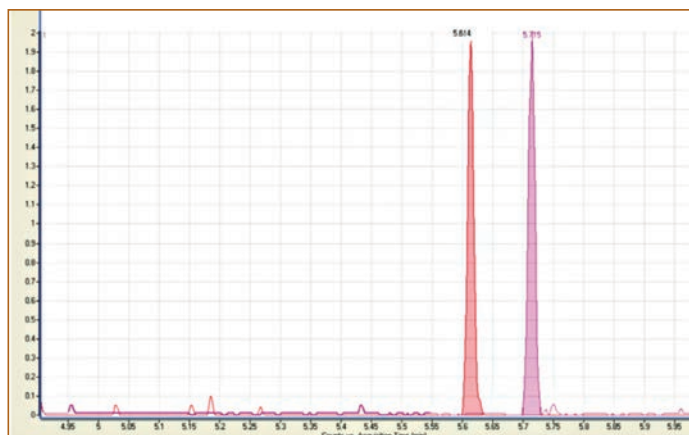
## Maintain retention times with backflush and the Purged Ultimate Union

The Pressure Controlled Tee configuration provides a simple approach to rapid backflushing and GC-serving on all MS systems. If retention times can be permanent on any system, complex MS acquisition methods – such as selected ion monitoring and multiple reaction monitoring (MRM) modes – need not be changed when columns are trimmed or replaced. Similarly, compound retention times are unchanged in data analysis, which simplifies identification, quantitation and the use of databases of compound retention times. Applying simple “Mechanical Retention Time Locking” quickly returns the GC/MS to acquisition without method changes or additional complexity (**Table 2**).

For an example of how to generate compound retention times that are permanent and universal through Retention Time Locking, see Agilent Application Note 5990-4643EN.

GC configuration	RT variation(s)	Normalized MRM Signal area	RSD (%)	Normalized MRM Signal height	RSD (%)	Normalized MRM S/N
Continuous column without PCT	0.063	1	14	1	15	1
With PCT	0.098	1.1	15	1.0	16	1.2

**Table 1.** Comparison between PCT and Continuous Column configurations for MRM 272 →241 (OFN). To simplify the comparison, the results for the peak area, height and signal-to-noise (S/N) ratio have been normalized against the standard configuration.



**Figure 1.** OFN 272 & 241 m/z transition without the PCT (5.614 min) and using the PCT (5.715 min). The same absolute abundance scale is applied to both.

Compound	RT Error (s)
Dichlorvos	-0.66
Mevinphos	-0.66
Ethoprophos	-0.9
Sulfotep	-0.36
Phorate	-0.96
Fonofos	-0.54
Diazinon	-0.48
Disulfoton	-0.48
Chlorpyrifos Methyl	0.06
Methyl parathion	-0.78
Fenclorphos	-0.42
Fenitrothion	-0.42
Malathion	-0.12
Chlorpyrifos	-0.12
Fenthion	-0.36
Tetrachlorvinphos	0.12
Fenamiphos	0
Prothiofos	0.06
S,S,S-Tributylphosphoro	0.12
Ethion	0.48
Sulprofos	0.18
Carbophenothion	0.18
EPN	0.42
Azinphos-methyl	0.36
Azinphos-ethyl	0.72
Coumaphos	2.3

**Table 2.** Illustration of selected retention time error results using the purged and non-purged union.

## What is required?



### 7890 GC or 6890N GC with 5977A Series GC/MSD

#### Purged Ultimate Union accessory

- On-site installation and verification are strongly recommended

#### Aux EPC module

- Aux EPC Purge Regulator Kit is recommended

#### High-temperature Silitite ferrules and fittings

- Included with Purged Ultimate Union option and accessory

#### Restrictor

- 2 each of 100- and 110- $\mu$ m id restrictors included with Purged Ultimate Union option and accessory

#### Flow Calculator or Method Translation Software

- Included with Purged Ultimate Union option and accessory

## For more information

Learn more about Agilent's Capillary Flow Technology at [agilent.com/chem/CapillaryFlowTechnology](http://agilent.com/chem/CapillaryFlowTechnology)

Buy online or find an Agilent customer center in your country:  
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