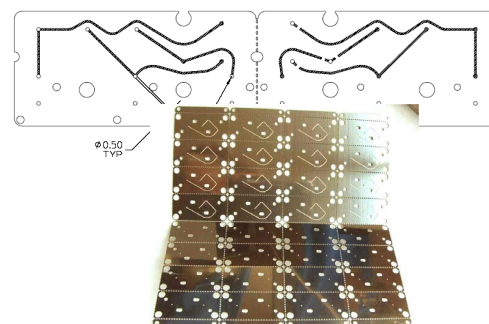


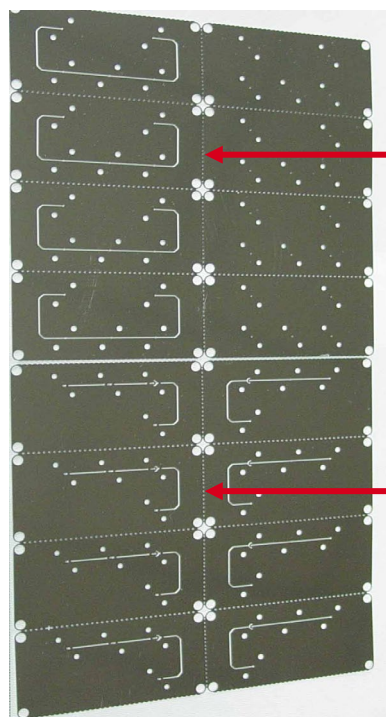
Capillary Flow Technology



Gary Boardman
Product Support Engineer (GC Products)
Date : August 18, 2021

Capillary Flow Technology

Photolithography and Chem-milling technologies used to produce CFT plates



Deans switch

Splitter

Traditional fittings

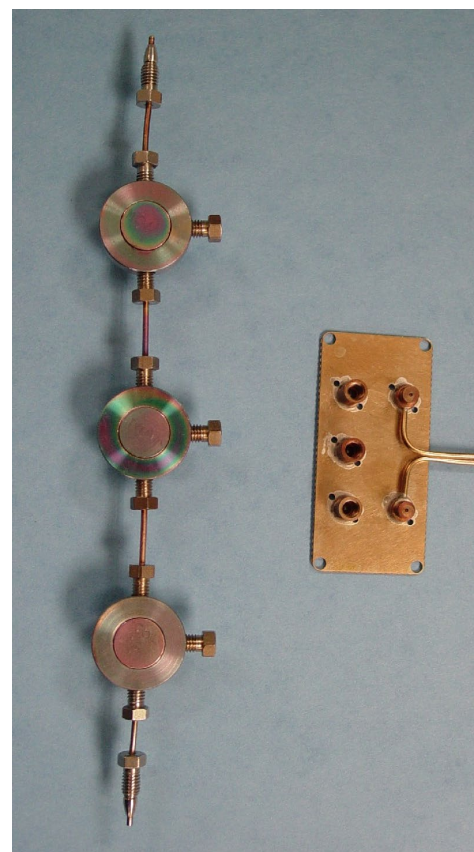


Plate technology

Capillary Flow Technology

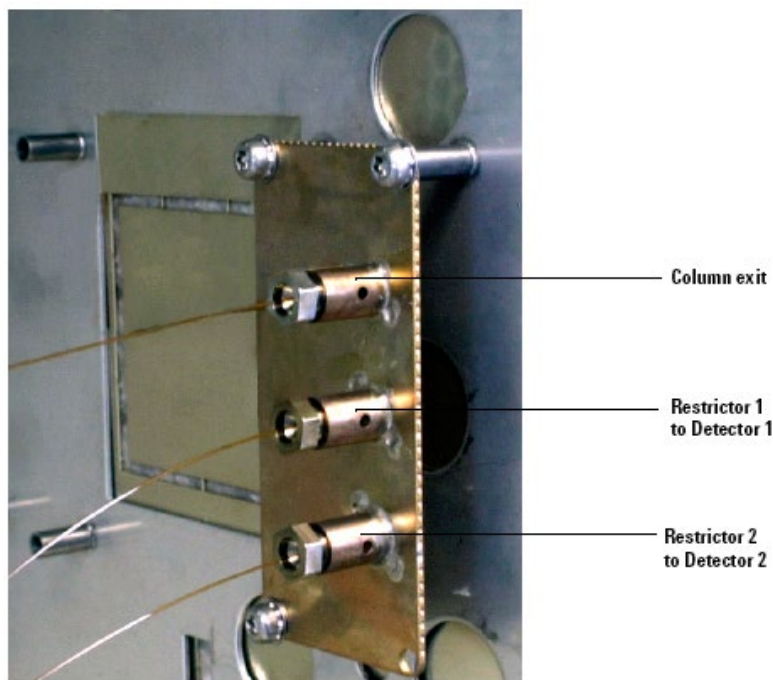
Types of devices:

- Splitters
- Deans switching
- Purged union
- QuickSwap
- Ultimate unions
- GC x GC

Capillary Flow Technology

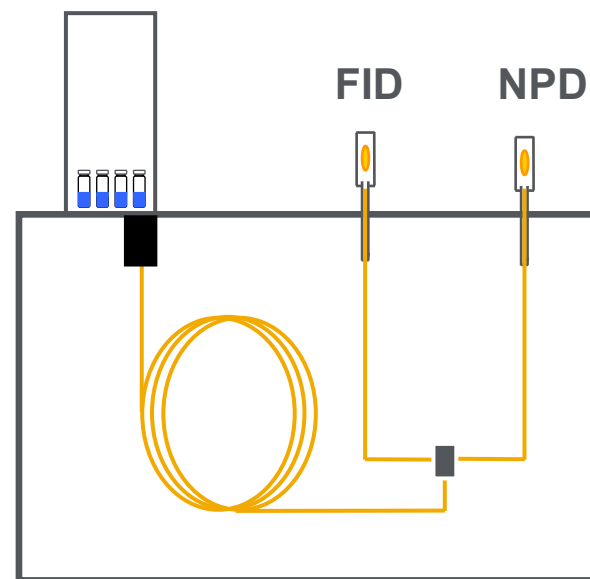
Splitters

Unpurged two-way splitter



Typical uses:

- Splitting column effluent between two different detectors.
- Injecting into two different columns.



Capillary Flow Technology

Software – Splitter calculator

Agilent Technologies
Custom Solutions Group
2 Way Effluent Splitter Calculator (without Makeup)

Inputs

Initial Column flow (mL/min)	5
Initial Oven Temp (C)	80
Carrier Gas (Helium,Hydrogen,Nitrogen,Argon)	Helium
Splitter (Column outlet) pressure (psig)	3.75
Detector 1 operating pressure (psia)	14.696
Detector 1 flow (mL/min)	1
Detector 2 operating pressure (psia)	14.696
Flow ratio of Det 2 to Det 1	4

Results

	0.10	0.15	0.18	0.20	0.25	0.32	0.53
Length Det 1 tube (m)	0.163	0.825	1.712	2.609	6.369	17.096	128.649
Holdup Time Det 1 (min)	0.001	0.014	0.042	0.078	0.299	1.315	27.134
Length Det 2 tube (m)	0.041	0.206	0.428	0.652	1.592	4.274	32.162
Flow Det2 (mL/min)	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000
Holdup Time Det 2 (min)	0.000	0.001	0.003	0.005	0.019	0.082	1.696

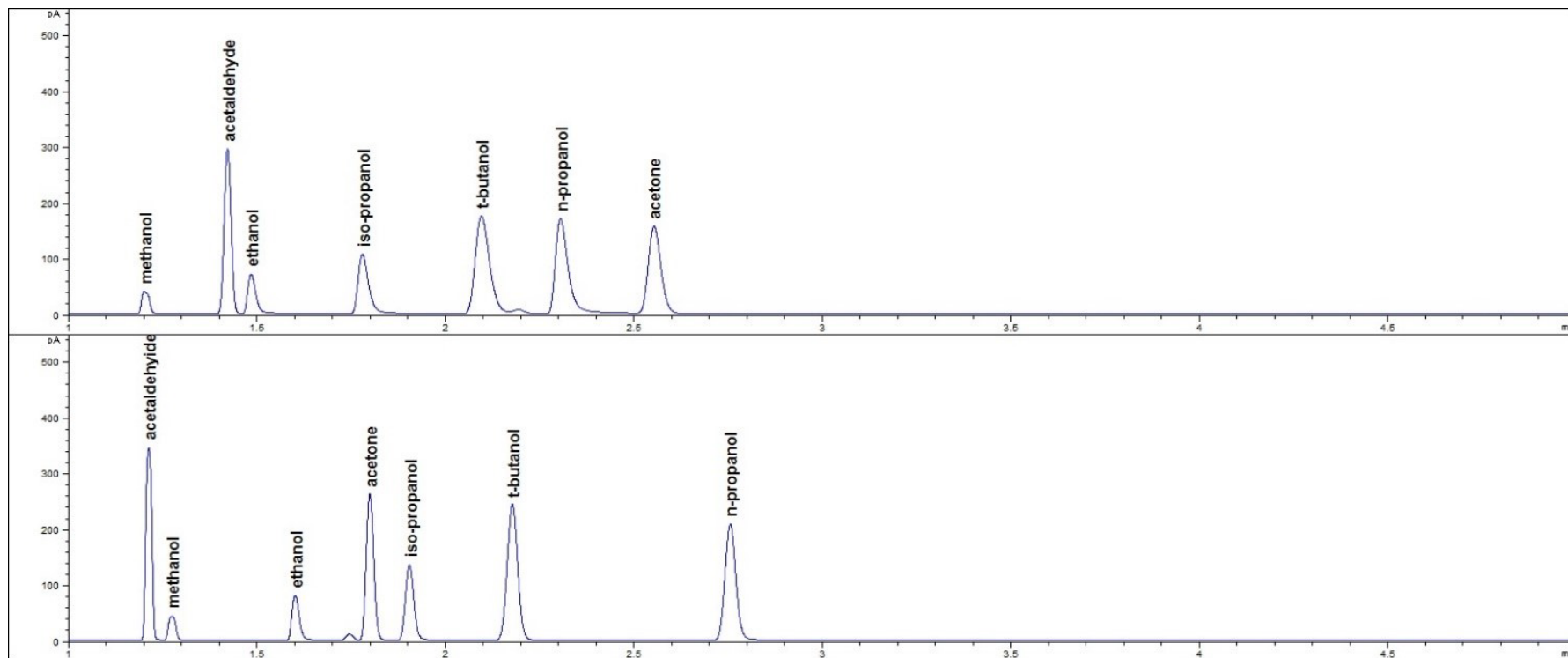
See reference tables below

Instructions

- 1) Determine desired column flow using ChemStation, GC, Flow Calculator or Method Translator.
- 2) Enter values into Inputs section of calculator.
- 3) Operating pressure for most detectors = 14.696 psia. Exceptions are MSD (= 0 psia) and AED (= 16.196 psia).
- 4) If one of the detectors is an MSD, make sure the flow to the MSD is than the pumping limit (usually 2 mL/min for diff pumps 4 mL/min for turbos).
- 5) From the output results table, choose the diameter and length of for each detector. In general, choose the smallest that gives a length sufficient length to reach the detector. For most detectors, the length should be at least 0.3 m. For MSDs, the length should be at least 0.8 m. **Also, make sure to choose a tube size where the flow is > the minimum flow listed below.**
- 6) The difference in holdup times for the selected tubes will be the in retention times for a peak on detectors 1 and 2.

2 Way (Makeup) | **2 Way (No Makeup)** | 3 Way (Makeup) | ...

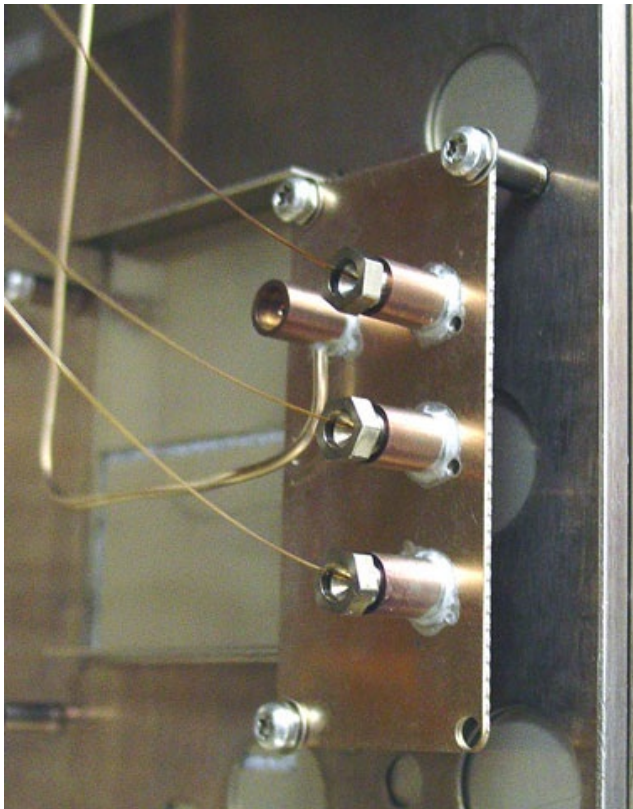
Blood Alcohol Analysis



Capillary Flow Technology

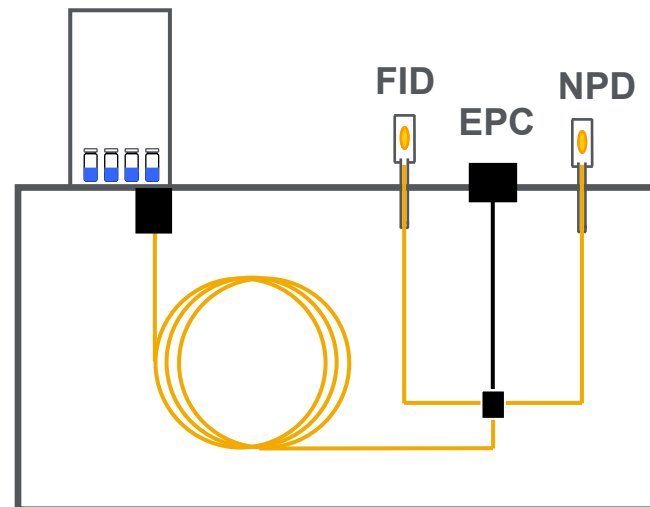
Splitters

Purged two-way splitter



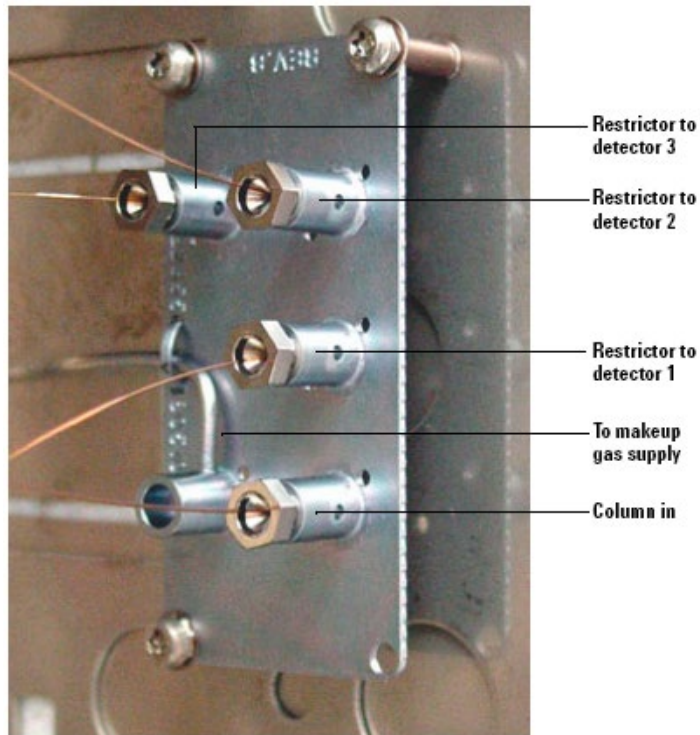
Typical uses:

- Same as two-way unpurged
- Backflushing
- Can be used as QuickSwap
- Splitting with dilution



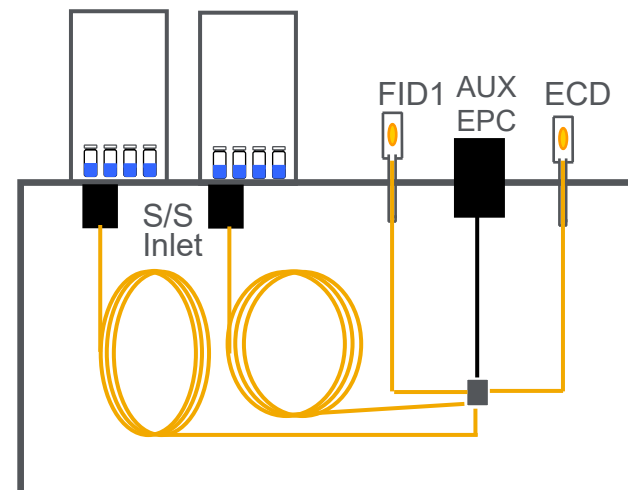
Splitters

Purged three-way splitter



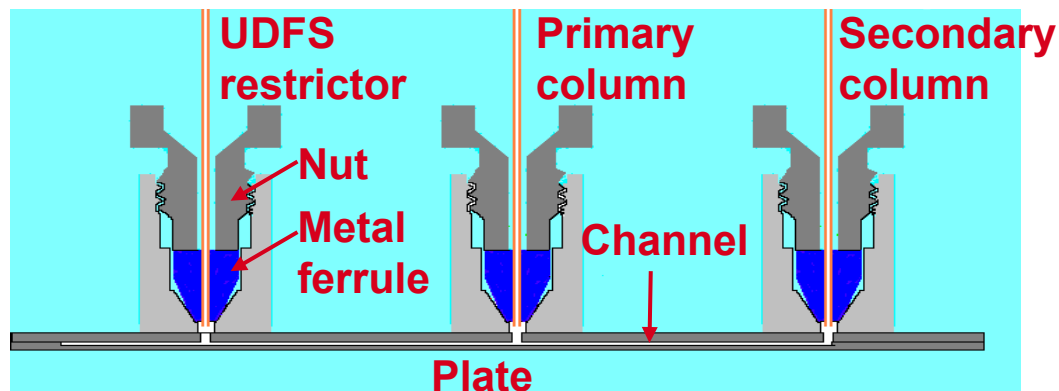
Typical uses:

- Same as two-way purged
- Backflushing
- Can be used as QuickSwap
- Splitting between inlets and detectors.



Capillary Flow Technology

Ferrules



Simple, easy to make connectors

A single, specialized metal ferrule

- More inert than graphite/vespel
- Does not leak at high oven temperatures



Ferrules

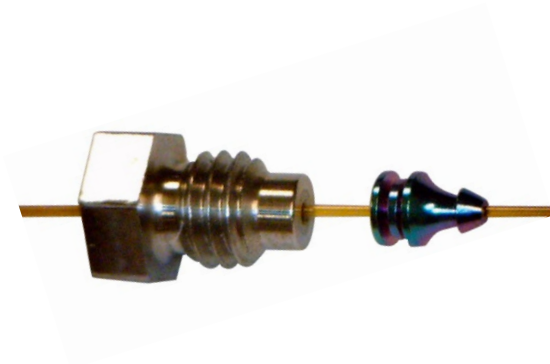
Item	Compatible Column id	UM+ FMF part number	Gold-Plated FMF part number
1	0.1 to 0.25 mm	G3188-27501	G2855-28501
2	0.32 mm	G3188-27502	G2855-28502
3	0.45 to 0.53 mm	G3188-27503	G2855-28503
4	Plug	G3188-27504	N/A
5	0.25 to 0.32 mm UltiMetal	G3188-27505	G2855-28505
6	0.53 mm UltiMetal	G3188-27506	G2855-28506



Each ferrule has its own distinctive shape!

Capillary Flow Technology

Ferrules



Ferrule part number	Degrees to tighten internal nut
G3188-27501	50 – 100 degrees
G3188-27502	30 – 70 degrees
G3188-27503	20 – 50 degrees
G3188-27504	60 degrees
G3188-27505	40 – 90 degrees
G3188-27506	20 – 50 degrees

Capillary Flow Technology

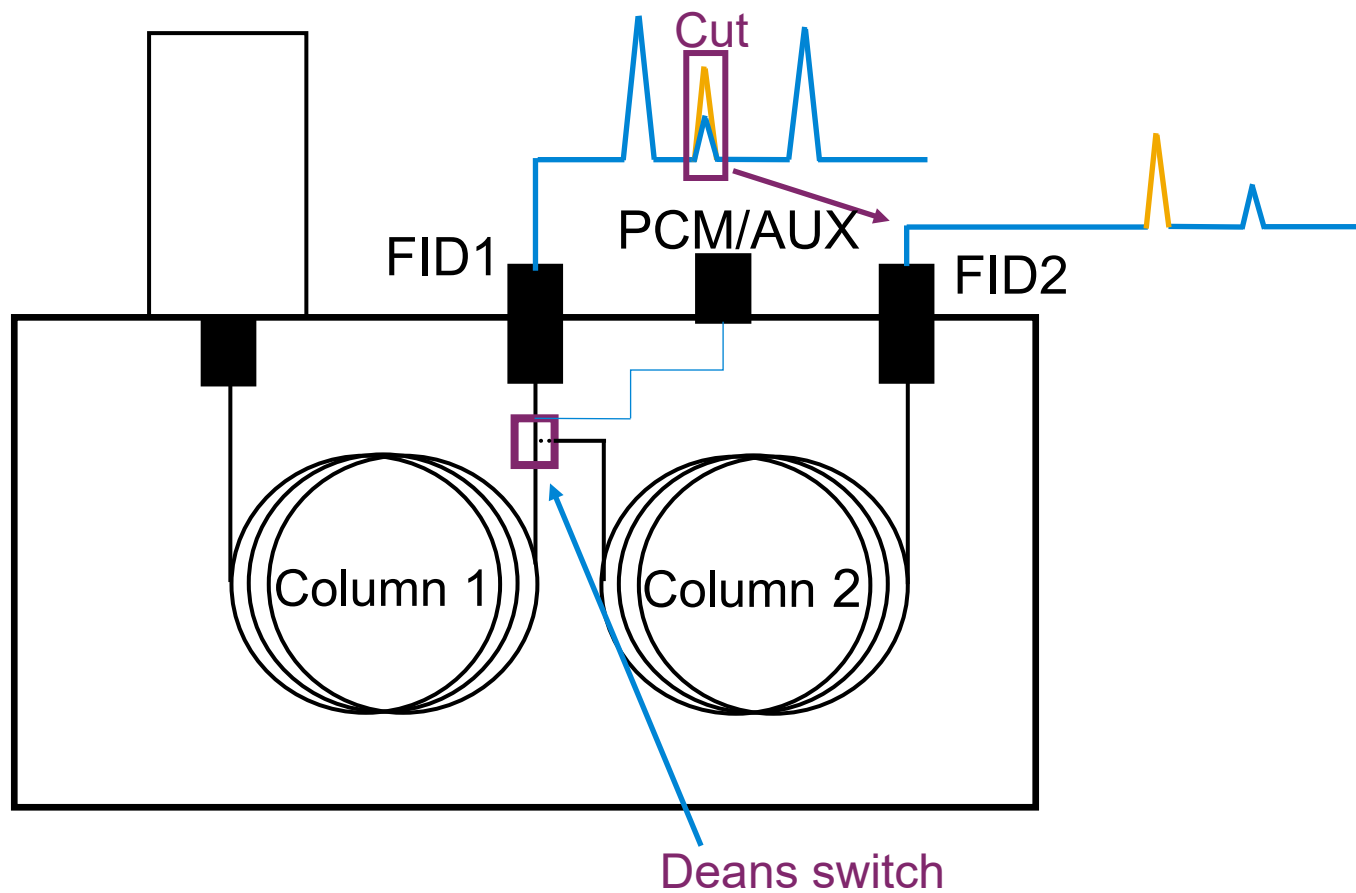
Make up gas control



- PSD module (8890/Intuvo)
- AUX EPC module
- PCM module

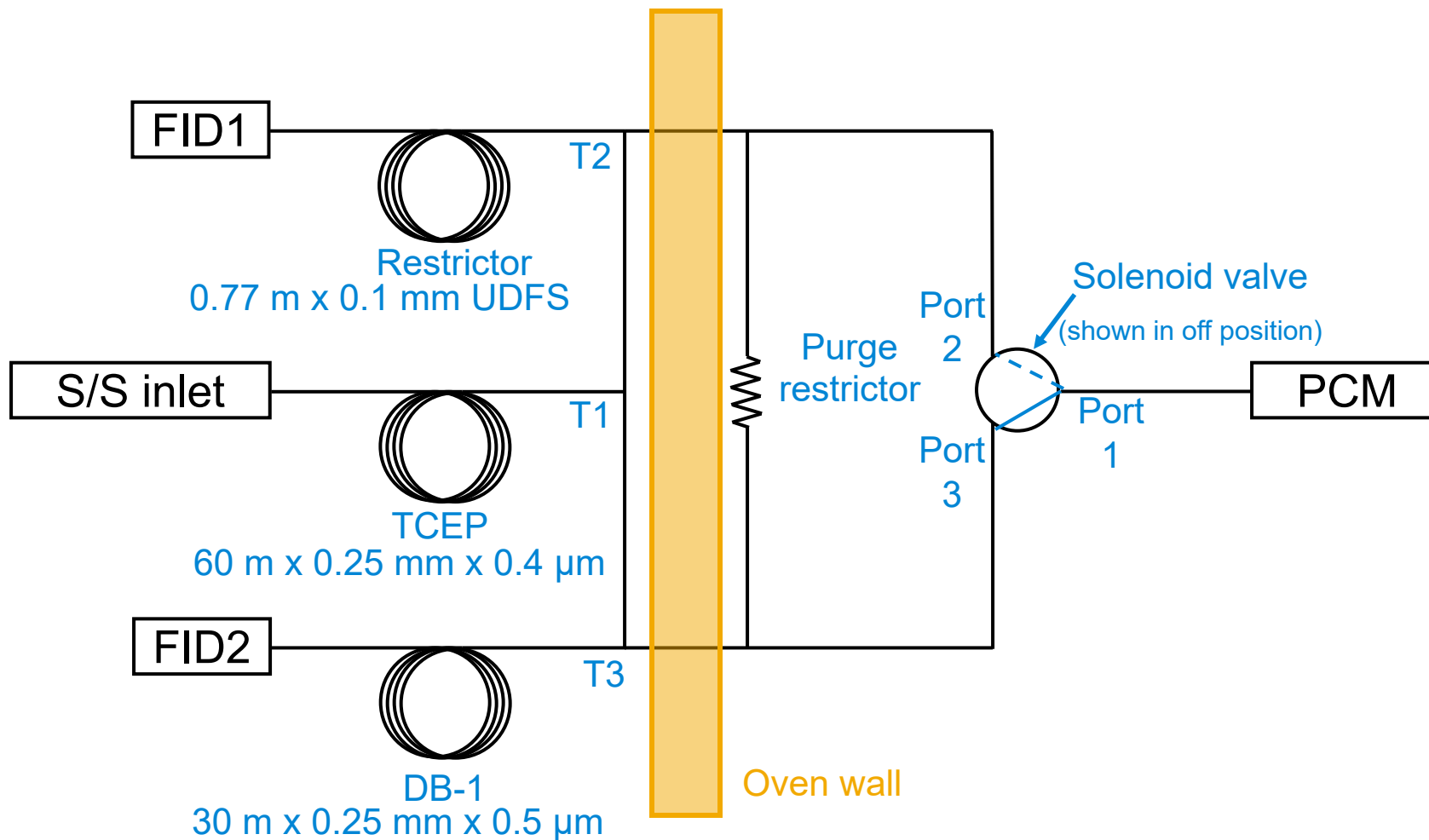
Capillary Flow Technology

Deans switching



Capillary Flow Technology

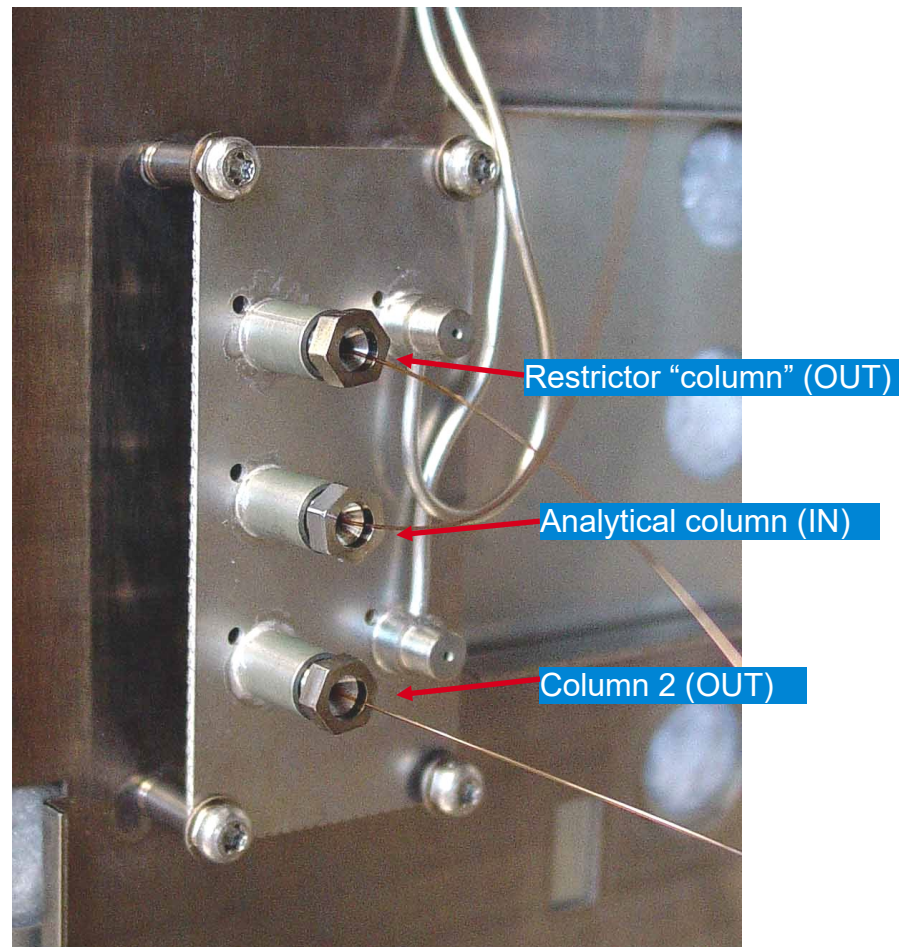
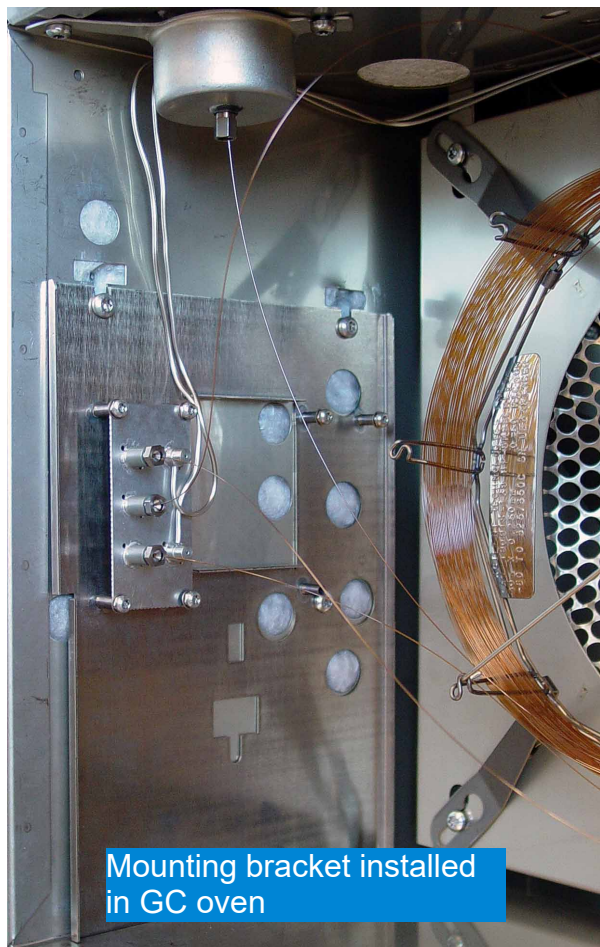
Deans switching



Capillary Flow Technology

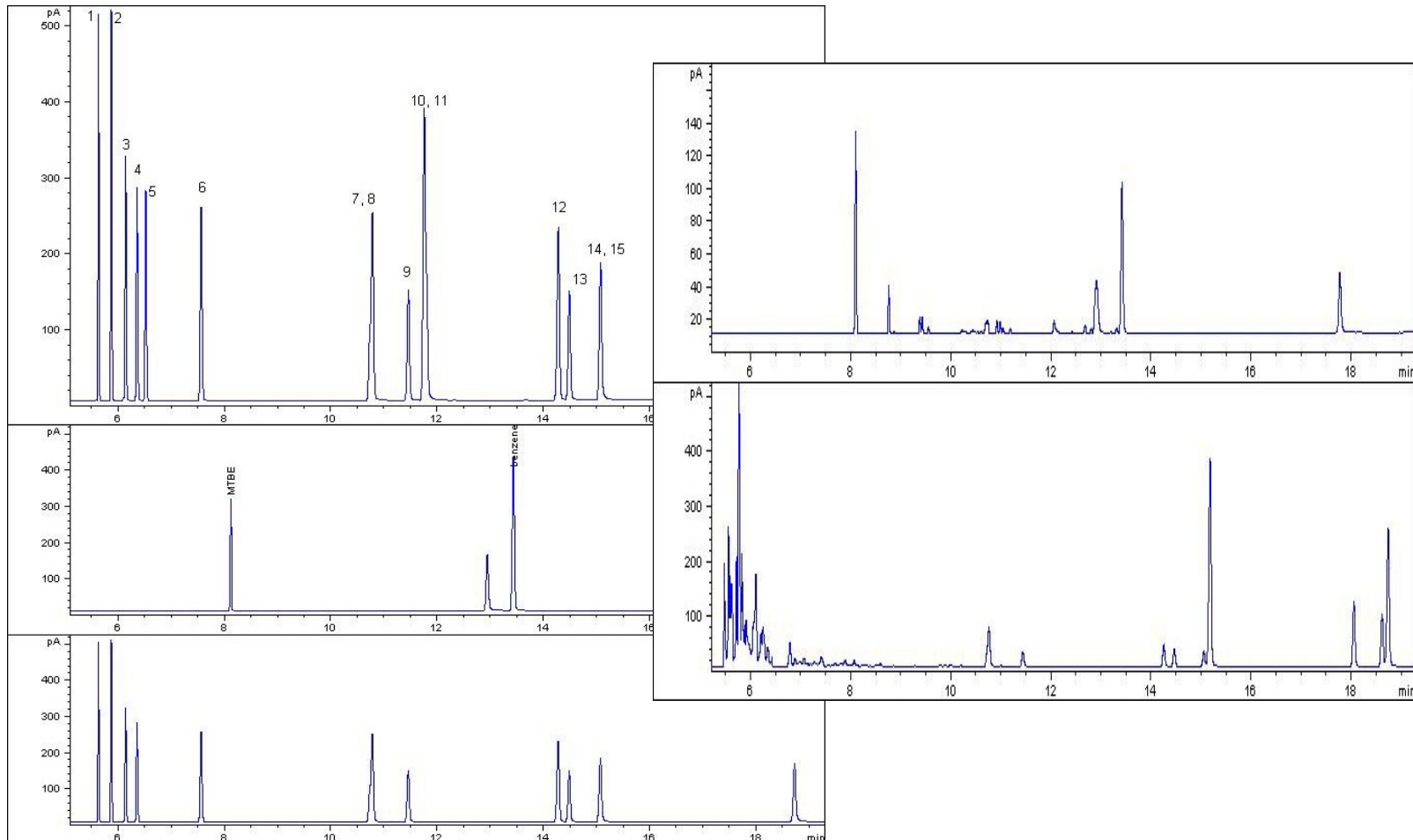
Deans switching

Switching gas connections
from PCM or AUX EPC



Capillary Flow Technology

Deans switching – Gasoline



Capillary Flow Technology

Deans Switch Calculator

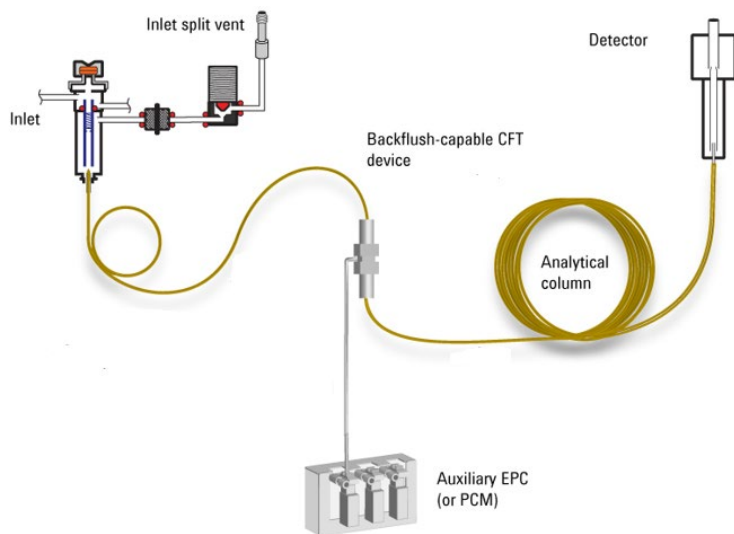
Agilent Technologies Dean Switch Calculator

File Method Version A.01.01

Primary Detector Outlet Pressure: 14.6960 psi
Primary Detector: FPD
Restrictor Flow: 2.500 ml/min
Restrictor Length: 0.265 m
Restrictor Diameter: 0.100 mm
Restrictor Holdup Time: 0.0010 min
Oven Temperature: 70 degC
Carrier Gas: Helium
Inlet Split: 50
Desired Split Ratio: 50
Set Split Flow: 75.000 ml/min
Primary Flow: 1.500 ml/min
Primary Column Length: 15.00 m
Primary Column Diameter: 0.250 mm
Primary Column Type: HP-1MS
Secondary Detector Outlet Pressure: 0.0000 psi
Secondary Detector: MS (Turbo)
Secondary Flow: 2.500 ml/min
Secondary Column Length: 15.00 m
Secondary Column Diameter: 0.250 mm
Secondary Column Type: DB-17ms
Shunt Restrictor Length: 0.000 m
Shunt Restrictor Diameter: 0.001 mm
Equivalent Restrictor Length: 1.000 m
Equivalent Restrictor Diameter: 0.250 mm
PCM: 12.66 psi
Comment:

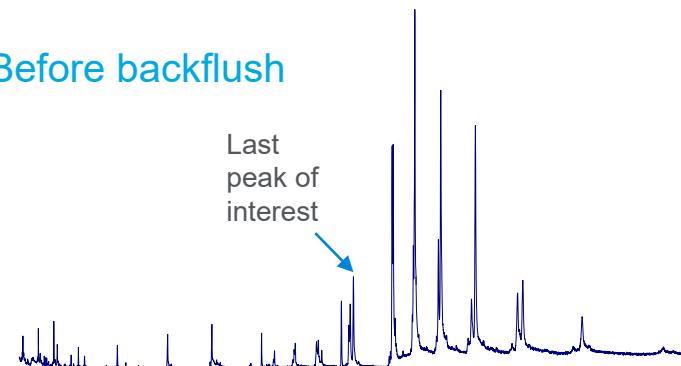
Capillary Flow Technology

Backflush

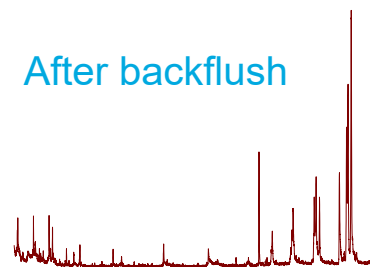


Backflush is a technique that is used to chromatographically remove mainly high boiling compounds from samples, performed either at the end of, or during, an analytical run.

Before backflush



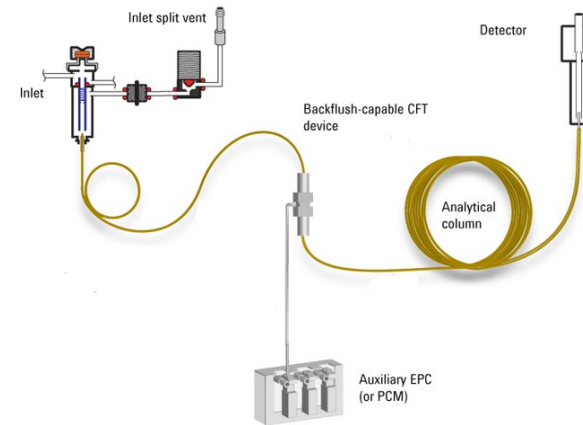
After backflush



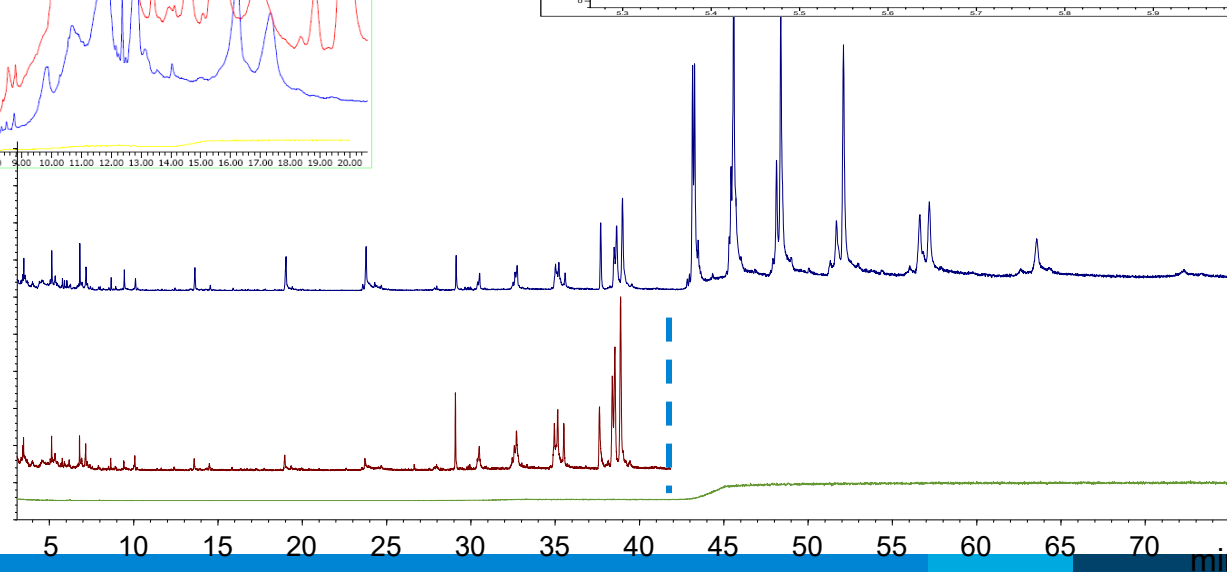
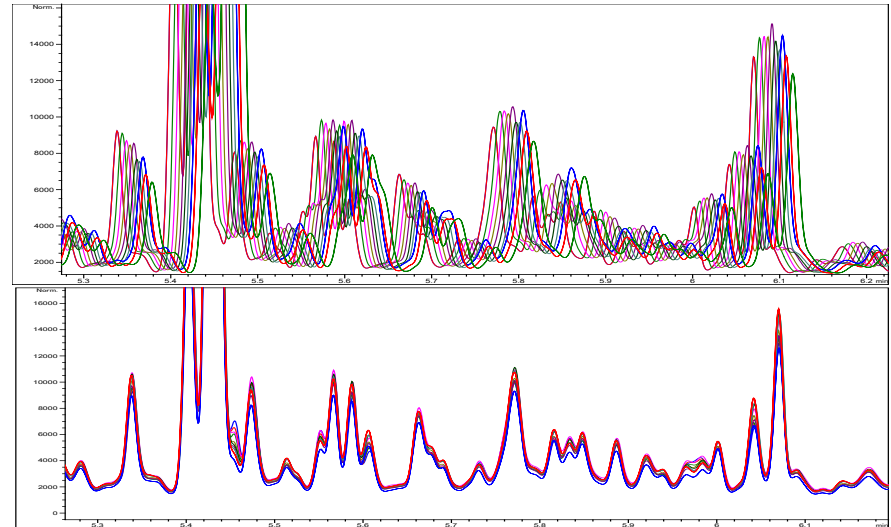
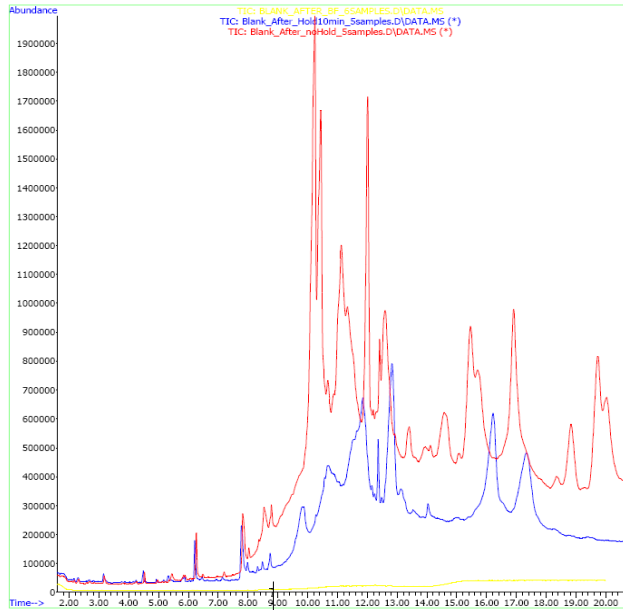
Backflush

Backflush is:

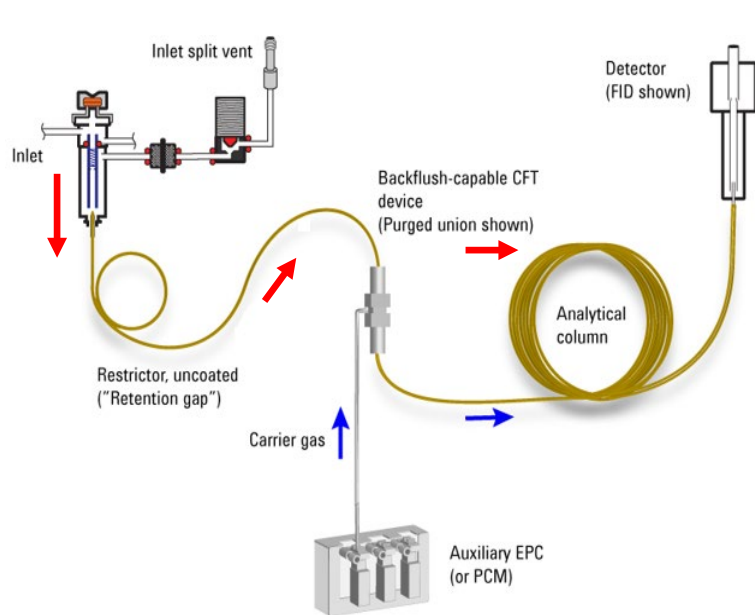
- Used to avoid unwanted sample components from entering analytical column.
- Used to avoid heavy compounds from reaching detector
- Used to shorten run times



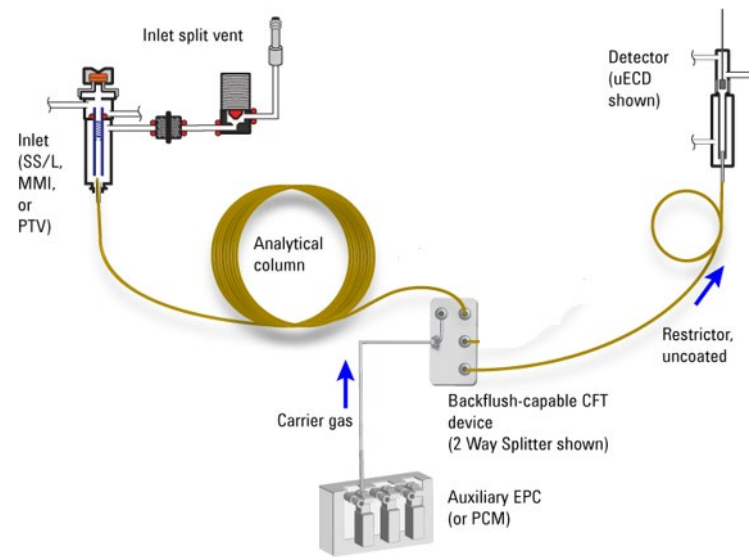
Capillary Flow Technology



Backflush



Precolumn



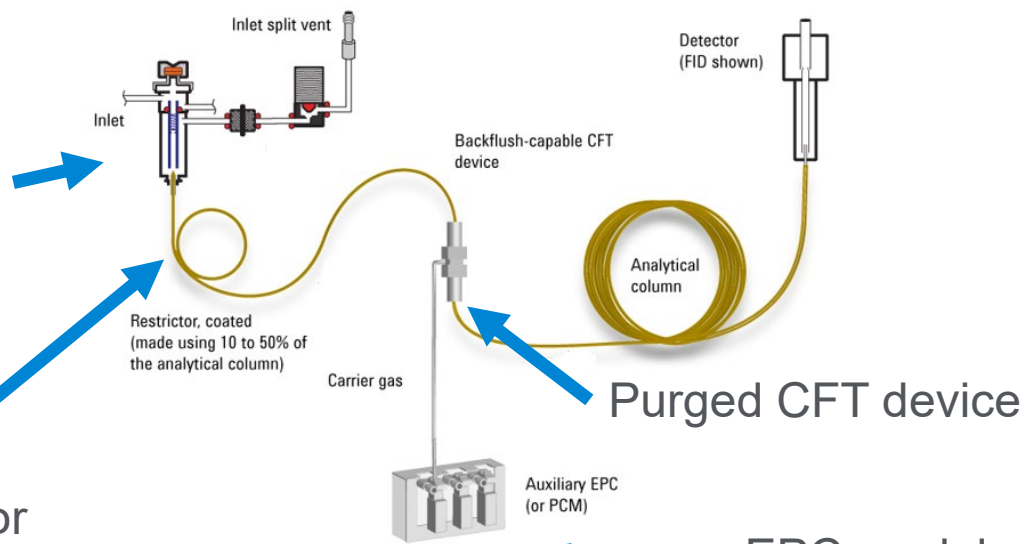
Postcolumn

Capillary Flow Technology

Backflush

Inlet must have a split vent (SSI/MMI or PTV)

Restrictor



Purged CFT device

EPC module can be either AUX EPC, PCM, or PSD.

Capillary Flow Technology

Backflush

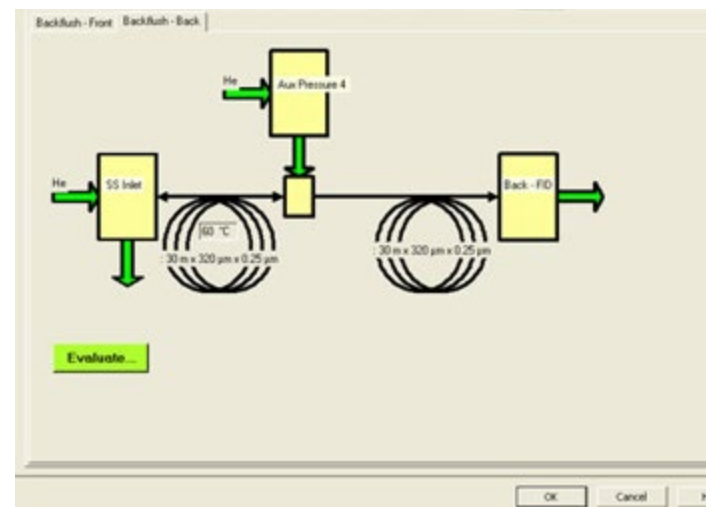
Welcome to the Backflush Wizard Help

Before you begin!
[Review the requirements for running the Backflush Wizard from your data system.](#)

Get started with the Backflush Wizard...

Ready to add backflush to the current method? ➔

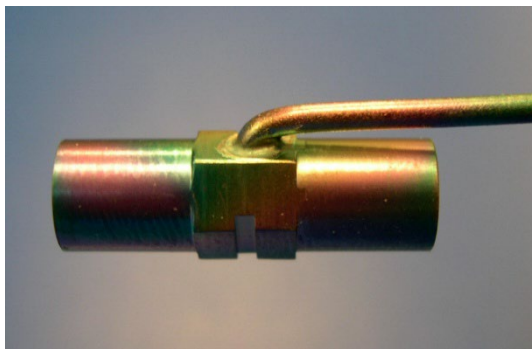
Click here to begin the process. (This window will close)



Capillary Flow Technology

Backflush

Union, purged at midpoint
(Purged Ultimate Union)



Enables the backflushing
of the precolumn (such as retention gap or
prefractionator)



Contact Agilent Chemistries and Supplies Technical Support



1-800-227-9770 Option 3, Option 3:

[Option 1 for GC and GC/MS columns and supplies](#)

Option 2 for LC and LC/MS columns and supplies

Option 3 for sample preparation, filtration, and QuEChERS

Option 4 for spectroscopy supplies

Option 5 for chemical standards

Available in the USA and Canada 8–5, all time zones



gc-column-support@agilent.com

lc-column-support@agilent.com

spp-support@agilent.com

spectro-supplies-support@agilent.com

chem-standards-support@agilent.com

Capillary Flow Technology

Questions?



Agilent CrossLab

From Insight to Outcome