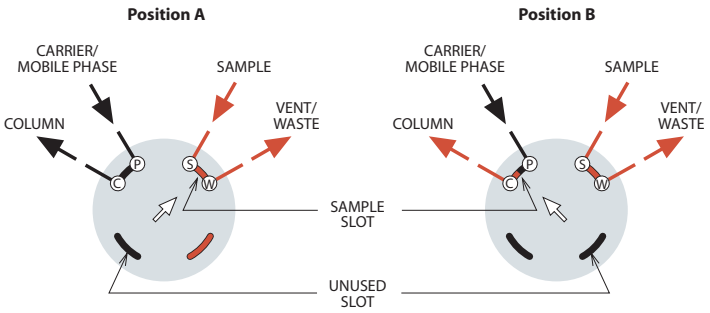
These illustrations show basic sample injection techniques using Valco two position valves. With rare exceptions, there is no difference between switching valves and external volume sampling valves, so the same valve can be used for either function.

The unique advantage of 8 and 10 port valves is that they reduce extra column volume by combining sampling and switching functions in a single valve. This minimizes expense, maintenance, service, and risk of leaks as compared to multiple 6 port valve systems.

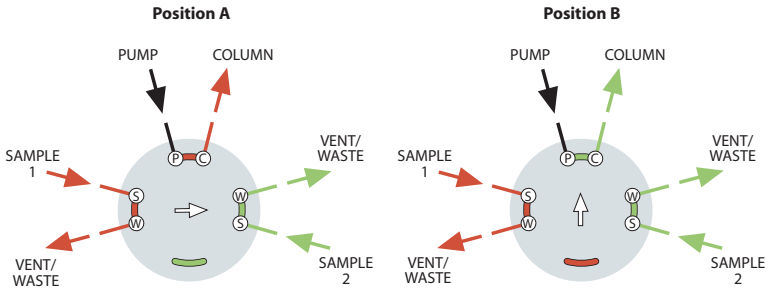
4 port internal sample injector



MICROVOLUME SAMPLE INJECTION

The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve rotor, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the mobile phase flows through to the column. The third passage is inactive. In Position B, the sample passage is in line with the column and the mobile phase injects the contents of the sample passage onto the column. The passage which was inactive in Position A allows the sample to continue flowing without interruption.

6 port internal sample injector



DUAL MICROVOLUME SAMPLE INJECTION

This microvolume injector can be used to alternate between two different samples. Each time the valve is switched, a sample is injected. By connecting the two sample inlets in series, the valve injects the sample each time the valve switches. This is particularly useful in heavy duty cycle operations to minimize valve wear. The valve can also be used to make alternating injections of the same sample onto two different columns by swapping sample/waste and pump/column connections.

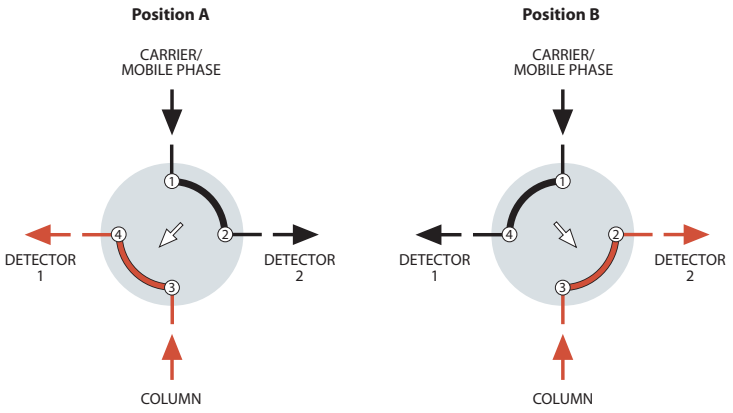
Note: This CI6 valve is not shown in this catalog. Call for details.

Two Position Applications

4 port switching valve

DETECTOR SELECTION FROM TWO COLUMNS OR ONE COLUMN AND AUXILIARY CARRIER

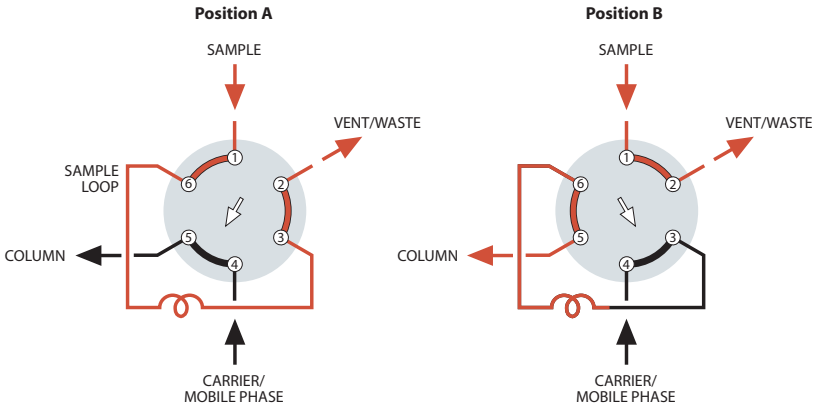
This unique configuration allows analyses of different parts of one analysis with two different detectors, without splitting or multiple injections. For example, fixed gases can be analyzed with a thermal conductivity detector, followed by the analysis of a hydrocarbon fraction with a flame ionization detector.



6 port external sample injector

SAMPLE INJECTION

With the valve in Position A, sample flows through the external loop while the mobile phase flows directly through to the chromatographic column. When the valve is switched to Position B, the sample contained in the sample loop and valve flow passage is displaced by the mobile phase and is carried onto the column.
Note: This is especially critical for partially-filled loops. The flow direction of the mobile phase through the loop should be opposite (backflush) to the flow direction during the loading of the loop.

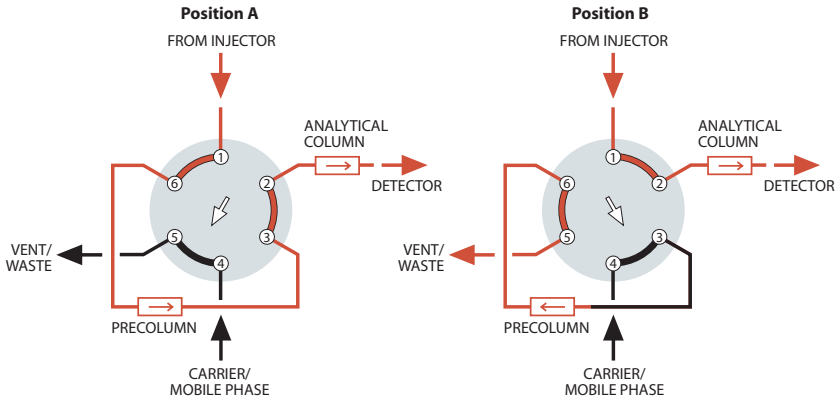


6 port column switching

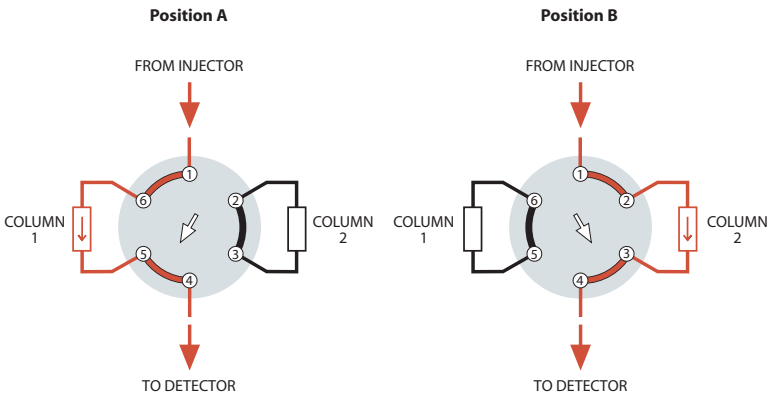
BACKFLUSH OF PRECOLUMN TO VENT

This plumbing scheme allows slower eluting components (end cut) which are not of interest to be backflushed to vent. Often a shorter version of the analytical column is used as the precolumn. Once all the components of interest have entered the main column (at port 2), the valve switches, backflushing the precolumn to vent and reducing analysis time.

Note: An auxiliary source of carrier or mobile phase is required for this application.



6 port column selection

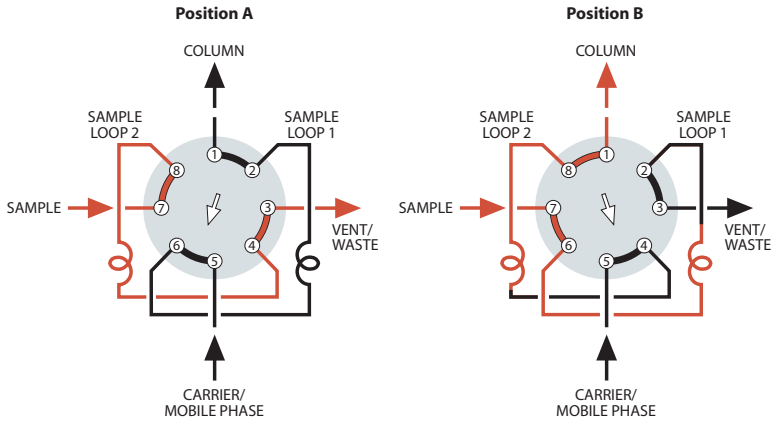


TWO COLUMN SELECTION

When two different columns are required at frequent intervals at similar oven temperatures, a 6 port valve can provide rapid selection of the one to be used. The column not in use is protected by a blanket of inert mobile phase and may be rapidly brought to equilibrium when required.

Note: If flow must be maintained to the non-selected column, an 8 or 10 port valve is required.

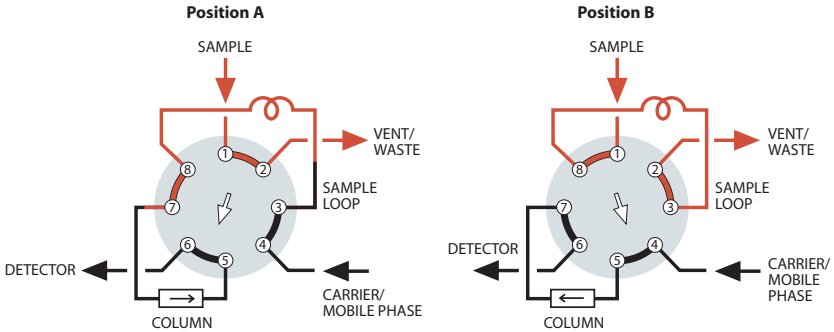
8 port dual external sample injector



SAME SAMPLE TO DIFFERENT LOOPS

In a dual external sample loop configuration, sample is injected in both positions. In Position A, Loop 2 is loaded while the mobile phase flows through Loop 1 and onto the column. In Position B, the Loop 2 sample is injected into the column and another sample is loaded into Loop 1. When the valve is returned to Position A, the Loop 1 sample is injected onto the column and Loop 2 is reloaded.

8 port sampling/switching



LOOP SAMPLING WITH BACKFLUSH TO DETECTOR

One valve functions as both a sampling and a backflush valve, simplifying operation and reducing cost. When components of interest are detected, the strongly retained components are backflushed and removed from the column without temperature programming.

Two Position Applications

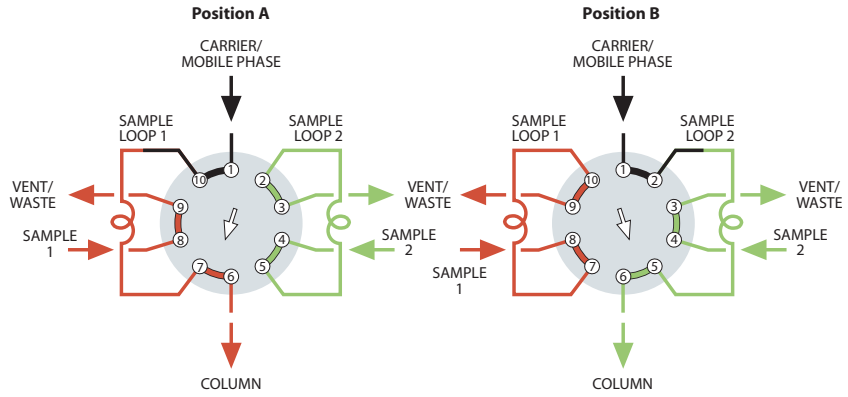
10 port dual external sampling

TWO DIFFERENT SAMPLES TO SAME COLUMN

A 10 port valve permits alternate injections from the two loops, which may be identical or of different sizes. This technique replaces a 4 port sample selector and a 6 port sample injector.

In Position A, Loop 2 is loaded with sample 2 while the mobile phase flows through Loop 1 and onto the column.

In Position B, the Loop 2 sample is injected onto the column and Loop 1 is loaded with sample 1. When the valve is returned to Position A, the Loop 1 sample is injected onto the column and Loop 2 is reloaded with sample 2.

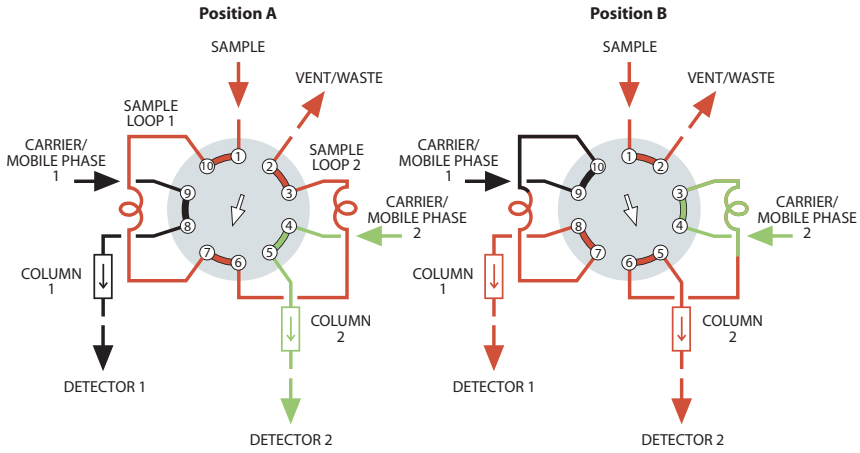


10 port dual external sampling

SIMULTANEOUS INJECTION OF THE SAME SAMPLE ONTO SEPARATE COLUMNS

In Position A, sample fills the two loops in series. In Position B, the sample is simultaneously injected into two separate flow systems. A single autosampler used with this flowpath can automate two analytical procedures for the same sample.

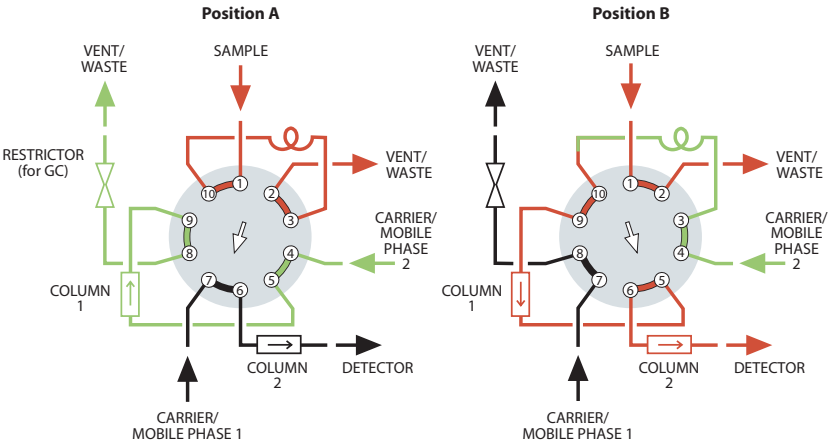
In an important non-chromatographic application, the roles of carrier and sample are reversed, permitting two different quantities of two different materials to be dispensed together, as in automatic dilution.



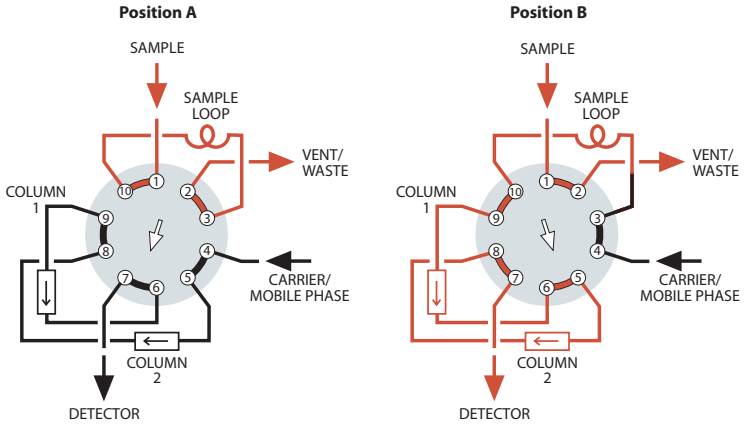
10 port sampling/switching

LOOP SAMPLING WITH BACKFLUSH OF PRE-COLUMN TO VENT

When components of interest have low boiling points, this plumbing scheme allows "heavy" components with long retention times to be backflushed to waste. After the sample loop is loaded in Position A, the valve is switched to Position B to inject the sample onto column 1. As soon as all components of interest have entered column 2, the valve is switched back to Position A. Column 1 is backflushed to vent during the analysis, reducing the total analysis time.



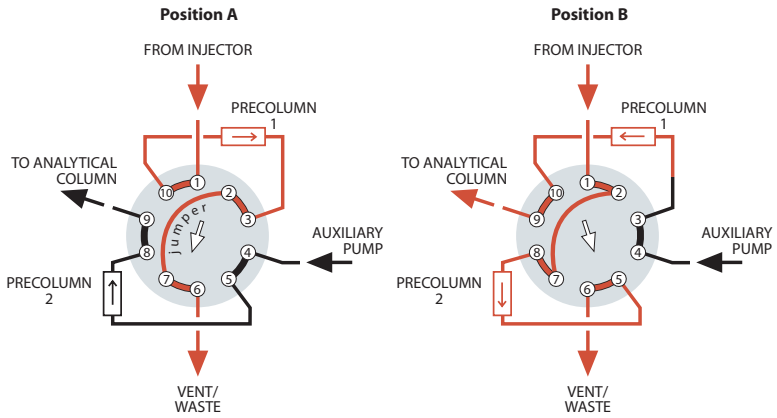
10 port sampling/switching



LOOP SAMPLING WITH TWO COLUMN SEQUENCE REVERSAL

This is ideal for fixed-gas-from-CO_2 analysis where no "high boilers" are present. Column 1 is packed with a porous polymer and Column 2 with molecular sieve. The sample loop is loaded in Position A. When the valve is switched, the loop contents are sent onto Column 1. As the inorganic gases and methane leave Column 1 and enter Column 2, the valve is returned to Position A, reversing the column sequence. CO_2 now leaves Column 1, becoming the first peak. The inorganics and methane are separated by the molesieve and pass through the porous polymer column to the detector.

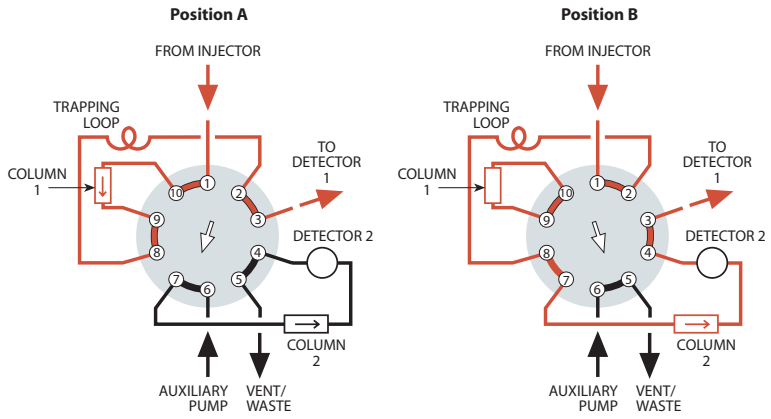
10 port column switching



SAMPLE ENRICHMENT (CLEANUP) USING DUAL PRECOLUMNS

Sample is injected by a separate injector onto one of two precolumns (stripper). Early eluting components vent at port 6 while components of interest are retained on the stripper. When the valve is switched, a new injection is made onto the second stripper while components retained on the first stripper are backflushed onto the analytical column at port 9.
Note: This application requires an auxiliary pump at port 4.

10 port column switching



HEART CUT TRAPPED IN A LOOP AND INJECTED ONTO A SECOND COLUMN

Sample is injected (using a separate injector) onto an analytical column. Early eluting components (front cut) pass through a trapping loop and are detected (at port 3). The valve is then switched, and the center (or heartcut) which was retained in the trapping loop is injected onto the second column to the detector (at port 4). Late eluting components (end cut) are trapped on the first column. When the valve is switched again, the end cut passes through the trapping loop to the first detector, completing the analysis.