



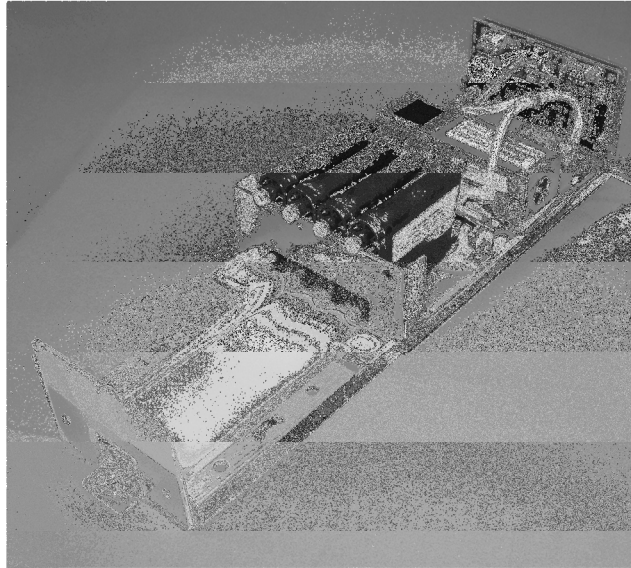
Alliance Theory of Operation

- Solvent management system
 - Degasser
 - Gradient Proportioning Valve (GPV)
 - Solvent handling unit
- Sample management system
 - Sample carrier system
 - Injector system

Solvent Management System

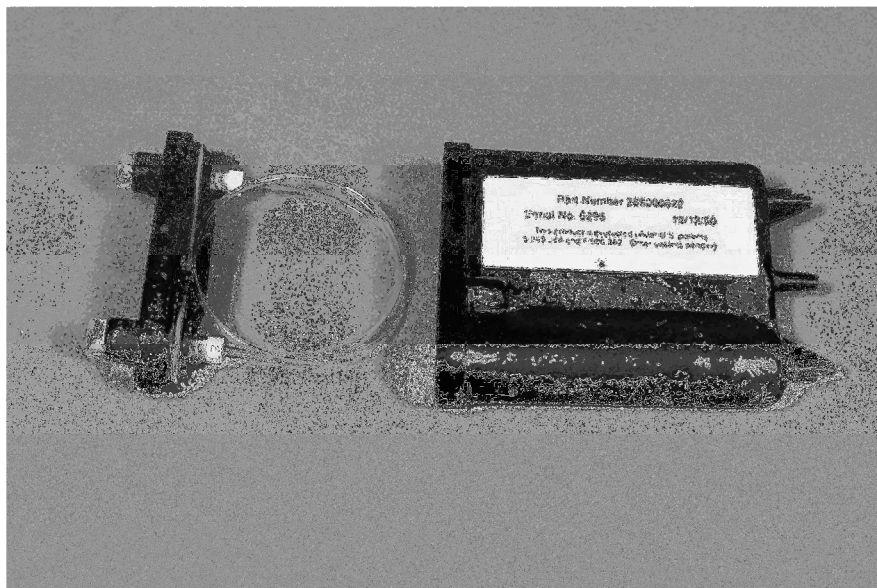
- Solvent Degasser
- Gradient Proportioning Valve (GPV)
- Solvent handling unit

Solvent Degasser



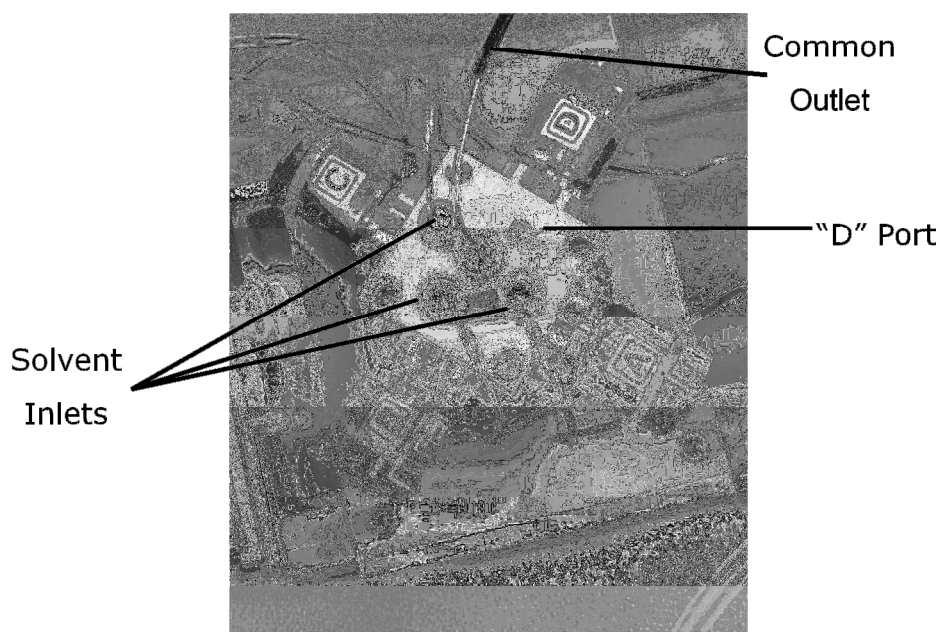
- Degassing efficiency is based upon the solvent gas load and the length of time the solvent remains in the chamber. Degassing efficiency drops off above 4.5 ml/minute flow rate through a chamber.

Degasser Chamber

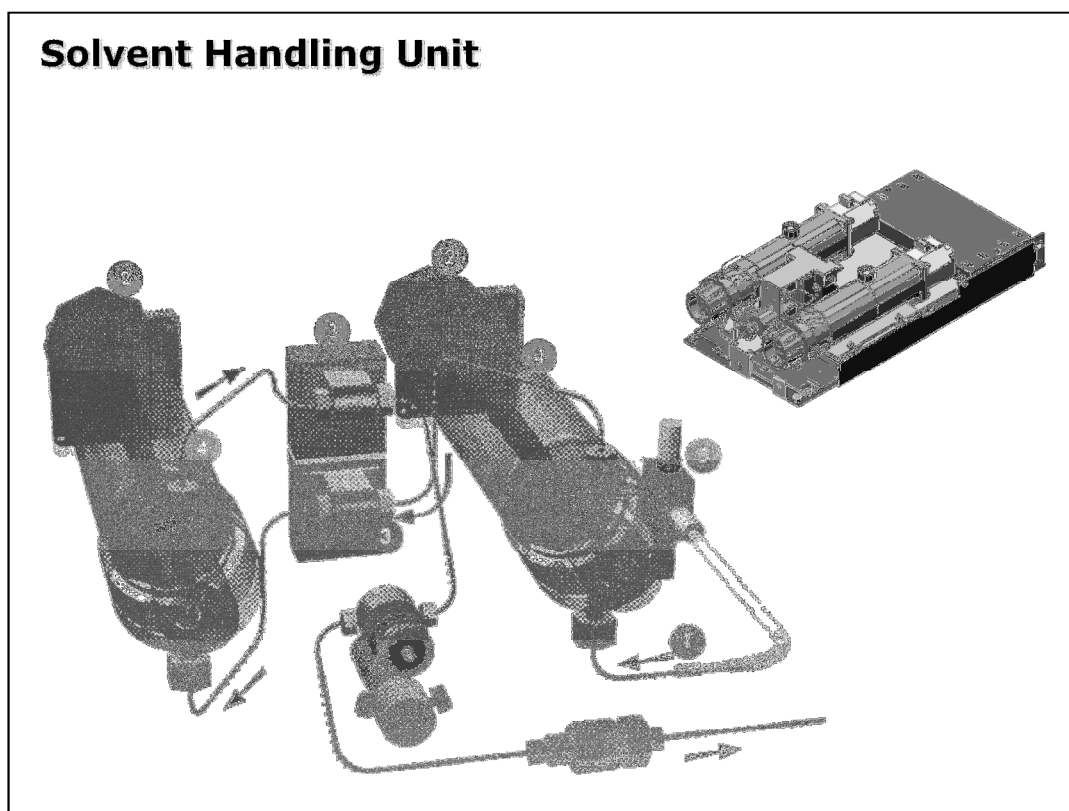


- The solvent degasser has an internal volume of approximately 500 ul.

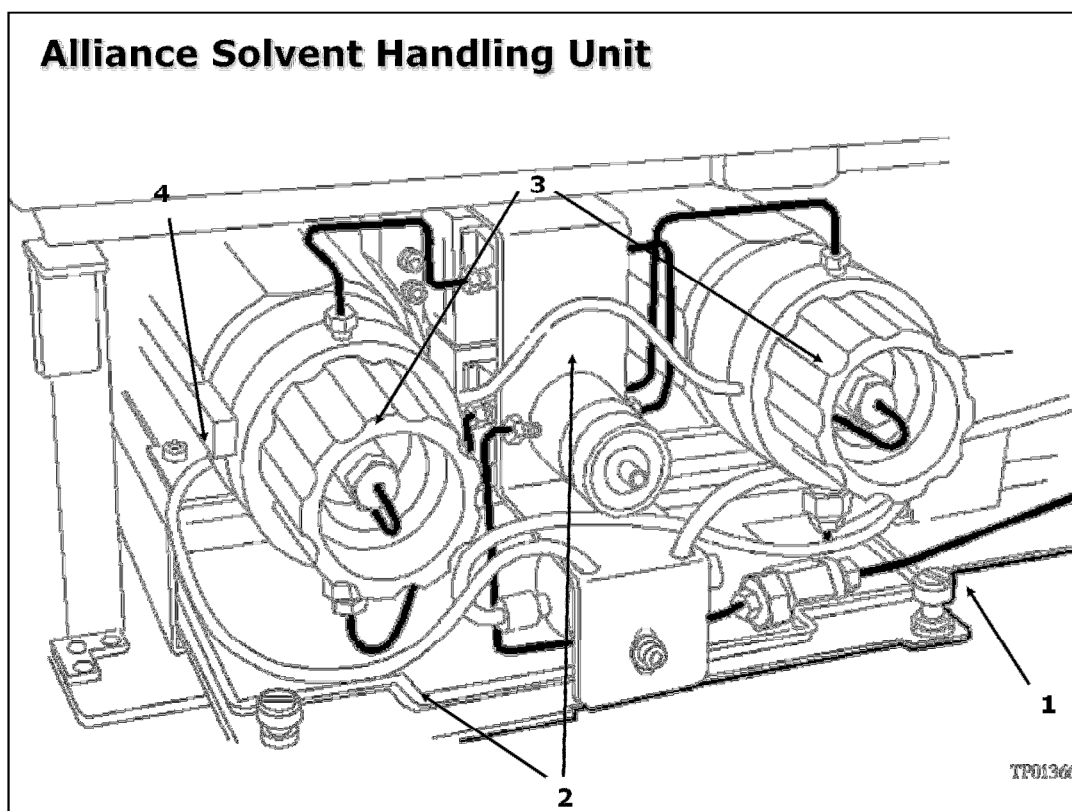
Gradient Proportioning Valve (GPV)



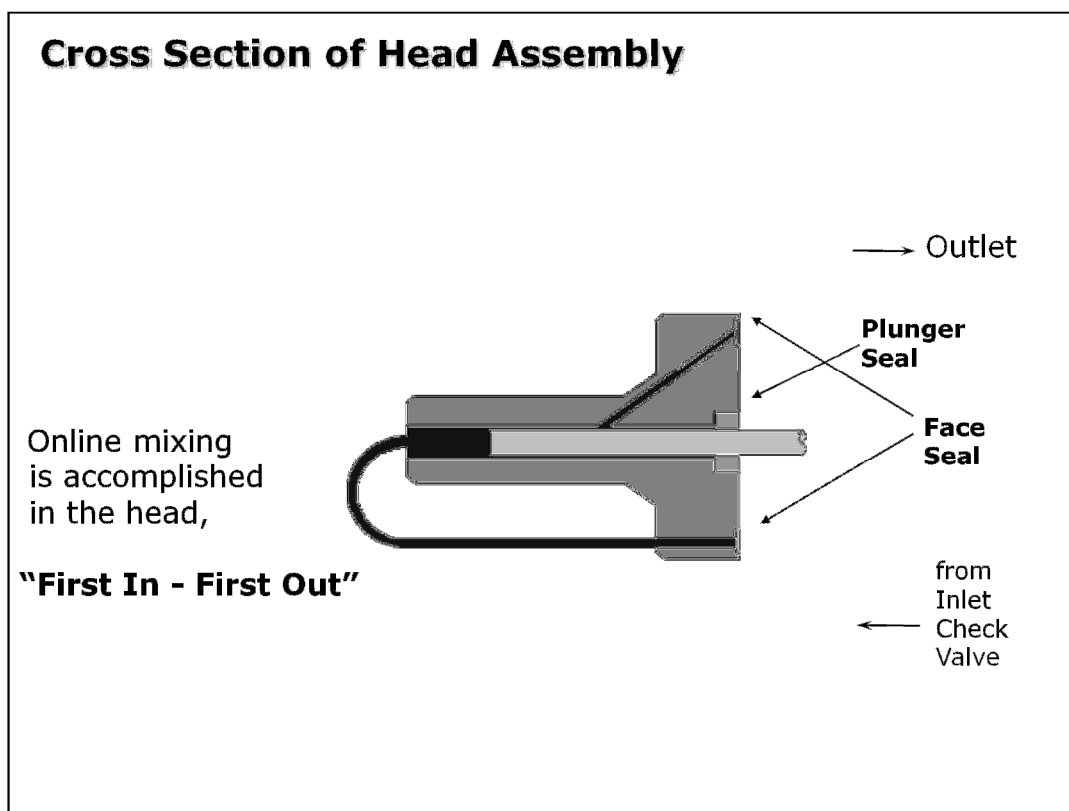
- The Gradient Proportioning Valve (GPV) has 4 solenoid valves, one for each solvent reservoir (A,B,C,D). When a solvent valve is open, flow from that solvent reservoir is allowed through the manifold to the common outlet. From the common outlet the flow travels to the inlet check valve of the Primary Head.
- The line from the degasser to the "D" port has been removed to show the threaded fitting.



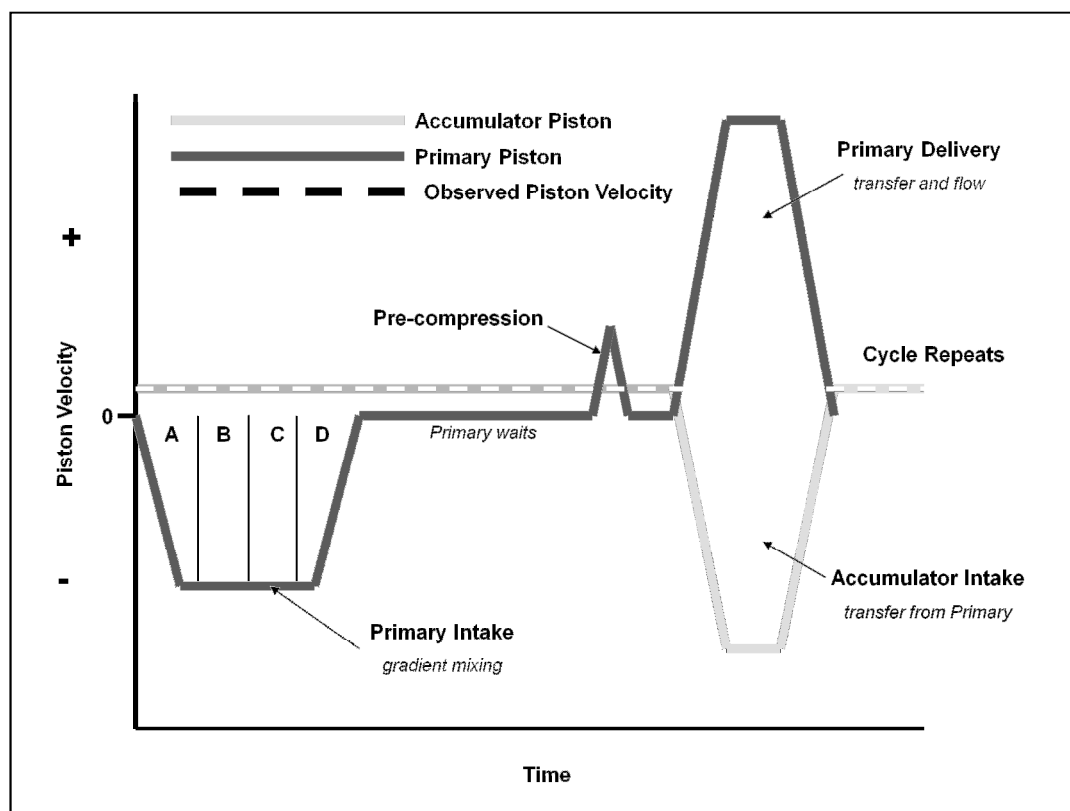
- 1. Serial Flow Path – Solvent blending in piston chamber
- 2. Independent Piston Drive – Dual drive motors
- 3. Dual Pressure Transducers – Two point performance monitoring
- 4. Variable Piston Volume – Balanced with flow rate
- 5. Gradient Proportioning Valve – Low volume design



- 1. High pressure fluid path (solid black)
- 2. Seal wash tubing
- 3. Head nut
- 4. Locking ring



- FIFO - First in, first out results in mixing in heads. Gradients run smoothly.



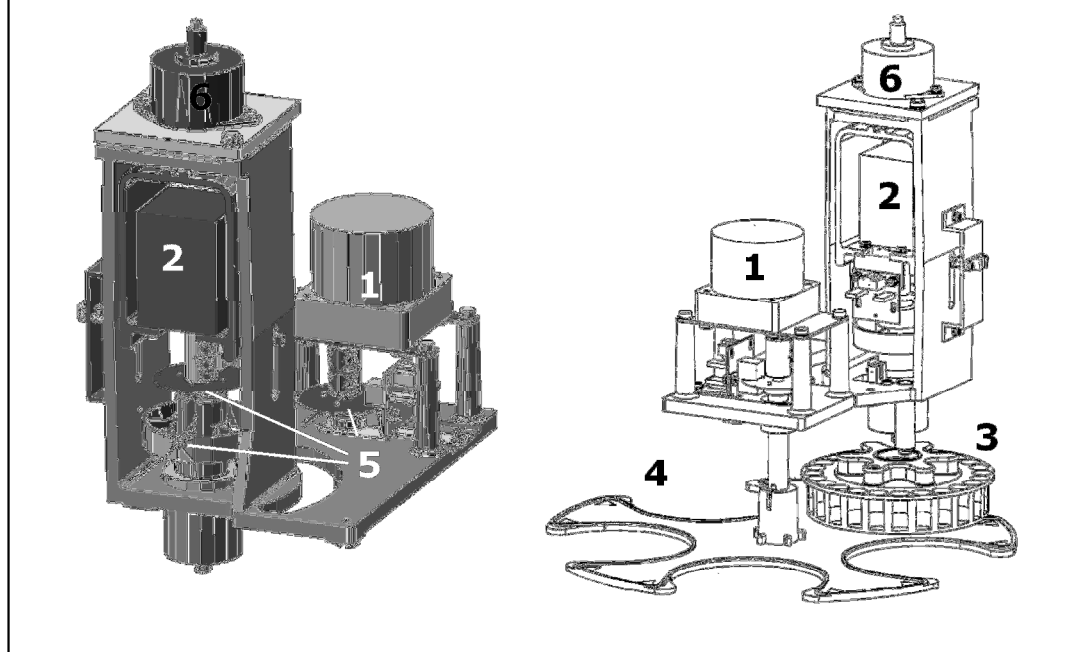
- The above slide shows the relative piston velocities for the primary and accumulator pistons in the solvent management system for the 2695. The solvent management system components work together to deliver solvent in the following sequence.
- The accumulator plunger (left plunger) moves forward delivering solvent, while the primary plunger (right plunger) moves backwards filling with solvent.
- While the accumulator continues to deliver solvent, the primary plunger waits. The primary pressure transducer then measures the pressure and matches it to the system pressure by moving the primary plunger forward, pre-compressing the solvent.
- When the accumulator plunger reaches the end of its stroke, it slows down and reverses direction. Simultaneously, the primary plunger moves forward delivering solvent.
- While the accumulator plunger moves backwards, the primary plunger moves forward slightly faster which allows the primary plunger stroke to both fill the accumulator piston chamber and to deliver solvent to the rest of the system

Sample Management System

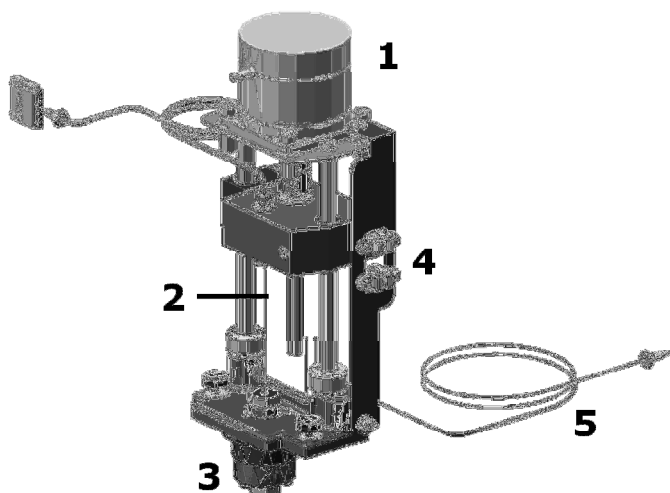
- Sample carrier
 - Carrier drive
 - Carousel drive
 - Carousels
- Injector system
 - Injector assembly
 - High pressure valves
 - Low pressure valves

- The sample carrier includes the carousels. Its function is to position the vials under the injector so samples can be withdrawn.
- The injector, and associated valves, withdraws the sample at atmospheric pressure and inserts it into the high pressure solvent stream.

Sample Carrier

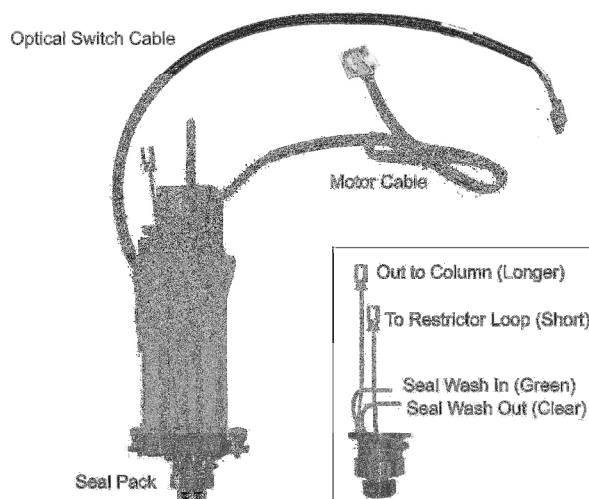


- 1 - Carousel Carrier Motor
- 2 - Sample Carousel Motor
- 3 - Sample Carousel
- 4 - Carousel Carrier
- 5 - Position Sensors
- 6 - Z-axis motor

2695 Injector

- 1 - Injector Motor
- 2 - Needle
- 3 - Seal Pack
- 4 - Position Sensors
- 5 - Outlet Tube to Column

Phase 2 Alliance 2695 Injector



- Beginning in October 2005, a new injector design was implemented in the 2695 and 2695D instruments.
- The new injector assembly is compatible with earlier 2690/5 instruments, no firmware upgrade is required to make use of this new style injector assembly.
- All 2695's and 2695D's beginning with the following serial numbers have the new Phase 2 injector.

<u>Serial #</u>	<u>Type</u>
J05 SM4 035M	2695 with sample heater/cooler
J05 SM7 373M	2695 without sample heater/cooler
J05 SD6 228M	2695D, 6-sample
J05 SD8 225M	2695D, 8-sample

New Injector Assembly

P/N 700002789

Injector only

New Injector Upgrade Kit

P/N 70000279

Includes sample & restrictor loop, bracket & cable assemblies

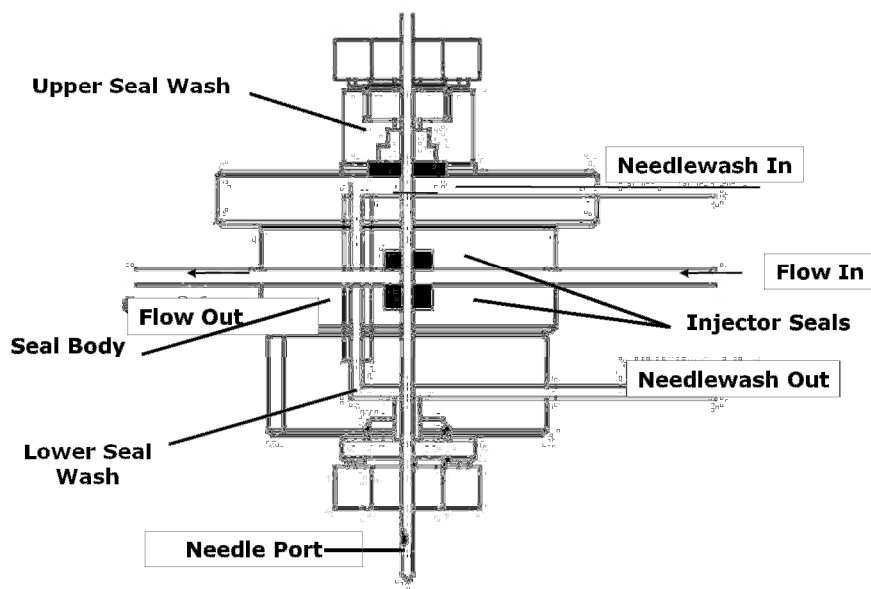
New Seal Pak
assembled seal pak,
with all

P/N 700002791

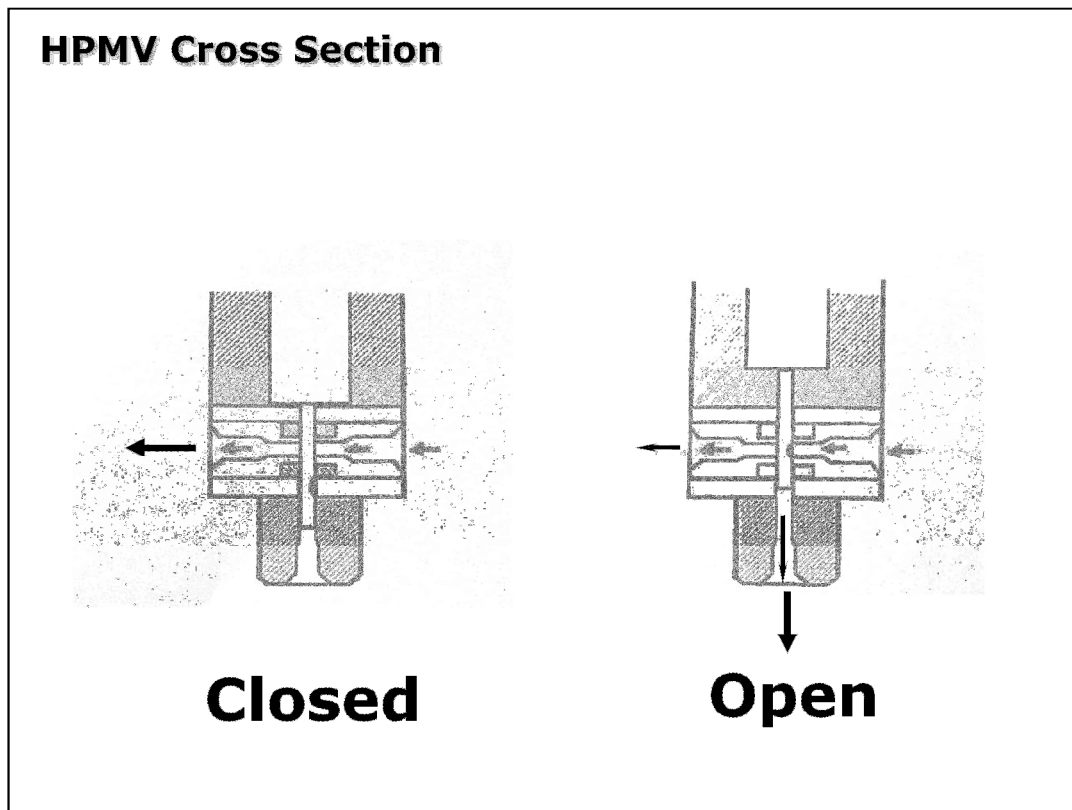
Pre-
compatible
earlier injectors

Waters

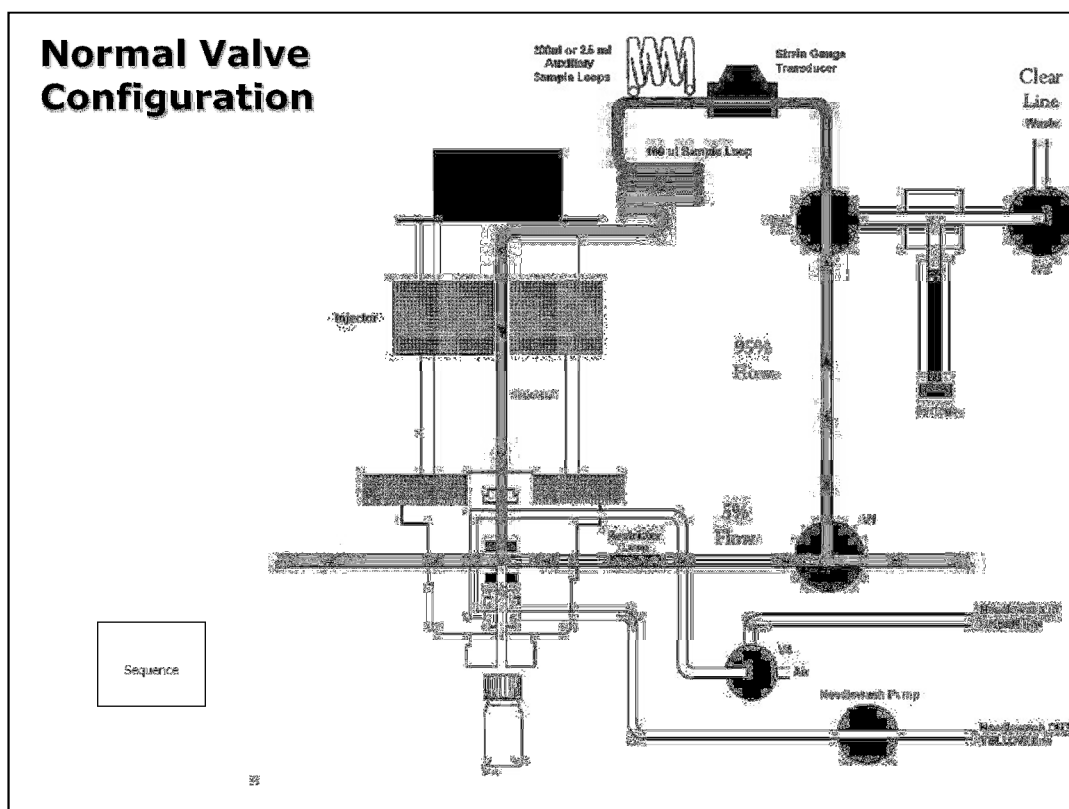
THE SCIENCE OF WHAT'S POSSIBLE.™

PerformancePLUS Seal Pack Cross Section

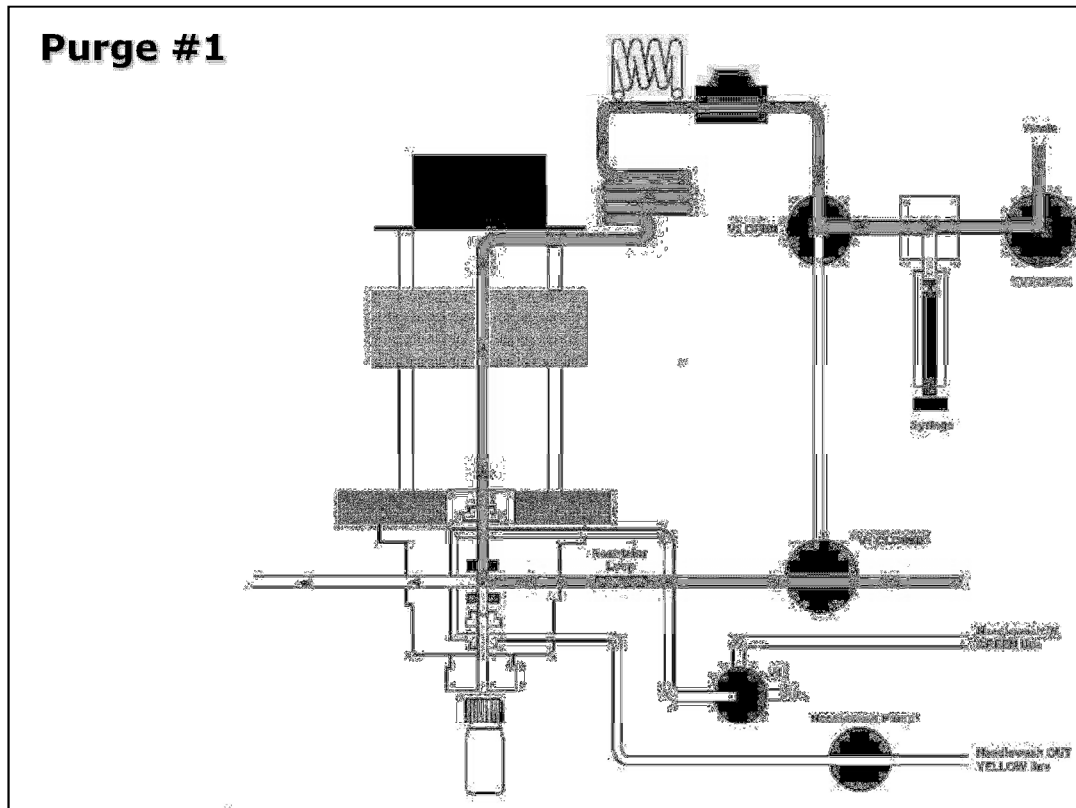
- The 2695 needle wash uses approximately 0.8 ml per injection.



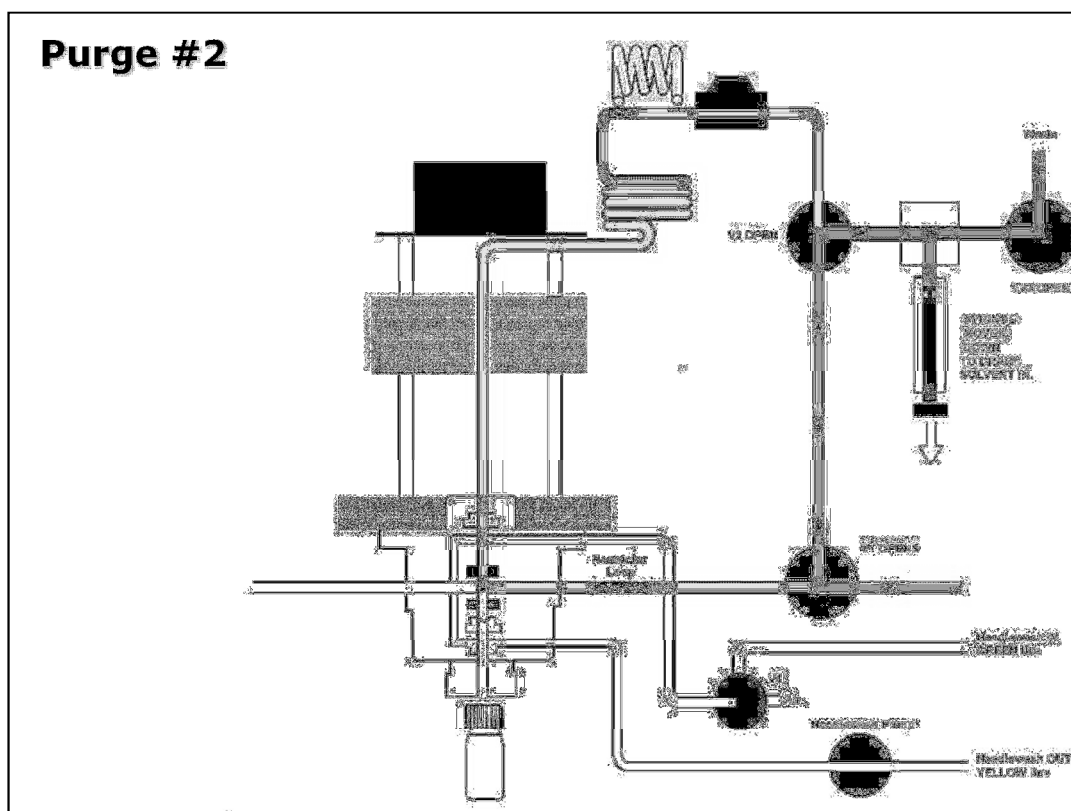
- When the High Pressure Motorized Valve (HPMV) is closed, the cross port in the spool is outside the flow path.
- When the valve opens, the cross port in the spool is pulled back between the valve seals and flow can exit through the nose cap.



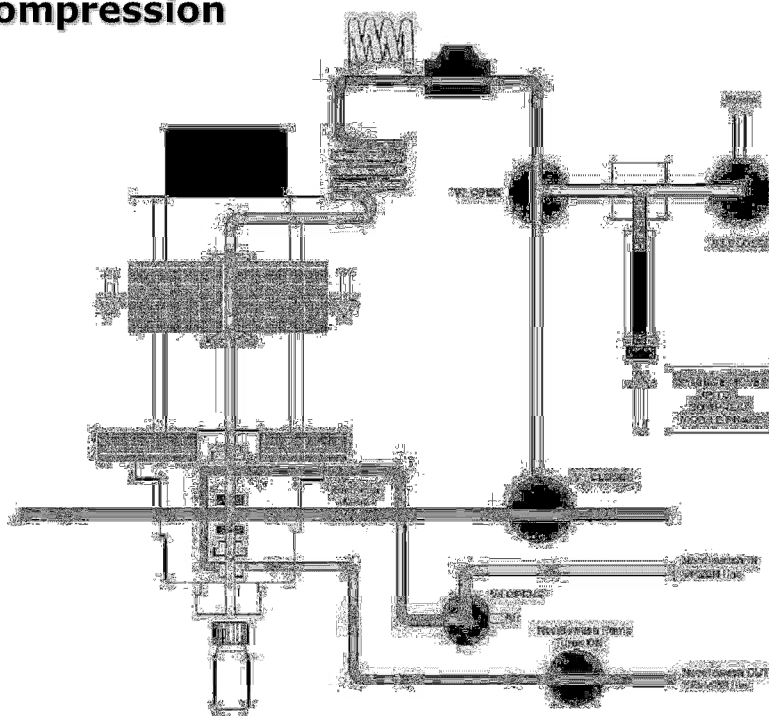
- The normal valve configuration is Valve 1 (inject) open, Valve 2 (syringe) closed, Valve 3 (vent) closed, Valve 4 (needle wash) closed.
- Because of the restrictor loop between Valve 1 and the injector, 95% of the flow will go through the sample loop and 5 % will go through the restrictor.
- For the next set of slides,
 - Valve 1 = V1
 - Valve 2 = V2
 - Valve 3 = V3
 - Valve 4 = V4



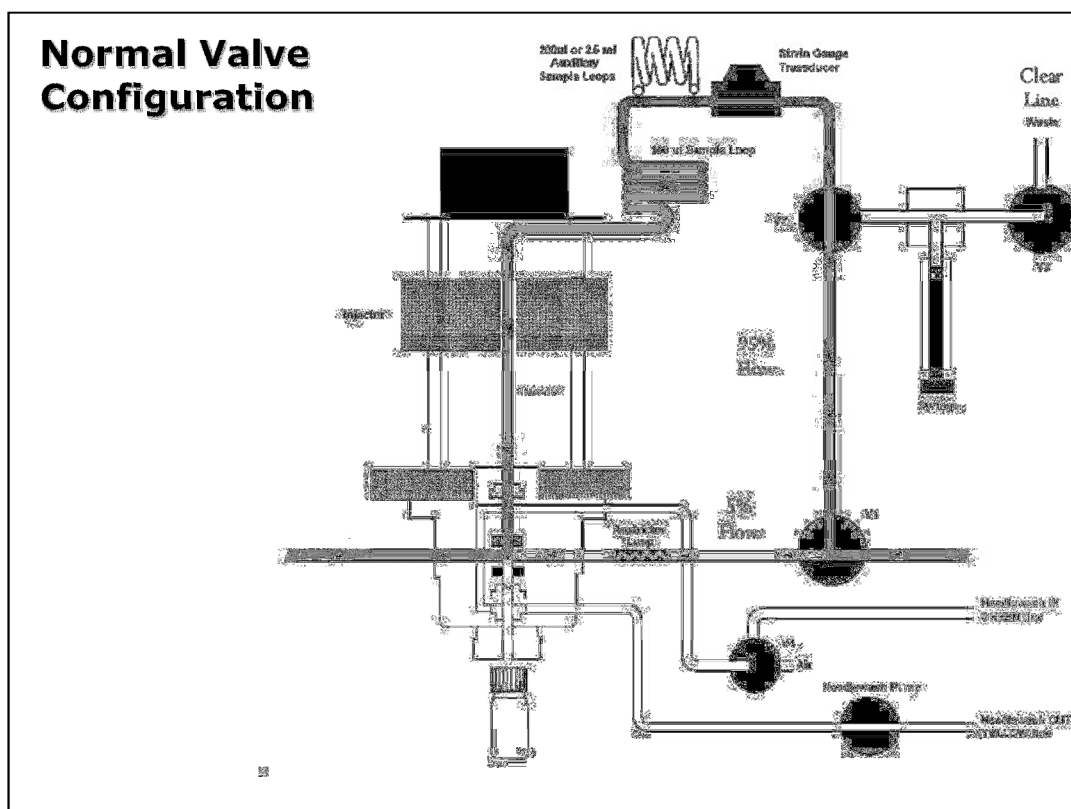
- At the start of the purge cycle,
 - V1 closes,
 - V3 opens,
 - V2 opens, flow goes up the sample loop and out to waste.
 - The syringe drives to its upper limit (Empty position).
- The Sample Loop Volumes applies only to this part of the purge cycle.



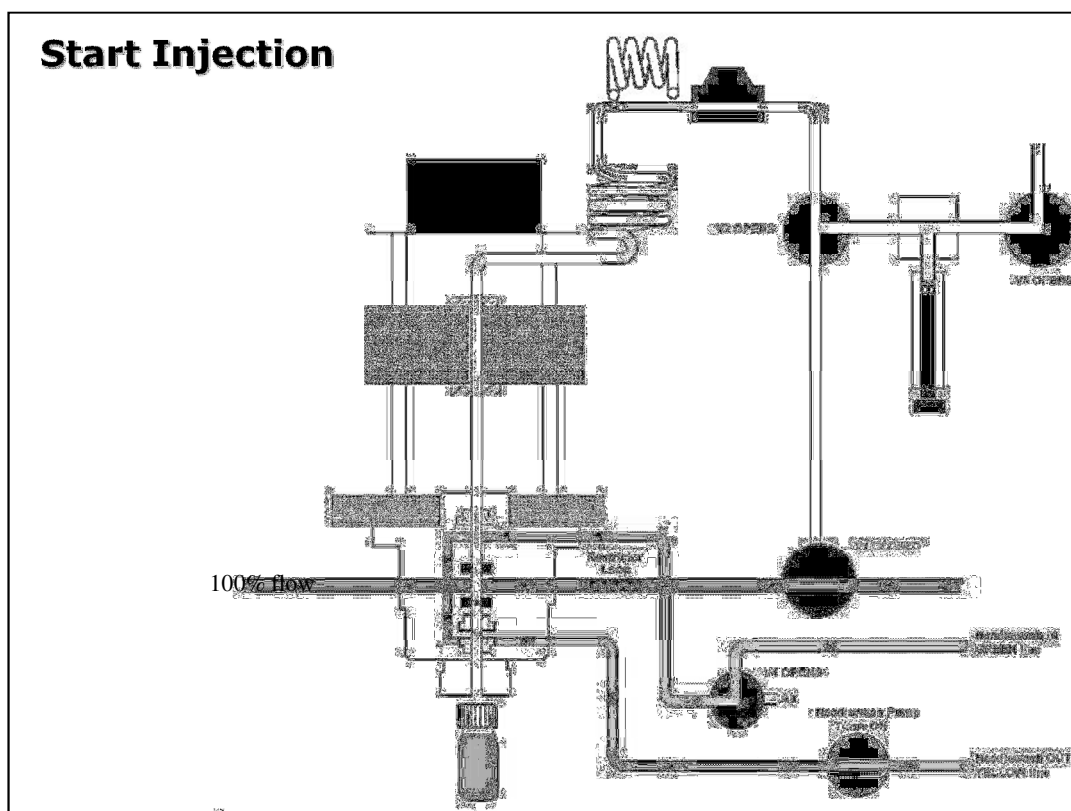
- In the second part of the purge cycle, V1 opens, 95% of the flow goes through the connection from V1 to V2.
- The syringe drives to its lower limit (Full position), reverses direction again and drives to its upper limit (Empty position), then returns to its Home position.

Purge #3 - Compression

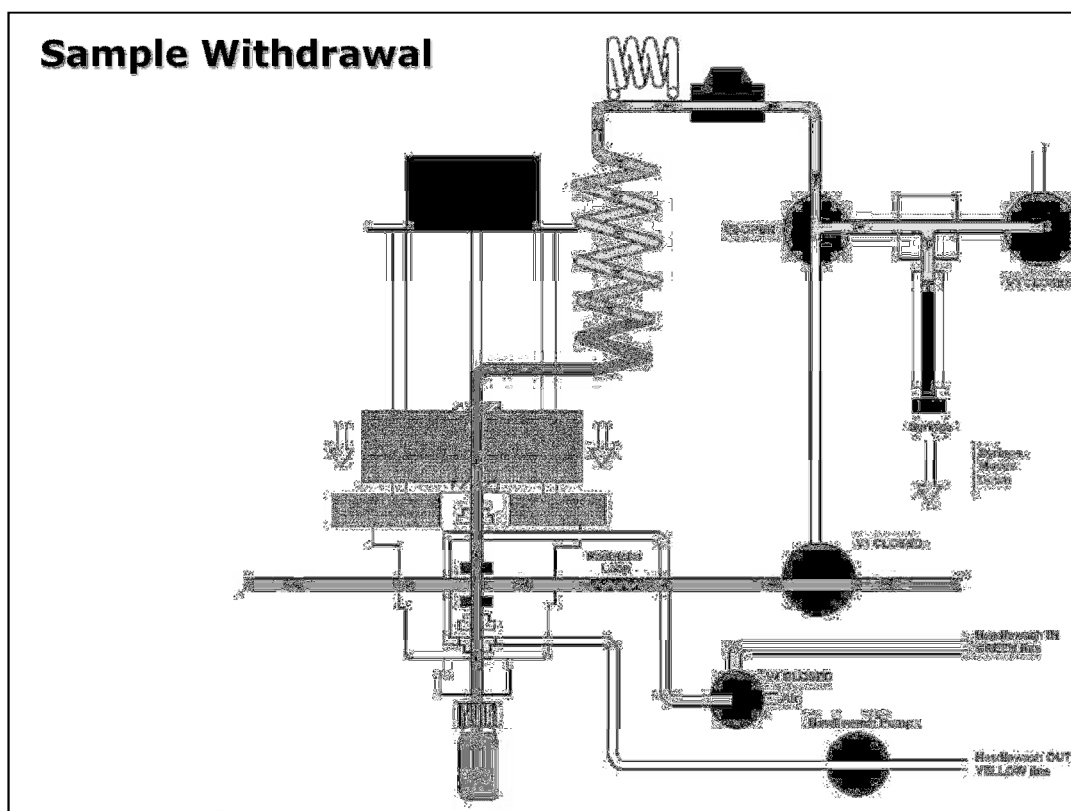
- The third part of the purge cycle is optional.
- If you select to do a Compression Check;
 - V1 closes.
 - The needle lowers till the port is in the lower seal.
 - V3 closes.
 - The syringe is driven up to compress the mobile phase.
 - The pressure limit can be set between 30 and 300 psi.



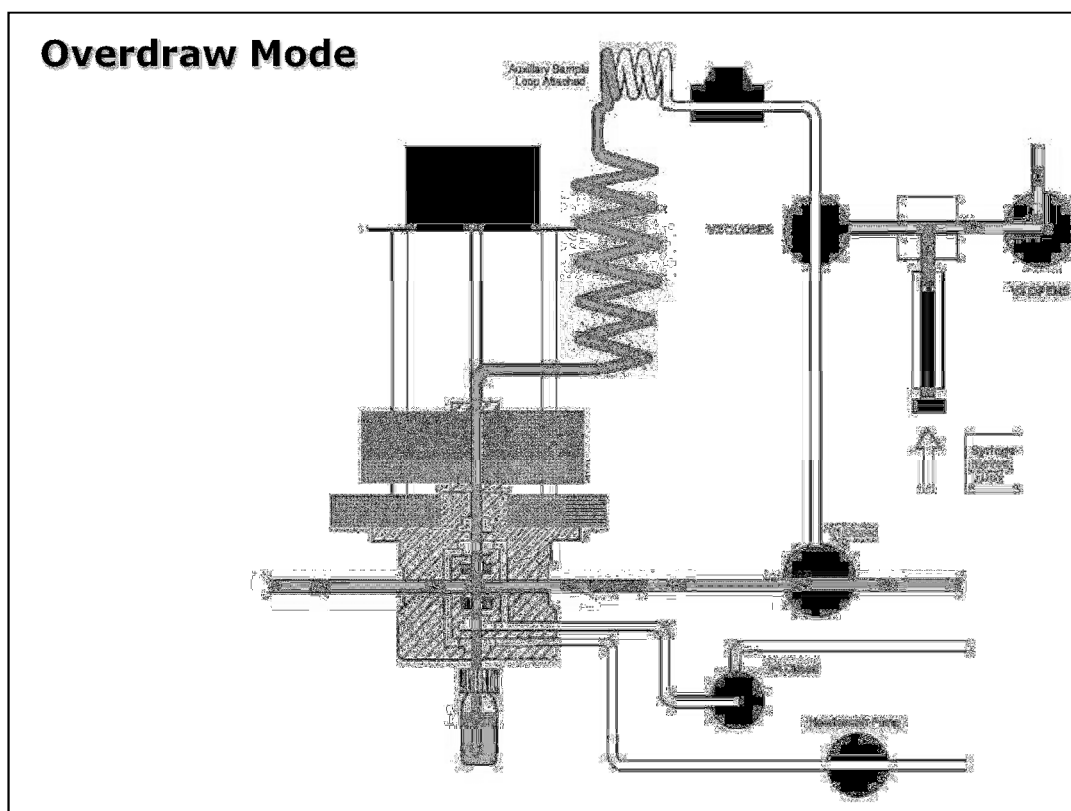
- The injection cycle starts from the Normal valve configuration.



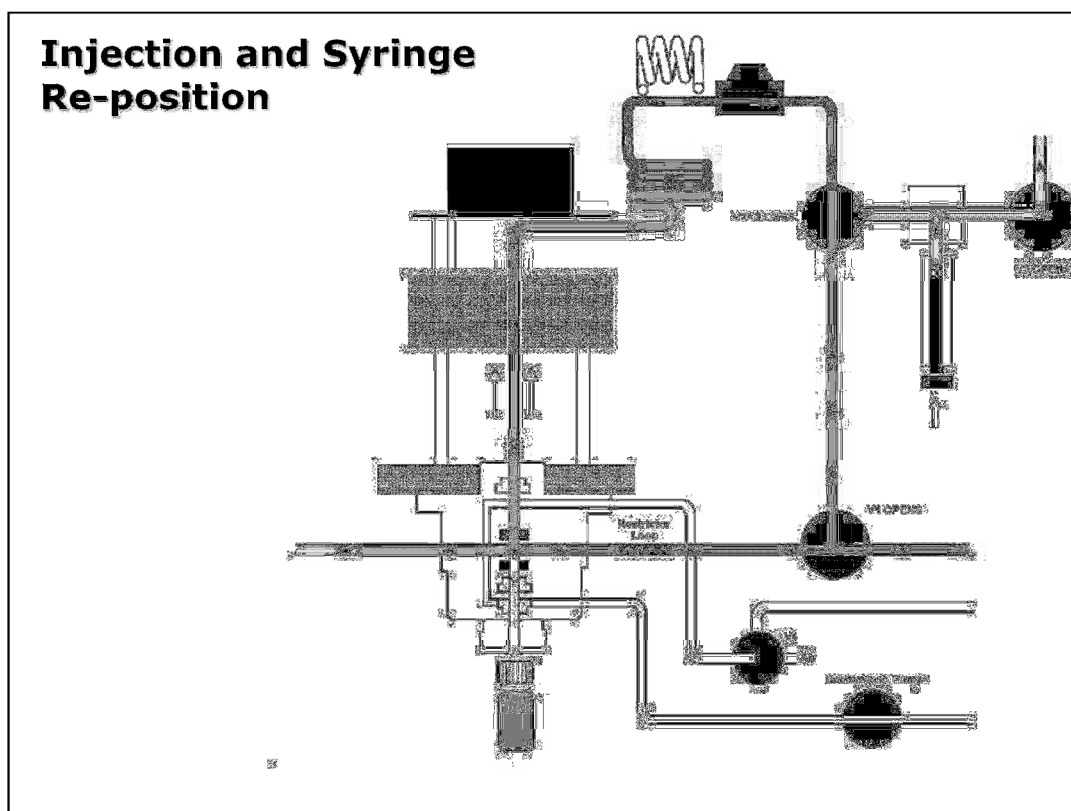
- At the injection start,
 - V1 closes, all flow now passes through the restrictor.
 - The needle lowers till the port is in the lower seal.
 - V3 opens,
 - V2 opens venting the pressure in the sample loop.
 - V3 closes to prevent siphoning.
 - The needle wash pump starts. V4 opens.



- With V3 closed,
 - the needle lowers into the vial.
 - V4 closes. The needle wash pump stops.
 - The syringe plunger lowers pulling sample into the needle (27 motor steps / μL for the 250 μL syringe).



- If the sample volume is greater than the syringe can draw (60% of full capacity),
 - V2 closes,
 - V3 opens,
 - The syringe expels the drawn volume,
 - V3 closes,
 - V2 opens and the syringe draws the remaining volume.
- If large sample volumes are being drawn, be sure to attach an appropriate size auxiliary sample loop.



- When the total sample volume has been drawn into the sample loop,
 - the needle rises until the port is in the lower seal,
 - V3 opens,
 - V2 closes,
 - the syringe expels the drawn volume.
 - V3 closes.
 - The needle rises until the port is between the upper and lower seals. The sample loop pressurizes.
 - V1 opens, 95% of the flow goes through the sample loop delivering the sample to the column.