



## Preventative Maintenance Procedure for the Pinnacle PCX

### Maintenance Schedule

#### Routine Maintenance:

- Check for leaks
- Replace the flush and piston wash solution every other day
- Record operating pressures

If there is an increase in pressure determine the cause of the increased pressure.

Replace filters or flush system with 80/20 Water/MeOH mixture.

#### Annual Maintenance:

- PM at least once a year

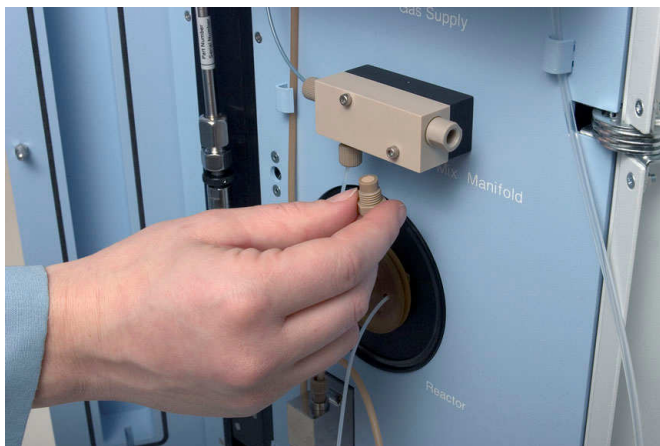
It is recommended to replace valve seals, pump seals, and reagent frit filter every 6 months. This may have to be more frequent depending on how much the instrument is used or if the instrument is being used with aggressive reagents.

To troubleshoot a pressure increase, start from waste line connections and work your way backwards disconnecting tubing to find the blockage. A pressure drop of greater than 120 psi will pinpoint the point of blockage.

- Always wear gloves when performing maintenance on the Pinnacle.

### Reagent Filter(s) Replacement

- Replace Frit when Reagent Pressure increases by 100 psi
- Replace approx. every 6 months (depending on usage)
- There are two filters in the Duplex system, and one filter on the Simplex system.
  1. Before removing the filter, make sure the HPLC and post-column pumps are stopped. Turn the valve on the reagent bottles to the "Closed" position and proceed.
  2. Remove the 1/16" fitting from the inlet of the reagent filter.
  3. Use a 7/16" wrench to remove the filter.
  4. Replace the Frit filter. The correct Frit filter is 3102-9040, a 10 µm frit. Tighten with fingers then ¼ turn with wrench. (The filter is included in the PM kits 1000-1004 for the dual and 1000-1003 for the single pump model)



## Valve Maintenance

- Before changing the valve seals, select “Instrument” on the Pinnacle software, then select “Maintenance” then “Change Seal”. This will flush out the valve and pump. The software will then ask you to remove the flush line so that it can pump in air. Remove the flush line from the solution and continue.
- Power down the Pinnacle and turn the power back on again. This will move the valve to the blocked position. Power down once again, until the Valve is reinstalled.
- Now Valves are ready for maintenance.

All Fittings are:

¼-28 Nuts + Ferrules for 1/8” Tube

Except For: Position 2

¼-28 Nuts + Ferrules for 1/16” Tube

Positions:

1-2: Reactor

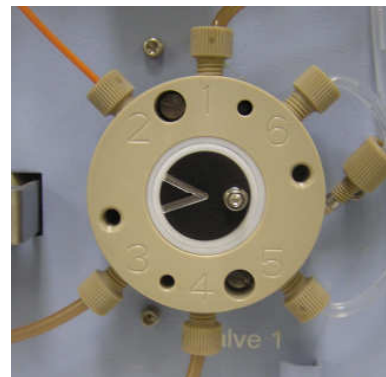
2-3: Blocked

3-4: Reagent

4-5: Flush

5-6: N/A

1-6: Waste



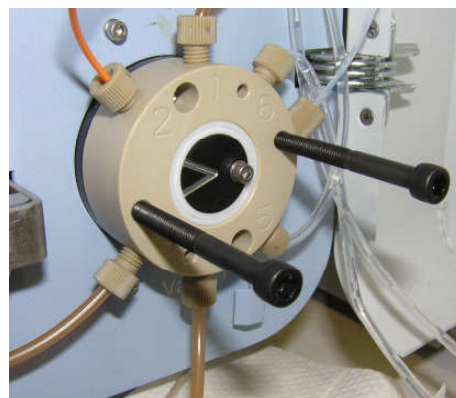
- Place some paper towels under the Pinnacle PCX to absorb any excess liquid that is in the Flush line.
- Disconnect the Waste line (position 6) from the Valve face.
- Hold the end of the tubing upright for a moment to allow any liquid to drain into the waste container.
- Disconnect the remaining fittings from the valve face.
- Using an Alan wrench and a flat-head screwdriver, loosen the cap screw that holds the valve indicator plate in the center of the valve, and the 2 shoulder screws located between ports 1-2 and 4-5.
- Pull the entire face horizontally forward. There will be some resistance.

- If there has been any crystal build-up behind the valve and you are having a hard time removing the valve face, insert the jack screws contained in the Valve Maintenance kit and tighten them until the face of the valve comes forward and you are able to remove it.

- **Warning:** When removing the valve face with the jack screws it is important to remember to remove the valve using equal turns on each side.

- The valve should come off of the instrument as straight as possible to prevent deforming the soft PEEK material.

- Remove the jackscrews after the valve is removed.



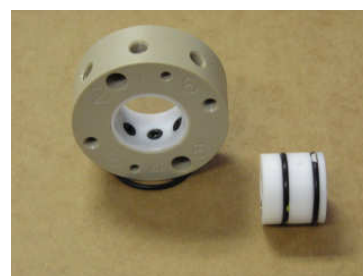
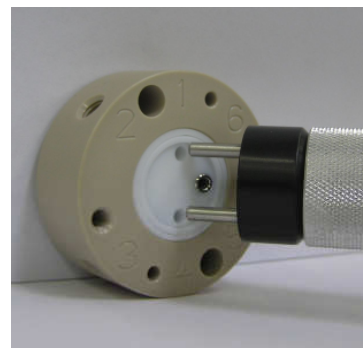
## O-Ring Removal

- DO NOT use any sharp tools, as this will scratch the soft plastic of the insert. Use the special removal tool for the center. Make sure to rotate in a clockwise direction while pushing from the other side.
- For the 5 smaller O-rings (Size 4) – use a length of 1/16 OD Peek tubing to remove.
- For the 2 large O-rings (Size 18) – pinch o-rings with fingers and roll over to remove.

*Part Number 1452-0201 Set of O-Rings for the Pinnacle Valve (Five #4 and 2 #18)*

*Part Number 1452-0202 Pinnacle Valve Maintenance Kit (Tool and O-Rings for valve maintenance)*

- Once O-rings are removed, sonicate PEEK ring, insert and new O-rings to remove any crystals from valve. Be sure to rinse thoroughly.
- Wear gloves and use care not to get dust or dirt on them after cleaning.
- Assemble the valve using the new O-Rings. Port 6 (Waste port) does not have an O-ring.
- Never reuse the O-rings. Never use substitute O-rings.



## Rebuild/Replace the Valve

- Using the special Pinnacle Valve Seal tool (the same tool used to remove the spool), carefully put the center back into place in the PEEK ring.
- Line up the holes in the spool so that when it is placed on the Pinnacle, the V on the black indicator plate will point to 2-3. This is the equivalent to the blocked position of the insert.
- Ensure that at the front face of the re-sealed valve, the body and spool are completely flush. These two pieces must be level.
- Slide the re-sealed valve onto the motor mount, so that the Number 1 port is at the top.
- Push the valve face firmly against the Valve Motor base. Ensure that the Valve Spool is firmly pushed against the motor mount.
- Replace the shoulder screws and tighten until you feel slight resistance. Then make 1/8 turn past snug.
- Reinstall the six lines to the valve.
- Turn the instrument ON.
- Perform a pump flush to exercise the new valve and to properly position the spool within the body. To do this, be sure the flush line is placed back into the flush solution. Go to “Instrument” then ‘Maintenance’ then “Flush Pump” in the Pinnacle PCX Control Software.

## Pump Maintenance

Before performing maintenance on the pump, select “Instrument” on the Pinnacle software, then select “Maintenance” then “Change Seal”. This will flush out the valve and pump. The software will then ask you to remove the flush line so that it can pump in air. Remove the flush line from the solution and continue.

Turn off the Pinnacle PCX.

Open the panels on the right side of the Pinnacle PCX by removing the captive screw located at the back of the Pinnacle PCX, then push the cover back, and lift it up.

Remove the Piston wash tubing from the top of the pump.

Disconnect the two pump lines from the front of the pump head.

Disconnect the electronic pin connector from the inside wall of the Pinnacle PCX.

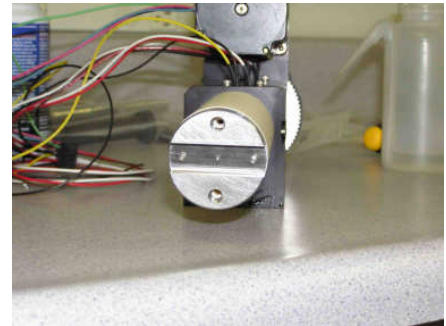
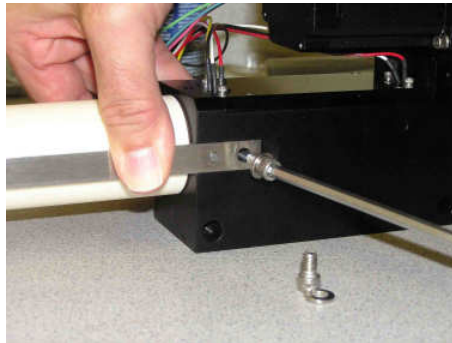
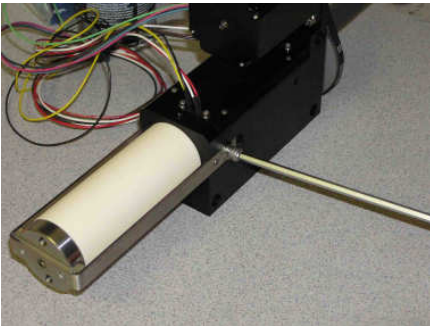
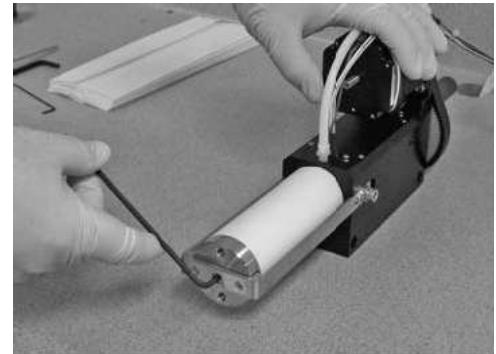
### To Remove the Pump From the PINNACLE PCX

- Remove the two Alan bolts from the bottom of the pump first.
- Loosen and remove the third top screw.
- Carefully remove the pump from the chassis.
  - If it is Pump 1, tilt the back end up and remove the pump in a vertical position.
  - If it is Pump 2, tilt the back end down, and remove the pump in a vertical position.



### Remove the Syringe From the Body of the Pump

- Place the pump on clean paper towels on the bench.
- Using a 1/8" Alan wrench loosen the setscrew at the front of the syringe until the screw front sits flush with Cylinder retainer assembly.
- Loosen the two 1/4-20 x 3/8" cap screws.
- Completely remove the Cylinder Retainer Assembly



- Remove the Cylinder Cap from the head of the cylinder.
- Carefully remove the ceramic syringe body by turning it in a clockwise direction as you pull toward you.
- Warning: Never turn ceramic syringe body counter clockwise. This will cause the Piston Head to unscrew and fall off inside of the cylinder, making it very difficult to remove.
- There will be some liquid inside the body, which will spill onto the paper towels.
- Set the syringe body aside on a clean dry surface.
- The piston should be fully extended from the pump.

## Piston Head Unit Seal Replacement

1. Using a 1/16" Allen wrench Loosen the 6-32 brass tip set screw.
2. Remove the piston head by turning it in a counter-clockwise direction. It is threaded onto the lead screw. If needed, use a crescent wrench to loosen the piston head.
- Note: Very Important! Never re-use the setscrew. It has a soft brass end that is designed to be used only once.
- A new setscrew is included with the seal kit. Re-use of the setscrew can cause the piston head to come lose and damage the threads.
3. Place the piston head on the bench with the PEEK side down.
4. Using a 3/32" Hex Head Driver, remove the metal plate by removing the 3, 4 - 40 x 1/4" cap screws and washers. These cannot be reused and must be replaced.
5. The piston head will disassemble into 3 parts:
  1. Metal Piston Face (sonicate)
  2. Piston Head O-ring (replace)
  3. PEEK Piston Head (sonicate)
6. Now you can fully remove the 6-32 brass tip set screw (replace).
7. Blow out debris from brass-ended setscrew that may be inside the piston head. Remove and discard the old O-ring.
8. Sonicate the metal plate, PEEK piston head, piston O-ring guide, and new O-rings in a beaker of water with a few drops of soap.
9. Rinse with DI water and reassemble the Piston Head using the new O-ring and cap screw.

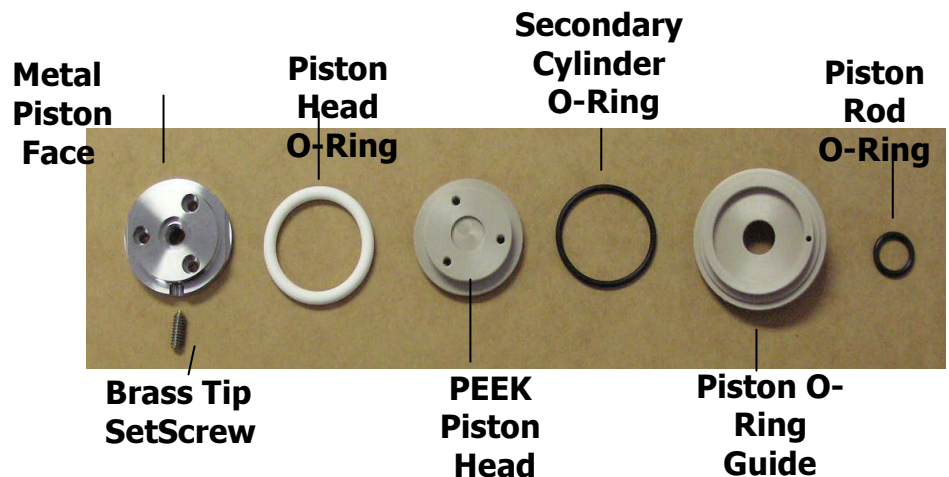
### Replace:

Three 4-40 x 1/4" cap nuts and washers, Brass ended set screw, Piston Head O-ring, Secondary Cylinder O-ring and Small Piston rod O-ring.

### Sonicate:

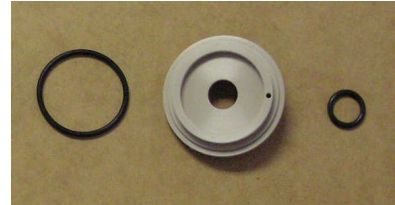
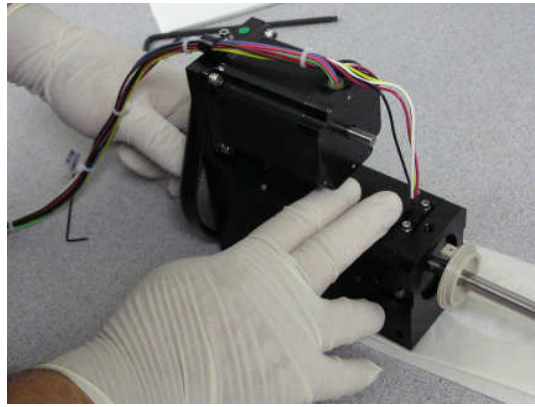
Metal Piston Face, PEEK Piston Head, Piston O-ring guide, all new O-rings and Ceramic Syringe Body

10. Set the reassembled Piston Head Unit aside until Pump Reassembly. Do not tighten brass setscrew.



## Secondary O-ring and Piston Rod O-ring Replacement

- First remove the piston wash connection.
  - *Note* O-ring guide will not come out with piston wash connection in.
- “back piston” by turning the lead screw 4 to 5 full turns manually.
- Reverse direction of turn by 4 to 5 full turns by turning the lead screw in the opposite direction. This will extend the guide at the base of the pump.
- Remove the Secondary Cylinder O-Ring from the back of the O-Ring guide.

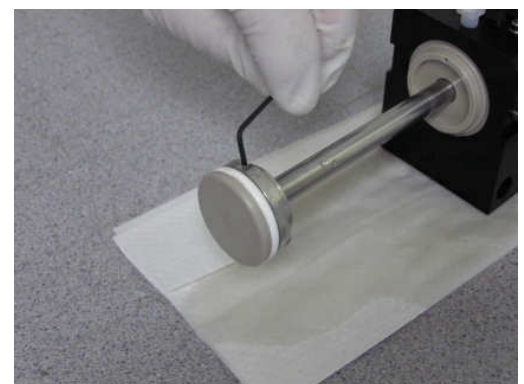


- Slide the O-ring guide out and replace the small piston rod O-ring that is located at the back of the guide.

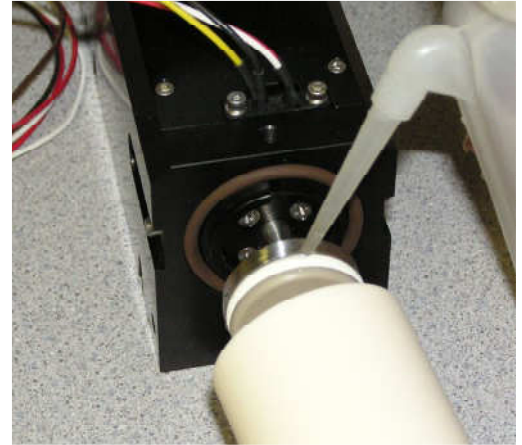


## Pump Reassembly

- Place the clean Piston O-ring guide back on the piston rod with new clean small piston rod O-ring.
- Replace the Secondary Cylinder O-Ring in the designated groove.
- Assemble the new Piston Head unit. Place the Metal Piston face and PEEK Piston head together with the Piston Head O-ring. Place the three new screws and washers and tighten. If it does not tighten, you may have broken threads and may need a new PEEK Piston head.



- Screw the newly assembled Piston Head Unit onto the head screw (hand tight).
- Using a new brass-ended setscrew, tighten the setscrew with the 1/16" Allen wrench. It is important to make this tight.
- Lubricate the ceramic body with some methanol or isopropanol.
- Turning it in a clockwise direction, push it back over the piston, using care to keep it horizontal.
- Ensure that the through holes are orientated top and bottom.



- The setscrew at front of cylinder has "adjustment" depression to center bracket. Center the bracket by sliding it back and forth a little bit until you feel it in the depression.
- Once it is centered, tighten the setscrew. Tighten the setscrew so that the syringe is tight against the base of the pump.
- Finally, tighten the two 1/4-20 x 3/8" cap screws using the 3/16" Allen wrench.

#### Replace the Pump in the Pinnacle PCX

- Replace the pumps in the Pinnacle PCX by following the reverse of the directions "To Remove the Pump From Pinnacle PCX"
- Be sure that the body of the pump rests on the support brackets, and that the front of the pump is protruding through the front of the chassis.
- **Note:** Be very careful not to pinch any of the other wires inside this area. Be especially careful of the reactor wires and the valve wires when reinstalling Pump
- Attach the reagent and piston wash lines.
- Re-connect the electronic pin connector from the inside wall of the Pinnacle PCX.

#### Replacing Tubing

There are tubing kits available for the Pinnacle Single and Dual pump systems. Remove and replace tubing according to the diagrams and tables attached.

#### Flush and Refill Pumps

Once you insert the pumps, flush them using the Flush command. Replace your reagents with 80/20 water/methanol and refill the pumps. Make sure you have no column attached and that you plug the mixing tee from the column. This ensures that nothing goes back into the column. Turn

on the pumps and let the pumps run for about an hour to break in the new seals. Perform another pump flush, then do the pressure and leak test described below.

### **Pressure and Leak Test**

Remove your column and block the end of the line. Turn pumps on and look for leaks. Brush a Kim wipe by each fitting to check for droplets. Tighten fittings if you find a leak. Block the line to the reactor and let pressure build up slowly. When pressure reaches 480 stop the pumps. Set a timer for 10 minutes while the system equilibrates. Brush a Kim wipe by each fitting at this time to check for leaks at fittings. At the end of 10 minutes take a reading of the pressure and time for another 10 minutes. Note the change in pressure for those 10 minutes. If the pressure has dropped more than 50 psi, then there is a leak somewhere. Build up pressure again and look for water droplets.

Remove the waste line and look for any small amount of flow to come out when performing a pressure test. There is a leak in the valve if you observe fluid coming out of the waste line. This may be a very slow leak. Dab the end of the waste line with a paper towel and create a small amount of air inside the end of the tube. Leave the waste line for a few minutes and check to see if the air bubble has moved. If you have a leak in the valve you may need to clean the valve and replace seals.



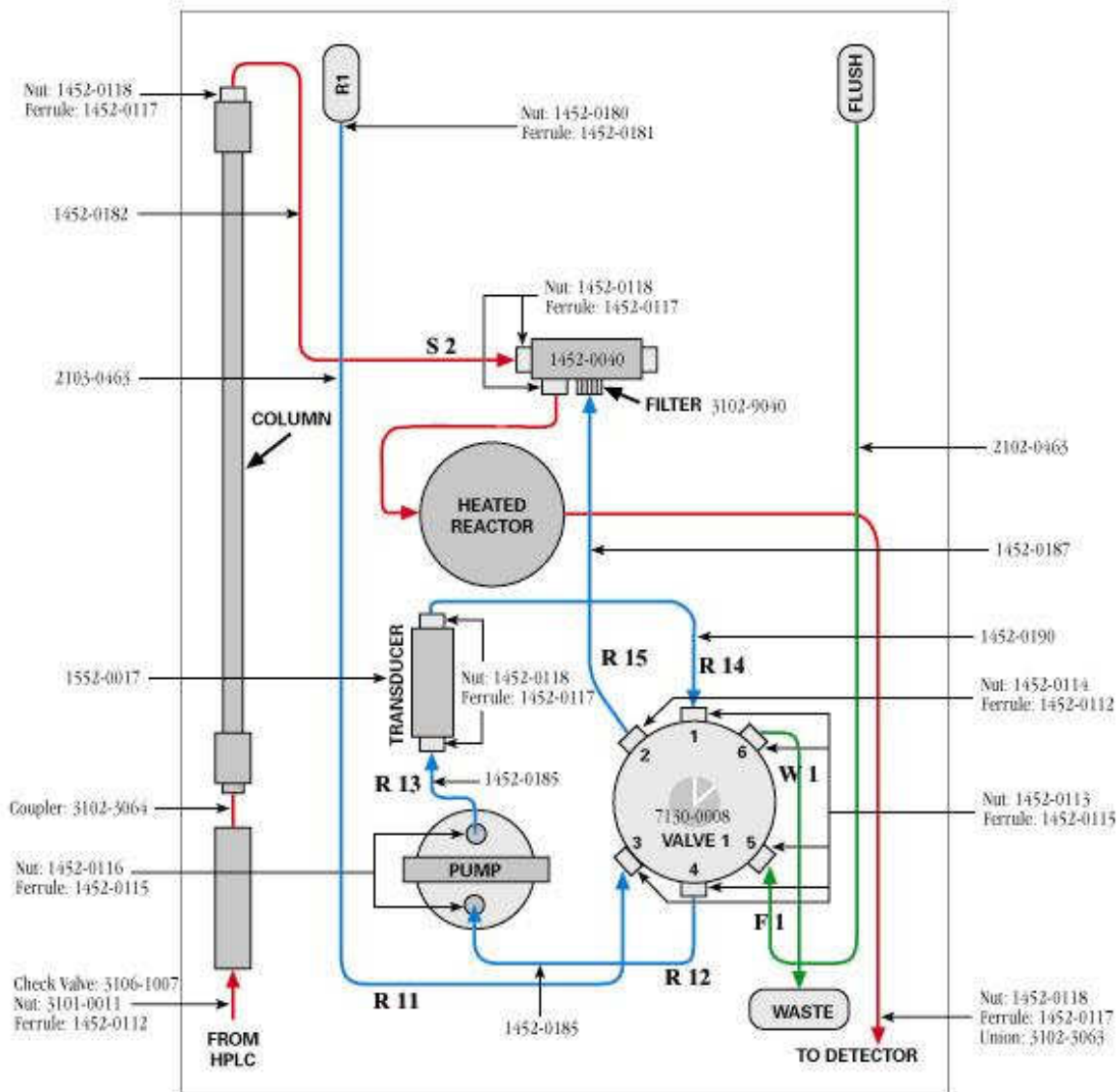
## Plumbing kit for 2-pump Pinnacle PCX

Part number 1100-0500

Below are not part numbers, but labels to help with installation.

### Assembly's identification

Assembly	Connection
S2	Outlet of the analytical column to manifold 1
R13	Outlet of pump1 (long nut) to inlet of transducer 1 (short nut)
R14	Outlet of transducer 1 to valve 1 port 1
R11	Valve 1 port 3 to reagent bottle 1
R12	Valve 1 port 4 (short nut) to inlet of pump 1 (long nut)
F1	Valve 1 port 5 to Flush bottle
W1	Valve 1 port 6 to waste
R15	Valve 1 port 2 to manifold 1
R24	Outlet of transducer 2 to Valve 2 port 1
R23	Outlet of pump2 (long nut) to inlet of transducer 2 (short nut)
R21	Valve 2 port 3 to reagent bottle 2
R22	Valve 2 port 4 (short nut) to inlet of pump 2 (long nut)
F2	Valve 2 port 5 to Flush bottle
W2	Valve 2 port 6 to waste
R25	Valve 2 port 2 to manifold 2
BPR	Outlet of the backpressure regulator on manifold 1 to the drip tray



Plumbing kit for 1-pump Pinnacle PCX  
Part number 1100-0501

Below are not part numbers, but labels to help with installation.

**Assembly's identification**

<b>Assembly</b>	<b>Connection</b>
S2	Outlet of the analytical column to manifold 1
R13	Outlet of pump1 (long nut) to inlet of transducer 1 (short nut)
R14	Outlet of transducer 1 to valve 1 port 1
R11	Valve 1 port 3 to reagent bottle 1
R12	Valve 1 port 4 (short nut) to inlet of pump 1 (long nut)
F1	Valve 1 port 5 to Flush bottle
W1	Valve 1 port 6 to waste
R15	Valve 1 port 2 to manifold 1
BPR	Outlet of the backpressure regulator on manifold 1 the to drip tray