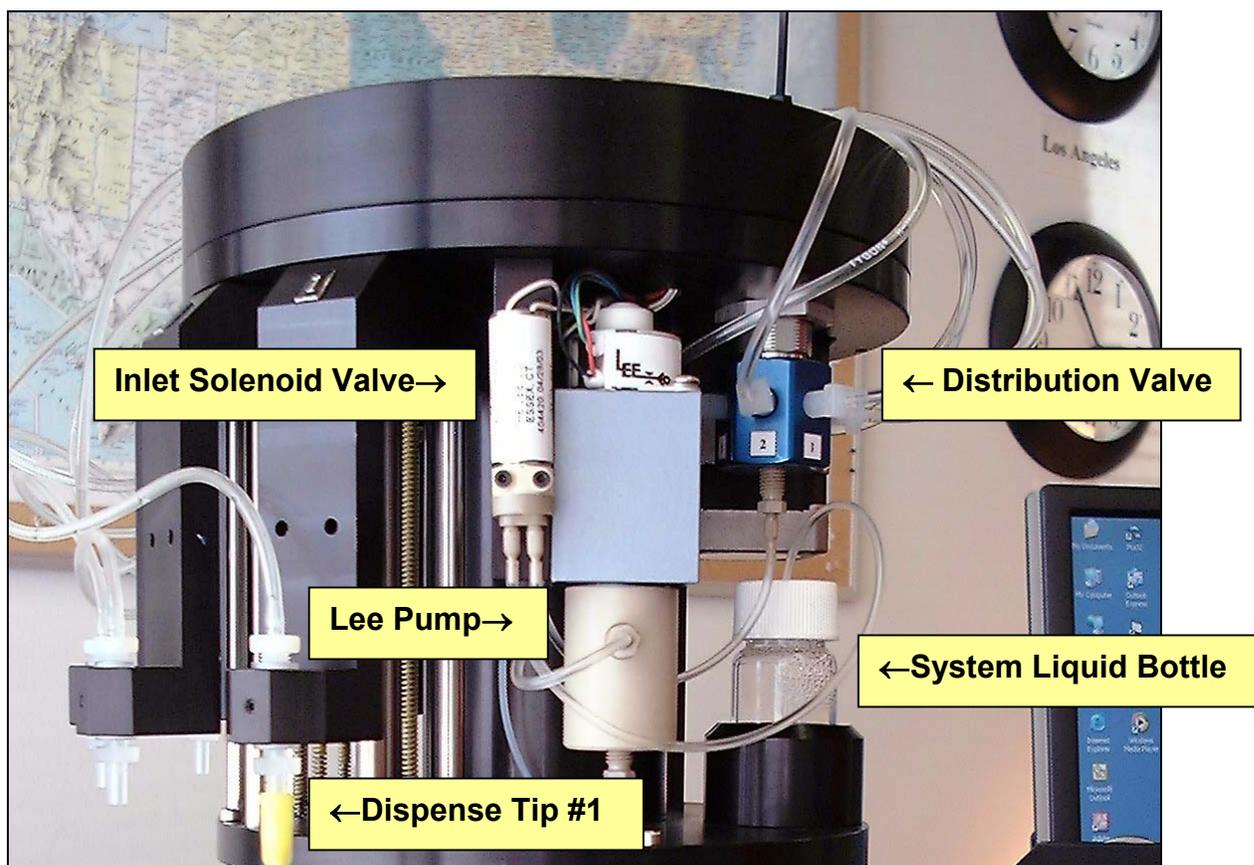


FTA2000 Distribution Valve Setup

May 3, 2005

The FTA2000 has a 6-way distribution valve to connect the Lee pump to one of the six dispense tips. This valve is located in the top half of the rotating autosampler carousel. The photo below shows its location.



Liquid system. The Outlet Solenoid Valve is not visible; it is hidden on the far side of the block behind the Inlet Solenoid Valve.

The liquid path is illustrated schematically in the diagram on the next page. System liquid is normally DI water. It can be dispensed directly or it can be used only as a vehicle to fill the hydraulic system while the actual dispensed liquid is picked up from one of the 17 small two milliliter vials. In the latter case, an airgap is kept between the system liquid and the dispense liquid. The two solenoid valves are necessary to control the direction of liquid flow. The normal direction is *towards the dispense tip*, but the direction can be reversed to *towards the system liquid bottle*. One solenoid valve is open and one closed at any time.

Sys Liquid → Inlet Valve → Lee Pump → Outlet Valve → Distribution Valve → Tip 1
→ Tip 2
→ Tip 3
→ Tip 4
→ Tip 5
→ Tip 6

The Lee pump functions like a syringe pump. It has an up stroke (dispense) and a down stroke (aspirate). As indicated above, the solenoid valves control the direction of liquid flow during either stroke.

The distribution valve functions by an internal vertical shaft that is rotated by a stepper motor hidden under the black aluminum top cover. Liquid comes into the valve through the port in the lower center, where it enters the rotating shaft. The shaft has a horizontal liquid passage that will turn and meet up with one of six output ports arranged at 60° intervals around the circle. While it is turning from one port to another, the shaft will line up with no port and liquid can not flow through the valve. The distribution valve is very reliable and should need no maintenance. The following section will, however, explain how to align the “home” position of the stepper motor so that the valve is correctly pointing at and connected to each port after a stepper motor move.

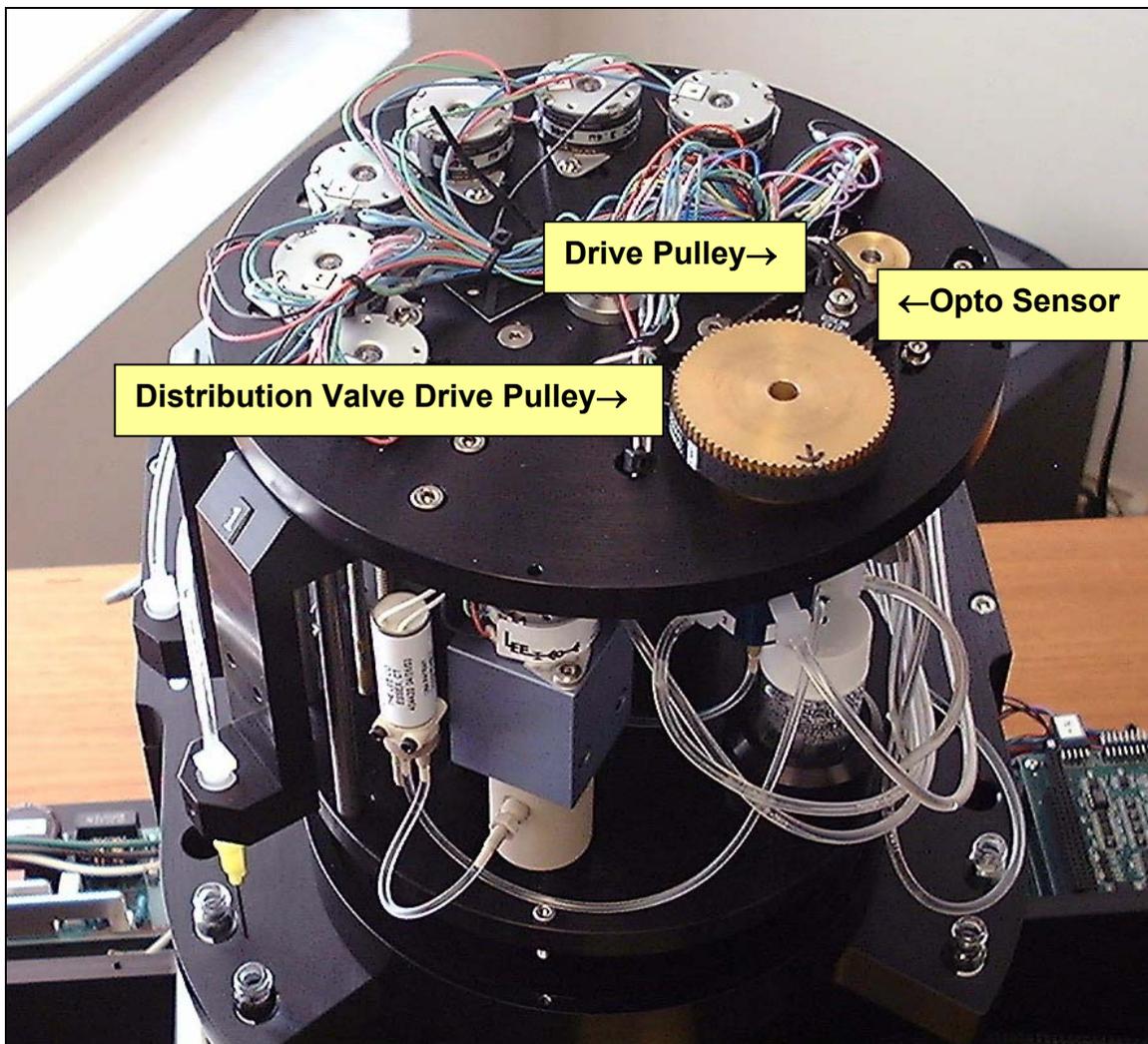
Homing the Distribution Valve

The photo on the following page shows the top cover of the autosampler removed. The distribution valve has a large brass drive pulley mounted on its vertical shaft. This pulley is driven by a belt from a gearhead stepper motor. Centered between the belt runs is an opto sensor that detects “home.” Home is an arbitrary, but fixed, position on the large gear. It corresponds to an arbitrary, but fixed, rotation of the valve shaft. The motor will turn the pulley until the home position is sensed. Then it will turn an additional distance, called the offset, to move the shaft to port 1 for Tip 1. The offset rotation varies from instrument to instrument and the individualized number is part of the Driver Setup on the Autosampler tab.

The opto sensor that detects Home “sees” a hole drilled in the outside edge of the large pulley. The sensor should be placed as close as possible to the pulley teeth without rubbing them. It should not be moved unless absolutely necessary as it is difficult to realign. The proper gap between the sensor face and the outside edges of the gear teeth is 0.005 inches, or approximately 0.12 millimeters. A metal feeler gauge is necessary to set the gap.

Determining the proper offset rotation requires trial and error. One must iteratively

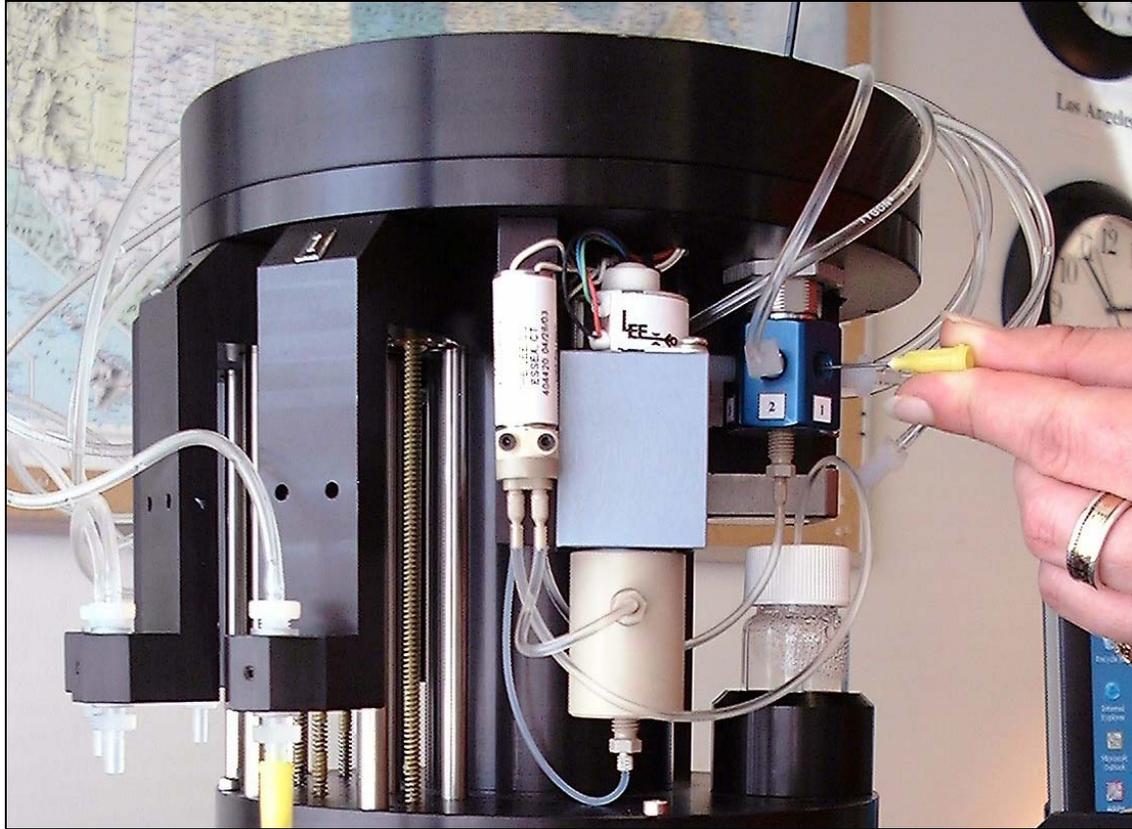
1. Propose an offset value and type it into the Driver Setup box.
2. Execute a Home (or Home All) from the software.
3. Probe port 1 to see if the valve is pointing at it.



The arrow drawn on the large pulley points to the Home location hole drilled in the pulley. It is currently also pointing at port 1 for Tip 1 after a Home + offset move.

The photo on the next page shows the process for verifying that the distribution valve has stopped in the right place after a Home + offset move.

1. Remove the liquid fitting from port 1 so you can see inside the port.
2. You can verify the position either visually (the liquid passage way appears as a small dark dot, about 1 millimeter in diameter, when it points at the port, or you can do it by probing as illustrated in the photo. The needle will penetrate about 5 millimeters when the passage way is not pointing at the port, and about 15 when it is.



Probing the port to check valve position.

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