

## 4.7 COMPACT TEE DIFFERENTIAL PUMPING and VARIABLE LEAK VALVE OPTIONS

### COMPACT TEE DIFFERENTIAL PUMPING OPTION

The Compact Tee Differential Pumping connector allows the attachment of a separate, user-supplied turbo-molecular pump to the Ion Gun by a 2 $\frac{3}{4}$  inch CF flange. (See Figure 4.7.1.) Because the ceramic on the firing unit makes a seal, the interior space of the Ion Gun is separated from the host vacuum system, and a different pressure can be maintained in the two regions. For example, the gun can be at 10<sup>-5</sup> torr, while the chamber is at 10<sup>-7</sup> torr. Gas admitted into the Ion Gun at the inlet valve can be differentially pumped out via the Tee connector, and the pressure in the ion source region may be monitored at the differential pumping port.

Maintaining a constant gas pressure will aid in maintaining a constant ion emission current, and so a constant ion beam current. The number of ions created is directly dependent on the gas pressure. If the pressure is too low, an adequate ion beam current will not be produced.

**However, if the gas pressure is too high, the ion beam current can become unstable. At high pressures, excess gas may diffuse past the ionization area and cause a glow discharge between the grid and the extract, or cause discharging at other places where there are electrical connections.** In adjusting gas pressure, it is important to wait for the pressure to stabilize before evaluating the effect on the ion beam produced.

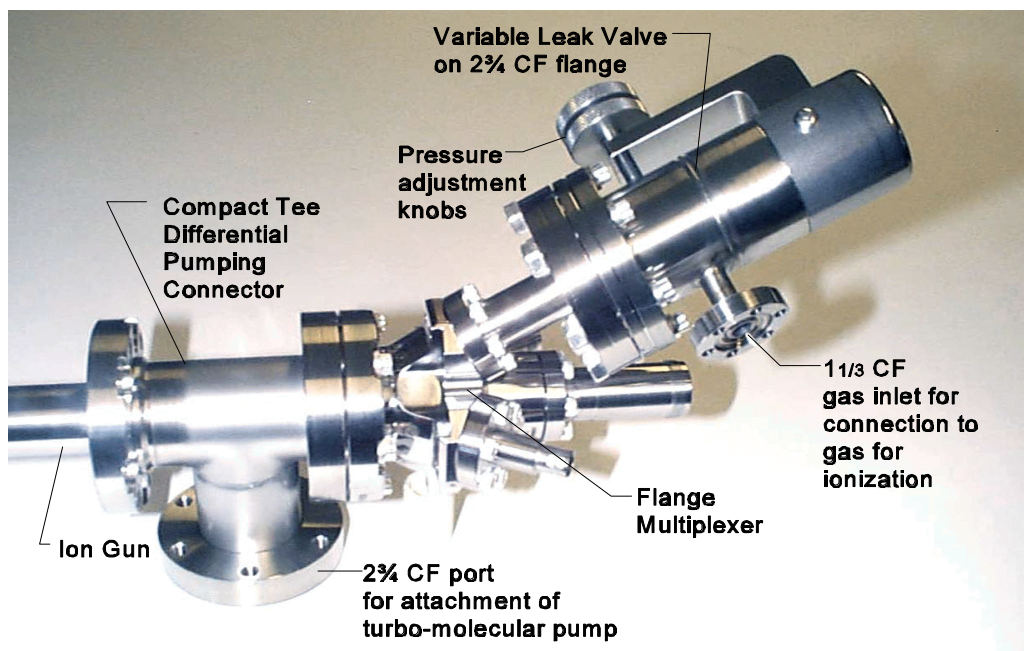


Figure 4.7.1 Ion Gun with Compact Tee Differential Pumping Port and optional factory-installed Variable Leak Valve

## 4.7 COMPACT TEE DIFFERENTIAL PUMPING and VARIABLE LEAK VALVE OPTIONS cont.

### VARIABLE LEAK VALVE OPTION

**See the attached manual on the Varian Variable Leak Valve in the Appendix for detailed information about installation, operation, adjustment, maintenance, and bakeout of the valve.**

Instead of the standard, simple gas inlet valve on the Flange Multiplexer, the Ion Gun may have an optional Variable Leak Valve to better control the introduction of gas into the Ion Gun. If the gun was purchased with a standard gas inlet, a Variable Leak Valve can be substituted if the gun is returned to the factory for rebuild to change the internal gun tubing. As discussed above, the control of gas pressure directly affects the performance of the ion source.

As shown in Fig 4.7.1 above, the Variable Leak Valve is mounted on the Flange Multiplexer on a 2 $\frac{3}{4}$  CF flange with a copper gasket, and gas from a tank or other source is introduced at the 1 $\frac{1}{2}$  CF flange gas inlet on the side of the leak valve. A mini conflat (1 $\frac{1}{2}$  CF) flange with a Swagelok adaptor for connection to user-supplied gas tubing (such as 0.125" O.D. 0.085" I.D. stainless steel tubing) is mounted to the gas inlet.

The flow rate of the gas into the chamber is controlled by gently turning the double knobs on the other side of the leak valve together: counterclockwise to open, and clockwise to shut the valve. An initial stop position is pre-set, but a different stop position can be set as described in the attached manual. **Careful operation of the leak valve is necessary, as the sapphire in the seal mechanism in the leak valve is fragile.**