

4.8 DIFFERENTIAL PUMPING AND VARIABLE LEAK VALVE

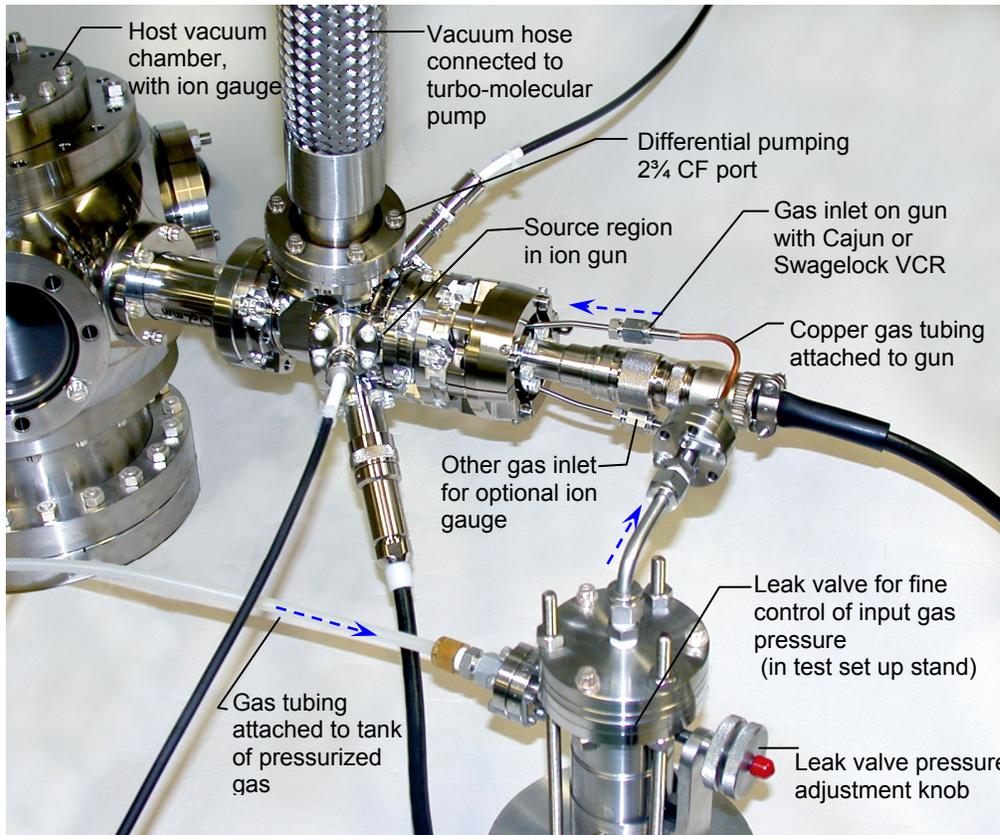


Fig. 4.8-1 A typical Ion Gun with Differential Pumping Port and optional Variable Leak Valve in a test setup

DIFFERENTIAL PUMPING

The Differential Pumping connector on the ion gun allows the attachment of a separate turbo-molecular pump to better control the gas pressure in the ionization region of the gun. The sealing plates around the extract tube provide a separation between the ionization region of the Ion Gun and optics region which is open to the host vacuum system. Thus a different pressure can be maintained in the two regions. For example, the ion source chamber in the gun can be at 10^{-5} torr, while the host vacuum system is at 10^{-7} torr.

There are three general ways in which the ion gun may be set-up for pumping.

1) The 2 $\frac{3}{4}$ inch CF differential pumping port on the Flange Multiplexer of the ion gun can be connected to a separate, user-supplied turbo-molecular pump either directly or via flexible vacuum hose. With the sealing plates in place in the gun, the two pressures can be carefully maintained. Gas admitted at the inlet valve can be differentially pumped out via the connector. The gas pressure in the ionization region can be controlled, and gas admitted to the gun should not affect the main vacuum system. Also, the pressure in the ion source region may be monitored at the differential pumping port or at the unused gas inlet valve. This method provides true differential pumping.

2) The differential pumping port can be connected to the main vacuum chamber via flexible tubing. The sealing plates will provide separation between the ionization region and the host vacuum chamber, so the two pressures will be different. However, the relative pressures will vary considerably depending on the user's particular vacuum pump and system set up.

3) If, and only if, the sealing plates around the extract are removed, the 2 $\frac{3}{4}$ CF port can be blanked off. In this case the interior of the gun will be connected to the general vacuum system. The pressures will vary as the gas is admitted at the gas inlet on the gun. **CAUTION: If the port is blanked off, the sealing plates inside the gun must be removed, or there may be discharging in the ion source region.**

SEE MAINTENANCE SECTION 6.5 TO REMOVE SEALING PLATES, IF NOT USING DIFFERENTIAL PUMPING PORT

4.8 DIFFERENTIAL PUMPING cont.

PRESSURE CONSIDERATIONS

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 low, an adequate ion beam current will not be produced. There is an optimum pressure which will provide maximum ion beam current; either lower or higher pressures will give poorer performance.

In adjusting gas pressure, it is important to wait for the pressure to stabilize before evaluating the effect on the beam produced.

If the gas pressure is too high, the ion beam current can become unstable. At high pressures, excess gas may cause discharging in the ion source region.

VARIABLE LEAK VALVE OPTION

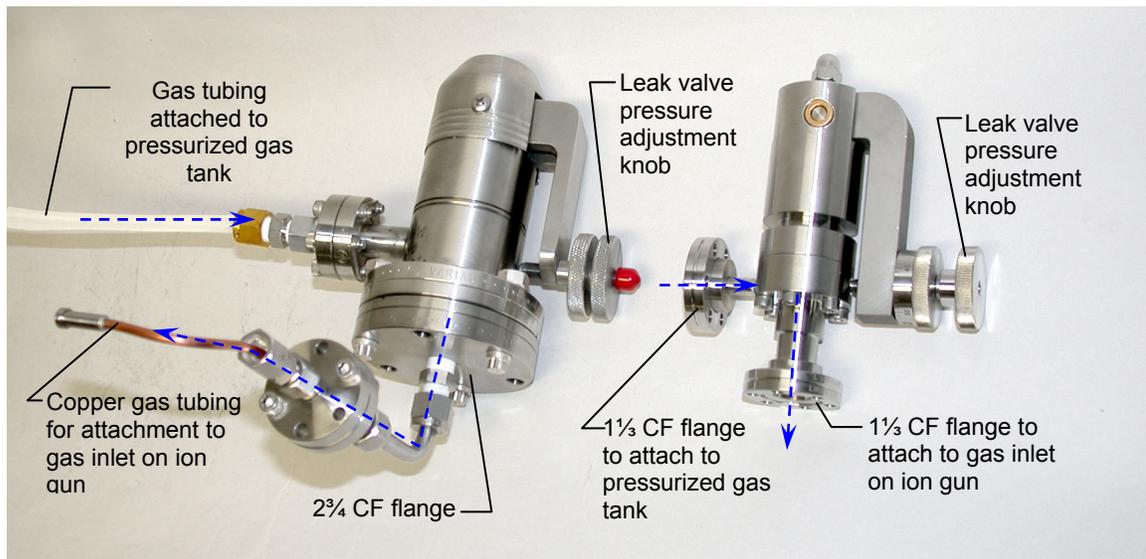


Fig. 4.8-2 Optional Leak Valves, uninstalled, (two typical models, one showing connections)

	CAUTION
	The optional Variable Leak Valve is fragile. See attached valve manual for detailed information and precautions.

See the Variable Leak Valve manual for detailed information about installation, operation, adjustment, maintenance, and bakeout of the valve. If the valve is purchased with the ion gun, the separate leak valve manual is usually included as an Appendix in the gun manual.

As discussed above, the control of gas pressure directly affects the performance of the ion source. An optional Variable Leak Valve is generally used to carefully regulate the introduction of gas into the ionization chamber of the ion gun.

Gas from a pressurized tank or other source is introduced at the gas inlet (1 1/2 CF flange) on one side of the leak valve. The output from the leak valve (1 1/2 CF or 2 3/4 CF flange) is connected to the gas inlet of the gun with user-supplied gas tubing (such as 0.125" O.D. 0.085" I.D. stainless steel tubing). The gas inlet may have either a Swagelok or Cajun VCR adaptor. Depending on the user's leak valve and setup some sort of connector adaptor may be needed.

The flow rate of the gas into the gun 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, of the leak valve is fragile. Some models include sapphire in the seal mechanism.**