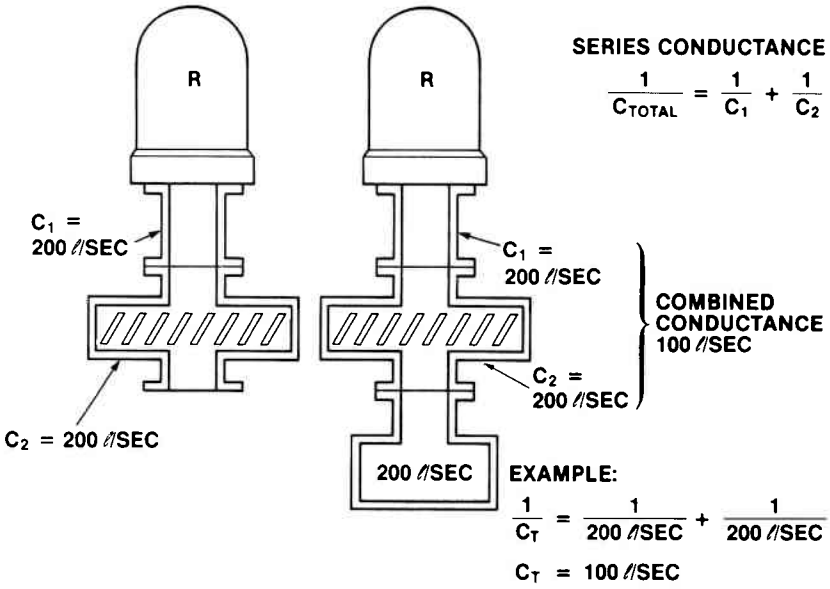
Series Conductance

When you place components in series in a vacuum system, the total conductance is less than the smallest of the conductances in series.



Let's look at the result (point "R" at the vacuum chamber) of adding a pump (shown in the drawing) with a speed (S) of 200 ℓ/sec to the combined 100 ℓ/sec series conductance.

The pump can be represented by another conductance of 200 ℓ/sec in the line. In this case, we call the total conductance, R, the combined pipe conductance, C, and the conductance of the pump, S. So:

$$\frac{1}{R} = \frac{1}{C} + \frac{1}{S}$$

If we play with this a bit, we get:

$$R = \frac{CS}{C + S}$$

Thus:

$$R = \frac{\frac{100\ \ell}{sec} \times \frac{200\ \ell}{sec}}{(100 + 200)\ \ell/sec}$$

$$= 66.6\ \ell/sec$$

Thus our 200 ℓ/sec pump is effectively delivering only one-third of its speed to pump the work chamber.