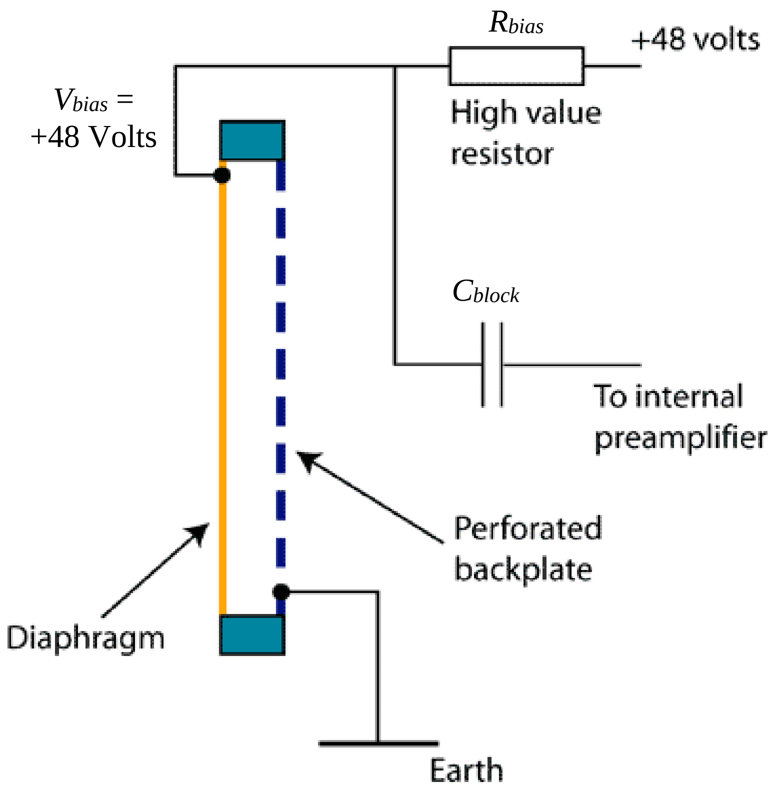
Because the {large} ambient pressure P_{amb} varies from day-to-day with the weather, it is necessary to have a small hole in the body of the sealed microphone element in order to allow equalization of the static pressures on either side of the diaphragm in order to avoid damaging it. The existence of the small pressure-equalization hole/port in the microphone body only affects extremely low frequency response $f \ll 20\ Hz$, well below the audio band of human hearing.

Condenser microphones also have a (very low mass) diaphragm – which has an extremely thin layer of conductor deposited on its surface. The diaphragm is in proximity to a planar electrode, thus forming the plates of a parallel-plate capacitor, as shown in the figure below.



A constant/*DC* voltage V_{bias} is placed across the plates of this capacitor {no *DC* current flows across the air-gap between the plates of this capacitor}. When an over-pressure $\tilde{p}(\vec{r},t)$ is present at the {metalized} diaphragm of the condenser mic, then for $a_{dia} \ll \lambda$, it exerts a {net} force $\vec{\tilde{F}}(t) \simeq -\tilde{p}_o \vec{A}_{dia} e^{i\omega t}\ (N)$ on the diaphragm, accelerating it, thereby causing it to vibrate in response to the over-pressure exerted on it. The {very} small gap d_{gap} between the diaphragm and electrode thus varies in time $d_{gap}(t) \equiv d_{gap} + x_{dia}(t)$, where $x_{dia}(t) \ll d_{gap}$ is the displacement of the diaphragm, and since the capacitance of this parallel plate capacitor is $C(t) = \varepsilon_o A_{dia} / d_{gap}(t) = \varepsilon_o A_{dia} / \left[d_{gap} + x_{dia}(t) \right] \simeq \varepsilon_o A_{dia} \left[1 - \left(x_{dia}(t)/d_{gap} \right) \right] / d_{gap}$ for $x_{dia}(t) \ll d_{gap}$, the capacitance also varies in time, which in turn causes the charge present on the planar electrode to vary in time, since $Q(t) = C(t) \cdot V_{bias}$.