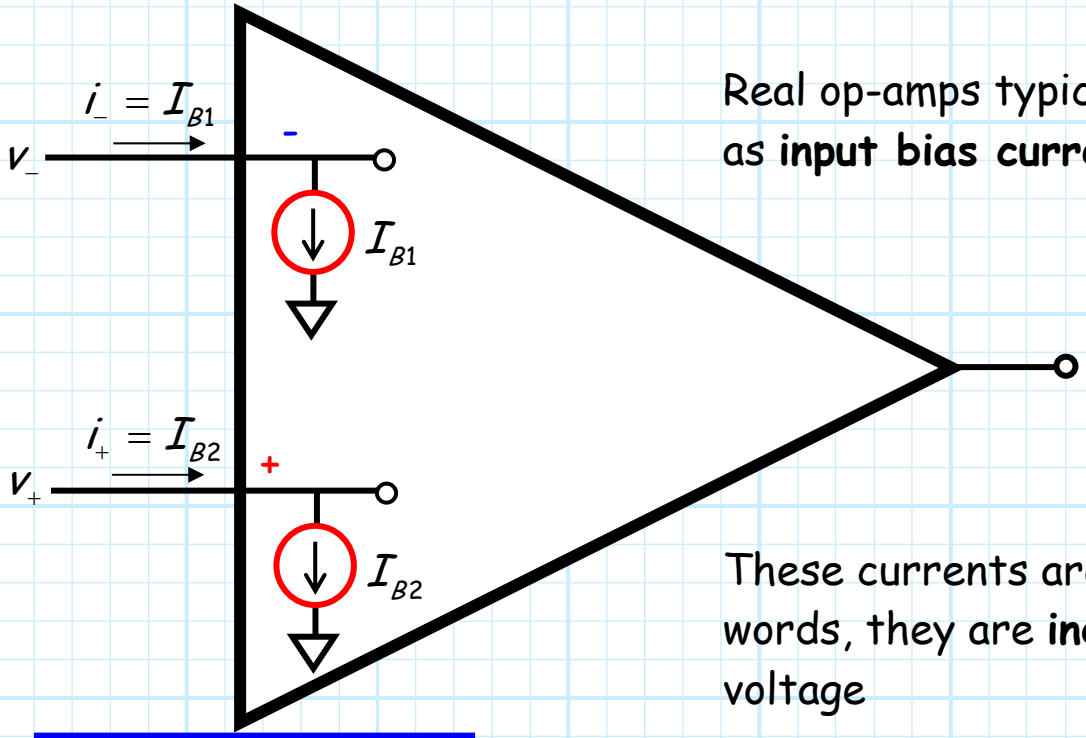
The Input Bias Current



Input Bias Current Op-Amp Model

Real op-amps typically exhibit a phenomenon known as **input bias current**.

We find that there is a **small** amount of current flowing into each of the op-amp inputs (i.e., $i_+ \neq 0$, and $i_+ \neq 0$)!

These currents are **constant** currents—in other words, they are **independent** of the input terminal voltage

Real op-amps act like there are small **current sources** at the inputs!!!!!!!

The input offset current

The values of bias currents I_{B1} and I_{B2} are **approximately**—but **not exactly**—equal.

As a result, we typically express these currents in terms of their common-mode (i.e., average) and differential modes.

The common mode is called the Input **Bias** Current:

$$I_B = \frac{I_{B1} + I_{B2}}{2} \doteq \text{Input } \textbf{Bias} \text{ Current}$$

The differential mode is called the Input **Offset** Current:

$$I_{os} = \left| I_{B1} - I_{B2} \right| \doteq \text{Input } \textbf{Offset} \text{ Current}$$

They seem so small, yet…

Thus, the two bias currents can be expressed as:

$$I_{B1} = I_B \pm \frac{I_{os}}{2} \qquad I_{B2} = I_B \mp \frac{I_{os}}{2}$$

Typical values of these parameters are, for example, I_B= 100nA and I_{os} =10nA.

Q: *These bias current values are so **tiny**, we do we even care about them????*

A: Because they can cause **offset voltages** in op-amp circuits!