**Diode Limiters**

Often, a voltage source (either DC or AC) is used to supply an electronic device that is very **expensive** and/or very **sensitive**.

In this case, we may choose insert a **diode limiter** between the source and the device—this limiter will provide **over-voltage protection**!

To see how, we should first consider a typical **transfer function** for a junction diode limiter:

![Diagram of a junction diode limiter](image)
Note that this transfer function indicates that the output voltage $v_O$ can never be more than a maximum voltage $L_+$, nor less than a minimum voltage $L_-$.  

Thus, the device places some limits on the value of the output voltage:  

$$L_- < v_O < L_+$$  

for any $v_I$.

The limits $L_-$ and $L_+$ provide a safe operating value for $v_O$, the voltage across our “sensitive” electronic device. 

Presumably, if no limiter were present, we might find that $v_O > L_+$ or $v_O < L_-$, resulting in damage to the device!

Note although $L_+ > L_-$, the values of $L_-$ and $L_+$ may be both positive, both negative, or even zero.

For example, a limiter with $L_- = 0$ ($L_+ = 0$) would prevent the voltage from ever becoming negative (positive). We find that for many devices, the wrong voltage polarity can be destructive!

To illustrate, let’s consider an example input voltage $v_I(t)$, and the resulting output voltage when passed through a limiter with values $L_- = 0$ and $L_+ = 20 \text{ V}$ ($K=1$).
Note there are a couple of “hiccups” in the input voltage that take the voltage value outside the “safety” range of the sensitive device. However, the limiter does in fact limit these excursions, such that the voltage across the sensitive device always remains between 0 and 20 Volts.

Q: Why would these “hiccups” occur?

A: There are many possible reasons, including:

1. A power surge (e.g., lightning strike)
2. Static discharge
3. Switching transients (e.g., at power up or down).
Perhaps the most **prevalent** reason, however, is **operator error**.

Someone connects the **wrong** source to the sensitive device!

Thus, limiters are often used on expensive/sensitive devices to make them **“fool-proof”**.

Your book has many **examples** of limiter circuits, including: