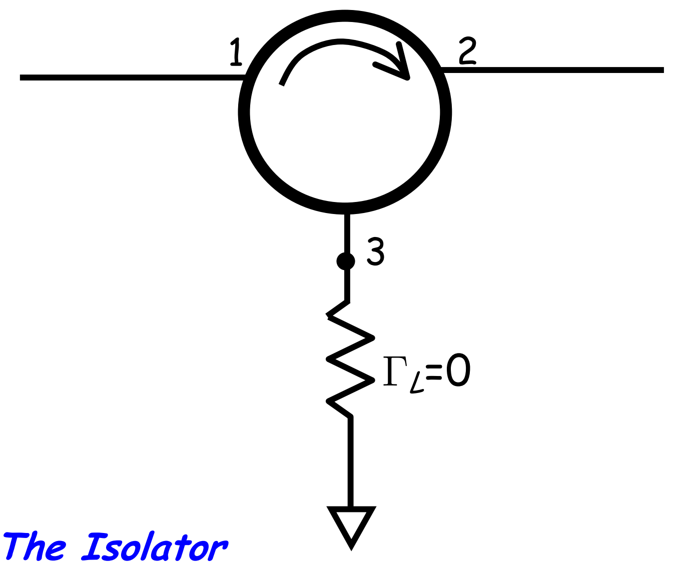
Isolators

An **isolator** is simply a **circulator**, with port 3 terminated in a **matched** load!



The Isolator

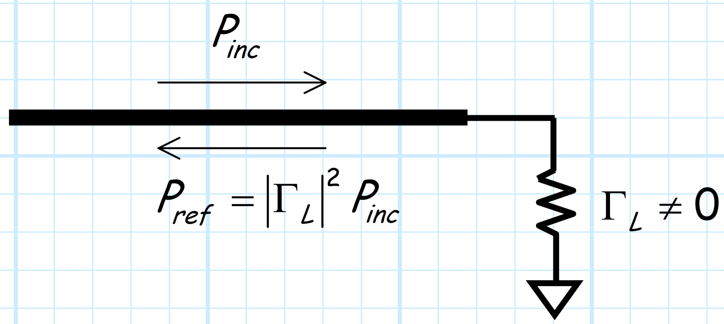
The matched load at port 3 insures that $P_3^+ = 0$ **always**. As a result we know that $P_1^- = P_3^+ = 0$ --**always**!

An ideal isolator is thus a **two-port** device with an **odd** looking scattering matrix:

$$\bar{\bar{\mathbf{S}}} = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$$

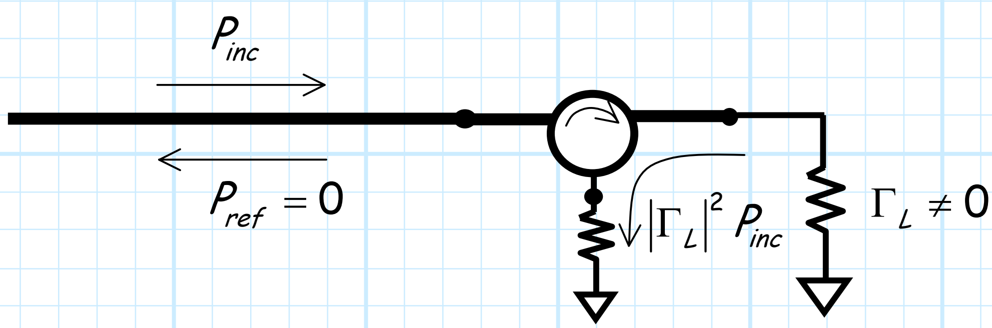
Therefore, $P_2^- = P_1^+$, but $P_1^- = 0$ regardless of P_2^+--an ideal isolator **is** matched, but is also non-reciprocal and **lossy**!

An isolator is useful for **isolating** a load from a source. For example, consider an **unmatched** load at the end of a transmission line:



Plenty of power is reflected back toward the source!

Now, let's **insert** an isolator between the source and load:



There is **no power** reflected back to the source! Instead, power reflected by the load is **absorbed** by the isolator.

To the source, the circuit appears **matched**—but its **not**!

If the isolator was truly a matching network, then the **absence** of reflected power would indicate that **all** the incident power was absorbed by the **load**. Instead, there is no reflected power because this power is instead absorbed by the **isolator**—the isolator is **lossy**!