

# Symmetric Power Splitter/Combiner

## Low-cost power splitter/combiner for differential signals

### 1. Introduction

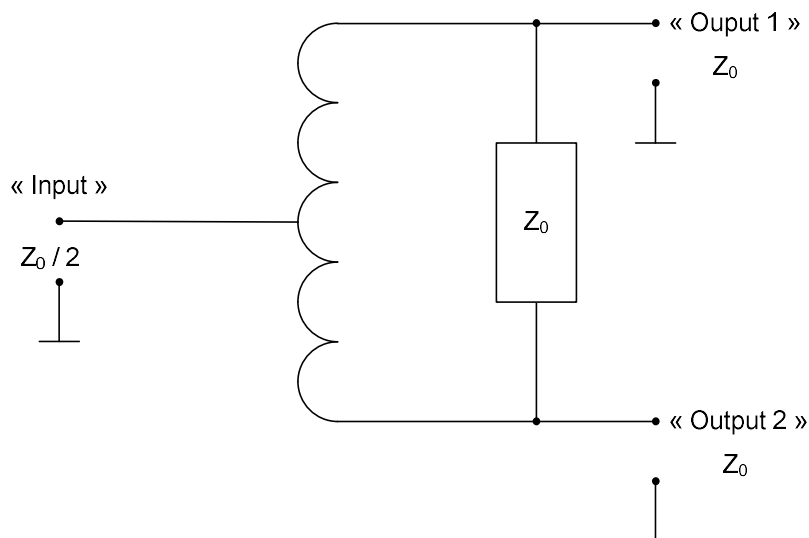
In high-speed and/or long range analog systems, differential pairs are used to convey signals. They allow common-mode and even-order nonlinearities rejection.

In RF domain, asymmetric power splitter/combiner are widely used for asymmetric (or ground-referenced) signals conveyed with cables or PCB traces of defined characteristic impedance  $Z_0$  (50, 75,... ohms).

If asymmetric power splitter/combiner can be easily found, the offer of symmetric ones is more than reduced. The goal here is to make such a symmetric power splitter/combiner for HF..VHF with standard low-cost off-the-shelf components.

### 2. Asymmetric power splitter

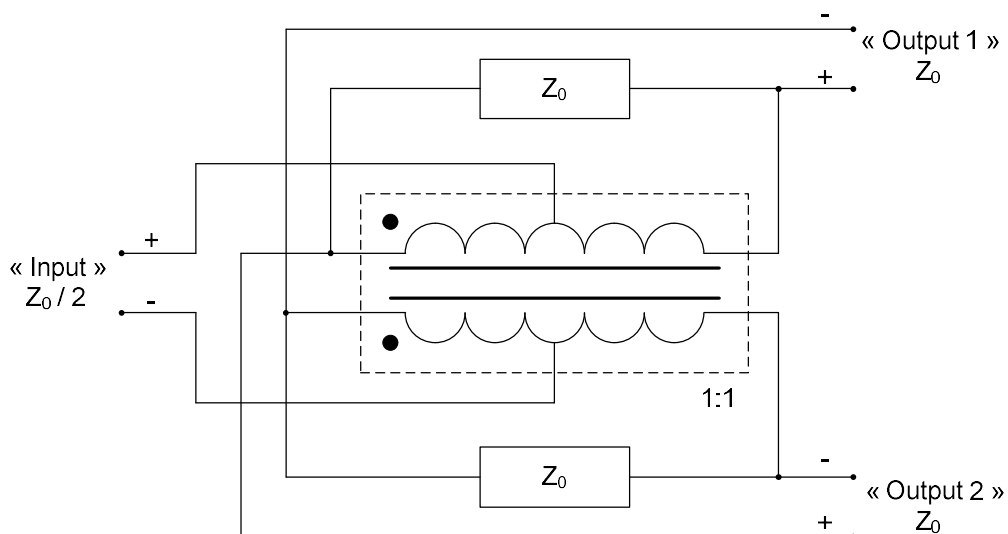
A basic power splitter at not too high RF frequencies (max some 100 MHz) can be made with a symmetric autotransformer :



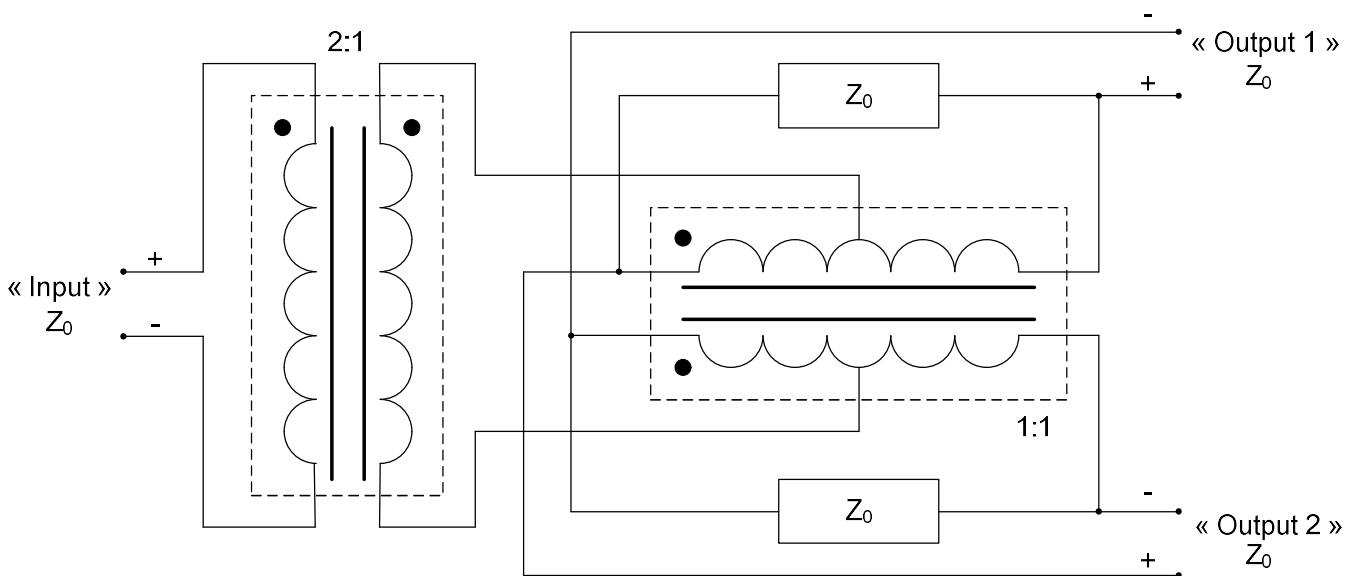
If required, an additional 1:2 ratio impedance transformer is added on input to get a  $Z_0$  impedance on each port.

## 2. Symmetric power splitter

A symmetric power splitter can be derived from this scheme by using a low-cost 1:1 transformer with mid-tap on each side (for example popular Mini-Circuits ADTT1-1, working from 0.3 to 300 MHz) :



Again, an additional 1:2 ratio impedance transformer (for ex. Mini-Circuits ADT2-1T) can be added on input to get a  $Z_0$  differential impedance on each port :



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