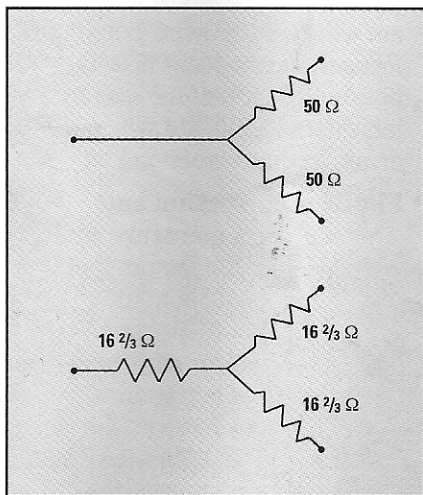


# Choosing and using resistive RF power splitters

When you're using RF power splitters, it's important to remember that two-resistor and three-resistor splitters have different applications – and they are not interchangeable. The two-resistor splitter is used to improve the effective output power match of RF sources, either through a leveling loop or a ratio measurement. The three-resistor power splitter equally divides power from a coax line. Both power splitter types present a 50 Ω impedance to the source when both arms of the splitters



**Figure 1:** Two- and three-resistor RF power splitters ( $Z_0 = 50 \Omega$ ).

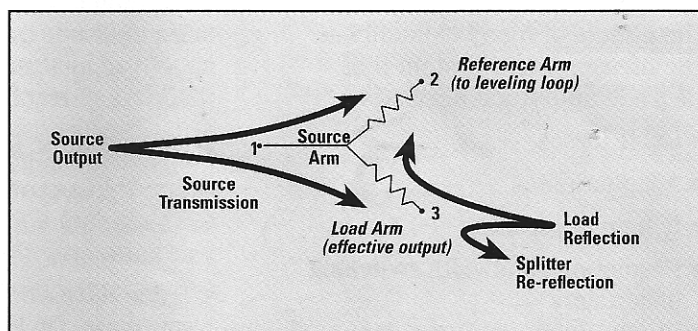
are loaded with their characteristic impedance (shown in **Figure 1** as 50 Ω). The differences between the splitters occur when you change the source power, vary source and load impedances (or reflection coefficient), or both.

## Use two-resistor splitters for RF source matching

You can optimise RF source match by keeping the effective source output power constant through a two-resistor power splitter and a leveling loop or ratio meter. In this application, port 3 of the power splitter becomes the effective source output. The resistive symmetry of the two-resistor splitter divides the source power equally between the input port 1 and reference arms. Both arms experience the same

variation in input power, so the leveling loop correctly compensates for any changes in the source output power.

When the load at the effective output port 3 is not perfectly matched (**Figure 2**), a portion of the source power reflects back into the power splitter. The power re-reflected by the two-resistor



**Figure 2:** Effects of source and load variations in leveling applications.

power splitter equals the power transmitted to the reference arm. Thus any change in output power caused by the load reflection is equally seen in the reference arm, allowing the leveling loop to correctly compensate for these

***"Splitters and other accessories can mean the difference between a good measurement and a bad one; talk to the HP DIRECT engineers to make sure you have everything you need."***



variations — which is why the two-resistor splitter is the right choice for this application.

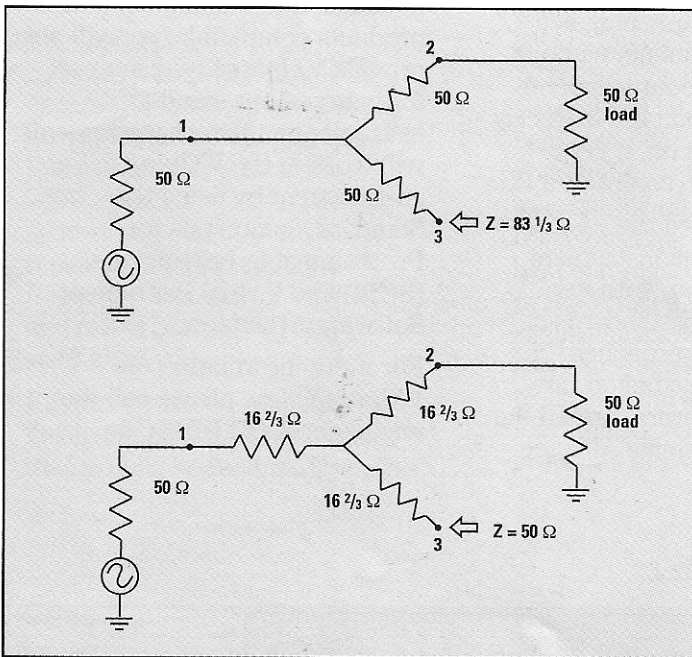
**Use three-resistor splitters for power division applications**

*Figure 3* compares the performance of two- and three-resistor splitters in a power division measurement. When

ports 1 and 2 are loaded with a 50 Ω characteristic impedance, the two-resistor splitter presents an 83⅓ Ω impedance to port 3 load — a poor output power match. In contrast, the three-resistor power splitter presents a 50 Ω impedance to port 3 load, dividing the power equally and providing a good impedance

match at each of the input and output arms.

HP offers several power splitters of both types, covering a broad frequency range. One of the engineers at HP DIRECT can help you select one that's right for your application.



*Figure 3: Compare two- and three-resistor splitters in this power-division application. The three-resistor splitter is clearly the right choice.*