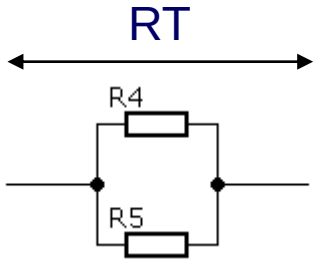
Resistors in Parallel - Graphical Calculations

(and Capacitors in Series)

by

Jim Butler GM3ZMA

Two Resistors in Parallel - Mathematically



$$RT = \frac{R4 \times R5}{R4 + R5}$$

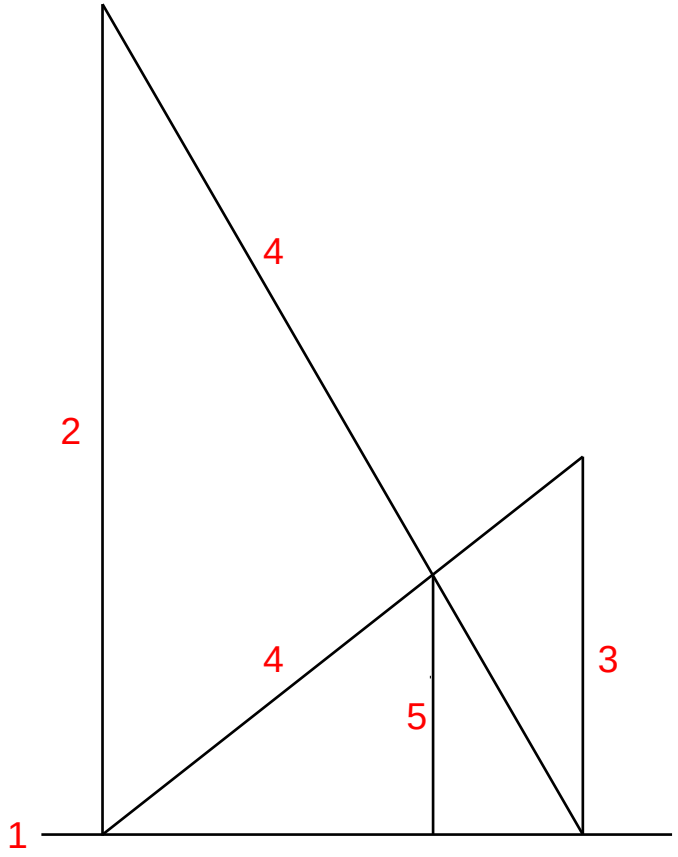
Let
R4 = 11 Ohm
R5 = 5 Ohm

Total Resistance = $\frac{11 \times 5}{11+5} = \frac{55}{16} = 3.44\ Ohm$

This also applies to capacitors in series.

Or, we could do it graphically…

Two Resistors in Parallel - Graphically



1 Draw a baseline

2 Draw a line 11 units* long perpendicular to the base line.

3 Draw a line 5 units* long, perpendicular to the base line.

4 Draw two diagonal lines from the top of each line to the bottom of the other line.

5 Draw a line from where the two diagonal lines cross to the base line. This line should be perpendicular to the base line.
The length of this line represents the combined value of the two resistors in parallel.

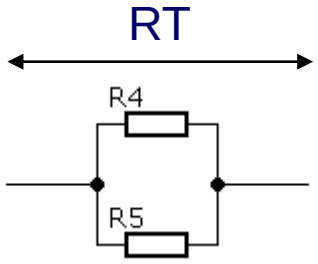
The drawing facilities of MS PowerPoint say it is 3.41 units* long.

*Units. Use inches, centimetres, whatever fits your measuring device and “canvas”.

The Units can represent Ohms, kilo-Ohms, Meg-Ohms or whatever, but must be the same for each line.

This also applies to capacitors in series.

Tips and Tricks - 1



When R4 = R5,

$$RT = \frac{R4}{2}$$

More than two resistors?
For N resistors of value R in parallel,

$$RT = \frac{R}{N}$$

This also applies to capacitors in series.

Example
Designs for simple RF Dummy Loads often use 20off 1kOhm resistors in parallel, giving:

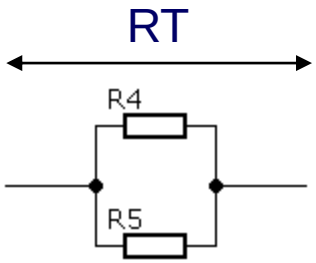
$$RT = \frac{R}{N} = \frac{1000}{50} = 50\ Ohm$$

We do not build RF Dummy Loads using Capacitors.

The commonly used value for an RF dummy load.

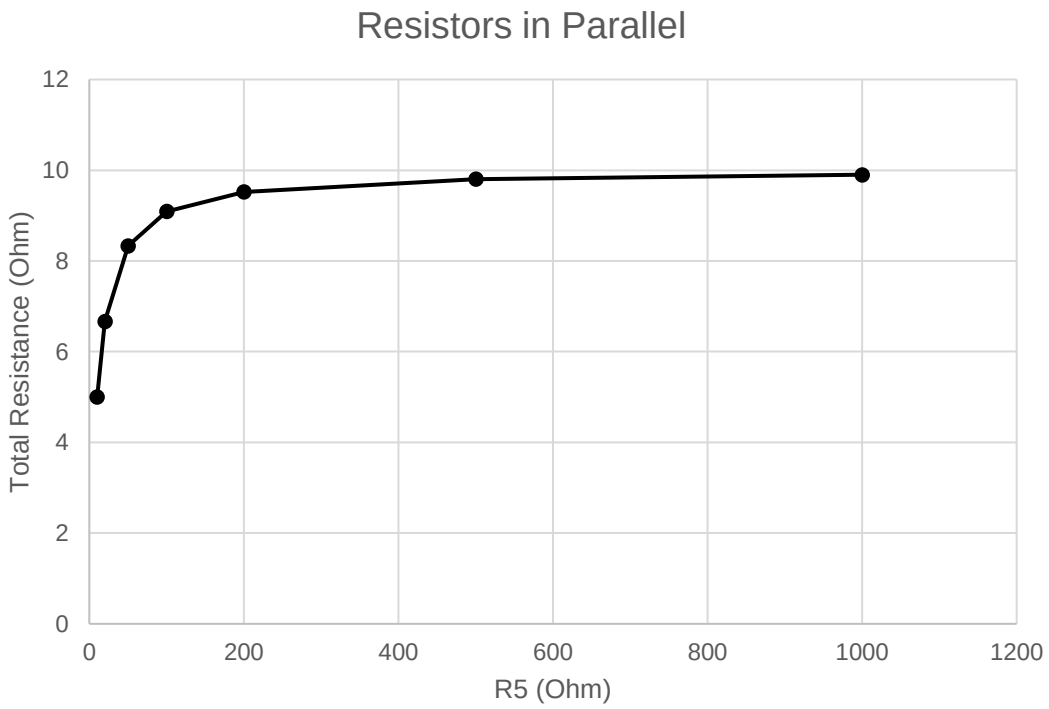
Tips and Tricks - 2

When a large value resistor is connected in parallel with a much smaller value resistor the change in overall resistance is quite small.



Let
R4 = 10 Ohm
R5 = ?? Ohm

R4 =	10	10	10	10	10	10	10	Ohm
R5 =	10.0	20.0	50.0	100.0	200.0	500.0	1000.0	Ohm
RT =	5.0000	6.6667	8.3333	9.0909	9.5238	9.8039	9.9010	Ohm



This also applies to capacitors in series.

Tips and Tricks - 3

When connecting resistors in parallel, the resulting total value will always be smaller than the lowest value of the individual resistors.

This also applies to capacitors in series.

The End