

Unit 11 - Reading 5 Overall resistance of series and parallel combinations

The increased difficulty we experience when we breathe through a longer tube is typical of the effect that a greater length of wire will have where charge is trying to flow. This leads to the idea that “longer is harder”. Adding more resistors in series creates the same effect as making a longer single resistance, which provides more overall resistance. In contrast, adding more resistors **in parallel** creates the same effect as a wider or thicker single resistance, which provides less total resistance. We could also say that there is more total conductance. Here is a useful way to think about the distinction between series and parallel:

- In a **series** circuit all of the moving charge passes through every resistor.
Each charge is resisted every time it passes through a resistor.
- In a **parallel** circuit the moving charge is split into parts.
Each charge will pass through only one resistor, so its motion will be resisted only once.

A summary of the last four activities indicates that multiple resistors affect charge flow and air flow in a similar manner, as follows:

More in series → acts like single longer resistor → makes flow harder
More in parallel → acts like single wider resistor → makes flow easier