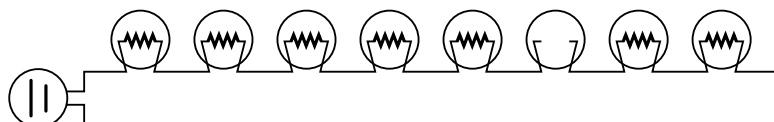


## Series circuits require all elements to conduct

What happens to a series circuit when a single bulb burns out? Consider what a circuit diagram for a string of lights with one broken filament would look like. As the schematic diagram in **Figure 11** shows, the broken filament means that there is a gap in the conducting pathway used to make up the circuit. Because the circuit is no longer closed, there is no current in it and all of the bulbs go dark.



**Figure 11**

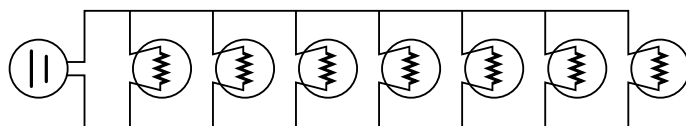
A burned-out filament in a bulb has the same effect as an open switch. Because this series circuit is no longer complete, there is no current in the circuit.

Why, then, would anyone arrange resistors in series? Resistors can be placed in series with a device in order to regulate the current in that device. In the case of decorative lights, adding an additional bulb will decrease the current in each bulb. Thus, the filament of each bulb need not withstand such a high current. Another advantage to placing resistors in series is that several lesser resistances can be used to add up to a single greater resistance that is unavailable. Finally, in some cases, it is important to have a circuit that will have no current if any one of its component parts fails. This technique is used in a variety of contexts, including some burglar alarm systems.

## RESISTORS IN PARALLEL

As discussed above, when a single bulb in a series light set burns out, the entire string of lights goes dark because the circuit is no longer closed. What would happen if there were alternative pathways for the movement of charge, as shown in **Figure 12**?

A wiring arrangement that provides alternative pathways for the movement of a charge is a **parallel** arrangement. The bulbs of the decorative light set shown in the schematic diagram in **Figure 12** are arranged in parallel with each other.



**Figure 12**

These decorative lights are wired in parallel. Notice that in a parallel arrangement there is more than one path for current.



### parallel

*describes two or more components of a circuit that provide separate conducting paths for current because the components are connected across common points or junctions*