

Circuit with two batteries

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In the circuit shown here the conventional current direction is from V2 to V1 and is equal to 3 Amp. I understand the theory. But, if I make this circuit with two batteries, according to the schematic the current (positive charge) leaves a positive side of one battery and goes through the positive side of the second battery.

So my question is, if I actually make this circuit with two batteries, does it mean that a battery (V1 here) accepts current to its positive side and send current from its negative side? How is that possible? How would the current circulates?

You can think of this as the source V2 charging the battery represented by V1. It is absorbing energy, and V2 is providing it. The current circulates just as you said, into the + terminal of V1 and out the - terminal.

If you do an energy balance sheet, the resistor will dissipate $I^2 \cdot R = 90W$ but V2 is providing $3A \cdot 150V = 450W$. The remainder (360W) is going into the V1 source. If V1 is a rechargeable battery it may be able to absorb that for a while, but at some point it will become fully charged and the battery will get very hot and may be damaged from overcharging.

Current direction would be from right to left because sources are connected in series opposing configuration, both the current will flow in the circuit in opposite direction and produce net effect to right because of larger magnitude of right source, and infact, current would flow from 120V source, completing the path for flow but that current is not produced by 120V source.

By the conventional direction, current points from + to -. But what happens when there are more than one batteries on the circuit, with the battery poles connected to each other with any combination?

It's completely arbitrary. Just choose a direction you want. After using Kirchhoff's voltage law and Kirchhoff's current law, if current becomes negative, that'd mean direction of current is opposite, else your primary choice is correct.

However, if you don't know Kirchhoff laws, you can assume that the direction of current will be determined by the most powerful source. Of course, it's not always the case, but in simple circuits (like the one with two batteries), it surely is. If you had several sources, more than 3, you should consider all batteries with same poles together, until you get two sources with opposite poles, and again you can use the same logic for circuit. But I will suggest learning Kirchhoff laws. They are very simple, and at the same time powerful.

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