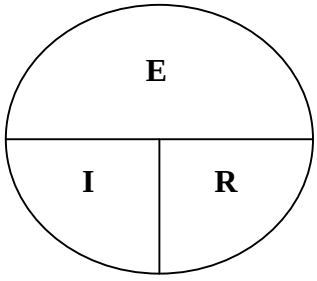
Electronic Fundamentals Part II

In the last session we briefly discussed conductors, insulators and semiconductors. We discussed the flow of electrons from a negative source to a positive location and that like charges repel and that opposite charges attract. The flow or amount of electrons moving is called amperes or just amps, the pressure pushing electrons is measured in volts and that all materials has more or less resistance to the flow of current and that resistance to current flow is measured in ohms.

There is a mathematical relationship between amps, volts and ohms. As you might imagine when resistance is increased or decreased one or both of the other value changes. And likewise when we change the voltage or amperes the other changes. In simple circuits it is accepted that resistance normally does not change as it is determined by the physical properties of the conductor. In a given direct current ccircuit the resistance values are fixed by the physical properties of the components.

In electronics, current is abbreviated with the letter "I". Voltage is represented by the letter "E" and ohms is, that is resistance, is represented by the letter "R".

Lets draw a simple diagram to illustrate the relationship between current, voltage and resistance. Make the circle one to two inches in diameter. In that circle draw a horizontal line thru the middle. Next draw a line vertically from the line you just drew to the bottom of the circle.



Next Place the letters E in the top half of the circle and the letter I in the lower left quarter and the letter R in the lower right of the circle.

This diagram shows us several things. First that I = E/R, E = I x R and that R = E/I.

If one volt is applied to one a ohm resistance we can easily see that current will be one amp. Remember resistance does not change in a direct current, that is dc, circuit when voltage or current changes. If we double the voltage to two volts then the current is also doubled. Lets say that we physically change the resistance that "R" represents from one ohm to 2 ohms. What happens? The voltage does not change as the battery or other voltage source has not been changed. But, the current does change. Does it decrease or increase. Look at the formulas we just talked about. When resistance increased the current decreases by the same ratio. Thus the current decreases to one half amp.

Suppose we have a circuit with 5 ohms and we measured the current and found 100 amps. What would the voltage be in the circuit? What formula would you use? We are looking for voltage so we would use the formula of E = I x R. Putting our values in the formula we would have E = 100 x 5. With simple multiplication with find that E = 500 volts.

Suppose we were wanting the value of current and the circuit measured 200 volts and the resistance was 10,000 ohms. What formula would we use. Yes, we would use I = E/R. Substituting values in the formula we find that I = 200 / 10,000. The result is I = 2/100 or 2 milliamps.

What formula would we use if we knew the value of E and I and needed to know the amount of resistance in a circuit. We would use R = E / I. That is we would divide the voltage by the current to find the resistance. Suppose that voltage is 600 volts and the current was one milliamp. Our formula would read R = 600 / .001. The resulting resistance in ohms would be 600,000 ohms or 600 kiloohms or 0.6 megohms.

You are encouraged to take the time to make your own examples as we have done above. Work each to conclusion including using the correct terms for each value you find.

Remember when voltage increases current also increase by the same proportion without a change in resistance. When voltage decrease so does current. The voltage decreases or increases current follow the

voltage proportionally. When current increases or decreases and resistance is unchanged voltage changes proportionally but in the opposite direction. Current and resistance have an opposite relationship.

That concludes our tech talk today. We've covered a lot of material and again recommend that you take a bit of extra time and down make some of your own examples. It would also help to download this part from the PPRAA website and carefully review it.