2324B, Voltage Reference Points
Fig 21, Voltage Reference Points

[Diagram of an electrical circuit with labels and components: A, B, C, D, E, F, G, Lamp, 8 Ω, 22 Ω, R₁, 6 Ω, 12 Ω, 24 V, 0.5 A]
Voltage is Always Relative

When someone asks you “What is the voltage at point “D” in Fig 21?"

• What do you tell them?
• Do you have enough information to answer their question?
• If so, what is the answer?
• If not, what else do you need to know?
• How many leads does a Volt Meter have?
• How do you measure the voltage at point “D” in Fig 21?
Fig 21, Voltage Reference Points

Diagram showing a circuit with a 24 V voltage source, a lamp, resistors R1 (22 Ω), R2 (6 Ω), and R3 (12 Ω), and a current of 0.5 A flowing through the circuit.
• As you hopefully know, a Volt Meter has two leads.
  • One is Positive
  • The other is Negative
• You did not have enough information to answer the question.
- You need to know what is your reference point.
  - You have six points that you could use as reference points.
  - You could use points “A”, “B”, “C”, “E”, “F” and “G”.

Let us start by stating we are going to measure “D” with reference to Point “A”.
Where do you place your Volt Meter Leads?

- The negative lead (Black Lead) goes to Point “A”.
- The positive lead (Red Lead) goes to Point “D”.
What are we going to measure?

Is the voltage going to be positive or negative?

Do we go clockwise or counterclockwise to determine the voltage?
What are the first steps we need to do?

- Pay attention to the givens
  - This is a Series Circuit
  - The Current is a given
  - The Resistance and Reactance values are givens
Use Ohm’s Law and calculate the voltage drops

- $0.5 \times 8 = 4V$
- $0.5 \times 12 = 6V$
- $0.5 \times 6 = 3V$
- $0.5 \times 22 = 11V$
• Does the sum of your answers equal to the Source voltage?

• $4 + 6 + 3 + 11 = 24V$ so Yes
Remember, when the negative lead of the meter is on a positive point, the voltage measured is a negative voltage.
What does point “D” measure with reference to Point “A”? 

[Diagram of an electric circuit with points A, B, C, D, E, G, F, and a Lamp, with voltages and currents labeled.]
What does point “D” measure with reference to Point “A”?
Go counter-clock wise from Point “D”. 

\[-3 + (-11) + (-4) = -18V\]
• Go clock wise from Point “D”.
• \[6 + (-24) = -18V \text{ or } -24 + 6 = -18V\]
What does point “C” measure with reference to Point “E”?
Go counter clockwise from Point “C”. \(-6 + -3 = -9V\)
What does point “F” measure with reference to Point “E”??
Go counter clockwise from Point “E” = 11V
What does point “A” measure with reference to Point “B”?
• Go clockwise from Point “A” = 24V
• Go CCW from B; 6 + 3 + 11 + 4 = 24V
What does point “B” measure with reference to Point “A”?
Go counter clockwise (ccw) from Point “A” = -24V
Go clockwise (cw) from Point “A” = $-4 + -11 + -3 + -6 = -24\text{V}$ or you can subtract as shown. $-4 - 11 - 3 - 6 = -24\text{V}$
Questions?
The End.

Developed and Produced by the Instructors in the CIE Instruction Department.

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