WORKSHEET 2-1
Series circuits

Worksheet Objectives

With this worksheet you will assemble series circuits. When you have completed this worksheet, you will have demonstrated use of the DMM to measure voltage, current, and resistance in a series circuit.

Tools and Equipment

For this exercise you will need the following:

- Electrical simulator
- Digital multimeter

Complete the related activities outlined in each step which include:

- Assembling the circuit as shown for each worksheet section.
- Use the DMM to take voltage, amperage, and resistance measurements.
- Answer the related questions.

Stop your work when you see the 

sign. You will review your work with the instructor before continuing to the next section.

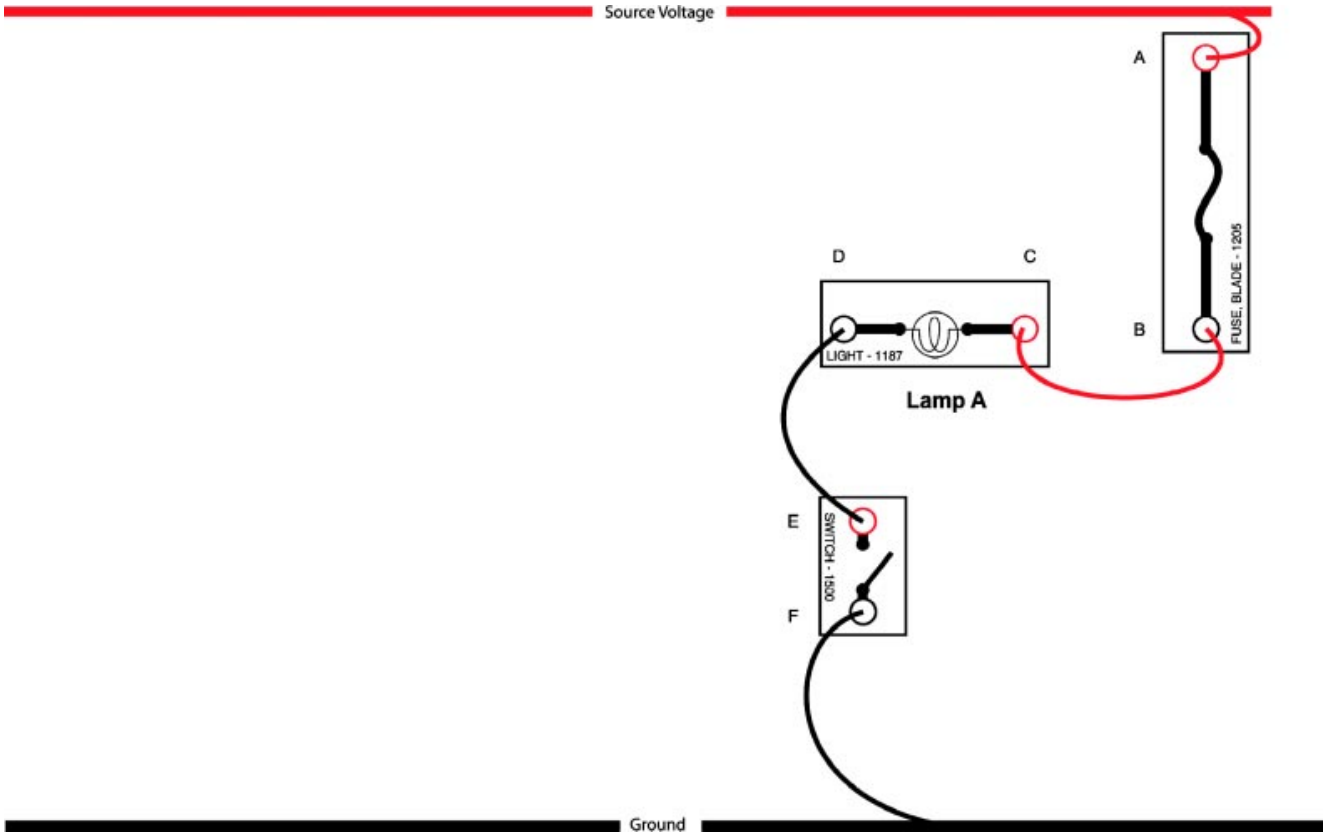


Fig. 2W1-1
TL623f001c-2W1

1. Build the circuit shown above on the electrical simulator.
2. Set up your DMM to measure the voltage in this circuit:
   - Mode selector to DC volts
   - Auto-range on
   - Black lead plugged into COM input jack
   - Red lead plugged into Volt/Ohm/Diode input jack
3. Turn on the electrical simulator power supply and close the switch (lamp should come on).

4. Predict the available voltage at the test points indicated:

   A. _____

   B. _____

   C. _____

   D. _____

   E. _____

   F. _____

5. Measure available voltage using the DMM. Place the black lead on the circuit ground point. Place the red lead at each test point and note the readings in the spaces below.

   A. _____

   B. _____

   C. _____

   D. _____

   E. _____

   F. _____

   Note: Ask your instructor if you are unsure why the actual voltage was different from what you predicted.

Exercise 2: Measuring Voltage drops in series circuits

6. Measure the voltage drop in the circuit as follows: Place the red lead on the most positive side of the circuit component and the black lead on the most negative (ground) side of the circuit component (example: red lead on A, black lead on B). Measure the voltage drops through each of the circuit components:

   A. Source: _____ (Measure from power supply to fuse location A.)

   B. Fuse: _____

   C. Lamp: _____

   D. Switch: _____

   E. Ground: _____ (Measure from switch ground point F to power supply.)

Exercise 3: Measuring Amperage in series circuits

7. Measure circuit amperage as follows:

   - Turn off the power supply.
   - Set the DMM to amperage and move the red lead to the 10 Amp jack.
   - Open the circuit at point A and connect the red lead to the wire and the black lead to the fuse point A.
   - Turn the power supply on.
   - What is the amperage? _____ (Note: You can use the 200mA scale for a more exact reading if the initial reading is less than 200mA. Move the dial and change the red lead to the mA jack.)
   - Measure amperage at test point E. _____ Was the amperage the same?

     YES / NO (circle one)

     If yes, why?

     _____

     _____

Stop here after completing all the related activities and answering the questions. Inform your instructor that you are ready to review this section.

Exercise 4: Series circuits with more than one load

8. Turn off the circuit. Add another 1187 lamp to the circuit as shown. Turn on the circuit.

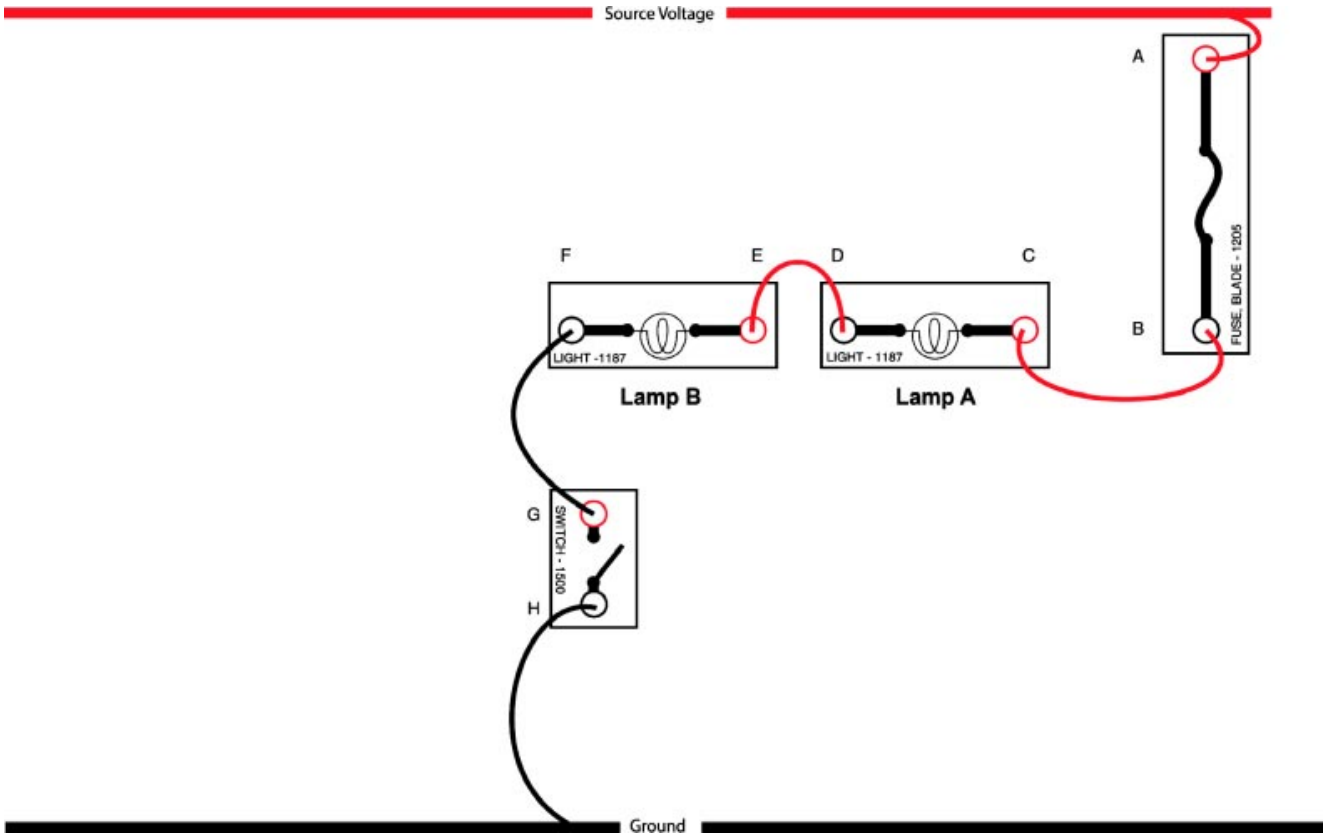


Fig. 2W1-2
TL623f002c-2W1

Did the brightness of the first lamp change? YES / NO (circle one)

If YES, explain why?

9. Predict and measure the available voltage in the circuit at each of the test points: (Caution: Change the red lead back to the Voltage position on the DMM and reset the dial to voltage before testing.)

	Predicted Voltage		**Available Voltage**
A.	_____	A.	_____
B.	_____	B.	_____
C.	_____	C.	_____
D.	_____	D.	_____
E.	_____	E.	_____
F.	_____	F.	_____
G.	_____	G.	_____
H.	_____	H.	_____

Note: Ask your instructor for assistance if you unsure why the actual voltage was different from what you predicted.

10. Measure the voltage drop in the circuit at the following locations.

    A. Source (wire): _____

    B. Fuse: _____

    C. Lamp A: _____

    D. Lamp B: _____

    E. Switch: _____

    F. Ground (wire): _____

11. Measure Amperage in the circuit.

12. Measure the resistance of lamp A _____ , Lamp B _____ .

13. Measure total circuit resistance (Disconnect the ground lead from the power supply): _____

14. Add the resistance of lamp A and B together: _____

    Do they equal total circuit resistance? YES / NO (circle one)

    Why? _____

    _____

Stop here after completing all the related activities and answering the questions. Inform your instructor that you are ready to review this section.

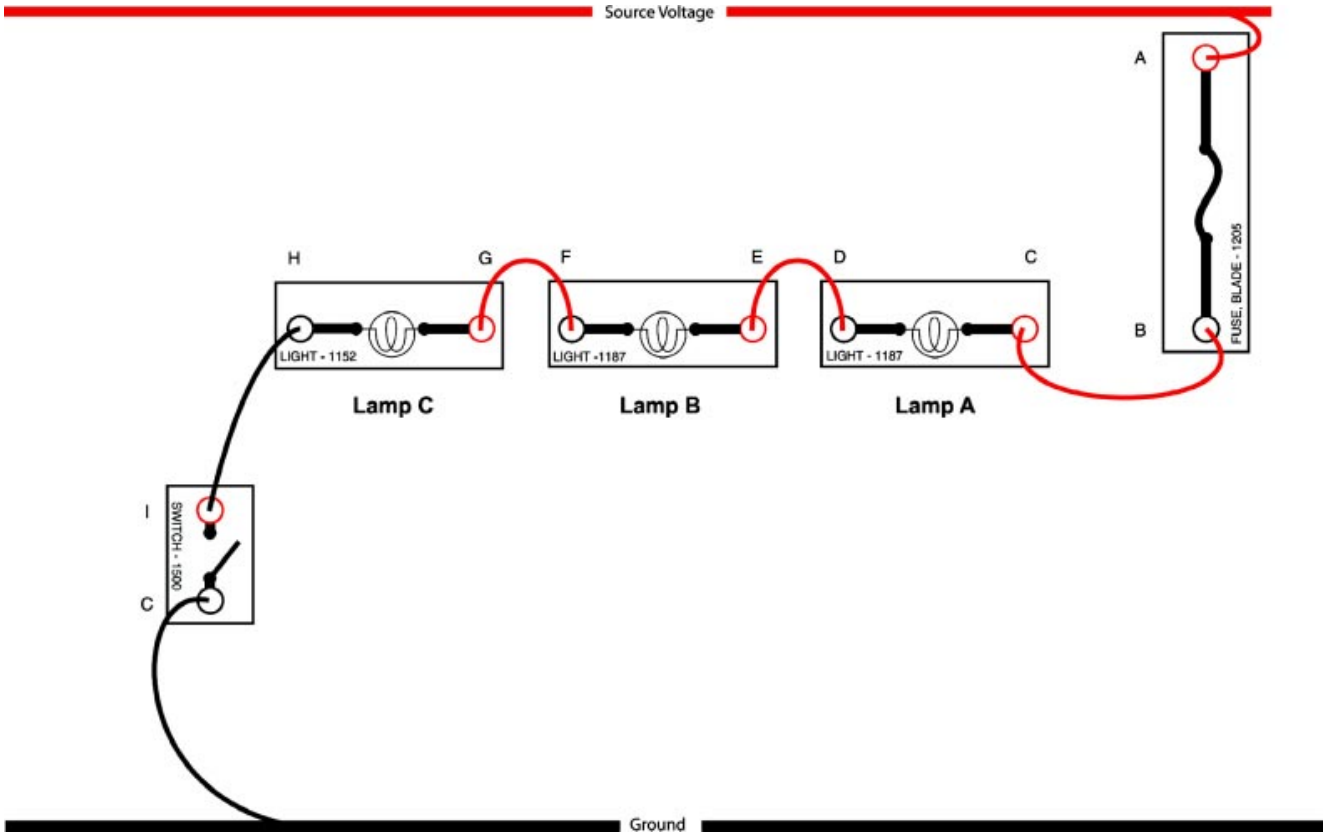


Fig. 2W1-3
TL623f003c-2W1

15. Turn the power supply off. Add lamp 1152 in the circuit as shown. Turn the power supply on.

    What do you notice about the lamps?

    _____

    Why? _____

16. Measure the voltage drop across each of the lamps:

    Lamp A: _____

    Lamp B: _____

    Lamp C: _____

    Add the voltage drop for each lamp together: _____

    Does the total equal source voltage? YES / NO (circle one)

17. Measure the resistance of the lamps as follows:

    - Turn the power supply off.
    - Set the DMM to measure resistance.
    - Isolate each lamp by disconnecting each as you measure their resistance (example: Disconnect wires at points C and D to measure the first lamp).

      Lamp A: _____

      Lamp B: _____

      Lamp C: _____

18. Reconnect all the lamps and turn the power supply on. Unscrew the 1152 lamp. Did they all turn off?

    YES / NO (circle one)

    Why?_____

    What voltage would you expect to see at point D? _____

    Measure the voltage at point D: _____

Stop here after completing all the related activities and answering the questions. Inform your instructor that you are ready to review this section.

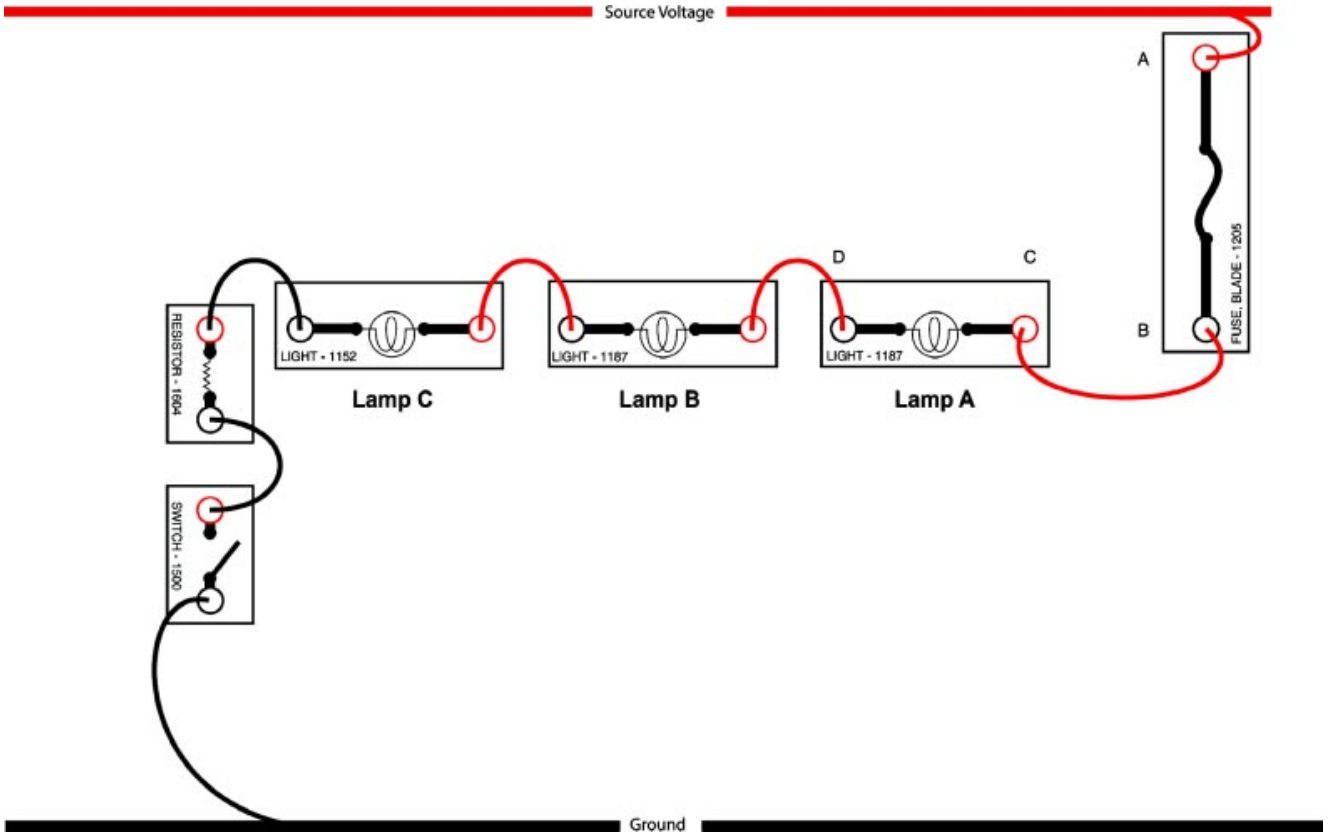


Fig. 2W1-4
TL623f004c-2W1

19. Turn the power supply off. Screw the lamp back in. Add resistor 1604 to the circuit as shown. Turn the power supply on.

    Do the bulbs light? YES / NO (circle one)

    Is the circuit working? YES / NO (circle one)

    Measure voltage drop and amperage in the circuit to verify operation:

    Voltage drop Circuit amperage: _____

    Lamp A: _____

    Lamp B: _____

    Lamp C: _____

    Resistor: _____

    20. Measure total circuit resistance: _____

21. Compared to the circuit with only 2 bulbs (pg. 2W1-5), resistance has [increased/decreased] (circle one) and amperage has [increased/decreased].

Stop here after completing all the related activities and answering the questions. Inform your instructor that you are ready to review this section.

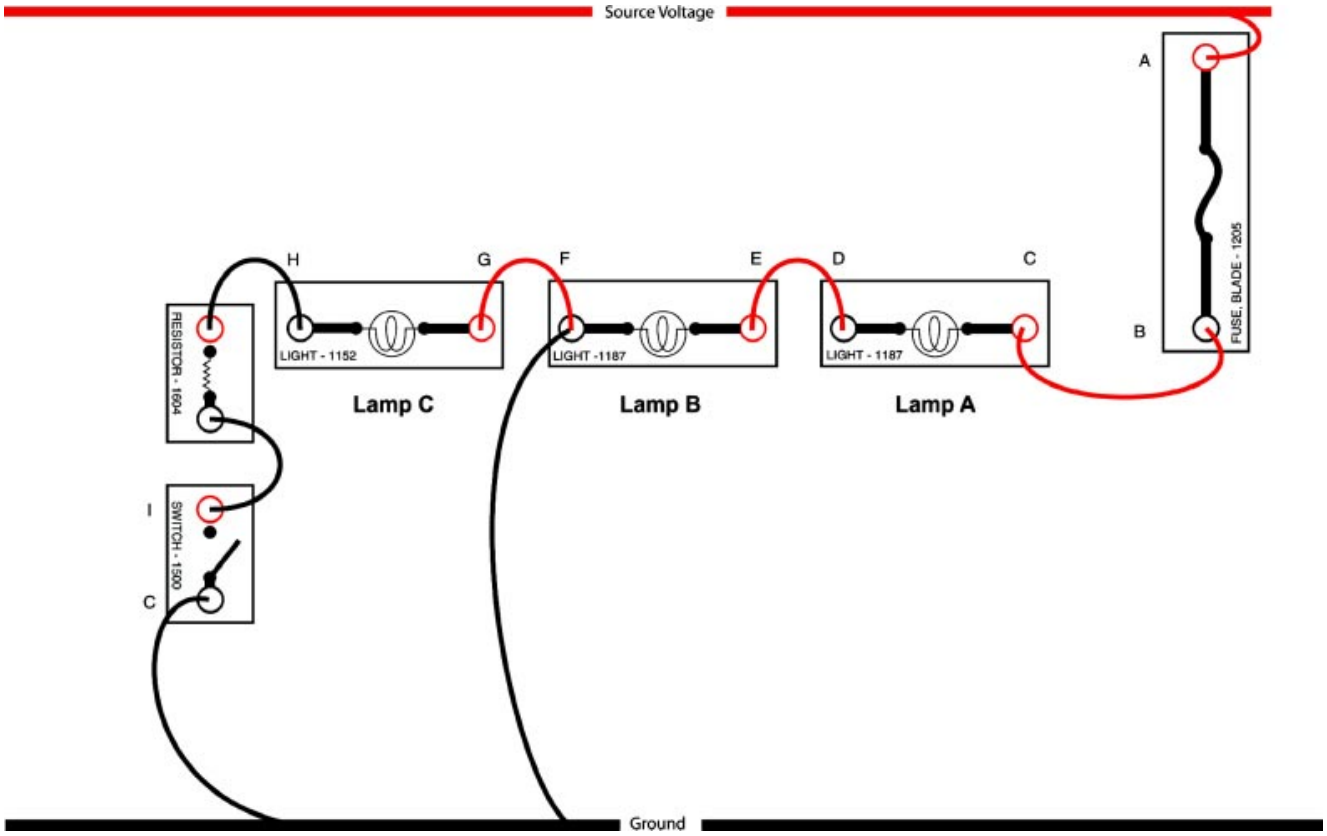


Fig. 2W1-5
TL623f005c-2W1

22. Turn the power supply off. Use a jumper wire to create a short circuit as shown above.

    Why did the first two lamps get brighter? _____

    Why did the last lamp go out? _____

23. Explain the relationship between Voltage, Amperage and Resistance based on your readings made in this module.

    Voltage: _____

    Amperage: _____

    Resistance: _____

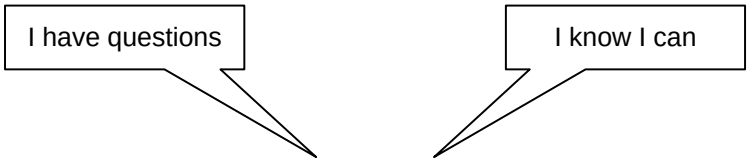
24. Turn off the power supply and the DMM.

Stop here after completing all the related activities and answering the questions. Inform your instructor that you are ready to review this section.

Series Circuits

Name: _____ Date: _____

Review this sheet as you are doing the Series Circuits worksheet. Check each category after viewing the instructor's presentation and completing the worksheet. Ask the instructor if you have questions regarding the topics provided below. Additional space is provided under topic for you to list any other concerns that you would like you instructor to address. The comments section is provided for your personal comments, information, questions, etc.



Topic			Comment
Predict Available Voltage			
Measure Available Voltage			
Measure Voltage Drop			
Measure Circuit Amperage			
Measure Resistance			

Notes