



Series and Parallel Circuits ab

Program: Electrician Technician

Course: EL120 Introduction to Electrical Theory

Objectives: Demonstrate your understanding of series and parallel circuits by safely wiring series and parallel circuits to specification.

After completing this lab, the student will be able to:

- Learn the characteristics of series, parallel, and series-parallel circuits by designing, wiring, and operating circuits using a 110-volt source.

Lab Equipment:

- N/A

Required Tools:

- Multimeter
- Wire Stripper
- Wire cutter
- 6-in-1 screwdriver

Materials:

- 20' - #14 THHN black solid
- 20' - #14 THHN white solid
- 10 - Wire nuts
- 1 - 120-volt power cord
- 3 - keyless fixtures
- 3 - light bulbs
- 3 - switches
- 1 - Pencil

Safety (PPE):

- Safety glasses/goggles

Resources: N/A Required

Time: 2 Days

Shop Maintenance:

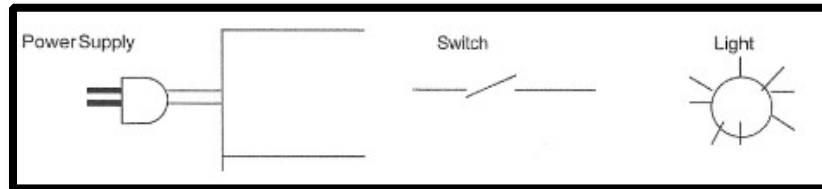
- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.



- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are students' responsibility

Procedures: (Eye protection must always be worn)

1. First draw each circuit using the following symbols:



2. Have the instructor check your drawing before wiring the circuit.
3. Wire each circuit according to your drawing.
4. All circuits should be checked by the instructor BEFORE they are energized.

Circuit 1

1. Design and draw a circuit with 1 switch controlling the load. The switch should be wired in a series with the load.

A large, empty rectangular box provided for the student to draw their circuit diagram.

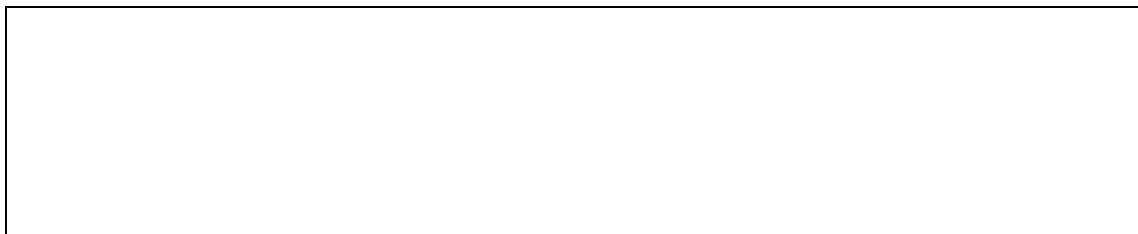
2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. What happens when the switch is opened? _____

4. What happens when the switch is closed? _____



Circuit 2

1. Design and draw a circuit with 2 switches controlling 1 load. The switches should be wired in series with each other and in series with the load.



2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)

3. Close both switches. Results? _____

4. Open one switch. Results? _____

5. Close the first switch and open the other switch. Results? _____

6. Summarize the operation of this circuit.





Circuit 3

1. Design and draw a circuit with 2 switches controlling 1 load. The switches should be wired in parallel with each other but in series with the load.



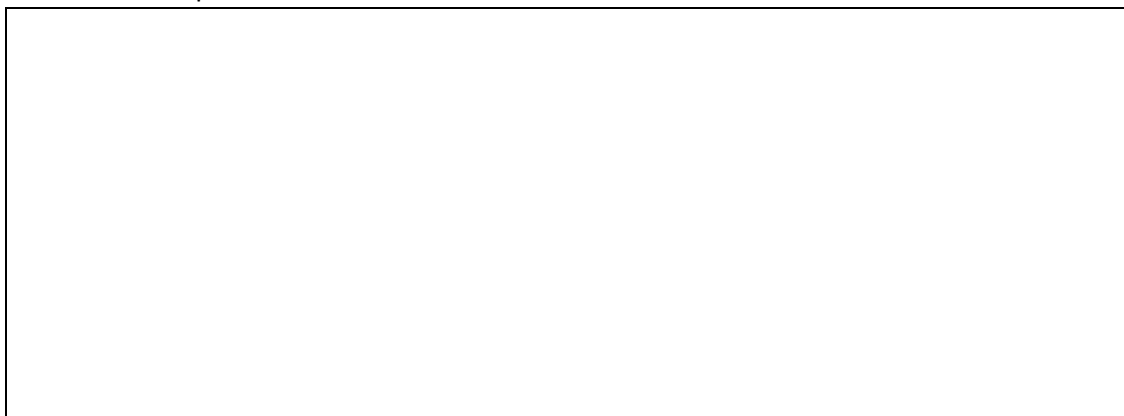
2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)

3. Open both switches. Results? _____

4. Close 1 switch. Results? _____

5. Open the first switch and close the other switch. Results?

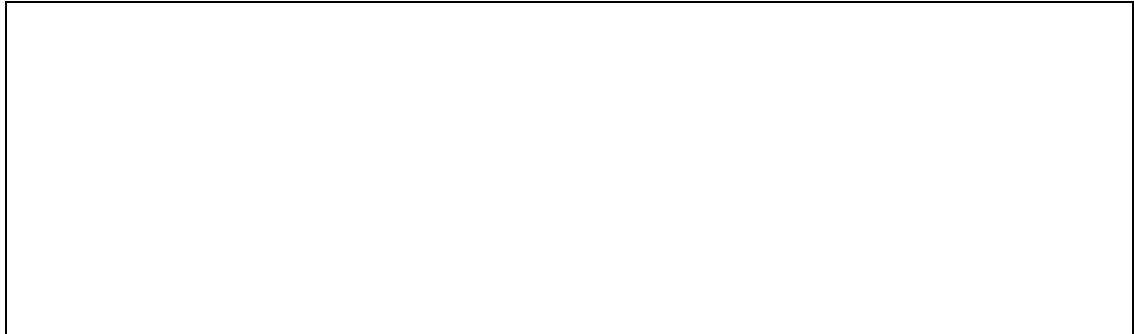
6. Summarize the operation of this circuit.



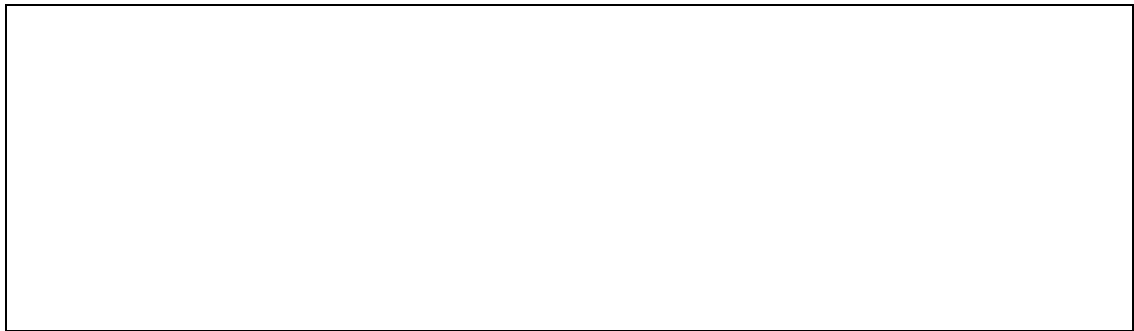


Circuit 4

1. Design and draw a circuit with 1 switch controlling 2 loads. The loads should be wired in parallel with each other but in series with the switch.



2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. Summarize the operation of this circuit.



Circuit 5

1. Design and draw a circuit with 2 switches controlling 2 loads. The loads should be wired in parallel with each other. The switches should be wired in a series with each other. The switches should be wired in series with the loads.





2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. Close both switches. Results? _____

4. Open 1 switch. Results? _____

5. Close the first switch and open the other switch. Results? _____

6. Summarize the operation of this circuit.

Circuit 6

1. Design and draw a circuit with 2 switches controlling 2 loads. The loads should be wired in parallel with each other. The switches should be wired in parallel with each other. The switches should be wired in a series with the loads.



2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. Close both switches. What Results? _____

4. Open 1 switch. What Results? _____

5. Close the first switch and open the other switch. Results? _____

6. Summarize the operation of the circuit.

Circuit 7

1. Design and draw a circuit with 2 switches controlling 2 loads. Each load should be wired in series with one switch. The switches should be wired so that each switch controls one load and the loads operate independently.



2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)

3. Close both switches. Results? _____

4. Open one switch. Results? _____

5. Close the first switch and open the other switch. Results? _____

6. Summarize the operation of this circuit.

Circuit 8

1. Design and draw a circuit with 1 switch controlling 2 loads. The loads should be wired in series with each other and in series with the switch.



2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. What do you notice about the amount of light the bulbs produce? _____

4. Why is this? _____

5. With the circuit operating, CAREFULLY unscrew one of the lightbulbs. What happened? Why?

Circuit 9

1. Design and draw a circuit with 1 switch controlling 2 loads. The loads should be wired in series with each other and in series with the switch. Wire another switch in parallel with one light.

2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)
3. Close both switches. Results? _____



4. Open the switch that is wired in parallel with one light. Results?

5. Explain the operation of the parallel-wired switch. _____

6. How does this contrast to the operation of the series-wired switch?

Circuit 10

1. Design and draw a circuit with 3 loads in series. Two of the loads should have a switch wired in parallel to them. Each switch should control 1 load in the circuit. 1 load will operate continuously while the other 2 loads will each be controlled by their own switch. **This circuit is tricky.**

2. Wire and operate the circuit. (Have the instructor check the circuit before operation.)

3. Close both switches. Results? _____

4. Open one switch. Results? _____

5. Close the first switch and open the other switch. Results?

6. Summarize the operation of this circuit.