

IND120 Lab 15: Troubleshooting Lab #2

Upon completion of this lab, the student should be able to:

1. Learn the operation of multiple electrical circuits on the ACDC training unit.
2. Explain the purpose of various devices in an electrical circuit.
3. Measure the voltage across a powered load using a DMM.
4. Insert faults into circuits through manual fault switches on the unit.
5. Troubleshoot the electrical circuit that has a fault condition.
6. Use an Ohmmeter to determine how the fault switch affects a circuit device.
7. Return the electrical circuit for full operation.

*Open the AC/DC Training Unit. Setup the unit on its base, or lay flat on the work table.

***Make sure all fault switches are in the “0” position.**

*Connect the power cord and turn off the power input switch to make sure the unit is not powered.

****Change the color covers (globes) on the pilot lights to have the following sequence: 1st indicator light is green, 2nd indicator light is yellow, and the 3rd indicator light is red.**

Part 1: Wire the following circuit on the AC/DC training system.

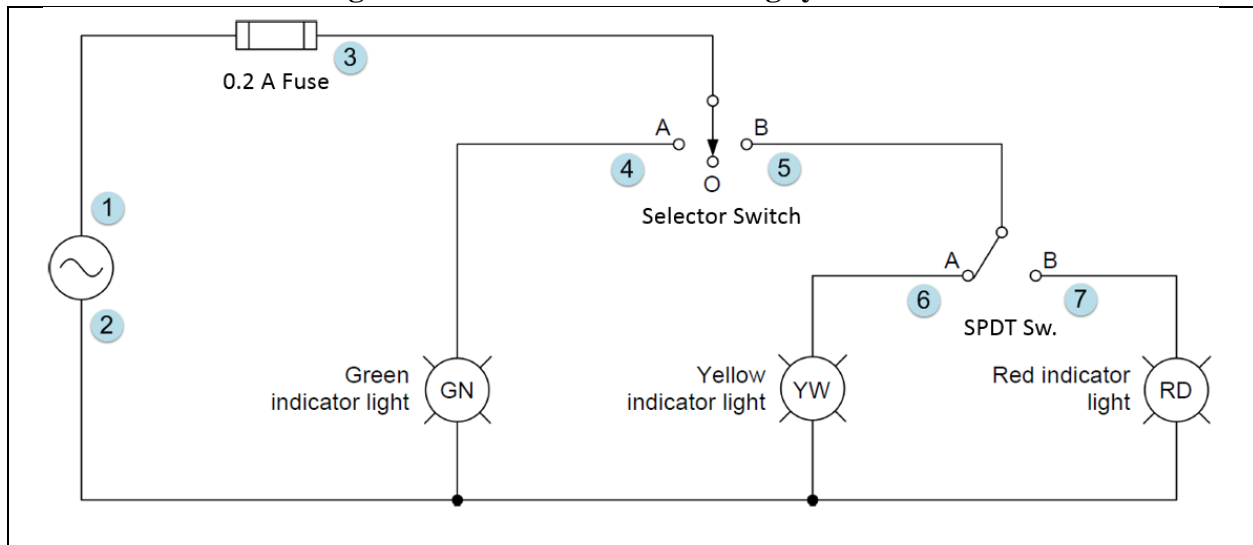


Figure 1. AC circuit 1 for troubleshooting.

Testing the Circuit for Part 1:

1. Set all the fault switches to the “0” (or off) position.
2. Power on the “Power Input” switch (lower right) to power the training unit.

3. Move the Selector Switch to the middle (“0”) position.
 - a. Are any outputs on? Explain!
 - b. What is the measured voltage between nodes 1 & 2 = _____
 - c. What is the measured voltage between nodes 3 & 2 = _____
 - d. What is the measured voltage between nodes 4 & 2 = _____
 - e. What is the measured voltage between nodes 5 & 2 = _____
 - f. What is the measured voltage between nodes 6 & 2 = _____
 - g. What is the measured voltage between nodes 7 & 2 = _____

4. Move the Selector Switch to the “A” position.
 - a. What indicator light(s) come on?
 - b. What is the measured voltage between nodes 4 & 2 = _____

5. Move the Selector Switch to the “B” position.

Move the SPDT switch to the “A” position

- a. What indicator light(s) comes on?
 - b. What is the voltage between wires 5 & 2 = _____
 - c. What is the voltage between wires 6 & 2 = _____
 - d. What is the voltage between wires 7 & 2 = _____
6. Move the SPDT switch to the “B” position.
 - a. How does the indicator lights respond?
 - b. What is the voltage between nodes 6 & 2 = _____
 - c. What is the voltage between nodes 7 & 2 = _____

Repeat the sequence to make sure you know how the circuit is supposed to work.

7. Turn on **Fault Switch #6**.
8. How does this change the operation of the circuit?
9. What component is affected by Fault Switch #6?
10. Power off the training unit, disconnect the wires to the Selector Switch.
11. Use the Ohmmeter to determine what effect the fault switch has on the Selector Switch.

Explain what was found when measuring the resistance.

12. Turn off all the fault switches to take the circuit back to normal operation.
13. Power off the “Power Input” switch to power off the training unit. Disassemble the circuit.

Part 2: Wire the following circuit on the AC/DC training system.

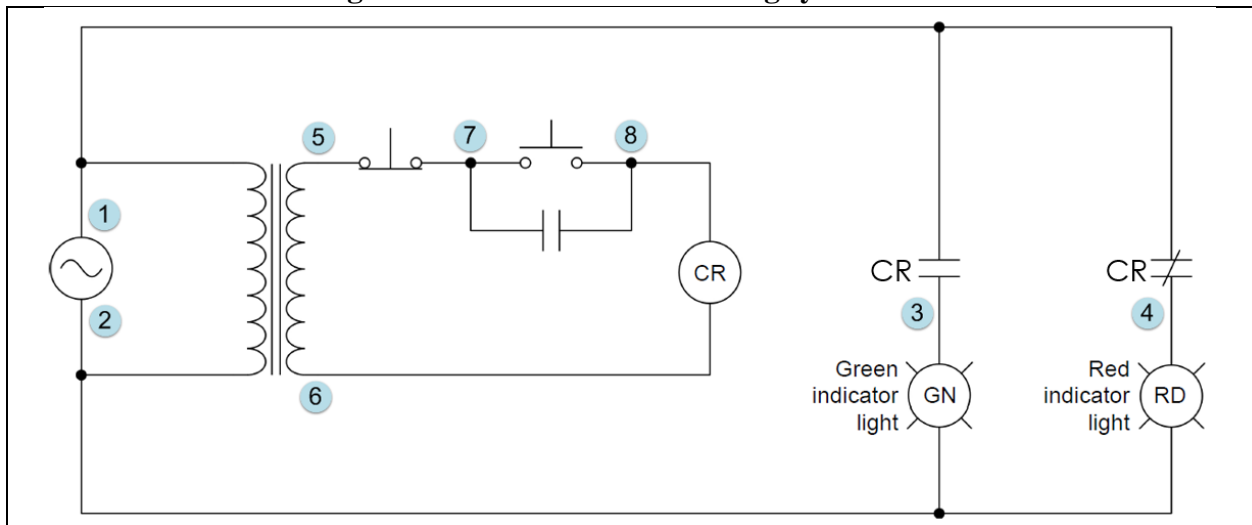


Figure 2. AC circuit 2 for troubleshooting.

Testing the Circuit for Part 2:

1. Set all the fault switches to the 0 (or off) position.

2. Power on the “Power Input” switch (lower right) to power the training unit.

Are any outputs currently on? Explain why if there is any output(s) on.

3. Momentarily push the start pushbutton. Does the AC relay pull in?

Does it remain pulled in when the start button is released?

What pilot light(s) are on when the relay is pulled in?

4. Turn on Fault **Switch #4**. Does the circuit continue to operate as it did before?

a. What is the voltage between nodes 5 & 6 = _____

b. What is the voltage between nodes 7 & 6 = _____

c. What is the voltage between nodes 8 & 6 = _____

d. What is the voltage across the coil of the relay?

e. Is the relay pulled in?

f. What is wrong?

g. Remove the power to the training unit, and check the resistance of the relay coil?

h. What device is the fault switch wired into?

****Turn off all the Fault Switches.**

5. Turn on Fault Switch #5.

a. Verify the operation of the circuit.

b. Does the circuit operate the way it should?

c. Does the coil stay pulled in except when the stop button is pushed?

d. Power down the training unit.

e. Disconnect the start and stop buttons individually and ring them out.

- f. Which device problematic?
 - g. How did Fault Switch #5 affect the component?
 - h. Turn off Fault Switch #5.
6. Power up the training unit and verify circuit operation
 7. Reset all fault switches. Power off the training unit. Disassemble the circuit.

Part 3: Wire the following circuit on the AC/DC training system.

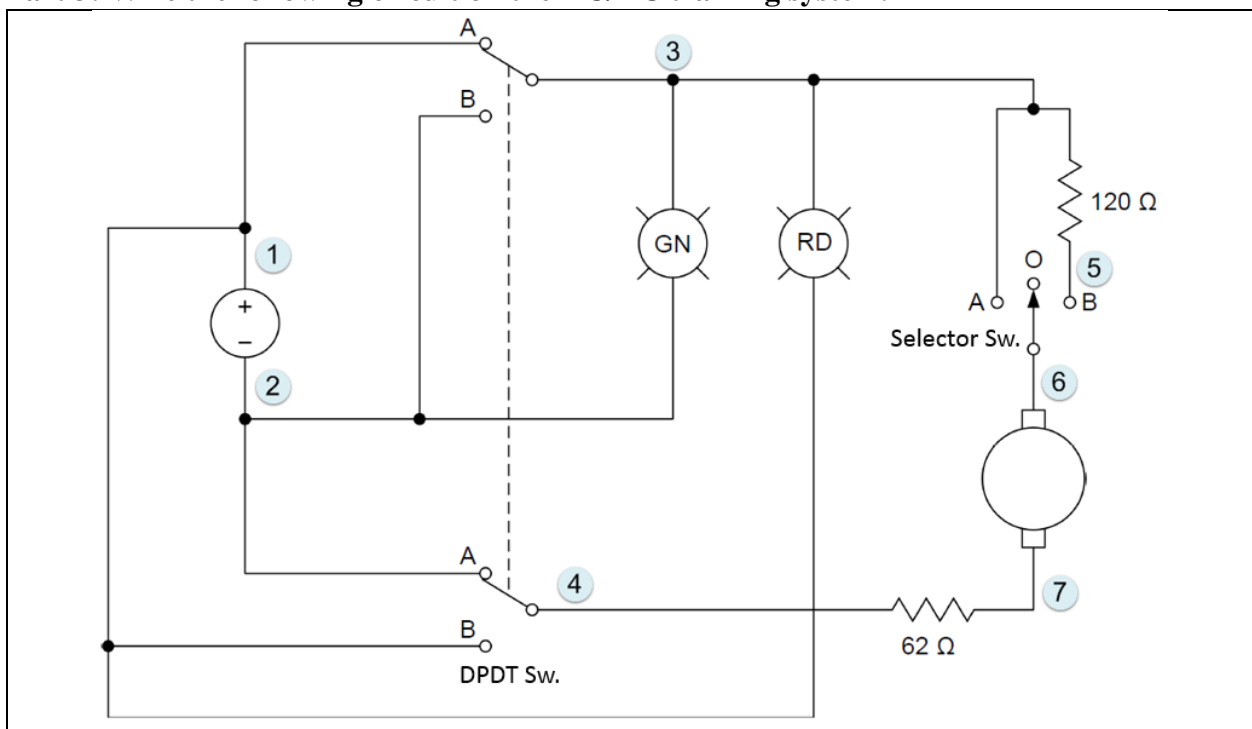


Figure 3. AC circuit 3 for troubleshooting.

Testing the Circuit for Part 3:

1. Set all the fault switches to the “0” (or off) position.
2. Power on the “Power Input” switch (lower right) to power the training unit.
3. Put the DPDT switch in the up position.

Put the Selector Switch in position “A”. The motor should start running.

4. Toggle the DPDT switch to the downward position. Does the DC Motor change direction? Explain!
 - a. Measure the voltage across the 62 Ohm resistor, between nodes 4 & 7 = _____
 - b. Measure the voltage across the DC motor, between nodes 6 & 7 = _____
 - c. Which indicator light(s) is on?
5. Change the Selector switch to position "B".
 - a. What happens to the speed of the motor?
 - b. What is the voltage drop across the 120 ohm resistor, nodes 3 & 5 = _____
 - c. What is the voltage drop across the DC Motor, nodes 6 & 7 = _____
6. Turn on **Fault Switch #1**.
 - a. What happens in the circuit?
 - b. Use the voltmeter to trace down the loss of voltage.
 - c. Is there DC voltage across the DC Motor?
 - d. Trace down where the voltage is lost.
 - e. Disconnect the faulty device that you find is stopping the motor.
 - f. Ring out the devices to see how Fault Switch #1 is wired into the devices.
7. Get the circuit back to full working order.
8. Power off the "Power Input" switch to power off the training unit, and disassemble the circuit.