

Alternate CBL Instructions

Series and Parallel Circuits

Safety Precautions



- Hazard from electric shock is minimal because of the low current used in this experiment.
- This experiment should not be carried out using current from an AC circuit, as this current is deadly.
- Handle wire ends with care as they may be sharp and could cause cuts.
- Use caution when plugging in, using, or unplugging the CBL 2 unit's power supply.

Materials

low-voltage power supply

two light sockets

two small lightbulbs

10 hook-up wires or wires with an alligator clip

CBL 2 unit

link cable

TI graphing calculator

voltage probe or differential voltage probe

current probe

DataMate program

Procedure

1. Connect the voltage probe to Channel 1 of the CBL 2 unit. Connect the current probe to Channel 2 of the CBL 2 unit. Connect the CBL 2 unit to the graphing calculator using a link cable. Firmly press the ends of the cable into each unit.
2. Turn on the graphing calculator. Start the DataMate program. Press CLEAR to reset the application program. The CBL 2 unit should automatically identify the two probes.
3. Before connecting the probes to a circuit, the probes need to be zeroed. Select SETUP from the Main screen. Select ZERO from the SETUP menu. Select ALL CHANNELS from the SELECT CHANNEL menu. Press ENTER to zero the probes.
4. Set up a data table like the one shown in the textbook.
5. Wire two lightbulb sockets in series with the current probe and a low-voltage power supply. Observe the correct polarity while connecting the current probe. Screw the lightbulbs into the sockets. Turn on the power supply. Adjust the power control so that the bulbs are dimly lit.
6. Unscrew one of the lightbulbs. Record your observations in the data table. Screw in the bulb again and find the potential difference across both sets of bulbs by placing the positive voltage probe wire on the positive end of the circuit and

the negative wire of the probe on the negative end of the circuit. Read the voltage and current values on the graphing calculator screen. Record your data in your data table.

7. Find the potential difference across each individual lightbulb by placing the positive wire of the voltage probe on the positive end of a lightbulb and the negative wire of the voltage probe on the negative end of the bulb. Record your data in the data table. Repeat this step for the other lightbulb in series.
8. Place the current probe at various locations in the series circuit. This can be done by simply disconnecting a wire and inserting the current probe at that point in the circuit. Record the current values in your data table. Turn off the power supply and unscrew the lightbulbs.
9. Wire the two lightbulb sockets in parallel with the low-voltage power supply and in series with the current probe.
10. Screw the lightbulbs into the sockets. Turn on the power supply. Adjust the power control so that the bulbs are dimly lit. Record the current shown on the current probe in the data table.
11. Check the potential difference across the entire circuit and across each lightbulb. Record the values in the data table.
12. Place the voltage-probe wires across one of the lightbulbs. Now unscrew one of the lightbulbs. Record your observations of both lightbulbs, and record the current and potential difference read by the probes in the data table.
13. Return the lightbulb you removed in the previous step to its socket. Now unscrew the other lightbulb. Record your observations of both lightbulbs, and record the current and potential difference read by the probes in the data table. Turn off the power supply and unscrew the lightbulbs.

Alternate lab procedure, using a CBL unit

1. Connect the voltage probe to Channel 1 of the CBL unit. Connect the current probe to Channel 2 of the CBL unit. Connect the CBL unit to the graphing calculator using the link cable. Firmly press the ends of the cable into each unit.
2. Turn on the CBL unit and the graphing calculator. Start the PHYSICS program. From the MAIN MENU select SET UP PROBES. From the NUMBER OF PROBES menu select TWO. On the SELECT PROBE menu select the appropriate voltage probe, VOLTAGE or C-V VOLTAGE. Check to see that it is connected to Channel 1 and press ENTER.
3. From the SELECT PROBE menu select C-V CURRENT. Check to see that it is connected to Channel 2 and then press ENTER. Select USE STORED from the CALIBRATION menu.
4. From the MAIN MENU select ZERO PROBES. On SELECT CHANNEL menu, select ALL CHANNELS. Press CH VIEW on the CBL unit to view each channel followed by pressing TRIGGER. Repeat this step for each channel.

5. From the MAIN MENU select COLLECT DATA. On the DATA COLLECTION menu select MONITOR INPUT. Each channel will have its sensor value displayed on the calculator.
6. Set up a data table like the one shown in the textbook.
7. Wire two lightbulb sockets in series with the current probe and a low-voltage power supply. Observe the correct polarity while connecting the current probe. Screw the lightbulbs into the sockets. Turn on the power supply. Adjust the power control so that the bulbs are dimly lit.
8. Unscrew one of the lightbulbs. Record your observations in the data table. Screw in the bulb again and find the potential difference across both sets of bulbs by placing the positive voltage probe wire on the positive end of the circuit and the negative wire of the probe on the negative end of the circuit. Read the voltage and current values on the graphing calculator screen. Record your data in your data table.
9. Find the potential difference across each individual lightbulb by placing the positive wire of the voltage probe on the positive end of a lightbulb and the negative wire of the voltage probe on the negative end of the bulb. Record your data in the data table. Repeat this step for the other lightbulb in series.
10. Place the current probe at various locations in the series circuit. This can be done by simply disconnecting a wire and inserting the current probe at that point in the circuit. Record the current values in your data table. Turn off the power supply and unscrew the lightbulbs.
11. Wire the two lightbulb sockets in parallel with the low-voltage power supply and in series with the current probe.
12. Screw the lightbulbs into the sockets. Turn on the power supply. Adjust the power control so that the bulbs are dimly lit. Record the current shown on the current probe in the data table.
13. Check the potential difference across the entire circuit and across each lightbulb. Record the values in the data table.
14. Place the voltage-probe wires across one of the lightbulbs. Now unscrew one of the lightbulbs. Record your observations of both lightbulbs, and record the current and potential difference read by the probes in the data table.
15. Return the lightbulb you removed in the previous step to its socket. Now unscrew the other lightbulb. Record your observations of both lightbulbs, and record the current and potential difference read by the probes in the data table. Turn off the power supply and unscrew the lightbulbs.