

Alternate CBL Instructions

Diode Current and Voltage

Safety Precautions



- Use caution with electric connections. Avoid contact with the resistor, which may become hot.
- Plug power supplies into only GFCI-protected receptacles to prevent shock hazards.
- Use caution when plugging in, using, or unplugging the CBL 2 unit's power supply.

Materials

DC power supply, variable, 0-6 VDC

100- Ω resistor, $\frac{1}{2}$ - or 1-W

1N4002 diode

LED, red

six hook-up wires or wires with alligator clips

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. Prepare a data table like the one shown in the textbook. As indicated on the schematic diagram in the textbook, wire the negative terminal of the power supply to the negative side of the current probe using the hook-up wires. The current probe is replacing the ammeter. Carefully observe the correct hookup of the positive and negative probe leads.
5. Locate the end of the diode with the silver band around it. Attach this end to the positive side of the current probe.
6. Attach a wire from the free end of the 100- Ω resistor to the positive lead on the power supply.

7. The voltage probe is to be placed parallel with the diode, replacing the voltmeter on the schematic shown in the textbook. Attach a wire from the positive side of the voltage probe to the end of the diode attached to the resistor. Connect the negative side of the voltage probe to the end of the diode with the silver band, which is attached to the current probe.
8. The diode circuit should look like part **a** of the schematic in the textbook. Make sure the power supply is turned to zero and plug it in. The voltage and current readings can be read from the graphing calculator screen identified by the appropriate channel that each is plugged into. Slowly turn up the power supply to increase the voltage drop across the diode from 0 up to 0.8 V, in 0.1-V increments. Record the corresponding current at each voltage. **CAUTION: While adjusting the power supply voltage, observe the current reading. Your current reading reached 500 mA, 0.5 A, then stop taking readings, turn the power supply to zero, and unplug it immediately to prevent damage to the current probe.** Observe the LED leads. One should be shorter than the other. Replace the 1N4002 diode with the LED so that it corresponds with part **b** of the schematic in the textbook.
9. Connect the shorter lead on the LED to the positive side of the current probe, or negative side of the voltage probe, where the silver banded end of the diode had been connected. Connect the longer lead of the LED to the resistor and to the positive side of the voltage probe.
10. Plug in the power supply. Slowly turn up the power supply to increase the voltage drop across the LED from 0 to 2.0 V, in 0.1-V increments. Record the corresponding current at each voltage. Additionally, observe the LED and record your observations of it.

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 plugged into Channel 1 and press ENTER.
3. From the SELECT PROBE menu select C-V CURRENT. Check to see that it is plugged into Channel 2 and then press ENTER. Select USE STORED from the CALIBRATION menu.
4. From the MAIN MENU select ZERO PROBES. On the 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. Prepare a data table like the one shown in the textbook. As indicated on the schematic diagram in the textbook, wire the negative terminal of the power supply to the negative side of the current probe using the hook-up wires. The current probe is replacing the ammeter. Carefully observe the correct hookup of the positive and negative probe leads.
7. Locate the end of the diode with the silver band around it. Attach this end to the positive side of the current probe.
8. Attach a wire from the free end of the 100- Ω resistor to the positive lead on the power supply.
9. The voltage probe is to be placed parallel with the diode, replacing the voltmeter on the schematic shown in the textbook. Attach a wire from the positive side of the voltage probe to the end of the diode attached to the resistor. Connect the negative side of the voltage probe to the end of the diode with the silver band, which is attached to the current probe.
10. The diode circuit should look like part **a** of the schematic in the textbook. Make sure the power supply is turned to zero and plug it in. The voltage and current readings can be read from the graphing calculator screen identified by the appropriate channel that each is plugged into. Slowly turn up the power supply to increase the voltage drop across the diode from 0 up to 0.8 V, in 0.1-V increments. Record the corresponding current at each voltage. **CAUTION: While adjusting the power supply voltage, observe the current reading. Your current reading reached 500 mA, 0.5 A, then stop taking readings, turn the power supply to zero, and unplug it immediately to prevent damage to the current probe.** Observe the LED leads. One should be shorter than the other. Replace the 1N4002 diode with the LED so that it corresponds with part **b** of the schematic in the textbook.
11. Connect the shorter lead on the LED to the positive side of the current probe, or negative side of the voltage probe, where the silver banded end of the diode had been connected. Connect the longer lead of the LED to the resistor and to the positive side of the voltage probe.
12. Plug in the power supply. Slowly turn up the power supply to increase the voltage drop across the LED from 0 to 2.0 V, in 0.1-V increments. Record the corresponding current at each voltage. Additionally, observe the LED and record your observations of it.