Laboratory Application Assignment

In this lab application assignment you will examine the coding systems used to indicate the capacitance and tolerance of a capacitor. You will also measure the value of a capacitor using either a Z meter or a DMM capable of measuring capacitance values. And finally, you will examine how capacitance values combine when connected in series and in parallel.

Equipment: Obtain the following items from your instructor.

- Assortment of plastic-film capacitors
- Z meter or DMM capable of measuring capacitance values

Measuring Capacitance

Obtain five plastic-film capacitors from your instructor. Make sure each capacitor has a different coded value. In the space provided below, indicate the coded value of each capacitor. Next, indicate the capacitance (in pF) corresponding to the coded value, including the tolerance. Finally, measure and record each capacitance value using either a Z meter or a DMM capable of measuring capacitance values. (If a measured value is displayed in nF or μF, convert it to pF.)

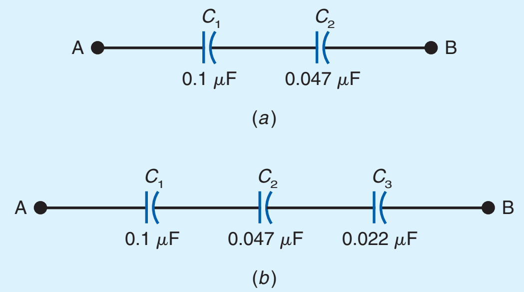
Coded Value	Capacitance Value	Measured Value
__________	__________	__________
__________	__________	__________
__________	__________	__________
__________	__________	__________
__________	__________	__________

Is the measured value of any capacitor out of tolerance? __________ If so, which one(s)? ____________________

Series Capacitors

Connect a 0.1-μF capacitor in series with a 0.047-μF capacitor as shown in Fig. 16–41*a*. Calculate and record the equivalent capacitance, C_{EQ}, of this series combination. C_{EQ} = ________ Next, measure and record the equivalent capacitance, C_{EQ}, across terminals A and B. C_{EQ} = ________ Add another 0.022-μF capacitor, as shown in Fig. 16–41*b*. Calculate and record the equivalent capacitance, C_{EQ}, of this series combination. C_{EQ} = ________ Finally, measure and record the equivalent capacitance, C_{EQ}, across terminals A and B. C_{EQ} = ________

Figure 16–41



Parallel Capacitors

Connect a 0.1-μF capacitor in parallel with a 0.047-μF capacitor, as shown in Fig. 16–42*a*. Calculate and record the total capacitance, C_T, of this parallel combination. C_T = ________ Next, measure and record the total capacitance, C_T, across terminals A and B. C_T = ________ Add another 0.022-μF capacitor, as shown in Fig. 16–42*b*. Calculate and record the total capacitance, C_T, of this parallel combination. C_T = ________ Finally, measure and record the total capacitance, C_T, across terminals A and B. C_T = ________

Do capacitors in series combine the same way as resistors in parallel? ________

Do capacitors in parallel combine the same way as resistors in series? ________

Capacitor Leakage

Because there is no such thing as a perfect insulator, all capacitors have a small amount of current flowing through the dielectric. This current is called leakage current. For a good capacitor, this leakage current is usually insignificant and can therefore be ignored. Due to the very nature of their construction, electrolytic capacitors have a much higher leakage current than other types of capacitors. If a Z meter is available, have your instructor demonstrate how it can be used to measure the leakage current in a plastic-film and an electrolytic capacitor. When checking for leakage, be sure to apply the rated working voltage across the capacitor. Your instructor can also show you how to test the ESR value of a capacitor.

Figure 16–42