

ELECTRONICS FOR ME Laboratory 1

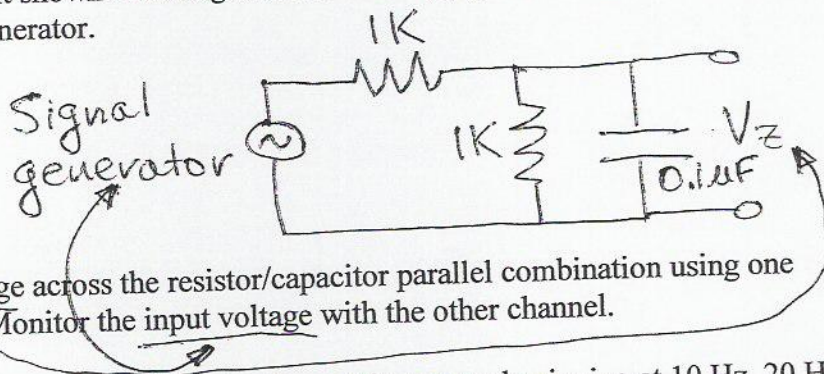
Purpose

At the conclusion of this lab, the student will:

1. Understand the concept of impedance magnitude and phase in an AC circuit;
2. Understand the signal frequency dependency of impedance;
3. Make appropriate measurements using standard test equipment to verify (1) and (2).

Procedure

Construct the R-C circuit shown in the figure below and apply a 2 volt peak-to-peak sine wave from the signal generator.



Measure the peak voltage across the resistor/capacitor parallel combination using one channel of the scope. Monitor the input voltage with the other channel.

Perform these measurements for different values of frequency beginning at 10 Hz, 20 Hz, 50 Hz. Repeat these measurements for each decade of frequency up to 1 MHz. Record measurements in a spread sheet.

Measure the phase angle between capacitor current and capacitor voltage using the scope. (The instructor will show you how to do this.) Record the phase angle in degrees for each frequency that you measured capacitor voltage and current.

Results and Discussion

Plot the impedance of the calculated impedance of the resistor/capacitor combination that you calculated using your measurements vs. frequency and compare to the theoretical value in both tabular and graphical form.

Plot the phase angle between the resistor/capacitor voltage and the source voltage vs. frequency and compare to the theoretical value in both tabular and graphical form.

What happens to the magnitude and phase of the impedance as the frequency increases? Is this what you expected based on the in-lab discussion? Why or why not?

CD4049 Hex Inverter

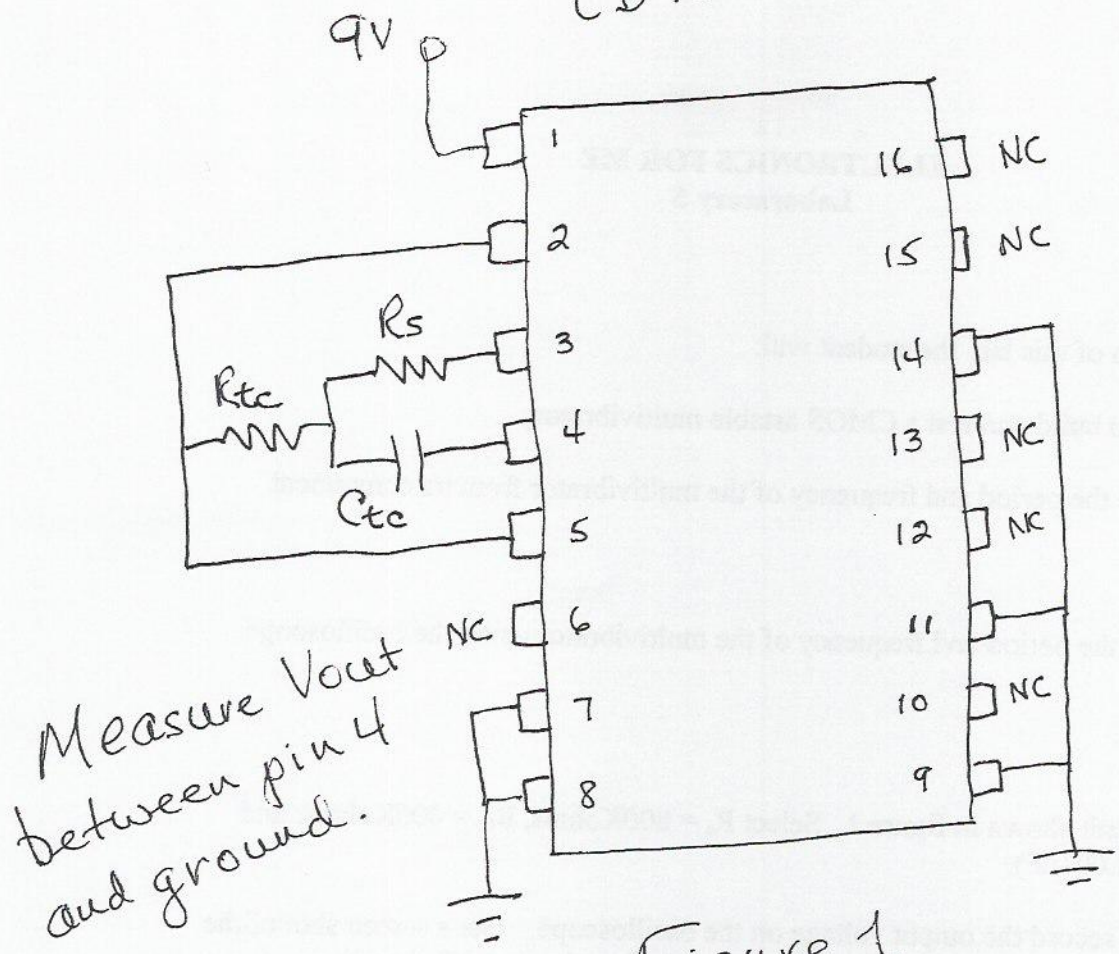


Figure 1.

$$T = \frac{1}{f} = 2.2 R_{tc} C_{tc}$$

T = period
 f = frequency

