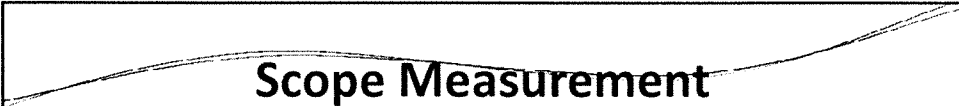




Measuring Waveform Values Using an Oscilloscope

Lesson 11 EET 150



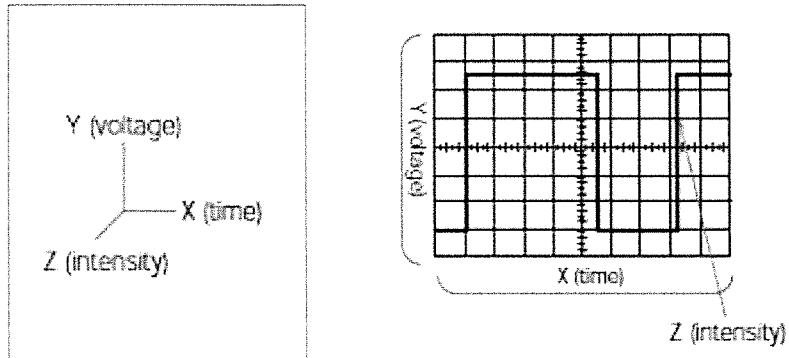
Scope Measurement Learning Objectives

- ▣ In this lesson you will:
- ▣ what measurements an oscilloscope can make.
- ▣ how to interpret an oscilloscope display.
- ▣ how to measure signal amplitudes.
- ▣ how to measure signal frequency.
- ▣ see phase shift of waveforms.
- ▣ measure the phase shift between two waveforms.



What Is an Oscilloscope?

An oscilloscope is an instrument that graphs electrical waveforms



Axis Definitions

Oscilloscope Measurements

Period and voltage values of signal waveforms

Frequency of oscillating signals

Circuit operation represented by signal waveforms

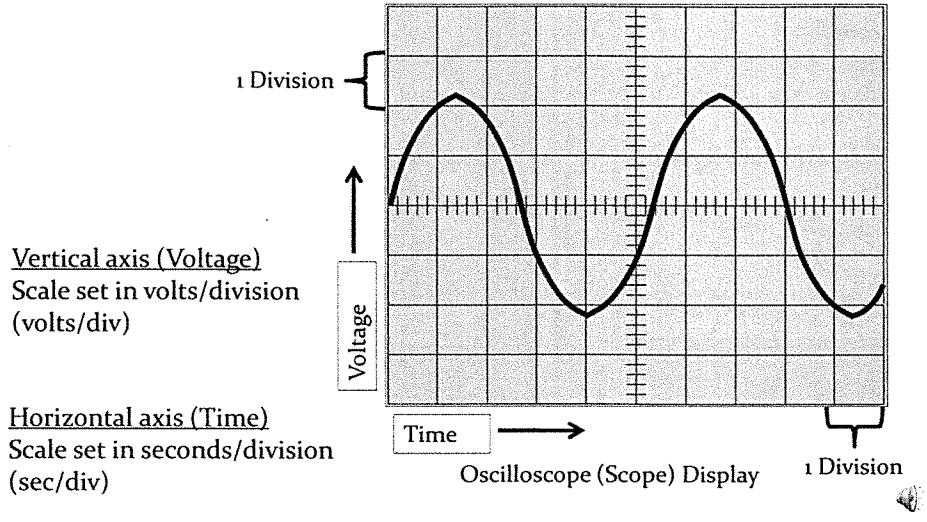
Phase shift of one circuit signal relative to another signal

If a malfunctioning component is distorting a signal

How much of a signal is ac and how much is dc.

Circuit noise levels

Making Voltage and Time Measurements with Oscilloscope



Making Voltage and Time Measurements with an Oscilloscope-Peak and Peak-to-Peak Voltage

Example:
Time axis 1 mS/div
Voltage axis 2 V/div

Find peak voltage

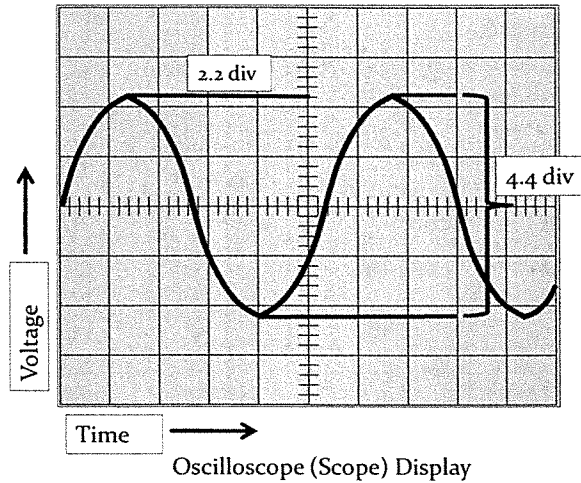
$$V_p = 2.2 \text{ div}(2 \text{ V/div})$$

$$V_p = 4.4 \text{ V peak}$$

Find peak-to-peak Value

$$V_{pp} = 4.4 \text{ div}(2 \text{ V/div})$$

$$V_{pp} = 8.8 \text{ V peak-to-peak}$$



Making Voltage and Time Measurements with an Oscilloscope-Period and Frequency

Example:
 Time axis 1 mS/div
 Voltage axis 2 V/div

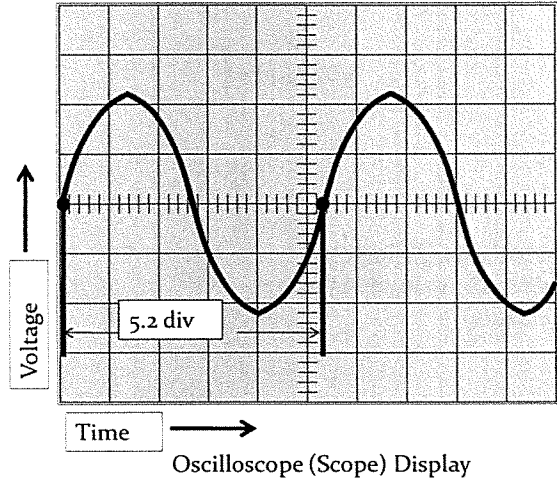
Find period of signal

$T = 5.2 \text{ div}(1 \text{ mS/div})$
 $T = 5.2 \text{ mS}$

Find frequency of signal

$$f = \frac{1}{T}$$

$$f = \frac{1}{5.2 \times 10^{-3} \text{ s}} \approx 192 \text{ Hz}$$



Making Voltage and Time Measurements with an Oscilloscope-Phase Shift

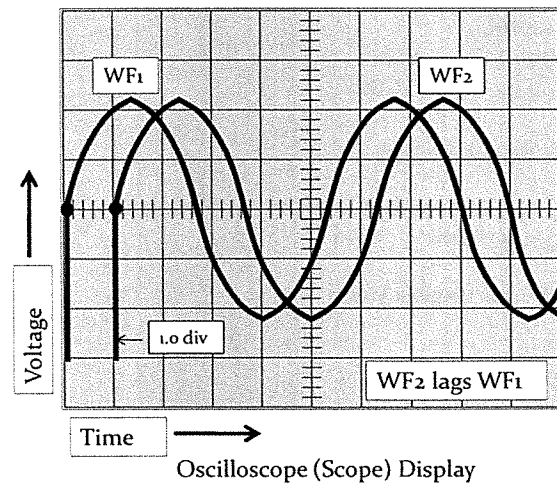
Example:
 Time axis 1 mS/div
 Voltage axis 2 V/div

Find phase shift
 between WF1 and WF2
 (WF1 reference)

$t_p = 1.0 \text{ div}(1 \text{ mS/div})$
 $t_p = 1.0 \text{ mS}$

$$\phi = \left(\frac{t_p}{T} \right) (360)$$

$$\phi = \left(\frac{1.0 \text{ mS}}{5.2 \text{ mS}} \right) (360) = 69.2^\circ$$





Measuring Waveform Values Using an Oscilloscope

End Lesson 11 EET 150

Coming Next: Oscilloscope Controls



