Oscilloscope Solutions

2. What is the $V_{pp}$ across the 100 $\Omega$ in the diagram below?

![Diagram of oscilloscope setup]

The function generator has a $R_S=50$ Ohm internal series resistor that will be in series with $R_L$. The voltage source in the FG is twice what the meter says. The field standard uses $R_L = 50$ ohms, in which case the voltage divider will make the output voltage match the front meter. However, we do not always use $R_L = 50$ Ohms, so we have to calculate the voltage divider. $V_{out}=2*1.0\, V_{pp}\,*R_L/(R_S+R_L)$

3. Describe what the oscilloscope does after graphing the voltage over a single time interval, for the following three triggering modes: Copy from manual.

III. Hands On
The points of the graphs is to get familiar with triggering. The trigger point is indicated by an arrow at the top of the grid. The trigger tells the scope when to sweep across the screen to draw a waveform.

b. Triggering
What happens when the trigger level is beyond that of the signal? Why?
Triggering automatically will find a good level to trigger on the signal in most cases. But when the scope fails to find a good level when the signal is small or noisy, it sweeps across the screen at a phase usually not related to the input signal. Thus, the sweeps are at random phases of the input signal, so the display looks messy.

3. On step 8, explain what is happening when the trigger source is changed from A1 to A2. To the best of your ability, draw the curves you see. = There is a phase shift in the signals with respect to the screen.

5. Based on step 11, does the RC circuit pass low-frequency signals or high-frequency signals? Explain how you can tell.
The circuit is a low pass filter because it lets low frequency voltage signals pass through but attenuates high-frequency signals.

c. More Fun Stuff
1. Disconnect the ground from your oscilloscope probe, remove the probe clip if there is one and touch the tip of the probe to your finger (be careful – the probe tip is sharp like a tack). With your finger touching the probe tip, hit the Autoscale button. What kind of waveform do you see? What's the frequency of this waveform? Where is it coming from?
Are you generating electricity? Hint: in Europe, the frequency of the signal you see would be 5/6 of what you see here in North America. (Answer as many of these questions as you can.)

It is induced voltages and currents due to propagation of electromagnetic energy from the mains electricity and transformers and fluorescent lights. Energy is also radiated from CRT monitors (check sweep rate). Your body acts as a conductive antenna. The scope is sensitive enough to pick these signals up. In Europe, the mains is oscillating at 240VAC, 50 Hz. In the US, it’s 120 VAC, 60Hz.

2. Draw the voltage signal created from sound by a speaker, microphone, or buzzer. Watch the waveform across the device as you change the frequency of the generator. Please state which device you are using, and try to figure out what the frequency range of the device and your hearing might be. The range of human hearing is about 20Hz to 20 kHz. You might have not seen the sine waves that you can hear, but with the scope and mini-speakers or microphones, you can get a better sense of what audible signals look like.