

MODULE 2: Circuits, Signals and the Analog Discovery Board

SUMMER CHALLENGE

Electrical Engineering: Smart Lighting

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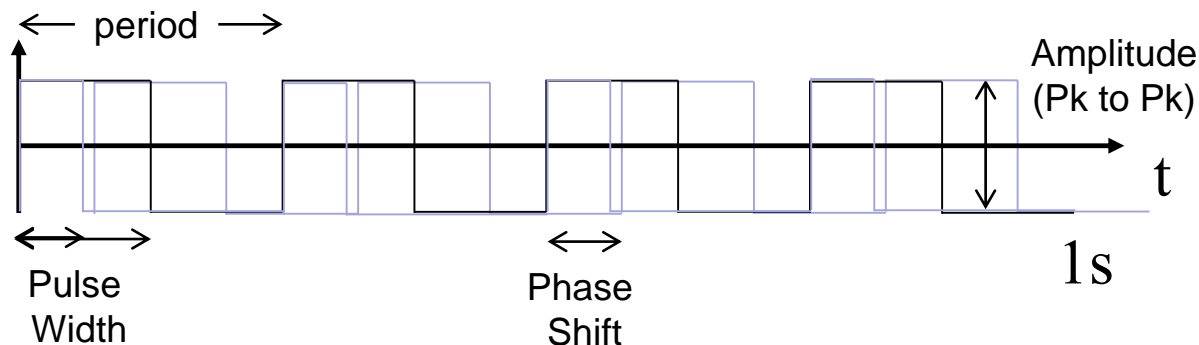
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Signal Analysis - Recap

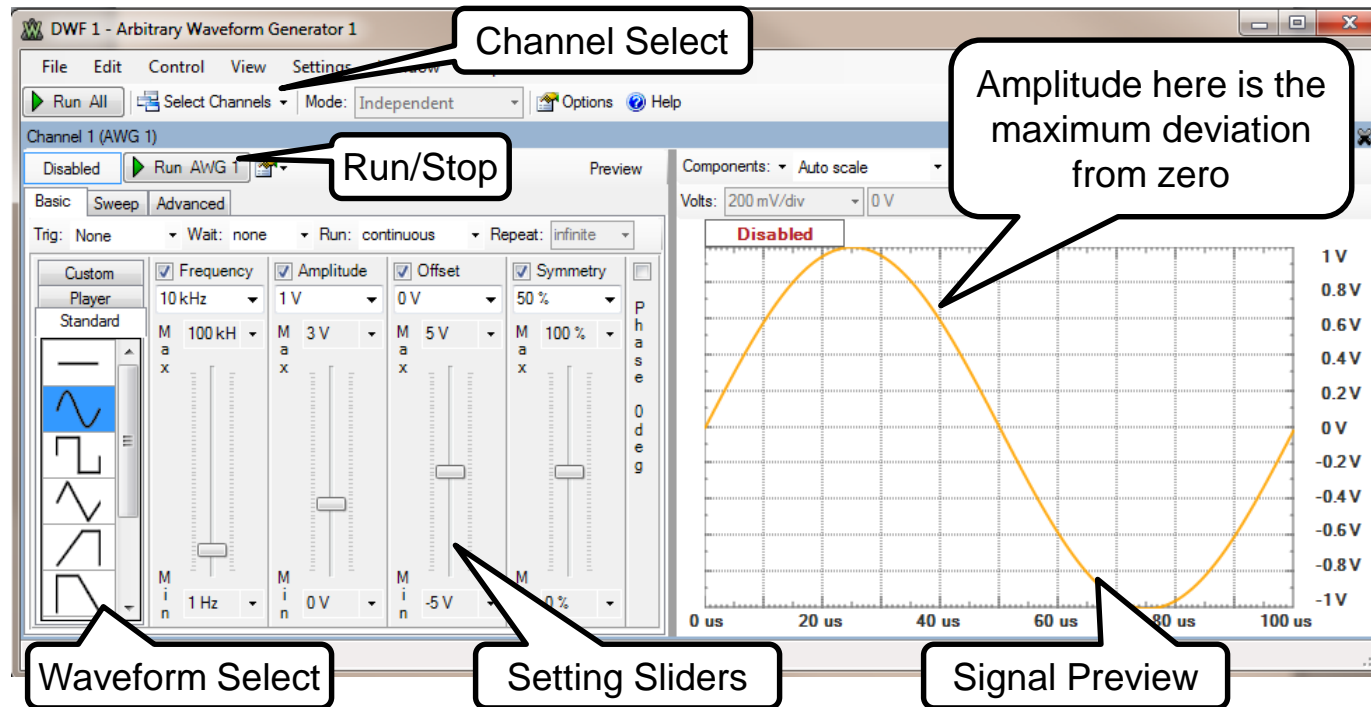
- Draw 3 more periods of the square wave
- What is the frequency of this waveform?
- Label the amplitude
- Label the pulse width
- What is the duty cycle of this square wave?
- Draw another signal with 25% duty cycle
- Draw another signal with a phase shift



Signal Generation



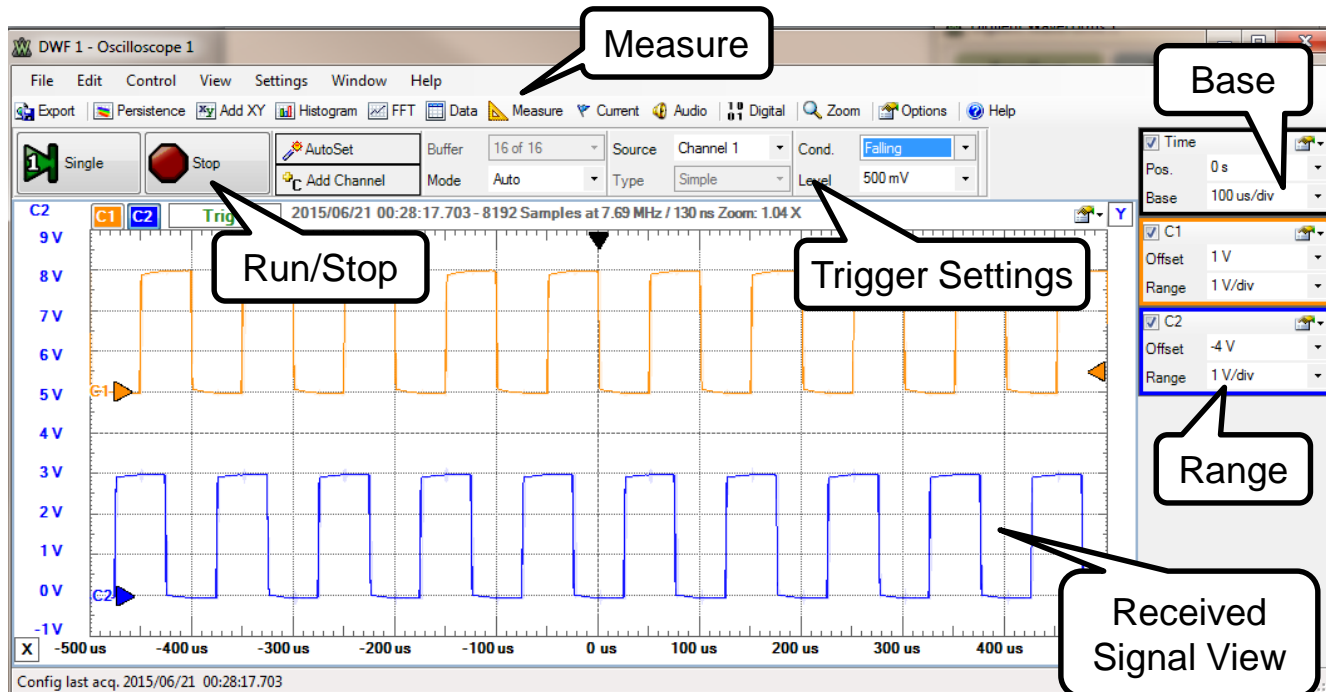
Function Generator



Signal Observation

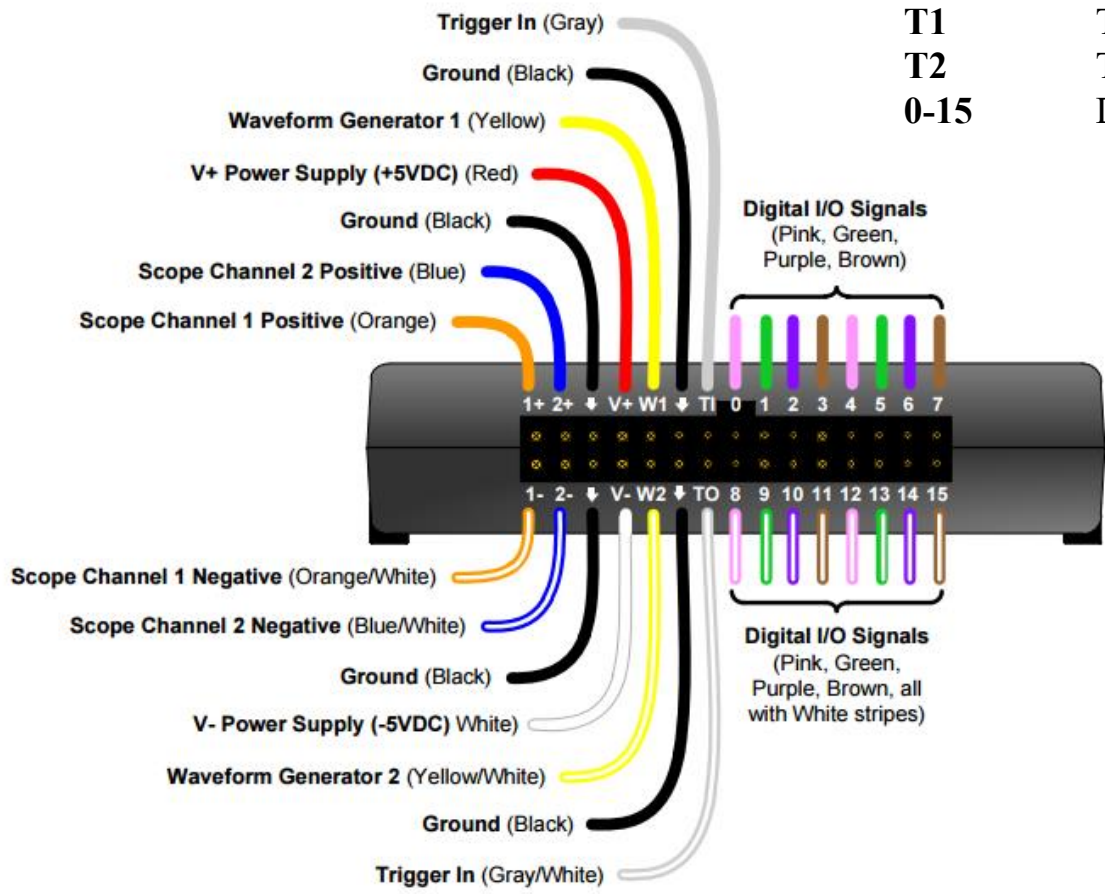


Oscilloscope



AD Board Pinout

- 1+/- Analog Input 1 (Oscilloscope and Voltmeter)
- 2+/- Analog Input 2 (Oscilloscope and Voltmeter)
- ↓ Ground
- V+/- 5V DC Supply
- W1 Analog Output 1 (Waveform Generator)
- W2 Analog Output 2 (Waveform Generator)
- T1 Trigger 1
- T2 Trigger 2
- 0-15 Digital Input and Output

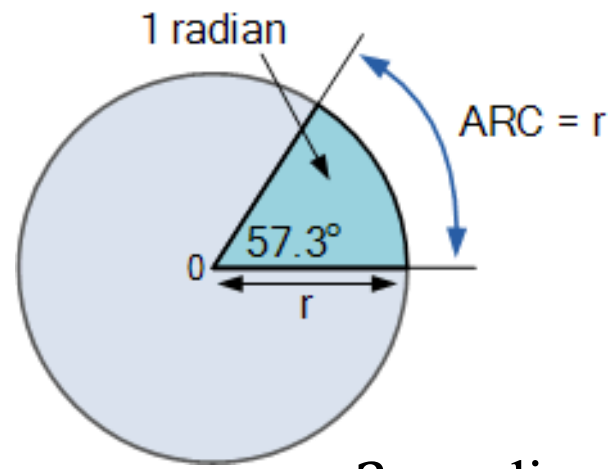
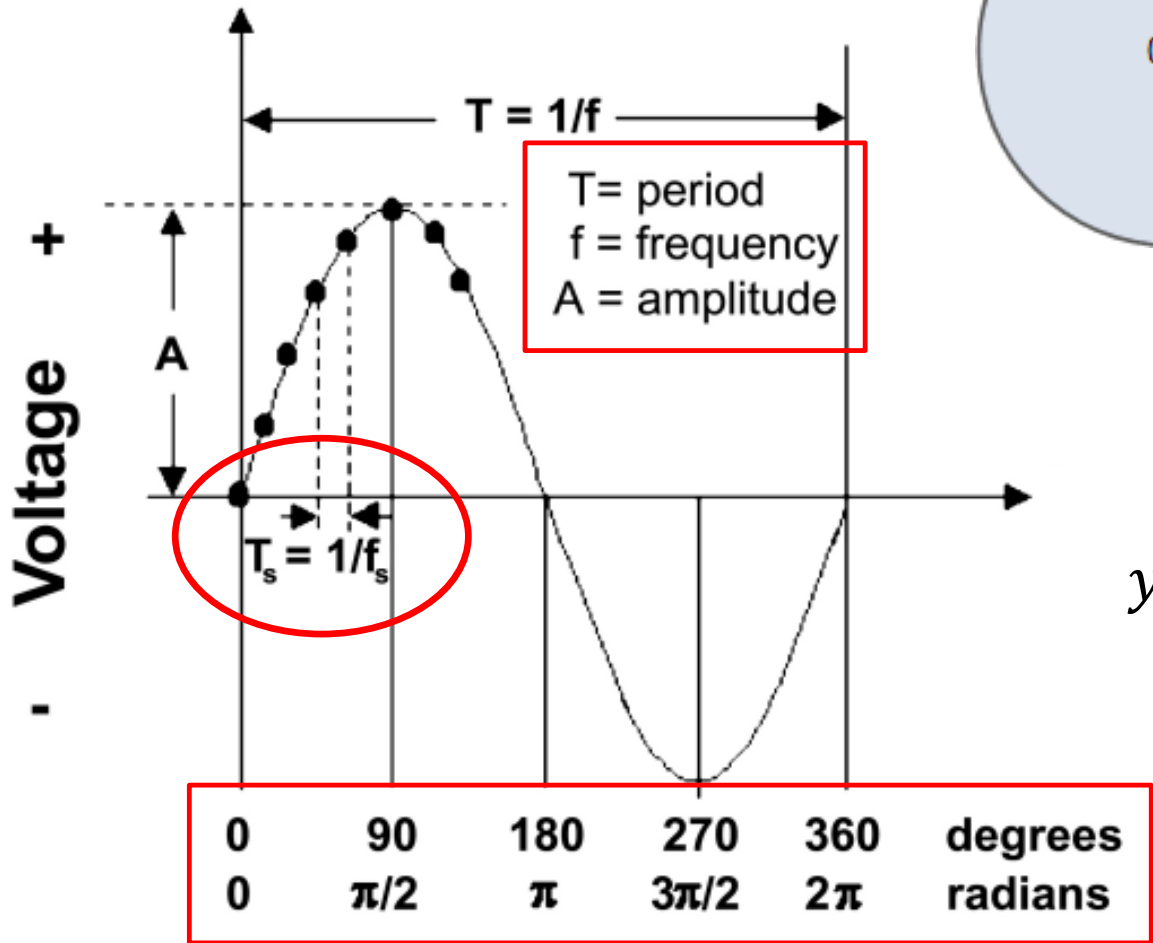


Experiment II

- WaveForms Signal Generation
 - Function Generator (i.e., waveform generator)
 - Oscilloscope
- NOTES
 - *Connect the output of one analog discovery to the input of another*
 - *Take screen shots of your work! (PrtSc, then paste in paint)*

Analog Signals

Oscillating Sine Wave



2π radians = 360°

$y(t) = A \sin(2\pi ft + \varphi)$

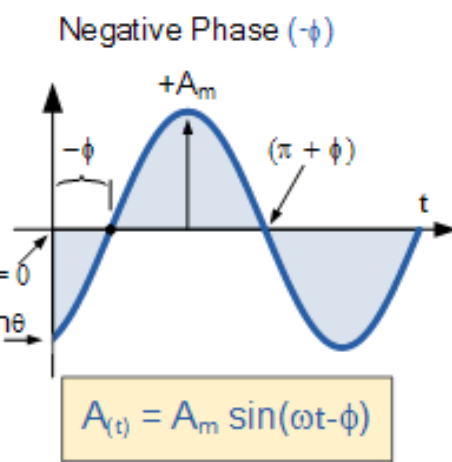
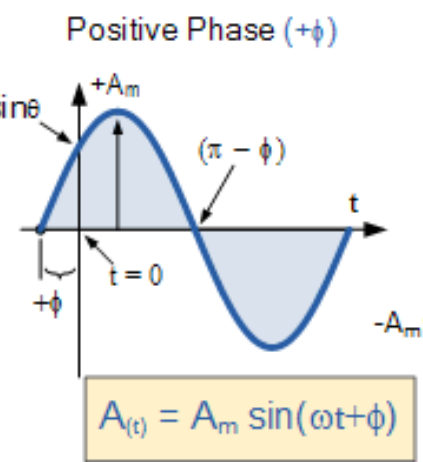
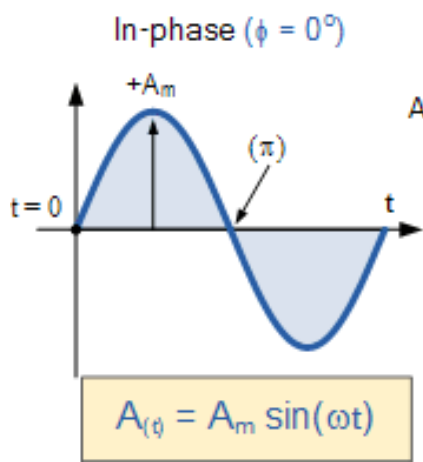
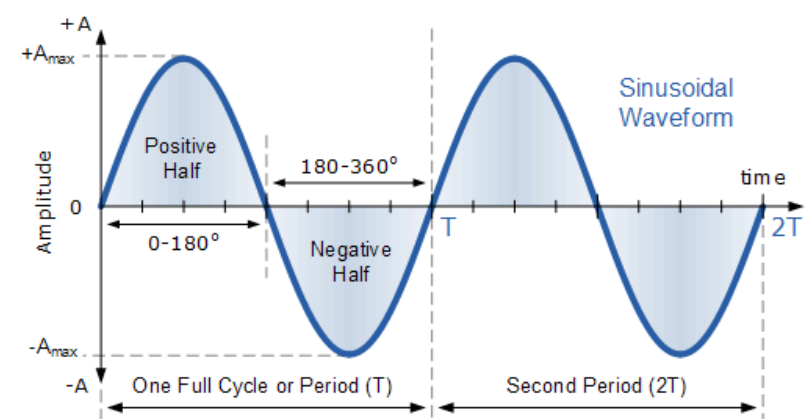
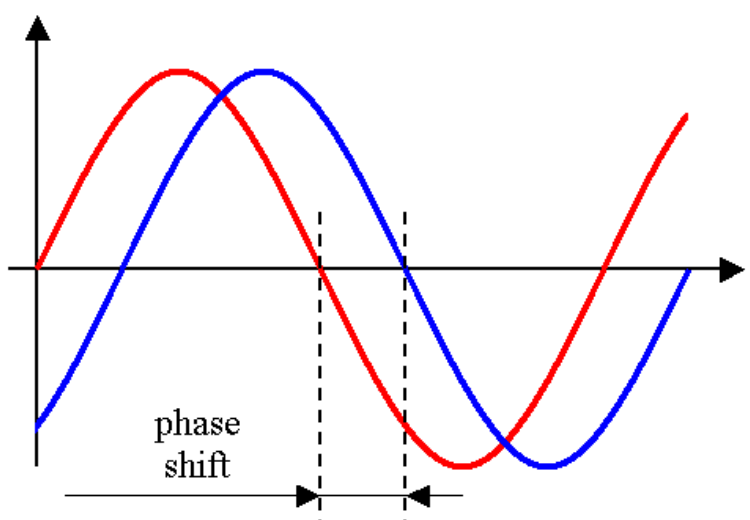
$\omega = 2\pi f$

$y[n] = A \sin(\omega n + \varphi)$

Analog Signals

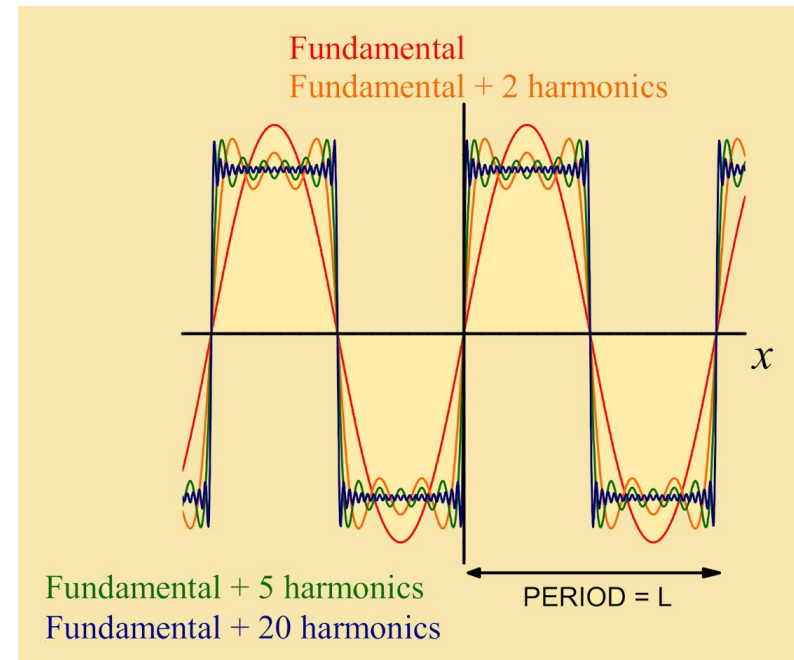
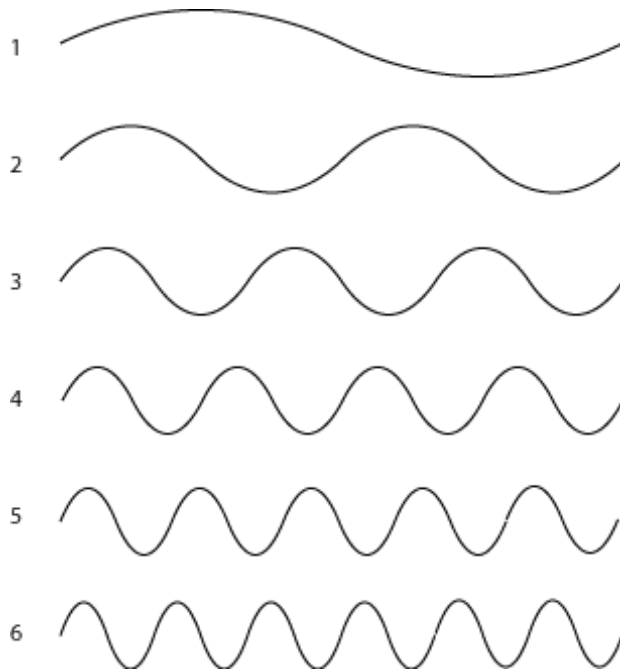
Example: Sine Wave

$$y(t) = A \sin(\omega t + \phi)$$



Frequency Domain Analysis

- Sine waves generate a “pure” frequency
 - Time domain signals have a frequency domain representation and can be generated with a combination of sine waves
- Harmonics
 - Integer multiples of a signals fundamental frequency



Experiment III

- Arbitrary Waveform Generator (AWG)
 - Standard signals are a subset of potential AWG signals!
- Spectrum Analyzer

- NOTES
 - *When you connect the headphones, be careful! It might be very loud. Run the AWG BEFORE putting your headphones on.*

Recap

- References:
 - <http://www.physicsclassroom.com/>
 - <http://www.allaboutcircuits.com/>

- What did you **LEARN** today?

