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XY Display Mode Example

The XY time mode converts the oscilloscope from a volts-versus-time display to a volts-versus-volts display using two input channels. Channel 1 is the X-axis input, channel 2 is the Y-axis input. You can use various transducers so the display could show strain versus displacement, flow versus pressure, volts versus current, or voltage versus frequency.

This exercise shows a common use of the XY display mode by measuring the phase difference between two signals of the same frequency with the Lissajous method.

1. Connect a sine wave signal to channel 1, and a sine wave signal of the same frequency but out of phase to channel 2.

2. Press the **[Auto Scale]** key, press the **[Acquire]** key; then, press Time Mode and select "XY".

3. Center the signal on the display with the channel 1 and 2 position (⬍) knobs. Use the channel 1 and 2 volts/div knobs and the channel 1 and 2 Fine softkeys to expand the signal for convenient viewing.

   The phase difference angle (θ) can be calculated using the following formula (assuming the amplitude is the same on both channels):

   $$\sin\theta = \frac{A}{B} \, or \, \frac{C}{D}$$

Measuring phase difference	Signals 90 degrees out of phase	Signals in phase
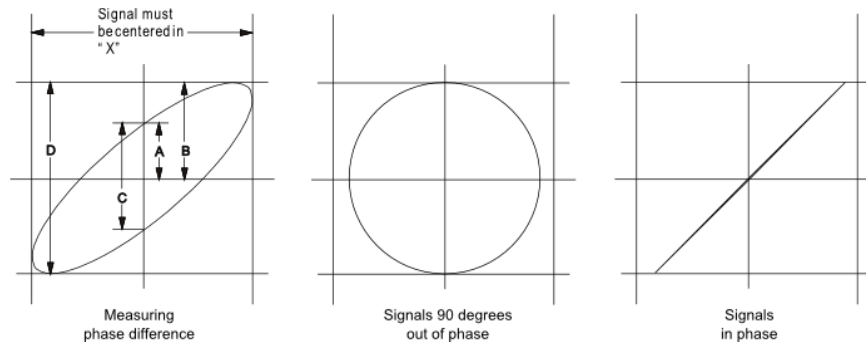
4. Press the **[Cursors]** key.

5. Set the Y2 cursor to the top of the signal, and set Y1 to the bottom of the signal.

   Note the ΔY value at the bottom of the display. In this example, we are using the Y cursors, but you could have used the X cursors instead.

6. Move the Y1 and Y2 cursors to the intersection of the signal and the Y axis. Again, note the ΔY value.

7. Calculate the phase difference using the formula below.

   For example, if the first ΔY value is 2.297 and the second ΔY value is 1.319:

$$\sin\theta = \frac{\text{second } \varDelta\, Y}{\text{first } \varDelta\, Y} = \frac{1.319}{2.297};\ \theta = 35.05 \text{ degrees of phase shift}$$

NOTE: Z-Axis Input in XY Display Mode (Blanking)
When you select the XY display mode, the time base is turned off. Channel 1 is the X-axis input, channel 2 is the Y-axis input, and the EXT TRIG IN is the Z-axis input.
If you only want to see portions of the Y versus X display, use the Z-axis input. Z-axis turns the trace on and off (analog oscilloscopes called this Z-axis blanking because it turned the beam on and off). When Z is low (<1.4 V), Y versus X is displayed; when Z is high (>1.4 V), the trace is turned off.

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