

# 256-PLL/D Synchro Check Relay

The 256-PLL/D is a synchronism check relay. It compares the BUS and GEN voltage signals to ensure they are closely matched with respect to volts and phase angle before a breaker can be closed.

The product monitors the Bus and Gen inputs, and continuously compares the instantaneous voltage. The difference in Voltage at any moment in time can be effected by phase angle shift or actual difference in Voltage. A frequency difference is effectively a phase shift. The PLL/D looks for the maximum difference between the two waveforms.

Since this product will detect differences due to voltage or phase angle independently, it can be quite complicated to accurately work out the trip setting. Both conditions behave in a non-linear fashion, and the following examples are intended to demonstrate these relationships.

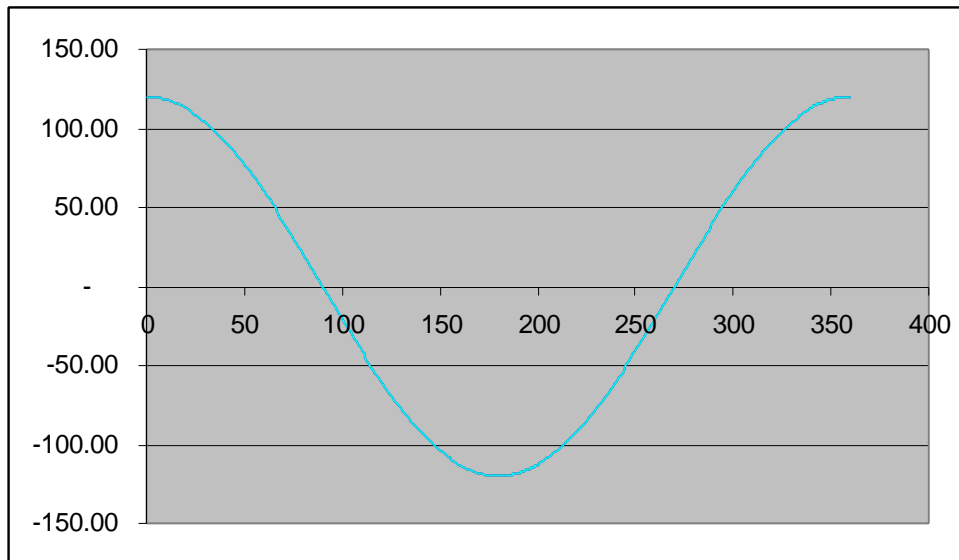
## Example 1

The BUS and GEN inputs are identical in Voltage, frequency and phase angle. The two sinewaves are superimposed, and cancel out, so the difference is zero.

$V_{BUS} = 120V$

$V_{GEN} = 120V$  Angle = 0 degrees

The maximum Difference = 0%



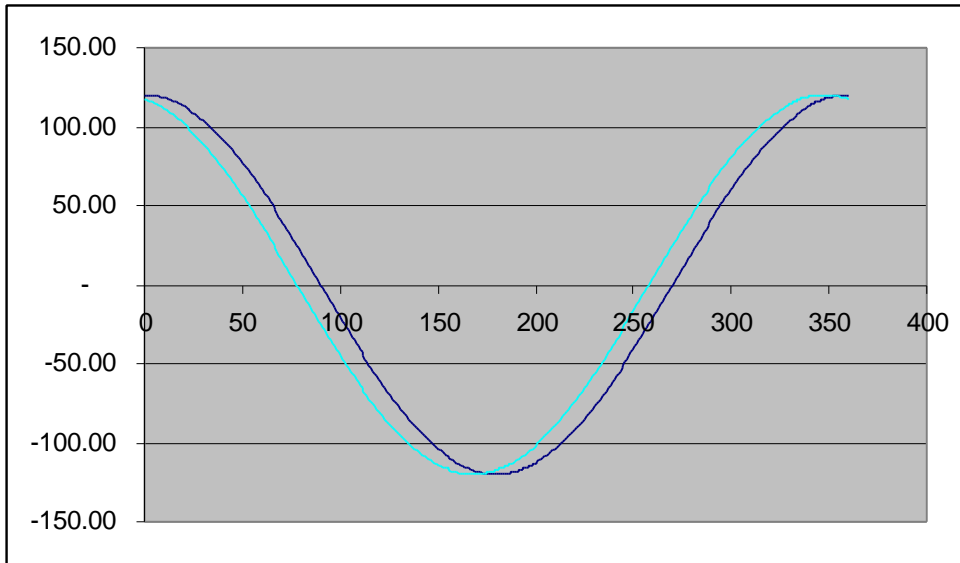
## Example 2

With the BUS and GEN inputs still identical in Voltage, a small phase angle difference is introduced. This offsets one sinewave, so the PLL/D measures the maximum difference between the waveforms.

VBUS = 120V

VGEN = 120V Angle = 12 degrees

The maximum Difference = 20%



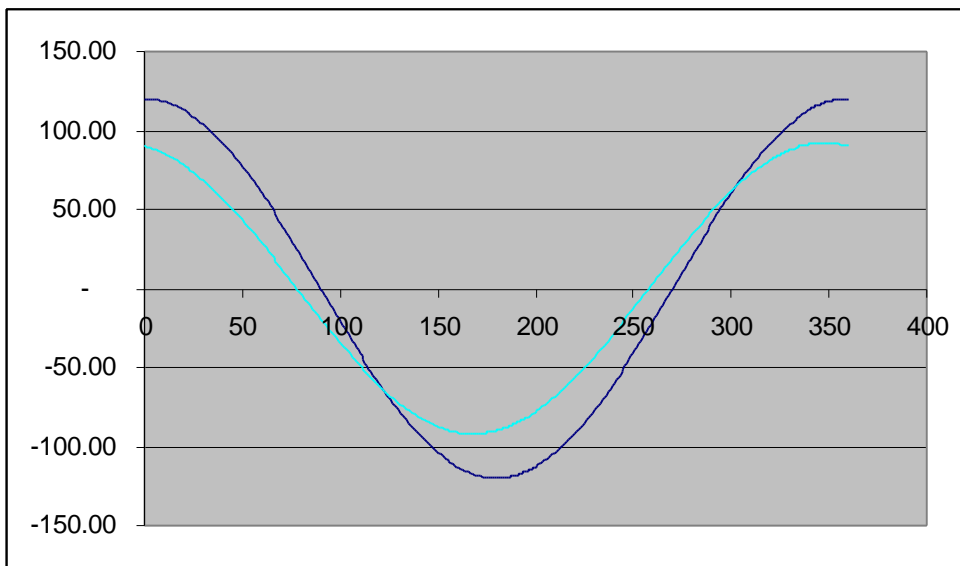
### Example 3

Keeping the phase shift at 12 degrees, now look at the maximum difference when the Voltage is also changed. This offsets one sinewave even more, so the PLL/D measures the maximum difference between the waveforms.

VBUS = 120V

VGEN = 92V Angle = 12 degrees

The maximum Difference = 30%



#### Example 4

Now remove the phase shift, and look at the effect that the voltage difference had on the waveforms.

$V_{BUS} = 120V$

$V_{GEN} = 92V$  Angle = 0 degrees

The maximum Difference = 23%

