

## Synchronizing Outputs with a Rigol DG4000 Series Arbitrary Waveform Generator

The Rigol DG4000 series of arbitrary waveform generators can be used to create and source many different types of waveforms. They feature sine, square, ramp, and pulse waveforms as well as the ability to create arbitrary waveforms. This can be useful when testing the limitations or to ensure normal operation of a design.

In some instances, you may need to synchronize both outputs of the DG4000. In this application note, we are going to describe how to use the coupling and DDS Hold features of the DG4000 series to synchronize the outputs. This will link each channel together. The amplitudes and phases of each channel will change simultaneously.

### Initial Setup

First, we'll start at factory default settings to make configuration steps repeatable. You can reset the factory defaults by pressing the green Preset Key on the front panel.



Alternately, you can set the PowerOn selection to Default by pressing Utility > System > PowerOn = Default and then power cycle the instrument.

Now that the instrument is in factory defaults, we can begin to configure the instrument for channel synchronization.

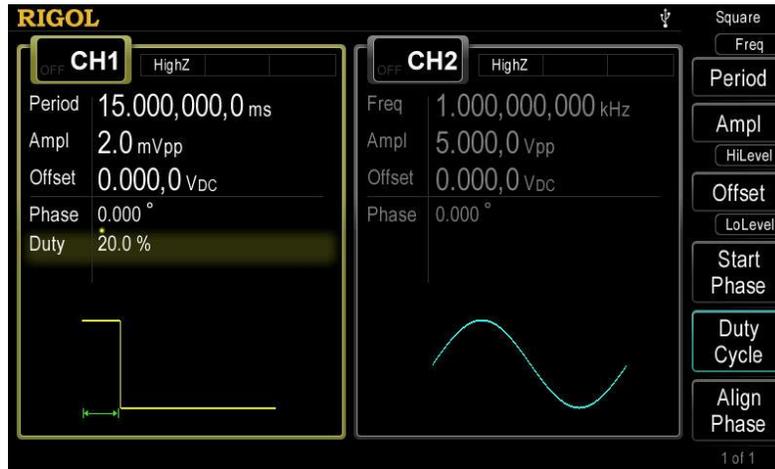
### Using Channel Copy

Channel copy enables you to copy the characteristics of one channel of the generator and apply those settings to the other channel. In this example, we are going to configure a square wave with a total period of 15ms and then set the duty cycle to a minimum to create a short pulse.

1. Press CH1 to select channel 1



2. Press Freq/Period to toggle to Period. This shows the time duration of each period of the desired waveform.
3. Set the amplitude to 2mV by pressing Ampl and set the amplitude to 2mV. This is the minimum voltage value.
4. Set the Duty cycle for your application.



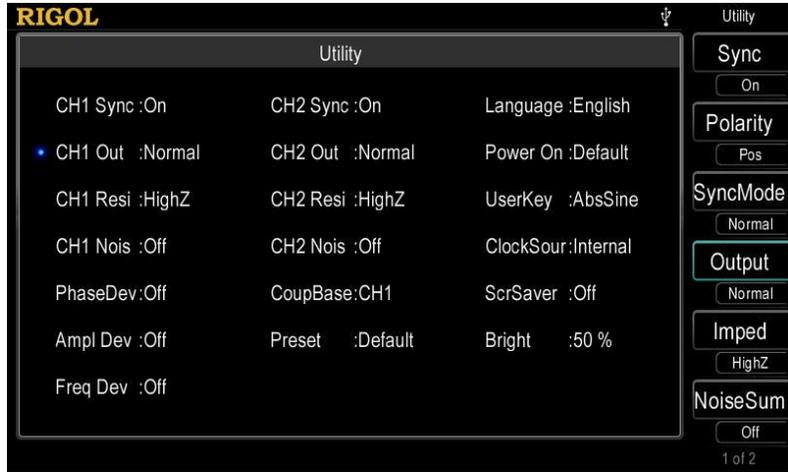
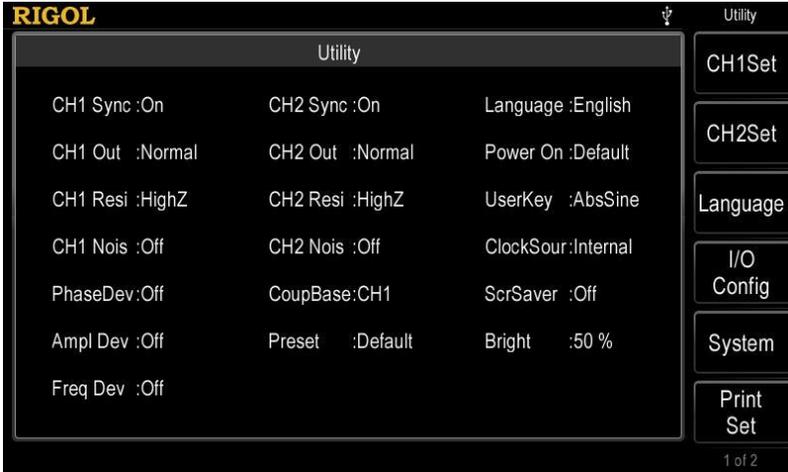
5. Press the Channel Copy key located between CH1 and CH2. Channel 2 should now have the same waveform type, period, amplitude, and duty cycle as channel 1.



### Enable DDS Hold

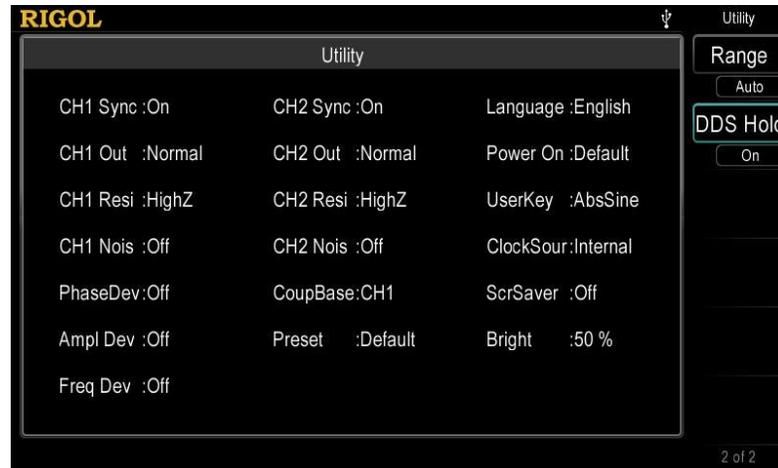
DDS Hold will link the phase alignment of the channels, even after cycling the output of either channel. In this way, you can be confident that the outputs will stay in phase alignment, even if you cycle the output state of an individual channel.

1. Press Utility > CH1 Set



2. Press Down Arrow to get to page 2/2

- Set DDS Hold to ON



- Back Arrow to get out of that menu

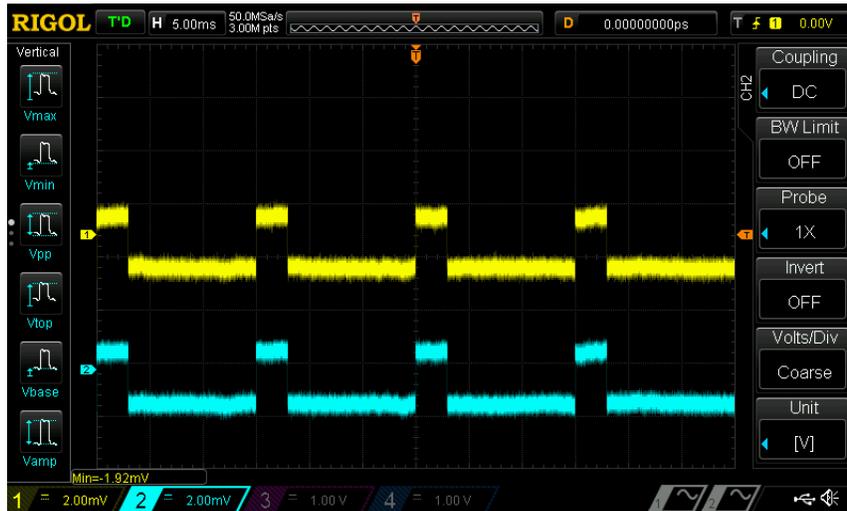


- Select CH2 Set
- Press Down Arrow to get to page 2/2
- Set DDS Hold to ON
- Connect the outputs to an oscilloscope and configure the oscilloscope to capture the signals
- Enable the output of CH1 and CH2 by pressing the Output1 and Output2 buttons



10. Align the phases by pressing CH1 and then press Align Phase

Now, the channels are phase locked. You can enable each channel output and the phases will align.



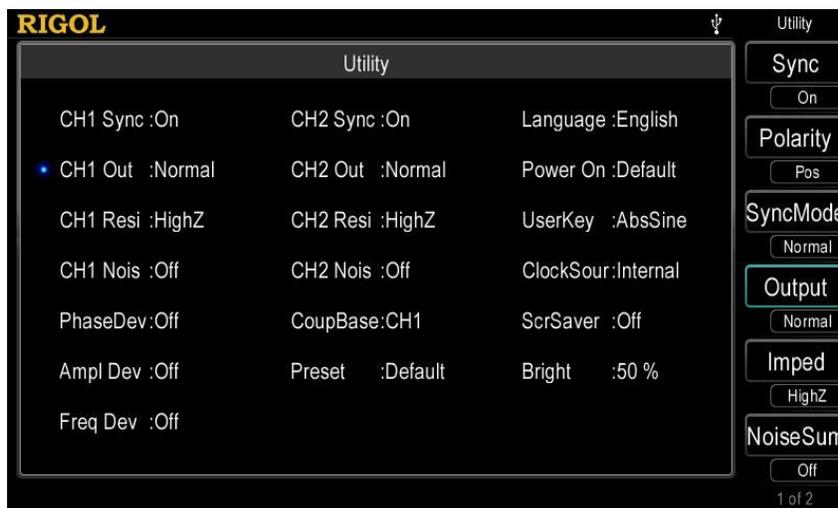
**NOTE:** If the instrument is power cycled, you will need to enable the outputs and perform the phase alignment once to ensure that the phases are aligned.

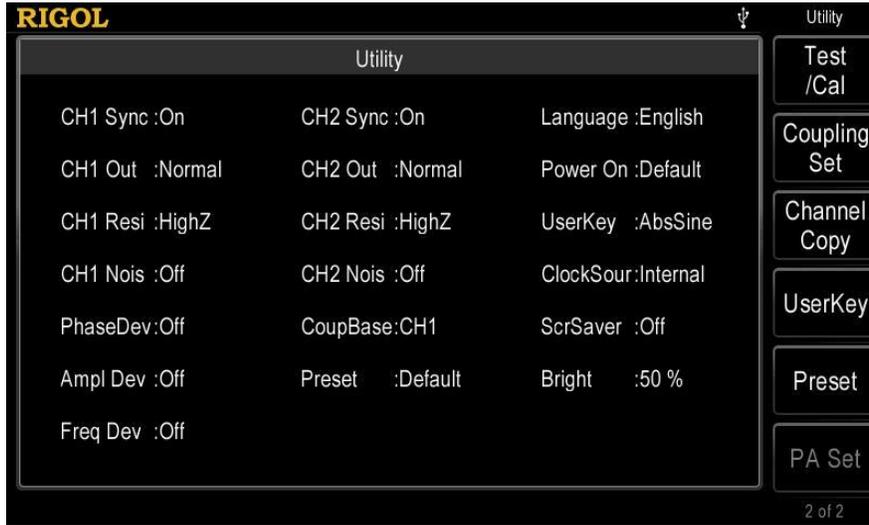
### Enable Channel Coupling

The Channel Coupling feature links the amplitude, frequency, and phase adjustments between channels. For example, if you activate amplitude coupling, any amplitude changes for channel 1 will simultaneously apply to channel 2.

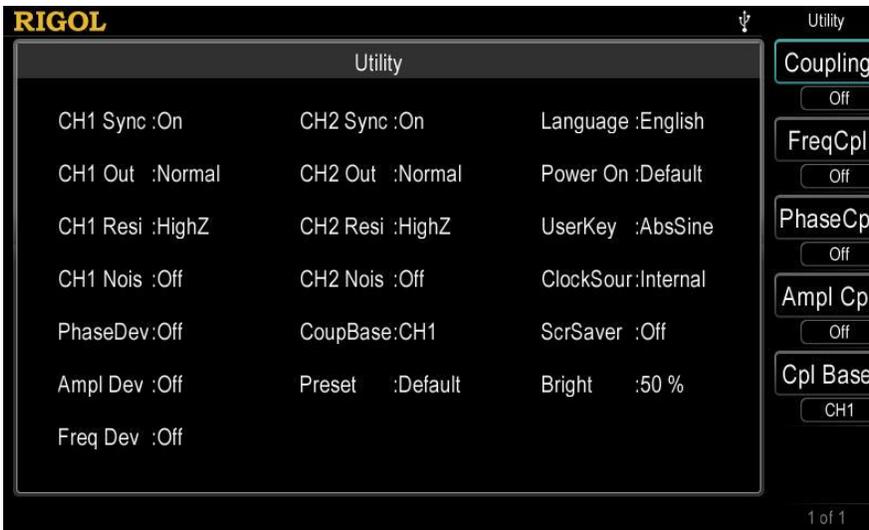
**NOTE:** Channel coupling is only available with sine, square, and ramp waveforms.

1. Press Utility > Down arrow to page 2/2 and select Coupling Set

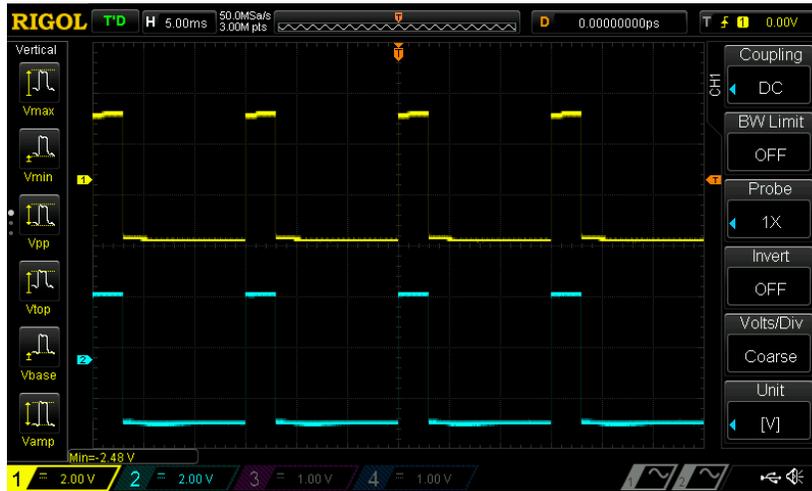




2. Set Ampl Cpl (amplitude coupling) ON. Now, any changes to CH1 amplitude will apply to CH2 simultaneously.



You can set the amplitude of CH1 to 2mV at the start of your testing. This is effectively 0V output for most applications and will set both CH1 and CH2 to a very low voltage.



When you want to apply a higher voltage, simply select CH1 Amplitude and set it to the new value. Once you have selected the new amplitude, both outputs will go to the new value simultaneously.

Find more information online [DG4000 Family Information page](#)

For more information on our waveform generators or other products please go to [rigolna.com](http://rigolna.com) or contact us directly at [applications@rigoltech.com](mailto:applications@rigoltech.com) or call us toll free at 877-4-RIGOL-1.

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