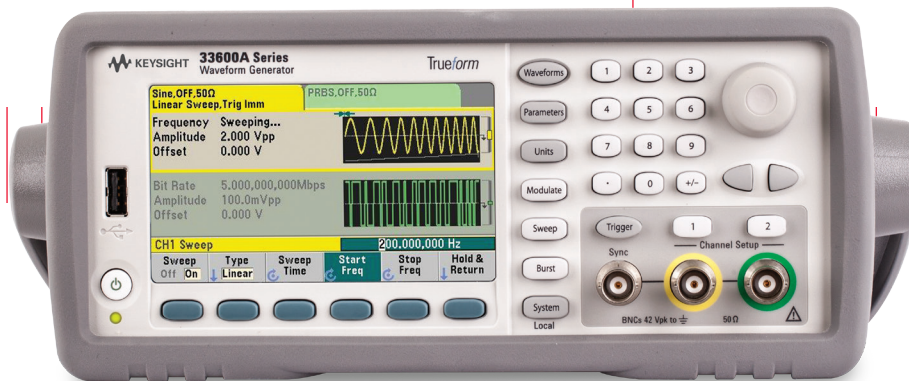


Keysight Technologies

Effortlessly Couple or Synchronize Two Signals on a Waveform Generator

Application Brief



Effortlessly Couple or Synchronize Two Signals on a Waveform Generator

Test challenge examples:

- IQ modulation testing
- Provide a stimulus for device and trigger signals
- Simulating a differential pair signal
- Creating a frequency relationship on two signals

How Trueform technology can help:

- Dual channels
- Easy frequency coupling
- Easy amplitude coupling
- Match or mirror signals between two channels

It can be challenging for engineers to couple two signals together with a phase, amplitude or frequency relation. They need to ensure that if the parameter changes it changes on both signals. While the two signals by themselves might be simple, the act of keeping track of both of them is incredibly tedious. Dual-channel Trueform waveform generators now make keeping track of two signals much simpler. Using these waveform generators, coupling your signals together has never been easier or more accurate.

See our test challenges below to learn how Trueform waveform generators can help you effortlessly couple or synchronize two signals:

IQ modulation testing

You need to generate an I/Q signal to test your RF component or system design such as a converter or signal conditioning system. The testing involves qualifying a number of parameters such as IQ gain imbalance, frequency response or quadrature error. You would like to generate the signal easily, without a significant financial investment and with a short learning curve. Two-channel Trueform waveform generators with up to 120-MHz bandwidth can easily simulate I/Q signals thanks to their built-in coupling features and incredible jitter performance. Optional I/Q generation software for the waveform generators now makes it even easier to go from simulation to signal generation output.

Simulating a a differential pair signal

Generating a differential pair signal from a waveform generator isn't intuitive. With differential signals, you want to create complimentary signals to carry your data, which helps reject noise from external interference. Waveform generator outputs, on the other hand, are configured to be a referenced signal with a single wire and a reference for the return path. Two-channel Trueform waveform generators can be easily configured to output differential signals. Creating complimentary signals or matching signals is a single setting with the Trueform Series waveform generators. With 14-bit amplitude resolution, signals now have enough accuracy to simulate your real world outputs.

Provide a stimulus for device and trigger signals

If you're testing a semiconductor (e.g., an RFID receiver IC) you need a trigger signal to initiate your test. You must be able to generate a test signal and trigger at the same time. Waveform generators, with their amplitude adjustment feature, variable trigger widths and signal delays, are ideal for this task. With the dual-channel synchronization and phase matching available in the Trueform waveform generators, generating stimulus and trigger signals is now simpler than ever.

Creating a frequency relationship on two signals

You want to generate two clock signals where the clock frequency of one signal is a fraction of the other's frequency. You could do this with two separate waveform generators, but if you want to vary the frequencies while keeping the signals' frequency relationship in sync, you would need large amounts of manual work or programming. With the Trueform waveform generators' dual-channel operation modes, keeping two signals coupled together is easy and will save you development time. With up to 120-MHz bandwidth, the Trueform waveform generators can help you tests your components from design validation through production testing.

Phase synchronization or a 90-degree relationship for IQ signals

If timing between two channels is important to you then being able to control the phase between two channels is essential. In the previous stimulus and trigger example, the key factor was the time synchronization of the trigger and stimulus signals. If you use the normal built-in functions (e.g., sine wave, square wave, pulse, triangle, or PRBS) on both channels you can easily synchronize the channels by going to the parameters button > phase > then sync internal. This will start both channels at the same time. You simply change the phase to obtain different delays between the two channels.

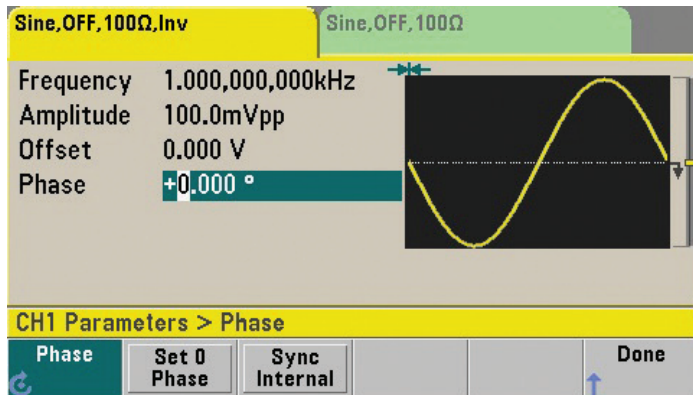


Figure 1. 33600A Series' menu for internal phase sync.

Similarly, for custom IQ signals, you will want to keep a 90-degree relationship between your I and Q channels. To accomplish this you simply set the signals to initiate at the same time and then load both arbs onto channel 1 and 2. Finally, go to the parameters menu and press the SYNC ARBS button (on the second page of buttons).

With the 33600A Series Trueform waveform generators, you can even change the units for the phase parameter. All that's required is to go to the units menu and choose phase, which gives you a choice of degrees, radians, seconds, or sample (for arbs).

Measurement tip:

IQ signal generation has now been made even easier with the IQP option for Trueform waveform generators. This IQ signal player option configures and controls both channels as if they were a single channel. It also keeps the phase of each channel in nominal IQ range. For more details, refer to: *Simplify the Generation of High Quality IQ Signals* (pub no. 5991-1048EN).

Easy creation of differential signals

Trueform waveform generators make it easy to mirror two signals to create a differential signal. You simply use the inverted tracking capability that is available when the unit is in dual-channel operation mode. This mode forces channel 2 to be a mirror image of the signal from channel 1, which is exactly what you need for a differential signal. Once you have this enabled mode, all you need to do is set up your signal on channel 1 and it will be inverted on channel 2 to create your differential signal. For more information, refer to: *Creating a Differential Signal with a Waveform Generator* (pub no. 5991-3992EN)

Frequency and amplitude coupling

Frequency coupling allows you to specify that one channel's frequency is related to the other channel's frequency either by a ratio (multiplying) or an offset (adding). To access this setting, you simply press the channel output key above either channel's output connector. Then, press More > Dual Channel on the soft-key menu. Enabling this feature and setting the offset or ratio will save you configuration time. Rather than setting it for both channels, the Trueform waveform generator will keep track of your settings for you. In other words, changing channel 2's frequency will change channel 1's frequency to maintain the specified offset or ratio.

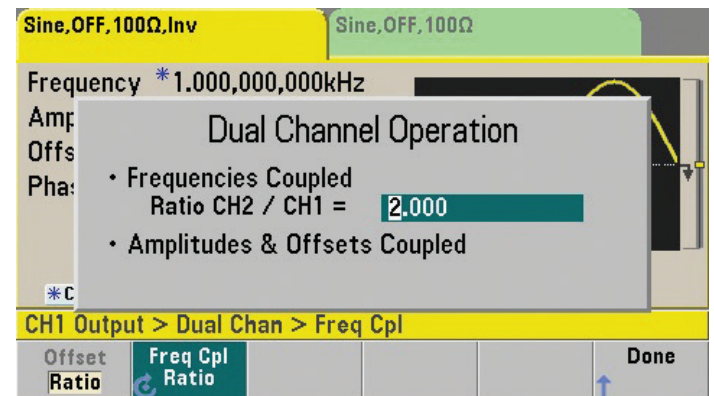


Figure 2. Frequency coupling with the generator in dual-channel operation mode.

Similarly, amplitude coupling ensures that the amplitudes and offsets on both channels are the same, even if you make amplitude changes on only one channel.

Summary

Using a two-channel Trueform waveform generator enables fast simulation of your signals. Whether you want to create an IQ signal, differential signal, or have a relationship between two channels, the Trueform waveform generators provide the ideal solution. Using them, the signal generation process has never been simpler, quicker or less frustrating.



See the *Trueform* waveform generator test challenge web site for additional topics such as:

- Generating a waveform with many points
- Simulating signals with the highest integrity
- Using a waveform generator to generate a PRBS signal
- Creating a differential signal with a waveform generator
- Be more efficient designing and using your arbitrary waveforms

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