

Captured RF Signal Playback on the TSG4100A using the AFG31000

APPLICATION NOTE



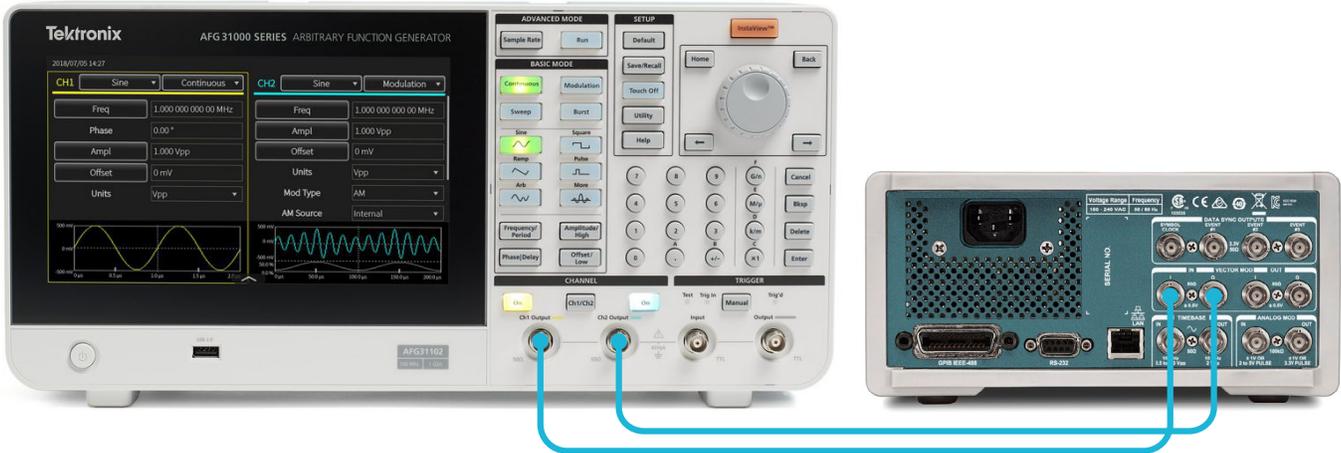
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The [TSG4100A family of Vector Signal Generators](#) have an option for using external IQ signals (Options VM00+EIQ) which can provide >200MHz of RF modulation bandwidth for carrier frequencies above 400MHz. This application note describes how to use the RF signal captured using an RSA, along with the SourceXpress application to format the baseband IQ signals, and then how-to setup the [AFG31000 Arbitrary Function Generator](#) to drive the IQ inputs on the TSG.

Hardware Connections

Connect the AFG31000 channel 1 and 2 outputs to the TSG4100A External I and Q inputs respectively.



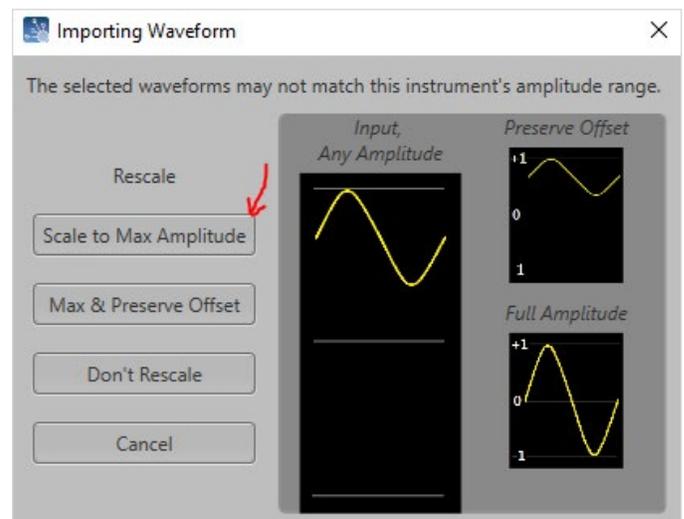
Step by Step Procedure

RF Signal Capture on the RSA

Any of the Tektronix RSA Realtime Spectrum Analyzers can be setup to record an RF signal of interest. The specific setup of the RSA to acquire the signal will depend on the type of signal being acquired (signal frequency, bandwidth and duration, and the necessary trigger configuration to target the signal of interest). Be sure to take note of the IQ sample rate (shown in the Setup>Acquire tab).

Waveform Import

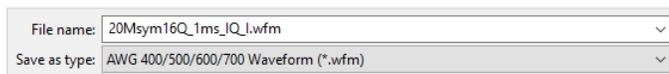
Using SourceXpress, use the File>Open function to read the .TIQ file that was saved from the RSA. Hit the “Scale to Max Amplitude” to properly scale the imported IQ baseband data:



In the Waveform list, hit the down-arrow the left of the waveform name to expose the individual I and Q component waveforms.



Right-click on the “I” waveform, and select **Save As...** In the Save As.. dialog box, navigate to where you want to save the waveform, enter the desired filename, change the “Save as type” selection to **AWG400/500/600/700 Waveform (*.wfm)** type and then hit **Save**.

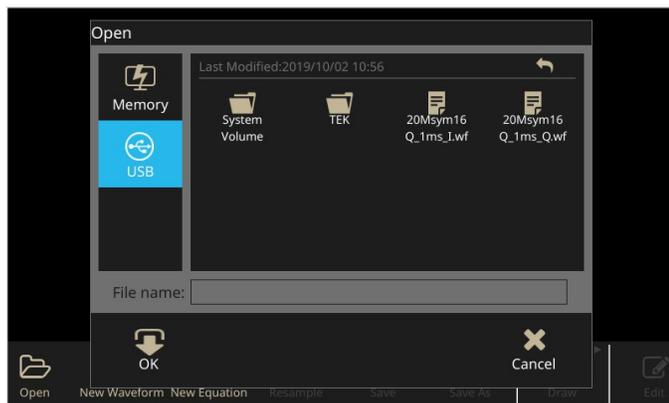


Repeat the above process for the “Q” waveform.

You now have the baseband I and Q waveforms that you'll use to drive the external I and Q inputs of the TSG4100A vector signal generator. Copy the .wfm files to a USB stick to transfer them to the AFG31000 Arbitrary Waveform Generator.

AFG31000 Setup

The ArbBuilder application in the AFG31000 is used to convert the .wfm files into the .tfwx file format used by the AFG. Hit the **Home** key, and select **ArbBuilder** on the touch-screen. Insert the USB stick into the AFG’s front panel USB port. Touch the **Open** icon, then touch the **USB** icon, and you'll see a list of files on the USB stick.



Touch the “I” waveform icon and touch **OK**.



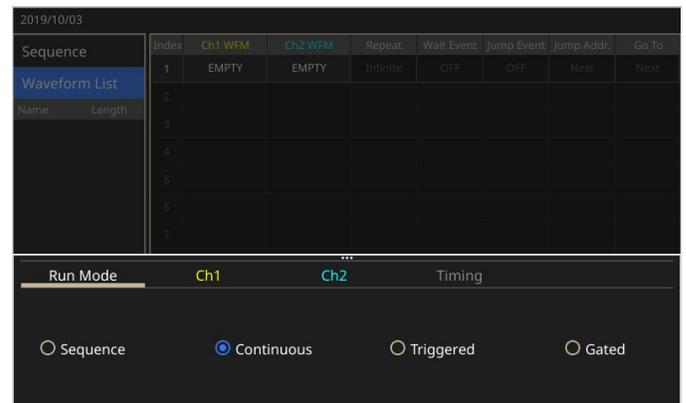
Touch the **Save As** icon, then choose a filename and location. You can save to internal memory or to the USB stick.

Repeat the above steps for the “Q” waveform.

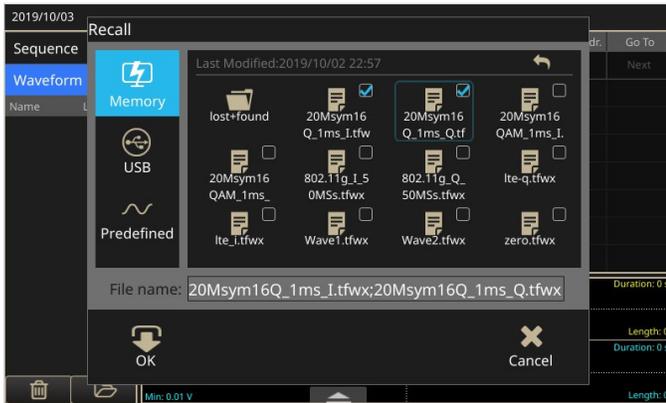
When completed, slide the ArbBuilder menu to the left and touch **Exit**.

Touch the **Advanced** icon on the screen to enter the advanced mode in the AFG31000. The advanced mode provides features typically only found in Arbitrary Waveform Generators, such as deep waveform memory, adjustable sample rate, waveform sequencing and more.

Slide your finger up through the bottom of the display to bring up the **Setting Bar** menu (if it isn't already displayed). Under the **Run Mode** tab, select either **Sequence** or **Continuous** (Continuous is used in this example). Slide the Setting bar back down to close it.

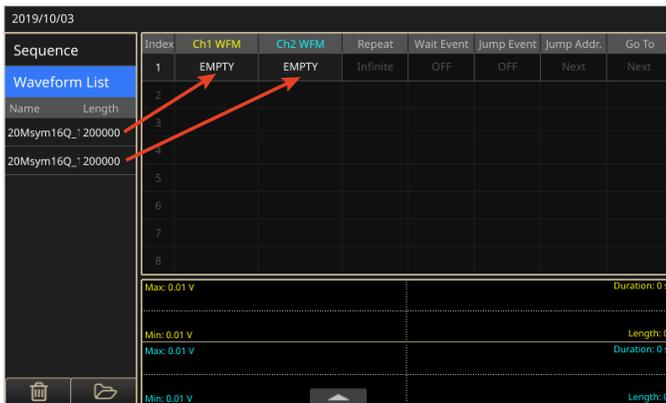


Touch the **File Open** icon (looks like an open folder) to bring up the file dialog box.



Touch the icons of the waveforms you wish to load into the waveform list (checkmarks will appear on those selected) and touch the **OK** icon. These waveforms will then be loaded into the waveform list.

Carefully drag the “I” waveform to the “EMPTY” slot under Ch1 WFM, and the “Q” waveform to the “EMPTY” slot under Ch2 WFM.



When loaded, the amplitude of the waveforms will likely be scaled to 2Vpp centered around 0V (+1 and -1V peaks). These need to be scaled down to about 1Vpp centered at 0V ($\pm 0.5V$ peak). To do this, re-open the **Settings Bar** menu, select Ch1 and change its **Scale** factor to 50%. The actual \pm Peak values, after scaling, will be shown. Repeat for Ch2.



The final setting is the **sample rate** for the waveforms. Touch the **Timing** tab and set the sample rate to the same value that was noted from the Setup>Acquire tab in the RSA before the TIQ file was saved.



To run these waveforms, hit the Ch1 and Ch2 “On” keys, then hit the **Run** key on the front panel. Note that any changes in the Settings Bar menu will only take effect after toggling the **Run** key off and on again.

TSG4100A Setup

Begin by selecting the Frequency and Amplitude of the desired RF output. Then hit the MOD key to bring up the Modulation menu. Under Mod Type, select Vector (the type of vector modulation doesn't matter).



Then select the **Source** key, and choose **Ext**.



To create the output, simply hit the **RF** and **Mod ON/OFF** keys (translucent). They will illuminate when active.

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