



Rigol DG5 4 Channel Arb Synchronization

Date: 12/21/2012

Solution: This document outlines the setup to synchronize the outputs of (2) Rigol DG5xx2 series of arbitrary waveform generators.

This will deliver 4 output channels that have a synchronized start point and is capable of utilizing an arb file of up to 128M points/each.

Equipment List:

- (2) Rigol DG5000 Series Arbitrary Waveform Generators
- (5) SMB Plug to SMB Plug cable assemblies (ideally 6” or less in length)
- (1) Custom breakout 1-to-3 board or box to fan out trigger signal from controlling DG5
- (4) BNC cable assemblies to connect to devices-under-test.
- Optional: PC running Rigol UltraSigma and Ultra Station software
- Optional: (2) USB cables for remote communications with DG5000s.
- Optional: (1) Oscilloscope with sufficient bandwidth to check signal fidelity.

Instrument description and configuration:

DG5xx2 (Unit 1): Dual channel arb. Main controller of test synchronization.

- Create arb file and send to DG5 using Ultra Station. Select channel nonvolatile memory to store.
- Create arb file for next channel and transfer to DG5 using Ultra Station.
- Can store arbfiles (.RAF extension) in nonvolatile memory but this takes 6+ hours.
- Set Clock to Internal (using internal oscillator)

DG5xx2 (Unit 1) Channel 1: Source output signal/main trigger output.

- Output impedance set to desired value
- Mode set to Arb
- Arb set to Play Mode (forces point-by-point)
- Sample Frequency (FsDiv) set to N ($N = 3$ – output sample of 250Msamp/s)
- Arb set to nonvolatile waveform of choice (Store/Recall)
- Burst > N type > $N = 1$
- Burst Source Manual Trigger
- Burst Slope Out Leading
- Use Channel 1 Burst Delay to aid in synchronization of pulse leading edges

DG5xx2 (Unit 1) Channel 2: Source output signal.

- Output impedance set to desired value
- Mode set to Arb
- Arb set to Play Mode (forces point-by-point)
- Sample Frequency (FsDiv) set to N ($N = 3$ – output sample of 250Msamp/s)
- Arb set to nonvolatile waveform of choice (Store/Recall)
- Burst > Ntype > $N = 1$
- Burst Source External
- Burst Slope In Leading
- Use Channel 2 Burst Delay to aid in synchronization of pulse leading edges



DG5xx2 (Unit 2): Dual channel arb. Tethered secondary output.

- Create arb file and send to DG5 using Ultra Station. Select channel nonvolatile memory to store.
- Create arb file for next channel and transfer to DG5 using Ultra Station.
- Can store arbfiles (.RAF extension) in nonvolatile memory but this takes 6+ hours.
- Set Clock to External to use external connection to 10MHz from DG 5 Unit1

DG5xx2 (Unit 2) Channel 1: Source output signal.

- Output impedance set to desired value
- Mode set to Arb
- Arb set to Play Mode (forces point-by-point)
- Sample Frequency (FsDiv) set to N (N = 3 – output sample of 250Msamp/s)
- Arb set to nonvolatile waveform of choice (Store/Recall)
- Burst > N type > N = 1
- Burst Source External
- Burst Slope In Leading
- Use Channel 1 Burst Delay to aid in synchronization of pulse leading edges

DG5xx2 (Unit 2) Channel 1: Source output signal.

- Output impedance set to desired value
- Mode set to Arb
- Arb set to Play Mode (forces point-by-point)
- Sample Frequency (FsDiv) set to N (N = 3 – output sample of 250Msamp/s)
- Arb set to nonvolatile waveform of choice (Store/Recall)
- Burst > N type > N = 1
- Burst Source External
- Burst Slope In Leading
- Use Channel 2 Burst Delay to aid in synchronization of pulse leading edges



Electrical Connections:

1. Qty 1 SMB plug to SMB plug cable assembly required. Shorter is better
DG5 Unit 1, 10MHz out to DG5 Unit 2 10MHz IN
2. Qty 3 SMB plug to SMB plug cable assemblies. Shorter is better. You will also need to build a small board to break out the Channel 1 trigger to the other three channels.
 - 1 cable - DG5 Unit 1 Trigger output to Unit 1 Channel 2 Trigger Input
 - 1 cable - DG5 Unit 1 Trigger output to Unit 2 Channel 1 Trigger Input
 - 1 cable - DG5 Unit 1 Trigger output to Unit 2 Channel 2 Trigger Input

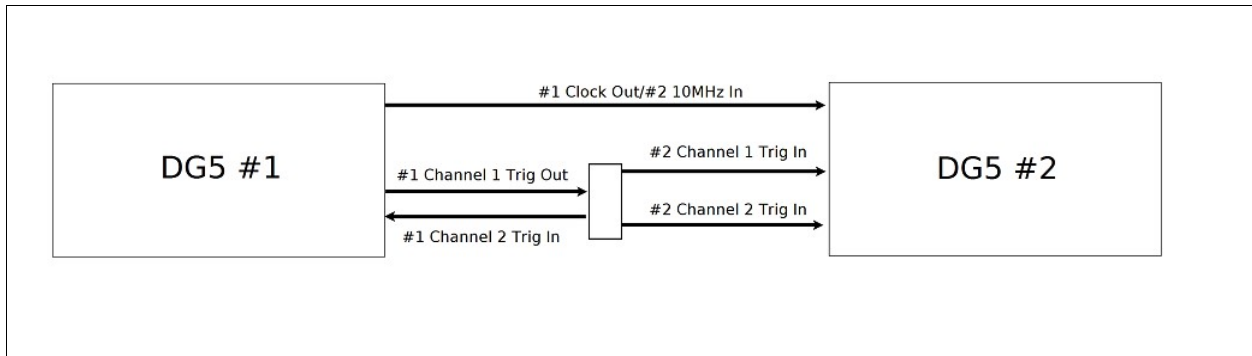


Figure 1: Wiring diagram

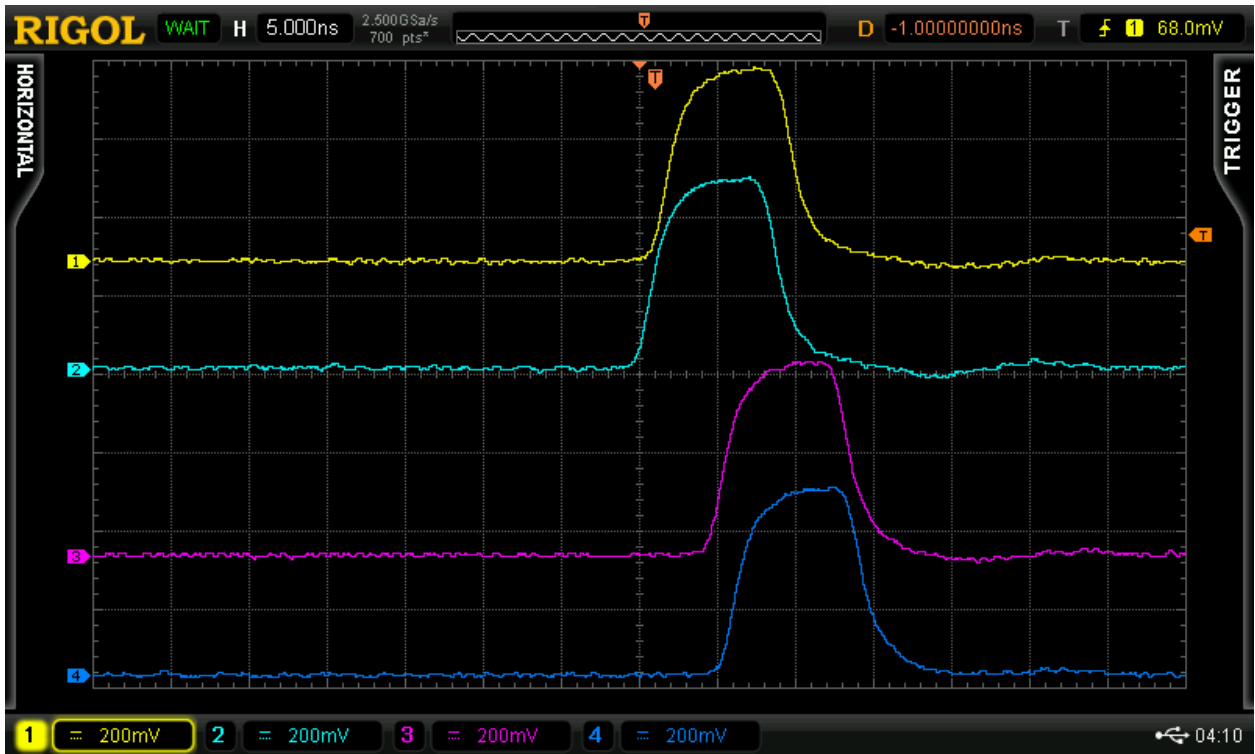


Figure 2: Screenshot of the four outputs after adjusting the delays. Note the sample rate in play mode is 125MSa/s. This equates to 8ns/point and leads to a +/- 8ns resolution on setting the waveform delay.



File Format: 128M point waveform files are large.. about 256M or more when saved as binary .RAF files and over 1GB when saved as a CSV file.

Here is a view of a CSV file opened using commercial software called Ultra Edit.

