

# 81150A Pulse Function Arbitrary Noise Generator



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Demo Guide

Version 1.0



When signal fidelity matters - test with confidence.



High precision pulse generator enhanced with a function, arbitrary and noise generator for:

Accurate and accelerated insight into your device through ideal and real-world signals

**81150A** Function  
Arbitrary  
Noise



Agilent Technologies

## The 81150A Pulse Function Arbitrary Noise Generator at a Glance

- 1  $\mu$ Hz–120 MHz pulse generation with variable rise/fall time
- 1  $\mu$ Hz–240 MHz sine waveform output
- 14-bit, 2 GSa/s arbitrary waveforms
- 512k samples deep arbitrary waveform memory per channel
- Pulse, sine, square, ramp, noise and arbitrary waveforms
- Noise, with an adjustable crest factor, and signal repetition time of 26 days
- FM, AM, PM, PWM, FSK modulation capabilities
- 1 or 2 channel, coupled and uncoupled
- Differential outputs
- Two selectable output amplifiers:
  - High bandwidth amplifier
    - Amplitude: 50 mVpp to 5 Vpp; 50  $\Omega$  into 50  $\Omega$
    - 100 mVpp to 10 Vpp; 50  $\Omega$  into open
    - Voltage window:  $\pm 5$  V; 50  $\Omega$  into 50  $\Omega$
    - $\pm 10$  V; 50  $\Omega$  into open
    - $\pm 9$  V; 5  $\Omega$  into 50  $\Omega$
  - High voltage amplifier
    - Amplitude: 100 mVpp to 10 Vpp; 50  $\Omega$  into 50  $\Omega$
    - 200 mVpp to 20 Vpp; 5  $\Omega$  into 50  $\Omega$  , or 50  $\Omega$  into open
    - Voltage window:  $\pm 10$  V; 50  $\Omega$  into 50  $\Omega$
    - $\pm 20$  V; 5  $\Omega$  into 50  $\Omega$  or 50  $\Omega$  into open
- Glitch free change of timing, parameters (delay, frequency, transition time, width, duty cycle)
- Programming language compatible with Agilent 81101A, 81104A, 81105A
- ISO 17025 and Z540 calibration

## Introduction

Agilent pulse generators are focused on high signal integrity to provide clear, stable and repetitive signals. This is required for all kinds of DUT development in R&D, followed by dedicated stress test with distorted and real world signals. A key and unique feature of the Agilent 81150A Pulse Function Arbitrary Noise Generator is to combine two independent output channels. There are two ways of doing this. Either couple the channels or add the channels together.

Required Equipment for this Lab:

1. 1x Agilent Pulse Function Arbitrary Noise Generator with two output channels (81150A incl. opt. #002)
2. 1x Agilent Oscilloscope DSO or MSO6104A incl. 4x BNC cables

How to hook up the instruments:

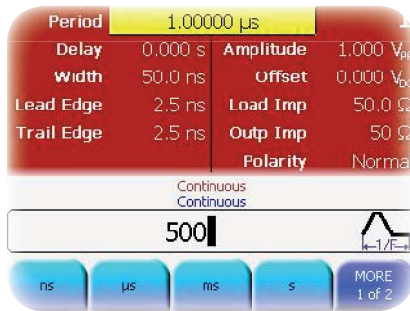
1. Connect 'OUTPUT 1' (81150A) to channel 1 (Scope)
2. Connect 'OUTPUT 2' (81150A) to channel 2 (Scope )
3. Connect 'STROBE OUT 2' (81150A) to Channel 3 (Scope )
4. Connect 'TRIGGER OUT 2' (81150A) to channel 4 (Scope)

### Coupling between channels:

In this lab it is shown how two channels can be coupled, so that the instrument behaves like a two-channel instrument with only one time-base. As a result of coupling, the output function and all other parameters like burst, sweep and modulation are also kept identical.

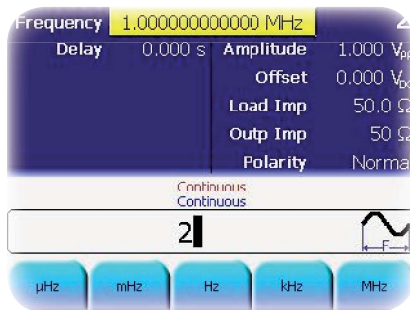
The very first task you should always do, is to reset the instrument to default settings ('STORE/RECALL' and 'SET TO DEFAULTS').

### 1) Setup the first channel



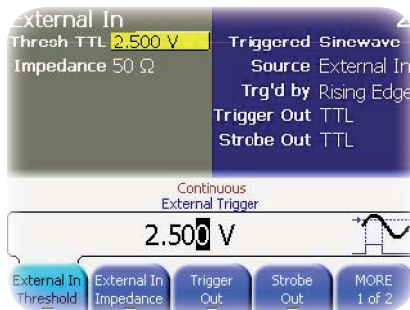
1. Select 'CHANNEL 1'
2. Enable 'CONTINUOUS TRIGGER MODE'
3. Select 'PULSE WAVEFORM'
4. Enter the pulse shape parameters:  
 Frequency: 1 MHz  
 Delay: 0 ns  
 Amplitude: 2.000 Vpp  
 Offset: 1 VDC

### 2) Setup the second channel



1. Select 'CHANNEL 2'
2. Select 'SINE WAVEFORM'
3. Enter the sine wave parameters:  
 Frequency: 2 MHz  
 Delay: 10 ns  
 Amplitude: 3.000 Vpp  
 Offset: 0 VDC

### 3) Enable the trigger mode



1. Select 'TRIGGER MODE' for Ch2
2. Select 'SINEWAVE' as trigger signal
3. Enter trigger source (e.g. External In)
4. Triggered by rising edge
5. Set 'TRIGGER OUT' and 'STROBE OUT' to TTL or ECL

#### 4) Setup the burst length



1. Set the burst length for channel 2.

#### 5) Switch back to channel 1 and enable coupling

This enables coupling of both channels. Since channel 1 is currently selected, the settings of channel 2 will be adjusted to match the settings of channel 1. As a result the following parameters of channel 1 are copied to channel 2:

Waveform: pulse wave is applied to Channel 2  
(incl. all parameters without delay)  
Trigger mode: changed from, 'TRIGGER MODE' to  
'CONTINUOUS BURST': set to 'OFF'

## Channel adding (this requires a two channel instrument)

In this exercise we add the output signals of the two independent output channels together. This is the only way to generate distorted signals out of standard waveforms. Even more flexibility is provided when using Arb based signals on one channel.

Please reset the instrument to default settings ('STORE/RECALL' and "SET TO DEFAULTS").

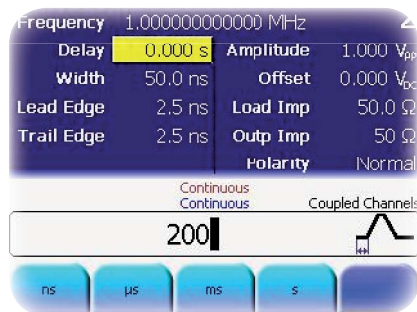
### 1) Setup the first channel



1. Select 'CHANNEL 1'
2. Enable 'CONTINUOUS TRIGGER MODE'
3. Select 'PULSE WAVEFORM'
4. Enter the pulse shape parameters:
  - Frequency: 1 MHz
  - Width: 500 ns
  - Delay: 0 ns
  - Amplitude: 3.000 Vpp
  - Offset: 0 VDC
  - Lead Edge: 75 %
  - Trail Edge: 50 %

**Note:** Make sure that the channels are not coupled (Coupling key is not highlighted).

### 2) Setup the second channel



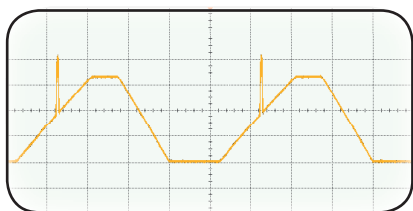
- Enter the pulse shape parameters:
- Frequency: 1 MHz
  - Width: 10 ns
  - Delay: 200 ns
  - Amplitude: 2.000 Vpp
  - Offset: 0 VDC
  - Lead Edge: 2.5 ns
  - Trail Edge: 2.5 ns

### 3) Perform channel addition



1. Select 'CHANNEL 1'
2. Press 'UTILITY KEY' and choose the 'OUTPUT SETUP' softkey
3. Press the 'CHANNEL ADD' key once. To reset it to separate channels, press the key again.

### 4) View the resulting waveform on an oscilloscope



**Note:**

In this mode it is important to have chosen the right amplifier type. Remember, there are two modes. First, the full bandwidth provides a frequency range of +/- 5 V, the max. Amplitude mode provides a range of +/- 10 V. To change these settings go to 'UTILITY, OUTPUT SETUP' and press the softkey 'AMPLIFIER TYPE'.

## A) How to generate customer based waveforms and add noise

Agilent pulse generators are focused on high signal integrity to provide clear, stable and repetitive signals. Individual and customer based signals can stimulate real world stress tests. Very often specific setups and circumstances lead to abnormal behaviors of DUTs. This behavior is seen and can be measured by oscilloscopes.

A key feature of the Agilent 81150A Pulse Generator is to define individual signals and also to provide signals which are filed by an oscilloscope. The third way to generate specific wave forms is to use IntuiLink which runs on each PC.

Required Equipment for this lab:

1. 1x Agilent Pulse Generator with 2 output channels (81150A incl. opt. #002)
2. 1x Agilent oscilloscope DSO or MSO6104A incl. 4 x BNC cables

How to hook up the instruments:

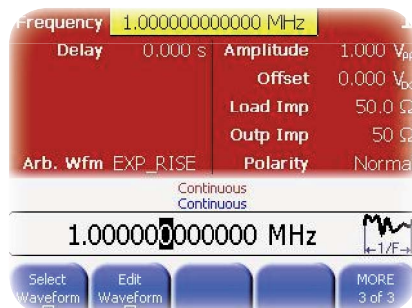
1. Connect 'OUTPUT 1' (81150A) to Channel 1 (Scope)
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### Creating and storing an arbitrary waveform

This lab gives an example which shows you how to create and store an arbitrary waveform from the front panel.

The very first task you should always do, is to reset the instrument to default settings ('STORE/RECALL' and 'SET TO DEFAULTS').

#### 1) Setup the first channel



1. Select the arbitrary waveform function on channel 1
2. Enter the waveform parameters:  
Frequency: 10 MHz  
Delay: 0 ns  
Amplitude: 3.000 V<sub>pp</sub>  
Offset: 0 VDC
3. Start the editor 'EDIT WAVEFORM' and create a new one

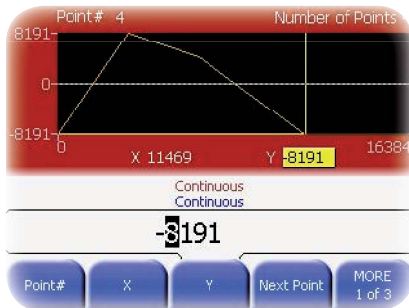


## 2) Define the customized waveform



1. Enter the number of waveform points (max. nb. is 16384)
2. Enable the linear interpolation to have straight-line connection between points. Auto update means that changes in the editor are immediately applied to the output.
3. Press the 'EDIT' softkey.

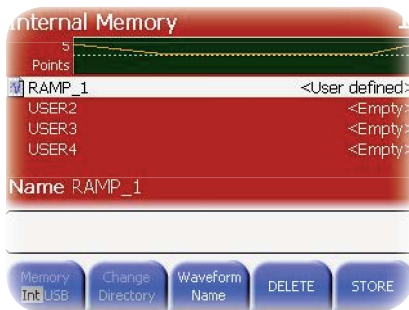
## 3) Define the waveform points



1. Start with point #1. The values on the Y-scale are in the range from -8191 to +8191. This span reflects the amplitude in  $V_{pp}$ .
2. Go to the next points by pressing 'NEXT POINT' or enter the number of point you want to edit.
3. Enter the following points:
  - #1: X=0      Y=-8191
  - #2: X=3279   Y=8191
  - #3: X=6554   Y=4096
  - #4: X=11469   Y=-8191

You can now enter additional points or remove them. Simply go to the point you want to edit, then press insert or delete. With the equidistant spacing all points in the waveform get an equal distance from one-another.

## 4) Store the waveform in the memory



END Edit applies the waveform to the hardware and exits the editor. In this case, the waveform is stored in the volatile memory! When switching off the instrument, this waveform is deleted.

'STORE IN NON-VOLATILE' saves the waveform permanently on the unit. In this case, assign a name and/or save it to an USB memory stick.

The arbitrary waveform can be generated by the Agilent 81150A Intu-iLink Waveform Editor as well. The editor is part of the product CD. Please ensure that you have the IVI com driver installed.

## B) Add Noise to the ARB waveform (this requires a two channel instrument)

In this exercise we generate noise on channel two and add it to the output signal of channel one.

### 1) Setup the second channel and generate noise



1. Enable channel 2 and select the 'NOISE' button on the keyboard
2. Select PDF (Probability Density Function). This is defined as the amplitude distribution.
3. Select the equivalent Crest Factor (CF). CF is defined as the ratio between amplitude in Vp to RMS.
4. Enter the amplitude and offset

On the oscilloscope you can see how the different parameters influence the noise itself.

### 2) Perform channel addition



1. Select channel 1
2. Press 'UTILITY' key and choose the 'OUTPUT SETUP' softkey
3. Press the 'CHANNEL ADD' key once. To reset it to separate channels, press the key again.

Note: In this mode it is important to have chosen the right amplifier type. Remember, there are 2 modes. First, the full bandwidth provides a frequency range of +/- 5 V, the max. Amplitude mode provides a range of +/- 10 V. To change this setting go to 'UTILITY', 'OUTPUT SETUP' and press the softkey 'AMPLIFIER TYPE'.

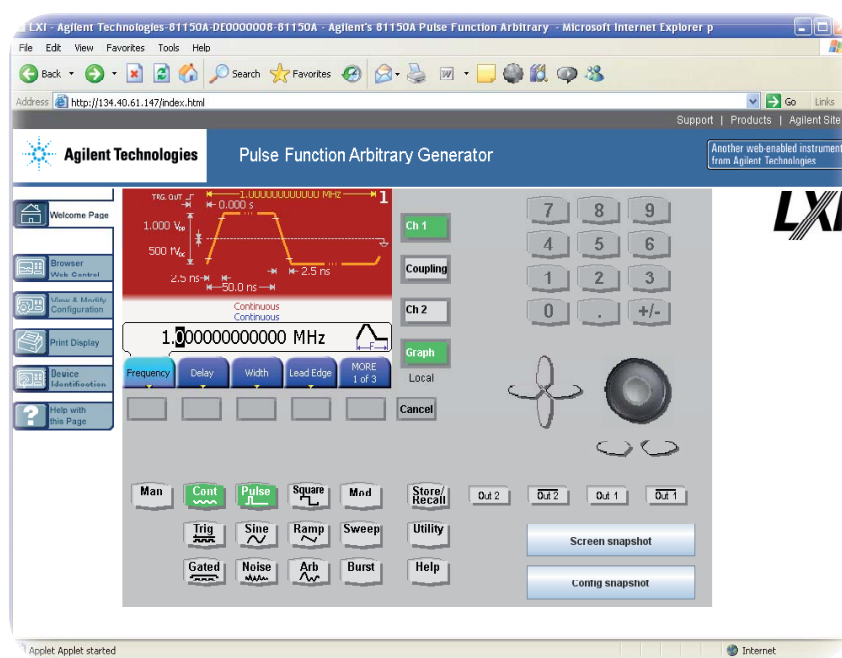
### 3) Remote control of the 81150A



The Agilent 81150A is LXI Class C compliant and therefore has a web browser installed. It is very easy to control the unit via a web server. Once setup, all functions and keys can be accessed via mouse control of the hosting PC. Even screen-shots of the unit or the configuration screen can be captured. This makes documentation and the use of the instrument very easy.

In this additional exercise, connect to the instrument via the local LAN network.

1. Connect the instrument to the LAN.
2. Look up the IP address.
3. The IP address can be found under 'UTILITY', 'I/O INTERFACES' and then select 'LAN'.
4. Go to the controlling PC which is also connected to the LAN and open the installed WEB-browser. Simply enter the IP address of the 81150A in the address line or the hostname. Finally, press the 'BROWSER WEB CONTROL' button and enter the password. The password is AGT81150.



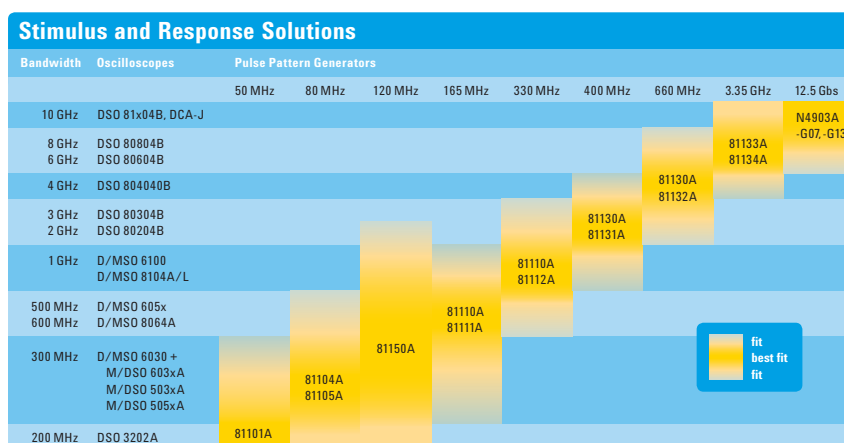
## How to configure the 81150A

| Product/Option                 | Description   | US\$ DDP | Configuration  |
|--------------------------------|---|----------|--|
| 81150A                         | 1-or-2 channel 120 MHz Pulse Function Arbitrary Noise Generator | \$0.00   |  |
| 81150A-001                     | One output channel for 81150A                                   | \$9,004  | Please select either option #001 or #002. One option is mandatory. |
| 81150A-002                     | Two output channels for 81150A                                  | \$13,248 | Upgrade from one to two channels not available.                    |
| <b>Accessories and Options</b> |   |          |  |
| 81150A-DOC                     | Documentation   | \$62.40  | Optional; this is printed documentation. Also available on CD.     |
| 81150-1CP                      | Rackmount and handle kit  | \$98.80  | Optional   |
| 81150A-1A7                     | ISO17025 compliant calibration and certificate                  | \$416    | Optional   |
| 81150A-1A6                     | Z540 compliant calibration and certificate                      | \$416    | Optional   |

## Accessories

| Product/Options | Description                               |
|-----------------|---|
| 5962-0476       | Calibration certificate                   |
| 81150-10101     | Agilent user SW media kit                 |
| 81150-68301     | Packaging assy                            |
| 8121-0905       | Cable-Assy USB Type A-B 3M LG             |
| 9222-1364       | BAG-STAT-SHLD-POLYM/MET ALY/POLYM FLM     |
| 9222-1368       | BAG-STAT-SHLD-POLYM/MET ALY/POLYM FLM     |
| 9230-0333       | Envelope - CAL CERT                       |
| 9320-6687       | ROHS ADDENDUM for Pulse Pattern Generator |
| E2094-60003     | IO LIBRARIES MEDIA SUITE                  |

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## Related Literature

81150A Pulse Function  
Arbitrary Noise Generator  
Data Sheet

## Pub. No.

5989-6433EN

81150A Pulse Function  
Arbitrary Noise Generator  
Flyer

5989-7720EN

81150A Pulse Function  
Arbitrary Noise Generator  
Application Booklet

5989-7860EN

Pulse Pattern and Data Generator  
Brochure

5980-0489E

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| <b>Europe:</b>                       | (tel) 31 20 547 2111                           |
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Product specifications and descriptions in this document subject to change without notice.



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