M8190A Arbitrary Waveform Generator

The following steps will guide you through configuring a turn key M8190A modular system.

Step 1. Choose the number of channels per module. This is a hardware option and it is not upgradable later on (must choose one of the two options)	
Option No.	**Description**
M8190A-001	Arbitrary Waveform Generator module with 1 Channel
M8190A-002	Arbitrary Waveform Generator module with 2 Channels
M8190A-LPN	Arbitrary Waveform Generator module with 2 Channels and Low Phase Noise

Step 2. Choose the sample rate/resolution combination per module (must choose one of the two options or both)	
Option No.	**Description**
M8190A-12G	12 GSa/s with 12 bit resolution
M8190A-14B	14 bit resolution with 8 GSa/s

Comment: It is also possible to choose both options for one module and select the run mode as required. The options are upgradable with the product number M8190AU-12G or M8190AU-14B.)

Refer to Upgrade kits section on page 8 for retrofit information on the above options.

Step 3. Choose the amount of memory per channel (If not required, go to step 4)	
Option No.	**Description**
M8190A-02G	Upgrade from 128 MSa to 2 GSa Memory /Channel

Comment: Select this option Qty 1 for a module with 1 Channel and Qty 2 for a 2-channel module.

Refer to Upgrade kits section on page 8 for retrofit information on the above options.

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Step 4. Choose additional options per module (If not required, go to step 5; refer to Software upgrade section for retrofit information on the above option)	
Option No.	**Description**
M8190A-AMP	Additional AC and DC Amplifier
M8190A-SEQ	Sequencer
M8190A-FSW	Fast Switching (requires Export Control License in conjunction with M8190A-12G)
M8190A-DUC	Digital Upconversion License for the M8190A Arbitrary Waveform Generator

Comment: Option M8190A-FSW determines the minimum switching time between selected segments in sequence mode in 12 bit/12 GSa/s operation. For quoting option M8190A-FSW, options M8190A-12G and M8190A-SEQ are required.
Option M8190A-FSW does not affect switching time in 14 bit/8 GSa/s mode, it is basically included in option M8190A-14B.

Streaming is included in M8190A firmware version 3.x.

Refer to Upgrade kits section on page 8 for retrofit information on the above options.

Step 5. Choose multi-channel support (if not required, go to step 6)	
Option No.	**Description**
M8192A	Synchronization Module for up to six M8190A AWG modules. Please note that two clock cables and two trigger cables are included. For more than two modules, the corresponding number of clock cables and trigger cables needs to be ordered separately.
M8192A-801	Clock Cable for the Synchronization Module (M8192A) (required for configurations with three or more M8190A modules)
M8192A-802	Trigger Cable for the Synchronization Module (M8192A) (required for configurations with three or more M8190A modules)
Typical configurations	**Description**
Up to 4 analog channels	One M9505A 5-slot AXIe chassis, two M8190A AWG modules and one M8192A synchronization module (two clock cables and two trigger cables are included). This configuration can also be ordered as a pre-configured M8190S Multichannel Arbitrary Waveform Generator System.
Up to 8 analog channels	Two M9505A 5-slot AXIe chassis, three or four M8190A AWG modules and one M8192A synchronization module (two clock cables and two trigger cables are included). For 8 analog channels, two M8192A-801 clock cables and two M8192A-802 trigger cables are needed in addition. This configuration can also be ordered as a pre-configured M8190S Multichannel Arbitrary Waveform Generator System.
Up to 12 analog channels	Three M9505A 5-slot AXIe chassis, five or six M8190A AWG modules and one M8192A synchronization module (two clock cables and two trigger cables are included). For 12 analog channels, four M8192A-801 clock cables and four M8192A-802 trigger cables are needed in addition.

Comment: Please order the needed M8190A units in step 1. Units have to have the same configuration.

Step 6. Choose calibration option per module (If not required, go to step 7)	
Option No.	**Description**
M8190A-1A7	Calibration Certificate for ISO 17025
M8190A-Z54	Calibration Certificate for Z540

Comment: Keysight factory calibration is provided as standard and free of additional charges.

Step 7. Choose the AXIe chassis (If not required, go to step 8)	
Option No.	**Description**
M9502A	2-slot AXIe chassis with USB option (Will fit max one M8190A module at the same time.)
M9505A	5-slot AXIe chassis with USB option (Will fit max two M8190A modules and one M9536A embedded controller at the same time.)

Comment: Both the M9502A and M9505A chassis contain an embedded system module that does not take up an instrument slot. This module performs the chassis management functions contained in the AXIe specification.
Any mainframe includes AXIe filler modules, getting started guide, drivers, and Keysight I/O libraries.

Comment: Please also consider ordering bundle options M8190A-BU1 and M8190A-BU2 for turn-key configurations of the M8190A modules. Find more details in the Bundle options Section, just after Step 13 on page 7.

Step 8. Choose the AXIe mainframe accessories (if not required, go to step 9)	
Option No.	**Description**
Y1225A	Rack mount kit for M9502A
Y1226A	Rack mount kit for M9505A
Y1223A	AXIe multi-frame cable: 0.5 m
Y1224A	AXIe multi-frame cable: 3 m
Y1232A	Soft carry bag for M9502A

Comment: AXIe multi-frame cable synchronizes timing signals with multiple daisy-chained chassis.

Step 9. Choose PC controller (must choose one of the three PC configurations)	
Option No.	**Description**
1. Embedded PC configuration	
M9536A	Embedded AXIe PC controller (will only fit into a M9505A 5-slot mainframe if ordered together with min 1 and max 2 M8190A modules.)
2. Laptop configuration	
M9045B	PCIe® ExpressCard adapter: Gen 1 Not needed if the USB interface is used.
Y1200B	PCIe cable: x1 to x8, 2.0 m (used with M9045B)
3. Desktop configuration	
M9048A	PCIe desktop PC adapter: Gen 2, x8 Not needed if the USB interface is used.
Y1202A	PCIe cable: x8, 2.0 m (used with M9048A)

Comment: In order to control the M8190A, a personal computer is required. It can be the embedded AXIe PC controller M9536A or a computer from the regularly updated Tested Computer List Technical Note: http://literature.cdn.keysight.com/litweb/pdf/5990-7632EN.pdf.

Comment: Supported operating systems — Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit), Microsoft Windows 7 (32/64-bit). Linux is supported via SCPI command link to a Windows driven computer with M8190A installed on the Windows PC.

Comment: The M8190A can also be controlled from a M9036A PXIe Embedded Controller with the M8190A firmware installed on it. An additional M9018A PXI chassis may be required.

Comment: Standard compliant drivers — IVI-COM, IVI-C, LabVIEW.

Step 10. Choose one or more application software options per setup (if not required, go to step 11)

Option No.	Description
N6171A-M03	Instrument Control Toolbox Communications System Toolbox DSP System Toolbox Signal Processing Toolbox RF Toolbox
N6171A-M02	Instrument Control Toolbox Communications System Toolbox DSP System Toolbox Signal Processing Toolbox
N6171A-M01	Instrument Control Toolbox

Comment: Matlab is a general purpose application programming environment. Free sample scripts are available on www.keysight.com/find/M8190 > Product Support Center > Technical Support > Drivers, Firmware & Software > AWG MATLAB examples. In order to use the full functionality of the sample scripts, options N6171A-M02 or N6171A-M03 are recommended.

Option No.	Description
N7620B	Signal Studio for Pulse Building
N7620B-AF1	Connect to M8190A arbitrary waveform generator, fixed 1 month license
N7620B-AFP	Connect to M8190A arbitrary waveform generator, fixed perpetual license
N7620B-ATP	Connect to M8190A arbitrary waveform generator, transportable perpetual license

Note: Besides the options for instrument connectivity to the M8190A, you will also need the different application options of the Signal Studio for Pulse Building. Please see the configuration guide of the Pulse Building software for more details.
www.keysight.com/find/n7620b

Option No.	Description
N7617B	Signal Studio for WLAN 802.11a/b/g/n/ac
N7617B-AF1	Connect to M8190A arbitrary waveform generator, fixed 1 month license
N7617B-AFP	Connect to M8190A arbitrary waveform generator, fixed perpetual license
N7617B-ATP	Connect to M8190A arbitrary waveform generator, transportable perpetual license

Note: Besides the options for instrument connectivity to the M8190A, you will also need the different application options of the Signal Studio for Pulse Building. Please see the configuration guide of the Pulse Building software for more details.
www.keysight.com/find/n7617b

The option M8190A-DUC is a prerequisite and M8190A-AMP is recommended for best EVM performance.

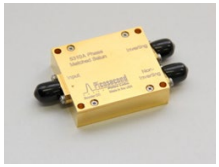
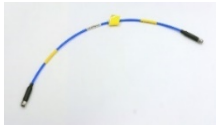
Option No.	Description
N7621B	Signal Studio for Multitone Distortion
N7621B-AF1	Connect to M8190A arbitrary waveform generator, fixed 1 month license
N7621B-AFP	Connect to M8190A arbitrary waveform generator, fixed perpetual license
N7621B-ATP	Connect to M8190A arbitrary waveform generator, transportable perpetual license

Note: Besides the options for instrument connectivity to the M8190A, you will also need the different application options of the Signal Studio for Pulse Building. Please see the configuration guide of the Pulse Building software for more details.
www.keysight.com/find/n7621b

Option No.	Description
W1461BP	SystemVue Comms Architect Perpetual bundle license

Comment: The hardware connectivity is included in the W1461 core platform. Recommended add-on libraries mostly used for the truly wideband AWGs are:

Application	Related products
Interference and complex multi-format signal/jamming scenarios • Radar/EW • Mobile phone formats • Networking & connectivity • Multi-band carrier aggregation	W1905 Radar W1910 LTE W1915 802.11ad W1916 3G W1917 WLAN W1918 LTE-A
Wideband custom signal generation • OFDM (in W1461 core platform) • SatComm and MilComm formats • 802.11ad (re-uses 81199 DLL) • Radar	W1461 SystemVue W1461 SystemVue W1915 mmWave W1905 Radar
Signal generation requiring 3x-5x oversampling of common wireless waveforms for Digital Predistortion (DPD) • LTE-Advanced, LTE, MSR • 802.11ac	W1716 DPD W1918 LTE-A W1917 WLAN W1916 3G

Step 11. Choose test accessories (If not required, go to step 12)		
Option No.	**Related products**	
M8190A-801	Microwave Phase Matched Balun, 6.5 GHz, Max SMA Jack (qty 1 per channel recommended)	
M8190A-805	Low Pass Filter, 2800 MHz Max SMA, VLF 2850+ (qty 2 per channel recommended)	
M8190A-806	Low Pass Filter, 3900 MHZ Max SMA, VLF 3800+ (qty 2 per channel recommended)	
M8190A-810	Cable Assembly Coaxial—50 Ω, SMA to SMA, 457 mm length (qty 2 per channel recommended)	
M8190A-811	Cable Assembly Coaxial–50 Ω, SMA to SMA, 1220 mm length (qty 2 per channel recommended)	
M8190A-815	Dynamic Control Input Cable (qty 1 per module recommended) Comment: the DYNAMIC CONTROL IN allows selecting a new segment or sequence at run time from an external source. The connector provides 13 data bits, a select bit and a load signal. Comment: DYNAMIC CONTROL IN Connector - Description: Receptacle, Mini D * Number of Contacts: 20 * Manufacturer: 3M * Part Number: 10220-0210EC	
M8190A-820	Connector-RF, SMA Termination, Plug Straight, 50 Ω, 12.4 GHz, 0.5 W (qty 2 per channel recommended)	

Step 12. Choose calibration service plan (If not required, go to step 13)	
Option No.	**Description**
R-50C-011-3	Calibration Assurance Plan – Return to Keysight – 3 years
R-50C-011-5	Calibration Assurance Plan – Return to Keysight – 5 years
R-50C-016-3	Keysight Calibration + Uncertainties + Guardbanding – 3 years
R-50C-016-5	Keysight Calibration + Uncertainties + Guardbanding – 5 years
R-50C-021-3	ANSI Z540-1-1994 Calibration – 3 years
R-50C-021-5	ANSI Z540-1-1994 Calibration – 5 years

Step 13. Choose startup assistance and consulting services (skip this step if not required)	
Option No.	**Description**
PS-S10	Remote scheduled productivity assistance. Select the number of hours.
PS-S20	Startup assistance
PS-X10	Custom services to be qualified by a Keysight technical consultant.

Bundle options (Choose one of the two. Not compatible with separately chosen 5-slot or 2-slot mainframes from configuration step 7)	
Option No.	**Description**
M8190A-BU1	Bundle 1 consisting of M9505A AXIe chassis with 5-slots and M9536A AXIe Embedded Controller
M8190A-BU2	Bundle 2 consisting of M9502A AXIe chassis with 2-slots (PCIe connectivity accessories will be added automatically) Note: When choosing option BU2, you will be asked for the type of PCIe card and cable, that you would prefer. Available configurations are M9048A and Y1202A for a desktop configuration and M9045B and Y1200B for a laptop configuration.

Comment: To maximize customer satisfaction, Keysight offers its AWG customers the bundled options BU1 and BU2. This way an AWG will be built into a mainframe and shipped containing all the necessary connectivity items, such as embedded controller and/or PCIe cards and PCIe cable. The unit is literally configured for immediate use.

Comment: When choosing either BU1 or BU2, usually it does not make sense to choose separate additional mainframes in one order. Either one of the bundle options or one separate mainframe configuration is sufficient.

Option No.	**Description**
M8190S	Multichannel Arbitrary Waveform Generator System - two multi-channel selections are available
4-channel system	Consists of one M9505A 5-slot AXIe chassis (M8190S-B04), one M8192A synchronization module and two M8190A AWG modules, including the required number of clock and trigger cables.
8-channel system	Consists of two M9505A 5-slot AXIe chassis (M8190S-B08), one M8192A synchronization module and four M8190A AWG modules, including the required number of clock and trigger cables.

Comment: PCIe connectivity accessories will always be added automatically.

Upgrade kits (Software keys, installable by field/customer)	
Option No.	**Description**
M8190AU-14B	Upgrade M8190A with 14 bit Resolution with 8 GSa/s (one per module)
M8190AU-12G	Upgrade M8190A with 12 GSa/s with 12 bit resolution (one per module)
M8190AU-DUC	Digital Upconversion License Upgrade for the M8190A Arbitrary Waveform Generator (one per module)
M8190AU-AMP	Upgrade M8190A with Additional AC and DC Amplifier (one per module)
M8190AU-SEQ	Upgrade M8190A with Sequencer (one per module)
M8190AU-FSW	Upgrade M8190A with Fast Switching (requires Export Control License for certain countries)
M8190AU-02G	Upgrade from 128 MSa to 2 GSa Memory (one per channel)
M8190AU-LPN	Upgrade M8190A to low phase noise performance, only available for 2 channels instrument, requires return to factory

Related Keysight Literature

Publication title	Pub Number
M8190A Arbitrary Waveform Generator, Data Sheet	5990-7516EN
M9502A and M9505A 2- and 5-Slot AXIe Chassis, Data Sheet	5990-6584EN
PXI and AXIe Modular Instrumentation Tested Computer List, Technical Note	5990-7632EN
Tips to Achieve PCIe Connectivity with your Keysight AXIe or PXIe Chassis, Application Note	5991-0385EN
N6171A MATLAB Data Analysis Software, Technical Overview	5989-9723EN
Signal Studio for Pulse Building N7620B, Technical Overview	5991-0779EN
33503A BenchLink Waveform Builder Pro and Basic Software, Data Sheet	5990-7569EN
81199A Wideband Waveform Center, Data Sheet	5990-9141EN
Keysight EEsof EDA SystemVue 2012, Technical Overview	5990-4731EN
M8192A Multi-Channel Synchronization Module for M8190A, Data Sheet	5991-2863EN
Creating and Optimizing 802.11ac Signals with the M8190A AWG, Application Note	5991-2908EN

Videos

Scan the QR code provided below with your mobile internet device or enter the youtube link into your internet browser on your laptop or desktop computer.

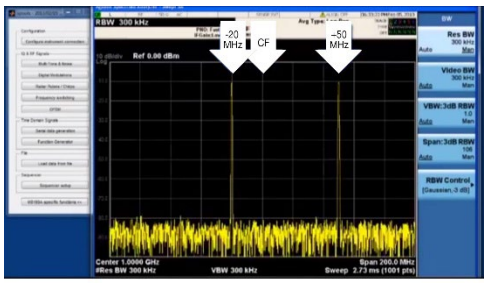
M8190A AWG, Creating QAM Modulation

http://www.youtube.com/watch?v=GdTm-q02Ti8

Best IF w/ Keysight M8190A AXIe AWG

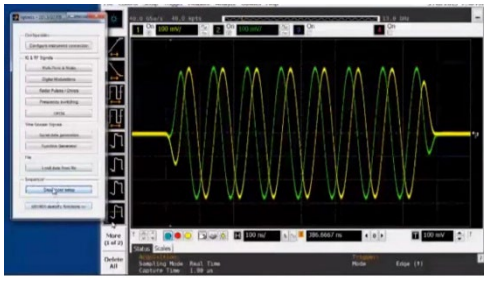
http://www.youtube.com/watch?v=Yk35Hsy_95M

How to demo Digital Up-Conversion with the M8190A



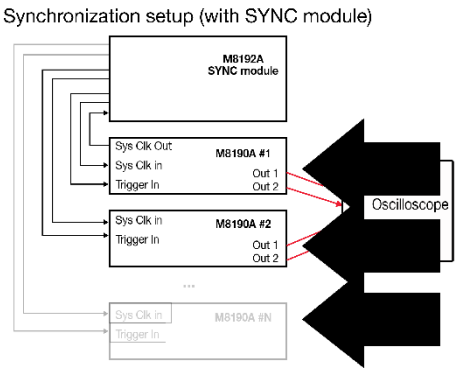
http://www.youtube.com/watch?v=N_HteslgtZo

Digital Up-Conversion with the M8190A - Advanced Topics



http://www.youtube.com/watch?v=dhzYXqD9wiQ

Synchronization of multiple M8190A modules



http://www.youtube.com/watch?v=db19nV4cxAc

More M8190A AWG videos are available on http://www.keysight.com/find/M8190A-videos

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

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