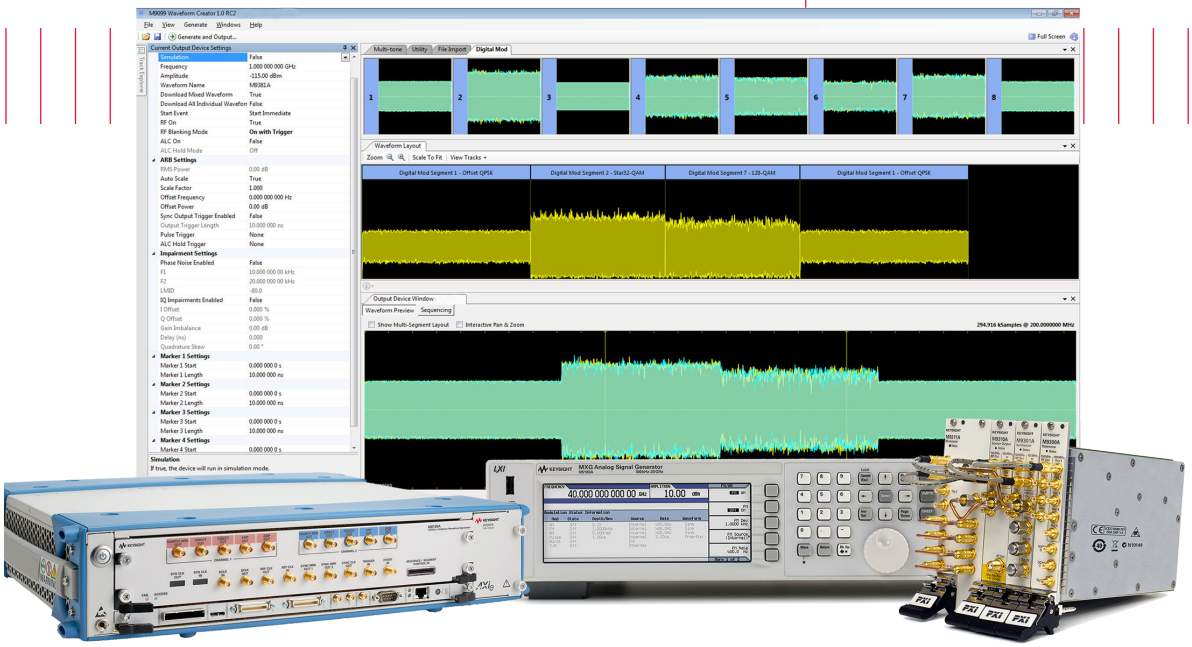
Keysight Technologies
M9099 Waveform Creator Application Software

Technical Overview

M9099 Waveform Creator software is no longer orderable after December 2018. For signal creation software, consider Signal Studio or Keysight EEsof EDA SystemVue to create waveforms.



KEYSIGHT TECHNOLOGIES

Product Description

The M9099 Waveform Creator modular software application enables easy development and re-use of complex baseband and vector signals used to validate and test digital communications products. Its "drag and drop" graphical user interface allows quick development of multi-format, multi-track waveforms with waveform segments displayed in frequency and time. Waveform Creator supports multiple waveform types (input plug-ins), and a variety of vector signal generators (VSG, MXG, EXG and ESG) and arbitrary waveform generators (AWG), with an expandable architecture to support future waveform types, VSG and AWG.

Key Features

- Waveform plug-in capability supporting popular digital modulation, import of Signal Studio (.wfm) and custom waveforms
- Simple signal parameter setting interface for composing waveform segments
- Select from provided waveform plug-ins or develop your own
- Pre-correct or distort to model device behavior
- Build complex waveforms by combining waveform segments into tracks
- Composite waveform tracks can have different modulation rates and carrier frequencies, with the final output waveform resampled for correct reproduction
- Preview final combined waveform in either time or frequency domain before output to AWG/VSG or to a file
- Play back waveforms on the Keysight Technologies M9381A PXIe VSG, M8190A/95A AWG, M9330/31A AWG, N5182A/B MXG, N5172B EXG, E4438C ESG, 81180A/B AWG or N8241A/42A AWG, 33522A/33622A AWG
- Generate unencrypted files to export waveforms to your specific test environment (optional)
- SCPI capability for remote operation in test environments

See page 4 for newer features added in Waveform Creator 3.0 and later.

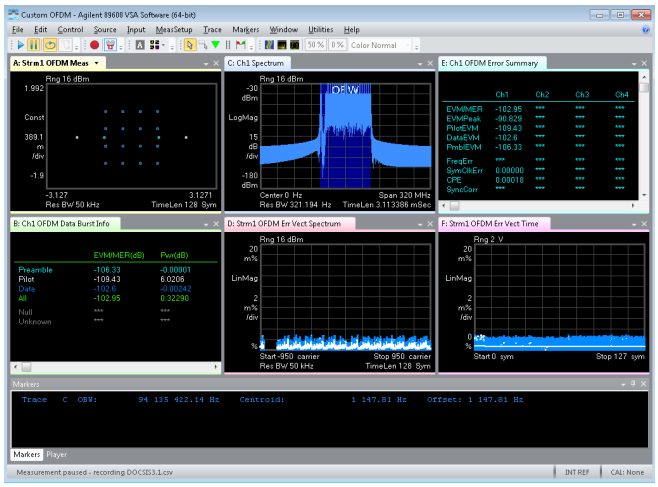
Easily Create Complex Baseband and Vector Signals

Increasing data rates and wider bandwidths continue to drive the need to create more complex signals to verify device performance in real world environments. From proprietary radars to commercial multi-channel, multi-emitter communication systems, the difficulty in creating test waveforms is becoming exponentially more challenging. Traditionally, creating such test waveforms required multiple tools to aggregate different waveform formats, leaving the user with the task of time aligning waveforms, resampling to different carrier frequencies and sample rates, and validating the resulting waveform.

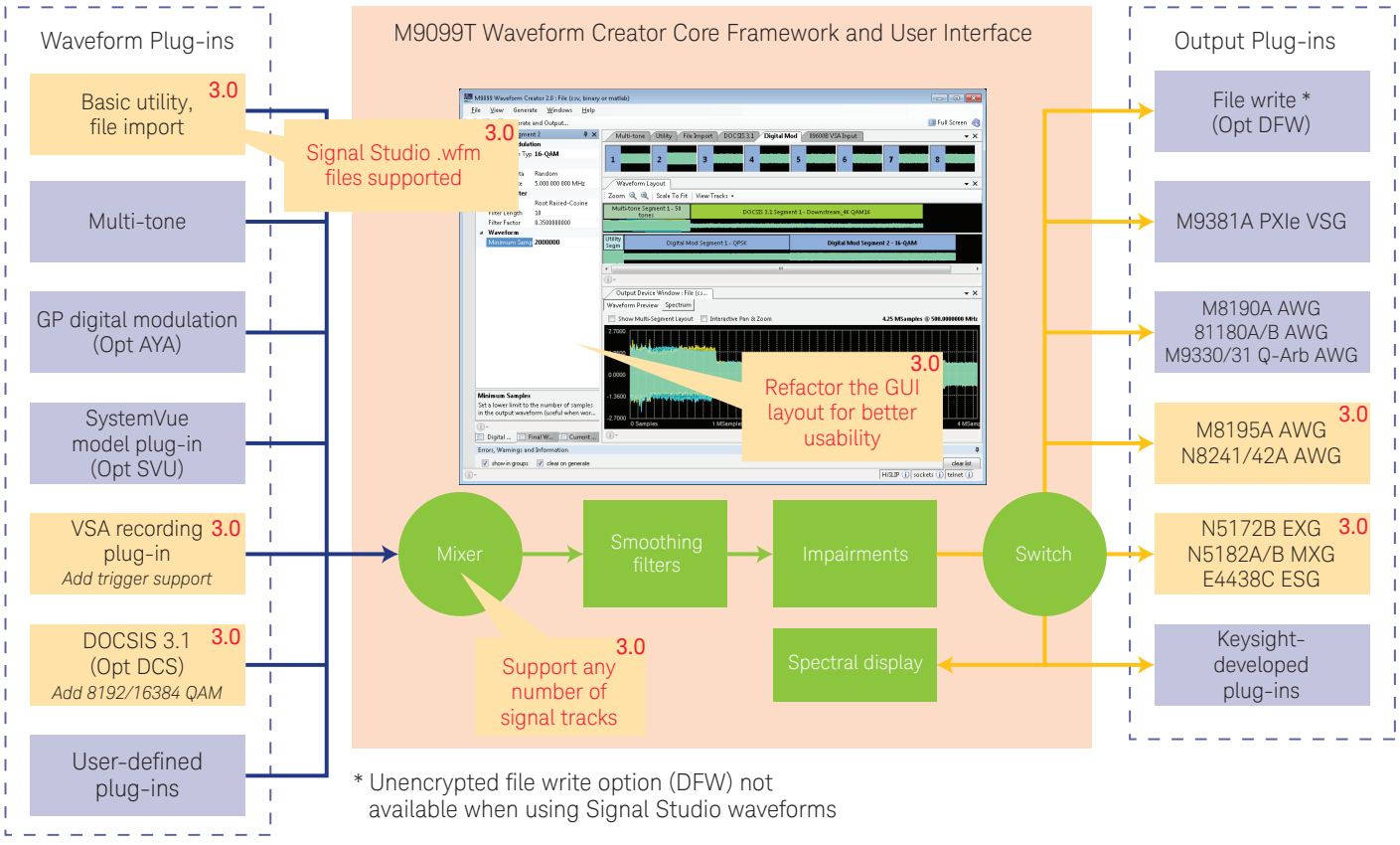
Keysight's M9099 Waveform Creator simplifies the creation of custom, proprietary complex waveforms through modular plug-ins that combine useful and needed waveform formats with links to VSG and AWG. Its simple and sophisticated "drag & drop" framework includes a dynamic arbitrary resampling engine, segment smoothing filters and digital corrections interface.

Waveform Creator's modularity allows re-use of your custom waveforms and development of user-defined waveform plug-ins. It also enables use and modification of waveforms created in Keysight model-based EDA software tools like SystemVue for export to Keysight signal generators like the M8190A/95A AWG, M9381A PXIe VSG, N5182A/B MXG, N5172B EXG, E4438C ESG, M9330A/31A AWG for real-time play back.

The M9099 Waveform Creator software is designed to support current and future digital modulation formats, including waveforms created using Keysight's Signal Studio. It pays for itself by saving time and effort to create and manage complex waveform stimulus used in R&D, design validation, and manufacturing test.



Keysight 89600 VSA software provides powerful analysis of signals created using Waveform Creator.



M9099T Waveform creator overview, including new features with version 3.0, in yellow boxes.

Waveform Creator 3.0

Signal Studio .wfm files import	Import Keysight Signal Studio waveforms into Waveform Creator. Waveform license information in the .wfm file is preserved.
Unlimited waveform segments and mixing tracks	Previous Waveform Creator versions supported only four mixing tracks. Now you can create even more complex waveforms with an unlimited number of waveform segments into Waveform Creator.
Trigger settings support for 89600 VSA recording plug-in	Adds Free Run/Magnitude/External/External TTL trigger settings into the Keysight 89600 VSA software recording plug-in to fully integrate VSA's recording capabilities into Waveform Creator.
Additional modulation types for DOCSIS 3.1	8192 and 16384-QAM are supported in both DOCSIS 3.1 upstream and downstream signals.
89600 VSA support	Supports and integrates with Keysight 89600 VSA software version up through 20.
New output plug-ins	Along with the Keysight M9381A PXIe VSG, M8190A, M9330A/31A, and 81180A/B AWGs, Waveform Creator supports the N5182A/B MXG, N5172B EXG, E4438C ESG, M8195A AWG and N8241A/42A AWG.

Waveform Creator 3.1

New output plug-ins	Adds Keysight 335xx AWG - 33522B, Keysight 336xx AWG - 33622A
Output plug-ins enhancements	M9381A (ARB ON to enable/disable the modulator, adds SCPI command :OUTPut:M9381A:PARB <numeric_value> to play a specific ARB waveform if multiple ARB waveforms are downloaded.
	M8190A (Adds Sequencing Mode and Dynamic Control On settings for dynamic sequencer, adds waveform download to one-channel M8190A without option 002)
Input plug-ins enhancements	New waveform type, DualSineWave, is added in Basic Waveform Plug-in and Multi-tone Waveform Plug-in (analog modulation signal type for single tone)
	Lower limit of waveform frequency down from 100 kHz to 1 Hz to extend the usage.
	Digital Modulation Plug-in adds 2048/4096-QAM, C4FM, CQPSK, TETRA-1 and ARIB T98/61/102.
	DOCSIS Plug-in is updated to align with DOCSIS Config Wizard (of 89600 VSA)

Waveform Creator 3.2

General	Carrier summing in track alignment.
	Additional marker types (Period/length pair, ALC from highest power track, Auto generated RF blanking)
Output plug-ins enhancements	MXG/EXG/ESG (Adds ALC On/Off and marker routing setting for ALC Hold and RF Blanking.
	M8190A (Transmit OSR and Granularity options, Ability to download specified segment IDs and Waveform Caching, SCPI commands for creating user-defined pre-correction)
	Pre-correction when using the File Output Device.
Input plug-ins enhancements	Digital Modulation Plug-in with FSK filer for 2FSK/4FSK/8FSK/16FSK.

Key Applications

Early R&D testing, design validation testing or even manufacturing test automation of RF, wireless and wireline communications products, components or systems in the following industries:

- DOCSIS 3.1 cable modem development
- Satellite communications, ground-, space-, and deep-space
- Military communications and secure backhaul
- Academic research
- Extended test equipment support for specialized modulation formats
- Component validation, using either simulation, or the latest wideband test equipment

Key Benefits

- Higher productivity, through a simple, open, and expandable waveform creation environment
- Lower project overhead, scripting, verification, and NRE
- Faster time to deployment, through superior connectivity with Keysight EDA and modeling software like SystemVue and test equipment like Keysight's M8190A/95A AWG, M9381A PXIe VSG, N5182A/B MXG, N5172B EXG, E4438C ESG, M9330A/31A AWG, 33522B/33622A AWG.

Construct Complex Waveforms with Drag-and-Drop Simplicity

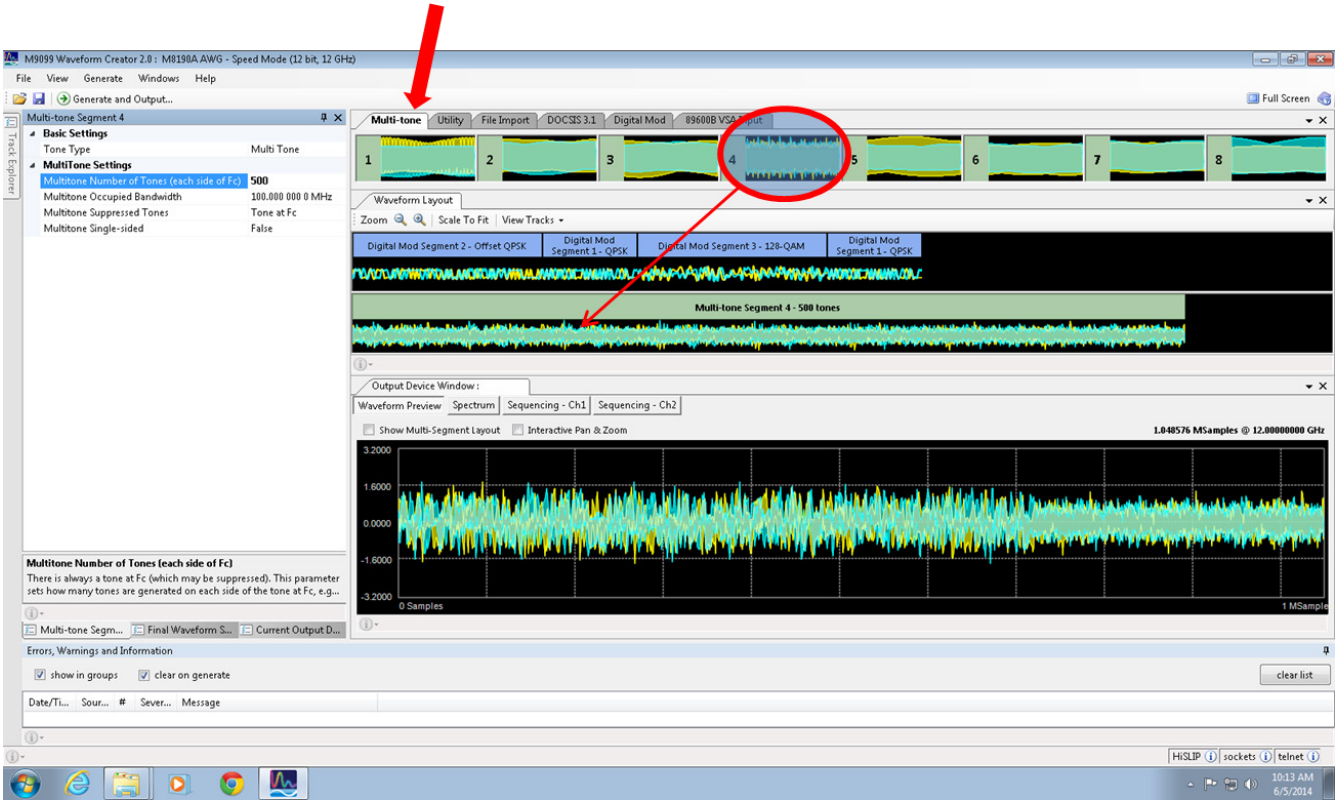
A variety of powerful software tools are available for waveform creation at baseband and RF frequencies. The most popular choices for custom baseband and modulated RF waveform creation have been EDA tools like Keysight ADS or Keysight SystemVue, and algorithm tools like MATLAB from The MathWorks or other scripting/programming languages like C++, Python, or LabView. Each of these choices have strengths and weaknesses.

Keysight's Waveform Creator provides a superior framework for creating custom baseband and modulated RF waveforms while allowing you to preserve your investment in other software through a drag-and-drop interface that supports importing waveform IP from other tools. This complements other Waveform Creator capabilities such as multi-tone waveform creation, basic digital modulation, and standard "utility" waveforms.

With Waveform Creator you create individual waveform segments using waveform plug-ins that come with the software – or custom plug-ins that you create. Once you configure a waveform segment, assembling a signal is a matter of dragging and dropping waveform segments into tracks and modifying the segment attributes using user-definable parameters. You can also add noise, IQ impairments, smoothing filters, and pre-corrections to customize the final, aggregated waveform as needed. In the final step, you select a sample rate that matches the desired hardware and download the signal to a compatible signal generator or arbitrary waveform generator, or output to a waveform file. Every step of the way, Waveform Creator automatically recalculates the final waveform and displays the result in both time and frequency domains prior to download. For more information, please refer to the application note "Easily Create Custom Waveforms with Waveform Creator", literature number 5991-3203EN.

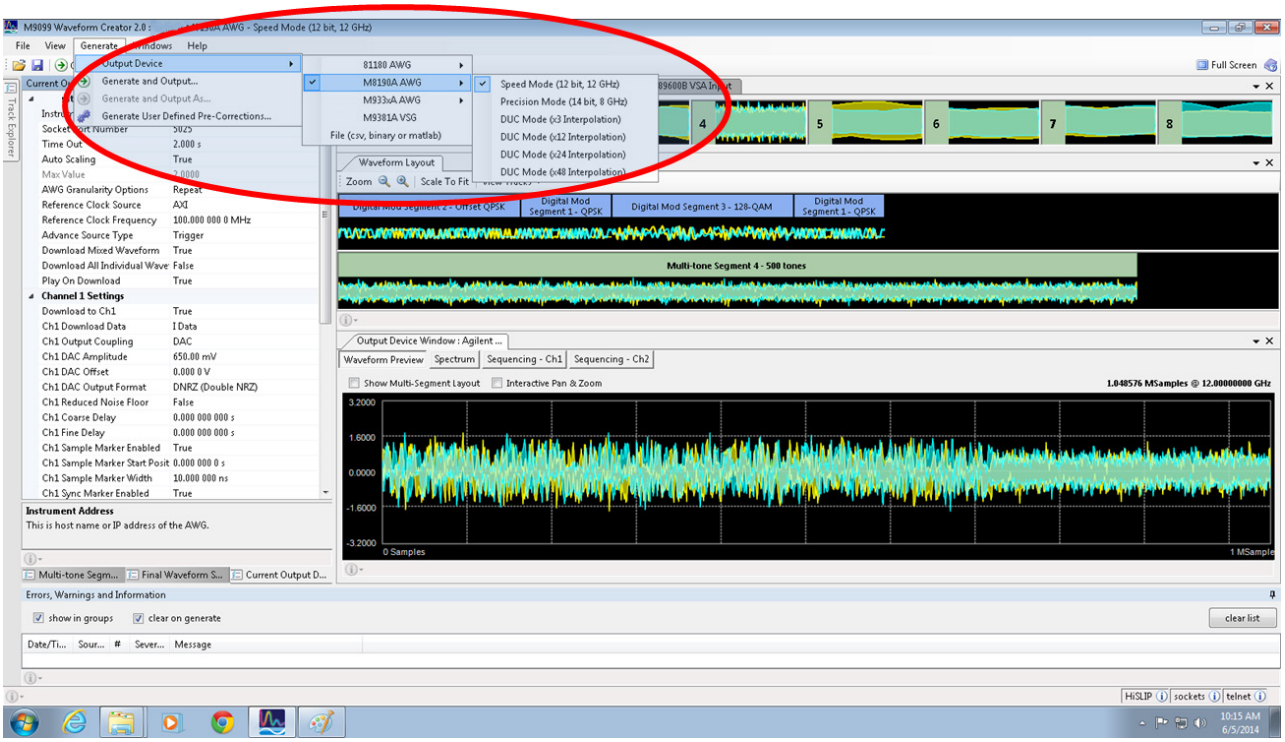
As Simple as 1, 2, 3...

Step 1. Select the desired waveform parameters and drag them onto the desired track.

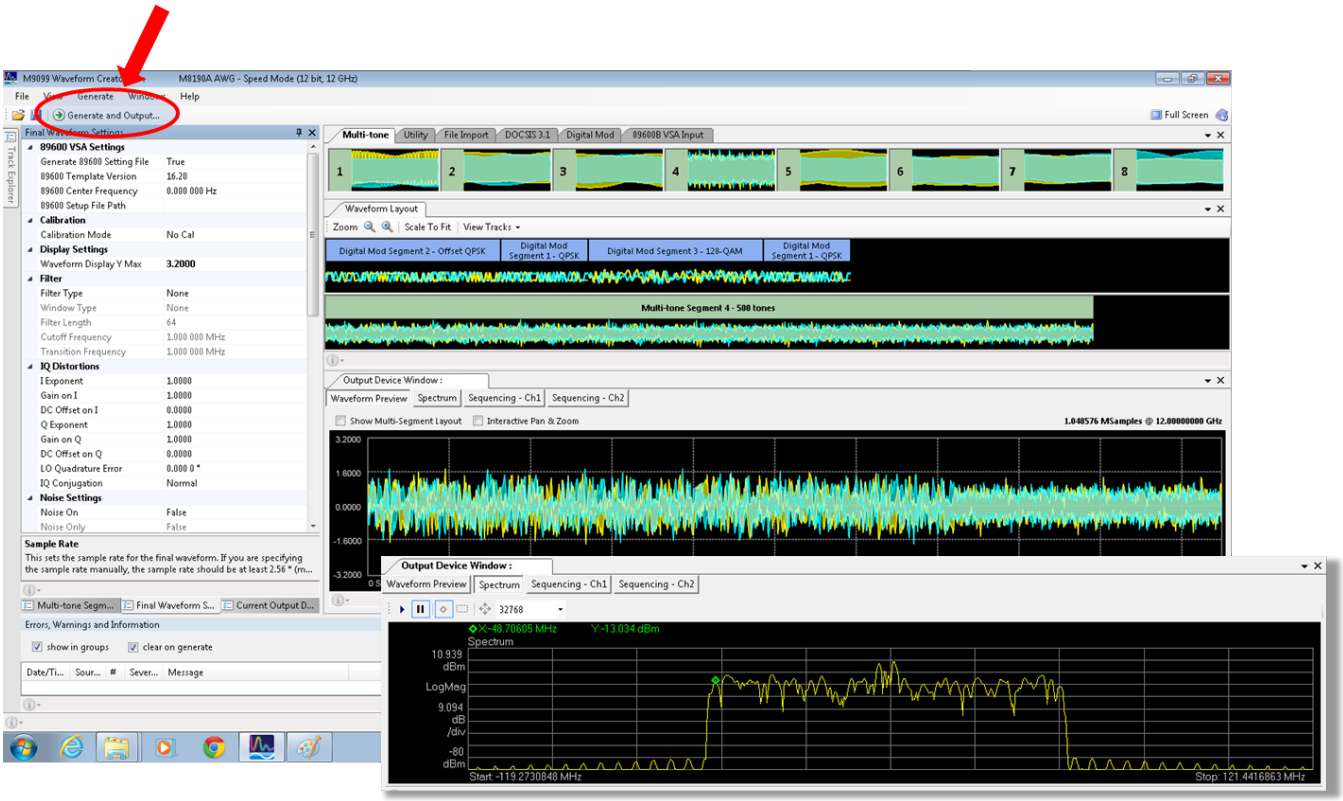


As Simple as 1, 2, 3... (continued)

Step 2. Choose the desired output device and specify the final output parameters.



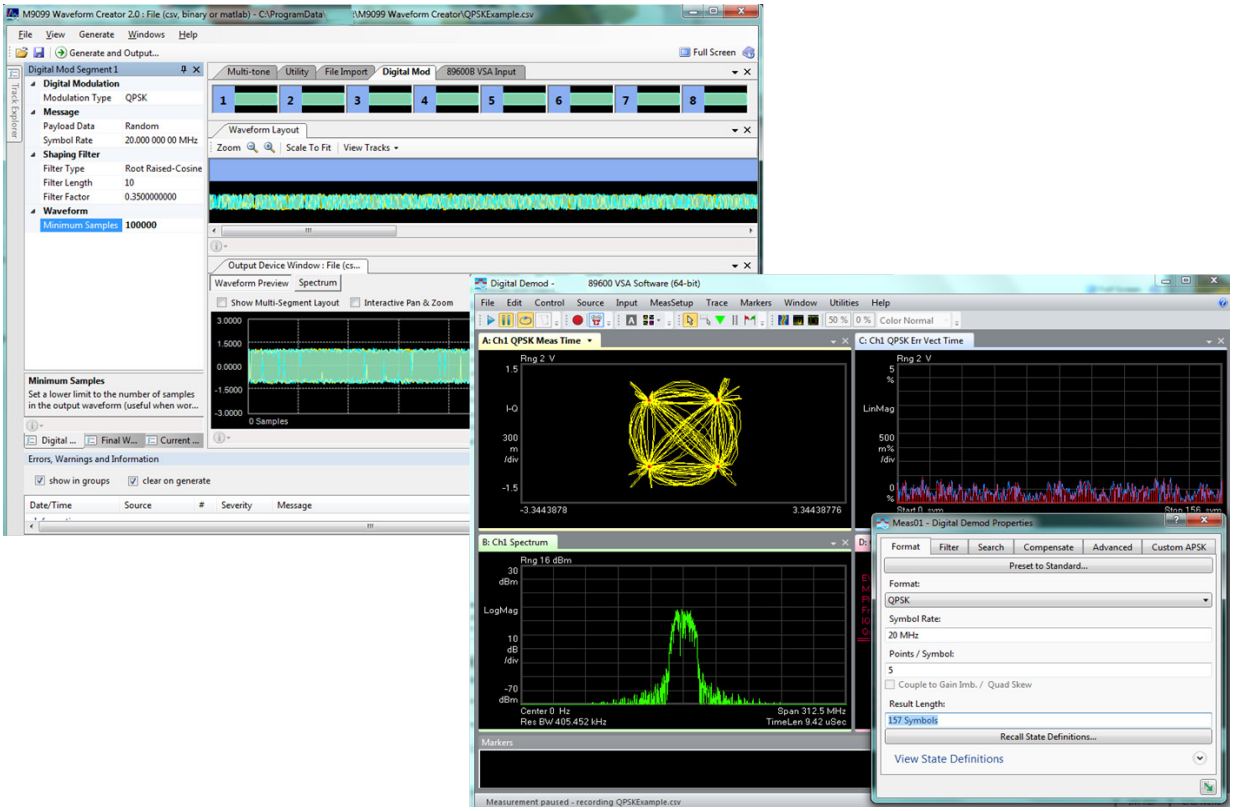
Step 3. Preview the final waveform in time or frequency domains, then generate and output to a file or your VSG/AWG hardware.



Examples of Waveforms You Can Easily Create

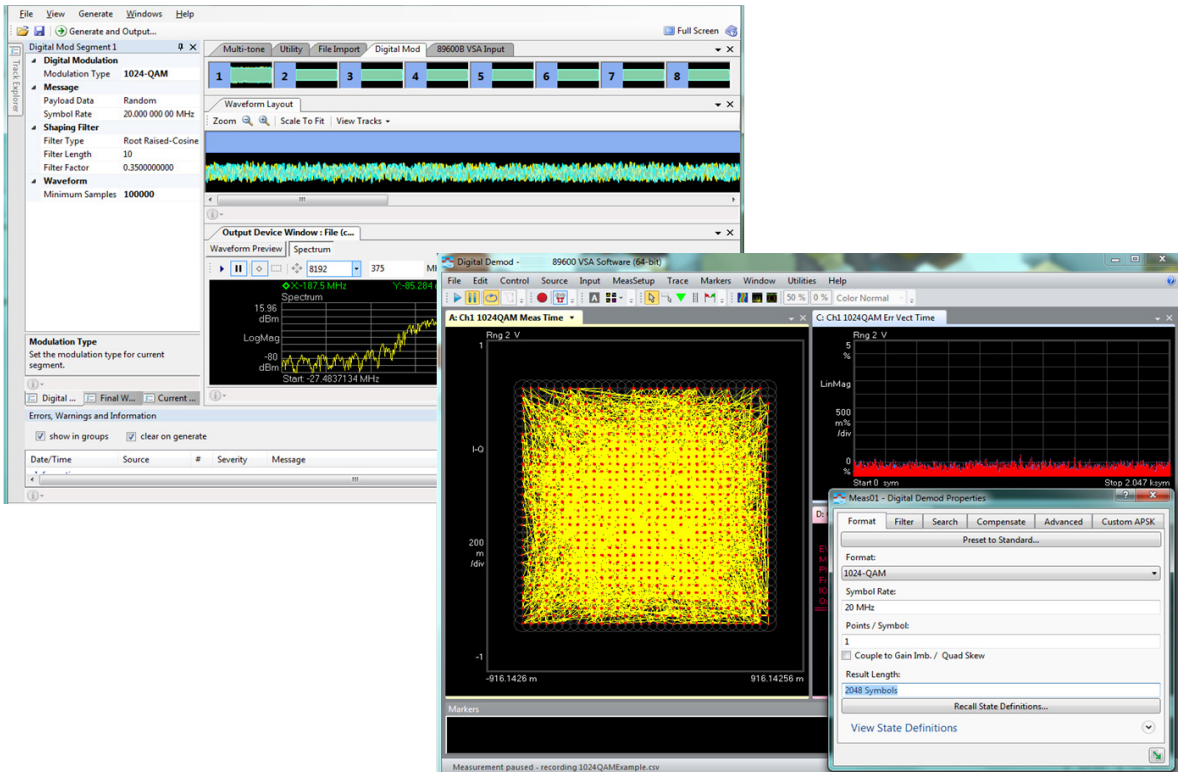
M9099 Waveform Creator makes it easy to create complex waveforms. Here are just a few examples of digitally modulated waveforms created with the M9099 and measured using the 89600 VSA software.

QPSK signal



Examples of Waveforms You Can Easily Create (continued)

1024 QAM signal



Multi-carrier signal (QPSK, 8PSK, 16 QAM)

Examples of Waveforms You can Easily Create (continued)

DOCSIS 3.1 downstream signal

Radar pulse signal

Waveform Creator core license

M9099T, Option LIC - Waveform Creator core license includes the following:

General core features

- GUI driven, drag-drop waveform construction interface
- Signal mixing and resampling for proper reproduction
- IQ impairments and Gaussian noise addition
- Pre-distortion: complex and sin(x)/x
- Pre-correction filter calibration (requires 89600 VSA v15 or higher)
- Output direct to Keysight M9381A PXIe VSG, M8190A/95A AWG, N5182A/B MXG, N5172B EXG, E4438C ESG, M9330/31A AWG, N8241A/42A AWG, 81180A/B AWG, 33522B & 33622A AWG
- Remote SCPI capability for remote operation in test environments
- Smoothing filters minimize spectral regrowth and impurities from discontinuities between combined waveform segments
- Preview final waveform spectrum
- Marker provides frequency and amplitude readout
- Trace scaling to zoom in on desired spectral details
- Selectable FFT sizes to optimize frequency resolution (256, 512, 1024, 2048, 4096, 8192, 16384, 32768 and 65536 points)
- Waveform summary window: highlight the operations on the combined output waveform
- Unlimited number of segments and tracks
- Carrier summing in track alignment

Input plug-ins, included

General purpose multi-tone plug-in

- Single tone, two-tone and multi-tone
- User definable: Number of tones (each side of fundamental), occupied bandwidth, multi-tone suppressed tones, multi-tone single sided,
- Tone length
- Configurable baseband filtering types: Root-raised cosine, raised cosine, Gaussian

Single tone modulation (includes dual sine wave)	– AM, AM-USB, AM-LSB, AM-DSB – FM, PM	– GMSK – π/2-BPSK – QPSK	– 8 PSK – 16 QAM – 64 QAM
Two-tone modulation	– GMSK – π/2-BPSK	– QPSK – 8 PSK	– 16 QAM – 64 QAM

Basic utility plug-in

- Add blanking (silent time), Square waves, dual sine wave, and/or Guassian Noise segments to your waveform.
- User definable: Amplitude scale, frequency, I/Q phase difference, start phase, number of cycles
- Sinusoid, Saw (sawtooth) and triangle segments

File import plug-in

- Import waveform file formats: BIN, CSV, LabView CSV, HDF and M8190A DUC IQBIN formats
- User definable: Manual Sample Rate, Frequency Multiplier, Amplitude Multiplier
- Import Signal Studio .wfm files

89600 VSA software input plug-in (requires version 15 through 20)

Settings to create imported VSA recording file:	– Amplitude: Range – Configuration: Desired hardware configuration name from 89600 VSA software	– Frequency: Span, Center Frequency, ResBW – Length: Record Length

- Trigger settings: Channel, Trigger Style (Free Run/Magnitude/External/External TTL), Slope, Delay, Holdoff Style, Holdoff

Waveform Creator core license

M9099T, Option LIC - Waveform Creator core license includes the following:

Final combined output waveform settings

- Sample rate: Auto/Manual, Sample Rate Frequency
- Resampling skew: Skew
- Track skew settings: Amplitude, Phase, Offset Frequency
- Tracks truncation: Truncate Unequal Tracks
- Waveform length adjustment: Granularity Options and Granularity
- Smoothing filter
  - Filter type: None, Rectangular, Gaussian
  - Window type: None, Gaussian, Kaiser, Spline, Spline2
  - User definable: Filter Length, Cutoff Frequency, Transition Frequency
- Gaussian noise: C/N ratio, measurement bandwidth
- Sin(x)/x correction: Sin(x)/x correction on, Sin(x)/x filter boost
- Pre-correction
  - Modes: No Cal, Cal on Every Download, Cal on Settings Change, User Defined Cal
  - User definable: Calibration Center Frequency, Calibration Receiver Mirror Spectrum, Apply All Pre-corrections, Apply Channel Response Correction Only, Pre-corrections Coefficients File
- IQ distortion: I Exponent, Gain on I, DC Offset on I, Q Exponent, Gain on Q, DC Offset on Q, LO Quadrature Error, IQ Conjugation
- Phase modulation: Peak Amplitude, Modulation Frequency
- Marker settings
  - Marker source: Start/Length Pair, From File, Period/Length Pair, ALC from highest power trace, Auto generated RF blanking
  - User definable: Marker Start, Marker Length, Marker File Name
- VSA Setx settings: Generate 89600 Setting File, 89600 Template Version, 89600 Center Frequency, 89600 Setup File Path
- Display settings: Waveform display Y max

Waveform Creator core license

M9099T, Option LIC - Waveform Creator core license includes the following:	
Output plug-ins, included	
M9381A PXIe vector signal generator	– Output to M9381A PXIe VSG, simulated hardware, or as M9381A format file – Device settings: Instrument address, Frequency, Amplitude, Waveform Name, Download Mixed Waveform, Download All Individual Waveforms, Start Event Immediate or Triggered, RF On, RF Blanking Mode, ALC, ALC Hold Mode – ARB settings: ARB On, RMS Power, Auto Scale, Scale Factor, Offset Frequency, Offset Power, Sync Output Trigger, Output Trigger Length, Pulse Trigger, ALC Hold Trigger, Select & Play ARB via SCPI – Impairment settings: Phase Noise, F1, F2, IQ Impairments, I & Q Offsets, Gain Imbalance, Delay, Quadrature Skew – Marker settings: Start, Length – Marker source – Device setting: Disconnect Driver
M8190A AXIe arbitrary waveform generator	– Supported modes: – Speed Mode (12-bit, 12 GHz) – Precision Mode (14-bit, 8 GHz) – DUC Mode (x3 Interpolation) – DUC Mode (x12 Interpolation – DUC Mode (x24 Interpolation) – DUC Mode (x48 Interpolation) – Sample markers, sync markers – DUC sequencer – Dynamic sequencer – Pre-correction (requires 89600 VSA software), SCPI commands for creating user-defined pre-correction – Device settings: Instrument Address, Socket Port Number, Time Out, Auto Scaling, Max Value, Reference Clock Frequency, Advanced Source Type (Trigger, Event), Download Mixed Waveform, Download All Individual Waveforms, Play on Download, Waveform download reset, Download to one-channel without option 002, Download specified segment IDs and waveform caching, Transmit OSR and granularity options – Channel 1 & 2 settings: Download I or Q data, Output Coupling (DC, AC or DAC), DC Amplitude, DC Offset, DC Output Format (NRZ, RZ, Doublet), AC Power, AC Output Format (DNRZ, NRZ, RZ, Doublet), DAC Amplitude, DAC Offset, DAC Output Format (DNRZ, NRZ, RZ, Doublet), Reduced Noise Floor, Course Delay, Fine Delay, Sample Marker Source, Sync Marker Source
81180A/B arbitrary waveform generator	– Device settings: Instrument Address, Socket Port Number, Time Out, Offset (points), Skew, Auto Scaling, Max Value, Download Mixed Waveform, Download All Individual Waveforms, Play on Download – Channel 1 & 2 settings: Download I or Q data, Output Coupling (DC, AC or DAC), DC Amplitude, DC Offset, AC Power
M9330/31A arbitrary waveform generator	– Supported modes: Basic and DDS Modes – Output to M9330A AWG, M9331A AWG, or simulated hardware – Device settings: Instrument Address, Reference Clock Source (Backplane 10MHz, 10MHz REF IN, EXT CLK IN), Sync Clock, Download Mixed Waveform, Download All Individual Waveforms, Play on Download – PreDistortion and Disconnect Driver – Channel 1 & 2 settings: Download I or Q data, Output Level, Offset, Output Config (Single Ended, Differential, Amplified), Play Mode (Continuous, Burst), Filter Enabled, Marker Start Position, Marker Width, Marker Source – Marker settings: Delay, Pulse Width, Source (Disabled, Waveform Start, Waveform Repeat, Waveform Gate, Software 1, Software 2, Software 3, Software 4, CH1 Memory Mkr1, CH1 Memory Mkr2, CH2 Memory Mkr1, CH2 Memory Mkr2, DDS Waveform Start, Scenario Repeat, Sequence Start, Sequence Repeat, Sequence Gate, Hardware Trigger 1-4, Hardware Auxiliary Trigger)

Waveform Creator core license

M9099T, Option LIC - Waveform Creator core license includes the following:	
Output plug-ins, included	
M8195A AXIe arbitrary waveform generator	– Device settings: Instrument Address, Socket Port Number, Time Out, Reference Clock Frequency, Download Mixed Waveform, Download All Individual Waveforms, Play on Download, and Waveform Download Reset – Channel 1, 2, 3 & 4 settings: Download I or Q data, Amplitude and Offset
N8241A/42A arbitrary waveform generator	– Supported modes: Basic and DDS Modes – Output to N8241A AWG, N8241B AWG, or simulated hardware – Device settings: Instrument Address, PreDistortion, Reference Clock Source (Backplane 10MHz, 10MHz REF IN, EXT CLK IN), Sync Clock, Download Mixed Waveform, Download All Individual Waveforms, Play on Download, Disconnect Driver – Channel 1 & 2 settings: Download I or Q data, Output Level, Offset, Output Config (Single Ended, Differential, Amplified), Play Mode (Continuous, Burst), Filter Enabled, Marker Source – Marker settings: Delay, Pulse Width, Source (Disabled, Waveform Start, Waveform Repeat, Waveform Gate, Software 1, Software 2, Software 3, Software 4, CH1 Memory Mkr1, CH1 Memory Mkr2, CH2 Memory Mkr1, CH2 Memory Mkr2, DDS Waveform Start, Scenario Repeat, Sequence Start, Sequence Repeat, Sequence Gate, Hardware Trigger 1-4, Hardware Auxiliary Trigger)
N5182A/B MXG, N5172B EXG, E4438C ESG	– Device settings: Instrument Address, Frequency, Amplitude, RF on, ALC On/Off – Download settings: Download to (Internal Storage/BBG Memory), Waveform Name, Play On Download – IQ Adjustment Settings: Optimized Path (not supported by E4438C), IQ Offset, IQ Gain Imbalance, Quad Angle Adjust, IQ Skew, IQ Delay, DC IQ Calibration (not supported by E4438C) – Marker source
33522B, 33622A AWG	– Marker routing setting for ALC Hold & RF blanking

Optional plug-in - digital modulation

M9099T, Option AYA - Waveform Creator digital modulation plug-in includes the following:			
General features	– Access to basic and advanced digital modulation formats. – 89600 VSA setup files (.setx) can be created automatically to simplify modulation analysis.		
Supports the following modulation formats	– BPSK – QPSK – DQPSK – Pi/4 DQPSK – Offset QPSK – Shaped OQPSK – 8-PSK – D8PSK	– EDGE – Pi/8 D8PSK – MSK – CPM, C4FM, CQPSK – 16, 32, 64, 128, 256, 512, 1024, 2048, 4096-QAM – 16, 32-APSK – Custom APSK – TETRA-1	– Star16-QAM – Star32-QAM – 2, 4, 8, 16-FSK – 16-PSK – IJF-OQPSK – FQPSK, EFQPSK – ARIB T98/61/102 – SOQPSK-MIL
Payload data	– Random – PN9/15/23/32	– User-defined (file based) – User-defined symbol rate	
Shaping filters	– None – Rect – Raised Cosine – Root Raised Cosine	– Gaussian – User-defined (file) – User-defined filter lengths, filter shaping factor – FSK filer	
M9099T, Option SVU - Waveform Creator SystemVue model plug-in includes the following:			
General features	– Direct import of SystemVue models to be used as a waveform plug-in – Supports the full modeling capability in SystemVue, including its add-on libraries for Radar, GNSS, 3G, 4G, and WLAN – "SystemVue Plug-in Generator" simplifies creating new input plug-ins from your SystemVue models – Requires SystemVue license for waveform generation – Whatever you can model in SystemVue can be used to generate waveforms – Supports SystemVue 2013.08 release, including its 2013.08SP1 release – For more information, refer to www.keysight.com/find/systemvue		
M9099T, Option DFW - Waveform Creator unencrypted data file writer includes the following:			
General features	– Supports writing of Waveform Creator signals as unencrypted files to the PC file system		
Supported file types	– Native M9381A file format – CSV file – Binary file	– MATLAB file – M8190A DUC IQBIN file – Signal Studio .wfm files *	
Save file settings	– Waveform File Name – Save Mixed Waveform – Save All Individual Waveforms – Include 89600 VSA Header – Repeat count	– CSV file style: One Channel, Two Channel, t,I,Q format, Interleaved – BIN file style: IQ Interleaved, IQ Separated – Normalize data – Load file in 89600 VSA – Pre-correction when using Output Device: File	

* Note: Unencrypted files cannot be created when the Waveform Creator project includes any encrypted Signal Studio waveforms.

Optional plug-in - DOCSIS 3.1

M9099T, Option DCS - Waveform Creator DOCSIS 3.1 plug-in includes the following:			
General features	– Supports Data Over Cable Service Interface Specification (DOCSIS 3.1) standard downstream and upstream waveforms – Creates compatible 89600 VSA setup file (.setx) to easily demodulate and analyze the created DOCSIS 3.1 waveforms (requires 89600 VSA version 18.5 or later)		
DOCSIS 3.1 Downstream	– FFT modes: 4096, 8192 – Active subcarriers – Data modulation: BPSK, QPSK; 8, 16, 32, 64, 128, 256, 512, 1024, 4096, 2048, 8192, 16384-QAM – PLC Start Index – Exclusion bands: Start Position (subcarrier), Length (subcarrier) – Continuous pilots (CP): Specify "M" and CP positions are generated automatically, or you can enter CP positions manually		
	– Cyclic prefix: – 0.9375 µs (192 * Tsd) – 1.25 µs (256 * Tsd)	– 3.75 µs (768 * Tsd) – 5 µs (1024 * Tsd)	
	– Windowing: – 0 µs (0 * Tsd) – 0.3125 µs (64 * Tsd)	– 0.625 µs (128 * Tsd) – 0.9375 µs (192 * Tsd)	– 1.25 µs (256 * Tsd)
DOCSIS 3.1 Upstream	– FFT modes: 2048, 4096 – Data modulation: BPSK, QPSK: 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 8192, 16384-QAM – Exclusion bands: Start Position (subcarrier), Length (subcarrier)		
	– Pilot pattern – Minislot start and stop	– Active subcarriers – K (Sympols/frame)	
	– Cyclic prefix: – 0.9375 µs (96 * Tsu) – 1.25 µs (128 * Tsu) – 1.5625 µs (160 * Tsu) – 1.875 µs (192 * Tsu)	– 2.1875 µs (224 * Tsu) – 2.5 µs (256 * Tsu) – 2.8125 µs (288 * Tsu) – 3.125 µs (320* Tsu)	– 3.75 µs (384 * Tsu) – 5 µs (512 * Tsu) – 6.25 µs (640 * Tsu)
	– Windowing: – 0 µs (0 * Tsu) – 0.3125 µs (32 * Tsu) – 0.625 µs (64 * Tsu)	– 0.9375 µs (96 * Tsu) – 1.25 µs (128 * Tsu) – 1.5625 µs (160 * Tsu)	– 1.875 µs (192 * Tsu) – 2.1875 µs (224 * Tsu)

User developed waveform plug-ins

Along with the waveform plug-ins provided by Keysight, you can develop your own custom waveform plug-ins using the M9099 software's simple, open and expandable waveform creation environment.

The M9099 software enables custom functions, implemented as external DLLs, to be created and "plugged into" the general purpose core with very little system programming overhead. These custom plug-ins can be used to implement in-house proprietary technology that can then be distributed as a reference implementation to other Waveform Creator installations within an organization. Once a waveform is generated by a plug-in, it can take advantage of the full suite of Waveform Creator features, such as being mixed with other signals, deliberately distorted, post processed, have noise added, be sin(x)/x pre-corrected, then saved to a file for use in simulation work, or downloaded to an Keysight instrument, such as a vector signal generator, for real-time play out.

More details and examples are provided in the Application Note "Easily Create Custom Waveform Plug-ins with Waveform Creator Application Software", publication number 5991-3203EN. This application note describes how to create user plug-ins which can be fully integrated with Waveform Creator to deploy signal generation capabilities that meet your requirements. Additional support and training materials are provided with the Premium Support Membership Program (PSP) subscription.

Configuration

M9099 Waveform Creator licensing

Keysight M9099 Waveform Creator is licenses software based on the options purchased. Licenses are sold as transportable perpetual which allows you to re-host your license on different MS Windows based computers, giving you the flexibility to utilize your software purchase efficiently and allowing you to upgrade your PC or embedded PXIe or AXIe controller at any time.

Licenses reside on the PC or embedded controller, so a single Waveform Creator license can be used to output waveforms to multiple VSGs or AWGs.

Model-Option	Description
M9099T	Waveform Creator software (transportable perpetual license)
M9099T-LIC	Core product w/ utility & multi-tone plug-ins (required)
M9099T-AYA	Digital modulation plug-in
M9099T-DCS	DOCSIS 3.1 plug-in
M9099T-SVM	SystemVue plug-in license (requires SystemVue version 2013.08 or later)
M9099T-DFW	File-based write (unencrypted waveform license)

Recommended minimum PC configuration

- Operating System: Microsoft Windows 7 Professional, Enterprise, or Ultimate (64/32 bit)
- 2 GHz or faster CPU, either 32-bit (x86) or 64-bit (x64)
- 2 GB RAM for 32-bit (x86), 4 GB for 64-bit (x64)
- 512 MB video RAM recommended
- 1 GB available hard disk space
- DVD to load software; license transfer requires network access, USB flash drive, USB hard drive, or USB DVD drive

Prerequisite drivers and software

- Microsoft .NET Framework, version 4 or higher
- Keysight IO Libraries Suite, version 16.3 or higher (included on Waveform Creator installation CD)
- Keysight M8190 AWG drivers, version 3.0 or later (if M8190A streaming feature is used)
- Keysight M9381A VSG source instrument drivers, version 1.2 or later (if M9381A output plug-in feature is installed)
- Keysight M933x AWG source instrument drivers, version 2.01 or later (if M933xA output plug-in feature is installed)
- Keysight N8241A AWG Source Instrument Drivers 1.31.3 or higher (if N8241A output plug-in feature is installed)
- NI-IVI compliance package, version 4.1 or greater (pre-requisite for M933xA driver)
- Keysight 89600 VSA software, version 15 or higher (required to use the optional pre-corrections filter calibration)
- Keysight SystemVue 2013.08 release, including its 2013.08SP1 release (if SystemVue Option SVM plug-in is used)

For More Information

For additional product information, refer to:
www.keysight.com/find/M9099

Related hardware:

M9381A PXIe vector signal generator
www.keysight.com/find/M9381A

M8190A 12 GSa/s arbitrary waveform generator
www.keysight.com/find/M8190A

81180A/B arbitrary waveform generator
www.keysight.com/find/81180B

M9330/31A arbitrary waveform generator
www.keysight.com/find/M9330A

N5172B EXG X-Series RF Vector Signal Generator
www.keysight.com/find/N5172B

N5182A/B MXG X-Series Vector Signal Generator
www.keysight.com/find/N5182B

E4438C ESG Vector Signal Generator
www.keysight.com/find/E4438C

M8195A 65 Gsa/s Arbitrary Waveform Generator
www.keysight.com/find/M8195A

N8241A/N8242A Arbitrary Waveform Generator
www.keysight.com/find/N8241A

Related software:

SystemVue
www.keysight.com/find/systemvue

89600 VSA software
www.keysight.com/find/89600vsa

Signal Studio software
www.keysight.com/find/SignalStudio

Related applications:

Quickly Validate Designs for DOCSIS 3.1 Compliance, literature number 5991-4301EN
Easily Create Custom Waveforms with Waveform Creator literature number 5991-3203EN

Related videos:

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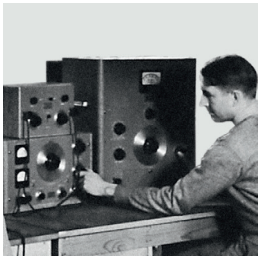
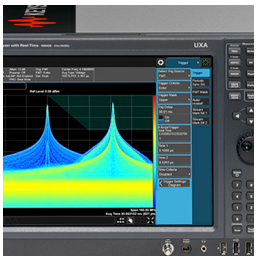


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