

# Startup Guide

## Keysight M9099 Waveform Creator 3.0

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## Manual Part Number

M9099-90002

## Published By

Keysight Technologies  
Ground Floor and Second Floor, CP-11  
Sector-8, IMT Manesar – 122051  
Gurgaon, Haryana, India

## Edition

Edition 3, August, 2015  
Printed In USA

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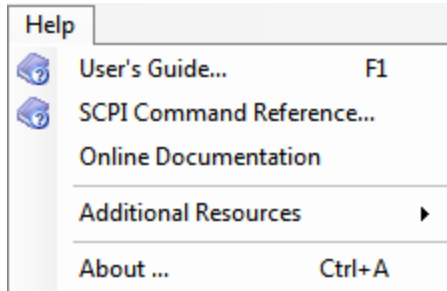
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# Preface

The scope of the Startup Guide is to introduce you to Waveform Creator software and describe the process of Installing and Licensing the product. It also encloses details on how to quickly get started with the software.

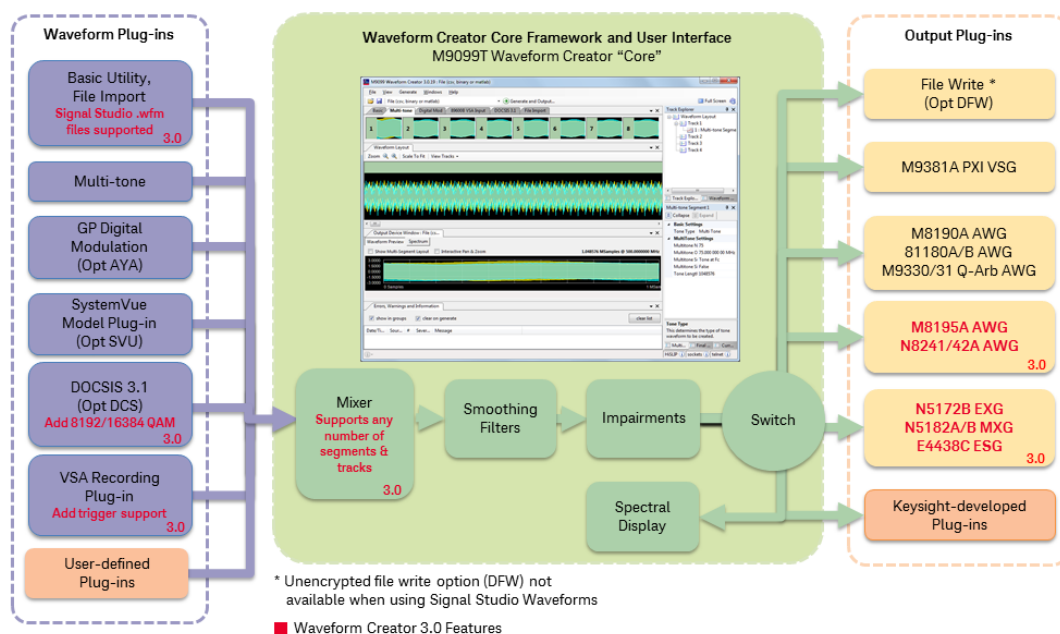
To access M9099 Waveform Creator help, launch the Product and click **Help > User's Guide**.



# Introduction

M9099 Waveform Creator provides a modular and flexible waveform creation environment supporting analog and digital modulation formats for a series of Keysight instruments for R&D, design validation, and test engineers who need to create and manage custom waveforms for wireless and high speed wireline product design and testing.

Waveform Creator provides a simple, easy, and modular SW framework for creating, combining & managing custom, arbitrary waveforms, with support for corrected waveform download to Keysight AWGs and Signal Generators. It accelerates design validation and testing of chips, modules, and systems by streamlining development and management of custom stimulus waveforms.



Waveform Creator provides various benefits out of the box:

- Optional generation of DOCSIS 3.1 downstream and upstream signals.
- Optional waveform creation plug-in for basic digital modulation.
- Optional waveform creation plug-in for SystemVue simulation models.
- Other Standard waveform plug-ins for general-purpose waveform creation.
- Importing of waveform data from CSV, LabVIEW CSV, HDF, BIN, M8190A DUC IQBINFile, or Signal Studio's WFM file type.
- Flexible waveform creation and generation capability for the following Keysight products:
  - M9381A PXI VSG,
  - N5182A/B MXG, N5172B EXG, and E4438C ESG,

- M933xA AWG, N824xA AWG, and
  - M8195A AWG, M8190A AWG and 81180A/B AWG
- Output plug-in for writing unencrypted waveform files (CSV, MAT, BIN, M8190A DUC IQBIN, M9381A native files, and WFM).
- User extendable functionality such as creating your own waveform input plug-ins.
- SCPI remote control for test automation.



## Related Documentation

To access documentation related to M9099 Waveform Creator, click the links below to open the related document.

Document	Description	Help Link/Location	Format
Startup Guide	This guide includes quick install and license setup instructions with instructions to quickly get started with Waveform Creator	<a href="http://edadownload.software.keysight.com/eedl/m9099wc3/M9099_StartupGuide.pdf">http://edadownload.software.keysight.com/eedl/m9099wc3/M9099_StartupGuide.pdf</a>	PDF
M9099 Waveform Creator Help	This help includes Waveform Creator Core GUI and supported Plug-ins' documentation	<b>32-bit</b> - <i>C:\Program Files (x86)\Keysight\M9099\Documentation\wc.chm</i>	(Microsoft Help Format) CHM
SCPI Reference Manual	This manual includes descriptions and details of SCPI commands supported in Waveform Creator	<b>32-bit</b> - <i>C:\Program Files (x86)\Keysight\M9099\Documentation\SCPI Command Reference.html</i>	HTML
Keysight License Manager Help	This help file provides information on Keysight Licensing	<b>32-bit</b> - <i>C:\Program Files\Agilent\Agilent License Manager\AgilentLicenseManager.chm</i> <b>64-bit</b> - <i>C:\Program Files(x86)\Agilent\Agilent License Manager\AgilentLicenseManager.chm</i> Alternatively, you can find help under: <b>Start &gt; All Programs &gt; Keysight License Manager &gt; Keysight License Manager Help</b>	(Microsoft Help Format) CHM
Keysight I/O Libraries Help	This help file provides information on Keysight I/O libraries	<b>32-bit</b> - <i>C:\Program Files\Agilent\I/O Libraries Suite\VisaCom.chm</i> <b>64-bit</b> - <i>C:\Program Files(x86)\Agilent\I/O Libraries Suite\VisaCom.chm</i>	(Microsoft Help Format) CHM

SystemVue  
e Help

This is online  
version of  
SystemVue  
software  
help

<http://www.keysight.com/find/eesof-systemvue-documentation>

Web

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For more details, visit:

- Product Documentation on the web: <http://www.keysight.com/find/modular-m9099-docs> .
- KC for Waveform Creator: <http://www.keysight.com/find/modular-wfc-knowledge> .
- KC for Modular Solutions: <http://www.keysight.com/find/modular-knowledgecenter> .

## System Requirements

Following are Keysight recommended configurations:

CPU	2 GHz or faster 32-bit (x86) or 64-bit (x64) processor
RAM	2 GB recommended (32-bit) / 4 GB recommended (64-bit)
Video RAM	512 MB recommended
Hard Disk	1 GB available
Additional Drives	DVD to load software; license transfer requires network access, USB Flash drive, USB hard drive, or USB DVD drive
Operating System	Microsoft Windows® 7 Professional, Enterprise, or Ultimate (64-bit/32-bit)

## Summary of Software/Hardware Compatibility with Waveform Creator

Microsoft .NET Framework	Ensure that you have Microsoft .NET Framework version 4 or higher installed on your system. The Microsoft .NET Framework 4 can be found at <a href="http://www.microsoft.com/en-in/download/details.aspx?id=17851">http://www.microsoft.com/en-in/download/details.aspx?id=17851</a> .
Keysight IO Libraries Suite	Ensure that you have IO Libraries Suite 16.3 or higher installed on your system. The Keysight IO Libraries Suite can be found on the CD that is part of shipment content or at <a href="http://www.keysight.com/find/iosuite">http://www.keysight.com/find/iosuite</a> .
VSA for pre-corrections filter calibration	If you wish to use the optional pre-corrections filter calibration capability, you also need Keysight 89601B VSA version 15 or higher installed on your system. Support till version 18.5 is provided.
M9381A VSG/CW Source Instrument Drivers	Install M9381A VSG Drivers from <a href="http://www.keysight.com/find/M9381A">http://www.keysight.com/find/M9381A</a> Please install M9381A driver version 1.3.300.0 or higher.
M8190A AWG Driver	If you wish to use the M8190A streaming capability, you also need Keysight M8190A Driver. Install the M8190A driver from <a href="http://www.keysight.com/main/software.jsp?ckey=sw385">http://www.keysight.com/main/software.jsp?ckey=sw385</a> . Please install version 3.0 or higher.
NI-IVI Compliance Package	The M933xA series AWG require that the NI IVI Compliance Package 4.1 or greater be installed. To get the latest release of the NI IVI Compliance Package, go to <a href="http://www.ni.com/drivers/">http://www.ni.com/drivers/</a>
M933xA AWG Source Instrument Drivers	Install M933xA Drivers from <a href="http://www.keysight.com/main/software.jsp?ckey=2033326">http://www.keysight.com/main/software.jsp?ckey=2033326</a> . Please install M933xA driver version 2.01 or higher.
N824xA AWG Source Instrument Drivers	If you want to use N824xA output plug-in, please install N824xA AWG Source Instrument Drivers 16.3 or higher from <a href="http://www.keysight.com/main/software.jsp?ckey=1670471">http://www.keysight.com/main/software.jsp?ckey=1670471</a> .
SystemVue Software	To use SystemVue Model Plug-in, please install <a href="#">SystemVue software 2013.08</a> or <a href="#">2013.08 SP1</a> release.

## Installing Waveform Creator

Follow the given steps to get the executable and install Keysight M9099 Waveform Creator software (core and plug-ins) on your system.

### Pre-requisites

A host PC with [Keysight IO Libraries Suite](#) software correctly installed. For more details, refer to Summary of Software/Hardware Compatibility with Waveform Creator section under [System Requirements](#).

### Obtain Waveform Creator Executable

Obtain the Waveform Creator executable from the following sources:

- [K.com](#)
- CD-ROM (Product ordered with -MED option)

### Installing Waveform Creator

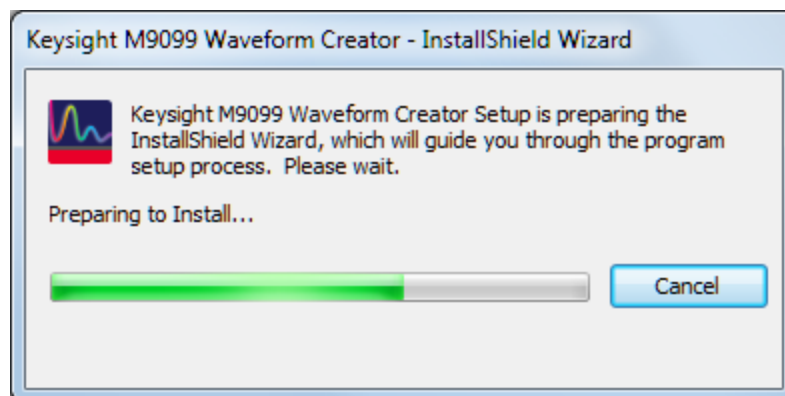
The installer for Waveform Creator supports smooth upgrade from previous version. You don't need to uninstall previous version of Waveform Creator (core and plug-ins) from your computer. This is automatically done of by the Waveform Creator installer.

**NOTE**

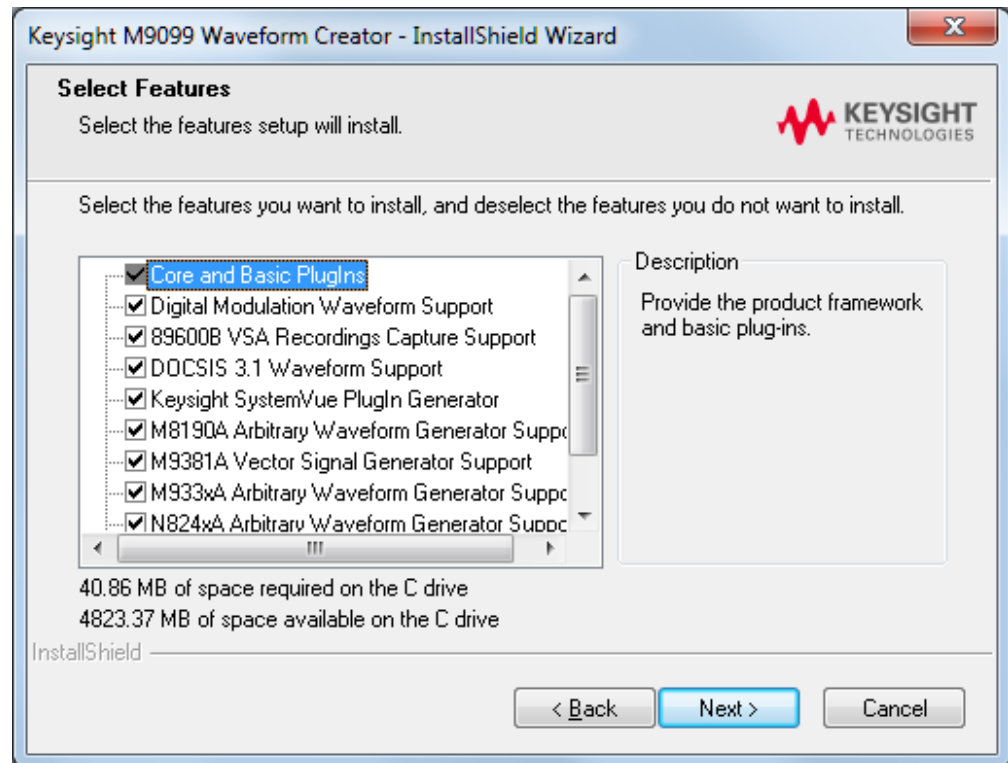
The installer for Waveform Creator supports smooth upgrade from previous version. You don't need to uninstall previous version of Waveform Creator (core and plug-ins) from your computer. This is automatically done of by the Waveform Creator installer.

Perform the following steps to install Waveform Creator:

1. Double-click the executable (*Keysight\_M9099\_3-0\_Setup.exe*) to run the Waveform Creator setup. The following screen appears:



2. Follow the guided tour.



3. Select the features (plug-ins) you want to install and click **Next** to install in the default folder.
4. Follow the guided tour to complete the installation.

**NOTE** If you do not have the Keysight M938x Instrument Driver Version 1.1.199.3 or later or M933x Arbitrary Waveform Generator Instrument Drivers installed on your system, download the same from <http://www.keysight.com/find/adnivicomdrivers>.

Install the M8190A driver from <http://www.keysight.com/main/software.aspx?ckey=sw385>.

Similarly, locate the installers for the other drivers on [K.com](http://www.keysight.com).

## Silent Installation of Waveform Creator

To install Waveform Creator silently, perform the following steps:

1. Copy the following file to a non read-only directory.
  - \* `Keysight_M9099_3-0_Setup.exe`
2. Run the command prompt as an administrator.
3. Navigate to the directory in which the M9099 Setup file is located.

4. Run the following command:

```
Keysight_M9099_3-0_Setup.exe /s /v /qn
```


# Setting Up Licenses

This section describes Keysight software licensing and the licenses required to run the Keysight Waveform Creator software.

## Keysight Software Licensing

The Waveform Creator software supports Node-Locked licensing type.

**NOTE** For more details on different license types and setup, launch **Keysight License Manager** from **Start > All Programs >**

**Keysight License Manager** or by clicking  from system tray.

When you purchase Waveform Creator, you are provided with a License Redemption Entitlement Certificate that documents the options to which you are entitled. You can redeem the certificate at <http://www.keysight.com/find/softwaremanager> using the purchase order number, entitlement certificate number, and other details to run the software.

The Keysight Software Licensing system issues a license file for each purchased option, by e-mail, to an address you specify. Each license file is a plain text file attachment with a file name in the form *XXXXXX\_YYYYYY.lic*.

When you receive the e-mail, you should save the attached .lic file(s) to the Agilent license directory, which is, by default, located at *C:\Program Files\Agilent\licensing*.

**NOTE** You can check the status of your software licenses by running the optional **Keysight License Manager** or by selecting **Help > About...** from the Waveform Creator menu and then selecting the **Licenses** tab in the **About** dialog.

If a license is not available or not valid, the corresponding features will not be enabled by the Keysight Waveform Creator.

## Waveform Creator Licenses

### Keysight Waveform Creator Software Options

Product-Option	*Feature	Version*	Description
M9099T			Waveform Creator (Transportable Perpetual License)
M9099T-LIC	M9099_CS_CoreSoftware	3.000	Core product w/ Basic & Multi-tone plug-in licenses (Required)
M9099T-AYA	M9099_Wp_DigMod	3.000	Digital Modulation Library plug-in license
M9099T-DCS	M9099_Dc_Docsis	3.000	Docsis 3.1 Plug-in license
M9099T-DFW	M9099_Dp_DataFileWrite	3.000	Unencrypted Data File Write plug-in License
M9099T-SVM	M9099_Wp_SystemVue	3.000	SystemVue Model plug-in license (requires SystemVue software)

### Waveform Creator Trial licenses

Product-Option	Feature	Version	Description
M9099T-LIC-TRL	M9099_CS_CoreSoftware	3.000	Waveform Creator core software (Trial)
M9099T-AYA-TRL	M9099_Wp_DigMod	3.000	Digital Modulation Plug-in (Trial)
M9099T-DCS-TRL	M9099_Dc_Docsis	3.000	Waveform Creator Docsis 3.1 Plug-in (Trial)
M9099T-SVM-TRL	M9099_Wp_SystemVue	3.000	SystemVue Model Plug-in (Trial)



### Waveform Creator Support licenses

Product-Option	Feature	Version	Description
M9099T-LIC-12M		3.000	Waveform Creator, Core Software, Premium Support Plan (1-year)
M9099T-AYA-12M		3.000	Waveform Creator Digital Modulation, Premium Support Plan (1-year)
M9099T-DCS-12M		3.000	Waveform Creator Docsis 3.1 Plug-in, Premium Support Plan (1-year)
M9099T-DFW-12M		3.000	Waveform Creator Data File Write, Premium Support Plan (1-year)
M9099T-SVM-12M		3.000	Waveform Creator SystemVue Model, Premium Support Plan (1-year)

## Quick Start

This section introduces a typical Waveform Creator workflow. You will create a test modulation in M9099 Waveform Creator, download it to the M9381A Vector Signal Generator (VSG), and verify the resulting RF signal using the N9020A MXA Signal Analyzer.

This should be sufficient to get you familiar with the basic workflow.

- [Configure the System \(page 18\)](#)
- [Create a Simple Waveform \(page 18\)](#)
- [Download the Waveform \(page 19\)](#)

## Configure the System

Refer to [System Requirements \(page 11\)](#)

## Create a Simple Waveform

Waveforms are created by dragging and dropping waveform segments from the active Segment Library window into the Waveform Layout window. Once the desired sequence of waveform segments is achieved, the composite waveform, including any added noise or other impairments, can be reviewed in the Output Device window.

Follow these steps to create a simple waveform:

1. Run the M9099 Waveform Creator software.
2. Select the Multi-tone Segment Library tab.
3. Drag and drop Segment 1 from the Segment Library window into the Waveform Layout window by selecting the colored box numbered 1.  
The Multi-tone Segment 1 panel appears on the left.
4. Change the segment 1 settings to the following (leave all others at their default values):
  - a. Tone Type: Single Tone
  - b. Tone Frequency: 60.00 MHz
  - c. Tone Modulation Symbol Rate: 10.00 MHz
  - d. Tone Modulation Type: 16 QAM
  - e. Tone Filter Type: Root Raised-Cosine
  - f. Tone Filter BT/Shape: 0.300
  - g. Tone Minimum Length: 65536

NOTE

Waveforms can also be imported in the form of CSV, LabVIEW CSV, HDF, BIN, M8190A DUC IQBIN, or WFM file format using File Import plug-in. To import:

1. In the File Import Segment, under **Segment Settings**, set the **File Type** to "XXX File", where XXX=CSV, LabVIEW CSV, HDF, BIN, M8190A DUC IQBIN, or WFM.
2. Specify the **Waveform File Name** under **Segment Settings** to import the desired file.

## Download the Waveform

Generated waveforms using Waveform Creator can be downloaded to any of the supported output devices or File (csv, matlab or binary format).

This section provides instructions for downloading waveforms on M9381A VSG. Similar steps can be taken to download waveforms on other supported output devices.

### M9381A VSG: An Example Output Plug-in

To download waveform on an M9381A VSG:

1. [Connect the M9099 Waveform Creator to the M9381A Vector Signal Generator \(page 19\)](#)
2. Run M9099 software
3. [Generate Output \(page 20\)](#)

### Connect the M9099 Waveform Creator to the M9381A Vector Signal Generator

The Agilent M9381A VSG hardware comprises four interconnected PXIe modules, typically hosted in an Agilent M9018A PXIe chassis. These modules must be controlled over the PXIe bus by the M9381A instrument driver in order to deliver the product functionality. The driver may be hosted by an embedded controller PC in the same PXIe chassis, or by an external laptop or desktop PC whose PCIe backplane has been extended (by adapters and cable) onto the backplane of the PXIe chassis. The possible configurations are fully described in the *Agilent M9381A Configuration Guide (5991-0897EN)*.

Once the M9381A hardware is configured and the M938x VSG/CW Source Instrument Driver is installed, other applications (such as M9099) may communicate with the M9381A by means of IVI-COM driver calls to the VISA PXI address assigned to the M9381A in the Agilent IO Libraries Suite.

## Generate Output

To generate output:

1. Select **Generate** > **Output Device** > **Agilent M9381A VSG** to select the output device.
2. Select the Current Output Device Settings window and change the device settings to the following (leave all other parameters at their default values):
  - a. Instrument Address: <VISA string from Agilent IO Libraries>
  - b. Frequency: 1.5 GHz
  - c. Amplitude: 0 dBm
  - d. RF On: True
3. Click the Generate and Output button in the tool bar to send the created waveform to M9381A VSG.

**WARNING** If you have no M9381A hardware installed (and therefore have no address to enter), you can still explore the software functionality by changing the M9381A output device setting **Output To** to **Output to Simulated HW**. In this mode, Settings changes and waveform downloads will appear to work, but the changes and data are simply discarded by the M9381A driver.

For more details on M9381A Output plug-in settings, refer to the User's Guide.

## Data File Write

Waveform Creator allows you to save the output waveform to a file in either of the following formats:

- CSV (comma separated)
- N5110A waveform (\*.bin)
- MATLAB® Level 5 MAT-File
- M8190A DUC IQBIN File
- WFM

To download waveform to a file:

1. Select **Generate** > **Output Device** > **File (csv, binary or matlab)**.
2. Set the parameter values.
3. Click the Generate and Output button in the tool bar to save the output to a file on the host computer.

For file data, the maximum sample rate is not limited by hardware, so for internal coding purposes a nominal limit of 5 GHz is set. Within this limit, the auto sample rate algorithm chooses the most appropriate sample rate for the generated waveform. If a higher sample rate is needed, then this nominal limit can be over-ruled by using the manual sample rate setting.

The output files are unencrypted and can be formatted in various ways to facilitate their import into other Agilent and non-Agilent tools.  
For more details on File settings, refer to Data File Write Plug-in .

**NOTE** Output to all supported Keysight VSGs is standard as part of Waveform Creator functionality but file output is separately licensed as Waveform Creator option DFW.



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Edition 3, August, 2015  
Printed In USA



M9099-90002  
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