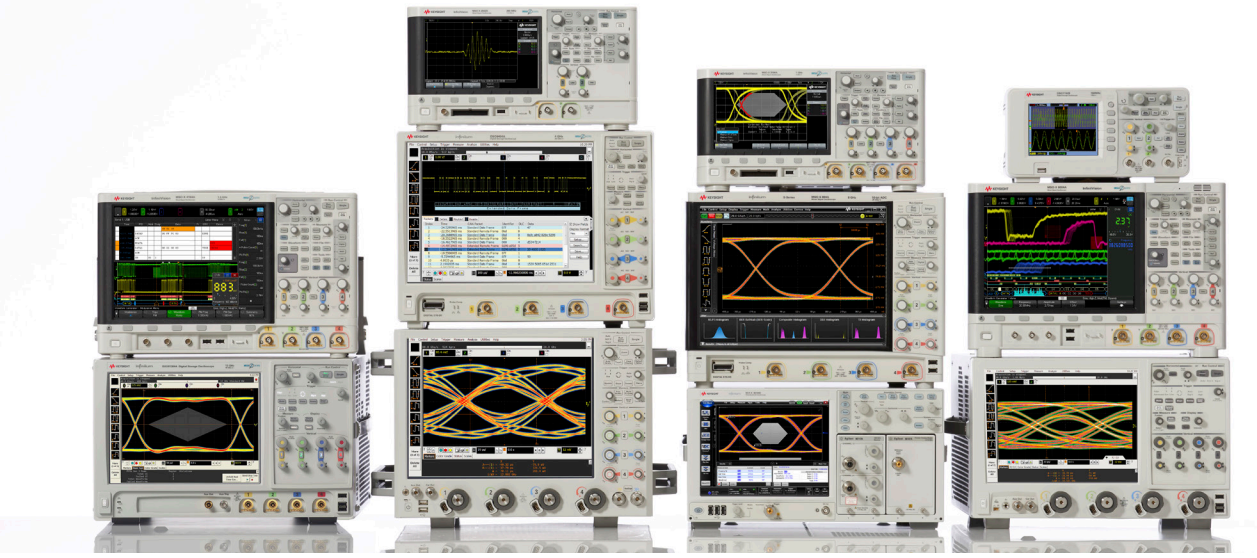
Keysight Technologies

MATLAB® Data Analysis Software Packages

For Keysight Oscilloscopes

Data Sheet

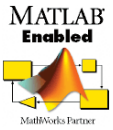


KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

- Enhance your InfiniiVision or Infiniium oscilloscope with the analysis power of MATLAB software
- Develop custom analysis functions directly on Infiniium oscilloscopes
- Combine with other Keysight analysis software solutions
- Use with Keysight 2000 X-, 3000 X-, 4000 X-, 6000 X-, 5000, 6000, 7000, 9000, 90000, S-Series, Z-Series, or 86100D DCA-X oscilloscopes or 90008A oscilloscope/digitizers

Get Powerful MATLAB Software Options on the Most Popular Keysight Oscilloscopes



With today's increasingly complex signals, the standard analysis routines that come with your oscilloscope are sometimes not enough. Now, Keysight Technologies, Inc. has joined forces with The MathWorks to offer powerful MATLAB software options that can be ordered right with your new InfiniiVision or Infiniium oscilloscope. These options give you advanced math and analysis options and allow you to create your own math functions and filters to meet your specific needs.

MATLAB extends the functionality of Keysight oscilloscopes by enabling you to analyze and visualize your data, execute and test various filters/equalization methods/transfer functions, and develop automated tests. With these capabilities, you can:

- Test the functionality of electronic devices by making measurements with Keysight instruments and comparing them against known baselines in MATLAB
- Capture waveforms using a Keysight oscilloscope controlled through the Instrument Control Toolbox and then manipulate or analyze the waveforms within MATLAB
- Send MATLAB processed waveforms (either captured using an oscilloscope or derived mathematically) to a Keysight waveform/signal generator
- Verify new algorithms or measurement routines using live data from Keysight instruments

MATLAB is a well known and respected data analysis software environment and programming language developed by The MathWorks and now available for purchase directly from Keysight. MATLAB software can be used to make measurements, analyze and visualize data, generate arbitrary waveforms, control instruments, and build test systems. It provides interactive tools and command-line functions for a wide range of applications, including signal processing, signal modulation, digital filtering, and curve fitting. MATLAB has more than 1,000,000 users in diverse industries and disciplines, and it is a standard at more than 3,500 colleges and universities worldwide.

Benefits of Purchasing MATLAB Software Directly from Keysight

Adding MATLAB software to the purchase of your Keysight oscilloscope provides five key benefits:

- Convenience: Acquire software and analyzer on a single purchase order
- Confidence: MATLAB software sold through Keysight has been tested and qualified by Keysight
- Support: Contact either Keysight or The MathWorks for help with installation and technical questions
- Quick start: Acquire numerous application examples directly from Keysight to get started
- Reliability: Ensure that your MATLAB software is always available to you when you need it

Two MATLAB packages available

Keysight offers two MATLAB software packages that are typical packages needed by oscilloscope users. These packages range from basic MATLAB capabilities to acquire and analyze data to full support for signal processing, communications systems, filter design, and automated testing:

Table 1. Descriptions of MATLAB packages available.

Description	Additional information
MATLAB – Basic signal analysis package	This basic configuration includes the MATLAB software environment and the Instrument Control Toolbox. Use this configuration to configure, control, and acquire data from an Keysight InfiniiVision or Infiniium oscilloscope. Also use it to perform basic signal analysis and visualization tasks.
MATLAB - Standard signal analysis package	Includes the products in the MATLAB – Basic signal analysis package plus the DSP System Toolbox and Signal Processing Toolbox. Combining the Signal Processing Toolbox with the extended features of the DSP System Toolbox in the standard analysis package provides digital and analog filter algorithms for use in the MATLAB environment. The filters and associated modeling and visualization tools are valuable for analyzing waveform data in MATLAB, but could also be used to emulate a theoretical circuit's response on the signal sampled by the oscilloscope.

The Instrument Control Toolbox is included with every MATLAB option Keysight sells. Using the Instrument Control Toolbox, you can easily communicate with the oscilloscope using one of the available built-in programming interfaces (for example, Ethernet LAN, USB, or GPIB – options vary depending on the scope you use) to remotely control or import data into the MATLAB environment. Once the digitized data exists in an array in the MATLAB software, a wide variety of analysis and visualization tools are available. Depending on the enabled toolboxes, you can use various filters and custom algorithms to process and manipulate the waveform data. Then you can visualize the data using a wide variety of 2D and 3D plot types in the MATLAB software or send it back out to another instrument using the Instrument Control Toolbox. For instance, it might be useful to take a waveform data set that was captured by a Keysight oscilloscope, pass it through a transfer function in the MATLAB software, then use it as the input to an arbitrary waveform generator. You can use this method to tune a stimulus-response test.

Keysight provides the license certificate redeemable for MATLAB software with the shipment of the instrument.

Additional Details on Toolboxes Provided in the MATLAB Packages

The Instrument Control Toolbox lets you communicate with instruments, such as oscilloscopes, function generators and signal analyzers directly from MATLAB software. The toolbox enables you to communicate with instruments via instrument drivers, such as IVI and VXIplug&play, and commonly used communication protocols, such as GPIB, VISA, TCP/IP, and UDP. With the Instrument Control Toolbox product, you can generate data in MATLAB to send out to an instrument, or read data into MATLAB software for analysis and visualization.

The Signal Processing Toolbox is a collection of industry standard algorithms for analog and digital signal processing (DSP). Signal Processing Toolbox software also provides graphical user interfaces for interactive design and analysis and command-line functions for advanced algorithm development

The DSP System Toolbox provides algorithms, apps, and scopes for designing, simulating, and analyzing signal processing systems in MATLAB® and Simulink®. You can model real-time DSP systems for communications, radar, audio, medical devices, IoT, and other applications.

Use MATLAB software packages with the 86100D DCA-X oscilloscope

The DCA-X is able to interface with MATLAB using Option 201 so that you can apply almost any filtering or signal processing algorithm you wish and see the results on the DCA-X immediately. It is recommended that users of the DCA-X purchase “MATLAB - Standard digital analysis package” as it provides MATLAB, the DSP System Toolbox, and the Signal Processing Toolbox, which are important toolboxes for developing and applying digital filters to your oscilloscope signals.

Starting with firmware revision 8.02 you can also run MATLAB scripts that you write yourself or that are recommended by standards such as IEEE 802.3, FC-PI-4 and others. This allows you to see live Waveform Dispersion Penalty (WDP), non-compensatable data-dependent jitter (ncDDJ) and other results right on your oscilloscope screen. Transmitter Waveform Dispersion Penality (TWDP) is an example of a wrapper script as demonstrated in Figure 2.

Use MATLAB software packages with Infiniium User-Defined Function (UDF)

Keysight offers an option with Infiniium Series oscilloscopes called User-Defined Function that enables oscilloscope users to process oscilloscope data in the MATLAB data analysis engine and display the results as an additional oscilloscope channel. User-defined function requires MATLAB software to create and modify these custom analysis routines. It is recommended that users of UDF also purchase “MATLAB - Standard Signal Analysis Package” as it provides MATLAB and the Signal Processing Toolbox, which is an important toolbox for developing and applying digital filters to your oscilloscope signals.

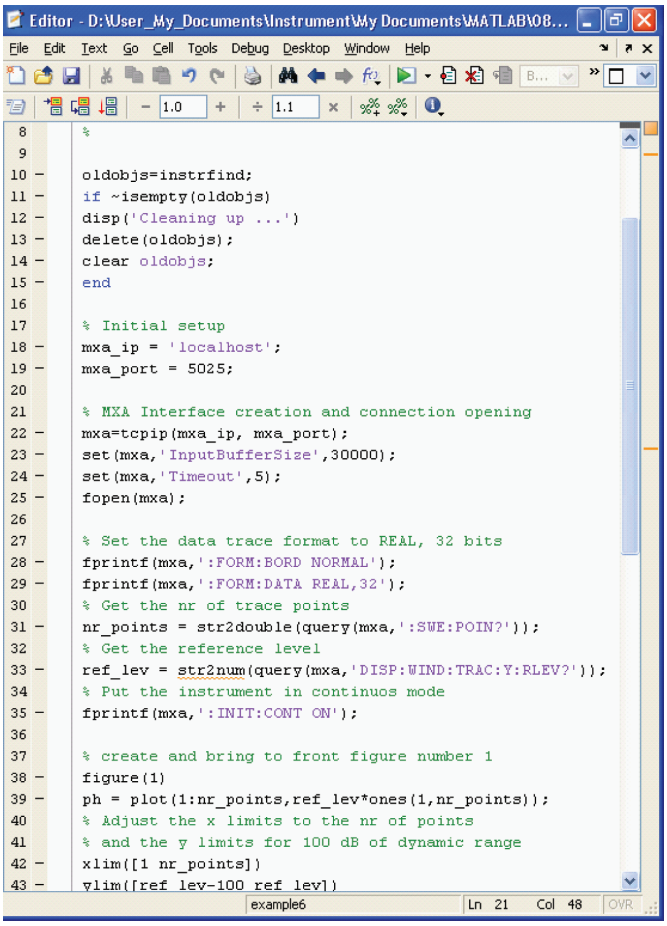


Figure 1. Developing a new MATLAB application or modifying an existing MATLAB application using the MATLAB Editor provided by MATLAB

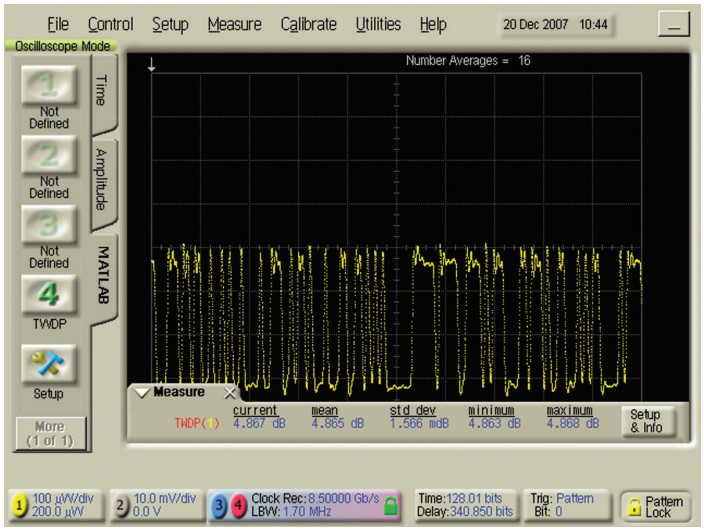


Figure 2. Example of a MATLAB script, TWDP, that expands the measurement functionality of the 86100D DCA-X by generating live, instant results viewable directly on the DCA-X from within the “classic” user-interface.

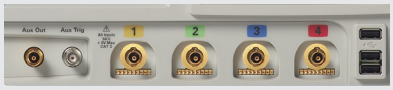
Specifications

Oscilloscopes:	Required software revision
Infiniium Z-Series	Rev 5.0 or later
Infiniium DSOX90000 Series	Rev 3.0 or later
Infiniium DSO90000A Series	Rev 2.1 or later
InfiniiVision DSO7000A/B Series	Rev 5.15 or later
Infiniium S-Series	Rev 5.0 or later
Infiniium 9000 Series	Rev 2.1 or later
InfiniiVision DSO6000A Series	Rev 5.15 or later
InfiniiVision DSO5000A Series	Rev 5.15

Ordering information

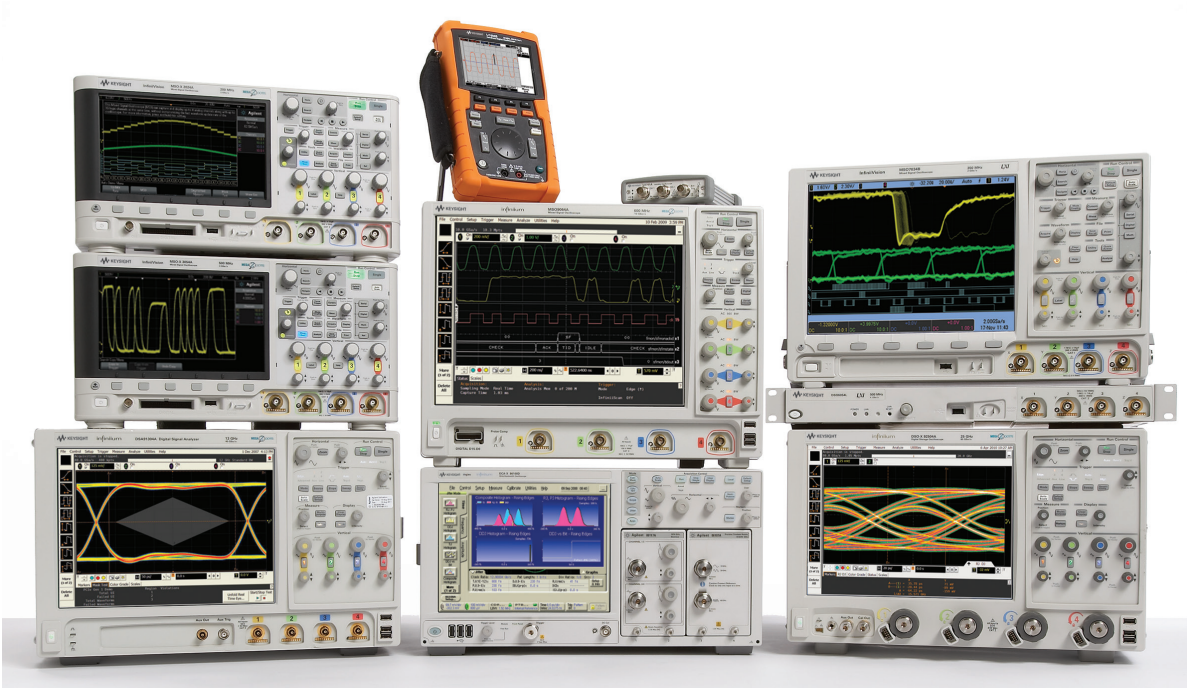
Model	Description
InfiniiVision Series scope models	
N6174A	MATLAB - Basic digital analysis package
N6175A	MATLAB - Standard digital analysis package
Infiniium Series scope models	
N8831A-001	MATLAB - Basic digital analysis package
N8831A-002	MATLAB - Standard digital analysis package
5000 Series scopes	
DSO5000-061	MATLAB - Basic digital analysis package
DSO5000-062	MATLAB - Standard digital analysis package
6000 Series scopes	
DSO6000-061	MATLAB - Basic digital analysis package
DSO6000-062	MATLAB - Standard digital analysis package
MSO6000-061	MATLAB - Basic digital analysis package
MSO6000-062	MATLAB - Standard digital analysis package
7000 Series scopes	
DSO7000-061	MATLAB - Basic digital analysis package
DSO7000-062	MATLAB - Standard digital analysis package
MSO7000-061	MATLAB - Basic digital analysis package
MSO7000-062	MATLAB - Standard digital analysis package
9000 Series scopes	
DSO9000-061	MATLAB - Basic digital analysis package
DSO9000-062	MATLAB - Standard digital analysis package
MSO9000-061	MATLAB - Basic digital analysis package
MSO9000-062	MATLAB - Standard digital analysis package
90000 Series and 90000 X-Series scopes	
DSO90000A-061	MATLAB - Basic digital analysis package
DSOX90000A-061	MATLAB - Basic digital analysis package
DSO90000A-062	MATLAB - Standard digital analysis package
DSOX90000A-062	MATLAB - Standard digital analysis package
86100D DCA-X	
86100D-061	MATLAB - Basic digital analysis package
86100D-062	MATLAB - Standard digital analysis package

Modern connectivity



Chose the best connection for your requirements

- USB - seven ports
- LAN - 100 based-T
- GPIB
- LXI - class-C compliant



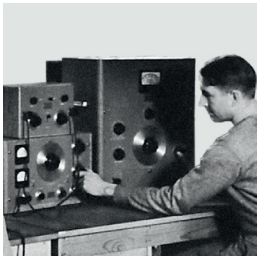
Keysight Technologies Oscilloscopes

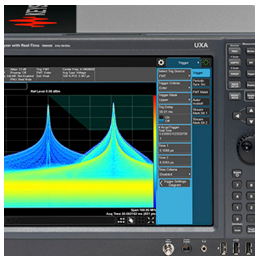
Multiple form factors from 20 MHz to > 90 GHz | Industry leading specs | Powerful applications

To learn more about using MATLAB with Keysight oscilloscopes, to request a free MATLAB software trial, or to download MATLAB examples for Keysight oscilloscopes, go to www.keysight.com/find/matlab_oscilloscopes

Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. We are unlocking the future of technology.





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