Keysight M8190A Arbitrary Waveform Generator

Getting Started Guide

KEYSIGHT TECHNOLOGIES

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Notices

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For Assistance and Support

http://www.keysight.com/find/assist

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ESD Sensitive Device

All front-panel connectors of the M8190A are sensitive to Electrostatic discharge (ESD).

We recommend to operate the instrument in an electrostatic safe environment.

There is a risk of instrument malfunction when touching a connector.

Please follow this instruction:

Before touching the front-panel connectors discharge yourself by touching the properly grounded mainframe.

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Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Summary

General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

For safe operation the general safety precautions for the M9502A and M9505A AXIe chassis, must be followed. See: http://www.keysight.com/find/M9505A

Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically. The Performance Tests give procedures for checking the operation of the instrument. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Keysight Technologies Sales/Service Office.

WARNING To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, etc.).

General

This product is a Safety Class 3 instrument. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate within a temperature range of 0 °C – 40 °C (32 °F – 105 °F) at a maximum relative humidity of 80% and at altitudes of up to 2000 meters.

This module can be stored or shipped at temperatures between -40 °C and +70 °C. Protect the module from temperature extremes that may cause condensation within it.

Before Applying Power

Verify that all safety precautions are taken including those defined for the mainframe.

Line Power Requirements

The Keysight M8190A operates when installed in A Keysight AXIe mainframe.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Symbols on Instruments

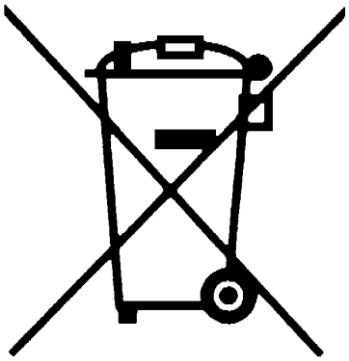
Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.

CE Marking to state compliance within the European Community: This product is in conformity with the relevant European Directives.

General Recycling Mark

C-Tick Conformity Mark of the Australian ACA for EMC compliance.

Environmental Information



This product complies with the WEEE Directive (2002/96/EC) marketing requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product category: With reference to the equipment types in the WEEE Directive Annexure I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Keysight office, or see **www.keysight.com/environment/product/** for more information.

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1 Introduction

Introduction

The Keysight M8190A is a 12 GSa/s Arbitrary Waveform Generator. It combines excellent signal fidelity with highest sampling rates. It offers up to 2 GSa waveform memory per channel and three different high bandwidth output paths to ideally address applications.

Features and Benefits

- Precision AWG with
  - 14-bit resolution up to 8 GSa/s with Option -14B
  - 12-bit resolution up to 12 GSa/s with Option -12G
  - 14-bit resolution up to 7.2 GSa/s with Option -DUC
- Spurious-free-dynamic range (SFDR) up to 80 dBc typical
- Harmonic distortion (HD) up to -72 dBc typical
- Standard arbitrary waveform memory size 128 MSa per channel with Option -14B and Option -12G, 64 MSa IQ sample pairs with Option -DUC
  - 2^{31} = ~2147 MSa arbitrary waveform memory per channel with Option -02G in 12 bit mode
  - ~1610 MSa arbitrary waveform memory per channel with Option -02G in 14 bit mode
  - ~805 MSa IQ sample pair arbitrary waveform memory per channel with Option -02G in DUC mode. I.e. with Option -02D and Option -DUC, the M8190A offers ~805 MSa I data and ~805 MSa Q data per channel.
- Analog bandwidth 3.5 GHz; (5 GHz with Option - AMP)
- Transition times 50 ps (20 % to 80 %) with Option - AMP
- Differential output
- Form-factor: 2-slot AXIe module
- Controlled via external PC or embedded AXIe system controller M9536A

Getting Started with M8190A

The M8190A is a modular instrument packaged in the AXIe form factor. AXIe is a new open standard for high-performance modular instrumentation. Two form factors are available: five-slot and two-slot AXIe chassis. These include an embedded AXIe system module that does not occupy a module slot. In addition, an AXIe embedded controller forms an entire system that can control the M8190A AWG. This embedded controller consumes one module slot of the AXIe chassis. Besides using an embedded controller, the M8190A AWG can be controlled by an external desktop PC or an external laptop as well. In this case, a PCIe adapter card and PCIe cable are needed to connect to the AXIe chassis.

There are two different ordering possibilities:

- AXIe chassis, PCIe cable, PC and M8190A AWG are ordered separately. The different components come in different packages and need to be installed. Please follow the instructions given in chapter 3 of M8190A User's Guide or the instructions given in the User's Guide of the AXIe chassis.
- M8190A bundle, there are two configurations available:
  - Option -BU1, contains a 5- slot AXIe chassis, embedded controller and the M8190A AWG. The M8190A firmware and SFP (soft front panel) is already installed and configured on the embedded controller.

    User set up:

    - Username: `M8190a_admin`
    - Password: `admin!123`

    Directory of the software:

    - Firmware:
      `C:\Program Files (x86)\Keysight\M8190\bin`
    - SoftFrontPanel:
      `C:\Program Files (x86)\Keysight\M8190\SFP`
  - Option -BU2, contains a 2- slot AXIe chassis and either a laptop cable with laptop adapter card or desktop cable with desktop adapter card. The AWG is already plugged in the 2- slot AXIe chassis. Cable and adapter card needs to be connected as described in chapter 2 of M8190A User's Guide or as described in the User's Guide of the AXIe chassis.

Additional Documents

Additional documentation can be found at:

- http://www.keysight.com/find/M9505A for 5-slot chassis related documentation.
- http://www.keysight.com/find/M9502A for 2-slot chassis related documentation.
- http://www.keysight.com/find/M9045A for PCIe laptop adapter card related documentation.
- http://www.keysight.com/find/M9047A for PCIe desktop adapter card related documentation.
- http://www.keysight.com/find/M9536A for embedded AXIe controller related documentation.
- http://www.keysight.com/find/M8190A for AXIe based AWG module related documentation.
- http://www.keysight.com/find/M8192A for AXIe based synchronization module related documentation.

2 M8190A Software Installation

This chapter explains the steps required to install M8190A software package.

2.1 Pre-Requisites

The following are the pre-requisites for installing Keysight M8190A software:

- The supported operating systems are:
  - Windows Vista (32 bit)
  - Windows Vista (64 bit)
  - Windows 7 (32 bit)
  - Windows 7 (64 bit)
  - Windows 8
- Ensure that you have Keysight IO Libraries Suite Version 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 http://www.keysight.com/find/iosuite.

NOTE The Keysight M8190A V3.0 or later does not support Windows® XP® operating system.

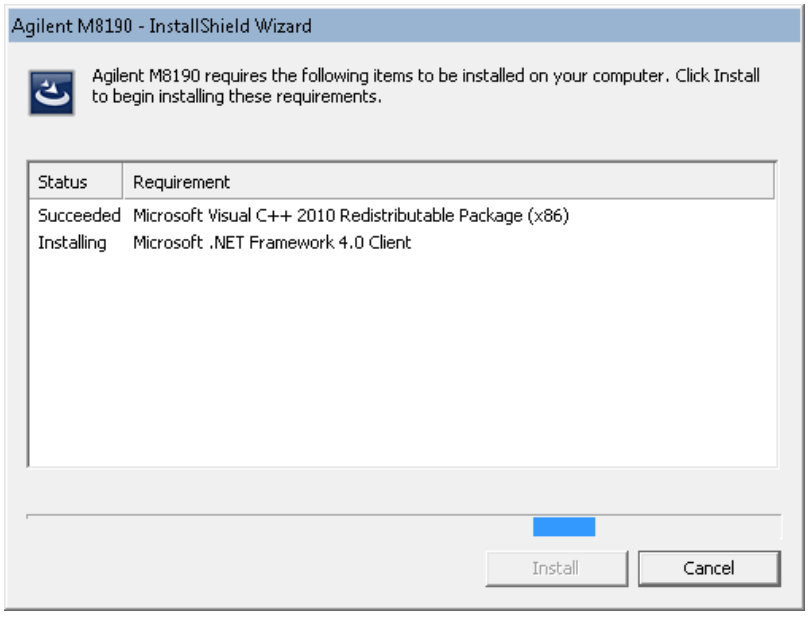
NOTE Even if a non-Keysight I/O library is already installed, it is still necessary to install the Keysight I/O library. The Keysight I/O library will install as "secondary" I/O library in this case. This use case is fully supported. There only needs to be some additional considerations when doing SCPI remote programming. For more information on SCPI remote programming, refer to M8190A User's Guide. A non-Keysight "primary" I/O library must support the HiSLIP protocol otherwise; the Soft Front Panel and the IVI drivers will not work.

2.2 Installation Process

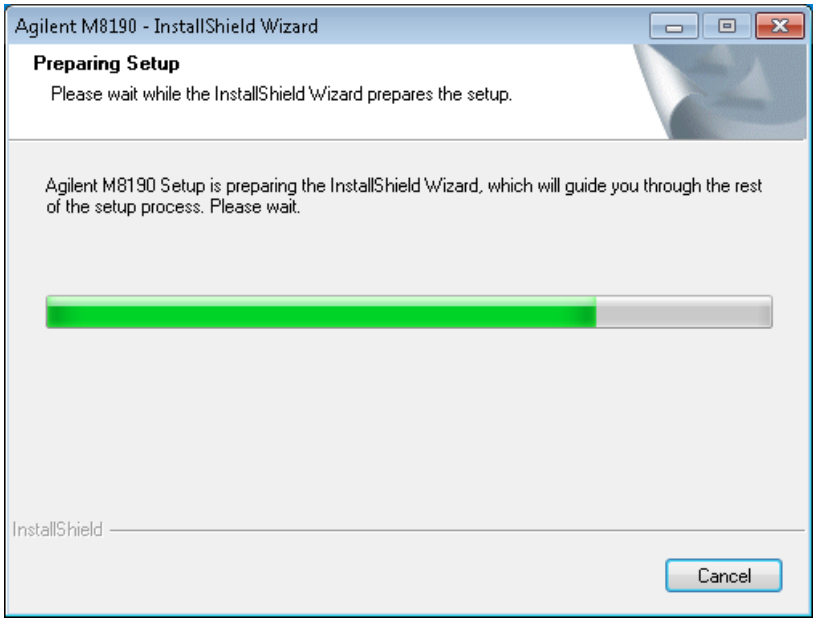
Follow the given steps to install **Keysight M8190A** software on your system.

1. Double-click the executable (M8190_Setup.exe). This executable file will be available either on CD or Web.

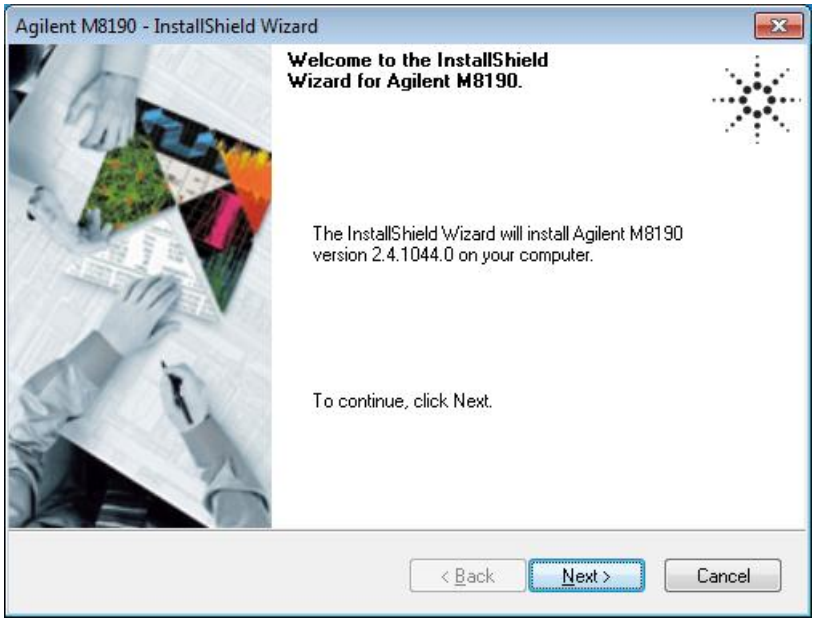
NOTE The installer will first check for some pre-requisites and install them, if necessary. It is possible that your PC requests a reboot during this step. Reboot your PC, if requested.



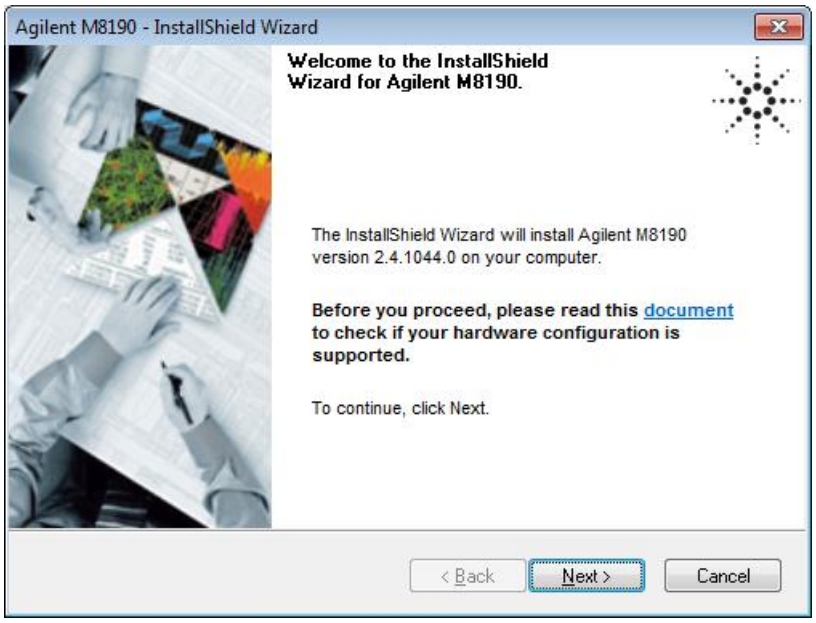
2. The Keysight **M8190A Setup** will prepare the **InstallShield Wizard** for the installation process. The following window will appear.



3. Follow the onscreen instructions to begin the installation process. Click **Next**.

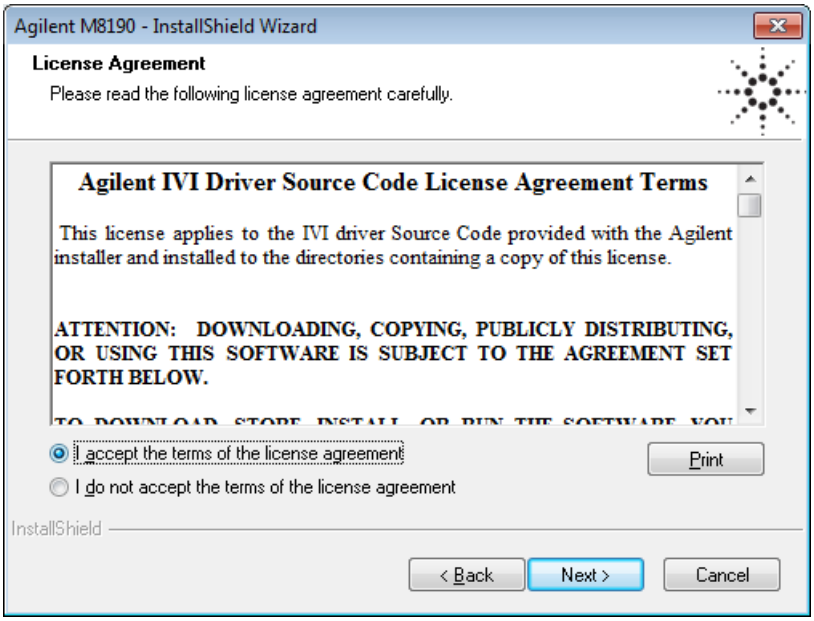


4. We recommend you to read the document to check if your hardware configuration is supported.
   Click **Next** to proceed to the license agreements.



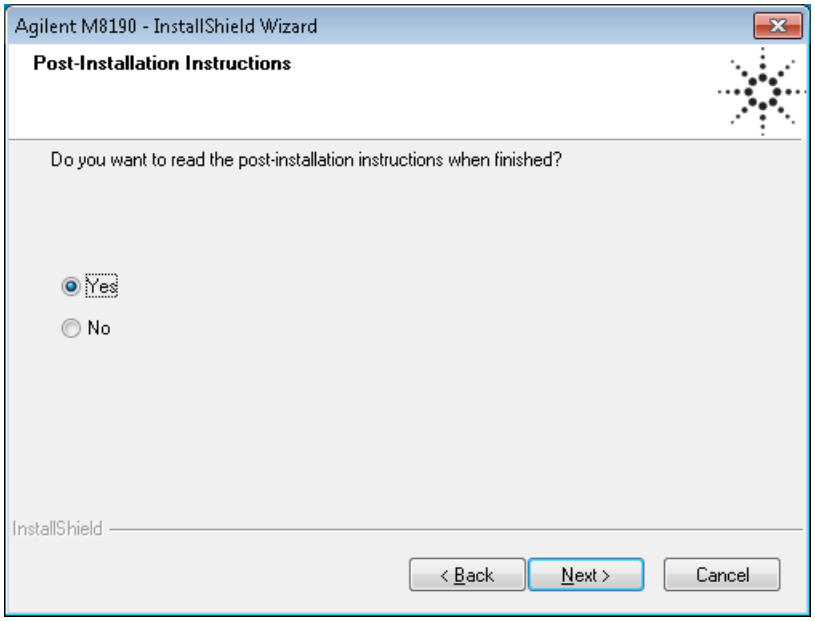
5. Accept the terms of Keysight software end-user license agreement.
   Click **Next**.

6. Accept the terms of Keysight IVI driver source code license agreement terms. Click **Next**.

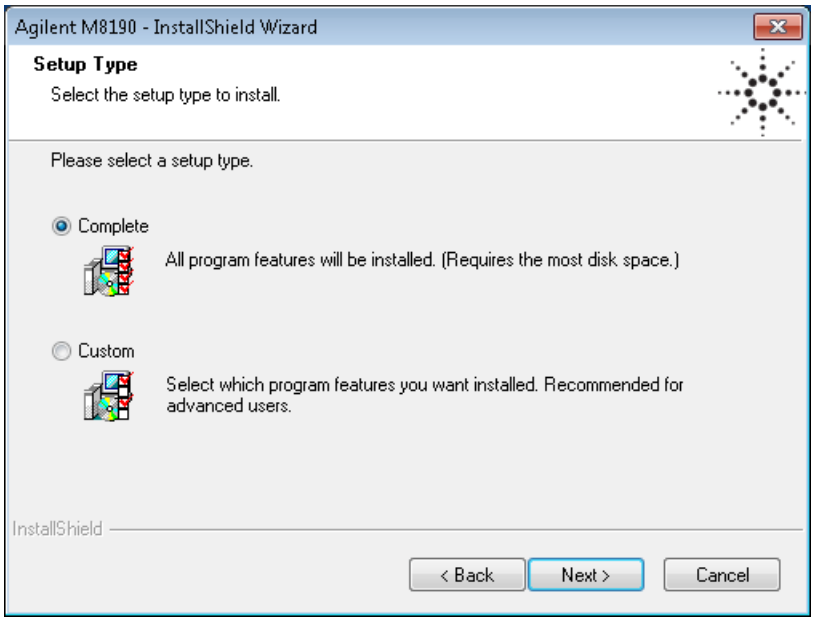


7. Select **Yes** if you want to read the post-installation instructions when finished.

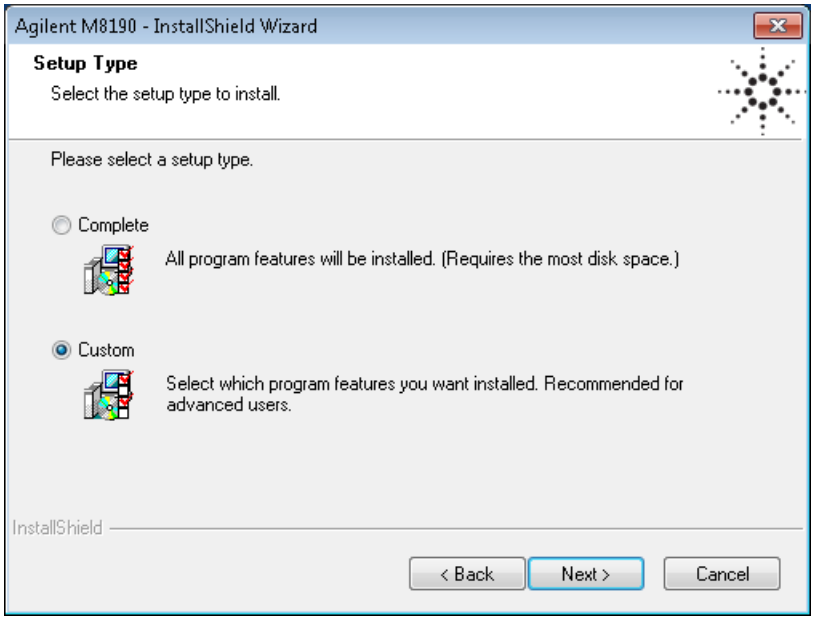
   Click **Next** to select setup type.

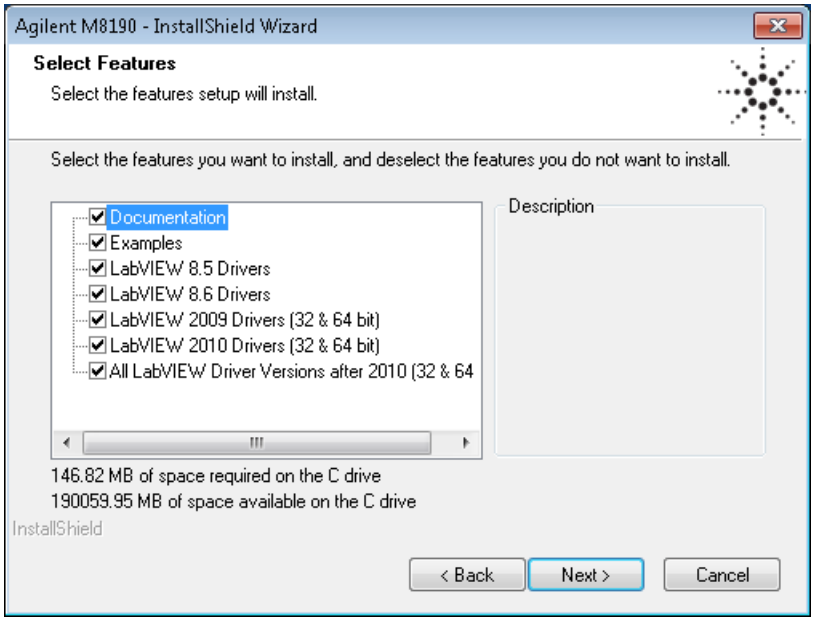


8. Select a setup type either **Complete** or **Custom**.
   Click **Next**.

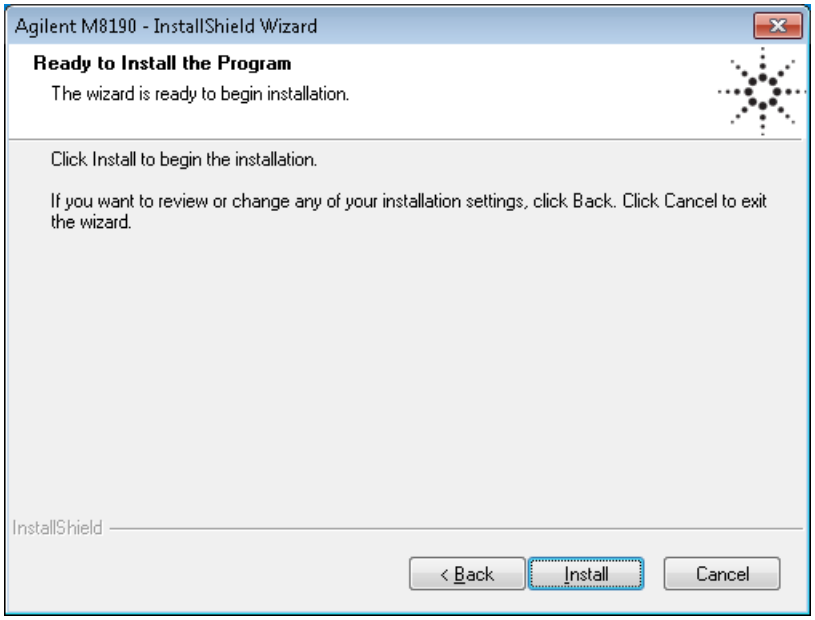


If you select **Custom** and click **Next**, you can specify which optional features will be installed:

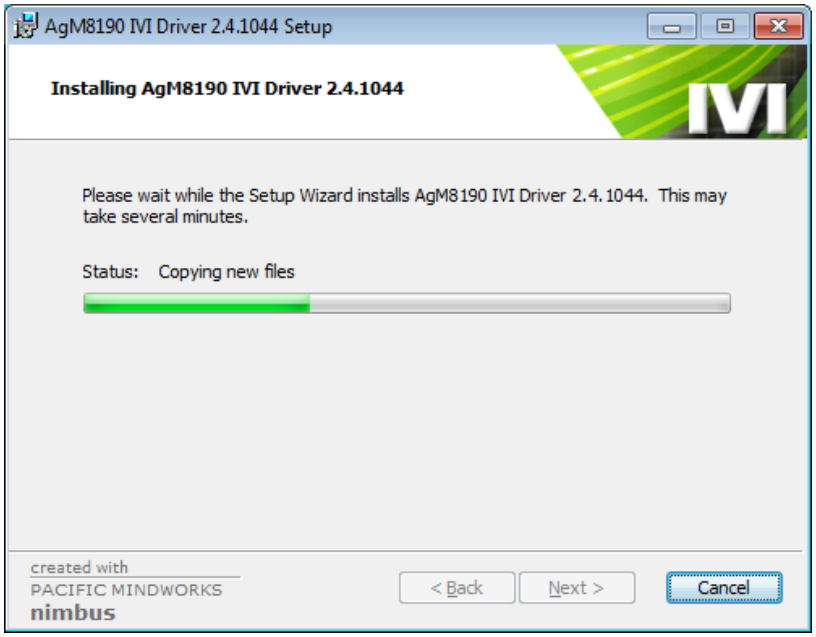




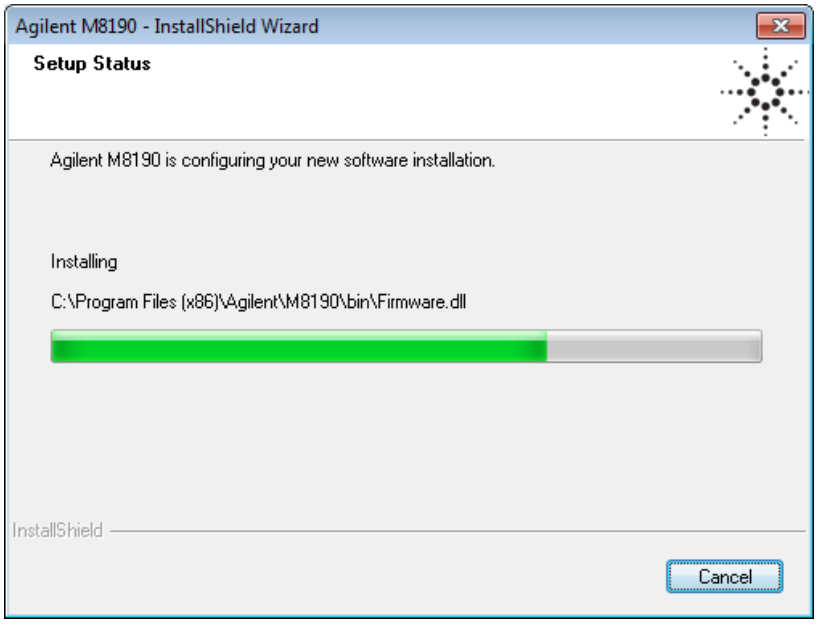
9. Click **Next** to begin installation.



10. The **Setup Wizard** will now install AgM8190 IVI Drivers.

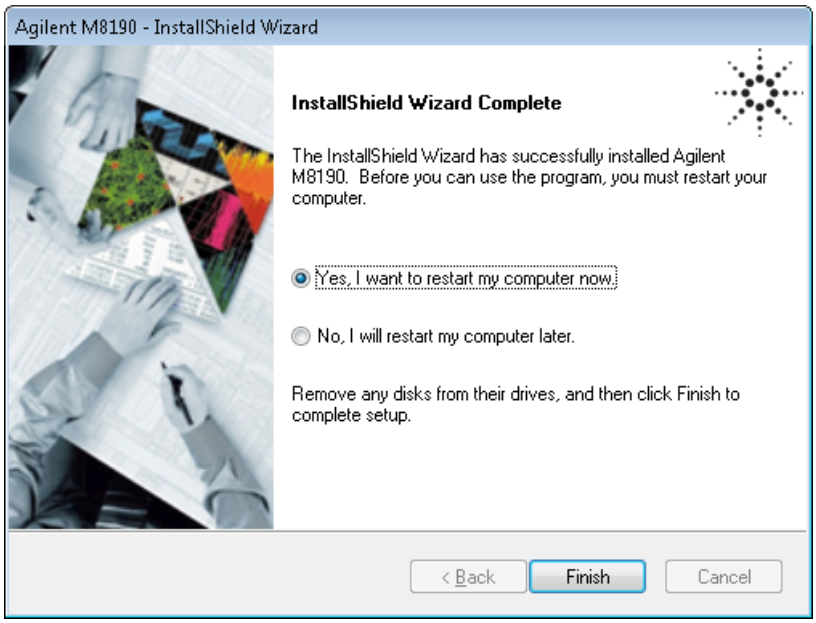


11. The **Keysight M8190A** will configure the new software installation.



12. The following screen will appear once the **Keysight M8190A** software is successfully installed on your system.

    Click **Finish** to restart your system. Do not connect the AXIe chassis to your system using the PCIe cable during this reboot.



    This completes the Keysight M8190A software installation.

2.3 Post Installation Steps

Follow the post installation steps as shown below:

NOTE If your instrument is already powered up and connected to your PC using the PCIe cable, just reboot your PC and start with step 5.

1. Shut down PC and instrument.
2. Connect the instrument to the PC using the PCIe cable.
3. Switch on the instrument. Wait until the 'Access' LED of the M8190A has switched from red to green.
4. Switch on the PC.
5. The PC should automatically recognize the instrument.
   Check this in the device manager; e.g. via *Start – Control Panel – Device Manager*, or right-click *Computer – Manage – Device Manager*:
   The instrument should be visible in the device tree as *Keysight – M8190*.

NOTE Your PC might request a reboot. Reboot your PC, if requested.

6. Check if the M8190 is also visible in the Keysight Connection Expert (e.g. via *Start – Keysight IO Libraries Suite – Keysight Connection Expert)*.
   If something went wrong and the instrument is not shown in the PXI section, it may be necessary to reboot the PC once more.
7. Install Intel Network Drivers on Windows XP: The AXIe chassis contains an Intel 82573L NIC as a PCIe endpoint. Refer to the AXIe chassis User's Guide at http://www.keysight.com/find/M9505A for instructions how to install this driver.

2.4 How to use the Instrument

In order to use the instrument:

1. It must always be connected and switched on before you start the PC.
2. Start the firmware (*Start – Keysight – M8190 – M8190*). The user interface will display the VISA resource strings for different kinds of connection.
3. Using the appropriate VISA resource string you can:
   - Start the Soft Front Panel (*Start Menu – Keysight – M8190 – Soft Front Panel*).
   - Control the instrument with your own application using the M8190 IVI Drivers or add it as a LAN instrument in the Keysight Connection Expert (TCPIP0::localhost::...) and control it using SCPI (with e.g. the VISA Assistant or your own application).

You must start the firmware in order to send SCPI commands to the instrument.

NOTE The M8190 IVI Drivers and the Soft Front Panel start the firmware automatically. In this case, the firmware is only visible as an icon in the task bar's notification area.

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3 AXIe Chassis

Introduction

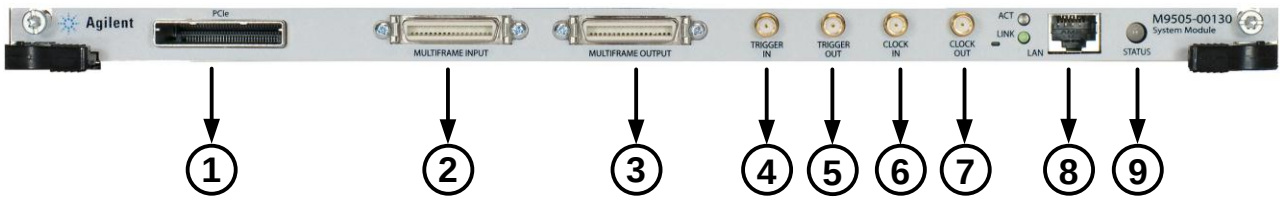
This chapter describes the usage of the AXIe chassis in combination with the M8190A.

The detailed documentation for the AXIe chassis can be found at:

- http://www.keysight.com/find/M9505A for 5-slot chassis
- http://www.keysight.com/find/M9502A for 2-slot chassis.

3.1 ESM Front Panel Connector

The ESM Front Panel Connector is shown in the figure below:



1	PCIe	Connects a host PC to the chassis via PCIe. PCIe is the only interface that can be used to control the M8190A module.
2	Multiframe Input	Synchronizes timing signals with multiple daisy-chained chassis.
3	Multiframe Output	
4	Trigger In	External Trigger connections. The Trigger In of the AXIe ESM cannot be used to trigger the M8190A. The M8190A has its own Trigger In. The Trigger Out of the AXIe ESM cannot be controlled by the M8190A.
5	Trigger Out	
6	Clock In	External clock connections.
7	Clock Out	
8	LAN	Connects the host PC to the chassis, via 10/100/1000 Ethernet. In particular, the LAN connector is used for ESM configuration, but NOT to communicate to the M8190A.
9	Status Light	Indicates the chassis status.

4 M8190A Maintenance

Introduction

This chapter explains how to install and maintain the M8190A. It covers the following topics:

- ESD Protection
- Power & Ventilation Requirements
- Thermal Protection
- Battery
- Operating Environment
- Cleaning Recommendation

4.1 ESD Protection

Caution

All the connectors are very sensitive to electrostatic discharge (ESD). When you connect a device or cable that is not fully discharged to these connectors, you risk damage to the instrument and expensive instrument repairs.

Caution

Electrostatic discharge (ESD) can damage the circuits of the M8190A. Avoid applying static discharges to the front-panel connectors. Before connecting any coaxial cable to the connectors, momentarily short the center and outer conductors of the cable together. Avoid touching the front-panel connectors without first touching the frame of the instrument. Be sure the instrument and all connected devices (DUT, etc.) are properly earth-grounded (to a common ground) to prevent buildup of static charge and electrical over-stress.

4.2 Power and Ventilation Requirements

For power and ventilation requirements, refer to:

- http://www.keysight.com/find/M9505A for 5-slot chassis related documentation.
- http://www.keysight.com/find/M9502A for 2-slot chassis related documentation.

4.3 Thermal Protection

Overheating Detection

The instrument monitors its internal temperature. If the temperature exceeds approximately 80°C the power supply is switched off. The instrument will not turn on automatically if the temperature is decreasing again.

Fan Failure

If a fan is broken or prevented from operating by a blockage the temperature will increase. When the temperature exceeds approximately 80°C the overheating detection switches off the instrument for safety reasons. For reliability it is recommended to send instruments with broken or defective fans immediately to Keysight Service for repair.

4.4 Battery

The M8190A does not have a battery.

4.5 Operating Environment

Storage Temperature	–40 °C to +70 °C
Operating Temperature	0 °C to 40 °C
Humidity	95%R.H. (at 40 °C)
Altitude	Up to 2000 m
Installation	Category II
Pollution	Degree 2

WARNING The instrument is not designed for outdoor use. Do not expose the instrument to rain or other excessive moisture. Protect the instrument from humidity and temperature changes, which could cause condensation within the instrument.

Do not operate the instrument in the presence of flammable gases, fumes or powders. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

4.6 Cleaning Recommendation

WARNING To prevent electrical shock, disconnect the instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean external case parts. Do not attempt to clean internally.

5 Characteristics

5.1 Performance Specification

The performance specification can be found in the Data Sheet of the M8190A at: http://www.keysight.com/find/M8190A

5.2 General

Power consumption	210 W (nom), 12 GSa/s operation
Operating temperature	0 °C to 40 °C
Storage temperature	-40 °C to 70 °C
Operating humidity	5 % to 80 % relative humidity, non-condensing
Operating altitude	up to 2000 m
Safety designed to	IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1
EMC tested to	IEC61326-1
Warm-up time	30 min
Calibration interval	1 year recommended
Warranty	1 year standard

Cooling Requirements

When operating the M8190A choose a location that provides at least 80 mm of clearance at rear, and at least 30 mm of clearance at each side for the AXIe chassis.

This information is subject to change without notice.
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