

Keysight M9186A PXI Voltage/Current Source

NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to **www.keysight.com**.



Notices

© Keysight Technologies 2010 - 2015

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Keysight Technologies as governed by United States and international copyright laws.

Manual Part Number

M9186-90001

Edition

Edition 3, June 2015

Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, CA 95403

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the "support" links on the following Keysight web resources:

- www.keysight.com/find/M9186A
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

Information on preventing damage to your Keysight equipment can be found at www.keysight.com/find/tips.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Keysight disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Keysight shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Keysight and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Keysight Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

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.

The following safety precautions should be observed before using this product and any associated instrumentation.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the user documentation for complete product specifications.

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

The types of product users are:

- Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.
- Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.
- Maintenance personnel perform routine procedures on the product to keep it operating properly (for example, setting the line voltage or replacing consumable materials). Maintenance procedures are described in the user documentation. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.
- Service personnel are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present.

A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock.

Before operating an instrument, ensure that the line cord is connected to a properly-grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided in closed proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions, or the safety of the equipment may be impaired.

CAUTION

- Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.
 - Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.
 - If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.
 - Instrumentation and accessories shall not be connected to humans.
-

To maintain protection from electric shock and fire, replacement components in mains circuits - including the power transformer, test leads, and input jacks - must be purchased from Keysight. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. Other components that are not safety-related may be purchased from other suppliers as long as they are equivalent to the original component (note that selected parts should be purchased only through Keysight to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keysight office for information.

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

Front and Rear Panels Symbols



The CE mark is a registered trademark of the European Community.



N10149

The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



This symbol indicates product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). It also identifies the product is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).



The CSA mark is a registered trademark of the CSA International.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.

Cleaning Precautions

WARNING

To prevent electrical shock, disconnect the Keysight Technologies instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally. To clean the connectors, use alcohol in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

Contents

Introduction	1
Related documentation	1
Step 1: Unpack and Inspect the Module	2
ESD precaution	2
Inspect the module for damage	3
Return the module for service	4
Step 2: Verify the Shipment Contents	5
Step 3: Install the Software	6
System requirements	6
Power up the controller	8
Install the softwares	8
Step 4: Install the Module	10
M9186A front panel features	14
Interlock function	15
M9186A system connections	16
Step 5: Verify the Operation of the M9186A Module	17
Conduct performance verification (optional)	19
Specifications	20

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

Introduction

The scope of this Startup Guide is to detail the processes of receiving and setting up the Keysight M9186A PXI Voltage/Current Source, installing the required software, and verifying basic module operation.

If you have any questions after reviewing this information, please contact your local Keysight Technologies representative or contact us through our Web site at <http://www.keysight.com/find/M9186A>.

Related documentation

A softcopy of this Startup Guide, and the documentation listed below, can be found on the CD-ROM that is shipped with this product. You can also download them for free through our Web site at www.keysight.com/find/M9186A.

Check the manual revision on the first page of each manual.

- **Startup Guide.** This manual. Printed copy for outdoor use, included with shipment.
- **Keysight M9186A PXI Voltage/Current Source Device Drivers and Help.** Available for IVI-C and IVI-COM, and LabVIEW G drivers.
- **Keysight M9186A PXI Voltage/Current Source Soft Front Panel Software and Help.**
- **Keysight M9186A PXI Voltage/Current Source Data Sheet.**

Step 1: Unpack and Inspect the Module

CAUTION

The M9186A is shipped in materials which prevent damage from static. The module should only be removed from the packaging in an anti-static area after ensuring that correct anti-static precautions are taken. Store all modules in anti-static envelopes when not in use.

ESD precaution

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. The following figure shows an example of a static-safe work station using two types of ESD protection.

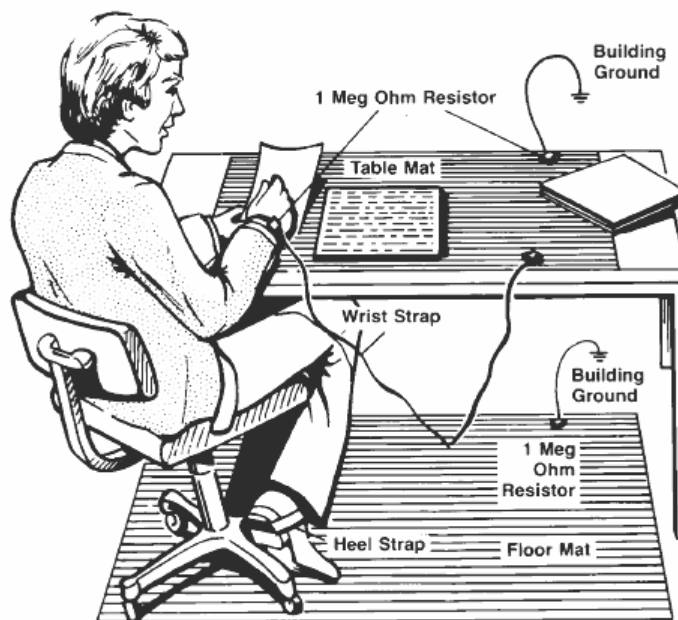


Figure 1 Static-safe work station example

Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 Ω of isolation from ground.

WARNING

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 V.

Inspect the module for damage

After unpacking the M9186A, carefully inspect the unit for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (warranty information can be found at the beginning of this manual).

CAUTION

To avoid damage when handling a module, do not touch exposed connector pins.

NOTE

Information on preventing damage to your Keysight equipment can be found at www.keysight.com/find/tips.

Return the module for service

Should it become necessary to return the M9186A for repair or service, follow the steps below:

- 1 Review the warranty information shipped with your product.
- 2 Contact Keysight to obtain a Return Material Authorization (RMA) and return address. If you need assistance finding Keysight's contact information, go to www.keysight.com/find/assist (worldwide contact information for repair and service) or refer to the Support information on the product web page at www.keysight.com/find/M9186A.
- 3 Write the following information on a tag and attach it to the malfunctioning equipment.
 - Name and address of owner. A P.O. box is not acceptable as a return address.
 - Product model number (for example, M9186A).
 - Product serial number (for example, MYXXXXXXXXX). The serial number label is located on the side panel of the module. The serial number can also be read from the Soft Front Panel interface, but only after the software is installed.
 - Description of failure or service required.
- 4 Carefully pack the module in its original ESD bag and packing carton. If the original carton is not available, use bubble wrap or packing peanuts and place the instrument in a sealed container and mark the container **"FRAGILE"**.
- 5 On the shipping label, write **"ATTENTION REPAIR DEPARTMENT"** and the RMA number.

NOTE

If any correspondence is required, refer to the product by its serial number and model number.

Step 2: Verify the Shipment Contents

The following items are included in the M9186A shipment:

- *M9186A voltage/current source Software and Product Information CD-ROM* (M9186-10001) - contains software, drivers, and all product documentation in PDF format.
- Printed copy of this document, *M9186A Startup Guide*
- Calibration certificate

NOTE

Every PXI module is shipped with a Software and Product Information CD-ROM. The M9186A-CD1 option provides the *M9186A Software and Product Information CD-ROM* (M9186-10001).

All of the files contained on the CD are available for free download at the Keysight Web site at www.keysight.com/find/M9186A.

Step 3: Install the Software

System requirements

Table 1 Minimum system requirements

Operating systems	Windows [®] XP SP3 or later (32-bit) Home or Professional	Windows Vista [®] SP1 and SP2 or later (32-bit and 64-bit) Home Basic, Home Premium, Business, Ultimate, or Enterprise	Windows [®] 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, or Enterprise
Processor speed	600 MHz or higher required 800 MHz recommended	1 GHz 32-bit (x86) or 1 GHz 64-bit (x64), Itanium 64 is not supported	1 GHz 32-bit (x86) or 1 GHz 64-bit (x64), Itanium 64 is not supported
Available memory	256 MB minimum (1 GB or more recommended)	1 GB minimum	1 GB minimum
Available disk space ^[1]	1.5 GB available hard disk space, includes: <ul style="list-style-type: none"> • 1 GB for Microsoft[®] .NET Framework 2.0 SP2^[2] • 65 MB for Keysight IO Libraries Suite 	1.5 GB available hard disk space, includes: <ul style="list-style-type: none"> • 1 GB for Microsoft[®] .NET Framework 2.0 SP2^[2] • 65 MB for Keysight IO Libraries Suite 	1.5 GB available hard disk space, includes: <ul style="list-style-type: none"> • 1 GB for Microsoft[®] .NET Framework 2.0 SP2^[2] • 65 MB for Keysight IO Libraries Suite
Video	Super VGA (800 × 600) 256 colors or more	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft [®] Internet Explorer 6.0 or greater	Microsoft [®] Internet Explorer 7 or greater	Microsoft [®] Internet Explorer 7 or greater
Chassis	A cPCI, PXI-1, or PXIh chassis peripheral slot. The Keysight M9018A chassis is recommended.		
Interface controller	A PXI or PXIe remote or embedded controller.		
Remote controller	A Keysight M9045A ExpressCard interface (for portable laptops) or Keysight M9047A PCIe interface (for desktop PCs) or equivalent PXI or PXIe remote controllers running one of the above operating systems.		

Table 1 Minimum system requirements

Embedded controller	A Keysight M9021A System Interface Card, or equivalent embedded controller running one of the above operating systems. Note: The embedded controller must be compatible with the Keysight M9018A chassis.
Softwares	<ul style="list-style-type: none">• Keysight IO Libraries Suite 16.0 and above is required.• Adobe® Reader® version 6.0 or higher is required to view the provided PDF files.

[1] Because of the installation procedures, less memory may be required for the operation than is required for the installation.

[2] .NET Framework Runtime Components are installed by default with Windows Vista and Windows 7. Therefore, you may not need this amount of available disk space.

Power up the controller

If you are using a remote controller, power up the host computer.

If you are using an embedded controller, complete the following steps:

- 1 Install the embedded controller module into a compatible chassis.

Recommended: Keysight M9018A 18 slot PXIe Chassis

- 2 Connect your I/O peripherals (mouse, keyboard, and monitor).
- 3 Power up the chassis.

Install the softwares

The M9186A softwares are located on the bundled CD (M9186-10001). The same softwares are also available for free download at the Keysight Web site:

www.keysight.com/find/M9186A.

This installation includes the following:

- Keysight IO Library Suite (IOLS), which includes the Keysight Connection Expert.
- Soft Front Panel (SFP), device drivers (IVI-C and IVI-COM, and LabVIEW G), and related user documentation for the M9186A.

NOTE

Each PXI module has its own device driver (IVI-C and IVI-COM, and LabVIEW G) and soft front panel (SFP) software.

- 1 From the CD browser, launch the installer.
- 2 Follow the installer prompts to install all software and documentation for the M9186A PXI Voltage/Current Source.

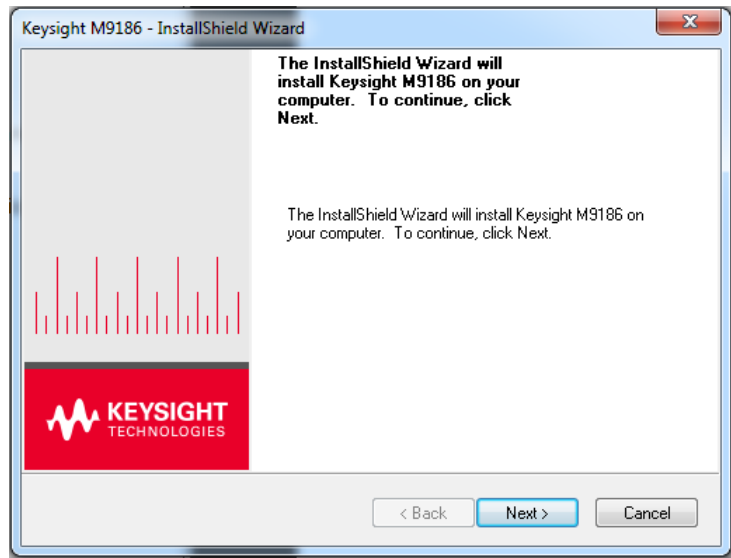


Figure 2 InstallShield Wizard for Keysight M9186A

- 3 After installation is complete, power down the chassis (and the host PC if using the remote controller).

Step 4: Install the Module

CAUTION

- The PXI hardware does not support “hot-swapping” capabilities (changing modules while power is applied to the chassis).
- Before installing the M9186A into the chassis, ensure that the chassis is powered off and unplugged to prevent damage to the module.

NOTE

The M9186A module can be used in a chassis with a cPCI, PXI-1, or PXIh chassis peripheral slot.



The module can be installed in any standard PXI slot marked with a peripheral slot compatibility image (a circle containing the slot number).



The module can also be installed in any hybrid PXI slot marked with a peripheral slot compatibility image (the letter “H” and a solid circle containing the slot number).

- 1 Ensure that the chassis power switch is at the Off (Standby) position before you unplug the PXI chassis.
- 2 If the chassis has multiple fan speed settings, ensure that the fans are set to automatic. Do not set the fan speed to low or turn it off.
- 3 Position the chassis so that there is ample space between the chassis fan intake and exhaust vents. Blockage by walls or obstructions affects the air flow needed for cooling. (Refer to the chassis documentation for more information about cooling).
- 4 If you are using an embedded controller, proceed to **step 5**. If you using a remote controller, skip to **step 6**.

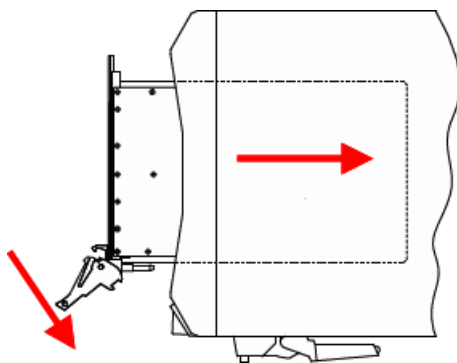


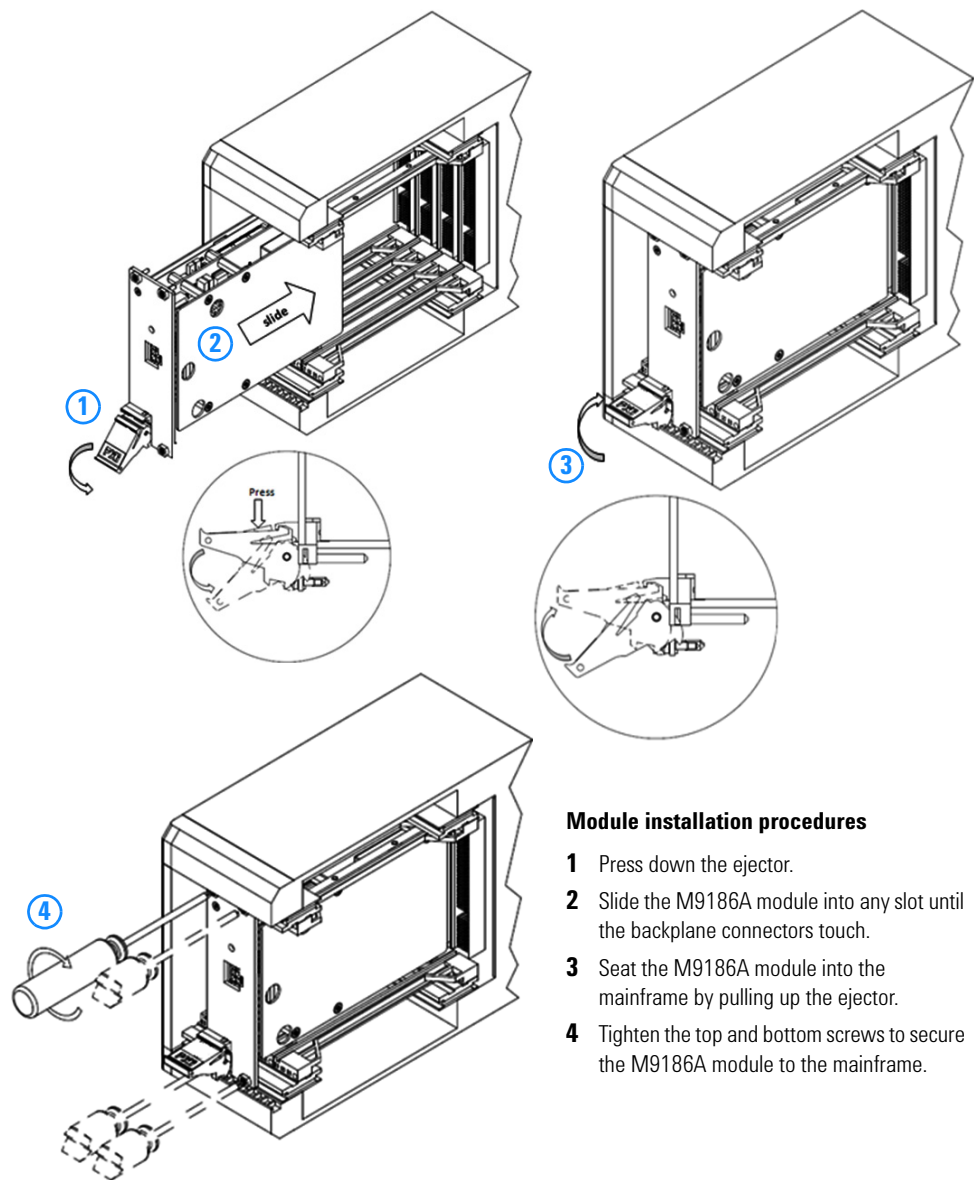
Figure 3 Installing the module to the chassis

- 5** Hold the module by the injector/ejector handle, and slide it into an available PXI (or hybrid) slot, as shown in **Figure 3**.
 - Install the module into the PXI slot of the chassis by placing the module card edges into the front module guides (top and bottom).
 - Slide the module to the rear of the chassis and assure that the injector/ejector handle is pushed down in the unlatched (downward) position.
 - Slide the module completely into the chassis.
 - When you begin to feel resistance, push up on the injector/ejector handle to fully inject the module into the chassis.
- 6** If you are using a remote controller, install the System Interface Card in the chassis.
- 7** Latch the module by pulling up on the injector/ejector handle and secure the front panel to the chassis using the module front-panel mounting screws.
- 8** Tighten the screws on the module (or remote controller) front panel. Performance may suffer if the screws are not tightened properly.
- 9** Verify that the PXI chassis fans are operable and free of dust and other contaminants that may restrict airflow.

- 10** Install all chassis covers and filler panels after installing the module. Missing filler panels may disrupt necessary air circulation in the chassis.
- 11** If you are using a remote controller, connect the System Interface Card in the chassis to host computer.
- 12** Plug in and power up the PXI chassis.
- 13** If you are using a remote controller, reboot the host PC.

WARNING

Tighten the screws on the module front panel. Protection provided by the equipment could be impaired if the screws are not tightened properly.

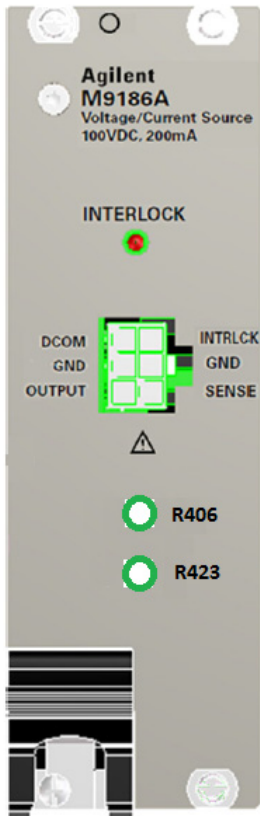


Module installation procedures

- 1 Press down the ejector.
- 2 Slide the M9186A module into any slot until the backplane connectors touch.
- 3 Seat the M9186A module into the mainframe by pulling up the ejector.
- 4 Tighten the top and bottom screws to secure the M9186A module to the mainframe.

Figure 4 Module installation procedures

M9186A front panel features



Front panel connectors

DCOM	Digital circuits common ground return.
INTRLCK	Disable the interlock function when shorted to DCOM.
GND	Floating analog ground.
OUTPUT	Voltage/Current source output
SENSE	Current sense through internal precision resistors.

Front panel LED

INTERLOCK LED	When indicator lights, the output is disabled.
----------------------	--

Figure 5 M9186A front panel

Interlock function

The M9186A includes a safety interlock that by default, disables the output when it detects the interlock circuit is broken; that is, the interlock must be enabled for the module to work.

Interlock events are latched and indicated by an LED on the module's front panel. You cannot close relays on the module during an interlock event. The purpose of the interlock is to provide a means of prohibiting device-under-test (DUT) access while dangerously high voltages may be present.

This can be accomplished, for example, by installing a DUT safety cover secured by a fixture screw and activating a limit switch. Internally, when the module is programmed for output, it will always sense for either an open or a short across the two interlock pins on the front panel connector.

NOTE

The INTRLCK pin needs to be physically shorted to DCOM pin on the front panel connector in order to enable the output of the M9186A.

M9186A system connections

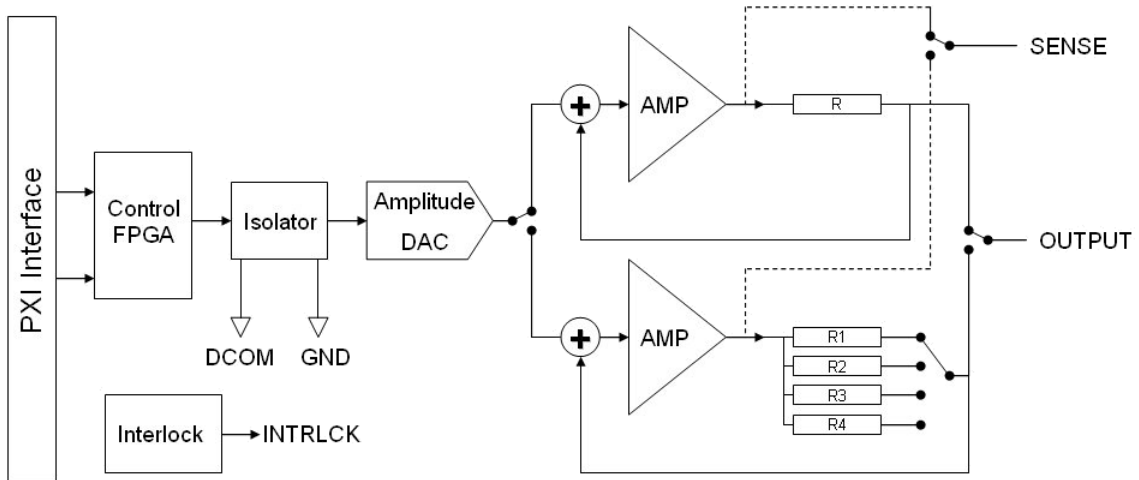


Figure 6 M9186A functional block diagram

Step 5: Verify the Operation of the M9186A Module

The intention of this step is to verify the basic operations of the newly installed module.

Run the Keysight Connection Expert (KCE) by clicking its desktop shortcut icon, or by clicking **Start > All Programs > Keysight IO Library Suite > Keysight Connection Expert**.

The KCE will display all modules that are connected and installed. Review the configuration data and launch the M9186A Soft Front Panel (SFP). The M9186A SFP will provide control over the module for operational verification procedures.

This is a screen capture of the SFP interface:

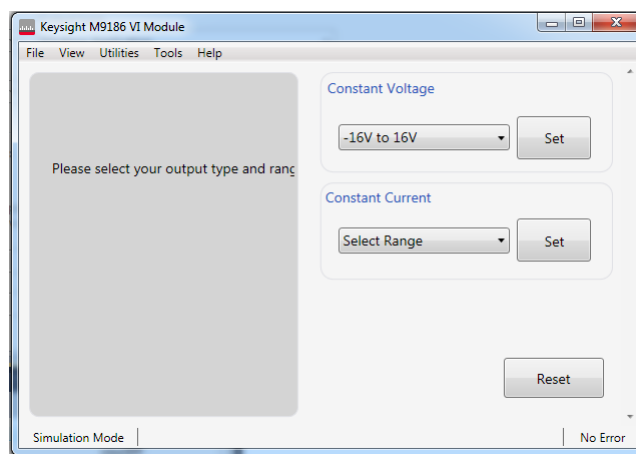


Figure 7 SFP interface

To start, select an output range from either the Constants Voltage or Constants Current Mode and click **Set**.

Keysight M9186A PXI Voltage/Current Source

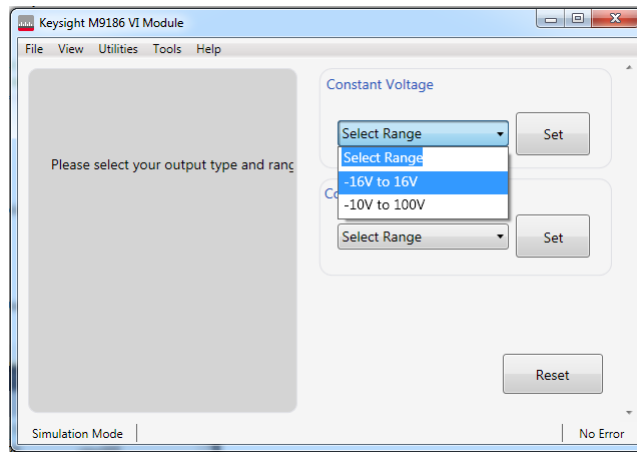


Figure 8 Select an output range

Next, specify your desired output value, select a sense resistor value, and click **Apply**.

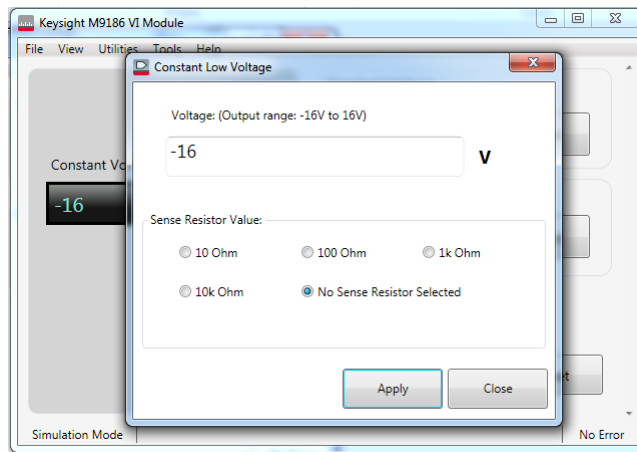


Figure 9 Specify an output value

You may refer to *Keysight M9186A Soft Front Panel Help* for details on how to use the SFP.

Conduct performance verification (optional)

Requirements for verification

The M9186A is verified by setting a typical low dc voltage (for example, 5 V or 20 V) and measuring the OUTPUT pin with respect to the GND pin on the front panel connector. The following procedure verifies that all associated relays, connectors, cables, and circuitry are operational.

Required hardware

Verifying the performance of the module requires external equipment. This includes a 6.5-digit precision voltmeter and mating connector. Refer to the following table for the recommended performance verification hardware.

Table 2 Required performance verification hardware

Hardware	Description
Keysight 34411A	6.5-Digit Digital Multimeter

M9186A performance verification procedure

- 1 Run the M9186A Soft Front Panel (SFP). Configure the module to output 5 V.
- 2 Connect the OUTPUT pin to the HI input of the voltmeter.
- 3 Connect the GND pin to the LO input of the voltmeter.
- 4 Read the voltmeter. It should display 5 V with the accuracy as specified in the specifications.
- 5 Now configure the module to output 20 V without changing any connections.
- 6 Read the voltmeter again. It should display 20 V with the accuracy as specified in the specifications.

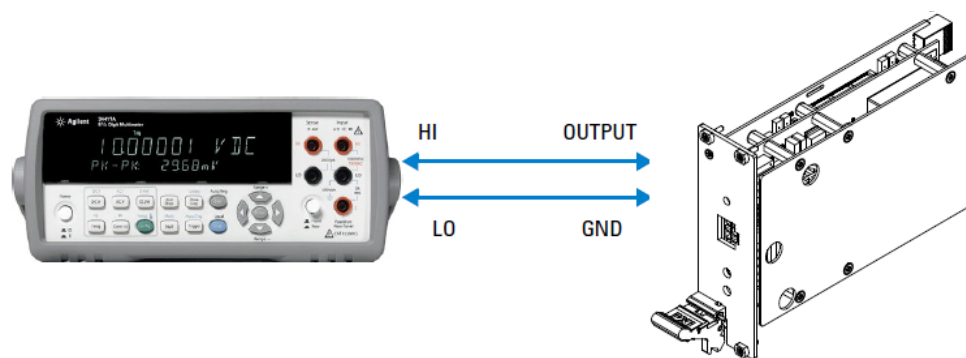


Figure 10 Connections for M9186A verification

If a problem is found

If a problem is found, perform the following checks:

- 1 Verify that all relevant hardware is turned on.
- 2 Verify that the M9186A paths are correctly set from the SFP and that the multimeter is set to the proper voltage measurement range and that cable is properly connected.
- 3 Check that the INTERLOCK LED is not lit up.
- 4 If the problem persists, refer to **“Return the module for service” on page 4** for details on sending the module to Keysight Technologies for service.

Specifications

Complete specifications for the M9186A (*M9186A Data Sheet, 5990- 6655EN*) are included on the *Keysight M9186A Software and Product Information CD-ROM* that came with your module. Please check the Keysight Web site at www.keysight.com/find/M9186A for the latest updates to these specifications.

Contact us

To obtain service, warranty, or technical assistance, contact us at the following phone or fax numbers:

United States:

(tel) 800 829 4444 (fax) 800 829 4433

Canada:

(tel) 877 894 4414 (fax) 800 746 4866

China:

(tel) 800 810 0189 (fax) 800 820 2816

Europe:

(tel) 31 20 547 2111

Japan:

(tel) (81) 426 56 7832 (fax) (81) 426 56 7840

Korea:

(tel) (080) 769 0800 (fax) (080) 769 0900

Latin America:

(tel) (305) 269 7500

Taiwan:

(tel) 0800 047 866 (fax) 0800 286 331

Other Asia Pacific Countries:

(tel) (65) 6375 8100 (fax) (65) 6755 0042

Or visit Keysight World Wide Web at:

www.keysight.com/find/assist

Product specifications and descriptions in this document are subject to change without notice. Always refer to the Keysight web site for the latest revision.

This information is subject to change without notice.

© Keysight Technologies 2010 - 2015

Edition 3, June 2015



M9186-90001

www.keysight.com

