Agilent M9216A PXI High Voltage Data Acquisition

Startup Guide

Agilent Technologies

Notices

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Sales and Technical Support

To contact Agilent for sales and technical support, refer to the "support" links on the following Agilent web resources:
- www.agilent.com/find/M9186A (product-specific information and support, software and documentation updates)
- www.agilent.com/find/assist (worldwide contact information for repair and service)

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

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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.

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.

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.

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 Agilent. 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 Agilent to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call an Agilent office for information.

Front and Rear Panels Symbols

The CE mark is a registered trade-mark of the European Community.

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

N10149

ICES/NMB-001
ISM GRP.1 CLASS A
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 Agilent 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

The scope of this Startup Guide is to detail the processes of receiving and setting up the Agilent M9216A PXI High Voltage Data Acquisition, installing the required software, and verifying basic module operation.

If you have any questions after reviewing this information, please contact your local Agilent Technologies, Inc. representative or contact us through our website at http://www.agilent.com/find/M9216A.

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 website at http://www.agilent.com/find/M9216A.

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

- **Startup Guide**. This manual. Printed copy for outdoor use, included with shipment.
- **Agilent M9216A PXI High Voltage Data Acquisition Device Drivers and Help.** Available for IVI-C and IVI-COM, and LabVIEW G drivers.
- **Agilent M9216A PXI High Voltage Data Acquisition Soft Front Panel Software and Help**.
- **Agilent M9216A PXI High Voltage Data Acquisition Data Sheet.**

Step 1: Unpack and Inspect the Module

CAUTION	The M9216A 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.
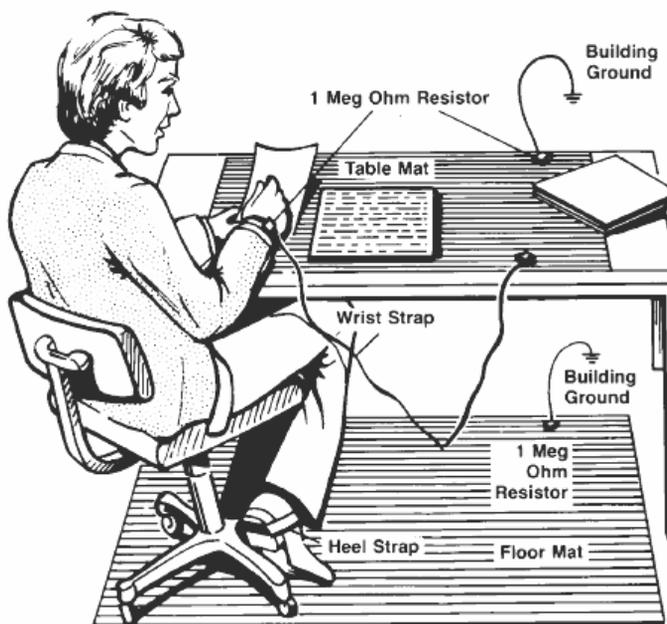

Figure 1   Static-safe work station example

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 M9216A, 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 Agilent equipment can be found at http://www.agilent.com/find/tips.

Return the module for service

Should it become necessary to return the M9216A for repair or service, follow the steps below:

1 Review the warranty information shipped with your product.

2 Contact Agilent to obtain a Return Material Authorization (RMA) and return address. If you need assistance finding Agilent's contact information, go to http://www.agilent.com/find/assist (worldwide contact information for repair and service) or refer to the Support information on the product web page at http://www.agilent.com/find/M9216A.

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, M9216A).

   • Product serial number (for example, MYXXXXXXXX). 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 M9216A shipment:

- *M9216A PXI High Voltage Data Acquisition Software and Product Information CD- ROM* (M9216- 10001) - contains software, drivers, and all product documentation in PDF format.

- Printed copy of this document, *M9216A Startup Guide*

- Calibration certificate

NOTE	Every PXI module is shipped with a Software and Product Information CD-ROM. The M9216A-CD1 option provides the *M9216A Software and Product Information CD-ROM* (M9216-10001).

All of the files contained on the CD are available for free download at the Agilent website at http://www.agilent.com/find/M9216A.

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: • 1 GB for Microsoft® .NET Framework 2.0 SP2[2] • 65 MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: • 1 GB for Microsoft® .NET Framework 2.0 SP2[2] • 65 MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: • 1 GB for Microsoft® .NET Framework 2.0 SP2[2] • 65 MB for Agilent 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 Agilent M9018A chassis is recommended.		
Interface controller	A PXI or PXIe remote or embedded controller.		
Remote controller	An Agilent M9045A ExpressCard interface (for portable laptops) or Agilent 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 (continued)

Embedded controller	An Agilent M9021A System Interface Card, or equivalent embedded controller running one of the above operating systems. **Note:** The embedded controller must be compatible with the Agilent M9018A chassis.
Softwares	• Agilent 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: Agilent M9018A 18 slot PXIe Chassis

2 Connect your I/O peripherals (mouse, keyboard, and monitor).

3 Power up the chassis.

Install the softwares

The M9216A softwares are located on the bundled CD (M9216-10001). The same softwares are also available for free download at the Agilent website: http://www.agilent.com/find/M9216A.

This installation includes the following:

• Agilent IO Library Suite (IOLS), which includes the Agilent Connection Expert.

• Soft Front Panel (SFP), device drivers (IVI-C and IVI-COM, and LabVIEW G), and related user documentation for the M9216A.

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 M9216A PXI High Voltage Data Acquisition.
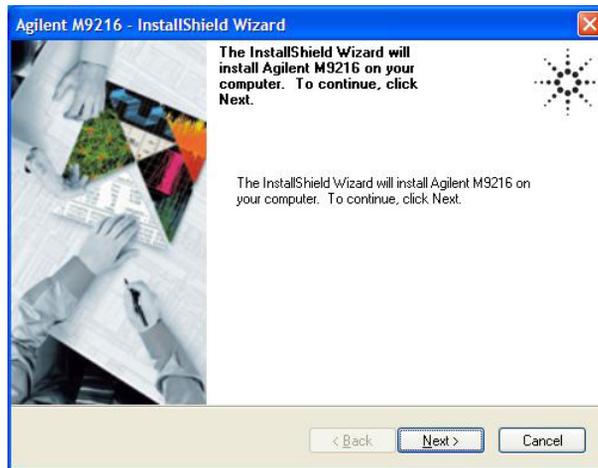
Figure 2   InstallShield Wizard for Agilent M9216A

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 M9216A into the chassis, ensure that the chassis is powered off and unplugged to prevent damage to the module.

NOTE	The M9216A 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.
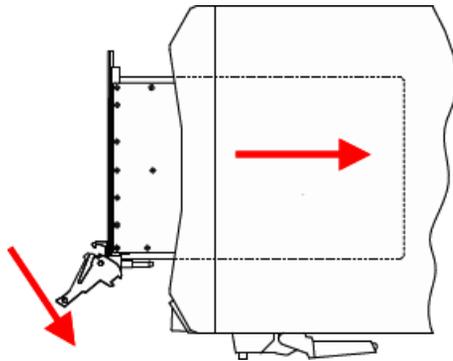
Figure 3   Installing the module to the chassis

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.**
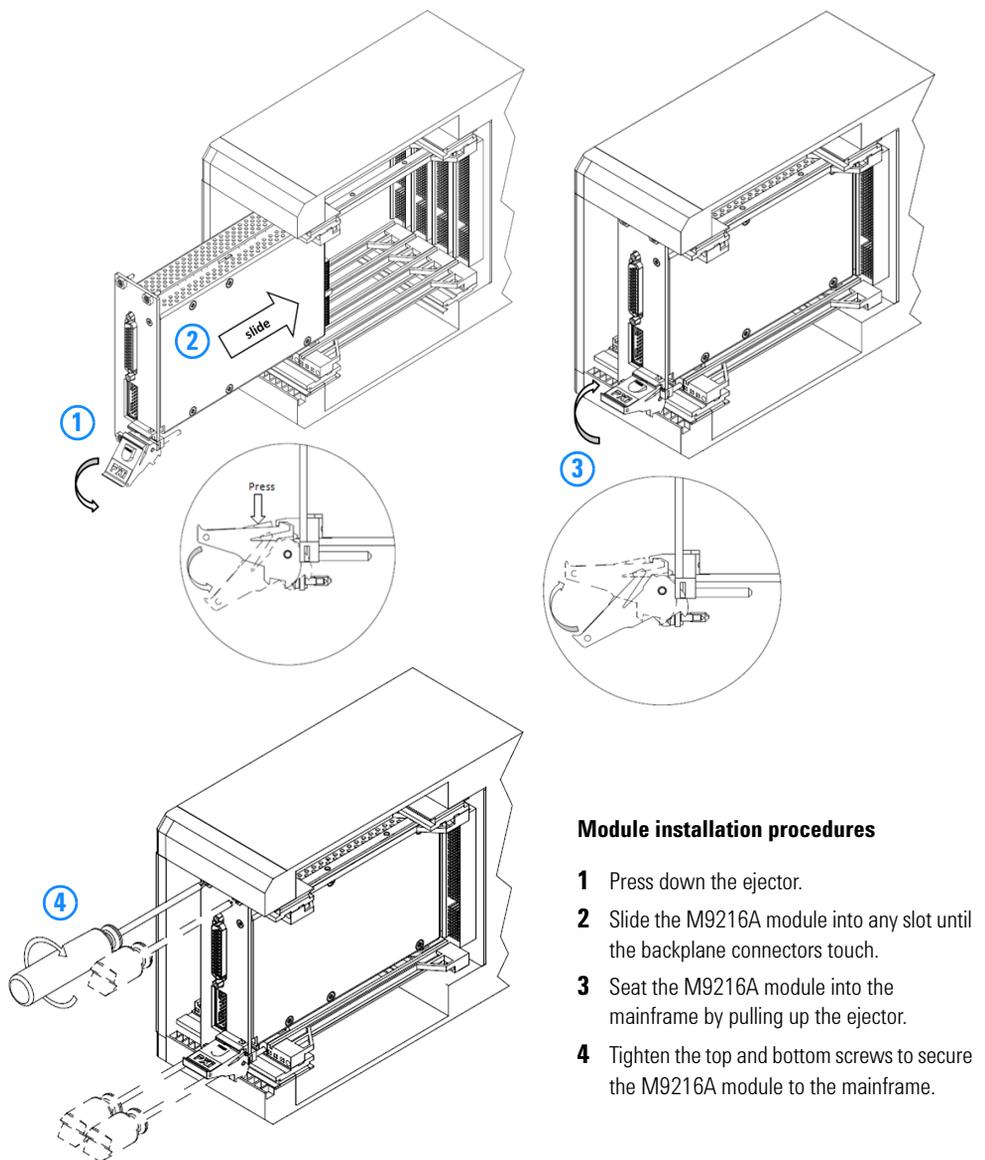
Figure 4   Module installation procedures

Module installation procedures

1 Press down the ejector.

2 Slide the M9216A module into any slot until the backplane connectors touch.

3 Seat the M9216A module into the mainframe by pulling up the ejector.

4 Tighten the top and bottom screws to secure the M9216A module to the mainframe.

Step 5: Verify the Operation of the M9216A Module

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

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

The ACE will display all modules that are connected and installed. Review the configuration data and launch the M9216A Soft Front Panel (SFP). The M9216A SFP will provide control over the module for operational verification procedures.
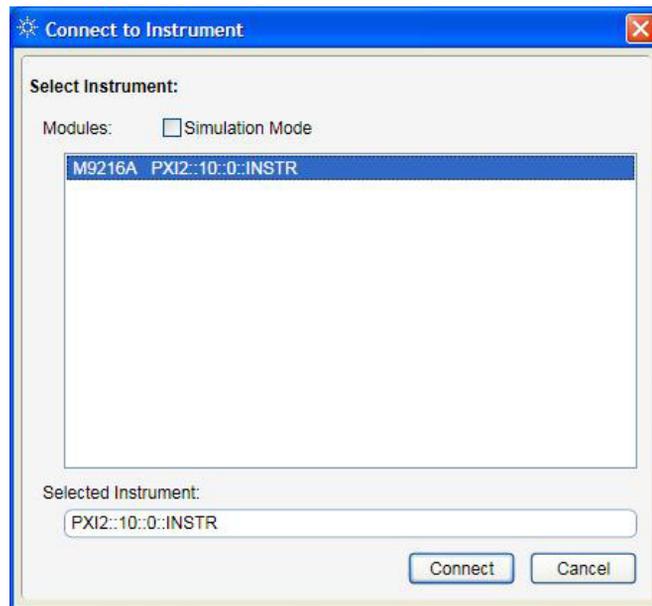
Figure 5   Connect to Instrument dialog box

If the M9216A does not show up on the instrument list:

- Verify the M9216A is correctly installed in the mainframe.

- If using an external host PC and PCI bus extender system, verify that the mainframe power is turned on. Ensure that the mainframe is powered on before the PC controller. See the mainframe user's manual for additional information.

- Check that the bus extender card residing in the host computer is plugged in properly.

Connectivity verification

1 Launch the SFP software. For full descriptions and details on how to use the SFP, please refer to the *Agilent M9216A Soft Front Panel Help* document. When successful, the M9216A SFP dialog box will appear.

By default the M9216A will be started in *Multiple Channel Mode*. Click on the **Help > About** menu and view the information of the M9216A. You will be able to see something similar to Figure 6.
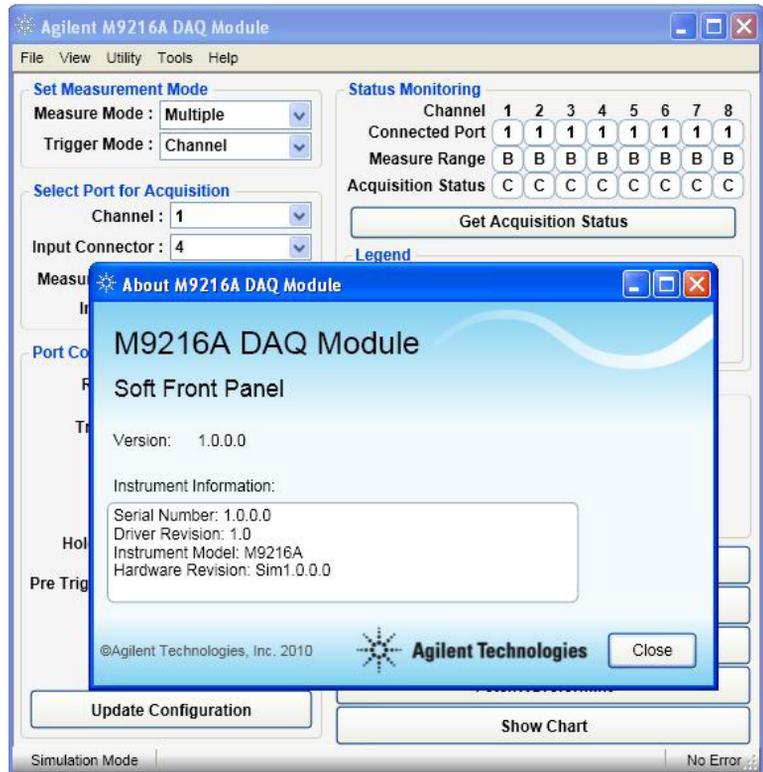
Figure 6   SFP main tab

Functional verification (optional)

Requirements

The M9216A High Voltage DAQ digitizer channels are functionally verified by setting a DC voltage at the input port and measuring the voltage with the SFP.

The input multiplexer is verified by measuring the resistance between the input and auxiliary ports with a multimeter. These procedures will verify whether the connectors, relays of the input multiplexer, and digitizers of the M9216A are functioning properly.

The SFP will be used to manually control the M9216A.

Required hardware

To perform functional verification of the digitizer channel, a stable DC source preferably with low noise is required. A multimeter can also be used to provide a second verification of the voltage. If you intend to verify that the M9216A meets accuracy specification, a DC reference source will be required. Refer to the *M9216A Service Manual* for steps to perform DC accuracy verification.

To have easy access to the pins and prevent mechanical damage to the connector pins, we recommend that cables, terminal blocks, or connector savers be used during the verification.

Figure 7 shows the front panel layout and port labels for both the input and auxiliary out connectors.

WARNING   **The M9216A is capable of measuring voltages of up to 100 V. Due to safety concerns, Agilent does not recommend that high voltages be used for functional verification unless appropriate safety concerns are taken.**

Figure 7   M9216A front panel layout of the input and auxiliary ports

Verifying the digitizer channels

The following steps will verify that the M9216A digitizer channels are functional and are able to acquire waveforms. You may repeat the steps outlined below to verify all eight digitizer channels in the M9216A.

For verification purpose, the M9216A will be used in *Multiple Channel Measurement Mode*. The block diagram of the M9216A in Multiple Channel Mode is reproduced from the *M9216A Service Manual* and shown in Figure 8.
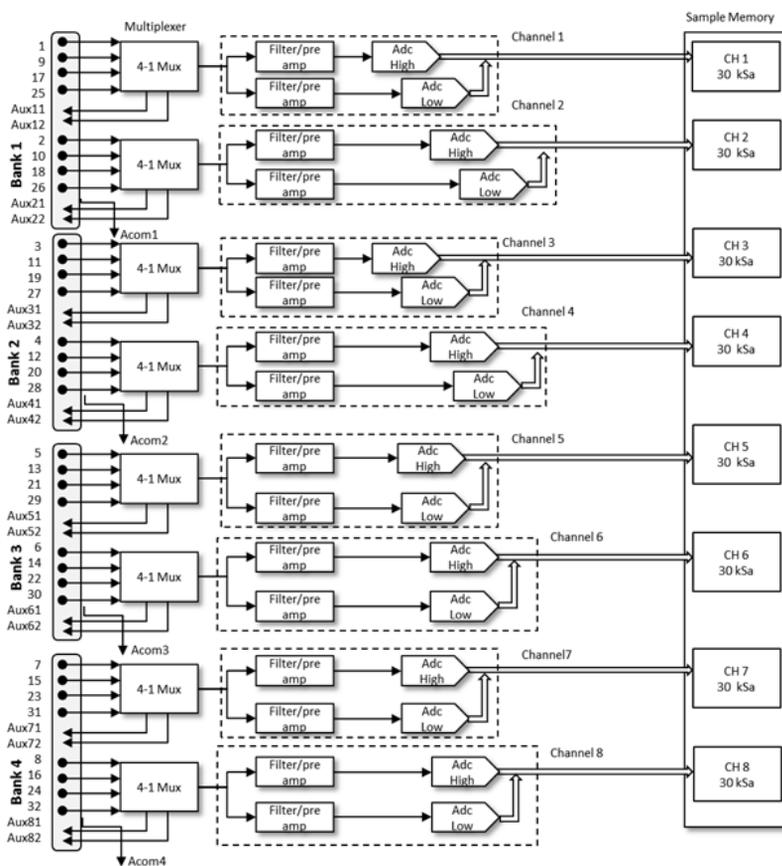
Figure 8   M9216A in Multiple Channel Measurement Mode

Step A

The M9216A should already be in *Multiple Channel Measurement Mode* when started up; if not, please set the measurement mode to *Multiple Channel*. Note that a hardware reset will occur when switching the measurement mode.

By default, all *input ports* will be configured with a *Record Size* of 5000 points and the recording from both the 5 V and 100 V waveforms will be available.

Figure 9   Setting the M9216A for Multiple Channel acquisition

Step B

Set the DC voltage source to 1.0 V or any suitable voltage. Connect the DC source to the input port and channel-under-test either manually or via an external multiplexer. Select the input port and digitizer channel using the SFP dialog window. Press **Update Hardware** to ensure that the input port selection and configuration are updated to the M9216A hardware. Note that the relays of the M9216A input port multiplexer require about 1 millisecond to settle.

After steps A and B, the SFP dialog should look similar to Figure 9. In Figure 9, *Input Port* 10 (*Input Connector* 2 of Channel 2) has been configured and selected for acquisition.

NOTE	The SFP uses the *Input Connector* number to select the physical input port. In this scheme, each of the eight channels has four logical *input connectors* which is numbered 1 to 4 from top to bottom. Use Figure 8 to help locate the corresponding *input connector* number for any *input port*.
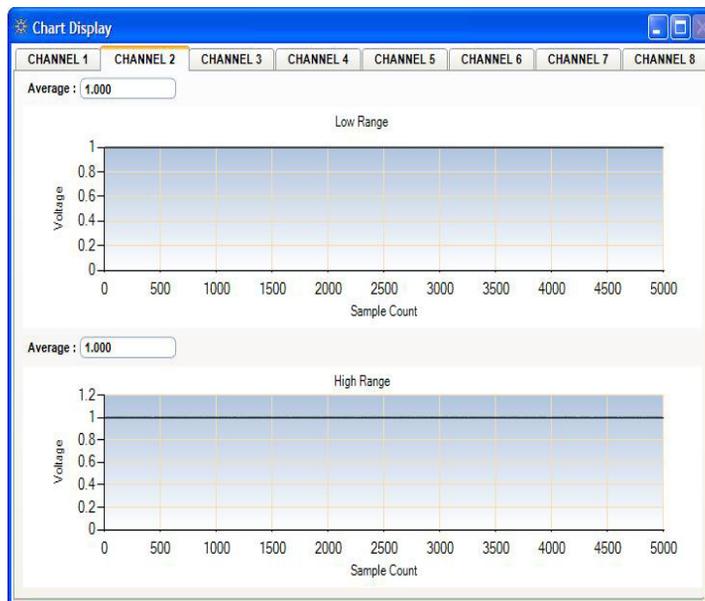
Figure 10   Waveform capture display

Step C

Press **Initiate Capture**. Check the status of the acquisition for the channel-under-test in the *Status Monitoring* section of the SFP.

When the acquisition is completed for all channels, bring up the waveform display window by pressing **Show Chart**. Select the tab for the channel-under-verification and press **FetchWaveformReal**. The recorded waveform of the DC signal will be displayed for both the 5 V and 100 V sub-channel. The mean voltage is also shown at the top left corner of each waveform display.

Confirm that the displayed mean voltage is sufficiently close to the expected voltage. Compare the measured value to the voltage measured with a multimeter.

| NOTE | Repeat steps A and B to verify the input ports for all channels. |

Verifying the auxiliary output ports

To verify that the M9216A multiplexer is functioning; the input ports are switched to the auxiliary output ports. The resistance between the input port and auxiliary ports are then measured with a multimeter to check connectivity.

Note that there are two auxiliary ports available per channel. The operation of the input multiplexer is described in the section "*Using the Auxiliary Output Ports*" in Chapter One of the *M9216A Service Manual.*

Figure 11 which is reproduced from the *Service Manual* shows the input multiplexer diagram for Bank 1. Table 2 shows the relationship between the primary and complementary auxiliary output ports. For example, when you switch input port 9 to *Primary* Auxiliary Port, input port 25 will be connected to the *Complementary* Auxiliary Port.
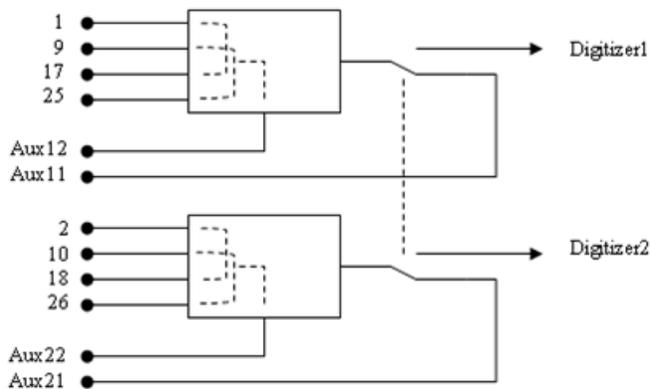
Figure 11   Input Port Multiplexer for Bank 1

Table 2   Connection logic of Bank 1

Channel 1	
Aux11 (Primary)	**Aux12 (Complementary)** **Always Connected**
Port 1	Port 17
Port 9	Port 25
Port 17	Port 1
Port 25	Port 9

Channel 1	
Aux21 (Primary)	**Aux22 (Complementary)** **Always Connected**
Port 2	Port 18
Port 10	Port 26
Port 18	Port 2
Port 26	Port 10

Step A

As in "Verifying the Digitizer Channels", set the M9216A *Multiple Channel* measurement mode. However, no waveform acquisition will be initiated during this verification.

Step B

In this example, we will verify that the input ports of *Channel 2* are able to be switched to the auxiliary output ports. To route the input ports to auxiliary output, tick the check box **Bank 2 Aux Out** in the Auxiliary Settings.

To select a port, select *Channel 2* and *input connector* number in the "Select Port for Acquisition" section in the SFP.

Press **Update Hardware** to ensure that the relays in the M9216A are switched into position. Figure 12 shows the SFP dialog window where input port 18 of *Channel 2* is switched to *auxiliary* out.

Figure 12   Setting the auxiliary output ports

Step C

Use a multimeter to measure the resistance between the input ports and auxiliary ports.

For example, if input port 18 of *Channel 2* was switched to the *auxiliary* output port Aux21, input port 2 will automatically be switched to the *complementary auxiliary* port Aux22.

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