



Agilent Technologies PXI Express 12-bit Wideband IF Digitizer

M9202A

Startup Guide



Agilent Technologies

Notices

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Sales and Technical Support

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- www.agilent.com/find/M9202A(product-specific information and support, software and documentation updates)
- www.agilent.com/find/Digitizers
- 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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This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. To review the Declaration of Conformity, go to <http://regulations.corporate.agilent.com/DoC/search.htm>.

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Safety Notices

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.

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 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.

Agilent products are designed for use with electrical signals that are rated Measurement Category I and Measurement Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664. Most measurement, control, and data I/O signals are Measurement Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Measurement Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the user documentation.

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. If the circuit is capable of operating at or above 1000V, no conductive part of the circuit may be exposed.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance-limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

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 close 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.

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.

When fuses are used in a product, replace with the same type and rating for continued protection against fire hazard.

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.

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.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

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.

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers. For continued protection against fire hazard, replace fuse with same type and rating.

Front and Rear Panel Symbols:



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



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).



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 on an instrument means caution, risk of danger. You should refer to the operating instructions located in the user documentation in all cases where the symbol is marked on the instrument.



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.



This symbol indicates the instrument is sensitive to electrostatic discharge (ESD). ESD can damage the highly sensitive components in your instrument. ESD damage is most likely to occur as the module is being installed or when cables are connected or disconnected. Protect the circuits from ESD damage by wearing a grounding strap that provides a high resistance path to ground. Alternatively, ground yourself to discharge any built-up static charge by touching the outer shell of any grounded instrument chassis before touching the port connectors.

Cleaning Precautions:

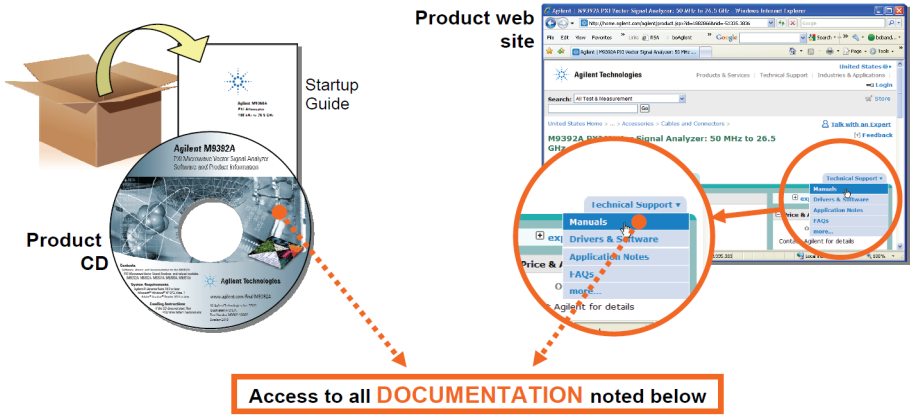
WARNING

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.

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Documentation Map



Start-up Guide



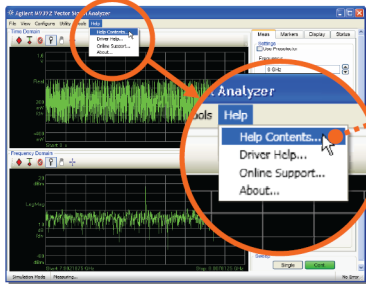
- Unpack product
- Verify shipment
- Install software
- Install & connect hardware
- Verify operation

Data Sheet

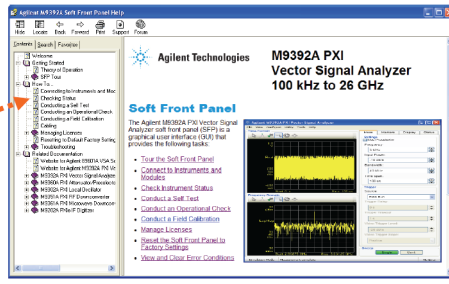


- Product description
- Technical specifications

Soft Front Panel (SFP) user interface

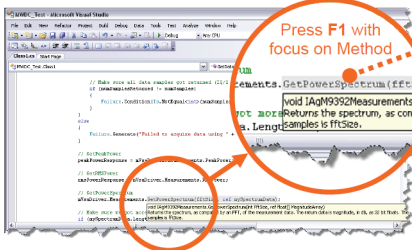


SFP help system



- Product theory of operation
- Configuration
- Self test
- Field calibration
- Error reports

Visual Studio

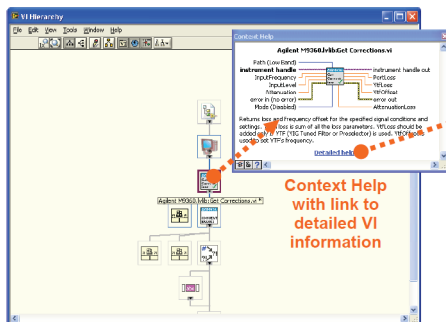


IVI Driver help system

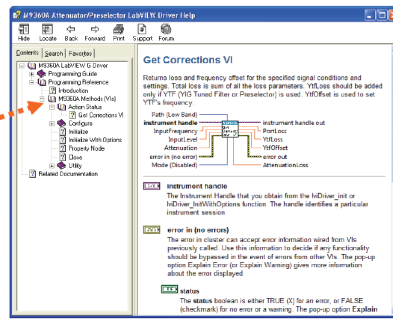


- IVI-COM and IVI-C driver programmer's reference

LabVIEW



LabVIEW Driver help system



- LabVIEW driver programmer's reference

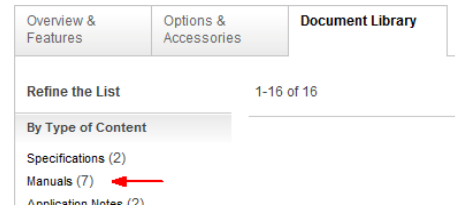
Agilent M9202A Introduction

The scope of this Startup Guide is to detail the processes of receiving and installing the Agilent M9202A PXI Express 12-bit Wideband IF Digitizer, installing the required software, and verifying basic module operation. If you have any questions after reviewing this information, please contact your local Agilent representative or contact us through our website at www.agilent.com/find/assist

Related Documentation

This Startup Guide and the documentation listed below are on the CD and at www.agilent.com/find/M9202A. Select **Technical Support > Manuals**.

- Help system for the Soft Front Panel
- Help systems for the device drivers (IVI-C and IVI-COM, and LabVIEW G)
- Specifications (Data Sheet)



Follow the Startup Sequence

This Start-Up Guide is intended to lead the user through the four steps of product installation as summarized in the diagram below. An optional fifth step shows how to perform an operational verification of the M9202A.

Step 1: Unpack and Inspect



Step 2: Verify Shipment



Step 3: Install Drivers and Software



Step 4: Install Modules



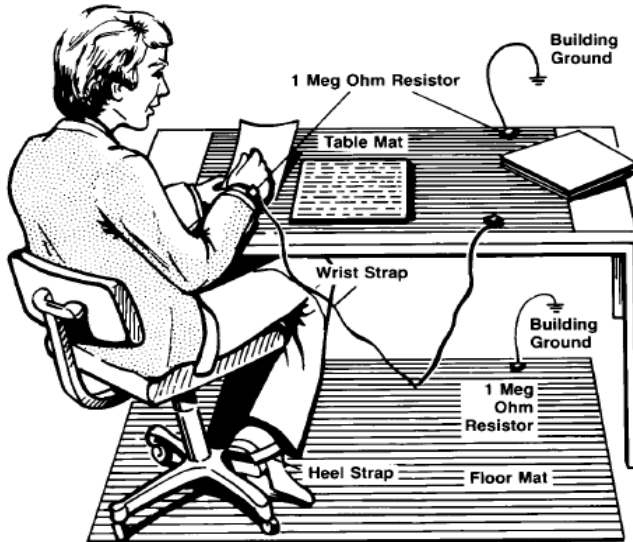
WARNING Closely follow the startup process flow in this document. Deviating from the sequence can cause unpredictable system behavior, damage your system, and may cause personal injury.

Step 1: Unpack and Inspect the Module

CAUTION

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

ESD



Electrostatic discharge (ESD) can damage or destroy electronic components. Use a static-safe work station to perform all work on electronic assemblies. The figure (left) shows a static-safe work station using two types of ESD protection: conductive table-mat and wrist-strap combination, and 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 M Ω of isolation from ground.

WARNING

DO NOT use these techniques for a static-safe work station when working on circuitry with a voltage potential greater than 500 volts.

Inspect for damage

After unpacking the module, carefully inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty. Warranty information for your product can be found at: www.agilent.com/find/warranty.

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

CAUTION

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

Return the module for service

Should it become necessary to return the M9202A module for repair or service, follow the steps below:

1. Review the warranty information shipped with your product.
2. Contact Agilent for instructions on the return of equipment for repair. If you need assistance finding Agilent contact information go to www.agilent.com/find/assist (worldwide contact information for repair and service) or refer to the “Support” information on the product web page at www.agilent.com/find/PXI-Digitizers.
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, M9202A).
 - Product serial number (for example, CHXXXXXXXX). 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. If the original packing materials are not available, put the module in a sealed ESD bag and place that in a suitable, filled, shipping container. The shipping container must be large and strong enough to accommodate your instrument and allow at least 3 to 4 inches (8 to 10 cm) on all sides for packing material. Mark the container “FRAGILE”.

CAUTION Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and cushion the instrument on all sides. NEVER USE STYRENE PELLETS IN ANY SHAPE AS PACKAGING MATERIALS. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.

NOTE If any correspondence is required, refer to the product by model and serial numbers.

Step 2: Verify M9202A Shipment Contents

The following items are included with your M9202A order:

- Software and Product Information CD. It contains software, drivers and all product printed documentation in PDF format). The part number for this CD is M9210-90007.
- Agilent IO Library Suite CD, The part number for this CD is E2094-60003.
- M9202A Startup Guide in hard copy (M9202-90001).
- Standard certificate of calibration.
- Commercial calibration certificate with test data (M9202A-UK6), if ordered.
- M9202A Data Sheet.
- Cables:
 - 2x Coaxial 50 Ω SMB-MMCX (190 mm).
 - 1x Coaxial 50 Ω SMB-MMCX (80 mm).
 - 1x Coaxial 50 Ω SMA-SMB (190 mm).

NOTE All of the files contained on the CDs are available for downloading at the Agilent website at: www.agilent.com/find/M9202A

Step 3: Install the Software

System Requirements

The following table lists the system configurations that Agilent have tested IO Libraries 16.0 on, and are therefore guaranteed to work. In general, any x86 or x64 (except Itanium) processor should work but there may be a decrease in performance.

Topic	System Requirements		
	Windows XP	Windows Vista®	Windows 7
Operating system	Windows XP, Service Pack 3	Windows Vista®, SP1 and SP2 (32-bit and 64-bit), Business, Ultimate, Enterprise, Home Basic, Home Premium	Windows 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise
Processor speed	600 MHz or higher required 800 MHz recommended	1 GHz 32-bit (x86), 1 GHz 64-bit (x64), no support for Itanium64	1 GHz 32-bit (x86), 1 GHz 64-bit (x64), no support for Itanium64
Available memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	1 GB minimum
Available disk space¹	1.5 GB available hard disk space, includes: <ul style="list-style-type: none"> • 1 GB available for Microsoft .NET Framework 3.5 SP1² • 100MB for Agilent IO Libraries Suite 		
Video	Super VGA (800x600) 256 colors or more	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
Adobe Reader	Adobe Reader version 6.0 or higher is required to view the provided PDF files.		

¹ Note: Because of the installation procedure, less disk space may be required for operation than is required for installation. The amount of space listed above is required for installation.

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

Topic	Module & Chassis Requirements
Chassis	PXIe chassis
PXI System / Host Controller	A remote PC Host or PXI Express embedded controller is required
Embedded Controller	An embedded PC host controller must meet the following requirements: <ul style="list-style-type: none"> • PXIe System Controller (in PXIe chassis) • Utilize a 2x8, 4x4, 1x8, or 1x4 PXIe System slot link configuration • Run one of the above operating systems
Remote Controller	Agilent M9021A PXIe System Interface x8 with one of the following PC interface options: <ul style="list-style-type: none"> • Agilent M9045A PCIe ExpressCard Adaptor x1, with cable (for laptops) • Agilent M9047A PCIe Desktop Adaptor x8, with cable (for desktop PCs) Or an equivalent remote controller connected to a PC running one of the above operating systems.

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 the compatible chassis (Agilent M9018A chassis recommended).
2. Connect peripherals (mouse, keyboard, monitor).
3. Power up the chassis.

Install the Software

The M9202A PXI Express 12-bit Wideband IF Digitizer module software is located on the Agilent MD1 High-Speed Digitizer Software and Product Information CD (M9210-90007) and the Agilent IO Library Suite CD (E2904-60003).

This software is also available for download at the Agilent website www.agilent.com/find/PXI-Digitizers

NOTE

Administrator privileges will be needed for software and hardware installation. This includes the case of first-time installation of a module in a different crate slot.

This installation includes the following:


- Agilent IO Library Suite (IOLS), which includes the Agilent Connection Expert. This software must be installed first.
 - Soft Front Panel (SFP), device drivers (IVI-C, IVI-COM, and LabVIEW G) for all modules and for the M9202A PXI Express 12-bit Wideband IF Digitizer.
1. From the Agilent IOLS CD (E2904-60003) browser launch the installer.
 2. Follow the installer prompts to install the IO Library Suite.
 3. From the Agilent MD1 High-Speed Digitizer Software and Product Information CD (M9210-90007) launch the installer.
 4. Follow the installer prompts to install all software and documentation.
 5. After installation is complete, re-start the chassis and the host PC if you are using a remote controller.

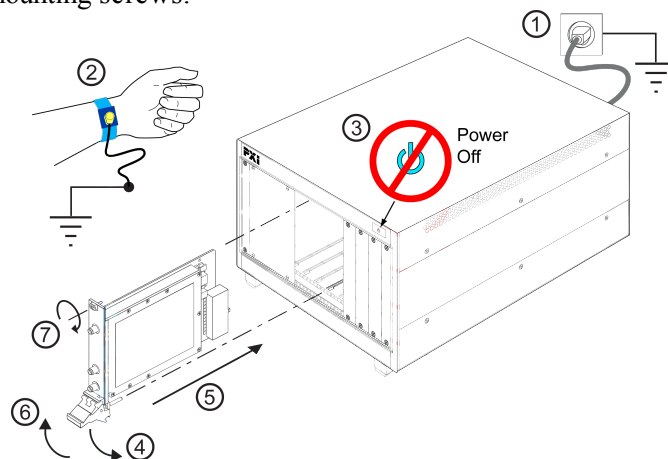
Step 4: Install the Module

CAUTION

PXI hardware does not support "hot-swap" operation. Before installing the module into the chassis, power off the chassis to prevent damage to the module.

- 4** The module can be installed in any PXIe slot marked with a peripheral slot compatibility image (a circle containing the slot number).
- 7^H** The module can also be installed in any hybrid PXIe slot marked with a peripheral slot compatibility image (the letter "H" and a solid circle containing the slot number).

1. Make sure the chassis power switch is in the Off (Standby) position.
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 a remote controller, install the System Interface Card in the Crate Controller identified by the triangle symbol: 
 - a. Install the module into the appropriate slot of the chassis by placing the module card edges into the front module guides (top and bottom).
 - b. Slide the module to the rear of the chassis and assure that the injector/ejector handle is pushed down in the unlatched (downward) position.
 - c. Slide the module completely into the chassis until you begin to feel resistance.
 - d. 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.



5. Tighten the screws on the module (or remote controller) front panel. Performance may suffer if the screws are not tightened properly.
6. Verify that the chassis fans are operable and free of dust and other contaminants that may restrict airflow.
7. Install all chassis covers and filler panels after installing the module. Missing filler panels may disrupt necessary air circulation in the chassis.
8. Plug in and power up the PXI chassis.
9. If you are using a remote controller, reboot the host PC.

10. Check the status LED on the module front panel. If this LED is not glowing orange or red when the power is applied there is a severe problem. Either the module is broken or the necessary voltages for its use are not available.
11. Follow the New Hardware Wizard's instructions to install the driver.
12. Reboot the system.





M9202A Front Panel Features



Front Panel Connectors

Connector	Description
TRG 1	This MMCX female connector is a 50 Ω terminated input for an external trigger signal. The trigger signal range is ± 5 V.
TRG 2	This MMCX female connector is a 50 Ω terminated input for an external trigger signal. The trigger signal range is ± 5 V.
TRG 3	This MMCX female connector is a 50 Ω terminated input for an external trigger signal. The trigger signal range is ± 5 V.
INPUT 1	This SMA female connector is the analog signal input. This input is AC-coupled and 50 Ω terminated. The input full scale range is 1 V (+4 dBm). Frequency range: 30 MHz to 1 GHz.
CLK 1 IN	This SMA female connector is the external clock signal input. This input is AC-coupled and 50 Ω terminated. The recommended signal level is 1 V pk-pk (+4 dBm). The clock signal frequency should be half of the desired sampling frequency.
TRG OUT	This MMCX female connector features a trigger signal output.
REF IN	This MMCX female connector is the clock external reference input (100 MHz). This input is AC-coupled and 50 Ω terminated. The recommended signal level is 1 V pkpk (+4 dBm).

Front Panel LED

LED	Description
STATUS	<ul style="list-style-type: none">  (off) Power is not present or the module has a fault  (green) Indicates that the trigger is armed and waiting for a valid trigger to occur.  (red) Indicates that a trigger has occurred, and the acquisition is complete t.  (yellow) Identifies the module associated with the current channel in the Soft Front Panel when the 'Identify' function is used.

CAUTION

The maximum input to the input connectors (INPUT 1) must not exceed +30 dBm.

Step 5: Verify Operation of the M9202A Module

The intention of this step is to verify correct operation of the newly installed module.

1. Run Agilent Connection Expert (from the desktop icon, or from **Start > Programs > Agilent IO Libraries Suite > Agilent Connection Expert**). It will display the modules that are installed.
2. Check that the M9202 module is recognized.
3. Select the M9202A module and check that the correct Model Name appears in the Instrument Properties.
4. Select the Installed Drivers tab and review the configuration data (as shown below).
5. Launch the SFP. This will provide control of the module for self test and other operational verification procedures.

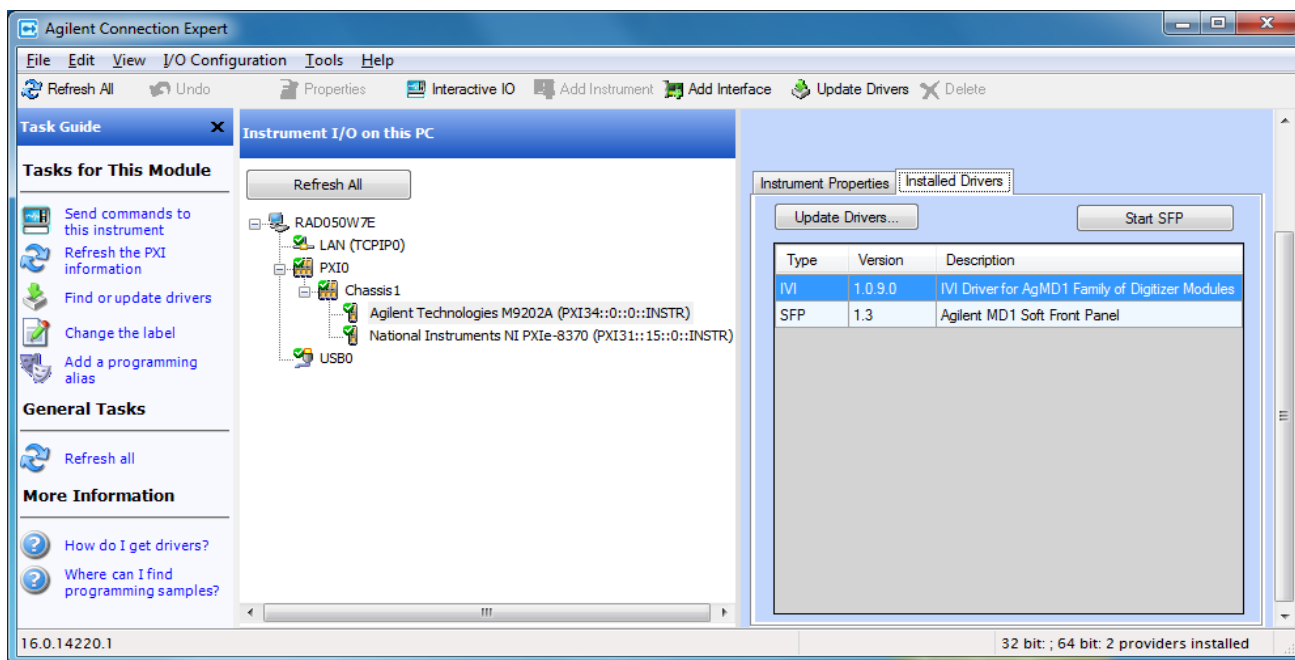


Figure 2 - Agilent Connection Expert (ACE)

Conducting a Self-Test

The purpose of this self-test is to verify that the unit functions correctly, in that it can self-calibrate and communicate with the processor controlling it.

When the SFP is launched it will initiate a self-calibration which takes a little over 1 minute. Verify that no error is shown in the lower left hand log area. The image below shows the desired result.

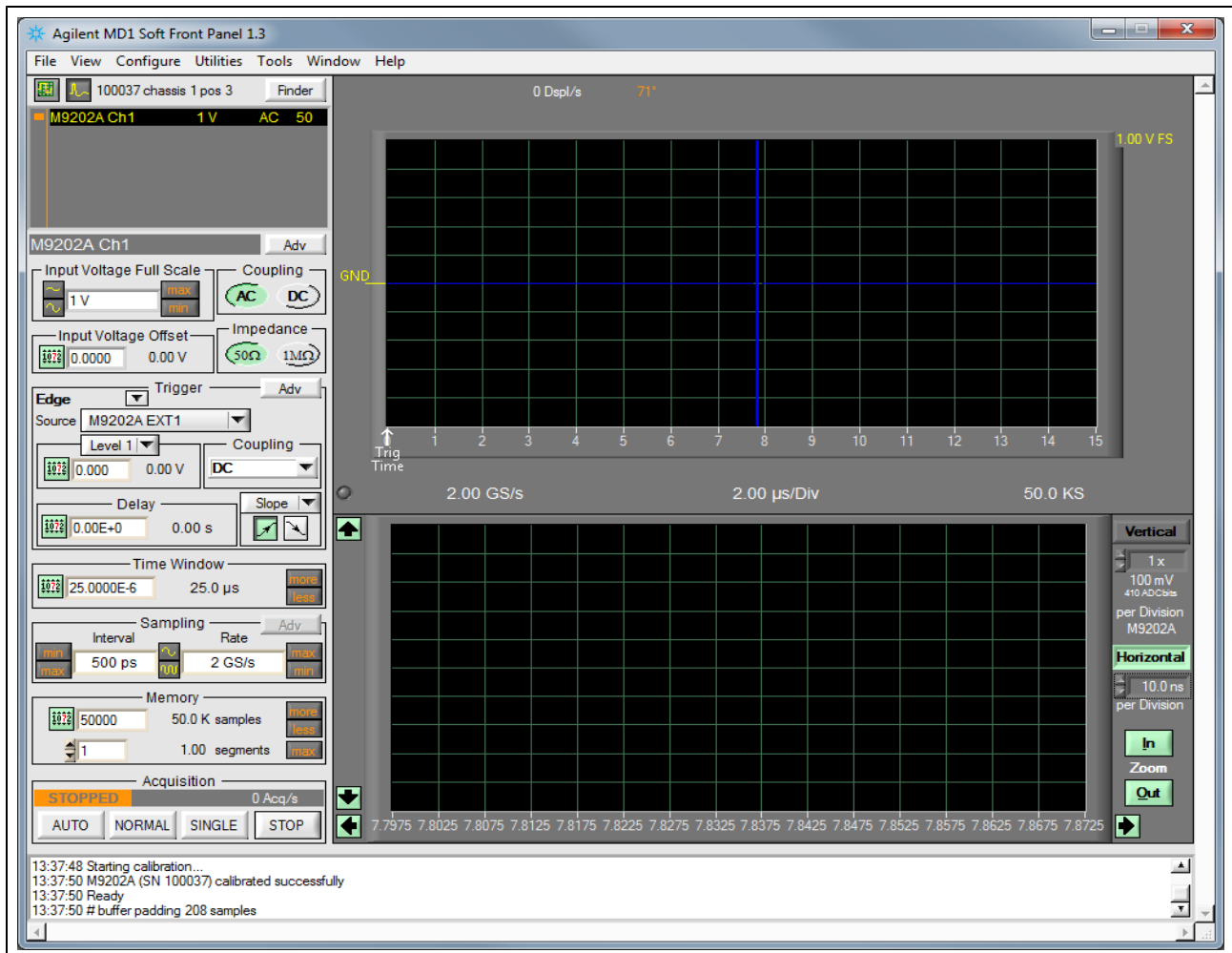


Figure 3 - Soft Front Panel (SFP) showing results of Self-Test

Conduct M9202A Operational check (optional)

Requirements for Verification

The M9202A PXI Express 12-bit Wideband IF Digitizer is verified by using it to trigger on and visualize a signal from a Function Generator. The trigger must be stable and the signal frequency and amplitude must correspond to that set on the generator.


Required Hardware

To verify that the module works requires an external signal source which will be sent to both the input and the trigger. Almost any sine wave or function generator capable of generating a signal with a Peak-Peak Amplitude in the range 0.1-2 V at a frequency in the range 100-500 MHz can be used. The rest of this description will assume that an Agilent N5181A MXG RF Analog Signal Generator is available for this purpose.

Hardware	Description
Agilent N5181A	MXG RF Analog Signal Generator
1x BNC - BNC cable	50 Ω Coaxial BNC(m) - BNC(m) cable (min 20 cm)
1x Agilent 11667L Splitter	DC to 2 GHz Power Splitter with BNC connector
1x BNC - SMA cable	50 Ω Coaxial BNC(m) to SMA(m) cable (100 cm)
1x Agilent 1250-1476 Adaptor	Type N(m) to BNC(f) adaptor
1x BNC - MMCX cable	50 Ω Coaxial (100 cm)

Operational Verification Procedure

CAUTION Do not exceed the maximum power level to the INPUT connector (0.5 W).

1. Launch the soft front panel (SFP). The calibration must successfully end as noted above.
2. Configure the RF Generator to produce a Sine signal with a Frequency of 100 MHz, an Amplitude of 560 mV pp (+8.0 dBm), and an Offset of 0 V.
3. Connect the RF GENERATOR output to the Splitter with the Adaptor and the BNC-BNC cable. Using the BNC-SMA cable, connect one Splitter output to INPUT 1. Use the BNC-MMCX cable to connect the other Splitter output to the TRG1 input. Turn on the RF GENERATOR output.
4. Configure the SFP for the Oscilloscope Mode. 
5. Select the 'Connect data points' option from the 'View' menu.
6. Configure the Input for:
 - Input Voltage Offset – 0.0
 - Trigger Source – M9202A EXT1
 - Trigger Level 1 – 0.0 V
 - Trigger Coupling – DC
 - Trigger Delay – 0.0
 - Trigger Slope – Positive
 - Timebase – 5 ns/Div
 - Memory – 100
 - Segments – 1
7. Select the NORMAL Acquisition mode and the Waveform Display should be as shown below.

8. Verify that:
 - the waveform shown is stable from one acquisition to the next,
 - the period of the signal is 2 divisions
 - the pk-pk amplitude is 8 ± 0.6 divisions

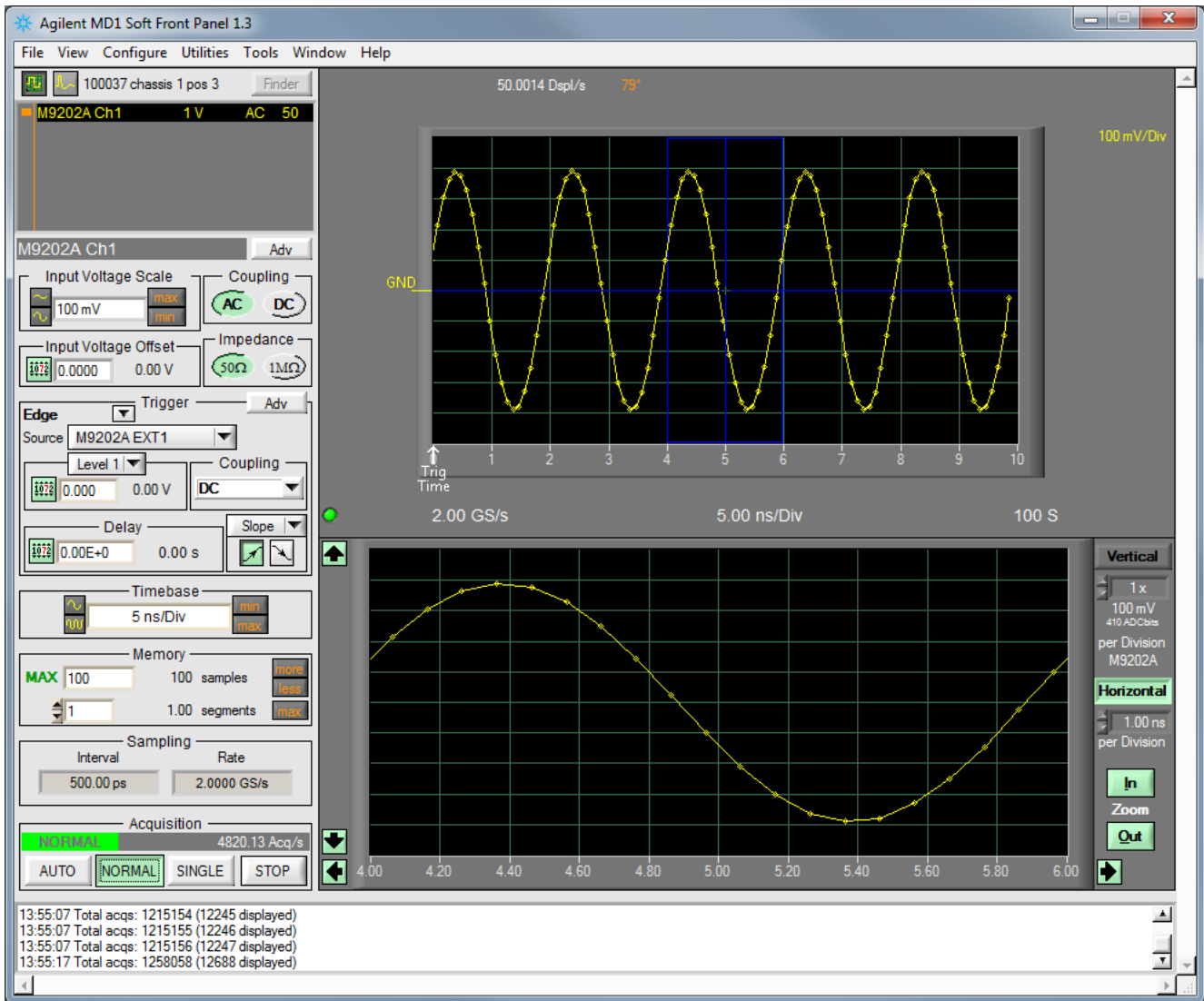
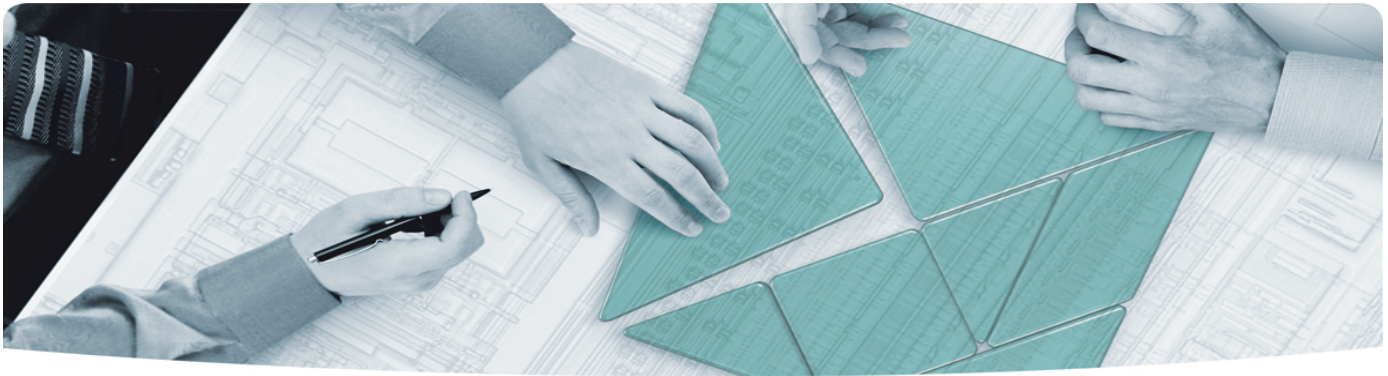


Figure 4 - SFP showing measured waveform

If a Problem is Found

1. Verify that you have set all configuration settings as shown above.
2. Verify that the RF Generator is ON and producing the desired signals at the end of the BNC cables. This can be done with an oscilloscope.
3. If the problem occurs during Operational Verification disconnect the input signal and note the status of the LED on the front panel; it should be GREEN. Reconnect the signal and select the AUTO acquisition mode; note the behavior for subsequent reference.
4. Verify that the problem is reproducible.
5. Refer to ["Return the module for service"](#) on page 9, concerning the details on sending the module to Agilent for service.



The Modular Tangram

The four-sided geometric symbol that appears in Agilent modular product literature is called a tangram. The goal of this seven-piece puzzle is to create shapes—from simple to complex. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—hardware, software—Agilent can help you create the system you need, from simple to complex.



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