

Startup Guide

Keysight M9506A 5-Slot AXIe Chassis



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The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product must not be impaired if it is used in a manner specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the external markings described under "Safety Symbols".

Ground the Instrument

Keysight chassis' are provided with a grounding-type power plug. The instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the module/chassis in the presence of flammable gases or fumes.

Do Not Operate Near Flammable Liquids

Do not operate the module/chassis in the presence of flammable liquids or near containers of such liquids.

Cleaning

Clean the outside of the Keysight module/chassis with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

Do Not Remove Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Keep away from live circuits

Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment

Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Keysight Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT block the primary disconnect

The primary disconnect device is the appliance connector/power cord when a chassis used by itself, but when installed into a rack or system the disconnect may be impaired and must be considered part of the installation.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Keysight Sales and Service Office to ensure that safety features are maintained.

In Case of Damage

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

CAUTION

Do NOT block vents and fan exhaust: To ensure adequate cooling and ventilation, leave a gap of at least 50mm (2") around vent holes on both sides of the chassis.

Do NOT operate with empty slots: To ensure proper cooling and avoid damaging equipment, fill each empty slot with an AXle filler panel module.

Do NOT stack free-standing chassis: Stacked chassis should be rack-mounted.

All modules are grounded through the chassis: During installation, tighten each module's retaining screws to secure the module to the chassis and to make the ground connection.

WARNING

Operator is responsible to maintain safe operating conditions. To ensure safe operating conditions, modules should not be operated beyond the full temperature range specified in the Environmental and physical specification. Exceeding safe operating conditions can result in shorter lifespan, improper module performance and user safety issues. When the modules are in use and operation within the specified full temperature range is not maintained, module surface temperatures may exceed safe handling conditions which can cause discomfort or burns if touched. In the event of a module exceeding the full temperature range, always allow the module to cool before touching or removing modules from the chassis.

Safety Symbols

CAUTION

A CAUTION denotes a hazard. It calls attention to an operating procedure or practice, 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 denotes a hazard. It calls attention to an operating procedure or practice, 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.

Products display the following symbols:

-  Warning, risk of electric shock
-  Refer to manual for additional safety information.
-  Earth Ground.
-  Chassis Ground.
-  Alternating Current (AC).
-  Standby Power. Unit is not completely disconnected from AC mains when switch is in standby.
-  Antistatic precautions should be taken.
- CAT I IEC Measurement Category I, II, III, or IV
- CAT II
- CAT III
- CAT IV

For localized Safety Warnings, Refer to Keysight Safety document (p/n 9320-6792).



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The Regulatory Compliance Mark (RCM) mark is a registered trademark. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.

ICES/NMB-001

ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001.



This symbol represents 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 this product.



MSIP-REM-Kst
-BLM9506A

South Korean Class A EMC Declaration. This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

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2002/96/EC

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Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

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Introduction

The Keysight M9506A AXIe chassis is a modular instrument chassis fully compatible with the AXIe Wide PCIe specification. It allows multiple application-specific instrument modules to share a common chassis frame, power supply, cooling system, PCI Express (PCIe) x16 Generation (Gen) 3 backplane, Gigabit LAN hub, local bus for module-to-module signaling, and host PC connections. The full rack chassis provides five general purpose peripheral slots that accept 1U AXIe instrument modules.

Additional features include:

- Up to 300 W per slot power
- Five AXIe Wide compliant slots
- PCIe x16 Gen 3 Backplane allows module to module communication
- Default PCIe configuration merges both cable ports to one Gen 3 x16 PCIe Cable Port.
- Open AXIe Zone 3 for custom use (cable access, analog backplane, etc.)
- Thunderbolt™ 3 Connection Port¹
- Cascaded PCIe for multiple chassis systems
- Parallel and Star Triggering
- Push-pull fan system for quieter operation

The chassis includes a half-height Embedded System Module (ESM) that manages chassis functions. The ESM provides all ATCA (Advanced Telecommunications Computing Architecture) shelf manager functions, plus these AXIe extensions:

- Host PC connectivity (Gen 3 PCIe x8/x16, Thunderbolt 3, Ethernet)
- Sources timing signals (CLK100, SYNC, and FCLK)
- Routes STRIG (Star Trigger) to instruments through the backplane
- Two bi-directional trigger access ports route trigger signals through to the backplane parallel trigger bus and star triggers (STRIG) to each slot
- Provides backplane PCIe and Ethernet communication between modules

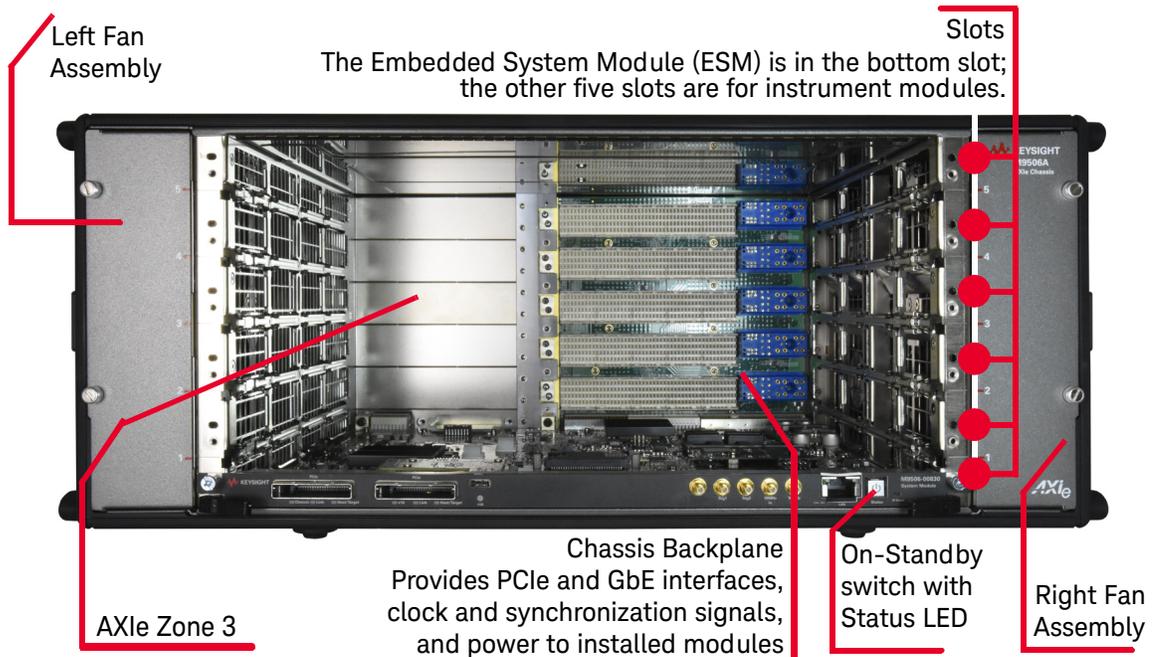
Other than a power button/status light (on the ESM), all monitoring, control, and communication with the chassis requires a *host PC*. This can be an *embedded PC* specifically designed for use in an AXIe chassis (such as the Keysight M9537A) or *remote* (a rackmount, desktop, or laptop) PC.

The Gen 3 PCIe Cable Interface ports provides up to a 8GB/s (theoretical) for Gen 3 x8 and 16 GB/s (theoretical) for Gen 3 x16. The Thunderbolt 3 port provides a Gen 3 x4 link with up to 4 GB/s (theoretical) bandwidth.

¹ Thunderbolt™ is the brand name of an interface standard developed by Intel (in conjunction with Apple) that allows connection of external peripherals to a computer. Thunderbolt 3 specification provides Gen 3 PCI Express (PCIe), DisplayPort, and DC power in one USB-C compatible cable; only PCIe is supported on the M9506A. Charging devices such as laptop computers over Thunderbolt 3 is **not** supported on the M9506A.

M9506A 5-Slot AXIe Chassis at a Glance

The M9506A is shipped with bumpers and two carry handles installed for benchtop use (these remove for rack mounting), The front panel is shown below:



AXIe Embedded System Module (ESM) at a Glance

The ESM is installed in a half-height slot at the base of the chassis. It performs the following functions:

- Tracks inserted modules and manages power requirements
- Monitors chassis temperature and controls variable-speed chassis fans
- Monitors module sensors and reports component failures to a system log
- Acts as a Gigabit Ethernet switch; forwards frames along the backplane
- Connects an external host PC to the chassis
- Provides trigger routing between front panel trigger ports and backplane parallel and star trigger lines to all modules.
- Provides a 100 MHz clock reference to all modules, which can be locked to an external 10 MHz clock source
- provides two Gen 3 x8 PCIe cable ports, one Thunderbolt 3, and one LAN port for connecting to the Host PC

NOTE

The M9506A chassis is not compatible with the M9502A or M9505A AXIe chassis ESM module. Nor is the M9506A ESM compatible with the M9502A or M9505A AXIe Chassis.



ESM Front Panel

1		Reserved for future use.
2	Power Switch	Turns the chassis power on or off. The status indicator light is a bi-color LED. Flashing green indicates the chassis is powered on and booting. Solid green indicates normal operation. Red indicates a power-up error.
3	LAN Port	RJ45 connector. Connects the host PC to the chassis, auto crossover. Amber Link/Activity LED, Bicolor Speed LED (Amber = 1 Gbps, Green = 100 Mbps, Off = 10 Mbps). An embedded controller module does not use this port for direct communication with the ESM.
	Clock	External clock connections. SMB connectors with ESD suppression.
4	10 MHz Clock Out	Extends the internal clock source to external instruments. 3.3 V CMOS, 50 Ω line drive, 3-state, AC-coupled.
5	10 MHz Clock In	Accepts an external 10 MHz clock. Input range: 5 Vpk-pk, AC coupled, 50 Ω terminated, 250 mV minimum swing
	Trigger	Bi-directional, external trigger connections. Extends the backplane parallel and star trigger resources to external instruments. SMB connectors with ESD suppression.
6	TRIG1 TRIG2	Output: 3.3 V CMOS, 50 Ω output impedance (push-pull), open-drain capable. Input: Adjustable threshold input range -5 V to +5 V, 250 mV minimum swing.
7	Thunderbolt	Thunderbolt 3 port with USB-C connector.
8	PCIe Cable Port	Used to create a x16 link to a Host Adapter or to connect a cascaded chassis. Gen 3 compliant PCIe x8 connector.
9	PCIe Cable Port	Connects a remote host PC to the chassis via PCIe. Gen 3 compliant PCIe x8 connector.

PCIe Cable Ports and Status LEDs. These Upstream \ Downstream ports can be merged to form single X16 port.

LED	Color	Description
Chassis (Link speed between ESM and backplane)	Off	No connection present
	White	Gen 1 connection
	Blue	Gen 2 connection
	Green	Gen 3 connection
Link (left port for x8 mode or both ports x16 mode)	Off	No link present
	White	Gen 1 connection
	Blue	Gen 2 connection
	Green	Gen 3 connection
Link (right port)	Off	No link present in x8 mode or if in merged x16 mode
	White	Gen 1 connection
	Blue	Gen 2 connection
	Green	Gen 3 connection
Host or Target Mode (right port)	Off	Right cable port is merged with left port to form X16
	Green	Host more (default) Right port is Downstream facing
	Blue	Target Mode Right port is Upstream facing

For detailed feature information, refer to the *M9506A User Guide*.

What is Thunderbolt 3?

Thunderbolt 3 provides PCI Express (PCIe) connectivity with data transfer rates at up to 40 Gbps¹. There are no Upstream or Downstream ports with Thunderbolt 3.

Thunderbolt 3 uses USB-C and requires Thunderbolt 3 certified cables for correct operation. To quickly check whether the port you have on a host PC is a USB-C or Thunderbolt 3 version, look next to or just above the port for a Thunderbolt icon (a lightning bolt).² Your host PC must have a Thunderbolt 3 port. Even though they use the same cables, Thunderbolt 3 is not USB-C compatible. Thunderbolt 3 cables have no polarity and are reversible – connect either end to the PC or chassis.



Plugging a Thunderbolt 3 device into a Thunderbolt 3 port, provides between 20 Gbps and 40 Gbps maximum throughput, depending on the type of cable you're using:

- Passive Thunderbolt 3 cables are identical to USB-C cables and plug into Thunderbolt 3 or USB-C ports and achieve data rates up to 20 Gbps.
- For maximum data transfer rate over Thunderbolt 3, use active cables. Active Thunderbolt 3 cables achieve full 40 Gbps throughput. Active optical cables can extend connection length from 6 feet up to approximately 200 feet.

NOTE

Factory default is PCIe Cable Ports configured as x16 Gen 3. If you want to use the Thunderbolt 3 port, you must set a switch on the ESM. See “SW56 Switch Positions” in the *M9506A User Guide*.

CAUTION

Thunderbolt 3 is hot-swappable. However, avoid removing the cable after the system is powered on. Doing so may cause error in data transmission.

Do not connect USB Type C (USB-C) devices into the Thunderbolt port on the M9506A chassis.

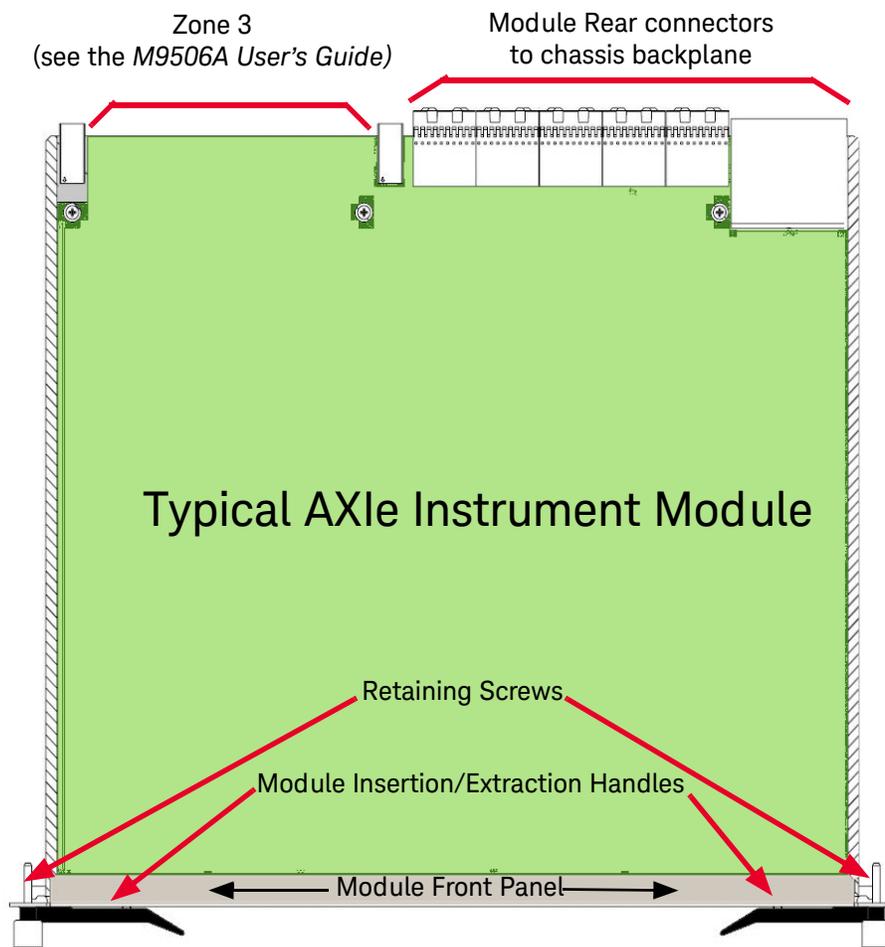
¹ Thunderbolt 3 provides PCIe connectivity and provides faster data transfer than a standard PCIe interface. It requires short, <0.5 M or active Thunderbolt 3 cables for highest speed. Charging devices such as laptop computers over Thunderbolt 3 is **not** supported on the M9506A.

² The original Thunderbolt and Thunderbolt 2 interfaces use mini DisplayPort-shaped connectors that are not compatible with Thunderbolt 3.

AXle Instrument Modules

The chassis slots accept AXle instrument modules. These may comprise one or more instruments for signal injection, data acquisition, and measurement. They can be installed in any available AXle slot.

The drawing below illustrates the AXle module's general layout, backplane connections and chassis fasteners, viewed from the top.



Test connections are made at the module's front panel. The front panel and backplane connectors will vary depending on the module.

M9506A AXle Chassis System Block Diagrams

The “[M9506A System Block Diagram \(Graphic\)](#)” on page 8 shows a block diagram of the M9506A 5-slot AXle chassis system, showing the chassis and the host PC. The key points regarding this diagram are:

- The diagram shows the host PC interfaces to the chassis: (1) The PCIe Cable ports, (2) Thunderbolt 3 interface, and (3) the LAN interface. The PCIe Cable ports and Thunderbolt signals route through the ESM PCIe Switch to the slot x16 PCIe links. The LAN interface signals are routed through the LAN Switch to the slot Gb Ethernet links. The PCIe and Thunderbolt interface signals can also be routed to the slot Gb signals (through the network interface controller and the LAN Switch). However, the LAN interface signals cannot be routed to the slot x16 PCIe links.
- The network interface controller (NIC) is an Intel I210 NIC. The PCIe Switch and the NIC provide an x1 path from the chassis PCIe interface to the LAN Switch and, ultimately, the Shelf Manager (described further below).

NOTE

If you're using the PCIe interface to connect to the chassis, the Intel I210 NIC will appear to Windows as a locally-installed device. Windows 7 and Windows 10 provide the necessary Intel NIC driver.

- Install either the M9048B or the M9049A PCIe Desktop Adapter in the host PC to provide a PCIe interface. The PCIe Desktop Adapter is used in desktop or rack-mount computers. A PCIe cable (Y1202A, 2.0 m cable) connects the adapter to the AXle chassis. For Thunderbolt access, a standard Thunderbolt cable connects the ESM to the host PC. For LAN access, a standard Ethernet cable connects the ESM to the host PC.
- The chassis contains a processor called the *Shelf Manager* that monitors the status of the chassis sensors and the module sensors over the Intelligent Platform Management Bus (IPMB). The Shelf Manager also controls the fan speeds and provides the chassis Web Interface. The Web Interface allows you to use your browser to monitor the status of the chassis and configure certain aspects of chassis operation, such as the trigger subsystem.
- The chassis supports a Soft Front Panel (SFP). The SFP runs on the host PC and provide the same monitor and control functionality as the Web Interface.
- Keysight provides a host PC driver for the chassis. This driver provides programmable control and monitoring of the chassis trigger bus and sensors. For further information on these drivers, please see the *M9506A User's Guide*.
- The chassis contains customer upgradeable firmware. To check if a later version is available, go to the website below for your product, then click the tabs/links indicated: www.keysight.com/find/M9506A then select **Technical Support > Drivers & Software > Firmware Update**

CAUTION

Some AXIe test system software applications, such as the Keysight logic and protocol analyzer software and modules, sets and uses specific trigger lines in the AXIe chassis. Do not use the AXIe Chassis SFP software or the AXIe Chassis Web Interface to set or reroute any of the AXIe chassis trigger lines. Rerouting any of the trigger lines may cause the application software to not function correctly.

NOTE

In order for a computer to serve as host PC, its BIOS must support enumeration of PCIe slots in the AXIe chassis; many computers are not capable of enumerating a sufficient number of PCIe slots to ensure that slots in an external chassis are enumerated. Keysight maintains a document listing the integrated, rack mount, desktop and laptop computers that have been verified to properly enumerate PCIe devices in the AXIe chassis, at www.keysight.com/find/M9506A.

Performing the Startup Steps

The remainder of this Startup Guide describes how to unpack and inspect the chassis, connect it to a host PC, power-up the chassis and verify basic operation. It is not necessary to install modules or device drivers to do this.

Exception: If you decide to use an embedded controller module, such as Keysight's M9537A, as your Host PC, you will need to install it before proceeding to Step 3. Module installation instructions are in the *M9506A User's Guide*.

Keysight recommends you follow these steps in preparing and turning on the chassis:

Step 1: Unpack and Inspect the Chassis

Step 2: Verify Shipment Contents

Step 3: Power-Up and Power-Down

Step 4: Set Up the Host PC

Step 5: Install IO Libraries Suite and Connect to the Web Interface

Step 6: Install the Chassis Software

Step 7: Next Steps

In Step 7, you will download the *M9506A User's Guide*. Continue with the User Guide to complete installation, learn the chassis's features and operation, and access service information.

NOTE

IMPORTANT: The installation and setup information in this manual is generic. Some AXIe modules and systems require a different installation and setup procedure than described in this manual. Refer to the installation documentation supplied with your AXIe module and or system for detailed installation information.

For example, installation of the Keysight IO Libraries (“[Step 5: Install IO Libraries Suite and Connect to the Web Interface](#)” in this manual) is not required for all AXIe systems.

Step 1: Unpack and Inspect the Chassis

CAUTION

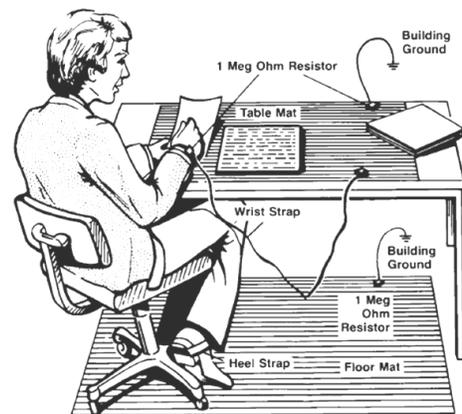
Keysight's AXIe chassis and instrument modules are shipped in materials which prevent static electricity damage. These instruments should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store all modules in anti-static envelopes when not installed.

ESD

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. 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 M Ω of isolation from ground.



Inspect for Damage

After unpacking the chassis, carefully inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty.

To find warranty information on your M9506A AXIe chassis, go to www.keysight.com/find/warranty and enter your model number (**M9506A**) in the **Product Number** field, and enter the serial number from the chassis rear panel in the **Serial No.** field.

CAUTION

To avoid damage when handling the AXIe chassis and modules, do not touch exposed connector pins.

Step 2: Verify Shipment Contents

Your shipment should include the following:

Chassis The Keysight chassis that you ordered. The ESM comes pre-installed in the chassis. Any additional AXIe modules you may have ordered from Keysight do not come pre-installed; they will be in separate shipments.

Chassis Power Cord For country of destination.

Startup Guide This document, *Keysight M9506A 5-Slot AXIe Chassis Startup Guide*.

Product specifications, available accessories, firmware and software may change over time.

Please check the Keysight website at: www.keysight.com/find/M9506A for the latest updates to the product software, guides, data sheet, and help files.

Step 3: Power-Up and Power-Down

Circuit Breaker

The chassis circuit breaker is a toggle switch, marked OFF (O) when open and ON (I) when closed:



Circuit Breaker Open (OFF)



Circuit Breaker Closed (ON)

Power Modes

The chassis has three power modes:

OFF With the power cord removed or the circuit breaker in the open position, the chassis is **OFF**.

STANDBY With the power cord connected, the circuit breaker closed, and the **STATUS** light is turned off, the chassis is in **STANDBY** mode. Although no power is supplied to the ESM and installed modules when in Standby, the chassis is energized and consumes power. The internal power supply unit fans may operate.

ON With the power cord attached, circuit breaker closed, and the **STATUS** light is turned on (either blinking green, solid green, or red), the chassis is **ON**. Power is supplied to the ESM and installed modules. Fans will operate as dictated by chassis thermal load.

FAULT Chassis main power will be off, but the **STATUS** light will be blinking red. Refer to the table on the next page for more information.

ON/STANDBY Switch

The chassis **ON/STANDBY** switch is located on the ESM module. It is lit when the chassis is ON. The **STATUS** light in the ESM's **ON/STANDBY** switch cycles as described on the next page.

To Power Up the Chassis

1. Plug-In Chassis Using the supplied cord, connect the chassis to an appropriate AC power main. Use with a ground-fault circuit interrupter (GFCI) is not recommended.

2. Close Circuit Breaker Close the rear panel circuit breaker (ON position).

Press On/Standby Button Press the ESM's **ON/STANDBY** switch. It should light when depressed

The **STATUS** light in the ESM's **ON/STANDBY** switch cycles as follows:

Status Color	Flash Rate	Chassis Power State	Description
Off		Off	Chassis is powered off
RED	1 flash every 5 seconds	Off	Fault - PSU Over Temperature
	2 flashes every 5 seconds	Off	Other PSU fault
	3 flashes every 5 seconds	Off	ESM/Chassis Power Fault
	4 flashes every 5 seconds	Off	ESM/Chassis Over Temperature Fault
	Solid (no flashes)	On	Unrecoverable alert
GREEN	1 second on, 1 second off	On	Chassis is powered on but not ready for enumeration or self test error
	0.5 second on, 0.5 second off	On	Power button has been pushed and chassis is shutting down
	Solid (no flashes)	On	Chassis is powered on and ready for enumeration

CAUTION

The chassis and host PC must be powered up and down in the following sequence. The chassis should be powered up first, which will initiate its built-in Self-Test. During Self-Test, the chassis STATUS LED will be blinking green (1 s on, 1 s off). The STATUS LED will blink green and then stay green continuously when the ESM is ready. The ESM then powers up each module slot. The remote host PC should be turned on only after all installed modules have performed their initialization—see your module documentation for initialization information. An embedded controller such as the M9537A handles this sequence automatically.

NOTE

The method of powering up the chassis depends on the position of the INHIBIT switch on the chassis rear panel, which can be set to the DEF (DEFault) position or to the MAN (MANual) position. Refer to the M9506A User's Guide for more information.

To Power Down the Chassis

For routine power-down or to cycle power to the chassis, momentarily (< 5 seconds) press the chassis **ON/STANDBY** switch. The main chassis fans gradually drop in speed to off, and the power supply unit (PSU) fans gradually return to idle speed as the PSU cools. This is normal.

CAUTION

For routine power-down, do not use the circuit breaker to turn the chassis off. Doing so interrupts power to the power supply fans, which may shorten the life of the PSU. Use the front panel On/Standby switch to power down the unit, and allow the PSU fans to return to idle before removing power from the chassis.

Once the chassis has cooled, you may isolate the chassis from AC power as needed. This is usually done by opening the circuit breaker.

NOTE

Pressing and holding the power **ON/STANDBY** switch for greater than five (5) seconds shuts down the power supply immediately. If the chassis is in a fault condition, the fault resets and the chassis goes to the OFF state.

Step 4: Set Up the Host PC

Communication with the Embedded System Module (ESM) and installed instrument modules requires a *host PC*, a Windows based computer that may be:

An Embedded Controller (takes up slot one in the chassis).

An AXIe embedded PC (also commonly called an *embedded controller module*) allows for mainframe portability and stand-alone test system operation. PCIe and LAN connections from PC to ESM are made directly at the chassis backplane.

NOTE

If you decide to use an embedded controller module as your host PC, install at least that module in the chassis before proceeding with this section. See the *M9506A User's Guide* for complete module installation instructions.

A separate rack-mounted or desktop PC.

To use the chassis PCIe data transfer capabilities, this host PC must have an available PCIe x8 slot and BIOS support for proper enumeration of devices on the PCIe bus. PCIe connection from host PC to ESM requires a PCIe adapter card and cable. Keysight recommends use of a PC, card and cable tested with the AXIe mainframe; a current list can be found at: [PC Tested Configurations with PXIe/AXIe Chassis - Technical Overview](#).

NOTE

To ensure proper system operation, you should use an approved (embedded, rackmount, or desktop) host computer along with an approved PCIe adapter and cable. While you may use other controllers, the approved computers have verified hardware support for PCIe x8 and their BIOS can properly enumerate multiple instruments on the shared PCIe bus.

Keysight provides a list of tested host PCs at [PC Tested Configurations with PXIe/AXIe Chassis - Technical Overview](#). For the recommended PCIe host adapter cards and cables, see [page 17](#).

General controller requirements (such as operating system and RAM) are listed in "[System Requirements](#)" on [page 19](#).

CAUTION

You should not enable the Microsoft Windows sleep or hibernate modes on the host PC. The controller may not have proper chassis enumeration when it wakes up and unpredictable operation may result.

Hardware Connections to the Host PC

CAUTION

Except where noted, connections between the host PC and the chassis Embedded System Module (ESM) should be made with both the PC and chassis powered off.

Physical connections to the host PC may include monitor, mouse, and keyboard; LAN and/or PCIe (to the AXIe chassis); and corporate LAN. Make the following connections as needed.

For Local Control

If you need local access to the host PC, connect a monitor, mouse, and keyboard.

From M9506A AXIe Chassis to the Host PC

The connection between the chassis and the host PC may vary depending on whether you're performing chassis turn-on or using the chassis in production:

- **Initial Turn-on and Verification:** Keysight recommends that you make a LAN-only connection to the chassis for initial turn-on – this is the simplest connection and doesn't require installation of a PCIe Host Adapter card in the host PC. The host PC can either be connected directly to the ESM with a crossover Gigabit Ethernet cable, or can be connected through your network with a straight Ethernet cable.
- **Continuous Run for Production:** If you're using PCIe modules in the chassis, use the chassis PCIe interface. This requires installing a PCIe adapter card in the host PC. As described in section "[M9506A AXIe Chassis System Block Diagrams](#)" on page 6, the PCIe interface may be used to access both the slot PCIe interfaces and the slot Gb interfaces. However, the chassis LAN interface cannot access the slot PCIe interfaces.

For PCIe cable recommendations, see "[Specific PCIe Adapter and Cable Recommendations](#)" on page 17. The PCIe adapter card may require that you load its device driver for your Windows environment, perhaps before installing the adapter card. Follow the adapter vendor's installation instructions.

Alternately, use a Thunderbolt 3 cable to connect the host PC to the chassis. Using the Thunderbolt 3 connection disables the ESM PCIe cable ports.

NOTE

As shown on the [M9506A System Block Diagram \(Graphic\)](#) on page 8, an Intel network interface controller (NIC) connects to the PCIe switch in the chassis. The NIC appears to the PC as if it is installed in the PC itself. Therefore, an Intel network driver must be installed on the PC in order for PCIe interface communications through the NIC to work.

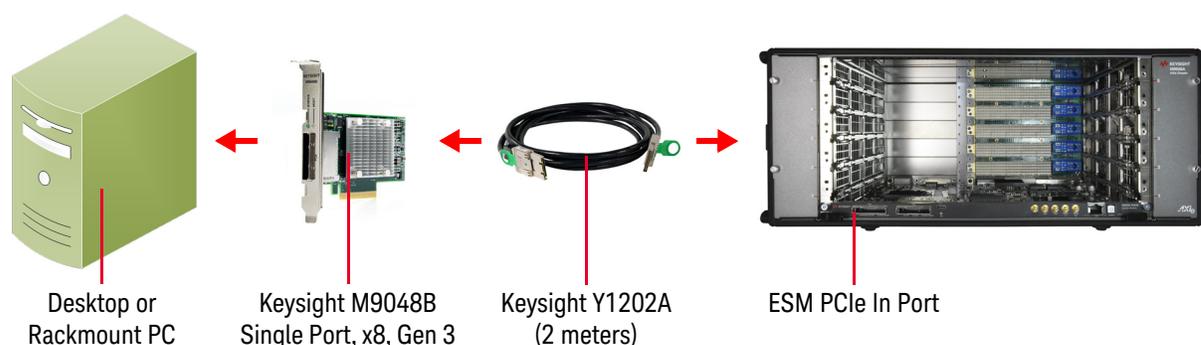
Specific PCIe Adapter and Cable Recommendations

If Using an Embedded Controller: This PC (such as the Keysight M9537A) communicates with the ESM through the backplane; external PCIe and Ethernet connections from embedded controller to chassis are not required.

If Using a Desktop or Rackmount PC: Install a compatible PCIe Host Adapter in the PC. Connect the adapter to the ESM PCIe port.

NOTE

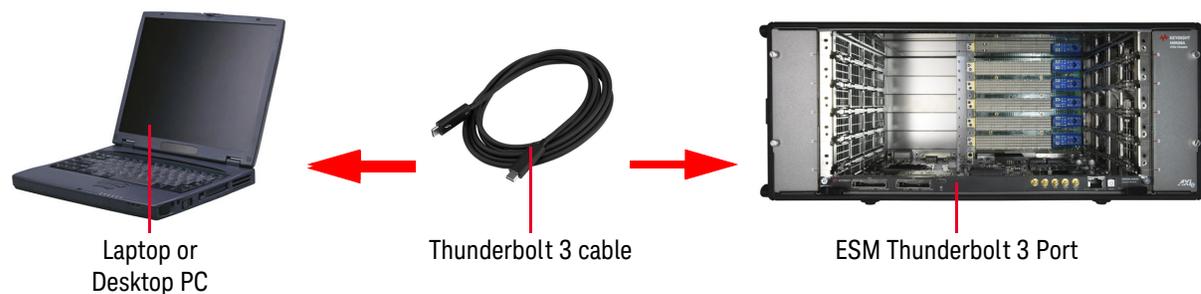
The default PCIe Cable Port Configuration is x16. To change the configuration to two x8 ports, you must set a switch on the ESM. Refer to “SW56 Switch Positions” in the *M9506A User’s Guide*.



If Using Thunderbolt 3 with Laptop or Desktop PC: Thunderbolt 3 provides PCIe connectivity and provides up to 4 GB/s data transfer at most (PCIe Gen 3 x4) with a standard, short, <0.5 M cable or active Thunderbolt 3 cable.

NOTE

The default configuration for the ESM is to use the cable PCIe ports. To use the Thunderbolt port, you must set a switch on the ESM. Refer to “SW56 Switch Positions” in the *M9506A User’s Guide*.



NOTE

Connecting the Thunderbolt 3 port disables the PCIe ports on the M9506A ESM. Charging devices such as laptop computers over Thunderbolt 3 is not supported on the M9506A.

NOTE

For examples of connecting multiple chassis to a host controller, refer to the *M9506A User's Guide* for more information.

Step 5: Install IO Libraries Suite and Connect to the Web Interface

This step describes how to install the Keysight IO Libraries Suite and verify that the chassis can be found by Keysight Connection Expert, which is part of IO Libraries Suite.

NOTE

IMPORTANT: The installation and setup information in this manual is generic. Some AXIe modules and systems require a different installation and setup procedure than described in this manual. Refer to the installation documentation supplied with your AXIe module and or system for detailed installation information.

For example, installation of the Keysight IO Libraries is not required for all AXIe systems.

As described in section [M9506A AXIe Chassis System Block Diagrams](#) on page 6, you can use either the Web Interface or the SFP to monitor and control the chassis. In this step, the Web Interface is used to verify that the host PC can communicate to the chassis. Using the SFP to monitor and control the chassis is described in the *M9506A User's Guide*.

System Requirements

To install and run the required software (Microsoft .NET, Keysight IO Libraries, and chassis device drivers), the host PC requires the following:

Operating System	Win 7 SP1 32/64bit Win 8.1 32/64bit Windows 10 32/64 bit
Minimum RAM	4 GB
Graphics	Support for DirectX 9 graphics with 128MB graphics memory recommended

Installing the Keysight IO Libraries Suite

Note that IO Libraries Suite is required to access the chassis features. We recommend that you always use the latest version of Keysight IO Libraries.

NOTE

The latest version can be downloaded from: www.keysight.com/find/iosuite.

NOTE

Only one installation of the Keysight IO Libraries Suite is required on the host PC. This installation is used by the M9506A driver software that is installed in the next section as well as the drivers associated with each module that you install in the chassis.

NOTE

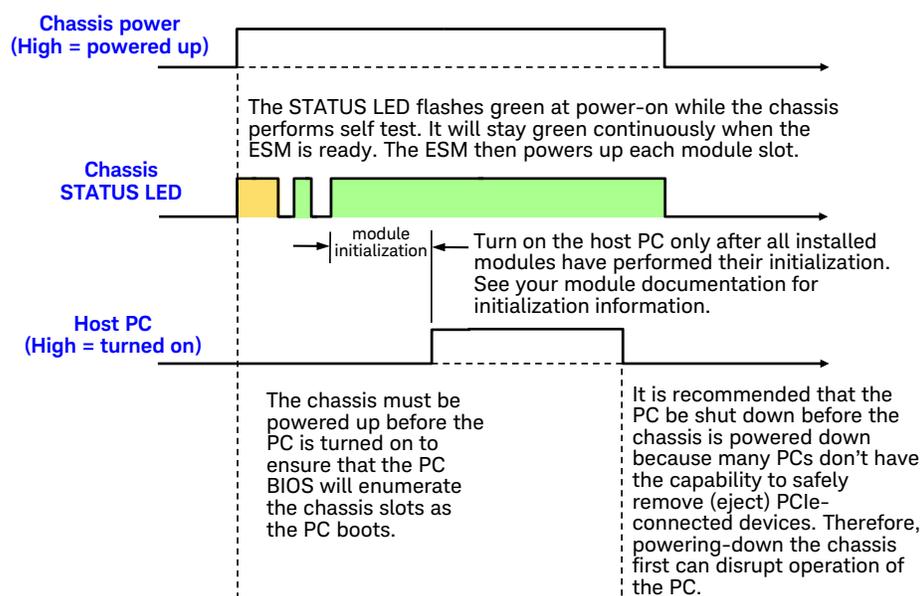
Two libraries, **IVI Shared Components** and **VISA Shared Components**, are required by the IO Libraries Suite. If these libraries are not already installed on your controller, the IO Libraries Suite installer will install them. If **IVI Shared Components** and **VISA Shared Components** are already installed, the IO Libraries Suite installer will upgrade these libraries to the latest version, if necessary, using the same installation location used by the previous version.

Turning on the Chassis

In powering the chassis up or down, please follow the steps listed in [“Step 3: Power-Up and Power-Down”](#) on page 12 and the sequences shown below.

CAUTION

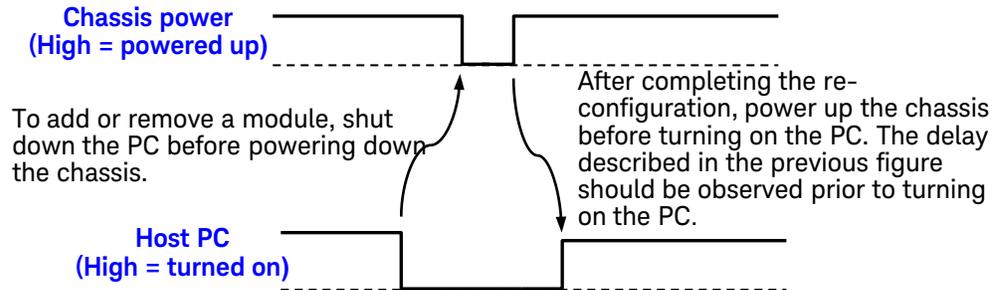
The chassis and host PC must be powered up and down in the following sequence. The chassis should be powered up first, which will initiate its built-in self test. During self test, the chassis STATUS LED (in the power switch) flashes green. The STATUS LED blinks green and then stays green continuously when the ESM is ready. The ESM then powers up each module in the chassis. The PC should be turned on only after all the installed modules have performed their initialization—see your module documentation for initialization information.



In brief, the host PC must be off whenever the chassis is powered up or down. Note the need to restart the host PC (after Windows starts) if the chassis configuration has been changed in any way while the PC was turned off.

While the power sequencing shown above doesn't apply to an embedded controller (because an embedded controller and chassis are powered simultaneously), an embedded controller must also be restarted (after Windows starts) if the chassis configuration was changed in any way while the chassis and embedded controller were turned off.

In the figure below, the previous diagram is applied to the situation where the chassis configuration has changed. Because modules are not hot-swappable, the chassis must be powered down before modules are added or removed. As you can see, the host PC is shut down before the chassis is powered down, and then the PC is turned on after the chassis is powered up.



There are situations where a host controller restart may need to be performed, including:

- When Windows detects the presence of a new module (that is a new module was added to the chassis without powering down the PC)
- When Keysight *Connection Expert* fails to detect the presence of the chassis
- Whenever you detect or suspect that the host PC has an incorrect view of how the chassis is configured

Using Keysight Connection Expert to Confirm Connection to the Chassis

This section describes use of Keysight Connection Expert to confirm that the host PC can connect to the chassis. Keysight Connection Expert is installed during the installation of Keysight IO Libraries Suite.

NOTE

This section assumes Keysight IO Libraries Suite is installed. Always use the latest version of Keysight IO Libraries Suite.

NOTE

Keysight *Connection Expert* uses either the LAN interface or the PCIe interface to connect to the chassis, whichever interface is cabled between the host PC and the chassis. Both of these interfaces will appear under the LAN category in Keysight Connection Expert. The listing of the PCIe interface under the LAN category is due to the presence of the Intel I210 NIC as a chassis PCIe endpoint.

NOTE

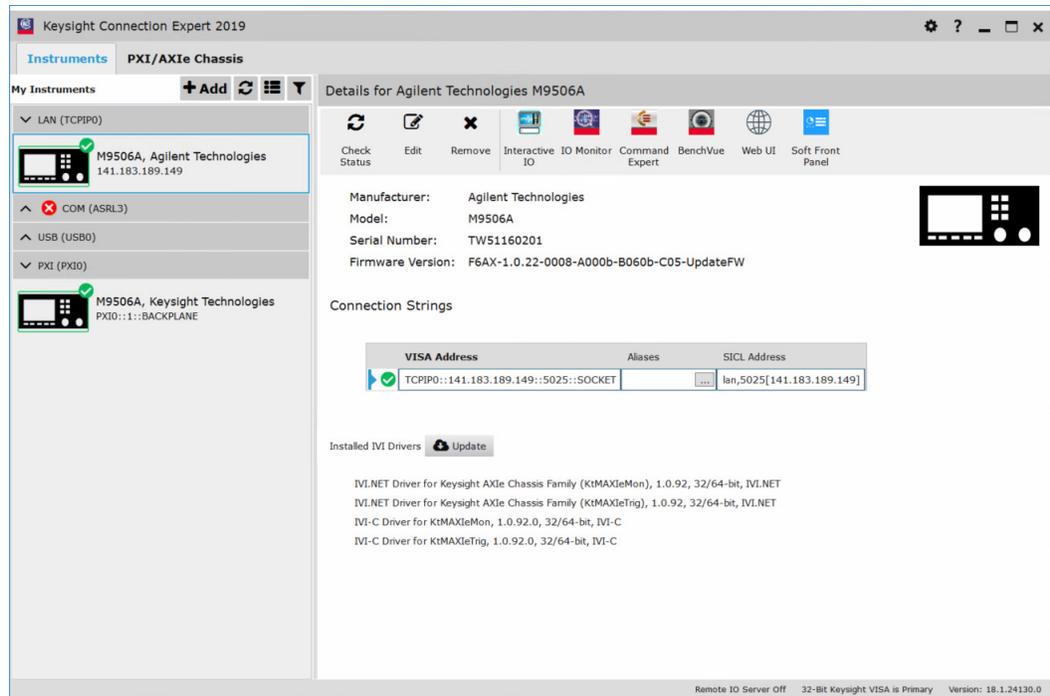
The section “[Host PC/Chassis Interface Topics](#)” on page 28 includes a number of interface topics that may be of assistance in establishing a connection between the host PC and the chassis.

- 1 Launch *Keysight Connection Expert* using one of these methods:
 - From the Windows Start menu, select **All Programs\Keysight IO Libraries Suite\Keysight Connection Expert** to launch the program.
 - From a Command Prompt window, type:

```
<c>:\Program Files\Keysight\IO Libraries Suite\KeysightConnectionExpert.exe
```

to launch the program.

The **Keysight Connection Expert** window displays:



- 2 The **Instruments** tab shows the instrument connections on your PC. If connected through PCIe or Thunderbolt 3, the chassis appears under the PXI0 interface. If connected through LAN, both the chassis and ESM appear under the LAN interface.

Launch the Chassis Web Interface from Keysight Connection Expert

This section describes how to launch and use the Chassis Web Interface. Note that the Chassis Web Interface can be accessed over PCIe, Thunderbolt 3, or LAN, whichever interface is connected. Note also that the chassis SFP provides many of the same capabilities as the Web Interface. However, using the Web Interface requires only a browser on the host PC, whereas using the SFP requires installing the AXIe chassis software (which includes the SFP) on the host PC.

- 1 To launch the Chassis Web Interface, select the M9506A chassis in Connection Expert. Then, click the **Web UI** button. The Web Interface will be displayed in a new window:

NOTE

If IO Libraries Suite is not installed, access to the Web interface is through your Host PC's browser using the default local address: 169.254.1.0

NOTE

If you have problems launching the Chassis Web Interface, check your browser's proxy settings. When Keysight Connection Expert launches a Web interface for a chassis, it hands off the **http://<address>** to the browser or dedicated Web application. Therefore, it should not use a proxy.

The home page displays information about your chassis and the connection to the chassis.

Chassis
Firmware
Version

Connected to AXIe M9506A chassis at IP address 141.183.189.149

Turn On Front Panel Identification Indicator

Description

Model number	M9506A
Manufacturer	Keysight Technologies
Serial number	TW51160201
Firmware revision	F6AX-1.0.22-0008-A000b-B060b-C05-UpdateFW
Description	M9506A AXIe 5 Slot Chassis
Host ID	PCSERNO,LK42477582
License Option	Full Range

^ Less Information

LAN details

DNS hostname	K-M9506A-160201
NetBIOS name	Keysight-E8708A
mDNS hostname	K-M9506A-160201.local
IPv4 address	141.183.189.149
IPv6 addresses	[fe80::ad9c:af4b:1d31:250d]
IPv6-enabled protocols	HiSLIP, Socket
Ethernet (MAC) address	00:18:49:04:70:3C
Auto-MDIX capable	Yes

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The six tabs on top are the Web Interface's menu: Below is a brief description of what you can do on each page.

Home Page General Information about the chassis, such as product identification, firmware version, and LAN parameters.

Module Configuration Page View basic product and model information for instrument modules loaded in the chassis.

Fan Control Page Displays the fan operating level for module cooling.

E-Keying Page Shows the connection protocols each module has with other modules in the chassis over the backplane (read-only). E-keying permission occurs as modules activate during power on.

Configure LAN Page View/change IP address, domain, and subnet. Display service discovery information and LAN status.

Health Page Shows read-only diagnostic information for chassis fan speed, voltage rails, and temperature sensors. It also shows voltage rails and temperature sensors on AXIe modules if they are so equipped.

Help Button The Help button () provides general help for the current page.

The *M9506A User's Guide* has a chapter covering the Web Interface, with examples showing all parameters you can view or configure.

Step 6: Install the Chassis Driver Software

You can monitor and control the chassis entirely from the Web Interface. To use the chassis SFP to monitor and control the chassis, and to develop programs to control the chassis, you will need to install the chassis driver software (IVI or LabVIEW) appropriate for your programming environment. To do so:

- 1 Open your PC's web browser and go to www.keysight.com/find/M9506A.
- 2 Click on  **Visit Technical Support**.
- 3 Click on the **Drivers, Firmware & Software** tab.
- 4 Click the **M9506A AXIe Chassis Drivers** button.
- 5 Ensure that you are downloading the current version of the chassis driver software, and click **Download** then download the executable file.



- 6 Double-click on the executable file and follow the steps shown in the installer to install the chassis driver software.

The *User Guide* describes how to bring up the SFP and how to get started with programming the chassis. Two SFP drivers are included with the M9506A – a Monitor SFP and a Trigger SFP.

NOTE

There are eight drivers for the M9506A chassis with ESM.

- Two Monitor IVI drivers (IVI-C and IVI.net) for monitoring the chassis temperature sensors, setting the fan speed, and utility functions
- Two Trigger IVI drivers (IVI-C and IVI.net) for triggering
- Two SFP drivers (Monitor SFP and Trigger SFP)

Ensure that you have the proper driver(s) installed on your host controller prior to programming the M9506A chassis and ESM.

Step 7: Next Steps

Now that you have completed basic chassis startup, Keysight recommends you to access and read the *Keysight M9506A User's Guide*. To do so:

- 1 Open your PC's web browser and go to www.keysight.com/find/M9506A.
- 2 Click on  **Visit Technical Support**.
- 3 From the list of documents in the *Document Library*, select the "**Keysight M9506A 5-Slot AXIe Chassis - User Guide**".

Host PC/Chassis Interface Topics

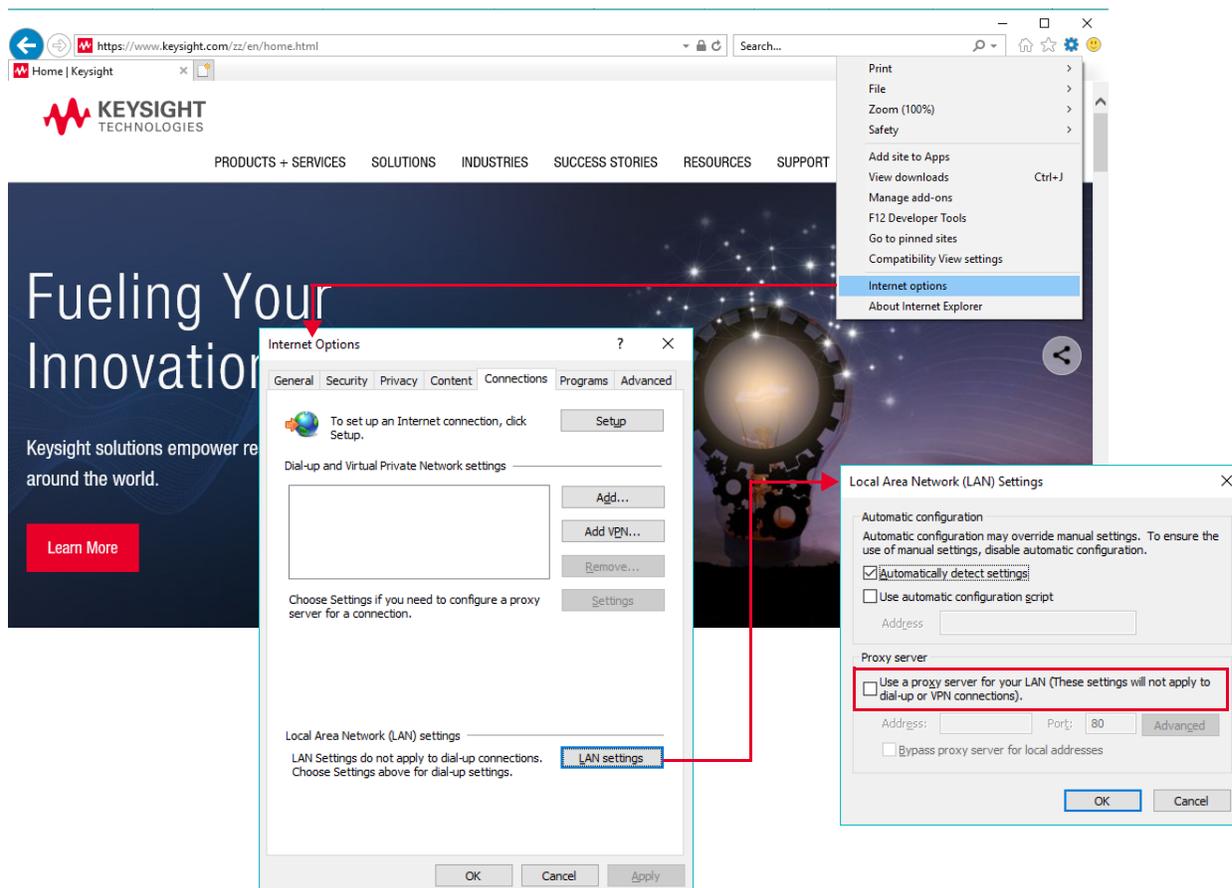
This section lists a number of host PC/chassis interface topics that may be of assistance in establishing a connection between the host PC and the chassis. Unless otherwise noted, these topics relate to interfacing to the chassis components themselves, such as the ESM, not to modules in the chassis slots.

NOTE

The LAN connection to the ESM provides communication to the chassis only -- chassis firmware updates, using the Web Interface to monitor and control the chassis, etc. It does not provide communication with individual AXIe modules. Use the PCIe connection to control individual AXIe modules.

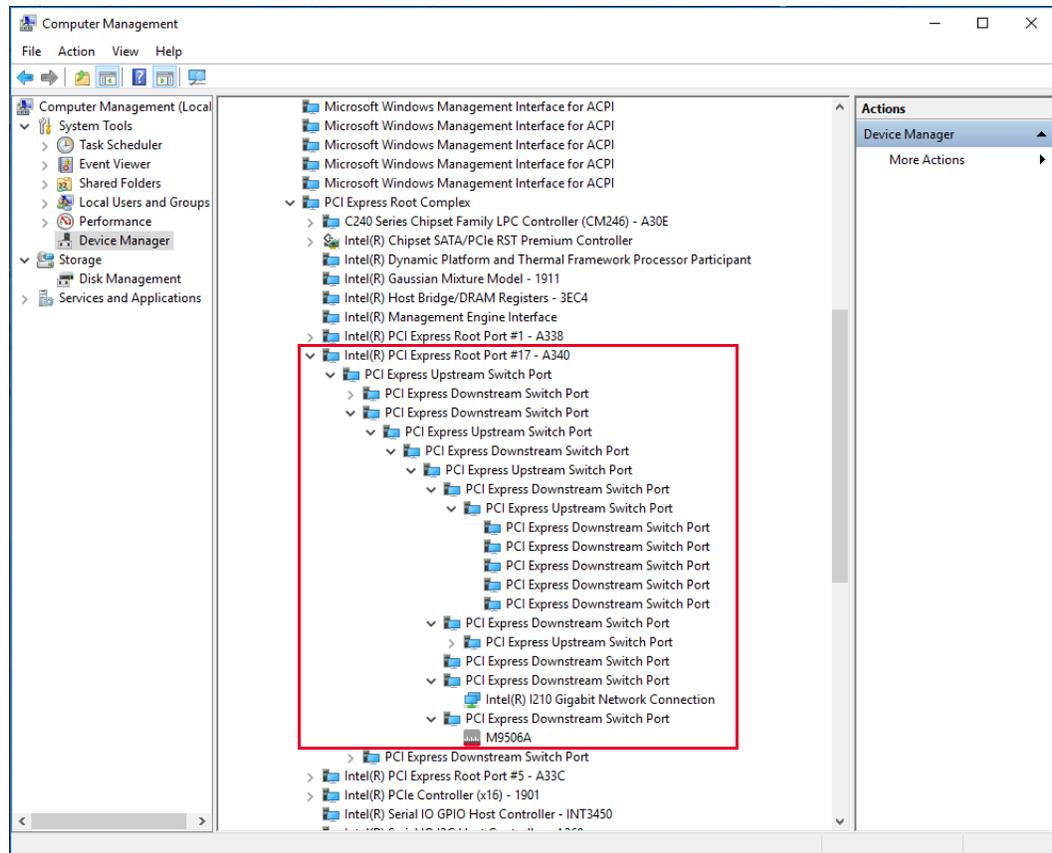
- 1** Chassis communications over PCIe uses the TCP/IP network protocol because the chassis PCIe endpoint is an Intel I210 NIC. Therefore, when accessed over PCIe, the AXIe chassis appears as a LAN device in Keysight Connection Expert. When accessed over LAN, the AXIe chassis will, as expected, also appear as a LAN device in Keysight Connection Expert.
- 2** Modules installed in the chassis slots that use the PCIe interface will be displayed by Keysight Connection Expert under the PXIO label, not under the LAN label.
- 3** For a PCIe or Thunderbolt 3 connection to the chassis, a private IP address beginning with 169.254 will be assigned. If a direct LAN connection is made from the host PC to the chassis, a private IP address beginning with 169.254 will likewise be assigned.
- 4** The LAN port is used for controlling and monitoring the chassis (i.e., monitoring chassis temperatures, monitoring/setting chassis fan speeds, and setting chassis routing). It is not intended for controlling AXIe modules. The PCIe port is provided for module data transfer and control.

- 5 If you have established a direct LAN connection to the chassis (establishing, for example, a private IP address of 169.254.1.0) and if your browser is configured to use a proxy server, your browser may not be able to display the chassis Web Interface. The example figure below shows how to bring up the **LAN Settings** dialog that is used to configure proxy server settings.



- 6 PCIe is logically an extension of the host PC backplane. If the PCIe interface is used to connect to the chassis, the chassis Intel I210 NIC will appear to Windows as if it is installed directly in the PC. Windows 7 provides the necessary Intel NIC driver.

- 7 The example window below shows the Device Manager view of the PCI bus for an M9506A chassis that contains one recognized PCIe module (the Keysight module), one unrecognized PCIe module (“PCI Device”), plus the Intel NIC. This window was displayed by selecting **Devices by connection** under the Device Manager **View** drop down menu. This information can be useful in both verifying connection to the chassis (the Intel NIC) and verifying connection to the modules installed in the chassis.



- 8 If the chassis is connected only to LAN, the chassis will attempt to obtain an IP address using DHCP.
- 9 If both PCIe and LAN are connected to the chassis, the LAN VISA resource name is used to connect to the chassis.
- 10 Do not attach a LAN cable after communications has been established over the PCIe cable. Doing this will disrupt PCIe communications, and will not provide LAN communications – the chassis will become inaccessible and rebooting of the PC will be required to restore communications.

If you need both LAN and PCIe communications, connect *both* cables prior to powering-up the chassis.

- 11 If you have connected to the chassis using PCIe and/or LAN, and want to visually confirm that you are, in fact, interfacing to the chassis that you believe you are interfacing to, you can click the **Turn on Front Panel Identification Indicator** link on the Web Interface home page as highlighted below. This will flash the STATUS LED on the ESM power switch on the chassis you are interfacing to.

Connected to AXIe M9506A chassis at IP address 141.183.189.149

Turn On Front Panel Identification Indicator

Description

Model number	M9506A
Manufacturer	Keysight Technologies
Serial number	TW51160201
Firmware revision	F6AX-1.0.22-0008-A000b-B060b-C05-UpdateFW
Description	M9506A AXIe 5 Slot Chassis
Host ID	PCSERNO,LK42477582
License Option	Full Range

▲ Less Information

LAN details

DNS hostname	K-M9506A-160201
NetBIOS name	Keysight-E8708A
mDNS hostname	K-M9506A-160201.local
IPv4 address	141.183.189.149
IPv6 addresses	[fe80::ad9c:af4b:1d31:250d]
IPv6-enabled protocols	HiSLIP, Socket
Ethernet (MAC) address	00:18:49:04:70:3C
Auto-MDIX capable	Yes

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Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your Keysight customer engineer through your local Keysight Technologies Service Center.

Keysight on the Web

You can find information about technical and professional services, product support, and equipment repair and service on the Web: www.keysight.com. Select your country from the drop-down menu at the top. Under **Electronic Test and Measurement**, click on **Services**. The Web page that appears next has contact information specific for your country.

Keysight by Phone

If you do not have access to the Internet, call one of the numbers in the table below:

Keysight Call Centers and Regional Headquarters	
United States and Canada:	(800) 452 4844 (toll-free in US)
Europe:	(41 22) 780 8111
Japan:	Measurement Assistance Center (81) 0426 56 7832
Latin America:	305 269 7548
Asia-Pacific:	(85 22) 599 7777

Product Warranty

To find warranty information on your M9506A AXIe chassis, go to www.keysight.com/find/warranty and enter your model number in the **Product Number** field, and enter the serial number from the chassis rear panel in the **Serial No.** field.

If You Should Need to Return the Chassis for Service

Should you need to return the chassis for service, follow these steps:

- 1** Review the warranty information for your product.
- 2** Contact Keysight to obtain a Return Material Authorization (RMA) and return address. If you need assistance finding Keysight 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: [PC Tested Configurations with PXIe/AXIe Chassis - Technical Overview](#).
- 3** Write the following information on a tag and attach it to the malfunctioning equipment.
 - Name and return address of owner. A Post Office box is not acceptable as a return address.
 - Product model number (for example, **M9506A**)
 - Product serial number (for example, **TWxxxxxxx**). The serial number label is located on the chassis back panel. The serial number can also be read via LAN interface, but only after the software is installed.
 - *Completely describe the failure and service required.* Provide as much detail as possible about your chassis and host PC configuration, the nature of the problem and the conditions under which it occurred.
- 4** Carefully pack the chassis 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 serial number and model number.



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