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Agilent Technologies 2-Slot and 5-Slot AXIe Chassis

M9502A, M9505A

User Guide

Agilent Technologies

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Safety Information

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. Agilent 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 instrument's external markings described under “Safety Symbols”.

Ground the Instrument

Agilent 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 Agilent module/chassis in the presence of flammable gases or fumes.

Do Not Operate Near Flammable Liquids

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

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.

Cleaning

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

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 an Agilent 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 an Agilent 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.

Cautions

Do NOT block vents and fan exhaust: To ensure adequate cooling and ventilation, leave a gap of at least 50mm (2") around vent holes and particularly around the sides of the chassis. For benchtop use, provide adequate area ventilation to dissipate chassis exhaust heat.

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

Do NOT stack free-standing chassis: For benchtop use, do not stack chassis. Stacked chassis should be rackmounted. Exception—the bumpers, if installed on both chassis, are designed to safely stack one M9502A atop an M9502A or M9505A.

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.

CAUTION

A CAUTION notice 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 notice 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.

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Safety Symbols

Products display the following symbols:



Refer to manual for additional safety information.



Earth Ground.



Chassis Ground.



Alternating Current (AC).



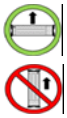
Direct Current (DC).



Standby Power. Unit is not completely disconnected from AC mains when power switch is in standby position



Indicates that antistatic precautions should be taken.



Operate the 2-slot and 5-slot AXIe chassis in the horizontal orientation. Do NOT operate either chassis in the vertical orientation. Feet on the supplied bumpers are for resting the chassis in transport or in storage—not for operation.



The CSA mark is a registered trademark of the Canadian Standards Association and indicates compliance to the standards laid out by them. Refer to the product Declaration of Conformity for details.



Notice for European Community: This product complies with the relevant European legal Directives: EMC Directive (2004/108/EC) and Low Voltage Directive (2006/95/EC).

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This is the symbol for an Industrial, Scientific, and Medical Group 1 Class A product.



The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. 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.

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

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

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

Do not dispose in domestic household waste.

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



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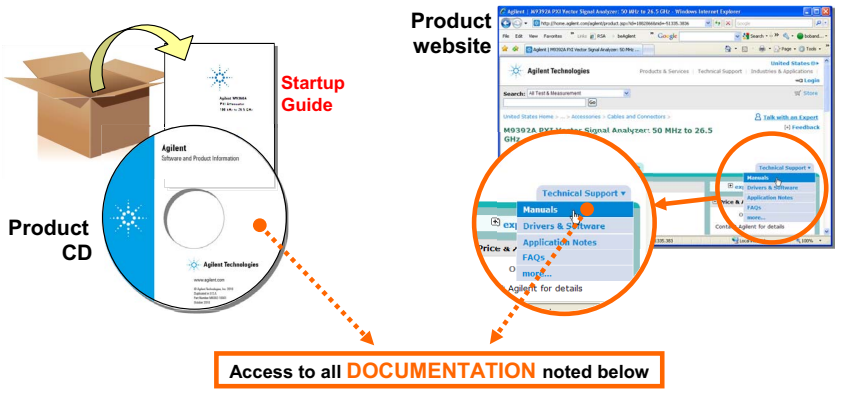
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Documentation Map



Startup Guide



- Unpack product
- Verify shipment
- Connect hardware
- Install software
- Verify operation

Data Sheet



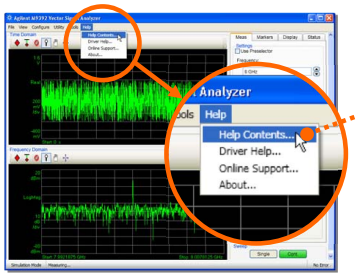
- Product description
- Technical specifications

User's Guide

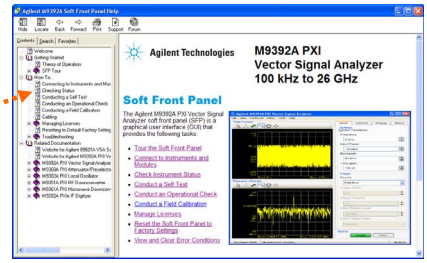


- Complete Installation
- Detailed chassis configuration and operating instructions
- Module developer's kit
- Troubleshooting and service instructions

Chassis Web user interface (Web UI)

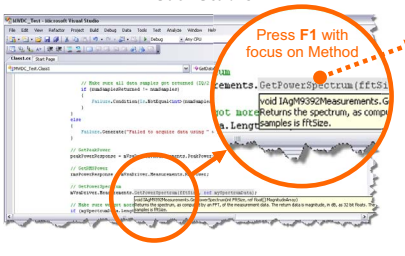


Web UI help system



- Configuration
- Self test
- Error reports

Visual Studio

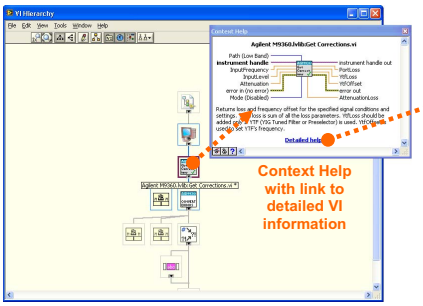


IVI Driver help system

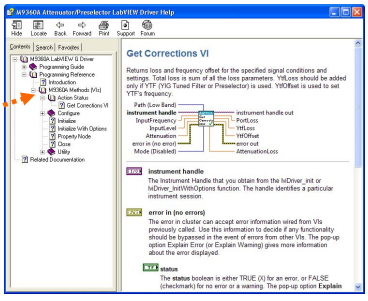


- IVI-COM and IVI-C driver programmer's reference

LabVIEW



LabVIEW Driver help system



- LabVIEW driver programmer's reference

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1 Introduction

This chapter provides a brief introduction to the AXIe chassis.

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NOTE

This version of the M9505A/M9502A User Guide supports and describes features of the chassis firmware revision 1.3.23 (and later). This version of firmware adds features that were not available in previous firmware versions. These features include, but are not limited to the following:

- Support for E-Keying (see "Module Configuration Page" on page 43)
- Fan speed adjustable from 35 to 100 (previously it was 8 to 15) (see "Chassis Health Page" on page 48 and the notes concerning "Configure Fan Control" on page 49)
- Ability to force the ESM to PCIe Gen 1 speeds (see "Embedded System Module (ESM)" on page 110)

To identify the chassis firmware revision, see "Home Page" on page 40

To update chassis firmware, IVI driver (including Soft Front Panel), and LabVIEW driver, and get the most up-to-date documentation, refer to the Agilent AXIe chassis web pages:

www.agilent.com/find/M9502A or www.agilent.com/find/M9505A

To update IO Libraries Suite, go to: www.agilent.com/find/iosuite

Always use the latest version of chassis firmware, IVI and LabVIEW drivers, and IO Libraries Suite to get the best performance and latest features.

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AXIe Chassis Description

The Agilent M9502A (2-slot) and M9505A (5-slot) AXIe chassis are modular instrument chassis fully compatible with the AXIe 1.0 specification. They allow multiple application-specific instrument modules to share a common chassis frame, power supply, cooling system, PCI Express (PCIe) Gen 2 data bus, Gigabit LAN hub, local bus for module-to-module signaling, and host PC connections. Multiple chassis may be interconnected for scalability, a feature Agilent calls MultiFrame.

The full rack chassis provides (two or five) general purpose peripheral slots that accept 1U AXIe instrument modules.

Each module slot is supplied with a Gen 2 x4 link (maximum of 2 GB/s data rate per module) to the chassis primary data 'fabric' hub—a x8 PCIe switch and data bus.

Both chassis include a half-height Embedded System Module (ESM) which manages chassis functions. The ESM provides all ATCA shelf manager functions, plus these AXIe extensions:

- provides host PC connectivity (Gen 2 PCIe x8 and/or Ethernet)
- sources timing signals (CLK100, SYNC and FCLK)
- routes STRIG (Star Trigger) to instruments through the backplane
- routes trigger signals through an external parallel trigger bus
- provides backplane PCIe and Ethernet communication between modules

Other than a Power button and instrument status light, all monitoring, control and communication with the chassis requires a *host PC*. This can be an *embedded* controller such as the Agilent M9536A (a Windows®-based PC specifically designed for use in an AXIe chassis) or *remote* (a rackmount, desktop, or laptop PC).

The shared Gen 2 x8 PCIe interface from the ESM to an external host PC provides up to a 4 GB/s data rate shared among installed modules.

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. Agilent 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.agilent.com/find/axie-chassis.

For general host PC requirements, such as operating system and RAM requirements, please refer to the *M9502A/M9505A AXIe Chassis Startup Guide*.

For the ESM and for each other installed module, appropriate control software and instrument drivers must be installed on the host PC.

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The *M9502A/M9505A AXIe Chassis Startup Guide* provides just the basics to get you started with your AXIe chassis. Provided in print with each new chassis, it can also be viewed in PDF form on the *Software and Product Information CD*. The Startup Guide includes:

- A high-level overview of the 2-slot and 5-slot AXIe chassis and basic nomenclature
- Unpacking the contents and planning your installation
- Connecting to a host PC
- Loading chassis software
- Verifying basic chassis operation

This *User Guide* includes detailed instructions for chassis configuration, operation and service. Chapters include:

- Chapter 1: Introduction
- Chapter 2: Installation
  - Installing Modules
  - Mounting the Chassis
  - Setting Up a Host PC
- Chapter 3: Navigating the Web Interface
- Chapter 4: Using the Soft Front Panel
- Chapter 5: Features and Functions
  - Chassis Topology
  - Shelf Management Functions
  - PCIe and LAN Data Transfer
  - Instrument Synchronization and Triggering
  - MultiFrame Signaling
  - LVDS Local Bus
- Chapter 6: For Module Developers
  - ATCA and AXIe Requirements
  - Module and Backplane Connectors and Pin Assignments
- Chapter 7: Troubleshooting and Service
  - Updating Firmware
  - Troubleshooting
  - Parts Replacement

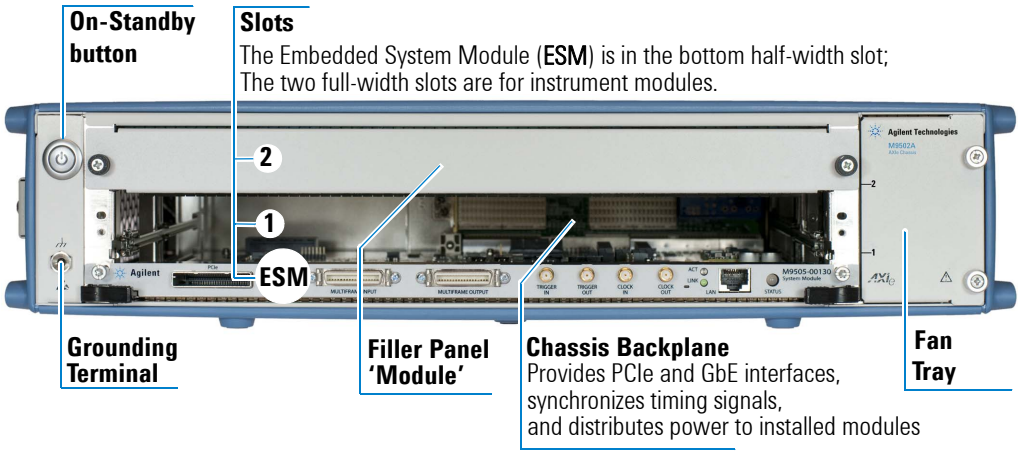
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M9502A 2-Slot AXIe Chassis at a Glance

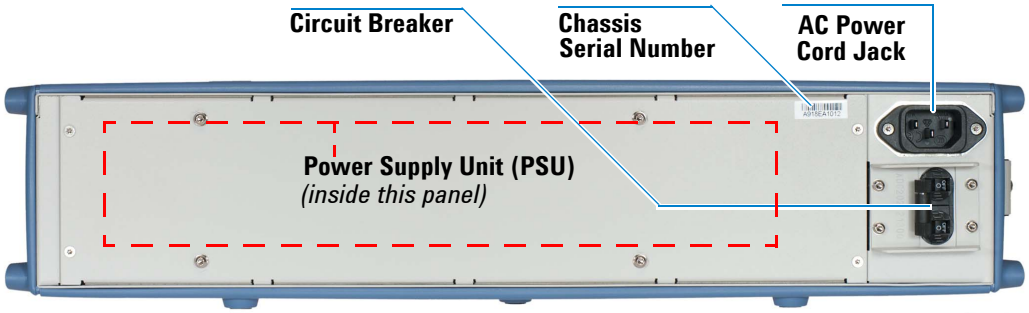
Designed for portable or small system testing, the M9502A is shipped with bumpers and a carry handle installed for benchtop use (these remove for rack mounting), Slot 1 open and a filler panel module installed in Slot 2.

Main components on the 2-slot chassis are shown below:

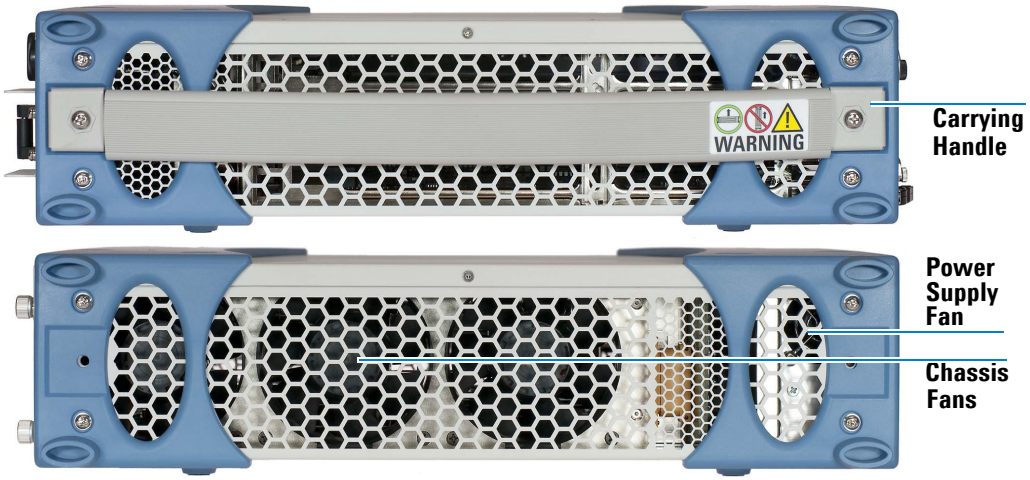
Front Panel



Rear Panel



Side Views

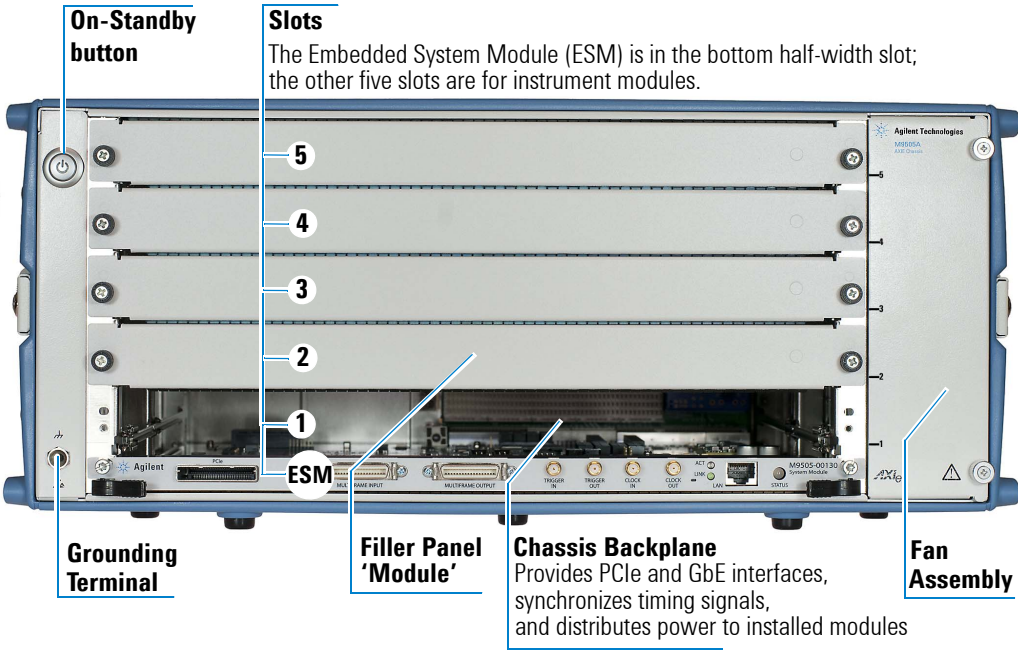


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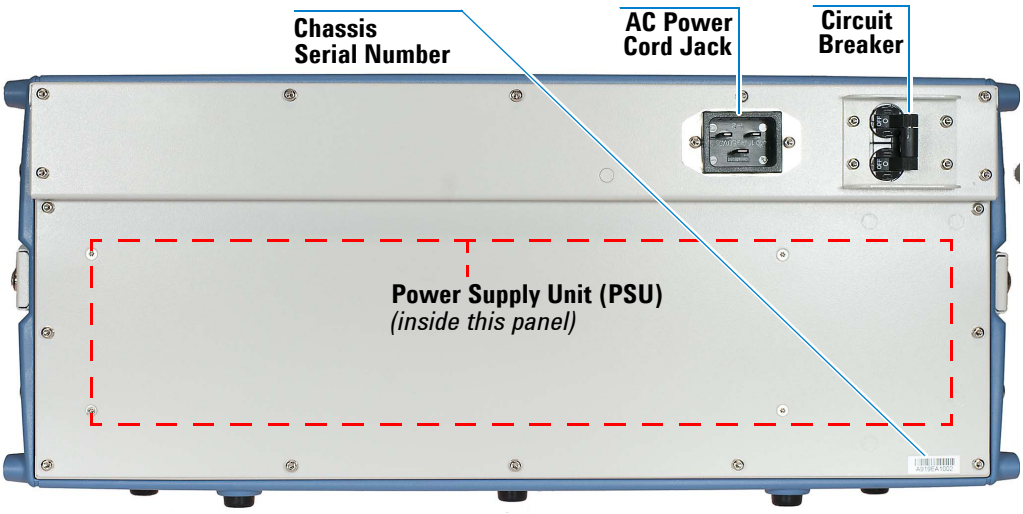
M9505A 5-Slot AXIe Chassis at a Glance

The M9505A is shipped with bumpers and two carry handles installed for benchtop use (these remove for rack mounting), Slot 1 open and filler panel modules installed in Slots 2 through 5.

Main components on the 5-slot chassis are shown below:

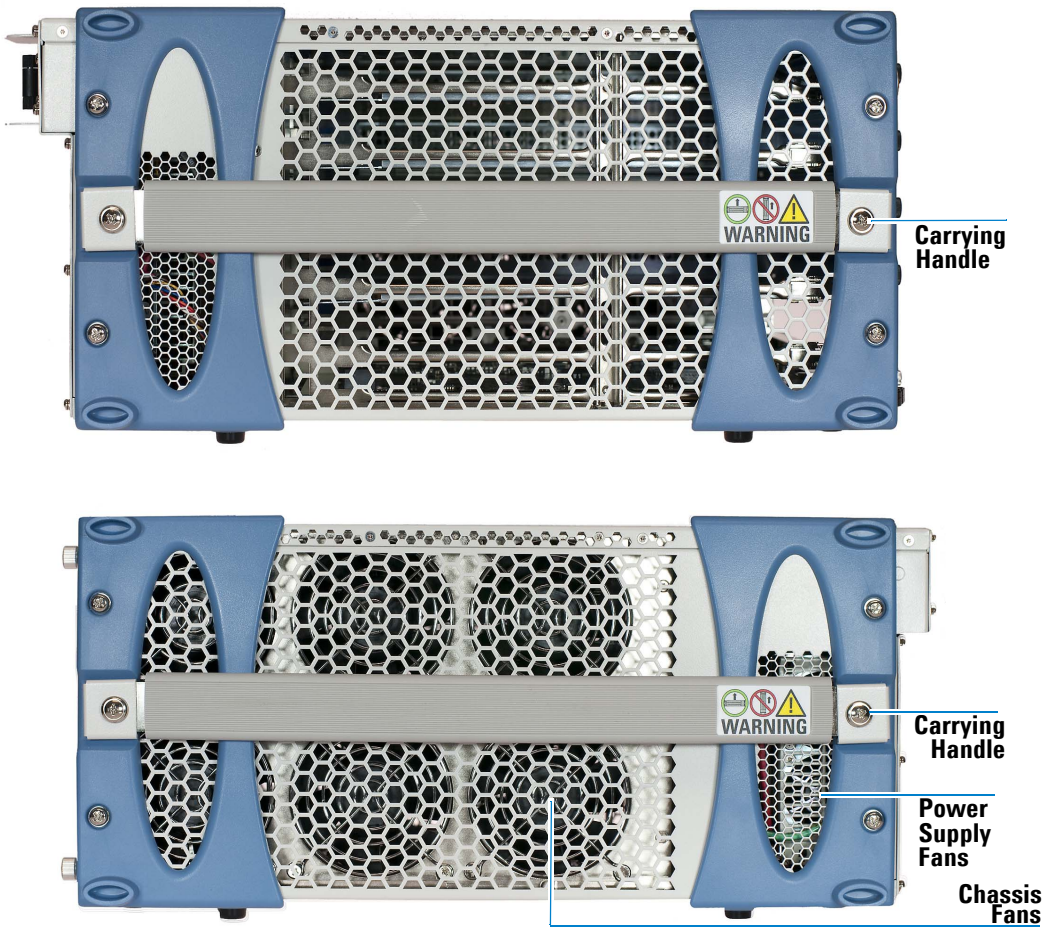


Rear Panel



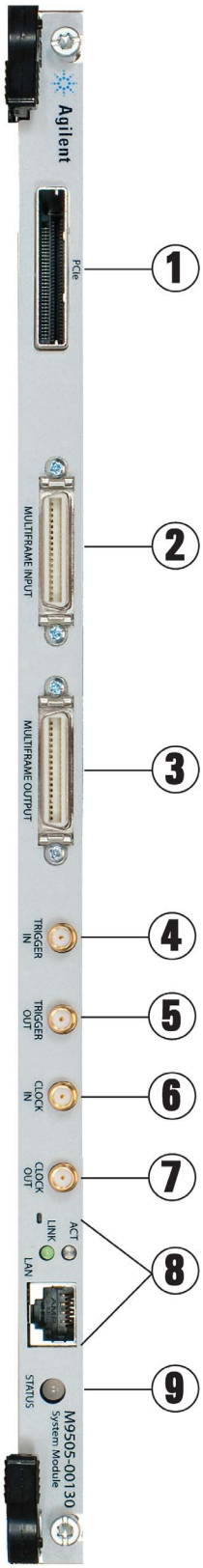
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Side Views



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AXIe Embedded System Module (ESM)



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 packets along the backplane
- connects an external host PC to the chassis
- synchronizes timing across all modules through the Agilent Trigger Bus, using an internal or external clock source

ESM Front Panel

1	**PCIe**	Connects a remote host PC to the chassis via PCIe. Gen 2 compliant PCIe x8 connector.
	MULTIFRAME	Synchronizes timing signals with multiple daisy-chained chassis (either 2-slot or 5-slot). 36-pin mini D connectors use accessory Agilent cables.
2	**INPUT**	Gets timing signals from the previous chassis. If this chassis is at the head of the chain, it becomes the master, using an internal or external clock to send timing signals to other chassis in the chain.
3	**OUTPUT**	Provides timing signals to the next chassis.
	TRIGGER	External trigger connections. SMA connectors with ESD suppression.
4	**IN**	Accepts an external trigger. Adjustable threshold input, +/-5V range, 250 mV minimum swing.
5	**OUT**	Extends the parallel trigger bus to external instruments. 3.3V CMOS, 50W line drive, 3-state.
	CLOCK	External clock connections. SMA connectors with ESD suppression.
6	**IN**	Accepts an externally sourced timing input. Input range -5V to +5V, AC coupled, unterminated, 100 mV minimum swing.
7	**OUT**	Extends the internal clock source to external instruments. 3.3V CMOS, 50W line drive, 3-state.
8	**LAN**	Connects the host PC to the chassis, RJ45 connector. Tri-rate 10/100/1000 Base-T, auto crossover. Green LINK light and amber ACT light indicate power and port activity. An embedded controller module does not use this port; it communicates with the ESM through the chassis backplane.
9	**STATUS Light**	The status indicator light is a bi-color LED. Green indicates normal operation. Red indicates a power-up error. Both lights on (amber) indicates the chassis is powered on and booting.

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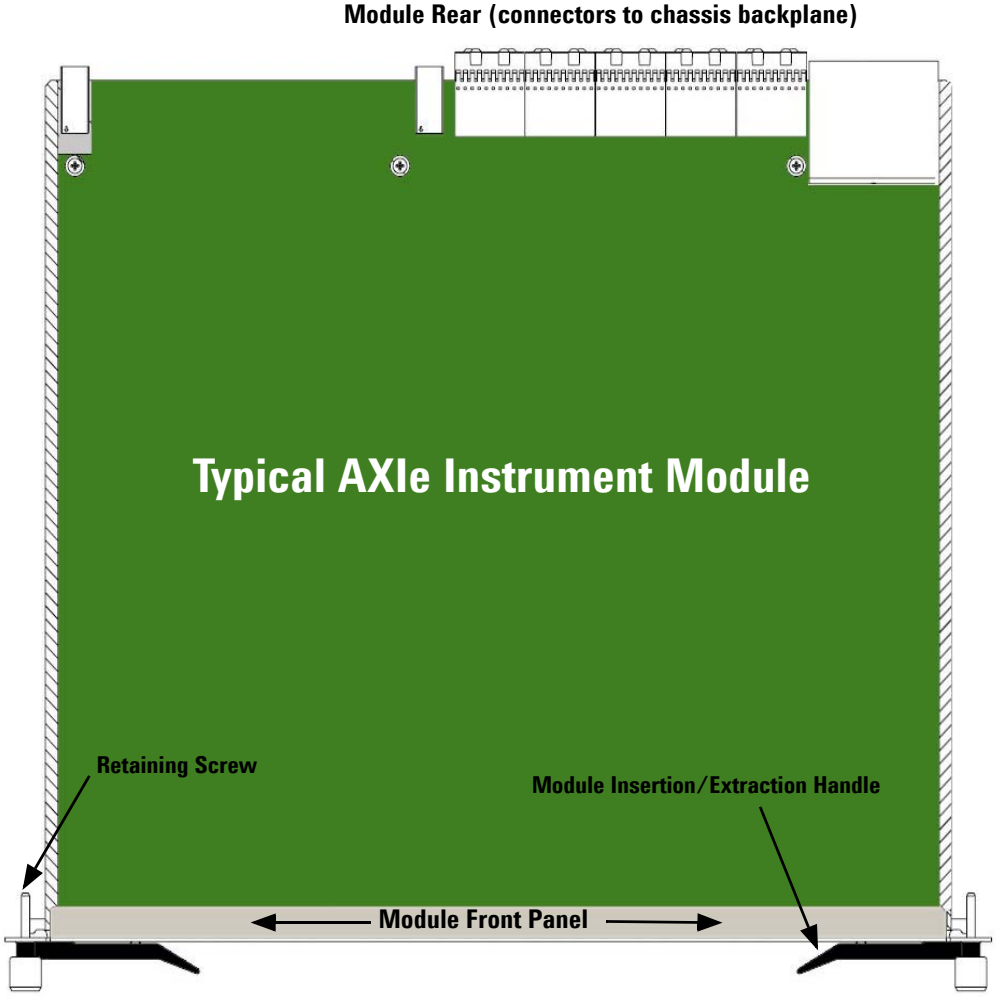
AXIe Instrument Modules

The chassis slots accept AXIe instrument modules. These may comprise one or more instruments for signal injection, data acquisition, and measurement. Install them in any available AXIe slot.

There are two special type of instrument modules which—if used—are most typically installed in slot 1 (consult the module vendor for specific slot placement requirements).

- An instrument hub module — a specialty instrument module which also acts as a hub for a secondary vendor-defined x4 data fabric.
- *An integrated controller module*— this is a host PC with a form factor and backplane connections specifically designed for an AXIe chassis. It uses the chassis backplane for PCIe and LAN connection to the ESM.

The drawing below illustrates the AXIe 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.

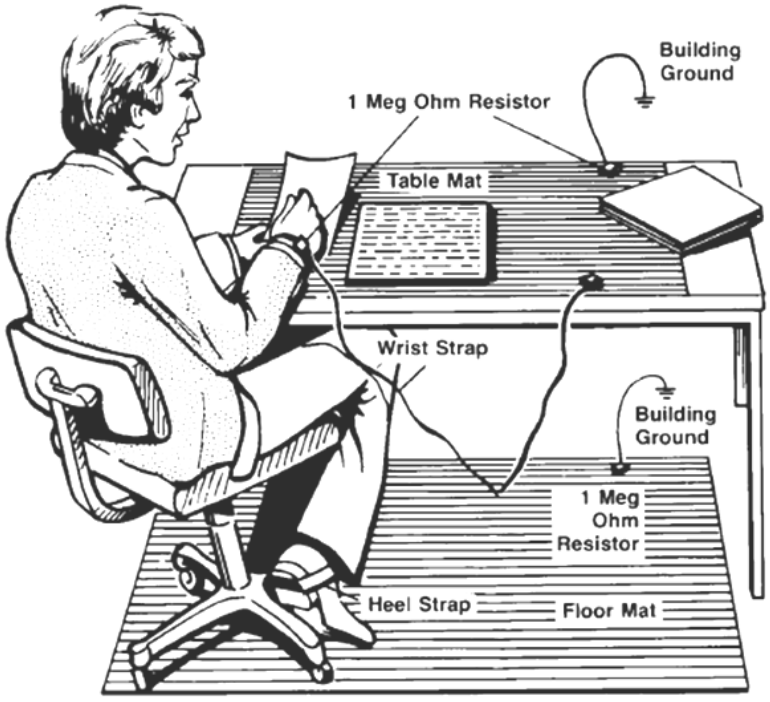
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ESD Precautions

CAUTION Agilent'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.

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 MΩ of isolation from ground.

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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)

ON/STANDBY Switch

The chassis' button on the front of the chassis is the ON/STANDBY switch, lit when the chassis is ON:



STANDBY
(off if power is disconnected or breaker is open)



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 front panel switch in the standby (not depressed) position, 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. Fans may operate.

ON With the power cord attached, circuit breaker closed, and the front panel switch in the ON (depressed) position, the chassis is ON. Power is supplied to the ESM and installed modules. Fans will operate as dictated by chassis thermal load.

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To Power Up the Chassis

Plug-In Chassis Using the supplied cord, connect the chassis to an appropriate AC power main.

Close Circuit Breaker Close the rear panel circuit breaker

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

The STATUS light on the ESM will cycle as follows:

1. Light off - with button in STANDBY mode
2. Amber, steady - after pressing switch, ESM is performing a power-on self-test (POST)
3. Green, blinking - for a few seconds after POST
4. Green, steady - successful chassis power-up is complete

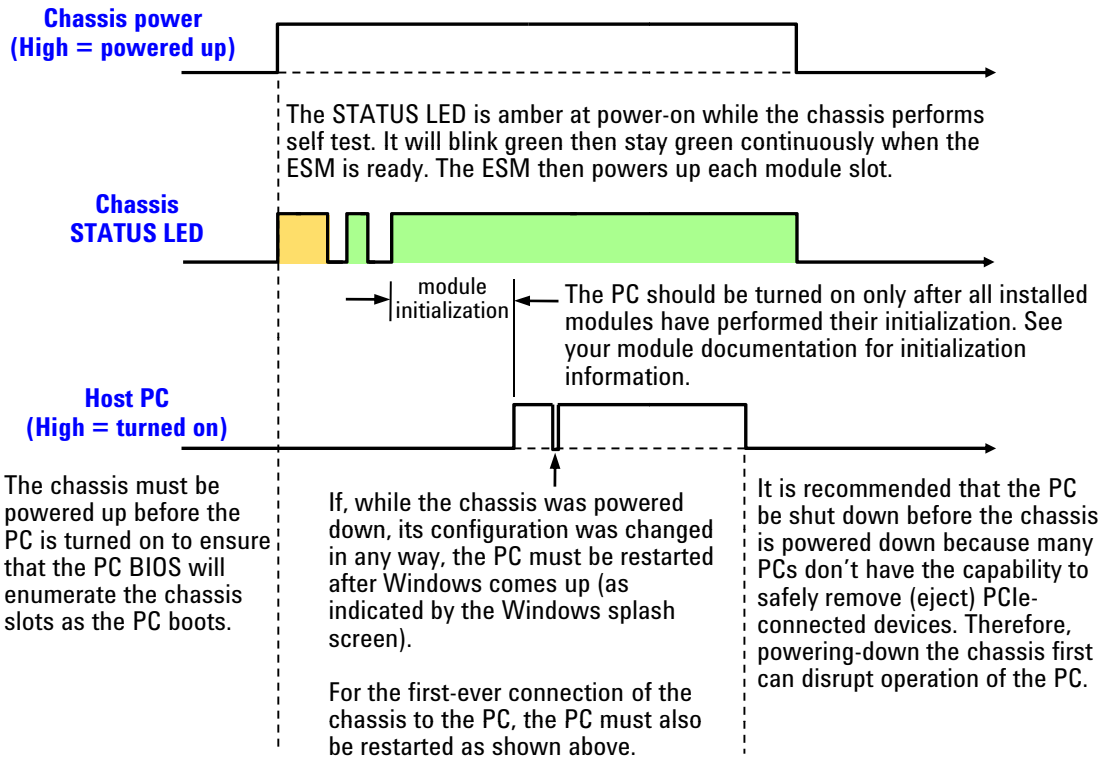
1 

2 

4 

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 amber. 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 M9536A handles this sequence automatically.

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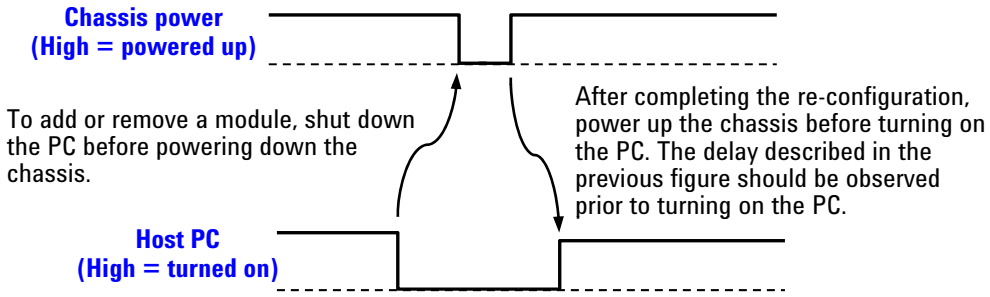
In brief, the host PC must be off whenever the chassis is powered up or down. Note the need to restart the host PC (after Windows starts) if the chassis configuration has been changed in any way while the PC was turned off.

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.

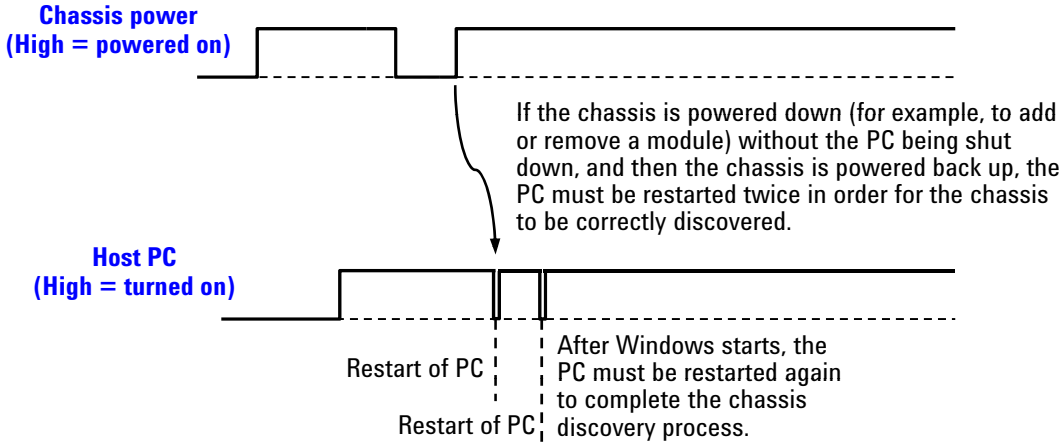
In the figure below, the previous diagram is applied to the situation where the chassis configuration is changed. Because modules are not hot-swappable, the chassis must be powered down before modules are added

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or removed. As you can see below, 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.



Although it is not advised that the chassis be powered up and down with the PC turned on, the figure below shows what is required in the situation where the chassis configuration is changed while the PC is turned on—the PC may need to be restarted (specifically with IO Libraries 16.0 and 16.1) twice after the chassis is powered up.



There are other situations where the sequence of two consecutive restarts should be performed, including:

- When Windows detects the presence of a new module
- When Agilent 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

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To Power Down the Chassis

For routine power-down or to cycle power to the chassis, press the chassis ON/STANDBY switch. The main chassis fans will gradually drop in speed to off, and the PSU fans will gradually return to idle speed as the PSU cools. This is normal.

CAUTION If you are using an embedded controller such as the Agilent M9536A, always shut down the Windows operating system before pressing the chassis ON/STANDBY switch.

Also, ensure that the embedded PC never goes into sleep or hibernate mode. It is possible for the PC to lose its chassis enumeration.

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 could 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.

Chassis Firmware, IVI Driver, and IO Libraries Matrix

The following table lists the various chassis firmware versions, IVI software versions, and IO Libraries versions shipped with the Agilent M9502 and M9505A AXIe chassis.

Approximate chassis shipment date	AXIe Chassis Firmware Version	AXIe Chassis Driver (IVI) version	IO Libraries Suite Minimum Version	IO Libraries Suite Version the chassis firmware or drivers were released with
May, 2011	1.3.8 (actually 1.3.08)*	1.1.1.1	16.0	16.0
December, 2011	1.3.23	1.1.1.1	16.0	16.1 Update 1
May, 2012	1.3.23	1.2.1.x	16.2	16.2

* Although the chassis firmware version number is listed in the chassis web Home page (see "Home Page" on page 40) as 1.3.8, it is actually 1.3.08.

Always use the latest version of chassis firmware, IVI and LabVIEW drivers, and IO Libraries Suite to get the best performance and latest features. Refer to the Note on page 1 of this manual for upgrading information.

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Safety-Related Specifications

This section provides a partial set of safety-related Specifications for the Agilent M9502A and M9505A AXIe chassis, to ensure safe startup. Complete specifications are included in the *Agilent M9502A/M9505A Data Sheet*.

Regulatory

Safety Conforms to the following:	Complies with European Low Voltage Directive 2006/95/EC - IEC/EN 61010-1, 2nd edition - Canada: CSA-C22.2 NO. 61010-1-04 USA:/UL 61010-1:2004
EMC Conforms to the following:	Complies with European EMC Directive 2004/108/EC - IEC/EN 61326-1 ICES/NMB-001 - CISPR Pub 11 Group 1, class A AS/NZS CISPR 11

Operating Conditions

Temperature	Humidity	Altitude
0°C to 50°C	Type tested at 95%, +40°C (non-condensing)	up to 3000 meters

Chassis Weight

Chassis	Weight (as shipped, no modules)	Weight (maximum, all slots filled)
M9502A	7.7 kg	15.7 kg
M9505A	13.3 kg	33.3 kg

AC Power Supply Requirements

	M9502A		M9505A (Serial Number TW51150212 and earlier)		M9505A (Serial Number TW51160201 and later)
Operating voltage range:	100-120VAC	200-240VAC	100-120VAC	200-240VAC	100-240VAC
Input frequency range:	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz
Input power consumption:	800 VA	800 VA	865 VA	1350 VA	1280VA
Overcurrent protection:	auto recovery		auto recovery		auto recovery
Efficiency (typical):	85-90%		85-93%		85-93%

Chassis Power Dissipation

Slot airflow direction	Right to left
Chassis cooling intake	Right side of chassis
Chassis cooling exhaust	Left side of chassis
Power dissipation, per instrument slot	200W maximum* see DC Power Supply table below

DC Power Supply Output

	M9502A	M9505A (Serial Number TW51150212 and earlier)	M9505A (Serial Number TW51160201 and later)
DC Output	50V	52V	52V
Total DC Power	520W	100VAC - 120VAC: 680 W 200VAC - 240VAC: 1020 W*	100-240VAC: 1020W*

* M9505A configurations that consume more than 850W (200-240V) or 400W (100-120V)total power across all 5 slots may experience occasional system reset if installed in environments prone to line voltage dropouts in excess of 20ms. In such an event, the PC controlling the chassis will require a restart of reboot. To avoid system resets due to line dropouts, use an uninterruptable power supply.

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Related Documentation

The documentation listed below can be found on the M9502-10001 *Software and Product Information* CD that came with your chassis. The CD covers both the 2-slot and 5-slot AXIe chassis, and includes.

- *M9502A/M9505A AXIe Chassis Startup Guide*

  Provided with each new chassis in print, this manual is also provided in PDF.

- *M9502A/M9505A AXIe Chassis User Guide*

  This printable PDF document. A complete guide for configuring, operating, and troubleshooting the chassis.

- Help file for the Agilent M9502A/M9505A IVI-C and IVI-COM device drivers
- The interactive help provides instruction for programming the chassis using Microsoft development environments.
- Help file for the Agilent M9502A/M9505A LabVIEW G device drivers
- The interactive help provides instruction for programming the chassis using National Instruments® Labview(TM).
- Agilent M9502A/M9505A Data Sheet.

  The Data Sheet contains complete physical and electrical specifications for the chassis.

Product specifications, available accessories, firmware and software may change over time. Please check the Agilent website at www.agilent.com/find/axie-chassis for the latest updates to the product software, Guides, Help files and Data Sheets.

Product Warranty

To find warranty information on your M9502A or M9505A AXIe chassis, go to www.agilent.com/find/warranty and enter your model number (`M9502A` or `M9505A`) in the **Product Number** field, and enter the serial number from the chassis rear panel in the **Serial No.** field.

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2 Chassis Installation

This chapter begins where the Startup Guide leaves off, and provides the detailed procedures for module installation and removal, bumper removal, rack mounting, and module software installation.

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- Basic Chassis Verification 18
- Complete Installation 18

Installing Modules 19
- To Remove a Filler Panel Module 19
- To Install a Module: 20
- To Remove a Module 23

Mounting the Chassis 25
- Environmental and Power Considerations 25
- Rackmounting the Chassis 26

Setting Up a Host PC 30
- To Install Module Soft Front Panel and Device Drivers 30

Verifying Operation with Modules Installed 30

Using the M9536A Embedded Controller LAN Ports 31

Using Multiple Chassis 36

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Planning the Installation

Basic Chassis Verification

The *M9502A/M9505A AXIe Chassis Startup Guide*, provided in print and on CD with each chassis, includes a step-by-step procedure to connect the chassis to a host PC and establish basic LAN communication with the chassis using the built-in Web Interface. Agilent recommends you follow the Steps in the *Startup Guide* before proceeding. You may also obtain the latest *Startup Guide* at www.agilent.com/find/axie-chassis.

To verify basic chassis operation, it is not mandatory to install modules, mount the chassis, or interconnect to other chassis.

Complete Installation

After basic chassis operation is verified, you can complete the installation:

Install Modules Install the instrument modules in the chassis (see page 19). If you'll be rackmounting the chassis, it is easiest to remove the bumpers (see page 26) before installing modules.

Mount the Chassis If required, rackmount the chassis using an available hardware kit. You will need to remove the bumpers before rackmounting the chassis. See page 25 for instructions; this section also provides considerations for benchtop use.

Make MultiFrame Connections You may interconnect two or more AXIe chassis to share data bus, sync and trigger lines. For configuration examples, see page 83.

Once Chassis Are In Place:

Set Up a Host PC Reconnect the chassis to the host PC (complete instructions are in the *Startup Guide*).

Install Software You should have already installed the chassis device drivers and Agilent IO Libraries Suite on your host PC. You should now install any device drivers or Soft Front Panel software required for your installed modules. See page 30.

Verify Operation Verify that the chassis powers up correctly and that Agilent Connection Expert recognizes the chassis configuration and installed modules (see page 30).

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Installing Modules

The AXIe chassis accept modules conforming to the single slot, 1U AXIe standard. These may include:

- AXIe instrument or instrument hub* modules
- AXIe embedded controller* module
- AXIe filler panel modules

* If used, a hub or controller module must be installed in slot 1

The insertion and removal procedures are the same for the 2-slot and 5-slot chassis, and for all module types except filler panels.

CAUTION

Static Electricity—The components and connectors on modules are sensitive to static electricity. To minimize electrostatic damage, take the necessary anti-static precautions. Both chassis provide a grounding terminal, to which you can connect a wrist strap. To locate this terminal, see "M9502A 2-Slot AXIe Chassis at a Glance" on page 4 and "M9505A 5-Slot AXIe Chassis at a Glance" on page 5.

Empty Slots—Except for performing initial chassis verification or troubleshooting, do not operate the chassis with empty slots. Always insert a filler panel module or instrument module into empty slots. This is especially important for the slots on either side of an instrument module. This allows proper air flow and cooling, and provides EMI shielding for the chassis and installed components. Leaving slots empty can increase fan speed, raise ambient noise, overheat components, and shut down modules.

ESM—The Embedded System Manager is integral to the operation of the chassis. Except for troubleshooting purposes, do not remove the ESM.

Hot Swap—AXIe does not explicitly support hot swap for instrument modules. Agilent recommends fully powering down the chassis before installing or removing modules

Embedded Controller Module—Manually initiate a graceful shutdown of the controller operating system and power off the chassis before removing the module.

The chassis is shipped with filler panel modules in all but Slot 1; you may need to remove filler panels from covered slots.

To Remove a Filler Panel Module

1 Power down and unplug the AXIe chassis.

2 Fully loosen the captive retaining screws on both sides of the filler panel.

CAUTION

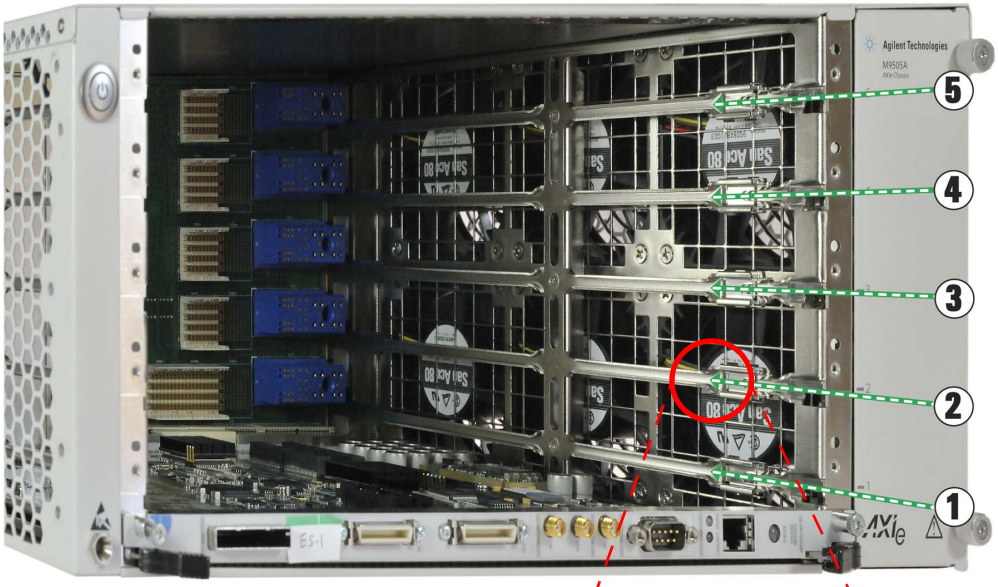
Ensure you fully loosened the captive module retaining screws before trying to extract any module. If you attempt to pull the module out by the screws (for filler panels) or by using the extraction handles (other modules) with these screws still engaged, damage to the chassis or module could result.

3 Grasp the panel by the two retaining screws, and slide it out of the chassis.

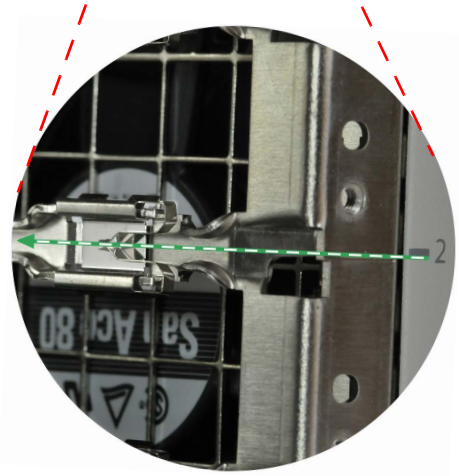
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To Install a Module:

1. Power down and unplug the AXIe chassis (see "To Power Down the Chassis" on page 14).
2. Plan slot usage. If you are using an embedded controller module, it must be in Slot 1. If there are modules that will be removed often, insert them into the topmost slots.
3. Locate the (left and right) guide rails for each slot. The example below shows the right side guide rails in the M9505A with all slots empty; typically one or more will be covered. The rails on the M9502A are identical, just fewer.



Spring guides center the module's PCB at the entry of the guide rail



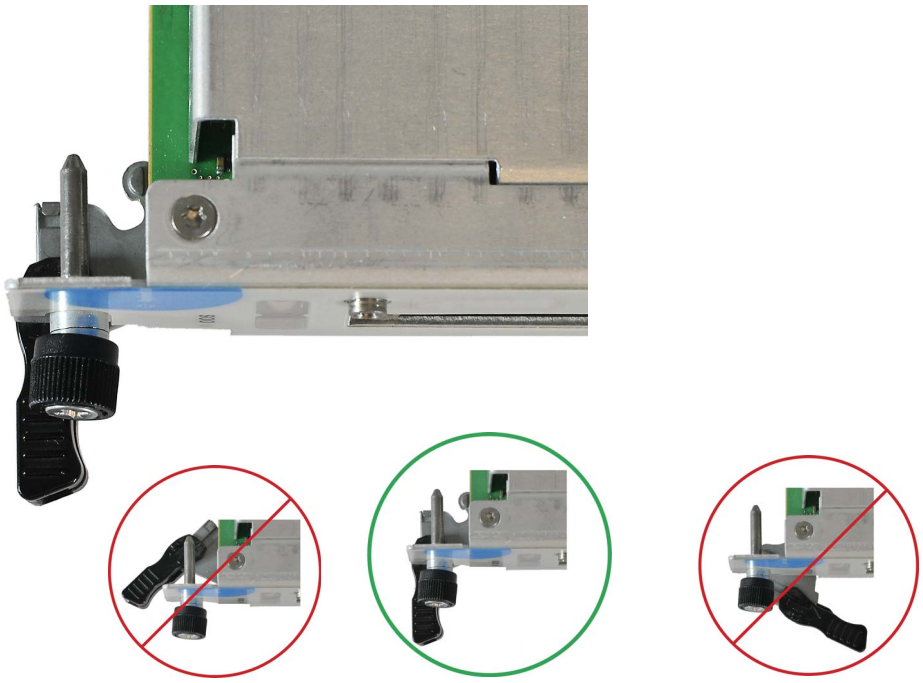
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The illustrations below show the M9502A, but apply to both chassis.

4 Align the module's circuit board with the guide rails on both ends of the chassis. If the blade has metal plates covering the board, be sure to insert the circuit board and not the metal plates into the rails. Slide the board gently into the two rails. If the fit is tight, slide the board back out and recheck alignment.



5 Locate the insertion/extraction handles at each side of the module's front panel. Extend the ends of both handles, by pulling them inwards towards each other; the plastic handle end slides about 1 cm on the metal handle shaft. Then fully open the handles by pivoting them out towards you until they are perpendicular to the front panel. The left handle is shown below, from the top view, correctly extended.



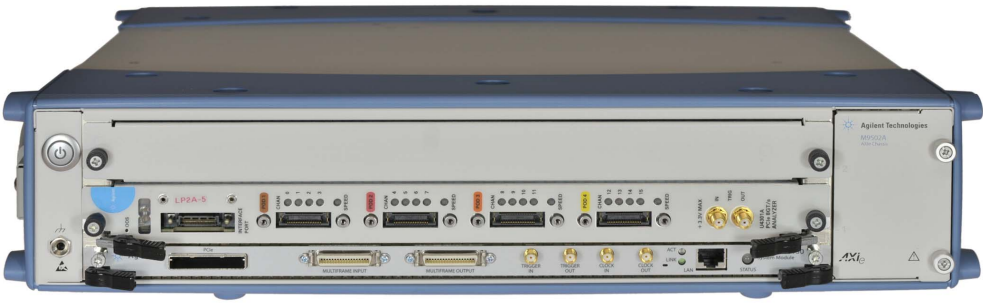
If either handle is misaligned, you will not be able to properly install the module.

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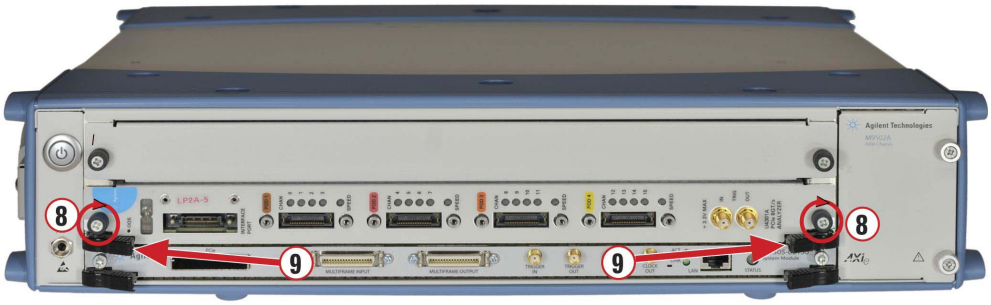
6 Slide the module completely into the chassis. When the module's backplane connectors contact the chassis backplane, you will feel resistance and the two handles will begin to close toward each other. The module's faceplate will be about 1 cm from the chassis front panel.



7 Continue nudging the module faceplate gently but firmly with your thumbs, until the handles are pressed up against the chassis and the module's front panel lies flush with the chassis' front panel. This seats the module firmly in the chassis backplane. If necessary, gently press inward (toward the chassis) on the handles to ensure full insertion.



8 Tighten the captive retaining screws at both sides of the module.



CAUTION Modules are grounded through the chassis. Tighten the module retaining screws to ensure a proper ground connection.

9 Retract the handle ends by sliding them outward on their metal shafts, away from each other, toward the chassis edge; this secures them out of the way of test connections.

10 Repeat steps 4 through 9 for additional modules, as needed. Ensure that each slot has an instrument or filler panel module installed.

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11 Plug in and power up the AXIe chassis. Verify that the chassis fans are operating and free of obstructions that may restrict airflow.

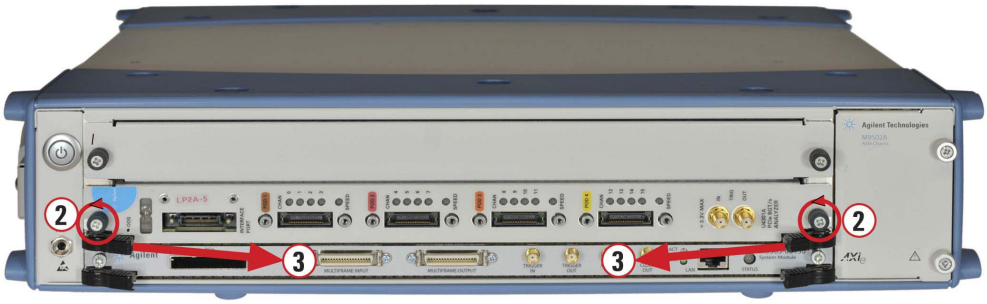
To Remove a Module

The instructions below apply to all module types. The Embedded System Module (ESM) has the same extraction handles and retaining screws as instrument modules. If you should ever have to remove the ESM, follow the instructions for instrument modules below.

1 Power down and unplug the AXIe chassis (see page 14).

2 Fully loosen the captive retaining screws on both sides of the module.

CAUTION Ensure you fully loosened the captive module retaining screws before trying to extract any module. If you attempt to pull the module out by the screws (for filler panels) or by using the extraction handles (other modules) with these screws still engaged, damage to the chassis or module could result.



3 For a filler panel module, grasp the panel by the two captive retaining screws, and slide it out of the chassis.

For all other modules, locate the insertion/extraction handles at each side of the module's front panel. Extend the plastic ends of both handles by sliding them outward on their metal handle shafts, inwards towards each other.

4 Open the handles by pivoting them out towards you, away from the chassis. This is easiest to do with thumb and forefinger of both hands simultaneously. Place each thumb at the inside of the handle, forefinger outside the handle, and rotate the handles with your thumbs. When the handles are perpendicular with the chassis, stop. The module should now

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be unseated the module from the chassis backplane and its faceplate from the chassis front panel.



Grasp the levers to slide the module out of the chassis.

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Mounting the Chassis

Environmental and Power Considerations

Consider your anticipated chassis weight (with modules installed), power and ventilation requirements, benchtop use and rackmounting options to ensure safety and optimize access to test and control instrumentation.

Weight The 2-slot chassis weighs 7.7 kg (17 lbs), including ESM but with no other modules installed. With two instrument modules, it can weigh 15.7 kg (35 lbs).

The 5-slot chassis weighs 13.3 kg (29 lbs) with ESM, and can weigh 33.3 kg (73 lbs) fully loaded. It is typically used rackmounted, but can also be used on the bench, with proper support and ventilation.

AC Input The chassis will operate on 100-120VAC or 200-240VAC, with input frequency from 50-60 Hz. Maximum input power consumption is 800 VA for the M9502A, 1350 VA for the M9505A.

.

WARNING **Avoid overloading an electrical circuit. Ensure your power supply matches the AC Input requirements listed above.**

In case you need to power down the chassis in an emergency, make sure that you have clear and quick access to the primary disconnect. If the chassis is rackmounted, this primary disconnect can be a power system on the rack or the circuit breaker on the chassis.

Ventilation The chassis is designed to dissipate 200W per instrument slot. Depending on load, the chassis and power supply fans may exhaust significant heat. Whether used on the benchtop or rackmounted, operate in a well ventilated environment and allow 2” (5 cm) clearance around both sides of the chassis.

CAUTION Do not block the vent holes on the chassis. This overheats and damages components. Leave a gap of at least 2” (50mm) around all vent holes and fan exhaust areas.

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Rackmounting the Chassis

An optional rack mount kit is available from Agilent for each chassis. The kits include mounting instructions.

Description of Parts Kit	Agilent Part Number
2-Slot Chassis Rackmount Kit	Y1225A
5-Slot Chassis Rackmount Kit	Y1226A

Installed Carry Handles and Bumpers

Both the 2-slot and 5-slot chassis are shipped with carry handles and bumpers installed for portability and desktop use. For rackmounting, the carry handles and bumpers must first be removed. Tool needed:

- #2 Phillips driver for M9502A
- #1 and #2 Phillips drivers for M9505A

CAUTION If you have been using the chassis with modules and bumpers installed, you should remove all modules (including the ESM) before removing the bumpers. This will make handling the chassis easier and reduce chances of damaging modules. See "To Remove a Module" on page 23.

To Remove the Carry Handle and Bumpers from the M9502A

1 The 2-slot chassis has a single carry handle, which must be removed before the plastic bumpers. Remove the two #2 Phillips round head screws securing the handle.



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2 Remove the two #2 Phillips round head screws from each side of both bumpers (8 screws total)

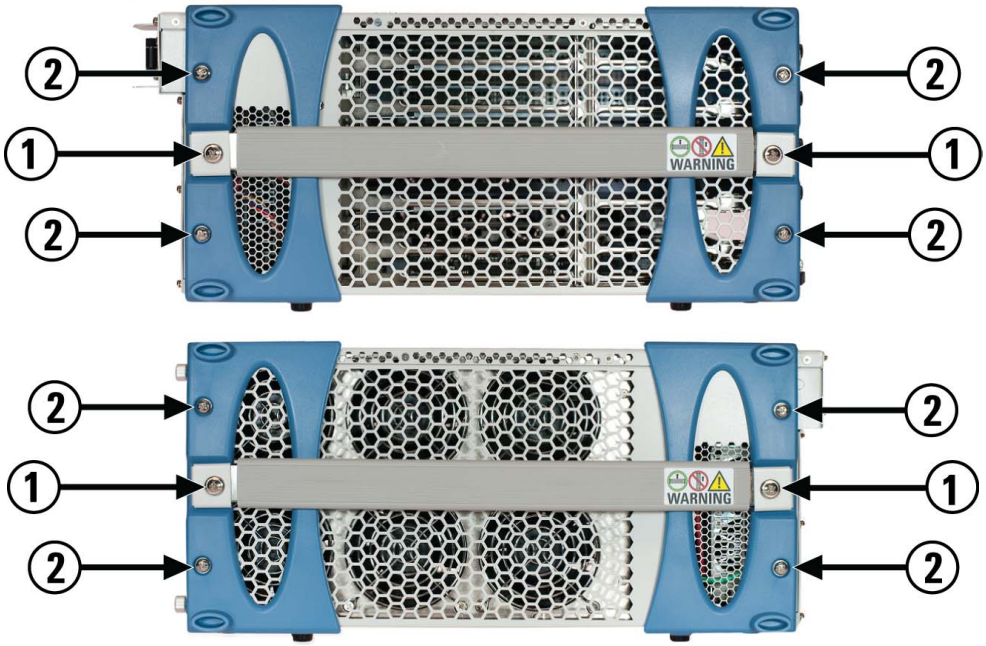


3 Prise the bumpers off the chassis.

To Remove the Carry Handles and Bumpers from the M9505A

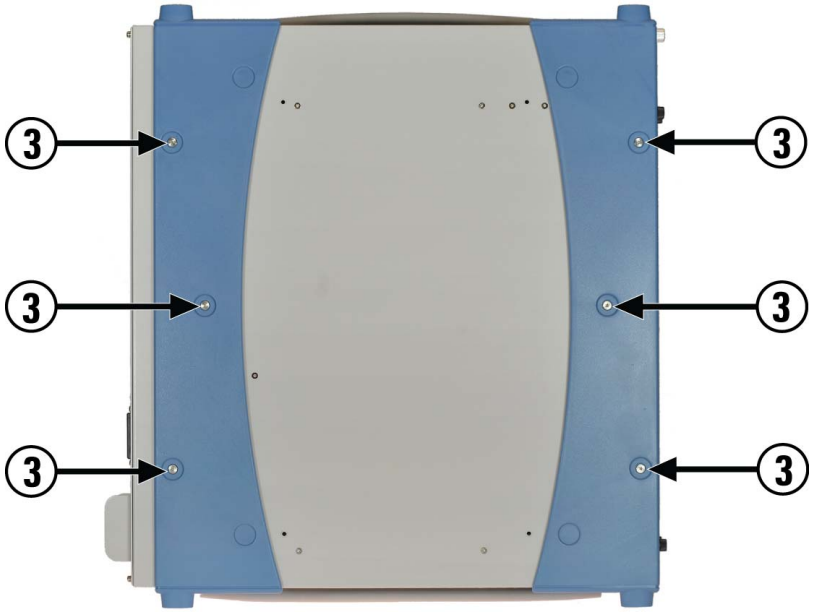
1 The 5-slot chassis has two carry handles, which must be removed before the plastic bumpers. Remove the two #2 Phillips round head screws securing each handle.

2 Remove the two #2 Phillips round head screws from each side of both bumpers (8 screws total)



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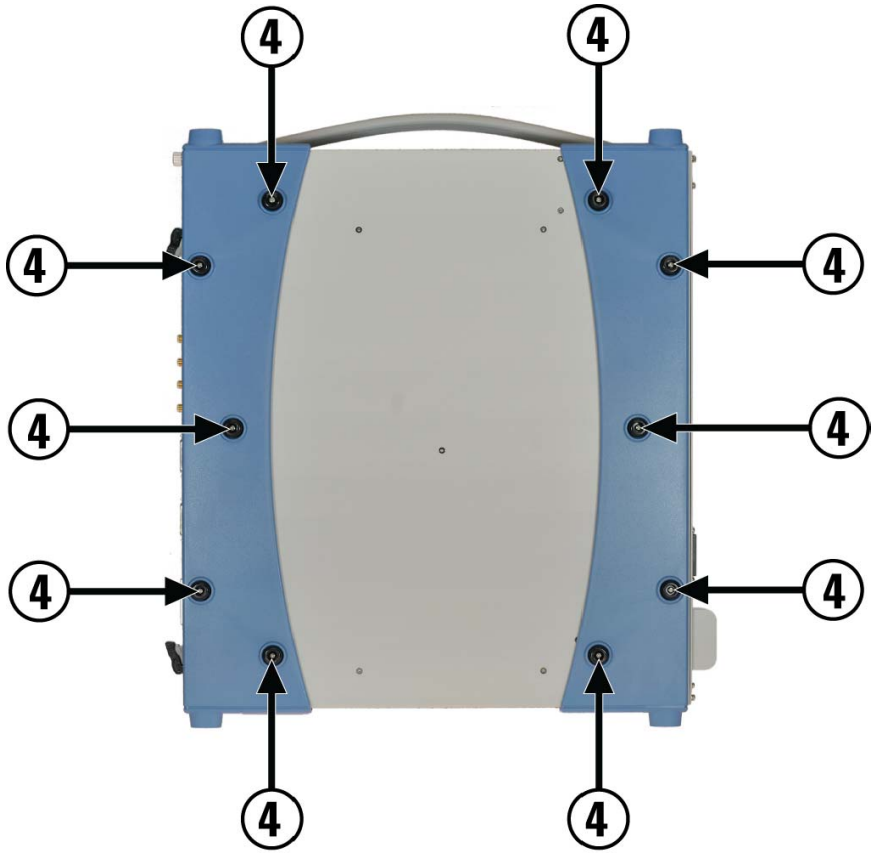
3 Remove the three #1 Phillips flat head screws from the top of each bumper (6 screws total).



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4 Carefully turn the chassis over onto its top.

5 Remove the four plastic feet from the bottom of each bumper (8 feet total). Each foot is attached to the chassis through the bumper with a small #2 Phillips screw retained at the back of the foot with a plastic washer. Loosen each screw just enough to disengage from the chassis; the foot, screw and washer will remain intact.



6 Slide the bumpers off the chassis.

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Setting Up a Host PC

Following the *M9502A/M9505A AXIe Chassis Startup Guide*, you should have selected a host PC, made physical connection to the chassis, and communicated with the chassis using its Web Interface. You may have then disconnected the host PC from the chassis in order to install modules or mount the chassis. Re-establish that connection, per the *Startup Guide*.

CAUTION Do not enable the Microsoft® Windows® sleep mode on the host PC. The controller may not have proper chassis enumeration when it wakes up and unpredictable operation may result.

To Install Module Soft Front Panel and Device Drivers

Each installed module will typically require device drivers and control software. You need not install them to verify basic chassis operation, but would logically install them on the host PC at this time. For Agilent instrument modules, load each module's *Software and Product Information* CD into the optical drive of your PC and follow the prompts. For others, consult the module provider for software requirements and instructions.

Verifying Operation with Modules Installed

In the M9502A/M9505A AXIe Chassis Startup Guide, you should have verified basic power-on operation of the AXIe chassis and communication with the host PC. Subsequently, in this chapter you have installed instrument modules and perhaps rackmounted the chassis. Then you have reconnected the host PC, and loaded chassis and module software drivers.

You should now reverify that Agilent Connection Expert correctly communicates with the chassis and installed modules.

- Power up the chassis (solid green status light on the ESM).
- Reboot the host PC. This will allow the host PC's BIOS to recognize the PCIe devices in the chassis.
- You may need to run the appropriate Add Hardware process in Windows for the host PC's operating system to correctly recognize and enumerate modules on the PCIe bus.
- Establish chassis communication with Agilent Connection Expert.
- Agilent Connection Expert should recognize the installed modules, and they also should be listed on the Module Configuration Page in the chassis Web Interface.
- The Web Interface is covered in detail in Chapter 3.
- After driver installation is complete, restart your PC. The Ethernet Controller **Found New Hardware Dialog** should no longer appear.

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Using the M9536A Embedded Controller LAN Ports

If you installed an Agilent M9536A Embedded Controller in the Agilent AXIe chassis (M9502A or M9505A), there are a total of three LAN ports accessible on the front panels -- two on the M9536A controller and one on the Embedded System Module (ESM). Windows Device Manager shows a total of five (5) individual Network Interface Cards (NICs); one is not used and one connects to the chassis backplane. Refer to Figure 1 and Figure 2 below.

CAUTION Changing the LAN port connection or removing the LAN cable, may cause Agilent Connection Expert to lose track of LAN-enabled instruments. Reboot the AXIe chassis to restore the complete list of LAN-enabled instruments. Read the following for details.

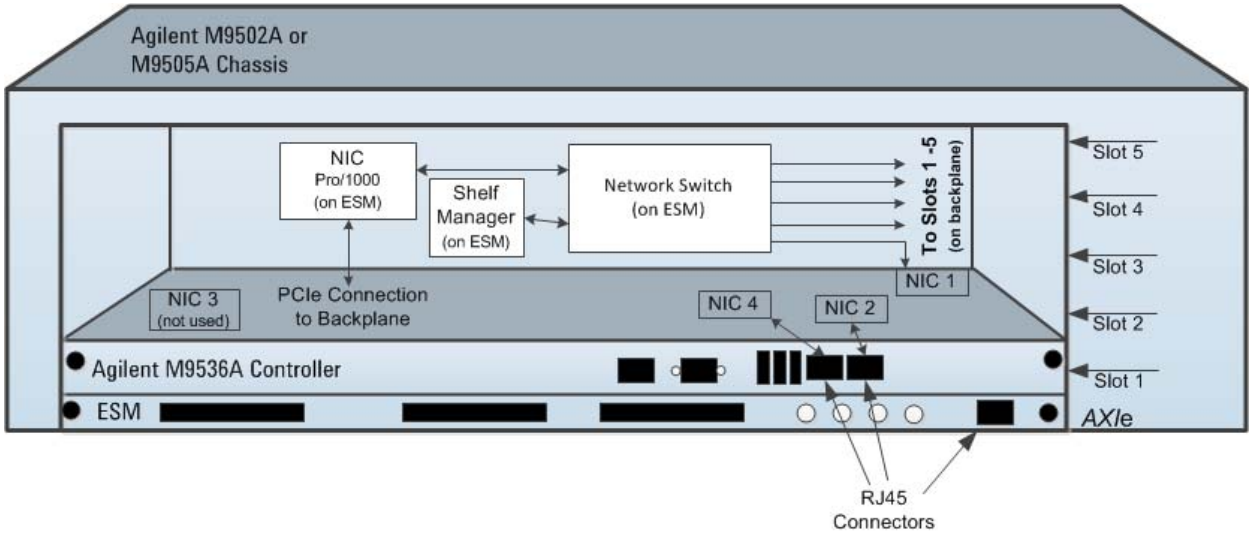


Figure 1 NIC ports reported for the M9536A (NIC 3 is not used)

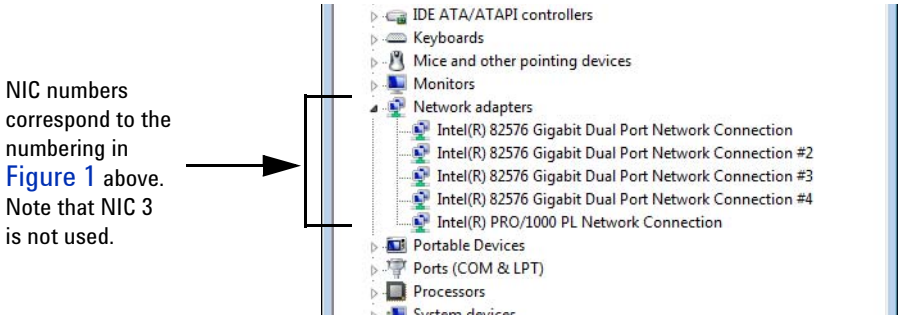


Figure 2 Windows Device Manager showing Network Connections

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This section provides overall guidance on selecting and using the M9536A LAN ports. The controller uses the Agilent IO Libraries configuration file to keep track of all instrument connections. Any change to LAN connections after running Connection Expert (adding, removing, or changing LAN cable connections) may cause a change in LAN address and therefore cause Connection Expert to lose track of instruments. If your application programs rely on a specific IP address, these programs may cease to operate if you change LAN cable connections.

Changes to the ESM PCIe or LAN connection are only detected as the ESM is powered up. Perform the following steps when you change either of these two connections:

1 Within Agilent Connection Expert, delete the LAN interfaces (right click on the interface then select **Delete**). This causes connection Expert to forget all instrument history.

2 Power down the AXIe chassis using the chassis power button.

3 Make the desired cabling change to the ESM PCIe and/or LAN connections.

4 Power up the AXIe chassis with the embedded controller.

5 Run Agilent Connection Expert and verify that the LAN interfaces are operating correctly and that Connection Expert finds the AXIe chassis.

NOTE With Agilent IO Libraries 16.2 (and later versions) Agilent Connection Expert should automatically identify the AXIe chassis. With Agilent IO Libraries version 16.1, you may need to start Connection Expert, then power down the controller and chassis and reboot them in order for Connection Expert to identify the AXIe chassis.

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Recommendations

As a general rule, connect a network LAN cable to the ESM's LAN port and connect LXI instruments to the M9536A's LAN ports. While other configurations are viable, this configuration provides the fastest and most consistent reporting in Agilent Connection Expert. Refer to Figure 3.

- Where you have the network and instruments connected when the chassis and controller first power on determines how quickly Agilent Connection Expert locates network instruments. If necessary, shut down the controller and chassis and reboot.
- If you move a LAN cable while chassis power is applied, Connection Expert may not find all of the instruments available on the network.

  For example, if the LAN cable is connected to the ESM when power is first applied to the chassis and subsequently moved to one of the two LAN ports on the controller (while the chassis is still powered on), Connection Expert may only find the M9536A controller and AXIe modules installed in the chassis. Shut down the controller and chassis and reboot to restore Connection Expert's ability to locate other network instruments.
- Connect external LAN-enabled instruments (LXI instruments) to the M9536A controller LAN ports. This allows Agilent Connection Expert to automatically find the instruments. These instruments will have a local LAN IP address or private network range.

  LXI instruments may be connected to the ESM's LAN port but Connection Expert may not automatically find them when these instruments are not located on the same LAN subnet range. However, instruments may be added manually using Connection Expert's Add Address feature.
- If you are using an external LAN router or switch, cycling power on the chassis may cause the IP address of the chassis ESM and controller to change. Therefore you may want to set a static IP address. Refer to your particular network device's documentation for information on setting static IP addresses.

  With the Agilent M9536A Embedded Controller installed in the AXIe chassis, the x8 PCIe connection on the ESM module is disabled. However, the PCIe cable detect mechanism may reset the hardware when attaching a PCIe cable. This hardware reset may change the IP address.

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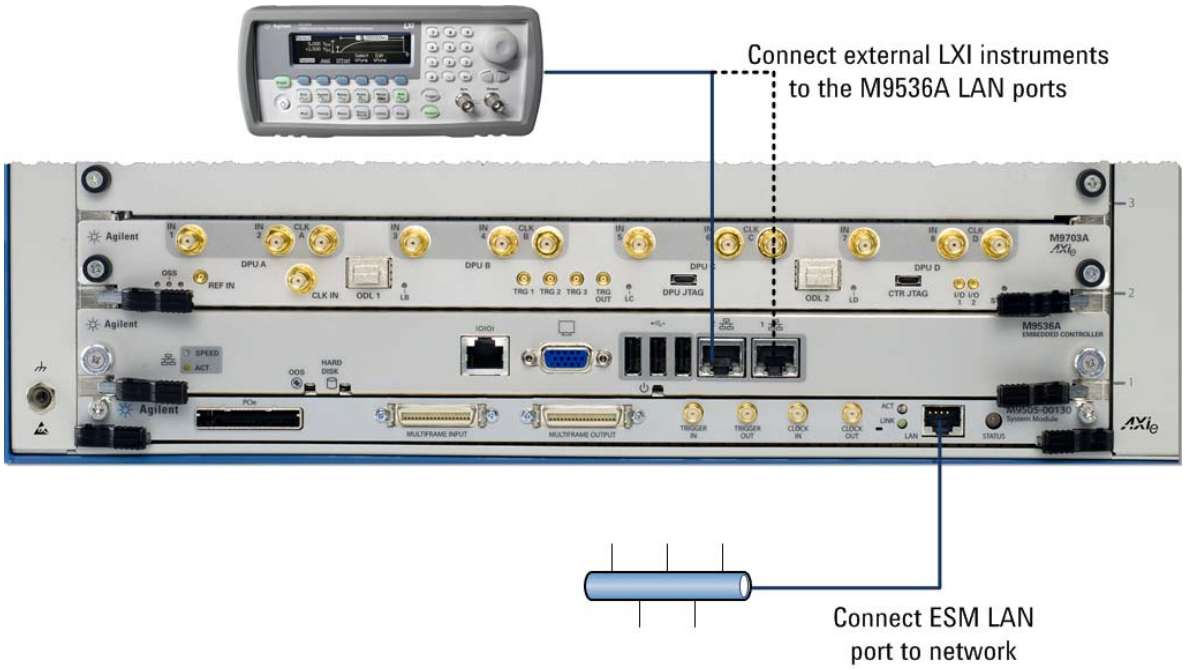


Figure 3 Recommended LAN Connections

Figure 3 shows the recommended LAN connections to the AXIe chassis/ESM and the M9535A. Two other possible LAN connections are shown in Figure 4. Note that you may need to manually add instrument IPO addresses to Agilent Connection Expert.

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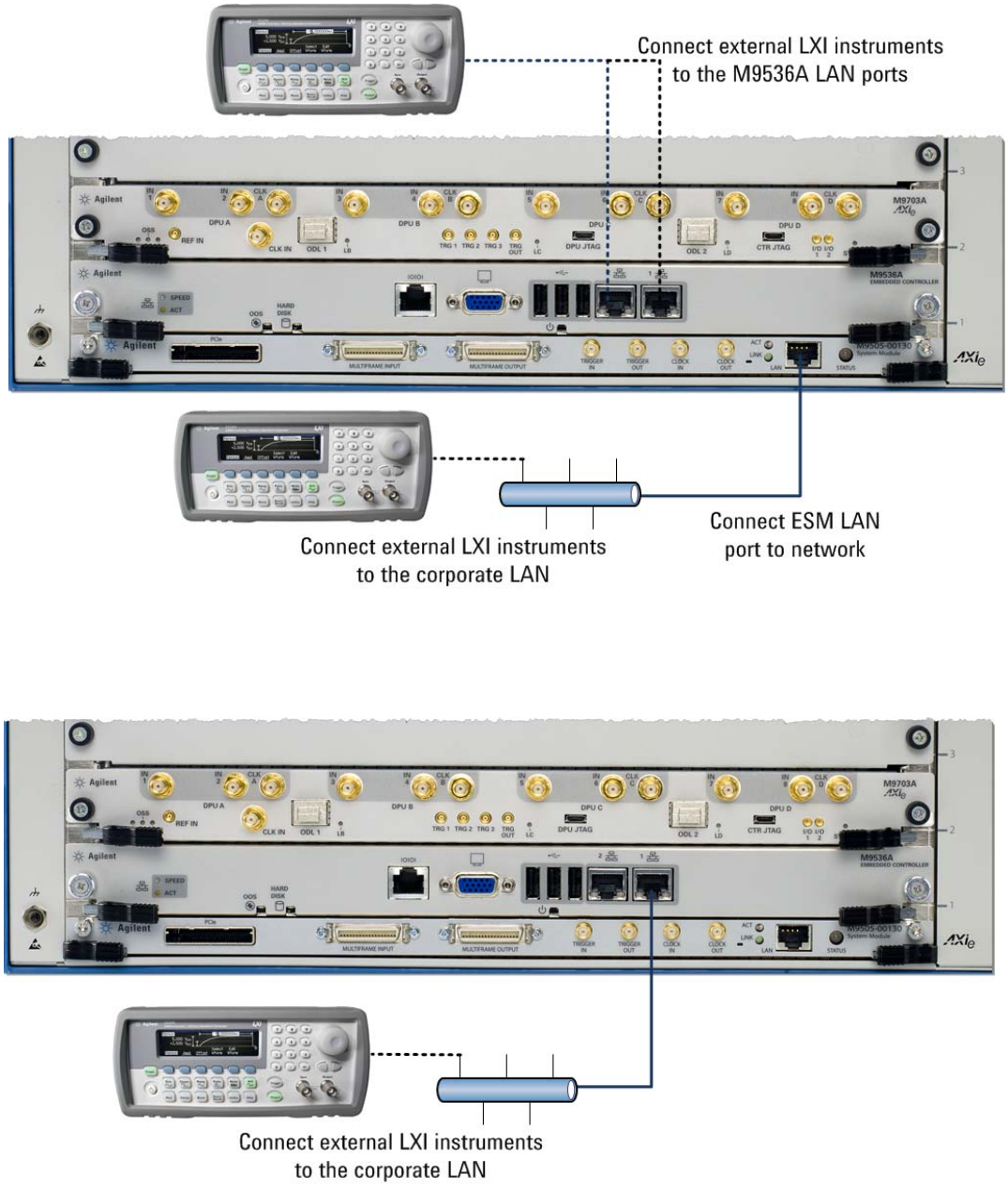


Figure 4 Possible Alternate LAN Connections. You may need to manually add instrument IP addresses to Agilent Connection Expert. (see text)

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Using an external controller

Changes to the ESM PCIe or LAN connection are only detected as the ESM is powered up. Perform the following steps when you change either of these two connections:

1. Within Agilent Connection Expert, delete the LAN interfaces (right click on the interface then select **Delete**). This causes connection Expert to forget all instrument history.
2. Turn off the remote host controller.
3. Power down the AXIe chassis using the chassis power button.
4. Make the desired cabling change to the ESM PCIe and/or LAN connections.
5. Power up the AXIe chassis.
6. Power on the remote host controller.
7. Run Agilent Connection Expert and verify that the LAN interfaces are operating correctly and that Connection Expert finds the AXIe chassis.

Using Multiple Chassis

If you are using multiple AXIe chassis (any combination of the Agilent M9502A 2-Slot or M9505A 5-Slot chassis) connected to you host PC, Agilent Connection Expert finds both chassis at the same local IP address (TCPIP0::169.254.1.0::5025:SOCKET). Refer to Figure 5.

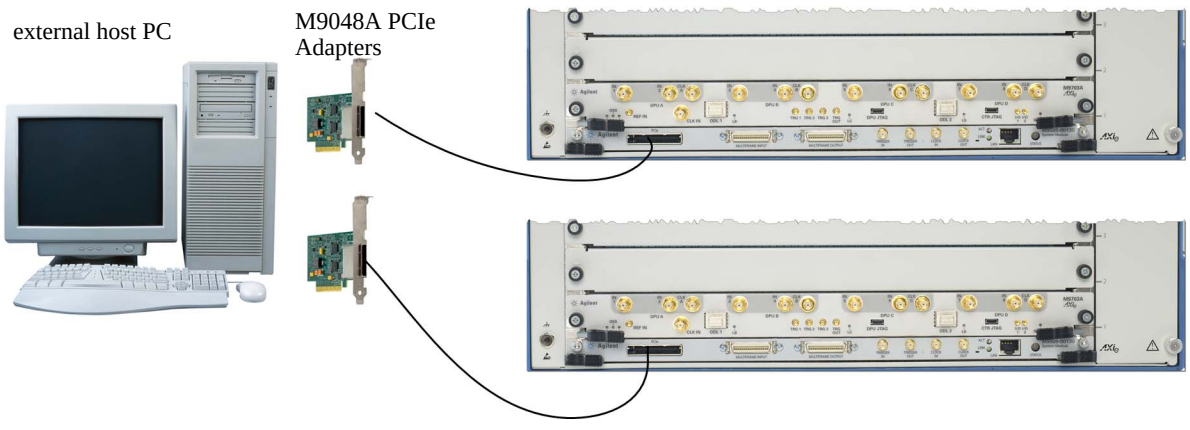


Figure 5 Multiple AXIe chassis connected to external host PC

Agilent Connection Expert (part of the Agilent IO Libraries Suite) finds both chassis but since the IP address are the same, it is impossible to use the chassis Web Page, Soft Front Panel, or specify a chassis for programming.

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NOTE Multiple AXIe chassis control via PCIe connections is only possible with an external host PC. It is not possible to control multiple AXIe chassis via PCIe with the Agilent M9536A Embedded Controller.

If you have only two AXIe chassis, the easy solution is to connect a LAN cable between the two ESM modules. This is shown in Figure 6.

Both chassis must be powered up before powering on the external host PC.

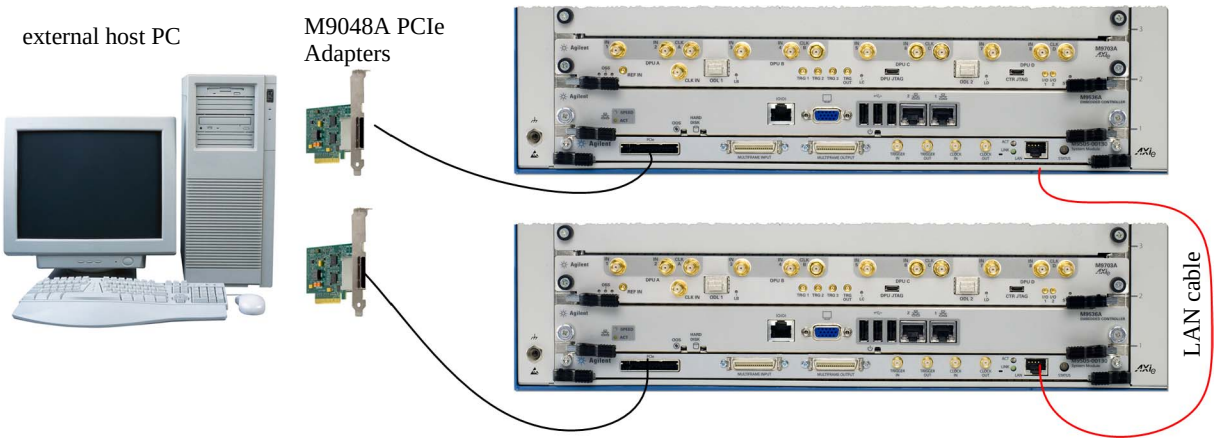


Figure 6 Two chassis solution

If you have two or more AXIe chassis, the solution is to connect them to a router or hub as shown in Figure 7.

In this scenario, the Host PC must connect to the same network hub or router as the AXIe chassis.

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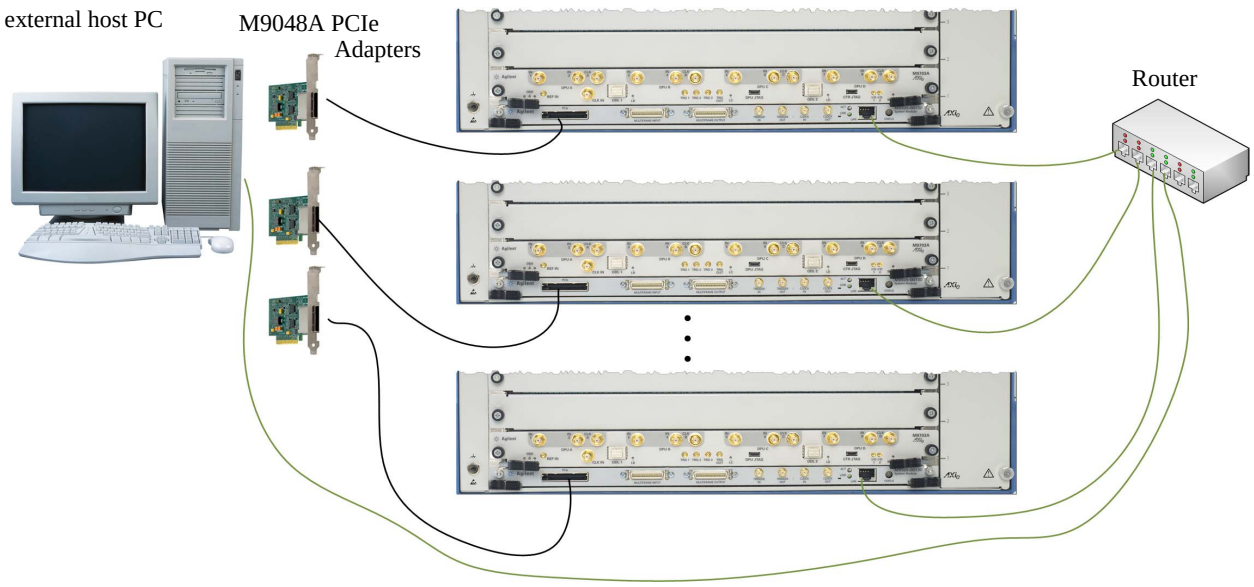


Figure 7 Use a router for multiple chassis

Although it is not required, manually assigning a unique, static IP address in the router, will speed up network resolution at MS Windows startup and eliminate any potential network resolution issues.

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3 Navigating the Web Interface

This chapter provides a complete overview of the AXIe chassis Web Interface, which allows for chassis monitoring and configuration.

The Web Interface is stored in the chassis firmware, and may evolve in look and functionality as more recent versions of the firmware are developed. The examples in this manual reflect the firmware at time of product introduction.

Launching the Web Interface 40
Home Page 40
Menu 41
LAN Configuration Page 42
Module Configuration Page 43
Trigger Routing Page 46
Chassis Health Page 48
Configure Fan Control 49

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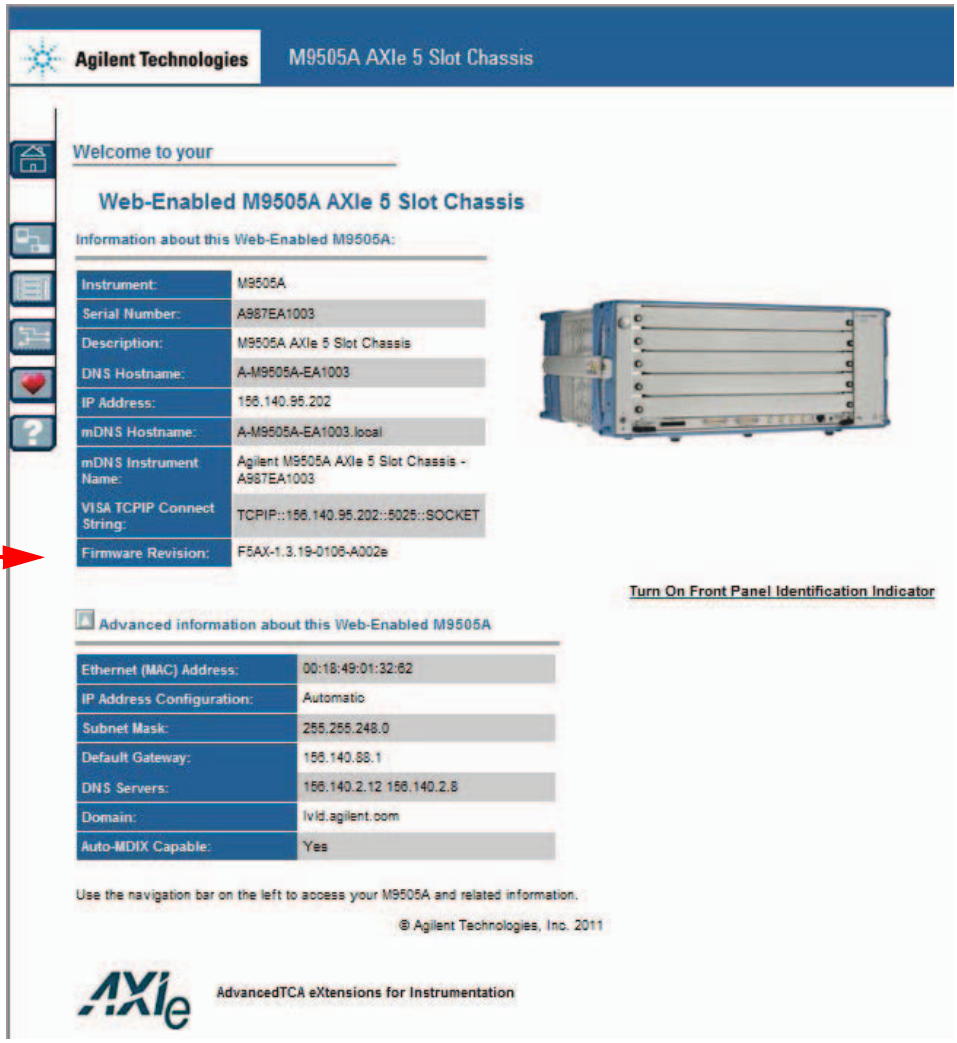
Launching the Web Interface

The *M9502A/M9505A Startup Guide* provides detailed instructions for connecting to the chassis using Agilent Connection Expert and launching the chassis Web Interface. Following those instructions, launch the Web Interface.

NOTE If you have problems launching the chassis Web interface, check your browser's proxy settings. When Agilent 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.

Home Page

The home page displays identifying information about your chassis and LAN connection, more if you click the Advanced Information (Advanced) button.



Chassis Firmware Version (see page 104)

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Clicking **Turn On Front Panel Identification Indicator** will cause the ESM front panel STATUS light to flash steadily; use this to quickly identify which chassis you are communicating with.

Menu

The six buttons at left are the Web Interface's Menu:



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

LAN Configuration Page - Display IP address, domain, and subnet, service discovery information, and LAN status.

Module Configuration Page - Displays product and model information for instrument modules loaded in the chassis.

Trigger Routing Page - Configure static trigger routing from all chassis-based sources to the backplane and external connectors.

Chassis Health Page - Displays PSU voltages, fan speeds and temperature. Provides detailed event alarms for the chassis and any installed Intelligent Platform Management Bus (IPMB) equipped instrument modules.

Help Page - General help topics for the current page.

We will explore each Page in the order they are listed in the menu.

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LAN Configuration Page

Click the button to display the LAN Configuration page:



Initial releases of the AXIe chassis will have IP configuration set to Automatic; the IP Address, Subnet Mask and Default Gateway are set automatically and cannot be changed.

When you make a LAN connection between host PC and chassis ESM, and then power-on the chassis, the following process happens:

1. The chassis, as client, seeks a Dynamic Host Configuration Protocol (DHCP) server to set the IP configuration.
2. If you connected the chassis and PC to a corporate LAN, the network will provide the DHCP addresses.
3. If you made a direct LAN connection (physical LAN or implicit LAN connection through PCIe), the chassis reverts to link-local addressing.

NOTE **If you are having difficulty 'finding' a specific AXIe chassis on a network, you can search by the mDns Instrument Name, which includes the unique chassis serial number. This number is located at the rear of the chassis.**

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Module Configuration Page

Click the button to display the Module Configuration page. This page allows you to view the physical location and identifying information for recognized modules installed in the chassis, as well as the chassis frame and Embedded System Module.

Chassis Module Configuration

Module Slot	Product Name	Description	
5	-empty-	P/N	
		S/N	
		Revision	
		Manufacturer	
4	LPT_AMP_REF_blade	P/N	000000
		S/N	PPS0000123
		Revision	Rev 1.1
		Manufacturer	Agilent Technologies
3	LPT_AMP_REF_blade	P/N	000000
		S/N	PPS0000123
		Revision	Rev 1.1
		Manufacturer	Agilent Technologies
2	-empty-	P/N	
		S/N	
		Revision	
		Manufacturer	
1	AG-M9536A	P/N	AG-M9536A
		S/N	B398EA1007
		Revision	A3
		Manufacturer	ADLINK Technology
Chassis			
Frame	M9505A	P/N	AG-M9505-00100
		S/N	A987EA1003
		Revision	AX5-ES2.E0M0
		Manufacturer	Agilent Technologies
ESM	ESM001-AXIe-MPO	P/N	AG-M9505-00130
		S/N	A918EA1011
		Revision	ESM001-ES2.E0M0.SM4A
		Manufacturer	Agilent Technologies
		PCIe Mode	PCIe Gen 2 Enabled (SW6.2 is on)
		PCIe Rev	1.3

Refresh

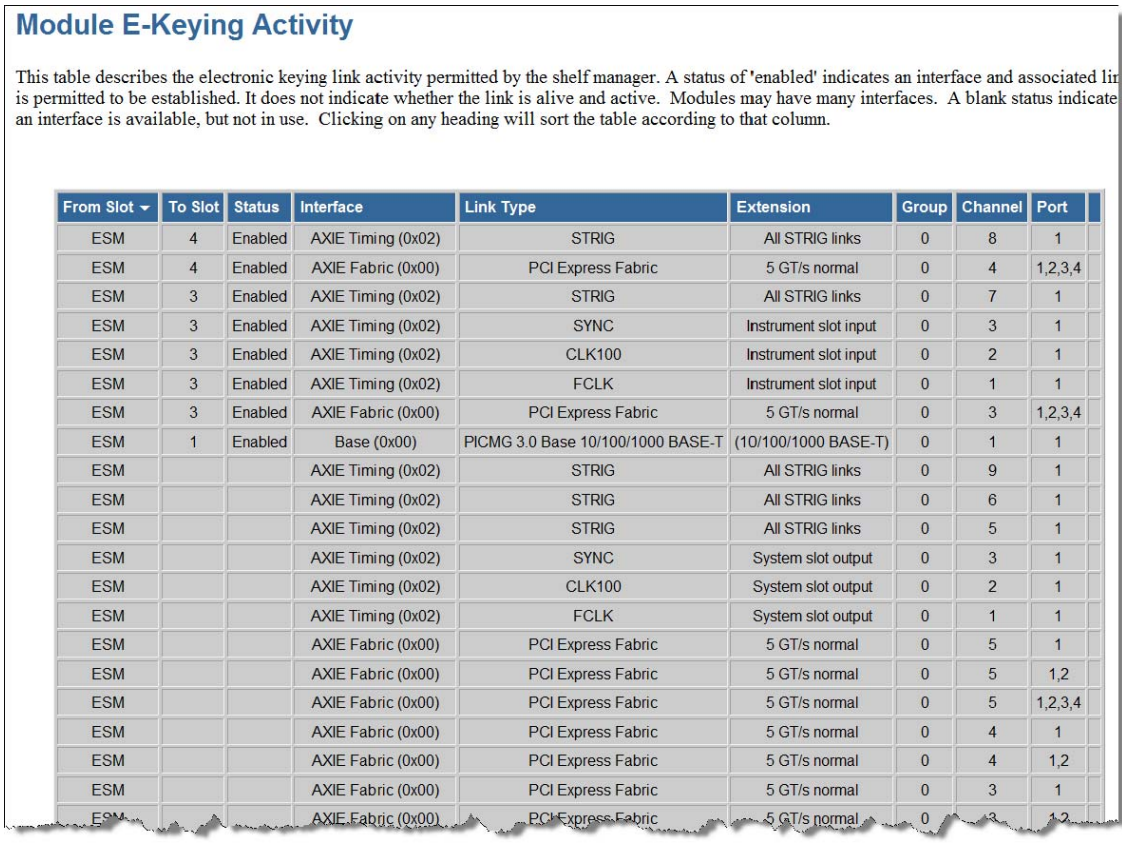
Note PCIe mode; either Gen1 or Gen 2, see page 111

The above example shows an M9505A chassis with two installed modules (slots 3 and 4) and the Agilent M9536A Embedded Controller in slot 1.

Scrolling down the Module Configuration page displays the E-Keying Activity information. E-Keying (short for Electronic Keying) is a process in which compatible matches over links between different modules are identified and enabled to be used. For more information on E-Keying refer to "Electronic Keying (E-Keying)" on page 86.

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In general, you do not need to understand how E-Keying works. The E-Keying process is handled by the chassis shelf manager. The following two figures illustrate the Module E-Keying Activity display in the Module Configuration Page.



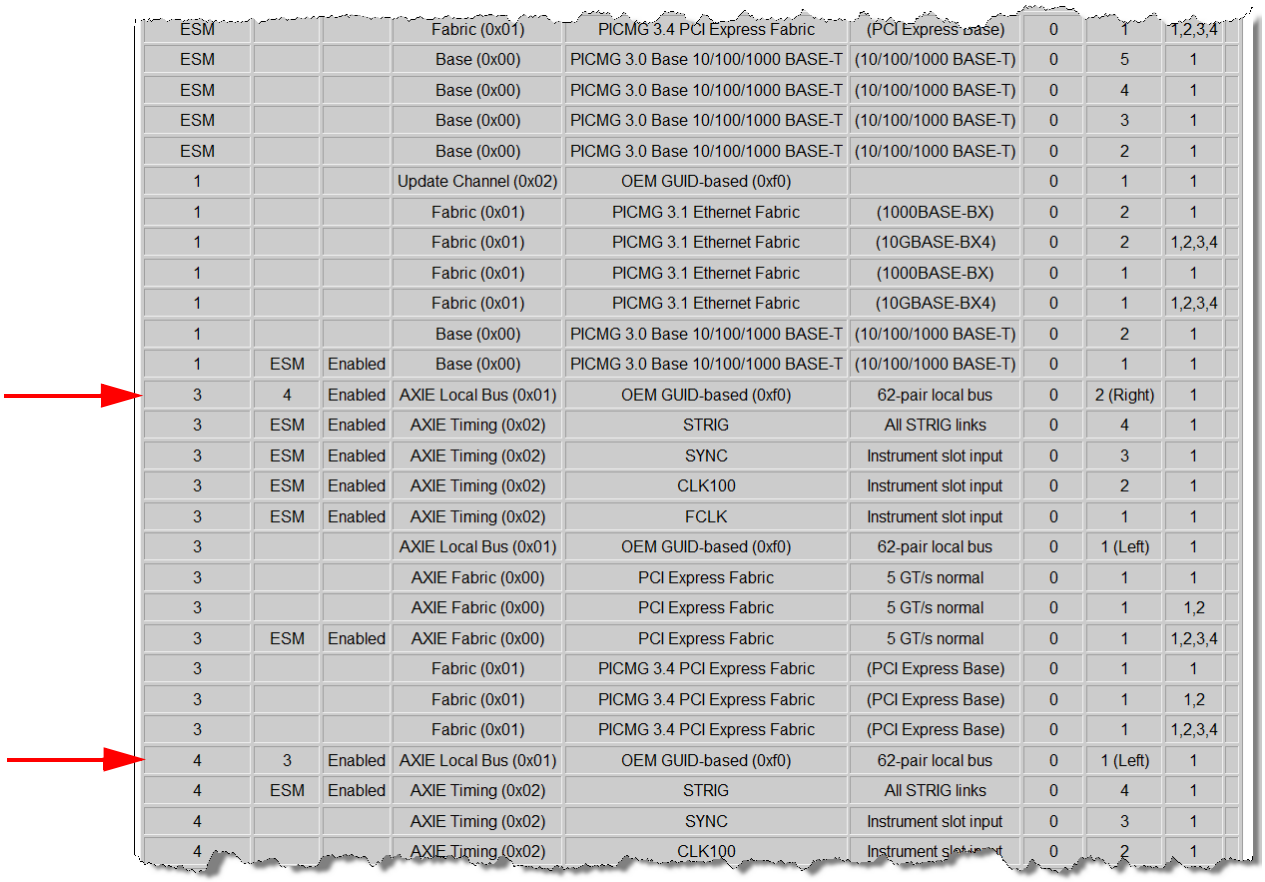
Module E-Keying Activity

This table describes the electronic keying link activity permitted by the shelf manager. A status of 'enabled' indicates an interface and associated lir is permitted to be established. It does not indicate whether the link is alive and active. Modules may have many interfaces. A blank status indicate an interface is available, but not in use. Clicking on any heading will sort the table according to that column.

From Slot	To Slot	Status	Interface	Link Type	Extension	Group	Channel	Port
ESM	4	Enabled	AXIE Timing (0x02)	STRIG	All STRIG links	0	8	1
ESM	4	Enabled	AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	4	1,2,3,4
ESM	3	Enabled	AXIE Timing (0x02)	STRIG	All STRIG links	0	7	1
ESM	3	Enabled	AXIE Timing (0x02)	SYNC	Instrument slot input	0	3	1
ESM	3	Enabled	AXIE Timing (0x02)	CLK100	Instrument slot input	0	2	1
ESM	3	Enabled	AXIE Timing (0x02)	FCLK	Instrument slot input	0	1	1
ESM	3	Enabled	AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	3	1,2,3,4
ESM	1	Enabled	Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	1	1
ESM			AXIE Timing (0x02)	STRIG	All STRIG links	0	9	1
ESM			AXIE Timing (0x02)	STRIG	All STRIG links	0	6	1
ESM			AXIE Timing (0x02)	STRIG	All STRIG links	0	5	1
ESM			AXIE Timing (0x02)	SYNC	System slot output	0	3	1
ESM			AXIE Timing (0x02)	CLK100	System slot output	0	2	1
ESM			AXIE Timing (0x02)	FCLK	System slot output	0	1	1
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	5	1
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	5	1,2
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	5	1,2,3,4
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	4	1
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	4	1,2
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	3	1
ESM			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	3	1,2

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In the following segment, note that modules in Slots 3 and 4 (column 1 “From Slot” and column 2 “To Slot”) have an Enabled status and use the AXIe Local Bus (62 pair Local Bus). This simply states that the Shelf Manager has given the two modules permission to communicate directly (E-Keying) over the AXIe backplane local bus. Also note that both modules are enabled to use the AXIe Timing STRIG link and the PCI Express fabric.



ESM			Fabric (0x01)	PICMG 3.4 PCI Express Fabric	(PCI Express base)	0	1	1,2,3,4
ESM			Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	5	1
ESM			Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	4	1
ESM			Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	3	1
ESM			Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	2	1
1			Update Channel (0x02)	OEM GUID-based (0xf0)		0	1	1
1			Fabric (0x01)	PICMG 3.1 Ethernet Fabric	(1000BASE-BX)	0	2	1
1			Fabric (0x01)	PICMG 3.1 Ethernet Fabric	(10GBASE-BX4)	0	2	1,2,3,4
1			Fabric (0x01)	PICMG 3.1 Ethernet Fabric	(1000BASE-BX)	0	1	1
1			Fabric (0x01)	PICMG 3.1 Ethernet Fabric	(10GBASE-BX4)	0	1	1,2,3,4
1			Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	2	1
1	ESM	Enabled	Base (0x00)	PICMG 3.0 Base 10/100/1000 BASE-T	(10/100/1000 BASE-T)	0	1	1
3	4	Enabled	AXIE Local Bus (0x01)	OEM GUID-based (0xf0)	62-pair local bus	0	2 (Right)	1
3	ESM	Enabled	AXIE Timing (0x02)	STRIG	All STRIG links	0	4	1
3	ESM	Enabled	AXIE Timing (0x02)	SYNC	Instrument slot input	0	3	1
3	ESM	Enabled	AXIE Timing (0x02)	CLK100	Instrument slot input	0	2	1
3	ESM	Enabled	AXIE Timing (0x02)	FCLK	Instrument slot input	0	1	1
3			AXIE Local Bus (0x01)	OEM GUID-based (0xf0)	62-pair local bus	0	1 (Left)	1
3			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	1	1
3			AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	1	1,2
3	ESM	Enabled	AXIE Fabric (0x00)	PCI Express Fabric	5 GT/s normal	0	1	1,2,3,4
3			Fabric (0x01)	PICMG 3.4 PCI Express Fabric	(PCI Express Base)	0	1	1
3			Fabric (0x01)	PICMG 3.4 PCI Express Fabric	(PCI Express Base)	0	1	1,2
3			Fabric (0x01)	PICMG 3.4 PCI Express Fabric	(PCI Express Base)	0	1	1,2,3,4
4	3	Enabled	AXIE Local Bus (0x01)	OEM GUID-based (0xf0)	62-pair local bus	0	1 (Left)	1
4	ESM	Enabled	AXIE Timing (0x02)	STRIG	All STRIG links	0	4	1
4			AXIE Timing (0x02)	SYNC	Instrument slot input	0	3	1
4			AXIE Timing (0x02)	CLK100	Instrument slot input	0	2	1

More information on AXIe E-Keying is available on the AXIe Consortium website: www.axiestandard.org.

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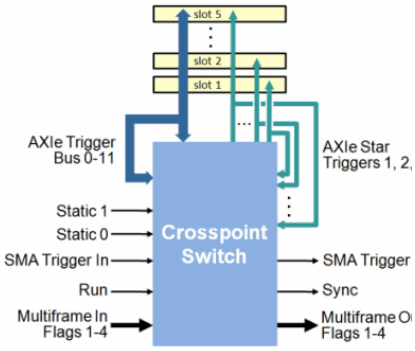
Trigger Routing Page

Click the button to display the Trigger Routing page. This page allows you to view and assign static trigger routing through the ESM, using the chassis *Crosspoint Switch*.

Trigger Routing on your M9505A AXIe 5 Slot Chassis

This page allows control of trigger routing connections through the crosspoint switch between the chassis backplane and external connections located on the the Embedded System Module (ESM). These connections may be applied, saved as a default configuration, and later restored if necessary. For more detailed information on the trigger subsystem, see the ***M9502A/M9505A AXIe Chassis User's Guide.***

Please note this page does not control signal routing on module slots. Refer to the routing setup instructions for those modular instrument products.



Destination To:		Output Signal	Output Enable	Input Signal	Conditions
Chassis Internal Backplane	AXIe Trigger Bus	TRIG 0	☐	Static 0	
		TRIG 1	☐	Static 0	
		TRIG 2	☐	Static 0	
		TRIG 3	☐	Static 0	
		TRIG 4	☐	Static 0	
		TRIG 5	☐	Static 0	
		TRIG 6	☐	Static 0	
		TRIG 7	☐	Static 0	
		TRIG 8	☐	Static 0	
		TRIG 9	☐	Static 0	
		TRIG 10	☐	Static 0	
		TRIG 11	☐	Static 0	
		SYNC		Static 0	☑ Sync routed through crosspoint switch
	AXIe Star Trigger	To Slot 1	☐	Static 0	
		To Slot 2	☐	Static 0	
		To Slot 3	☐	Static 0	
		To Slot 4	☐	Static 0	
		To Slot 5	☐	Static 0	
Chassis External Connectors	SMA Trigger	In			Threshold Volts: 1.65
					Inversion: None
		Out	☐	Static 0	Pulsed: None
					Inversion: None
	SMA Clock	In	*May be connected to a 10 MHz clock source.*		
		Out	☐		
	Multiframe Interconnect	Flag 1		Static 0	
		Flag 2		Static 0	
		Flag 3		Static 0	
		Flag 4		Static 0	

Apply Changes | Don't Apply Changes, Keep Previous Settings | Clear Form

Save Trigger Routing as Default State

Restore Trigger Routing from Default State

Restore Factory Default

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The Crosspoint Switch provides the flexibility of routing many signal events from the backplane, flags or external trigger to different destinations. You can choose to enable and assign the input source for any or all signal destinations (trigger/timing resources to be output from the ESM). You can also source a logical 0 or 1 to drive any output for test purposes.

Multiple outputs may be driven from the same input, but each output can have only one input assigned. The default input for all outputs is “Static 0”, which assigns a logic 0.

These trigger bus inputs and outputs are covered in detail in “Triggering” beginning on page 72.

Making Trigger Routing Changes

The Trigger Routing page provides several buttons at the bottom of the form, which allow you to apply, save, and restore trigger bus *States*, complete sets of trigger bus configuration settings. These States are stored in non-volatile RAM (NVRAM); settings do not change when you cycle power to the chassis.

NOTE Trigger bus settings displayed in the Trigger Routing page form are not activated until you apply them.

Active State: Each time you load or refresh the Trigger Routing page, it shows the Active State (of the trigger bus).

- The displayed form allows you to make and display configuration changes, but they are not made Active until you specifically apply them.
- If you click the **Apply Changes** button, the displayed settings will be made Active (become the Active State).
- If you do not want to apply the displayed changes, do not click **Apply Changes**. You can click **Clear Form** to clear all trigger bus assignments on the form.
- If you want to restore the Active State, click the **Discard and Refresh** button.

Default State: The chassis will store a custom set of default settings, called the Default State.

- If you click the **Save as Default** button, the displayed settings will be made Active and be saved as the new Default State.
- You can always restore the form to the Default State by clicking the **Restore Form from Default** button. Then, if you click the **Apply Changes** button, the Default State will be made Active.

Factory Default State: You can always restore the form to the factory default, by clicking the **Restore Form from Default** button. Then, if you click the **Apply Changes** button; the factory default becomes the Active State.

Complete description, selection and routing instructions for the trigger bus are provided in “Chassis Synchronization and Triggering”, beginning on page 69.

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Chassis Health Page

Click the  button to display the Chassis Health page. Note that, in the example below, three fan speeds are shown as below the minimum fan speed limit. .

Chassis Health

Sensors

Module Slot	Instrument	State	Sensor Readings			
5	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
4	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
3	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
2	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
1	AXIe System Controller	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		6	Voltage	+1.5V DDR-CPU1	1.54 Volts
	Nominal		7	Voltage	+1.8V CPU1	1.80 Volts
	Nominal		10	Voltage	+5.0V	5.10 Volts
	Nominal		11	Voltage	+3.3V	3.34 Volts
	Nominal		12	Voltage	+12V	12.15 Volts
	Nominal		18	Temperature	LM75 SYS Temp	57.00 degrees C
	Nominal		19	Temperature	CPU1 Temp	60.00 degrees C
	Nominal		20	Temperature	CPU2 Temp	0.00 degrees C
Chassis	5-SLOT-AXIe-MPO	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		120	Temperature	External Temp1	35.00 degrees C
	Nominal		121	Temperature	External Temp2	32.00 degrees C
	Nominal		2	Fan	Front-Lower	2436 RPM
	Nominal		3	Fan	Middle-Lower	2406 RPM
	Nominal		4	Fan	Rear-Lower	2406 RPM
	Nominal		5	Fan	Front-Upper	2466 RPM
	Nominal		6	Fan	Middle-Upper	2377 RPM
	Nominal		7	Fan	Rear-Upper	2377 RPM

Refresh Readings

Configure Fan Control

Fan Status	Normal	
Cooling Status	Normal	
Current Speed Level	42	
Dynamic Minimum Fan Level	42	
Adjust Current Speed Level and Dynamic Minimum Fan Level	40 % of maximum RPM	Apply

Chassis Firmware Update

The following link opens a form to update the firmware components of this chassis. The components checked during an update are the Embedded Systems Module (ESM) and chassis backplane modules. Instrument modules are not included in this update. For updating an instrument module, please follow the directions provided by the module vendor.

Open the Chassis Firmware Update page.

This page has three sections: Sensors, Fan Control and Chassis Firmware Upgrade. Sensor monitoring is explained in detail in "Shelf Management Functions" on page 62. To update the chassis firmware, see "Updating the Chassis Firmware" on page 104.

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Configure Fan Control

The minimum chassis fan speed is approximately 2200 RPM; the maximum fan speed is approximately 6000 RPM. Using a range of 35 to 100 (percentage of maximum), you can manually set the minimum speed you want the fans to operate at — 35 means the minimum fan speed of approximately 2200 RPM and 100 is the maximum fan speed of approximately 6000 RPM. Each increment is approximately 58 RPM.

NOTE

Do not attempt to set the fan speed below 35. Earlier chassis firmware versions (see AXIe Chassis Version Information below), used fan speed numbers from 8 to 15, with 8 representing the minimum fan speed and 15 representing the maximum fan speed. For backwards compatibility, these numbers are now reserved.

If you have an existing application program using IVI or LabVIEW drivers to set the minimum fan speed using the old 8 to 15 range, your program will continue to work normally with the new AXIe chassis firmware; 8 now corresponds to the new 35 (minimum fan speed) and 15 corresponds to the new 100 (or maximum fan speed).

The new firmware revision returns fan speed as 35 to 100. If your application program reads the current fan speed and expects a value between 8 and 15, your program may error. Please adjust your application appropriately.

NOTE

Regardless of where you set the minimum fan speed, if the temperature inside the AXIe chassis rises, the fans speed increases to provide additional cooling. The resolution of the Current Fan Level, as shown on the Chassis Health web page, is an approximation of the fan speed.

The Configure Fan Control section of the Chassis Health Page has the following 5 fields:

Fan Status The shelf manager continuously monitors chassis fan speed, looking for indication that one or more fans are not turning. **Normal** fan status represents a fan speed of at least 2200 RPM (or higher when required by instrumentation load). Below that speed, the shelf manager reports an alarm condition for that fan, it attempts to increase fan speed and continues to monitor. Failure of one fan will not result in interruption of power to installed modules.

Cooling Status The shelf manager continuously monitors reported module temperatures, looking for indication that one or more modules is outside its optimal temperature range. This range is specified by the module vendor, as are the thresholds for alarm conditions. Typically only high temperatures generate an alarm, although it is possible for a vendor to specify low temperature alarm levels as well.

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In the event of a high temperature alarm from any module, the shelf manager responds by increasing chassis fan speed and continuing to monitor. If the Upper Non-Recoverable threshold is reached, the shelf manager requests the module to power down to its inactive state. Because this level is set by the module vendor, it may not indicate that the module has failed, only that continued operation is inadvisable until the module cools.

Current Speed Level This is the level the fans are currently operating and is controlled by the Shelf Manager. It increases from a set minimum as needed to adjust for changes in chassis temperature. The range is from 35 to 100, where 35 is the slowest speed level and 100 is the highest speed level. The Current Speed Level indicates an approximate percentage of maximum fan RPM. Therefore, a level of 40 indicates the fans are operating at approximately 40% of maximum RPM, and 100 indicates the fans are operating at 100% of maximum RPM. Note, the default/reset value is 40.

Dynamic Minimum Fan Level This is the minimum fan level the shelf manager algorithm sets as it actively monitors the overall system temperature and temperature threshold events received from instrument modules. Over time, the algorithm adjusts this level towards the user-specified minimum fan level provided the cooling status remains at Normal.

Adjust Current Speed Level and Dynamic Minimum Fan Level This user adjustable parameter actually sets both values. This level is kept in non-volatile RAM until you change it; cycling power to the chassis does not change the minimum fan level. Adjust the minimum fan level by entering a value in the field, or clicking the up/down arrows, and then clicking the **Apply** button.

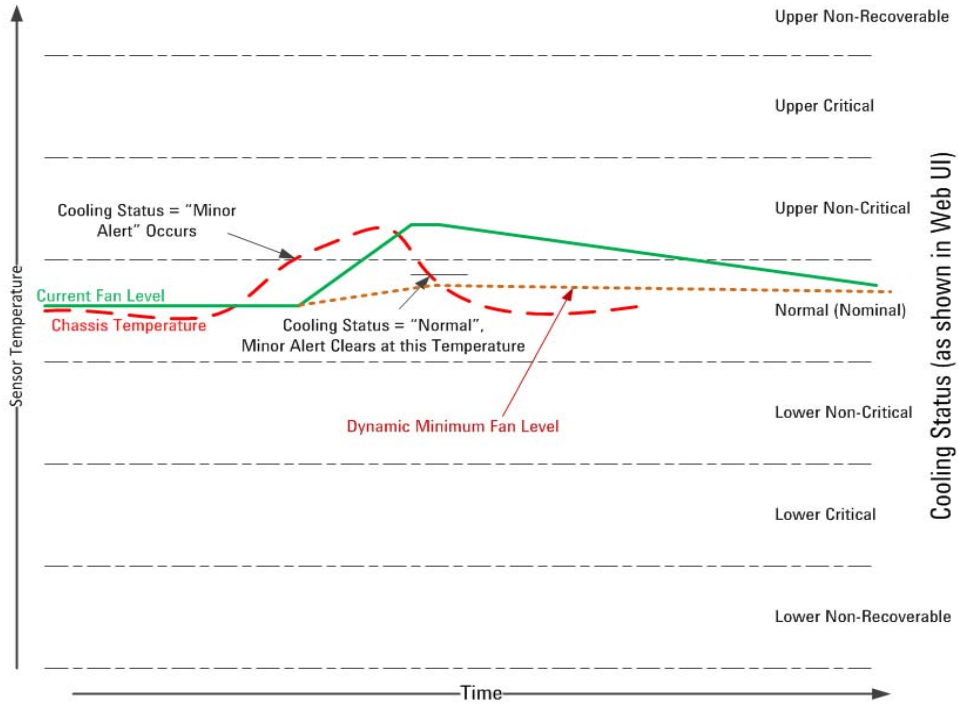
Note that you can individually set the Current Speed Level and the Dynamic Minimum Fan Level using ICI controls. The Web UI (and the Soft Front Panel) binds these two together. Setting the Current Speed Level is always temporary because the Dynamic Minimum Fan Level algorithm continuously adjusts the fan speed towards a dynamic minimum when cooling conditions permit. For example, consider a situation where the chassis and installed modules require a fan speed of 50 to maintain proper cooling. If you attempt to manually set the Current Fan Speed to a lower value (40 for example) the algorithm overrides the setting and maintains the fan speed to provide adequate cooling. Conversely, if you manually set the fan speed to a higher value (65 for example), the algorithm sets that fan speed and does not change it unless additional cooling becomes required.

Of course, since the actual cooling requirements for the chassis and modules may continuously change, that actual fan Current Speed Level and the Dynamic Minimum Fan Speed will also change over time.

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Example of Chassis Fan Speed

The following graph illustrates how the chassis fan speed operates. For simplicity, only one temperature event is shown; in reality, temperature events may be happening frequently causing the fan Current Speed Level to change and the Dynamic Minimum Fan Speed to gradually change.



Assume at the beginning, the chassis is reporting a Nominal cooling status. The Dynamic Minimum Fan Level is approximately the same as the fan Current Speed Level. When one (or more) temperature sensors reports that a temperature has increased above its Nominal range and is now above its Upper Non-Critical threshold, a Minor Alert occurs on the cooling status. At this point, the chassis fan Current Speed Level begins ramping up to provide additional cooling. Note that the change is not instantaneous.

When the temperature sensors report that the temperature has dropped back into the Nominal range (because of hysteresis it is actually a few degrees below the Upper Non-Critical threshold), the chassis fan Current Speed Level begins to gradually slow down, compensating for the reduced heat load.

During this entire time, the Dynamic Minimum Fan Level algorithm is recalculating to provide a new minimum fan speed. As additional temperature events occur, and the Current Fan Level changes, the Dynamic Minimum Fan Level algorithm recalculates the minimum fan speed required to ensure optimal cooling in the chassis.

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AXIe Chassis Version Information and Fan Speed

AXIe Chassis Firmware version	IVI Driver version	Fan Speed Range
1.3.8 (actually, 1.3.08)	1.1.1.1	8 (minimum) to 15 (maximum)
1.3.23	1.1.1.1	Chassis firmware, including the chassis web page uses 35 to 100. However, the IVI and LabVIEW drivers, including the Soft Front Panel interface, had not been updated to use the 35 to 100 range.
1.3.23 (and later)	1.2.0.x (and later)	Chassis firmware and the IVI and LabVIEW drivers, including the Soft Front Panel interface, were updated to use the 35 to 100 range.

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4
Using the Soft Front Panel

This chapter provides an overview of the AXIe chassis soft front panel (SFP). The SFP provides the same functionality as the Web Interface. While the Web Interface runs in a browser window and accesses the web server built into the chassis, the SFP is an executable which runs on a PC and communicates to the chassis using the IVI drivers. The SFP is installed automatically when the chassis software is installed.

Starting the Soft Front Panel 54
SFP Screens 55

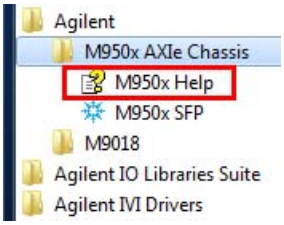
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Starting the Soft Front Panel

After the chassis software is installed, the SFP can be started from the Start menu as follows:

```
Start > All Programs > Agilent > M950x AXIe Chassis > M950x SFP
```

The SFP help system can be launched from the Start menu as well. The SFP help system menu item is immediately above the menu item used to start the SFP, as shown below:



For detailed information on the features and functionality of the SFP, see the SFP help system.

NOTE

IMPORTANT: If your chassis is connected to the host PC via a LAN connection, and Agilent Connection Expert has discovered the chassis as a LAN device, then the Soft Front Panel software will also find the chassis.

However, if you connected the chassis to the host PC via PCIe cable, you must manually add the chassis to the LAN device tree. This is true, even if Agilent Connection Expert has found the chassis and listed it under the PXI device tree. To add the chassis as a LAN device, select the LAN tree, then select Add Instrument. The chassis must be added as Socket protocol (typically port 5025).

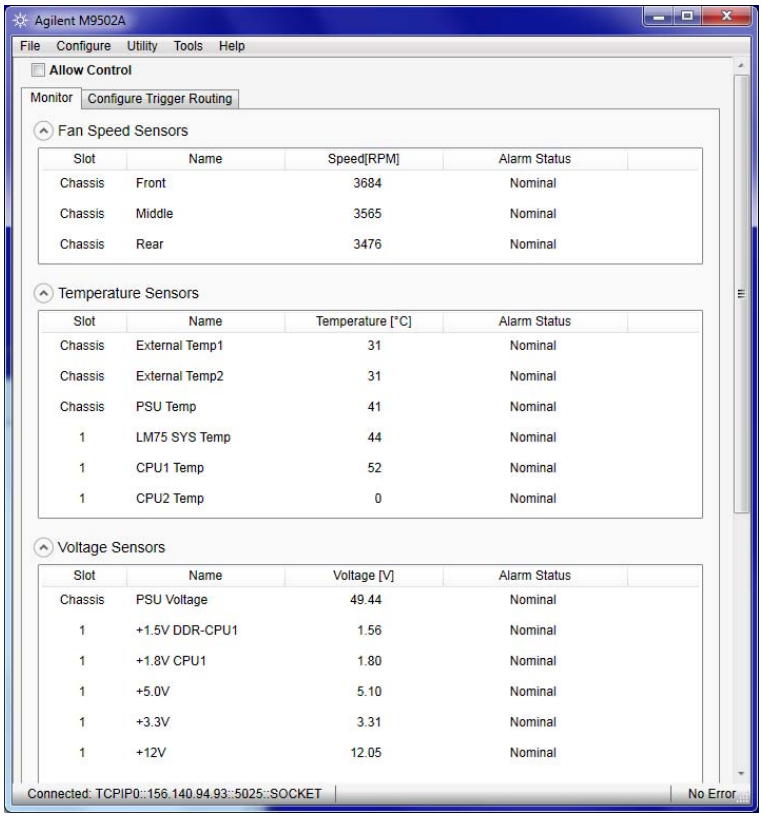
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SFP Screens

The SFP contains two screens, the **Monitor** screen and the **Configure Trigger Routing** Screen.

Monitor screen

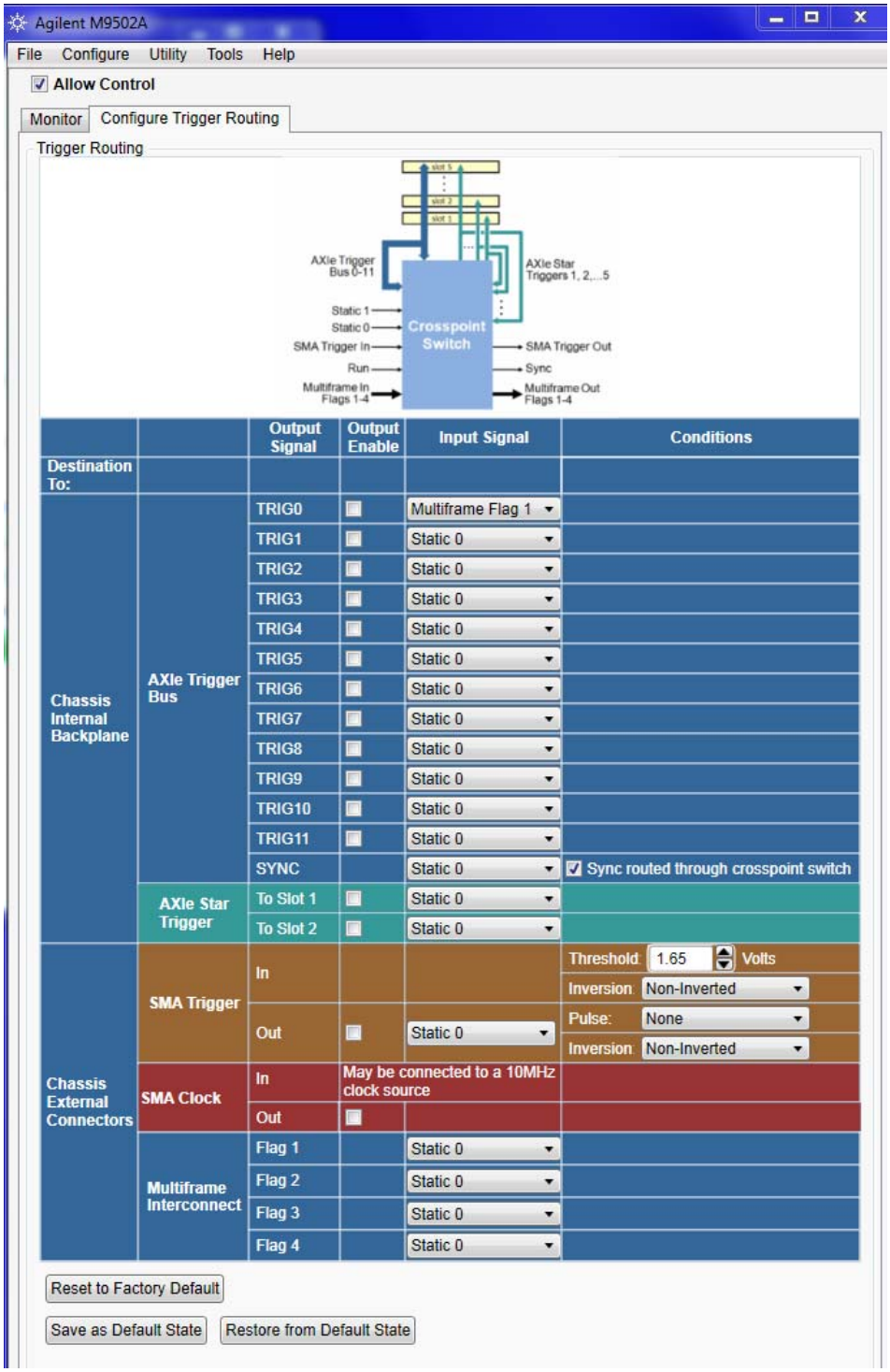
The **Monitor** screen is used to monitor the chassis fan speeds, the temperature sensors, and the chassis voltages. The following graphic shows an M9502A 2-slot chassis with a module in slot 1 that has both Temperature and Voltage sensors.



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Configure Trigger Routing

The **Configure Trigger Routing** screen is used to configure the inputs and outputs of the chassis Crosspoint Switch.



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Note that the **Allow Control** check box in the top-left corner of the window must be checked in order to make changes to the trigger routing. This check box is provided to prevent changes from being inadvertently made to the trigger routing.

Below the Configure Trigger Routing table are three buttons:

- **Reset to Factory Default:** This button resets the chassis trigger subsystem to the factory default configuration, including setting TriggerInThreshold to 1.65 VDC, connecting Static 0 to all crosspoint switch inputs, and disabling the Trigger Bus and Star Trigger Output Buffers.
- **Save as Default State:** This button saves the trigger subsystem configuration as the new power-on default configuration, replacing the current power-on default configuration. The just-saved configuration is re-applied using the Restore from Default State button. Only one state can be saved.
- **Restore from Default State:** This button restores the trigger subsystem to the power-on default configuration. The power-on default configuration can be a previous configuration saved by using the Save as Default State button. Otherwise, the power-on default configuration is the factory default configuration.

NOTE In the Simulation Mode, the Save as Default State button does not actually save the configuration. The Restore from Default State always restores the Factory Default configuration. The state is saved in the chassis hardware, hence, in Simulation Mode, there is no ability to save or recall states.

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5
Features and Functions

This chapter explains the monitoring, synchronization, triggering and signal routing options for the AXIe chassis.

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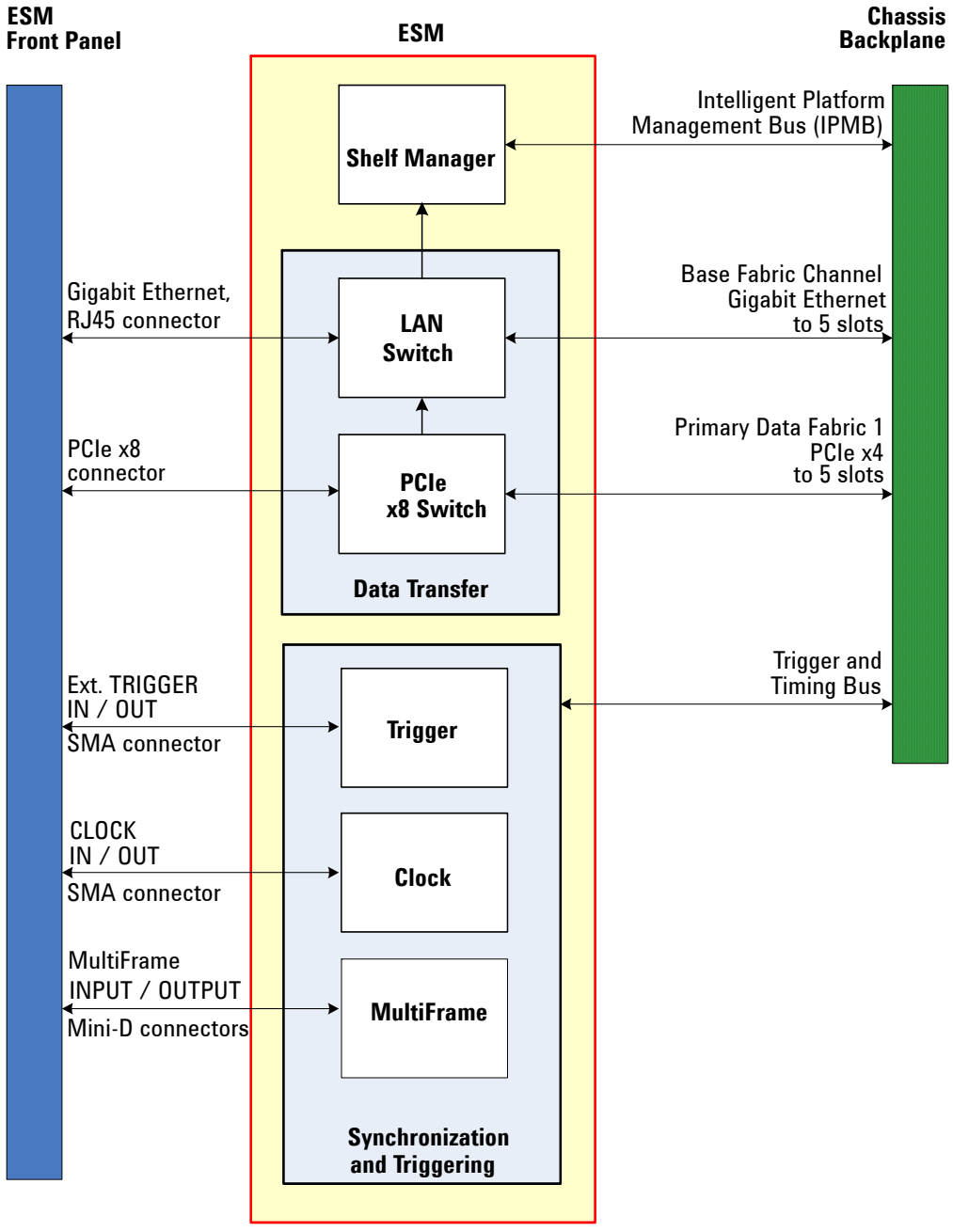
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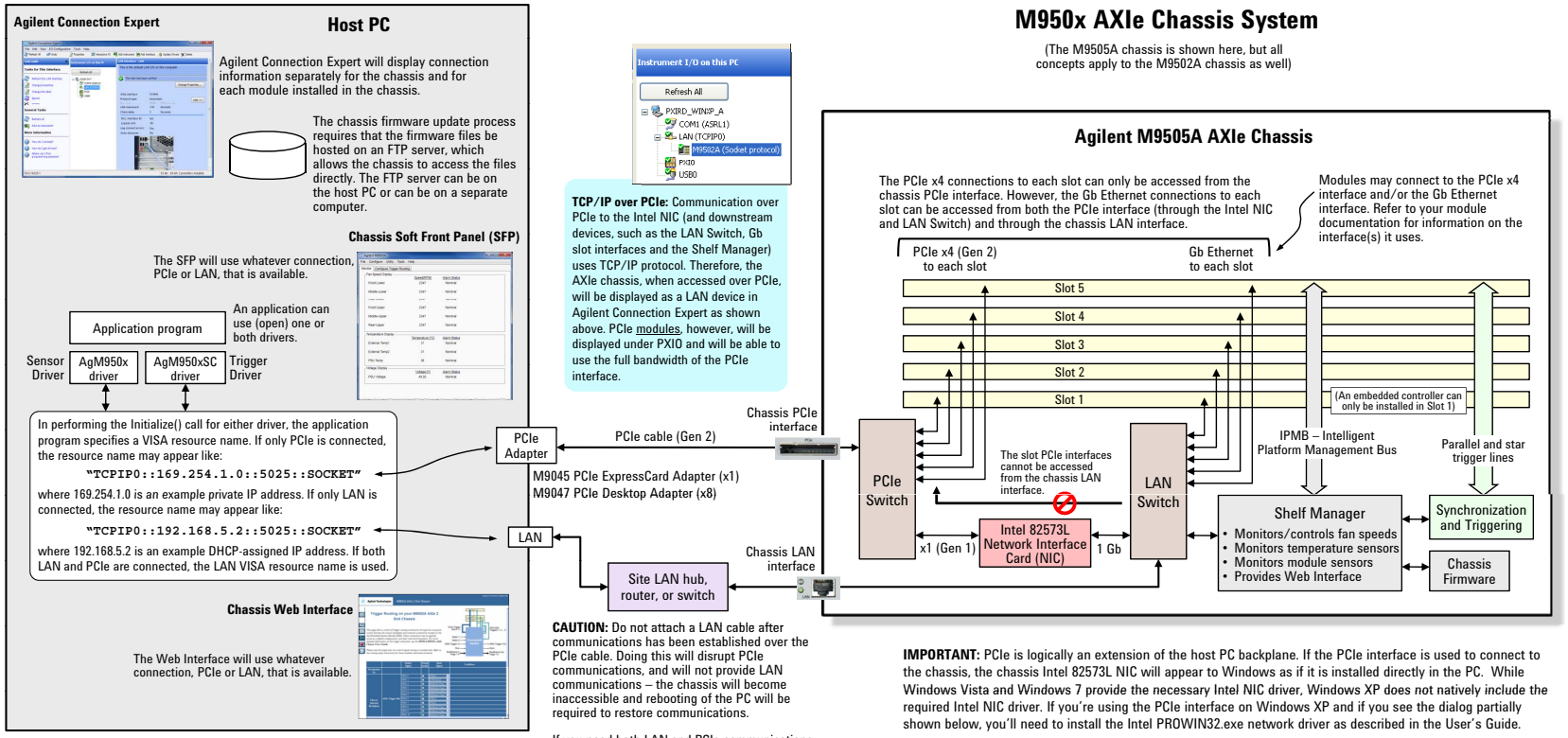
Chassis Block Diagram

Below is a high-level diagram showing how signals are routed between the Embedded System Module (ESM), front panel, and chassis backplane slots.



A block diagram of an M9505A 5-slot AXIe chassis system is presented on the next page.

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NOTES:

1. PCIe and LAN connectivity:
   - A. If the chassis PCIe interface is connected and the chassis LAN interface isn't connected, the Intel NIC provides a means for the PC to access the LAN Switch – this provides PC access to the Shelf Manager as well as access to the Gb Ethernet connections to each slot.
   - B. While the Intel NIC allows the host PC to use the PCIe interface to access the LAN Switch (and the devices connected to the LAN Switch), the reverse does not apply -- the PC cannot use the LAN interface and the Intel NIC to access the slot PCIe x4 interfaces..
2. PCIe Generation ("Gen") 1 peak speed is 2.5 Gb/s per lane. PCIe Gen 2 peak speed is 5.0 Gb/s per lane. Taking into account encoding and other overhead, typical Gen 2 performances in MB/s and GB/s are as follows for x1, x4 and x8:
   x1: 500 MB/s
   x4: 2 GB/s
   x8: 4 GB/s
3. The PCIe Switch internal buffering allows the chassis to communicate to the host PC at 4 GB/s, and simultaneously communicate at 2 GB/s to each of two x4 module slots. Factoring in certain overheads, nominal data rates of 1.85 GB/s per slot can be achieved.

IMPORTANT: PCIe is logically an extension of the host PC backplane. If the PCIe interface is used to connect to the chassis, the chassis Intel 82573L NIC will appear to Windows as if it is installed directly in the PC. While Windows Vista and Windows 7 provide the necessary Intel NIC driver, Windows XP does not natively include the required Intel NIC driver. If you're using the PCIe interface on Windows XP and if you see the dialog partially shown below, you'll need to install the Intel PROWIN32.exe network driver as described in the User's Guide.



Situations where the above dialog won't be displayed include:

1. If a Windows XP-based host PC contains Intel-based networking, the required Intel NIC driver will likely already be installed – if so, the above dialog won't be displayed.
2. If you're connected to the chassis using *only* the LAN interface, the NIC will not be visible to the Host Controller PC and the above dialog won't be displayed.

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Shelf Management Functions

All AXIe chassis provide these ATCA shelf management functions:

- Monitor and control chassis fan speed
- Monitor chassis backplane temperature
- Monitor module health, as provided by the module vendor (may include voltages and temperatures, fuse status, alarms and alarm setpoints)
- Automatically and safely shutdown power upon a fan tray or power supply unit (PSU) failure

You may monitor chassis behavior and make fan settings as explained below using the chassis *Web Interface*, on the **Chassis Health** page.

Shelf management is implemented in the ESM firmware. You may upgrade firmware through the base interface (LAN) connection.

To Monitor Fans:

You can check the individual chassis fan speeds, fan levels, and status. The fan speeds are listed under the **Chassis** header in the **Sensors** section of the Chassis Health page.

Sensors

Module Slot	Instrument	State	Sensor Readings			
Chassis	5-SLOT-AXIe-MPO	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		120	Temperature	External Temp1	23.00 degrees C
	Nominal		121	Temperature	External Temp2	24.00 degrees C
	Nominal		2	Fan	Front-Lower	2109 RPM
	Nominal		3	Fan	Middle-Lower	2050 RPM
	Nominal		4	Fan	Rear-Lower	2050 RPM
	Nominal		5	Fan	Front-Upper	2080 RPM
	Nominal		6	Fan	Middle-Upper	2139 RPM
	Nominal		7	Fan	Rear-Upper	2080 RPM

Under **Fan Control**, you can monitor Fan Status, Cooling Status, Present Fan Level, and Minimum Fan Level. These are explained in order below.

Configure Fan Control

Fan Status	Normal	
Cooling Status	Normal	
Current Speed Level	42	
Dynamic Minimum Fan Level	42	
Adjust Current Speed Level and Dynamic Minimum Fan Level	40 ↓ ↑ % of maximum RPM	Apply

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Fan Status: The shelf manager continuously monitors chassis fan speed, looking for possible indication that one or more fans are not turning. Nominal fan status represents a fan speed of approximately 2,000 RPM, higher when required by instrumentation load. Below that range, the shelf manager will report an alarm condition for that fan, attempt to increase fan speed and continue to monitor. Failure of one fan will not result in interruption of power to installed modules. The fan status conditions are listed below.

Fan Status	Fan Speed (RPM)	Shelf Manager Response
Nominal	2,000 or higher	Continue monitoring fan speed
Lower Non-Critical		Increase fan speed one step and continue monitoring
Lower Critical		Increase fan speed to maximum and continue monitoring
Lower Non-Recoverable		This usually indicates a fan has stopped turning; increase fan speed to maximum and continue monitoring

Cooling Status: The shelf manager continuously monitors reported module temperatures, looking for indication that one or more modules is outside its optimal temperature range. This range is specified by the module vendor, as are the thresholds for alarm conditions. Typically only high temperatures generate an alarm, although it is possible for a vendor to specify low temperature alarm levels as well.

In the event of a high temperature alarm from any module, the shelf manager will respond by increasing chassis fan speed and continuing to monitor. If the Upper Non-Recoverable level is reached, the shelf manager will shut down power to that module. As this level is set by the module vendor, it may not indicate that the module has failed, only that continued operation is inadvisable until the module cools.

Cooling Status	Module Temp	Shelf Manager Response
Nominal	specified by module vendor	Continue monitoring module temperature
Upper Non-Critical		Increase fan speed one step and continue monitoring
Upper Critical		Increase fan speed to maximum and continue monitoring
Upper Non-Recoverable		Increase fan speed to maximum, deactivate that module and continue monitoring. This usually implies imminent module damage if operation continues;

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Current Speed Level

This is the level the fans are currently operating at and is controlled by the Shelf Manager. It increases from a set minimum as needed to adjust for changes in chassis temperature. The range is from 35 to 100, where 35 is the slowest speed level and 100 is the highest speed level. The speed level indicates an approximate percentage of maximum fan RPM. Therefore, a level of 40 indicates the fans are operating at 40% of maximum RPM, and 100 indicates the fans are operating at 100% of maximum RPM.

Dynamic Minimum Fan Level

This is the minimum fan level the shelf manager algorithm sets as it actively monitors the overall system temperature and temperature threshold events received from instrument modules. Over time, the algorithm adjusts this level towards the user-specified minimum fan level provided the cooling status remains at normal.

Adjust Current Speed Level and Dynamic Minimum Fan Level

This is a user adjustable parameter allowing you to specify a minimum fan speed level. This level is kept in non-volatile RAM until you change it; cycling power to the chassis does not change the minimum fan level. Adjust the minimum fan level by entering a value, or clicking the up/down arrows and clicking the Apply button.

You cannot monitor the PSU fans.

To Control Fan Speed:

You can set the *minimum fan level*, over a range from 35 to 100 as a percentage of maximum fan speed, by setting that level in the Adjust Current Speed Level and Dynamic Minimum Fan Level field and clicking the **Apply** button. This specifies the minimum level at which you want the chassis fans to run. The Shelf Manager will increase fan speed from that minimum—for all (three or six) chassis fans—if required by an alarm condition (low fan speed or high module temperature).

NOTE If the minimum fan speed is changed using the Web Interface, the newly-set value will become the chassis power-on default value. This is unlike other parameters set using the Web Interface, which do not persist through a power cycle. For more detailed information on controlling the fans using the Web Interface, refer to "Configure Fan Control" on page 49.

The power supply (PSU) fans are controlled automatically, you cannot override them.

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To Monitor Chassis Temperature:

There are two backplane sensors which measure chassis temperature in degrees celsius. These temperatures are listed in the **Sensors** section of the Chassis Health page.

Chassis	5-SLOT-AXIe-MPO	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		120	Temperature	External Temp1	32.00 degrees C
	Nominal		121	Temperature	External Temp2	30.00 degrees C

They are provided as an indication of ambient chassis temperature only; the individual slot temperatures reported by installed modules control the chassis fans.

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To Monitor Module Health:

The Sensors section of the Chassis Health page lists sensor measurements for each module slot. The sensors are vendor-specific, and the type of readings will vary by module. Below is a screen capture of the Sensors section from a chassis with two modules installed.

Sensors

Module Slot	Instrument	State	Sensor Readings			
5	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
4	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
3	LPT_AMP_REF_blade	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		1	Voltage	+5.0V	5.17 Volts
	Lower Non-Recoverable		2	Voltage	+3.3V	0.61 Volts
	Nominal		3	Voltage	+2.5V	2.61 Volts
	Lower Critical		4	Voltage	ADC +3.3V IPMI	3.00 Volts
	Upper Non-Recoverable		5	Voltage	+1.8V PROM	2.26 Volts
2	-empty-					
	Status		*ID*	*Type*	*Name*	*Value*
1	aTCA-6100	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		6	Voltage	+1.5V DDR-CPU1	1.54 Volts
	Nominal		7	Voltage	+1.8V CPU1	1.80 Volts
	Nominal		10	Voltage	+5.0V	5.04 Volts
	Nominal		11	Voltage	+3.3V	3.34 Volts
	Nominal		12	Voltage	+12V	12.05 Volts
	Nominal		20	Temperature	LM75 SYS Temp	27.00 degrees C
	Nominal		18	Temperature	CPU1 Temp	32.00 degrees C
	Nominal		19	Temperature	CPU2 Temp	0.00 degrees C
Chassis	5-SLOT-AXIe-MPO	Active				
	Status		*ID*	*Type*	*Name*	*Value*
	Nominal		120	Temperature	External Temp1	32.00 degrees C
	Nominal		121	Temperature	External Temp2	32.00 degrees C
	Nominal		2	Fan	Front-Lower	2347 RPM
	Nominal		3	Fan	Middle-Lower	2317 RPM
	Nominal		4	Fan	Rear-Lower	2288 RPM
	Nominal		5	Fan	Front-Upper	2258 RPM
	Nominal		6	Fan	Middle-Upper	2258 RPM
	Nominal		7	Fan	Rear-Upper	2258 RPM

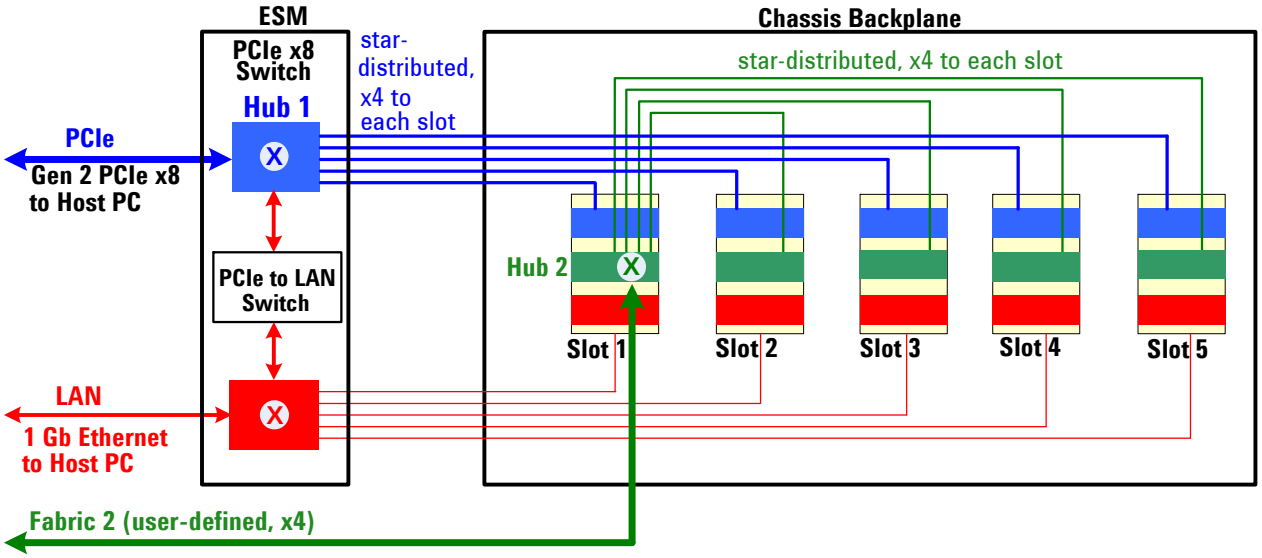
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PCIe and LAN Switching (data transfer)

Data Channels Explained

The AXIe chassis provides three paths for communication and data transfer to and from installed modules:

- Gigabit (Gb) Ethernet
- PCIe
- Fabric 2 (optional, requires instrument hub module)



Gb Ethernet: This is a star-distributed 1 Gb Ethernet:

- From the LAN switch in the ESM—the base channel hub—to each slot.
- From the LAN switch in the ESM to the RJ45 front panel LAN connection; 10/100/1000BASE-TX.

PCIe: This is the high speed primary data path:

- From the PCIe switch in the ESM—the fabric 1 hub—four lanes to each instrument slot through the backplane defined as PCIe x4.
- From the PCIe switch in the ESM to the PCIe x8 front panel connection.

Fabric 2: *Fabric 2*, if implemented, provides a high speed secondary data path through the backplane:

- From an instrument hub module in slot 1—the fabric 2 hub—four lanes to each instrument slot through the backplane; protocol is vendor-defined.
- Fabric 2 data does not pass through the ESM; you must make external connections to the instrument hub to use fabric 2 data

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Implementing Fabric 2

To utilize *fabric 2*, the secondary data path (four channels) through the chassis backplane, you must:

- Install in slot 1 an AXIe instrument hub module designed to implement the fabric 2 star. Access to these backplane signals must be controlled by the instrument hub module.
- Use a remote host PC. With an instrument hub module, you cannot simultaneously use an embedded controller, which must also be installed in slot 1.

Maximizing Data Upload Speeds

The maximum data bandwidth to each slot is dictated by the x4 connection.

You will typically achieve higher PCIe data throughput to a remote (desktop or rackmount) host PC than to an embedded controller.

- Using a high speed rackmount or desktop PC and a x8 cable, the primary data fabric utilizes a x8 connection between the ESM and the host PC. The ESM's PCIe switch can achieve Gen2 upload speeds when transferring data to the host from multiple modules simultaneously.
- If an embedded controller is installed in the chassis, that x8 connection is disabled; the controller uses its slot 1 backplane x4 link to the PCIe switch.
- By using both an instrument hub module and a fast remote host PC with dual x8 cable adapters, you could potentially move two x8 fabric channels to the host at Gen 2 speeds (if the instrument hub outputs PCIe x8).

PCIe, LAN or Both?

You can establish communication between the chassis and host PC over either a LAN or a PCIe connection. In practice, the choice is usually driven by the interface(s) on your modules. For example, if you have a module with a x4 PCIe interface, you'll want to establish a PCIe connection to the chassis.

PCIe Connection Only You may connect the ESM to the host PC using only a PCIe cable. This will allow you to use both the base (LAN) channel and fabric 1 data channels.

Base channel communication between PC, ESM and any LAN capable installed instruments are made through the PCIe connection. A PCIe to LAN switch in the ESM manages the base channel communication to the slots; it is seen as a network interface device by Windows Device Manager.

LAN Connection Only You may connect ESM to host PC using only a LAN cable. You will have base channel communication only and significantly less data throughput that when using PCIe.

Hybrid Operation: You may connect both LAN and PCIe cables from ESM to host PC. This provides the most operational flexibility and some data throughput advantages over using only PCIe.

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Chassis Synchronization and Triggering

The Agilent AXIe chassis provides a rich set of signaling (triggering and timing) options. These allow you to achieve time-aligned operation of multiple instruments installed in a single chassis or MultiFrame (interconnected AXIe chassis system).

NOTE MultiFrame, Agilent's method of interconnecting multiple chassis, is described in "MultiFrame Operation" on page 83. For this chapter, 'instruments in the chassis' includes all instrument modules in the single chassis or MultiFrame. If you are using only a single chassis, the MultiFrame references are inapplicable.

An example of time aligned operation would be starting and stopping some aspect of a test running on multiple instruments in the chassis. The time alignment of these operations can be:

- *Synchronous*: A single event (trigger signal or sync signal), initiated by an external trigger, flag, or other signal transition, triggers one or more instruments simultaneously.
- *Asynchronous:* Instruments operate independently, with their resulting data to be time-aligned post-collection in your analysis software. This requires the data to be referenced to a common clock source.

Moreover, there is capability to group instruments and perform such operations on several independent groups simultaneously. For example, instrument group A can be triggered from a 100MHz clock and instrument group B can receive an external trigger from an event transition in the test environment, while receiving the same clock signal to synchronize the two groups.

Although the triggering and timing options can be inter-operated, it is easiest to understand them using distinct Clock Bus and Trigger Bus diagrams, each providing ESM front panel and backplane signal connections.

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Synchronization

Available Clocks

Clock Outputs The Embedded System Module (ESM) generates a 100 MHz instrument clock signal from its clock bus. This signal is:

- Star distributed to all instrument slots as **CLK100**
- Provided to the ESM's front panel SMA connector **CLOCK OUT**, as a 10 MHz external reference clock (3.3V CMOS, 50Ω)
- Distributed to additional chassis as **MULTIFRAME OUTPUT CLK100**

A separate 100 MHz distributed PCIe fabric reference clock (**FCLK**) is provided from the ESM to all instrument slots.

Clock Sources There are three possible sources for the clock bus in a given chassis. Clock detection logic is automatic, and the input source is chosen in the following priority order, depending on which external inputs are sensed:

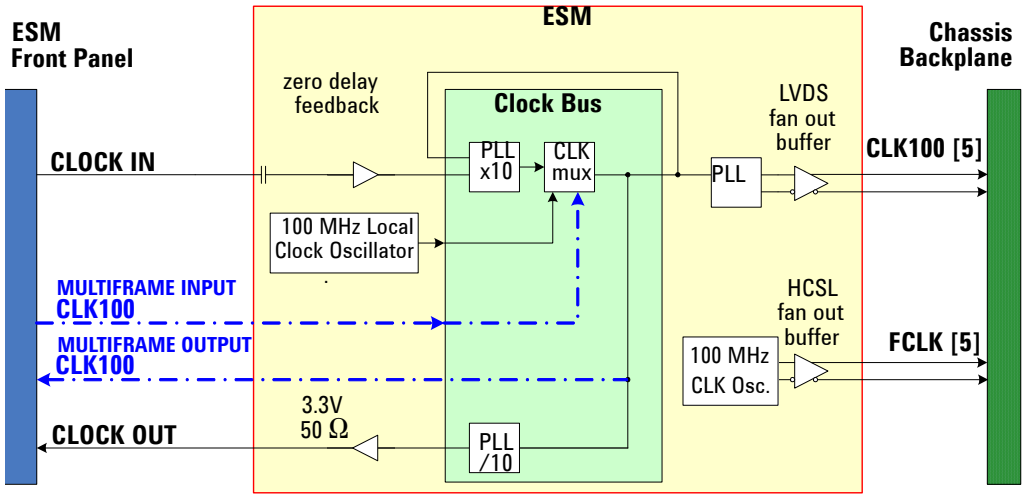
1 An external reference clock (**MULTIFRAME INPUT CLK100**) from the lower chassis connector

2 A 10 MHz external reference clock (**CLOCK IN**) applied at the ESM's front panel SMA connector

NOTE If you choose the external 10 MHz reference clock, it must be present at the front panel SMA connector when the chassis is powered on. If you attach the cable after power is applied, you must cycle power on the chassis.

3 The local 100 MHz clock oscillator within the ESM

Clock Bus Diagram The clock resources are illustrated below.



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Selecting a Clock Bus Source

By default, the clock bus is driven by the local 100 MHz clock oscillator. You can also drive the clock bus from an external reference clock supplied by CLOCK IN or the MultiFrame Cable.

To use CLOCK IN: You can connect a 10 MHz external reference clock source to drive the clock bus on any given chassis.

1 Provide a clock source at that chassis's front panel SMA connector. The chassis will recognize a signal with these characteristics:
   - AC coupled, -5V to +5V input
   - 250 mV minimum swing
   - frequency 10 MHz ±5%

2 The chassis will automatically select CLOCK IN if sensed*

   * When a chassis senses both CLOCK IN and MULTIFRAME INPUT CLK100, MULTIFRAME INPUT CLK100 has priority.

NOTE

If you choose the external 10 MHz reference clock, it must be present at the front panel SMA connector when the chassis is powered on. If you attach the cable after power is applied, you must cycle power on the chassis.

To use MultiFrame INPUT CLK100: In a MultiFrame system, the CLK100 signal sourced from the master chassis drives the clock buses for all slave chassis.

1 The CLK100 signal is provided from the master to each slave chassis's MULTIFRAME INPUT (lower chassis) connector.

2 Each slave chassis will automatically select MULTIFRAME INPUT CLK100 as its clock source if sensed.

Using the Clocks

To use CLK100: Regardless of source, the clock bus output CLK100 can be accessed by AXIe instruments via the backplane or MultiFrame connection.

1 AXIe modules installed in a given chassis may access CLK100 via the backplane.

2 If the module is in a slave chassis in a MultiFrame, its clock source is MULTIFRAME INPUT CLK100 from the Master chassis.

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To use CLOCK OUT: You can extend the clock bus output to *external instruments*. These are instruments which cannot access CLK100 from that chassis, either via the backplane or MultiFrame connection. They may be external to the AXIe chassis or chassis system.

The 10 MHz output is synchronous with the internal CLK100 signal.

1 Connect the external instrument's clock input to the ESM's front panel SMA **CLOCK OUT** connector.

2 Enable the external clock output by checking its **Enable** box on the Web Interface's Chassis Health page.

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
Chassis External Connectors	SMA Clock	In	*May be connected to a 10 MHz clock source.*		
		Out	☑		

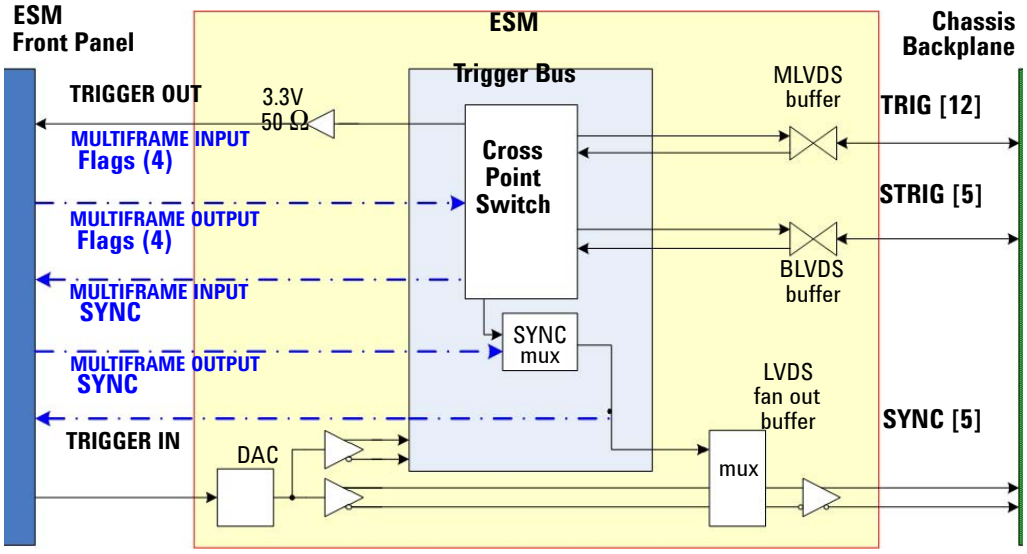
Triggering

This section introduces the AXIe chassis's trigger bus resources and some of the many ways you may use them. Any AXIe instrument can be triggered:

- internally, based on its own automation or signals from DUT connected directly to it
- through an externally applied trigger.
- through the chassis backplane,

The AXIe chassis allows you to trigger instruments—singly, in groups, or all instruments in the chassis—from different signal sources.

The diagram below shows how the triggering resources are derived.



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Trigger Resources

The primary AXIe trigger resource is the Crosspoint Switch. It allows any trigger input to be connected to any trigger output.

Trigger Inputs There are many inputs to the Crosspoint Switch. Any input can be connected to one or more trigger outputs. The inputs include:

- An external trigger (**TRIGGER IN**) applied at the ESM's front panel SMA connector
- Any of the 12 **TRIG** signals. As these lines are bidirectional, any AXIe module can source a trigger via the backplane using them. E-keying is used to manage traffic on the parallel trigger bus.
- Any of the (two to five) **STRIG** signals. As these lines are bidirectional, any AXIe module can source a trigger via the backplane using them.
- Any of the four event Flag signals (**MULTIFRAME INPUT Flags 1 through 4**) from the lower chassis connector
- A MultiFrame SYNC signal (**MULTIFRAME INPUT SYNC**) from the lower chassis connector
- A MultiFrame **RUN** Signal from the lower or upper chassis connector

Trigger Outputs From the diagram, note that the ESM can output six types of trigger signal:

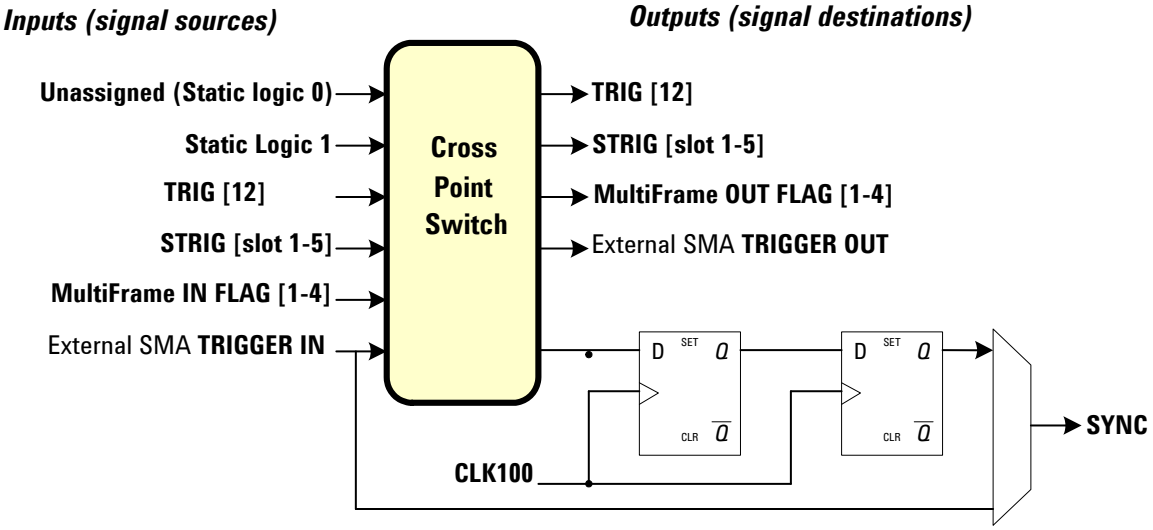
- From the chassis backplane
  - **TRIG**
  - **STRIG**
  - **SYNC**
- From the ESM front panel
  - **TRIGGER OUT** (SMA connector to any instrument)
  - **MultiFrame Out Flags** 1 through 4 (MultiFrame to upper chassis)
  - **MultiFrame Out SYNC** (MultiFrame connector to upper chassis)

Each type of trigger output signal is explored in detail, after a closer look at the Crosspoint Switch.

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Crosspoint Switch

The Crosspoint Switch provides the flexibility of routing many signal events from the backplane, flags or external trigger to different destinations. You can choose to enable and assign the input *source* for any or all of 19 signal *destinations* (trigger/timing resources to be output from the ESM). You can also source a logical 0 or 1 to force any destination low or high for test purposes.



Outputs Each of the Crosspoint Switch outputs (see page 73) can be enabled and driven independently. An output must be enabled before it can be used as an output.

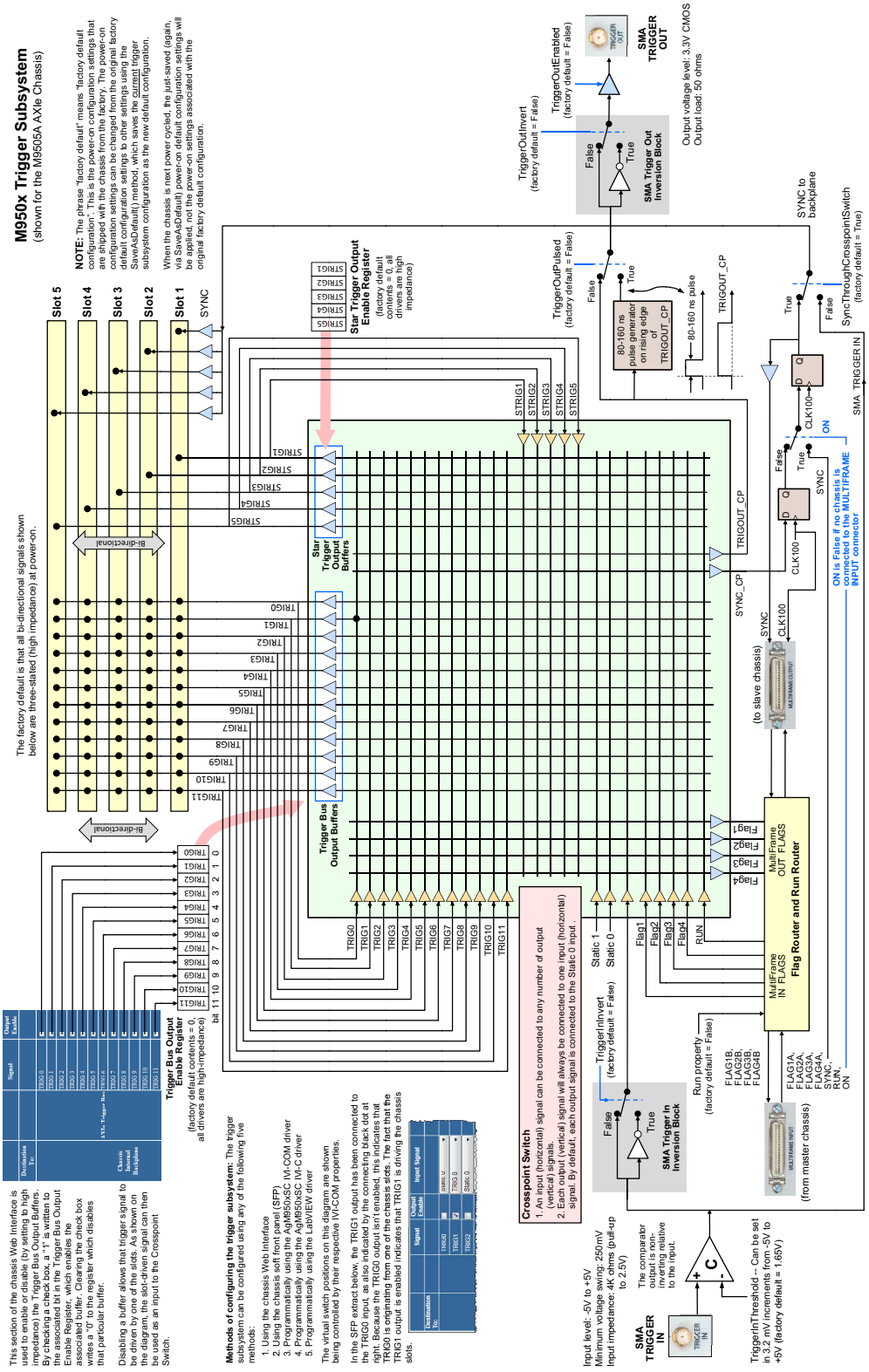
Inputs Any of the Crosspoint Switch inputs (see page 73) can be assigned to any output, except that you cannot assign the same input as the output.

Multiple outputs may be driven from the same input, but each output may have only one input assigned.

The default input for all outputs is **"Static 0"**. If you don't specify the input signal for a specific output signal, the input signal will be logic 0 by default for that output signal.

The detailed trigger diagram "M950x Trigger Subsystem" is presented on page 60.

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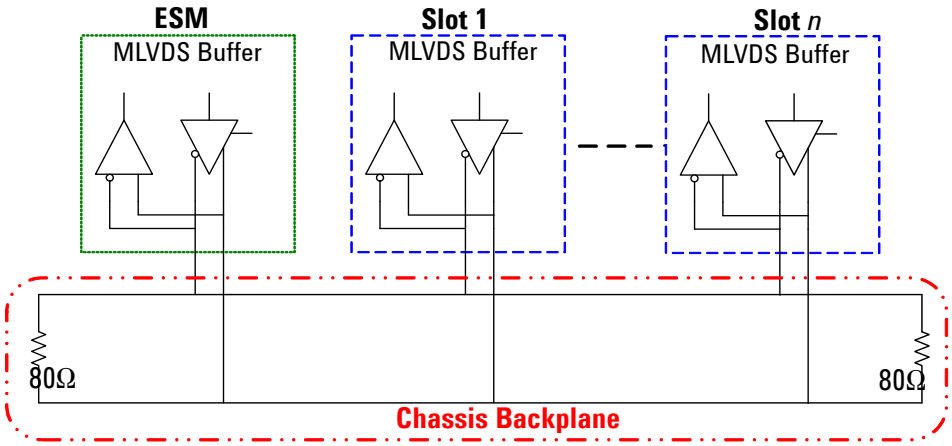
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TRIG

The TRIG bus (TRIG[0,11]) is a set of 12 Multipoint Low Voltage Differential Signaling (MLVDS) signal pairs with the following characteristics representative for each pair:

- Multi-point and bidirectional to all slots plus the ESM
- Backplane terminated with 80Ω at each end
- Requires the instrument module to provide MLVDS buffers (blue lines)
- TRIG bus resources are allocated through E-Keying)

TRIG Bus (one of 12 pairs)



Each TRIG line (signal pair) is a parallel bus, with connections to all logical slots (ESM slot plus the instrument slots). Any instrument in the chassis can send or receive a trigger signal using any of these lines.

Use When: The TRIG bus's multipoint topology makes it fast and direct for module-to-module triggering.

To use a TRIG line as a trigger output:

1 Using the chassis Web Interface, on the **Trigger Routing** page, check the Output Enable box to enable the **TRIG** line as an output signal.

2 From the **Input Signal** drop down list, select an input signal for the output-enabled **TRIG** output.

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
Chassis Internal Backplane		TRIG 0	☑	STRIG Slot 1	
		TRIG 1	☐	Static 0	
		TRIG 2	☑	SMA Trigger In	

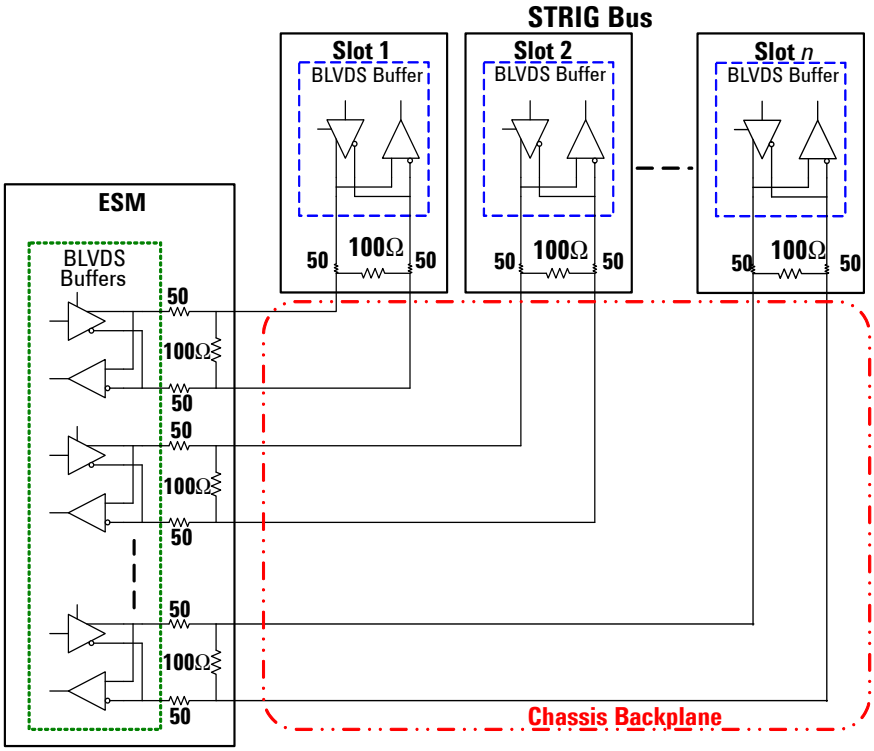
In the above example, TRIG 0 is enabled as an output, and will trigger when slot 1 sends a STRIG signal. TRIG 2 is also enabled, and will trigger when an external SMA trigger is applied.

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STRIG

The STRIG signal is a Bidirectional Low Voltage Differential Signaling (BLVDS) star trigger with the following characteristics:

- Point-to-point and bidirectional between the ESM (logical slot 1) and instrument slots (physical slots 1 through *n*)
- Slot terminated with 100Ω differential and 50Ω series (optional)
- All STRIG lines are trace length matched to 0.025")



Use When: The STRIG bus's trace matched lines ensure the lowest skew when synchronously triggering multiple modules.

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To use a STRIG line as an output:

1 Using the chassis Web Interface, on the **Trigger Routing** page, check an **Output Enable** box to enable any individual slot **AXIe Star Trigger** line as an output signal.

2 From the **Input Signal** drop down list, select an input signal for each output-enabled AXIe Star Trigger output(s).

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
Chassis Internal Backplane	AXIe Star Trigger	To Slot 1	☑	TRIG 0	
		To Slot 2	☑	TRIG 0	
		To Slot 3	☑	TRIG 0	
		To Slot 4	☐	Static 0	
		To Slot 5	☐	Static 0	

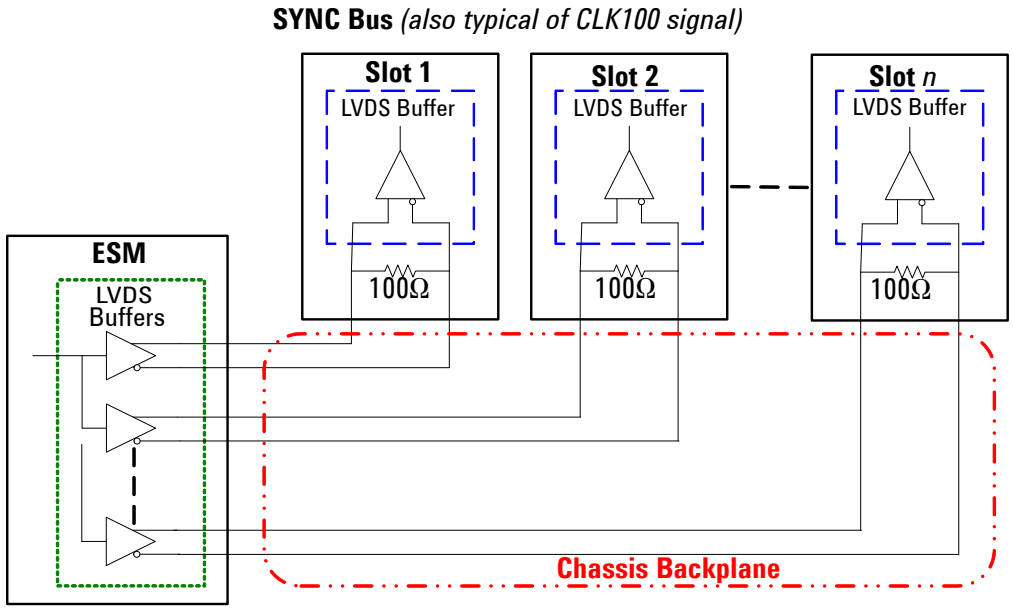
In the example shown above, STRIG output is enabled for slots 1 through 3, and will simultaneously trigger these three STRIG lines when an input signal is received from any instrument on the TRIG 0 bus.

SYNC

The **SYNC** and **CLK100** signals are a Low Voltage Differential Signaling (LVDS) star trigger and a star clock. SYNC provides an LVDS trigger signal, output at the next rising edge of CLK100 after the source trigger is received. The SYNC and CLK100 lines use identical fan out buffers and are trace length matched to 0.25” to operate as a pair, with the following characteristics:

- Point-to-point between the ESM (logical slot 1) and instrument slots (physical slots 1 through n)
- Slot terminated with 100Ω differential

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Use When: For truly synchronous applications, SYNC allows you to trigger multiple instruments both simultaneously and in sync with the reference clock. It can also be used as a general asynchronous star trigger output line.

To use SYNC as a trigger output:

1 Using the chassis Web Interface, on the **Trigger Routing** page, note that **SYNC** is always output-enabled, as it is not bidirectional.

2 From the **Input Signal** drop down list, select an input signal for the SYNC output.

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
Chassis Internal Backplane		TRIG 10	☐	Static 0	
		TRIG 11	☐	Static 0	
		SYNC		SMA Trigger In	☑ Sync routed through crosspoint switch

In the above example, SYNC will be driven high synchronously on the next rising edge of CLK100 after an external SMA trigger input signal is received. To drive the line asynchronously, uncheck the **Sync routed through crosspoint** box; the external trigger will drive SYNC directly.

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TRIGGER OUT

The **TRIGGER OUT** signal (also known as **SMA TRIGGER OUT**) is available on the ESM front panel **TRIGGER OUT SMA** connector with the following characteristics:

- 3.3V CMOS drive, 100 mV minimum swing
- 50Ω output termination

Use When: **TRIGGER OUT** allows you to extend the trigger bus to instruments outside the chassis system or which require an external input.

To use SMA TRIGGER OUT as an Output Signal:

1. Connect a cable from the chassis **SMA TRIGGER OUT** connector to the instrument you wish to trigger.
2. Using the chassis Web Interface, on the **Trigger Routing** page, check the **Output Enable** box to enable the **SMA TRIGGER OUT** signal as an output signal.
3. From the **Input Signal** drop down list, select an input signal to connect to the output-enabled **SMA TRIGGER OUT** output signal.
4. Under **Conditions**, you can select whether or not an 80-160 ns pulse is generated (always on the rising edge of the signal) and whether the signal is inverted just prior to the **SMA TRIGGER OUT** connector. The default is no pulse (“None”) and Passthrough (no inversion).

		Output Signal	Output Enable	Input Signal	Conditions	
Destination To:						
Chassis External Connectors	SMA Trigger	In			Threshold Volts:	1.65
					Inversion:	None
		Out	☑	STRIG Slot 1	Pulsed:	None
					Inversion:	Inverted

In the above example, the **SMA TRIGGER OUT** output signal is enabled and it will output an inverted signal when a STRIG signal is received from slot 1.

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MultiFrame Flags

Four BLVDS flags are provided on the MultiFrame cables. These flags can be distributed among any applications in a MultiFrame chassis that use asynchronous flagging.

A *flag* is an asynchronous pulse, which any instrument in any chassis can generate in response to a signal transition or program command.

Asynchronous flagging is accomplished by sending a flag and having the rest of the system act in a pre-configured way when it receives the flag. Any flag can be set or cleared (by assigning a static 1 or 0) or sourced, using the Web Interface.

The Flag lines are bidirectional. Any chassis can enable any of the four Flag lines as a trigger bus destination or specify a Flag as a trigger bus source; the MultiFrame logic will only allow one source per Flag in the MultiFrame.

Use When: The MultiFrame Flags provide for module to module signaling between modules in different chassis.

To use a MultiFrame Flag as an output signal:

1 As you can see below, there are no **Output Enable** check boxes; the MultiFrame output signals are always enabled.

2 From the **Input Signal** drop down list, select the input signal for each MultiFrame Flag output signal.

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
Chassis External Connectors	Multiframe Interconnect	Flag 1		TRIG 0	
		Flag 2		TRIG 1	
		Flag 3		Static 0	
		Flag 4		Static 0	

In the above example, Flag 1 will output a trigger when an input signal is received from an instrument on the TRIG 0 bus. Flag 2 will output a trigger when an input signal is received from an instrument on the TRIG 1 bus.

Separately, you will need to program other chassis how to respond to a received MultiFrame flag.

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MultiFrame SYNC

A SYNC line is provided on the MultiFrame cables. This can be used to synchronously trigger any AXIe instruments in the MultiFrame.

To use MultiFrame SYNC as a Trigger Output

A SYNC signal output from the master chassis in the MultiFrame will be passed to the other chassis over the MultiFrame cable, as MultiFrame Sync.

To Output MultiFrame SYNC

Using the chassis Web Interface, on the **Trigger Routing** page, from the **Input Signal** drop down list, select the input signal for **SYNC**.

		Output Signal	Output Enable	Input Signal	Conditions
Destination To:					
		TRIG 10	☐	Static 0	
		TRIG 11	☐	Static 0	
		SYNC		SMA Trigger In	☑ Sync routed through crosspoint switch

The master chassis will output the SYNC signal over the MultiFrame cable. Only one chassis in the MultiFrame may be set to output on the shared SYNC line.

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MultiFrame Operation

MultiFrame is an Agilent feature by which multiple measurement instruments in multiple chassis can be interconnected to appear as one integral instrument to the user. It includes hardware, software, and cabling specifications.

In practice, the potential combinations of instruments which can share synchronization and triggering are numerous, and there is no practical limit on the number of chassis which you may interconnect. This section introduces basic MultiFrame connection and features, based on a simple MultiFrame of three M9505A chassis.

NOTE Multiframe operation is an Agilent feature, not an AXIe specification. Cables may be hot plugged.

Use When: Use MultiFrame to increase the number of measurement modules which utilize a common time base or cross triggering to achieve correlation. The MultiFrame cables extend trigger and timing features to instruments not connected to the master chassis's backplane.

Shared Features

All chassis (therefore all installed instruments) in the MultiFrame can share:

Clock Source A common 100 MHz clock is sourced from the master chassis. The time offset for clock signals to traverse the cable and signal path between each pair of chassis is about 35 ns. The MultiFrame design calibrates this out, within about 600 ps of error.

Cross Synchronization A common SYNC signal is sourced from the master chassis. The time offset for SYNC to traverse the cable and signal path between each pair of chassis is about 35 ns. The MultiFrame design calibrates this out, within about 600 ps of error.

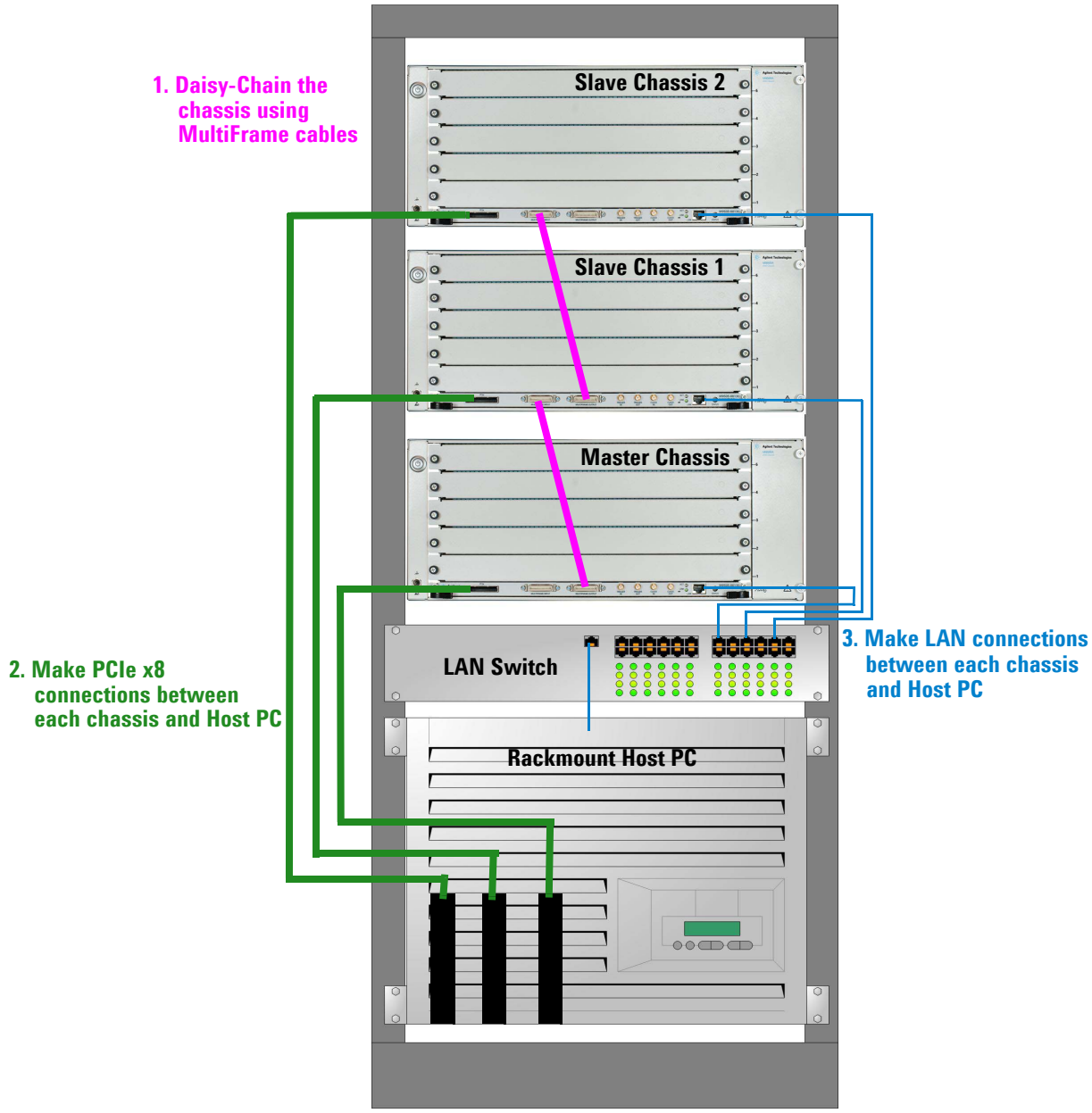
Cross Triggering Any instrument in the MultiFrame can source or receive a trigger, using any of the four Flag signals carried between chassis using the MultiFrame cables.

NOTE MultiFrame cables (such as the Y1223A and 1224A) can be hot plugged; that is, you do not need to cycle chassis power when connecting multiple chassis. The slave chassis detects the presence of the MultiFrame cable and automatically switches its clock source to the master chassis' clock output from the MultiFrame cable.

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Interconnection

You will need to interconnect the chassis using MultiFrame cables, then make LAN and PCIe connections between the chassis and host PC. The illustration below shows an example of a three-chassis MultiFrame connection with a rack-mount host PC and a LAN switch. Instrument modules are not shown.

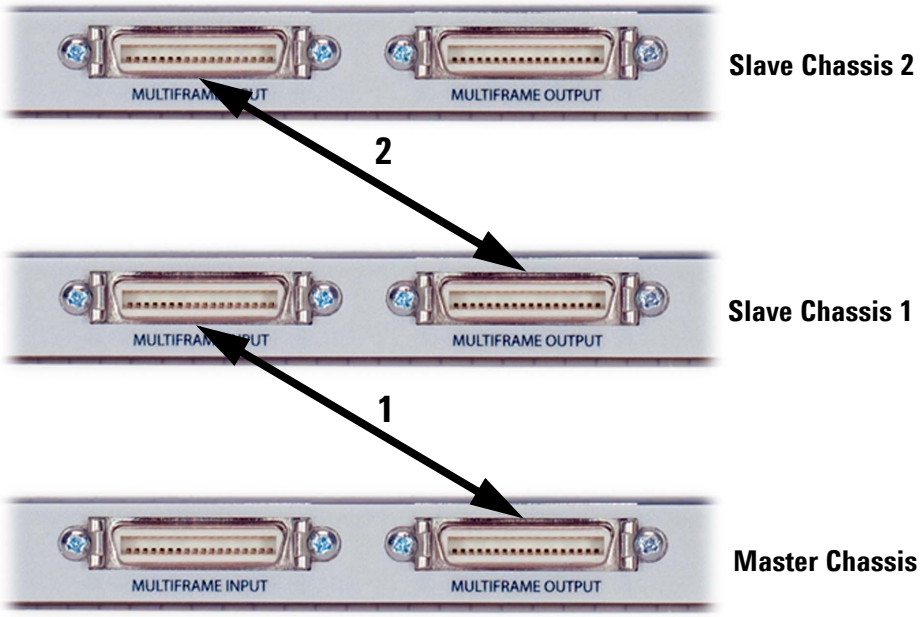


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To Connect a MultiFrame Chassis:

Daisy-Chain the Chassis Interconnect the MultiFrame ports as follows:

1 Using an Agilent Multi-Chassis cable (see table below), connect the Master Chassis's MULTIFRAME OUTPUT port to the first slave chassis's MULTIFRAME INPUT port.



Agilent Part Number	Description
Y1223A	AXIe Multi-Chassis Cable, 0.5M
Y1224A	AXIe Multi-Chassis Cable, 3M

2 Repeat Step 1 from each slave chassis's MULTIFRAME OUTPUT port to the next slave chassis's MULTIFRAME INPUT port.

Make LAN Connections Make host LAN connections as follows:

1 Connect each chassis's LAN port to a Gigabit Ethernet switch or hub, and connect the hub to the host PC.

Make PCIe Connections Make host PCIe connections as follows:

1 For chassis requiring PCIe data transfer, connect each of those chassis's PCIe x8 ports to a PCIe x8 cable adapter in the host PC.

2 Some adjustment of BIOS or OS settings may be required to properly recognize and enumerate all instruments on the host PC's PCIe bus.

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LVDS Local Bus

The M9502A and M9505A chassis backplane provides a *local bus* with 62 differential signaling pairs between each pair of adjacent instrument physical slots. This bus is the Low Voltage Differential Signaling or LVDS bus.

Availability of these signal lines to any module will depend on vendor implementation of the Zone 2 connectors and related commands to manage signaling on the local bus. See "Interconnection" on page 84 for a look at these connectors.

The chassis provides these local bus pairs on Zone 2 backplane connectors P20-P24. Most instrument modules will load connector P20 to access the trigger and timing bus, and will load connector J23 in order to utilize the AXIe base and data fabrics. Connector J23 provides the first 22 local bus pairs from backplane to module.

Modules designed to take maximum advantage of the AXIe local bus will load additional connectors (P24, P21) and expand the local bus up to 42 or 62 signals to each adjacent module slot. If P24 (or P24 and P21) are loaded on your module, likely the vendor is utilizing the local bus.

Check with the module vendor for any instrument in your AXIe chassis to determine if it utilizes the AXIe local bus and what functionality that feature provides you.

Electronic Keying (E-Keying)

Electronic keying is one of several capabilities AXIe inherits from the AdvancedTCA architecture. Like ATCA, AXIe promotes a fabric independent (also known as fabric-agnostic) backplane with respect to local bus connectivity.

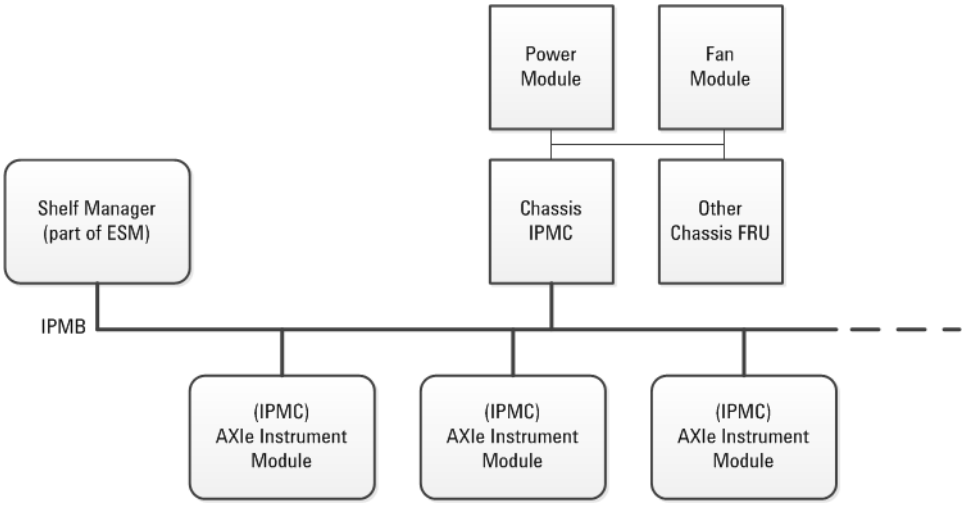
Each module plugged into a chassis may provide various communication protocols and hardware signaling that connect to pins on the backplane that link adjacent modules together. In general, the backplane itself does not provide internal buffering, so a link connection between two adjacent modules is simply a wired connection, either configured point to point or tied together on a common bus. This allows different modules in the system to establish their own link protocols provided a connection path exists.

This flexibility frees the chassis configuration from dictating signal levels and protocols involved with any particular link. However, this flexibility presents a challenge: how to know whether the endpoints of a link are compatible or not.

NOTE If you have modules in your system that are E-Keying compatible, refer to the documentation provided with your modules for detailed installation information.

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E-Keying is a process in which compatible matches over links between different modules are identified and enabled to be used. The E-Keying process is handled by the chassis shelf manager. Each module in the chassis runs a Intelligent Platform Manager Controller (IPMC). These IPMCs interface with the shelf manager and each other using the Intelligent Platform Management Bus (IPMB). IPMB is basically a side channel protocol built on top of I2C that connects all modules in a chassis together. See the figure below.



The shelf manager has two primary roles:

- Manage the inventory and infrastructure of a chassis by communicating with IPMCs in the chassis:
  - Power requirements of the modules and managing the power module
  - Chassis cooling control of the fan module.
  - Individual Field Replaceable Unit (FRU)* inventory located in non-volatile memory that tracks ATCA and AXIe attributes from each module
  - E-Keying interconnection resources among modules:
    - Point-to-point (P2P) connections for base, fabric, and update channel interfaces. P2P connections are predominately what AXIe is concerned with.
    - Bussed resources for clock and metallic test bus (in ATCA).
- External connectivity to a system manager, using an IPMI connection over Ethernet using a RMCP protocol.

* A field replaceable unit is a part that may be removed from a system and exchanged with another part or returned to a factory for service Examples of FRUs may be a module card in a chassis slot, a fan tray, a power supply, and the chassis frame.

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E-Keying Process

When the chassis powers on, the first step the shelf manager does in point-to-point (P2P) E-Keying is read the backplane P2P connectivity records from the chassis modules. These connectivity records specify the P2P interconnections the backplane routes between specific slots and specific channels on each slot.

Next, for each board loaded in the chassis, the shelf manager reads each board's Field Replaceable Unit (FRU) table for the P2P connections that board makes to the backplane. The shelf manager builds up a connection inventory of all the potential links a particular board can implement. This list is later used to examine the potential logical links each board has to other boards. Each potential link end has a link descriptor that identifies the following information:

- P2P interface on the backplane and a channel number within that interface
- The ports on a given channel that are involved with this link. This may include sets of differential signal pairs.
- Finally, the link type which identifies the specification entity, such as PICMG 3.x, AXIe 1.0, or other specification that fully describes the link classification. The link type may also be an OEM-defined value using a 128-bit Globally Universal Identifier (GUID); each card may support up to 15 different GUIDs.

The shelf manager goes through the backplane connection possibilities, identifying each end of a P2P connection and searches for a compatible link descriptors. If a pair of ends match, such as both ends are PCIe Express x4, then the shelf manager issues a “Set Port State (enable)” command to each board for that link. For the matches that are not found, the shelf manager issues a “Set Port State (disable)” command to ensure that incompatible link connections are kept off.

As a final note, the shelf manager is truly agnostic about specific details of a link protocol. This permits new protocols to be added without modification to the chassis.

For additional information on E-Keying, refer to the AdvancedTCA specification (http://www.picmg.org) and the AXIe specification (http://www.axiestandard.org).

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6
For Module Developers

This chapter provides a detailed look at the AXIe chassis backplane and connectors, provided as a quick reference for AXIe module developers.

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Module Types

The AXIe chassis provide a wealth of options for high speed, low voltage differential (LVDS signaling. Whether you can develop individual instrument modules or modular instrumentation sets, communication between modules may travel across the backplane.

Depending on your application, you have the flexibility create a variety of module types.

- **Instrument Module:** An instrument module can go in any slot and will typically use the AXIe trigger bus resources. It will not typically use the local bus unless it is part of an instrumentation set.
- **Instrumentation Sets:** AXIe provides the opportunity for you to create scalable, modular measurement and test systems which can occupy two or more chassis slots.
  - If you create a two-module instrumentation set intended to occupy adjacent slots, you can utilize up to 62 LVDS backplane local bus lines. This set would function in both the 2-slot and 5-slot chassis, and could be designed to function in any two adjacent slots of the M9505A. Refer to “LVDS Local Bus” on page 86 and “Electronic Keying (E-Keying)” on page 86.
  - You can also create instrumentation sets with up to five AXIe modules, and may implement backplane features and specify module placement as required.
  - Your multiple module instrumentation set can include an instrument hub module installed in slot 1. That hub may use AXIe trigger bus features, communicate between adjacent modules using the local bus, and provide the hub for a secondary x4 backplane data fabric to slots 2 through 5.

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ATCA and AXIe Requirements

Overview

The Agilent AXIe (ATCA eXtensions for Instrumentation) chassis backplanes used in the M9502A and M9505A comply with the AXIe 1.0 Base Architecture Specification. AXIe 1.0 is based on AdvancedTCA® (ATCA) architecture, expanded with several *eXtensions*, all of which will remain electrically compatible with standard ATCA blades. These modifications provide timing, triggering, local bus signaling and data transport features.

Agilent provides this chapter as a quick backplane reference for developers of AXIe instrument and instrument hub modules. It gives a brief explanation of how the M9502A and M9505A chassis implement AXIe features, and provides signal connection pin assignments for module backplane connectors.

NOTE

This summary of AXIe requirements is not intended to replace the applicable module design standards, which specify mechanical, electrical, and logical interfaces between module and chassis. AXIe modules must comply with:

- AXIe 1.0 Base Architecture Specification, available at http://www.axiestandard.org
- AdvancedTCA® PICMG 3.0® Specification, available at http://www.picmg.org

Most ATCA modules should be able to work in an AXIe environment. Conversely, developers should design AXIe modules to be compatible in an ATCA environment.

ATCA Requirements and Exceptions for AXIe 1.0

Mechanical AXIe modules must meet all ATCA mechanical requirements for modules.

Exception: AXIe 1.0 chassis do not accommodate rear transition modules (RTM).

Hardware Platform (shelf) Management AXIe modules must incorporate the ATCA hardware platform management features.

Exceptions:

- AXIe uses an intelligent platform bus (IPMB) for platform management communication between the intelligent FRUs (for example: shelf manager, module IPMC) in a chassis. This IPMB conforms to the ATCA requirements for IPMB-0, but with no IPMB redundancy.
- AXIe modules are not required to support the complete hot swap capabilities of ATCA. However, the module's FRUs are required to support all of the operational states required for ATCA front boards.

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- AXIe modules are not required to have the handle switches that sense the module's insertion and impending removal from the chassis nor the blue hot-swap LEDs.
- AXIe modules do not implement ATCA electronic keying, metallic test bus, and ringing bus.

Power Distribution Dual power supplies are provided to each slot. AXIe Modules may use either or both supply feeds, and must be able to operate over a range from –53VDC to –45VDC.

Data Transport AXIe modules must comply with all ATCA requirements for Zone 2 base and fabric interfaces.

Exceptions:

- AXIe modules only implement a single base interface channel (LAN channel 1).
- AXIe modules may connect to data fabric channel 1 or channel 2, or both.
- Data fabric channel 1, if used by the AXIe module, must implement a PCIe connection, operated from the supplied 100MHz reference clock (FCLK).
- Data fabric channel 2, if used by the AXIe module, may implement proprietary protocols.
- AXIe modules may connect to any of the CLK100, SYNC or STRIG signal pairs, any of the 12 AXIe TRIG pairs, and any number of available pairs on either or both local bus ports.

Synchronization Clock AXIe backplanes maintain the bused topology of most Synchronization Clock signals, and devices implement the same MLVDS signaling levels as ATCA.

Exceptions:

- AXIe architecture expands the use of the ATCA Synchronization Clock Interface. The signals and connector pin assignments for AXIe modules differ from ATCA.

No Update Channel Interface

Exception:

- The AXIe architecture does not implement the ATCA Update Channel Interface. AXIe backplanes implement a single bused MLVDS topology for the signals connecting to those Zone 2 connector contacts, and devices implement different signaling schemes as defined in the AXIe specification. AXIe modules must implement electronic keying appropriate to prevent incompatible connections between AXIe and ATCA devices installed in either system environment.

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AXIe Extensions to AdvancedTCA®

AXIe expands the ATCA specification with several *eXtensions*, Zone 2 customizations which include:

- The AXIe *timing interface*, providing for specific clock distribution and signaling between the ESM and instrument slots 1 through 5. This interface includes timing resources SYNC, CLK100, and STRIG. See "Instrument Synchronization and Triggering" on page 43 for a complete functional description of these timing resources.
- A 12 pair MLVDS *trigger bus*, TRIG[0,11], bused across all slots (the ESM slot and instrument slots 1 through 5). See "Triggering" on page 46.
- A 62 pair *local bus* for signaling between adjacent instrument slots. See "LVDS Local Bus" on page 55.
- The *data transport fabric*, a dual star x4 PCIe gen2 interface:
  - Channel 1 connects the ESM slot in a star configuration to provide an x4 link to each instrument slot
  - Channel 2 star connects slot 1—the instrument hub slot—in a star configuration to provide an x4 link to instrument slots 2 through 5
  - Uses a distributed PCIe fabric reference clock (FCLK) driven from the ESM

  See "LVDS Local Bus" on page 55.
- AXIe chassis implement an extended set of electronic keying records to assure consistent use of AXIe-defined backplane fabrics and resources.

In the AXIe chassis, the ESM acts as logical slot 1 for base fabric signaling (LAN) and channel 1 data fabric signaling (PCIe) signaling in addition to shelf management.

An *AXIe instrument hub module* is an instrument module that may optionally serve as a hub for vendor-defined protocols using the data fabric channel 2 star. An instrument hub module must be installed in slot 1 (logical slot 2), while other AXIe modules can be installed in any slot.

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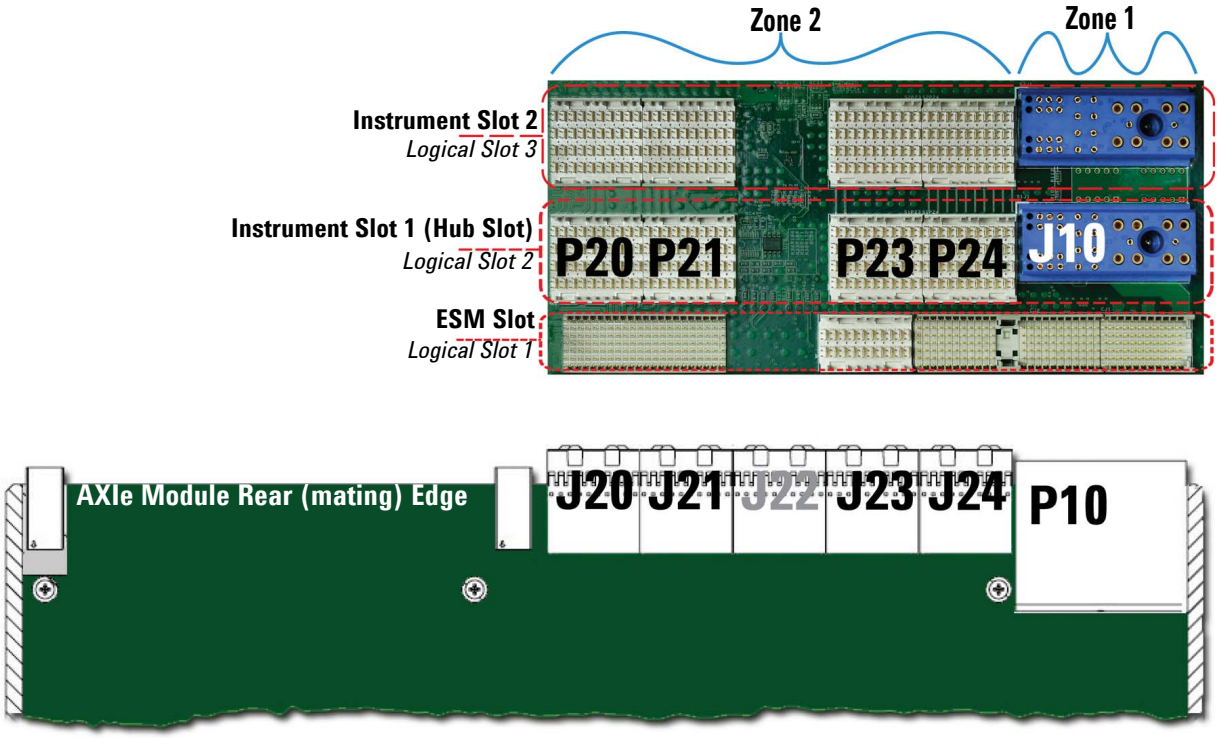
Chassis Backplane Connections

M9502A Backplane

The photo below reveals the M9502A backplane, with modules removed from all slots. The backplane provides Zone 2 connectors P20, P21, P23, P24 and Zone 1 connector J10. Connector designations are shown for instrument slot 1.

The backplane differs from the M9505A in that the 2-slot backplane does not utilize P22 (see "M9505A Backplane" on page 95).

A typical module layout is shown below the backplane photo, with the mating connectors J20 through J24 and P10.



Depending on module type, you may implement all or none of J20-J24 for use in the 2-slot chassis. You will always need connector P10 to power the module. Optionally, you may need connector:

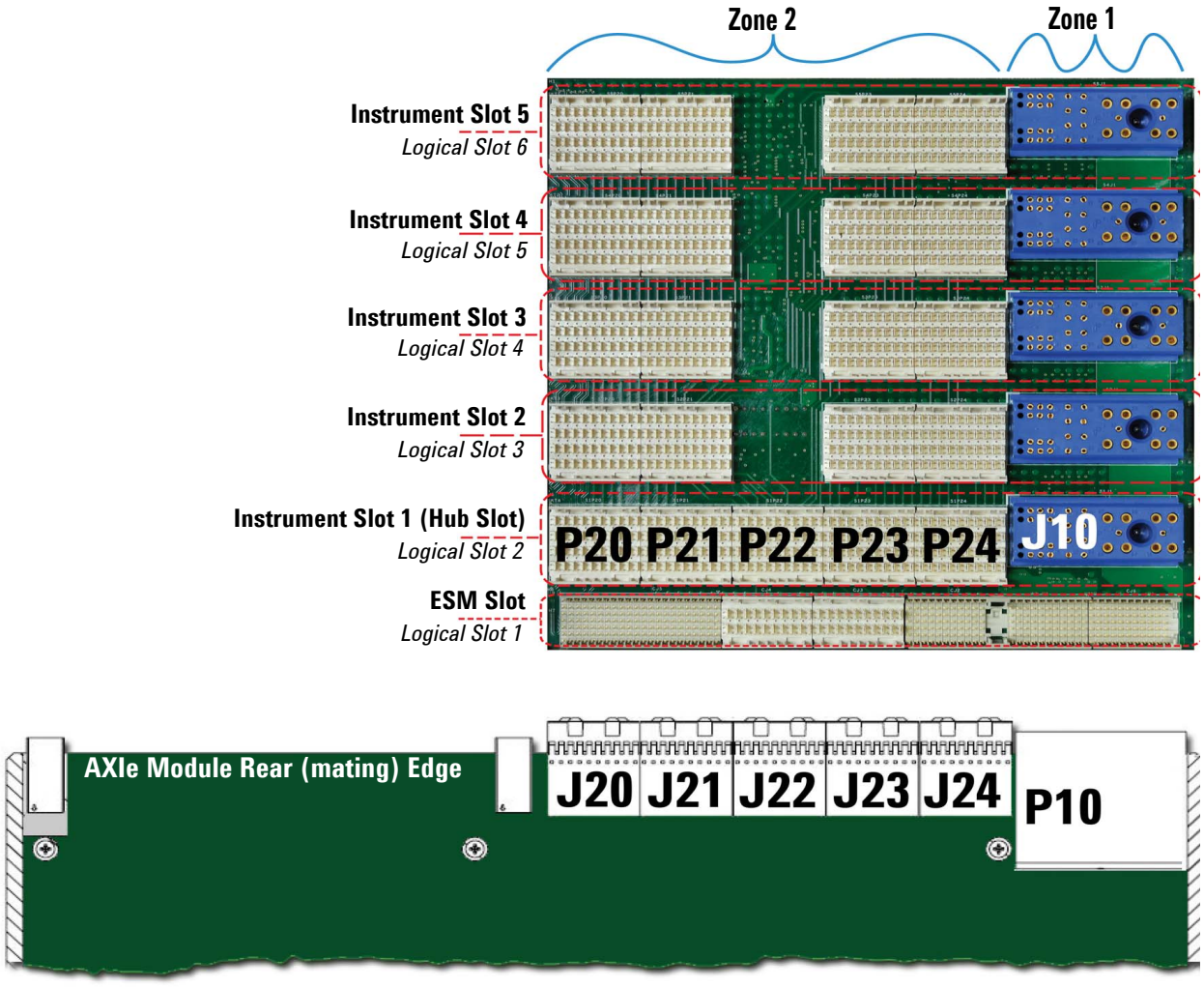
- J20 to use the timing and trigger buses
- J23 to use the base fabric (channel 1) and data fabric (channels 1 and/or 2) interfaces
- J23 and J20 to use up to 22 local bus interface pairs
- J24 to expand local bus use to 42 pairs
- J24 and J21 to expand local bus use to 62 pairs
- J22 if the module is to be used as an instrument hub for the M9505A

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M9505A Backplane

The photo below reveals the M9505A backplane, with modules removed from all slots. The backplane provides connectors P20 through P24 and J10. Connector designations are shown for instrument slot 1. This layout differs from the M9502A backplane in that the M9505A provides an additional slot 1 connector, P22, to implement the data fabric channel 2 star.

A typical module connector layout is illustrated below the backplane photo, with the mating connectors J20 through J24 and P10.



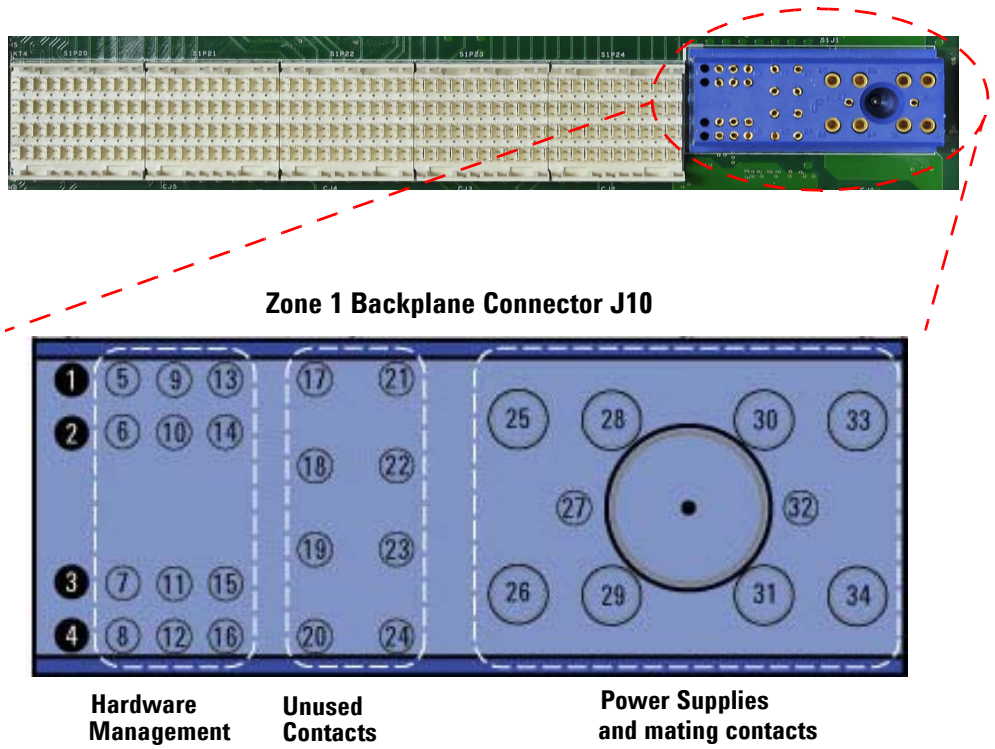
Depending on module type, you may implement all or none of J20-J24, just as with the M9502A. You will always need connector P10 to power the module.

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Zone 1 Connector Layout

The blue jack at far right in each slot is J10, the AXIe Zone 1 backplane connector. Through J10, the chassis distributes power feeds and provides shelf management. AXIe modules should be capable of operating normally from either feed, over a range from –53V to –45V. Your module must provide mating connector P10.

The photo below shows slot 1 from the M9505A, normal chassis orientation. The pin layout for J10 (all slots) is illustrated below the photo.



Zone 1 Connector Usage

Zone 1 provides these connections to each module slot:

- Dual redundant –48 VDC power supplies, per the ATCA specification.
- Hardware management circuits. including the Intelligent Platform Management Bus (IPMB) and Hardware Addressing (HA), per the ATCA specification.
- Metallic test and ringing generator buses are *not* provided in AXIe 1.0. Connector J10 will physically accommodate P10 pins 17-24 from a legacy ATCA module, but with no functionality.

Complete circuit definitions and design specifications can be found in the ATCA 3.0 base specification. Pin assignments are listed on the following page.

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Zone 1 Pin Assignments

The Zone 1 pin assignments and circuit definitions for backplane connector J10 and module connector P10 are listed below:

Power Circuit Contacts for J10/P10

Contact Number	ATCA Designation	Description
25	SHELF_GND	Connection to Shelf Ground and safety ground
26	LOGIC_GND	Ground reference and return for Front Board-to-Front Board logic signals
27	ENABLE_B	Short pin for power sequencing, Feed B, tied to VRTN_B on backplanes
28	VRTN_A	–48 v return, Feed A
29	VRTN_A	–48 v return, Feed B
30	EARLY_A	–48 v input, Feed A pre-charge
31	EARLY_B	–48 v input, Feed B pre-charge
32	ENABLE_A	Short pin for power sequencing, Feed A, tied to VRTN_A on backplanes
33	–48V_A	–48 v input, Feed A, uses ENABLE_A to enable converters
34	–48V_B	–48 v input, Feed B, uses ENABLE_B to enable converters

Legacy ATCA Test Circuit Pins for J10/P10

Contact Number	ATCA Designation	Description
17	MT1_TIP	These backplane J10 contacts will physically accept pins from ATCA modules, but do not provide ATCA metallic test and ringing generator bus circuits.
18	MT2_TIP	
19	–RING_A	
20	–RING_B	
21	MT1_RING	
22	MT2_RING	
23	RRTN_A	
24	RRTN_B	

Hardware Management Circuit Contacts for J10/P10

Contact Number	ATCA Designation	Description
1-4		*Reserved, do not connect*
5	HA0	Hardware address bit 0
6	HA1	Hardware address bit 1
7	HA2	Hardware address bit 2
8	HA3	Hardware address bit 3
9	HA4	Hardware address bit 4
10	HA5	Hardware address bit 5
11	HA6	Hardware address bit 6
12	HA7/P	Hardware address bit 7 (odd parity bit)
13	SCL_A	IPMB clock, Port A
14	SDA_A	IPMB data, Port A
15	SCL_B	IPMB clock, Port B
16	SDA_B	IPMB data, Port B

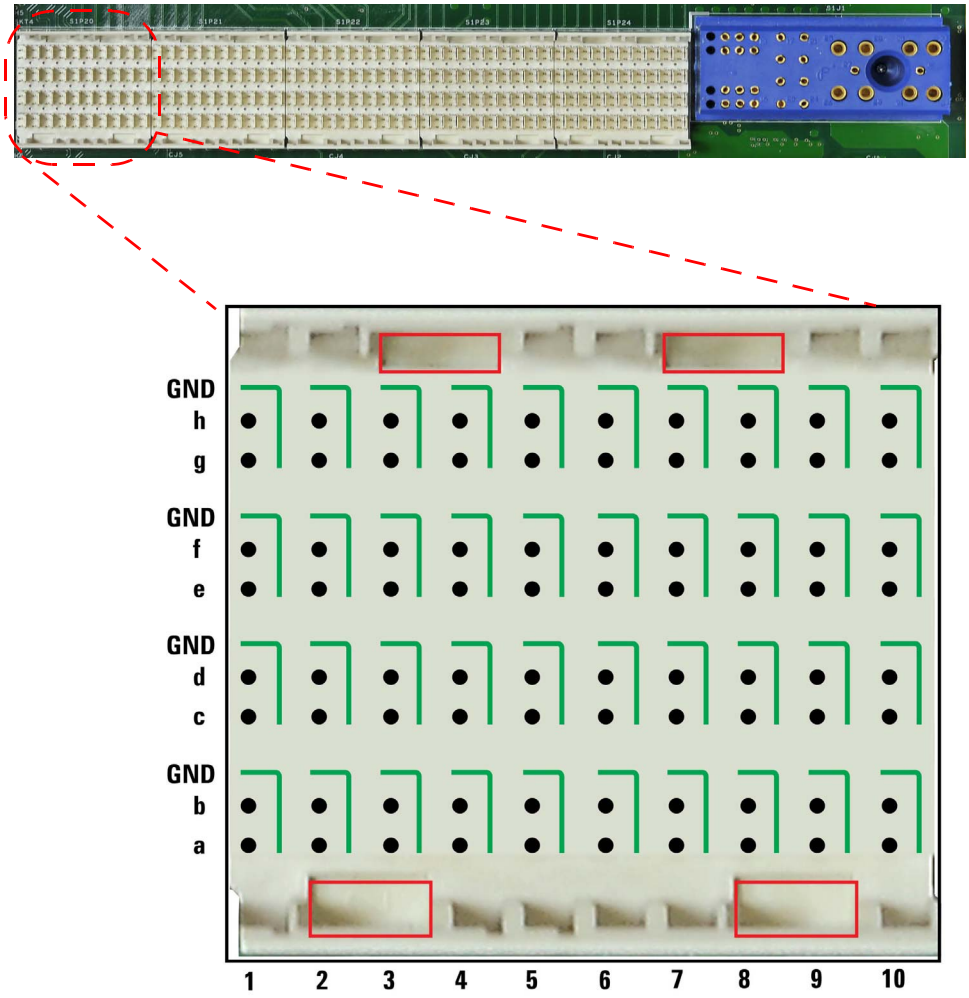
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Zone 2 Connector Layout

The Zone 2 connectors provide pins for up to 200 differential signaling pairs per slot (40 pairs per connector), although most slots and many modules will not feature all these connectors.

Zone 2 provides the signal connections for the data transport fabric and AXIe extensions, using P20 through P24; the white plugs in each instrument slot. Only instrument hub slot 1 on the M9505A uses P22, as shown in the single slot photo below. For complete backplane photos, see “M9502A Backplane” on page 94 and “M9505A Backplane” on page 95.

Each Zone 2 plug provides 40 differential signal contact pairs with ground in 10 columns, four pairs to a column. The pin layout for P20 (typical for all Zone 2 connectors) is illustrated below the slot photo.



These plugs use male contacts; the mating module connectors J20 through J24 use female contacts. Note the areas shown with red boxes; these are for alignment/keying.

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Zone 2 Connector Usage

Your module may implement any or none of the Zone 2 connectors. If you want:

- to utilize the AXIe trigger, timing, data, and local bus (22 pair) features in your module, load connectors J20 and J23.
- to expand the local bus up to 62 pair, load connectors J24 and J21.
- to complete a five-slot star hub for data fabric channel 2—used in instrument hub modules only—load connector J22.

The table below provides a locational map linking each AXIe Zone 2 interface type (function) with its backplane connectors

Interface Type	Interface	Number of Signal Pairs	Chassis Backplane Connector
Trigger Bus	TRIG[0,11]	12	**P20**
Timing Bus	STRIG, SYNC, CLK100 and FCLK	4	**P20**
Local Bus	pairs 0 through 7	8	**P20**
	pairs 8 through 17	10	**P23**
	pairs 18 through 21	4	**P20**
	pairs 22 through 41	20	**P24**
	pairs 42 through 61	20	**P21**
Base Channel		4	**P23**
Fabric Channel 1 *(PCIe x4)*	*from ESM star hub*	8	**P23**
Fabric Channel 2 *(User-defined)*	*from slot 1 instrument hub module*	8	**P23**

For both chassis, these pairs are also provided to slot 1:

Interface Type	Interface	Number of Signal Pairs	Backplane Connector
Fabric Channel 2	Channel 2 star hub *(implemented by hub module in slot 1)* *one x4 connection each to slots 1 and 2*	16	**P23**

For the M9505A chassis only, backplane connector P22 is added to slot 1:

Interface Type	Interface	Number of Signal Pairs	Backplane Connector
Fabric Channel 2	Channel 2 star hub *one x4 connection each to slots 3 through 5*	24	**P22**

Complete circuit definitions and design specifications can be found in the ATCA and AXIe specifications. Pin assignments are listed on the following page.

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Zone 2 Pin Assignments

The Zone 2 pin assignments and circuit definitions for connector pairs P20/J20 through P24/J24 are listed below. For the local bus assignments:

- Pin designations beginning with LBL connect to the adjacent lower slot
- Pin designations beginning with LBR connect to the adjacent upper slot

P20/J20

Row	Interface	Instrument Slot 1-5 (Logical Slot 2-6)							
		ab		cd		ef		gh	
1	Trigger	TRIG[0]+	TRIG[0]–	TRIG[1]+	TRIG[1]–	TRIG[2]+	TRIG[2]–	TRIG[3]+	TRIG[3]–
2	Trigger	TRIG[4]+	TRIG[4]–	TRIG[5]+	TRIG[5]–	TRIG[6]+	TRIG[6]–	FCLK+	FCLK–
3	Trigger	TRIG[7]+	TRIG[7]–	TRIG[8]+	TRIG[8]–	TRIG[9]+	TRIG[9]–	TRIG[0]+	TRIG[0]–
4	Timing	TRIG[11]+	TRIG[11]–	STRIG+	STRIG–	SYNC+	SYNC–	CLK100+	CLK100–
5	Local Bus	LBL[0]+	LBL[0]–	LBL[1]+	LBL[1]–	LBR[0]+	LBR[0]–	LBR[1]+	LBR[1]–
6		LBL[2]+	LBL[2]–	LBL[3]+	LBL[3]–	LBR[2]+	LBR[2]–	LBR[3]+	LBR[3]–
7		LBL[4]+	LBL[4]–	LBL[5]+	LBL[5]–	LBR[4]+	LBR[4]–	LBR[5]+	LBR[5]–
8		LBL[6]+	LBL[6–	LBL[7]+	LBL[7]–	LBR[6]+	LBR[6–	LBR[7]+	LBR[7]–
9		LBL[18]+	LBL[18]–	LBL[19]+	LBL[19]–	LBR[18]+	LBR[18]–	LBR[19]+	LBR[19]–
10		LBL[20]+	LBL[20]–	LBL[21]+	LBL[21]–	LBR[20]+	LBR[20]–	LBR[21]+	LBR[21]–

P23/J23

Row	Interface	Instrument Slot 1-5 (Logical Slot 2-6)							
		ab		cd		ef		gh	
1	Fabric Channel 2	TX2[2]+	TX2[2]–	RX2[2]+	RX2[2]–	TX3[2]+	TX3[2]–	RX3[2]+	RX3[2]–
2		TX0[2]+	TX0[2]–	RX0[2]+	RX0[2]–	TX1[2]+	TX1[2]–	RX1[2]+	RX1[2]–
3	Fabric Channel 1	TX2[1]+	TX2[1]–	RX2[1]+	RX2[1]–	TX3[1]+	TX3[1]–	RX3[1]+	RX3[1]–
4		TX0[1]+	TX0[1]–	RX0[1]+	RX0[1]–	TX1[1]+	TX1[1]–	RX1[1]+	RX1[1]–
5	Base Channel 1	BI_DA1+ (Tx1+)	BI_DA1– (Tx1–)	BI_DB1+ (Rx1+)	BI_DB1– (Rx1–)	BI_DC1+	BI_DC1–	BI_DD1+	BI_DD1–
6	Local Bus	LBL[8]+	LBL[8]–	LBL[9]+	LBL[9]–	LBR[8]+	LBR[8]–	LBR[9]+	LBR[9]–
7		LBL[10]+	LBL[10]–	LBL[11]+	LBL[11]–	LBR[10]+	LBR[10]–	LBR[11]+	LBR[11]–
8		LBL[12]+	LBL[12–	LBL[13]+	LBL[13]–	LBR[12]+	LBR[12–	LBR[13]+	LBR[13]–
9		LBL[14]+	LBL[14]–	LBL[15]+	LBL[15]–	LBR[14]+	LBR[14]–	LBR[15]+	LBR[15]–
10		LBL[16]+	LBL[16]–	LBL[17]+	LBL[17]–	LBR[16]+	LBR[16]–	LBR[17]+	LBR[17]–

P24/J24

Row	Interface	Instrument Slot 1-5 (Logical Slot 2-6)							
		ab		cd		ef		gh	
1	Add for 42-Pair Local Bus	LBL[22]+	LBL[22]–	LBL[23]+	LBL[23]–	LBR[22]+	LBR[22]–	LBR[23]+	LBR[23]–
2		LBL[24]+	LBL[24]–	LBL[25]+	LBL[25]–	LBR[24]+	LBR[24]–	LBR[25]+	LBR[25]–
3		LBL[26]+	LBL[26]–	LBL[27]+	LBL[27]–	LBR[26]+	LBR[26]–	LBR[27]+	LBR[27]–
4		LBL[28]+	LBL[28]–	LBL[29]+	LBL[29]–	LBR[28]+	LBR[28]–	LBR[29]+	LBR[29]–
5		LBL[30]+	LBL[30]–	LBL[31]+	LBL[31]–	LBR[30]+	LBR[30]–	LBR[31]+	LBR[31]–
6		LBL[32]+	LBL[32]–	LBL[33]+	LBL[33]–	LBR[32]+	LBR[32]–	LBR[33]+	LBR[33]–
7		LBL[34]+	LBL[34]–	LBL[35]+	LBL[35]–	LBR[34]+	LBR[34]–	LBR[35]+	LBR[35]–
8		LBL[36]+	LBL[36]–	LBL[37]+	LBL[37]–	LBR[36]+	LBR[36]–	LBR[37]+	LBR[37]–
9		LBL[38]+	LBL[38]–	LBL[39]+	LBL[39]–	LBR[38]+	LBR[38]–	LBR[39]+	LBR[39]–
10		LBL[40]+	LBL[40]–	LBL[41]+	LBL[41]–	LBR[40]+	LBR[40]–	LBR[41]+	LBR[41]–

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P21/J21

Row	Interface	Instrument Slot 1-5 (Logical Slot 2-6)							
		ab		cd		ef		gh	
1	Add for 62-Pair Local Bus	LBL[42]+	LBL[42]–	LBL[43]+	LBL[43]–	LBR[42]+	LBR[42]–	LBR[43]+	LBR[43]–
2		LBL[44]+	LBL[44]–	LBL[45]+	LBL[45]–	LBR[44]+	LBR[44]–	LBR[45]+	LBR[45]–
3		LBL[46]+	LBL[46]–	LBL[47]+	LBL[47]–	LBR[46]+	LBR[46]–	LBR[47]+	LBR[47]–
4		LBL[48]+	LBL[48]–	LBL[49]+	LBL[49]–	LBR[48]+	LBR[48]–	LBR[49]+	LBR[49]–
5		LBL[50]+	LBL[50]–	LBL[51]+	LBL[51]–	LBR[50]+	LBR[50]–	LBR[51]+	LBR[51]–
6		LBL[52]+	LBL[52]–	LBL[53]+	LBL[53]–	LBR[52]+	LBR[52]–	LBR[53]+	LBR[53]–
7		LBL[54]+	LBL[54]–	LBL[55]+	LBL[55]–	LBR[54]+	LBR[54]–	LBR[55]+	LBR[55]–
8		LBL[56]+	LBL[56]–	LBL[57]+	LBL[57]–	LBR[56]+	LBR[56]–	LBR[57]+	LBR[57]–
9		LBL[58]+	LBL[58]–	LBL[59]+	LBL[59]–	LBR[58]+	LBR[58]–	LBR[59]+	LBR[59]–
10		LBL[60]+	LBL[60]–	LBL[61]+	LBL[61]–	LBR[60]+	LBR[60]–	LBR[61]+	LBR[61]–

P22 (M9505 Only)/J22

Row	Interface	ONLY Instrument Hub Slot 1 (Logical Slot 2)							
		ab		cd		ef		gh	
1		NC	NC	NC	NC	NC	NC	NC	NC
2		NC	NC	NC	NC	NC	NC	NC	NC
3		NC	NC	NC	NC	NC	NC	NC	NC
4		NC	NC	NC	NC	NC	NC	NC	NC
5	Fabric Ch 2	TX2[5]+	TX2[5]–	RX2[5]+	RX2[5]–	TX3[5]+	TX3[5]–	RX3[5]+	RX3[5]–
6	*Hub to Slot 3*	TX0[5]+	TX0[5]–	RX0[5]+	RX0[5]–	TX1[5]+	TX1[5]–	RX1[5]+	RX1[5]–
7	Fabric Ch 2	TX2[4]+	TX2[4]–	RX2[4]+	RX2[4]–	TX3[4]+	TX3[4]–	RX3[4]+	RX3[4]–
8	*Hub to Slot 4*	TX0[4]+	TX2[4]–	RX0[4]+	RX0[4]–	TX1[4]+	TX1[4]–	RX1[4]+	RX1[4]–
9	Fabric Ch 2	TX2[3]+	TX2[3]–	RX2[3]+	RX2[3]–	TX3[3]+	TX3[3]–	RX3[3]+	RX3[3]–
10	*Hub to Slot 5*	TX0[3]+	TX0[3]–	RX0[3]+	RX0[3]–	TX1[3]+	TX1[3]–	RX1[3]+	RX1[3]–

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7
Troubleshooting and Service

This chapter provides instructions for updating the chassis firmware, troubleshooting problems with your AXIe chassis, a list of user-replaceable parts, and instructions for parts replacement.

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User-Replaceable Parts 112
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Updating the Chassis Firmware

The current version of your chassis' firmware is listed on the Home Page of the web interface. See "Home Page" on page 40. You can update the AXIe chassis firmware to take advantage of refinements and added features as they become available. To check if a later version is available, go to the website below for your product, then click the tabs/links indicated:

M9502A: www.agilent.com/find/M9502A, then **Technical Support > Drivers & Software** > **Firmware Update**

M9505A: www.agilent.com/find/M9505A, then **Technical Support > Drivers & Software** > **Firmware Update**

Revision string numbering format

The chassis firmware revision string is organized in the following format:

<Chassis Class>.<Firmware Version>-<Chassis Component>-<Acomponent>[-<Bcomponent>]...

Where:
<Chassis Class> is either

F2AX Identifies an M9502A 2 slot AXIe chassis
F5AX Identifies an M9505A 5 slot AXIe chassis

<Firmware Version> is structured as: **<major>.<minor>.<build>**

<major> Identifies the major release number.
<minor> Identifies the minor release number.
<build> Identifies a build number.

<Chassis Component> is a four digit number, <xxxx>

Where <xxxx> is a hexadecimal value identifying the backplane firmware revision. The backplane revision may be different between a 2 slot and 5 slot chassis. While it is possible to move an ESM from one chassis to another, the revision of the target chassis may not reside at the same revision level installed on the ESM (and its previous chassis). It is important to review the revision string after relocation to verify that the complete revision string is current. If not up-to-date, run through the firmware update process.

<Acomponent> is A<xxxx>; **<Bcomponent>** is B<xxxx>

Where <xxxx> is a hexadecimal value for the firmware component. The actual content of these components is for Agilent internal use only.

A firmware revision example: F2AX-1.3.8-0103-A002e-CA1.0-DA1.0-E1.3

This example identifies an M9502A AXIe 2 slot chassis using firmware revision 1.3.8. The backplane revision number is 0103 and component A is at revision 002e, component CA is at revision 1.0, component DA is at 1.0, and component E is at 1.3.

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Troubleshooting

Overview

The Agilent AXIe chassis is typically used as part of a complex test *system*, where system refers to the complete hardware/software system including:

- One or more AXIe chassis with installed application modules
- Connections from modules to devices under test (DUT)
- A host PC running Agilent Connection Expert software, chassis and module device drivers, and programming environment software
- LAN connection from the Host PC to Chassis Web Interface software
- A compatible PCIe host cable adapter installed and configured in the PC
- Compatible PCIe and LAN interface cables

Troubleshooting that complete test system is beyond the scope of this chapter. Agilent recommends that to properly isolate complex operational problems, you take all routine steps to rule out a host software or connectivity issue.

You may also wish to physically isolate the chassis from your DUT or installed modules, to distinguish a module hardware issue from a chassis hardware issue. As a temporary measure, you may (with the chassis powered down) partially remove a module without disturbing DUT connections, by removing it far enough to disengage it from the chassis backplane.

Agilent recommends returning a failing chassis to Agilent Service. They will inspect, test and replace failed components, then retest the chassis.

In general, an AXIe chassis has three major subsystems that can be replaced to service a failing chassis:

- Fan Tray
- Power Supply Unit (PSU)
- Embedded System Module (ESM)

This chapter assumes you can identify a suspected faulty subsystem, or have access to known good replacement subsystems you can swap to help isolate a hardware problem. Detailed step-by-step instructions are provided for fan tray, PSU, and ESM replacement.

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Normal Chassis Operating Behavior

When the chassis is new and operating properly, familiarize yourself with its expected normal power-up and power-down behavior. This behavior involves these observable components:

- Front panel power switch (mechanical feel and indicator light)
- Rear panel circuit breaker (mechanical feel and resulting relay activation)
- ESM front panel STATUS light
- PSU fan operation
- Chassis fan operation
- Web Interface Chassis Health page (fan speeds, fan settings, fan/cooling system status, backplane and slot temperatures)

1 **OFF:** With the chassis plugged into a correct power main, the rear panel circuit breaker open (OFF) and the front panel switch off (flush with chassis), all chassis lights should be extinguished.

2 **BREAKER CLOSED:** Close the circuit breaker (ON). You should observe:

- The breaker handle engages with a solid click, overcoming slight spring pressure.
- After a slight delay, you may hear a softer click; this is a relay closing in the PSU. You may not hear this relay close, due to PSU fan noise.
- The front panel power switch may light briefly, then extinguish.
- The two PSU fans will initially spin up to maximum speed, then gradually step down in speed (4-5 distinct steps) to idle over two seconds. These fans should remain on at idle with the breaker closed.

3 **ON:** Press the ON/STANDBY switch (turn the chassis ON). You should observe:

- The switch will depress (ON) and will light.
- The chassis fans will briefly turn on at high speed, then drop to and remain at low speed, until chassis load dictates otherwise.
- The PSU fans will increase to and remain at high speed.
- The ESM front panel STATUS light will cycle as follows:
  - Amber - ESM is booting; for about 20 seconds
  - Flashing green - briefly
  - Steady green - booted
  - Steady red - the ESM has detected failure and requires service.

4 **WHILE ON:** With the chassis ON, you can monitor real-time shelf management functions using the chassis's Web Interface.

5 **STANDBY:** Press the ON/STANDBY switch again. You should observe:

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- The switch should return to the flush position (OFF) and its light will extinguish.
- The ESM front panel STATUS light will extinguish.
- The chassis fans will turn off.
- The PSU fans will slowly drop in speed, while continuing to cool the PSU from operating temperature to standby temperature.
- Once the PSU cools down, the PSU fans will return to a steady idle speed.

6 **OFF:** Open the circuit breaker (OFF). You should observe:

- The breaker handle releases spring pressure.
- After a slight delay, you should hear a soft click; this is a relay opening in the PSU. You may not hear this relay open, due to PSU fan noise.
- The front panel power switch may light briefly, then extinguish.
- The two PSU fans will turn off.

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Chassis Hardware Troubleshooting

Chassis Fans

If module loads are kept within the 200W per slot rating and adequate ventilation is provided around the chassis, the chassis fans are designed to automatically cool the chassis. If the chassis powers up properly, the fans should be turning at all times, with speed in proportional to thermal load.

There are a few reasons you may suspect a fan tray failure:

- One or more fans does not turn.
- A fan makes excessive bearing noise.
- You observe reduced speed for one or more fans relative to the others.
- One or more fans do not behave as described in "Normal Chassis Operating Behavior" on page 106.
- You experience an overheat condition, whether detected by the chassis Health Monitor, module monitoring software or other means.

In the event you experience unacceptably high chassis or module operating temperatures or other indications of fan failure, follow the procedure below.

To Check Chassis Fan Operation In the event you experience unacceptably high chassis or module operating temperatures, or other indications of fan failure, follow the procedure below.

1. Visually check that all three (M9502A) or six (M9505A) fans are turning. If any fans are not turning, check for and remove obstructions. If there is evidence of excessive buildup on the fan blades, remove the fan tray to clean and reinsert it (see page 119), and recheck. If any fans still do not turn, replace the fan tray. Else continue.
2. Using the Web Interface, access the Chassis Health page. In the Sensors section, each fan is listed individually, with real time speed in rpm.
3. The six speeds should be reasonably close. Identify any that turn more slowly than the group. Any large deviation may indicate reveal early signs of fan failure.
4. Below the fan speed readouts are your fan settings. You may set a higher fan speed to see if the fans are responsive.
5. For fan noise problems, make sure which fans are noisy or not turning properly, by visually inspecting both the PSU and chassis fans through the side of the chassis.
6. For all routine chassis fan failures, replace the fan tray assembly (see "To Replace the Fan Tray" on page 119). For PSU fan failures, replace the PSU (see "To Replace the Power Supply Unit" on page 113).

If the fans are operating correctly and you still have high temperatures, reduce your chassis load or troubleshoot installed modules.

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Power Supply Unit (PSU)

The PSUs are self regulating, constant voltage supplies that will shut themselves down (or not power up at all) if they are out of spec. These are standard ATCA supplies.

The PSU operation is binary. If the supply is delivering voltage within a very wide range, it will turn on its output and power up the chassis. You can then view PSU voltages using the Web Interface. If the system does not power up, it likely has failed and should be replaced (see "To Replace the Power Supply Unit" on page 113).

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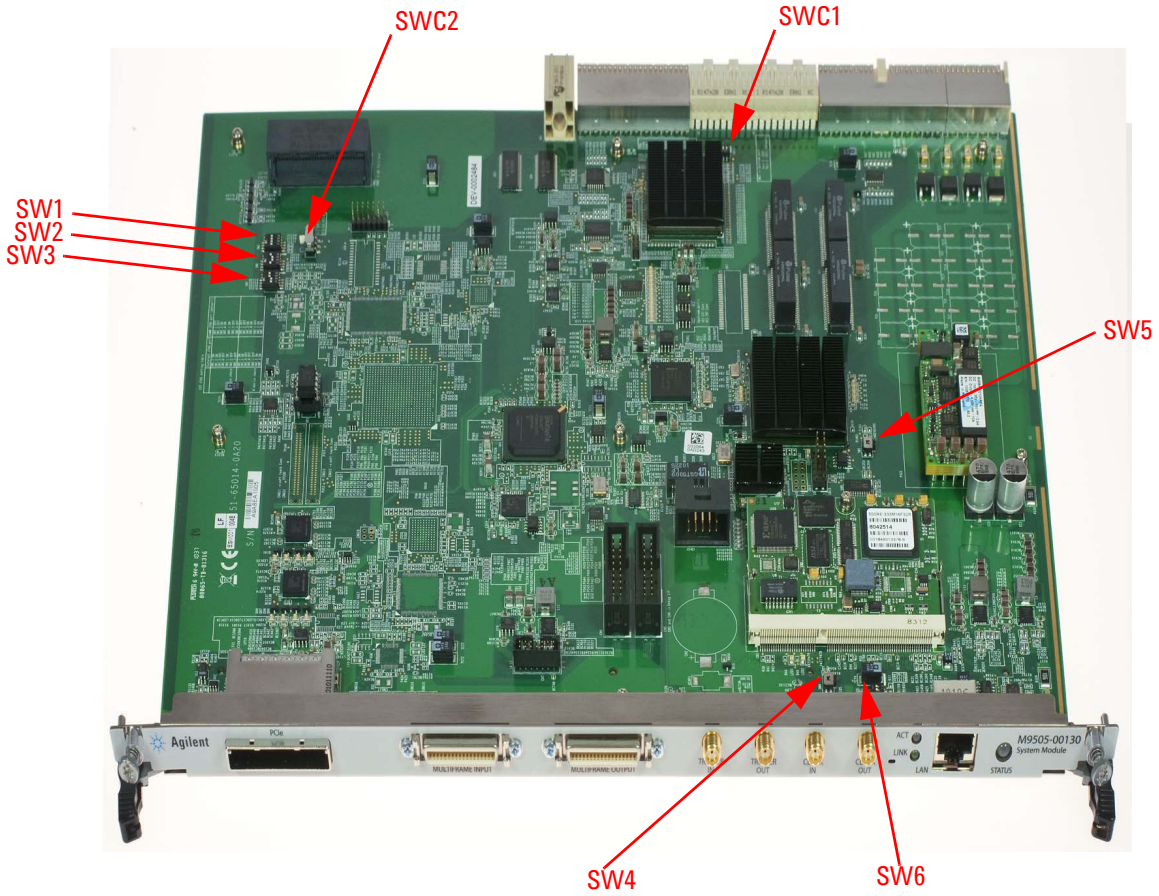
Embedded System Module (ESM)

If, upon power up, the ESM does not boot to a steady green STATUS light, replace the ESM (see "To Replace the Embedded System Module" on page 119).

If replacing the PSU or ESM does not correct an operating problem, and the ESM still fails to boot to a steady green STATUS light, the problem is in the remainder of the chassis; replace it.

To Reset ESM DIP Switches The ESM has several sets of dual in-line package (dip) switches. Should you believe any of these may have been changed, you may verify and reset them to their correct positions; see photo and table below.

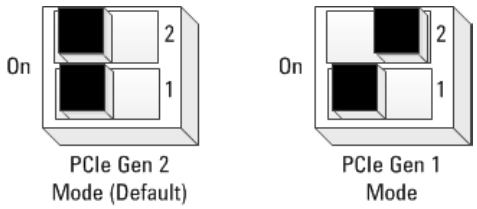
NOTE Most of these switches are reserved for factory testing purposes or reserved for future use and should not be changed.



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Switch Number on ESM	Factory Switch Setting	What it Does
SW1	0011	JTAG Testing (see silk-screen)
SW2	0111	JTAG Testing (see silk-screen)
SW3	1111	JTAG Testing (see silk-screen)
SW4	N/A	Reserved (momentary contact)
SW5	N/A	Reserved (momentary contact)
SW6	2 - left (see below)	Set PCIe Gen 2 (default) speed or Gen 1 speed
	1- left (see below)	Reserved
SWC1	0010	Upstream Port
SWC2	Left	Internal/External PCIe setting (see silk-screen)

A DIP switch (SW6) on the ESM configures the PCIe operational mode setting. The default mode is PCIe Gen 2 operation. If your controller cannot enumerate the AXIe chassis, switch to PCIe Gen 1 speed behavior. See the following figure.



The Chassis Module Configuration Page ("Module Configuration Page" on page 43) indicates the current PCIe mode.

NOTE Turn chassis power off before setting this switch. After setting the switch to either position, the host PC must have power cycled to re-enumerate the chassis.

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User-Replaceable Parts

The following user-replaceable assemblies and accessories are available from Agilent:

AXIe Mainframe	Description of Parts Kit or Subassembly	Agilent Part Number
M9502A	2-Slot Chassis Fan Tray	M9502-00017
	2-Slot Chassis Power Supply Unit	M9502-64800
	AXIe Embedded System Module (ESM)	M9505-00130
	2-Slot Chassis Bumper Kit (includes one handle)	N5650-00018
	2-Slot Chassis Rackmount Kit	N5650-00020
	AXIe Filler Panel Module	N5650-00080
M9505A	5-Slot Chassis Fan Tray	M9505-00017
	5-Slot Chassis Power Supply Unit	M9505-64800
	AXIe Embedded System Module (ESM)	M9505-00130
	5-Slot Chassis Bumper Kit (includes two handles)	M9505-47901
	5-Slot Chassis Rackmount Kit	M9505-00020
	AXIe Filler Panel Module	N5650-00080

Other parts originally supplied with the mainframe may be available from Agilent. Go to https://onlinestore.tm.agilent.com for a current parts list, or contact Agilent Service.

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To Replace the Power Supply Unit

PSU replacement should be performed at a static-safe work station (see"ESD Precautions" on page 9), preferably on the bench. While it is possible—given adequate room for access—to perform this job with the chassis rackmounted, extra caution must be taken to avoid damage to the chassis' back panel wiring or loss of small parts.

To remove the PSU from the M9502A

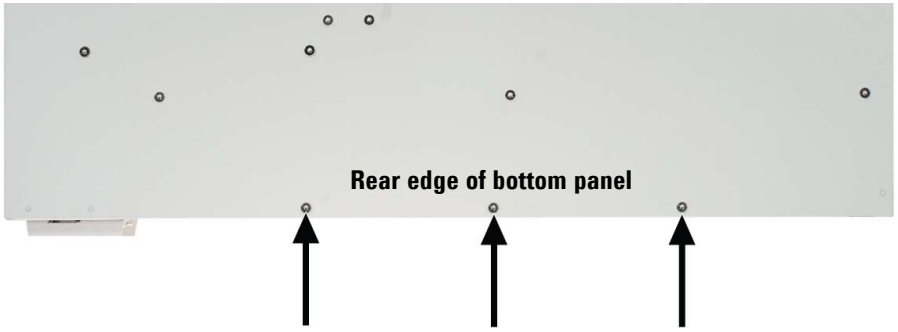
Tools needed: #8 and #10 Torx drivers.

1 Power down and disconnect the power cord from the chassis.

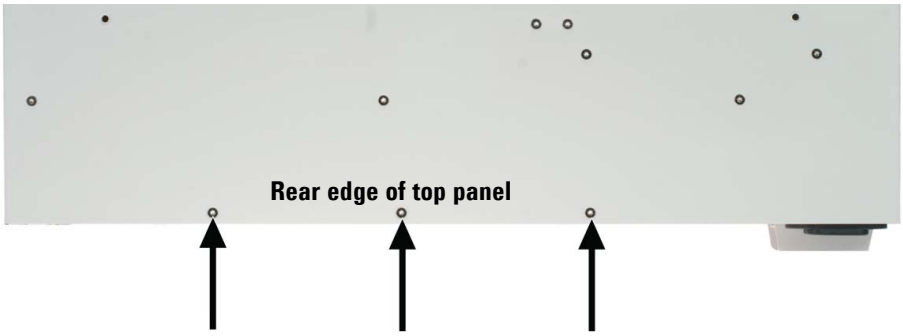
2 If the chassis is rack-mounted, remove it from the rack.

3 If installed, remove the carry handle and rear bumper (see "To Remove the Carry Handle and Bumpers from the M9502A" on page 26).

4 Position the chassis top panel down. Remove the three #8 Torx flat head screws from rear edge of the bottom panel.

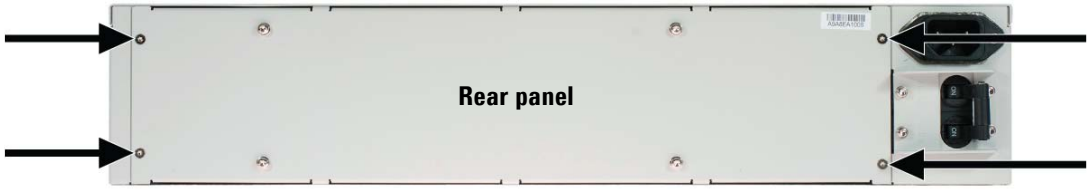


5 Flip the chassis over onto bottom panel (normal orientation). Remove the three #8 Torx flat head screws from rear edge of the top panel.



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6 Remove the four #8 Torx flat head screws from the rear panel.

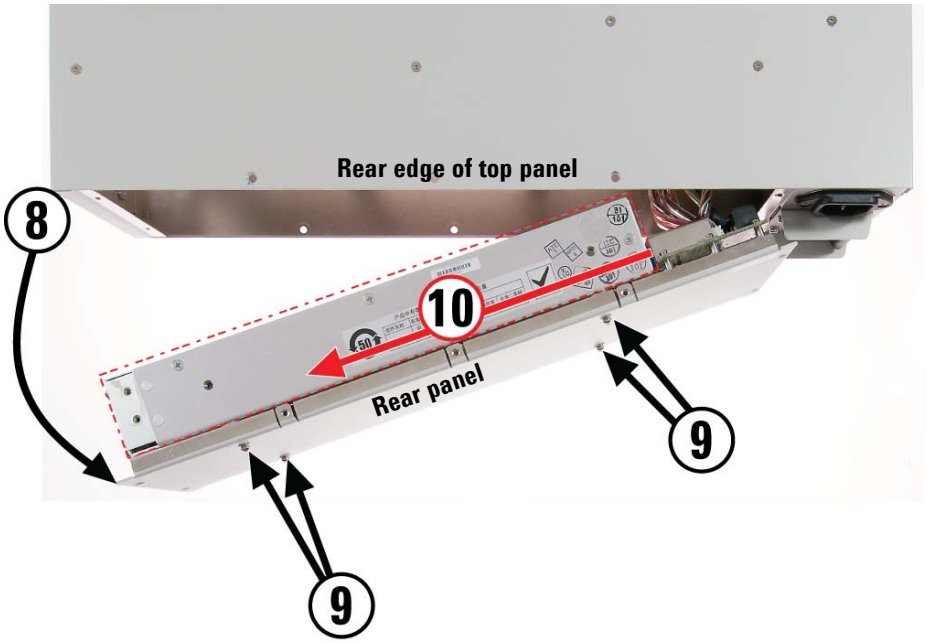


7 The rear panel is now detached from the chassis. Take care not to strain the power connections between the rear panel and chassis.

8 Rotate the rear panel away from the left side of the chassis, as shown below.

9 Remove the four #10 Torx round head screws holding the PSU to the rear panel.

10 While holding the rear panel firmly in one hand, pull the PSU out of its blue chassis connector, in the direction shown below.



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11 The removed PSU is show below, in proximity to its chassis connector.



12 To install the PSU, reverse these steps. The new PSU must be firmly inserted into its chassis connector for its rear panel attachment screws to line up.

To remove the PSU from the M9505A

Tools needed: #8 and #10 Torx drivers.

1 Power down and disconnect the power cord from the chassis.

2 If the chassis is rack-mounted, remove it from the rack.

3 Remove the 16 #10 Torx round head screws from the perimeter of the rear panel, as shown below. Do not remove the similar screws holding the circuit breaker to the rear panel.



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4 The rear panel is now detached from the chassis. Take care not to strain the power connections between the rear panel and chassis.

5 Remove four #8 Torx flat head screws holding the PSU to the rear panel.

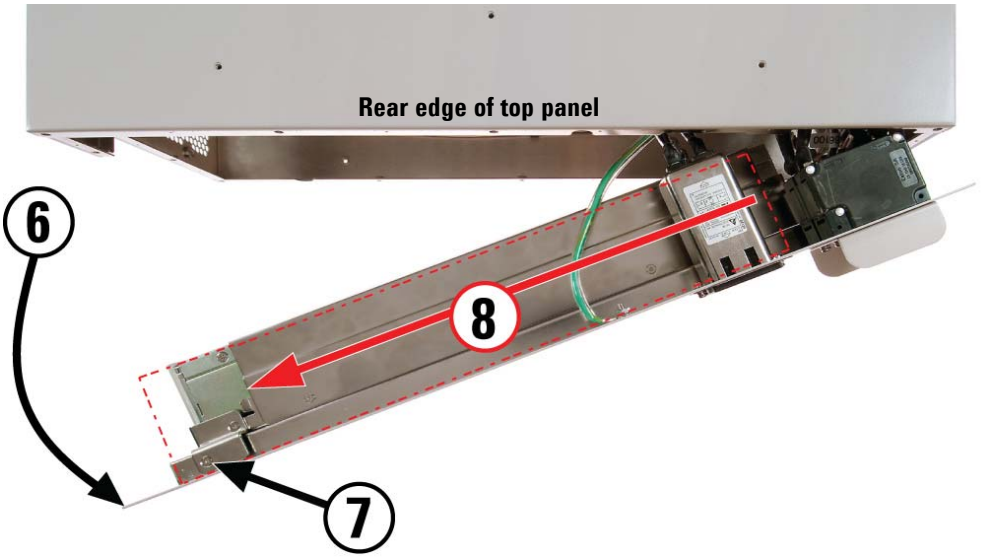


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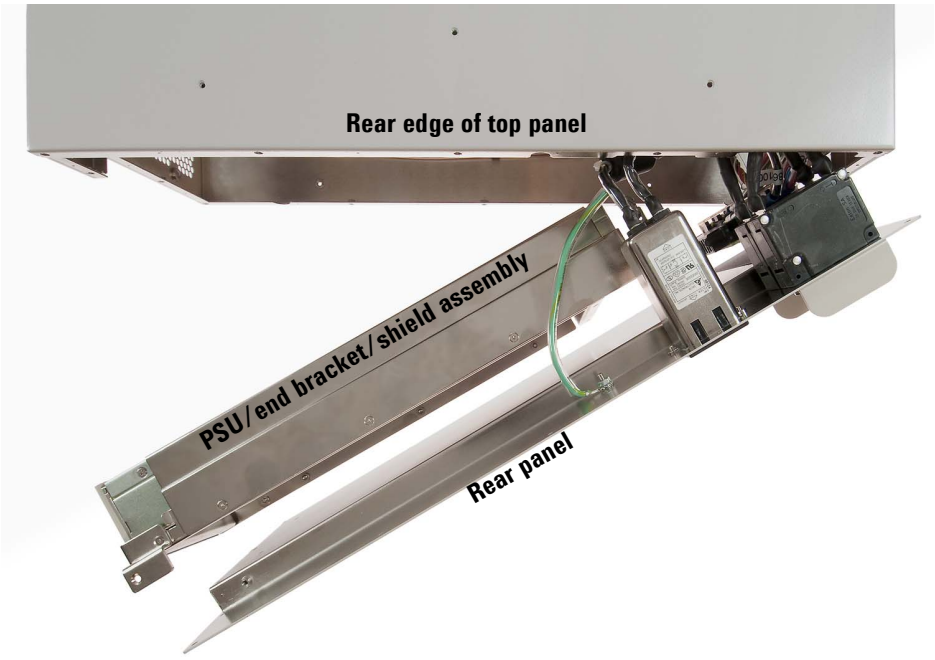
6 Rotate the rear panel away from the left side of the chassis, as shown below.

7 Remove the #8 Torx flat head screw holding the PSU end bracket to the rear panel.

8 While holding the rear panel firmly in one hand, pull the PSU/end bracket/shield assembly out of its chassis connector, in the direction shown below.



9 The removed PSU/end bracket/shield assembly is show below, in proximity to its chassis connector...

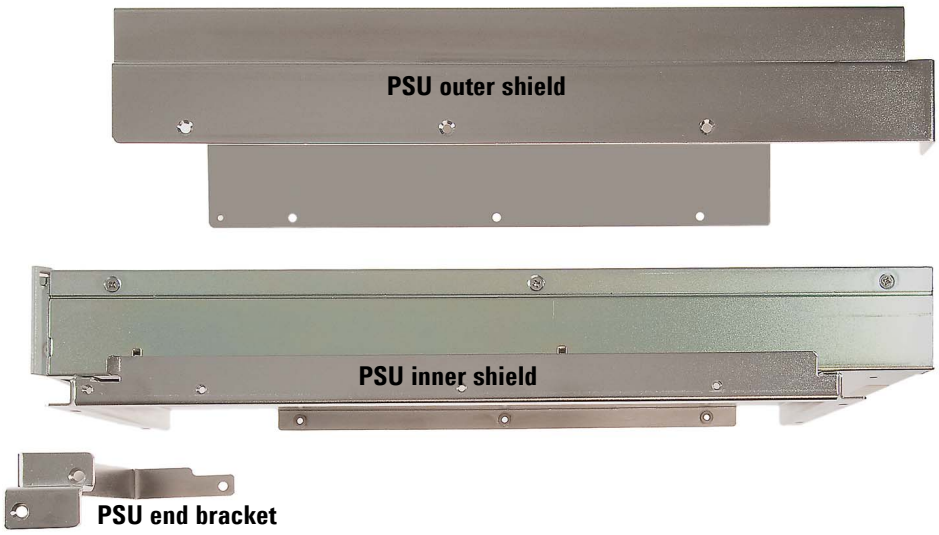


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10 Remove the four #8 flat head Torx screws from the top and bottom of the PSU outer shield and end bracket (8 screws total).



11 Slide the outer shield and end bracket off the PSU/inner shield assembly; they are shown removed below.



12 Slide the PSU out of the inner shield, as shown below.



13 The removed PSU:



14 To install the PSU, reverse these steps.

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To Replace the Fan Tray

The illustrations below show the M9502A; the procedure is identical for the 5-slot chassis.

1 Power down and unplug the AXIe chassis.

2 Fully loosen the two captive retaining screws on the front panel of the fan tray.

CAUTION Ensure you fully loosened the captive retaining screws before trying to extract the fan tray. If you attempt to pull the fan tray out by the screws with these screws still engaged, damage could result.



3 Grasp the fan tray by the two captive retaining screws, and slide it out of the chassis.



4 To install the fan tray, reverse these steps.

To Replace the Embedded System Module

Remove and reinstall the ESM exactly like an application module, except that it can only fit in the bottom half-height slot. See “Installing Modules” on page 19 for instructions.

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Memory Declassification Procedure

Some test equipment users have a need to “declassify” or “sanitize” their instruments for security purposes. This involves following a procedure to clear all user data from the instrument’s memory. The result is a sanitized instrument that can be removed from a secure area without any chance of classified data being recovered from it.

The following tables list the types of memory used in the AXIe chassis (including the ESM). It explains the memory size, how it is used, its location, volatility, and the sanitization procedure.

M9502A 2 slot AXIe Chassis

Memory Type: Serial EEPROM	Memory Size: 64KB
Memory Function: Chassis Field Replaceable Unit (FRU) containing product, serial, part, and configuration information, Board Management Controller (BMC) firmware.	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: Redundant Chassis Field Replaceable Unit (FRU) containing product, serial, part, and configuration information, Board Management Controller (BMC) firmware.	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: FAN Controller Field Replaceable Unit (FRU) containing product, serial, part, and configuration information	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: SRAM	**Memory Size**: 40KB
Memory Function: Board Management Controller (BMC) memory for fan control	
User Modifiable (Y/N): N	**Volatile** (Y/N): Y
Memory Erase Processes: Cycle power	

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Memory Type: Flash ROM	**Memory Size**: 256KB
Memory Function: Fan controller firmware	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: EEPROM	**Memory Size**: 256B
Memory Function: Power supply FRU configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: none	

M9505A 5 slot AXIe Chassis

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: Chassis Field Replaceable Unit (FRU) containing product, serial, part, and configuration information, Board Management Controller (BMC) firmware.	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: Redundant Chassis Field Replaceable Unit (FRU) containing product, serial, part, and configuration information, Board Management Controller (BMC) firmware.	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: FAN Controller Field Replaceable Unit (FRU) containing product, serial, part, and configuration information	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

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Memory Type: SRAM	**Memory Size**: 40KB
Memory Function: Board Management Controller (BMC) memory for fan control	
User Modifiable (Y/N): N	**Volatile** (Y/N): Y
Memory Erase Processes: Cycle power	

Memory Type: Flash ROM	**Memory Size**: 256KB
Memory Function: Fan controller firmware	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: EEPROM	**Memory Size**: 64Kb
Memory Function: Power supply FRU configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: None	

Embedded System Module

Memory Type: PROM	**Memory Size**: 16Mb
Memory Function: Trigger control FPGA	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: Embedded System Module carrier field replaceable unit (FRU) for part, serial number, product information.	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: N	

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Memory Type: SDRAM	**Memory Size**: 64MB
Memory Function: Shelf manager chassis controller	
User Modifiable (Y/N): Y	**Volatile** (Y/N): Y
Memory Erase Processes: Cycle power	

Memory Type: Flash	**Memory Size**: 32MB
Memory Function: Shelf manager micro controller firmware	
User Modifiable (Y/N): Y	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: ADM1060 EEPROM	**Memory Size**: 256B
Memory Function: Shelf Manager hardware configuration information	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: None	

Memory Type: Serial EEPROM	**Memory Size**: 8KB
Memory Function: Shelf Manager non-volatile storage for software configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: None	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: PCIe switch configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

Memory Type: Serial EEPROM	**Memory Size**: 64KB
Memory Function: Alternative PCIe switch configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: Firmware upgrade procedure	

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Memory Type: Serial Flash	**Memory Size**: 4Mb
Memory Function: PCI-E Network Interface Controller configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: None	

Memory Type: Serial EEPROM	**Memory Size**: 128Kb
Memory Function: LAN switch configuration	
User Modifiable (Y/N): N	**Volatile** (Y/N): N
Memory Erase Processes: None	

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Glossary

Many of the terms in this manual and glossary are AXIe®, ATCA® or PICMG® specific. Refer to the relevant specifications for more detail on these terms.

aDB-6100AX Apple Desktop Bus (ADB) is an obsolete bit-serial computer bus for connecting low-speed devices (mouse, keyboard, etc.) to a computer.

ATCA® Advanced Telecommunication Computing Architecture® (also known as AdvancedTCA) is a PCI Industrial Computing Manufacturers Group (PICMG) specification. See AXIe below.

AXIe® AdvancedTCA eXtensions for Instrumentation is a platform for general purpose modular instrumentation. It is an open industry standard aimed at test equipment and instrumentation. It builds on the experience of VXIbus, PXI and LXI technologies.

Base Channel Supports a 10/100/1000 Base-T LAN port on the backplane of the AXIe shelf.

BMC Baseboard Management Controller

BMR-H8S Board Management Reference design for AdvancedTCA®

ESD Electrostatic Discharge. See “ESD Precautions” on page 9

FRU Field Replaceable Unit. A unit (such as a module or power supply) that the user can replace in the field. Many FRUs are not hot swappable.

GbE Gigabit Ethernet. Ethernet at a rate of 1 gigabit per second.

GUID **globally unique identifier** is a unique identifier number used in computer software.The term GUID also is used for Microsoft's implementation of the Universally Unique IDentifier (UUID). The value of a GUID is represented as a 32-character hexadecimal string, and is usually stored as a 128-bit integer

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HPM Hardware Platform Management. PICMG specification that defines an open mechanism to upgrade the resident management software and firmware.

IPMB Intelligent Platform Management Bus. Based on the I^2C (also known as Inter IC, IIC or I2C) bus, the IPMB interface provide communication between components on a PC chassis; it is an internal chassis bus that also connects to the external chassis through a bridge chip.

IPMC Intelligent Platform Management Interface. It is used to monitor system health and manage the computer system.

IPMI Intelligent Platform Management Interface

KCS Keyboard Style Controller

LPC Low Pin count. An interface specification for legacy I/O. Allows legacy I/O of motherboard components, such a Super I/O chip, to migrate from the ISA/X bus to the new LPC interface while retaining software compatibility. It runs at the PCI 33MhZ clock making LPC much faster than the older ISA running with an 8MHz clock.

OEM Original Equipment Manufacturer.

PCI Peripheral Component Interface bus. A standard for connecting hardware in a computer.

PCI-E PCI Express. Peripheral Component Interface Express (or PCIe) A standard to replace PCI.

PICMG® PCI Industrial Computer Manufacturers Group. PICMG is a consortium of hundreds of companies that develop open specifications for high performance telecommunications and industrial computing applications.

SATA Serial ATA or Serial Advanced Technology Attachment. A computer bus interface for connecting host adapters to mass storage devices (hard drives, etc.) This standard is also known as EIDE.

SerDes Serializer/Deserializer. Two blocks used in high speed communications to compensate for limited throughput. They convert data between serial and parallel interfaces.

Super I/O A class of ICs that combines interfaces for a variety of low-bandwidth devices such as serial ports, keyboard and mouse, temperature and fan speed monitoring, etc.

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TPM Trusted Platform Module. An IC designed by the Trusted Computing Group (TCG) for storing passwords, encryption keys, digital certificates, etc.

UXGA Abbreviation for **Ultra eXtended Graphics Array** referring to a standard monitor resolution of 1600×1200 pixels.

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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 — architecture, hardware, software — Agilent can help you create the system you need, from simple to complex.



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