

User Guide

Keysight M9018A PXIe Chassis



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Manual Part Number

M9018-90005

Edition

Seventh Edition, September 2014

Published in U.S.A.
900 S. Taft Avenue
Loveland, CO. 80537

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General

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

Before Applying Power

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

Ground the Instrument

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

Do Not Operate in an Explosive Atmosphere

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

Do Not Operate Near Flammable Liquids

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

Cleaning

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

Do Not Remove Instrument Cover

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

Keep away from live circuits

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

DO NOT operate damaged equipment

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

DO NOT block the primary disconnect

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

Do Not Modify the Instrument

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

In Case of Damage

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

CAUTION

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

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

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

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

WARNING

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

Safety Symbols

CAUTION

A CAUTION denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING denotes a hazard. It calls attention to an operating procedure or practice, that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Products display the following symbols:



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 PXIe chassis in the horizontal orientation. Do NOT operate this chassis in the vertical orientation.



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ICES/NMB-001

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



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



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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.

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Do not dispose in domestic household waste.

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1 Introduction

The 18-slot Keysight M9018A PXIe Chassis has these key features:

- Contains an advanced PCIe switch fabric that operates at PCI Express Generation 2 (“Gen 2”) speeds.
- Provides a mix of x4 and x8 links to the module slots. At Gen 2 speeds, the x8 links can deliver data to modules at 4 GB/s when connected to an x8-capable computer. Module-to-module communications are also supported at 4 GB/s for modules installed in x8 capable slots.
- Supports multiple chassis. There are several possible ways to configure multiple M9018A PXIe and M9502A 2-Slot and M9505A 5-Slot AXIe chassis together; all of them controlled by a single host controller. The host controller can be either a PXIe Embedded Controller (such as the Keysight M9036A) or a desktop or rack-mounted computer. For detailed multiple PXIe and AXIe chassis arrangement information, refer to *Keysight's Multiple PXIe and AXIe Chassis Configuration* tool. This tool is available on the M9018A Product information CD as well as on line at:
www.keysight.com/find/pxie-multichassis.
- A system timing module can be installed in the chassis to provide advanced trigger signals to all slots.

About this Guide

This User Guide provides detailed information on using the M9018A chassis, including the following:

- How to configure the M9018A chassis to meet your needs. Parameters such as the following can be configured:
 - The PCIe link configuration: 1x8, 2x8, or 4x4
 - Voltage limits around the power supply rails at which an alarm will be generated if a rail falls outside of its limit
 - The temperature at which an alarm will be generated if the chassis exceeds this temperature
 - The fan speed at which an alarm will be generated if a fan speed falls below this limit
- How to ensure that your modules don't exceed the chassis power supply capacity.
- Rack mounting of the chassis
- How to diagnose and troubleshoot issues with the chassis
- How to replace the power supply or the fan assembly

NOTE

It is assumed that you have used the M9018A Startup Guide to turn on the chassis system, including installing the Keysight IO Libraries Suite, the chassis drivers, and the chassis soft front panel. If the chassis has not yet been turned on, please use the Startup Guide to perform the initial chassis turn on prior to configuring the chassis as described in this guide.

If you have been unable to turn on the chassis system using the M9018A Startup Guide and need assistance, please see [“Troubleshooting M9018A System Turn On Issues”](#) on page 139. This appendix provides step-by-step guidance on turning on the chassis system.

If you are still unable to turn on the chassis system, see [“Troubleshooting the M9018A System”](#) on page 99. Note that having ready access to certain spare parts may accelerate the troubleshooting process. Chapter 16 includes a list of spare parts that you may want to acquire to support any repairs that are ever needed.

Before continuing, some important terminology is presented. The computer that controls the chassis is known as the *host controller* or *system controller*, and is shown at the top of the hierarchy in Figure 2:

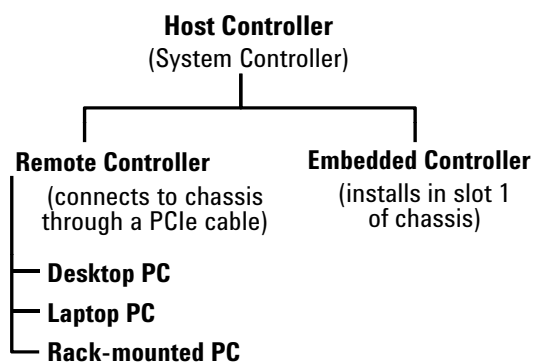


Figure 1 The host controller, remote controller, and embedded controller hierarchy

The host controller can either be a *remote controller* or an *embedded controller*. A remote controller is a Windows-based PC, and can be a desktop PC, a laptop PC, or a rack mounted PC. The remote controller interfaces to the chassis through a PCIe cable.

An embedded controller, such as the Keysight M9036A Embedded Controller, is a small form factor, Windows-based PC that is designed for installation in the system controller slot (slot 1) of the chassis. An embedded controller also consumes two or three expansion slots to the left of slot 1.

The combination of the chassis, the host controller (and a PCIe cable if the host controller is a remote controller), and the chassis I/O software running on the host controller is referred to as a *chassis system*.

NOTE

In order for a PC to serve as a remote controller, its BIOS must support enumeration of the PCIe slots in the chassis; many computers are not capable of enumerating a sufficient number of PCIe slots to ensure that slots in an external chassis are enumerated.

Keysight provides the document “PCI and AXIe Modular Instrumentation Tested Computer List Technical Note” which lists the embedded, desktop, laptop, and rack-mounted PCs that have been verified to enumerate the PCIe slots in the M9018A chassis. Please use this document, available under the Document Library tab at www.keysight.com/find/M9018A, to guide your selection of remote controller PCs.

For general PC requirements, such as operating system and RAM requirements, please see the section “Software Requirements” in the M9018A Startup Guide.

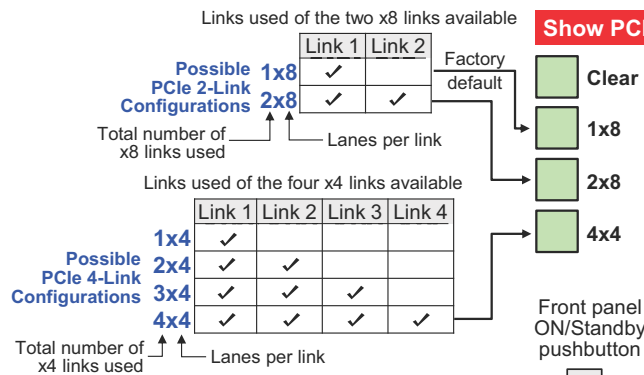
M9018A Block Diagram

The M9018A block diagram (non-interactive) from the Startup Guide is presented on the next page. Please see the Startup Guide for a description of the key elements on the diagram and for information on how to use the interactive features. View the complete interactive block diagram from the Windows Start button:

Start > All Programs > Keysight > M9018 > M9018 Block Diagram

You can also view the block diagram on the Software and Product Information CD or you can download the block diagram from www.keysight.com/find/M9018A.

PCIe 2-Link and 4-Link Configurations

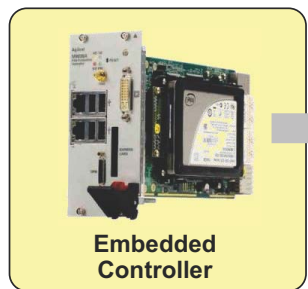
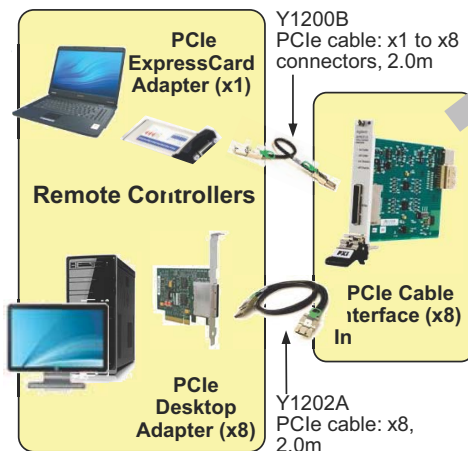


Show PCIe Link Configurations

- Clear
- 1x8
- 2x8
- 4x4

Show Host Controller Software

- Clear
- Keysight Connection Expert
- Soft Front Panel
- Development environments



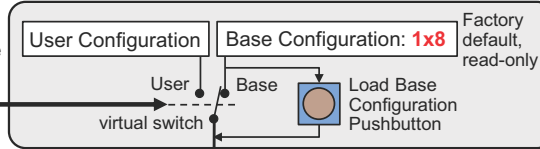
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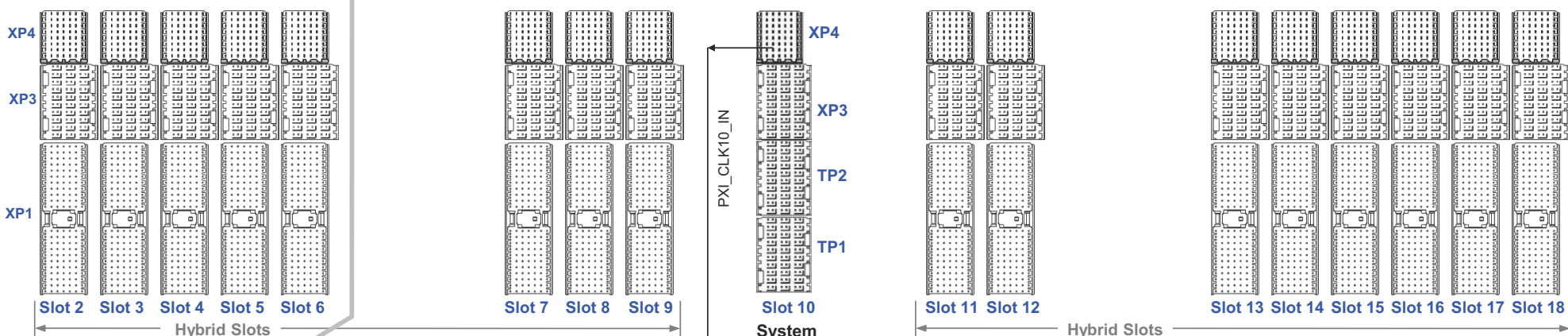
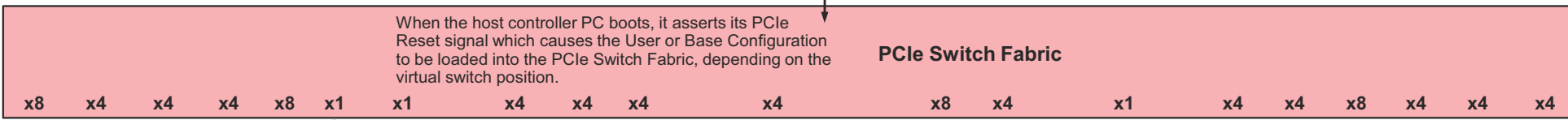
Keysight M9018A PXIe Chassis

START HERE
Please place your mouse over this rounded rectangle to view information about this diagram.

PCIe Switch Fabric Configurator
This program can be used to set the User Configuration to 2x8 or 4x4 (and point the virtual switch to the User Configuration), or point the switch to the Base Configuration.

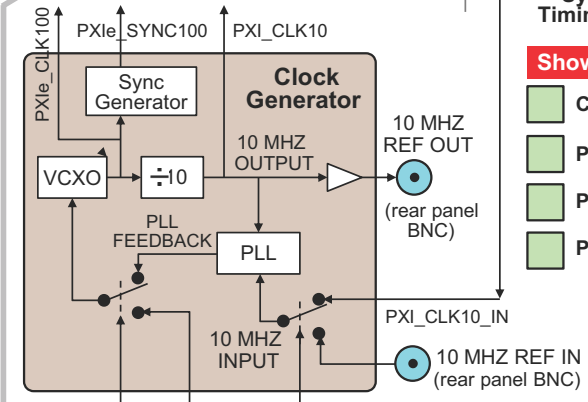


Eight backplane temperature sensors



- #### Show SMBus
- Clear
 - PXI_CLK10
 - PXIe_CLK100
 - PXIe_SYNC100

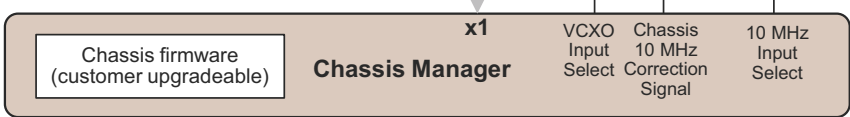
Show Clocks



Show Triggers

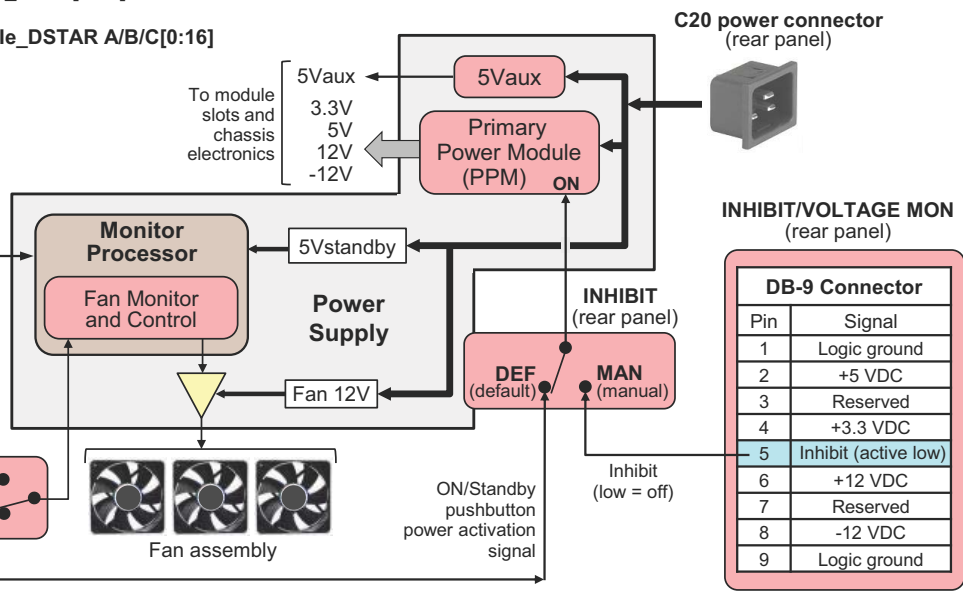
- Clear
- PXI_TRIG[0:7]
- PXI_STAR[0:16]
- PXIe_DSTAR A/B/C[0:16]

- Show Boards Supported by the Hybrid Slots
- Show Hybrid Slot Pin Outs



Show Chassis Views

- Clear
- Front View
- Rear View



Pin	Signal
1	Logic ground
2	+5 VDC
3	Reserved
4	+3.3 VDC
5	Inhibit (active low)
6	+12 VDC
7	Reserved
8	-12 VDC
9	Logic ground

Chassis maintenance and inspection

WARNING

- **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited. Inspect the protective conductor periodically to ensure that it is uninterrupted.**
- **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**
- **To prevent electrical shock, disconnect the chassis power cord before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**
- **Cleaning connectors with alcohol shall only be done with the chassis power cord removed and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the chassis.**

No periodic maintenance of the chassis is required. However, Keysight recommends monitoring the following chassis parameters on an ongoing basis:

- **Power supply voltages**—The four main power supply rails (3.3V, 5V, 12V, and -12V) should all be within $\pm 5\%$ of their nominal values. Keysight recommends checking the power rails at least yearly using the chassis soft front panel (SFP) or programmatically. In addition, the power rails are accessible on the rear panel DB-9 connector, and can be checked with a DMM as described in [“Measuring the four main voltage rails directly”](#) on page 18.
- **Fan speeds**—The chassis has three fans located at the rear of the chassis. A low fan speed possibly indicates that a fan is wearing out or a fan blade is partially obstructed. Keysight recommends using the chassis SFP to check the fan speeds yearly as well.
- **Chassis firmware**—Keysight recommends that you periodically check to see if there is a chassis firmware revision available that is later than your chassis firmware revision. If so, it is suggested that you download and install the latest firmware revision available as described in [“Chassis firmware revision checking and installation”](#) on page 34.

If a power supply voltage is out of tolerance or a fan speed is low, please see [“Troubleshooting the M9018A System”](#) on page 99 for diagnostic information and troubleshooting tips.

Module handling procedures

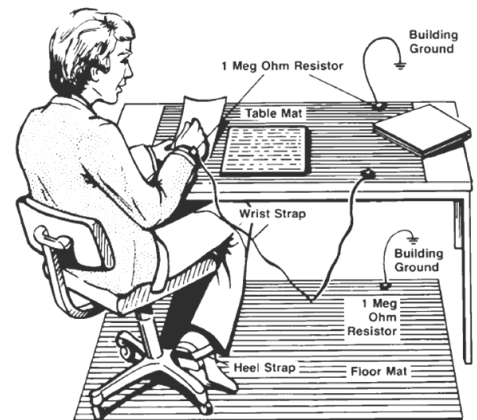
To avoid electrostatic discharge damage when handling modules, please read and follow the guidelines provided below.

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. Keysight modules and interface cards are shipped in materials which prevent static electricity damage. These items should only be unpacked and inspected at a static-safe work station. The following figure shows an example of a static-safe work station which uses the following two ESD protection methods:

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

ESD protection accessories can be purchased from numerous electronics suppliers.



Both ESD protection methods listed above, when used together, provide a significant level of protection. Of the two methods, only the table-mat and wrist-strap combination (method 1) provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least $1\text{ M}\Omega$ of isolation from ground.

To avoid damaging components when unpacking or handling a module, do not touch the module connector pins or the components on the printed circuit board. Store all modules and interface cards in anti-static envelopes when not in use.

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

Installing modules in the chassis

To install a module in the chassis, perform the following steps:

- 1 Turn the chassis off and unplug the chassis from AC power.
- 2 Before inserting the module, inspect the chassis slot to ensure there are no bent pins on the slot connectors.

CAUTION

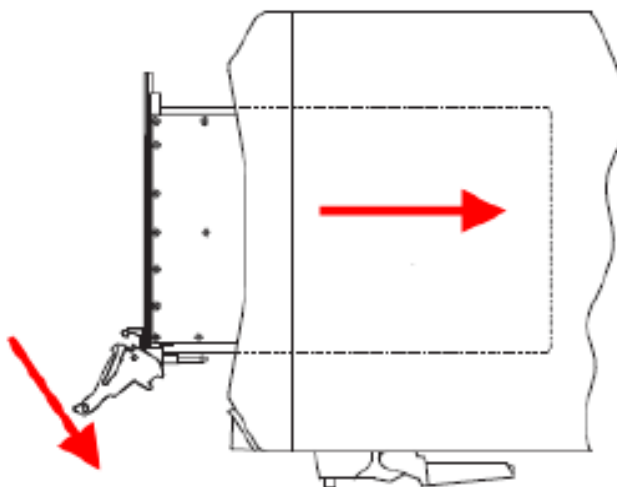
- To avoid damaging the module, do not touch exposed connectors or components on the printed circuit board as you install the module.
- Modules are usually shipped with thread protectors on the mounting screw threads. These protectors must be removed before installing modules in the chassis.

- 3 Insert the module in the chassis slot by placing the module card edges into the top and bottom module guides.

CAUTION

Take care to ensure that the module is aligned perpendicularly to the chassis as you begin sliding it in. Otherwise, it's possible for components on the module (or on adjacent modules) to be damaged by contact between modules.

- 4 With the injector/ejector handle in the down position, carefully slide the module to the rear of the chassis. When you begin to feel resistance from the backplane connectors, push up on the injector/ejector handle to complete insertion of the module and latch it into place.



- 5 Secure the module front panel to the chassis using the captive front panel mounting screws. All modules have two captive mounting screws. Tighten the screws for both mechanical security and to ensure proper grounding of the front panel.

IMPORTANT: Ensure that all empty chassis slots are covered by filler panels or air inlet modules.

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

2 Power Supply Operation

This chapter describes operation of the chassis power supply, and includes the following topics:

- **Voltage rails**—Describes each of the voltage rails supported by the chassis.
- **Power supply capacity**—Describes how much power can be drawn from each voltage rail.
- **Over temperature protection**—Describes how the power supply responds to an over temperature condition.
- **Temperature derating of the primary power module**—Indicates how the power capacity of the primary power module (which provides 5 VDC and 12 VDC) is derated with temperature.
- **Overcurrent protection**—Describes how the power supply responds to an overcurrent condition.
- **Short circuit protection**—Describes how the power supply responds to a short circuit condition.
- **Monitoring of the 3.3V rail by the chassis**—Describes how the chassis monitors the 3.3V rail at power-on, and how the voltage limits are expanded by the IVI-COM driver.
- **Measuring of the four primary voltage rails**—The four primary voltage rails (3.3V, 5V, 12V, and -12V) can be measured on the chassis rear panel DB-9 connector. The voltage rail pin assignments on this connector are listed.

Voltage rails

The M9018A power supply provides the six voltage rails listed below. The name of each voltage rail as it appears on the chassis backplane connectors is shown in the second column—these names are used in this guide for brevity. Figure 2 on the next page shows these voltage rails in a block diagram format, and describes the power available from each rail.

Note that two of the rails, 5 VDC auxiliary and Fan 12 VDC, are active (powered) whenever the chassis is connected to AC power. The remaining rails are switch on/off either by the front panel power pushbutton or by the **INHIBIT** signal on the rear panel DB-9 connector.

Table 1 Power supply voltage rails.

Voltage rail	Backplane name	Comments
3.3 VDC	3.3V	This voltage rail is generated by a DC-to-DC converter operating from the 12 VDC rail.*
5 VDC	5V	As shown by the backplane names, this rail connects to the backplane under two different names.*
	5V V(I/O)	
5 VDC auxiliary	5Vaux	This rail provides standby power to the Monitor Processor and the modules, and is available anytime the chassis is connected to AC power.
12 VDC	12V	This rail and the 5 VDC rail can both be switched on/off, either by the front panel power pushbutton or the INHIBIT signal on the rear panel DB-9 connector.*
-12 VDC	-12V	As with the 3.3 VDC rail, this rail is generated by a DC-to-DC converter operating from the 12 VDC rail.*
Fan 12 VDC	Fan 12V	This rail supplies the fan driver circuitry, and is not connected to the backplane connectors. This power supply is active anytime the chassis is connected to AC power.

* The 3.3VDC, 5VDC, 12 VDC, and the -12VDC rails can be switched on/off, either by the front panel power pushbutton or by the **INHIBIT** signal on the rear panel DB-9 connector. The 3.3VDC and -12VDC rail regulators are fed by the +12VDC.

Power supply capacity

Figure 2 shows the maximum power available from each rail. The rails cannot all provide their maximum power simultaneously to the modules in the chassis. Therefore, tradeoffs are required to ensure that certain maximum power limits aren't exceeded, as described below.

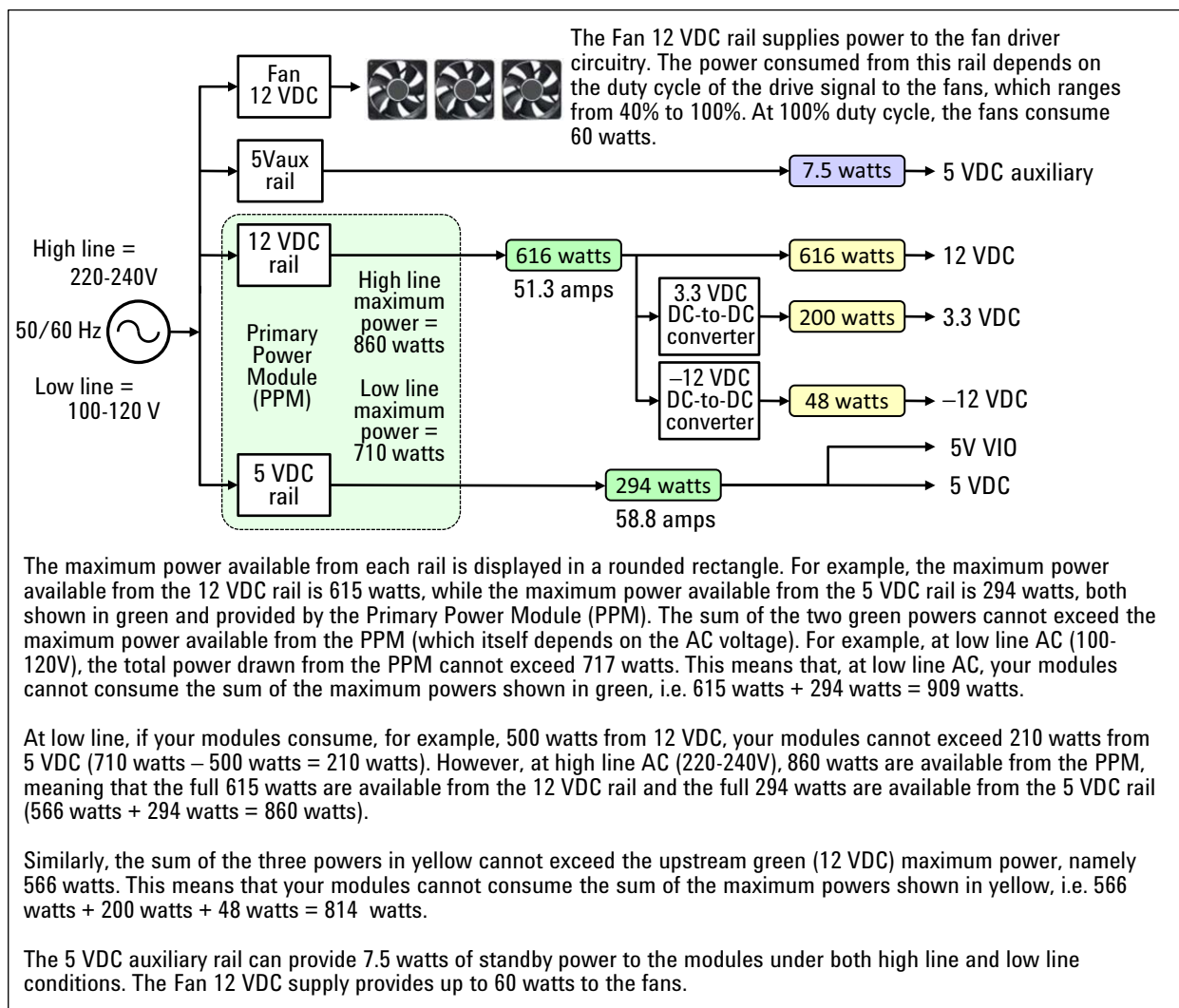


Figure 2 The maximum power available to the modules from each rail*

* The +12 volt power specification and total low line DC output power specification apply to Keysight M9018A chassis with serial number TW52450100 and later. Prior chassis limited the +12 Vdc to 566 W and the total low line DC output power to 660 W.

Over temperature protection

The Primary Power Module (PPM) will shut down if its internal temperature exceeds 115 °C. This not only shuts down the 5 VDC and 12 VDC rails, but also shuts down the 3.3 VDC and -12 VDC rails because they are generated from the 12 VDC rail.

NOTE

If the chassis is operating within its normal ambient temperature range of 0-55 °C and is operating within the power limits described previously, an over temperature condition is unlikely to occur. Therefore, if the chassis appears to be powered down (for example, based on the front panel LEDs being off), you should consider other possible causes prior to considering an over temperature condition. Please see [“Troubleshooting the M9018A System”](#) on page 99 for further information.

Note that it is not possible to determine the temperature of the PPM based on the temperatures reported by the eight temperature sensors—the PPM and the eight temperature sensors have different ventilation airflows.

To recover from a suspected over temperature shutdown, the PPM internal temperature must be below 115 °C and the chassis must be power cycled. Power cycling of the chassis should be performed by detaching and re-attaching the power cord because neither the front panel ON/OFF pushbutton nor the **Inhibit** signal on the rear panel DB-9 connector will function if the PPM is shut down.

If the chassis is power cycled but does not resume operation, either the PPM was not at fault or the PPM internal temperature is still above 115 °C. Additional cooling time should be allowed followed by another power cycle to see if that resolves the problem.

Temperature derating of the primary power module

At ambient temperatures of 45 °C and above, the power available from the PPM is derated as shown in Figure 3 (low-line) and in Figure 4 (high-line).

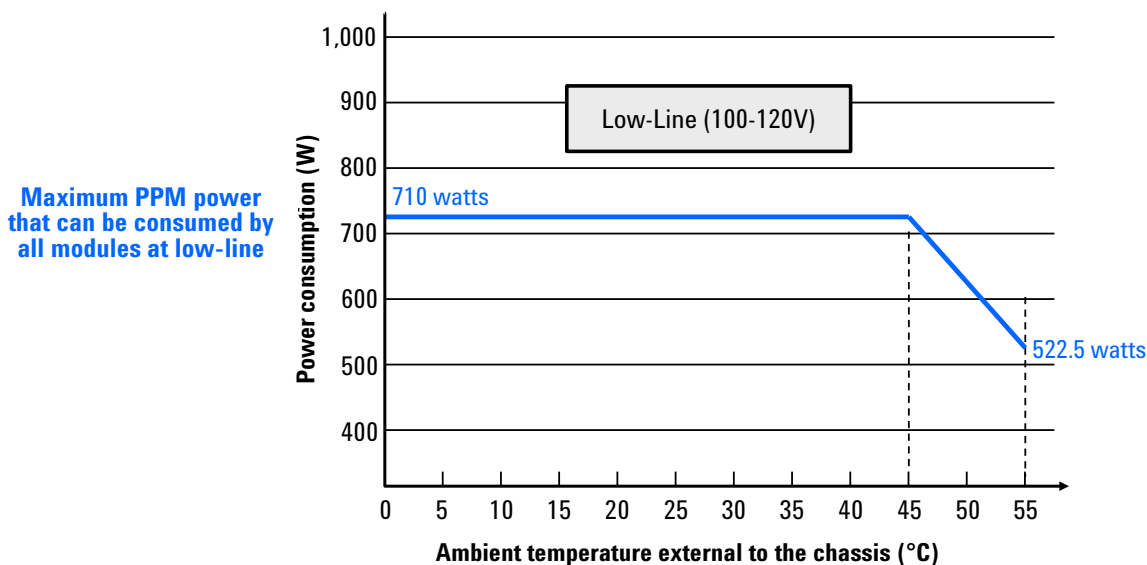


Figure 3 Module power consumption vs. temperature at low-line (100-120V)*

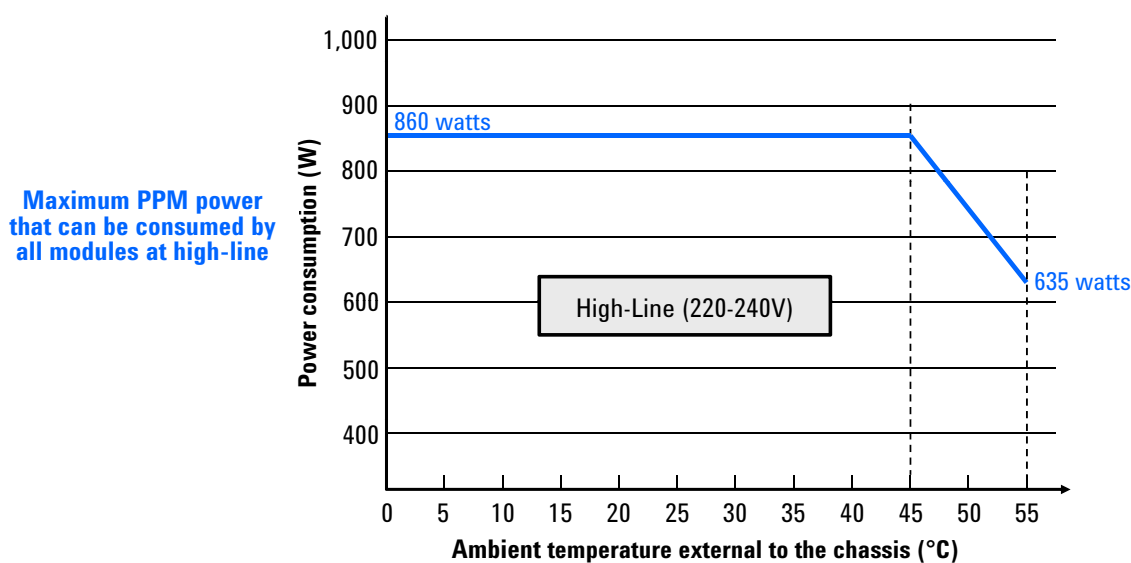


Figure 4 Module power consumption vs. temperature at high-line (220-240V)

* This chart is valid for Keysight M9018A chassis with serial number TW52450100 and later. Chassis with prior serial numbers limited the maximum power consumption to 660 W and derated to 485 W at 55 °C.

Power calculator spreadsheet

The Microsoft Excel power calculator spreadsheet is available on the M9018A Software and Product Information CD under the label **M9018A Power Spreadsheet**. This spreadsheet allows you to enter the following information and determine if the chassis will be operating within its power limits:

- 1** The ambient temperature that the chassis will be operating at—as noted in the previous section, the ambient temperature affects the power available to the modules from the power supply.
- 2** The mains voltage of the chassis, either low line (100-120V) or high line (220-240V).
- 3** The power consumed on each rail by each module.

After the above information is entered, the spreadsheet will indicate if any power supply limits are exceeded.

Overcurrent protection of the 5V and 12V rails maximum PPM

The PPM has overcurrent protection on its two rails, 5V and 12V. Overcurrent protection can occur at currents from 110% of the maximum current available up to 140% of the maximum current available. For example, overcurrent protection on the 5V rail can occur anywhere from 65.3 amps (110% of 59.4 amps, the maximum current available on 5V) up to 83.2 amps (140% of 59.4 amps).

Overcurrent protection of the 5V and 12V rails are independent of each other. For example, an overcurrent situation on the 5V rail will not affect operation of the 12V rail.

In response to an overcurrent condition on a rail, the PPM will momentarily shut down that rail and then attempt to resume operation. If the overcurrent condition is still present, the PPM will again momentarily shut down, and so on, until the overcurrent condition is no longer present.

In response to an overcurrent situation, modules (especially high-powered modules) should be removed one at a time to see if that resolves the situation.

Short circuit protection of the 5V and 12V rails

The PPM response to a short circuit condition is the same as its response to an overcurrent condition—the PPM will momentarily shut down the affected rail and then attempt to resume operation. If the short circuit condition is still present, the PPM will again momentarily shut down, and so on, until the short circuit condition is no longer present.

Short circuit protection of the 3.3V rail

In the event of a short circuit on the 3.3V rail, two steps are required to restore operation: (1) The short circuit condition needs to be eliminated and (2) the chassis needs to be power cycled before the 3.3V supply will resume operation.

Monitoring of the 3.3V rail by the chassis

The 3.3V rail power supply ensures that its voltage is regulated to within $\pm 5\%$ of 3.3V on the backplane. In ensuring that the backplane 3.3V is within specification, it's possible for the 3.3V rail to be greater than 5% above 3.3V where the voltage measurement occurs in the chassis. If the 3.3V rail exceeds the $\pm 5\%$ limit, the chassis front panel Power LED will flash.

Accordingly, when the IVI-C or IVI-COM driver first communicates with the chassis, the driver will modify the 3.3V limit to be $\pm 10\%$ around 3.3V instead of $\pm 5\%$. At this point, if the LED was flashing due to the 3.3V rail exceeding the 5% limit, the flashing should cease and the LED should turn on continuously.

Because the SFP uses the IVI-COM driver, bringing up the SFP also triggers this initial communications with the chassis and modifies the 3.3V limits to be $\pm 10\%$ around 3.3V. If the Power LED was flashing prior to starting the SFP and then the LED turns on continuously after the SFP starts, the termination of flashing is very likely due to the software-driven expansion of the 3.3V limits from $\pm 5\%$ to $\pm 10\%$. Having the wider ($\pm 10\%$) limits is not an issue because, as mentioned previously, the chassis ensures that the 3.3V rail is within specifications on the backplane itself.

If the IVI-C or IVI-COM driver (including the SFP) establishes contact with the chassis, but the Power LED continues to flash, or if software is unable to make contact with the chassis, the problem is likely unrelated to the 3.3V rail.

Internal fuses

Each supply connected directly to AC is protected by an internal fuse. These fuses are not customer- replaceable, please contact Keysight if you suspect a fuse is blown.

Measuring the four main voltage rails directly

The four main voltage rails can be measured on the DB-9 connector on the chassis rear panel using a digital multi-meter. The voltage rail pin assignments are shown in Figure 5.

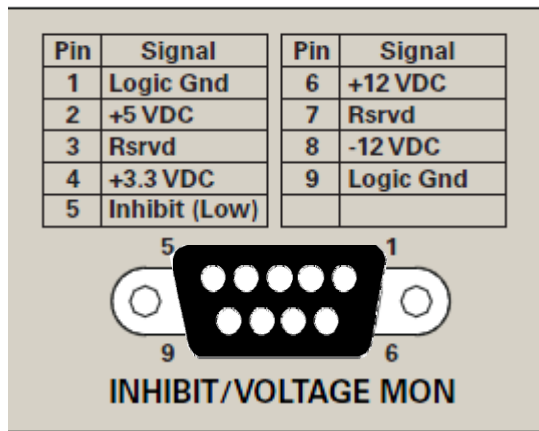


Figure 5 3.3V, 5V, 12V, and -12V pin assignments

Each voltage rail contains a current limiting resistor to prevent accidentally shorting the supplies during measurements.

3 Chassis Cooling and Rack Mounting

This chapter describes chassis cooling and rack mounting of the chassis. These topics are presented together so that chassis cooling can be considered when rack mounting the chassis.

Overview of chassis cooling

The key points regarding chassis cooling are:

- The chassis is cooled by three 186 cubic feet per minute (CFM) fans, providing a total airflow of up to 558 CFM.
- The fans are mounted on the chassis rear panel and exhaust air out the rear of the chassis. The air intakes are in the front, sides and bottom of the chassis.
- A minimum of 50 mm (2 inches) of clearance should be provided in the front, rear and sides of the chassis for ventilation. Depending on module power consumption, clearance may also be needed below the chassis to accommodate the air intakes on the bottom of the chassis. This is discussed further in the next section.
- The fans can either be set to operate at maximum speed, or can be set so that the fan speeds are a function of the chassis temperature. With the latter capability, you can specify the fan speed vs. temperature profile using either the soft front panel (SFP) or programmatically using the IVI drivers.
- The chassis contains eight temperature sensors mounted to the top of the backplane to allow you to monitor the temperatures in the airflow downstream from the modules. These temperatures can be read using the SFP or programmatically. Please see [“Monitoring the Chassis Temperature”](#) on page 45 for information on the sensor locations and how to read their temperatures.

Rack mounting of the chassis

This section describes how to rack mount the chassis.

CAUTION

- Chassis should never be stacked on top of each other. To position chassis vertically, they should be rack mounted as described in this chapter.
- In handling the chassis in preparation for rack mounting, do not stand the chassis on its side; the side handles can cause the chassis to tip over.
- Depending on the power consumed by the chassis, a 1U space may be required below the chassis to ensure adequate ventilation for cooling. Be sure to provide this space if required as described in this chapter.

CAUTION

The weight of an empty M9018A PXIe chassis (no modules installed in the chassis) is approximately 34 lbs (15.5 kg). Lift the chassis using a single side handle only when the total chassis weight (chassis plus installed modules) does not exceed 75 lbs (34.0 kg). Otherwise use both side handles to lift the chassis. Two people may be required to lift the chassis and install it in a rack.

Installing modules in the chassis may increase its weight to a point where two people are required to lift the chassis. If two people are not available, use a mechanical lift to lift the chassis. The chassis should be transported using a rolling cart.

To rack mount the chassis, order the Y1215A Rack Mount Kit. This kit provides the hardware and instructions to mount the chassis in a standard 482.6 mm (19 inch) wide rack. In rack mounting the chassis, follow these guidelines:

- 1 Always begin installing chassis at the bottom of the rack and work up. This maintains a lower center of gravity and reduces the likelihood of the rack tipping.
- 2 Anti-tipping feet, if available with the rack, should always be extended.
- 3 The heaviest chassis should always be mounted in the bottom of the rack.
- 4 For maximum cooling and optimum rack thermal efficiency, place the chassis with the greatest power consumption towards the top of the rack. This promotes efficient cooling since heat rises. When placed nearer to the top of the rack, high power chassis will not unnecessarily heat other chassis. However, in doing this, do not violate the guideline that the heaviest chassis be placed at the bottom of the rack.
- 5 As described in “[Power Supply Operation](#)” on page 11, the maximum power that can be supplied to the modules is 849 watts. If your modules are consuming the maximum power, 1U of space is required for ventilation below the chassis when you rack mount it.

4 Chassis and Host Controller Power Up/Down Sequence

This chapter describes the chassis and host controller PC power up and power down sequences. In order for the chassis and the host controller PC to interoperate correctly, they must be powered up and down in specific sequences. Furthermore, the PC must be restarted in certain situations after the chassis and PC are powered up. If these sequences aren't followed, the PC may not be able to access the chassis or the modules in the chassis.

NOTE

The chassis has three power states: Powered up, powered down, and unplugged. When powered up, the chassis is fully operational. When powered down, the Primary Power Module (described in “[Power Supply Operation](#)” on page 11) is turned off, but 5Vaux is available to the Monitor Processor and the modules. When unplugged, the chassis is completely unpowered. Unless otherwise stated, the chassis is presumed to be plugged in, and is changing power states between powered up and powered down.

NOTE

When you press the chassis power-on button, if the chassis does not power up and the front panel LEDs do not light, it is possible for the chassis to be in a safety shutdown state. Remove the chassis AC power cord from the chassis for one minute. Reconnect the power cord and turn on the chassis again. If it still does not power on, refer to the troubleshooting information later in the manual.

This chapter also describes differences in starting up the host controller PC based on the version of Keysight IO Libraries Suite installed on your system controller.

Power sequence requirements

When powering-up the system, the chassis should be powered up first. After powering up the chassis, you should wait at least three seconds before turning on a remote PC. The chassis front panel temperature LED, which is on for three seconds after the chassis is powered up, provides a convenient way to measure this delay, as shown below.

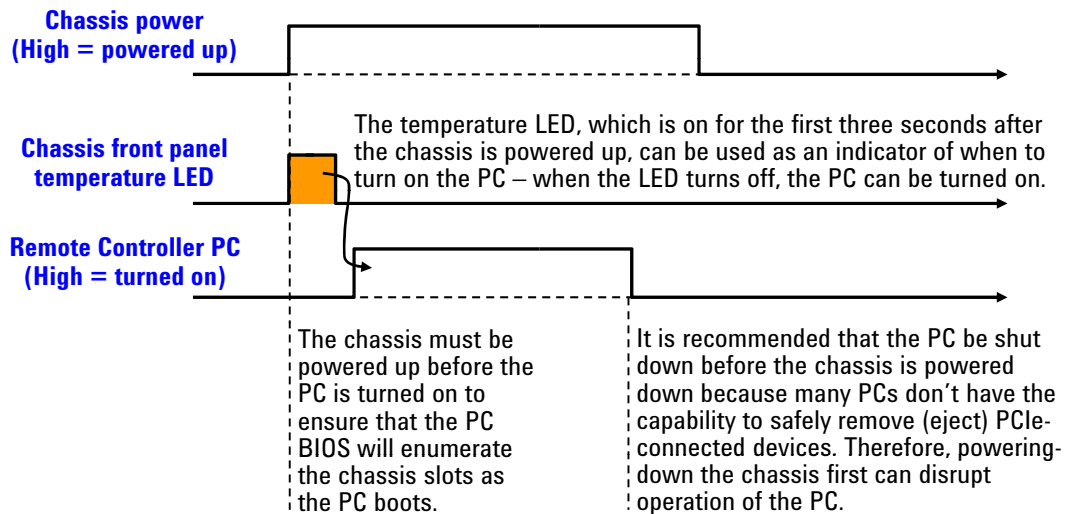


Figure 6 Wait three seconds after powering up the chassis before turning on the PC

The PC should be shut down before the chassis is powered down. This will prevent the chassis, as it's being powered down, from disrupting operation of the PC.

In brief, the PC should be off whenever the chassis is powered up or down. Because chassis modules are not hot-swappable, chassis modules should only be added or removed when the chassis is powered down.

The above power sequence doesn't apply to an embedded controller installed in the chassis because the embedded controller and chassis are powered together.

PC startup events for Keysight IO Libraries Suite

This section describes the PC startup events for Keysight IO Libraries Suite, versions 16.0 and 16.1 (and later). Improvements have been made in Keysight IO Libraries Suite 16.1 that considerably simplify the PC startup process, which is why Keysight recommends use of version 16.1 or later.

Before describing the PC startup events for each version, two situations are described where Connection Expert, which is part of Keysight IO Libraries Suite, won't display a PCIe device, be it the chassis or a module in the chassis.

- 1** If Windows can't find a driver for a device, Windows won't be able to identify the device and therefore Connection Expert won't be able to display it. If this occurs, you'll typically be presented with the Windows **New Hardware Found Wizard**, which will give you the opportunity to assist Windows in finding a driver. If a driver is found, you should restart the PC and verify that Windows identifies the device (which will be evident by the lack of the New Hardware Found Wizard for that device).
- 2** The other situation where Connection Expert won't display a PCIe device is in the event that, when Connection Expert is started, Windows has not yet completed assigning drivers to the devices (the chassis or modules in the chassis) found during enumeration. This is similar to the case above—Connection Expert will not display modules that it cannot identify. In this situation, however, the driver exists but it has not yet been assigned to the device by the time Connection Expert is started.

This situation should be very rare; if it occurs, it would be expected to occur with slower PCs. The solution for this situation depends on which version of IO Libraries Suite you have installed and is described below.

The next two sections describe the PC startup events for Keysight IO Libraries Suite versions 16.0 and 16.1 (and later).

PC startup events for Keysight IO Libraries Suite 16.0

In addition to following the power sequence described earlier, the PC must be restarted in certain situations to ensure that the chassis and its modules are recognized by Connection Expert 16.0, which is part of Keysight IO Libraries Suite 16.0. The PC must be restarted as shown in Figure 7.

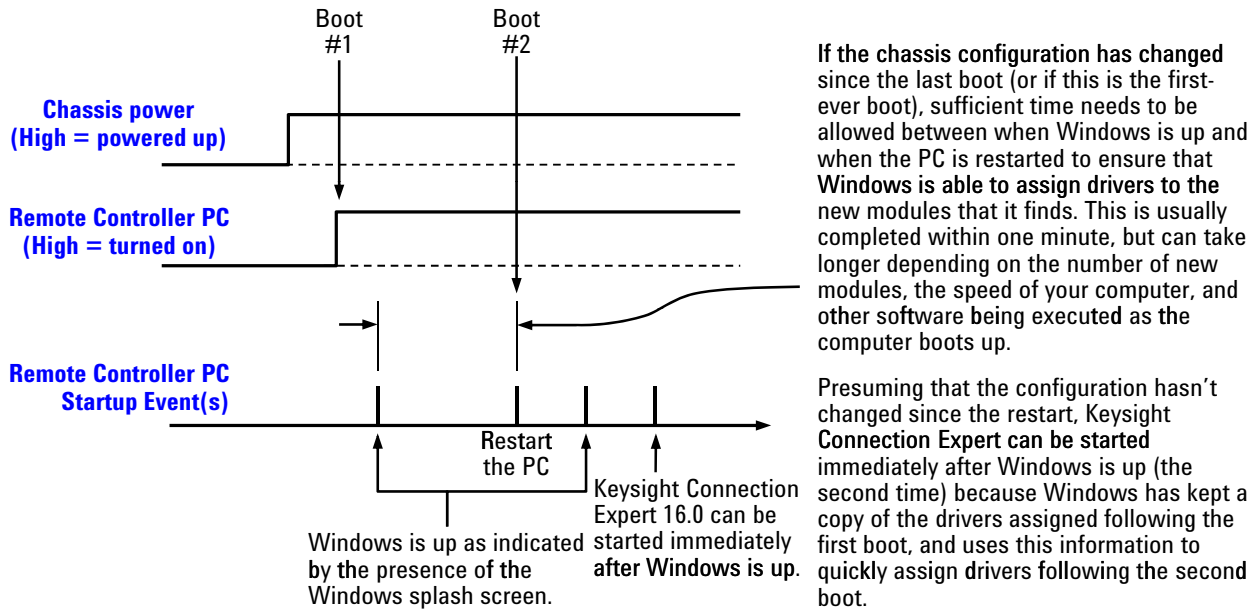


Figure 7 Restarting of the Remote Controller PC after Windows starts for Keysight IO Libraries Suite 16.0

The PC restart is required to ensure that Connection Expert 16.0 has a correct view of the chassis configuration if the configuration has been changed. As noted in Figure 7, the Restart needs to be sufficiently delayed after Windows starts to allow Windows to assign drivers to any new modules detected during enumeration by the BIOS. The remote controller PC also needs to be restarted if this is the first-ever connection of the chassis to the PC.

While Figure 7 depicts a system with a remote controller PC, the same requirement applies to a chassis containing an embedded controller. After powering up the chassis (which powers up the embedded controller), the embedded controller should be restarted if the conditions listed in Figure 7 apply.

Although it is not advised that the chassis be powered up and down while the PC is turned on, Figure 8 shows what is required in the situation where the chassis configuration is changed while the PC is turned on—the PC must be restarted twice after the chassis is powered up. As noted in Figure 8, the second restart needs to be sufficiently delayed after Windows starts the first time to allow Windows to assign drivers to the new modules detected during enumeration by the BIOS. This will ensure that the chassis and its modules are recognized by Connection Expert 16.0 when it is brought up after the second restart.

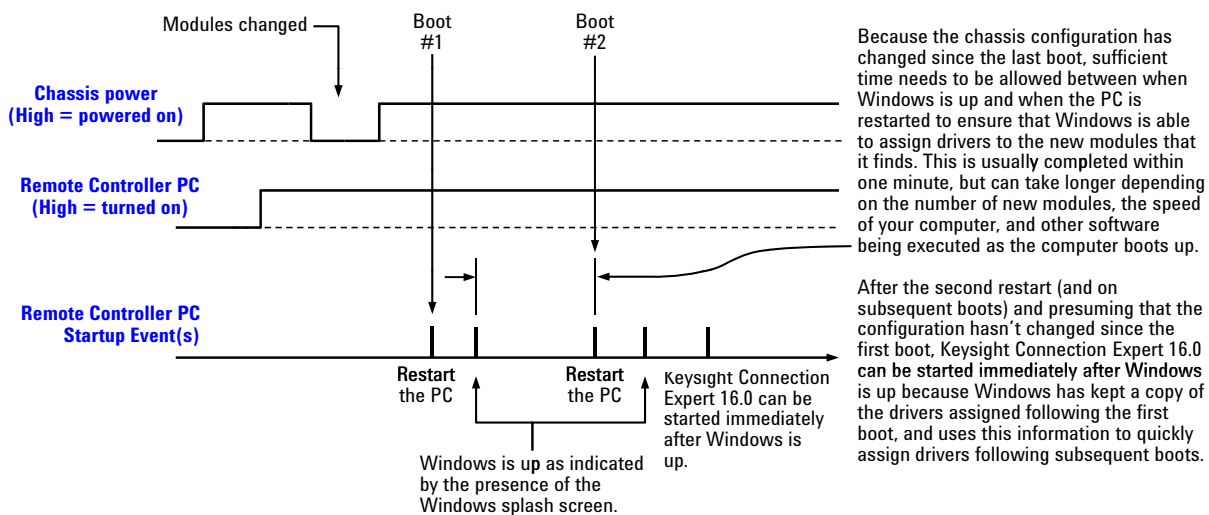


Figure 8 Restarting the PC twice is required with IO Libraries Suite 16.0 if the chassis is re-configured while the PC is on.

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

- If Connection Expert 16.0 fails to detect the presence of the chassis
- If Windows detects the presence of a new module but it isn't displayed by Connection Expert. This will cover the second of the two cases described on [page 23](#).
- Whenever you detect or suspect that the host controller PC has an incorrect view of how the chassis is configured.

PC startup events for Keysight IO Libraries Suite 16.1 or later

With IO Libraries Suite 16.1 or later, the need for the restart following boot #1 in [Figure 7](#) on page 24, and the need for the double restart shown in [Figure 8](#) have been reduced. For the first-ever connection of the chassis to the PC, or after changing the chassis configuration, only a single boot of the PC is needed. However, sufficient time needs to be allowed between when Windows is up and when Keysight Connection 16.1 is started, as shown in [Figure 9](#) and [Figure 10](#).

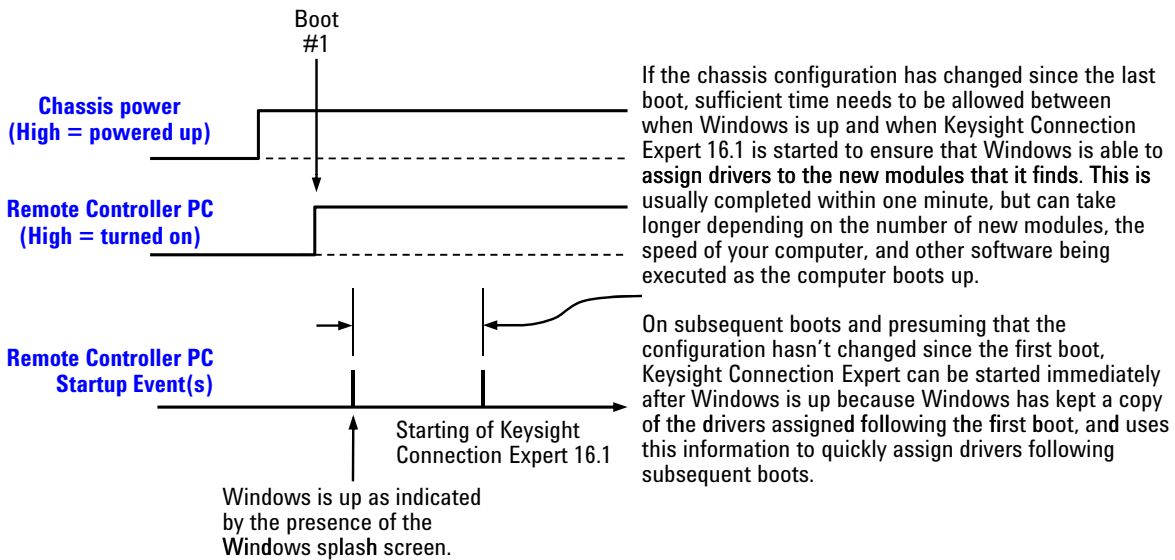


Figure 9 A single boot is required with Connection Expert 16.1.

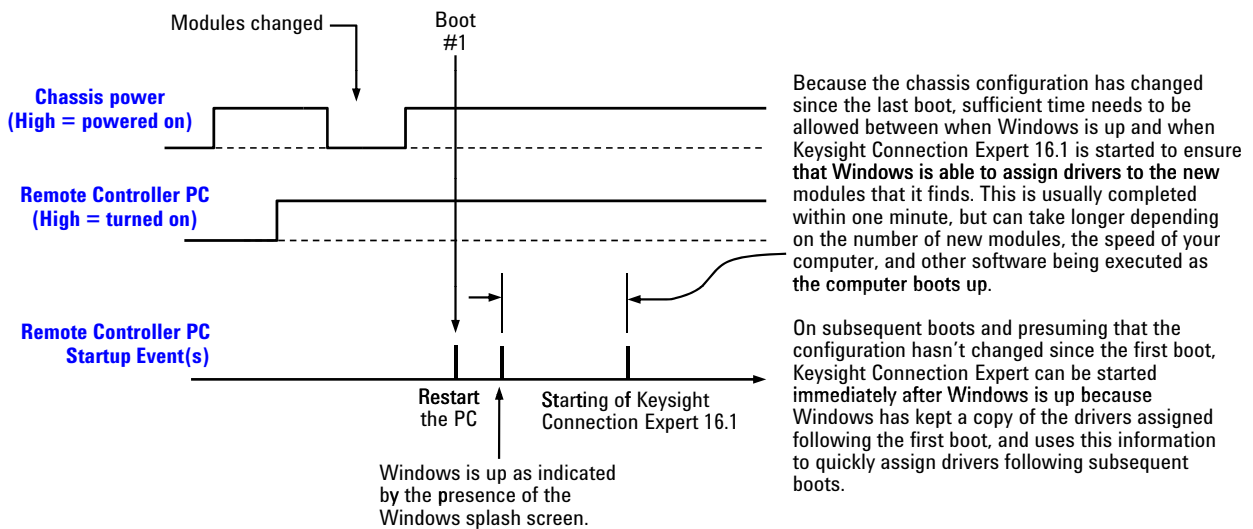


Figure 10 A single restart is required after chassis modules are changed with Connection Expert 16.1.

The two cases described on [page 23](#) where Connection Expert doesn't display the chassis or a module in the chassis can occur with Connection Expert 16.1. If the **New Hardware Found Wizard** is displayed, follow the steps presented on [page 23](#) to associate a driver with the device. If Connection Expert 16.1 doesn't display a particular device, click the **Refresh All** button to see if Windows has now assigned a driver to the device, which will allow Connection Expert 16.1 to display the device.

In general, if it ever appears that your chassis configuration as displayed by Connection Expert 16.1 differs from your actual configuration, click the **Refresh All** button—this should align the displayed configuration to the actual configuration.

NOTE

Even with IO Libraries 16.1 and later versions, it is always advisable to boot the PC a second time to ensure that the PC properly enumerates the chassis.

Performing a system restart

For a system with a remote controller PC, *system restart* refers to the power sequence shown in Figure 11. The remote controller PC is turned off followed by the chassis being powered down for at least one second. The chassis is then powered up followed by turning on the PC.

NOTE: When the chassis is powered down using the front panel ON/Standby pushbutton or the **Inhibit** signal on the rear panel DB-9 connector, the chassis is still connected to AC power. Therefore, the 5Vaux (auxiliary) supply is powered, and is supplying power to components such as the Monitor Processor. The other chassis supplies (3.3V, 5V, 12V, and -12V) are not powered.

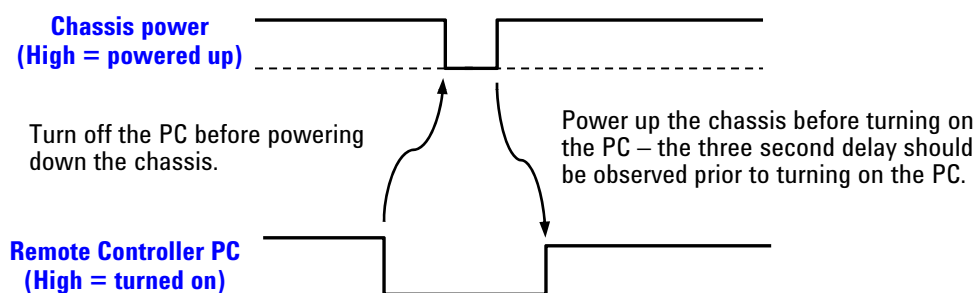


Figure 11 Power sequence for a system restart

A system restart is used in situations such as restoring the 1x8 factory default PCIe link configuration if the reconfiguration process is interrupted. The first part of the restoration process is performing a system restart.

If the chassis contains an embedded controller, a system restart consists simply of power cycling the chassis, which will also restart the embedded controller.

Performing a chassis hard reset

A *chassis hard reset* refers to powering down the chassis and then disconnecting it from AC power. A hard reset is required in response to certain self test failures as described in [Chapter 21](#), “Troubleshooting Based on the Self Test Results,” starting on page 129. As noted in [Figure 11](#) on page 27, when the chassis is connected to AC power, the 5Vaux supply is powered, and is supplying power to certain chassis components, such as the Monitor Processor. Performing a hard reset ensures that power is removed from all chassis components.

To perform a chassis hard reset, the chassis should be removed from AC power for a minimum of 30 seconds—this is to ensure that the 5Vaux supply is completely powered down. The entire sequence is shown in [Figure 12](#).

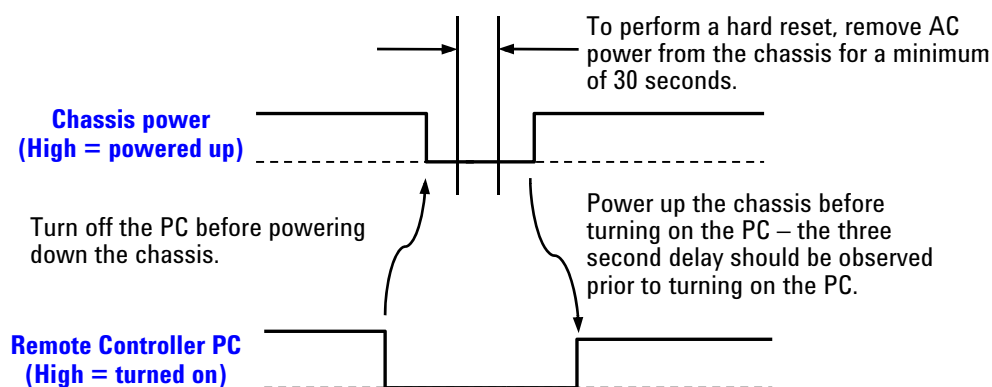


Figure 12 Power sequence for a chassis hard reset

In essence, a chassis hard reset is a system restart that includes unplugging the chassis from AC power after the chassis is powered down.

5 Overview of Chassis Management Capabilities

The M9018A chassis provides extensive management capabilities to allow you to monitor and control many aspects of the chassis operation. For example, you can monitor the temperatures reported by the eight backplane temperature sensors using the soft front panel (SFP). Furthermore, you can use the SFP to set a maximum temperature alarm threshold such that an alarm will be generated if the temperature of any temperature sensor exceeds the threshold.

In addition to using the SFP to monitor and control the chassis, you can develop programs to monitor and control the chassis. Keysight provides IVI (Interchangeable Virtual Instrument, see www.ivifoundation.org) drivers for the chassis. To support the most popular programming languages and development environments, Keysight offers both the IVI-C and IVI-COM drivers—please see the IVI Foundation website for a description of these drivers. In addition, Keysight provides a LabVIEW driver for the chassis.

Keysight recommends that you use the SFP to learn the chassis management capabilities. Because the programmatic capabilities largely parallel the capabilities provided by the SFP, learning the SFP first will provide the basis for learning how the IVI-COM and IVI-C drivers interface to the chassis. In support of this approach, each chassis management capability is first described by a diagram showing how that chassis management capability is accessed using the SFP. Subsequently, the same diagram is used twice, first with an IVI-COM overlay showing the IVI-COM C# methods and properties, and secondly with an IVI-C overlay showing the IVI-C C++ functions and attributes.

Summary of chassis management capabilities

The chassis provides the following management capabilities:

- Viewing the chassis hardware and software revision information
- Monitoring the speed of the three fans. This monitoring capability includes the ability to set a fan speed threshold such that, if any fan speed falls below the threshold, an alarm is generated.
- Monitoring the temperatures of the eight chassis temperature sensors. This monitoring capability includes the ability to set a temperature threshold such that, if the temperature reported by any sensor rises above the threshold, an alarm is generated.
- Setting of the fan speed vs. chassis temperature profile
- Monitoring of the four main power supply rails: 3.3 VDC, 5 VDC, 12 VDC and -12 VDC. This monitoring capability includes the ability to set upper and lower voltage limits around each voltage rail such that, if a voltage rail falls outside of its limits, an alarm is generated.
- Monitoring the 10 MHz reference clock source
- Monitoring and selecting the PCIe link configuration
- Configuring and monitoring the parallel trigger bus signals PXI_TRIG[0:7]
- Executing a chassis self test

Enabling use of the SFP to configure chassis parameters

In order to use the SFP to configure the chassis, the SFP **Allow Control** check box shown in Figure 13 must be checked. This check box, which is available on all three tabs of the SFP, is provided to prevent unintentionally changing a chassis parameter.

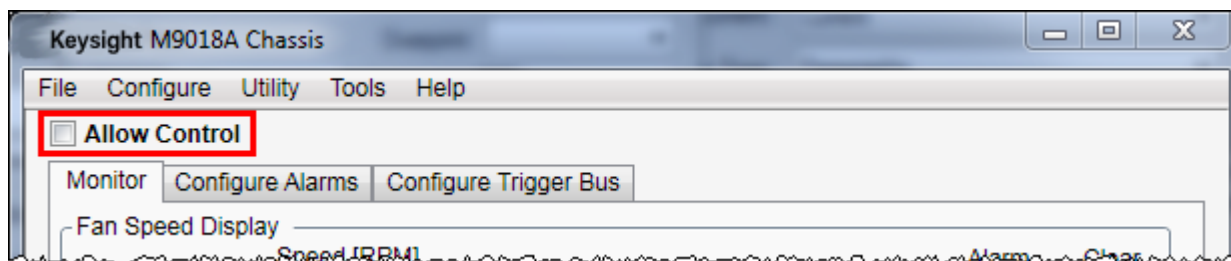


Figure 13 SFP **Allow Control** check box

The chassis alarm architecture

The chassis provides seven alarms to assist you in monitoring the chassis. For example, you can set a temperature alarm threshold such that, if a chassis temperature sensor reports a temperature above the threshold, an alarm is generated. Alarms can be set and monitored using the SFP and programmatically.

Chapter 7 describes the chassis alarm architecture, including the functionality that is provided in hardware and the functionality that is provided in software. The chapter also describes how alarms operate if multiple processes are using the same alarm.

6 Viewing the Chassis Revision and Updating Firmware

This chapter describes how to use the M9018A SFP and IVI drivers to view the chassis revision information. Included in this information is the revision number of the chassis firmware. The chassis firmware is shown within the Chassis Manager block diagram (see “M9018A Block Diagram” on page 4, and controls much of chassis operation. The chapter also describes how to determine if there is a later revision of the chassis firmware available from Keysight.

Viewing the chassis revision information using the SFP

Bring up the SFP About dialog from the SFP menu bar by clicking **Help > About**. This will display the dialog in Figure 14.

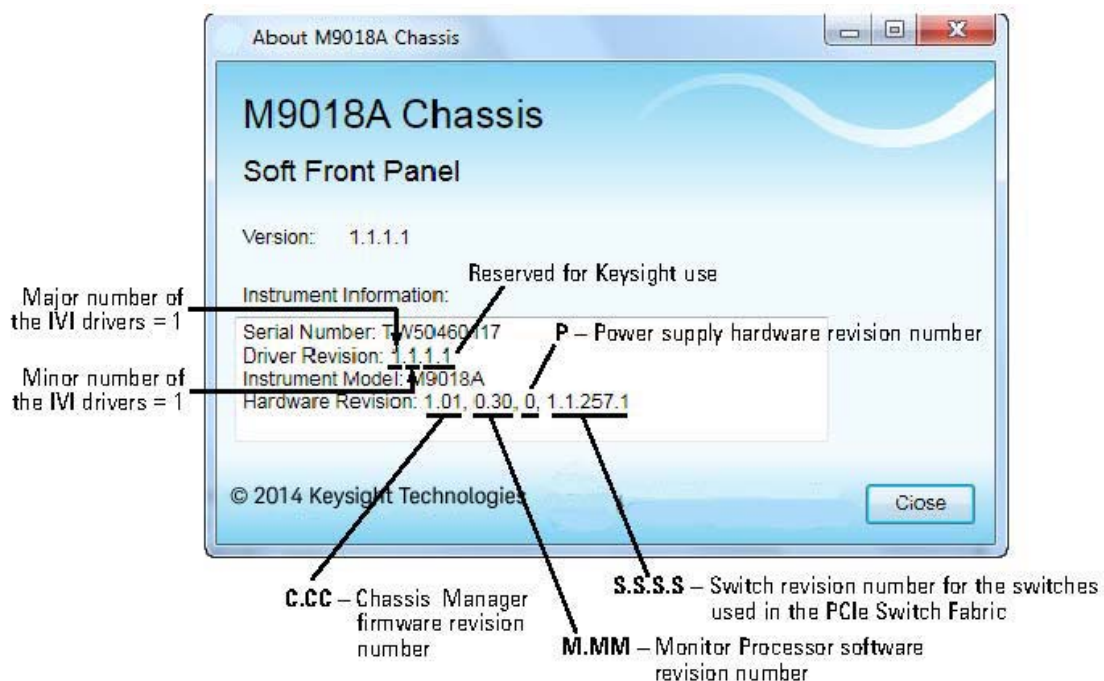


Figure 14 SFP Help > About dialog

The **Hardware Revision** contains four numbers representing four chassis components—the chassis firmware revision is the first number listed. Of the four components whose revision numbers are being reported, only the chassis firmware is customer upgradeable. Information on upgrading chassis firmware is provided below.

Viewing the chassis revision information using the IVI drivers

The chassis revision string can be viewed using the IVI-COM and IVI-C drivers as follows:

IVI-COM: Use the `InstrumentFirmwareRevision` property.

IVI-C: Use the `AGM9018_ATTR_INSTRUMENT_FIRMWARE_REVISION` attribute

Chassis firmware revision checking and installation

To determine if there is a later revision of chassis firmware available, perform the following steps:

- 1 Go to www.keysight.com/find/M9018A and click the **Technical Support** tab.
- 2 Under **Technical Support**, click the **Drivers & Software** tab. If there are chassis firmware updates available, they will be listed under this tab, and can be viewed by clicking **Firmware Update** under **Refine the List**.
- 3 Compare your chassis firmware revision number to the list of chassis firmware revision numbers that are available. If there are later revisions available, Keysight recommends installing the latest version.

To install the latest chassis firmware, perform these steps:

- 1 Click the link to the latest (or desired) firmware update and follow the instructions provided to download and install the firmware on your chassis.
- 2 Power cycle the chassis after the firmware installation is complete, and verify that your host controller PC can communicate to the chassis.

7 The Chassis Alarm Architecture

The chassis provides seven alarms to assist you in monitoring the chassis. For example, you can set a temperature alarm threshold such that, if a chassis temperature sensor reports a temperature above the threshold, an alarm will be generated. Alarms can be set and monitored programmatically and using the SFP.

Figure 15 on page 36 describes the chassis alarm architecture, including identifying the functionality that is provided in hardware and the functionality that is provided in software. The figure also describes how alarms operate if multiple processes are using the same alarm.

Following Figure 15, the information provided by the front panel Power, Fan, and Temperature LEDs is described.

Chassis Alarm Architecture

Alarm operation

- The chassis has these seven alarms:
1. Fan speed alarm
 2. Temperature alarm
 3. 3.3V alarm
 4. **5V** alarm
 5. 12V alarm
 6. -12V alarm
 7. 10 MHz reference clock changed alarm

Each alarm has an Alarm Set/Reset Latch (“latch”) – please see the figure below for an example of one latch . Each of the seven latches is set if the associated alarm limit/threshold is exceeded. “Exceeded”, in this context, means that the associated alarm threshold has been surpassed. In the case of the fan speed alarm, this means that at least one fan speed is *lower* than the **Minimum Fan Speed Alarm Threshold**. Similarly, a power supply rail that has exceeded its limits means that its voltage is *outside* of the range defined by the upper and lower voltage limits.

Setting of the latches allows alarm conditions to be detected/captured in the absence of an operator. The latch OUTPUT does not have a default value—if the SET input is true (for example, at power-on due to a fan speed being below the default Minimum Fan Speed Threshold of 1000 RPM), the fan alarm latch OUTPUT will be set True at power-on.

Each latch can be reset (cleared) using its associated Clear Alarm button on the SFP. Reset on the SFP Utility dropdown menu will reset all seven latches. However, if any alarm threshold is still exceeded when the latch is reset, the latch will be immediately set true again.

If the latch output is True and if the SFP Alarm Enabled is true, Alarm Occurred will be lit on the SFP. Alarm Occurred is set false if Alarm Enabled is set false. However, setting Alarm Enabled false does not reset the latch—this can only be done using Clear Alarm or Reset. Likewise, changing the corresponding alarm threshold to a value such that the alarm limit is no longer being exceeded does not reset the latch.

Interactions between programs using the chassis alarms

It is important to understand how your IVI-COM or IVI-C program interacts with the SFP alarms -- or, for that matter, with any program(s) that use the alarms. Programs that are operating simultaneously will need to share certain alarm resources. Each of the seven alarms has one instance of the tan-colored Set/Reset Latch and each alarm has the OR gate feeding into the latch – these tan elements represent hardware in the chassis. For discussion purposes, the Fan Speed Alarm Set/Reset Latch will be used as an example. The chassis contains one Fan Speed Alarm Set/Reset Latch, which all processes share.

The elements which provide *inputs* to the tan-colored hardware elements are also singular and shared. For example, there is only one Minimum Fan Speed Alarm Threshold. If the threshold is set using the SFP and is then set to a different value using the IVI-COM driver, the last-set threshold will be in effect.

NOTE: To keep the SFP in sync with any changes that have been made programmatically to their shared resources, the SFP will poll the relevant chassis parameters every second and update its display accordingly. For example, if your program changes the Minimum Fan Speed Alarm Threshold, the new value will be reflected on the SFP Configure Alarms tab (if the SFP is running, of course) within one second. If your application program is running in an environment where the SFP is also running and if chassis parameters are being changed using the SFP, your program can likewise poll the relevant parameters in order to detect if they’ve been changed by the SFP user.

Continuing with the fan alarm example, the two fan alarm resources that are not shared are Alarm Enabled and Alarm Occurred. Each process, including the SFP, will have its *own software version* of these two properties as shown in the figure below. This allows a process that is interested in the fan alarm to enable its version of fan alarm while another, disinterested process can disable its version of fan alarm. In the example below, there are three Alarm Occurred properties, one for the SFP and two representing user applications. While they share the output of the Set/Reset Latch, they each have their own Alarm Enabled signal and their own Alarm Occurred signal.

IMPORTANT: Even though the Alarm Enabled and Alarm Occurred properties are separate for each process, all processes share the same latch as shown below. This can lead to the situation where one process detects that its version of Alarm Occurred is true and then resets the shared latch (using the Clear Alarm call) before a second, also-interested process has read its version of Alarm Occurred. This can result in the second process missing its version of Alarm Occurred. As recommended in the section M9018A Software Architecture, application developers should establish policies for accessing shared resources to avoid this situation.

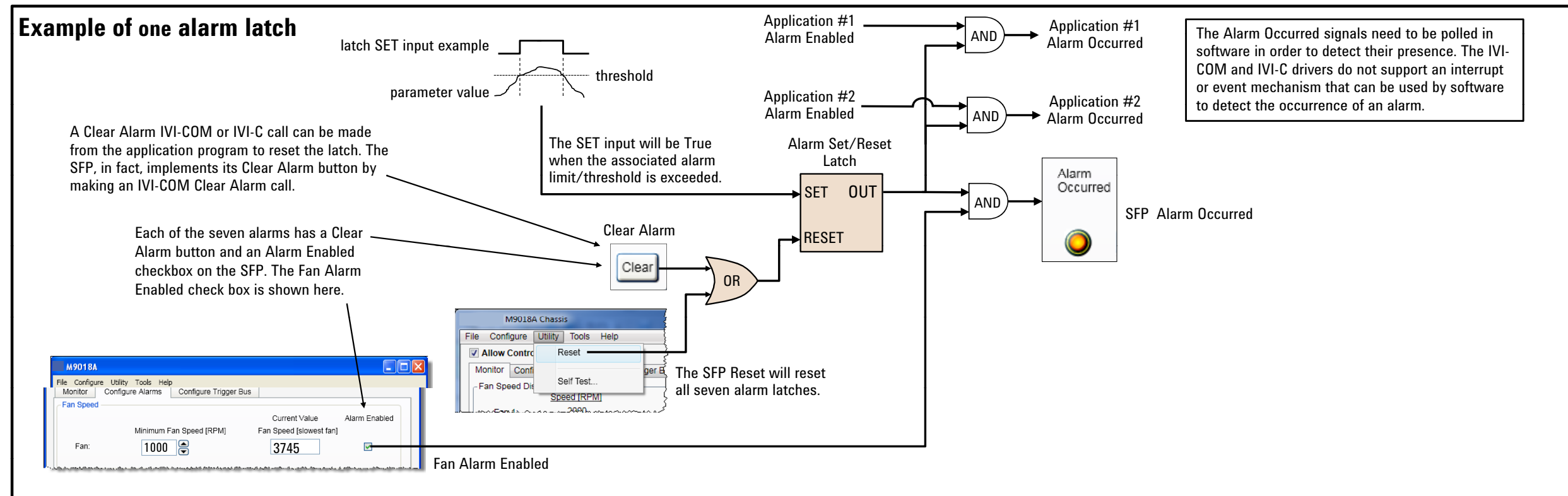


Figure 15 Chassis Alarm Architecture

Relationship between Alarm Occurred and the front panel LEDs

The fans, temperature sensors, and voltage rails have front panel LEDs associated with them. This section describes the relationship between each LED and its associated Alarm Occurred indicator.

Figure 16 shows one example of an alarm latch and an LED.

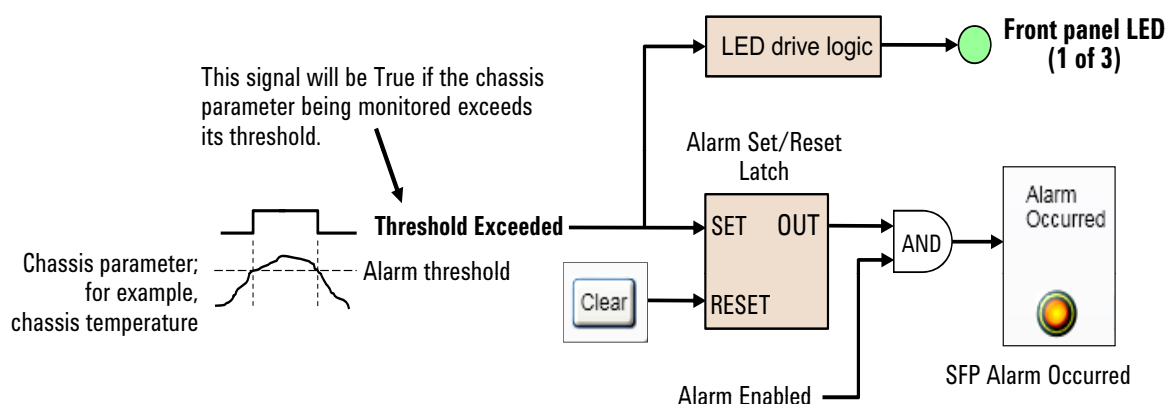


Figure 16 Alarm latch and front panel LED drive logic

In this example, the **Threshold Exceeded** signal will be True if the chassis parameter being monitored exceeds its threshold—for example, if a temperature sensor reports a temperature greater than the temperature threshold. A True value of **Threshold Exceeded** will cause the following:

- 1 The LED drive logic will flash the front panel LED, indicating that the parameter being monitored has exceeded its threshold.
- 2 The Alarm Set/Reset Latch will be set. If, in addition, Alarm Enabled is True, the SFP Alarm Occurred indicator will be illuminated.

If the parameter being monitored then returns to below its threshold (for example, the room temperature is lowered, causing the chassis temperature sensors to report lower temperatures), **Threshold Exceeded** will go False. This will cause the LED to cease flashing. However, the alarm latch will *remain latched*. This can lead to the situation where Alarm Occurred (based on the latched signal) will be indicating an alarm condition, while the associated LED is not likewise indicating an alarm condition.

This situation simply means that the condition that caused the alarm is no longer present. While the alarm can be easily cleared by pressing the SFP Clear button, it is suggested that the cause of the alarm be explored. Although it can be difficult to determine the cause of a prior alarm, the SFP will often provide information regarding what might have caused the alarm. For example, the temperature threshold may be set too close to the temperature being reported by

one of the chassis temperature sensors, which could cause intermittent setting of the temperature alarm latch. Possible next steps include determining if a module is running excessively hot, or adjusting the temperature threshold higher to provide additional margin.

Note that, while the front panel Temperature LED is off when temperatures are normal, the Fan and Power LEDs are on when their associated parameters are normal. In all cases, a flashing LED indicates that the associated parameter has exceeded its alarm threshold.

Power-on default alarm thresholds

This section summarizes the power-on default values of the chassis alarm thresholds as well as the valid range over which the alarm thresholds can be set. The phrase *power-on default* means that, regardless of how the thresholds are changed while power is applied, the thresholds return to factory-defined default values whenever the chassis is power cycled.

For example, if you use the SFP to set the Minimum Fan Speed Alarm Threshold to 500 RPM, this setting will not persist through a power cycle; the Minimum Fan Speed Alarm Threshold will be restored to the power-on default value of 1200 RPM when the chassis is power cycled.

Both the SFP and the IVI drivers will error check the alarm values to ensure they are within the valid range. The SFP will prevent setting of alarm values outside the valid range while the IVI drivers will return an error for values outside the valid range.

Table 2 Chassis power-on default thresholds

Threshold		Default Threshold	Settable Range
Minimum Fan Speed Alarm Threshold		1200 RPM	1 to 10,000 RPM
Maximum Temperature Alarm Threshold		65 °C	1 to 65 °C
3.3V Rail	Upper Voltage Limit	3.465V* (3.3V + 5%)	nominal value +.01% up to nominal value + 20%
	Lower Voltage Limit	3.135V* (3.3V - 5%)	nominal value -.01% down to nominal value -20%
5V Rail	Upper Voltage Limit	5.25V	nominal value +.01% up to nominal value + 20%
	Lower Voltage Limit	4.75V	nominal value -.01% down to nominal value - 20%
12V Rail	Upper Voltage Limit	12.6V	nominal value +.01% up to nominal value +20%
	Lower Voltage Limit	11.4V	nominal value -.01% down to nominal value -20%
-12V Rail	Upper Voltage Limit	-11.4V	nominal value +.01% up to nominal value + 20%
	Lower Voltage Limit	-12.6V	nominal value -.01% down to nominal value -20%

* Note that the 3.3V rail initially has voltage limits of $\pm 5\%$ around the nominal value. However, as noted in [Chapter 2](#), the IVI driver will expand the 3.3V limits to $\pm 10\%$. Because the M9018A chassis SFP uses the IVI-COM driver, the SFP also expands the 3.3V limits to $\pm 10\%$

Events which re-establish the power-on default thresholds

Power cycling is just one event that causes the chassis power-on default alarm thresholds to be re-established by the chassis. The complete list is:

- Power cycling, as mentioned
- Asserting a chassis reset using the SFP **Utility > Reset** menu
- Asserting a programmatic chassis reset using the IVI-COM, IVI-C or LabVIEW drivers.

The SFP alarm thresholds

In Simulation Mode, the SFP default alarm thresholds are identical to the chassis alarm thresholds shown in [Table 2](#) on page 38. However, in Simulation Mode, the alarms are not active. In Hardware Mode, however, the SFP reads and displays the chassis thresholds. In other words, the SFP does not provide its own default thresholds in Hardware Mode.

For example, assume that the SFP has been used to change the Minimum Fan Speed Threshold from 1200 RPM to 500 RPM followed by closing the SFP. When the SFP is started next, it will read the value of Minimum Fan Speed Threshold from the chassis (500 RPM, in this example), and display this value on the SFP as the Minimum Fan Speed Alarm Threshold.

Power cycling the chassis will re-establish all default values. Continuing with the previous example, the chassis Minimum Fan Speed Alarm Threshold will be set back to its power-on default value of 1200 RPM by the power cycle. When the SFP next connects to the chassis, it will read this value from the chassis and display 1200 RPM as the Minimum Fan Speed Alarm Threshold.

NOTE

In the description of each SFP alarm capability, the SFP alarm diagrams will show the *chassis* default alarm thresholds as presented in [Table 2](#) on page 38. This is because, as described above, the SFP reads and displays the chassis alarm thresholds. As long as the particular chassis alarm hasn't been changed earlier (for example, during a prior SFP session), the chassis power-on default alarm threshold will still be in effect—and will be read and displayed by the SFP.

8 Monitoring Fan Speeds

The M9018A chassis contains three fans that are mounted on the chassis rear panel and provide cooling for the chassis. The chassis allows you to monitor the speed of each fan in revolutions per minute (RPM). You can also set a minimum fan speed threshold such that, if any fan speed falls below this threshold, a fan speed alarm is generated.

These monitoring capabilities are available using the SFP and programmatically using the chassis drivers. In addition, the front panel Fan LED provides information on fan speeds. Use of the SFP, the front panel Fan LED, and the IVI drivers to monitor the chassis temperature sensors are described in the following three diagrams:

- SFP and the front panel Fan LED – [Figure 17](#) on page 42
- IVI-COM driver and C# – [Figure 18](#) on page 43
- IVI-C driver and C++ – [Figure 19](#) on page 44

NOTE

Early M9018A chassis had a minimum fan speed of 800 RPM. Chassis with Monitor Processor Software revision number 0.59, 5 and greater have a default minimum fan speed of 1200 RPM. To identify the Monitor Processor software revision number, refer to [Chapter 6](#), “Viewing the Chassis Revision and Updating Firmware” on [page 33](#).

Fan Speed Monitoring using the SFP and the Front Panel Fan LED

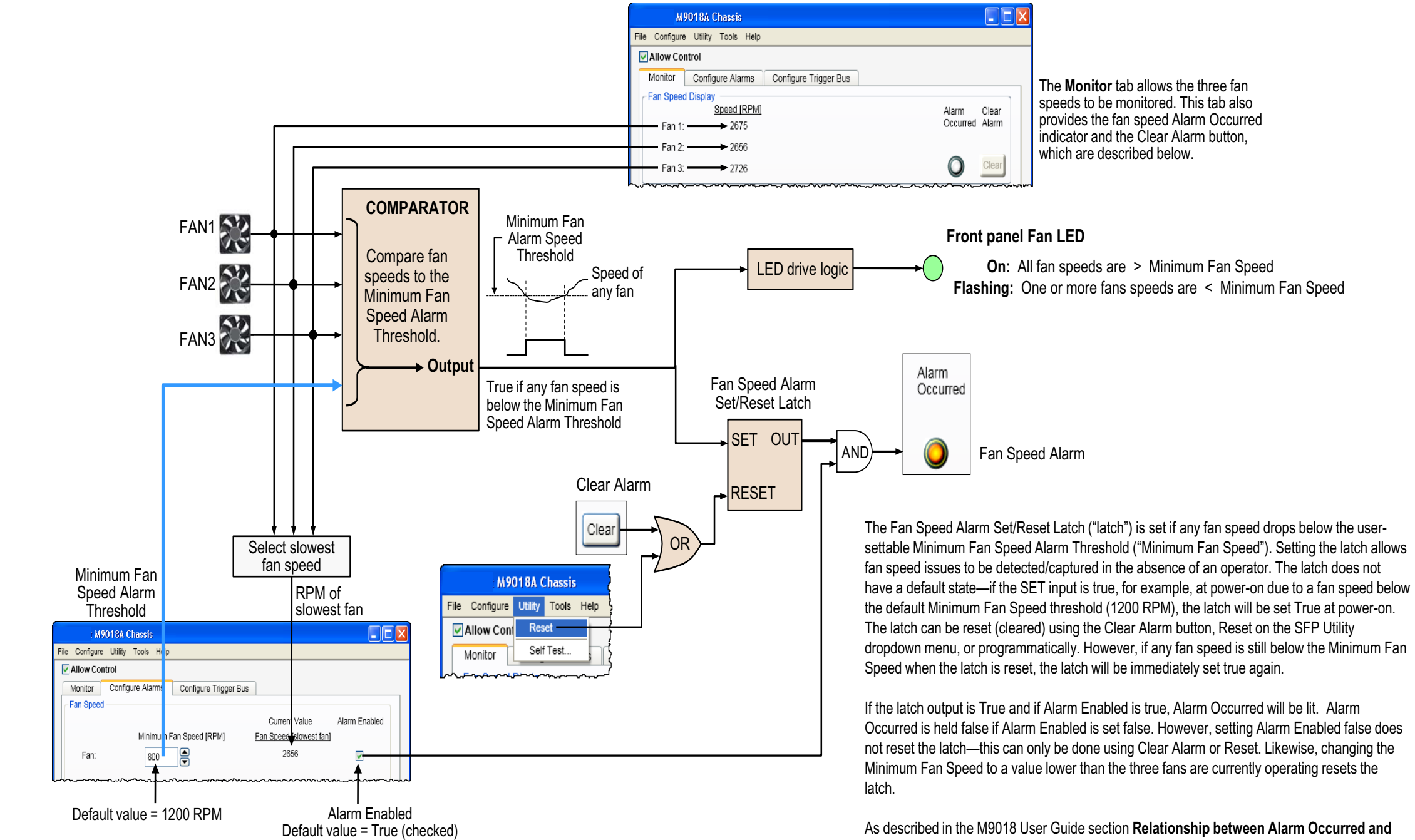


Figure 17 Fan speed monitoring using the SFP and the front panel Fan LED

Fan Speed Monitoring using the IVI-COM Driver and C#

```
driver.Fans.Name()
```

Name() takes a fan index of 1, 2, or 3 and returns the fan name. For example, the value returned for Name(2) is "FAN2". A fan name, not an index, is required to obtain a fan RPM, as shown at right.

```
driver.Fans.get_Item("FAN2").RPM
```

This property takes a fan name (for example, "FAN2") and returns the RPM of that fan.

```
driver.Fans.Count
```

Returns the number of fans. For the M9018A chassis, Count = 3.

```
driver.Fans.Alarm.MinRPM
```

Sets the Minimum Fan Speed Alarm Threshold.

```
driver.Fans.Alarm.Clear()
```

Clears the Fan Alarm Latch.

```
driver.Fans.Alarm.Occurred
```

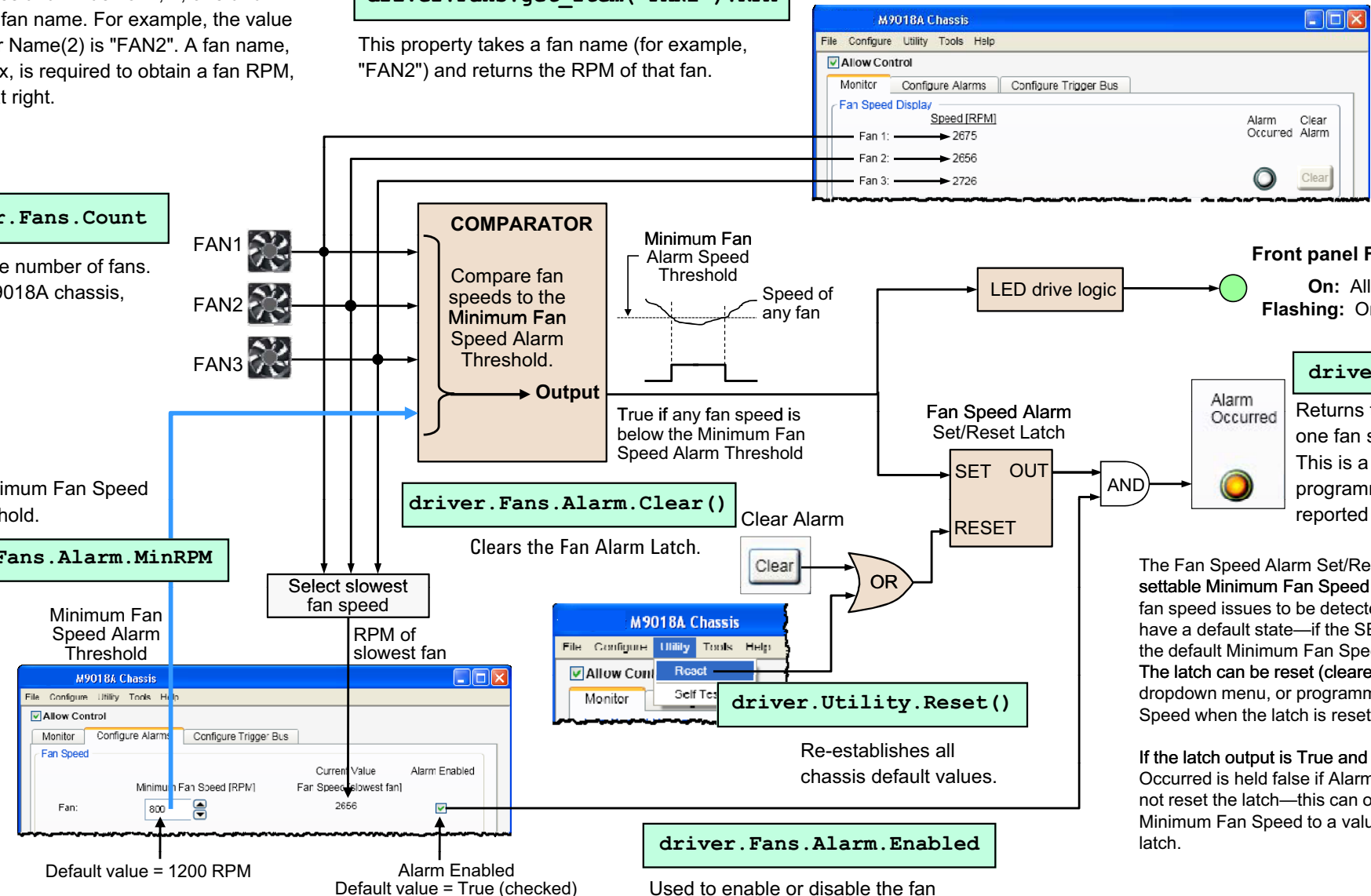
Returns the status of the fan alarm. If True, this indicates that at least one fan speed is below the Minimum Fan Speed Alarm Threshold. This is a per-application property and therefore the value reported programmatically may be different than the fan Alarm Occurred status reported by the SFP.

```
driver.Fans.Alarm.Enabled
```

Used to enable or disable the fan speed alarm.

```
driver.Fans.Alarm.Configure()
```

Configures the fan alarm behavior by allowing setting of both the Minimum Fan Speed Alarm Threshold (MinRPM) and the Enabled property.



The Fan Speed Alarm Set/Reset Latch ("latch") is set if any fan speed drops below the user-settable Minimum Fan Speed Alarm Threshold ("Minimum Fan Speed"). Setting the latch allows fan speed issues to be detected/captured in the absence of an operator. The latch does not have a default state—if the SET input is true, for example, at power-on due to a fan speed below the default Minimum Fan Speed threshold (1200 RPM), the latch will be set True at power-on. The latch can be reset (cleared) using the Clear Alarm button, Reset on the SFP Utility dropdown menu, or programmatically. However, if any fan speed is still below the Minimum Fan Speed when the latch is reset, the latch will be immediately set true again.

If the latch output is True and if Alarm Enabled is true, Alarm Occurred will be lit. Alarm Occurred is held false if Alarm Enabled is set false. However, setting Alarm Enabled false does not reset the latch—this can only be done using Clear Alarm or Reset. Likewise, changing the Minimum Fan Speed to a value lower than the three fans are currently operating resets the latch.

To show the parallels between the SFP capabilities and the programmatic capabilities, the IVI-C driver attributes and functions are overlaid next to their SFP counterparts.

It is important to understand how your program interacts with the SFP. If your program and the SFP (or, for that matter, any other program) are operating simultaneously, they will need to share certain chassis resources. Please see the diagram "Chassis Alarm Architecture" in the M9018A User Guide chapter "Overview of Chassis Management Capabilities" for a description of how the alarm resources are shared between multiple processes.

Figure 18 Fan speed monitoring using the IVI-COM driver and C++

Fan Speed Monitoring using the IVI-C Driver and C++

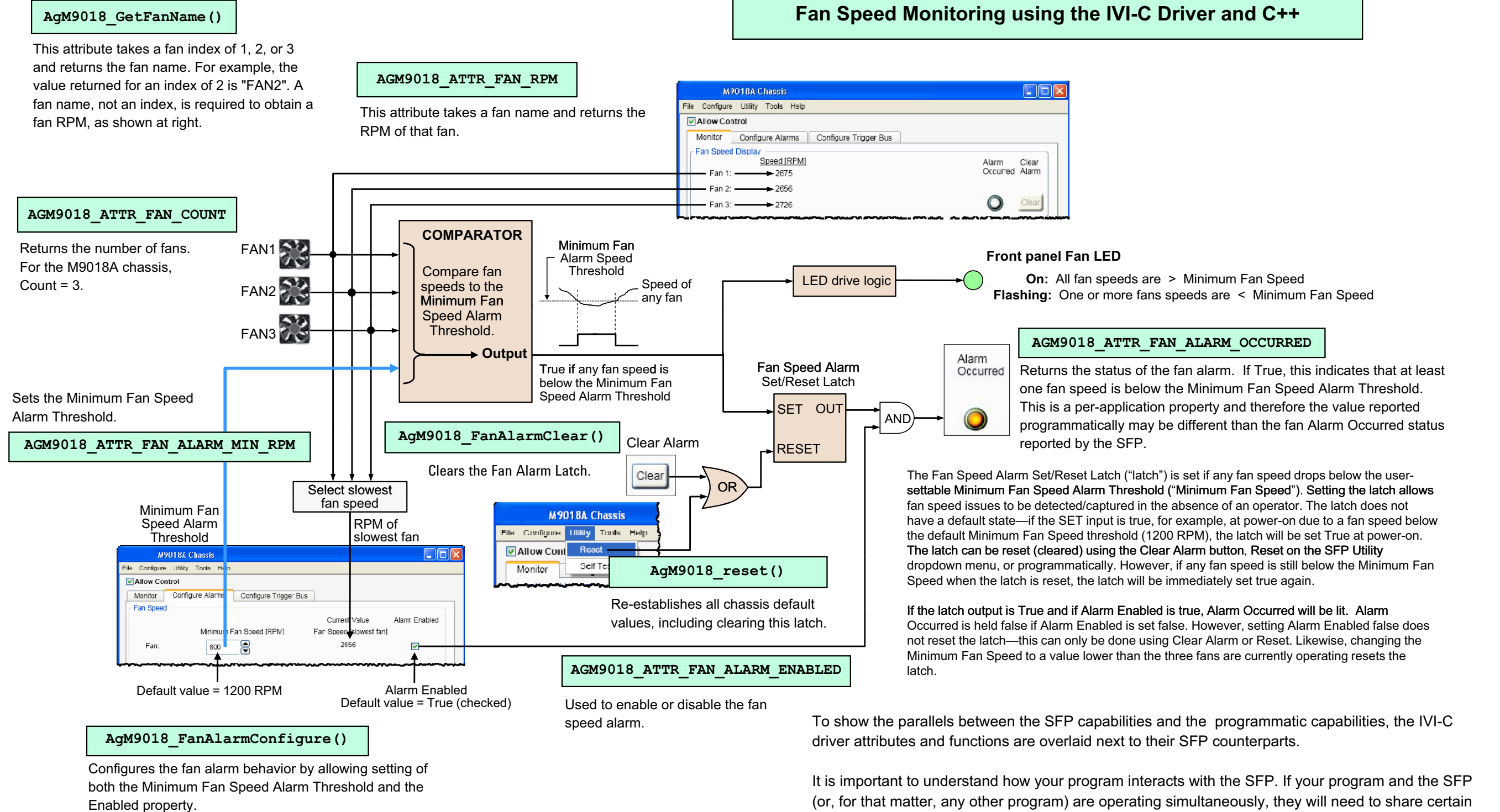


Figure 19 Fan speed monitoring using the IVI-C driver and C++

9 Monitoring the Chassis Temperature

The M9018A chassis allows you to monitor each of the eight temperature sensors using either the SFP, the IVI drivers, or the LabVIEW driver. In addition, the SFP and IVI drivers can be used to set an upper temperature threshold such that an alarm will be generated if any temperature sensor reports a temperature above the specified threshold. The front panel Temperature LED also provides information about the chassis temperature.

The eight chassis temperature sensors are located on the chassis printed circuit board that contains the module connectors as shown in Figure 20. This board is known as the *chassis backplane* or just *backplane*.

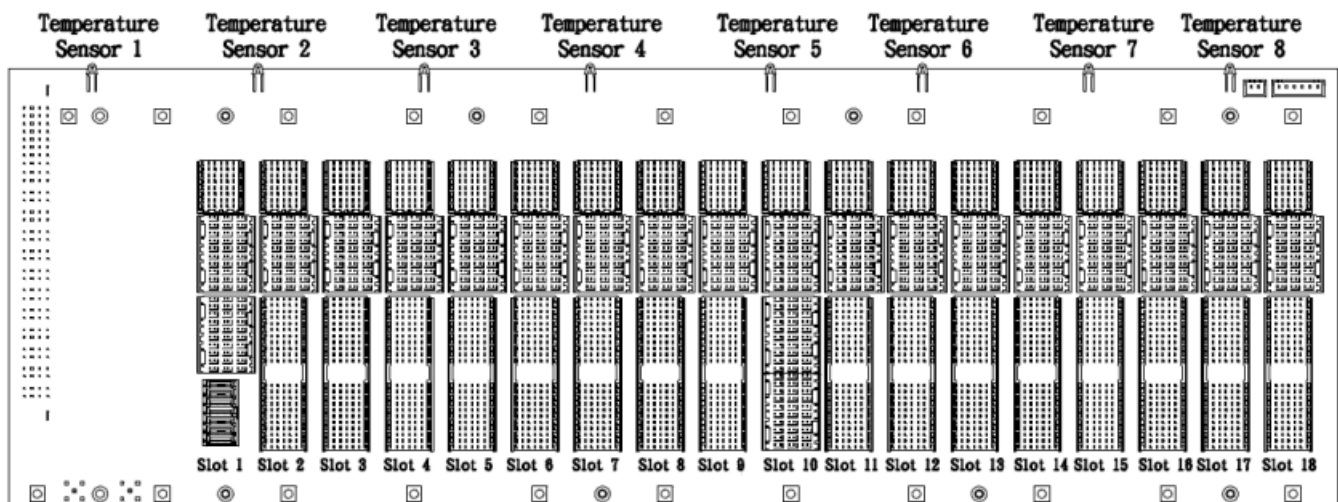


Figure 20 Location of the eight temperature sensors on the backplane

By knowing the location of the temperature sensors relative to the chassis slots, you can determine which modules are potentially contributing to excessive temperatures. To address this, you can take steps such as redistributing modules in the chassis or installing air inlet modules adjacent to high power modules to provide additional ventilation.

Monitoring the Chassis Temperature

Use of the SFP, the front panel Temperature LED, and the IVI drivers to monitor the chassis temperature sensors is described in the following three diagrams:

- Temperature Monitoring using the SFP and the Front Panel Temperature LED – [Figure 21](#) on page 47
- IVI-COM driver and C# – [Figure 22](#) on page 48
- IVI-C driver and C++ – [Figure 23](#) on page 49

Temperature Monitoring using the SFP and the Front Panel Temperature LED

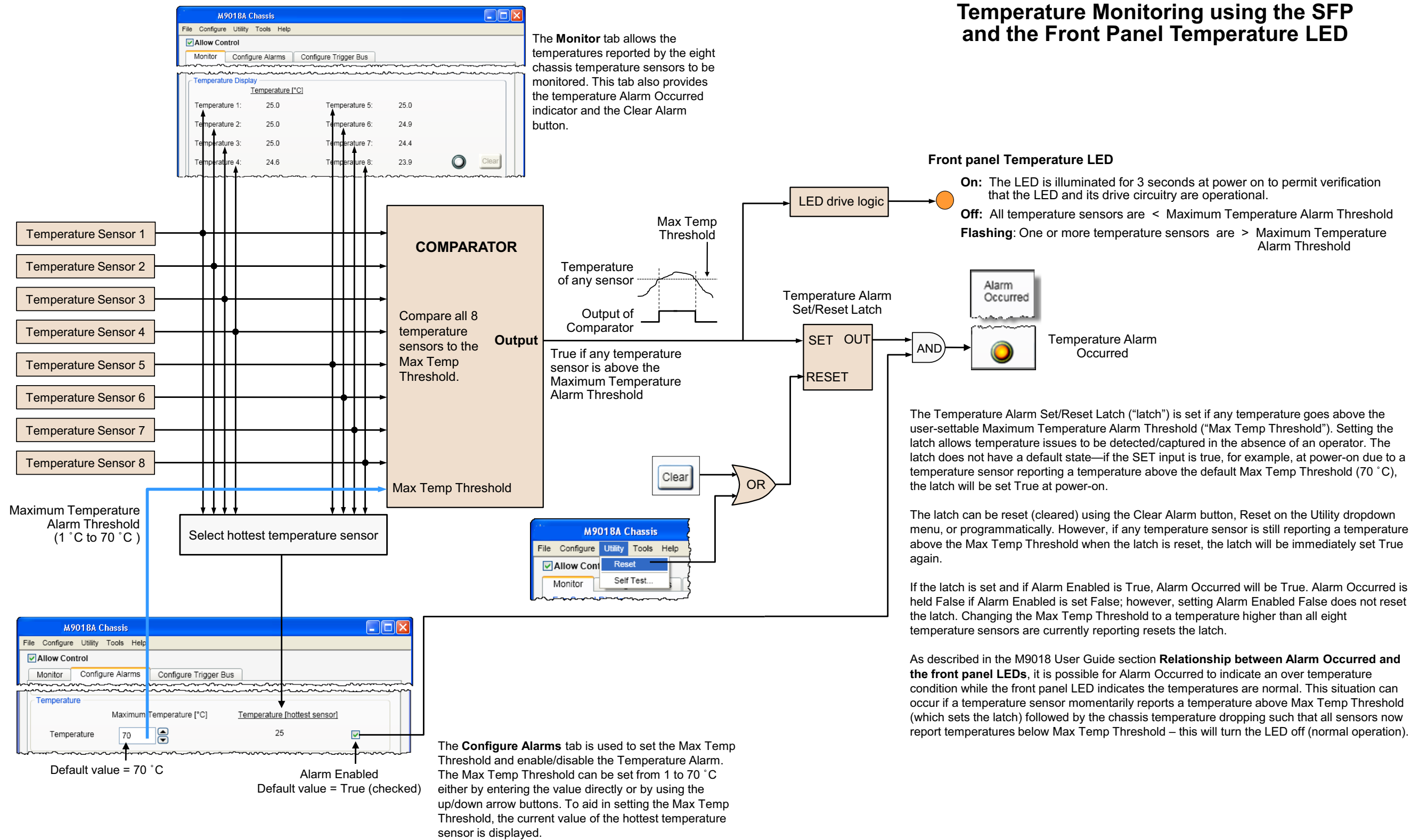


Figure 21 Temperature monitoring using the SFP and front panel LEDs

Temperature Monitoring using the IVI-COM Driver and C#

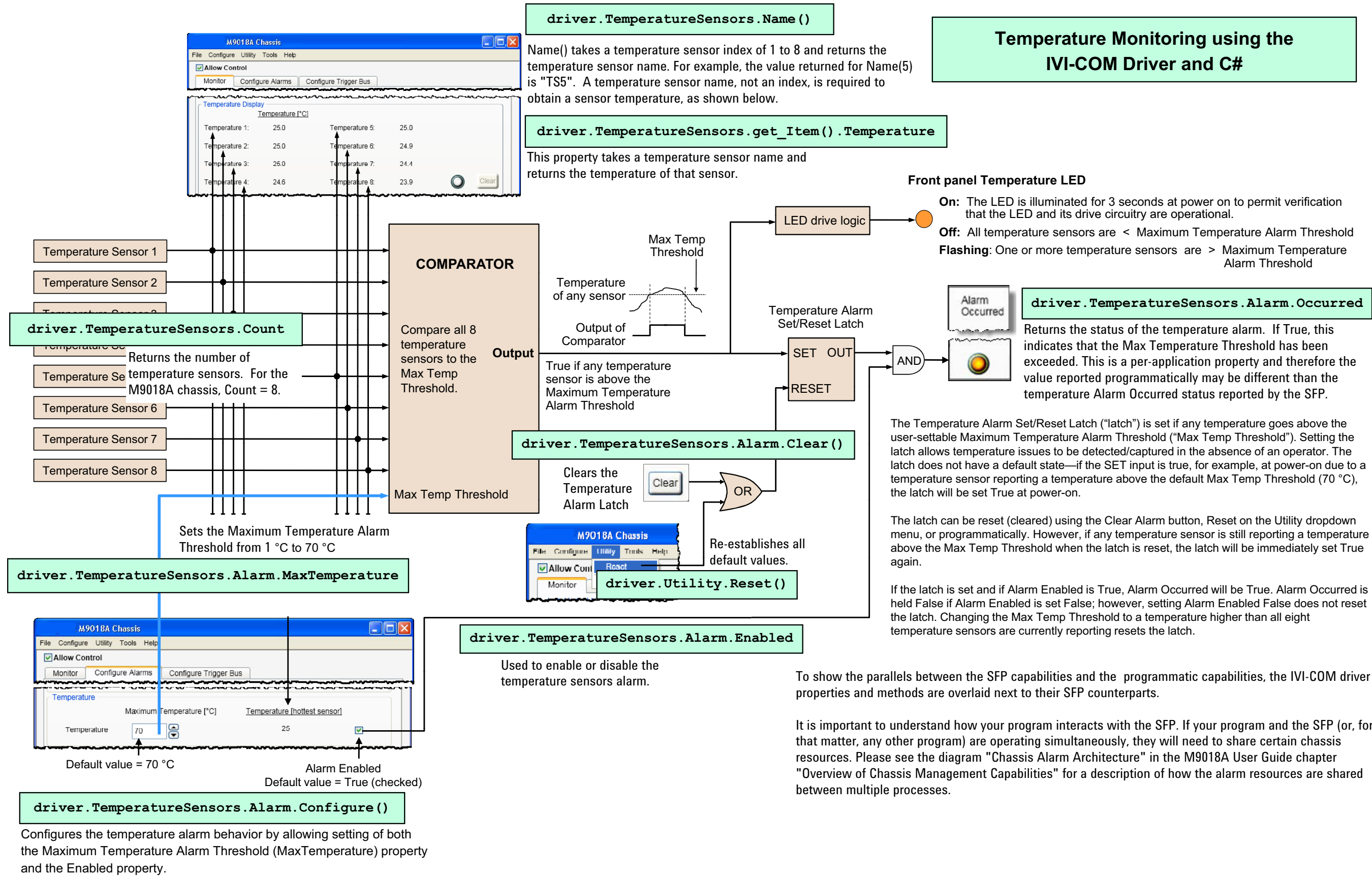


Figure 22 Temperature monitoring using the IVI-COM driver and C#

Temperature Monitoring using the IVI-C Driver and C++

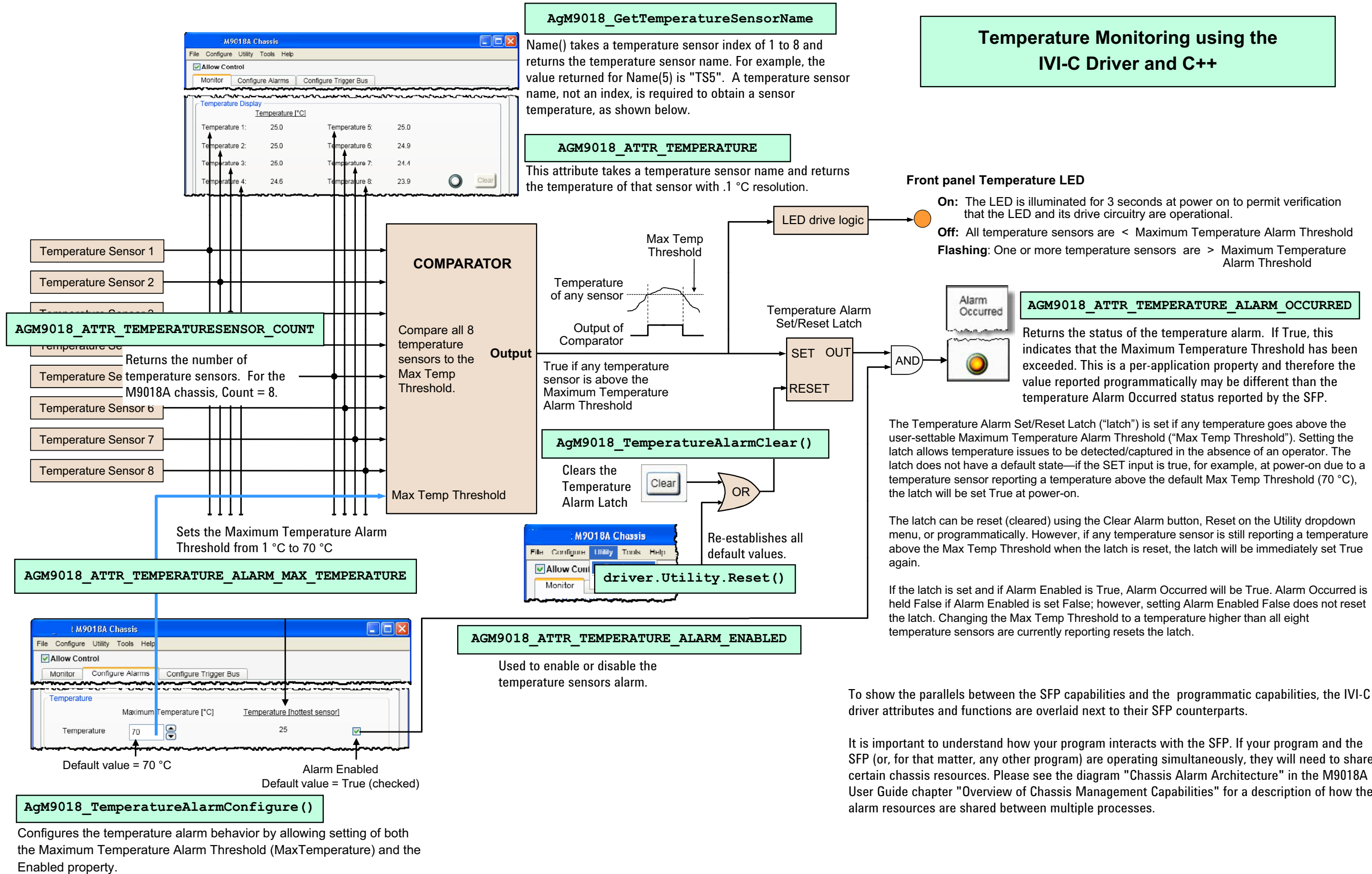


Figure 23 Temperature monitoring using the IVI-C driver and C++

10 Setting the Fan Speed vs. Chassis Temperature Profile

The chassis allows you to control the fan speed vs. temperature profile. This is done by specifying a chassis temperature at which the three fans will operate at maximum speed. Maximum speed is achieved by the chassis supplying a drive voltage to the fans with a 100% duty cycle.

For temperatures below the specified chassis temperature, the duty cycle of the fan drive voltage will be less than 100%, which reduces the fan speed and the fan noise. The reduction in fan speed is proportional to how far the chassis temperature is below the specified chassis temperature. To ensure adequate cooling at any temperature, the drive voltage to the fan will never drop below 40% duty cycle.

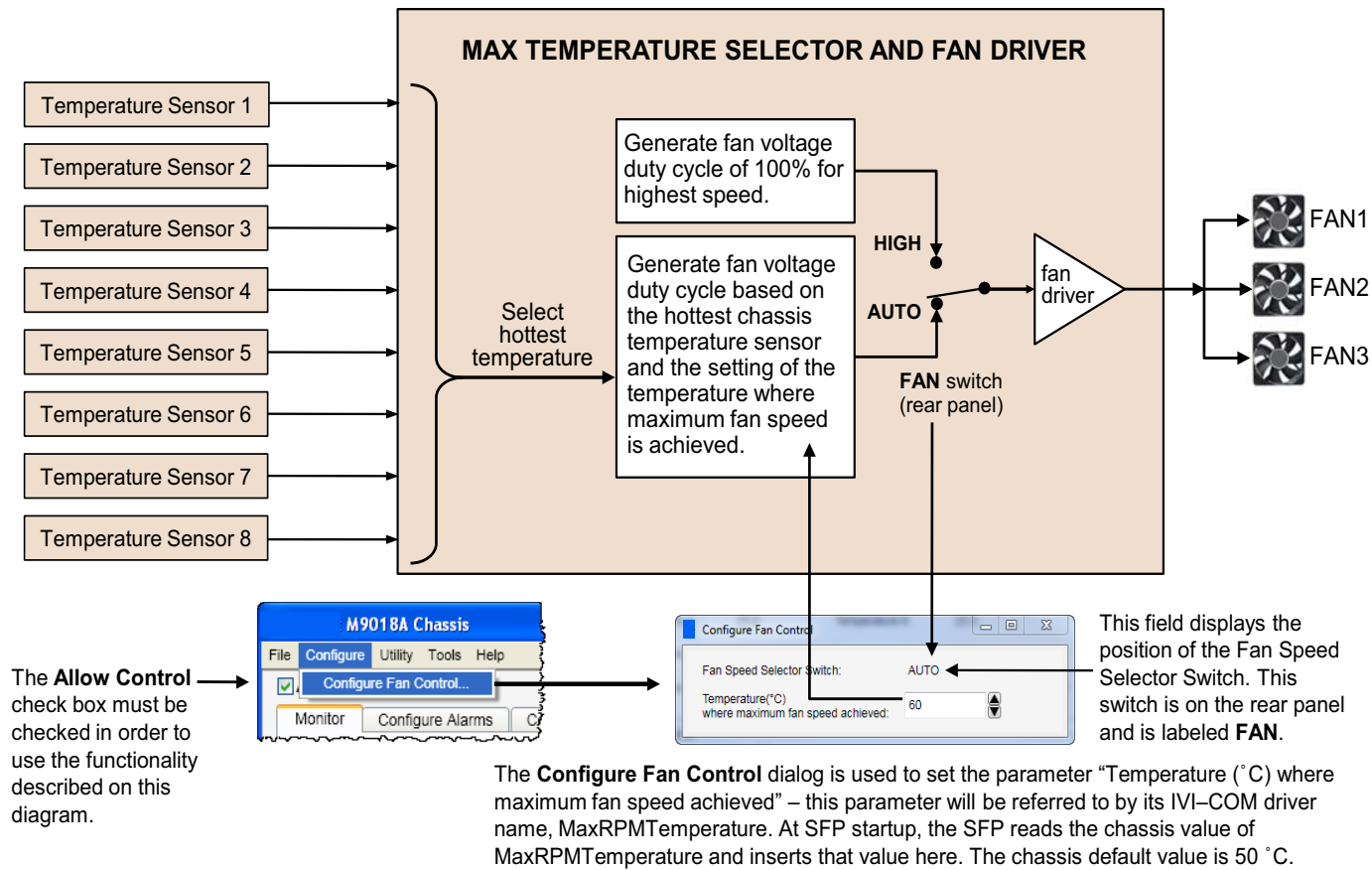
These fan speed vs. chassis temperature profile can be set using both the SFP and programmatically, as described in the following three figures:

- Using the SFP – [Figure 24](#) on page 51
- Using the IVI-COM driver and C# – [Figure 25](#) on page 52
- Using IVI-C driver and C++ – [Figure 26](#) on page 53

NOTE

Early M9018A chassis had a minimum fan speed of 800 RPM. Chassis with Monitor Processor Software revision number 0.59, 5 and greater have a default minimum fan speed of 1200 RPM. To identify the Monitor Processor software revision number, refer to [Chapter 6](#), “Viewing the Chassis Revision and Updating Firmware” on [page 33](#).

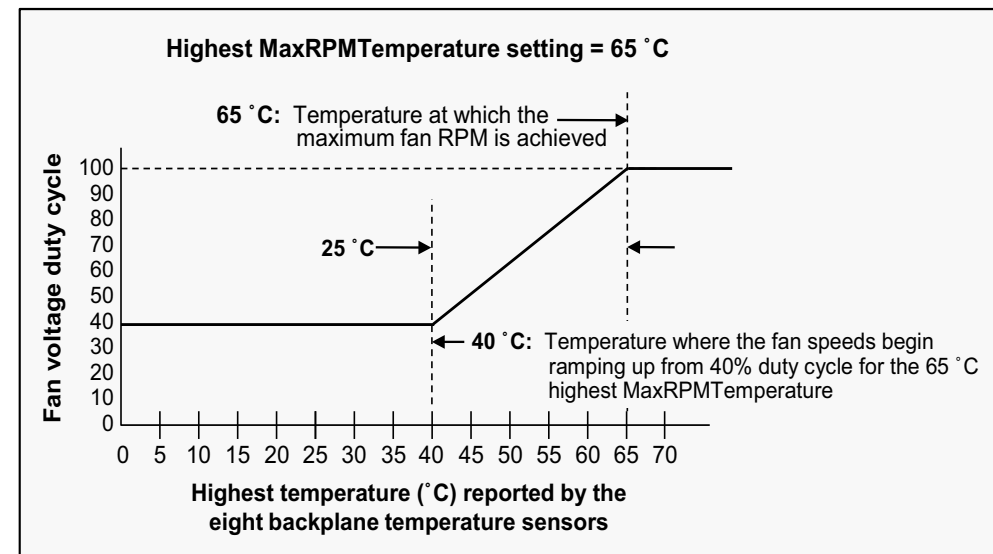
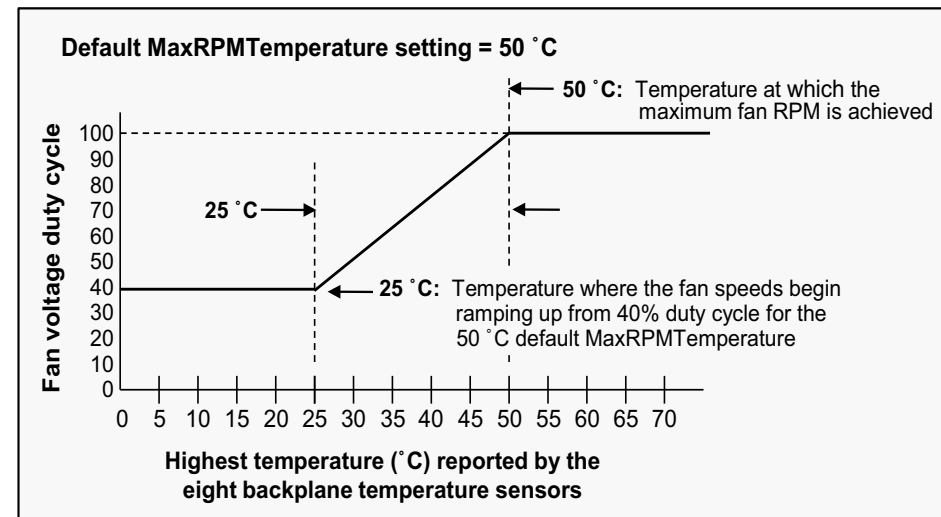
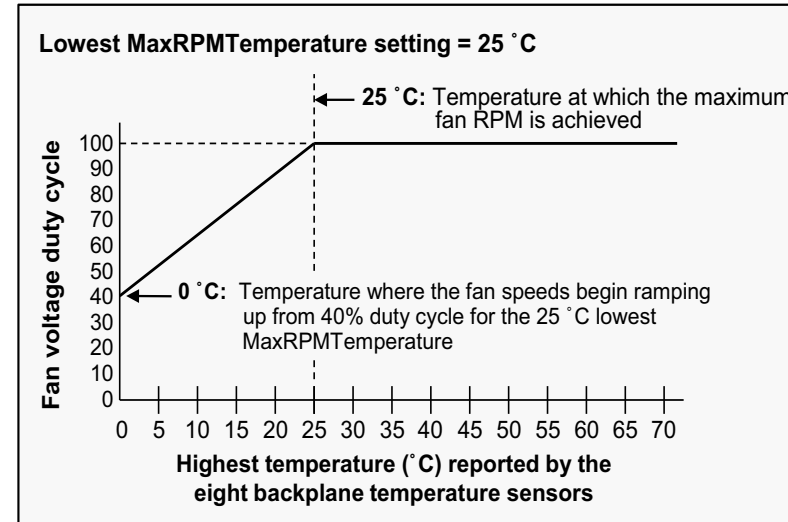
Setting the Temperature at which the Maximum Fan Speed is Achieved using the SFP



The **Allow Control** check box must be checked in order to use the functionality described on this diagram.

This field displays the position of the Fan Speed Selector Switch. This switch is on the rear panel and is labeled **FAN**.

The **Configure Fan Control** dialog is used to set the parameter "Temperature (°C) where maximum fan speed achieved" – this parameter will be referred to by its IVI-COM driver name, MaxRPMtemperature. At SFP startup, the SFP reads the chassis value of MaxRPMtemperature and inserts that value here. The chassis default value is 50 °C.



The M9018A chassis controls the speed of its three fans by varying the duty cycle of the drive voltage to the fans. When the rear panel **FAN** switch (referred to as the "Fan Speed Selector Switch") is set to **HIGH**, the fan voltage duty cycle is set to 100%, which generates the highest fan speeds and the best chassis cooling – however, this also generates the most fan noise.

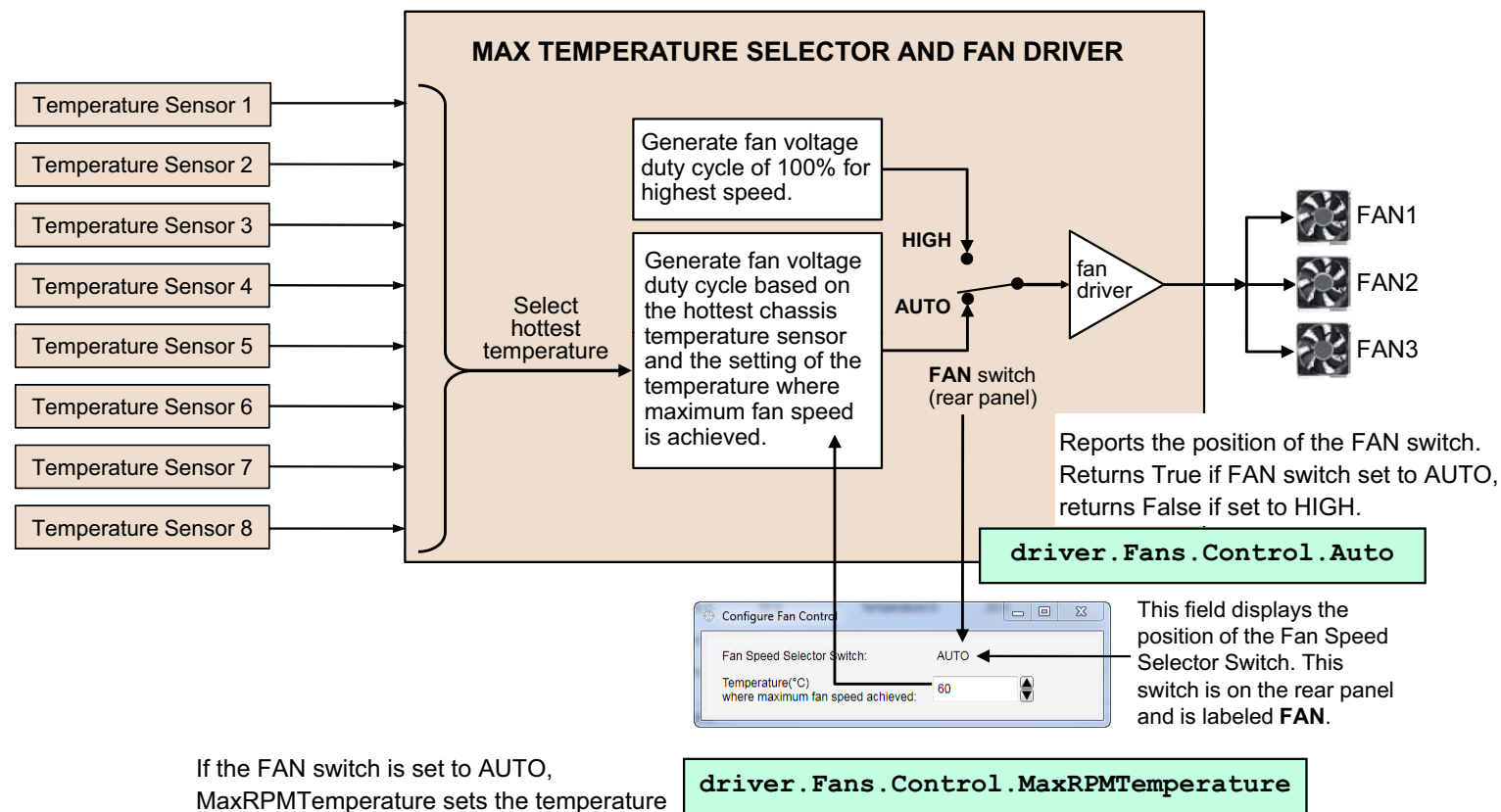
When the Fan Speed Selector Switch is set to **AUTO**, the speed of the three fans is controlled based on the temperature of the chassis *and* the setting of the SFP parameter "Temperature (°C) where maximum fan speed achieved" shown above (which will be referred to by its IVI-COM driver name for brevity, "MaxRPMtemperature"). MaxRPMtemperature specifies the chassis temperature where the maximum (100% duty cycle) fan speed is achieved, and is set using the Configure Fan Control dialog – this dialog is opened from the SFP **Configure** pull down menu. The hottest temperature reported by the eight temperature sensors is used to control the fan speed as shown in the block diagram. MaxRPMtemperature can be set from 25 °C (right top curve) to 65 °C (right bottom curve) in 1 °C increments either by entering the value directly or by using the up/down arrow buttons. The default MaxRPMtemperature parameter is 50 °C (right middle curve).

Regardless of the MaxRPMtemperature that is set, the fan speeds begin ramping up at 25 °C *below* MaxRPMtemperature. For example, if MaxRPMtemperature is set to 65 °C (bottom curve), the fan speed begins ramping up at 25 °C below this temperature, or at 40 °C. At 65 °C, the fan voltage duty cycle will be 100% (maximum fan speed).

Note that the chassis doesn't attempt to maintain its temperature at a particular temperature although it is expected that, in most cases, the chassis temperature will stabilize before MaxRPMtemperature is reached. To maximize cooling, MaxRPMtemperature should be set lower while, to minimize fan noise, MaxRPMtemperature should be set higher.

Figure 24 Setting the temperature using the Soft Front Panel

Setting the Temperature at which the Maximum Fan Speed is Achieved using the IVI-COM Driver and C#



If the FAN switch is set to AUTO, MaxRPMTemperature sets the temperature at which the fans will be operating at maximum RPM.

The M9018A chassis controls the speed of its three fans by varying the duty cycle of the drive voltage to the fans. When the rear panel **FAN** switch (referred to as the "Fan Speed Selector Switch") is set to **HIGH**, the fan voltage duty cycle is set to 100%, which generates the highest fan speeds and the best chassis cooling – however, this also generates the most fan noise.

When the Fan Speed Selector Switch is set to **AUTO**, the speed of the three fans is controlled based on the temperature of the chassis *and* the setting of the SFP parameter "Temperature (°C) where maximum fan speed achieved" shown above (which will be referred to by its IVI-COM driver name for brevity, "MaxRPMTemperature"). MaxRPMTemperature specifies the chassis temperature where the maximum (100% duty cycle) fan speed is achieved, and is set using the Configure Fan Control dialog – this dialog is opened from the SFP **Configure** pull down menu. The hottest temperature reported by the eight temperature sensors is used to control the fan speed as shown in the block diagram. MaxRPMTemperature can be set from 25 °C (right top curve) to 65 °C (right bottom curve) in 1 °C increments either by entering the value directly or by using the up/down arrow buttons. The default MaxRPMTemperature parameter is 50 °C (right middle curve).

Regardless of the MaxRPMTemperature that is set, the fan speeds begin ramping up at 25 °C *below* MaxRPMTemperature. For example, if MaxRPMTemperature is set to 65 °C (bottom curve), the fan speed begins ramping up at 25 °C below this temperature, or at 40 °C. At 65 °C, the fan voltage duty cycle will be 100% (maximum fan speed).

Note that the chassis doesn't attempt to maintain its temperature at a particular temperature although it is expected that, in most cases, the chassis temperature will stabilize before MaxRPMTemperature is reached. To maximize cooling, MaxRPMTemperature should be set lower while, to minimize fan noise, MaxRPMTemperature should be set higher.

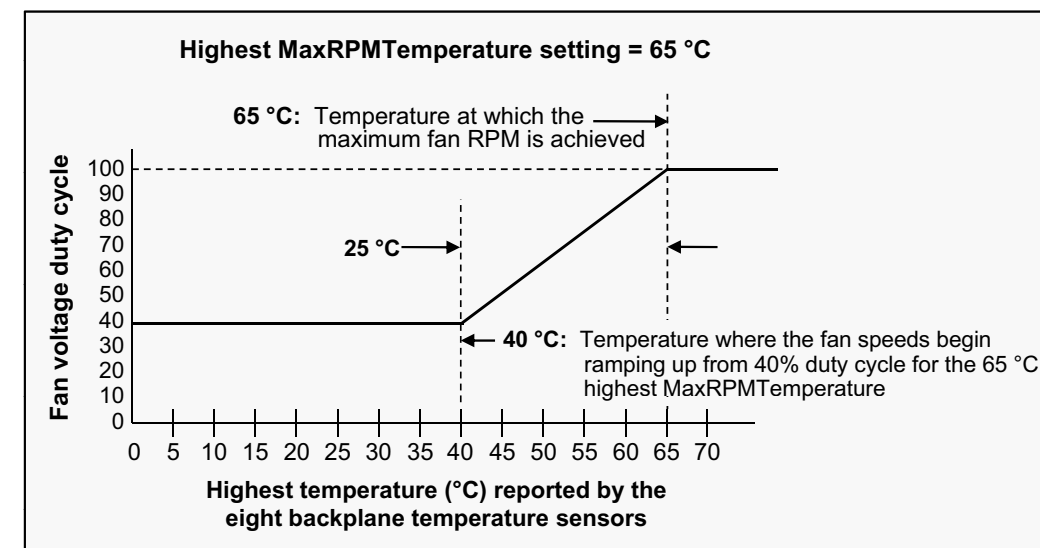
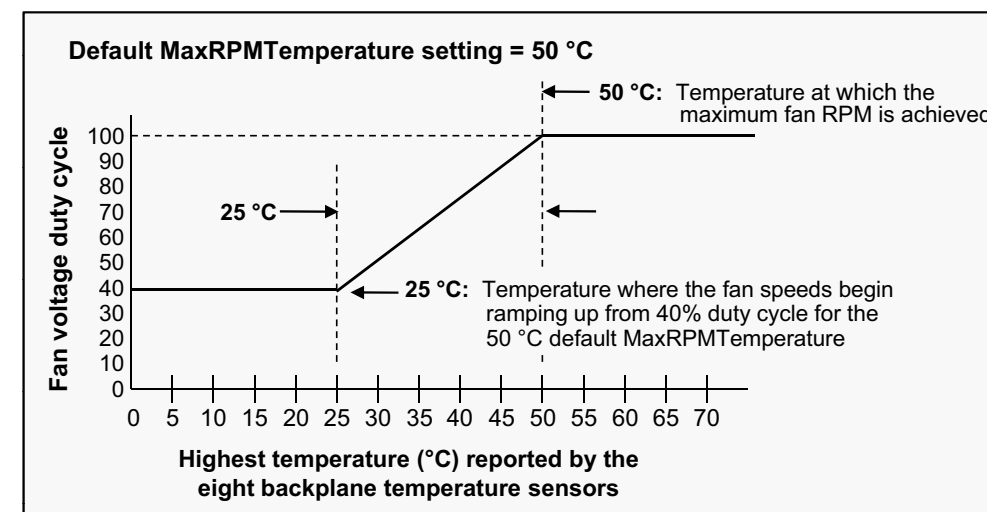
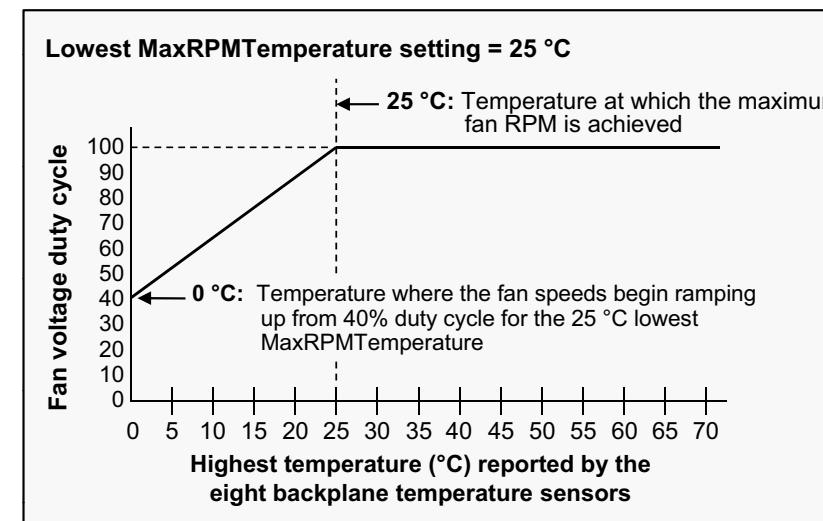
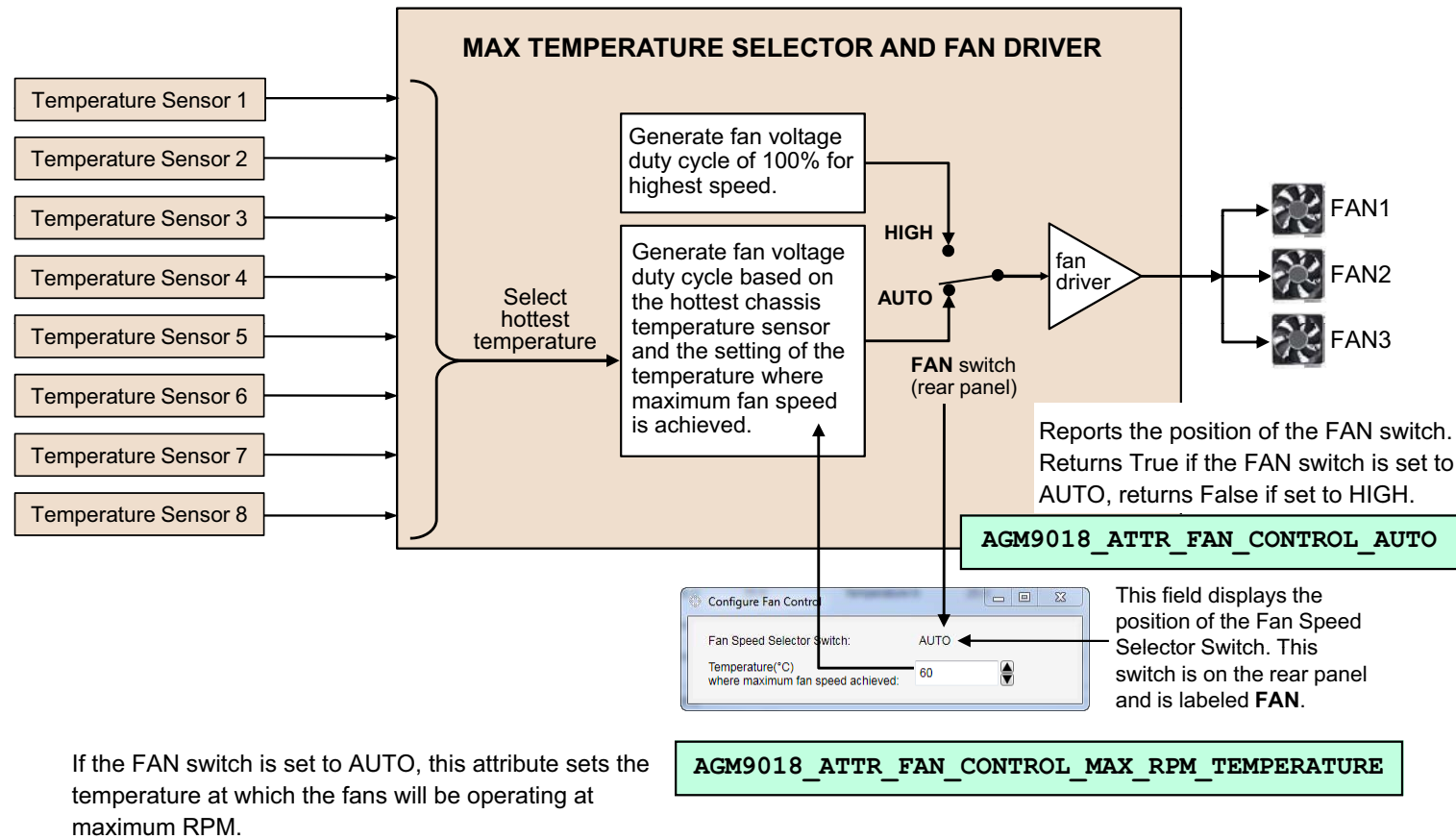


Figure 25 Setting the temperature using IVI-COM and C#

Setting the Temperature at which the Maximum Fan Speed is Achieved using the IVI-C Driver and C++



The M9018A chassis controls the speed of its three fans by varying the duty cycle of the drive voltage to the fans. When the rear panel **FAN** switch (referred to as the "Fan Speed Selector Switch") is set to **HIGH**, the fan voltage duty cycle is set to 100%, which generates the highest fan speeds and the best chassis cooling – however, this also generates the most fan noise.

When the Fan Speed Selector Switch is set to **AUTO**, the speed of the three fans is controlled based on the temperature of the chassis *and* the setting of the SFP parameter "Temperature (°C) where maximum fan speed achieved" shown above (which will be referred to by its IVI-COM driver name for brevity, "MaxRPMTemperature"). MaxRPMTemperature specifies the chassis temperature where the maximum (100% duty cycle) fan speed is achieved, and is set using the Configure Fan Control dialog – this dialog is opened from the SFP **Configure** pull down menu. The hottest temperature reported by the eight temperature sensors is used to control the fan speed as shown in the block diagram. MaxRPMTemperature can be set from 25 °C (right top curve) to 65 °C (right bottom curve) in 1 °C increments either by entering the value directly or by using the up/down arrow buttons. The default MaxRPMTemperature parameter is 50 °C (right middle curve).

Regardless of the MaxRPMTemperature that is set, the fan speeds begin ramping up at 25 °C *below* MaxRPMTemperature. For example, if MaxRPMTemperature is set to 65 °C (bottom curve), the fan speed begins ramping up at 25 °C below this temperature, or at 40 °C. At 65 °C, the fan voltage duty cycle will be 100% (maximum fan speed).

Note that the chassis doesn't attempt to maintain its temperature at a particular temperature although it is expected that, in most cases, the chassis temperature will stabilize before MaxRPMTemperature is reached. To maximize cooling, MaxRPMTemperature should be set lower while, to minimize fan noise, MaxRPMTemperature should be set higher.

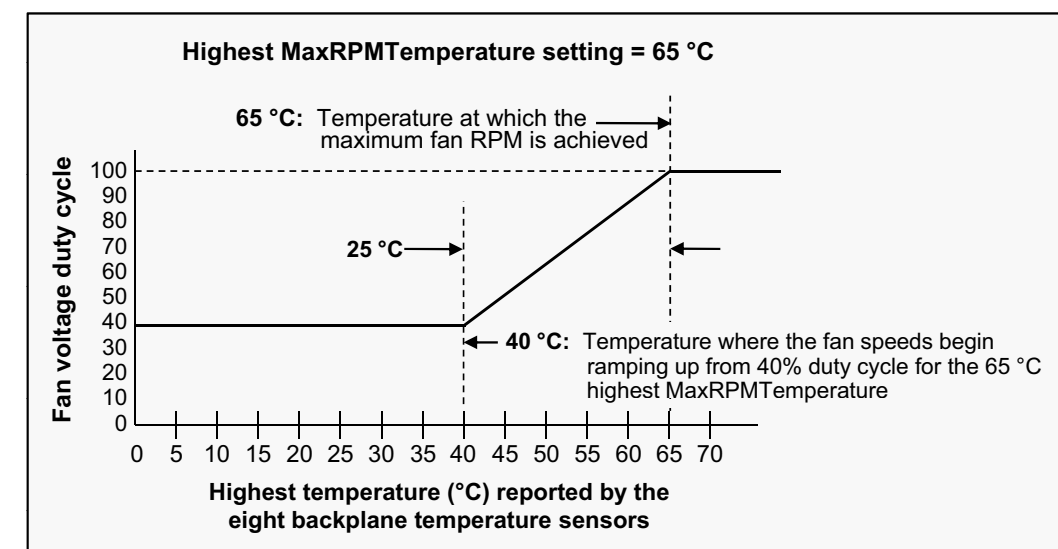
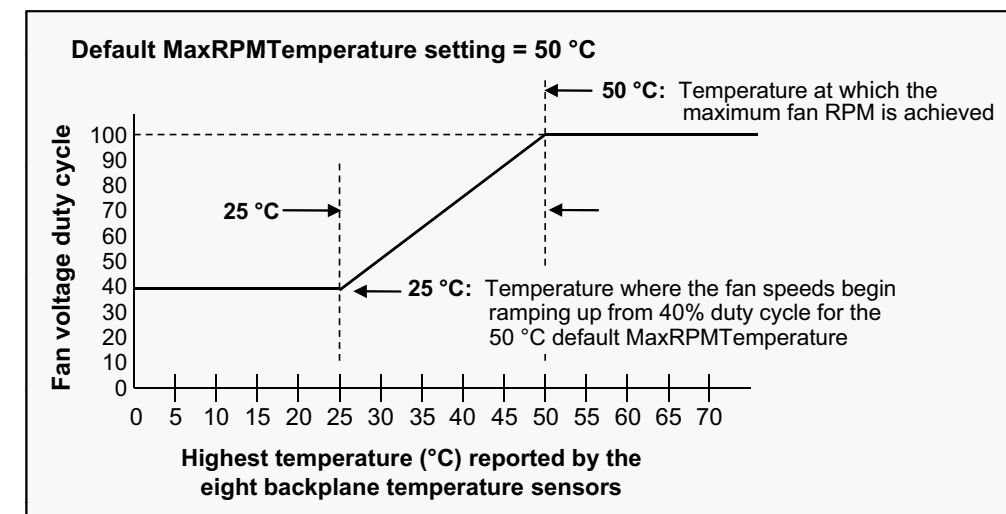
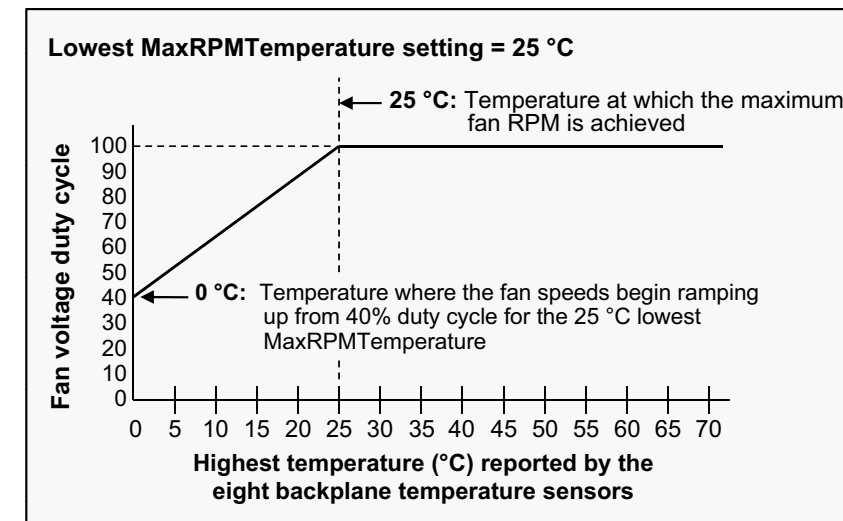


Figure 26 Setting the temperature using IVI-C and C++

11 Monitoring the Power Supply Rails

The chassis allows you to monitor the following five power supply rails:

- 3.3V
- 5V
- 5Vaux (This rail is monitored indirectly using the front panel Power LED)
- 12V
- -12V

For a description of these rails, please see [Chapter 2](#), “Power Supply Operation”. With the exception of the 5Vaux rail, all voltage rails can be viewed using the SFP, can be read programmatically using the chassis drivers, and can be read directly on the rear panel DB-9 connector using a voltmeter.

In addition, the SFP and the chassis drivers can be used to set voltage limits around the rails (again, except for the 5Vaux rail) such that an alarm will be generated if a rail voltage falls outside of the specified limits. The front panel Power LED provides collective information about all five rails.

Use of the SFP, the front panel Power LED, and the IVI drivers to monitor the power supply rails is described in the following three figures:

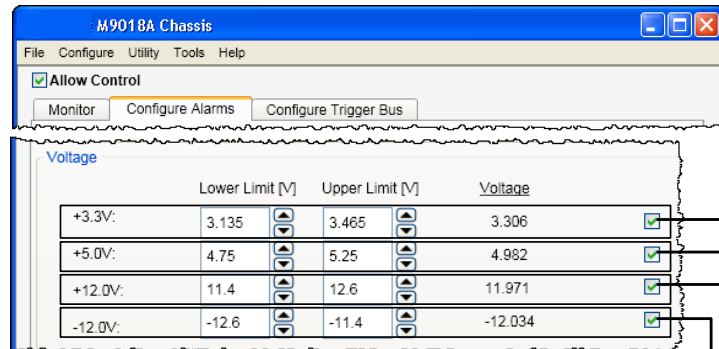
- Soft front panel (SFP) and the front panel Power LED – [Figure 27](#) on page 56
- Using the IVI-COM driver and C# – [Figure 28](#) on page 57
- Using the IVI-C driver and C++ – [Figure 29](#) on page 58

NOTE

In rare cases where the 5Vaux is loaded to the point where it deviates outside of the $\pm 5\%$ tolerance, it can cause the Power LED to blink. Unfortunately, the 5Vaux is not visible through the IVI command layer. Therefore, you will not see voltage nor alarm change on the Soft Front Panel.

Monitoring the Power Supply Rails

Voltage Monitoring using the SFP and the Front Panel Power LED



The **Configure Alarms** tab is used to set the Upper and Lower Voltage Limits for each of the four primary voltage rails.

The **Configure Alarms** Voltage column displays the current value of each supply; these values are also displayed on the **Monitor** tab. Each voltage rail has a Comparator and Voltage Alarm Set/Reset Latch ("latch") that are used to detect and store the occurrence of an out-of-limit power supply condition. The voltage rail latch is set if the associated voltage rail is outside of its Upper/Lower Voltage Limits. Setting of the latch allows power supply issues to be detected/captured in the absence of an operator. The latch can be reset (cleared) using the corresponding Clear Alarm button, Reset on the Utility dropdown menu, or programmatically. However, if the voltage rail is still outside of its Upper/Lower Voltage Limits when the latch is cleared, the latch will immediately be set true again.

If a latch is set and if the corresponding Alarm Enabled is True, Alarm Occurred will be True. Alarm Occurred is held False if Alarm Enabled is set False; however, setting Alarm Enabled False does not reset the latch. Likewise, changing the Upper/Lower Voltage Limits such that the voltage rail is within the limits resets the latch.

As described in the M9018 User Guide section **Relationship between Alarm Occurred and the front panel LEDs**, it is possible for Alarm Occurred to indicate an out-of-range voltage condition while the front panel Power LED indicates the voltages are normal. This situation can occur if a voltage rail momentarily exceeds its limits (which sets that particular latch) followed by the voltage rail changing such that the voltage rail is now within its limits -- this will restore the Power LED to being on continuously (normal operation).

Note: the internal voltage measurement system has a worst case accuracy of $\pm 50\text{mV}$.

The 5Vaux supply provides 5 VDC standby power to every slot. There is no alarm associated with the 5Vaux supply. The only indicator of an out-of-range condition is the front panel Power LED. However, this LED reports on the status of all five voltage rails on this diagram, not just 5Vaux.

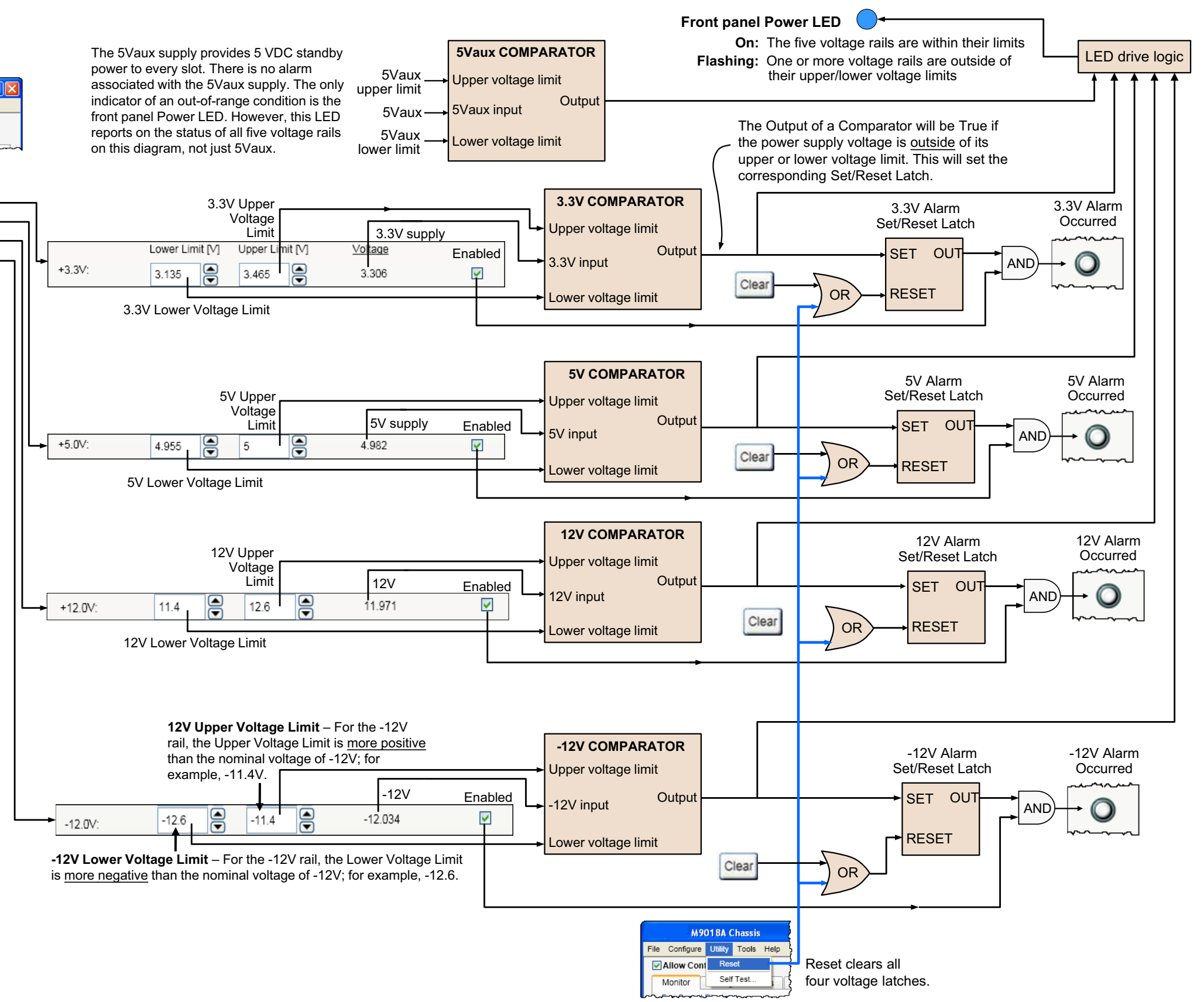


Figure 27 Voltage monitoring using the Soft Front Panel

Voltage Monitoring using the IVI-COM Driver and C#

	Lower Limit [V]	Upper Limit [V]	Voltage
+3.3V:	3.135	3.465	3.300
+5.0V:	4.75	5.25	4.982
+12.0V:	11.4	12.6	11.971
-12.0V:	-12.6	-11.4	-12.034

To show the parallels between the SFP capabilities and the programmatic capabilities, the IVI-COM driver properties and methods are overlaid next to their SFP counterparts.

It is important to understand how your program interacts with the SFP. If your program and the SFP (or, for that matter, any other program) are operating simultaneously, they will need to share certain chassis resources. Please see the diagram "Chassis Alarm Architecture" in the M9018A User Guide chapter "Overview of Chassis Management Capabilities" for a description of how the alarm resources are shared between multiple processes.

`driver.VoltageRails.get_Item().Alarm.Configure`

Configures the specified voltage alarm by allowing setting of Enabled, and the LowerLimit and UpperLimit voltage limits.

`driver.VoltageRails.Count`

The number of primary power supply voltage rails in the chassis. Count returns 4 for the M9018A chassis.

`driver.VoltageRails.Name`

Returns the power supply rail name for a given index, where index is a 1-based index into the collection of voltage rails. The Name properties returned for indices 1-4 are "VPLUS_3_3", "VPLUS_5_0", "VPLUS_12_0", and "VMINUS_12_0", respectively. The Name property, not the index, is used in the `get_Item()` calls.

`driver.VoltageRails.get_Item().Alarm.Clear`

Resets the specified voltage rail alarm set/reset latch. However, if the voltage rail is still outside of the upper or lower limits, the latch will be immediately set True again.

The desired upper voltage limit for the specified voltage rail. When a voltage rail exceeds its UpperLimit voltage and if Enabled is True for that rail, the voltage alarm Occurred property will be set True. Programming the UpperLimit voltage resets the Alarm Latch. However, if the UpperLimit voltage is still exceeded, the Alarm Latch will be set again.

`driver.VoltageRails.get_Item().Alarm.UpperLimit`

The nominal power supply voltage for the specified rail. The ExpectedVoltage properties for the four rails are 3.3, 5.0, 12.0 and -12.0 volts. For this example, the ExpectedVoltage is -12.0 volts.

`driver.VoltageRails.get_Item().ExpectedVoltage`

`driver.VoltageRails.get_Item().Alarm.LowerLimit`

The desired lower voltage limit for the specified voltage rail. When a voltage rail falls below its LowerLimit voltage and if Enabled is True for that rail, that voltage alarm Occurred property will be set True. Programming the LowerLimit voltage resets the Alarm Latch. However, if the voltage rail still falls below its LowerLimit voltage, the Alarm Latch will be set again.

Returns the power supply voltage of the specified rail in volts, quantized to 1 mV.

`driver.VoltageRails.get_Item().Voltage`

Returns the status of the the specified voltage alarm. If True, this indicates that the voltage is outside of the upper/lower limits. This is a per-application property and therefore the value reported programmatically may be different than the corresponding voltage Alarm Occurred status reported by the SFP.

`driver.VoltageRails.get_Item().Alarm.Occurred`

12V Upper Voltage Limit – For the -12V rail, the Upper Voltage Limit is more positive than the nominal voltage of -12V; for example, -11.4V.

-12V Lower Voltage Limit – For the -12V rail, the Lower Voltage Limit is more negative than the nominal voltage of -12V; for example, -12.6.

`driver.VoltageRails.get_Item().Alarm.Enabled`

Enables or disables generation of an alarm due to the specified voltage rail being below the LowerLimit or above the UpperLimit. If the voltage rail is outside either limit, this will set the Alarm Set/Reset Latch True. If Enabled is True, Occurred will be set True. Enabled default value = True.

`driver.Utility.Reset()`

Clears all four voltage rail latches.

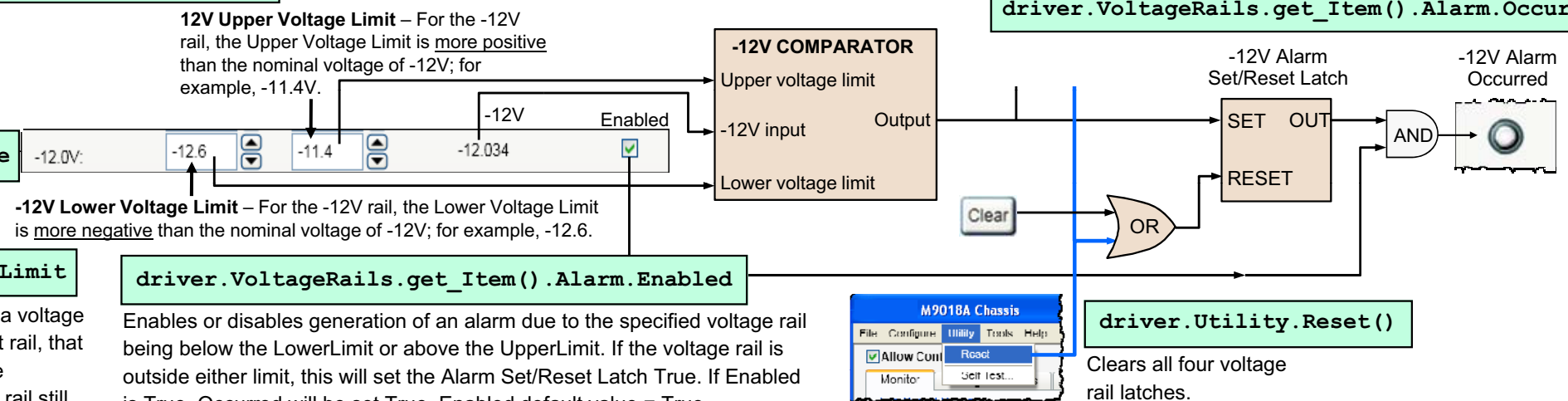
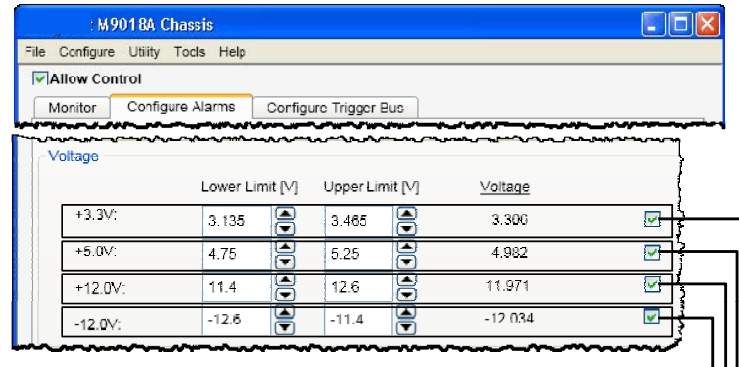


Figure 28 Voltage monitoring using ICI-COM and C#

Voltage Monitoring using the IVI-C Driver and C++



AgM9018_VoltageAlarmConfigure ()

Configures the specified voltage alarm by allowing setting of Enabled, and the LowerLimit and UpperLimit voltage limits.

To show the parallels between the SFP capabilities and the programmatic capabilities, the IVI-C driver attributes and functions are overlaid next to their SFP counterparts.

It is important to understand how your program interacts with the SFP. If your program and the SFP (or, for that matter, any other program) are operating simultaneously, they will need to share certain chassis resources. Please see the diagram "Chassis Alarm Architecture" in the M9018A User Guide chapter "Overview of Chassis Management Capabilities" for a description of how the alarm resources are shared between multiple processes.

AGM9018_ATTR_VOLTAGERAIL_COUNT

The number of primary power supply voltage rails in the chassis. Count returns 4 for the M9018A chassis.

AgM9018_GetVoltageRailName ()

Returns the power supply rail name for a given index, where index is a 1-based index into the collection of voltage rails. The Name properties returned for indices 1-4 are "VPLUS_3_3", "VPLUS_5_0", "VPLUS_12_0", and "VMINUS_12_0", respectively. The Name property, not the index, is used in the get_Item() calls.

AgM9018_VoltageAlarmClear ()

Resets the specified voltage rail alarm set/reset latch. However, if the voltage rail is still outside of the upper or lower limits, the latch will be immediately set True again.

The desired upper voltage limit for the specified voltage rail. When a voltage rail exceeds its UpperLimit voltage and if Enabled is True for that rail, the voltage alarm Occurred property will be set True. Programming the UpperLimit voltage resets the Alarm Latch. However, if the UpperLimit voltage is still exceeded, the Alarm Latch will be set again.

AGM9018_ATTR_VOLTAGE_ALARM_UPPER_LIMIT

The nominal power supply voltage for the specified rail. The ExpectedVoltage properties for the four rails are 3.3, 5.0, 12.0 and -12.0 volts. For this example, the ExpectedVoltage is -12.0 volts.

AGM9018_ATTR_EXPECTED_VOLTAGE

AGM9018_ATTR_VOLTAGE_ALARM_LOWER_LIMIT

The desired lower voltage limit for the specified voltage rail. When a voltage rail falls below its LowerLimit voltage and if Enabled is True for that rail, that voltage alarm Occurred property will be set True. Programming the LowerLimit voltage resets the Alarm Latch. However, if the voltage rail still falls below its LowerLimit voltage, the Alarm Latch will be set again.

Returns the power supply voltage of the specified rail in volts, quantized to 1 mV.

AGM9018_ATTR_VOLTAGE

Returns the status of the the specified voltage alarm. If True, this indicates that the voltage is outside of the upper/lower limits. This is a per-application property and therefore the value reported programmatically may be different than the corresponding voltage Alarm Occurred status reported by the SFP.

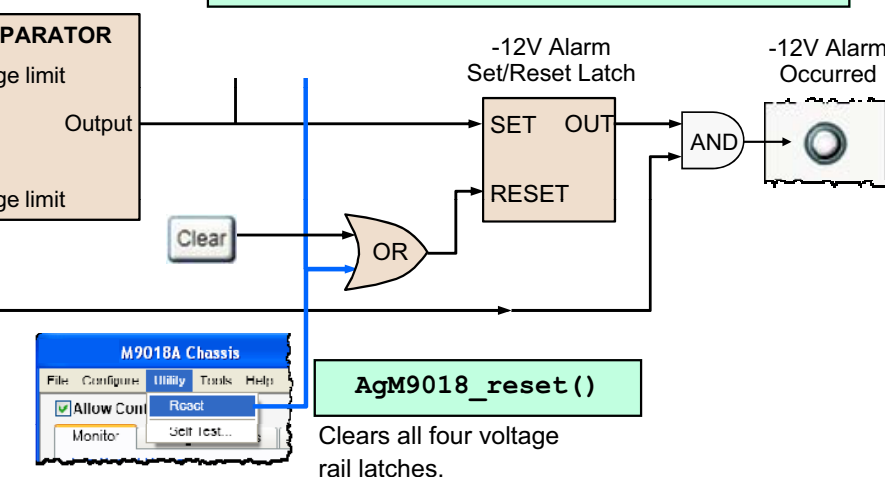
AGM9018_ATTR_VOLTAGE_ALARM_OCCURRED

12V Upper Voltage Limit – For the -12V rail, the Upper Voltage Limit is more positive than the nominal voltage of -12V; for example, -11.4V.

-12V Lower Voltage Limit – For the -12V rail, the Lower Voltage Limit is more negative than the nominal voltage of -12V; for example, -12.6.

Enables or disables generation of an alarm due to the specified voltage rail being below the LowerLimit or above the UpperLimit. If the voltage rail is outside either limit, this will set the Alarm Set/Reset Latch True. If Enabled is True, Occurred will be set True. Enabled default value = True.

AGM9018_ATTR_VOLTAGE_ALARM_ENABLED



AgM9018_reset ()

Clears all four voltage rail latches.

Figure 29 Voltage monitoring using ICI-C and C++

12 Monitoring the 10 MHz Reference Clock Source

Chassis timing is based on a 10 MHz reference clock. The 10 MHz reference clock can originate from the three sources listed below. These sources are listed in the order of precedence from low to high if multiple 10 MHz reference clock sources are available:

- 1 Chassis internal 10 MHz clock
- 2 Rear panel 10 MHz clock (connected to the chassis through a BNC connector)
- 3 System timing slot (slot 10) 10 MHz clock

A clock source with a higher number supersedes a clock source with a lower number if both are present. For example, if both a rear panel 10 MHz clock (#2) and a system timing slot 10 MHz clock (#3) are provided, the system timing slot 10 MHz clock (#3) will be used by the chassis to generate its internal timing signals.

There are no means to override this order of precedence; for example, there are no means to select the rear panel 10 MHz clock if a system timing slot clock is present. The module in the system timing slot would need to be removed from the chassis in order to activate selection of the rear panel 10 MHz clock.

NOTE

The chassis references either the rear panel 10 MHz clock or the system timing slot 10 MHz clock as long as the clock frequency remains within the specification range of ± 100 ppm. The chassis clocks are undefined if the reference clock is outside of this range.

Monitoring the 10 MHz clock source

Use of the SFP and the IVI drivers to monitor the 10 MHz reference clock source is described in the following three diagrams:

- Using the SFP – [Figure 30](#) on page 61
- Using the IVI-COM driver and C# – [Figure 31](#) on page 62
- Using the IVI-C driver and C++ – [Figure 32](#) on page 63

Monitoring the 10 MHz Reference Clock Source

Monitoring the 10 MHz clock source

10 MHz Reference Clock Source Monitoring Using the SFP

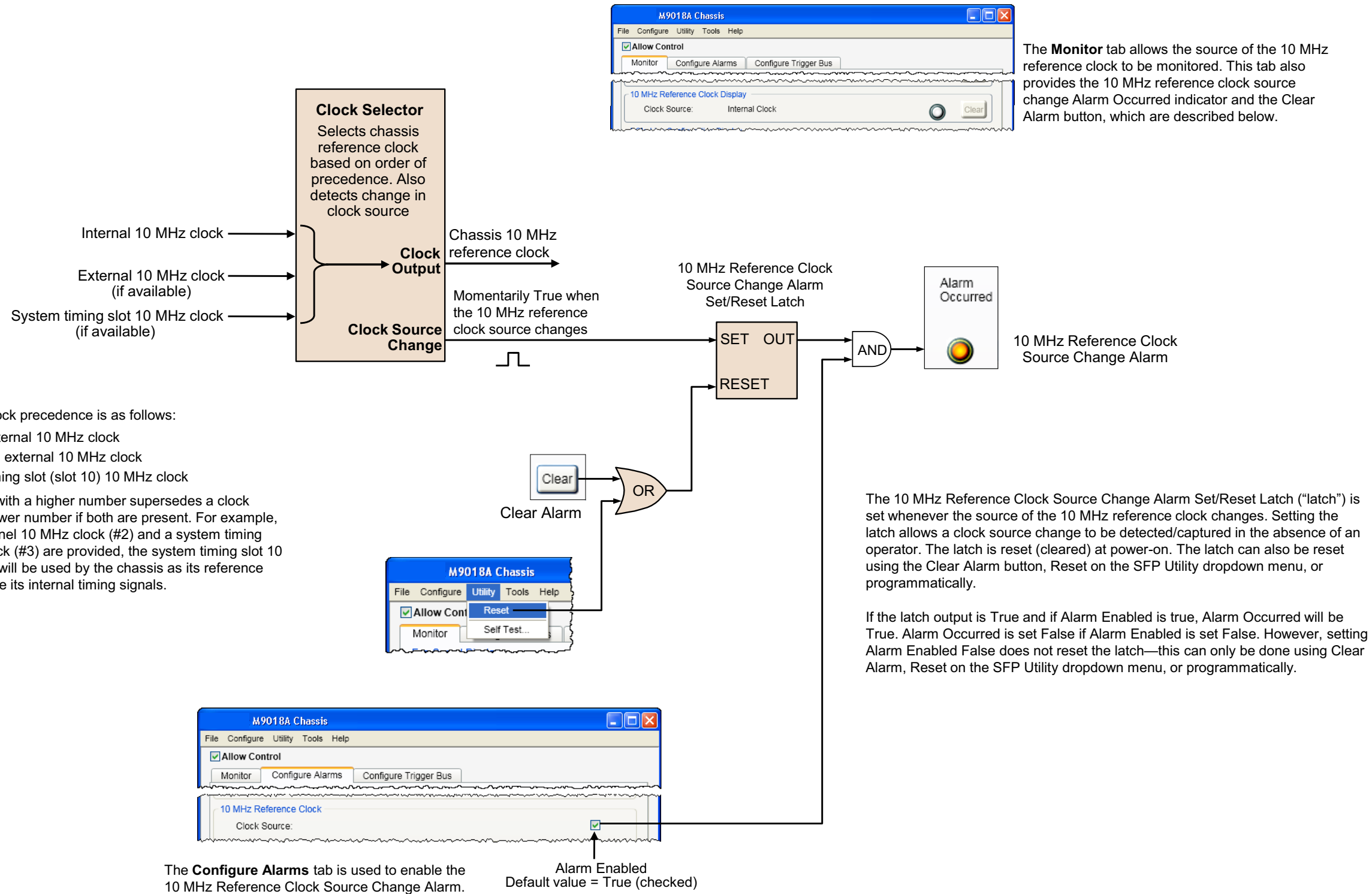


Figure 30 10MHz Reference Clock monitoring using the Soft Front Panel

10 MHz Reference Clock Source Monitoring using IVI-COM and C#

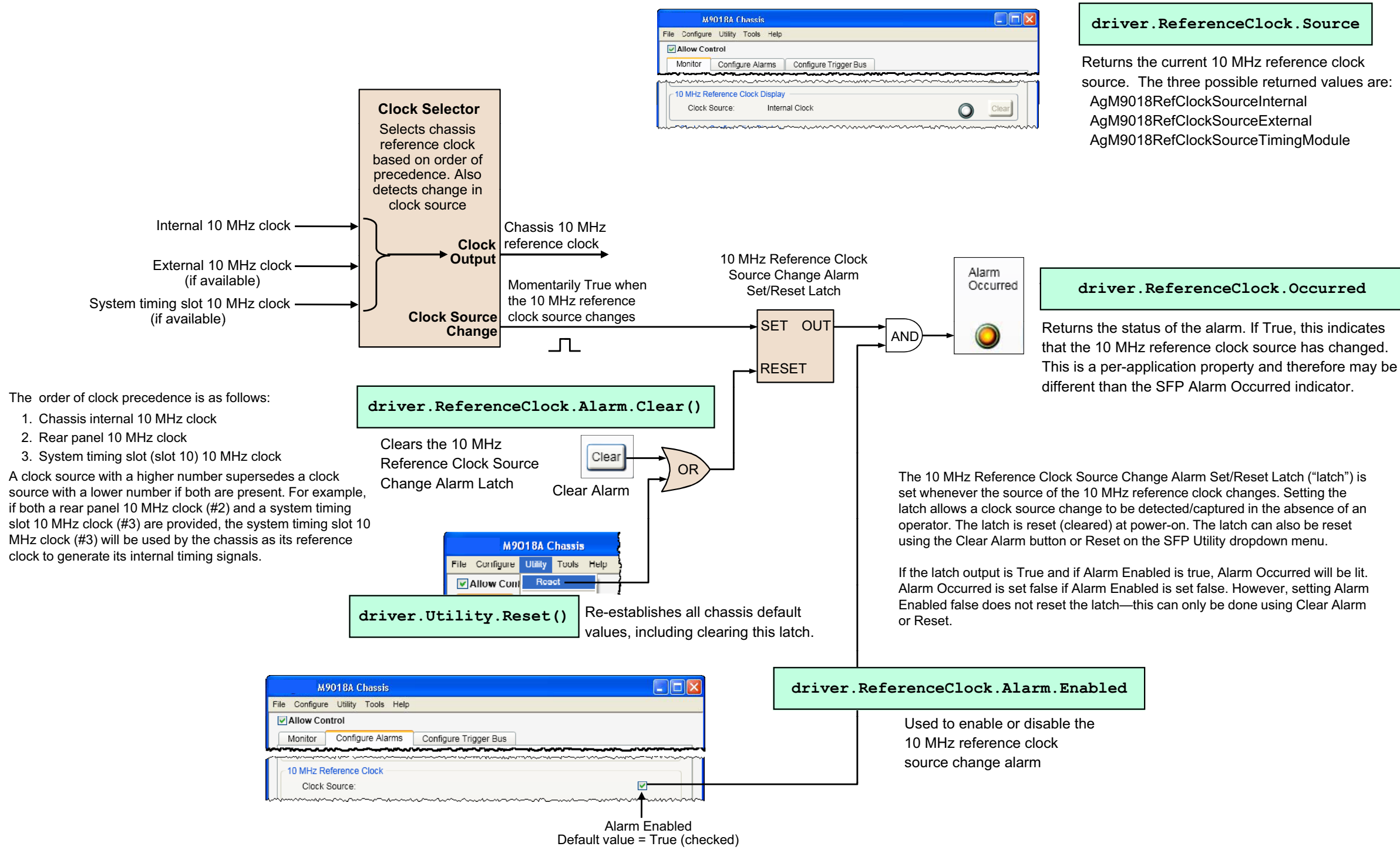


Figure 31 10MHz Reference Clock monitoring using IVI-COM and C#

10 MHz Reference Clock Source Monitoring using IVI-C and C++

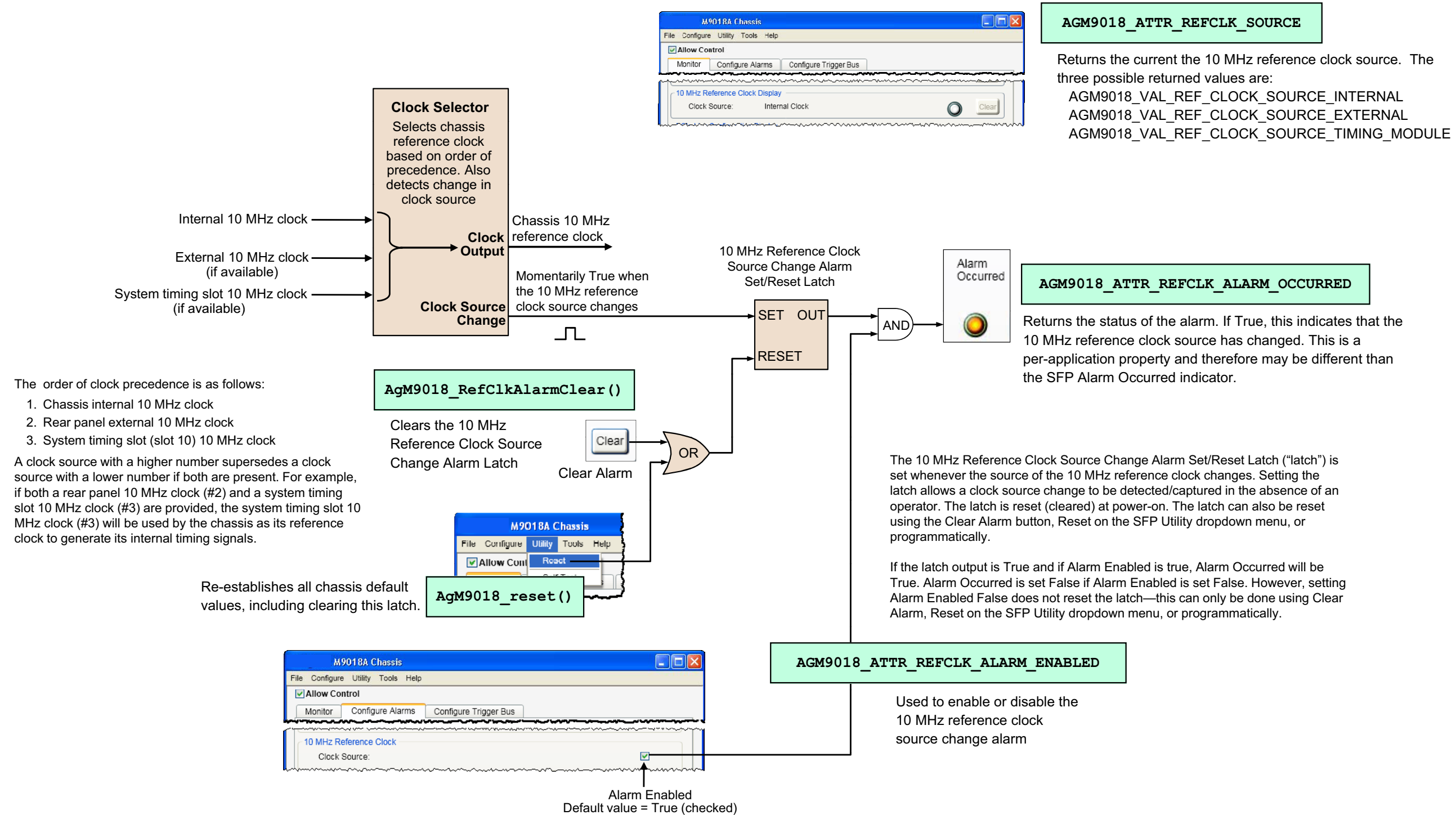
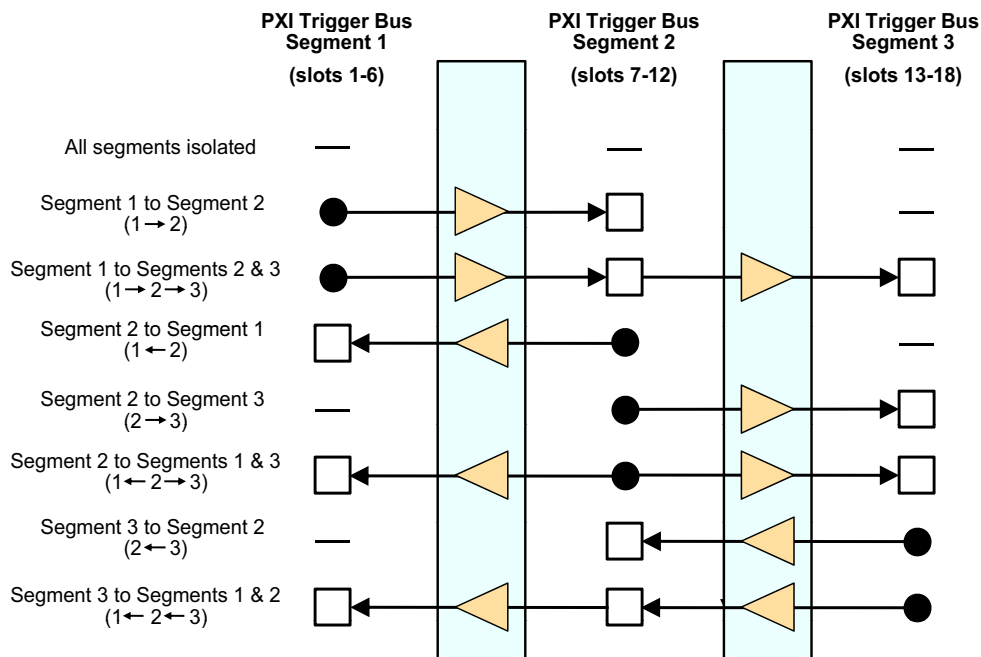


Figure 32 10MHz Reference Clock monitoring using IVI-C and C++

13 Configuring the PXI Trigger Bus

This chapter describes how to configure the PXI trigger bus. To view the PXI trigger bus, see the “M9018A Block Diagram” on page 4, and click the **PXI_TRIG[0:7]** check box under the **Show Triggers** label. As you’ll see, the PXI trigger bus consists of eight trigger lines spanning the XP4 backplane connectors. The trigger lines are divided into three trigger bus segments, numbered 1-3.

Figure 33 shows the eight combinations of trigger bus segment connections that are possible between the three trigger bus segments. Any of these combinations can be applied to each of the eight trigger lines **PXI_TRIG[0:7]**.



NOTES:

- Trigger sources are shown as solid circles while trigger destinations are shown as squares.
- Below each segment description on the left side is the notation used by the SFP, in parenthesis.

Figure 33 The eight combinations of trigger bus segment connections between trigger bus segments

NOTE

Care should be taken to avoid confusing the eight *combinations* of trigger bus segment connections with the eight *trigger lines* of the PXI_TRIG[0:7] bus. Again, any one of the eight trigger bus segment combinations in Figure 33 can be applied to each of the eight trigger lines PXI_TRIG[0:7].

Some PXI modules, such as the M9381A use peer-to-peer (module-to-module) triggering across the chassis backplane. Therefore, when installing these modules, ensure that all necessary modules are installed in one of the three bus segments.

Configuring PXI trigger bus connections

The PXI trigger bus can be configured using the SFP or programmatically. Use of the SFP is described first followed by a description of using the IVI drivers.

Using the SFP to configure PXI trigger bus connections

Figure 34 shows the SFP **Configure Trigger Bus** tab that is used to configure the PXI trigger bus connections. At this point, no configuration has been performed and all trigger bus segments are isolated.

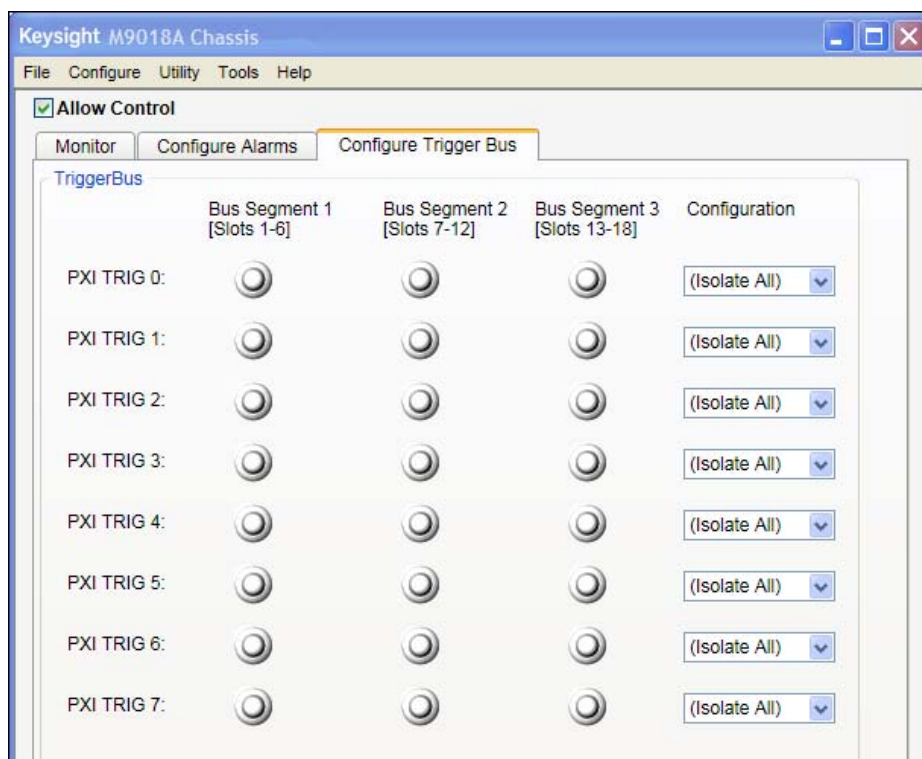


Figure 34 SFP **Configure Trigger Bus** tab

To configure the trigger bus segment connection for each of the eight trigger lines (**PXI TRIG 0** through **PXI TRIG 7**), use the drop down menus under the **Configuration** label on the right side of the screen. Note that the **Allow Control** check box in the upper left corner must be checked to use these drop down menus.

In Figure 35, four of the eight PXI trigger lines have been configured using the dropdown menus. The remaining **PXI TRIG** lines are still isolated.

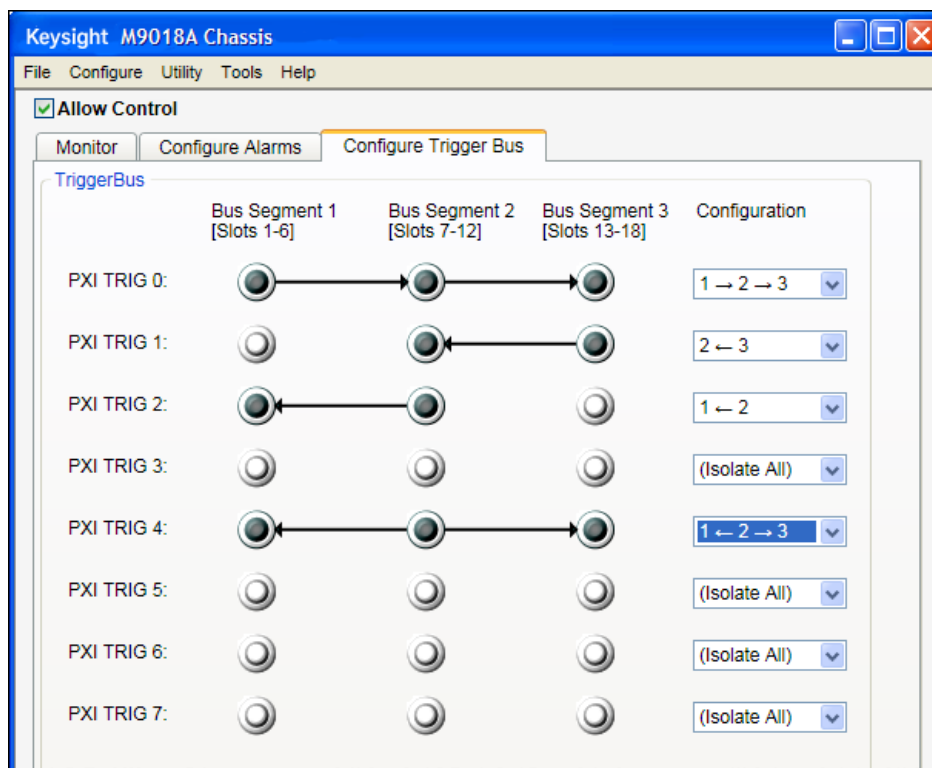


Figure 35 Configuration of four of the eight **PXI TRIG** trigger lines between the trigger bus segments

Using the IVI drivers to configure trigger bus connections

Use of the IVI drivers to configure the PXI triggers is described in the following two diagrams:

- Using the IVI-COM driver and C# – [Figure 36](#) on page 68
- Using the IVI-C driver and C++ – [Figure 36](#) on page 68

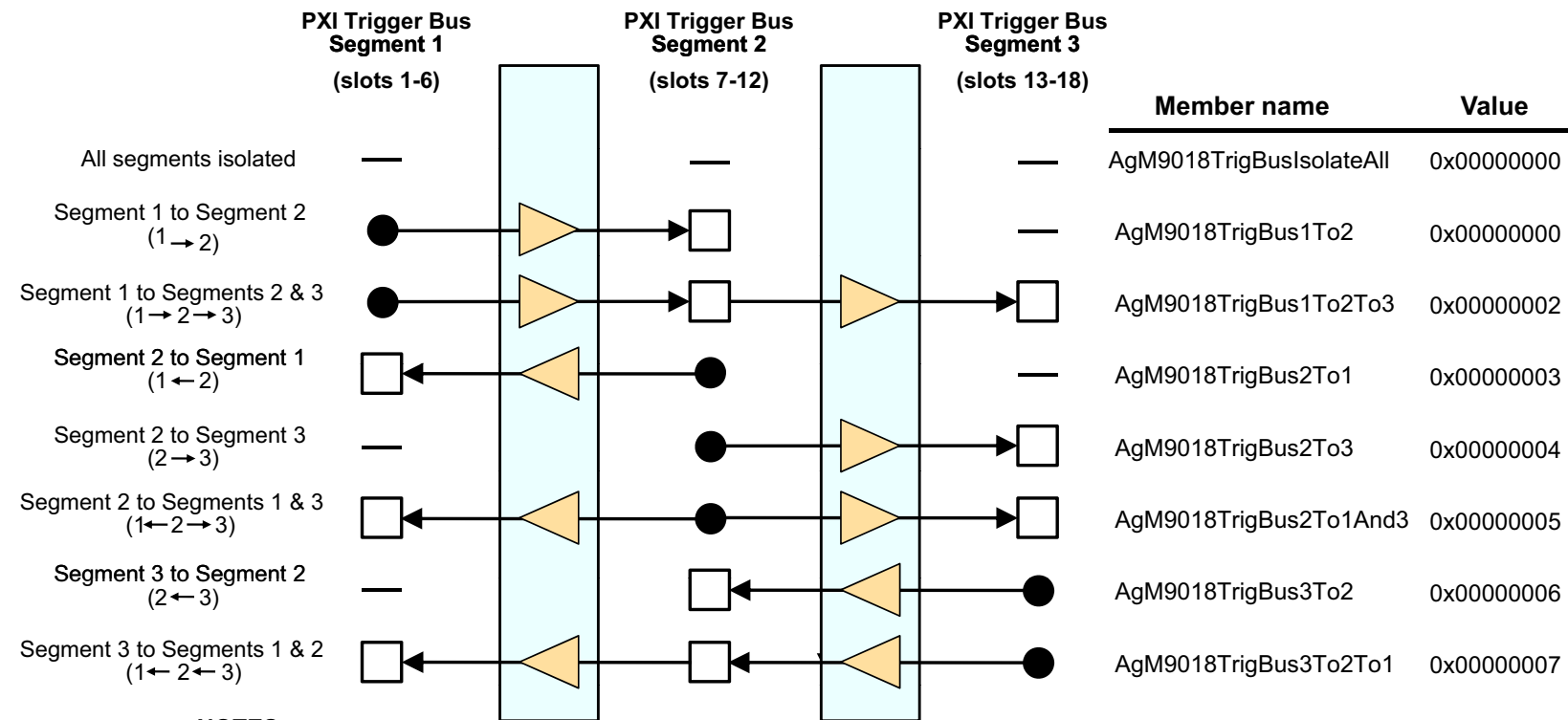
NOTE

The M9018A does not retain the trigger bus configuration when power is removed from the chassis.

Configuring the PXI Trigger Bus using the IVI-COM Driver and C#

Example instantiation of an AgM9018 driver class: `driver = new Keysight.AgM9018.Interop.AgM9018()`

This diagram shows the eight combinations of trigger bus segment connections between the three trigger bus segments. Any combination can be applied to each of the eight PXI_TRIG lines.



NOTES:

- Trigger sources are shown as solid circles while trigger destinations are shown as squares.
- Below each segment description on the left side is the notation used by the SFP, in parenthesis.

`driver.TriggerBus.Connect()`

This method connects the specified trigger line (0-7) between the specified trigger bus segment(s), 1, 2, and 3. The values of the trigger bus segment specifiers are listed above, adjacent to the connections that they specify.

`driver.TriggerBus.Connection()`

Based on the specified trigger line (0-7), this method returns one of the values shown above describing how the specified trigger line is configured.

`driver.TriggerBus.ConnectDefault()`

`driver.TriggerBus.DisconnectAll()`

Both of the above methods currently disconnect all eight PXI_TRIG[0:7] trigger lines, returning each line to the state shown in the top row of the left diagram.

Perhaps the best way to understand how the different combinations of trigger bus segment connections can be applied to each of the PXI_TRIG lines is to use the **SFP Configure Trigger Bus** tab as shown below. Each row represents one of the eight PXI_TRIG lines. The drop down menus in the Configuration column can be used to apply one of the eight trigger bus segment connections to each PXI_TRIG line.

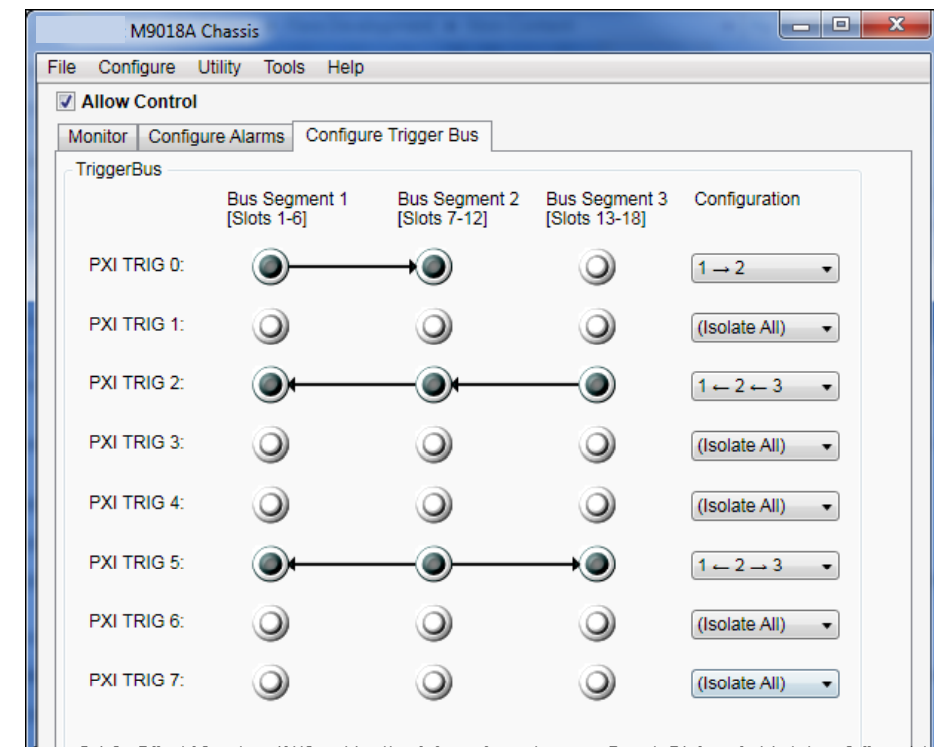
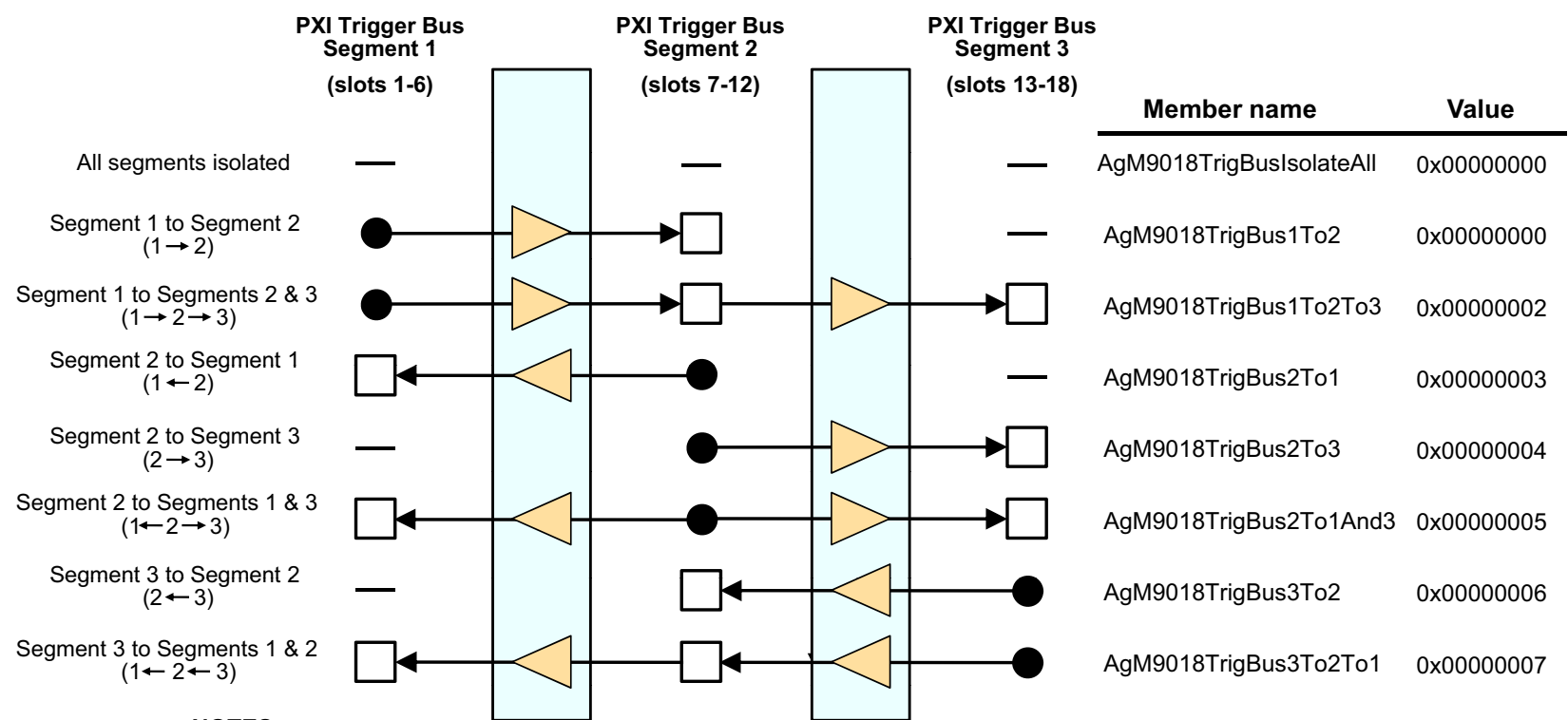


Figure 36 Configuring the PXI Trigger Bus using IVI-COM and C#

Configuring the PXI Trigger Bus using the IVI-C Driver and C++

This diagram shows the eight combinations of trigger bus segment connections between the three trigger bus segments. Any combination can be applied to each of the eight PXI_TRIG lines.



- NOTES:**
- Trigger sources are shown as solid circles while trigger destinations are shown as squares.
 - Below each segment description on the left side is the notation used by the SFP, in parenthesis.

AgM9018_TriggerBusConnect ()

This function connects the specified trigger line (0-7) between the specified trigger bus segment(s), 1, 2, and 3. The values of the trigger bus segment specifiers are listed above, adjacent to the connections that they specify.

AgM9018_TriggerBusConnection ()

Based on the specified trigger line (0-7), this function returns one of the values shown above describing how the specified trigger line is configured.

AgM9018_TriggerBusConnectDefault ()

AgM9018_TriggerBusDisconnect ()

Both of the above methods currently disconnect all eight PXI_TRIG[0:7] trigger lines, returning each line to the state shown in the top row of the left diagram.

Perhaps the best way to understand how the different combinations of trigger bus segment connections can be applied to each of the PXI_TRIG lines is to use the **SFP Configure Trigger Bus** tab as shown below. Each row represents one of the eight PXI_TRIG lines. The drop down menus in the Configuration column can be used to apply one of the eight trigger bus segment connections to each PXI_TRIG line.

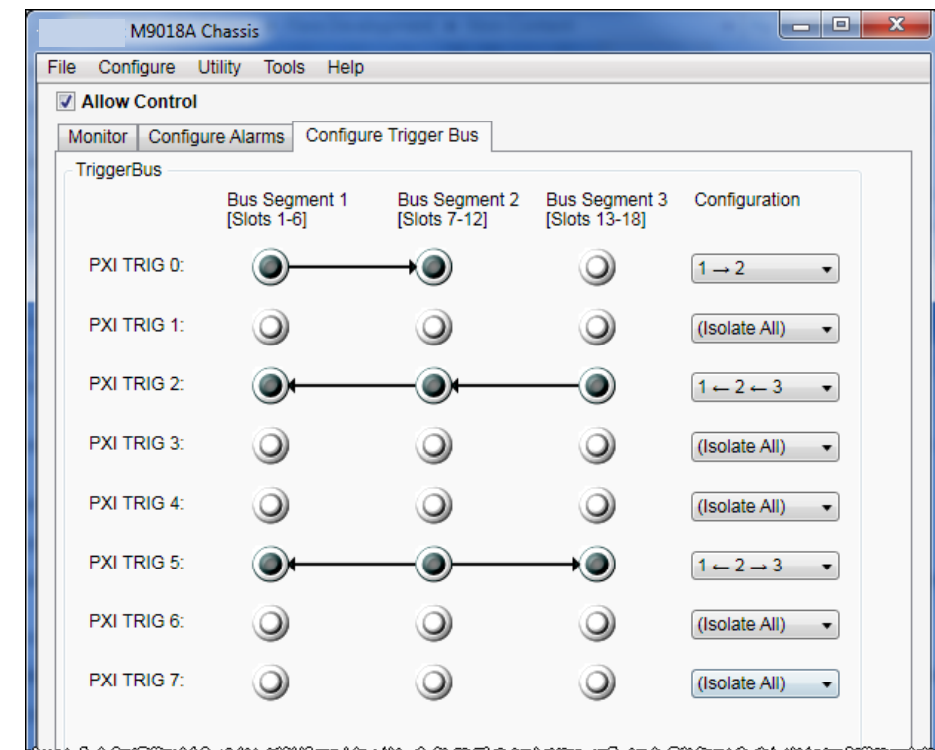


Figure 37 Configuring the PXI Trigger Bus using IVI-C and C++

14 Changing and Restoring the PCIe Link Configuration

PCIe link configuration refers to how the chassis PCIe Switch Fabric is configured to connect PCI Express signals between slot 1, the system controller slot, and the other chassis slots. For a review of the supported PCIe link configurations, please see the “[M9018A Block Diagram](#)” on page 4. The check boxes in the upper left corner of the block diagram can be used to view each PCIe link configuration.

As shown on the block diagram, the chassis ships from the factory in “2-Link Configuration: 1x8”. This configuration, referred to as “1x8”, provides one x8 PCIe link from the system controller slot to the PCIe Switch Fabric. Use the 1x8 configuration when using the M9021A PCIe Cable Interface module connected to laptop computer PCIe adapters such as the M9045A/B. This link can be routed by the PCIe Switch Fabric to the chassis slots as either x4 or x8 links as shown on the block diagram.

The other supported PCIe link configurations are:

- **2-Link Configuration:** 1x8 [Limited to PCIe Gen1 speed] – (Abbreviated as 1x8 (Gen 1) in this manual.) This fabric is specifically for use in secondary chassis in multi-chassis configurations. For details, refer to Keysight's Multiple PXIe and AXIe Chassis Configuration tool. This tool is available on the M9018A Product information CD as well as on line at: www.keysight.com/find/pxie-multichassis.
- **2-Link Configuration:** 2x8 – Referred to as “2x8”, this configuration provides two x8 links from the system controller slot to the PCIe Switch Fabric. Link 2 can be routed by the PCIe Switch Fabric to slots 2-9, while Link 1 can be routed to slots 10-18.
- **4-Link Configuration:** 4x4 – Referred to as “4x4”, this configuration provides four x4 links from the system controller slot to the PCIe Switch Fabric. Link 1 can be routed by the PCIe Switch Fabric to slots 10-14, Link 2 can be routed to slots 15-18, Link 3 can be routed to slots 2-5, and Link 4 can be routed to slots 6-9.

Figure 38 shows that part of the block diagram that relates to the PCIe link configurations. The chassis provides storage for two configurations, referred to as the User Configuration and the Base Configuration. The Base Configuration is 1x8 and is set at the factory. It is read-only and cannot be changed. The User Configuration can be set by the user to either 2x8 or 4x4. This is done by using the **PCIe Switch Fabric Configurator** (“Configurator”) program.

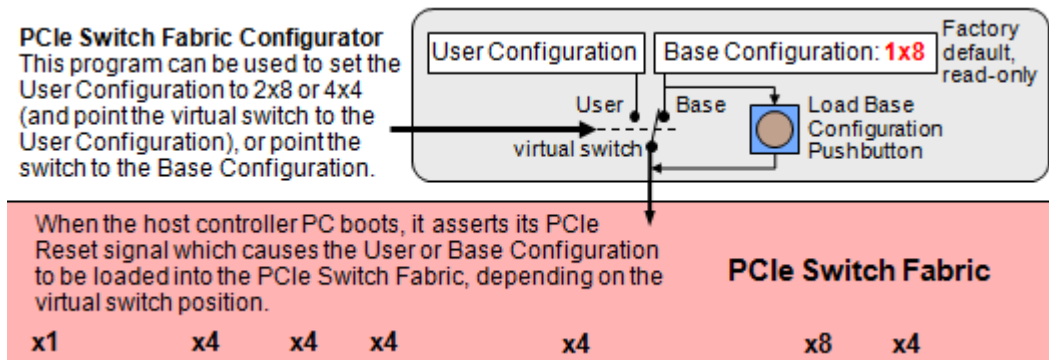


Figure 38 User and Base Configurations

The virtual switch shown in Figure 38 determines which configuration is loaded into the PCIe Switch Fabric. As shipped from the factory, the virtual switch is set to the Base position, and the Base Configuration is set to 1x8. This ensures that the factory default PCIe link configuration is 1x8. Figure 39 shows that the first-ever PCIe Reset signal received by the chassis from the host PC loads the 1x8 configuration into the PCIe Switch Fabric.

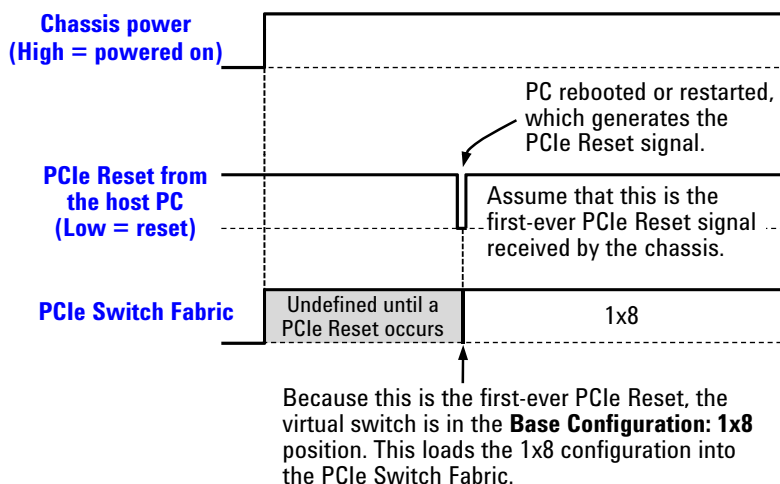


Figure 39 The first-ever PCIe Reset signal loads the 1x8 PCIe Switch Fabric

Note that the PCIe Switch Fabric is undefined between when the chassis is powered on and when the PCIe Reset signal occurs.

The position of the virtual switch depends on the selection you make using the **Configurator** program. Because the virtual switch position is stored in chassis non-volatile memory, the switch position persists through chassis power cycles.

Selecting a Link Configuration

CAUTION

Changing the PCIe fabric to one that is incompatible with your system controller can result in you no longer being able to connect with your M9018 chassis from your controller.

Use Table 3 to determine the fabric link settings for a single chassis or for a master chassis (a master chassis cascades from its peripheral slot(s) to one or more secondary chassis). Use Table 4 for the fabric link settings for secondary chassis.

NOTE

If you are using the M9018A in a multiple chassis arrangement, make certain you have the latest chassis firmware (with fabric links) installed. Chassis firmware updates are available at: www.keysight.com/find/M9018A.

Table 3 Single or Master Chassis Fabric Link Settings

Single Chassis or Master Chassis Configuration	1x8 (Factory Default) Link	1x8 (Gen 1) Link	2x8 Link	4x4 Link
External controller connected to an M9021A module installed in slot 1.	✓ See Note 3			
M9036A or M9037A PCIe Embedded Controller in slot 1.	See Note 1		✓ See Note 2	✓
Other non-Keysight Embedded Controller in slot 1.	See Note 1		See Note 4	✓

Note 1:

- The 1x8 (Factory Default) fabric is the default fabric you will boot with when the M9018A PCIe fabric reset button is pressed at boot.
- Although all PXI System Modules can function using the 1x8 (Factory Default) fabric, it is not recommended for normal use with System Modules other than the M9021A due to better performance with the other fabrics, and the possibility of PXI Standard compliance issues with other system modules.

Note 2:

- The M9018A 2x8 fabric is recommended when using the Keysight M9036A Controller for performance reasons because it facilitates x8 connectivity to the x8 slots of the M9018A chassis (slots 2, 6, 11, and 15).

Note 3:

- An M9021A will function with either the 1x8 (Factory Default) fabric, or the 1x8 (Gen1) fabric. However, using the 1x8 (Factory Default) fabric is capable of better Gen2 PCIe performance and is preferred for all cases when the M9018 chassis is NOT a secondary chassis cascaded from another M9018 Chassis peripheral slot.

Note 4:

- Some non-Keysight system modules and embedded controllers cannot operate with the M9018A configured to the 2x8 fabric, and therefore, this fabric is not normally recommended for non-Keysight system modules.

Table 4 Secondary Chassis Fabric Link Settings

Secondary Chassis Configuration	1x8 (Factory Default) Link	1x8 (Gen 1) Link	2x8 Link	4x4 Link
M9021A Cable Interface card in slot 1 of the second M9018A chassis connected to the PCI ExpressCard port of a M9036A or PCIe cable port on an M9037A embedded controller in the master M9018A chassis.	✓			
M9021A Cable Interface card in slot 1 of the second M9018A chassis cascaded from a M9021A card in a peripheral slot of the master M9018A chassis.		✓ See Note 5		

Note 5:

- In M9018 Cascaded systems where an M9021 interface is used at each end of the connecting PCIe cable, the 1x8 (Gen 1) fabric is used in the secondary M9018 chassis to ensure PCIe signal fidelity. Note: this configuration is not supported with the M9037A Embedded Controller.
- See the *Keysight Multiple PXIe and AXIe Chassis Configuration* tool. for details on use of this fabric and the configuration of M9021 modules for Cascading M9018 chassis. This tool is available on the M9018A Product information CD as well as on line at: www.keysight.com/find/M9018A.
- Configure an M9018 chassis for the Gen 1 fabric by first connecting it directly to a controller (remote PC or M9036) and using the M9018 fabric configuration tool to set this fabric.

Additional Fabric Information

- When using 2x8 or 4x4 links, there are two performance gains that are really slot independent but imply slot performance. By creating two links (2x8) into the system instead of four (4x4), you get a wider communication link back to the host controller. This means that we do not explicitly impose restriction on a x8 module's bandwidth if it were available. A x8 module would connect at x8 in the four M9018A slots that support x8 lane width (see [chassis block diagram on page 4](#)).
- 4x4 links provide the best Peer-to-Peer (P2P) communication which means any P2P communication occurring between slots will not have to route up to the host (reducing congestion to the host link as well as packet latency) as well allowing more devices to communicate within a segment.
- If you accidentally reconfigure the chassis fabric to an invalid configuration, use another system module that is compliant with this M9018A fabric to allow you to operate the M9018A PCIe Fabric Configurator to restore the M9018A fabric back to a usable fabric. Alternately, use the M9018A Load Base Configuration Pushbutton to restore the default 1x8 fabric to allow you to again operate the M9018A chassis.

For example, on earlier M9018A driver releases, if you are using the M9021 interface card, and you then accidentally reconfigure the M9018A fabric to 4x4 fabric, you will then find after a reboot that you can no longer see the M9018A chassis instrument via the Keysight M9021 interface (see table above).

To restore an M9018A configuration that will work with the M9021 interface, you can do one of two things:

- Reboot with a slot 1 System Module that functions with the M9018A 4x4 fabric, and then run the PCIe Fabric Configurator to restore the original M9018A 1x8 fabric. Then reboot with the M9021 cable interface.
- Refer to [“Preemptively restoring the factory default 1x8 Base Configuration”](#) on page 87 to restore the default M9018A fabric. (Note: this procedure requires disassembly of the M9018A casing.)

Using the PCIe Switch Fabric Configurator program

If your chassis is in its factory default configuration (1x8) and your system controller slot module uses the 1x8 configuration, there is no need to use the **Configurator** program to change the PCIe link configuration. The Keysight M9021A Cable Interface module, for example, uses the 1x8 configuration. Because 1x8 is the factory default PCIe link configuration, this module will work with the chassis without changing its configuration.

The M9036A Embedded Controller will operate with any PCIe Switch Fabric: 1x8, 2x8, or 4x4. You should use the **Configurator** program to change the PCIe Switch Fabric from 1x8 to 2x8 or 4x4, depending on your application.

NOTE

Using the Configurator program requires that the host controller PC recognizes the presence of the chassis as evidenced by “Keysight Technologies M9018” being displayed in Connection Expert. If your chassis is not displayed by Connection Expert, you won’t be able to use the Configurator program to change the PCIe link configuration.

If your chassis is configured for a fabric other than the 1x8 fabric and you are using the M9021A PCIe Cable Interface module, you may lose PCIe connectivity to the internal M9018A chassis device. With the Keysight M9018A chassis driver releases prior to revision 1.4.xx.xx, only the 1x8 fabric placed the internal M9018A PCIe device in Link 1, thus, for the earlier 2x8 and 4x4 fabrics the M9021A could not access the internal M9018A device through its single PCIe link. Chassis PCIe fabrics installed after the M9018A driver revision 1.4.xx.xx and later always place the M9018A device on Link 1 so these later fabrics allow M9021A users to use the Configurator program even on 2x8 and 4x4 fabrics.

Fabric installed from M9018A PXle Chassis Driver version:	PCIe Switch Fabric Configurator program can function using these fabrics through an M9021A Cable Interface module.		
	1x8	2x8	4x4
< 1.4.xx.xx	Yes	No	No
≥ 1.4.xx.xx	Yes	Yes	Yes

After using Connection Expert to verify the presence of the M9018A chassis, close the Connection Expert, the NI MAX tool, and any other M9018A program (such as Soft Front Panel) prior to running the Configurator program.

CAUTION

The following procedure assumes that the chassis is currently operating with the 1x8 configuration and that the PCIe link configuration is being changed from 1x8 to 2x8. It is further assumed that you have a system module other than the M9021A in use or ready to install in the system controller slot—for example, the Keysight M9036A embedded controller.

After the PCIe link configuration is changed from 1x8 to 2x8, host controllers using the M9021A will no longer be able to properly communicate to the chassis through an M9021A PCIe Cable Interface module. Only perform the procedure in this section if you have a module that supports 2x8 ready to install in slot 1.

If, while performing this procedure, communications is lost with the chassis and cannot be re-established through your 2x8 module, you can restore the default 1x8 configuration by performing the procedure described in [“Preemptively restoring the factory default 1x8 Base Configuration”](#) on page 87.

Before describing how to use the **Configurator** to change from 1x8 to 2x8, let’s look at the timing of the change as shown in Figure 40. The time line repeats the first-ever PCIe Reset from Figure 39 (which loads 1x8 into the PCIe Switch Fabric), and then adds use of the **Configurator** to change the configuration to 2x8.

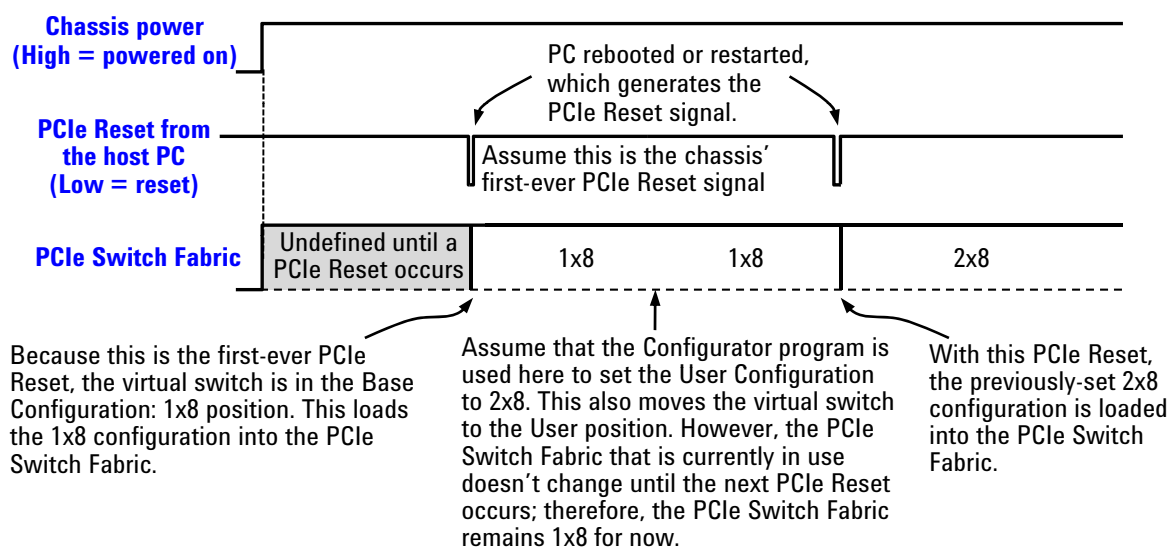


Figure 40 Using the **Configurator** program to set the 2x8 configuration

The time line shows use of the **Configurator** to set the User Configuration to 2x8. When 2x8 is selected, the **Configurator** program moves the virtual switch to the User Position.

However, the PCIe Switch Fabric doesn't change from 1x8 to 2x8 until the *next* PCIe Reset occurs. PCIe Reset occurs when the host PC is either rebooted or restarted. Until a PCIe Reset occurs, the PCIe Switch Fabric will remain 1x8, and normal communications with the chassis can continue.

The fact that the PCIe Switch Fabric doesn't change until a PCIe Reset occurs provides the option shown in Figure 41. Between the period when the **Configurator** is used to select the next configuration (2x8, in this case) and when the PCIe Reset occurs, it is possible to use the **Configurator** again to re-select the original configuration (1x8, in this case). Then, when PCIe Reset occurs, the PCIe Switch Fabric will remain 1x8. This is useful in case you realize, for example, that your slot 1 system controller card is not compatible with the PCIe link configuration that you've just selected.

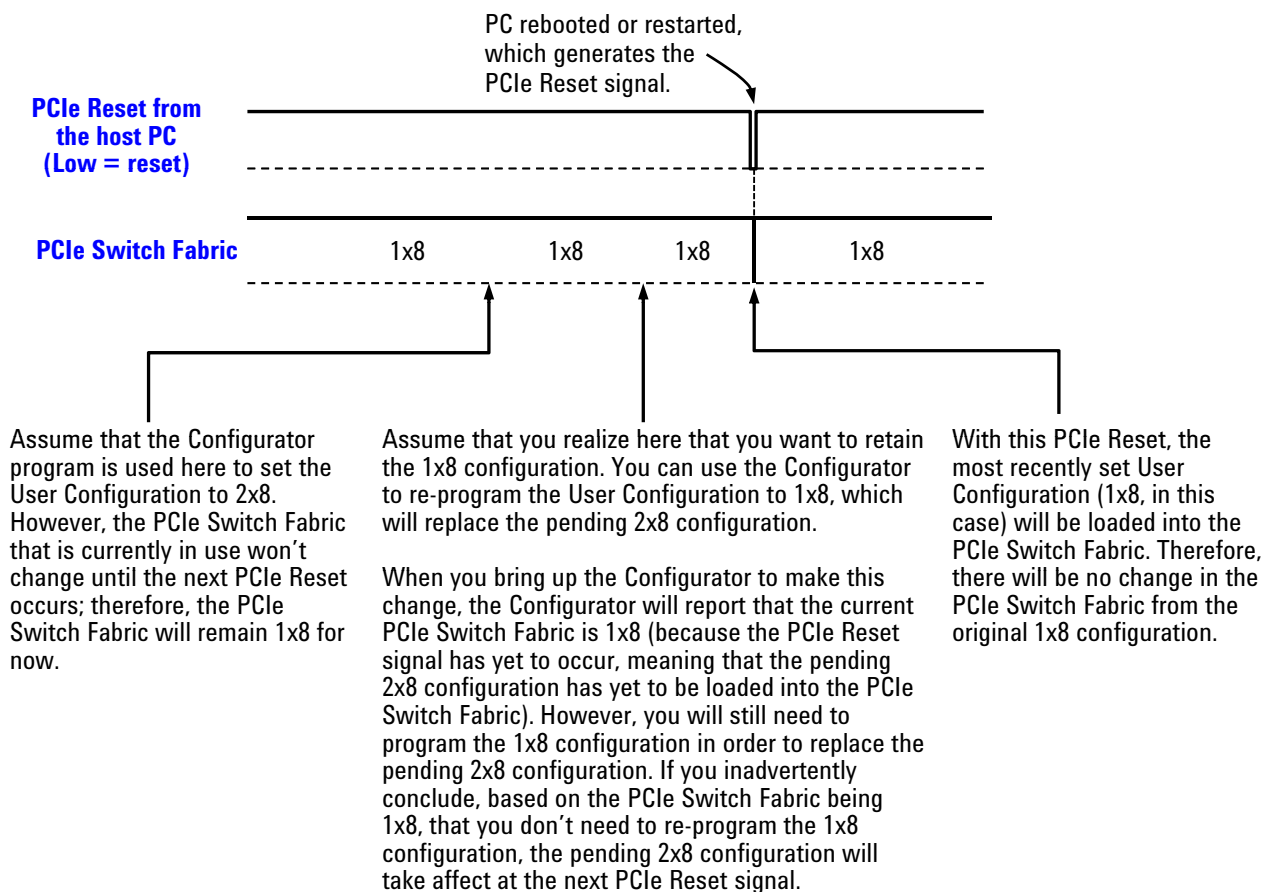


Figure 41 Re-selecting the original PCIe link configuration prior to a PCIe Reset will retain the original configuration

Now let's describe how to use the **Configurator** program to select the 2x8 configuration. The **Configurator** program is installed as part of the M9018A software installation process described in the M9018A Startup Guide.

CAUTION

As described earlier, if you are using the M9021A PCIe Cable Interface module and if you change the PCIe link configuration from 1x8 to 2x8 on older versions of the M9018A fabrics, the host controller PC will no longer be able to communicate to the chassis through the M9021A module. Change only to the 2x8 configuration (or the 4x4 configuration) if you have a module that supports the target PCIe link configuration, such as the M9036A or M9037A embedded controller.

CAUTION

Once the configuration process begins, it is very important that the process be allowed to run to completion. Any interruption of the configuration process will leave the chassis PCIe Switch Fabric in an indeterminate state, and will require multiple power cycles of the chassis and multiple reboots of the computer to restore operation (which will be to the 1x8 factory default PCIe Switch Fabric). To ensure that the configuration process runs to completion, perform the following:

- 1 If you are using a laptop PC, attach the AC power adapter to ensure that you will not experience a low battery shutdown.
- 2 Ensure your Windows power management Sleep and Hibernate modes are not configured to power down the host PC during the configuration process which can take several minutes.
- 3 Do not turn the PC nor the chassis off while configuration of the switch fabric is underway.
- 4 Do not terminate the Configurator program while it is configuring the switch fabric.
- 5 Do not operate the Keysight Configuration Expert (part of IO Libraries), the NI MAX tool, nor run any M9018A application (IVI, Soft Front Panel, etc.) while performing a fabric update.

If the configuration process is interrupted, see [“Restoring operation after an interruption of the configuration process”](#) on page 85 for information on how to restore your chassis to an operating state.

To select the 2x8 configuration, perform the following steps:

- 1 The **Configurator** utility program is available from the Windows **Start** button; select **All Programs > Keysight > M9018 > PCIe Switch Fabric Configurator**. This opens the dialog shown in [Figure 42](#).

NOTE

On older systems, an older version of the **Configurator** utility can be found in one of the following locations, depending on your Windows operating system:

Program Files > Keysight > M9018 > bin > PCIeFabric.exe

Program Files (x86) > Keysight > M9018 > bin > PCIeFabric.exe

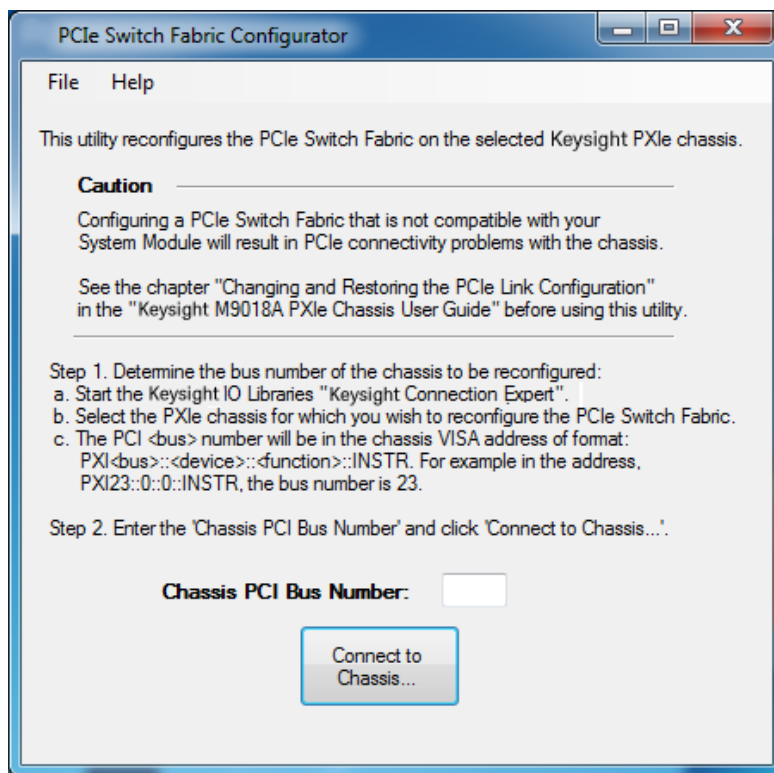


Figure 42 Configurator startup dialog

- 2 Enter your chassis PCI bus number in the **Chassis PCI Bus number** field. As noted in the dialog, the chassis PCI bus number is displayed in Connection Expert. Click **Connect to Chassis...** after entering the PCI bus number.

NOTE

Make certain that Connection Expert is closed prior to selecting the fabric in the next step.

- 3 The **Fabric Configurator** selection dialog is displayed next as shown in Figure 43. To change to the 2x8 PCIe link configuration, use the Fabric Configuration pull down menu to select **2-Link Configuration: 2x8**, and then click **Start Reconfiguration**.

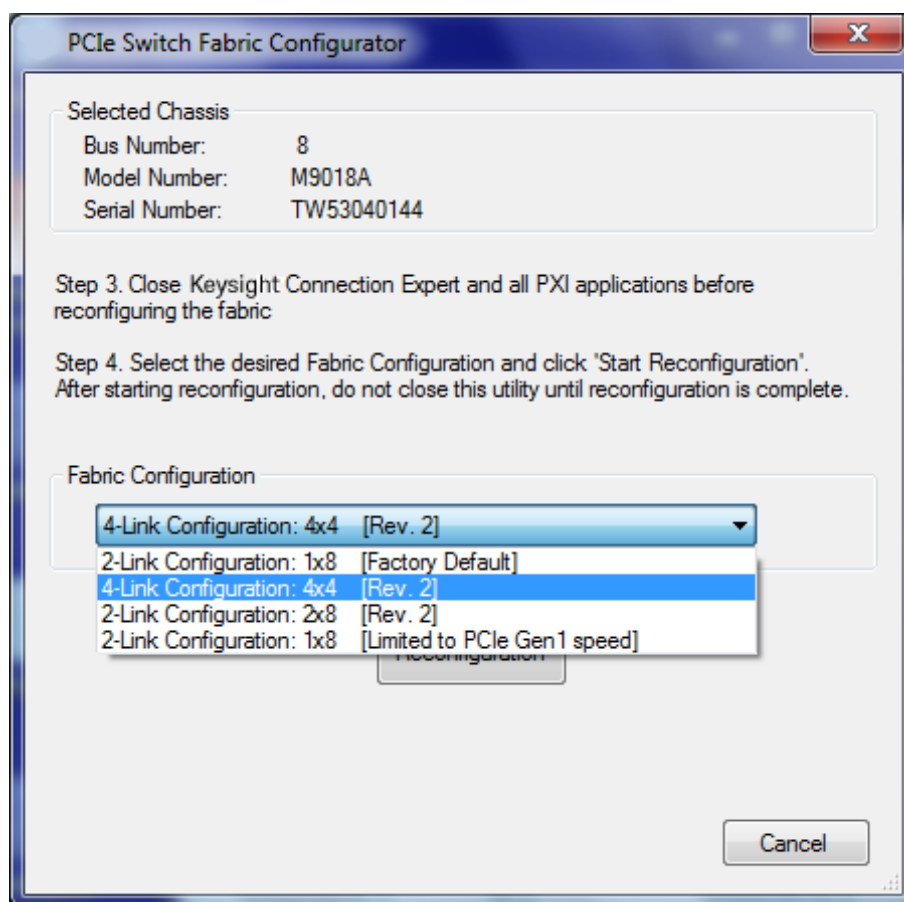


Figure 43 Fabric Configuration selection dialog

NOTE

Newer fabric versions that are available on newer driver versions of the M9018A software installations have appended “[Rev.<n>]” to indicate the version number of that fabric.

While the reconfiguration is in progress, the progress indicator shown in Figure 44 will be displayed. It is very important that the **Configurator** program not be terminated or otherwise interrupted during the reconfiguration.

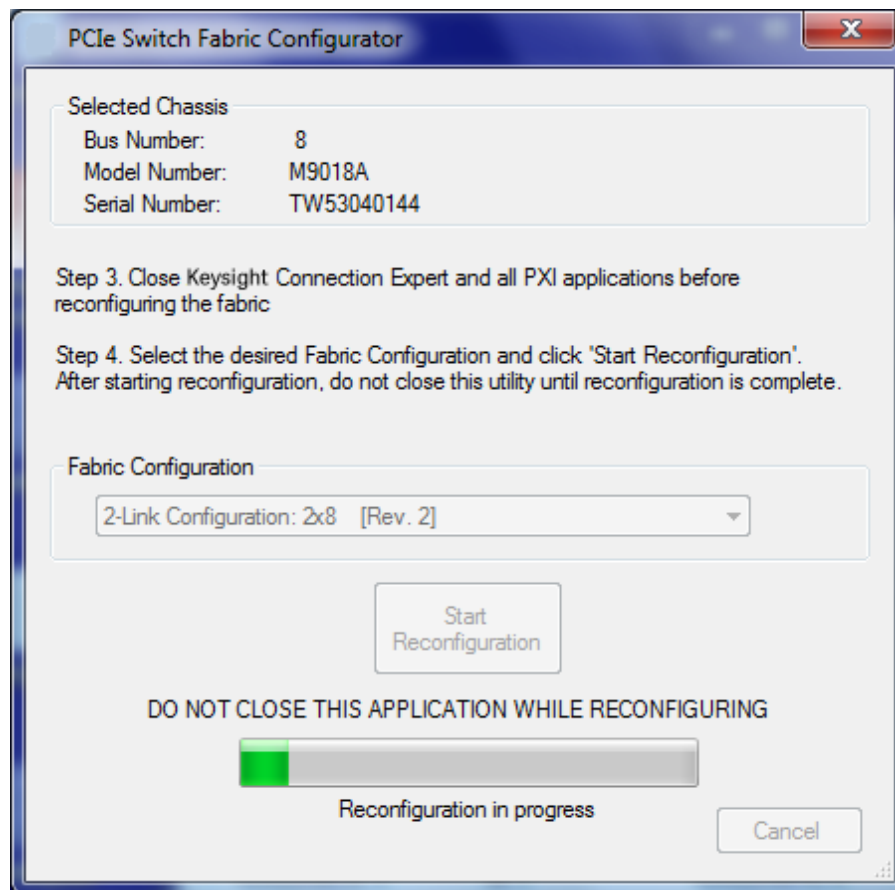


Figure 44 Configurator progress indicator

If the reconfiguration successfully completes, the Configurator displays the dialog shown in Figure 45.

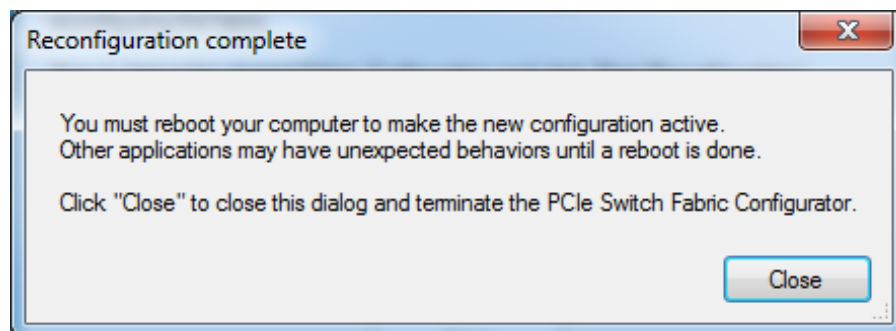


Figure 45 Dialog if reconfiguration is successful

At this point, the virtual switch shown in [Figure 38](#) on page 71 is in the User position and the User Configuration has been set to 2x8. However, the 2x8 configuration has not yet been loaded into the PCIe Switch Fabric. As noted above, you must reboot your computer in order for the 2x8 configuration to become active, as shown in [Figure 40](#) on page 76. It is not necessary to power cycle the chassis.

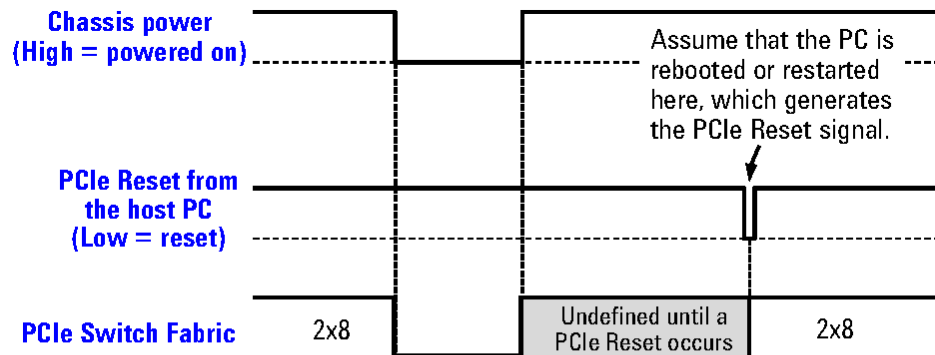
If the reconfiguration is not successful, the **Configurator** will present you with several options as described in [“Reconfiguration failure”](#) on page 84.

ASIDE: Self test operation, which is described in the next chapter, will detect the post-configuration need to reboot your computer, and will generate the following error message if self test is run at this point. This is basically a restatement of the need shown in [Figure 40](#) on page 76 to reboot your computer in order to load the just-selected PCIe Switch Fabric.



Figure 46 If self test is run prior to rebooting your computer, it will detect that the computer needs to be rebooted

The 2x8 PCIe link configuration that has been installed will persist across a chassis power cycle as shown in Figure 47. However, as usual, the PCIe Switch Fabric will be undefined until a PCIe Reset occurs.



This diagram shows the status of the PCIe Switch Fabric across a chassis power cycle. In this example, the PCIe Switch Fabric is set to 2x8. When the chassis is powered down and powered back up, the PCIe Switch Fabric is, as usual, undefined until a PCIe Reset signal occurs.

When PCIe Reset occurs, the configured 2x8 PCIe fabric is loaded.

Figure 47 Persistence of the PCIe link configuration across a power cycle

Configuring the chassis to run at Gen 1 speeds

At times it may be necessary to run the Keysight M9018A chassis at Gen 1 speeds (also known as Safe Mode as the bit error rate of a questionable PCIe connection goes down with the slower data rate of Gen 1). To do this you must run the PCIe Fabric Configurator program:

- 1 The **Configurator** utility program is available from the Windows **Start** button; select **All Programs > Keysight > M9018 > PCIe Switch Fabric Configurator**.
- 2 Follow the instructions to enter the chassis bus number. (See also [Figure 42](#))
- 3 In the fabric configurator drop down box, select:
2-link Configuration 1x8 [Limited to PCIe Gen1 Speed]
(see [Figure 48](#))
- 4 Press the **Start Reconfiguration** button.
- 5 Allow the configuration process to complete. Follow all instructions on the display.
- 6 Cycle the chassis power.

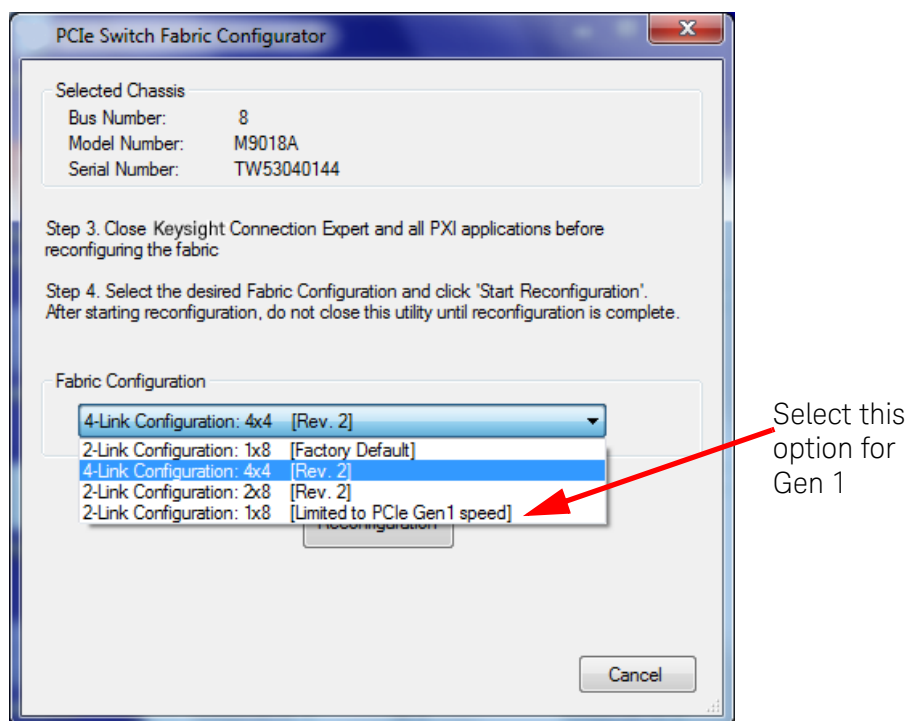


Figure 48 PCI Configurator for Gen1 speeds

Reconfiguration failure

If the reconfiguration fails for any reason, the **Configurator** displays the dialog shown in Figure 49.

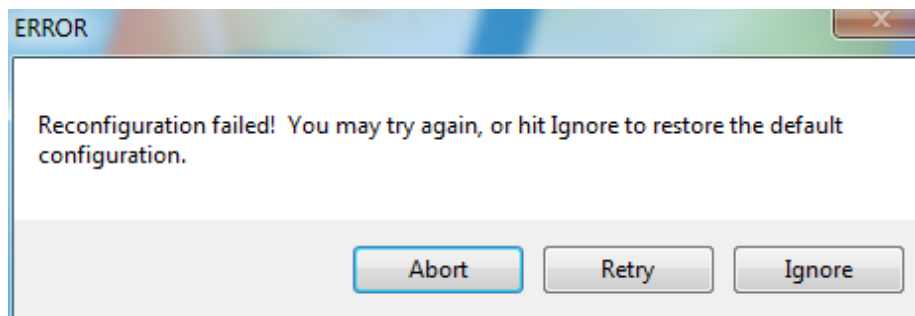


Figure 49 Dialog displayed if the reconfiguration fails

Click **Retry** to attempt to program the previously-selected switch fabric. Click **Ignore** if, instead of attempting to program the previously-selected configuration, you want to restore the 1x8 factory default configuration. Both of these

operations will bring up the **Configurator** progress indicator shown in [Figure 44](#) on page 81. If reconfiguration is successful, the selected configuration will become active after the next boot.

Clicking **Abort** terminates all attempts to program a configuration, displays the dialog shown in [Figure 50](#) and the chassis defaults back to 1x8, which becomes active after the next boot. If self test is run following the boot, code 537 and message "Error detected during PCIe Switch Fabric configuration. Base (factory default) PCIe Switch Fabric was re-selected." will be returned. This code/message indicates that the initial reconfiguration failed, and that the 1x8 Base Configuration was automatically re-selected. Once the default fabric has been restored, you may attempt to reconfigure the fabric again. If you continue to get the failure message, contact Keysight support.

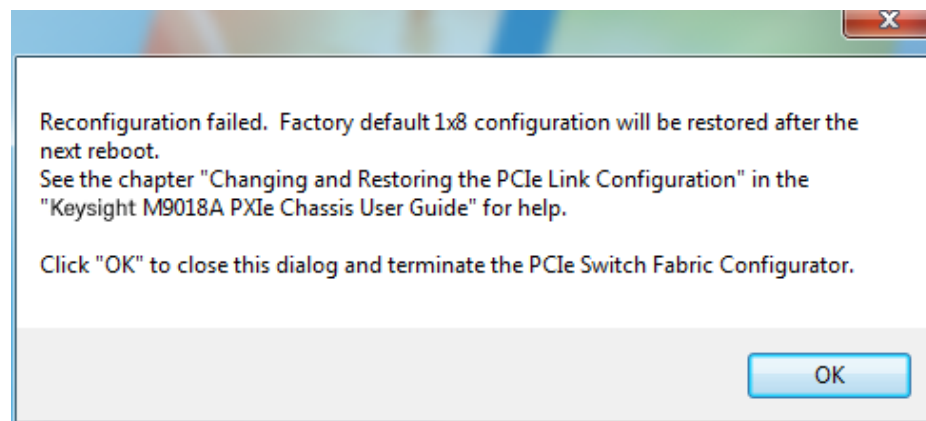


Figure 50 Dialog displayed after selecting Abort

Restoring operation after an interruption of the configuration process

This section lists the steps that are needed if the configuration process is interrupted—for example, if the chassis is powered down during the configuration process. These steps are based on using Keysight IO Libraries Suite 16.1 (or later), and will restore the PCIe Switch Fabric to the 1x8 factory default configuration.

NOTE

An important aspect of programming the PCIe Switch Fabric is that, as the fabric is being programmed, the virtual switch shown in [Figure 38](#) on page 71 is set to point to the 1x8 Base Configuration. If programming of the fabric (for example, to the 2x8 configuration) is successful, the virtual switch is then set to the Base Configuration, which contains the 2x8 fabric. When the PC is booted next, the 2x8 Base Configuration will be loaded into the PCIe Switch Fabric as shown in [Figure 40](#) on page 76.

If programming of the 2x8 (or 4x4) configuration is interrupted, the fabric being stored in the Base Configuration will likely be incomplete. However, the virtual switch is set to the 1x8 Base Configuration during the programming (and therefore remains set there after the interruption) will allow the 1x8 configuration to be loaded at the next PC boot. When the chassis driver communicates to the chassis after the boot (for example, when the SFP is brought up), the driver will detect that the PCIe programming was interrupted, and will perform several additional steps to instantiate 1x8 as the current chassis configuration.

The following steps to restore 1x8 assume a remote controller PC, not an embedded controller. If you have an embedded controller, steps 1–4 can be combined into these steps: Power down your chassis, wait one second, and power up your chassis.

- 1 Shut down your PC.
- 2 Power down your chassis and wait one second.
- 3 Power up your chassis and wait three seconds.
- 4 Turn on your PC.
- 5 After Windows is up, start Connection Expert, and verify that the chassis is displayed. If Connection Expert isn't able to display the chassis, you will need to perform the recovery operation described in "[Preemptively restoring the factory default 1x8 Base Configuration](#)" on page 87.
- 6 Start the chassis SFP by clicking the Connection Expert **Start SFP** button. This allows the chassis driver to perform the steps necessary to instantiate 1x8 as the current chassis configuration.
- 7 From the SFP and for informational purposes, perform a chassis self test. Self test should display codes 506 and 537 (and possibly error code 509). For the messages associated with these codes, see "[Self test codes and messages](#)" on page 95.
- 8 Restart your PC.
- 9 Start the SFP, rerun self test, and verify that codes 506 and 507 are not reported.

At this point, the PCIe Switch Fabric will be the 1x8 configuration. If desired, the **Configurator** program can be run again to select another configuration.

Preemptively restoring the factory default 1x8 Base Configuration

Assume that your PCIe Switch Fabric is currently set to a 2x8, and that you have an embedded controller that is using the 2x8 configuration. Assume furthermore that you want to reconfigure the chassis to work with the M9021A Cable Interface module. In this case, you would run the **Configurator** on the embedded controller to select the 1x8 configuration.

If, for any reason, you are not able to run the **Configurator** program on the embedded controller in order to select 1x8, the chassis allows you to preemptively restore the 1x8 Base Configuration. The preemptive restoration requires pressing a pushbutton internal to the chassis while, at the same time, restarting the host controller PC to generate the PCIe Reset signal.

For an embedded controller PC, it is typically straightforward to restart the PC while simultaneously pressing the chassis internal pushbutton because you're only interacting with one device, the chassis. For a remote controller PC that may be several feet from the chassis, the task of restarting the PC while simultaneously pressing the chassis internal pushbutton may be best accomplished with an assistant.

WARNING

Restoring the chassis PCIe switch fabric to its factory default configuration requires pressing a pushbutton internal to the chassis while the chassis is powered up. Only qualified, service-trained personnel shall be allowed to remove the instrument cover and actuate the pushbutton while the instrument is energized. High current and high energy source connectors are proximate to the pushbutton which could cause potential burns if short circuited.

To restore the Base Configuration, perform the following steps:

- 1 Turn the chassis off and unplug the chassis from AC power.
- 2 Remove the chassis top cover as follows:
 - a Remove the two rear feet of the chassis by using a Torx T8 screwdriver. Each of the two rear feet has two Torx screws.
 - b Next, remove the 14 screws holding the top cover in place using a #2 Phillips screwdriver. There are 5 screws on each side of the cover, two on top of the cover near the front panel, and two in the back of the chassis that screw into the chassis rear panel.
 - c After the screws are removed, lift up the rear of the chassis cover about 12 mm (.5 inches) and slide the cover back off of the chassis. Place the cover in a location away from the chassis.

- 3 Identify the Load Base Configuration Pushbutton at the top of the backplane behind the three-wide expansion slot to the left of slot 1—see Figure 51.

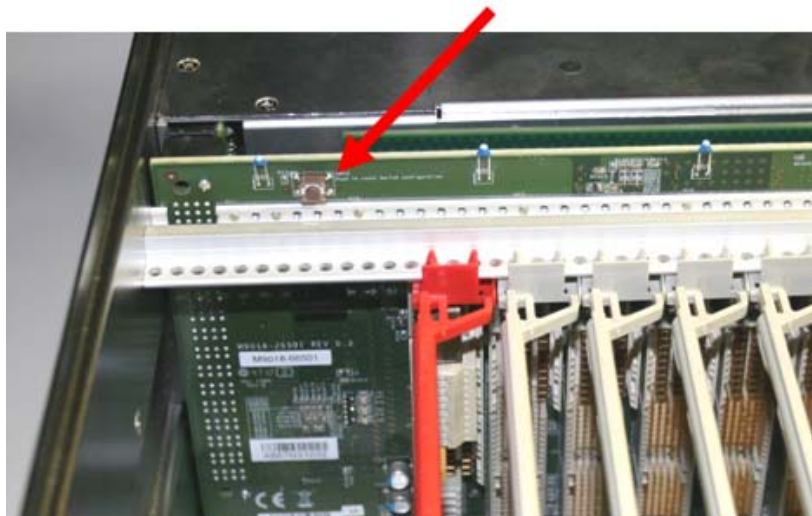


Figure 51 Load Base Configuration Pushbutton

- 4 If you have an **embedded controller**, perform the following steps (for an external controller, proceed to step 5):
 - a Re-connect the chassis power cord to AC power.
 - b Press and hold the Load Base Configuration Pushbutton *before* powering up the chassis.

WARNING

In the next step, you'll power up the chassis. In doing so, ensure that no contact is made with anything in the chassis other than the pushbutton. Ensure that no metallic object, such as a ring or a watchband, contacts any chassis components.

- c Power up the chassis while continuing to press the pushbutton. As the embedded controller powers up, the PCIe Reset signal is generated.
- d After the embedded controller has restarted as indicated by the Windows splash screen appearing, release the Load Base Configuration Pushbutton.

At this point, the Base Configuration (1x8) has been loaded into the PCIe Switch Fabric.

e Continue onto step 6.

5 If you have an external (remote) controller PC, perform the following steps:

WARNING

In the next step, you'll power up the chassis. In doing so, ensure that no contact is made with anything in the chassis other than the pushbutton. Ensure that no metallic object, such as a ring or a watchband, contacts any chassis components.

a Re-connect the chassis power cord to AC power and power up the chassis.

b Press the Load Base Configuration Pushbutton and then, while continuing to press the pushbutton, restart the remote controller PC. As noted earlier, this may be best accomplished with an assistant.

c After the remote controller PC has restarted as indicated by the Windows splash screen appearing, release the Load Base Configuration Pushbutton. At this point, the Base Configuration (1x8) has been loaded into the PCIe Switch Fabric.

6 While the Base Configuration: 1x8 has now been loaded into the PCIe Switch Fabric, the virtual switch is still set to the 2x8 position—use of the pushbutton doesn't affect the position of the virtual switch. In order to re-position the switch to the Base position, chassis software needs to be run. This is most easily accomplished by bringing up the SFP. In running the SFP, the IVI driver used by the SFP will detect that the Load Base Configuration Pushbutton has been used, and will reposition the virtual switch to the Base Configuration position. The PCIe Link Configuration display on the SFP **Monitor** tab will now show "2-Link Configuration: 1x8 (Factory Default)".

7 Power down the chassis and unplug the chassis from AC power.

8 Re-install the chassis top cover by performing steps a-c (in step 2) in reverse order, ensuring that all screws are reinserted.

9 Re-connect the power cord to AC power and perform the power sequence described in [Chapter 4](#), "Chassis and Host Controller Power Up/Down Sequence".

[52](#) on page 90 shows the complete time line for preemptively restoring the factory default 1x8 Base Configuration.

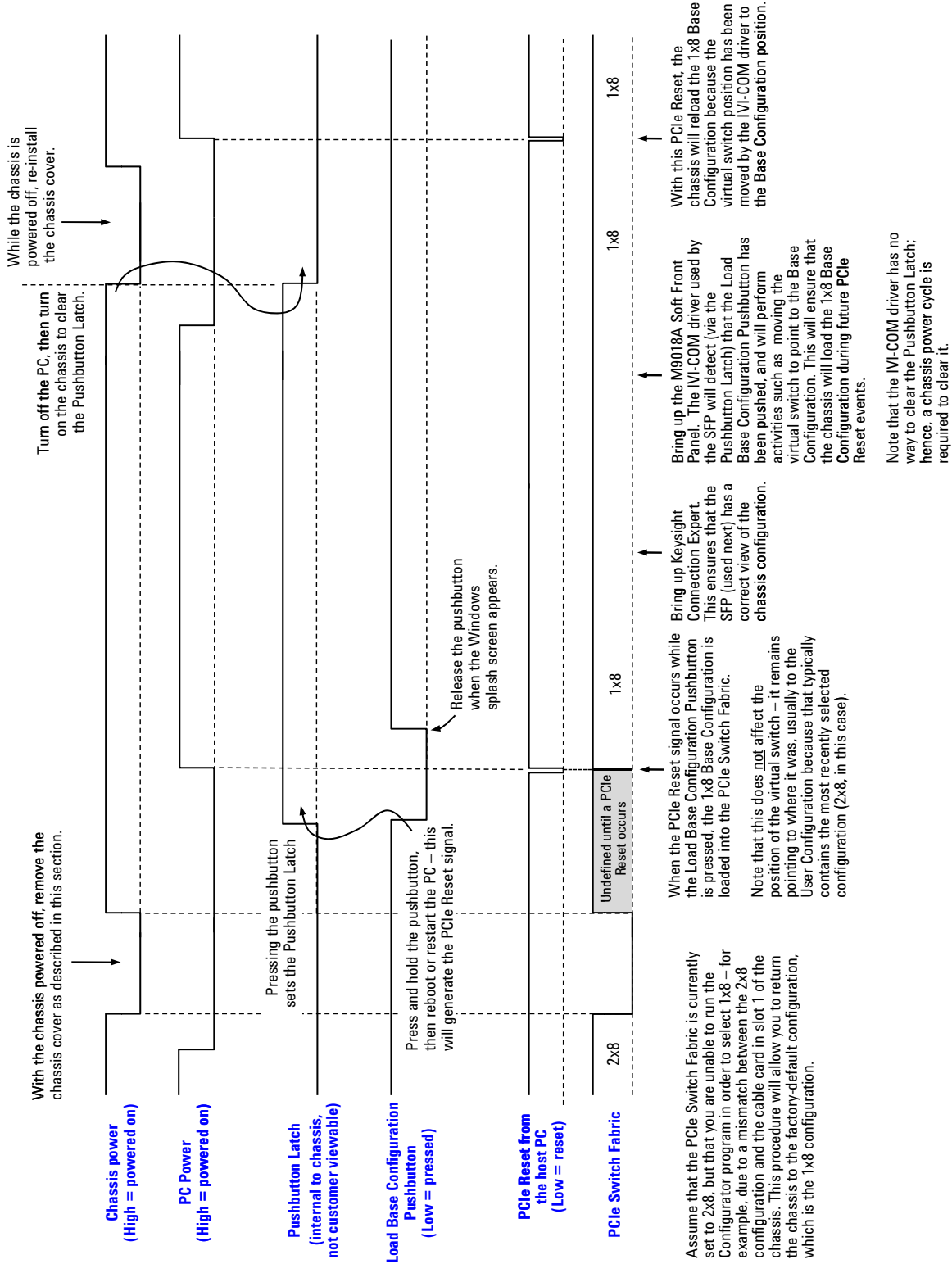


Figure 52 Time line for preemptive restoration of 1x8

15 Performing a Chassis Self Test

This chapter describes how to perform a chassis self test, and lists the codes and messages generated by self test. For detailed information on the self test messages and how to use the self test results to troubleshoot issues with the chassis, see [Chapter 21](#), “Troubleshooting Based on the Self Test Results”.

Self test can be initiated from the SFP or programmatically using the IVI or LabVIEW drivers. Figure 53 shows how to initiate self test from the M9018A soft front panel. Note that the **Allow Control** check box must be checked in order to perform a self test.

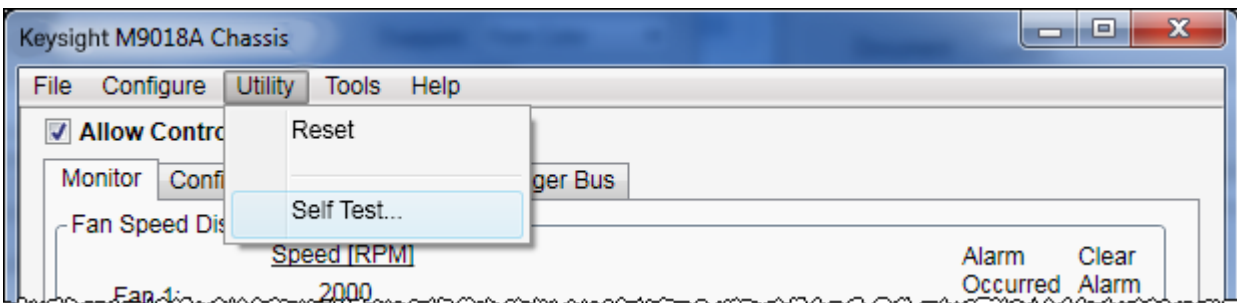


Figure 53 Initiating self test from the SFP

[Figure 54](#) on page 94 shows the SFP implementation of self test. This diagram shows that a limited set of self tests are performed whenever any program, including the SFP, performs the first initialization call to the chassis. Any self test results from the first initialization call are then merged with any self test results generated when the full self test is executed.

NOTE

IVI users are alerted to first initialization self test failures by the error codes:

IVI-COM: E_AGM9018_SELF_TEST_RECOMMENDED
IVI-C: AGM9018_ERROR_SELF_TEST_RECOMMENDED

The programmatic execution of self test is performed in a similar manner to the SFP implementation of self test. In fact, the process by which the SFP reads the self test results (green box in [Figure 54](#) on page 94) is the same process that would be followed by an application program.

Performing self test using the IVI drivers

Refer to the IVI help system for information on performing self test programmatically. As noted above, executing self test programmatically is very similar to the SFP implementation of self test.

M9018A Chassis Self Test Using the SFP

1. SFP actions are shown above the blue timeline, chassis actions are shown below the timeline.
2. This diagram assumes that two self test errors occur during the chassis initialization process (represented by yellow rectangles) and that three self test errors occur during the full self test (salmon rectangles).

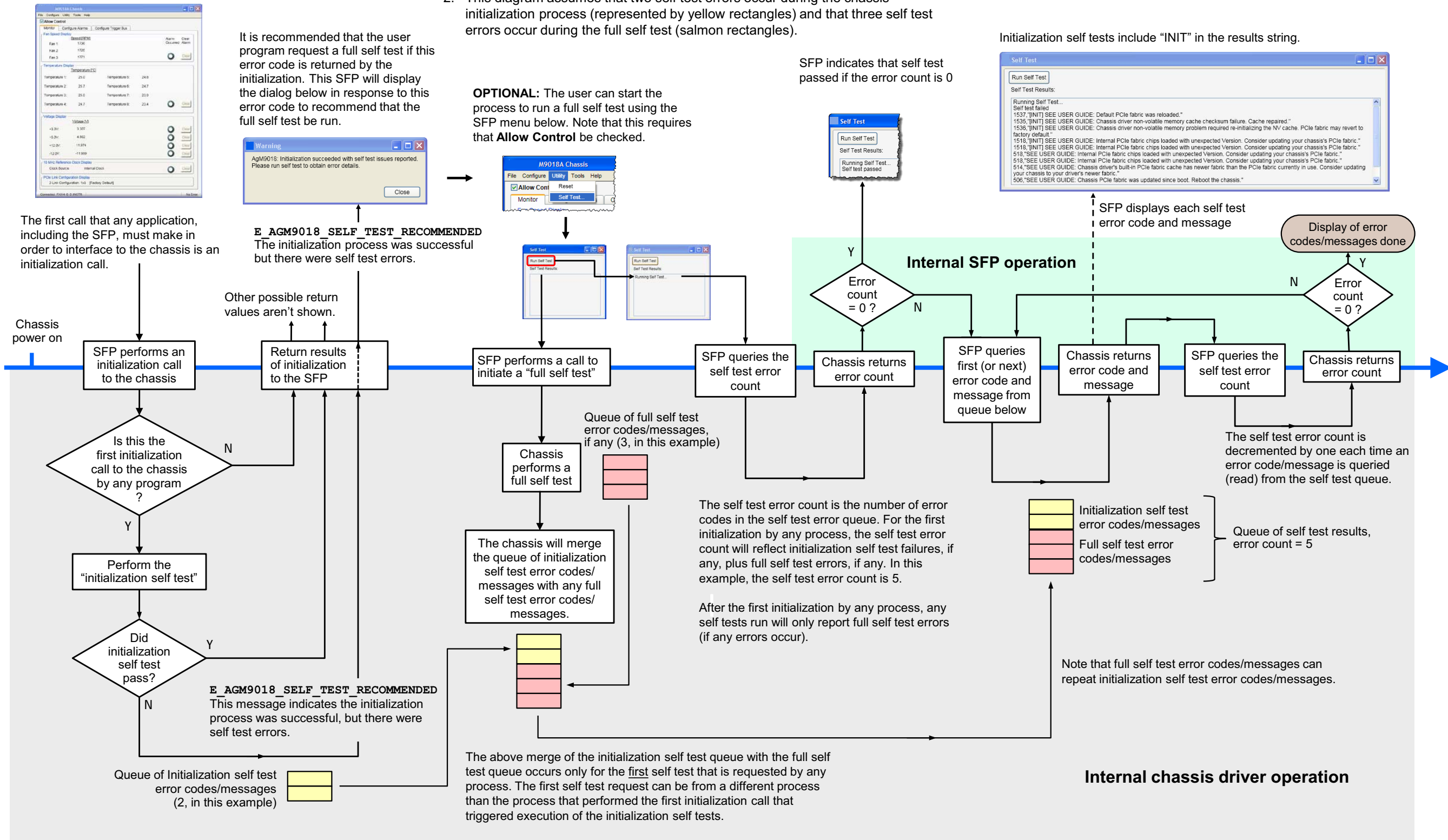


Figure 54 Chassis Self Test using the Soft Front Panel

Self test codes and messages

The self test codes and messages are listed below. The messages are grouped into low numbered codes (starting at 1) and high numbered codes (starting at 500). Low-numbered codes generally indicate a situation where service is required. High-numbered codes indicate situations that you can often resolve yourself. For details on these groups, the meaning of each message and possible actions to take in response to the messages, see [Chapter 16](#), “Troubleshooting the M9018A System”.

Low-numbered self test codes (service typically is required)

- 1, “Chassis Monitor processor is not responsive.”
- 2, unused
- 3, “Unable to operate IO channel that allows PCIe Switch Fabric reconfiguration.”
- 4, “Unable to operate IO channel to PXI Trigger routing buffers.”
- 5, “Unable to operate IO channel to chassis EPROM.”
- 6, “Error writing to the chassis EPROM. Reinstall chassis PCIe Switch Fabric.”
- 7, “One or more chassis fans operating outside valid RPM range.”
- 8, “Chassis fan 1 operating outside valid RPM range.”
- 9, “Chassis fan 2 operating outside valid RPM range.”
- 10, “Chassis fan 3 operating outside valid RPM range.”

- 11, “Chassis fan speed selector switch is in HIGH position, but one or more fans not operating at maximum speed.”
- 12, “Chassis fans are operating at dissimilar speeds.”
- 13, “Chassis fan AUTO speed control is not functioning properly.”
- 14, “IO failure during self test. If problem persists, contact Keysight Technical Support.”
- 15, unused
- 16, unused
- 17, “Reading from non-volatile chassis memory failed.”
- 18, “Corrupt serial number in non-volatile memory.”
- 19, “Chassis self-test cache memory inaccessible.”
- 20, “Failed to recover to the Base (factory default) PCIe Switch Fabric during initialization.”

High numbered self test codes (situation may be customer resolvable)

- 500, "Chassis Manager operating on backup (read-only) firmware image. See Keysight Technical Support."
- 501, "Chassis Manager firmware was updated since power-up. Power cycle the chassis and reboot system controller."
- 502, "Chassis memory structure corrupted. Run IVI driver (or SFP utility) Reset command, and then rerun self test to validate."
- 503, "Previous reset operation found chassis memory structure corrupted, chassis memory was re-initialized."
- 504, "PCI Configuration Space Header corrupted. Power cycle the chassis and reboot the system controller."
- 505, "Unable to operate IO channel to Chassis Manager. Check PCIe connection."
- 506, "New PCIe Switch Fabric has been selected, but not loaded. Reboot the system controller to load the new fabric."
- 507, "Previous PCIe Switch Fabric update failed. Restoring Base (factory default) PCIe Switch Fabric."
- 508, "PCIe Switch Fabric currently in use is of a type that is not recognized by this version of chassis driver software. Consider updating your chassis driver software to a newer version."
- 509, "Chassis EPROM checksum failure. Reinstall PCIe Switch Fabric."
- 510, "Chassis EPROM does not match currently installed PCIe Switch Fabric. Reinstall PCIe Switch Fabric."

- 511, unused
- 512, "Non-volatile memory failure during PCIe Switch Fabric install/repair operations. Reinstall PCIe Switch Fabric."
- 513, "Chassis driver's built-in PCIe Switch Fabric cache has an older fabric revision than the PCIe Switch Fabric currently in use. Consider updating your chassis driver software to a newer version."
- 514, "Chassis driver's built-in PCIe Switch Fabric cache has newer fabric than the PCIe Switch Fabric currently in use. Consider updating your chassis to your driver's newer fabric."

- 515, "PCIe Switch Fabric chip loaded with wrong image for that chip. Reinstall PCIe Switch Fabric."
- 516, "PCIe switch fabric chips loaded with mismatching Type code. Reinstall PCIe switch Fabric."
- 517, "PCIe switch fabric chips loaded with mismatching Revision code. Reinstall PCIe Switch Fabric."
- 518, "PCIe switch fabric chips loaded with unexpected Revision. Reinstall PCIe Switch Fabric."
- 519, "One or more chassis temperatures operating outside valid range."
- 520, "Chassis temperature sensor 1 operating outside valid range."
- 521, "Chassis temperature sensor 2 operating outside valid range."
- 522, "Chassis temperature sensor 3 operating outside valid range."
- 523, "Chassis temperature sensor 4 operating outside valid range."
- 524, "Chassis temperature sensor 5 operating outside valid range."
- 525, "Chassis temperature sensor 6 operating outside valid range."
- 526, "Chassis temperature sensor 7 operating outside valid range."
- 527, "Chassis temperature sensor 8 operating outside valid range."
- 528, "One or more voltage rails operating outside valid range."
- 529, "3.3V voltage rail operating outside valid range."
- 530, "5V voltage rail operating outside valid range."
- 531, "-12V voltage rail operating outside valid range."
- 532, "+12V voltage rail operating outside valid range."
- 533, "5V auxiliary voltage supply operating outside valid range."
- 534, "Non-volatile self test memory cache size is invalid. Cache repaired, please rerun self test to validate repair."
- 535, "Non-volatile self test memory cache checksum failure. Cache repaired, please rerun self test to validate repair."
- 536, "Non-volatile self test memory problem required re-initializing the memory."

537,"Error detected during PCIe Switch Fabric configuration. Base (factory default) PCIe Switch Fabric was re-selected."

538,"Load Base Configuration Pushbutton press was latched. Power cycle chassis to clear latch, and then reboot the system controller."

539,"Currently loaded PCIe Switch Fabric has no revision information"

16 Troubleshooting the M9018A System

This chapter describes how to troubleshoot the M9018A system, where *M9018A system* refers to the complete hardware/software system shown in Figure 55. The system may include a laptop PC, a desktop PC, a rack-mounted PC, or an embedded controller. This chapter does not describe how to troubleshoot modules in the chassis other than the module installed in slot 1, the system controller slot. For information on troubleshooting other modules, please see your module documentation.

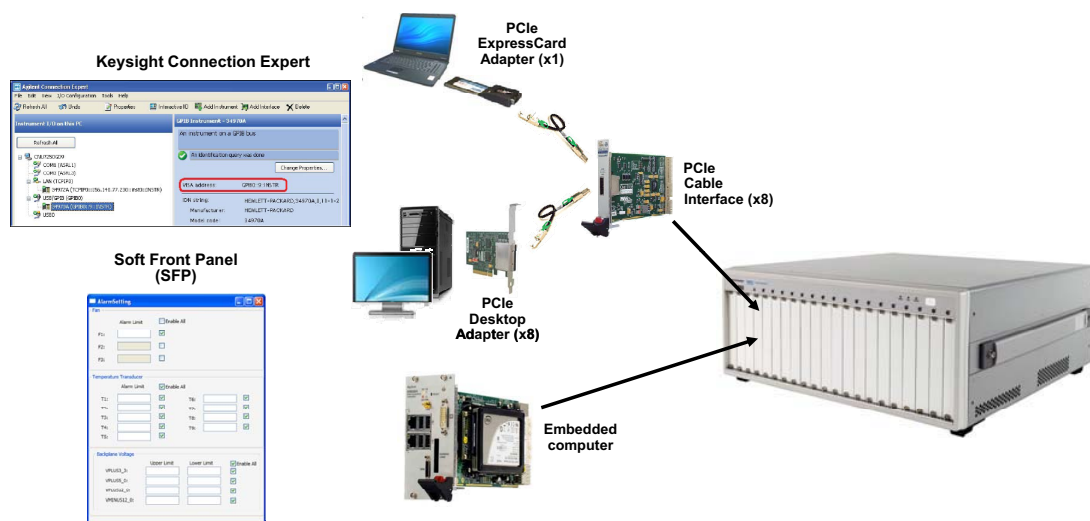


Figure 55 M9018A system

The troubleshooting process focuses on investigating and resolving *exceptions* to normal system operation. An exception may be as benign as a chassis temperature alarm caused by a mis-set temperature threshold, or as impacting as a failed hardware component such as the chassis power supply. The goal of this guide is to provide sufficient information for you to resolve system exceptions and return the chassis system to normal operation.

NOTE

If you're troubleshooting the M9018A system, Keysight recommends checking if there is a later version of this guide available at www.keysight.com/find/M9018A.

The six types of exceptions covered in this guide are shown in Figure 56. Comments and examples are provided for each type of exception.

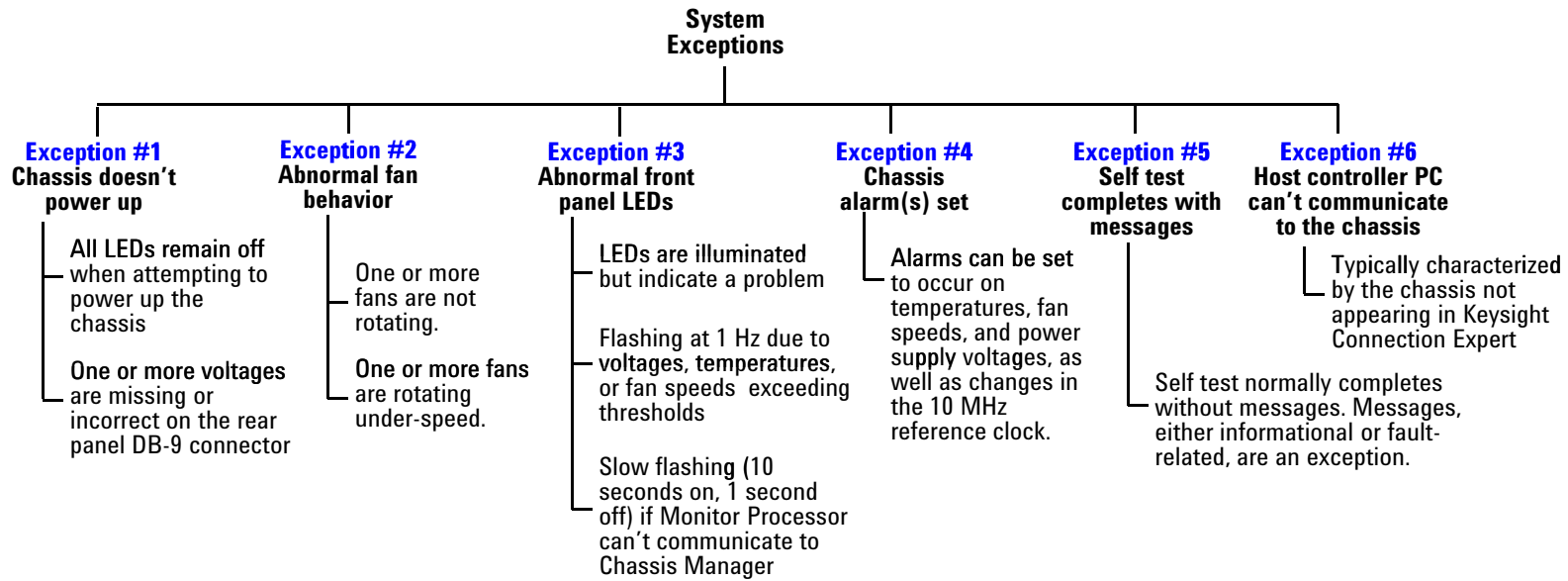


Figure 56 The six types of system exceptions

An exception doesn't necessarily indicate a failure. For example, assume that a chassis application uses an external 10 MHz clock, and assume further that the user wants to be notified if the external 10 MHz clock is no longer available—this is the user's definition of an exception for this application. The user could enable the alarm that reports if the source of the 10 MHz clock changes. Based on the occurrence of this particular alarm, the user could then take steps to restore the external 10 MHz clock.

In some cases, an exception will be based on a failure in the system—for example, a failure of one of the chassis fans. In other cases, an exception will be generated based on a fault that the user can correct through reconfiguring the chassis. For example, if too many high-powered modules are installed in the chassis, this can cause a current overload shutdown of the power supply. This type of fault can be resolved by reconfiguring the chassis to have fewer high-powered modules.

There is overlap between certain exceptions. For example, a temperature sensor that is over the temperature threshold will cause the front panel temperature LED to flash, and will also cause the corresponding SFP temperature alarm to be set (if that alarm is enabled). Resolving the underlying issue will eliminate both types of exceptions.

The **Exception #6: Host controller PC can't communicate to the chassis** is perhaps the most complex of the exceptions to troubleshoot. The cause of this exception can range from issues with the PC's software to issues with the PC's PCIe adapter card to issues with the chassis itself. Considerable troubleshooting guidance is provided for this exception category.

Overarching objective

The overarching troubleshooting objective of this guide is to allow you to quickly and efficiently take steps to resolve system exceptions. The steps can vary depending on the exception, and include actions such as changing a voltage alarm threshold, changing the configuration of modules in the chassis, replacing a failed component, or returning the chassis to Keysight for service.

To provide you with the most flexibility to resolve failures yourself, Keysight provides two orderable chassis replacement parts, the power supply and the fan assembly. This guide describes how to determine if either of these components has failed, and provides the repair procedures for both.

Quick troubleshooting tips

Before going into detail on responding to exceptions, listed below are a number of troubleshooting suggestions that may help you restore system operation without needing to perform the more detailed troubleshooting procedures in this guide.

- Keysight recommends installing the latest chassis software on the host controller PC because issues from earlier software versions may be addressed. The latest IO Libraries Suite can be found by starting at www.keysight.com/find/iosuite, and then clicking the link **Download Latest Release**. The latest chassis drivers can be found by starting at www.keysight.com/find/pxi-chassis, and then clicking **Technical Support > Drivers & Software**.
- Check to see if there is an update to the Chassis Manager firmware as described in [“Chassis firmware revision checking and installation”](#) on page 34.
- Check also to see if there are any service notes related to the M9018A chassis or any accessories that you are using. Go to www.keysight.com/find/servicenotes, then enter the product number you're interested in, such as “M9018” or “M9021”.

- If you're using the M9021A Cable Interface module and the chassis isn't turning on in response to pushing the front panel ON/Standby pushbutton, make sure the rear panel **INHIBIT** switch is set to the **DEF** (default) position—this allows the ON/Standby pushbutton to control the chassis power supply.
- Likewise, if you're using the **Inhibit** signal on the rear panel **INHIBIT/VOLTAGE MON** DB-9 connector and the chassis isn't turning on in response to a logic high signal, make sure the rear panel **INHIBIT** switch is set to the **MAN** (manual) position.

Troubleshooting tools

The following items may be of assistance during the troubleshooting process:

- **Spare parts**—Having spare parts will allow you to use the technique known as “parts swapping” to troubleshoot certain issues. Parts swapping is often the most efficient and cost effective method of troubleshooting complex systems. The next section lists several possible spare parts that you may want to have available for troubleshooting.
- **Digital multimeter**—This is useful to check the four voltage rails that are on the rear panel DB-9 connector. The ohms scale is useful to validate chassis ground continuity if you ever replace the power supply.
- **Receptacle tester**—Also known as an outlet tester, this device can be used to verify that an outlet is powered and wired correctly. Ensure that you use a tester appropriate for your mains AC voltage.

Spare parts

Listed below are several spare parts that you may want to acquire in case it's ever necessary to perform troubleshooting using the parts swapping technique.

- PCIe adapter card that plugs into the host controller PC—The two Keysight PCIe adapter cards are the M9045 and the M9048A.
- Cable interface module that plugs into slot 1 of the chassis—The Keysight cable interface module is the M9021A Cable Interface module.
- PCIe cable between the remote controller PC and the chassis
- Chassis power supply
- Chassis fan assembly

“Chassis and Accessory Model Numbers” on page 181 lists several of the above parts as well as other parts that you may want to acquire as spare parts. The appendix also describes how to order the chassis power supply and fan assembly.

NOTE

The power supply and the fan assembly are the only two customer-replaceable parts in the chassis. If you are doing self-repair and conclude that your chassis is inoperative due to a failure of a part other than the power supply or fan assembly, the chassis will need to be returned to Keysight for service.

Troubleshooting system exceptions

This section lists the six types of system exceptions, and provides links to chapters that provide troubleshooting recommendations for each type of exception.

Exception #1: Chassis doesn't power up

When the chassis is powered up, the following behavior should occur:

- The front panel LEDs should illuminate. While their exact behavior may vary because of their reporting of chassis status (as described in [Chapter 19](#), “Troubleshooting Flashing of the Front Panel LEDs”), the LEDs will typically behave as follows:
- The Temperature (“Temp”) LED will be on for three seconds and then turn off.
- The Fan LED will be on continuously
- The Power LED will be on continuously
- The three rear panel fans will begin rotating and stay on continuously.

The lack of the LEDs illuminating (in some pattern) almost always indicates that the chassis hasn't powered up. If the LEDs don't illuminate, see [Chapter 17](#), “Troubleshooting Failure of the Chassis to Power Up”.

Exception #2: Abnormal fan behavior

The three rear panel chassis fans should operate as follows:

- When the chassis is powered up, all three fans should rotate.
- When the rear panel **FAN** switch is changed from **AUTO** to **HIGH**, the fans should switch to maximum speed. When the **FAN** switch is changed back to **AUTO**, the fans should slow down.

If the above behavior doesn't occur, or if the following behavior does occur, see [Chapter 18](#), “Troubleshooting Fan Issues”.

- The chassis front panel Fan LED is flashing.
- The SFP displays one or more fan speeds below 1200 RPM.

Exception #3: Abnormal behavior of the front panel LEDs

The front panel LEDs, shown in Figure 57, provide important information, including:

- Whether the chassis is powered up
- The status of the chassis fans, temperature sensors, and power supplies
- Whether the Monitor Processor within the power supply is able to communicate to the Chassis Manager. The Monitor Processor monitors the chassis fans, temperature sensors, and power supplies, and directly controls the front panel LEDs.

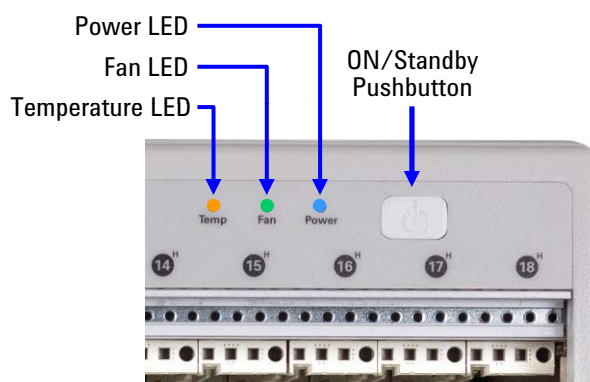
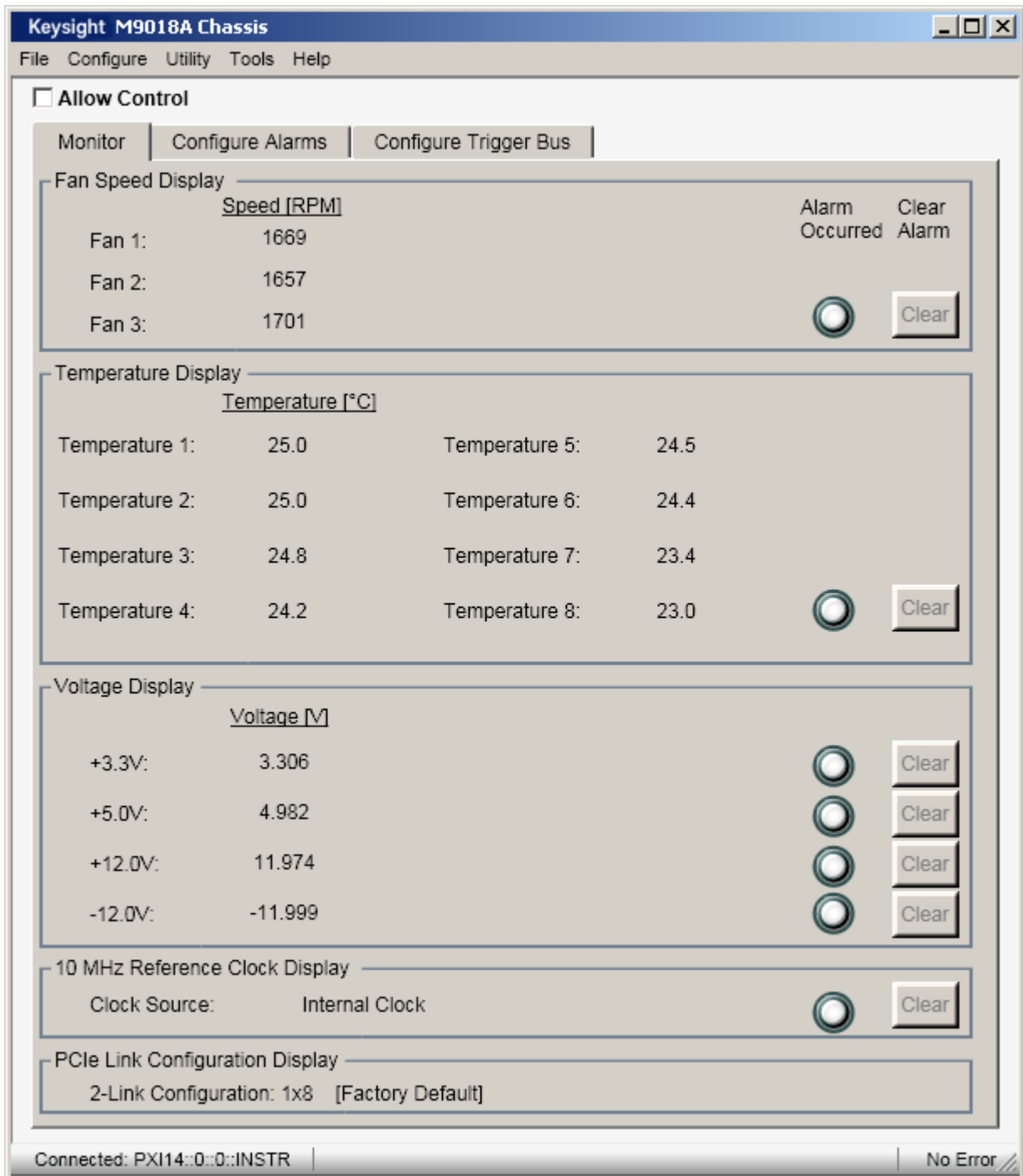


Figure 57 Front panel LEDs

The normal behavior of the chassis fans is for the Temperature LED to be off and the Fan and Power LEDs to be on. Any flashing of the LEDs is considered abnormal and an exception. [Chapter 19](#), “Troubleshooting Flashing of the Front Panel LEDs” describes the information communicated by flashing of the LEDs.

Exception #4: Chassis alarm(s) are set

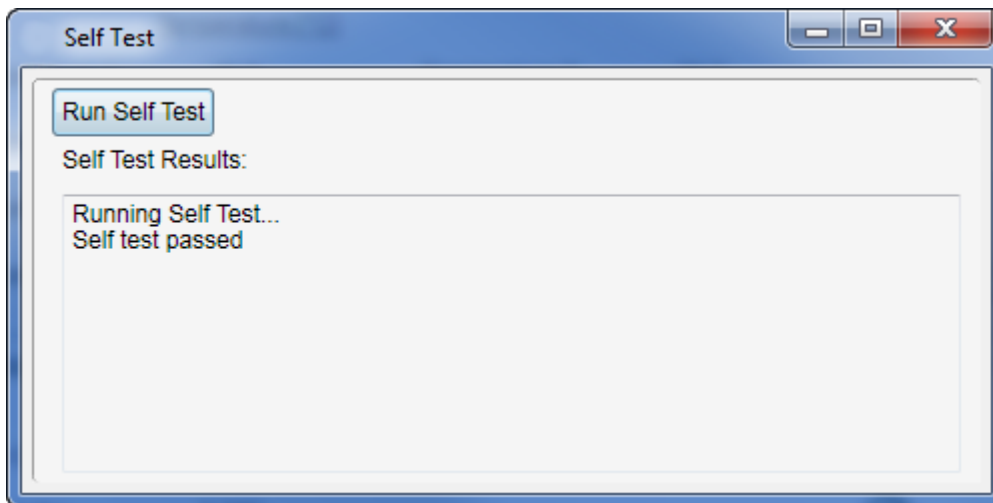
The occurrence of any chassis alarm is considered an exception. This may indicate an actual problem or a missed alarm threshold. The figure below shows the SFP **Monitor** tab and the seven chassis alarms.



If any of the seven alarms are set, see [Chapter 20](#), “Troubleshooting the Chassis Alarms”.

Exception #5: Self test completes with messages

When self test is run, it should complete as shown below:



The display of any self test message(s) in the above dialog is considered an exception and should be investigated. Some self test messages are informational while other messages indicate a fault in the system. See [Chapter 21](#), “Troubleshooting Based on the Self Test Results” for a description of the possible self test messages and the recommended actions.

Exception #6: Host controller PC can't communicate to the chassis

This exception is not a specific error message or a single fault, but is a condition where you are unable to establish communications from the host controller PC to the chassis. The most common indicator of this exception is when the chassis is not displayed in Connection Expert. Upon further investigation, you might discover that the chassis is also not displayed in Windows Device Manager.

This exception can have a number of different causes, such as

- Not having the chassis drivers installed on the host controller PC
- A faulty PCIe adapter card plugged into the host controller PC
- A faulty PCIe cable
- A faulty M9021A Cable Interface module installed in the chassis
- A failure of the chassis power supply

See [Chapter 22](#), “Troubleshooting M9018A System Turn On Issues” for a description of the possible causes of this condition and the corrective actions.

17 Troubleshooting Failure of the Chassis to Power Up

This section describes how to troubleshoot failure of the chassis to power up. A failure of the chassis to power up is indicated by the three front panel LEDs not illuminating when an attempt is made to power up the chassis. In general, there are three reasons that the chassis might not power up:

- 1 The chassis power up hardware is being incorrectly activated.
- 2 The chassis power up hardware has failed.
- 3 The chassis power supply itself has failed.

Each of these possibilities is described in this chapter.

NOTE

The chassis does not have a customer-replaceable fuse. Instead, the individual power supplies (such as the 5VDC and 12VDC supplies) each have a fuse. These fuses are not accessible nor replaceable. If the power supply fails, including any of its fuses, it must be replaced as a complete unit.

Behavior of a powered up chassis

When the chassis is powered up, the following should occur:

- 1 The three front panel LEDs will illuminate for three seconds. While their exact behavior may vary because of their reporting of chassis status (as described in [Chapter 19](#), “Troubleshooting Flashing of the Front Panel LEDs”), the LEDs will typically behave as follows:
 - The Temperature (“Temp”) LED will be on for three seconds and then turn off. If any temperature sensor is above the default temperature threshold of 65 °C (unlikely at power on), the Temperature LED will begin flashing.
 - The Fan LED will be on for three seconds and then will continue on uninterrupted if all three fans are operating above 1200 RPM. If any fan is below 1200 RPM, the Fan LED will begin flashing.
 - The Power LED will be on for three seconds and then will continue on uninterrupted if all voltage rails are within their $\pm 5\%$ limits. If any voltage rail is outside of its $\pm 5\%$ limits, the Power LED will begin flashing.
- 2 The three rear panel fans should begin rotating and stay on continuously.

This chapter focuses on the three LEDs as the primary indicator of the chassis powering up. The rotation of the fans is used to distinguish between different possible failures.

Power supply background information

This section provides background information regarding the power supply to assist in the troubleshooting process. First, please review [Chapter 2](#), “Power Supply Operation” for information on the power supply that is relevant to troubleshooting power supply issues, including:

- [“Over temperature protection”](#) on page 14
- [“Temperature derating of the primary power module”](#) on page 15
- [“Overcurrent protection of the 5V and 12V rails maximum PPM”](#) on page 16
- [“Short circuit protection of the 5V and 12V rails”](#) on page 16
- [“Short circuit protection of the 3.3V rail”](#) on page 17
- [“Monitoring of the 3.3V rail by the chassis”](#) on page 17
- [“Measuring the four main voltage rails directly”](#) on page 18

Next, see [Chapter 11](#), “Monitoring the Power Supply Rails” for information on how the front panel Power LED works.

Power supply and fan architecture

[Figure 58](#) on page 110 shows the power supply and fan architecture. The key aspects of the power supply architecture are listed below; the fan architecture details are described in [“Fan background information”](#) on page 115.

- The primary power module (PPM) contains two supplies that operate from AC power, the 5VDC (5V) supply and the 12VDC (12V) supply. These supplies are switched on by the PPM **ON** signal.
- The 3.3VDC (3.3V) and the -12VDC (-12V) supplies operate from the 12V supply. If the 12V supply partially or completely fails, the 3.3V and -12V voltage rails will be partially or completely missing.
- The four PPM voltage rails are brought out to the rear panel DB-9 connector to allow you to measure these rails. A 1K ohm resistor is in series with each rail to prevent accidentally shorting between rails during measurements.
- The PPM is switched on and off either by the front panel ON/Standby pushbutton or by the **Inhibit** signal on the rear panel **INHIBIT/VOLTAGE MON** DB-9 connector. Which mechanism is used is determined by the position of the rear panel **INHIBIT** switch.
- The Monitor Processor is not involved with turning on the PPM. The Monitor Processor monitors the PPM rails to determine when the PPM has been turned on by the mechanism described in the above paragraph.
- The 5Vaux supply provides auxiliary (standby) power to all slots and is powered directly from AC. When the chassis is plugged in, 5Vaux is available.

- The Monitor Processor monitors the five voltage rails shown. If the five voltage rails are within their $\pm 5\%$ limits, the front panel Power LED will be on continuously. If any rail is outside of its $\pm 5\%$ limit, the Power LED will flash. The 5% limits are the default, power on limits, and can be changed using either the SFP or programmatically.
- The front panel LEDs are powered by 3.3V. Therefore, if the 3.3V supply fails, the LEDs will be off.
- The Monitor Processor is powered by 5Vstandby, which is connected to AC power. When the chassis is plugged in, the Monitor Processor is active—for example, it monitors the five rails to determine when the power supply is turned on.
- When the Monitor Processor detects that the power supply is turned on, it activates the fans. The fan speed is determined by the setting of the rear panel **FAN** switch as described in [Chapter 10](#), “Setting the Fan Speed vs. Chassis Temperature Profile”.
- Activation of the fans indicates that the 5Vstandby supply is on (which powers the Monitor Processor) and the Fan 12V supply is on.
- The Chassis Power OK signal from the Monitor Processor drives the Chassis Power OK LED on the M9021A Cable Interface module. This signal indicates that the 3.3V, 5V, and 12V rails are within their specifications. The -12V and 5Vaux rails are not included in the reporting by this LED.
- To power the M9021A Cable Interface module, the M9021A power slide switch on the backplane of the chassis (and to the left of slot 1) must be slid to the right. For all other modules inserted in this slot, including embedded controllers, the slide switch should be positioned to the left.

Identifying the power supply version

Refer to [Figure 14](#) on page 33 to use the Soft Front Panel (SFP) to identify the Power Supply Hardware Revision Number.

NOTE

A “1” in the Power Supply Hardware Revision Number position indicates the new, high-power power supply.

You can also look through the fan blades on the rear of the chassis (left side) for a label on the power supply enclosure. This label indicates the actual power supply revision.

NOTE

An “F” (or later) revision indicates the new, high-power power supply.

M9018A Power Supply and Fan Architecture

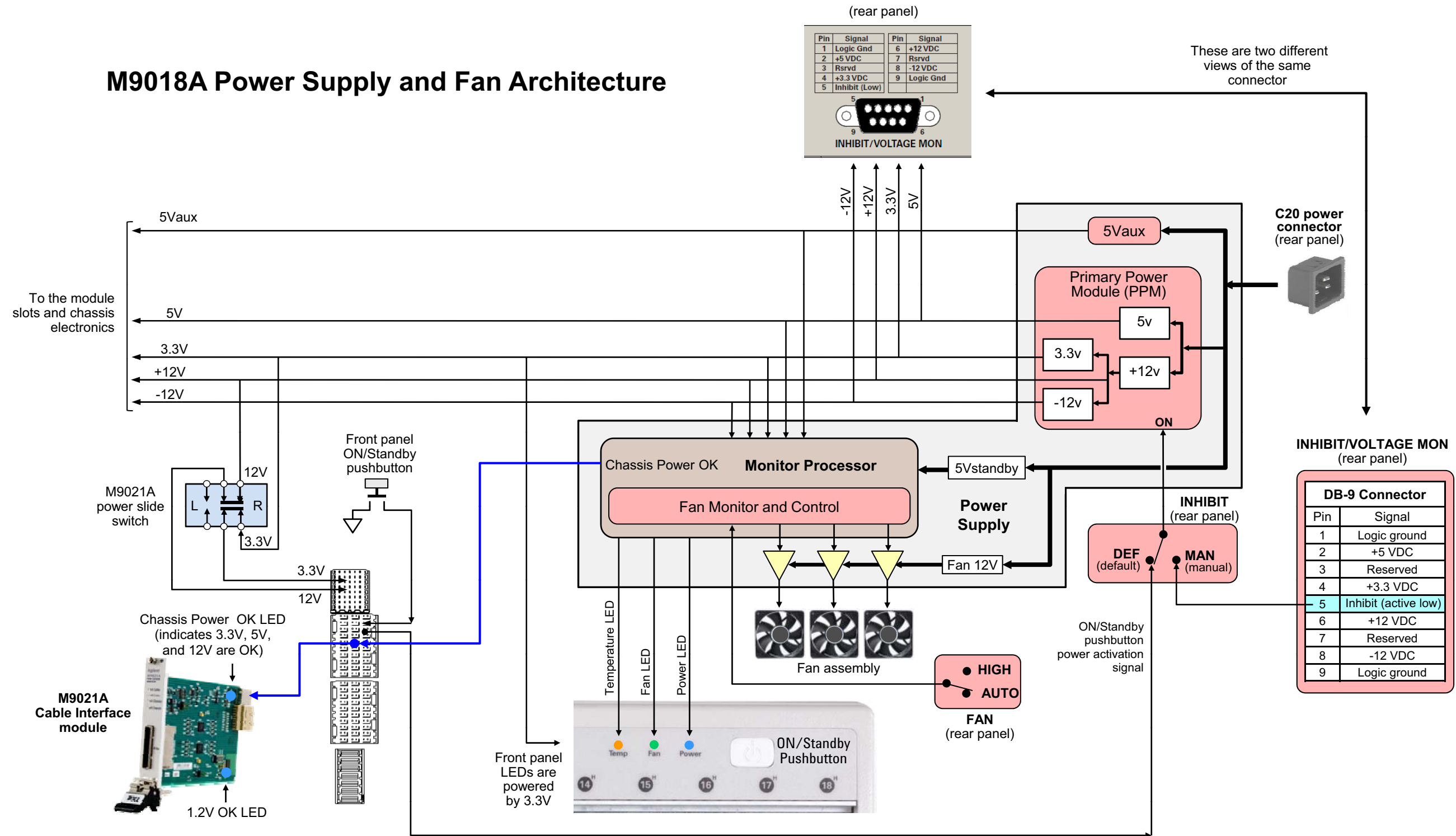


Figure 58 M9018A Chassis Power Supply and Fan architecture

Troubleshooting failure of the chassis to power up

This section provides the troubleshooting procedure to diagnose and resolve failure of the chassis to power up.

NOTE

When you press the chassis power-on button, if the chassis does not power up and the front panel LEDs do not light, it is possible for the chassis to be in a safety shutdown state. Remove the chassis AC power cord from the chassis for one minute. Reconnect the power cord and turn on the chassis again. If it still does not power on, refer to the following troubleshooting information.

Verify AC power

The first step is to verify that AC power is connected to the chassis. The receptacle tester described in “[Troubleshooting tools](#)” on page 102 provides a convenient way to verify that AC power is available.

Troubleshoot the power up hardware

The next step is to troubleshoot the power up hardware. This is the circuitry that turns on the chassis power supply. This troubleshooting step consists of: (1) Determining if the power up hardware is being correctly activated, and (2) determining if the power up hardware is operating correctly.

There are two means of powering up the chassis based on these positions of the rear panel **INHIBIT** switch:

- **DEF (Default)**—When the **INHIBIT** switch is in this position, the chassis is powered up by the front panel ON/Standby pushbutton.
- **MAN (Manual)**—When the **INHIBIT** switch is in the position, the chassis is powered up by the **Inhibit** input signal on the rear panel **INHIBIT/VOLTAGE MON** DB-9 connector.

NOTE

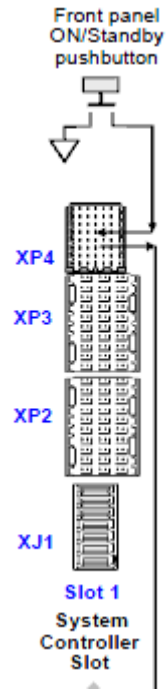
Keysight recommends leaving the **INHIBIT** switch in the **DEF** position when connecting the AC power cord to the chassis. After inserting the power AC power cord, then move the **INHIBIT** switch to the **MAN** position.

Ensure that the switch is set to the position consistent with your method of powering up the chassis. If you're using the front panel ON/Standby pushbutton, set the switch to **DEF**. If you're using the **Inhibit** input signal on the rear panel **INHIBIT/VOLTAGE MON** DB-9 connector, set the switch to **MAN**.

The next two sections provide details on troubleshooting the power up hardware.

Troubleshoot the ON/Standby pushbutton

This section applies to the situation where pushing of the ON/Standby pushbutton doesn't power up the chassis. As shown in the diagram at right (which is extracted from the "M9018A Block Diagram" on page 4), the ON/Standby pushbutton signal travels to the system controller slot (slot 1). The module in that slot receives the pushbutton signal and generates the output signal that turns on the power supply.



Therefore, a module must be installed in slot 1 in order for the pushbutton to work. The M9021A Cable Interface module contains the necessary circuitry to process the signal from the ON/Standby pushbutton and generate the output signal to turn on the power supply.

If you have a M9021A module installed in slot 1, and the chassis doesn't power up in response to pushing the ON/Standby pushbutton, the power up hardware on the module may have failed. However, the M9021 module power up hardware is relatively simple, and it is less likely than other components (such as the power supply itself) to fail. If you have a spare M9021A module, replace the installed module, and see if you can now power up the chassis.

If you don't have a spare M9021 module, try to turn on the chassis as described in the next section. Specifically, set the **INHIBIT** switch to the **MAN** position, and leave the **Inhibit** signal on the **INHIBIT/VOLTAGE MON** connector open circuit—this should power up the chassis. If this doesn't power up the chassis, continue to "Troubleshoot the power supply" on page 113.

Troubleshoot the Inhibit input signal

If you're using the **Inhibit** input signal on the rear panel **INHIBIT/VOLTAGE MON** DB-9 connector and if this signal doesn't power up the chassis, check the voltage that is being applied to the **Inhibit** signal. This signal is active low, meaning that a 0 VDC signal inhibits operation of the power supply (keeps it off). Therefore, a logic high will turn on the power supply. Use a DMM to verify that the signal you're providing to the **Inhibit** input on the DB-9 connector is truly switching between logic high and low.

Because there is an internal pullup resistor on the **Inhibit** signal, an open circuit (no signal connected) on the **Inhibit** signal will also turn on the power supply. This means that, if the **INHIBIT** switch is set to the **MAN** position and if no signal is connected to the **Inhibit** input signal, the chassis will power up as soon as AC power is applied. If this doesn't occur, continue with "Troubleshoot the power supply" on page 113.

Remove and re-install modules

If you're correctly applying your method of powering up the chassis but it is still not powering up, Keysight recommends that you remove all modules from the chassis except the system controller module in slot 1. Removing modules is done in case a module has a short on one of its voltage rails, or in case the total power of all of chassis modules is causing a current overload shutdown of the power supply. If the chassis successfully powers up after removing the modules, then perform the steps listed below; if the chassis doesn't power up, continue with the next section.

- 1 Prior to re-installing the modules, use the Microsoft Excel power calculator spreadsheet described in [“Power calculator spreadsheet”](#) on page 16 to determine if the chassis is operating within its power limits. If not, adjust your configuration accordingly.
- 2 Re-install the modules one module at a time and see if the power supply problem is associated with installation of a particular module. If so, that module might have a short on one of its voltage rails. If you have another module of the same type, remove the potentially problematic module, and install the replacement module, and see if the problem recurs.

Troubleshoot the power supply

This section describes troubleshooting of the power supply, and assumes that you have been unable to power up the chassis after performing the preceding steps, namely:

- You have verified the presence of AC power as described in [“Verify AC power”](#) on page 111.
- If you're using the ON/Standby pushbutton to power up the chassis, you have performed the steps described in [“Troubleshoot the ON/Standby pushbutton”](#) on page 112.
- If you're using the rear panel **Inhibit** signal, you have set the position of the rear panel **INHIBIT** switch as described in [“Troubleshoot the Inhibit input signal”](#) on page 112.
- You have removed all modules from the chassis except for the module in slot 1, the system controller slot.

The power supply troubleshooting table on the next page lists possible power supply issues, their possible causes, and suggested corrective actions.

CAUTION

The power supply contains no customer-serviceable parts such as fuses. If the power supply fails, it must be replaced as a complete unit. Replacement of the power supply is described in [Chapter 23, “Repairing the Chassis”](#).

Power supply troubleshooting table

The table below lists possible power supply issues, their potential causes, and recommended corrective actions. Keysight recommends that you explore the possible causes from top-to-bottom in the table.

Power supply issue	Possible causes	Further diagnostics, if any	Corrective action
None of the three front panel LEDs are illuminated when you attempt to power up the chassis.	The 12V supply did not turn on. The 3.3V supply, which powers the front panel LEDs, is powered by the 12V supply, and will therefore also be off.	Use a DMM to read the 3.3V, 5V, and 12V rails on the rear panel INHIBIT/VOLTAGE MON connector.	If the 12V supply did not turn on but if the 5V supply did turn on, this indicates that power supply activation worked correctly but that the 12V supply has possibly failed. Replace the power supply.
	The 12V supply did turn on, but the 3.3V supply did not turn on.		If the 12V supply did turn on, this indicates that power supply activation worked correctly. The fact that 3.3V supply did not come up indicates that this supply has likely failed. Replace the power supply.
	The Monitor Process is not working, or the front panel LEDs, the wiring to the LEDs, or the wiring connectors have failed.	Use a DMM to read the 3.3V, 5V, and 12V rails on the rear panel INHIBIT/VOLTAGE MON connector. Also, determine if the fans are rotating.	If both 3.3V and 12V are valid, and the fans are rotating, the power supply (which contains the Monitor Processor) is likely OK. This is potentially an issue with the wiring/connections to the LEDs or the LEDs themselves. Contact Keysight Technical Support to arrange service. If both 3.3V and 12V are valid, and the fans are not rotating, the power supply (which contains the Monitor Processor) is possibly bad. Replace the power supply.
The Power LED flashes when the chassis is turned on.	As described in Chapter 11 , “Monitoring the Power Supply Rails”, the Power LED will flash if any of the five power rails are outside of their $\pm 5\%$ limits.	The fact that the Power LED is flashing indicates that the chassis has powered up. However, the flashing LED represents Exception #3: Abnormal behavior of the front panel LEDs. See Chapter 19 , “Troubleshooting Flashing of the Front Panel LEDs” to perform further troubleshooting.	

18 Troubleshooting Fan Issues

This chapter describes how to troubleshoot the following issues with the three fans:

- The situation where one or more fans are not rotating.
- The situation where a fan is rotating but is rotating below 1200 RPM, which is the factory default minimum fan speed.

Because the fans receive their power from the chassis power supply, it's possible that a power supply failure can be interpreted as a failure of the fans. In situations where it's not possible to determine whether a failure is due to the power supply or a fan, this guide will recommend replacement of the fan assembly first due to its lower cost.

Fan background information is presented below to assist you in troubleshooting fan issues. This information includes a description of the inter-dependencies between the power supply and the fans. Next, a fan troubleshooting table is presented that lists possible fan issues, their potential causes, and recommended corrective actions.

Fan background information

This section provides information regarding the fans to assist you in the troubleshooting process. First, please review [Chapter 8](#), "Monitoring Fan Speeds" for information on how the fan speed is monitored by the chassis. Next, see [Chapter 10](#), "Setting the Fan Speed vs. Chassis Temperature Profile" for information on how the fan speeds can be set to operate as a function of temperature.

Next, see "[Power supply and fan architecture](#)" on page 108 and [Figure 58](#) on page 110 for information on the power supply and fan architecture. The fan information below is intended to supplement this previous information.

- The fans are powered by the Fan 12V supply. This supply is not monitored by the Monitor Processor, nor is this voltage available on the rear panel DB-9 connector.
- The fans are controlled by the Monitor Processor. Each fan has its own driver circuit (yellow triangle) that interfaces between the Monitor Processor and the fan.
- The Monitor Processor reads the **FAN** switch and either sets the fans to maximum speed (if the **FAN** switch is set to **HIGH**) or controls the fan speed as a function of chassis temperature (if the **FAN** switch is set to **AUTO**).

- The fans are not directly dependent on any of the four Primary Power Module supplies. However, the Monitor Processor will only start the fans if it detects that *at least one* of the four PPM supplies is up.
- It is possible for the three front panel LEDs to all be off (which typically indicates that the chassis is not powered up) yet the fans can still be running. This can occur if the 3.3V supply fails. Because the front panel LEDs are driven from 3.3V, they will all be off. However, as long as at least one (of the three) remaining PPM supplies is up, the Monitor Processor will run the fans.

Troubleshooting fan issues

This section provides the troubleshooting procedure to diagnose and resolve failure of the fans to rotate. As noted earlier, it is not always possible to distinguish with certainty between a failure of the power supply and a failure of the fan assembly. For example, if a single fan ceases to rotate, it could either be the fan driver (in the power supply) or the fan itself. In such cases, this guide will recommend replacement of the fan assembly first because of its lower cost.

Fan troubleshooting table

Table 5 Potential fan issues

Fan issue	Possible causes	Further diagnostics, if any	Next step
None of the three fans rotate when the chassis is powered up.	The fuse internal to the fan 12 VDC supply is blown.	None, neither the fan 12 VDC supply, its fuse, nor the fan driver circuitry are accessible for testing.	More information is needed, see the next row.
	The 12 VDC fan supply or the fan driver circuitry have failed		
One or two fans don't rotate when the chassis is powered up.	The Monitor Processor or the 5Vstandby power supply which powers the Monitor Processor have failed.	Determine if the three front panel LEDs are off, which are controlled by the Monitor Processor.	If the front panel LEDs are off, this is evidence that the Monitor Processor within the power supply has failed. Replace the power supply.
	The non-rotating fan(s) have failed	It is not possible to determine if this issue is caused by the drive electronics in the power supply or the fans themselves.	Replace the fan assembly because of its lower cost. If this doesn't resolve the problem, replace the power supply.
The drive circuitry to the non-rotating fan(s) has failed.			
The front panel Fan LED is flashing.	At least one of the fans is running below the minimum fan speed RPM threshold. This threshold is 1200 RPM at power on, and can be changed from 1 RPM to 10,000 RPM using the SFP or programmatically.	Bring up the SFP to view the fan speeds and the minimum fan speed alarm threshold.	Check to see if the slow fan(s) are partially obstructed. Fix as needed.
			Verify that the minimum fan speed alarm threshold isn't set too high, causing spurious fan speed alarms. Fix as needed.
			If a fan speed is, for example, below the default threshold of 1200 RPM, this possibly indicates that a fan is wearing out. Check the fan speeds periodically, and replace the fan assembly if the fan speed progressively slows.

19 Troubleshooting Flashing of the Front Panel LEDs

This chapter describes how to perform troubleshooting based on flashing of one or more front panel LEDs shown in Figure 59. If none of the LEDs are illuminated after attempting to power up the chassis, see [Chapter 17](#), “Troubleshooting Failure of the Chassis to Power Up”.

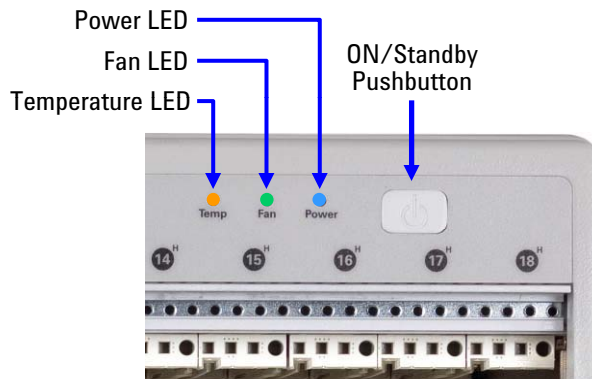


Figure 59 The three front panel LEDs

Troubleshooting flashing of the front panel LEDs means taking steps to eliminate the cause of their flashing. These steps can take two forms: (1) Addressing the particular parameter that is out of tolerance (for example, excessive temperature caused by too many high powered modules), or (2) adjusting the particular threshold that is being exceeded. Care should be taken to understand the underlying cause of a flashing LED before adjusting its threshold to eliminate the flashing.

There is overlap between the information conveyed by the chassis front panel LEDs and the information conveyed by the chassis alarms. For example, the front panel Temperature LED and the SFP temperature alarm will both indicate if the hottest of the eight temperature sensors is above the maximum temperature threshold that has been set.

However, there is a key difference between the front panel LEDs and the alarms. The alarms are latched while the front panel LEDs report conditions real time (via flashing of the LEDs). For example, if the hottest temperature sensor momentarily exceeds the maximum temperature threshold, that will set (latch)

the temperature alarm (presuming the alarm is enabled). However, the Temperature LED will only flash for the period of time that the temperature actually exceeds the temperature threshold.

This means that it's possible for the temperature alarm to indicate an excessive temperature while the Temperature LED indicates the temperatures are fine.

Table 6 on page 121 lists each LED and describes under what conditions it is off, on continuously, or flashing. **“Troubleshooting abnormal LED behaviors”** on page 122 describes how to troubleshoot abnormal LED behaviors.

Table 6 Behaviors of the front panel LEDs

LED	Off	On continuously	Flashing	All three LEDs on for 10 seconds and off for 1 second
Power LED (blue)	Indicates that the chassis is turned off. This could also indicate a failed LED, a failure of the LED drive circuitry, or a failure of the interconnect wiring.	Indicates that the four main supply voltages (3.3V, 5V, 12V, and -12V) plus 5Vaux are within their respective limits. The factory default limits are plus and minus 5% around the nominal values.	Indicates that one or more of the supply voltages (including the 5Vaux) are outside of their limits, either the 5% factory default limits or, if changed, the user-set limits.	This indicates that the Monitor Processor, which controls flashing of the LEDs, has been unable to communicate to the Chassis Manager.
Fan LED (green)	Typically indicates that the chassis is turned off. This could also indicate a failed LED or a failure of the LED drive circuitry, or a failure of the interconnect wiring.	Indicates that all three fans are operating above 1200 RPM, the factory default limit.	Indicates that one or more of the three fans are operating below the RPM limit, either the 1200 RPM factory- default limit or, if changed, the user-set limit.	
Temp (Temperature) LED (amber)	This LED is <i>off</i> if the chassis temperatures are OK. To allow you to validate that this LED is working, the LED is turned on for the first three seconds after the chassis is turned on as shown in Figure 6 on page 22.	This LED is never on continuously. It will either be off if the temperatures reported by the eight temperature sensors are all below the temperature limit, or it will be flashing if one or more of the temperature sensors are reporting a temperature above the limit.	Indicates that at least one of the eight temperature sensors is reporting a temperature above the limit, either the 65°C factory default limit or, if changed, the user-set limit. Having this LED flash for a just-powered chassis would be unexpected because the default (power-on) temperature threshold is sufficiently high (65 °C) that it would be unlikely for this threshold to be exceeded at power on.	

Troubleshooting abnormal LED behaviors

The table below provides troubleshooting suggestions for abnormal LED behaviors. This table is applicable to both troubleshooting LED behaviors as well as troubleshooting the corresponding alarm behaviors.

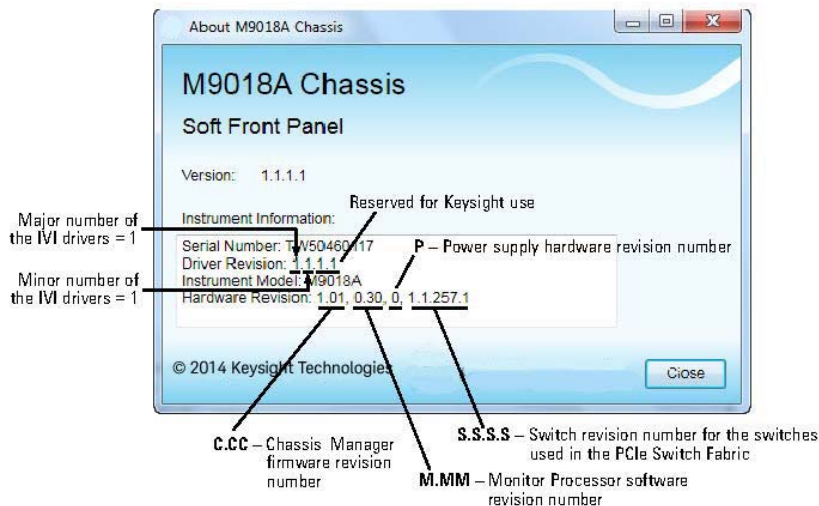
Figure 60 Troubleshooting abnormal LED behavior

Abnormal Front Panel LED Behavior	Troubleshooting suggestion
All three LEDs don't illuminate when the ON/Standby pushbutton is pressed, or when the rear panel Inhibit signal is used to turn on the chassis.	This is Exception #1: Chassis doesn't power up . See Chapter 17 , "Troubleshooting Failure of the Chassis to Power Up".
Power LED flashes	See Chapter 11 , "Monitoring the Power Supply Rails" to determine if this is an issue with one or more voltage rails, or if this is an issue with mis-set voltage thresholds. If the voltage thresholds are mis-set, correct them programmatically or using the SFP. If the voltage rails are outside of their limits, see "Troubleshooting out-of-limits power supplies" on page 125.
Fan LED flashes	See Chapter 8 , "Monitoring Fan Speeds" to determine if this is an issue with the fan speeds, or if this is an issue with a mis-set minimum fan speed threshold. If the minimum fan speed threshold is mis-set, correct it programmatically or using the SFP. If the minimum fan speed threshold is set correctly, see Chapter 18 , "Troubleshooting Fan Issues".
Temperature LED flashes	See Chapter 9 , "Monitoring the Chassis Temperature" to determine if this is an issue with the temperature reported by one or more temperature sensors, or if this is an issue with a mis-set maximum temperature threshold. If the maximum temperature threshold is mis-set, correct it programmatically or using the SFP. If the maximum temperature threshold is set correctly, see "Troubleshooting chassis temperatures that are over the maximum temperature threshold" on page 126.
All three LEDs are on for 10 seconds and then off for 1 second.	This behavior indicates that the Monitor Processor in the power supply is unable to communicate to the Chassis Manager. Based on circuit complexity, the issue is more likely to be in the chassis electronics compared to the power supply. Contact Keysight Technical Support to arrange service of the chassis.
All three LEDs alternately blink for 1/3 Second then chassis shuts down.	Indicates a fan behavior problem. Applies to chassis Monitor Processor software revision number 0.38 and greater. See description below.

All three LEDs alternately blink for 1/3 Second then chassis shuts down

NOTE

Applies to chassis Monitor Processor software revision number and Power Supply Hardware Revision number 0.59, 5 and greater. Previous software versions did not exhibit this behavior. The Monitor Processor software revision number can be seen in the Soft Front Panel **Help > About** screen:



If one or more fans is rotating below 1000 RPM the three chassis front panel LEDs alternately flash on a 1/3 second cycle. If this condition exists for more than one minute the chassis shuts down the Primary Power Module (PPM) and the LEDs indicate the state of the chassis during the last 5 seconds before shutdown. [Table 7](#) describes the LED indicators:

Table 7 Chassis LEDs indicate show shutdown state during the last 5 seconds

LED State			Problem
TEMP	FAN	POWER	
Off	Off	On	Fan control register check failed.
Off	On	Off	At least one fan is not working (<1000 RPM).
On	On	Off	Fan speed is not within +20%/-30% of control range.
On	Off	On	Fan speed does not change when the control changes by ±1.2%
On	Off	Off	MCU Code checksum error.
On	On	On	Static memory for fan speed read/write error.

If this situation occurs

- 1** Unplug the AC power from the chassis (power must be removed for at least one minute). This is necessary because neither the front panel ON/OFF push button nor the Inhibit signal on the rear panel DB-9 connector will function if the Primary Power Module (PPM) is shut down.
- 2** If modules in the chassis are hot, wait several minutes for them to cool.
- 3** Inspect the chassis fans to ensure there is no obstruction.
- 4** Reapply AC power and attempt to power-up the chassis.
- 5** Monitor the fans to ensure they are all rotating normally.
- 6** If the chassis does not power up or the behavior described above repeats, immediately shut down the chassis and troubleshoot the problem.

NOTE

This behavior supersedes the 800 RPM minimum fan speed mentioned in previous versions of the M9018A User and Startup Guides.

CAUTION

If critical systems are being operated by the chassis, you should take precautions in your application software to monitor the M9018A fans for operating below 1000 RPM so that any necessary shutdown operations on your systems will be completed within the one minute period prior to the chassis's power supply shutting down. The default fan alarm threshold (1200 RPM) may be used to alert applications of an approaching system shutdown event. Normal (healthy) fans never operate as low as 1200 RPM.

NOTE

The fans are mounted on the chassis rear panel and exhaust air out the rear of the chassis. The air intakes are in the front, sides and bottom of the chassis. Ensure these are not obstructed.

Additional Troubleshooting Guidelines

- If only one or two fans are running slow or stopped, the problem is most likely the individual fan(s). Replace the entire fan assembly.
- If all three chassis fans stop operating, the problem is most likely the Primary Power Module (PPM) which should be replaced.

Troubleshooting out-of-limits power supplies

The default power supply limits are $\pm 5\%$ except for the 3.3V rail, which has its limits adjusted to $\pm 10\%$ when any application makes contact with the chassis. If any power supply rail is outside of its limits, perform the following steps:

- 1** Remove all modules from the chassis except the system controller module in slot 1. Removing modules is done in case a module has a short on one of its voltage rails, or in case the total power of all of chassis modules is causing a current overload shutdown of the power supply. If the voltage rails return to normal after removal of the modules, continue with the next step. If the voltage rails do not return to normal, the power supply is likely bad – replace the power supply.
- 2** Prior to re-installing the modules, use the Microsoft Excel power calculator spreadsheet described in “[Power calculator spreadsheet](#)” on page 16 to determine if the chassis is operating within its power limits. If not, adjust your chassis configuration accordingly.
- 3** Next, re-install the modules one module at a time and see if the power supply issue is associated with installation of a particular module. If so, that module might have a short on one of its voltage rails. If you have another module of the same type, remove the potentially problematic module, and install the replacement module, and see if the problem recurs. If the problem does not recur, the replaced module was likely bad.
- 4** If the problem does recur with the replacement module, the problem is possibly due to the aggregate load on the power supply. If you concluded based on step 2 that your module configuration is operating within the power budget of the chassis, then it’s possible that the power supply is bad. Therefore, replace the power supply.

Troubleshooting chassis temperatures that are over the maximum temperature threshold

This section applies to the situation where you've concluded that the maximum temperature threshold has been set correctly, but one or more temperature sensors are reporting temperatures in excess of this threshold. It is assumed that the excessive temperatures have plausible values. In other words, the temperature sensors reporting the excessive temperatures are working correctly. If you suspect that one or more temperature sensors have failed, the chassis will need servicing by Keysight to repair them.

Listed below are several steps that can be taken to address excessive chassis temperatures. Additional information can be found on this topic in [Chapter 3](#), "Chassis Cooling and Rack Mounting".

- Ensure that you have adequate space (50 mm minimum) in the front, rear, and sides of the chassis for ventilation. Space below the chassis will help also.
- If you have multiple, high-powered modules clustered in proximity to each other, spread them out in the chassis if possible.
- Consider installing air inlet modules in the chassis to increase the airflow.
- Ensure that all unoccupied slots are covered by filler panels.
- Verify that all three fans are rotating.
- Set the fans to operate at high speed by positioning the rear panel **FAN** switch to the **HIGH** position.
- If you have multiple chassis mounted in a rack, place the highest powered chassis at or near the top of the rack so that, as its heat rises, it doesn't heat up other chassis.

20 Troubleshooting the Chassis Alarms

This chapter describes how to troubleshoot the chassis alarms. For information on the chassis alarm architecture, see [Chapter 7](#), “The Chassis Alarm Architecture”. Alarms can be viewed and responded to programmatically or by using the SFP. In this chapter, the SFP is used.

Troubleshooting chassis alarms means taking steps to prevent their recurrence. If an alarm is just cleared using the SFP **Clear** button for that alarm but no action is taken to correct the underlying condition that originally set the alarm, the alarm will be immediately set again. Keysight recommends that care be taken to understand and address the root cause of any alarm that occurs.

There is overlap between the information conveyed by the chassis front panel LEDs and the information conveyed by the alarms. For example, the front panel Temperature LED and the SFP temperature alarm will both indicate if the hottest of the eight temperature sensors is above the maximum temperature threshold that has been set. However, the SFP temperature alarm will be latched, while the front panel Temperature LED will only flash for the period of time that the temperature actually exceeds the temperature threshold.

For example, if the hottest temperature sensor momentarily exceeds the maximum temperature threshold, that will set (latch) the temperature alarm (presuming it's enabled). The temperature alarm will remain set if the temperature drops below the threshold. However, the Temperature LED will only flash for the momentary period that the temperature exceeds the threshold.

This means that it's possible for the temperature alarm to indicate an excessive temperature while the Temperature LED indicates the temperatures are fine.

[Figure 61](#) on page 128 shows the seven alarms supported by the chassis.

Troubleshooting the chassis alarms

Because the chassis alarms are just latched versions of the real time conditions reported by the front panel LEDs, see [“Troubleshooting abnormal LED behaviors”](#) on page 122 for troubleshooting information.

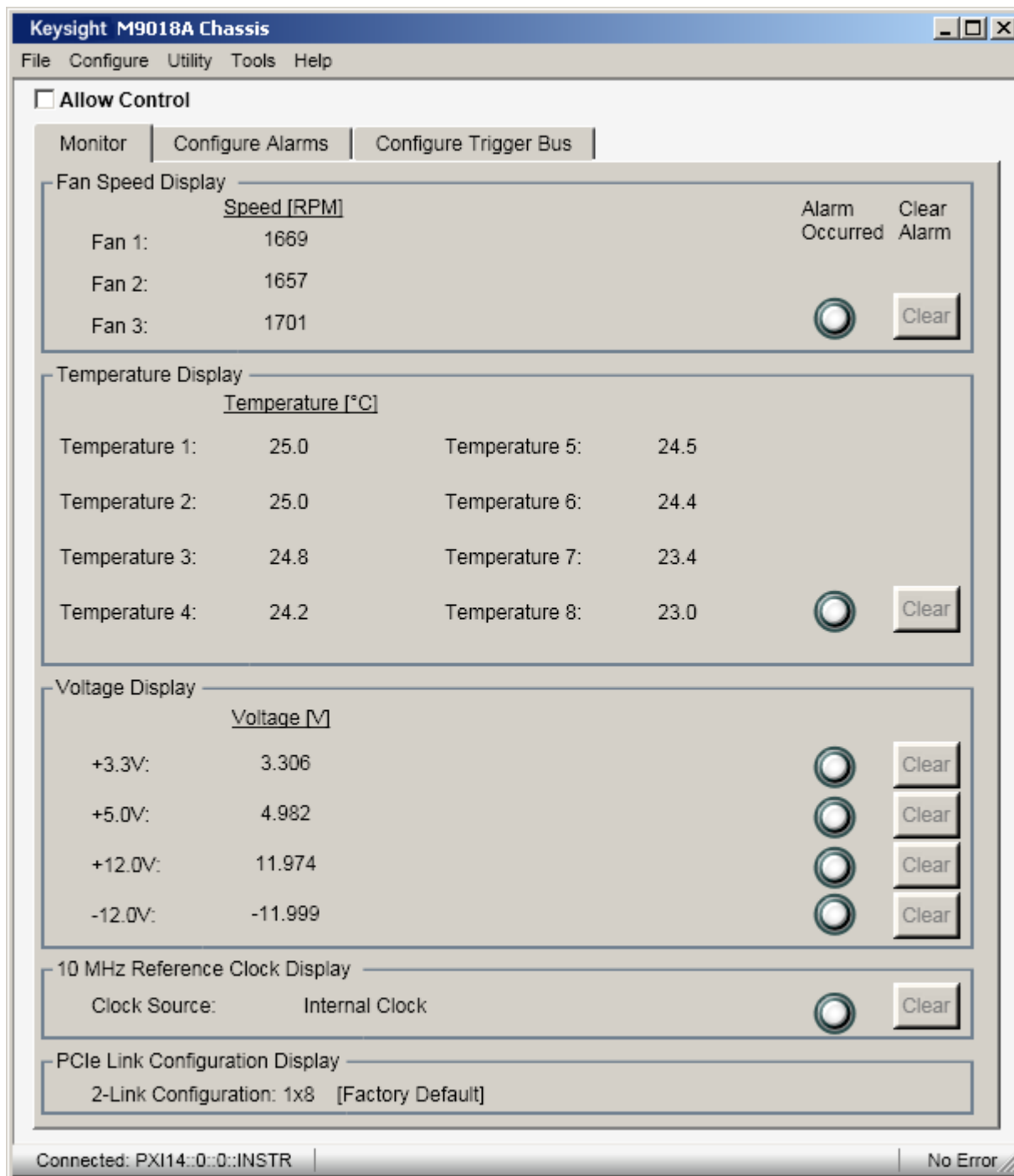


Figure 61 The seven alarms supported by the chassis

21 Troubleshooting Based on the Self Test Results

This section provides details about each self test message and provides suggested user actions for each message. For information on running self test, see [Chapter 15](#), “Performing a Chassis Self Test”. Running self test produces two types of results:

- 1 Informational results** – For example, self test code 506, “New PCIe Switch Fabric has been selected, but not loaded. Reboot the system controller to load the new fabric.”, indicates that a reboot is needed to complete the selection of a new PCIe Switch Fabric. Informational messages typically indicate situations that can be resolved without reconfiguration or repair.
- 2 Fault-related results** – For example, self test code 1 below, “Chassis Monitor Processor is not responsive.”, indicates that the host controller PC was unable to communicate with the Monitor Processor in the chassis. Fault-related messages indicate the presence of a situation that likely requires reconfiguration or repair.

The self test results are grouped into low-numbered codes (starting at 1) and high-numbered codes (starting at 500). Low-numbered codes generally indicate a situation where service is required. High-numbered codes indicate situations that you can often resolve yourself.

In several cases, the suggested user action includes performing a system restart (described in [“Performing a system restart”](#) on page 27). In other cases, the suggested user action includes performing a chassis hard reset (described in [“Performing a chassis hard reset”](#) on page 28).

Low-numbered codes (service is typically required)

Low-numbered codes generally indicate a situation where service is required. However, where possible, suggested user actions are provided that may resolve the situation.

1,"Chassis Monitor Processor is not responsive."

The host controller PC cannot communicate to the Monitor Processor, which provides functionality such as monitoring of fan speeds, temperature sensors, and voltage rails. The Monitor Processor is contained within the power supply case. Perform a chassis hard reset as described in ["Performing a chassis hard reset"](#) on page 28, and rerun self test. If this code repeats, service is required. If you are doing self repair, see [Chapter 17](#), "Troubleshooting Failure of the Chassis to Power Up". If you are not doing self repair, contact Keysight Technical Support.

2, unused

3,"Unable to operate IO channel that allows PCIe Switch Fabric reconfiguration."

The host controller PC is not able to reconfigure the PCIe Switch Fabric. This may indicate that there are other issues with the chassis as well. Service is required, contact Keysight Technical Support. If you continue to use the chassis, you will not be able to change the PCIe Switch Fabric.

4,"Unable to operate IO channel to PXI Trigger routing buffers."

The host controller PC is not able to configure the PXI triggers. This may indicate that there are other issues with the chassis as well. Service is required, contact Keysight Technical Support. If you continue to use the chassis, you will not be able to change the PXI triggers segment configuration.

5,"Unable to operate IO channel to chassis EPROM."

The host controller PC is not able to read the chassis EPROM, which contains information such as the PCI Express topology and the chassis serial number. Service of the chassis is recommended, contact Keysight Technical Support. If you continue to use the chassis, it will not be PXIe compliant, which may affect some applications.

6,"Error writing to the chassis EPROM. Reinstall chassis PCIe Switch Fabric."

An error was detected while attempting to write to the chassis EPROM, which is done during use of the PCIe Switch Fabric Configurator program to set the PCIe Switch fabric. Please try use of the Configurator program again, and then rerun self test. If this code repeats, service of the chassis is required, contact Keysight Technical Support.

7,"One or more chassis fans operating outside valid RPM range."

8,"Chassis fan 1 operating outside valid RPM range."

9,"Chassis fan 2 operating outside valid RPM range."**10,"Chassis fan 3 operating outside valid RPM range."**

This comment applies to the four self test messages above. The valid RPM range of the fans is from 1200 to 7000 RPM. Bring up the SFP to determine if a fan is running too slow (below 1200 RPM)—if so, check if the fan is obstructed. If you are unable to identify a resolvable issue such as an obstructed fan, service is required. If you are doing self repair, see [Chapter 18](#), "Troubleshooting Fan Issues" and [Chapter 17](#), "Troubleshooting Failure of the Chassis to Power Up" for guidance on possibly isolating the issue to either the power supply or fan assembly. If you are not doing self repair, contact Keysight Technical Support.

11,"Chassis fan speed selector switch is in HIGH position, but one or more fans not operating at maximum speed."**12,"Chassis fans are operating at dissimilar speeds."****13,"Chassis fan AUTO speed control is not functioning properly."**

This comment applies to the three self test messages above. Bring up the SFP to determine if these errors are related to a fan that is running too slow—if so, check if the fan is obstructed. If you are unable to identify a resolvable issue such as an obstructed fan, service is required. If you are doing self repair, see [Chapter 18](#), "Troubleshooting Fan Issues" and [Chapter 17](#), "Troubleshooting Failure of the Chassis to Power Up" for guidance on possibly isolating the issue to either the power supply or fan assembly. If you are not doing self repair, contact Keysight Technical Support.

14,"IO failure during self test. If problem persists, contact Keysight Technical Support."

A chassis internal I/O bus error prevented the completion of self test. Perform a system restart as described in ["Performing a system restart"](#) on page 27, and rerun self test. If this code repeats, contact Keysight Technical Support.

15, unused**16, unused****17,"Reading from non-volatile chassis memory failed."**

This message indicates that the host controller PC could not read chassis non-volatile memory. Perform a system restart as described in ["Performing a system restart"](#) on page 27, and rerun self test. If this code repeats, contact Keysight Technical Support.

18,"Corrupt serial number in non-volatile memory."

The chassis serial number is stored in non-volatile memory, but could not be read. The serial number is used when performing PCIe Switch Fabric reconfiguration operations. Install the latest chassis drivers on the host controller PC and rerun self test. If this code repeats, contact Keysight Technical Support.

19,"Chassis self-test cache memory inaccessible."

This message indicates that the host controller PC could not read chassis non-volatile memory that stores self test codes. Perform a system restart as described in ["Performing a system restart"](#) on page 27, and rerun self test. If the problem persists, contact Keysight Technical Support.

20,"Failed to recover to the Base (factory default) PCIe Switch Fabric during initialization."

This error is generated when an attempt to restore the 1x8 Base (factory default) Configuration has failed—for example, after using the Load Base Configuration Pushbutton to try to re-establish the 1x8 Base Configuration as described in ["Preemptively restoring the factory default 1x8 Base Configuration"](#) on page 87. The chassis software on the host controller PC will detect the failure and generate this error if self test is run. Perform a chassis hard reset as described in ["Performing a chassis hard reset"](#) on page 28, and rerun self test. If the problem persists, contact Keysight Technical Support.

High numbered self test codes (situation may be customer resolvable)

High-numbered codes indicate situations that you can often resolve yourself. Accordingly, suggested user actions are provided that may resolve the situation.

500,"Chassis Manager operating on backup (read-only) firmware image. See Keysight Technical Support."

A checksum failure was detected on the Chassis Manager firmware, and the Chassis Manager is now operating on a backup firmware image. See [Chapter 6](#), "Viewing the Chassis Revision and Updating Firmware". This chapter describes how to check if there is a chassis firmware update available on the Keysight website. If so, follow the instructions in chapter 6 to download and install the latest chassis firmware, even if the latest version is the same as the version you currently have installed. If no firmware updates are available, service is required, contact Keysight Technical Support.

501,"Chassis Manager firmware was updated since power-up. Power cycle the chassis and reboot system controller."

This message should only occur if you've updated the Chassis Manager firmware. Perform a system restart as described in ["Performing a system restart"](#) on page 27. Then rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

502,"Chassis memory structure corrupted. Run IVI driver (or SFP utility) Reset command, and then rerun self test to validate."

Running the Reset command should resolve this problem. If, after the Reset command has been run, self test reports this code again, perform a system restart as described in ["Performing a system restart"](#) on page 27. Then rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

503, "Previous reset operation found chassis memory structure corrupted, chassis memory was re-initialized."

The chassis driver has attempted to correct this problem. Therefore, no further action should be necessary. If the problem persists, download and install the latest chassis drivers, then rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

504, "PCI Configuration Space Header corrupted. Power cycle the chassis and reboot the system controller."

This self test code is unlikely to occur. Rebooting the system controller PC will cause the BIOS to reconfigure the PCI Configuration Space Header. Rerun self test after booting. If this code repeats, contact Keysight Technical Support.

505, "Unable to operate IO channel to Chassis Manager. Check PCIe connection."

This message indicates that the PC initially was connected to the chassis (sufficiently connected that self test could be initiated), and then connection to the chassis was lost. In addition to being a chassis issue, this could also be a PC issue or a PCIe cable issue. Check the PCIe cable connections and perform a system restart as described in ["Performing a system restart"](#) on page 27. Then rerun self test. If this code repeats, contact Keysight Technical Support.

506, "New PCIe Switch Fabric has been selected, but not loaded. Reboot the system controller to load the new fabric."

After a new PCIe Switch Fabric is selected, rebooting of the host controller PC is required in order to generate the PCIe Reset signal that loads the new PCIe Switch Fabric. After the reboot, rerun self test. If this code repeats, service is required, contact Keysight Technical Support

507, "Previous PCIe Switch Fabric update failed. Restoring Base (factory default) PCIe Switch Fabric."

The chassis driver has detected that the previous update of the PCIe Switch Fabric failed – for example, due to the chassis being powered down during the fabric update process. After the computer was rebooted following the failed attempt, and after contact was made with the chassis (for example, by running the SFP), the driver has taken steps to restore the 1x8 Base (factory default) PCIe Switch Fabric.

A system restart as described in ["Performing a system restart"](#) on page 27 is required to complete the restoration. Rerun self test after performing the system restart. If this code repeats, service is required, contact Keysight Technical Support.

508, "PCIe Switch Fabric currently in use is of a type that is not recognized by this version of chassis driver software. Consider updating your chassis driver software to a newer version."

The chassis driver does not recognize the current PCIe Switch Fabric. This may be due to the PCIe Switch Fabric being updated while the chassis was connected to another computer that had a later chassis driver installed. Download and install the latest chassis drivers from Keysight's website, and then rerun self test. If this code repeats, service is required, contact Keysight Technical Support. If you continue to use the chassis system as-is (without updating your chassis drivers), you'll receive this code again when self test is run.

509,"Chassis EPROM checksum failure. Reinstall PCIe Switch Fabric."

The chassis EPROM is updated whenever the PCIe Switch Fabric Configurator program is run. Therefore, rerun the Configurator program. In doing this, you can select the same PCIe Switch Fabric that you already have. Then reboot your PC and rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

510,"Chassis EPROM does not match currently installed PCIe Switch Fabric. Reinstall PCIe Switch Fabric."

This self test code is unlikely to occur. Use the Configurator program to reinstall your switch fabric. Then reboot your PC and rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

511, unused

512,"Non-volatile memory failure during PCIe Switch Fabric install/repair operations. Reinstall PCIe Switch Fabric."

The above message is incorrectly assigned to this code. The message for code 512 should state: "Non-volatile memory containing the Serial Number could not be read. You will not be able to update the fabric. Service Required". If you receive this code, service is required, contact Keysight Technical Support.

513,"Chassis driver's built-in PCIe Switch Fabric cache has an older fabric revision than the PCIe Switch Fabric currently in use. Consider updating your chassis driver software to a newer version."

The chassis driver maintains copies of all PCIe Switch Fabrics. This test indicates that the driver's copy is an older revision than the PCIe Switch Fabric that is currently installed in the chassis. Updating to the latest chassis drivers should resolve this, which will update the driver's copies of the PCIe Switch Fabric. If you continue to use the chassis system as-is (without updating your chassis drivers), you'll receive this code again when self test is run.

Notes:

- 1 The driver found that your M9018 is configured with a PCIe fabric that is newer than the version of fabric found in the M9018 software installed on your host controller. You can make this Self Test warning go away doing either of the following:
 - a. Download and install the latest M9018 driver SW from the Keysight M9018 product web page (www.keysight.com/find/M9018A).
 - b. Re-configure your M9018 PCIe fabric to use the older fabric your host controller's version of M9018 software has.
- 2 Changing to a newer/older version PCIe fabric can result in a change in the PCIe Bus/Device/Function numbers for your PXI devices, which can break existing applications that hard-code the Bus/Device/Function numbers into the ResourceName parameter when Initializing. See VISA documentation for resource string options that do not involve direct use of Bus/Device/Function numbers.
- 3 Code 513 is a warning to the user that there is a newer driver with repairs and/or new features they could be using.

Users may choose to ignore code 513 and continue using their existing driver if they have no reason to change.

514,"Chassis driver's built-in PCIe Switch Fabric cache has newer fabric than the PCIe Switch Fabric currently in use. Consider updating your chassis to your driver's newer fabric."

This is the opposite of self test code 513. In this case, the driver has a more recent copy of the PCIe Switch Fabric than is installed in the chassis. Run the Configurator program and specify the same PCIe configuration you already have – this will update the PCIe Switch Fabric to the driver's version of the fabric. If you continue to use the chassis system as-is (without updating the chassis PCIe Switch Fabric), you'll receive this code again when self test is run.

Notes:

- 1 The driver found that your M9018 is configured with a PCIe fabric that is older than the version of fabric found in the M9018 software installed on your host controller. You can make this Self Test warning go away by doing either of the following:
 - a. Re-configure the PCIe fabric on your M9018 using your newer host driver, which will allow you access to repairs and/or new features of the newer fabric.
 - b. Re-install the older version of the M9018 driver SW that is coherent with the M9018 fabric in use.
- 2 Changing to a newer/older version PCIe fabric can result in a change in the PCIe Bus/Device/Function numbers for your PXI devices, which can break

existing applications that hard-code the Bus/Device/Function numbers into the ResourceName parameter when Initializing. See VISA documentation for resource string options that do not involve direct use of Bus/Device/Function numbers.

- 3 Code 514 is a warning to the user that there is a newer PCIe fabric with repairs and/or new features they could be using.

Users may choose to ignore code 514 and continue using their existing PCIe fabric.

515,"PCIe Switch Fabric chip loaded with wrong image for that chip. Reinstall PCIe Switch Fabric."

516,"PCIe switch fabric chips loaded with mismatching Type code. Reinstall PCIe switch Fabric."

517,"PCIe switch fabric chips loaded with mismatching Revision code. Reinstall PCIe Switch Fabric."

518,"PCIe switch fabric chips loaded with unexpected Revision. Reinstall PCIe Switch Fabric."

This comment applies to the four self test codes/messages above. These self test codes are unlikely to occur. Run the Configurator program and re-specify your current configuration. Reboot your host controller PC and rerun self test. If this code repeats, service is required, contact Keysight Technical Support. If you continue to use the chassis system as-is (without running the Configurator program), you'll receive this code again when self test is run.

519,"One or more chassis temperatures operating outside valid range."

520,"Chassis temperature sensor 1 operating outside valid range."

521,"Chassis temperature sensor 2 operating outside valid range."

522,"Chassis temperature sensor 3 operating outside valid range."

523,"Chassis temperature sensor 4 operating outside valid range."

524,"Chassis temperature sensor 5 operating outside valid range."

525,"Chassis temperature sensor 6 operating outside valid range."

526,"Chassis temperature sensor 7 operating outside valid range."

527,"Chassis temperature sensor 8 operating outside valid range."

This comment applies to the nine self test messages above. The valid temperature range is from 0 °C to 65 °C. Temperatures outside of this range either indicate a failed component, such as a temperature sensor, that actual temperature conditions are outside the specified operating range of the M9018A (0 °C to 65 °C), or the that one or more modules are running very hot. Bring up the M9018A soft front panel to assess the situation. If, for example, one of the temperature sensors is reporting a temperature

significantly different than adjacent temperature sensors, that temperature sensor is likely bad. Therefore, service is required, contact Keysight Technical Support.

If multiple (usually contiguous) temperature sensors are reporting temperatures above 65 °C, this is likely related to one or more modules that are dissipating excessive heat. Check the power consumption of your modules as described in “[Power calculator spreadsheet](#)” on page 16.

528,”One or more voltage rails operating outside valid range.”

529,”3.3V voltage rail operating outside valid range.”

530,”5V voltage rail operating outside valid range.”

531,”-12V voltage rail operating outside valid range.”

532,”+12V voltage rail operating outside valid range.”

533,”5V auxiliary voltage supply operating outside valid range.”

This comment applies to the six self test messages above. The valid range of the 3.3V rail is $\pm 10\%$ while the valid range of all other rails is $\pm 5\%$. Bring up the M9018A soft front panel (SFP) to view the actual voltages. Note that 5Vaux is not displayed by the SFP. For additional troubleshooting information regarding these voltage rails, see [Chapter 17](#), “Troubleshooting Failure of the Chassis to Power Up”.

534,”Non-volatile self test memory cache size is invalid. Cache repaired, please rerun self test to validate repair.”

535,”Non-volatile self test memory cache checksum failure. Cache repaired, please rerun self test to validate repair.”

536,”Non-volatile self test memory problem required re-initializing the memory.”

This comment applies to the three self test messages above. These self test codes are unlikely to occur. Reboot your PC and then rerun self test. If these codes repeat, service is required, contact Keysight Technical Support.

537,”Error detected during PCIe Switch Fabric configuration. Base (factory default) PCIe Switch Fabric was re-selected.”

This self test code is reported if the 1x8 (factory default) configuration has been successfully restored after a previous failure of a configuration attempt. Reboot your PC and use the soft front panel to verify that the 1x8 PCIe link configuration is active. Then rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

538,”Load Base Configuration Pushbutton press was latched. Power cycle chassis to clear latch, and then reboot the system controller.”

See “[Preemptively restoring the factory default 1x8 Base Configuration](#)” on page 87 for a description of this pushbutton and the associated latch. Perform a hard reset as described in “[Performing a chassis hard reset](#)” on page 28 and then rerun self test. If this code repeats, service is required, contact Keysight Technical Support.

539, “Currently loaded PCIe Switch Fabric has no revision information”

This message indicates that the chassis driver does not recognize the current PCIe Switch Fabric. For example, the chassis may contain a custom fabric that has been installed with the assistance of Keysight. This self test code will continue to be reported until a PCIe Switch Fabric is installed that is recognized by the chassis driver.

22 Troubleshooting M9018A System Turn On Issues

This chapter describes the major hardware components, software components, and configuration settings of a M9018 system, and describes their expected or recommended states. This information is provided for two purposes:

- To supplement the turn on instructions provided in the M9018A Startup Guide in case you haven't been able to turn on your system using that information.
- This information can also be used to troubleshoot system issues—for example, a situation where the host controller PC was previously able to communicate to the chassis but no longer can. By comparing the current state of the system to the expected or recommended state, you should be able to identify the problematic area and determine the action required to restore operation.

NOTE

If your chassis appears to be inoperative—for example, the front panel LEDs don't illuminate when you attempt to turn on the chassis—please begin with [Chapter 16](#), “Troubleshooting the M9018A System”. That chapter provides an overview of the troubleshooting process, and references information such as how to troubleshoot a chassis that won't turn on and how to troubleshoot a chassis where the fans aren't rotating. These issues, if present, need to be resolved before using this chapter to turn on the host PC/chassis system.

Even if the M9018A system can't be immediately turned on (or restored) based on the information in this chapter, methodically looking at each system component will usually identify an area for further investigation. For example, looking at the Windows Device Manager view of the chassis will allow you to determine if the chassis was properly enumerated by the BIOS during booting of the PC. Troubleshooting suggestions are provided in case this doesn't occur.

This chapter focuses on Keysight components, such as the M9048A Desktop Adapter card and the M9021A Cable Interface module. However, the information should be generally applicable to other interface components.

NOTE

When you press the chassis power-on button, if the chassis does not power up and the front panel LEDs do not light, it is possible for the chassis to be in a safety shutdown state. Remove the chassis AC power cord from the chassis for one minute. Reconnect the power cord and turn on the chassis again. If it still does not power on, refer to the troubleshooting information elsewhere in this manual.

M9018A system components and settings

This section summarizes the key hardware components, software components, and configuration settings of a M9018A system. These are shown in Figure 62.

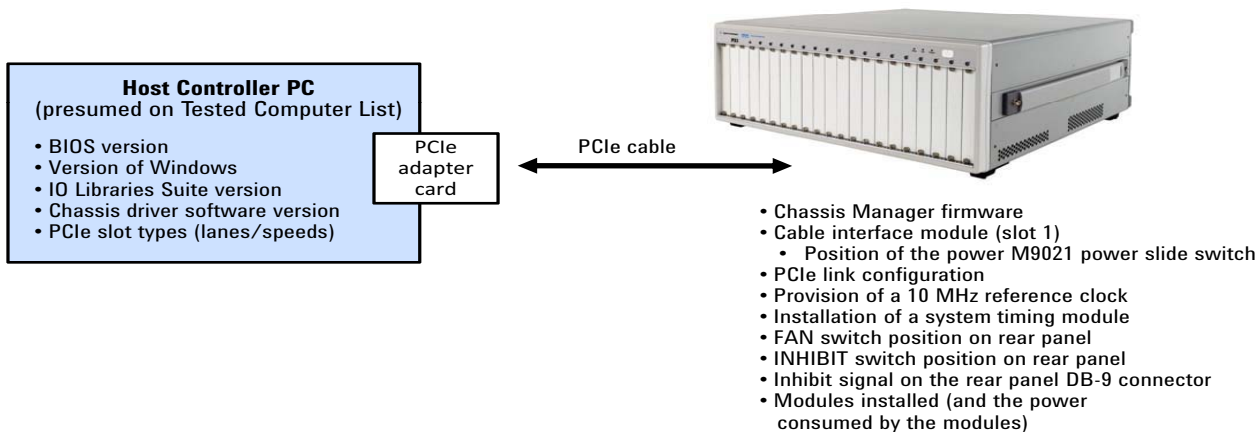


Figure 62 Key software components, hardware components, and configuration settings of a M9018A system

Successfully turning on a system involves dealing with many hardware and software components, such as installing Keysight IO Libraries Suite and the chassis driver software. In some situations, your BIOS will be fine as-is while, in other situations, you'll need to update your BIOS.

You may find that your PC contains multiple PCIe slots with a mix of different speeds and different numbers of lanes. It is important to understand how to select a particular PCIe slot for your PCIe adapter card.

This chapter discusses each of the primary system hardware and software components. For each component, the actions that are required to configure and/or validate the component are described. Issues that might arise with each component are also described. This detailed information should allow you to find and resolve issues preventing you from turning on your M9018A system.

The turn on procedures in this chapter do not include setting the chassis alarms for the simple reason that, if you're able to set the alarms (which is done from the host controller PC), then the chassis system is turned on and working. However, Keysight recommends, when the system is operational, that you regularly check the chassis parameters monitored by the alarms (whether or not you actually use the alarms themselves). This is to detect any parameters that are deviating from their nominal values, which may provide an early indication of a issue that will impact system operation in the future.

The primary hardware components, software components, and configuration settings of the M9018A system are listed below, and follow the organization of [Figure 62](#) on page 140. Each item listed below affects operation of the system. For certain items in your M9018A system, the current situation may be fine as-is while, for other items, action may be required in order to turn on or restore operation of the system.

The list below provides recommendations for each item. Subsequent sections provide additional details on selected items.

1 Host controller PC—The host controller PC hardware and software that are pertinent to functioning of the M9018A system are listed below. It is assumed that you are using a computer on the Tested Computer List as described in [Chapter 1](#), “Introduction”.

- **Version of the BIOS**—The BIOS performs enumeration of the chassis slots during booting. It is required to have a version of the BIOS that has been verified to work. Even if your computer is on the Tested Computer List, it may not have the required BIOS version. See the Tested Computer List for details on the required BIOS version.
- **Version of Windows**—In general, Windows 7 is better than Windows XP at identifying PCIe devices and associating Windows drivers with the identified devices. Using Windows 7 is recommended.
- **Version of Keysight IO Libraries Suite on the host controller PC**—Keysight recommends installing the latest version of IO Libraries Suite that is available.
- **Version of the chassis drivers**—Keysight also recommends installing the latest version of the chassis drivers that are available.
- **PCIe slots and speeds**—It is important to be aware of how the PCIe slots are implemented in your PC. It is not unusual to have a PCIe slot that is x4 electrically but is x8 mechanically. It is likewise not unusual to have such slots run at Gen 1 speeds, not Gen 2 speeds. If you install a M9048A Desktop Adapter card in such a slot (x4 electrically and Gen 1), it will run at 1/4 the speed of the same adapter card installed in an x8 (electrically) Gen 2 slot.
- **Adapter card installed in the host controller PC**
 - **M9048A PCIe Desktop Adapter**—In order to achieve full performance, this x8 card needs to be installed in a PCIe slot that is x8 (or greater, electrically) and has Gen 2 performance.
 - **M9045 PCIe ExpressCard Adapter**—This x1 card provides Gen 1 performance

NOTE

Ensure that the M9045 PCIe ExpressCard Adapter is fully seated in the laptop computer. Also ensure that the PCIe cable connectors, discussed next, are also fully seated on both the PC and the chassis. You should hear an audible click when the connector is fully seated.

- 2 **PCIe cable**—As described in the M9018A Startup Guide (specifically, the appendix providing chassis specifications), the PCIe cable connector and receptacle mating cycles are limited to 250 cycles. Mating cycles beyond this can impact system reliability.
- 3 **M9018A chassis**—The chassis hardware, software, and configuration settings that affect operation of the M9018A system are listed below.
 - **Chassis Manager firmware**—The Chassis Manager firmware controls operation of the chassis. To determine if there is an update to the firmware, see “[Chassis firmware revision checking and installation](#)” on page 34.
 - **M9021 Cable Interface module**—This module is installed in slot 1 and provides a 1x8 PCIe interface to the chassis. The M9021A power slide switch on the chassis backplane must be set to the correct position as described in section Setting the M9021A power slide switch in the M9018A Startup Guide.

The M9021A is only compatible with the M9018A’s 1x8 PCIe fabric. The M9021A interface has a single 1x8 link. If the M9021A is used with the M9018A’s 2x8 or 4x4 fabrics, then only the 1st PCIe link of that fabric will be connected. The following table shows what is typically seen on the host controller when the M9021S is used with the M9018A’s PCIe fabrics:

Table 8 How the M9018A appears on host controller when using an M9021A Cable Interface module

M9018A PCIe Fabric	M9021A Link 1 connected to M9018A slots	M9018A chassis device connected and visible in Windows Device Manager	In Connection Expert	
			M9018A only shows under “Other Devices”	M9018A shows properly as “Chassis <n>”
1x8	2 - 18 (all slots)	✓		✓
2x8	Original Fabric	M9018A device not on link 1 so Windows does not find	M9018A device not on link 1 so Windows does not find	M9018A device not on link 1 so Windows does not find
	Rev. 2 ¹	✓	✓	
4x4	Original Fabric	M9018A device not on link 1 so Windows does not find	M9018A device not on link 1 so Windows does not find	M9018A device not on link 1 so Windows does not find
	Rev. 2 ¹	✓	✓	

¹ The Rev.2 fabrics are available when the PCIe Switch Fabric Configurator is used on M9018A chassis host controllers driver version 1.4.xxx.xxx and later.

- **PCIe link configuration**—The default PCIe link configuration is 1x8. Using the Configurator program, the chassis can be configured with 2x8 and 4x4 PCIe link configurations.

- **10 MHz reference clock**—Instead of using the internal 10 MHz reference clock, an external 10 MHz reference clock can be provided through the rear panel BNC connector.
- **System timing module**—A 3rd party system timing module can be installed in slot 10, the system timing slot. If this module is present, the chassis uses its 10 MHz reference clock.
- **FAN switch position on the rear panel**—This switch controls whether the fans are operating at maximum speed (HIGH switch position), or whether the fan speeds are a function of the chassis temperature (AUTO switch position).
- **MAN/DEF switch position on the rear panel**—This switch controls whether the chassis is powered up by the front panel ON/Standby pushbutton or the Inhibit signal on the rear panel DB-9 connector. This switch and its affect on powering up the chassis are described at length in [“Troubleshoot the power up hardware”](#) on page 111.
- **Inhibit signal on the rear panel DB-9 connector**—Likewise, see [“Troubleshoot the power up hardware”](#) on page 111 for details.
- **Chassis power supply**—The chassis power supply is customer-replaceable. Troubleshooting of the power supply is described in [Chapter 17](#), “Troubleshooting Failure of the Chassis to Power Up”.
- **Chassis fan assembly**—The chassis fan assembly is customer-replaceable. Troubleshooting of the fans is described in [Chapter 18](#), “Troubleshooting Fan Issues”.

Host controller PC

This section provides additional details on the host controller PC hardware and software.

Tested computer list

In order for a PC to serve as a host controller, its BIOS must support enumeration of the PCIe slots in the chassis; many computers are not capable of enumerating a sufficient number of PCIe slots to ensure that slots in an external chassis are enumerated.

Keysight provides the document “PCI and AXIe Modular Instrumentation Tested Computer List Technical Note” which lists the embedded, desktop, laptop, and rack-mounted PCs that have been verified to enumerate the PCIe slots in the M9018A chassis. Please use this document, available under the **Document Library** tab at www.keysight.com/find/M9018A, to guide your selection of remote controller PCs. Also use this document to ensure that you have the latest BIOS installed.

Keysight IO Libraries Suite and the chassis drivers

The table below shows the chassis driver releases and their compatibility with the releases of Keysight IO Libraries Suite. The table is ordered by M9018A chassis driver releases, with the most recent release lowest in the table.

Table 9 Chassis Drivers and IO Libraries Suite compatibility

M9018A Chassis Drivers Compatibility with Keysight IO Libraries Suite		
M9018A Chassis Drivers Version	IO Libraries Suite Minimum Version	IO Libraries Suite Version the Chassis Drivers were Released With
1.0.1.3	16.0	16.0
1.2.1.x	16.2	16.2
1.3.x.1	16.2	16.3 update 1
1.4.3xx.xxx	16.3 update 1	16.3 update 2

Keysight recommends using the latest version of IO Libraries Suite available. However, for those customers interested in using the version of IO Libraries Suite that the M9018A chassis drivers were released with, that information is provided in the above table.

PCIe slots and speeds

Host controller PC PCIe sockets are characterized by two attributes:

- 1 The physical size of the socket as indicated by the maximum number of PCIe lanes that the socket is sized for, independent of how many lanes are actually wired to the socket. For example, a socket physically sized for eight lanes is referred to as an *x8 socket*.
- 2 The number of PCIe lanes electrically wired to the socket. For example, a socket wired to four PCIe lanes is known as *x4*.

Although the nomenclature varies, a common nomenclature is to refer to the socket size first followed by the number of lanes in parenthesis, often with “mode” following the number of lanes. These parameters are then ascribed to each PCIe slot in a computer. For example, an *x8 socket* that contains four electrical lanes would be referred to as an “*x8 (x4 mode) slot*”.

x8 (x4 mode) slots are quite common in PCs. Such a slot will accommodate the M9048A PCIe Desktop Adapter, which has eight lanes and is therefore designed to mate with an *x8 socket*. However, because an *x8 (x4 mode)* slot only has four active lanes, only four lanes (of the M9048A’s eight lanes) will actually be used. This will provide half the PCIe bandwidth compared to operating the M9048A in an *x8 (x8 mode)* slot.

Figure 63 (which is rotated 180 degrees so that the printed circuit board labels can be read) shows a M9048A card installed in slot 3, an *x8 (x4 mode)* slot. This particular PC only labels the number of active lanes (*x4*), not the mechanical width of the slot (*x8*). Note the adjacent *x16 (x16 mode)* slot 4. Note also that slot 4 is labeled “PCIe2”, indicating that it is Gen 2. Because slot 3 is labeled “PCIe”, one can infer that it is Gen 1.



Figure 63 An example PC’s *x8 (x4 mode)* and *x16 (x16 mode)* PCIe slots

By moving the M9048A card to the *x16 (x16 mode)* slot, the performance will be four times as great. The performance will double because all eight lanes of the M9048A card will be used, and the performance will double again because the card will be in a Gen 2 slot, not a Gen 1 slot.

M9018A chassis

This section provides additional details on the chassis hardware, software, and configuration settings. Several Windows Device Manager views and Connection Expert views of the chassis are also included in this section.

M9021A Cable Interface module

The M9021A Cable Interface module contains LEDs (both front panel and side or PC board LEDs) that indicate how many PCIe lanes are actually being used to communicate between the PC and the chassis. If your chassis application is running slower than you expect, check the M9021A LEDs to see how wide your data path is to the chassis. Each lane is denoted by one yellow LED.

NOTE

If you remove a slot 2 module or filler panel to view the M9021A LEDs, ensure that the module or filler panel is reinstalled. This is required to maintain chassis cooling as well as minimize radio frequency interference.

The M9021A front panel has four LEDs to indicate the communication speed to the host controller. The following table describes the LED indications:

Configuration to Host PC	M9021A Front Panel LEDs (see Figure 64)	PC Board (or side) LEDs
x1 PCIe Link	x4 Cable & x4 Chassis	Single pair yellow LEDs (see Figure 65)
x4 PCIe Link	x4 Cable & x4 Chassis	4 pairs yellow LEDs (see Figure 66)
x8 PCIe Link	x4 Cable & x4 Chassis & x8 Cable & x8 Chassis	All 8 pairs yellow LEDs (see Figure 67)



Figure 64 M9021A Front Panel LEDs

Figure 65 shows the LEDs that are illuminated for single lane (x1) communications to the chassis, which is provided by the M9045 PCIe Express Card Adapter. The left-most set of LEDs indicates the number of lanes communicating to the chassis backplane, while the right-most set of LEDs indicates the number of lanes communicating to the host PC.

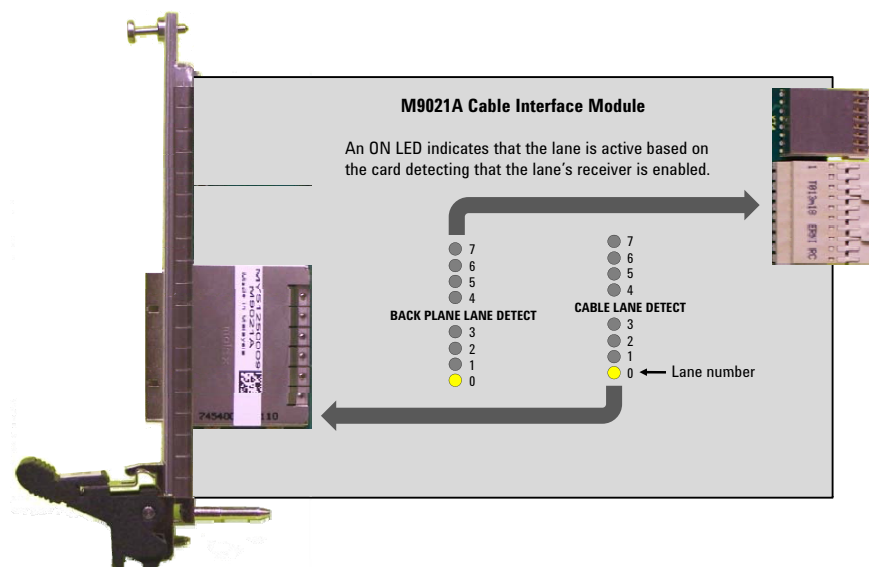


Figure 65 Single lane communications between the host controller PC and the chassis

Figure 66 shows the LEDs that are illuminated for x4 communications. An example of four lane communications would be an eight lane M9048A PCIe Desktop Adapter installed in an x8 (mode x4) slot.

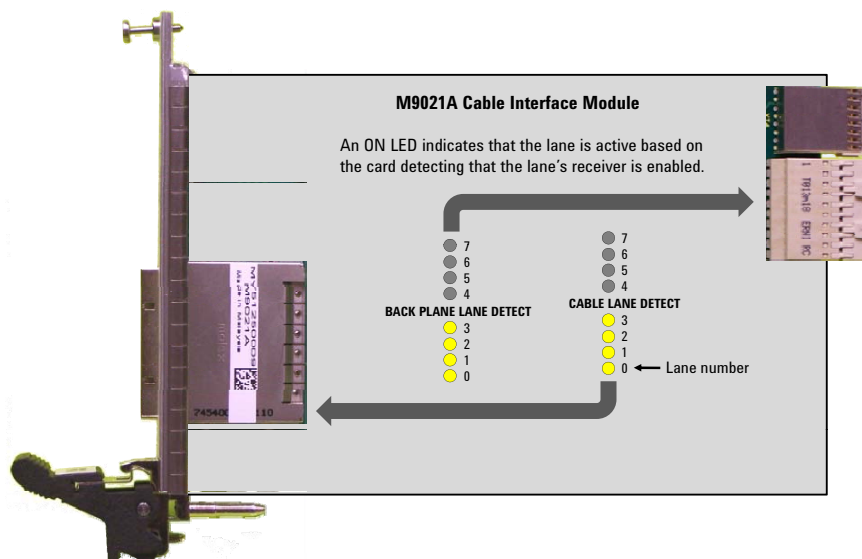


Figure 66 x4 communications between the host controller and the chassis

Figure 67 shows the LEDs that are illuminated for x8 communications. An example of eight lane communications would be an eight lane M9048A PCIe Desktop Adapter installed in an x8 (mode x8) slot or in an x16 (mode x16) slot.

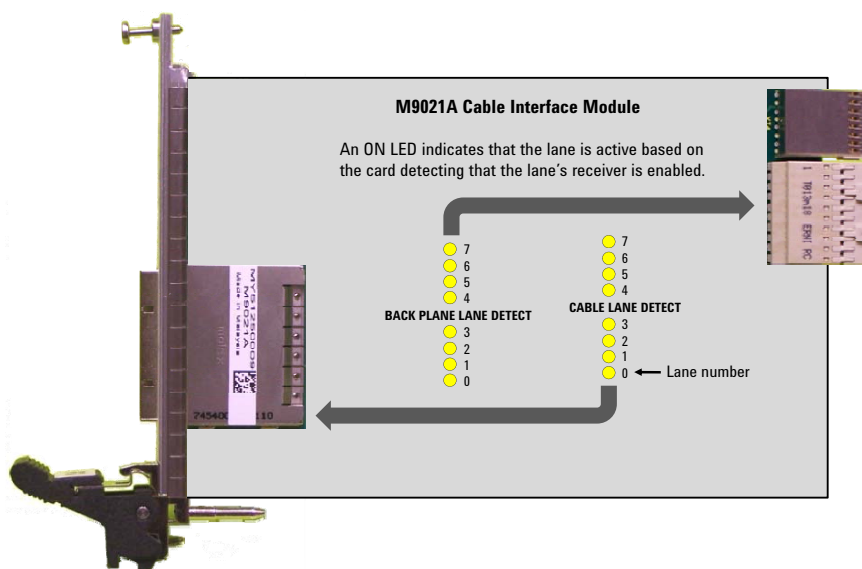


Figure 67 x8 communications between the host controller and the chassis

Troubleshooting issues indicated by the M9021A LEDs

Listed below are issues that might be indicated by the M9021A LEDs along with recommendations for resolving the issues.

- 1 If you are using the M9048A PCIe Desktop Adapter but only four LEDs are illuminated, see if the card is installed in a x8 (mode x4) slot in the host controller PC. Such a slot will only provide four electrical lanes. Install the card in a slot that supports at least eight lanes, such as an x8 (mode x8) slot or an x16 (mode x16) slot.
- 2 The M9021A LEDs should always be symmetrical. For example, if four lanes are active to the host PC, four lanes should also be active to the chassis. If the LEDs are asymmetric, try replacing the PCIe adapter card in the host controller PC. If the LEDs are still asymmetric, next try replacing the M9021A module. If the LEDs are still asymmetric, the problem may lie with the chassis itself, contact Keysight Technical Support.

Windows Device Manager and Connection Expert views of the PCIe devices

This section presents the Windows Device Manager and Connection Expert views of the configurations listed below. These views are provided to assist you in sequentially bringing up the chassis and its modules by showing what to expect at each of these steps:

- 1 The host controller PC without a PCIe adapter card installed
- 2 The host controller PC with a PCIe adapter card installed
- 3 The host controller PC with a PCIe adapter card installed which is connected over a PCIe cable to an M9018A chassis

All Device Manager views were generated by selecting **View > Devices by connection** within Device Manager.

NOTE

Windows Device Manager contains the menu selection **Actions > Scan for hardware changes**. Using this selection does not generate the same results as the BIOS-performed enumeration that occurs during booting of the PC. The enumeration process will ensure that all PCIe devices are found, whereas scanning for hardware changes may not detect all PCIe configuration changes that have been made. Therefore, the PC should always be rebooted whenever the PCIe configuration is changed.

Device Manager view without a PCIe adapter card installed in the PC

Figure 68 shows the devices displayed when no PCIe adapter card is installed in the host PC. This particular host PC has two PCI Express Root Ports. The PCIe adapter card, when installed, will be attached to PCI Express Root Port 1. Root Port 2 is dedicated to a Broadcom Ethernet controller, and is not used for interfacing to the chassis.

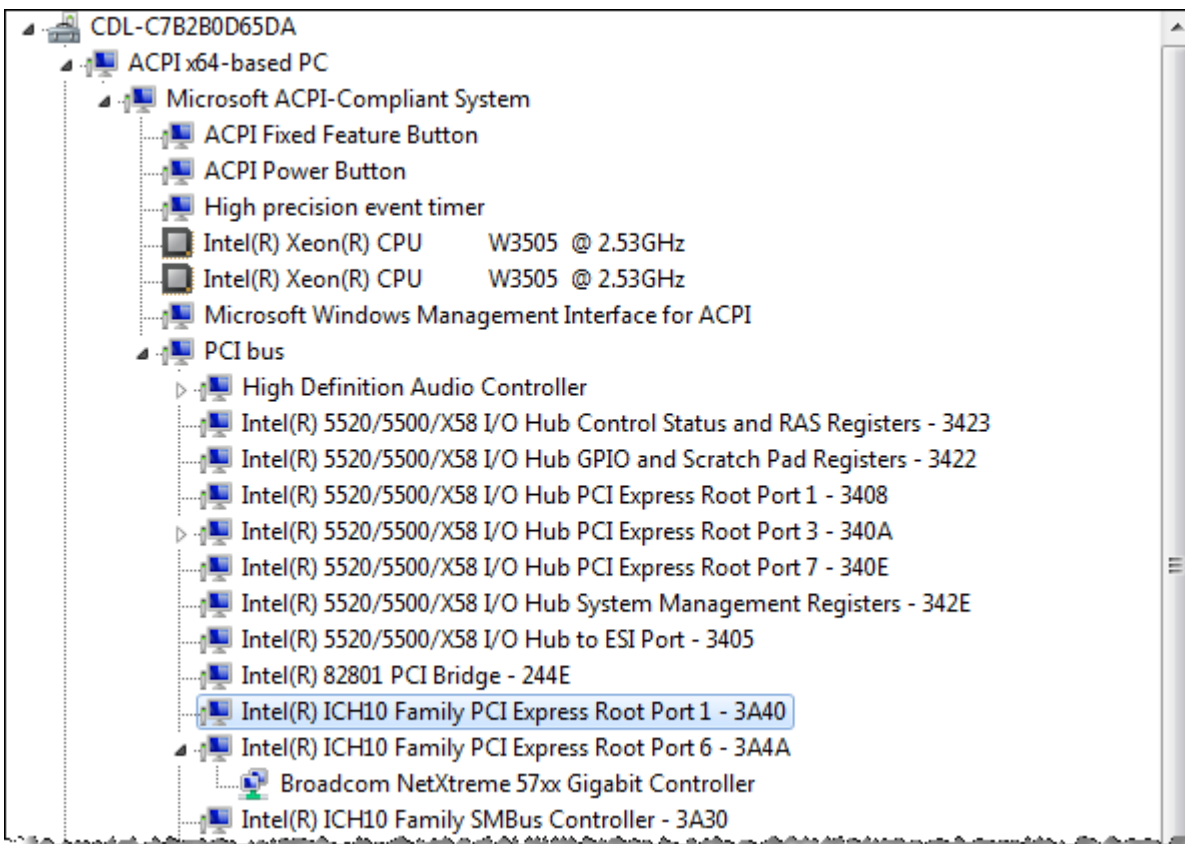


Figure 68 PCI Express root ports for a particular computer

Device Manager view with a PCIe adapter card installed in the PC

Figure 69 lists the devices displayed when a PCIe adapter card is installed but without a connection to a chassis. As you can see, there is no PCIe hierarchy below PCI Express Root Port 1 – hence, this is unchanged from Figure 68.

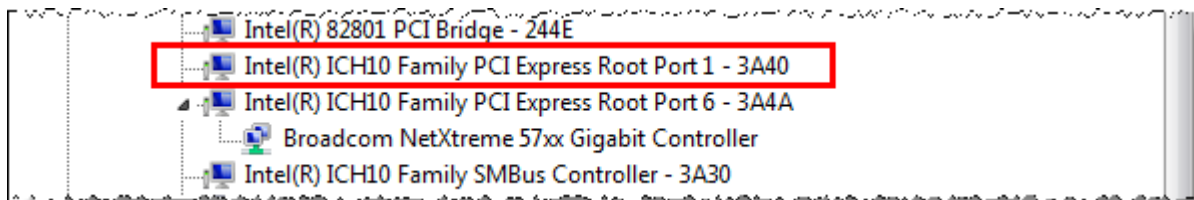


Figure 69 Device Manager view with a PCIe adapter card installed

Device Manager and Connection Expert views of a connection to a chassis

Figure 70 shows the devices displayed when a PCIe adapter card is installed in the host PC, and a connection is made to the M9018A chassis. Because the M9018A chassis drivers have been installed, Device Manager recognizes and displays the chassis (arrow). However, the five circled devices have yet to be identified by Windows because their drivers haven't been installed.

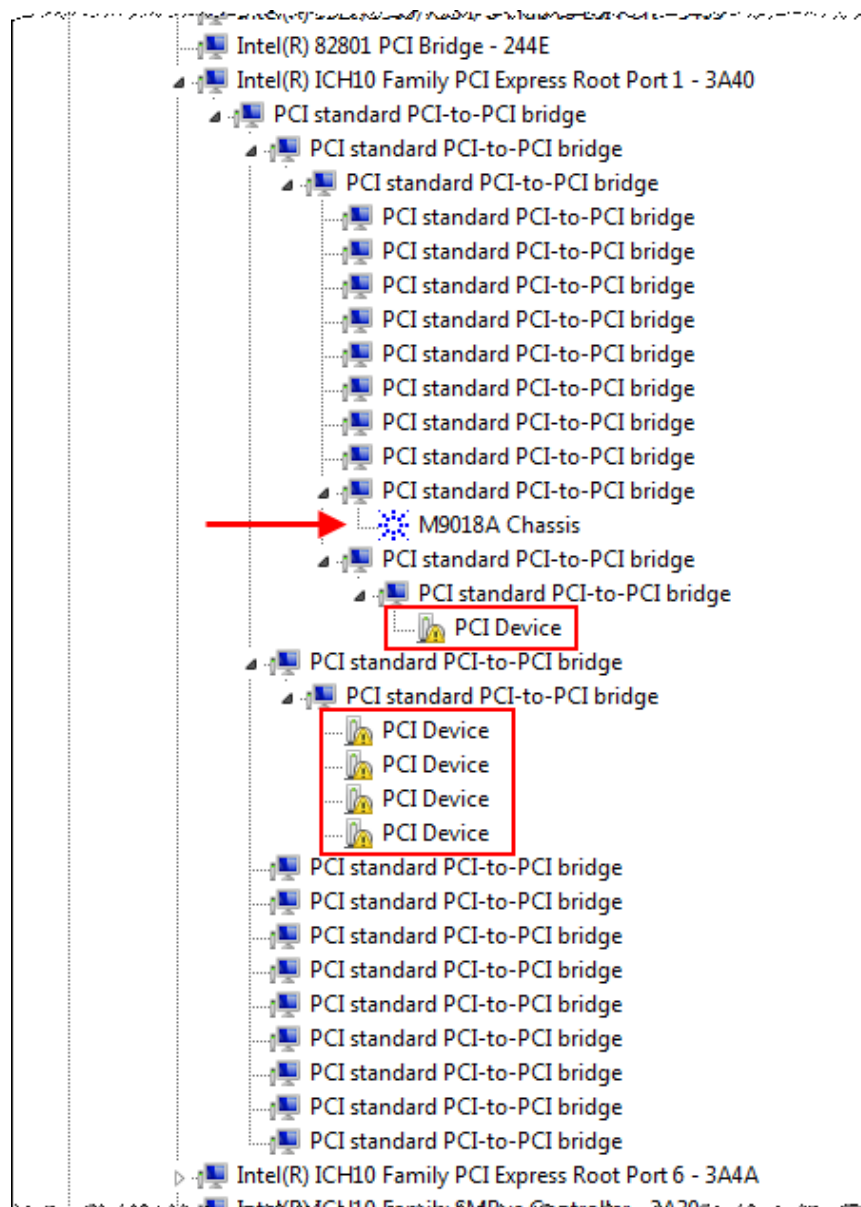


Figure 70 Windows Device Manager view of the chassis with five unrecognized devices

Because Connection Expert retrieves its information from Windows, it likewise doesn't recognize the modules in the chassis, one of which is shown in Figure 71.

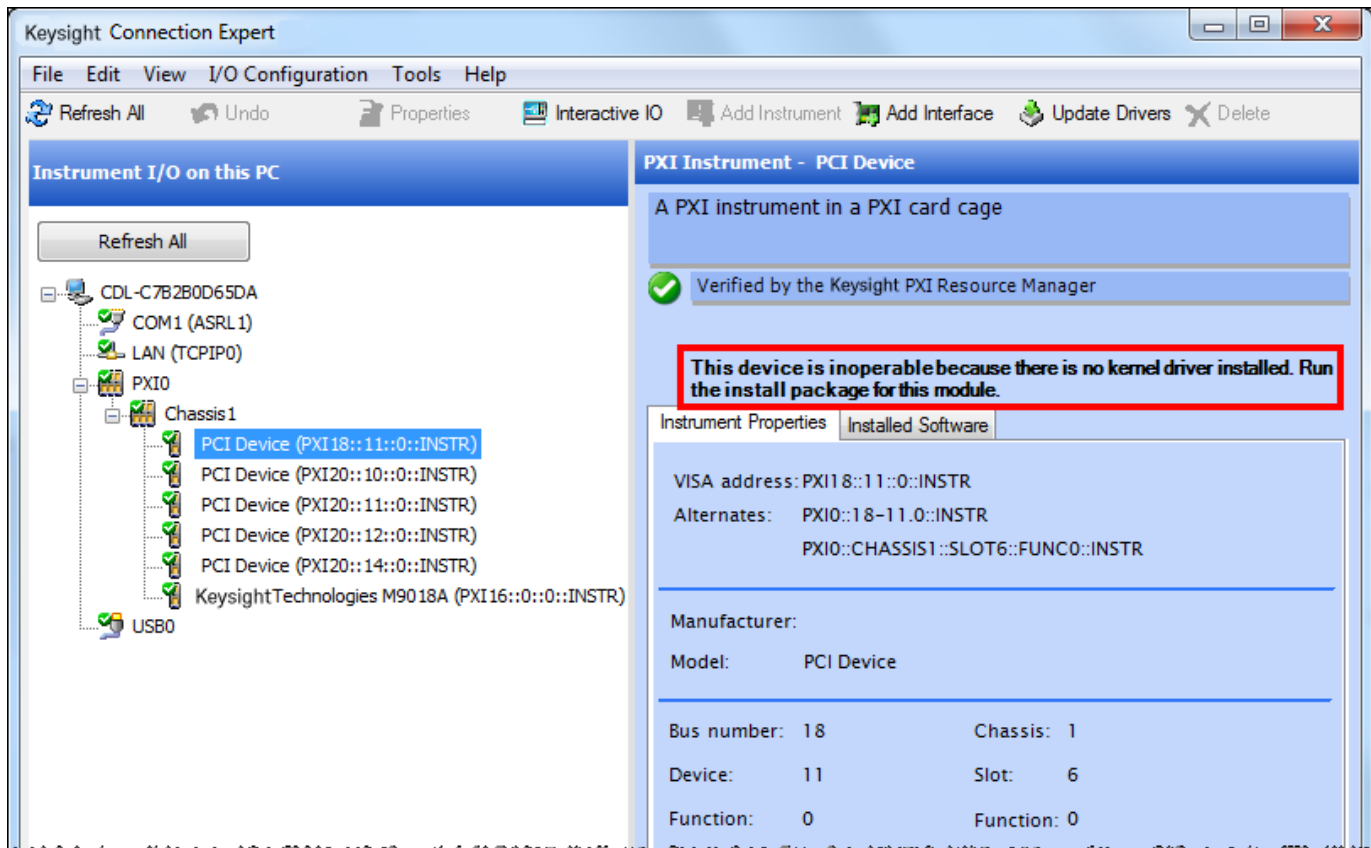


Figure 71 Connection Expert indicates that the device driver needs to be installed for this particular (slot 6) module.

The slot 6 module is an Keysight M9153A RF switch. The driver for this device can be downloaded by starting at www.keysight.com/find/M9153A. After downloading and installing this driver, Windows Device Manager now has the following view of the chassis:

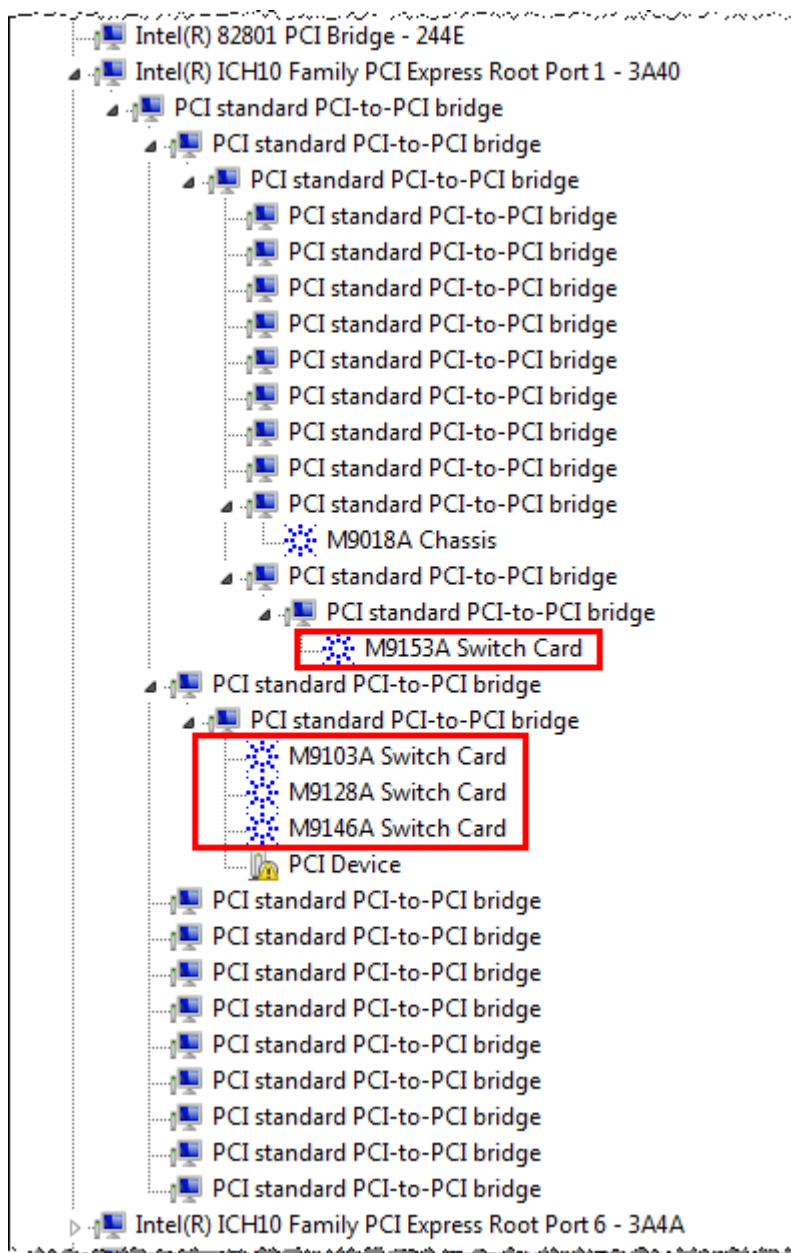


Figure 72 Windows Device Manager after installation of the M9153A driver

Note that installation of the M9153A driver also satisfied the need for a driver by three related Keysight switch cards. One module remains without a driver assigned to it.

In order to update Connection Expert’s view of the chassis system, the **Refresh All** button needs to be clicked. After doing so, Connection Expert now recognizes that the slot 6 module is a M9153A Switch Card. Clicking **Installed Software** will show the software that has been installed for this module.

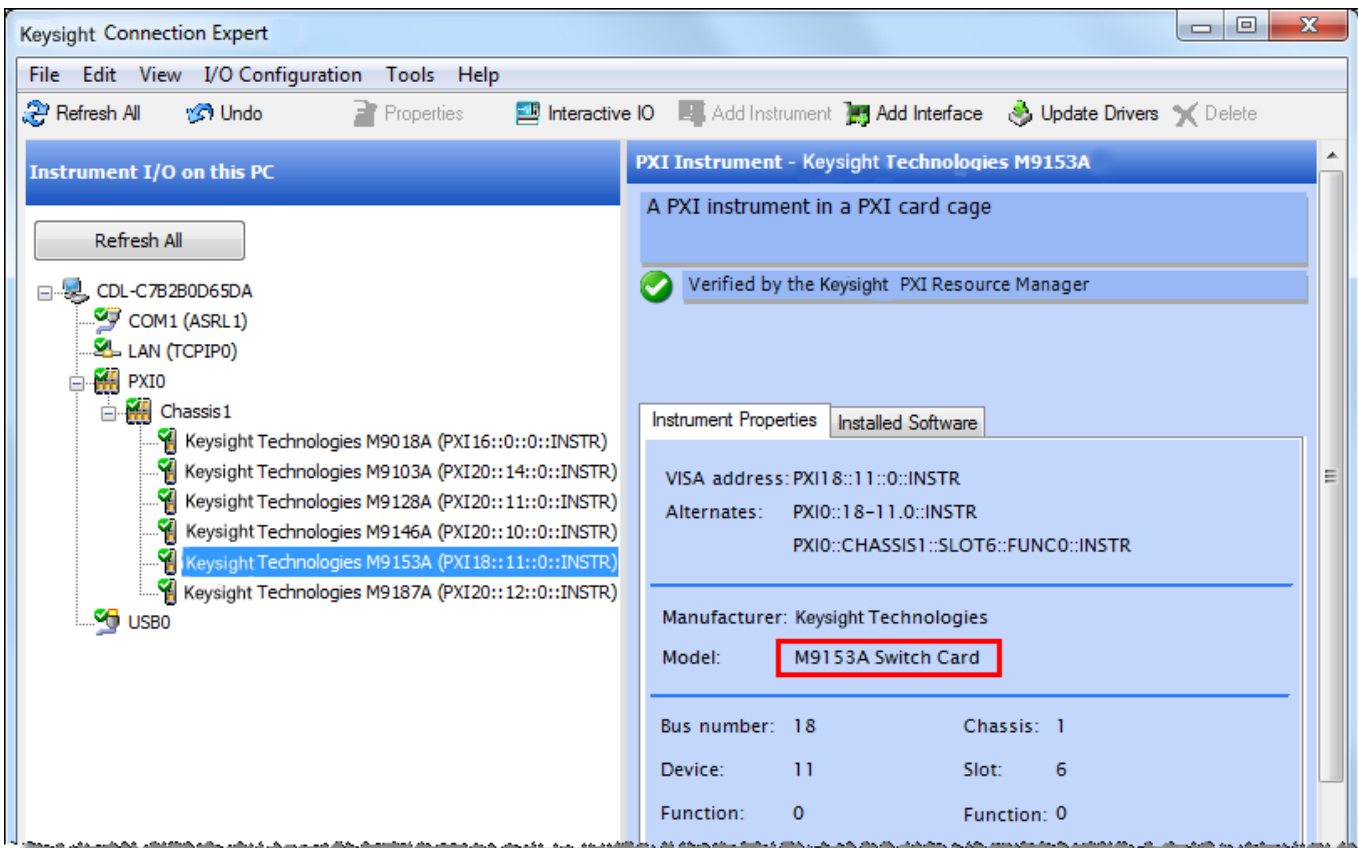


Figure 73 Connection Expert’s view of the slot 6 M9153A Switch Card.

Troubleshooting based on the Windows Device Manager views

If the chassis appears as shown in [Figure 70](#) on page 151, the chassis is being properly enumerated by the BIOS as the PC boots. The next step, as previously indicated, is to ensure that drivers are associated with each identified device.

Association of a driver with each device also includes associating the M9018A chassis driver with the chassis itself. The appearance of “M9018A Chassis” in [Figure 70](#) on page 151 (arrow) indicates that Windows has associated the M9018A chassis driver with the chassis. If “M9018A Chassis” doesn’t appear in Windows Device Manager, the most likely

cause is that Windows has not been able to associate a driver with the chassis. Repairing or reinstalling the M9018A chassis driver is recommended.

Even if the chassis itself isn't recognized by Windows Device Manager, it is still possible for your application programs to access the modules in slots 2-18. In this situation, you will not be able to run applications such as the chassis SFP, but your module-specific applications can still be run.

However, if the host PC is unable to access chassis functionality such as the temperature sensors and power supply voltages, you will not be able to set chassis alarms or view the status of the chassis. Therefore, Keysight recommends that the chassis be serviced in such situations.

If, instead of the chassis appearing in a manner similar to [Figure 70](#) on page 151, the chassis isn't displayed by Windows Device Manager at all (appearing like [Figure 68](#) on page 150), there are a number of possible causes, including failure of the following components:

- M9045 PCIe ExpressCard Adapter
- M9048A PCIe Desktop Adapter
- PCIe cable between the host PC and the chassis
- M9021A PCIe Cable Interface module

Keysight recommends replacing each of the above components one at a time to see if that restores operation. If not, Keysight recommends that you contact Keysight Technical Support to arrange servicing of the chassis.

23 Repairing the Chassis

This chapter describes how to order and replace the following two assemblies:

- Fan assembly—The fan assembly, shown in Figure 74, includes all three chassis fans, which are attached to the rear panel. The fans are not individually replaceable. All three fans are detached from the rear panel for replacement, and the new fan assembly is attached to the rear panel.



Figure 74 Chassis fan assembly

- Power supply—The power supply, shown in Figure 75, is accessed from the rear of the chassis by first removing the rear panel. The power supply has no customer-serviceable parts, and is replaced as a complete unit.



Figure 75 Chassis power supply

WARNING

Only qualified, service-trained personnel who are aware of the hazards involved shall remove the chassis rear panel or top cover. Always turn the chassis off and disconnect the power cord before removing the rear panel or top cover. Upon reassembly, ensure that all cable connectors are properly seated in their receptacles, and that the latching mechanisms of all connectors are engaged.

Ordering the fan assembly and power supply

To order the fan assembly or power supply, start at:
www.keysight.com/find/parts

Enter “M9018” in the **Find by Keysight Product** dialog, click **Find by Product**, and then click **View Parts**, as shown below:

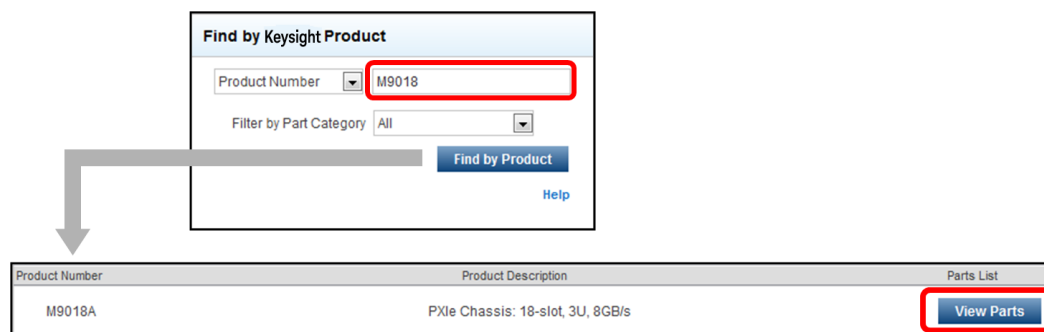


Figure 76 Steps to find the fan assembly and power supply parts

The M9018A parts list page will be displayed. The power supply is listed as the “PXIe Chassis Power Supply Assembly”, and the fan assembly is listed as the “PXIe Chassis – Fan Kit”.

Tools that you’ll need

The following tools are needed to replace the fan assembly or power supply:

- Phillips #2 screwdriver, preferably magnetic tipped
- Torx T8 and T10 screwdrivers, preferably magnetic tipped.
- Supplemental lighting—You may find supplemental lighting beneficial to better see inside the chassis after removing the rear panel. Supplemental lighting is especially beneficial if you’re repairing a chassis installed in a rack.

- Digital multimeter (DMM) if you're replacing the power supply—This is used to verify primary earth ground continuity after the power supply is replaced. The DMM can also be used to measure the four primary power supply rails after the new power supply is installed.

Important aspects of the repair process

In replacing the fan assembly or the power supply, keep the following in mind:

- 1 The fan assembly and power supply can both be replaced while the chassis is mounted in a rack and without removing the chassis top cover.*
- 2 Regardless of whether the fan assembly is being replaced or the power supply is being replaced, the rear panel must be removed from the chassis first. The fan assembly is attached to the rear panel, and the power supply is accessed through the rear of the chassis after the panel is removed.
- 3 Once the rear panel is detached from the chassis, it is still connected by a wiring harness. Support the rear panel to ensure that the wiring harness and its connector are not subjected to the weight of the panel.
- 4 The nine screws that hold the rear panel in place and the six screws that hold the power supply in place are identical and interchangeable—they are all M3 5 mm long screws.

Removing the rear panel

To remove the rear panel, perform the following steps:

- 1 Power down the chassis and remove the chassis power cord.
- 2 Remove the two rear feet of the chassis as shown in Figure 77. Each rear foot is secured by two T8 Torx screws at the indicated locations.



Figure 77 Removal of the two rear feet

* Later chassis added two shipping screws on the sides of the chassis to secure the power supply. See instructions on [page 166](#).

CAUTION

In the next step, the nine screws which secure the rear panel to the chassis are removed. After the screws are removed, the rear panel will be connected to the chassis only by the fan assembly wiring harness. Ensure that the rear panel is not allowed to fall from the chassis after the screws are removed, especially if the chassis is mounted in a raised position such as in a rack. The wiring harness or the wiring harness connector can be damaged by the force exerted by dropping the panel.

- 3 Remove the 9 screws highlighted in Figure 78. Depending on your chassis, these 9 screws may either be Phillips #2 or Torx T8.

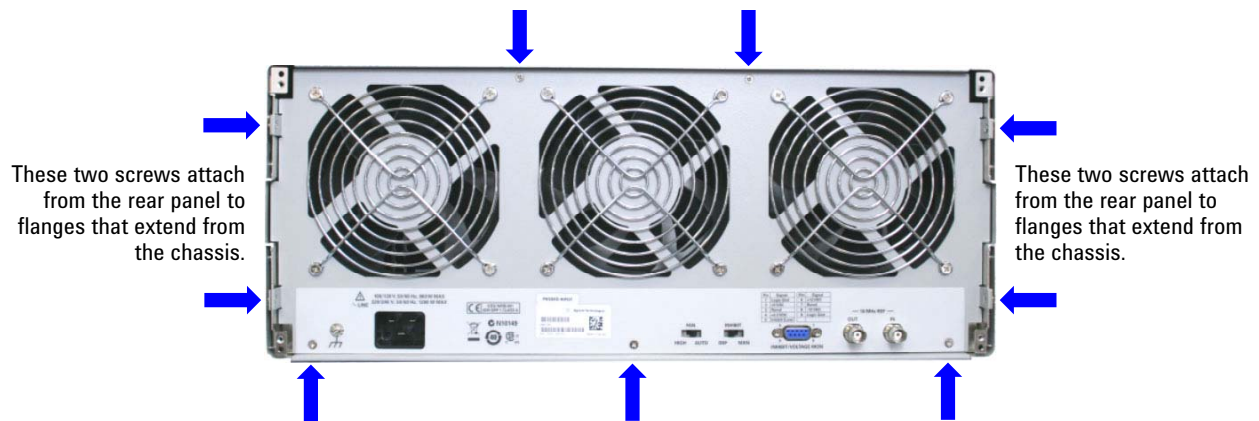


Figure 78 The nine screws which secure the rear panel to the chassis

- Next, slide the base of the rear panel out from the chassis as shown in Figure 79.



As you perform the following procedure, ensure that the rear panel doesn't fall, especially if the chassis is elevated in a rack.

Slide the base of the rear panel out from the chassis, being careful as the chassis passes over small protrusions on the two BNC connectors. Then lower the panel slightly to make room for the fans to clear the inside top of the chassis.

Figure 79 The base of the rear panel is slid out first

- Pivot the top of the rear panel outward from the chassis, and lower the rear panel down next to the chassis as shown in Figure 80. At this point, the rear panel is only connected to the chassis by the fan assembly wiring harness and its connector.



The rear panel is still attached to the chassis by the fan assembly wiring harness, so ensure that the rear panel is supported after its removal.

Figure 80 Removal of the rear panel

- 6 Next, lay the rear panel flat in a supported, stable position so that you can disconnect the fan wiring harness from the power supply as shown in Figure 81.



Figure 81 Positioning of the rear panel/fan assembly in preparation for disconnecting the fan connector

- 7 Figure 82 shows the fan connector plugged into the power supply. Of the four connectors which plug into the power supply, only the fan connector needs to be removed in order to replace the fan assembly.



Figure 82 The fan connector is the top-most connector.

NOTE

In the next step, the fan connector is disconnected from the power supply. To give yourself more room to grab the fan connector, you can optionally take the chassis top cover off. If you do this, follow the cover removal procedure presented in [“Preemptively restoring the factory default 1x8 Base Configuration”](#) on page 87.

- 8** To remove the fan connector, grab it with your fingers while pressing the release tab (shown below) with your fingernail. While continuing to press the tab, rock the connector backward and forward in the vertical plane as you pull. Removing the connector may require multiple attempts.

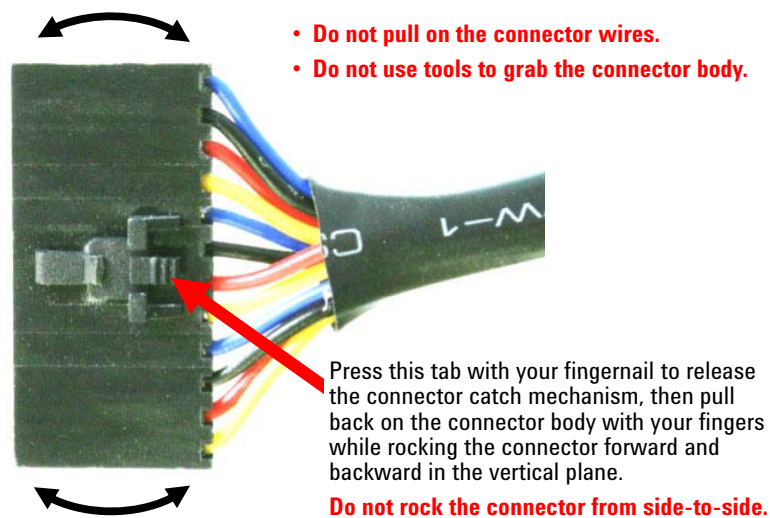


Figure 83 Rock the connector backward and forward while you press on the release tab

If you're replacing the fan assembly, continue with the next section to remove the three fans from the rear panel, replace them with a new fan assembly, and install the rear panel back in the chassis. If you're replacing the power supply, set the rear panel aside, and continue with [“Replacing the power supply”](#) on page 166.

Replacing the fan assembly

To replace the fan assembly, perform the following steps.

- 1 Lay the rear panel on a flat surface with the rear panel shown in Figure 84 facing up.

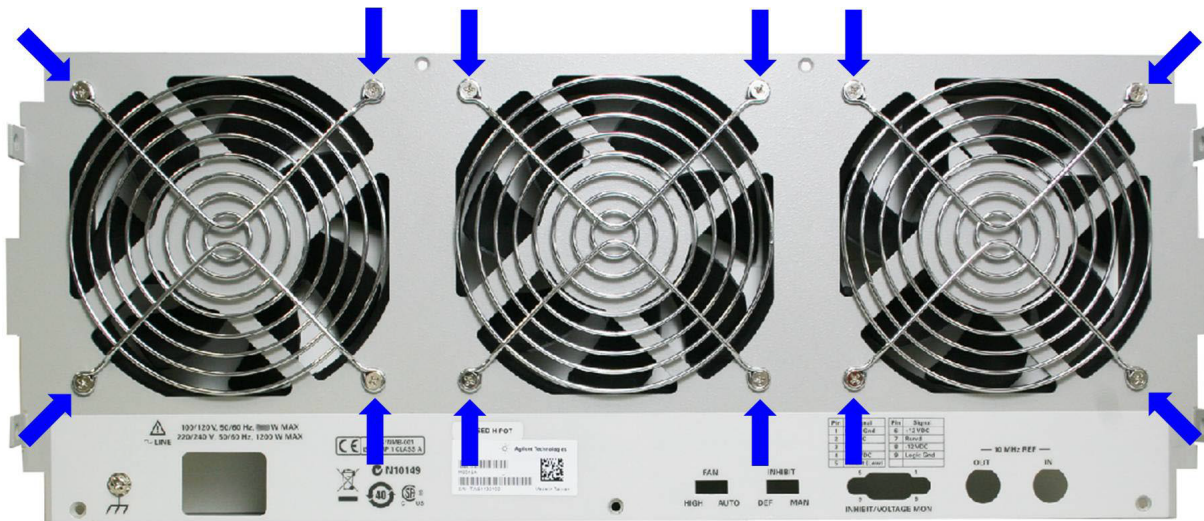


Figure 84 Remove these screws to detach the fan assembly

- 2 The fans are attached by screws that mount through the eyelets of the fan guards. Remove the 12 screws highlighted in Figure 84 (note, some early M9018A chassis used #2 Phillips screws, all later chassis used T8 Torx screws). As you do this, note the orientation of the fan guards. The fan guards are mounted with their eyelets flush with the rear panel. Note also the position of the fan wiring harness—it is attached to the fan assembly proximate to the lower right corner of the rear panel.
- 3 After removing the 12 screws, lift the rear panel off of the old fan assembly. Lay your new fan assembly on your work surface in the same orientation as your old fan assembly, relative both to the sides of the fans that are facing up and the location of the fan wiring harness. For a rear panel positioned as shown in Figure 84 on page 164, the fan assembly will be laid out as shown in Figure 85.



Figure 85 The fan assembly prior to mating with the rear panel

- 4 Lay your rear panel on top of the new fan assembly. Align the holes in the rear panel with the fan mounting holes.
- 5 Place the three fan guards on the rear panel over the fans, ensuring that the fan guard mounting eyelets are flush with the rear panel.

CAUTION

In the next step, the rear panel will be attached to the new fan assembly using the 12 screws you removed in step 2. These are thread forming screws, be careful not to overtighten them.

- 6 Attach the fan guards and rear panel to the new fan assembly using the screws removed in step 2. Be careful not to overtighten the screws, this can strip the mounting holes in the fans.
- 7 Position the rear panel/fan assembly in the position shown in Figure 81, and re-attach the fan connector. Ensure that the connector is fully inserted, and that you hear an audible click upon insertion.
- 8 Mount the rear panel back in the chassis and insert the 9 screws shown in Figure 78. Tighten these screws securely.
- 9 Attach the two rear feet shown in Figure 77, and tighten these screws securely.

Verifying the fan assembly

To verify the fan assembly, connect the AC power cord, power up the chassis, and confirm that all three fans are rotating. If they are not rotating, remove the rear panel and make sure that the fan connector is fully seated in its power supply connector. For further verification of the fan assembly, set the rear panel FAN switch to AUTO followed by setting it to HIGH – confirm that the fan speed increases as you change the switch.

Replacing the power supply

CAUTION

The power supply contains no user serviceable parts, and is replaced as a complete assembly. Do not attempt to repair it.

NOTE

Modifications have been made to the M9018A chassis power supply mounting. Depending on which version of the chassis you have, the power supply removal/installation procedure is slightly different; you may need to remove two screws on the side of the chassis. Carefully follow the instructions below to determine which version you have and follow the appropriate procedure.

To replace the power supply, carefully perform the following steps:

- 1 **IMPORTANT!** Check the serial number of the chassis:
 - a If the chassis serial number is TW54450000 or lower, there may be two M4x8mm long socket head cap screws inside of the chassis top cover. These two screws secure the power supply for shipping and must be removed before attempting to remove the power supply. You must reinstall these screws* before shipping the M9018A. Proceed to [step 2](#) below.
 - b If your chassis has serial number TW54450001 or greater, there are two M4x8mm long socket head cap screws accessible through holes in the chassis top cover. These two screws secure the power supply for shipping and must be removed before attempting to remove the power supply. If the chassis has been rack mounted, these two screws have been previously removed. You must reinstall these screws* before shipping the M9018A. Proceed to [step 3](#) on [page 167](#).
- 2 If you have a chassis with serial number TW54450000 or lower, check for the internal mounting screws. You must remove the chassis top cover first.
 - a Remove the 14 screws holding the top cover in place using a #2 Phillips screwdriver. There are five screws on each side of the cover, two on top of the cover near the front panel, and two in the back of the chassis that screw into the chassis rear panel.
 - b After the screws are removed, lift up the rear of the chassis cover about 12 mm (0.5 inches) and slide the cover back off of the chassis. Place the cover in a location away from the chassis.
 - c Locate and remove the two M4x8mm long cap screws securing the power supply. There is one screw on each side of the chassis. See [Figure 86](#)

* Kit of two replacement screws is available as part number M9018-80019

below. Retain these screws as they will be needed when reassembling the power supply and chassis.

- d Proceed to [step 4](#) on [page 168](#).



Figure 86 Remove two screws inside of chassis securing power supply

- 3 If you have a chassis with serial number TW54450001 or greater, do not remove the chassis top cover. There are two M4x8mm long cap screws accessible through holes in the chassis top cover. Refer to [Figure 87](#) below. If the chassis has been rack mounted, these two screws may have been removed previously. You must reinstall these screws before shipping the M9018A.

- a Remove the two M4x8mm cap screws, one on each side of the chassis.
- b Proceed to [step 4](#) on [page 168](#).



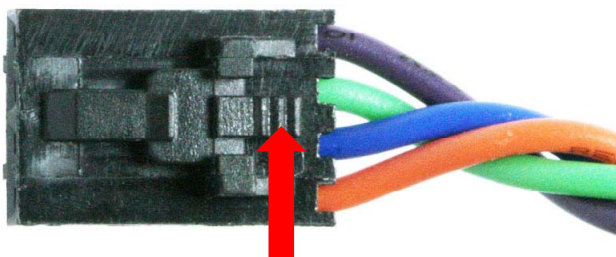
Figure 87 Remove screws on side of chassis

- 4 Remove the rear panel as described in “Removing the rear panel” on page 159.
- 5 Next, remove the two connectors below the fan connector shown in Figure 88.



Figure 88 Remove the two remaining power supply connectors

- 6 The top-most of the two connectors in Figure 88 uses the same retention mechanism as the fan connector (see Figure 89).



Press this tab with your fingernail to release the connector catch mechanism, then pull back on the connector body with your fingers while rocking the connector forward and backward in the vertical plane.
Do not rock the connector from side-to-side.

Figure 89 Remove the connector below the fan connector

To remove this connector, grab it with your fingers while pressing the release tab shown above with your fingernail. While continuing to press the tab, rock the connector backward and forward while pulling it until it releases.

- 7 Next, remove the white connector shown in Figure 90. This is accomplished by pressing in with your fingers at the points shown below as you pull on the connector.

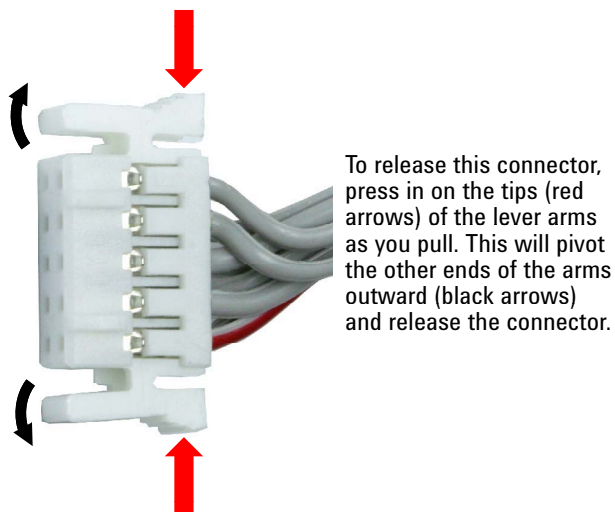


Figure 90 Remove the bottom-most white connector

NOTE

The connectors just removed in steps 3 and 4 above should be temporarily tucked in below their cables on the chassis deck (the flat surface immediately inside the rear of the chassis) so that the connectors and cables do not interfere with the power supply as it is removed from the chassis or installed back in the chassis.

- 8 Next, the AC power connector to the power supply is removed. To remove this connector, press in on the tab shown in Figure 91 and pull the connector from the power supply.

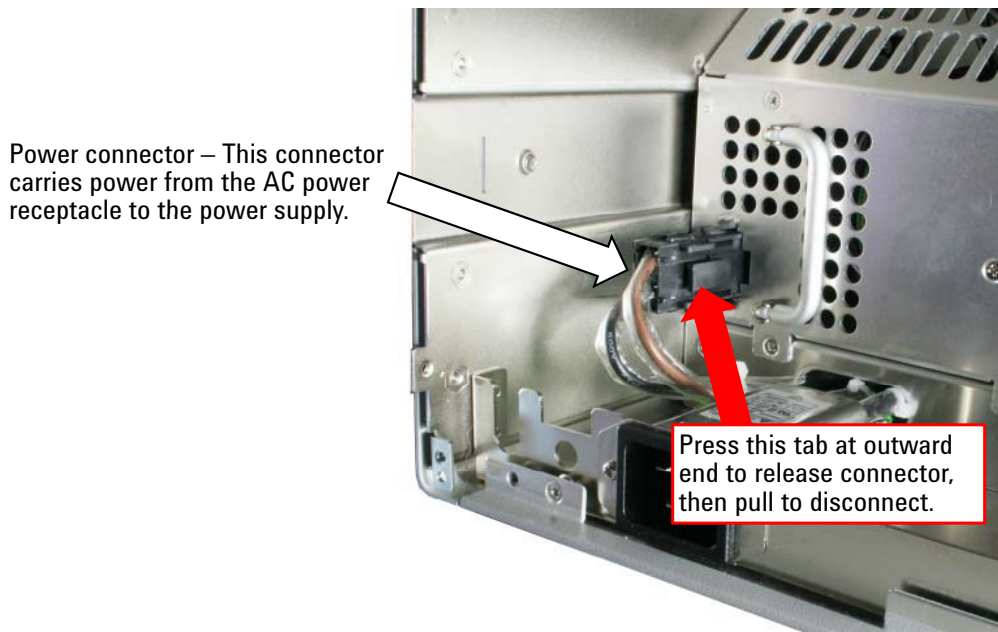


Figure 91 Remove the power supply connector

- 9 The power supply is held in place by the six screws shown in Figure 92. Remove these screws. At this point, the power supply should be ready to be removed from the chassis – verify that all connectors and all screws have been removed from the power supply.

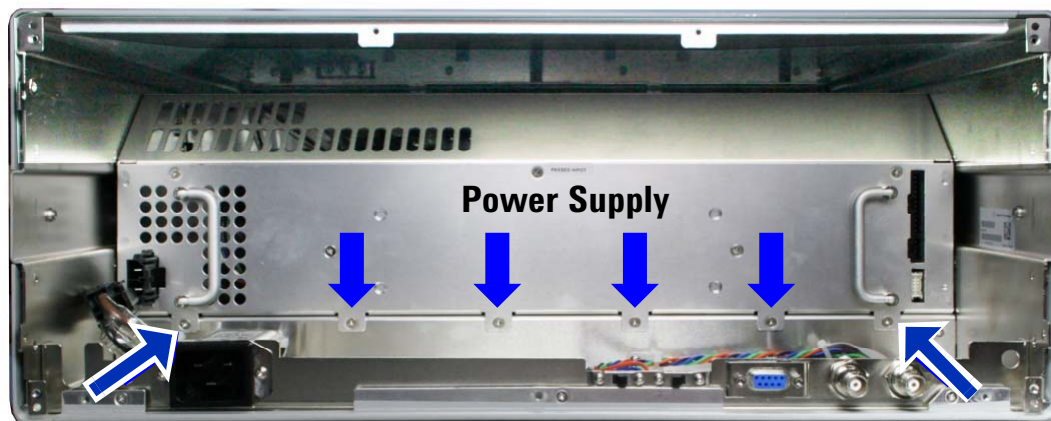


Figure 92 Remove the six highlighted power supply screws

CAUTION

In the next step, the power supply is removed from the chassis. Earlier it was noted that the two connectors that mate below the fan connector need to be tucked in below their cables to keep them from interfering with the power supply as it is removed. Likewise, the AC power wires need to be held down so that the left-most tab of the power supply doesn't make contact with these wires.

10 Using the two handles on the power supply, slowly but firmly pull it out of the chassis. There will be initial resistance prior to the main power connector to the chassis releasing. As you pull the power supply out, ensure that the AC power wires are held down so that the power supply doesn't make contact with these wires.

As you pull on the left handle, you can use a finger to simultaneously hold down the AC power wires. Alternatively, you can enlist an assistant to hold down the wires (using an object such as a screwdriver) as you pull the power supply from the chassis by its two handles. In Figure 93, a screwdriver is being used to hold down the AC wires as the power supply is pulled from the chassis.

A screwdriver can be used to hold down the AC power wires so that the tab on the power supply doesn't make contact with them.

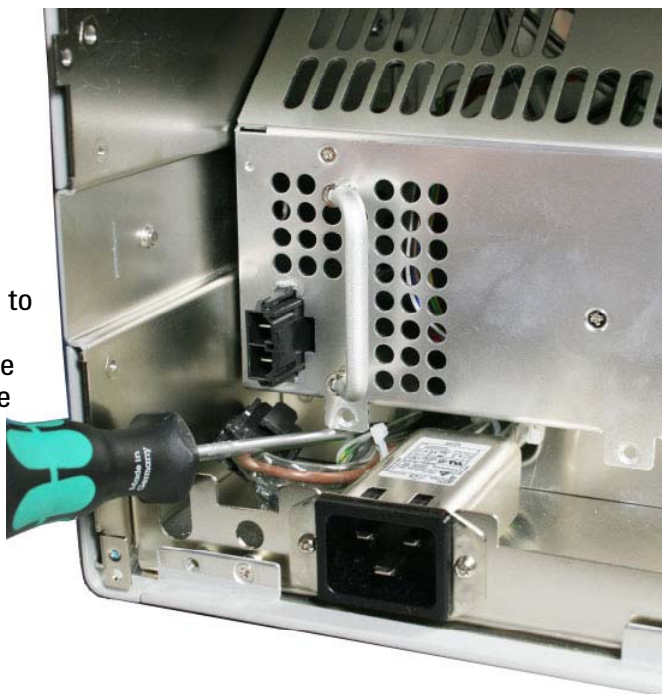


Figure 93 Using a screwdriver to hold down the AC power wires as the power supply is removed

- 11** Figure 94 shows the power supply after removal. The power supply contains no serviceable parts, and should be disposed of as described in Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC on page iv.



Figure 94 The power supply after removal

Installing the new power supply

To install the new power supply, perform the following steps:

CAUTION

As you slide the power supply in, use the same precautions you used previously to press the AC connector and AC wires down. Without the appropriate precautions, the AC connector and wires can get caught between the power supply and the base that the power supply mounts on. Also ensure that the two connectors previously connected to the right side of the power supply are still tucked in below their cables.

- 1 Slide the power supply in the chassis, ensuring that the six guide pins on each side of the power supply are aligned in the channel inside each side of the chassis—see Figure 95.

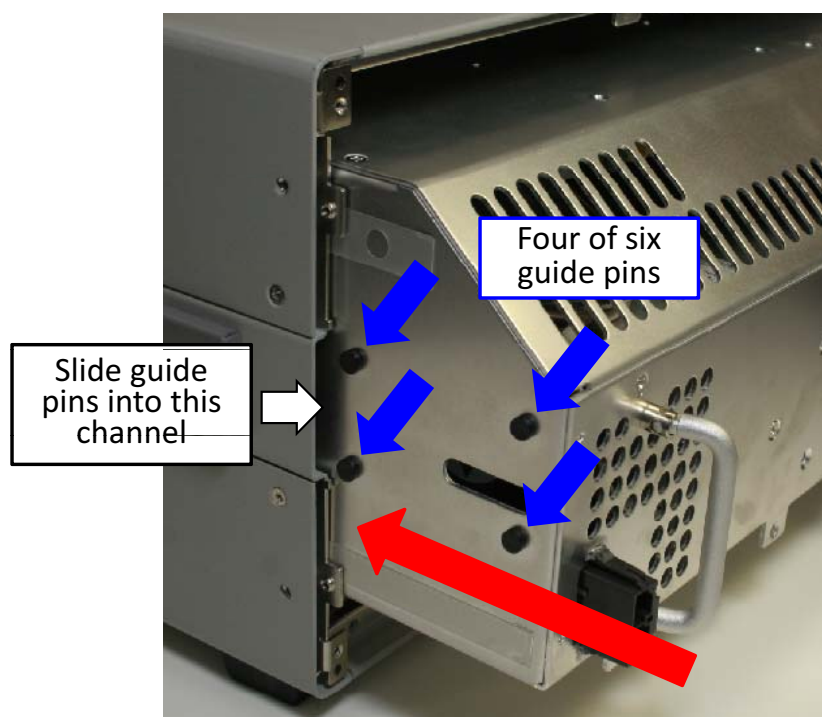


Figure 95 Slide the power supply in using the guide pins to align it

- 2 Using the power supply handles, push the power supply in until you feel the power connector on the reverse, right side of the power supply engage with the chassis connector. Continue firmly pushing until the power supply connector is fully seated in the chassis connector, at which point the six power supply tabs will be flush with the base that the power supply mounts on.

- 3** Insert the six screws shown in Figure 92 and tighten securely.
- 4** Reconnect the following four connectors:
 - a** Reconnect the small, black connector shown in Figure 89. Ensure that the connector is fully inserted, and that you hear an audible click upon insertion.
 - b** Next, reconnect the white connector shown in Figure 90. Push firmly to engage. Note that this connector will not make an audible click.
 - c** Reconnect the AC power connector shown in Figure 91. Push firmly and ensure that you hear an audible click upon insertion.
 - d** Position the rear panel/fan assembly in the position shown in Figure 81, and re-attach the fan connector. Ensure that the connector is fully inserted, and that you hear an audible click upon insertion.

CAUTION

The following steps verify continuity of grounds between the power supply and the chassis primary earth ground, and between the power supply and the primary earth ground conductor on the rear panel AC power connector. These steps shall be performed only by qualified, service-trained personnel.

- 5** To verify continuity of earth grounds, use a digital multimeter (DMM) set to the 10-20 ohms scale. Place one DMM probe anywhere on the power supply enclosure. Place the other DMM probe on the points described below, and confirm that the resistance measurements are 0.1Ω or less.

- a The primary earth ground connection on the chassis deck as shown below.



Figure 96 Measure the resistance from the power supply enclosure to the primary earth ground connection on the chassis deck.

- b The primary earth ground conductor on the rear panel AC power connector as shown in Figure 97.

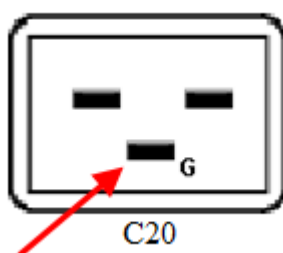


Figure 97 The ground conductor on the rear panel AC power connector

- 6 Following the reverse of the procedure you used to remove the rear panel, re-attach the rear panel to the chassis, and attach the 9 screws shown in Figure 78. Tighten these screws securely.

Power supply side mounting screws

- 7 If you have a chassis with serial number TW54450001 or greater and you are not rack mounting the chassis, reinstall the two M4x8mm long cap screws on the side of the chassis. If you are rack mounting the chassis, do not install the

screws. Refer to [Figure 87](#) on page 167 for the location of these screws.
Proceed to [step 9](#) below.

NOTE

The M4x8mm long socket head cap screws must be in place before shipping the chassis. Tighten these screws to 18 inch-lbs (20.7 KG-cm). A kit of two replacement screws is available as part number M9018-80019

- 8** If you have a chassis with serial number TW54450000 or lower, and IF THE SCREWS WERE PREVIOUSLY INSTALLED (some early chassis did not have the power supply mounting screws on the side of the chassis), you must reinstall the two screws on the inside of the chassis before reinstalling the chassis top cover.
If the chassis did not have the side mounting screws, you do not need to install them.
 - a** Reinstall the two M4x8mm long cap screws securing the power supply.
There is one screw on each side of the chassis. **See [Figure 86](#) on page 167.**

NOTE

The M4x8mm long socket head cap screws must be in place before shipping the chassis. Tighten these screws to 18 inch-lbs (20.7 KG-cm). Kit of two replacement screws is available as part number M9018-80019

- b** Reinstall the chassis top cover and the 14 screws.
 - c** Proceed to [step 9](#) below.
- 9** Attach the two rear feet shown in [Figure 77](#), and tighten all screws securely.

Verifying the power supply

To verify the power supply, connect the AC power cord, power up the chassis, and verify that the three front panel LEDs behave as described in [Chapter 19, “Troubleshooting Flashing of the Front Panel LEDs”](#). Confirm also that the three rear panel fans are rotating.

Additional verification can be performed by using the DMM to measure the voltages on the rear panel DB9 connector as described in [“Measuring the four main voltage rails directly”](#) on page 18, or by bringing up the M9018A soft front panel and viewing the voltages of the four main power supply rails.

A How to Return the Chassis to Keysight

- 1 If your chassis is being returned for service, review your chassis warranty information. This can be found online by going to: www.keysight.com/find/warranty and entering your product number (M9018A) and your serial number. The serial number is on a tag affixed to the rear of the chassis, and can also be read using the soft front panel after the chassis software is installed.
- 2 Contact Keysight to obtain a Return Material Authorization (RMA) and shipping address. For Keysight contact information, go to www.keysight.com/find/assist (worldwide contact information for repair and service) or refer to the **Support** information on the product web page at www.keysight.com/find/pxi-chassis. When you contact Keysight, you will typically be assigned a case ID number—please be sure to retain this number.
- 3 Write the following information on a tag and attach it to the chassis:
 - Name and address of owner. A P.O. box is not an acceptable address.
 - Product model number (for example, M9018A)
 - Product serial number (for example, TWnnnnnnnn). The serial number label is located on the back of the chassis. The serial number can also be read from the Soft Front Panel, but only if the chassis is operational and the Soft Front Panel software is installed on the host controller.
IMPORTANT: Keep a copy of the serial number for your records.
- 4 If the chassis is being returned for service, please print and fill out the **Failure information** sheet on the next page. This information can expedite repair of the chassis. When you're done, tape the sheet to the top of the chassis.
- 5 Remove and retain all modules and slot covers from the chassis, including the slot 1 module. This module is typically an embedded controller or a PCIe cable interface module.
- 6 Carefully pack the chassis in its original packaging. If the original packaging is not available, use bubble wrap or packing peanuts, and place the chassis in a sturdy, sealed container and mark the container "**FRAGILE**".
- 7 On the shipping label, write **ATTENTION REPAIR DEPARTMENT** and the RMA number provided by Keysight in step 2.

NOTE

Keep a copy of the chassis serial number, your Keysight-assigned case ID number, and the RMA number for your records. Provide these numbers in any future communications along with the chassis model number (M9018A).

Failure information

If the M9018A chassis is being returned for service, please print this page and provide as much of the information below as possible to expedite the repair of your chassis. After filling out this page, please tape it to the top of the chassis.

Was the chassis initially functional and then it failed, or did it never work?

Failure symptoms:

Is the failure consistent or intermittent?

If the chassis fails consistently but works some time before it fails, how long does it work before the failure occurs?

What is the status of the three front panel LEDs?

Did Connection Expert display the chassis slots?

Were you able to use the soft front panel (SFP) with the chassis?

If you were able to use the SFP, what information did it display for example, on the Monitor tab) that may help with repair?

If you were able to use the SFP to run its self test, what failure codes, if any, did it display?

Module plugged into slot 1, the system controller slot:

Model of PCIe Desktop Adapter or PCIe ExpressCard

Adapter if you're using a remote controller PC:

Model of timing card, if any, plugged into slot 10, the system timing slot:

Operating system of the host controller PC, including service pack information:

Please provide any other information that might assist in the repair of your chassis:

Thank you for providing this information.

B Chassis and Accessory Model Numbers

Table 10 lists the model number of the chassis and its accessories. Information on these parts can be found by starting at www.keysight.com/find/pxi-chassis.

Table 10 Chassis and accessory model numbers

M9018A	PXIe Chassis: 18 slot, 3U, 8 GB/s																																																						
opt 900-931	Power cord options																																																						
	<table border="1"> <thead> <tr> <th>Option</th> <th>Power Cord Description</th> <th>Part No.</th> </tr> </thead> <tbody> <tr> <td>900</td> <td>United Kingdom, BS 1363/A male plug</td> <td>8120-8620</td> </tr> <tr> <td>901</td> <td>Australia and New Zealand, AS 3112 male plug</td> <td>8120-8619</td> </tr> <tr> <td>902</td> <td>Continental Europe, CEE 7 male plug</td> <td>8121-2221</td> </tr> <tr> <td>903</td> <td>U.S. and Canada, NEMA 5-15P male plug - 120V</td> <td>8121-1713</td> </tr> <tr> <td>904</td> <td>U.S. and Canada, NEMA 6-15P male plug - 240V</td> <td>8120-8623</td> </tr> <tr> <td>906</td> <td>Switzerland, SEV Type 12 male plug</td> <td>8121-1765</td> </tr> <tr> <td>912</td> <td>Denmark, SR 107-2-D male plug</td> <td>8121-1786</td> </tr> <tr> <td>917</td> <td>India, IEC 83-B1 male plug</td> <td>8121-0710</td> </tr> <tr> <td>918</td> <td>Japan, JIS C8303 male plug</td> <td>8121-1763</td> </tr> <tr> <td>919</td> <td>Israel, Israel SI 32 male plug</td> <td>8121-0161</td> </tr> <tr> <td>920</td> <td>Argentina, IRAM 2073 male plug</td> <td>8121-1857</td> </tr> <tr> <td>921</td> <td>Chile, CEI 23-16 male plug</td> <td>8121-1084</td> </tr> <tr> <td>922</td> <td>China, GB 1002 (figure 3) male plug</td> <td>8121-1766</td> </tr> <tr> <td>923</td> <td>South Africa, SANS 164-1 male plug</td> <td>8121-0710</td> </tr> <tr> <td>927</td> <td>Thailand, Philippines NEMA 5-15P 250 male plug</td> <td>8121-1764</td> </tr> <tr> <td>930</td> <td>Brazil, NBR 14136 male plug</td> <td>8121-1787</td> </tr> <tr> <td>931</td> <td>Taiwan, CNS 10917-2 male plug</td> <td>8121-1853</td> </tr> </tbody> </table>	Option	Power Cord Description	Part No.	900	United Kingdom, BS 1363/A male plug	8120-8620	901	Australia and New Zealand, AS 3112 male plug	8120-8619	902	Continental Europe, CEE 7 male plug	8121-2221	903	U.S. and Canada, NEMA 5-15P male plug - 120V	8121-1713	904	U.S. and Canada, NEMA 6-15P male plug - 240V	8120-8623	906	Switzerland, SEV Type 12 male plug	8121-1765	912	Denmark, SR 107-2-D male plug	8121-1786	917	India, IEC 83-B1 male plug	8121-0710	918	Japan, JIS C8303 male plug	8121-1763	919	Israel, Israel SI 32 male plug	8121-0161	920	Argentina, IRAM 2073 male plug	8121-1857	921	Chile, CEI 23-16 male plug	8121-1084	922	China, GB 1002 (figure 3) male plug	8121-1766	923	South Africa, SANS 164-1 male plug	8121-0710	927	Thailand, Philippines NEMA 5-15P 250 male plug	8121-1764	930	Brazil, NBR 14136 male plug	8121-1787	931	Taiwan, CNS 10917-2 male plug	8121-1853
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M9021A	PCIe Cable Interface module (x8)																																																						
M9045	PCIe ExpressCard Adapter (x1)																																																						
M9048A	PCIe Desktop Adapter (x8)																																																						
Y1200A	PCIe cable: x4 to x8, 2.0m (for use with M9045)																																																						
Y1202A	PCIe cable: x8, 2.0m (for use with M9048A)																																																						
Y1212A	Slot Blocker Kit																																																						
Y1213A	PXI EMI Filler Panel Kit: 5 single-slot																																																						
Y1214A	Air Inlet Module Kit																																																						
Y1215A	Rack Mount kit for the M9018A																																																						

Chassis and Accessory Model Numbers

C Chassis Temperature Parameters

Figure 98 lists several chassis temperature parameters, including the operating temperature range, the storage temperature range, and various temperature thresholds.

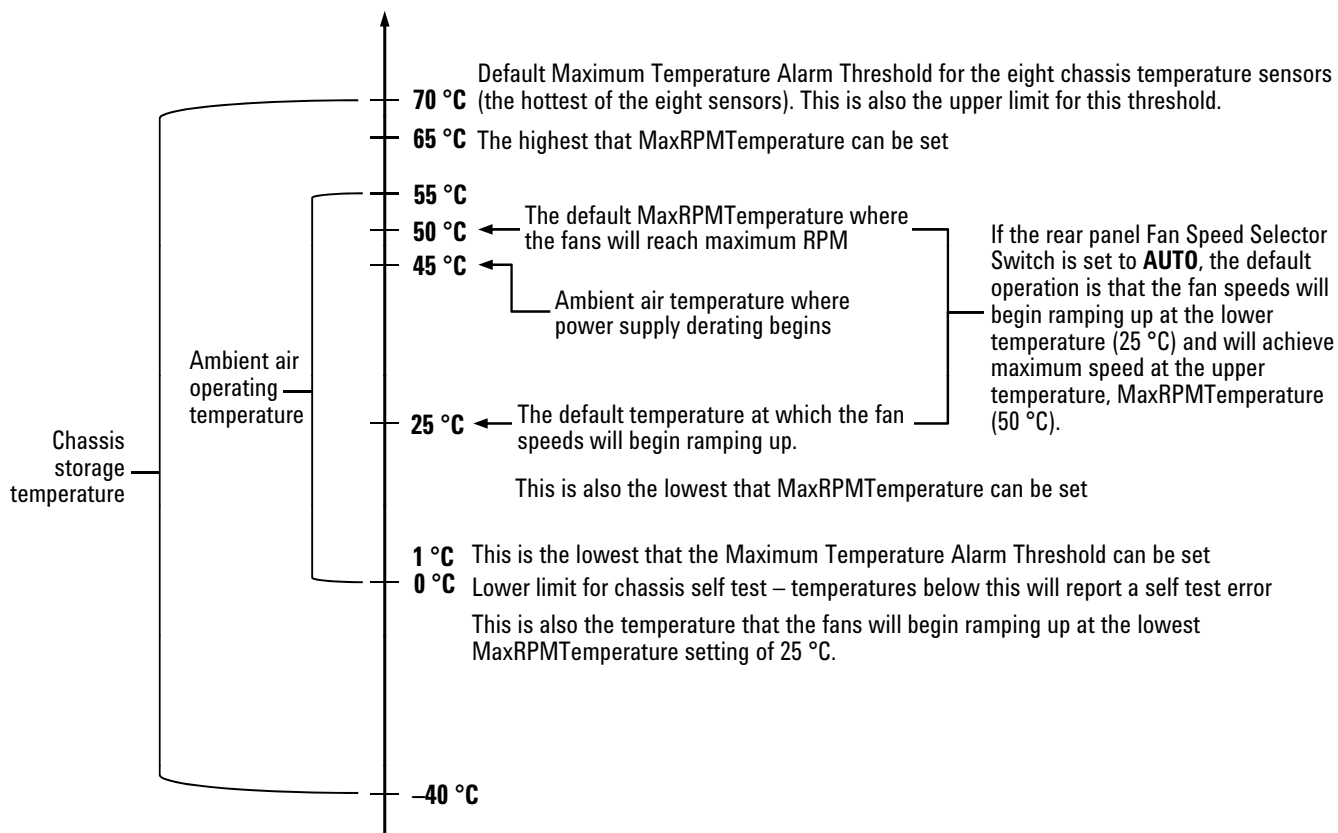


Figure 98 Key chassis temperature parameters

Chassis Temperature Parameters

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Edition 7 September 2014



M9018-90001

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