

User  
Guide

# Keysight M9037A PXIe Embedded Controller





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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:

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

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



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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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To return unwanted products, contact your local Keysight office, or see [www.keysight.com/environment/product](http://www.keysight.com/environment/product) for more information.





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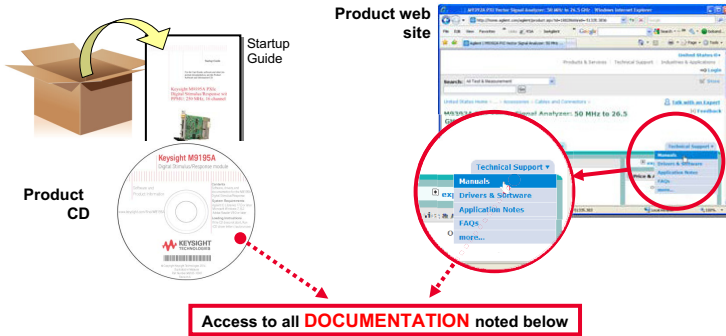
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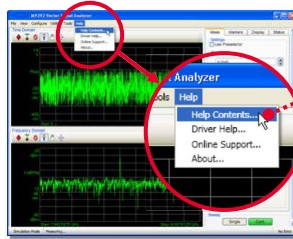
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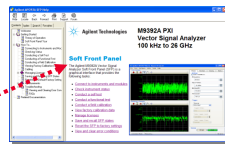


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|--|---|--|--|
| <p><b>Startup Guide</b></p> <ul style="list-style-type: none"> <li>• Install software</li> <li>• Install &amp; connect hardware</li> <li>• Verify operation</li> </ul> | <p><b>User Guide</b></p> <ul style="list-style-type: none"> <li>• Detailed config/operating instructions</li> </ul> | <p><b>Data Sheet</b></p> <ul style="list-style-type: none"> <li>• Product Description</li> <li>• Technical specifications</li> </ul> | <p><b>Other Manuals</b></p> <ul style="list-style-type: none"> <li>• Service Guide</li> <li>• Security Guide</li> <li>• Specification Guide</li> </ul> |
|--|---|--|--|

## Soft Front Panel (SFP) user interface

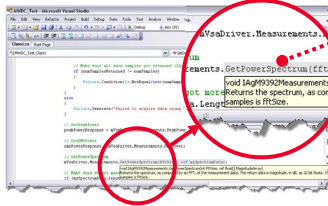


## SFP help system



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

## Visual Studio

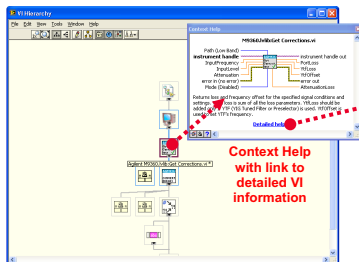


## IVI Driver help system

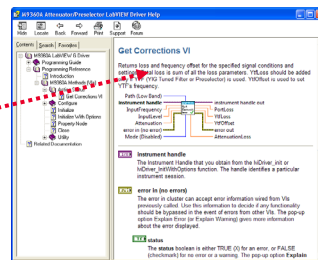


- IVI-COM and IVI-C driver programmer's reference

## LabVIEW



## LabVIEW Driver help system



- LabVIEW driver programmer's reference

# 1 Introduction

Keysight's M9037A is a 3U, 4-Slot PXIe Embedded Controller providing:

- Intel Haswell Core™ i7-4700EQ quad-core, 2.4 GHz processor
- 4 GB standard (or optional 8 or 16 GB) 1600 MHz DDR3 Memory\*
- 240GB SATA 2.5 inch solid state drive (SSD) front panel removable
- Integrated IO on the front panel includes two Gigabit Ethernet ports, four USB 2.0 ports†, two USB 3.0 ports, GPIB connector, two DisplayPort video ports (also known as DisplayPort++), one PCIe x8 connector
- Front Panel SMB Trigger Connector used to route an external trigger signal (TTL level) to/from the PXI backplane with software trigger
- Preloaded with Keysight IO Libraries and your choice of either Microsoft Windows Embedded Standard 7 (WES7) 32-bit or 64-bit Operating System
- Pre-installed IVI drivers for the Keysight M9018A 18-slot PXIe chassis

## Related Documentation

A Windows Embedded Standard 7 (WES7) Operating System and all M9037A drivers were installed at the factory, no additional drivers are required. No printed documentation other than this Startup Guide is supplied with the Controller. This Startup Guide and User Guide are also found on the Product Information CD supplied with the controller.

Complete M9037A documentation, as well as the M9018A PXIe chassis documentation, is available preinstalled on the M9037A SSD. From the Windows **Start** button, select **All Programs** > **Keysight** > **M9037A** or **M9018A**.

Adobe Reader is required to view the documentation supplied on the M9037A and product CD. It is available free at: <http://www.adobe.com>. You should install this on your M9037A prior to attempting to open a .PDF file.

For the latest M9037A specifications, go to: [www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A).

\* The M9037A has two 240-pin, RDIMM sockets that support DDR3-1600 REG/ECC RAM sticks. The standard M9037A configuration is a single 4 GB memory module with a factory options to provide either 8 or 16 GB memory. A 32-bit OS system may not be able to address 4GB memory space. To use the full 16GB memory, a 64-bit OS must be used. The M9037A can address up to 32 GB total memory.

† The USB 2.0 and 3.0 ports do not support the USB Battery Charging specification. Do not connect non-standard or defective USB devices.

For the IVI driver, help file, program examples, etc. go to:

C:\ProgramFiles\IVI Foundation\IVI\Drivers\AgPxiPc

or

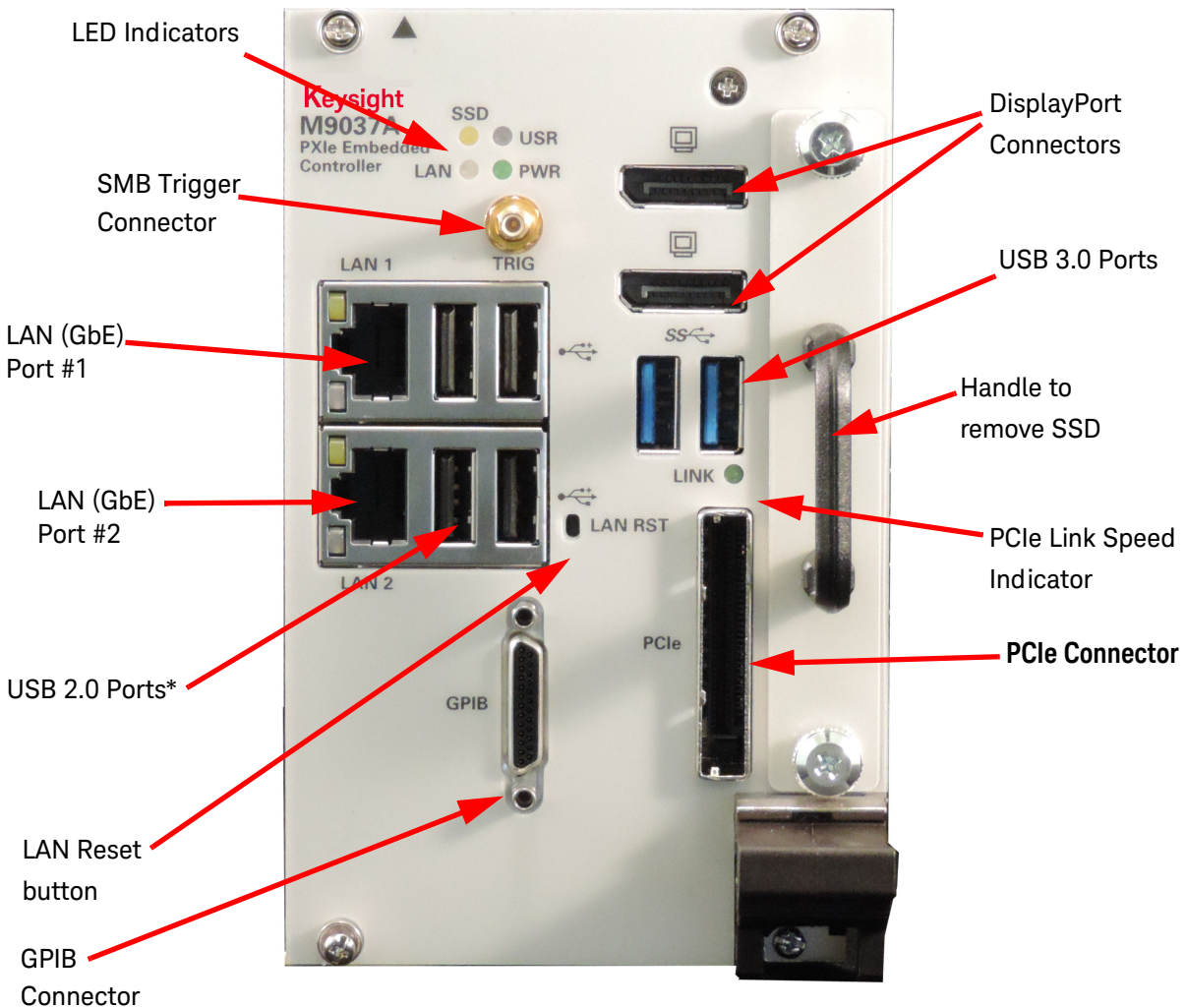
C:\ProgramFiles (x86)\IVI Foundation\IVI\Drivers\AgPxiPc

For the Soft Front Panel interface: from the Window's Start menu, select:

Start > All Programs > Keysight > PXIe Embedded Controller > Embedded Controller SFP

## M9037A at a Glance

The following figure shows the front panel for the M9037A PXIe Controller. Detailed information about the module follows in this manual.



**Figure 1** M9037A Embedded Controller Front Panel

\* The USB 2.0 and 3.0 ports do not support the USB Battery Charging specification. Do not connect non-standard or defective USB devices.

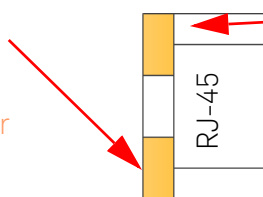
## Front panel LED indicators

The following table lists the LEDs on the front panel and a brief description of their use and what they indicate.

LED Indicator	Color	Description
PWR	Green	If the LED is on, the power supply to the controller is good and the system should boot.
SSD	Amber	When the Solid State Drive (SSD) is active, the LED will flash.
LAN	N/A	These two LEDs and the LAN RST switch are reserved for Keysight use only. The LEDs should never turn on or flash. Depressing the LAN RST switch has no effect.
USB	N/A	
PCIe Link	Green	Indicates PCIe Link Status: Off = no link; blinking @ 1 Hz rate = Gen1 speed blinking @ 2 Hz = Gen2 speed LED on steady = Gen3 speed

### Gigabit Ethernet (GbE) connector LEDs

Speed and Link  
10Mbps: off  
100Mbps: Green  
1000Mbps: Amber



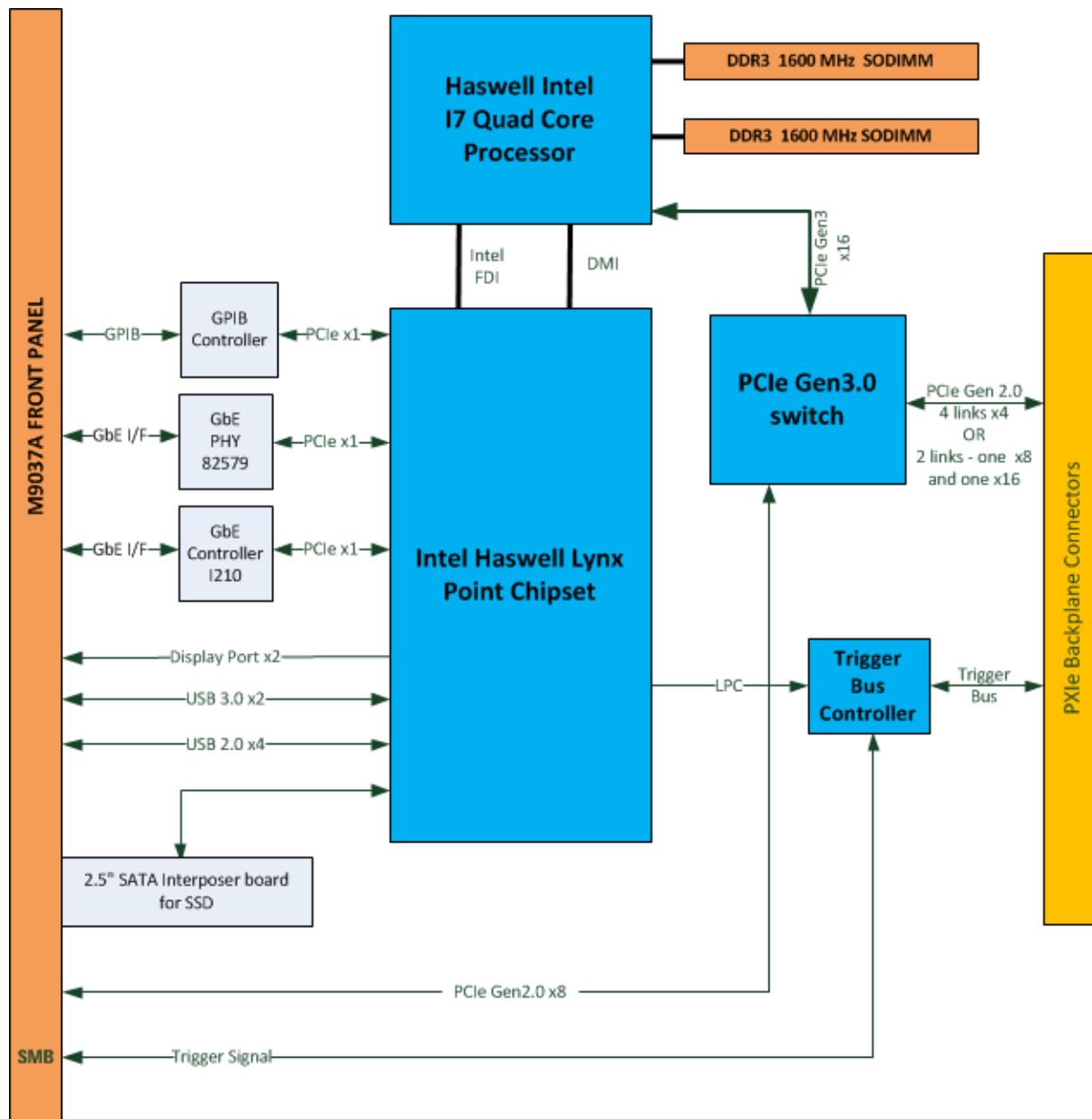
LED1: Activity  
Blinking when  
accessing IO

Status		Speed LED (Green/Amber)	Activity LED (Yellow)
Network link is not established or system is powered off		OFF	OFF
10 Mbps	Link	Off	ON
	Active	Off	Blinking
100 Mbps	Link	Green	ON
	Active	Green	Blinking
1000 Mbps	Link	Amber	ON
	Active	Amber	Blinking

### LAN RST Switch

The LAN RST switch is reserved for Keysight use only. Depressing the LAN RST switch has no effect.

# M9037A Functional Description



**Figure 2** M9037A Embedded Controller Functional Block Diagram

## CPU, Memory and Chipset

By introducing Intel quad core technology, the M9037A has four computing engines on a single processor, which can execute independent tasks at the same time in a multi-tasking environment. Combining this superior performance with a variety of instrument platforms makes the M9037A an ideal solution for your hybrid PXIe-based testing system.

The M9037A is also specifically designed to deliver excellent durability and reliability. A large aluminum heat sink dissipates heat generated by CPU and other critical components uniformly to maintain a stable operating temperature.

### Processor

- Intel i7-4700EQ (Haswell) 2.4 GHz quad core
- DMI (Direct Media Interface) with 1 GB/s of bandwidth in each direction

### Chipset

- Mobile Intel QM57 Express

### Memory

- Two standard 204-pin DDR3 SODIMM sockets
- Supports +1.5V DDR3, 1600 MHz RAM per socket (up to 32 GB total)
- Supports non-ECC, unbuffered memory

#### **NOTE**

The M9037A was tested with the following RAM module configurations:

- one 4 GB RAM module
- one 8 GB RAM module
- two 8GB RAM modules (a total of 16 GB RAM)

Other configurations have not been tested.

---

### CMOS Backup Battery

Keysight's M9037A is equipped with a 3.0 V "coin cell" lithium battery. This battery powers the clock circuit and retains configuration memory in CMOS RAM while the system is turned off.

## I/O Interfaces

### USB\*

Keysight's M9037A provides four USB 2.0 Type A ports and two USB 3.0 Type A ports on the faceplate. All USB ports are compatible with high-speed, full-speed and low-speed USB devices. The M9037A controller supports multiple boot devices. The boot priority and boot device can be configured in BIOS. USB to VGA display adapters are also supported.

**Differences between USB 2.0 and USB 3.0** USB 3.0 is the latest version of the Universal Serial Bus (USB). It provides better speed and more efficient power management than USB 2.0. USB 3.0 is backward compatible with USB 2.0 devices; however, data transfer speeds are limited to USB 2.0 levels when these devices inter-operate.

	USB 2.0	USB 3.0
Backwards Compatibility:	USB 1.1	USB 1.1 and USB 2.0 (data transfer speeds are limited to USB 1.1 or USB 2.0 levels)
Speed:	480 Mbps (known as High Speed/HS)	10 times faster than USB 2.0. Super Speed or SS, 4.8 Gbps
Signaling Method:	Half duplex	Full duplex (Asynchronous -- it can send and receive data simultaneously)
Power:	Up to 500 mA	Up to 900 mA. Allows better power efficiency with less power for idle states. Can power more devices from one hub.
Number of wires within cable:	4	9
Cables and Connectors	Grey color	Blue color. USB 3.0 receptacles are electrically compatible with USB 2.0 plugs if they physically match. USB 3.0 type-A plugs and receptacles are completely backward compatible, and USB 3.0 type-B receptacles accept USB 2.0 and earlier plugs. However, USB 3.0 type-B plugs will not fit into USB 2.0 and earlier receptacles.  This means that USB 3.0 cables cannot be used with USB 2.0 and USB 1.1 peripherals, although USB 2.0 cables can be used with USB 3.0 devices, if at USB 2.0 speeds.

\* The USB 2.0 and 3.0 ports do not support the USB Battery Charging specification. Do not connect non-standard or defective USB devices.



## DisplayPort video connector

The DisplayPort (also known as DisplayPort++) video connectors connect the M9037A to standard video monitors. Multiple monitors are supported. The DisplayPort video ports provide a maximum resolution of 3840 x 2160 @ 60 Hz. Resolution for other video interfaces (such as VGA) depends on the adapter used. Typical maximum resolutions are:

DVI: 1920 x 1200 @ 60 Hz  
HDMI: 2560 x 1600 @ 60 Hz  
VGA: 1920 x 1200 @ 60 Hz

For detailed information about the DisplayPort video, refer to “[DisplayPort Video](#)” on page 36.

## Ethernet

The M9037A has two RJ-45 connectors with link speed/activity LEDs on the faceplate.

## GPIO connector

The GPIO connector on M9037A is a D-sub 25-pin connector and is used to control external bench-top instruments. You need the supplied GPIO adapter cable to connect instruments. The on-board GPIO controller has the following features:

- Compatible with the IEEE 488 standard
- Up to 1.5MB/s data transfer rates
- On-board 2 KB FIFO for read/write operations
- Connect up to 14 instruments
- GPIO is a standard VISA Resource

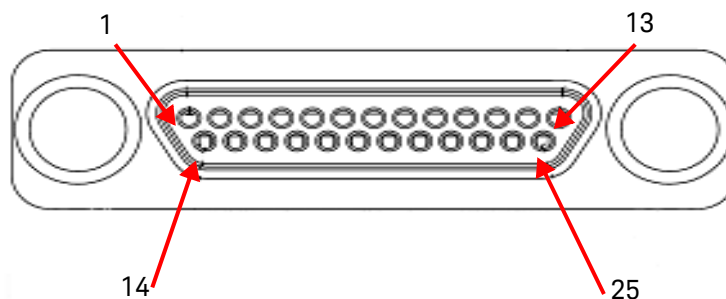
### NOTE

A GPIO cable is NOT supplied with the controller. Note that the GPIO cable is a standard micro type 2 GPIO cable with standard pin wiring and is not compatible with the M9036A Embedded Controller GPIO cable. It is available from Keysight as an accessory cable, part number Y1260A.

### NOTE

You must have Keysight IO Libraries Suite version 16.3 Update 2 (or later) to use the GPIO.

The following table provides the pin-out of the front panel D-sub 25-pin GPIO connector.



Pin	Signal	Description	Pin	Signal	Description
1	DIO1#	GPIB Data 1	14	DIO6#	GPIB Data 6
2	DIO2#	GPIB Data 2	15	DIO7#	GPIB Data 7
3	DIO3#	GPIB Data 3	16	DIO8#	GPIB Data 8
4	DIO4#	GPIB Data 4	17	REN	Remote Enable
5	EOI	End or Identify	18	GND	Signal Ground
6	DAV	Data Valid	19	GND	Signal Ground
7	NRFD	Not Ready for Data	20	GND	Signal Ground
8	NDAC	Not Data Accepted	21	GND	Signal Ground
9	IFC	Interface Clear	22	GND	Signal Ground
10	SRQ	Service Request	23	GND	Signal Ground
11	ATN	Attention	24	GND	Signal Ground
12	Shield	Chassis Ground	25	GND	Signal Ground
13	DIO5#	GPIB Data 5			

### PXI trigger (TRIG)

The front panel PXI trigger connector is an SMB connector and is used to route an external trigger signal to or from the PXI backplane or from a software-generated trigger. Trigger signals are TTL compatible and edge sensitive. The M9037A provides the following trigger routing possibilities:

- From the front panel PXI trigger connector to a specified PXI backplane trigger bus line.
- From a selected PXI backplane trigger bus line to the front panel PXI trigger connector.

- From a software-generated trigger to a specified PXI backplane trigger bus line.
- From a software-generated trigger to the front panel SMB connector via a specified PXI backplane trigger bus line.

**Trigger IO functions** All trigger modes are programmable through the factory-installed IVI trigger driver (M9037). You can learn more about the trigger functions by using the M9037A Soft Front Panel software available at: Select the Windows **Start** button > **Keysight** folder > **PXIe Embedded Controller** folder > **Embedded Controller SFP**.

Also, refer to the Trigger Driver help files for information on using the trigger functions. The help files are available at: Select the Windows **Start** button > **Keysight IVI Drivers** folder > **AgPxiPc PXIe Embedded Controller** > **Documentation**.

- The default trigger route (the path established at power on or at `ResetRoute`) has no internal connection to the front panel SMB connector and no connection to any of the PXI backplane trigger lines.
- If you read the current trigger routing (`GetRoute`) at power on or after executing a `ResetRoute`, it will return the string:  
`AgPxiPcTriggerRouteNone`.
- Trigger routes other than the four described above and in the following diagrams are invalid and result in an error. For example, you cannot route a trigger from one backplane trigger bus line to another backplane trigger bus line. Similarly, you cannot route a trigger sourced by the front panel SMB connector back to itself.

Refer to the following diagrams and explanations. Also, for an example program, refer to the IVI program examples; go to:

**C:\ProgramFiles\IVI Foundation\IVI\Drivers\AgPxiPc**

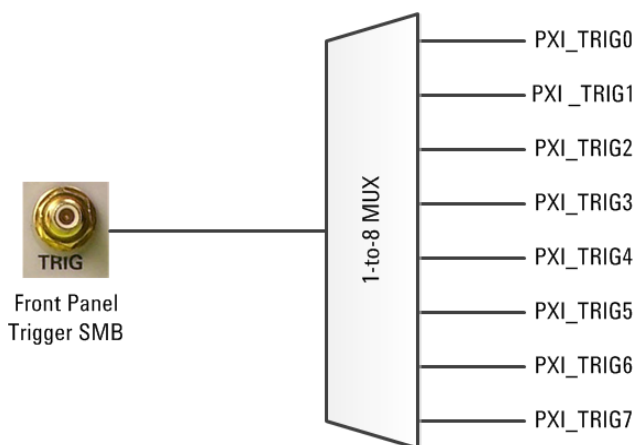
or

**C:\ProgramFiles (x86)\IVI Foundation\IVI\Drivers\AgPxiPc**

### Front panel SMB trigger connector to selected backplane trigger bus

**Trigger Source:**  
Front Panel SMB Trigger Connector  
(External)

**Trigger Destination:**  
One of the eight PXI backplane trigger lines



#### IVI Driver Syntax (C#):

```
TriggerRouting.SetRoute (
    AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteExternalToTriggerBus,
    AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7])
```

#### Notes:

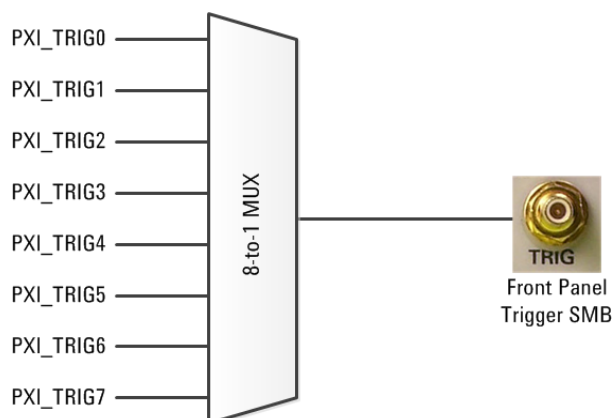
- You must select only one of the eight PXI backplane trigger bus lines (PXI\_TRIG[0:7])
- TriggerRouting.Enabled returns “true” if and only if the trigger routing subsystem is enabled.
- Use TriggerRouting.RouteConfiguration to determine the current routing configuration.
- TriggerRouting.ResetRoute() opens all trigger routing paths and disables the trigger routing subsystem.

### Selected backplane trigger bus to front panel SMB trigger connector

**Trigger Source:**

One of the eight PXI backplane trigger lines

**Trigger Destination:**

 Front Panel SMB Trigger Connector  
(External)

**IVI Driver Syntax (C#):**

```
TriggerRouting.SetRoute (
  AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteTriggerBusToExternal,
  AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7])
```

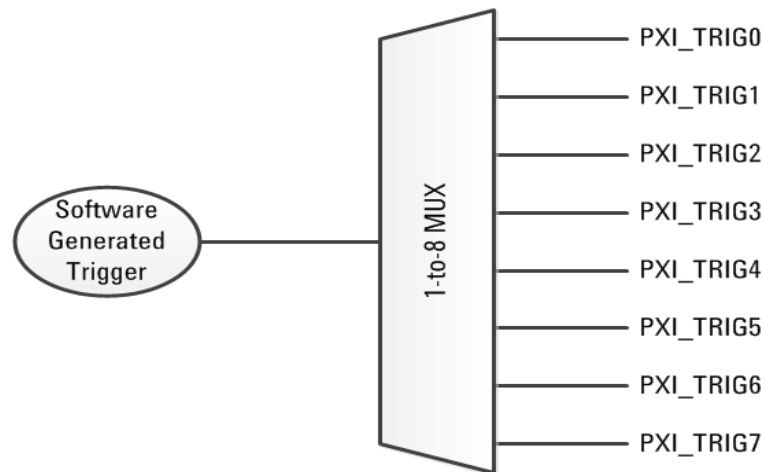
**Notes:**

- You must select only one of the eight PXI backplane trigger bus lines (PXI\_TRIG[0:7])
- TriggerRouting.Enabled returns “true” if and only if the trigger routing subsystem is enabled.
- Use TriggerRouting.RouteConfiguration to determine the current routing configuration.
- TriggerRouting.ResetRoute opens all trigger routing paths and disables the trigger routing subsystem.

### Software generated trigger to selected backplane trigger bus

**Trigger Source:**  
Software Generated

**Trigger Destination:**  
One of the eight PXI backplane trigger lines



IVI Driver Syntax (C#):  
 TriggerRouting.SetRoute (  
 AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteSoftwareToTriggerBus,  
 AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7]);

To set the software trigger level use the property:  
 TriggerRouting.SoftwareRouteTriggerState  
 For example, to create a negative-going edge (⌋):  
 TriggerRouting.SoftwareRouteTriggerState = true;  
 TriggerRouting.SetRoute (  
 AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteSoftwareToTriggerBus,  
 AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7]);  
 TriggerRouting.SoftwareRouteTriggerState = false;

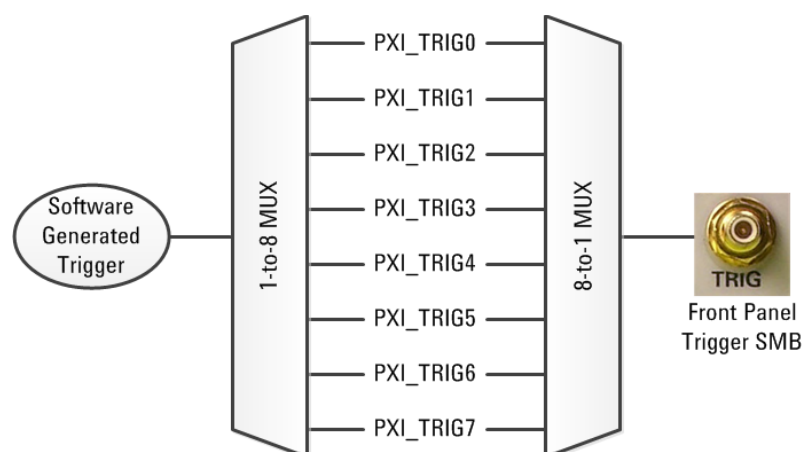
#### Notes:

- A “software trigger” does not generate a trigger pulse. The SoftwareRouteTriggerState property in the IVI driver defines a voltage level: True = 3.3V (asserted) and False = 0.0V (not asserted). To generate a pulse, you must toggle the state of the SoftwareRouteTriggerState property; that is, set the property to one state, wait for the desired length of pulse, and then set the property to the opposite state.
- You must select only one of the eight PXI backplane trigger bus lines (PXI\_TRIG[0:7]) as a destination.
- TriggerRouting.Enabled returns “true” if and only if the trigger routing subsystem is enabled.
- Use TriggerRouting.RouteConfiguration to determine the current routing configuration.
- TriggerRouting.ResetRoute opens all trigger routing paths and disables the trigger routing subsystem. ResetRoute does not alter the state of the SoftwareRouteTriggerState property. However, the Reset method of the IVI driver resets the state to the power-on default of True (3.3V).

### Software generated trigger to selected backplane trigger bus and front panel SMB trigger connector

**Trigger Source:**  
Software Generated

**Trigger Destination:**  
One of the eight PXI backplane trigger lines and the front panel SMB trigger connector



IVI Driver Syntax (C#):

```
TriggerRouting.SetRoute (
AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteSoftwareToTriggerBusAndExternal,
AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7])
```

To set the software trigger level use the property:

```
TriggerRouting.SoftwareRouteTriggerState
```

For example, to create a negative-going edge ( $\neg$ ):

```
TriggerRouting.SoftwareRouteTriggerState = true;
```

```
TriggerRouting.SetRoute (
```

```
AgPxiPcTriggerRouteEnum.AgPxiPcTriggerRouteSoftwareToTriggerBusAndExternal,
AgPxiPcPxiTrigEnum.AgPxiPcPxiTrig[0:7]);
```

```
    TriggerRouting.SoftwareRouteTriggerState = false;
```

Notes:

- A “software trigger” does not generate a trigger pulse. The `SoftwareRouteTriggerState` property in the IVI driver defines a voltage level: True = 3.3V (asserted) and False = 0.0V (not asserted). To generate a pulse, you must toggle the state of the `SoftwareRouteTriggerState` property; that is, set the property to one state, wait for the desired length of pulse, and then set the property to the opposite state.
- You must select one of the eight PXI backplane trigger bus lines (TTL TRIG[0:7]). The software-generated trigger signal will be active on the selected backplane trigger bus line and thus available to any PXI module installed in the chassis. You cannot select only the front panel SMB trigger connector as a trigger destination without selecting one of the PXI backplane trigger bus lines.
- `TriggerRouting.Enabled` returns “true” if and only if the trigger routing subsystem is enabled.
- Use `TriggerRouting.RouteConfiguration` to determine the current routing configuration.
- `TriggerRouting.ResetRoute` opens all trigger routing paths and disables the trigger routing subsystem. `ResetRoute` does not alter the state of the `SoftwareRouteTriggerState` property. However, the `Reset` method of the IVI driver resets the state to the power-on default of True (3.3V).

**Trigger bus routing** A formal PXI trigger bus specification does not yet exist. Consequently, trigger bus routing across PXI\_TRIG segments may not work on all non-Keysight PXI chassis. Of course, the PXI\_TRIG routing of all Keysight chassis works with any controller due to the open nature of the drivers. Keysight is working with PXISA to define a standard chassis trigger routing driver.

## SATA port

The M9037A provides a SATA 2.0 connector and is shipped with a pre-installed 2.5" 240GB SATA 2.5" solid state drive (SSD). The SSD may be replaced from the module's front panel without removing the module from the chassis.

## Upgrading from the M9036A

If you already have a Keysight M9036A Embedded Controller and you are upgrading to an M9037A, be aware of the following:

- The GPIB connector and cables are not compatible.
- The video cables and adapters are not compatible.
- The IVI and LabVIEW API drivers and the Soft Front Panel software are not the same. You will need to update any programs/applications you have written and rebuild them. The IVI Driver syntax (for the Trigger driver) M9036A used `AgM9036Trigger...` (for example, `AgM9036TriggerRouteTriggerBusToExternal`) but the M9037A uses `AgPxiPxTrigger...`. Other than the prefix, the commands are identical.
- The M9037A Trigger Output has a mild pull-down (via a 100 K $\Omega$  resistor) to ~0 V. The M9036A Trigger output floated to ~3 V.



## M9037A Accessories

Accessory Number	Description
Y1206A	Keyboard and optical mouse
Y1260A	GPIB Cable*
Y1262A	DisplayPort Cable
Y1264A	Spare SSD with Carrier, WES7, 32-bit preinstalled†
Y1265A	Spare SSD with Carrier, WES7, 64-bit preinstalled†
Y1212A	Slot Blocker Kit (5 single slot blockers)
Y1213A	EMI Filler Panel Kit (5 single slot panels)
Y1214A	Air Inlet Kit (one 3-slot, two 1-slot)

\* This is not the same GPIB cable used on the Keysight M9036A PXIe Controller, they are not compatible.

† The Y1264A and Y1265A spare SSDs will not work in M9036A Embedded Controller



## 2 Using the Controller

Your M9037A comes with either the Microsoft Windows Embedded Standard 7 (WES7) 32-bit or 64-bit Operating System preinstalled along with Keysight's IO Libraries Suite. This chapter provides general system configuration and preventive maintenance procedures that you are responsible for. In general, the M9037A operates as any other PC.

The M9037A controller supports USB CD-ROM drive, USB flash disk, or a USB external hard drive as the first boot device. Please refer to [“Accessing the BIOS setup utility”](#) on page 53 for information about setting the boot devices. These devices should be configured, installed, and tested with the supplied drivers before attempting to load a new operating system.

### CAUTION

To minimize the risk of data loss, you should do the following:

- Create a system repair disk.
  - Periodically create a complete system image. [page 42](#).
  - Back-up your important data daily to an external memory device.
-

## Activating Microsoft Windows

Keysight ensures that your copy of WES7 is activated at the time it ships from the factory. However, the first time you install and turn on the M9037A and the Windows OS starts, you must accept the End User License Agreement (EULA). A copy of the EULA was included in your controller shipment. A copy of the EULA is included on your controller in the folder:

**C:\Windows\System32\en-US\License\OEM\Professional\license.rtf**

For information about Windows EULA, go to [www.microsoft.com](http://www.microsoft.com).

### How to verify Windows Activation

To verify WES7 Activation, do the following:

- 1 Open the System by clicking the Windows **Start** button. Click **Control Panel**, then **System**.
- 2 Scroll down to the bottom of the screen. Under **Windows Activation**, you can view the activation status.

#### CAUTION

By Keysight's agreement with Microsoft, Windows Automatic Update is turned off at installation. You may choose to turn Windows Automatic Update on after starting the operating system. However, Keysight cannot be held responsible for changes to the system caused by the automatic update process. It is possible for automatic updates to cause unexpected behavior in the system.

---

## Controller Startup

After installing the M9037A controller in a PXIe chassis, press the chassis' power on button. After a few moments, the controller will beep indicating it passed its Power On Self Test (POST). Typically, you would allow the controller to run through its normal startup routine. However, at the initial startup splash screen, you can press the <**DELETE**> key to enter the BIOS setup or press <**F7**> for the boot order menu.

**NOTE**

Depending on the system configuration, the BIOS may take up to 90 second (or longer) to boot. During this time, the Keysight splash screen is present and it may appear that nothing is happening. This is generally caused by the inclusion of certain devices in the switch fabric (such as RAID controller) that require a longer time for PCI enumeration.

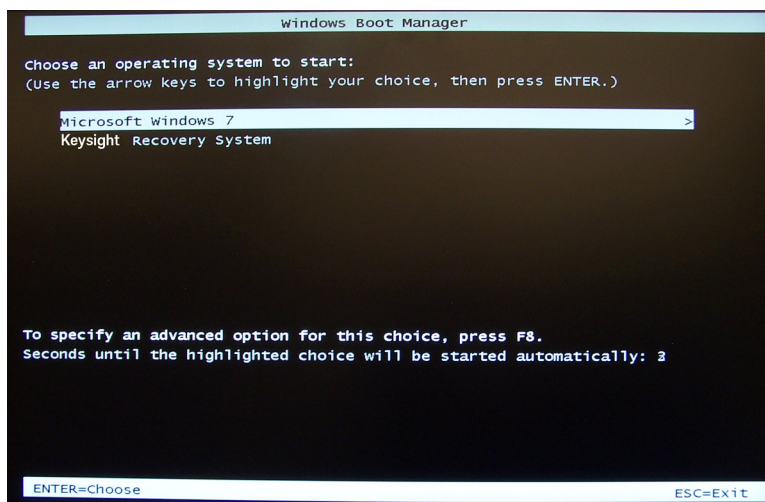
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**NOTE**

The M9037A controller and the M9018A chassis will automatically boot under the following conditions:

- Two M9018A chassis. The master has the M9037A controller installed. The subordinate chassis has a Keysight M9021A installed.
  - Both chassis are powered on and then you power down the master chassis.
  - Connect a PCIe cable from the subordinate chassis' M9021A to the M9037A controller in the master chassis.
  - The controller and master chassis automatically boot.
-

With WES7, you will see the following screen. Either press the Enter key or simply ignore it and the Windows OS will start normally. Either one allows the WES7 operating system to start normally:



**Figure 3** Windows Embedded Standard 7 Operating System Boot Manager

After a few moments, the operating system starts.

#### NOTE

Microsoft Windows Embedded Standard 7 (WES7) 32-bit or 64-bit is the only operating system installed on your M9037A. It includes a small system partition for the Keysight Recovery System. If you select the Keysight Recovery System, the Windows Boot Manager opens a menu with five selections:

- 1) Run Check Disk on the system drive
- 2) Recover the original factory system image
- 3) View troubleshooting documentation
- 4) Repair the system drive
- 5) Exit and restart the instrument.

Enter your selection and press the **OK** button. Follow the instructions on the screen.

## Chassis Power Inhibit Functionality

On some PXIe chassis, the controller may go into a state where the blue Status LED on the front panel is constantly lit but the controller never boots.

- For the Keysight M9018A 18-Slot PXIe chassis, this may happen when the rear panel Inhibited switch is set to “MAN.” If the controller is stuck in this state, toggling (pulse low for a minimum of 500 ms) the Inhibit pin (pin 5) on the DB-9 connector causes the system to reboot. Alternately, change the Inhibit switch to the Default position and then power-on or reboot the chassis.
- For other chassis, refer to the manufacturer’s chassis documentation.

## Changing and Restoring the PCIe Link Configuration

*PCIe link configuration* refers to how the PXIe chassis (such as the M9018A) 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 refer to the M9018A User Guide (available from the Windows **Start** button, select **All Programs > Keysight > M9018A**).

The M9018A 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. This link can be routed by the PCIe Switch Fabric to the chassis slots as either x4 or x8 links.

The other supported PCIe link configurations are:

- **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 1 can be routed by the PCIe Switch Fabric to slots 2-9, while Link 2 can be routed to slots 10-18. This fabric provides a pair of x8 links for high data IO performance.
- **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. This fabric is more compatible with other non-Keysight system modules.

If your system design requires another PCIe link configuration, such as 2x8, you’ll need to use the chassis Configurator utility to change the PCIe Switch Fabric from 1x8 to 2x8.

**CAUTION**

Once the chassis 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 chassis configuration process runs to completion, perform the following:

- 1 Windows power management Sleep and Hibernate modes must be disabled so that your computer doesn't power down during the configuration process.
- 2 Do not turn your M9037A Controller off nor terminate the Configurator program while it is reconfiguring the switch fabric.

If the configuration process is interrupted, see section [Restoring operation after an interruption of the configuration process](#) in the M9018A User Guide for information on how to restore your system to an operating state. The User Guide was supplied with the M9018A chassis and is available on the web at:

[www.keysight.com/find/M9018A](http://www.keysight.com/find/M9018A)

---

**CAUTION**

Changing the PCIe fabric to one that is incompatible with your system controller can cause PCIe connectivity problems with the M9018A PXIe chassis. Review the PCIe Fabric Configurator documentation provided in the M9018A User Guide before reconfiguring your chassis PCIe fabric.

---



## Selecting a Link Configuration

Selecting the right link configuration (link fabric) for your application depends on several factors. The following table lists the best link setting depending on the system controller you are using. The 2x8 fabric is the generally recommended fabric for everything EXCEPT the Keysight M9021 System Interface Module.

System Controller (Slot 1)	1x8 Link	2x8 Link (best link fabric for most applications)	4x4 Link
M9021A to External Host PC	Use this link configuration	Do not use this link configuration	Do not use this link configuration
M9037A PCIe Embedded Controller	See note 1 below	Recommended link configuration See note 3 below	Works but not the highest performance See note 3 below
Other Embedded Controllers	See note 1 below	See note 2 below	Use this link configuration

**Note 1.** All system modules will support PCIe operation when the M9018A is in the 1x8 fabric, however only the M9021 is recommended for normal operation in 1x8. The 1x8 fabric is the default fabric configured when the M9018A PCIe Load Base Configuration button is pressed at power on.

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

**Note 3.** The M9018A 2x8 fabric is recommended when using the Keysight M9037A Controller for performance reasons because it facilitates x8 connectivity to the x8 slots of the M9018A chassis (slots 2, 6, 11, and 15).

### 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 prescribed slots no matter the link configuration of our chassis but communication to the host would be restricted to x4.
- Also, you get larger segments for 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 PCIe Load Base Configuration push button to restore the default 1x8 fabric to allow you to again operate the M9018A chassis.


For example, 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).

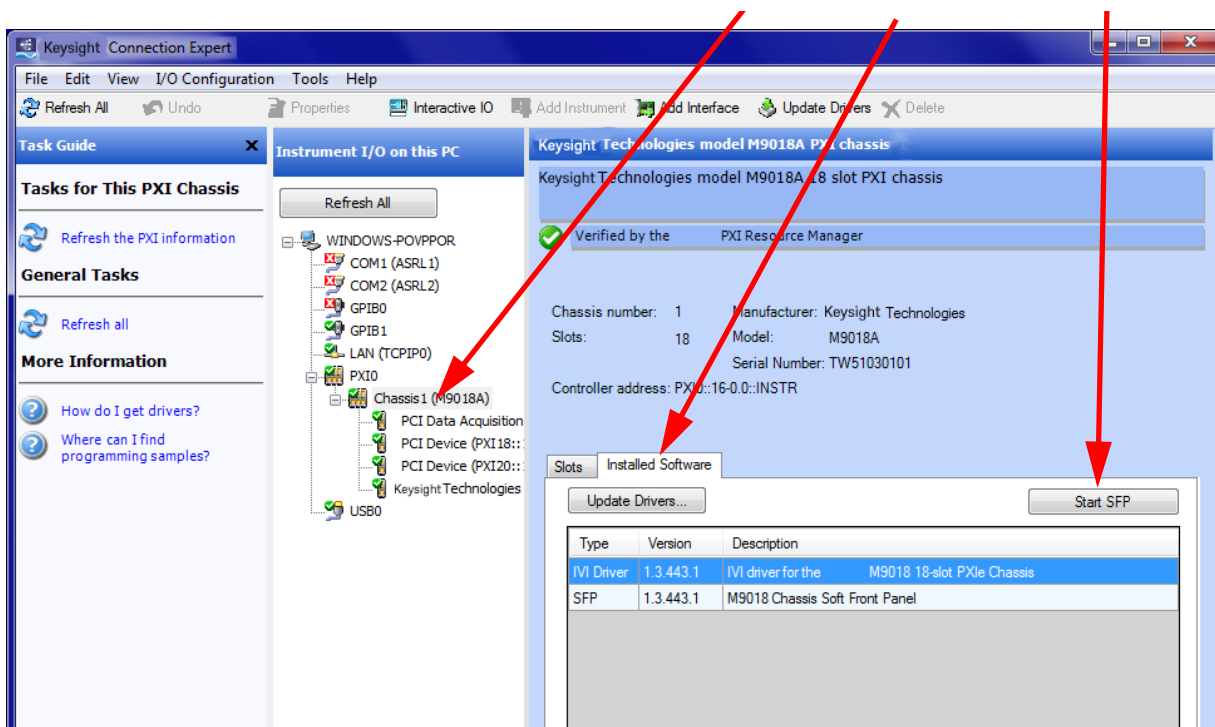
To restore an M9018A configuration that will work with the M9021 interface, you can do one of two things:

- 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 information in the M9018A User Guide on PCIe Load Base Configuration push button to restore the default M9018A fabric. (Note: requires disassembly of the M9018A casing.)

The **Configurator** utility program is available from the Windows **Start** button; select **All Programs > Keysight > M9018A**. Instructions for using the **Configurator** program are provided in the M9018A Chassis User Guide.

## Using Keysight Connection Expert

- 1 From the Windows Start button, select **All Programs > Keysight IO Libraries Suite > Keysight Connection Expert**. Alternately, you can double-click the IO control icon (  ) in the lower right Windows Notification area to run Keysight Connection Expert.
- 2 The **Instrument I/O on this PC** pane shows instrument connections on your controller. From here you can interact with the instruments in the chassis. For example, [Figure 4](#) shows the M9018A PXIe chassis is selected. Select the Installed Software tab in the right-hand pane. Then select the Start SFP button to initiate the Soft Front Panel software for the instrument (in this example, the chassis).



**Figure 4** Keysight Connection Expert LAN (TCPIP0) Connection

## DisplayPort Video

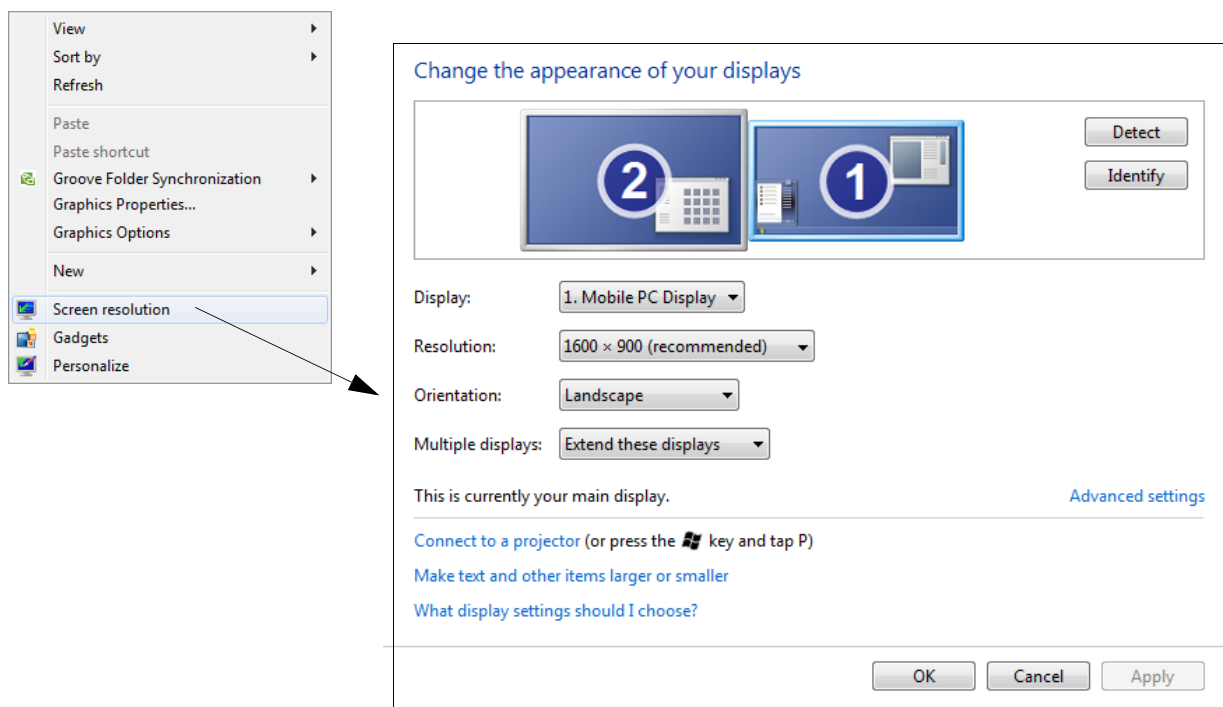
DisplayPort\* is designed to be compatible with legacy display monitors. However, you may need a simple and inexpensive DisplayPort to DVI, HDMI, or VGA adapter. DisplayPort provides high resolution and long video cables. You must purchase an adapter for other video interfaces (such as VGA); maximum resolution depends on the adapter used.

A standard copper DisplayPort cable can support a video resolution of up to 3840 by 2160 over a length of 6.5 feet or 1080p resolution up to 50 feet.

### Using Multiple Monitors

Keysight's M9037A controller supports dual monitor configurations through the two DisplayPort connectors. Once you've connected the two monitors, you may want to configure their arrangement.

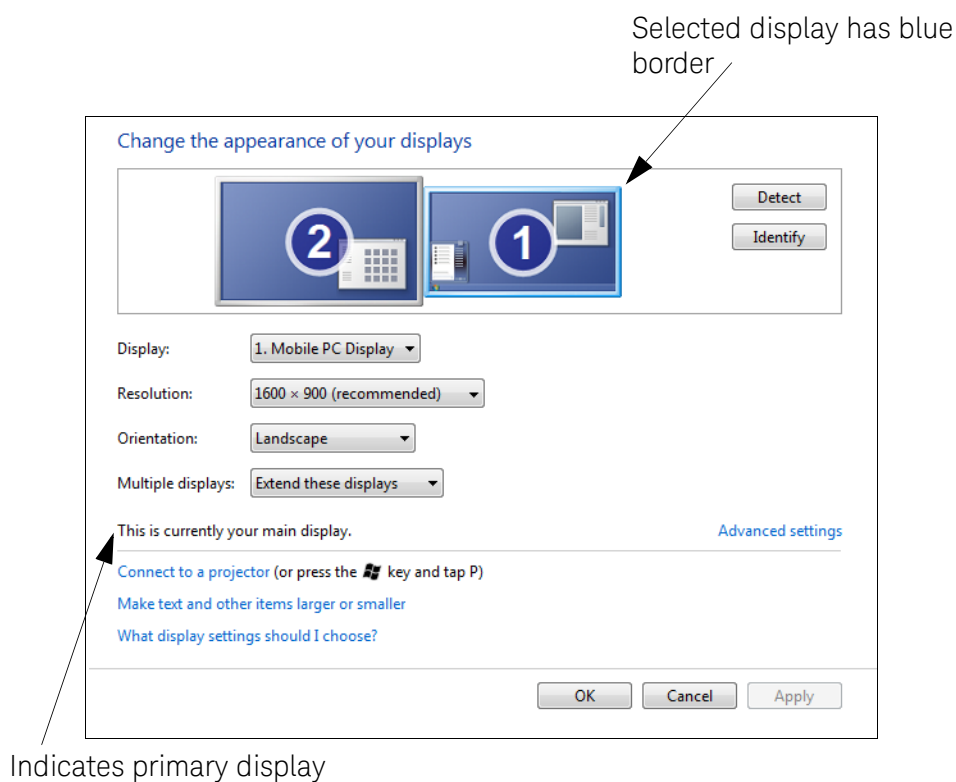
Right-click on a blank area of the display (Desktop) then click on **Screen Resolution**. This opens the Screen Resolution display:



**Figure 5** Setting up multiple monitors

\* DisplayPort (also known as DisplayPort++) is a digital display interface developed by the Video Electronics Standards Association (VESA). The interface is primarily used to connect a video source to a display device such as a computer monitor, though it can also be used to carry audio.

Click on the **Identify** button. One of the screens will be your “primary” monitor (numbered 1) and the other the secondary (numbered 2). Click on one of the two the monitor displays, the border around the display changes to a light blue. Check **Make this my main display** on the monitor you want to be your primary display—the main taskbar and Start menu will appear here, as well as the initial run of most application windows. Both monitors should have **Extend desktop to this display** selected in the **Multiple displays** drop down menu.



**Figure 6** Multiple monitors

## Audio

There is no audio hardware or drivers included in the M9037A controller. Other than the Power-On Self Test (POST) beeps, you will hear no sound from the controller. The means that there are no Windows alerts or sounds.

## BIOS Settings

The Basic Input/Output System (BIOS) is a program that provides a basic level of communication between the processor and peripherals. The BIOS setup program includes menus for configuring settings and enabling M9037A controller features. In general, you should leave the BIOS settings alone. If you are knowledgeable in BIOS settings you may want to set the following.

- Passwords
- PCIe Boot (Holdoff) Time
- Restoring Defaults (User Set or Factory Defaults)
- Automatic Power-on
- Monitor System Status

### NOTE

Depending on your application, you may never need to update the BIOS on your M9037A. However, you should always upgrade to the latest Keysight BIOS. Any BIOS update for the M9037A will be available on the Keysight web site: [www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A).

The BIOS is custom designed specifically for the M9037A. Do not attempt to replace it with a generic BIOS.

### CAUTION

Modifying BIOS settings may cause unexpected behavior in the M9037A. If this happens, follow the instructions under “**Clear CMOS**” on page 57 and then restore the factory default settings. Do not change a BIOS setting unless you are absolutely certain of what it does.

## Passwords

There are two passwords that may be set using the BIOS Setup Utility: Administrator Password and User Password.

**Administrator Password** If the Administrator Password is set, then before the BIOS Setup Utility can be entered, a message box appears asking for that Password. After the Administrator Password is entered the controller will continue into the BIOS Setup Utility.

**User Password** If the User Password is set, then before the black splash screen is displayed a message box will appear asking for that Password. After the User Password is entered the controller will continue to the black Splash Screen. At that time if the **[Delete]** is pressed the Setup Utility will be entered. Notice the Administrator Password was NOT needed even if it is set.

## PCIe Boot (Holdoff) Time

You should not need to change the PCIe Boot time. However, some PXIe instrument modules may take longer to be ready for enumeration than the PXI link ready requirement of 100ms. Consequently, it is possible for some controllers (such as the Keysight M9037A Embedded Controller) to enumerate the chassis before all of the individual modules are ready and therefore not enumerate them. If you have a situation where Keysight Connection Expert and/or the Windows Device Manager consistently do not find specific instrument modules when the chassis powers up, increase the wait time (valid range is 0 to 60 seconds).

This can be configured from the **Advanced** BIOS screen > **Holdoff Timer**.

## Restoring Defaults (User Set or Factory Defaults)

There are two types of stored default settings. They are

- **Factory Default Values:** The initial optimal setting that were shipped with the M9037A from the factory. Both the User Password and the Administrator Password are cleared.
- **User Default Values:** You can modify the BIOS settings and save them to memory and restore them when needed.

## Automatic Power-on

By default setting, the M9037A will turn on as soon as it senses that power is applied. This means that the chassis will power up as soon as you insert the controller into an M9018A chassis. Alternate BIOS settings are:

- Start the system only when the chassis power switch is pressed
- Power the system to its last power state prior to losing power.

This can be configured from the **Main** BIOS screen > **Power-up Mode**.

## Monitor System Status

The BIOS monitors the following on the controller module:

- PCIe switch temperature
- CPU temperature
- Main PC board temperature
- Power supply voltages

These can be observed from the **Main** BIOS screen > **System Management**.

## Windows security

If your system is connected to the Internet, you should take the following steps to ensure the operating system is protected:

- Use an Internet fire wall
- Get the latest Windows updates
- Install and use up-to-date antivirus software.

To check the status of, or make changes to, the security settings for your controller, open the Windows Security Center (Start > Control Panel > System > Windows Update > Change Settings).

## Windows updates

The default system setting is Windows Automatic Updates is turned off. You need to manually update Windows OS by accessing Internet Explorer and from the **Tools** menu, select **Windows Update**.

### NOTE

Downloading and installing Windows Updates can be network and CPU intensive (impacting system performance) and some Windows Updates automatically reboot the controller. Therefore, Windows updates should be performed when the system is not in normal use.

### NOTE

There is no antivirus or anti-spyware software included with your controller. Antivirus application software is the customer's responsibility. Having antivirus software installed may have a slight impact on system performance if your system uses intensive network data transfer.

## User data backup

All user data should be regularly backed up to an external memory device. This can be done across a network or to a USB device. Your IT department may already have a backup strategy which is suitable for the system and data. Also, user data back up must be done just prior to sending the controller back to Keysight for service.

The WES7 operating system supplied with your M9037A is licensed for use on the Solid State Drive (SSD) installed in the controller. If the SSD is replaced, you may be responsible to purchase or relicense the operating system.



## System Backup and Recovery

After activating the Windows OS, you should create a complete System Image of your SSD as a backup in case you ever need to reinstall the operating system. There are several third-party backup solutions available. By definition, a system image is an exact copy of the computer hard drive. A system image includes the Windows operating system files as well as your system settings, application programs, and data files. You should regularly create a system image so that all data, applications, etc. have backups. The system image may be stored on a USB memory stick, multiple CD/DVDs, an external (USB) hard drive, or to a separate LAN drive.

When you restore your hard drive from a system image, it's a complete restoration—you cannot choose individual items to restore, and all of your current programs, system settings, and files are replaced with the contents of the system image. Therefore, you should also keep a regular backup of your data and applications.

You can also create Windows Restore Points to return your system files and settings without affecting data or application files.

Microsoft Windows Embedded Standard 7 (WES7) 32-bit or 64-bit operating system is the only operating system installed on your M9037A. In WES7 there is a small system partition for the Keysight Recovery System on the SSD. During the WES7 boot process, you are given the choice to boot to WES7 normally or boot from the recovery partition.

### NOTE

**Some third-party backup utilities may destroy Keysight's Recovery System partition. If this happens, the Keysight Recovery System will not work.**

## Windows Embedded 7 Recovery Process

During the WES7 boot process, you are given the choice to boot to the Windows operating system normally or boot from the recovery partition. If you select to boot from the recovery partition, you are prompted to review the Keysight Technologies Software License Agreement. Click **YES** to review the agreement, click **NO** to proceed. You must then accept the agreement in order to proceed. The Windows Boot Manager opens a menu with five selections:

- 1) Run Check Disk on the system drive**
- 2) Recover the original factory system image**
- 3) View troubleshooting documentation**
- 4) Repair the system drive**
- 5) Exit and restart the instrument.**

Enter your selection and press the **OK** button. Follow the instructions on the screen.

**NOTE**

Selection number 2 restores Keysight's original factory system image. All data and system applications are lost.

---

## Create a System Image

You should regularly create a system image of the SSD on the M9037A. The following procedure explains how to create an initial system image after activating Windows.

**NOTE**

If you purchase a replacement SSD drive (or hard disc drive) from a vendor other than Keysight, it must be the same size or larger than the original (240 GB) SSD in your M9037A. You cannot create a system image of one size of hard drive and then try to restore it to a smaller hard drive.

---

Always store your back up CDs/DVDs, hard drives, memory sticks, etc., in a secure place to prevent unauthorized access to your files

**NOTE**

Some third-party disk backup utilities may destroy the Keysight backup partition. If this happens, the Keysight Recovery System will not work. follow the instructions provided on the following pages carefully.

---

To create a complete image backup of the SSD, perform the following steps before running your image backup solution:

- 1** Unhide the Keysight Recovery Partition. If you do not do this, it remains hidden and not included in the system image.
  - a** Click the Windows Start button.
  - b** Type **CMD** into the **Search programs and files** text box.
  - c** Press **CTRL+SHIFT+ENTER**. This is the keyboard shortcut allowing elevation to "Run as Administrator."
  - d** In the DOS Command window, type: **CD\** and press **Enter**.
  - e** In the DOS Command window, type: **CD Agilent\Scripts**. Press **Enter**.
  - f** Type: **HideUnhideRecoveryPartition.vbs unhide**
  - g** Press **Enter**
  - h** The Keysight Recovery Partition is now unhidden and should appear in the Windows File Explorer.
  - i** Close the DOS Command window.

- 2 Connect a USB hard drive to the M9037A. Make certain that Windows identifies and can run the external hard drive. If you are using a LAN drive, make certain the LAN cable is connected to the M9037A.

**NOTE**

The external drive must be formatted NTFS.

---

- 3 Now, run your system image backup solution.
- 4 When you have created the system backup, you can re-hide the Keysight Recovery Partition.
  - a Click the Windows Start button.
  - b Type **CMD** into the Search text box field.
  - c Press **CTRL+SHIFT+ENTER**. This is the keyboard shortcut to trigger elevation to “Run as Administrator.”
  - d In the DOS Command window, type: **CD\** and press **Enter**.
  - e In the DOS Command window, type: **CD Agilent\Scripts**. Press **Enter**.
  - f Type: **Run HideUnhideRecoveryPartition.vbs hide**
  - g Press **Enter**
  - h The Keysight Recovery Partition is now hidden and should not appear in the Windows File Explorer.
  - i Close the DOS Command window.
- 5 The system is now ready for use.

## Restoring a System Image

If your SSD becomes inoperable and you need to replace the SSD, if you have previously created a backup using Microsoft Backup and Restore, you can restore your system using a utility provided by Keysight.

### CAUTION

When you restore your computer from a system image, it is a complete restoration. You can not choose individual items to restore. All of your programs, system settings, and files are replaced with those on the system image.

---

If you have been backing up your system using Microsoft Backup and Restore, you can use a Keysight provided utility to copy your previously saved backup to a new SSD. Go to [www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A), select the **Visit Technical Support** link, click the **Drivers, Firmware, & Software** tab. Click on the **WinSystemRestore** link. This link provides a .zip file with a utility and instructions to prepare your replacement drive.

### NOTE

This Keysight utility does **not** contain a Windows Embedded System image. It describes how to create and use a bootable USB memory stick. Using this utility and a copy of your system image that you previously backed up using Microsoft Backup and Restore, you can copy your backed up image to the new drive.

---

If you used third-party software to create a system image, be sure to follow the instructions in your third-party backup utility to restore the system image. Typically, you will use the most recent backup. Once the system image is restored, your system should function exactly like it was at the time you created the system image.

### NOTE

**IMPORTANT: IMPORTANT:** You must regularly back-up your WES 7 system image because if your SSD fails, there is no other way to get it back. This is required to completely restore your system on the replacement drive including any application files and data you saved on the drive.

---

## Chassis and Controller Shutdown

As with any PC, Windows-based instruments should not be shut down by either turning off the power via an external power source or by pulling the power plug out from the rear panel. This could corrupt the operating system. The approved way to shut down the controller is to execute the Windows shutdown process which shuts down the M9037A controller then turns off the M9018A chassis.

Pressing and holding the M9018A chassis power switch will also power-down the M9037A controller safely.

### Power down modes

Keysight's M9037A defaults to the Windows High Performance Power Plan. This plan does not allow the controller display to shut off or the controller to enter a sleep or hibernate mode. In the following discussion, the power modes or states are:

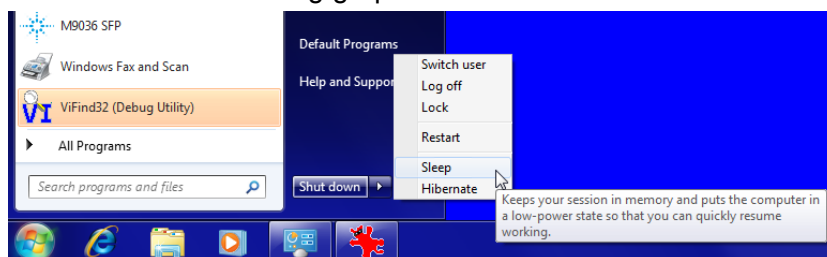
- S0—Power on and fully operational
- S1—Standby (sleep), CPU clock stopped, CPU/RAM powered on.
- S2—Low Power (sleep), CPU powered off, context cache lost.
- S3—Suspend to RAM (sleep), all context lost, system memory retained.
- S4—Suspend to Disk (hibernation), context data written to SSD.
- S5—Power Off (G2, Soft Off), requires reboot, LAN Port 2 is powered.

#### NOTE

You should not enable the Microsoft Windows sleep or hibernate modes. It is possible that the M9037A controller could go into sleep mode while it is running a user test program. The controller may not have proper chassis enumeration when it wakes up.

If you have a USB keyboard with a Sleep button (sometimes this is a key with a moon logo), do not use it.

Do not use the Sleep or Hibernate modes from the Startup Button as shown in the following graphic.



If you install the M9037A controller in a chassis other than the Keysight M9018A, consult your chassis manual for power down behavior.

## Wake on LAN

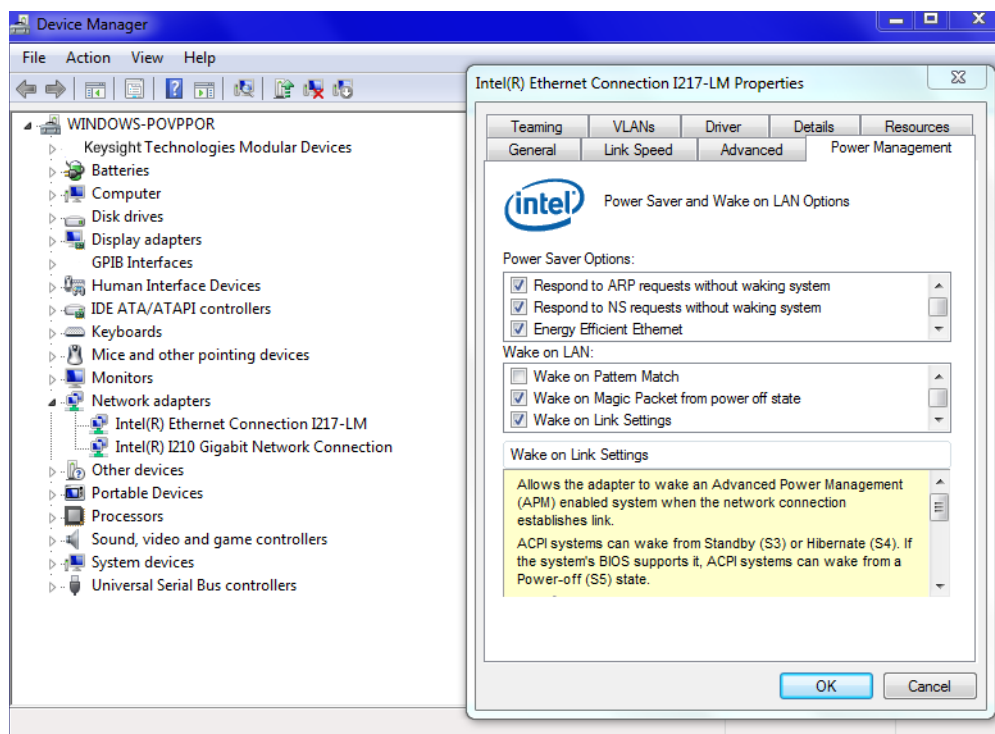
Wake on LAN\* (WoL, also known as Remote Wake-Up) is an industry standard protocol for waking up computers that are in a low power mode (sleep, hibernating, or turned off but still has power applied) to be turned on by a network message. Keysight's M9037A supports WoL when the chassis and controller are powered down but AC power is still applied to the chassis.

On the M9037A, WoL is supported on both LAN ports of the controller. These ports are powered from the auxiliary power supply in the M9018A even if the power is turned off (as long as AC power is still connected to the chassis). The chassis INHIBIT switch must be in the DEFault position.

To configure the M9037A for WoL from power down:

- 1 From the Windows Start button, select **Control Panel > Device Manager > Network Adapters**.
- 2 Double click on the **Intel(R) Ethernet Connection I217-LM**. This opens the Properties dialog box for the Port #1 NIC. See [Figure 7](#). Note that **Intel(R) I210 Gigabit Network Connection is for the LAN Port #2 NIC**.
- 3 Select the **Power Management** tab.
- 4 Select both the **Wake on Magic Packet from power off state** and **Wake on Link Settings** checkboxes.

\* The term "Wake on LAN" is a trademark of IBM Corporation.



**Figure 7** Set the Wake on LAN feature

**5** Click **OK** to save and exit the settings and then close the Windows Device Manager.

Notes: **Wake on Magic Packet\*** This mode is not supported.

**Wake on Magic Packet\* from power off** This mode wakes the M9037A from a power off state (S5) when it receives a Magic Packet\*.

**Wake on Link Settings** If this is the only mode selected, it requires the controller to be in sleep or hibernate mode. This mode is not supported. However, when checked along with **Wake on Magic Packet from power off**, the M9037A will power on when plugging a LAN cable into the LAN 2 connector.

**Wake on Pattern Match** This mode is not supported.

\* The Magic Packet is a broadcast (UDP) frame targeted to the controller. It contains 6 bytes of all 255 (FFFFFFFF in hexadecimal) followed by sixteen instances of the controller's 48-bit MAC address, for a total of 102 bytes. Typical ports for sending WoL Magic Packets are UDP 7 and 9. There are a number of free network tools that can send WoL Magic Packets.

## M9018A chassis and INHIBIT switch

The Keysight M9018A chassis has an INHIBIT switch on the rear panel. It controls whether the M9037A controller or the Inhibit signal on the rear panel DB-9 connector is allowed to turn the chassis power on/off. The default (DEF) switch setting allows the M9037A controller to control chassis power.

For more information, refer to the M9018A chassis documentation.

### Default Position

If the M9018A INHIBIT switch is set to the DEFault position and the chassis is powered up, momentarily pressing the chassis front panel ON button will cause a clean shut down of the M9037A followed by the chassis powering down. The next press of the chassis ON button initiates the standard power up process.

Pressing the M9018A ON button for greater than 5 seconds causes a forced shut down of Windows followed by the chassis powering down. The next press of the chassis ON button initiates the power up process where the chassis will be powered up and then the M9037A brings up Windows. However, Windows safe mode may be displayed in this situation because of the forced shut down of Windows.

### Manual Position

Set the rear panel INHIBIT switch to the MANual position if you want to remotely control the chassis power using the Inhibit signal on the rear panel DB-9 connector. A high (or open circuit) on the Inhibit signal powers up the chassis while a low on the Inhibit signal powers down the chassis. Applying a low on the Inhibit signal powers down the chassis and the M9037A simultaneously - that is, without shutting down Windows first. This may leave Windows in an unknown state. Therefore always shut down Windows prior to powering down the chassis using the Inhibit signal.

To avoid leaving Windows in an unknown state, the front panel ON button can be used with the rear panel Inhibit signal. In this situation, however, the chassis power is no longer completely controlled remotely, and local interaction is required.

If the chassis and M9037A are powered up, momentarily pressing the ON button causes an orderly shutdown of the M9037A, but the chassis remains powered and the M9037A System Status LED HS (Blue) remains on. At this point, you have two options:

- Momentarily press the ON button again to turn on the M9037A and bring up Windows.
- Complete the power down process by grounding the Inhibit signal (pin 5 of the rear panel DB-9 connector).



If the chassis and M9037A are powered up, pressing the M9018A ON button for greater than 5 seconds causes a forced shut down of Windows but, as before, the chassis will not be powered off. At this point, you have the same two options listed in the previous paragraph. However, Windows safe mode may be displayed if the M9037A is turned on because of the forced shut down of Windows.

## Things to not do

As with any PC, there are several system-level settings and files that you should not change, move, or delete as this could cause a number of difficulties.

### Windows Registry

Do not manually make any changes to the registry unless you know exactly what you are doing. Making changes to the registry could affect the controller's ability to boot-up, execute programs, and display desired information.

### Application software

Do not remove files under the **C:\Program Files** folder by any means other than using the Add or Remove Programs utility found on the Control Panel. Do not remove any software application that was preinstalled by Keysight, even using the Add or Remove Program Utility, unless you are instructed by Keysight to do so while performing an update.

### Display Settings

Do not change any of the settings on Settings tab of the Display settings window.

### SSD Drive

Do not repartition the Solid State Drive (SSD) drive or rename any of the existing partitions. Doing so could cause the controller to either not have the disk space required or not be able to find needed data.

## Software application licenses

Some software applications require a license to use the software. For security reasons the licensing mechanism often uses a composite HostID which depends on several system identifiers. A change to any identifier may result in invalidating the licenses on that system. In general, you can retrieve “lost” Keysight software licenses at any time on the Keysight Software Licensing system (ASL) web site at <http://www.keysight.com/find/softwarelicense>. You will need the license order number and certificate number as well as a valid login and password.

If either of the following occurs, verify and possibly reissue the license.

- The SSD is reimaged, replaced, or corrupted.
- The controller motherboard is replaced or the primary (system) BIOS serial number has changed.

For more information, refer to the software application documentation.

## Microsoft Operating System Licensing

The Microsoft Windows Embedded Standard 7 (WES7) 32-bit or 64-bit Operating System supplied with your M9037A is licensed for use on the SSD mounted to the controller. If the SSD is replaced, you may be responsible to purchase or relicense the operating system.

## Drivers

All of the M9037A Controller and M9018A Chassis drivers were installed on your controller at the factory. You should not need to reinstall them. However, you should periodically check the M9037A web page ([www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A)) for updated drivers. Instructions for updating the drivers are on the web.

For the IVI driver, help file, program examples, etc. go to the following SSD folder:

```
C:\ProgramFiles\IVI Foundation\IVI\Drivers\AgPxiPc
```

For the Soft Front Panel interface: from the Window's Start menu, select:

```
Start > All Programs > Keysight > PXIe Embedded Controller  
> Embedded Controller SFP
```

## 3 Controller Maintenance

This chapter covers only user information for maintaining the controller. F

### BIOS Setup

The Basic Input/Output System (BIOS) is a program that provides a basic level of communication between the processor and peripherals. In addition, the BIOS also contains code for various advanced features applied to the M9037A controller. The BIOS setup program includes menus for configuring settings and enabling M9037A controller features.

#### NOTE

Depending on your application, you may never need to update the BIOS on your M9037A. However, you should always upgrade to the latest Keysight BIOS. Any BIOS update for the M9037A will be available on the Keysight web site:

[www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A).

The BIOS is custom designed specifically for the M9037A. Do not attempt to replace it with a generic BIOS.

#### CAUTION

Changing BIOS settings may lead to incorrect controller behavior and possibly an unbootable controller. If this happens, follow the instructions under “Clear CMOS” on page 57 and then restore the default settings. Do not change a BIOS setting unless you are absolutely certain of what it does.

## Normal BIOS Operation and Updates

The M9037A has two BIOS images, a Default and a Backup. The Default BIOS is what the system normally boots on, and is updatable by running a BIOS update script from a Windows console. Refer to [“Updating the M9037A BIOS”](#) on page 62.

However, if the Default BIOS becomes corrupt, the Baseboard Management Controller (BMC) detects that the Default BIOS was unable to boot, and re-configures serial connections to allow the Backup BIOS to boot the system. All subsequent boots will be from the Backup BIOS until the user repairs the Default BIOS using a provided tool from Keysight to restore the Default BIOS image to the original shipping BIOS image.

- Typically, all normal boots occur from the Default BIOS; the Backup BIOS is not used.
- Updates to the Default BIOS are done using BIOS update scripts from Keysight which are based on American Megatrends (AMI) tools.
- A BIOS update does not overwrite permanent SMBios data values (such as SerialNumber, BaseBoardVersion, UUID etc), but will clear the customer CMOS settings.

## Accessing the BIOS setup utility

To start the BIOS setup program:

- 1** Power on or reboot your M9037A controller.
- 2** Press the **<Delete>** key when the controller beeps. This should be concurrent with the main startup screen. The BIOS setup program loads after a short delay.

The Main BIOS setup menu, [Figure 1](#), is displayed when you first enter the BIOS setup program.

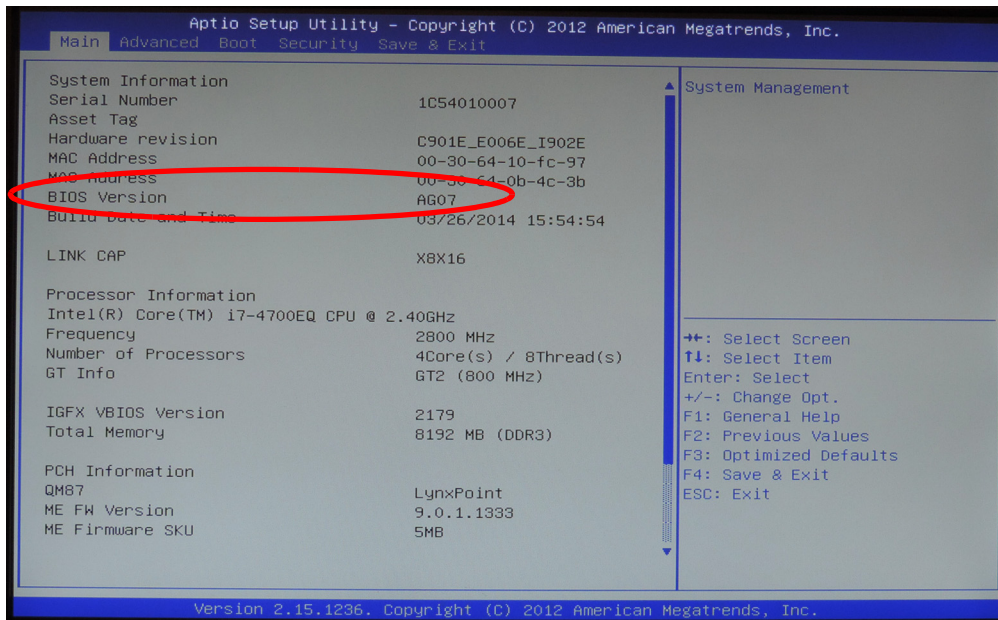
Use the following keys to navigate through the BIOS setup program:

- **<←, →>** - Use the left/right arrow keys to move between the setup menus.
- **<↑, ↓>** - Use the up/down arrow keys to move between options in a menu.
- **<Enter>** - Use this key to enter a submenu or display all available settings for a highlighted configuration option.
- **<Esc>** - Use this key to return to the previous menu. This key serves as a shortcut to the Exit menu when user is at the top-level menus.
- **<+>** and **<->** - Use these keys to cycle between available settings.
- **<Tab>** - Use this key to select time and date fields.
- **<F1>** - This key opens the general help window for the BIOS.
- **<F2>** - This key loads previous values into the BIOS.
- **<F3>** - This key restores default values into the BIOS.
- **<F4>** - This key saves the current configuration and exits the BIOS setup.
- **<F9>** - Use this key to load the optimal default BIOS settings.

## BIOS Main Setup Menu

The Main setup menu reports some basic information of controller:

Current BIOS Version



**Figure 1** Main BIOS Setup Menu

- BIOS Information - This item includes the BIOS version and the date when the BIOS was built.
- Memory Information - This item shows the M9037A’s memory size, type and speed detected by the BIOS.
- ME Information - This value indicates the version of management engine.
- Board Information - Such as hardware revisions and serial number.
- From this screen you can set the system date and time.

## Default Settings

There are two types of stored default settings in the BIOS. They are:

- Factory Default Values: The initial optimal settings that were shipped with the M9037A. Both the User Password and the Administrator Password are cleared.
- User Default Values: The default settings that are saved by using the BIOS Setup Utility. After making changes, tab over to the Save & Exit tab, select the Save as User Defaults field.

## Restoring Defaults

Default settings can be recovered by any of the following three processes:

- Execute a Clear CMOS (see “Clear CMOS” on page 57). This clears more data than **Restore Defaults** alone.
- Entering the BIOS Setup Utility then navigate to the **Save & Exit** tab, select **Restore Defaults**.
- Entering the BIOS Setup Utility then navigate to the **Save & Exit** tab then restore user defaults by selecting the **Restore User Defaults** field.

The first two processes result in the same factory default settings being restored. The Clear CMOS is used when the System or the Setup Utility cannot be entered because either the Administrator Password and/or the User Password is set and unknown. If the Setup Utility can be entered then use the Restore Default field to set all fields back to their default values and clear both passwords.

**Restore Using Clear CMOS** To clear the CMOS RAM, i.e., change the BIOS settings back to the Factory Default Setting, the chassis must be powered down and the M9037A must be removed. See “Clear CMOS” on page 57.

**Restore Using the Setup Utility** To restore the Factory BIOS settings then use the Setup Utility navigate to Save & Exit tab Restore Defaults field and press enter then do a save. The passwords will be cleared, the BIOS settings will return to their factory values. The User Default Values will NOT be cleared including any passwords stored with these values.

## Difference between ClearCMOS and Restore Defaults

Both of these methods set the BIOS values to their factory settings. This includes clearing both the Administrator Password and the User Password. The ClearCMOS should be used when one or both Administrator and User Passwords are unknown, or when Restore Defaults does not work. If the ClearCMOS is used then the clock must manually be set to the correct date/time.

## Restore the User Default Values

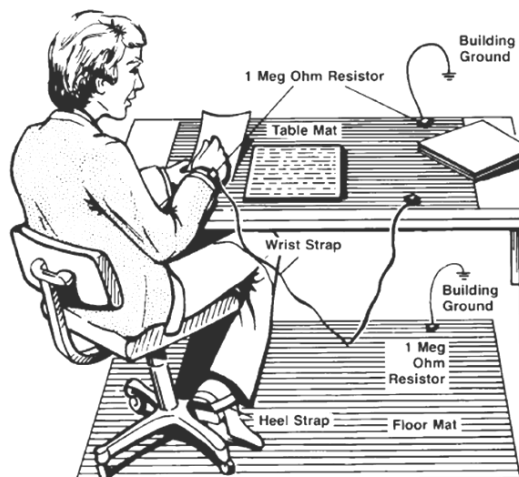
To restore the User Default Values use the BIOS Setup Utility then navigate to **Save & Exit** tab, select the **Restore User Defaults** field, press <Enter> then do a save. The passwords will be the values that were stored, the BIOS settings will set to their User Default values.

## Electrostatic discharge (ESD)

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. The following figure shows an example of a static-safe work station using two types of ESD protection. Purchase acceptable ESD accessories from your local supplier.

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

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



### Inspect for damage

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

#### CAUTION

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

#### NOTE

Information on preventing damage to your Keysight equipment can be found at [www.keysight.com/find/tips](http://www.keysight.com/find/tips).



## Clear CMOS

If you encounter an abnormal condition that causes M9037A to halt or fail to boot, clear the CMOS and restore the controller BIOS to its factory default settings.

### CAUTION

Always observe ESD precautions. See “[Electrostatic discharge \(ESD\)](#)” on page 56.

---

To clear the CMOS:

- 1 Shut down the controller operating system. Do not unplug the chassis.
- 2 Remove the M9037A Embedded Controller from the chassis. Observe all anti-static precautions.
- 3 Locate the Clear CMOS switch on the board. It is near the CMOS backup battery. Move the switch from Normal to Clear. Refer to Figure 2 below.
- 4 Wait at least 30 seconds then return the switch to its Normal position.
- 5 Reinstall the controller back into the PXIe chassis.
- 6 Power on the chassis.
- 7 Press the <Delete> key when the controller beeps. This should be concurrent with the main startup screen. The BIOS setup program loads after a short delay.
- 8 Load Optimized defaults in the BIOS setup.
  - a The Main setup menu reports some basic information of controller. Refer to “[BIOS Settings](#)” on page 38 for more information.
  - b Use the down arrow key (↓) to select the System Date and System Time.
  - c Set these to the correct current date and time.
  - d Press the <F4> key to save the settings and then the <ESC> key to exit the BIOS setup.

### NOTE

System date and time should be set before pressing F4. F4 saves and then exits the BIOS setup utility. If the BIOS data is not saved before exiting the utility, then the last BIOS settings remain.

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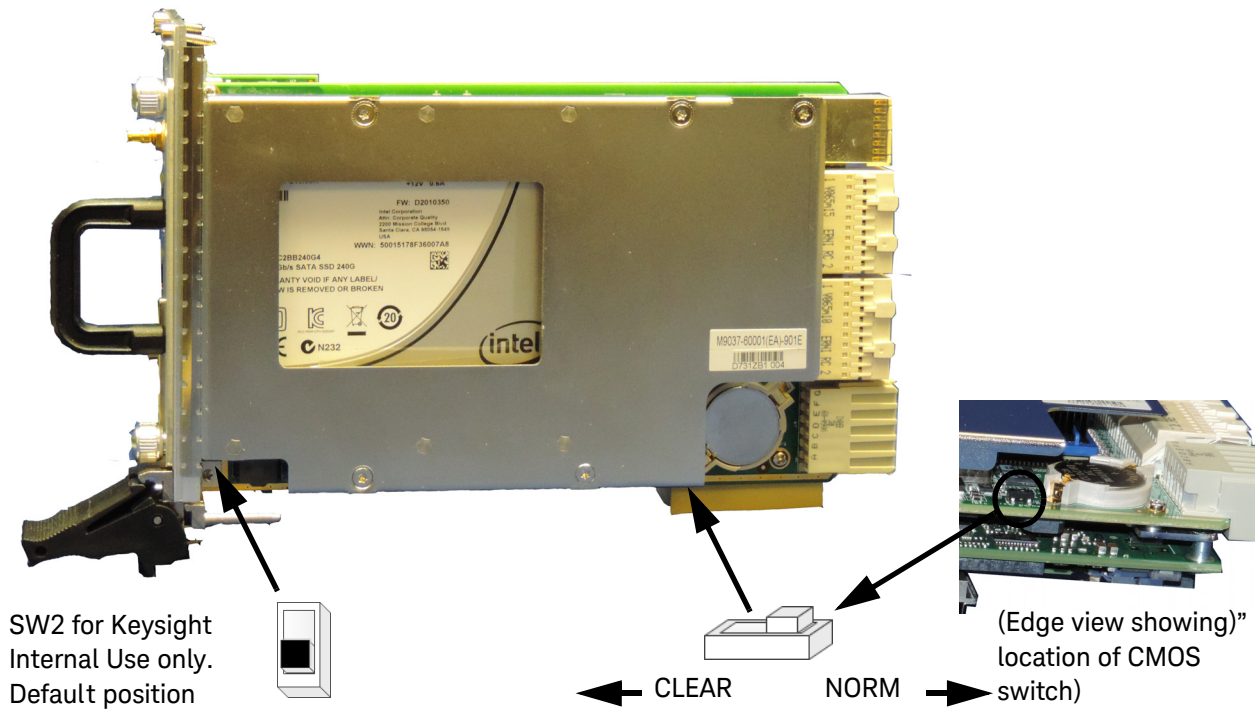


Figure 2 M9037A Switches

## Passwords

There are two passwords that may be set using the BIOS Setup Utility: Administrator Password and User Password. [Figure 3](#) on page 60 shows what happens with passwords when the controller powers-up.

### Administrator Password

At power-on, if the Administrator Password is set then before the BIOS Setup Utility can be entered, a message box appears asking for the Administrator Password. After you enter the Administrator Password, the controller continues into the BIOS Setup Utility.

### User Password

At power-on, if the User Password is set, then before the black splash screen is displayed a message box will appear asking for the User Password. After you enter the User Password, the controller continues to the black Splash Screen. At that time if the [Delete] is pressed the Setup Utility will be entered. Notice the Administrator Password was NOT needed even if it is set.

### Creating a Password

The Administrator and User passwords can be set or cleared by:

- 1 Pressing the <**Delete**> key during power-up. This should be concurrent with the main startup screen. The BIOS setup program loads after a short delay.
- 2 Then navigate to the **Security** tab in the BIOS Setup Utility and select (highlighting) the password to be changed.
  - If the password is not already set, a message box appears asking for a password to be created, then another message box will ask for it to be entered again to confirm the password.
  - If the password was already set, then a message box will appear asking for the password to be entered followed by a message box asking for the new password.
  - If a new password is not entered (left blank) then a box will appear asking if the password should be cleared. Any changes to any passwords will be discarded unless a save (**Save & Exit** tab) is executed. The Administrator Password will be active on the next restart of the M9037A. The User Password will be requested when the Setup Utility is exited.

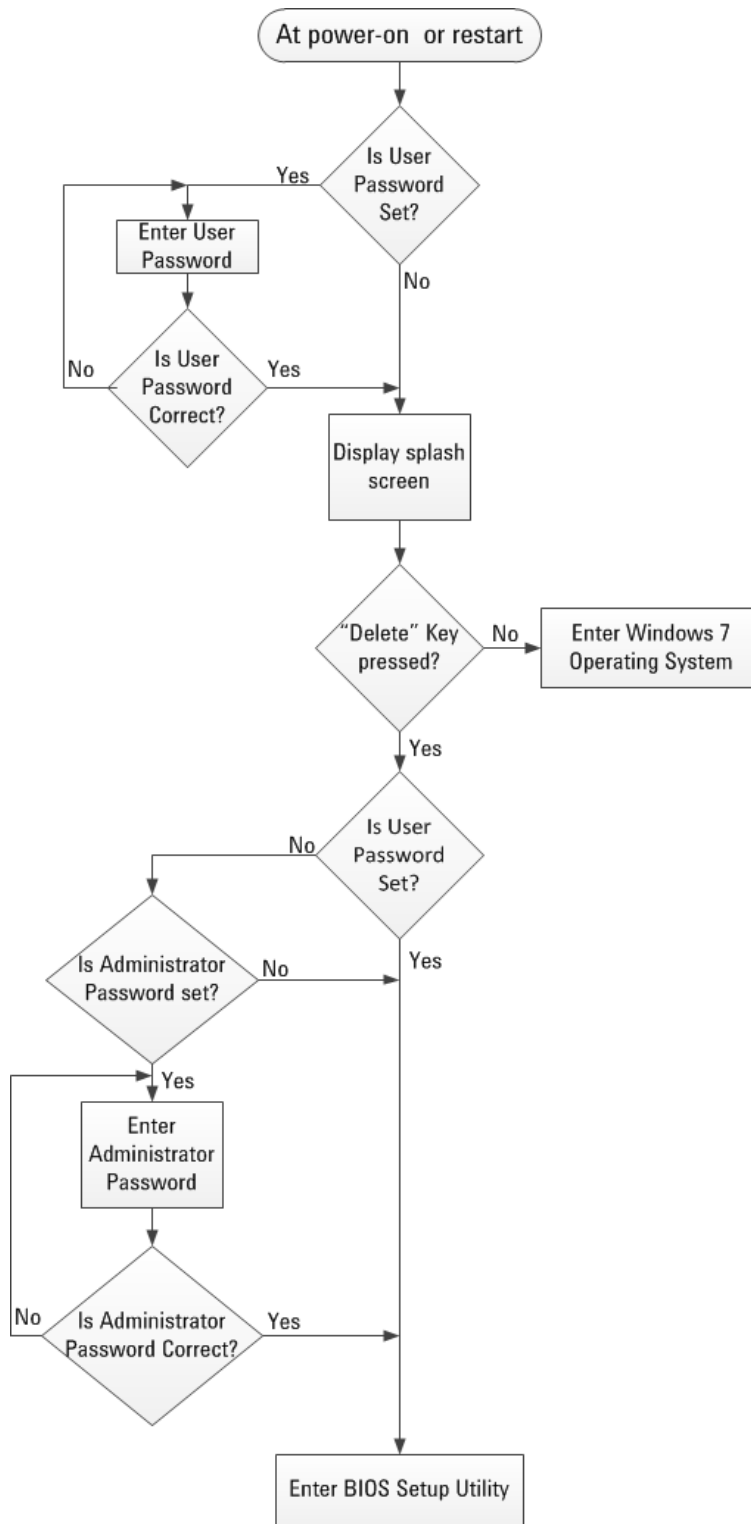


Figure 3 Password Flowchart

## PCIe Boot (Holdoff) Time

You should not need to change the PCIe Boot time. However, some PXIe instrument modules may take longer to be ready for enumeration than the PXI link ready requirement of 100ms. Consequently, it is possible for some controllers (such as the Keysight M9037A Embedded Controller) to enumerate the chassis before all of the individual modules are ready and therefore not enumerate them. If you have a situation where Keysight Connection Expert and/or the Windows Device Manager consistently do not find specific instrument modules when the chassis powers up, increase the wait time (valid range is 0 to 8 seconds).

This can be configured from the **Advanced** BIOS screen > **ACPI and Power Management field > Power-up Mode**.

## Automatic Power-on

By default setting, the M9037A will turn on as soon as it senses that power is applied. This means that the chassis will power up as soon as you insert the controller into an M9018A chassis. Alternate BIOS settings are:

- Start the system only when the chassis power switch is pressed
- Power the system to its last power state prior to losing power.

This can be configured from the **Main** BIOS screen > **Power-up Mode**.

## Monitor System Status

The BIOS monitors the following on the controller module:

- PCIe switch temperature
- CPU temperature
- Main PC board temperature
- Power supply voltages

These can be observed from the **Main** BIOS screen > **System Management**.

## System Date and Time

You can set the system date and time in the BIOS Main screen or in the Windows Operating System.

## Updating the M9037A BIOS

Depending on your application, you may never need to update the BIOS on your M9037A. However, you should always upgrade to the latest Keysight BIOS. Keysight's AGxx BIOS' are custom designed specifically for the M9037A. Do not attempt to replace it with a generic BIOS.

Any BIOS update for the M9037A will be available on the Keysight web site: [www.keysight.com/find/M9037A](http://www.keysight.com/find/M9037A). Click on **Visit Technical Support**, then the **Drivers, Firmware, and Software** tab. Scroll down and click on the **M9037A BIOS** link. Under **Supporting Documentation** is an instruction sheet for updating the BIOS. The Keysight BIOS upgrade utility allows you to restore or upgrade the BIOS in your M9037A PXIe Embedded Controller.

## Boot Device

After installing the M9037A controller in a PXIe chassis, press the chassis' power on button. After a few moments, the controller will beep indicating it passed its POST self tests. Typically, you would allow the controller to run through its normal startup routine. However, at this screen, press <F7> to open the boot order menu.

In the boot order menu, the top item listed (typically device 00C8) is Lan #1.

## Replacing the SSD

The Keysight M9037A Embedded controller comes with a 240 GB, 2.5" Serial ATA (SATA) II Solid State Drive (SSD).

Replacement SSD drives are available with installed operating system as:

- Y1264A spare SSD with carrier, WES7, 32-bit OS.<sup>1</sup>
- Y1265A spare SSD with carrier, WES7, 64-bit OS.<sup>1</sup>

To replace the SSD, perform the following steps:

### CAUTION

**BACK UP YOUR HARD DRIVE BEFORE PROCEEDING!** There are several ways to transfer files from your old drive to the new one. One possible way of doing this is with disk-imaging software. A disk image is an exact duplicate of your existing hard drive including the operating systems, user settings, all data files and application software. The imaging software should also create an "emergency" bootable CD or USB drive.

The replacement hard drive must conform to the same dimensions and mounting as the original.

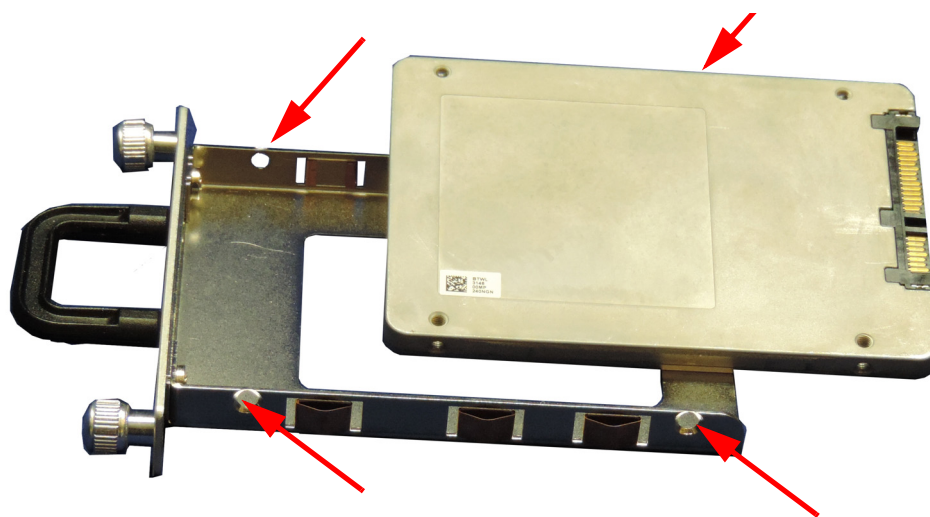
- 1** Power off the PXIe chassis. You do not need to remove the M9037A controller from the chassis to replace the SSD drive.
- 2** Loosen the two thumb screws securing the SSD cover to the controller's front panel.
- 3** Unseat the removable SSD with its mounting bracket from the connector and pull straight out.

### NOTE

If the SSD is removed from the M9037A, do not attempt to power up the controller. Always install the SSD before applying power to the M9037A. If you do not, then the SATA selection is eliminated from the boot option list. If the SSD is then reinstalled, then at boot the SATA selection will no be the first option to boot from. The boot order should be changed so that SATA is the first option.

- 4** Remove the SSD from the mounting bracket by removing the four mounting screws. See Figure 4.

<sup>1</sup> These spare SSD drives will not work with the M9036A PCIe Embedded Controller.



**Figure 4** Remove the four SSD Mounting Screws

- 5 To install an SSD, hold the removable SSD so that the top side is facing right as shown the figure above.
- 6 Install the SSD into the mounting bracket. Use all four screws to secure the SSD to the bracket.
- 7 Insert the SSD and mounting bracket into the M9037A front panel so that it is completely seated into it's connector.
- 8 The insertion resistance increases for the final connector mating.

**CAUTION**

If the SSD does not easily insert, do not force it. Check the alignment and try again. The SSD mounting bracket should be flush with the M9037A front panel when properly installed.

- 9 Tighten the front panel two thumb screws to secure the SSD mounting bracket to the M9037A. If the thumb screws do not thread properly, the SSD may not be fully inserted. Remove the SSD mounting bracket and reinstall.



## Memory modules

Keysight's M9037A has two memory connectors; one on top of the other. The module comes standard with one 4 GB memory module (installed in the bottom position). Optionally, 8 GB or 16 GB memory may be factory installed. Memory modules can be installed bringing the total memory to 16 GB. Up to 32 GB memory may be installed in the module when appropriate 16 GB memory modules become available. The controller uses DDR3 1600 SODIMM memory modules.

**NOTE**

Observe anti-static precautions when adding, removing, or installing memory modules.

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