USER MANUAL

PXIe-8881

This document provides reference information for PXI Express and the PXIe-8881 embedded controller.

Contents

Related Documentation

The following documents contain information you may find helpful as you read this manual:

- *PICMG EXP.0 R2.0 CompactPCI Express Specification*, PCI Industrial Computers Manufacturers Group
- *PCI Express Base Specification*, PCI Special Interest Group
- *PXI-5 PXI Express Hardware Specification*, PXI Systems Alliance
- *PXI-6 PXI Express Software Specification*, PXI Systems Alliance
- *Serialized IRQ Support for PCI Systems Specification*, Compaq Computer et al.

PXIe-8881

Description

The PXIe-8881 PXI Express/CompactPCI Express embedded controller is a high-performance PXI Express/CompactPCI Express-compatible system controller. The PXIe-8881 controller integrates standard I/O features into a single unit by using state-of-the-art packaging.

Combining a PXIe-8881 embedded controller with a PXI Express-compatible chassis, such as the PXIe-1095, results in a fully PC-compatible computer in a compact, rugged package.

The PXIe-8881 has an Intel® Xeon® W processor (4-Core, 8-Core, and 18-Core configurations), all the standard I/O, and a 500 GB or larger M.2 NVMe solid state drive.

Table 1. PXIe-8881 Processors

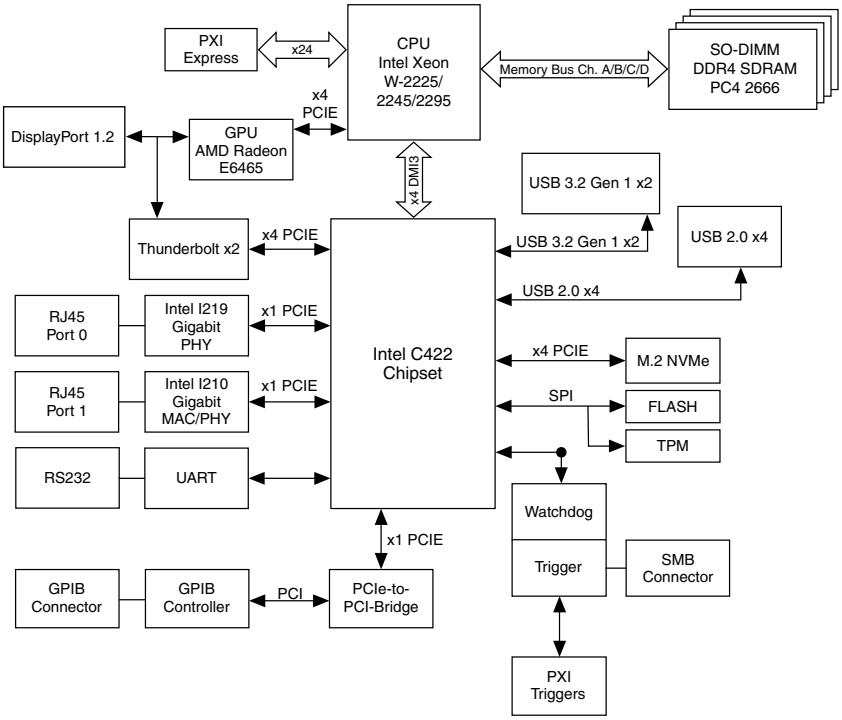
Processor	Core Count	Base Frequency	Turbo Frequency
Xeon® W-2225	4	4.1 GHz	4.6 GHz
Xeon® W-2245	8	3.9 GHz	4.5 GHz
Xeon® W-2295	18	3.0 GHz	4.6 GHz

The standard I/O on each module includes one DisplayPort, one RS-232 serial port, four Hi-Speed USB ports, two SuperSpeed USB ports, two Gigabit Ethernet ports (one enabled for 1588), two Thunderbolt 3 ports, a reset button, GPIB, and an SMB connector for triggers.

Functional Overview

The PXIe-8881 is a modular PC in a PXI Express 3U-size form factor. The following figure is a functional block diagram of the PXIe-8881. Following the diagram is a description of each logic block shown.

Figure 1. PXIe-8881 Block Diagram



The PXIe-8881 consists of the following logic blocks on three circuit card assemblies (CCAs):

- The *processor* is an Intel® Xeon® W available with different core count and base frequency.
- The *SO-DIMM block* consists of four SO-DIMM sockets that can hold up to 64 GB of DDR4-2666 MHz PC4-21300 ECC memory.
- The processor provides the PCI Express interface to the PXI Express backplane.
- The *Platform Controller Hub* (PCH) provides the USB, PCI Express x1, and LPC interfaces that connect to the peripherals on the PXIe-8881.
- The *DisplayPort 1.2* block consists of a 1.2 compatible DisplayPort connector.
- The *USB* block consists of four Hi-Speed USB 2.0 connectors and two SuperSpeed USB 3.2 Gen 1 connectors.
- The *Ethernet Port 0* block consists of an Intel® I219 Gigabit Ethernet Connection.
- The *Ethernet Port 1* block consists of an Intel® I210 Gigabit Ethernet Controller.
- The *UART* block connects to one serial port.
- The *SMB* Front Panel Trigger provides a routable connection of the PXI triggers to/from the SMB on the front panel.

- The *Watchdog* block consists of a watchdog timer that can reset the controller or generate triggers.
- The *PXI Express Connectors* connect the PXIe-8881 to the PXI Express/CompactPCI Express backplane.
- The *GPIB* block contains the GPIB interface.
- The *Thunderbolt 3* block contains the Thunderbolt 3 interface and connects to two USB-C connectors.

Configuration

BIOS Setup Utility

You can change the PXIe-8881 configuration settings in the BIOS setup program. The BIOS is the low-level interface between the hardware and operating system software that configures and tests your hardware when you boot the system. The BIOS setup program includes menus for configuring settings and enabling PXIe-8881 controller features.

Most users do not need to use the BIOS setup program, as the PXIe-8881 controller ships with default settings that work well for most configurations.

Caution Changing BIOS settings may lead to incorrect controller behavior and possibly an unbootable controller. If this happens, follow the instructions for restoring default settings in the *System CMOS* section. In general, do *not* change a setting unless you are absolutely certain what it does.

Accessing BIOS Setup Utility

1. Power on or restart your PXIe-8881 controller.
2. When the message **`Press <DEL> to enter setup`** appears, press the <Delete> key. The setup program loads after a short delay.

The **Main** menu is displayed when you first enter the BIOS setup program.

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

- **Left Arrow, Right Arrow**—Use these keys to move between the different setup menus. If you are in a submenu, these keys have no effect, and you must press <Esc> to leave the submenu first. (To use the arrows on the numeric keypad, you must turn off Num Lock.)
- **Up Arrow, Down Arrow**—Use these keys to move between the options within a setup menu. (To use the arrows on the numeric keypad, you must turn off Num Lock.)
- **<Enter>**—Use this key either to enter a submenu or display all available settings for a highlighted configuration option.
- **<Esc>**—Use this key to return to the parent menu of a submenu. At the top-level menus, this key serves as a shortcut to a `Quit without Saving?` prompt.
- **<+> and <–>**—Use these keys to cycle between all available settings for a selected configuration option.

- **<Tab>**—Use this key to select time and date fields.
- **<F9>**—Use this key to load the optimal default values for BIOS configuration settings. The optimal default values are the same as the shipping configuration default values.

Main Setup Menu

The most commonly accessed and modified BIOS settings are in the **Main** setup menu. The **Main** setup menu reports the following configuration information:

- **Serial Number**—This value is the controller identity.
- **BIOS Version and Build Date**—These values indicate the version of the PXIe-8881 controller BIOS and the date on which the BIOS was built.
- **Hardware Revision**—This value identifies the hardware version.
- **Embedded Firmware Version**—This value helps identify the built-in hardware capabilities.
- **Processor Type, Base/Max Processor Frequency, and Active Processor Cores**—These values indicate the type of processor used in the PXIe-8881 controller, the processor speed, and the maximum number of processor cores.
- **Microcode Revision**—This is the microcode revision of your PXIe-8881 processor.
- **Total Memory and Frequency**—This value indicates the system RAM size and frequency the BIOS detects.
- **PXI Express Chassis Information**—These values indicate the overall chassis link configuration, the link width of each link, and the link speed of each link.

The **Main** setup menu also includes the following settings:

- **System Date**—This setting controls the date, which is stored in a battery-backed real-time clock. Most operating systems also include a way to change this setting. Use <+> and <-> in conjunction with <Enter> and <Tab> to change these values.
- **System Time**—This setting controls the time of day, which is stored in a battery-backed real-time clock. Most operating systems include a way to change this setting. Use <+> and <-> in conjunction with <Enter> and <Tab> to change these values.

Advanced Setup Menu

This menu contains BIOS settings that normally do not require modification. If you have specific problems such as unbootable disks or resource conflicts, you may need to examine these settings.

Caution Changing settings in this menu may result in an unstable or unbootable controller. If this happens, follow the procedures outlined in the *System CMOS* section to restore BIOS settings to their factory defaults.

The **Advanced** setup menu includes the following settings and submenus:

- **System Profile Configuration**—Use this setting to access the **System Profile Configuration** submenu. Refer to the *System Profile Configuration Submenu* section for more information.
- **CPU Configuration**—Use this setting to access the **CPU Configuration** submenu. Refer to the *CPU Configuration Submenu* section for more information.
- **Video Configuration**—Use this setting to access the **Video Configuration** submenu. Refer to the *Video Configuration* Submenu section for more information.
- **Power/Wake Configuration**—Use this setting to access the **Power/Wake Configuration** submenu. Refer to the *Power/Wake Configuration Submenu* section for more information.
- **PCI Configuration**—Use this setting to access the **PCI Configuration** submenu. Refer to the *PCI Configuration Submenu* section for more information.
- **USB Configuration**—Use this setting to access the **USB Configuration** submenu. Refer to the *USB Configuration Submenu* section for more information.
- **Embedded Firmware Programming**—Use this setting to access the **Embedded Firmware Programming** submenu. Refer to the *Embedded Firmware Programming Submenu* section for more information.
- **TPM Configuration**—Use this setting to access the **TPM Configuration** submenu. Refer to the *TPM Configuration Submenu* section for more information.
- **Network Boot Configuration**—Use this setting to access the **Network Boot Configuration** submenu. Refer to the *Network Boot Configuration Submenu* section for more information.
- **Thunderbolt Configuration**—Use this setting to access the **Thunderbolt Configuration** submenu. Refer to the *Thunderbolt Configuration Submenu* section for more information.

System Profile Configuration Submenu

Use this submenu to apply alternate settings to the System Profile. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **System Profile**—This setting specifies which system profile configuration the BIOS should use to optimize hardware settings depending on application. To configure the settings optimized for Windows, select **Performance Optimized**. To customize the settings manually, select **Custom**. The default is **OS Defined**, in which the system detects

the OS it is in and automatically selects between **Performance Optimized** or **NI Linux RT Optimized** (disables Hyper-Threading).

- **Current OS Defined Profile**—This setting shows which system profile configuration the system is currently using based on the OS it is being booted in. It shows either **Performance Optimized** or **NI Linux RT Optimized**. This setting is hidden if **OS Defined** is not selected in **System Profile**.
- **Hyper Threading**—This setting enables or disables Intel Hyper-Threading technology. The default value is **Enabled**. Enabling Hyper-Threading increases performance for some applications by adding virtual CPU cores. Hyper-Threading can increase application jitter, so be careful when enabling this setting on a Real Time system. When the BIOS is configured to boot RTOS, Hyper-Threading is disabled automatically. You can change this setting only if **Custom** is selected in **System Profile**. Otherwise, this setting is greyed out.

CPU Configuration Submenu

Use this submenu to apply alternate settings to the CPU. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Hyper Threading**—This setting enables or disables Intel Hyper-Threading technology. The default value is **Enabled**. Enabling Hyper-Threading increases performance for some applications by adding virtual CPU cores. Hyper-Threading can increase application jitter, so be careful when enabling this setting on a Real Time system. When the BIOS is configured to boot RTOS, Hyper-Threading is disabled automatically. You can change this setting only if **Custom** is selected in **System Profile**. Refer to the *System Profile Configuration Submenu* section for more information.
- **Configure CPU Power Limit**—This setting enables standard or extreme performance. The default value is **Standard Performance**. Extreme mode runs the CPU at a higher frequency, which may result in CPU throttling at lower temperatures or workloads and drawing more power than typical. Operating the CPU while throttled for long periods of time may reduce the product lifetime. Extreme mode is not recommended for heavy workloads. If your application is throttling while in extreme mode, use standard mode.
- **Enabled CPU Cores**—This setting selects the number of active CPU cores for the processor. Valid values are **1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,** and **All**. The default value is **All**.
- **C-States**—This setting enables or disables CPU power management. The default value is **Enabled**. Enabling C-States allows the processor to put idle CPU cores to sleep, allowing active cores to run at higher than base frequencies when Turbo Boost is enabled. Enabling C-States can increase application jitter, so be careful when enabling this setting on a Real Time system.
- **Turbo Boost**—This setting enables or disables Intel Turbo Boost technology. The default is **Enabled**. Enabling Turbo Boost allows CPU cores to run at higher than their base frequency for short durations, while other cores are idle. Enabling Turbo Boost can also

increase application jitter, so be careful when enabling this setting on a LabVIEW Real-Time system. To achieve maximum possible Turbo Boost frequencies, also enable the C-States setting.

- **Hardware Prefetcher**—This setting enables or disables CPU cache hardware prefetching. The default value is **Disabled** when booting RTOS and **Enabled** when booting other OSs. Enabling hardware prefetching can increase system performance for some applications, but can cause control algorithms to behave less deterministically.
- **Adjacent Cache Line Prefetch**—This setting enables or disables prefetching of adjacent cache lines from memory to the CPU cache. The default value is **Disabled** when booting RTOS and **Enabled** when booting other OSs. Enabling adjacent cache line prefetching can increase system performance for some applications, but can cause control algorithms to behave less deterministically.
- **VT-d**—This setting enables or disables VT-d. The default value is **Enabled**. VT-d improves performance of I/O devices in virtualized environments.

Video Configuration Submenu

Use this submenu to apply alternate settings to the video configuration. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Primary Video Device**—This setting specifies which video adapter the BIOS should use as the primary adapter if more than one is present. To use an external video adapter as the primary graphics adapter, choose **Offboard Video**. The default value is **Onboard AMD Video**.

Power/Wake Configuration Submenu

Use this submenu to apply alternate configurations to the power and wake features of the chipset and controller. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Restore After Power Loss**—This setting specifies the power state that the controller should return to after AC power is lost. Valid values are **Stay Off**, **Last State**, and **Turn On**. The default is **Stay Off**. When set to **Stay Off**, the controller returns to the soft off power state after AC power is restored. When set to **Last State**, the controller returns to the state it was in when power was lost. When set to **Turn On**, the controller powers on when AC power is restored.
- **Power Button Behavior**—This setting specifies how the PXI Express power button should behave. Valid options are **Enabled** and **Disabled**. The default value is **Enabled**. When set to **Enabled**, the OS controls the power button. When set to **Disabled**, pressing the power button has no effect. The **Disabled** option should be used only in conjunction with the PXI Express chassis' inhibit mode.

- **PXI Express Backplane WAKE#**—This setting enables or disables a PXI Express peripheral module's ability to wake a soft off system. The default value is **Disabled**.
- **PXI Express Backplane SMBus ALERT#**—This setting enables or disables a System Management device's ability to wake a soft off system by asserting the ALERT# signal. The default value is **Disabled**.

PCI Configuration Submenu

Use this submenu to apply alternate settings to PCI devices. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **64-Bit Memory Mapped IO**—This setting enables or disables support for memory-mapped I/O above the 4 GB boundary. It can be useful when using a 64-bit OS and a large number of PCI devices. The default value is **Enabled**.
- **PCIe Max Payload Size**—This setting determines the maximum payload size of PCI Express devices. Valid options are **Auto** and **128 Bytes**. The default value is **Auto**, which allows the BIOS to choose an optimal value based on which devices are present.
- **PCIe Max Read Request Size**—This setting determines the maximum size of memory read requests for PCI Express devices. Valid options range from 128 bytes to 4096 bytes. The default value is **4096 Bytes**, which allows the BIOS to choose an optimal value based on which devices are present.
- **PCI System Error Reporting**—This setting enables/disables reporting of PCI system errors. The default value is **Enabled**.

USB Configuration Submenu

Use this submenu to apply alternate configurations to the USB ports. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **USB Devices**—This item lists the total number of devices detected in the system, categorized by device type.
- **Legacy USB Support**—This setting specifies whether legacy USB support is enabled. Legacy USB support refers to the ability to use a USB keyboard and mouse during system boot or in a legacy operating system such as DOS. The default value is **Enabled**.
- **Overcurrent Reporting**—This setting allows the BIOS to notify the operating system of any USB ports which sources too much current. The default value for this setting is **Disabled**.
- **Transfer Timeout**—This setting specifies the timeout value for Control, Bulk, and Interrupt USB transfers. The default value for this setting is 20 seconds.
- **Device Reset Timeout**—This setting specifies the number of seconds the Power-On Self Test waits for a USB mass storage device to start. The default is 20 seconds.
- **Device Power-Up Delay**—This setting specifies the maximum time a device takes before it properly reports itself to the host controller. When set to **Auto**, a root port is granted

100 ms, and for a hub port, the delay value is taken from the hub descriptor. When set to **Manual**, you can set the delay manually. The default value for this setting is **Auto**.

- **Device Power-Up Delay in Seconds**—This setting specifies the number of seconds the Power-On Self Test waits for a USB device or hub to power on. This setting is visible only if **Device Power-Up Delay** is set to **Manual**. The default is 5 seconds.

In addition, the following option is available for each detected device if a USB mass storage device is present:

- **Emulation Type**—This setting specifies how the BIOS presents the USB mass storage device to the system. You can use this option to present a USB mass storage device as a **Floppy**, **Forced FDD**, **Hard Disk**, or **CD-ROM** drive. The default is **Auto**, which allows the BIOS to treat small USB flash disk drives as floppy drives and larger USB flash disk drives as hard disk drives.

Embedded Firmware Submenu

Use this submenu to enable or disable firmware updates at startup. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Current Firmware Version**—This item displays the firmware version currently installed.
- **Available Firmware Version**—This item displays the firmware version available.
- **Embedded Firmware Programming Mode**—This setting specifies whether firmware updates are performed at startup. When enabled, the BIOS checks to see if an older version of the firmware is currently installed and provides the option to update the firmware. When disabled, the BIOS does not check the firmware. The default value is **Enabled**.

TPM Configuration Submenu

Use this submenu to view the Trusted Platform Module (TPM) hardware type and execute selected TPM commands.

- **Clear TPM**—Use this option to clear the TPM.

Caution Clearing the TPM is a destructive operation that may result in the loss of all data protected by the TPM device.

TPM Physical Presence Confirmation Screen

Some TPM commands may require confirmation of physical presence before they can be executed. In this case, the system will reboot and the BIOS will present a screen asking for confirmation to execute the TPM command. You can confirm or reject the execution of the TPM command.

Network Book Configuration Submenu

Use this submenu to view and configure the network boot, such as the UEFI HTTP boot.

- **TLS Auth Configuration**—Use this option to import the CA certificate for HTTPS boot.
- **Intel i210/i219-LM Gigabit Network Connection**—Use this option to view Ethernet port 1 and port 0 device configuration.
- **VLAN Configuration (MAC Address)—**Use this option to configure VLAN for the respective Ethernet port.
- (**MAC Address) – IPv4—**Use this option to configure IPv4 network configuration for the respective Ethernet port.
- **(MAC Address) HTTP Boot Configuration**—Use this option to configure HTTP/HTTPS boot configuration for the respective port.
- **(MAC Address) - IPv6—**Use this option to configure IPv4 network configuration for the respective Ethernet port.

Thunderbolt Configuration Submenu

Use this submenu to enable or disable Thunderbolt support and configure the Thunderbolt security level.

- **Thunderbolt Support**—This option enables or disables Thunderbolt support. The default value is **Enabled**.
- **Thunderbolt Security Level**—Use this option to configure the Thunderbolt security level. The default value is **SL-1 User Authorization**.
- **Extra Bus Reserved**—Use this option to configure the number of the bus reserved for Thunderbolt ports. The default value is **106**.

Security Menu

Use this menu to enable BIOS security options.

- **Administrator Password**—This setting specifies a password that must be entered to access the BIOS Setup Utility. If only the Administrator's password is set, this setting limits access to only the BIOS setup program and is asked for only when entering the BIOS setup program. By default, no password is specified.
- **User Password**—This setting specifies a password that must be entered to access the BIOS Setup Utility or boot the system. If only the user's password is set, this is a power on password and must be entered to boot or enter the BIOS setup program. In the BIOS setup program, the user has Administrator rights. By default, no password is specified.
- **Secure Boot**—Use this menu to enable or disable secure boot. If factory keys are not installed, install the factory keys from the **Secure Boot** submenu before turning on secure boot. There are two profiles for secure boot: standard or custom. Standard installs the default keys from the system, while custom allows you to freely install user-defined keys.

Boot Setup Menu

Use this menu to configure settings related to the boot process and boot device priority.

- **Boot Settings Configuration**—Use this setting to access the **Boot Settings Configuration** submenu. Refer to the *Boot Settings Configuration Submenu* section for more information.
- **Network Boot**—This setting specifies whether the PXE network boot Legacy or UEFI agent is enabled. When **Legacy** is selected, the Intel Boot Agent is displayed in the **Boot Option Priorities** menu, allowing you to boot from a PXE server on the local subnet. Note that **IBA GE Slot** or **IBA CL Slot** precedes the Intel Boot Agent device names in the **Boot Option Priorities** menu. Ethernet port 1(i210 Gigabit ethernet) allows an additional option for legacy iSCSI boot. When **UEFI** is selected, you must enable the supported UEFI Network boot option, IPv4 PXE, IPv6 PXE, IPv4 HTTP, or IPv6 HTTP. You must restart the system for this setting to take effect. Note that **UEFI** precedes the Intel Boot Agent device names, followed by the selected protocol. For example, if you choose PXE IPv4, **PXE IPv4** precedes the device name in the **Boot Option Priorities** menu. The default value is **Disabled**.
- **Network Boot**—This setting specifies whether the PXE network boot Legacy or UEFI agent is enabled. When **Legacy** is selected, the Intel Boot Agent is displayed in the **Boot Option Priorities** menu, allowing you to boot from a PXE server on the local subnet. Note that **IBA GE Slot** or **IBA CL Slot** precedes the Intel Boot Agent device names in the **Boot Option Priorities** menu. When **UEFI** is selected, you must enable the supported UEFI Network boot option, IPv4 PXE or IPv6 PXE. You must restart the system for this setting to take effect. Note that **UEFI** precedes the Intel Boot Agent device names, followed by the selected protocol. For example, if you choose PXE IPv4, **PXE IPv4** precedes the device name in the **Boot Option Priorities** menu. The default value is **Disabled**.
- **Boot Option Priorities**—These settings specify the order in which the BIOS checks for bootable devices, including the local hard disk drive, removable devices such as USB flash disk drives or USB CD-ROM drives, or the PXE network boot agent. The BIOS first attempts to boot from the device associated with **1st Boot Device**, followed by **2nd Boot Device**, and **3rd Boot Device**. If multiple boot devices are not present, the BIOS setup utility does not display all these configuration options. To select a boot device, press <Enter> on the desired configuration option and select a boot device from the resulting menu. You also can disable certain boot devices by selecting **Disabled**.

Note Only one device of a given type is shown in this list. If more than one device of the same type exists, use the *Device BBS Priorities* submenus to re-order the priority of devices of the same type.

The following submenus are displayed if one or more bootable devices of the corresponding type is present:

- **Hard Drive BBS Priorities**—Use this setting to access the **Hard Drive BBS Priorities** submenu to re-order or disable bootable hard drive devices. Refer to the *Hard Drive BBS Priorities Submenu* section for more information.

Boot Settings Configuration Submenu

Use this submenu to apply alternate configurations to boot settings. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Setup Prompt Timeout**—This setting specifies the number of seconds the system waits for a BIOS Setup menu keypress (the <Delete> key). The default value is **2**.
- **Bootup NumLock State**—This setting specifies the power-on state of the keyboard NumLock setting. The default value is **On**.

Hard Drive BBS Priorities Submenu

- **Boot Option #1, Boot Option #2, Boot Option #3**—These settings specify the boot priority of hard drive devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

CD/DVD ROM Drive BBS Priorities Submenu

- **Boot Option #1, Boot Option #2, Boot Option #3**—These settings specify the boot priority of CD/DVD ROM drive devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Floppy Drive BBS Priorities Submenu

- **Boot Option #1, Boot Option #2, Boot Option #3**—These settings specify the boot priority of floppy drive devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Network Device BBS Priorities Submenu

- **Boot Option #1, Boot Option #2, Boot Option #3**—These settings specify the boot priority of network devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Save & Exit Menu

The **Save & Exit** setup menu includes all available options for exiting, saving, and loading the BIOS default configuration. As an alternative to this screen, press <F9> to load optimal BIOS default settings and <F10> to save changes and exit setup.

The **Save & Exit** setup menu includes the following settings:

- **Save Changes and Reset**—Any changes made to BIOS settings are stored in NVRAM. The setup program then exits and reboots the controller. You also can use the <F10> key to select this option.
- **Discard Changes**—Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The BIOS setup continues to be active.
- **Restore Defaults**—This option restores all BIOS settings to the factory default. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting. Notice that any nondefault settings such as boot order, passwords, and so on also are restored to their factory defaults. You also can use the <F9> key to select this option.
- **Save As User Defaults**—This option saves a copy of the current BIOS settings as the User Defaults. This option is useful for preserving custom BIOS setup configurations.
- **Restore User Defaults**—This option restores all BIOS settings to the user defaults. This option is useful for restoring previously preserved custom BIOS setup configurations.
- **Boot Override**—This option lists all possible bootable devices and allows the user to override the **Boot Option Priorities** list for the current boot. If no changes have been made to the BIOS setup options, the system continues booting to the selected device without first rebooting. If BIOS setup options have been changed and saved, a reboot is required and the boot override selection is not valid.

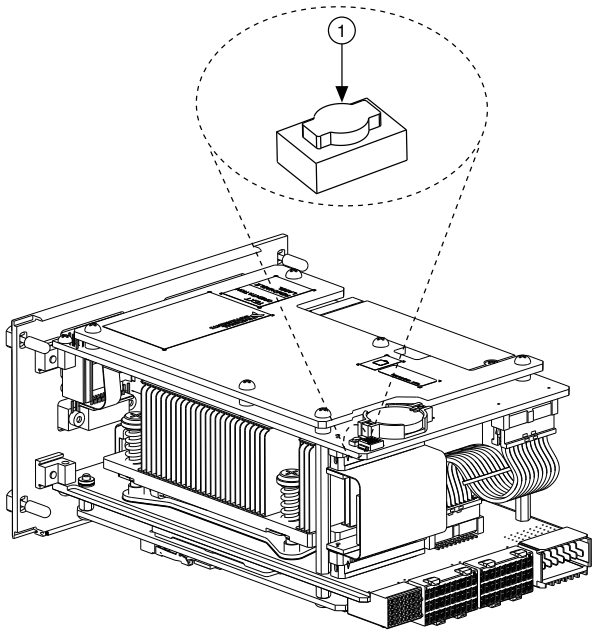
System CMOS

The PXIe-8881 contains memory backed up by a battery to store BIOS configuration information.

Complete the following steps to clear the CMOS contents:

1. Power off the chassis.
2. Remove the controller from the chassis.
3. Press the clear CMOS button (SW2) as shown in the following figure.
4. Reinstall the controller in the chassis.

Figure 2. Clearing the CMOS Contents



1. Push-Button Switch SW2

Boot Options

The PXIe-8881 can boot from the following devices:

- The internal solid state drive.
- An external USB mass storage device such as a USB hard drive, USB CD/DVD-ROM, or USB flash drive.
- Most PCI or PCI Express-based devices that provide an Option ROM.

There are two ways to configure the controller to boot from these devices:

- Enter the BIOS setup by rebooting the controller and pressing <Delete> during the memory tests. Select the **Boot** menu. You will see a list of all bootable devices, ordered by device type. You can set the boot order by altering the **1st Boot Device**, **2nd Boot Device**, and **3rd Boot Device** settings.
- To boot from a different device without permanently changing the boot order, press <F10> during POST. After the BIOS completes the POST and just before the controller boots the OS, the **Boot** menu is displayed. You can select the device type you want to boot from.

Hard Drive Recovery

You can recover the PXIe-8881 system using external recovery media created by NI (part number 502239B-00) or using Windows Recovery tools.

Note Recovering the OS erases the contents of your hard disk. Back up any files you want to keep.

Upgrade Information

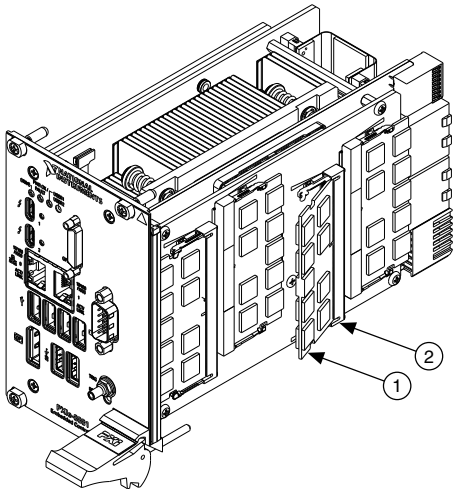
You can change the amount of installed RAM on the PXIe-8881.

NI offers the following SO-DIMMs for use with the PXIe-8881 controller.

- 16 GB, DDR4-2666 PC4-21300 ECC compatible (NI part number 787659-01)

Note NI has tested and verified that the SO-DIMMs we sell work with the PXIe-8881 controller. We recommend you purchase your SO-DIMM modules from NI. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.

Figure 3. Installing a SO-DIMM in a PXIe-8881 Controller

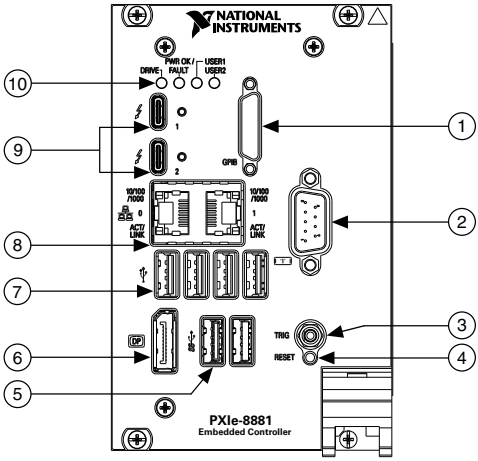


1. SO-DIMM Module
2. SO-DIMM Socket

I/O Information

The following figure shows the PXIe-8881 front panel I/O connectors.

Figure 4. PXIe-8881 Front Panel Layout



1. GPIB
2. RS-232 Serial
3. Trigger
4. Reset Button
5. USB 3.2 Gen 1
6. DisplayPort 1.2
7. USB 2.0
8. Ethernet
9. Thunderbolt 3
10. LEDs

Front Panel Connectors

The following table lists various peripherals and their corresponding PXIe-8881 external connectors, bus interfaces, and functions.

Peripheral	External Connector	Description
Video (DisplayPort 1.2)	DisplayPort	ATI Radeon E6465 Embedded GPU
Thunderbolt 3	USB Type-C (2 ports)	Thunderbolt 3 compliant, supports USB, PCI Express, and DisplayPort
Serial	COM1 (9-pin DSUB)	16550 RS-232 serial port
Ethernet Port 0	LAN (RJ45)	10/100/1000 Ethernet connection Intel I219 Wake on LAN
Ethernet Port 1	LAN (RJ45)	10/100/1000 Ethernet connection Intel I210

Peripheral	External Connector	Description
USB 2.0	USB 4-pin Series A stacked receptacle (4 ports)	Hi-Speed USB 2.0
USB 3.2 Gen 1	USB 9-pin Series A stacked receptacle (2 ports)	SuperSpeed USB, backwards compatible with USB 2.0
PXI trigger	Trigger (SMB)	Routing PXI triggers to or from the backplane trigger bus
GPIB	GPIB (25-pin Micro D)	General-Purpose Interface Bus, IEEE 488.2

NI Services

Visit *ni.com/support* to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit *ni.com/services* to learn about NI service offerings such as calibration options, repair, and replacement.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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