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PXIe-8861

2024-03-08

Contents

Introduction. . . . 4
Related Documentation. . . . 4
PXI Express Features. . . . 4
Benefits of PXI Express. . . . 4
PXIe-8861. . . . 5
Description. . . . 5
Functional Overview. . . . 6
National Instruments Software. . . . 7
Configuration. . . . 9
BIOS Setup Utility. . . . 9
Accessing BIOS Setup Utility. . . . 9
Main Setup Menu. . . . 10
Advanced Setup Menu. . . . 11
CPU Configuration Submenu. . . . 12
Video Configuration Submenu. . . . 13
Power/Wake Configuration Submenu. . . . 13
PCI Configuration Submenu. . . . 14
USB Configuration Submenu. . . . 14
Thunderbolt Configuration Submenu. . . . 15
TPM Configuration Submenu. . . . 16
TPM Physical Presence Confirmation Screen. . . . 16
Boot Setup Menu. . . . 16
Boot Settings Configuration Submenu. . . . 18
Hard Drive BBS Priorities Submenu. . . . 18
CD/DVD ROM Drive BBS Priorities Submenu. . . . 18
Floppy Drive BBS Priorities Submenu. . . . 18
Network Device BBS Priorities Submenu. . . . 18
Security Menu. . . . 19
Save & Exit Menu. . . . 19
System CMOS. . . . 20
Boot Options. . . . 21
Hard Drive Recovery. . . . 22
Upgrade Information. . . . 22

Installing an OS. 23
Removable Hard Drive. 23
Installing the Removable Hard Drive. 23
Removing the Removable Hard Drive. 24
I/O Information. 24
DisplayPort. 24
RS-232 Serial Port. 25
Ethernet. 25
Universal Serial Bus. 26
Trigger. 27
Worldwide Support and Services. 27

Introduction

This document provides reference information for PXI Express and the PXIe-8861 embedded controller.

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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
- IEEE Standard P1284.1-1997 **(C/MM) Standard for Information Technology for Transport Independent Printer/System Interface**
- **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.

PXI Express Features

Benefits of PXI Express

The PXI (PCI eXtensions for Instrumentation) industry standard, an open specification governed by the PXI Systems Alliance (PXISA), has quickly gained adoption and grown in prevalence in test, measurement, and control systems since its release in 1998. One of the key elements driving the rapid adoption of PXI is its use of PCI in the communication backplane. As the commercial PC industry has improved the available bus bandwidth by evolving PCI to PCI Express, PXI is now able to meet even more application needs by integrating PCI Express into the PXI

standard. By taking advantage of PCI Express technology in the backplane, PXI Express increases the available PXI bandwidth from up to 132 MB/s to up to 8 GB/s for a more than 60x improvement in bandwidth.

PXI Express maximizes both hardware and software compatibility with PXI modules. PXI Express hybrid slots deliver both PCI and PCI Express signaling to accept devices that use PXI communication and triggering or the newer PXI Express standard. Software compatibility is maintained because PCI Express uses the same OS and driver model as PCI, resulting in complete software compatibility among PCI-based systems, for example PXI, and PCI Express-based systems such as PXI Express.

PXI Express, like PXI, leverages from the CompactPCI specification to define a rugged, modular form factor that offers superior mechanical integrity and easy installation and removal of hardware components. PXI Express products offer higher and more carefully defined levels of environmental performance required by the shock, vibration, temperature, and humidity extremes of industrial environments. Mandatory environmental testing and active cooling is added to the CompactPCI mechanical specification to ease system integration and ensure multivendor interoperability.

The demanding timing and synchronization requirements of instrumentation systems are met by the integrated features of PXI Express. Not only are the trigger bus, 10 MHz system reference clock, and star trigger bus available in PXI retained by PXI Express, but new timing and synchronization features that include a 100 MHz differential system reference clock for the synchronization of multiple modules and three differential star trigger buses for the distribution of precise clock and trigger signals have been added. Differential timing and synchronization signals provide PXI Express systems with increased noise immunity and the ability to transmit clock signals at higher frequencies.

Description

The PXIe-8861 PXI Express/CompactPCI Express embedded controller is a high-performance PXI Express/CompactPCI Express-compatible system controller. The PXIe-8861 controller integrates standard I/O features in a single unit by using state-of-the-art packaging. Combining a PXIe-8861 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.

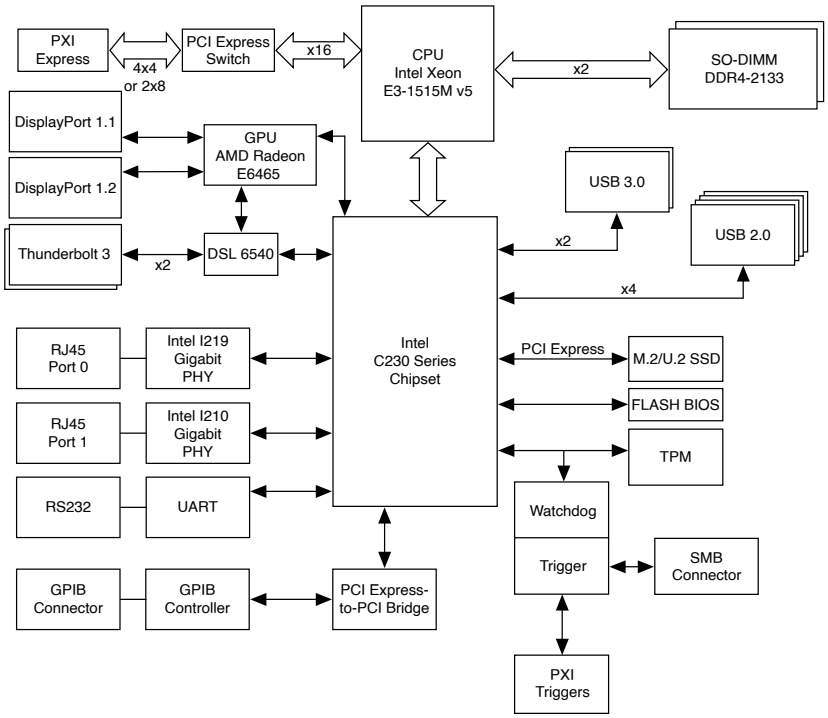
The PXIe-8861 has an Intel® Xeon® E3-1515M v5 processor (Quad Core, 2.8 GHz base, 3.7 GHz turbo frequency), all the standard I/O, and a 512 GB or larger solid state drive.

The standard I/O on each module includes two DisplayPort video, 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, and an SMB connector for triggers.

Functional Overview

The PXIe-8861 is a modular PC in a PXI Express 3U-size form factor. The following figure is a functional block diagram of the PXIe-8861. Following the diagram is a description of each logic block shown.

Figure 1. PXIe-8861 Block Diagram



The PXIe-8861 consists of the following logic blocks on two circuit card assemblies (CCAs):

- The **processor** is an Intel® Xeon® E3-1515M v5 processor (Quad Core, 2.8 GHz base, 3.7 GHz turbo frequency).

- The **SO-DIMM block** consists of two DDR4 PC-2133 SO-DIMM sockets that can hold up to 32 GB of memory.
- The processor provides the PCI Express interface to the PXI Express backplane through a PCI Express switch.
- The **Platform Controller Hub** (PCH) provides the USB, PCI Express x1, and LPC interfaces that connect to the peripherals on the PXIe-8861.
- The **DisplayPort 1.1** block consists of a 1.1 compatible DisplayPort connector nearest the USB 3.0 ports.
- The **DisplayPort 1.2** block consists of a 1.2 compatible DisplayPort connector nearest the Thunderbolt 3 connectors.
- The **USB** block consists of two Hi-Speed USB 2.0 connectors and two SuperSpeed USB 3.0 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 Connection.
- 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-8861 to the PXI Express/CompactPCI Express backplane.

National Instruments Software

National Instruments has developed several software tools you can use with the PXIe-8861.

National Instruments hardware and software work together to help you make the most of your PXI system. The LabVIEW, Measurement Studio, and LabWindows™/CVI™ application development environments combine with leading hardware drivers such as NI-DAQmx to provide exceptional control of NI hardware. Instrument drivers are available at ni.com/idnet to simplify communication with instruments over a variety of buses.

LabVIEW is a powerful and easy-to-use graphical programming environment you can use to acquire data from thousands of different instruments including USB, IEEE 488.2, VXI, serial, PLCs, and plug-in boards. LabVIEW helps you convert acquired data into meaningful results using powerful data analysis routines. Add-on tools provide additional specialized functionality. For more information, visit ni.com/labview and ni.com/toolkits.

If you prefer to use Microsoft's Visual Basic, Visual C++, and Visual Studio .NET for the core of your application, Measurement Studio adds tools for Measurement and Automation to each language. For more information, visit ni.com/mstudio.

LabWindows/CVI is an interactive ANSI C programming environment designed for building virtual instrument applications. LabWindows/CVI delivers a drag-and-drop editor for building user interfaces, a complete ANSI C environment for building your test program logic, and a collection of automated code generation tools, as well as utilities for building automated test systems, monitoring applications, or laboratory experiments. For more information, visit ni.com/lwcvi.

NI-DAQmx provides an extensive library of functions that you can call from your application development environment or interactive environment such as NI Signal Express. These functions provide an intuitive API for National Instruments multifunction DAQ products. Features available include analog input (A/D conversion), buffered data acquisition (high-speed A/D conversion), analog output (D/A conversion), waveform generation, digital I/O, counter/timer operations, SCXI signal conditioning, RTSI or PXI synchronization, self-calibration, messaging, and acquiring data to extended memory. For more information, visit ni.com/daq.

National Instruments modular instruments use specialized drivers suited to each product's specialization. Express VIs provide customized, interactive programming of instruments in a single interface, and soft front panels provide an interface for testing the functionality of each instrument with no programming required. NI Switches, DMMs, High-Speed DIO, High-Speed Digitizers, and Sources each have customized drivers for high-end modular instrumentation systems. RF applications leverage two drivers, NI-RFSG and NI-RFSA, and Dynamic Signal Acquisition is available through NI-DAQmx. For more information, visit ni.com/modularinstruments.

You can expand the timing and triggering functionality of your PXI system with PXI Timing and Synchronization products. These products provide precision clock

sources, custom routing of triggers for multi-chassis synchronization, clock sharing, and more and are programmed with NI-Sync. For more information, visit ni.com/pxi.

NI-VISA is the National Instruments implementation of the VISA specification. VISA is a uniform API for communicating and controlling USB, Serial, GPIB, PXI, VXI, and various other types of instruments. This API aids in the creation of portable applications and instrument drivers. For information about writing your own PXI instrument driver with NI-VISA, refer to the **NI-VISA Getting Started Manual** and the readme.txt file in the NI-VISA directory. For more information, visit ni.com/visa.

With LabVIEW for Linux and support for more than two hundred devices on Linux with the NI-DAQmx driver, you can now create virtual instruments based on the Linux OS. Instrument control in Linux has been improved by the NI-VISA driver for Linux, and NI modular instruments are partially supported. For more information, visit ni.com/linux.

Configuration

BIOS Setup Utility

You can change the PXIe-8861 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-8861 controller features.

Most users do not need to use the BIOS setup program, as the PXIe-8861 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-8861 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 the Exit menu.
- <+> 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:

- BIOS Version and Build Date—These values indicate the version of the PXIe-8861 controller BIOS and the date on which the BIOS was built.
- 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-8861 controller, the processor speed, and the maximum number of processor cores.
- Microcode Revision—This is the microcode revision of your PXIe-8861 processor.

- Total Memory and Frequency—This value indicates the system RAM size and frequency the BIOS detects.
- PXIe 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:

- 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.
- AMT Configuration—Use this setting to access the AMT Configuration submenu. Refer to the **AMT 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.
- Thunderbolt Configuration—Use this setting to access the Thunderbolt Configuration submenu. Refer to the **Thunderbolt Configuration 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.

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 LabVIEW Real-Time, Hyper-Threading is disabled automatically.
- Enabled CPU Cores—This setting selects the number of active CPU cores for the processor. Valid values are 1, 2, 3, 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. When the BIOS is configured to boot LabVIEW Real-Time, C-States are disabled automatically.

- 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.

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 Display—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 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 Turn On, the controller powers on when AC power is restored.
- Power Button Off 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 switch.

- PXIe 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.
- 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 Disabled.
- 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 best possible configuration.

- **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**. This option is disabled automatically when booting LabVIEW Real-Time to reduce application jitter.

- **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, Zip, 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.

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 **User Authorization**.

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.

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.
- **PXI Drive Boot**—This setting specifies whether boot support is enabled for legacy mass storage devices, such as SCSI drives. When enabled, legacy mass storage controllers with boot support are displayed in the **Boot Option Priorities** menu. The default value is **Enabled**.
- **PXE Network Boot**—This setting specifies whether the PXE network boot agent is enabled. When enabled, 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 the Intel Boot Agent device names are preceded by **IBA GE**

Slot in the **Boot Option Priorities** menu. You must restart the system for this setting to take effect. 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.
- **CD/DVD ROM Drive BBS Priorities**—Use this setting to access the **CD/DVD ROM Drive BBS Priorities** submenu to re-order or disable bootable CD/DVD ROM drive devices. Refer to the **CD/DVD ROM Drive BBS Priorities Submenu** section for more information.
- **Floppy Drive BBS Priorities**—Use this setting to access the **Floppy Drive BBS Priorities** submenu to re-order or disable bootable floppy drive devices. Refer to the **Floppy Drive BBS Priorities Submenu** section for more information.
- **Network Device BBS Priorities**—Use this setting to access the **Network Device BBS Priorities** submenu to re-order or disable bootable network

devices. Refer to the **Network Device 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.

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.

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 Factory 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.

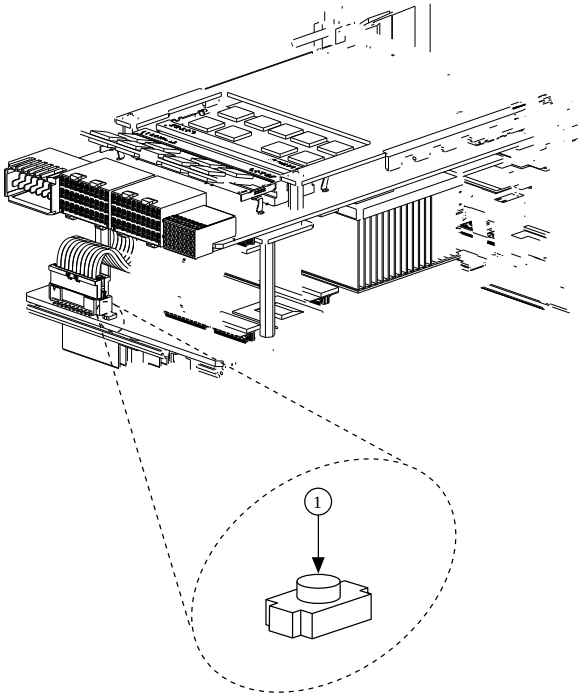
System CMOS

The PXIe-8861 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 push-button switch, as shown in the following figure.
4. Wait 10 seconds.
5. Reinstall the controller in the chassis.

Figure 2. Clearing the CMOS Contents



1. Push-Button Switch SW1

Boot Options

The PXIe-8861 can boot from the following devices:

- The internal solid state drive
- An external SCSI hard drive or SCSI CD/DVD-ROM if an SCSI adapter, such as the PXI-8214, is used.
- A network PXE server on the same subnet.
- An external USB mass storage device such as a USB hard drive, USB CD/DVD-ROM, or USB flash drive.
- An external USB floppy 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

PXIe-8861 controllers preinstalled with Windows include two methods of restoring the original factory condition of your drive. Solid state drive-based recovery stores a factory backup on a separate portion of your drive, allowing you to restore your controller without additional media. You also can recover the system using external recovery media created by NI (p/n 502202A-00) or by using Windows Recovery tools.

Note The drive recovery hot key is <1>. To access the drive-based recovery tool, press and hold <1> when video first appears during the boot process.

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

Upgrade Information

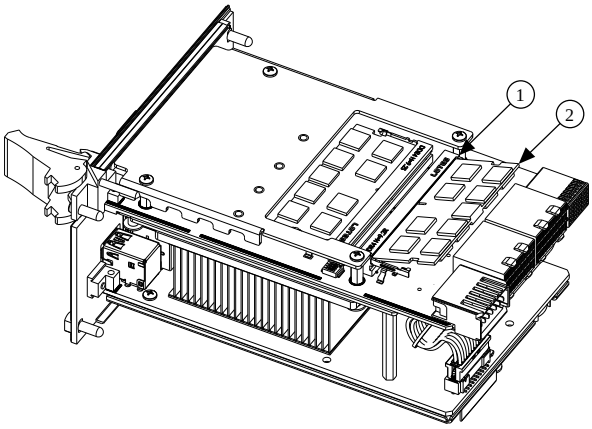
You can change the amount of installed RAM on the PXIe-8861.

National Instruments offers the following SO-DIMMs for use with the PXIe-8861 controller.

- 8 GB DDR4-2133 compatible SO-DIMM (NI part number 786777-01)
- 16 GB DDR4-2133 compatible SO-DIMM (NI Part number 786776-01)

Note National Instruments has tested and verified that the SO-DIMMs we sell work with the PXIe-8861 controller. We recommend you purchase your SO-DIMM modules from National Instruments. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.

Figure 3. Installing a SO-DIMM in a PXIe-8861 Controller



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

Installing an OS

PXIe-8861 controllers may include a preinstalled OS. In some cases, you may want to install a different OS. Refer to the **Boot Options** section of this document for a list of devices the PXIe-8861 may boot from for OS installations.

Removable Hard Drive

This section describes how to install and remove the removable hard drive.

Caution You must install the removable hard drive before powering on the PXIe-8861. Do not remove the hard drive during operation.

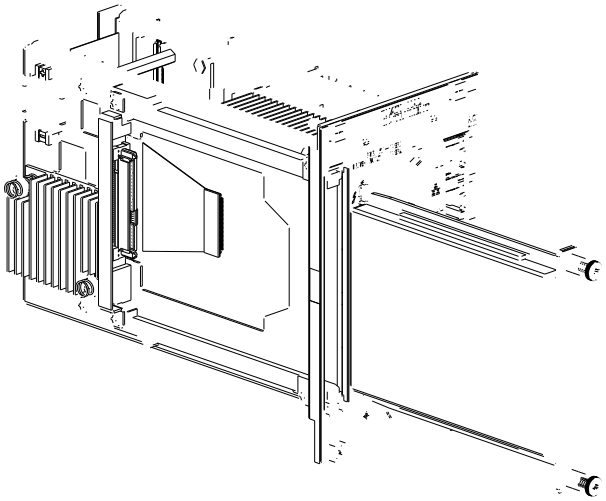
Installing the Removable Hard Drive

To install the removable hard drive, complete the following steps:

1. Hold the removable hard drive so that the top side is facing left, as shown in the following figure.
2. Insert the removable hard drive so that it is completely seated in its connector. The insertion resistance will increase for the final connector mate.
3. If the removable hard drive does not easily insert, do not force the drive. Check the alignment and try again.

4. Tighten the thumb screws. If the thumb screws do not thread, the removable hard drive may not be fully inserted. Try removing and completely inserting the removable hard drive.

Figure 4. Installing the Removable Hard Drive in a PXIe-8861 Controller



1. Removable Hard Drive
2. Thumb Screws (2x)

Removing the Removable Hard Drive

To remove the removable hard drive, complete the following steps:

1. Power off the chassis.
2. Loosen the thumb screws.
3. Unseat the removable hard drive from the connector and remove it from the slot.

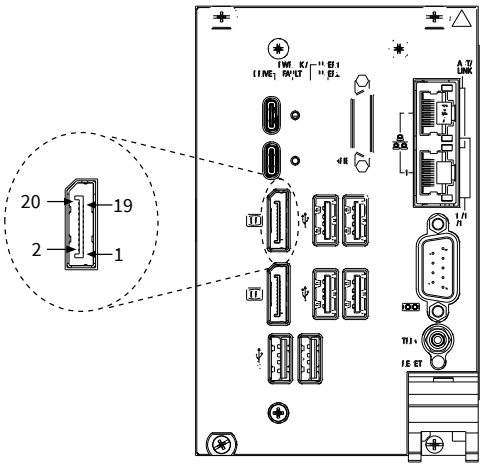
Store the hard drive in the original antistatic packaging when not in use to avoid damage.

I/O Information

DisplayPort

The following figure shows the location and pinouts for the DisplayPort connectors on the PXIe-8861.

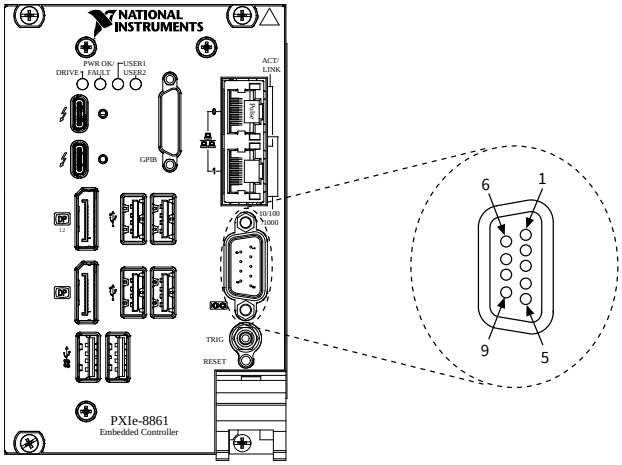
Figure 5. DisplayPort Connector Location and Pinout



RS-232 Serial Port

The following figure shows the location and pinouts for the serial port connector on the PXIe-8861.

Figure 6. Serial Port Connector Location and Pinout

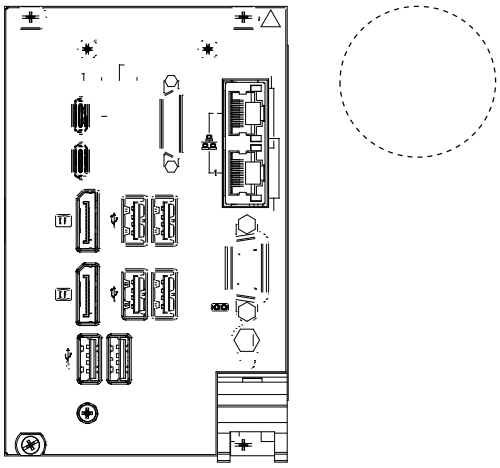


Ethernet

The following figure shows the dual stacked Ethernet connector location on the PXIe-8861.

Note Only Ethernet Port 0 supports the Wake on LAN feature.

Figure 7. Ethernet Connector Location and Pinout



Note The Ethernet controller can perform an automatic crossover, thus eliminating the need for crossover cables.

The following table lists and describes the 10/100/1000 LAN connector LED states.

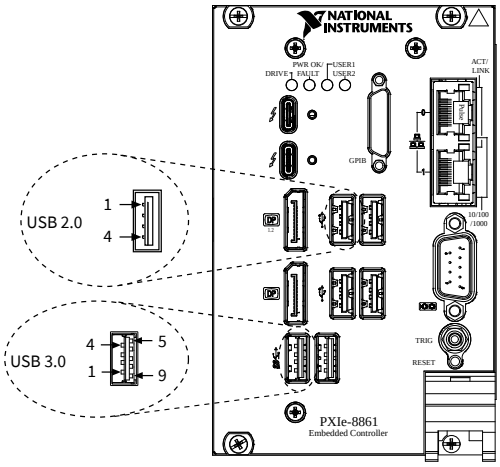
Table 1. 10/100/1000 LAN Connector LED States

LED	Color	LED State	Condition
Top	Green	Off	LAN link is not established.
		On (steady state)	LAN link is established.
		On (brighter and pulsing)	The controller is communicating with another computer on the LAN.
Bottom	Unlit	Off	10 Mbit/sec data rate is selected.
	Green	On	100 Mbit/sec data rate is selected.
	Amber	On	1000 Mbit/sec data rate is selected.

Universal Serial Bus

The following figure shows the Universal Serial Bus (USB) connector locations on the PXIe-8861. Each controller has four USB 2.0 ports and two USB 3.0 ports on the front panel.

Figure 8. USB Connector Location



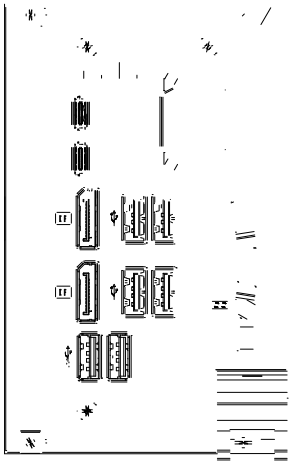
Trigger

The TRIG connector is the software-controlled trigger connection for routing PXI triggers to or from the backplane trigger bus.

The following figure shows the TRIG connector location on the PXIe-8861.

Refer to **PXI Trigger Connectivity** in the **PXIe-8861 Getting Started Guide** for more information about the SMB trigger.

Figure 9. TRIG Connector Location and Pinout



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